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NINE MILE POINT NUCLEAR STATION UNIT 2

OPERATING PROCEDURE

PROCEDURE NO. N2-OP-97

REACTOR PROTECTION SYSTEM

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NIAGARA MOHAWK POWER CORPORATION

THIS PROCEDURE NOT TO BE USED
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SUBJECT TO PERIODIC REVIEW.

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N2-OP-97

REACTOR PROTECTION SYSTEM

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REACTOR PROTECTION SYSTEM

A. TECHNICAL SPECIFICATIONS

1.0	2.2	Limiting Safety System Settings
2.0	3/4.3.1	Reactor Protection System Instrumentation
3.0	3/4.3.2	Isolation Actuation Instrumentation
4.0	3/4.3.4	Recirculation Pump Trip Actuation Instrumentation
5.0	3/4.8.4.4	Reactor Protection System Power Supply Monitoring

B. SYSTEM DESCRIPTION

1.0 The Reactor Protection System (RPS) initiates a rapid shutdown or "SCRAM" of the reactor when specific operating parameters indicate a potentially unsafe operating condition. The RPS system is designed as a "Fail-Safe" system such that loss of a signal or power will produce a protective action.

The logic of the RPS system is known as a "one out of two-taken twice-coincident" logic.

The RPS utilizes two separately powered trip systems identified as Trip System A and Trip System B. Each trip system is comprised of two automatic trip channels which produce the automatic trip signals. The two trip channels for Trip System A are identified as Trip Channels A-1 and A-2. Similarly, the trip channels for Trip System B are Trip Channels B-1 and B-2. The trip systems receive power from the 10kVA RPS uninterruptible power supplies 2VBB-UPS3A&3B.

The trip channels receive input from various sensing and initiating devices which monitor plant parameters. Each channel monitors the same plant parameters. All of the control switches, relays, and instruments (except those mounted locally) for Trip System A are located on control room panel 2CEC*PNL609. All of the control switches, relays, and instruments for Trip System B are located on control room panel 2CEC*PNL611. The separation of the two trip systems minimizes the probability of interactions that could increase the possibility of false scrams or failure to scram.

During normal operation, all of the sensor and trip contacts are closed, energizing Trip Channels A-1, A-2, B-1, and B-2. A trip of any device in a trip channel trips the channel. A FULL SCRAM is initiated only when a trip occurs in both trip systems. If only one trip system is tripped, a 1/2 SCRAM exists. A reactor scram is the rapid insertion of the control rods into the reactor core. There are a total of 185 control rods, which are controlled by individual hydraulic control units (HCUs). The HCUs are divided into four groups. Group 1 has 45 units, Group 2 has 45 units, Group 3 has 47 units, and Group 4 has 48 units.

The components of each hydraulic control unit scram section consist of the scram inlet and outlet valves, (AOV126 and 127, respectively) the scram pilot valve (SOV-139), a scram accumulator, and all associated valves and instrumentation. | 3

Trip Systems A and B supply control signals to scram pilot valve RDS-SOV139. The scram pilot valve is a solenoid-operated, three-way valve. It receives power from the RPS buses. RPS Bus A supplies power to the A solenoid and RPS Bus B supplies power to the B solenoid. The RPS buses are energized from the high inertia MG sets (2RPM-MG1A, B). When energized, the valve provides an instrument air path to the scram inlet and outlet valves. Only one of the two scram pilot valve solenoids need be energized to provide the instrument air path to the scram inlet and outlet valves. | 3

The scram inlet and outlet valves are air-to-close, fail open valves. When no scram signal exists, the scram pilot valve is energized and there is a path for instrument air to hold closed the scram inlet and outlet valves. If a trip occurred in trip system A, either as a result of a channel A-1 or A-2 trip, the scram pilot valve A solenoid would de-energize and a control room annunciator and computer point would be energized. The result would be 1/2 SCRAM. The scram inlet and outlet valves would still be closed since a path for the instrument air would still exist. A trip of trip system B would be similar to that described above except that the scram pilot valve B solenoid would de-energize instead of the A solenoid.

If a trip occurs in both trip systems, both scram pilot valve solenoids de-energize, cutting off the instrument air supply to the scram inlet and outlet valves and venting the scram inlet and outlet instrument air lines to atmosphere. The scram inlet and outlet valves fail open and a FULL SCRAM exists. When a full scram exists, the scram discharge volume (SDV) instrument air isolation valves, (2RDS-SOV154-155) are de-energized. The SDV isolation valves, when energized, provide a path for instrument air to the SDV vent and drain valves (2RDS*AOV132 and *AOV124, and AOV123 and 130 respectively). The SDV vent and drain valves are air-to-open, fail closed globe valves. During a FULL SCRAM, the SDV vent and drain valves fail closed, isolating the SDV. Also, when a FULL SCRAM

exists, both control rod drive backup scram valves (2RDS*137, *138) energize to vent the air supply from the scram air header. Backup scram valves act as a second means of opening the scram valves, thus providing an added safety factor.

Following a 1/2 SCRAM or FULL SCRAM, the RPS must be manually reset. The reset is possible only if the conditions that initially caused the trip have been cleared. Reset is accomplished by utilizing the scram reset switches on control room panel 2CEC*PNL603. The switches are control switches with NORMAL - RESET positions. The switch spring returns to NORMAL from the RESET position. One switch is utilized in each trip channel. To reset a 1/2 SCRAM, the reset switch in the tripped channel is utilized. A FULL SCRAM cannot be reset for 10 sec after the scram is first initiated. This assures that the control rods have been fully inserted. *2

2.0 RPS Power Supplies

2.1 RPS Trip System

RPS Trip Systems A and B are energized from individual 10kVA uninterruptible power supplies (2VBB-UPS3A and B, respectively). Each UPS receives a normal 575-V, alternate 120-V regulated ac supply, and a 125-V dc supply (refer to Table II).

Under normal operating conditions, 2VBB-UPS3A is energized from 600VAC non-safety related lighting panel 2LAT-PNL100. In case of loss of its normal supply, UPS3A automatically receives power from its backup dc source provided by non-safety related 125VDC battery 2BYS-BAT1C via the non-safety related switchgear bus 2BYS-SWG001C. This battery is capable of feeding the UPS for up to 2 hours in the event of loss of all ac sources. In case of failure of any inverter, the UPS is fed from its alternate 600VAC source from non-safety related distribution panel 2NJS-PNL500.

2VBB-UPS3B operates the same as 2VBB-UPS3A. Its normal AC power is received from 2NJS-PNL402 with backup 125dc power supplied from 2BYS-BAT1B via bus 2BYS-SWG001B. It receives alternate 600VAC power from non-safety related distribution panel 2NJS-PNL600.

2.2 RPS MG Sets (refer to Table II)

The scram pilot valve is energized from the RPS buses, which normally receive power from the high inertia motor-generator sets (2RPM-MG1A, B). Each motor-generator set consists of a horizontal induction motor driving a flywheel and a synchronous generator. The flywheel is provided with the MG set to supply

sufficient stored energy to maintain voltage and frequency during momentary power interruptions. MG sets 2RPM-MG1A and B provide power for RPS Bus A (2RPM*PNLA100) and RPS Bus B (2RPM*PNLB100), respectively, via panels 2RPM-PNL1A and 1B respectively and electrical protective assemblies (EPAs, 2RPM*ACB1A & 2A for 2RPM*PNLA100 and 2RPM*ACB1B & 2B for 2RPM*PNLB100).

The EPAs consist of trip components that disconnect RPS circuitry from input power whenever voltage or frequency exceed their normal tolerance.

An alternate power source is available for each RPS bus to allow for MG maintenance. The alternate power sources for RPS Bus A and RPS Bus B are transformers 2RPM-X1A and B, respectively. Transformers 2RPM-X1A and B are powered from panels 2LAT-PNL100 and 2LAS-PNL400, respectively. Transformers 2RPM-X1A and X1B feed the RPS buses via panels 2RPM-PNL1A and 1B, respectively, and the electrical protective assemblies. An interlock prevents both RPS buses from being supplied from the alternate power supply at the same time.

C. OPERATING REQUIREMENTS

1.0	Control Rod Drive Hydraulic System (RDS)	N2-OP-30
2.0	Instrument and Service Air (IAS)	N2-OP-19
3.0	Neutron Monitoring System (NMS)	N2-OP-92
4.0	Nuclear Boiler Instruments (ISC)	N2-OP-34
5.0	Normal AC Distribution as required	N2-OP-71
6.0	Standby and Emergency AC Distribution as required	N2-OP-72
7.0	Normal DC Distribution as required	N2-OP-73A
8.0	Reactor Building Drains	N2-OP-63

TCN-1

D. PRECAUTIONS/LIMITATIONS

1.0 Observe normal safety precautions when working with RPS circuits and the RPS motor generator sets.

2.0 The RPS MG sets are equipped with thermal overload heaters which trip the MG set when a thermal overload condition exists. These heaters will automatically reset after cooldown. Following an MG set trip, an operator should be dispatched to manually depress the "OFF" pushbutton if unexpected restart of the MG set could result in personal injury or equipment damage.

3.0 Following any trip of an RPS channel, that channel must be manually reset using the scram reset switch on P603.

4.0 Care should be exercised when performing routine surveillances and calibrations on instruments providing input to RPS. When performing surveillances and/or calibrations on more than one instrument loop at a time, it should be verified that these instruments are in the same channel. This will prevent inadvertant scrams.

E. STARTUP PROCEDURE

1.0 Startup of RPS Power Supply 2VBB-UPS3A and 2VBB-UPS3B

1.1 Startup 2VBB-UPS3A and 2VBB-UPS3B per the appropriate sections of N2-OP-71.

1.2 Reset the appropriate Electrical Protection Assemblies (EPA's) by placing the EPA's output breaker to the "OFF" position and then back to the "ON" position to energize the RPS instrumentation.

1.3 Reset scram signals at P603 using appropriate scram reset switches. TCN

1.4 Reset NSSSS isolations by depressing both MSIV and drain valve manual isolation reset switches on P602.

2.0 Startup of the RPS MG sets 2RPM-MG1A and 2RPM-MG1B

2.1 Verify electrical lineup per Table II of this procedure.

NOTE: If both RPS MG sets have been secured with one RPS channel on its alternate power supply and the other RPS channel de-energized, then the RPS MG sets should be started in the following order:

a. Start the MG set for the de-energized channel first.

b. Start the MG set for the channel on the Alternate Power Supply second.

Starting the MG sets in this order will prevent a full scram being caused by both RPS channels being de-energized at the same time.

2.2 At the MG set to be started, depress the START pushbutton.

2.3 When the MG set has reached rated speed and voltage (as indicated by the voltmeter on the MG set control panel), close the MG set output breaker.

NOTE: The RPS EPA's must be reset manually in order to supply MG set power to the RPS channels. To reset the EPA's, place the EPA's output breaker in the "OFF" position and then return it to the "ON" position.

2.4 If the RPS channel powered by the MG set has been on its alternate power supply, then perform the following:

a. Verify that no scram signals are present on the other RPS channel, if possible.

b. Place the Power Source Selector Switch on P610 to the "NORM" position.

c. Locally reset the RPS channel's EPA's.

d. Verify appropriate pilot scram valve solenoid lights energize on P603.

2.5 If the RPS channel powered by the MG set has been de-energized, then perform the following:

a. Locally reset the RPs channel's EPA's.

b. Verify appropriate pilot scram valve solenoid lights energize on P603.

2.6 Repeat steps 2.2 thru 2.5 for the other RPS MG set as required.

F. NORMAL OPERATION

The RPS system does not require operator action for normal operation except for routine monitoring of power supplies 2VBB-UPS3A and 2VBB-UPS3B.

G. SHUTDOWN PROCEDURE

1.0 Shutdown of RPS Power Supply 2VBB-UPS3A and 3B.

1.1 Shutdown 2VBB-UPS3A and 2VBB-UPS3B per the appropriate sections of procedure N2-OP-71.

2.0 Shutdown or trip of RPS MG Sets 2RPM-MG1A and/or 2RPM-MG1B

2.1 Verify that appropriate alternate power supply transformer is available for the MG set to be shutdown (2RPM-X1A for the A MG set and 2RPM-X1B for the B MG set) if required.

NOTE: Shifting from normal to alternate supplies will result in a half-scram on that channel. Insure that no scram signals are present on the other channel prior to transferring to the alternate power supply or a full scram will result.

Only one RPs channel may be supplied from its alternate power supply at a time. If both MG sets are to be secured, determine which channel is to be supplied by its alternate power supply and secure that MG set first. After that MG set has been secured and its associated RPS channel is powered by its alternate power supply, the second MG set can be secured without causing a full scram.

2.2 At P610, place the Power Source Selector Switch to "ALT A" if the A MG set is to be secured or has tripped, or "ALT B" if the B MG set is to be secured or has tripped.

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2.3 Locally reset the RPS channels EPA.

2.4 If the over voltage trip will not reset:

2.4.1 Reduce bus voltage at 2NPS-SWG001 (or 003) to approximately 13.4 KV.

2.4.2 Reset the EPA.

2.4.3 Restore bus voltage at 2NPS-SWG001 (or 003) to a nominal 13.8 KV.

2.5 Verify appropriate pilot scram valve solenoid lights energize on P603.

2.6 At the MG set to be secured, manually open the MG set output breaker.

2.7 Depress the MG set "STOP" pushbutton and hold until the green "OFF" status light is illuminated.

2.8 If a second MG set is to be shutdown, repeat Steps 2.5 and 2.6 for the other MG set.

H. OFF NORMAL PROCEDURE

1.0 Loss of Protective System Channel

Place the inoperative RPS channel in the tripped condition if doing so will not result in a full scram.

1.2 Refer to Technical Specification 3/4.3.1 for required actions.

1.3 After returning the channel to an operable condition, place the channel back in service and reset the half scram using the scram reset switches on P603.

2.0 This section has been deleted.

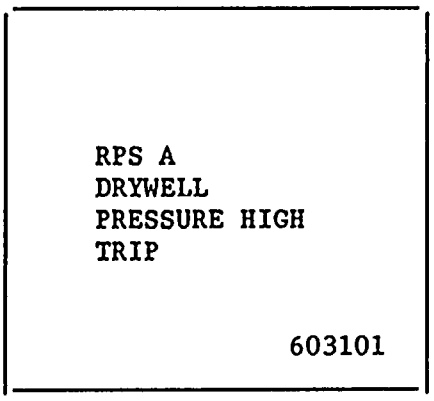
TCN- 19

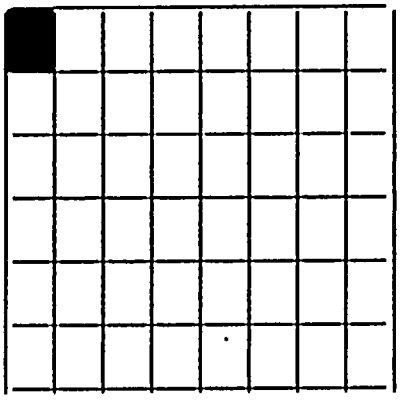
I. PROCEDURES FOR CORRECTING ALARM CONDITIONS

1.0 603101 Reactor Protection System A Drywell Pressure High Trip

Reflash: Yes

TCN 18





603101

1.1

Computer Point	Computer Printout	Source
ISCUC09	RPS A1 DW PRESS HI TR	2ISC*PIS-1650A
ISCUC10	RPS A2 DW PRESS HI TR	2ISC*PIS-1650C

*3

1.2 Automatic Response

a. RPS Channel A Half Scram

b. Traversing Incore Probe (TIP) System half isolation (Group 3).

c. RHR sample and Radwaste valves half isolation (Group 4).

d. Containment purge valves half isolation (Group 9).

e. RCIC Vacuum Bkr Isolation Valve half isolation permissive (also requires low RCIC steam supply for half isolation).

f. Group 8 half isolation.

g. Standby Gas Treatment half initiation signal.

1.3 Corrective Action

a. If a scram has occurred, perform the following:

1. Verify all automatic actions have occurred. If any automatic action did not occur, manually initiate that action.

2. Refer to N2-OP-101C for scram recovery.

3. Refer to Emergency Operating Procedures.

b. If no scram has occurred, perform the following.

1. Check drywell pressure indicators 2ISC-PIS1650A and 1650C on P609 and 2ISC-PIS1650B and 1650D on P611 to verify that no scram should have occurred.

2. If a scram should have occurred then:

a. Enter the Emergency Operating Procedures.

3. If no scram should have occurred then perform the following:

a. Refer to Technical Specifications for actions.

b. Troubleshoot and correct the cause of the alarm condition.

c. After correction of the alarm condition, reset the half scram using the scram reset switches on P603 and reset the half NS^4 isolation using the applicable isolation reset pushbuttons on P601.

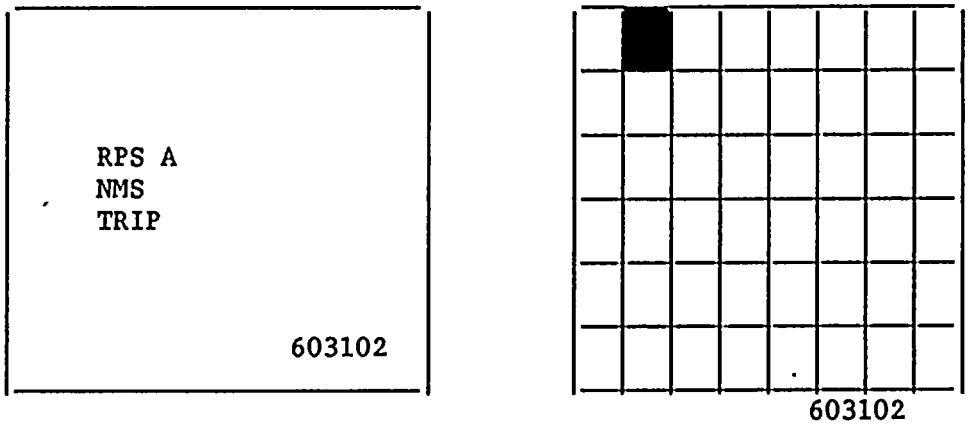
d. Return any isolated systems to service using the applicable operating procedures.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

2.0 603102 Reactor Protection System A Neutron Monitoring System Trip

Reflash: Yes

TCN- 18



2.1	Computer Point	Computer Printout	Source	
	NMEUC01	RPS CH A1 NMS TRIP	APRM A or E IRM A or E	* 3
	NMEUC02	RPS CH A2 NMS TRIP	APRM C or E IRM C or G	*3

Setpoints: APRM:

a. Thermal Power 118% in Run

b. Flow Biased
51% + .66(W-ΔW) in Run.

c. > 15% not in run.

d. Inop

Setpoints: IRM:

a. 120/125 of scale (not in run).

b. Inop (not in run).

2.2 Automatic Response

a. RPS Channel A Half Scram

2.3 Corrective Action

a. If a scram has occurred, then refer to N2-OP-101C for scram recovery.

b. If no scram has occurred, perform the following:

1. Check the other IRM or APRM channels on P603 to verify that no Reactor Scram should have occurred.

2. If a scram should have occurred, then:

a. Enter the Emergency Operating Procedures.

3. If no scram should have occurred, then perform the following:

a. Refer to Technical Specifications for actions.

b. Troubleshoot and correct the cause of the alarm.

c. After correction of the problem, reset the half scram using the Scram Reset switches on P603.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

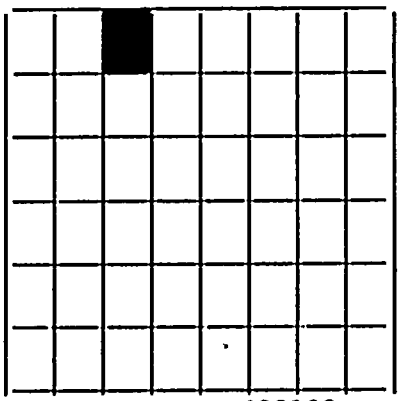
3.0 603103 Reactor Protection System A Reactor Pressure High Trip

TCN-18

Reflash: Yes

RPS A
REACTOR
PRESSURE HIGH
TRIP

603103



603103

3.1	Computer Point	Computer Printout	Source
	ISCUC05	RPS A1 RX PRESS HI TR	2ISC*PIS-1678A
	ISCUC06	RPS A2 RX PRESS HI TR	2ISC*PIS-1678C

*3

Setpoint: 1037 psig

3.2 Automatic Response

a. RPS Channel A Half Scram

3.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Refer to N2-OP-101C.

2. Refer to Emergency Operating Procedures.

b. If no Reactor Scram has occurred, perform the following:

1. Check reactor pressure indicators 2ISC-PIS1678A and 2ISC-PIS1678C on P609 and 2ISC-PIS1678B and 2ISC-PIS1678D on P611 to verify that no scram should have occurred.

2. If a Reactor Scram should have occurred then:

   a. Enter the Emergency Operating procedures.

3. If no scram should have occurred then perform the following:

   a. Refer to Technical Specifications for actions.

   b. Troubleshoot and correct the cause of the alarm condition.

   c. After correction of the alarm condition, reset the half scram using the scram reset switches on P603.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

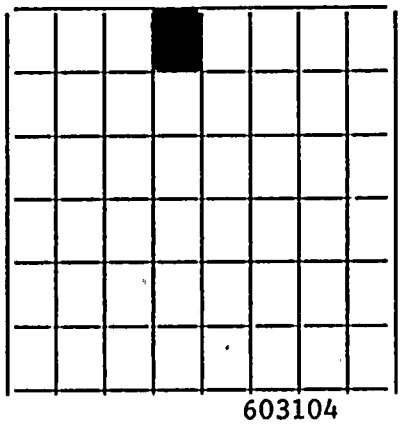
4.0 603104 Reactor Protection System A Turbine Control Valve Fast Closure Trip

Reflash: Yes

TCN. 18

RPS A
TURB CONT VLV
FAST CLOSE
TRIP

603104



603104

4.1

Computer Point	Computer Printout	Source
MSSUC09	TURB CV FAST CLS TR 2RPS*PS2A CH A	* 3
MSSUC10	TURB CV FAST CLS TR 2RPS*PS2C CH C	

Setpoint: EHC Oil Pressure 530 psig dec.

4.2 Automatic Response

a. RPS Channel A Half Scram

4.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Refer to N2-OP-101C for scram recovery.

b. If no scram has occurred, perform the following:

1. Check the Main Turbine panel and verify that a turbine trip has not occurred and that no scram was required.

2. If a scram should have occurred, then:

   a. Enter the Emergency Operating Procedures.

3. If no scram should have occurred, then perform the following:

   a. Refer to Technical Specifications for actions.

   b. Troubleshoot and correct the cause of the alarm.

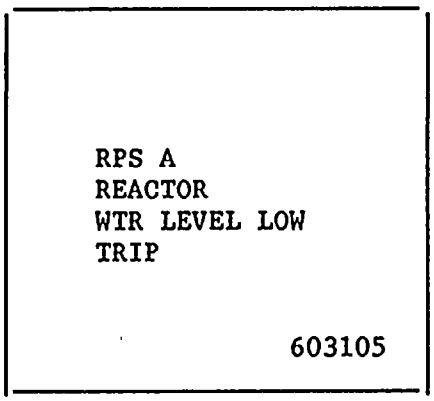
   c. After correction of the alarm condition, reset the half scram using the Scram Reset switches on P603.

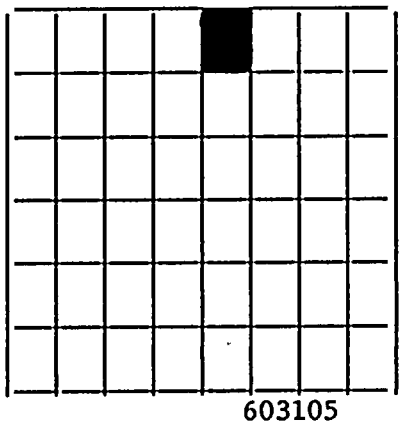
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

5.0 603105 Reactor Protection System A Reactor Water Level Low Trip

TCN 18

Reflash: Yes





5.1

Computer Point	Computer Printout	Source
ISCUC01	RPS A1 RX WTR LVL LO TR	2ISC*LIS1680A
ISCUC02	RPS A2 RX WTR LVL LO TR	2ISC*LIS1680C

* 8

Setpoint: 159.3 inches

5.2 Automatic Response

a. RPS Channel A Half Scram

b. Group 4 NS^4 half isolation.

c. Group 5 NS^4 half isolation.

5.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Verify all automatic actions have occurred. Manually initiate any action that did not occur.

2. Refer to N2-OP-101C for scram recovery.

3. Refer to Emergency Operating Procedures.

b. If no Reactor Scram has occurred, perform the following:

1. Check that Reactor Water Level is greater than the Level 3 trip point per 2ISC*LIS1680A and *LVS1680C on P609 and 2ISC*LIS1680B and *LIS1680D and that no Reactor Scram is required.

2. If a Reactor Scram should have occurred then:

a. Enter the Emergency Operating Procedure.

3. If no Reactor Scram should have occurred then perform the following:

a. Refer to Technical Specifications for actions.

b. Troubleshoot and correct the cause of the alarm condition.

c. After correction of the alarm condition, reset the Reactor Scram using the scram reset switches on P603. Reset the group 4 and group 5 isolation by depressing the appropriate NS4 isolation reset pushbuttons at P602.

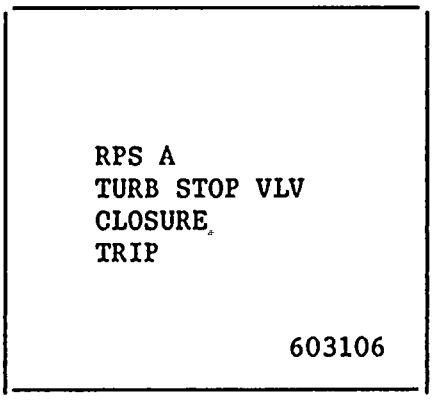
d. Return any isolated systems to service using the applicable operating procedure.

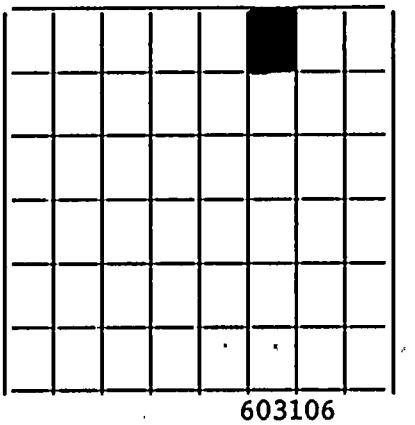
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

6.0 603106 Reactor Protection System A Turbine Stop Valve Closure Trip

TCN 18

Reflash: Yes





6.1

Computer Point	Computer Printout	Source
MSSUC13	TURB SV FAST CLS TR CH A	2RPS*ZS1A 2RPS*ZS1D
MSSUC14	TURB SV FAST CLS TR CH C	2RPS*ZS1C 2RPS*ZS1E

* 3

Setpoint: Valve 5% Closed.

6.2 Automatic Response

a. RPS Channel A Half Scram

6.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Refer to N2-OP-101C for scram recovery.

b. If no scram has occurred, perform the following:

1. Check the Main Turbine panel and verify that a turbine trip has not occurred and that no scram was required.

2. If a scram should have occurred, then:

   a. Enter the Emergency Operating Procedures.

3. If no scram should have occurred, then perform the following:

   a. Refer to Technical Specifications for actions.

   b. Troubleshoot and correct the cause of the alarm condition.

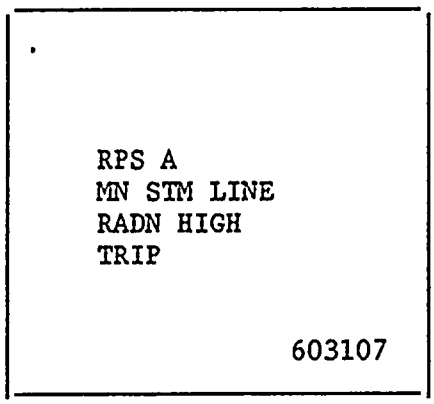
   c. After correction of the alarm condition, reset the half scram using the Scram Reset switches on P603.

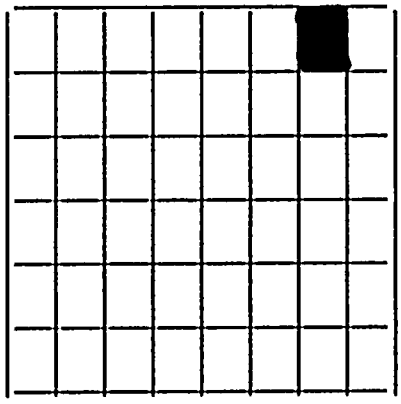
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

7.0 603107 Reactor Protection System A Main Steam Line Radiation High Trip

Reflash: Yes

TCN- 18





603107

7.1	Computer Point	Computer Printout	Source
	MSSUC05	MN STM LN CHAN A RADN HI	C51A-Z2A
	MSSUC06	MN STM LN CHAN C RADN H	C51A-Z2C

Setpoint: 3X Normal full power background.

7.2 Automatic Response

a. RPS Channel A Half Scram

b. Group 1 half isolation (MSIV's and MSIV drain lines).

c. Group 2 half isolation (Recirc. sample valves).

d. Half trip signal to the Mechanical Vacuum Pumps 2ARC-P1A and P1B.

e. Half isolation signal to valve 2ARC-AOV105.

7.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Verify that all automatic actions have occurred. Manually initiate any automatic action that did not occur.

2. Refer to the Emergency Operating Procedures.

b. If no scram has occurred, perform the following.

1. Check the main steam line radiation monitors 2C51A-Z2A and Z2C on P606 and 2C51A-Z2B and Z2D on P633 to verify that no scram should have occurred.

2. If a scram should have occurred then:

a. Enter the Emergency Operating procedures.

3. If no scram should have occurred then perform the following:

a. Refer to Technical Specifications for actions.

b. Troubleshoot and correct the cause of the alarm condition.

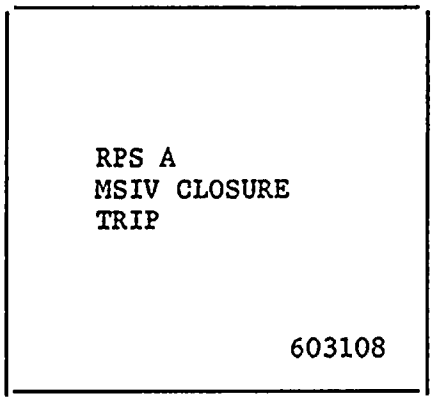
c. After correction of the alarm condition, reset the Group 1 and Group 2 half isolations using the appropriate isolation reset pushbuttons on P603.

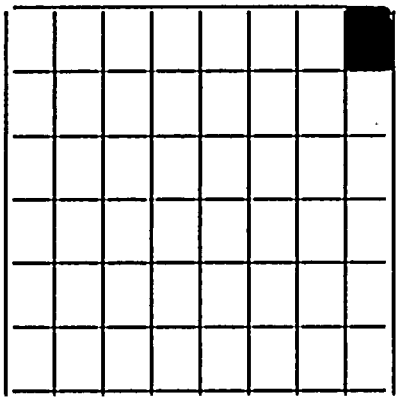
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

8.0 603108 Reactor Protection System A Main Steam Isolation Valve Closure Trip

Reflash: Yes

TCN- 18





603108

8.1	Computer Point	Computer Printout	Source
	MSSUC01	MSL ISOL V CLOS CHAN A	2MSS*AOV6A 2MSS*AOV7A
	MSSUC02	MSL ISOL V CLOS CHAN C	2MSS*AOV6C 2MSS*AOV7C

Setpoint: MSIV 8% Closed.

8.2 Automatic Response

a. RPS Channel A Half Scram

8.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Refer to N2-OP-101C for scram recovery.

2. Refer to Emergency Operating Procedure.

b. If no scram has occurred, perform the following:

1. Check MSIV status lights on P602 to verify that MSIV's are open and no scram was required.

2. If a scram should have occurred then:

   a. Enter the Emergency Operating Procedures.

3. If no scram should have occurred, then perform the following:

   a. Refer to Technical Specifications for actions.

   b. Troubleshoot and correct the cause of the alarm condition.

   c. After correction of the alarm condition, reset the half scram using the scram reset switches on P603 and reset the Group 1 and Group 2 isolation signal using the appropriate reset pushbuttons on P602.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

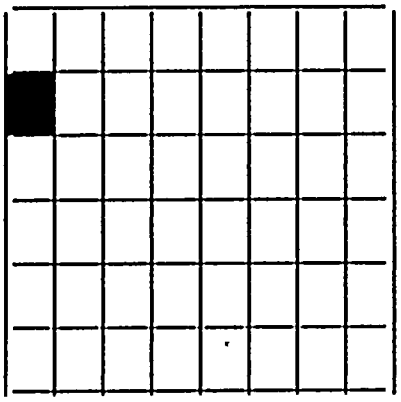
9.0 603109 Reactor Protection System A Discharge Volume High Level Trip

Reflash: Yes

TCN-18

RPS A
DISCH VOLUME
HIGH LEVEL
TRIP

603109



603109

9.1

Computer Point	Computer Printout	Source
RDSUC05	RPS A1 DIS VOL HI LVL TR	2RDS*LISY12B 2RDS*LSY11A
RDSUC06	RPS A2 DIS VOL HI LVL TR	2RDS*LISY12A 2RDS*LSY11B

Setpoint: 46.5"

* 3

9.2 Automatic Response

a. RPS Channel A Half Scram

9.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Refer to N2-OP-101C for scram recovery.

b. If no scram has occurred, perform the following:

1. Check the scram discharge volume level indicating switches 2RDS*LISY12A and 12B on P609 and 2RDS*LISX12A and 12B on P611 to verify that no scram should have occurred.

2. If a scram should have occurred then:

   a. Enter the Emergency Operating Procedure.

3. If no scram should have occurred, then perform the following:

   a. Refer to Technical Specifications for actions.

   b. Troubleshoot and correct the cause of the alarm condition.

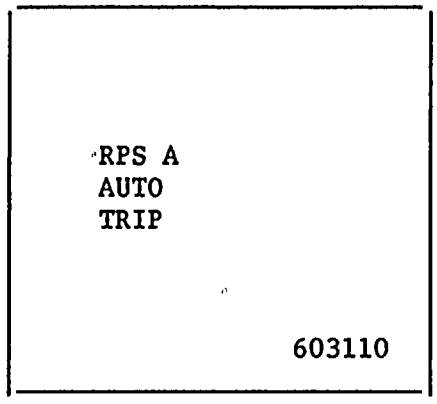
   c. After correction of the alarm condition, reset the half scram using the scram reset switches on P603.

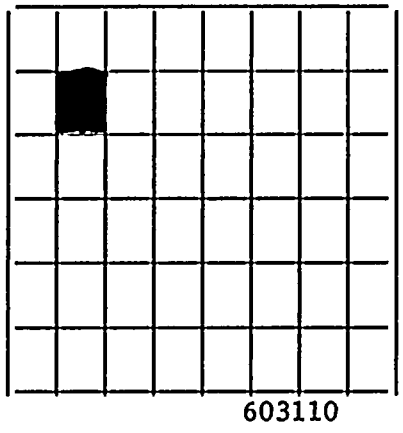
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

10.0 603110 Reactor Protection System A Auto Trip

Reflash: No

TCN- 18





10.1	Computer Point	Computer Printout	Source
	RPSUC03	REACTOR SCRAM DIV 1 OR 3	C72A-K14A C72A-K14C

10.2 Automatic Response

a. RPS Channel A Half Scram

b. RPS Scram pilot valve solenoid A de-energizes and either 2 or 4 of the RPS A pilot valve status lights on P603 de-energize.

10.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Determine the cause of the scram by observing other annunciators on P603.

2. Refer to N2-OP-101C for scram recovery.

3. Refer to Emergency Operating Procedures if the parameter causing the scram is an entry condition to an EOP.

a. If no scram has occurred, perform the following:

1. Determine the cause of the channel trip and verify that no scram should have occurred by observing that no monitored parameter in trip Channel B has exceeded its setpoint.

2. If a scram should have occurred then:

3. Refer to Emergency Operating Procedures.

b. If no scram should have occurred then perform the following:

a. Refer to Technical Specifications for actions.

b. Troubleshoot and correct the cause of the alarm condition.

c. After correction of the alarm condition, perform the following:

1. Reset the half scram using the scram reset switches on P603.

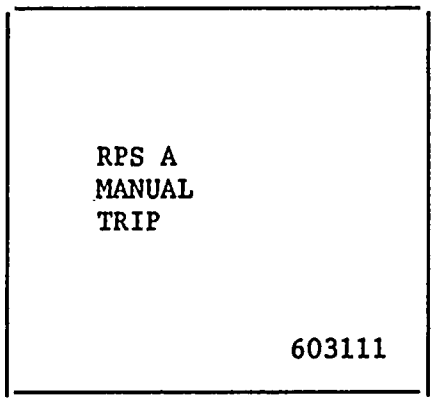
2. Verify that all scram pilot valve status lights on P603 are energized.

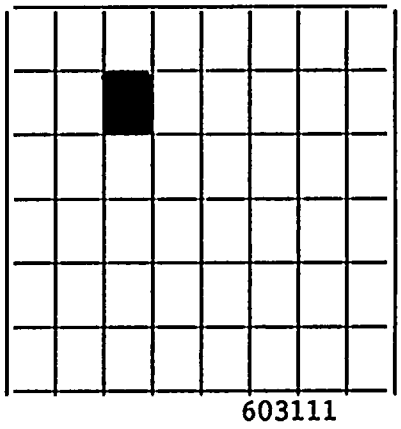
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

11.0 603111 Reactor Protection System A Manual Trip

Reflash: No

TCN- 18





11.1	Computer Point	Computer Printout	Source
	RPSUC01	MANUAL SCRAM DIV 1 OR 3	Channel A1 or A2 Manual scram pushbuttons on P603 armed and depressed or reactor mode switch in "SHUTDOWN."

11.2 Automatic Response

a. RPS Channel A Half Scram

11.3 Corrective Action

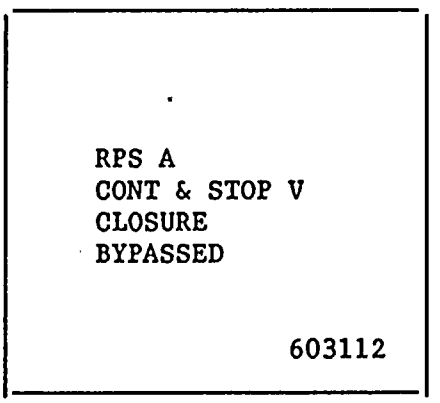
NOTE: If this annunciator is caused by placing the Reactor Mode Switch in "SHUTDOWN," the scram signal will be bypassed after approximately 10 seconds. The manual scram pushbutton is spring return to normal. Therefore this annunciator will clear when, 1) the manual scram pushbutton is released; and/or 2) 10 seconds after the mode switch is placed in the "SHUTDOWN" position. The half scram signal must still be reset using the scram reset switches, on P603.

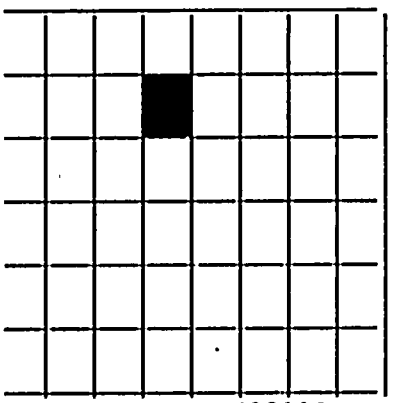
a. Reset the scram using the scram reset switch on P603 when appropriate.

12.0 603112 Reactor Protection System A Control & Stop Valve Closure Bypassed

Reflash: Yes

TCN- 18





12.1

Computer Point	Computer Printout	Source
RPSBC01	RPS A1 CV/SV CLSR BYP	2MSS*PIS1652A
RPSBC02	RPS A2 CV/SV CLSR BYP	2MSS*PIS1652C

* 3

Setpoint: 30% power.

12.2 Automatic Response

a. RPS A Turbine Control Valve Fast Closure and Turbine Stop Valve closure - scrams are bypassed.

12.3 Corrective Action

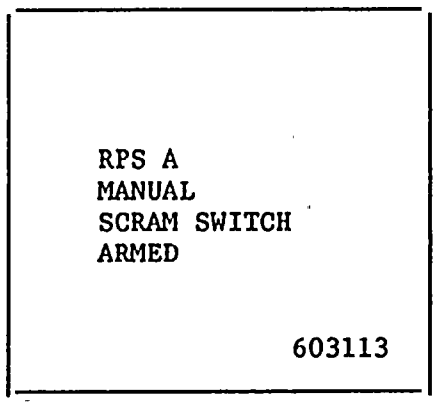
a. Verify that this annunciator clears prior to exceeding 30% power.

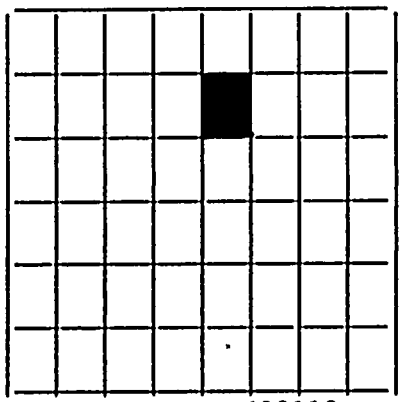
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

13.0 603113 Reactor Protection System A Manual Scram Switch Armed

Reflash: Yes

TCN- 18





13.1

Computer Point	Computer Printout	Source
RPSBC17	RPS A1 MAN SCRAM SW ARM	RPS A manual scram switches on P603 armed.
RPSBC18	RPS A2 MAN SCRAM SW ARM	

*3

13.2 Automatic Response

a. NONE

13.3 Corrective Action

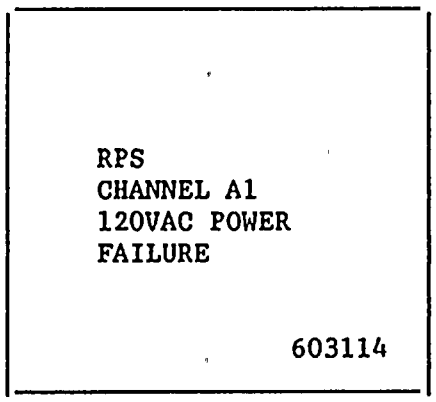
a. Rotate the manual scram switch collar on P603 to clear the alarm condition.

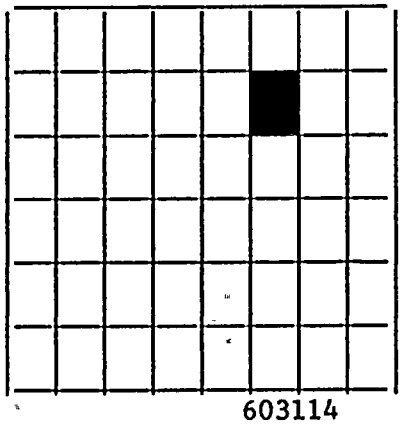
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

14.0 603114 Reactor Protection System Channel A1 120VAC Power Failure

Reflash: No

TCN-18





14.1	Computer Point	Computer Printout	Source
	RPSBC38	RPS CHAN A1 120VAC PWR	Loss of 2VBB-UPS3A

* 3

14.2 Automatic Response

a. RPS Channel A half scram.

b. NS^4 half isolations due to loss of power (DIV I).

c. Leak Detection system loss of power (DIV I).

d. Neutron Monitoring system loss of power (DIV I).

14.3 Corrective Action

a. Determine the cause of the loss of power to RPS channel A1.

b. Correct the cause of the loss of power.

c. Restore 2VBB-UPS3A per the appropriate sections of N2-OP-71.

d. Place the RPS system in its normal configuration.

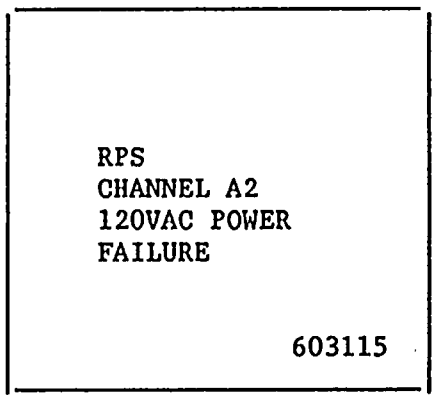
e. Reset Channel A half scram and/or half isolations at panels P602 and P603.

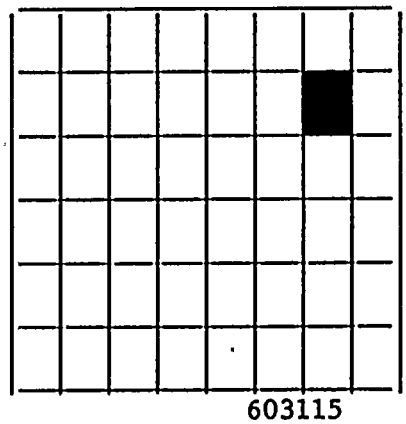
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

15.0 603115 Reactor Protection System Channel A2 120VAC Power Failure

Reflash: No

TCN-18





15.1	Computer Point	Computer Printout	Source	
	RPSBC40	RPS CHAN A2 120VAC PWR	Loss of 2VBB-UPS3A	*3

15.2 Automatic Response

a. RPS Channel A half scram.

b. NS^4 half isolations due to loss of power (DIV I).

c. Leak Detection system loss of power (DIV I).

d. Neutron Monitoring system loss of power (DIV I).

15.3 Corrective Action

a. Determine the cause of the loss of power to RPS channel A2.

b. Correct the cause of the loss of power.

c. Restore 2VBB-UPS3A per the appropriate sections of N2-OP-71.

d. Place the RPS system in its normal configuration.

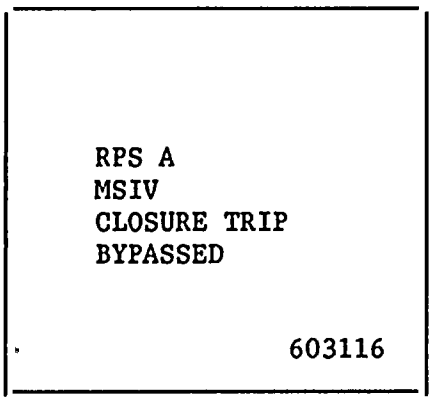
e. Reset Channel A half scram and/or half isolations at panels P602 and P603.

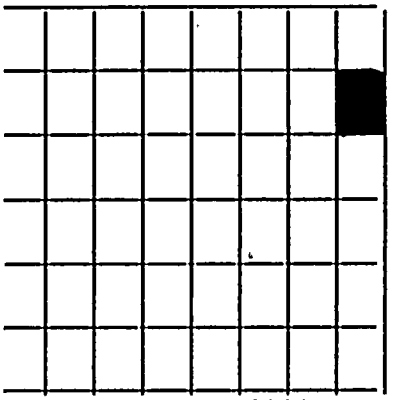
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

16.0 603116 Reactor Protection System A Main Steam Isolation Valve Closure Trip Bypassed

Reflash: Yes

TCN. 18





16.1	Computer Point	Computer Printout	Source
	RPSBC05	RPS A1 MSIV CLSR TR BYP	Reactor Mode Switch on P603 NOT in RUN.
	RPSBC06	RPS A2 MSIV CLSR TR BYP	

* 3

16.2 Automatic Response

a. NONE

16.3 Corrective Action

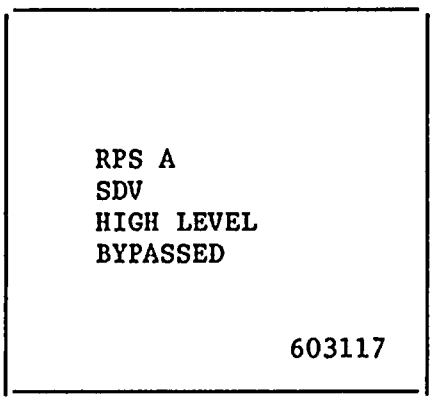
a. Verify that the annunciator clears when the reactor mode switch is placed in run.

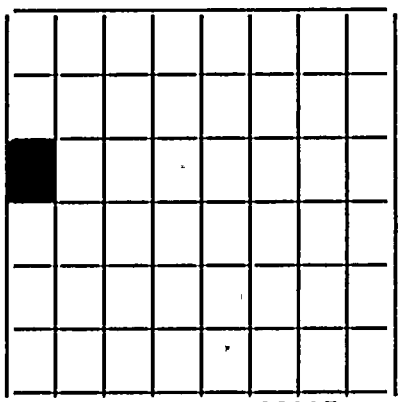
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

17.0 603117 Reactor Protection System A Scram Discharge Volume High Level Bypassed

Reflash: Yes

TCN- 18





17.1

Computer Point	Computer Printout	Source
RPSBC13	RPS A1 SDV HI LVL BYP	Mode switch in Refuel or shutdown and the appropriate channel's bypass switch in bypass.
RPSBC14	RPS A2 SDV HI LVL BYP	

*3

17.2 Automatic Response

a. NONE

17.3 Corrective Action

NOTE: This annunciator is actuated when the SDV high level scram bypass switches on P603 are in bypass and the mode switch is in shutdown or refuel. This bypass allows the scram to be reset so that the scram discharge volume can be drained

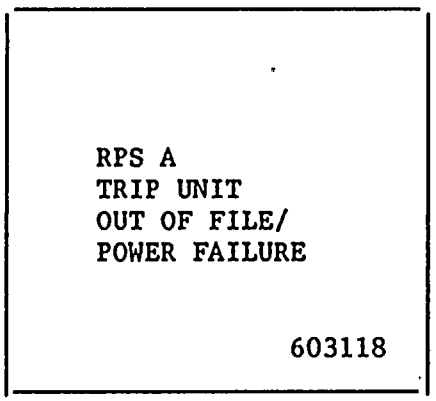
a. When scram discharge volume level decreases below the scram setpoint, place the SDV high level scram bypass switches on P603 in normal.

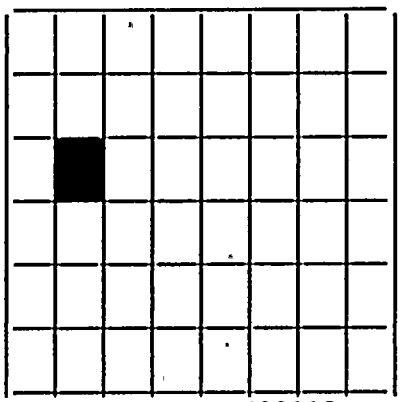
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

18.0 603118 Reactor Protection System A Trip Unit Out of File/Power Failure

Reflash: Yes

TCN-18





18.1	Computer Point	Computer Printout	Source	
	RPSBC22	RPS A1 T-U OOF/PWR FAIL	Anytime trip units monitoring Rx Press., Drywell Pressure, Rx water level or turbine 1st stage pressure are unplugged or experience a loss of power.	*3
	RPSBC27	RPS A2 T-U OOF/PWR FAIL		*3

18.2 Automatic Response

a. RPS Channel A half scram.

b. Possible NS^4 isolations or half isolations (depends on trip unit).

18.3 Corrective Action

a. Determine which trip unit is causing the alarm.

b. Refer to plant Technical Specifications.

c. Repair or replace the appropriate trip unit as required.

d. Reset any isolations by depressing the appropriate NS4 isolation reset pushbuttons on P602.

e. Return any isolated systems to service per the appropriate operating procedures.

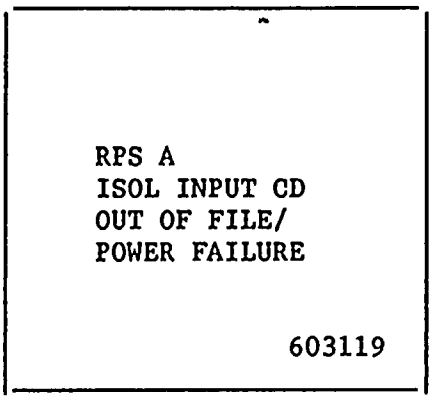
f. Reset the half scram using the scram reset switches on P603.

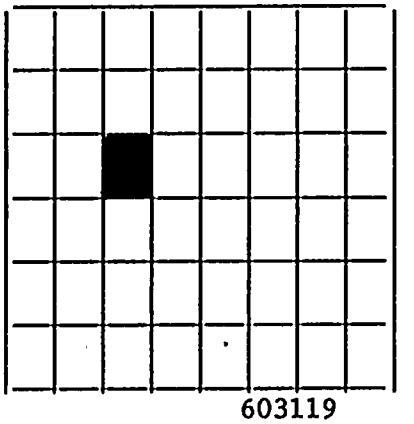
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

19.0 603119 Reactor Protection System A Isolation Input Card Out of File/ Power Failure

Reflash: Yes

TCN- 18





19.1

Computer Point	Computer Printout	Source
RPSBC23	RPS A1 ISOL INP CD OOF	Any Div I NS^4 Input Card unplugged or power failure.
RPSBC25	RPS A2 ISOL INP CD OOF	

*3

19.2 Automatic Response

a. Possible Div I NS^4 isolations or half isolations.

b. Possible RPS Channel A half scram.

19.3 Corrective Action

a. Refer to plant Technical Specifications for possible LCO's and applicable actions.

b. Troubleshoot and repair as required.

c. Reset any isolations or half isolations received using the reset pushbuttons on P602.

d. Reset any RPS A half scrams received using the scram reset switches on P603.

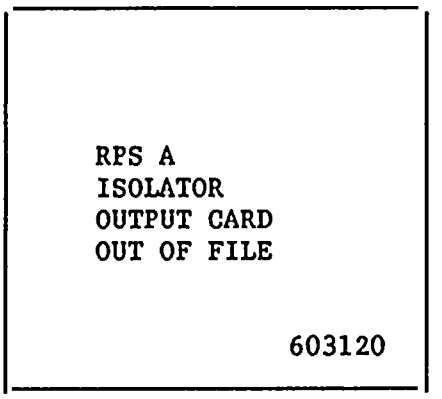
e. Restore any isolated systems to service per the applicable operating procedures.

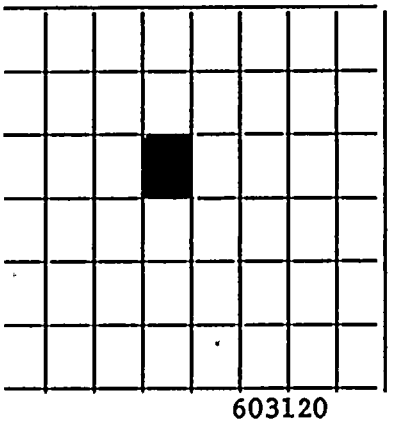
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

20.0 603120 Reactor Protection System A Isolator Output Card Out of File

Reflash: Yes

TCN- 18





20.1	Computer Point	Computer Printout	Source
	RPSBC24	RPS A1 ISO OUTPUT CD OOF	Any Div I NS^4 Output Card out of file.
	RPSBC26	RPS A2 ISO OUTPUT CD OOF	

*3

20.2 Automatic Response

a. Possible Div I NS^4 isolations or half isolations.

b. Possible RPS Channel A half scram.

20.3 Corrective Action

a. Refer to Plant Technical Specifications for possible LCO's and applicable actions.

b. Troubleshoot and repair as required.

c. Reset any isolations or half isolations received using the isolation reset pushbuttons on P602.

d. Reset any RPS A half scrams received using the scram reset switches on P603.

e. Return any isolated systems to service per the applicable operating procedures.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

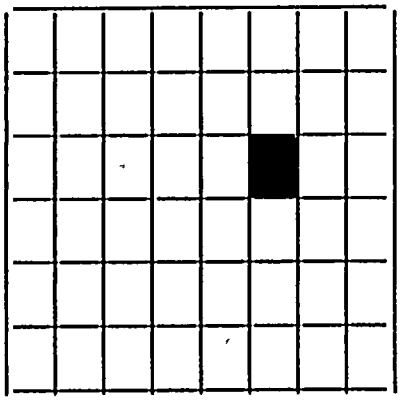
21.0 603122 Scram Discharge Volume Trip Unit In Calibrate/Gross Failure

Reflash: No

TCN- 18

SDV
TRIP UNIT
IN CALIB/
GROSS FAILURE

603122



603122

21.1	Computer Point	Computer Printout	Source
	RPSBC44	SDV T-U IN CAL/GR FAIL	2RDS*LISY12A 2RDS*LISY12B 2RDS*LISX12A 2RDS*LISX12B

* 3

21.2 Automatic Response

a. RPS Channel A or Channel B half scram (if mode switch is in run.

21.3 Corrective Action

a. Refer to plant Technical Specifications for possible LCO's and applicable actions.

b. Troubleshoot and repair as required.

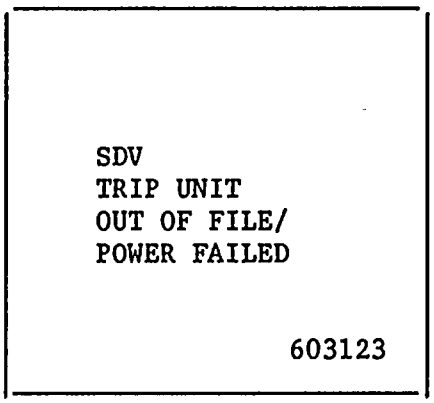
c. Reset any half scrams that occur using the scram reset switches on P603.

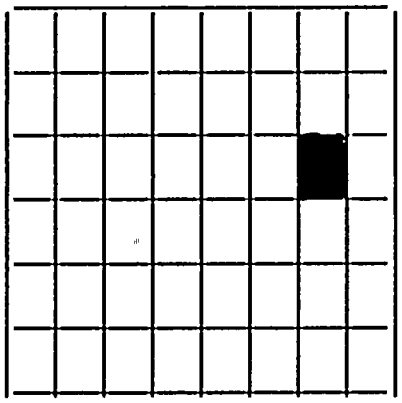
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

22.0 603123 Scram Discharge Volume Trip Unit Out of File/Power Failure

Reflash: No

TCN- 18





603123

22.1

Computer Point	Computer Printout	Source
RPSBC45	SCRAM DISC VOL TRIP COOF	2RDS*LISY12A 2RDS*LISY12B 2RDS*LISX12A 2RDS*LISX12B

22.2 Automatic Response

a. Possible RPS Channel A or B half scram.

22.3 Corrective Action

a. Refer to plant Technical Specifications for possible LCO's and applicable actions.

b. Troubleshoot and repair as required.

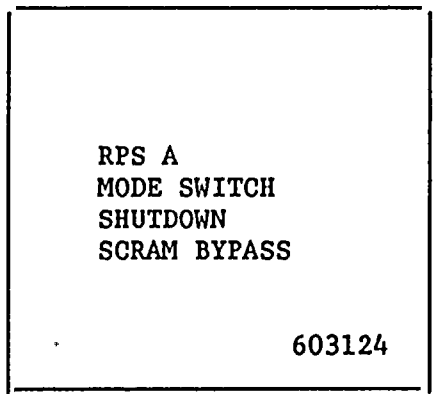
b. Reset any half scrams that occur using the scram reset switches on P603.

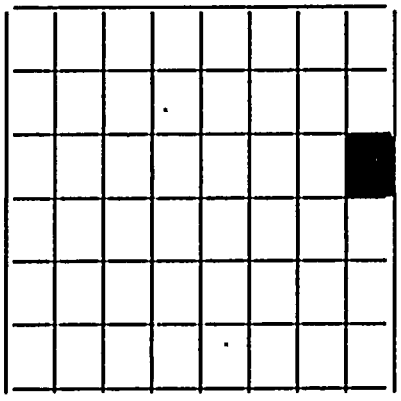
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

23.0 603124 Reactor Protection System A Mode Switch Shutdown Scram Bypass

Reflash: Yes

TCN-18





603124

23.1	Computer Point	Computer Printout	Source	
	RPSBC09	RPS A1 MODE SW SCRAM BYP	Reactor Mode switch in shutdown and 10 second timer timed out.	* 8
	RPSBC10	RPS A2 MODE SW SCRAM BYP		

23.2 Automatic Response

a. NONE.

23.3 Corrective Action

NOTE: When the Reactor Mode switch on P603 is placed in the "SHUTDOWN" position, an automatic scram signal is initiated. After approximately 10 seconds, this scram signal is bypassed to allow the scram to be reset.

a. Reset the reactor scram, when appropriate, using the scram reset switches on P603.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

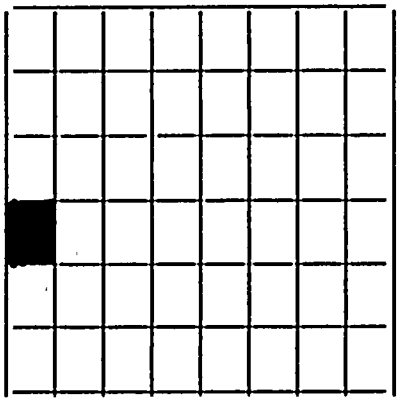
24.0 603125 Division I Reactor Water Level Lo-Lo

Reflash: Yes

TCN-18

DIVISION I
REACTOR
WATER LEVEL
LO-LO

603125



603125

24.1

Computer Point	Computer Printout	Source
ISCLC01	D1 RX WTR LVL RPS A1	2ISC*LIS1681A
ISCLC02	D1 RX WTR LVL RPS AL	2ISC*LIS1681C

*3

Setpoint: LL2(108.8")

24.2 Automatic Response

a. Traversing Incore Probe (TIP) system half isolation (Group 3).

b. Recirc sample valve half isolation (Group 2).

c. Reactor Water Cleanup (WCS) half isolation (Group 6/7).

d. Containment purge half isolation (Group 9).

e. Group 8 half isolation.

f. Standby gas treatment half initiation signal.

24.3 Corrective Action

a. If actual water level has decreased to the Lo-Lo level (level 2) then perform the following:

1. Verify that all automatic actions have occurred. Manually initiate any automatic action that has not occurred.

2. Refer to N2-OP-101C (scram occurred at level 3).

3. Refer to the Emergency Operating procedures (Rx water level 3 is an entry condition).

b. If water level has not decreased to LL2, perform the following:

1. Refer to Technical Specifications for actions.

2. Determine the cause of the alarm condition and correct.

3. After correction of the condition, reset the half isolations using the isolation reset pushbuttons on P602.

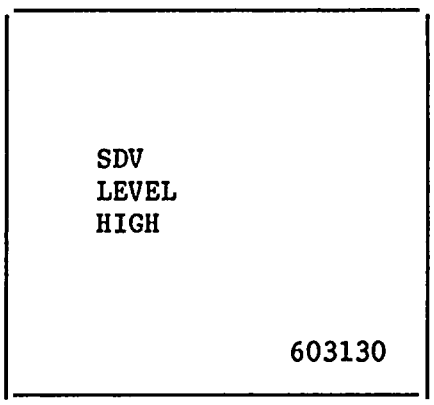
4. Return any isolated system to service using the appropriate system operating procedure.

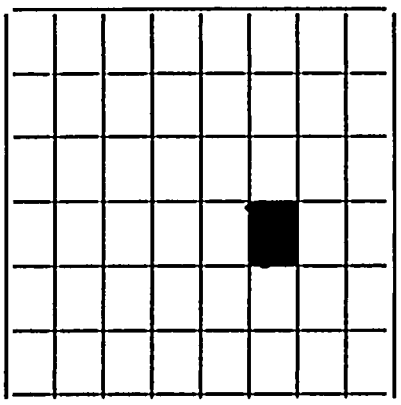
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

25.0 603130 Scram Discharge Volume Level High

Reflash: No

TCN- 18





603130

25.1	Computer Point	Computer Printout	Source
	RPSBC17	SCRAM DISCH VOL LEVEL	2RDS-LS129 2RDS-LS126

25.2 Automatic Response

a. NONE

25.3 Corrective Action

a. Investigate the cause of the high level. Possible causes are:

1. Vent and drain valve on SDV not open.

2. Hydraulic control units with leaking scram outlet valves.

3. Instrument drift.

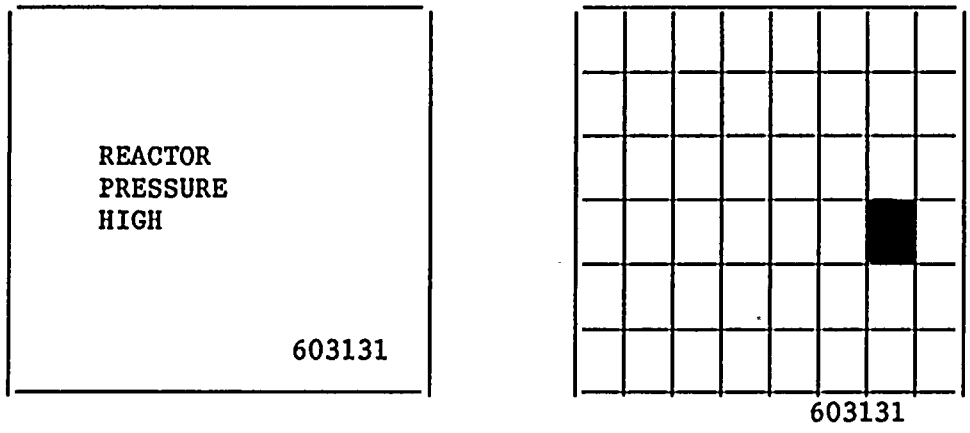
b. Determine the cause of the high level and correct.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

26.0 603131 Reactor Pressure High

Reflash: No

TCN- 18



26.1

Computer Point	Computer Printout	Source
FWSPC01	REACTOR PRESSURE	2ISC-PSH1108

26.2 Automatic Response

a. NONE

26.3 Corrective Action

a. Determine Reactor Pressure by observing the indicated pressure from 2ISC-PI1108 on P603. If 2ISC-PI1108 (C33-R605) indicates high pressure then begin action to restore normal Reactor Pressure and reduce Reactor Pressure to less than 1020 psig within 15 minutes or be in at least hot shutdown within 12 hours. Refer to Technical Specification 3.4.6.2.

b. If 2ISC-PI1108 does not indicate a high pressure condition, then determine the cause of the high pressure alarm and correct.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

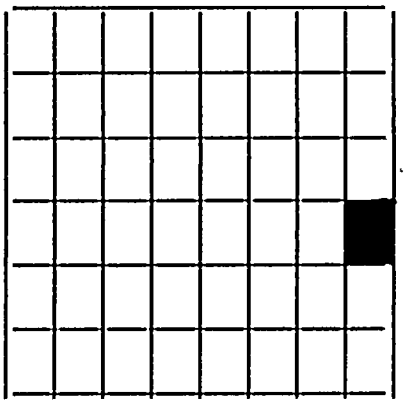
27.0 603132 Reactor Protection System Non Divisional Trip Unit in CALIBRATE/GROSS FAILURE

Reflash: No

TCN 18

RPS NON DIV
TRIP UNIT
IN CALIB/
GROSS FAILURE

603132



603132

27.1	Computer Point	Computer Printout	Source
	RPSBC35	RPS NONSF U IN CAL/GR FL	Any non-safety related RPS trip unit mode switch in calibrate or unplugged.

27.2 Automatic Response

a. NONE

27.3 Corrective Action

a. Determine the cause of the alarm condition and correct.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

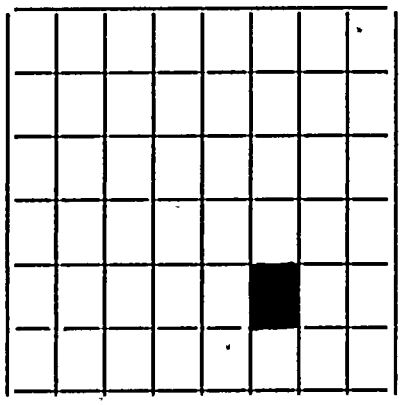
28.0 603138 Reactor Protection System A Scram Discharge Volume Trip Unit in Calibrate/Gross Failure

Reflash: No

TCN-18

RPS A
SDV
TRIP UNIT
IN CALIB/GROSS
FAILURE

603138



603138

28.1	Computer Point	Computer Printout	Source	
	RPSBC42	RPS A T-U IN CAL/GR FAIL	SDV High Level Trip unit mode switch not in Operate or trip unit failed.	*3

28.2 Automatic Response

a. NONE

28.3 Corrective Action

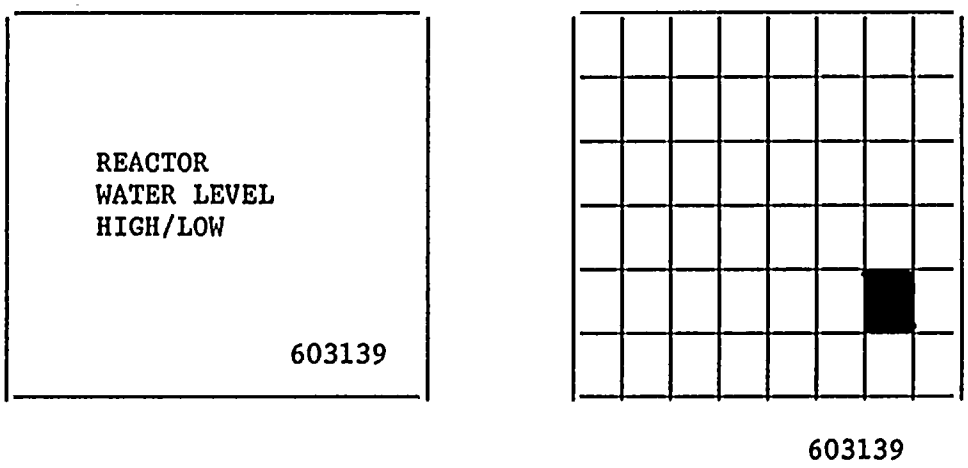
a. Determine the cause of the annunciator and correct.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

29.0 603139 Reactor Water Level High/Low

Reflash: No

TCN- 18



603139

29.1	Computer Point	Computer Printout	Source
	FWSLC01	REACTOR WATER LVL HI/LO	2ISC-LS1635
			Setpoint: 187.3" (L7) 178.3" (L4)

29.2 Automatic Response

a. NONE.

29.3 Corrective Action

NOTE: If water level increases to level 8 (202.3") the reactor feed pumps and main turbine will trip. If water level decreases to level 3 (159.3) a Reactor Scram will occur.

a. Monitor and maintain reactor water level in the normal operating range.

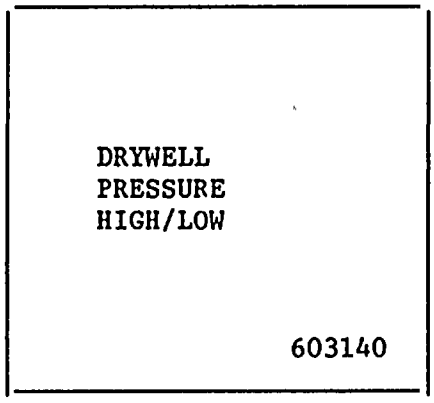
b. Determine the cause of the alarm and correct.

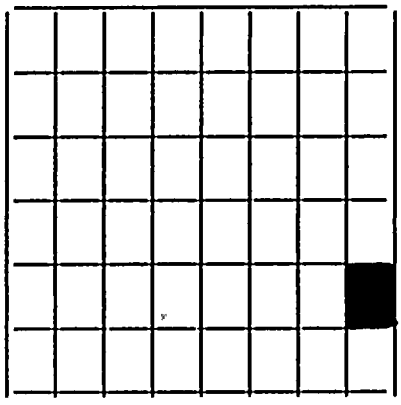
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

30.0 603140 Drywell Pressure High/Low

Reflash: No

TCN- 18





603140

30.1	Computer Point	Computer Printout	Source
	RPSPC01	RPS DW PRESS	2ISC-PS1651 2ISC-PS1653

30.2 Automatic Response

a. NONE.

30.3 Corrective Action

a. Check Drywell pressure indicators on P609 and P611 to determine whether drywell pressure is high or low.

b. IF low, refer to OP-61A Section F.5.

c. IF high, refer to OP-61A Section H.1.

d. Monitor other primary containment parameters such as:

1. Drywell Temperatures

2. Drywell Leak Rates

3. Radiation Levels

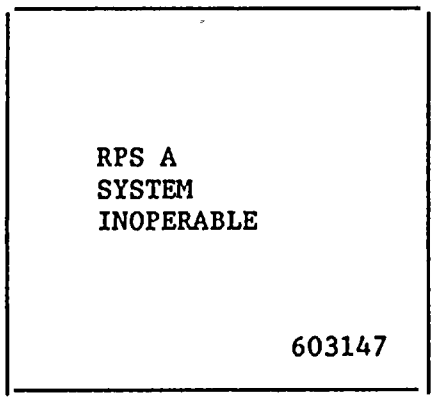
e. Take action to correct problem.

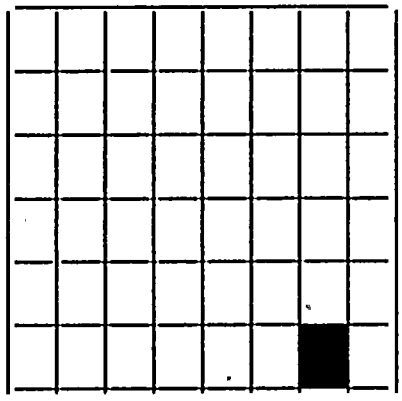
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

31.0 603147 Reactor Protection System A System Inoperable

Reflash: No

TCN-18





603147

31.1	Computer Point	Computer Printout	Source	
	RPSBC21	RPS SYS A OUT OF SERVICE	RPS A bypass pushbutton depressed (Amber back-lighted pushbutton) on P603.	*3

31.2 Automatic Response

a. Reactor Recirc Pump end of Cycle Pump Trip is bypassed.

31.3 Corrective Action

a. Refer to Technical Specifications for actions.

b. Return the RPS Channel A bypass switch to "NORMAL" when appropriate.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

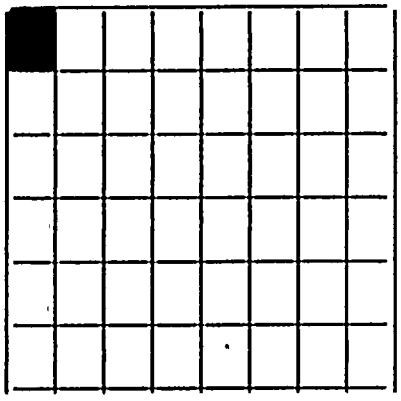
32.0 603401 Reactor Protection System B Drywell Pressure High Trip

Reflash: Yes

TCN- 18

RPS B
DRYWELL
PRESSURE HIGH
TRIP

603401



603401

32.1

Computer Point	Computer Printout	Source
ISCUC11	RPS B1 DW PRESS HI TR	2ISC*PIS-1650B
ISCUC12	RPS B2 DW PRESS HI TR	2ISC*PIS-1650D

*3

32.2 Automatic Response

a. RPS Channel B Half Scram

b. Traversing Incore Probe (TIP) System half isolation (Group 3).

c. RHR sample and Radwaste valves half isolation (Group 4).

d. Containment purge valves half isolation (Group 9).

e. RCIC Vacuum Bkr Isolation Valve half isolation permissive (also requires low RCIC steam supply for half isolation).

f. Group 8 half isolation.

g. Standby Gas Treatment half initiation signal.

32.3 Corrective Action

a. If a scram has occurred, perform the following:

1. Verify all automatic actions have occurred. If any automatic action did not occur, manually initiate that action.

2. Refer to N2-OP-101C for scram recovery.

3. Refer to Emergency Operating Procedures.

b. If no scram has occurred, perform the following.

1. Check drywell pressure indicators 2ISC-PIS1650A and 1650C on P609 and 2ISC-PIS1650B and 1650D on P611 to verify that no scram should have occurred.

2. If a scram should have occurred then:

a. Enter the Emergency Operating Procedures.

3. If no scram should have occurred then perform the following:

a. Refer to Technical Specifications for actions.

b. Troubleshoot and correct the cause of the alarm condition.

c. After correction of the alarm condition, reset the half scram using the scram reset switches on P603 and reset the half NS^4 isolation using the applicable isolation reset pushbuttons on P602.

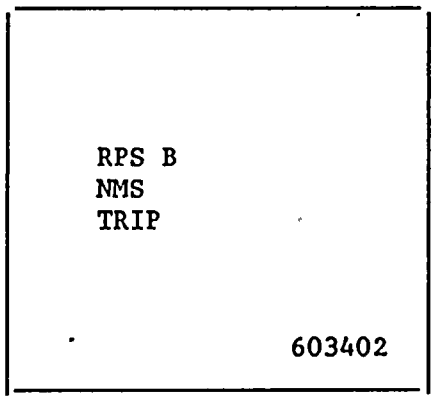
d. Return any isolated systems to service using the applicable operating procedures.

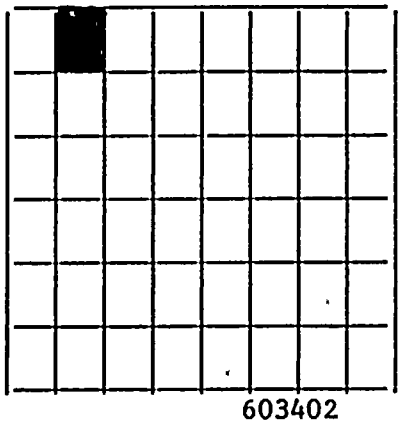
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

33.0 603402 Reactor Protection System B Neutron Monitoring System Trip

Reflash: Yes

TCN 18





33.1	Computer Point	Computer Printout	Source	
	NMEUC03	RPS CH B1 NMS TRIP	APRM B or F IRM B or F	*3
	NMEUC04	RPS CH B2 NMS TRIP	APRM D or F IRM D or H	*3

Setpoints: APRM:

a. Thermal Power 118% in Run

b. Flow Biased 51% + .66(W-ΔW) in Run.

c. > 15% not in run.

d. Inop

Setpoints: IRM:

a. 120/125 of scale (not in run).

b. Inop (not in run).

33.2 Automatic Response

a. RPS Channel B Half Scram

33.3 Corrective Action

a. If a Reactor Scram has occurred, then refer to N2-OP-101C for scram recovery.

b. If no scram has occurred, perform the following:

1. Check the other IRM or APRM channels on P603 to verify that no Reactor Scram should have occurred.

2. If a scram should have occurred, then:

a. Enter the Emergency Operating Procedures.

3. If no scram should have occurred, then perform the following:

a. Refer to Technical Specifications for actions.

b. Troubleshoot and correct the cause of the alarm.

c. After correction of the problem, reset the half scram using the Scram Reset switches on P603.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

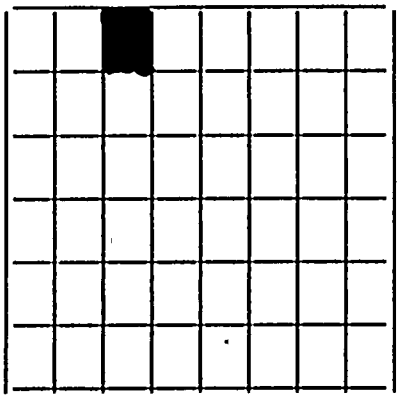
34.0 603403 Reactor Protection System B Reactor Pressure High Trip

Reflash: Yes

TCN 18

RPS B
REACTOR
PRESSURE HIGH
TRIP

603403



603403

34.1

Computer Point	Computer Printout	Source
ISCUC07	RPS B1 RX PRESS HI TR	2ISC*PIS-1678B
ISCUC08	RPS B2 RX PRESS HI TR	2ISC*PIS-1678D

* 8

Setpoint: 1037 psig

34.2 Automatic Response

a. RPS Channel B Half Scram

34.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Refer to N2-OP-101C.

2. Refer to Emergency Operating Procedures.

b. If no Reactor Scram has occurred, perform the following:

1. Check reactor pressure indicators 2ISC-PIS1678A and 2ISC-PIS1678C on P609 and 2ISC-PIS1678B and 2ISC-PIS1678D on P611 to verify that no scram should have occurred.

2. If a Reactor Scram should have occured then:

   a. Enter the Emergency Operating procedures.

3. If no Reactor Scram should have occurred then perform the following:

   a. Refer to Technical Specifications for actions.

   b. Troubleshoot and correct the cause of the alarm condition.

   c. After correction of the alarm condition, reset the half scram using the scram reset switches on P603.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

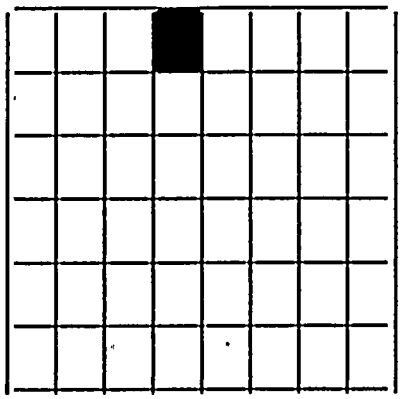
35.0 603404 Reactor Protection System B Turbine Control Valve Fast Closure Trip

Reflash: Yes

TCN- 18

RPS B
TURB CONT VLV
FAST CLOSE
TRIP

603404



603404

35.1

Computer Point	Computer Printout	Source
MSSUC11	TURB CV FAST CLS TR 2RPS*PS2B CH B	* 8
MSSUC12	TURB CV FAST CLS TR 2RPS*PS2D CH D	

Setpoint: EHC Oil Pressure 530 psig dec.

35.2 Automatic Response

a. RPS Channel B Half Scram

35.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Refer to N2-OP-101C for scram recovery.

b. If no scram has occurred, perform the following:

1. Check the Main Turbine panel and verify that a turbine trip has not occurred and that no scram was required.

2. If a scram should have occurred, then:

   a. Enter the Emergency Operating Procedures.

3. If no scram should have occurred, then perform the following:

   a. Refer to Technical Specifications for actions.

   b. Troubleshoot and correct the cause of the alarm condition.

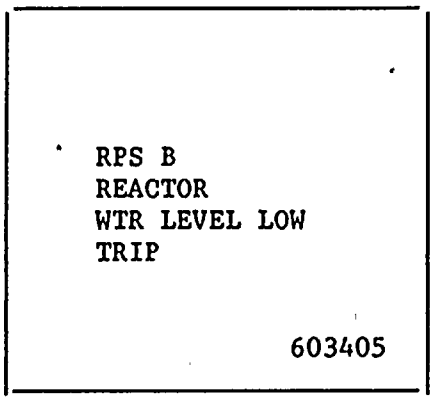
   c. After correction of the alarm condition, reset the half scram using the Scram Reset switches on P603.

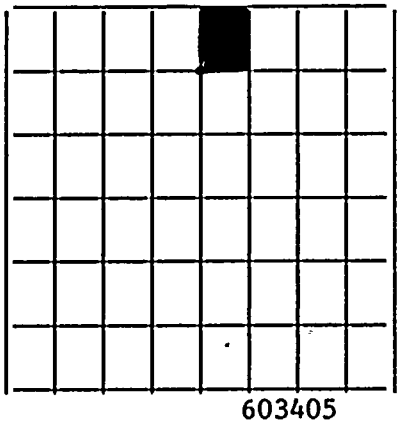
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

36.0 603405 Reactor Protection System B Reactor Water Level Low Trip

Reflash: Yes

TCN- 18





36.1

Computer Point	Computer Printout	Source
ISCUC03	RPS B1 RX WTR LVL LO TR	2ISC*LIS1680B
ISCUC04	RPS B2 RX WTR LVL LO TR	2ISC*LIS1680D

* 8

Setpoint: 159.3 inches

36.2 Automatic Response

a. RPS Channel B Half Scram

b. Group 4 NS^4 half isolation.

c. Group 5 NS^4 half isolation.

36.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Verify all automatic actions have occurred. Manually initiate any action that did not occur.

2. Refer to N2-OP-101C for scram recovery.

3. Refer to Emergency Operating Procedures.

b. If no Reactor Scram has occurred, perform the following:

1. Check that Reactor Water Level is greater than the Level 3 trip point per 2ISC*LIS1680A and *LIS1680C on P609 and 2ISC*LIS1680B and *LIS1680D and that no Reactor Scram is required.

2. If a Reactor Scram should have occurred then:

a. Enter the Emergency Operating Procedure.

3. If no Reactor Scram should have occurred then perform the following:

a. Refer to Technical Specifications for actions.

b. Troubleshoot and correct the cause of the alarm condition.

c. After correction of the alarm condition, reset the reactor scram using the scram reset switches on P603. Reset the group 4 and group 5 isolation by depressing the appropriate NS^4 isolation reset pushbuttons on P602.

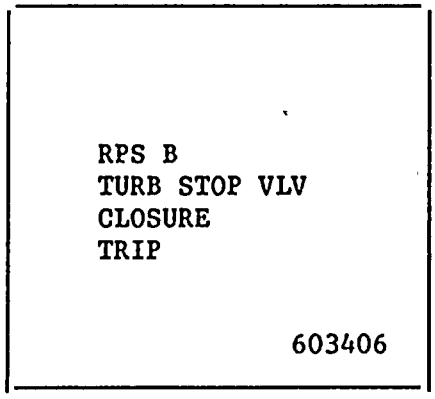
d. Return any isolated systems to service using the applicable operating procedure.

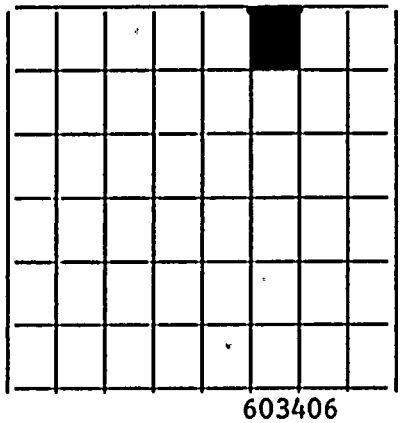
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

37.0 603406 Reactor Protection System B Turbine Stop Valve Closure Trip

Reflash: Yes

TCN-18





37.1

Computer Point	Computer Printout	Source
MSSUC15	TURB SV FAST CLS TR CH B	2RPS*ZS1A 2RPS*ZS1E
MSSUC16	TURB SV FAST CLS TR CH D	2RPS*ZS1D 2RPS*ZS1C

*3

Setpoint: Valve 5% Closed.

37.2 Automatic Response

a. RPS Channel B Half Scram

37.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Refer to N2-OP-101C for scram recovery.

b. If no scram has occurred, perform the following:

1. Check the Main Turbine panel and verify that a turbine trip has not occurred and that no scram was required.

2. If a scram should have occurred, then:

   a. Enter the Emergency Operating Procedures.

3. If no scram should have occurred, then perform the following:

   a. Refer to Technical Specifications for actions.

   b. Troubleshoot and correct the cause of the alarm condition.

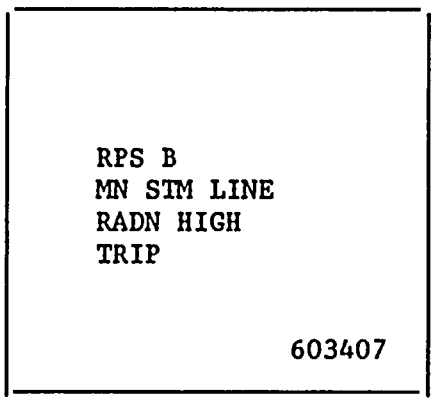
   c. After correction of the alarm condition, reset the half scram using the Scram Reset switches on P603.

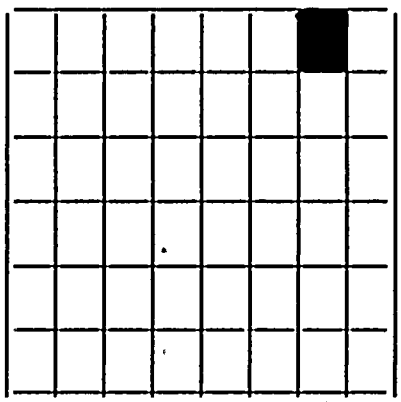
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

38.0 603407 Reactor Protection System B Main Steam Line Radiation High Trip

Reflash: Yes

TCN- 18





38.1

Computer Point	Computer Printout	Source
MSSUC07	MN STM LN CHAN B RADN H	C51A-Z2B
MSSUC08	MN STM LN CHAN D RADN H	C51A-Z2D

Setpoint: 3X Normal full power background.

38.2 Automatic Response

a. RPS Channel B Half Scram

b. Group 1 half isolation (MSIV's and MSIV drain lines).

c. Group 2 half isolation (Recirc. sample valves).

d. Half trip signal to the Mechanical Vacuum Pumps 2ARC-P1A and P1B.

e. Half isolation signal to valve 2ARC-AOV105.

38.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Verify all automatic actions have occurred. Manually initiate any automatic action that did not occur.

2. Refer to Emergency Operating Procedures.

b. If no scram has occurred, perform the following.

1. Check the main steam line radiation monitors 2C51A-Z2A and Z2C on P606 and 2C51A-Z2B and Z2D on P633 to verify that no scram should have occurred.

2. If a scram should have occurred then:

a. Enter the Emergency Operating procedures.

3. If no scram should have occurred then perform the following:

a. Refer to Technical Specifications for actions.

b. Troubleshoot and correct the cause of the alarm condition.

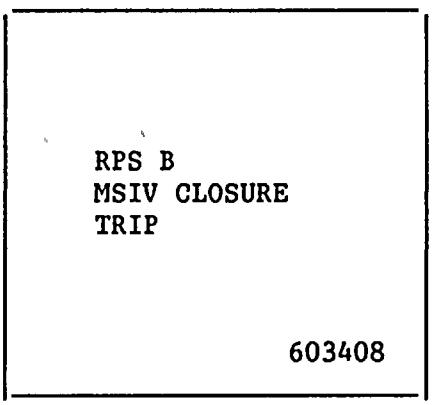
c. After correction of the alarm condition, reset the half scram using the scram reset switches on P603 and reset the Group 1 and Group 2 half isolations using the applicable isolation reset pushbuttons on P602.

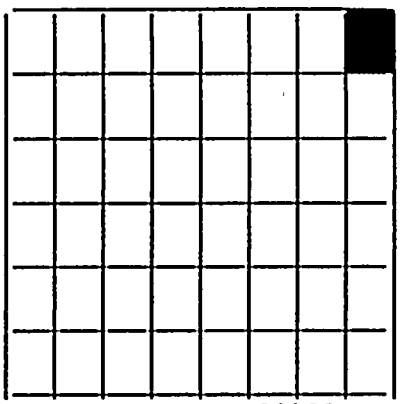
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

39.0 603408 Reactor Protection System B Main Steam Isolation Valve Closure Trip

Reflash: Yes

TCN- 18





39.1	Computer Point	Computer Printout	Source
	MSSUC03	MSL ISOL V CLOS CHAN B	2MSS*AOV6B 2MSS*AOV7B
	MSSUC04	MSL ISOL V CLOS CHAN D	2MSS*AOV6D 2MSS*AOV7D

Setpoint: MSIV 8% Closed.

39.2 Automatic Response

a. RPS Channel B Half Scram

39.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Refer to N2-OP-101C for scram recovery.

2. Refer to Emergency Operating Procedure.

b. If no scram has occurred, perform the following:

1. Check MSIV status lights on P602 to verify that MSIV's are open and no scram was required.

2. If a scram should have occurred then:

   a. Enter the Emergency Operating Procedures.

3. If no scram should have occurred, then perform the following:

   a. Refer to Technical Specifications for actions.

   b. Troubleshoot and correct the cause of the alarm condition.

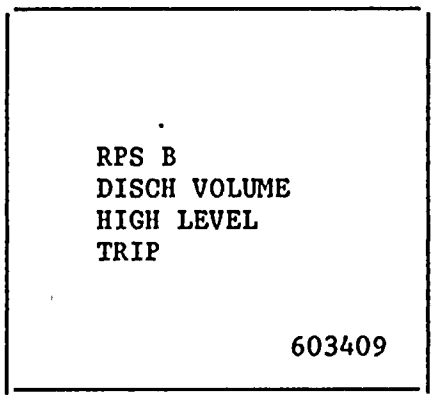
   c. After correction of the alarm condition, reset the half scram using the scram reset switches on P603 and reset the Group 1 and Group 2 isolation signal using the appropriate reset pushbuttons on P602.

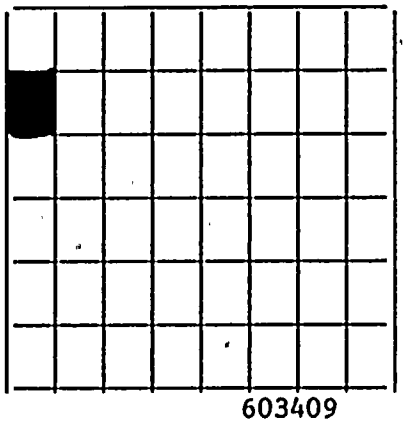
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

40.0 603409 Reactor Protection System B Discharge Volume High Level Trip

Reflash: Yes

TCN 18





40.1

Computer Point	Computer Printout	Source
RDSUC07	RPS B1 DIS VOL HI LVL TR	2RDS*LISX12B 2RDS*LSX11A
RDSUC08	RPS B2 DIS VOL HI LVL TR	2RDS*LISX12A 2RDS*LSX11B
		Setpoint: 46.5"

* 8

40.2 Automatic Response

a. RPS Channel B Half Scram

40.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Refer to N2-OP-101C for scram recovery.

b. If no scram has occurred, perform the following:

1. Check the scram discharge volume level indicating switches 2RDS*LISY12A and 12B on P609 and 2RDS*LISX12A and 12B on P611 to verify that no scram should have occurred.

2. If a scram should have occurred then:

   a. Enter the Emergency Operating Procedure.

3. If no scram should have occurred, then perform the following:

   a. Refer to Technical Specifications for actions.

   b. Troubleshoot and correct the cause of the alarm condition.

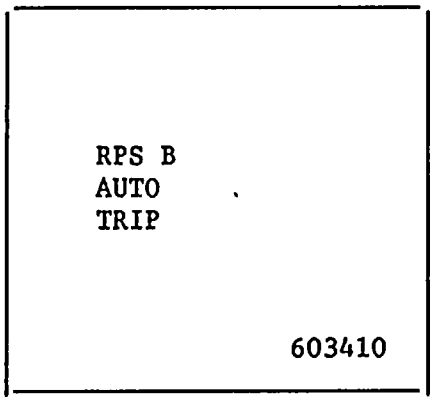
   c. After correction of the alarm condition, reset the half scram using the scram reset switches on P603.

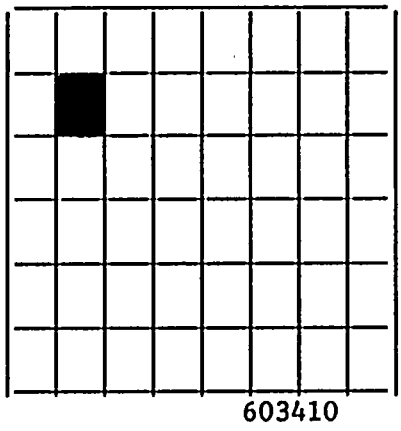
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

41.0 603410 Reactor Protection System B Auto Trip

Reflash: No

TCN- 18





41.1

Computer Point	Computer Printout	Source
RPSUC04	REACTOR SCRAM DIV 2	C72A-K14B
	OR 4	C72A-K14D

41.2 Automatic Response

a. RPS Channel B Half Scram

b. RPS Scram pilot valve solenoid B de-energizes and either 2 or 4 of the RPS B pilot valve status lights on P603 de-energize.

41.3 Corrective Action

a. If a Reactor Scram has occurred, perform the following:

1. Determine the cause of the scram by observing other annunciators on P603.

2. Refer to N2-OP-101C for scram recovery.

3. Refer to Emergency Operating Procedures if the parameter causing the scram is an entry condition to an EOP.

a. If no scram has occurred, perform the following:

1. Determine the cause of the channel trip and verify that no scram should have occurred by observing that no monitored parameter in trip Channel A has exceeded its setpoint.

2. If a scram should have occurred then:

3. Refer to Emergency Operating Procedures.

b. If no scram should have occurred then perform the following:

a. Refer to Technical Specifications for actions.

b. Troubleshoot and correct the cause of the alarm condition.

c. After correction of the alarm condition, perform the following:

1. Reset the half scram using the scram reset switches on P603.

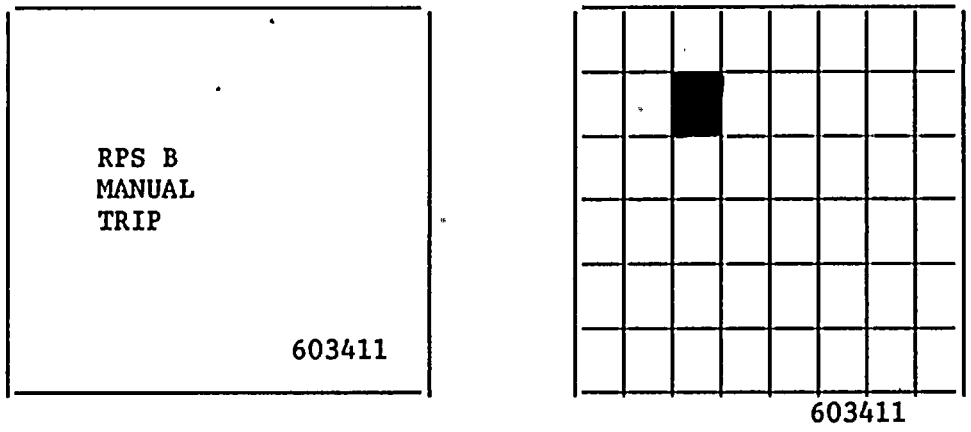
2. Verify that all scram pilot valve status lights on P603 are energized.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

42.0 603411 Reactor Protection System B Manual Trip

Reflash: No

TCN- 18



42.1	Computer Point	Computer Printout	Source
	RPSUC02	MANUAL SCRAM DIV 2 OR 4	Channel B1 or B2 Manual scram pushbuttons on P603 armed and depressed or reactor mode switch in "SHUTDOWN."

42.2 Automatic Response

a. RPS Channel B Half Scram

42.3 Corrective Action

NOTE: If this annunciator is caused by placing the Reactor Mode Switch in "SHUTDOWN," the scram signal will be bypassed after approximately 10 seconds. The manual scram pushbutton is spring return to normal. Therefore this annunciator will clear when, 1) the manual scram pushbutton is released; and/or 2) 10 seconds after the mode switch is placed in the "SHUTDOWN" position. The half scram signal must still be reset using the scram reset switches, on P603.

a. Reset the scram using the scram reset switches on P603 when appropriate.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

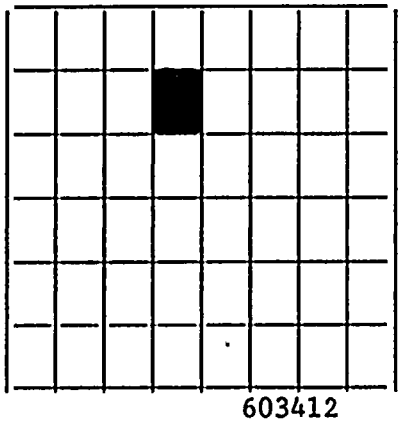
43.0 603412 Reactor Protection System B Control & Stop Valve Closure Bypassed

Reflash: Yes

TCN 18

RPS B
CONT & STOP V
CLOSURE
BYPASSED

603412



603412

43.1

Computer Point	Computer Printout	Source
RPSBC03	RPS B1 CV/SV CLSR BYP	2MSS*PIS1652B
RPSBC04	RPS B2 CV/SV CLSR BYP	2MSS*PIS1652D

*3

Setpoint: 30% power.

43.2 Automatic Response

a. RPS B Turbine Control Valve Fast Closure and Turbine Stop Valve closure scrams are bypassed.

43.3 Corrective Action

a. Verify that this annunciator clears prior to exceeding 30% power.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

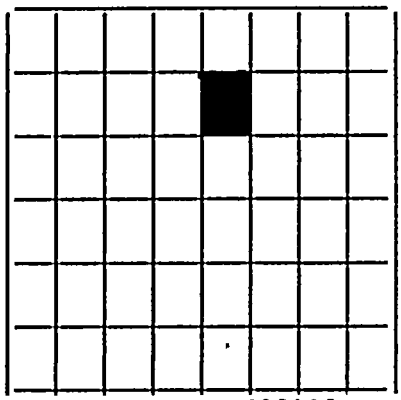
44.0 603413 Reactor Protection System B Manual Scram Switch Armed

Reflash: Yes

TCN- 18

RPS B
MANUAL
SCRAM SWITCH
ARMED

603413



603413

44.1	Computer Point	Computer Printout	Source
	RPSBC19	RPS B1 MAN SCRAM SW ARM	RPS B manual scram switches on P603 armed.
	RPSBC20	RPS B2 MAN SCRAM SW ARM	

* 8

44.2 Automatic Response

a. NONE

44.3 Corrective Action

a. Rotate the manual scram switch collar on P603 to clear the alarm condition.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

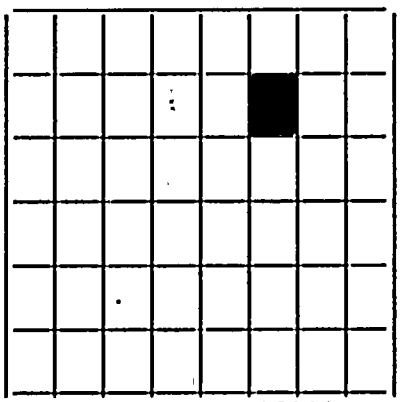
45.0 603414 Reactor Protection System Channel B1 120VAC Power Failure

Reflash: No

TCN-18

RPS
CHANNEL B1
120VAC POWER
FAILURE

603414



603414

45.1

Computer Point	Computer Printout	Source
RPSBC39	RPS CHAN B1 120VAC PWR	Loss of 2VBB-UPS3B

* 3

45.2 Automatic Response

a. RPS Channel B half scram.

b. NS^4 half isolations due to loss of power (DIV II).

c. Leak Detection system loss of power (DIV II).

d. Neutron Monitoring system loss of power (DIV II).

45.3 Corrective Action

a. Determine the cause of the loss of power to RPS channel B1.

b. Correct the cause of the loss of power.

c. Restore 2VBB-UPS3B per the appropriate sections of N2-OP-71.

d. Place the RPS system in its normal configuration.

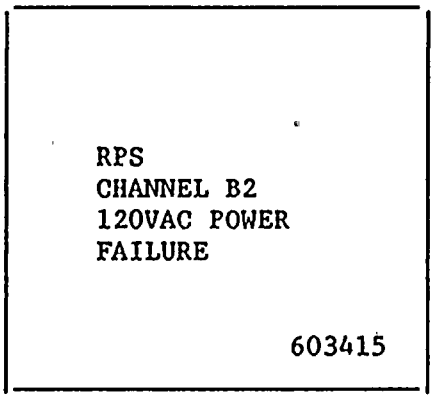
e. Reset Channel B half scram and/or half isolations at P603 and P602.

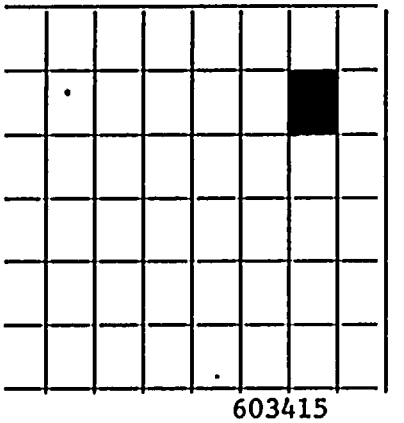
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

46.0 603415 Reactor Protection System B2 120VAC Power Failure

Reflash: No

TCN- 18





46.1	Computer Point	Computer Printout	Source	
	RPSBC41	RPS CHAN B2 120VAC PWR	Loss of 2VBB-UPS3B	*3

46.2 Automatic Response

a. RPS Channel B half scram.

b. NS4 half isolations due to loss of power (DIV II).

c. Leak Detection system loss of power (DIV II).

d. Neutron Monitoring system loss of power (DIV II).

46.3 Corrective Action

a. Determine the cause of the loss of power to RPS channel B2.

b. Correct the cause of the loss of power.

c. Restore 2VBB-UPS3B per the appropriate sections of N2-OP-71.

d. Place the RPS system in its normal configuration.

e. Reset Channel B half scram and/or half isolations at panels P603 and P602.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

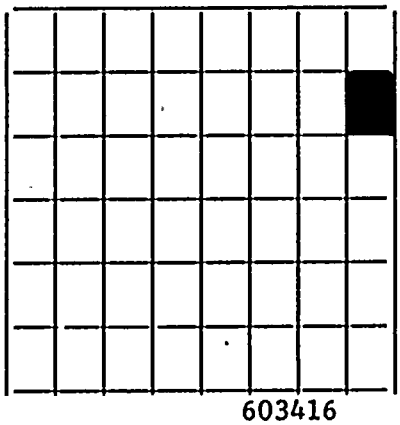
47.0 603416 Reactor Protection System B Main Steam Isolation Valve Closure Trip Bypassed

Reflash: Yes

TCN-18

RPS B
MSIV
CLOSURE TRIP
BYPASSED

603416



603416

47.1

Computer Point	Computer Printout	Source
RPSBC07	RPS B1 MSIV CLSR TR BYP	Reactor Mode Switch on P603 NOT in RUN.
RPSBC08	RPS B2 MSIV CLSR TR BYP	

*3

47.2 Automatic Response

a. NONE

47.3 Corrective Action

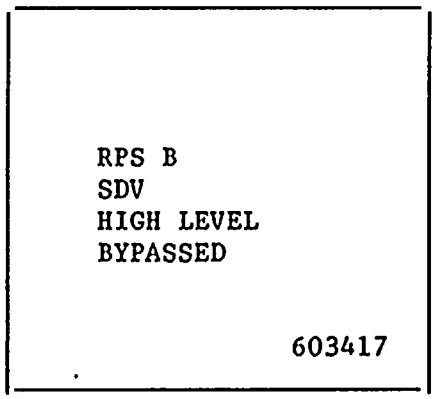
a. Verify that the annunciator clears when the reactor mode switch is placed in run.

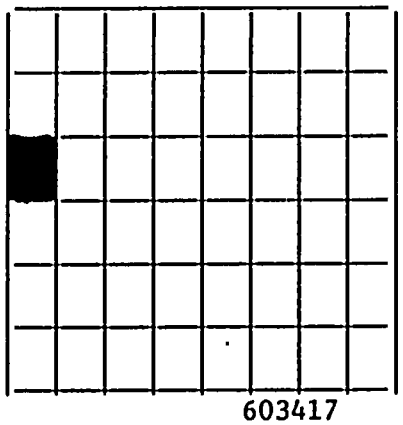
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

48.0 603417 Reactor Protection System B Scram Discharge Volume High Level Bypassed

Reflash: Yes

TCN-18





48.1

Computer Point	Computer Printout	Source	
RPSBC15	RPS B1 SDV HI LVL BYP	Mode switch in Refuel or SHUTDOWN and the appropriate channel's bypass switch in bypass.	*3
RPSBC16	RPS B2 SDV HI LVL BYP		*3

48.2 Automatic Response

a. NONE

48.3 Corrective Action

NOTE: This annunciator is actuated when the SDV high level scram bypass switches on P603 are in bypass and the mode switch is in shutdown or refuel. This bypass allows the scram to be reset so that the scram discharge volume can be drained.

a. When scram discharge volume level decreases below the scram setpoint, place the SDV high level scram bypass switches on P603 in normal.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

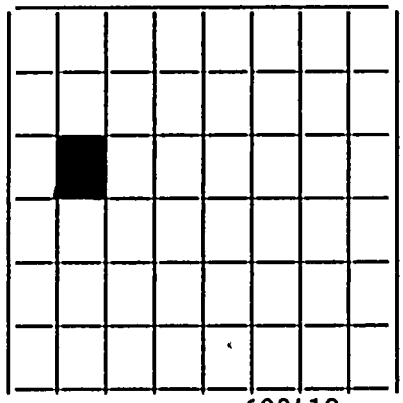
49.0 603418 Reactor Protection System B Trip Unit Out of File/Power Failure

Reflash: Yes

TCN-18

RPS B
TRIP UNIT
OUT OF FILE/
POWER FAILURE

603418



603418

49.1	Computer Point	Computer Printout	Source	
	RPSBC28	RPS B1 T-U OOF/PWR FAIL	Anytime trip units monitoring Rx Press., Drywell Pressure, Rx water level or turbine 1st stage pressure are unplugged or experience a loss of power.	*3
	RPSBC34	RPS B2 T-U OOF/PWR FAIL		*3

49.2 Automatic Response

a. RPS Channel B half scram.

b. Possible NS^4 isolations or half isolations (depends on trip unit).

49.3 Corrective Action

a. Determine which trip unit is causing the alarm.

b. Refer to plant Technical Specifications.

c. Repair or replace the appropriate trip unit as required.

d. Reset any isolations by depressing the appropriate NS^4 isolation reset pushbuttons on P602.

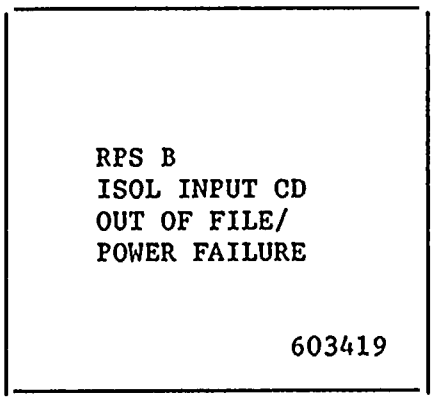
e. Return any isolated systems to service per the appropriate operating procedures.

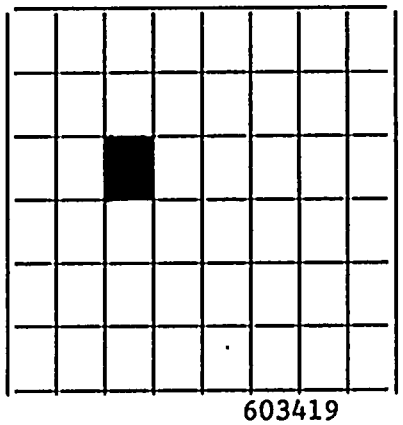
f. Reset the half scram using the scram reset switches on P603.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

50.0 603419 Reactor Protection System B Isolation Input Card Out of File/ Power Failure

Reflash: Yes TCN-18





50.1

Computer Point	Computer Printout	Source	
RPSBC30	RPS B1 ISOL INP CD OOF	Any Div II NS^4 Input Card unplugged or power failure.	*3
RPSBC32	RPS B2 ISOL INP CD OOF		*3

50.2 Automatic Response

a. Possible Div II NS^4 isolations or half isolations.

b. Possible RPS Channel B half scram.

50.3 Corrective Action

a. Refer to plant Technical Specifications for possible LCO's and applicable actions.

b. Troubleshoot and repair as required.

c. Reset any isolations or half isolations received using the reset pushbuttons on P602.

d. Reset any RPS B half scrams received using the scram reset switches on P603.

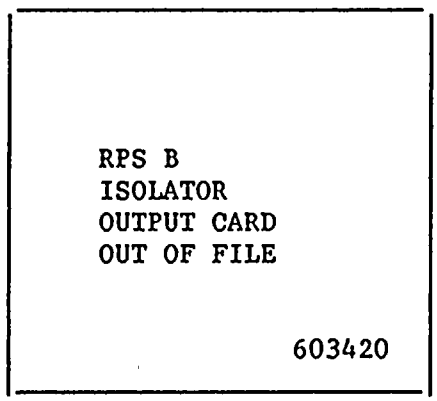
e. Restore any isolated systems to service per the applicable operating procedures.

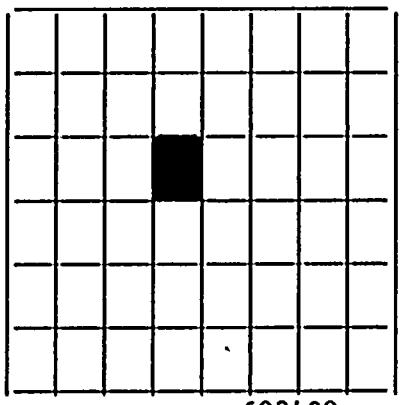
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

51.0 603420 Reactor Protection System B Isolator Output Card Out of File

Reflash: Yes

TCN- 18





51.1

Computer Point	Computer Printout	Source
RPSBC31	RPS B1 ISO OUTPUT CD OOF	Any Div II NS^4 Output Card out of file.
RPSBC33	RPS B2 ISO OUTPUT CD OOF	

*3

51.2 Automatic Response

a. Possible Div II NS^4 isolations or half isolations.

b. Possible RPS Channel B half scram.

51.3 Corrective Action

a. Refer to plant Technical Specifications for possible LCO's and applicable actions.

b. Troubleshoot and repair as required.

c. Reset any isolations or half isolations received using the reset pushbuttons on P602.

d. Reset the half scrams if received using the scram reset switches on P603.

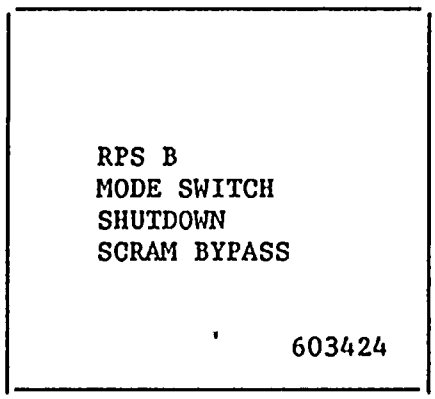
e. Restore any isolated systems to service per the applicable operating procedures.

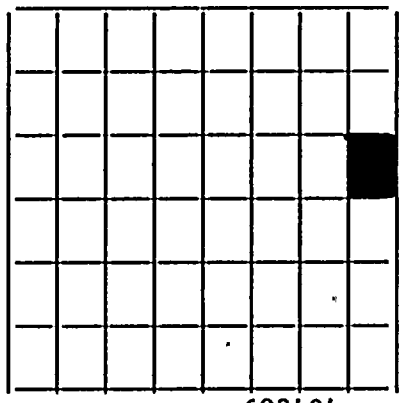
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

52.0 603424 Reactor Protection System B Mode Switch Shutdown Scram Bypass

Reflash: Yes

TCN- 18





52.1	Computer Point	Computer Printout	Source	
	RPSBC11	RPS B1 MODE SW SCRAM BYP	Reactor Mode switch in shutdown and 10 second timer timed out.	*3
	RPSBC12	RPS B2 MODE SW SCRAM BYP		*3

52.2 Automatic Response

a. NONE

52.3 Corrective Action

NOTE: When the Reactor Mode switch on P603 is placed in the "SHUTDOWN" position, an automatic scram signal is initiated. After approximately 10 seconds, this scram signal is bypassed to allow the scram to be reset.

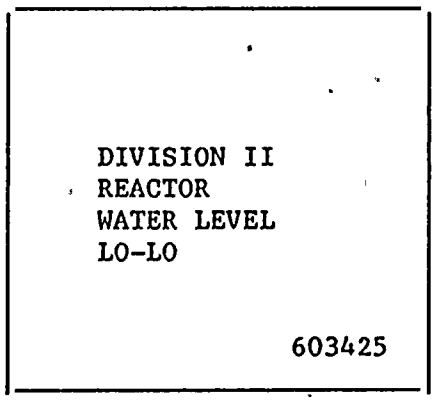
a. Reset the reactor scram, when appropriate, using the scram reset switches on P603.

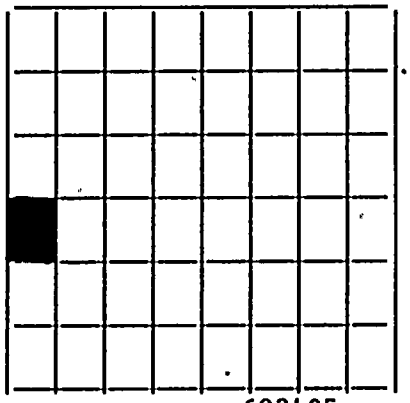
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

53.0 603425 Division II Reactor Water Level Lo-Lo

Reflash: Yes

TCN- 18





53.1

Computer Point	Computer Printout	Source
ISCLC03	D2 RX WTR LVL RPS B1	2ISC*LIS1681B
ISCLC04	D2 RX WTR LVL RPS B2	2ISC*LIS1681D

* 3

Setpoint: LL2(108.8")

53.2 Automatic Response

a. Traversing Incore Probe (TIP) system half isolation (Group 3).

b. Recirc sample valve half isolation (Group 2).

c. Reactor Water Cleanup (WCS) half isolation (Group 6/7).

d. Containment purge half isolation (Group 9).

e. Group 8 half isolation.

f. Standby gas treatment half initiation signal.

53.3 Corrective Action

a. If actual water level has decreased to the Lo-Lo level (level 2) then perform the following:

1. Verify that all automatic actions have occurred. Manually initiate any automatic action that has not occurred.

2. Refer to N2-OP-101C (scram occurred at level 3).

3. Refer to the Emergency Operating procedures (Rx water level 3 is an entry condition).

b. If water level has not decreased to LL2, perform the following:

1. Refer to Technical Specifications for actions.

2. Determine the cause of the alarm condition and correct.

3. After correction of the condition, reset the half isolations using the isolation reset pushbuttons on P602.

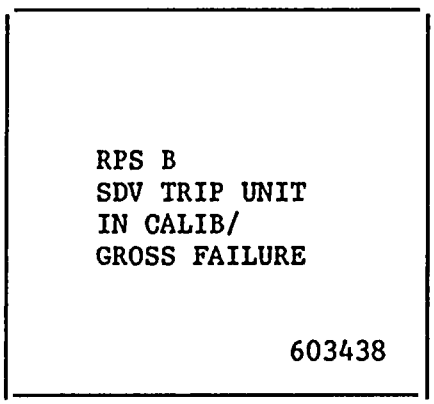
4. Return any isolated system to service using the appropriate system operating procedure.

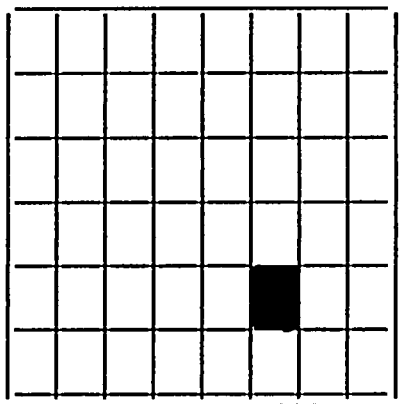
I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

54.0 603438 Reactor Protection System B Scram Discharge Volume Trip Unit in Calibrate/Gross Failure

Reflash: No

TCN- 18





54.1	Computer Point	Computer Printout	Source
	RPSBC43	RPS B T-U IN CAL/GR FAIL	SDV High Level Trip unit mode switch not in Operate or trip unit failed. * 9

54.2 Automatic Response

a. NONE

54.3 Corrective Action

a. Determine the cause of the alarm condition and correct.

I. PROCEDURE FOR CORRECTING ALARM CONDITIONS (Cont.)

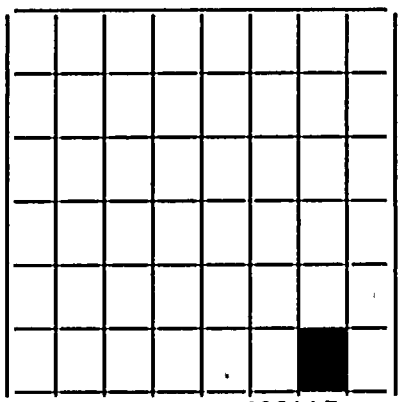
55.0 603447 Reactor Protection System B System Inoperable

Reflash: No

TCN- 18

RPS B
SYSTEM
INOPERABLE

603447



603447

55.1

Computer Point	Computer Printout	Source
RPSPC29	RPS B SYS OUT OF SERVICE	RPS B bypass pushbutton (Amber backlite push-button) on P603 depressed.

*3

55.2 Automatic Response

a. Reactor Recirc Pump end of Cycle Pump Trip is bypassed.

55.3 Corrective Action

a. Refer to Technical Specifications for actions.

b. Return the RPS Channel B bypass switch to "NORMAL" when appropriate.

TABLE I

VALVE LINEUP

VALVE NO.	DESCRIPTION	REQUIRED POSITION	ACTUAL POSITION	INITIALS & DATE	REMARKS
N/A					

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2RPM-MG1A	RPS MG Set 1A	2NHS-MCC008-7EL	CLOSED (ON)			
2RPM-X1A	2RPM-PNL1A Alt Feed XFMR	2LAT-PNL100-31	ON			
2RPM-PNL1A	Normal Pwr Supply	2RPM-MG1A Output Bar	ON			
2RPM-PNL1A	Alternate Pwr Supply	2RPM-BKR1A	ON			
2RPM-PNL1A	Alternate Input To 2RPM-PNL1A	2RPM-PNL1A-CB1A	ON			
2RPM-PNL1A	Feed to RPS 'A' Scram Pilot Solenoids	2RPM*PNL1A-CB8A	ON			
		BREAKERS POWERED FROM 2RPM-PNL1A				
2RPM*ACB1A EPA	RPS Protective BKR	2RPM*ACB1A EPA	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2RPM*ACB2A EPA	RPS Protective BKR	2RPM*ACB2A EPA	ON			
CKT*2RPSA02	Pilot Scram Valve Sol 'A' (Scram Grp 1) & IND Lite 'C'	2RPM*PNLA100-3	ON			*
CKT*2RPSB02	Pilot Scram Valve Sol 'A' (Scram Grp 2) & IND Lite 'G'	2RPM*PNLA100-2	ON			*
CKT*2RPSC02	Pilot Scram Valve Sol 'A' (Scram Grp 3) & IND Lite 'E'	2RPM*PNLA100-1	ON			*
CKT*2RPSD02	Pilot Scram Valve Sol 'A' (Scram Grp 4) & IND Lite 'A'	2RPM*PNLA100-4	ON			*

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2RPM-MG1B	RPS MG Set 1B	2NHS-MCC009-4EL	CLOSED (ON)			
2RPM-X1B	2RPM-PNL 1A Alt Feed XFMR	2LAS-PNL400-25	ON			
2RPM-PNL1B	Normal Pwr Supply	2RPM-MG1B Output BKR	ON			
2RPM-PNL1B	Alternatic Pwr Supply	2RPM-BRR1B	ON			
2RPM-PNL1B	Alternate Input To 2RPM-PNL1B	2RPM-PNL1B-CB1B	ON			
2RPM-PNL1B	Feed to RPA 'B' Scram pilot Solenoids	2RPM-PNL1B-CB2B	ON			
		BREAKERS POWERED FROM 2RPM-PNL1B				
2RPM*ACB1B EPA	RPS Protective BKR	2RPM*ACB1B EPA	ON			
2RPM*ACB2B EPA	PRS Protective BKR	2RPM*ACB2B EPA	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS	
CKT*RPSA03	Pilot Scram Valve Sol 'B' (Scram Grp 1) & IND Lite 'D'	2RPM*PNLB100-3	ON				*
CKT*RPSB03	Pilot Scram Valve Sol 'B' (Scram Grp 2) & IND Lite 'H'	2RPM*PNLB100-2	ON				*
CKT*RPSC03	Pilot Scram Valve Sol 'B' (Scram Grp 3) & IND Lite 'F'	2RPM*PNLB100-1	ON				*
CKT*RPSD03	Pilot Scram Valve Sol 'B' (Scram Grp 4) & IND Lite 'B'	2RPM*PNLB100-4	ON				*

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2VBB-UPS-3A	Normal Pwr Supply	2LAT-PNL100-26	ON			
2VBB-UPS-3A	Alternate Pwr Supply	2NJS-PNL500-2	ON			
2VBB-XRC503	Alt. Supply XFMR To 2VBB-UPS3A	2VBB-XRC503 Input BKR	ON			
2VBB-UPS-3A	Backup Pwr Supply	2BYS-SWG001C-2D	ON			
2VBB-UPS-3A	Input Power	2VBB-UPS-3A-CB1	ON			
2VBB-UPS-3A	Battery Input	2VBB-UPS-3A-CB2	ON			
		BREAKERS POWERED FROM 2VBB-UPS-3A				
2VBB-BKR-3A	2VBB-UPS3A Output BKR	2VBB-BKR-3A	ON			
2VBS*ACB1A EPA	RPS Protective BKR	2VBS*ACB1A EPA	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2VBS*ACB2A EPA	RPS Protective BKR	2VBS*ACB2A EPA	ON			
2VBS*PNLA103	RPS Power Supply PNL	2VBS*PNLA100-1	ON			
2VBS*PNLA104	RPS Power Supply PNL	2VBS*PNLA100-2	ON			
2VBS*PNLA105	RPS Power Supply PNL	2VBS*PNLA100-3	ON			
2VBS*PNLA106	RPS Power Supply PNL	2VBS*PNLA100-4	ON			
2VBS*PNLA110	RPS Power Supply PNL	2VBS*PNLA100-6	ON			
CKT*2RPSA01	Trip Channel A1 Sensors	2VBS*PNLA103-14	ON			
CKT*2RPSC01	Trip Channel A2 Sensors	2VBS*PNLA104-13	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
CKT*2RPSA06	Trip Channel B1	2VBS*PNLA106-6	ON			
CKT*2RPAN01	Scram Disch Vol ISO, Valve Pos. IND Lites	2VBS*PNLA103-7	ON			
CKT*2RPSA07	A1 Trip ALM CKT	2VBS*PNLA103-5	ON			
CKT*2RPSC07	A2 Trip ALM CKT	2VBS*PNLA104-1	ON			
CKT*2RPSC06	Trip Channel B2	2VBS*PNLA110-1	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2VBB-UPS3B	Normal Pwr Supply	2NJS-PNL402-32	ON			
2VBB-UPS3B	Alternate Pwr Supply	2NJS-PNL600-2	ON			
2VBB-XRC603	Alt Supply XFRM To 2VBB-UPS3B	2VBB-XRC603 Input BKR	ON			
2VBB-UPS3B	Backup Pwr Supply	2BYS-SWG001B-3D	ON			
2VBB-UPS3B	Input Pwr	2VBB-UPS3B-CB1	ON			
2VBB-UPS3B	Battery Input	2VBB-UPS3B-CB2	ON			
		BREAKERS POWERED FROM 2VBB-UPS3B				
2VBB-BKR3B	2VBB-UPS3B Output BKR	2VBB-BKR3B	ON			
2VBS*ACB1B EPA	RPS Protective BKR	2VBS*ACB1B EPA	ON			
2VBS*ACB2B EPA	RPS Protective BKR	2VBS*ACB2B EPA	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
2VBS*PNLB103	RPS Power Supply PNL	2VBS*PNLB100-1	ON			
2VBS*PNLB104	RPS Power Supply PNL	2VBS*PNLB100-2	ON			
2VBS*PNLB105	RPS Power Supply PNL	2VBS*PNLB100-3	ON			
2VBS*PNLB106	RPS Power Supply PNL	2VBS*PNLB100-4	ON			
2VBS*PNLB110	RPS Power Supply PNL	2VBS*PNLB100-6	ON			
CKT*2RPSB01	Trip Channel B1 Sensors	2VBS*PNLB103-14	ON			
CKT*2RPSD01	Trip Channel B2 Sensors	2VBS*PNLB104-13	ON			
CKT*2RPSB06	Trip Channel A1	2VBS*PNLB105-6	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
CKT*2RPSB07	B1 Trip Alm Ckt	2VBS*PNLB103-6	ON			
CKT*2RPSD07	B2 Trip Alm Ckt	2VBS*PNLB104-1	ON			
CKT*2RPSD06	Trip Channel A2	2VBS*PNLB110-1	ON			

TABLE II

SYSTEM POWER SUPPLY LINEUP

COMPONENT NO.	DESCRIPTION	POWER SUPPLY	NORMAL POSITION	ACTUAL POSITION	INITIALS/ DATE	REMARKS
		BACKUP SCRAM CIRCUITS POWER				
CKT*2RPSA04	Channel 'A' Backup Scram Ckt & RPT Sys 'A'	2BYS*PNL201A-17	ON			
CKT*2RPSB04	Channel 'B' Backup Scram Ckt & RPT Sys 'B'	2BYS*PNL201B-17	ON			

1988

INTERNAL CORRESPONDENCE
FORM 112-2 R 02-80 55-01-013

NIAGARA MOHAWK

FROM R. Main RM for RM.

DISTRICT Nine Mile Point Unit 2 07-194-91

TO File

DATE Aug. 26, 1991 FILE CODE NMP-76828

SUBJECT Transformer Consultants

The following individuals have assisted in the investigation of the B Main Phase Transformer failure:

Harold Light	NMPC
Charlie Raymond	G.E.
Kenneth Skinger	Stone & Webster
Doctor Chei	Root Cause
Jim Riddle	Root Cause
Mike Petronka	Cooper Ind.
George Rushmore	McGraw Edison

RM/gb

(7) .250 HOLES
(4 HOLES LOCATED IN BLACK BAND AT TOP, 3 IN BOTTOM BAND)

2.750 — 2.750

.188 R.

12.000

11.378

GENERAL ELECTRIC

TRANSFORMER

NO. CLASS FOA· THREE-PHASE 60 HERTZ

CAUTION! BEFORE INSTALLING OR OPERATING READ INSTRUCTIONS GEK-49040 DYNA-CON(THICLAMPING SYSTEM

VOLTAGE RATING 24888-13888Y/7978-13888Y/7978
KVA RATING 188888 CONTINUOUS 55 C RISE FORCED-OIL AND FORCED-AIR-COOLED
KVA RATING 112888 CONTINUOUS 55 C RISE FORCED-OIL AND FORCED-AIR-COOLED

H WINDING CONNECTIONS
LINES ON H1.H2.H3

VOLTS LINE TO LINE	112888 KVA AMP	DIAL POS.	MECHANISH CONNECTS A TO	B TO	H TO	
27788	2388	12	C	C		
27238	2375	13	D	C		
27688	2388	14	D	D		
28888	2488	15	C	D		
28778	2415	16	C	C		
28888	2488	17	F	C		
28888	2488	18	F	F		
28938	2488	8	G	F		
28888	2475	9	G	G		
28888	2488	7	H	G		O
28888	2588	6	H	H		
28888	2588	5	K	H		
28888	2588	4	K	K		
28778	2588	3	L	K		
28888	2588	2	L	L		
28888	2588	1	H	L		
28888	2588	N	H	H		
28748	2588	1	H	C		
28888	2588	2	C	C		
28438	2848	3	D	C		
28288	2988	4	D	D		
28138	2888	5	C	D		
28878	2788	6	C	C		
28818	2715	7	F	C		
28588	2735	8	F	F		
28588	2758	9	G	F		
28748	2778	10	G	G		
28888	2788	11	H	G		
28938	2885	12	H	H		
28738	2848	13	K	H		
28578	2888	14	K	K		
28418	2888	15	L	K		P
28218	2888	16	L	L		

RAISE LOW VOLTAGE — LOWER LOW VOLTAGE

X WINDING CONNECTIONS
LINES ON X1 X2 X3 · NEUTRAL ON X0

VOLTS LINE TO LINE	VOLTS LINE TO NEUT.	56888 KVA AMPS.
13888	7978	3343

Y WINDING CONNECTIONS
LINES ON Y1 Y2 Y3 · NEUTRAL ON Y0

VOLTS LINE TO LINE	VOLTS LINE TO NEUT.	56888 KVA AMPS.
13888	7978	3343

BASIC INSULATION LEVELS

ITEM	IMPULSE LEVEL FULL WAVE KV
H1 H2 H3	158
X1 X2 X3 X0	118
Y1 Y2 Y3 Y0	118

SUITABLE FOR SIMULTANEOUS THREE-WINDING OPERATION PROVIDING THE KVA OF ANY WINDING IS NOT EXCEEDED, AND THE ARITHMETICAL SUM OF THE OUTPUTS DOES NOT EXCEED 112888 KVA.

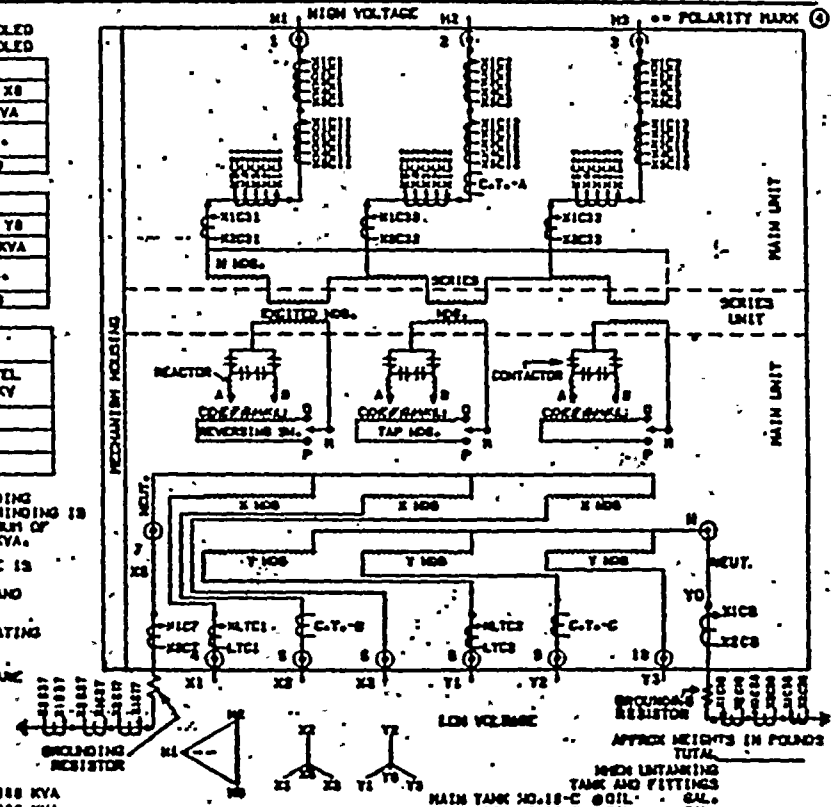
TRANSFORMER OPERATING PRESSURE RANGE IS 10 PSI POSITIVE TO 2 PSI NEGATIVE. TRANSFORMER TANK SUITABLE TO WITHSTAND 12.5 PSI PRESSURE AND FULL VACUUM.

C.T.'S A,B,C ARE FOR USE WITH INDICATING THERMAL RELAYS AND REMOTE WINDING TEMPERATURE INDICATORS.

C.T.'S NO. 1-2-3-11-12-13-21-22-23 ARE 3888/5 AMP.
C.T.'S NO. 7-8-17-18-27-28-37-38 ARE 988/5 ARE WOUND TYPE T200 ACC.

C.T.'S NO.31-32-33 ARE 4588/8.5 AMP.
REFER TO C.T. NAMEPLATE NP287888 FOR CONNECTIONS AND RATIOS.
LTC C.T.'S ARE 2388/8.2 AMP.

IMPEDANCE VOLTS PER CENT 24888-13888Y(X MOG.) VOLTS AT 56888 KVA
IMPEDANCE VOLTS PER CENT 24888-13888Y(Y MOG.) VOLTS AT 56888 KVA



CALCULATED IMPEDANCE AT 56888 KVA
H-X///Y= 9.83%
H-Y = 7.12%
H-Y = 7.18%
X-Y =13.33%

Rpf 108849 (8-87)
REVISED (10-77)

REVISIONS	POINTS TO
11-1-77	035
6-13-78	036
8-13-78	037
	038A
	38OF
	38OG
	38OH
	38IP
	3838
	38J

MADE IN U.S.A.

8.438 — 2.750 — 2.750 — 16.378 — 17.000

ETCHED STN. STL. CSOFIER, .020 THK. ETCHING FILLED WITH BLACK BAKING ENAMEL.
AREA: 204.000 SQ. IN. MATERIAL CODE 12208

NP 269304

Ac-2

MASTER

PROC. ID R 12997
EPN
ASSIGNED TO Jim Altman
ASSOC. EQUIP.

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION

ELECTRICAL PREVENTIVE MAINTENANCE PROCEDURE

S-EPM-GEN-V060

REVISION 01

5-29-91

INFRARED INSPECTION OF ELECTRICAL EQUIPMENT

FOR INFO. ONLY

CONTROLLED COPY

Approved By: _____
W. C. Drews Superintendent Maintenance-Nuclear

Date 9/6/90

THIS REVISION IS A GENERAL REWRITE

Effective Date: 9/7/90

NOT TO BE USED AFTER SEPTEMBER 1994
SUBJECT TO PERIODIC REVIEW

CONTROLLED WORKING COPY
VERIFIED BY John Higby
NOT TO BE USED AFTER 6/1/91

Initials/Date

6.0 PREREQUISITES

6.1 Plant/System Conditions

6.1.1 Plant Conditions

Any

6.1.2 System Conditions

Equipment being surveyed should be carrying normal load current and voltage. JH 5/29/91

6.2 Administrative

6.2.1 Specify reason for procedure performance below:

(✓) Routine Maintenance
(__) Maintenance due to Failure
(__) Post Maintenance Testing
(__) Other (Specify reason) _____
Work Request Number _____ JH 5/29/91

NOTE: The following step is to be performed by all personnel performing this procedure.

6.2.2 Read this procedure. If there is information contained within this procedure that you do not understand, contact supervision for clarification. When the information contained within this procedure is understood, print your name and sign your initials below.

PRINTED NAME	INITIALS/DATE
Tom OTTMAN	5/29/91
JOE KIRKPATRICK	JCK 5/29/91

QB, 5/29/91

6.2.3 Obtain an RHP in accordance with AP-3.3.2.

RHP Number _____

N/A, no RHP is required..... (✓) QB, 5/29/91

Initials/Date

NOTE: Information in Step 6.2.4 may be recorded when each piece of M&TE is used.

6.2.4 Verify that calibration dates of test equipment used have not expired. Record M&TE nomenclature, M&TE number and calibration due date.

Test Equipment Nomenclature	M&TE Number	Range(s) Used	Calibration Due Date
HUGHES	EM-40	N/A	N/A

JB, 5/29/91

6.2.5 Conduct job briefing to familiarize personnel with procedure, safety concerns, and work to be done.

JB, 5/29/91
Lead

6.3 Notifications

None

7.0 PROCEDURE

7.1 Preliminary Actions

7.1.1 Discuss the Plant Impact and resulting effect on the plant due to performance of the procedure with Station Shift Supervisor (SSS) and the Chief Shift Operator (CSO).

JB, 5/29/91

PLANT IMPACT: NONE

7.1.2 Obtain SSS and CSO permission to perform the procedure by obtaining their signatures below.

[signature] 5/29/91
SSS Signature Date

[signature] 5/29/91
CSO Signature Date

JB 5/29/91

7.1.3 Notify CSO of commencement and record Start Time/Date.

1130 5/29/91
Start Time Date

JB 5/29/91

JB 5/29/91

7.2 Probeye Infrared Viewer Setup

a. Place Probeye Infrared Viewer upside down on a padded surface ..... (✓)

b. Disconnect stainless steel strap ..... (✓)

NOTE: Fully pressurized cylinders (5000 psi) should be installed to allow for maximum operating time (approximately four hours).

c. Place Argon cylinder in frame ..... (✓)

d. Align cylinder so that cylinder outlet port can be engaged with coupling nut ..... (✓)

e. Tighten coupling nut to cylinder, finger tight ..... (✓)

f. Connect stainless steel strap around cylinder and tighten knurled knob ..... (✓).

NOTE: Use of excessive torque on coupling nut may distort pressure seal and cause pressure loss.

g. Tighten coupling nut snug tight ..... (✓)

NOTE: A hissing sound of gas transfer from the argon cylinder should be heard and continue for up to 30 seconds as the infrared detector cools to proper operating temperature.

WARNING

The storage and use of Argon gas requires adequate ventilation.

---

h. Open gas valve one full turn and wait approximately 30 seconds ..... (✓)

Initials/Date

7.2 (Cont)

NOTE: Keeping the gas valve open unless the viewer is expected to remain idle for greater than twenty minutes will assure maximum hours of continuous operation.

i. Turn BRIGHTNESS and CONTRAST knobs fully counterclockwise..... (X)

j. Turn viewer knob ON..... (X) WBC 15-29.91

7.3 Infrared Survey

WARNINGS

1. Potentially lethal voltages may exist on electrical components, such as Transformers, Power Boards and Circuit Breakers.

2. Removal of manufacturer protective barriers is NOT recommended on energized components.

---

a. Select component to be surveyed, and record on Attachment 1.

b. Ensure component is accessible for survey. Open panel covers as necessary.

c. Adjust BRIGHTNESS knob clockwise until background intensity appears as a uniform "weak" red color.

d. Adjust CONTRAST knob until the objects of warmer temperatures (brighter) begin to appear.

e. Adjust FOCUS knob for optimum focus.

f. Scan object, noting all "hot" spots as indicated by bright white area on viewer screen. Record results on Attachment 1.

Initials/Date

7.3 (Cont)

NOTE: Surface contact temperature can be measured using an infrared thermometer such as Wahl Instrument Heat Spy Digital Infrared Thermometer.

g. IF hot spots detected, measure surface temperature. Record results on Attachment 1.

h. Inspect for foreign material, loose objects and debris. Record results on Attachment 1.

i. Install panel covers if removed in Step 7.3.b.

j. Repeat Steps 7.3.a - 7.3.i for remaining components, if applicable. WAR 15-29-91

7.4 Probeye Infrared Viewer Storage

a. Turn viewer knob OFF..... (X)

* *

CAUTION

Failure to shut gas valve may result in Infrared Viewer damage during subsequent use.

* *

b. Shut gas valve..... (X)

c. Disconnect Argon cylinder and remove..... (X) WAR 15-29-91

8.0 RETURN TO NORMAL

8.1 Perform a general cleanup of all equipment and space within the work area. WAR 15-29-91

8.2 Return the RHP, if applicable. WAR 15-29-91

8.3 Record stop time and date and have CSO and SSS acknowledge completion by obtaining their initials.

1430 15-29-91 [CSO] [SSS] FEI 5/31/91

Stop Time Date CSO SSS

8.4 Complete the Calibration Log Card for each piece of M&TE utilized. NA

Initials/Date

8.5 Return Probeye Infrared Viewer to M&TE Issue. WAC 15-29-91

9.0 ACCEPTANCE CRITERIA

Infrared heat inspection of electrical switchgear or electrical components have been completed and results recorded on Attachment 1.

10.0 RECORD REVIEW AND DISPOSITION

10.1 Record remarks concerning procedure performance, WRs, problems that occurred, and method of resolution, as applicable. Attach a copy of any WRs generated as a result of this procedure.

Remarks: _____

10.2 Personnel ~~who~~ have performed portions of this procedure, sign initials, print name, and sign name below:

	Initials	Printed Name	Signature
Leadman	JO	TOM OTTMAN	
Performed by	WR	LUAYNE A. ROTH	Wayne A. Roth
Performed by	JCK	JOE KIRKPATRICK	J. Kirkpatrick
Performed by			
Performed by			
Performed by			

10.3 Maintenance supervision shall review data resulting from performance of the procedure for completeness, accuracy, and acceptability.

Frank Lop 5/31/91
Supervision Date

10.4 Maintenance supervision shall ensure records (maintenance or test data) are included in the Work Request Package.

F Lop 5/31/91
Supervision Date

ATTACHMENT 1
INFRARED SURVEY DATA SHEET

Component ID	Infrared Survey Sat	Unsat	Surface Temp.[2]	Visual Inspection Sat	Unsat[1]	Initials/Date
2Y4L-MDS2	(✓)	(__)		(✓)	(__)	JCK 5/29/91
2Y4C-MDS4	(✓)	(__)		(✓)	(__)	JCK 5/29/91
2ABS-X1	(✓)	(__)		(✓)	(__)	JCK 5/29/91
2Y4C-MDS5	(✓)	(__)		(✓)	(__)	JCK 5/29/91
2RTX-XSR1B	(✓)	(__)		(✓)	(__)	JCK 5/29/91
2Y4L-MDS1	(✓)	(__)		(✓)	(__)	JCK 5/29/91
2Y4C-MDS3	(✓)	(__)		(✓)	(__)	JCK 5/29/91
2RTX-XSR1A	(✓)	(__)		(✓)	(__)	JCK 5/29/91

Discrepancies Found

Component ID	Remarks	Initials/Date
		/
		/
		/
		/
		/
		/
		/
		/

1 A Unsat requires a entry in Discrepancies Found.
2 Surface Temperature required only if Infrared Survey is checked unsat.

ATTACHMENT 1
INFRARED SURVEY DATA SHEET

Component ID	Infrared Survey Sat	Infrared Survey Unsat	Surface Temp.[2]	Visual Inspection Sat	Visual Inspection Unsat[1]	Initials/Date
2YXC - MDS1	(✓)	(__)		(✓)	(__)	QLK 15/27/91
2MTX-XM1A	(✓)	(__)		(✓)	(__)	QLK 15/27/91
2MTX-XM1B	(✓)	(__)		(✓)	(__)	QLK 15/27/91
2MTX-XM1C	(✓)	(__)		(✓)	(__)	QLK 15/27/91
2MTX-XM1D	(✓)	(__)		(✓)	(__)	QLK 15/27/91
2STX - XNS1	(✓)	(__)		(✓)	(__)	QLK 15/27/91
	(__)	(__)		(__)	(__)	/
	(__)	(__)		(__)	(__)	/

Discrepancies Found

Component ID	Remarks	Initials/Date
		/
		/
		/
		/
		/
		/
		/
		/

1 A Unsat requires a entry in Discrepancies Found.
2 Surface Temperature required only if Infrared Survey is checked unsat.

WORK IN PROGRESS DATA SHEET

PLANNER & TECHNICAL REVIEWER

☐ WR* _____
☐ P* _____
☐ Other _____
☐ Not Applicable

DIV: ☐ I ☐ II ☐ III ☒ NA

Switchyard
☐ Mark No. _____
☐ EPN _____
☐ Not Applicable

S-EAP-GEN VOLD
Procedure No. _____ ☐ NA

Estimated Duration: N/A
(Equipment Out of Service)

Permissible Reactor Mode:
☒ All ☐ Hot Shutdown
☐ Run ☐ Cold Shutdown
☐ Start-up ☐ Refuel

Mark-up Required ☐ Yes ☒ No

EQUIPMENT IMPACT (LIST OUT OF SERVICE EQUIPMENT)

NO IMPACT
INFRARED Inspection of
Switchyard Components
*Some Panel Covers May be
Removed for Inspection

PLANT IMPACT (REQUIRES OPERATION'S INPUT)

NO IMPACT - INFRARED INSPECTION OF
TRANSFORMERS

REFERENCE DRAWINGS: (LIST BELOW)

COMMENTS

Prepared By Rusty G. Olson Date: 5/29/91 Tech. Reviewer Stephen C. Black Date: 5/29/91

☐ This section N/A with No Plant Impact

Reviewed with Crew By: _____ Supv/Chief Date: 5/29/91
Permission Requested to Start By: _____ Date: 5/29/91 Time: 12:30
Permission Granted to Start By: SSS _____ Date: 5/29/91 Time: 1059 CSO _____ Date: 5/29/91 Time: 12:55
Renotifications: ☐ ____/____ SSS ____/____ CSO ☐ ____/____ SSS ____/____ CSO ☐ ____/____ SSS ____/____ CSO

CONTINUED ON BACK

POST MAINTENENCE TESTS — PMT REQUIRED ☐YES ☐NO

PLANNER AND TECHNICAL REVIEWER

OPS ACCEPTANCE

TEST REQUIREMENTS

PROCEDURES

☐ No. S-EPM-GEN.VOL.0	Step No.'s 9.0	☐N/A
☐ No.	Step No.'s	☐N/A
☐ No.	Step No.'s	☐N/A
☐ No.	Step No.'s	☐N/A

TESTS

Test	Acceptance Criteria
☐ Test	☐
☐ Test	☐
☐ Test	☐
☐ Test	☐

TEST RESULTS

Deferred	Sat	Performed By	Verified By
☐Yes ☐No	☑ Sat	[signature] 5-30-91 1530	[signature] 5-30-91
☐Yes ☐No	☐ Sat	/	/
☐Yes ☐No	☐ Sat	/	/
☐Yes ☐No	☐ Sat	/	/
☐Yes ☐No	☐ Sat	/	/
☐Yes ☐No	☐ Sat	/	/
☐Yes ☐No	☐ Sat	/	/
☐Yes ☐No	☐ Sat	/	/

Prepared by: [signature] Date: 5/28/91

Technical Reviewer: [signature] Date: 5/29/91

☐ Shaded section not used with WR/Document on WR

Remarks:

Note: The below signature, when signed, declares the equipment operable at the date and time specified.

Reviewed by: [signature] ASSS/SSS Date: 6/5/91

Accepted By [signature] SSS Date: 6/5/91 Time 1020

07-198-01

INTERNAL CORRESPONDENCE
FORM 112-2 R 02-80 55-01-013

NIAGARA MOHAWK

FROM R. Crandall JTD for RC

TO R. G. Randall

DISTRICT Nine Mile Point Unit 2

DATE June 15, 1988 FILE CODE NMP 32888

SUBJECT SOER 83-3
(Supersedes NMP25340)

TITLE: Inverter Failures Resulting in Loss of Power to Vital Systems Resulting in Severe Operational Transients

EXECUTIVE SUMMARY

PROBLEM STATEMENT

Inverter failures due to internal component failures, electromagnetic interference, and inadequate electrical protection coordination have caused loss of power to reactor protection, vital instrumentation, and control systems. Loss of power to these vital systems has resulted in inadvertent reactor trips and severe operational transients at operating nuclear power plants.

CONCLUSION

It should be noted that there has never been an inverter component failure at Nine Mile Point Unit 2 that has directly caused a loss of power to any bus. Loss of power to downstream buses has only occurred by a combination of a component failure with a subsequent (second action) human error.

ACTION REQUIRED

Inverter failures are not a problem at NMP2. There has been one Category II uninterruptible power supply (UPS) that experienced failure of an inverter diode thought to be a result of overheating caused by construction dust becoming entrained in the inverter fans. No further action is required.

DETAILED DISCUSSION

BACKGROUND

More than 200 inverter failures have been reported from various nuclear plants over a period of six years. Inverter failures throughout the industry have caused loss of power to the vital buses supplying Reactor Protection System (RPS), vital instrumentation and annunciation. These losses of power have caused inadvertent reactor scrams as well as unexpected plant transients. The failures have been attributed to internal inverter component failures, electromechanical interference, inadequate electrical protection coordination of fuses as well as some human errors in operation of the inverter units. Older units typically had a mean time between failures of 10,000 hours (1.1 years) while newer units are having a typical mean time between failures of 40,000 hours (or 4 1/2 years) due to the use of more reliable components in the newer model inverters.

DETAILED DISCUSSION

The causes of failures were categorized by a study done by the Nuclear Safety Analysis Center (NSAC Report-44) as follows:

Inverter Internal Components	43 percent
Fuses	11 percent
Human Error	10 percent
Transients	7 percent
Miscellaneous	29 percent

The installation and testing of all inverters was done under strict procedures. In each case the manufacturers felt that the test group at Nine Mile Point Unit 2 tested the units far beyond that normally done at most sites. Each unit was tested at full load with transfers of the output to verify no loss of load or component failure. Input power was switched to verify response to loss of input power to the units. Each unit was subjected to 24 hours at full load to eliminate infant mortality of components. It is felt that this testing "weeded out" weak components within each unit and proved that the units can withstand the plant transients. It also should be noted that the units at Nine Mile Point Unit 2 have been operating at their full expected load for approximately two years with a minimal number of component failures - even though they have been subjected to tremendous transients because of the extensive startup program in progress. The startup transients are far worse than those the plant will experience in actual operation.

See attachment for a listing of Unit #2 UPS.

DETAILED EVALUATIONS

1. INPO SOER 83-3, Recommendation #1

   RECOMMENDATION: Review and upgrade purchase specifications for capacitors (procured separately or as part of printed circuit boards) to ensure the use of capacitors certified for application at higher than expected temperature, voltage, and service conditions. Purchase specifications for capacitors should consider inverter cabinet ambient temperature (not the room ambient temperature), voltage levels at special operating conditions (battery charger in equalizing voltage condition), and voltage and current surges during transient conditions.

   NMPC RESPONSE: Upgrade of our purchase specifications for capacitors is not required at this time. The SOER-referenced report (NSAC/44) is concerned about equalizing current being too high, internal UPS temperatures above manufacturer's expected and adverse voltage/current transients.

   a) Our units run at 140 vdc per the vendor recommendation which is our maximum battery voltage. Our UPS units have blocking diodes that prevent feeding ANY current to the DC system and they DO NOT charge our DC system (separate chargers are supplied for that purpose). Our batteries are a standby source only.

b) Our internal UPS temperatures are controlled, as suggested in the referenced report, by forced ventilation in eight units and the other two have natural convection cooling to keep all units within manufacturer's expected conditions. One unit has exhibited overheating alarms, found to be caused by cement dust entrained in the cooling fans from construction conditions and lack of heat-sink grease on the inverter SCR's. To correct this the floors have been painted, the SCR's were removed and heat sink grease put on them and they were reinstalled and the unit filters are now checked in conjunction with the battery weekly checks.

c) Operational voltage transients have already been applied to each unit as part of their initial startup and testing and startup of the plant - full load transfers, loss of each infeed source with full load on output, upstream fast transfer of feeder buses, full load application on output, to point out a few. From initial start to the present, in all ten units, a total of three capacitors have failed, two during first turn-on of two units (infant mortality), the third failed as a result of an off-normal maintenance transfer (done to attempt to troubleshoot another problem) - three total failures even though our units have approximately 25,000 hours of operation each.

Based on this operational experience, our units run within the operating envelop expected by the manufacturer. Adequate design features are incorporated to preclude premature aging due to operational transients. By purchasing parts as specified by the vendor we are insuring quality parts designed for the operational conditions expected for the life of our units. DC voltage of 140 VDC per the manufacturer, capacitors that are rated at 175 VDC surge, etc.

CONCLUSION: No further action required.

2. INPO SOER 83-3, Recommendation #2

RECOMMENDATION: Ensure that storage conditions for spare capacitors and printed circuit boards meet manufacturer's specifications in order to achieve the projected shelf life.

NMPC RESPONSE: With each purchase order the manufacturer is required to furnish shelf life and climate control requirements. Per procedure MMP-604 the parts are tracked and verified. Shelf-life is stamped on the component upon delivery as well as it being input into the computer. The part is stored in Level A, B, etc. according to the manufacturer's recommendations. All inside warehouse storage areas have recording thermometers and for Level A storage, humidity as well. These are checked and if readings outside of those required are noted the components in that area are put on hold until materials engineering can evaluate the effects of that temperature (humidity) variation.

Monthly, a computer run is made of all components with shelf life expirations due that month. Those parts are put on hold and will not be released out to the field until released by engineering or they are replaced, if necessary.

Whenever a materials requisition is presented at the storeroom/warehouse, the computer is checked to verify that the component is not past its shelf life and the part itself is checked for its stamped shelf life date. If the component is past its shelf life the part will not be released to the field. The shelf life is written right on the materials issue form at the time of issue as a verification that the date code has been verified.

CONCLUSION: No action required.

3. INPO SOER 83-3, Recommendation #3

RECOMMENDATION: Review inverter ventilation conditions and improve, if necessary, to preclude overheating of inverter internal components.

NMPC RESPONSE: Per recommendation of NSAC/44, 8 of our units have forced ventilation - the QA Cat I units have flow sensors on each fan and overtemperature alarms, both of which initiate control room annunciation. The QA Cat II units have forced ventilation with overtemperature alarms also initiating control room annunciation. The remaining CAT II units (two 10 KVA each) have natural convection cooling with wide spacing of components within these units to preclude localized high temperatures. (These units are loaded less than 30% of full rated load). The units at NMP2 meet the ventilation recommendation of NSAC/44.

As long as the supplied ventilation is operational, there is no need to monitor internal temperatures of our units. There are no vendor recommended temperature limits for the UPS units.

4. INPO SOER 83-3, Recommendation #4

RECOMMENDATION: Analyze and, if necessary, improve the electrical protection coordination of the inverter feeder, inverter supplied bus, and associated branch circuits. The protection coordination should consider inverter output characteristics, over voltage under special operating conditions, inverter associated bus and branch circuit interruption time, fault conditions, and time response characteristics of fuses and circuit breakers for various fault conditions.

NMPC RESPONSE: This was done for UPS3A and 3B because it was felt that they were critical to the RPS buses and we wanted to verify that a potential problem did not exist there. The fusing used was found to be within the desired range of response for adequate coordination.

Because our units are designed with summing transformers on their outputs, the maximum output current under bus-fault conditions downstream are current limited. Per Specification N2-E035A, each unit was designed to be able to withstand a "bolted fault" on its output without tripping any upstream breakers or fuses. Each unit was tested for this at the factory. Our units are designed to sense the fault (or overload condition) and transfer the load to the "maintenance supply" transformer within 1/4 cycle (or < 4 milliseconds).

It should be noted that the single failure problems of static inverters are not experienced with Uninterruptible Supplies that are fed from A.C. as the primary source with the batteries being only a standby "backup" source, with a third "maintenance" source available. Our units have the NSAC/44 recommended solid-state "static switch" transfer design to allow transfer to the "maintenance" source without loss of load.

CONCLUSION: No action required.

5. INPO SOER 83-3, Recommendation #5

RECOMMENDATION: Plants with manual switching capability for inverters should consider adding an automatic bumpless transfer switch to improve power supply reliability.

NMPC RESPONSE: All units at Nine mile Point Unit 2 have a static switch on their outputs with switching from the inverter output to the maintenance supply and vice versa within 1/4 cycle (or < 4 msec.). These static switches prevent loss of power to the downstream loads with transfers to the maintenance supply whether the transfer is intentional or is an automatic response to an inverter signal.

CONCLUSION: No action required.

6. INPO SOER 83-3, Recommendation #6

RECOMMENDATION: Preventive maintenance programs should be reviewed to include periodic replacement of capacitors or printed circuit boards, whichever is feasible, as recommended by the manufacturer.

NMPC RESPONSE: There are no manufacturer recommendations requiring any periodic component replacement for any Category 2 Uninterruptible Power Supply (UPS), UPS1A, B, C, D, G, H or UPS3A/B. For these units parts replacements are done on a "failure of part" basis. As previously stated, any component failure will cause, as a worst case, transfer to the maintenance supply without loss of output to the critical bus.

For UPS2A/B the manufacturer recommends specific capacitor replacement every 10 years and fan replacement every 2 years. Each fan has a redundant fan and flow sensor associated with it so these are replaced as they fail. The Equipment Qualification (EQ) program tracks when the capacitors should be replaced and then Electrical Maintenance Procedure N2-EPM-GEN-9Y638 (formerly #N2-EPM-V15) documents the safe and efficient replacement of each affected capacitor. An equipment Qualification Maintenance Program Data Sheet (EQMPDS), specifically EQMPDS #E305AAA and #E305AAB, spell out the specific manufacturer requirements. It also identifies each capacitor by part no. and assembly part no. in the unit.

CONCLUSION: No action required.

7. INPO SOER 83-3, Recommendation #7

RECOMMENDATION: Ensure that maintenance procedures for testing and trouble shooting inverters include sufficient guidance to preclude damage to internal components from human error.

NMPC RESPONSE: Procedures N2-EMP-VBA-623, N2-IMP-UPS-@001 and N2-IMP-VBA-@001 give very specific direction on how to calibrate certain circuit boards and delineate very specifically how to align the units so that mistakes aren't made in setpoints where these can have an adverse affect upon the unit. N2-OP-71 and N2-OP-72 outline very descriptively the manner in which to startup and shutdown the units. This is the area where component damage is most likely to occur - when the units are capable of being switched "out of proper sequence". The part per part replacement process is controlled by the WR program and is far more than adequate. Our technicians and electricians have worked hand in hand with the system engineer and vendor representatives on each of the units and are highly qualified. The site craftsmen are highly trained people and it is felt that this is the best mechanism to preclude "sloppy" workmanship that could lead to associated component damage. Procedural controls can not take the place of using skilled craftsmen in the field and our practice of using Technicians and Electricians together has proven very effective in assuring quality workmanship.

CONCLUSION: No action required.

8. INPO SOER 83-3, Recommendation #8

RECOMMENDATION: Procedures or guidelines should be developed to assist in the investigation of fuse failures and to control the replacement of fuses.

NMPC RESPONSE: For replacement of fuses in CAT I units, the procedure, N2-EMP-VBA-623 lists every fuse and its appropriate position in the CAT I units. For replacement of fuses in the CAT II units, procedure N2-EMP-GEN-500 and Operations Standing Order #14 give guidance for their replacement. A memo has been sent to Electrical Maintenance to incorporate Standing Order #14 into their procedure as additional guidance.

As for troubleshooting within the UPS, each vendor manual incorporates a troubleshooting section. In addition, each of our units is "fuse-sectionalized" well enough that fuse failures to date have not had to be "ciphered-out", they have been obvious. The only exception to this was when, through a design-flaw downstream and floating UPS grounds, two units were forced-paralleled causing a fuse failure in one. Because this was an external condition in direct contradiction to the vendor recommendations, its investigation was very thorough and time-consuming in order to verify that it was indeed a design flaw within the load circuitry that caused the paralleling and not a UPS failure in, and of, itself.

CONCLUSION: No action required.

9. INPO SOER 83-3, Recommendation #9

RECOMMENDATION: Inverters with unequal and paralleled internal transformers should be investigated for high internal circulating currents. Corrective actions (i.e., capacitor replacement, proper tuning) should be included in maintenance procedures.

NMPC RESPONSE: This is not a problem at Nine Mile Point Unit 2. In the units where high internal circulating currents can occur design fixes have been developed to prevent them from occurring. A typical example is in UPS2A/B and UPS3A/B, when a particular input transient occurs it blows the input fuse to the maintenance supply regulator. A modification is being done that limits the inrush current to those transformers and thus eliminates the high internal circulating currents. Modification #PN2Y87MX037, is scheduled in two parts - neutral grounding of the UPS will be done prior to the September outage, with the Circuit Board and Sensing Circuit change to take place during the September outage. For UPS1A, B, C, D, G a particular plant evolution being done a certain way caused foldback of the switching inverter silocon controlled rectifiers (SCR's) resulting in inverter input fuses blowing. The existing procedure (NMP2-OP-71) and subsequent operator training has now eliminated that plant evolution from being done in that manner.

CONCLUSION: No action required.

10. INPO SOER 83-3, Recommendation #10

RECOMMENDATION: Develop a procedure or approved listing that indicates which critical components, instruments, indications, and annunciators are powered from vital power supply buses and inverters.

NMPC RESPONSE: This was done for the RPS inverters, UPS3A/B. In early 1987 Operations had problems identifying some loads off the RPS inverters and an operational event occurred that generated LER 87-17. A direct result of that LER was the creation of the VBS*Load List. This is an extensive list of every circuit off UPS3A/B including a description of the results of opening any individual fuse in those circuits.

Except for the RPS UPS, that have multiple loads off individual fuses, Operations prefers to research load distribution off actual design drawings - elementaries and connection drawings. The panel connection diagrams show circuit designation directly on the drawing. When load lists are generated from the design drawings the circuit designation directly on the drawing. When load lists are generated from the design drawings, the possibility exists of making a mistake in extracting that data. With the computer data retrieval system available and the controlled design drawings available within the control room it is fairly simple to determine which panel a particular load is fed from. All vital bus panels are designated such by their letter code "VBS" in the panel number.

The RPS circuit drawings were not adequately definitive so a "Load List" was developed for those circuits as a guide. Operations still verified each load on the design drawing itself. They use the load list only as a help to get to the design drawing.

CONCLUSION: No action required.

11. INPO SOER 83-3, Recommendation #11

RECOMMENDATION: Operator training should include understanding of inverter operation, arrangement of power supplies, backup computer readings and alarms, techniques for identification of failed inverters, and inverter failure recovery actions.

NMPC RESPONSE: This particular recommendation is being done but more extensively than recommended. A plant engineer who tested the UPS's is presenting a seminar as part of the operator requalification training cycle. The seminar is on UPS operation and terminology. One of the concerns at the plant is that some of the terminology is unique to the UPS. The engineer is discussing terms as well as actual design of each of the different types of units on site. He is presenting some of the possible trouble indications and discussing the operator action appropriate for it. In addition, the operating procedure has been updated to describe what each local alarm indicates. The nameplate descriptions on the front of the units are being changed to be more "user friendly" so that operators can readily determine what each indication means.

Nuclear training is developing more extensive UPS training as part of their operator training program. As a starting basis they will use the system engineer lesson plans and operational history.

Techniques for identification of failed inverters and inverter recovery actions are already incorporated into the operating procedures: N2-OP-71 and shortly into N2-OP-72.

Nuclear training is developing more extensive UPS training (TMR #02-88.075) as part of their operator training program. As a starting basis they will use the system engineer lesson plans and operational history.

Techniques for identification of failed inverters and inverter recovery actions are already incorporated into the operating procedures: N2-OP-71 and shortly into N2-OP-72.

REQUIRED ACTION: Training Department to complete the program and implement it. (TMR #02.88-075)

This action was a direct result of a failure caused by a human error which resulted in a loss to an inverter output bus (RPS). It was determined that the human error was a direct result of the lack of sufficient training on the UPS operation.

It should be noted that the operating procedure also describes under what conditions the maintenance department should be called in lieu of the Operations department attempting corrective action.

CONCLUSION: No action required.

REFERENCES

Manufacturer's Manual (2VBB-UPS1A, B, C, D, G) -
E035A, VI/101 710 343-77223, NMPC Access Number - 430000742
Exide Electronics 75-KVA UPS

Manufacturer's Manual (2VBA*UPS2A/B) -
E035A, Inst. 1.560-5002, NMPC Access Number - 430002188
Elgar Corporation 25-KVA UPS

Manufacturer's Manual (2VBB-UPS3A/B) -
E035A, Inst. 1.560-5006, NMPC Access Number 430004490
Exide Electronics 5-KVA UPS

Equipment Qualification Maintenance Program Data Sheets -
#E035AAA, #E035AAB

Electrical maintenance Procedure N2-EPM-GEN-9Y638
Uninterruptible Power Supply Ten (10) Year Capacitor Replacement

Operating Procedure - N2-OP-71, "13.8KV/4160/600V A.C. Power Distribution", 12/87

CONTACTS

Mark McCrobie, Generation Specialist, Electrical Maintenance

DISTRIBUTION

Standard OEA

RC/mjd
(0707u)

Attachment

OEA COMMITTEE APPROVED
DATE: 6/15/88 88-81

NMP 32888
Attachment #1

NINE MILE POINT #2 HAS 10 UNINTERRUPTIBLE POWER SUPPLIES

2VBB-UPS1A, B, C, D, G - 75 KVA units manufactured in 1981 which use switching SCR's to regulate output.

UPS1A feeds Radwaste Computer, plant instrumentation/annunciation.
UPS1B feeds Lekay-Wire radio system, instrumentation/annunciation.
UPS1C feeds Gaitronics and Essential Lighting (half of plant).
UPS1D feeds Gaitronics and Essential Lighting (half of plant).
UPS1G feeds the Plant Computer.

2VBA*UPS2A/2B - 25 KVA units manufactured in 1982 which use Pulse Width Modulation design. Class 1-E units.

- each unit feeds one division of Class 1 redundant instrumentation/control circuit loads.

2VBB-UPS3A/3B - 10KVA units manufactured in 1982 which use the Pulse Width Modulation Design.
- each unit is a Category 2 unit feeding one half of the Class 1-E RPS control logic through an electrical protection assembly.

2VBB-UPS1H - 5KVA unit manufactured around 1984. This unit uses the "Line Interactive" design 2/microprocessor controls. The inverter section incorporates Pulse Width Modulation of the voltage output.

- UPS1H feeds the stack radiation monitoring panel.

Each type of unit has its own operating characteristics and different transient response and different effects on the operation of the plant. Each type of unit has been evaluated according to its own susceptibility to different plant conditions and according to how critical it is to the overall operation of the plant.