FORM 5326

INDIANA & MICHIGAN
ELECTRIC COMPANY
DONALD C. COOK NUCLEAR PLANT

PROCEDURE COVER SHEET

Procedure No.	12 PMP 4021 TRP.001
Revision No.	1

TITLE REACTOR TRIP REVIEW

SCOPE OF REVISION : Major revision. Re-organized to reduce redundancy and to comply with PMI 2010. Added sign-off sheets 6 and 16 in response to SOER 83-07. Added sign-off sheets 7, 8, 17 and 18 to assist in organizing procedural requirements and assignments prior to reactor restart authorization. Changed the Reactor Trip Breaker Undervoltage response requirement from a time measurement to observed only. Incorporated PC's 1 & 2. Organized sign-off sheets 1-8 for Unit 1 and 11-18 for Unit 2.

SIGNATURES	REVISION NUMBER			
* * * * * *	Rev. 1			
PREPARED BY				
DEPARTMENT HEAD APPROVAL				
INTERFACING DEPARTMENT HEAD CONCURRENCE	C E Murphy Operations Plan			
QUALITY ASSURANCE SUPERVISOR APPROVAL				
PLANT NUCLEAR SAFETY COMMITTEE	Mtg. #1967			
PLANT MANAGER APPROVAL				
APPROVAL DATE	9/25/86			
EFFECTIVE DATE	10/2/86			

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INDIANA & MICHIGAN ELECTRIC COMPANY
DONALD C. COOK NUCLEAR PLANT

1.0 TITLE Reactor Trip Review

2.0 OBJECTIVE

2.1 To determine the exact cause of a Reactor Trip.

2.2 To ensure all required automatic responses associated with a reactor trip have either functioned properly or have been investigated and resolved.

2.3 To establish requirements for a Reactor restart.

3.0 REFERENCES

3.1 References on which the Procedure is based.

3.1.1 NUREG 0977 and NUREG 1000, Vol 1 describing the ATWS events at Salem Nuclear Generating Station.

3.1.2 The NRC's "Salem Restart Status Report" of March 28, 1983 response.

3.1.3 Generic letter 83-28, "Required Actions based on Generic Implications of SALEM ATWS Events", July 8, 1983.

3.1.4 AEP:NRC:0838A - response to Generic letter 83-28.

3.1.5 INPO Good Practice OP-211, "Post Trip Reviews", 9/83.

3.1.6 10 CFR 50.73 (IV).

3.1.7 1-OHP 4021.001.002 Rev. 15 and 2-OHP 4021.001.002 Rev. 9.

3.1.8 Oconee Nuclear Station directive, Investigation of Unit Trips, Revision of 10/23/75.

3.1.9 Oconee Nuclear Station Performance Manual, Section 4.7, Support of Reactor Trips, Revision of 2/16/83.

3.1.10 Memo, V. VanderBurg to W.G. Smith 6/30/83.

3.1.11 SOER 83-7 'Inadvertent Reactor Trips Caused by Instrumentation and Control Problems.'

3.2 References to assist in procedure implementation.

3.2.1 Elementary Diagrams

3.2.1.1 98501 - 98515, Reactor Protection and Safeguards Logic Diagrams.

3.2.1.2 98361 - 98377, Elementary Diagrams for Protection System and Safeguards, Train A.

3.2.1.3 98381 - 98397, Elementary Diagrams for Protection System and Safeguards, Train B.

3.2.1.4 1-98101, 2-98101, 2-98102, Turbine Control.

3.2.1.5 98211, Steam Generator Feedwater Turbine E. 98212, Steam Generator Feedwater Turbine W.

3.2.1.6 98021, Generator and Transformer Differential.

3.2.1.7 98120, Turbine Events Monitor and Miscellaneous Recorders.

3.2.1.8 98655, 98656, 98657, Operations Sequence Monitor.

3.2.1.9 98665, 98666, 98667, Oscillograph.

3.2.2 1200-A,B,C,G, one Line Electrical Diagrams.

3.2.3 Recorder Chart Index, 4/21/81 Revision.

3.2.4 Hathaway H634 Manual, Issue #5, May 1975.

3.2.5 Hathaway H-559 Manual, Issue #1, April 1970.

3.2.6 Westinghouse DI11 P250 Manual, 1/68 Revision.

3.2.7 Westinghouse P250 Continuous Monitoring System Manual S2G-08A, issued 11/68.

3.2.8 S2C-09B Westinghouse Post Trip Review Program Description, original issue.

3.2.9 D. C. Cook Plant operating records.

3.2.10 Appendix A: Miscellaneous information relating to the Operation of Trip Monitoring Devices.

4.0 DETAILED PROCEDURE

4.1 Responsibilities

4.1.1 The Shift Supervisor (SS) has the overall responsibility for the safe and reliable operation of the plant. The Shift Technical Advisor Section (STA) is responsible for the coordination of this procedure, the thoroughness and completeness of the procedure. As directed by the STA Supervisor, the STA is responsible for the drafting of the review report.

4.1.2 The use of "Not Applicable" is allowed for the completion of the procedure. 'N/A' will be written in the sign off space with an explanation describing the reason for not being applicable. This will then be followed by the initials of the person making this decision and the date of this decision.

4.2 Definitions

4.2.1 The classification scheme differentiates between "minor" and "major" safety-related equipment. The classification is relative and no implication is intended that "minor" equipment is unimportant. Whether a failure has serious safety significance shall be determined by those classifying the event.

4.2.1.1 A "Major Equipment Failure" is where failure of equipment could have a substantial adverse impact on a normal plant shutdown or an accident situation. Such failures merit examination by the PNSRC prior to plant start-up. Examples: Failure of an auxiliary feedpump to start when required, failure of a reactor trip breaker to open, failure of a turbine trip system to depressurize.

4.2.1.2 A "Minor Equipment Failure" is where failure of equipment does not have a substantial adverse impact on a normal plant shutdown or accident situation. Examples of minor equipment failures: Failure of a single reactor trip instrumentation channel or feedwater isolation actuation slightly below the Technical Specification value of 554°.

4.3 SignOff Sheets

4.3.1 The Signoff Sheets are sorted into two sets. The first set, Signoff Sheets 1 thru 8 is for Unit One and the second set, Signoff Sheets 11 thru 18 is for Unit Two. When directed by the detailed procedure to use a signoff sheet, the first number is associated with Unit One and the second number, in brackets (), is associated with Unit Two. To avoid confusion, discard the signoff sheets from the unaffected Unit.

4.3.2 Signoff Sheet #6 (16), 'Corrective Action Review', is required to be completed and reviewed prior to "Reactor Restart Authorization", (4.8). This Signoff sheet will be initiated by the STA section with input from all affected departments who will sign the applicable subsection. Procedural defects will be only those procedure related errors which are due to logic errors, misprints, or failure to address a situation and not those errors related to personnel noncompliance or misunderstandings. Noncompliance will be a personnel error. Section C on Signoff Sheet #6 (16) is to be completed for personnel errors or procedural defects only. Section F on Signoff Sheet #6 (16) will be signed by the Plant Manager or his designee prior to recommendation of Reactor Restart Authorization.

4.3.3 Signoff Sheet #7 (17) is to be used as a guide for the requirements of the different event conditions.

4.3.4 Signoff Sheet 8(18) is to be used by the STA for tracking the status of any items requiring action prior to "Reactor Restart Authorization". Required action could be to repair malfunctional equipment, make procedural changes, install additional work controls, provide additional training, etc. These would be for items causing the Reactor Trip or problems as the result of the Reactor Trip. The status of Job Orders, Procedural Changes, etc., will be monitored and noted on signoff sheet 8(18) by the STA.

4.4 PREREQUISITES

4.4.1 E-O, "Reactor Trip or Safety Injection" and/or other Emergency Operating Procedures directed to be performed by E-O have been performed to where the plant is stable.

And

4.4.3 A reactor Trip has occurred that was not part of a preplanned event of a surveillance test procedure.

And

4.4.4 Appropriate notification has been made as specified in PMI 7030, "Condition Reports and Plant Reporting", Attachment No 2, "Immediate Notifications by the Shift Supervisor of significant events."

4.5 DATA COLLECTION

4.5.1 The Operations Department is to check the relays on Panel G and the A panels. Use Signoff Sheet #1 (11) and place an X to indicate actuated status. Actuated status is indicated by targets being shown or indicating lights being unlit. Relays with indicating lights are shown with a * by the relay number on Signoff Sheet #1 (11). If the Reactor Trip occurred with the turbine reset, the Operations Department is to check the First Hit annunciator in the EHC Cabinet, Unit One only. Record the "First Hit" on Signoff Sheet #1.

4.5.2 The I&C Section is responsible for collecting copies of the charts listed on Signoff Sheet 2 (12), "Chart Collecitons". These copies are to include portions of the trace prior to and following the Reactor Trip. Copies are to be labeled appropriately.

4.5.3 All personnel involved with the Reactor Trip are to complete Signoff Sheet 3 (13), "Personnel Interview Form". As a minimum, the Unit Supervisor, the Control Room Reactor Operators and the Shift Supervisor are to complete these forms. The STA is to review these forms with the individuals to ensure completeness.

4.5.4 Using data obtained from the OSM, complete Signoff Sheet 4 (14), "Trip Response Times".

4.5.5 With the assistance of a Licensed Control Room Operator, the STA is to complete Signoff Sheet 5 (15), "System Status Response".

4.6 Data Analysis

NOTE: This Section should be performed by all those classifying the event.

*4.6.1 Review Signoff Sheet 1 (11) "Relay Targets" for abnormal items. These items are then to be listed on Signoff Sheets 6 (16) and/or 8 (18).

*4.6.2 Review the charts obtained [see Signoff Sheet 2 (12)]. Any traces which are abnormal and appear to be the result of degraded equipment are to be noted on Signoff Sheets 6 (16) and/or 8 (18).

*4.6.3 Review Signoff Sheet 3 (13), "Personnel Interview Form". Any items noted in these interviews pertaining to procedural defects, personnel noncompliance, misunderstandings or equipment problems are to be listed on Signoff Sheets 6 (16) and/or 8 (18).

*4.6.4 Review Signoff Sheet 4 (14), "Response Times". The Trip Response Times are to be compared to those responses from past Reactor Trips. These Time Responses may differ from past trips because of sequential differences due to varying initiating events. Where Responses Times differ from past Time Responses, verify it is not due to degraded equipment. When degraded equipment has been identified, the equipment is to be listed on Signoff Sheets 6 (16) and/or 8 (18).

*4.6.5 Review Signoff Sheet 5 (15), "System Status and Response". Include any equipment malfunctions on Signoff Sheets 6 (16) and/or 8 (18).

* Requires Signoff

4.6.6 Determine and list the exact cause of the Reactor Trip from the following applicable information sources:

Source	Cause of Reactor Trip
OSM	_____
P-250 Post Trip Review	_____
P-250 Table of Alarms	_____
Interviews	_____
Others	_____

4.7 EVENT CLASSIFICATION

4.7.1 A Reactor Trip is classified by one of the next 3 conditions.

4.7.1.1 The reactor trip is classified a Condition I event if the cause of the event is known (4.6.6), no major discrepancies in time responses due to degraded equipment (4.6.4) and no indication of improperly functioning safety related equipment.

4.7.1.2 The reactor trip is classified a Condition II event if the cause of the trip is positively known (4.6.6), and some minor safety related equipment did not function properly. However, the malfunction has been corrected and the status of events or equipment malfunction directly related to the trip do not prevent a restart.

4.7.1.3 The Reactor Trip is classified a Condition III event if the cause of the trip is not positively known, or some minor safety related equipment malfunctioned during the event and has not been repaired, or some major safety related equipment malfunctioned during the event, whether or not repairs have been made.

4.7.2 Review of 4.6, "Data Analysis", which has been summarized on Signoff Sheets 6 (16) and 8 (18) and in step 4.6.6 has determined the Rector Trip Event is classified as follows:

4.7.2.1 Concurrence between the SS and STA classifies the event as a Condition I event.

_____ / _____
SS

_____ / _____
STA

There is a disagreement between the SS and STA on the RX Trip event being a Condition I event. The Operations Superintendent along with SS or STA have decided to classify the event as a Condition I event.

_____ / _____
OPS Supv

_____ / _____
SS or STA

4.7.2.2 The Operations Superintendent and STA concur that the event satisfies the criteria for Condition II events.

_____ / _____
OPS Supv

_____ / _____
STA

There is a disagreement between the Operations Superintendent and STA on the Reactor Trip event being classified a Condition II event. The Assistant Plant Manager Production, along with the Operations Superintendent or STA have decided to classify the event as a Condition II event.

_____ / _____
Asst. PM/Prod.

_____ / _____
OPS Supv or STA

4.7.2.3 The Operations Superintendent and STA concur the Reactor Trip event satisfies the criteria for Condition III events.

_____ / _____
OPS Supv

_____ / _____
STA

There is a disagreement between the Operations Superintendent and STA on the Reactor Trip event being classified a Condition III event. The Assistant Plant Manager-Production, along with the Operations Superintendent or STA have decided to classify the event as a Condition III event.

_____ / _____
Asst. PM/Prod

_____ / _____
OPS Supv or STA

4.8 REACTOR RESTART AUTHORIZATION

4.8.1 For Condition I events with concurrence between the SS and STA (4.7.2.1), the SS has the authority and recommends the restart of the effected unit to the Plant Manager.

_____ / _____
SS

4.8.2 For Condition I events without concurrence between the SS and STA (4.7.2.1), the Operations Superintendent has the authority and recommends the restart of the effected unit to the Plant Manager.

_____ / _____
OPS Supv

4.8.3 For Condition II events with concurrence between the Operations Superintendent and STA (4.7.2.2), the Operations Superintendent has the authority and recommends the restart of the effected unit to the Plant Manager.

_____ / _____
OPS Supv

4.8.4 For Condition II events without concurrence between the Operations Superintendent and STA (4.7.2.2) the Assistant Plant Manager-Production has the authority and recommends the restart of the effected unit to the Plant Manager.

_____/_____
Asst PM Prod

4.8.5 For Condition III events (4.7.2.3) all open items associated with the trip must be reviewed by the PNSRC with no unresolved safety questions. The PNSRC has the authority and recommends the restart of the effected unit to the Plant Manager.

_____/_____
PNSRC

PANEL G RELAY TARGETS
UNIT 1

(HAA)

T1	T2	T3
Turbine Valves	Generator Relays	Excitation Relays

T4	T5	T6
Turbine Mech. Trip Solenoid	Transformer Relays	Emerg. P.B. Trip Gen. Panel

(HAA)

T11	T12	T13
Turbine Hyd Trip Soleniod	Stator Cooling Trip	Trans. 1 Sudden Pressure

T12	T15	T16
Trans. 1AB Sudden Pressure	Trans. ICD Sudden Pressure	Trans 1 Tap Chgr Hndl in

UNIT DIFFERENTIAL (HEA)

87X-U1	87X1-U1	87X2-U1

OVERALL DIFFERENTIAL (HEA)

87X-OA1	87X1-OA1	87X2-OA1

PANEL A RELAY TARGETS
UNIT 1

Panel A-2			Panel A-3		Panel A-4		
					87-OA PH.1	87-OA PH.2	87-OA PH.3
87-A1 PH.1	87-A1 PH.2	87-A1 PH.3	83G	83B			
			25Z	25A			
64-GF PH.1 PH.2		64-AF PH.1 PH.2			87-T PH.1	87-T PH.2	87-T PH.3
	96-G1S			59 N	87-G PH.1	87-G PH.2	87-G PH.3
	151-G1S			159N			

PANEL A RELAY TARGETS
UNIT 1

Panel A-8			Panel A-7			Panel A-6	
		125A					
87T-1CD PH.1	87T-1CD PH.2	87T-1CD PH.3	87T-1AB PH.1	87T-1AB PH.2	87T-1AB PH.3		
51TN-1CD		251TN-1CD	51TN-1AB		251TN-1AB	27-4EP1	27-4EP3

PANEL A RELAY TARGETS
UNIT 1

Panel A-11			Panel A-10			Panel A-9		
51T-11A PH.1	51N-T11B	51T-11B PH.1	51 12CD	25-TCD		51 12AB	25 TAB	
51T-11A PH.3		51T-11B PH.3	87-TCDLD PH.1	87-TCDLD PH.2	87-TCLD PH.3	87-TABLD PH.1	87-TABLD PH.2	87-TABLD PH.3
87-DGAB PH.1	87-DGAB PH.2	87-DGAB PH.3	87T-101CD PH.1	87T-101CD PH.2	87T-101CD PH.3	87T-101AB PH.1	87T-101AB PH.2	87T-101AB PH.3
87T-11A PH.1	87T-11A PH.2	87T-11A PH.3	TR101CD Voltage Low PH.1 ☆	PH.2 ☆	PH.3 ☆	TR101AB Voltage Low PH.1 ☆	PH.2 ☆	PH.3 ☆
87T-11B PH.1	87T-11B PH.2	87T-11B PH.3	51TN-101CD		251TN-101CD	51TN-101AB		251TN-101AB
51-DGAB PH.1	51N-DGAB	51-DGAB PH.3	4KV T11D Volt Low PH.1 ☆	PH.2 ☆	PH.3 ☆	4KV T11A Voltage Low PH.1 ☆	PH.2 ☆	PH.3 ☆

PANEL A RELAY TARGETS
UNIT 1

	Panel A-13		Panel A-12			
	51T-11C PH.1	51N-T11C	51T-11D PH.1	87 RCP1 PH.1	87 RCP1 PH.2	87 RCP1 PH.3
	51T-11C PH.3		51T-11D PH.3	87 RCP2 PH.1	87 RCP2 PH.2	87 RCP2 PH.3
	87-DGCD PH.1	87-DGCD PH.2	87-DGCD PH.3	87-TBMC PH.1	87-TBMC PH.2	87-TBMC PH.3
	87T-11C PH.1	87T-11C PH.2	87T-11C PH.3	87-TCMC PH.1	87-TCMC PH.2	87-TCMC PH.3
	87T-11D PH.1	87T-11D PH.2	87T-11D PH.3	87-RCP3 PH.1	87-RCP3 PH.2	87-RCP3 PH.3
	51DGCD PH.1	51N-DGCD	51DGCD PH.3	87-RCP4 PH.1	87-RCP4 PH.2	87-RCP-4 PH.3

UNIT ONE

SWITCHGEAR COMPLEX RELAY TARGETS

TIME _____ DATE _____ PERFORMED BY: _____

RC Pump Bus and T-bus 4KV Switchgear:

List all relay targets actuated. Specify "1", "3", or "N" where applicable. Note alarm lights lit ("GF", "OT", PL, etc.).

Breaker	Instrument No.	Name	Reset Attempted	Reset Successful

600 V Safety Bus Switchgear

List all relay targets actuated. Include relays on back of breaker panels (01,2,3 feeder relays).

Instrument No.	Name	Reset Attempted	Reset Successful

UNIT ONE

EHC FIRST HIT ANNUNCIATOR

FIRST HIT	PS 100	CUST.	NO EHC DC	FIRST	POWER/LOAD	-22VDC
	A & B	TRIP	INPUT	HIT	UNBALANCE	LOST
			POWER			
& RESET	SPD SIG LOST	MA TRIP BUS ENERGIZER	BACKUP OVERSPEED TRIP	& RESET	FAST CLST IV'S	+30VDC LOST

UNIT 1

CHART COLLECTION

The I & C Section is to obtain a copy of the following charts for all Reactor Trips:

Pressurizer Water Level
Pressurizer Pressure
Operations Sequence Monitor
P-250 Trend (Post Trip Review)
P-250 Alarm (Sequence of Events)
Control Room Log
Wide Range Temperature, All Four Loops.

As specified by the cognizant STA, the I & C section is to obtain a copy of any chart associated with the specific transient causing the trip.

_____

_____

_____

As specified by the cognizant STA, obtain a copy of charts associated with any equipment which has malfunctioned:

_____

_____

_____

Charts Reviewed By: _____/_____

_____/_____

_____/_____

UNIT ONE

PERSONNEL INTERVIEW FORM

Person interviewed Role in Event

Description of the event:

Include the plant conditions prior to the trip, your indications that a problem existed, your action as a result of those indications, noted equipment malfunctions or inadequacies, and any identified procedure deficiencies.

INTERVIEWED BY _____

REVIEWED BY _____ / _____

_____ / _____

_____ / _____

REACTOR TRIP EXPECTED RESPONSE (U1)

Expected Response Point #	(Initial Event)	Data Type	Requirement	Time	Acceptance Criteria
44 Reactor Trip Breaker A		Meas	All	0	0
45 Reactor Trip Breaker B		Meas	All		*
46 Reactor Trip Breaker Undervoltage coil A		Meas	Obsv		*
47 Reactor Trip Breaker Undervoltage coil B		Meas	Obsv		Yes
Control Rods Bottom		Obsv	All		Yes
Mechnical Trip Operated (Turb)		Obsv	All		*
112 WMFPT Vacuum Trip		Meas	WMFPT Vac Trip Reset		*
98 EMFPT Vacuum Trip		Meas	EMFPT Vac Trip Reset		*
118 WMFPT Hydr Pr Low		Meas	WMFPT Reset		*
104 EMFPT Hydr Pr Low		Meas	EMFPT Reset		*
Feedwater Isolation		Obsv	On Main Feed		Yes
WMDAFP Start		Obsv	On Main Feed, Aux feed on standby		Yes
EMDAFP Start		Obsv	On Main Feed, Aux feed on standby		Yes
TDAFP Start		Obsv	On Main Feed, Aux feed on standby		Yes If start signal required

* - To be compared to past trips as per 4.6.4

TURBINE TRIP EXPECTED RESPONSE (U1)

Expected Response	Data Type	Requirement	Time	Acceptance Criteria
(Initial Event)	Meas		0	0
006 RT-Turbine Trip + P7	Meas	Turbine Reset & above P-7		*
140 Mech Trip Oper	Meas	Turbine Reset		*
141 Emerg Gov OVSP Trip	Meas	Turb Reset		*
127 MT Reheat VA CL	Meas	Turb Reset		*
126 MT Stop VA CL	Meas	Turb Reset		*
157 Overall Diff Oper	Meas	Turb Reset		*
137 EHC Trip Sys Trip	Meas	Turb Reset		*
145 DC BRG Oil PP Run	Meas	Turb Reset		*
147 TRB Oil Buppp Run	Meas	Turb Reset		*
153 STM Seal PR Low	Meas	Turb Reset		*
Steam Dump Actuation	Obsv	Tavg Mode		Yes

* - To be compared to past trips as per 4.6.4

GENERATOR TRIP EXPECTED RESPONSE (U1)

Expected Response	Data Type	Requirement	Time	Acceptance Criteria
(Initial Event)			0	0
Mech Trip Oper	Meas	Generator Exciter		*
157 Overall Diff Oper	Meas	Generator Exciter		*
159 Alterx Diff Oper	Meas	Generator Exciter		*
156 Generat Motoring	Meas	Generator Exciter		*
164 Unit/Sys Freq Hi Lo	Meas	Generator Exciter		*
151 Gen Cool Flow Lo	Meas	Generator Exciter		*
162 Gen Cool Trip Oper	Meas	Generator Exciter		*
Trans To Normal Reserve	Obsv	Gen Supplies Auxiliaries		Yes
Generator Field Breakers Open	Obsv	Field Breaker Closed		Yes
Generator Output Breakers Open	Obsv	Paralleled		Yes

* - To be compared to past trips as per 4.6.4

REVIEWED BY _____ / _____

_____ / _____

_____ / _____

UNIT ONE

SYSTEM STATUS AND RESPONSE

Nuclear Instrumentation

List all NI drawer "negative rate" trip status lights which are energized.

Source Range instrument power restored automatically as designed (both channels) _____

Major equipment out of service:

Describe any abnormal conditions (such as 'loss of detector voltage' or 'channel in test') or behavior noticed during the transient.

Reactor Coolant Pumps

Describe circumstances, including place in sequence of events, of any RCP trips (manual or automatic) which occurred during the transient.

Describe effect of reactor transient on leakoff flows.

Describe any behavioral abnormalities noticed during the transient.

UNIT ONE

RCS Pressure Control

Control status prior to trip (man/auto) _____

Backup heaters "on" _____ banks

"auto" _____ banks

Pressure channels selected (control/bistables) _____/_____

Pressurizer PORV's blocked prior to transient: _____

Spray valves in "auto" _____

Did pressurizer PORV's or safeties lift during transient? Describe circumstances.

Major equipment out of service:

Describe any behavioral abnormalities noticed during the transient

Pressurizer Level Control

Control Status prior to trip (man/auto) _____

Charging pump in service _____

Charging flow controller (QRV-251 or Recip speed controller) status prior to trip (man/auto) _____

Level channels selected (control/bistables) _____/_____

Describe any behavioral abnormalities noticed during the transient.

UNIT ONE

CVCS Makeup

Prior to transient, blender line contained (acid, pri. water, blend)

_____

Makeup in auto with 'start' signal? (yes/no)

_____

Control and Shutdown Rods

Full insertion of all control and shutdown rods verified.

_____

Rods that did not insert:

_____

Rod control status prior to trip (auto/man) _____

Was the rod control status changed during the transient? If so, when in the sequence of events?

Major equipment out of service:

Describe any behavioral abnormalities noticed during the transient.

Main Feedwater/Steam Generator Level

Operating main feed pumps tripped on reactor trip (yes/no/OOS)

EMFP _____

WMFP _____

UNIT ONE

Feed water isolation received when Tavg <554°F. Valves closed (yes/no)

FRV210	_____
FRV220	_____
FRV230	_____
FRV240	_____
FMO201	_____
FMO202	_____
FMO203	_____
FMO204	_____

Feedpump control status prior to trip (auto/man)

East feedpump speed control_____
West feedpump speed control_____
DP controller _____

Feedpump steam supply prior to trip

East feedpump (reheat/main/aux)

_____

West feedpump (reheat/main/aux)

_____

Feedwater regulating valve status prior to trip (auto/man)

FRV210	_____
FRV220	_____
FRV230	_____
FRV240	_____

Condensate bypass valve status prior to trip (auto/man)

CRV224	_____

Feedwater Heater level controls in manual prior to trip:

Major equipment out of service:

UNIT ONE

Describe any behavioral abnormalities noticed during the transient.

Auxiliary Feedwater

MDAFP's started automatically on trip of main feedpumps

EMDAFP _____

WMDAFP _____

TDAFP opearated? Describe circumstances and approximate duration of operation.

Did operator intervene in the TDAFP response (place in manual or trip)? If so, when in the sequence of events?

Describe the response of the S/G levels.

Describe any behavioral abnormalities noticed during the transient.

Steam Dump/Steam Generator Pressure Relief

Control status prior to trip (Tavg/Steam Pressure)

_____

If in Tavg mode, steam dump valves modulated to maintain Tavg ~547. (yes/no)

_____

If Tavg dropped below 541°F, steam dump blocked (yes/no)

_____

UNIT ONE

Did steam dump valve open prior to trip (yes/no)? If yes desribe.

_____

If vacuum trip, did steam dump valves stay closed (yes/no)?

_____

Control status of atmospheric steam dumps prior to trip (auto/manual)

MRV213 _____
MRV223 _____
MRV233 _____
MRV243 _____

Did atmospheric steam dumps operate during transient (yes/no)? If yes, describe (automatically, manually, circumstances).

_____

Was the control status of atmospheric steam dumps changed during the course of the transient? If so, when in the sequence of events?

Did steam generator safeties lift during transient (yes/no)? If yes describe.

_____

Major equipment out of service.

Describe any other behavioral abnormalities noticed during transient.

UNIT ONE

Main Turbine/MSR

Was there a turbine runback (yes/no):

_____

If yes, provide best estimate of power change and the time in sequence of events when it occurred.

Did the operator intervene in the turbine runback? If so, when in the sequence of events?

Turbine trip: Main turbine stop, control, and intercept valves closed

_____

Controlling device prior to trip (load limiter/operating device)

_____

Set rates loading _____

unloading _____

Were valve or misc turbine tests in progress when the trip occurred?
Which one?

_____

Did exhaust hood sprays actuate (yes/no)?

_____

Vacuum breakers opened following trip? (yes/no)

_____

'Hogging' SJAE's in service following trip? (yes/no)

_____

UNIT ONE

MSR in service prior to trip?
(no/partial/full)

_____

Did any MSR safety valves lift during the transient (yes/no/identify)?

_____

Major equipment out of service:

_____

Describe any behavioral abnormalities noticed during the transient.

Generator/Electrical

Generator trip. This will occur 30 seconds after the reactor trip unless it results from a generator event.

Output breakers open (yes/no)

K _____

K1 _____

Exciter breaker open (yes/no)

_____

If auxiliaries were suppled by the generator, were auxiliaries automatically transferred to normal reserve (yes/no/NA)? Describe any failures.

_____

Diesel generators operated?
Describe curcumstances.

UNIT ONE

Any CRID or CRP bus switched to alternate supply? Describe circumstances. (OSM point 154, white light on G panel, ann 19 drops 20 + 40, ann 20 drop 80 + 100).

Major equipment out of service:

Describe any behavioral abnormalities noticed during transient.

Safety Injection

Was the event associated with an SI (yes/no)?

_____

If yes, did verification of automatic actuations indicate failure of any required response (yes/no)?

_____

If yes, list actuations not received, reason if known, and whether the response was successfully initiated manually.

List major equipment out of service.

Describe any abnormalities noticed in the response of the safety injection system.

UNIT ONE

Phase B

Was there a phase B (yes/no)?

_____

If yes, did verification of automatic actuations indicate failure of any required response (yes/no)?

_____

If yes, list actuations not received, reason if known, and whether the response was successfully initiated manually.

List major equipment out of service.

Describe any abnormalities noticed in the response of the CTS System.

Miscellaneous

List any major plant equipment not covered above which is out of service and could have had an effect on the progression of the transient.

Describe any behavioral abnormalities of systems not covered above which may affect plant safety.

COMPLETED BY _____

_____

REVIEWED BY _____/_____

_____/_____

_____/_____

UNIT ONE

CORRECTIVE ACTION REVIEW

A. Trip signal which initiated RPS:

B The determined cause of the trip signal was: (check one)

___ 1. Equipment Failure -

a. Failed component:
b. Mode of failure:
c. Spurious:
d. Is this a repetive failure?

___ 2. Procedural defect (see procedure step 4.3)

___ 3. Personnel Error (see procedure step 4.3)

STA: _____ S.S. _____

Departments Affected: _____ _____

C. Description of error: (complete only if B.2 or B.3 apply)
(include interviews with affected personnel in P.T.R. package).

_____
_____
_____

STA signature: Reviewed by: Dept's Affected:

D. Immediate actions required to mitigate the failure or error prior to restart of Unit:

_____
_____
_____

STA signature: Dept's Affected:

E. Actions proposed to prevent recurrence:

_____
_____
_____

STA signature: Dept's Affected:

Reviewed by _____/_____

_____/_____

Unit One

This checklist is to assist in organizing the requirements for reactor restart. The event condition determined by 4.7 "Event Classification" should be circled below and the other two columns N/A'd. The space provided is to be initialed and dated by the STA when the associated requirement has been completed.

	Condition One Event	Condition Two Event	Condition Three Event
Signoff Sheet 1	____/____	____/____	____/____
Signoff Sheet 2	____/____	____/____	____/____
Signoff Sheet 3	____/____	____/____	____/____
Signoff Sheet 4	____/____	____/____	____/____
Signoff Sheet 5	____/____	____/____	____/____
Signoff Sheet 6	____/____	____/____	____/____
Signoff Sheet 8	____/____	____/____	____/____
PNSRC Approval	N/A	N/A	____/____

UNIT ONE

Items Requiring Action	Assignments

Status

Time and Date	Status of Item Requiring Action	STA

PANEL G RELAY TARGETS
UNIT 2

(HAA)

T17	T18	T19
Main Transf Sudden Press. PH.1	Main Transf Sudden Press. PH.2	Main Transf Sudden Press. PH.3

T20	T21
Trans. 2AB Sudden Press	Trans 2CD Sudden Press

(HAA)

T1	T2	T3
Turbine Valves	Generator Relays	Excitation Relays

T4	T5	T6
Turbine Tripping (Left Syst)	Transformer Relays	Emerg. P. B. Trip Gen. Panel

(HAA)

T11	T12
Turbine Tripping (Right Sys)	Stator Cooling Trip

UNIT DIFFERENTIAL (HEA)

87X-U2	87X1-U2	87X2-U2

OVERALL DIFFERENTIAL (HEA)

87X-OA2	87X1-OA2	87X2-OA2

PANEL A RELAY TARGETS
UNIT 2

Panel A-2			Panel A-3		Panel A-4		
					87-OA PH.1	87-OA PH.2	87-OA PH.3
87-A PH.1	87-A PH.2	87-A PH.3	83G	83B			
			25Z	25A			
64-GF	64-AF				87-T PH.1	87-T PH.2	87-T PH.3
	96-GS			59 N	87-G PH.1	87-G PH.2	87-G PH.3
	151-GS			159N			

PANEL A RELAY TARGETS
UNIT 2

Panel A-7			Panel A-8			Panel A-9		
			125A			25 TAB		
87T-AB PH.1	87T-AB PH.2	87T-AB PH.3	87T-CD PH.1	87T-CD PH.2	87T-CD PH.3	87T-201AB PH.1	87T-201AB PH.2	87T201AB PH.3
51TN-AB		251TN-AB	51TN-CD		251TN-CD	51TN-201AB	TR-201AB Volt Low PH.1* PH.2* PH.3*	251TN 201AB
						T21A Volt Low PH.1* PH.2* PH.3*		

* Relay is Actuated when white light is unlit.

PANEL A RELAY TARGETS
UNIT 2

Panel A-10			Panel A-11			Panel A-12		
	25-TCD		51T-21A PH.1	51N-T21B	51T-21B PH.1	87-RCP1 PH.1	87-RCP1 PH.2	87-RCP1 PH.3
			51T-21A PH.3		51T-21B PH.3	87-RCP2 PH.1	87-RCP2 PH.2	87-RCP2 PH.3
			87-DGAB PH.1	87-DGAB PH.2	87-DGAB PH.3	87-TBMC PH.1	87-TBMC PH.2	87-TBMC PH.3
87T-201CD PH.1	87T-201CD PH.2	87T-201CD PH.3	87T-21A PH.1	87T-21A PH.2	87T-21A PH.3	87-TCMC PH.1	87-TCMC PH.2	87-TCMC PH.3
51TN-201CD	TR-201CD Volt Low PH.1* PH.2* PH.3*	251TN-201CD	87T21B PH.1	87T21B PH.2	87T21B PH.3	87-RCP3 PH.1	87-RCP3 PH.2	87-RCP3 PH.3
T21D Volt Low PH.1*	PH.2*	PH.3*	51DGAB PH.1	51NDGAB	51DGAB PH.3	87-RCP4 PH.1	87-RCP4 PH.2	87-RCP4 PH.3

* Relay is Actuated when white light is unlit.

PANEL A RELAY TARGETS
UNIT 2

	Panel A-13	
51T-21C PH.1	51NT-21C	51T-21D PH.1
51T-21C PH.3		51T-21D PH.3
87-DGCD PH.1	87-DGCD PH.2	87-DGCD PH.3
87-T21C PH.1	87-T21C PH.2	87-T21C PH.3
87T-21D PH.1	87T-21D PH.2	87T-21D PH.3
51-DGCD PH.1	51N-DGCD	51-DGCD PH.3

UNIT TWO

SWITCHGEAR COMPLEX RELAY TARGETS

TIME _____ DATE _____ PERFORMED BY: _____

RC Pump Bus and T-bus 4KV Switchgear:

List all relay targets actuated. Specify "1", "3", or "N" where applicable. Note alarm lights lit ("GF", "OT", PL, etc.).

Breaker	Instrument No.	Name	Reset Attempted	Reset Successful

600 V Safety Bus Switchgear

List all relay targets actuated. Include relays on back of breaker panels (feeder relays).

Instrument No.	Name	Reset Attempted	Reset Successful

COMPLETED BY _____ / _____ REVIEWED BY _____ / _____

_____ / _____

_____ / _____

UNIT 2

CHART COLLECTION

The I & C Section is to obtain a copy of the following charts for all Reactor Trips:

Pressurizer Water Level
Pressurizer Pressure
Operations Sequence Monitor
P-250 Trend (Post Trip Review)
P-250 Alarm (Sequence of Events)
Control Room Log
Wide Range Temperature, All Four Loops.

As specified by the cognizant STA, the I & C section is to obtain a copy of any chart associated with the specific transient causing the trip.

_____

_____

_____

As specified by the cognizant STA, obtain a copy of charts associated with any equipment which has malfunctioned:

_____

_____

_____

Charts Reviewed By: _____/_____

_____/_____

_____/_____

UNIT TWO

PERSONNEL INTERVIEW FORM

Person interviewed Role in Event

Description of the event:

Include the plant conditions prior to the trip, your indications that a problem existed, your action as a result of those indications, noted equipment malfunctions or inadequacies, and any identified procedure deficiencies.

INTERVIEWED BY _____

REVIEWED BY _____ / _____

_____ / _____

_____ / _____

UNIT TWO
REACTOR TRIP EXPECTED RESPONSE (U2)

Expected Response	Data Type	Requirement	Time	Criteria
(Initial Event)	Meas	All	0	0
44 Reactor Trip Breaker A	Meas	All		☆
45 Reactor Trip Breaker B	Meas	All		☆
46 Reactor Trip Breaker Undervoltage coil A	Obsv	All		Yes
47 Reactor Trip Breaker Undervoltage coil B	Obsv	All		Yes
Control Rods Bottom	Obsv	All		Yes
131 Main Turbine Left System Trip	Meas	All		☆
132 Main Turbine Right System Trip	Meas	All		☆
111 WMFPT Vacuum Trip	Meas	WMFPT Vac Trip Reset		☆
99 EMFPT Vacuum Trip	Meas	EMFPT Vac Trip Reset		☆
114 WMFPT Emergency System Trip	Meas	WMFPT Reset		☆
102 EMFPT Emergency System Trip	Meas	EMFPT Reset		☆
Feedwater Isolation (<554°F)	Obsv	On Main Feed		Yes
WMDAFP Start	Obsv	On Main Feed, Aux feed on standby		Yes
EMDAFP Start	Obsv	On Main Feed, Aux feed on standby		Yes
TDAFP Start	Obsv	On Main Feed, Aux feed on standby		Yes If start required

☆ - To be compared to past trips as per 4.6.4

UNIT TWO
TURBINE TRIP EXPECTED RESPONSE (U2)

Expected Response	Data Type	Requirement	Time	Acceptance Criteria
(Initial Event)	Meas	Turb Reset	0	0
131 Main Turbine Left System Trip	Meas	Turb Reset		☆
132 Main Turbine Right System Trip	Meas	Turb Reset		☆
151 Left Emergency Circuit Trip (<8.5 psig)	Meas	Turb Reset		☆
152 Right Emergency Circuit Trip (<8.5 psig)	Meas	Turb Reset		☆
137 Control Fluid Safety Circuit Trip	Meas	Turb Reset		☆
139 Auxilliary Lube Oil Pump	Meas	Turb Reset		☆
140 West Emergency Lube Oil Pump Running	Meas	Turb Reset		☆
141 East Emergency Lube Oil Pump Running	Meas	Turb Reset		☆
121 Main Turbine Stop Valves Closed	Meas	Turb Reset		☆
122 Main Turbine Intercept Valves Closed	Meas	Turb Reset		☆
6 Reactor Trip from Turbine Trip	Meas	Above P-7		☆
165 Overall Differential Generator Trip from Turbine Stop Valves Closed	Meas	Turb Reset		☆
Steam Dump Actuation	Obs	Tavg Mode		Yes

☆ - To be compared to past trips as per 4.6.4

UNIT TWO
GENERATOR TRIP EXPECTED RESPONSE (U2)

Expected Response	Data Type	Requirement	Time	Acceptance Criteria
(Initial Event)	Meas	Generator Exciter	0	0
131 Main Turbine Left System Trip	Meas	Generator Exciter		*
132 Main Tubine Right System Trip	Meas	Generator Exciter		*
Transfer to Normal Reserve	Obs	Gen Supplies Auxiliaries		Yes
Generator Field Breakers Open	Obs	Field Breaker Closed		Yes
Generator Output Breakers Open	Obs	Paralleled		Yes

* - To be compared to past trips as per 4.6.4

Reviewed by _____ /

_____ /

_____ /

UNIT TWO

SYSTEM STATUS AND RESPONSE

Nuclear Instrumentation

List all NI drawer "negative rate" trip status lights which are energized.

Source Range instrument power restored automatically as designed (both channels) _____

Major equipment out of service:

Describe any abnormal conditions (such as 'loss of detector voltage' or 'channel in test') or behavior noticed during the transient.

Reactor Coolant Pumps

Describe circumstances, including place in sequence of events, of any RCP trips (manual or automatic) which occurred during the transient.

Describe effect of reactor transient on leakoff flows.

Describe any behavioral abnormalities noticed during the transient.

UNIT TWO

RCS Pressure Control

Control status prior to trip (man/auto) _____

Backup heaters "on" _____ banks

"auto" _____ banks

Pressure channels selected (control/bistables) _____/_____

Pressurizer PORV's blocked prior to transient: _____

Spray valves in "auto"

_____

Did pressurizer PORV's or safeties lift during transient? Describe circumstances.

Major equipment out of service:

Describe any behavioral abnormalities noticed during the transient

Pressurizer Level Control

Control Status prior to trip (man/auto) _____

Charging pump in service

_____

Charging flow controller (QRV-251 or Recip speed controller) status prior to trip (man/auto)

_____

Level channels selected (control/bistables) _____/_____

Describe any behavioral abnormalities noticed during the transient.

UNIT TWO

CVCS Makeup

Prior to transient, blender line contained (acid, pri. water, blend)

_____

Makeup in auto with 'start' signal? (yes/no)

_____

Control and Shutdown Rods

Full insertion of all control and shutdown rods verified.

_____

Rods that did not insert:

_____

Rod control status prior to trip (auto/man) _____

Was the rod control status changed during the transient? If so, when in the sequence of events?

Major equipment out of service:

Describe any behavioral abnormalities noticed during the transient.

Main Feedwater/Steam Generator Level

Operating main feed pumps tripped on reactor trip (yes/no/OOS)

EMFP _____

WMFP _____

UNIT TWO

Feed water isolation received when Tavg <554°F. Valves closed (yes/no)

FRV210	_____
FRV220	_____
FRV230	_____
FRV240	_____
FMO201	_____
FMO202	_____
FMO203	_____
FMO204	_____

Feedpump control status prior to trip (auto/man)

East feedpump speed control _____
West feedpump speed control _____
DP controller _____

Feedpump steam supply prior to trip

East feedpump (reheat/main/aux)

_____

West feedpump (reheat/main/aux)

_____

Feedwater regulating valve status prior to trip (auto/man)

FRV210	_____
FRV220	_____
FRV230	_____
FRV240	_____

Condensate bypass valve status prior to trip (auto/man)

CRV224 _____

Feedwater Heater level controls in manual prior to trip:

Major equipment out of service:

UNIT TWO

Describe any behavioral abnormalities noticed during the transient.

Auxiliary Feedwater

MDAFP's started automatically on trip of main feedpumps

EMDAFP _____

WMDAFP _____

TDAFP opearated? Describe circumstances and approximate duration of operation.

Did operator intervene in the TDAFP response (place in manual or trip)? If so, when in the sequence of events?

Decribe the response of the S/G levels.

Describe any behavioral abnormalities noticed during the transient.

Steam Dump/Steam Generator Pressure Relief

Control status prior to trip (Tavg/Steam Pressure)

_____

If in Tavg mode, steam dump valves modulated to maintain Tavg ~547. (yes/no)

_____

If Tavg dropped below 541°F, steam dump blocked (yes/no)

_____

UNIT TWO

Did steam dump valve open prior to trip (yes/no)? If yes desribe.

_____

If vacuum trip, did steam dump valves stay closed (yes/no)?

_____

Control status of atmospheric steam dumps prior to trip (auto/manual)

MRV213 _____
MRV223 _____
MRV233 _____
MRV243 _____

Did atmospheric steam dumps operate during transient (yes/no)? If yes, describe (automatically, manually, circumstances).

_____

Was the control status of atmospheric steam dumps changed during the course of the transient? If so, when in the sequence of events?

Did steam generator safeties lift during transient (yes/no)? If yes describe.

_____

Major equipment out of service.

Describe any other behavioral abnormalities noticed during transient.

UNIT TWO

Main Turbine/MSR

Was there a turbine runback (yes/no)?

_____

If yes, provide best estimate of power change and the time in sequence of events when it occurred.

Did the operator intervene in the turbine runback? If so, when in the sequence of events?

Turbine trip: Main turbine stop, control, and intercept valves closed

_____

Controlling device prior to trip (load limiter/operating device)

_____

Set rates loading _____

unloading _____

Were valve or misc turbine tests in progress when the trip occurred?
Which one?

_____

Did exhaust hood sprays actuate (yes/no)?

_____

Vacuum breakers opened following trip? (yes/no)

_____

'Hogging' SJAE's in service following trip? (yes/no)

_____

UNIT TWO

MSR in service prior to trip?
(no/partial/full)

_____

Did any MSR safety valves lift during the transient (yes/no/identify)?

_____

Major equipment out of service:

_____

Describe any behavioral abnormalities noticed during the transient.

Generator/Electrical

Generator trip. This will occur 30 seconds after the reactor trip unless it results from a generator event.

output breakers open (yes/no)

A1 _____

A2 _____

Exciter breaker open (yes/no)

_____

If auxiliaries were suppled by the generator, were auxiliaries automatically transferred to normal reserve (yes/no/NA)? Describe any failures.

_____

Diesel generators opérated?
Describe curcumstances.

UNIT TWO

Any CRID or CRP bus switched to alternate supply? Describe circumstances.
(OSM Point 156, white light on G panel, ann 20 drops 80+100, ann 19 drops 20+40

Major equipment out of service:

Describe any behavioral abnormalities noticed during transient.

Safety Injection

Was the event associated with an SI (yes/no)?

_____

If yes, did verification of automatic actuations indicate failure of any required response (yes/no)?

_____

If yes, list actuations not received, reason if known, and whether the response was successfully initiated manually.

List major equipment out of service.

Describe any abnormalities noticed in the response of the safety injection system.

UNIT TWO

Phase B

Was there a phase B (yes/no)?

_____

If yes, did verification of automatic actuations indicate failure of any required response (yes/no)?

_____

If yes, list actuations not received, reason if known, and whether the response was successfully initiated manually.

List major equipment out of service.

Describe any abnormalities noticed in the response of the CTS System.

Miscellaneous

List any major plant equipment not covered above which is out of service and could have had an effect on the progression of the transient.

Describe any behavioral abnormalities of systems not covered above which may affect plant safety.

COMPLETED BY _____

_____

REVIEWED BY _____/_____

_____/_____

_____/_____

UNIT TWO

CORRECTIVE ACTION REVIEW

A. Trip signal which initiated RPS:

B The determined cause of the trip signal was: (check one)

___ 1. Equipment Failure -

a. Failed component:
b. Mode of failure:
c. Spurious:
d. Is this a repetive failure?

___ 2. Procedural defect (see procedure step 4.3)

___ 3. Personnel Error (see procedure step 4.3)

STA: _____ S.S. _____

Departments Affected: _____ _____

C. Description of error: (complete only if B.2 or B.3 apply)
(include interviews with affected personnel in P.T.R. package).

_____
_____
_____

STA signature: Reviewed by: Dept's Affected:

D. Immediate actions required to mitigate the failure or error prior to restart of Unit:

_____
_____
_____

STA signature: Dept's Affected:

E. Actions proposed to prevent recurrence:

_____
_____
_____

STA signature: Dept's Affected:

REVIEWED BY _____ / _____

_____ / _____

Unit Two

This checklist is to assist in organizing the requirements for reactor restart. The event condition determined by 4.7 "Event Classification" should be circled below and the other two columns N/A'd. The space provided is to be initialed and dated by the STA when the associated requirement has been completed.

	Condition One Event	Condition Two Event	Condition Three Event
Signoff Sheet 11	____/____	____/____	____/____
Signoff Sheet 12	____/____	____/____	____/____
Signoff Sheet 13	____/____	____/____	____/____
Signoff Sheet 14	____/____	____/____	____/____
Signoff Sheet 15	____/____	____/____	____/____
Signoff Sheet 16	____/____	____/____	____/____
Signoff Sheet 18	____/____	____/____	____/____
PNSRC Approval	N/A	N/A	____/____

UNIT TWO

Items Requiring Action	Assignments

Status

Time and Date	Status of Item Requiring Action	STA

APPENDIX A: Miscellaneous Information

Relating to the Operation of Trip Monitoring Devices.

I. HATHAWAY OPERATIONS SEQUENCE MONITOR

The sequence monitor provides a printed record of the operation of certain selected events. It has the capacity to monitor 192 on-off points and produces a line item output on a printer located in the control room when any one of the monitored points indicates an abnormal condition. Forty five points are used to monitor events related to reactor trip initiation or reactor trip circuit breaker position, 6 points monitor condensate or hotwell pumps, 13 points monitor feedwater heater extreme high level events, 6 points monitor onsite power diesel generators, 22 points monitor the main feedwater pumps, 40 points monitor the main turbine-generator, and 8 points monitor the step-up and auxiliary transformers and miscellaneous items.

The operations sequence monitor permits discrimination for contact closures which occur more than 2 milliseconds apart.

A contact closure will result in a line item printout on a dedicated printer located in the control room. The line item contains a 3 digit number for the day of the year, a 4 digit number for the hours a minute, a 2 digit number for the second, a 3 digit number for the milliseconds, an "A" indicating an off normal condition, a 3 digit number to identify the event to the operator. A sample output is attached to the end of this section.

The following information elaborates on the meaning of particular alarms that commonly appear as a result of reactor trips.

A. UNIT I

019 Reactor Trip, S.G. Lo Lo Water Level, Loop 4.

This alarm is a typical example of a signal from the RPS initiating a trip.

044 Reactor Trip Breaker Tripped, Train A.

This alarm originates from breaker position limit switches. It indicates the breaker is actually open.

046 Reactor Breaker Undervoltage, Train A.

This alarm indicates the undervoltage trip attachments have operated. They report late in spite of the fact UVTA's actuate the trip breakers for reactor trips other than manual trips. This situation results from the fact that the auxiliary relay the reports the event is part of an RL circuit. The delay is ~200 msec.

112 WMFP Vaccuum Trip

As indicated on elementary, Dia 1-98212-5 coordinate H-3, this alarm indicates a vacuum trip has occurred.

1118 WMFP HYDR. Press Low.

This alarm results when the MFP Hydr. Oil pressure reaches 130 psi dec.

140 Mechanical Trip Operated.

This alarm indicates a turbine trip has been initiated. As indicated on elementary diagram 1-98101, the following trip signals will initiate this alarm:

1) Overall differential

2) Unit differential

3) Thrust bearing wear & low bearing oil trip

4) MSR level

5) Turbine high vibration trip

6) Turbine solenoid trip

7) Loss of stator cooling turbine trip

8) Turbine low vacuum trip

9) EHC low hydraulic press trip

10) EHC trip system press trip

11) Turbine shaft P.P. low oil press trip

12) EHC master trip

13) Rx trip train A + SG HI HI or S.I.

156 Generator Motoring

As indicated on elementary Dia 1-98021-2 coordinates C1, this alarm results from: (All valves closed or control valves at no load position) and (generator output breakers closed).

B. UNIT II

019 Reactor Trip, S.G. Lo Lo Water Level, Loop 4

This alarm is a typical example of a signal from the RPS initiating a trip.

044 Reactor Trip Breaker Tripped, Train A

This alarm originates from breaker position limit switches. It indicates the breaker is actually open. (verbal comment by T. King)

046 Reactor Breaker Undervoltage, Train A

This alarm indicates the undervoltage trip attachments (UVTA's) have operated. They report late in spite of the fact UVTA's actuate the trip breakers for reactor trips other than manual trips. This situation results from the fact that the auxiliary relay that reports the event is part of an RL circuit. The delay is typically ~200 msec.

131 Main Turbine Left System Trip

This alarm indicates a turbine trip has been initiated. As indicated on Elementary Diagram 2-98101, coordinate D-2, the following trip signals will initiate this alarm:

1) Turbine solenoid trip control switch
2) Unit overall differential
3) Transformer and generator unit differential
4) Thrust bearing position trip
5) Moisture separator reheater high level trip
6) Turbine vibration
7) Lube oil pressure low
8) Loss of stator cooling
9) Reactor trip, SI, or steam generator hi-hi
10) Turbine low vacuum trip
11) High exhaust hood temperature

137 Main Turbine Control Fluid Safety Circuit Tripped

As indicated on Elementary Diagram 2-98101, coordinate H1, this signal results from pressure switch 63X TSP indicating low pressure in the safety fluid circuit. It is operated by pressure switch 2515 on the Turbine Control Diagram, Figure PGS-4B-11 in the training manuals.

151 Left Emergency Circuit Tripped

As indicated on Elementary Diagram 2-98102, coordinate D-7, this alarm results from pressure switch 63 ECL indicating that emergency circuit pressure dropped below 8.5 psig. It is operated by pressure switch 4591 on the Turbine Control Diagram, Figure PGS-4B-11 in the training manual.

NOTE: 63 indicates a pressure switch on an elementary diagram.

158 Generator Motoring

As indicated on Elementary Diagram 2-98021-2, coordinates D2, this alarm results from: (all valves closed OR control valves at no load position) AND (generator output breakers closed)

165 Turbine valve Trip overall Differential

As indicated on Elementary Diagram 2-98021-2, this signal results from a trip of the unit overall differential by turbine valves closed and required delays.

111 FPTW Vacuum Trip

As indicated on Elementary, Diagram 98217-3, coordinate D-4, this alarm indicates a vacuum trip has occurred. It is operated by limit switch 33X BVTW on a mechanical linkage. This mechanical linkage is operated by all trips (verbal coment by T. King) and is expected for FPT trips initiated with the vacuum trip reset.

114 FPTW Emergency System Trip

As indicated on Elementary Diagram 2-98217, coordinate H-3, this signal results from pressure switch 63X BESTW indicating low pressure in the emergency circuit.

NOTE: 33 indicates a limit switch on an elementary diagram.

NOTE: 63 indicates a pressure switch on an elementary diagram.

SAMPLE OSM OUTPUT

```
026 1630 00 401 T 000 DCCOOK 2 TEST PT
026 1730 00 400 T 000 DCCOOK 2 TEST PT
026 1830 00 400 T 000 DCCOOK 2 TEST PT
026 1930 00 401 T 000 DCCOOK 2 TEST PT
026 2030 00 401 T 000 DCCOOK 2 TEST PT
026 2130 00 401 T 000 DCCOOK 2 TEST PT
026 2215 08 212 A 058 DG2AB HEA OPER
026 2226 03 820 A 060 DG 2AB START
026 2230 00 401 T 000 DCCOOK 2 TEST PT
026 2330 00 400 T 000 DCCOOK 2 TEST PT
027 0030 00 400 T 000 DCCOOK 2 TEST PT
027 0130 00 401 T 000 DCCOOK 2 TEST PT
027 0230 00 401 T 000 DCCOOK 2 TEST PT
027 0330 00 401 T 000 DCCOOK 2 TEST PT
027 0350 53 105 A 075 HTR IC LEVEL HI
027 0424 58 082 A 149 MT VAC TRIP BLOCKED
027 0424 59 019 A 149 MT VAC TRIP BLOCKED
027 0425 23 307 A 158 GENERAT MOTORING
027 0425 25 128 A 013 RT LP3FDWT FL LO
027 0425 25 217 A 045 REACT BKR  TRIP B
027 0425 25 237 A 044 REACT BKR  TRIP A
027 0425 25 261 A 131 MT L SYSTEM TRIP
027 0425 25 282 A 132 MT R SYSTEM TRIP
027 0425 25 436 A 028 RT LP1FDWT FL LO
027 0425 25 461 A 151 LEFT EMERG CKT TRIP
027 0425 25 463 A 006 RT TURB TRIP & P7
027 0425 25 489 A 111 FPTW VACUUM TRIP
027 0425 25 535 A 099 FPTE VACUUM TRIP
027 0425 25 610 A 029 RT PWRG PNRATE TR
027 0425 25 635 A 046 REACT BKR UV A
027 0425 25 639 A 047 REACT BKR UV B
027 0425 25 654 A 010 RT LP3FDWT FL LO
027 0425 25 656 A 137 MT CONFL SAFCKT TR
027 0425 26 224 A 102 FPTE EMERGSYS TR
027 0425 26 242 A 075 HTR IC LEVEL HI
027 0425 26 298 A 102 FPTE EMERGSYS TR
027 0425 26 669 A 114 FPTW EMERGSYS TR
027 0425 27 480 A 016 RT SG1 LEV EX LO
027 0425 27 756 A 016 RT SG1 LEV EX LO
027 0425 27 824 A 018 RT SG3 LEV EX LO
027 0425 28 089 A 017 RT SG2 LEV EX LO
027 0425 28 595 A 009 RT LP2FDWT FL LO
027 0425 28 644 A 018 RT SG3 LEV EX LO
027 0425 28 895 A 010 RT LP3FDWT FL LO
027 0425 28 924 A 009 RT LP2FDWT FL LO
027 0425 29 070 A 017 RT SG2 LEV EX LO
027 0425 29 174 A 008 RT LP1FDWT FL LO
027 0425 29 448 A 011 RT LP4FDWT FL LO
027 0425 29 856 A 011 RT LP4FDWT FL LO
027 0425 30 220 A 019 RT SG4 LEV EX LO
027 0425 34 467 A 113 FPTW CONTOIL PR LO
027 0425 34 845 A 101 FPTE CONTOIL PR LO
027 0425 35 271 A 101 FPTE CONTOIL PR LO
027 0425 36 217 A 011 RT LP4FDWT FL LO
027 0425 36 389 A 113 FPTW CONTOIL PR LO
027 0425 36 661 A 009 RT LP2FDWT FL LO
027 0425 36 868 A 101 FPTE CONTOIL PR LO
027 0425 38 227 A 011 RT LP4FDWT FL LO
027 0425 38 622 A 009 RT LP2FDWT FL LO
027 0425 38 763 A 012 RT LP3FDWT FL LO
027 0425 38 799 A 011 RT LP4FDWT FL LO
027 0425 38 816 A 008 RT LP1FDWT FL LO
027 0425 39 248 A 011 RT LP4FDWT FL LO
027 0425 39 264 A 008 RT LP1FDWT FL LO
027 0425 39 698 A 011 RT LP4FDWT FL LO
```

0425 1-27-83 Trip

II. ESTERLINE ANGUS TURBINE EVENT MONITOR.

The turbine event monitor is a dual unit strip chart recorder. Each of the 2 charts has 20 on-off points. The speed of the continuously moving charts is changed after a trip initiation so that 24 hours of chart are advanced through the recorder in 24 seconds. Fast speed on Unit I is 3 inches/sec. Fast speed on Unit II is 1.5 inches/sec. The chart speed then returns to normal and a trip initiation event recurs. Two points, one on each chart, are used to monitor the Train A and Train B reactor trip circuit breakers, 2 points monitor electrical lockout relays which indicate an electrical system level trip, 16 points monitor the position of turbine emergency and pre-emergency valves

(stop and interceptor valves). The remaining points monitor various turbine trip initiating events.

The time discrimination between events is approximately 20 milliseconds when the chart is in high speed operation.

The data is displayed on 2 strip charts. Each point operates a heat pen which leaves a continuous trace on the thermally sensitized chart. The pens trace a printed line on the chart to indicate a normal condition. The pen moves off the printed line to a position approximately midway between the printed lines for 2 adjacent points to indicate an off normal condition. A sample strip chart is attached to the end of this section.

UNIT I PEN IDENTIFICATIONS

Stylus number Chart	Equipment or Device Being Monitored
1.	* Unit differential
2.	* Overall differential
3.	* Reactor trip TR-A
4.	* Reactor trip TR-B
5.	* Mechanical trip
6.	* AEP to master trip
7.	* EHC master trip
8.	* Back-up overspeed trip
9.	* Loss of speed
10.	* Loss of station battery
11.	* Trip system pressure EHC
12.	* Mechanical overspeed trip operated
13.	* Mechanical trip operated
14.	* Power load unbalance
15.	* AEP EHC trip system
16.	* Stop valves closed
17.	* Reheat and Intercept valves closed
18.	* Vibration trip operated
19.	* Trip system pressure HFA
20.	* Time

Stylus Number, Chart 2	Equipment or Device
21.	Stop valve No. 1 closed
22.	Stop valve No. 2 closed
23.	Stop valve No. 3 closed
24.	Stop valve No. 4 closed
25.	Reheat valve No. 1 closed
26.	Reheat valve No. 2 closed
27.	Reheat valve No. 3 closed
28.	Reheat valve No. 4 closed
29.	Reheat valve No. 5 closed
30.	Reheat valve No. 6 closed
31.	Intercept valve No. 1 closed
32.	Intercept valve No. 2 closed
33.	Intercept valve No. 3 closed
34.	Intercept valve No. 4 closed
35.	Intercept valve No. 5 closed
36.	Intercept valve No. 6 closed
37.	* Thrust bearing wear or low bearing oil trip operated
38.	* Low vacuum trip operated
39.	* Moisture separator trip operated
40.	Time

*Those devices that will automatically activate the turbine sequence of events monitor hi-speed drive when operated.

UNIT II PEN IDENTIFICATIONS

Stylus number	Equipment or Device Being Monitored
1.	* Unit differential
2.	* Overall differential
3.	* Reactor bkr tripped TR-A
4.	* Reactor bkr tripped TR-B
5.	* Turbine trip left system
6.	* Loc Vacuum trip operated
7.	* Condenser A low Vacuum trip
8.	* Condenser B low Vacuum trip
9.	* Condenser C low Vacuum trip
10.	Spare
11.	Spare
12.	* Left emergency ckt tripped
13.	* Right emergency ckt tripped
14.	* Feed pump turbine "E" & "W" emergency trip
15.	* Turbine trip right system
16.	* Stop valves closed
17.	* Reheat stop and intercept valves closed
18.	* Vibration trip operated
19.	* Cont. fluid safety circ. tripped
20.	Time

Recorder Points 21-40

Stylus Number	Equipment or Device
21.	No. 1 stop valve closed
22.	No. 2 stop valve closed
23.	No. 3 stop valve closed
24.	No. 4 stop valve closed
25.	No. 1 reheat stop valve closed
26.	No. 4 reheat stop valve closed
27.	No. 2 reheat stop valve closed
28.	No. 5 reheat stop valve closed
29.	No. 3 reheat stop valve closed
30.	No. 6 reheat stop valve closed
31.	No. 1 intercept valve closed
32.	No. 4 intercept valve closed

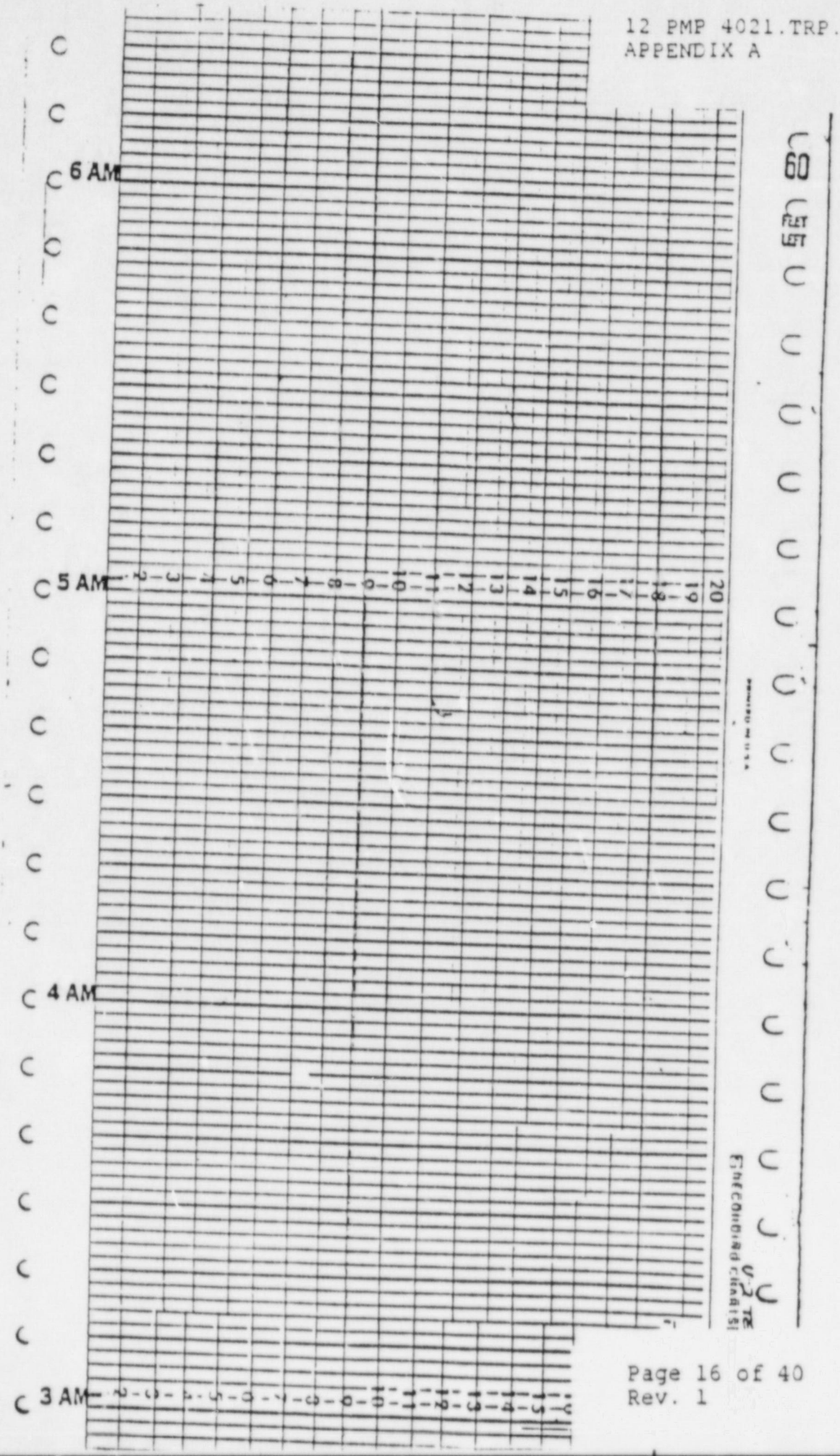
*Those devices that will automatically activate the turbine sequence of events monitor hi-speed drive when operated.

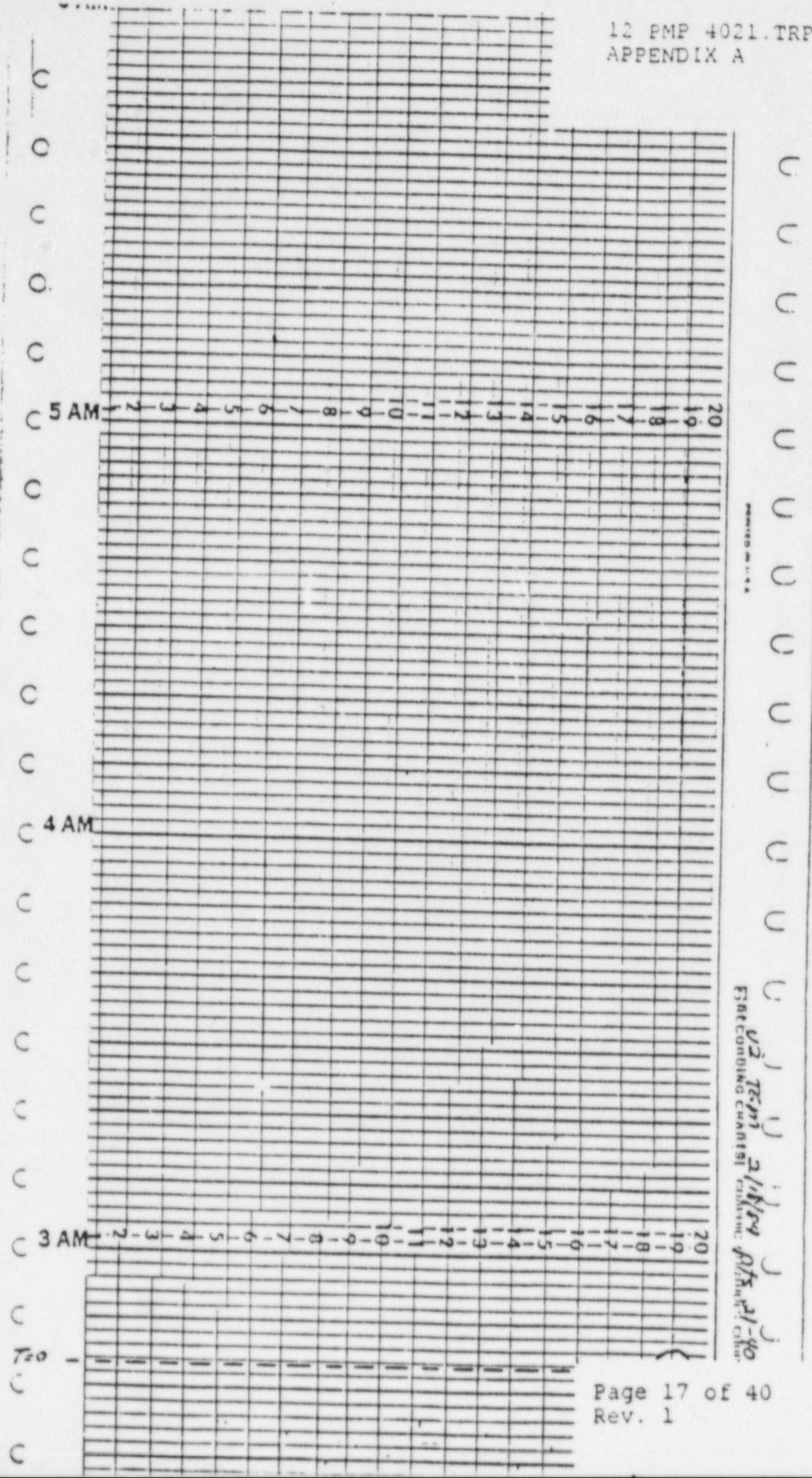
Recorder Points 21-40 (cont.)

Stylus Number	Equipment or Device
33.	No. 2 intercept valve closed
34.	No. 5 intercept valve closed
35.	No. 3 intercept valve closed
36.	No. 6 intercept valve closed
37.	Feed pump turbine "E" emergency trip
38.	Feed pump turbine "W" emergency trip
39.	* Moisture separator Hi level trip
40.	Time

*Those devices that will automatically activate the turbine sequence of events monitor hi-speed drive when operated.

SAMPLE TEM STRIP CHARTS


6 AM
5 AM
4 AM
3 AM
60
FEET


5 AM
4 AM
3 AM
2 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

III. UNIT I EHC FIRST HIT MONITOR PANEL

PS 100 A & B — Are the Emergency Trip Pressure Switches which signal the electrical trip system logic that the Emergency Trip System has depressurized.

SPD SIG LOST — Activated by concurrent loss of primary and secondary speed signals with turbine speed greater than 200 RPM.

CUST. TRIP — Customer trips are the following:

Thrust bearing wear & low bearing oil trip
Steam Generator High Level
Overall differential
Unit differential
MSR high level
Reactor trip (P-7)
Turbine high vibration (1 right plus 1 left)
Solenoid trip (Control Switch)
Loss of stator cooling
Low condensor vacuum
EHC hydraulic pressure low: 1100 PSIG
EHC system pressure trip: 800 PSIG
Shaft pump oil pressure low > 1300 RPM
Safety injection

MA TRIP BUS ENERGIZER	Indicates that a turbine trip has occured, and the master trip bus has been energized. Also indicates trip is sealed in.
NO EHC DC INPUT POWER	Loss of 24 V DC @1800 RPM or 250 V DC if < 1800 RPM. Verify "No Station Battery" Annunciator in Miscellaneous Turbine Test Cabinet.
BACKUP OVER-SPEED TRIP	Activated by excessive turbine speed.
POWER LOAD UNBALANCE	Initiates rapid control and intercept valve closure on greater than 40% power/load mismatch.
FAST CLST IV'S	Rapid closure of intercept valves demanded by turbine supervisory instruments.
-22 VDC LOST OR +30 VDC LOST	DC supply for electrical control lost. Verify indication on lambda power supplies to the left of the First Hit Panel.

IV. HATHAWAY OSCILLOGRAPH

The unit oscillograph has 32 galvanometers. Each galvanometer will record one analog channel or, if properly modified, 4 on-off functions. Eight galvanometers have been converted to on-off functions and the remaining galvanometers are reserved for electrical analog quantities. The unit has a prefault recording feature where all input quantities are continuously recorded on a magnetic disc. Under normal conditions, the data are erased and current recordings written over the old space after approximately 100 milliseconds. If one of a specific set of events occurs, the data are recorded on ultra-violet sensitive photographic paper such that the information recorded prior to the event is recorded followed by additional data resulting from the event. The recording is continued for a fixed time period following the event. Recording chart speed may be selected to be either 12" or 3" per second, the usual practice being to record the initial portion of the event at the higner chart speed followed by additional recording at the slower chart speed.

Six points are used to monitor the A and B train reactor trip circuit breaker positions, undervoltage trip initiation, and safety injection actuation, 2 points monitor the start of onsite power diesel generators, 1 point monitors the trip of the feedwater pumps, 10 points monitor turbine initiated events, 7 points monitor generator and excitation events, and 4 traces are used for references to assist in identification of trace

locations. The analog traces record generator phase currents, phase and ground voltages, and field current.

The display provided by the developed photographic paper is a reproduction of the amplitude and wave shapes of the analog electrical quantities. The on-off events are indicated by a continuous straight line trace for a normal condition or the absence of the trace at that location signifying an off normal event. The photographic paper is developed by exposure to ultra-violet light (fluorescent lights are adequate sources) and no wet chemical processes are required. A sample strip chart is included at the end of this section.

The time descrimination between events during higher chart speed is better than 5 milliseconds between events and better than 10 milliseconds during slower chart speed.

DONALD C. COOK NUCLEAR PLANT

UNIT #1 OSCILLOGRAPH 1/84

TRACE	NO.	TRACE ASSIGNMENT	RATIO	CALIBRATION
	1	Generator Current #1	7000/1	37,960 A/in.
	2	Spare	-----	------
	3	Generator Current #3	7000/1	37,960 A/in.
	4	Spare	-----	------
	5	Spare	-----	------
	6	Spare	-----	------
	7	Gen. Grounding Trans. Voltage	41.5/1	220 V/in.
	8	Spare	-----	------
	(9)	Gen. Field Current Zero Mirror	-----	------
	9	Gen. Field Current (Shunt-4000 A/100 M.V.)	160 M.V./in.	9,466 A/in.
	10	Spare	-----	------
	11	Gen. Metering Pot. Voltage	220/1	227 V/in.
	12	Spare	-----	------
	13	345 KV Pot. Timing Trace	1800/1	213 V/in.
	14	Spare (Current)	-----	------
	15	Spare	-----	------
	16	Spare (Current)	-----	------
	17	OM4 Traces: 1-Reference; 2-Reactor Breaker Tripped 'A'; 3-Reactor Breaker Tripped 'B'; 4-Reactor Breaker Under-volt Trip 'A'	------	On/Off
	18	OM4 Traces: 1-Safety Injection 'A'; 2-Safety Injection 'B'; 3-Diesel Gen. 'AB' Start; 4-Diesel Gen. 'CD' Start.	-----	On/Off
	19	OM4 Traces: 1-Reference; 2-Feed PP. Turb. 'E'. 'W' Trip; 3-Spare; 4-Spare.	------	On/Off
	20	OM4 Traces: 1-Main Stop Valves Closed; 2-Main Turb. Mech. Trip; 3-Emerg. Gov. Overspeed Trip; 4-Back-up Overspeed Trip.	-----	On/Off
	21	OM4 Traces: 1-Reference; 2-FHC System Trip; 3-Reactor Bkr. Undervolt Trip 'B'; 4-Thrust Bearing Trip.	------	On/Off
	22	OM4 Traces: 1-Moisture Separator Hi. Level Trip; 2-Vacuum Trip Operating; 3-Main Turb. High Vib. Trip; 4-Lube Oil Press. Low Trip.	------	On/Off
	23	OM4 Traces: 1-Reference; 2-Stator Outlet Cooling Water Temp. High; 3-Stator Cool Turb. Trip; 4-Stator Cool Gen. Trip.	------	On/Off
	24	OM4 Traces: 1-Generator Motoring; 2-Unit HEA Operated; 3-Overall HEA operated; 4-Alterrex & Excitation Trip.	------	On/Off

OSCILLOGRAPH STARTING SENSOR CALIBRATION

1.-3Ø Undervoltage - - - 109 VAC Note: Overcurrent - (Not Used)
2.-3Ø Overvoltage - - - 130 VAC
3.-1Ø Overvoltage - - - 50 VAC
4.-Any on/off operation will start oscillograph

U-2 OSCILLOGRAPH

9/11/84

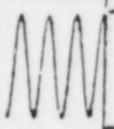
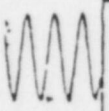
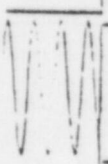
No.	Trace Assignment	Ratio	Calibration
1	Generator potential E Ø1-2 volts	220/1	130 V/in.
2	Generator potential E Ø2-3 volts	220/1	128 V/in.
3	Generator potential E Ø1-3 volts	220/1	124 V/in.
4	Spare	--	--
5	Spare	--	--
6	Spare	--	--
7	Generator nutral voltage	--	126 V/in.
8	Generator current I Ø1	7,000/1	36,119 A/in.
9	Generator current I Ø2	7,000/1	36,119 A/in.
10	Generator current I Ø3	7,000/1	43,914 A/in.
11	Spare	--	--
12	Generator field current	--	--
13	Spare	--	--
15	Spare	--	--
16	765 KV timing trace	--	128 V/in.
17	OM4 Traces: 1-Reference; 2-Reactor Breaker Tripped "A"; 3-Reactor Breaker Tripped "B"; 4-Reactor Breaker Undervoltage Trip "A"	--	On/Off
18	OM4 Traces: 1-Safety Injection "A"; 2-Safety Injection "B"' 3-Diesel Generator AB Start; 4-Diesel Generator CD Current	--	On/Off
19	OM4 Traces: 1-Reference; 2-Feed Pump Turbine "E" and "W" Trip; 3-Feed Pump Turbine "E" and "W" Trip (Emergency); 4-Spare	--	On/Off
20	OM4 Traces: 1-Vacuum Trip Operated; 2-Main Stop Valve Closed; 3-Main Turbine Left System Trip; 4-Main Turbine Right System Trip.	--	On/Off
21	OM4 Traces: 1-Reference; 2-Control Fluid Safety Circ. Tripped; 3-Reactor Breaker Undervoltage Trip "B"; 4-Thrust Bearing Trip	--	On/Off
22	OM4 Traces: 1-Moisture Separator Hi-Level Trip; 2-Air-Oil, H2 Diff. Press. Low Trip; 3-Main Turbine High Vib. Trip; 4-Lube Oil Press Low Trip	--	On/Off
23	OM4 Traces: 1-Reference; 2-Stator Outlet Cooling Water Temp High, 3-Stator Cooling Turbine Trip; 4-Stator Cooling Generator Trip	--	On/Off
24	OM4 Traces: 1-Generator Motoring; 2-Unit Hea Operated; 3-Overall Hea Operated; 4-Alterrex and Excitation Trip	--	On/Off

*NOTE - Trace #14 is a spare but doesn't trace because galvanometer is broken.

SAMPLE OSCILLOGRAPH STRIP CHART

DONALD C. COOK NUCLEAR PLANT

UNIT NO. 2 OSCILLOGRAPH

TRACE	NO.	TRACE ASSIGNMENT	RATIO	CALIBRATION
	1	Generator Potential EØ1-2 Volts	220/1	130 V/in.
	2	Generator Potential EØ2-3 Volts	220/1	128 V/in.
	3	Generator Potential EØ3-1 Volts	220/1	124 V/in.
	4	Generator Current IØ1	7,000/1	36,119 A/in.
	5	Spare	———	———
	6	Generator Neutral Voltage	———	126 V/in.
	7	Spare	———	———
	8	Generator Current IØ2	7,000/1	36,119 A/in.
	9	Generator Current IØ3	7,000/1	43,914 A/in.
	10	Spare	———	———
	11	Spare	———	———
	12	Spare	———	———
	13	Spare	———	———
	14	765 KV Timing Trace	———	126 V/in.
	15	OM4 Traces: 1-Reference; 2-Reactor Breaker Tripped "A"; 3-Reactor Breaker Tripped "B"; 4-Reactor Breaker Undervoltage Trip "A"	———	On/Off
	16	OM4 Traces: 1-Safety Injection "A"; 2-Safety Injection "B" 3-Diesel Generator AB Start; 4-Diesel Generator CD Start.	———	On/Off
	17	OM4 Traces: 1-Reference; 2-Feed Pump Turbine "E" and "W" Trip; 3-Feed Pump Turbine "E" and "W" Trip (Emergency); 4-Spare	———	On/Off
	18	OM4 Traces: 1-Vacuum Trip Operated; 2-Main Stop Valve Closed; 3-Main Turbine Left System Trip; 4-Main Turbine Right System Trip.	———	On/Off
	19	OM4 Traces: 1-Reference; 2-Control Fluid Safety Circ. Tripped; 3-Reactor Breaker Undervoltage Trip "B"; 4-Thrust Bearing Trip	———	On/Off
	20	OM4 Traces: 1-Moisture Separator Hi-Level Trip; 2-Air-Oil, H_2 Diff. Press. Low Trip; 3-Main Turbine High Vib. Trip; 4-Lube Oil Press Low Trip.	———	On/Off
	21	OM4 Traces: 1-Reference; 2-Stator Outlet Cooling Water Temp High; 3-Stator Cooling Turbine Trip; 4-Stator Cooling Generator Trip.	———	On/Off
	22	OM4 Traces: 1-Generator Motoring; 2-Unit Has Operated; 3-Overall Has Operated; 4-Alterrex and Excitation Trip	———	On/Off

OSCILLOGRAPH STARTING SENSOR CALIBRATION

1. 3Ø Undervoltage EØ1-2 — 102 VAC
   " EØ2-3 — 105 VAC
   " EØ3-1 — 107 VAC
2. 3Ø Overvoltage EØ1-2 — 128 VAC
   " EØ2-3 — 129 VAC
   " EØ3-1 — 125 VAC
3. 1Ø Overvoltage 52 VAC
4. Any On/Off operation will start

V. P250 SEQUENCE OF EVENTS RECORDING PROGRAM

The Sequence of Events Recording program records the sequerce of operation of a number of monitored contacts to a high time resolution. When one of the monitored contacts changes state, an interrupt is initiated which causes the P250 to scan each monitored contact for any change from its previous state. The program stores such changes and the cycle count since the first event. A cycle is approximately 20 milliseconds in length. Due to a dead time of 2 milliseconds in the interrupt process, an automatic rebid of the program is programmed for the cycle following each interrupt bid. This is done to avoid loss of contact changes during the dead time. The Sequence of Events Recording program is terminated when either the cycle count reaches 3600 or 25 contact changes have been recorded.

When the program is terminated, an output routine is called. All collected data are first moved to the output program buffers to free the Sequence of Events Recording program buffers for continued monitoring. The output routine prints the time of the first event in hours, minutes, and seconds. Following this message, the alpha-numeric address, a 36 character contact description, and cycle count from the first event are printed for each contact change. The first event will always have a cycle count of zero. A sample output is included at the end of this section.

SEQUENCE OF EVENT ADDRESSES
(Reference P250 Manual TPS129)

F0403D	RCL LO F ABOVE P-8 CAUS RE
F0423D	RCL LO F ABOVE P-7 CAUS REF
F0493D	STM LINE HI F SI CAUS RE
L0406D	STM GEN A LO LO L CAUS RE
L0426D	STM GEN B LO LO L CAUS RE
L0446D	STM GEN C LO LO L CAUS RE
L0466D	STM GEN D LO LO L CAUS RE
L0483D	PRESSURIZER HI 1 CAUS RE
N0005D	PWR RNG CHAN HI Q CAUS RE
N0010D	PWR RNG CHAN LO Q CAUS RE
N0024D	INTERM RNG HI Q CAUS RE
N0029D	PWR RNG CHAN HI Q RATE CAUS RE
N0036D	SOURCE RNG HI Q CAUSE RE
P0407D	STM LINE A HI DP SI CAUS RE
P0427D	STM LINE B HI DP SI CAUS RE
P0447D	STM LINE C HI DP SI CAUS RE
P0467D	STM LINE D HI DP SI CAUS RE
P0483D	PRESSURIZER HI P CAUS RE
P0488D	PRESSURIZER LO P CAUS RE
P1003D	CONTAINM HI P SI CAUS RE
T0498D	RCL OVERTEMP DI CAUS RE
T0499D	RCL OVERPWR DT CAUS RE
V0324D	RCP BUS UNDER VOLT &P7 CAUSE RE
Y0004D	REAC MANUAL TR 1 CAUS RE
Y0005D	REAC MANUAL TR 2 CAUS RE
Y0006D	REAC MAIN TR BKR A
Y0007D	REAC MAIN TR BKR B
Y0026D	REAC AUX TR BKR A
Y0027D	REAC AUX TR BKR B
Y0320D	RCP BUS UNDER FREQ PART RE
Y0321D	RCP BUS UNDER FREQ PART RE
Y0322D	RCP BUS UNDER FREQ PART RE
Y0323D	RCP BUS UNDER FREQ PART RE
Y0324D	RCP BUS UNDER FREQ CAUS RE
Y0335D	UNIT ON LINE TIE OCB A1 BKR
Y0335D	UNIT ON LINE TIE OCB A2 BKR
Y0337D	UNIT ON LINE TIE OCB B1 BKR
Y0390D	TB TRIP CAUSE RE
Y0391D	TB STOP VLV A CI PART RE
Y0392D	TB STOP VLV B CI PART RE
Y0393D	TB STOP VLV C CI PART RE
Y0394D	TB STOP VLV D CI PART RE
Y0400D	RCPA BKR OP CAUS RE
Y0401D	STM GEN A LO L & FW F CAUS RE
Y0420D	RCPB BKR OP CAUS RE
Y0421D	STM GEN B LO L & FW F CAUS RE
Y0440D	RCPC BKR OP CAUS RE
Y0441D	STM GEN C LO L & FW F CAUS RE
Y0460D	RCPD BKR OP CAUS RE
Y0461D	STM GEN D LO L & FW F CAUS RE
Y0480D	PRESUZER LO P&L SI CAUS RE
Y0920D	SFTY INJ SET MANUAL 1 CAUS RE
Y0921D	SFTY INJ SET MANUAL 2 CAUS RE

SAMPLE SEQUENCE OF EVENTS OUTPUT

```
0257   ALARM HI   TD410A   AI   RCLA OVERTEMP DT 1 SP                    178.5    H   152.0    DEGF
0257  RETRN OR  TD430A  AI  RCLB OVERTEMP DT 1 SP          159.4   DEGF
0257  RETRN OR  TD450A  AI  RCLC OVERTEMP DT 1 SP          164.1   DEGF
0257  RETRN OR  TD470A  AI  RCLD OVERTEMP DT 1 SP          160.3   DEGF
0257   ALARM LO   TD400A   AI   RCLA 1 TAVG                          544.7    L   552.0    DEGF

0257  SEQUENCE OF EVENTS RECORD.  FIRST EVENT AT H 2 856 640
0257   ALARM LO   TD420A   AI   RCLB 1 TAVG                          547.5    L   553.0    DEGF
     TD390D  TB TRIP CAUSE RE                IR      C   0
0258  RETRN LO  UD340A  AI  UNIT GENERATOR GROSS MW          3.0   L   -2.0   MW
0258   ALARM HI   TD450A   AI   RCLC OVERTEMP DT 1 SP                    152.4    H   152.0    DEGF
     TD007D  REAC RAIN IR EXR B              IR      C   4
0258   ALARM LO   TD440A   AI   RCLC 1 TAVG                          545.6    L   552.0    DEGF
0258   ALARM HI   UD40B    CV   RCLA OVERPWR SP DEV FR COMPUTED      104.2    H     6.0    PC
     TD006D  REAC RAIN IR EXR A              IR      C   5
0258   ALARM LO   TD460A   AI   RCLD 1 TAVG                          545.2    L   552.0    DEGF
     ND029D  PWR RNG CHAN HI R RATE CAUS RE  IR      C  21
0258   ALARM HI   UD44B    CV   RCLC OVERPWR SP DEV FR COMPUTED      104.7    H     6.0    PC
0258   ALARM HI   UD46B    CV   RCLD OVERPWR SP DEV FR COMPUTED      104.1    H     6.0    PC
     TD392D  TB STOP VLV B CL PART RE        IR      C  28
0258   ALARM HI   TD470A   AI   RCLD OVERTEMP DT 1 SP                    150.1    H   150.0    DEGF
0258   ALARM LO   PD142A   AI   CHARG PMP DISCH HDR P                2145.0    L  2200.0    PSIG
     TD394D  TB STOP VLV D CL PART RE        IR      C  28
 0258 DELTA FLUX PROGRAM IN LOW POWER CUTOFF MODE
     TD393D  TB STOP VLV C CL PART RE        IR      C  30
     TD391D  TB STOP VLV A CL PART RE        IR      C  32
     TD441D  STM GEN C LO L & FW F CAUS RE   IR      C  226
     TD426D  STM GEN B LO LO L CAUS RE       IR      C  257
     PD486D  PRESSURIZER LO P CAUS RE        IR      C  266
0259   ALARM HI   UD42B    CV   RCLB OVERPWR SP DEV FR COMPUTED      104.0    H     6.0    PC
     TD404D  STM GEN A LO LO L CAUS RE       IR      C  271
     TD422D  STM GEN D LO LO L CAUS RE       IR      C  272
0259   INCR   HI   TD470A   AI   RCLD OVERTEMP DT 1 SP                    152.2    I   152.0    DEGF
     TD446D  STM GEN C LO LO L CAUS RE       IR      C  278
     TD421D  STM GEN B LO L & FW F CAUS RE   IR      C  278
     TD401D  STM GEN A LO L & FW F CAUS RE   IR      C  307
     TD441D  STM GEN D LO L & FW F CAUS RE   IR      C  307
0300   2/18/1984  DC COOK UNIT 2
     TD441D  STM GEN D LO L & FW F CAUS RE   NI IR   C  317
     TD441D  STM GEN D LO L & FW F CAUS RE   IR      C  321
     TD421D  STM GEN B LO L & FW F CAUS RE   NI IR   C  660
     TD401D  STM GEN A LO L & FW F CAUS RE   NI IR   C  666
0300   ALARM HI   TD430A   AI   RCLB OVERTEMP DT 1 SP                    150.6    H   150.0    DEGF
     TD441D  STM GEN D LO L & FW F CAUS RE   NI IR   C  679
     TD441D  STM GEN C LO L & FW F CAUS RE   NI IR   C  746
     PD488D  PRESSURIZER LO P CAUS RE        NI IR   C 1082
0301   INCR   HI   TD430A   AI   RCLB OVERTEMP DT 1 SP                    152.0    I   152.0    DEGF
     TD336D  UNIT ON LINE IIR OLB A2 BKR     OP      C 1474
     TD335D  UNIT ON LINE IIL OLB A1 BKR     OP      C 1476
0301  END SEQUENCE OF EVENTS RECORD

0301  SEQUENCE OF EVENTS RECORD.  FIRST EVENT AT H 2 859 631
     TD390D  TB TRIP CAUSE RE                NI IR   C   0
     TD441D  STM GEN C LO L & FW F CAUS RE   IR      C 1811
     TD441D  STM GEN C LO L & FW F CAUS RE   NI IR   C 2250
0301  END SEQUENCE OF EVENTS RECORD
        0303  ANALOG TREND-DEVICE  2 STOPPED
```

VI. POST TRIP REVIEW PROGRAM.

The Post Trip Review program periodically records a number of pre-selected inputs. These inputs are stored on a disc in a circular buffer, with newer sets of data replacing the older sets. When a trip occurs, either automatically (Post Trip) or manually (Test Trip), the pre trip data being entered into the circular buffer are frozen and the data are thereafter stored in a post trip buffer. When this buffer is filled, both sets of data (pre and post) are printed out on the typewriter..

The parameters monitored are analog in nature. At the present time, they include selected RPI indication (for unit 2 only), steam generator feed water flow and steam flow, steam generator narrow range and wide range level, pressurizer level, pressurizer livel setpoint, source range detector output,

intermediate range detector output, power range detector output, first stage turbine pressure, steam generator pressure, pressurizer pressure, containment pressure, unit gross electrical output, Taverage, delta T power, overtemperature delta T setpoint, overpower delta T setpoint, wide range cold leg temperatures, pressurizer steam temperatures, T-reference, auctioneered delta T, and auctioneered Tavg. These parameters remain as selected by the computor vendor, Westinghouse Electric Corporation, except for certain RPI indications on Unit 2. The RPI indications were substituted for the four channels of total power range NIS power in order to obtain data on the anomalous response of RPI H-8 upon trip. The individual power range upper

and lower detector outputs remain in the Post Trip Review output for both units to monitor NIS power range indications.

Eight of the parameters in the previous paragraph are sampled at 2 second intervals 6 seconds before and after the trip. These are total NIS power range power on unit 1 and RPI indications on unit 2, turbine first stage pressure, unit gross electrical output, and auctioneered Taverage. All parameters are sampled at 8 second intervals for 2 minutes before and 3 minutes after the trip. These sampling times remain as set by the computor vendor.

The Post Trip Print program first outputs a start message on the appropriate typewriter. It then outputs a line of headings for the values which will be printed in columnar form. The headings consist of the six-character name of the point. The values are printed below their names starting with the oldest set of data on the first line, the next oldest on the next line and so on until the most recent pre-trip data are printed. Included in each row of data is a column indicating the time. When all the pre-trip data for this set of points are printed, the message POST TRIP DATA - TRIP TIME XXXX is printed. All the post-trip data for these points are printed in the same format as described above.

After all the post-trip data for these points are finished, the program starts over with another set of data in the same format: 6 character names, pre-trip values, trip message, and post-trip values. When all the points have been printed, the program outputs a finished message, unblocks the collection

programs, and exits. A sample output is included at the end of this section.

POST TRIP REVIEW ADDRESSES

C0010A	Cont. Rod Bank B Group 1 Pos M08 (Unit 2 Only)
C0027A	Cont. Rod Bank D Group 2 Pos P10 (Unit 2 Only)
C0029A	Cont. Rod Bank D Group 2 Pos H08 (Unit 2 Only)
C0075A	SD Rod Bank D Group 1 Pos F10 (Unit 2 Only)
F0403A	Stm Gen A Feed Wtr in 1 F
F0404A	Stm Gen A Feed Wtr in 2 F
F0405A	Stm Gen A Stm Out 1 F
F0406A	Stm Gen A Stm Out 2 F
F0423A	Stm Gen B Feed Wtr in 1 F
F0424A	Stm Gen B Feed Wtr in 2 F
F0425A	Stm Gen B Stm Out 1 F
F0426A	Stm Gen B Stm Out 2 F
F0443A	Stm Gen C Feed Wtr in 1 F
F0444A	Stm Gen C Feed Wtr in 2 F
F0445A	Stm Gen C Stm Out 1 F
F0446A	Stm Gen C Stm Out 2 F
F0463A	Stm Gen D Feed Wtr in 1 F
F0464A	Stm Gen D Feed Wtr in 2 F
F0465A	Stm Gen D Stm Out 1 F
F0466A	Stm Gen D Stm Out 2 F
L0400A	Stm Gen A Nar Rng 1 L
L0401A	Stm Gen A Nar Rng 2 L
L0402A	Stm Gen A Nar Rng 3 L
L0403A	Stm Gen A Wide Rng L
L0420A	Stm Gen B Nar Rng 1 L
L0421A	Stm Gen B Nar Rng 2 L
L0422A	Stm Gen B Nar Rng 3 L
L0423A	Stm Gen B Wide Rng L
L0440A	Stm Gen C Nar Rng 1 L
L0441A	Stm Gen C Nar Rng 2 L
L0442A	Stm Gen C Nar Rng 3 L
L0443A	Stm Gen C Wide Rng L
L0460A	Stm Gen D Nar Rng 1 L
L0461A	Stm Gen D Nar Rng 2 L
L0462A	Stm Gen D Nar Rng 3 L
L0463A	Stm Gen D Wide Rng L
L0480A	Pressurizer 1 L
L0481A	Pressurizer 2 L
L0482A	Pressurizer 3 L
L0483A	Pressurizer Lvl Control S.P.
N0031A	Source Rng Detector 1 Log Q
N0032A	Source Rng Detector 2 Log Q
N0035A	Source Rng Detector 1 Log Q
N0036A	Interm Rng Detector 2 Log Q
N0041A	PWR Rng 1 Top Detector Q
N0042A	PWR Rng 1 Bottom Detector Q
N0043A	PWR Rng 2 Top Detector Q
N0044A	PWR Rng 2 Bottom Detector Q
N0045A	PWR Rng 3 Top Detector Q
N0046A	PWR Rng 3 Bottom Detector Q
N0047A	PWR Rng 4 Top Detector Q
N0048A	PWR Rng 4 Bottom Detector Q

POST TRIP REVIEW ADDRESSES

N0049A	PWR Rng Channel 1 Q (Unit 1 Only)
N0050A	PWR Rng Channel 2 Q (Unit 1 Only)
N0051A	PWR Rng Channel 3 Q (Unit 1 Only)
N0052A	PWR Rng Channel 4 Q (Unit 1 Only)
P0398A	Tb First Stage 1 P
P0399A	Tb First Stage 2 P
P0400A	Stm Gen A Stm Out 1 P
P0401A	Stm Gen A Stm Out 2 P
P0402A	Stm Gen A Stm Out 3 P
P0420A	Stm Gen B Stm Out 1 P
P0421A	Stm Gen B Stm Out 2 P
P0422A	Stm Gen B Stm Out 3 P
P0440A	Stm Gen C Stm Out 1 P
P0441A	Stm Gen C Stm Out 2 P
P0442A	Stm Gen C Stm Out 3 P
P0460A	Stm Gen D Stm Out 1 P
P0461A	Stm Gen D Stm Out 2 P
P0462A	Stm Gen D Stm Out 3 P
P0480A	Pressurizer 1 P
P0481A	Pressurizer 2 P
P0482A	Pressurizer 3 P
P0483A	Pressurizer 4 P
P1000A	Containment 1 P
P1001A	Containment 2 P
P1002A	Containment 3 P
P1003A	Containment 4 P
Q0340A	Unit Generator Gross
T0400A	RCL A 1 T-Avg.
T0403A	RCL A 1 DT
T0406A	RCL A 1 Cold T
T0407A	RCL Overpwr DT 1 SP
T0410A	RCL A Overtemperature ΔT Setpoint
T0420A	RCL B 1 T-Avg.
T0423A	RCL B 1 DT
T0426A	RCL B Cold T
T0427A	RCL B Overpwr DT 1 SP
T0430A	RCL B Overtemp DT 1 SP
T0440A	RCL C 1 T-Avg.
T0443A	RCL C 1 DT
T0446A	RCL C Cold T
T0447A	RCL C Overpwr DT 1 SP
T0450A	RCL C Overtemp DT 1 SP
T0460A	RCL D 1 T-Avg.
T0463A	RCL D 1 DT
T0466A	RCL D Cold T
T0467A	RCL D Overpwr DT 1 SP
T0470A	RCL D Overpwr DT 1 SP
T0481A	Pressurizer Stm T
T0496A	RC T-Ref.
T0497A	RCL Auct. DT
T0499A	RCL Auct. T-Avg.

SAMPLE POST TRIP REVIEW OUTPUT

```
    0.00    0.00 *  -81.7    18.2    -1.0    547.7   5821.6 *    0.0 *    0.0    98.8 *    0.0 *    0.0    42.5   229.4 *    0.0
    0.00    0.00 *  -83.7    18.2     0.0    547.7   5829.6 *    0.0 *    0.0    96.8 *    0.0 *    0.0    42.5   250.0 *    0.0
    0.00    0.00 *  -81.7    18.4     1.0    547.7   5837.6 *    0.0 *    0.0   139.8 *    0.0 *    0.0   114.9   250.0 *    0.0
    0.00    0.00 *  -83.7    18.6    -1.0    547.7   5845.6 *    0.0 *    0.0    98.8 *    0.0 *    0.0    42.5   268.8 *    0.0
0707 POSI-IKIR DATA - IKIR TIME 015847
    0.00    0.00 *  -83.7    18.6    -1.0    547.7   5853.6 *    0.0 *    0.0   221.0 *    0.0 *    0.0    42.5   229.6 *    0.0
    0.00    0.00 *  -81.7    18.6     0.0    547.7   5901.6 *    0.0 *    0.0   197.4 *    0.0 *    0.0    42.5   229.6 *    0.0
    0.00    0.00 *  -83.7    18.6     0.0    547.7   5911.7 *    0.0 *    0.0   171.2 *    0.0 *    0.0    42.5   250.0 *    0.0
    0.00    0.00 *  -81.7    19.2     1.0    547.9   5917.4 *    0.0 *    0.0    98.8 *    0.0 *    0.0    42.5   250.0 *    0.0
    0.00    0.00 *  -83.7    18.9     1.0    547.8   5925.6 *    0.0    116.9   171.2 *    0.0 *    0.0   114.9   268.8 *    0.0
    0.00    0.00 *  -81.7    19.2     1.0    547.9   5933.6 *    0.0     42.5   139.8 *    0.0 *    0.0   114.9   412.2 *    0.0
    0.00    0.00 *  -83.7    19.2     0.0    547.8   5941.6 *    0.0 *    0.0   139.8 *    0.0 *    0.0   114.9   250.0 *    0.0
    0.00    0.00 *  -81.7    19.4     1.0    547.8   5949.6 *    0.0 *    0.0   242.1 *    0.0 *    0.0   114.9   250.0 *    0.0
    0.00    0.00 *  -83.7    19.6     1.0    547.8   5958.7 *    0.0     42.5   139.8 *    0.0 *    0.0   114.9   286.4 *    0.0
    0.00    0.01 *  -81.7    19.4     1.0    547.8     5.4 *    0.0     42.5   171.2 *    0.0 *    0.0   114.9   268.8 *    0.0
    0.00    0.00 *  -83.7    19.6     1.0    547.9    13.6 *    0.0     42.5   242.1 *    0.0 *    0.0   114.9   250.0 *    0.0
    0.00    0.00 *  -81.7    18.9     1.0    547.7    21.6 *    0.0 *    0.0    98.8 *    0.0 *    0.0    42.5   250.0 *    0.0
    0.00    0.00 *  -83.7    19.2     0.0    547.7    29.6 *    0.0 *    0.0   221.0 *    0.0 *    0.0 *    0.0   207.3 *    0.0
    0.00    0.00 *  -81.7    18.9     0.0    547.7    37.6 *    0.0 *    0.0    98.8 *    0.0 *    0.0    42.5   250.0 *    0.0
    0.00    0.00 *  -83.7    18.9     0.0    547.7    45.6 *    0.0 *    0.0     0.0 *    0.0 *    0.0    42.5   250.0 *    0.0
    0.00    0.00 *  -81.7    18.6     0.0    547.7    51.6 *    0.0 *    0.0    98.8 *    0.0 *    0.0 *    0.0   207.3 *    0.0
    0.00    0.00 *  -83.7    18.9     0.0    547.8   103.7 *    0.0 *    0.0     0.0 *    0.0 *    0.0 *    0.0   229.6 *    0.0
    0.00    0.00 *  -81.7    18.6     0.0    547.7   109.4 *    0.0 *    0.0     0.0 *    0.0 *    0.0 *    0.0   229.6 *    0.0
    0.00    0.00 *  -83.7    18.6     0.0    547.7   117.6 *    0.0 *    0.0    96.8 *    0.0 *    0.0 *    0.0   229.6 *    0.0
    0.00    0.00 *  -81.7    18.6     0.0    547.7   125.6 *    0.0 *    0.0    98.8 *    0.0 *    0.0     42.5   250.0 *    0.0
    0.00    0.00 *  -83.7    18.2     0.0    547.7   133.6 *    0.0 *    0.0     0.0 *    0.0 *    0.0 *    0.0   207.3 *    0.0
    0.00    0.00 *  -81.7    18.6     1.0    547.7   141.4 *    0.0 *    0.0    98.8 *    0.0 *    0.0     42.5   229.6 *    0.0
    0.00    0.00 *  -83.7    18.4     1.0    547.7   149.6 *    0.0 *    0.0   221.0 *    0.0 *    0.0     42.5 *    0.0 *    0.0
    0.00    0.00 *  -81.7    18.4     1.0    547.7   157.4 *    0.0 *    0.0   171.2 *    0.0 *    0.0     42.5   250.0 *    0.0
   TIME    ID444A   ID444A   ID443A   ID447A   ID463A   ID464A   ID465A   ID466A   ID440A   ID441A   ID442A   ID460A   ID461A   ID462A
  5841.8   250.0 *    0.0 *    0.0    151.1 *    0.0    182.2    114.9     42.5    971.7    971.2    985.2    972.0    969.1    970.5
  5849.8   250.0 *    0.0 *    0.0    182.2 *    0.0    182.2    116.9    116.9    971.7    973.2    985.2    972.0    969.9    969.9
  5857.8   250.0 *    0.0 *    0.0    114.9 *    0.0    151.1     42.5     42.5    971.7    972.5    981.7    972.0    969.1    969.9
  5905.8   250.0 *    0.0 *    0.0    151.1 *    0.0    151.1     42.5     42.5    971.7    973.2    983.7    972.0    969.9    970.5
  5913.8   250.0 *    0.0 *    0.0    114.9 *    0.0    151.1    114.9     42.5    971.7    971.2    985.2    972.0    969.9    970.5
  5921.8   207.3 *    0.0 *    0.0    116.9 *    0.0    116.9 *    0.0 *    0.0    971.0    973.2    983.7    971.2    969.1    969.9
  5929.8   229.6 *    0.0 *    0.0     42.5 *    0.0    116.9 *    0.0 *    0.0    971.7    971.2    984.5    971.2    969.1    970.5
  5937.8   207.3 *    0.0 *    0.0    116.9 *    0.0    116.9 *    0.0 *    0.0    971.7    973.2    984.5    971.2    969.9    969.9
  5945.8   207.3 *    0.0 *    0.0     42.5 *    0.0    114.9 *    0.0 *    0.0    971.7    973.2    985.2    972.0    969.9    970.5
  5953.8   207.3 *    0.0 *    0.0     42.5 *    0.0    116.9 *    0.0 *    0.0    971.7    972.5    983.7    971.2    969.9    969.9
  5801.8   229.6 *    0.0 *    0.0     42.5 *    0.0    116.9 *    0.0 *    0.0    971.7    971.2    985.2    972.0    970.5    970.5
  5809.9   182.2 *    0.0 *    0.0     42.5 *    0.0     42.5 *    0.0 *    0.0    971.7    973.2    984.5    972.0    969.9    969.9
  5817.8   229.6 *    0.0 *    0.0    1 .9 *    0.0    153.1     42.5     42.5    972.5    974.7    985.9    973.5    970.5    971.2
  5825.8   250.0 *    0.0 *    0.0    116.9 *    0.0    153.1     42.5     42.5    973.2    975.5    985.9    972.7    971.2    971.2
  5833.8   250.0 *    0.0 *    0.0    151.1 *    0.0    151.1     42.5     42.5    973.2    975.5    988.1    973.5    971.2    972.0
  5841.9   229.6 *    0.0 *    0.0    151.1 *    0.0    116.9     42.5 *    0.0    973.2    975.5    987.4    973.5    971.2    972.0
0707 POSI-IKIR DATA - IKIR TIME 015847
  5849.8   207.3 *    0.0 *    0.0    116.9 *    0.0    116.9     42.5 *    0.0    973.2    975.5    985.9    973.5    971.2    972.0
  5857.8   229.6 *    0.0 *    0.0    151.1 *    0.0    151.1     42.5     42.5    974.0    975.5    985.9    973.5    972.0    972.0
  5905.8   250.0 *    0.0 *    0.0    153.1 *    0.0    153.1     42.5     42.5    974.7    975.5    986.6    975.0    972.0    972.7
  5913.8   229.6 *    0.0 *    0.0    151.1 *    0.0    153.1     42.5*    42.5    974.7    976.2    987.4    974.2    972.7    974.5
  5921.8   268.8     42.5 *    0.0    207.3 *    0.0    207.3     153.1    116.9    976.2    977.6    988.9    975.6    973.5    974.2
  5929.8   268.8 *    0.0 *    0.0    182.2 *    0.0    182.2     114.9    114.9    976.2    977.6    988.9    975.6    974.2    974.2
  5937.8   250.0 *    0.0 *    0.0    153.1 *    0.0    182.2     116.9     42.5    974.2    977.6    988.9    975.6    974.2    974.2
  5945.9   229.6 *    0.0 *    0.0    114.9 *    0.0    182.2     114.9    114.9    975.5    977.6    988.1    974.4    973.5    974.2
  5953.8   250.0 *    0.0 *    0.0    182.2 *    0.0    153.1     116.9    116.9    976.9    977.6    989.6    976.4    974.2    975.0
    1.8    250.0 *    0.0 *    0.0    151.1 *    0.0    153.1     114.9     42.5    974.2    978.4    989.6    977.1    975.0    975.6
```

9.8	250.0 *	0.0 *	0.0	153.1 *	0.0	182.2	116.9	116.9	976.9	978.4	989.6	977.1	975.0	975.6
17.8	229.6 *	0.0 *	0.0	153.1 *	0.0	153.1	42.5	42.5	976.9	979.1	991.1	977.1	975.0	975.0
25.9	229.6 *	0.0 *	0.0	116.9 *	0.0	116.9	42.5 *	0.0	976.2	977.6	988.9	976.4	974.2	975.0
33.8	250.0 *	0.0 *	0.0	116.9 *	0.0	153.1	42.5	42.5	976.9	979.1	990.4	977.1	975.0	975.6
41.8	229.6 *	0.0 *	0.0	182.2 *	0.0	116.9 *	0.0	42.5	976.9	979.1	991.1	977.1	975.0	975.6
49.9	229.6 *	0.0 *	0.0	42.5 *	0.0	116.9 *	0.0 *	0.0	976.9	978.4	989.6	976.4	974.2	975.0
57.8	207.3 *	0.0 *	0.0	116.9 *	0.0	42.5	42.5 *	0.0	976.9	978.4	989.6	977.1	975.0	975.6
105.8	207.3 *	0.0 *	0.0	116.9 *	0.0	116.9 *	0.0 *	0.0	976.9	978.4	989.6	976.4	975.0	975.0
113.8	229.6 *	0.0 *	0.0	153.1 *	0.0	42.5	42.5 *	0.0	976.9	978.4	990.4	977.1	975.0	976.4
121.8	229.6 *	0.0 *	0.0	116.9 *	0.0	153.1 *	0.0	42.5	976.9	978.4	989.4	977.1	975.0	975.6
129.8	229.6 *	0.0 *	0.0	42.5 *	0.0	116.9 *	0.0 *	0.0	976.2	977.6	989.6	976.4	974.2	975.0
137.8	229.6 *	0.0 *	0.0	116.9 *	0.0	116.9	42.5	42.5	976.2	977.6	988.9	976.4	975.0	975.0
145.8	250.0 *	0.0 *	0.0	116.9 *	0.0	153.1 *	0.0	42.5	976.2	978.4	988.9	976.4	975.0	975.0
153.8	250.0 *	0.0 *	0.0	116.9 *	0.0	153.1	42.5	42.5	975.5	977.6	988.9	975.6	974.2	974.2
TIME4	F0400A	F0401A	F0402A	F0420A	F0421A	F0422A	TIME5	T0400A	T0403A	T0407A	T0410A	T0420A	T0423A	T0427A
5641.9	976.2	976.2	968.4	964.7	968.4	962.6	5641.9	545.4	-0.5	108.0	131.7	544.5	-0.5	108.1
5649.9	975.0	975.0	967.6	965.4	968.4	962.6	5650.6	545.5	-0.6	108.0	131.7	544.5	-0.5	108.1
5658.0	975.0	976.2	967.6	964.7	967.6	962.6	5658.1	545.5	-0.6	108.0	131.5	544.5	-0.6	108.1
5705.9	976.2	976.2	967.6	965.4	968.4	963.4	5706.0	545.5	-0.5	107.9	131.5	544.5	-0.5	108.0
5713.9	975.0	976.2	968.4	965.4	968.4	961.4	5711.9	545.5	-0.4	108.0	131.5	544.5	-0.5	108.1
5722.0	976.2	973.5	967.6	964.7	967.6	962.6	5722.0	545.4	-0.6	107.8	131.5	544.5	-0.7	107.9
5730.0	975.0	976.2	967.6	964.7	968.4	962.6	5730.0	545.5	-0.4	107.9	131.5	544.6	-0.6	108.0
5737.9	975.0	976.2	968.4	965.4	968.4	962.6	5738.0	545.5	-0.6	107.8	131.5	544.5	-0.7	108.6
5745.9	975.0	975.0	968.4	965.4	968.4	962.6	5745.9	545.5	-0.4	107.9	131.5	544.6	-0.7	107.9
5753.9	976.2	975.0	967.6	965.4	968.4	963.4	5754.0	545.5	-0.7	107.8	131.4	544.6	-0.8	107.9
5801.9	975.0	975.0	968.4	965.4	968.4	962.6	5802.0	545.5	-0.4	107.8	131.5	544.6	-0.7	107.9
5810.0	976.2	976.2	968.4	965.4	968.4	962.6	5810.1	545.5	-0.7	107.8	131.5	544.6	-0.8	107.8
5817.9	975.6	975.6	970.5	966.9	969.9	964.1	5818.0	545.7	-0.6	107.9	131.5	544.7	-0.7	108.0
5825.9	975.6	976.4	969.9	966.9	969.9	964.1	5825.9	545.7	-0.6	107.9	131.5	544.7	-0.7	108.0
5834.0	977.1	976.4	970.5	966.9	970.5	964.9	5834.0	545.7	-0.6	108.0	131.5	544.7	-0.6	108.1
5842.0	976.4	976.4	969.9	967.6	970.5	964.9	5842.1	545.7	-0.6	107.9	131.5	544.7	-0.6	108.0
0312 POST TRIP DATA - TRIP TIME 015847														
5850.0	975.6	975.6	969.9	966.1	969.9	965.5	5850.1	545.6	-0.6	107.9	131.5	544.7	-0.6	107.9
5857.9	976.4	976.4	969.9	964.9	970.5	964.9	5858.0	545.7	-0.4	107.9	131.5	544.7	-0.7	108.0
5905.9	977.1	977.1	970.5	968.4	971.2	965.5	5906.0	545.7	-0.6	107.9	131.5	544.8	-0.7	108.0
5913.9	977.9	977.9	971.2	968.4	971.2	965.5	5911.9	545.8	-0.4	107.9	131.5	544.8	-0.7	108.0
5921.9	978.6	978.6	972.7	969.1	972.7	967.7	5922.0	545.8	-0.6	108.0	131.5	547.0	-0.5	108.2
5929.9	978.6	978.6	972.0	969.1	972.7	967.0	5930.0	545.9	-0.4	108.0	131.5	544.9	-0.4	108.1
5937.9	978.6	978.6	972.0	969.1	972.7	967.0	5937.9	545.9	-0.6	108.0	131.4	547.0	-0.6	108.0
5944.0	978.6	978.6	972.0	969.9	972.7	967.0	5944.1	545.9	-0.4	108.0	131.3	547.0	-0.4	108.1
5953.9	977.1	978.6	972.7	968.4	972.7	966.2	5954.0	546.0	-0.6	108.1	131.3	547.0	-0.5	108.1
1.9	979.4	980.1	973.5	970.5	974.2	967.7	2.0	544.0	-0.6	108.0	131.3	547.0	-0.5	108.1
9.9	980.1	980.1	973.5	970.5	973.5	968.5	10.0	546.0	-0.6	108.0	131.4	547.0	-0.5	108.1
17.9	979.4	979.4	973.5	970.5	973.5	967.7	17.9	544.0	-0.4	108.0	131.3	547.0	-0.5	108.0
26.0	979.4	979.4	972.7	969.9	972.7	967.0	26.0	545.8	-0.6	107.8	131.4	546.9	-0.6	107.9
33.9	980.1	980.1	973.5	970.5	973.5	968.5	33.9	545.9	-0.4	107.9	131.1	547.0	-0.5	108.0
41.9	980.1	980.1	973.5	970.5	974.5	968.5	42.0	545.8	-0.4	107.9	131.4	547.0	-0.6	108.0
50.0	979.4	979.4	972.7	970.5	973.5	968.5	50.1	545.8	-0.5	107.8	131.2	544.9	-0.6	107.9
57.9	979.4	979.4	974.2	969.9	973.5	967.7	58.0	545.8	-0.6	107.8	131.1	546.9	-0.6	107.9
105.9	979.4	980.1	973.5	969.9	973.5	968.5	105.9	545.9	-0.4	107.8	131.0	546.9	-0.5	108.0
113.9	979.4	979.4	973.5	970.5	973.5	969.2	113.9	545.8	-0.6	107.9	131.2	546.9	-0.6	108.0
121.9	979.4	979.4	972.7	970.5	972.7	969.2	122.0	545.8	-0.7	107.9	131.2	546.9	-0.5	107.9
129.9	979.4	979.4	972.7	969.9	972.7	[illegible]	129.9	545.8	-0.6	107.9	131.4	546.8	-0.5	108.0
137.9	979.4	979.4	972.7	969.9	972.7	[illegible]	138.0	545.8	-0.4	107.9	131.5	546.7	-0.5	108.9
145.9	979.4	978.6	972.7	969.9	973.5	967.0	146.0	545.7	-0.5	107.9	131.7	546.7	-0.5	108.1
154.0	977.9	977.1	972.0	969.1	972.7	967.0	154.0	545.4	-0.5	107.9	131.8	546.7	-0.5	108.0
T0430A	T0440A	T0443A	T0447A	T0450A	T0460A	T0463A	T0467A	T0470A	T0497A	T0499A	[illegible]	T0480A	T0481A	T0482A

116.8	548.2	-2.3	107.4	127.9	544.2	-0.7	107.7	129.5	-0.4	548.3	5642.1	17.6	19.1	17.5
155.1	548.2	-2.4	107.4	128.0	544.2	-0.7	107.6	129.4	-0.4	548.3	5650.1	17.6	19.1	17.5
111.9	548.2	-2.5	107.4	128.0	544.2	-0.8	107.6	129.4	-0.5	548.4	5658.2	17.6	19.0	17.5
111.9	548.2	-2.5	107.3	128.0	544.3	-0.8	107.6	129.4	-0.5	548.4	5706.1	17.5	19.0	17.3
111.9	548.2	-2.4	107.4	128.0	544.1	-0.8	107.7	129.4	-0.4	548.4	5714.1	17.5	19.0	17.3
111.7	548.1	-2.5	107.2	127.7	544.2	-0.9	107.4	129.3	-0.5	548.3	5722.2	17.3	18.8	17.2
111.9	548.2	2.5	107.1	127.7	544.2	-0.8	107.5	129.4	-0.5	548.5	5730.2	17.5	18.9	17.3
111.8	548.2	-2.5	107.3	127.8	544.2	-0.8	107.5	129.4	-0.5	548.5	5738.1	17.5	19.0	17.3
111.8	548.2	-2.5	107.1	127.7	544.2	-0.7	107.4	129.1	-0.5	548.5	5744.1	17.5	19.0	17.3
111.6	548.2	-2.5	107.2	127.8	544.2	-0.9	107.5	129.3	-0.5	548.5	5754.1	17.5	19.0	17.3
111.7	548.2	-2.5	107.2	127.7	544.2	-0.8	107.4	129.3	-0.5	548.5	5802.1	17.4	19.1	17.4
111.6	548.2	-2.5	107.2	127.7	544.2	-0.9	107.5	129.2	-0.5	548.5	5810.2	17.6	19.1	17.5
111.8	548.1	-2.5	107.1	127.8	544.3	-0.7	107.6	129.4	-0.5	548.5	5818.1	17.8	19.3	17.4
111.8	548.3	-2.4	107.3	127.8	544.4	-0.7	107.6	129.3	-0.5	548.6	5826.1	17.9	19.3	17.6
111.9	548.4	-2.4	107.4	127.8	544.4	-0.6	107.6	129.5	-0.3	548.7	5834.2	17.9	19.5	17.8
111.8	548.4	-2.4	107.3	127.8	544.4	-0.7	107.6	129.4	-0.4	548.7	5842.2	18.0	19.5	17.8
0714 LOST TREND DATA - TRIP TIME 015847														
111.6	548.4	-2.5	107.3	127.7	544.4	-0.8	107.5	129.3	-0.5	548.6	5850.2	18.1	19.5	17.9
111.8	548.4	-2.5	107.1	127.7	544.4	-0.8	107.6	129.1	-0.4	548.4	5858.1	18.2	19.4	18.1
111.7	548.5	-2.4	107.3	127.8	544.4	-0.8	107.6	129.4	-0.4	548.7	5906.1	18.2	19.6	18.2
111.8	548.5	-2.5	107.4	127.7	544.4	-0.8	107.6	129.3	-0.5	548.7	5914.1	18.4	19.9	18.4
111.8	548.6	-2.4	107.4	127.7	544.6	-0.7	107.8	129.4	-0.4	548.8	5922.1	18.6	20.1	18.4
111.7	548.6	-2.4	107.4	127.7	544.6	-0.8	107.7	129.2	-0.5	548.8	5930.1	18.7	20.1	18.5
111.7	548.6	-2.5	107.4	127.7	544.6	-0.8	107.6	129.2	-0.5	548.8	5938.1	18.7	20.2	18.5
111.6	548.6	-2.5	107.4	127.7	544.7	-0.8	107.4	129.2	-0.5	548.8	5946.2	18.9	20.3	18.7
111.7	548.7	-2.4	107.4	127.6	544.7	-0.8	107.4	129.2	-0.5	549.0	5954.1	18.9	20.5	18.9
111.7	548.7	-2.4	107.4	127.7	544.7	-0.7	107.7	129.1	-0.5	548.9	2.2	19.0	20.5	19.0
111.7	548.7	-2.3	107.4	127.7	544.7	-0.8	107.6	129.0	-0.5	549.0	10.1	19.1	20.6	19.0
111.5	548.7	-2.5	107.1	127.5	544.7	-1.0	107.5	129.0	-0.5	548.9	18.1	19.2	20.7	19.2
111.6	548.7	-2.5	107.2	127.3	544.6	-1.0	107.4	128.9	-0.6	548.9	26.2	19.2	20.7	19.1
111.5	548.7	-2.5	107.1	127.4	544.7	-0.9	107.4	129.0	-0.5	549.0	34.1	19.3	20.8	19.2
111.4	548.8	-2.5	107.3	127.3	544.7	-0.9	107.5	129.0	-0.5	549.0	42.1	19.4	20.9	19.3
111.4	548.8	-2.5	107.2	127.1	544.7	-0.9	107.4	129.0	-0.5	549.0	50.2	19.4	20.9	19.1
111.2	548.8	-2.5	107.2	127.2	544.7	-0.9	107.5	128.8	-0.5	549.0	58.1	19.4	20.9	19.3
111.4	548.7	-2.5	107.4	127.4	544.6	-0.6	107.4	129.0	-0.5	549.0	106.1	19.4	20.9	19.3
111.6	548.8	-2.5	107.3	127.4	544.6	-0.6	107.6	129.1	-0.4	549.0	114.1	19.4	20.9	19.3
111.6	548.7	-2.5	107.6	127.6	544.6	-0.7	107.5	128.9	-0.5	548.9	122.1	19.3	20.8	19.2
111.8	548.7	-2.5	107.3	127.5	544.6	-0.7	107.5	129.0	-0.5	548.9	130.1	19.3	20.7	19.2
111.8	548.4	-2.4	107.4	127.7	544.4	-0.7	107.5	129.2	-0.4	548.8	138.1	19.3	20.7	19.2
116.0	548.5	-2.3	107.4	127.8	544.5	-0.6	107.6	129.3	-0.4	548.8	146.1	19.2	20.7	19.1
111.8	548.4	-2.1	107.3	127.9	544.4	-0.4	107.5	129.4	-0.3	548.7	154.2	19.1	20.6	19.0
T0484A	F0480A	F0481A	F0482A	F0483A	T0406A	T0427A	T0446A	T0466A	11867	T0400A	T0401A	T0402A	T0403A	T0420A
23.5	2237.7	2223.0	2235.9	2223.5	539.5	545.1	542.2	544.2	5642.2	46.2	46.8	48.3	45.5	51.0
23.4	2237.7	2223.0	2235.4	2223.5	539.5	544.6	542.6	543.8	5650.2	46.3	46.8	48.2	45.6	50.9
23.4	2237.7	2223.0	2235.9	2223.5	539.5	544.6	542.4	544.2	5658.1	46.0	46.8	48.2	45.4	50.9
23.4	2237.2	2222.5	2235.9	2223.5	539.1	545.1	541.7	543.8	5706.2	46.0	46.7	48.1	45.5	50.8
23.4	2237.7	2223.0	2235.9	2223.5	539.1	545.1	542.6	543.8	5714.2	46.1	46.8	48.2	45.2	50.9
23.4	2237.2	2222.5	2235.4	2223.0	539.1	544.6	541.7	543.4	5722.2	46.0	46.7	48.1	45.2	50.6
23.4	2238.2	2223.5	2236.4	2224.0	538.7	544.6	541.7	543.8	5730.1	46.2	46.7	48.2	45.3	50.4
23.4	2238.2	2224.0	2236.9	2224.0	539.1	544.2	541.7	543.8	5738.2	46.2	46.8	48.1	45.1	50.6
23.4	2238.2	2224.0	2236.9	2224.5	539.1	544.6	541.1	543.8	5744.2	46.0	46.7	48.1	45.2	50.4
23.3	2238.7	2224.0	2236.9	2224.5	538.7	544.2	541.3	542.9	5754.2	45.9	46.4	47.9	45.2	50.5
23.4	2238.7	2224.5	2236.9	2224.5	538.7	544.6	541.7	543.4	5802.2	45.7	46.3	47.7	45.3	50.5
23.3	2238.7	2224.5	2236.9	2224.0	538.7	544.2	541.3	543.4	5810.3	45.4	46.2	47.5	45.1	50.4
23.4	2239.7	2224.5	2237.2	2225.5	539.1	544.6	541.7	543.8	5818.2	45.6	46.2	47.6	45.3	50.4
23.5	2240.2	2224.5	2237.2	2226.0	539.1	545.1	542.2	543.8	5826.2	45.4	46.1	47.5	45.2	50.4
23.4	2240.2	2225.5	2238.2	2226.5	539.9	545.5	542.2	544.2	5834.1	45.4	46.1	47.4	45.3	[illegible]

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      23.4   2240.2   2225.0   2237.7   2226.0   539.5   545.1   542.6   543.8   5842.3    45.1    45.9    47.3    45.1    50.3
0714  POST-INIT DATA - INIT TIME 015847
      23.4   2239.7   2225.0   2237.7   2226.0   539.5   545.1   542.6   543.8   5850.3    45.2    45.8    47.1    45.1    50.3
      23.4   2240.7   2225.5   2237.7   2226.0   539.1   545.1   542.6   543.8   5858.2    45.3    45.9    47.2    45.2    50.2
      23.5   2240.2   2226.0   2238.2   2226.5   539.5   545.5   542.2   544.2   5906.2    45.2    45.9    47.4    45.3    50.4
      23.5   2241.2   2226.0   2238.2   2226.9   539.9   545.1   542.2   544.2   5914.2    45.5    46.0    47.5    45.3    50.4
      23.5   2241.7   2227.0   2239.2   2227.4   539.9   545.9   543.0   545.1   5922.2    45.8    46.4    47.6    45.5    50.8
      23.5   2241.2   2226.0   2238.2   2226.9   539.9   545.5   542.6   544.2   5930.2    45.7    46.3    47.4    45.4    50.9
      23.5   2240.7   2226.0   2238.7   2226.5   539.9   545.5   542.6   544.6   5938.2    45.9    46.4    47.8    45.7    51.0
      23.5   2240.7   2225.5   2238.7   2226.5   539.9   545.5   542.2   544.2   5946.3    45.7    46.2    47.4    45.9    51.0
      23.5   2240.7   2226.0   2238.7   2226.9   540.4   545.5   542.6   544.6   5954.2    45.9    46.4    47.8    45.9    51.1
      23.5   2241.2   2226.0   2238.2   2226.9   540.4   545.9   542.6   544.6     2.3     45.7    46.5    47.9    46.1    51.0
      23.5   2240.2   2225.0   2238.2   2226.0   539.9   545.5   542.6   544.2    10.2     45.9    46.7    48.1    46.1    51.0
      23.4   2239.7   2224.5   2237.7   2225.5   539.5   545.1   541.7   543.8    26.3     45.7    46.5    47.9    46.1    51.0
      23.5   2240.2   2225.0   2237.7   2225.5   539.9   545.5   542.2   544.2    34.2     46.1    47.0    48.1    46.4    51.3
      23.5   2240.7   2225.5   2238.2   2226.0   539.1   545.5   542.2   544.2    42.2     46.6    47.4    48.7    46.4    51.4
      23.5   2240.7   2225.0   2238.2   2226.0   539.5   545.1   541.7   543.8    50.3     47.1    47.7    49.1    46.6    51.8
      23.5   2240.2   2224.5   2237.7   2225.5   539.5   545.1   542.2   544.2    58.2     46.5    47.4    48.7    46.8    52.1
      23.5   2240.7   2225.0   2238.2   2226.0   539.1   545.1   542.2   544.2   106.2     46.8    47.4    48.9    46.8    52.3
      23.5   2241.7   2225.5   2238.7   2226.5   539.5   545.5   542.2   543.8   114.2     47.2    47.8    49.3    46.9    52.4
      23.4   2241.2   2225.0   2238.7   2226.0   539.5   545.1   542.2   542.5   122.2     47.0    47.8    49.2    46.9    52.9
      23.4   2240.7   2225.0   2238.7   2226.0   539.5   545.5   542.2   543.8   130.2     47.2    47.9    49.3    47.0    53.0
      23.4   2241.2   2225.0   2238.7   2226.5   539.5   545.5   542.2   544.2   138.2     47.3    48.0    49.5    47.0    53.1
      23.4   2240.7   2224.5   2238.4   2226.0   539.5   545.1   542.6   544.6   146.2     47.5    48.2    49.6    47.0    53.2
      23.4   2240.7   2224.5   2238.4   2226.0   539.5   545.1   542.6   544.6   154.3     47.8    48.5    49.9    47.0    53.4
      I0461A   I0462A   I0463A   I0464A   I0465A   I0466A   I0467A   I0468A   I0469A   I0470A   I0471A   I0472A   I0473A   I0474A   I0475A
      51.0   51.5   47.4   44.8   44.2   47.3   45.9   44.2   44.9   45.7   46.1   5842.3   0.008   0.086   0.000
      51.9   51.5   47.4   44.8   44.2   47.3   45.7   44.2   44.9   45.9   46.1   5850.4   0.000   0.086   -0.008
      51.8   51.4   47.3   44.2   44.4   47.4   45.9   45.9   44.8   45.6   46.2   5858.5   0.008   0.086   -0.008
      51.8   51.4   47.4   44.8   44.2   47.3   45.8   45.8   44.6   45.6   46.2   5906.4   0.008   0.086   -0.008
      51.7   51.2   47.2   45.9   46.1   47.1   45.7   45.9   44.8   45.5   46.4   5914.4   0.008   0.086   0.000
      51.6   51.2   47.2   45.7   45.9   47.0   45.8   45.7   44.5   45.4   46.0   5922.4   0.000   0.082   0.008
      51.6   51.2   47.3   45.6   45.7   46.9   45.7   45.5   44.3   45.2   46.1   5930.4   -0.008   0.070   -0.021
      51.5   51.1   47.2   45.5   45.7   46.8   45.6   45.6   44.2   45.1   46.1   5938.4   -0.008   0.062   -0.023
      51.5   51.0   47.1   45.4   45.5   46.6   45.6   45.4   44.2   44.9   46.0   5946.4   0.000   0.070   -0.008
      51.5   51.0   47.1   45.2   45.4   46.5   45.7   45.4   44.4   45.1   46.0   5954.4   0.000   0.070   -0.031
      51.4   50.9   47.1   45.1   45.2   46.4   45.6   45.2   43.9   44.9   45.9   5802.4   -0.008   0.062   -0.021
      51.4   51.0   47.2   45.1   45.1   46.4   45.5   45.4   44.2   45.0   46.0   5810.5   -0.008   0.062   -0.023
      51.4   50.9   47.2   45.1   45.3   46.4   45.6   45.2   43.7   44.8   46.0   5818.4   0.000   0.070   -0.008
      51.5   51.0   47.2   45.1   45.1   46.4   45.4   45.1   44.1   44.9   46.0   5826.3   0.008   0.070   0.000
      51.4   50.9   47.1   45.0   45.2   46.3   45.5   45.2   44.0   44.8   45.9   5834.4   0.008   0.086   -0.008
0718  POST-INIT DATA - INIT TIME 015847
      51.2   50.9   47.1   44.8   45.0   46.1   45.5   45.1   44.0   44.8   45.9   5842.5   0.000   0.086   -0.008
      51.2   50.9   47.1   44.9   45.0   46.2   45.4   45.1   44.0   44.8   45.9   5850.5   0.000   0.070   -0.023
      51.4   50.9   47.1   44.9   45.1   46.2   45.5   45.3   44.2   44.9   45.8   5858.4   0.008   0.070   -0.008
      51.6   51.0   47.1   45.0   45.2   46.4   45.7   45.2   44.0   44.8   45.7   5906.4   0.008   0.086   0.008
      51.7   51.4   47.3   45.1   45.4   46.4   45.6   45.4   44.2   45.0   46.0   5914.4   0.008   0.086   -0.008
      51.8   51.4   47.3   45.2   45.4   46.5   45.4   45.4   44.2   45.1   46.0   5922.4   0.023   0.094   0.000
      52.0   51.5   47.4   45.2   45.5   46.6   45.8   45.7   44.5   45.3   45.9   5930.4   0.008   0.086   0.000
      52.0   51.5   47.4   45.3   45.5   46.6   45.8   45.7   44.5   45.3   46.0   5938.4   0.008   0.086   0.000
      52.1   51.7   47.7   45.5   45.7   46.8   45.9   45.8   44.6   45.4   46.1   5946.4   0.023   0.086   -0.003
      52.0   51.6   47.8   45.5   45.7   46.8   45.9   45.7   44.5   45.4   44.2   2.5   0.008   0.086   -0.008
      52.0   51.6   47.9   45.7   45.9   47.0   45.9   45.8   44.5   45.4   46.2   10.4   0.008   0.086   0.000
      52.1   51.7   48.0   45.5   45.7   46.8   46.1   45.9   44.6   45.5   44.3   18.4   0.000   0.086   -0.008
      52.4   51.8   47.9   45.5   45.6   46.7   46.   45.8   44.5   45.4   46.2   26.4   0.000   0.062   0
```

52.6	52.1	48.1	45.5	45.7	46.8	46.2	46.2	45.0	45.9	46.3	34.4	0.048	0.070	-0.008
52.8	52.3	48.1	45.3	45.5	46.7	46.3	46.3	45.1	46.0	46.2	42.4	0.000	0.070	-0.023
53.0	52.4	48.2	45.1	45.3	46.5	46.4	46.2	45.3	45.9	46.1	50.5	0.000	0.070	-0.023
53.3	52.9	48.2	45.3	45.6	46.7	46.6	46.3	45.6	45.9	46.5	58.4	-0.008	0.070	-0.023
53.4	53.1	48.3	45.2	45.4	46.6	46.7	46.3	45.2	45.4	46.5	104.4	0.000	0.070	-0.023
53.7	53.3	48.4	45.4	45.5	46.7	46.7	46.5	45.2	46.0	46.7	114.4	0.000	0.070	-0.008
53.9	53.6	48.5	45.4	45.5	46.7	46.8	46.6	45.1	46.0	46.9	122.4	0.000	0.070	-0.023
53.9	54.6	48.4	45.7	46.0	47.1	46.9	46.9	45.8	46.7	46.8	130.3	0.000	0.070	-0.023
54.2	54.7	48.6	45.8	46.0	47.1	47.0	47.1	45.9	46.8	47.0	138.4	0.000	0.070	0.000
54.3	54.9	48.6	45.9	46.2	47.3	47.1	47.3	46.2	46.3	47.1	146.4	0.008	0.070	-0.008
54.4	54.2	48.7	45.9	46.1	47.3	47.2	47.4	46.5	47.0	47.1	154.5	0.008	0.062	-0.008

11B03A	11B19	10481A	11B110
0.0	5663.5	657.5	5667.1
0.0	5650.5	656.4	5655.1
0.0	5698.6	657.1	5702.8
0.0	5704.5	656.8	5711.0
0.1	5714.5	656.4	5718.7
0.0	5722.6	656.4	5727.1
0.0	5730.6	656.8	5734.8
0.0	5738.6	656.4	5743.0
0.0	5746.5	656.4	5750.8
0.0	5754.5	656.4	5758.9
0.0	5802.5	656.4	5806.8
0.0	5810.7	656.1	5814.7
0.0	5818.5	656.8	5823.0
0.0	5826.5	656.4	5830.9
0.0	5834.4	656.4	5839.1
0.0	5842.6	656.8	5846.8

0220 1451 1A1F 0A1A - 1B1F 1B8E 015847

0.0	5850.7	656.8	5854.9
0.0	5858.5	656.4	5903.8
0.0	5906.5	656.8	5910.8
0.0	5914.5	657.9	5919.1
0.0	5922.6	657.5	5927.0
0.0	5930.4	656.8	5934.7
0.0	5938.5	656.8	5943.1
0.0	5946.4	657.5	5950.7
0.0	5954.5	657.1	5958.9
0.0	2.4	656.8	7.1
0.0	10.5	657.1	14.8
0.0	18.5	656.4	22.8
0.0	26.6	656.4	31.0
0.0	34.5	656.8	38.8
0.0	42.5	656.4	47.0
0.0	50.7	656.4	54.8
0.0	58.6	656.8	102.9
0.0	106.5	656.4	110.7
0.0	114.5	657.1	118.8
0.0	122.6	656.8	126.7
0.0	130.5	656.4	134.8
0.0	138.5	656.4	143.1
0.0	146.6	657.1	150.7
0.0	154.6	657.1	158.7

0220 1451 1A1F AEVIEW FINISHED

66	0220	K0018A	K0003A	K0004A	K0007A	K0011A	K0012A	K0015A	K0016A	K0017A	K0019A	K0024A	K0025A	K0026A	K0021A	K0001A	K0005A	K0022A
01	0220	278.	16.0	0.1	1.7	12.	12.	5.	21.9	15.9	4.	2.	11.	4.	80.	0.4	0.2	227.
67	0220	10501A	10523A	10463A	10463A	00685	10400A	10470A	10440A	10460A	00484	K0049A	K0050A	K0051A	K0052A	U1150	U1167	U1119

PROTECTION AND SAFEGUARDS SETPOINTS

TRIP DESCRIPTION	UNIT 1 SETPOINTS		UNIT 2 SETPOINTS	
	Actual	Tech. Spec.	Actual	Tech. Spec.
1) Manual	N/A	N/A	N/A	N/A
2) Pwr. Range Neutron Flux				
a) Low	25%	≤25%	25%	≤25%
b) High	109%	≤109%	109%	≤109%
3) Pwr. Range Flux Rate				
a) Positive	5% In 2 sec	≤5% In ≧ 2 sec	5% In 2 sec	≤5% In ≧ 2 sec
b) Negative	5% In 2 sec	≤5% In ≧ 2 sec	5% In 2 sec	≤5% In ≧ 2 sec
4) Intermediate Range Neutron Flux	25% (Current Equival.) (9.6×10^{-5} amps)	≤25% (Current Equival.)	25% (Current Equival.) (8.1×10^{-5} amps)	≤25% (Current Equival.)
5) Source Range Neutron Flux	9×10^4 cps	$\leq 10^5$ cps	9×10^4 cps	$\leq 10^5$ cps
6) OTΔT	As Per Tech Spec		As Per Tech Spec	
7) OPΔT	As Per Tech Spec		As Per Tech Spec	
8) Low PZR. Press	1872 psig	≧1865 psig	1966 psig	≧1950 psig
9) High PZR Press	2378 psig	≤2385 psig	2378 psig	≤2385 psig
10) High PZR Lvl.	91%	≤92%	91%	≤92%
11) Loss of Flow	90%	≧90%	93%	≧90%

PROTECTION AND SAFEGUARDS SETPOINTS

TRIP DESCRIPTION	UNIT 1 SETPOINTS Actual	UNIT 1 SETPOINTS Tech. Spec.	UNIT 2 SETPOINTS Actual	UNIT 2 SETPOINTS Tech. Spec.
12) S/G Wtr. Lvl.Low-Low	17%(N.R.)	≧17%(N.R.)	21%(N.R.)	≧21%(N.R.)
13) Stm./Feed Flow Mismatch W/Low S/G Wtr Lvl	0.6 x 10^6pph Coincident with 26% (N.R.)	≦0.71 x 10^6pph Coincident with ≧25% (N.R.)	0.6 x 10^6pph Coincident with 26% (N.R.)	≦1.47 x 10^6pph Coincident with ≧25% (N.R.)
14) RCP Undervoltage	3150 Volts	≧2750 Volts	3150 Volts	≧2905 Volts
15) RCP Underfrequency	58.2 HZ	≧57.5 HZ	58.2 HZ	≧57.5 HZ
16) RCP Bkr. Position	1/4 Open Bkrs Above P-8 2/4 Open Bkrs Between P-7 & P-8	NA	1/4 Open Bkrs. Above P-8, 2/4 Open Bkrs. between P-7 & P-8	NA
17) Turbine Trip				
a) Low Sys. Press.	800 psig	≧800 psig	62 psig	≧58 psig
b) Stop Vlv. Position	1% open	≧1% open	1% open	≧1% open
18) Safety Injection				
a) Manual	NA	NA	NA	NA
b) High Containment Press	1.1 psig	≦1.1 psig	1.1 psig	≦1.1 psig
c) Low PZR Press.	1837 psig	≧1815 psig	1908 psig	≧1900 psig
d) High Stm. Line Diff. Press.	100 psid	≦100 psid	100 psid	≦100 psid
e) High Stm. Line Flow Coincident with	1.42 x 10^6 pph for 0→20% Pwr. Ramped to 3.88 x 10^6 pph at 100%	≦1.42 x 10^6 pph for 0→20% Pwr. Ramped to 3.88 x 10^6 pph at 100%	NA	NA
Lo-Lo Tavg or	541°F	≧541°F	NA	NA
Low Stm. Line Press.	600 psig	≧600 psig	600 psig	≧600 psig

ATTACHMENT 2 TO AEP:NRC:0838S

DONALD C. COOK NUCLEAR PLANT

TABLE OF PARAMETERS IDENTIFIED AS

DESIRABLE FOR POST-TRIP REVIEW

FROM SAIC REPORT TABLE
Desirable PWR Parameters for Post-Trip Review

AEP Response for D. C. Cook Nuclear Plant on Parameters listed in the TER as Not Recorded

SOE RECORDER	TIME HISTORY RECORDER	PARAMETER/SIGNAL	SOURCE
1. X		Containment Isolation	1. Emergency Operating Procedure E-0 requires operator action to verify Containment isolation valves are closed and manually close any containment isolation valves which are open. We believe these actions provide the necessary verification of closed valves.
2. X		Control Rod Position	2. Emergency Operating Procedure E-0 requires immediate operator action to verify all rods are inserted. Operators are required to take specific actions when automatic control rod insertion does not occur, and the cause would be evaluated during a post-trip review.
3. X		Neutron Flux Power	3. Hathaway Operations Sequence Monitor 3.1 - Point 025 Reactor Trip NIS - Source Range Level Trip 3.2 - Point 026 Reactor Trip NIS - Intermediate Range Hi Level Trip 3.3 - Point 027 Reactor Trip NIS - Power Range Overpower Trip Low Range 3.4 - Point 028 Reactor Trip NIS - Power Range Overpower Trip High Range 3.5 - Point 029 Reactor Trip NIS - Power Range Pos-Neg Rate Trip
4. X		Containment Pressure	4. Hathaway Operation Sequence Monitors 4.1 - Point 034 Reactor Trip - High Containment Pressure Safety Injection
5. (2) Parameter may be recorded by either an SOE or time history		Containment Radiation	5. The Eberline radiation monitoring system prints the level when an alarm limit is exceeded and can provide 10 minute averages for the past 4 hours. The control terminal/printer is run from an uninterruptible power source
6.	X	Containment Sump Level	6. We have redundant containment sump level indicators. We do not have a recorder.

SOE RECORDER	TIME HISTORY RECORDER	PARAMETER/SIGNAL	SOURCE
7. X (1) Trip Parameter		Primary System Pressure	7. Hathaway Operations Sequence Monitor 7.1 - Point 030 Reactor Trip - Pressurizer Safety Injection 7.2 - Point 031 Reactor Trip - Pressurizer Low Pressure 7.3 - Point 032 Reactor Trip - Pressurizer High Pressure
8. X		Primary System Temperature	8. Hathaway Operations Sequence Monitor 8.1 - Point 001 Reactor Trip - Overtemperature DT 8.2 - Point 002 Reactor Trip - Overpower DT
9. X (1) Trip Paramter		Pressurizer Level	9. Hathaway Operations Sequence Monitor 9.1 - Point 033 Reactor Trip - Pressurizer High Water Level
10. X (1) Trip Parameter		Reactor Coolant Pump Status	10. Hathaway Operations Sequence Monitor 10.1 - Point 048 Reactor Coolant Pump No. 1 Trip 10.2 - Point 049 Reactor Coolant Pump No. 2 Trip 10.3 - Point 050 Reactor Coolant Pump No. 3 Trip 10.4 - Point 051 Reactor Coolant Pump No. 4 Trip
11. X (1) Trip Parameter	X	Primary System Flow	11. Hathaway Operations Sequence Monitor 11.1 - Point 003 Reactor Trip Undervoltage RCP Bus 11.2 - Point 004 Reactor Trip - Low Flow RCP/P7 Permissive 11.3 - Point 005 Reactor Trip - Low Flow RCP/P8 Permissive 11.4 - Point 007 Reacator Trip Underfrequency RCP Bus 11.5 - We have redundant Primary System Flow indicators and believe that information essential to a post-trip review could be provided from information recorded by the operators.
12. (3) Acceptable recorder options are: system flow on a SOE, system flow on a THR, or equipment status recorder in an SOE.		Safety Inj: Flow, Pump/Valves status	12. We have flow indicators on all Safety Injection Pumps and limit switch indicators on key ECCS valves. Emergency Operating Procedure E-0 requires operator actions for validation which indicates the pumps are operating and the valves are properly positioned. Any anomalies are annotated for later use in a post-trip review.
13. X		MSIV Position	13. Hathaway Operations Sequence Monitor 13.1 - Point 020 Reactor Trip Safety Injection steamline pressure/flow steamline isolation gives indication of initiation of signal. Limit switches are available to determine valve closure and are subject to operator verification.

SOE RECORDER	TIME HISTORY RECORDER *	PARAMETER/SIGNAL	SOURCE
14. X		Steam Generator Pressure	14. Hathaway Operations Sequence Monitor 14.1 - Point 020 Reactor Trip - Safety Injection Steam Line Pressure/Flow Steam Line Isolation
15. X (1) Trip Parameter		Steam Generator Level	15. Hathaway Operations Sequence Monitor 15.1 - Point 016 Reactor Trip - Steam Generator Low/Low Water Level Loop 1 15.2 - Point 017 Reactor Trip - Steam Generator Low/Low Water Level Loop 2 15.3 - Point 018 Reactor Trip - Steam Generator Low/Low Water Level Loop 3 15.4 - Point 019 Reactor Trip - Steam Generator Low/Low Water Level Loop 4
16. X (1) Trip Parameter		Feedwater Flow	16. Hathaway Operations Sequence Monitor 16.1 - Point 008 Reactor Trip - Low Feed Water Flow Loop 1 16.2 - Point 009 Reactor Trip - Low Feed Water Flow Loop 2 16.3 - Point 010 Reactor Trip - Low Feed Water Flow Loop 3 16.4 - Point 011 Reactor Trip - Low Feed Water Flow Loop 4
17. X (1) Trip Parameter		Steam Flow	17. Hathaway Operations Sequence Monitor 17.1 - Point 020 Reactor Trip Safety Injection Steamline pressure/flow steamline isolation
18. (3) Acceptable Recorder options are: system flow on an SOE, system flow on a THR, or equipment status recorder on an SOE.		Auxiliary Feedwater System; Flow, Pump/ Valve Status	18. Flow indication is available on all auxiliary feedwater pumps. Emergency Operating Procedure E-0 requires operator action to verify auxiliary feedwater system status. Any anomalies of the AFW system would be recorded in the post-trip review procedure and investigated as needed.
19. X		AC and DC System Status (Bus Voltage)	19. Hathaway Operating Sequence Monitor 19.1 - Point 003 Reacator Trip Undervoltage RCP Bus 19.2 - Point 007 Reactor Trip Underfrequency RCP Bus 19.3 - Point 046 Reactor Breaker Undervoltage Train "A" 19.4 - Point 047 Reactor Breaker Undervoltage Train "B" 19.5 - Point 060 Diesel Generator 2 AB Start 19.6 - Point 061 Diesel Generator 2 CD Start 19.7 - Point 156 CRP on Backup (Unit 2) Point 154 CRP on Backup (Unit 1)
20 X		PORV Position	20. Limit switches are available on PORVs and block valves. Emergency Operating Procedure E-0 requires operator action to verify the PORV position. Any anomalies of the pressure relief system would be recorded in the post-trip review procedure and investigated as needed.