Zion Simulator
Initial Certification Report
March, 1991

Commonwealth Edison

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ZION SIMULATOR
ANSI/ANS-3.5-1985 CERTIFICATION REPORT
INITIAL REPORT, MARCH 1991

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TABLE OF CONTENTS

TABLE OF CONTENTS

A.1 Simulator Information

A.1.1 General

This report is being submitted as the initial certification report for the Zion Simulator as prescribed by Regulatory Guide 1.149. The Commonwealth Edison owned Westinghouse PWR 4-loop, 3250 MW power plant simulator will be used for training the Zion Unit 1 and Unit 2 operators. Because of the near exact duplication between the two units, it is considered a plant specific simulator for both Zion Unit 1 and Unit 2, hereafter referred to as the Zion Simulator. The Zion Simulator is modeled after Zion Unit with Zion Unit 1 being considered the reference plant. The simulator was constructed by Simulation, Systems and Services Technologies (S3 Technologies), between November 1988 and March 1991 and will be declared ready for training July, 1991.

At the time of this report the acceptance testing of the simulator is 97% complete. Acceptance testing is scheduled to be completed on March 22, 1991. Even though an acceptance test section has been coompleted, some open items associated with those tests have been identified. These items are being tracked by Discrepancy Reports or Work Requests and where applicable are included in this report.

Appendix 7 of this report contains a cross reference matrix showing ANSI/ANS-3.5-1985 requirements and the location in this report were the requirements are met.

A.1.2.1 Control Room Physical Arrangement

The physical arrangement of the simulator's control room (Attachment 5 Figure 1) duplicates Zion Station with the following exceptions:

Item Number	Exception
1.	The back of panel 1CB11 does not butt up against the end of panel 1CB17.
2.	The distance between the balance of plant panels and the neutron monitoring panels is fifteen inches less than the Zion Station panels.
3.	Panel OCB15 is mounted on the simulator viewing gallery wall which results in mounting it at about a 65 degree angle from the Zion Station Control Room mounting.
4.	Panels 1CB18 through 1CB25, 1CB41, 1CB106, 1CB116, OCB03, OCB04, and OCB05 are six inches deeper than the Zion Station panels.

The above exceptions are considered minor and the requirements of ANSI/ANS-3.5-1985, Section 3.2.3, Control Room Environment, have been met.

A.1.2.2 Panels/Equipment

The Zion Simulator contains sufficient operational panels to provide the controls, instrumentation, alarms, and other man-machine interfaces to conduct normal plant evolutions of ANSI/ANS-3.5-1985, section 3.1.1 and respond to the malfunctions of section 3.1.2. Attachment 5 is the control room layouts of Zion Units 1/2, and the simulator. The following panels are simulated:

a.	1CB01	Auxiliary Power
b.	1CB02	Main Generator
c.	1CB03	Main Turbine
d.	1CB04	Condensate
e.	1CB05	Feedwater
f.	1CB06	Reactor Control
g.	1CB07	CVCS
h.	1CB08	Safeguard Systems
i.	1CB09	Safeguard Systems
j.	1CB10	Safeguard Systems
k.	1CB11	Containment Isolation
l.	1CB12	Safeguard Systems
m.	1CB16	Miscellaneous Instruments
n.	1CB17	Miscellaneous Instruments
o.	1CB18	Incore Nuclear Detectors
p.	1CB19	Incore Nuclear Detectors
q.	1CB20	Incore Nuclear Detectors
r.	1CB21	Incore Nuclear Detectors
s.	1CB22	Excore Nuclear Detectors
t.	1CB23	Excore Nuclear Detectors
u.	1CB24	Excore Nuclear Detectors
v.	1CB25	Excore Nuclear Detectors
w.	*1CB41	Axial Power Distribution Monitoring System
x.	1CB51	Wet Pipe Sprinkler
y.	1CB70	Diesel Generator 0
z.	1CB71	Diesel Generator 1A
aa.	1CB72	Diesel Generator 1B
bb.	1CB99	Fire Annunciator Panel
cc.	*1CB106	Loose Parts Monitoring System
dd.	*1CB116	Incore Thermocouple Display Panel
ee.	OCB03	345 KV Switchyard
ff.	OCB04	General Services
gg.	OCB05	Heating, Ventilation & Air Cond.
hh.	OCB15	Off Gas Control Panel
ii.	**1CM007	Computer Desk Complex

* Visually simulated hardware only.

** Computer Desk Complex includes: Process Computer keyboard and CRT's and typers, Eberline Rad Monitoring Console, and Radiation Monitoring Display System Terminal and CRT.

A.1.2.2 (cont.)

The Zion Simulator does not model the following panels/equipment:

a. Radiation monitoring panels 1CB13, 1CB14, and 1CB73. The functions of these backpanels are duplicated by the Radiation Monitor Display System, which is located on the Computer Desk Complex, 1CM007, and is functionally modeled.
b. Acoustic Monitor Panel, 1CB116 (visually simulated hardware only)
c. Axial Power Distribution Monitoring System, 1CB41 (visually simulated hardware only)
d. MIDS/APDMS Transfer Panel, on 1CB18 (visually simulated hardware only)
e. Auxiliary Thermocouple Panel on 1CB21.
f. Pressurizer Safety Valve Acoustic Monitor Panels on backpanel 1CB16.
g. Main turbine and feedwater pump turbines supervisory instrumentation on backpanel 1CB17.

The above omissions are not considered significant and have little or no impact on training.

Differences between the Zion Simulator and Zion Station are:

	Zion Unit 1	Simulator	Explanation
1.	Sound powered phone jacks are installed at various locations in the control room.	One non-functional sound powered phone jack is installed on the EHC panel.	The sound Power Phones are not required for training during normal and emergency conditions.
2.	The manufacturer's name is on various panels, recorders, controllers, and handswitches.	The manufacturer's name may be missing or different on various panels, recorders, controllers, and hand-switches, when that component was purchased from a different manufacturer.	Due to legal considerations the manufacturer could not put another manufacturers name on their component.

A.1.2.2 (cont.)

	Zion Unit 1	Simulator	Explanation
3.	The Annunciator Panels have red DC Ground Isolation indicating lights.	Annunciator Panels do not have DC Ground Isolation lights.	The DC Ground Isolation lights presently are not used in the Zion Unit 1 control room and their removal is being evaluated as part of modification M22-1-88-78.
4.	Recorders 1XR-TS07, 1XR-TS01, 1RR-AR02, 1RR-AR03, are Leeds & Northrup Model M, Mark II.	Simulator uses Leeds & Northrup Model 100.	The Leeds & Northrup Model M Mark II recorder is obsolete.
5.	Recorders OWR-MPP-CE01, OWR-MPP-CE02 are Leeds & Northrup Model W/L.	Simulator uses Leeds & Northrup Model 250.	The Leeds & Northrup Model W/L is obsolete.
6.	Hagan Manual/Auto Control stations and setpoint control potentiometers are a mixture of silver and black face plates.	Hagan Manual/Auto control stations have been standardized. All M/A stations have black face plates. All Setpoint control potentiometers have silver face plates.	This was done to allow consistency in ordering of the components.
7.	The digital clock on 1CB41 is manufactured by ERC.	The digital clock on 1CB41 is manufactured by DGI.	The ERC digital clock is obsolete.
8.	Recorder 1PR-CS50 is a Texas Instrument TIGRAPH. 100 Model.	Recorder 1PR-CS50 is an Esterline Angus Model 200A.	The Texas Instrument TIGRAPH 100 Model recorder is obsolete.

A.1.2.2 (cont.)

	Zion Unit 1	Simulator	Explanation
9.	Recorder 1GR-TS08 is an Esterline Angus Model L1124S.	Recorder 1GR-TS08 is a Tracor Westronics Model M11 E.	The Esterline Angus Model L1124S recorder is obsolete.
10.	The plant process computer monitors above 1CB07 are manufactured by Aydin.	The plant process computer monitors above 1CB07 are manufactured by Mitsubishi.	The Aydin monitors were not available.
11.	1CB07 lower access door ventilation louvers do not fill entire width of access doors.	1CB07 lower access door ventilation louvers fill the entire panels.	This was due to manufacturing difficulties.
12.	Lower right ventilation louver on 0CB05 is a replacement cover.	Lower right ventilation louver on 0CB05 is an original type cover.	This is due to consistency in manufacturing.
13.	Reheater Control Panel has a brushed chrome face plate.	Reheater Control Panel has a polished chrome face plate.	This is due to a manufacturing error.
14.	Panels 1CB106 and 1CB116 are two inches higher than adjacent panels.	Panels 1CB106 and 1CB116 are the same height as their adjacent panels.	This was done to accommodate installation of valences on the panels.
15.	Panels 1CB41, 1CB106, 1CB116, 0CB03 and 0CB04 do not have valances.	Panels 1CB41, 1CB106, 1CB116. 0CB03 and 0CB04 have valances installed.	Valences were installed to hide ventilation duct work required to cool components in the simulator panels.
16.	The control room panels have a 1/4" radius bend on all exposed corners.	The simulator panels except 1CB22, exposed corners are a 90 degree angle.	This is due to a manufacturing error

A.1.2.2 (cont.)

	Zion Unit 1	Simulator	Explanation
17.	The A Model typer is functional.	The A Model typer is non-functional.	The A Model typer is not required for operator training.
18.	The mimic on panel OCB03 is metal.	The mimic on panel OCB03 is plastic and slightly thinner.	The plastic mimic was used to allow for easier installation and the metal mimic is not required for training.
19.	The position indication lights for the high pressure and low pressure feedwater heater isolation valves (12 valves) are spaced 2 7/8 " apart.	The position indication lights for the high pressure and low pressure feedwater isolation valves (12 valves) are spaced 2 1/2" apart, this also resulted in smaller labels and reduced size lettering	This is due to a manufacturing error.
20.	Modifications M22-1-88-021, M22-1-88-025, M22-1-88-026, and M22-0-87-027 have not been installed at the Zion Unit 1.	Modifications M22-1-88-021, M22-1-88-025,M22-1-88-026, and M22-0-87-027 have been incorporated into the Zion Simulator. Modification M22-1-88-021 removes the boron injection tanks. Modifications M22-1-88-025 & 026 are UCRDR enhancements to panel 1CB07. Modification M22-0-87-027 changes boric acid to 4%, changes boric pumps to single speed, and adds an additional boric acid pump.	These modifications are preceding Zion Unit 1 based on their training value as per ANSI/ANS-3.5-1985 section 5.3. These modifications are scheduled to be done on Zion Unit 1 during the next refueling outage.

A.1.2.2 (cont.)

	Zion Unit 1	Simulator	Explanation
21.	The Scaler Timer is a Hewlett Packard model 5202L.	The Scaler Timer is an E&L Instruments model 1530/ST101.	The Hewlett Packard model 5202L Scaler Timer is obsolete.
22.	The high range containment radiation monitor recorders 1RR-AR02 and 1RR-AR03 are located on panel 1CB73.	The high range containment radiation monitor recorders 1RR-AR02 and 1RR-AR03 are located on panel 1CB16.	Panel 1CB73 is not modeled. Recorders 1RR-AR02 and 1RR-AR03 were added to 1CB16 to enhance operator training.
23.	Power range channel overpower recorder 1NR-47 is mounted below recorder 1NR-46.	Power range channel overpower recorder 1NR-47 is mounted to the side of recorder 1NR-46.	This was due to a manufacturing error.

All control board equipment substitutions which were made, were done due to original equipment being obsolete/unavailable. Effort was made to find substitute equipment which will provide the closest match in both physical appearance and function.

The above differences are not considered significant and have little or no impact on training.

A.1.2.3 Systems

The Zion Simulator software models most of the plant's control room operated systems. Systems not modeled by the simulator software are:

a. Acoustic Monitoring (Loose Parts) System.
b. Axial Power Distribution Monitoring (APDMS) System

The systems that are not modeled do not detract from training. The tasks related to these systems are handled administratively to ensure procedural compliance is maintained. The Axial Power Distribution Monitoring System is no longer functional at Zion Unit 1 or 2. There are no longer any regulatory or administrative requirements to operate the system. In addition, these non-modeled systems do not impact on the ability to perform the normal plant evolutions in ANSI/ANS-3.5-1985, Section 3.1.1 or respond to the malfunctions in Section 3.1.2.

A.1.2.4 Simulator Control Room Environment

The Zion Simulator Room environment closely duplicates the Zion Unit 1 control room. The following plant communication systems will be present in the simulator: Plant telephones, selected GSEP phone systems, Gai-Tronics announcing system, and Control Room/Shift Engineer intercom system.

The simulator room lighting was constructed to closely match the Zion Unit 1 Control Room. The simulator also has the same type ceiling tiles to ensure the lighting of the simulator is similar to the Zion Unit 1 Control Room. The Simulator room lighting intensity will be compared with the Zion Unit 1 Control Room and adjusted as necessary, this is being tracked under Work Request 07-91-0001. The estimated completion date for this work request is 7/92.

A.1.2.4 (cont.)

The annunciators in the simulator are the same as those used in the Zion Unit 1 Control Room (Beta Tone III). The Beta Tone III annunciators are adjustable in volume, frequency and tone, and following completion of the simulator facility the annunciators will be tuned to match those in the reference plant. This is being tracked under Work Request 07-91-0002. The estimated completion date for this work request is 7/92. The requirements of ANSI/ANS-3.5-1985, Section 3.2.3, Control Room Environment, have been met.

A.1.3 Instructor Interface

A.1.3.1 Initial Conditions

The Zion Simulator has 39 predetermined initial conditions with the capacity for an additional 61 initial conditions to be used by the instructor when appropriate to store additional initial conditions. A list of the initial conditions can be found in Appendix 1. Additionally, the simulator has backtrack capability, which is discussed in Section A.1.3.4.a. The requirements of ANSI/ANS-3.5-1985, section 3.4.1 have been met.

A.1.3.2 Malfunctions

The certified malfunction cause and effect book can be found in Attachment 6.

The Zion Simulator malfunction assessment process utilizes LER's, plant specific operating experiences (DVR's), NRC bulletins and circulars and other industry events for determining additions/deletions to the existing simulator malfunctions.

A.1.3.2 (cont.)

The applicable malfunctions listed in Attachment 6 are cross-referenced to the ANSI/ANS-3.5-1985, Section 3.1.2 required malfunctions as follows:

ANSI/ANS-3.5-1985 Section 3.1.2	Simulator Malfunctions corresponding to the ANSI requirement
(1) Loss of coolant:	(1)
(a) Significant PWR S/G tube leaks	(a) TH04
(b) Inside/outside primary containment	(b) CV22, CV23, CV24 CV25, CV29, CV31, CV32, RH08, RH12
(c) Large/small Rx coolant breaks (including demonstration of saturation condition)	(c) TH05, TH06, TH09
(d) Failure of safety/relief valves	(d) CV29, RH07, TH13, TH15
(2) Loss of instrument air to the extent that the whole system or individual headers can lose pressure and affect the plant's static or dynamic performance.	(2) IA01, IA02, IA05
(3) Loss or degraded electrical power to the station, including loss of offsite power, loss of emergency power, loss of emergency generators, loss of power to the plant's electrical distribution buses and loss of power to the individual instrumentation buses (AC as well as DC) that provide power to control room indication or plant control functions affecting the plant's response.	(3) ED03, ED04, ED05 ED07, ED08, ED10 ED14, EG03, EG07
(4) Loss of forced core coolant flow due to single or multiple pump failure.	(4) TH02, TH20
(5) Loss of condenser vacuum including loss of condenser level control.	(5) FW09, FW10, FW11

A.1.3.2 (cont.)

ANSI/ANS-3.5-1985 Section 3.1.2	Simulator Malfunctions corresponding to the ANSI requirement
(6) Loss of service water or cooling to individual components	(6) SW01, SW02, SW04, SW06, SW07
(7) Loss of shutdown cooling	(7) RH01, RH02, RH03, RH07, RH08, RH12
(8) Loss of component cooling system or cooling to individual components	(8) CC01, CC04, CC05, CC07 CC08, CC09
(9) Loss of normal feedwater or normal feedwater system failure	(9) FW01, FW02, FW03, FW04 FW16, FW20, FW22, FW25 FW26, RX03, RX05, RX06, RX07, RX08, RX11, RX12
(10) Loss of all feedwater (normal and emergency)	(10) FW05, FW06, FW28, MS15
(11) Loss of protective system channel	(11) CH07, NI02, NI06, NI08, NI09, RP01, RP07, RP09, RP10, RX03, RX06, RX08, RX12, RX21, RX23, RX28, RX29, RX30
(12) Control rod failure including stuck rods, uncoupled rods, drifting rods, rod drops, and misaligned rods.	(12) RD02, RD03, RD09, RD10, RD13
(13) Inability to drive control rods	(13) RD07, RD15, RD16, RD17
(14) Fuel cladding failure resulting in high activity in reactor coolant or off gas and the associated high radiation alarms	(14) TH19
(15) Turbine trip	(15) TU07, RP05, RP06
(16) Generator trip	(16) EG01, EG03
(17) Failure in automatic control system(s) that affect reactivity and core heat removal	(17) RP01, RP02, RP04, RP07, RP08, RD02, RD03, RD09, RD10, RD12
(18) Failure of reactor coolant pressure and volume control systems (PWR)	(18) CV01, CV02, CV07, CV08, CV10, CV11, CV13, CV14, CV15, CV28, CV32, RX17, RX21, RX22, RX23, TH13, TH14, TH15, TH16

A.1.3.2 (cont.)

ANSI/ANS-3.5-1985 Section 3.1.2	Simulator Malfunctions corresponding to the ANSI requirement
(19) Reactor trip	(19) RP05, RP06
(20) Main steam line as well as main feed line break (both inside and outside containment)	(20) FW22, FW26, MS07, MS09, MS10, MS15
(21) Nuclear instrumentation failure(s)	(21) NI02, NI06, NI07, NI08, NI09
(22) Process instrumentation, alarms, and control system failures	(22) CC10, CV07, CV08, CV10, CV11, CV13, CV14, CV15, CV28, EG01, EG06, FW10, FW11, MS04, RD12, RH03, RP12, RP13, RP16, RP17, RX05, RX07, RX11, RX13, RX14, RX17, RX20, RX22, RX24, RX25, RX34, RX36, TC05, TC08
(23) Passive malfunctions in systems, such as engineered safety features, emergency feedwater systems	(23) CC01, CH01, CS01, CS02, CV01, ED07, FW05, FW06, RH01, RP04, RP07, RP08, RP09, RP10, SI01
(24) Failure of the automatic reactor trip system	(24) RP02
(25) Reactor pressure control system failure including turbine bypass failure (BWR)	(25) N/A - BWR

A.1.3.3 Control Provided For Items Outside Control Room

Appendix 2 is a listing of remote functions for the simulator. The appropriate remote functions exist for systems that are operated outside of the Control Room and that are needed to perform normal plant evolutions and/or the malfunctions required by ANSI/ANS-3.5-1985, section 3.1.1/3.1.2.

A.1.3.4 Additional Special Instructor/Training Features Available

a. Backtrack

As previously mentioned, the Zion Simulator has the capability of backtracking. Normally, the simulator can be backtracked anywhere from 1 to 60 minutes. However, the time frame for recording the backtrack snapshots is adjustable so that, if the instructor desires, he can offer a backtrack capability of 60 discrete conditions with the ability to vary the time interval from 2 seconds to an unlimited number of hours.

b. Freezing

The Zion Simulator has the capability to freeze the dynamic simulation. This feature may be used to develop static examinations.

c. Simulator Speed

The Zion Simulator has the capability to vary the speed of simulation. The most useful portion of this feature is slowing down the simulation to allow the students and instructor to observe and discuss all parameters. The simulator also has the capability to go into fast time for the below listed parameters:

Parameter	Range
Reactor Coolant System heatup	1 to 10 times
Pressurizer heatup	1 to 10 times
Xenon	1 to 30 times
Decay Heat	1 to 1000 times
Condenser evacuation	1 to 10 times
Turbine coastdown	1 to 10 times
Turbine Metal temperature	1 to 10 times

A.1.3.4 (cont.)

d. Override — The Zion Simulator override feature allows the instructor to manually override Simulator I/O driven hardware and annunciators. This includes lamps, switches, meters, pen recorders, relays and potentiometers. Up to 32 analog and/or 150 digital overrides may be selected at one time.

e. Roll-Around Instructor Console — The Zion Simulator has a roll-around instructor's console which can be used when the instructor wishes to interact to a large degree with the students. This console is a full scope instructor's station identical to the main instructor console.

f. Environmental Remote Functions — The Zion Simulator also uses Environmental Remote Functions which give the instructor the flexibility to modify parameters which are outside the operating staff's control. Examples include atmospheric temperature and wind speed.

g. Hand-Held Remote Control — The Hand-Held Remote Control Unit allows the instructor to leave the instructor's station to more closely observe the students while maintaining the ability to intervene on the training session with appropriate instructor actions.

A.1.3.4 (cont.)

h. Event Triggers — The Zion Simulator has event trigger capability such that certain functions can be initiated when a predetermined set of exact conditions is met.

i. Monitored Parameters — The monitored parameter feature allows the instructor to monitor up to 20 parameters by specifying the desired global variable name. These parameters may be trended, plotted on charts (maximum of 6 per chart) or plotted on an 8 pen recorder.

j. Step Time — The step time feature causes the simulator to automatically return from Run Mode to Freeze Mode after a selected time interval.

A.1.4 Operating Procedures for Reference Plant

The procedures used on the Zion Simulator are controlled copies of Zion Station's procedures.

Simulator unique procedures are contained in the Simulator Differences Book. This book will be utilized when performing procedures that differ from the Zion Station controlled procedures. The following items are in the Simulator Differences Book.

A.1.4 (cont.)

1. Core reactivity curves, which are based on Zion Station Unit 2, cycle 11 core load. The Unit 2, cycle 11 core load data was used to develop the core model because it was the most up to date information available prior to the simulator initial construction data base freeze.

2. Nomographs and tables associated with boration. This difference is due to the 4% boric acid change in modification M22-0-87-027.

3. AOP-2.2, Emergency Boration Procedure. This difference is due to modification M22-0-87-027, which changes boric acid to 4%, boric acid pumps to single speed and adds an additional common plant boric acid pump.

Note: Modification M22-0-87-027 has been incorporated on the simulator and is scheduled to be done on Zion Unit 1 during the next refueling outage.

A.1.5 Changes Since Last Report

This is the initial certification report, therefore, this section is not applicable.

A.2. Simulator Design Database

The simulator design database for the Zion Simulator is maintained from Zion Unit 1 data with the exception of Unit 2 Cycle 11 core load data as mentioned in A.1.4. The simulator design database includes the data from which the simulator was designed and built, and on which upgrades and modifications are based. The database includes design documents, performance data, records, assumptions, simplifications, derivations and other definable data on which the current design of the simulator hardware and software is based. These documents can be found in the General Files Pattern Simulator (SIM) file.

A.3 Simulator Tests

A.3.1 Computer Real Time Test

A real time test was conducted as part of the Zion Simulator Acceptance Test Procedure (Section 1.0, Hardware & Configuration Verification) in accordance with Appendix A of ANSI/ANS-3.5-1985. The results of the test are located in Attachment 2.

A.3.2 Steady State and Normal Operations Tests

Steady state tests were conducted as part of the Zion Simulator Acceptance Test Procedure (Section 7.1, Steady State Testing) in accordance with ANSI/ANS-3.5-1985. The test results are located in Attachment 2.

A.3.2 (cont.)

Normal operations tests were conducted as part of the Zion Simulator Acceptance Test Procedure (Section 3, Power Plant Performance Testing) in accordance with ANSI/ANS-3.5-1985. The tests results are located in Attachment 2.

Core performance tests were conducted as part of the Zion Simulator Acceptance Test Procedure (Section 6, Core Physics Testing) in accordance with ANSI/ANS-3.5-1985. The test results are located in Attachment 2.

Operator performed surveillance tests (Periodic Tests) were conducted as part of the Zion Simulator Acceptance Test Procedure (Section 5, Surveillance Testing) in accordance with ANSI/ANS-3.5-1985. The tests results are located in Attachment 2.

A.3.3 Transient Tests

Transient tests were conducted as part of the Zion Simulator Acceptance Test Procedure (Section 7.2, Transient Tests) in accordance with Appendix B of ANSI/ANS-3.5-1985. Appendix 6 contains the members and qualifications of the Zion Simulator Transient Test Review Board. The Transient Test Review Board results, with the test abstracts and plotted data are located in Attachment 2.

A.3.4 Malfunction Tests

Malfunctions have been tested in accordance with ANSI/ANS-3.5-1985 as part of the Zion Simulator Acceptance Test Procedure (Section 4, Malfunction Testing). Appendix 4 contains a list of certified malfunctions and the projected schedule to test approximately 25% of the malfunctions annually. The certified malfunction cause and effect book which serves as the malfunction test abstracts can be found in Attachment 6. The malfunction tests were satisfactory except those listed in Attachment 7.

A.3.4 (cont.)

In the event that a malfunction fails its test, a Work Request is written to correct the problem. In the interim, any malfunctions that are unavailable for training are documented on a "Simulator Items Not Authorized for Use List (PTAO-103T3)" which is kept in the Malfunction Cause and Effect Book. This list informs each instructor as to which malfunctions are currently unavailable for training.

In order to avoid negative training which can result when the simulator progresses beyond design limits, the instructor system computer console displays a message to the instructor. This message alerts the instructor when selected parameters approach values indicative of events beyond the implemented model or known plant behavior. The requirements of ANSI/ANS-3.5-1985, Section 4.3, Simulator Operating Limits, have been met.

A License Event Report and Deviation Report review of Zion Unit 1 and Unit 2 events during 1987 and 1988 was conducted and utilized in the Zion Simulator malfunction selection process. Some significant earlier Zion events and similar plant events were reviewed as well. A review of Zion Unit 1 and Unit 2, 1989 and 1990 License Event Reports and Deviation Reports will be performed prior to the next annual update of this certification report.

A summary of malfunctions relating to these events are listed below:

EVENT	TITLE/SUMMARY	ZION SIMULATOR MALFUNCTION
LER-20-1-88-025	Loss of Instrument Air	IA01
LER-22-1-88-021	CCW Pump Inadvertent Auto Start	CC02 *
DVR-22-1-87-074	Air Bound CCW Pump	CC03
LER-22-2-88-087	Urgent Failure in Logic Section of S/D C or D	RD16
DVR-22-1-88-065 LER-22-2-88-029	Loss of 120 vac Inst Bus	ED10

A.3.4 (cont.)

EVENT	TITLE/SUMMARY	ZION SIMULATOR MALFUNCTION
LER-22-1-87-006 DVR's 22-1-86-076 22-1-87-089 22-2-87-032 22-2-88-030 22-1-85-229	Diesel Generator Failure	EG05 EG07
DVR-22-2-87-060	Loss of SW to D/G	SW04
DVR-22-2-87-019 LER-22-1-88-061	Failure of 2nd Level U/V	ED18
LER-22-1-88-015	Degraded System Voltage	ED09 *
LER-22-1-88-024	Inadvertent Station Blackout Signal	ED13 *
DVR-22-1-86-093 LER-22-2-86-106	Failure of 480v Loads to Transfer or Sequence	ED07 ED06 *
DVR-22-2-86-099 LER-22-1-86-061	D/G Voltage Reg Failure	EG06
LER-22-1-88-013	Feed Flow Xmtr Failure	RX06
DVR-22-1-88-107	Feedwater Heater Level Control Failure	FW12 * FW13 *
DVR-22-1-87-034 LER-22-1-87-044	TDAFW Pump Trip Valve Failure	FW06
LER-22-1-87-009	MSIV's Fail Open	MS01
DVR-22-1-87-045	Steam Flow Detector Failure	RX08
LER-22-1-87-004 DVR-22-1-87-036 DVR-22-2-87-039	Source Range NI Failure	NI02
LER-22-1-87-011	Noisy SR Channel	NI01
DVR-22-1-87-012 DVR-22-2-87-086	Power Range NI Failure	NI08 NI09
LER-22-2-88-012	Inadvertent Safety Injection	RP06
LER-22-2-86-024	PZR Press Ch. Failure	RX21
DVR-22-1-88-114	PZR Level Ch. Failure	RX23

A.3.4 (cont.)

EVENT	TITLE/SUMMARY	ZION SIMULATOR MALFUNCTION
LER-22-2-86-024	PZR Master Press Cont. Failure	RX17
LER-22-2-86-024	PZR Level Master Cont. Failure	RX22
DVR-22-2-87-067	RCS Leak	CV29
DVR-22-2-88-021	RCS to RHR Leakage	RHC8
LER-22-2-87-003	RCFC Inadvertent Auto Start	CH04 *
DVR-22-1-88-67	SI Accum Check Valve Leakage	SI04 *
DVR-22-1-87-37 LER-22-1-88-018	1C CS Pump Fail to Start	CS02
DVR-22-1-87-110 DVR-22-1-88-063 DVR-22-1-88-064	Failure of RCFC to Start in Slow Speed	CH01
DVR-22-2-87-080 DVR-22-1-88-77 DVR-22-2-88-020	CS Pump Eductor Valve Failure	CS05 *
DVR-22-2-87-068	Inop Rad Mon. due to Low Flow	RM03 *
DVR-22-1-88-049	Inadvertent Rad Mon Actuation	RM04 *
DVR-22-1-86-087 DVR-22-2-88-039	Failure of Turb to Trip from Pushbutton	TC02
DVR-22-1-87-028	HP Turb Gov Vlv Leakage	TC12 *

* Denotes Non-Certified Malfunction

A.4 Simulator Discrepancy Resolution and Upgrading

1. Identifying, logging, correcting, and testing simulator discrepancies.

   Administrative Procedure PTAO-103, Simulator Related Work Request Procedure, describes how an identified simulator discrepancy is resolved. Attachment 3 is a copy of PTAO-103, Simulator Related Work Request Procedure.

2. Tracking of design changes incorporated into the reference plant but not yet incorporated into the simulator.

   Production Training Department receives modifications from Zion Station. Modifications are reviewed and if a modification is deemed appropriate to change simulation, a Work Request is written in accordance with PTAO-103, Simulator Related Work Request Procedure. In addition, all modifications that require simulator work are approved and tracked by the Simulator Review Board in accordance with PTAO-104, Simulator Review Board Procedure. See Attachment 4 for a copy of PTAO-104, Simulator Review Board Procedure.

   To assist in Zion Station Modification tracking, the Zion Simulator Training Supervisor is on the distribution list for all modification approval letters. The Simulator Training Supervisor also receives minutes of all Zion Station Mod Review Committee meetings and when possible, he or a designate attends these meetings.

APPENDIX 1

LIST OF INITIAL CONDITIONS

APPENDIX 1
LIST OF INITIAL CONDITIONS (IC's)

****
* NOTE *
* IC's 1-39 are *
* Protected *
****

IC	DESCRIPTION
1	- 0%, 100°F, 3 psig, 2000 ppm, GOP-4, step 98
2	- 0%, 110°F, 50 psig, 1000 ppm, GOP-1, step 30 Pzr Solid
3	- 0%, 150°F, 400 psig, 1000 ppm, GOP-1, step 32, Ready for RCP start
4	- 0%, 150°F, 400 psig, 2000 ppm, GOP-4, step 89, Prepare to go solid
5	- 0%, 195°F, 400 psig, 1000 ppm, GOP-1, step 46, Ready to leave cold S/D
6	- 0%, 350°F, 400 psig, 1000 ppm, GOP-4, step 69, Ready to go on RHR
7	- 0%, 350°F, 400 psig, 1000 ppm, GOP-1, step 52, Ready to secure RHR
8	- 0%, 395°F, 900 psig, 1000 ppm, GOP-1, step 58, Heatup in progress
9	- 0%, 400°F, 1100 psig, 1000 ppm, GOP-4, step 60, Cooldown in progress
10	- 0%, 450°F, 1700 psig, 1000 ppm, GOP-1, step 38, Heatup in progress
11	- Hot S/D, Xe Free, GOP-1, step 73, (MSIV's closed)
12	- Hot S/D, Xe Free, S/D Rods out, GOP-2, step 12, BOL RX startup
13	- Hot S/D, Xe Free, S/D Rods out, GOP-2, step 12, MOL Rx startup
14	- Hot S/D, Xe Free, S/D Rods out, GOP-2. step 12. EOL Rx startup
15	- Hot S/D, Xe Peaking, S/D Rods out, BOL Rx startup 8 hrs after Rx trip
16	- Hot S/D, Xe Peaking, S/D Rods out, EOL Rx startup 8 hrs after Rx trip
17	- Hot S/D, Xe Decreasing, S/D Rods out, BOL Rx startup with decay from peak Xenon
18	- Hot S/D, Xe Decreasing, S/D Rods out, EOL Rx startup with decay from peak Xenon
19	- Hot STBY, Bank D at 150, Following BOL Xe free Rx startup
20	- 7%, Bank D at 150, 1800 RPM, Xe free, BOL
21	- 7%, Bank D at 150, 1800 RPM, Xe free, MOL
22	- 7%, Bank D at 150, 1800 RPM, Xe free, EOL

APPENDIX 1
LIST OF INITIAL CONDITIONS (IC's)

****
* NOTE *
* IC's 1-39 are *
* Protected *
****

IC	DESCRIPTION
23	- 7%, Bank D at 150, 1800 RPM, Xenon Decreasing, MOL
24	- 30%, Xe Build in, BOL preconditioning startup
25	- 30%, Xe Build in, EOL shutdown for refueling
26	- 40%, Bank D at 175, Eq Xe, BOL stabilize chemistry
27	- 45%, Bank D at 175, Xe Decreasing, BOL Increasing load, One MFP
28	- 50%, Bank D at 180, Eq Xe, steady state, BOL two MFP's
29	- 55%, Bank D at 175, Xe Build in, MOL load decrease from 100% (RCP oil addition)
30	- 65%, Bank D at 231, Xe Build in, MOL load decrease
31	- 65%, Bank D at 160, Xe Build in, EOL load decrease
32	- 75%, Bank D at 180, Eq Xe, Steady state BOL
33	- 85%, Bank D at 190, Xe Build in, BOL load swing (Ramp Just complete)
34	- 99.5%, Bank D at 231, Xe Build in, BOL, Just achieved full power
35	- 99.5%, Bank D at 231, Xe Build in, MOL, Just achieved full power
36	- 99.5%, Bank D at 231, Xe Build in, EOL, Just achieved full power
37	- 99.5%, Bank D at 231, Eq Xe, BOL steady state full base load
38	- 99.5%, Bank D at 231, Eq Xe, MOL steady state full base load
39	- 99.5%, Bank D at 231, Eq Xe, EOL steady state full base load

40 - 100 - Available for Instructor use.

APPENDIX 2

LIST OF IN-PLANT REMOTE FUNCTIONS

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CC01	CC SUCT. HDR X-TIE VLV (1CC9459A) RANGE-COND: CLOSE/OPEN
CC02	CC SUCT. HDR X-TIE VLV (1CC9459B) RANGE-COND: CLOSE/OPEN
CC03	CC PUMP OE INLET ISOL VLV (1CC9460A) RANGE-COND: CLOSE/OPEN
CC04	CC PUMP OD INLET ISOL VLV (1CC9460B) RANGE-COND: CLOSE/OPEN
CC05	CC PUMP OC INLET ISOL VLV (0CC9461) RANGE-COND: CLOSE/OPEN
CC06	CC PUME OE DISCH. ISOL VLV (1CC9466A) RANGE-COND: CLOSE/OPEN
CC07	CC PUMP OD DISCH. ISOL VLV (1CC9466B) RANGE-COND: CLOSE/OPEN
CC08	CC PUMP OC DISCH. ISOL VLV (0CC9465) RANGE-COND: CLOSE/OPEN
CC09	CC PMPS OE/OD DISCH. HDR X-TIE (1CC9458A) RANGE-COND. CLOSE/OPEN
CC10	CC PMPS OD/OC DISCH. HDR X-TIE (1CC9458B) RANGE-COND: CLOSE/OPEN
CC11	CC PMP OC DISCH. HDR X-TIE (0CC9509) RANGE-COND: CLOSE/OPEN
CC12	CC PMP RECIRC. TO CC SURGE TANK (1CC9462) RANGE-COND: CLOSE/OPEN
CC13	DEMIN MAKEUP WTR TO CC SURGE TANK (1CC9441) RANGE-COND: 0-100%
CC14	PW EMER. MAKEUP TO CC SURGE TANK (1CC9454) RANGE-COND: 0-100%
CC15	CC SURGE LINE TO PMP OE ISOL (1CC9456A) RANGE-COND: CLOSE/OPEN
CC16	CC SURGE LINE TO PMP OD ISOL (1CC9456B) RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CC17	CC SURGE TANK TO AUX. BLDG. DRAINS (1AD0063) RANGE-COND: 0-100%
CC18	CC SURGE TANK TO AUX. BLDG. DRAINS (1AD0064) RANGE-COND: 0-100%
CC19	CC OC PUMP BUS 141 CONNECTED (0CC005) RANGE-COND: OFF/ON
CC20	CC HX INLET HDR. X-TIE (1CC9467C) RANGE-COND: CLOSE/OPEN
CC21	CC HX INLET HDR. X-TIE (1CC9467D) RANGE-COND: CLOSE/OPEN
CC22	SUCT LINE X-TIE (2CC9459B) RANGE-COND: CLOSE/OPEN
CC23	PUMP 0CC004 CONTROL RANGE-COND: AUTO/OFF
CC24	PUMP 0CC003 CONTROL RANGE-COND: AUTO/OFF
CC25	CC SURGE LINE TO PUMP 0A ISOL (2CC9456B) RANGE-COND: CLOSE/OPEN
CC26	CC SURGE LINE TO PUMP 0B ISOL (2CC9456A) RANGE-COND: CLOSE/OPEN
CC27	DEMIN MAKEUP TO CC SURGE TANK (2CC9441) RANGE-COND: 0-100%
CC28	PRIMARY WATER EMER MAKEUP TO CC SURGE TANK (2CC9454) RANGE-COND: 0-100%
CC29	CC SURGE TANK TO AUX. BLDG. DRAIN TANK (2AD0065) RANGE-COND: 0-100%
CC30	CC SURGE TANK TO AUX. BLDG. DRAIN TANK (2AD0064) RANGE-COND: 0-100%
CC31	CC PUMP DISCH HDR X-TIE (2CC9458B) RANGE-COND: CLOSE/OPEN
CC32	CC PUMP RECIRC. TO CC SURGE TANK (2CC9462) RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CC33	CC PUMP DISCH DHR X-TIE (2CC9467D) RANGE-COND: CLOSE/OPEN
CC34	CC HX #1 INLET ISOL VLV (1CC9470B) RANGE-COND: CLOSE/OPEN
CC35	CC HX #0 INLET ISOL VLV (0CC9471B) RANGE-COND: CLOSE/OPEN
CC36	CC HX #1 DISCH. ISOL VLV (1CC9470A) RANGE-COND: 0-100%
CC37	CC HX #0 DISCH. ISOL VLV (0CC9471A) RANGE-COND: 0-100%
CC38	TRAIN A CC ISOL VLV (1CC9467A) RANGE-COND: CLOSE/OPEN
CC39	TRAIN B CC ISOL VLV (1CC9467B) RANGE-COND: CLOSE/OPEN
CC40	RHR PUMP A OIL COOLER INLET ISOL (1CC9506B) RANGE-COND: CLOSE/OPEN
CC41	RHR PMP A OIL COOLER OUTLET ISOL (1CC9506A) RANGE-COND: CLOSE/OPEN
CC42	RHR HX 1A INLET ISOL VLV (1CC9504A) RANGE-COND: CLOSE/OPEN
CC43	RHR HX 1A DISCH THROTTLE VLV (1CC9507A) RANGE-COND: 0-100%
CC44	RHR PMP B OIL COOLER INLET ISOL (1CC9474B) RANGE-COND: CLOSE/OPEN
CC45	RHR HX 1B INLET ISOL VLV (1CC9474A) RANGE-COND: CLOSE/OPEN
CC46	RHR HX 1B INLET ISOL VLV (1CC9504B) RANGE-COND: CLOSE/OPEN
CC47	RHR HX 1B DISCH. THROTTLE VLV (1CC9507B) RANGE-COND: 0-100%
CC48	SF PIT HX OUTLET THROTTLE VLV (1CC9503) RANGE-COND: 0-100%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CC49	LTDN HX CCW INLET ISOL VLV (1CC9452A) RANGE-COND: CLOSE/OPEN
CC50	LTDN HX CCW DISCH. ISOL VLV. (1CC9452B) RANGE-COND: CLOSE/OPEN
CC51	SEAL WTR HX CCW INLET ISOL VLV (1CC9449A) RANGE-COND: CLOSE/OPEN
CC52	SEAL WTR HX CCW DISCH ISOL VLV (1CC9449B) RANGE-COND: CLOSE/OPEN
CC53	XS LTDN HX CCW INLET ISOL VLV (1CC9499) RANGE-COND: CLOSE/OPEN
CC54	XS LTDN HX CCW DISCH. ISOL VLV. (1CC9511) RANGE-COND: CLOSE/OPEN
CC55	RCP A OIL COOLER DISCH. ISOL (1CC9493A) RANGE-COND: 0-100%
CC56	RCP B OIL COOLER DISCH. ISOL (1CC9493B) RANGE-COND: 0-100%
CC57	RCP C OIL COOLER DISCH. ISOL (1CC9493C) RANGE-COND: 0-100%
CC58	RCP D OIL COOLER DISCH. ISOL (1CC9493D) RANGE-COND: 0-100%
CC59	RCP 1A THERM BARR HX OUTLET THROTTLE VLV (1CC-9496A) RANGE-COND: 0-100%
CC60	RCP 1B THERM BARR HX OUTLET THROTTLE VLV (1CC-9496B) RANGE-COND: 0-100%
CC61	RCP 1C THERM BARR HX OUTLET THROTTLE VLV (1CC-9496C) RANGE-COND: 0-100%
CC62	RCP 1D THERM BARR HX OUTLET THROTTLE VLV (1CC-9496D) RANGE-COND: 0-100%
CC63	SFP PUMP (1SF003) RANGE-COND: OFF/ON
CC64	SPENT FUEL PIT VARIABLE HEAT LOAD RANGE-COND: 0-10MW

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CC65	AUTO START FAILURE, LIFTED LEAD ON CCW PUMP OC CS/CTO CONTACT RANGE - COND: NORMAL/LIFTED
CC66	AUTO START FAILURE, LIFTED LEAD ON CCW PUMP OD CS/CTO CONTACT RANGE - COND: NORMAL/LIFTED
CC67	AUTO START FAILURE, LIFTED LEAD ON CCW PUMP OE CS/CTO CONTACT RANGE - COND: NORMAL/LIFTED

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CH01	TEST VALVE 1RV-0008 VALVE RANGE-COND: CLOSE/OPEN
CH02	HYDROGEN RECOMBINER ENGAGE/DISENGAGE TO CONTAINMENT RANGE-COND: OFF/ON
CH03	HYDROGEN PURGE FAN 1RV020 RANGE-COND: OFF/ON
CH04	HYDROGEN PURGE FAN 1RV021 RANGE-COND: OFF/ON
CH05	CONTAINMENT SUMP PUMP 1A 1WD085 POWER RANGE-COND: RACK IN/OUT
CH06	CONTAINMENT SUMP PUMP 1B 1WD086 POWER RANGE-COND: RACK IN/OUT
CH07	REACTOR HEAD REMOVAL RANGE-COND: NORMAL/REMOVED
CH08	FUEL TRANSFER CANAL GATE VALVE RANGE-COND: CLOSE/OPEN
CH09	CRDM BOOST FAN 1RV022 CONTROL SWITCH RANGE-COND: AUTO/OFF
CH10	CRDM BOOST FAN 1RV023 CONTROL SWITCH RANGE-COND: AUTO/OFF
CH11	CRDM BOOST FAN 1RV024 CONTROL SWITCH RANGE-COND: AUTO/OFF
CH12	CRDM BOOST FAN 1RV025 CONTROL SWITCH RANGE-COND: AUTO/OFF
CH13	SPENT FUEL ASSEMBLY IN THE MANIPULATOR CRANE RANGE-COND: OFF/ON
CH14	AUTO START FAIL, LIFTED LEAD ON RCPC 1A LOW SPEED CS/CTO CONTACT RANGE - COND: NORMAL/LIFTED
CH15	AUTO START FAIL, LIFTED LEAD ON RCPC 1B LOW SPEED CS/CTO CONTACT RANGE - COND: NORMAL/LIFTED

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CC16	AUTO START FAIL, LIFTED LEAD ON RCPC 1C LOW SPEED CS/CTO CONTACT RANGE - COND: NORMAL/LIFTED
CC17	AUTO START FAIL, LIFTED LEAD ON RCPC 1D LOW SPEED CS/CTO CONTACT RANGE - COND: NORMAL/LIFTED
CC18	AUTO START FAIL, LIFTED LEAD ON RCPC 1E LOW SPEED CS/CTO CONTACT RANGE - COND: NORMAL/LIFTED

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CR01	QUADRANT 1 REFUELING RANGE-COND: NO CHG/DE-FUEL/RE-FUEL
CR02	QUADRANT 2 REFUELING RANGE-COND: NO CHG/DE-FUEL/RE-FUEL
CR03	QUADRANT 3 REFUELING RANGE-COND: NO CHG/DE-FUEL/RE-FUEL
CR04	QUADRANT 4 REFUELING RANGE-COND: NO CHG/DE-FUEL/RE-FUEL
CR05	FUEL ASSEMBLY G-15 REFUEL RANGE-COND: OUT/IN
CR06	FUEL ASSEMBLY J-03 REFUEL RANGE-COND: OUT/IN
CR07	FUEL ASSEMBLY H-03 REFUEL RANGE-COND: OUT/IN
CR08	FUEL ASSEMBLY G-03 REFUEL RANGE-COND: OUT/IN
CR09	FUEL ASSEMBLY J-02 REFUEL RANGE-COND: OUT/IN
CR10	FUEL ASSEMBLY H-02 REFUEL RANGE-COND: OUT/IN
CR11	FUEL ASSEMBLY G-02 REFUEL RANGE-COND: OUT/IN
CR12	FUEL ASSEMBLY J-01 REFUEL RANGE-COND: OUT/IN
CR13	FUEL ASSEMBLY H-01 REFUEL RANGE-COND: OUT/IN
CR14	FUEL ASSEMBLY G-01 REFUEL RANGE-COND: OUT/IN

ZION SIMULATOR
ANSI/ANS-3.5-1985 CERTIFICATION REPORT
INITIAL REPORT, MARCH 1991

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CS01	CS PUMP 1CS001 1A POWER RANGE-COND: RACK IN/OUT
CS02	CS PUMP 1CS002 1B POWER RANGE-COND: RACK IN/OUT
CS03	CS PUMP 1CS003 1C POWER RANGE-COND: RACK IN/OUT
CS04	SPRAY ADDITIVE TANK ISO VALVE 1CS0014 RANGE-COND: 0-100%
CS05	SPRAY ADDITIVE TANK ISO VALVE 1CS0019 RANGE-COND: 0-100%
CS06	SPRAY ADDITIVE TANK ISO VALVE 1CS0024 RANGE-COND: 0-100%
CS07	CONTAINMENT SPRAY PUMP 1A TO RWST VALVE 1CS0037 RANGE-COND: 0-100%
CS08	CONTAINMENT SPRAY PUMP 1B TO RWST VALVE 1CS0040 RANGE-COND: 0-100%
CS09	CONTAINMENT SPRAY PUMP 1C TO RWST VALVES 1CS0043 RANGE-COND: 0-100%
CS10	CNMT SPRAY PMP 1A DISCH ISO V 1CS0004 RANGE-COND: 0-100%
CS11	CNMT SPRAY PMP 1B DISCH ISO V 1CS0008 RANGE-COND: 0-100%
CS12	CNMT SPRAY PMP 1C DISCH ISO V 1CS0012 RANGE-COND: 0-100%
CS13	CNMT SPRAY PMP 1A SUCT ISO V 1CS0002 RANGE-COND: 0-100%
CS14	CNMT SPRAY PMP 1B SUCT ISO V 1CS0006 RANGE-COND: 0-100%
CS15	CNMT SPRAY PMP 1C SUCT ISO V 1CS0010 RANGE-COND: 0-100%
CS16	SPRAY ADDITIVE TANK LEVEL RANGE-COND: 0-100%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CS17	CS PUMP 1C LOCAL CONTROL SWITCH RANGE-COND: TEST/AUTO/OFF
CS18	CS LOOP 1A 1MOV-CS0002 POWER ON/OFF RANGE-COND: RACK IN/OUT
CS19	CS LOOP 1B 1MOV-CS0006 POWER ON/OFF RANGE-COND: RACK IN/OUT
CS20	CS LOOP 1C 1MOV-CS0006 POWER ON/OFF RANGE-COND: RACK IN/OUT

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CV001	MINIFLOW FROM CENT CHRG PMP A (1VC8479A) RANGE-COND: CLOSE/OPEN
CV002	MINIFLOW FROM CENT CHRG PMP B (1VC8479B) RANGE-COND: CLOSE/OPEN
CV003	CENT. CHRG PMP A TO RCP SEALS (1VC8387B) RANGE-COND: 0-100%
CV004	CENT. CHRG PMP B TO RCP SEALS (1VC8387A) RANGE-COND: 0-100%
CV005	HCV-182 ISOL (1VC8402B) RANGE-COND: CLOSE/OPEN
CV006	HCV-182 BYPASS (1VC8403) RANGE-COND: 0-100%
CV007	LOOP FILL HEADER ISOL (1VC8480A,1VC8480B) RANGE-COND: CLOSE/OPEN
CV008	PCV-131 ISOL (1VC8408A) RANGE-COND: CLOSE/OPEN
CV009	PCV-131 BYPASS (1VC8409) RANGE-COND: 0-100%
CV010	PDP 1C DISCHARGE ISOLATION VALVE (1VC8388) RANGE-COND: CLOSE/OPEN
CV011	PRIMARY WATER TK 1 LEVEL (1PW003) RANGE-COND: 0-100%
CV012	SEAL WTR HX INLET ISOL (1VC8398A) RANGE-COND: CLOSE/OPEN
CV013	SEAL WTR HX OUTLET ISOL (1VC8398B) RANGE-COND: CLOSE/OPEN
CV014	SEAL WTR HX BYPASS (1VC8400) RANGE-COND: CLOSE/OPEN
CV015	SEAL WTR RTN TO VCT INLET (1VC8326) RANGE-COND: CLOSE/OPEN
CV016	SEAL WTR RTN TO VCT OUTLET (1VC8325) RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CV017	N2 SUPPLY TO VCT ISOL (1VC8410) RANGE-COND: CLOSE/OPEN
CV018	H2 SUPPLY TO VCT ISOL (1VC8376) RANGE-COND: CLOSE/OPEN
CV019	VCT DRAIN (1VC8419) RANGE-COND: 0-100%
CV020	MIXED BED DEMIN A INLET ISOL (1VC8524A) RANGE-COND: CLOSE/OPEN
CV021	MIXED BEB DEMIN B INLET ISOL (1VC8524B) RANGE-COND: CLOSE/OPEN
CV022	CATION BED DEMIN INLET NORM/DEMIN (1VC8516/8514) RANGE-COND: NORM/DEMIN
CV023	DEBOR DEMIN A INLET ISOL (1VC8512A) RANGE-COND: CLOSE/OPEN
CV024	DEBOR DEMIN B INLET ISOL (1VC8512B) RANGE-COND: CLOSE/OPEN
CV025	LOAD DEBOR DEMIN A CAPAC=1 (1VC0016) RANGE-COND: 0-100%
CV026	LOAD DEBOR DEMIN B CAPAC=1 (1VC0017) RANGE-COND: 0-100%
CV027	LOAD MIXED BED DEMIN A CAPAC=1 (1VC0019) RANGE-COND: 0-100%
CV028	LOAD MIXED BED DEMIN B CAPAC=1 (1VC0020) RANGE-COND: 0-100%
CV029	LOAD CATION BED CAPAC=1 (1VC0018) RANGE-COND: 0-100%
CV030	EMERGENCY BORATION TO CHRG PMP SUCT. HDR (1VC8439) RANGE-COND: 0-100%
CV031	REACTOR MAKEUP WTR TO CHRG PMP SUCT HDR (1VC8441) RANGE-COND: 0-100%
CV032	REACTOR MAKEUP WTR TO CVC CHARGING (1VC8455) RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CV033	RCPA SEAL WTR INJECTION THROTTLE (1VC8369A) RANGE-COND: 0-100%
CV034	RCPC SEAL WTR INJECTION THROTTLE (1VC8369B) RANGE-COND: 0-100%
CV035	RCPD SEAL WTR INJECTION THROTTLE (1VC8369C) RANGE-COND: 0-100%
CV036	RCPB SEAL WTR INJECTION THROTTLE (1VC8369D) RANGE-COND: 0-100%
CV037	SEAL INJECTION FILTER BYPASS (1VC8383) RANGE-COND: CLOSE/OPEN
CV038	SEAL INJECTION FILTER A ISOL (1VC8384A) RANGE-COND: 0-100%
CV039	SEAL INJECTION FILTER B ISOL (1VC8384B) RANGE-COND: 0-100%
CV040	SPARE REMOTE RANGE-COND:
CV041	BA RECIRC ISOL VLV TK A (1VC8459) RANGE-COND: CLOSE/OPEN
CV042	BA RECIRC ISOL VLV TK B (1VC8470) RANGE-COND: CLOSE/OPEN
CV043	BAT A SUCTION ISOL (1VC8461) RANGE-COND: CLOSE/OPEN
CV044	BAT A SUCTION ISOL (1VC8472) RANGE-COND: CLOSE/OPEN
CV045	MIXED BED DEMIN 1VC019 DRAIN VALVE (1VC8528A) RANGE-COND: 0-100%
CV046	MIXED BED DEMIN 1VC020 OUTLET ISOLATION VALVE (1VC8528B) RANGE-COND: 0-100%
CV047	MIXED BED DEMIN 1VC019 OUTLET ISOLATION VALVE (1VC8522A) RANGE-COND: 0-100%
CV048	MIXED BED DEMIN 1VC020 OUTLET ISOLATION VALVE (1VC8522B) RANGE-COND: 0-100%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CV049	BA XFER PMP B DISCH TO FILTER (1VC8469) RANGE-COND: CLOSE/OPEN
CV050	BA FILTER ISOL (1VC8446) RANGE-COND: 0-100%
CV051	BORIC ACID PUMP OA SUCTION ISOLATION (OVCOXX) RANGE-COND: OPEN/CLOSE
CV052	BA XFER PMP OA POWER (OVC00A) RANGE-COND: RACK IN/OUT
CV053	BA BATCHING TK OUTLET VLVS (OVC8492/OVC8476) RANGE-COND: CLOSE/OPEN
CV054	BA XFER PMP A POWER (1VC023) RANGE-COND: RACK IN/OUT
CV055	BA XFER PMP B POWER (1VC024) RANGE-COND: RACK IN/OUT
CV056	PDP 1C SUCTION ISOLATION VALVE (1VC8394) RANGE-COND: CLOSE/OPEN
CV057	CHG PUMPS ISOLATION VLV (1VC8485A) RANGE-COND: CLOSE/OPEN
CV058	CHG PUMPS ISOLATION VLV (1VC8485B) RANGE-COND: CLOSE/OPEN
CV059	CENT. CHRG. PUMP B SUCTION ISOLATION VALVE (1VC8471A) RANGE-COND: CLOSE/OPEN
CV060	CENT. CHRG PUMP A SUCTION ISOLATION VALVE (VC8471B) RANGE-COND: CLOSE/OPEN
CV061	VCT VENT ISOLATION VALVE (1VC8413) RANGE-COND: CLOSE/OPEN
CV062	VCT LETDOWN ISOLATION VALVE (1VC8416) RANGE-COND: CLOSE/OPEN
CV063	RCP SEALS #1 SEAL BYPASS DISCHARGE (1VC8142) RANGE-COND: CLOSE/OPEN
CV064	RC FILTER 1VC0015 BYPASS VLV (1VC8421) RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CV065	B.A. BLENDER DISCH. TO RWST (1VC8432/1VC8434) RANGE-COND: CLOSE/OPEN
CV066	B.A. BLENDER TO VCT OUTLET (1VC8428) RANGE-COND: CLOSE/OPEN
CV067	SEAL WATER INJ FILTER 1VC005 DRAIN VALVE (1VC8368B) RANGE-COND: CLOSE/OPEN
CV068	PWST #2 DISCHARGE VALVE (0PW0001) RANGE-COND: CLOSE/OPEN
CV069	RCP STANDPIPE TO RCDT VALVE (1VC8536A) RANGE-COND: CLOSE/OPEN
CV070	RCP STANDPIPE TO RCDT VALVE (1VC8536B) RANGE-COND: CLOSE/OPEN
CV071	RCP STANDPIPE TO RCDT VALVE (1VC8536C) RANGE-COND: CLOSE/OPEN
CV072	RCP STANDPIPE TO RCDT VALVE (1VC8536D) RANGE-COND: CLOSE/OPEN
CV073	POS DISP PMP 1C POWER (1VC008) RANGE-COND: RACK IN/OUT
CV074	CENT. CHRG. PUMP 1B POWER (1VC007) RANGE-COND: RACK IN/OUT
CV075	CENT. CHRG. PUMP 1A POWER (1VC006) RANGE-COND: RACK IN/OUT
CV076	PRIMARY WATER PUMP A POWER (OPW0001) RANGE-COND: RACK IN/OUT
CV077	PRIMARY WATER PUMP B POWER (OPW0002) RANGE-COND: RACK IN/OUT
CV078	BORON CONCENTRATION RANGE-COND: 0-2500 PPM
CV079	LOOP FILL HEADER DRAIN VALVE (1VC8484) RANGE-COND: 0-100%
CV080	MIXED BED DEMIN DECONTAMINATION FACTOR RANGE-COND: 0-1000

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CV081	CATION BED DEMIN DECONTAMINATION FACTOR RANGE-COND: 0-1000
CV082	REGENERATIVE HX CHARGING ISO. MOV POWER (1VC8105) RANGE-COND: RACK IN/OUT
CV083	REGENERATIVE HX CHARGING ISO. MOV POWER (1VC8106) RANGE-COND: RACK IN/OUT
CV084	SEAL WTR HX INLET ISO. MOV POWER (1VC8100) RANGE-COND: RACK IN/OUT
CV085	VCT DISCHARGE ISO. MOV POWER (1LCV112B) RANGE-COND: RACK IN/OUT
CV086	VCT DISCHARGE ISO. MOV POWER (1LCV112C) RANGE-COND: RACK IN/OUT
CV087	SAFETY INJECTION INLET ISO. MOV POWER (1LCV112D) RANGE-COND: RACK IN/OUT
CV088	SAFETY INJECTION INLET ISO. MOV POWER (1LCV112E) RANGE-COND: RACK IN/OUT
CV089	EMERGENCY BORATION OUTLET ISO. MOV POWER (1VC8104) RANGE-COND: RACK IN/OUT
CV090	BORON INJ. TO COLD LEG #1 ISO. MOV POWER (1VC8800A) RANGE-COND: RACK IN/OUT
CV091	BORON INJ. TO COLD LEG #2 ISO. MOV POWER (1VC8800B) RANGE-COND: RACK IN/OUT
CV092	BORON INJ. TO COLD LEG #3 ISO. MOV POWER (1VC8800C) RANGE-COND: RACK IN/OUT
CV093	BORON INJ. TO COLD LEG #4 ISO. MOV POWER (1VC8800D) RANGE-COND: RACK IN/OUT
CV094	SEAT WTR HX INLET ISOLATION VALVE POEWR (1VC8100) RANGE-COND: RACK IN/OUT
CV095	BORON INJECTION TANK INLET ISOLATION MOV POWER (1SI8803A) RANGE-COND: RACK IN/OUT
CV096	BORON INJECTION LINE INLET ISOLATION MOV POWER (1SI8803B) RANGE-COND: RACK IN/OUT

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CV097	DEBORATING DEMINERALIZERS DECONTAMINATION FACTOR RANGE-COND: 0-50 PPM
CV098	BORIC ACID PUMP 1A SUCTION ISOLATION (1VC8163) RANGE-COND: OPEN/CLOSE
CV099	BORIC ACID PUMP 1B SUCTION ISOLATION (1VC8175) RANGE-COND: OPEN/CLOSE
CV100	AUTO START FAILURE, LIFTED LEAD ON CHG PUMP 1A CS/CTO CONTACT RANGE - COND: NORMAL/LIFTED
CV101	AUTO START FAILURE, LIFTED LEAD ON CHG PUMP 1B CS/CTO CONTACT RANGE - COND: NORMAL/LIFTED

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
CW02	MAIN CONDENSER TUBE CLEANING SYSTEM A RANGE-COND: IN/OUT
CW03	MAIN CONDENSER TUBE CLEANING SYSTEM B RANGE-COND: IN/OUT
CW04	FOREBAY INLET SLIDE GATE OMOG-CW0101 RANGE-COND: 0-100%
CW05	CIRC WATER PUMP 1A DISCH VLV, 1MOV-CW0001 RANGE-COND: POWER ON/OFF
CW06	CIRC WATER PUMP 1A DISCH VLV, 1MOV-CW0001 RANGE-COND: 0-100%
CW07	CIRC WATER PUMP 1B DISCH VLV, 1MOV-CW0002 RANGE-COND: POWER ON/OFF
CW08	CIRC WATER PUMP 1B DISCH VLV, 1MOV-CW0002 RANGE-COND: 0-100%
CW09	CIRC WATER PUMP 1C DISCH VLV, 1MOV-CW0003 RANGE-COND: POWER ON/OFF
CW10	CIRC WATER PUMP 1C DISCH VLV, 1MOV-CW0003 RANGE-COND: 0-100%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
ED01	4160V. BUS 142 LOCKOUT RELAY RANGE-COND: NORMAL/RESET
ED02	4160V. BUS 143 LOCKOUT RELAY RANGE-COND. NORMAL/RESET
ED03	4160V. BUS 144 LOCKOUT RELAY RANGE-COND: NORMAL/RESET
ED04	4160V. BUS 145 LOCKOUT RELAY RANGE-COND: NORMAL/RESET
ED05	4160V. BUS 147 LOCKOUT RELAY RANGE-COND: NORMAL/RESET
ED06	4160V. BUS 148 LOCKOUT RELAY RANGE-COND: NORMAL/RESET
ED07	4160V. BUS 149 LOCKOUT RELAY RANGE-COND: NORMAL/RESET
ED08	BUS 111 POWER SUPPLY SELECT RANGE-COND: INV/OPEN/DIRT POWER
ED09	BUS 112 POWER SUPPLY SELECT RANGE-COND: INV/OPEN/DIRT POWER
ED10	BUS 113 POWER SUPPLY SELECT RANGE-COND: INV/OPEN/DIRT POWER
ED11	BUS 114 POWER SUPPLY SELECT RANGE-COND: INV/OPEN/DIRT POWER
ED12	BATT CHARGER BKR TO BATT 111 RANGE-COND: CLOSE/OPEN
ED13	BATT CHARGER BKR TO BATT 112 RANGE-COND: CLOSE/OPEN
ED14	BATT CHARGER BKR TO BATT 011-1 RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
ED17	UNIT 2 GENERATOR IN OPERATION RANGE-COND: OFF/ON
ED18	MAIN GENERATOR OCB 1718 LOCAL OPERATION RANGE-COND: NORMAL/TRIP
ED19	MAIN GENERATOR OCB 1819 LOCAL OPERATION RANGE-COND: NORMAL/TRIP
ED20	MCC 1371 FEED TO DIRTY POWER XFRMR (BUS 111) RANGE-COND: CLOSE/OPEN
ED21	MCC 1381B FEED TO DIRTY POWER XFRMR (BUS 112) RANGE-COND: CLOSE/OPEN
ED22	MCC 1391 FEED TO DIRTY POWER XFRMR (BUS 113) RANGE-COND: CLOSE/OPEN
ED23	MCC 1331A FEED TO DIRTY POWER XFRMR (BUS 114) RANGE-COND: CLOSE/OPEN
ED24	BUS 137 FEED TO BATT CHAR 011 RANGE-COND: CLOSE/OPEN
ED25	BUS 138 FEED TO BATT CHAR 111 RANGE-COND: CLOSE/OPEN
ED26	BUS 139 FEED TO BATT CHAR 112 RANGE-COND: CLOSE/OPEN
ED27	UNIT 2 FEED TO ESF BUSES RANGE-COND: CLOSE/OPEN
ED28	1CB01 CONTROL POWER FEED RANGE-COND: NORMAL/RESERVE
ED29	LINE 9922 DISPATCHING DISCONNECT RANGE-COND: OFF/ON
ED30	LINE 2224 DISPATCHING DISCONNECT RANGE-COND: OFF/ON
ED31	LINE 2219 DISPATCHING DISCONNECT RANGE-COND: OFF/ON
ED32	LINE 2221 DISPATCHING DISCONNECT RANGE-COND: OFF/ON

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
ED33	LINE 2223 DISPATCHING DISCONNECT RANGE-COND: OFF/ON
ED34	LINE 2218 DISPATCHING DISCONNECT RANGE-COND: OFF/ON
ED35	SYS AUX XFRMR LOCKOUT RELAY RANGE-COND: NORMAL/RESET
ED36	BUS 141 LOCKOUT RELAY RANGE-COND: NORMAL/RESET
ED37	MCC 1371 FEED TO INVERTER 111 RANGE-COND: CLOSE/OPEN
ED38	MCC 1381A FEED TO INVERTER 112 RANGE-COND: CLOSE/OPEN
ED39	MCC 1391 FEED TO INVERTER 113 RANGE-COND: CLOSE/OPEN
ED40	MCC 1331A FEED TO INVERTER 114 RANGE-COND: CLOSE/OPEN
ED41	UNIT 2 SUPPLY TO BATT CHARGER 011 RANGE-COND: CLOSE/OPEN
ED42	SWITCHYARD LINE 2219 (NORTHBROOK) LOAD RANGE - COND: 0-100%
ED43	GRID FREQUENCY OSCILATION RANGE - COND: -0.03 TO 0.03 Hz
ED44	GRID BASE FREQUENCY REMOTE FUNCTION RANGE - COND: -3 TO 3 Hz
ED45	SAT WATER SPRAY RELAY RESET RANGE - COND: NORMAL/RESET
ED46	UAT WATER SPRAY RELAY RESET RANGE - COND: NORMAL/RESET

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
EG01	DG 1-A LOCAL/REMOTE CONTROL SWITCH RANGE-COND: LOCAL/REMOTE
EG02	DG 1-B LOCAL/REMOTE CONTROL SWITCH RANGE-COND: LOCAL/REMOTE
EG03	DG 0 LOCAL/REMOTE CONTROL SWITCH RANGE-COND: LOCAL/REMOTE
EG04	DG 1-A LOCAL START AIR VALVE RANGE-COND: CLOSE/OPEN
EG05	DG 1-B LOCAL START AIR VALVE RANGE-COND: CLOSE/OPEN
EG06	DG 0 LOCAL START AIR VALVE RANGE-COND: CLOSE/OPEN
EG07	DG 1-A BREAKER 1483 LOCK-OUT RELAY RANGE-COND: NORMAL/RESET
EG08	DG 1-B BREAKER 1493 LOCK-OUT RELAY RANGE-COND: NORMAL/RESET
EG09	DG 0 BREAKER 1473 LOCK-OUT RELAY RANGE-COND: NORMAL/RESET
EG10	MAIN GEN DISCONNECT RANGE-COND: CLOSE/OPEN
EG11	MAIN TRANS DISCONNECT RANGE-COND: CLOSE/OPEN
EG12	DG 1-A LOCAL OPERATION STOP PUSHBUTTON RANGE-COND: NORMAL/STOP
EG13	DG 1-B LOCAL OPERATION STOP PUSHBUTTON RANGE-COND: NORMAL/STOP
EG14	DG "0" LOCAL OPERATION STOP PUSHBUTTON RANGE-COND: NORMAL/STOP
EG15	DG 1-A LOCAL SPEED CONTROL RANGE-COND: RAISE/NORM/LWR
EG16	DG 1-B LOCAL SPEED CONTROL RANGE-COND: RAISE/NORMA/LWR

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
EG17	DG "O" LOCAL SPEED CONTROL RANGE-COND: RAISE/NORM/LWR
EG18	DG 1-A EMERGENCY TRIP RANGE-COND: NORMAL/TRIP
EG19	DG 1-B EMERGENCY TRIP RANGE-COND: NORMAL/STOP
EG20	DG "O" EMERGENCY TRIP RANGE-COND: NORMAL/STOP
EG21	DG 1-A EMERGENCY TO NORMAL RESET RANGE-COND: NORMAL/RESET
EG22	DG 1-B EMERGENCY TO NORMAL RESET RANGE-COND: NORMAL/RESET
EG23	DG "O" EMERGENCY TO NORMAL RESET RANGE-COND: NORMAL/RESET
EG24	MAIN GEN F.ELD BREAKER (41-M) RANGE-COND: NORMAL/TRIP
EG25	DG 1-A GOVERNOR DROOP RANGE-COND: 0-100%
EG26	DG 1-B GOVERNOR DROOP RANGE-COND: 0-100%
EG27	DG "O" GOVERNOR DROOP RANGE-COND: 0-100%
EG28	DG 1-A LOAD LIMIT RANGE-COND: 0-100%
FG29	DG 1-B LOAD LIMIT RANGE-COND: 0-100%
EG30	DG "O" LOAD LIMIT RANGE-COND: 0-100%
EG31	DG 1-A FIELD FLASHING RANGE-COND: CLOSE/OPEN
EG32	DG 1-B FIELD FLASHING RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
EG33	DG "O" FIELD FLASHING RANGE-COND: CLOSE/OPEN
EG34	DG 1-A PARALLEL RANGE-COND: UNIT/PARALLEL
EG35	DG 1-B PARALLEL RANGE-COND: UNIT/PARALLEL
EG36	DG "O" PARALLEL RANGE-COND: UNIT/PARALLEL
EG37	DG 1-A REVERSE POWER SET POINT RANGE-COND: -200KW - +200KW
EG38	DG 1-B REVERSE POWER SET POINT RANGE-COND: -200KW - +200KW
EG39	DG "O" REVERSE POWER SET POINT RANGE-COND: -200KW - +200KW
EG40	MAIN GEN REVERSE POWER SET POINT RANGE-COND: -100 - +100MW
EG41	MAIN GEN REVERSE POWER TIME DELAY RANGE-COND: 0-300 SEC
EG42	MAIN GEN LOCK-OUT RELAY RANGE-COND: NORMAL/RESET
EG43	DG 1-A OUTPUT BREAKER RANGE-COND: NORMAL/TRIP
EG44	DG 1-B OUTPUT BREAKER RANGE-COND: NORMAL/TRIP
EG45	DG O OUTPUT BREAKER RANGE-COND: NORMAL/TRIP
EG46	DG 1-A LOCAL START RANGE-COND: NORMAL/START
EG47	DG 1-B LOCAL START RANGE-COND: NORMAL/START
EG48	DG O LOCAL START RANGE-COND: NORMAL/START

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
EG49	LOCAL TRANSFER SWITCH 43 DG 1-A RANGE-COND: MCB/LOCAL
EG50	LOCAL TRANSFER SWITCH 43 DG 1-B RANGE-COND: MCB/LOCAL
EG51	LOCAL TRANSFER SWITCH 43 DG "0" RANGE-COND: MCB/LOCAL
EG52	DG 1-A INCOMPLETE SEQUENCE RESET. RANGE-COND: NORMAL/RESET
EG53	DG 1-B INCOMPLETE SEQUENCE RESET. RANGE-COND: NORMAL/RESET
EG54	DG "0" INCOMPLETE SEQUENCE RESET. RANGE-COND: NORMAL/RESET
EG55	DG 1-A LOCAL VOLTAGE ADJUST RANGE-COND: RAIS/NORMAL/LOWER
EG56	DG 1-B LOCAL VOLTAGE ADJUST RANGE-COND: RAIS/NORMAL/LOWER
EG57	DG "0" LOCAL VOLTAGE ADJUST RANGE-COND: RAIS/NORMAL/LOWER
EG58	AUTO START FAILURE, LIFTED LEAD ON DG 0 4EMX RELAY RANGE-COND: NORMAL/LIFTED
EG59	AUTO START FAILURE, LIFTED LEAD ON DG 1A 4EMX RELAY RANGE-COND: NORMAL/LIFTED
EG60	AUTO START FAILURE, LIFTED LEAD ON DG 1B 4EMX RELAY RANGE-COND: NORMAL/LIFTED
EG61	DG 1A LOCAL PANEL ANNUNCIATOR RESET RANGE-COND: NORMAL/RESET
EG62	DG 1B LOCAL PANEL ANNUNCIATOR RESET RANGE-COND: NORMAL/RESET
EG63	DG 0 LOCAL PANEL ANNUNCIATOR RESET RANGE-COND: NORMAL/RESET

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
EG64	MAIN TRANSFORMER WATER SPRAY RELAY RESET RANGE-COND: NORMAL/RESET
EG65	MAIN TRANSFORMER 1E COOLING SYSTEM NORMAL BKR CLOSE DEVICE RANGE-COND: NORMAL/CLOSE
EG66	MAIN TRANSFORMER 1E COOLING SYSTEM RESERVE BKR CLOSE DEVICE RANGE-COND: NORMAL/CLOSE
EG67	MAIN TRANSFORMER 1W COOLING SYSTEM NORMAL BKR CLOSE DEVICE RANGE-COND: NORMAL/CLOSE
EG68	MAIN TRANSFORMER 1W COOLING SYSTEM RESERVE BKR CLOSE DEVICE RANGE-COND: NORMAL/CLOSE

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
FP01	MAIN TRANSFOR DELUGE SYSTEM RESET RANGE-COND: NORMAL/RESET
FP02	SYSTEM AUXILIARY TRANSFORMER DELUGE SYSTEM RESET RANGE-COND: NORMAL/RESET
FP04	DIESEL DRIVEN FIRE PUMP OB LOCAL HANDSWITCH RANGE-COND: TEST/AUTO/OFF
FP05	MOTOR DRIVEN FIRE PUMP OA LOCAL HANDSWITCH RANGE-COND: TEST/AUTO/OFF

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
FW001	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129A RANGE-COND: AUTO/CLOSE
FW002	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129B RANGE-COND: AUTO/CLOSE
FW003	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129C RANGE-COND: AUTO/CLOSE
FW004	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129D RANGE-COND: AUTO/CLOSE
FW005	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129E RANGE-COND: AUTO/CLOSE
FW006	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129F RANGE-COND: AUTO/CLOSE
FW007	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129G RANGE-COND: AUTO/CLOSE
FW008	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129H RANGE-COND: AUTO/CLOSE
FW009	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129J RANGE-COND: AUTO/CLOSE
FW010	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129K RANGE-COND: AUTO/CLOSE
FW011	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129L RANGE-COND: AUTO/CLOSE
FW012	CND HTWL STM DUMP SPRAY CNT VLV, 1FCV-CD129M RANGE-COND: AUTO/CLOSE
FW013	BSTR PMP RECIRC FLOW CNTL VLV, 1FCV-CD23C RANGE-COND: AUTO/CLOSE
FW014	CONDENSATE PUMP 1A INLET ISO VLV, 1CD0050 RANGE-COND: 0-100%
FW015	CONDENSATE PUMP 1B INLET ISO VLV, 1CD0051 RANGE-COND: 0-100%
FW016	CONDENSATE PUMP 1C INLET ISO VLV, 1CD0052 RANGE-COND: 0-100%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
FW017	CONDENSATE PUMP 1D ISO VLV, 1CD0053 RANGE-COND: 0-100%
FW018	CONDENSATE PUMP 1A OUTLET ISO VLV, 1CD0001 RANGE-COND: CLOSE/OPEN
FW019	CONDENSATE PUMP 1B OUTLET ISO VLV, 1CD0002 RANGE-COND: CLOSE/OPEN
FW020	CONDENSATE PUMP 1C OUTLET ISO VLV, 1CD0003 RANGE-COND: CLOSE/OPEN
FW021	CONDENSATE PUMP 1D OUTLET ISO VLV, 1CD0004 RANGE-COND: CLOSE/OPEN
FW022	SJAE CNDSR 1A COND INLET ISO VLV, 1CD0011 RANGE-COND: CLOSE/OPEN
FW023	SJAE CNDSR 1B COND INLET ISO VLV, 1CD0009 RANGE-COND: CLOSE/OPEN
FW024	GLAND STEAM CNDSR 1A COND OUTLET ISO VLV, 1CD0012 RANGE-COND: CLOSE/OPEN
FW025	GLAND STEAM CNDSR 1B COND OUTLET ISO VLV, 1CD0010 RANGE-COND: CLOSE/OPEN
FW026	SJAE/GLAND CNDSR CONDENSATE BYPASS VLV, 1CD0017 RANGE-COND: 0-100%
FW027	COND BSTR PMP 1A INLET ISO VLV, 1CD0020 RANGE-COND: 0-100%
FW028	COND BSTR PMP 1B INLET ISO VLV, 1CD0021 RANGE-COND: 0-100%
FW029	COND BSTR PMP 1C INLET ISO VLV, 1CD0022 RANGE-COND: 0-100%
FW030	COND BSTR PMP 1D INLET ISO VLV, 1CD0023 RANGE-COND: 0-100%
FW031	COND BSTR PMP 1A OUTLET ISO VLV, 1CD0039 RANGE-COND: 0-100%
FW032	COND BSTR PMP 1B OUTLET ISO VLV, 1CD0040 RANGE-COND: 0-100%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
FW033	COND BSTR PMP 1C OUTLET ISO VLV, 1CD0041 RANGE-COND: 0-100%
FW034	COND BSTR PMP 1D OUTLET ISO VLV, 1CD0042 RANGE-COND: 0-100%
FW035	MAIN CNDSR EMERG OVR FLOW CNTRL ISO VLV, 1CD0037 RANGE-COND: CLOSE/OPEN
FW036	MAIN CNDSR NORM OVR FLOW CNTRL ISO VLV, 1CD0024 RANGE-COND: CLOSE/OPEN
FW037	MAIN CNDSR OVR FLOW CNTRL BYPASS VLV, 1CD0026 RANGE-COND: 0-100%
FW038	MAIN FW PMP 1A INLET ISO VLV, 1CD0047 RANGE-COND: 0-100%
FW039	MAIN FW PMP 1B INLET ISO VLV, 1CD0049 RANGE-COND: 0-100%
FW040	MAIN FW PMP 1C INLET ISO VLV, 1CD0048 RANGE-COND: 0-100%
FW041	FW PMP 1A RECIRC ISO VLV, 1FW0028 RANGE-COND: CLOSE/OPEN
FW042	FW PMP 1B RECIRC ISO VLV, 1FW0030 RANGE-COND: CLOSE/OPEN
FW043	FW PMP 1C RECIRC ISO VLV, 1FW0029 RANGE-COND: CLOSE/OPEN
FW044	MAIN FW TO S/G 1A LVL CNTRL ISO VLV, 1FW0019 RANGE-COND: 0-100%
FW045	MAIN FW TO S/G 1A VLV CNTRL BYPASS ISO VLV, 1FW0173 RANGE-COND: 0-100%
FW046	MAIN FW TO S/G 1B LVL CNTRL ISO VLV, 1FW0017 RANGE-COND: 0-100%
FW047	MAIN FW TO S/G 1B VLV CNTRL BYPASS ISO VLV, 1FW0171 RANGE-COND: 0-100%
FW048	MAIN FW TO S/G 1C LVL CNTRL ISO VLV, 1FW0018 RANGE-COND: 0-100%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
FW049	MAIN FW TO S/G 1C VLV CNTRL BYPASS ISO VLV, 1FW0172 RANGE-COND: 0-100%
FW050	MAIN FW TO S/G 1D LVL CNTRL ISO VLV, 1FW0020 RANGE-COND: 0-100%
FW051	MAIN FW TO S/G 1D VLV CNTRL BYPASS ISO VLV, 1FW0174 RANGE-COND: 0-100%
FW052	AUX FW PUMP 1B MOTOR POWER 1FW005 RANGE-COND: RACK IN/OUT
FW053	AUX FW PUMP 1C MOTOR POWER 1FW006 RANGE-COND: RACK IN/OUT
FW054	AUX FW PMP 1A DISCH ISO VLV, 1FW0034 RANGE-COND: 0-100%
FW055	AUX FW PMP DISH HDR CROSS TIE ISO VLV, 1FW0035/0037 RANGE-COND: 0-100%
FW056	AUX FW PMP 1B DISCH ISO VLV, 1FW0038/0042 RANGE-COND: 0-100%
FW057	AUX FW PMP 1C DISCH ISO VLV, 1FW0036 RANGE-COND: 0-100%
FW058	AUX FW PMP 1A RECIRC ISO VLV, 1FW0041 RANGE-COND: 0-100%
FW059	AUX FW PMP 1B RECIRC ISO VLV, 1FW0040 RANGE-COND: 0-100%
FW060	AUX FW PMP 1C RECIRC ISO VLV, 1FW0039 RANGE-COND: 0-100%
FW061	COND STORAGE TANK DISCH ISO VLV, OCD0101 RANGE-COND: CLOSE/OPEN
FW062	COND MAKE UP PMP SUCTION ISO VLV, OCD0102 RANGE-COND: CLOSE/OPEN
FW063	COND MAKE UP PMP DIS TO LAKE ISO VLV, 1CD0383 RANGE-COND: 0-100%
FW064	COND MAKE UP PMP DIS TO MC MAKE UP ISO VLV, 1CD0385 RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
FW065	MAIN CNDSR EMERG MAKE UP CNTRL ISO VLV, 1CD0028 RANGE-COND: CLOSE/OPEN
FW066	MAIN CNDSR NORM MAKE UP CNTRL ISO VLV, 1CD0030 RANGE-COND: CLOSE/OPEN
FW067	MAIN CNDSR NORM MAKE UP CNTRL BYPASS VLV, 1CD0032 RANGE-COND: 0-100%
FW068	AUX FW PMP RECIRC TO CSTK ISO VLV, 1FW0170 RANGE-COND: CLOSE/OPEN
FW069	DEMINERALIZER M/U TO CST ISO VLV, 0MU0293 RANGE-COND: 0-100%
FW070	CST DRAIN ISO VLV, 0CD0292 RANGE-COND: 0-100%
FW071	U-1 CST TO U-2 CST CROSS TIE ISO VLV, 0FW0169 RANGE-COND: CLOSE/OPEN
FW072	HTR DRN PMP 1A SUCT ISO VLV, 1HD0059 RANGE-COND: 0-100%
FW073	HTR DRN PMP 1B SUCT ISO VLV, 1HD0060 RANGE-COND: 0-100%
FW074	HTR DRN PMP 1C SUCT ISO VLV, 1HD0061 RANGE-COND: 0-100%
FW075	HTR DRN PMP DIS HDR TO HTR 15A ISO VLV, 1HD0069 RANGE-COND: 0-100%
FW076	HTR DRN PMP DIS HDR TO HTR 15B ISO VLV, 1HD0071 RANGE-COND: 0-100%
FW077	HTR DRN PMP DIS HDR TO HTR 15C ISO VLV, 1HD0073 RANGE-COND: 0-100%
FW078	HTR DRN PMP 1A POWER 1HD008 RANGE-COND: RACK IN/OUT
FW079	HTR DRN PMP 1B POWER 1HD009 RANGE-COND: RACK IN/OUT
FW080	HTR DRN PMP 1C POWER 1HD010 RANGE-COND: RACK IN/OUT

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
FW081	CND BSTR PMP M/U TO HTR DRN TNK CNT VLV, 1LCV-CD99 RANGE-COND: AUTO/OPEN
FW082	CND BSTR PMP M/U TO HTR DRN TNK ISO VLV, 1CD0054 RANGE-COND: CLOSE/OPEN
FW083	MFPT 1B HP MS INLET ISO VLV, 1MS0012 RANGE-COND: 0-100%
FW084	MFPT 1C HP MS INLET ISO VLV, 1MS0013 RANGE-COND: 0-100%
FW085	MFPT 1B LP MS INLET ISO VLV, 1MS0003 RANGE-COND: 0-100%
FW086	MFPT 1B LP MS INLET ISO VLV, 1MS0002 RANGE-COND: 0-100%
FW087	MFPT 1B EXH VLV, 1EHV-FW1B RANGE-COND: 0-100%
FW088	MFPT 1C EXH VLV, 1EHV-FW1C RANGE-COND: 0-100%
FW089	AUX FW PUMP 1A TURBINE MS STOP VLV, 1SV-AFW RANGE-COND: 0-100%
FW090	MFPT 1B TURNING GEAR MOTOR, 1FW002D RANGE-COND: AUTO/DISENGAGE
FW091	MFPT 1B OIL RSRVR M/U LINE ISO VLV, 1TD0034 RANGE-COND: 0-100%
FW092	MFPT 1B OIL RSRVR DRAIN LINE ISO VLV, 1TD0025 RANGE-COND: 0-100%
FW093	MFPT 1B OVERSPEED AND LOW VAC TRIP RESET RANGE-COND: NORMAL/RESET
FW094	MFPT 1C TURNING GEAR MOTOR, 1FW003D RANGE-COND: AUTO/DISENGGE
FW095	MFPT 1C OIL RSRVR M/U LINE ISO VLV, 1T00028 RANGE-COND: 0-100%
FW096	MFPT 1C OIL RSRVR DRAIN LINE ISO VLV, 1T00039 RANGE-COND: 0-100%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
FW097	MFPT 1C OVERSPEED AND LOW VAC TRIP RESET RANGE-COND: NORMAL/RESET
FW098	LCC BFPT 1B S/U SIG OVERRIDE SWITCH 1 RANGE-COND: OVROFF/ENABLE
FW099	LCC BFPT 1B S/U SIG OVERRIDE SWITCH 2 RANGE-COND: DOWN/HOLD/UP
FW100	LCC BFPT 1B FW SIG OVERRIDE SWITCH RANGE-COND: OVROFF/ENABLE
FW101	LCC BFPT 1B FW SIG OVERRIDE POS KNOB RANGE-COND: 0-100%
FW102	LCC BFPT 1B SIG LOCAL PNL RESET RANGE-COND: NORMAL/RESET
FW103	LCC BFPT 1C S/U SIG OVERRIDE SWITCH 1 RANGE-COND: OVROFF/ENABLE
FW104	LCC BFPT 1C S/U SIGN OVERRIDE SWITCH 2 RANGE-COND: DOWN/HOLD/UP
FW105	LCC BFPT 1C FW SIG OVERRIDE SWITCH RANGE-COND: OVROFF/ENABLE
FW106	LCC BFPT 1C FW SIG OVERRIDE POS KNOB RANGE-COND: 0-100%
FW107	LCC BFPT 1C SIG LOCAL PNL RESET RANGE-COND: NORMAL/RESET
FW108	LCC BFPT 1B IA SUPPLY TO I/P A VLV, 1FW-IA3A RANGE-COND: 0-100%
FW109	LCC BFPT 1B IA SUPPLY TO I/P B VLV, 1FW-IA4A RANGE-COND: 0-100%
FW110	LCC BFPT 1B MANUAL AIR SIG CNTRL VLV SET POINT RANGE-COND: 0-15 PSIG
FW111	LCC BFPT 1B LATCH PERMISSIVE AIR PRESSURE SET POINT RANG-COND: 0-15 PSIG
FW112	LCC BFPT 1B PNEU PNL RESET RANGE-COND: NORMAL/RESET

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
FW113	LCC BFPT 1C IA SUPPLY TO I/P A VLV, 1FW-IA3B RANGE-COND: 0-100%
FW114	LCC BFPT 1C IA SUPPLY TO I/P B VLV, 1FW-IA4B RANGE-COND: 0-100%
FW115	LCC BFPT 1C MANUAL AIR SIG CNTRL VLV SET POINT RANGE-COND: 0-15 PSIG
FW116	LCC BFPT 1C LATCH PERMISSIVE AIR PRESSURE SET POINT RANGE-COND: 0-15 PSIG
FW117	LCC BFPT 1C PNEU PNL RESET RANGE-COND: NORMAL/RESET
FW118	AUTO START FAILURE, LIFTED LEAD ON AFW PUMP 1B CS/CTO CONTACT RANGE-COND: NORMAL/LIFTED
FW119	AUTO START FAILURE, LIFTED LEAD ON AFW PUMP 1C CS/CTC CONTACT RANGE-COND: NORMAL/LIFTED
FW124	SJAE 1A CONDENSER VENT ISO VLV, 1TD0064 RANGE-COND: 0-100%
FW125	SJAE 1B CONDENSER VENT ISO VLV, 1TD0071 RANGE-COND: 0-100%
FW126	PUMP SEAL WTR FILTER ISO VLVS, 1CD0123/0125/0127 RANGE-COND: 0-100%
FW127	RESET TDAFW PP OVERSPEED TRIP VLV, 1SV-AFW RANGE-COND: NORMAL/RESET
FW128	STM JET AIR EJECTOR 1A OPERATION RANGE-COND: IN/OUT SERVICE
FW129	STM JET AIR EJECTOR 1B OPERATOR RANGE-COND: IN/OUT SERVICE
FW130	AUXILIARY FW PUMP OIL TEST SWITCH RANGE-COND: STOP/AUTO/START

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
FW131	AUXILIARY FW PUMP OIL TEST SWITCH RANGE-COND: STOP/AUTO/START
FW132	AUXILIARY FW PUMP OIL TEST SWITCH RANGE-COND: STOP/AUTO/START
FW133	SG 1A SUP V 1MOV-FW0054 LOCAL MANUAL CONTROL RANGE-COND: CLOSE/NORM/OPEN
FW134	SG 1B SUP V 1MOV-FW0050 LOCAL MANUAL CONTROL RANGE-COND: CLOSE/NORM/OPEN
FW135	SG 1C SUP V 1MOV-FW0052 LOCAL MANUAL CONTROL RANGE-COND: CLOSE/NORM/OPEN
FW136	SG 1D SUP V 1MOV-FW0056 LOCAL MANUAL CONTROL RANGE-COND: CLOSE/NORM/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
HV01	ATMOSPHERIC TEMPERATURE RANGE-COND: 0-100 DEGF
HV02	AUX BUILDING AIR SUPPLY FAN EXHAUST DAMPER RANGE-COND: 0-100%
HV03	LAKE MICHIGAN TEMPERATURE RANGE-COND: 32-80 DEGF
HV04	WIND SPEED RANGE-COND: 0-1[illegible] MPH
HV05	WIND DIRECTION RANGE-COND: 0-360 DEG

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
IA01	SER AIR UNIT 1/2 ISO VLV'S OSA0023, OSA0024, OSA0140 RANGE-COND: CLOSE/OPEN
IA02	IA / SA CROSSTIE VLV 1IA0049 RANGE-COND: CLOSE/OPEN
IA03	IA / SA CROSSTIE VLV'S 2SA0143, 2IA0049 RANGE-COND: CLOSE/OPEN
IA04	INST AIR UNIT 1/2 IOS VLV'S OIA0003, OIA0021, OIA0026 RANGE-COND: CLOSE/OPEN
IA05	IA TO PENETRATION PRESS SYSTEM ISO VLV 1IA0055 RANGE-COND: CLOSE/OPEN
IA06	EMER POWER TO COMPRESSOR 1A RANGE-COND: RACK IN/OUT
IA07	EMER POWER TO COMPRESSOR OB RANGE-COND: RACK IN/OUT
IA08	EMER POWER TO COMPRESSOR 2A RANGE-COND: RACK IN/OUT
IA09	IA AUX. COMPR. ISOL. VLV RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
MS01	SG 1A PORV ISOLATION 1MS-0070 RANGE-COND: CLOSE/OPEN
MS02	SG 1B PORV ISOLATION 1MS-0073 RANGE-COND: CLOSE/OPEN
MS03	SG 1C PORV ISOLATION 1MS-0071 RANGE-COND: CLOSE/OPEN
MS04	SG 1D PORV ISOLATION 1MS-0072 RANGE-COND: CLOSE/OPEN
MS05	STM DUMP 1PCV-MS21A ISOL 1MS-0100 RANGE-COND: CLOSE/OPEN
MS06	STM DUMP 1PCV-MS21B ISOL 1MS-0102 RANGE-COND: CLOSE/OPEN
MS07	STM DUMP 1PCV-MS21C ISOL 1MS-0104 RANGE-COND: CLOSE/OPEN
MS08	STM DUMP 1PCV-MS21D ISOL 1MS-0106 RANGE-COND: CLOSE/OPEN
MS09	STM DUMP 1PCV-MS21E ISOL 1MS-0108 RANGE-COND: CLOSE/OPEN
MS10	STM DUMP 1PCV-MS21F ISOL 1MS-0110 RANGE-COND: CLOSE/OPEN
MS11	STM DUMP 1PCV-MS21G ISOL 1MS-0112 RANGE-COND: CLOSE/OPEN
MS12	STM DUMP 1PCV-MS21H ISOL 1MS-0114 RANGE-COND: CLOSE/OPEN
MS13	STM DUMP 1PCV-MS21J ISOL 1MS-0116 RANGE-COND: CLOSE/OPEN
MS14	STM DUMP 1PCV-MS21K ISOL 1MS-0118 RANGE-COND: CLOSE/OPEN
MS15	STM DUMP 1PCV-MS21L ISOL 1MS-0120 RANGE-COND: CLOSE/OPEN
MS16	STM DUMP 1PCV-MS21M ISOL 1MS-0122 RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
MS17	HTG SYS HX OA AUX STM SUP ISOL OAX-0011 RANGE-COND: CLOSE/OPEN
MS18	HTG SYS HX OB AUX STM SUP ISOL OAX-0012 RANGE-COND: CLOSE/OPEN
MS19	AUX STM SUP TO GS HDR ISOL 1AX-0350 RANGE-COND: CLOSE/OPEN
MS20	AUX STM BOILER USAGE RANGE-COND: OFF/ON
MS21	SG 1A MSIV HYDRAULIC SYS HAND VLV (R8) RANGE-COND: CLOSE/OPEN
MS22	SG 1B MSIV HYDRAULIC SYS HAND VLV (R8) RANGE-COND: CLOSE/OPEN
MS23	SG 1C MSIV HYDRAULIC SYS HAND VLV (R8) RANGE-COND: CLOSE/OPEN
MS24	SG 1D MSIV HYDRAULIC SYS HAND VLV (R8) RANGE-COND: CLOSE/OPEN
MS25	SG 1A MSIV HYDRAULIC CYLINDER VLV RANGE-COND: CLOSE/OPEN
MS26	SG 1B MSIV HYDRAULIC CYLINDER VLV RANGE-COND: CLOSE/OPEN
MS27	SG 1C MSIV HYDRAULIC CYLINDER VLV RANGE-COND: CLOSE/OPEN
MS28	SG 1D MSIV HYDRAULIC CYLINDER VLV RANGE-COND: CLOSE/OPEN
MS29	SG 1A MSIV HYDRAULIC SYS N2 PRECHARGE VLV (N) RANGE-COND: CLOSE/OPEN
MS30	SG 1B MSIV HYDRAULIC SYS N2 PRECHARGE VLV (N) RANGE-COND: CLOSE/OPEN
MS31	SG 1C MSIV HYDRAULIC SYS N2 PRECHARGE VLV (N) RANGE-COND: CLOSE/OPEN
MS32	SG 1D MSIV HYDRAULIC SYS N2 PRECHARGE VLV (N) RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
MS33	SG 1A MSIV HYDRAULIC SYS N2 PRECHARGE VLV (N1) RANGE-COND: CLOSE/OPEN
MS34	SG 1B MSIV HYDRAULIC SYS N2 PRECHARGE VLV (N1) RANGE-COND: CLOSE/OPEN
MS35	SG 1C MSIV HYDRAULIC SYS N2 PRECHARGE VLV (N1) RANGE-COND: CLOSE/OPEN
MS36	SG 1D MSIV HYDRAULIC SYS N2 PRECHARGE VLV (N1) RANGE-COND: CLOSE/OPEN
MS37	SG 1A & 1C MSIV HYDRAULIC CROSSTIE 1MV-MS1036 RANGE-COND: NORM/RESET
MS38	SG 1B & 1D MSIV HYDRA[illegible] CROSSTIE 1MOV-MS1035 RANGE-COND: NORM/RES[illegible]
MS39	MSIV HYDRAULIC SYSTEM N[illegible] STATUS RANGE-COND: AVAIL/VENT
MS40	MSR 1CE REHT STM SUPPLY BYPASS VLV 1MS0136 RANGE-COND: CLOSE/OPEN
MS41	MSR 1BE REHT STM SUPPLY BYPASS VLV 1MS0137 RANGE-COND: CLOSE/OPEN
MS42	MSR 1AE REHT STM SUPPLY BYPASS VLV 1MS0138 RANGE-COND: CLOSE/OPEN
MS43	MSR 1CW REHT STM SUPPLY BYPASS VLV 1MS0139 RANGE-COND: CLOSE/OPEN
MS44	MSR 1BW REHT STM SUPPLY BYPASS VLV 1MS0140 RANGE-COND: CLOSE/OPEN
MS45	MSR 1AW REHT STM SUPPLY BYPASS VLV 1MS0141 RANGE-COND: CLOSE/OPEN
MS46	MSR 1CW REHT STM SUPPLY ISOL VLV 1MS0124 RANGE-COND: CLOSE/OPEN
MS47	MSR 1BW REHT STM SUPPLY ISOL VLV 1MS0126 RANGE-COND: CLOSE/OPEN
MS48	MSR 1AW REHT STM SUPPLY ISOL VLV 1MS0128 RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
MS49	MSR 1AE REHT STM SUPPLY ISOL VLV 1MS0130 RANGE-COND: CLOSE/OPEN
MS50	MSR 1BE REHT STM SUPPLY ISOL VLV 1MS0132 RANGE-COND: CLOSE/OPEN
MS51	MSR 1CE REHT STM SUPPLY ISOL VLV 1MS0134 RANGE-COND: CLOSE/OPEN
MS52	MSR SEALING STM VLV 1MS0435 RANGE-COND: CLOSE/OPEN
MS53	MSR SEALING STM VLV 1MS0436 RANGE-COND: CLOSE/OPEN
MS54	MSR SEALING STM VLV 1MS0437 RANGE-COND: CLOSE/OPEN
MS55	MSR SEALING STM VLV 1MS0438 RANGE-COND: CLOSE/OPEN
MS56	MSR SEALING STM VLV 1MS0439 RANGE-COND: CLOSE/OPEN
MS57	MSR SEALING STM VLV 1MS0440 RANGE-COND: CLOSE/OPEN
MS58	MSR SEALING STM VLV 1MS0441 RANGE-COND: CLOSE/OPEN
MS59	MSR SEALING STM VLV 1MS0442 RANGE-COND: CLOSE/OPEN
MS60	MSR SEALING STM VLV 1MS0443 RANGE-COND: CLOSE/OPEN
MS61	MSR SEALING STM VLV 1MS0444 RANGE-COND: CLOSE/OPEN
MS62	UNIT 2 7TH STG EXTR PRESSURE AVAILABILITY RANGE-COND: NORM/OFF
MS63	GLAND STM CNDR FAN DISCH VLV 1OG0053 RANGE-COND: 0-100%
MS64	GLAND STM CNDR FAN DISCH VLV 1OG0054 RANGE-COND: 0-100%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
MS65	GLAND STM CNDR FAN DISCH VLV 10G0057 RANGE-COND: 0-100%
MS66	GLAND STM CNDR FAN DISCH VLV 10G0058 RANGE-COND: 0-100%
MS67	HTG STM BLR MAKEUP PUMP OAX003 RANGE-COND: OFF/ON
MS68	HTG STM BLR MAKEUP PUMP OAX004 RANGE-COND: OFF/ON
MS69	HTG STM BLR FEEDWATER PUMP OAX005 RANGE-COND: OFF/ON
MS70	HTG STM BLR FEEDWATER PUMP OAX006 RANGE-COND: OFF/ON
MS71	FAIL HI STM FLO SI AUTO CLOSE LOOP A MSIV BR-2 CONTACT RANGE-COND: NORMAL/LIFTED
MS72	FAIL HI STM FLO SI AUTO CLOSE LOOP B MSIV BR-2 CONTACT RANGE-COND: NORMAL/LIFTED
MS73	FAIL HI STM FLO SI AUTO CLOSE LOOP C MSIV BR-2 CONTACT RANGE-COND: NORMAL/LIFTED
MS74	FAIL HI STM FLO SI AUTO CLOSE LOOP D MSIV BR-2 CONTACT RANGE-COND: NORMAL/LIFTED
MS75	MSR VENT VALVE TO CONDENSER 1ES0086 RANGE-COND: CLOSE/OPEN
MS76	MSR VENT VALVE TO CONDENSER 1ES0088 RANGE-COND: CLOSE/OPEN
MS77	MSR VENT VALVE TO CONDENSER 1ES0090 RANGE-COND: CLOSE/OPEN
MS78	MSR VENT VALVE TO CONDENSER 1ES0092 RANGE-COND: CLOSE/OPEN
MS79	MSR VENT VALVE TO CONDENSER 1ES0094 RANGE-COND: CLOSE/OPEN
MS80	MSR VENT VALVE TO CONDENSER 1ES0096 RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
NI01	SOURCE RANGE HIGH SHUTDOWN FLUX (CH 31) RANGE-COND: 10E0-10E6 CPS
NI02	SOURCE RANGE HIGH SHUTDOWN FLUX (CH 32) RANGE-COND: 10E0-10E6 CPS
NI03	DETECTOR BOT CORE LIMIT RANGE-COND: 0-160 INCHES
NI04	DETECTOR TOP CORE LIMIT RANGE-COND: 0-160 INCHES
NI05	POWER RANGE DETECTOR COARSE GAIN MULTIPLIER RANGE-COND: 0-5 VOLTS
NI06	DETECTOR A EMERGENCY/STORAGE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI07	DETECTOR A EMERGENCY/STORAGE TOP LIMIT RANGE-COND: 0-2000 INCHES
NI08	DETECTOR A CALIBRATE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI09	DETECTOR A CALIBRATE TOP LIMIT RANGE-COND: 0-2000 INCHES
NI10	DETECTOR B EMERGENCY/STORAGE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI11	DETECTOR B EMERGENCY/STORAGE TOP LIMITY RANGE-COND: 0-2000 INCHES
NI12	DETECTOR B CALIBRATE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI13	DETECTOR B CALIBRATE TOP LIMIT RANGE-COND: 0-2000 INCHES
NI14	DETECTOR C EMERGENCY/STORAGE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI15	DETECTOR C EMERGENCY/STORAGE TOP LIMIT RANGE-COND: 0-2000 INCHES

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
NI16	DETECTOR C CALIBRATE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI17	DETECTOR C CALIBRATE TOP LIMIT RANGE-COND: 0-2000 INCHES
NI18	DETECTOR D EMERGENCY/STORAGE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI19	DETECTOR D EMERGENCY/STORAGE TOP LIMIT RANGE-COND: 0-2000 INCHES
NI20	DETECTOR D CALIBRATE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI21	DETECTOR D CALIBRATE TOP LIMIT RANGE-COND: 0-2000 INCHES
NI22	DETECTOR E EMERGENCY/STORAGE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI23	DETECTOR E EMERGENCY/STORAGE TOP LIMIT RANGE-COND: 0-2000 INCHES
NI24	DETECTOR E CALIBRATE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI25	DETECTOR E CALIBRATE TOP LIMIT RANGE-COND: 0-2000 INCHES
NI26	DETECTOR F EMERGENCY/STORAGE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI27	DETECTOR F EMERGENCY/STORAGE TOP LIMIT RANGE-COND: 0-2000 INCHES
NI28	DETECTOR F CALIBRATE BOTTOM LIMIT RANGE-COND: 0-2000 INCHES
NI29	DETECTOR F CALIBRATE TOP LIMIT RANGE-COND: 0-2000 INCHES

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RD01	BANK OVERLAP THUMBWHEEL S1 SETPOINT RANGE-COND: 0-999 STEPS
RD02	BANK OVERLAP THUMBWHEEL S2 SETPOINT RANGE-COND: 0-999 STEPS
RD03	BANK OVERLAP THUMBWHEEL S3 SETPOINT RANGE-COND: 0-999 STEPS
RD04	BANK OVERLAP THUMBWHEEL S4 SETPOINT RANGE-COND: 0-999 STEPS
RD05	BANK OVERLAP THUMBWHEEL S5 SETPOINT RANGE-COND: 0-999 STEPS
RD06	BANK OVERLAP THUMBWHEEL S6 SETPOINT RANGE-COND: 0-999 STEPS
RD07	PA CONVERTER OF CONTROL BANK A RANGE-COND: 0-235 STEPS
RD08	PA CONVERTER OF CONTROL BANK B RANGE-COND: 0-235 STEPS
RD09	PA CONVERTER OF CONTROL BANK C RANGE-COND: 0-235 STEPS
RD10	PA CONVERTER OF CONTROL BANK D RANGE-COND: 0-235 STEPS
RD11	RD MOTOR GENERATOR 1A RANGE-COND: START/NORM/STOP
RD12	RD MOTOR GENERATOR 1B RANGE-COND: START/NORM/STOP

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER TITLE, RANGE-CONDITION

R.F. NUMBER	TITLE, RANGE-CONDITION
RH01	RHR TRAIN A TO CV LETDOWN 1RH8734A RANGE-COND: CLOSE/OPEN
RH02	RHR TRAIN B TO CV LETDOWN 1RH8734B RANGE-COND: CLOSE/OPEN
RH03	RHR RETURN TO RWST ISO VALVE 1SI8735 RANGE-COND: 0-100%
RH04	RHR TRAIN A TO SI ISO V 1RH8726A RANGE-COND: CLOSE/OPEN
RH05	RHR TRAIN B TO SI ISO V 1RH8726B RANGE-COND: CLOSE/OPEN
RH06	RC LOOP A1 TO RH PUMP ISO V 1MOV-RH8701 PWR RANGE-COND: RACK IN/OUT
RH07	RC LOOP A1 TO RH PUMP ISO V 1MOV-RH8702 PWR RANGE-COND: RACK IN/OUT
RH08	RH PUMP TO RC HOT LEG A1&D3 ISO V 1MOV-RH8703 PWR RANGE-COND: RACK IN/OUT
RH09	RH PUMP TO RC HOT LEG A1&D3 ISO V 1MOV-RH9000 PWR RANGE-COND: RACK IN/OUT
RH10	RH PUMP TRAIN A TO COLD LEG ISO V 1MOV-SI8809A PWR RANGE-COND: RACK IN/OUT
RH11	RH PUMP TRAIN B TO COLD LEG ISO V 1MOV-SI8809B PWR RANGE-COND: RACK IN/OUT
RH12	RWST TO RH PUMP ISO V 1MOV-SI8812A PWR RANGE-COND: RACK IN/OUT
RH13	RWST TO RH PUMP ISO V 1MOV-SI8812B PWR RANGE-COND: RACK IN/OUT
RH14	RHR PUMP 1A POWER RANGE-COND: RACK IN/OUT
RH15	RHR PUMP 1B POWER RANGE-COND: RACK IN/OUT
RH16	SI HL ISO V 1AOV-RH9008A RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RH17	SI HL ISO V 1AOV-RH9008B RANGE-COND: CLOSE/OPEN
RH18	RH TO SI ACC TST V RH9009C RANGE-COND: CLOSE/OPEN
RH19	RH TO CL C2 TEST V 1AOV-SI8884A RANGE-COND: CLOSE/OPEN
RH20	RH TO CL B4 TEST V 1AOV-SI8884B RANGE-COND: CLOSE/OPEN
RH21	RH TO CL D3 TEST V 1AOV-SI8884C RANGE-COND: CLOSE/OPEN
RH22	RH TO CL A1 TEST V 1AOV-SI88884D RANGE-COND: CLOSE/OPEN
RH23	RH TO HLDUP TK TEST V 1AOV-SI8885A RANGE-COND: CLOSE/OPEN
RH24	RH TO HLDUP TK TEST V 1AOV-SI8885B RANGE-COND: CLOSE/OPEN
RH25	AUTO START FAILURE, LIFTED LEAD ON RH PUMP 1A CS/CTO CONTACT RANGE-COND: NORMAL/LIFTED
RH26	AUTO START FAILURE, LIFTED LEAD ON RH PUMP 1B CS/CTO CONTACT RANGE-COND: NORMAL/LIFTED
RH27	AUTO CLOSE ENABLE/DISABLE OF 1MOV-RH8701 RANGE-COND: ENABLE/DISABLE
RH28	AUTO CLOSE ENABLE/DISABLE OF 1MOV-RH8702 RANGE-COND: ENABLE/DISABLE

ZION SIMULATOR
ANSI/ANS-3.5-1985 CERTIFICATION REPORT
INITIAL REPORT, MARCH 1991

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RM01	SEQUENCER 1RJ-PR15 TIMER RANGE-COND: 1-20 SEC
RM02	POWER SUPPLY BUS 1391/1381 FOR RADIATION MONITORS RANGE-COND: NORM/OFF/ALT
RM03	POWER SUPPLY BUS 111/112 FOR RADIATION MONITORS RANGE-COND: NORM/OFF/ALT
RM04	POWER SUPPLY BUS 111 FOR RADIATION MONITORS RANGE-COND: ON/OFF
RM05	POWER SUPPLY BUS 112 FOR RADIATION MONITORS RANGE-COND: ON/OFF

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APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RP01	TRIP REACTOR TRIP BRK A RANGE-COND: NORMAL/TRIP
RP02	TIME REACTOR TRIP BRK B RANGE-COND: NORMAL/TRIP
RP03	SAFETY INJECTION TIME DELAY RANGE-COND: 0-999 MIN
RP04	CONNECT BYPASS BKR A RANGE-COND: OPEN/CLOSE
RP05	CONNECT BYPASS BKR B RANGE-COND: OPEN/CLOSE
RP06	LIFTED LEADS CLEAR P-4: TRAIN A RANGE-COND: NORMAL/LIFTED
RP07	LIFTED LEADS CLEARS P-4: TRAIN B RANGE-COND: NORMAL/LIFTED
RP08	BSTBL CNTMT PRESSURE HI CS19A RANGE-COND: NORMAL/TRIP
RP09	BSTBL CNTMT PRESSURE HI CS 20A RANGE-COND: NORMAL/TRIP
RP10	BSTBL CNTMT PRESSURE HI CS21A RANGE-COND: NORMAL/TRIP
RP11	BSTBL CNTMT PRESSURE HI CS22A RANGE-COND: NORMAL/TRIP
RP12	BSTBL CNTMT PRESSURE HI HI CS19B RANGE-COND: NORMAL/TRIP
RP13	BSTBL CNTMT PRESSURE HI HI CS20B RANGE-COND: NORMAL/TRIP
RP14	BSTBL CNTMT PRESSURE HI HI C21B RANGE-COND: NORMAL/TRIP
RP15	BSTBL CNTMT PRESSURE HI HI CS22B RANGE-COND: NORMAL/TRIP
RP16	PROTECTION SET #1 CABINET DOOR OPEN RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RP17	PROTECTION SET #2 CABINET DOOR OPEN RANGE-COND: CLOSE/OPEN
RP18	PROTECTION SET #3 CABINET DOOR OPEN RANGE-COND: CLOSE/OPEN
RP19	PROTECTION SET #4 CABINET DOOR OPEN RANGE-COND: CLOSE/OPEN
RP20	IR HI FLUX ROD STOP NC35E RANGE-COND: 1.0E-11/1.0E-3
RP21	IR HI FLUX ROD STOP NC36E RANGE-COND: 1.0E-11/1.0E-3
RP22	SR HI FLUX P-6 NC35D RANGE-COND: 1.0E-11/1.0E-3
RP23	SR HI FLUX P-6 NC36D RANGE-COND: 1.0E-11/1.0E-3
RP24	PR HI FLUX P-8 NC41N RANGE-COND: 0%/120%
RP25	PR HI FLUX P-8 NC42N RANGE-COND: 0%/120%
RP26	PR HI FLUX P-8 NC43N RANGE-COND: 0%/120%
RP27	PR HI FLUX P-8 NC44N RANGE-COND: 0%/120%
RP28	P-10 NC41M RANGE-COND: 0%/120%
RP29	P-10 NC42M RANGE-COND: 0%/120%
RP30	P-10 NC43M RANGE-COND: 0%/120%
RP31	P-10 NC44M RANGE-COND: 0%/120%
RP32	OVERPOWER ROD STOP HI FLUX NC41L RANGE-COND: 0%/120%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RP33	OVERPOWER ROD STOP HI FLUX NC43L RANGE-COND: 0%/120%
RP34	OVERPOWER ROD STOP HI FLUX NC43L RANGE-COND: 0%/120%
RP35	OVERPOWER ROD STOP HI FLUX NC44L RANGE-COND: 0%/120%
RP36	OVERPOWER ROD STOP BYPASS NC41L RANGE-COND: NORMAL/BYPASS
RP37	OVERPOWER ROD STOP BYPASS NC42L RANGE-COND: NORMAL/BYPASS
RP38	OVERPOWER ROD STOP BYPASS NC43L RANGE-COND: NORMAL/BYPASS
RP39	OVERPOWER ROD STOP BYPASS NC44L RANGE-COND: NORMAL/BYPASS
RP40	RX TRIP BRK A RACK IN/OUT RANGE-COND: RIN/ROUT
RP41	RX TRIP BRK B RACK IN/OUT RANGE-COND: RIN/ROUT
RP42	RX TRIP BYPASS A RACK IN/OUT RANGE-COND: RIN/ROUT
RP43	RX TRIP BYPASS B RACK IN/OUT RANGE-COND: RIN/ROUT
RP44	SI TEST TRAIN A RANGE-COND: NORMAL/TEST
RP45	SI TEST TRAIN B RANGE-COND: NORMAL/TEST

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RX001	RCS LO FL LP 1 FC414 RANGE-COND: NORMAL/TRIP
RX002	RCS LO FL LP 1 FC415 RANGE-COND: NORMAL/TRIP
RX003	RCS LO FL LP 1 FC416 RANGE-COND: NORMAL/TRIP
RX004	RCS LO FL LP 2 FC424 RANGE-COND: NORMAL/TRIP
RX005	RCS LO FL LP 2 FC425 RANGE-COND: NORMAL/TRIP
RX006	RCS LO FL LP 2 FC426 RANGE-COND: NORMAL/TRIP
RX007	RCS LO FL LP 3 FC434 RANGE-COND: NORMAL/TRIP
RX008	RCS LO FL LP 3 FC435 RANGE-COND: NORMAL/TRIP
RX009	RCS LO FL LP 3 FC436 RANGE-COND: NORMAL/TRIP
RX010	RCS LO FL LP 4 FC444 RANGE-COND: NORMAL/TRIP
RX011	RCS LO FL LP 4 FC445 RANGE-COND: NORMAL/TRIP
RX012	RCS LO FL LP 4 FC446 RANGE-COND: NORMAL/TRIP
RX013	RCS OT DT TC411C LP 1A TRP RANGE-COND: NORMAL/TRIP
RX014	RCS OP DT TC411G LP 1A TRP RANGE-COND: NORMAL/TRIP
RX015	LO TAVG TC412D LP 1A SF SI RANGE-COND: NORMAL/TRIP
RX016	LO TAVG TC412C LP 1A FW ISO RANGE-COND: NORMAL/TRIP

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RX017	RCS OT DT TC421C LP 1C TRIP RANGE-COND: NORMAL/TRIP
RX018	RCS OP DT TC421G LP 1C TRIP RANGE-COND: NORMAL/TRIP
RX019	LO-LO TAVG TC422D LP 1C SF SI RANGE-COND: NORMAL/TRIP
RX020	LO TAVG TC422G LP 1C FW ISO RANGE-COND: NORMAL/TRIP
RX021	RCS OT DT TC431C LP 1D TRIP RANGE-COND: NORMAL/TRIP
RX022	RCS OP DT TC431G LP 1D TRIP RANGE-COND: NORMAL/TRIP
RX023	LO-LO TAVG TC432D LP 1D SF SI RANGE-COND: NORMAL/TRIP
RX024	LO TAVG TC 432G LP 1D FW ISO RANGE-COND: NORMAL/TRIP
RX025	RCS OT DT TC441C 1B TRIP RANGE-COND: NORMAL/TRIP
RX026	RCS OP DT TC441G 1B TRIP RANGE-COND: NORMAL/TRIP
RX027	LO-LO TAVG TC442D LP 1B SF SI RANGE-COND: NORMAL/TRIP
RX028	LO TAVG TC442G LP 1B FW ISO RANGE-COND: NORMAL/TRIP
RX029	PZR HI LVL LC459A TRP RANGE-COND. NORMAL/TRIP
RX030	PZR HI LVL LC460A TRP RANGE-COND: NORMAL/TRIP
RX031	PZR HI LVL LC461A TRP RANGE-COND: NORMAL/TRIP
RX032	PZR HI PRESS PC455A TRP RANGE-COND: NORMAL/TRIP

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RX033	PZR PRESS PC455B SI BLK ENABLE RANGE-COND: NORMAL/TRIP
RX034	PZR LO PRESS PC455C TRP RANGE-COND: NORMAL/TRIP
RX035	PZR LO PRESS PC455D S.I. RANGE-COND: NORMAL/TRIP
RX036	PZR HI PRESS PC456A TRP RANGE-COND: NORMAL/TRIP
RX037	PZR PRESS PC456B SI BLK ENABLE RANGE-COND: NORMAL/TRIP
RX038	PZR LO PRESS PC456C TRP RANGE-COND: NORMAL/TRIP
RX039	PZR LO PRESS PC456D S.I. RANGE-COND: NORMAL/TRIP
RX040	PZR HI PRESS PC457A TRP RANGE-COND: NORMA/TRIP
RX041	PZR PRESS PC457B SI BLK ENABLE RANGE-COND: NORMAL/TRIP
RX042	PZR LO PRESS PC457C TRP RANGE-COND: NORMAL/TRIP
RX043	BSTBL PZR LO PRESS PC457D SI RANGE-COND: NORMAL/TRIP
RX044	PZR HI PRESS PC458A TRP RANGE-COND: NORMAL/TRIP
RX045	PZR LO PRESS PC458C TRP RANGE-COND: NORMAL/TRIP
RX046	TURBINE POWER P-13 PC506A RANGE-COND: NORMAL/TRIP
RX047	SG1 HI-HI LEVEL LC517A RANGE-COND: NORMAL/TRIP
RX048	SG1 LO-LO LVL LC517B RANGE-COND: NORMAL/TRIP

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RX049	SG1 HI-HI LEVEL LC518A RANGE-COND: NORMAL/TRIP
RX050	SG1 LO-LO LVL LC518B RANGE-COND: NORMAL/TRIP
RX051	SG1 HI-HI LEVEL LC519A RANGE-COND: NORMAL/TRIP
RX052	SG1 LO-LO LVL LC519B RANGE-COND: NORMAL/TRIP
RX053	SG2 HI-HI LEVEL LC527A RANGE-COND: NORMAL/TRIP
RX054	SG2 LO-LO LVL LC527B RANGE-COND: NORMAL/TRIP
RX055	SG2 HI-HI LEVEL LC528A RANGE-COND: NORMAL/TRIP
RX056	SG2 LO-LO LVL LC528B RANGE-COND: NORMAL/TRIP
RX057	SG2 HI-HI LEVEL LC529A RANGE-COND: NORMAL/TRIP
RX058	SG2 LO-LO LVL LC529B RANGE-COND: NORMAL/TRIP
RX059	SG3 HI-HI LEVEL LC537A RANGE-COND: NORMAL/TRIP
RX060	SG3 LO-LO LVL LC537B RANGE-COND: NORMAL/TRIP
RX061	SG3 HI-HI LEVEL LC538A RANGE-COND: NORMAL/TRIP
RX062	SG3 LO-LO LVL LC538B RANGE-COND: NORMAL/TRIP
RX063	SG3 HI-HI LEVEL LC539A RANGE-COND: NORMAL/TRIP
RX064	SG3 LO-LO LVL LC539B RANGE-COND: NORMAL/TRIP

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RX065	SG4 HI-HI LEVEL LC547A RANGE-COND: NORMAL/TRIP
RX066	SG4 LO-LO LVL LC547B RANGE-COND: NORMAL/TRIP
RX067	SG4 HI-HI LEVEL LC548A RANGE-COND: NORMAL/TRIP
RX068	SG4 LO-LO LVL LC548B RANGE-COND: NORMAL/TRIP
RX069	SG4 HI-HI LEVEL LC549A RANGE-COND: NORMAL/TRIP
RX070	SG4 LO-LO LVL LC549B RANGE-COND: NORMAL/TRIP
RX071	CONTROLLER LC517D RESET TIME RANGE-COND: 0-2000 SEC
RX072	CONTROLLER LC527D RESET TIME RANGE-COND: 0-2000 SEC
RX073	CONTROLLER LC537D RESET TIME RANGE-COND: 0-2000 SEC
RX074	CONTROLLER LC547D RESET TIME RANGE-COND: 0-2000 SEC
RX075	HI STM DP PC514A (P1<P2) RANGE-COND: NORMAL/TRIP
RX076	LO STM PRESS PC514B (P1>P2) RANGE-COND: NORMAL/TRIP
RX077	HI STM DP PC515A (P1<P3) RANGE-COND: NORMAL/TRIP
RX078	LO STM PRESS PC515B (P1>P3) RANGE-COND: NORMAL/TRIP
RX079	HI STM DP PC516C (P1<P4) RANGF-COND: NORMAL/TRIP
RX080	LO S/G PRESS PC516A HI FLOW SI RANGE-COND: NORMAL/TRIP

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RX081	HI STM DP PC516D (P1>P4) RANGE-COND: NORMAL/TRIP
RX082	HI STM DP PC526D (P2>P3) RANGE-COND: NORMAL/TRIP
RX083	HI STM DP PC525A (P2<P4) RANGE-COND: NORMAL/TRIP
RX084	LO S/G PRESS PC525B (P2>P4) RANGE-COND: NORMAL/TRIP
RX085	HI STM DP PC526C (P2<P3) RANGE-COND: NORMAL/TRIP
RX086	LO STM PRESS PC526A HI FLOW S.I. RANGE-COND: NORMAL/TRIP
RX087	HI STM DP PC534A (P3<P4) RANGE-COND: NORMAL/TRIP
RX088	LO S/G PRESS PC534B (P3>P4) RANGE-COND: NORMAL/TRIP
RX089	TURBINE POWER P-13 PC505A RANGE-COND: NORMAL/TRIP
RX090	EXCHANGE PT505 PT506 RANGE-COND: NORMAL/EXCHG
RX092	LP3 LO STM PRESS PC536A HI FLOW S.I. RANGE-COND: NORMAL/TRIP
RX093	CONTROLLER 1PHC455K RESET TIME RANGE-COND: 0-200 SEC.
RX094	CONTROLLER 1PHC455K PROPORTIONAL GAIN RANGE-COND: 0-10
RX095	SET PT FC414 RC LP 1 LO FL RANGE-COND: 0-120%
RX096	SET PT FC415 RC LP 1 LO FL RANGE-COND: 0-120%
RX097	SET PT FC416 RC LP 1 LO FL RANGE-COND: 0-120%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RX098	LO STM PRESS PC546A HI FLOW SI RANGE-COND: NORMAL/TRIP
RX099	SG1 (SET1) SF < FF FC510A RANGE-COND: NORMAL/TRIP
RX100	SG1 FF < SF FC510B TRIP LOGIC RANGE-COND: NORMAL/TRIP
RX101	SG2 (SET1) SF < FF FC520A RANGE-COND: NORMAL/TRIP
RX102	SG2 FF < SF FC520B TRIP LOGIC RANGE-COND: NORMAL/TRIP
RX103	SG3 (SET1) SF < FF FC530A RANGE-COND: NORMAL/TRIP
RX104	SG3 FF < SF FC530B TRIP LOGIC RANGE-COND: NORMAL/TRIP
RX105	SG4 (SET1) SF < FF FC540A RANGE-COND: NORMAL/TRIP
RX106	SG4 FF < SF FC540B TRIP LOGIC RANGE-COND: NORMAL/TRIP
RX107	SG1 (SET2) SF < FF FC511A) RANGE-COND: NORMAL/TRIP
RX108	SG1 FF < SF FC511B TRIP LOGIC RANGE-COND: NORMAL/TRIP
RX109	SG2 (SET2) SF < FF FC521A RANGE-COND: NORMAL/TRIP
RX110	SG2 FF < SF FC521B TRIP LOGIC RANGE-COND: NORMAL/TRIP
RX111	SG3 (SET2) SF < FF FC531A RANGE-COND: NORMAL/TRIP
RX112	SG3 FF < SF FC531B TRIP LOGIC RANGE-COND: NORMAL/TRIP
RX113	SG4 (SET2) SF < FF FC541A RANGE-COND: NORMAL/TRIP

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RX114	SG4 FF < SF FC541B TRIP LOGIC RANGE-COND: NORMAL/TRIP
RX115	SG1 LO LVL (SET1) LC518C RANGE-COND: NORMAL/TRIP
RX116	SG2 LO LVL (SET2) LC528C RANGE-COND: NORMAL/TRIP
RX117	SG3 LO LVL (SET3) LC538C RANGE-COND: NORMAL/TRIP
RX118	SG4 LO LVL (SET4) LC548C RANGE-COND: NORMAL/TRIP
RX119	SG1 LO LVL (SET1) LC517C RANGE-COND: NORMAL/TRIP
RX120	SG2 LO LVL (SET2) LC527C RANGE-COND: NORMAL/TRIP
RX121	SG3 LO LVL (SET3) LC537C RANGE-COND: NORMAL/TRIP
RX122	SG4 LO LVL (SET4) LC547C RANGE-COND: NORMAL/TRIP
RX127	LP1 H LEG TEMP TC413A RANGE-COND: NORMAL/TRIP
RX128	LP1 C LEG TEMP TC413B RANGE-COND: NORMAL/TRIP
RX129	LP2 H LEG TEMP TC423A RANGE-COND: NORMAL/TRIP
RX130	LP2 C LEG TEMP TC423B RANGE-COND: NORMAL/TRIP
RX131	LP3 H LEG TEMP TC433A RANGE-COND: NORMAL/TRIP
RX132	LP3 C LEG TEMP TC433B RANGE-COND: NORMAL/TRIP
RX133	LP4 H LEG TEMP TC443A RANGE-COND: NORMAL/TRIP

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RX134	LP4 C LEG TEMP TC443B RANGE-COND: NORMAL/TRIP
RX135	RC LP1 OT DT/C3 TC411D RUNBK/ROD STP RANGE-COND: NORMAL/TRIP
RX136	RC LP1 OP DT/C4 TC411H RUNBK/ROD STP RANGE-COND: NORMAL/TRIP
RX137	RC LP2 OT DT/C3 TC421D RUNBK/ROD STP RANGE-COND: NORMAL/TRIP
RX138	RC LP2 OP DT/C4 TC421H RUNBK/ROD STP RANGE-COND: NORMAL/TRIP
RX139	RC LP3 OT DT/C3 TC431D RUNBK/ROD STP RANGE-COND: NORMAL/TRIP
RX140	RC LP3 OP DT/C4 TC431H RUNBK/ROD STP RANGE-COND: NORMAL/TRIP
RX141	RC LP4 OT DT/C3 TC441D RUNBK/ROD STP RANGE-COND: NORMAL/TRIP
RX142	RC LP4 OP DT/C4 TC441H RUNBK/ROD STP RANGE-COND: NORMAL/TRIP
RX143	SET PT FC424 RC LP 2 LO FL RANGE-COND: 0-120%
RX144	SET PT FC425 RC LP 2 LO FL RANGE-COND: 0-120%
RX145	SET PT FC426 RC LP 2 LO FL RANGE-COND: 0-120%
RX146	SET PT FC434 RC LP 3 LO FL RANGE-COND: 0-120%
RX147	SET PT FC435 RC LP 3 LO FL RANGE-COND: 0-120%
RX148	SET PT FC436 RC LP 3 LO FL RANGE-COND: 0-120%
RX149	SET PT FC444 RC LP 4 LO FL RANGE-COND: 0-120%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
RX150	SET PT FC445 RC LP 4 LO FL RANGE-COND: 0-120%
RX151	SET PT FC446 RC LP 4 LO FL RANGE-COND: 0-120%
RX152	CONTROLLER 1HSC509A RESET TIME RANGE-COND: 0-500 SEC
RX153	NI PWR GAIN BYPASS FW FLOW RANGE-COND: 0-10
RX154	C-5 LO PWR INTLK PC505C RANGE-COND: NORMAL/TRIP
RX155	HI STM FL SI LP1 FC512 RANGE-COND: NORMAL/TRIP
RX156	HI STM FL SI LP1 FC513 RANGE-COND: NORMAL/TRIP
RX157	HI STM FL SI LP2 FC522 RANGE-COND: NORMAL/TRIP
RX158	HI STM FL SI LP2 FC523 RANGE-COND: NORMAL/TRIP
RX159	HI STM FL SI LP3 FC532 RANGE-COND: NORMAL/TRIP
RX160	HI STM FL SI LP3 FC533 RANGE-COND: NORMAL/TRIP
RX161	HI STM FL SI LP4 FC542 RANGE-COND: NORMAL/TRIP
RX162	HI STM FL SI LP4 FC543 RANGE-COND: NORMAL/TRIP

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
SI01	ACCUMU 1A DRAIN ISO V 1SI8955A TO R.C. RANGE-COND: CLOSE/OPEN
SI02	ACCUMU 1B DRAIN ISO V 1SI8955B TO R.C. RANGE-COND: CLOSE/OPEN
SI03	ACCUMU 1C DRAIN ISO V 1SI8955C TO R.C. RANGE-COND: CLOSE/OPEN
SI04	ACCUMU 1D DRAIN ISO V 1SI8955D TO R.C. RANGE-COND: CLOSE/OPEN
SI05	ISO VALVE 1SI9003A TO HOT LEG A-1 RANGE-COND: 0-100%
SI06	ISO VLAVE 1SI9003B TO HOT LEG D-3 RANGE-COND: 0-100%
SI07	ISO VALVE 1SI9003C TO HOT LEG B-4 RANGE-COND: 0-100%
SI08	ISO VALVE 1SI9003D TO HOT LEG C-2 RANGE-COND: 0-100%
SI09	ISO VALVE 1SI9013A TO COLD LEG A-1 RANGE-COND: 0-100%
SI10	ISO VALVE 1SI9013B TO COLD LEG D-3 RANGE-COND: 0-100%
SI11	ISO VALVE 1SI9013C TO COLD LEG C-2 RANGE-COND: 0-100%
SI12	ISO VALVE 1SI9013D TO COLD LEG B-4 RANGE-COND: 0-100%
SI13	SI TO COLD LEG ISO V 1MOV-SI8802 PWR RANGE-COND: RACK IN/OUT
SI14	SI PUMP MINIMUM FLOW ISO VALVE 1SI8920A RANGE-COND: CLOSE/OPEN
SI15	SI PUMP MINIMUM FLOW ISO VALVE 1SI8920B RANGE-COND: CLOSE/OPEN
SI16	SI TO HOLD UP TANK ISO VALVE 1SI8961 RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
SI17	SI PUMP 1A DISCHARGE HEADER ISO V 1SI8921A RANGE-COND: 0-100%
SI18	SI PUMP 1A DISCHARGE HEADER ISO V 1SI8921B RANGE-COND: 0-100%
SI19	RWST TO PUMP 1A & 1B ISO V 1MOV-SI8806 PWR RANGE-COND: RACK IN/OUT
SI20	SI ACCUMULATOR TO COLD LEG A1 ISO V 1MOV-SI8808A PWR RANGE-COND: RACK IN/OUT
SI21	SI ACCUMULATOR TO COLD LEG B4 ISO V 1MOV-SI8808D PWR RANGE-COND: RACK IN/OUT
SI22	SI ACCUMULATOR TO COLD LEG C2 ISO V 1MOV-SI8808B PWR RANGE-COND: RACK IN/OUT
SI23	SI ACCUMULATOR TO COLD LEG D3 ISO V 1MOV-SI8808C PWR RANGE-COND: RACK IN/OUT
SI24	SI TRAIN A TO HOT LEG A/D ISO V 1MOV-SI9011A PWR RANGE-COND: RACK IN/OUT
SI25	SI TRAIN B TO HOT LEG B/C ISO V 1MOV-SI9011B PER RANGE-COND: RACK IN/OUT
SI26	SI PUMP 1SI003 1A POWER RANGE-COND: RACK IN/OUT
SI27	SI PUMP 1SI004 1B POWER RANGE-COND: RACK IN/OUT
SI28	RWST BORIC ACID FLOW RANGE-COND: 0-300 GPM
SI29	RWST BORIC PURE WATER FLOW RANGE-COND: 0-1000 GPM
SI30	ACCUM TANK 1SI005 FILL UP LINE ISO VALVE 1SI8916A RANGE-COND: CLOSE/OPEN
SI31	ACCUM TANK 1SI006 FILL UP LINE ISO VALVE 1SI8916D RANGE-COND: CLOSE/OPEN
SI32	ACCUM TANK 1SI007 FILL UP LINE ISO VALVE 1SI 8916B RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
SI33	ACCUM TANK 1SI008 FILL UP LINE ISO VALVE 1SI8916C RANGE-COND: CLOSE/OPEN
SI38	ACCUM TANK 1SI005 DISCH CKV TEST VLV 1SI8879A RANGE-COND: CLOSE/OPEN
SI39	ACCUM TANK 1SI007 DISCH CKV TEST VLV 1SI8879B RANGE-COND: CLOSE/OPEN
SI40	ACCUM TANK 1SI008 DISCH CKV TEST VLV 1SI8879C RANGE-COND: CLOSE/OPEN
SI41	ACCUM TANK 1SI006 DISCH CKV TEST VLV 1SI8879D RANGE-COND: CLOSE/OPEN
SI42	SI TO HOT LEG B4 CKV TEST VALVE 1SI9008C RANGE-COND: CLOSE/OPEN
SI43	SI TO HOT LEG C2 CKV TEST VALVE 1SI9008D RANGE-COND: CLOSE/OPEN
SI44	SI TO HEADER TEST VALVE 1SI9009A RANGE-COND: CLOSE/OPEN
SI45	SI TO HEADER TEST VALVE 1SI9009B RANGE-COND: CLOSE/OPEN
SI46	ACCUM TANK 1SI005 DISCH CKV TEST VLV 1SI8877A RANGE-COND: CLOSE/OPEN
SI47	ACCUM TANK 1SI007 DISCHG CKV TEST VLV 1SI8877B RANGE-COND: CLOSE/OPEN
SI48	ACCUM TANK 1SI008 DISCHG CKV TEST VLV 1SI8877C RANGE-COND: CLOSE/OPEN
SI49	ACCUM TANK 1SI006 DISCH CKV TEST VLV 1SI8877D RANGE-COND: CLOS/OPEN
SI50	SI PUMP RECIRC VALVE 1MOV-SI8813 POWER SUPPLY RANGE-COND: RACK IN/OUT
SI51	SI PUMP RECIRC VALVE 1MOV-SI8814 POWER SUPPLY RANGE-COND: RACK IN/OUT
SI52	SI PUMP RECIRC VALVE 1MOV-SI8813 LOCAL SWITCH RANGE-COND: CLOSE/OPEN
SI53	SI PUMP RECIRC VALVE 1MOV-SI8814 LOCAL SWITCH RANGE-COND: CLOSE/OPEN

ZION SIMULATOR
ANSI/ANS-3.5-1985 CERTIFICATION REPORT
INITIAL REPORT, MARCH 1991

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
SW01	SW UNIT 1/2 CROSSTIE VLV 0MOV-SW0003 RANGE-COND: CLOSE/OPEN
SW02	COMPONENT COOLING HEAT EXCH ISOL VLV OMOV-SW0013 RANGE-COND: CLOSE/OPEN
SW03	COMPONENT COOLING HEAT EXCH ISO VLV OMOV-SW0014 RANGE-COND: CLOSE/OPEN
SW04	CC CLR SW THROTTLE VLV OSW0034 RANGE-COND: 0-100%
SW05	CC CLR SW THROTTLE VLV OSW0037 RANGE-COND: 0-100%
SW06	DG ISO VLV [illegible]-SW0008 RANGE-COND: RACK IN/OUT
SW07	SW PUMP 1A POWER RACK IN/OUT RANGE-COND: RACK IN/OUT
SW08	SW PUMP 1B POWER RACK IN/OUT RANGE-COND: RACK IN/OUT
SW09	SW PUMP 1C POWER RACK IN/OUT RANGE-COND: RACK IN/OUT
SW10	DG HEAT EXCH ISO VLV 1MOV-SW0018 RANGE-COND: CLOSE/OPEN
SW11	DG HEAT EXCH ISO VLV 1MOV-SW0017 RANGE-COND: CLOSE/OPEN
SW12	CONTAINMENT VENT CLR ISO VLV 1MOV-SW0004 RANGE-COND: CLOSE/OPEN
SW13	CONTAINMENT VENT CLR ISO VLV 1MOV-SW0005 RANGE-COND: CLOSE/OPEN
SW14	TURB BLDG SW UNIT 2/1 XTIE VLV OSW0005 RANGE-COND: CLOSE/OPEN
SW15	COND & COND BOOSTER PUMP OIL CLR ISO VLV 1SW0203 RANGE-COND: CLOSE/OPEN
SW16	COND & COND BOOSTER PUMP OIL CLR ISO VLV 1SW0202 RANGE -COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
SW17	COND & COND BOOSTER PUMP OIL CLR ISO VLV 1SW0201 RANGE-COND: CLOSE/OPEN
SW18	COND & COND BOOSTER PUMP OIL CLR ISO VLV 1SW0200 RANGE-COND: CLOSE/OPEN
SW19	TURB DR FW PUMP OIL CLR THROTTLE VLV 1SW0217/1SW0218 RANGE-COND: 0-100%
SW20	TURB DR FW PUMP OIL CLR THROTTLE VLV 1SW0219/1SW0220 RANGE-COND: 0-100%
SW21	MTR DR FW PUMP OIL CLR ISO VLV 1SW0221 RANGE-COND: CLOSE/OPEN
SW22	MAIN TURB OIL CLR ISO VLV 1SW0500/1SW0502 RANGE-CONDL CLOSE/OPEN
SW23	AUX BLDG DISCH LINE VLV 1SW0468 RANGE-COND: 0-100%
SW24	H2 CLR THROTTLE VLV 1SW0240 & 1SW0241 RANGE-COND: 0-100%
SW25	H2 CLR THROTTLE VLV 1SW0242 & 1SW0243 RANGE-COND: 0-100%
SW26	H2 CLR THROTTLE VLV 1SW0244 & 1SW0245 RANGE-THROTTLE 0-100%
SW27	H2 CLR THROTTLE VLV 1SW0246 & 1SW0247 RANGE-COND: 0-100%
SW28	H2 TEMP CONTROLLER BYPASS VLV 1SW0230 RANGE-COND: 0-100%
SW29	SA CLR ISO VLV 1SW0269/1SW0271 RANGE-COND: CLOSE/OPEN
SW30	SA CLR ISO VLV 1SW0274/1SW0275 RANGE-COND: CLOSE/OPEN
SW31	H2 & AIR SEAL OIL CLR SW THROTTLE VLV 1SW0802 RANGE-COND: 0-100%
SW32	MAIN GEN STATOR WATER CLR ISO VLV 1SW0265 RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
SW33	MAIN GEN STATOR WATER CLR ISO VLV 1SW0267 RANGE-COND: CLOSE/OPEN
SW34	STATOR WATER TEMP CONTROLLER BYPASS VLV 1SW0292 RANGE-COND: CLOSE/OPEN
SW35	CS DIESEL CLR THROTTLE VLV 1SW0424 RANGE-COND: 0-100%
SW36	SW TO MISC. AUX. BLDG CS CLR ISO VLV 0SW0020 RANGE-COND: CLOSE/AUTO/OPEN
SW37	SW TO MISC. AUX. BLDG CS CLR ISO VLV 0SW0021 RANGE-COND: CLOSE/AUTO/OPEN
SW38	SW TO IA COMP HEAT EXCHANGER ISO VLV 1SW1570 RANGE-COND: CLOSE/OPEN
SW39	SW BOOSTER PMP 0A RACK IN/OUT (0SW006) RANGE-COND: RACK IN/OUT
SW40	SW BOOSTER PMP 0B RACK IN/OUT (0SW007) RANGE-COND: RACK IN/OUT
SW41	AUTO START FAILURE, LIFTED LEAD ON SW PUMP 1A CS/CTO CONTACT RANGE-COND: NORMAL/LIFTED
SW42	AUTO START FAILURE, LIFTED LEAD ON SW PUMP 1B CS/CONTACT RANGE-COND: NORMAL/LIFTED
SW43	AUTO START FAILURE, LIFTED LEAD ON SW PUMP 1C CS/CONTACT RANGE-COND: NORMAL/LIFTED
SW44	SW UNIT 2 SUPPLY ISOLATION VALVE RANGE-COND: CLOSE/OPEN
SW45	SW BOOSTER PUMP ISOLATION VALVE 0MOV-SW0005 RANGE-COND: CLOSE/AUTO/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
TC01	AUTO STOP OIL VLV FOR CONTROL BLOCK TESTING RANGE-COND: CLOSE/OPEN
TC02	EHC RESERVOIR FLUID LEVEL MAKE UP RANGE-COND: STOP/FILL
TC03	TURBINE MANUAL LATCH RANGE-COND: TRIP/LATCH
TC04	AUTOMATIC LATCH IS AVAILABLE RANGE-COND: DISABLE/ENABLE
TC05	PULSE UP (EGC) RANGE-COND: IN/OUT
TC06	PULSE DOWN (EGC) RANGE-COND: IN/OUT
TC07	VARY EGC TRIP ON NUCLEAR POWER (EGC) RANGE-COND: 0-100%
TC08	EH FLUID PRESSURE UNLOADER RANGE-COND: 0-100%
TC09	EH FLUID DRAIN RANGE-COND: CLOSE/OPEN
TC10	OVERSPEED TRIP SET POINT RANGE-COND: 0-2500 RPM
TC11	KNIFESWITCH ON SOLENOID 20/ET RANGE-COND: CLOSE/OPEN
TC12	KNIFESWITCH ON SOLENOID 20-2/AST RANGE-COND: CLOSE/OPEN
TC13	KNIFESWITCH ON SOLENOID 20-1/AST RANGE-COND: CLOSE/OPEN
TC14	EH FLUID VARIABLE LEAKAGE RANGE-COND: 0-100 LB/SEC

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
TH01	PRZR SPRAY A ISOL (1RC0020) RANGE-COND: CLOSE/OPEN
TH02	PRZR SPRAY B ISOL (1RC0022) RANGE-COND: CLOSE/OPEN
TH03	PRT N2 SUPPLY REG STPT PSIG (1AOVRC8024) RANGE-COND: 0-50 PSIG
TH04	REACTOR VESSEL REFUELING LEVEL RECORDER (1LRRC22) RANGE-COND: DISABLE/ENABLE
TH05	RX VESSEL LVL ISO SOV POWER (RC-0102) RANGE-COND: RACK IN/OUT
TH06	PRT VENT TO CONTM. (1RC8048) RANGE-COND: CLOSE/OPEN
TH07	LOOP DRAIN VALVE (1RC8083A) RANGE-COND: 0-100%
TH08	LOOP DRAIN VALVE (1RC8083B) RANGE-COND: 0-100%
TH09	LOOP DRAIN VALVE (1RC8083C) RANGE-COND: 0-100%
TH10	LOOP DRAIN VALVE (1RC8083D) RANGE-COND: 0-100%
TH11	RCPA OVERCURRENT RESET (MOMENTARY ACTION) RANGE-COND: NORM/RESET
TH12	RCPB OVERCURRENT RESET (MOMENTARY ACTION) RANGE-COND: NORM/RESET
TH13	RCPC OVERCURRENT RESET (MOMENTARY ACTION) RANGE-COND: NORM/RESET
TH14	RCPD OVERCURRENT RESET (MOMENTARY ACTION) RANGE-COND: NORM/RESET
TH15	LOOP 1 HOT LEG ISOL VLV PWR (1RC8001A) RANGE-COND: RACK IN/OUT
TH16	LOOP 2 HOT LEG ISOL VLV PWR (1RC8001B) RANGE-COND: RACK IN/OUT

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
TH17	LOOP 3 HOT LEG ISOL VLV PWR (1RC8001C) RANGE-COND: RACK IN/OUT
TH18	LOOP 4 HOT LEG ISOL VLV PWR (1RC8001D) RANGE-COND: RACK IN/OUT
TH19	LOOP 1 COLD LEG ISOL VLV PWR (1RC8002A) RANGE-COND: RACK IN/OUT
TH20	LOOP 2 COLD LEG ISOL VLV PWR (1RC8002B) RANGE-COND: RACK IN/OUT
TH21	LOOP 3 COLD LEG ISOL VLV PWR (1RC8002C) RANGE-COND: RACK IN/OUT
TH22	LOOP 4 COLD LEG ISOL VLV PWR (1RC8002D) RANGE-COND: RACK IN/OUT
TH23	RX HEAD VENT SOV POWER (RC-0008) RANGE-COND: RACK IN/OUT
TH24	RX HEAD VENT SOV POWER (RC-0009) RANGE-COND: RACK IN/OUT
TH25	RX HEAD VENT SOV POWER (RC-0010) RANGE-COND: RACK IN/OUT
TH26	RX HEAD VENT SOV POWER (RC-0011) RANGE-COND: RACK IN/OUT
TH27	LOOP 1 DRAIN ISOL (1RC8057A) RANGE-COND: CLOSE/OPEN
TH28	LOOP 2 DRAIN ISOL (1RC8057B) RANGE-COND: CLOSE/OPEN
TH29	LOOP 3 DRAIN ISOL (1RC8057C) RANGE-COND: CLOSE/OPEN
TH30	LOOP 4 DRAIN ISOL (1RC8057D) RANGE-COND: CLOSE/OPEN
TH31	LOOP 1 FILL ISOL (1RC8058A) RANGE-COND: CLOSE/OPEN
TH32	LOOP 2 FILL ISOL (1RC8058B) RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
TH33	LOOP 3 FILL ISOL (1RC8058C) RANGE-COND: CLOSE/OPEN
TH34	LOOP 4 FILL ISOL (1RC8058D) RANGE-COND: CLOSE/OPEN
TH35	RCPA LOCAL TRIP 1RC110 RANGE-COND: NORMAL/TRIP
TH36	RCPB LOCAL TRIP 1RC410 RANGE-COND: NORMAL/TRIP
TH37	RCPC LOCAL TRIP 1RC210 RANGE-COND: NORMAL/TRIP
TH38	RCPD LOCAL TRIP 1RC310 RANGE-COND: NORMAL/TRIP
TH39	PORV ISO VLV POWER (1MOV-RC8000A) RANGE-COND: ON/OFF
TH40	PORV ISO VLV POWER (1MOV-RC8000B) RANGE-COND: ON/OFF
TH41	RCPA OIL DRAIN VALVE RANGE-COND: 0-100%
TH42	RCPB OIL DRAIN VALVE RANGE-COND: 0-100%
TH43	RCPC OIL DRAIN VALVE RANGE-COND: 0-100%
TH44	RCPD OIL DRAIN VALVE RANGE-COND: 0-100%
TH45	STEAM GENERATOR 1A TUBE PLUGGING RANGE-COND: 0-20%
TH46	STEAM GENERATOR 1B TUBE PLUGGING RANGE-COND: 0-20%
TH47	STEAM GENERATOR 1C TUBE PLUGGING RANGE-COND: 0-20%
TH48	STEAM GENERATOR 1D TUBE PLUGGING RANGE-COND: 0-20%

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
TP01	STATOR WATER PUMP 1A POWER (1TG010) RANGE-COND: RACK IN/OUT
TP02	STATOR WATER PUMP 1B POWER (1TG011) RANGE-COND: RACK IN/OUT
TP03	STATOR WATER FILTER 1A ISOL (1GC0403) RANGE-COND: 0-100%
TP04	STATOR WATER FILTER 1B ISOL (1GC0404) RANGE-COND: 0-100%
TP05	STATOR WATER HX #2 OUTLET ISOL (1GC0405) RANGE-COND: 0-100%
TP06	STATOR WTR HX #1 OUTLET ISOL (1GC0406) RANGE-COND: 0-100%
TP07	STATOR WTR HX X-TIE (1GC0407) RANGE-COND: 0-100%
TP08	STATOR WTR HX #2 INLET ISOL (1GC0408) RANGE-COND: 0-100%
TP09	STATOR WATER HX #1 INLET ISOL (1GC0409) RANGE-COND: 0-100%
TP10	STATOR WATER CONDUCTIVITY (1GC001) RANGE-CIBD: 0-10 MICROMHO/CM
TP11	STATOR WATER LEVEL (1GC001) RANGE-COND: 0-100%
TP12	H2 SIDE SEAL OIL PUMP POWER (1TG008) RANGE-COND: RACK IN/OUT
TP13	H2 SIDE SOP RECIRC VALVE (1GC0419) RANGE-COND: 0-100%
TP14	SEAL OIL BACKUP PRESS REDUCING VLV (1PCVGSS291) RANGE-COND: 0-125 PSIG
TP15	SEAL OIL BACKUP PRESS REG VALVE (1PCVGSS264) RANGE-COND: 0-10 PSID
TP16	AIR SIDE SOP PRESS CONTROL VALVE (1PCVGSS256) RANGE-COND: 0-10 PSID

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
TP17	AIR SIDE SEAL OIL BACKUP PUMP POWER (1GS005) RANGE-COND: RACK IN/OUT
TP18	AIR SIDE SEAL OIL PUMP POWER (1TG009) RANGE-COND: RACK IN/OUT
TP19	GENERATOR VENT VALVE (1HTT0007) RANGE-COND: 0-100%
TP20	H2 SUPPLY ISOL VLV (HTT0008) RANGE-COND: CLOSE/OPEN
TP21	CHANGE GENERATOR ATMOSPHERE (1HTT0005) RANGE-COND: 0-98% H2
TP22	ANN 13-7D; GEN CORE MON TROUBLE; RESET RANGE-COND: NORMAL/RESET

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
TU01	TURNING GEAR LOCAL SWITCH AT GEAR RANGE-COND: DISENGAGE/ENGAGE
TU02	TURNING GEAR START (MOMENTARY ACTION) RANGE-COND: NORMAL/START
TU03	TURNING GEAR STOP (MOMENTARY ACTION) RANGE-COND: NORMAL/STOP
TU04	TURBINE OIL RESERVOIR DRAIN (1TO0013) RANGE-COND: 0-100%
TU05	TURBINE OIL RESERVOIR MAKEUP (1TD0009) RANGE-COND: CLOSE/OPEN

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
WD01	SG 1B BD FLOW CONTROL VALVE (1MOVBD0009) RANGE-COND: 0-100%
WD02	SG 1B BD FLOW CONTROL VALVE (1MOVBD0010) RANGE-COND: 0-100%
WD03	SG 1D BD FLOW CONTROL VALVE (1MOVBD0011) RANGE-COND: 0-100%
WD04	SG 1D BD FLOW CONTROL VALVE (1MOVBD0012) RANGE-COND: 0-100%
WD05	SG 1C BD FLOW CONTROL VALVE (1MOVBD0013) RANGE-COND: 0-100%
WD06	SG 1C BD FLOW CONTROL VALVE (1MOVBD0014) RANGE-COND: 0-100%
WD07	SG 1A BD FLOW CONTROL VALVE (1MOVBD0015) RANGE-COND: 0-100%
WD08	SG 1A BD FLOW CONTROL VALVE (1MOVBD0016) RANGE-COND: 0-100%
WD09	BD COND. PUMP OPERATION (OBD003) RANGE-COND: OFF/ON
WD10	BD MON TANK PUMP OPERATION (OWD001) RANGE-COND: OFF/ON
WD11	TURB BLDG FIRE & OIL SUMP PUMP OA PWR (OTD101) RANGE-COND: RACK IN/OUT
WD12	TURB BLDG FIRE & OIL SUMP PUMP OB PWR (OTD002) RANGE-COND: RACK IN/OUT
WD13	TURB BLDG FIRE & OIL SUMP PUMP OC PWR (OTD003) RANGE-COND: RACK IN/OUT
WD14	WASTEWATER EQUAL. TANK PUMP OA PWR (OWT204) RANGE-COND: RACK IN/OUT
WD15	WASTEWATER EQUAL. TANK PUMP OB PWR (OWT205) RANGE-COND: RACK IN/OUT
WD16	WASTEWATER EQUAL. TANK PUMP OC PWR (OWT206) RANGE-COND: RACK IN/OUT

APPENDIX 2
LIST OF IN-PLANT REMOTE FUNCTIONS (R.F.)

R.F. NUMBER	TITLE, RANGE-CONDITION
WD17	BD HEADER MANUAL ISOL VALVE (0BD0002) RANGE-COND: CLOSE/OPEN
WD18	RCDT DRAIN TO CONTM SUMP (1DT9163) RANGE-COND: CLOSE/OPEN
WD19	RCDT DISCH PUMP 0A LOCAL HAND SWITCH (1DT001) RANGE-COND: TRP/AAT/AAC/CLS
WD20	RCDT DISCH PUMP 0B LOCAL HAND SWITCH (1DT002) RANGE-COND: TRP/AAT/AAC/CLS
WD21	RCDT DISCH. VALVE LOCAL HAND SWITCH (1LCVDT1003) RANGE-COND: CLS/AUT/OPN
WD22	GAS DECAY TANK ACTIVITY RANGE-COND: 0-10E6 CURIES
WD24	SG 1B BD VALVE 1BD0801 RANGE-COND: 0-100%
WD25	SG 1B BD VALVE 1BD0802 RANGE-COND: 0-100%
WD26	SG 1D BD VALVE 1BD0803 RANGE-COND: 0-100%
WD27	SG 1D BD VALVE 1BD0804 RANGE-COND: 0-100%
WD28	SG 1C BD VALVE 1BD0805 RANGE-COND: 0-100%
WD29	SG [illegible] VALVE 1BD0806 RANGE-COND: 0-100%
WD30	SG 1A BD VALVE 1BD0807 RANGE-COND: 0-100%
WD31	SG 1A BD VALVE 1BD0808 RANGE-COND: 0-100%
WD32	SG BD VALVE 1FCV BD0018 RANGE-COND: 0-100%
WD33	SG BD VALVE 1BD0818 RANGE-COND: 0-100%
WD34	SG BD VALVE 0BD0806 RANGE-COND: 0-100%

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APPENDIX 3

LIST OF ACRONYMS/ABBREVIATIONS

APPENDIX 3

LIST OF ACRONYMS/ABBREVIATIONS

ACRONYM/ABBREVIATION	DESCRIPTION
AMMI	Advanced Man Machine Interface
AOV	Air Operated Valve
ATP	Acceptance Test Procedure
BOL	Beginning of Life
CC	Component Cooling Water
C/D	Cooldown
CR	Core
CS	Containment Spray
CW	Circulating Water
DCRDR	Detailed Control Room Design Review
DG	Diesel Generator
DVR	Deviation Report
ED	Electrical Distribution
EG	Electrical Generation
EOL	End of Life
ESF	Engineered Safety Features
FCV	Flow Control Valve
FW	Feedwater (including Condensate and Auxiliary Feedwater)
GSEP	Generating Station Emergency Plan
HD	Heater Drains
HDR	Header
HV	Heating & Ventilation
HX	Heat Exchanger
IA	Instrument Air
IC	Initial Condition
IPC	In-Plant Computer
I/O	Input/Output
KV	Kilovolts
LCV	Level Control Valve
LED	Light Emitting Diode
LER	Licensee Event Report
MCC	Motor Control Center
MOL	Middle of Life

APPENDIX 3

LIST OF ACRONYMS/ABBREVIATIONS

ACRONYM/ABBREVIATION	DESCRIPTION
MOV	Motor Operated Valve
MS	Main Steam
MW	Megawatt
NI	Nuclear Instrumentation System
PA	Public Address
PCC	Plant Process Computer
PCV	Pressure Control Valve
PPM	Parts per Million
PZR	Pressurizer
PTAO	Production Training Administrative Procedure (Operations)
PWR	Pressurized Water Reactor
RCFC	Reactor Containment Fan Cooler
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RD	Rod Drive System
RH	Residual Heat Removal System
RM	Radiation Monitoring System
RMDS	Radiation Monitor Display System
RP	Reactor Protection System
RPM	Revolutions per Minute
RX	Reactor Control System
SA	Service Air System
S/D	Shutdown
SER	Sequence of Events Recorder
SG	Steam Generator
SI	Safety Injection
SPDS	Safety Parameters Display System
SS	Nuclear Sample System
S/U	Startup
SW	Service Water System
TC	Turbine Control System
TGIS	Third Generation Instructor System
TH	Thermal Hydraulic System
TP	Turbine Plant Cooling System
TU	Turbine System
VC	Chemical and Volume Control System
WR	Wide Range/Work Request
XE	Xenon

APPENDIX 4

SIMULATOR MALFUNCTION TESTING SCHEDULE

(CERTIFIED MALFUNCTIONS)

NOTES

The annual testing periods are as follows:

91/92 - March 18, 1991 to March 17, 1992
92/93 - March 18, 1992 to March 17, 1993
93/94 - March 18, 1993 to March 17, 1994
94/95 - March 18, 1994 to March 17, 1995

The approximate test date refers to the first, second, third or fourth quarter of the above testing periods. For example, the first quarter of the 91/92 testing period is from March 18, 1991 to June 17, 1991 and the fourth quarter is from December 18, 1991 to March 17, 1992.

ZION SIMULATOR
ANSI/ANS-3.5-1985, CERTIFICATION REPORT
INITIAL REPORT, MARCH, 1991

APPENDIX 4
PROPOSED SIMULATOR MALFUNCTION TESTING SCHEDULE
(CERTIFIED MALFUNCTIONS)

MALF NUMBER	MALFUNCTION DESCRIPTION	ANNUAL TESTING PERIOD (YR) 91/92	92/93	93/94	94/95
		APPROX TEST DATE (QTR)			
CC01	CC PUMP TRIP / FAILS TO START	1			
CC03	AIR BOUND CCW PUMP	1			
CC04	ESSENTIAL CCW RHR TRAIN BREAK	1			
CC05	NON-ESSENTIAL CCW BREAK		1		
CC07	CC SURGE TANK A LEAK		1		
CC08	CC SURGE TANK B LEAK			1	
CC09	RCP THERMAL BARRIER TUBING CCW LEAK			1	
CC10	CCW FLOW TRANSMITTER 1FICA-685 FAILURE				1
CH01	RCFC FAN (LOW SPEED) TRIP / FAILS TO START	1			
CH07	CONTAINMENT PRESSURE TRANSMITTER FAILURE		2		
CS01	CS PUMP TRIP / FAILS TO START			2	
CS02	CS PUMP 1C DIESEL TRIP / FAILS TO START				2
CV01	CENTRIFUGAL CHARGING PUMP TRIP / FAILS TO START	2			
CV02	POSITIVE DISP. CHARGING PUMP TRIP / FAILS TO START	2			
CV03	PW MAKE-UP PUMP TRIP / FAILS TO START	2			
CV04	BORIC ACID TRANSFER PUMP TRIP / FAILS TO START	2			
CV07	PCV 131 CONTROL FAILURE		3		
CV08	CHARGING HEADER HCV-182 CONTROL FAILURE		3		
CV10	VCT LEVEL CHANNEL 1LICA-112 FAILS		4		
CV11	VCT LEVEL CHANNEL 1LICA-185 FAILS		4		
CV13	AUTOMATIC MAKE-UP CONTROL FAILURE			3	
CV14	FAILURE OF PT-131			3	
CV15	FAILURE OF TE-130			3	
CV16	RCP SEAL #1 FAILURE				3
CV17	RCP SEAL #2 FAILURE				3
CV20	LETDOWN HEAT EXCHANGER TUBE LEAK				4
CV22	LETDOWN LINE LEAK INSIDE CONTAINMENT				4
CV23	CHARGING LINE LEAK INSIDE CONTAINMENT	3			
CV24	LETDOWN LINE LEAK OUTSIDE CONTAINMENT	3			
CV25	CHARGING LINE LEAK OUTSIDE CONTAINMENT		1		
CV28	FLOW CONTROL VALVE VC-121 FAILURE		1		
CV29	LETDOWN RELIEF VALVE 1VC-8117 FAILURE			4	
CV31	SEAL WATER RETURN LINE BREAK			4	
CV32	VCT LOWER LEVEL TAP LEAK				1
CW01	CIRC WATER PUMP TRIP / FAILS TO START				1
ED03	FAILURE OF UNIT AUXILIARY TRANSFORMER	3			
ED04	FAILURE OF SYSTEM AUXILIARY TRANSFORMER	3			
ED05	LOSS OF 4160 VOLT BUS		2		
ED07	FAILURE OF 4160 TO 480 VOLT BKR TO AUTO CLOSE			1	
ED08	LOSS OF DC DISTRIBUTION BUS			1	
ED10	VOLT TRANSIENT AND LOSS OF 120 VAC ESF INST BUS				2
ED14	FAILURE OF 4160 VOLT BUS TO ABT				2
ED18	FAILURE OF SECOND LEVEL UNDERVOLTAGE		2		

APPENDIX 4
PROPOSED SIMULATOR MALFUNCTION TESTING SCHEDULE (CERTIFIED MALF'S)
(CONTINUED)

MALF NUMBER	MALFUNCTION DESCRIPTION	ANNUAL TESTING PERIOD (YR) 91/92	92/93	93/94	94/95 APPROX TEST DATE (QTR)
EG01	MAIN GENERATOR VOLTAGE REGULATOR FAILURE	4			
EG03	MAIN TRANSFORMER LOW VOLTAGE SIDE GROUND		2		
EG05	DIFFERENTIAL CURRENT ON DIESEL GENERATOR			1	
EG06	DIESEL GENERATOR VOLTAGE REGULATOR FAILURE			2	
EG07	DIESEL GENERATOR SEIZURE				3
FW01	MAIN FEEDWATER PUMP TRIP / FAILS TO START	4			
FW02	MOTOR DRIVEN FEED PUMP TRIP / FAILS TO START	4			
FW03	COND. / COND. BOOSTER PUMP TRIP / FAILS TO START	4			
FW04	HEATER DRAIN PUMP TRIP / FAILS TO START	1			
FW05	MOTOR DRIVEN AFW PUMP TRIP / FAILS TO START		2		
FW06	TURBINE DRIVEN AFW PUMP TRIP / FAILS TO START		3		
FW09	LOSS OF CONDENSER VACUUM		3		
FW10	HOTWELL LEVEL CONTROLLER FAILS HIGH		4		
FW11	HOTWELL LEVEL CONTROLLER FAILS LOW		4		
FW16	LOW PRESSURE FW HTR 15 TUBE LEAK			2	
FW20	LOW PRESSURE FW HTR 11 TUBE LEAK			2	
FW22	FEED LINE BREAK INSIDE CONTAINMENT			2	
FW25	MAIN FEED REG VALVE SEAT LEAKAGE				3
FW26	MAIN FEED LINE BREAK BEFORE MAIN FEED ISOL VALVE				4
FW28	AUX FEEDWATER LINE RUPTURE				4
IA01	LOSS OF INSTRUMENT AIR		1		
IA02	LOSS OF SERVICE AIR		1		
IA03	INSTRUMENT AIR COMPRESSOR TRIPS / FAILS TO START			3	
IA04	SERVICE AIR COMPRESSOR TRIPS / FAILS TO START			3	
IA05	INSTRUMENT AIR LEAK INSIDE CONTAINMENT				1
MS01	MAIN STEAM ISOLATION VALVE FAILS OPEN	1			
MS03	MAIN STEAM CHECK VALVE FAILURE	1			
MS04	STEAM DUMP CONTROL FAILURE		2		
MS07	STEAMLINE BREAK IN CONT. AFTER FLOW RESTRICTOR			4	
MS09	STEAM GENERATOR SAFETY VALVE FAILURE			4	
MS10	MAIN STEAM HEADER STEAM BREAK				2
MS15	TURBINE DRIVEN AFW PUMP SUPPLY STEAMLINE BREAK				2
NI01	NOISY SOURCE RANGE CHANNEL				2
NI02	SOURCE RANGE CHANNEL FAILURE			1	
NI06	INTERMEDIATE RANGE CHANNEL FAILURE			1	
NI07	NTERMEDIATE RANGE CHANNEL GAMMA COMP FAILURE				3
NI08	POWER RANGE DETECTOR FAILURE				3
NI09	POWER RANGE CHANNEL FAILURE				3
RD01	ROD DRIVE MG SET TRIP / FAILS TO START	2			
RD02	DROPPED ROD	2			
RD03	DROPPING ROD		3		
RD06	ROD EJECTION			2	
RD07	STUCK ROD		3		
RD08	RODS FAIL TO MOVE		3		
RD09	UNCONTROLLED ROD INSERTION			2	
RD10	UNCONTROLLED ROD WITHDRAWL				4

APPENDIX 4
PROPOSED SIMULATOR MALFUNCTION TESTING SCHEDULE (CERTIFIED MALF'S)
(CONTINUED)

MALF NUMBER	MALFUNCTION DESCRIPTION	ANNUAL TESTING PERIOD (YR) APPROX TEST DATE (QTR) 91/92	92/93	93/94	94/95
RD12	AUTO ROD SPEED CONTROLLER FAILURE	2			
RD13	ROD BANK MISALIGNMENT		2		
RD15	FAILURE ON LOGIC CABINET			2	
RD16	URGENT FAILURE ON LOGIC SECTION OFS/D BANKS C & E				1
RD17	POWER CABINET URGENT FAILURE				1
RH01	RHR PUMP TRIP / FAILS TO START	3			
RH02	RHR PUMP CAVITATION	3			
RH03	RHR HEAT EXCHANGER FLOW CONTROL VALVE FAILURE		4		
RH07	RHR PUMPS SUCTION RELIEF VALVE FAILURE		4		
RH08	RCS TO RHR SYSTEM LEAKAGE			3	
RH12	RHR DISCHARGE HEADER BREAK			3	
RP01	REACTOR FAILS TO TRIP				2
RP02	REACTOR FAILS TO AUTO TRIP	3			
RP04	FAILURE OF FEEDWATER ISOLATION TO ACTUATE	4			
RP05	INADVERTANT P-14 FEEDWATER ISOLATION	4			
RP06	INADVERTANT SAFETY INJECTION ACTUATION		1		
RP07	FAILURE OF SAFETY INJECTION TO ACTUATE		1		
RP08	FAILURE OF SAFETY INJECTION TO AUTO ACTUATE		1		
RP09	FAILURE OF PHASE A TO ACTUATE			4	
RP10	FAILURE OF PHASE B TO ACTUATE			4	
RP11	REACTOR TRIP PERMISSIVE P-4 FAILS AS IS			4	
RP12	SOURCE RANGE PERMISSIVE P-6 FAILS AS IS			4	
RP13	AT POWER PERMISSIVE P-7 FAILS AS IS				3
RP16	PRESSURIZER SI PERMISSIVE P-11 FAILS AS IS				4
RP17	HI STEAM FLOW SI PERMISSIVE P-12 FAILS AS IS				4
RX03	NARROW RANGE STEAM GENERATOR LEVEL FAILURE	4			
RX05	STEAM GENERATOR FEEDWATER CONTROL VALVE FAILURE	1			
RX06	FEEDWATER FLOW TRANSMITTER FAILURE	1			
RX07	FEEDWATER PRESSURE DETECTOR (PT-508) FAILURE	1			
RX08	STEAM FLOW DETECTOR FAILURE	2			
RX11	STEAM LINE PRESSURE DETECTOR (PT-507) FAILURE		2		
RX12	STEAM PRESSURE DETECTOR FAILURE		2		
RX13	FIRST STAGE PRESSURE TRANSMITTER (PT-505) FAILURE		2		
RX14	FIRST STAGE PRESSURE TRANSMITTER (PT-506) FAILURE		3		
RX17	PRESSURIZER PRESSURE MASTER CONTROLLER FAILURE		3		
RX20	RCS WIDE RANGE PRESSURE TRANSMITTER FAILURE			1	
RX21	PRESSURIZER PRESSURE CHANNEL FAILURE			1	
RX22	PRESSURIZER LEVEL MASTER CONTROLLER FAILURE			2	
RX23	PRESSURIZER LEVEL CHANNEL FAILURE			2	
RX24	PRIMARY COLD LEG NARROW RANGE RTD FAILURE			2	
RX25	PRIMARY HOT LEG NARROW RANGE RTD FAILURE				1
RX28	RCS LOOP FLOW TRANSMITTER FAILURE				1
RX29	OVERPOWER DELTA-T SETPOINT FAILURE				2
RX30	OVERTEMPERATURE DELTA-T SETPOINT FAILURE				2
RX34	STEAM DUMP VALVES GROUP CONTROL FAILS				3
RX36	ROD CONTROL T-REF FAILURE				3

APPENDIX 4
PROPOSED SIMULATOR MALFUNCTION TESTING SCHEDULE (CERTIFIED MALF'S)
(CONTINUED)

MALF NUMBER	MALFUNCTION DESCRIPTION	ANNUAL TESTING PERIOD (YR) APPROX TEST DATE (QTR) 91/92	92/93	93/94	94/95
SI01	SAFETY INJECTION PUMP TRIP / FAILS TO START	2			
SI03	SI ACCUMULATOR LOW LEVEL	2			
SW01	SERVICE WATER PUMP TRIP / FAILS TO START		3		
SW02	SERVICE WATER BOOSTER PUMP TRIP / FAILS TO START		3		
SW04	LOSS OF SERVICE WATER COOLING TO DIESEL GEN.			3	
SW06	SERVICE WATER SYSTEM BREAK			3	
SW07	SERVICE WATER BREAK AFTER RCFC HEAT EXCHANGER				4
TC02	TURBINE MANUAL TRIP FAILURE	3			
TC03	EH PUMP TRIP / FAILS TO START		4		
TC05	EHC IMPULSE PRESSURE CHANNEL (MS-24) FAILURE		4		
TC08	EHC AUX SPEED CHANNEL FAILURE			4	
TC13	LOAD REJECTION			4	
TC14	HP TURBINE STOP VALVE FAILURE				4
TH02	REACTOR COOLANT PUMP SHAFT BREAK	3			
TH04	STEAM GENERATOR TUBE LEAK	3			
TH05	HOT LEG LOCA		4		
TH06	COLD LEG LOCA		1		
TH09	PRESSURIZER STEAM SPACE LEAK		2		
TH13	PRESSURIZER PORV FAILURE			1	
TH14	FAILURE OF PRESSURIZER PORV BLOCK VALVES			1	
TH15	PRESSURIZER SAFETY VALVE FAILURE			2	
TH16	PRESSURIZER SPRAY VALVE FAILURE				1
TH19	RCS FUEL ELEMENT FAILURE				1
TH20	REACTOR COOLANT PUMP SHAFT SEIZURE				2
TP01	STATOR COOLING WATER PUMP TRIP / FAILS TO START		3		
TP02	SEAL OIL SYSTEM PUMP TRIP / FAILS TO START			2	
TU01	MAIN TURBINE BRG OIL PUMP TRIP / FAILS TO START	4			
TU02	MAIN TURBINE BRG LIFT OIL PUMP TRIP / FAILS TO START	4			
TU03	MAIN TURBINE SO BACKUP PUMP TRIP / FAILS TO START	4			
TU04	MAIN TURBINE EMERG OIL PUMP TRIP / FAILS TO START				2
TU05	TURBINE VIBRATION				3
TU07	MAIN TURBINE BRG OIL PUMP DISCHARGE LINE BREAK				3
WD01	GAS DECAY TANK RUPTURE		4		

SIMULATOR CERTIFICATION REPORTING AND TESTING PROGRAM

A. Purpose

The purpose of this procedure is to:

1. standardize initial and annual simulator certification report formats.
2. provide an approval mechanism for simulator certification reports.
3. define time requirements for installation of a reference plant modification.
4. standardize simulator certification testing procedures.
5. establish an administrative procedure for performing simulator certification testing.

B. References

1. ANSI/ANS-3.5-1985: Nucle Power Plant Simulators for Use in Operator Training
2. 10CFR 55.45: Operating Tests
3. NRC Reg Guide 1.149: Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations
4. NRC NUREG 1258: Evaluation Procedure for Simulation Facilities Certified under 10CFR 55
5. INPO TQ-504: Simulator Configuration Management System - Good Practices
6. PTAG-115: Review and Processing of Operating Experience Event Reports
7. PTAG-202: Production Training Department Revision Process
8. Operations Policy #1: Configuration Management
9. Operations Policy #2: Simulator Fidelity and Appearance
10. PTAO-101: Document Tracking and Review Process Procedure
11. PTAO-102: Tracking Training Course Changes Procedure
12. PTAO-103: Simulator Work Request Procedure
13. PTAO-104: Simulator Review Board Procedure

C. Definitions

1. <u>Configuration Management Control</u> - A system that ensures that all training programs and the simulator appearance, performance, and environment are kept current and reflect the reference plant as closely as possible.

2. <u>Design Database</u> - A collection of material which documents the current performance and appearance status of the simulator hardware and software. It is further defined as the contents of the General Files Pattern Simulator (SIM) file. Any document that is <u>NOT</u> in the General Files Pattern Simulator (SIM) file is considered <u>NOT</u> part of the Simulator Design Database.

3. <u>Environmental Fidelity</u> - The degree of similarity between the simulator and the reference plant in the environmental aspects such as lighting circuits, lighting intensity, annunciator sound levels, and carpeting/flooring of the control room.

4. <u>Fidelity</u> - The combination of Environmental, Functional, and Physical Fidelity.

5. <u>Functional Fidelity</u> - The degree of similarity between the simulator and the reference plant in the static and dynamic response of equipment and controls.

6. <u>Performance Tests</u> - The tests used to verify that the dynamic behavior of the simulator adequately represent that of the reference plant as required by ANSI/ANS-3.5-1985 section 5.4 and NRC Reg Guide 1.149 section C.5.

7. <u>Physical Fidelity</u> - The degree of similarity between the simulator and the reference plant in the physical design and location of the panels, equipment, instruments, and controls.

8. <u>Reference Plant</u> - The specific nuclear power plant reactor from which the simulator control room configuration, system control arrangement, and simulator design data is derived.

9. <u>Simulator</u> - A simulator incorporating detailed modeling of systems of the reference plant with which the operator interfaces in the control room. The control room operating consoles are included. Such a simulator demonstrates expected plant response to normal and off-normal conditions.

10. <u>Work Request</u> - A document that identifies and tracks deviations in simulator performance or appearance from the current Design Database; or a document that is used to justify simulator design changes that might be incorporated into the Design Database.

D. Procedure

1. Certification Reporting

a. Each Production Training Department Site Operations Staff prepares an initial simulator certification report to be submitted to the Simulator Review Board for approval.

b. After the initial report, each Production Training Department Site Operation Staff prepares a annual simulator certification report which updates the initial report. The annual simulator certification report is prepared on the anniversary date of the initial report. The annual report is used for internal documentation only and approved by the Simulator Review Board.

c. Every four years after the initial simulator certification report, each Production Training Department Site Operations Staff prepares a Simulator Certification Update Report to be submitted to the Simulator Review Board for approval. The Simulator Certification Update Report summarizes the activities of the previous 4 years on the simulator.

d. The Initial, Annual, and Four Year Update certification reports are written in the format identified in appendix A of ANSI/ANS-3.5-1985: Nuclear Power Plant Simulators for Use in Operator Training. An example, the Braidwood Initial Certification Report is included as Attachment T-1.

e. For purposes of simulator certification reporting, the Production Training Department has interpreted ANSI/ANS-3.5-1985: Nuclear power Plant Simulators for Use in Operator Training, section 5.3 Simulator Modifications, to mean the following:

"Each Production Training Department Site Operations Staff must identify reference plant modifications which have been declared operational on the next annual simulator certification report. The Production Training Department Site Operations Staff then has one year (until the subsequent annual simulator certification report) to install the modification on the simulator."

In order to assure the highest fidelity of the simulator and the best possible training environment, it is Production Training Department philosophy that plant modifications be installed and operational on the simulator within 12 months of the <u>operational date</u> of the reference plant modification.

2. Certification Testing - Overview

   a. Each Production Training Department Site Operations Staff shall prepare certification test procedures to verify the fidelity of the simulator. The depth of these procedures shall be specific enough to ensure repeatability. Example of a test procedures can be found in Attachment 2.

   b. Each year, the Production Training Department Site Operations Staff conducts performance tests as required by NRC Reg Guide 1.149 section C.5. Each Production Training Department Site Operations Staff prepares a guideline specifying the testing schedule for each test.

3. Certification Testing Administrative Procedure

   a. A copy of the Simulator Test Cover Sheet, PTAO-105T1, shall be attached to each simulator certification test being performed with the test title, number, date performed, and a brief description of the test written on the Simulator Test Cover Sheet, PTAO-105T1.

   b. The outcome of the test shall be indicated on the Simulator Test Cover Sheet, PTAO-105T1 as follows:

NOTE

No test can be signed as successful and complete if any simulator work request(s) were written as a result of performing the test. All simulator work request(s) associated with a particular test must be cleared prior to accepting that test as completed.

   1) If the test PASSES and <u>NO simulator work requests were written</u> as a result of performing this test the test is considered acceptable:

      a) check the appropriate space on the Simulator Test Cover Sheet, PTAO-105T1.

      b) sign and date the Simulator Test Cover Sheet, PTAO-105T1.

      c) file in the SIM file.

2) If the test PASSES, but some simulator work requests were written as a result of performing this test, the test is considered acceptable but not complete until all associated work request have been completed:

   a) check the appropriate space on the Simulator Test Cover Sheet, PTAO-05T1.

   b) sign and date the Simulator Test Cover Sheet, PTAO-105T1.

   c) write any simulator work requests referencing the test by number on the work request.

   d) write the simulator work requests number(s) on the Simulator Test Cover Sheet, PTAO-105T1, when work request numbers have been assigned.

   e) after the associated simulator work request are completed, so indicate on the Simulator Test Cover Sheet, PTAO-105T1.

   f) after all simulator work requests are completed, file in the SIM file.

3) If the test FAILS:

   a) check the appropriate space on the Simulator Test Cover Sheet, PTAO-105T1.

   b) sign and date the Simulator Test Cover Sheet, PTAO-105T1.

   c) attach Simulator Test Cover Sheet, PT[illegible]105T1, to the test document.

   d) write any simulator work requests referencing the test by number on the work request.

   e) write the simulator work requests number(s) on the Simulator Test Cover Sheet, PTAO-105T1, when work request numbers have been assigned.

   f) after the simulator work requests are completed, so indicate on the Simulator Test Cover Sheet, PTAO-105T1.

   g) use additional Simulator Test Cover Sheets, PTAO-105T1, for performing subsequent tests. Use the original test number on any additional sheets. The original test sheet must remain with the test document.

E. Attachments

Appendix 1.	Braidwood Simulator Initial Certification Report
Appendix 2.	Examples of Testing Procedures
PTAO-105T1	Simulator Test Cover Sheet

Arthur M. Roberts

Arthur M. Roberts
Production Training Manager

TEST PROCEDURE COVER SHEET

Simulator ______________

Test Number ______________

Date Performed ______________

Test Description ____

____

____

Discrepancies

Item	Comments	Section of Test Requiring Retest	Discrepancy Report #	Corrected (initials) and Date

Test Results

______ 1. Test Completed Satisfactorily

______ 2. After correction of the above discrepancies, test results are satisfactory. Retest is Not necessary.

______ 3. Teste results UNSATISFACTORY. Retest the above after correction of above discrepancies.

Retest Complete ______________________ Date ________

Test Complete ______________________ Date ________

SFCC Acceptance ______________________ Date ________

Simulator Supervisor's Acceptance ______________________ Date ________

APPENDIX 5

SIMULATOR MALFUNCTION TESTING SCHEDULE

(NON-CERTIFIED MALFUNCTIONS)

NOTES

The annual testing periods are as follows:

91/92 - March 18, 1991 to March 17, 1992
92/93 - March 18, 1992 to March 17, 1993
93/94 - March 18, 1993 to March 17, 1994
94/95 - March 18, 1994 to March 17, 1995

The approximate test date refers to the first second, third or fourth quarter of the above testing periods. For example, the first quarter of the 91/92 testing period is from March 18, 1991 to June 17, 1991 and the fourth quarter is from December 18, 1991 to March 17, 1992.

ZION SIMULATOR
ANSI/ANS-3.5-1985, CERTIFICATION REPORT
INITIAL REPORT, MARCH, 1991

APPENDIX 5
PROPOSED SIMULATOR MALFUNCTION TESTING SCHEDULE
(NON CERTIFIED MALFUNCTIONS)

MALF NUMBER	MALFUNCTION DESCRIPTION	ANNUAL TESTING PERIOD (YR) APPROX TEST DATE (QTR) 91/92	92/93	93/94	94/95
AN01	LOSS OF ANNUNCIATOR HORN				1
AN02	LOSS OF ANNUNCIATOR PANEL				1
CC02	COMP. COOL. WATER PUMP INADVERTANT AUTO-START	1			
CC06	COMP. COOL. WATER HEAT EXCHANGER TUBE LEAK		1		
CH02	RX CAVITY VENT FAN DISCH. DAMPER FAILS CLOSED			1	
CH03	CRDM VENTILATION FAN TRIP / FAILS TO START			1	
CH04	INADVERTANT RCFC (SLOW SPEED) AUTO START				2
CH05	CONTAINMENT PURGE EXHAUST PIPING BREAK				2
CH06	REACTOR CAVITY BOOT FAILURE	1			
CH08	INNER ESCAPE HATCH SEAL FAILURE	1			
CH09	FUEL HANDLING ACCIDENT	2			
CR01	CORE EXIT THERMOCOUPLE PPC POINT OUTPUT FAILURE		2		
CR02	CORE EXIT PPC POINT THERMOCOUPLE FAILURE		2		
CS03	CONTAINMENT SPRAY PUMP 1C INADVERTANT AUTO-START			2	
CS04	CONTAINMENT SPRAY PUMP INADVERTANT AUTO-START			2	
CS05	CONTAINMENT SPRAY EDUCTOR SUCTION VALVE FAILURE				3
CS06	CONTAINMENT SPRAY PUMP 1A SUCTION LINE BREAK				3
CS07	CONTAINMENT SPRAY PUMP RECIRC CHECK VALVE LEAK				3
CV05	FAILED POS. DISP. CHARGING PUMP SPEED CONTROL	2			
CV06	VCT DIVERT VALVE FAILURE	2			
CV09	CLOGGED CVCS FILTER (REACTOR COOLANT FILTER 1)	3			
CV12	BORIC ACID FLOW TRANSMITTER (FT-110) FAILURE		3		
CV18	SEAL WATER RETURN RELIEF VALVE FAILURE		3		
CV19	SEAL WATER HEAT EXCHANGER TUBE LEAK		3		
CV21	SEAL INJECTION SUPPLY LINE LEAK		3		
CV26	HIGH HEAD SAFETY INJ LINE LEAK INSIDE CONTAINMENT			3	
CV27	REGENERATIVE HEAT EXCHANGER TUBE LEAK			3	
CV30	CHARGING PUMP SUCTION LINE BREAK			1	
CV33	CHARGING PUMP SUCTION RELIEF 1VC-8124 FAILURE				4
CV34	BIT INJECTION LINE TO RCS LOOP PIPING BREAK				4
CV35	BIT INJECTION LINE CHECK VALVE LEAKAGE	3			
CV36	CENTRIFUGAL CHARGING PUMP DISCHARGE LINE BREAK	3			
CW02	CIRC WATER PUMP DISCHARGE VALVE FAILS TO CLOSE		4		
CW03	CIRC WATER TUBE LEAK IN CONDENSOR TUBE BUNDLE A		4		
CW04	LOSS OF FOREBAY LEVEL			4	
CW05	CIRC WATER PUMP TRIPS ON HIGH DELTA-P			4	
ED01	LOSS OF OFFSITE POWER	4			
ED02	345 KV SWITCHYARD SECTIONALIZING TRIP				4
ED06	LOSS OF FEED TO 480 VOLT BUS OR MCC			1	

APPENDIX 5
PROPOSED SIMULATOR MALFUNCTION TESTING SCHEDULE (NON CERTIFIED)
(CONTINUED)

MALF NUMBER	MALFUNCTION DESCRIPTION	ANNUAL TESTING PERIOD (YR) 91/92	92/93	93/94	94/95
		APPROX TEST DATE (QTR)			
ED09	DEGRADED SYSTEM VOLTAGE	4			
ED11	GRID FREQUENCY VARIATION	4			
ED12	DC POWER TO MAIN CONTROL BOARD FAILURE		1		
ED13	INADVERTANT STATION BLACKOUT SIGNAL		1		
ED15	SYNCHRONIZING RELAY DRIFT			1	
ED16	ISOLATED GRID MALFUNCTION			1	
ED17	TRANSMISSION LINE INSTABILITY CAUSING OVERLOAD				1
EG02	FAILURE OF MAIN EXCITATION LIMITER	1			
EG04	FAILURE OF BASE FOLLOWER UNIT (WTA REGULATOR)		2		
FP01	ACTIVATION OF FIRE SUPPRESSION WATER SYSTEM				2
FW07	TURBINE DRIVEN AFW PUMP GOVERNOR OSCILLATION	1			
FW08	MAIN FEED WATER PUMP LOW NPSH	1			
FW12	LOW PRESSURE FW HTR 11 LEVEL CONTROL FAILS LOW	2			
FW13	HIGH PRESSURE FW HTR [illegible] LEVEL CONTROL FAILS LOW	2			
FW14	HEATER DRAIN SYSTEM CONTROL FAILURE		2		
FW15	HIGH PRESSURE FW HTR 16 TUBE LEAK		1		
FW17	LOW PRESSURE FW HTR 14 TUBE LEAK		1		
FW18	LOW PRESSURE FW HTR 13 TUBE LEAK		1		
FW19	LOW PRESSURE FW HTR 12 TUBE LEAK		1		
FW21	DRAIN COOLER 15 TUBE LEAK			3	
FW23	FEED PUMP SUCTION LINE BREAK			3	
FW24	MAIN FW PUMP RECIRC LINE BREAK			4	
FW27	AUXILIARY FEEDWATER CHECK VALVE LEAKAGE			4	
FW29	HEATER DRAIN TANK RUPTURE DISK FAILURE				3
FW30	NONLINEARIZED 1PCV-FW21B FLOW				3
FW31	LOVEJOY TRACK AND HOLD SYSTEM FAILURE				4
FW32	MFP TURBINE HP CONTROL OIL FILTER / ORIFACE PLUGGING				4
HV01	AUX BUILDING CHARCOAL BSTR FAN TRIP / FAILS TO START				1
HVO2	DIESEL GENERATOR VENT SYSTEM FAILURE			1	
MS02	MAIN STEAM ISOLATION DRAIN VALVE FAILS AS IS	2			
MS0[illegible]	GLAND STEAM REGULATOR OSCILLATION	2			
MS06	STEAMLINE BREAK IN CONT. BEFORE FLOW RESTRICTOR		2		
MS08	STEAMLINE BREAK OUTSIDE CONTAINMENT		2		
MS11	PIPING BREAK DOWNSTREAM OF GOVERNOR VALVE		2		
MS12	1CE MOISTURE SEP. REHEATER CROSS OVER PIPE BREAK			2	
MS13	LP HTR 13A EXTRACTION LINE BREAK AFTER CHECK VALVE			2	
MS14	LP HTR 14A EXTRACTION LINE BREAK AFTER CHECK VALVE			2	
MS16	LP TURBINE CASING RUPTURE DISC FAILURE				1
MS17	HP TURBINE GOVERNOR VALVE LEAKAGE				2
MS18	LP HTR [illegible]4 EXT STM NON-RETURN CHECK VALVE FAILS OP[illegible]				2
NI03	FAIL OF SOURCE RANGE HIGH VOLTAGE TO DISCONNECT			2	
NI04	SOURCE RANGE CHANNEL HIGH VOLTAGE FAILURE				3

APPENDIX 5

PROPOSED SIMULATOR MALFUNCTION TESTING SCHEDULE (NON CERTIFIED)

(CONTINUED)

MALF NUMBER	MALFUNCTION DESCRIPTION	ANNUAL TESTING PERIOD (YR) 91/92	92/93	93/94	94/95
		APPROX TEST DATE (QTR)			
NI05	SOURCE RANGE DISCRIMINATOR FAILURE	3			
NI10	INCORE MONITORING SYSTEM FAILURE				4
NI11	STUCK INCORE DETECTOR				4
NI12	POWER RANGE SPIKE RATE TRIP	3			
NI13	NUCLEAR INSTRUMENTATION SEAL TABLE LEAK				1
RD04	DROPPED ROD GROUP	3			
RD05	DROPPED RODLET	3			
RD11	CONTROL RODS MOVE IN WRONG DIRECTION		4		
RD14	ROD POSITION STEP COUNTER FAILURE		4		
RD18	INTERMEDIATE RANGE ROD STOP C-1 FAILS AS IS			3	
RD19	POWER RANGE ROD STOP C-2 FAILS AS IS			4	
RD20	OVERTEMPERATURE DELTA-T ROD STOP C-3 FAILS AS IS			4	
RD21	OVERPOWER DELTA-T ROD STOP C-4 FAILS AS IS				1
RD22	LOW POWER ROD STOP C-5 FAILS AS IS				2
RD23	BANK D ROD WITHDRAWL STOP C-11 FAILS AS IS				2
RH04	RHR HX BYPASS VALVE CONTROL FAILURE	4			
RH05	RHR HEAT EXCHANGER TUBE LEAK		4		
RH06	RHR HEAT EXCHANGER BYPASS LINE LEAK		4		
RH09	1RH-9001 CHECK VALVE LEAKAGE			1	
RH10	1RH-9002 CHECK VALVE LEAKAGE			1	
RH11	RHR SUCTION HEADER BREAK				3
RH13	1RH-8949 CHECK VALVE LEAKAGE				3
RM01	AREA RADIATION MONITOR ACTUATION	4			
RM02	PROCESS RADIATION MONITOR ACTUATION		1		
RM03	INOPERABLE RADIATION MONITOR			2	
RM04	INADVERTANT AUTO RADIATION MONITOR ACTUATION				4
RM05	FAILURE OF RADIATION MONITOR INTERLOCK ACTUATION				4
RP03	REACTOR TRIP BREAKER / BYPASS BREAKER FAILS CLOSED	4			
RP14	3 LOOP FLOW PERMISSIVE P-8 FAILS AS IS		1		
RP15	NUCLEAR AT POWER PERMISSIVE P-10 FAILS AS IS			3	
RP18	TURBINE AT POWER PERMISSIVE P-13 FAILS AS IS			3	
RP19	SG HI LVL OVERIDE PERMISSIVE P-14 FAILS AS IS				1
RX01	FAILURE OF STEAM GENERATOR LEVEL PROGRAM	1			
RX02	UNSTABLE STEAM GENERATOR LEVEL CONTROLLER	1			
RX04	WIDE RANGE STM GEN LVL TRANSMITTER FAILURE	1			
RX09	STEAM FLOW OSCILLATION - TIME		2		
RX10	STEAM FLOW OSCILLATION - MAGNITUDE		2		
RX15	MFP SPEED DEMAND OSCILLATION - TIME		3		
RX16	MFP SPEED DEMAND OSCILLATION - MAGNITUDE		3		
RX18	PRESSURIZER VARIABLE HEATER CONTROL FAILURE			4	
RX19	PRESSURIZER BACKUP HEATERS FAILURE			4	
RX26	PRIMARY COLD LEG WIDE RANGE RTD FAILS				1
RX27	PRIMARY HOT LEG WIDE RANGE RTD FAILS				1
RX31	LOSS OF LOAD CONTROL INTERLOCK C-7 FAILS AS IS				1

APPENDIX 5

PROPOSED SIMULATOR MALFUNCTION TESTING SCHEDULE (NON CERTIFIED)

(CONTINUED)

MALF NUMBER	MALFUNCTION DESCRIPTION	ANNUAL TESTING PERIOD (YR) 91/92	92/93	93/94	94/95
		APPROX TEST DATE (QTR)			
RX32	TURBINE TRIPPED CONTROL INTERLOCK C-8 FAILS AS IS			2	
RX33	CONDENSOR AVAIL. CONTROL INTERLOCK C-9 FAILS AS IS			2	
RX35	ROD CONTROL SYSTEM FAILURE				2
RX37	ERRATIC OPERATION OF IA MFP DISCH FCV (1PCV-FW21B)				2
SI02	SI ACCUMULATOR HIGH PRESSURE	2			
SI04	SI ACCUMULATOR HIGH LEVEL	2			
SI05	COLD LEG INJECTION CHECK VALVE LEAKAGE		4		
SI06	HOT LEG INJECTION CHECK VALVE LEAKAGE		4		
SW03	STATOR COOLING WATER TCV FAILS CLOSED	4			
SW05	GENERATOR AUX TEMPERATURE CONTROLLER FAILURE		1		
SW08	SERVICE WATER TO EHC COOLER TUBE LEAK			1	
SW09	SERVICE WATER TO MAIN LUBE OIL COOLER TUBE LEAK				2
TC01	TURBINE AUTO TRIP FAILURE			1	
TC04	LOSS OF EHC REFERENCE CHANNEL	3			
TC06	LP TURBINE INLET PRESSURE CHANNEL (MS-25) FAILURE	3			
TC07	EHC MAIN SPEED CHANNEL FAILURE		2		
TC09	EHC-MW TRANSDUCER FAILURE		2		
TC10	EHC - GOVERNOR VALVE OSCILLATION - MAGNITUDE			3	
TC11	EHC - GOVERNOR VALVE OSCILLATION - TIME			3	
TC12	GOVERNOR CONTROL VALVE FAILURE				3
TC15	LP TURBINE INTERCEPT / REHEAT VALVE FAILURE				3
TH01	DEGRADED REACTOR COOLANT PUMP PERFORMANCE	4			
TH03	RCP REVERSE ROTATION PAWL FAILURE	4			
TH07	COLD LEG BREAK BEFORE REACTOR COOLANT PUMP		3		
TH08	REACTOR VESSEL FLANGE LEAK		3		
TH10	PRESSURIZER LEVEL DETECTOR VARIABLE LEG LEAK		3		
TH11	PRESSURIZER RELIEF TANK LEAK			4	
TH12	PRESSURIZER RELIEF TANK PRIMARY WATER IN-LEAKAGE			4	
TH17	PRESSURIZER RELIEF LINE RTD FAILURE			1	
TH18	PRESSURIZER RELIEF TANK PRESS. DETECTOR FAILURE				4
TH2	REACTOR VESSEL REFUELING LEAK				4
TU06	MAIN TURBINE MAIN LUBE OIL PUMP DISCH. LINE BREAK		4		

APPENDIX 6

ZION SIMULATOR TRAINSIENT TEST REVIEW BOARD

ZION SIMULATOR TRANSIENT REVIEW BOARD

The following is a list of the members and qualifications of the Zion Simulator Transient Review Board for the initial certification report.

	Member	Qualifications		
1.	Raymond E. Landrum	Position	-	Zion Simulator Training Supervisor
		Background	-	SRO License Zion Station
			-	Shift Engineer Zion Station - 2 yrs.
			-	Operations Training Group Leader, Zion Station - 4 yrs.
			-	Training Instructor, Operating Group, Zion Station - 2 yrs.
			-	Nuclear Station Operator, Zion Station - 4.5 yrs.
			-	Equipment Operator, Zion Station - 1 yr.
				Equipment Attendant, Zion Station - 1.5 yrs.
			-	U.S. Nuclear Navy, ERS - 6 yrs.
2.	Dan T. Giernoth	Position	-	Shift Engineer, Zion Station
		Background	-	SRO License, Zion Station
			-	Shift Foreman Zion Station 5 yrs.
			-	Nuclear Station Operator, Zion Station - 6 yrs.
			-	Equipment Operator, Zion Station - 1 yr.
			-	Equipment Attendant, Zion Station - 1 yr.
3.	Timothy P. Koleno	Position	-	Operations Training Group Leader
		Background	-	SRO License, Zion Station
			-	Certified Instructor, Zion Station
			-	Zion Station Training Department - 5 yrs.

Member		Qualifications	
	Timothy P. Koleno (cont.)		- Shift Foreman, Zion Station - 2 yrs.
			- Radwaste Foreman, Zion Station - 4 yrs.
			- Equipment Attendant, Zion Station - 1 yr.
			- U.S. Nuclear Navy, EWS - 8 yrs.
4.	Jim Madden	Position	- Assistant Tech Staff Supervisor, Zion Station
		Background	- B.S. Nuclear Engineering
			- Professional Engineer, Illinois License
			- SRO License, Zion Station
			- Zion Tech Staff - 3 yrs.
			- Zion Control Room Positions - 5 yrs.
5.	Paul DiGiovanna	Position	- General Instructor - SRO
		Background	- SRO Certification, Braidwood/Byron Stations
			- SRO Certification, Callaway Station
			- U.S. Nuclear Navy, EWS - 8 yrs.
6.	Donald Phillips	Position	- General Instructor
		Background	- Simulator Staff Test Operator, Singer-Link Miles Simulation Corp., 12 yrs.
			- RO Certification, Browns Ferry
			- RO License, Calvert Cliffs Nuclear Power Plant
			- Control Room Operator, Calvert Cliffs - 5 yrs.
			- U.S. Nuclear Navy, ERS - 7.5 yrs.

APPENDIX

ANSI/ANS-3.5-1985 - CERTIFICATION REPORT

CROSS REFERENCE MATRIX

NOTE

This appendix contains a cross reference matrix showing ANSI/ANS-3.5-1985 requirements and the location in this report where the requirements are met.

APPENDIX 7

ANSI/ANS-3.5-1985-CERTIFICATION REPORT

CROSS REFERENCE MATRIX

ANSI/ANS-3.5-1985 REQUIREMENT		LOCATION IN CERTIFICATION REPORT
SECTION	DESCRIPTION	SECTION
3.1.1	Normal Plant Evolutions	A.3.2; Attachment 2
3.1.2	Plant Malfunctions	A.1.3.2, A.3.4, Attachment 6
3.2.1	Degree of Panel Simulation	A.1.2.2, Attachment 5
3.2.2	Controls on Panels	A.1.2.2
3.2.3	Control Room Environment	A.1.2.1, A.1.2.4
3.3.1	Control Room Systems	A.1.2.3
3.3.2	System Operation Outside Control Room	A.1.3.3, Appendix 2
3.4.1	Initial Conditions	A.1.3.1, Appendix 1
3.4.2	Malfunctions	A.1.3.2
3.4.3	Other Control Features	A.1.3.4
3.4.4	Instructor Interface	A.1.3.3, Appendix 2
4.1	Steady State Operation	A.3.2, Attachment 2
4.2	Transient Operation	A.1.3.2, A.3.2, A.3.3, Attachment 2
4.3	Simulator Operating Limits	A.3.4
4.4	Monitoring Capability	Attachment 2

ZION SIMULATOR
ANSI/ANS-3.5-1985 CERTIFICATION REPORT
INITIAL REPORT, MARCH 1991

APPENDIX 7
ANSI/ANS-3.5-1985-CERTIFICATION REPORT
CROSS REFERENCE MATRIX

ANSI/ANS-3.5-1985 REQUIREMENT		LOCATION IN CERTIFICATION REPORT
SECTION	DESCRIPTION	SECTION
5.1	Simulator Design Data	A.2
5.2	Simulator Update Design Data	A.4.2
5.3	Simulator Modifications	A.4.2
5.4.1	Simulator Performance Testing	A.3
5.4.2	Simulator Operability Testing	A.3
B.2.1	Steady State Performance	A.3.2, Attachment 2
B.2.2	Transient Performance	A.3.2, Attachment 2

ATTACHMENT 1

REGULATORY GUIDE 1.149 REQUIREMENTS FOR

DUAL PLANT SIMULATION FACILITY

- Comparison of the Zion Simu'ator to Zion Unit 2.

ZION SIMULATOR
ANSI/ANS-3.5-1985 CERTIFICATION REPORT
INITIAL REPORT, MARCH 1991

ATTACHMENT 1
REG. GUIDE 1.149 REQUIREMENTS FOR
DUAL PLANT SIMULATION FACILITY

This attachment demonstrates that the Zion Simulator meets the requirements and guidance of ANSI/ANS-3.5-1985 for Zion Unit 2.

The simulator design database is maintained from Zion Unit 1 data with the exception of the core load data which is Unit 2 Cycle 11 data. Unit 2, Cycle 11, core data was used for the simulator because it was the most recent "Low Leakage" Loading Pattern Core Data available. Deviation Reports (DVR's), License Event Reports (LER's), and modifications are reviewed by the Zion Simulator Staff.

There are no significant differences between Zion Unit 1 or Unit 2 regarding facility design or systems relevant to control room personnel. Both units utilize the same Technical Specifications, and procedures (normal, abnormal and emergency). With the exception of Unit 2 nomenclature on component labels, no significant differences exist between Unit 1 and Unit 2 in regards to control room design and instrumentation/control location or operational characteristics. The component labeling nomenclature difference is considered minor and does not detract from training.

ZION SIMULATOR
ANSI/ANS-3.5-1985 CERTIFICATION REPORT
INITIAL REPORT, MARCH 1991

ATTACHMENT 2

STEADY STATE/NORMAL OPERATIONS/

REAL TIME/TRANSIENT

.EST ABSTRACTS

ZION SIMULATOR

STEADY STATE TESTING

The objective of the Steady State Testing is to verify the Zion Simulator performance meets the criteria of ANSI/ANS-3.5-1985 Section 4.1.

Steady State heat balance tests were performed at 40%, 72% and 100% power. These power levels were chosen due to availability of Zion Unit 1 plant data.

Additionally, a 100% power, 60 minute stability test was performed.

Abstracts for these tests and associated results are included in this attachment.

ZION SIMULATOR

STEADY STATE TEST

40% POWER

The 40% Power Steady State Heat Balance Test was performed fr(1 a beginning of life, 40% power initial condition (IC26).

Data was collected in accordance with ANSI/ANS-3.5-1985, Appendix B.2.1. This data was compared to Zion Unit 1, 40% power values where plant data was available. All parameters were within ± 2% (plus instrument error) of available references plant data and do not detract from training, with the following exceptions:

Parameter	ATP Discrepancy Report Number	Estimated Correction Date
S/G Wide Range Levels	F182	4/91

ZION SIMULATOR

STEADY STATE TEST

72% POWER

The 72% Power Steady State Heat Balance Test was performed from a beginning of life, 75% power initial condition (IC32). Turbine load was reduced to achieve a power level of approximately 72.5% and stabilized.

Data was collected in accordance with ANSI/ANS-3.5-1985, Appendix B.2.1. This data was compared to Zion Unit 1, 72.5% power values where plant data was available. All parameters were within ± 2% (plus instrument error) of available reference plant data and do not detract from training, with the following exceptions:

Parameter	ATP Discrepancy Report Number	Estimated Correction Date
RCS Hot Leg Temp Loop A,B,D	F180	4/91
S/G Wide Range Levels	F182	4/91

ZION SIMULATOR

STEADY STATE TEST

100% POWER

The 100% Power Steady State Heat Balance Test was performed from a beginning of life, 100% power initial condition (IC37).

Data was collected in accordance with ANSI/ANS-3.5-1985, Appendix B.2.1. This date was compared to Zion Unit 1, 100% power values where plant data was available. All parameters were within ± 2% (plus instrument error) of available reference plant data and do not detract from training, with the following exceptions:

Parameters	ATP Discrepancy Report Number	Estimated Correction Date
RCS Hot Leg Temp Loop A,B,D	F180	4/91
S/G Wide Range Levels	F182	4/91

ZION SIMULATOR

STEADY STATE TEST

100% STABILITY TEST

The 100% Power Stability Test was performed from a beginning of life, 100% power initial condition (IC37).

Data was collected in accordance with ANSI/ANS-3.5-1985, Appendix B.2.1. The simulator was run for 60 minutes. Following 60 minutes of operation, data was recorded again. The final values did not vary more than ± 2% of the initial values.

The results of the 100% Power Stability Test were acceptable.

ZION SIMULATOR

NORMAL OPERATIONS TEST

The objective of the Normal Operations Tests is to verify that the Zion Simulator performance meets the criteria of ANSI/ANS-3.5-1985 Section 3.1.1. The Normal Operations Acceptance Test Procedures are based on the Zion Station General Operation Procedures. The tests performed and associated results are as follows:

A. Reactor Coolant System Heatup — Accepted

B. Nuclear Startup — Exceptions noted below:

Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
Mechanical problem with 3 rod step counters	P2213	4/91
Steam flow oscillations at low steaming rates	P2215	4/91

C. Startup and Synchronization — Exceptions noted below:

Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
Turbine steam and metal temperatures incorrect	P2219	4/91

D. Increase Reactor Power from 20% to 100% — Accepted

E. Decrease Reactor Power from 100% to 20% — Accepted

F. Pre-Shutdown Preparation — Accepted

G. Shutdown of the Reactor and Main Generator — Accepted

H. Shutdown of the Reactor to Cold Shutdown — Accepted

I. Reactor trip followed by recovery to rated power — Accepted

J. Operations at Hot Standby — Accepted

ZION SIMULATOR

CORE PERFORMANCE TESTS

The objective of the Core Performance Tests is to verify that the Zion Simulator performance meets the criteria of ANSI/ANS-3.5-1985 Section 3.1.1.

The Core Physics Acceptance Test Procedures, were applicable, are based on Zion Station procedures. The tests were performed using permanently installed instrumentation and simulator unique features. The tests performed and associated results are as follows:

A. Shutdown Margin Verification — Accepted

B. Verification of Differential and Integral Rod Worths — Exceptions noted below:

Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
Rod bank worths incorrect	P1376	4/91
Differential and integral EOL rod worths incorrect	P2287	4/91

C. Verification of Isothermal Temperature Coefficient — Accepted

D. Verification of Power Coefficient — Accepted

ZION SIMULATOR

OPERATOR PERFORMED SURVEILLANCE TESTS

The objective of the Operator Performed Surveillance Tests is to verify that the Zion Simulator performance meets the criteria of ANSI/ANS-3.5-1985 Section 3.1.1.

The Surveillance Tests Acceptance Test Procedure utilized the Zion Station Periodic Test procedures. The tests performed are listed below and the results of all these tests were accepted.

PT-1	Rod Cluster Control Exercise
PT-2A	Safety Injection System Tests
PT-2C	(Sect. B) ECCS Valve Interlock Test
PT-2I	Centrifugal Charging Pump Tests
PT-2J	Residual Heat Removal Pump Tests
PT-3D	Main Steam Isolation Valves Monthly Check
PT 4A	Source Range Functional Test
PT 4B	Intermediate Range Functional Test
PT 4C	Power Range Channel Functional Test
PT 6	Containment Spray System Tests and Checks
PT 7	Auxiliary Feedwater System Checks and Tests
PT 11	(SOI-11 Portion) Diesel Generator Loading Test
PT 20	Centrifugal Charging and Letdown System Power Operated Valve Tests
PT 24	Unit To System Auxiliary Transformer Auto Feed Transfer Test
PT-27A	(Parts of) Pressurizer Porv Tests
PT-27D	Feedwater and Steam Generator PORV Tests
PT-28	Containment Purge Valves/H2 Monitor Valves Stroke Time Verification
PT-102	Interceptor and Reheat Stop Valve Testing
PT-103	Turbine Stop Valve and Governor Valve Testing
PT-300	Containment Isolation Valves Stroke Time Verification

ZION SIMULATOR

REAL TIME TEST

The objective of the Real Time Test is t ve· · Zion Simulator performance meets the criteria of ANSI/ANS-3.5-1985 ,rne

The Real Time T st Acceptance Test Procedu sisted of timing and recording several valve travel times during normal plant operation and then during a loss of coolant accident with a loss of off-site power.

The results of the Real Time Tests were satisfactory, with a less than 1% difference in the steady state travel times and the accident condition travel times.

ZION SIMULATOR

TRANSIENT TESTS

The objective of the Zion Simulator Transient Tests is to verify the ability of the simulator to perform the transients as required by ANSI/ANS-3.5-1985 Appendix B 2.2. All Appendix B 2.2 Transients were performed. No operator action was taken. Data was collected as prescribed in ANSI/ANS-3.5-1985 Appendix B 2.2 at 0.5 second intervals. Transients were run until stable conditions were reached.

The simulator response was reviewed by the Zion Simulator Transient Test Review Board. The acceptance criteria for these tests is that the observable change in parameters correspond in the same direction to those expected from a best estimate and do not violate the physical laws of nature.

An abstract of each test along with plotted data is included in this Attachment.

The makeup of the Transient Test Review Board is located in Appendix 6.

As indicated on the enclosed transient test review sheets, the Transient Test Review Board accepted the individual data plots and the overall test results with the understanding that any discrepancy reports (DR's) written before or as a result of the transient review will explain or correct the problem. The discrepancy reports written before the transient review are noted in section 1 of the transient test review sheet and the discrepancy reports written as a result of the transient review are noted in section 2.

The following page is a description of how to interpret the transient data plots.

NOTE

Individual loop steam flow and feed flow were used because total steam flow and total feed flow are unavailable.

DESCRIPTION OF TERMS AND UNITS USED IN TRANSIENT DATA PLOTS

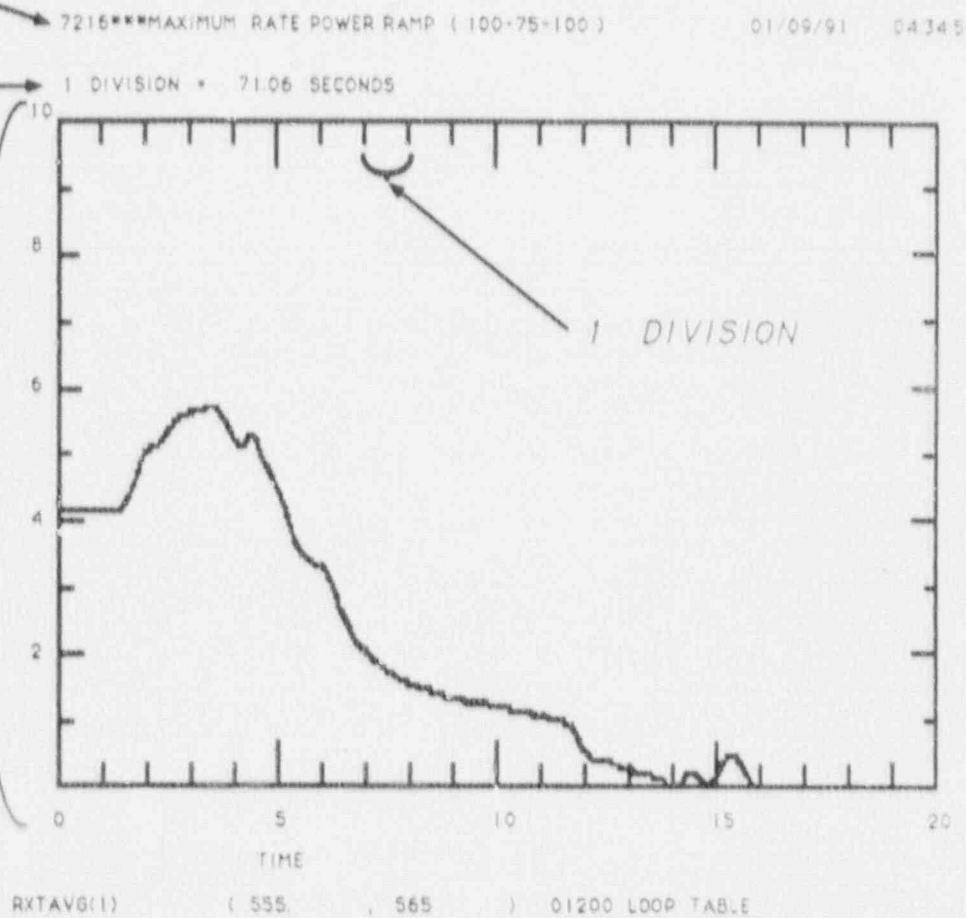
TITLE, DATE AND TIME THAT THE DATA WAS PLOTTED

THE ELAPSED TIME OF EACH TRANSIENT WAS DIVIDED INTO 20 INTERVALS (DIVISIONS) FOR PLOTTING

THE ELAPSED TIME OF EACH DIVISION IS LISTED IN SECONDS

THE VERTICAL AXIS OF EACH PLOT DIVIDES THE VARIABLE RANGE (LISTED BELOW) BY 10.

FOR THIS PLOT, THE VERTICLE AXIS WOULD BE FROM 555 TO 565°F, WITH EACH DIVISION BEING 1°F



VARIABLE NAME

VARIABLE RANGE

DESCRIPTION OF VARIABLE

VARIABLE UNITS

FLOW VARIABLES (Except RCS Loop Flow)	lbm/sec
RCS Loop Flow	%
TEMPERATURE VARIABLES	Degree's F
LEVEL VARIABLES	%
PRESSURE VARIABLES (Except Pressurizer Pressure)	psia
Pressurizer Pressure	psig
NEUTRON FLUX VARIABLES:	
Power Range	%
Source Range	counts/sec

ZION SIMULATOR TRANSIENT TEST

MANUAL REACTOR TRIP

The manual reactor trip was performed from a beginning of core, 100% power initial condition (IC37). Data was collected in accordance with ANSI/ANS-3.5-1985 Appendix B 2.2.1.

Reference plant data was available for this test from a Zion Unit 1, 100% power plant trip on 8-13-90.

Test results were reviewed and found satisfactory with the exception of:

Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
Steam Flow oscillation developed approximately 15 minutes after trip	F208	4/91
Aux feedwater flow spike	F224	4/91
S/G wide range level spike	F225	4/91

Collected and Plotted Data:

1. YCN0049 - Power Range, Neutron Flux
2. YCL0480 - Pressurizer level
3. YCT0480 - Pressurizer liquid Temp
4. THTHLRTD(1) - Loop A Hot Leg RTD Temp
   THTCLRTD(1) - Loop A Cold Leg RTD Temp
5. THPSG(1) - A S/G Pressure
6. FWFSG(1) - A S/G Feedwater Flow
7. MSFSG(1) - A S/G Steam Flow
8. RXTAVG(1) - A Loop Tavg
9. YCP0480 - Pressurizer Pressure
10. FWFAFSG(1) - A S/G Auxilliary Feedwater Flow
11. YCL0403 - A S/G Wide Range Level

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Manual Reactor Trip **DATE :** 02/06/91

1. **Data utilized for test comparison in order of preference (circle appropriate choices)**

   a. **Actual Plant Transient Data** **Event :** Rx Trip on 08/13/90

   b. **Analytical or design data** **Data :** PPC Trends

   c. **Transient Data from similar plant** **Plant :** Zion Unit 1

   d. **Panel of experts (best estimate)**

COMMENTS : Open DR # F208, steam flow oscillation at about 15 minutes after the trip.

2. **Data Comparison Summary**

VARIABLE	COMMENTS	RESOLUTION
Rx Power	NONE	Accepted
Pzr Level	Level overshoot is not same as plant due to	Accepted
	lower RCS temperature response	
Pzr Wtr Temp	NONE	Accepted
Hot Leg Temp	RCS temperature does not return to 547° F due	Accepted
Cold Leg Temp	to maximum Auxilliary FW flow and beginning	
RCS Tavg	of core life decay heat conditions	
S/G Pressure	NONE	Accepted
FW Flow	Slight increase in FW flow due to FW regulating	Accepted
	valves opening on low level just prior to FW	
	isolation on P-4 w/ low Tavg (554° F)	
Steam Flow	NONE	Accepted
AFW Flow	Unexplained spike when motor driven pumps	Accepted
	start, DR # F224 written to explain / correct.	
Pzr Pressure	NONE	Accepted
S/G WR Level	Unexplained spike after initial decrease, DR #	Accepted
	F225 written to explain / correct	

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Manual Reactor Trip **DATE** : 02/06/91

VARIABLE	COMMENTS	RESOLUTION

3. Comparison Results

Simulator capability to reproduce the defined transient: (circle one)

a. ACCEPTABLE

b. UNACCEPTABLE

4. Review Board Signatures (differing opinions must be documented)

Donald E Phillips　　D L Scott

Paul D Piersma

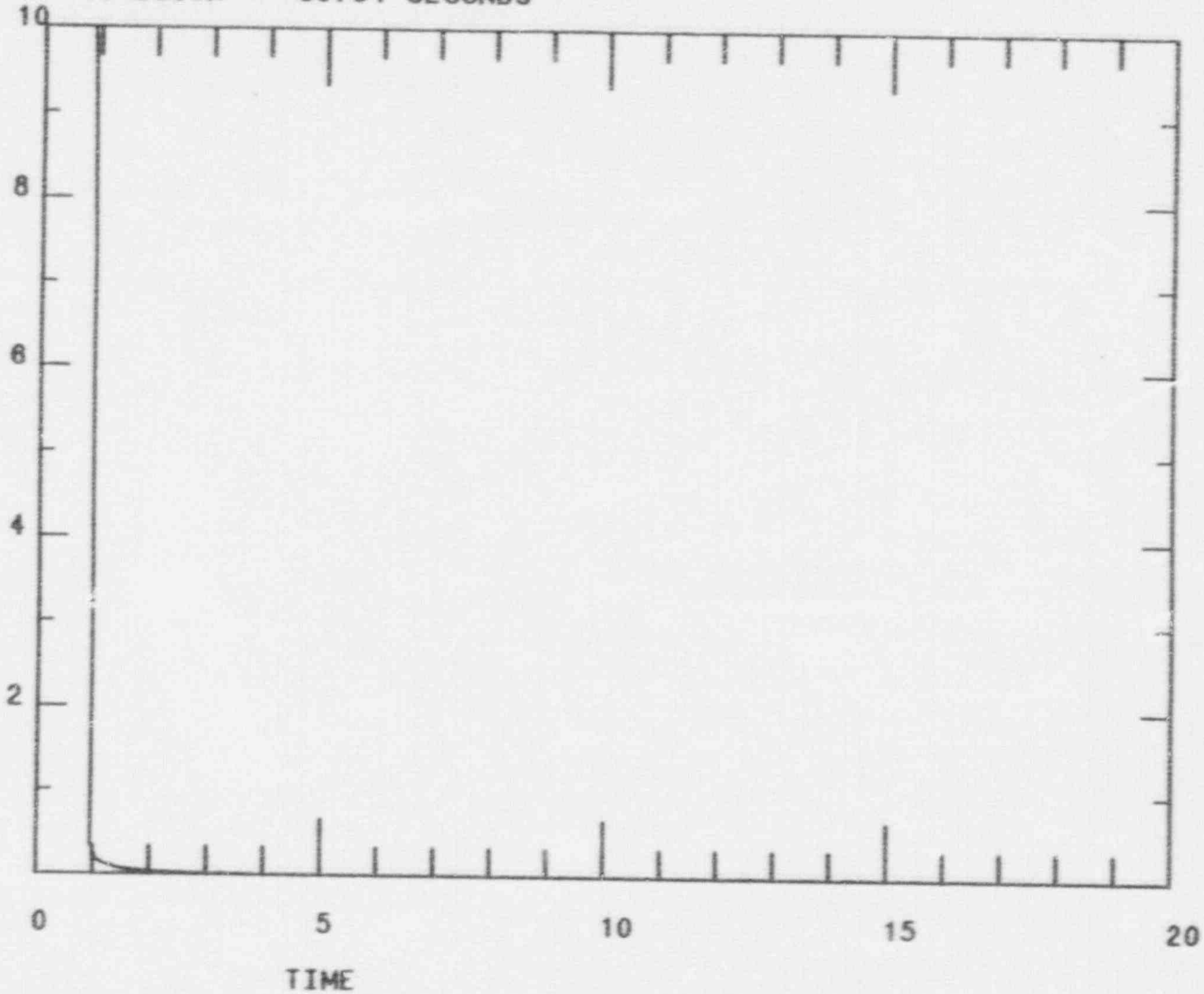
R.E. Landrum

T P Kolono

James J Madden

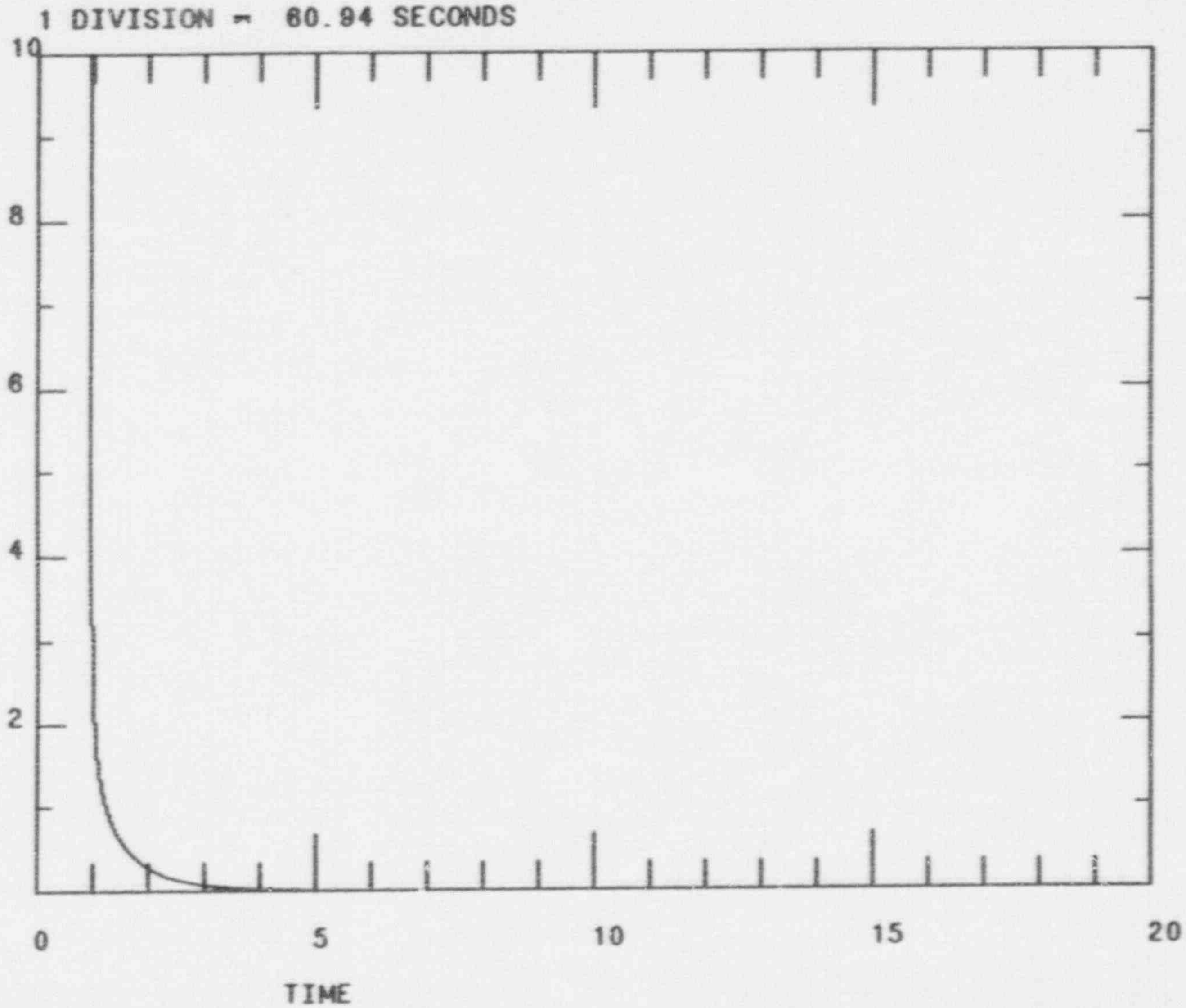
COMMENTS :

7201***MANUAL RX TRIP 02/02/91 10:20:41



YCN0049 (.000 , 100.) 21170 POWER RANGE CHANNEL 1 FL

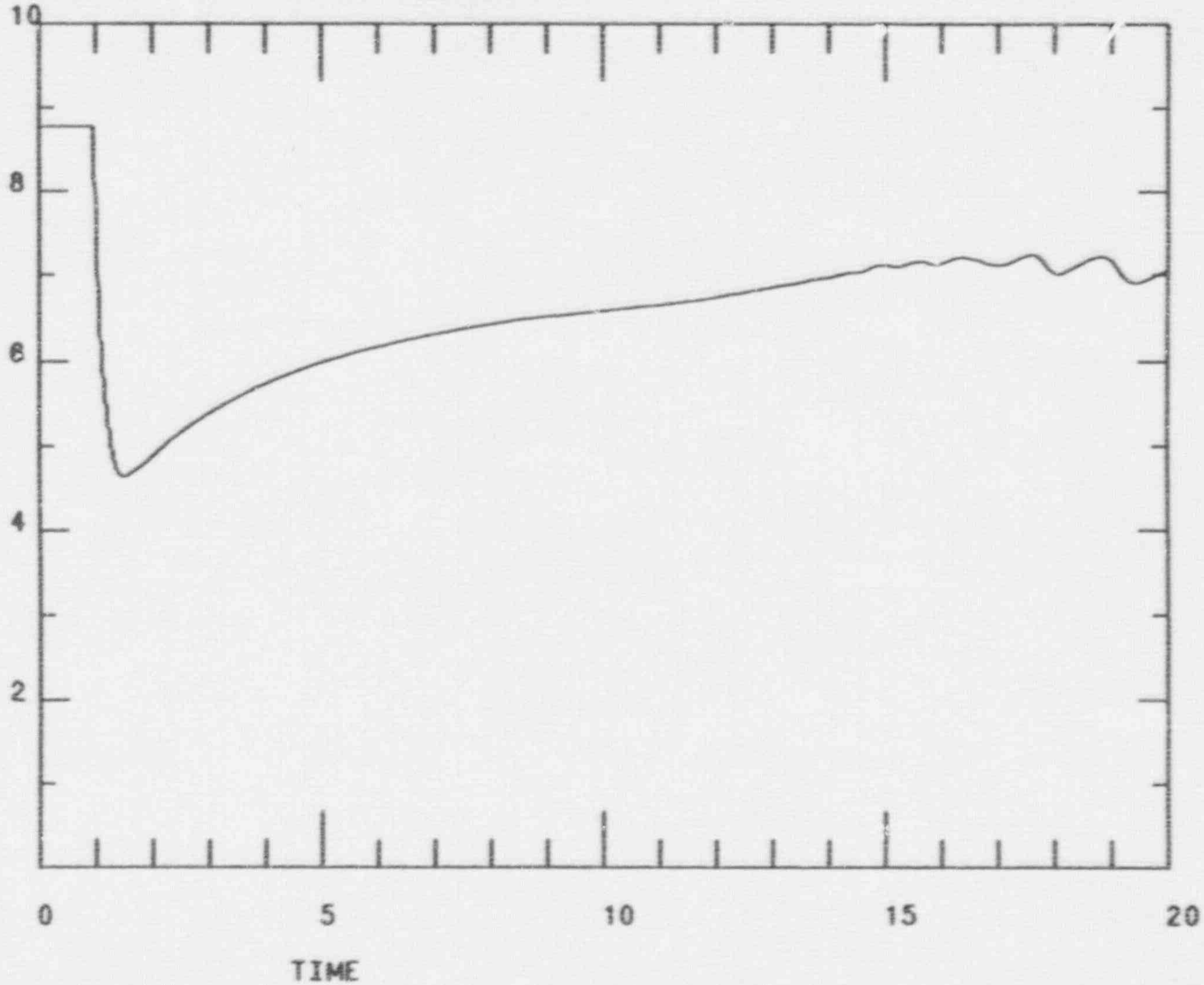
7201***MANUAL RX TRIP 01/10/91 07:17:04



YCN0049 (.000 , 10.0) 21170 POWER RANGE CHANNEL 1 FL

7201***MANUAL RX TRIP 01/10/91 07:30:09

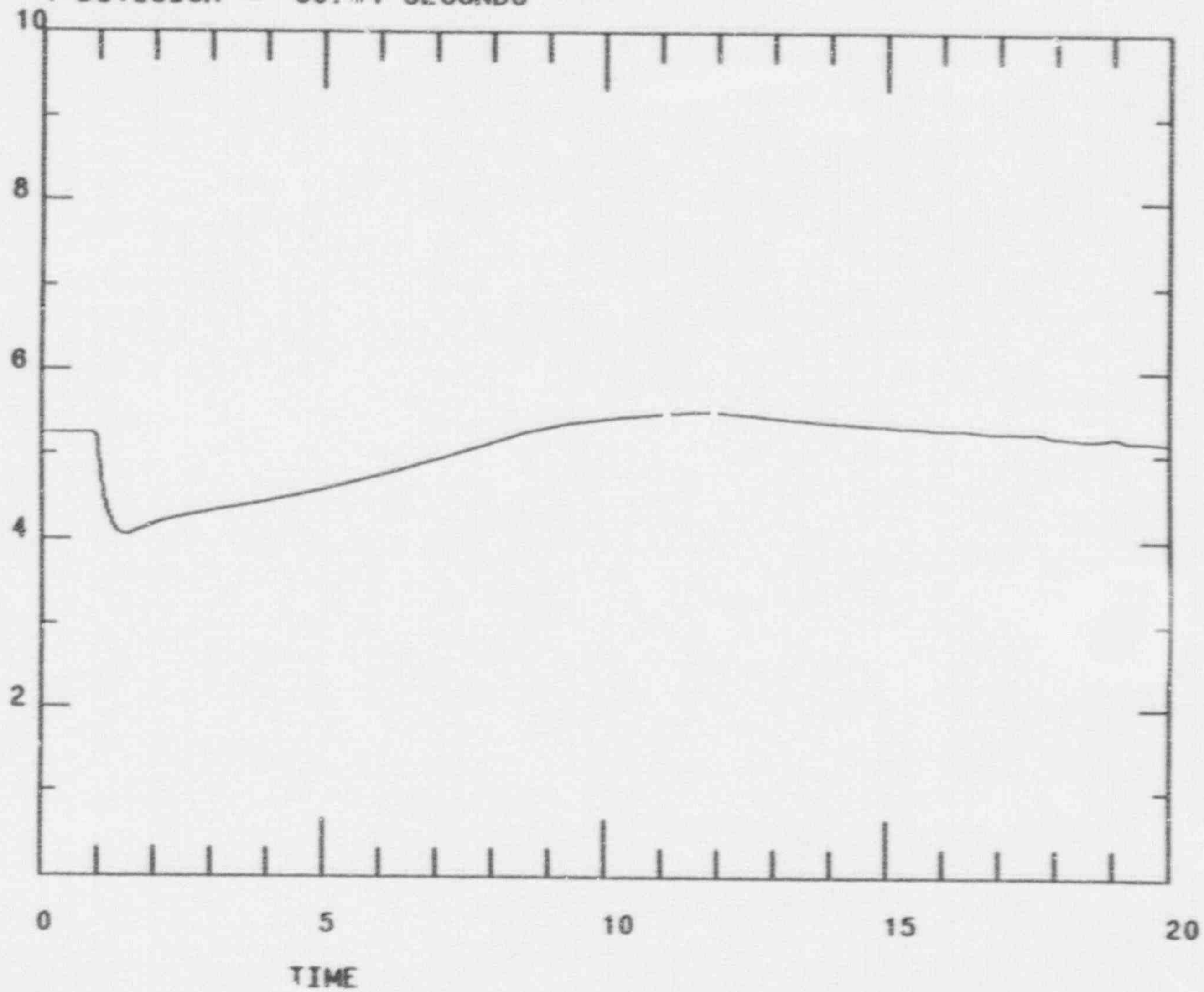
1 DIVISION = 60.94 SECONDS



YCL0480 (.000 , 50.0) 06950 PRESSURIZER 1 LEVEL

7201***MANUAL RX TRIP 01/10/91 09:25:53

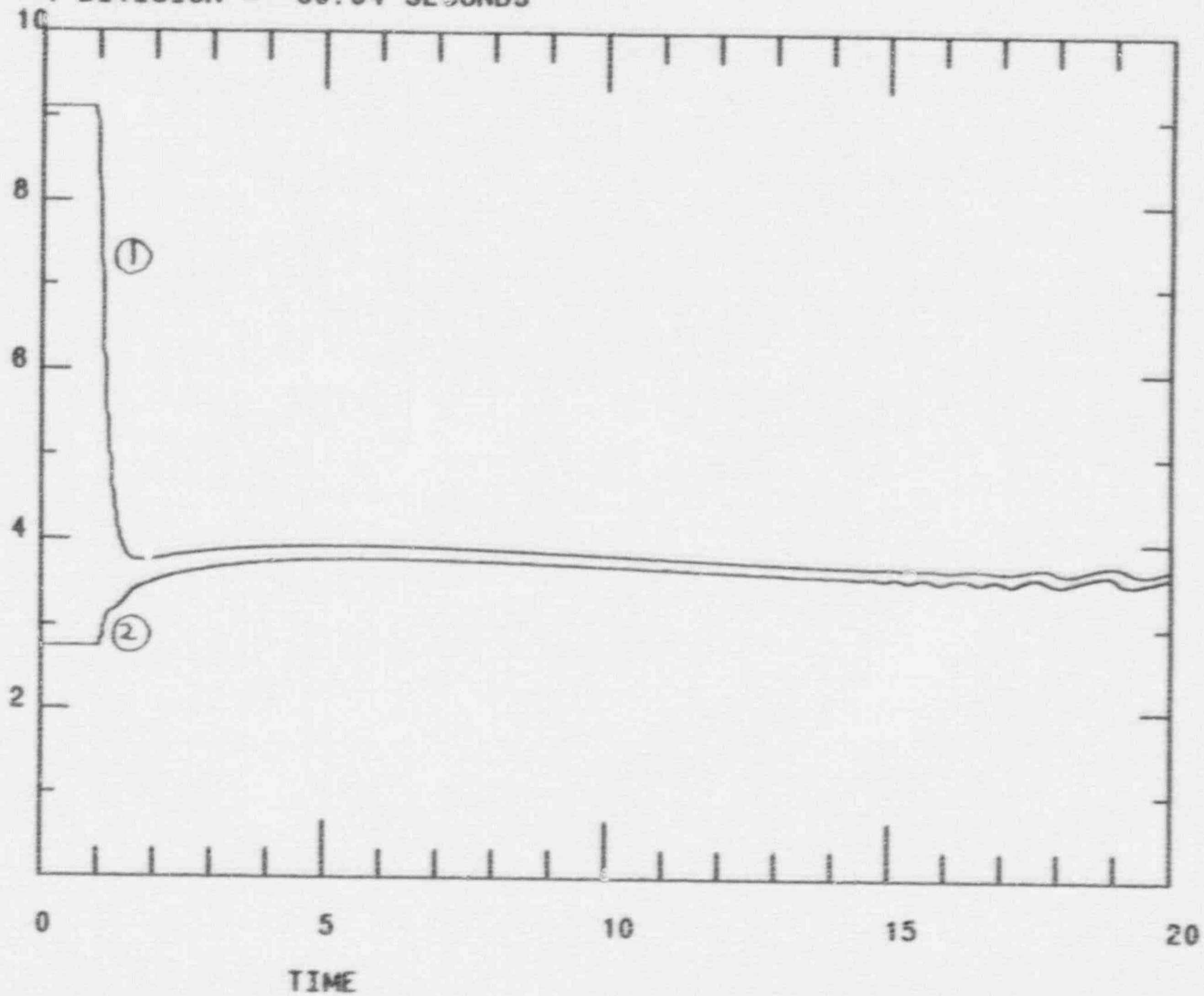
1 DIVISION = 60.94 SECONDS



YCT0480 (600. , 700.) 91220 PRESSURIZER WTR TEMP

7201***MANUAL RX TRIP 01/10/91 09:35:12

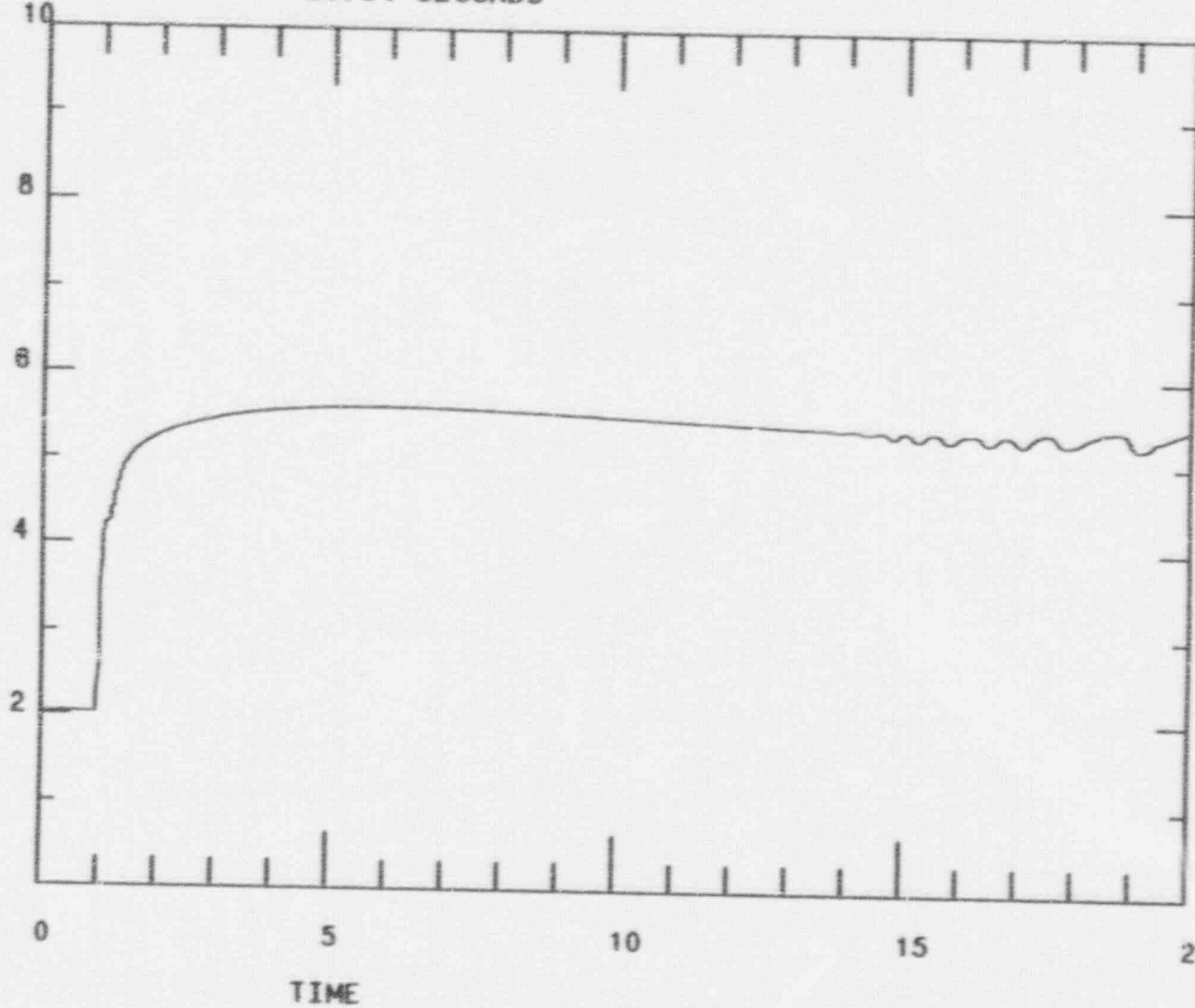
1 DIVISION = 60.94 SECONDS



① THTHLRTD(1) (500. . 600.) 65210 RC HOT LEG RTD TEMP.
② [illegible]RTD(1) (500. . 600.) 65210 RC CLOD LEG RTD TEMP.

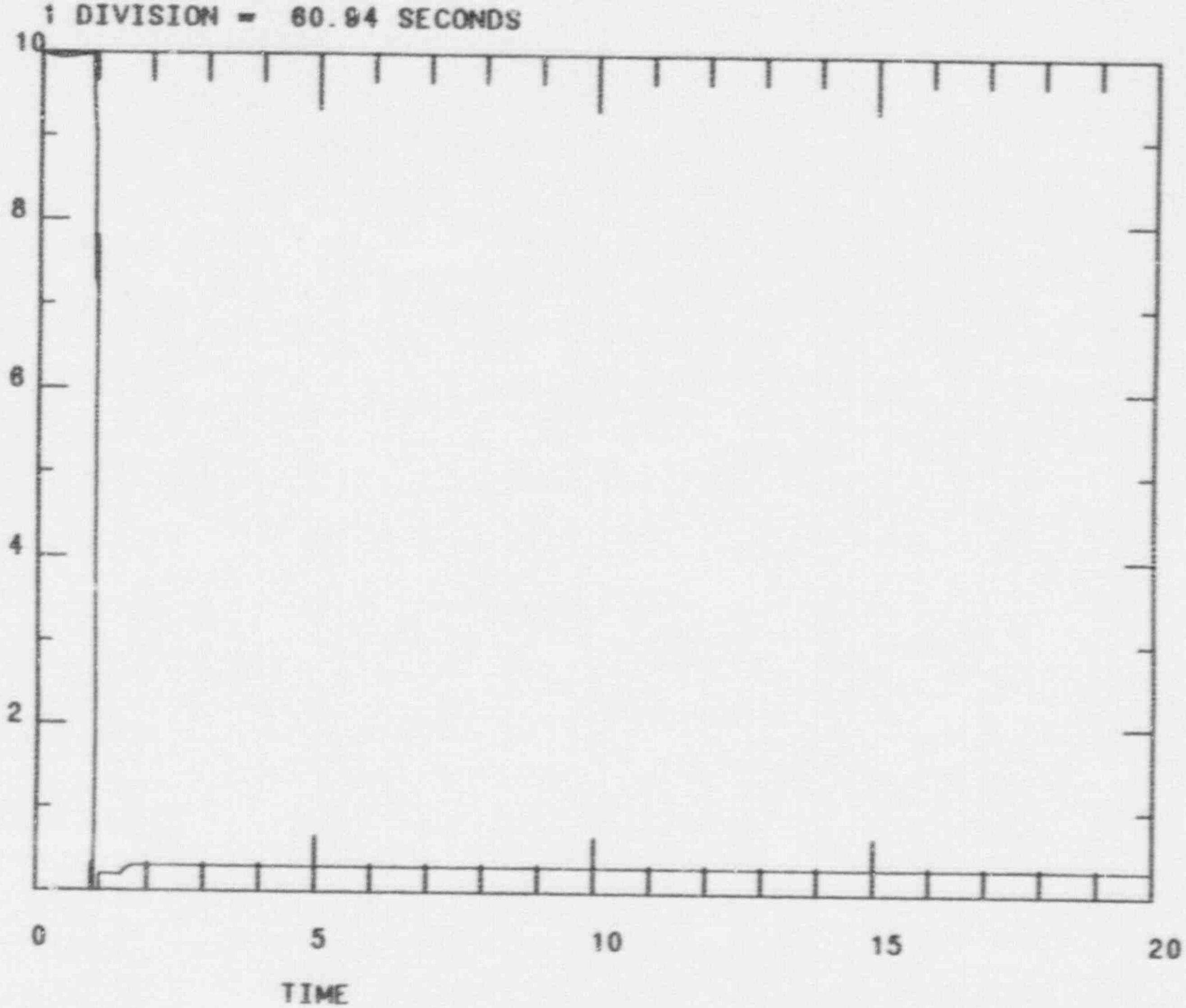
7201***MANUAL RX TRIP 01/10/91 10:35:57

1 DIVISION = 60.94 SECONDS



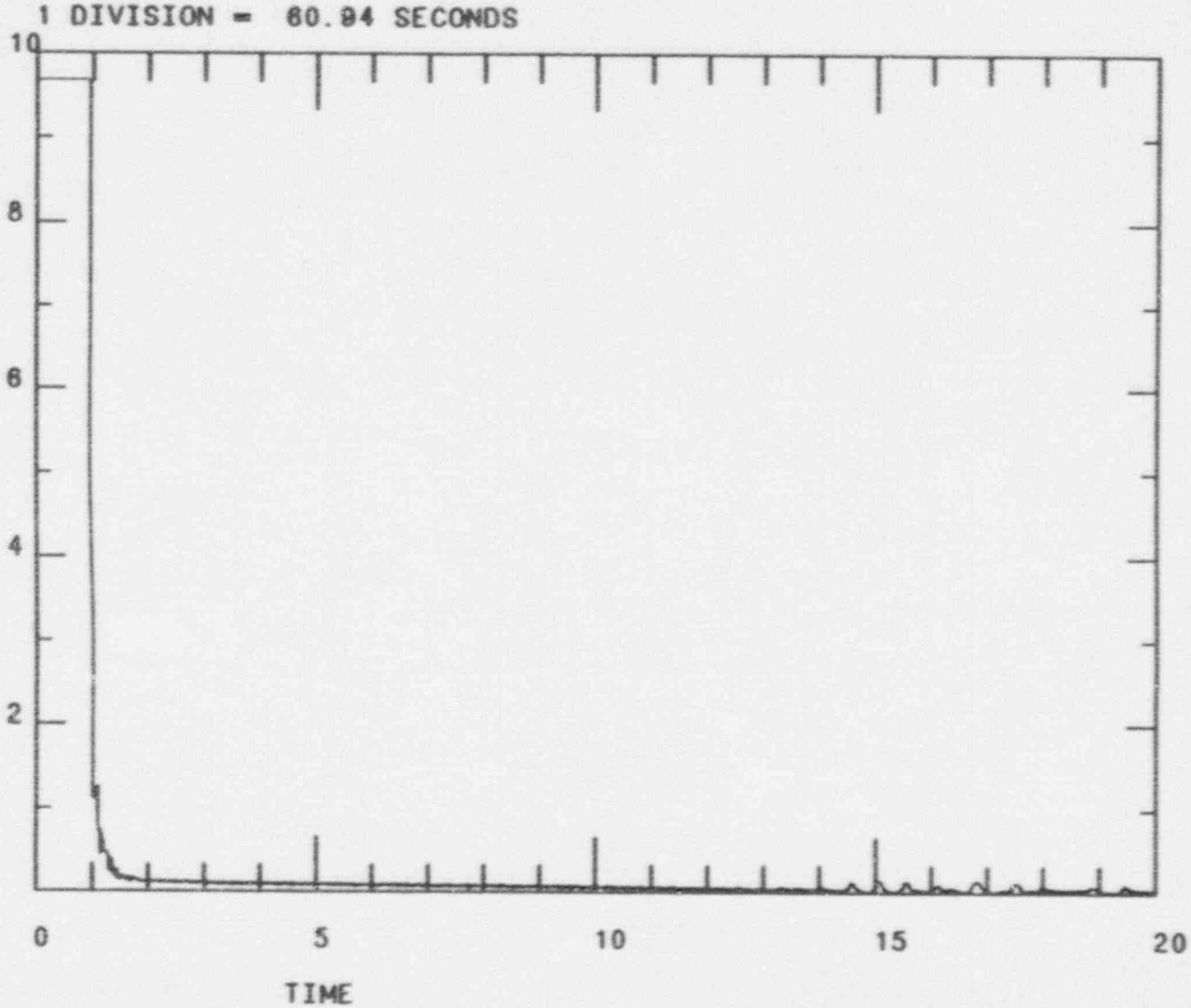
THPSG(1) (600. . .120E+04) 65130 SG DOME PRESSURE

7201***MANUAL RX TRIP 01/10/81 10:03:21



FWFSG(1) (.000 . 971.) 03020 FW TO S/G FLOW

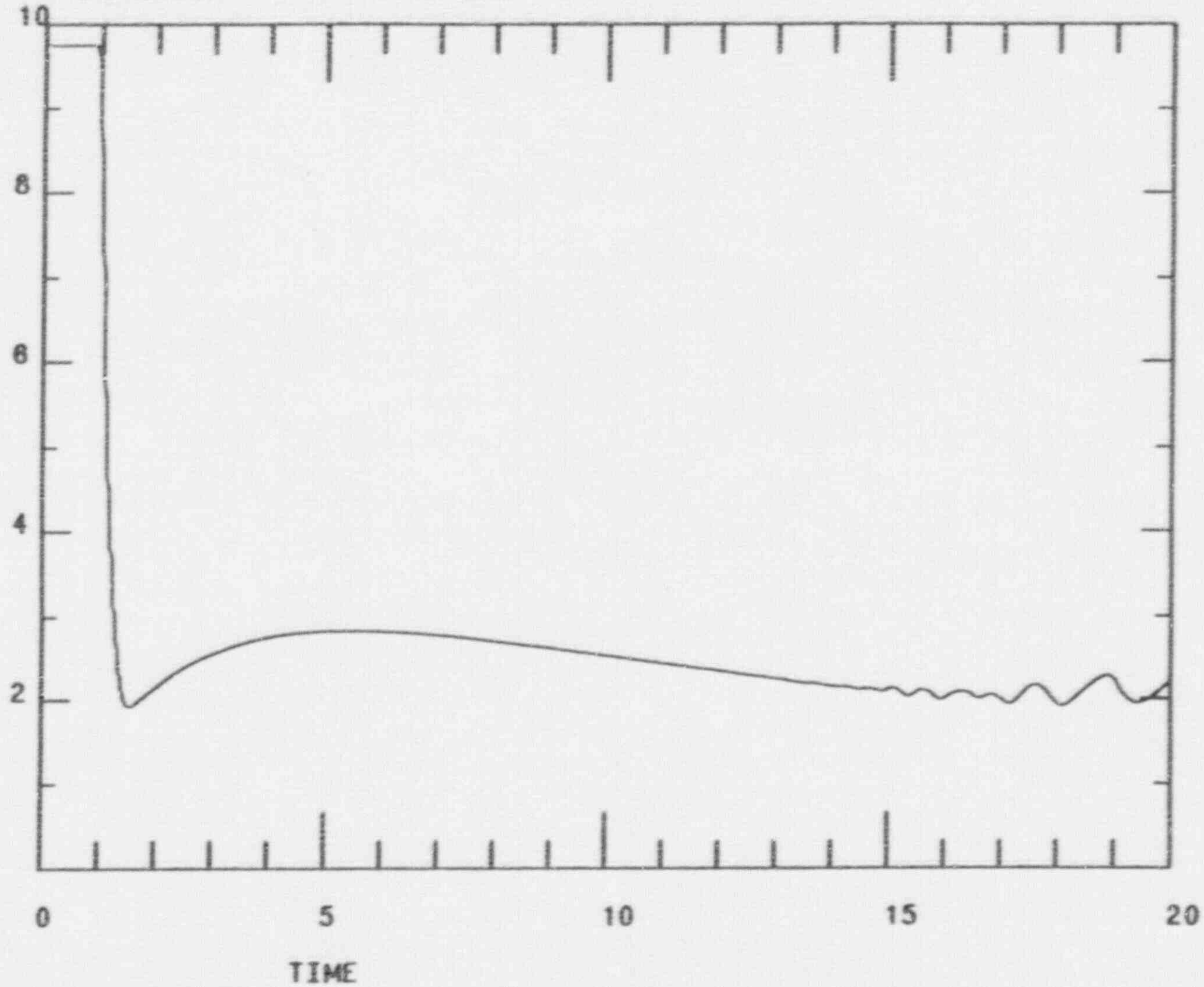
7201***MANUAL RX TRIP 01/10/91 10:41:34



MSFSG(1) (.000 , .100E+04) 01160 MS TOTAL FLOW FROM SG

7201***MANUAL RX TRIP 01/10/91 10:22:17

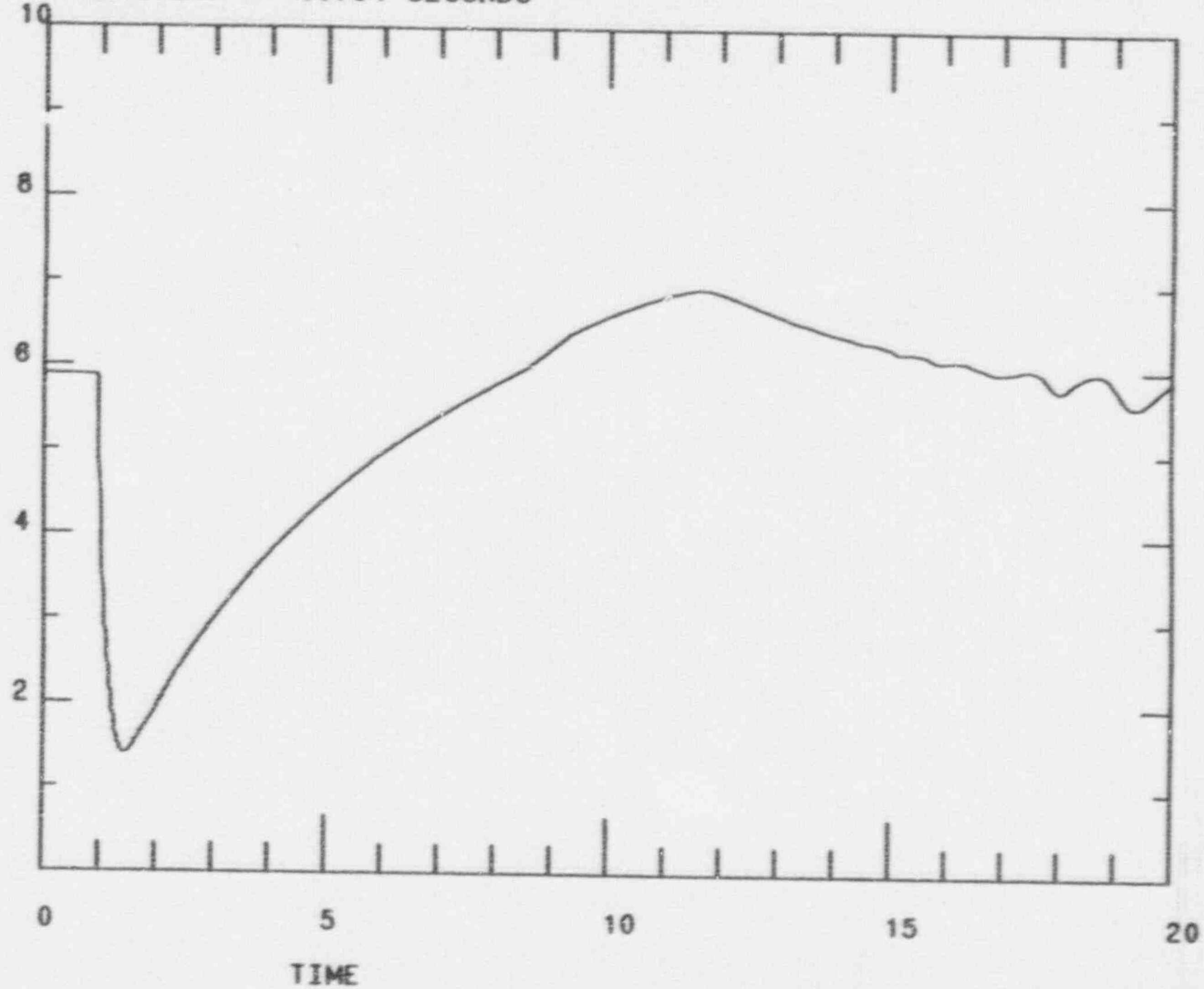
1 DIVISION = 60.84 SECONDS



RXTAVG(1) (530. , 560.) 01200 LOOP TAVG

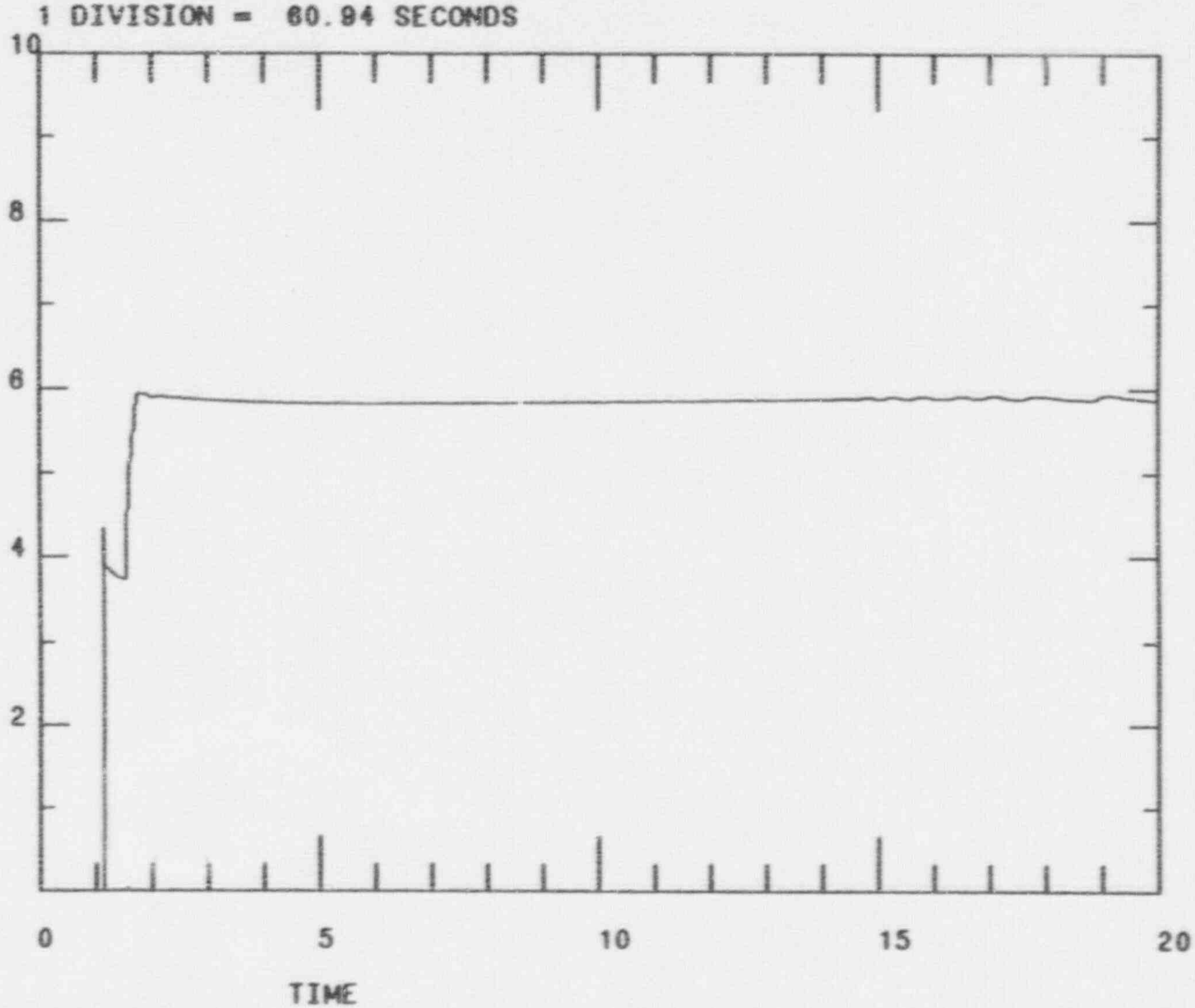
7201***MANUAL RX TRIP 01/10/91 07:22:52

1 DIVISION = 60.94 SECONDS



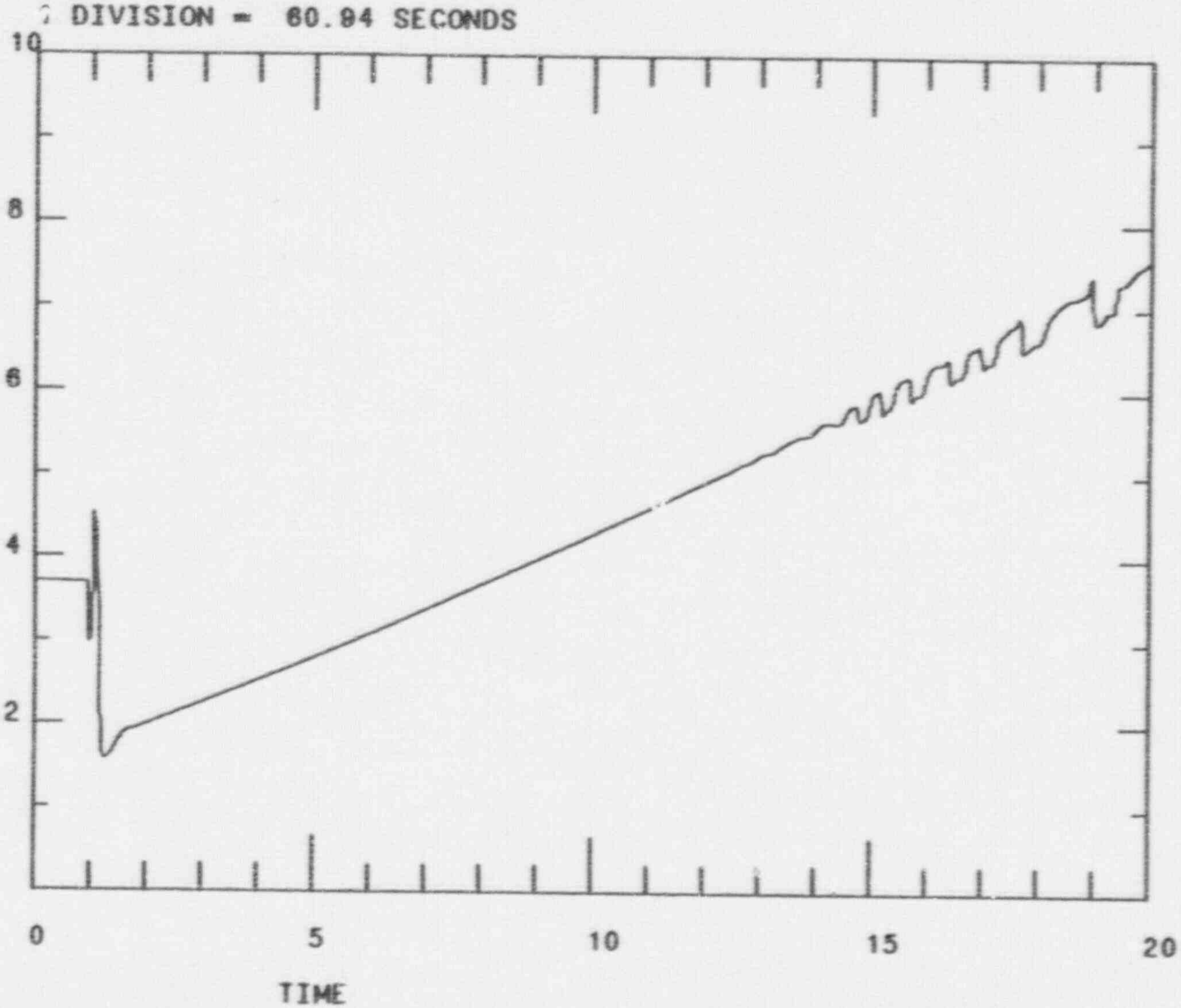
YCP0480 (.200E+04, .240E+04) 07330 PRESSURIZER 1 PRESSURE

7201***MANUAL RX TRIP 01/10/91 10:28:09



FWFAFSG(1) (.000 , 50.0) 06020 AF TO S/G FLOW

7201***MANUAL RX TRIP 01/10/81 10:47:17



YCL0403 (40.0 , 60.0) 06790 S/G A WIDE RANGE LEVEL

ZION SIMULATOR TRANSIENT TEST

MAIN TURBINE TRIP (MAXIMUM POWER LEVEL

WHICH DOES NOT RESULT IN IMMEDIATE REACTOR TRIP)

The Main Turbine Trip test was performed from a beginning of core, 40% power, initial condition (IC26). Turbine load was reduced to less than 10% reactor power (<P7). The main turbine was manually tripped. Data was collected in accordance with ANSI/ANS-3.5-1985 Appendix B 2.2.1.

Test results were reviewed and found satisfactory with the exception of:

Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completed Date
Sudden increase in steam flow about 7 minutes after turbine trip.	F226	4/91

Collected and Plotted Data:

1. YCN0049 - Power Range, Neutron Flux
2. YCL0480 - Pressurizer level
3. YCT0480 - Pressurizer liquid Temp
4. THTHLRTD(1) - Loop A Hot Leg RTD Temp
   THTCLRTD(1) - Loop A Cold Leg RTD Temp
5. THPSG(1) - A S/G Pressure
6. FWFSG(1) - A S/G Feedwater Flow
7. MSFSG(1) - A S/G Steam Flow
8. RXTAVG(1) - A Loop Tavg
9. YCP0480 - Pressurizer Pressure
10. FWFAFSG(1) - A S/G Auxilliary Feedwater Flow
11. YCL0403 - A S/G Wide Range Level 1.
12. YCL0400 - A S/G Narrow Range Level 1.

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Main Turbine Trip **DATE** : 02/06/91

1. **Data utilized for test comparison in order of preference (circle appropriate choices)**

   a. Actual Plant Transient Data Event :

   b. Analytical or design data Data :

   c. Transient Data from similar plant Plant :

   d. Panel of experts (best estimate)

   COMMENTS : NONE

2. **Data Comparison Summary**

VARIABLE	COMMENTS	RESOLUTION
Rx Power	NONE	Accepted
Pzr Level	NONE	Accepted
Pzr Wtr Temp	NONE	Accepted
Hot Leg Temp	NONE	Accepted
Cold Leg Temp	NONE	Accepted
RCS Tavg	NONE	Accepted
S/G Pressure	Same as steam flow	Accepted
FW Flow	NONE	Accepted
Steam Flow	Unexplained small increase in steam flow at	Accepted
	about 8.5 minutes into the transient. DR #	
	F226 written to explain / correct	
Pzr Pressure	NONE	Accepted
AFW Flow	See Man Rx Trip. DR # F224	Accepted
S/G level	NONE	Accepted

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Main Turbine Trip DATE : 02/06/91

VARIABLE	COMMENTS	RESOLUTION

3. Comparison Results

Simulator capability to reproduce the defined transient: (circle one)

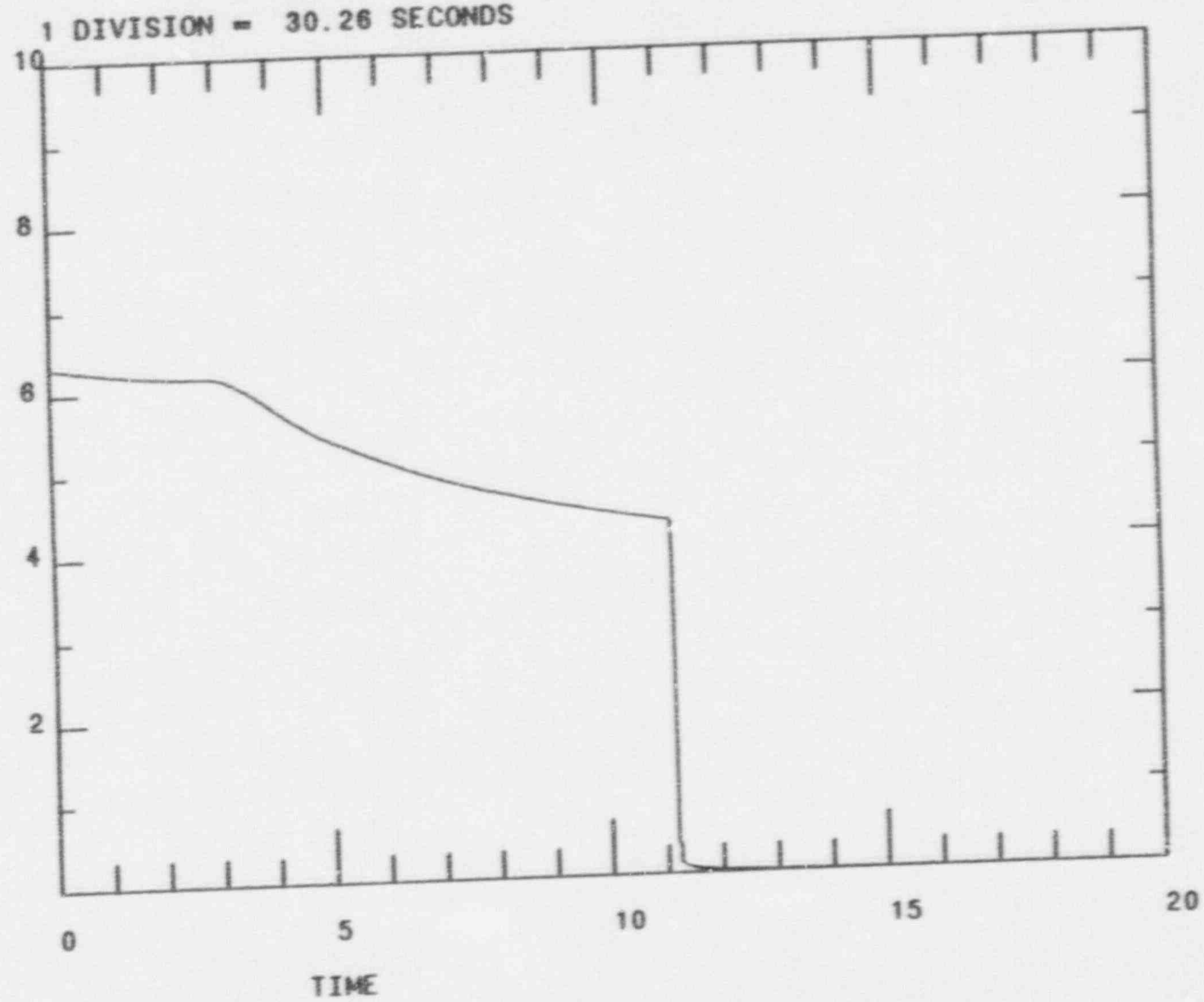
a. ACCEPTABLE

b. UNACCEPTABLE

4. Review Board Signatures (differing opinions must be documented)

COMMENTS :

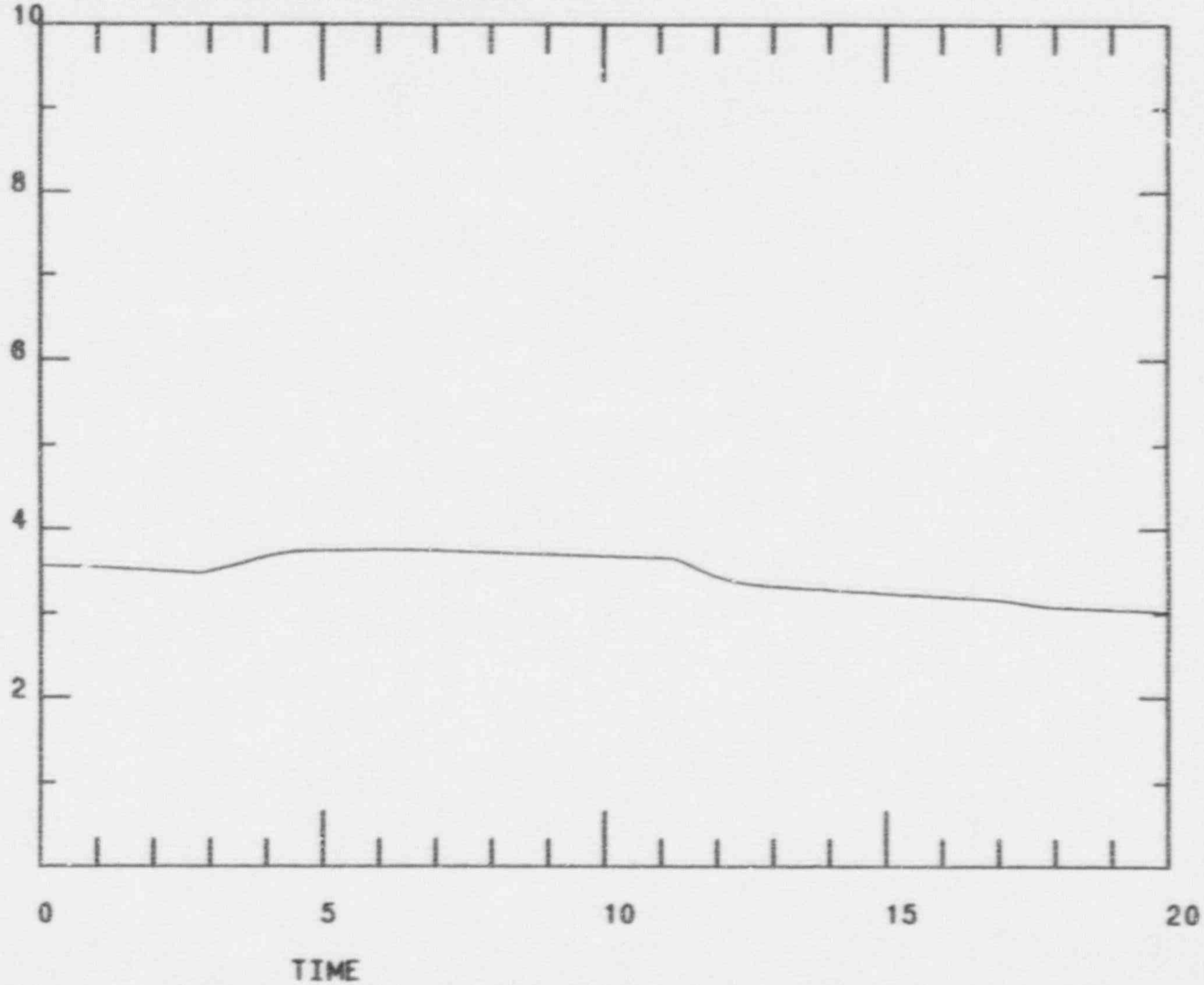
7203•••MAIN TURBINE TRIP FROM 10% POWER 01/10/91 13:14:48



YCN0049 (.000 . 10.0) 21170 POWER RANGE CHANNEL 1 FL

7203***MAIN TURBINE TRIP FROM 10% POWER 01/10/91 12:24:16

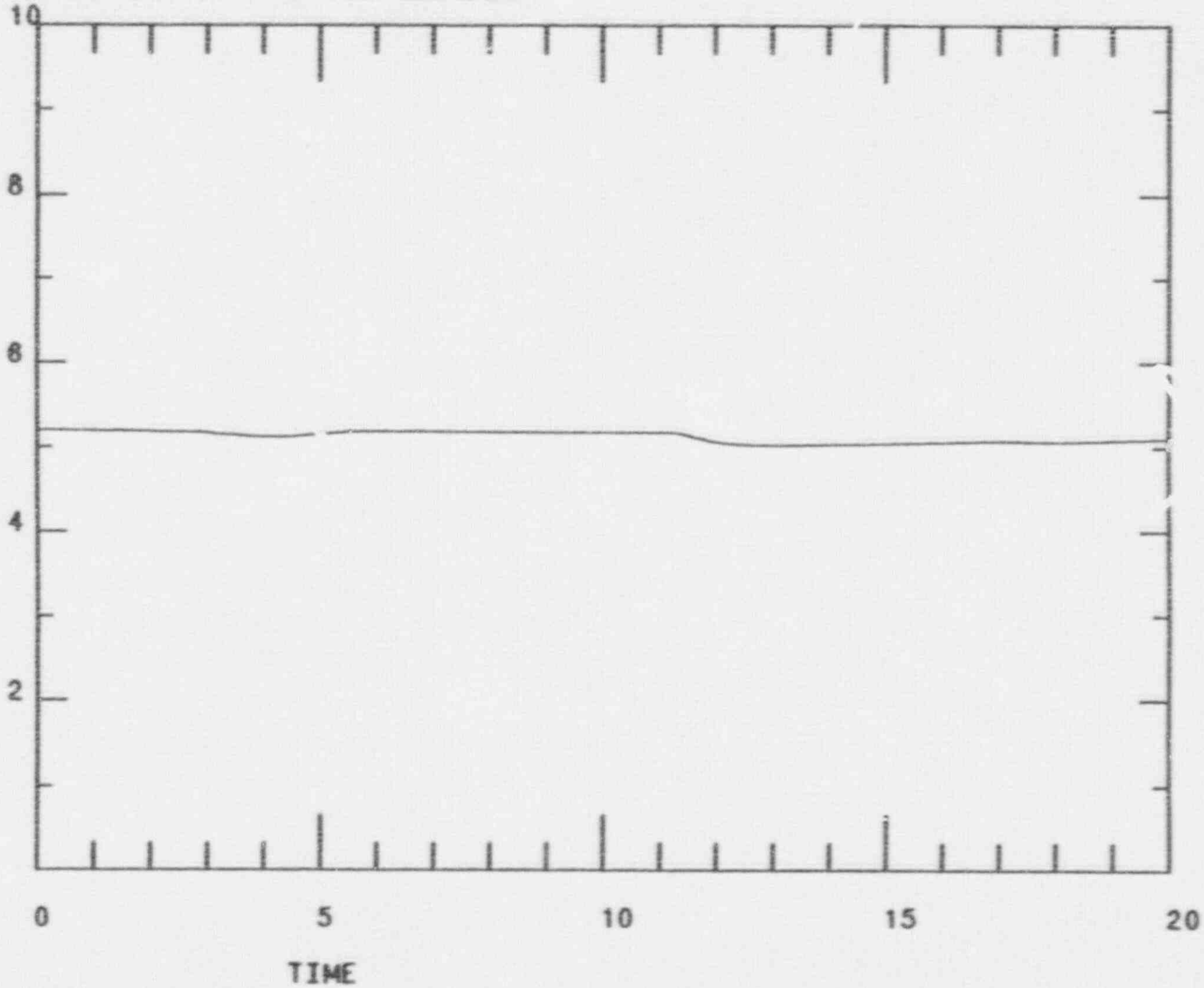
1 DIVISION = 30.26 SECONDS



THLPRZR (.000 , 1.00) 65180 PRESSURIZER LEVEL

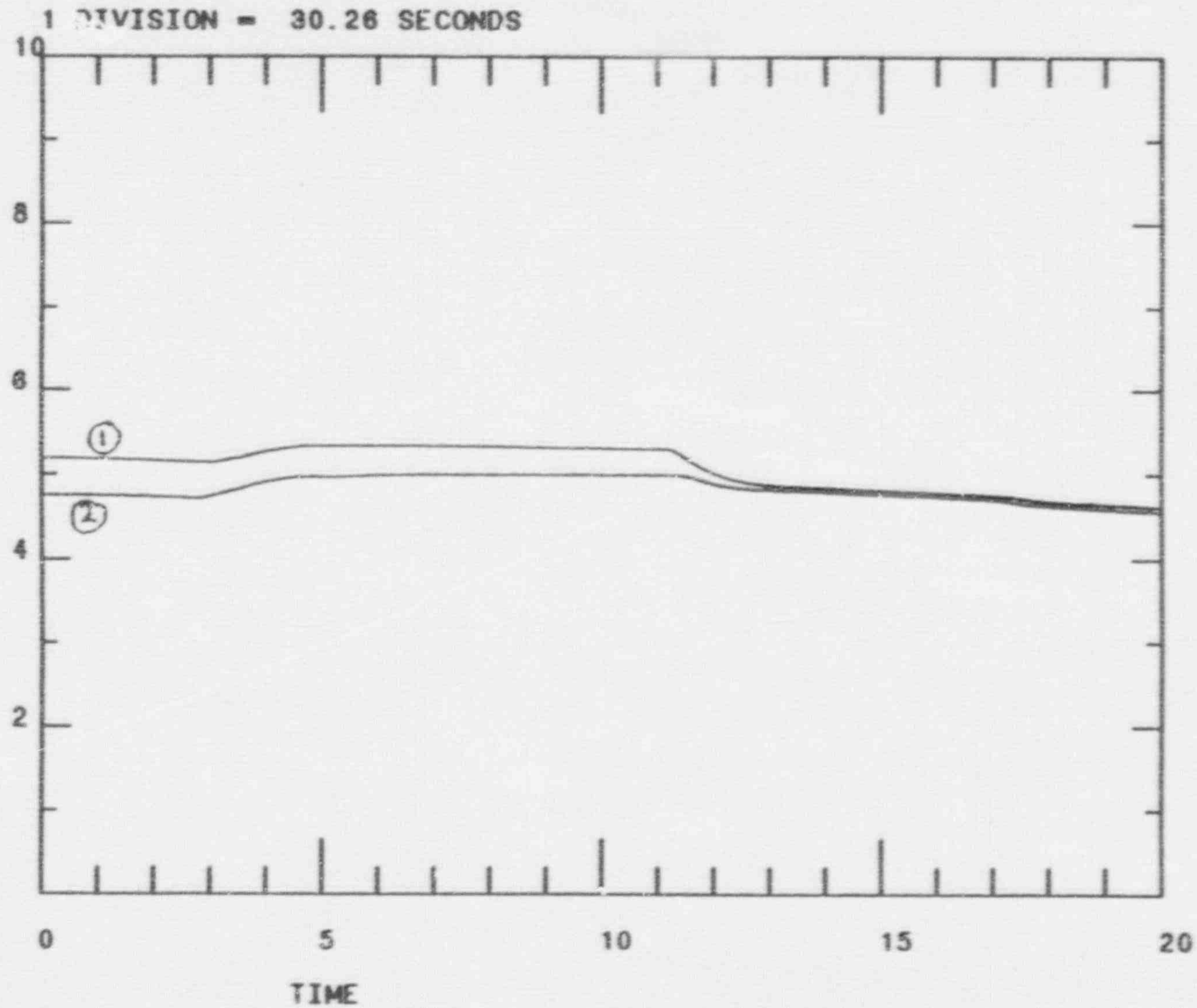
7203***MAIN TURBINE TRIP FROM 10% POWER 01/10/91 12:37:06

1 DIVISION = 30.26 SECONDS



YCT0480 (600. , 700.) 91220 PRESSURIZER WTR TEMP

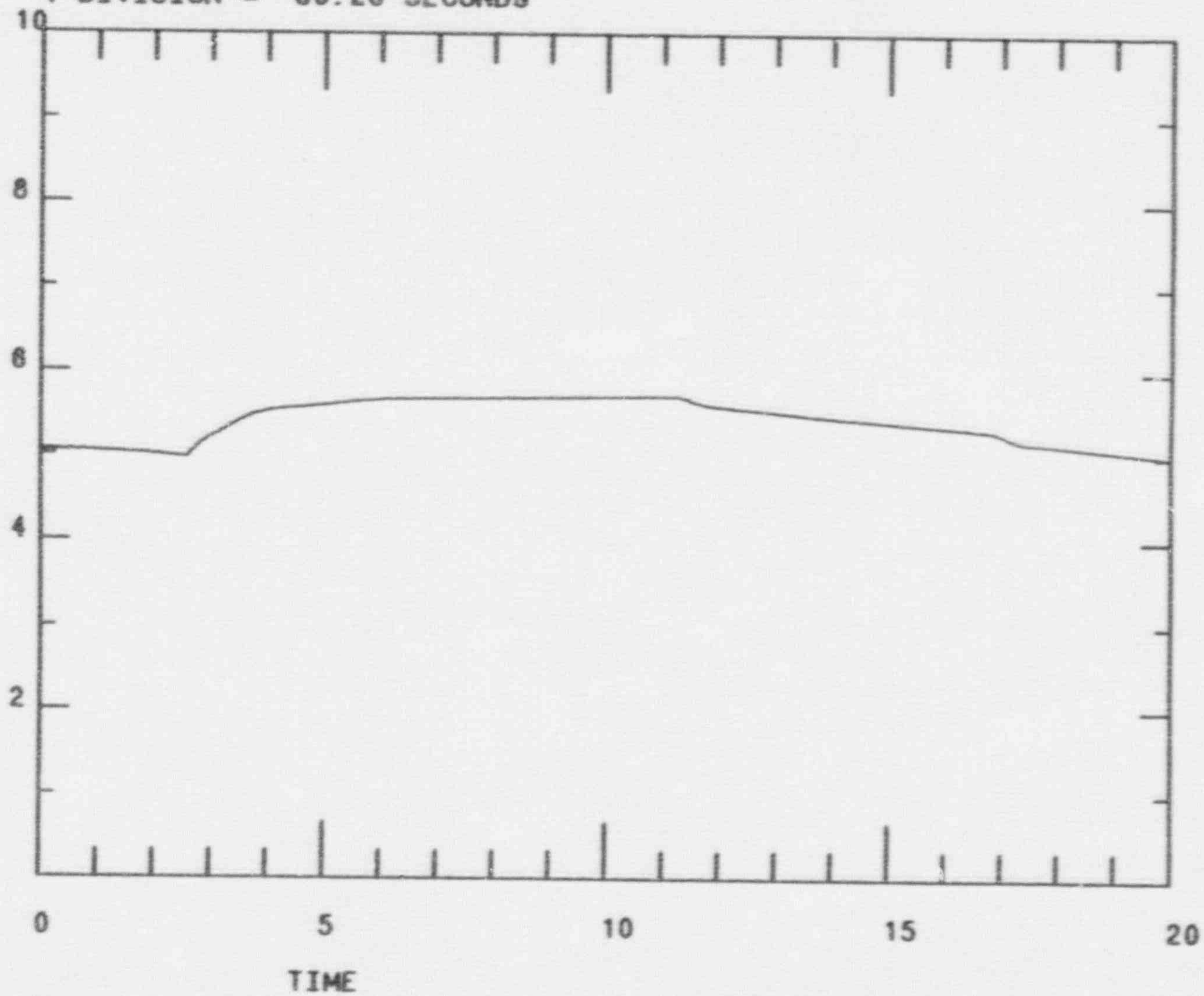
7203***MAIN TURBINE TRIP FROM 10% POWER 01/10/91 12:44:48



(1) THTHLRTD(1) (500. , 600.) 65210 RC HOT LEG RTD TEMP.
(2) HTCLRTD(1) (500. , 600.) 65210 RC CLOD LEG RTD TEMP.

7203***MAIN TURBINE TRIP FROM 10% POWER 01/10/91 12:48:51

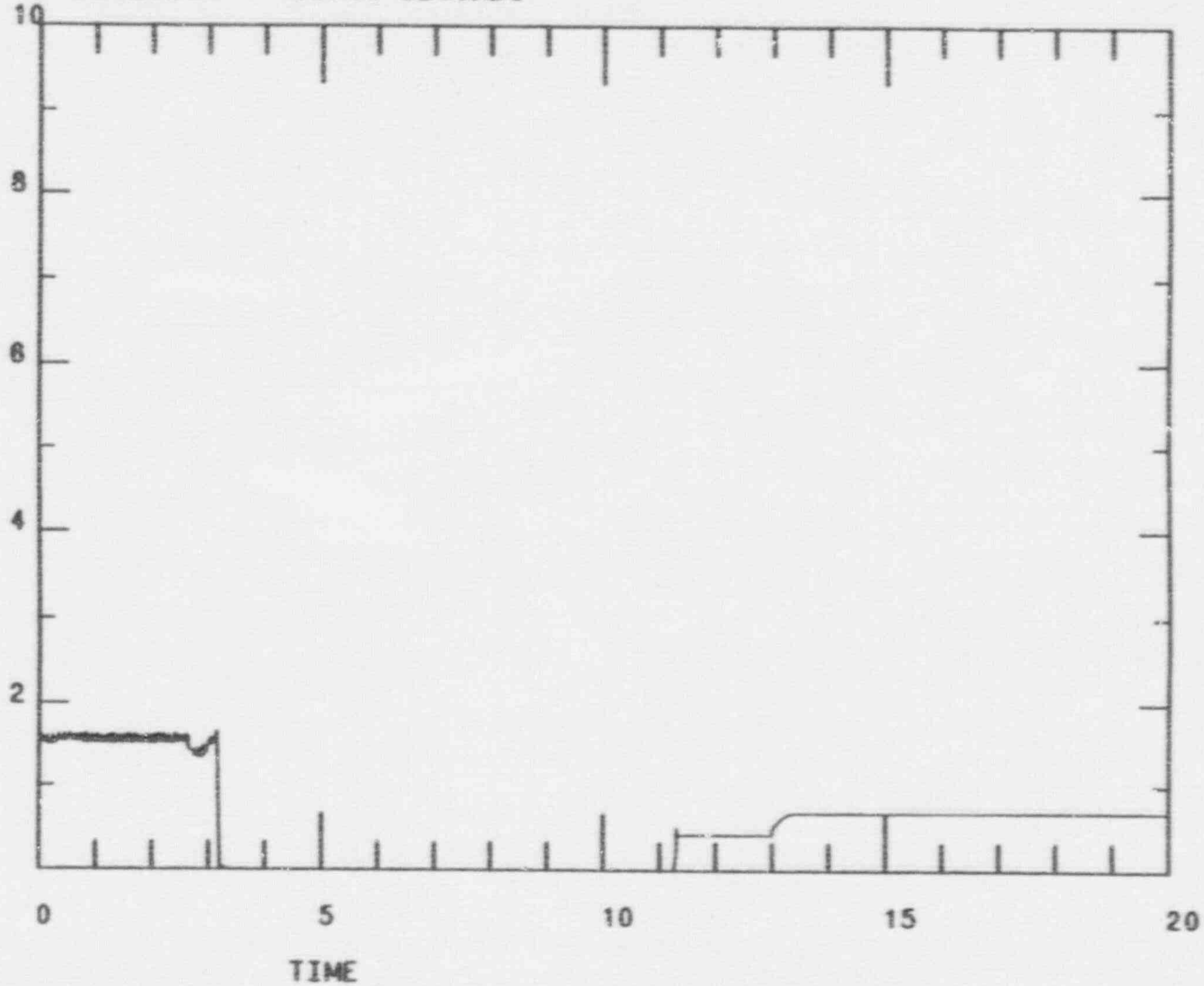
1 DIVISION = 30.26 SECONDS



THPSG(1) (800. , .120E+04) 65130 SG DOME PRESSURE

7203•••MAIN TURBINE TRIP FROM 10% POWER 01/10/91 12:52:45

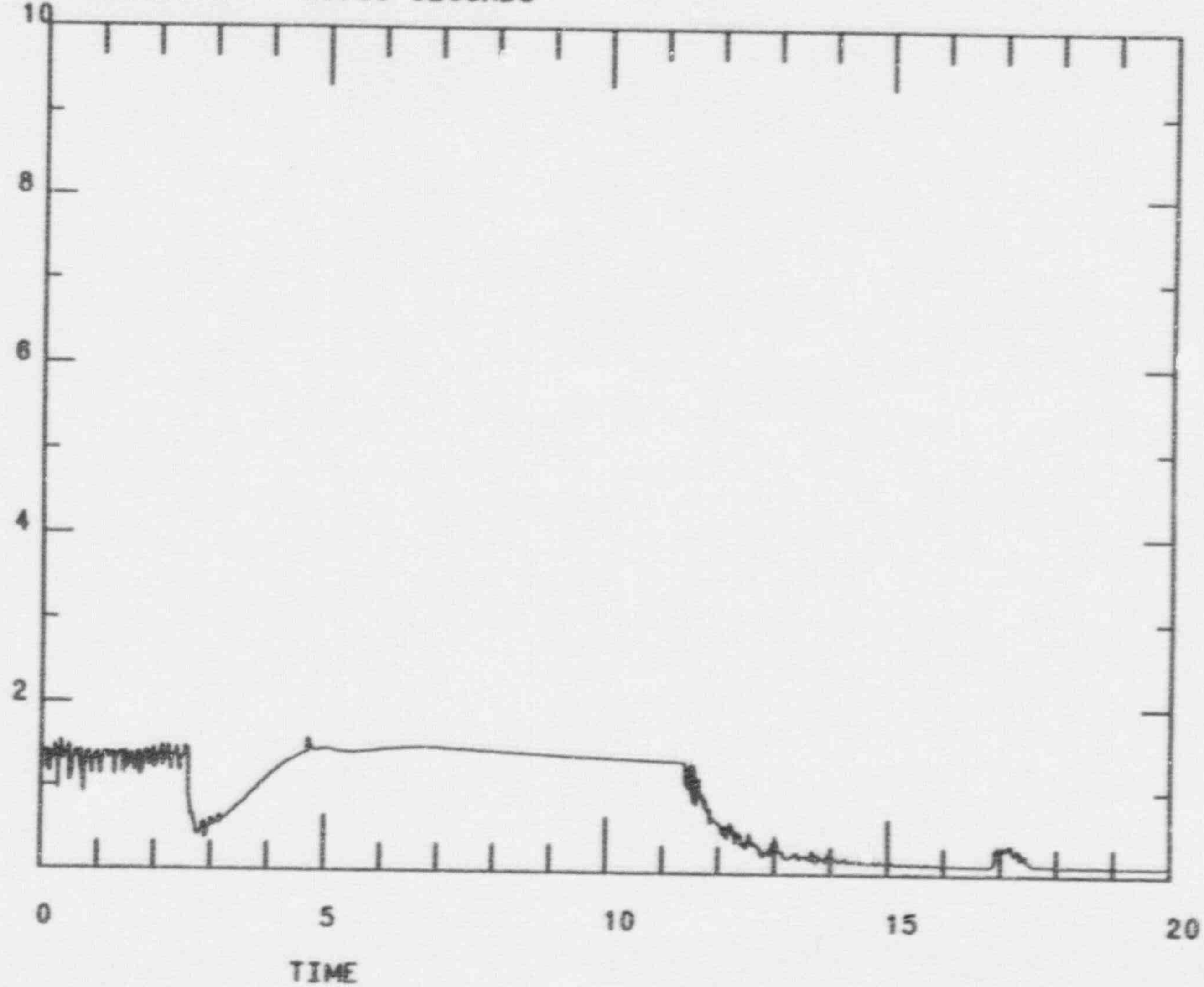
1 DIVISION = 30.26 SECONDS



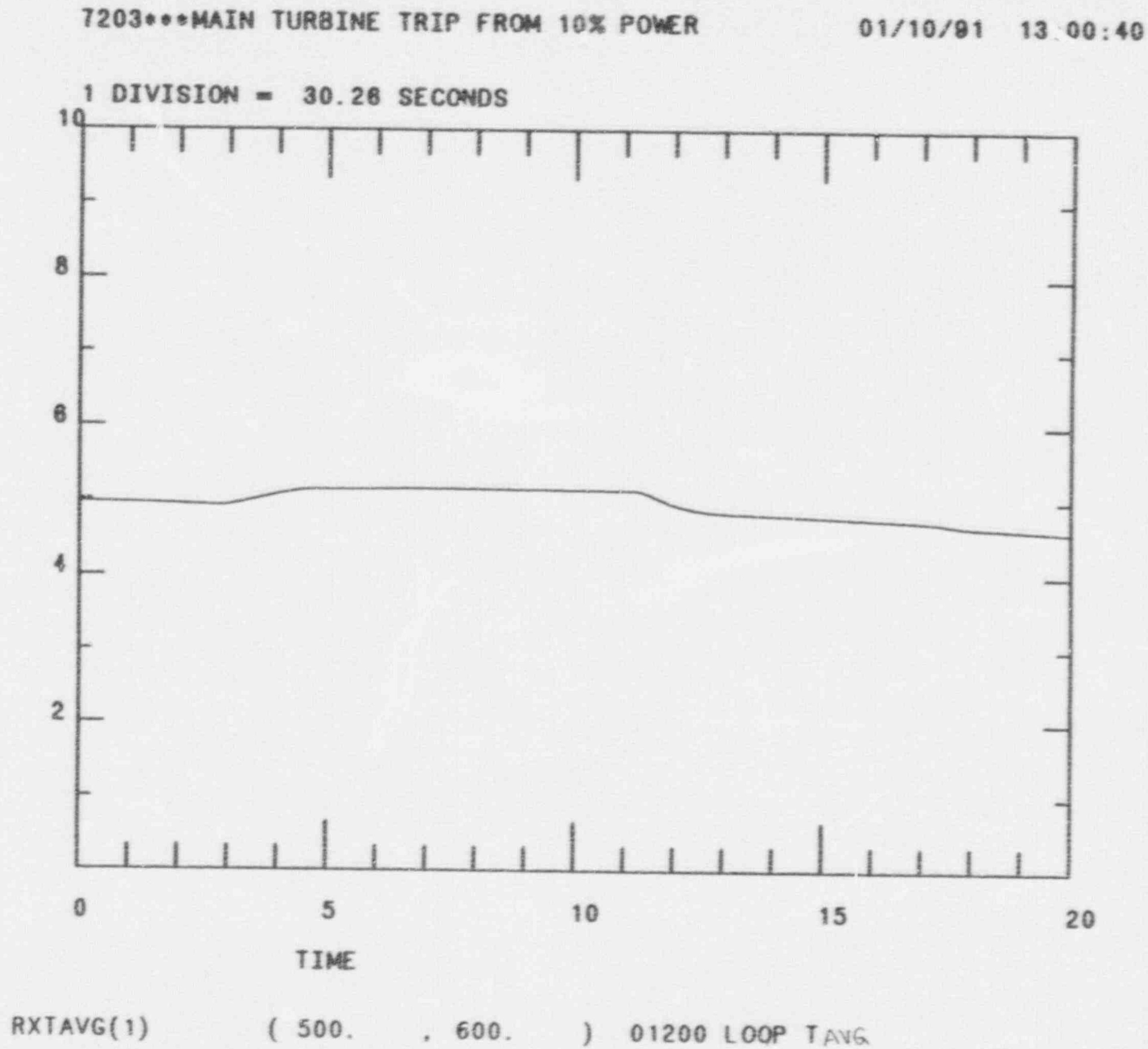
FWFSG(1) (.000 , 400.) 03020 FW TO S/G FLOW

7203***MAIN TURBINE TRIP FROM 10% POWER 01/10/91 12:56:24

1 DIVISION = 30.26 SECONDS

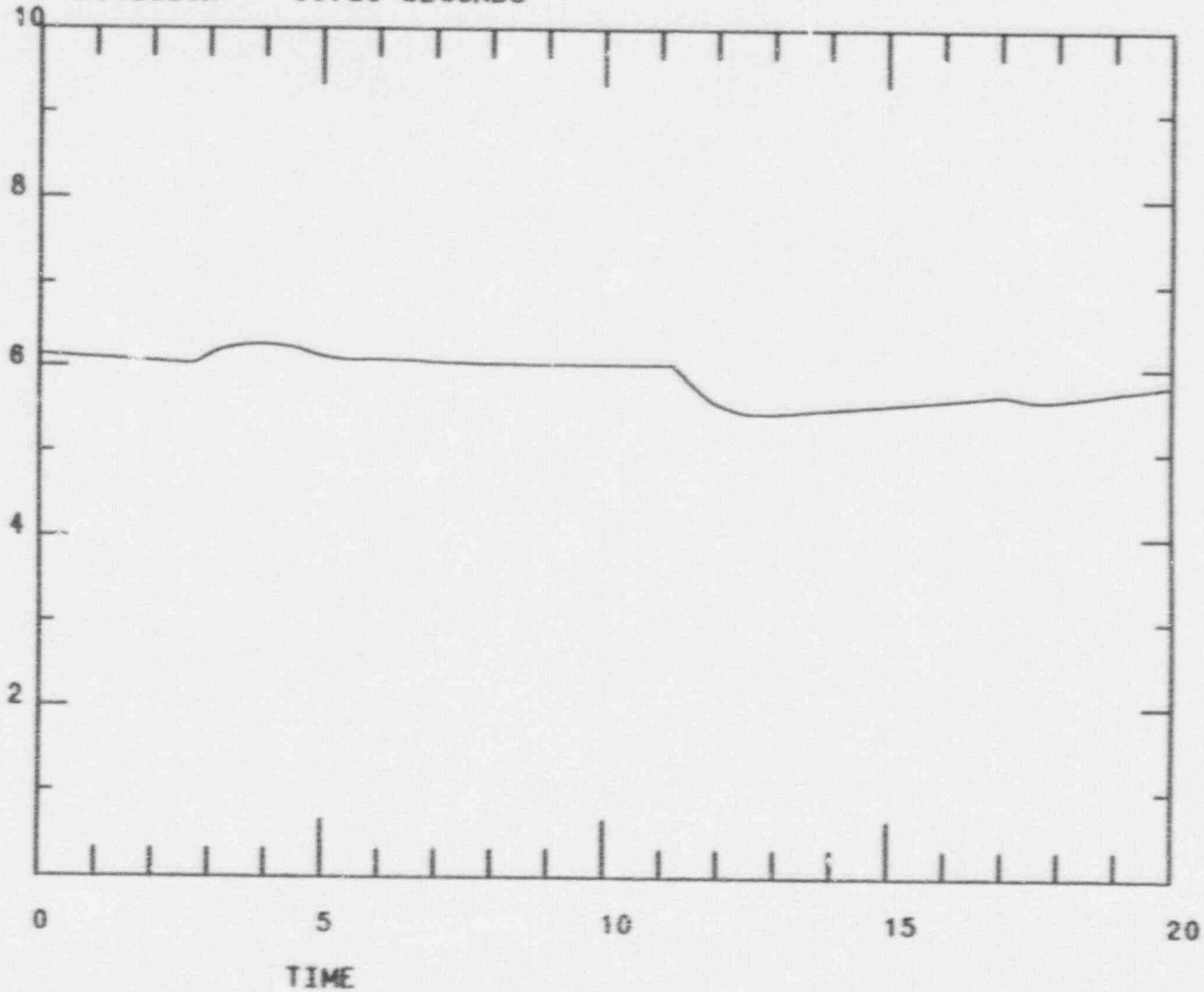


MSFSG(1) (.000 , 400.) 01160 MS TOTAL FLOW FROM SG


7203***MAIN TURBINE TRIP FROM 10% POWER
01/10/91 13:00:40
1 DIVISION = 30.26 SECONDS
10
8
6
4
2
0
5
10
15
20
TIME
RXTAVG(1) (500. , 600.) 01200 LOOP TAVG

7203***MAIN TURBINE TRIP FROM 10% POWER 01/10/91 13:04:41

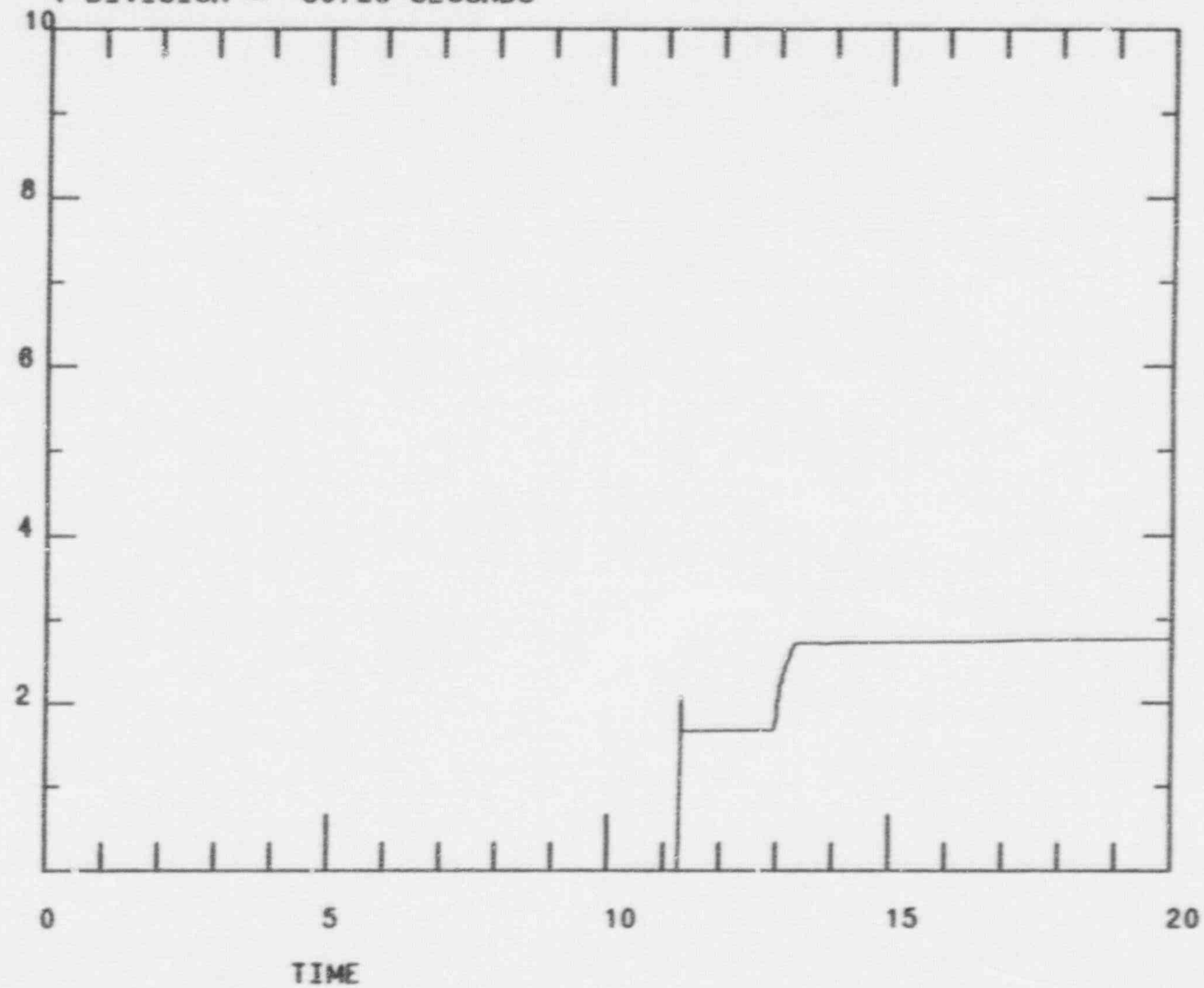
1 DIVISION = 30.26 SECONDS



THPPRZR (.200E+04, .240E+04) 65170 PRESSURIZER PRESSURE

7203***MAIN TURBINE TRIP FROM 10% POWER   01/10/91   13:07:59

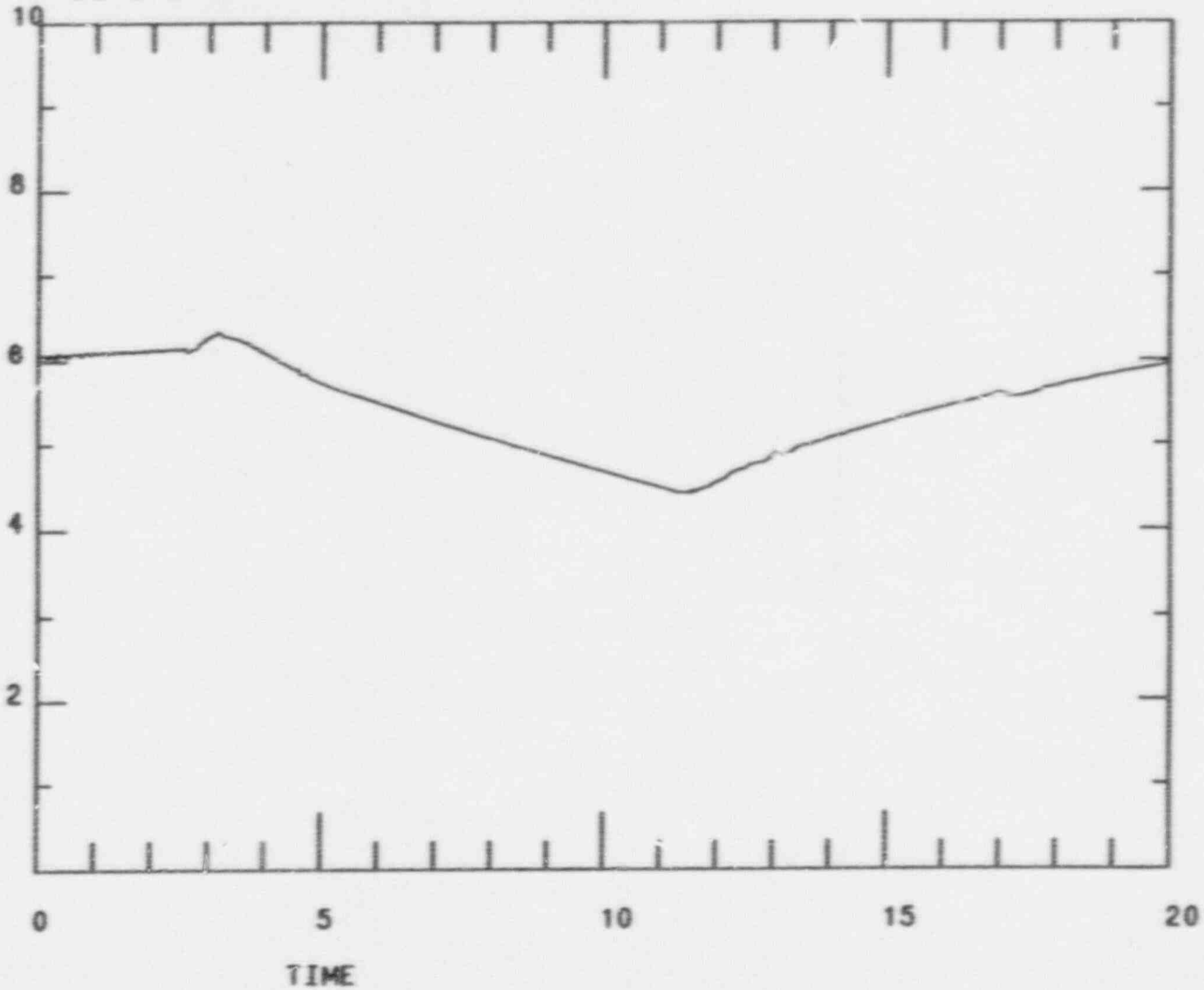
1 DIVISION = 30.26 SECONDS



FWFAFSG(1)   (.000   , 100.   ) 06020 AF TO S/G FLOW

7203•••MAIN TURBINE TRIP FROM 10% POWER 01/10/91 11:01:22

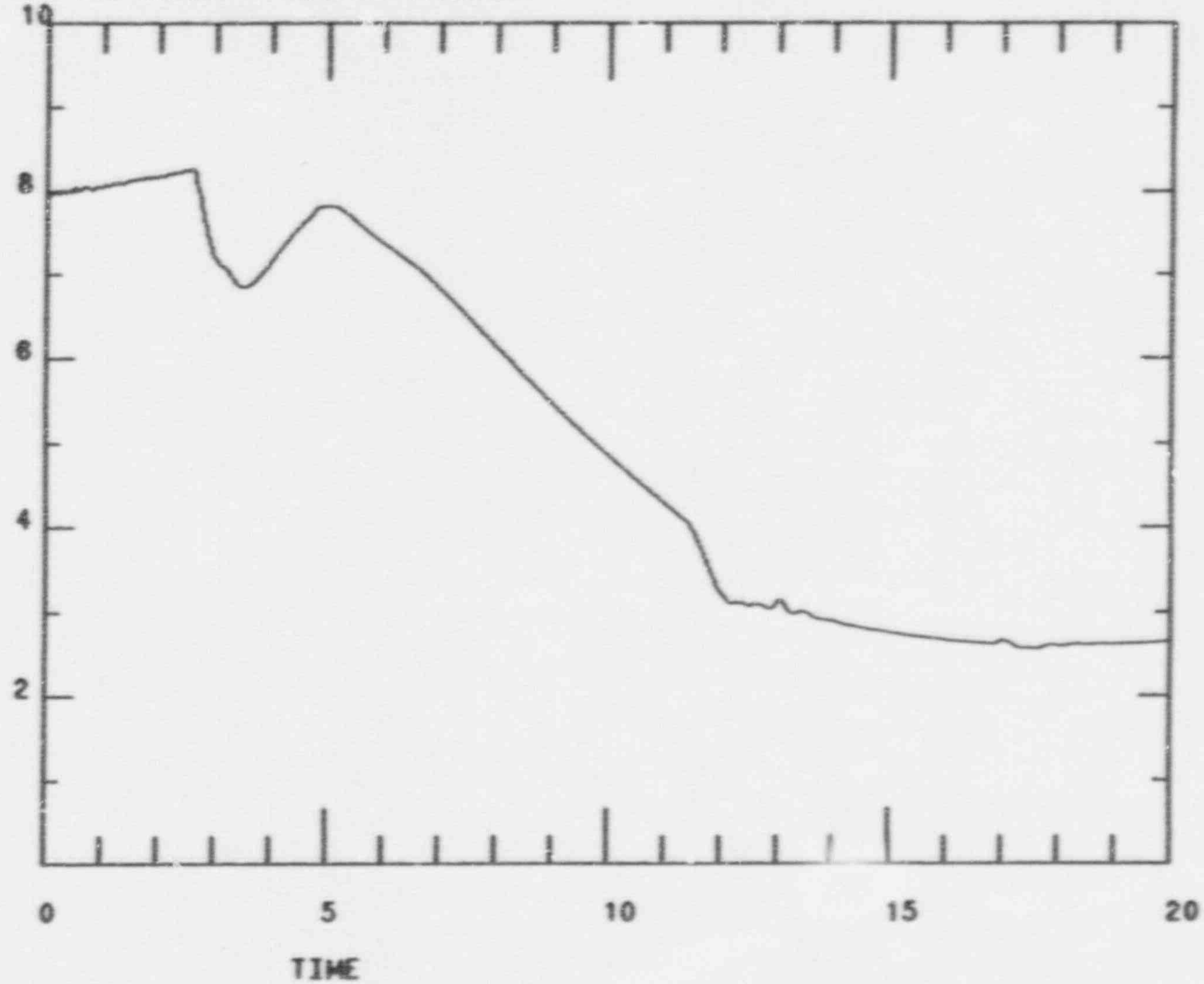
1 DIVISION = 30.26 SECONDS



YCL0403 (50.0 , 70.0) 06790 S/G A WIDE RANGE LEVEL

7203***MAIN TURBINE TRIP 02/05/91 13:19:25

1 DIVISION = 30.26 SECONDS



YCL0400 (.000 , 50.0) 06010 S/G A NARROW RANGE 1 LEV

ZION SIMULATOR
ANSI/ANS-3.5-1985 CERTIFICATION REPORT
INITIAL REPORT, MARCH 1991

ZION SIMULATOR TRANSIENT TEST

TRIP OF ANY SINGLE REACTOR COOLANT PUMP

The Trip of Any Single Reactor Coolant Pump was performed from a beginning of core, 100% power, initial condition (IC 37). Reactor Coolant Pump 1A was manually tripped. Data was collected in accordance with ANSI/ANS-3.5-1985 Appendix B 2.2.2.

The test results were reviewed and found satisfactory with the exception of:

Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
Loop A S/G Press Oscillation	F209	4/91
Unexplained downward spike in S/G steam flow	F227	4/91
Sudden increase in RCP 1A reverse flow	F228	4/91

Collected and Plotted Data:

1. THTHLWR (1,3) - Loop A & D Hot Leg Wide Range Temp
2. THTCLWR (1,3) - Loop A & D Cold Leg Wide Range Temp
3. THTHLRTD (1,3) - Loop A & D Hot Leg RTD Temp
4. THTCLRTD (1,3) - Loop A & D Cold Leg RTD Temp
5. THPSG (1,3) - Loop A & D S/G Pressure
6. FWFSG (1,3) - Loop A & D S/G Feedwater Flow
7. MSFSG (1,3) - Loop A & D S/G Steam Flow
8. YCL0403/463 - Loop A & D S/G Wide Range Level
9. YCF0400/460 - Loop A & D RCS Flow
10. YCN0049 - Power Range Neutron Flux
11. YCP0480 - Pressurizer Pressure

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Single RCP Trip **DATE** : 02/06/91

1. **Data utilized for test comparison in order of preference (circle appropriate choices)**

   a. **Actual Plant Transient Data** **Event :** ____________

   b. **Analytical or design data** **Data :** ____________

   c. **Transient Data from similar plant** **Plant :** ____________

   d. **Panel of experts (best estimate)**

COMMENTS : Open DR # F209 on Loop A S/G pressure oscillation

2. **Data Comparison Summary**

VARIABLE	COMMENTS	RESOLUTION
Hot Leg Temp's	NONE	Accepted
Cold Leg Temp's	NONE	Accepted
HL WR Temp's	NONE	Accepted
CL WR Temp's	NONE	Accepted
S/G Pressure	NONE	Accepted
FW Flow	NONE	Accepted
Steam Flow	Unexplained downward spike, DR # F227	Accepted
	written to explain / correct	
WR S/G Level	See Man Rx Trip DR # F225	Accepted
RCS Loop Flow	Curve showing increasing reverse flow has	Accepted
	small section with sharp increase. DR # F228	
	written to correct	
Rx Power	NONE	Accepted
Pzr Pressure	NONE	Accepted

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Single RCP Trip   DATE : 02/06/91

VARIABLE	COMMENTS	RESOLUTION

3. Comparison Results

Simulator capability to reproduce the defined transient: (circle one)

a. ACCEPTABLE

b. UNACCEPTABLE

4. Review Board Signatures (differing opinions must be documented)

Donald E. Phillips   D. J. Smith

[illegible]

R. E. Landrum

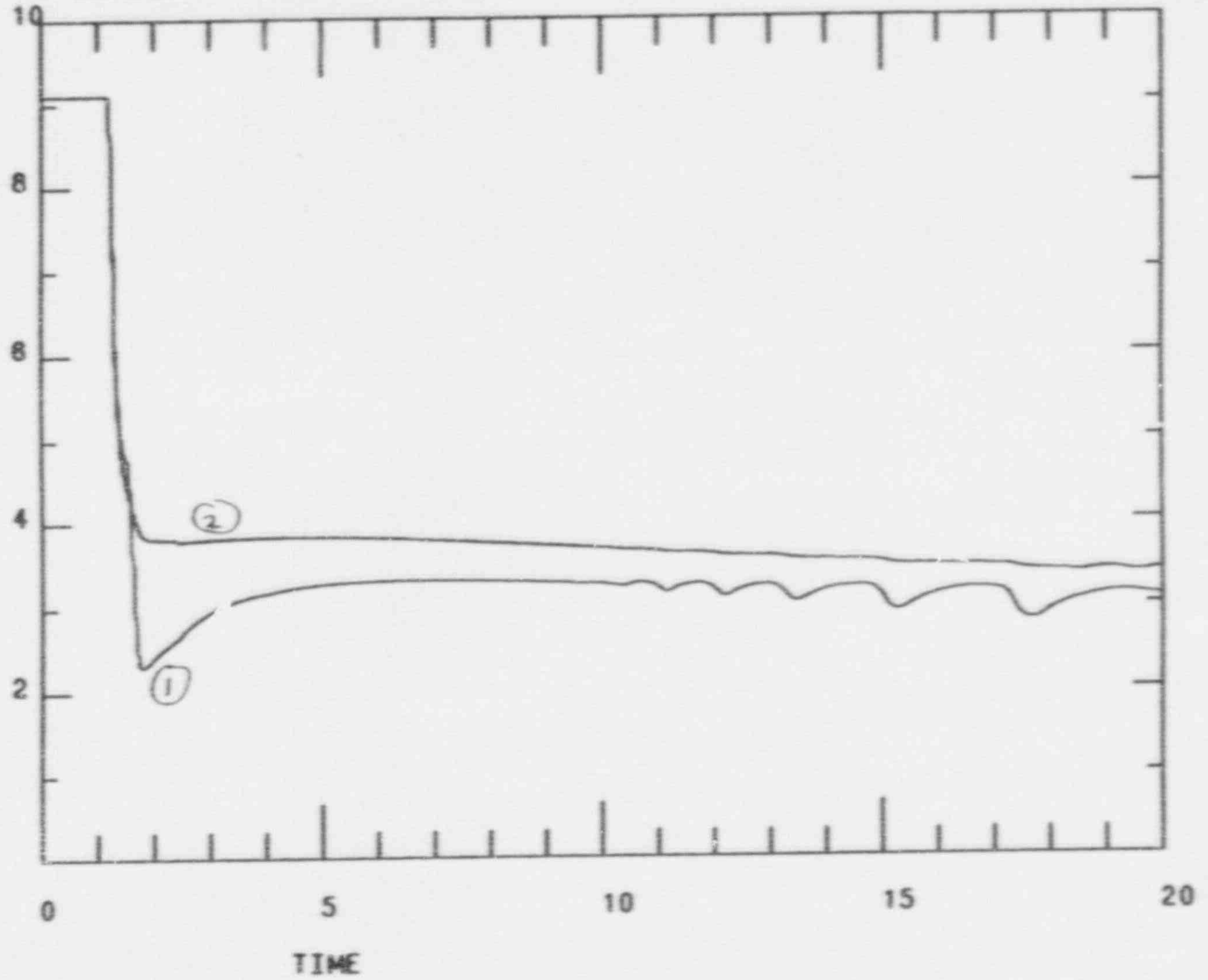
TP Calero

James J. Madden

COMMENTS :

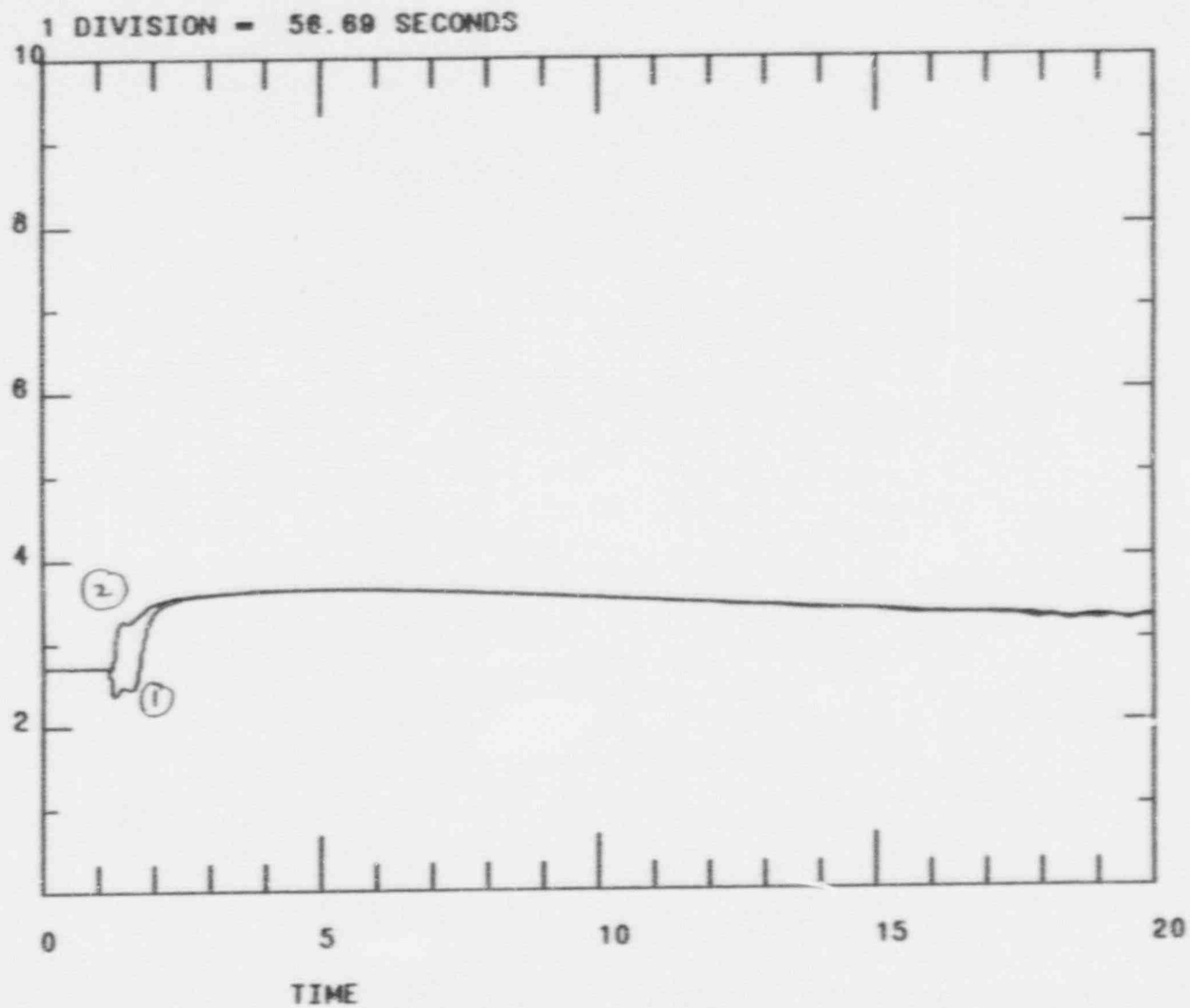
7204***SINGLE RCP TRIP 01/10/91 16:33:46

1 DIVISION = 56.69 SECONDS



(1) THTHLWR(1) (500. . 600.) 65210 RC HOT LEG WR TEMP.
(2) THTHLWR(3) (500. . 600.) 65210 RC HOT LEG WR TEMP.

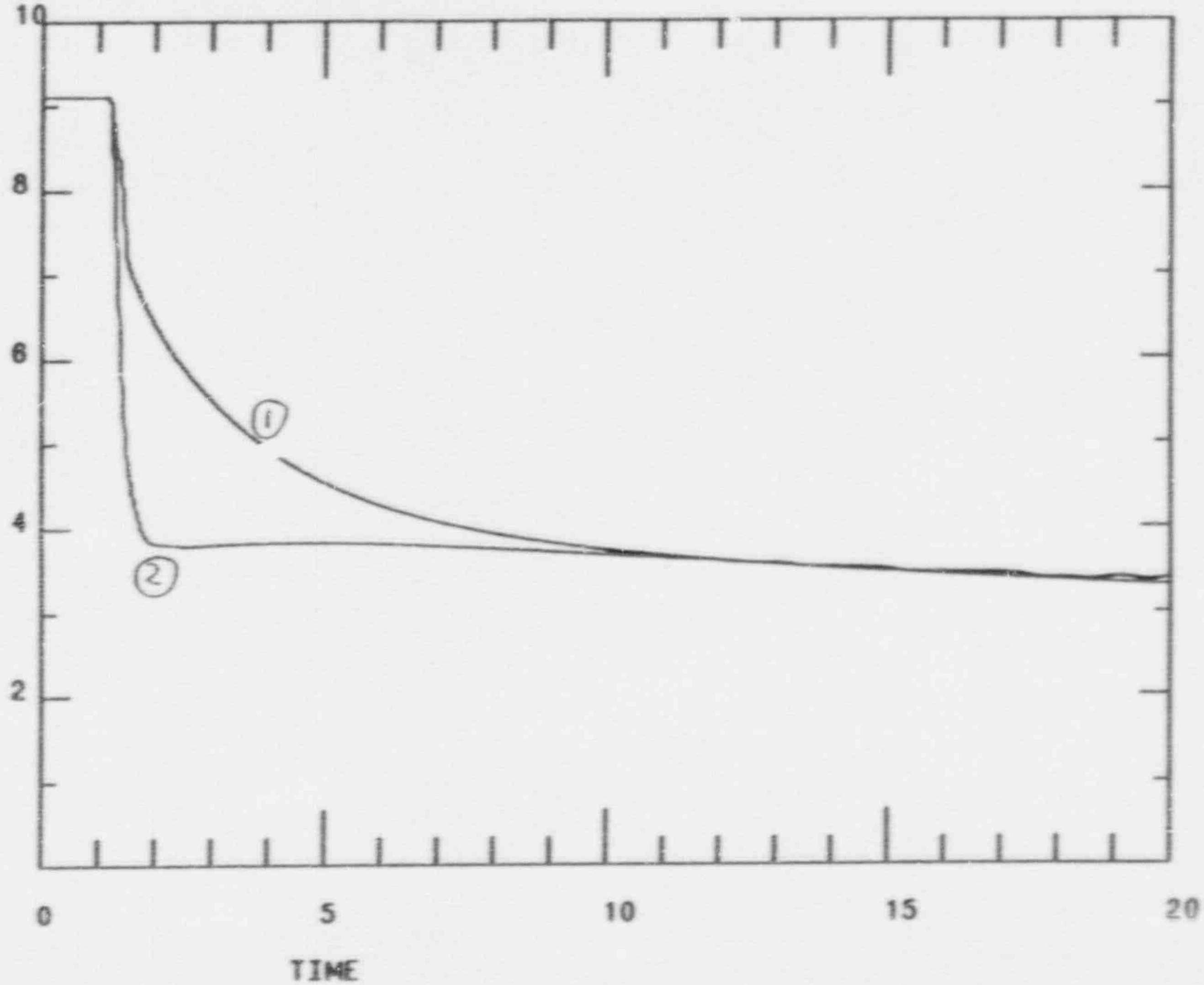
7204***SINGLE RCP TRIP 01/10/91 16:46:20



(1) THTCLWR(1) (500. , 600.) 65210 RC CLOD LEG WR TEMP.
(2) THTCLWR(3) (500. , 600.) 65210 RC CLOD LEG WR TEMP.

7204***SINGLE RCP TRIP 01/10/81 16:15:54

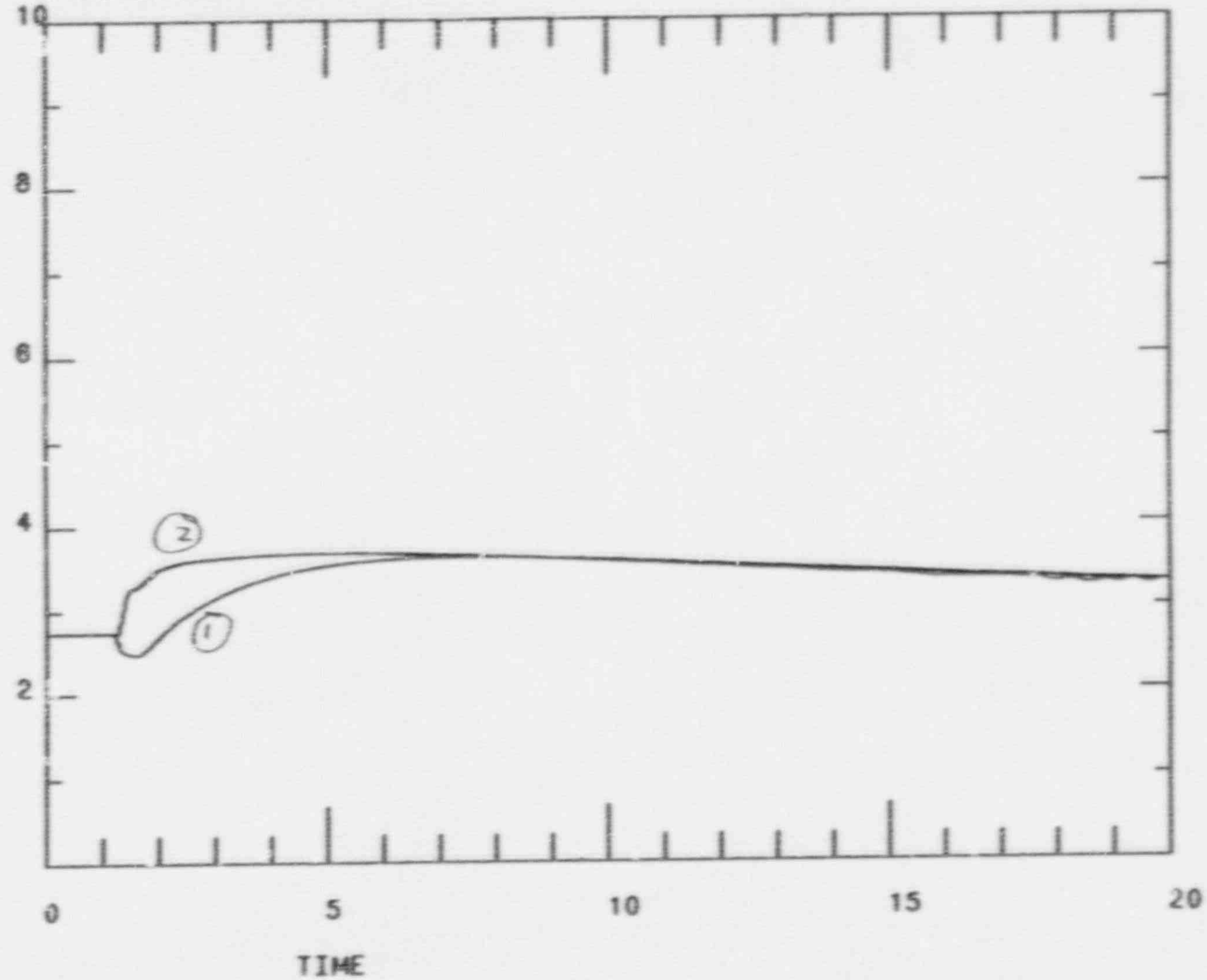
1 DIVISION = 56.69 SECONDS



1 THTHLRTD(1) (500. , 600.) 65210 RC HOT LEG RTD TEMP.
2 THTHLRTD(3) (500. , 600.) 65210 RC HOT LEG RTD TEMP.

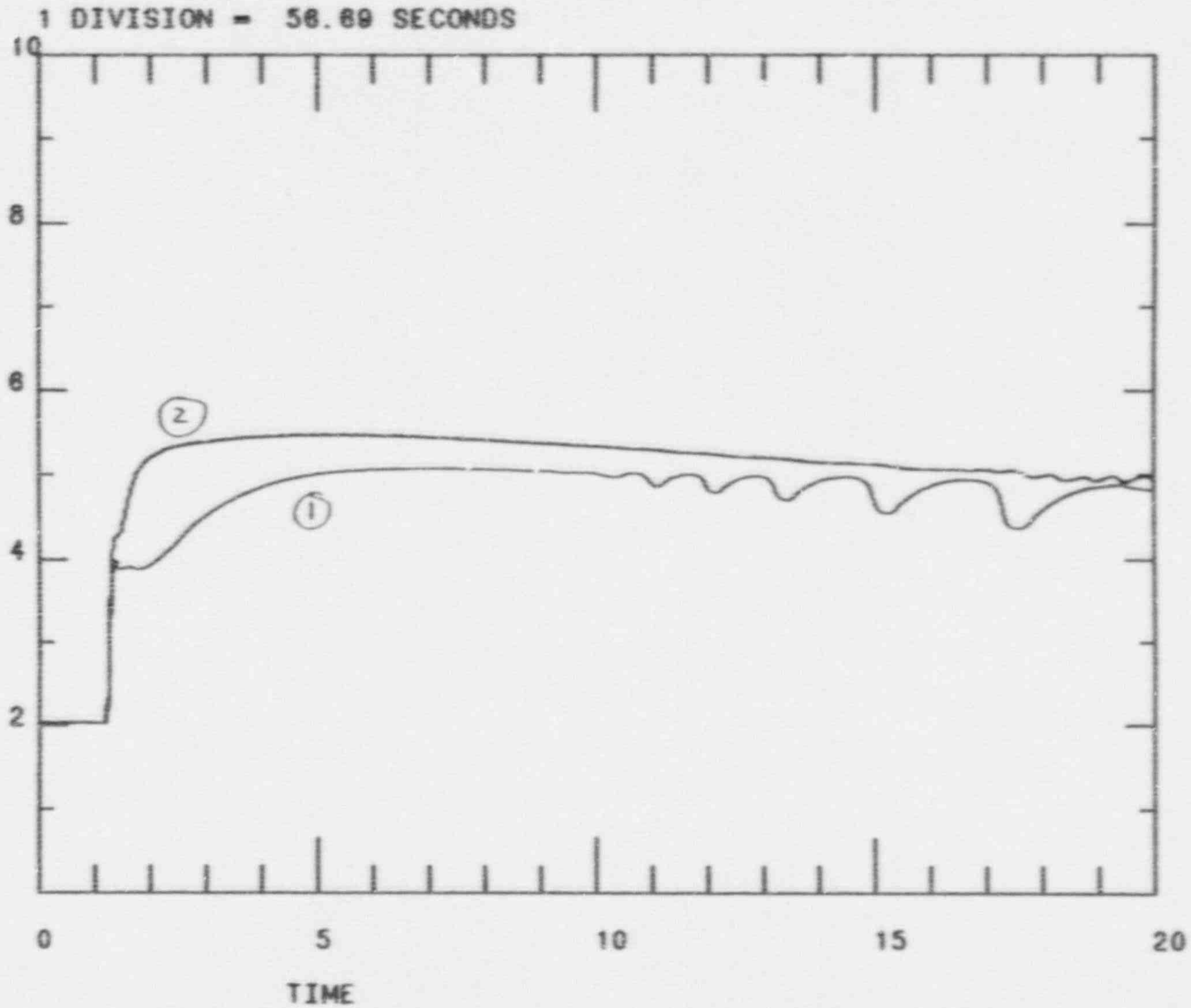
T204***SINGLE RCP TRIP 01/10/81 16:24:12

1 DIVISION = 56.69 SECONDS



① THTCLRTD(1) (500. . 600.) 65210 RC CLOD LEG RTD TEMP.
② THTCLRTD(3) (500. . 600.) 65210 RC CLOD LEG RTD TEMP.

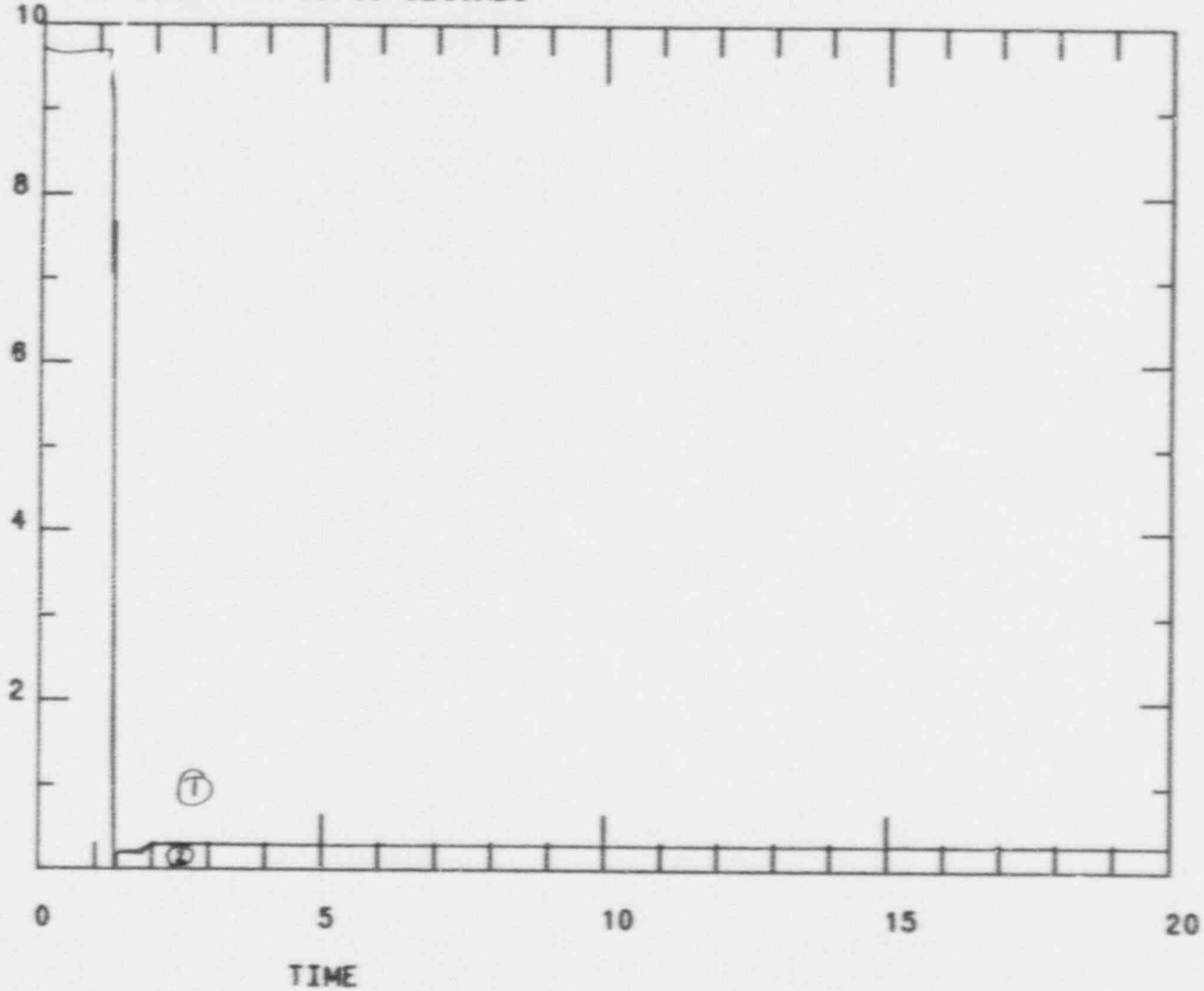
7204***SINGLE RCP TRIP 01/10/91 17:02:42



(1) THPSG(1) (600. , .120E+04) 65130 SG DOME PRESSURE
(2) THPSG(3) (600. , .120E+04) 65130 SG DOME PRESSURE

7204***SINGLE RCP TRIP 01/12/91 08:36:41

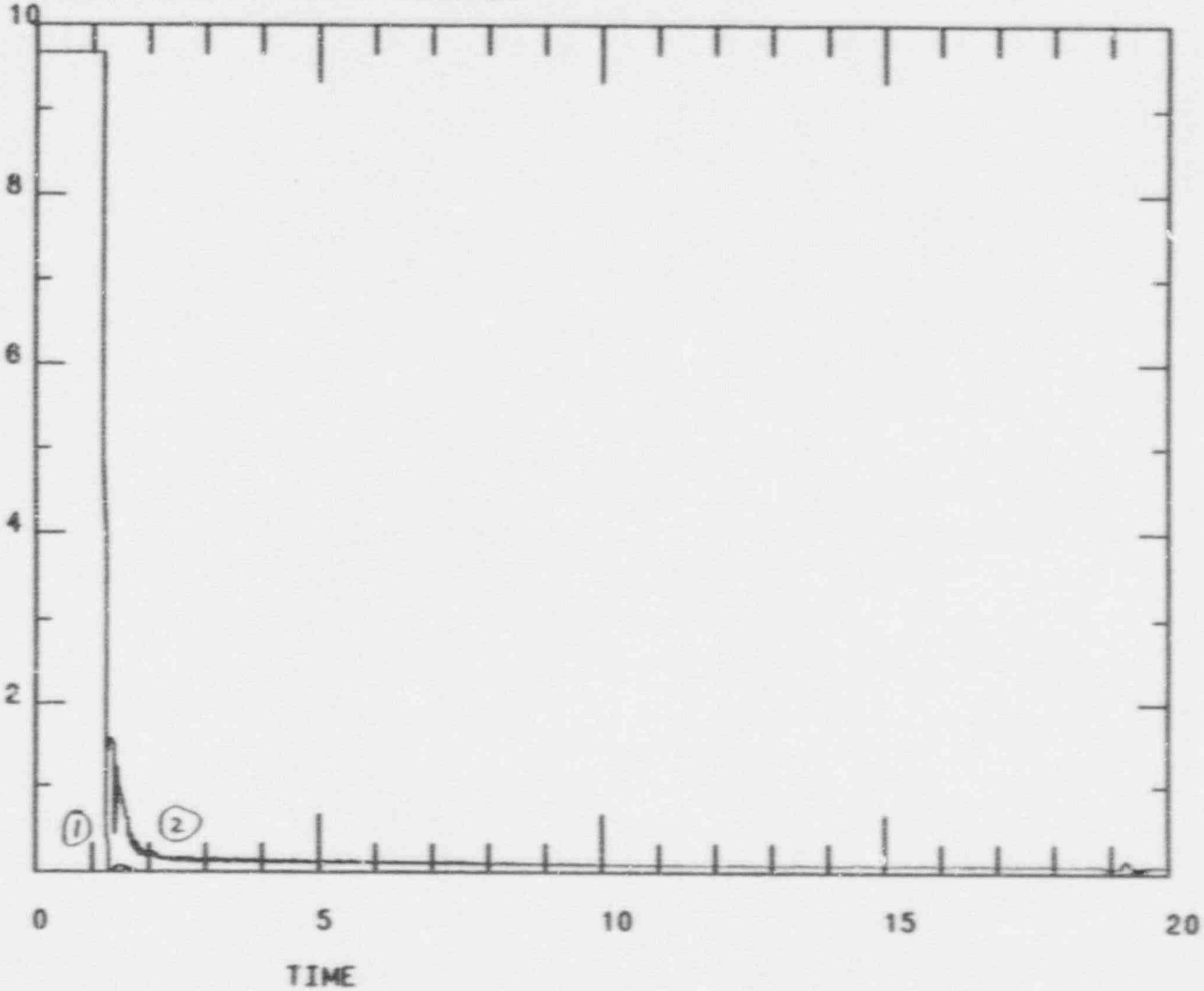
1 DIVISION = 56.60 SECONDS



(1) FWFSG(1) (.000 , .100E+04) 03020 FW TO S/G FLOW
(2) FWFSG(3) (.000 , .100E+04) 03020 FW TO S/G FLOW

7204***SINGLE RCP TRIP 01/10/91 17:11:18

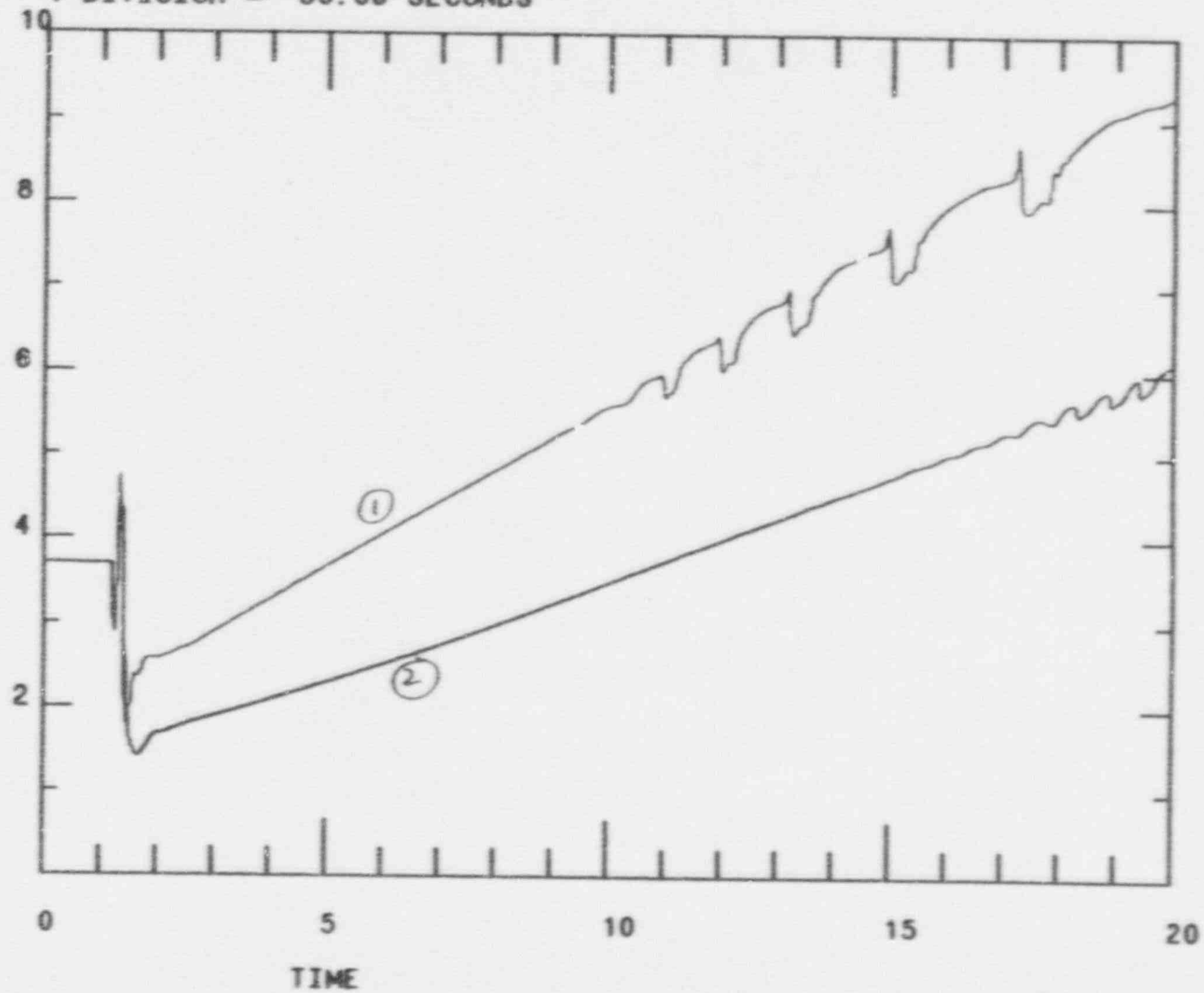
1 DIVISION = 56.69 SECONDS



① MSFSG(1) (.000 , .100E+04) 01160 MS TOTAL FLOW FROM SG
② MSFSG(3) (.000 , .100E+04) 01160 MS TOTAL FLOW FROM SG

7204***SINGLE RCP TRIP 01/12/81 08:44:22

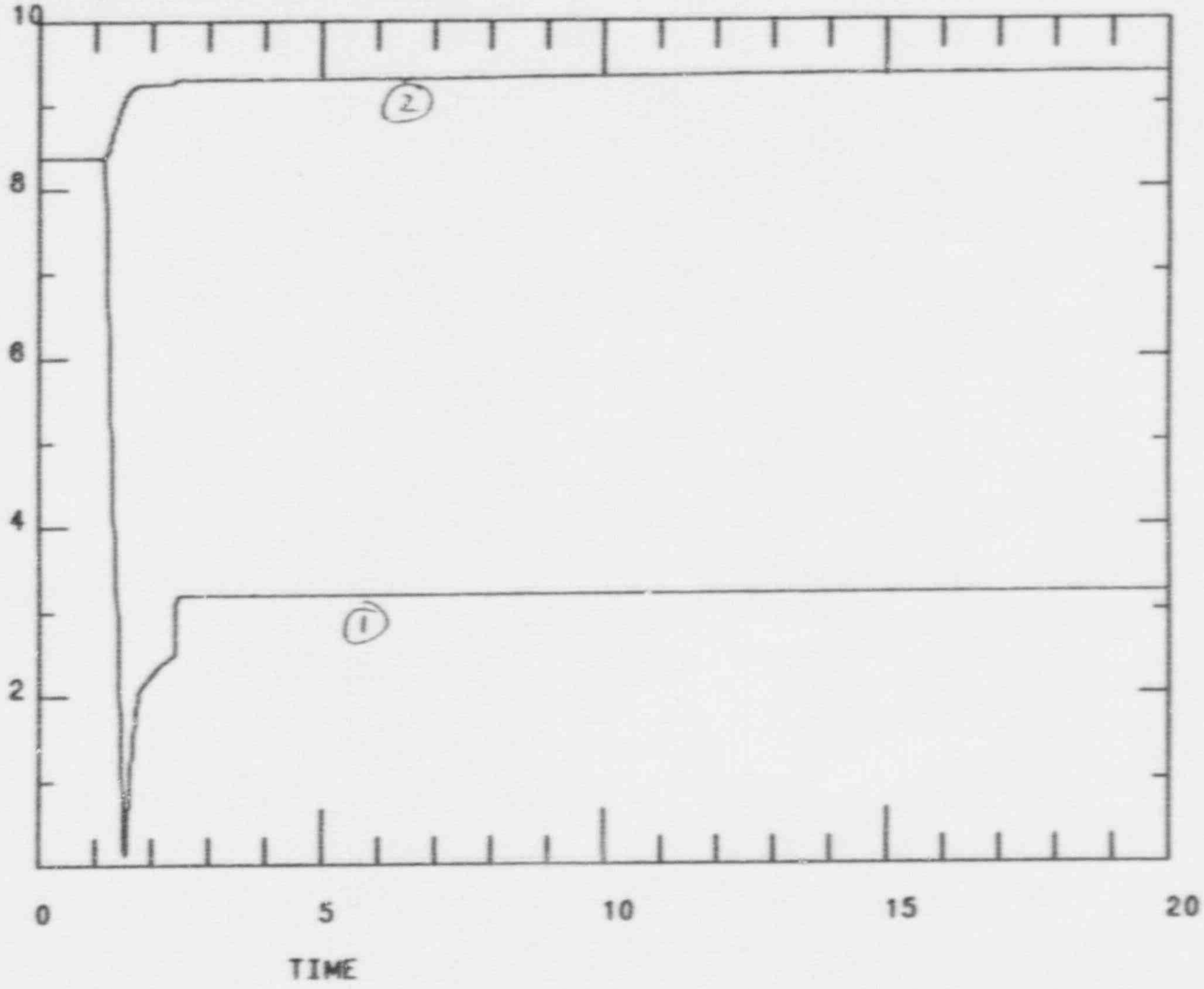
1 DIVISION = 56.69 SECONDS



(1) YCL0403 (40.0 . 60.0) 06790 S/G A WIDE RANGE LEVEL
(2) YCL0463 (40.0 . 60.0) 06840 S/G D WIDE RANGE LEVEL

7204***SINGLE RCP TRIP 01/10/81 16:55:18

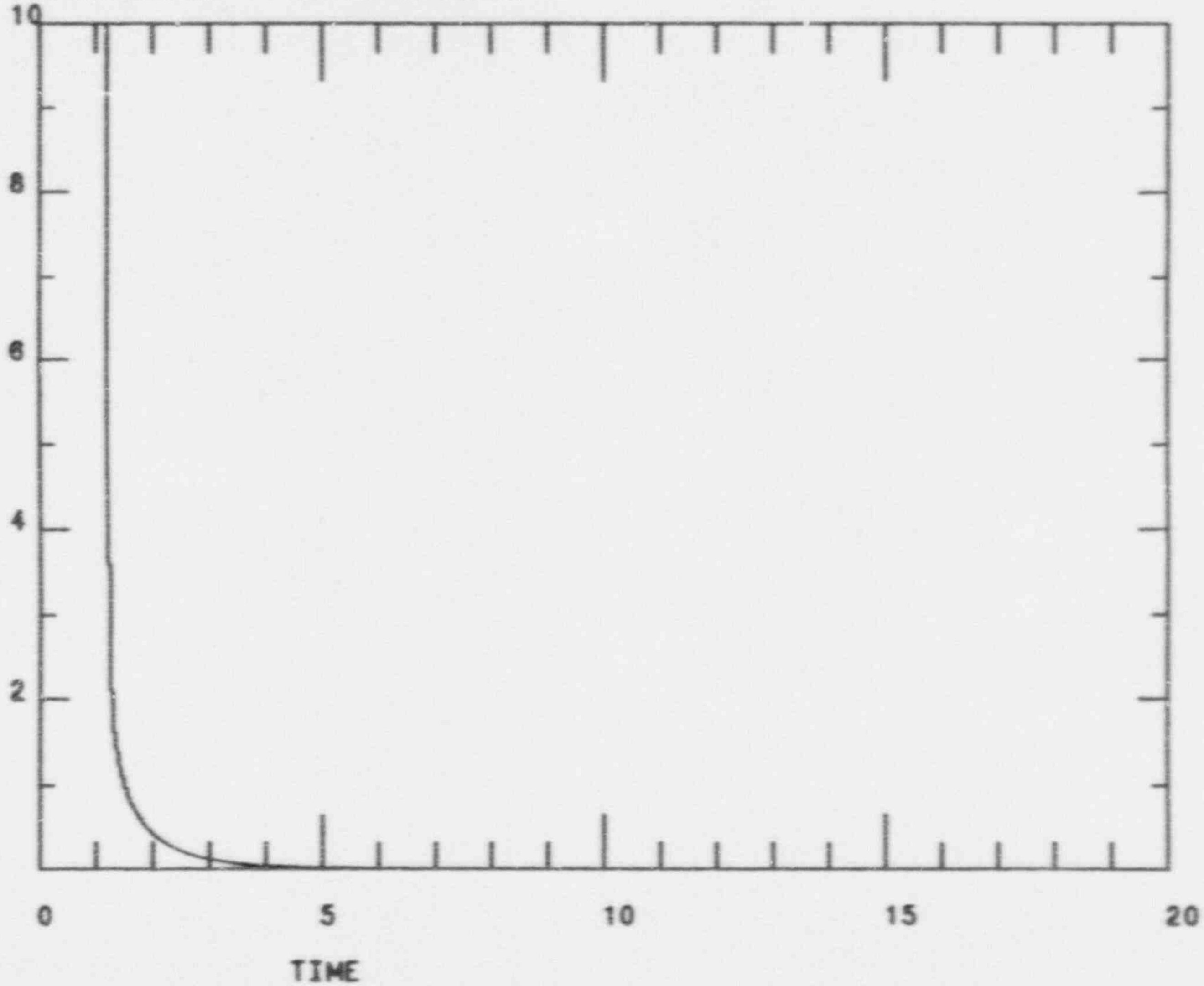
1 DIVISION = 56.69 SECONDS



1 YCF0400 (.000 , 120.) 06220 RCLA 1 FLOW
2 YCF0460 (.000 , 120.) 06360 RCLD 1 FLOW

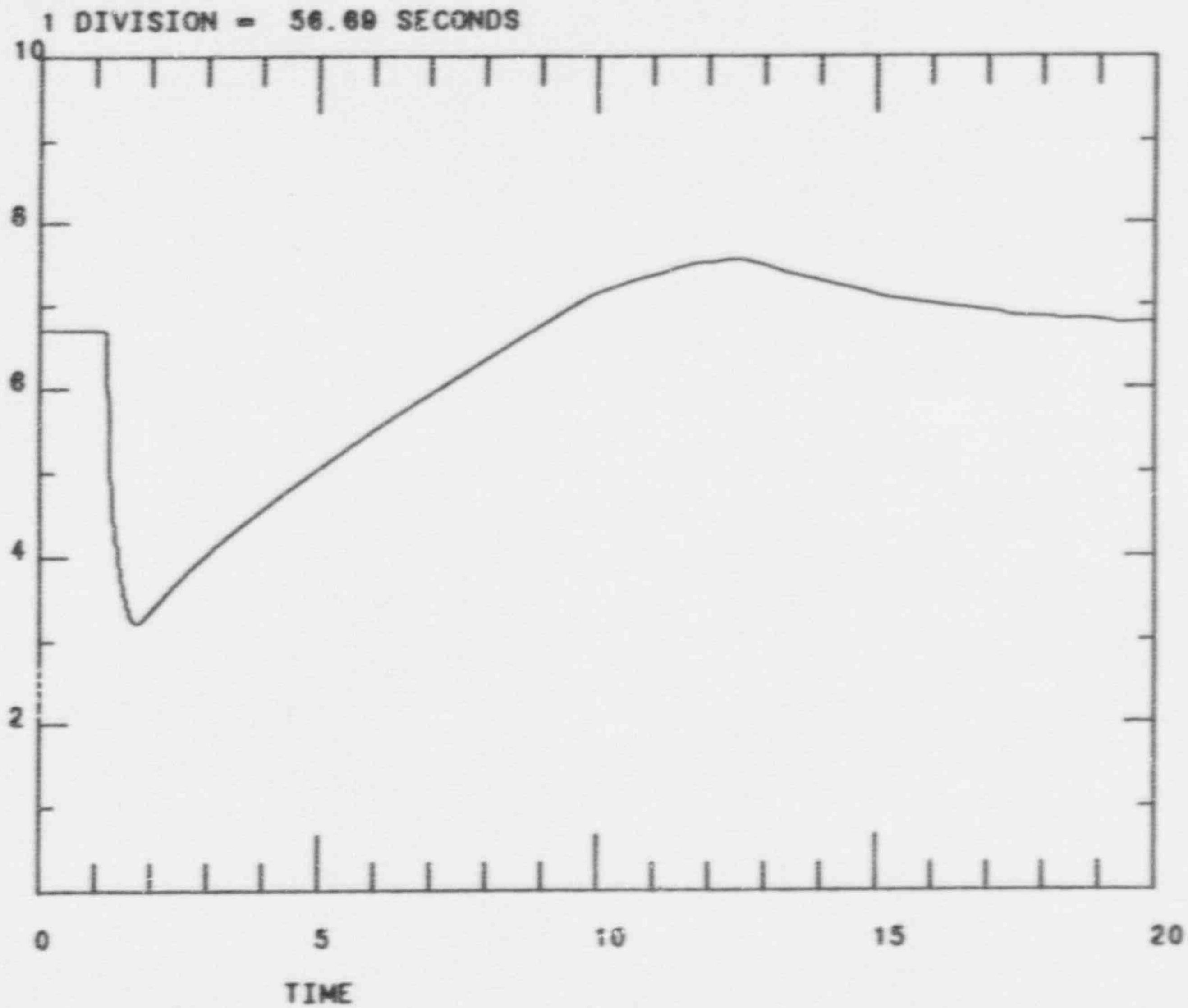
7204***TRIP OF ANY SINGLE RCP 02/04/91 07:51:05

1 DIVISION = 56.68 SECONDS



YCN0049 (.000 , 10.0) 21170 POWER RANGE CHANNEL 1 FL

7204***TRIP OF ANY SINGLE RCP 02/04/91 07:55:44



YCP0480 (.190E+04, .240E+04) 07330 PRESSURIZER 1 PRESSURE

ZION SIMULATOR TRANSIENT TEST

SIMULTANEOUS TRIP OF ALL REACTOR COOLANT PUMPS

The Simultaneous Trip of All Reactor Coolant Pumps was performed from a beginning of core, 100% power, initial condition (IC 37). All four reactor coolant pumps were simultaneously tripped. Data was collected in accordance with ANSI/ANS-3.5-1985 Appendix B 2.2.1.

The tests were reviewed and found satisfactory with the exception of:

Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
Momentary pressure drop during re-pressurization following safety injection.	F212	4/91

Collected and Plotted Data:

1. YCN0049 - Power Range, Neutron Flux
2. YCL0480 - Pressurizer level
3. YCT0480 - Pressurizer liquid Temp
4. THTHLRTD(1) - Loop A Hot Leg RTD Temp
   THTCLRTD(1) - Loop A Cold Leg RTD Temp
5. THPSG(1) - A S/G Pressure
6. FWFSG(1) - A S/G Feedwater Flow
7. MSFSG(1) - A S/G Steam Flow
8. RXTAVG(1) - A Loop Tavg
9. YCP0480 - Pressurizer Pressure
10. FWFAFSG(1) - A S/G Auxilliary Feedwater Flow
11. YCL0403 - A S/G Wide Range Level 1.
12. THTHLWR(1) - Loop A Hot Leg WR Temperature
    THTCLWR(1) - Loop A Cold Leg WR Temperature

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Simultaneous RCP Trip **DATE** : 02/06/91

1. **Data utilized for test comparison in order of preference (circle appropriate choices)**

   a. **Actual Plant Transient Data** **Event** : ____________

   b. **Analytical or design data** **Data** : ____________

   c. **Transient Data from similar plant** **Plant** : ____________

   d. **Panel of experts (best estimate)**

   COMMENTS : DR # F212 fixed, problem due to typo in the temperature computation.

2. **Data Comparison Summary**

VARIABLE	COMMENTS	RESOLUTION
Rx Power	NONE	Accepted
Pzr Level	NONE	Accepted
Pzr Temp	NONE	Accepted
Cold Leg RTD	NONE	Accepted
Hot Leg RTD	NONE	Accepted
S/G Pressure	NONE	Accepted
FW Flow	See Manual Rx Trip comment	Accepted
Steam Flow	Oscillations due to natural circulation	Accepted
RCS Tavg	NONE	Accepted
Pzr Pressure	NONE	Accepted
AFW Flow	See Manual Rx Trip DR # F224	Accepted
S/G WR Level	See Manual Rx Trip DR # F225	Accepted
HL WR Temp	NONE	Accepted
CL WR Temp	NONE	Accepted

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Simultaneous RCP Trip **DATE** : 02/06/91

VARIABLE	COMMENTS	RESOLUTION

3. Comparison Results

Simulator capability to reproduce the defined transient: (circle one)

a. ACCEPTABLE

b. UNACCEPTABLE

4. Review Board Signatures (differing opinions must be documented)

Donald E Phillips

Paul [illegible]

T E [illegible]

J P [illegible]

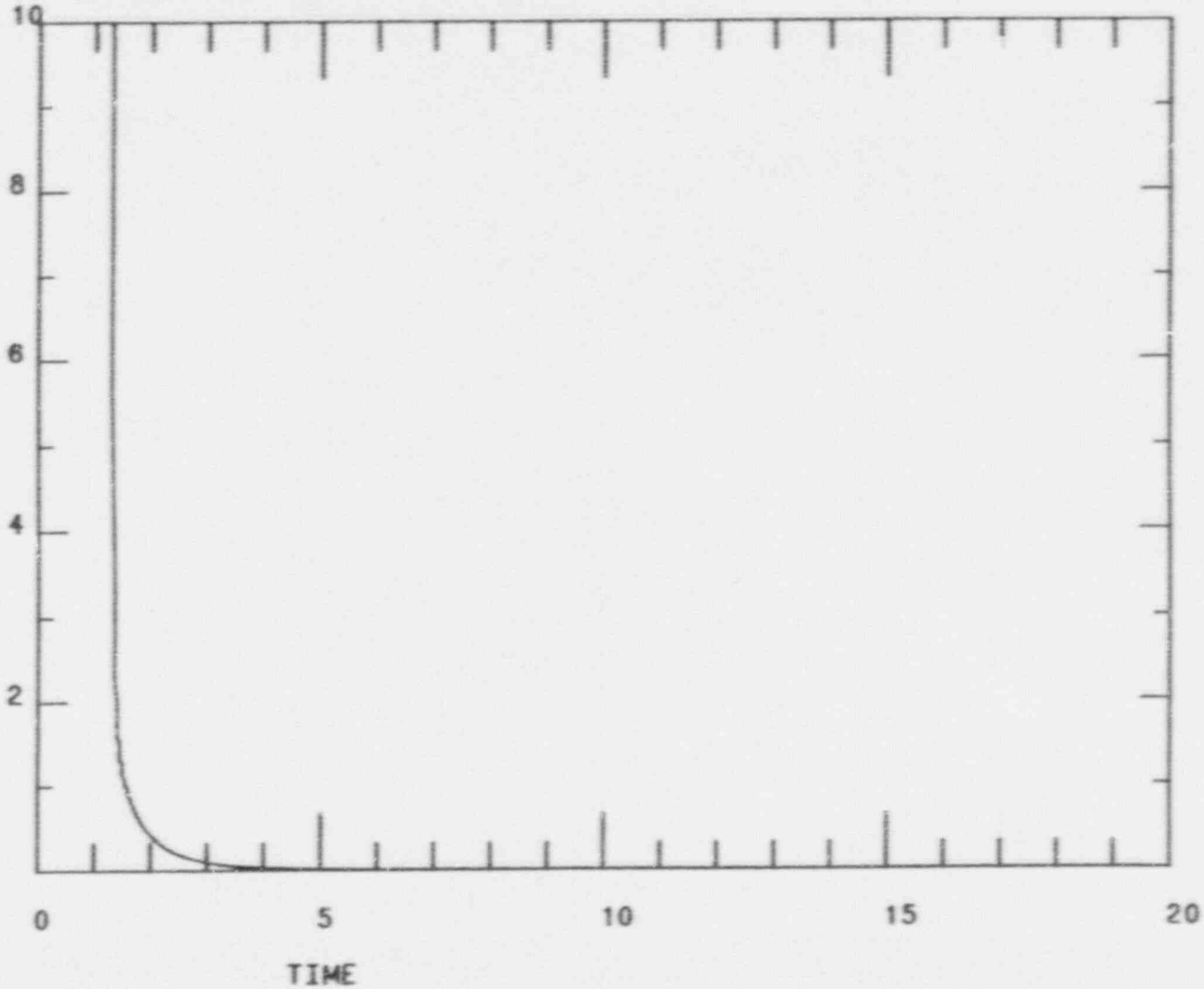
James [illegible] Madden

[illegible]

COMMENTS :

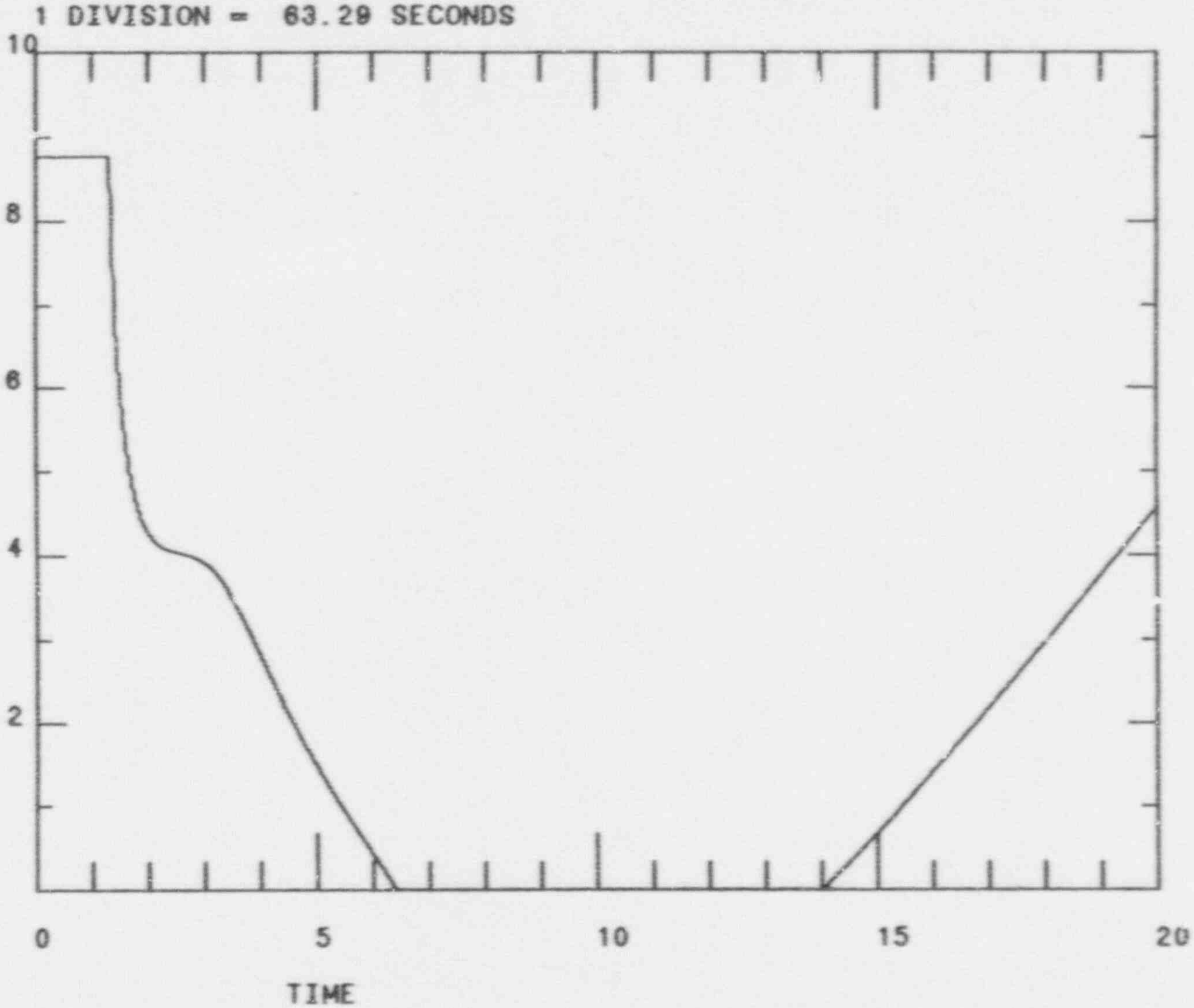
7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 08:33:54

1 DIVISION = 63.29 SECONDS



YCN0049 (.000 , 10.0) 21170 POWER RANGE CHANNEL 1 FL

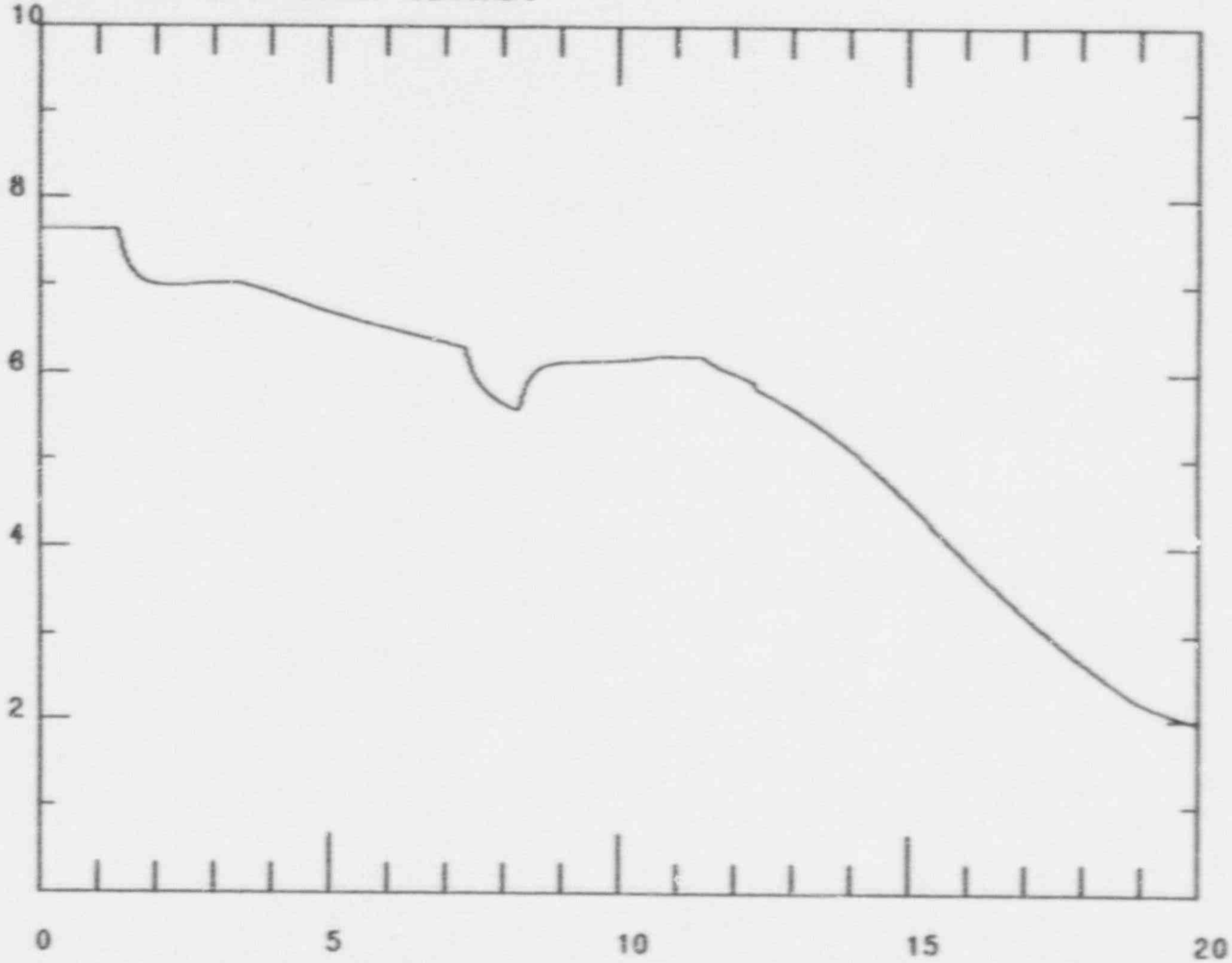
7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 08:27:45



YCL0480 (.000 , 50.0) 06950 PRESSURIZER 1 LEVEL

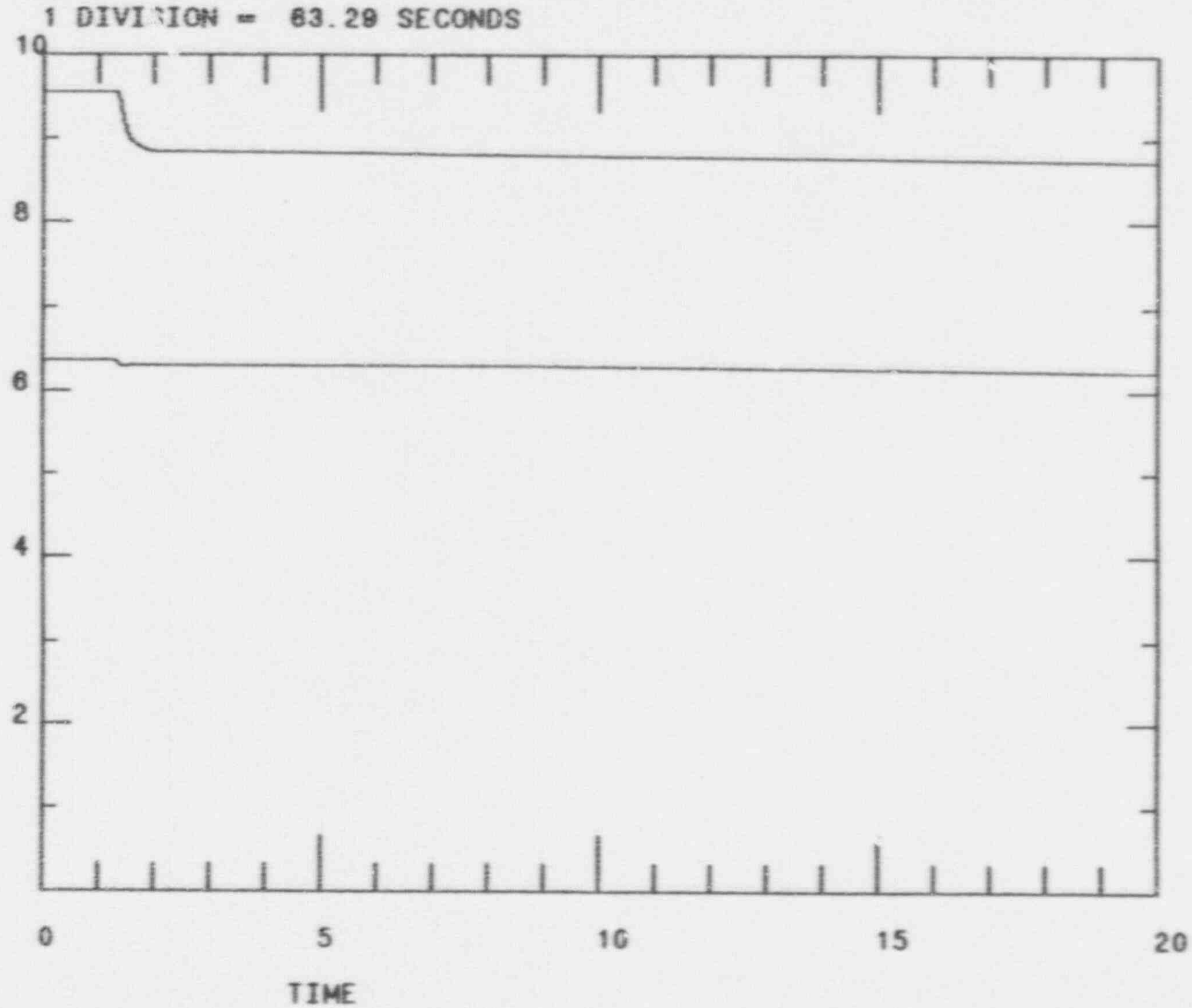
7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/9, 08:59:40

1 DIVISION = 63.29 SECONDS



YCT0480 (500. , 700.) 91220 PRESSURIZER WTR TEMP

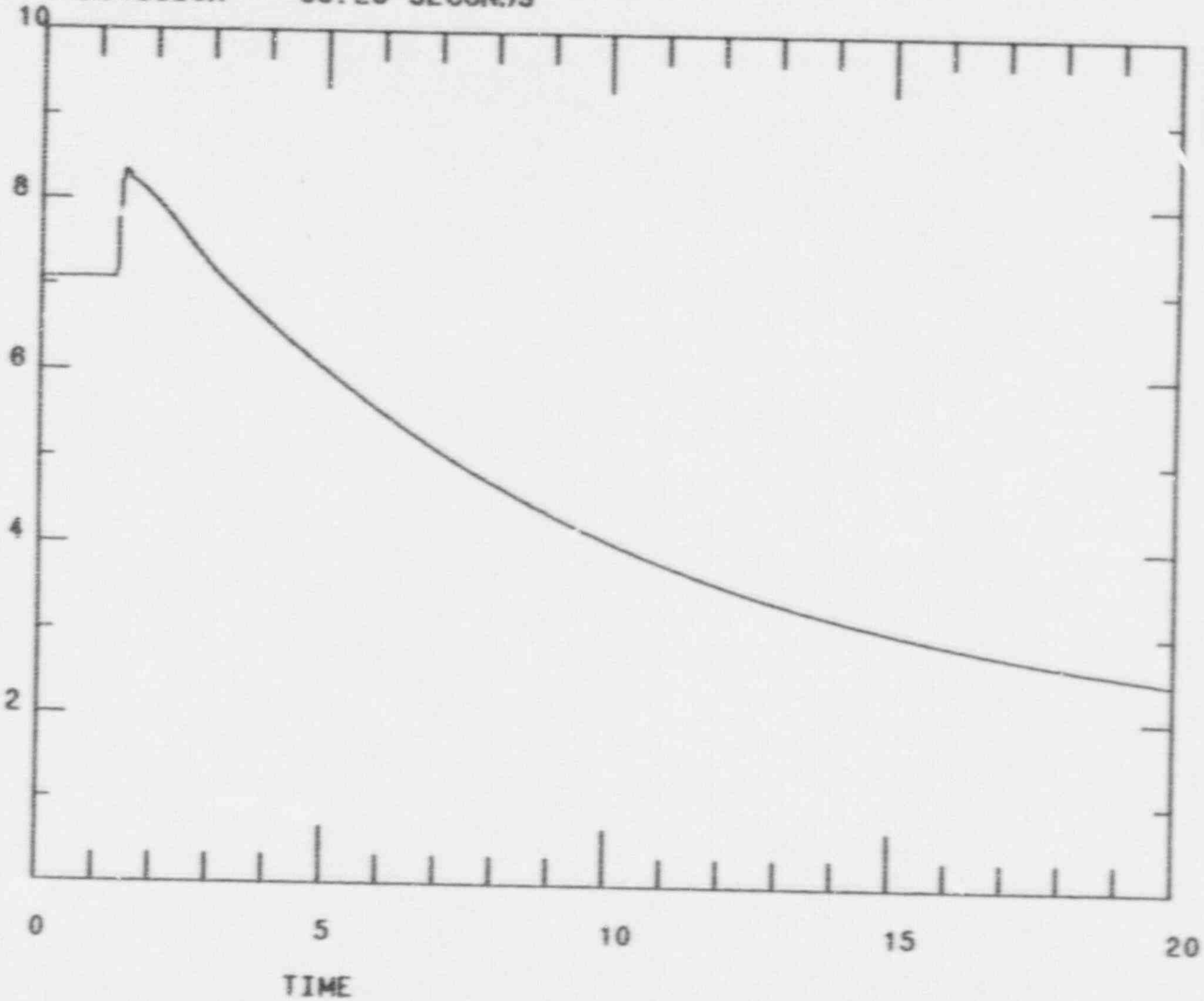
7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 09:20:44



THTHLRTD(1) (400. , 600.) 65210 RC HOT LEG RTD TEMP.
THTCLRTD(1) (400. , 600.) 65210 RC CLOD LEG RTD TEMP.

7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 09:35:10

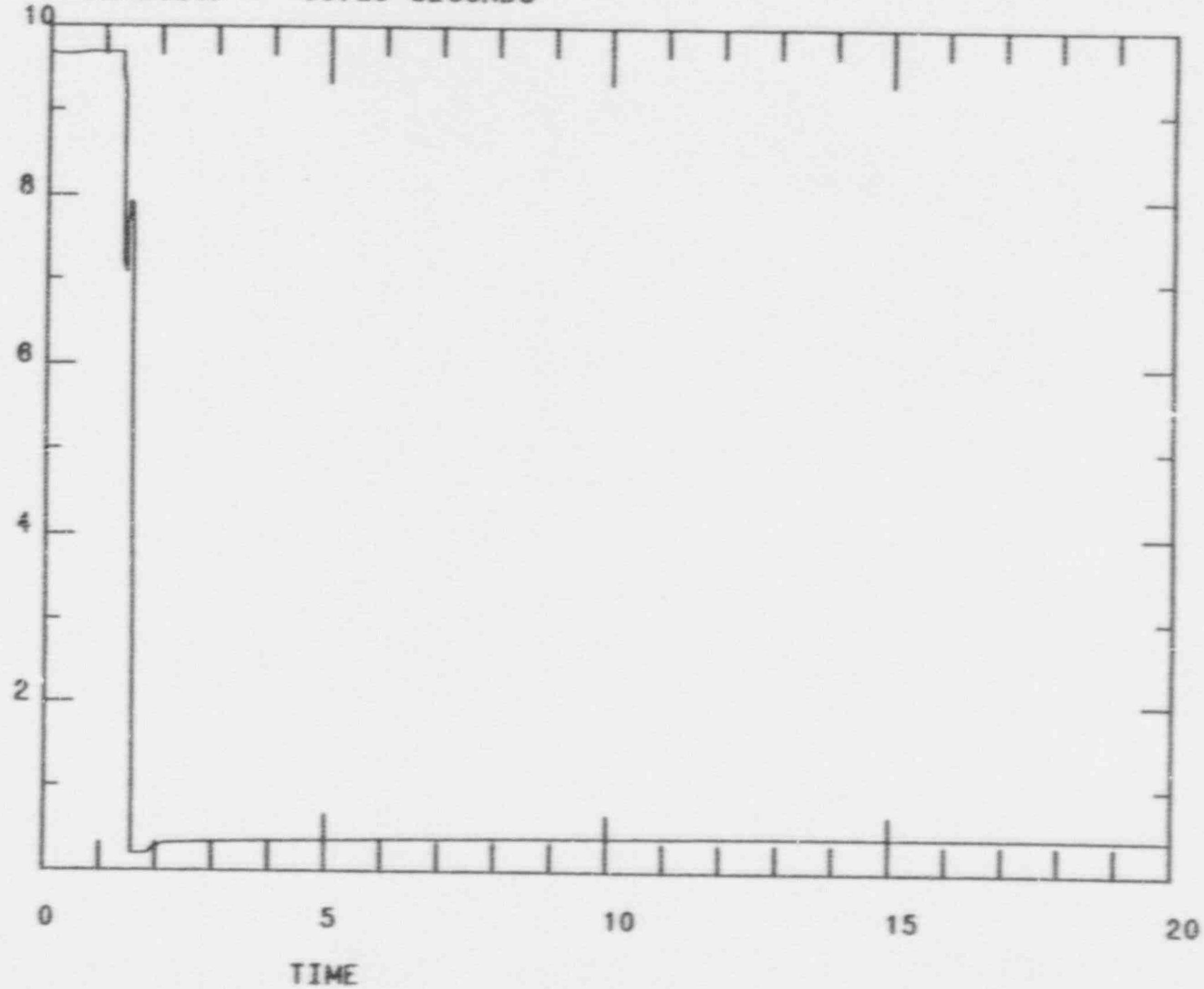
1 DIVISION = 63.29 SECONDS



THPSG(1) (14.7 , .101E+04) 65130 SG DOME PRESSURE

7205•••SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 08:39:50

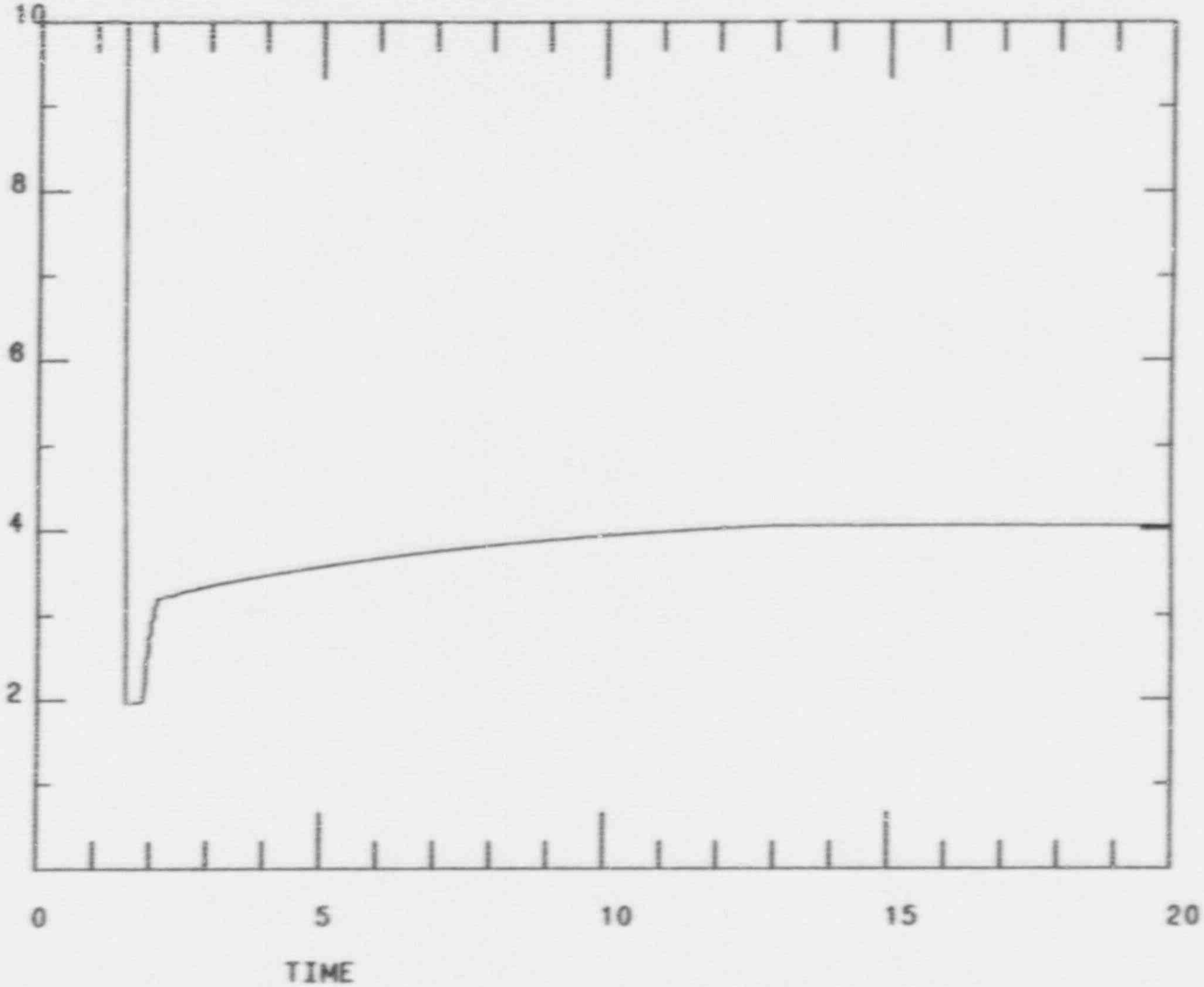
1 DIVISION = 63.29 SECONDS



FWFSG(1) (.000 , .100E+04) 03020 FW TO S/G FLOW

7205***SIMULTANEOUS TRIP OF ALL RCP'S   02/02/91 08:47:33

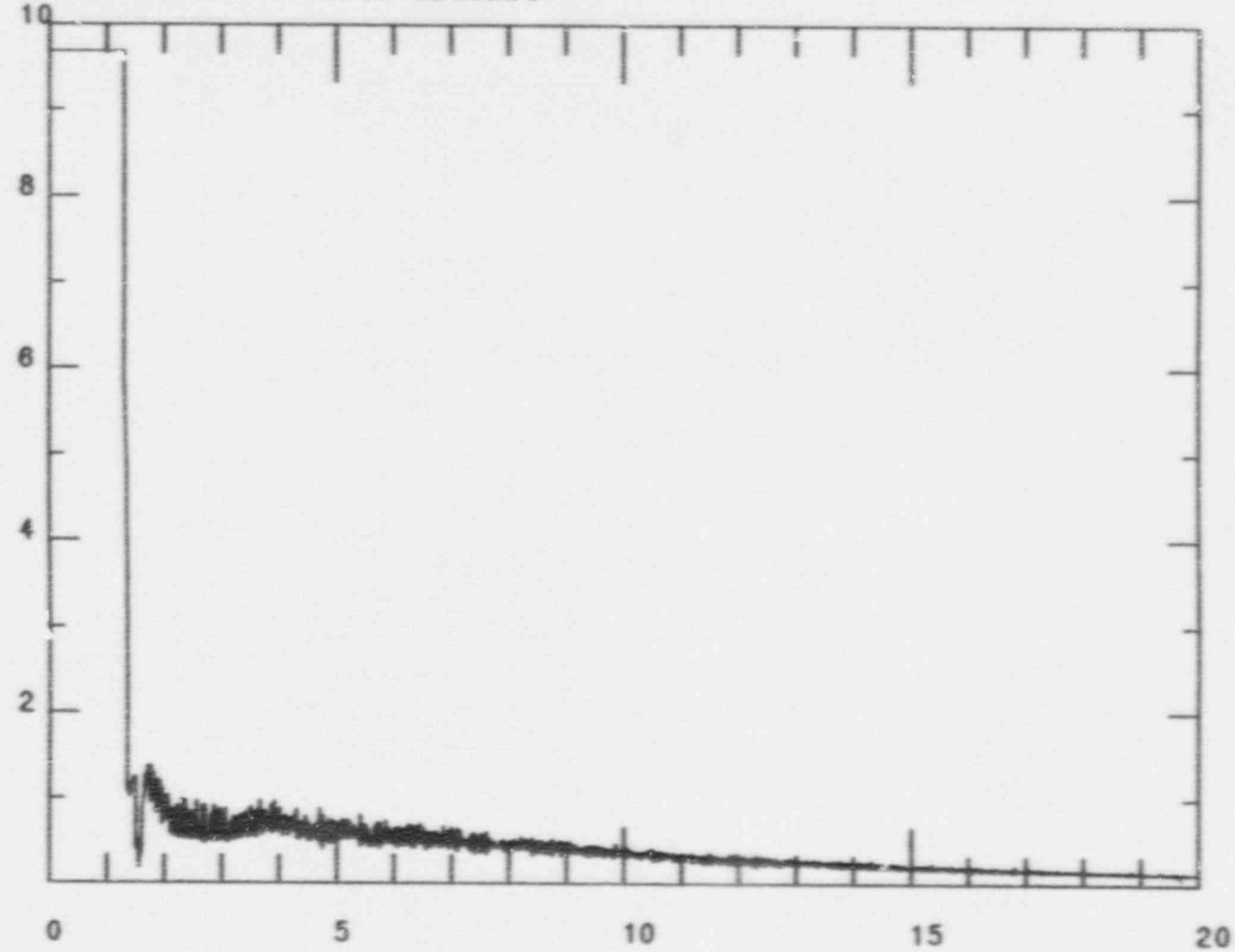
1 DIVISION = 63.20 SECONDS



FWFSG(1)   (.000   , 100.   ) 03020 FW TO S/G FLOW

7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/81 09:57:28

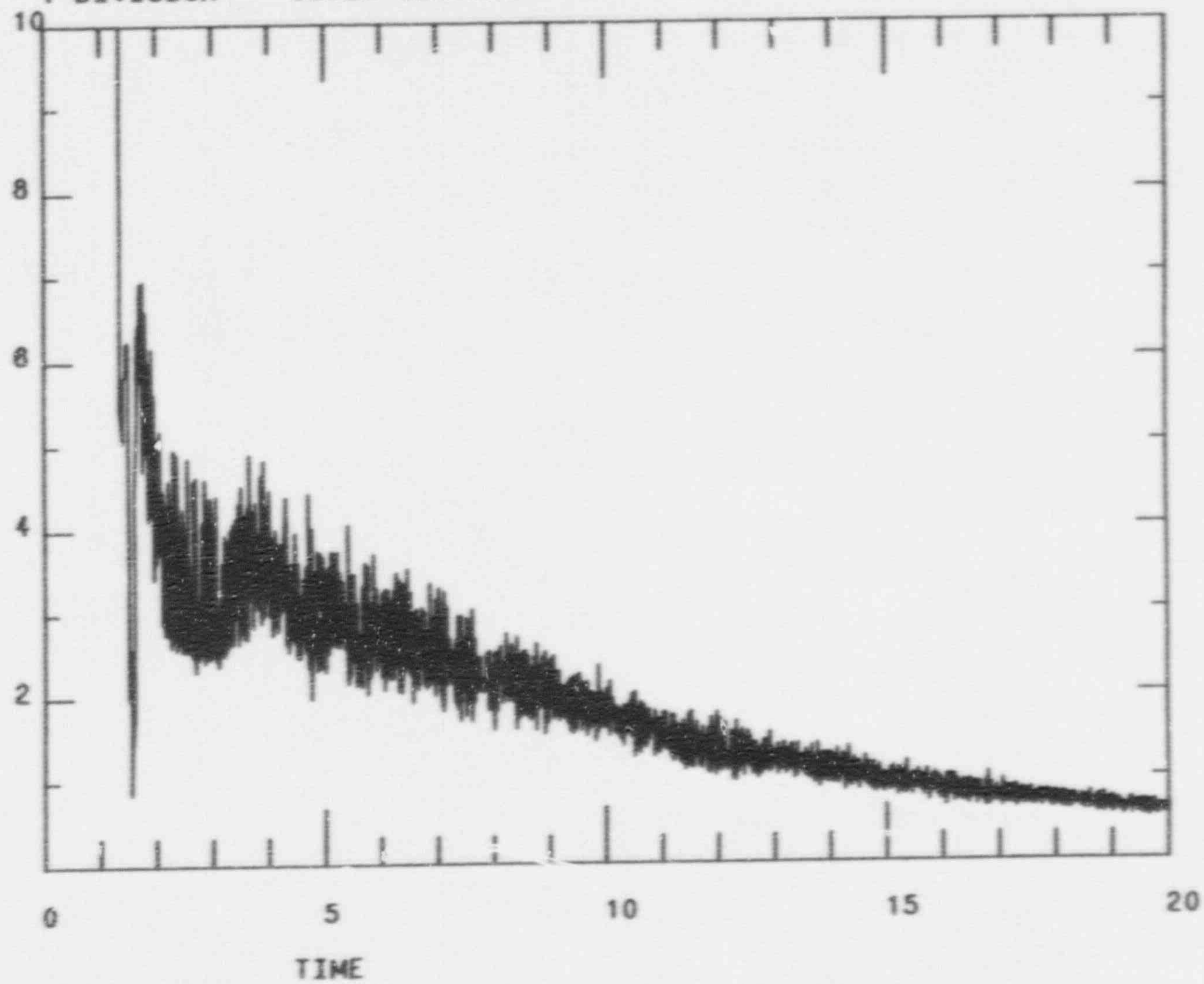
1 DIVISION = 63.20 SECONDS



MSFSG(1) (.000 , .100E+04) 01160 MS TOTAL FLOW FROM SG

7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 10:04:05

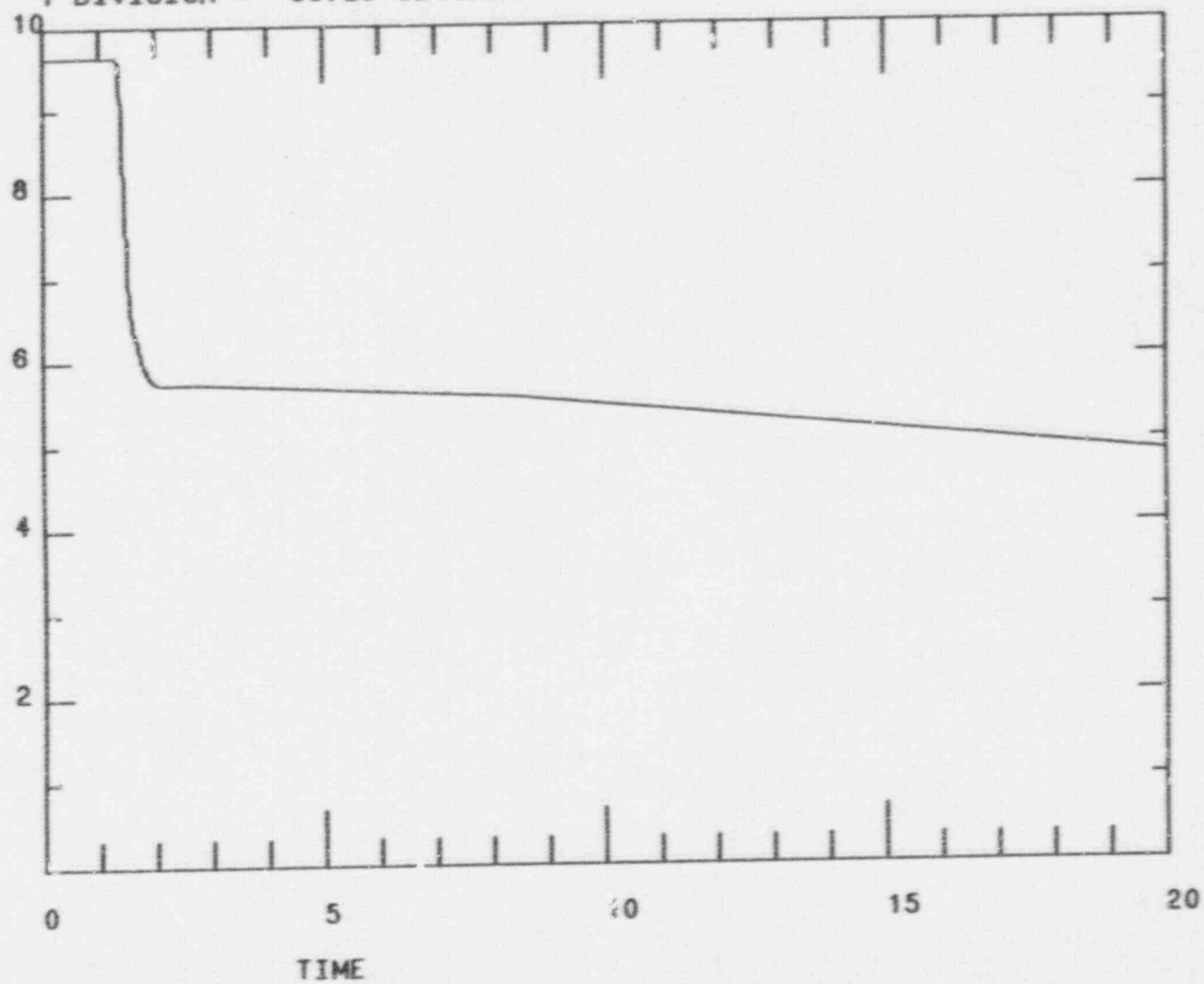
1 DIVISION = 63.29 SECONDS



MSFSG(1) (.000 , 200.) 01160 MS TOTAL FLOW FROM SG

7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 10:12:53

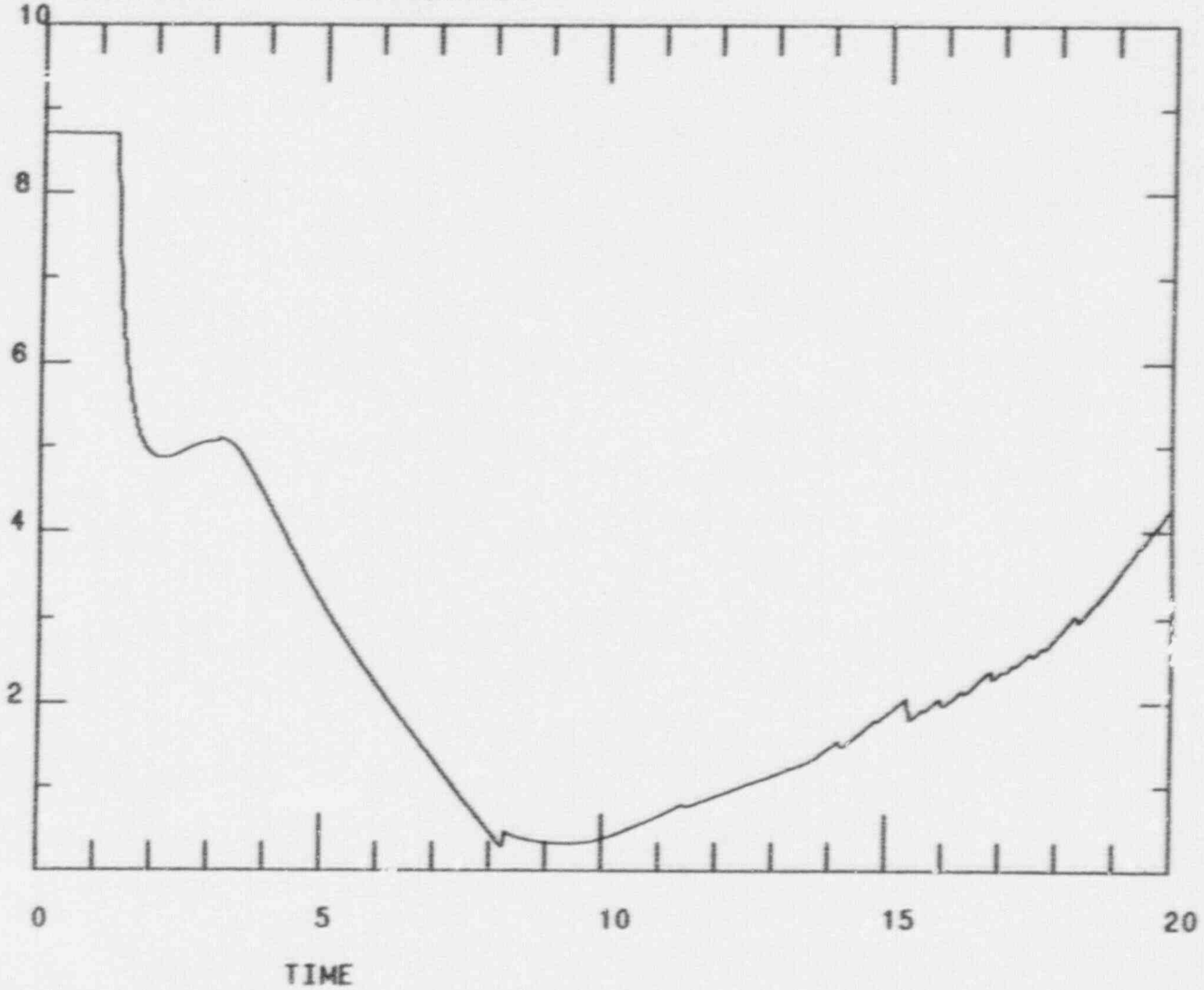
1 DIVISION = 63.29 SECONDS



RXTAVG(1) (540. , 560.) 01200 LOOP TAVG

7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 08:53:30

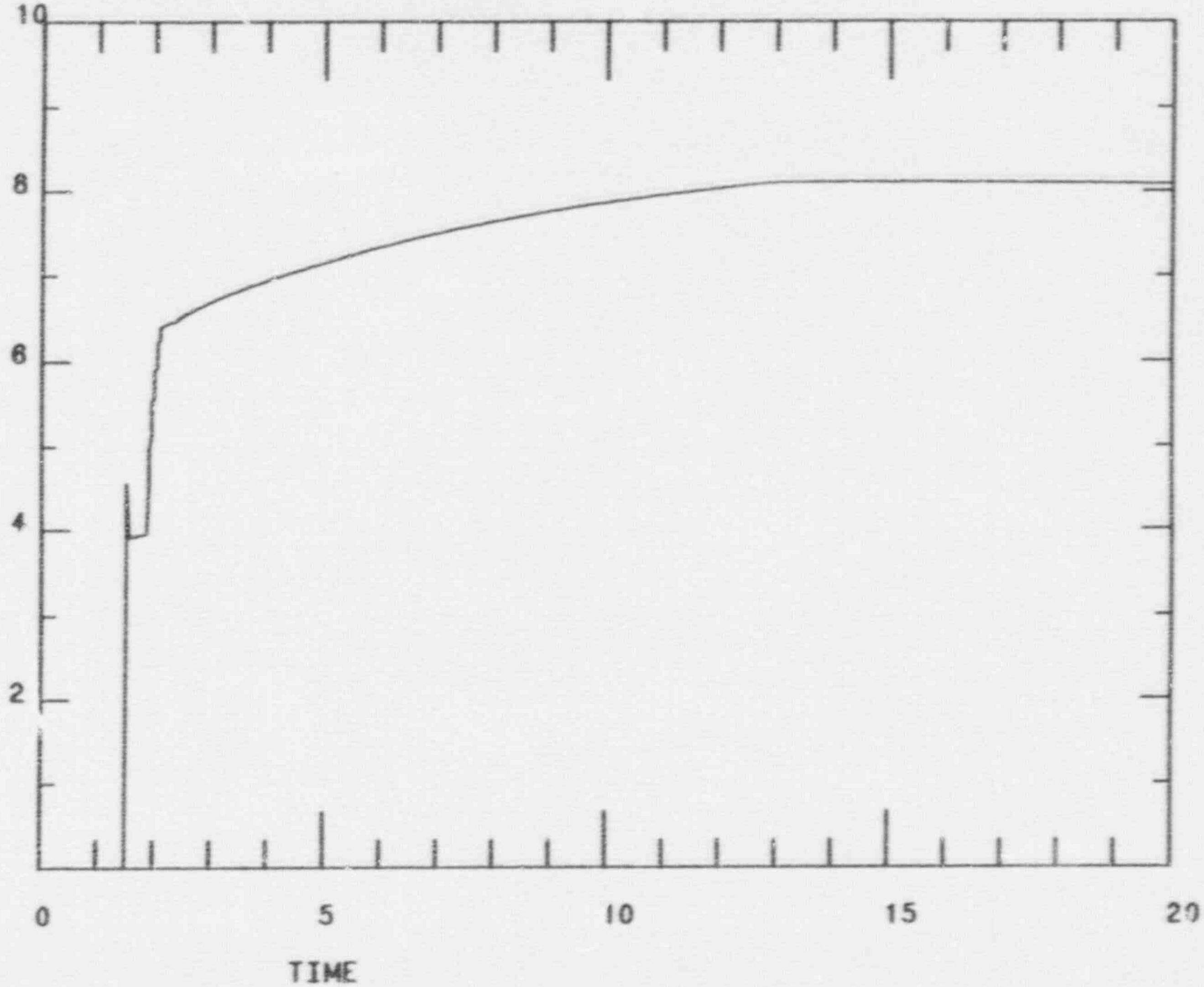
1 DIVISION = 63.20 SECONDS



YCP0480 (.180E+04, .230E+04) 07330 PRESSURIZER 1 PRESSURE

7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 09:29:13

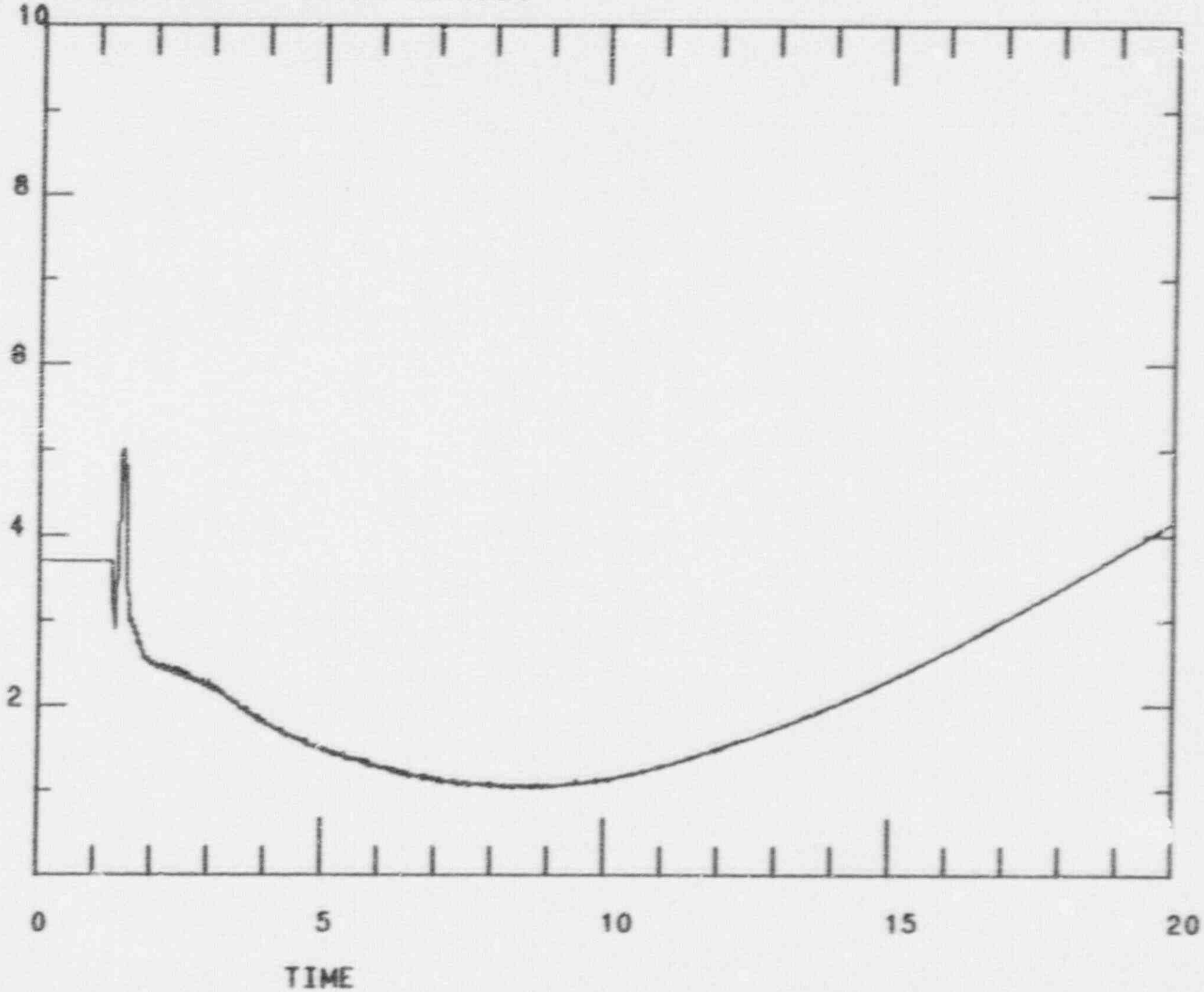
1 DIVISION = 63.29 SECONDS



FWFAFSG(1) (.000 , 50.0) 06020 AF TO S/G FLOW

7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 09:42:17

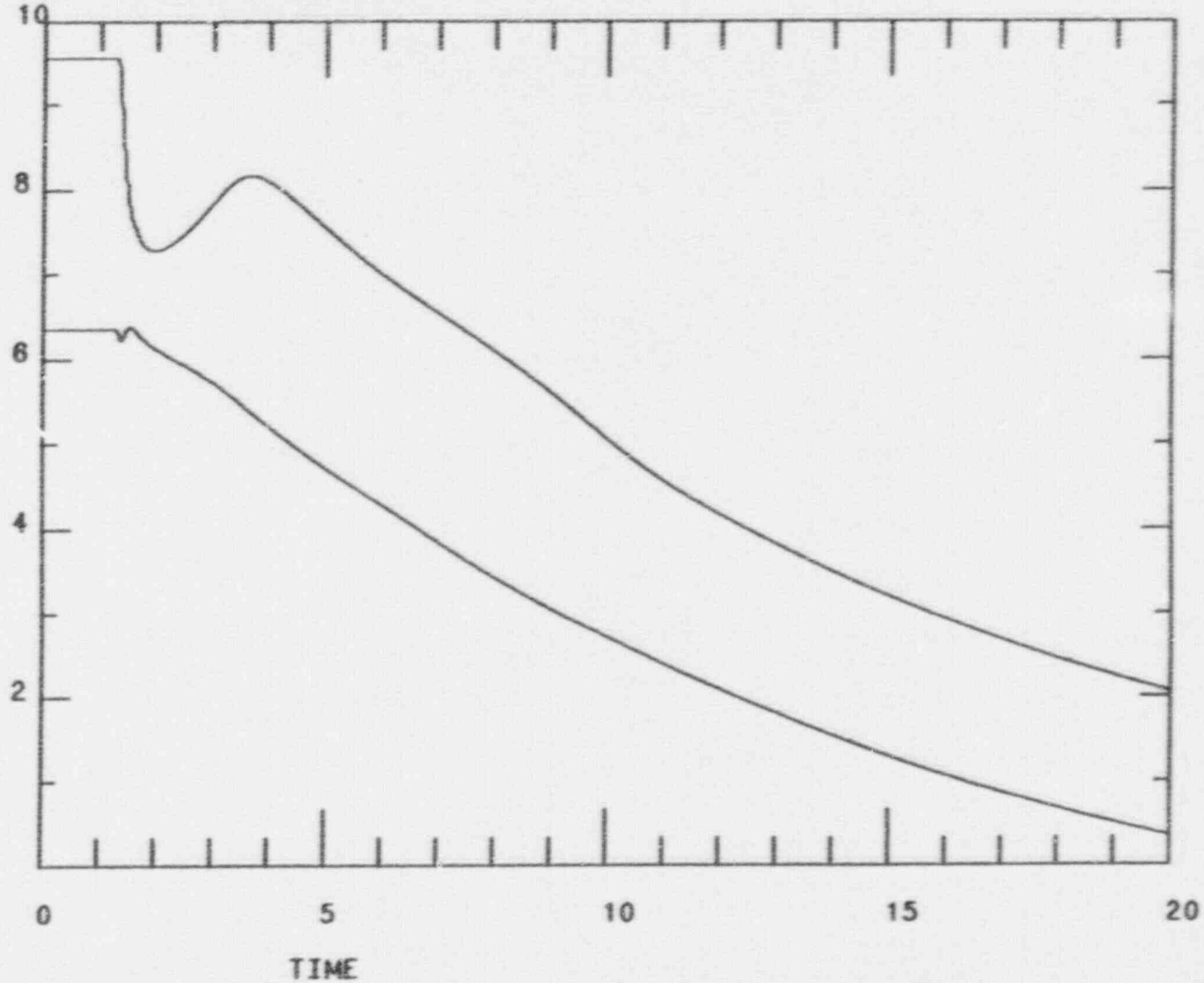
1 DIVISION = 63.29 SECONDS



YCL0403 (40.0 , 60.0) 06790 S/G A WIDE RANGE LEVEL

7205***SIMULTANEOUS TRIP OF ALL RCP'S 02/02/91 09:11:50

1 DIVISION = 63.20 SECONDS



THTHLWR(1) (400. , 600.) 65210 RC HOT LEG WR TEMP.
THTCLWR(1) (400. , 600.) 65210 RC CLOD LEG WR TEMP.

ZION SIMULATOR TRANSIENT TEST

MAXIMUM SIZE REACTOR COOLANT RUPTURE COMBINED WITH A LOSS OF OFFSITE POWER

The Maximum Size Reactor Coolant Rupture Combined With A Loss of Offsite Power was performed from a beginning of core, 100% power, initial condition (IC 37). Malfunction ED01 was used to cause a loss of all offsite power and malfunction TH07A was inserted at 100% severity to cause a maximum size loss of coolant accident. Data was collected in accordance with ANSI/ANS-3.5-1985 Appendix B 2.2.3.

Test results were reviewed and found satisfactory with the exception of:

Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
Containment Pressure Response	F195	4/91
Reactor Coolant System Pressure Response	F196	4/91
Containment Sump Response	F198/219	4/91
Core Reflood Response	F199	4/91
SI flow spike	F229	4/91
RHR flow spike	F230	4/91

Collected and Plotted Data:

1. YCL0480 - Pressurizer Level
2. YCP0480 - Pressurizer Pressure
3. THPHL(3) - Hot Leg Pressure (RH Pump Suction Pressure)
4. CHPCONT - Containment Average Pressure
5. CHTAVGCM - Containment Average Temperature
6. CVFBITIN - Flow through BIT Injection Line
7. SIF10 - SI Pump A Flow (SI Flownet Path 10)
8. RHF18 - RH HX 1A Flow (RH Flownet F18)
9. SILRWST - RWST Level
10. CSF1AS - Containment Spray Loop 1A Flow
11. CSF1B4 - Containment Spray Loop 1B Flow
12. CSF1C4 - Containment Spray Loop 1C Flow
13. CHLCM1 - Containment Sump Level
    CHLCAVITYS - Cavity Sump Level

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Max Size LOCA **DATE :** 02/06/91

1. **Data utilized for test comparison in order of preference (circle appropriate choices)**

   a. **Actual Plant Transient Data** **Event :** ____________

   b. **Analytical or design data** **Data :** ____________

   c. **Transient Data from similar plant** **Plant :** ____________

   d. **Panel of experts (best estimate)**

COMMENTS : Open DR's F195, Containment Pressure Response
F196, RCS pressure response during blowdown
F198, Containment Sump Lights
F199, Core reflood response
F219, Containment Sump response

2. **Data Comparison Summary**

VARIABLE	COMMENTS	RESOLUTION
Pzr Level	NONE	Accepted
Pzr Pressure	DR # F196	Accepted
WR Pressure	NONE	Accepted
Cont Pressure	DR # F195	Accepted
Cont Temp	NONE	Accepted
BIT Flow	NONE	Accepted
SI Pump Flow	Unexplained downward spike, DR # F229 written to explain / correct	Accepted
RHR Pmp Flow	Unexplained upward spike, DR # F230 written to explain / correct	Accepted
RWST Level	NONE	Accepted
CS PMP Flows	NONE	Accepted
Cont Sump	DR # F198, F219	Accepted

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Max Size LOCA DATE : 02/06/91

VARIABLE	COMMENTS	RESOLUTION

3. Comparison Results

Simulator capability to reproduce the defined transient: (circle one)

a. ACCEPTABLE

b. UNACCEPTABLE

4. Review Board Signatures (differing opinions must be documented)

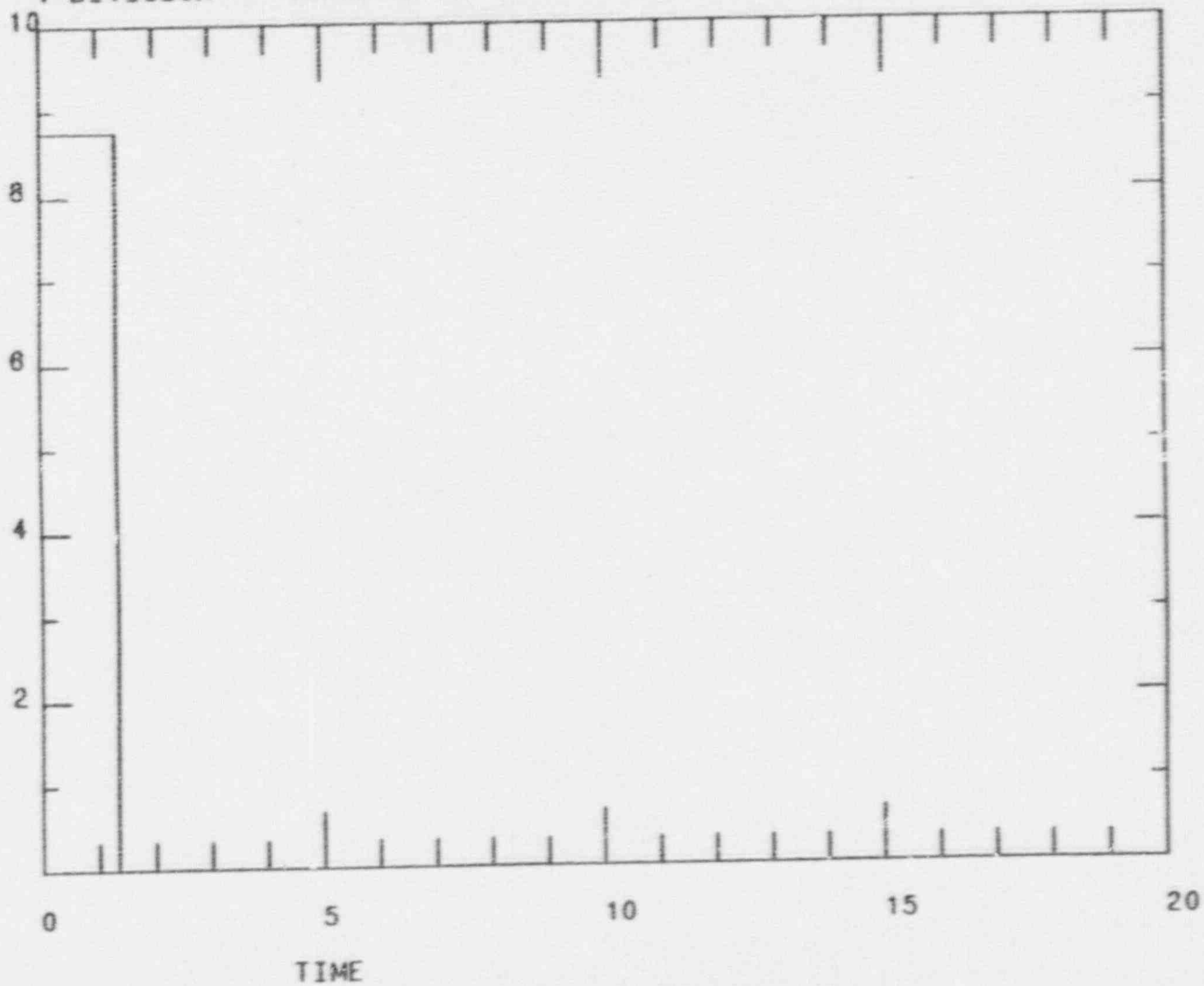
Donald E Phillips

James J. Madden

COMMENTS :

7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 14:33:23

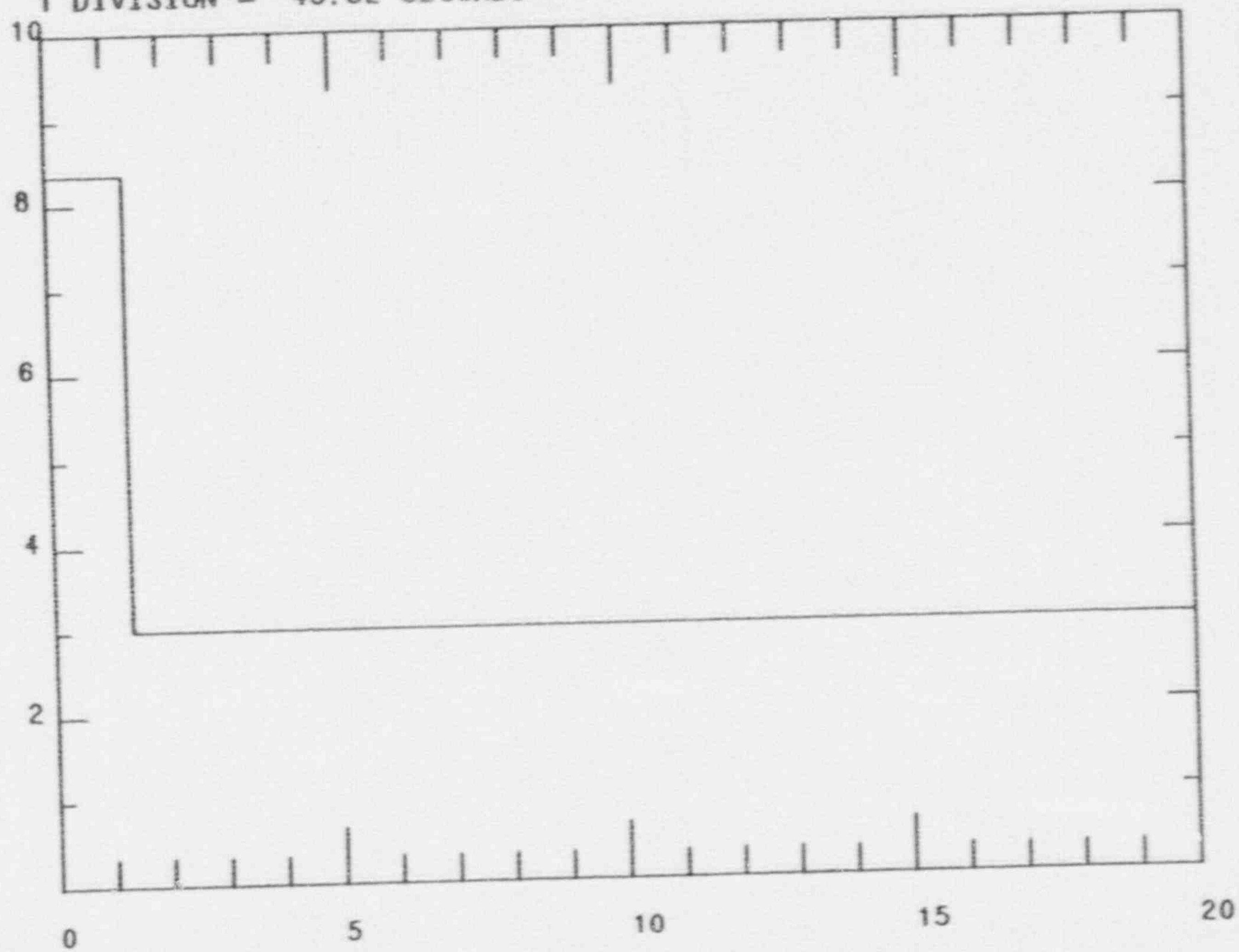
1 DIVISION = 45.32 SECONDS



YCL0480 (.000 . 50.0) 06950 PRESSURIZER 1 LEVEL

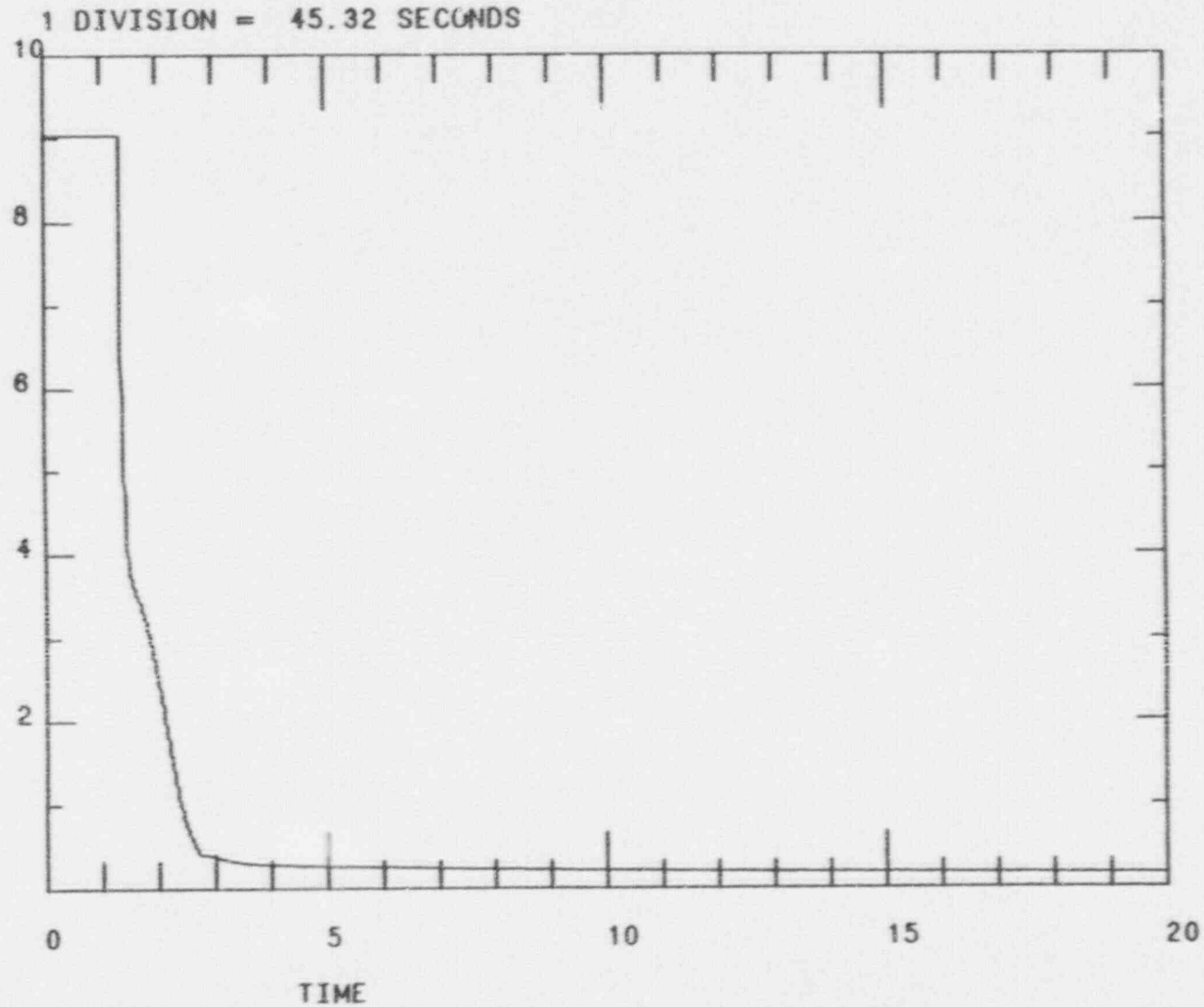
7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 14:52:16

1 DIVISION = 45.32 SECONDS



YCP0480 (.140E+04, .240E+04) 07330 PRESSURIZER 1 PRESSURE

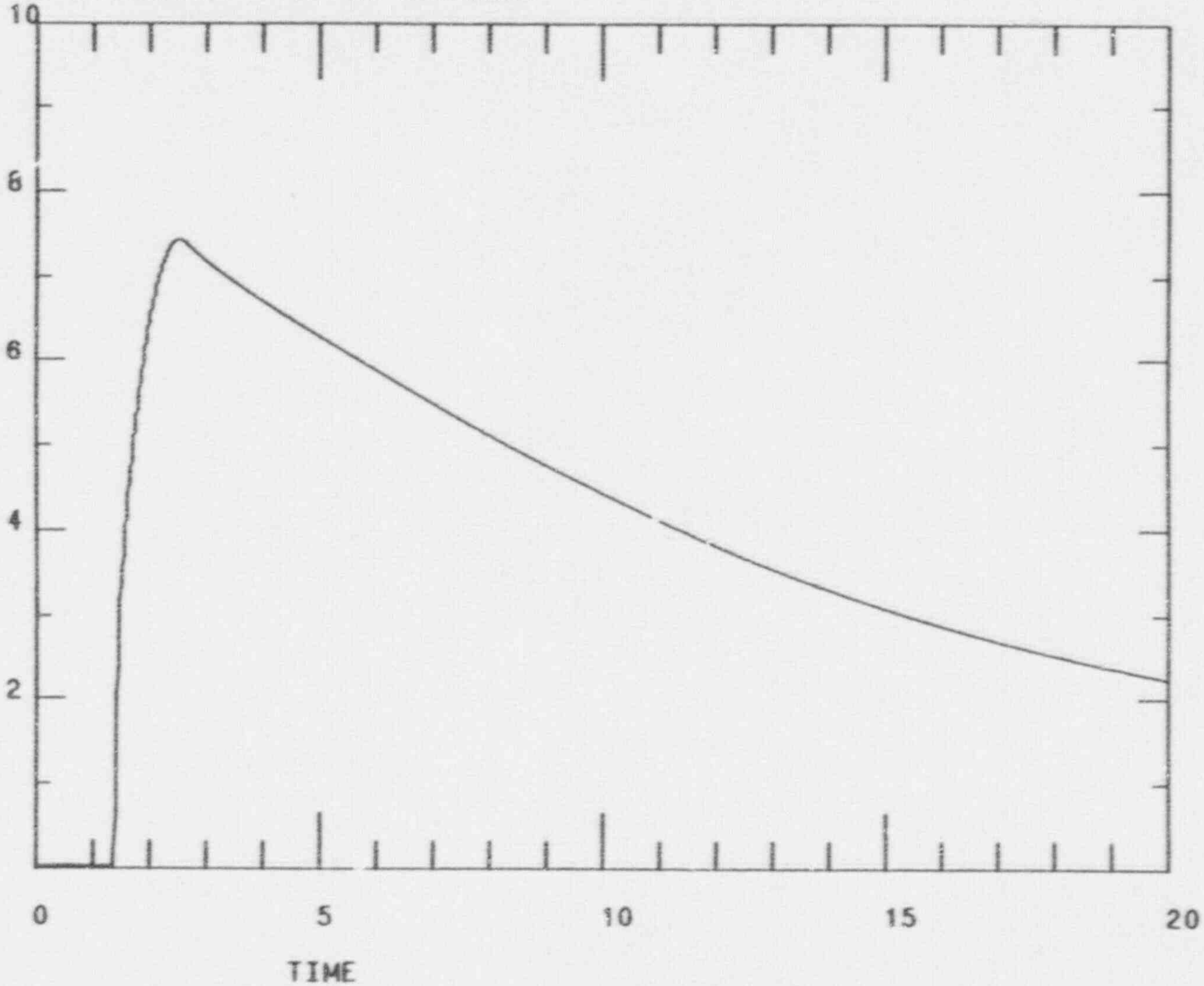
7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 14:56:44



THPHL(3) (.000 , .250E+04) 65100 HOT LEG PRESSURE

7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 15:01:28

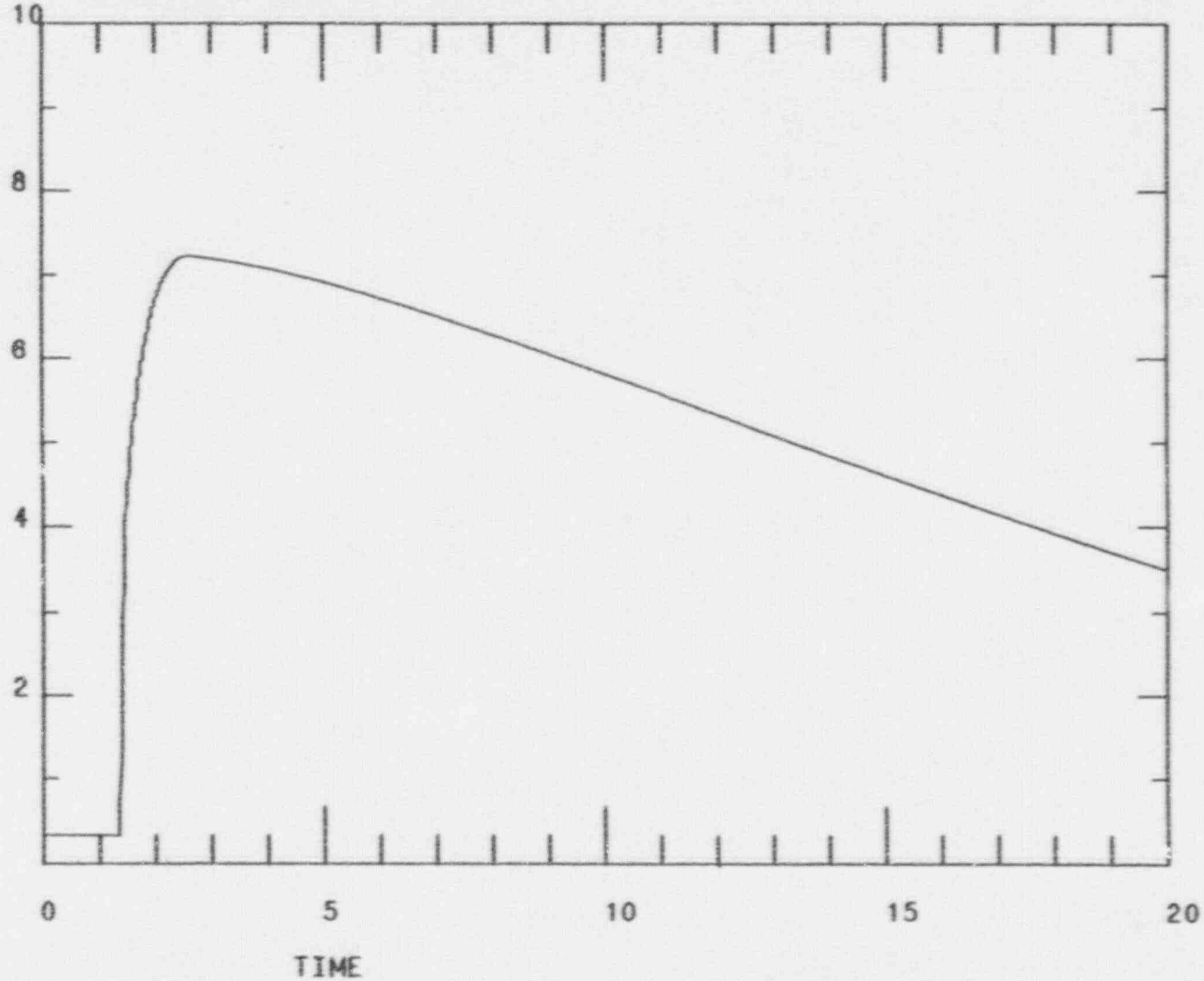
1 DIVISION = 45.32 SECONDS



CHPCONT (14.7 , 64.7) 09130 CNMT AVG PRESS

7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 15:08:04

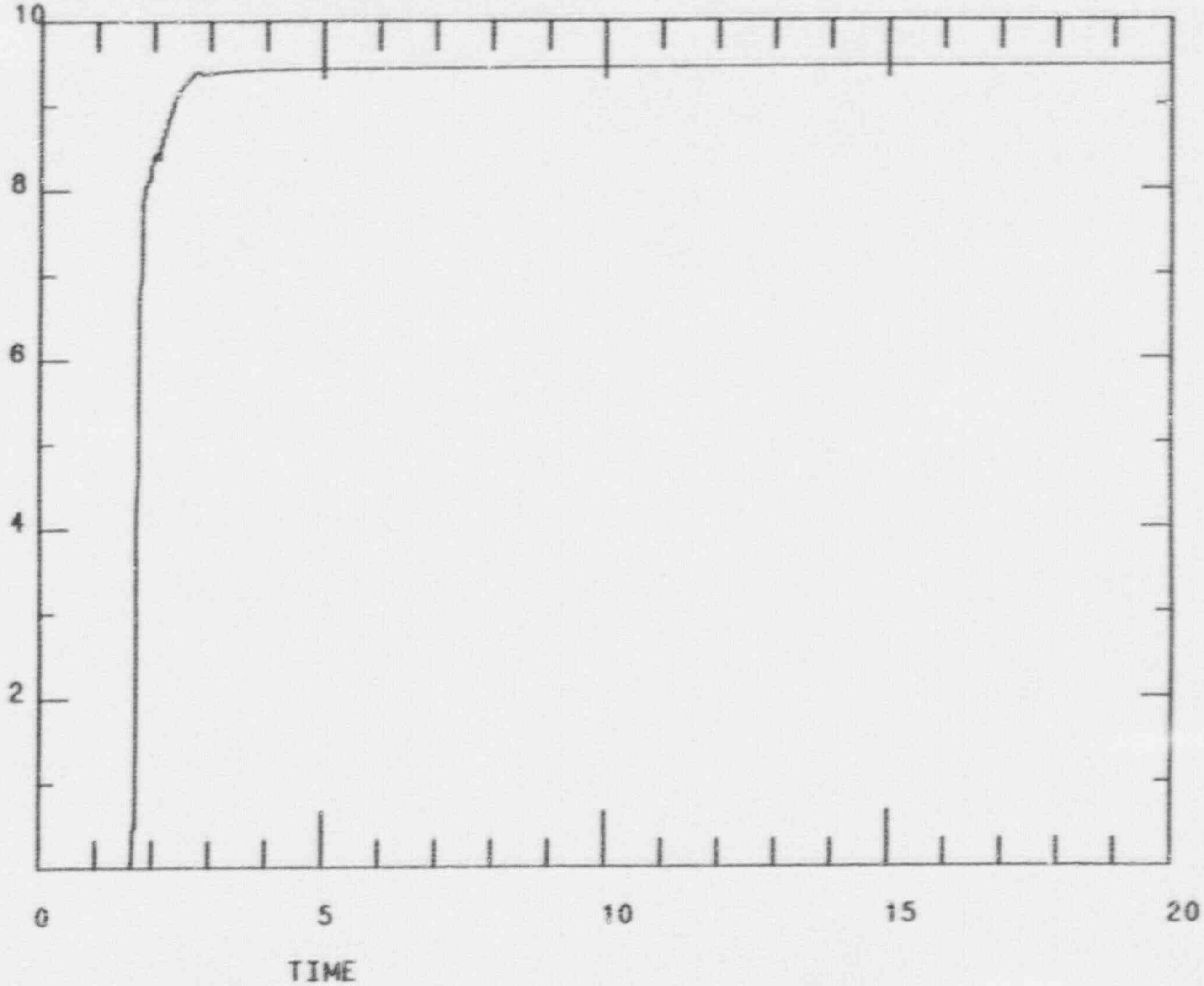
1 DIVISION = 45.32 SECONDS



CHTAVGCM (100. , 300.) 11180 CNMT AVG TEMP

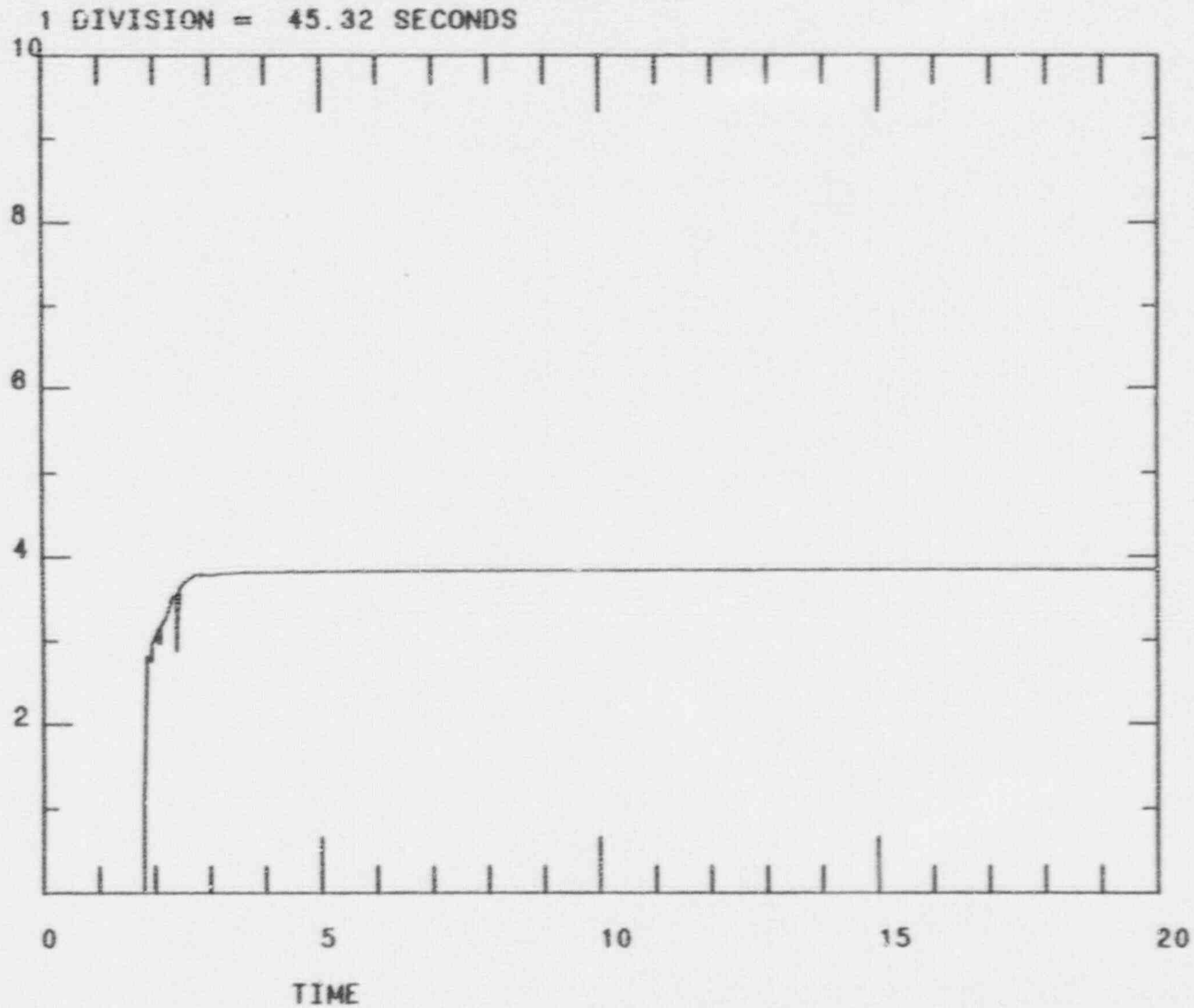
7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 15:10:51

1 DIVISION = 45.32 SECONDS



CVFBITIN (.000 , 100.) 15020THRU BIT LINE INLET

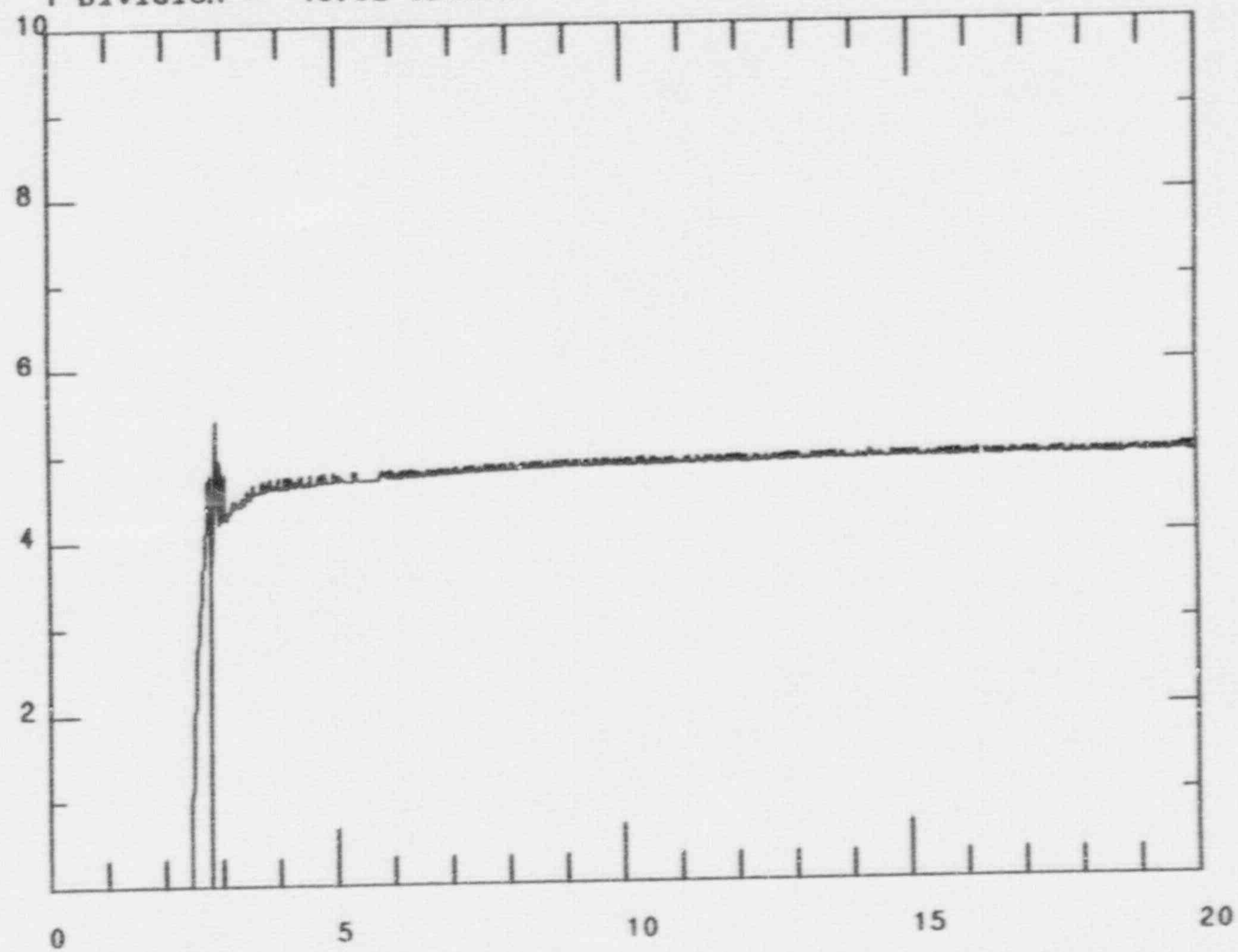
7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 15:23:52



SIF10 (.000 , 200.) 03020 SI FLOWNET PATH 10 FLOW

7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 15:19:18

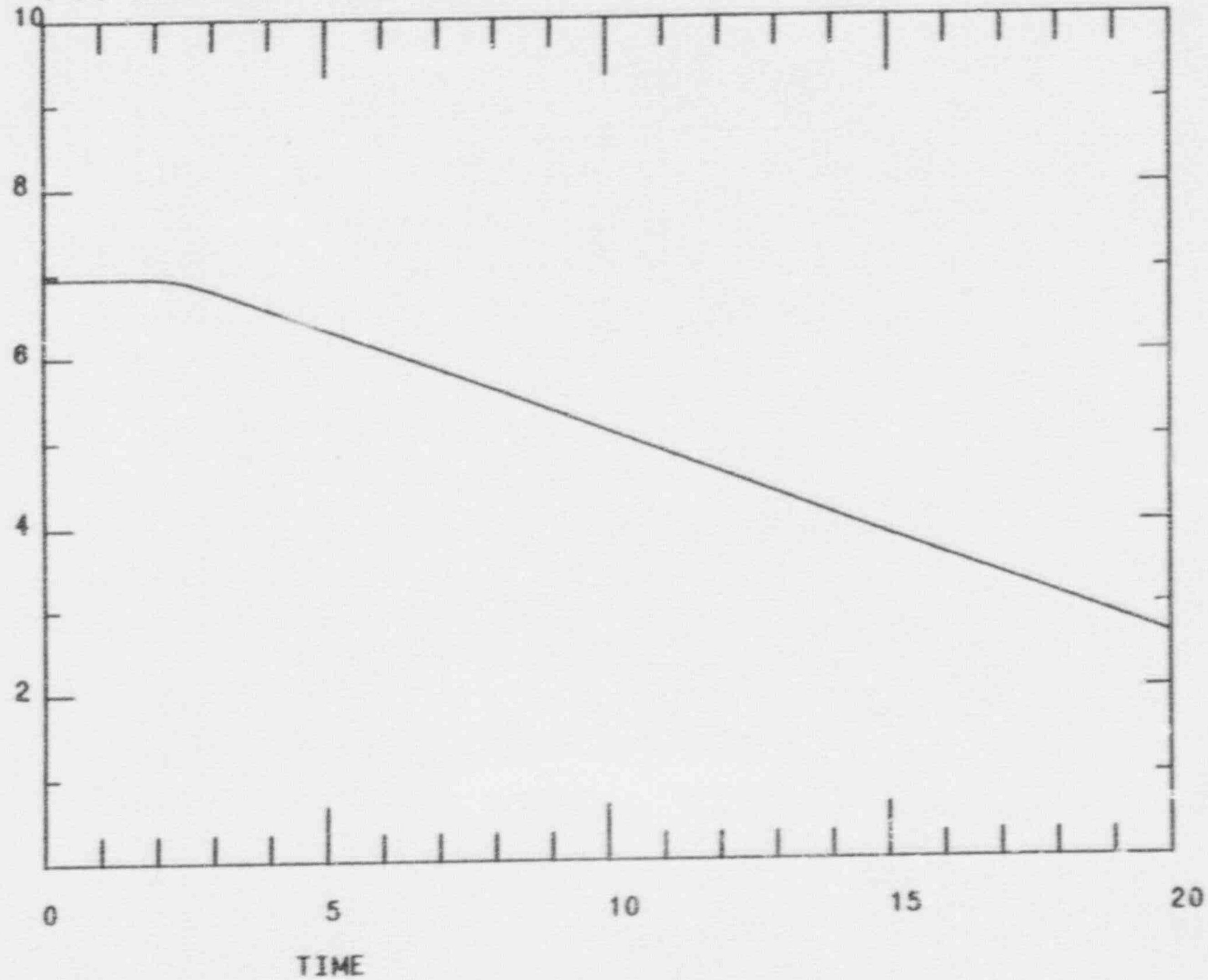
1 DIVISION = 45.32 SECONDS



RHF18 (.000 . .100E+04) 03020 RH FLOWNET F18

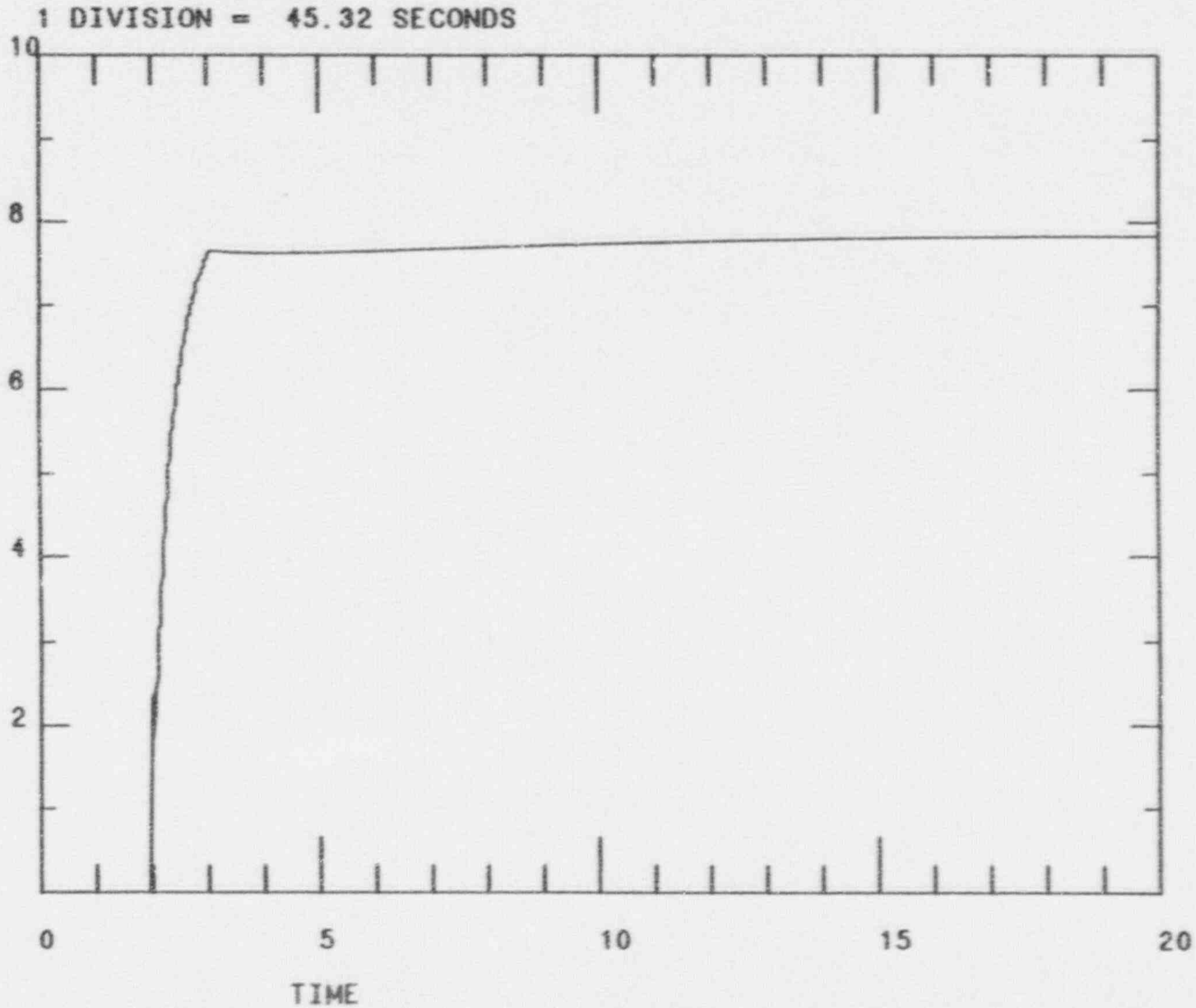
7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 15:28:24

1 DIVISION = 45.32 SECONDS



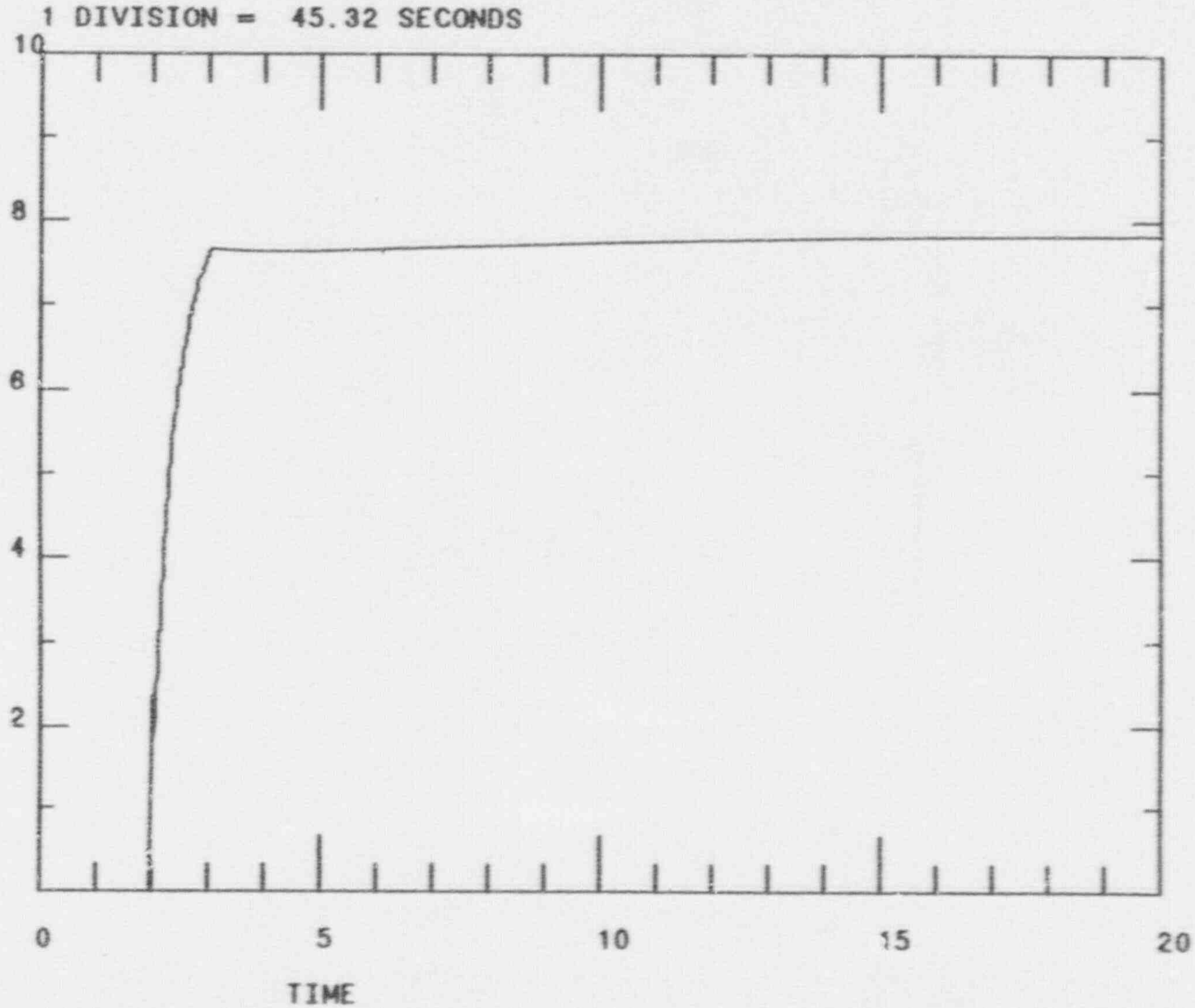
SILRWST (.000 , 50.0) 05130 RWST LEVEL

7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 15:32:42



CSF1A5 (.000 , 500.) 03020 CNMT SPRAY LP 1A F5

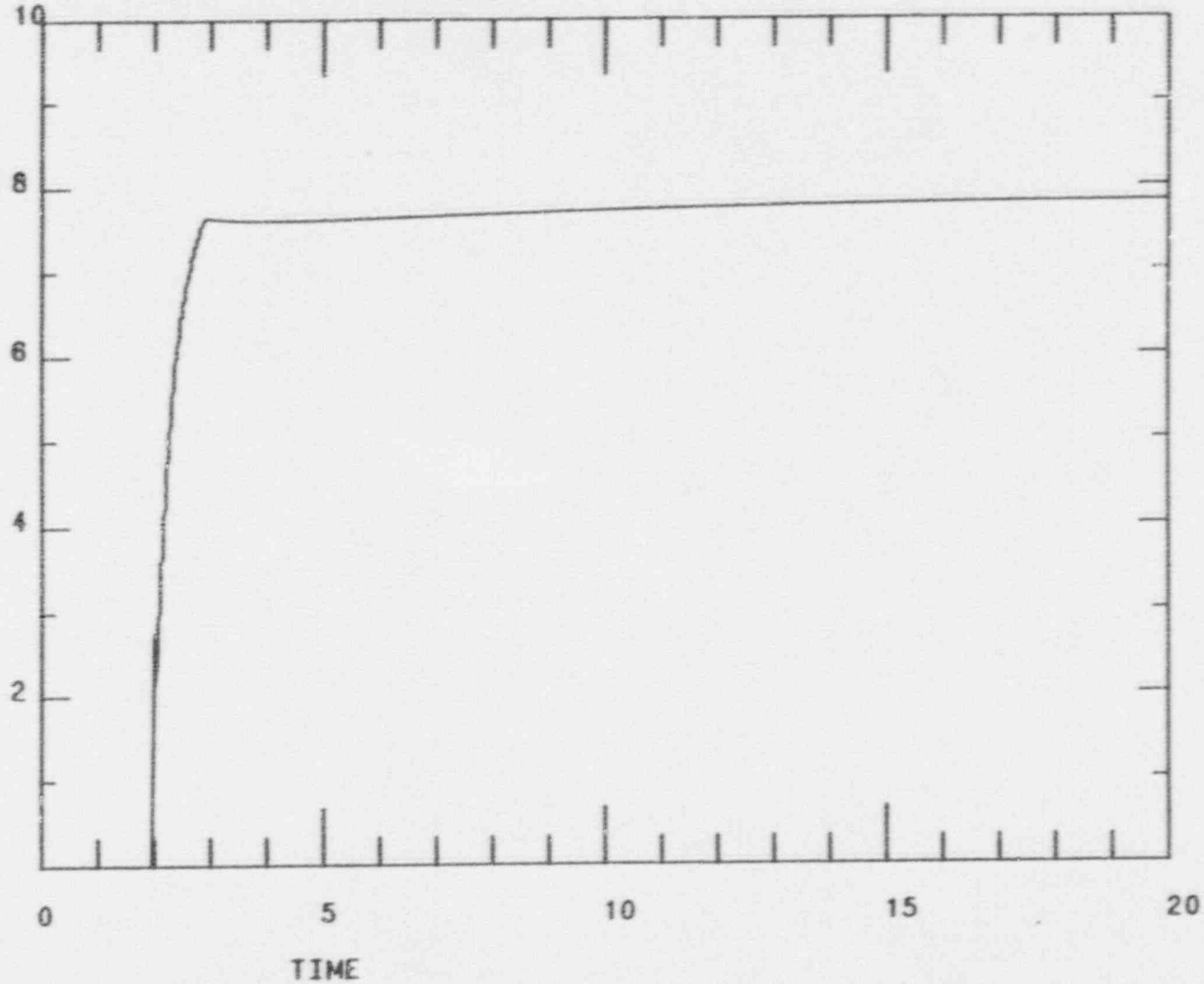
7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 15:36:52



CSF1B4 (.000 , 500.) 06020 CNMT SPRAY 1B LP F4

7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 15:50:20

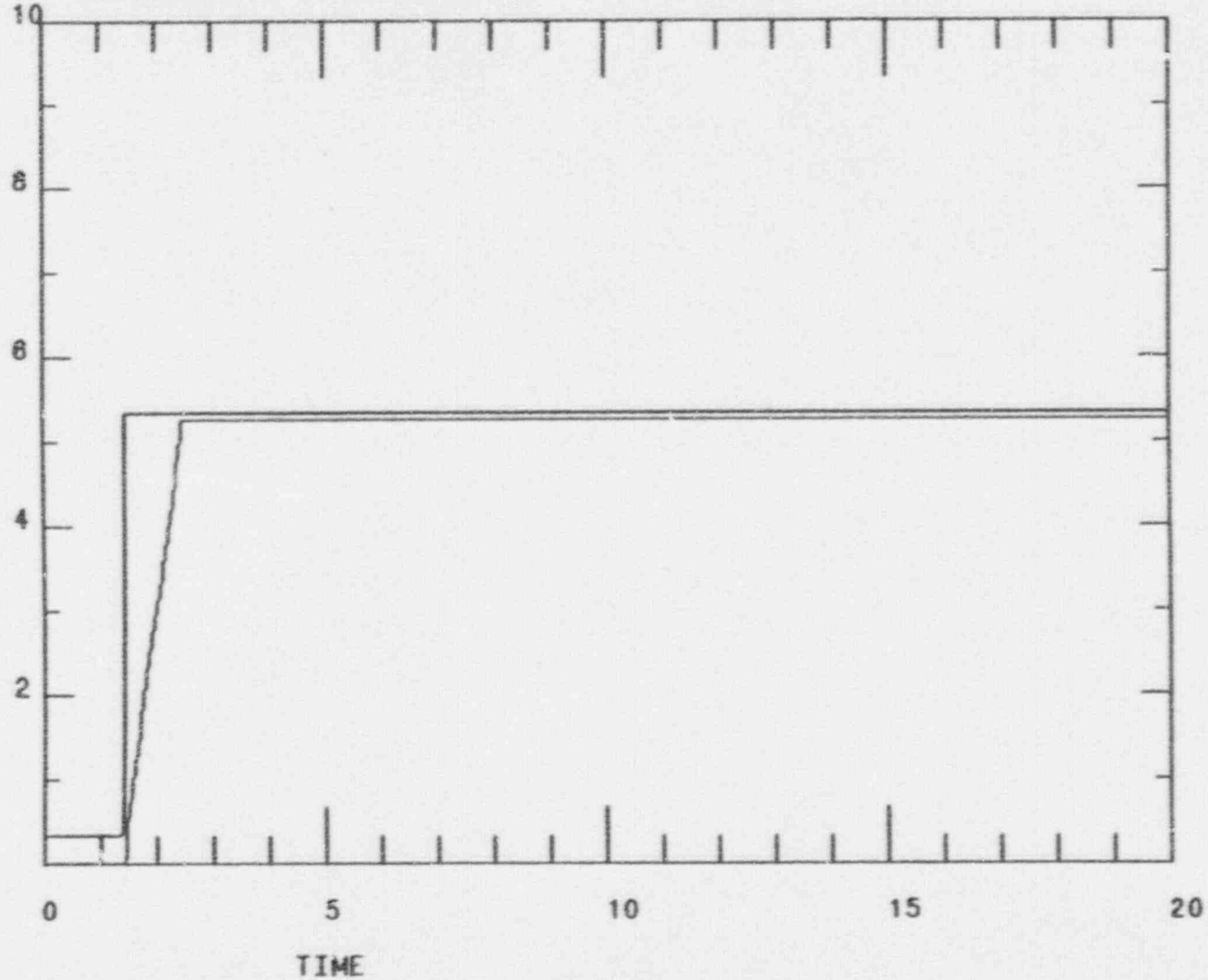
1 DIVISION = 45.32 SECONDS



CSF1C4 (.000 , 500.) 09020 CNMT SPRAY 1C LP F4

7210***MAX SIZE RCS RUPTURE W/ STATION BLACKOUT 02/01/91 16:02:49

1 DIVISION = 45.32 SECONDS



CHLCAVITYS (.000 , 50.0) 08010 CAVITY SUMP LVL
CHLCM1 (.000 , 50.0) 09130 CNMT SUMP LEVEL

ZION SIMULATOR TRANSIENT TEST

SIMULTANEOUS TRIP OF ALL MAIN FEEDWATER PUMPS

The Simultaneous Trip of All Main Feedwater Pumps was performed from a beginning of core, 100% power initial condition (IC37). Both 1B and 1C Main Feedwater Pumps were tripped simultaneously. Data was collected in accordance with ANSI/ANS-3.5-1985 Appendix B 2.2.1.

Test results were reviewed and found satisfactory.

Collected and Plotted Data:

1. YCN0049 - Power Range, Neutron Flux
2. YCL0480 - Pressurizer level
3. YCT0480 - Pressurizer liquid Temp
4. THTHLRTD(1) - Loop A Hot Leg RTD Temp
   THTCLRTD(1) - Loop A Cold Leg RTD Temp
5. THPSG(1) - A S/G Pressure
6. FWFSG(1) - A S/G Feedwater Flow
7. MSFSG(1) - A S/G Steam Flow
8. RXTAVG(1) - A Loop Tavg
9. YCP0480 - Pressurizer Pressure
10. FWFAFSG(1) - A S/G Auxiliary Feedwater Flow
11. YCL0403 - A S/G Wide Range Level 1.

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Simultaneous MFP Trip **DATE** : 02/06/91

1. **Data utilized for test comparison in order of preference (circle appropriate choices)**

   a. **Actual Plant Transient Data** **Event** : ____________

   b. **Analytical or design data** **Data** : ____________

   c. **Transient Data from similar plant** **Plant** : ____________

   d. **Panel of experts (best estimate)**

   COMMENTS : NONE

2. **Data Comparison Summary**

VARIABLE	COMMENTS	RESOLUTION
Rx Power	NONE	Accepted
Pzr Level	NONE	Accepted
Pzr Temp	NONE	Accepted
Hot Leg RTD	NONE	Accepted
Cold Leg RTD	NONE	Accepted
S/G Pressure	NONE	Accepted
FW Flow	NONE	Accepted
Steam Flow	NONE	Accepted
RCS Tavg	NONE	Accepted
Pzr Pressure	NONE	Accepted
AFW Flow	See Manual Rx Trip DR # F224	Accepted
S/G WR Level	See Manual Rx Trip DR # F225	Accepted

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Simultaneous MFP Trip **DATE** : 02/06/91

VARIABLE	COMMENTS	RESOLUTION

3. Comparison Results

Simulator capability to reproduce the defined transient: (circle one)

a. ACCEPTABLE

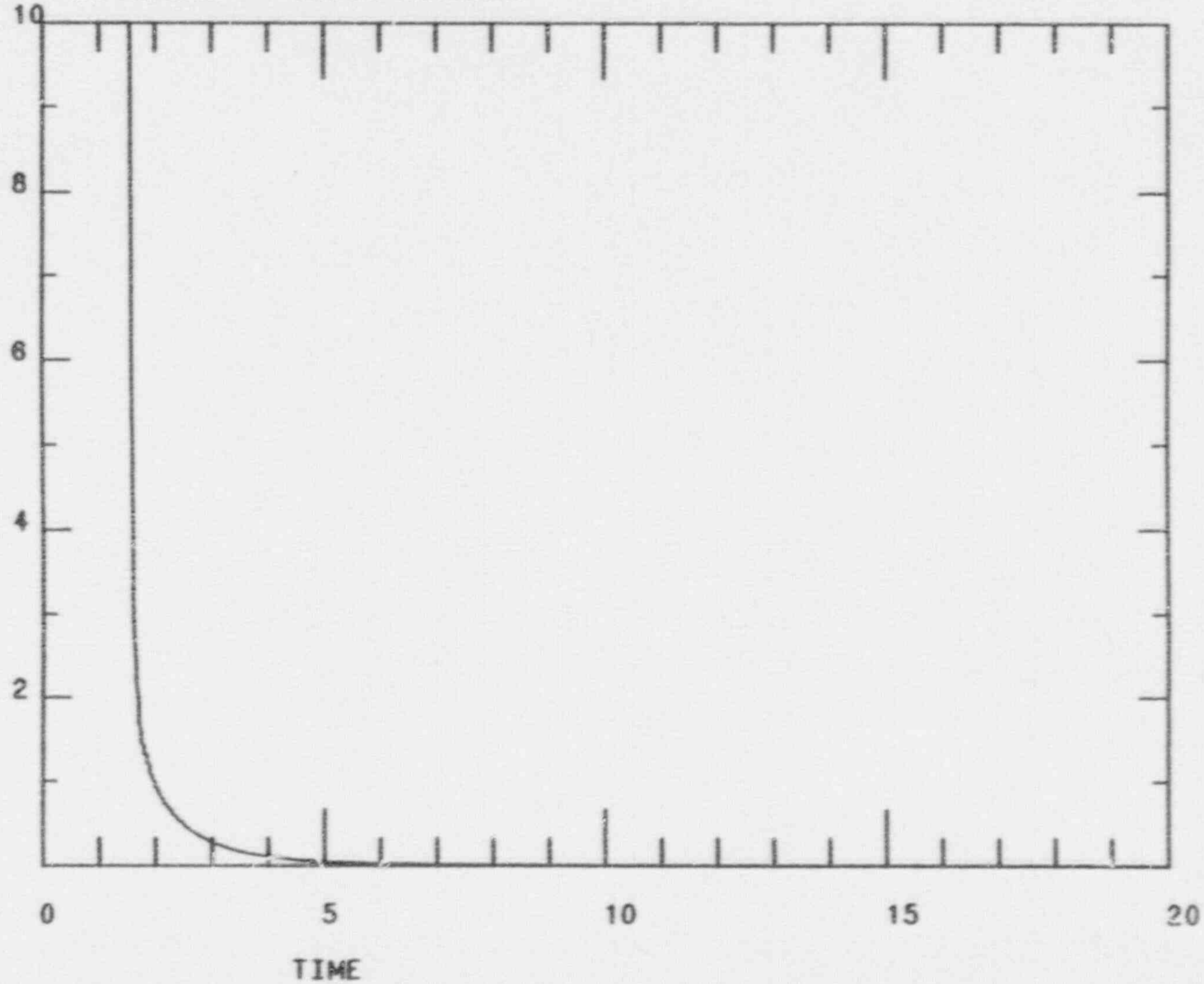
b. UNACCEPTABLE

4. Review Board Signatures (differing opinions must be documented)

COMMENTS :

7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/91 10:30:18

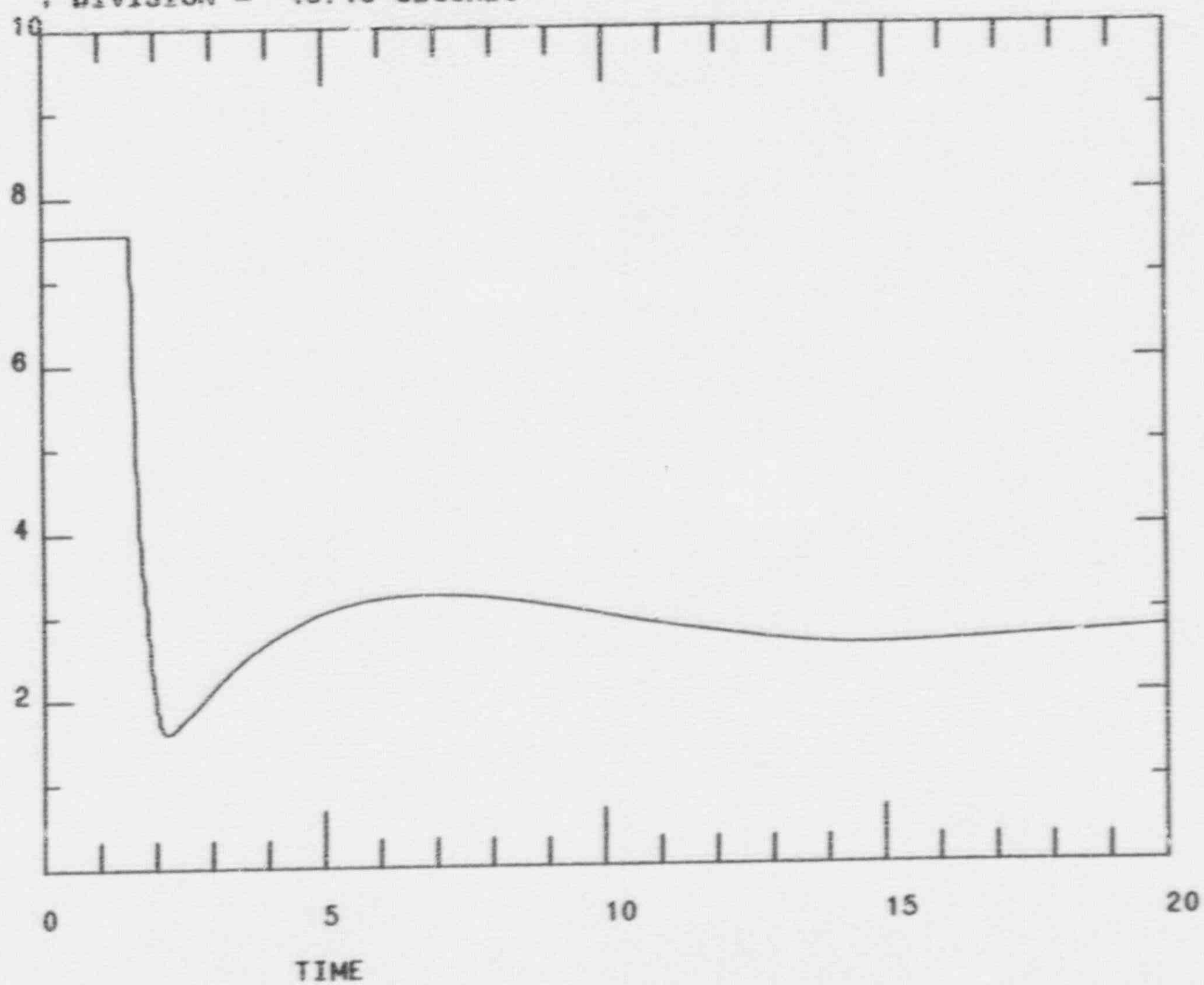
1 DIVISION = 45.16 SECONDS



YCN0049 (.000 , 10.0) 21170 POWER RANGE CHANNEL 1 FL

7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/81 10:38:13

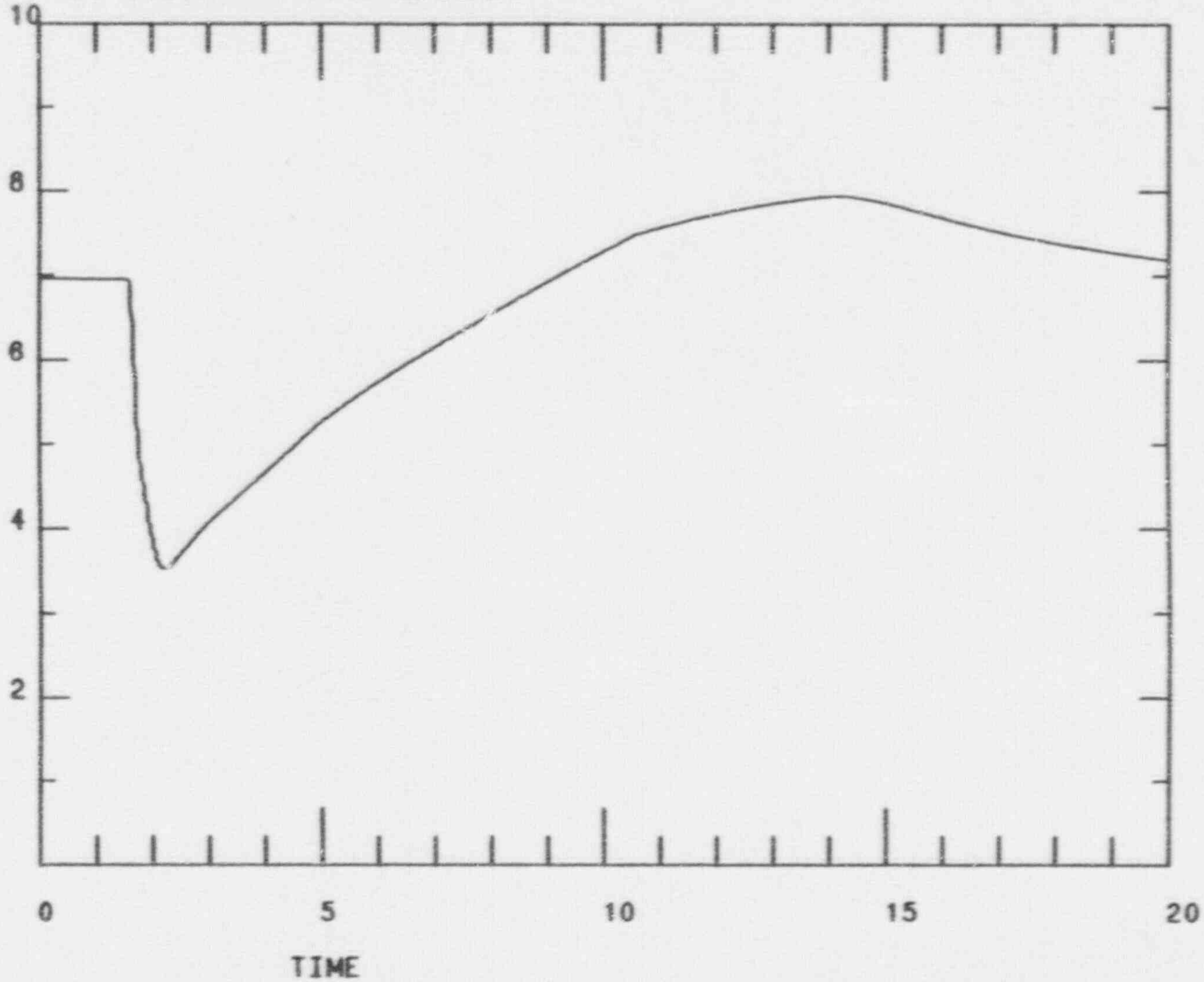
1 DIVISION = 45.18 SECONDS



YCL0480 (25.0 , 50.0) 06850 PRESSURIZER 1 LEVEL

7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/91 10:58:20

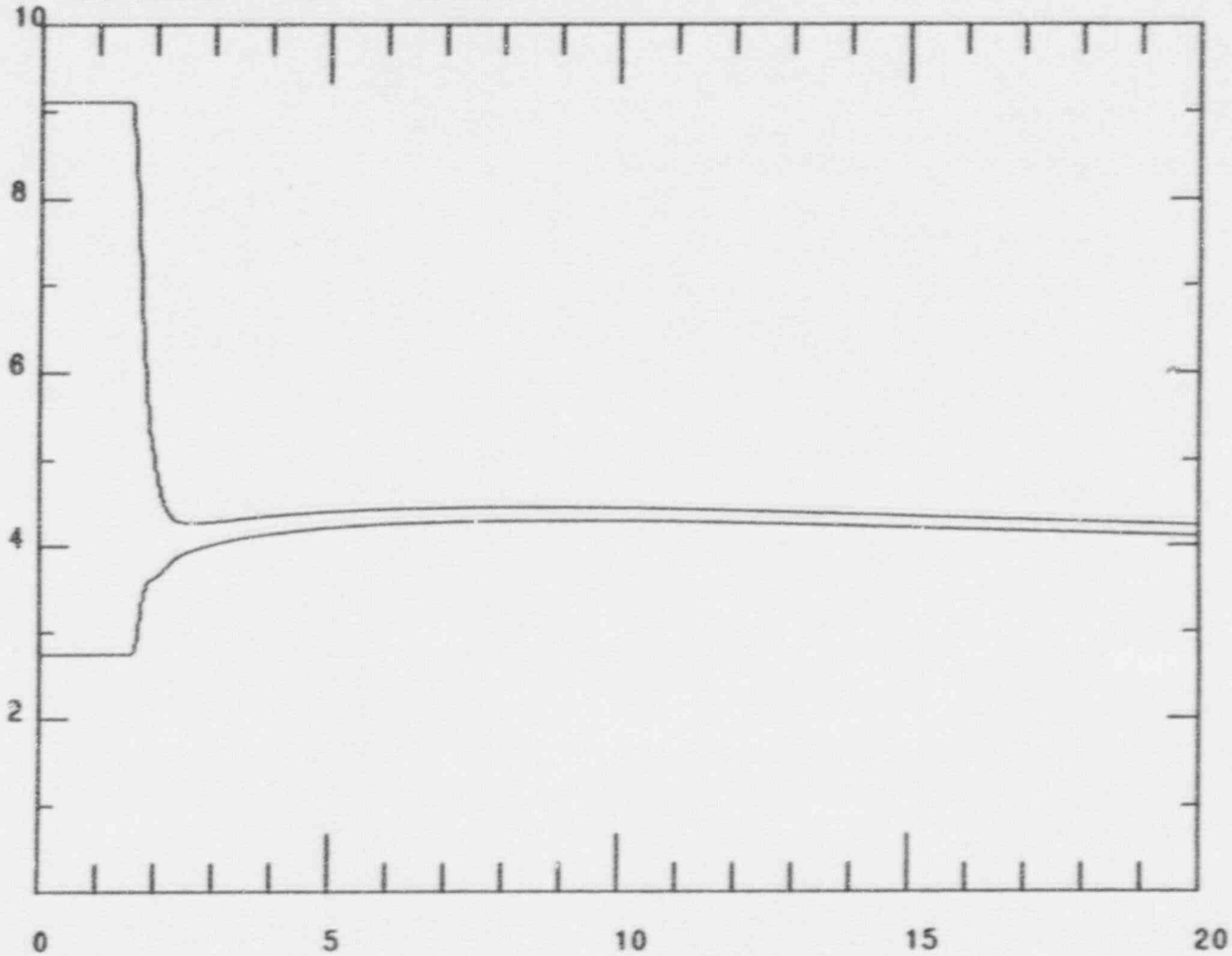
1 DIVISION = 45.16 SECONDS



YCT048? (635. , 660.) 91220 PRESSURIZER WTR TEMP

7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/91 10:48:43

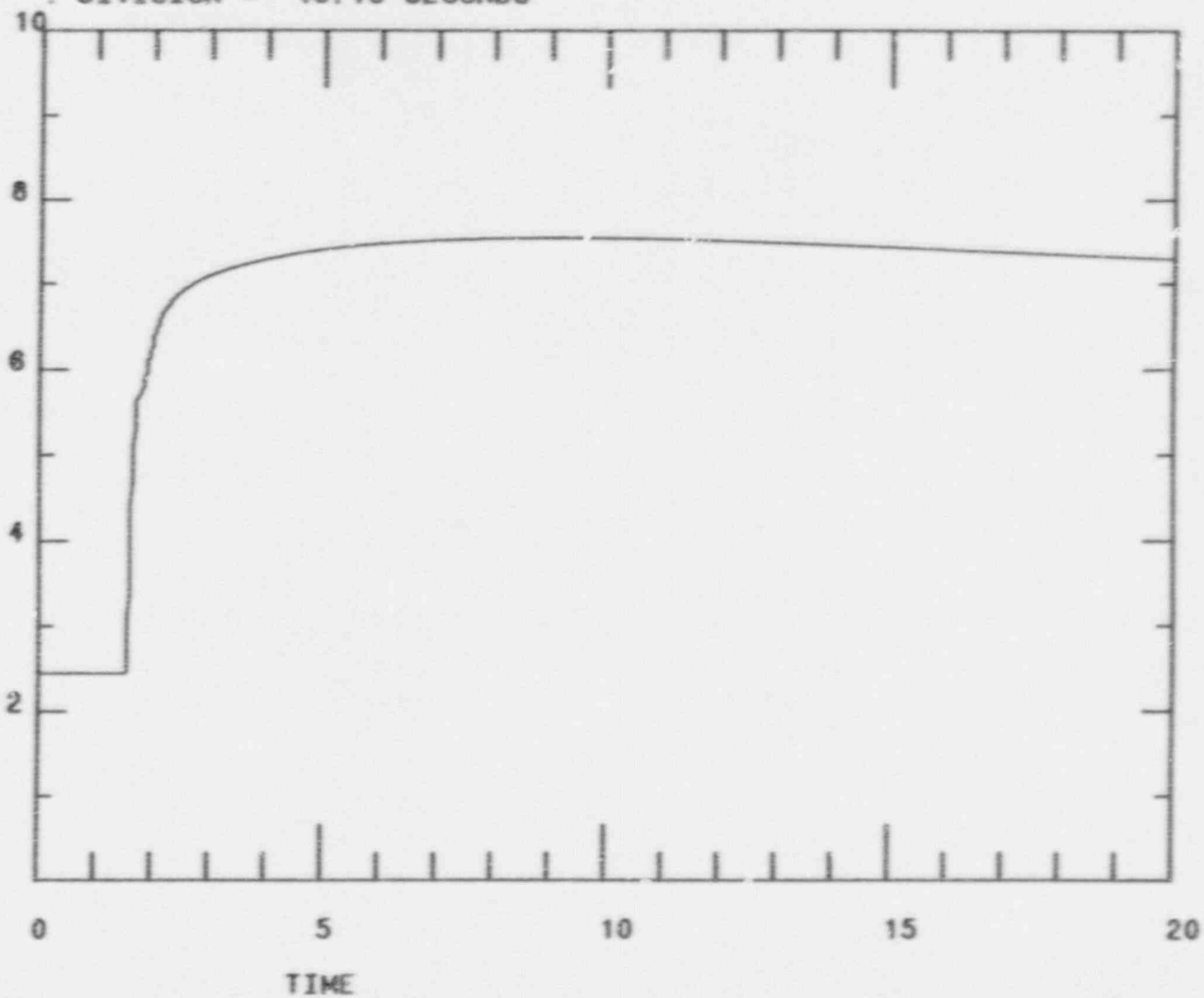
DIVISION = 45.16 SECONDS



THTHLRTD(1) (500. , 600.) 65210 RC HOT LEG RTD TEMP.
THTCLRTD(1) (500. , 600.) 65210 RC CLOD LEG RTD TEMP.

7214***SIMULTANEOUS TRIP OF ALL MFP'S   02/02/91 10:54:16

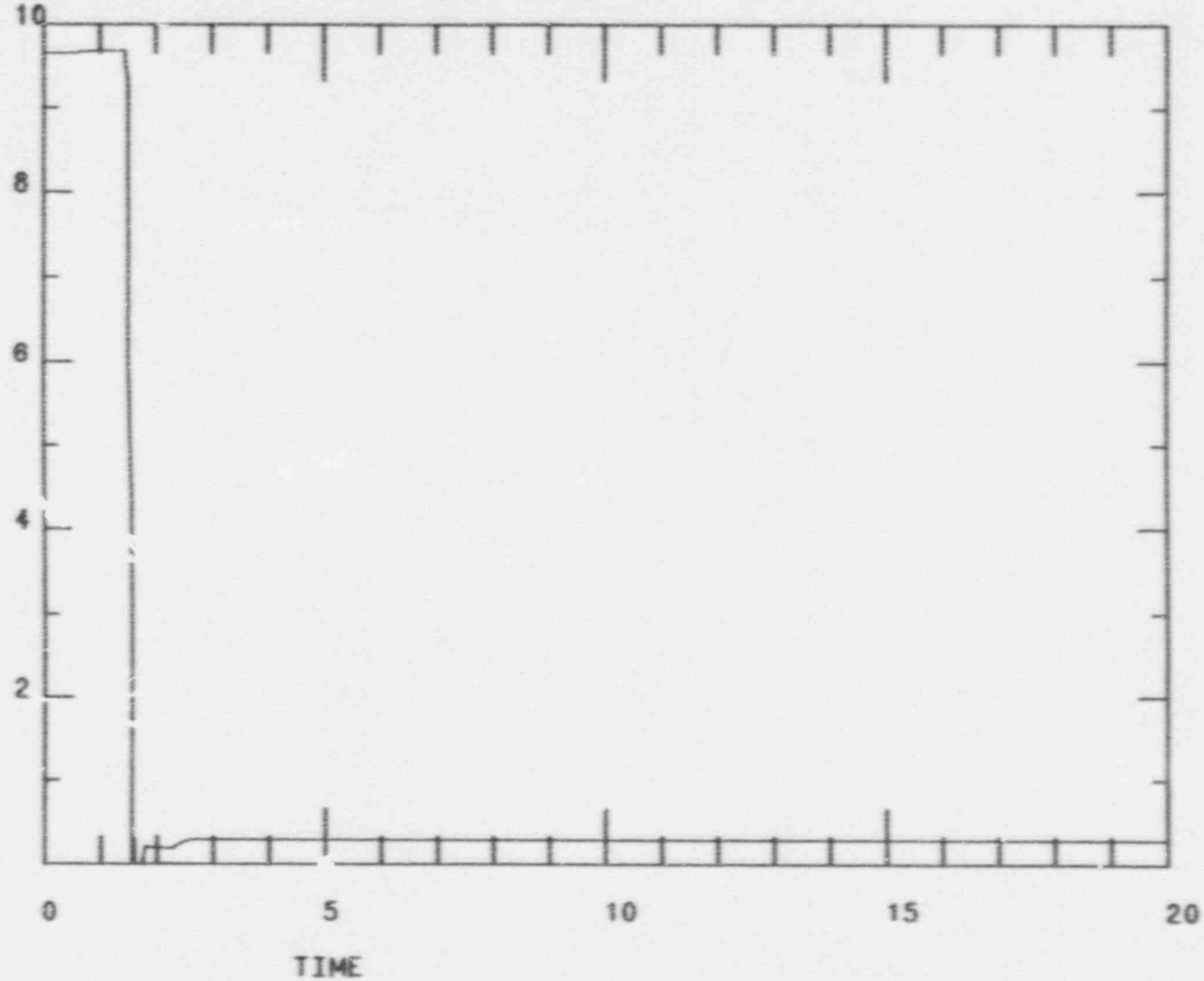
: DIVISION = 45.16 SECONDS



THPSG(1)   (600.   , .110E+04) 65130 SG DOME PRESSURE

7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/31 10:43:50

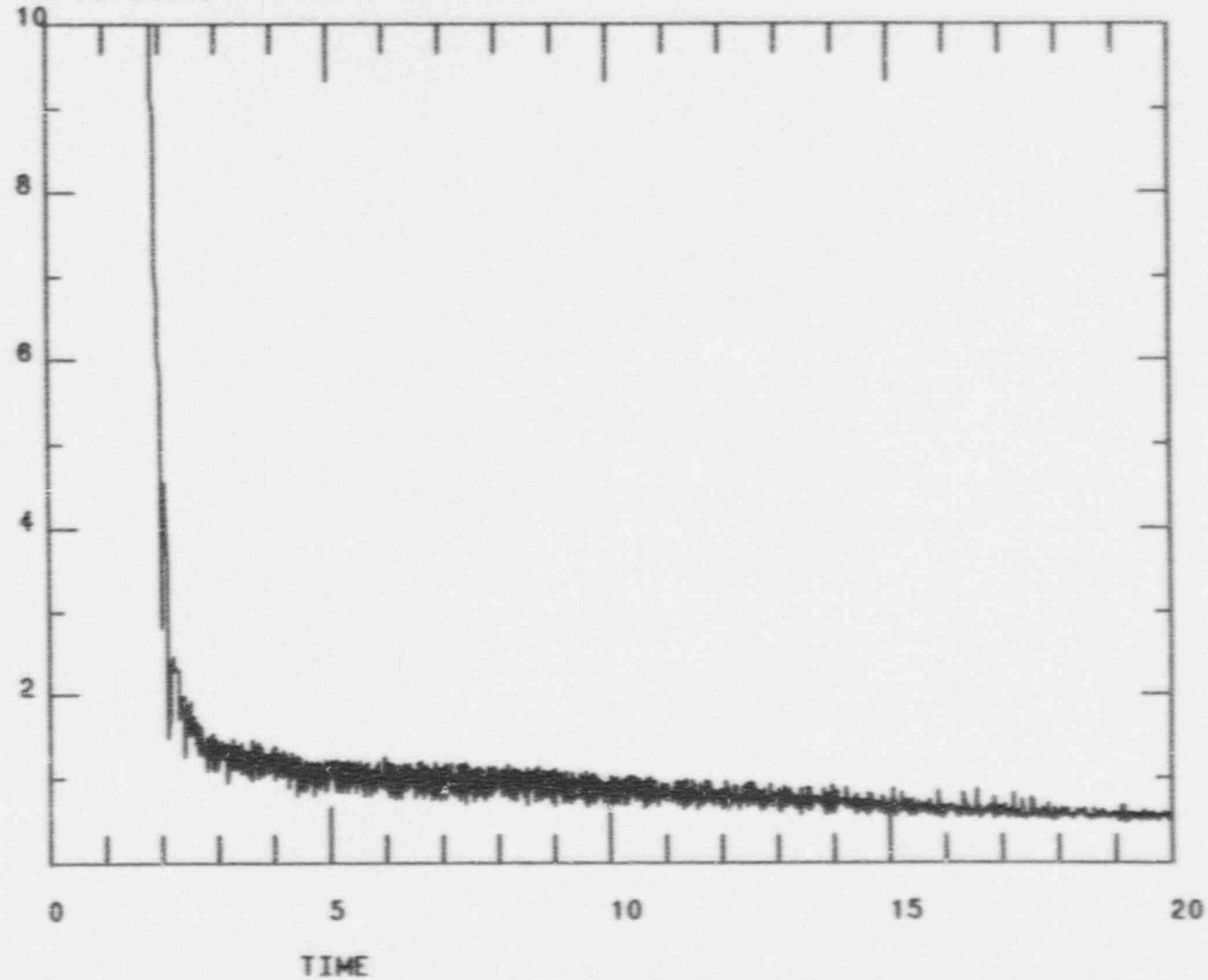
1 DIVISION = 45.16 SECONDS



FWFSG(1) (.000 , .100E+04) 03020 FW TO S/G FLOW

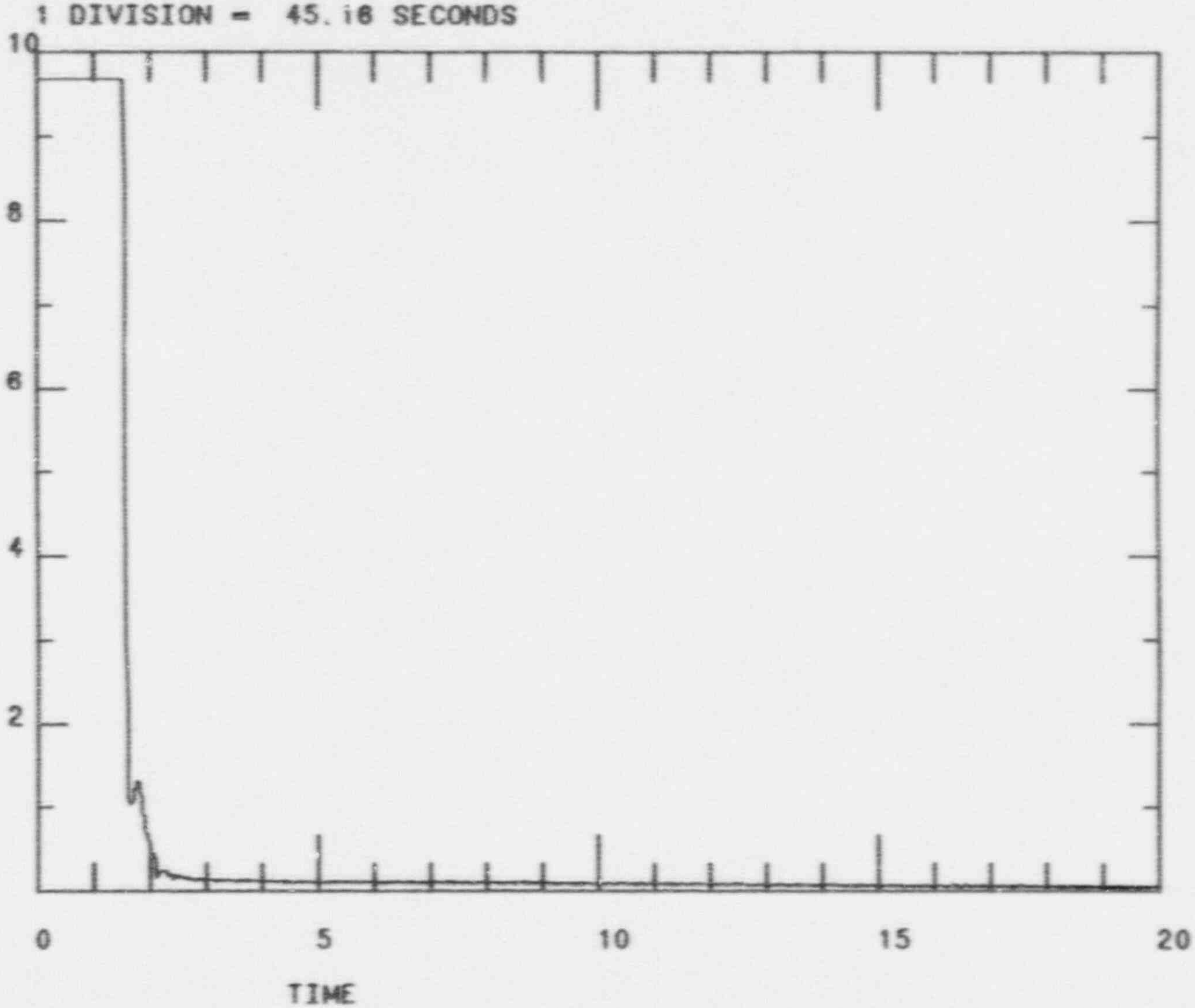
7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/81 11:28:56

1 DIVISION = 45.16 SECONDS



MSFSG(1) (.000 , 100.) 01160 MS TOTAL FLOW FROM SG

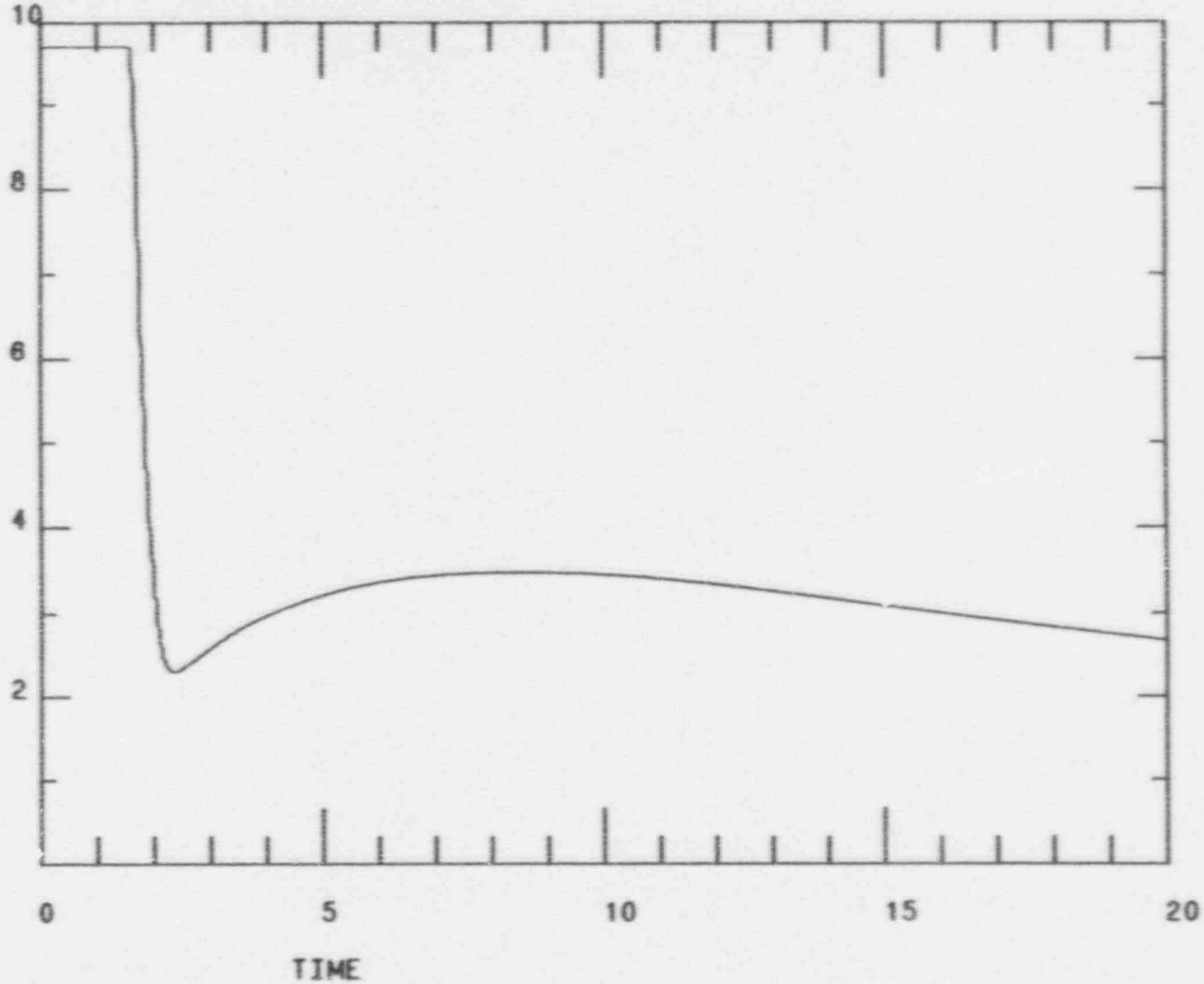
7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/91 11:20:32



MSFSG(1) (.000 , .100E+04) 01160 MS TOTAL FLOW FROM SG

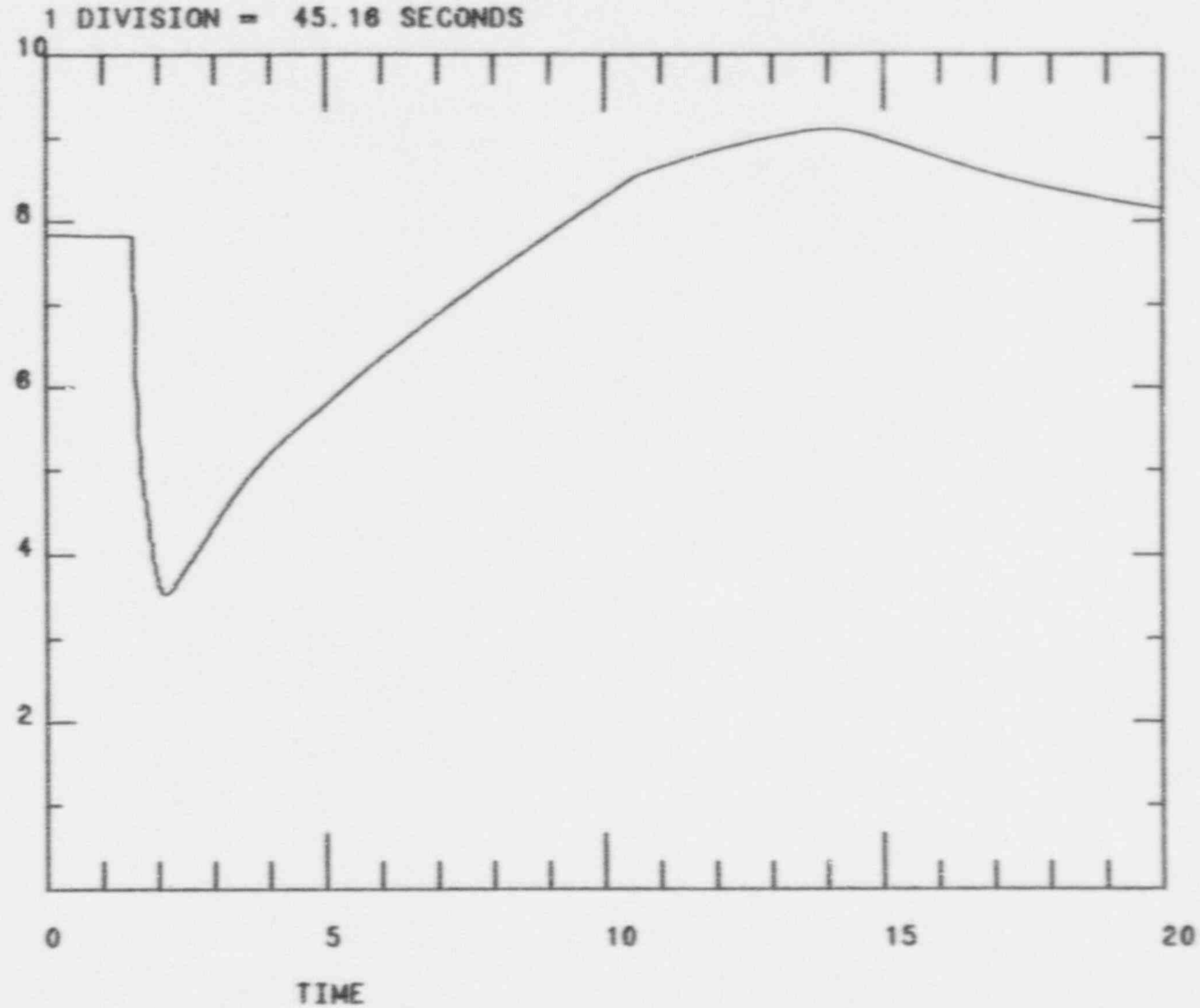
7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/91 10:26:04

1 DIVISION = 45.16 SECONDS



RXTAVG(1) (535. , 560.) 01200 LOOP TAVG

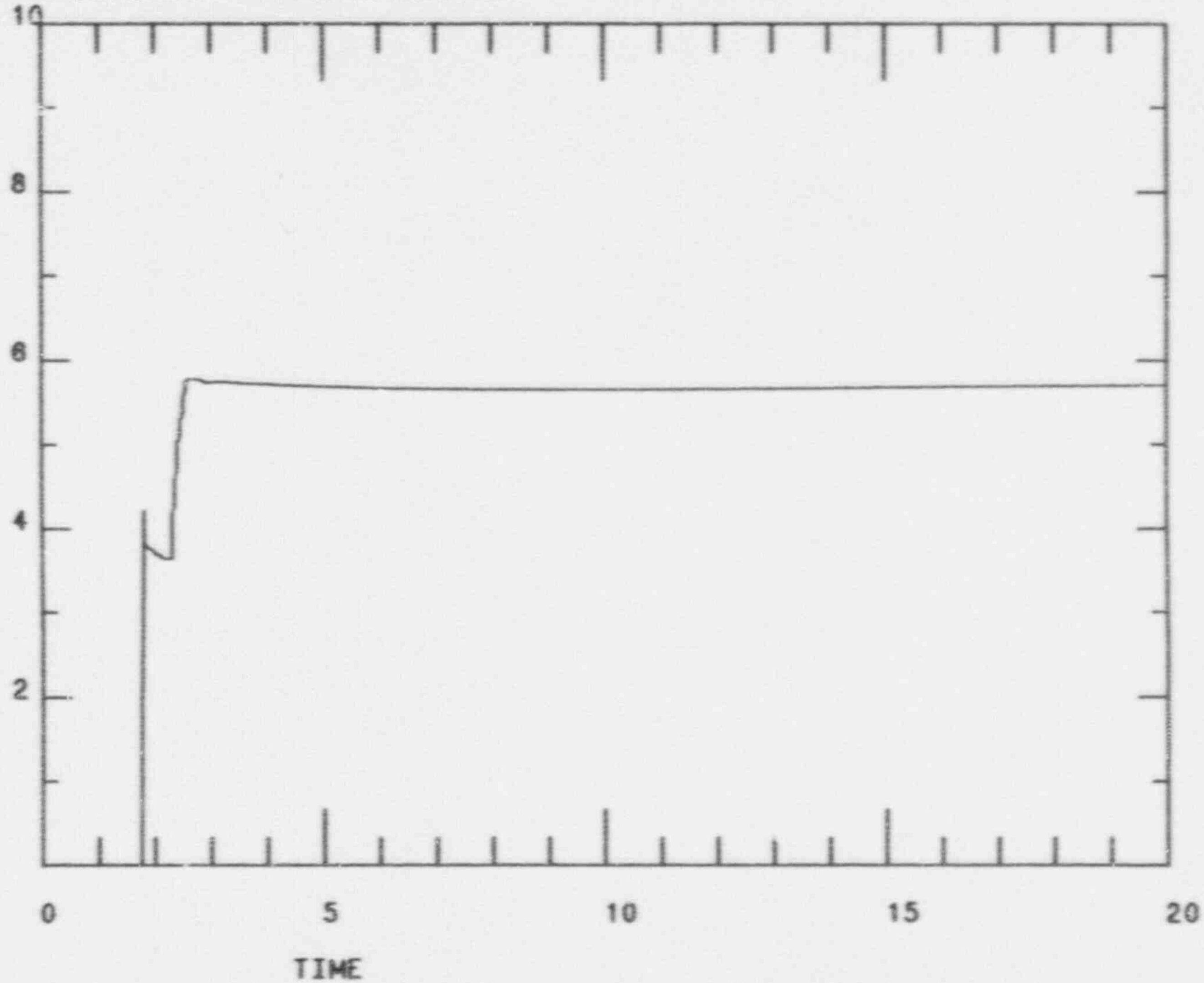
7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/91 11:03:38



YCP0480 (.200E+04, .230E+04) 07330 PRESSURIZER 1 PRESSURE

7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/81 11:25:41

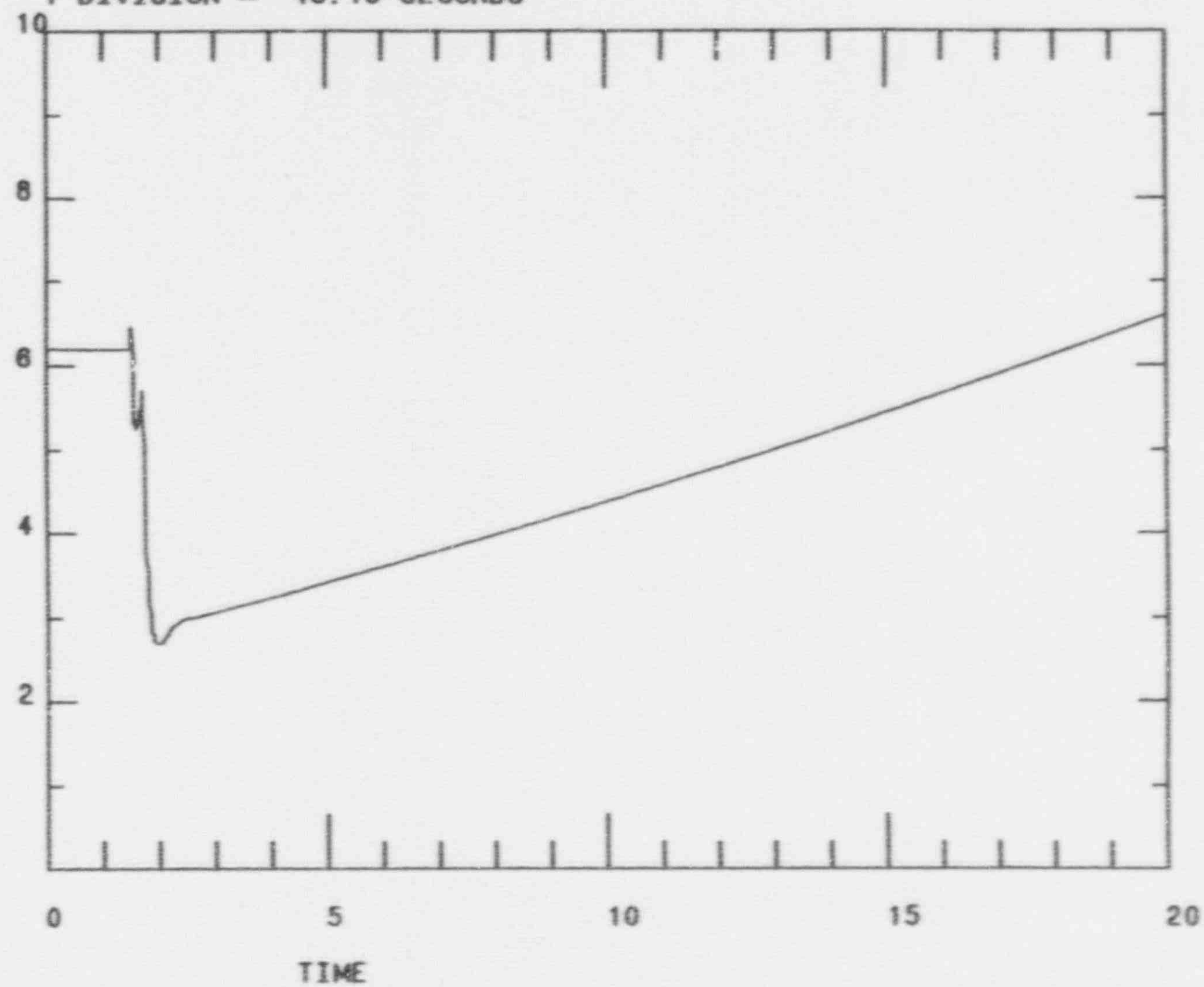
1 DIVISION = 45.16 SECONDS



FWFAFSG(1) (.000 , 50.0) 06020 AF TO S/G FLOW

7214***SIMULTANEOUS TRIP OF ALL MFP'S 02/02/91 11:07:51

1 DIVISION = 45.16 SECONDS



YCL0403 (35.0 , 55.0) 06780 S/G A WIDE RANGE LEVEL

ZION SIMULATOR TRANSIENT TEST

SIMULTANEOUS CLOSURE OF ALL MAIN STEAM ISOLATION VALVES

The Simultaneous Closure of All Main Steam Isolation Valves was performed from a beginning of core, 100% power, initial condition (IC37). All four main steam isolation valves were simultaneously closed. Data was collected in accordance with ANSI/ANS-3.5-1985 Appendix B 2.2.1.

The test results were reviewed and found satisfactory.

Collected and Plotted Data:

1. YCN0049 - Power Range, Neutron Flux
2. YCL0480 - Pressurizer level
3. YCT0480 - Pressurizer liquid Temp
4. THTHLWR(1) - Loop A Hot Leg WR Temperature
   THTCLWR(1) - Loop A Cold Leg WR Temperature
5. THPSG(1) - A S/G Pressure
6. FWFSG(1) - A S/G Feedwater Flow
7. MSFSG(1) - A S/G Steam Flow
8. RXTAVG(1) - A Loop Tavg
9. YCP0480 - Pressurizer Pressure
10. FWFAFSG(1) - A S/G Auxilliary Feedwater Flow
11. YCL0403 - A S/G Wide Range Level 1.

ZiON SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Simultaneous MSIV Closure **DATE** : 02/06/91

1. **Data utilized for test comparison in order of preference (circle appropriate choices)**

   a. **Actual Plant Transient Data** **Event** : ____

   b. **Analytical or design data** **Data** : ____

   c. **Transient Data from similar plant** **Plant** : ____

   d. **Panel of experts (best estimate)**

   COMMENTS : NONE

2. **Data Comparison Summary**

VARIABLE	COMMENTS	RESOLUTION
Rx Power	NONE	Accepted
Pzr Level	NONE	Accepted
Pzr Temp	NONE	Accepted
CL WR Temp	NONE	Accepted
HL WR Temp	NONE	Accepted
S/G Pressure	NONE	Accepted
FW Flow	NONE	Accepted
Steam Flow	NONE	Accepted
RCS Tavg	NONE	Accepted
Pzr Pressure	NONE	Accepted
AFW Flow	See Manual Rx Trip DR # F224	Accepted
S/G WR Level	See Manual Rx Trip DR # F225	Accepted

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Simultaneous MSIV Closure **DATE** : 02/06 91

VARIABLE	COMMENTS	RESOLUTION

3. **Comparison Results**

Simulator capability to reproduce the defined transient: (circle one)

a. ACCEPTABLE

b. UNACCEPTABLE

4. **Review Board Signatures (differing opinions must be documented)**

Donald E Phillips

Paul D. Dziurzynski

R. E. Hendrum

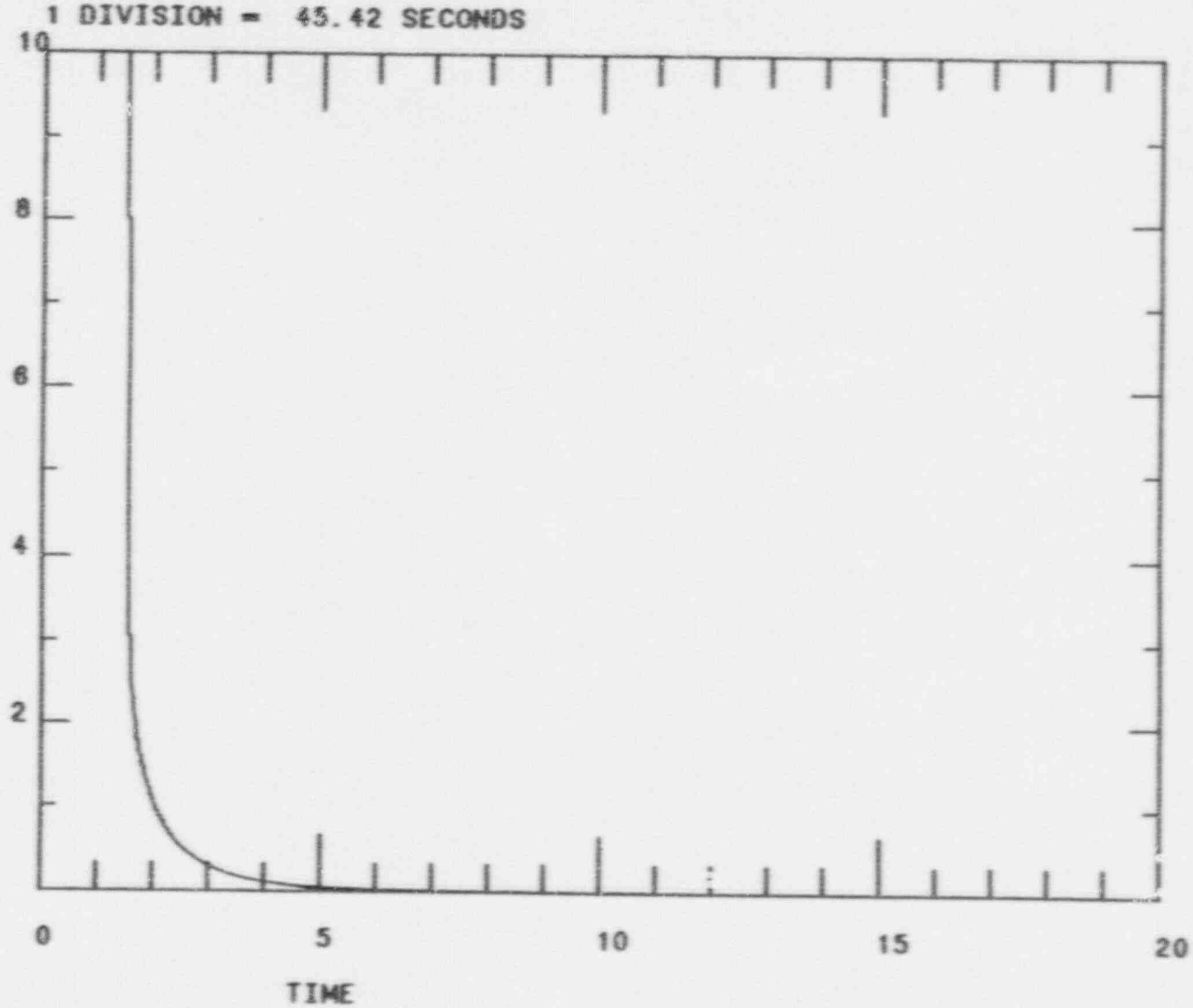
T P Valerio

James J Madden

D J Smith

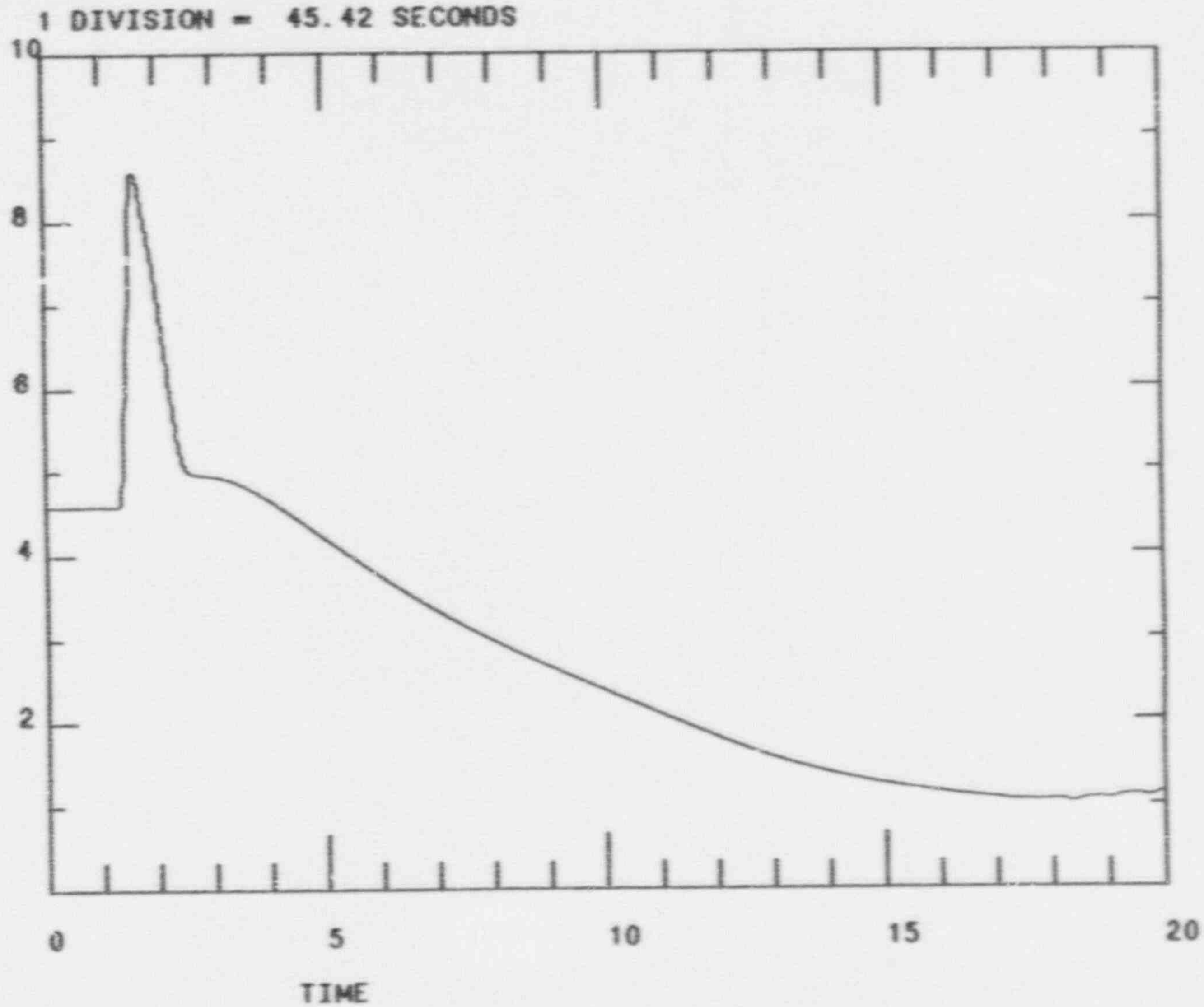
COMMENTS :

7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S   02/02/81 12:21:03



YCN0048   (.000   , 10.0   ) 21170 POWER RANGE CHANNEL 1 FL

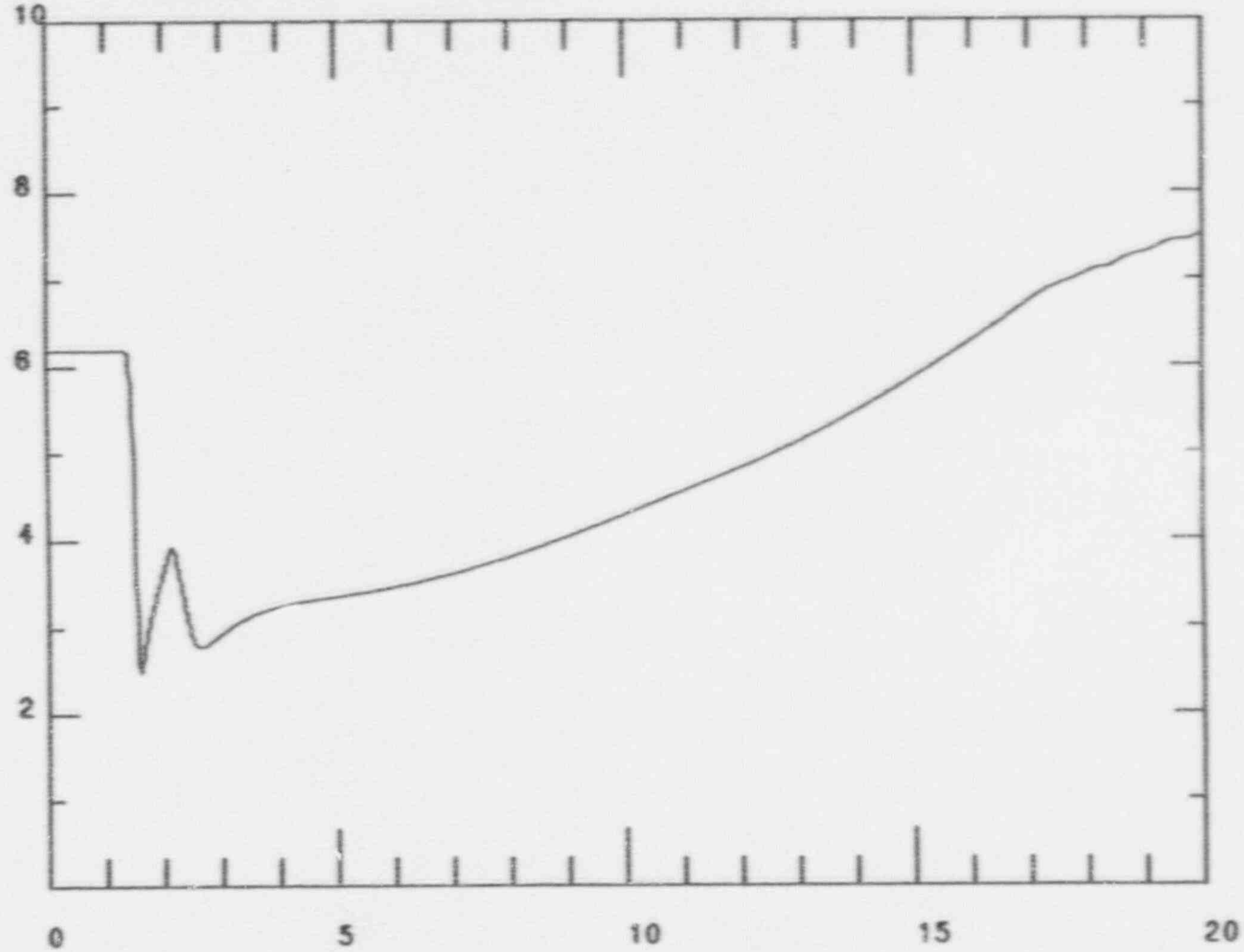
7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/91 11:58:19



YCL0480 (30.0 , 60.0) 06950 PRESSURIZER 1 LEVEL

7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/81 11:40:31

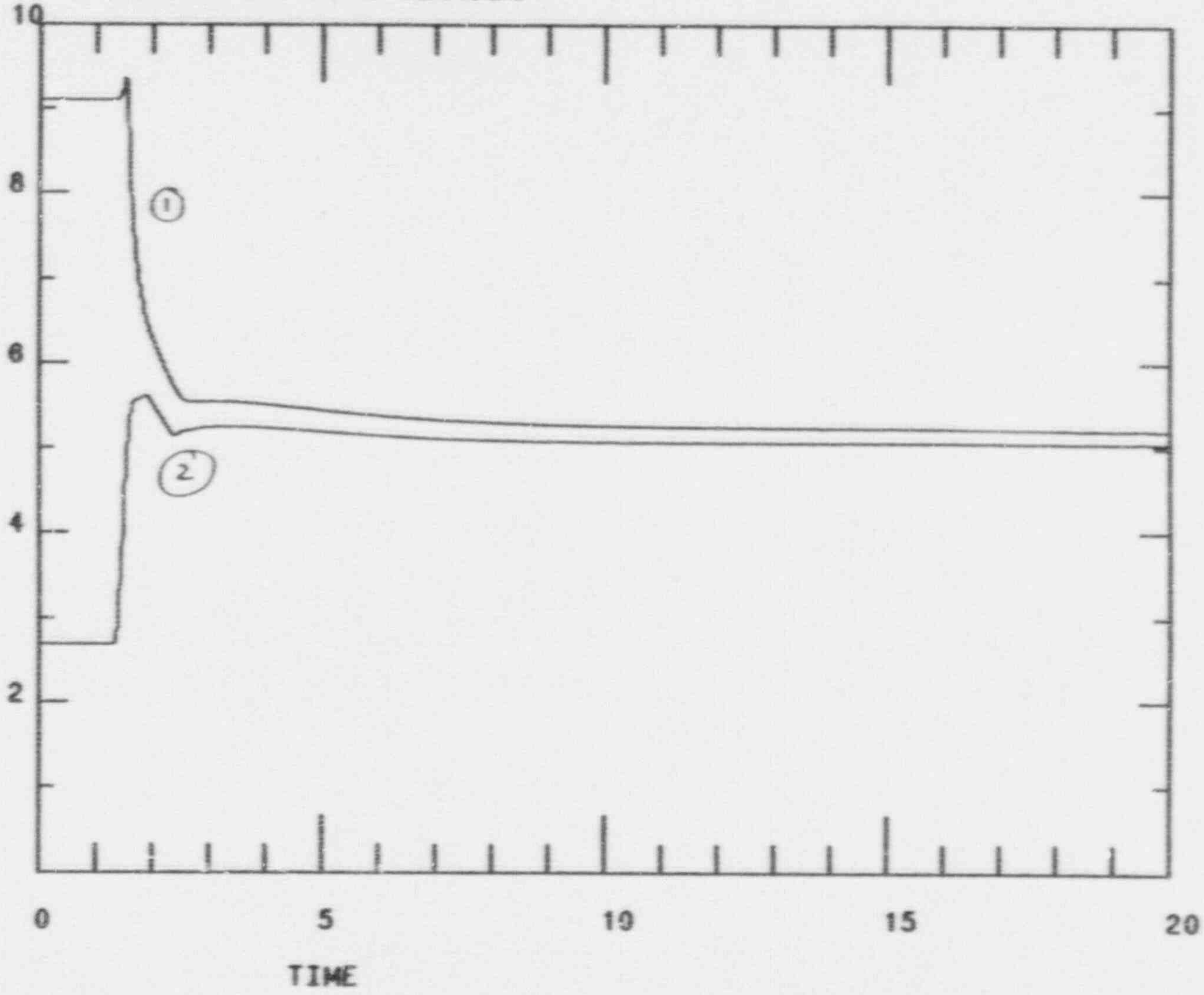
1 DIVISION = 45.42 SECONDS



YCT0480 (640. , 660.) 91220 PRESSURIZER WTR TEMP

7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/81 12:30:19

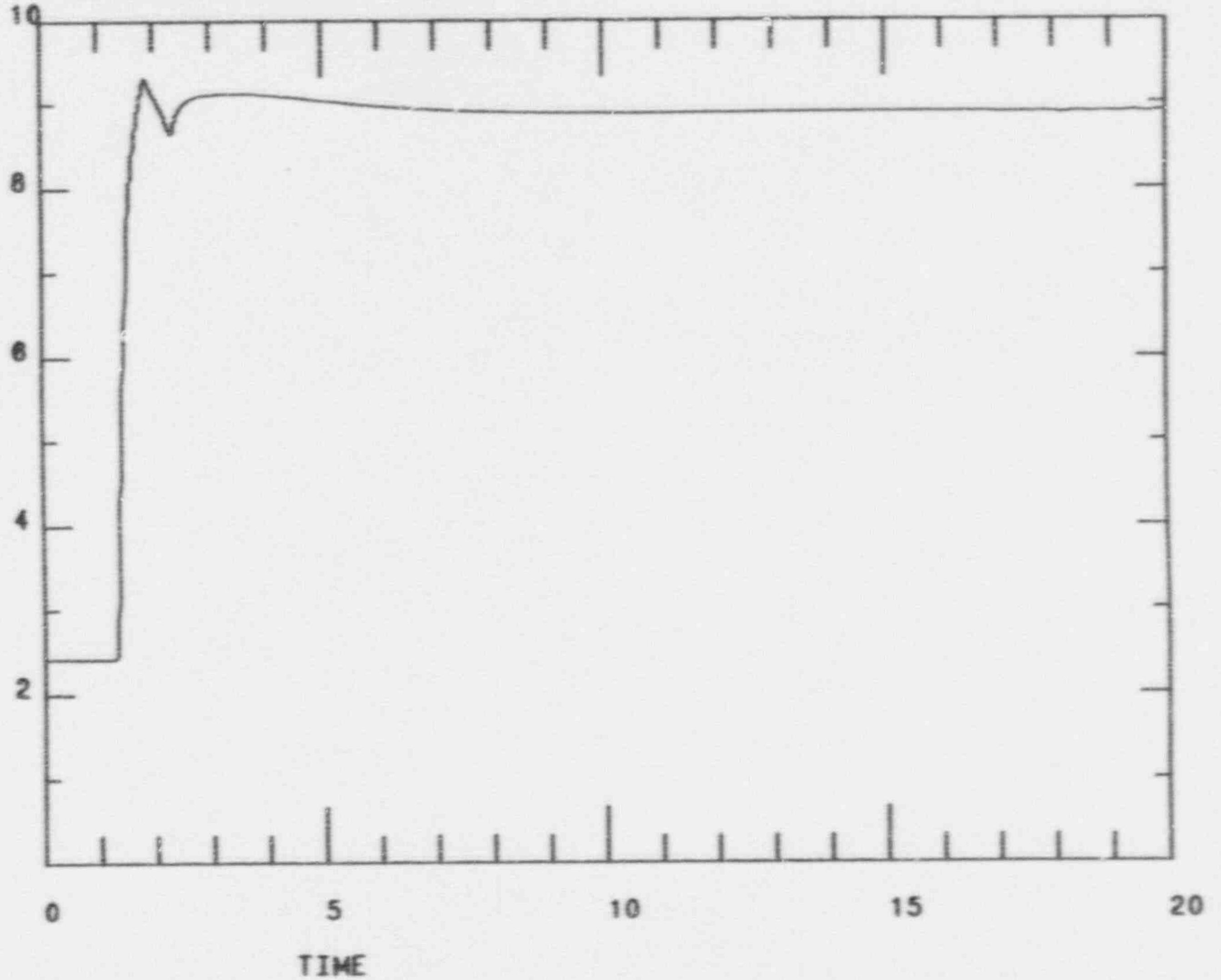
1 DIVISION = 45.42 SECONDS



THTHLWR(1) (500. , 600.) 65210 RC HOT LEG WR TEMP. 1
THTCLWR(1) (500. , 600.) 65210 RC CLOD LEG WR TEMP. 2

7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/91 11:44:53

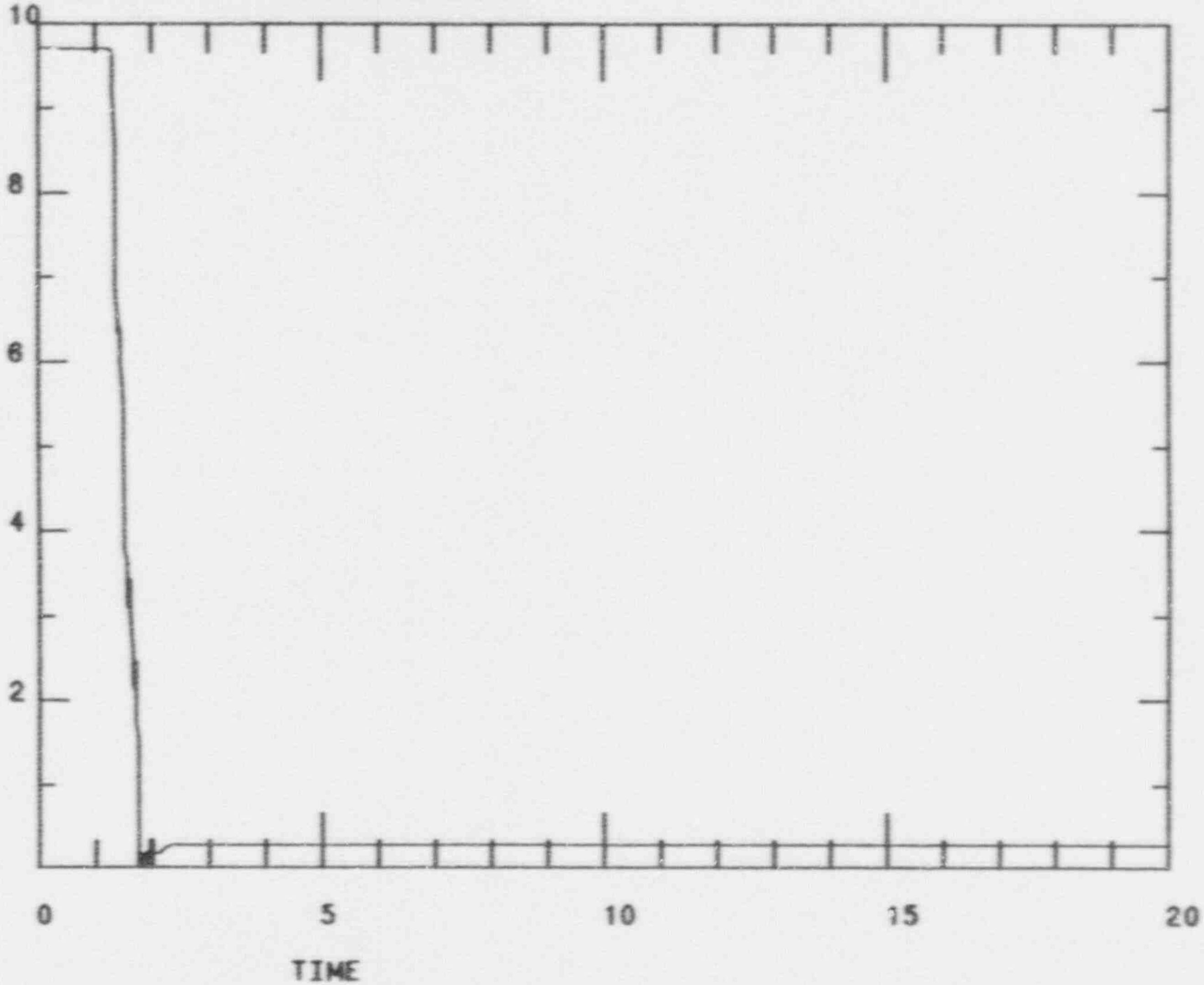
1 DIVISION = 45.42 SECONDS



THPSG(1) (600. , .110E+04) 65:30 SG DOME PRESSURE

7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/91 12:11:47

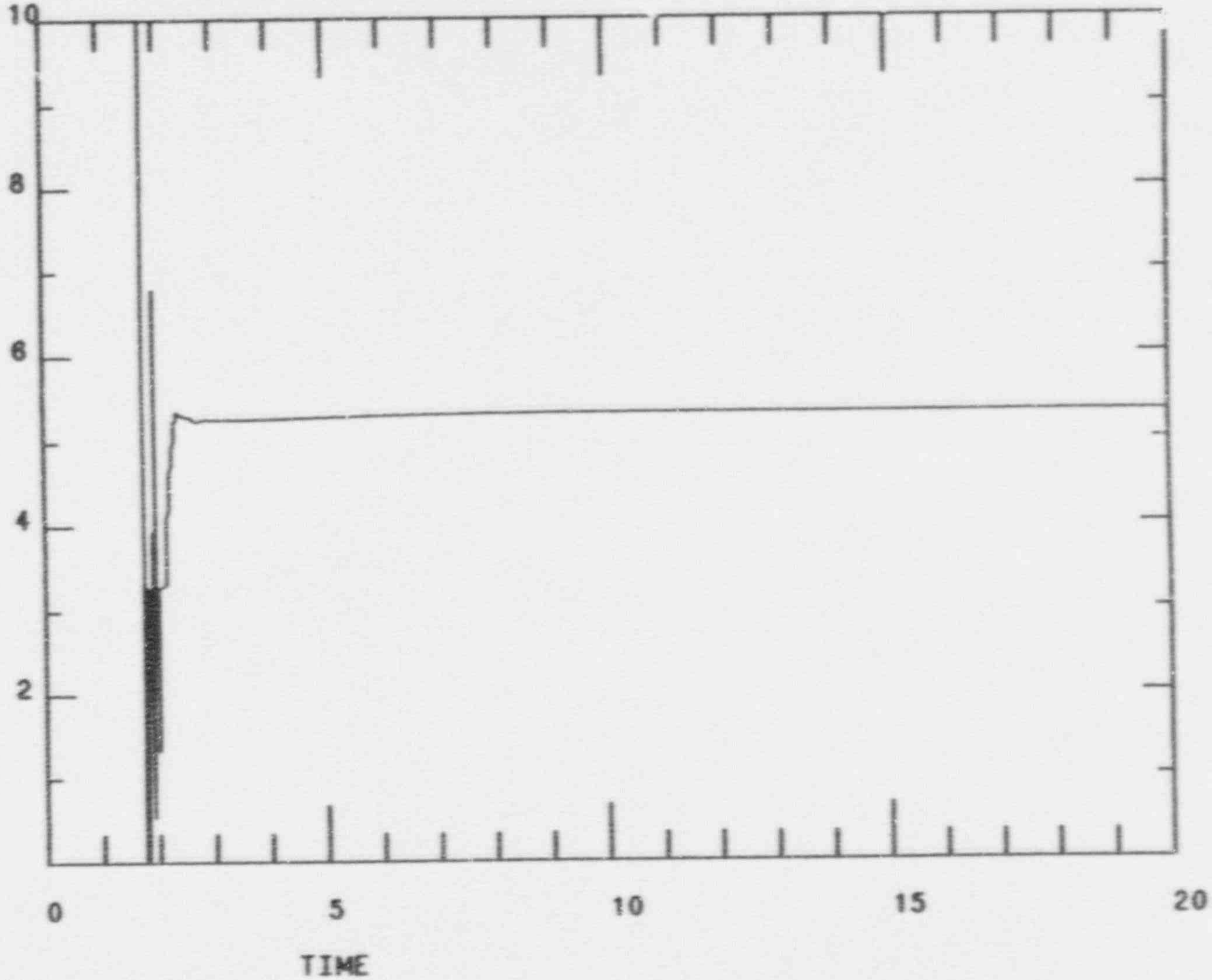
1 DIVISION = 45.42 SECONDS



FWFSG(1) (.000 , .100E+04) 03020 FW TO S/G FLOW

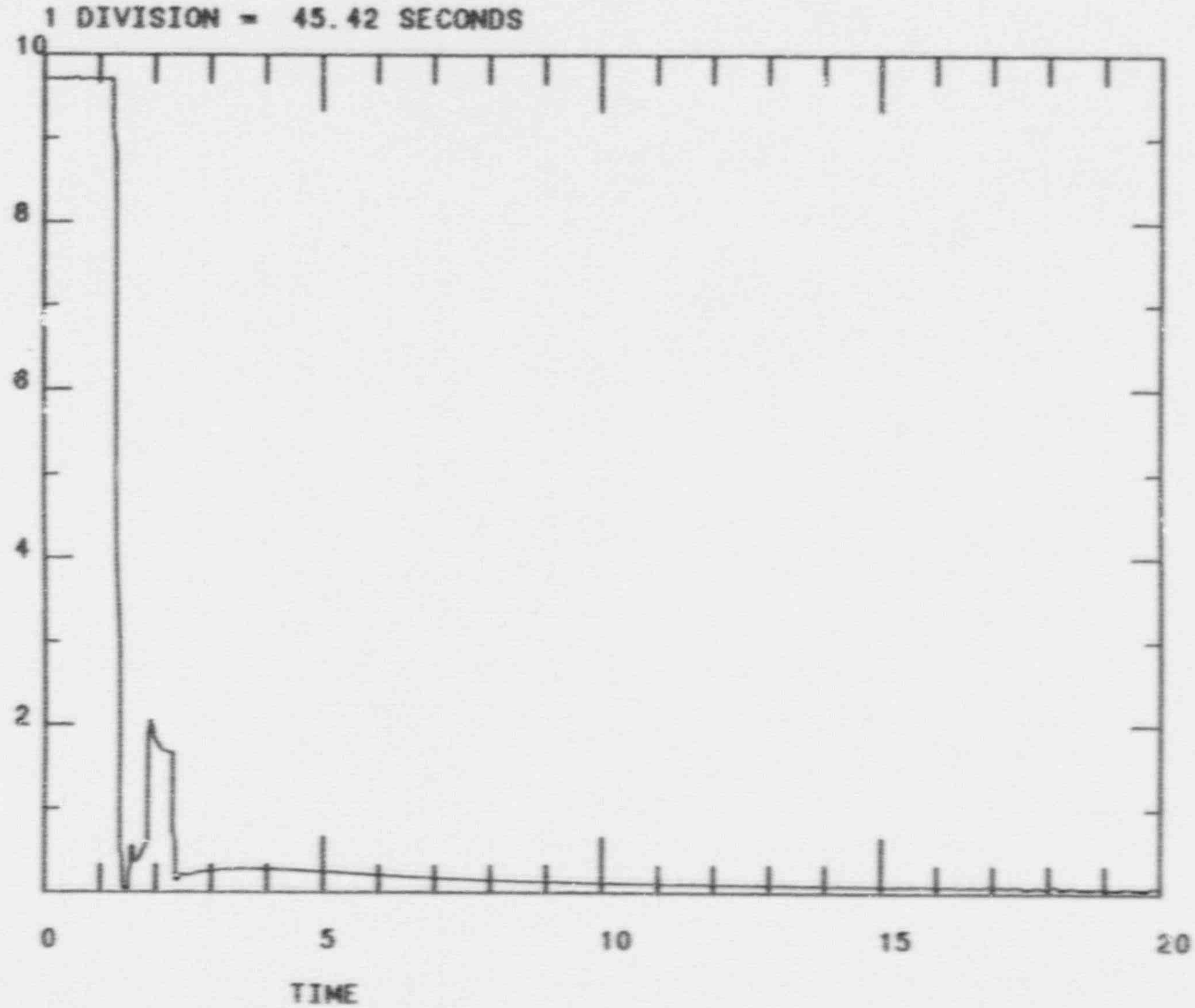
7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/91 12:16:37

1 DIVISION = 45.42 SECONDS



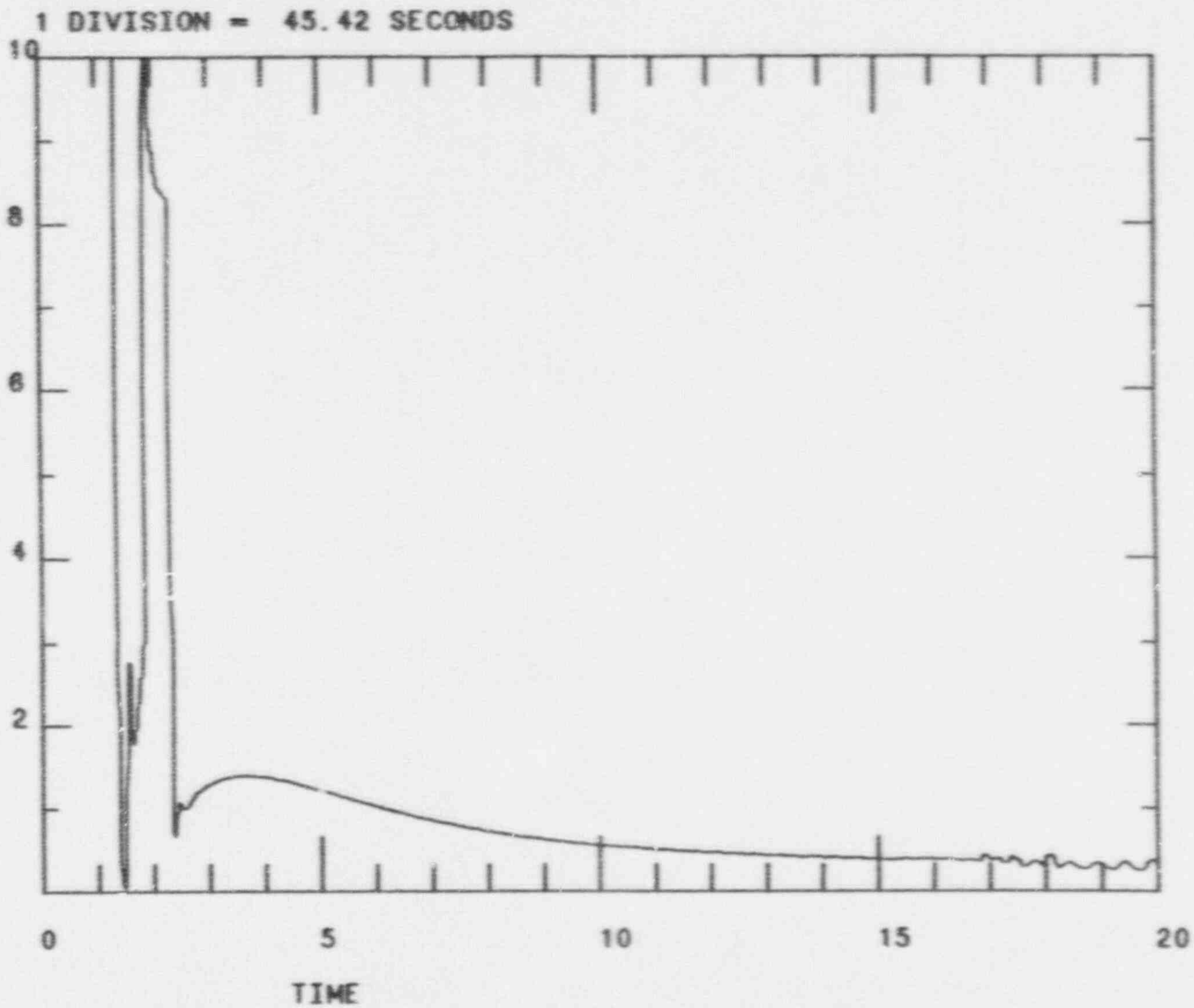
FWFSG(1) (.000 . 50.0) 03020 FW TO S/G FLOW

7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/91 12:02:48



MSFSG(1) (.000 , .100E+04) 01160 MS TOTAL FLOW FROM SG

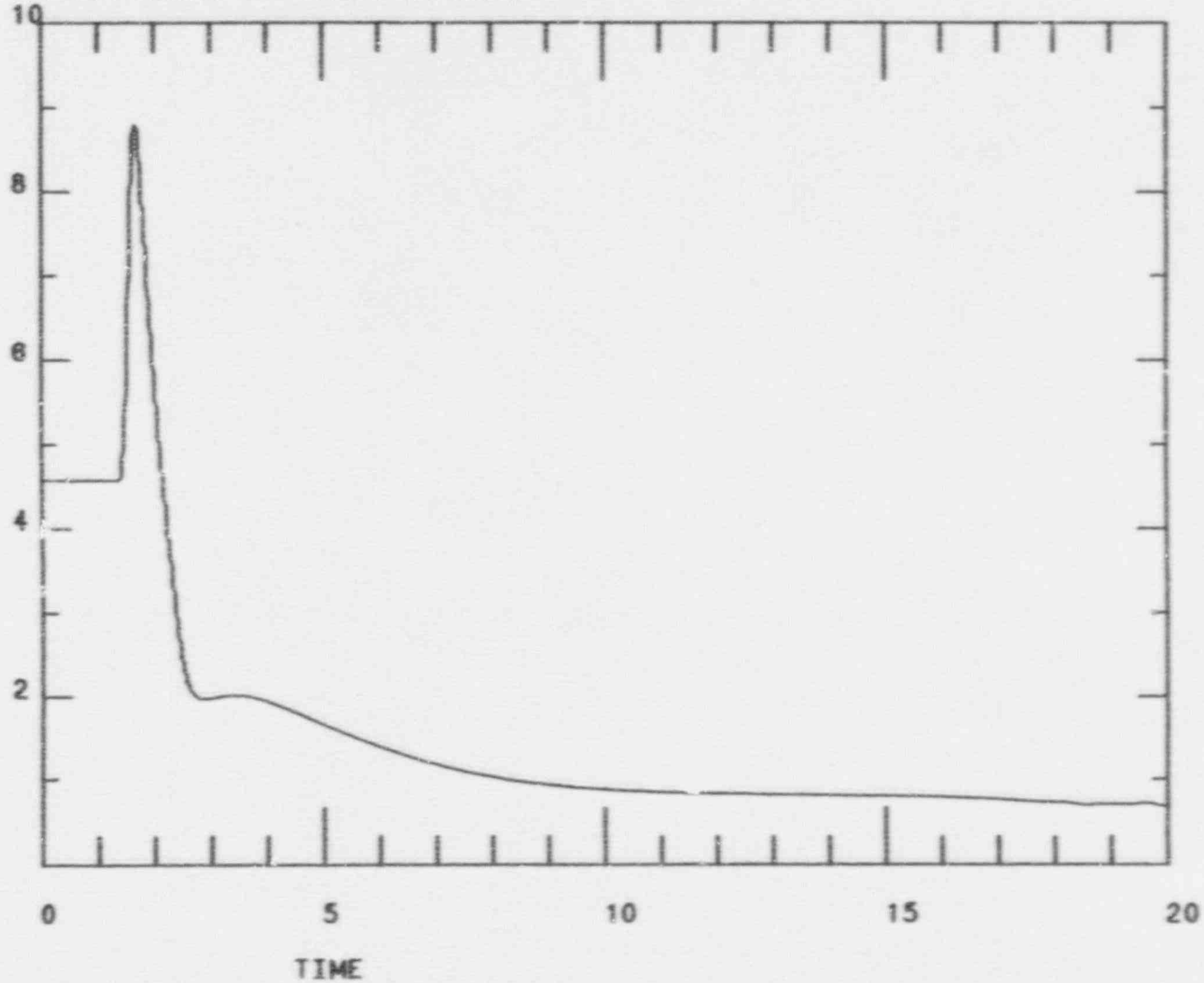
7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S   02/02/91 12:07:12



MSFSG(1)   (.000   , 200.   ) 01160 MS TOTAL FLOW FROM SG

7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/81 11:49:14

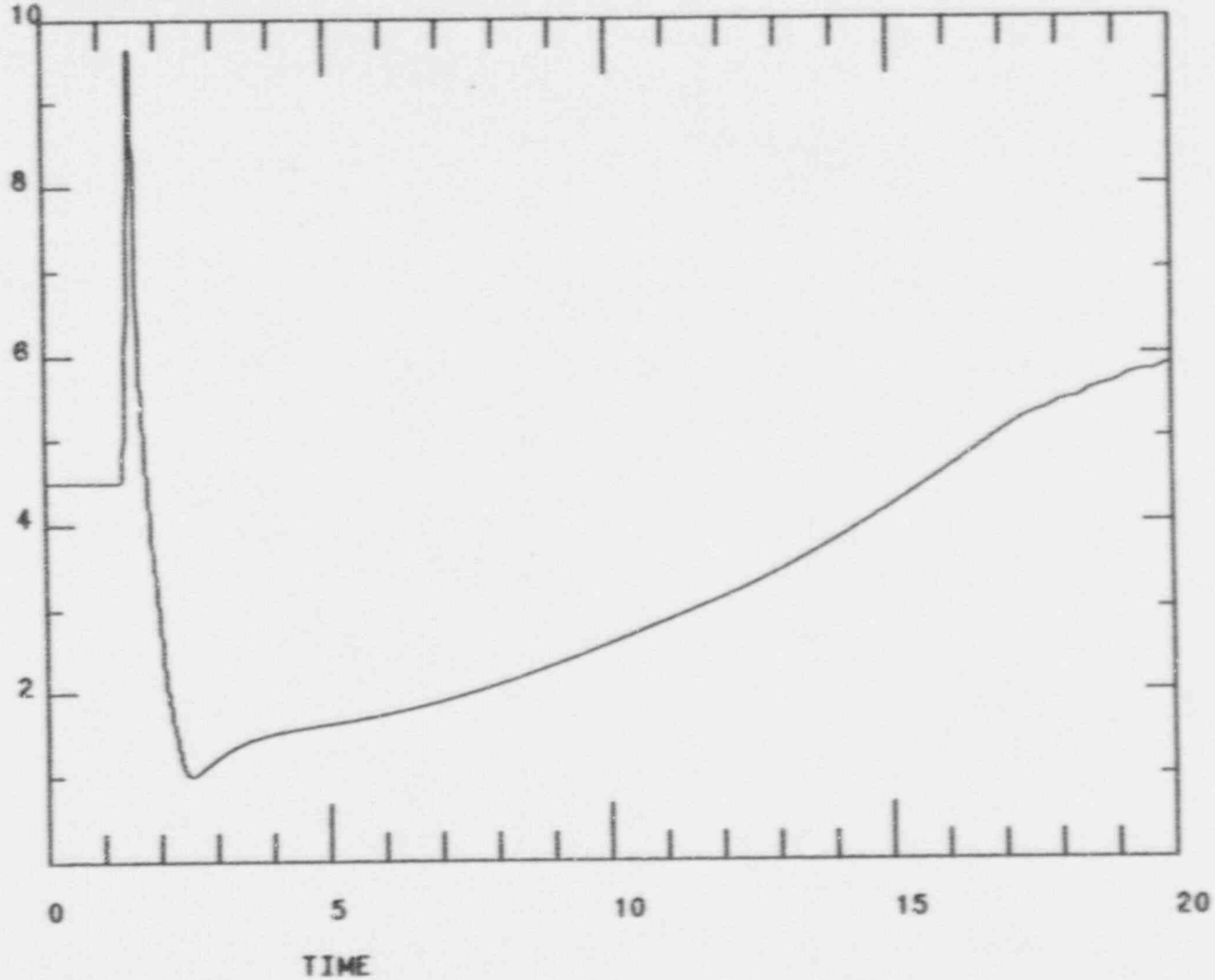
1 DIVISION = 45.42 SECONDS



RXTAVG(1) (550. , 570.) 01200 LOOP TAVG

7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/91 11:53:33

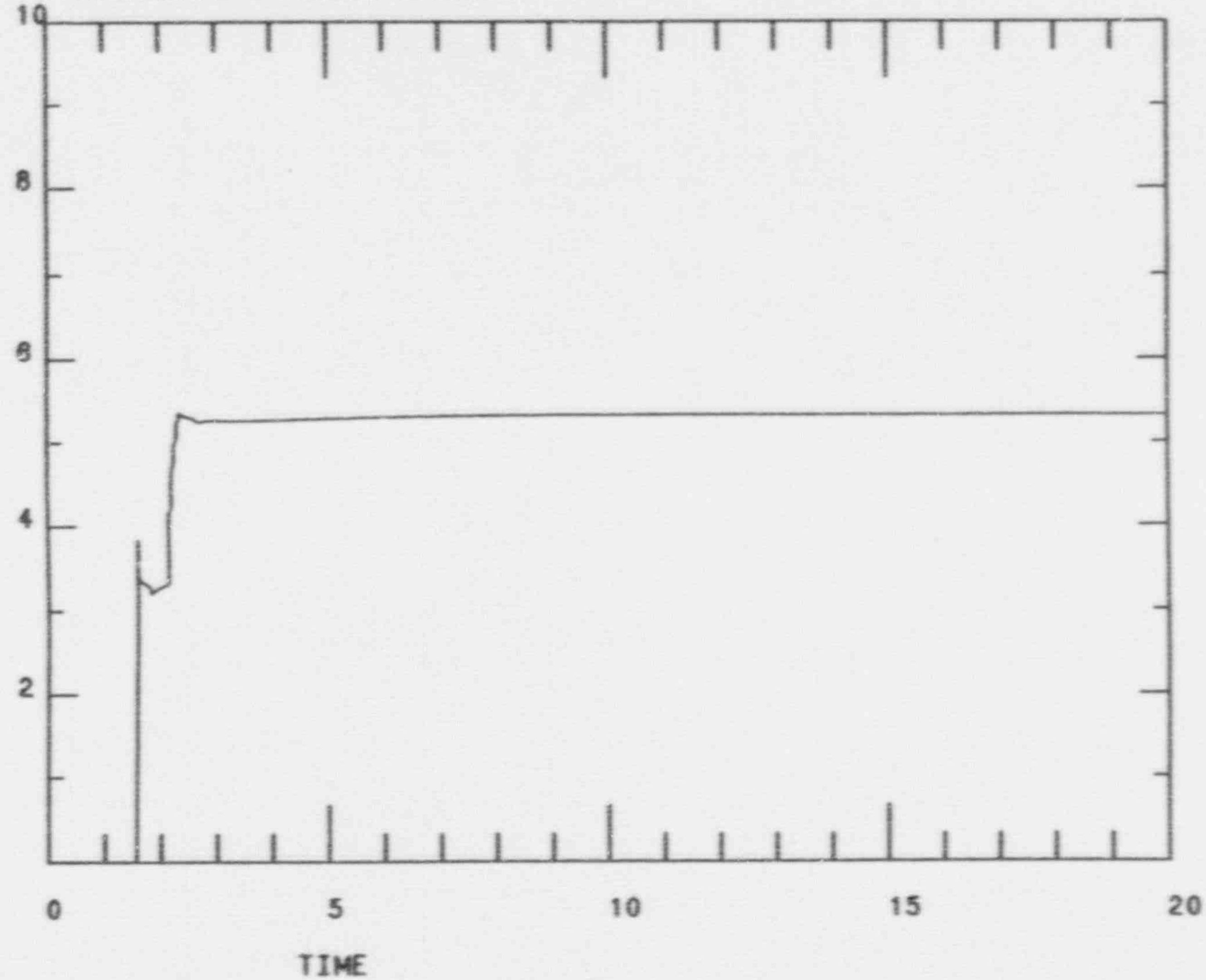
1 DIVISION = 45.42 SECONDS



YCP0480 (.210E+04, .240E+04) 07330 PRESSURIZER 1 PRESSURE

7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/91 11:34:46

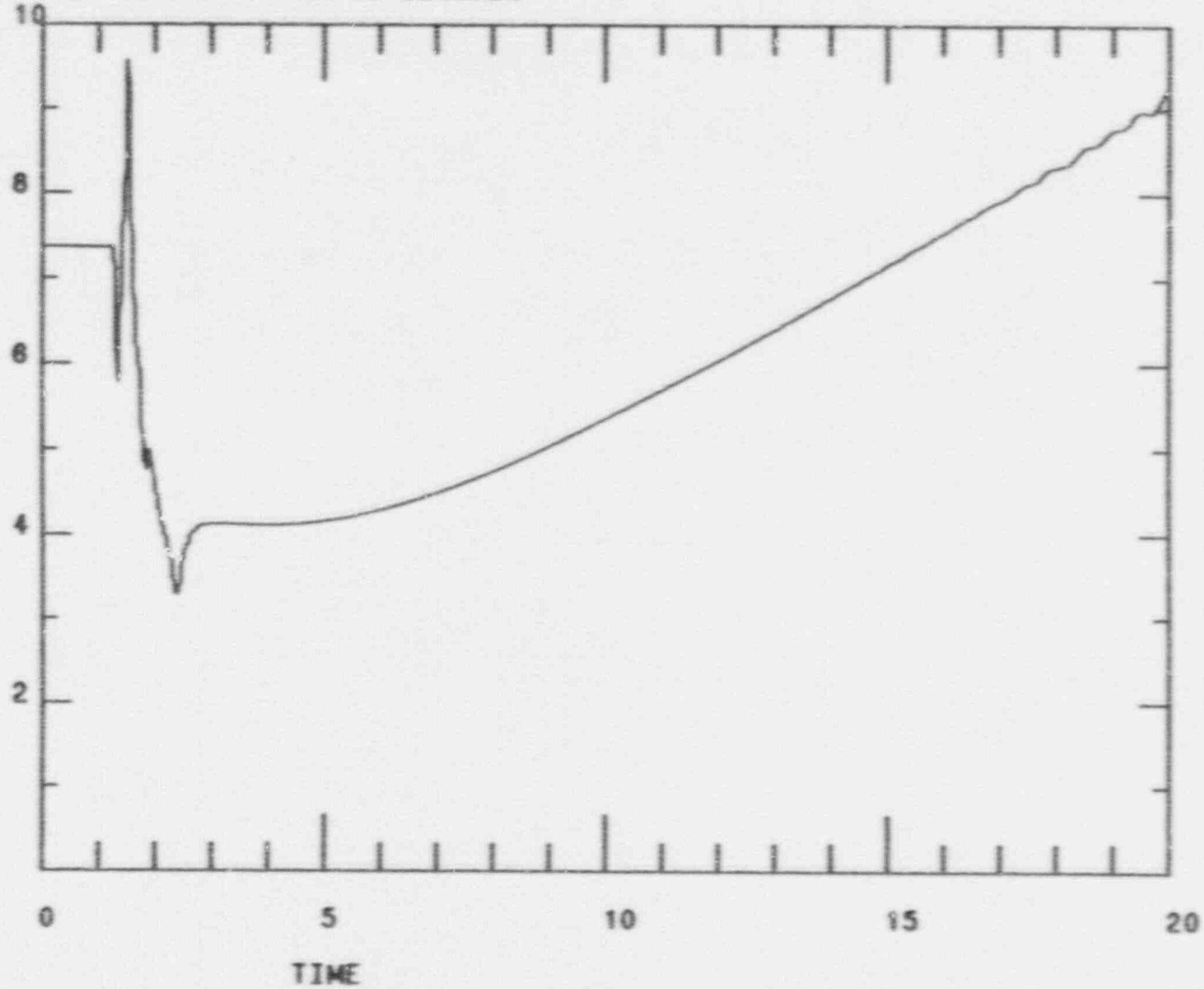
1 DIVISION = 45.42 SECONDS



FWFAFSG(1) (.000 , 50.0) 06020 AF TO S/G FLOW

7215***SIMULTANEOUS CLOSURE OF ALL MSIV'S 02/02/81 12:25:20

1 DIVISION = 45.42 SECONDS



YCL0403 (40.0 , 50.0) 06790 S/G A WIDE RANGE LEVEL

ZION SIMULATOR TRANSIENT TEST

MAXIMUM RATE POWER RAMP

The Maximum Rate Power Ramp was performed from a beginning of core, 100% power, initial condition (IC 37). Turbine load was ramped to 75% power at 5% per minute. Load was stabilized at 75% and then ramped back to 100% at 5% per minute. Data was collected in accordance with ANSI/ANS-3.5-1985 Appendix B 2.2.1.

The test results were reviewed and found satisfactory with the exception of:

Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
Nuclear Power Spike on decrease and increase	F217	4/91

Collected and Plotted Data:

1. YCN0049 - Power Range, Neutron Flux
2. YCL0480 - Pressurizer level
3. YCT0480 - Pressurizer liquid Temp
4. THTHLRTD(1) - Loop A Hot Leg RTD Temp
   THTCLRTD(1) - Loop A Cold Leg RTD Temp
5. THPSG(1) - A S/G Pressure
6. FWFSG(1) - A S/G Feedwater Flow
7. MSFSG(1) - A S/G Steam Flow
8. RXTAVG(1) - A Loop Tavg
9. YCP0480 - Pressurizer Pressure
10. YCL0403 - A S/G Wide Range Level 1.
11. YCL0400 - A S/G Narrow Range Level

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Maximum Rate Power Ramp **DATE** : 02/06/91

1. **Data utilized for test comparison in order of preference (circle appropriate choices)**

   a. **Actual Plant Transient Data** **Event :** ____________

   b. **Analytical or design data** **Data :** ____________

   c. **Transient Data from similar plant** **Plant :** ____________

   d. **Panel of experts (best estimate)**

   COMMENTS : DR # F217 corrected problem of power spikes as rods moved between core nodes

2. **Data Comparison Summary**

VARIABLE	COMMENTS	RESOLUTION
Rx Power	DR # F217	Accepted
Pzr Level	NONE	Accepted
Pzr Temp	NONE	Accepted
Cold Leg RTD	NONE	Accepted
Hot Leg RTD	NONE	Accepted
S/G Pressure	NONE	Accepted
FW Flow	NONE	Accepted
Steam Flow	NONE	Accepted
RCS Tavg	Tavg did not return to original value due to	Accepted
	Rod Stop at 220 steps (Rods started at 231)	
Pzr Pressure	NONE	Accepted
S/G WR Level	NONE	Accepted

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Maximum Rate Power Ramp   DATE : 02/06/91

VARIABLE	COMMENTS	RESOLUTION

3. Comparison Results

Simulator capability to reproduce the defined transient: (circle one)

a. ACCEPTABLE

b. UNACCEPTABLE

4. Review Board Signatures (differing opinions must be documented)

Donald E Phillips

Paul E Barrama

R. E. Landrum

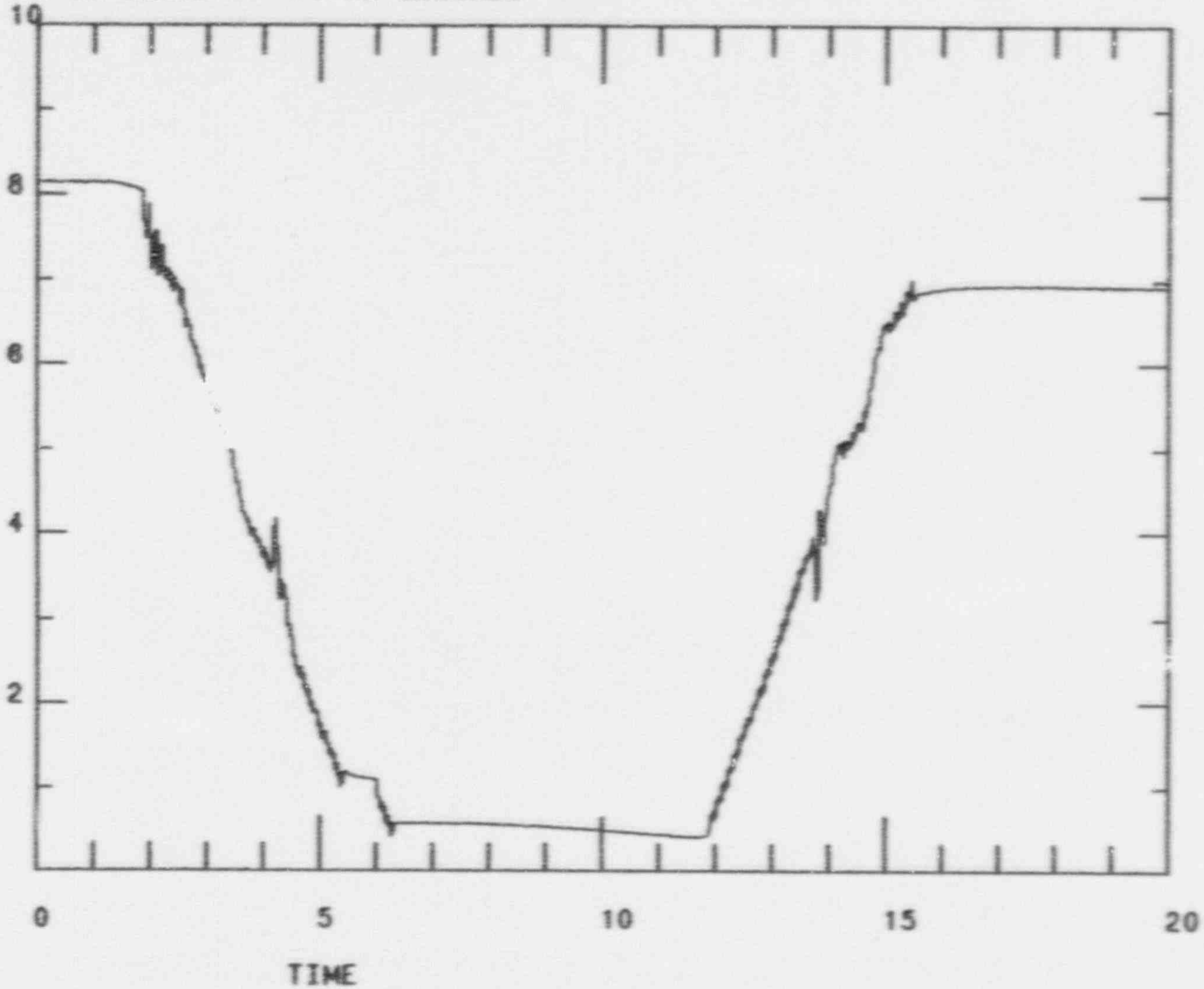
T P Colerio

James J. Madden

COMMENTS :

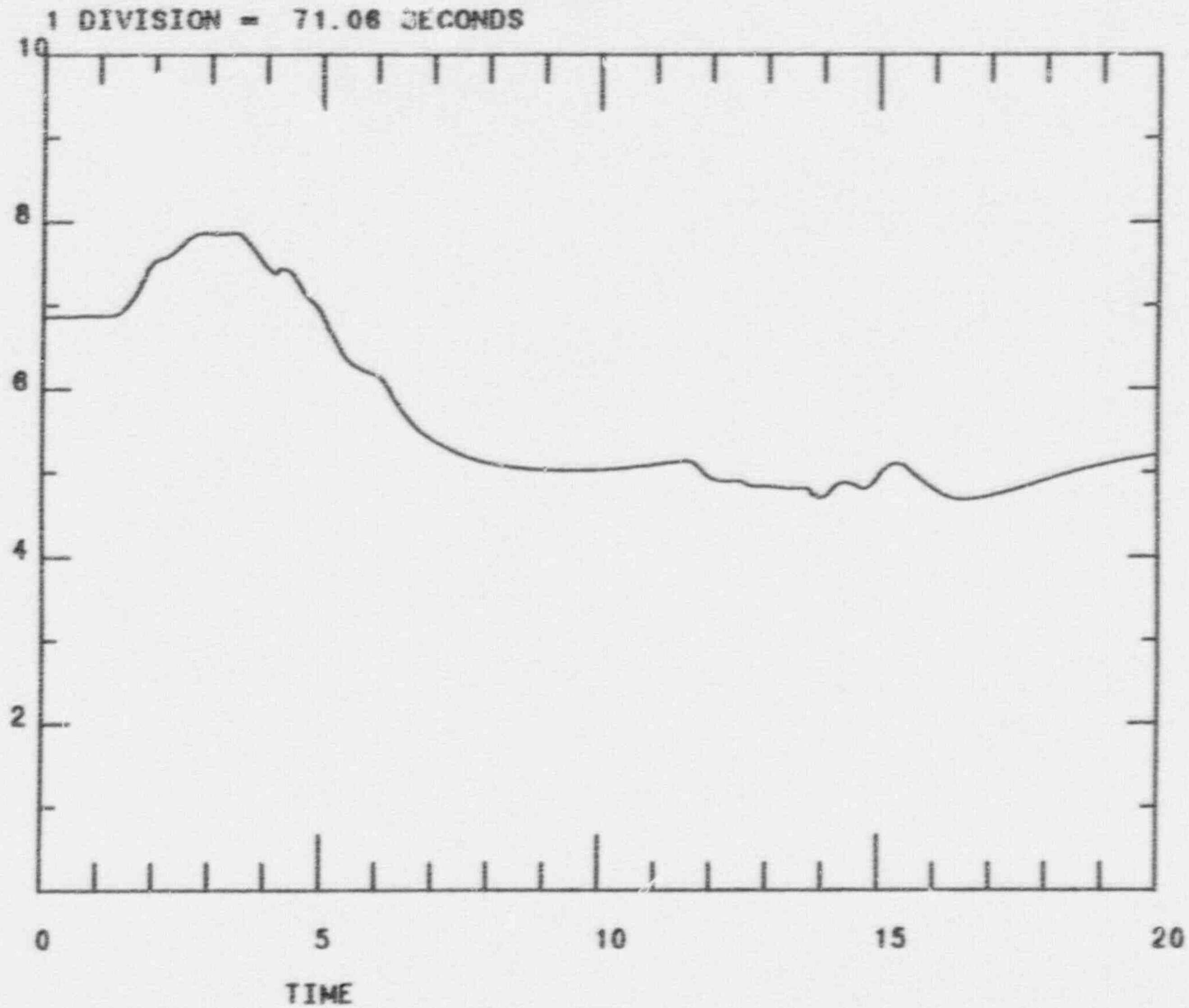
7216***MAXIMUM RATE RAMP (100-75-100) 02/02/91 12:53:29

1 DIVISION = 71.06 SECONDS



YCN0049 (80.0 , 105.) 21170 POWER RANGE CHANNEL 1 FL

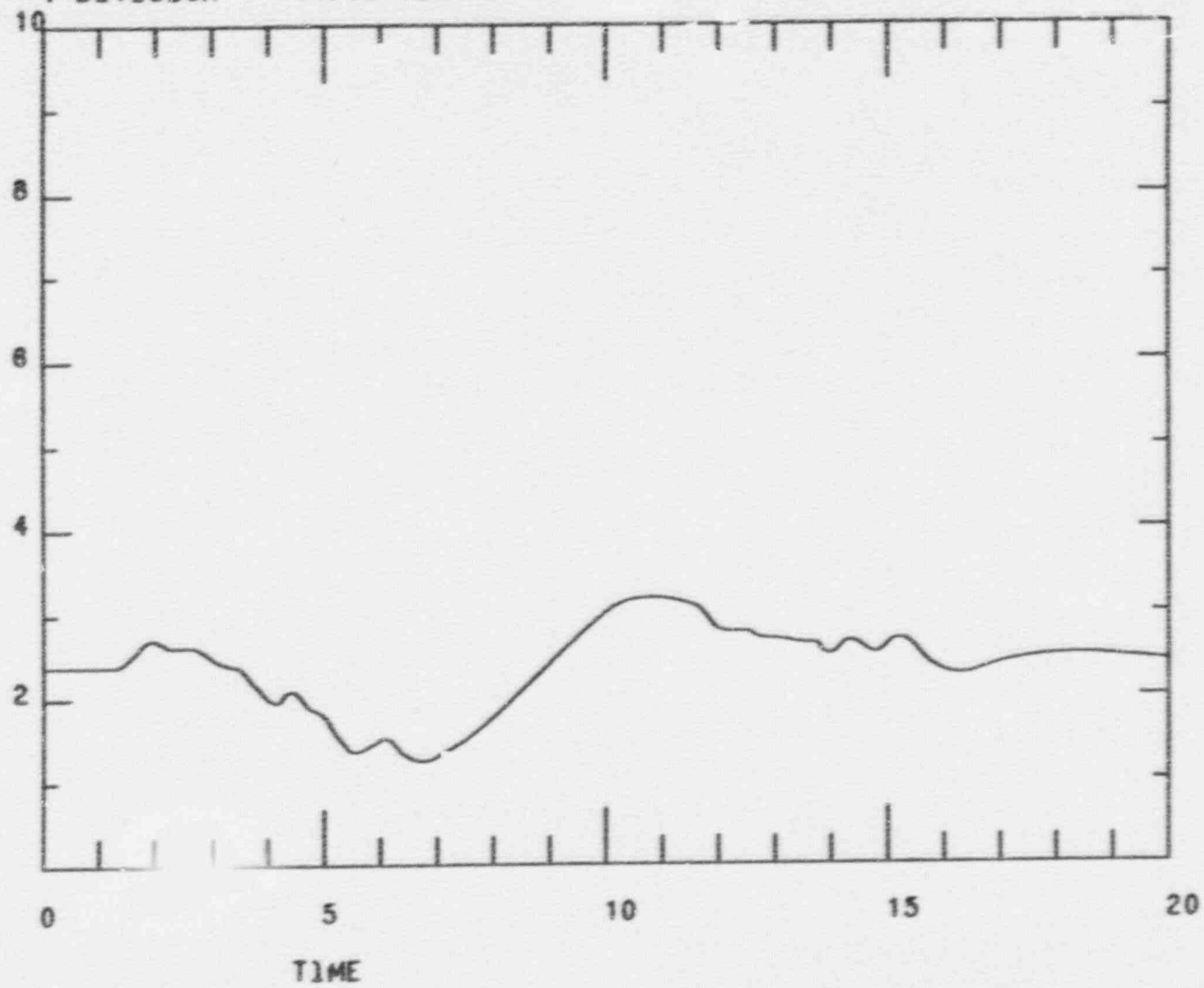
7216***MAXIMUM RATE POWER RAMP (100-75-100)   02/03/91 07:27:20



YCL0480   (30.0 , 50.0) 06950 PRESSURIZER 1 LEVEL

7218***MAXIMUM RATE POWER RAMP (100-75-100)   02/03/81 07:13:25

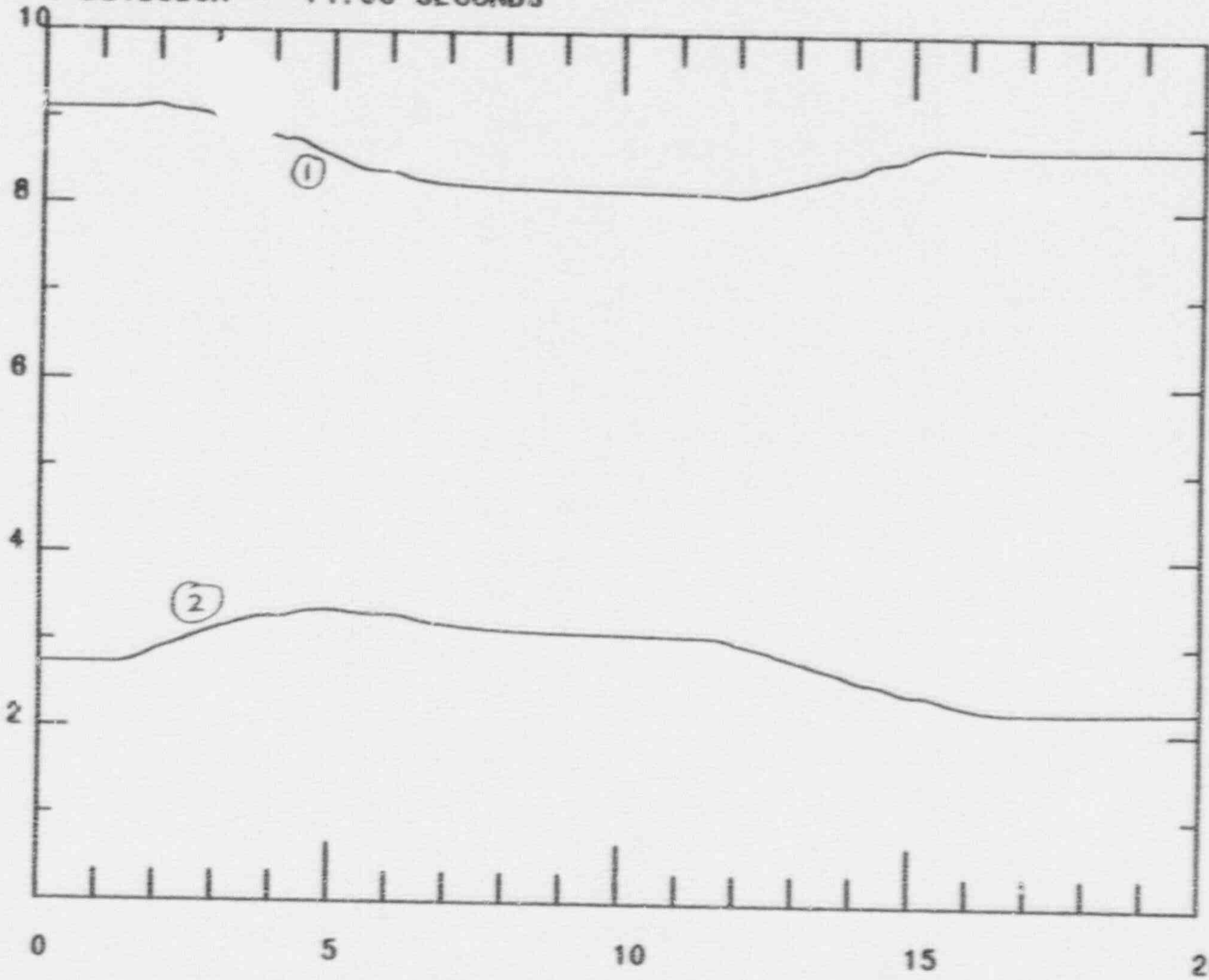
1 DIVISION = 71.08 SECONDS



YCT0480   (650.   , 660.   ) 81220 PRESSURIZER WTR TEMP

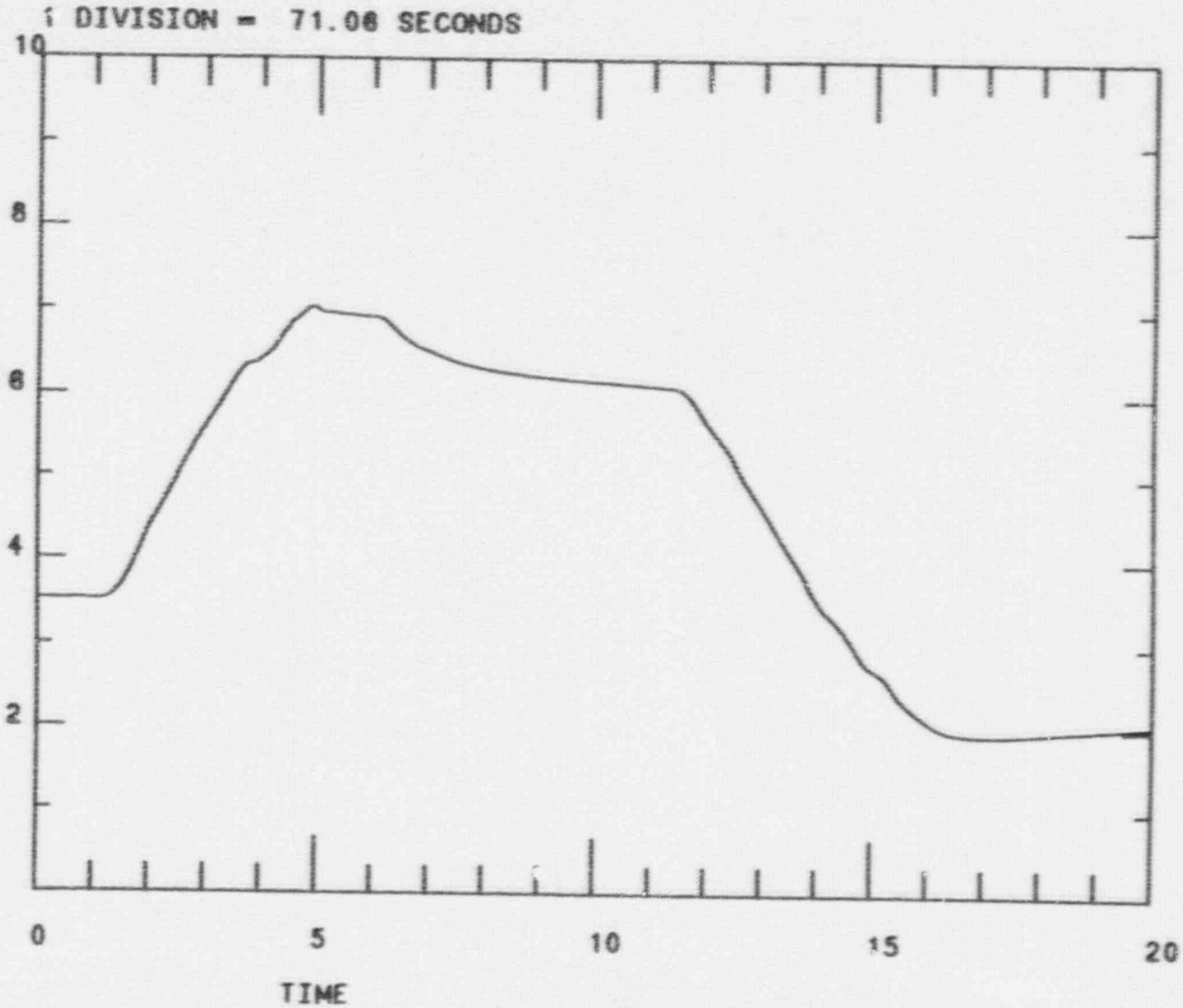
7216***MAXIMUM RATE RAMP (100-75-100) 02 02/9\ 12:44:37

1 DIVISION = 71.06 SECONDS



(1) THTHLRTD(1) (500. , 600.) 65210 RC HOT LEG RTD TEMP.
(2) THTCLRTD(1) (500. , 600.) 65210 RC CLOD LEG RTD TEMP.

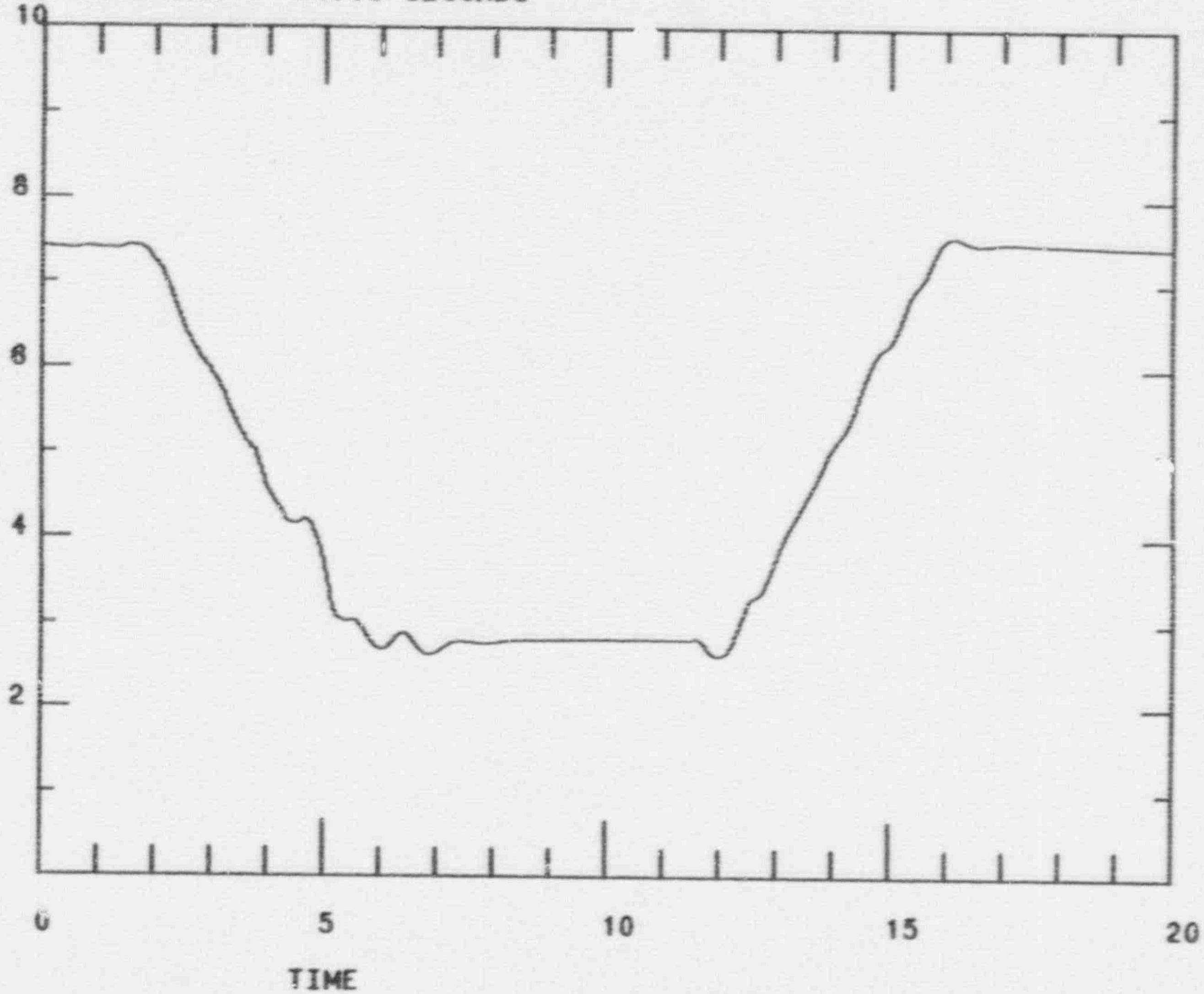
7216***MAXIMUM RATE POWER RAMP (100-75-100)   02/03/91 07:44:56



THPSG(1)   (650.   , 850.   ) 65130 SG DOME PRESSURE

7216***MAXIMUM RATE RAMP (100-75-100)   02/02/91 13:07:36

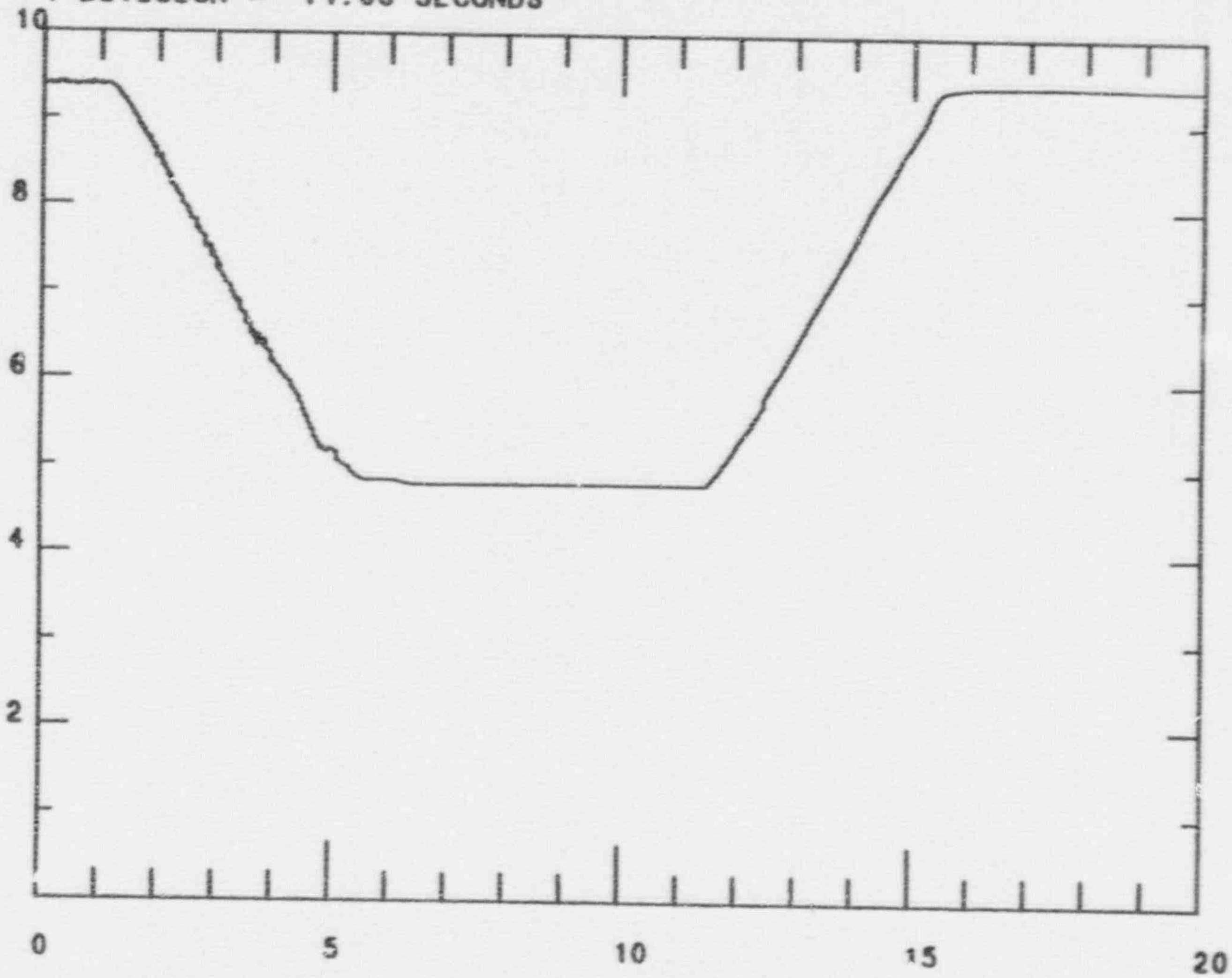
1 DIVISION = 71.06 SECONDS



FWFSG(1)   (600. , .110E+04) 03020 FW TO S/G FLOW

7218***MAXIMUM RATE POWER RAMP (100-75-100)   02/03/91 07:20:30

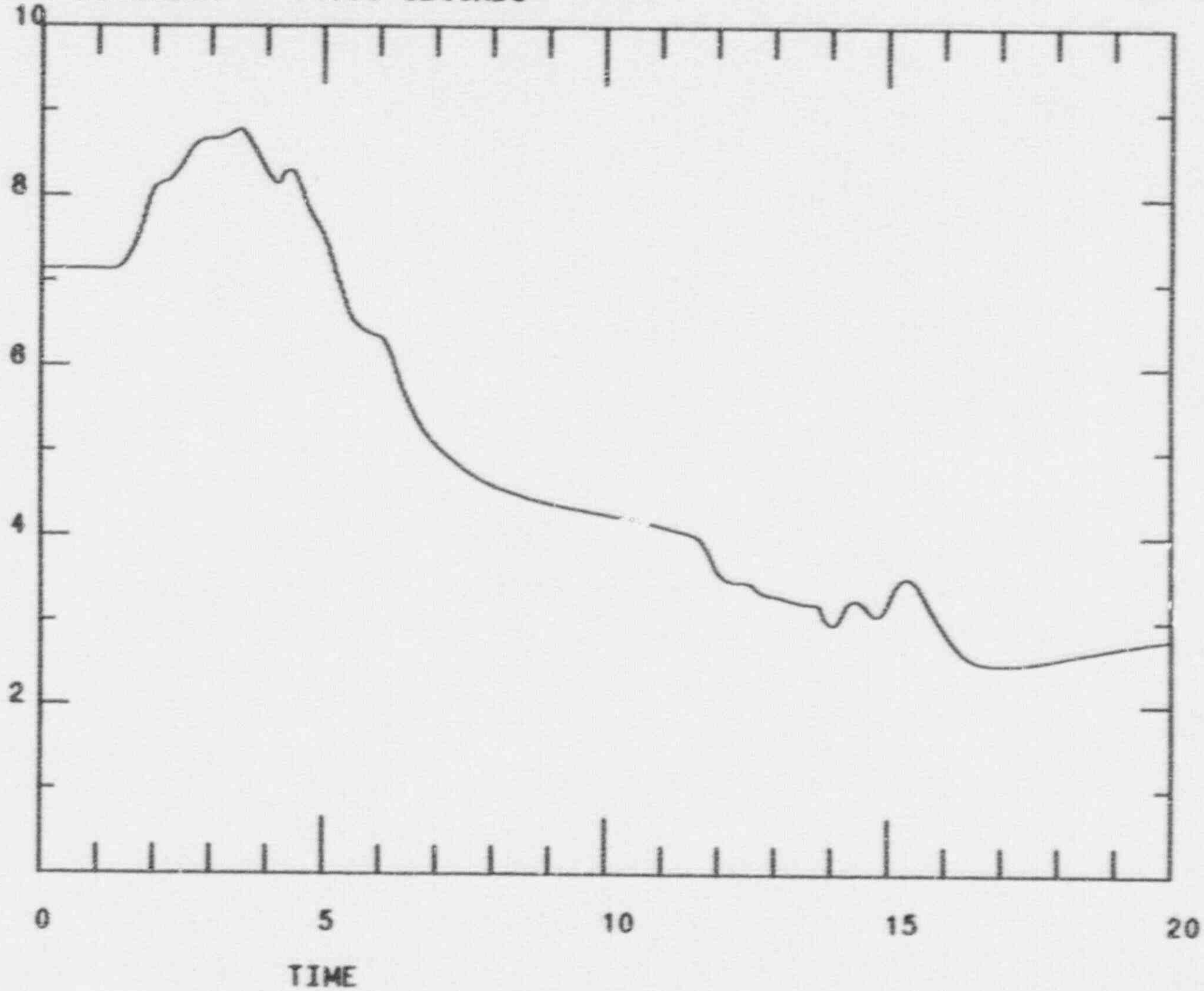
1 DIVISION = 71.06 SECONDS



MSFSG(1)   (500.   , .100E+04) 01160 MS TOTAL FLOW FROM SG

7216***MAXIMUM RATE RAMP (100-75-100) 02/02/91 12:37:45

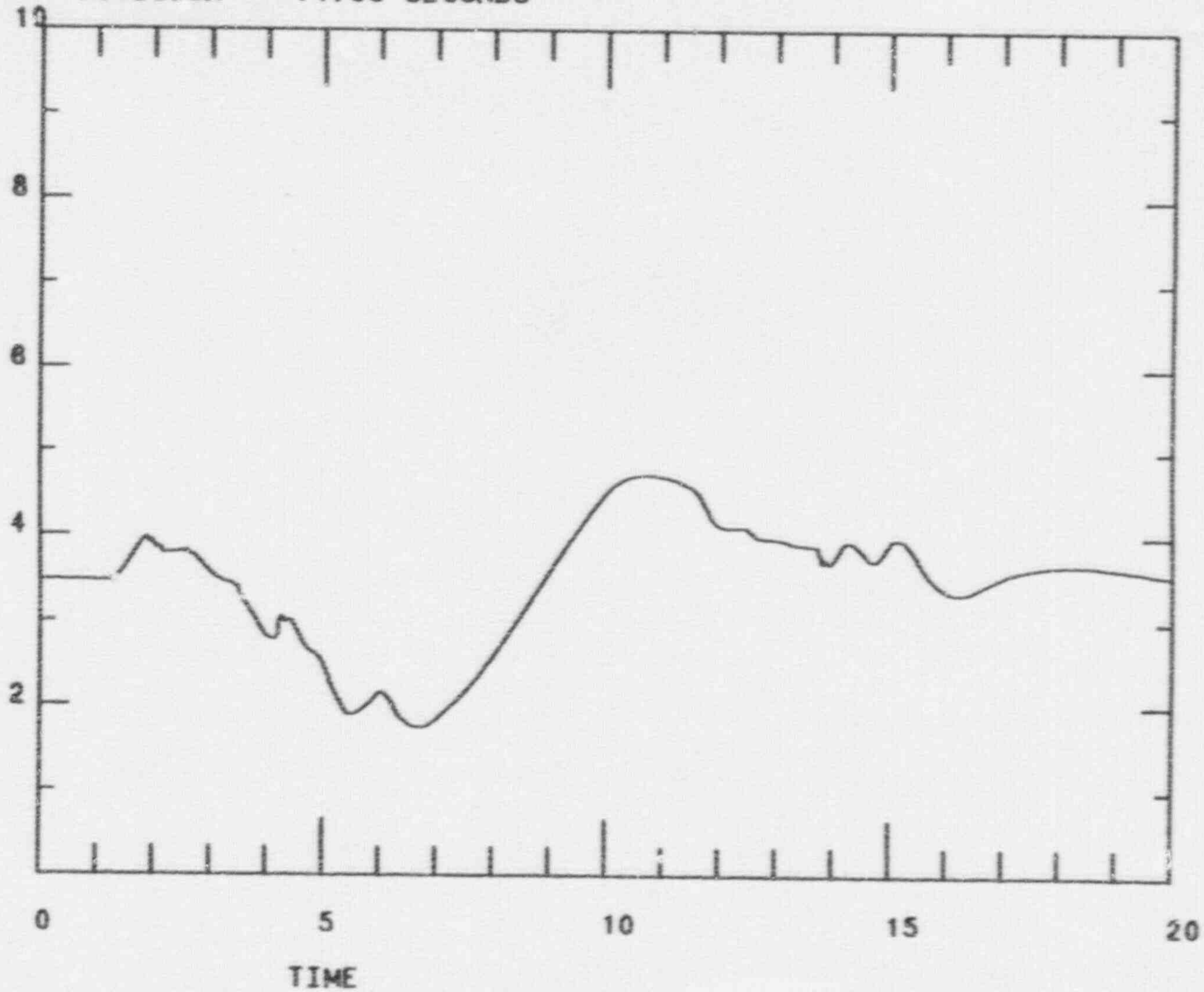
1 DIVISION = 71.06 SECONDS



RXTAVG(1) (552. , 562.) 01200 LOOP TAVG

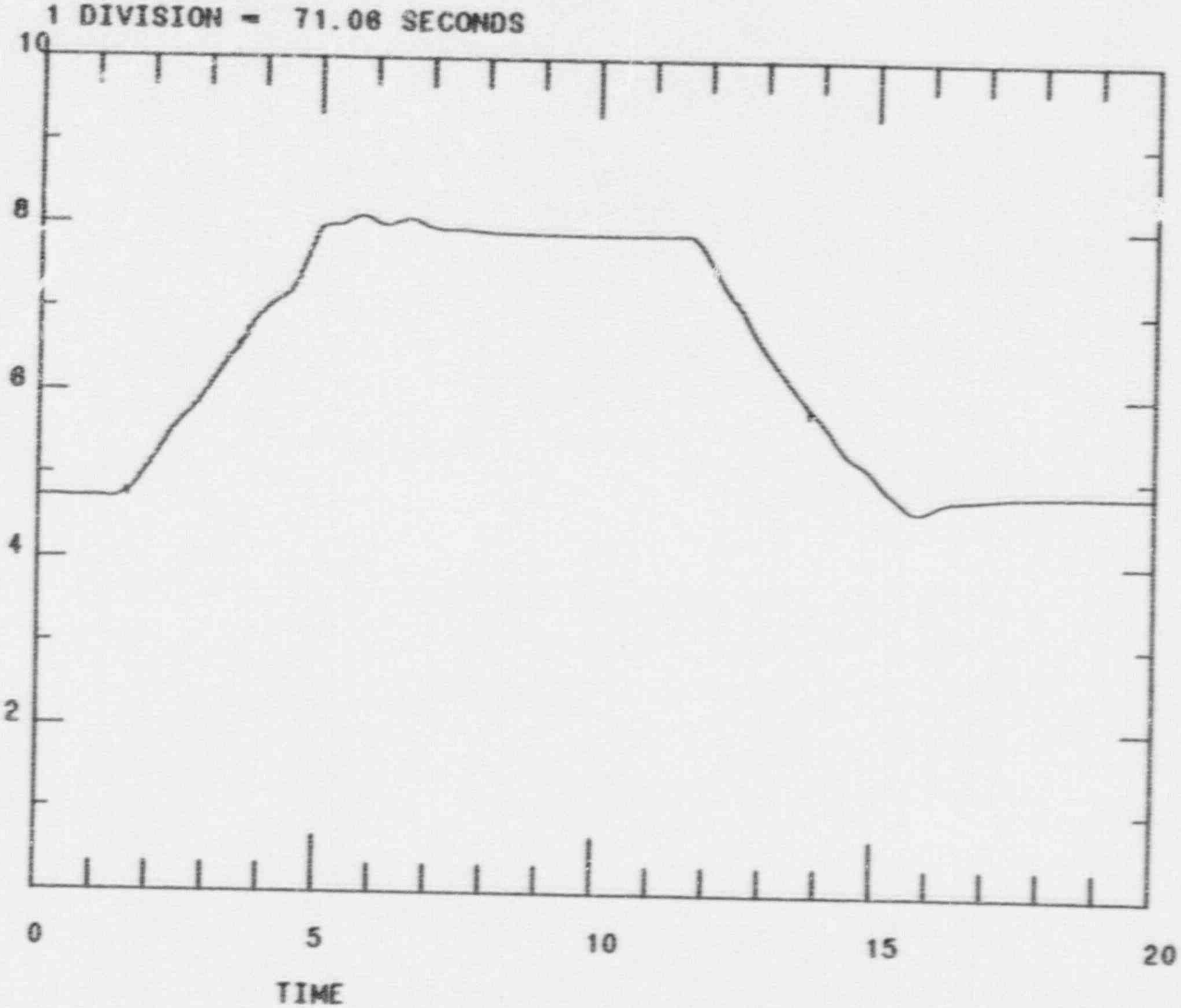
7216***MAXIMUM RATE POWER RAMP (100-75-100)   02/03/91 07:34:56

1 DIVISION = 71.08 SECONDS



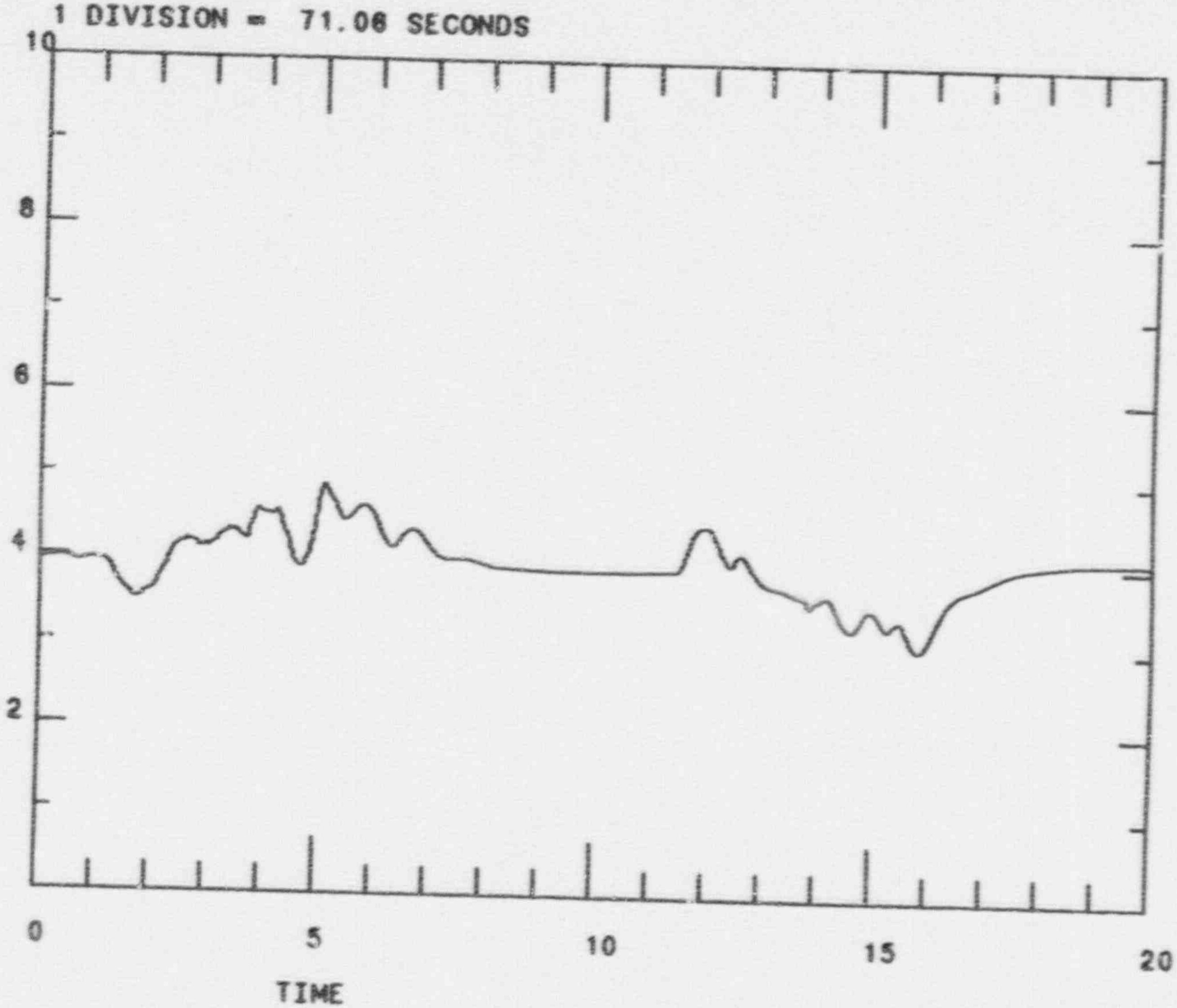
YCP0480   (.220E+04, .230E+04) 07330 PRESSURIZER 1 PRESSURE

7216***MAXIMUM RATE RAMP (100-75-100) 02/02/81 13:00:24



YCL0403 (45.0 . 50.0) 06790 S/G A WIDE RANGE LEVEL

7216***MAXIMUM RATE POWER RAMP (100-75-100)   02/04/91 07:45:50



YCL0400   (40.0   . 50.0   ) 06010 S/G A NARROW RANGE 1 LEV

ZION SIMULATOR TRANSIENT TEST

MAXIMUM SIZE UNISOLABLE MAIN STEAM LINE RUPTURE

The Maximum Size Unisolable Main Steam Line Rupture was performed from a beginning of core, 100% power, initial condition (IC 37). Malfunction MS06A was inserted at 100% severity to cause a maximum unisolable main steam break. Data was collected in accordance with ANSI/ANS-3.5-1985 Appendix B 2.2.3.

The test results were reviewed and found satisfactory with the exception of:

Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
Containment Pressure Response	F220	4/91
Safety Injection Flow Oscillation	F221	4/91
RHR flow spike	F231	4/91
CNMT spray flow spike	F232	4/91
Safety Injection flow spike	F234	4/91

Collected and Plotted Data:

1. YCL0480 - Pressurizer Level
2. YCP0480 - Pressurizer Pressure
3. THPHL(3) - Hot Leg Pressure (RH Pump Suction Pressure)
4. CHPCONT - Containment Average Pressure
5. CHTAVGCM - Containment Average Temperature
6. CVFBITIN - Flow through BIT Injection Line
7. SIF10 - SI Pump A Flow (SI Flownet Path 10)
8. RHF18 - RH HX 1A Flow (RH Flownet F18)
9. SILRWST - RWST Level
10. CSF1AS - Containment Spray Loop 1A Flow
11. CSF1B4 - Containment Spray Loop 1B Flow
12. CSF1C4 - Containment Spray Loop 1C Flow
13. CHLCM1 - Containment Sump Level
    CHLCM2 - Containment Recirc Sump Level

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Max Size Unisolable Steam Break **DATE** : 02/06/91

1. **Data utilized for test comparison in order of preference (circle appropriate choices)**

   a. **Actual Plant Transient Data** **Event** : ____________

   b. **Analytical or design data** **Data** : ____________

   c. **Transient Data from similar plant** **Plant** : ____________

   d. **Panel of experts (best estimate)**

   COMMENTS : Open DR's #F220 (Cont Pressure), and #F221 (SI Flow Oscillations)

2. **Data Comparison Summary**

VARIABLE	COMMENTS	RESOLUTION
Pzr Level	NONE	Accepted
Pzr Pressure	NONE	Accepted
WR Pressure	NONE	Accepted
Cont Pressure	DR # F220	Accepted
Cont Temp	NONE	Accepted
BIT Flow	NONE	Accepted
SI Pump Flow	Unexplained spike at about same time as BIT	Accepted
	flow was initiated. DR # F234 written to correct	
RHR Flow	Unexplained spike, should have NO RHR	Accepted
	system flow. DR # F231 written to correct	
RWST Level	NONE	Accepted
CS Pump flows	Unexplained spike when pumps started. DR	Accepted
	# F232 written to explain / correct	
Cont Sump	See LOCA, DR # F198 & F219	Accepted

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Max Size Unisolable Steam Break **DATE** : 02/06/91

VARIABLE	COMMENTS	RESOLUTION

3. Comparison Results

Simulator capability to reproduce the defined transient: (circle one)

a. ACCEPTABLE

b. UNACCEPTABLE

4. Review Board Signatures (differing opinions must be documented)

Donald E Phillips   [illegible]

Paul E [illegible]

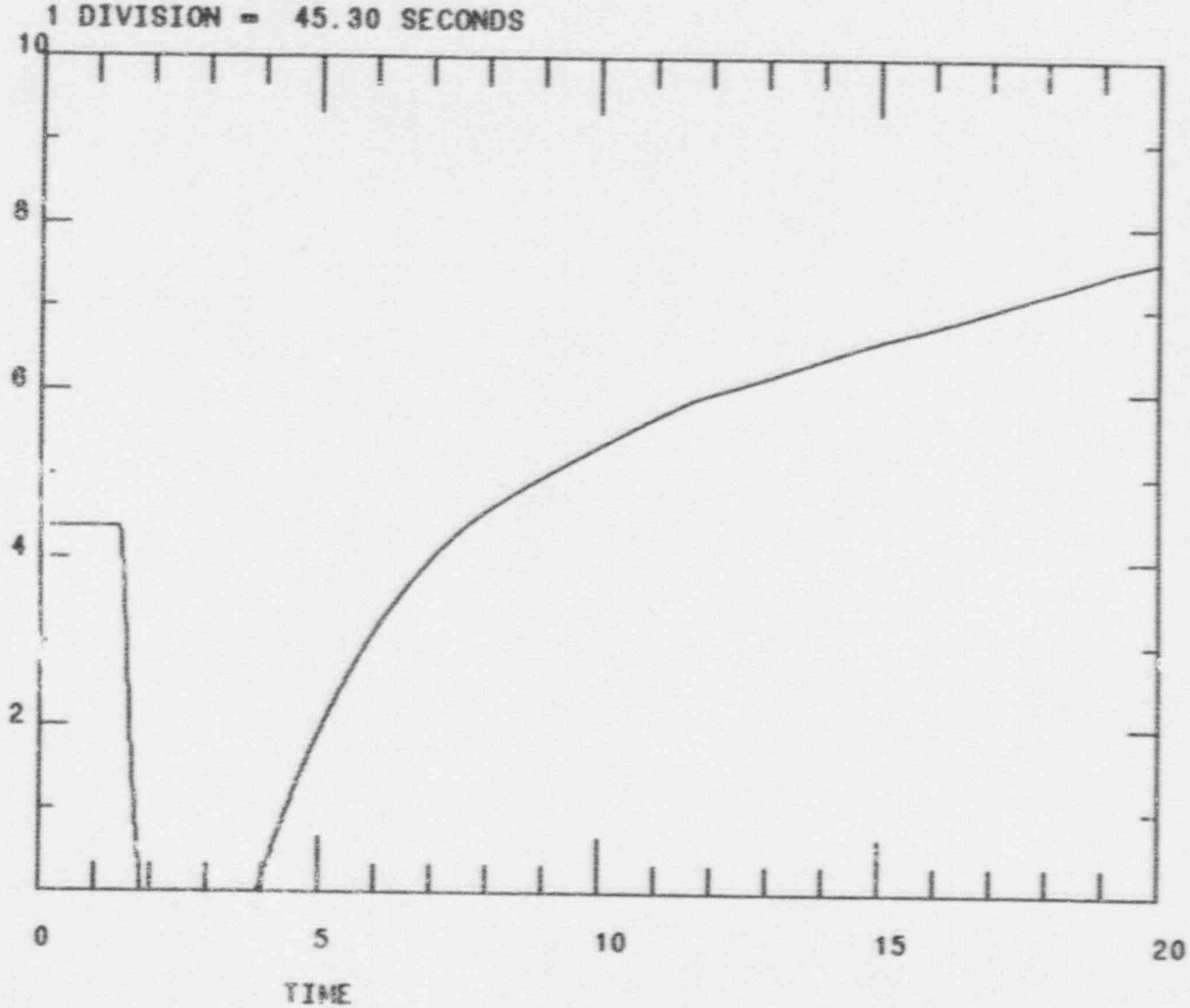
R E [illegible]

T P [illegible]

James J Madden

COMMENTS :

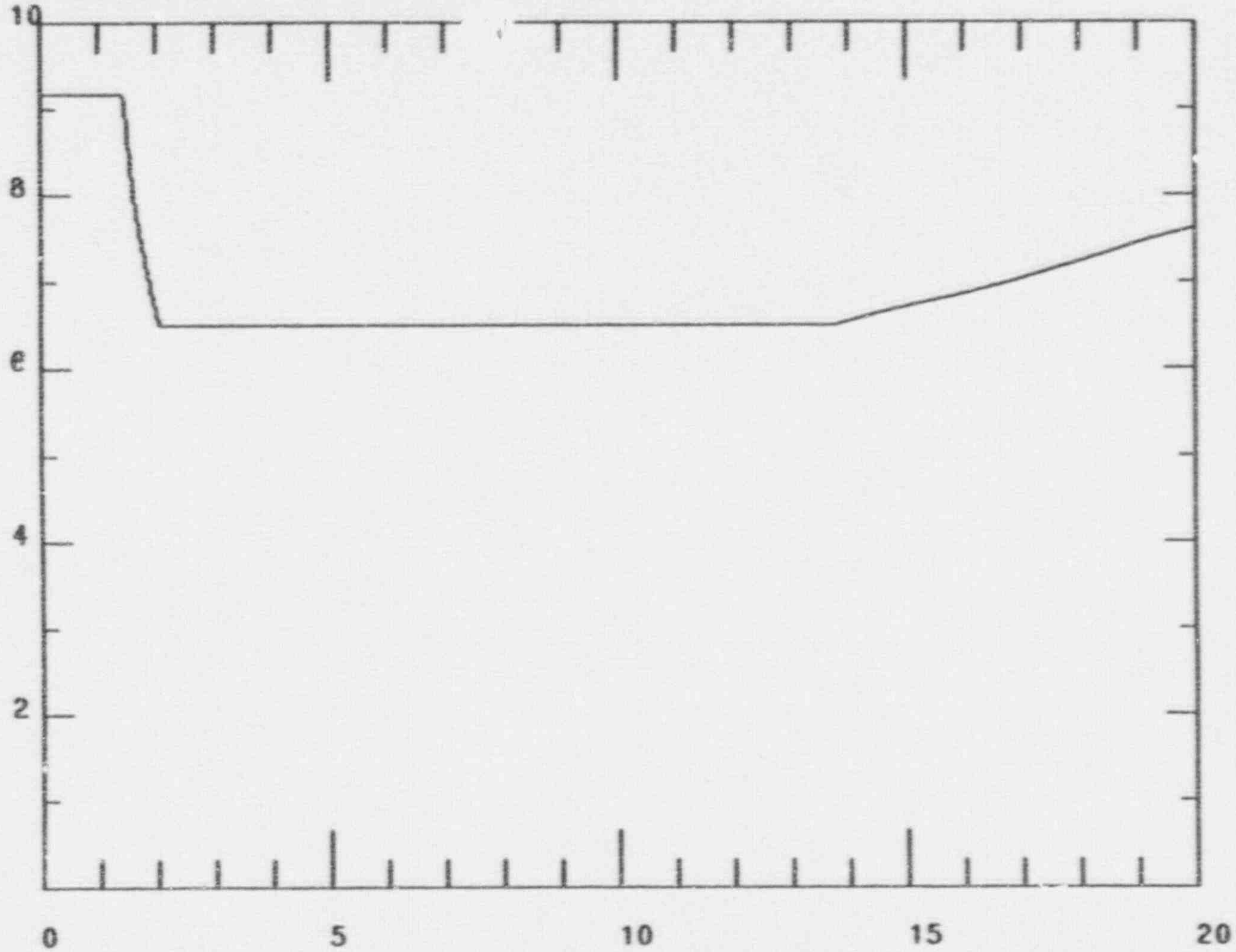
7217***MAX SIZE UNISOLABLE STEAMLINE RUPTURE   01/09/81 22:08:44



YCL0480   (.000 , 100.) 06950 PRESSURIZER 1 LEVEL

7217***MAX SIZE UNISOLABLE STEAMLINE RUPTURE 01/09/91 20:49:21

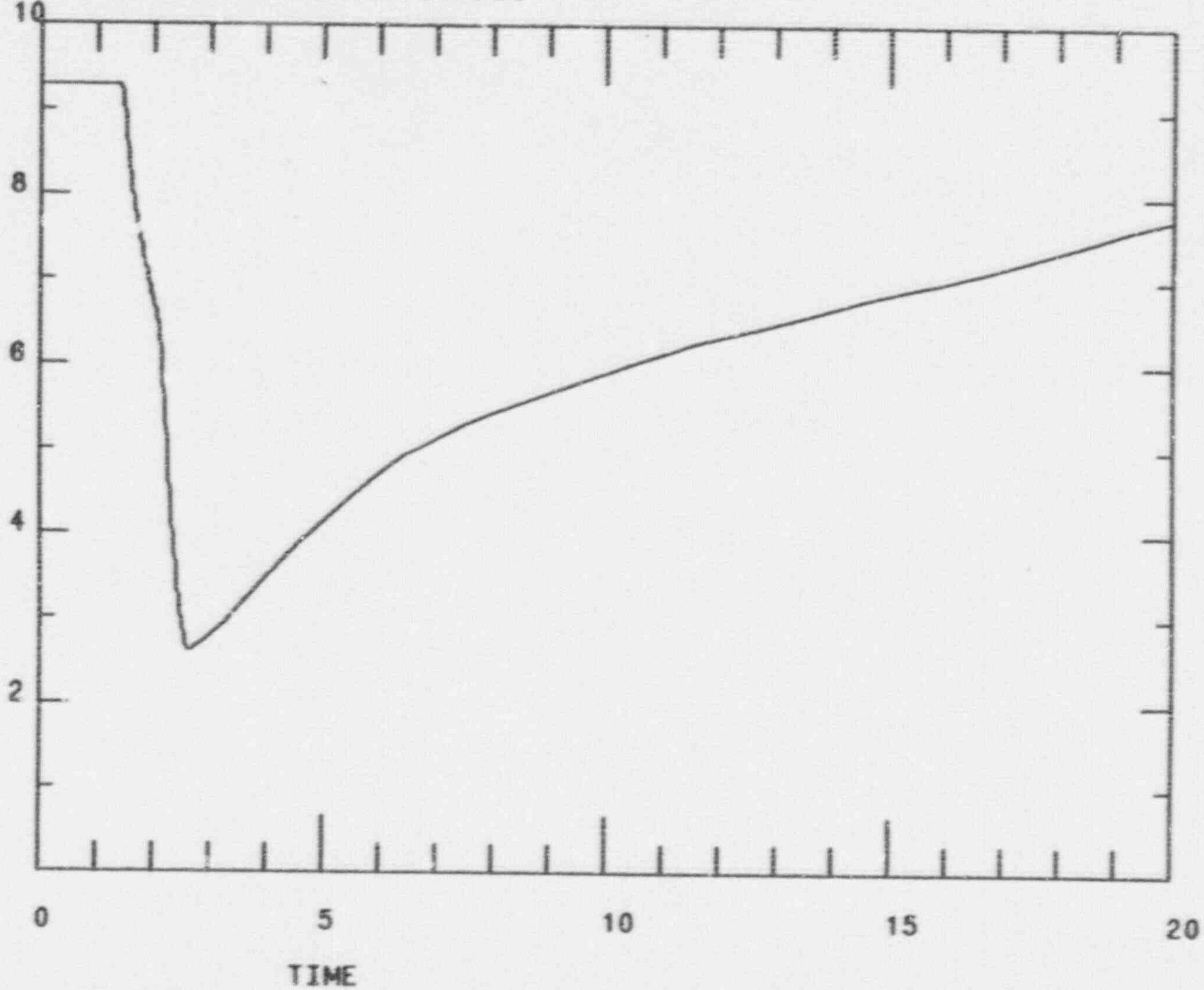
1 DIVISION = 45.30 SECONDS



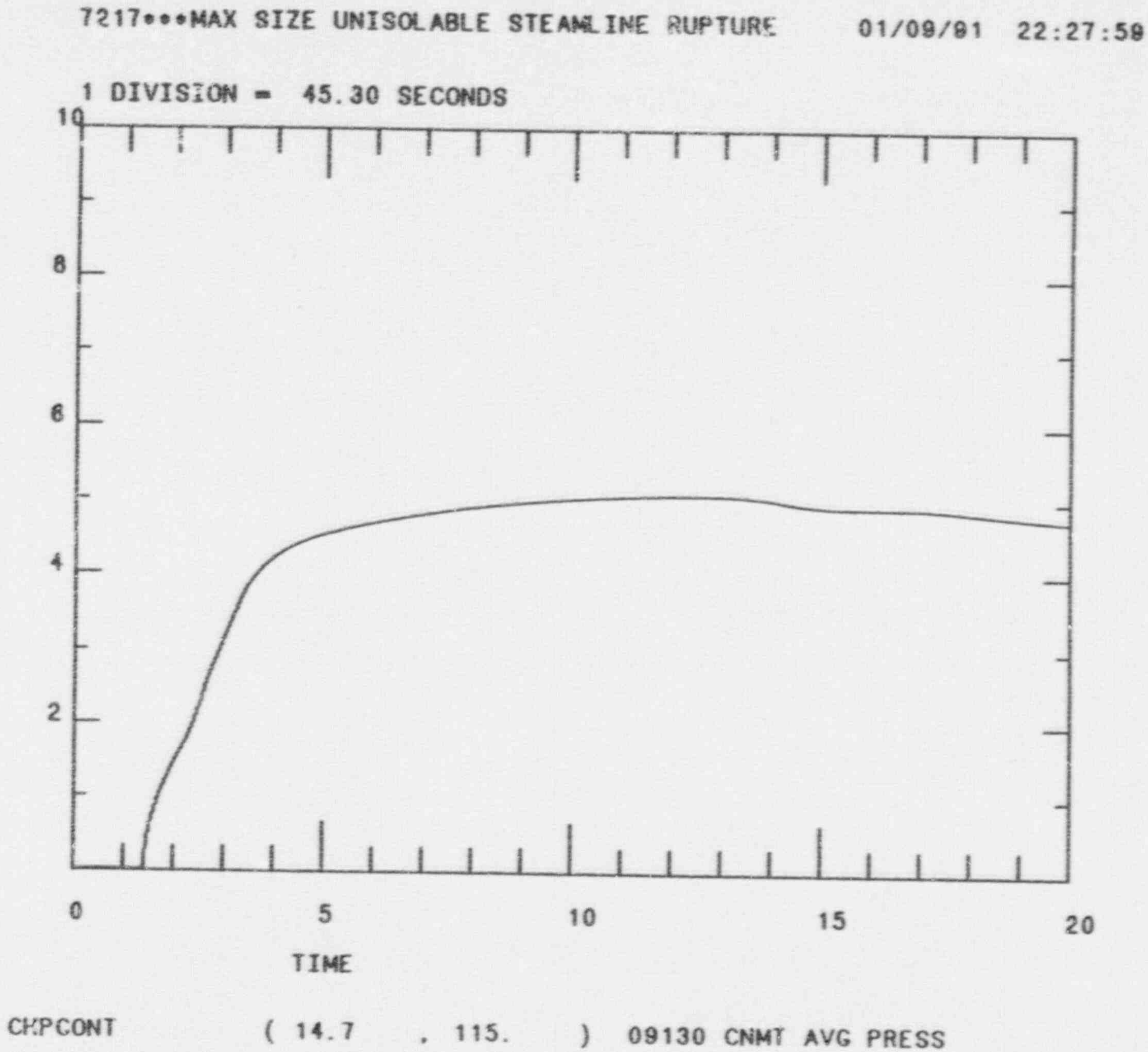
YCP0480 (400. , .240E+04) 07330 PRESSURIZER 1 PRESSURE

7217***MAX SIZE UNISOLABLE STEAMLINE RUPTURE 01/09/91 22:23:28

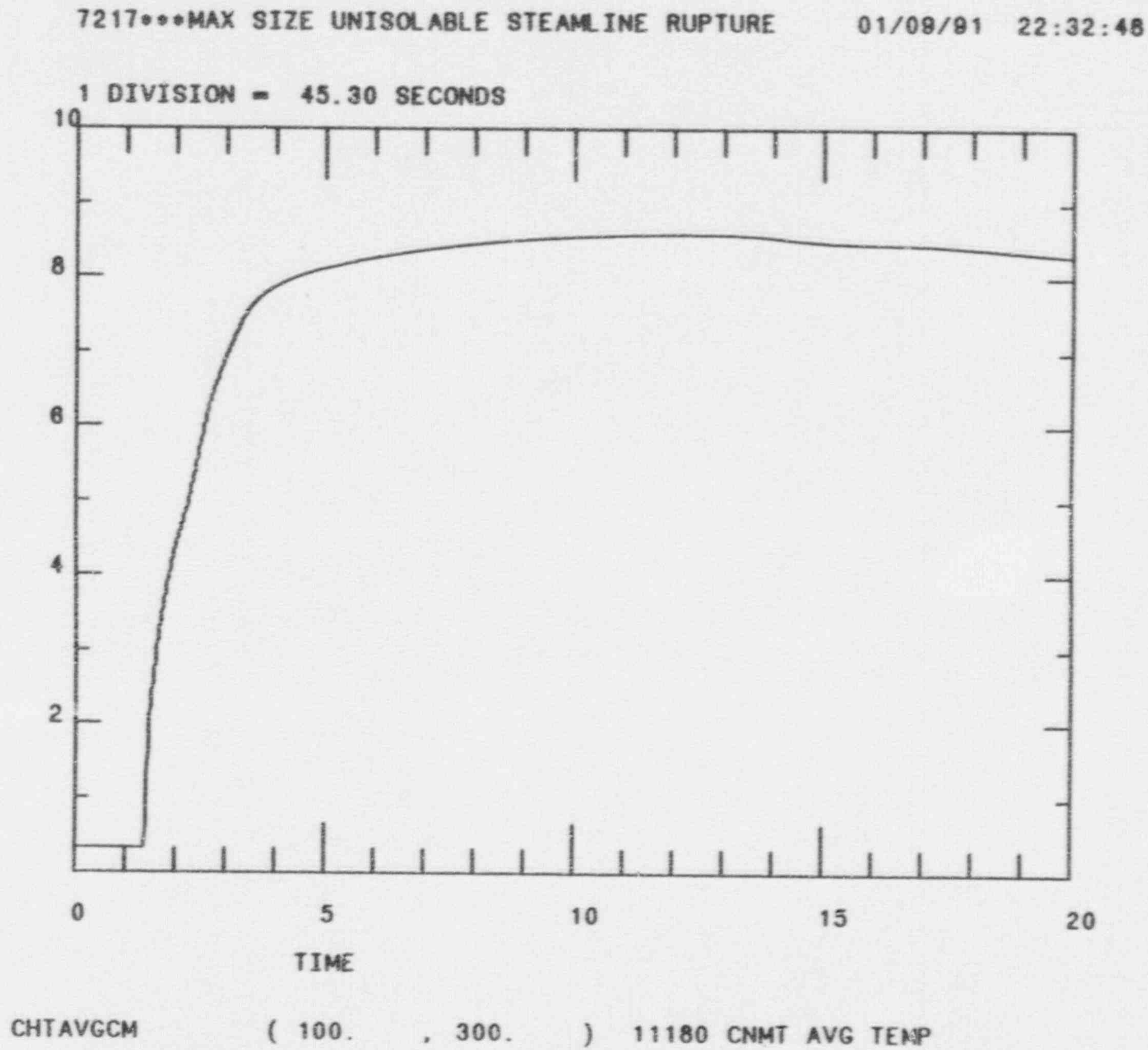
1 DIVISION = 45.30 SECONDS



THPHL(3) (400. , .240E+04) 65100 HOT LEG PRESSURE

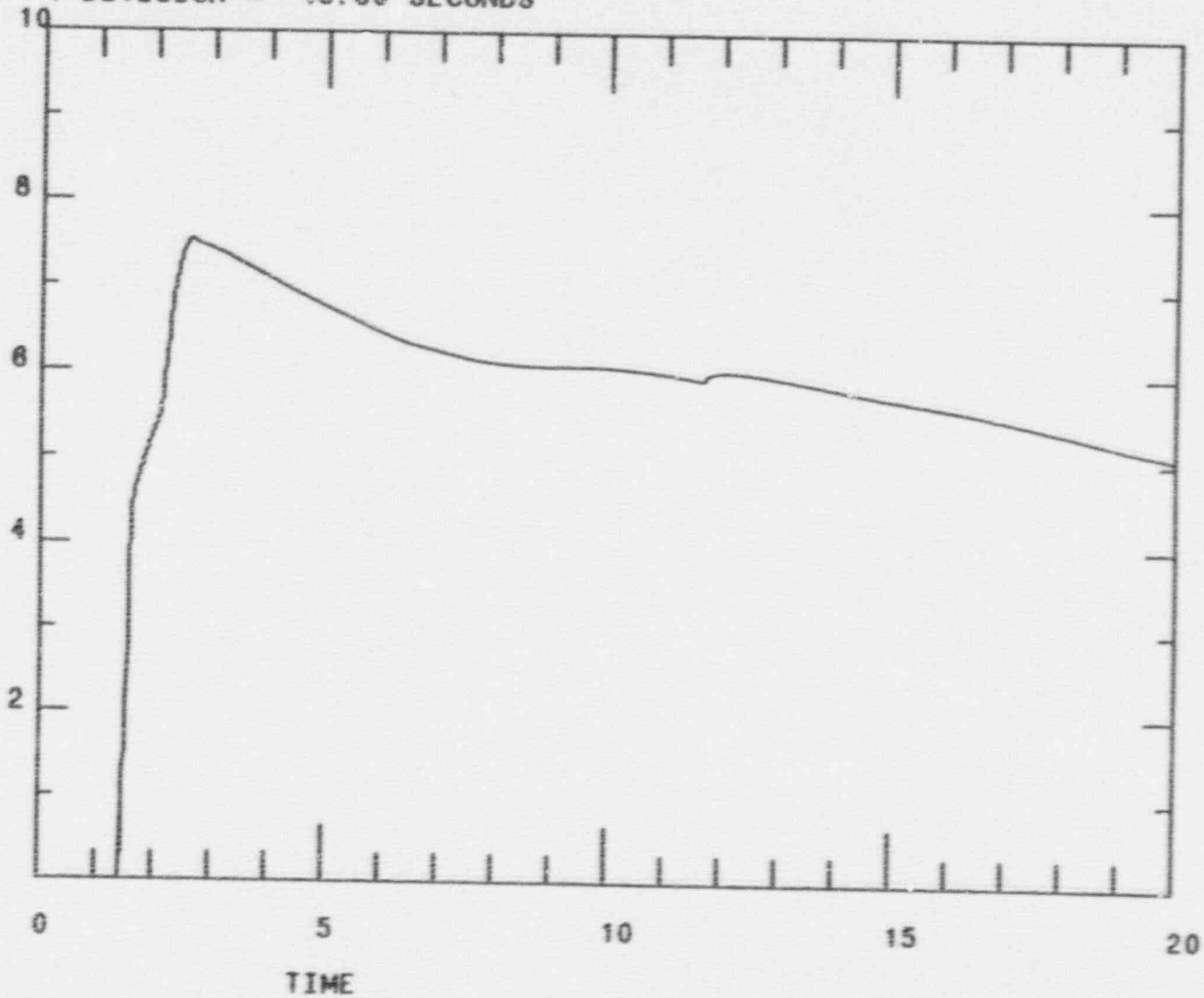


7217***MAX SIZE UNISOLABLE STEAMLINE RUPTURE 01/09/81 22:27:59
1 DIVISION = 45.30 SECONDS
10
8
6
4
2
0
5
10
15
20
TIME
CHPCONT (14.7 , 115.) 09130 CNMT AVG PRESS



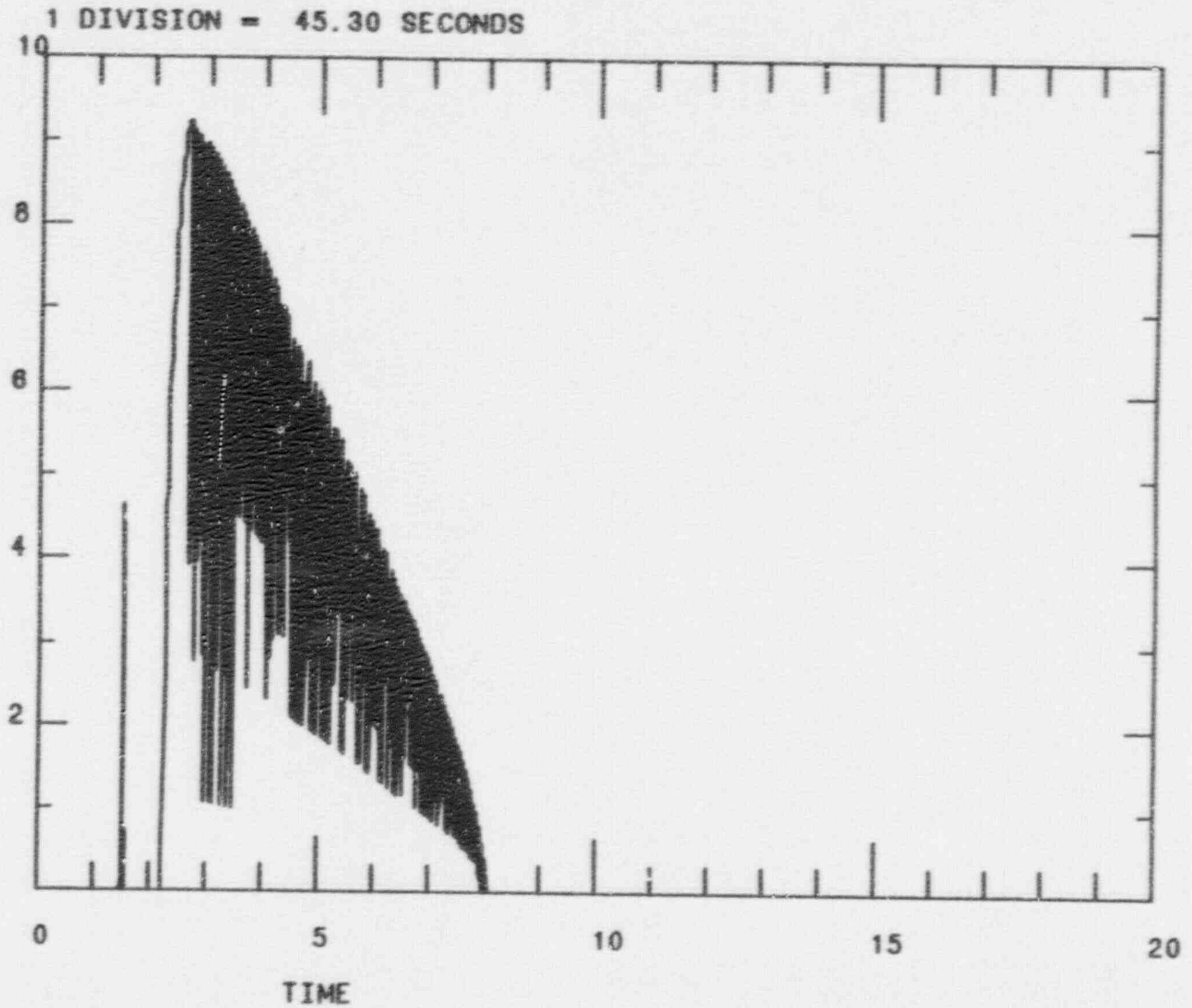
7217***MAX SIZE UNISOLABLE STEAMLINE RUPTURE 01/09/91 22:32:48
1 DIVISION = 45.30 SECONDS
10
8
6
4
2
0
5
10
15
20
TIME
CHTAVGCM (100. , 300.) 11180 CNMT AVG TEMP

7217***MAX SIZE UNISOLABLE STEAMLINE RUPTURE 01/09/81 22:39:36



CVFBI~IN (.000 , 100.) 15020THRU BIT LINE INLET

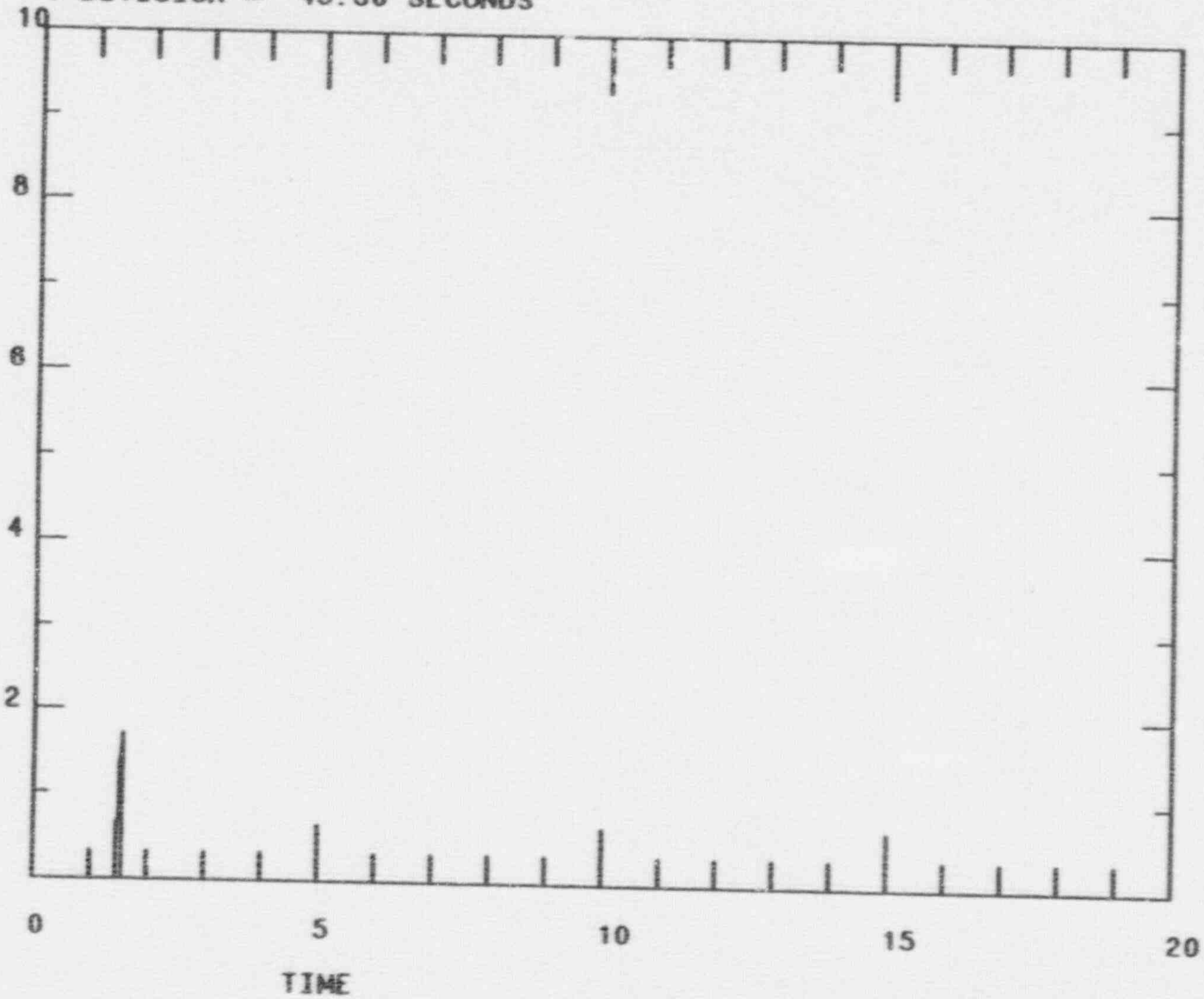
7217***MAX SIZE UNISOLABLE STEAMLINE RUPTURE   01/08/81 22:50:07



SIF10   (.000 , 50.0) 03020 SI FLOWNET PATH 10 FLOW

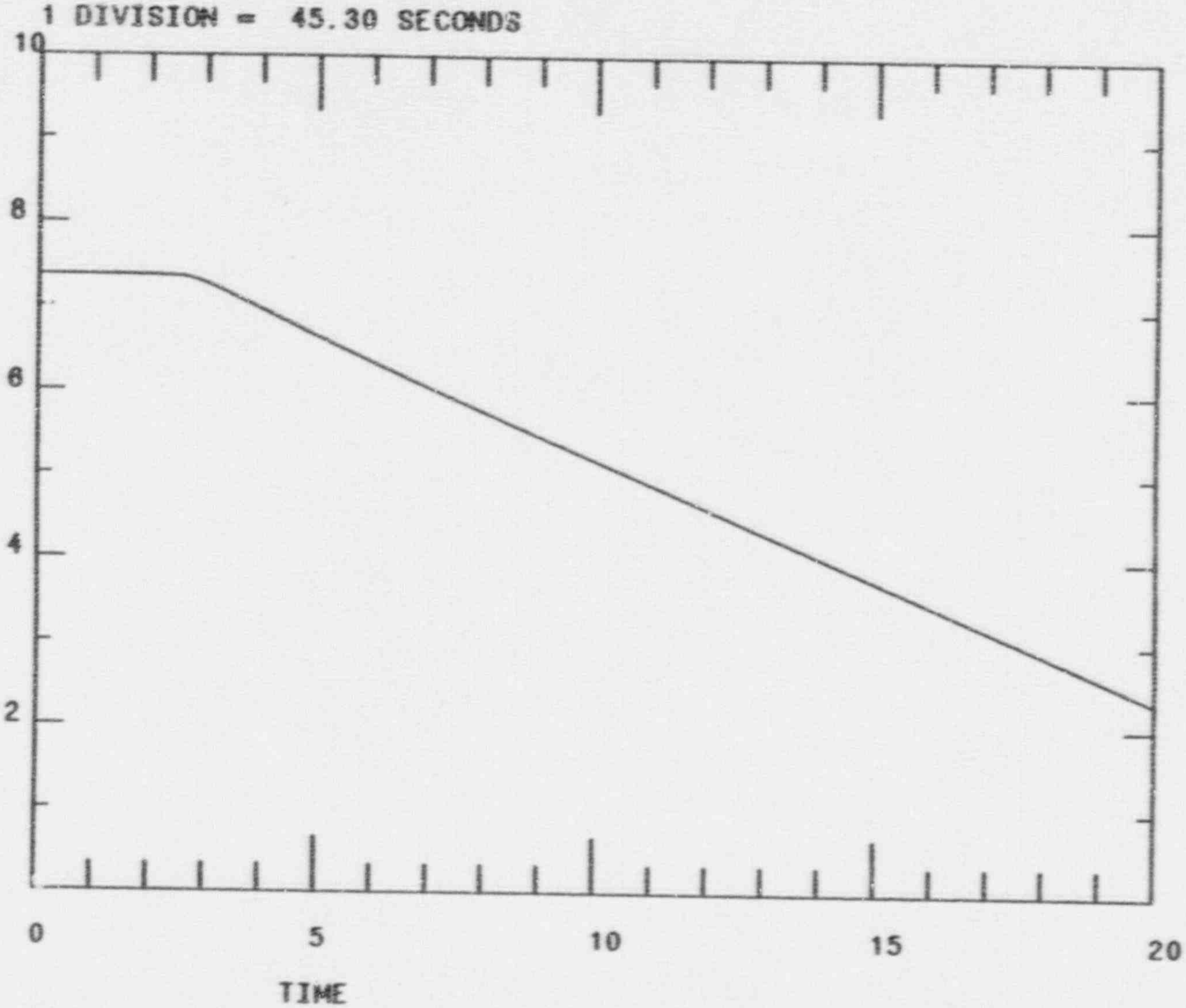
7217***MAX SIZE UNISOLABLE STEAMLINE RUPTURE 01/09/81 22:59:03

1 DIVISION = 45.30 SECONDS



RHF18 (.000 . 10.0) 03020 RH FLOWNET F18

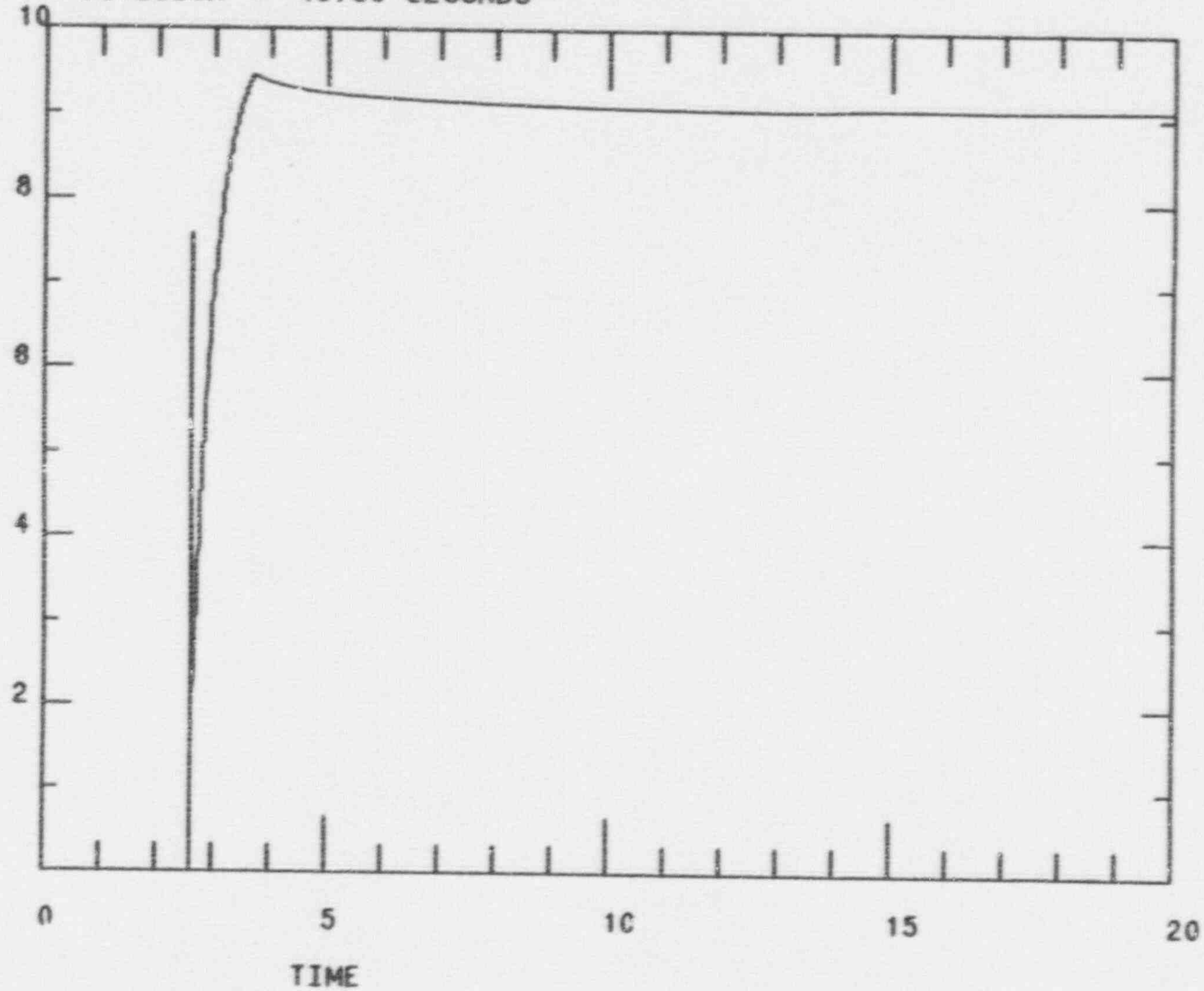
7217***MAX SIZE UNISOLABLE STEAMLINE RUPTURE 01/09/91 23:05:29



SILRWST (20.0 . 40.0) 05130 RWST LEVEL

7217•••MAX SIZE UNISOLABLE STEAMLINE RUPTURE   01/09/91 23:14:43

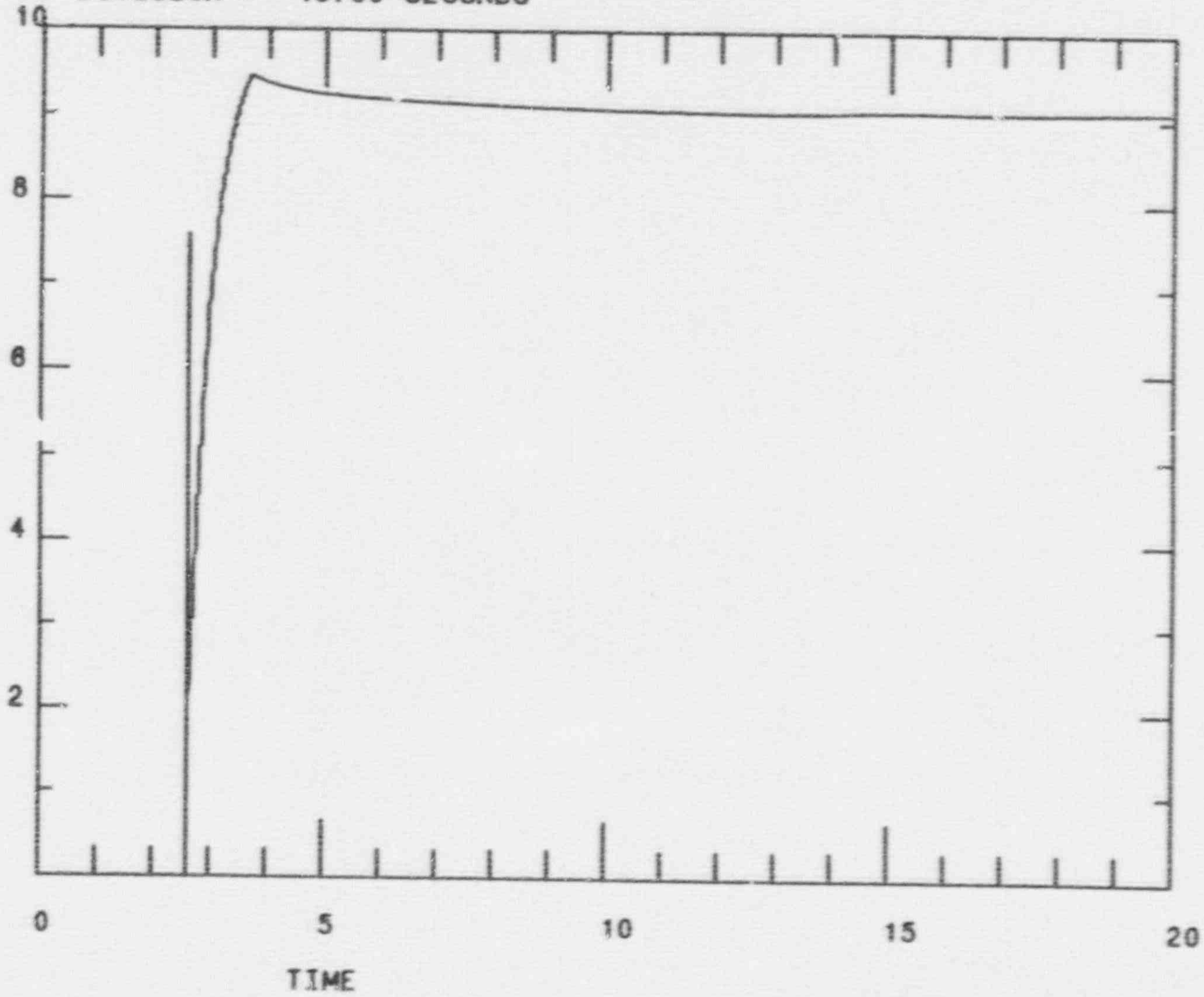
1 DIVISION = 45.30 SECONDS



CSF1A5   (.000   , 400.   ) 03020 CNMT SPRAY LP 1A F5

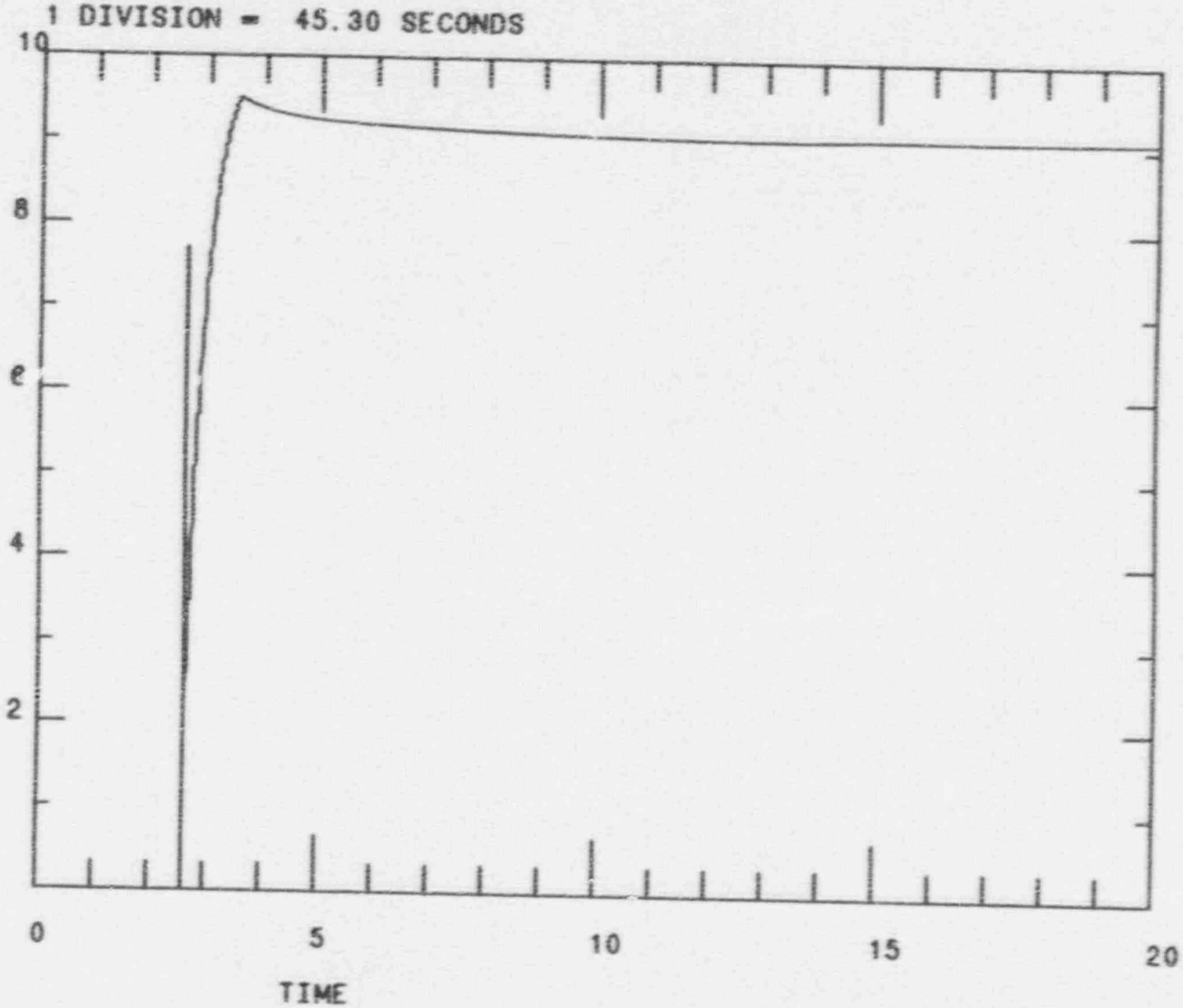
7217***MAX SIZE UNISOLABLE STEAMLINE RUPTURE 01/09/91 23:19:56

1 DIVISION = 45.30 SECONDS

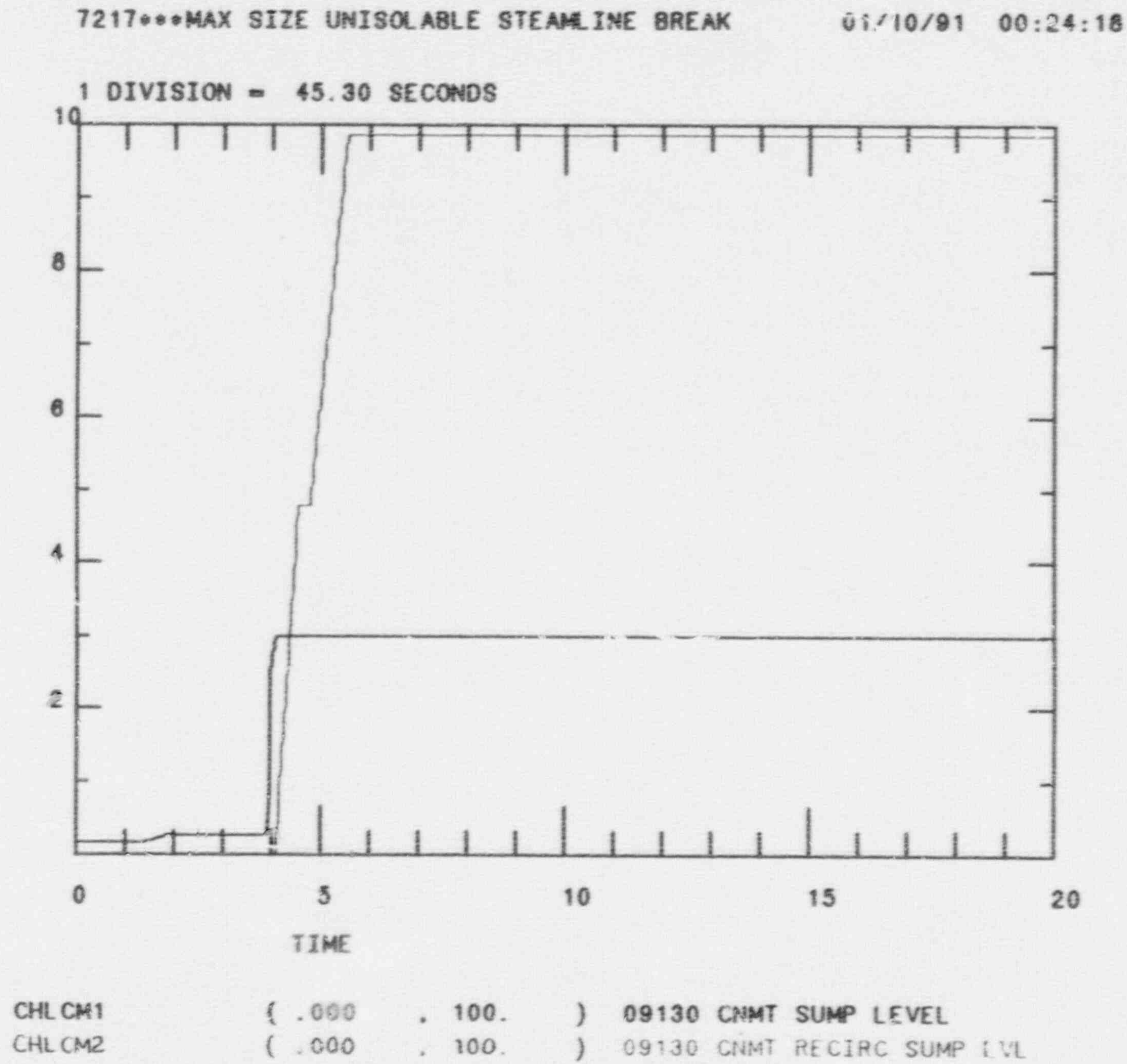


CSF1B4 (.000 , 400.) 06020 CNMT SPRAY 1B LP F4

7217***MAX SIZE UNISOLABLF STEAMLINE RUPTURE   01/09/91 23:33:55



CSF1C4   (.000   , 400.   ) 09020 CNMT SPRAY 1C LP F4


7217***MAX SIZE UNISOLABLE STEAMLINE BREAK
01/10/91 00:24:18
1 DIVISION = 45.30 SECONDS
10
8
6
4
2
0
5
10
15
20
TIME
CHLCM1 (.000 . 100.) 09130 CNMT SUMP LEVEL
CHLCM2 (.000 . 100.) 09130 CNMT RECIRC SUMP LVL

ZION SIMULATOR TRANSIENT TEST

SLOW PRIMARY PLANT DEPRESSURIZATION TO SATURATED CONDITION USING PRESSURIZER RELIEF OR SAFETY VALVE STUCK OPEN (INHIBITED ACTIVATION OF HIGH HEAD ECCS)

The Slow Primary Plant Depressurization to Saturated Condition Using Pressurizer Relief or Safety Valve Stuck Open (High Head ECCS Inhibited) was performed from a beginning of core, 100% power, initial condition (IC 37). Both Centrifugal Charging Pumps were placed in Pull-To-Lock. Malfunction TH15A was inserted at 100% to fail pressurizer safety valve 1RC8010A fully open. The transient was run until pressure stabilized at saturated conditions. Data was collected in accordance with ANSI-3.5-1985 Appendix B 2.2.4.

The test results were reviewed and found satisfactory.

Collected and Plotted Data:

1. THFRC8010A - Flow through valve 1RC8010A
2. YCL0480 - Pressurizer Level
3. YCP0480 - Pressurizer Pressure
4. YCT0480 - Pressurizer Liquid Temperature
5. YCF0400/420/440/460 - RCS Loop 1-4 Flow
6. YCT0482 - Pressurizer Surge Line Temperature
7. THTHLRTD(4) - Loop B Hot Leg Temperature
8. YCN0031 - Source Range Detector 31 Counts
9. YCY9073 - RVLIS - Narrow Range Level
10. THPHL(3) - Hot Leg Pressure (RH Pump Suction Pressure)

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Slow Primary Depress to Sat. **DATE :** 02/06/91

1. **Data utilized for test comparison in order of preference (circle appropriate choices)**

   a. **Actual Plant Transient Data** **Event :**__________

   b. **Analytical or design data** **Data :** __________

   c. **Transient Data from similar plant** **Plant :** __________

   d. **Panel of experts (best estimate)**

COMMENTS : NONE

2. **Data Comparison Summary**

VARIABLE	COMMENTS	RESOLUTION
Safety Flow	NONE	Accepted
Pzr Level	NONE	Accepted
Pzr Pressure	NONE	Accepted
Pzr Temp	NONE	Accepted
RCP Flows	NONE	Accepted
Surg Ln Temp	Dip in surge line temp can't be fully explained	Accepted
HL Temp's	NONE	Accepted
Source Range	NONE	Accepted
RVLIS NR	NONE	Accepted
WR pressure	NONE	Accepted

ZION SIMULATOR
TRANSIENT TEST REVIEW

TRANSIENT TEST : Slow Primary Depress to Sat DATE : 02/06/91

VARIABLE	COMMENTS	RESOLUTION

3. Comparison Results

Simulator capability to reproduce the defined transient: (circle one)

a. ACCEPTABLE

b. UNACCEPTABLE

4. Review Board Signatures (differing opinions must be documented)

Donald E Phillips

Paul E Pirsson

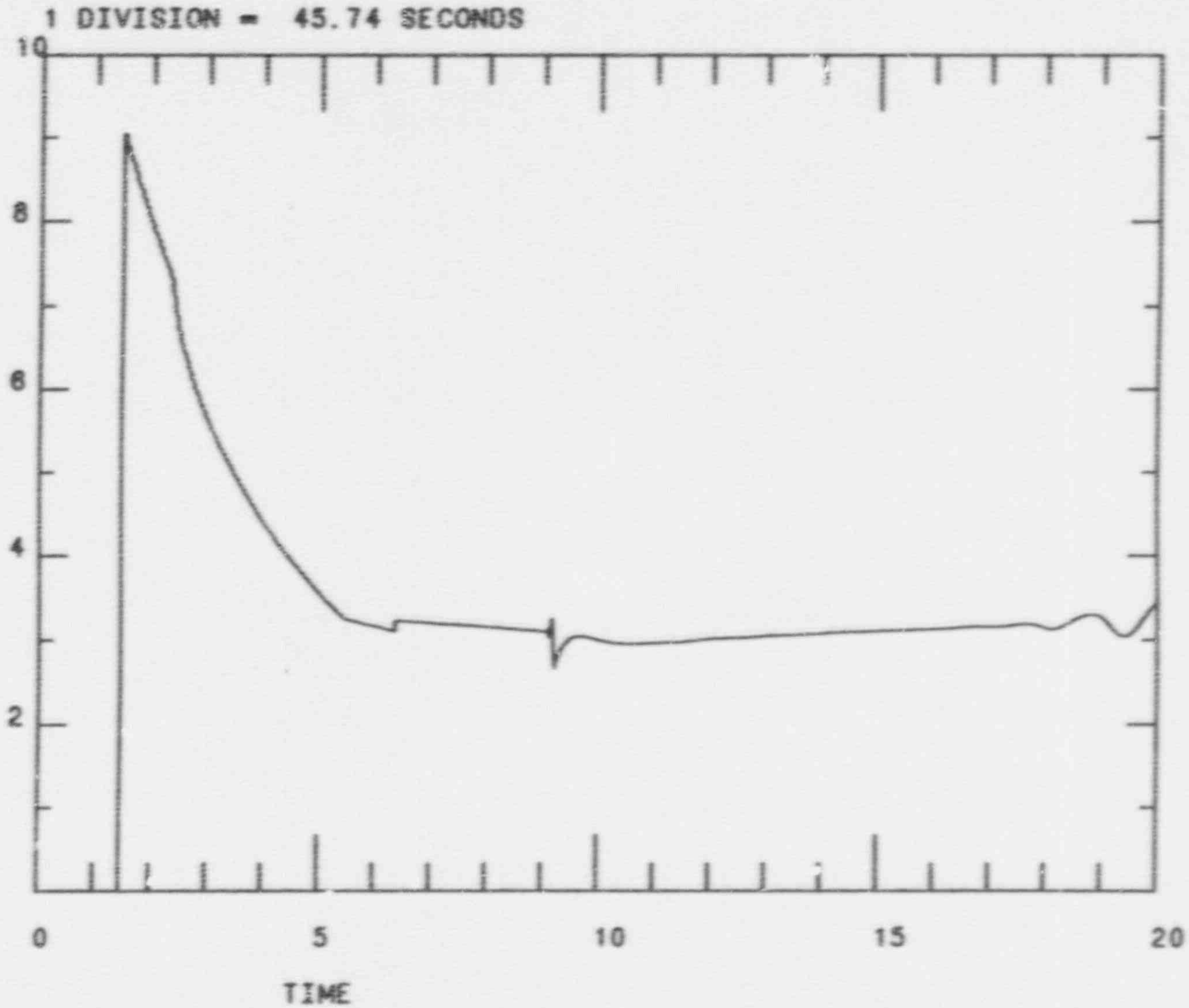
R. E. Lundin

J P Callens

James J Madden

COMMENTS :

7218•••PZR SAF STUCK OPEN W/ HI HEAD ECCS INHIB 01/10/91 00:38:44



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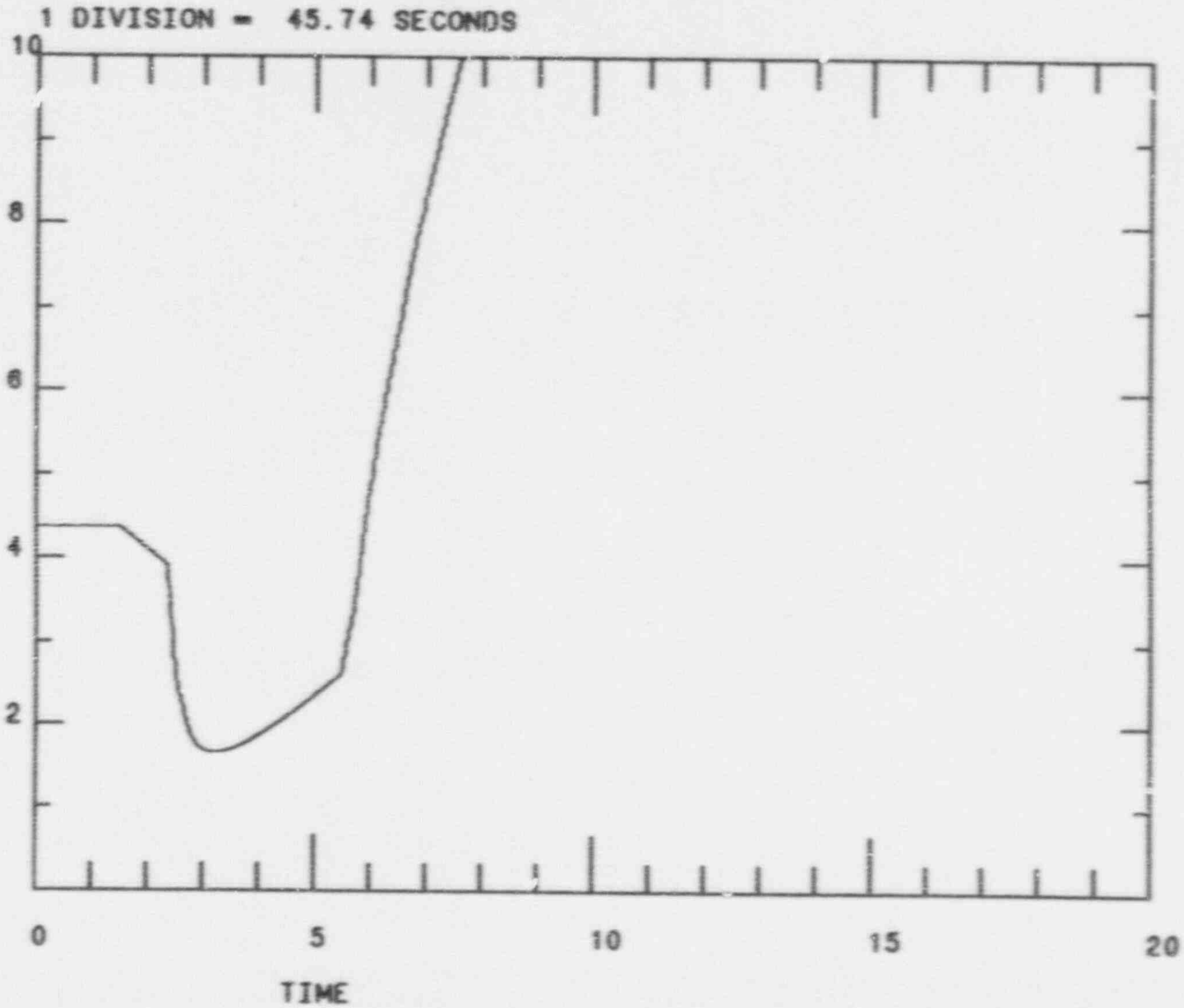

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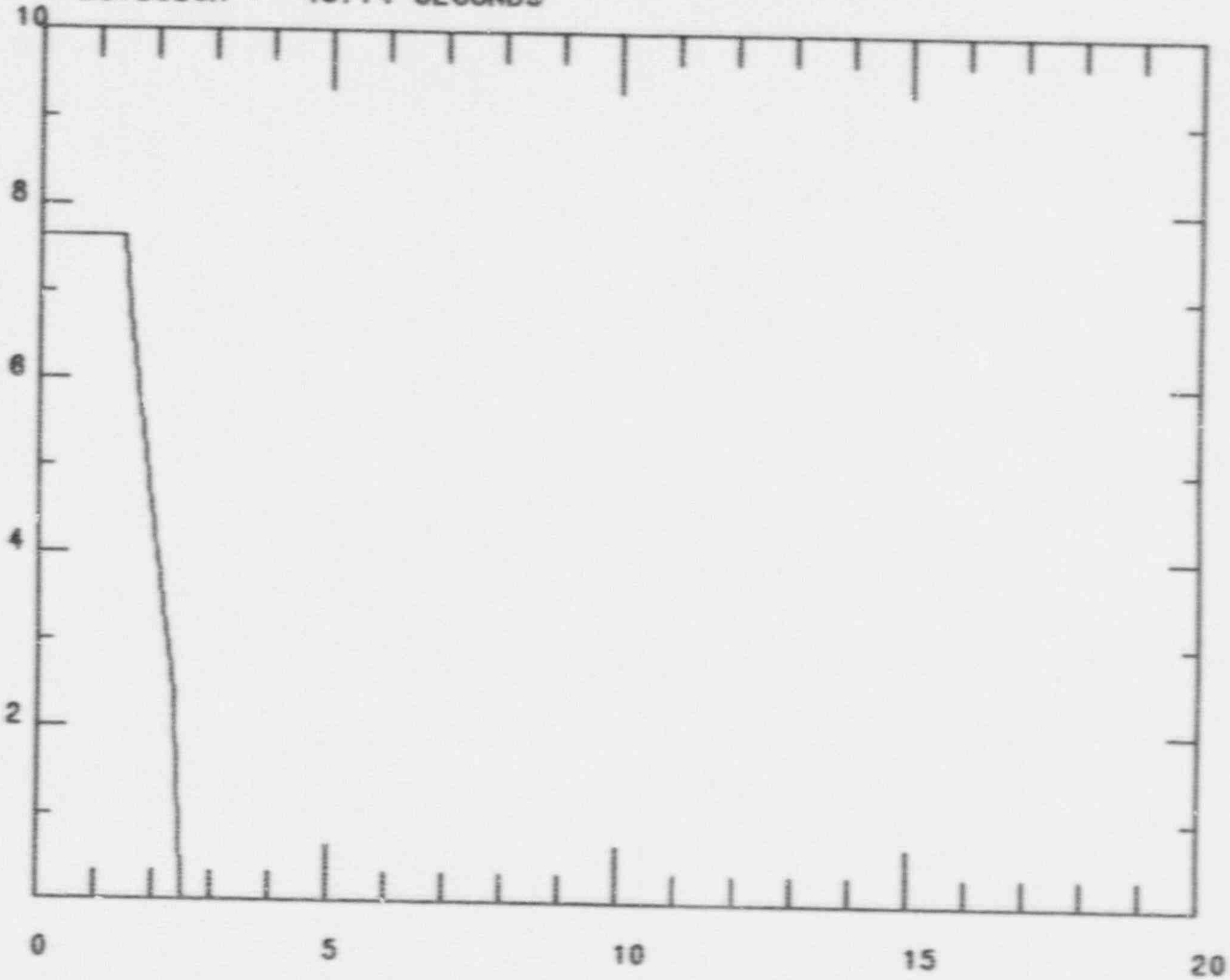
1 DIVISION = 45.74 SECONDS



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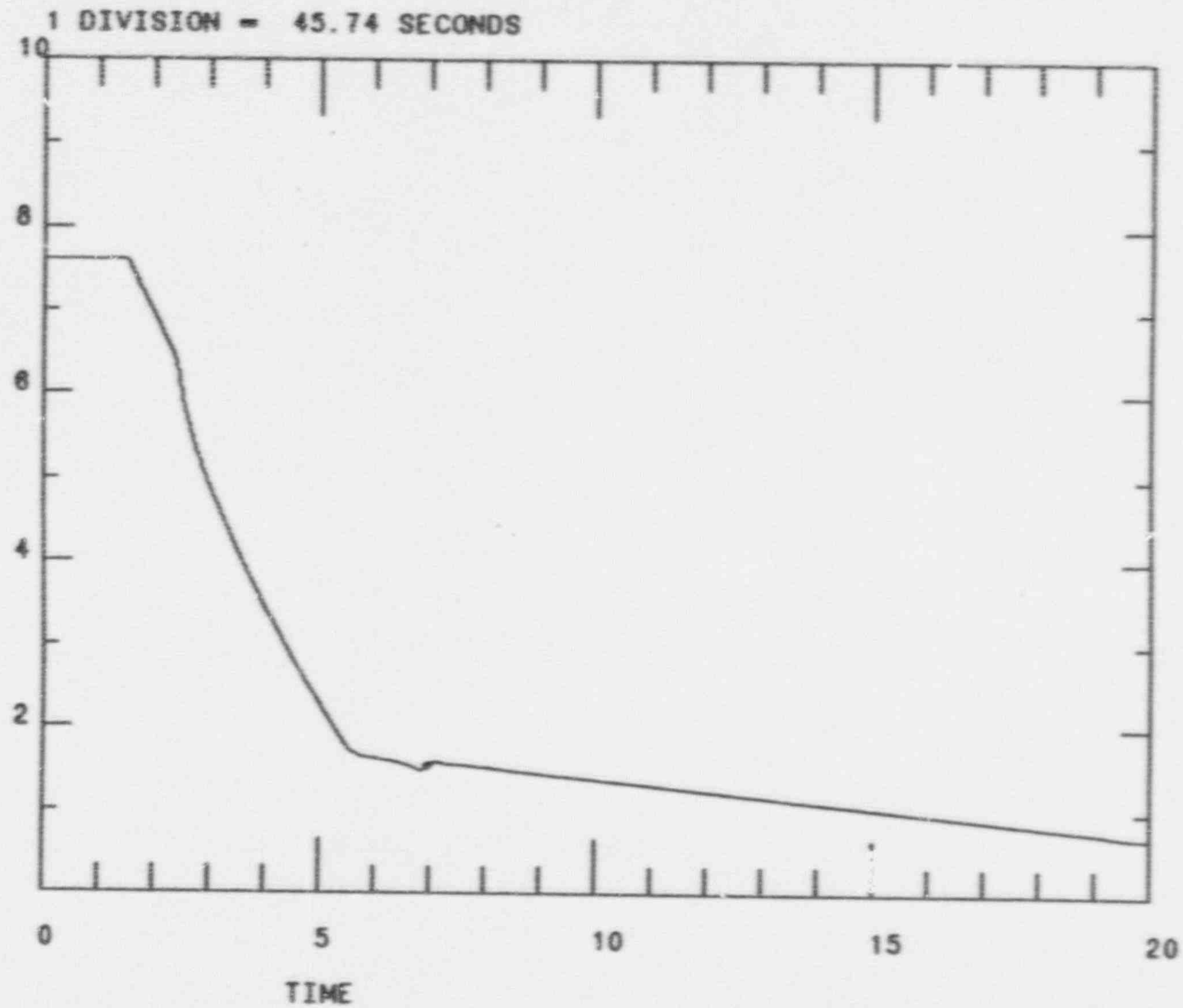

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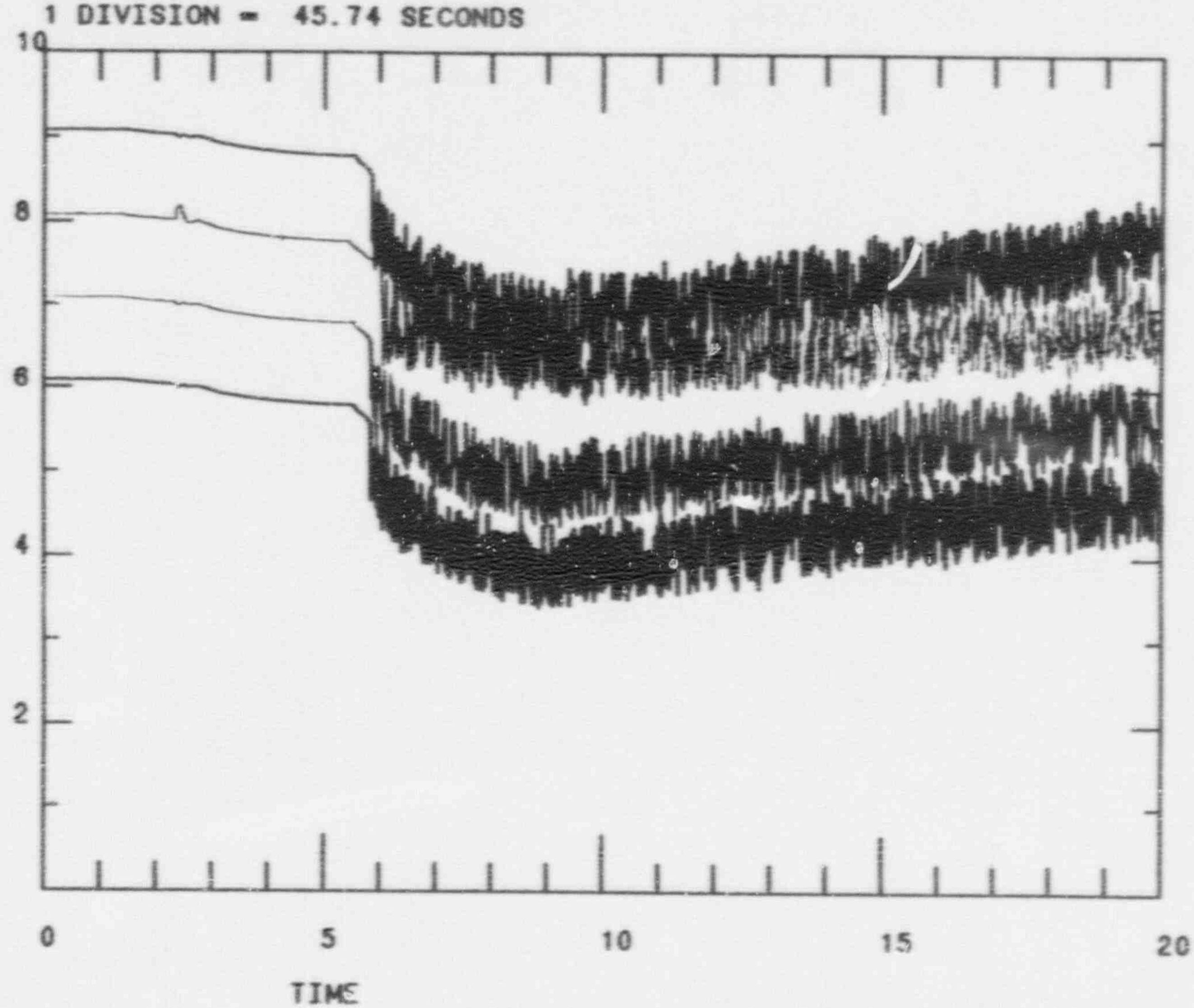
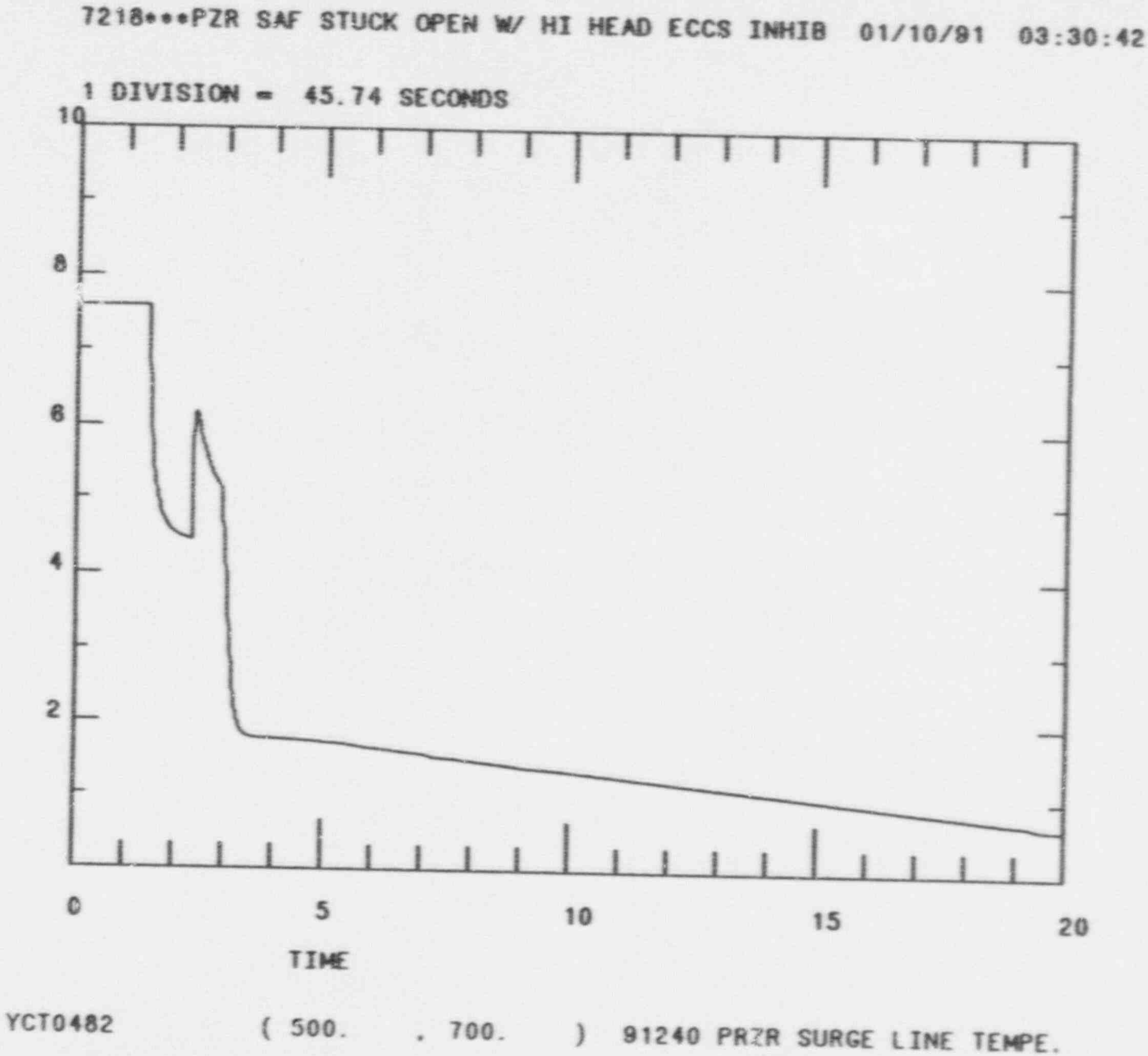


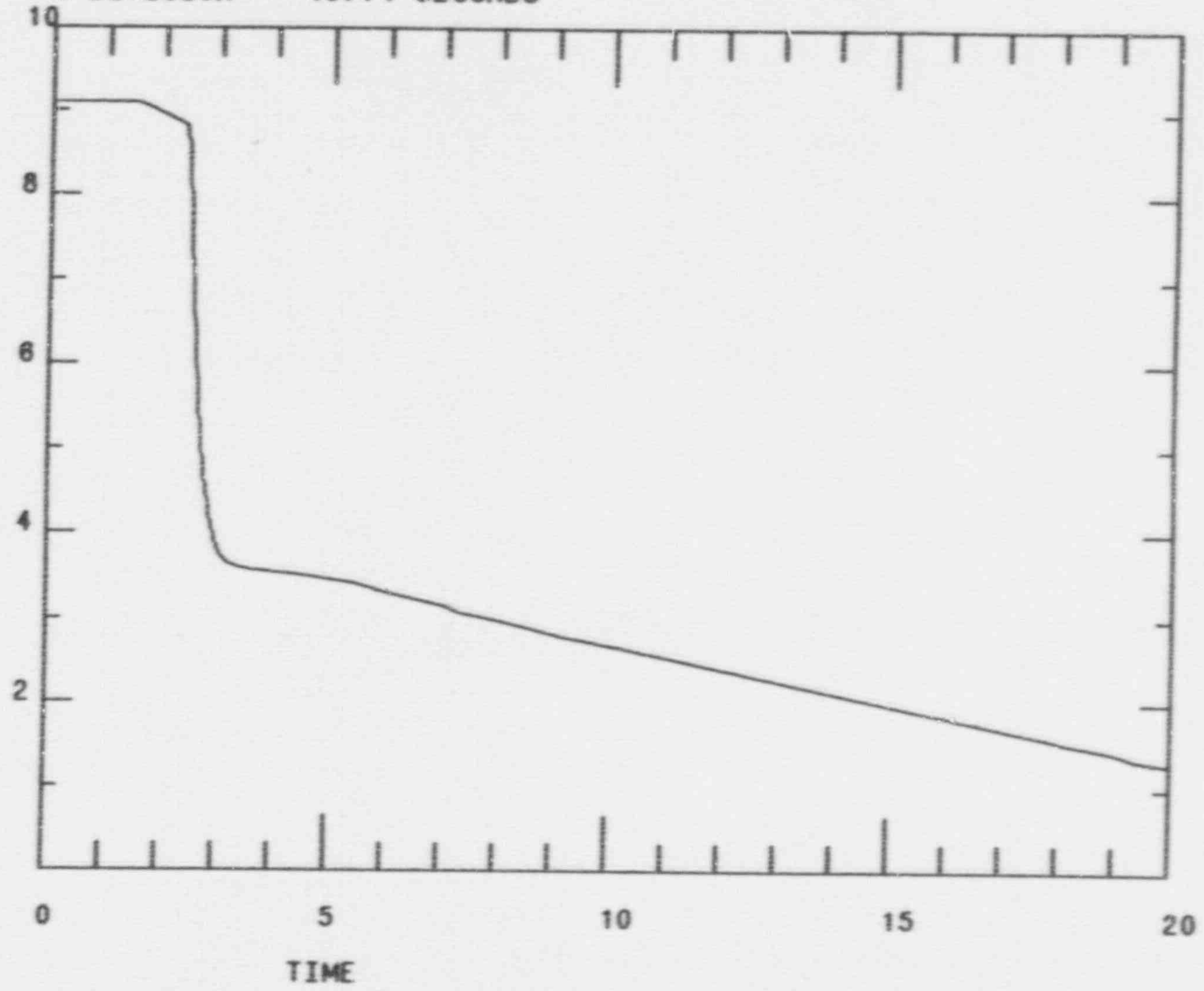
YCF0400	(55.0	. 105.	)	06220 RCLA 1 FLOW
[illegible]	(60.0	. 110.	)	06270 RCLB 1 FLOW
YCF0440	(65.0	. 115.	)	06310 RCLC 1 FLOW
YCF0460	(70.0	. 120.	)	06360 RCLD 1 FLOW



7218***PZR SAF STUCK OPEN W/ HI HEAD ECCS INHIB 01/10/91 03:30:42
1 DIVISION = 45.74 SECONDS
10
8
6
4
2
0
5
10
15
20
TIME
YCT0482 (500. , 700.) 91240 PRZR SURGE LINE TEMPE.

7218•••PZR SAF STUCK OPEN W/ HI HEAD ECCS INHIB 01/10/91 03:41:12

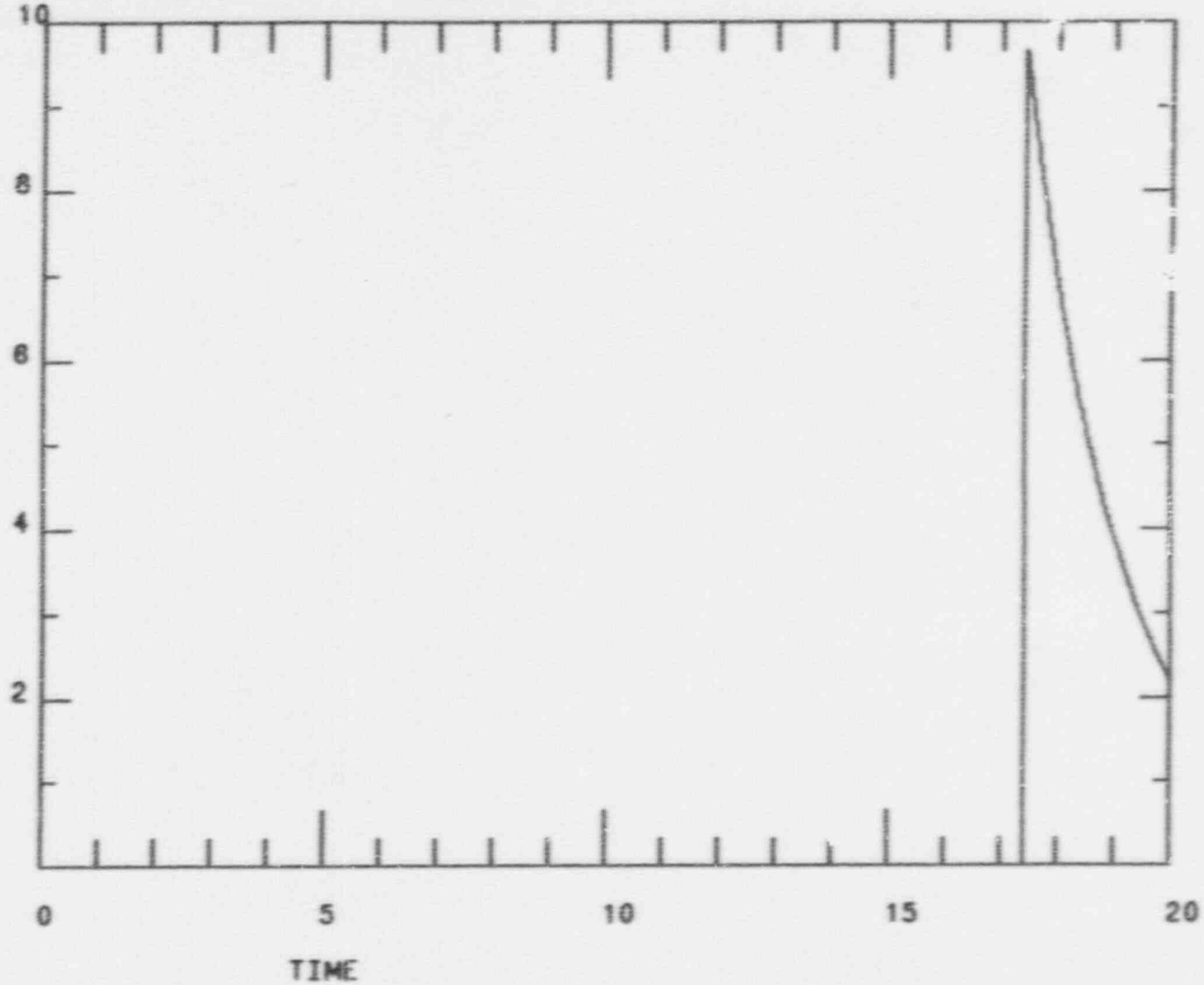
1 DIVISION = 45.74 SECONDS



THTHLRTD(4) (500. . 600.) 65210 RC HOT LEG RTD TEMP.

7218***PZR SAF STUCK OPEN W/ HI HEAD ECCS INHIB 01/1[illegible]/91 J3:56:28

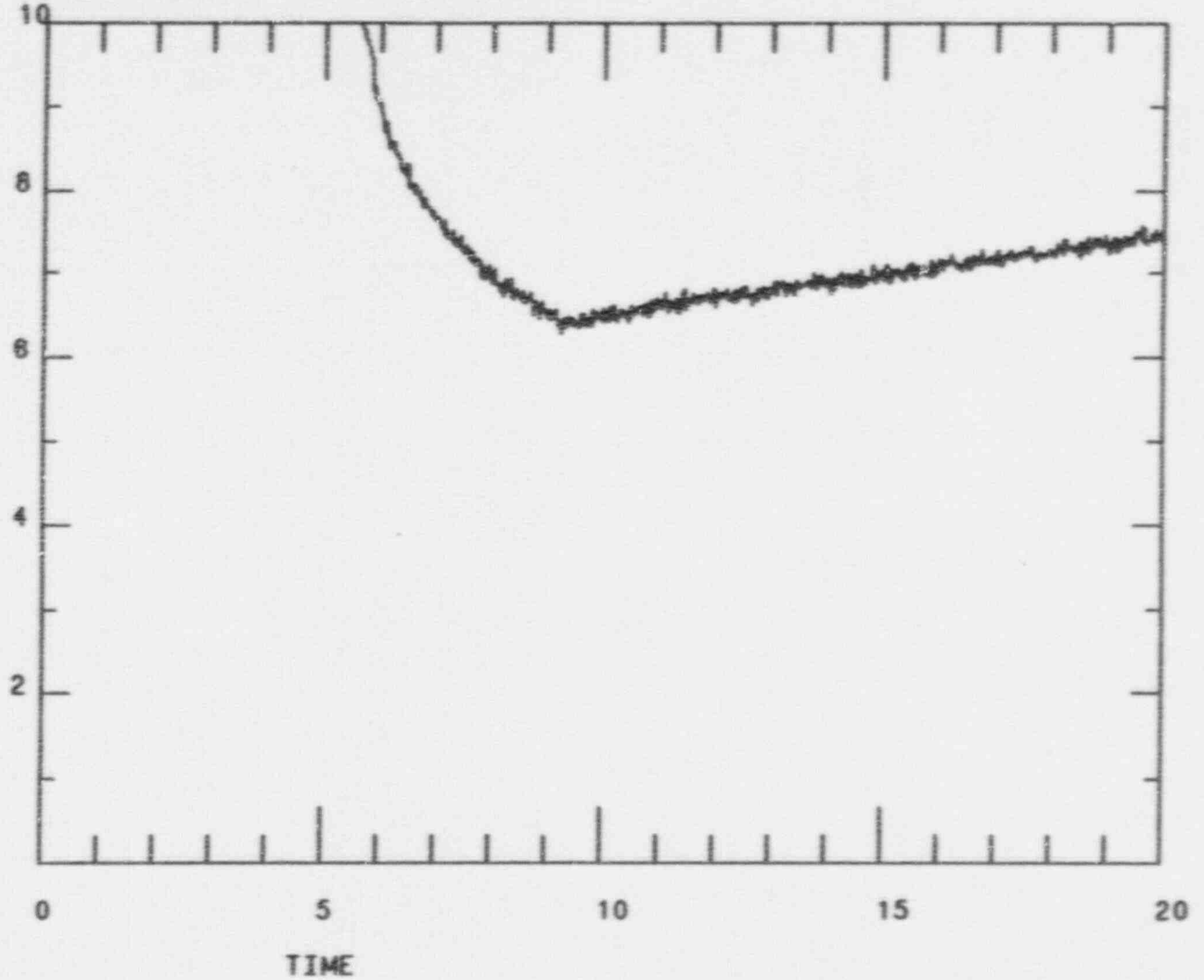
1 DIVISION = 45.74 SECONDS



YCN0031   (.000   , .200E+04) 21140 SOURCE RANGE DET 31 COUN

7218***PZR SAF STUCK OPEN W/ HI HEAD ECCS INHIB 01/10/81 04:49:58

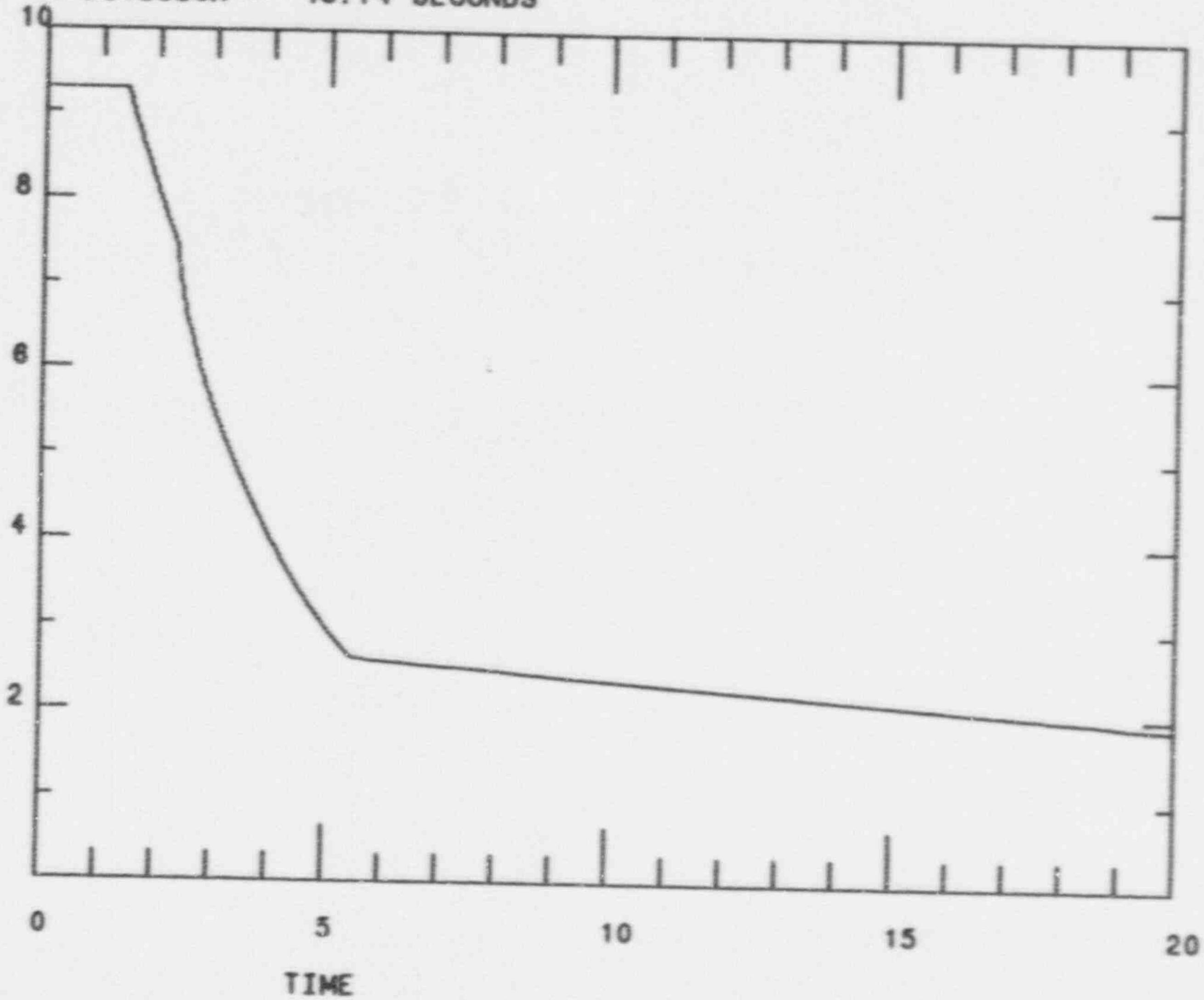
1 DIVISION = 45.74 SECONDS



YCY9073 (80.0 , 100.) 91360 RVLIS-NARROW RANGE LEVEL

7218***PZR SAF STUCK OPEN W/ HI HEAD ECCS INHIB 01/10/91 03:05:44

1 DIVISION = 45.74 SECONDS



THPHL(3) (400. , .240E+04) 65100 HOT LEG PRESSURE

ATTACHMENT 3
SIMULATOR RELATED
WORK REQUEST PROCEDURE

SIMULATOR WORK REQUEST PROCEDURE

A. Purpose

The purpose of this procedure is to delineate the method used to track, review, approve, implement, and test hardware maintenance, software maintenance, and changes to Production Training Department Simulators.

B. References

1. INPO TQ-504: Simulator Configuration Management - Good Practices
2. PTAO-100: Configuration Management Control
3. PTAO-104: Simulator Review Board Procedure
4. Operations Policy #1: Configuration Management
5. Operations Policy #2: Simulator Fidelity and Appearance
6. Conduct of Maintenance (Simulator Support Guideline - 1)
7. Total Job Management System User's Manual

C. Definitions:

1. Total Job Management System (TJM) - A CECO computer system used for controlling and tracking maintenance. It is accessed via a TSO terminal.
2. Minor Hardware Maintenance - Maintenance items associated only with hardware aspects of the simulator. Maintenance items that do NOT require parts to be withdrawn from the storeroom except as outlined below. Examples of minor maintenance:

a. Recorders

1) Repair/replacement of broken strings.

2) Correction of inking problems.

3) Repair/replacement of broken spring clips.

b. Lights

1) Replacement of broken light bulbs in sockets.

2) Removal of stuck light bulbs from sockets.

c. Miscellaneous

1) Cleaning of printers.

2) Cleaning of spilled ink on main control panels, etc.

3) Rehanging of existing labels and name tags that have become loose or fallen off.

4) Cleaning sticky and dirty switches.

D. Procedure

```
******************************************************************
*                                                                *
*                              NOTE                              *
*                                                                *
* The Simulator Work Request (PTAO-103T1) has block numbers which *
* are used to correlate procedure steps to the corresponding block *
* of the work request form.  In this procedure, numbers correspon- *
* ding to specific blocks of the Simulator Work Request are shown *
* in parenthesis.                                                *
*                                                                *
******************************************************************
```

1. Work Request Initiation

a. A work request may be initiated by any PTD staff member discovering a need for change or repair to simulator equipment or software. Trainees should be encouraged to bring potential simulator problems to the attention of their instructor through the use of verbal and written feedback.

b. The originator shall write the following information on the Simulator Work Request (PTAO-103T1):

1) Equipme t Name (1).

2) EID (Equipment Identification) Number (2). This number can be obtained from the TJM-EID printout located at the instructor station.

3) Location (3). The location can also be obtained from the TJM-EID printout. It is normally the panel on which the device in question is located.

4) Work Requested/Problem (4). Provide a full description of the requested work or problem encountered. Be as specific as possible. Include Disk #, IC #, and % PWR in the spaces provided. Sign and date in the space provided.

NOTE

Equipment tags may be used to identify hardware malfunctions (e.g. broken switch) or other problems as appropriate. Equipment tags are not to be used for design database problems. Applicable station procedures on the use of equipment tags may be used.

5) Fill out an equipment tag and hang the original copy on the panel near the affected equipment. The use of equipment tags is optional.

6) If an equipment tag is used, write the equipment tag number in the Tag No. block (5).

7) Route the work request to the Simulator Fidelity/Certification Coordinator (SFCC).

c. The SFCC shall perform the following:

1) Review the work request for applicability, clarity, accuracy, and legibility. If the work request is rejected or cancelled, mark it as such and return it to the originator along with the reason for its rejection or cancellation. Since no work request number has been assigned, the work request may be disposed of.

2) Enter the work request into TJM and obtain the assigned work request number and write the assigned number in the space provided (6).

3) Enter the work request description into TJM.

4) Write an optional serial number in the space provided (7). If a serial number is used it should be in the following format:

Simulator # - Year & Sequence # (6 digits)

Example: - 06-0001 LaSalle Simulator 1st work request of 1990

a) Simulator #

Dresden	-	04
Quad Cities	-	05
LaSalle	-	06
Zion	-	07
Byron	-	08
Braidwood	-	09

b) The serial number, if used, can be entered into TJM at the time the completed work request is transferred to history. To enter the serial number into TJM, type the number into the DR# field.

5) Enter the appropriate lead work group in the Dept. block (8) and into TJM. If more than one work group is needed then an additional work group may be designated in the SUPP DEPT block (19). Refer to Attachment 6 for the appropriate code to enter.

6) Assign a SME (Subject Matter Expert) by entering his/her initials in the SME block (9). SME review may not be required for every work request. If the SME review is not required, mark the SME Approved/Date block (10) N/A and continue with this procedure at section D.2.b.

7) Route the work request to the assigned SME.

2. Work Request Approval

a. The SME shall perform the following:

1) Review the work request.

2) Provide additional information to the description of the problem. List drawing numbers, technical manuals, and any other references used to identify and describe the problem. Enter this information in the Work Requested/Problem block (4). Attach Simulator Work Request - Sheet 2 (PTAO-103T2) as necessary.

3) Attach a hard copy of drawings and data required to support the work requested.

4) Complete the Test Required block (11) by circling Y or N to indicate whether testing will be required or not upon completion of the maintenance. At the direction of the Simulator Training Supervisor, write a test plan that will determine if the maintenance has been successfully completed.

5) If testing is required complete the Testing By block (12) by circling the appropriate department to conduct the testing.

6) Sign and date the work request in the SME Approved/Date block (10).

7) Route the work request to the SFCC.

b. The SFCC shall perform the following.

1) Enter the Test Required (Y or N) designation into TJM.

2) Assign a Priority to the work request and enter it in block (13) and into TJM. Refer to Attachment 7 for the appropriate priority codes and definitions.

a) Assignment of a priority above B22 requires the concurrence of the Simulator Training Supervisor and notification of the Simulator Support Supervisor. This concurrence/notification is required so that, if necessary, additional resources can be assigned to accomplish high priority items in a timely manner. Concurrence and notification can be obtained/made via telephone.

b) Lower priority items (below B23) may have their priority raised based on the length of time since the work request was initiated. The priority of an item may be increased in single step increments for every 30 days a work request remains open.

c) In no case will a priority of a work request be elevated past B23 solely based on the length of time a work request has remained open.

d) Priority increases should be made as a joint decision by the SFCC, Simulator Training Supervisor, and appropriate personnel from the Simulator Support Group. The option to raise the priority of a work request should be used prudently.

3) Assign an Availability to the work request and enter it in block (14) and into TJM. Refer to Attachment 8 for the appropriate Availability codes and definitions.

4) Complete the ANSI Certification block (15) by circling Y or N to indicate if the work request is a simulator certification item. Enter the designation into TJM. This field is intended to be used to identify those items directly related to the simulator certification report, yearly update to the certification report and certification testing.

5) Complete the Modification block (16) by circling Y or N to indicate if the work request is associated with a modification at the reference plant, enter the designation into TJM. If the work request is associated with a modification, enter the modification number in the MOD # block (17), and enter the Mod. Implementation Date (18) in the space provided. The same date should be entered into TJM in the IMPL DATE field. The modification implementation date is 12 months from the date the reference plant declared the modification operational. If the work request is not associated with a modification, enter N/A in the MOD # block (17) and Mod. Implementation Date (18) field.

6) Review the work request to determine if it will require/cause the simulator design data base to change. Indicate if the design data base will be affected by circling Y or N in the Data Base Change block (20).

7) If the simulator design data base is affected, assign an SRB # per Simulator Review Board Procedure (PTAO-104) and enter that number in the SRB # block (22). Assign the work request a Pending Status of HSRBA using TJM.

8) If the simulator design data base is not affected, sign and date the work request in the SFCC/SRB Approved/Date block (21).

9) There may be times when the operations training staff identifies a simulator function (such as a malfunction or an initial condition) which no longer appears to be responding properly. At this time, in addition to the issuing of a work request to repair the problem, the SFCC shall add the simulator function in question to the Simulator Items NOT AUTHORIZED For Use sheet (PTAO-103T3) or equivalent. When the simulator function has been repaired, tested and determined to be valid again, the SFCC shall clear the item from the list by entering the DATE CLEARED on the Simulator Items NOT AUTHORIZED For Use sheet (PTAO-103T3) or equivalent.

10) Route the work request to the Simulator Training Supervisor.

c. The Simulator Training Supervisor shall perform the following:

1) Review the work request, sign and date the SIM. TRNG SUPV. Approved/Date block (24).

2) If the work request involves a design data base change, submit it to the SRB (Simulator Review Board) for approval per Simulator Review Board Procedure (PTAO-104).

3) If the work request does not involve a design data base change, route the work request to the section clerk.

4) If the Simulator Training Supervisor decides to cancel the work request (non-design data base work requests) he/she shall perform the following:

a) Mark the work request cancelled in the Work Performed block (28) along with the reason for cancellation.

b) Sign and date the SIM. TRNG SUPV. ACCEPTANCE/DATE block (42).

c) Route the work request to the SFCC for cancellation of the work request per section D.6.c. of this procedure.

3. Conduct of Simulator Maintenance

   a. The section clerk shall separate the work request and route the copies as follows:

      1) Original copy of the work request - filed in the work request master file/work request log.

      2) Yellow copy of the work request - routed to the appropriate work group leader along with supporting documentatior

      3) Pink copy of the work request - route to the

      4) Goldenrod copy of the work request - routed to Simulator Support Supervisor. The routing of work requests to the Simulator Support Supervisor should be done once each regular work day.

   b. The actual performance of simulator maintenance shall be controlled and performed in accordance with Conduct of Maintenance (Simulator Support Guideline - 1).

4. Work Request Testing - The SFCC shall perform the following:

   a. If testing is not required, verify that the required work has been completed and continue with this procedure at section D.4.e.

   b. Perform or have performed the testing necessary to verify that the simulator maintenance has been completed satisfactory.

   c. Indicate the results of the testing by checking the appropriate block in the Pass/Fail block (36).

   d. Write in any pertinent comments in the Remarks block (37) and sign and date the Remarks block in the space provided.

e. If the testing passed then proceed as follows:

1) Attach the equipment tag/s (if used) to the original work request.

2) If the work request has Y circled in the Data Base Change block (20) verify that the design data base has been updated by reviewing the Simulator Data Base Update Checklist (Conduct of Maintenance - Simulator Support Guideline - 1). Indicate the status of the data base change by circling Y or N in the Conf. Data Base Updated block (38) and complete the VERIFIED BY: SFCC Init & Date block (39).

3) If the work request has N circled in the Data Base Change block (20) write N/A in the VERIFIED BY: SFCC Init & Date block (39).

4) Route the completed work request package to the Simulator Training Supervisor.

f. If the testing fails then proceed as follows:

1) Document the problems/discrepancies found in the Remarks block (37). Use Simulator Work Request - Sheet 2 (PTAO-103T2) as necessary.

2) Remove the Pending Status RTEST from the work request using TJM.

3) Report the work request as having failed testing using TJM.

4) Route the work request package to the appropriate work group for rework/discrepancy correction.

5. Work Request Completion

a. The Simulator Training Supervisor shall perform the following:

1) Verify that the work request is completed.

2) Obtain the original copy of the work request, sign and date the SIM. TRNG SUPV. ACCEPTANCE:/DATE:block (42).

3) Route the completed work request package to the TJM clerk.

b. The TJM clerk shall enter the following work request data into the TJM system:

1) Work Comp. Date (29) in the maintenance complete date of TJM.

2) The latest date entered in the Remarks block (37/41) in the TJM work request completion date.

3) Act. Hrs block (31).

4) PM block (34).

5) CM Block (35).

6) Maint. Code block (32).

7) Maint. Cause block (33).

8) Parts/Tools block (30).

9) Work Performed block (28) and Remarks block (37/42) in the work performed description of TJM.

10) When the above information has been correctly entered into the TJM system transfer the work request to history.

c. The TJM clerk shall route the work request package to the section clerk.

d. The section clerk shall file the completed work request package in General File #SIM-XX-6.

6. Work Request Cancellation (Design database related work requests)

   a. Design database related work requests can only be cancelled by the Simulator Review Board in accordance with the Simulator Review Board Procedure (PTAO-104).

   b. The Simulator Review Board Chairman shall perform the following:

      1) Mark the work request cancelled in the Work Performed block (28) along with the reason for cancellation.

      2) Circle CANCELLED in the SRB APPROVED/CANCELLED block (23).

      3) Sign and date the SFCC/SRB Approved/Date block (21).

      4) Route the work request to the SFCC for cancellation in TJM.

   c. The SFCC shall perform the following:

      1) Have the equipment tag removed (if used) and attached to the work request.

      2) Report the work request as cancelled using TJM.

      3) Forward one copy of the cancelled work request to the originator.

      4) Route the work request to the section clerk for filing in General File # SIM-XX-6.

7. Maintenance That Must be Performed Immediately - Outside of Normal Working Hours

   a. This method of routing work requests is for special cases and should only be used in situations where a simulator failure (usually hardware orientated) inhibits the effective use of the simulator. Work requests requiring Simulator Review Board approval shall not be accomplished until SRB approval has been granted.

b. The work request routing and TJM data entry will follow the normal procedure except that the SFCC and Simulator Training Supervisor approvals along with TJM data entry shall take place during the next regular work day.

c. If the work request has been completed prior to the final approvals, the work request should be annotated to show that the work has been accomplished, and that the work request is in routing for approvals and data entry only.

8. Change in Scope - during the performance of maintenance or testing situations will arise where the scope of the requested work may change or expand beyond the area originally requested and approved. Should a situation arise where there is a change in scope it is necessary to initiate a new work request and have it approved in accordance with section D.1 & D.2 of this procedure to cover the increased/changed scope.

9. Minor Hardware Maintenance

NOTE

This section of the procedure shall only be used for those maintenance items as specified in section C.2. of this procedure. All other maintenance items shall use the normal work request process.

a. Upon identification of a minor hardware problem the originator shall fill out the following sections of the Minor Hardware Maintenance Log (PTAO-103T4) - Originator's Section.

1) Originator's Name

2) Date

3) EID # of item needing maintenance. This number can be obtained from the TJM-EID printout located at the instructor station. If the EPN # is available on the equipment name tag it may be used in place of the EID #.

4) Panel #.

5) Problem - provide a description of the problem in sufficient detail for the HW Technician to correct the problem.

b. The SFCC shall perform the following:

1) Review the Minor Hardware Maintenance Log (PTAO-103T4) periodically to ensure needed maintenance is being accomplished.

2) Make arrangements to have a HW Technician complete needed maintenance.

3) If a Minor Hardware Maintenance Log (PTAO-103T4) item requires work not considered routine or minor, place an X over the Problem block and write the Simulator Work Request number assigned to the problem in the Work Performed block.

c. Hardware Technician

1) Upon receiving a work assignment from the Minor Hardware Maintenance Log (PTAO-103T4), the HW Technician shall:

a) Review the problem description and location.

b) Obtain authorization to correct the problem.

c) Perform the appropriate repairs/maintenance requested.

d) Complete the following sections of the Minor Hardware Maintenance Log (PTAO-103T4) - HW Technician Section:

- HW Technician's Name

- Date

- Work Performed - provides a brief description of the work performed including a list of parts used.

2) The HW Technician should request, when necessary, that the repaired item be functionally tested.

3) If the HW Technician determines that the maintenance required is beyond the scope allowed by the section, he/she shall notify the SFCC to determine of a Simulator Work Request should be written.

E. Attachments

1. PTAO-103T1 Simulator Work Request

2. PTAO-103T2 Simulator Work Request - Sheet 2

3. PTAO-103T3 Simulator Items NOT AUTHORIZED For Use

4. PTAO-103T4 Minor Hardware Maintenance Log

5. Guide for Entering Work Request Data into TJM

6. TJM Department Codes

7. TJM Priority Codes

8. TJM Availability Codes

9. TJM Pending Status Codes

10. TJM Group/Area Codes

Arthur M Roberts

Arthur M. Roberts
Production Training Manager

PTAO - 103T1 SIMULATOR WORK REQUEST

(7)SERIAL #

(6)No. U

(5)Tag No.

(1)Equipment Name

(2)EIID

(3)Location

(4)WORK REQUESTED/PROBLEM

DISK # | IC # | % PWR | Requested By / Date

(8)DEPT (9)SME (10)SME Approved/Date (11)TEST REQ Y N (12)BY OPS HW SW (13)PRIORITY (14)AVAIL

(15)ANSI CERT Y N (16)MOD Y N (17)MOD # (18)MOD IMPL Date (19)SUPP DEPT (20)DATABASE CHANGE Y N (22)SRB#

(21)SFCC/SRB Approved/Date (23)SRB APPROVED/ CANCELLED (24)SIM TRNG SUPV Approved/Date (25)Assigned To (26)Group/Area

(28)WORK PERFORMED

(29)Work Comp Date

(30)Parts/Tools

(27)Est Hrs (31)Act Hrs (32)Maint Code (33)Maint Cause (34)PM Y N (35)CM Y N (38)Conf Database Upda. Y N

(39) VERIFIED BY: SFCC Init&Date

(36)TEST #1 PASS FAIL (37)REMARKS

Signature/Date

(40)TEST #2 PASS FAIL (41)REMARKS

Signature/Date

(42)SIM TRNG SUPV ACCEPTANCE/DATE

PTAO - 103T2
SIMULATOR WORK REQUEST
SHEET 2

No. U

Page ____ of ____

WORK REQUESTED/PROBLEM (CONT)

WORK PERFORMED (CONT)	Parts/Tools (CONT)

TEST #____ PASS ☐ FAIL ☐	REMARKS Signature/Date

TEST #____ PASS ☐ FAIL ☐	REMARKS Signature/Date

PTAO-103T3

Simulator Items NOT AUTHORIZED For Use

ITEM	REASON/W.R.#	DATE ENTERED	DATE CLEARED

PTA0-103T4
MINOR MAINTENANCE LOG

ORIGINATOR		HW TECHNICIAN
NAME:	DATE:	NAME:
EID #:	PANEL	WORK PERFORMED:
PROBLEM:		

ORIGINATOR		HW TECHNICIAN
NAME:	DATE:	NAME:
EID #:	PANEL	WORK PERFORMED:
PROBLEM:		

ORIGINATOR		HW TECHNICIAN
NAME:	DATE:	NAME:
EID #:	PANEL	WORK PERFORMED:
PROBLEM:		

ORIGINATOR		HW TECHNICIAN
NAME:	DATE:	NAME:
EID #:	PANEL	WORK PERFORMED:
PROBLEM:		

ATTACHMENT 5

GUIDE FOR ENTERING WORK REQUEST DATA INTO TJM

I. TJM Introduction

A. The TJMSYS (Total Job Management System) is an integrated computer system which includes several subsystems used by generating station maintenance departments. The Production Training Department is using TJM to track simulator maintenance.

B. When a maintenance task is identified a work request number is assigned by TJM and written in the Shift Engineer's Log.

C. TJM then enters the work request into the Pending Work Request subsystem where the work request flow can be tracked.

D. Upon completion, the work request along with a description of the task performed is transferred to historical files. When a work request is transferred to history, labor and parts information become permanently associated with it.

E. Several reporting tools can be used to review maintenance performance and backlog, and track common equipment failures.

F. The TJM system is administered by Fossil Stations Division. The Simulator Support-Configuration Management Coordinator is the Production Training Department TJM Coordinator and point of contact for TJM issues. All concerns, problems, requests, etc. regarding TJM are to be brought to the attention of the Simulator Support - Configuration Management Coordinator.

G. Nothing in this guide is meant to supersede instructions provided in the Simulator Work Request Procedure (PTAO-103) or Conduct of Maintenance (Simulator Support Guideline-1). This guide is meant only to provide a tool for use of TJM when performing steps from these procedures.

II. TJM Access/Exiting

A. TJM is a menu driven system. The various subsystems are accessed through selection of options from several menus.

B. TJM is accessed through the TSO option on CENET. To use TSO and subsequently TJM you must have a valid user ID (SHW--) and password.

C. The ability to enter and change data in TJM is further controlled by a validated access table. Anyone with a valid user ID (SHW--) and password can browse TJM data.

D. To access TJM use the normal TSO log on procedure. At the TSO 'READY' prompt type TJMSYS and hit ENTER. The TJMSYS Primary Menu will appear.

```
*********************************************************************
*        ------    TOTAL JOB MANAGEMENT SYSTEM    ------            *
*  OPTION ===>                          USERID - SHWFH              *
*                                         TIME - 11:57              *
*                                         DATE - 08/16/90           *
*                                                                   *
*  1  PENDING WORK REQUEST          6  SAS REPORTING                *
*                                                                   *
*  2  HISTORICAL WORK REQUEST       7  PARTS FOR WR IN PROGRESS     *
*                                                                   *
*  3  EID/SI CROSS-REFERENCE        T  TUTORIAL                     *
*                                                                   *
*  4  LABOR REPORTS                                                 *
*                                                                   *
*  5  SWITCH SUBSYSTEM                                              *
*                                                                   *
*            SELECT PROCESSING OPTION FROM LIST ABOVE               *
*                 PRESS PF3/PF15 TO EXIT SYSTEM                     *
*                                                                   *
*********************************************************************
```

E. To exit TJM hit PF3/PF15 repeatedly until the TSO 'READY' prompt is received. Use the normal TSO log off procedure to leave TSO. To immediately leave TJM without paging back through all the selection menus traversed, type '=X' in the option field and hit ENTER.

III. Using TJM

A. General Information - a few items are common to the different subsystems within TJM. They are as follows:

1. When a field on a panel is in error, a message is returned in the upper right corner of the panel. If no errors are detected, the transaction is processed and a message to that effect is displayed.

2. Required fields on most panels are represented by underlines while optional fields are represented by dotted lines.

3. In most cases, hitting PF3 while doing data entry causes cancellation of the request.

B. EID Entry

1. TJM requires that each work request entered have an EID (Equipment Identification #) associated with it. EID records are part of the Historical Work Request Subsystem.

2. To enter a new or modify an existing EID complete a Maintenance History Header Records Form (86-2238) with the EID, Description and Location sections filled out. Forward the completed form to the Simulator Support-Configuration Management Coordinator.

3. To delete an existing EID contact the Simulator Support-Configuration Management Coordinator.

C. New Work Request Entry

1. From the TJMSYS Primary Menu select Option 1 - Pending Work Request, hit ENTER. The Pending WR Main Menu will appear.

```
*****************************************************************
*     ------   TJM PENDING WORK REQUEST SUBSYSTEM    ------     *
*  OPTION ===>                             USERID - SHWFH       *
*                                            TIME - 12:11       *
*                                            DATE - 08/16/90    *
*                                                               *
*             1  ENTER NEW WORK REQUESTS                        *
*                                                               *
*             2  CHANGE/DELETE/COMPLETE EXISTING WORK REQUESTS  *
*                                                               *
*             3  WORK REQUEST REPORTING                         *
*                                                               *
*             4  WORK REQUEST SCHEDULING                        *
*                                                               *
*                T  TUTORIAL                                    *
*                                                               *
*                SELECT PROCESSING OPTION FROM LIST ABOVE       *
*          PRESS PF3/PF15 TO RETURN TO THE TJMSYS MAIN MENU     *
*                                                               *
*****************************************************************
```

2. From the Pending WR Main Menu select Option 1 - Enter New Work Requests, hit ENTER. The Shift Engineer's Log EID Panel will appear.

```
***********************************************************************
*          ------   TJM SHIFT ENGINEER'S WR LOG ENTRY   ------        *
*                                                                     *
*                                                                     *
*           DO YOU WANT TO ADD A BLANKET WORK REQUEST?  (Y/N)  N      *
*                                                                     *
*   (ENTER AN EID OR AN EPN TO ADD ENTRIES TO THE SHIFT ENGINEER'S LOG) *
*                                                                     *
*                                                                     *
*                                                                     *
*                          EID:  _______________                      *
*                          EPN:  _______________                      *
*                                                                     *
*   LIST OTHER WORK REQUESTS WITH THIS EID?  (Y/N)  Y                 *
*                                                                     *
*               PRESS ENTER TO PROCESS THE REQUEST                    *
*            PRESS PF3/PF15 TO RETURN TO SELECTION MENU               *
***********************************************************************
```

3. Enter the EID number listed on the work request, hit ENTER. (The EID must be entered correctly or the work request will be entered against the wrong piece of equipment or rejected totally.) The Shift Engineer's Log WR Entry Panel will appear.

```
**************************************************************************
*       ------  TJM NUCLEAR STATION WORK REQUEST ENTRY   ------         *
*                                                                        *
*       DATE OF REQ:  09 05 90                    DEPT:  op             *
*                                                                        *
*       EID:  U00XX-SPEQS---M10-        TAG #:  _______                 *
*                                                                        *
*       FUNCTION:  ________             LOCATION:  LOCATION___          *
*                                                                        *
*       EQUIP. NAME:  TEST DESCRIPTION ENTRY_____________________       *
*                                                                        *
*       WORK REQUESTED:  TEST OF TJM SYSTEM FOR PTD SIMULATORS________< *
*                        _________________________________________<     *
*                        ____________________________________________<  *
*                        ____________________________________________<  *
*                        ____________________________________________<  *
*                        ____________________________________________<  *
*                                                                        *
*                                                                        *
*              PRESS ENTER TO PROCESS THE WORK REQUEST ENTRY            *
*              PRESS PF3/PF15 TO CANCEL WORK REQUEST ENTRY              *
**************************************************************************
```

4. Enter the Dept Code, the Work Requested and Tag # (if used). Hit ENTER to process the work request entry. The Shift Engineer's Log WR Entry Panel (2) will appear showing the work request number assigned.

```
**************************************************************************
*         ------  TJM SHIFT ENGINEER'S WR LOG ENTRY   ------            *
*                                                                        *
*                                                                        *
*           DO YOU WANT TO ADD A BLANKET WORK REQUEST?  (Y/N)  N        *
*                                                                        *
*  (ENTER AN EID OR AN EPN TO ADD ENTRIES TO THE SHIFT EHGINEER'S LOG)  *
*                                                                        *
*                  **CREATFD WORK REQUEST U00708**                      *
*                                                                        *
*                          EID:  __________________                     *
*                          EPN:  __________________                     *
*                                                                        *
*  LIST OTHER WORK REQUESTS WITH THIS EID?  (Y/N)  Y                    *
*                                                                        *
*                 PRESS ENTER TO PROCESS THE REQUEST                    *
*               PRESS PF3/PF15 TO RETURN TO SELECTION MENU              *
**************************************************************************
```

5. If other work requests need to be entered repeat this process beginning with entering the EID number from the work request.

6. If no other work requests need to be added hit PF3/PF15 to return to the Pending WR Main Menu.

D. Work Request Data Entry - this section can be used to add additional data to newly entered work requests or change data on work requests already in the pending file.

1. From the TJMSYS Primary Menu select Option 1 - Pending Work Requests, hit ENTER. The Pending WR Main Menu will appear.

```
*****************************************************************
*     ------  TJM PENDING WORK REQUEST SUBSYSTEM   ------        *
*  OPTION ===>                          USERID - SHWFH          *
*                                         TIME - 12:11          *
*                                         DATE - 08/16/90       *
*                                                               *
*              1  ENTER NEW WORK REQUESTS                       *
*                                                               *
*              2  CHANGE/DELETE/COMPLETE EXISTING WORK REQUESTS *
*                                                               *
*              3  WORK REQUEST REPORTING                        *
*                                                               *
*              4  WORK REQUEST SCHEDULING                       *
*                                                               *
*                 T  TUTORIAL                                   *
*                                                               *
*                 SELECT PROCESSING OPTION FROM LIST ABOVE      *
*            PRESS PF3/PF15 TO RETURN TO THE TJMSYS MAIN MENU   *
*                                                               *
***    **********************************************************
```

From the Pending WR Main Menu select Option 2 - Change/Delete/Complete Existing Work Requests, hit ENTER. The Pending WR Revision Menu will appear.

```
*********** ****************************************************************
*     ------        TJM WORK REQUESTS REVISIONS        ------                *
*  OPTION ===>                           USERID - SHWFH                      *
*                                          TIME   12:15                      *
*             C  MAINTENANCE COMPLETE      DATE - 08/16/90                   *
*                                                                            *
*             D  DELETE                                                      *
*                                                                            *
*             F  FAILED TESTING                                              *
*                                                                            *
*             H  TRANSFER COMPLETED WORK REQUESTS TO HISTORY                 *
*                                                                            *
*             M  MODIFY FIELDS                                               *
*                                                                            *
*             O  MODIFY TEST DATA                                            *
*                                                                            *
*             R  REINSTATE COMPLETED OR DELETED WORK REQUESTS                *
*                                                                            *
*             T  TESTING COMPLETE                                            *
*                                                                            *
*                SELECT PROCESSING OPTION FROM LIST ABOVE                    *
*     PRESS PF3/PF15 TO RETURN TO THE TJM WORK REQUEST MAIN MENU             *
******************************************************************************
```

3. From the Pending WR Revision Menu select Option M - Modify Fields, hit ENTER. The following prompt will appear:

ENTER WR# THAT YOU WISH TO MODIFY, OR "END":

4. Enter the work request number you wish to add or modify data on and hit ENTER. The WR Field Modification Panel will appear.

```
****************************************************************************
*       ------  TJM PROD TRAIN CNTR WORK REQUEST REVISION   ------          *
*                                                                          *
*  WR:  U00585                      STATUS:  PENDING                       
*                                                                          *
*  EQUIP.NAME:  SOFTWARE MODEL REACTOR PRES VESSEL INDIC                   *
*                                                                          *
*  EID:  U06NB-0202---S60-      WORK REQUESTED:  L90-097 MNB070F DID NOT   *
*  WORK (P601) MNB07?F FAILED METER B21-R604 DOWNSCALE VS U   TEST REQ:  Y *
*                                                                          *
*  DEPT:  SW       DATE OF REQUEST:  03 19 90      PRIORITY:  ...          *
*                                                                          *
*  AV:  NOW                          MOD:  N     ANSI CERT:  N             *
*                                                                          *
*                      ASSIGNED  ...        EST.HRS.:  ............        *
*                                                                          *
*  MANUAL HOURS:  .....   DATE OF COMP:  .. .. ..    TEST COMP DATE  .. .. .. *
*                                                                          *
*  TAG#:  ......  GRP/AREA:  06S  TRACKING CODE:  ...   IMPL DATE:  .. .. .. *
*  LOCATION:  LASALLE...      RESP. DEPT:  SW         SUPP. DEPTS:  .. .. .. *
*                        PENDING STATUS:  ....                             *
*         PRESS PF3/PF15 AFTER ALL WORK REQUESTS HAVE BEEN PROCESSED       *
****************************************************************************
```

5. The following work request data fields can be entered initially or modified (field formats are shown in parenthesis):

   a. TEST REQ: (Y or N)

   b. DEPT: (AA)

   c. DATE OF REQUEST: (MM DD YY)

   d. PRIORITY: (A##)

   e. AV (availability): (AXX)

   f. MOD: (Y or N)

   g. ANSI CERT: (Y or N)

   h. ASSIGNED: (AAA)

   i. EST. HRS.: (#####.##)

j. TAG#: (XXXXXX)

k. GRP/AREA: (##A)

l. TRACKING CODE: (XXX)

m. IMPL DATE: (MM DD YY)

n. RESP DEPT: (AA)

o. SUPP. DEPTS: (AA AA AA)

p. PENDING STATUS: (AAAAA)

6. After entering the appropriate data hit ENTER to process the data entries/modifications.

7. To continue to enter data for new work requests or modify data on existing work requests enter the work request number when prompted and hit ENTER.

8. If no other work requests need data entered or modified then type 'END' when prompted and hit ENTER.

E. Work Request Maintenance Completion - this section is used to report that the requested maintenance has been completed and the number of hours expended in the performance of the requested maintenance.

1. From the TJMSYS Primary Menu select Option 1 - Pending Work Requests, hit ENTER. The Pending WR Main Menu will appear.

```
***************************************************************************
*     ------   TJM PENDING WORK REQUEST SUBSYSTEM    ------               *
*  OPTION ===>                              USERID - SHWFH                *
*                                             TIME - 12:11                *
*                                             DATE - 08/16/90             *
*                                                                         *
*            1  ENTER NEW WORK REQUESTS                                   *
*                                                                         *
*            2  CHANGE/DELETE/COMPLETE EXISTING WORK REQUESTS             *
*                                                                         *
*            3  WORK REQUEST REPORTING                                    *
*                                                                         *
*            4  WORK REQUEST SCHEDULING                                   *
*                                                                         *
*               T  TUTORIAL                                               *
*                                                                         *
*               SELECT PROCESSING OPTION FROM LIST ABOVE                  *
*           PRESS PF3/PF15 TO RETURN TO THE TJMSY[illegible] MAIN MENU    *
*                                                                         *
***************************************************************************
```

2. From the Pending WR Main Menu select Option 2 - Change/Delete/Complete Existing Work Requests, hit ENTER. The Pending WR Revision Menu will appear.

```
***************************************************************************
*     ------        TJM WORK REQUESTS REVISIONS          ------           *
*  OPTION ===>                              USERID - SHWFH                *
*                                             TIME - 12:15                *
*            C  MAINTENANCE COMPLETE          DATE - 08/16/90             *
*                                                                         *
*            D  DELETE                                                    *
*                                                                         *
*            F  FAILED TESTING                                            *
*                                                                         *
*            H  TRANSFER COMPLETED WORK REQUESTS TO HISTORY               *
*                                                                         *
*            M  MODIFY FIELDS                                             *
*                                                                         *
*            O  MODIFY TEST DATA                                          *
*                                                                         *
*            R  RE[illegible]ATE COMPLETED OR DELETED WORK REQUESTS       *
*                                                                         *
*            T  TESTING COMPLETE                                          *
*                                                                         *
*               SELECT PROCESSING OPTION FROM LIST ABOVE                  *
*    PRESS PF3/PF15 TO RETURN TO THE TJM WORK REQUEST MAIN MENU           *
***************************************************************************
```

3. From the Pending WR Revision Menu select Option C - Maintenance Complete, hit ENTER. The following prompt will appear:

ENTER WR# THAT YOU WISH TO MAINTENANCE COMPLETE, OR "END":

4. Enter the work request number that you wish to report as having maintenance completed, hit ENTER. The WR File Modification Panel will appear.

```
******************************************************************************
*       ------   TJM PROD TRAIN CNTR WORK REQUEST REVISION   ------          *
*                                                                            *
*  WR:  U00585                        STATUS:  PENDING                       *
*                                                                            *
*  EQUIP.NAME:  SOFTWARE MODEL REACTOR PRES VESSEL INDIC                     *
*                                                                            *
*  EID:  U06NB-0202---S60-      WORK REQUESTED:  L90-097 MNB070F DID NOT     *
*  WORK (P601) MNB072F FAILED METER B21-R604 DOWNSCALE VS U   TEST REQ:  Y   *
*                                                                            *
*  DEPT:  SW       DATE OF REQUEST:  03 19 90       PRIORITY:  ...           *
*                                                                            *
*  AV:  NOW                             MOD:  N     ANSI CERT:  N            *
*                                                                            *
*                      ASSIGNED  ...         EST.HRS.:  ............         *
*                                                                            *
*  MANUAL HOURS:  .....   DATE OF COMP:  .. .. ..    TEST COMP DATE  .. .. ..*
*                                                                            *
*  TAG#:  ......  GRP/AREA:  06S  TRACKING CODE:  ...   IMPL DATE:  .. .. .. *
*  LOCATION:  LASALLE...      RESP. DEPT:  SW          SUPP. DEPTS:  .. .. ..*
*                         PENDING STATUS:  ....                              *
*      PRESS PF3/PF15 AFTER ALL WORK REQUESTS HAVE BEEN PROCESSED            *
******************************************************************************
```

5. Enter or modify work request data as necessary, hit ENTER. If it is not necessary to enter or modify data, hit ENTER. The WR Completion by Maintenance Panel will appear.

```
************************************************************
*   ------      TJM WORK REQUESTS COMPLETION      ------   *
*                                                          *
*                                                          *
*                                                          *
*     WR#:  U00585                  STATUS:  C             *
*                                                          *
*              FOREMAN CODE:  ...                          *
*                                                          *
*                                                          *
*              DATE OF COMP:  __ __ __                     *
*                                                          *
*              MANUAL HOURS:   .......                     *
*                                                          *
*                                                          *
*   PRESS PF3/PF15 AFTER ALL COMPLETIONS HAVE BEEN ENTERED *
*                                                          *
*                                                          *
************************************************************
```

6. Enter the Date of Completion and Manual Hours, hit ENTER.

7. If the work request TEST REQ: field is N the following prompt will appear:

DO YOU WANT TO TRANSFER WR U00708 TO HISTORY AT THIS TIME (Y/_)?

Type 'N' and hit ENTER. Do not transfer the work request to history at this time.

8. To continue to report maintenance completion on additional work requests enter the work request number at the prompt, hit ENTER and repeat steps 5 through 7 above.

9. If no other work requests need to be reported as maintenance complete, type 'END' and hit ENTER.

F. Test Reporting - this section is used to report failed testing and completion of testing on work request.

1. Failed Test Reporting - reporting a work request as having failed testing resets the work request status to Pending, removes the maintenance completion date, and resets the manual hours to zero.

   a. From the TJMSYS Primary Menu select Option 1 - Pending Work Requests, hit ENTER. The Pending WR Main Menu will appear.

```
***********************************************************************
*      ------   TJM PENDING WORK REQUEST SUBSYSTEM   ------          *
*  OPTION ===>                              USERID - SHWFH           *
*                                             TIME - 12:11           *
*                                             DATE - 08/16/90        *
*                                                                    *
*             1  ENTER NEW WORK REQUESTS                             *
*                                                                    *
*             2  CHANGE/DELETE/COMPLETE EXISTING WORK REQUESTS       *
*                                                                    *
*             3  WORK REQUEST REPORTING                              *
*                                                                    *
*             4  WORK REQUEST SCHEDULING                             *
*                                                                    *
*                T  TUTORIAL                                         *
*                                                                    *
*                SELECT PROCESSING OPTION FROM LIST ABOVE            *
*           PRESS PF3/PF15 TO RETURN TO THE TJMSYS MAIN MENU         *
*                                                                    *
***********************************************************************
```

   b. From the Pending WR Main Menu select Option 2 - Change/Delete/Complete Existing Work Requests, hit ENTER. The Pending WR Revision Menu will appear.

```
*********************************************************************
*     ------       TJM WORK REQUESTS REVISIONS      ------          *
*  OPTION ===>                            USERID - SHWFH            *
*                                          TIME - 12:15             *
*           C  MAINTENANCE COMPLETE        DATE - 08/16/90          *
*                                                                   *
*           D  DELETE                                               *
*                                                                   *
*           F  FAILED TESTING                                       *
*                                                                   *
*           H  TRANSFER COMPLETED WORK REQUESTS TO HISTORY          *
*                                                                   *
*           M  MODIFY FIELDS                                        *
*                                                                   *
*           O  MODIFY TEST DATA                                     *
*                                                                   *
*           R  REINSTATE COMPLETED OR DELETED WORK REQUESTS         *
*                                                                   *
*           T  TESTING COMPLETE                                     *
*                                                                   *
*              SELECT PROCESSING OPTION FROM LIST ABOVE             *
*    PRESS PF3/PF15 TO RETURN TO THE TJM WORK REQUEST MAIN MENU     *
*********************************************************************
```

c. From the Pending WR Revision Menu select Option F - Failed Testing, hit ENTER. The WR Test Failure Panel will appear.

```
*********************************************************************
*     ------      TJM WORK REQUEST TEST FAILURES       ------       *
*                                                                   *
*                                                                   *
*     WR # => ......      WR # => ......      WR # => ......        *
*     WR # => ......      WR # => ......      WR # => ......        *
*     WR # => ......      WR # => ......      WR # => ......        *
*     WR # => ......      WR # => ......      WR # => ......        *
*     WR # => ......      WR # => ......      WR # => ......        *
*     WR # => ......      WR # => ......      WR # => ......        *
*     WR # => ......      WR # => ......      WR # => ......        *
*     WR # => ......      WR # => ......      WR # => ......        *
*     WR # => ......      WR # => ......      WR # => ......        *
*     WR # => ......      WR # => ......      WR # => ......        *
*                                                                   *
*         PRESS ENTER TO PROCESS THE WORK REQUESTS ENTERED          *
*    PRESS PF3/PF15 TO EXIT AND BYPASS WORK REQUEST PROCESSING      *
*********************************************************************
```

d. Enter the work request number/s that has/have failed testing, hit ENTER. Up to 30 work requests may be entered at a single time.

e. Successfully processed work requests are erased from the panel and invalid ones are redisplayed.

f. Repeat step d above to report failed testing on additional work requests.

g. Upon completion of failed test reporting hit PF3/PF15 to return to the Pending WR Revision Menu.

2. Testing Complete Reporting - reporting a work request as testing complete is necessary to complete a work request and transfer it to history.

a. From the TJMSYS Primary Menu select Option 1 - Pending Work Requests, hit ENTER. The Pending WR Main Menu will appear.

```
*****************************************************************
*      ------   TJM PENDING WORK REQUEST SUBSYSTEM   ------     *
*  OPTION ===>                          USERID - SHWFH          *
*                                         TIME - 12:11          *
*                                         DATE - 08/16/90       *
*                                                               *
*            1  ENTER NEW WORK REQUESTS                         *
*                                                               *
*            2  CHANGE/DELETE/COMPLETE EXISTING WORK REQUESTS   *
*                                                               *
*            3  WORK REQUEST REPORTING                          *
*                                                               *
*            4  WORK REQUEST SCHEDULING                         *
*                                                               *
*               T  TUTORIAL                                     *
*                                                               *
*               SELECT PROCESSING OPTION FROM LIST ABOVE        *
*           PRESS PF3/PF15 TO RETURN TO THE TJMSYS MAIN MENU    *
*                                                               *
*****************************************************************
```

b. From the Pending WR Main Menu select Option 2 - Change/Delete/Complete Existing Work Requests, hit ENTER. The Pending WR Revision Menu will appear.

```
*************************************************************************
*      ------       TJM WORK REQUESTS REVISIONS        ------           *
*  OPTION ===>                           USERID - SHWFH                 *
*                                          TIME - 12:15                 *
*             C  MAINTENANCE COMPLETE      DATE - 08/16/90              *
*                                                                       *
*             D  DELETE                                                 *
*                                                                       *
*             F  FAILED TESTING                                         *
*                                                                       *
*             H  TRANSFER COMPLETED WORK REQUESTS TO HISTORY            *
*                                                                       *
*             M  MODIFY FIELDS                                          *
*                                                                       *
*             O  MODIFY TEST DATA                                       *
*                                                                       *
*             R  REINSTATE COMPLETED OR DELETED WORK REQUESTS           *
*                                                                       *
*             T  TESTING COMPLETE                                       *
*                                                                       *
*                SELECT PROCESSING OPTION FROM LIST ABOVE               *
*    PRESS PF3/PF15 TO RETURN TO THE TJM WORK REQUEST MAIN MENU         *
*************************************************************************
```

c. From the Pending WR Revision Menu select Option T - Testing Complete, hit ENTER. The following prompt will appear:

ENTER WR# THAT YOU WISH TO TEST COMPLETE, OR "END":

d. Enter the work request number that you wish to report as having testing completed, hit ENTER. The WR Completion by Operating panel will appear.

```
*************************************************************************
*     ------    TJM WORK REQUEST TESTING COMPLETION     ------          *
*                                                                       *
*                                                                       *
*                                                                       *
*       WR#:  U00788                      STATUS:  T                    *
*                                                                       *
*                                                                       *
*             DATE OF TEST COMPLETION:  __ __ __                        *
*                                                                       *
*                                                                       *
*     PRESS PF3/PF15 AFTER ALL COMPLETIONS HAVE BEEN ENTERED            *
*                                                                       *
*                                                                       *
*************************************************************************
```

e. Enter the Date of Test Completion, hit ENTER. The following prompt will appear:

PROCESSING TO TEST COMPLETE WR# U00788 FINISHED
DO YOU WANT TO TRANSFER WR U00788 TO HISTORY AT THIS TIME (Y/_)

f. Type 'N' and hit ENTER. Do not transfer the work request to history at this time.

g. To continue to report testing completed on additional work requests enter the work request number at the prompt, hit ENTER and complete step e above.

h. If not other work requests need to be reported as testing complete, type 'END' and hit ENTER.

G. Work Request Deletion - work requests are deleted or cancelled using this section. Delete and cancel are used interchangeably and mean the same thing in TJM.

1. From the TJMSYS Primary Menu select Option 1 - Pending Work Requests, hit ENTER. The Pending WR Main Menu will appear.

```
*****************************************************************
*     ------   TJM PENDING WORK REQUEST SUBSYSTEM   ------      *
*  OPTION ===>                          USERID - SHWFH          *
*                                         TIME - 12:11          *
*                                         DATE - 08/16/90       *
*                                                               *
*             1  ENTER NEW WORK REQUESTS                        *
*                                                               *
*             2  CHANGE/DELETE/COMPLETE EXISTING WORK REQUESTS  *
*                                                               *
*             3  WORK REQUEST REPORTING                         *
*                                                               *
*             4  WORK REQUEST SCHEDULING                        *
*                                                               *
*                T  TUTORIAL                                    *
*                                                               *
*                SELECT PROCESSING OPTION FROM LIST ABOVE       *
*           PRESS PF3/PF15 TO RETURN TO THE TJMSYS MAIN MENU    *
*                                                               *
*****************************************************************
```

2. From the Pending WR Main Menu select Option 2 - Change/Delete/Complete Existing Work Requests, hit ENTER. The Pending WR Revision Menu will appear.

```
**********************************************************************
*     ------       TJM WORK REQUESTS REVISIONS        ------         *
*  OPTION ===>                               USERID - SHWFH          *
*                                              TIME - 12:15          *
*             C  MAINTENANCE COMPLETE ______   DATE - 08/16/90       *
*                                                                    *
*             D  DELETE                                              *
*                                                                    *
*             F  FAILED TESTING                                      *
*                                                                    *
*             H  TRANSFER COMPLETED WORK REQUESTS TO HISTORY         *
*                                                                    *
*             M  MODIFY FIELDS                                       *
*                                                                    *
*             O  MODIFY TEST DATA                                    *
*                                                                    *
*             R  REINSTATE COMPLETED OR DELETED WORK REQUESTS        *
*                                                                    *
*             T  TESTING COMPLETE                                    *
*                                                                    *
*                SELECT PROCESSING OPTION FROM LIST ABOVE            *
*    PRESS PF3/PF15 TO RETURN TO THE TJM WORK REQUEST MAIN MENU      *
**********************************************************************
```

3. From the Pending WR Revision Menu select Option D - Delete. The rollowing prompt will appear:

ENTER WR# THAT YOU WISH TO CANCEL, OR "END":

4. Enter the work request number that you wish to delete/cancel, hit ENTER. The following prompt will appear:

PROCESSING TO CANCEL WR# U00789 FINISHED
DO YOU WANT TO TRANSFER WR U00789 TO HISTORY AT THIS TIME (Y/_)?

5. Type 'Y' and hit ENTER. The WR Deletion Panel will appear.

```
*********************************************************************
*   -----   TJM CANCELLED WORK REQUEST HISTORY TRANSFER   -----     *
*                                                                   *
*                                                                   *
*                  DELETE DATE:  __ __ __                           *
*                                                                   *
*                                                                   *
*          PRESS PF3/PF15 TO CANCEL HISTORY TRANSFER                *
*                                                                   *
*                                                                   *
*********************************************************************
```

6. Enter the Delete Date, hit ENTER. The Automatic WR Transfer to History Panel will appear.

```
*****************************************************************************
*   ------   TJM PROD TRAIN DEPT HISTORY WORK REQUEST TRANSFER   ------     *
*             (REQUIRED FIELD ____  OPTIONAL FIELD  ...)                    *
*                                                                           *
*  WR#:  U00788   EID:  U00XX-SPEQS--M10-      COMPLETION DATE:  09 05 90   *
*                                                                           *
* DEPT:  OP              PRIORITY:  ...           AVAILABILITY:  NOW        *
*                                                                           *
*                        MOD.:  N   ANSI CERT:  N        N                  *
*                                                                           *
*           CONT.:  ..............   TKC:  ...  ASSIGNED:  ...  CS:  ..     *
*                                                                           *
* EST.HRS:  .......   MAN.HRS:  .......   SER#:  .........................  *
*                                                                           *
* PM:  N      CM:  N    MAINT CODE:  ...    MAINT CAUSE:  ..   DR#:  .. ....*
*                                                                           *
*                         PENDING STATUS:  .....                            *
*                                                                           *
* TOOL/MISC:    ........   ........   ........   ........   ........        *
*               ........   ........   ........   ........   ........        *
*               ........   ........   ........   ........   ........        *
*               ........   ........   ........   ........   ........        *
*        PRESS PF3/PF15 AFTER ALL WORK REQUESTS HAVE BEEN PROCESSED         *
*****************************************************************************
```

7. The Auto WR Transfer to History Panel allows for verification of work request data prior to transfer to history. At this point there should be no need to add or modify data to a work request about to be deleted. Hit ENTER, the Automatic Transfer of WR Description Panel will appear.

```
****************************************************************************
*    ------        TJM HISTORICAL WORK REQUEST DESCRIPTION        ------    *
*                                                                          *
*  WR#: U00788   EID: U00XX-SPEQS--M10-     COMPLETION DATE:  09 05 90    *
*                             WORK REQUESTED                               *
*                 TEST OF TJM SYSTEM FOR PTD SIMULATORS---                 *
*                 ----------------------------------------                 *
*                                                                          *
*                             WORK PERFORMED                               *
*                                                                          *
*  ____________________________________________________________________   *
*  ____________________________________________________________________   *
*  ____________________________________________________________________   *
*  ____________________________________________________________________   *
*  ____________________________________________________________________   *
*  ____________________________________________________________________   *
*  ____________________________________________________________________   *
*  ____________________________________________________________________   *
*  ____________________________________________________________________   *
*  ____________________________________________________________________   *
*                                   MORE DESCRIPTION (Y/N)?   N            *
*                                                                          *
*      PRESS PF3/PF15 AFTER ALL DESCRIPTIONS HAVE BEEN ENTERED             *
****************************************************************************
```

8. Enter the reason for cancellation written on the work request into the work performed block. If more space is needed type 'Y'. in the More Description field, hit ENTER. If no additional space is needed hit ENTER to return to the WR Delete prompt.

9. If another work request is to be deleted/cancelled repeat steps 4-8 above.

10. If no other work requests are to be deleted/cancelled type 'END' and hit ENTER.

H. Work Request Reinstatement - work requests which were inadvertently completed or deleted can be placed back in the Pending file using this section. A deleted work request remains in the Pending file until the next monthly merge. It may be reinstated anytime during that period. A completed work request can be reinstated so long as it has not been transferred to history.

1. From the TJMSYS Primary Menu select Option 1 - Pending Work Requests, hit ENTER. The Pending WR Main Menu will appear.

```
**************************************************************************
*      ------   TJM PENDING WORK REQUEST SUBSYSTEM   ------              *
*  OPTION ===>                            USERID - SHWFH                 *
*                                           TIME - 12:11                 *
*                                           DATE - 08/16/90              *
*                                                                        *
*              1  ENTER NEW WORK REQUESTS                                *
*                                                                        *
*              2  CHANGE/DELETE/COMPLETE EXISTING WORK REQUESTS          *
*                                                                        *
*              3  WORK REQUEST REPORTING                                 *
*                                                                        *
*              4  WORK REQUEST SCHEDULING                                *
*                                                                        *
*                 T  TUTORIAL                                            *
*                                                                        *
*                 SELECT PROCESSING OPTION FROM LIST ABOVE               *
*           PRESS PF3/PF15 TO RETURN TO THE TJMSYS MAIN MENU             *
*                                                                        *
**************************************************************************
```

2. From the Pending WR Main Menu select Option 2 - Change/Delete/Complete Existing Work Requests, hit ENTER. The Pending WR Revision Menu will appear.

```
**************************************************************************
*      ------        TJM WORK REQUESTS REVISIONS        ------           *
*  OPTION ===>                            USERID - SHWFH                 *
*                                           TIME - 12:15                 *
*              C  MAINTENANCE COMPLETE      DATE - 08/16/90              *
*                                                                        *
*              D  DELETE                                                 *
*                                                                        *
*              F  FAILED TESTING                                         *
*                                                                        *
*              H  TRANSFER COMPLETED WORK REQUESTS TO HISTORY            *
*                                                                        *
*              M  MODIFY FIELDS                                          *
*                                                                        *
*              O  MODIFY TEST DATA                                       *
*                                                                        *
*              R  REINSTATE COMPLETED OR DELETED WORK REQUESTS           *
*                                                                        *
*              T  TESTING COMPLETE                                       *
*                                                                        *
*                 SELECT PROCESSING OPTION FROM LIST ABOVE               *
*     PRESS PF3/PF15 TO RETURN TO THE TJM WORK REQUEST MAIN MENU         *
**************************************************************************
```

3. From the Pending WR Revision Menu select Option R - Reinstate Completed or Deleted Work Requests, hit ENTER. The WR Reinstatement Panel will appear.

```
*************************************************************************
*     ------        TJM WORK REQUEST REINSTATES         ------          *
*                                                                       *
*                                                                       *
*     WR # => ......      WR # => ......      WR # => ......            *
*     WR # => ......      WR # => ......      WR # => ......            *
*     WR # => ......      WR # => ......      WR # => ......            *
*     WR # => ......      WR # => ......      WR # => ......            *
*     WR # => ......      WR # => ......      WR # => ......            *
*     WR # => ......      WR # => ......      WR # => ......            *
*     WR # => ......      WR # => ......      WR # => ......            *
*     WR # => ......      WR # => ......      WR # => ......            *
*     WR # => ......      WR # => ......      WR # => ......            *
*     WR # => ......      WR # => ......      WR # => ......            *
*                                                                       *
*          PRESS ENTER TO PROCESS THE WORK REQUESTS ENTERED             *
*    PRESS PF3/PF15 TO EXIT AND BYPASS WORK REQUEST PROCESSING          *
*************************************************************************
```

4. Enter the work request number/s that is/are to be reinstated, hit ENTER. Up to 30 work request numbers may be entered at a single time.

5. Successfully processed work requests are erased from the panel and invalid ones are redisplayed.

6. Repeat step 4 above to reinstate additional work requests as necessary.

7. Upon completion of work request reinstatement hit PF3/PF15 to return to the Pending WR Revision Menu.

I. Work Request Completion and Transfer to History - this section is used to enter the remaining work request information associated with completion of a work request and then transferring the work request to the history subsection of TJM. For a work request to be considered complete and therefore ready to be transferred to history it is necessary for it to have a maintenance completion date and a test completion date (test completion date may not be required if no test was required).

1. From the TJMSYS Primary Menu select Option 1 - Pending Work Requests, hit ENTER. The Pending WR Main Menu will appear.

```
**********************************************************************
*      ------   TJM PENDING WORK REQUEST SUBSYSTEM    -----          *
*  OPTION ===>                              USERID - SHWFH           *
*                                             TIME - 12:11           *
*                                             DATE - 08/10/90        *
*                                                                    *
*             1  ENTER NEW WORK REQUESTS                             *
*                                                                    *
*             2  CHANGE/DELETE/COMPLETE EXISTING WORK REQUESTS       *
*                                                                    *
*             3  WORK REQUEST REPORTING                              *
*                                                                    *
*             4  WORK REQUEST SCHEDULING                             *
*                                                                    *
*                T  TUTORIAL                                         *
*                                                                    *
*                SELECT PROCESSING OPTION FROM LIST ABOVE            *
*            PRESS PF3/PF15 TO RETURN TO THE TJMSYS MAIN MENU        *
*                                                                    *
**********************************************************************
```

2. From the Pending WR Main Menu select Option 2 - Change/Delete/Complete Existing Work Requests, hit ENTER. The Pending WR Revision Menu will appear.

```
*************************************************************************
*     ------         TJM WORK REQUESTS REVISIONS          ------        *
*  OPTION ===>                               USERID - SHWFH              *
*                                              TIME - 12:15              *
*          C  MAINTENANCE COMPLETE             DATE - 08/16/90           *
*                                                                        *
*          D  DELETE                                                     *
*                                                                        *
*          F  FAILED TESTING                                             *
*                                                                        *
*          H  TRANSFER COMPLETED WORK REQUESTS TO HISTORY                *
*                                                                        *
*          M  MODIFY FIELDS                                              *
*                                                                        *
*          O  MODIFY TEST DATA                                           *
*                                                                        *
*          R  REINSTATE COMPLETED OR DELETED WORK REQUESTS               *
*                                                                        *
*          T  TESTING COMPLETE                                           *
*                                                                        *
*             SELECT PROCESSING OPTION FROM LIST ABOVE                   *
*     PRESS PF3/PF15 TO RETURN TO THE TJM WORK REQUEST MAIN MENU         *
*************************************************************************
```

3. From the Pending WR Revision Menu select Option H - Transfer Completed Work Request to History, hit ENTER. The following prompt will appear:

ENTER WR# THAT YOU WISH TO TRANSFER, OR "END":

4. Enter the work request number that you wish to complete and transfer to history, hit ENTER. The Automatic WR Transfer to History Panel will appear.

```
**************************************************************************
*   ------  TJM PROD TRAIN DEPT HISTORY WORK REQUEST TRANSFER   ------  *
*          (REQUIRED FIELD ____  OPTIONAL FIELD  ...)                    *
*                                                                        *
*  WR#:  U00788   EID:  U00XX-SPEOS--M10-     COMPLETION DATE:  09 05 90 *
*                                                                        *
*  DEPT:  OP            PRIORITY:  ...        AVAILABILITY:  NOW         *
*                                                                        *
*                   MOD.:  N   ANSI CERT:  N        N                    *
*                                                                        *
*            CONT..  ..............   TKC:  ...  ASSIGNED:  ...  CS.  .. *
*                                                                        *
*  EST.HRS:  .......   MAN.HRS:  .......   SER#:  ...................... *
*                                                                        *
*  PM.  N      CM:  N    MAINT CODE   ...    MAINT CAUSE:  ..   DR#:  .. ....*
*                                                                        *
*                    PENDING STATUS:  .....                              *
*                                                                        *
*  TOOL/MISC:     ........  ........  ........  ........  ........      *
*                 ........  ........  ........  ........  ........      *
*                 ........  ........  ........  ........  ........      *
*                 ........  ........  ........  ........  ........      *
*          PRESS PF3/PF15 AFTER ALL WORK REQUESTS HAVE BEEN PROCESSED    *
**************************************************************************
```

5. Enter the following data as shown on the Simulator Work Request (PTAO-103T1/T2).

   a. PM (Preventive Maintenance): (Y or N)

   b. CM (Corrective Maintenance): (Y or N)

NOTE: The PM and CM fields can not both be N.

   c. Maint Code: (AAA)

   d. Maint Cause: (AA)

   e. Parts/Tools in the space provided in the Tool/Misc: field of the Automatic WR Transfer to History Panel. (XXXXXXXX)

   f. Verify that the information on the screen agrees with the information on the work request. Make any appropriate changes to the information on the screen, hit ENTER. The Automatic Transfer of WR Description (Primary Panel) will appear.

```
*******************************************************************************
*   ------         TJM HISTORICAL WORK REQUEST DESCRIPTION          ------   *
*                                                                            *
*   WR#:  U00788   EID:  U00XX-SPEQS--M10-     COMPLETION DATE:  09 05 90    *
*                              WORK REQUESTED                                *
*                  TEST OF TJM SYSTEM FOR PTD SIMULATORS---                  *
*                  ---------------------------------------                   *
*                                                                            *
*                             WORK PERFORMED                                 *
*                                                                            *
*   ______________________________________________________________________   *
*   ______________________________________________________________________   *
*   ______________________________________________________________________   *
*   ______________________________________________________________________   *
*   ______________________________________________________________________   *
*   ______________________________________________________________________   *
*   ______________________________________________________________________   *
*   ______________________________________________________________________   *
*   ______________________________________________________________________   *
*   ______________________________________________________________________   *
*                                 MORE DESCRIPTION (Y/N)?   N                *
*                                                                            *
*        PRESS PF3/PF15 AFTER ALL DESCRIPTIONS HAVE BEEN ENTERED             *
*******************************************************************************
```

6. Enter the Work Performed description in the space provided. If more space is needed type 'Y' in the More Description field, hit ENTER. If no additional space is needed, hit ENTER. Hit PF3/PF15 to return to the WR Transfer prompt.

7. If another work request is to be completed and transferred to history repeat steps 4-6 above.

8. If no other work requests are to be transferred to history type 'END' and hit ENTER.

IV. Miscellaneous

A. The Historical Work Request Subsystem of TJM provides a means for documenting maintenance performed on EIDs associated with each simulator. This subsection has report generating capabilities explained in the TJM User's Manual.

B. The SAS reporting option of TJM is used to create customized summaries from both the pending and historical files. This option uses a program called EASYSAS to establish selection criteria and to select fields for printing. The use of this option is covered in the TJM User's Manual and the EASYSAS User's Manual.

ATTACHMENT 6

TJM DEPARTMENT CODES (AA)

BS	-	BUILDING SERVICES
EG	-	ENGINEERING
MD	-	MODIFICATIONS
OA	-	SOAD
OP	-	OPERATIONS
SW	-	SOFTWARE
TE	-	TECHNICIAN GROUP

ATTACHMENT 7

TJM PRIORITY CODES (A##)

A00	-	SIMULATOR IS SHUTDOWN AND PROHIBITS TRAINING IN PROGRESS. TRAINING CANNOT CONTINUE AND SIMULATOR MUST BE MADE AVAILABLE FOR MAINTENANCE.
	-	SAFETY HAZARD.
B10	-	SIMULATOR OR EQUIPMENT PROBLEM PROHIBITS MEETING TRAINING OBJECTIVES SCHEDULED IN THE NEXT 8 HOURS.
B20	-	SIMULATOR OR EQUIPMENT PROBLEM PROHIBITS MEETING TRAINING OBJECTIVES SCHEDULED IN THE NEXT 24 HOURS.
B21	-	SIMULATOR OR EQUIPMENT PROBLEM PROHIBITS MEETING TRAINING OBJECTIVES SCHEDULED IN THE NEXT 7 DAYS.
B22	-	SIMULATOR OR EQUIPMENT PROBLEM IDENTIFIED AS THE RESULT OF A REGULATORY AUDIT (I.E.: NRC, INPO, ETC.).
B23	-	SIMULATOR OR EQUIPMENT PROBLEM PROHIBITS MEETING TRAINING OBJECTIVES SCHEDULED IN THE NEXT 30 DAYS.
B30	-	SIMULATOR OR EQUIPMENT PROBLEM IDENTIFIED AS THE RESULT OF OR RELATED TO AN ANS 3.5 PERFORMANCE TEST ITEM, SIMULATOR FIDELITY, OR SIMULATOR CERTIFICATION.
B31	-	SIMULATOR OR EQUIPMENT PROBLEM RESULTS IN SOME DEGRADATION OF TRAINING EFFECTIVENESS. THE PROBLEM DOES NOT, HOWEVER, RENDER THE TRAINING FEATURE UNUSABLE.
B32	-	SIMULATOR OR EQUIPMENT PROBLEM CAUSES NO SPECIFIC DEGRADATION IN TRAINING EFFECTIVENESS. THE PROBLEM MAY BE AN IRRITATION TO TRAINEES OR INSTRUCTORS IN THE CONDUCT OF SIMULATOR EXERCISES. THIS ITEM SHOULD BE RESOLVED TO ENSURE TECHNICAL ACCURACY.
B33	-	ROUTINE AND COSMETIC SIMULATOR ITEMS THAT HAVE NO IMPACT ON TRAINING.
C00	-	ROUTINE ITEMS NOT RELATED SPECIFICALLY TO A SIMULATOR.

ATTACHMENT 8

TJM AVAILABILITY CODES (AXX)

NON	-	NON-OUTAGE
U04	-	SIMULATOR OUTAGE OF $\leq$ 4 HOURS
U08	-	SIMULATOR OUTAGE OF $\leq$ 8 HOURS
U88	-	SIMULATOR OUTAGE OF > 8 HOURS
U24	-	SIMULATOR OUTAGE OF $\geq$ 24 HOURS
S04	-	SIM. PANEL OUTAGE OF $\leq$ 4 HOURS
S08	-	SIM. PANEL OUTAGE OF $\leq$ 8 HOURS
S88	-	SIM. PANEL OUTAGE OF > 8 HOURS
S24	-	SIM. PANEL OUTAGE OF $\geq$ 24 HOURS
C04	-	SIM. COMPUTER OUTAGE OF $\leq$ 4 HOURS
C08	-	SIM. COMPUTER OUTAGE OF $\leq$ 8 HOURS
C88	-	SIM. COMPUTER OUTAGE OF > 8 HOURS
C24	-	SIM. COMPUTER OUTAGE OF $\geq$ 24 HOURS

ATTACHMENT 9

TJM PENDING STATUS CODES

ACTIV	-	BEING WORKED
EVAL	-	HOLD FOR PARTS EVALUATION
HDGSP	-	HOLD FOR DESIGN SUPPORT
HENSP	-	HOLD FOR ENGINEERING SUPPORT
HHWSP	-	HOLD FOR HARDWARE SUPPORT
HMGSP	-	HOLD FOR MODIFICATION SUPPORT
HPRTS	-	HOLD FOR PARTS
HSRBA	-	HOLD FOR SRB APPROVAL
HSWSP	-	HOLD FOR SOFTWARE SUPPORT
READY	-	READY TO WORK
RTEST	-	READY TO TEST

ATTACHMENT 10

TJM GROUP/AREA CODES (##A)

03	-	PTC/SIM. SUPPORT	B	-	BUILDING SERVICES
04	-	DRESDEN SIMULATOR	E	-	ENGINEERING
05	-	QUAD CITIES SIMULATOR	M	-	MODIFICATIONS
06	-	LASALLE SIMULATOR	O	-	SOAD
07	-	ZION SIMULATOR	P	-	OPERATIONS
08	-	BYRON SIMULATOR	S	-	SOFTWARE
09	-	BRAIDWOOD SIMULATOR	T	-	TECHNICIAN GROUP

ATTACHMENT 4
SIMULATOR REVIEW BOARD PROCEDURE

SIMULATOR REVIEW BOARD

A. Purpose

1. The purpose of this procedure is to establish a consistent process for reviewing changes to the simulator design data base and reviewing other items concerning simulator certification.

B. References

1. ANSI/ANS-3.5-1985: Nuclear Power Plant Simulators for Use in Operator Training

2. INPO TQ-504: Simulator Configuration Management System-Good Practices

3. PTAO-100: Configuration Management Control

4. PTAO-103: Simulator Work Request Procedure

5. Operations Policy #1: Configuration Management

6. Operations Policy #2: Simulator Fidelity and Appearance

C. Definitions

1. Design Database - A collection of material which documents the current performance and appearance status of the simulator hardware and software. It is further defined as the contents of the General Files Pattern Simulator (SIM) file. Any document that is NOT in the General Files Pattern Simulator (SIM) file is considered NOT part of the Simulator Design Database.

D. Procedure

1. Scope

a. The Simulator Review Board functions as a management team to:

1) approve changes to the simulator design data base.

2) authorize and document deviations between the simulator and reference plant.

3) approve Simulator Certification Reports.

2. Simulator Review Board Composition

a. The Simulator Review Board will consist of the following members:

1) Production Training Department Director of Operating Programs (or designee).

2) Production Training Department Simulator Support Supervisor (or designee).

3) Production Training Department Simulator Training Supervisor (or designee).

4) Station licensed or certified SRO.

5) Production Training Department Simulator Fidelity and Certification Coordinator.

b. A minimum of three members must be present to conduct a Simulator Review Board Meeting. Every effort should be made to include the Station licensed SRO as an attendee.

c. Other personnel may be invited to the Simulator Review Board Meeting to observe or serve as subject matter experts.

3. Determination of Simulator Review Board Discussion Items

a. The Simulator Training supervisor determines which items require review by the Simulator Review Board. Required review items are:

1) Modifications which affect the simulator design data base.

2) Setpoint Change Requests which affect the simulator design data base.

3) Simulator Configuration Changes (meter color banding changes, green board changes and other related Human Factor changes) which affect the simulator design data base.

4) Simulator Certification Report (prior to submittal to the NRC and annual updates).

5) Other items designated by the Simulator Training Supervisor.

b. When it has been determined that an item requires a review, the Simulator Fidelity and Certification Coordinator assigns a Simulator Review Board number (SRB #) on the Simulator Review Board Approval Sheet (PTAO-104T1).

1) The SRB # will be logged as XX-YY-ZZ:

XX = simulator two letter code

DR = Dresden
QC = Quad Cities
LA = LaSalle
ZN = Zion
BY = Byron
BW = Braidwood

YY = year

ZZ = sequential SRB # for that year

2) In addition, the following information will also be recorded on PTAO-104T1:

a) Work Request number (WR #), if applicable.

b) Modification number (MOD #), if applicable.

c) Brief description of the discussion item.

d) Assign the file pattern number with the appropriate simulator two letter code (XX) and year (YR) for FILE: SIM-XX-5-YR.

c. The Simulator Review Board Log Sheet (PTAO-104T2) is used for assigning SRB numbers and tracking the status of each SRB discussion item.

d. The Simulator Fidelity and Certification Coordinator maintains the Simulator Review Board Log Book.

4. Simulator Review Board Meeting Preparation

   a. The Simulator Training Supervisor submits the package of Simulator Review Board Approval Sheets (PTAO-104T1's) to the Simulator Review Board Chairman when a Simulator Review Board Meeting is warranted.

      1) The Simulator Review Board should meet at a minimum of at least once every three months and each meeting should have no more than two hours of discussion items scheduled.

      2) SRB items will be forwarded to the Simulator Review Board Chairman in a timely manner.

      3) The Simulator Support Supervisor gathers the necessary data to discuss each work request. This data should be recorded on the Simulator Review Board Approval Sheet (PTAO-104T1). This data may include:

         a) cost.
         b) manpower (hardware and/or software).
         c) lead time for obtaining parts.
         d) simulator availability.
         e) regulatory commitments.

   b. The Simulator Review Board Chairman is responsible for issuing a Meeting Notice to the Simulator Review Board members and other personnel, as appropriate, after sufficient data has been obtained to hold a discussion of each item.

5. Review Process

   a. The Simulator Support Supervisor normally serves as the Simulator Review Board Chairman to ensure consistency of all Simulator Review Board Meetings. In the Simulator Support Supervisor's absence, the following individuals serve as chairman:

      1) Production Training Department Director of Operating Programs.

      2) Production Training Department Simulator Training Supervisor.

   b. The Simulator Review Board Chairman addresses each discussion item (new business) and leads a discussion concerning each item.

      1) The Simulator Fidelity and Certification Coordinator addresses all open discussion items (old business) as directed by the Simulator Review Board Chairman.

c. The Simulator Review Board members should consider the following prior to voting on each item:

1) training value/impact.
2) resource requirements.
3) priority relative to other changes.
4) cost/benefit.
5) regulatory commitments.

d. A majority of the members present must agree on the disposition of each SRB discussion item. The appropriate members sign PTAO-104T1 signifying agreement with the disposition. In addition, any dissenting members sign PTAO-104T1 signifying disagreement with the disposition.

e. Discussion items requiring further clarification (items that were not APPROVED or DISAPPROVED) are placed on HOLD until the next Simulator Review Board Meeting.

f. The Simulator Review Board Chairman may use the comments section of PTAO-104T1 to document questions or comments concerning the discussion item.

1) Each discussion item is addressed to determine if a Simulator vs. Station Difference exists based on the disposition. The results of this determination are documented in the comments section of PTAO-104T1.

2) Check the appropriate box on PTAO-104T1 if the item is to be documented as a Simulator vs. Station Difference in the certification report.

g. Discussion items involving work requests:

1) If APPROVED, mark the APPROVED box of the DATA BASE CHANGE block of the work request. In addition, the work request is signed by the Simulator Review Board Chairman in the CONFIGURATION MANAGEMENT APPROVAL block. The Chairman also assigns a required completion date for the work request in the COMPLETI [illegible] UIRED BY block. The required completion date must me [illegible] SI/ANS-3.5-1985, section 5 requirements.

2) If DISAPPROVED, mark the CANCELLED box of the DATA BASE CHANGE block of the work request. In addition, the work request is cancelled by the Simulator Review Board Chairman and the reason for the cancellation is documented on the work request and PTAO-104T1.

3) A copy of the DISAPPROVED PTAO-104T1 is sent to the Station Training Supervisor and the Production Training Department Director of Operating Programs for review by the On Site Simulator Coordinating Committee.

h. The Simulator Fidelity and Certification Coordinator updates the Simulator Review Board Log Sheet (PTAO-104T2) after each Simulator Review Board Meeting. In addition, the completed Simulator Review Board Approval Sheets (PTAO-104T1's) are filed in the appropriate file as determined by step D.3.b.2 of this procedure.

E. Attachments

1. PTAO-104T1: Simulator Review Board Approval Sheet

2. PTAO-104T2: Simulator Review Board Log Sheet

Arthur M Roberts
Arthur M. Roberts
Production Training Manager

SIMULATOR REVIEW BOARD APPROVAL SHEET

SRB # _____-_____ -_____ MOD # ___________________ WR # _____-_____-_____

DISCUSSION ITEM

COST

MANPOWER HW-
SW-

LEAD TIME (PARTS)

SIMULATOR AVAILABILITY

REGULATORY COMMITMENTS

WILL BE DOCUMENTED AS A SIM. vs. STATION DIFFERENCE IN CERTIFICATION REPORT

☐ YES

☐ NO

COMMENTS

DISPOSITION

☐ Approved

☐ Disapproved

☐ Hold _____
Date

Chairman/Date

CONSENTING SIGNATURES

FILE: SIM - _____ - 5 - _____ DISSENTING SIGNATURES

SIMULATOR REVIEW BOARD LOGSHEET

SRB#	ITEM CLOSED (DATE)	DESCRIPTION OF SRB ITEM	WR#	DISPOSITION		
				APPROVED	DISAPPROVED	HOLD

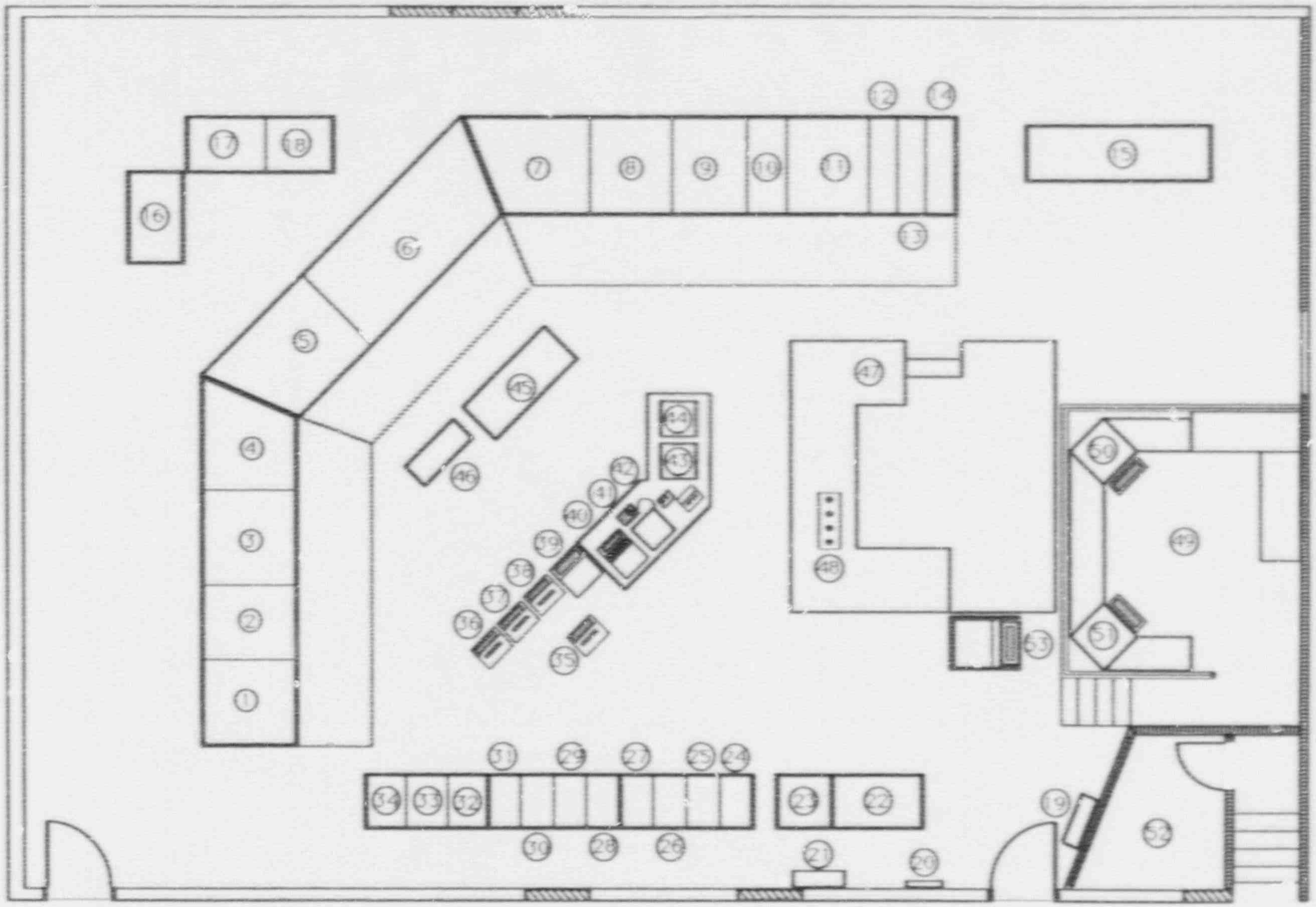
ATTACHMENT 5
SIMULATOR AND CONTROL ROOM LAYOUTS

NOTE

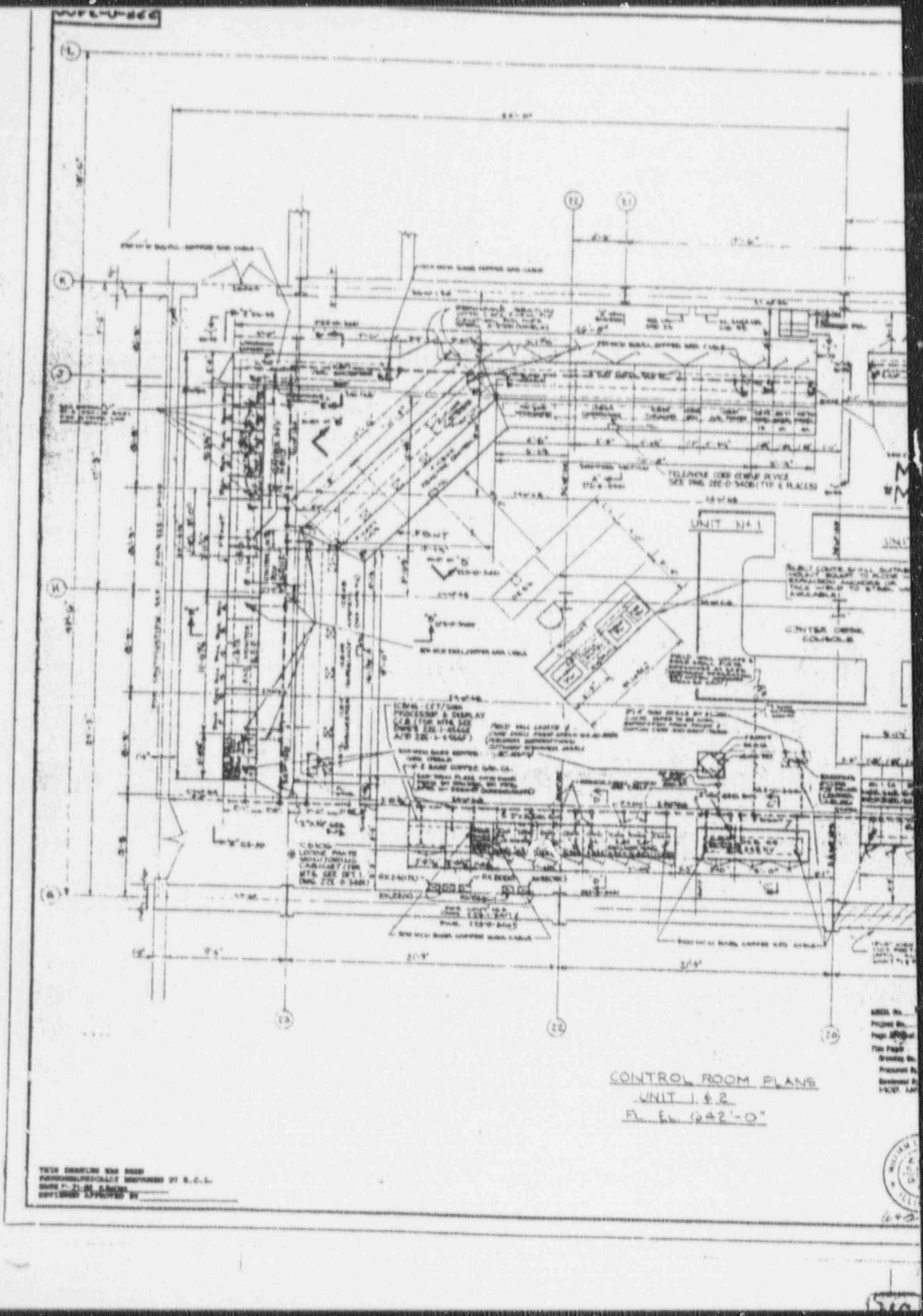
Three Control Room Arrangement drawings are included to insure that the most recent changes are shown.

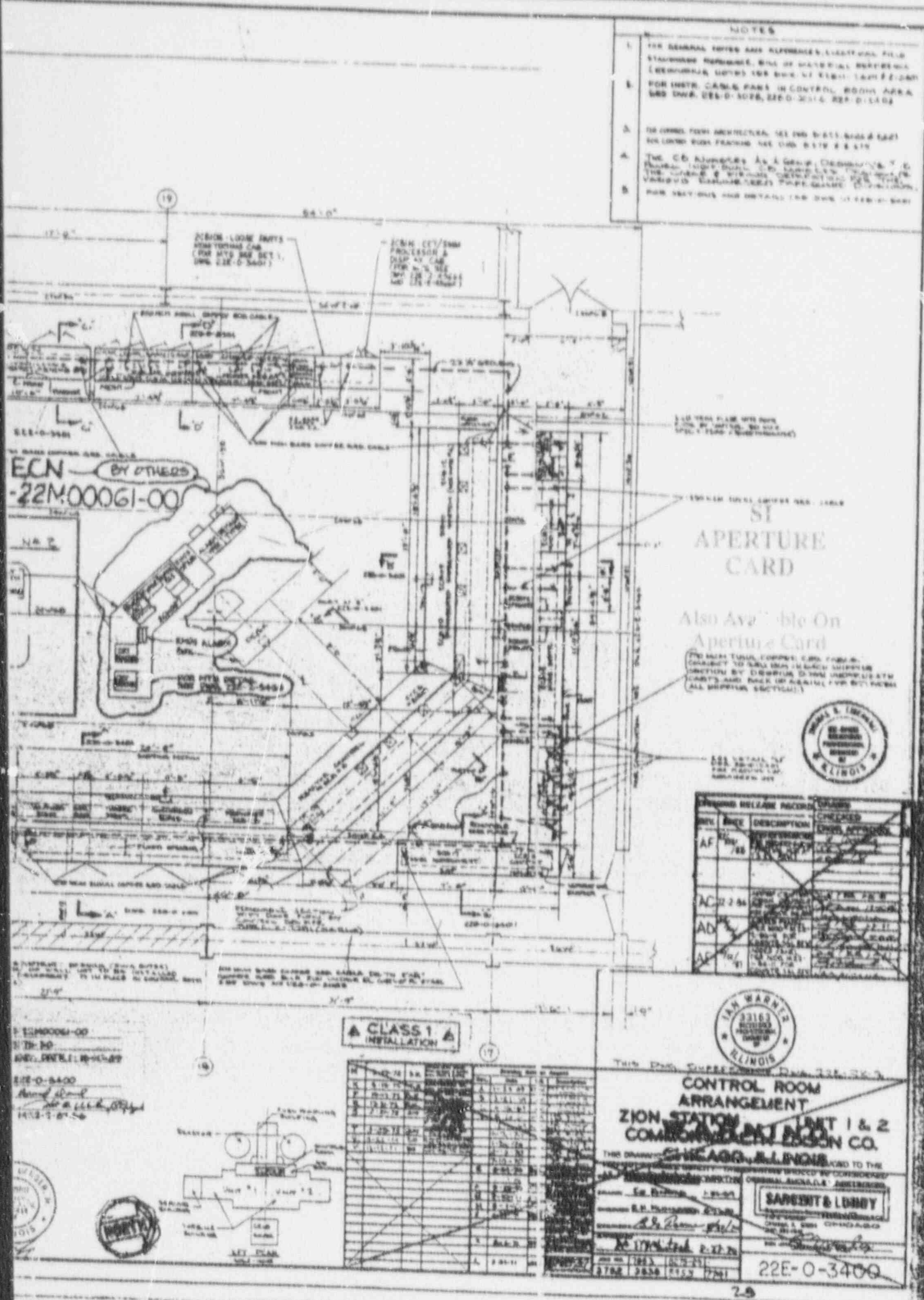
ATTACHMENT 5
SIMULATOR FLOORPLAN LEGEND

1 - 1CB12 ---------- SAFEGUARD SYSTEMS
2 - 1CB10 ---------- SAFEGUARD SYSTEMS
3 - 1CB09 ---------- SAFEGUARD SYSTEMS
4 - 1CB08 ---------- SAFEGUARD SYSTEMS
5 - 1CB07 ---------- CVCS
6 - 1CB06 ---------- REACTOR CONTROL
7 - 1CB05 ---------- FEEDWATER
8 - 1CB04 ---------- CONDENSATE
9 - 1CB03 ---------- MAIN TURBINE
10 - 1CB02 ---------- MAIN GENERATOR
11 - 1CB01 ---------- AUXILIARY POWER
12 - 1CB72 ---------- DIESEL GENERATOR 1B
13 - 1CB71 ---------- DIESEL GENERATOR 1A
14 - 1CB70 ---------- DIESEL GENERATOR 0
15 - 0CB05 ---------- HVAC
16 - 1CB16 ---------- MISC. INSTRUMENTS
17 - 1CB11 ---------- CONTAINMENT ISOLATION
18 - 1CB17 ---------- MISC. INSTRUMENTS
19 - 0CB15 ---------- OFF GAS CONTROL PANEL
20 - 1CB99 ---------- FIRE ANNUNCIATOR PANEL
21 - 1CB51 ---------- WET PIPE SPRINKLER
22 - 0CB03 ---------- SWITCHYARD
23 - 0CB04 ---------- GENERAL SERVICES
24 - 1CB22 ---------- EXCORE NUCLEAR DETECTORS
25 - 1CB23 ---------- EXCORE NUCLEAR DETECTORS
26 - 1CB24 ---------- EXCORE NUCLEAR DETECTORS
27 - 1CB25 ---------- EXCORE NUCLEAR DETECTORS
28 - 1CB18 ---------- INCORE NUCLEAR DETECTORS
29 - 1CB19 ---------- INCORE NUCLEAR DETECTORS
30 - 1CB20 ---------- INCORE NUCLEAR DETECTORS
31 - 1CB21 ---------- INCORE NUCLEAR DETECTORS
32 - 1CB41 ---------- AXIAL POWER DISTRIBUTION MONITORING SYSTEM
33 - 1CB106 --------- LOOSE PARTS MONITORING SYSTEM
34 - 1CB116 --------- INCORE THERMOCOUPLE DISPLAY PANEL
35 ------------------ SPARE TYPER
36 ------------------ MSG / TREND TYPER
37 ------------------ DEMAND TYPER
38 ------------------ ALARM TYPER
39 ------------------ EBERLINE RADIATION MONITORING SYSTEM
40 ------------------ SUPER BEE
41 ------------------ RMDS & TEKTRONICS PRINTER
42 ------------------ RMDS ALARM BOX
43 ------------------ PROCESS CRT #1
44 ------------------ PROCESS CRT #5
45 ------------------ OPERATORS DESK
46 ------------------ OPERATORS DESK
47 ------------------ CENTER DESK
48 ------------------ CENTER DESK ALARM / SILENCE
49 ------------------ INSTRUCTORS BOOTH
50 ------------------ INSTRUCTOR STATION
51 ------------------ INSTRUCTOR STATION
52 ------------------ VIEWING GALLERY
53 ------------------ ROLL AROUND INSTRUCTOR STATION



ZION STATION UNIT 1 SIMULATOR
FIGURE 1


CONTROL ROOM PLANS
UNIT 1 & 2
FL. EL. 642'-0"
UNIT No 1
CENTER DESK CONSOLE
TELEPHONE CORD CONTROL DEVICE
SEE DWG 22E-0-5406 (TYP 6 PLACES)
FRONT



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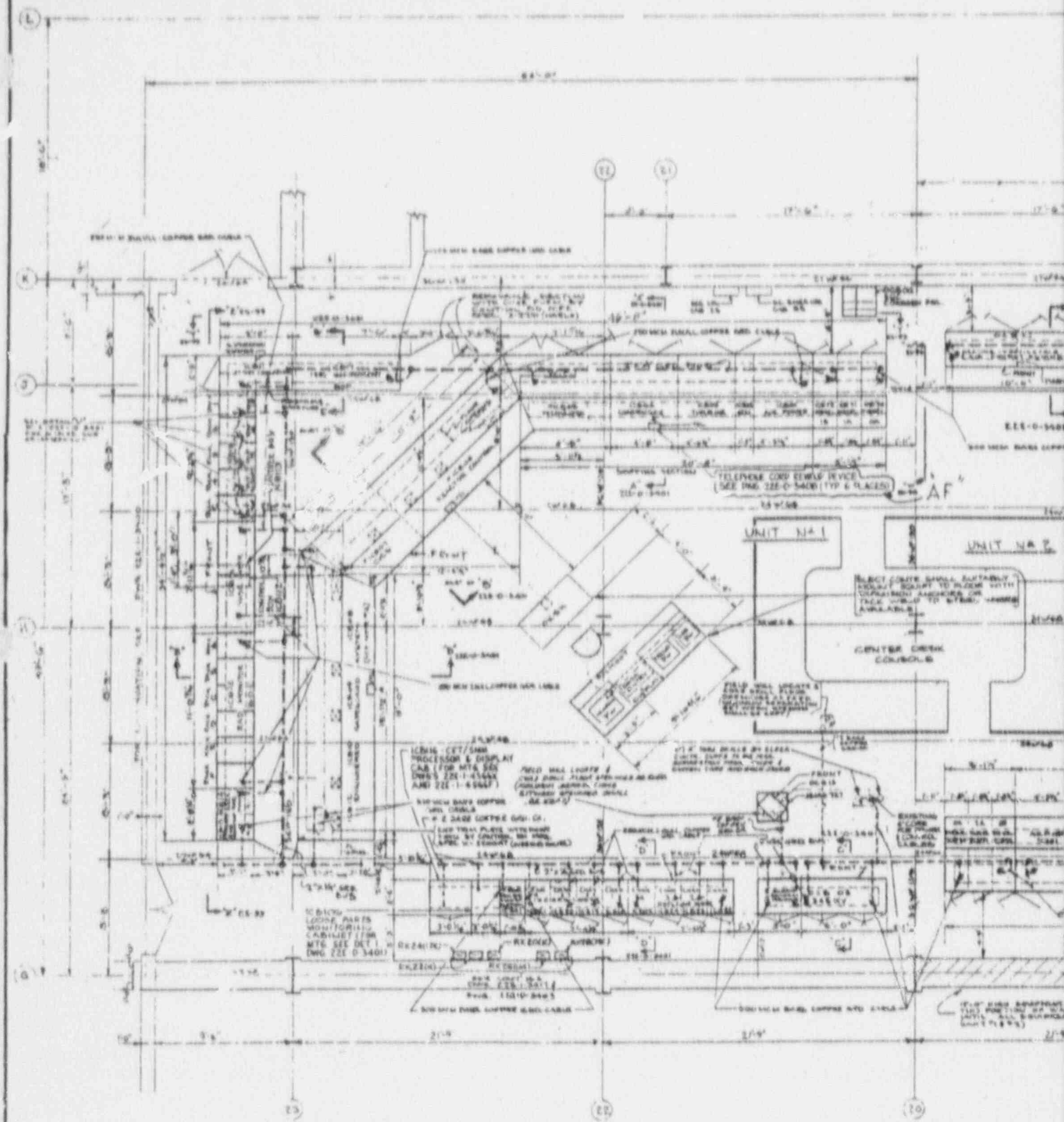

CONTROL ROOM PLANS
UNIT 1 & 2
FL. EL. 642'-0"

THIS DRAWING HAS BEEN PHOTOGRAPHICALLY REPRODUCED BY R.C.I.
DATE
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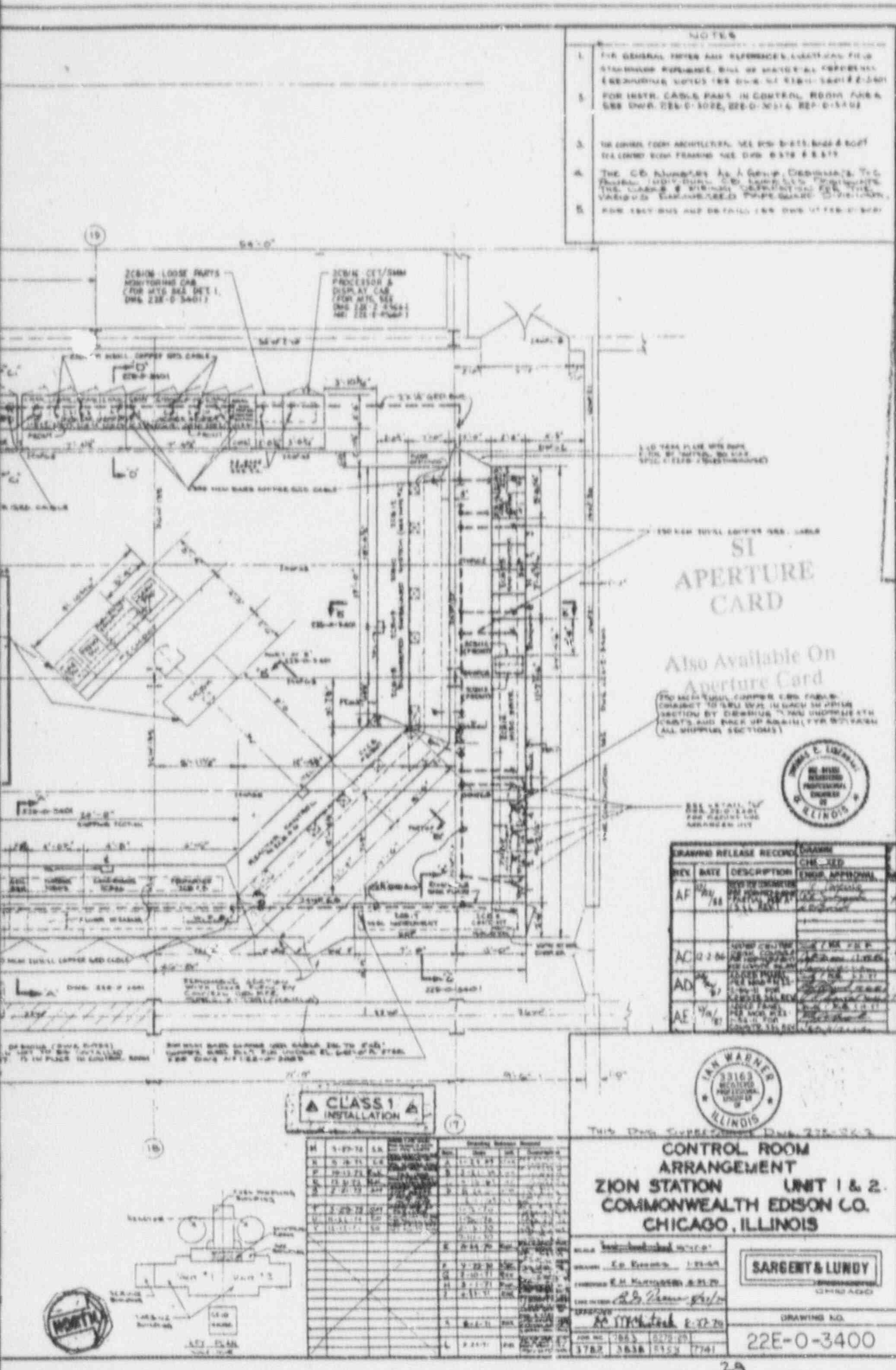

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REVISION PENDING -
REVIEW ALL DRAWING CHANGES
ASSOCIATED WITH THIS DRAWING

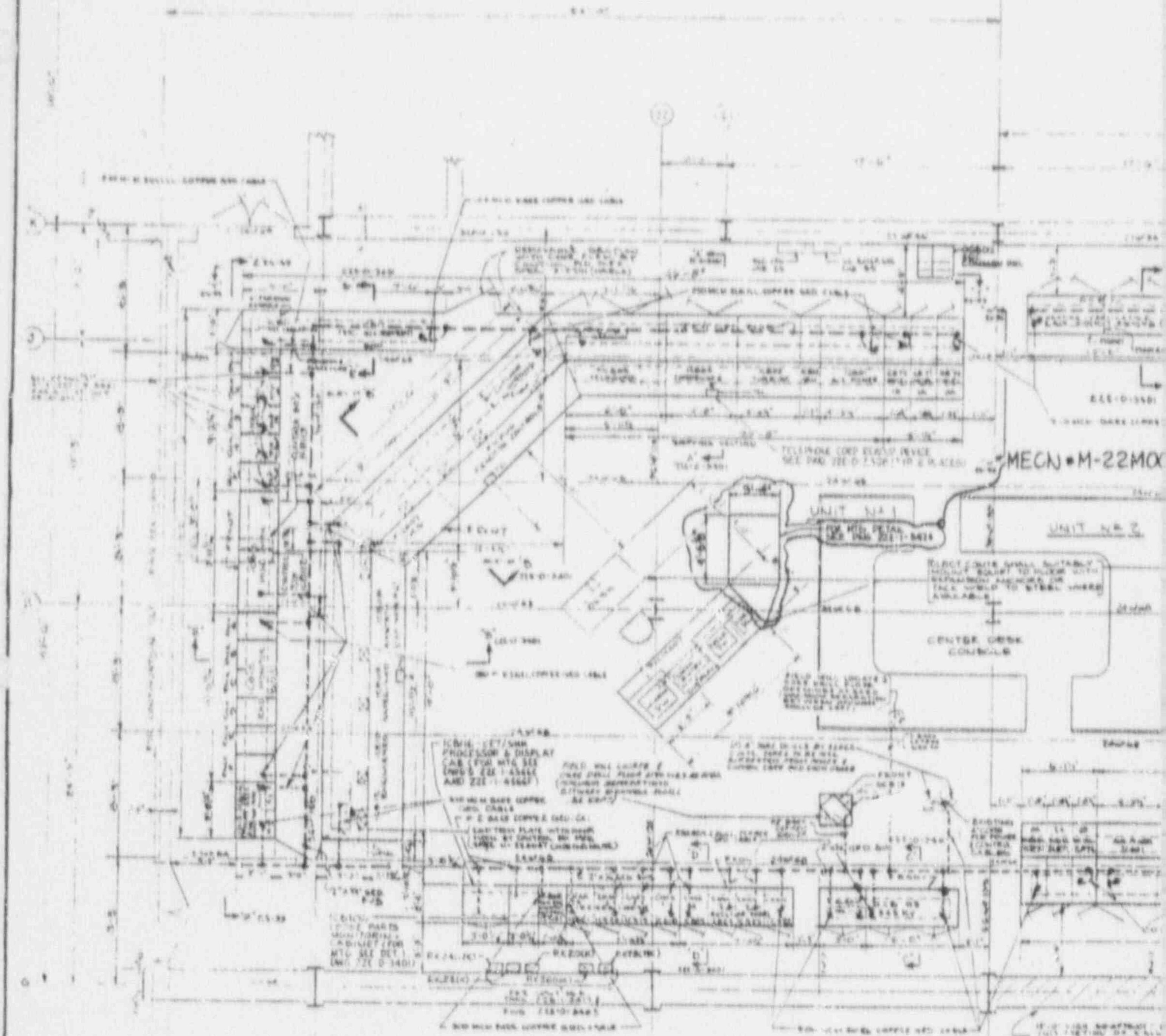
12/18/90
22M000-22-00-85-80
32-01-04
32-03-04

12-18-90

28

9104030133-02

22E-0-3400



CONTROL ROOM PLANS
UNIT 1 & 2
FL. EL. 642'-0"

MECN No. M-22M00032-01
Project No. 8273-30
Page 8 of 19 DATE: 5-24-89
This Page:
Drawing No. 22E-0-3400
MOD NO M22-1-87-56

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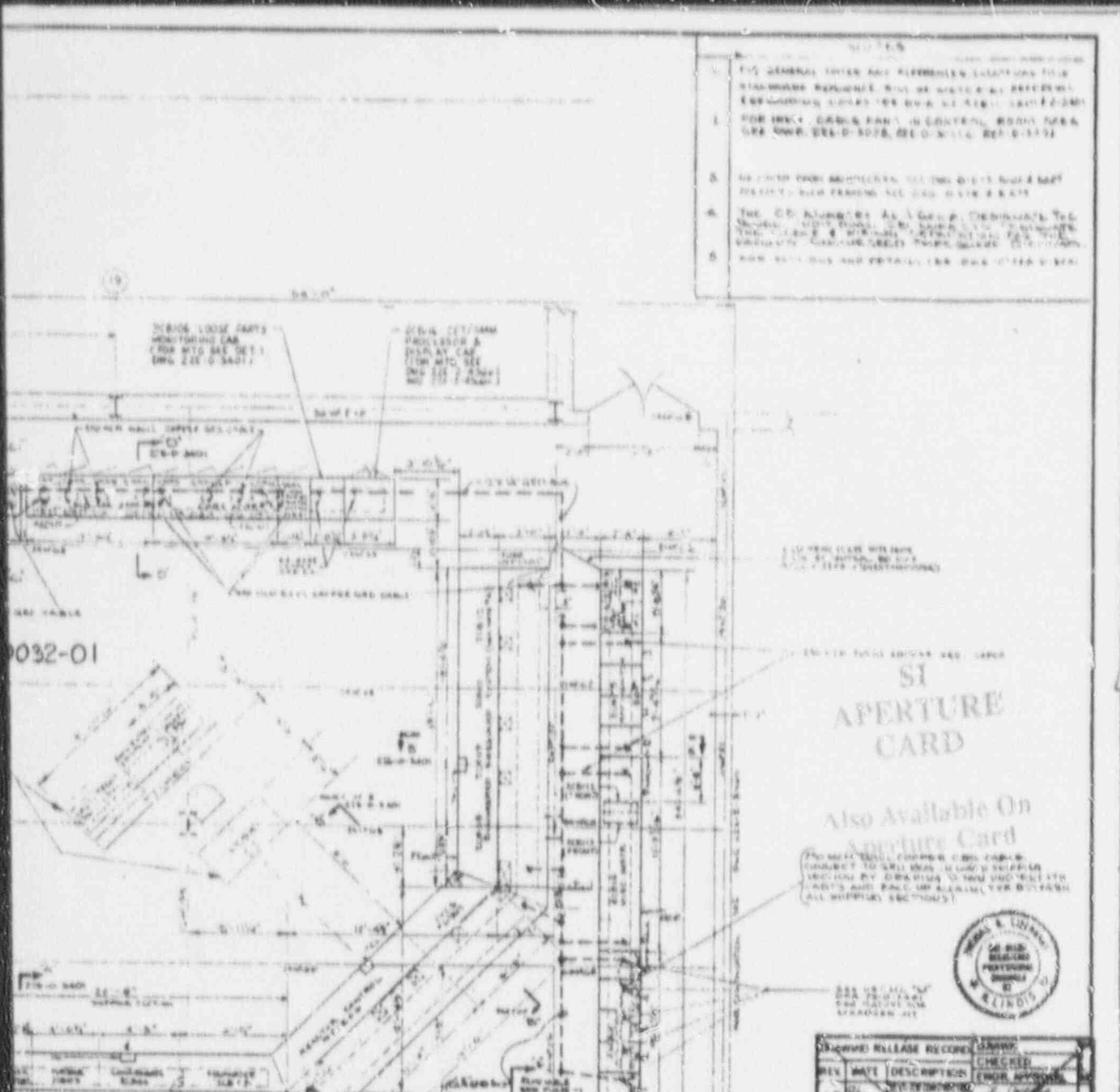

FOR REFERENCE ONLY
DATE ISSUED 1-16-91
VOID AFTER 30 DAYS

9104030133-03

ZION SIMULATOR
ANSI/ANS-3.5-1985 CERTIFICATION REPORT
INITIAL REPORT, MARCH 1991

ATTACHMENT 6
CERTIFIED MALFUNCTION CAUSE AND EFFECT BOOK

ZION MALFUNCTION

CAUSE AND EFFECTS

CC01 COMPONENT COOLING WATER PUMP TRIP/FAIL TO START

TYPE: GENERIC, RB

A) COMPONENT COOLING PUMP 0E
B) COMPONENT COOLING PUMP 0D
C) COMPONENT COOLING PUMP 0C

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-66 REV AB
22E-0-4840 CC5 REV W
22E-0-4840 CC4 REV V
22E-0-4840 CC3 REV Z
ANNUNCIATOR RESPONSE: 4-3E, 4-2B,
4-6C

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED COMPONENT COOLING WATER PUMP BREAKER WILL TRIP. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 4-3E "COMPONENT COOLING PUMPS 0E,0D,0C TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. COMPONENT COOLING PUMP DISCHARGE PRESSURE DECREASES RESULTING IN THE AUTOMATIC START OF THE STANDBY COMPONENT COOLING WATER PUMP AT 80 PSIG DISCHARGE PRESSURE, RESTORING SYSTEM PRESSURE. ANNUNCIATORS 4-2B "COMPONENT COOLING PUMPS DISCH PRESS LOW" AND 4-6C "COMPONENT COOLING PUMP AUTO START" ACTUATE AT 80 PSIG.

THE OPERATOR MAY RESET THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CC03 COMPONENT COOLING WATER PUMP AIRBOUND

TYPE: GENERIC, RB

A) COMPONENT COOLING PUMP OE
B) COMPONENT COOLING PUMP OD
C) COMPONENT COOLING PUMP OC

CAUSE: IMPROPER VENTING

REF: M-66 REV AB
DVR 22-1-87-074
ANNUNCIATOR RESPONSE: 4-2B, 4-6C, 4-3E

PLT STA: IC04

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE AFFECTED PUMP WHEN STARTED WILL NOT PRODUCE NORMAL DISCHARGE PRESSURE OR FLOW. PUMP CURRENT INDICATION WILL BE LOWER THAN NORMAL RUNNING CURRENT. THE DECREASE OF CCW FLOW TO DOWNSTREAM COMPONENTS WILL CAUSE TEMPERATURE INCREASES IN THE AFFECTED COMPONENTS.

WHEN DISCHARGE PRESSURE DECREASES TO 80 PSIG, ANNUNCIATORS 4-2B "COMPONENT COOLING PUMPS DISCH PRESS LOW" AND 4-6C "COMPONENT COOLING PUMP AUTO START" ACTUATE AND THE STANDBY CCW PUMP AUTO STARTS TO RESTORE SYSTEM PRESSURE. IF THE RUNNING PUMP CAVITATES FOR 5 MINUTES, IT WILL TRIP. ANNUNCIATOR 4-3E "COMPONENT COOLING PUMPS OE,OD,OC TRIP" WILL ACTUATE.

MALFUNCTION REMOVAL WILL RESTORE THE PUMP TO NORMAL OPERATION.

[REV 1]

CC04 ESSENTIAL COMPONENT COOLING WATER RHR TRAIN BREAK

TYPE: GENERIC, RV 100% = 12" PIPE BREAK @ NOP

A) CCW RHR TRAIN A
B) CCW RHR TRAIN B

CAUSE: PIPING FAILURE ON RHR ESSENTIAL CCW TRAIN HEADER

REF: M-66 REV AB
ANNUNCIATOR RESPONSE: 4-2D, 4-2B, 4-6C

PLT STA: IC04

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE COMPONENT COOLING WATER SYSTEM WILL RESULT. CCW SURGE TANK LEVEL WILL DECREASE AT A RATE DETERMINED BY THE SELECTED SEVERITY. ANNUNCIATOR 4-2D "COMPONENT COOLING SURGE TANK LEVEL HIGH LOW" ACTUATES WHEN LEVEL DECREASES TO 41.3%.

AS MALFUNCTION SEVERITY IS INCREASED, COMPONENT COOLING WATER DISCHARGE PRESSURE WILL DECREASE AND PUMP FLOW WILL INCREASE. THE DECREASE OF CCW FLOW TO THE DOWNSTREAM COMPONENTS WILL CAUSE TEMPERATURE INCREASES IN THE AFFECTED COMPONENTS. WHEN DISCHARGE PRESSURE DECREASES TO 80 PSIG, ANNUNCIATORS 4-2B "COMPONENT COOLING PUMPS DISCH PRESS LOW" AND 4-6C "COMPONENT COOLING PUMP AUTO START" ACTUATE AND THE STANDBY CCW PUMP AUTO STARTS TO ATTEMPT TO RESTORE SYSTEM PRESSURE.

AS SURGE TANK LEVEL(S) CONTINUE TO DECREASE, NPSH WILL EVENTUALLY BE LOST TO THE CCW PUMPS RESULTING IN PUMP CAVITATION. ALL COMPONENTS COOLED BY CCW WILL INCREASE IN TEMPERATURE.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE COMPONENT COOLING SYSTEM PIPING INTEGRITY.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CC05 NON-ESSENTIAL COMPONENT COOLING WATER BREAK

TYPE: DISCRETE, RV 100% = 16" PIPE BREAK @ NOP

CAUSE: PIPING FAILURE DOWNSTREAM OF 1MOV-CC9415

REF: M-66 REV AB
ANNUNCIATOR RESPONSE: 4-2D, 4-2B, 4-6C

PLT STA: IC04

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE COMPONENT COOLING WATER SYSTEM WILL RESULT. CCW SURGE TANK LEVEL WILL DECREASE AT A RATE DETERMINED BY THE SELECTED SEVERITY. ANNUNCIATOR 4-2D "COMPONENT COOLING SURGE TANK LEVEL HIGH LOW" ACTUATES WHEN LEVEL DECREASES TO 41.3%.

AS MALFUNCTION SEVERITY IS INCREASED, COMPONENT COOLING WATER DISCHARGE PRESSURE WILL DECREASE AND PUMP FLOW WILL INCREASE. THE DECREASE OF CCW FLOW TO THE DOWNSTREAM COMPONENTS WILL CAUSE TEMPERATURE INCREASES IN THE AFFECTED COMPONENTS. WHEN DISCHARGE PRESSURE DECREASES TO 80 PSIG, ANNUNCIATORS 4-2B "COMPONENT COOLING PUMPS DISCH PRESS LOW" AND 4-6C "COMPONENT COOLING PUMP AUTO START" ACTUATE AND THE STANDBY CCW PUMP AUTO STARTS TO ATTEMPT TO RESTORE SYSTEM PRESSURE.

AS SURGE TANK LEVEL(S) CONTINUE TO DECREASE, NPSH WILL EVENTUALLY BE LOST TO THE CCW PUMPS RESULTING IN PUMP CAVITATION. ALL COMPONENTS COOLED BY CCW WILL INCREASE IN TEMPERATURE.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE COMPONENT COOLING SYSTEM PIPING INTEGRITY.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CC07 COMPONENT COOLING WATER SURGE TANK A LEAK

TYPE: DISCRETE, RB

CAUSE: PIPE BREAK UPSTREAM OF 1CC-9456A LEAKS AT 100 GPM

REF: M-66 REV AB
ANNUNCIATOR RESPONSE: 4-2D

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE COMPONENT COOLING WATER SYSTEM WILL RESULT. CCW SURGE TANK LEVEL WILL DECREASE AT A RATE OF 100 GPM.

IF THE CCW SURGE TANK A IS ISOLATED, SURGE TANK B LEVEL WILL STOP DECREASING AT THE BAFFLE PLATE LEVEL OF 38%, WHILE SURGE TANK A LEVEL CONTINUES TO DECREASE. ANNUNCIATOR 4-2D "COMPONENT COOLING SURGE TANK LEVEL HIGH LOW" ACTUATES WHEN LEVEL DECREASES TO 41.3%.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY ADDING PRIMARY MAKEUP WATER TO THE CCW SYSTEM.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE COMPONENT COOLING SYSTEM PIPING INTEGRITY.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CC08 COMPONENT COOLING WATER SURGE TANK B LEAK

TYPE: DISCRETE, RB

CAUSE: PIPE BREAK UPSTREAM OF 1CC-9456B LEAKS AT 100 GPM

REF: M-66 REV AB
ANNUNCIATOR RESPONSE: 4-2D

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE COMPONENT COOLING WATER SYSTEM WILL RESULT. CCW SURGE TANK LEVEL WILL DECREASE AT A RATE OF 100 GPM.

IF THE CCW SURGE TANK B IS ISOLATED, SURGE TANK A LEVEL WILL STOP DECREASING AT THE BAFFLE PLATE LEVEL OF 38%, WHILE SURGE TANK B LEVEL CONTINUES TO DECREASE. ANNUNCIATOR 4-2D "COMPONENT COOLING SURGE TANK LEVEL HIGH LOW" ACTUATES WHEN LEVEL DECREASES TO 41.3%.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY ADDING DEMINERALIZED MAKEUP WATER TO THE CCW SYSTEM.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE COMPONENT COOLING SYSTEM PIPING INTEGRITY.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CC09 RCP THERMAL BARRIER TUBING CCW LEAK

TYPE: GENERIC, RV 100% = 50 GPM @ NOP

A) REACTOR COOLANT PUMP 1A
B) REACTOR COOLANT PUMP 1B
C) REACTOR COOLANT PUMP 1C
D) REACTOR COOLANT PUMP 1D

CAUSE: RCP THERMAL BARRIER TUBING LEAK

REF: REACTOR COOLANT SYSTEM DESCRIPTION
M-54 REV AG, M-66 REV AB, M-67 REV Z
22E-1-4840 CC7 REV L
22E-1-4840 CC13 REV C
ANNUNCIATOR RESPONSE: 9-7E, 4-2D, 9-6B

PLT STA: IC57

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED RCP THERMAL BARRIER WILL LOSE MASS FROM THE RCS TO THE CCW SYSTEM. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. INCREASING MALFUNCTION SEVERITY WILL RESULT IN AN INCREASED RCS MASS LOSS RATE. CCW SURGE TANK LEVEL WILL INCREASE AS INDICATED ON 1LI-670/676 (1CB08). ANNUNCIATOR 4-2D "COMPONENT COOLING SURGE TANK LEVEL HIGH LOW" WILL ACTUATE AT 58.7% LEVEL. ANNUNCIATOR 9-6C "REACTOR COOLANT PUMPS THERMAL BARRIER COOLING WATER TEMP HIGH" ACTUATES AT > 120 °F. AFFECTED SEAL LEAKOFF FLOW, AS INDICATED ON 1FR-154/156/ 158/160 (1CB07), WILL DECREASE AS THE NORMALLY RETURNING SEAL WATER LEAKS TO THE CCW SYSTEM. CCW SYSTEM ACTIVITY LEVELS WILL INCREASE, AS INDICATED ON 1RE-0017A AND/OR ORE-PR07, DEPENDENT UPON SYSTEM ALIGNMENT, PROPORTIONAL TO THE IN- LEAKED MASS ACTIVITY LEVEL AND THE LEAK RATE. WHEN VCT LEVEL, AS INDICATED ON 1LI-185 (1CB07), DECREASES TO 14%, ANNUNCIATOR 9-7E "VOLUME CONTROL TANK LEVEL HIGH LOW" WILL ACTUATE AND AUTO MAKEUP INITIATES.

ANNUNCIATOR 9-6B "REACTOR COOLANT PUMPS THERMAL BARRIER COOLING WATER FLOW HIGH" ACTUATES AT > 190 GPM AND COMMON THERMAL BARRIER HEAT EXCHANGERS RETURN LINE ISOLATION VALVE, 1MOV-FCV685 THROTTLES CLOSED TO MAINTAIN 190 GPM FLOW.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE COMPONENT COOLING SYSTEM PIPING INTEGRITY.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

CC10 COMPONENT COOLING WATER FLOW TRANSMITTER 1FICA-685 FAILURE

TYPE: DISCRETE, RV 100% = 100% TRANSMITTER OUTPUT

CAUSE: TRANSMITTER FAILURE

REF: M-67 REV Z
22E-1-4840 CC7 REV L
22E-1-4840 CC13 REV C
COMPONENT COOLING WATER SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 9-6A, 9-6B

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, CCW FLOW TRANSMITTER 1FICA-685 WILL FAIL TO A VALUE DETERMINED BY THE SELECTED SEVERITY. IF THE MALFUNCTION SEVERITY IS LESS THAN A 190 GPM SIGNAL, 1MOV-CC685 WILL NOT THROTTLE CLOSED WHEN AN ACTUAL HIGH FLOW CONDITION IS RECEIVED. ANNUNCIATOR 9-6B "REACTOR COOLANT PUMPS THERMAL BARRIER COOLING WATER FLOW HIGH" DOES NOT ACTUATES AT > 190 GPM ACTUAL FLOW AS REQUIRED.

IF THE MALFUNCTION SEVERITY IS GREATER THAN A 190 GPM SIGNAL, CCW ISOLATION VALVE 1MOV-CC685 WILL THROTTLE CLOSED WHICH RESULTS IN A DECREASE OF CCW FLOW THROUGH THE REACTOR COOLANT PUMPS. ANNUNCIATOR 9-6A "REACTOR COOLANT PUMPS THERMAL BARRIER COOLING WATER FLOW LOW" WILL NOT ACTUATE WHEN RETURN FLOW DECREASES TO < 130 GPM.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY FLOW TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CH01 RCFC FAN (LOW SPEED) TRIP/FAILS TO START

TYPE: GENERIC, RB

A) RCFC 1RV001
B) RCFC 1RV002
C) RCFC 1RV003
D) RCFC 1RV004
E) RCFC 1RV005

CAUSE: FAULTY (CX) RELAY OPENS CX CONTACTS

REF: M-76 REV M
22E-1-4840 RV1 REV L
22E-1-4840 RV3 REV K
22E-1-4840 RV5 REV L
22E-1-4840 RV7 REV M
22E-1-4840 RV9 REV K
ANNUNCIATOR RESPONSE: 2-5E
DVR 22-1-87-110
DVR 22-1-88-063
DVR 22-1-88-064

PLT STA: RCFC FAN IN OPERATION AT LOW SPEED

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED REACTOR CONTAINMENT FAN COOLER FAN LOW SPEED BREAKER TRIPS. ANNUNCIATOR 2-5E "CONTAINMENT FAN COOLERS LO SPD BKR TRIP HI SPD BKR TRIP" IS ACTUATED. CURRENT INDICATION ON THE SELECTED FAN DECREASES TO ZERO AND THE AMBER LAMP ON THE ASSOCIATED CONTROL SWITCH ILLUMINATES.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND AMBER LAMP BY PLACING THE CONTROL SWITCH IN TRIP. IF THE OPERATOR ATTEMPTS TO RESTART THE FAN, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN. A LONG TERM EFFECT OF THE FAN TRIPPING WILL BE AN INCREASE IN CONTAINMENT TEMPERATURE.

MALFUNCTION REMOVAL WILL RESTORE THE CX RELAY TO NORMAL OPERATION.

[REV 2]

CH07 CONTAINMENT PRESSURE TRANSMITTER FAILURE

TYPE: GENERIC, RV 100% = 100% TRANSMITTER OUTPUT

A) CHANNEL I CONTAINMENT PRESSURE (1PT-CS19)
B) CHANNEL II CONTAINMENT PRESSURE (1PT-CS20)
C) CHANNEL III CONTAINMENT PRESSURE (1PT-CS21)
D) CHANNEL IV CONTAINMENT PRESSURE (1PT-CS22)
E) CONTAINMENT PRESSURE TRANSMITTER 1PT-CS50
F) CONTAINMENT PRESSURE TRANSMITTER 1PT-CS51

CAUSE: TRANSMITTER FAILURE

REF: PRIMARY CONTAINMENT AND SUPPORT SYSTEMS DESCRIPTION
22E-1-4840 RP50 REV F
22E-1-4840 RP51 REV G
22E-1-4840 RP52 REV F
22E-1-4840 RP53 REV G
22E-1-4840 RP54 REV F
22E-1-4840 RP55 REV F
22E-1-4840 RP56 REV F
22E-1-4840 RP57 REV F
M-44 REV JK
ANNUNCIATOR RESPONSE: 4-6A, 4-6B, 6-3E

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE AFFECTED CONTAINMENT PRESSURE CHANNEL FAILS TO THE SELECTED SEVERITY. AS THE MALFUNCTION SEVERITY IS INCREASED, THE AFFECTED CHANNEL CONTAINMENT PRESSURE SIGNAL WILL INCREASE. GENERICS E AND F ARE FED TO METER INDICATIONS AND PPC POINTS ONLY. AT 4.5 PSIG, ANNUNCIATOR 4-6A "REACTOR CNMT PRESS CHANNELS I, II, III, IV PRESS HIGH" ACTUATES. WHEN INCREASED TO 22.4 PSIG, ANNUNCIATOR 4-6B "REACTOR CNMT PRESS CHANNELS I, II, III, IV PRESS HIGH HIGH" WILL BE ACTUATED.

IF TWO GENERIC PORTIONS OF THIS MALFUNCTION ARE INCREASED TO 4.5 PSIG, ANNUNCIATOR 6-3E "CONTAINMENT SAFETY INJ PRESSURE HIGH REACTOR TRIP" WILL ACTUATE WITH THE FOLLOWING AUTOMATICALLY OCCURRING:

- A FEEDWATER ISOLATION SIGNAL IS GENERATED
- A REACTOR TRIP IS GENERATED
- A SAFETY INJECTION SIGNAL IS GENERATED
- A CONTAINMENT ISOLATION PHASE A SIGNAL IS GENERATED
- THE ISOLATION VALVE SEAL WATER SYSTEM IS ACTUATED
- A CONTAINMENT VENTILATION ISOLATION SIGNAL IS GENERATED

IF TWO GENERIC PORTIONS OF THIS MALFUNCTION ARE INCREASED TO 22.4 PSIG, THE FOLLOWING AUTOMATICALLY OCCURS:

CH07 CONTAINMENT PRESSURE TRANSMITTER FAILURE (cont.)

- STEAMLINE ISOLATION SIGNALS ARE GENERATED
- CONTAINMENT SPRAY IS ACTUATED
- CONTAINMENT ISOLATION PHASE B IS INITIATED

IF ACTUAL CONTAINMENT PRESSURE IS > 4.5 PSIG, AND THE MALFUNCTION SEVERITY IS LOW ON 3 OF THE 4 CHANNELS, THE NORMALLY GENERATED SIGNALS WILL NOT BE GENERATED.

MALFUNCTION REMOVAL WILL RESTORE THE PRESSURE TRANSMITTER TO NORMAL OPERATION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

CS01 CONTAINMENT SPRAY PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) CONTAINMENT SPRAY PUMP 1A
B) CONTAINMENT SPRAY PUMP 1B

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-44 REV JK
22E-1-4840 CS1 REV N
22E-1-4840 CS2 REV N
ANNUNCIATOR RESPONSE: 2-4A

PLT STA: AFFECTED CONTAINMENT SPRAY PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED CONTAINMENT SPRAY PUMP BREAKER WILL TRIP. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 2-4A "CONTAINMENT SPRAY PUMPS TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. CONTAINMENT SPRAY PUMP DISCHARGE FLOW/RECIRC FLOW, AS INDICATED ON 1FI-CS01A/02A (1CB09), DECREASES TO ZERO. CONTAINMENT PRESSURE DOES NOT DECREASE AS RAPIDLY AS NORMAL IF SPRAY IS REQUIRED.

THE OPERATOR MAY RESET THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 1]

CS02 CONTAINMENT SPRAY PUMP 1C DIESEL TRIP/FAILS TO START

TYPE: DISCRETE, RB

CAUSE: FAULTY (R19) OVERSPEED RELAY

REF: M-44 REV JK
22E-1-4840 CS17 REV L
ANNUNCIATOR RESPONSE: 2-4A
DVR-22-1-87-037
LER-22-1-88-018

PLT STA: DIESEL DRIVEN CONTAINMENT SPRAY PUMP 1C IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, CONTAINMENT SPRAY PUMP 1C DIESEL WILL TRIP. ANNUNCIATOR 2-4A "CONTAINMENT SPRAY PUMPS TRIP" ACTUATES. CONTAINMENT SPRAY PUMP DISCHARGE FLOW/RECIRC FLOW, AS INDICATED ON 1FI-CS03A (1CB09), DECREASES TO ZERO. CONTAINMENT PRESSURE DOES NOT DECREASE AS RAPIDLY AS NORMAL IF SPRAY IS REQUIRED.

ANY ATTEMPT BY THE OPERATOR TO RESTART THE PUMP, WILL RESULT IN AN IMMEDIATE PUMP TRIP.

MALFUNCTION REMOVAL WILL RESTORE THE OVERSPEED RELAY TO NORMAL OPERATION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV01 CENTRIFUGAL CHARGING PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) CHARGING PUMP 1A
B) CHARGING PUMP 1B

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-55 REV AM
22E-1-4840 VC1 REV U
22E-1-4840 VC2 REV T
ANNUNCIATOR RESPONSE: 5-3A, 5-4D

PLT STA: CHARGING PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED CHARGING PUMP BREAKER WILL OPEN. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 5-3A " CHARGING PUMPS TRIP" ACTUATES AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. PUMP DISCHARGE FLOW, AS INDICATED BY 1FI-121A (1CB07), DECREASES TO ZERO AND DISCHARGE PRESSURE, AS INDICATED BY 1PI-120A (1CB07), DECREASES TO MINIMUM. ANNUNCIATOR 5-4D "CHARGING LINE FLOW LOW" IS ACTUATED AT 35 GPM. THE LETDOWN ORIFICE STOP VALVES AUTO CLOSE ON THE LOSS OF CHARGING FLOW.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND AMBER LAMP BY PLACING THE CONTROL SWITCH IN TRIP. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE, THEN IMMEDIATELY TRIP OPEN. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY STARTING ONE OF THE OTHER CHARGING PUMPS.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 2]

CV02 POSITIVE DISPLACEMENT CHARGING PUMP TRIP/FAILS TO START

TYPE: DISCRETE, RB

CAUSE: FAULTY 138LSX CONTACT CLOSURE

REF: M-55 REV AM
22E-1-4840 VC3 REV K
ANNUNCIATOR RESPONSE: 5-3A, 5-4D

PLT STA: CHARGING PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED CHARGING PUMP BREAKER WILL OPEN. ANNUNCIATOR 5-3A " CHARGING PUMPS TRIP" ACTUATES AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. PUMP DISCHARGE FLOW, AS INDICATED BY 1FI-121A (1CB07), DECREASES TO ZERO AND DISCHARGE PRESSURE, AS INDICATED BY 1PI-120A (1CB07), DECREASES TO MINIMUM. ANNUNCIATOR 5-4D "CHARGING LINE FLOW LOW" IS ACTUATED AT 35 GPM. THE LETDOWN ORIFICE STOP VALVES AUTO CLOSE ON THE LOSS OF CHARGING FLOW.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND AMBER LAMP BY PLACING THE CONTROL SWITCH IN TRIP. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE, THEN IMMEDIATELY TRIP OPEN. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY STARTING ONE OF THE OTHER CHARGING PUMPS.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY CONTACT TO NORMAL OPERATION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV03 PRIMARY WATER MAKE-UP PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) PRIMARY WATER MAKEUP PUMP OA
B) PRIMARY WATER MAKEUP PUMP OB

CAUSE: FAULTY OL CONTACTS FAIL OPEN

REF: M-41 REV S
22E-0-4840 PW1 REV K
22E-0-4840 PW2

PLT STA: PRIMARY WATER MAKEUP PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED PRIMARY WATER MAKEUP PUMP BREAKER WILL TRIP. THE CONTROL SWITCH AMBER LAMP ILLUMINATES AND THE PRIMARY WATER MAKEUP PUMPS DISCHARGE PRESSURE, AS INDICATED ON OPI-PW07 (OCB04) WILL DECREASE UNTIL THE STANDBY PRIMARY WATER MAKEUP PUMP AUTO STARTS AT 55 PSIG.

WHEN THE CVCS MAKEUP SYSTEM REQUIRES THE ADDITION OF PRIMARY WATER, THE LOSS OF THE PRIMARY WATER PUMP WILL BE INDICATED BY DEMIN WATER FLOW, AS INDICATED ON 1FI-111 & 1FR-110 (1CB07), REMAINING AT ZERO. THE PRIMARY WATER COUNTER WILL NOT COUNT. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY STARTING THE OTHER PRIMARY WATER MAKEUP PUMP.

THE OPERATOR MAY RESET THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY OL CONTACTS TO NORMAL OPERATION.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV04 BORIC ACID TRANSFER PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) BORIC ACID TRANSFER PUMP 1A
B) BORIC ACID TRANSFER PUMP 1B
C) BORIC ACID TRANSFER PUMP 1C

CAUSE: FAULTY OL CONTACTS FAILS OPEN

REF: M-57 REV Z
22E-1-4840 VC7 REV F
22E-1-4840 VC8 REV F
ANNUNCIATOR RESPONSE: 5-5E

PLT STA: BORIC ACID TRANSFER PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED BORIC ACID TRANSFER PUMP BREAKER WILL TRIP. ANNUNCIATOR 5-5E "BORIC ACID TRANSFER PUMPS TRIP" IS ACTUATED.

WHEN THE CVCS MAKEUP SYSTEM REQUIRES THE ADDITION OF BORIC ACID, THE LOSS OF THE BORIC ACID TRANSFER PUMP WILL BE INDICATED BY BORIC ACID FLOW, AS INDICATED ON 1FI-110 (1CB07), REMAINING AT ZERO. THE BORIC ACID COUNTER WILL NOT COUNT. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY STARTING THE OTHER BORIC ACID TRANSFER PUMP.

THE OPERATOR MAY RESET THE ANNUNCIATOR BY PLACING THE CONTROL SWITCH IN TRIP. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE, THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY OL CONTACTS TO NORMAL OPERATION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV07 PCV 131 CONTROL FAILURE

TYPE: DISCRETE, RV 100% = VALVE FULLY OPEN

CAUSE: CONTROLLER FAILURE

REF: M-54 REV AG
M-55 REV AM
CVCS SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 5-3C, 5-3D

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, LETDOWN LINE PRESSURE CONTROL VALVE 1VC-PCV131 WILL TRAVEL TO THE VALUE SELECTED BY THE MALFUNCTION SEVERITY AND WILL NOT RESPOND TO POSITION DEMANDS FROM ITS CONTROLLER.

IF THE SELECTED SEVERITY RESULTS IN 1VC-PCV131 MODULATING CLOSED, LETDOWN LINE PRESSURE, AS INDICATED ON 1PI-131 (1CB07), WILL INCREASE AND LETDOWN LINE FLOW, AS INDICATED ON 1FI-132 (1CB07), WILL DECREASE. ANNUNCIATOR 5-3C "LOW PRESSURE LETDOWN LINE FLOW HIGH PRESSURE HIGH" WILL ACTUATE IF PRESSURE INCREASES TO 400 PSIG. IF LETDOWN LINE PRESSURE INCREASES TO 600 PSIG, HIGH PRESSURE LETDOWN RELIEF VALVE, 1VC8117, WILL LIFT ACTUATING ANNUNCIATOR 5-3D "LOW PRESSURE LETDOWN RELIEF TEMPERATURE HIGH" AT 120 ^{O}F.

IF THE SELECTED SEVERITY RESULTS IN 1VC-PCV131 MODULATING OPEN, LETDOWN LINE PRESSURE WILL DECREASE AND LETDOWN LINE FLOW WILL INCREASE. ANNUNCIATOR 5-3C "LOW PRESSURE LETDOWN LINE FLOW HIGH PRESSURE HIGH" WILL ACTUATE IF LETDOWN FLOW INCREASES TO 130 GPM. IF LETDOWN LINE PRESSURE DECREASES TO THE SATURATION PRESSURE FOR THE TEMPERATURE OF THE LETDOWN FLUID, FLASHING WILL OCCUR.

MALFUNCTION REMOVAL WILL RESTORE 1VC-PCV131 AIR SUPPLY TO NORMAL.

[REV 1]

CV08 CHARGING HEADER HCV-182 CONTROL FAILURE

TYPE: DISCRETE, RV 100% = VALVE FULLY OPEN

CAUSE: I/P CONVERTER FAILS - NO MAN CONTROL

REF: M-54 REV AG
ANNUNCIATOR RESPONSE: 5-3B, 5-3E

PLT STA: 1C37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, CHARGING HEADER BACK PRESSURE CONTROL VALVE, 1VC-HCV182, FAILS TO THE VALUE SELECTED BY THE MALFUNCTION SEVERITY. OPERATION OF 1HCV-182 (1CB07) WILL HAVE NO EFFECT ON VALVE POSITION.

CLOSURE OF 1VC-HCV182 WILL RESULT IN INCREASED FLOW TO THE RCP INJECTION LINES. THE DECREASE IN FLOW THROUGH THE REGENERATIVE HEAT EXCHANGER WILL RESULT IN INCREASED LETDOWN LINE TEMPERATURES. DUE TO THE THROTTLING ACTION OF 1VC8369A/B/C/D, THE DECREASE IN NORMAL CHARGING LINE FLOW MAY NOT BE OFFSET BY THE INCREASE IN SEAL INJECTION LINE FLOW RESULTING IN PRESSURIZER LEVEL DECREASING.

OPENING 1VC-HCV182 AS SEVERITY IS INCREASED WILL RESULT IN DECREASED FLOW TO THE RCP INJECTION LINES. THE INCREASE IN FLOW THROUGH THE REGENERATIVE HEAT EXCHANGER WILL RESULT IN DECREASED LETDOWN LINE TEMPERATURES. THE THROTTLING ACTION OF 1VC8369A/B/C/D WILL LIMIT THE DECREASE IN SEAL INJECTION LINE FLOW, THUS THE INCREASE IN NORMAL CHARGING LINE FLOW WILL DOMINATE CHARGING SYSTEM FLOW RESULTING IN PRESSURIZER LEVEL INCREASING.

MALFUNCTION REMOVAL WILL RESTORE THE I/P CONVERTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV10 VCT LEVEL CHANNEL 1LICA-112 FAILS

TYPE: DISCRETE,RV 100% = 100% LEVEL

CAUSE: TRANSMITTER FAILURE

REF: M-55 REV AM
CVCS SYSTEM DESCRIPTION
22E-1-6950 SHT 12 REV B
ANNUNCIATOR RESPONSE: 9-7E

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, VCT LEVEL TRANSMITTER 1LT-112 FAILS TO THE PERCENTAGE SELECTED BY THE MALFUNCTION SEVERITY AS INDICATED ON 1UDR-761 (1CB07). DEPENDING ON THE SEVERITY SELECTED, THE FOLLOWING ANNUNCIATORS/AUTOMATIC ACTIONS WILL OCCUR:

- ANN 9-7E "VOLUME CONTROL TANK LEVEL HIGH LOW"	@ 87%
- 1LCV-VC112A FULLY DIVERT TO THE HOLDUP TANKS	@ 87%
- AUTO MAKEUP STOP	@ 24%
- ANN 9-7E "VOLUME CONTROL TANK LEVEL HIGH LOW" (MAKEUP NOT IN AUTOMATIC)	@ 14.3%
- AUTO MAKEUP START	@ 14%
- TRANSFER CHG PP SUCTION TO RWST (ONE INPUT)	@ 4.2%

MALFUNCTION REMOVAL WILL RESTORE VCT LEVEL TRANSMITTER 1LT-112 TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV11 VCT LEVEL CHANNEL 1LICA-185 FAILS

TYPE: DISCRETE,RV 100% = 100% LEVEL

CAUSE: TRANSMITTER FAILURE

REF: M-55 REV AM
CVCS SYSTEM DESCRIPTION
22E-1-6950 SHT 85 REV B
ANNUNCIATOR RESPONSE: 9-7E

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, VCT LEVEL TRANSMITTER 1LT-185 FAILS TO THE PERCENTAGE SELECTED BY THE MALFUNCTION SEVERITY AS INDICATED ON 1LI-185 (1CB07). DEPENDING ON THE SEVERITY SELECTED, THE FOLLOWING ANNUNCIATORS/AUTOMATIC ACTIONS WILL OCCUR:

- 1LCV-VC112A FULLY DIVERT TO THE HOLDUP TANKS @ 87%
- 1LCV-VC112A OPEN TO HOLDUP TANKS @ 77%
- 1LCV-VC112A CLOSE TO HOLDUP TANKS @ 67%
- ANN 9-7E "VOLUME CONTROL TANK LEVEL HIGH LOW" @ 10%
- TRANSFER CHG PP SUCTION TO RWST (ONE INPUT) @ 4.2%

MALFUNCTION REMOVAL WILL RESTORE VCT LEVEL TRANSMITTER 1LT-185 TO NORMAL.

[REV 2]

CV13 AUTOMATIC MAKE-UP CONTROL FAILURE

TYPE: DISCRETE, RB

CAUSE: MU X4 RELAY FAILURE

REF: M-55 REV AM
22E-1-4840 VC48 REV G
22E-1-4840 VC49 REV G
22E-1-4840 VC50 REV E

PLT STA: IC37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, WITH THE REACTOR COOLANT MODE SELECTOR SWITCH IN AUTO AND THE REACTOR COOLANT MAKEUP CONTROL SWITCH (BOTH ON 1CB07) IN NORMAL AFTER START, WHEN VCT LEVEL DECREASES TO 14% AN AUTO MAKEUP DOES NOT OCCUR. 1FCV-VC0111A DOES NOT OPEN, 1FCV-VC0110A DOES NOT MODULATE, 1FCV-VC0111B DOES NOT OPEN AND THE SELECTED BORIC ACID TRANSFER PUMP DOES NOT AUTO START. ALL OTHER MODES OF VCT MAKEUP WILL OPERATE PROPERLY.

MALFUNCTION REMOVAL WILL RESTORE THE MAKEUP CONTROL MU X4 RELAY TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV14 FAILURE OF PT-131

TYPE: DISCRETE, RV 100% = 100% TRANSMITTER OUTPUT

CAUSE: TRANSMITTER FAILURE (LETDOWN PRESSURE CONTROL)

REF: M-55 REV AM
ANNUNCIATOR RESPONSE: 5-3., 5-3C

PLT STA:IC37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, THE OUTPUT OF PRESSURE TRANSMITTER PT-131 WILL CORRESPOND TO THE VALUE SELECTED BY THE MALFUNCTION SEVERITY AS INDICATED ON 1PI-131 (1CB07). LETDOWN LINE PRESSURE CONTROL VALVE 1PCV-VC0131 WILL MODULATE TO ATTEMPT TO MAINTAIN NORMAL LETDOWN LINE PRESSURE.

IF THE SEVERITY SELECTED IS GREATER THAN THE ACTUAL LETDOWN LINE PRESSURE, THE RESULTANT OPENING OF THE PRESSURE CONTROL VALVE WILL CAUSE LETDOWN LINE PRESSURE TO DECREASE AND LETDOWN LINE FLOW TO INCREASE. ANNUNCIATOR 5-3C "LOW PRESSURE LETDOWN LINE FLOW HIGH PRESSURE HIGH" WILL ACTUATE AT 130 GPM FLOW. IF LETDOWN LINE PRESSURE DECREASES TO THE SATURATION PRESSURE FOR THE TEMPERATURE OF THE LETDOWN FLUID, FLASHING WILL OCCUR. IF THE SELECTED SEVERITY INCREASES TO THE VALUE CORRESPONDING TO 400 PSIG, ANNUNCIATOR 5-3C "LOW PRESSURE LETDOWN LINE FLOW HIGH PRESSURE HIGH" WILL REFLASH.

IF THE SEVERITY SELECTED IS LESS THAN THE ACTUAL LETDOWN LINE PRESSURE, THE RESULTANT CLOSURE OF THE PRESSURE CONTROL VALVE WILL CAUSE LETDOWN LINE PRESSURE TO INCREASE AND LETDOWN LINE FLOW TO DECREASE. ANNUNCIATOR 5-3C "LOW PRESSURE LETDOWN LINE FLOW HIGH PRESSURE HIGH" WILL NOT ACTUATE AS IT NORMALY WOULD IF PRESSURE INCREASES TO 400 PSIG DUE TO THE FAILED TRANSMITTER. IF LETDOWN LINE PRESSURE INCREASES TO 600 PSIG, HIGH PRESSURE LETDOWN RELIEF VALVE, 1VC8117, WILL LIFT ACTUATING ANNUNCIATOR 5-3D "LOW PRESSURE LETDOWN RELIEF TEMPERATURE HIGH" AT 120 ^{O}F.

MALFUNCTION REMOVAL WILL RESTORE THE PRESSURE TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV15 FAILURE OF TE-130

TYPE: DISCRETE, RV 100% = 100% TRANSMITTER OUTPUT

CAUSE: TRANSMITTER FAILS HIGH (LETDOWN HX OUTLET)

REF: M-54 REV AG
M-67 REV Z
ANNUNCIATOR RESPONSE: 1-1E, 5-3B

PLT STA: IC37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, THE OUTPUT OF TEMPERATURE TRANSMITTER TE-130 WILL CORRESPOND TO THE VALUE SELECTED BY THE MALFUNCTION SEVERITY AS INDICATED ON 1TI-130 (1CB07). LETDOWN HEAT EXCHANGER TEMPERATURE CONTROL VALVE 1TCV-CC130 WILL MODULATE TO ATTEMPT TO MAINTAIN NORMAL LETDOWN HEAT EXCHANGER OUTLET TEMPERATURE.

IF THE SEVERITY SELECTED IS GREATER THAN THE ACTUAL TEMPERATURE, THE RESULTANT OPENING OF THE TEMPERATURE CONTROL VALVE WILL CAUSE A DECREASE IN ACTUAL LETDOWN FLUID TEMPERATURE. ANNUNCIATOR 5-3B "LETDOWN HX OUTLET TO DEMINERALIZERS TEMP HIGH" WILL BE ACTUATED AT 127 ^{o}F TRANSMITTER OUTPUT.

IF THE SEVERITY SELECTED IS LESS THAN THE ACTUAL TEMPERATURE, THE RESULTANT CLOSURE OF THE TEMPERATURE CONTROL VALVE WILL CAUSE AN INCREASE IN ACTUAL LETDOWN FLUID TEMPERATURE. AT 145 ^{o}F ACTUAL TEMPERATURE, ANNUNCIATOR 1-1E "LETDOWN FLOW DIVERTED TEMPERATURE HIGH" IS ACTUATED AND DIVERSION VALVE 1TCV-VC129 WILL OPEN TO THE VCT AND BYPASS THE DEMINERALIZERS.

MALFUNCTION REMOVAL WILL RESTORE THE TEMPERATURE TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV16 RCP SEAL NO. 1 FAILURE

TYPE: GENERIC, NRVI 100% = 50 GPM @ 2200 PSID

A) REACTOR COOLANT PUMP 1A
B) REACTOR COOLANT PUMP 1B
C) REACTOR COOLANT PUMP 1C
D) REACTOR COOLANT PUMP 1D

CAUSE: EXCESSIVE WEAR

REF: AOP-1.4
M-54 REV AG
REACTOR COOLANT SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 9-4A, 9-1C, 9-1E, 9-1D, 9-2E

PLT STA: IC37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, THE SELECTED REACTOR COOLANT PUMP #1 SEAL LEAKOFF FLOW WILL INCREASE BY THE SELECTED MALFUNCTION SEVERITY. THE RCP #1 SEAL DIFFERENTIAL PRESSURE WILL DECREASE. AS FLOW REVERSES THROUGH THE LABYRINTH SEAL, COMPONENT COOLING WATER SYSTEM TEMPERATURE INCREASE WHICH CAUSES RCP LOWER BEARING TEMPERATURE TO INCREASE AND RCP #1 SEAL OUTLET TEMPERATURE INCREASE.

RCP #2 SEAL LEAKOFF WILL INCREASE WITH ANNUNCIATOR 9-4A/B/C/D "REACTOR COOLANT PUMP 1A/1B/1C/1D STANDPIPE LEVEL HIGH LOW" ACTUATING AT 8' ABOVE #2 SEAL. ANNUNCIATOR 9-1C "REACTOR COOLANT PUMPS LABYRINTH SEAL DP LOW" WILL ACTUATE AT < 20" H_2O. ANNUNCIATOR 9-1E "REACTOR COOLANT PUMPS SEAL LEAKOFF FLOW HIGH" WILL BE ACTUATED AT > 5 GPM.

THE LOSS OF MASS FROM THE REACTOR COOLANT SYSTEM WILL CAUSE A DECREASE IN PRESSURIZER LEVEL. CHARGING PUMP FLOW WILL INCREASE TO MAINTAIN LEVEL. AT THE HIGHER SEVERITIES, VOLUME CONTROL TANK TEMPERATURE AND LEVEL WILL BE INCREASING, CHARGING FLOW WILL HAVE INCREASED TO MAXIMUM, AND PRESSURIZER LEVEL WILL BE DECREASING.

CV16 RCP SEAL NO. 1 FAILURE (cont.)

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY ISOLATING THE AFFECTED REACTOR COOLANT PUMP'S #1 SEAL LEAKOFF (1AOV-VC8141A/D/B/C ON 1CB06) WHICH WILL ACTUATE ANNUNCIATOR 9-1D "REACTOR COOLANT PUMPS SEAL LEAKOFF FLOW LOW" AT < .8 GPM AND ANNUNCIATOR 9-2E "REACTOR COOLANT PUMPS SHAFT SEAL WATER DP LOW" AT 275 PSID.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV17 RCP SEAL NO. 2 FAILURE

TYPE: GENERIC, NRB

A) REACTOR COOLANT PUMP 1A
B) REACTOR COOLANT PUMP 1B
C) REACTOR COOLANT PUMP 1C
D) REACTOR COOLANT PUMP 1D

CAUSE: EXCESSIVE WEAR

REF: M-54 REV AG
REACTOR COOLANT SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 9-1D, 9-4A

PLT STA:IC37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, THE SELECTED REACTOR COOLANT PUMP #1 SEAL LEAKOFF FLOW WILL DECREASE TO ~ 0.5 GPM OVER A FIVE MINUTE PERIOD. ANNUNCIATOR 9-1D "REACTOR COOLANT PUMPS SEAL LEAKOFF FLOW LOW" WILL ACTUATE AT < .8 GPM. RCP #2 SEAL LEAKOFF FLOW WILL INCREASE RESULTING IN INCREASED RCDT PUMP OPERATION, AS INDICATED BY THE DISCHARGE ISOLATION VALVE, 1LCV-DT1003 (1CB11),THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION OPERATION AND ANNUNCIATOR 9-4A/4B/4C/4D "REACTOR COOLANT PUMP 1A/1B/1C/1D STANDPIPE LEVEL HIGH LOW" ACTUATES WHEN THE LEVEL REACHES 8' ABOVE #2 SEAL. VCT LEVEL WILL DECREASE AT A RATE DETERMINED BY THE INCREASED RCP #2 SEAL LEAKOFF FLOW.

IF MALFUNCTION CV16 IS ACTIVE AT 100% ON THE SELECTED PUMP WHEN THIS MALFUNCTION IS INSERTED, RCP #3 SEAL WILL ALSO FAIL. THE LOSS OF ALL 3 RCP SEALS WILL RESULT IN A LOSS OF MASS FROM THE REACTOR COOLANT SYSTEM OF ~ 150 GPM THROUGH #3 SEAL LEAKOFF INTO THE CONTAINMENT SUMP, ~ 30 GPM THROUGH #2 SEAL LEAKOFF INTO THE RCDT AND ~ 50 GPM THROUGH #1 SEAL LEAKOFF INTO THE VCT.

THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 3]

CV20 LETDOWN HEAT EXCHANGER TUBE LEAK

TYPE: DISCRETE, RV 100% = 80 GPM @ 240 PSID

CAUSE: TUBE FAILURE AT INLET TUBE SHEET

REF: M-54 REV AG
M-55 REV AM
CVCS SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 9-7E, 4-2D

PLT STA: IC37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, REACTOR COOLANT LEAKAGE INTO THE COMPONENT COOLING WATER SYSTEM WILL RESULT. INDICATED (1FI-132 ON 1CB07) LETDOWN FLOW WILL DECREASE AND 1PCV-VC0131 WILL MODULATE TO MAINTAIN NORMAL LETDOWN PRESSURE (1PI-131 ON 1CB07). AS MALFUNCTION SEVERITY IS INCREASED TO GREATER THAN THE CAPACITY OF THE IN-SERVICE LETDOWN ORIFICE(S), INDICATED LETDOWN FLOW WILL DECREASE TO ZERO AND PRESSURE WILL DECREASE TO THE PRESSURE OF THE COMPONENT COOLING SYSTEM AT THE TUBE BREAK LOCATION. VCT LEVEL WILL DECREASE AT THE MALFUNCTION SEVERITY SELECTED RATE UNTIL THE SEVERITY SELECTED EXCEEDS THE CAPACITY OF THE IN-SERVICE LETDOWN ORIFICE(S).

THE LEAKAGE INTO THE COMPONENT COOLING WATER SYSTEM WILL RESULT IN CCW SURGE TANK LEVEL INCREASING, AS INDICATED ON 1LI-670/676 (1CB09). CCW ACTIVITY LEVELS WILL INCREASE AS INDICATED ON ORE-0017A AND/OR ORE-PR07, DEPENDENT UPON SYSTEM ALIGNMENT. AS SEVERITY IS INCREASED, ANNUNCIATOR "COMPONENT COOLING SURGE TANK LEVEL HIGH LOW" WILL BE ACTUATED AT 58.7% LEVEL.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY ISOLATING NORMAL LETDOWN AND INITIATING EXCESS LETDOWN FOR PRESSURIZER LEVEL CONTROL.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE LETDOWN HEAT EXCHANGER INTEGRITY.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV22 LETDOWN LINE LEAK INSIDE CONTAINMENT

TYPE: DISCRETE, RV 100% = 3" PIPE BREAK @ NOP

CAUSE: PIPE BREAK AT REGENERATIVE HX INLET

REF: M-54 REV AG
CVCS SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 9-7E

PLT STA: IC37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, LEAKAGE OF REACTOR COOLANT TO THE CONTAINMENT ATMOSPHERE WILL RESULT. CONTAINMENT AIRBORNE ACTIVITY LEVELS WILL INCREASE. CONTAINMENT TEMPERATURE, ACTIVITY LEVELS, AREA RADIATION LEVELS AND SUMP LEVELS MAY INCREASE DEPENDENT UPON THE SELECTED MALFUNCTION SEVERITY.

AS MALFUNCTION SEVERITY IS INCREASED, NORMAL LETDOWN FLOW (1FI-132 ON 1CB07) WILL DECREASE. 1PCV-VC0131 WILL MODULATE CLOSED TO ATTEMPT TO MAINTAIN NORMAL LETDOWN PRESSURE. CHARGING LINE TEMPERATURE OUT OF THE REGENERATIVE HEAT EXCHANGER WILL DECREASE AS LETDOWN FLOW DECREASES. VCT LEVEL WILL DECREASE AT THE MALFUNCTION SEVERITY SELECTED RATE UNTIL THE SELECTED SEVERITY EXCEEDS THE CAPACITY OF THE IN-SERVICE LETDOWN ORIFICE(S) WHICH LIMIT THE LEAK RATE. VCT AUTO MAKEUP IS INITIATED AT 14%. NOTE: LETDOWN ISOLATES AT 17% PRESSURIZER LEVEL DUE TO LEAK.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY ISOLATING NORMAL LETDOWN AND INITIATING EXCESS LETDOWN FOR PRESSURIZER LEVEL CONTROL.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE LETDOWN LINE INTEGRITY.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV23 CHARGING LINE LEAK INSIDE CONTAINMENT

TYPE: DISCRETE, RV 100% = 600 GPM @ 2400 PSID

CAUSE: PIPE BREAK AT REGENERATIVE HX INLET

REF: M-54 REV AG
ANNUNCIATOR RESPONSE: 9-7E, 9-8C, 5-3E

PLT STA: IC37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE CVCS SYSTEM TO CONTAINMENT RESULTS. CONTAINMENT ACTIVITY LEVELS, AREA RADIATION LEVELS AND SUMP LEVELS MAY INCREASE DEPENDENT UPON THE SELECTED MALFUNCTION SEVERITY. THE EFFECTS ON CONTAINMENT TEMPERATURE AND PRESSURE WILL BE MINIMAL DUE TO THE LOW TEMPERATURE OF THE CHARGING RETURN WATER.

AS MALFUNCTION SEVERITY IS INCREASED TO THE POINT WHERE NORMAL LETDOWN FLOW PLUS THE MALFUNCTION LEAKAGE EXCEED THE OPERATING CHARGING PUMP(S) CAPACITY, PRESSURIZER LEVEL WILL BEGIN TO DECREASE. THE DECREASE IN CHARGING LINE FLOW THROUGH THE REGENERATIVE HEAT EXCHANGER WILL RESULT IN INCREASED LETDOWN TEMPERATURE. THE INCREASED CHARGING FLOW THROUGH THE PIPE BREAK WILL RESULT IN DECREASED CHARGING HEADER PRESSURE AND A DECREASE IN SEAL INJECTION FLOW.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY ISOLATING NORMAL LETDOWN, TRANSFERRING TO ALTERNATE LETDOWN AND CLOSING 1HCV-182 TO SEND THE CHARGING WATER THROUGH THE RCP SEALS.

MALFUNCTION REMOVAL WILL ONLY RESTORE CHARGING LINE INTEGRITY.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV24 LETDOWN LINE LEAK OUTSIDE CONTAINMENT

TYPE: DISCRETE, RV 100% = 150 GPM @ NOP

CAUSE: PIPE BREAK @ LETDOWN HEAT EXCHANGER INLET

REF: M-54 REV AG
ANNUNCIATOR RESPONSE: 9-7E

PLT STA:IC37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE REACTOR COOLANT SYSTEM TO THE AUXILIARY BUILDING VIA THE LETDOWN LINE WILL RESULT. LETDOWN RETURN LINE FLOW AND PRESSURE WILL DECREASE DUE TO MASS LOST OUT THE BREAK. VOLUME CONTROL TANK LEVEL WILL BEGIN TO DECREASE AT A RATE CONSISTANT WITH THE MALFUNCTION SEVERITY. 1PCV-VC0131 WILL MODULATE CLOSED TO ATTEMPT TO MAINTAIN NORMAL LETDOWN LINE PRESSURE. ACTIVITY LEVELS IN THE AUXILIARY BUILDING IN THE LOCAL AREA AND IN THE VENTILATION SYSTEM FLOW PATH WILL INCREASE DEPENDENT UPON THE INITIAL PRIMARY ACTIVITY LEVEL.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY ISOLATING NORMAL LETDOWN AND INITIATING EXCESS LETDOWN FOR PRESSURIZER LEVEL CONTROL.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE LETDOWN LINE INTEGRITY.

[REV 3]

CV25 CHARGING LINE LEAK OUTSIDE CONTAINMENT

TYPE: DISCRETE, RV 100% = 600 GPM @ NOP

CAUSE: PIPE BREAK AT UPSTREAM SIDE OF 1MOV-VC8106

REF: M-55 REV AM
ANNUNCIATOR RESPONSE: 9-7E, 9-8C

PLT STA:IC37

EFFECTS:

WHEN THE MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE CVCS SYSTEM TO THE AUXILIARY BUILDING RESULTS. ACTIVITY LEVELS IN THE AUXILIARY BUILDING IN THE LOCAL AREA AND IN THE VENTILATION SYSTEM FLOW PATH WILL INCREASE.

IF NORMAL LETDOWN FLOW PLUS THE MALFUNCTION LEAKAGE EXCEED THE OPERATING CHARGING PUMP(S) CAPACITY, PRESSURIZER LEVEL WILL BEGIN TO DECREASE. THE DECREASE IN CHARGING LINE FLOW THROUGH THE REGENERATIVE HEAT EXCHANGER WILL RESULT IN INCREASED LETDOWN TEMPERATURE. THE INCREASED CHARGING FLOW THROUGH THE PIPE BREAK WILL RESULT IN DECREASED CHARGING HEADER PRESSURE AND A DECREASE IN SEAL INJECTION FLOW.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY ISOLATING NORMAL LETDOWN, TRANSFERRING TO ALTERNATE LETDOWN AND CLOSING 1HCV-182 TO SEND THE CHARGING WATER THROUGH THE RCP SEALS.

MALFUNCTION REMOVAL WILL ONLY RESTORE CHARGING LINE INTEGRITY.

[REV 2]

CV28 FLOW CONTROL VALVE CV-121 AUTO FAILURE

TYPE: DISCRETE, RV 100% = VALVE FULLY OPEN

CAUSE: AUTO CONTROLLER FAILURE

REF: M-55 REV AM
ANNUNCIATOR RESPONSE: 9-8C, 9-7E, 5-4D, 5-3E

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, FLOW CONTROL VALVE CV-121 WILL FAIL TO THE POSITION DETERMINED BY THE SELECTED SEVERITY AND WILL NOT RESPOND TO POSITION DEMANDS FROM ITS CONTROLLER. IF THE SELECTED SEVERITY CAUSES THE VALVE TO OPEN FROM ITS ORIGINAL POSITION, CHARGING LINE FLOW WILL INCREASE. THE INCREASED CHARGING FLOW WILL RESULT IN PRESSURIZER LEVEL INCREASING WITH A CORRESPONDING DECREASE IN VOLUME CONTROL TANK LEVEL. ANNUNCIATOR 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" IS EVENTUALLY ACTUATED AT +5% PROGRAM LEVEL AND ANNUNCIATOR 9-7E "VOLUME CONTROL TANK LEVEL HIGH LOW" ACTUATES AND AUTO MAKEUP IS INITIATED AT 14%.

IF THE SELECTED SEVERITY CAUSES THE VALVE TO CLOSE FROM ITS ORIGINAL POSITION, CHARGING LINE FLOW WILL DECREASE. THE DECREASED CHARGING FLOW WILL RESULT IN PRESSURIZER LEVEL DECREASING WITH A CORRESPONDING INCREASE IN VOLUME CONTROL TANK LEVEL. ANNUNCIATOR 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" IS ACTUATED AT -5% PROGRAM LEVEL AND LETDOWN FLOW WILL BE DIVERTED ON HIGH VCT LEVEL. ANNUNCIATOR 5-4D "CHARGING LINE FLOW LOW" WILL BE ACTUATED AT 35 GPM. THE DECREASE IN CHARGING FLOW WILL CAUSE REGENERATIVE HEAT EXCHANGER LETDOWN OUTLET TEMPERATURE TO INCREASE. ANNUNCIATOR 5-3E "REGENERATIVE HX LETDOWN LINE TEMPERATURE HIGH" WILL ACTUATE AT 395 ^{O}F.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY TAKING MANUAL CONTROL OF THE FLOW CONTROL VALVE CONTROLLER.

MALFUNCTION REMOVAL WILL RESTORE CONTROL FLOW VALVE CV-121 TO NORMAL.

[REV 2]

CV29 LETDOWN RELIEF VALVE 1VC-8117 FAILURE

TYPE: DISCRETE, RV 100% = 100% VALVE CAPACITY (200 GPM)

CAUSE: VALVE SEAT LEAKAGE

REF: M-54 REV AG
ANNUNCIATOR RESPONSE: 5-3D, 9-1B
DVR 22-2-87-067

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE CVCS SYSTEM TO THE PRESSURIZER RELIEF TANK WILL RESULT. ANNUNCIATOR 5-3D "LOW PRESSURE LETDOWN RELIEF TEMPERATURE HIGH" WILL BE ACTUATED AT 120 °F. THE LOSS OF LETDOWN FLUID RETURNING TO THE VOLUME CONTROL TANK WILL RESULT IN DECREASING VCT LEVEL. LETDOWN FLOW, AS INDICATED ON 1FI-132 (1CB07), WILL DECREASE IN PROPORTION TO THE MASS LOST THROUGH THE RELIEF VALVE (LIMITED BY THE FLOW RATE THROUGH THE ON LINE ORIFICE). LETDOWN PRESSURE , AS INDICATED ON 1PI-131 (1CB07), WILL DECREASE DUE TO THE MASS LOSS. PRESSURE CONTROL VALVE 1PCV-131 WILL MODULATE CLOSED TO ATTEMPT TO MAINTAIN UPSTREAM PRESSURE.

VOLUME CONTROL TANK AUTO MAKEUP IS INITIATED AT 14%. THE ACCUMULATION OF MASS IN THE PRESSURIZER RELIEF TANK WILL RESULT IN AN INCREASE IN PRT LEVEL AND PRESSURE. ANNUNCIATOR 9-1B "PRESSURIZER RELIEF TANK TEMP HIGH PRESS HIGH LEVEL HIGH LOW" WILL BE ACTUATED ON HIGH PRESSURE OF 10 PSIG.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY ISOLATING NORMAL LETDOWN AND INITIATING EXCESS LETDOWN FOR PRESSURIZER LEVEL CONTROL.

MALFUNCTION REMOVAL WILL RESTORE RELIEF VALVE 1VC-8117 TO NORMAL.

[REV 4]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV31 SEAL WATER RETURN LINE BREAK

TYPE: DISCRETE, RV 100% = 200 GPM @ NOP

CAUSE: PIPE FAILURE IMMEDIATELY UPSTREAM OF 1VC-8398A

REF: M-55 REV AM
ANNUNCIATOR RESPONSE: 9-7E, 9-8C

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE CVCS SYSTEM TO THE AUXILIARY BUILDING WILL RESULT. ACTIVITY LEVELS IN THE AUXILIARY BUILDING IN THE LOCAL AREA AND IN THE VENTILATION SYSTEM FLOW PATH WILL INCREASE. ANNUNCIATOR 9-1E "REACTOR COOLANT PUMPS SEAL LEAKOFF FLOW HIGH" IS ACTUATED AT 5 GPM. THE LOSS OF SEAL RETURN WATER TO THE CHARGING PUMP SUCTION LINE WILL CAUSE THE VOLUME CONTROL TANK LEVEL TO DECREASE.

INCREASING MALFUNCTION SEVERITY WILL INCREASE THE MASS LOSS RATE. VCT AUTO MAKEUP WILL INITIATE AT 14% LEVEL TO RECOVER VCT LEVEL WITH ANNUNCIATOR 9-7E "VOLUME CONTROL TANK LEVEL HIGH LOW" BEING ACTUATED. THE LOSS OF VCT LEVEL WILL RESULT IN A DECREASE IN CHARGING FLOW. PRESSURIZER LEVEL WILL BEGIN TO DECREASE WHEN CHARGING FLOW IS DECREASED. 1FCV-VC121 WILL OPEN TO TRY TO RECOVER DECREASING PRESSURIZER LEVEL. ANNUNCIATOR 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" WILL BE ACTUATED AT -5% PROGRAM LEVEL.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY ISOLATING THE LEAK AND BYPASSING THE SEAL WATER HEAT EXCHANGER.

MALFUNCTION REMOVAL WILL RESTORE THE SEAL RETURN LINE PIPING INTEGRITY.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

CV32 VCT LOWER LEVEL TAP LEAK

TYPE: DISCRETE, RV 100% = 10 GPM @ NOP

CAUSE: 1VC-8418B PACKING LEAK TO ATMOSPHERE

REF: M-55 REV AM

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE CVCS SYSTEM TO THE AUXILIARY BUILDING WILL RESULT. ACTIVITY LEVELS IN THE AUXILIARY BUILDING IN THE LOCAL AREA AND IN THE VENTILATION SYSTEM FLOW PATH WILL INCREASE AT A RATE DETERMINED BY THE SELECTED SEVERITY. VOLUME CONTROL TANK INDICATED LEVEL MAY BE SLIGHTLY LOWER THAN ACTUAL LEVEL DUE TO LOSS OF MASS FROM THE VARIABLE LEG DEPENDING ON THE MALFUNCTION SEVERITY. IF APPARENT VCT LEVEL IS LESS THAN THE AUTO MAKEUP SETPOINT, VCT AUTO MAKEUP WILL BE ACTIVATED.

MALFUNCTION REMOVAL WILL ONLY RESTORE 1VC-8418B PACKING TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

CW01 CIRC WATER PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) CIRC WATER PUMP 1A
B) CIRC WATER PUMP 1B
C) CIRC WATER PUMP 1C

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-31 REV AE
22E-1-4840 CW1 REV M
22E-1-4840 CW2 REV M
22E-1-4840 CW3 REV L
ANNUNCIATOR RESPONSE: 12-9A, 12-1C

PLT STA: AFFECTED CIRC WATER PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED CIRCULATING WATER PUMP BREAKER WILL OPEN. PUMP CURRENT INDICATION DECREASES TO ZERO, ANNUNCIATOR 12-9A "BREAKER TRIP" WILL ACTUATE AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. THE ASSOCIATED CIRCULATING WATER PUMP DISCHARGE VALVE, 1MOV-CW0001/2/3, WILL AUTOMATICALLY CLOSE.

THE SELECTED PUMP'S DIFFERENTIAL PRESSURE, AS INDICATED ON 1PDI-CW10/11/12 (1CB04), DECREASES TO ZERO CAUSING ANNUNCIATOR 12-1C "CW PUMP DIFF PRESS LOW" TO BE ACTUATED AT < 13" PUMP DIFFERENTIAL PRESSURE.

THE CIRCULATING WATER PUMP TRIP WILL RESULT IN A DECREASE IN FLOW THROUGH THE MAIN CONDENSER. AS A NEW HEAT BALANCE IS ESTABLISHED AT THIS NEW FLOW RATE, CONDENSER VACUUM AND GENERATOR OUTPUT WILL DECREASE SLIGHTLY. THE MAGNITUDE OF THIS EFFECT IS DEPENDENT UPON THE INITIAL PLANT POWER.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE CIRCULATING WATER PUMP OVERCURRENT RELAY TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

ED03 FAILURE OF UNIT AUXILIARY TRANSFORMER

TYPE: DISCRETE, RB

CAUSE: FAULTY SUDDEN PRESSURE RELAY ACTUATION

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 15-1A, 15-1B, 14-1A, 23-4E, 22-2A, 22-3A, 15-5A, 15-8A, 15-1C, 23-2A, 23-1C, 6-1E

PLT STA: UNIT AUXILIARY TRANSFORMER IN SERVICE

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE UNIT AUXILIARY TRANSFORMER SUDDEN PRESSURE RELAY IS ACTUATED WHICH CAUSES ANNUNCIATOR 15-1B "UNIT AUX TR 141 SUDDEN PRESSURE" TO ALARM. THIS INITIATES A GENERATOR TRIP RESULTING IN ANNUNCIATOR 14-1A "GENERATOR TRIP RELAY TRIP" BEING ACTUATED. THE MAIN FEED BREAKERS TO THE 4KV SERVICE BUSES WILL TRIP AND SERVICE BUSES PREVIOUSLY FED FROM THE UNIT AUXILIARY TRANSFORMER SHOULD AUTO BUS TRANSFER TO THE SYSTEM AUXILIARY TRANSFORMER.

THE NORMAL AND EMERGENCY POWER SUPPLIES TO THE MAIN TRANSFORMER COOLING AUXILIARIES ARE TRIPPED AND THE UNIT AUXILIARY TRANSFORMER DELUGE SYSTEM IS INITIATED WHICH RESULTS IN ANNUNCIATOR 23-1C "FIRE PUMP OA RUNNING" BEING ACTUATED.

MALFUNCTION REMOVAL WILL RESTORE THE SUDDEN PRESSURE RELAY TO NORMAL.

[REV 3]

ED04 FAILURE OF SYSTEM AUXILIARY TRANSFORMER

TYPE: DISCRETE, RB

CAUSE: FAULTY SUDDEN PRESSURE RELAY ACTUATION

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
22E-1-4814B & 4822
ANNUNCIATOR RESPONSE: 15-3B, 22-2B, 22-3B, 23-1C, 14-1B, 15-4A, 11-1A, 15-2A, 15-2B, 15-5D, 15-7A, 15-6A, 23-2A, 15-3A

PLT STA: SYSTEM AUXILIARY TRANSFORMER IN SERVICE

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SYSTEM AUXILIARY TRANSFORMER SUDDEN PRESSURE RELAY IS ACTUATED WHICH CAUSES ANNUNCIATOR 15-3B "SYSTEM AUX TR 142 SUDDEN PRESSURE" TO ALARM.

THE SUDDEN PRESSURE RELAY WILL AUTOMATICALLY CAUSE BUS 141 BREAKERS 1412 AND 1413 TO TRIP, TRIPS THE 345 KV RING BUS BREAKERS OCB 67 AND OCB 720 WHICH ACTUATES ANNUNCIATORS 22-2B "345 KV CKT BKR 67 TRIP AND 22-3B "345 KV CKT BKR 720 TRIP. RESERVE POWER FEEDER BREAKERS TO BUSES 142, 143, 144 AND 145 WILL ALSO BE TRIPPED. THE 4KV SERVICE BUSES PREVIOUSLY FED FROM THE SYSTEM AUXILIARY TRANSFORMER WILL AUTO BUS TRANSFER TO THE UNIT AUXILIARY TRANSFORMER IF THE MAIN GENERATOR IS ON LINE.

THE NORMAL AND EMERGENCY POWER SUPPLIES TO THE SYSTEM AUXILIARY TRANSFORMER COOLING AUXILIARIES ARE TRIPPED AND THE SYSTEM AUXILIARY TRANSFORMER DELUGE SYSTEM IS INITIATED WHICH RESULTS IN ANNUNCIATOR 23-1C "FIRE PUMP OA RUNNING" BEING ACTUATED.

MALFUNCTION REMOVAL WILL RESTORE THE SUDDEN PRESSURE RELAY TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

ED05 LOSS OF 4160 V BUS

TYPE: GENERIC, RB

A) ESF BUS 147
B) ESF BUS 148
C) ESF BUS 149
D) NON-ESF BUS 142
E) NON-ESF BUS 143
F) NON-ESF BUS 144
G) NON-ESF BUS 145

CAUSE: OVERCURRENT ON BUS CAUSES FEEDER BREAKER TO TRIP

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
AOP-8.3 REV 2/8/88
ANNUNCIATOR RESPONSE: 15-4B, 15-8D, 19-1A, 19-2A, 15-6D, 18-1A, 18-2A, 15-6E, 17-1A, 17-2A, 14-1D, 15-8A, 15-7D, 15-7A, 15-6A, 15-5A, 17-4B, 18-4B, 19-4B

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, AN OVERCURRENT CONDITION WILL DEVELOP ON THE AFFECTED 4160 VOLT BUS. THIS RESULTS IN THE FEEDER BREAKER TRIPPING WITH THE SELECTED BUS GOING DEAD. LOADS NORMALLY POWERED BY THE AFFECTED BUS WILL BE DEENERGIZED WITH THE EFFECTS ON PLANT OPERATION BEING DIFFERENT DEPENDING ON WHICH BUS IS SELECTED. THE LOADS EFFECTED WILL BE IDENTIFIED BY THE POWER BUS TABLES WHICH CORRESPOND TO THE ZED'S.

ANNUNCIATORS ACTUATED BY SELECTING BUS 147 ARE AS FOLLOWS: 15-4B "4 KV BUS 147 VOLTAGE DEGRADED" ON < 3860 V FOR > 8 SECONDS; 19-1A "BUS 147 MN FD BKR 1471 TRIP" DUE TO THE CABLE DIFFERENTIAL CONDITION; 19-2A "BUS 147 OVERCURRENT LOCKOUT" BY THE OVERCURRENT RELAY ACTUATION.

ANNUNCIATORS ACTUATED BY SELECTING BUS 148 ARE AS FOLLOWS: 15-6D "4 KV BUS 148 VOLTAGE DEGRADED" ON < 3860 V FOR > 8 SECONDS; 18-1A "BUS 148 MN FD BKR 1481 TRIP" DUE TO THE CABLE DIFFERENTIAL CONDITION; 18-2A "BUS 148 OVERCURRENT LOCKOUT" BY THE OVERCURRENT RELAY ACTUATION.

ANNUNCIATORS ACTUATED BY SELECTING BUS 149 ARE AS FOLLOWS: 15-6E "4 KV BUS 149 VOLTAGE DEGRADED" ON < 3860 V FOR > 8 SECONDS; 17-1A "BUS 149 MN FD BKR 1491 TRIP" DUE TO THE CABLE DIFFERENTIAL CONDITION; 17-2A "BUS 149 OVERCURRENT LOCKOUT" BY THE OVERCURRENT RELAY ACTUATION.

ED05 LOSS OF 4160 V BUS (cont.)

ANNUNCIATORS ACTUATED BY SELECTING BUS 142 ARE AS FOLLOWS: 14-1D "4KV BUS VOLTAGE LOW" AT 72% OF NOMINAL VOLTAGE; 15-8A "BUS 142 BREAKER TRIP" WHEN THE BREAKER TRIPS OPEN; 15-7D "4 KV BUS OVERCURRENT LOCKOUT" BY THE OVERCURRENT RELAY ACTUATION.

ANNUNCIATORS ACTUATED BY SELECTING BUS 143 ARE AS FOLLOWS: 14-1D "4KV BUS VOLTAGE LOW" AT 72% OF NOMINAL VOLTAGE; 15-7A "BUS 143 BREAKER TRIP" WHEN THE BREAKER TRIPS OPEN; 15-7D "4 KV BUS OVERCURRENT LOCKOUT" BY THE OVERCURRENT RELAY ACTUATION.

ANNUNCIATORS ACTUATED BY SELECTING BUS 144 ARE AS FOLLOWS: 14-1D "4KV BUS VOLTAGE LOW" AT 72% OF NOMINAL VOLTAGE; 15-6A "BUS 144 BREAKER TRIP" WHEN THE BREAKER TRIPS OPEN; 15-7D "4 KV BUS OVERCURRENT LOCKOUT" BY THE OVERCURRENT RELAY ACTUATION.

ANNUNCIATORS ACTUATED BY SELECTING BUS 145 ARE AS FOLLOWS: 14-1D "4KV BUS VOLTAGE LOW" AT 72% OF NOMINAL VOLTAGE; 15-5A "BUS 145 BREAKER TRIP" WHEN THE BREAKER TRIPS OPEN; 15-7D "4 KV BUS OVERCURRENT LOCKOUT" BY THE OVERCURRENT RELAY ACTUATION.

FOR THE ESF BUSES, THE ASSOCIATED DIESEL GENERATOR WILL AUTO START BUT WILL NOT BE ABLE TO RE-ENERGIZE THE BUS AS THE OVERCURRENT CONDITION WILL LOCK IT OUT. ANNUNCIATOR 17/18/19-4B "DIESEL GENERATOR 1B/1A/0 RUNNING UNLOADED" WILL BE ACTUATED AS A RESULT OF THIS CONDITION

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED BUS TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

ED07 FAILURE OF 4160 TO 480 V BREAKER TO AUTO CLOSE

TYPE: GENERIC, RB

A) BREAKER 1474 (BUS 137)
B) BREAKER 1484 (BUS 138)
C) BREAKER 1494 (BUS 139)

CAUSE: CONNECTOR AJ9 OPEN

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
22E-1-4840 AP26 REV U
22E-1-4840 AP31 REV W
22E-1-4840 AP36 REV T
22E-1-4000P REV P
22E-1-4000Q REV E
DVR 22-1-86-093
LER 22-2-86-106

PLT STA: IC14

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN POWER IS LOST TO THE 4160 VOLT BUS, EITHER FROM A SAFEGUARDS ACTION OR UNDERVOLTAGE CONDITION, THE AFFECTED BREAKER WILL NOT AUTO CLOSE. THIS RESULTS IN A CONTINUED LOSS OF POWER TO THE ASSOCIATED 480V BUS LOADS AND ITS ATTACHED MCC'S. THE LOADS EFFECTED WILL BE IDENTIFIED BY THE POWER BUS TABLES WHICH CORRESPOND TO THE ZED'S.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY CLOSING THE AFFECTED BREAKER TO RESTORE POWER TO THE ASSOCIATED BUS AND ITS MCC'S.

MALFUNCTION REMOVAL WILL RESTORE AFFECTED BREAKER TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

ED08 LOSS OF DC DISTRIBUTION BUS

TYPE: GENERIC, RB

A) 125 VDC BUS 011-1
B) 125 VDC BUS 111
C) 125 VDC BUS 112

CAUSE: SUPPLY BREAKER OPENS DUE TO BUS FAULT

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
AOP-8.2 REV 10/7/88
22E-1-4000AW
22E-1-4000AX
ANNUNCIATOR RESPONSE: 14-3E, 14-7E, 16-1A, 16-1B, 16-1C, 16-1D.

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED 125V DC BUS SUPPLY BREAKER WILL TRIP DEENERGIZING THAT BUS. LOADS NORMALLY POWERED BY THE AFFECTED BUS WILL BE DEENERGIZED WITH THE EFFECTS ON PLANT OPERATION BEING DIFFERENT DEPENDING ON WHICH BUS IS SELECTED. THE LOADS EFFECTED WILL BE IDENTIFIED BY THE POWER BUS TABLES WHICH CORRESPOND TO THE ZED'S.

ANNUNCIATOR 14-3E "BATTERY 112 TIE BKR TRIP" IS ACTUATED BY THE BREAKER TRIPPING. ANNUNCIATOR 14-7E "BATTERY 111 TIE BKR TRIP" IS ACTUATED BY THE BREAKER TRIPPING. ANNUNCIATOR 16-1A "DC BUS 011-1 UNDERVOLTAGE" IS ACTUATED BY 95% OUTPUT. ANNUNCIATOR 16-1B "DC BUS 111 UNDERVOLTAGE" IS ACTUATED BY 95% OUTPUT. ANNUNCIATOR 16-1C "DC BUS 112 UNDERVOLTAGE" IS ACTUATED BY 95% OUTPUT. ANNUNCIATOR 16-1D "125 V DC BATT 011 BKR TRIP" IS ACTUATED BY THE BREAKER TRIPPING. ADDITIONALLY THERE WILL BE NUMEROUS ANNUNCIATORS FROM LOSS OF DC POWER TO THEIR ASSOCIATED LOADS.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED SUPPLY BREAKER TO NORMAL.

[REV 1]

ED10 VOLTAGE TRANSIENT AND LOSS OF 120 VAC ESF INSTRUMENT BUS

TYPE: GENERIC, RB (BUS GOES DEAD AFTER 30 SECONDS)

A) 120 VAC INSTRUMENT BUS 111
B) 120 VAC INSTRUMENT BUS 112
C) 120 VAC INSTRUMENT BUS 113
D) 120 VAC INSTRUMENT BUS 114

CAUSE: SHORT CIRCUIT IN INVERTER

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
AOP-8.1 REV 6/17/87
22E-1-4000BC REV J
22E-1-4000BD REV D
DVR 22-2-88-029
DVR 22-1-88-065

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED 120 VAC INSTRUMENT BUS VOLTAGE WILL BEGIN TO VARY. THE OSCILLATION WILL RAMP TO A MAXIMUM OF $\pm$ 15% OVER A PERIOD OF 30 SECONDS AT WHICH TIME THE AFFECTED INSTRUMENT BUS FEEDER BREAKER WILL TRIP DEENERGIZING THE BUS. THE LOADS EFFECTED WILL BE IDENTIFIED BY THE POWER BUS TABLES WHICH CORRESPOND TO THE ZED'S WITH THE MAJOR LOADS BEING REACTOR PROTECTION, SAFETY FEATURES AND CONTROL CHANNELS.

THERE ARE NO ANNUNCIATORS DIRECTLY ASSOCIATED WITH THE LOSS OF A 120 VAC INSTRUMENT BUS, BUT THE LOADS AFFECTED BY THE LOSS WILL GENERATE ALARMS AS POWER IS LOST. IF SUFFICIENT GENERIC PORTIONS OF THIS MALFUNCTIONS ARE ACTIVATED AT THE SAME TIME TO SATISFY THE REQUIRED LOGIC, THAT SAFEGUARD ACTION WILL OCCUR.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY TRANSFERRING THE INSTRUMENT BUS POWER SUPPLY TO THE TRANSFORMED BACKUP POWER TO REENERGIZE THE BUS.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED INVERTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

ED14 FAILURE OF 4 KV BUS TO ABT

TYPE: GENERIC, RB

A) 4KV BUS 142 (BREAKER 1421)
B) 4KV BUS 142 (BREAKER 1422)
C) 4KV BUS 143 (BREAKER 1431)
D) 4KV BUS 143 (BREAKER 1432)
E) 4KV BUS 144 (BREAKER 1441)
F) 4KV BUS 144 (BREAKER 1442)
G) 4KV BUS 145 (BREAKER 1451)
H) 4KV BUS 145 (BREAKER 1452)

CAUSE: OPEN AT AJ2 CONNECTOR

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
22E-1-4840 AP3 REV K
22E-1-4840 AP4 REV K
22E-1-4840 AP8 REV M
22E-1-4840 AP9 REV K
22E-1-4840 AP13 REV M
22E-1-4840 AP14 REV K
22E-1-4840 AP18 REV M
22E-1-4840 AP19 REV K
ANNUNCIATOR RESPONSE: 15-8A, 15-7A, 15-6A, 15-5A, 14-1D

PLT STA: IC24

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN THE OTHER FEEDER BREAKER TO THE ASSOCIATED 4160 VOLT BUS IS TRIPPED, THE AFFECTED BREAKER WILL NOT AUTO CLOSE TO REENERGIZE THE BUS.

THE APPROPRIATE ANNUNCIATOR 15-8A/7A/6A/5A "BUS 142/143/144/145 BREAKER TRIP" ACTUATES ON THE DEENERGIZING OPERATION. ANNUNCIATOR 14-1D "4KV BUS VOLTAGE LOW" IS ACTUATED AT 72% OF NOMINAL VOLTAGE. THE PLANT STATUS WILL CHANGE IN RESPONSE TO THE LOSS OF ANY OPERATING LOADS ON THAT BUS. IF THE AFFECTED BUS IS BUS 142/143/144, THE ASSOCIATED ESF BUS 147/148/149 WILL DEENERGIZE. THIS WILL RESULT IN THE ASSOCIATED DIESEL GENERATOR DGO/DGA/DGB/ AUTO START AND REENERGIZING THE AFFECTED BUS <u>ONLY</u> IF 2/3 SERVICE BUSES ARE DEENERGIZED CAUSING A STATION BLACKOUT SIGNAL TO BE GENERATED.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY CLOSING THE AFFECTED BREAKER TO REENERGIZE THE DEAD 4160 VOLT BUS.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY AJ2 CONNECTOR AND RETURN THE AFFECTED BREAKER TO NORMAL.

ZION MALFUNCTION

CAUSE AND EFFECTS

ED18 FAILURE OF SECOND LEVEL U/V RELAY TO SEQUENCE LOADS

TYPE: GENERIC, RB

A) ESF BUS 147
B) ESF BUS 148
C) ESF BUS 149

CAUSE: SECOND LEVEL U/V RELAY DOES NOT LATCH (TDR7;8;9)

REF: LER 22-1-88-061
DVR 22-2-87-019
22E-1-4840 AP27 REV S
22E-1-4840 AP69 REV G
22E-1-4840 AP32 REV V
22E-1-4840 AP70 REV G
22E-1-4840 AP37 REV S
22E-1-4840 AP95 REV G

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN AN UNDERVOLTAGE CONDITION OCCURS ON THE SELECTED BUS, THE ASSOCIATED DIESEL GENERATOR WILL NOT AUTO START, AND THE SAFE SHUTDOWN LOADS DO NOT SEQUENCE ONTO THE BUS AS REQUIRED.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY SECOND LEVEL U/V RELAY TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

EG01 MAIN GENERATOR VOLTAGE REGULATOR FAILURE

TYPE: DISCRETE, RV 100% = + 15 VOLTS
0% = - 15 VOLTS

CAUSE: FAILED VOLTAGE REGULATOR

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
MAIN GENERATOR SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 14-8B

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE MAIN GENERATOR VOLTAGE REGULATOR WILL FAIL TO A VALUE DETERMINED BY THE SELECTED SEVERITY. THE GENERATOR OUTPUT VOLTAGE WILL BEGIN TO CHANGE TO CORRESPOND TO THE SELECTED SEVERITY AT A LOGARITHMIC RATE. AS THE DIFFERENCE BETWEEN THE ACTUAL VOLTAGE AND THE BASE ADJUST VOLTAGE SETTING INCREASES, THE INDICATOR ON THE NULL METER, 1EI-GE04 (1CB01), WILL MOVE FURTHER AWAY FROM ZERO. GENERATOR MVARS WILL TREND IN THE DIRECTION OF THE VOLTAGE CHANGE. IF THE GENERATOR VOLTAGE IS DECREASED, THE OPERATING AMPS OF RUNNING 4160 VOLT EQUIPMENT WILL INCREASE. LOWERING GENERATOR VOLTAGE MAY POSSIBLY PLACE THE MAIN GENERATOR IN AN UNDEREXCITED CONDITION WHERE THE MVARS IS BELOW THE ALLOWABLE OPERATING ENVELOP AT THE LOWER SEVERITIES. IF THE GENERATOR IS SUFFICIENTLY UNDEREXCITED, THE GENERATOR WILL TRIP AS THE GENERATOR SLIPS A POLE.

IF THE GENERATOR VOLTAGE IS INCREASED, THE OPERATING AMPS OF RUNNING 4160 VOLT EQUIPMENT WILL DECREASE. GENERATOR MVARS WILL TREND IN THE DIRECTION OF THE VOLTAGE CHANGE. RAISING GENERATOR VOLTAGE MAY POSSIBLY PLACE THE MAIN GENERATOR IN AN OVEREXCITED CONDITION WHERE THE MVARS IS ABOVE THE ALLOWABLE OPERATING ENVELOP AT THE HIGHER SEVERITIES. WHEN THE MAXIMUM EXCITATION LIMITER SETPOINT IS EXCEEDED, THE AUTOMATIC VOLTAGE REGULATOR IS TRIPPED TO 'OFF', THE BASE ADJUSTER IS POSITIONED TO THE FULL-LOAD PRE-POSITION AND ANNUNCIATOR 14-8B "VOLTAGE REGULATOR TRIP" IS ACTUATED.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED VOLTAGE REGULATOR TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

EG03 MAIN TRANSFORMER LOW VOLTAGE SIDE GROUND

TYPE: GENERIC, NRB

A) 1E MAIN TRANSFORMER
B) 1W MAIN TRANSFORMER

CAUSE: LIGHTNING STRIKE

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
MAIN GENERATOR SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 14-4B, 14-6B, 14-1A

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED MAIN TRANSFORMER WILL DEVELOP A GROUND ON THE LOW VOLTAGE SIDE FROM A LIGHTNING STRIKE. ANNUNCIATOR 14-4B/6B "MAIN TR 1W/1E SUDDEN PRESSURE" IS ACTUATED AND THE GENERATOR WILL TRIP WHEN RELAY 86G1B IS ACTUATED BY THE MAIN TRANSFORMER SUDDEN PRESSURE CONDITION. ANNUNCIATOR 14-1A "GENERATOR TRIP RELAY TRIP" ACTUATES WHEN THE GENERATOR TRIPS, WHICH WILL CAUSE A RESULTANT REACTOR TRIP IF POWER IS HIGH ENOUGH.

THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 1]

EG05 DIFFERENTIAL CURRENT ON DIESEL GENERATOR

TYPE: GENERIC, RB

A) DIESEL GENERATOR 0
B) DIESEL GENERATOR 1A
C) DIESEL GENERATOR 1B

CAUSE: GROUND BETWEEN GENERATOR AND OUTPUT BREAKER

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 17-3B, 18-3B, 19-3B, 17-2E, 18-2E, 19-2E
LER 22-1-87-006
DVR's 22-1-86-076
22-1-87-089
22-2-87-032
22-2-88-030
22-1-89-096
22-1-85-229

PLT STA: DIESEL GENERATOR IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED DIESEL GENERATOR WILL DEVELOP A GROUND BETWEEN THE GENERATOR AND THE OUTPUT BREAKER. ANNUNCIATOR 17/18/19-3B "DIESEL GENERATOR 1B/1A/0 GROUND" WILL ACTUATE. THE GROUND WILL RESULT IN A DIFFERENTIAL CURRENT CONDITION OCCURRING.

THIS WILL CAUSE ANNUNCIATOR 17/18/19-2E "DIESEL GENERATOR 1B/1A/0 CURRENT DIFFERENTIAL" ACTUATES WITH THE FOLLOWING AUTOMATIC ACTIONS, WITH THEIR ASSOCIATED ANNUNCIATORS, OCCURRING:

1) DIESEL GENERATOR BREAKER TRIPS
2) STOPS FUEL INJECTION TO THE DIESEL (NOT OBSERVABLE IN MAIN CONTROL ROOM/SIMULATOR)
3) REMOVES FIELD EXCITATION FROM THE GENERATOR
4) BLOCKS CLOSURE OF DIESEL GENERATOR BREAKER
5) ENERGIZES DIESEL GENERATOR TRIP ALARM
6) SHORTS OUT THE THREE CURRENT TRANSFORMERS
7) STRIPS LOADS FROM THE ASSOCIATED 4160 AND 480 VOLT BUSES

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY DIESEL GENERATOR TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

EG06 DIESEL GENERATOR VOLTAGE REGULATOR FAILURE

TYPE: GENERIC, RB (10 TIMES AS SENSITIVE AS NORMAL)

A) DIESEL GENERATOR 0
B) DIESEL GENERATOR 1A
C) DIESEL GENERATOR 1B

CAUSE: FAULTY VOLTAGE ADJUST RHEOSTAT CAUSES VOLTAGE FLUCTUATIONS WHILE ATTEMPTING TO PARALLEL ONTO BUS

REF: DIESEL GENERATOR AND AUXILIARIES SYSTEM DESCRIPTION
DVR 22-2-86-099
LER 22-1-86-061

PLT STA: STARTING DIESEL GENERATOR

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN THE OPERATOR ATTEMPTS TO PARALLEL THE DIESEL ONTO ITS ESF BUS, THE VOLTAGE ADJUSTMENTS MADE TO SET UP CONDITIONS TO CLOSE THE OUTPUT BREAKER WILL BE 10 TIMES AS GREAT AS THEY WOULD BE NORMALLY. THIS WILL MAKE IT MORE DIFFICULT FOR THE OPERATOR TO GET THE DIESEL GENERATOR AND THE BUS IN THE PROPER PARALLEL CONDITION.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY VOLTAGE ADJUST RHEOSTAT TO NORMAL.

[REV 0]

EG07 DIESEL GENERATOR SEIZURE

TYPE: GENERIC, RB

A) DIESEL GENERATOR 0
B) DIESEL GENERATOR 1A
C) DIESEL GENERATOR 1B

CAUSE: BEARING FAILURE

REF: DIESEL GENERATOR AND AUXILIARIES SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 17-1B, 18-1B, 19-1B, 17-3A, 18-3A, 19-3A, 19-4E
LER 22-1-87-006
DVR's 22-1-85-229
22-1-86-076
22-2-87-032
22-1-87-089
22-2-88-030
22-1-89-096

PLT STA: DIESEL GENERATOR IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED DIESEL GENERATOR WILL HAVE A BEARING FAIL. THIS RESULTS IN THE DIESEL GENERATOR COMING TO AN IMMEDIATE HALT. THE DIESEL GENERATOR OUTPUT BREAKER WILL TRIP WITH ANNUNCIATOR 17/18/19-1B "BUS 149/148/147 DIESEL GEN-1B/1A/0 BKR 1493/1483/1473 TRIP" ACTUATING. ANNUNCIATOR 17/18/19-3A "DIESEL GENERATOR 1B/1A/0 TROUBLE AND FAIL TO START" WILL ALSO BE ACTUATED. IF THIS MALFUNCTION IS ACTIVATED PRIOR TO STARTING THE SELECTED DIESEL GENERATOR, THAT DIESEL WILL FAIL TO START WITH ANNUNCIATOR 17/18/19-3A "DIESEL GENERATOR 1B/1A/0 TROUBLE AND FAIL TO START" AND ANNUNCIATOR 17/18/19-4E "LOSS OF DC TO ENG PANEL" ACTUATING.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED DIESEL GENERATOR BEARING TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW01 MAIN FEEDWATER PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) TURB DRIVEN FEEDWATER PUMP 1B
B) TURB DRIVEN FEEDWATER PUMP 1C

CAUSE: FAULTY LOW BRG OIL PRESS TRIP PRESS SWITCH (63 LBOT)

REF: M-22 REV WA
M-530 SH3 REV K
MAIN FEEDWATER SYSTEM DESCRIPTION
22E-1-4840 FW53/54 REV V/Y
ANNUNCIATOR RESPONSE: 11-1B, 10-1A,
10-1B, 10-1C, 10-1D, 10-2A, 10-2B,
10-2C, 10-2D, 10-3A, 10-3B, 10-3C,
10-3D, 6-5A, 6-5B, 6-5C, 6-5D, 10-1E

PLT STA: 100% POWER WITH AFFECTED PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED MAIN FEED PUMP WILL TRIP AND THE AMBER FEEDWATER PUMP TURBINE TRIP LIGHT WILL ILLUMINATE. ANNUNCIATOR 11-1B/1C "FW PUMP TURBINE 1B/1C TRIP" WILL ACTUATE. THE ASSOCIATED PUMP RECIRC VALVE (1FCV-FW19/20) WILL REMAIN CLOSED DUE TO THE LP & HP STOP VALVES CLOSING. PUMP DISCHARGE FLOW, AS INDICATED ON 1FI-FW19/20 (1CB05), DECREASES. FEED WATER PUMP DISCHARGE HEADER PRESSURE, AS INDICATED ON 1PI-FW18 (1CB05), AND FEED HEADER PRESSURE, AS INDICATED ON 1PI-508 (1CB05), WILL ALSO DECREASE.

IF THE PLANT POWER LEVEL IS HIGH ENOUGH TO REQUIRE BOTH TURBINE DRIVEN MAIN FEED PUMPS TO BE OPERATING, A PLANT TRIP WILL RESULT DUE TO LOW STEAM GENERATOR LEVELS, OR DUE TO SF/FF MISMATCH COINCIDENT WITH LOW STEAM GENERATOR LEVELS..

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY STARTING THE MOTOR DRIVEN MAIN FEED PUMP. ANY ATTEMPT BY THE OPERATOR TO RESTART THE AFFECTED MAIN FEED PUMP, WHILE THE MALFUNCTION IS ACTIVE, IS INEFFECTIVE.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY LOW BEARING OIL PRESSURE SWITCH TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW02 MOTOR DRIVEN FEED PUMP TRIP/FAILS TO START

TYPE: DISCRETE, RB

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-22 REV WA
MAIN FEEDWATER SYSTEM DESCRIPTION
22E-1-4840 FW1 REV V
ANNUNCIATOR RESPONSE: 11-1A, 11-2A

PLT STA: MOTOR DRIVEN FEED PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE MOTOR DRIVEN MAIN FEED PUMP BREAKER WILL TRIP. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 11-1A "FEEDWATER PUMP 1A TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. PUMP RECIRC VALVE, 1FCV-FW21A, WILL REMAIN CLOSED DUE TO THE PUMP BREAKER OPENING. FEED WATER PUMP DISCHARGE HEADER PRESSURE, AS INDICATED ON 1PI-FW18 (1CB05), AND FEED HEADER PRESSURE, AS INDICATED ON 1PI-508 (1CB05), WILL ALSO DECREASE.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 1]

FW03 CONDENSATE/CONDENSATE BOOSTER PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) CONDENSATE/CONDENSATE BOOSTER PUMP 1A
B) CONDENSATE/CONDENSATE BOOSTER PUMP 1B
C) CONDENSATE/CONDENSATE BOOSTER PUMP 1C
D) CONDENSATE/CONDENSATE BOOSTER PUMP 1D

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-25 REV M
CONDENSATE SYSTEM DESCRIPTION
22E-1-4840 CD1 REV K
22E-1-4840 CD2 REV K
22E-1-4840 CD3 REV K
22E-1-4840 CD4 REV K
22E-1-4840 CD6 REV C
ANNUNCIATOR RESPONSE: 12-9A, 11-4D, 12-3C, 12-7C

PLT STA: 100% POWER, WITH THE AFFECTED PUMP IN SERVICE

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED CONDENSATE/CONDENSATE BOOSTER PUMP BREAKER WILL TRIP. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 12-9A "BREAKER TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. GLAND STEAM CONDENSER FLOW, AS INDICATED ON 1FI-CD23 (1CB04), WILL DECREASE SLIGHTLY THEN RETURN TO NORMAL AS THE GLAND STEAM CONDENSER/SJAE CONDENSER BYPASS VALVES CLOSE TO MAINTAIN FLOW.

CONDENSATE PUMP DISCHARGE HEADER PRESSURE, AS INDICATED BY 1PI-CD27 (1CB04), AND CONDENSATE BOOSTER PUMP DISCHARGE PRESSURE, AS INDICATED BY 1PI-CD62 (1CB04), WILL DECREASE TO THE PRESSURE SUPPLIED BY THE REMAINING PUMPS. WHEN THE FEED PUMP SUCTION PRESSURE, AS INDICATED BY 1PI-CD33B (1CB05), DECREASES TO 275 PSIG, ANNUNCIATOR 11-4D "FW PUMP SUCT PRESS LOW OR NPSH LOW" WILL ACTUATE. AT 160 PSIG, THE FEED PUMP NPSH CONTROL CIRCUIT WILL START THE STANDBY CONDENSATE/CONDENSATE BOOSTER PUMP, OPEN THE GLAND STEAM CONDENSER/SJAE CONDENSER BYPASS VALVES, OPEN THE HEATER DRAIN TANK LEVEL CONTROL VALVES, AND CLOSE THE BOOSTER PUMP RECIRC VALVE. ANNUNCIATOR 12- 3C "CNDS & BOOSTER PUMP AUTO START" WILL BE ACTUATED.

FW03 CONDENSATE/CONDENSATE BOOSTER PUMP TRIP/FAILS TO START (cont.)

THE OPERATOR MAY RESET THE TRIP ANNUNCIATOR AND AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN. ANY AUTO SIGNAL WILL ALSO BE INEFFECTIVE IN STARTING THE TRIPPED PUMP.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW04 HEATER DRAIN PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) HEATER DRAIN PUMP 1A
B) HEATER DRAIN PUMP 1B
C) HEATER DRAIN PUMP 1C

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-27 REV U
EXTRACTION STEAM AND FEEDWATER HEATER VENTS AND DRAINS
SYSTEM DESCRIPTION
22E-1-4840 HD1 REV Q
22E-1-4840 HD2 REV Q
22E-1-4840 HD3 REV Q
ANNUNCIATOR RESPONSE: 12-9A, 12-7C, 12-6D

PLT STA: AFFECTED HEATER DRAIN PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED HEATER DRAIN PUMP BREAKER WILL TRIP. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 12-9A "BREAKER TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. THE ASSOCIATED PUMP RECIRC VALVE (1FCV-HD48/49/50) WILL AUTO OPEN AS PUMP DISCHARGE FLOW, AS INDICATED ON 1FI-HD23/24/25 (1CB04), DECREASES TO < 390,000 #/HR.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW05 MOTOR DRIVEN AUX FEEDWATER PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) MOTOR DRIVEN AUX FEEDWATER PUMP 1B
B) MOTOR DRIVEN AUX FEEDWATER PUMP 1C

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-22 REV WA
AUXILIARY FEEDWATER SYSTEM DESCRIPTION
22E-1-4840 FW2 REV AL
22E-1-4840 FW3 REV AK
ANNUNCIATOR RESPONSE: 2-7B, 10-3A, 10-3B, 10-3C, 10-3D

PLT STA: AFFECTED MOTOR DRIVEN AUX FEEDWATER PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED AUXILIARY FEEDWATER PUMP BREAKER WILL TRIP. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 2-7B "AUX FW PUMPS 1B, 1C TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. THE SELECTED AUX FEEDWATER PUMP DISCHARGE PRESSURE, AS INDICATED ON 1PI-FW23B/24B (1CB12), AND AUXILIARY FEEDWATER FLOW TO THE STEAM GENERATORS, AS INDICATED ON 1FI-FW02/03/04/05 (1CB12), DECREASES TO ZERO, (IF NO OTHER AUX FEED PUMPS ARE RUNNING).

THE OPERATOR MAY RESET THE ANNUNCIATOR AND THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN. ANY AUTOMATIC SIGNAL WILL ALSO BE INEFFECTIVE IN STARTING THE TRIPPED PUMP.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW06 TURBINE DRIVEN AUX FEEDWATER PUMP TRIP/FAILS TO START

TYPE: DISCRETE, RB

CAUSE: FAULTY TURBINE OVERSPEED SIGNAL

REF: M-22 REV WA
AUXILIARY FEEDWATER SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 2-6A, 2-9B, 10-3A, 10-3B, 10-3C, 10-3D
DVR 22-1-87-034
LER 22-1-87-044

PLT STA: TURBINE DRIVEN AUX FEEDWATER PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE TURBINE DRIVEN AUXILIARY FEEDWATER PUMP WILL TRIP. THE TURBINE TRIP VALVE WILL TRIP CLOSED AND ANNUNCIATOR 2-9B "AUX FEEDWATER PUMP 1A TURB TRIP VALVE CLOSED" WILL BE ACTUATED. AUX FEEDWATER PUMP 1A DISCHARGE PRESSURE, AS INDICATED ON 1PI-FW22B (1CB12), AND AUXILIARY FEEDWATER FLOW TO THE STEAM GENERATORS, AS INDICATED ON 1FI-FW02/03/04/05 (1CB12), DECREASES TO ZERO, (IF NO OTHER AUX FEED PUMPS ARE RUNNING).

ANY ATTEMPT BY THE OPERATOR TO MANUALLY RESTART THE PUMP, WHILE THE MALFUNCTION IS INSERTED, WILL BE INEFFECTIVE. ANY AUTOMATIC START SIGNALS RECEIVED, WHILE THE MALFUNCTION IS ACTIVE, WILL ALSO BE INEFFECTIVE IN RESTARTING THE TRIPPED PUMP.

MALFUNCTION REMOVAL WILL RESTORE THE OVERSPEED SIGNAL TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW09 LOSS OF CONDENSER VACUUM

TYPE: DISCRETE, RV 100% - 16000 CFM @ 15 PSID

CAUSE: MAIN CONDENSER EXHAUST BOOT FAILURE

REF: M-40 REV AA
ANNUNCIATOR RESPONSE: 13-5C, 13-2A

PLT STA:IC39

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, CONDENSER VACUUM WILL BE LOST TO THE ATMOSPHERE AT A RATE DETERMINED BY THE SELECTED SEVERITY. THE CONDENSER VACUUM B RECORDER AND CONDENSER PRESSURE METER 1PI-\14 ON 1CB04 WILL SHOW THE DECREASING VACUUM CONDITION. ANNUNCIATOR 13-5C "CONDENSER VACUUM LOW" WILL BE ACTUATED AT < 27" HG.

CONDENSER TEMPERATURES WILL INCREASE AND MEGAWATT ELECTRIC OUTPUT WILL DECREASE IN PROPORTION TO THE MAIN CONDENSER VACUUM DECREASE. THE OPERATOR MAY TRY TO LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY PLACING ADDITIONAL AIR REMOVAL EQUIPMENT IN OPERATION, HOWEVER THE MAXIMUM SEVERITY OF THIS MALFUNCTION IS IN EXCESS OF THE TOTAL AIR REMOVAL CAPABILITIES.

CONTINUED VACUUM LOSS WILL RESULT IN A TURBINE, AND SUBSEQUENT REACTOR TRIP AT < 21" HG WITH ANNUNCIATOR 13-2A "TURB TRIP VACUUM LOW" ACTUATING. ANNUNCIATOR 6-1E "TURBINE TRIP REACTOR TRIP" IS ACTUATED. ANNUNCIATOR 7-1E "CONDENSER NOT AVAILABLE C-9" WILL ACTUATE AT < 17" HG WITH THE LOSS OF STEAM DUMP CAPABILITY TO THE MAIN CONDENSER RESULTING. THE EXCESS DECAY HEAT WILL BE RELEASED TO THE ATMOSPHERE BY THE STEAM GENERATOR SAFETY VALVES.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE MAIN CONDENSER EXHAUST BOOT TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW10 HOTWELL LEVEL CONTROLLER FAILS HIGH

TYPE: GENERIC, RB

A) NORMAL OVERFLOW CONTROLLER 1LC-CD74A
B) EMERGENCY OVERFLOW CONTROLLER 1LC-CD74B

CAUSE: CONTROLLER FAILURE RESULTS IN CONTROL VALVE OPENING

REF: M-37 SHT 1 REV AS
22E-1-4840 SC8
22E-0-4840 SC3, SC4, SC99
INSTR CAL PROC 1L-CD08, 1L-CD74
CONDENSATE MAKEUP WATER SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 12-2B, 12-2D, 12-2C

PLT STA: IC39

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED CONTROLLER WILL FAIL HIGH. THIS RESULTS IN ITS ASSOCIATED OVERFLOW VALVE OPENING WHICH WILL CAUSE AN ACTUAL HOTWELL LEVEL DECREASE. THE NORMAL OVERFLOW VALVE FLOW IS DISPLAYED ON 1FR-CD06 (1CB04) AND WILL INCREASE IF THAT IS THE AFFECTED VALVE AND DECREASE IF IT IS THE UNAFFECTED VALVE.

AS HOTWELL LEVEL, AS INDICATED ON 1LI-CD08 (1CB04), DECREASES, THE NORMAL MAKEUP VALVE, 1LCV-CD08A, WILL OPEN. AS LEVEL CONTINUES TO DECREASE ANNUNCIATOR 12-2D "CONDENSER EMERGENCY MAKEUP" WILL ACTUATE WITH EMERGENCY MAKEUP VALVE 1LCV-CD08B OPENING. CONDENSATE MAKEUP PUMP 1SC005 (0CB04) WILL ALSO START TO ATTEMPT TO RECOVER HOTWELL LEVEL. ANNUNCIATOR 12-2C "CONDENSER HOTWELL LEVEL HIGH LOW" ACTUATES AND CONDENSATE MAKEUP PUMP 0SC004 (0CB04) WILL AUTO START.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY ISOLATING THE AFFECTED VALVE.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED CONTROLLER TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW11 HOTWELL LEVEL CONTROLLER FAILS LOW

TYPE: GENERIC, RB

A) NORMAL MAKE-UP CONTROLLER 1LC-CD08A
B) EMERGENCY MAKE-UP CONTROLLER 1LC-CD08B

CAUSE: CONTROLLER FAILURE RESULTS IN CONTROL VALVE OPENING

REF: M-37 SHT 1 REV AF
22E-1-4840 SC8
22E-0-4840 SC3, SC4, SC99
INSTR CAL PROC 1L-CD08, 1L-CD74
CONDENSATE MAKEUP WATER SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 12-2D, 12-2B, 12-2C

PLT STA: IC39

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED CONTROLLER WILL FAIL LOW. THIS RESULTS IN ITS ASSOCIATED MAKEUP VALVE OPENING WHICH WILL CAUSE AN ACTUAL HOTWELL LEVEL INCREASE. THE NORMAL AND EMERGENCY MAKEUP VALVE FLOW IS DISPLAYED ON 1FR-CD06 (1CB04) AND WILL INCREASE IF THAT IS THE AFFECTED VALVE AND NORMAL MAKEUP WILL DECREASE IF IT IS THE UNAFFECTED VALVE.

AS HOTWELL LEVEL, AS INDICATED ON 1LI-CD08 (1CB04), INCREASES, THE NORMAL OVERFLOW VALVE, 1LCV-CD74A, WILL OPEN AS LEVEL CONTINUES TO INCREASE. ANNUNCIATOR 12-2B "CONDENSER EMERGENCY OVERFLOW" WILL ACTUATE WHEN THE EMERGENCY OVERFLOW VALVE 1LCV-CD74B OPENS. ANNUNCIATOR 12-2C "CONDENSER HOTWELL LEVEL HIGH LOW" ACTUATES.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY ISOLATING THE AFFECTED VALVE.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED CONTROLLER TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW16 LOW PRESS FW HTR 15 TUBE LEAK

TYPE: GENERIC, RV 100% = 2000 GPM @ NORMAL OPERATING DP

A) FEEDWATER HEATER 15A
B) FEEDWATER HEATER 15B
C) FEEDWATER HEATER 15C

CAUSE: TUBE FAILURE AT INLET TUBE SHEET

REF: M-26 REV K
M-27 REV U
EXTRACTION STM & FW HTR VENTS & DRAINS
SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 12-4E

PLT STA:IC39

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED FEEDWATER HEATER 15 TUBES WILL BEGIN TO LEAK. THE RATE OF LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY. THIS RESULTS IN AN INCREASING LEVEL IN THE AFFECTED 15 FEEDWATER HEATER AS THE FEEDWATER LEAKS INTO THE STEAM SIDE OF THE FEEDWATER HEATER. THIS WILL CAUSE A DECREASE IN THE CONDENSATE WATER TEMPERATURE OUT OF THE HEATER AS LESS AREA IS AVAILABLE FOR HEAT TRANSFER.

AS LEVEL CONTINUES TO INCREASE IN THE AFFECTED 15 FEEDWATER HEATER, MORE WATER WILL PASS ON TO THE ASSOCIATED 15 FEEDWATER DRAIN COOLER WITH ANNUNCIATOR 12-4E "HTR 15A-B-C LEVEL HIGH" ACTUATING AS THE FEEDWATER HEATER LEVEL IS INCREASED TO THE ALARM LEVEL SETPOINT AND THE ASSOCIATED EMERGENCY DRAIN VALVE WILL OPEN TO THE MAIN CONDENSER TO LIMIT THE LEVEL IN THE HEATER. ANNUNCIATOR 12-5E "HTR 15A-B-C EMERG DRAIN OPEN" IS ACTUATED.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE AFFECTED 15 FEEDWATER HEATER PIPING INTEGRITY.

[REV 2]

FW20 LOW PRESS FW HTR 11 TUBE LEAK

TYPE: GENERIC, RV 100% = 2000 GPM @ NORMAL OPERATING DP

A) FEEDWATER HEATER 11A
B) FEEDWATER HEATER 11B
C) FEEDWATER HEATER 11C

CAUSE: TUBE FAILURE AT INLET TUBE SHEET

REF: M-26 REV K
M-28 REV J
EXTRACTION STM & FW HTR VENTS & DRAINS
SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 12-5A

PLT STA:IC39

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED FEEDWATER HEATER 11 TUBES WILL BEGIN TO LEAK. THE RATE OF LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY. THIS RESULTS IN AN INCREASING LEVEL IN THE AFFECTED 11 FEEDWATER HEATER AND ITS ASSOCIATED FLASH TANK, AS THE FEEDWATER LEAKS INTO THE STEAM SIDE OF THE FEEDWATER HEATER. THIS WILL CAUSE A SLIGHT DECREASE IN THE CONDENSATE WATER TEMPERATURE OUT OF THE HEATER AS LESS AREA IS AVAILABLE FOR HEAT TRANSFER.

AS LEVEL CONTINUES TO INCREASE IN THE AFFECTED 11 FEEDWATER HEATER/FLASH TANK, THE FLASH TANK NORMAL LEVEL CONTROL VALVE WILL OPEN FURTHER TO LOWER THE WATER LEVEL PASSING MORE WATER THROUGH THE ASSOCIATED 11 FEEDWATER DRAIN COOLER. WHEN THE MALFUNCTION SEVERITY IS INCREASED SUFFICIENTLY TO INCREASE FEEDWATER HEATER LEVEL WITH THE NORMAL LEVEL CONTROL VALVE FULLY OPEN, THE ASSOCIATED EMERGENCY DRAIN VALVE WILL OPEN TO THE MAIN CONDENSER TO LIMIT THE LEVEL IN THE HEATER. ANNUNCIATOR 12-5A "FLASH TANK EMERG DRAIN OPEN" IS ACTUATED.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE AFFECTED 11 FEEDWATER HEATER PIPING INTEGRITY.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW22 FEED LINE BREAK INSIDE CONTAINMENT

TYPE: GENERIC, NRVI 100% = 6000 GPM @ NOP

A) SG 1A FEED LINE
B) SG 1B FEED LINE
C) SG 1C FEED LINE
D) SG 1D FEED LINE

CAUSE: PIPE BREAK AT STEAM GENERATOR INLET

REF: M-22 REV WA
ANNUNCIATOR RESPONSE: 20-1A, 10-2A, 10-1A, 10-3A, 6-7A, 10-1E, 4-6A, 6-3E, 3-5B, 3-5A, 6-6A

PLT STA:IC39

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, LEAKAGE OF FEEDWATER TO THE CONTAINMENT ATMOSPHERE WILL RESULT. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. CONTAINMENT TEMPERATURE, MOISTURE LEVELS, AND SUMP LEVELS MAY INCREASE DEPENDENT UPON THE SELECTED MALFUNCTION SEVERITY.

THE SELECTED STEAM GENERATOR LEVEL WILL DECREASE AT A RATE PROPORTIONAL TO THE SELECTED SEVERITY WHILE ITS PRESSURE WILL DECREASE AS THE STEAM GENERATOR BLOWS DOWN TO CONTAINMENT. INDICATED FEEDWATER FLOW TO THE AFFECTED STEAM GENERATOR WILL INCREASE. AS THE SELECTED SEVERITY IS INCREASED, THE RATE OF MASS LOSS TO CONTAINMENT WILL INCREASE. THE PLANT WILL TRIP ON LOW STEAM GENERATOR LEVEL WITH SF/FF MISMATCH OR ON A SAFETY INJECTION SIGNAL GENERATED BY HIGH CONTAINMENT PRESSURE.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY ISOLATING THE AFFECTED STEAM GENERATOR.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW25 MAIN FEED REG VALVE SEAT LEAKAGE

TYPE: GENERIC, RV 100% = 10% OF VALVE CAPACITY

A) 1LCV-FW510
B) 1LCV-FW540
C) 1LCV-FW520
D) 1LCV-FW530

CAUSE: EXCESSIVELY WORN VALVE SEAT

REF: M-22 REV WA
ANNUNCIATOR RESPONSE: 10-2A, 10-3A, 13-1B, 11-1B
GOP-2

PLT STA: IC20

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED MAIN FEED REG VALVE WILL LEAK BY. THE RATE OF LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY. AT LOWER MALFUNCTION SEVERITIES, THE INCREASE IN FEEDWATER FLOW TO THE ASSOCIATED STEAM GENERATOR WILL CAUSE LEVEL TO INCREASE. ANNUNCIATOR 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" WILL ACTUATE AT THE ALARM LEVEL SETPOINT FOR LEVEL DEVIATION FROM PROGRAM LEVEL. THE AFFECTED FEED REG VALVE WILL CLOSE DOWN TO RETURN STEAM GENERATOR LEVEL TO THE PROGRAM LEVEL. AT HIGHER MALFUNCTION SEVERITIES THE RATE OF LEAKAGE WITH THE FEED REG VALVE FULLY CLOSED WILL BE GREATER THAN THE REQUIRED FEEDWATER FLOW CAUSING STEAM GENERATOR LEVEL TO CONTINUE TO INCREASE. THE FEEDWATER ISOLATION VALVE IN THE AFFECTED FEED HEADER CAN BE THROTTLED TO CONTROL STEAM GENERATOR LEVEL. IF LEVEL IS ALLOWED TO INCREASE TO THE FEEDWATER ISOLATION SETPOINT, A FW ISOL WILL OCCUR, CAUSING THE MAIN TURBINE AND FW PUMPS TO TRIP.

AN INDICATION OF THIS MALFUNCTION, AT HIGHER POWER LEVELS, WILL BE A SMALLER CONTROLLING SIGNAL WILL BE SENT TO THE AFFECTED VALVE.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED FEED REG VALVE TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

FW26 MAIN FEED LINE BREAK BEFORE MAIN FEED ISOLATION VALVE

TYPE: GENERIC, RV 100% = 16" PIPE BREAK @ NOP

A) MAIN FEED LINE TO S/G 1A
B) MAIN FEED LINE TO S/G 1B
C) MAIN FEED LINE TO S/G 1C
D) MAIN FEED LINE TO S/G 1D

CAUSE: PIPE FAILURE BETWEEN UPSTREAM CHECK VALVE AND MAIN FEED ISOLATION VALVE (1MOV-FW18/16/17/19)

REF: M-22 REV WA
GEN. ARRANGEMENT DWGS M-5 & M-6
ANNUNCIATOR RESPONSE: 12-2D, 10-2A, 10-1A, 10-3A, 6-7A, 10-1E, 6-6A

PLT STA: IC39

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED MAIN FEED LINE WILL LEAK TO THE TURBINE BUILDING. THE RATE OF MASS LOSS FROM THE FEEDWATER SYSTEM WILL BE DETERMINED BY THE SELECTED SEVERITY. THE LOSS OF MASS TO THE ASSOCIATED STEAM GENERATOR WILL RESULT IN A DECREASING LEVEL. ANNUNCIATOR 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" ACTUATES AT THE ALARM LEVEL SETPOINT FOR DEVIATION FROM THE PROGRAM LEVEL.

THE ASSOCIATED FEED REG VALVE WILL OPEN TO ATTEMPT TO RECOVER THE DECREASING LEVEL WHICH WILL INCREASE THE FLOW OUT OF THE BREAK. THE AFFECTED MAIN FEED LINE FLOW WILL BE GREATER THAN THE OTHER FEED LINES. ANNUNCIATOR 10-1A/B/C/D "STEAM GENERATOR LOOP A/B/C/D FLOW MISMATCH" WILL ACTUATE AT THE ALARM SETPOINT.

WHEN THE AFFECTED STEAM GENERATOR LEVEL DECREASES TO THE ALARM LEVEL SETPOINT, ANNUNCIATORS 10-3A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL HI-HI LOW LO-LO" WILL ACTUATE.

THE PLANT WILL TRIP DUE TO LO-LO STEAM GENERATOR LEVEL WHEN LEVEL REACHES THE TRIP SETPOINT. ANNUNCIATORS 10-3A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL HI-HI LOW LO-LO" WILL REFLASH AND 6-7A/B/C/D "STM GEN LOOP A/B/C/D LOW LOW REACTOR TRIP" WILL ACTUATE.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY ISOLATING THE AFFECTED MAIN FEED LINE.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE PIPING INTEGRITY.

ZION MALFUNCTION

CAUSE AND EFFECTS

FW28 AUX FEEDWATER LINE RUPTURE

TYPE: GENERIC, RV 100% = 3" PIPE BREAK AT NOP

A) AUX FEED LINE TO STM GEN 1A
B) AUX FEED LINE TO STM GEN 1B
C) AUX FEED LINE TO STM GEN 1C
D) AUX FEED LINE TO STM GEN 1D

CAUSE: PIPE BREAK ON COMMON HEADER DOWNSTREAM OF MOV ISOLATIONS

REF: M-22 REV WA
ANNUNCIATOR RESPONSE: 2-6A, 10-3A

PLT STA: AUX FEEDWATER SYSTEM IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS A LOSS OF AUX FEEDWATER TO THE AUXILIARY BUILDING. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. AS MALFUNCTION SEVERITY IS INCREASED, THE RATE OF MASS LOSS WILL INCREASE. AUX FEEDWATER FLOW TO THE AFFECTED STEAM GENERATOR, 1FI-FW02/03/04/25 (1CB08), WILL DECREASE MARKEDLY WITH THE OTHER STEAM GENERATOR INDICATING A SLIGHT DECREASE IN FLOW. THE MASS LOST FROM THE AUX FEEDWATER SYSTEM WILL ACCUMULATE IN THE PIPE CHASE. THE ASSOCIATED STEAM GENERATOR LEVEL WILL DECREASE DUE TO THE LOSS OF MAKEUP FLOW.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY ISOLATING THE LEAK WHICH WILL ALSO RESULT IN A LOSS OF AUXILIARY FEEDWATER FLOW TO THE ASSOCIATED STEAM GENERATOR.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE PIPING INTEGRITY.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

IA01 LOSS OF INSTRUMENT AIR

TYPE: GENERIC, RV 100% = 2000 SCFM @ 110 PSID

A) INSTRUMENT AIR COMPRESSOR 1A DISCHARGE PIPING
B) INSTRUMENT AIR COMPRESSOR 0B DISCHARGE PIPING

CAUSE: PIPING FAILURE IMMEDIATELY UPSTREAM OF INSTRUMENT AIR RECEIVER

REF: AOP-3.3 APPENDIX A & C
M-72 REV R
PLANT AIR SYSTEMS DESCRIPTION
ANNUNCIATOR RESPONSE: 23-7B
LER 20-1-88-025

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED INSTRUMENT AIR PIPE WILL BEGIN TO LEAK TO THE ATMOSPHERE. THE RATE OF AIR LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. INSTRUMENT AIR HEADER PRESSURE, AS INDICATED ON 0PI-IA01 (0CB04), WILL DECREASE.

AS MALFUNCTION SEVERITY IS INCREASED, THE COMPRESSORS LOAD AS FOLLOWS:

@ 110 PSIG INCREASING AND REMAINS OVER 105 PSIG FOR MORE THAN 15 MINUTES - LEAD COMPRESSOR 0B STOPS
@ 108 PSIG INCREASING - LEAD COMPRESSOR 0B UNLOADS
@ 106 PSIG INCREASING AND REMAINS OVER 101 PSIG FOR MORE THAN 15 MINUTES - DEMAND FOLLOW COMPRESSOR 1A STOPS
@ 105 PSIG DECREASING - LEAD COMPRESSOR 0B HALF LOADS
@ 104 PSIG INCREASING - DEMAND FOLLOW COMPRESSOR 1A UNLOADS
@ 103 PSIG DECREASING - LEAD COMPRESSOR 0B LOADS FULLY
@ 102 PSIG INCREASING AND REMAINS OVER 97 PSIG FOR MORE THAN 15 MINUTES - STANDBY COMPRESSOR 2A STOPS
@ 101 PSIG DECREASING - DEMAND FOLLOW COMPRESSOR 1A HALF LOADS
@ 100 PSIG INCREASING - STANDBY COMPRESSOR 2A UNLOADS
@ 99 PSIG DECREASING - DEMAND FOLLOW COMPRESSOR 1A LOADS FULLY
@ 97 PSIG DECREASING - STANDBY COMPRESSOR 2A HALF LOADS
@ 95 PSIG DECREASING - STANDBY COMPRESSOR 2A LOADS FULLY

IA01 LOSS OF INSTRUMENT AIR (cont.)

AT HIGHER SEVERITIES, ANNUNCIATOR 23-7B "INSTRUMENT AIR RECEIVER PRESS LOW" WILL BE ACTUATED AT 90 PSIG DECREASING. THE AIR OPERATED VALVES WILL GO TO THEIR FAIL POSITION IF AIR SYSTEM PRESSURE DECREASES BELOW 70 PSIG.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE INSTRUMENT AIR PIPING INTEGRITY.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

IA02 LOSS OF SERVICE AIR

TYPE: GENERIC, RV 100% = 3500 SCFM @ 110 PSID

A) SERVICE AIR RECEIVER 1SA005
B) SERVICE AIR RECEIVER 2SA005

CAUSE: PIPE FAILURE IMMEDIATELY DOWNSTREAM OF SERVICE AIR RECEIVER OUTLET ISOLATION (1/2SA0011)

REF: M-71 REV AH
PLANT AIR SYSTEMS DESCRIPTION
22E-1-4840 SA1 REV J
22E-1-4840 SA2 REV J
ANNUNCIATOR RESPONSE: 23-7D

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED SERVICE AIR PIPE WILL BEGIN TO LEAK TO THE ATMOSPHERE. THE RATE OF AIR LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. SERVICE AIR HEADER PRESSURE, AS INDICATED ON OPI-SA04 (‘’B04), WILL DECREASE. AS PRESSURE DECREASES, THE AIR COMPRESSORS WILL OPERATE ON THE FOLLOWING SETPOINTS:

@ 111 PSIG INCREASING - 1B COMPRESSOR WILL UNLOAD
@ 110 PSIG INCREASING - 1A COMPRESSOR WILL UNLOAD
@ 109 PSIG INCREASING - 2A COMPRESSOR WILL UNLOAD
@ 105 PSIG DECREASING - 1A COMPRESSOR WILL LOAD
@ 104 PSIG DECREASING - 1B COMPRESSOR WILL LOAD
@ 103 PSIG DECREASING - 2A COMPRESSOR WILL LOAD
@ 103 PSIG DECREASING - 1A COMPRESSOR AUTO STARTS IN STANDBY
@ 101 PSIG DECREASING - 1B COMPRESSOR AUTO STARTS IN STANDBY
@ 99 PSIG DECREASING - 2A COMPRESSOR AUTO STARTS IN STANDBY

ON HIGHER SEVERITIES, ANNUNCIATOR 23-7D "SERVICE AIR PRESSURE LOW" WILL ACTUATE AT 98 PSIG FOR COMPRESSOR 1B, AT 103 PSIG FOR COMPRESSOR 1A AND AT 94 PSIG WITH COMPRESSOR 2A IN SERVICE. IF A COMPRESSOR RUNS UNLOADED CONTINUOUSLY FOR 30 MINUTES, IT WILL AUTOMATICALLY SHUTDOWN.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE SERVICE AIR PIPING INTEGRITY.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

IA03 INSTRUMENT AIR COMPRESSOR TRIP/FAILS TO START

TYPE: GENERIC, RB

A) INSTRUMENT AIR COMPRESSOR 1A
B) INSTRUMENT AIR COMPRESSOR 2A
C) INSTRUMENT AIR COMPRESSOR 0B

CAUSE: FAULTY HIGH FRAME OIL TEMPERATURE SWITCH

REF: PLANT AIR SYSTEMS DESCRIPTION
22E-1-4840 IA4
ANNUNCIATOR RESPONSE: 23-9E, 23-9D, 23-10D

PLT STA: SELECTED INSTRUMENT AIR COMPRESSOR IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED INSTRUMENT AIR COMPRESSOR BREAKER WILL TRIP. ANNUNCIATOR 23-9E "INST AIR COMPRESSOR TRIP" WILL ACTUATE AND THE AMBER LAMP ON THE ASSOCIATED CONTROL SWITCH ILLUMINATES. THE FAULTY HIGH FRAME OIL TEMPERATURE SWITCH WILL CAUSE ANNUNCIATOR 23-9D "INST AIR COMPRESSOR TROUBLE" TO BE ACTUATED.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND AMBER LAMP BY PLACING THE CONTROL SWITCH IN TRIP. ANNUNCIATOR 23-10D "INST. AIR COMPRESSOR OUT OF SERVICE" IS ACTUATED WHEN THE CONTROL SWITCH IS PLACED IN THE TRIP POSITION.IF THE OPERATOR ATTEMPTS TO RESTART THE AIR COMPRESSOR, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY HIGH FRAME OIL TEMPERATURE SWITCH TO NORMAL.

[REV 2]

IA04 SERVICE AIR COMPRESSOR TRIP/FAILS TO START

TYPE: GENERIC, RB

A) SERVICE AIR COMPRESSOR 1A
B) SERVICE AIR COMPRESSOR 1B
C) SERVICE AIR COMPRESSOR 2A

CAUSE: FAULTY HOT AIR TEMPERATURE SWITCH (CONTACTS 11/12 TS)

REF: PLANT AIR SYSTEM DESCRIPTION
22E-1-4840 SA1 REV J
22E-1-4840 SA2 REV J
ANNUNCIATOR RESPONSE: 23-8E, 23-8D

PLT STA: SELECTED SERVICE AIR COMPRESSOR IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED SERVICE AIR COMPRESSOR BREAKER WILL TRIP. ANNUNCIATOR 23-8E "SERVICE AIR COMPRESSOR TRIP" WILL ACTUATE FOR SERVICE AIR COMPRESSOR 1A ONLY, WITH ANNUNCIATOR 23-8D "SERVICE AIR COMPRESSOR TROUBLE" ACTUATES FOR ALL OF THE AIR COMPRESSORS DUE TO THE FAULTY HIGH AIR TEMPERATURE SWITCH. CURRENT INDICATION ON THE SELECTED SERVICE AIR COMPRESSOR DECREASES TO ZERO AND THE AMBER LAMP ON THE ASSOCIATED CONTROL SWITCH ILLUMINATES.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND AMBER LAMP BY PLACING THE CONTROL SWITCH IN TRIP. IF THE OPERATOR ATTEMPTS TO RESTART THE AIR COMPRESSOR, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY HIGH AIR TEMPERATURE SWITCH TO NORMAL.

[REV 1]

ZION MAL[illegible]NCTION

CAUSE AND EFFECTS

IA05 INSTRUMENT AIR LEAK INSIDE CONTAINMENT

TYPE: DISCRETE, RV 100% = 1.5" PIPE BREAK @ NOP

CAUSE: PIPING FAILURE INSIDE CONTAINMENT DOWNSTREAM OF 1FCV-IA01A

REF: M-72 REV R
ANNUNCIATOR RESPONSE: 23-7B

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE INSTRUMENT AIR LINE WILL BEGIN TO LEAK AIR INTO THE CONTAINMENT ATMOSPHERE. THE RATE OF AIR LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY. INSTRUMENT AIR HEADER PRESSURE, AS INDICATED BY OPI-IA01 (OCB04), WILL DECREASE.

AS MALFUNCTION SEVERITY IS INCREASED, THE COMPRESSORS LOAD AS FOLLOWS:

@ 110 PSIG INCREASING AND REMAINS OVER 105 PSIG FOR MORE THAN 15 MINUTES - LEAD COMPRESSOR 0B STOPS
@ 108 PSIG INCREASING - LEAD COMPRESSOR 0B UNLOADS
@ 106 PSIG INCREASING AND REMAINS OVER 101 PSIG FOR MORE THAN 15 MINUTES - DEMAND FOLLOW COMPRESSOR 1A STOPS
@ 105 PSIG DECREASING - LEAD COMPRESSOR 0B HALF LOADS
@ 104 PSIG INCREASING - DEMAND FOLLOW COMPRESSOR 1A UNLOADS
@ 103 PSIG DECREASING - LEAD COMPRESSOR 0B LOADS FULLY
@ 102 PSIG INCREASING AND REMAINS OVER 97 PSIG FOR MORE THAN 15 MINUTES - STANDBY COMPRESSOR 2A STOPS
@ 101 PSIG DECREASING - DEMAND FOLLOW COMPRESSOR 1A HALF LOADS
@ 100 PSIG INCREASING - STANDBY COMPRESSOR 2A UNLOADS
@ 99 PSIG DECREASING - DEMAND FOLLOW COMPRESSOR 1A LOADS FULLY
@ 97 PSIG DECREASING - STANDBY COMPRESSOR 2A HALF LOADS
@ 95 PSIG DECREASING - STANDBY COMPRESSOR 2A LOADS FULLY

AT HIGHER SEVERITIES, ANNUNCIATOR 23-7B "INSTRUMENT AIR RECEIVER PRESS LOW" ACTUATES AT 90 PSIG DECREASING. THE AIR OPERATED VALVES GO TO THEIR FAILURE POSITION IF AIR SYSTEM PRESSURE DECREASES BELOW 70 PSIG.

IA05 INSTRUMENT AIR LEAK INSIDE CONTAINMENT (cont.)

CONTAINMENT AIR ISOLATION VALVES 1FCV-IA01A/B WILL CLOSE ON LOW SYSTEM AIR PRESSURE AND ISOLATE THE LEAK. INSTRUMENT AIR PRESSURE WILL RECOVER ALLOWING THE VALVES TO AUTO OPEN REINITIATING THE LEAK. INSTRUMENT AIR PRESSURE AND CONTAINMENT ISOLATION VALVES WILL CYCLE.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE INSTRUMENT AIR PIPING INTEGRITY.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

MS01 MAIN STEAM ISOLATION VALVE FAIL OPEN

TYPE: GENERIC, RB (NOTE: DAMAGE TO STM PIPES NOT MODELED)

A) MSIV 1MOV-MS0001 (S/G 1A)
B) MSIV 1MOV-MS0004 (S/G 1B)
C) MSIV 1MOV-MS0002 (S/G 1C)
D) MSIV 1MOV-MS0003 (S/G 1D)

CAUSE: HYDRAULIC DRAIN SOLENOID VALVES FAIL CLOSED

REF: M-20 REV BB
M-530 SHT 1 REV J
LER 22-1-87-009
ANNUNCIATOR RESPONSE: 9-8C, 9-8B

PLT STA: PRESSURIZING MAIN STEAM LINES

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED MAIN STEAM ISOLATION VALVE WILL FAIL OPEN. THE RED VALVE POSITION INDICATING LAMP (1CB12), WILL ILLUMINATE WHEN THE AFFECTED VALVE OPENS. THE RAPID REMOVAL OF STEAM FROM THE STEAM GENERATOR WILL RESULT IN LEVEL AND PRESSURE DECREASING AND STEAM FLOW INCREASING FOR THE AFFECTED STEAM GENERATOR, AS INDICATED ON PANEL 1CB05.

REACTOR COOLANT SYSTEM PRESSURE AND TEMPERATURE WILL DECREASE RAPIDLY DUE TO THE EXCESSIVE HEAT REMOVAL. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" ACTUATES AT < 2210 PSIG AND ANNUNCIATOR 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" IS ACTUATED AT 5% DECREASE FROM THE PROGRAM LEVEL.

IF THIS MALFUNCTION IS ACTIVATED AT A POWER LEVEL WHEN THE MSIV'S ARE ALREADY OPEN, THE MALFUNCTION INSERTION WILL NOT BE SEEN UNTIL THE SELECTED MSIV RECEIVES A CLOSE SIGNAL AND REMAINS OPEN. ANY ATTEMPT BY THE OPERATOR TO MANUALLY CLOSE THE AFFECTED MSIV, WHILE THE MALFUNCTION IS ACTIVE, IS INEFFECTIVE.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED MSIV TO NORMAL.

[REV 1]

MS03 MAIN STEAM CHECK VALVE FAILURE

TYPE: GENERIC, RV 100% = VALVE FULLY CLOSED

A) MAIN STEAM LINE #1 CHECK VALVE
B) MAIN STEAM LINE #2 CHECK VALVE
C) MAIN STEAM LINE #3 CHECK VALVE
D) MAIN STEAM LINE #4 CHECK VALVE

CAUSE: MECHANICAL FAILURE OF CHECK VALVE HINGE

REF: M-20 REV BB

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED MAIN STEAM CHECK VALVE WILL FAIL. THE VALVE POSITION WILL BE DETERMINED BY THE SELECTED SEVERITY. CLOSURE OF THE VALVE, WHEN IT IS REQUIRED TO BE FULLY OPEN, WILL CAUSE A DECREASE IN MAIN STEAM FLOW OUT OF THE ASSOCIATED STEAM GENERATOR WITH A RESULTANT ELEVATED COLD LEG TEMPERATURE FOR THAT LOOP WITH THE ROD CONTROL SYSTEM IN MANUAL. IF THE VALVE IS FAILED IN AN OPEN POSITION, WHEN IT IS REQUIRED TO BE CLOSED, IT WILL RESULT IN ABNORMAL BACKFLOW TO THE ASSOCIATED STEAM GENERATOR/MAIN STEAM LINE, WHICH MAY CAUSE EXCESSIVE REACTOR COOLANT SYSTEM COOLDOWN.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED MAIN STEAM CHECK VALVE TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

MS04 STEAM DUMP CONTROL FAILURE

TYPE: GENERIC, RV 100% = VALVE FULLY OPEN

A) 1PCV-MS21A
B) 1PCV-MS21B
C) 1PCV-MS21C
D) 1PCV-MS21D
E) 1PCV-MS21E
F) 1PCV-MS21F
G) 1PCV-MS21G
H) 1PCV-MS21H
I) 1PCV-MS21J
J) 1PCV-MS21K
K) 1PCV-MS21L
L) 1PCV-MS21M

CAUSE: VALVE POSITIONER FAILURE

REF: M-21 SHT 1 REV S
5653D30 SHT 10 REV 5
ANNUNCIATOR RESPONSE: 5-4C, 9-8B, 9-8C

PLT STA: IC28

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED STEAM DUMP VALVE FAILS. THE VALVE POSITION WILL BE DETERMINED BY THE SELECTED SEVERITY. THE INDICATING LAMPS FOR THE AFFECTED VALVE WILL INDICATE INTERMEDIATE POSITION (BOTH LAMPS ILLUMINATED - 1CB03) FOR LESS THAN 100% SEVERITY FOR THE SELECTED VALVE. A FULLY OPEN STEAM DUMP VALVE WILL INCREASE TOTAL MAIN STEAM FLOW BY ~6%. IF THE REACTOR COOLANT SYSTEM COOLS DOWN SUFFICIENTLY, ANNUNCIATOR 5-4C "REACTOR COOLANT LOOPS T_{ave} DEVIATION" ACTUATES AT 3 ^{O}F DEVIATION FROM T_{ref}. PRESSURIZER LEVEL AND PRESSURE WILL DECREASE IN RESPONSE TO THE ADDED HEAT REMOVAL. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" IS ACTUATED AT < 2210 PSIG AND ANNUNCIATOR 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" WILL ACTUATE AT 5% DEVIATION FROM PROGRAM LEVEL.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY CLOSING THE ASSOCIATED MANUAL ISOLATION VALVE.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED STEAM DUMP VALVE TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

MS07 STEAMLINE BREAK INSIDE CONTAINMENT AFTER FLOW RESTRICTOR

TYPE: GENERIC, NRVI 100% = 34" PIPE BREAK @ NOP
(300% RATED FLOW)

A) STEAM GENERATOR 1A MAIN STEAM HEADER
B) STEAM GENERATOR 1B MAIN STEAM HEADER
C) STEAM GENERATOR 1C MAIN STEAM HEADER
D) STEAM GENERATOR 1D MAIN STEAM HEADER

CAUSE: PIPING FAILURE DOWNSTREAM OF MAIN STEAM FLOW RESTRICTOR

REF: M-20 REV BB
ANNUNCIATOR RESPONSE: 6-6A, 6-5A, 6-3E, 6-3D, 6-6E, 10-1E, 3-5B, 3-5A, 3-5C, 10-2E, 4-6A, 4-6B, 10-1A, 10-2A, 10-3A, 10-4E

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, MAIN STEAM LEAKAGE TO THE CONTAINMENT ATMOSPHERE WILL RESULT. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. CONTAINMENT TEMPERATURE, MOISTURE LEVELS, AND SUMP LEVELS MAY INCREASE DEPENDENT UPON THE SELECTED MALFUNCTION SEVERITY.

THE SELECTED STEAM GENERATOR LEVEL WILL DECREASE, AFTER INITIALLY SWELLING, AT A RATE PROPORTIONAL TO THE SELECTED SEVERITY WHILE ITS PRESSURE WILL DECREASE AS THE STEAM GENERATOR BLOWS DOWN TO CONTAINMENT. INDICATED MAIN STEAM FLOW FROM THE AFFECTED STEAM GENERATOR WILL INCREASE GREATLY, AS INDICATED FLOW FROM THE UNAFFECTED STEAM GENERATORS WILL INCREASE BY A SMALLER AMOUNT. AS THE SELECTED SEVERITY IS INCREASED, THE RATE OF MASS LOSS TO CONTAINMENT WILL INCREASE. THE PLANT WILL TRIP ON STEAMLINE SAFETY INJECTION DP HIGH OR ON LOW STEAM GENERATOR LEVEL WITH SF/FF MISMATCH OR ON A SAFETY INJECTION SIGNAL GENERATED BY HIGH CONTAINMENT PRESSURE OR ON A PRESSURIZER LOW PRESSURE SAFETY INJECTION TRIP CAUSED BY THE EXCESSIVE REACTOR COOLANT SYSTEM COOLDOWN.

IF CONTAINMENT PRESSURE INCREASES TO THE HIGH-HIGH SETPOINT OF 23 PSIG, CONTAINMENT SPRAY ACTUATION, CONTAINMENT PHASE B ISOLATION AND STEAM LINE ISOLATION

MS07 STEAMLINE BREAK INSIDE CONTAINMENT AFTER FLOW RESTRICTOR (cont.)

SIGNALS WILL BE GENERATED.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY ISOLATING THE AFFECTED STEAM GENERATOR.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 2]

MS09 STEAM GENERATOR SAFETY VALVE FAILURE

TYPE: GENERIC, RV 100% = 100% CAPACITY
(Q - 584105 #/HR, R - 845763 #/HR)

A) STM GEN 1A SAFETY VLV, 1MS0014 (Q)
B) STM GEN 1A SAFETY VLV, 1MS0015 (Q)
C) STM GEN 1A SAFETY VLV, 1MS0016 (R)
D) STM GEN 1A SAFETY VLV, 1MS0017 (R)
E) STM GEN 1A SAFETY VLV, 1MS0018 (R)
F) STM GEN 1B SAFETY VLV, 1MS0029 (Q)
G) STM GEN 1B SAFETY VLV, 1MS0030 (Q)
H) STM GEN 1B SAFETY VLV, 1MS0031 (R)
I) STM GEN 1B SAFETY VLV, 1MS0032 (R)
J) STM GEN 1B SAFETY VLV, 1MS0033 (R)
K) STM GEN 1C SAFETY VLV, 1MS0019 (Q)
L) STM GEN 1C SAFETY VLV, 1MS0020 (Q)
M) STM GEN 1C SAFETY VLV, 1MS0021 (R)
N) STM GEN 1C SAFETY VLV, 1MS0022 (R)
O) STM GEN 1C SAFETY VLV, 1MS0023 (R)
P) STM GEN 1D SAFETY VLV, 1MS0024 (Q)
Q) STM GEN 1D SAFETY VLV, 1MS0025 (Q)
R) STM GEN 1D SAFETY VLV, 1MS0026 (R)
S) STM GEN 1D SAFETY VLV, 1MS0027 (R)
T) STM GEN 1D SAFETY VLV, 1MS0028 (R)

CAUSE: VALVE SEAT LEAKS BY

REF: M-20 REV BB
ANNUNCIATOR RESPONSE: 10-4E

PLT STA: IC28

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED STEAM GENERATOR SAFETY VALVE WILL LEAK BY. THE LEAK RATE WILL BE DETERMINED BY THE SELECTED SEVERITY. THE ASSOCIATED MAIN STEAM LINE FLOW WILL INCREASE BY THE AMOUNT OF STEAM BEING LEAKED TO THE ATMOSPHERE. ANNUNCIATOR 10-4E "STEAMLINE FLOW HIGH" WILL ACTUATE IF STEAMLINE FLOW INCREASES ABOVE THE STEAM FLOW LOAD PROGRAM. AFTER SWELLING SLIGHTLY, THE ASSOCIATED STEAM GENERATOR LEVEL WILL DECREASE SLIGHTLY, WITH A CORRESPONDING DECREASE IN THE COLD LEG TEMPERATURE, DUE TO THE ADDITIONAL STEAM REMOVAL, WHICH WILL ALSO CAUSE AFFECTED STEAM GENERATOR PRESSURE TO DECREASE.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED STEAM GENERATOR SAFETY VALVE TO NORMAL.

[REV 0]

ZION MALFUNCTION

CAUSE AND EFFECTS

MS10 MAIN STEAM HEADER STEAM BREAK

TYPE: DISCRETE, NRVI 100% = 35.5" PIPE BREAK @ NOP

CAUSE: PIPE BREAK ON 35.5" HEADER BY 1PT-507

REF: M-20 REV BB
ANNUNCIATOR RESPONSE: 10-4E, 6-5A, 6-5B, 6-5C, 6-5D, 6-3D, 6-6E, 10-1E, 3-5B, 3-5A, 10-2E

PLT STA: IC28

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, MAIN STEAM LEAKAGE TO THE TURBINE BUILDING ATMOSPHERE WILL RESULT. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. TURBINE BUILDING TEMPERATURE, MOISTURE LEVELS, AND SUMP LEVELS MAY INCREASE DEPENDENT UPON THE SELECTED MALFUNCTION SEVERITY. MAIN STEAM HEADER PRESSURE, AS INDICATED ON 1PI-507 (1CB05) AND 1PI-MS27 (1CB03), WILL DECREASE.

ALL STEAM GENERATOR LEVELS WILL DECREASE, AFTER INITIALLY SWELLING, AT A RATE PROPORTIONAL TO THE SELECTED SEVERITY WHILE THEIR PRESSURE WILL DECREASE AS THE MAIN STEAM LINE BLOWS DOWN TO THE TURBINE BUILDING. INDICATED MAIN STEAM FLOW FROM ALL STEAM GENERATORS WILL INCREASE. AS THE SELECTED SEVERITY IS INCREASED, THE RATE OF MASS LOSS TO THE TURBINE BUILDING WILL INCREASE. THE PLANT WILL TRIP ON LOW STEAM GENERATOR LEVEL WITH SF/FF MISMATCH OR ON A PRESSURIZER LOW PRESSURE SAFETY INJECTION TRIP CAUSED BY THE EXCESSIVE REACTOR COOLANT SYSTEM COOLDOWN.

IF 2 OF 4 STEAM LINES HAVE A HIGH FLOW CONDITION, COINCIDENT WITH LOW STEAM PRESSURE OR LOW-LOW T_{ave} OCCURRING, A STEAM LINE ISOLATION SIGNAL WILL BE GENERATED.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

MS15 TURBINE DRIVEN AFW PUMP SUPPLY STEAM LINE BREAK

TYPE: DISCRETE, RV 100% = 3E5 #/HR AT 700 PSID

CAUSE: PIPE BREAKS IMMEDIATELY UPSTREAM OF 1MOV-MS0006

REF: M-20 REV BB

PLT STA: TURBINE DRIVEN AUX FEEDWATER PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE TURBINE DRIVEN AUX FEEDWATER PUMP STEAM SUPPLY LINE WILL LEAK TO THE AUX BUILDING ATMOSPHERE. THE RATE OF STEAM LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY. STEAM FLOW FROM STEAM GENERATOR 1A AND 1D WILL INCREASE IN PROPORTION TO THE TOTAL LEAK FLOW, WITH FLOW DIVIDED BETWEEN THE TWO STEAM GENERATORS. TURBINE DRIVEN AUX FEEDWATER PUMP DISCHARGE PRESSURE, AS INDICATED ON 1PI-FW22B (1CB08), WILL DECREASE AS THE TURBINE SLOWS DUE TO THE LOSS OF DRIVING STEAM.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY ISOLATING THE LEAK BY CLOSING 1MOV-MS0005, 0006 & 0011 (1CB12).

MALFUNCTION REMOVAL WILL ONLY RESTORE THE PIPING INTEGRITY.

[REV 0]

ZION MALFUNCTION

CAUSE AND EFFECTS

NI01 NOISY SOURCE RANGE CHANNEL

TYPE: GENERIC, RB

A) SOURCE RANGE CHANNEL 1 (N31)
B) SOURCE RANGE CHANNEL 2 (N32)

CAUSE: FAULTY CABLE SHIELDING

REF: SOURCE RANGE INSTRUMENTATION SYSTEM DESCRIPTION
LER 22-1-87-011
ANNUNCIATOR RESPONSE: 8-1B

PLT STA:IC11

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED SOURCE RANGE CHANNEL WILL BECOME NOISY. THE NOISE SPIKES WILL BE INDICATED ON THE FOLLOWING EQUIPMENT:
N31 NEUTRON LEVEL (CPS) ON 1CB22
N32 NEUTRON LEVEL (CPS) ON 1CB22
AUDIBLE COUNT RATE SPEAKER, SELECTED TO AFFECTED CHANNEL, ON 1CB25
RATE METER, SELECTED TO AFFECTED CHANNEL, ON 1CB25
SR 1/2 COUNT RATE, 1NI-31B/32B, ON 1CB06
SR 1/2 START UP RATE, 1NI-31D/32D, ON 1CB06
NEUTRON MONITORING RECORDER, 1NR-45, ON 1CB06

IF THE INITIAL SOURCE RANGE COUNT RATE IS HIGH ENOUGH, THE ADDITION OF THE NOISE WILL BE SUFFICIENT TO ACTUATE ANNUNCIATOR 8-1B "SOURCE RANGE HIGH FLUX AT SHUTDOWN". IF THE NOISE ADDITION CAUSES THE CHANNEL TO REACH 10E5 CPS, A SOURCE RANGE HIGH FLUX REACTOR TRIP WILL RESULT.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED SOURCE RANGE CHANNEL TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

NI02 SOURCE RANGE CHANNEL FAILURE

TYPE: GENERIC, RV 100% = 100% DETECTOR OUTPUT

A) SOURCE RANGE CHANNEL 1 (N31)
B) SOURCE RANGE CHANNEL 2 (N32)

CAUSE: FAILED SOURCE RANGE DETECTOR

REF: SOURCE RANGE INSTRUMENTATION SYSTEM DESCRIPTION
DVR 22-2-87-039
DVR 22-1-87-036
LER 22-1-87-004
ANNUNCIATOR RESPONSE: 8-1B, 6-4A, 8-1C

PLT STA:IC11

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED SOURCE RANGE CHANNEL WILL FAIL. THE VALUE OF THE AFFECTED SOURCE RANGE CHANNEL WILL BE DETERMINED BY THE SELECTED SEVERITY AND WILL BE INDICATED ON THE FOLLOWING EQUIPMENT:
N31 NEUTRON LEVEL (CPS) ON 1CB22
N32 NEUTRON LEVEL (CPS) ON 1CB22
AUDIBLE COUNT RATE SPEAKER, SELECTED TO AFFECTED CHANNEL, ON 1CB25
RATE METER, SELECTED TO AFFECTED CHANNEL, ON 1CB25
SR 1/2 COUNT RATE, 1NI-31B/32B, ON 1CB06
SR 1/2 START UP RATE, 1NI-31D/32D, ON 1CB06
NEUTRON MONITORING RECORDER, 1NR-45, ON 1CB06

ANNUNCIATOR 8-1B "SOURCE RANGE HIGH FLUX AT SHUTDOWN" WILL BE ACTUATED WHEN THE MALFUNCTION SEVERITY IS INCREASED ABOVE THE ALARM SETPOINT. IF THE SELECTED SEVERITY IS INCREASED SO THAT THE APPARENT DETECTOR OUTPUT IS GREATER THAN 10^5 COUNTS, THE REACTOR WILL TRIP. ANNUNCIATOR 6-4A "SOURCE RANGE FLUX LEVEL HIGH REACTOR TRIP" WILL ACTUATE ON THE TRIP. ANNUNCIATOR 8-1C "SOURCE RANGE HIGH SHUTDOWN FLUX ALARM BLOCKED" WILL BE ACTUATED IF THE BLOCK SWITCH IS REPOSITIONED TO BLOCK.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED SOURCE RANGE CHANNEL TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

NI06 INTERMEDIATE RANGE CHANNEL FAILURE

TYPE: GENERIC, RV 100% = 100% DETECTOR OUTPUT

A) INTERMEDIATE RANGE CHANNEL 1 (N35)
B) INTERMEDIATE RANGE CHANNEL 2 (N36)

CAUSE: LOG LEVEL AMP SIGNAL FAILURE

REF: INTERMEDIATE RANGE INSTRUMENTATION SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 8-2D, 6-4B

PLT STA: REACTOR POWER IN THE INTERMEDIATE RANGE

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED INTERMEDIATE RANGE CHANNEL WILL FAIL. THE VALUE OF THE DETECTOR OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY AND WILL BE INDICATED ON THE FOLLOWING EQUIPMENT:
N35 NEUTRON LEVEL (AMPERES) ON 1CB22
N36 NEUTRON LEVEL (AMPERES) ON 1CB23
RATE METER, SELECTED TO AFFECTED CHANNEL, ON 1CB25
IR 1/2 CURRENT, 1NI-35B/36B, ON 1CB06
IR 1/2 START UP RATE, 1NI-35D/36D, ON 1CB06
NEUTRON MONITORING RECORDER, 1NR-45, ON 1CB06

AS THE MALFUNCTION SEVERITY IS INCREASED, ANNUNCIATOR 8-2D "INTERMEDIATE RANGE HIGH FLUX LEVEL ROD WITHDRAWAL STOP" WILL BE ACTUATED AT THE CURRENT EQUIVALENT TO 20% REACTOR POWER. IF THE SELECTED SEVERITY IS INCREASED SO THAT THE APPARENT DETECTOR OUTPUT IS THE CURRENT EQUIVALENT TO GREATER THAN 25% REACTOR POWER, WITHOUT BLOCKING THE INTERMEDIATE RANGE (1CB06), WHICH IS ALLOWED WHEN 2/4 POWER RANGES ARE > 10% POWER, THE REACTOR WILL TRIP. ANNUNCIATOR 6-4B "INTERMEDIATE RANGE FLUX LEVEL HIGH REACTOR TRIP" WILL ACTUATE ON THE TRIP.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED INTERMEDIATE RANGE CHANNEL TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

NI07 INTERMEDIATE RANGE CHANNEL GAMMA COMPENSATION FAILURE

TYPE: ... IC, RV 100% = 2 DECADES HIGH, 0% = 2 DECADES LOW

A) INTERMEDIATE RANGE CHANNEL 1 (N...
B) INTERMEDIATE RANGE CHANNEL 2 (N...

CAUSE: IMPROPER ADJU MENT OF COMPENSATION VOLTAG...

REF: INTERMEDIATE RANGE INSTRUMENTATION SYSTEM DESCRIPTION
SOURCE RANGE INSTRUMENTATION SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 6-4A, 8-2B

PLT STA: REACTOR POWER IN THE INTERMEDIATE RANGE

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED INTERMEDIATE RANGE CHANNEL GAMMA COMPENSATION WILL FAIL. THE VALUE OF THE RESULTANT DETECTOR OUTPUT WILL BE DETERMINED BY THE SE...TED SEVERITY AND WILL BE INDICATED ON THE FOLL... EQUIPMENT:
N35 NEUTRON LEVEL (AMPERA...) ON 1CB22
N36 NEUTRON LEVEL (AMPE...S) ON 1CB23
RATE METER, SELECTED TO AFFECTED CHANNEL, ON 1CB25
IR 1/2 CURRENT, 1NI-35B/36B, ON 1CB06
IR 1/2 START UP RATE, 1NI-35D/36D, ON 1CB06
NEUTRON MONITORING RECORDER, 1NR-45, ON 1CB06

WITH THE MALFUNCTION SEVERITY ABOVE 50%, THE INDICATED REACTOR POWER WILL INCREASE. ANNUNCIATOR 8-2B/C "INTERMEDIATE RANGE NO. 1/2 LOSS OF COMPENSATE VOLTAGE" WILL ACTUATE AT 50% OF NORMAL COMPENSATING VOLTAGE.

WITH THE MALFUNCTION SEVERITY BELOW 50%, THE INDICATED REACTOR POWER WILL DECREASE. IF BOTH CHANNELS' OUTPUT ARE DECREASED BELOW THE P-6 LEVEL, THE SOURCE RANGE LEVEL TRIPS ARE AUTOMATICALLY REACTIVATED AND HIGH VOLTAGE IS RESTORED TO THE SOURCE RANGE DETECTORS. IF REACTOR POWER IS GREATER THAN 10^5 CPS, THE REACTOR WILL TRIP WITH ANNUNCIATOR 6-4A "SOURCE RANGE FLUX LEVEL HIGH REACTOR TRIP" ACTUATING.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED INTERMEDIATE RANGE CHANNEL GAMMA COMPENSATION TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

NI08 POWER RANGE DETECTOR FAILURE

TYPE: GENERIC, RV 100% = 120% FULL POWER

A) POWER RANGE CHANNEL 1A (N41A)
B) POWER RANGE CHANNEL 2A (N42A)
C) POWER RANGE CHANNEL 3A (N43A)
D) POWER RANGE CHANNEL 4A (N44A)
E) POWER RANGE CHANNEL 1B (N41B)
F) POWER RANGE CHANNEL 2B (N42B)
G) POWER RANGE CHANNEL 3B (N43B)
H) POWER RANGE CHANNEL 4B (N44B)

CAUSE: DETECTOR FAILURE

REF: POWER RANGE INSTRUMENTATION SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 8-3E, 8-4C, 8-4D, 8-4E, 8-3C
DVR 22-1-87-012
DVR 22-2-87-086

PLT STA: REACTOR OPERATING IN THE POWER RANGE

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED POWER RANGE CHANNEL WILL FAIL. THE VALUE OF THE DETECTOR OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY AND WILL BE INDICATED ON THE FOLLOWING EQUIPMENT:
N41A NEUTRON LEVEL (PERCENT FULL POWER) ON 1CB22
N41B NEUTRON LEVEL (DETECTOR CURRENT MICROAMPERES) ON 1CB22
N42A NEUTRON LEVEL (PERCENT FULL POWER) ON 1CB23
N42B NEUTRON LEVEL (DETECTOR CURRENT MICROAMPERES) ON 1CB23
N43A NEUTRON LEVEL (PERCENT FULL POWER) ON 1CB24
N43B NEUTRON LEVEL (DETECTOR CURRENT MICROAMPERES) ON 1CB24
N44A NEUTRON LEVEL (PERCENT FULL POWER) ON 1CB25
N44B NEUTRON LEVEL (DETECTOR CURRENT MICROAMPERES) ON 1CB25
COMPARATOR INDICATING LAMP ON 1CB25
PR 1 % DELTA FLUX, 1NI-41C, ON 1CB06
PR 2 % DELTA FLUX, 1NI-42C, ON 1CB06
PR 3 % DELTA FLUX, 1NI-43C, ON 1CB06
PR 4 % DELTA FLUX, 1NI-44C, ON 1CB06
PR 1 % FULL POWER, 1NI-41B, ON 1CB06
PR 2 % FULL POWER, 1NI-42B, ON 1CB06
PR 3 % FULL POWER, 1NI-43B, ON 1CB06
PR 4 % FULL POWER, 1NI-44B, ON 1CB06
UPPER/LOWER FLUX CHANNEL RECORDER, 1NR-41, ON 1CB06
UPPER/LOWER FLUX CHANNEL RECORDER, 1NR-42, ON 1CB06
UPPER/LOWER FLUX CHANNEL RECORDER, 1NR-43, ON 1CB06
UPPER/LOWER FLUX CHANNEL RECORDER, 1NR-44, ON 1CB06
NEUTRON MONITORING RECORDER, 1NR-45, ON 1CB06
OVERPOWER RECORDER, 1NR-46, ON 1CB17

NI08 POWER RANGE DETECTOR FAILURE (cont.)

WITH THE MALFUNCTION SEVERITY INCREASED ABOVE THE INITIAL POWER LEVEL, THE INDICATED REACTOR POWER WILL INCREASE FOR THE AFFECTED CHANNEL. IF THE AFFECTED CHANNEL DIFFERS BY ± 3% FROM THE LOWEST CHANNEL POWER, ANNUNCIATOR 8-3E "NIS POWER RANGE CHANNEL DEVIATION" WILL ACTUATE. IF THE RATE OF CHANGE OF POWER FOR THE SELECTED CHANNEL IS > 5% IN 2.2 SECONDS, ANNUNCIATOR 8-3C "NIS POWER RANGE POS FLUX RATE ALARM" ACTUATES. IF INDICATED REACTOR POWER EXCEEDS THE VARIABLE ALARM SETPOINT, (25% - LOW SETPOINT, 109% - HIGH SETPOINT), ANNUNCIATOR 8-3B "NIS POWER RANGE FLUX LEVEL HIGH" IS ACTUATED. IF REACTOR POWER IS GREATER THAN 50% AND THE AFFECTED CHANNEL CAUSES A UPPER TO LOWER DETECTOR OUTPUT RATIO OF 1.02, THE ASSOCIATED ANNUNCIATOR 8-4D/E "NIS POWER RANGE UPPER/LOWER DETECTOR HIGH FLUX DEVIATION" WILL BE ACTUATED.

WITH THE MALFUNCTION SEVERITY DECREASED BELOW THE INITIAL POWER LEVEL, THE INDICATED REACTOR POWER WILL DECREASE FOR THE AFFECTED CHANNEL. IF THE AFFECTED CHANNEL DIFFERS BY ± 3% FROM THE HIGHEST CHANNEL POWER, ANNUNCIATOR 8-3E "NIS POWER RANGE CHANNEL DEVIATION" WILL ACTUATE. IF THE RATE OF CHANGE OF POWER FOR THE SELECTED CHANNEL IS > 5% IN 2 SECONDS, ANNUNCIATOR 8-4C "NIS POWER RANGE NEG FLUX RATE ALARM" ACTUATES. IF REACTOR POWER IS GREATER THAN 50% AND THE AFFECTED CHANNEL CAUSES A UPPER TO LOWER DETECTOR OUTPUT RATIO OF 1.02, THE ASSOCIATED ANNUNCIATOR 8-4D/E "NIS POWER RANGE UPPER/LOWER DETECTOR HIGH FLUX DEVIATION" WILL BE ACTUATED.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED POWER RANGE CHANNEL TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

NI09 POWER RANGE CHANNEL FAILURE

TYPE: GENERIC, RV 100% = 120% FULL POWER

A) POWER RANGE CHANNEL 1 (N41A)
B) POWER RANGE CHANNEL 2 (N42A)
C) POWER RANGE CHANNEL 3 (N43A)
D) POWER RANGE CHANNEL 4 (N44A)

CAUSE: CHANNEL OUTPUT SIGNAL FAILURE

REF: POWER RANGE INSTRUMENTATION SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 8-3E, 8-4C, 8-3C, 8-3B, 8-3D
DVR 22-1-87-012
DVR 22-2-87-086

PLT STA: REACTOR OPERATING IN THE POWER RANGE

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED POWER RANGE CHANNEL WILL FAIL. THE VALUE OF THE CHANNEL OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY AND WILL BE INDICATED ON THE FOLLOWING EQUIPMENT:
N41A NEUTRON LEVEL (PERCENT FULL POWER) ON 1CB22
N42A NEUTRON LEVEL (PERCENT FULL POWER) ON 1CB23
N43A NEUTRON LEVEL (PERCENT FULL POWER) ON 1CB24
N44A NEUTRON LEVEL (PERCENT FULL POWER) ON 1CB25
COMPARATOR INDICATING LAMP ON 1CB25
PR 1 % FULL POWER, 1NI-41B, ON 1CB06
PR 2 % FULL POWER, 1NI-42B, ON 1CB06
PR 3 % FULL POWER, 1NI-43B, ON 1CB06
PR 4 % FULL POWER, 1NI-44B, ON 1CB06
NEUTRON MONITORING RECORDER, 1NR-45, ON 1CB06
OVERPOWER RECORDER, 1NR-46, ON 1CB17

WITH THE MALFUNCTION SEVERITY INCREASED ABOVE THE INITIAL POWER LEVEL, THE INDICATED REACTOR POWER WILL INCREASE FOR THE AFFECTED CHANNEL. IF THE AFFECTED CHANNEL DIFFERS BY ± 3% FROM THE LOWEST CHANNEL POWER, ANNUNCIATOR 8-3E "NIS POWER RANGE CHANNEL DEVIATION" WILL ACTUATE. IF THE RATE OF CHANGE OF POWER FOR THE SELECTED CHANNEL IS > 5% IN 2 SECONDS, ANNUNCIATOR 8-3C "NIS POWER RANGE POS FLUX RATE ALARM" ACTUATES. IF INDICATED REACTOR POWER EXCEEDS THE ALARM SETPOINT, (25% - LOW SETPOINT, 109% - HIGH SETPOINT), ANNUNCIATOR 8-3B "NIS POWER RANGE FLUX LEVEL HIGH" IS ACTUATED. ANNUNCIATOR 8-3D "NIS POWER RANGE OVERPOWER ROD WITHDRAWAL STOP" IS ACTUATED AT 103% POWER.

WITH THE MALFUNCTION SEVERITY DECREASED BELOW THE INITIAL POWER LEVEL, THE INDICATED REACTOR POWER WILL DECREASE FOR THE AFFECTED CHANNEL. IF THE AFFECTED CHANNEL DIFFERS BY ± 3% FROM THE HIGHEST CHANNEL POWER, ANNUNCIATOR 8-3E "NIS POWER RANGE CHANNEL DEVIATION" WILL ACTUATE. IF THE RATE OF CHANGE OF POWER FOR THE SELECTED CHANNEL IS > 5% IN 2 SECONDS, ANNUNCIATOR 8-4C "NIS POWER RANGE NEG FLUX RATE ALARM" ACTUATES.

NI09 POWER RANGE CHANNEL FAILURE (cont.)

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED POWER RANGE CHANNEL TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RD01 ROD DRIVE MG SET TRIP/FAILS TO START

TYPE: GENERIC, RB

A) ROD DRIVE MG SET 1A
B) ROD DRIVE MG SET 1B

CAUSE: FAULTY CX RELAY CAUSES CX CONTACTS TO OPEN

REF: ROD CONTROL SYSTEM DESCRIPTION
22E-1-4840 CR1 REV E
22E-1-4840 CR2 REV E
ANNUNCIATOR RESPONSE: 8-8D

PLT STA: ROD DRIVE MG SET IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED ROD DRIVE MG SET FEEDER BREAKER WILL TRIP. ANNUNCIATOR 8-8D "ROD CONTROL M-G SETS TRIPPED OR GROUNDED" WILL ACTUATE. IF THE OTHER ROD DRIVE MG SET IS ALSO TRIPPED, A REACTOR TRIP WILL RESULT. ANY ATTEMPT BY THE OPERATOR TO RESTART THE AFFECTED MG SET, WITH THE REMOTE FUNCTION, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY CX RELAY TO NORMAL.

[REV 1]

RD02 DROPPED ROD

TYPE: GENERIC, RB

D02) CONTROL ROD D-2
B12) CONTROL ROD B-12
M14) CONTROL ROD M-14
P04) CONTROL ROD P-4
B04) CONTROL ROD B-4
D14) CONTROL ROD D-14
P12) CONTROL ROD P-12
M02) CONTROL ROD M-2
G03) CONTROL ROD G-3
C09) CONTROL ROD C-9
J13) CONTROL ROD J-13
N07) CONTROL ROD N-7
C07) CONTROL ROD C-7
G13) CONTROL ROD G-13
N09) CONTROL ROD N-9
J03) CONTROL ROD J-3
E03) CONTROL ROD E-3
C11) CONTROL ROD C-11
L13) CONTROL ROD L-13
N05) CONTROL ROD N-5
C05) CONTROL ROD C-5
E13) CONTROL ROD E-13
N11) CONTROL ROD N-11
L03) CONTROL ROD L-3
H06) CONTROL ROD H-6
H10) CONTROL ROD H-10
F08) CONTROL ROD F-8
K08) CONTROL ROD K-8
F02) CONTROL ROD F-2
B10) CONTROL ROD B-10
K14) CONTROL ROD K-14
P06) CONTROL ROD P-6
B06) CONTROL ROD B-6
F14) CONTROL ROD F-14
P10) CONTROL ROD P-10
K02) CONTROL ROD K-2
H02) CONTROL ROD H-2
B08) CONTROL ROD B-8
H14) CONTROL ROD H-14
P08) CONTROL ROD P-8
F06) CONTROL ROD F-6
F10) CONTROL ROD F-10
K10) CONTROL ROD K-10
K06) CONTROL ROD K-6
D04) CONTROL ROD D-4
D12) CONTROL ROD D-12
M12) CONTROL ROD M-12
M04) CONTROL ROD M-4
H04) CONTROL ROD H-4
D08) CONTROL ROD D-8

RD02 DROPPED ROD (cont.)

H12) CONTROL ROD H-12
M08) CONTROL ROD M-8
H08) CONTROL ROD H-8

CAUSE: STATIONARY GRIPPER COIL FAILURE

REF: ROD CONTROL SYSTEM DESCRIPTION
NUCLEAR FUEL SYSTEM DESCRIPTION
AOP-2.1
ANNUNCIATOR RESPONSE: 8-6D, 8-6E

NOTE: MAXIMUM OF 4 RODS MAY BE DROPPED AT ANY ONE TIME

PLT STA: 1C26

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED CONTROL ROD STATIONARY GRIPPER COIL WILL FAIL. THIS CAUSES THE AFFECTED CONTROL ROD TO DROP RAPIDLY INTO THE CORE AND ANNUNCIATOR 8-6D "ROD BOTTOM ROD DROP" BEING ACTUATED WHEN THE ROD IS 20 STEPS FROM THE BOTTOM. THE AFFECTED CONTROL ROD RED ROD BOTTOM LAMP WILL BE ILLUMINATED.

NOTE: IF THE REACTIVITY OF THE DROPPED ROD IS SUFFICIENT, A NEGATIVE HIGH FLUX RATE REACTOR TRIP WILL OCCUR.

REACTOR POWER WILL DECREASE AS THE DROPPED CONTROL ROD ADDS NEGATIVE REACTIVITY TO THE CORE WHICH WILL DECREASE T_{ave}. THE CONTROL RODS WILL WITHDRAW IN AUTO TO RECOVER T_{ave} AND MATCH IT WITH T_{ref}. THE ROD STEP COUNTERS AND ROD SPEED DEMAND METER, 1SI-RD412 (1CB06) IN ADDITION TO THE ROD DIRECTION LAMPS, WILL INDICATE THE CONTROL ROD MOTION. THE RADIAL TILT CAUSED BY THE DROPPED CONTROL ROD CAUSES ANNUNCIATOR 8-6E "CMPTR ALARM NIS RAD TILT ROD DEV/SEQ" TO ACTUATE AT 2% RADIAL TILT. ANY ATTEMPT BY THE OPERATOR TO RELATCH AND WITHDRAW THE AFFECTED CONTROL ROD, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED CONTROL ROD STATIONARY GRIPPER COIL TO NORMAL.

[REV 3]

RD03 DROPPING ROD

TYPE: GENERIC, RB (ROD DROPS WHEN MOVABLE COIL ENERGIZED)

D02) CONTROL ROD D-2
B12) CONTROL ROD B-12
M14) CONTROL ROD M-14
P04) CONTROL ROD P-4
B04) CONTROL ROD B-4
D14) CONTROL ROD D-14
P12) CONTROL ROD P-12
M02) CONTROL ROD M-2
G03) CONTROL ROD G-3
C09) CONTROL ROD C-9
J13) CONTROL ROD J-13
N07) CONTROL ROD N-7
C07) CONTROL ROD C-7
G13) CONTROL ROD G-13
N09) CONTROL ROD N-9
J03) CONTROL ROD J-3
E03) CONTROL ROD E-3
C11) CONTROL ROD C-11
L13) CONTROL ROD L-13
N05) CONTROL ROD N-5
C05) CONTROL ROD C-5
E13) CONTROL ROD E-13
N11) CONTROL ROD N-11
L03) CONTROL ROD L-3
H06) CONTROL ROD H-6
H10) CONTROL ROD H-10
F08) CONTROL ROD F-8
K08) CONTROL ROD K-8
F02) CONTROL ROD F-2
B10) CONTROL ROD B-10
K14) CONTROL ROD K-14
P06) CONTROL ROD P-6
B06) CONTROL ROD B-6
F14) CONTROL ROD F-14
P10) CONTROL ROD P-10
K02) CONTROL ROD K-2
H02) CONTROL ROD H-2
B08) CONTROL ROD B-8
H14) CONTROL ROD H-14
P08) CONTROL ROD P-8
F06) CONTROL ROD F-6
F10) CONTROL ROD F-10
K10) CONTROL ROD K-10
K06) CONTROL ROD K-6
D04) CONTROL ROD D-4
D12) CONTROL ROD D-12
M12) CONTROL ROD M-12
M04) CONTROL ROD M-4
H04) CONTROL ROD H-4
D08) CONTROL ROD D-8

RD03 DROPPING ROD (cont.)

H12) CONTROL ROD H-12
M08) CONTROL ROD M-8
H08) CONTROL ROD H-8

CAUSE: MOVABLE GRIPPER COIL FAILURE

REF: ROD CONTROL SYSTEM DESCRIPTION
NUCLEAR FUEL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 8-6E, 8-6D

PLT STA:1C28

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED CONTROL ROD MOVABLE GRIPPER COIL WILL FAIL. WHEN THE ROD IS CALLED UPON TO MOVE IN EITHER DIRECTION, THE AFFECTED CONTROL ROD WILL DROP WHEN THE MOVABLE GRIPPER COIL IS ENERGIZED DURING THE NORMAL SEQUENCE OF ROD OPERATION. REACTOR POWER WILL DECREASE AS THE DROPPING CONTROL ROD ADDS NEGATIVE REACTIVITY TO THE CORE WHICH WILL DECREASE T_{ave}. THE CONTROL RODS RECEIVE A WITHDRAW SIGNAL, IN AUTO, TO RECOVER T_{ave} AND MATCH IT WITH T_{ref}. AS THE RODS STEP OUT OF THE CORE, WITH THE AFFECTED ROD IN THE CONTROLLING GROUP, THE AFFECTED ROD WILL CONTINUE TO SLIP DOWN INTO THE CORE. THE ROD STEP COUNTERS AND ROD SPEED DEMAND METER, 1SI-RD412 (1CB06) IN ADDITION TO THE ROD DIRECTION LAMPS, WILL INDICATE THE CONTROL ROD MOTION. THE RADIAL TILT CAUSED BY THE DROPPING CONTROL ROD CAUSES ANNUNCIATOR 8-6E "CMPTR ALARM NIS RAD TILT ROD DEV/SEQ" TO ACTUATE AT 2% RADIAL TILT. WHEN THE ROD IS 20 STEPS FROM THE BOTTOM, ANNUNCIATOR 8-6D "ROD BOTTOM ROD DROP" WILL BE ACTUATED. THE AFFECTED CONTROL ROD RED ROD BOTTOM LAMP WILL BE ILLUMINATED WHEN THE ROD REACHES THE BOTTOM.

ANY ATTEMPT BY THE OPERATOR TO RELATCH AND WITHDRAW THE AFFECTED CONTROL ROD, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED CONTROL ROD MOVABLE GRIPPER COIL TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RD06 ROD EJECTION

TYPE: GENERIC, NRB

D02) CONTROL ROD D-2
B12) CONTROL ROD B-12
M14) CONTROL ROD M-14
P04) CONTROL ROD P-4
B04) CONTROL ROD B-4
D14) CONTROL ROD D-14
P12) CONTROL ROD P-12
M02) CONTROL ROD M-2
G03) CONTROL ROD G-3
C09) CONTROL ROD C-9
J13) CONTROL ROD J-13
N07) CONTROL ROD N-7
C07) CONTROL ROD C-7
G13) CONTROL ROD G-13
N09) CONTROL ROD N-9
J03) CONTROL ROD J-3
E03) CONTROL ROD E-3
C11) CONTROL ROD C-11
L13) CONTROL ROD L-13
N05) CONTROL ROD N-5
C05) CONTROL ROD C-5
E13) CONTROL ROD E-13
N11) CONTROL ROD N-11
L03) CONTROL ROD L-3
H06) CONTROL ROD H-6
H10) CONTROL ROD H-10
F08) CONTROL ROD F-8
K08) CONTROL ROD K-8
F02) CONTROL ROD F-2
B10) CONTROL ROD B-10
K14) CONTROL ROD K-14
P06) CONTROL ROD P-6
B06) CONTROL ROD B-6
F14) CONTROL ROD F-14
P10) CONTROL ROD P-10
K02) CONTROL ROD K-2
H02) CONTROL ROD H-2
B08) CONTROL ROD B-8
H14) CONTROL ROD H-14
P08) CONTROL ROD P-8
F06) CONTROL ROD F-6
F10) CONTROL ROD F-10
K10) CONTROL ROD K-10
K06) CONTROL ROD K-6
D04) CONTROL ROD D-4
D12) CONTROL ROD D-12
M12) CONTROL ROD M-12
M04) CONTROL ROD M-4
H04) CONTROL ROD H-4
D08) CONTROL ROD D-8

RD06 ROD EJECTION (cont.)

H12) CONTROL ROD H-12
M08) CONTROL ROD M-8
H08) CONTROL ROD H-8

CAUSE: FAILURE OF ROD DRIVE ASSEMBLY HOUSING

REF: ROD CONTROL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 8-3C

NOTE: ONLY ONE EJECTED ROD MAY BE ACTIVATED AT ANY ONE TIME

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED ROD DRIVE ASSEMBLY HOUSING FAILS. THE AFFECTED CONTROL ROD WILL BE EJECTED FROM THE CORE BY REACTOR COOLANT SYSTEM PRESSURE. IF THE REACTIVITY ADDED BY THE EJECTION OF THE SELECTED CONTROL ROD IS SUFFICIENT, ANNUNCIATOR 8-3C "NIS POWER RANGE POS FLUX RATE ALARM" IS ACTUATED AT 5% POWER INCREASE IN 2 SECONDS. A TWO INCH REACTOR COOLANT SYSTEM LOSS OF COOLANT ACCIDENT INSIDE CONTAINMENT, CAUSED BY THE RUPTURE IN THE DRIVE ASSEMBLY HOUSING, WILL RESULT.

THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 2]

RD07 STUCK ROD

TYPE: GENERIC, RV 0 - 231 STEPS

D02) CONTROL ROD D-2
B12) CONTROL ROD B-12
M14) CONTROL ROD M-14
P04) CONTROL ROD P-4
B04) CONTROL ROD B-4
D14) CONTROL ROD D-14
P12) CONTROL ROD P-12
M02) CONTROL ROD M-2
G03) CONTROL ROD G-3
C09) CONTROL ROD C-9
J13) CONTROL ROD J-13
N07) CONTROL ROD N-7
C07) CONTROL ROD C-7
G13) CONTROL ROD G-13
N09) CONTROL ROD N-9
J03) CONTROL ROD J-3
E03) CONTROL ROD E-3
C11) CONTROL ROD C-11
L13) CONTROL ROD L-13
N05) CONTROL ROD N-5
C05) CONTROL ROD C-5
E13) CONTROL ROD E-13
N11) CONTROL ROD N-11
L03) CONTROL ROD L-3
H06) CONTROL ROD H-6
H10) CONTROL ROD H-10
F08) CONTROL ROD F-8
K08) CONTROL ROD K-8
F02) CONTROL ROD F-2
B10) CONTROL ROD B-10
K14) CONTROL ROD K-14
P06) CONTROL ROD P-6
B06) CONTROL ROD B-6
F14) CONTROL ROD F-14
P10) CONTROL ROD P-10
K02) CONTROL ROD K-2
H02) CONTROL ROD H-2
B08) CONTROL ROD B-8
H14) CONTROL ROD H-14
P08) CONTROL ROD P-8
F06) CONTROL ROD F-6
F10) CONTROL ROD F-10
K10) CONTROL ROD K-10
K06) CONTROL ROD K-6
D04) CONTROL ROD D-4
D12) CONTROL ROD D-12
M12) CONTROL ROD M-12
M04) CONTROL ROD M-4
H04) CONTROL ROD H-4
D08) CONTROL ROD D-8

ZION MALFUNCTION

CAUSE AND EFFECTS

RD07 STUCK ROD

H12) CONTROL ROD H-12
M08) CONTROL ROD M-8
H08) CONTROL ROD H-8

CAUSE: MECHANICAL BINDING OF CONTROL ROD

REF: ROD CONTROL SYSTEM DESCRIPTION
AOP-2.1
ANNUNCIATOR RESPONSE: 8-6E

NOTE: MAXIMUM OF 4 STUCK RODS MAY BE ACTIVATED AT ANY ONE TIME

PLT STA: REACTOR AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE AFFECTED CONTROL ROD BECOMES STUCK AT THE SELECTED SEVERITY. THE CONTROL ROD WILL OPERATE PROPERLY UNTIL IT REACHES THE SELECTED POSITION, AT WHICH TIME IT WILL NOT MOVE. WHEN THE SELECTED CONTROL ROD DEVIATES FROM ITS BANK AVERAGE BY > 12 STEPS, ANNUNCIATOR 8-6E "CMPTR ALARM NIS RAD TILT ROD DEV/SEQ" WILL ACTUATE. ANY ATTEMPT BY THE OPERATOR TO MOVE THE AFFECTED CONTROL ROD IN MANUAL, WHILE THE MALFUNCTION IS ACTIVE, IS INEFFECTIVE.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED CONTROL ROD TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RD08 RODS FAIL TO MOVE

TYPE: DISCRETE, RB

CAUSE: MASTER CYCLER OUTPUT FAILURE

REF: ROD CONTROL SYSTEM DESCRIPTION
AOP-2.1

PLT STA: REACTOR AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE CONTROL RODS WILL NOT MOVE. THE CONTROL RODS WILL NOT RESPOND TO ANY AUTOMATIC SIGNAL, EITHER TO WITHDRAW OR INSERT CONTROL RODS. IF THE OPERATOR ATTEMPTS TO MANUALLY MOVE CONTROL RODS, WHILE THE MALFUNCTION IS ACTIVE, THE RODS WILL NOT MOVE IN THE MANUAL MODE.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED MASTER CYCLER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RD09 UNCONTROLLED ROD INSERTION

TYPE: DISCRETE, RB (MOVEMENT @ 72 STEPS/MINUTE)

CAUSE: MASTER CYCLER OUTPUT FAILURE

REF: ROD CONTROL SYSTEM DESCRIPTION
AOP-2.1
ANNUNCIATOR RESPONSE: 5-3C, 9-8B, 9-8C

PLT STA: REACTOR AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE CONTROLLING ROD GROUP WILL BEGIN DRIVING INTO THE CORE AT 72 STEPS PER MINUTE. THE ROD STEP COUNTERS AND ROD SPEED DEMAND METER, 1SI-RD412 (1CB06) IN ADDITION TO THE ROD DIRECTION LAMPS, WILL INDICATE THE CONTROL ROD MOTION. REACTOR POWER, REACTOR COOLANT SYSTEM TEMPERATURE AND PRESSURE WILL DECREASE IN RESPONSE TO THE NEGATIVE REACTIVITY ADDITION. ANNUNCIATOR 5-3C "REACTOR COOLANT LOOP T_{avg} DEVIATION" IS ACTUATED AT 3 °F DEVIATION FROM T_{ref}. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" ACTUATES AT < 2210 PSIG AND ANNUNCIATOR 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" WILL ACTUATE AT 5% DEVIATION FROM THE PROGRAM LEVEL. IF THE OPERATOR ATTEMPTS TO MANUALLY MOVE CONTROL RODS, WHILE THE MALFUNCTION IS ACTIVE, THE RODS WILL NOT RESPOND IN THE MANUAL MODE, AND WILL CONTINUE DRIVING INTO THE CORE.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED MASTER CYCLE OUTPUT TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RD10 UNCONTROLLED ROD WITHDRAWAL

TYPE: DISCRETE,RB

CAUSE: MASTER CYCLER OUTPUT FAILURE

REF: ROD CONTROL SYSTEM DESCRIPTION
AOP-2.1
ANNUNCIATOR RESPONSE: 5-3C, 9-8C

INIT STA: REACTOR AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE CONTROLLING ROD GROUP WILL BEGIN WITHDRAWING FROM THE CORE AT 72 STEPS PER MINUTE. THE ROD STEP COUNTERS AND ROD SPEED DEMAND METER, 1SI-RD412 (1CB06) IN ADDITION TO THE ROD DIRECTION LAMPS, WILL INDICATE THE CONTROL ROD MOTION. REACTOR POWER, REACTOR COOLANT SYSTEM TEMPERATURE AND PRESSURE WILL INCREASE IN RESPONSE TO THE POSITIVE REACTIVITY ADDITION. ANNUNCIATOR 5-3C "REACTOR COOLANT LOOP T_{avg} DEVIATION" IS ACTUATED AT 3 °F DEVIATION FROM T_{ref}. ANNUNCIATOR 9-3C "PRESSURIZER CONTROL LEVEL HIGH LOW" WILL ACTUATE AT 5% DEVIATION FROM THE PROGRAM LEVEL. IF THE OPERATOR ATTEMPTS TO MANUALLY MOVE CONTROL RODS, WHILE THE MALFUNCTION IS ACTIVE, THE RODS WILL NOT RESPOND TO THE MANUAL MODE DEMANDS, AND WILL CONTINUE TO WITHDRAW FROM THE CORE.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED MASTER CYCLE OUTPUT TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

RD12 AUTO ROD SPEED CONTROLLER FAILURE

TYPE: DISCRETE, RV 1% = 8, 100% = 72 STEPS PER MINUTE

CAUSE: FAILURE OF ROD SPEED CONTROLLER OUTPUT

REF: ROD CONTROL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 9-8B

PLT STA: REACTOR AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, UNLESS AN AUTOMATIC ROD DEMAND SIGNAL IS ALREADY PRESENT, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT OTHER THAN THE ROD DEMAND GOING TO THE DEMAND CORRESPONDING TO THE SELECTED SEVERITY. WHEN AN AUTOMATIC ROD DEMAND SIGNAL IS RECEIVED, ALL ROD MOTION WILL OCCUR AT THE SPEED DETERMINED BY THE SELECTED SEVERITY. THE ROD STEP COUNTERS AND ROD SPEED DEMAND METER, 1SI-RD412 (1CB06) IN ADDITION TO THE ROD DIRECTION LAMPS, WILL INDICATE THE CONTROL ROD MOTION. REACTOR POWER, REACTOR COOLANT SYSTEM TEMPERATURE AND PRESSURE WILL VARY IN RESPONSE TO THE REACTIVITY CHANGE AND THE ASSOCIATED EXCESSIVE OR INSUFFICIENT ROD MOTION.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY PLACING THE ROD CONTROL MODE SELECTOR SWITCH IN MANUAL AND CONTROLLING THE RODS MANUALLY.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED ROD SPEED CONTROLLER TO NORMAL.

[REV 3]

RD13 ROD GROUP MISALIGNMENT

TYPE: GENERIC, RB

A) SHUTDOWN GROUP A-I
B) SHUTDOWN GROUP A-II
C) SHUTDOWN GROUP B-I
D) SHUTDOWN GROUP B-II
E) CONTROL GROUP A-I
F) CONTROL GROUP A-II
G) CONTROL GROUP B-I
H) CONTROL GROUP B-II
I) CONTROL GROUP C-I
J) CONTROL GROUP C-II
K) CONTROL GROUP D-I
L) CONTROL GROUP D-II

CAUSE: FAILURE OF MASTER CYCLER COUNTER OUTPUT (0 - I, 3 - II)

REF: ROD CONTROL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 8-6E

PLT STA: AFFECTED ROD BANK SELECTED FOR OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, UNLESS THE AFFECTED ROD BANK IS PRESENTLY IN MOTION, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN THE SELECTED ROD BANK RECEIVES A SIGNAL TO MOVE, THE AFFECTED GROUP, (I/II), WILL NOT RECEIVE THE PULSE SIGNAL TO MOVE. AS THE MOTION SIGNAL REMAINS APPLIED TO THAT ROD BANK, THE DEVIATION BETWEEN THE MOVING ROD GROUP AND THE STATIONARY ROD GROUP WILL BECOME LARGER. THE ROD STEP COUNTERS AND ROD SPEED DEMAND METER, 1SI-RD412 (1CB06) IN ADDITION TO THE ROD DIRECTION LAMPS, WILL INDICATE THE CONTROL ROD MOTION. ANNUNCIATOR 8-6E "CMPTR ALARM NIS RAD TILT ROD DEV/SEQ" WILL BE ACTUATED AT > 12 STEPS DEVIATION. ANY ATTEMPT BY THE OPERATOR TO MOVE THE AFFECTED ROD GROUP, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED FIRST PULSE CONTROL CIRCUIT TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RD15 FAILURE ON LOGIC CABINET

TYPE: DISCRETE, RB

CAUSE: INADVERTENT LOGIC CABINET CARD REMOVAL

REF: ROD CONTROL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 8-7A

PLT STA: ROD CONTROL SYSTEM IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE LOGIC CABINET WILL EXPERIENCE A FAILURE WITH ALL ROD MOTION STOPPING. ANNUNCIATOR 8-7A "ROD CONTROL SYSTEM URGENT FAILURE" IS ACTUATED. WHEN THE CONTROL ROD SYSTEM RECEIVES A SIGNAL TO MOVE, THE LOSS OF THE LOGIC CABINET WILL PREVENT ROD MOTION. ANY ATTEMPT BY THE OPERATOR TO RESET THE ANNUNCIATOR OR OPERATE THE ROD CONTROL SYSTEM IN MANUAL, BANK SELECT OR AUTOMATIC, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL.

MALFUNCTION REMOVAL WILL RESTORE THE LOGIC CABINET TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RD16 URGENT FAILURE IN LOGIC SECTION OF S/D BANKS C & D

TYPE: DISCRETE, RB

CAUSE: SCD SLAVE CYCLER FAILURE

REF: ROD CONTROL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 8-7A
LER 22-2-88-087

PLT STA: SHUTDOWN BANK C OR D IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SCD SLAVE CYCLER WILL FAIL WITH ALL ROD MOTION OF SHUTDOWN BANKS C AND D STOPPING. ANNUNCIATOR 8-7A "ROD CONTROL SYSTEM URGENT FAILURE" WILL ACTUATE. THIS MALFUNCTION ONLY AFFECTS THE OPERATION OF C AND D SHUTDOWN BANK. OPERATION OF SHUTDOWN BANKS A & B AND CONTROL BANKS A THROUGH D ARE UNAFFECTED. ANY ATTEMPT BY THE OPERATOR TO RESET THE ANNUNCIATOR OR MOVE SHUTDOWN BANK C OR D, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED SCD SLAVE CYCLER TO NORMAL.

[REV 2]

RD17 POWER CABINET URGENT FAILURE

TYPE: GENERIC, RB

A) POWER CABINET 1AC
B) POWER CABINET 2AC
C) POWER CABINET 1BD
D) POWER CABINET 2BD
E) POWER CABINET SCD

CAUSE: INADVERTENT CARD REMOVAL

REF: ROD CONTROL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 8-7A

PLT STA: AFFECTED CONTROL ROD BANK IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED POWER CABINET WILL FAIL WITH ALL ROD MOTION BEING STOPPED. ANNUNCIATOR 8-7A "ROD CONTROL SYSTEM URGENT FAILURE" IS ACTUATED. THE LOSS OF THE POWER CABINET WILL PREVENT ROD MOTION BY ALL CONTROL RODS IN THE AUTOMATIC OR MANUAL MODE OF OPERATION. IF THE OPERATOR ATTEMPTS TO MOVE A BANK OF RODS MANUALLY, IN THE ROD BANK SELECTED MODE, WHILE THE MALFUNCTION IS ACTIVE, THE RODS IN THE AFFECTED POWER CABINET WILL NOT MOVE, HOWEVER, RODS IN THE NON-AFFECTED POWER CABINET WILL MOVE. ANY ATTEMPT BY THE OPERATOR TO RESET THE ANNUNCIATOR WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL.

NOTE : FOR GENERIC E, USE SELECTED GROUP (SDC/SDD) WHICH STOPS RODS AND BRINGS IN THE URGENT FAILURE ALARM.

MALFUNCTION REMOVAL WILL RESTORE THE POWER CABINET TO NORMAL.

[REV 4]

ZION MALFUNCTION

CAUSE AND EFFECTS

RH01 RHR PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) RHR PUMP 1A
B) RHR PUMP 1B

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-62 REV AG
22E-1-4840 RH1 REV [illegible]
22E-1-4840 RH2 REV T
ANNUNCIATOR RESPONSE: 4-3C

PLT STA: AFFECTED RHR PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED RESIDUAL HEAT REMOVAL PUMP BREAKER WILL TRIP. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 4-3C "RESIDUAL HEAT REMOVAL PUMPS 1A, 1B TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. RESIDUAL HEAT REMOVAL PUMP DISCHARGE PRESSURE, AS INDICATED ON 1PI- 614/615 (1CB08), DECREASES. THE LOSS OF RHR COOLING TO THE REACTOR COOLANT SYSTEM WILL RESULT IN INCREASING RCS TEMPERATURES.

THE OPERATOR MAY RESET THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RH02 RHR PUMP CAVITATION

TYPE: GENERIC, RB

A) RHR PUMP 1A (VALVE 1MOV-RH8700A)
B) RHR PUMP 1B (VALVE 1MOV-RH8700B)

CAUSE: SUCTION VALVE DISK FALLS OFF BLOCKING LINE

REF: M-62 REV AG
ANNUNCIATOR RESPONSE: 4-1B, 4-3C

PLT STA: AFFECTED RESIDUAL HEAT REMOVAL PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED RHR PUMP SUCTION VALVE DISK FALLS OFF WHICH TOTALLY BLOCKS THE ASSOCIATED SUCTION LINE. THE ASSOCIATED FLOW TO THE REACTOR COOLANT LOOP(S), 1FI-971A & B/970A & B (1CB08), DECREASES TO ZERO, IF THE OTHER RHR PUMP IS NOT RUNNING. THE LOSS OF FLOW THROUGH THE AFFECTED RHR PUMP WILL CAUSE FLASHING IN THE SUCTION OF THE PUMP. ANNUNCIATOR 4-1B "RHR PUMPS SUCTION PRESSURE LO" WILL BE ACTUATED IF THE PRESSURE DECREASES TO 11.5 PSIG. THE LOSS OF RHR COOLING TO THE REACTOR COOLANT SYSTEM WILL RESULT IN INCREASING RCS TEMPERATURES.

THE AFFECTED RHR PUMP AMPS WILL BEGIN TO OSCILLATE SPORADICALLY AS THE PUMP CAVITATES. IF THE OPERATOR TAKES NO ACTION, AFTER CAVITATING FOR ONE MINUTE, THE AFFECTED PUMP WILL TRIP WITH ANNUNCIATOR 4-3C "RESIDUAL HEAT REMOVAL PUMPS 1A, 1B TRIP" BEING ACTUATED.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED RHR SUCTION VALVE TO NORMAL AND ALLOW REOPENING OF THAT VALVE.

[REV 2]

RH03 RHR HEAT EXCHANGER FLOW CONTROL VALVE FAILURE

TYPE: GENERIC, RV 100% = VALVE FULLY OPEN

A) RHR HX 1A FLOW CONTROL VALVE, 1RHHCV606
B) RHR HX 1B FLOW CONTROL VALVE, 1RHHCV607

CAUSE: I/P CONVERTER FAILURE

REF: M-62 REV AG

PLT STA: AFFECTED RESIDUAL HEAT EXCHANGER IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED RHR HEAT EXCHANGER FLOW CONTROL VALVE WILL FAIL. THE FAILED VALVE POSITION WILL BE DETERMINED BY THE SELECTED SEVERITY. IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALVE POSITION, THE AFFECTED FLOW CONTROL VALVE WILL CLOSE, DECREASING RHR SYSTEM FLOW TO THE REACTOR COOLANT SYSTEM. THE DECREASED FLOW WILL BE INDICATED ON 1FI-971A & B/970A & B (1CB08) AND BY THE INCREASING RCS TEMPERATURES.

IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALVE POSITION, THE AFFECTED FLOW CONTROL VALVE WILL OPEN, INCREASING RHR SYSTEM FLOW TO THE REACTOR COOLANT SYSTEM. THE INCREASED FLOW WILL BE INDICATED ON 1FI-971A & B/970A & B (1CB08) AND BY THE DECREASING RCS TEMPERATURES. THE DECREASE IN REACTOR COOLANT SYSTEM TEMPERATURES WILL RESULT IN DECREASING PRESSURIZER LEVEL AND PRESSURE.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED RHR HEAT EXCHANGER FLOW CONTROL VALVE TO NORMAL.

[REV 2]

RH07 RHR PUMPS SUCTION RELIEF VALVE FAILURE

TYPE: DISCRETE, RV 100% = VALVE FULLY OPEN

CAUSE: MECHANICAL FAILURE OF 1RH8708

REF: M-62 REV AG
ANNUNCIATOR RESPONSE: 9-1B

PLT STA:RESIDUAL HEAT REMOVAL SYSTEM IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE RHR SYSTEM TO THE PRESSURIZER RELIEF TANK WILL RESULT. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. THE MASS ACCUMULATING IN THE PRESSURIZER RELIEF TANK WILL CAUSE ANNUNCIATOR 9-1B "PRESSURIZER RELIEF TANK TEMP HIGH PRESS HIGH LEVEL HIGH LOW" TO ACTUATE AT EITHER 10 PSIG OR 91%. THE LOSS OF SUCTION LINE MASS WILL CAUSE A DECREASE IN PUMP(S) DISCHARGE PRESSURE AND FLOW, AS INDICATED ON 1FI-RH971A & B/970A & B AND 1PI-RH614/615 (1CB08). THE DECREASED MASS RETURNING TO THE REACTOR COOLANT SYSTEM WILL CAUSE A DECREASE IN PRESSURIZER LEVEL. PRESSURIZER PRESSURE WILL INCREASE DUE TO THE REACTOR COOLANT SYSTEM HEATUP AND THE PRESSURIZER HEATERS. THE DECREASE IN COOLED WATER FLOW RETURNING TO THE REACTOR COOLANT SYSTEM, WILL RESULT IN AN INCREASE IN RCS TEMPERATURES.

THE OPERATOR MAY LIMIT THE LEAK CONSEQUENCES OF THIS MALFUNCTION BY SECURING THE RHR SYSTEM AND MANUALLY ISOLATING THE RHR SUCTION LINE.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE FAILED RHR SUCTION RELIEF VALVE TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

RH08 RCS TO RHR SYSTEM LEAKAGE

TYPE: DISCRETE, RV 100% = 5000 GPM @ NOP

CAUSE: WORN SEATS ON VALVES 1MOV-RH8701 & RH8702

REF: M-62 REV AG
RESIDUAL HEAT REMOVAL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 9-8C, 9-8B, 9-1B
DVR 22-2-88-021

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE REACTOR COOLANT SYSTEM TO THE RHR SYSTEM WILL RESULT. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. THE LOSS OF MASS FROM THE REACTOR COOLANT SYSTEM WILL CAUSE A DECREASE IN PRESSURIZER LEVEL AND PRESSURE. ANNUNCIATOR 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" ACTUATES AT 5% DEVIATION FROM PROGRAM LEVEL. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW IS ACTUATED AT 2210 PSIG. AS THE SELECTED SEVERITY INCREASES, THE RHR SUCTION LINE PRESSURE WILL INCREASE AND AT 450 PSIG, RELIEF VALVE 1RH8708 WILL LIFT TO THE PRT. THE MASS ACCUMULATING IN THE PRESSURIZER RELIEF TANK WILL CAUSE ANNUNCIATOR 9-1B "PRESSURIZER RELIEF TANK TEMP HIGH PRESS HIGH LEVEL HIGH LOW" TO ACTUATE AT EITHER 10 PSIG OR 91%.

IF THE SELECTED SEVERITY IS GREATER THAN THE CAPACITY OF THE RHR SYSTEM RELIEF VALVES, THE RHR SYSTEM PRESSURE WILL INCREASE TO THE DESIGN PRESSURE AND THE IN-LEAKAGE WILL BE LIMITED TO THE RELIEF VALVE CAPACITY.

MALFUNCTION REMOVAL WILL RESTORE VALVES 1MOV-RH8701 & RH8702 TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RH12 RHR DISCHARGE HEADER BREAK

TYPE: GENERIC, RV 100% = 5000 GPM @ NOP

A) RHR DISCHARGE HEADER TRAIN A
B) RHR DISCHARGE HEADER TRAIN B

CAUSE: PIPING FAILURE IMMEDIATELY UPSTREAM OF 1MOV-SI8809A/B

REF: M-62 REV AG

PLT STA: SELECTED RHR DISCHARGE TRAIN IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A LOSS OF MASS FROM THE RESIDUAL HEAT REMOVAL SYSTEM TO THE AUXILIARY BUILDING WILL RESULT. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. ACTIVITY LEVELS IN THE AUXILIARY BUILDING IN THE LOCAL AREA AND IN THE VENTILATION SYSTEM FLOW PATH WILL INCREASE. THE LOSS OF MASS RETURNING TO THE REACTOR COOLANT SYSTEM WILL CAUSE A DECREASE IN PRESSURIZER LEVEL AND PRESSURE. THE DECREASE IN COOLED WATER FLOW RETURNING TO THE REACTOR COOLANT SYSTEM BY THE AFFECTED RHR TRAIN, AS INDICATED ON 1FI-RH971A & B/970A & B (1CB08), WILL RESULT IN AN INCREASE IN RCS TEMPERATURES. THE LOSS OF SYSTEM INTEGRITY WILL BE INDICATED BY THE DECREASED DISCHARGE PRESSURE ON 1PI-RH614/615 (1CB08).

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY ISOLATING THE AFFECTED RHR DISCHARGE HEADER AND PLACING THE UNAFFECTED TRAIN IN OPERATION.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE AFFECTED RHR DISCHARGE HEADER LINE PIPING INTEGRITY.

[REV 0]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP01 REACTOR FAILS TO TRIP

TYPE: DISCRETE, RB

CAUSE: IMPROPER LUBRICATION CAUSES THE REACTOR TRIP BREAKERS OR THE REACTOR TRIP BYPASS BREAKERS TO STICK CLOSED

REF: REACTOR PROTECTION SYSTEM DESCRIPTION
22E-4884 REV K

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN THE REACTOR RECEIVES A TRIP SIGNAL, THE REACTOR DOES NOT TRIP AS REQUIRED. THE INITIATING REACTOR TRIP SIGNAL WILL BE INDICATED BY THE FIRST OUT ANNUNCIATOR. ANY ATTEMPT BY THE OPERATOR TO MANUALLY TRIP THE REACTOR, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY STOPPING THE ROD DRIVE MG SETS.

MALFUNCTION REMOVAL WILL RESTORE THE REACTOR TRIP CIRCUIT TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP02 REACTOR FAILS TO AUTO TRIP

TYPE: DISCRETE, RB

CAUSE: OPEN CIRCUIT JUST AFTER THE TRIP COIL CONTACTS & JUMPER INSTALLED AROUND UNDERVOLTAGE CONTACTS FOR THE REACTOR TRIP BREAKERS AND THE REACTOR TRIP BYPASS BREAKERS

REF: REACTOR PROTECTION SYSTEM DESCRIPTION
22E-4884 REV K

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN THE REACTOR RECEIVES AN AUTOMATIC TRIP SIGNAL, THE REACTOR DOES NOT TRIP AS REQUIRED. THE INITIATING REACTOR TRIP SIGNAL WILL BE INDICATED BY THE FIRST OUT ANNUNCIATOR. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY TRIPPING THE REACTOR.

MALFUNCTION REMOVAL WILL RESTORE THE REACTOR TRIP CIRCUIT TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP04 FAILURE OF FEEDWATER ISOLATION TO ACTUATE

TYPE: GENERIC, RB

A) STEAM GENERATOR 1A
B) STEAM GENERATOR 1B
C) STEAM GENERATOR 1C
D) STEAM GENERATOR 1D

CAUSE: THE FEEDWATER ISOLATION RELAYS, F5A & F5B, "1-7" ("4-8", "3-4" & "7-8") CONTACTS FAIL CLOSED

REF: 22E-4921 REV N
5653D30 SHT 13 & 14

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN A FEEDWATER ISOLATION SIGNAL IS GENERATED, THE ANNUNCIATOR(S) ASSOCIATED WITH THE INITIATING EVENT FUNCTION PROPERLY, THE FEEDWATER REG VALVES ON THE NON-SELECTED STEAM GENERATORS CLOSE, BUT THE FEEDWATER REG VALVE ON THE SELECTED STEAM GENERATOR DOES NOT CLOSE. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY PERFORMING THE ACTIONS WHICH NORMALLY OCCUR AUTOMATICALLY.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED FEEDWATER ISOLATION CIRCUIT TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP05 INADVERTENT P-14 FEEDWATER ISOLATION

TYPE: GENERIC, RB

A) STEAM GENERATOR 1A
B) STEAM GENERATOR 1B
C) STEAM GENERATOR 1C
D) STEAM GENERATOR 1D

CAUSE: SHORT ACROSS THE SAFETY INJECTION SIX7-A CONTACTS, CAUSES FEEDWATER ISOLATION RELAY F1A (F2A, F3A, F4A) TO ENERGIZE

REF: 22E-4921 REV N
5653D30 SHT 13 & 14

PLT STA: IC28

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A FALSE FEEDWATER ISOLATION SIGNAL FOR THE SELECTED STEAM GENERATOR WILL BE RECEIVED. THE FEEDWATER ISOLATION SIGNAL WILL CAUSE THE FOLLOWING ACTIONS TO OCCUR: THE ASSOCIA D MFRV AND ITS BYPASS VALVE WILL RECEIVE CLOSE SIGNALS; THE MAIN TURBINE WILL TRIP AND ALL MAIN FEED PUMPS WILL TRIP IF REACTOR POWER/TURBINE POWER IS GREATER THAN 10%, THE TURBINE TRIP WILL CAUSE A REACTOR TRIP TO RESULT.

MALFUNCTION REMOVAL WILL RESTORE THE AFFECTED FEEDWATER ISOLATION CIRCUIT TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP06 INADVERTENT SAFETY INJECTION ACTUATION

TYPE: GENERIC, RB

A) TRAIN A
B) TRAIN B

CAUSE: SHORT ACROSS THE CONTAINMENT HIGH PRESSURE CPH1R (CPH2R) CONTACTS, CAUSES SAFETY INJECTION RELAYS SI1-A & SI2A (SI1-B & SI2-B) TO ACTUATE

REF: ENGINEERED SAFETY FEATURES ACTUATION SYSTEM DESCRIPTION
22E-4919 & 22E-4920
5653D30 SHT 8 REV 7
LER 22-2-88-012

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, A FALSE SAFETY INJECTION ACTUATION SIGNAL IS RECEIVED. THE FOLLOWING SAFEGUARDS SIGNALS WILL AUTOMATICALLY BE GENERATED: THE REACTOR RECEIVES A TRIP SIGNAL; A FEEDWATER ISOLATION SIGNAL IS GENERATED; THE AUXILIARY FEEDWATER PUMPS RECEIVE A START SIGNAL; THE EMERGENCY DIESEL GENERATORS RECEIVE A START SIGNAL; THE STANDBY SERVICE WATER PUMPS RECEIVE A START SIGNAL; THE REACTOR CONTAINMENT FAN COOLERS RECEIVE A SIGNAL TO SHIFT TO SLOW SPEED; A CONTAINMENT PHASE A ISOLATION SIGNAL IS GENERATED AND A CONTAINMENT VENTILATION ISOLATION SIGNAL IS GENERATED. THE CONTAINMENT PHASE A ISOLATION AND CONTAINMENT VENTILATION ISOLATIONS ARE TRAIN DEPENDENT. HOWEVER, EITHER TRAIN OF CONTAINMENT PHASE ISOLATION WILL CAUSE A LOSS OF INSTRUMENT AIR TO CONTAINMENT CAUSING AIR OPERATED VALVES INSIDE CONTAINMENT TO GO TO THEIR FAIL POSITIONS.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY STOPPING THE OPERATING SAFEGUARDS EQUIPMENT WHICH IS UNNECESSARILY ADDING WATER TO THE PRIMARY.

MALFUNCTION REMOVAL WILL RESTORE THE SAFETY INJECTION CIRCUIT TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP07 FAILURE OF SAFETY INJECTION TO ACTUATE

TYPE: GENERIC, RB

A) TRAIN A
B) TRAIN B

CAUSE: SAFETY INJECTION RELAYS, SI1-A & SI2-A (SI1-B & SI2-B) FAIL TO ACTUATE

REF: ENGINEERED SAFETY FEATURES ACTUATION SYSTEM DESCRIPTION
22E-4919 & 22E-4920
5653D30 SHT 8 REV 7

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN A CONDITION WHICH WOULD NORMALLY CAUSE A SAFETY INJECTION SIGNAL TO BE GENERATED EXISTS, THE TRAIN DEPENDENT AUTOMATIC ACTIONS WHICH NORMALLY OCCUR DO NOT HAPPEN ON THE AFFECTED TRAIN. MANUAL SAFETY INJECTION ACTUATION WILL ALSO BE INEFFECTIVE IN STARTING THE AFFECTED TRAIN EQUIPMENT. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY PERFORMING THE ACTIONS WHICH WOULD OCCUR UPON THE RECEIPT OF A SAFETY INJECTION SIGNAL.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED SI1 RELAY OPERATE COIL TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP08 FAILURE OF SAF .. INJECTION TO AUTO INITIATE

TYPE: GENERIC, RB

A) TRAIN A
B) TRAIN B

CAUSE: RESET RELAY SIR-A (SIR-B) "2-6" CONTACTS FAIL OPEN PREVENTING THE SAFETY INJECTION RELAYS FROM ACTUATING

REF: ENGINEERED SAFETY FEATURES ACTUATION SYSTEM DESCRIPTION
22E-4913 THRU 4925
5653D30 SHT 8 REV 7

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN A SAFETY INJECTION SIGNAL IS GENERATED, THE TRAIN DEPENDENT AUTOMATIC ACTIONS WHICH NORMALLY OCCUR DO NOT HAPPEN ON THE AFFECTED TRAIN. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY INITIATING SAFETY INJECTION.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED SIR RELAY TO NORMAL.

[REV 1]

RP09 FAILURE OF PHASE A TO ACTUATE

TYPE: GENERIC, RB

A) TRAIN A
B) TRAIN B

CAUSE: PHASE A ACTUATION RELAY CIA1/TR1 (CIA2/TR2) FAILS TO ACTUATE

REF: ENGINEERED SAFETY FEATURES ACTUATION SYSTEM DESCRIPTION
22E-4840-RP38 REV P
22E-4840-RP44 REV P
5653D30 SHT 8 REV 7

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN A CONDITION WHICH WOULD NORMALLY CAUSE A PHASE A CONTAINMENT ISOLATION SIGNAL TO BE GENERATED EXISTS, THE VALVES ASSOCIATED WITH THE AFFECTED TRAIN WILL NOT CLOSE AS REQUIRED. ANY ATTEMPT BY THE OPERATOR TO MANUALLY ACTUATE PHASE A CONTAINMENT ISOLATION, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY CLOSING THE VALVES ASSOCIATED WITH THE AFFECTED TRAIN.

MALFUNCTION REMOVAL WILL RESTORE THE PHASE A CONTAINMENT ISOLATION CIRCUIT TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP10 FAILURE OF PHASE B TO ACTUATE

TYPE: GENERIC, RB

A) TRAIN A
B) TRAIN B

CAUSE: PHASE B ACTUATION RELAY CIB1/TR1 (CIB2/TR2) FAILS TO ACTUATE

REF: 22E-1-4840RP40 REV-L
22E-1-484C`P46 REV-L
ENGINEERED SAFETY FEATURES ACTUATION SYSTEM DESCRIPTION
5653D30 SHT 8 REV 7

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN A CONDITION WHICH WOULD NORMALLY CAUSE A PHASE B CONTAINMENT ISOLATION SIGNAL TO BE GENERATED EXISTS, THE VALVES ASSOCIATED WITH THE AFFECTED TRAIN DO NOT AUTOMATICALLY CLOSE. ANY ATTEMPT BY THE OPERATOR TO MANUALLY ACTUATE PHASE B CONTAINMENT ISOLATION, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY CLOSING THE PHASE B ISOLATION VALVES ON THE AFFECTED TRAIN.

MALFUNCTION REMOVAL WILL RESTORE THE PHASE B CONTAINMENT ISOLATION CIRCUIT TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP11 REACTOR TRIP PERMISSIVE P-4 FAILS AS IS

TYPE: GENERIC, RB

A) TRAIN A
B) TRAIN B

CAUSE: REACTOR TRIP BREAKER & BYPASS BREAKER P-4 "52" CONTACTS FAIL IN THEIR PRESENT POSITION

REF: REACTOR PROTECTION SYSTEM DESCRIPTION
5653D30 SHT 2 REV 3
22E-4884 THRU 4907

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE P-4 PERMISSIVE FAILS AS IS. IF INSERTED WITH THE BREAKERS CLOSED, WHEN THE CONDITIONS FOR SATISFYING THE P-4 PERMISSIVE ARE MET (A REACTOR TRIP BREAKER AND ITS BYPASS BREAKER BOTH OPEN), THE P-4 PERMISSIVE FAILS TO PERFORM ITS NORMAL FUNCTIONS.

IF THE MALFUNCTION IS INSERTED WITH THE P-4 LOGIC SATISFIED, (A REACTOR TRIP BREAKER AND ITS BYPASS BREAKER BOTH OPEN), THE CLOSURE OF EITHER BREAKER WILL NOT CLEAR THE P-4 PERMISSIVE. THE P-4 SIGNAL WILL PREVENT THE STARTUP OF THE MAIN TURBINE WHEN THE SIGNAL WOULD NOT NORMALLY BE PRESENT.

THE P-4 PERMISSIVE NORMALLY DOES THE FOLLOWING: ACTUATES A TURBINE TRIP; CLOSES THE MFRV'S IF T_{ave} IS < 554 ^{O}F; LOCKS IN A CIRCUIT TO PREVENT RE-OPENING THE MAIN FEED WATER VALVES WHICH WERE CLOSED BY EITHER A SAFETY INJECTION ACTUATION OR A HIGH-HIGH STEAM GENERATOR LEVEL; PROVIDES A SIGNAL TO THE SAFETY INJECTION BLOCK AND RESET LOGIC CIRCUIT AND SENDS A SIGNAL TO THE PROCESS RACKS WHICH REDUCES THE HIGH STEAM FLOW PROGRAM.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY P-4 CIRCUIT TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP12 SOURCE RANGE PERMISSIVE P-6 FAILS AS IS

TYPE: GENERIC, RB

A) TRAIN A
B) TRAIN B

CAUSE: SOURCE RANGE BLOCK RELAYS SRB-XA & SRB-YA (SRB-XB & SRB-YB) STICK IN THEIR PRESENT POSITION

REF: REACTOR PROTECTION SYSTEM DESCRIPTION
22E-4884 THRU 4907
5653D30 SHT 4 REV 5

PLT STA: REACTOR POWER IN THE SOURCE RANGE

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE P-6 PERMISSIVE FAILS AS IS. IF INSERTED ON A POWER INCREASE FROM BELOW 10^{-10} AMPS, WHEN THE CONDITIONS FOR SATISFYING THE P-6 PERMISSIVE ARE MET (EITHER OF TWO INTERMEDIATE RANGE CHANNELS INCREASES ABOVE 10^{-10} AMPERES), THE P-6 PERMISSIVE FAILS TO PERFORM ITS NORMAL FUNCTIONS PREVENTING DEENERGIZATION OF BOTH SOURCE RANGE CHANNELS AND PREVENTING THE BLOCK OF THE RESPECTIVE TRAIN SOURCE RANGE HIGH FLUX REACTOR TRIP. IF POWER IS SUBSEQUENTLY INCREASED TO THE SOURCE RANGE HIGH FLUX REACTOR TRIP SETPOINT THE AFFECTED TRAIN REACTOR TRIP BREAKER WILL OPEN, THE UNAFFECTED TRAIN REACTOR TRIP BREAKER WILL NOT OPEN.

IF THE MALFUNCTION IS INSERTED ON A POWER DECREASE FROM ABOVE 10^{-10} AMPS, DECREASING POWER BELOW THE P-6 SETPOINT WILL NOT CLEAR THE P-6 PERMISSIVE. THIS RESULTS IN THE P-6 PERMISSIVE BEING PRESENT WHEN IT NORMALLY WOULD NOT BE ALLOWING IMPROPER BLOCKING OF THE SOURCE RANGE HIGH FLUX REACTOR TRIP.

THE P-6 PERMISSIVE NORMALLY DOES THE FOLLOWING: ALLOWS THE OPERATOR TO MANUALLY DEENERGIZE THE HIGH VOLTAGE SUPPLY TO THE SOURCE RANGE NUCLEAR DETECTORS AND BLOCK THE SOURCE RANGE HIGH FLUX REACTOR TRIP. FAILURE OF THE P-6 PERMISSIVE, WHILE INCREASING POWER, WILL RESULT IN A SOURCE RANGE HIGH FLUX REACTOR TRIP ON THE AFFECTED TRAIN REACTOR TRIP BREAKER.

INSERTION OF BOTH GENERICS OF THIS MALFUNCTION WILL PREVENT AUTOMATIC SOURCE RANGE REENERGIZATION WHEN POWER IS DROPPED TO BELOW 5×10^{-11} AMPS..

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY P-6 CIRCUIT TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP13 AT POWER PERMISSIVE P-7 FAILS AS IS

TYPE: GENERIC, RB

A) TRAIN A
B) TRAIN B

CAUSE: PERMISSIVE RELAYS P7-1XA, P7-1YA, P7-2XA & P7-2YA (P7-1XA, P7-1YA, P7-2XA & P7-2YA) STICK IN THEIR PRESENT POSITION

REF: REACTOR PROTECTION SYSTEM DESCRIPTION
22E-4884 THRU 4907
5653D30 SHT 5 REV 5

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE P-7 PERMISSIVE FAILS AS IS. IF DONE ON A POWER DECREASE, WHEN THE CONDITIONS FOR SATISFYING THE P-7 PERMISSIVE ARE MET (3 OF 4 POWER RANGE NUCLEAR INSTRUMENTS AND BOTH TURBINE IMPULSE CHAMBER PRESSURE SIGNALS INDICATE THAT POWER IS < 10%), THE P-7 PERMISSIVE FAILS TO PERFORM ITS NORMAL FUNCTIONS. FAILURE OF THE P-7 PERMISSIVE WILL CAUSE THE FOLLOWING REACTOR TRIPS TO REMAIN ENABLED: TWO LOOP LOW FLOW; RCP BUS UNDERVOLTAGE; PRESSURIZER LOW PRESSURE; PRESSURIZER HIGH WATER LEVEL AND TURBINE TRIP.

IF THE MALFUNCTION IS INSERTED ON A POWER INCREASE WITH THE P-7 LOGIC SATISFIED, THE POWER INCREASE ABOVE 10% POWER WILL NOT CLEAR THE P-7 PERMISSIVE. THIS RESULTS IN THE P-7 PERMISSIVE BEING PRESENT WHEN IT NORMALLY WOULD NOT BE WHICH WILL PREVENT THE ASSOCIATED TRIPS FROM OCCURRING WHEN THAT TRIP SIGNAL IS GENERATED.

THE P-7 PERMISSIVE NORMALLY AUTOMATICALLY BLOCKS THE FOLLOWING REACTOR TRIPS: LOW PRIMARY COOLANT FLOW TRIP (TWO LOOP LOW FLOW TRIP); RCP BUS UNDERVOLTAGE TRIP; PRESSURIZER LOW PRESSURE TRIP; PRESSURIZER HIGH WATER LEVEL TRIP AND TURBINE TRIP.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY P-7 CIRCUIT TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RP16 PRESSURIZER SI PERMISSIVE P-11 FAILS AS IS

TYPE: GENERIC, RB

A) TRAIN A
B) TRAIN B

CAUSE: PZR PRESS BISTABLE RELAYS PC-455B-XA & PC-456B-XA (PC-455B-XB & PC-4563-XB) STICK IN THEIR PRESENT POSITION

REF: REACTOR PROTECTION SYSTEM DESCRIPTION
22E-4913 THRU 4925 & 22E-4840-SI85
5653D30 SHT 6 REV 6

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE P-11 PERMISSIVE FAILS AS IS. IF INSERTED ON A PLANT SHUTDOWN, WHEN THE CONDITIONS FOR SATISFYING THE P-11 PERMISSIVE ARE MET (2 OF 3 PRESSURIZER PRESSURE SIGNALS ARE LESS THAN 1915 PSIG), THE P-11 PERMISSIVE FAILS TO PERFORM ITS NORMAL FUNCTIONS. FAILURE OF THE P-11 PERMISSIVE WILL PREVENT BLOCKING OF THE LOW PRESSURIZER PRESSURE SAFETY INJECTION.

IF THE MALFUNCTION IS INSERTED ON A PLANT STARTUP, INCREASING PRESSURIZER PRESSURE ABOVE 1915 PSIG WILL NOT CLEAR THE P-11 PERMISSIVE. THIS RESULTS IN THE P-11 PERMISSIVE BEING PRESENT WHEN IT NORMALLY WOULD NOT BE ALLOWING IMPROPER BLOCKING OF THE LOW PRESSURIZER PRESSURE SAFETY INJECTION.

THE P-11 PERMISSIVE NORMALLY ALLOWS THE OPERATOR TO BLOCK THE LOW PRESSURIZER PRESSURE SAFETY INJECTION.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY P-11 CIRCUIT TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RF17 HI STM FLOW SI PERMISSIVE P-12 FAILS AS IS

TYPE: GENERIC, RB

A) TRAIN A
B) TRAIN B

CAUSE: LOW LOW T_{ave} BISTABLE RELAYS TC-412D-XA, TC-422D-XA & TC-432D-XA (TC-412D-XB, TC-422D-XB & TC-432D-XB) STICK IN THEIR PRESENT POSITION

REF: REACTOR PROTECTION SYSTEM DESCRIPTION
22E-4913 THRU 4925
5653D30 SHT 5 REV 7

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE P-12 PERMISSIVE FAILS AS IS. IF INSERTED ON A PLANT SHUTDOWN, WHEN THE CONDITIONS FOR SATISFYING THE P-12 PERMISSIVE ARE MET (2 OF 4 T_{ave} SIGNALS ARE LESS THAN 540 °F), THE P-12 PERMISSIVE FAILS TO PERFORM ITS NORMAL FUNCTIONS. FAILURE OF THE P-12 PERMISSIVE WILL ALLOW THE STEAM DUMP VALVES TO BE OPENED BELOW 540°F POSSIBLY RESULTING IN AN EXCESSIVE RCS COOLDOWN.

IF THE MALFUNCTION IS INSERTED ON A PLANT STARTUP, INCREASING T_{ave} ABOVE 540 °F WILL NOT CLEAR THE P-12 PERMISSIVE. THIS RESULTS IN THE P-12 PERMISSIVE BEING PRESENT WHEN IT NORMALLY WOULD NOT BE ALLOWING IMPROPER BLOCKING OF THE HIGH STEAM FLOW SAFETY INJECTION AND BLOCKING NORMAL STEAM DUMP OPERATION.

THE P-12 PERMISSIVE NORMALLY DOES THE FOLLOWING: AUTOMATICALLY BLOCKS STEAM DUMP OPERATION [EXCEPT FOR 3 VALVES AVAILABLE IN THE BYPASS MODE]; ALLOWS THE OPERATOR TO BLOCK THE HIGH STEAM FLOW SAFETY INJECTION.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY P-12 CIRCUIT TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX03 NARROW RANGE STEAM GENERATOR LEVEL FAILURE

TYPE: GENERIC, RV 100% = 100% LEVEL

A) STEAM GENERATOR 1A CHANNEL II, 1LT-519
B) STEAM GENERATOR 1A CHANNEL III, 1LT-518
C) STEAM GENERATOR 1A CHANNEL IV, 1LT-517
D) STEAM GENERATOR 1B CHANNEL II, 1LT-549
E) STEAM GENERATOR 1B CHANNEL III, 1LT-548
F) STEAM GENERATOR 1B CHANNEL IV, 1LT-547
G) STEAM GENERATOR 1C CHANNEL I, 1LT-529
H) STEAM GENERATOR 1C CHANNEL III, 1LT-528
I) STEAM GENERATOR 1C CHANNEL IV, 1LT-527
J) STEAM GENERATOR 1D CHANNEL I, 1LT-539
K) STEAM GENERATOR 1D CHANNEL III, 1LT-538
L) STEAM GENERATOR 1D CHANNEL IV, 1LT-537

CAUSE: LEVEL TRANSMITTER FAILURE

REF: M-2? REV WA
5653D30 SHT 7 REV 6
22E-1-4943C, E & F
ANNUNCIATOR RESPONSE: 6-5A, 6-5B, 6-5C, 6-5D, 6-7A,
6-7B, 6-7C, 6-7D 10-1A, 10-1B, 10-1C, 10-1D, 10-2A,
10-2B,
10-2C, 10-2D, 10-3A, 10-3B, 10-3C, 10-3D.

PLT STA: IC39

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, TH SELECTED STEAM GENERATOR NARROW RANGE LEVEL TRANSMITTER WILL FAIL. THE VALUE OF THE FAILED NARROW RANGE LEVEL WILL BE DETERMINED BY THE SELECTED SEVERITY. EACH NARROW RANGE LEVEL TRANSMITTER SENDS SIGNALS TO REACTOR PROTECTION, ENGINEERED SAFEGUARDS ACTUATION, FEEDWATER REGULATING VALVE CONTROL (FED BY 519/549/529/539) AND STEAM GENERATOR LEVEL INDICATION, PPC POINT AND ALARMS.

THE VARIOUS LEVEL TRANSMITTERS FEED ANNUNCIATORS AS FOLLOWS:
ANNUNCIATORS 6-5A/B/C/D "STM GEN LOOP A/B/C/D FEEDWATER FLOW LOW REACTOR TRIP" ARE FED BY
517,518/547,548/527,528 /537,538 RESPECTIVELY.
ANNUNCIATORS 6-7A/B/C/D "STM GEN LOOP A/B/C/D LEVEL LOW LOW REACTOR TRIP" ARE FED BY
517,518,519/547,548,549/527, 528,529/537,538,539 RESPECTIVELY.
ANNUNCIATORS 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" ARE FED BY 519/549/529/539 RESPECTIVELY.
ANNUNCIATORS 10-3A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL HI-HI LOW LO-LO" ARE FED BY
517,518,519/547,548,549 /527,528,529/537,538,539 RESPECTIVELY WITH THE LOW NOT BEING FED BY
519/549/529/539.

ZION MALFUNCTION

CAUSE AND EFFECTS

VARYING 1LT-519 (549/529/539) WILL CAUSE ITS ASSOCIATED FEED REG VALVE TO MODULATE TO RECOVER FROM THE APPARENT LEVEL CHANGE. IF THE DEVIATION BETWEEN THE MODULATED FEED FLOW AND THE STEAM FLOW TO THE ASSOCIATED STEAM GENERATOR IS ± 7E6 #/HR, ANNUNCIATOR 10-1A/B/C/D "STEAM GENERATOR LOOP A/B/C/D FLOW MISMATCH" WILL BE ACTUATED. THE FAILURE OF THE 519/549/529/539 TRANSMITTER MAY LEAD TO A PLANT TRIP ON EITHER HIGH HIGH OR LOW LOW STEAM GENERATOR LEVEL.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY CONTROLLING THE ASSOCIATED STEAM GENERATOR LEVEL MANUALLY.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED LEVEL TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX05 STEAM GENERATOR FEEDWATER CONTROL VALVE FAILURE

TYPE: GENERIC, RV 100% = VALVE FULLY OPEN

A) #1 FEED REG VALVE, 1LCV-FW510
B) #2 FEED REG VALVE, 1LCV-FW540
C) #3 FEED REG VALVE, 1LCV-FW520
D) #4 FEED REG VALVE, 1LCV-FW530

CAUSE: I/P CONVERTER FAILURE

REF: M-22 REV WA
STM GEN WATER LEVEL CONTROL SYSTEM DESCRIPTION
617F768 SHT 4 REV 12
ANNUNCIATOR RESPONSE: 10-1A, 10-1B, 10-1C, 10-1D, 10-2A, 10-2B, 10-2C, 10-2D

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED MAIN FEED REG VALVE WILL FAIL. THE POSITION OF THE FAILED VALVE WILL BE DETERMINED BY THE SELECTED SEVERITY. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALVE POSITION, THE AFFECTED VALVE WILL OPEN. THE INCREASED FEEDWATER FLOW TO THE ASSOCIATED STEAM GENERATOR WILL RESULT IN LEVEL INCREASING. ANNUNCIATOR 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" WILL BE ACTUATED AT ACTUAL LEVEL 5% GREATER THAN PROGRAM LEVEL. IF THE SELECTED SEVERITY IS SUFFICIENT TO CAUSE A DIFFERENCE OF - 7E6 #/HR MISMATCH, ANNUNCIATOR 10-1A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" WILL ACTUATE. IF A HIGH HIGH LEVEL IS REACHED IN THE ASSOCIATED STEAM GENERATOR, A TURBINE TRIP/REACTOR TRIP WILL RESULT.

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALVE POSITION, THE AFFECTED VALVE WILL CLOSE. THE DECREASED FEEDWATER FLOW TO THE ASSOCIATED STEAM GENERATOR WILL RESULT IN LEVEL DECREASING. ANNUNCIATOR 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" WILL BE ACTUATED AT ACTUAL LEVEL 5% LESS THAN PROGRAM LEVEL. IF THE SELECTED SEVERITY IS SUFFICIENT TO CAUSE A DIFFERENCE OF +7E6 #/HR MISMATCH, ANNUNCIATOR 10-1A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" WILL ACTUATE. IF A LOW LEVEL OF < 25% WITH A FLOW CONDITION OF FEED FLOW LESS THAN STEAM FLOW BY .7E6 #/HR IS REACHED IN THE ASSOCIATED STEAM GENERATOR, A REACTOR TRIP/TURBINE TRIP WILL RESULT. IF THE DEVIATION IS TOO SMALL, THE REACTOR WILL TRIP ON LOW LOW STEAM GENERATOR LEVEL OF < 10% LEVEL IN THE AFFECTED STEAM GENERATOR.

ZION MALFUNCTION

CAUSE AND EFFECTS

ANY ATTEMPT BY THE OPERATOR TO LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY TAKING MANUAL CONTROL OF THE AFFECTED FEED REG VALVE, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED I/P CONVERTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX06 FEEDWATER FLOW TRANSMITTER FAILURE

T'PE: GENERIC, RV 100% = 100% TRANSMITTER OUTPUT

A) STEAM GENERATOR 1A, 1FT-510
B) STEAM GENERATOR 1A, 1FT-511
C) STEAM GENERATOR 1B, 1FT-540
D) STEAM GENERATOR 1B, 1FT-541
E) STEAM GENERATOR 1C, 1FT-520
F) STEAM GENERATOR 1C, 1FT-521
G) STEAM GENERATOR 1D, 1FT-530
H) STEAM GENERATOR 1D, 1FT-531

CAUSE: FAULTY TRANSMITTER

REF: STM GEN WATER LEVEL CONTROL SYSTEM DESCRIPTION
617F767 SHT 5 & 6 REV 11
22E-1-4943G,K,M,P,R,T,V & X
ANNUNCIATOR RESPONSE: 10-1A, 10-1B, 10-1C, 10-1D, 10-2A, 10-2B, 10-2C, 10-2D, 10-3A, 10-3B, 10-3C, 10-3D.
LER 22-1-88-013

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED FEEDWATER FLOW TRANSMITTER WILL FAIL. THE VALUE OF THE TRANSMITTER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY. THE TRANSMITTER OUTPUT WILL BE DISPLAYED ON THE ASSOCIATED METER ON 1CB05. IF THE AFFECTED TRANSMITTER IS BEING UTILIZED TO CONTROL THE ASSOCIATED FEED REG VALVE, THE VALVE WILL MODULATE TO CORRECT THE FLOW ERROR. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, THE FEED REG VALVE WILL CLOSE TO DECREASE THE DIFFERENCE BETWEEN FEED FLOW AND STEAM FLOW. IF THE DIFFERENCE BETWEEN FEED FLOW AND STEAM FLOW IS 7E6 #/HR, ANNUNCIATOR 10-1A/B/C/D "STEAM GENERATOR LOOP A/B/C/D FLOW MISMATCH" WILL BE ACTUATED. THE VALVE CLOSING WILL CAUSE ACTUAL STEAM GENERATOR LEVEL TO DECREASE WITH ANNUNCIATOR 10- 2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" TO ACTUATE AT 5% LEVEL DEVIATION. ANNUNCIATOR 10-3A/B/C/D "STEAM GENERATOR LOOP A/B/C/D/ HI-HI LOW LO-LO" ACTUATES AT 25% LEVEL. IF A LOW LEVEL OF < 25% WITH A FLOW CONDITION OF FEED FLOW LESS THAN STEAM FLOW BY .7E6 #/HR IS REACHED IN THE ASSOCIATED STEAM GENERATOR, A REACTOR TRIP/TURBINE TRIP WILL RESULT. IF THE DEVIATION IS TOO SMALL, THE REACTOR WILL TRIP ON LOW LOW STEAM GENERATOR LEVEL OF < 10% LEVEL IN THE AFFECTED STEAM GENERATOR.

ZION MALFUNCTION

CAUSE AND EFFECTS

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, THE FEED REG VALVE WILL OPEN TO DECREASE THE DIFFERENCE BETWEEN FEED FLOW AND STEAM FLOW. IF THE DIFFERENCE BETWEEN FEED FLOW AND STEAM FLOW IS 7E6 #/HR, ANNUNCIATOR 10-1A/B/C/D "STEAM GENERATOR LOOP A/B/C/D FLOW MISMATCH" WILL BE ACTUATED. THE VALVE OPENING WILL CAUSE ACTUALSTEAM GENERATOR LEVEL TO INCREASE WITH ANNUNCIATOR 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" TO ACTUATE AT 5% LEVEL DEVIATION. ANNUNCIATOR 10-3A/B/C/D "STEAM GENERATOR LOOP A/B/C/D/ HI-HI LOW LO-LO" ACTUATES AT 70% LEVEL. IF A HIGH HIGH LEVEL IS REACHED IN THE ASSOCIATED STEAM GENERATOR, A TURBINE TRIP/REACTOR TRIP WILL RESULT.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY TRANSFERRING THE CONTROLLING CHANNEL OF FEEDWATER FLOW TO THE OTHER TRANSMITTER.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX07 FEEDWATER PRESSURE DETECTOR (PT-508) FAILURE

TYPE: DISCRETE, RV 100% = 100% TRANSMITTER OUTPUT

CAUSE: TRANSMITTER FAILURE

REF: M-22 REV WA
STEAM GENERATOR WATER LEVEL CONTROL SYSTEM DESCRIPTION
22E-1-6953 SHT 8 & 9
ANNUNCIATOR RESPONSE: 10-1A, 10-1B, 10-1C, 10-1D, 10-2A, 10-2B, 10-2C, 10-2D.

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE OUTPUT OF FEEDWATER PRESSURE TRANSMITTER 1PT-508 WILL FAIL TO THE VALUE DETERMINED BY THE SELECTED SEVERITY. THIS SELECTED SEVERITY WILL BE INDICATED ON 1PI-508 (1CB05) AND WILL BE USED AS AN INPUT TO DP COMPARATOR IN THE MAIN FEEDWATER PUMP SPEED CONTROL CIRCUIT.

IF THE SELECTED SEVERITY IS GREATER THAN THE ACTUAL PRESSURE, THE GOVERNOR VALVES OF THE MAIN FEEDWATER PUMP TURBINES WILL RECEIVE A SIGNAL TO CLOSE TO LOWER THE APPARENT HIGH FEED TO STEAM DP. THIS WILL CAUSE ALL STEAM GENERATORS' LEVELS TO DECREASE. IF THE MOTOR DRIVEN MAIN FEEDWATER PUMP IS OPERATING, A SIMILAR EFFECT IS THE RESULT AS DISCHARGE VALVE, 1FCV-FW21B, WILL THROTTLE DOWN ALSO TO DECREASE THE DP.

ANNUNCIATORS 10-1A - D "STEAM GENERATOR LOOP A/B/C/D FLOW MISMATCH" WILL BE ACTUATED AT ± 7E6 #/HR (SF-FF) DEVIATION. ANNUNCIATORS 10-2A - D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" IS ACTUATED AT ± 5% PROGRAM LEVEL DEVIATION.

IF THE SELECTED SEVERITY IS LESS THAN THE ACTUAL PRESSURE, THE GOVERNOR VALVES OF THE MAIN FEEDWATER PUMP TURBINES WILL RECEIVE A SIGNAL TO OPEN TO RAISE THE APPARENT LOW FEED TO STEAM DP. THIS WILL CAUSE ALL STEAM GENERATORS' LEVELS TO INCREASE. IF THE MOTOR DRIVEN MAIN FEEDWATER PUMP IS OPERATING, A SIMILAR EFFECT IS THE RESULT AS DISCHARGE VALVE, 1FCV-FW21B, WILL MODULATE OPEN ALSO TO INCREASE THE DP.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY CONTROLLING THE MAIN FEEDWATER PUMP SPEED OR FLOW, FOR 1A PUMP, IN MANUAL.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED PRESSURE TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX08 STEAM FLOW DETECTOR FAILURE

TYPE: GENERIC, RV 100% = 100% TRANSMITTER OUTPUT

A) STEAM GENERATOR 1A, 1FT-512
B) STEAM GENERATOR 1A, 1FT-513
C) STEAM GENERATOR 1B, 1FT-542
D) STEAM GENERATOR 1B, 1FT-543
E) STEAM GENERATOR 1C, 1FT-522
F) STEAM GENERATOR 1C, 1FT-523
G) STEAM GENERATOR 1D, 1FT-532
H) STEAM GENERATOR 1D, 1FT-533

CAUSE: DETECTOR FAILURE DUE TO MANUFACTURING DEFECT

REF: STM GEN WATER LEVEL CONTROL SYSTEM DESCRIPTION
DVR 22-1-87-045
617F767 SHT 5 & 6
22E-1-4943H,L,N,Q,S,U,W & Y
ANNUNCIATOR RESPONSE: 10-1A, 10-1B, 10-1C, 10-1D, 10-2A, 10-2B, 10-2C, 10-2D, 10-3A, 10-3B, 10-3C, 10-3D.

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED STEAM FLOW TRANSMITTER WILL FAIL. THE VALUE OF THE TRANSMITTER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY. THE TRANSMITTER OUTPUT WILL BE DISPLAYED ON THE ASSOCIATED METER ON 1CB05. IF THE AFFECTED TRANSMITTER IS BEING UTILIZED TO CONTROL THE ASSOCIATED FEED REG VALVE, THE VALVE WILL MODULATE TO CORRECT THE FLOW ERROR. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, THE FEED REG VALVE WILL OPEN TO DECREASE THE DIFFERENCE BETWEEN FEED FLOW AND STEAM FLOW. IF THE DIFFERENCE BETWEEN FEED FLOW AND STEAM FLOW IS 7E6 #/HR, ANNUNCIATOR 10-1A/B/C/D "STEAM GENERATOR LOOP A/B/C/D FLOW MISMATCH" WILL BE ACTUATED. THE VALVE OPENING WILL CAUSE ACTUAL STEAM GENERATOR LEVEL TO INCREASE WITH ANNUNCIATOR 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" TO ACTUATE AT 5% LEVEL DEVIATION. ANNUNCIATOR 10-3A/B/C/D "STEAM GENERATOR LOOP A/B/C/D HI-HI LOW LO-LO" ACTUATES AT 70% LEVEL. IF A HIGH HIGH LEVEL IS REACHED IN THE ASSOCIATED STEAM GENERATOR, A TURBINE TRIP/REACTOR TRIP WILL RESULT.

ZION MALFUNCTION

CAUSE AND EFFECTS

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, THE FEED REG VALVE WILL CLOSE TO DECREASE THE DIFFERENCE BETWEEN FEED FLOW AND STEAM FLOW. IF THE DIFFERENCE BETWEEN FEED FLOW AND STEAM FLOW IS 7E6 #/HR, ANNUNCIATOR 10-1A/B/C/D "STEAM GENERATOR LOOP A/B/C/D FLOW MISMATCH" WILL BE ACTUATED. THE VALVE CLOSING WILL CAUSE ACTUAL STEAM GENERATOR LEVEL TO DECREASE WITH ANNUNCIATOR 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" TO ACTUATE AT 5% LEVEL DEVIATION. ANNUNCIATOR 10-3A/B/C/D "STEAM GENERATOR LOOP A/B/C/D/ HI-HI LOW LO-LO" ACTUATES AT 25% LEVEL. THE REACTOR/PLANT WILL TRIP [illegible] LOW STEAM GENERATOR LEVEL OF < 10% LEVEL IN [illegible] STEAM GENERATOR.

THE OPERATOR MAY [illegible] SEQUENCES OF THIS MALFUNCTION BY T[illegible]RRING THE CONTROLLING CHANNEL OF STEAM FLOW TO THE OTHER TRANSMITTER.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX11 STEAM LINE PRESSURE DETECTOR, PT-507 FAILURE

TYPE: DISCRETE, RV 100% = 100% DETECTOR OUTPUT

CAUSE: TRANSMITTER FAILURE

REF: STM GEN WATER LEVEL CONTROL SYSTEM DESCRIPTION
22E-1-6953 SHT 7 & 9
ANNUNCIATOR RESPONSE: 10-1A, 10-1B, 10-1C, 10-1D, 10-2A, 10-2B, 10-2C, 10-2D, 10-3A, 10-3B, 10-3C, 10-3D.

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, STEAM LINE PRESSURE TRANSMITTER 1PT-507 WILL FAIL. THE VALUE OF THE TRANSMITTER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY. THIS TRANSMITTER SUPPLIES SIGNALS TO THE STEAM DUMP CIRCUIT, THE MAIN FEED PUMP SPEED CONTROL SYSTEM AND WILL BE INDICATED ON 1PI-MS507 (1CB05). IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, THE OPERATING MAIN FEED PUMP(S) SPEED WILL INCREASE TO DECREASE THE DIFFERENCE BETWEEN FEED FLOW AND THE APPARENTLY INCREASED STEAM FLOW. IF THE DIFFERENCE BETWEEN FEED FLOW AND STEAM FLOW IS 7E6 #/HR, ANNUNCIATOR 10-1A/B/C/D "STEAM GENERATOR LOOP A/B/C/D FLOW MISMATCH" WILL BE ACTUATED. THE VALVE OPENING WILL CAUSE ACTUAL STEAM GENERATOR LEVEL TO INCREASE WITH ANNUNCIATOR 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" TO ACTUATE AT 5% LEVEL DEVIATION. ANNUNCIATOR 10-3A/B/C/D "STEAM GENERATOR LOOP A/B/C/D/ HI- HI LOW LO-LO" ACTUATES AT 70% LEVEL. IF A HIGH HIGH LEVEL IS REACHED IN THE ASSOCIATED STEAM GENERATOR, A TURBINE TRIP/REACTOR TRIP WILL RESULT. IF THE STEAM DUMP SYSTEM IS THE STEAM PRESSURE MODE, INCREASING APPARENT STEAM PRESSURE ABOVE THE DUMP SETPOINT WILL RESULT IN THE STEAM DUMP VALVES MODULATING OPEN.

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, THE OPERATING MAIN FEED PUMP(S) SPEED WILL DECREASE TO DECREASE THE DIFFERENCE BETWEEN FEED FLOW AND THE APPARENTLY DECREASED STEAM FLOW. IF THE DIFFERENCE BETWEEN FEED FLOW AND STEAM FLOW IS 7E6 #/HR, ANNUNCIATOR 10- 1A/B/C/D "STEAM GENERATOR LOOP A/B/C/D FLOW MISMATCH" WILL BE ACTUATED. THE VALVE CLOSING WILL CAUSE ACTUAL STEAM GENERATOR LEVEL TO DECREASE WITH ANNUNCIATOR 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" TO ACTUATE AT 5% LEVEL DEVIATION. ANNUNCIATOR 10-3A/B/C/D "STEAM GENERATOR LOOP A/B/C/D/ HI-HI LOW LO-LO" ACTUATES AT 25% LEVEL.

ZION MALFUNCTION

CAUSE AND EFFECTS

THE REACTOR/PLANT WILL TRIP ON LOW LOW STEAM GENERATOR LEVEL OF < 10% LEVEL IN THE AFFECTED STEAM GENERATOR. THE APPARENT LOW STEAM PRESSURE WILL PREVENT THE STEAM DUMP VALVES, WHILE IN THE STEAM PRESSURE MODE, FROM OPENING TO REDUCE RCS TEMPERATURES CAUSING THE STEAM GENERATOR RELIEFS/SAFETIES TO LIFT.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY TAKING MANUAL CONTROL OF THE PRESSURE MASTER, 1SHC-509A, TO CONTROL FEED PUMP SPEED AND BY TAKING THE STEAM DUMP VALVE CONTROL OUT OF STEAM PRESSURE MODE OF OPERATION.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX12 STEAM PRESSURE DETECTOR FAILURE

TYPE: GENERIC, RV 100% = 100% TRANSMITTER OUTPUT

A) 1PT-514 (S/G 1A)
B) 1PT-515 (S/G 1A)
C) 1PT-516 (S/G 1A)
D) 1PT-516A (S/G 1A)
E) 1PT-544 (S/G 1B)
F) 1PT-545 (S/G 1B)
G) 1PT-546 (S/G 1B)
H) 1PT-546A (S/G 1B)
I) 1PT-524 (S/G 1C)
J) 1PT-525 (S/G 1C)
K) 1PT-526 (S/G 1C)
L) 1PT-526A (S/G 1C)
M) 1PT-534 (S/G 1D)
N) 1PT-535 (S/G 1D)
O) 1PT-536 (S/G 1D)
P) 1PT-536A (S/G 1D)

CAUSE: TRANSMITTER FAILURE

REF: M-20 REV BB
5653D30 SHT 7 REV 6
22E-1-4943G,K,M,P,T,V,X & Z
22E-1-4944A
STEAM GENERATOR WATER LEVEL CONTROL SYSTEM DESCRIPTION

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED STEAM PRESSURE TRANSMITTER WILL FAIL. THE VALUE OF THE TRANSMITTER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY. THE OUTPUT FROM THESE TRANSMITTERS ARE USED FOR STEAM FLOW DENSITY COMPENSATION(514,515/544,545/524,525/534,535), SAFETY INJECTION (514,515,516/544,545,546/524,525,526/534,535,536), AND IS UTILIZED BY THE ATMOSPHERIC STEAM DUMP (516A/546A/526A/536A). IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, DEPENDING ON WHICH TRANSMITTER IS AFFECTED, THE ASSOCIATED MAIN FEED REG VALVE WILL OPEN FURTHER TO COMPENSATE FOR THE APPARENT INCREASE IN STEAM FLOW; THE DIFFERENCE IN STEAM LINE PRESSURES WILL BE INPUTTED TO THE SAFETY INJECTION LOGIC CIRCUIT. IF TRANSMITTERS 516A, 526A, 536A, or 546A ARE SELECTED, THE ASSOCIATED ATMOSPHERIC STEAM DUMP SEES THE APPARENT INCREASE IN HEADER PRESSURE AND WILL CAUSE THE VALVE TO OPEN.

CAUSE AND EFFECTS

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, DEPENDING ON WHICH TRANSMITTER IS AFFECTED, THE ASSOCIATED MAIN FEED REG VALVE WILL CLOSE DOWN TO COMPENSATE FOR THE APPARENT DECREASE IN STEAM FLOW; THE DIFFERENCE IN STEAM LINE PRESSURES WILL BE INPUTTED TO THE SAFETY INJECTION LOGIC CIRCUIT AND IF THE ATMOSPHERIC STEAM DUMP IS BEING USED (IF TRANSMITTERS 516A, 526A, 536A, or 546A ARE SELECTED), THE APPARENT DECREASE IN HEADER PRESSURE WILL CAUSE THE ASSOCIATED VALVE TO CLOSE.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY TAKING MANUAL CONTROL OF THE AFFECTED MAIN FEED REG VALVE (FOR THE APPROPRIATE TRANSMITTER FAILURE) OR BY CONTROLLING THE ASSOCIATED ATMOSPHERIC STEAM DUMP IN MANUAL (AS NECESSITATED BY ITS TRANSMITTER FAILING).

MALFUNCTION REMOVAL WILL RESTORE THE FAILED TRANSMITTER TO NORMAL.

[REV 0]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX13 FIRST STAGE PRESSURE TRANSMITTER 1PT-505 FAILURE

TYPE: DISCRETE, RV 100% = 100% TRANSMITTER OUTPUT

CAUSE: FAULTY TRANSMITTER FAILS

REF: ROD CONTROL SYSTEM DESCRIPTION
STEAM GENERATOR WATER LEVEL CONTROL SYSTEM DESCRIPTION
22E-1-4943A & B
22E-1-4944A
M-20 REV BB
ANNUNCIATOR RESPONSE: 7-4A

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE FIRST STAGE PRESSURE TRANSMITTER, 1PT-505, FAILS. THE VALUE OF THE TRANSMITTER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY. THE OUTPUT FROM THIS TRANSMITTER IS USED IN THE ROD CONTROL SYSTEM T_{ref} PROGRAMMER, IN THE STEAM GENERATOR WATER LEVEL PROGRAMMER, FOR INPUT TO THE P-13 PERMISSIVE FOR THE P-7 INTERLOCK CIRCUIT OF THE REACTOR PROTECTION SYSTEM, AND FOR PRESSURE INDICATION ON 1CB06.

IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, IN THE AUTO MODE, THE CONTROL RODS WILL AUTOMATICALLY WITHDRAW TO RAISE T_{ave} TO THE ELEVATED T_{ref}; IF LESS THAN 20% POWER, THE STEAM GENERATOR PROGRAM LEVEL WILL INCREASE WITH THE FEEDWATER SYSTEM COMPENSATING BY INCREASING FEEDWATER FLOW TO THE STEAM GENERATORS. THE INCREASED TRANSMITTER SIGNAL WILL ALSO BE SENT TO THE P-7 CIRCUITRY WHICH MAY SATISFY THE LOGIC FOR ENABLING SEVERAL REACTOR TRIPS (1/2 CHANNELS $\geq$10% TURBINE POWER) AND TURNS OFF THE P-13 PERMISSIVE LAMP.

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, IN THE AUTO MODE, THE CONTROL RODS WILL AUTOMATICALLY BE INSERTED TO REDUCE T_{ave} TO THE LOWERED T_{ref}; IF POWER IS 20% OR LESS, THE STEAM GENERATOR PROGRAM LEVEL WILL DECREASE WITH THE FEEDWATER SYSTEM COMPENSATING BY DECREASING FEEDWATER FLOW TO THE STEAM GENERATORS. THE DECREASED TRANSMITTER SIGNAL WILL ALSO BE SENT TO THE P-7 CIRCUITRY WHICH PREVENTS CLEARING P-7 IF THE OTHER IMPULSE PRESSURE CHANNEL (PT-506) OR REACTOR POWER (P-10) IS ABOVE 10%. IF THE PT-505 OUTPUT SIGNAL IS < 15% TURBINE POWER, ANNUNCIATOR 7-4A "LOW POWER ROD BLOCK" WILL BE ACTUATED AND AN AUTOMATIC ROD STOP IS ACTIVTED.

ZION MALFUNCTION

CAUSE AND EFFECTS

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY PLACING THE CONTROL ROD MODE SELECT SWITCH IN THE MANUAL POSITION.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX14 FIRST STAGE PRESSURE TRANSMITTER 1PT-506 FAILURE

TYPE: DISCRETE, RV 100% = 100% TRANSMITTER OUTPUT

CAUSE: FAULTY TRANSMITTER FAILS

REF: REACTOR PROTECTION SYSTEM DESCRIPTION
M-20 REV 2B
22E-1-4943A & 22E-1-4944A

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE FIRST STAGE PRESSURE TRANSMITTER, 1PT-506, FAILS. THE VALUE OF THE TRANSMITTER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY. THE OUTPUT FROM THIS TRANSMITTER IS USED IN THE STEAM DUMP CONTROL CIRCUIT, FOR INPUT TO THE P-7 INTERLOCK CIRCUIT OF THE REACTOR PROTECTION SYSTEM AND FOR PRESSURE INDICATION ON 1CB05.

IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, THE FAULTY PT-506 SIGNAL WILL PREVENT THE PROPER OPERATION OF THE STEAM DUMP SYSTEM DURING A LOSS OF LOAD CONDITION. THE INCREASED TRANSMITTER SIGNAL WILL ALSO BE SENT TO THE INDICATION AND TO THE P-7 CIRCUITRY WHICH MAY SATISFY THE LOGIC FOR ENABLING SEVERAL REACTOR TRIPS.

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, THE DECREASED TRANSMITTER SIGNAL WILL BE SENT TO THE INDICATION AND TO THE P-7 CIRCUITRY WHICH MAY SATISFY 1/2 OF THE PERMISSIVE LOGIC FOR BLOCKING SEVERAL REACTOR TRIPS. IF PT-506 DECREASES AT A RATE OF GREATER THAN 10% IN LESS THAN 120 SECONDS, C-7 WILL BE ACTIVATED TO ARM THE STEAM DUMPS IN THE LOAD REJECT MODE. THE TRANSMITTER SIGNAL DECREASING WILL NOT CLEAR P-13 OR P-7 FROM ABOVE 10% ACTUAL POWER.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX17 PRESSURIZER PRESSURE MASTER CONTROLLER FAILURE

TYPE: DISCRETE, RV 100% = 100% CONTROLLER OUTPUT

CAUSE: FAULTY PRESSURE REFERENCE SETPOINT

REF: PRESSURIZER SYSTEM DESCRIPTION
22E-1-4945F
5653D30 SHT 11 REV 5
ANNUNCIATOR RESPONSE: 6-3A, 6-3D, 9-8B, 9-8E, 9-9A.
LER 22-2-86-024

PLT STA: IC39

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE PRESSURIZER PRESSURE MASTER CONTROLLER, 1HC-455K, WILL FAIL. THE OUTPUT OF THE CONTROLLER WILL BE DETERMINED BY THE SELECTED SEVERITY. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE OF 2235 PSIG, A HIGHER PRESSURIZER PRESSURE THAN NORMAL WILL BE REQUIRED TO BE MAINTAINED. THE PRESSURIZER PRESSURE IS NORMALLY CONTROLLED AS FOLLOWS: THE PROPORTIONAL HEATERS START TO ENERGIZE AT A SIGNAL OF 15 PSI OVER THE SELECTED PRESSURE SETPOINT AND ARE FULL ON AT 15 PSI BELOW THE SETPOINT; THE BACKUP HEATERS ARE ON AT 25 PSI LESS THAN THE SETPOINT AND OFF AT 17 PSI BELOW THE SETPOINT; THE SPRAY VALVES BEGIN TO OPEN AT 25 PSI ABOVE THE SETPOINT AND ARE FULLY OPEN AT 75 PSI ABOVE THE SETPOINT AND THE PORV'S ALSO RECEIVE AN INPUT FROM THE PRESSURE MASTER CONTROLLER TO OPEN AT 100 PSID ABOVE THE SETPOINT AND CLOSE AT 80 PSID ABOVE THE SETPOINT. ELEVATING THE SETPOINT, DEPENDING ON THE SELECTED SEVERITY, MAY RESULT IN THE PRESSURIZER SAFETIES LIFTING PRIOR TO THE PORV'S OPENING DURING A PRESSURIZER OVERPRESSURE CONDITION. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" WILL BE ACTUATED AT 2310 PSIG. ANNUNCIATOR 9-8E "PRESSURIZER PRESSURE DEVIATION" IS ACTUATED AT 2385 PSIG AS IS ANNUNCIATOR 6-3A "PRESSURIZER PRESSURE HIGH REACTOR TRIP".

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE OF 2235 PSIG, A LOWER PRESSURIZER PRESSURE THAN NORMAL WILL BE REQUIRED TO BE MAINTAINED. LOWERING THE SETPOINT, DEPENDING ON THE SELECTED SEVERITY, MAY RESULT IN A PRESSURIZER LOW PRESSURE REACTOR TRIP AND SAFETY INJECTION OCCURRING DURING THE LOW PRESSURIZER PRESSURE OPERATING CONDITION. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" WILL BE ACTUATED AT 2185 PSIG. ANNUNCIATOR 9-8E "PRESSURIZER PRESSURE DEVIATION" IS ACTUATED AT 1825 PSIG AS IS ANNUNCIATOR 6-3B "PRESSURIZER PRESSURE LOW REACTOR TRIP", IF OPERATING ABOVE 10% POWER. AT LESS THAN 1815 PSIG, ANNUNCIATOR 6-3D "PRESSURIZER LOW PRESS SAFETY INJ REACTOR TRIP" AND ANNUNCIATOR 9-9A "PRESSURIZER LEVEL/PRESSURE ALERT" WILL ACTUATE.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY TAKING MANUAL CONTROL OF THE FAILED MASTER PRESSURE CONTROLLER TO MAINTAIN PRESSURIZER PRESSURE.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY PRESSURE REFERENCE SETPOINT TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX20 RCS WIDE RANGE PRESSURE TRANSMITTER FAILURE

TYPE: GENERIC, RV 100% = 100% TRANSMITTER OUTPUT

A) 1PT-403
B) 1PT-405

CAUSE: FAULTY TRANSMITTER FAILS

REF: REACTOR COOLANT SYSTEM DESCRIPTION
22E-1-6955 SH 3, 5, 311 & 312
22E-1-4945A & 22E-1-4945P
ANNUNCIATOR RESPONSE: 9-10B

PLT STA: IC03

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED RCS WIDE RANGE PRESSURE TRANSMITTER WILL FAIL. THE TRANSMITTER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY. THE TRANSMITTER OUTPUT WILL BE INDICATED ON 1PR-403 (1CB06), AND FOR 1PT-403, ON 1PI-403 (1CB06). THIS INDICATION IS UTILIZED BY THE OPERATOR AS A GUIDE FOR MANUAL PRESSURIZER HEATER AND SPRAY CONTROL AND WILL PROVIDE THE OPENING SIGNAL FOR THE PORV'S WHILE IN THE LOW TEMPERATURE OVERPRESSURE PROTECTION MODE. THESE TRANSMITTERS ALSO PROVIDE PERMISSIVE SIGNALS FOR THE RHR LOOP ISOLATION VALVES (PERMISSIVE TO OPEN < 425 PSIG AND AUTO CLOSE > 600 PSIG) INTERLOCK CIRCUITS.

WITH THE RCS IN A LOW PRESSURE CONDITION, WITH THE RHR SYSTEM IN OPERATION, FAILURE OF THE TRANSMITTER ABOVE 600 PSIG WILL CAUSE INADVERTENT CLOSURE OF THE ASSOCIATED RHR ISOLATION VALVE. THE PORV'S WILL AUTO OPEN AT 415 PSIG, CAUSING ANNUNCIATOR 9-10B "PRESSURIZER LOW TEMP HIGH PRESSURE" TO ACTUATE, TO ATTEMPT TO LOWER THE APPARENT HIGH PRESSURE.
FAILURE OF THE TRANSMITTER BELOW 425 PSIG WILL SATISFY THE OPEN PERMISSIVE, AND ALLOW THE OPERATOR TO OPEN THE ASSOCIATED RHR ISOLATION VALVE WITH ACTUAL RCS PRESSURE HIGHER THAN PERMISSIBLE. IT WILL ALSO PREVENT THE PORV'S FROM OPENING AS REQUIRED ON AN ACTUAL HIGH PRESSURE CONDITION WHILE IN THE LOW TEMPERATURE OVERPRESSURE PROTECTION MODE OF PORV OPERATION.

1PT-403 & 1PT-405 ALSO PROVIDE AN INPUT INTO THE DENSITY COMPENSATION CIRCUIT OF THE REACTOR VESSEL LEVEL INDICATING SYSTEM.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED TRANSMITTER TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX21 PRESSURIZER PRESSURE CHANNEL FAILURE

TYPE: GENERIC, RV 100% = 100% TRANSMITTER OUTPUT

A) PZR PRESSURE CHANNEL I, 1PT-455
B) PZR PRESSURE CHANNEL II, 1PT-456
C) PZR PRESSURE CHANNEL III, 1PT-457
D) PZR PRESSURE CHANNEL IV, 1PT-458

CAUSE: PRESSURE TRANSMITTER FAILURE

REF: 617F767 SHT 4 REV 7
REACTOR PROTECTION SYSTEM DESCRIPTION
PRESSURIZER SYSTEM DESCRIPTION
22E-1-4945E,F,G,H
M-53 REV AN
ANNUNCIATOR RESPONSE: 9-8B, 9-8E, 9-9A.
LER 22-2-86-024

PLT STA: AFFECTED CHANNEL CONTROLLING PRESSURIZER PRESSURE

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED PRESSURIZER PRESSURE TRANSMITTER WILL FAIL. THE VALUE OF THE TRANSMITTER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY. THE TRANSMITTER OUTPUT WILL BE INDICATED ON THE ASSOCIATED METER AND ON THE SELECTABLE RECORDER ON 1CB06. IF THE AFFECTED TRANSMITTER IS SELECTED FOR CONTROL, INCREASING OR DECREASING PRESSURIZER PRESSURE WILL RESULT DEPENDING ON THE SELECTED SEVERITY AS COMPARED TO THE INITIAL VALUE.

UNIQUE EFFECTS TO EACH INDIVIDUAL TRANSMITTER ARE AS FOLLOWS: **(ASSUMING THE PRESSURE CHANNEL SELECTOR IS IN THE 455 & 456 POSITION)**

A) 1PT-455 - SENDS PRESS ERROR SIGNAL: TO THE PZR HEATER AND SPRAY CONTROLLERS; TO ACTUATE PORV PCV-455C AT 2335 PSIG; TO ANNUNCIATOR 9-8B AT 100 PSIG OVER SETPOINT PRESS AND AT 25 PSIG UNDER SETPOINT PRESS; TO ANNUNCIATOR 9-8E AT 75 PSIG ABOVE SETPOINT PRESS.

1PT-455 ALSO SENDS A PRESSURE SIGNAL: TO LOOP A1 OTΔT SETPOINT CALCULATION; TO ANNUNCIATOR 9-8E AT 2385 PSIG; TO HI PRESSURE REACTOR TRIP LOGIC AT 2385 PSIG; TO LOW PRESSURE REACTOR TRIP LOGIC AT 1825 PSIG; TO SAFETY INJECTION BLOCK LOGIC AT 1915 PSIG; TO ANNUNCIATOR 9-9A AT 1815 PSIG; TO SAFETY INJECTION LOGIC AT 1815 PSIG.

CAUSE AND EFFECTS

B) 1PT-456 - SENDS PRESSURE SIGNAL: TO ACTUATE PORV PCV-456 AT 2335 PSIG; TO ANNUNCIATOR 9-8B AT 2310 PSIG AND AT 2335 PSIG; TO LOOP C2 OTΔT SETPOINT CALCULATION; TO ANNUNCIATOR 9-8E AT 2385 PSIG; TO HI PRESSURE REACTOR TRIP LOGIC AT 2385 PSIG; TO LOW PRESSURE REACTOR TRIP LOGIC AT 1825 PSIG; TO SAFETY INJECTION BLOCK LOGIC AT 1915 PSIG; TOANNUNCIATOR 9-9A AT 1815 PSIG; TO SAFETY INJECTION LOGIC AT 1815 PSIG.

C) 1PT-457 - SENDS PRESSURE SIGNAL: TO ANNUNCIATOR 9-8B AT 2335 PSIG (AND INTERLOCK SIGNAL TO PORV PCV-456); TO LOOP D3 OTΔT SETPOINT CALCULATION; TO ANNUNCIATOR 9-8E AT 2385 PSIG; TO HI PRESSURE REACTOR TRIP LOGIC AT 2385 PSIG; TO LOW PRESSURE REACTOR TRIP LOGIC AT 1825 PSIG; TO SAFETY INJECTION BLOCK LOGIC AT 1915 PSIG; TO ANNUNCIATOR 9-9A AT 1815 PSIG; TO SAFETY INJECTION LOGIC AT 1815 PSIG.

D) 1PT-458 - SENDS PRESSURE SIGNAL: TO ANNUNCIATOR 9-8B AT 2335 PSIG (AND INTERLOCK SIGNAL TO PORV PCV-455C); TO ANNUNCIATOR 9-8E AT 2205 PSIG; TO LOOP B4 OTΔT SETPOINT CALCULATION; TO ANNUNCIATOR 9-8E AT 2385 PSIG; TO HI PRESSURE REACTOR TRIP LOGIC AT 2385 PSIG; TO LOW PRESSURE REACTOR TRIP LOGIC AT 1825 PSIG.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY TRANSFERRING PRESSURIZER PRESSURE CONTROL TO AN UNAFFECTED CHANNEL.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED PRESSURE TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX22 PRESSURIZER LEVEL MASTER CONTROLLER FAILURE

TYPE: DISCRETE, RV 100% = 100% LEVEL

CAUSE: FAULTY T_{ave} SETPOINT CONTROLLER

REF: PRESSURIZER SYSTEM DESCRIPTION
22E-1-4945K & L; 5653D30 SHT 11 REV 5
ANNUNCIATOR RESPONSE: 6-3C, 9-8B, 9-8C, 9-8D, 9-9D.
LER 22-2-86-024

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE PRESSURIZER LEVEL MASTER CONTROLLER, 1LHC-459D, WILL FAIL. THE OUTPUT OF THE CONTROLLER WILL BE DETERMINED BY THE SELECTED SEVERITY. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE OF PRESSURIZER LEVEL, WITH THE SETPOINT BEING PROGRAMMED FROM T_{ave} (32.3% TO 44%), A LEVEL HIGHER THAN NORMAL WILL BE REQUIRED TO BE MAINTAINED. THE PRESSURIZER LEVEL IS NORMALLY CONTROLLED AS FOLLOWS: THE BACKUP HEATERS SELECTED FOR AUTOMATIC OPERATION ARE TURNED ON AND ANNUNCIATOR 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" IS ACTUATED AT 5% ABOVE THE LEVEL SETPOINT; ANNUNCIATOR 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" IS ACTUATED AT 5% BELOW THE LEVEL SETPOINT; AT 70% PRESSURIZER LEVEL, ANNUNCIATOR 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" IS ACTUATED (WITH PROGRAM LEVEL RAISED TO ~65%); ANNUNCIATOR 6-3C "PRESSURIZER WATER LEVEL HIGH REACTOR TRIP" WILL BE ACTUATED AT > 92% PRESSURIZER LEVEL AND THE REACTOR WILL TRIP IF > 10% POWER; AT 17% PRESSURIZER LEVEL, LETDOWN WILL ISOLATE AND ALL HEATERS WILL BE TURNED OFF WITH ANNUNCIATORS 9-8D "PRESSURIZER LEVEL LOW HEATER OFF AND LETDOWN SECURED" AND 9-9D "PRESSURIZER HEATERS AUTO TRIP" BEING ACTUATED. WITH AN ELEVATED PRESSURIZER LEVEL DEMAND, CHARGING AND LETDOWN WILL MODULATE TO RAISE LEVEL, WHICH WILL ALSO RESULT IN AN INCREASE IN PRESSURIZER PRESSURE. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" WILL BE ACTUATED AT 2310 PSIG.

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, A LOWER PRESSURIZER PROGRAM LEVEL WILL BE REQUIRED. CHARGING AND LETDOWN WILL MODULATE TO LOWER LEVEL, WHICH WILL ALSO RESULT IN A DECREASE IN PRESSURIZER PRESSURE. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" WILL BE ACTUATED AT 2210 PSIG.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY TAKING MANUAL CONTROL OF THE FAILED MASTER LEVEL CONTROLLER TO MAINTAIN PRESSURIZER LEVEL.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY T_{ave} SETPOINT CONTROLLER TO NORMAL.

ZION MALFUNCTION

CAUSE AND EFFECTS

RX23 PRESSURIZER LEVEL CHANNEL FAILURE

TYPE: GENERIC, RV 100% = 100% TRANSMITTER OUTPUT

A) PZR LEVEL CHANNEL I, 1LT-459
B) PZR LEVEL CHANNEL II, 1LT-460
C) PZR LEVEL CHANNEL III, 1LT-461

CAUSE: LEVEL TRANSMITTER FAILURE DUE TO PIPING RESTRICTIONS AND INSTRUMENT VALVE PACKING LEAKAGE

REF: 617F767 SHT 4 REV 7
22E-1-4945K & L
REACTOR PROTECTION SYSTEM DESCRIPTION
PRESSURIZER SYSTEM DESCRIPTION
DVR 22-01-88-114
M-53 REV AN
ANNUNCIATOR RESPONSE: 9-8C, 9-8D, 9-9A

PLT STA: AFFECTED CHANNEL CONTROLLING PRESSURIZER LEVEL

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED PRESSURIZER LEVEL TRANSMITTER WILL FAIL. THE VALUE OF THE TRANSMITTER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY AND WILL BE INDICATED ON THE ASSOCIATED METER AND DISPLAYED ON THE SELECTABLE RECORDER. IF THE AFFECTED TRANSMITTER IS SELECTED FOR CONTROL, INCREASING OR DECREASING PRESSURIZER LEVEL WILL RESULT DEPENDING ON THE SELECTED SEVERITY AS COMPARED TO THE INITIAL VALUE.

UNIQUE EFFECTS TO EACH INDIVIDUAL TRANSMITTER ARE AS FOLLOWS: **(ASSUMING THE LEVEL CHANNEL SELECTOR IS IN THE 459 & 460 POSITION)**

A) 1LT-459 - SENDS LEVEL ERROR SIGNAL: CHARGING FLOW CONTROL; TO TURN ON ALL BACK-UP HEATERS AT +5% DEVIATION; TO ANNUNCIATOR 9-8C AT ± 5% DEVIATION.

1LT-459 ALSO SENDS LEVEL SIGNAL: TO CLOSE LETDOWN ISOLATION VALVE 1LCV-459 AT 17%; TO CLOSE ALL ORIFICE ISOLATION VALVES AT 17%; TO DE-ENERGIZE ALL HEATERS AT 17%; TO ANNUNCIATOR 9-8D AT 17% LEVEL; TO ANNUNCIATOR 9-9A AT 5% AND 92% LEVEL; TO PZR HIGH LEVEL REACTOR TRIP LOGIC AT 92%.

B) 1LT-460 - SENDS LEVEL SIGNAL: TO CLOSE LETDOWN ISOLATION VALVE 1LCV-460 AT 17%; TO CLOSE ALL ORIFICE ISOLATION VALVES AT 17%; TO DE-ENERGIZE ALL HEATERS AT 17%; TO ANNUNCIATOR 9-8C AT 70% LEVEL; TO ANNUNCIATOR 9-8D AT < 17% LEVEL; TO ANNUNCIATOR 9-9A AT 5% AND 92% LEVEL;
TO PZR HIGH LEVEL REACTOR TRIP LOGIC AT 92%.

C) 1LT-461 - SENDS LEVEL SIGNAL: TO ANNUNCIATOR 9-9A AT 5% AND 92% LEVEL; TO PZR HIGH LEVEL REACTOR TRIP LOGIC AT 92%.THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY TRANSFERRING PRESSURIZER LEVEL CONTROL TO AN UNAFFECTED CHANNEL.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED LEVEL TRANSMITTER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX24 PRIMARY COLD LEG NARROW RANGE RTD FAILURE

TYPE: GENERIC, RV 100% = 100% RTD OUTPUT (510 - 610 ^{o}F)

A) RCS LOOP 1 (1TE 411B)
B) RCS LOOP 2 (1TE 421B)
C) RCS LOOP 3 (1TE 431B)
D) RCS LOOP 4 (1TE 441B)

CAUSE: RTD CIRCUIT FAILURE

REF: M-52 REV AE & M-53 REV AN
617F767 SHT 2 & SHT 3
22E-1-4946A THRU 22E-1-4946Q
REACTOR COOLANT SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 5-4A, 5-4B, 5-4C, 5-5A, 5-5B.

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED PRIMARY COLD LEG NARROW RANGE RTD FAILS. THE VALUE OF THE RTD OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY AND WILL BE INDICATED ON THE ASSOCIATED RECORDER ON 1CB06. THE RTD'S PROVIDE AN INPUT TO THE ΔT (WHICH ARE FED TO THE OTΔT AND OPΔT CALCULATIONS) AND T_{ave} CALCULATIONS AND ARE DISPLAYED ON THE RESPECTIVE METERS AND RECORDERS ON 1CB06. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, IT WILL RESULT IN A REDUCED ΔT AND A HIGHER T_{ave} FOR THAT LOOP. IF THE AFFECTED LOOP ΔT DECREASES TO 2 ^{o}F LESS THAN THE AUCTIONEERED HIGH ΔT, ANNUNCIATOR 5-4A "REACTOR COOLANT LOOP ΔT DEVIATION" WILL BE ACTUATED. ANNUNCIATOR 5-4C "REACTOR COOLANT LOOPS T_{AVG} DEVIATION" IS ACTUATED AT 2 ^{o}F DEVIATION FROM THE AUCTIONEERED HIGH T_{ave}. THE AUCTIONEERED HIGH T_{ave} IS USED FOR AUTOMATIC CONTROL ROD POSITIONING AND AS AN INPUT IN DETERMINING CONTROL ROD INSERTION LIMITS (AS IS THE AUCTIONEERED HIGH ΔT), STEAM DUMP CONTROL CIRCUITS AND PRESSURIZER LEVEL CONTROL CIRCUITS. THE AFFECT OF THE DECREASED ΔT WILL BE REFLECTED IN THE LOWER READINGS FOR THAT LOOP'S OTΔT AND OPΔT DISPLAYED ON 1CB06.

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, IT WILL RESULT IN AN INCREASED ΔT AND A LOWER T_{ave}. FOR THAT LOOP. IF THE AFFECTED LOOP ΔT INCREASES TO 2 F GREATER THAN THE AUCTIONEERED HIGH ΔT, ANNUNCIATOR 5-4A "REACTOR COOLANT LOOP ΔT DEVIATION" WILL BE ACTUATED. ANNUNCIATOR 5-4C "REACTOR COOLANT LOOPS T_{AVG} DEVIATION" IS ACTUATED AT 2 ^{o}F DEVIATION FROM THE AUCTIONEERED HIGH T_{ave}. IF THE REACTOR IS OPERATING AT LOW POWER, WITH A LOW HOT LEG TEMPERATURE, ANNUNCIATOR 5-4B "REACTOR COOLANT LOOPS T_{AVG} HI LOW" WILL BE ACTUATED AT 540 ^{o}F.

ZION MALFUNCTION

CAUSE AND EFFECTS

THE AFFECT OF THE INCREASED ΔT WILL BE REFLECTED IN THE HIGHER READINGS FOR THAT LOOP'S OTΔT AND OPΔT DISPLAYED ON 1CB06. IF THE MALFUNCTION SEVERITY IS DECREASED, THE OTΔT AND OPΔT OUTPUT FOR THAT LOOP MAY EXCEED THEIR SETPOINTS WITH ANNUNCIATORS 5-5A "REACTOR COOLANT LOOPS OVERPOWER ΔT TRIP ALERT" AND 5-5B "REACTOR COOLANT LOOPS OVERTEMP ΔT TRIP ALERT" BEING ACTUATED.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY DEFEATING THE AFFECTED LOOP T_{ave} AND DELTA T UTILIZING THE DEFEAT SWITCHES.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED RTD CIRCUIT TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX25 PRIMARY HOT LEG NARROW RANGE RTD FAILURE

TYPE: GENERIC, RV 100% = 100% RTD OUTPUT (530 - 630 °F)

A) RCS LOOP 1 (1TE 411A)
B) RCS LOOP 2 (1TE 421A)
C) RCS LOOP 3 (1TE 431A)
D) RCS LOOP 4 (1TE 441A)

CAUSE: RTD CIRCUIT FAILURE

REF: M-52 REV AE & M-53 REV AN
617F767 SHT 2 & SH 3
22E-1-4946A THRU 22E-1-4946Q
REACTOR COOLANT SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 5-4A, 5-4B, 5-4C, 5-5A, 5-5B.

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED PRIMARY LEG HOT LEG NARROW RANGE RTD FAILS. THE VALUE OF THE RTD OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY AND WILL BE INDICATED ON THE ASSOCIATED RECORDER ON 1CB06. THE RTD'S PROVIDE AN INPUT TO THE ΔT (WHICH ARE FED TO THE OTΔT AND OPΔT CALCULATIONS) AND T_{ave} CALCULATIONS AND ARE DISPLAYED ON THE RESPECTIVE METERS AND RECORDERS ON 1CB06. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, IT WILL RESULT IN A LARGER ΔT AND A HIGHER T_{ave} FOR THAT LOOP. IF THE AFFECTED LOOP ΔT INCREASES TO 2°F GREATER THAN THE AUCTIONEERED HIGH ΔT, ANNUNCIATOR 5- 4A "REACTOR COOLANT LOOP ΔT DEVIATION" WILL BE ACTUATED. ANNUNCIATOR 5-4C "REACTOR COOLANT LOOPS T_{AVG} DEVIATION" IS ACTUATED AT 2 °F DEVIATION FROM THE AUCTIONEERED HIGH T_{ave}. THE AUCTIONEERED HIGH T_{ave} IS USED FOR AUTOMATIC CONTROL ROD POSITIONING AND AS AN INPUT IN DETERMINING CONTROL ROD INSERTION LIMITS (AS IS THE AUCTIONEERED HIGH ΔT), STEAM DUMP CONTROL CIRCUITS AND PRESSURIZER LEVEL CONTROL CIRCUITS. IF THE REACTOR IS OPERATING AT HIGH POWER, WITH A HIGH COLD LEG TEMPERATURE, ANNUNCIATOR 5-4B "REACTOR COOLANT LOOPS T_{AVG} HI LOW" WILL BE ACTUATED AT 562°F. THE AFFECT OF THE INCREASED ΔT WILL BE REFLECTED IN THE HIGHER READINGS FOR THAT LOOP'S OTΔT AND OPΔT DISPLAYED ON 1CB06. IF THE MALFUNCTION SEVERITY IS INCREASED, THE OTΔT AND OPΔT OUTPUT FOR THAT LOOP MAY EXCEED THEIR SETPOINTS WITH ANNUNCIATORS 5-5A "REACTOR COOLANT LOOPS OVERPOWER ΔT TRIP ALERT" AND 5-5B "REACTOR COOLANT LOOPS OVERTEMP ΔT TRIP ALERT" BEING ACTUATED.

ZION MALFUNCTION

CAUSE AND EFFECTS

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, IT WILL RESULT IN AN DECREASED ΔT AND A LOWER T_{ave} FOR THAT LOOP. IF THE AFFECTED LOOP ΔT DECREASES TO 2°F LESS THAN THE AUCTIONEERED HIGH ΔT, ANNUNCIATOR 5-4A "REACTOR COOLANT LOOP ΔT DEVIATION" WILL BE ACTUATED. ANNUNCIATOR 5-4C "REACTOR COOLANT LOOPS T_{AVG} DEVIATION" IS ACTUATED AT 2°F DEVIATION FROM THE AUCTIONEERED HIGH T_{ave}. THE AFFECT OF THE DECREASED ΔT WILL BE REFLECTED IN THE LOWER READINGS FOR THAT LOOP'S OTΔT AND OPΔT DISPLAYED ON 1CB06.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY DEFEATING THE AFFECTED LOOP T_{ave} AND DELTA T UTILIZING THE DEFEAT SWITCHES.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED RTD CIRCUIT TO NORMAL.

[REV 1]

RX28 RCS LOOP FLOW TRANSMITTER FAILURE

TYPE: GENERIC, RV 100% = 100% TRANSMITTER OUTPUT

A) RCS LOOP 1 FT-414
B) RCS LOOP 1 FT-415
C) RCS LOOP 1 FT-416
D) RCS LOOP 2 FT-444
E) RCS LOOP 2 FT-445
F) RCS LOOP 2 FT-446
G) RCS LOOP 3 FT-424
H) RCS LOOP 3 FT-425
I) RCS LOOP 3 FT-426
J) RCS LOOP 4 FT-434
K) RCS LOOP 4 FT-435
L) RCS LOOP 4 FT-436

CAUSE: FAULTY TRANSMITTER

REF: M-52 REV AE
M-53 REV AN
REACTOR COOLANT SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 6-2C, 6-2D, 9-2A, 9-2B, 9-2C, 9-2D.

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED REACTOR COOLANT LOOP FLOW TRANSMITTER WILL FAIL. THE VALUE OF THE TRANSMITTER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY AND WILL BE INDICATED ON THE ASSOCIATED METER ON 1CB06. WHEN THE SELECTED SEVERITY IS DECREASED TO LESS THAN 90% FLOW, ANNUNCIATOR 9-2A/B/C/D "REACTOR COOLANT LOOP A/B/C/D FLOW LOW OR RCP-1A/1B/1C/1D BKR TRIP" WILL BE ACTUATED. IF TWO GENERICS FROM THE SAME LOOP ARE DECREASED BELOW 90% FLOW WITH REACTOR POWER GREATER THAN 60%, ANNUNCIATOR 6-2C "ONE LOOP LOW FLOW OR ACB OPEN REACTOR TRIP" WILL ACTUATE AND THE REACTOR WILL TRIP. IF TWO GENERICS FROM THE SAME LOOP FOR TWO LOOPS ARE DECREASED BELOW 90% FLOW WITH REACTOR/TURBINE POWER GREATER THAN 10%, ANNUNCIATOR 6-2D "TWO LOOP LOW FLOW OR ACB OPEN REACTOR TRIP" WILL ACTUATE AND THE REACTOR WILL TRIP.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED LOOP FLOW TRANSMITTER TO NORMAL.

[REV 1]

RX29 OVERPOWER DELTA T SET POINT FAILURE

TYPE: GENERIC, RV 100% = 150% SETPOINT

A) OPDT CHANNEL A
B) OPDT CHANNEL B
C) OPDT CHANNEL C
D) OPDT CHANNEL D

CAUSE: CARD FAILURE

REF: REACTOR PROTECTION SYSTEM DESCRIPTION
REACTOR COOLANT SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 5-5A, 6-2A

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED OVERPOWER DELTA T SETPOINT WILL FAIL. THE VALUE OF THE SETPOINT, AS INDICATED ON 1TR-411 (1CB06), WILL BE DETERMINED BY THE SELECTED SEVERITY. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, THE PLANT WILL BE FURTHER FROM A OPΔT ROD WITHDRAWAL BLOCK, RUNBACK OR REACTOR TRIP ON THAT CHANNEL. IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, THE PLANT WILL BE CLOSER TO A OPΔT RUNBACK OR REACTOR TRIP ON THAT CHANNEL. ANNUNCIATOR 5-5A "REACTOR COOLANT LOOPS OVERPOWER ΔT TRIP ALERT" IS ACTUATED WHEN THE VARIABLE SETPOINT IS EXCEEDED IN ONE LOOP. USING TWO GENERICS, IF THE OVERPOWER ΔT VALUES OF TWO LOOPS EXCEED THE DECREASED SETPOINTS, ANNUNCIATOR 6-2A "OVER POWER ΔT REACTOR TRIP" WILL ACTUATE AND THE REACTOR WILL TRIP.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED CARD TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX30 OVERTEMPERATURE DELTA T SET POINT FAILURE

TYPE: GENERIC, RV 100% = 150% SETPOINT

A) OTDT CHANNEL A
B) OTDT CHANNEL B
C) OTDT CHANNEL C
D) OTDT CHANNEL D

CAUSE: CARD FAILURE

REF: REACTOR PROTECTION SYSTEM DESCRIPTION
REACTOR COOLANT SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 5-5B, 6-2B.

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED OVERTEMPERATURE ΔT SETPOINT WILL FAIL. THE VALUE OF THE SETPOINT, AS INDICATED ON 1TR-411 (1CB06), WILL BE DETERMINED BY THE SELECTED SEVERITY. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, THE PLANT WILL BE FURTHER FROM A OTΔT ROD WITHDRAWAL BLOCK, RUNBACK OR REACTOR TRIP ON THAT CHANNEL. IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, THE PLANT WILL BE CLOSER TO A OTΔT RUNBACK OR REACTOR TRIP ON THAT CHANNEL. ANNUNCIATOR 5-5B "REACTOR COOLANT LOOPS OVERTEMP ΔT TRIP ALERT" IS ACTUATE WHEN THE VARIABLE SETPOINT IS EXCEEDED IN ONE LOOP. USING TWO GENERICS, IF THE OVERTEMPERATURE ΔT VALUES OF TWO LOOPS EXCEED THE DECREASED SETPOINTS, ANNUNCIATOR 6-2B "OVER TEMP ΔT REACTOR TRIP" WILL ACTUATE AND THE REACTOR WILL TRIP.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED CARD TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX34 STEAM DUMP VALVES I/P CONTROLLER FAILS

TYPE: DISCRETE, RV 100% = ALL VALVE GROUPS FULLY OPEN

CAUSE: I/P CONTROLLER FAILURE

REF: M-21 SHT 1 REV 5
5653D30 SHT 10 REV 5
STEAM DUMP CONTROL SYSTEM DESCRIPTION

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE WILL BE NO NOTICEABLE EFFECT UNTIL AN ARMING SIGNAL IS PRESENT. WHEN AN ARMING SIGNAL OCCURS (C-7, C-8, SP WITH CONDENSER AVAILABLE), THE STEAM DUMPS WOULD OPEN TO THE SELECTED SEVERITY. THE I/P CONTROLLER WILL SEND A FAULTY AIR SIGNAL PROPORTIONAL TO THE SEVERITY TO THE STEAM DUMP VALVES. IF THE MALFUNCTION SEVERITY IS FAILED LOW (0), THE STEAM DUMP VALVES WILL NOT OPEN AS REQUIRED ON A TURBINE TRIP OR LOAD REJECT CONDITION CAUSING RCS TEMPERATURES TO INCREASE. THIS MALFUNCTION HOWEVER DOES NOT AFFECT THE OPERATION OF THE HIGH/HIGH-HIGH BISTABLES, IF THE BISTABLE SETPOINTS ARE REACHED, THE AFFECTED GROUPS (1+2 FOR HIGH BISTABLES, 1,2,3+4 FOR HIGH-HIGH BISTABLES) WOULD GET A FULL OPEN SIGNAL, AND FULLY CLOSE WHEN THE BISTABLE RESETS. THE STEAM GENERATOR ATMOSPHERIC RELIEFS/SAFETY VALVES WILL OPEN TO LOWER THE RCS TEMPERATURES. IF THE MALFUNCTION SEVERITY IS GREATER THAN ZERO, THE STEAM DUMP VALVES WILL MODULATE OPEN TO THE SELECTED SEVERITY IF AN ARMING SIGNAL IS PRESENT, RESULTING IN A DECREASE IN RCS TEMPERATURES. IF THE P-12 SETPOINT IS REACHED, THE STEAM DUMPS WOULD CLOSE. ANY ATTEMPT BY THE OPERATOR TO MANUALLY CONTROL THE STEAM DUMP VALVES, WHILE THIS MALFUNCTION IS ACTIVE, IS INEFFECTIVE. THE OPERATOR MAY LIMIT THE SEVERITY OF FAILED OPEN STEAM DUMPS BY TAKING ONE OR BOTH STEAM DUMP INTERLOCK SELECTOR SWITCHES TO THE OFF POSITION.

MALFUNCTION REMOVAL WILL RESTORE THE I/P CONTROLLER TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

RX36 ROD CONTROL T-REF FAILURE

TYPE: DISCRETE, RV 100% = 565 °F (0 = 547 °F)

CAUSE: T_{ref} PROGRAMMER FAILS

REF: ROD CONTROL SYSTEM DESCRIPTION
5653D30 SHT9 REV 5
ANNUNCIATOR RESPONSE: 5-4B, 5-4C.

PLT STA: REACTOR OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE T_{ref} PROGRAMMER FAILS. THE VALUE OF THE T_{ref} PROGRAMMER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, WITH THE ROD CONTROL SYSTEM IN AUTOMATIC, THE CONTROL RODS WILL BEGIN TO WITHDRAW TO RAISE T_{ave} TO THE HIGHER T_{ref} SETPOINT. IF THE DEVIATION BETWEEN AUCTIONEERED HIGH T_{ave} AND T_{ref} REACHES 3 °F, ANNUNCIATOR 5-4C "REACTOR COOLANT LOOPS T_{AVG} DEVIATION" WILL BE ACTUATED. IF THE MALFUNCTION SEVERITY IS GREAT ENOUGH AND THE CONTROL RODS ARE WITHDRAWN SUFFICIENTLY TO RAISE T_{ave} TO 562 °F, ANNUNCIATOR 5-4B "REACTOR COOLANT LOOPS T_{AVG} HI LOW" WILL ACTUATE.

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, WITH THE ROD CONTROL SYSTEM IN AUTOMATIC, THE CONTROL RODS WILL BEGIN TO INSERT TO LOWER T_{ave} TO THE LOWER T_{ref} SETPOINT. IF THE DEVIATION BETWEEN AUCTIONEERED HIGH T_{ave} AND T_{ref} REACHES 3 °F, ANNUNCIATOR 5-4C "REACTOR COOLANT LOOPS T_{AVG} DEVIATION" WILL BE ACTUATED. IF THE MALFUNCTION SEVERITY IS LOW ENOUGH AND THE CONTROL RODS ARE INSERTED SUFFICIENTLY TO LOWER T_{ave} TO 540 °F, ANNUNCIATOR 5-4B "REACTOR COOLANT LOOPS T_{AVG} HI LOW" WILL ACTUATE.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY CONTROLLING THE ROD CONTROL SYSTEM IN MANUAL TO MAINTAIN REACTOR COOLANT SYSTEM TEMPERATURES.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED T_{ref} PROGRAMMER TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

SI01 SAFETY INJECTION PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) SAFETY INJECTION PUMP 1A
B) SAFETY INJECTION PUMP 1B

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-64 REV AB
22E-1-4840 SI1 REV M
22E-1-4840 SI2 REV M
ANNUNCIATOR RESPONSE: 4-1A

PLT STA: AFFECTED SAFETY INJECTION PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED SAFETY INJECTION PUMP BREAKER WILL TRIP. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 4-1A "SAFETY INJ PUMPS TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. PUMP DISCHARGE PRESSURE, AS INDICATED ON 1PI-SI923/935 (1CB10) AND, IF NOT RECIRCING BACK TO THE RWST, FLOW, AS INDICATED ON 1FI-SI922/932 (1CB10), WILL DECREASE TO ZERO.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

SI03 SI ACCUMULATOR LOW LEVEL

TYPE: GENERIC, RV 100% = 100% VALVE CAPACITY

A) ACCUMULATOR TANK 1A
B) ACCUMULATOR TANK 1B
C) ACCUMULATOR TANK 1C
D) ACCUMULATOR TANK 1D

CAUSE: DRAIN VALVE LEAKAGE

REF: M-65 REV AF
ANNUNCIATOR RESPONSE: 1-4A/B/C/D, 1-3A/B/C/D

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED ACCUMULATOR TANK DRAIN VALVE WILL BEGIN TO LEAK OUT OF THE SELECTED SI ACCUMULATOR AND INTO THE REACTOR COOLANT DRAIN TANK. THE RATE OF LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY. THE MASS ACCUMULATING IN THE REACTOR COOLANT DRAIN TANK WILL CAUSE THE LEVEL PPC POINT TO INCREASE. THE WATER DRAINAGE WILL RESULT IN ACCUMULATOR LEVEL, AS INDICATED ON 1LI-SI950,951/956,857/952,953/954,955 (1CB10) DECREASING AT THE SELECTED SEVERITY RATE. ANNUNCIATOR 1-4A/B/C/D "ACCUMULATOR TANK 1A/1B/1C/1D LEVEL HIGH LOW" WILL BE ACTUATED AT 74.8%. THE DECREASE IN ACCUMULATOR LEVEL WILL CAUSE A DECREASE IN THE AFFECTED ACCUMULATOR PRESSURE, AS INDICATED ON 1PI-SI960,961/966,967/962,963/964,965 (1CB10). ANNUNCIATOR 1-3A/B/C/D "ACCUMULATOR TANK 1A/1B/1C/1D PRESSURE HIGH LOW" WILL BE ACTUATED AT 625 PSIG. IF A LARGE BREAK LOCA, WHICH WOULD DUMP THE ACCUMULATORS, OCCURS DURING THIS MALFUNCTION, THE AFFECTED ACCUMULATOR WILL DISCHARGE LESS WATER INTO THE REACTOR COOLANT SYSTEM THAN THE OTHER ACCUMULATORS.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE AFFECTED DRAIN VALVE TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

SW01 SERVICE WATER PUMP TRIPS/FAILS TO START

TYPE: GENERIC, RB

A) SERVICE WATER PUMP 1A
B) SERVICE WATER PUMP 1B
C) SERVICE WATER PUMP 1C

CAUSE: FAULTY (450) OVERCURRENT RELAY

REF: M-32 SHT 1 REV AD
22E-1-4840 SW1 REV W
22E-1-4840 SW2 REV V
22E-1-4840 SW3 REV V
ANNUNCIATOR RESPONSE: 2-8A, 2-6D

PLT STA: SELECTED SERVICE WATER PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED SERVICE WATER PUMP BREAKER WILL TRIP. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 2-8A "SERVICE WATER PUMPS TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. SERVICE WATER HEADER PRESSURES, AS INDICATED ON 1PI-SW17/107 (1CB08), DECREASES TO THE PRESSURE SUPPLIED BY THE OTHER OPERATING PUMP(S). IF AUXILIARY BUILDING PRESSURE DECREASES TO 75 PSIG OR TURBINE BUILDING PRESSURE DECREASES TO 60 PSIG, ANNUNCIATOR 2-6D "SERVICE WATER HEADER PRESS LOW OR SW PUMP AUTO START" ACTUATES WITH THE SERVICE WATER PUMPS AUTO STARTING AS FOLLOWS:

AT 75 PSIG - PUMP 1A STARTS
AT 70 PSIG - PUMP 1B STARTS
AT 65 PSIG - PUMP 1C STARTS

THE OPERATOR MAY RESET THE ANNUNCIATOR AND THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

SW02 SERVICE WATER BOOSTER PUMP TRIPS/FAILS TO START

TYPE: GENERIC, RB

A) SERVICE WATER BOOSTER PUMP 0A
B) SERVICE WATER BOOSTER PUMP 0B

CAUSE: FAULTY 239LSX RELAY

REF: M-43 REV WY
22E-0-4840 SW1
22E-0-4840 SW2
PLANT FIRE PROTECTION SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 23-8F, 23-9F

PLT STA: SELECTED SERVICE WATER BOOSTER PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED SERVICE WATER BOOSTER PUMP BREAKER WILL TRIP. ANNUNCIATOR 23-8F "SERVICE WATER BOOSTER PMP TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. SERVICE WATER BOOSTER DISCHARGE HEADER PRESSURE DECREASES. ANNUNCIATOR 23-9F "SERVICE WATER BOOSTER PUMP AUTO START" IS ACTUATED WHEN PUMP DISCHARGE PRESSURE DECREASES TO < 120 PSIG.

THE OPERATOR MAY RESET THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE OVERCURRENT RELAY TO NORMAL OPERATION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

SW04 LOSS OF SERVICE WATER COOLING TO DIESEL GENERATOR

TYPE: DISCRETE, RO

CAUSE: OMOV-SW0007 AND OMOV-SW0008 FAIL CLOSED

REF: M-32 SHT 2 REV AW
22E-0-4840 SW9 REV E
22E-0-4840 SW10 REV F
ANNUNCIATOR RESPONSE: 17/18/19-4B, 17/18/19-3A, 23-4E

PLT STA: ISOLATION VALVES ORIGINALLY OPEN

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT, OTHER THAN THE INDICATING LAMPS CHANGING AS THE VALVES CLOSE WHICH RESULTS IN A COMPLETE LOSS OF SERVICE WATER COOLING TO ALL DIESEL GENERATORS. WHEN A DIESEL GENERATOR IS STARTED, EITHER AUTOMATICALLY OR FOR SURVEILLANCE, THE DIESEL GENERATOR TEMPERATURES WILL INCREASE RAPIDLY DUE TO THE LACK OF SERVICE WATER COOLING. ANNUNCIATOR 17/18/19-3A "DIESEL GENERATOR 1B/1A/0 TROUBLE AND FAIL TO START" WILL ACTUATE AT JACKET WATER HIGH TEMPERATURE OF 185 °F WITH A DIESEL GENERATOR TRIP AT 205 °F IF NO SAFETY INJECTION OR UNDERVOLTAGE SIGNAL IS PRESENT.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY MANUALLY OPENING THE FIRE SYSTEM BACKUP COOLING WATER SUPPLY ISOLATION VALVE FOR THE AFFECTED DIESEL GENERATOR(S).

MALFUNCTION REMOVAL WILL RESTORE THE FAILED CLOSED VALVES, OMOV-SW0007 AND OMOV-SW0008, TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

SW06 SERVICE WATER SYSTEM BREAK

TYPE: DISCRETE, NRVI 100% = 48" BREAK AT NOP

CAUSE: PIPE BREAK ON 48" DISCHARGE HEADER PIPE
(DOWNSTREAM OF DISCHARGE STRAINERS)

REF: M-32 SHT 1 REV AD
ANNUNCIATOR RESPONSE: 2-6D, 12-1E

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SERVICE WATER SYSTEM WILL BEGIN TO LOSE MASS TO THE CRIB HOUSE. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. DISCHARGE HEADER PRESSURE, AS INDICATED ON 1PI-SW17 (1CB08), WILL DECREASE. ANNUNCIATOR 2-6D "SERVICE WATER HEADER PRESS LOW OR SW PUMP AUTO START" ACTUATES IF AUXILIARY BUILDING PRESSURE DECREASES TO 75 PSIG OR TURBINE BUILDING PRESSURE DECREASES TO 60 PSIG, WITH THE SERVICE WATER PUMPS AUTO STARTING AS FOLLOWS:

AT 75 PSIG - PUMP 1A STARTS
AT 70 PSIG - PUMP 1B STARTS
AT 65 PSIG - PUMP 1C STARTS

AS THE SELECTED SEVERITY INCREASES, COMPONENTS COOLED BY THE SERVICE WATER SYSTEM WILL BEGIN TO HEAT UP DUE TO REDUCED COOLING FLOW. ANNUNCIATOR 12-1E "CRIB HOUSE SUMP LEVEL HIGH" IS ACTUATED AT 538' WHEN THE RATE OF MASS ACCUMULATION IN THE CRIB HOUSE EXCEEDS THE FLOW RATE OF THE CRIB HOUSE SUMP PUMPS.

AT ELEVATED SEVERITIES, THE LOSS OF COOLING TO SERVICE WATER LOADS WILL RESULT IN INCREASED TEMPERATURES THROUGHOUT THOSE COMPONENTS AND IN THE CASE OF THE COMPONENT COOLING SYSTEM, THEIR SUBSEQUENT LOADS.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

SW07 SERVICE WATER BREAK AFTER RCFC HEAT EXCHANGER

TYPE: GENERIC, RV 100% = 10" PIPE BREAK @ NOP

A) RCFC HEAT EXCHANGER 1A
B) RCFC HEAT EXCHANGER 1B
C) RCFC HEAT EXCHANGER 1C
D) RCFC HEAT EXCHANGER 1D
E) RCFC HEAT EXCHANGER 1E

CAUSE: PIPING FAILURE IMMEDIATELY AFTER RCFC HEAT EXCHANGER

REF: M-32 SHT 2 REV AW

PLT STA: SELECTED RCFC HEAT EXCHANGER IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SERVICE WATER SYSTEM WILL BEGIN TO LOSE MASS INTO CONTAINMENT. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. CONTAINMENT HUMIDITY (SLIGHTLY) AND SUMP LEVELS WILL INCREASE AT A RATE DEPENDENT UPON THE SELECTED MALFUNCTION SEVERITY. THE ADDITION OF COOLER SERVICE WATER TO THE CONTAINMENT ATMOSPHERE AND THE INCREASED SERVICE WATER FLOW THROUGH THE AFFECTED HEAT EXCHANGER WILL CAUSE CONTAINMENT TEMPERATURES TO DECREASE.

MALFUNCTION REMOVAL WILL ONLY RESTORE THE SERVICE WATER PIPING INTEGRITY.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TC02 TURBINE MANUAL TRIP FAILURE

TYPE: DISCRETE, RB

CAUSE: STICKY TURBINE TRIP BLOCK MECHANISM

REF: DVR 22-1-86-087
DVR 22-2-88-039
M-530 SHT 4 REV D
ANNUNCIATOR RESPONSE: 6-7E

PLT STA: TURBINE OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT. WHEN THE OPERATOR ATTEMPTS TO MANUALLY TRIP THE MAIN TURBINE, THE TURBINE WILL NOT TRIP. IF A SIGNAL IS RECEIVED WHICH WOULD CAUSE AN AUTOMATIC TURBINE TRIP, THE TURBINE WILL TRIP.

MALFUNCTION REMOVAL WILL RESTORE THE MANUAL TURBINE TRIP TO NORMAL.

[REV 1]

TC03 EH PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) EHC PUMP 1A
B) EHC PUMP 1B

CAUSE: FAULTY OL CONTACTS FAIL OPEN

REF: TURBINE CONTROL SYSTEM DESCRIPTION
M-530 SHT 4 REV D
22E-1-4840 EH1 REV C
22E-1-4840 EH2 REV C
ANNUNCIATOR RESPONSE: 13-6B

PLT STA: SELECTED EHC PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED EHC PUMP BREAKER WILL TRIP. ANNUNCIATOR 13-6B "EHC FLUID PUMP TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. THE STANDBY EHC PUMP WILL AUTO START AT 1350 PSIG DISCHARGE PRESSURE, MAINTAINING NORMAL TURBINE OPERATION.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY OL CONTACTS TO NORMAL OPERATION.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

TC05 EHC IMPULSE PRESSURE CHANNEL (MS-24) FAILURE

TYPE: DISCRETE, RV 100% = 500 PSIG

CAUSE: PRESSURE TRANSDUCER FAILURE

REF: EHC GOV CONTROL BOOK 1TP 090c.02.02
TURBINE CONTROL SYSTEM DESCRIPTION

PLT STA: TURBINE OPERATING AT POWER, TURBINE CONTROL IN THE "IMP IN" MODE

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, EHC IMPULSE PRESSURE TRANSDUCER MS-24 FAILS. THE VALUE OF THE TRANSDUCER OUTPUT WILL BE DETERMINED BY THE SELECTED SEVERITY. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, WITH TURBINE CONTROL IN THE "IMP IN" MODE, THE TURBINE GOVERNOR VALVES WILL CLOSE TO DECREASE THE APPARENTLY INCREASED TURBINE IMPULSE PRESSURE BACK TO THE MAINTAINED PRESSURE. THIS WILL RESULT IN DECREASED GENERATOR MEGAWATT OUTPUT AND INCREASED REACTOR COOLANT SYSTEM TEMPERATURES WHICH WILL CAUSE THE CONTROL RODS TO DRIVE IN TO LOWER THE ELEVATED TEMPERATURES.

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, WITH TURBINE CONTROL IN THE "IMP IN" MODE, THE TURBINE GOVERNOR VALVES WILL OPEN TO INCREASE THE APPARENTLY DECREASED TURBINE IMPULSE PRESSURE BACK TO THE MAINTAINED PRESSURE. THIS WILL RESULT IN INCREASED GENERATOR MEGAWATT OUTPUT AND DECREASED REACTOR COOLANT SYSTEM TEMPERATURES WHICH WILL CAUSE THE CONTROL RODS TO WITHDRAW TO RAISE THE LOWERED TEMPERATURES.

NOTE : A STEP CHANGE MALFUNCTION INSERTION AT A LOW SEVERITY WILL CAUSE THE GOVERNOR VALVES TO OPEN FULLY RESULTING IN A TRIP SIGNAL BEING GENERATED ON P-14 OR LOW-LOW STEAM GENERATOR LEVEL

MALFUNCTION REMOVAL WILL RESTORE THE FAILED PRESSURE TRANSDUCER TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TC08 EHC AUX SPEED CHANNEL FAILURE

TYPE: DISCRETE, RV 100% = 2500 RPM

CAUSE: CALIBRATION ERROR

REF: EHC GOV CONTROL BOOK 1TP 090c.02.02

PLT STA: TURBINE OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE EHC AUX SPEED CHANNEL WILL FAIL. THE VALUE OF THE SPEED SIGNAL WILL BE DETERMINED BY THE SELECTED SEVERITY AND IS USED TO INDICATE TURBINE SPEED ON THE TURBINE SPEED METER ON 1CB03. IF THE SELECTED SEVERITY IS GREATER THAN THE INITIAL VALUE, THE INDICATED TURBINE SPEED WILL BE GREATER THAN THE ACTUAL SPEED. THE OPERATOR MAY HAVE A CONCERN OF OVERSPEEDING THE TURBINE WHEN ACTUAL TURBINE SPEED IS FAR BELOW THE OVERSPEED SETPOINT.

IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALUE, THE INDICATED TURBINE SPEED WILL BE LESS THAN THE ACTUAL SPEED. IF THE OPERATOR IS INCREASING TURBINE SPEED RELYING ON THE INDICATED SPEED, THE ACTUAL SPEED MAY EXCEED THE 103% OPC SETTING.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED EHC AUX SPEED CHANNEL TO NORMAL.

[REV 0]

ZION MALFUNCTION

CAUSE AND EFFECTS

TC13 LOAD REJECTION

TYPE: DISCRETE, RV 100% = COMPLETE LOAD REJECTION

CAUSE: VALVE POSITION LIMITER FAILURE

REF: AC ELECTRICAL POWER SYSTEM DESCRIPTION
STEAM DUMP CONTROL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 6-3A

PLT STA: TURBINE OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE VALVE POSITION LIMITER WILL FAIL WHICH RESULTS IN A LOAD REJECTION. THE MAGNITUDE OF THE LOAD REJECTION IS DETERMINED BY THE SELECTED SEVERITY. AS MALFUNCTION SEVERITY INCREASES, THE VALVE POSITION LIMITER POSITION DECREASES, WHICH DECREASES STEAM FLOW THROUGH THE MAIN TURBINE REDUCING GENERATOR MEGAWATT OUTPUT. THE DECREASED HEAT REMOVAL RATE WILL CAUSE PRIMARY PRESSURE AND TEMPERATURE TO INCREASE AT A RATE PROPORTIONAL TO THE SELECTED SEVERITY. THE STEAM DUMP SYSTEM LOAD REJECTION CONTROLLER WILL ALLOW THE STEAM DUMPS TO LIMIT THE RCS TEMPERATURE AND PRESSURE INCREASE. WHEN THE SELECTED SEVERITY IS SUFFICIENT TO CAUSE ANNUNCIATOR 6-3A "PRESSURIZER PRESSURE HIGH REACTOR TRIP" TO ACTUATE AT > 2385 PSIG, THE REACTOR/PLANT WILL TRIP.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED VALVE POSITION LIMITER TO NORMAL.

[REV 1]

TC14 HP TURBINE STOP VALVE FAILURE

TYPE: GENERIC, RV 100% = VALVE FULLY OPEN

A) HP TURBINE STOP VALVE 1
B) HP TURBINE STOP VALVE 2
C) HP TURBINE STOP VALVE 3
D) HP TURBINE STOP VALVE 4

CAUSE: HYDRAULIC LOCK

REF: MAIN TURBINE AND REHEATERS SYSTEM DESCRIPTION
TURBINE CONTROL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 13-1D

PLT STA: TURBINE OPERATING AT POWER

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED HP TURBINE STOP VALVE FAILS. THE VALVE POSITION WILL BE DETERMINED BY THE SELECTED SEVERITY. IF THE SELECTED SEVERITY IS LESS THAN THE INITIAL VALVE POSITION, THE THROTTLING EFFECT OF THE STOP VALVE CLOSURE WILL BE COUNTERED BY THE GOVERNOR VALVE(S) OPENING WHILE IN THE "IMP IN" MODE. IN THE "IMP OUT" MODE, THE STOP VALVE CLOSURE WILL RESULT IN A DECREASE IN GENERATOR MEGAWATT OUTPUT AND AN INCREASE IN REACTOR COOLANT SYSTEM PRESSURE AND TEMPERATURE. ANNUNCIATOR 13-1D "LOW AUTO-STOP OIL PRESS OR TURBINE STOP VLVS CLOSED" WILL BE ACTUATED WHEN A SINGLE TURBINE STOP VALVE IS FULLY CLOSED. IF THE SELECTED SEVERITY IS ANY VALUE GREATER THAN FULLY CLOSED, ANY PERMISSIVE WHICH REQUIRES 4 OF 4 TURBINE STOP VALVES FULLY CLOSED, WILL NOT BE SATISFIED WHILE THIS MALFUNCTION IS ACTIVE. IF THE AFFECTED STOP VALVE IS OPENED, WHEN IT WOULD NORMALLY BE CLOSED, THERE IS NO NOTICEABLE EFFECT OTHER THAN THE OPEN LAMP ILLUMINATING.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED HP TURBINE STOP VALVE TO NORMAL.

[REV 1]

THO2 REACTOR COOLANT PUMP SHAFT BREAK

TYPE: GENERIC, NRB

A) REACTOR COOLANT PUMP 1A
B) REACTOR COOLANT PUMP 1B
C) REACTOR COOLANT PUMP 1C
D) REACTOR COOLANT PUMP 1D

CAUSE: MECHANICAL FAILURE OF RCP SHAFT

REF. M-52 REV AE
M-53 REV AN
ANNUNCIATOR RESPONSE: 9-2A/B/C/D; 6-2C

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED REACTOR COOLANT PUMP SHAFT WILL BREAK. THE AFFECTED PUMP AMPS, AS INDICATED ON 1CB06, WILL DECREASE AFTER INITIALLY SPIKING. THE ASSOCIATED REACTOR COOLANT LOOP FLOW, AS INDICATED ON 1FI-414,415,416/444,445,446/424, 425,426/434,435,436 (1CB06), WILL DECREASE TO ZERO THEN INCREASE AS LOOP FLOW REVERSES DUE TO THE REMAINING OPERATING REACTOR COOLANT PUMPS. THE ASSOCIATED LOOP TEMPERATURES WILL GO TO T-COLD FOR THE OPERATING LOOPS AS THE AFFECTED LOOP FLOW REVERSES. WHEN THE ASSOCIATED LOOP FLOW DECREASES TO < 90% FLOW, ANNUNCIATOR 9-2A/B/C/D "REACTOR COOLANT LOOP A/B/C/D FLOW LOW OR RCP 1-A/B/C/D BKR TRIP" WILL BE ACTUATED. IF 2 OF 4 POWER RANGE NUCLEAR INSTRUMENTS ARE > 60% POWER, WITH < 90% FLOW ON ONE LOOP, ANNUNCIATOR 6-2C "ONE LOOP LOW FLOW OR ACB OPEN REACTOR TRIP" WILL ACTUATE AND A REACTOR TRIP WILL OCCUR.

THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TH04 STEAM GENERATOR TUBE LEAK

TYPE: GENERIC, NRVI 100% = 5000 GPM @ 1200 PSID

A) STM GEN 1A
B) STM GEN 1B
C) STM GEN 1C
D) STM GEN 1D

CAUSE: TUBE FAILURE AT INLET TUBE SHEET

REF: M-52 REV AE
M-53 REV AN
AOP-1.2
ANNUNCIATOR RESPONSE: 10-2A/B/C/D, 9-8B, 9-8C

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED STEAM GENERATOR TUBES WILL LEAK. THE RATE OF MASS LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY AND THE RELATIVE DIFFERENTIAL PRESSURE ACROSS THE STEAM GENERATOR U-TUBES. THE AFFECTED STEAM GENERATOR ACTIVITY, LEVEL AND TO A SMALLER DEGREE PRESSURE, WILL INCREASE AT A RATE PROPORTIONAL TO THE INPUT SEVERITY. ANNUNCIATOR 10-2A/B/C/D "STEAM GENERATOR LOOP A/B/C/D LEVEL DEVIATION" IS ACTUATED AT 5% DEVIATION FROM PROGRAM LEVEL. FEEDWATER FLOW TO THE AFFECTED STEAM GENERATOR WILL DECREASE AS THE STEAM GENERATOR LEVEL CONTROL SYSTEM COMPENSATES FOR THE PRIMARY IN LEAKAGE. PRESSURIZER PRESSURE AND LEVEL WILL DECREASE AT A RATE PROPORTIONAL TO THE SELECTED SEVERITY, WITH ANNUNCIATORS 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" AND 9-8C "PRESSURIZER CONTROL LEVEL HIGH LOW" ACTUATING WHEN THEIR RESPECTIVE SETPOINTS ARE REACHED. THE AIR EJECTOR EXHAUST HEADER RAD MONITOR, 1RE-0015, THE STEAM GENERATOR BLOWDOWN MONITOR, 1RE-0019, AND THE ASSOCIATED EBERLINE MAIN STEAM LINE MONITOR, 1RE-PR58/59/60/61, WILL INDICATE THE RADIOACTIVITY TRANSPORT. AS MALFUNCTION SEVERITY INCREASES, THE FEED FLOW TO STEAM FLOW MISMATCH AND THE SECONDARY ACTIVITY LEVELS WILL INCREASE.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

TH05 HOT LEG LOCA

TYPE: GENERIC, NRVI 100% = 29" PIPE BREAK @ NOP

A) HOT LEG LOOP 1
B) HOT LEG LOOP 2
C) HOT LEG LOOP 3
D) HOT LEG LOOP 4

CAUSE: PIPE FAILURE AT REACTOR VESSEL NOZZLE

REF: M-52 REV AE
M-53 REV AN
ANNUNCIATOR RESPONSE: 6-3B, 6-3D, 3-5B, 3-5A, 3-5C, 10-2E

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, LEAKAGE OF REACTOR COOLANT TO THE CONTAINMENT ATMOSPHERE FROM THE SELECTED REACTOR COOLANT LOOP HOT LEG WILL RESULT. THE RATE OF MASS LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY. CONTAINMENT AIRBORNE ACTIVITY LEVELS WILL INCREASE. CONTAINMENT TEMPERATURE, MOISTURE LEVELS, ACTIVITY LEVELS, AREA RADIATION LEVELS AND SUMP LEVELS WILL INCREASE DEPENDENT UPON THE SELECTED SEVERITY. PRESSURIZER PRESSURE AND LEVEL WILL DECREASE AT A RATE PROPORTIONAL TO THE INPUT SEVERITY. AT HIGHER SEVERITIES THE REACTOR COOLANT SYSTEM WILL RAPIDLY DEPRESSURIZE AND FLASH TO THE CONTAINMENT. THIS WILL RESULT IN A REACTOR/PLANT TRIP WITH A SAFETY INJECTION ACTUATION, WHICH GENERATES SUBSEQUENT SAFEGUARDS INITIATION SIGNALS, AND PHASE B CONTAINMENT ISOLATION AND CONTAINMENT SPRAY ACTUATION OCCURRING. AS THE REACTOR COOLANT SYSTEM BLOWS DOWN TO CONTAINMENT, THE REACTOR COOLANT PUMPS WILL CAVITATE WITH THE SAFETY INJECTION ACCUMULATORS, AND THE CHARGING, SAFETY INJECTION AND RHR PUMPS ADDING MASS TO THE SYSTEM TO REFLOOD THE CORE. A PORTION OF THE FLUID INJECTED TO THE AFFECTED LOOP WILL SPILL OUT THE BREAK RATHER THAN PASSING THROUGH THE CORE.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TH06 COLD LEG LOCA

TYPE: GENERIC, NRVI 100% = 27.5" PIPE BREAK @ NOP

A) COLD LEG LOOP 1
B) COLD LEG LOOP 2
C) COLD LEG LOOP 3
D) COLD LEG LOOP 4

CAUSE: PIPE FAILURE AT REACTOR VESSEL NOZZLE

REF: M-52 REV AE
M-53 REV AN
ANNUNCIATOR RESPONSE: 6-3B, 6-3D. 3-5B, 3-5A, 3-5C, 10-2E

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, LEAKAGE OF REACTOR COOLANT TO THE CONTAINMENT ATMOSPHERE FROM THE SELECTED REACTOR COOLANT LOOP COLD LEG WILL RESULT. THE RATE OF MASS LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY. CONTAINMENT AIRBORNE ACTIVITY LEVELS WILL INCREASE. CONTAINMENT TEMPERATURE, MOISTURE LEVELS, ACTIVITY LEVELS, AREA RADIATION LEVELS AND SUMP LEVELS WILL INCREASE DEPENDENT UPON THE SELECTED SEVERITY. PRESSURIZER PRESSURE AND LEVEL WILL DECREASE AT A RATE PROPORTIONAL TO THE INPUT SEVERITY. AT HIGHER SEVERITIES THE REACTOR COOLANT SYSTEM WILL RAPIDLY DEPRESSURIZE AND FLASH TO THE CONTAINMENT. THIS WILL RESULT IN A REACTOR/PLANT TRIP WITH A SAFETY INJECTION ACTUATION, WHICH GENERATES SUBSEQUENT SAFEGUARDS INITIATION SIGNALS, AND PHASE B CONTAINMENT ISOLATION AND CONTAINMENT SPRAY ACTUATION OCCURRING. THE INITIAL CORE HEAT UP WILL BE FASTER THAN IN THE CASE OF AN EQUAL SIZED HOT LEG BREAK DUE TO DECREASED COOLING FLOW RETURNING THROUGH THE CORE. AS THE REACTOR COOLANT SYSTEM BLOWS DOWN TO CONTAINMENT, THE REACTOR COOLANT PUMPS WILL CAVITATE WITH THE SAFETY INJECTION ACCUMULATORS, AND THE CHARGING, SAFETY INJECTION AND RHR PUMPS ADDING MASS TO THE SYSTEM TO REFLOOD THE CORE. A PORTION OF THE FLUID INJECTED TO THE AFFECTED LOOP WILL SPILL OUT THE BREAK RATHER THAN PASSING THROUGH THE CORE.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TH06 COLD LEG LOCA

TYPE: GENERIC, NRVI 100% = 27.5" PIPE BREAK @ NOP

A) COLD LEG LOOP 1
B) COLD LEG LOOP 2
C) COLD LEG LOOP 3
D) COLD LEG LOOP 4

CAUSE: PIPE FAILURE AT REACTOR VESSEL NOZZLE

REF: M-52 REV AE
M-53 REV AN
ANNUNCIATOR RESPONSE: 6-3B, 6-3D, 3-5B, 3-5A, 3-5C, 10-2E

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, LEAKAGE OF REACTOR COOLANT TO THE CONTAINMENT ATMOSPHERE FROM THE SELECTED REACTOR COOLANT LOOP COLD LEG WILL RESULT. THE RATE OF MASS LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY. CONTAINMENT AIRBORNE ACTIVITY LEVELS WILL INCREASE. CONTAINMENT TEMPERATURE, MOISTURE LEVELS, ACTIVITY LEVELS, AREA RADIATION LEVELS AND SUMP LEVELS WILL INCREASE DEPENDENT UPON THE SELECTED SEVERITY. PRESSURIZER PRESSURE AND LEVEL WILL DECREASE AT A RATE PROPORTIONAL TO THE INPUT SEVERITY. AT HIGHER SEVERITIES THE REACTOR COOLANT SYSTEM WILL RAPIDLY DEPRESSURIZE AND FLASH TO THE CONTAINMENT. THIS WILL RESULT IN A REACTOR/PLANT TRIP WITH A SAFETY INJECTION ACTUATION, WHICH GENERATES SUBSEQUENT SAFEGUARDS INITIATION SIGNALS, AND PHASE B CONTAINMENT ISOLATION AND CONTAINMENT SPRAY ACTUATION OCCURRING. THE INITIAL CORE HEAT UP WILL BE FASTER THAN IN THE CASE OF AN EQUAL SIZED HOT LEG BREAK DUE TO DECREASED COOLING FLOW RETURNING THROUGH THE CORE. AS THE REACTOR COOLANT SYSTEM BLOWS DOWN TO CONTAINMENT, THE REACTOR COOLANT PUMPS WILL CAVITATE WITH THE SAFETY INJECTION ACCUMULATORS, AND THE CHARGING, SAFETY INJECTION AND RHR PUMPS ADDING MASS TO THE SYSTEM TO REFLOOD THE CORE. A PORTION OF THE FLUID INJECTED TO THE AFFECTED LOOP WILL SPILL OUT THE BREAK RATHER THAN PASSING THROUGH THE CORE.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TH09 PRESSURIZER STEAM SPACE LEAK

TYPE: DISCRETE, ARVI 100% = 4" PIPE BREAK @ NOP

CAUSE: SPRAY LINE BREAK AT PRESSURIZER VESSEL PENETRATION

REF: M-53 REV AN
ANNUNCIATOR RESPONSE: 9-8B, 9-8C, 6-3B, 6-3D

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, LEAKAGE OF REACTOR COOLANT TO THE CONTAINMENT ATMOSPHERE FROM THE PRESSURIZER STEAM SPACE WILL RESULT. THE RATE OF MASS LEAKAGE WILL BE DETERMINED BY THE SELECTED SEVERITY AND WILL BE AT A SLOWER RATE THAN AN EQUAL SIZED WATER SPACE LEAK AS THE STEAM FLASHES TO CONTAINMENT. CONTAINMENT AIRBORNE ACTIVITY LEVELS WILL INCREASE. CONTAINMENT TEMPERATURE, MOISTURE LEVELS, ACTIVITY LEVELS, AREA RADIATION LEVELS AND SUMP LEVELS WILL INCREASE DEPENDENT UPON THE SELECTED SEVERITY. PRESSURIZER PRESSURE AND LEVEL WILL DECREASE (PRESSURE WILL DECREASE RAPIDLY WITH A SLOWER LEVEL DECREASE AS COMPARED TO A LIQUID SPACE LEAK) AT A RATE PROPORTIONAL TO THE INPUT SEVERITY. PRESSURIZER HEATERS WILL ENERGIZE TO ATTEMPT TO MAINTAIN PRESSURE, CHARGING FLOW WILL INCREASE TO ATTEMPT TO MAINTAIN PRESSURIZER LEVEL. ANNUNCIATORS 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" AND 9-8C "PRESSURE CONTROL LEVEL HIGH LOW" ACTUATE WHEN THEIR RESPECTIVE SETPOINT ARE REACHED. IF PRESSURIZER PRESSURE DECREASES TO < 1825 PSIG, ANNUNCIATOR 6-3B "PRESSURIZER PRESSURE LOW REACTOR TRIP" WILL ACTUATE AND THE REACTOR WILL TRIP. IF PRESSURE CONTINUES TO DECREASE TO < 1815 PSIG, ANNUNCIATOR 6-3D "PRESSURIZER LOW PRESS SAFETY INJ REACTOR TRIP" WILL BE ACTUATED AND A SAFETY INJECTION SIGNAL WILL BE GENERATED.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

TH13 PRESSURIZER PORV FAILURE

TYPE: GENERIC, RV 100% = 100% VALVE CAPACITY

A) PORV 1PCV-455C
B) PORV 1PCV-456

CAUSE: CONTROLLER FAILURE

REF: M-53 REV AN
ANNUNCIATOR RESPONSE: 9-10A, 9-9E, 9-1B, 9-8B, 9-8C, 6-3B, 6-3D

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED PRESSURIZER PORV WILL OPEN TO THE SELECTED SEVERITY SENDING STEAM FROM THE PRESSURIZER STEAM SPACE TO THE PRESSURIZER RELIEF TANK. THE RATE OF MASS ACCUMULATION IN THE PRESSURIZER RELIEF TANK AND PORV OPENING WILL BE DETERMINED BY THE SELECTED SEVERITY. ANNUNCIATOR 9-10A "PRESSURIZER SAFETY VALVE/POWER OPERATED RELIEF VLV OPEN" IS ACTUATED WHEN THE LIMIT SWITCH IS NOT IN THE CLOSED POSITION AND ANNUNCIATOR 9-9E "PRESSURIZER POWER RELIEF LINE TEMP HIGH" WILL BE ACTUATED AT 180 °F WITH THE INCREASED TEMPERATURE BEING INDICATED ON 1TI-463 (1CB05). PRESSURIZER RELIEF TANK PRESSURE, TEMPERATURE AND LEVEL, AS INDICATED ON 1PI-RC0469/1TI-RC0468/1LI-RC0470 WILL INCREASE AT A RATE PROPORTIONAL TO THE SELECTED SEVERITY. PRESSURIZER PRESSURE AND LEVEL WILL DECREASE AS THE STEAM LEAKS BY THE PORV TO THE PRT. THE PRESSURIZER HEATERS WILL ENERGIZE IN AN ATTEMPT TO RECOVER THE DECREASING PRESSURIZER PRESSURE, CHARGING FLOW WILL INCREASE TO ATTEMPT TO MAINTAIN PRESSURIZER LEVEL. AS MALFUNCTION SEVERITY INCREASES, THE RATE OF MASS LOSS FROM THE PRESSURIZER WILL INCREASE. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" ACTUATES AT < 2210 PSIG AND ANNUNCIATOR 9-8C "PRESSURE CONTROL LEVEL HIGH LOW" IS ACTUATED IF A 5% DEVIATION FROM PROGRAM LEVEL IS REACHED. ANNUNCIATOR 9-1B "PRESSURIZER RELIEF TANK TEMP HIGH PRESS HIGH LEVEL HIGH LOW" WILL BE ACTUATED AT 125 °F, 10 PSIG, WHICH ALSO SENDS A CLOSE SIGNAL TO 1PCV-RC0469, OR 91% LEVEL. IF PRESSURIZER PRESSURE DECREASES TO < 1825 PSIG, THE REACTOR WILL TRIP AND ANNUNCIATOR 6-3B "PRESSURIZER PRESSURE LOW REACTOR TRIP" WILL ACTUATE. ANNUNCIATOR 6-3D "PRESSURIZER LOW PRESS SAFETY INJ REACTOR TRIP" ACTUATES AND A SAFETY INJECTION SIGNAL IS GENERATED WHEN PRESSURIZER PRESSURE DECREASES TO < 1815 PSIG.

ZION MALFUNCTION

CAUSE AND EFFECTS

ANY ATTEMPT BY THE OPERATOR TO CLOSE THE AFFECTED PORV, WHILE THE MALFUNCTION IS ACTIVE, IS UNSUCCESSFUL. THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY CLOSING THE ASSOCIATED PORV BLOCK VALVE.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED PORV CONTROLLER TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TH14 FAILURE OF PZR PORV BLOCK VALVES

TYPE: GENERIC, RB (VALVE FAILS OPEN)

A) PORV BLOCK VALVE, 1RC8000A
B) PORV BLOCK VALVE, 1RC8000B

CAUSE: SHORT IN VALVE OPENING CIRCUIT

REF: M-53 REV AN
22E-1-4840 RC18 REV L
22E-1-4840 RC19 REV K
ANNUNCIATOR RESPONSE: 9-10A

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THERE IS NO IMMEDIATELY NOTICEABLE EFFECT, AS THE AFFECTED VALVE IS NORMALLY OPEN. WHEN THE ASSOCIATED PORV LEAKS BY OR FAILS OPEN, THE OPERATOR WILL NOT BE ABLE TO CLOSE THE AFFECTED PORV BLOCK VALVE TO STOP THE MASS LOSS FROM THE PRESSURIZER. (THE BLOCK VALVE WILL CLOSE BUT WILL IMMEDIATELY RE-OPEN WHILE THE MALFUNCTION IS ACTIVE). IF THE BLOCK VALVE WAS INITIALLY CLOSED, THE INDICATING LAMPS WILL SHOW THE CHANGE IN VALVE POSITION.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED PORV BLOCK VALVE TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TH15 PRESSURIZER SAFETY VALVE FAILURE

TYPE: GENERIC, RV 100% = 100% VALVE CAPACITY

A) PZR SAFETY VALVE 1RC8010A
B) PZR SAFETY VALVE 1RC8010B
C) PZR SAFETY VALVE 1RC8010C

CAUSE: VALVE SEAT LEAKS BY

REF: M-53 REV AN
ANNUNCIATOR RESPONSE: 9-7C, 9-1B, 9-8B, 9-8C, 6-3B, 6-3D

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED PRESSURIZER SAFETY VALVE WILL BEGIN TO LEAK TO THE PRESSURIZER RELIEF TANK. THE RATE OF MASS ACCUMULATION IN THE PRESSURIZER RELIEF TANK AND SAFETY VALVE LEAK BY WILL BE DETERMINED BY THE SELECTED SEVERITY. ANNUNCIATOR 9-7C "PRESSURIZER SAFETY VALVE LINE A,B,C TEMP HIGH" IS ACTUATED AT 180 °F WITH THE INCREASED TEMPERATURE BEING INDICATED ON 1TI-RC0464/465/466 (1CB06) AND ANNUNCIATOR 9-10A "PRESSURIZER SAFETY VALVE/POWER OPERATED RELIEF VLV OPEN" WILL BE ACTUATED AT 9 G'S ON THE ASSOCIATED ACCELEROMETER. PRESSURIZER RELIEF TANK PRESSURE, TEMPERATURE AND LEVEL, AS INDICATED ON 1PI-RC0469/ 1TI-RC0468/1LI-RC0470, WILL INCREASE AT A RATE PROPORTIONAL TO THE SELECTED SEVERITY. PRESSURIZER PRESSURE AND LEVEL WILL DECREASE AS THE STEAM LEAKS BY THE AFFECTED SAFETY VALVE TO THE PRT. THE PRESSURIZER HEATERS WILL ENERGIZE IN AN ATTEMPT TO RECOVER THE DECREASING PRESSURIZER PRESSURE. AS MALFUNCTION SEVERITY INCREASES, THE RATE OF MASS LOSS FROM THE PRESSURIZER WILL INCREASE. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" ACTUATES AT < 2210 PSIG AND ANNUNCIATOR 9-8C "PRESSURE CONTROL LEVEL HIGH LOW" IS ACTUATED AT 5% DEVIATION FROM PROGRAM LEVEL. ANNUNCIATOR 9-1B "PRESSURIZER RELIEF TANK TEMP HIGH PRESS HIGH LEVEL HIGH LOW" WILL BE ACTUATED AT 125 °F, 10 PSIG, WHICH ALSO SENDS A CLOSE SIGNAL TO 1PCV-RC0469, OR 91% LEVEL. IF PRESSURIZER PRESSURE DECREASES TO < 1825 PSIG, THE REACTOR WILL TRIP AND ANNUNCIATOR 6-3B "PRESSURIZER PRESSURE LOW REACTOR TRIP" WILL ACTUATE. ANNUNCIATOR 6-3D "PRESSURIZER LOW PRESS SAFETY INJ REACTOR TRIP" ACTUATES AND A SAFETY INJECTION SIGNAL IS GENERATED WHEN PRESSURIZER PRESSURE DECREASES TO < 1815 PSIG.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED SAFETY VALVE TO NORMAL.

[REV 2]

+0287/16

...6 PRESSURI**R SPRAY VALVE FAILURE

TYPE: GENERIC, RV 100% = VALVE FULLY OPEN

A) SPRAY VALVE 1PCV-RC06 (1PCV-455A)
B) SPRAY VALVE 1PCV-RC07 (1PCV-455B)

CAUSE: PRESSURE SIGNAL TO VALVE (1PD/454B,1PD/445C) FAILURE

REF: M-53 REV AN
617F768 SHT 2 REV 12
ANNUNCIATOR RESPONSE: 9-8B, 6-3B, 6-3D

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED PRESSURIZER SPRAY VALVE WILL FAIL. THE VALVE POSITION AND FLOW RATE INTO THE PRESSURIZER WILL BE DETERMINED BY THE SELECTED SEVERITY. PRESSURIZER PRESSURE WILL DECREASE AT A RATE PROPORTIONAL TO THE SELECTED SEVERITY. AS MALFUNCTION SEVERITY IS INCREASED, THE RATE OF DECREASE OF PRESSURIZER PRESSURE WILL INCREASE. THE PRESSURIZER HEATERS WILL ENERGIZE IN AN ATTEMPT TO RECOVER PRESSURIZER PRESSURE. ANNUNCIATOR 9-8B "PRESSURIZER CONTROL PRESSURE HIGH LOW" WILL ACTUATE AT 2210 PSIG. WHEN PRESSURIZER PRESSURE DECREASES BELOW 1825 PSIG, ANNUNCIATOR 6-3B "PRESSURIZER PRESSURE LOW REACTOR TRIP" ACTUATES AND THE REACTOR/PLANT TRIPS. ANNUNCIATOR 6-3D "PRESSURIZER LOW PRESS SAFETY INJ REACTOR TRIP" WILL ACTUATE AT < 1815 PSIG AND A SAFETY INJECTION SIGNAL WILL BE GENERATED.

THE OPERATOR MAY LIMIT THE CONSEQUENCES OF THIS MALFUNCTION BY SENDING AN OPERATOR INTO CONTAINMENT TO MANUALLY CLOSE THE ASSOCIATED SPRAY VALVE INLET ISOLATION VALVE OR THE OPERATOR CAN TRIP THE REACTOR AND STOP THE RCP FEEDING THE SPRAY VALVE TO STOP THE DEPRESSURIZATION.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED PRESSURIZER SPRAY VALVE TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TH19 RCS FUEL ELEMENT FAILURE

TYPE: DISCRETE, NRVI 100% = 100% FAILURE
(10E6 CURIES ACTIVITY)

CAUSE: CLADDING FAILURE

REF: NUCLEAR FUEL SYSTEM DESCRIPTION

PLT STA:IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE FUEL CLADDING WILL FAIL. THE AMOUNT OF FUEL CLADDING FAILURE WILL BE DETERMINED BY THE SELECTED SEVERITY. THE REACTOR COOLANT SYSTEM AND CVCS SYSTEM ACTIVITY LEVELS WILL INCREASE AT A RATE PROPORTIONAL TO THE INPUT SEVERITY INCREASED RADIATION LEVELS WILL BE SEEN ON THE FOLLOWING RADIATION MONITORS: 1RE-0002, 1RE-0007, 1RT-AR01, 1RT-AR03, 1RT-AR04A, 1RT-PR05, 1RT-PR06, 1RT-PR-18, AND 1RT-PR27. AS MALFUNCTION SEVERITY INCREASES, THE REACTOR COOLANT SYSTEM AND DIRECT FLOW INTERCONNECTED SYSTEM ACTIVITY LEVELS WILL INCREASE. THE RADIATION MONITORING DISPLAY SYSTEM WILL ALARM WHEN AN APPROPRIATE MONITOR RADIATION LEVEL EXCEEDS THAT MONITOR'S ALARM SETPOINT.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

TH20 REACTOR COOLANT PUMP SHAFT SEIZURE

TYPE: GENERIC, NRB

A) RCP 1A
B) RCP 1B
C) RCP 1C
D) RCP 1D

CAUSE: MECHANICAL SHAFT BINDING RESULTS IN SHAFT SEIZURE

REF: REACTOR COOLANT SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 9-2A/B/C/D; 6-2C

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED REACTOR COOLANT PUMP SHAFT WILL BIND RESULTING IN AN IMMEDIATE SHAFT SEIZURE AND ANNUNCIATOR 9-6D "REACTOR COOLANT PUMPS TRIP" WILL BE ACTUATED. THE AFFECTED PUMP AMPS, AS INDICATED ON 1CB06, WILL SPIKE THEN DECREASE TO ZERO. THE ASSOCIATED REACTOR COOLANT LOOP FLOW, AS INDICATED ON 1FI-414,415,416/444,445,446/424,425,426/434, 435,436 (1CB06), WILL DECREASE TO ZERO THEN INCREASE AS FLOW THROUGH THE LOOP REVERSES. LOOP TEMPERATURE WILL DECREASE TO OPERATING LOOP Tc, LOOP ΔT WILL DECREASE TO ZERO. WHEN THE ASSOCIATED LOOP FLOW DECREASES TO < 90% FLOW, ANNUNCIATOR 9-2A/B/C/D "REACTOR COOLANT LOOP A/B/C/D FLOW LOW OR RCP 1-A/B/C/D BKR TRIP" WILL BE ACTUATED. IF 2 OF 4 POWER RANGE NUCLEAR INSTRUMENTS ARE > 60% POWER, WITH < 90% FLOW ON ONE LOOP, ANNUNCIATOR 6-2C "ONE LOOP LOW FLOW OR ACB OPEN REACTOR TRIP" WILL ACTUATE.

THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 2]

ZION MALFUNCTIONS

CAUSE AND EFFECTS

TP01 STATOR COOLING WATER PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) STATOR COOLING WATER PUMP 1
B) STATOR COOLING WATER PUMP 2

CAUSE: SHORT IN PUMP TRIPPING CIRCUIT

REF: M-530 SHT 6 REV C
22E-1-4840 TG18 REV D
22E-1-4840 TG19 REV D
ANNUNCIATOR RESPONSE: 13-8A, 14-2A

PLT STA: SELECTED STATOR COOLING WATER PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED STATOR COOLING WATER PUMP BREAKER WILL TRIP. PUMP CURRENT INDICATION DECREASES TO ZERO. ANNUNCIATOR 13-8A "STATOR COOL WATER PUMP TRIP" ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. THE STANDBY STATOR COOLING WATER PUMP WILL AUTO START WHEN THERE IS < 20 PSID ACROSS THE PUMP AND THE LOW DP LIGHT ASSOCIATED WITH THE AFFECTED PUMP WILL ILLUMINATE. WHEN THE STANDBY PUMP STARTS, THE LOW DP LIGHT ASSOCIATED WITH THE NOW RUNNING STANDBY PUMP WILL GO DARK. ANNUNCIATOR 14-2A "H_2 & STATOR COOLING PANEL TROUBLE" WILL ACTUATE ON THE PUMP TRIP.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE PUMP TRIPPING CIRCUIT TO NORMAL.

[REV 2]

ZION MALFUNCTIONS

CAUSE AND EFFECTS

TP02 SEAL OIL SYSTEM PUMP TRIPS/FAILS TO START

TYPE: GENERIC, RB

A) AIR SIDE SEAL OIL PUMP
B) HYDROGEN SIDE SEAL OIL PUMP
C) AIR SIDE SEAL OIL BACKUP PUMP

CAUSE: FAULTY M (1M) RELAY

REF: M-530 SHT 2 REV B
22E-1-4840 TG22 REV C
22E-1-4840 TG21 REV C
22E-1-4840 GS2 REV F
ANNUNCIATOR RESPONSE: 13-8C, 14-2D

PLT STA: SELECTED SEAL OIL PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED SEAL OIL PUMP BREAKER WILL TRIP. THE ASSOCIATED ANNUNCIATOR 13-8B "GEN H2 SEAL OIL BACKUP PUMP TRIP" FOR THE BACKUP PUMP OR ANNUNCIATOR 13-8C "GEN H2 SEAL OIL PUMP TRIP" FOR EITHER THE HYDROGEN OR AIR SIDE SEAL OIL PUMP ACTUATES, AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. IF THE AIR SIDE SEAL OIL PUMP IS THE PUMP TRIPPED, REGULATOR VALVE 1PCV-GSS251 WILL OPEN TO MAINTAIN AIR SIDE SEAL OIL PRESSURE (OPENS AT 8 PSIG ABOVE GENERATOR HYDROGEN PRESSURE) THE DC AIR SEAL OIL BACKUP PUMP WILL AUTO START IF PRESSURE DROPS TO 5 PSIG ABOVE GENERATOR HYDROGEN PRESSURE WHICH WILL ACTUATE ANNUNCIATOR 14-2D "AIR SIDE SEAL OIL BACKUP PUMP RUN".

THE OPERATOR MAY RESET THE ANNUNCIATOR AND THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY M RELAY TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TU01 MAIN TURBINE BEARING OIL PUMP TRIP/FAILS TO START

TYPE: DISCRETE,RB

CAUSE: SHAFT BINDING

REF: M-530 SHT 4 REV D
TURBINE BEARING AND SEAL OIL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 13-3A, 13-4C

PLT STA: MAIN TURBINE TURNING GEAR OIL PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE MAIN TURBINE BEARING OIL PUMP BREAKER WILL TRIP. ANNUNCIATOR 13-3A "TURNING GEAR OIL PUMP TRIP" WILL ACTUATE AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. IF BEARING OIL PRESSURE, AS INDICATED ON 1PI-T006 (1CB03), DECREASES TO 7 PSIG, THE EMERGENCY OIL PUMP WILL AUTO START WITH ANNUNCIATOR 13-4C "EMERG BRG OIL PUMP RUNNING" BEING ACTUATED. IF THIS MALFUNCTION IS ACTIVATED WHILE THE PUMP IS NOT RUNNING, THERE ARE NO IMMEDIATELY NOTICEABLE EFFECTS. THE PUMP WILL AUTO START AS REQUIRED AT LOW BEARING OIL PRESSURE OF 8 PSIG, BUT IT WILL IMMEDIATELY TRIP WHILE THE MALFUNCTION IS ACTIVATED.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY M RELAY TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

TU02 MAIN TURBINE BEARING LIFT OIL PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

A) BEARING LIFT PUMP 1T018
B) BEARING LIFT PUMP 1T019
C) BEARING LIFT PUMP 1T020
D) BEARING LIFT PUMP 1T021
E) BEARING LIFT PUMP 1T022
F) BEARING LIFT PUMP 1T023

CAUSE: FAULTY M RELAY

REF: M-530 SHT 4 REV D
22E-1-4840 T013 - 18 REV C
TURBINE BEARING AND SEAL OIL SYSTEM DESCRIPTION
ANNUNCIATOR RESPONSE: 13-3E, 13-3C

PLT STA: SELECTED MAIN TURBINE BEARING LIFT PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED MAIN TURBINE BEARING LIFT OIL BREAKER WILL TRIP. ANNUNCIATOR 13-3E "TURB BEARING OIL LIFT PUMP SYSTEM TROUBLE" WILL ACTUATE AND THE ASSOCIATED CONTROL SWITCH AMBER LAMP ILLUMINATES. IF THE MAIN TURBINE IS ON THE TURNING GEAR WHEN THIS MALFUNCTION IS INSERTED, THE TURNING GEAR WILL TRIP. IF THIS MALFUNCTION IS ACTIVATED WHILE THE PUMP IS NOT RUNNING (MAIN TURBINE ABOVE 600 RPM), THERE ARE NO IMMEDIATELY NOTICEABLE EFFECTS. THE PUMP WILL NOT AUTO START AS REQUIRED WHEN MAIN TURBINE SPEED DECREASES BELOW 600 RPM.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND THE AMBER LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY M RELAY TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TU03 MAIN TURBINE SEAL OIL BACKUP PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

CAUSE: FAULTY M RELAY

REF: M-530 SHT 4 REV D
22E-1-4840 T05 REV G
ANNUNCIATOR RESPONSE: 13-4B, 13-8B

PLT STA: MAIN TURBINE SEAL OIL BACKUP PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE MAIN TURBINE SEAL OIL BACKUP PUMP BREAKER WILL TRIP. ANNUNCIATOR 13-4B "SEAL OIL BACKUP PUMP RUNNING" WILL CLEAR AND THE CONTROL SWITCH AMBER LAMP ILLUMINATES. ANNUNCIATOR 13-8B "GEN H2 SEAL OIL BACKUP PUMP TRIP" IS ACTUATED. IF THIS MALFUNCTION IS ACTIVATED WHILE THE PUMP IS NOT RUNNING, THERE ARE NO IMMEDIATELY NOTICEABLE EFFECTS. THE PUMP WILL NOT AUTO START AS REQUIRED AT LOW BEARING OIL PRESSURE OF 8 PSIG.

THE OPERATOR MAY RESET THE AMBER LAMP AND ANNUNCIATOR 13-8B BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL NOT CLOSE.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY M RELAY TO NORMAL.

[REV 3]

ZION MALFUNCTION

CAUSE AND EFFECTS

TU04 MAIN TURBINE EMERGENCY OIL PUMP TRIP/FAILS TO START

TYPE: GENERIC, RB

CAUSE: FAULTY CX RELAY CAUSES CX CONTACTS TO OPEN

REF: M-530 SHT 4 REV D
22E-1-4840 TO4 REV F
ANNUNCIATOR RESPONSE: 13-4D, 13-4C

PLT STA: MAIN TURBINE EMERGENCY OIL PUMP IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE MAIN TURBINE EMERGENCY OIL PUMP BREAKER WILL TRIP. ANNUNCIATOR 13-4D "EMERG BRG OIL PUMP TRIP" WILL ACTUATE ANNUNCIATOR 13-4C WILL CLEAR AND THE CONTROL SWITCH BLUE LAMP ILLUMINATES. IF THIS MALFUNCTION IS ACTIVATED WHILE THE PUMP IS NOT RUNNING, THERE ARE NO IMMEDIATELY NOTICEABLE EFFECTS. THE PUMP WILL AUTO START AS REQUIRED AT LOW BEARING OIL PRESSURE, AS INDICATED ON 1PI-T006 (1CB03), OF 7 PSIG, BUT IT WILL IMMEDIATELY TRIP WHILE THE MALFUNCTION IS ACTIVATED.

THE OPERATOR MAY RESET THE ANNUNCIATOR AND THE BLUE LAMP BY PLACING THE CONTROL SWITCH IN THE TRIP POSITION. IF THE OPERATOR ATTEMPTS TO RESTART THE PUMP, THE BREAKER WILL CLOSE THEN IMMEDIATELY TRIP OPEN.

MALFUNCTION REMOVAL WILL RESTORE THE FAULTY CX RELAY TO NORMAL.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

TU05 TURBINE VIBRATION

TYPE: GENERIC, RV 100% = 20 MILS (ADDITIVE)

A) TURBINE BEARING 1
B) TURBINE BEARING 2
C) TURBINE BEARING 3
D) TURBINE BEARING 4
E) TURBINE BEARING 5
F) TURBINE BEARING 6
G) TURBINE BEARING 7
H) TURBINE BEARING 8
I) GENERATOR BEARING 9
J) GENERATOR BEARING 10
K) EXCITER BEARING 11

CAUSE: BEARING FAILURE

REF: ZION STATION PHOTOS
AOP-3.2
ANNUNCIATOR RESPONSE: 13-7C

PLT STA: MAIN TURBINE IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE SELECTED BEARING WILL FAIL AND BEGIN TO VIBRATE. THE VIBRATION VALUE WILL BE DETERMINED BY THE SELECTED SEVERITY AND WILL BE INDICATED ON 1GI-TS09 (1CB03) AND 1GR-TS02 (1CB17). BEARING VIBRATION WILL INCREASE AS SELECTED SEVERITY IS INCREASED AND WILL ALSO INCREASE IN PROPORTION TO THE INPUT SEVERITY ON THE BEARINGS NEXT TO THE AFFECTED BEARING. ANNUNCIATOR 13-7C "TURB VIBR ECCENTRICITY OR EXPANSION" WILL BE ACTUATED AT 7 MILS VIBRATION.

MALFUNCTION REMOVAL WILL RESTORE THE FAILED BEARING TO NORMAL.

[REV 1]

ZION MALFUNCTION

CAUSE AND EFFECTS

TU07 MAIN TURBINE BEARING OIL PUMP DISCHARGE LINE BREAK

TYPE: DISCRETE, NRVI 100% = MAX POSSIBLE SEVERITY

CAUSE: PIPING FAILURE IMMEDIATELY DOWNSTREAM OF 1PI-T00006

REF: M-530 SHT 4 REV D
TURBINE BEARING AND SEAL OIL SYSTEMS DESCRIPTION
ANNUNCIATOR RESPONSE: 13-4A, 13-3B, 13-2B, 13-4C, 13-5B

PLT STA: MAIN TURBINE LUBE OIL SYSTEM IN OPERATION

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE MAIN TURBINE BEARING OIL PUMP DISCHARGE LINE WILL LEAK TO THE TURBINE BUILDING. THE RATE OF MASS LOSS WILL BE DETERMINED BY THE SELECTED SEVERITY. MAIN BEARING OIL HEADER PRESSURE, AS INDICATED ON 1PI-T006 (1CB03), WILL DECREASE AT A RATE PROPORTIONAL TO THE INPUT SEVERITY. THE DECREASED OIL PRESSURE WILL RESULT IN DECREASED OIL FLOW TO THE BEARINGS WHICH WILL CAUSE BEARING TEMPERATURES TO INCREASE. ANNUNCIATOR 13-4A "TURB BEARING OIL PRESS LOW" WILL ACTUATE AT 10 PSIG. AS MALFUNCTION SEVERITY INCREASES, WHEN BEARING OIL PRESSURE DECREASES TO 8 PSIG, THE SEAL OIL BACKUP PUMP WILL AUTO START WITH ANNUNCIATOR 13-4B, "SEAL OIL BACKUP PUMP RUNNING" BEING ACTUATED. THE TURNING GEAR OIL PUMP WILL AUTO START WITH ANNUNCIATOR 13-3B "TURNING GEAR OIL PUMP RUNNING" BEING ACTUATED AT 8 PSIG BEARING PRESSURE. WHEN BEARING OIL PRESSURE DECREASES TO 7 PSIG, THE EMERGENCY OIL PUMP WILL AUTO START WITH ANNUNCIATOR 13-4C "EMERG BRG OIL PUMP RUNNING" BEING ACTUATED. IF OIL PRESSURE DECREASES TO 8 PSIG, THE TURBINE WILL TRIP WITH ANNUNCIATOR 13-2B "TURB TRIP BRG OIL PRESS LOW" ACTUATING.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 2]

ZION MALFUNCTION

CAUSE AND EFFECTS

WD01 GAS DECAY TANK RUPTURE

TYPE: DISCRETE, NRVI 100% = 4000 CFM AT NOP

CAUSE: TANK FAILURE

REF: M-7 REV H
M-85 REV AD
GASEOUS RADIOACTIVE WASTE SYSTEM DESCRIPTION

PLT STA: IC37

EFFECTS:

WHEN THIS MALFUNCTION BECOMES ACTIVE, THE GAS DECAY TANK WILL FAIL RELEASING RADIOACTIVE GAS TO THE AUXILIARY BUILDING. THE RATE OF GAS RELEASE WILL BE DETERMINED BY THE SELECTED SEVERITY. AS THE MALFUNCTION SEVERITY IS INCREASED, THE RATE OF GAS RELEASE WILL BE INCREASED. ACTIVITY LEVELS IN THE AUXILIARY BUILDING IN THE LOCAL AREA AND IN THE VENTILATION SYSTEM FLOW PATH WILL INCREASE DEPENDENT UPON THE INITIAL DECAY TANK ACTIVITY LEVEL. THE RADIATION MONITORING DISPLAY SYSTEM WILL ALARM IF ANY RADIATION MONITORS' ALARM SETPOINT IS REACHED. GAS DECAY TANK ACTIVITY MAY BE VARIED USING REMOTE FUNCTION WD 22.

MALFUNCTION SEVERITY MAY ONLY BE INCREASED FOR THIS MALFUNCTION AND THE SIMULATOR MUST BE RESET TO RECOVER FROM THIS MALFUNCTION.

[REV 3]

ZION SIMULATOR
ANSI/ANS-3.5-1985 CERTIFICATION REPORT
INITIAL REPORT, MARCH 1991

ATTACHMENT 7
CERTIFIED MALFUNCTIONS WITH
UNSATISFACTORY TEST RESULTS

ATTACHMENT 7
CERTIFIED MALFUNCTIONS WITH
UNSATISFACTORY TEST RESULTS

Malfunction Number	Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
CC09	Radiation monitors response incorrect.	F257, F258	5/3/91
CV22	Radiation monitors response incorrect.	F238	5/3/91
CV23	Radiation monitors response incorrect.	F240	5/3/91
CV24	Radiation monitors response incorrect.	F59, F235, F236	5/3/91
CV25	Radiation monitors response incorrect.	F237	5/3/91
ED08	Conds/Conds BSTR pump amps spike causing SAT to trip on loss of DC Bus 112.	F170	4/12/91
RD02	QPTR response with dropped rod & failure to trip	F163	4/12/91
RX06	S/G level response incorrect.	F4	4/12/91
TH06	Spray additive flows incorrect	F187	4/19/91
	CNMT pressure response incorrect	F195	4/19/91
	RHR HX outlet temperature response incorrect	F197	4/19/91
	Core reflood response incorrect.	F199	4/19/91
	RHR low suction pressure alarm	F264	4/19/91
	RHR temperature response during cold leg recirc.	F266	4/19/91
	CNMT pressure response during RHR sprays	F267	4/19/91

ATTACHMENT 7
CERTIFIED MALFUNCTIONS WITH
UNSATISFACTORY TEST RESULTS

Malfunction Number	Brief Description of Problem	ATP Discrepancy Report Number	Estimated Completion Date
TH06 (con't)	Incorrect simulator response while transferring to simultaneous hot and cold leg recirc.	F268	4/19/91
TH19	Radiation monitors response incorrect.	P2339	4/26/91
WD01	Radiation monitors response incorrect	F42, F44, F46, F60, F61, F64, F171, F172	5/3/91