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APPENDIX 8

EXPERIMENTAL OPERATING SPECIFICATION

TESTS S-08-1 THROUGH S-08-8

SEMISCALE MOD-3 UHI TEST SERIES

(TEST SERIES 8)

SEMISCALE PROGRAM

February 1979

Prepared for the

U. S. Nuclear Regulatory Commission

EG&G Idaho, Inc.

IDAHO NATIONAL ENGINEERING LABORATORY

DEPARTMENT OF ENERGY

IDAHO OPERATIONS OFFICE UNDER CONTRACT EY-76-C-07-1570

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INTERIM REPORT

EHR

APPENDIX 8

TO THE

SEMISCALE EXPERIMENTAL OPERATING SPECIFICATION

TEST SERIES 8

TESTS S-08-1 THROUGH S-08-8

SEMISCALE MOD-3 UHI TEST SERIES

SEMISCALE PROGRAM

EG&G IDAHO, INC.

February 1979

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I. INTRODUCTION

Semiscale Mod-3 is part of the overall Semiscale blowdown and emergency core cooling (ECC) project conducted by EG&G Idaho, Inc., to investigate the thermal and hydraulic phenomena accompanying a hypothesized loss-of-coolant accident (LOCA) in a pressurized water reactor (PWR) system. The primary objective of the Semiscale Program is to obtain representative integral and separate effects thermal-hydraulic response data to provide an experimental basis for analytical model development and verification. An additional objective is to provide other Nuclear Regulatory Commission (NRC) sponsored programs, such as the Loss-of-Fluid Test (LOFT) Program, with support in test planning, evaluation, and experiment design.

The purpose of this document is to establish the experiment specifications for the tests in Test Series 8 of the Semiscale Mod-3 Program. Test Series 8 is designated as the Upper Head Injection (UHI) Emergency Core Cooling System (ECCS) evaluation test series. The information contained in this document is suitable for the preparation of detailed experiment operation procedures for the tests in Test Series 8. Included herein are:

(1) Individual test objectives and basic description

(2) General system configuration

(3) Specific system requirements for various tests

(4) General instrumentation specification and operation

(5) Special instrumentation requirements where required.

1. SERIES OBJECTIVES

The primary objective of the Semiscale Mod-3 UHI test series is to investigate the influence of important UHI ECC parameters on the core thermal response and system hydraulic behavior during an integral LOCA test. Due to scaling compromises in the Mod-3 system, test results may not be directly applied to a PWR, but rather, they will be used to identify the influence of certain operational parameters and UHI characteristics which may be influential in a PWR. Results from this test series will also be used to assess UHI computer codes as well as to aid in the development of improved models for the prediction of UHI associated phenomena.

To accomplish these objectives, a series of tests have been specified in which various UHI parameters are systematically changed from an established baseline test. The results of each test will then be compared to the baseline test which does not include UHI, in order to characterize UHI behavior. The test conditions for each UHI test are also sufficiently similar that the relative influence of important system parameters can also be determined through comparitive analysis. The UHI parameters to be varied in Series 8 for cold leg break testing are:

(1) Degree of thermal stratification in the Semiscale Mod-3 upper head during and following injection

(2) UHI injection flow rate

(3) Total amount of ECC water injected into the upper head

(4) UHI initiation set point pressure.

To achieve the primary objectives outlined for the UHI test series, eight tests have been planned. The specific objectives and rationale for each of the tests are presented in the following section.

2. TEST OBJECTIVES AND BASIC DESCRIPTION

The individual test objectives for the Series 8 tests and the method of achieving these objectives are briefly described in this section. The tests in the series are numbered S-08-1 through S-08-8 where, in accordance with the standard Semiscale numbering system, S refers to Semiscale, the two center digits refer to the test series (Series 8), and the last digit refers to the test number within the series. The test matrix for the series is presented in Table I which lists the principal variables and objectives for each test. The test groups are listed in the table and are discussed below in the recommended order of testing.

Each test in Series 8 will be an integral blowdown-reflood test and, with the exception of the baseline test (Test S-08-1), each will include UHI. In addition to the UHI, ECC will be injected into the intact and broken loop cold legs for each test from accumulators, a high pressure injection system (HPIS), and a low pressure injection system (LPIS). The on-line power control system (described in detail in Reference 1) will be used during the blowdown and refill portions of the baseline test to control the core electrical power in a manner that will provide a simulation of the temperature response of a nuclear fuel pin. During the reflood period, a predetermined power decay curve will be utilized since the large variation in thermal-hydraulic conditions on either side of the core quench front during reflood make it difficult to accurately represent a nuclear fuel pin with the on-line power control system, which monitors thermal response at a single axial level. However, during reflood, the relatively low and constant core power together with a relatively flat radial temperature profile within the nuclear fuel pin minimize the potential for atypical electric rod temperature responses caused by differences between the electric rod and fuel pin thermal properties. As a result, the potential advantages of a closed loop power control system (on-line power controller) become less important. The power decay curve generated for the baseline test will be programmed for subsequent tests with UHI so that the influence of the UHI can be more easily determined. More detailed information concerning the operational sequence for the tests is given in Section III of this document.

2.1 Objectives and Basic Description of Test S-08-1

The initial test in Series 8, Test S-08-1, is an integral blowdown-reflood test which will be conducted with the same initial and boundary conditions as the other tests of the Series 8 group, except UHI will not be utilized. The objective of this test is to provide baseline performance data for a 200% cold leg break under conditions approximating those in a PWR with the capability of UHI but with only cold leg ECC injection. Results from Test S-08-1 will be compared with results from other Series 8 tests to characterize UHI behavior and to evaluate the effects of changes in the various UHI parameters.

2.2 Objectives and Basic Description of Tests S-08-2, S-08-3, and S-08-4

The principal objective of Tests S-08-2, S-08-3, and S-08-4 will be to assess the effects on the core thermal response and system hydraulic behavior of the degree of thermal stratification in the Semiscale Mod-3 upper head region. The degree of thermal stratification in the upper head region will be varied by changing either the configuration or the elevation of the tube bringing the ECC into the upper head region. The degree of thermal stratification obtained can be evaluated by observing fluid temperature measurements at various elevations in the upper head. For Test S-08-2, a perforated UHI discharge nozzle will run the entire length of the upper head to provide a uniform temperature distribution in the upper head region. Test S-08-3 will be conducted with the UHI discharge nozzle located near the top of the upper head to provide relatively good mixing but a somewhat stratified temperature distribution. Test S-08-4 will have the UHI discharge nozzle located near the bottom of the upper head to produce a strongly stratified temperature distribution. For each of the tests, the UHI system will actuate at a pressure of 8618 kPa and will inject ambient temperature ECC fluid into the upper head volume. The UHI flow rate and the total volume of UHI fluid to be injected will be system volume scaled to a PWR plant with UHI. Cold leg ECC injection will also be used for each test. With the exception of the UHI parameters Tests S-08-2, S-08-3, and S-08-4 will have initial and boundary conditions that are identical to those for the baseline test, Test S-08-1.

To provide the earliest indication of the influence of thermal stratification in the Mod-3 upper head, the tests in this group will be run in the following order. Test S-08-4 will be run first since a high degree of thermal stratification can strongly influence the system but may also be difficult to achieve. Test S-08-3 will be run next to determine the effect of the location of upper head injection on the thermal stratification in the Mod-3 upper head and the subsequent effect of this stratification on the system thermal-hydraulic behavior. Test S-08-2 will then be run to assess the effects of complete fluid mixing in the upper head on system response. The results of these three tests will then be evaluated to determine which upper head injection configuration should be used for the remaining tests in Series 8. The injection configuration selected will be dependent on the observed upper head mixing characteristics and the expected sensitivity of UHI parameters to the degree of thermal stratification in the upper head.

2.3 Objectives and Basic Description of Test S-08-5

The objective of the fifth test in Series 8, Test S-08-5, is to assess the effect of the magnitude of the UHI flow rate on the system and core thermal-hydraulic behavior. The flow resistance in the UHI line will be changed for this test in order to reduce the injection flow rate to half the flow rate for the previous UHI tests, while the volume of UHI fluid injected and the UHI actuation pressure will remain the same. The ECC fluid will be introduced into the upper head volume with the configuration decided upon after the analysis of Tests S-08-2, S-08-3, and S-08-4 has been completed as indicated in Section 2.2. All other initial and boundary conditions for Test S-08-5 will be the same as for the baseline test. The effects of the magnitude of the UHI flow rate will be evaluated by comparing results from Test S-08-5 with results from the baseline test and from the previous UHI tests.

2.4 Objectives and Basic Description of Test S-08-6

The effect on core thermal-hydraulic response of reducing the total amount of mass injected into the upper head will be investigated in the sixth test in Series 8, Test S-08-6. The total volume of UHI fluid injected into the upper head will be reduced from 0.0166 m^3 to 0.0083 m^3 for this test. The UHI actuation pressure and injection rate will be the same as specified for Tests S-08-2, S-08-3, and S-08-4, and the UHI discharge nozzle configuration will be the same as in Test S-08-5. All other initial and boundary conditions will be as for the baseline test.

2.5 Objectives and Basic Description of Tests S-08-7 and S-08-8

The objective of the seventh and eighth tests in Series 8, Tests S-08-7 and S-08-8, is to determine the effect on the core thermal-hydraulic response of the UHI activation pressure. The UHI will be initiated at 9653 kPa for Test S-08-7 and at 6895 kPa for Test S-08-8. The UHI injection rate, and volume of UHI water injected will be the same as in Tests S-08-2, S-08-3, and S-08-4, and will be introduced into the upper head region with the same injection configuration selected for Test S-08-5. All other initial and boundary conditions will be the same as for the baseline test.

TABLE I

TEST MATRIX FOR THE UHI TEST GROUP

TEST NUMBER	PRINCIPAL TEST VARIABLE	TEST OBJECTIVE
S-08-1	Full flow and full power approximating conditions in a PWR plant with UHI; no UHI to be used	Provide baseline performance data for comparison with remaining tests
S-08-2	UHI fluid injected uniformly in upper head by perforated discharge nozzle	Evaluate effects of upper head thermal stratification on system and core thermal-hydraulic response
S-08-3	UHI fluid injected near top of upper head	
S-08-4	UHI fluid injected near bottom of upper head	
S-08-5	UHI flow rate reduced by 1/2 compared to first three tests with UHI (Tests S-08-2, S-08-3, and S-08-4). Total injected volume remains the same.	Evaluate effects of UHI flow rate on system and core thermal hydraulic response
S-08-6	Total volume of UHI liquid injected in upper head reduced by 1/2 compared to first three test with UHI. Injection rate remains the same.	Evaluate effects of total UHI liquid volume introduced into upper head volume on system and core thermal-hydraulic response
S-08-7	UHI actuation pressure increased to 9653 kPa from 8618 kPa	Evaluate effects of UHI actuation pressure on system and core thermal-hydraulic response
S-08-8	UHI actuation pressure decreased to 6895 kPa compared to 8618 kPa for first three UHI tests	

II. GENERAL SYSTEM CONFIGURATION

The Semiscale Mod-3 system configuration for Test Series 8, shown in Figure 1, is basically the same as the configuration used during the Series 7 tests. Since this system configuration is discussed in detail in the EOS Appendix 7 (Reference 1), only a brief discussion of the Series 8 system configuration highlighting any modifications to the system for the different tests is included herein.

1. INTACT LOOP CONFIGURATION

The intact loop for Series 8 testing will be identical to that described in the EOS Appendix 7 except for the pressurizer, which will be located in the broken loop hot leg. Included in the intact loop configuration are the steam generator, primary coolant pump, and the associated loop piping which includes instrumented spool pieces.

2. VESSEL CONFIGURATION

The basic configuration of the vessel internals will be identical to that described in the EOS Appendix 7. The Mod-3 vessel configuration consists of an upper head, upper plenum, heated core region, and lower plenum contained within a multi-section pressure vessel, and an external inlet annulus and downcomer pipe. The arrangement of the pressure vessel and the external downcomer is shown in Figure 2. Since the vessel hardware configuration is important for UHI testing, the individual parts of the vessel are discussed in more detail in the following sections.

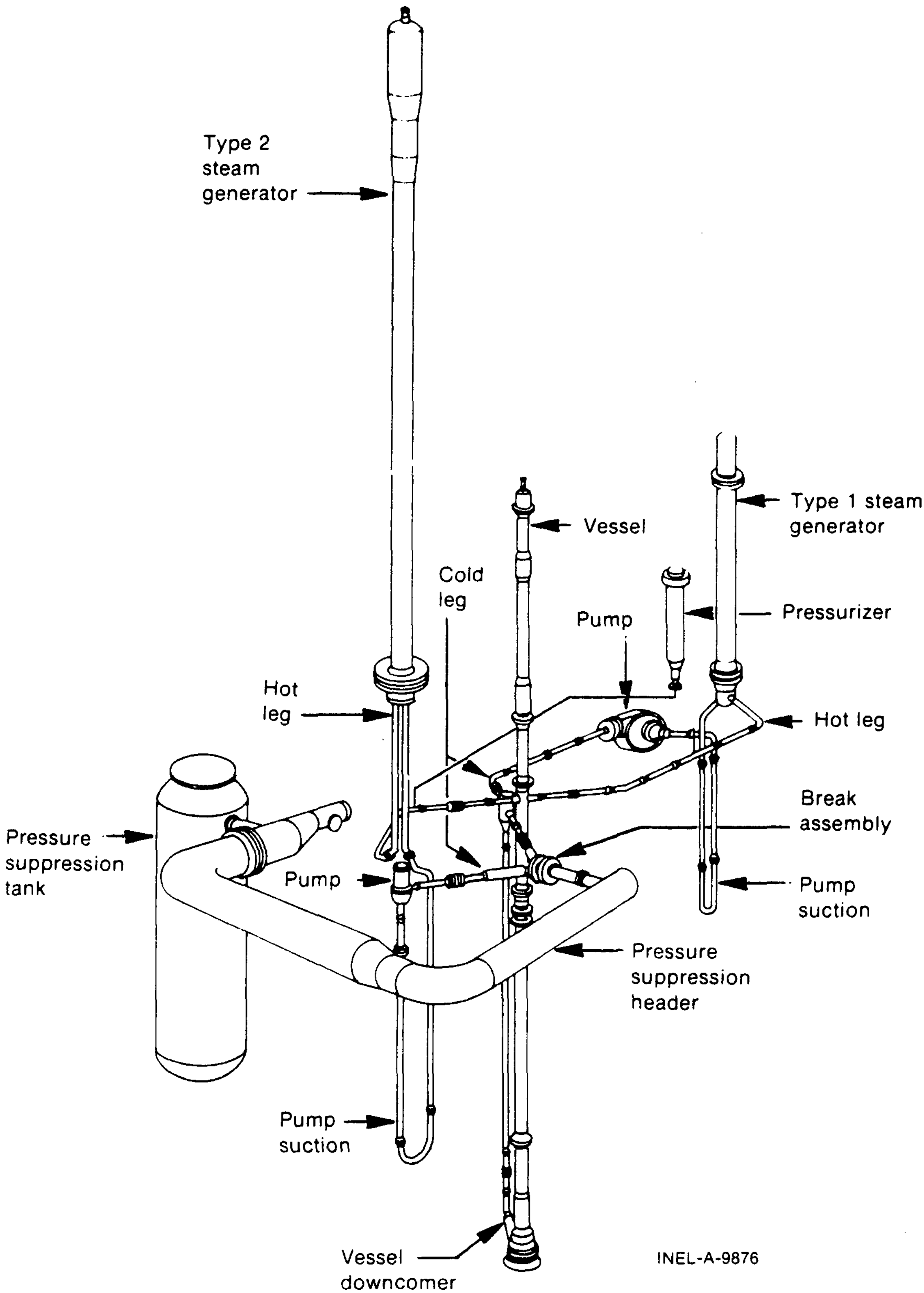

Fig. 1 Semiscale Mod-3 system cold leg noncommunitive break configuration - isometric.

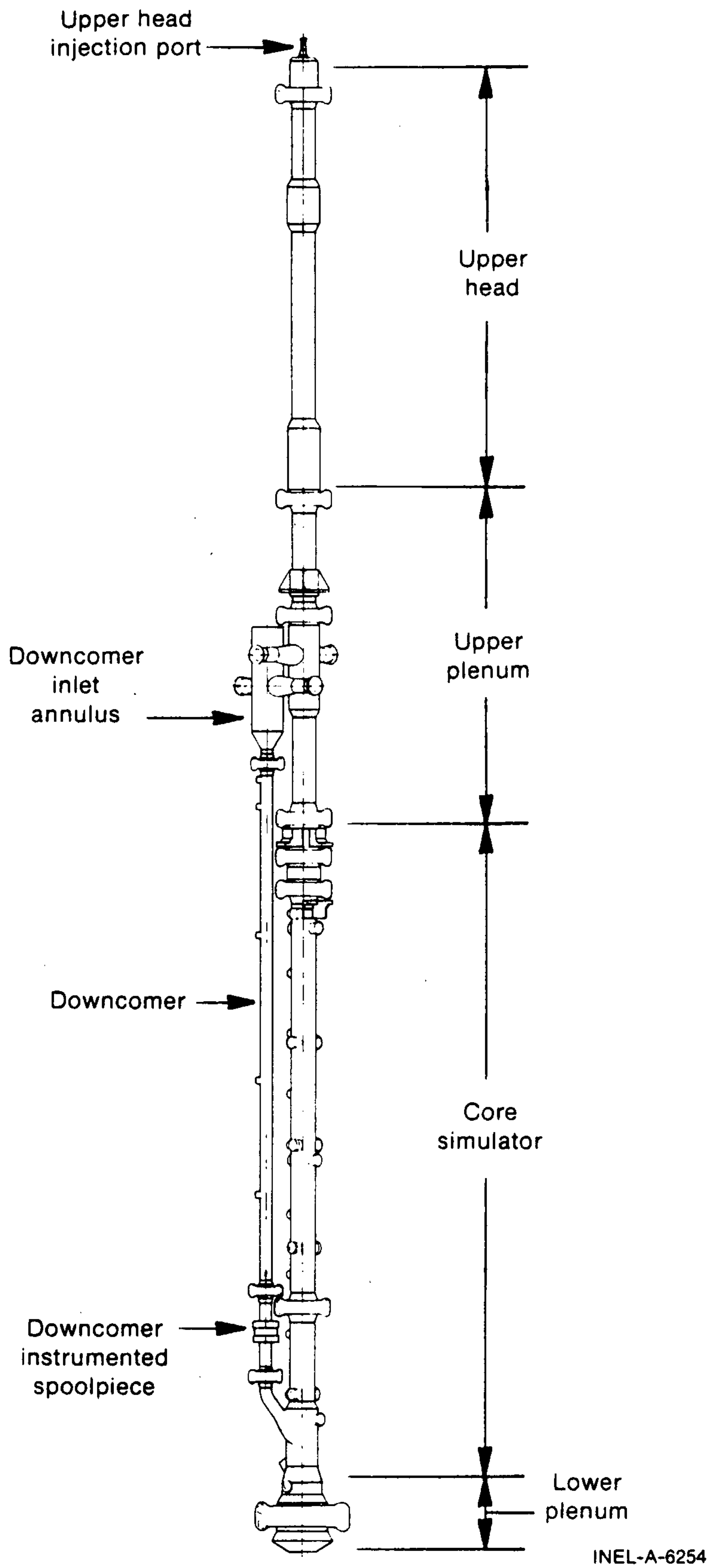

Fig. 2 Semiscale Mod-3 pressure vessel and external downcomer.

2.1 Upper Head Configuration

The upper head region is contained within approximately the top 25% of the pressure vessel. Internal to the upper head is an upper head ECC injection tube, a filler to provide the proper upper head internal volume, a simulated control rod guide tube, and the upper ends of two simulated core support columns. The design of the upper head ECC injection system provides the flexibility for varying the elevation and geometry of the tube used to inject accumulator liquid into the upper head. The temperature gradient in the upper head fluid due to the ECC injection can thus be varied by changing the elevation and configuration of the injection tube. Also included in the upper head region are numerous instrumentation ports, and a port for attaching a core bypass line. The core bypass line simulates the flow path from the downcomer upper annulus to the upper head in a PWR. This line is connected between the top of the vessel inlet annulus and the upper head and serves to circulate fluid through the upper head region to maintain the upper head temperature at a value close to that of the cold leg fluid during initial steady-state operation. At steady-state operating conditions prior to rupture, the core bypass line will pass a nominal 4% of the total system flow directly to the upper head region. An upper core support plate simulator forms the boundary between the upper head and upper plenum regions, and provides support for the simulated control rod guide tube and for the upper ends of the two simulated core support tubes which extend downward through the upper plenum region.

2.2 Upper Plenum Configuration

The upper plenum extends from the upper core support plate to the upper core plate at the top of the heated core. Two hot leg nozzles extend from the upper plenum approximately midway between the upper core support plate and the upper core plate. Internal to the upper plenum are the simulated guide tube and support columns, fillers to provide the proper volume, a core flow measurement station, and a flow restrictor assembly between the two hot leg nozzles which simulates the flow restriction in a PWR caused by control rod guide and core support tubes. The measurement station and flow restrictor effectively subdivide the upper plenum region into upper and lower sections. The guide tube has four slotted exits in the lower region of the upper plenum to simulate the slotted region in a PWR guide tube.

2.3 Core Configuration

The electrically-heated core consists of 23 powered heater rods, one unpowered rod, and one rod location containing a liquid level probe. Figure 3 shows the core configuration and the location of the unpowered rod and liquid level probe. The normalized axial power profile for the powered rods is shown in Figure 4. The nine center rods can be powered independently of the peripheral rods to simulate radial power peaking in a PWR. The core configuration will be the same as in the Series 7 testing (Reference 1). However, new heater rods will be installed between Series 7 and Series 8 to provide a greater number of cladding temperatures. A detailed description of the heater rod construction is contained in the Semiscale Mod-3 System Design Description (SDD), (Reference 2). The simulated control rod guide tube and core support columns, which extend from the entrance in the upper head through the upper plenum, terminate (open-ended) in the upper core plate located in the heater ground hub at the top of the active heated core.

2.4 Lower Plenum Configuration

The lower plenum consists of an annular region around the flow mixer box (below the heated core) and a chamber region below the mixer box which approximates the scaled volume of a PWR lower plenum. The bottom head forms the lower section of the lower plenum and provides penetration for the 24 core heater rods and liquid level probe, which extend through the lower plenum.

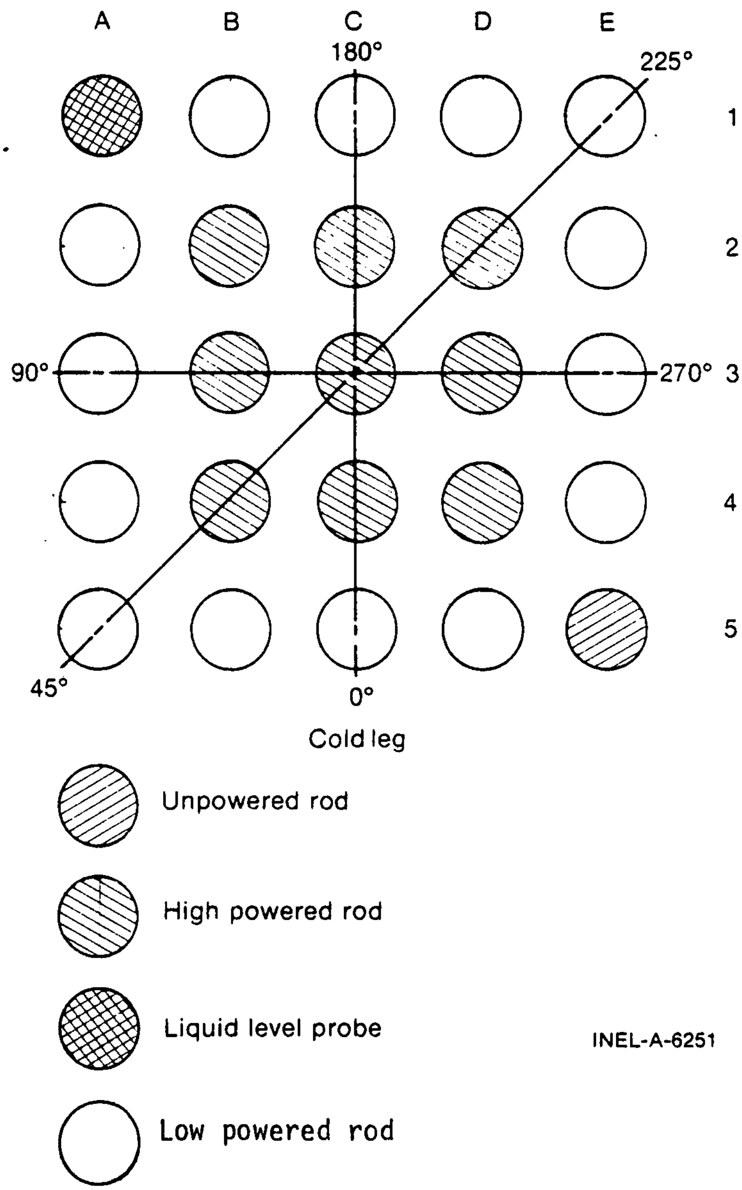

Fig. 3 Semiscale Mod-3 core - plan view

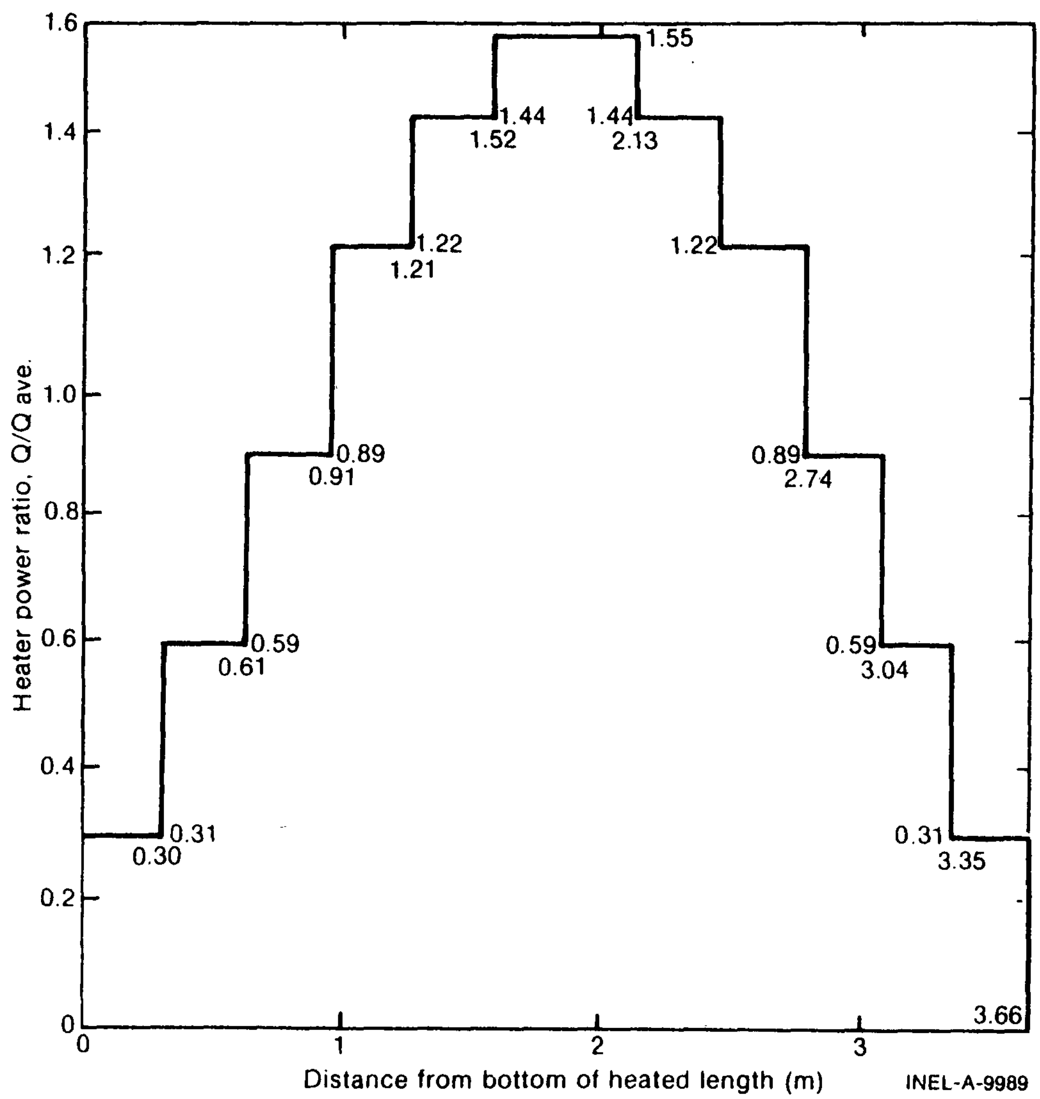

Fig. 4 Semiscale Mod-3 heater rod axial power distribution.

2.5 Downcomer and Inlet Annulus Configuration

The downcomer and inlet annulus assembly is described in detail in Reference 1. The downcomer consists of an inlet annulus assembly, an external downcomer pipe, and an instrumented spool piece. The inlet annulus in the Semiscale Mod-3 system is designed to approximate the fluid transient time characteristics of the annulus in a PWR plant, and to distribute the fluid prior to entering the downcomer pipe. The downcomer pipe extends from the bottom of the inlet annulus to the vessel lower plenum region, where it is joined to the vessel by a nozzle extending from the annular portion of the lower plenum.

3. BROKEN LOOP CONFIGURATION

The Mod-3 broken loop has been designed to provide for break simulation in the cold leg, hot leg, or pump suction piping. This test series will utilize the cold leg break configuration only. The broken loop also includes an active steam generator and pump, and the pressurizer. These components are discussed in detail in Reference 1.

4. PRESSURE SUPPRESSION SYSTEM AND STEAM SUPPLY CONFIGURATION

The pressure suppression system (PSS) and steam supply configuration is the same as for Series 7 described in Reference 1. The pressure suppression system consists of a header and a pressure suppression tank with a water spray system and a steam supply system. The Mod-3 system will blowdown through the header into the PSS tank, which simulates the containment system in a PWR. The water spray system and steam supply system are used to control containment system backpressure by injecting steam or water into the PSS tank.

5. COOLANT INJECTION SYSTEM CONFIGURATION

The cold leg coolant injection systems to be used in this series of tests include accumulator systems, high pressure injection systems, and low pressure injection systems. Each of these systems is described in the SDD for the Mod-1 system (Reference 3). In addition to the cold leg injection systems, an upper head injection system comprised of an accumulator and associated piping, valves, and nitrogen source will be used. This system is described in detail in the Semiscale Mod-3 SDD (Reference 2).

6. SYSTEM HYDRAULIC AND VOLUME SPECIFICATION

Table II presents centerline elevation changes and hydraulic resistances for the Mod-3 system. Most of the resistances listed in the table are based on measurements from a pressure drop test conducted at isothermal conditions of 550 K and 15.5 MPa. The hydraulic resistances were obtained from measured values for the pressure drop, fluid density, and mass flow rate using the following equation:

$$R' = \frac{\rho \Delta P}{\dot{m}^2}$$

where

ρ = Fluid density, kg/m^3

ΔP = Pressure drop, Pa = $\left(\frac{\text{kg-m}}{\text{sec}^2} \Big/ \text{m}^2 \right)$

$\dot{m}$ = Mass flow rate, kg/sec

Where measurements were not available, the hydraulic resistances were calculated as follows:

$$R' = \frac{\sum (K_L + fL/D)}{2\,A_f^2}$$

where K_L = Loss coefficient

f = Friction factor

L = Length of pipe, m

D = Diameter of pipe, m

A_f = Flow area, m^2

Table III presents a detailed tabulation of the design volume distribution for the Mod-3 system for the cold leg break configuration.

TABLE II

MOD-3 SYSTEM RESISTANCES
(Measured Values at 550 K)

Between Instrument Sections	Measurement	Resistance ($\times 10^5/m^4$)	Elevation Change(m)
Intact Loop			
Vessel upper plenum to spool 1A	DV-LUP-1A	1.77	0.35
Spool 1A to 6	DI-1-6	1.37	0.00
Steam Generator (Spool 6 to 7)**	DI-6-7	32.46	-0.47
Spool 7 to 13	DI-7-13	1.18	0.00 (-2.67)+
Spool 13 to 15 (exclusive of pump)		0.09*	0.25
Locked rotor pump		16.18*	-
Spool 15 to 17A	DI-15-17	1.77	0.00
Spool 17A to downcomer inlet annulus	DI-17-DIA	0.20	0.29
Broken Loop			
Vessel lower upper plenum to spool 20B	DB-13V-20B	13.73	0.35
Spool 20B to 21	DB-20B-21	8.92	0.00
Steam Generator (Spool 21 to 27A)**	DB-21-27	271.63	-0.01
Spool 27A to 37A	DB-27-37A		-0.86 (-2.91)+
Spool 37A to 40B (exclusive of pump)		2.94*	0.65
Locked rotor pump		1249.80*	-
Spool 40B to 45A	DB-40-45	62.66	0.00
Spool 45A to DC inlet annulus		8.83	0.29
Vessel			
DC inlet annulus to bottom of lower plenum	DD-DIA-578	5.49	-6.07
Bottom of lower plenum to bottom of core		1.57	0.77
Bottom of core to above core	DV-501-105	7.26	3.96
Above core to lower upper plenum	DV-105-13	1.57	0.92
Bypass Line		3824.4	
Support Column A	DV-154Q-105	8335.3	
Support Column B	DV-154D-105	8139.1	
Guide Tube	DV+331-105	4412.8	

* - calculated values
\+ - value in parentheses denotes maximum elevation change in section
** - Intact loop U-tube bend id 253 cm above bottom of tube sheet
Broken loop U-tube bend is 978 cm above bottom of tube sheet

TABLE III

VOLUME DISTRIBUTION FOR SEMISCALE MOD-3
(COLD LEG BREAK)

	SEMISCALE MOD-3 Desired Volume Scaled from PWR m^3	Design m^3	Percentage Total Liquid Volume
1.0 Vessel			
1.1 Downcomer Region			
1.0 Vessel			
1.1 Downcomer Region			
Distribution annulus	0.0071	0.0077	3.91
Downcomer pipe	0.0074	0.0145	7.38
Core bypass	0.0039	----	---
TOTAL DOWNCOMER VOLUME	0.0184	0.0222	11.29
1.2 Upper head region			
Above top of guide tube	0.0044	0.0046	2.37
Below top of guide tube	0.0087	0.0094	4.78
TOTAL UPPER HEAD VOLUME	0.0131	0.0140	7.15
1.3 Upper plenum	0.0103	0.0112	5.71
1.4 Core region	0.0107	0.0105	5.39
1.5 Lower plenum	0.0161	0.0151	7.99
1.6 Control rod guide tube	0.0050	0.0015	0.78
1.7 Core support tubes	0.0007	0.0004	0.20
TOTAL VESSEL VOLUME	0.0743	0.0749	38.51
2.0 Intact Loop			
2.1 Hot leg	0.0039	0.0103	5.23
2.2 Surge line	-----	0.0004	0.19
2.3 Steam generator	0.0536	0.0421	21.46
2.4 Pump suction leg	0.0063	0.0111	5.65
2.5 Pump	0.0040	0.0041	2.08
2.6 Cold leg	0.0042	0.0088	4.51
TOTAL INTACT LOOP VOLUME	0.0720	0.0767	39.12
3.0 Broken loop			
3.1 Hot leg	0.0013	0.0021	1.07
3.2 Pressurizer (liquid volume)	0.0179	0.0137	6.99
3.3 Steam Generator	0.0179	0.0175	8.96
3.4 Pump suction leg	0.0021	0.0054	2.76
3.5 Pump	0.0013	0.0013	0.68
3.6 Pipe	-----	0.0023	1.16
3.7 Cold leg	0.0014	0.0015	0.75
TOTAL BROKEN LOOP VOLUME	0.0419	0.438	22.37
TOTAL SYSTEM LIQUID VOLUME	0.1882	0.1954	100.00

III. TEST DESCRIPTION AND OPERATIONAL REQUIREMENTS

Test Series 8 consists of eight integral blowdown and reflood experiments, designated as Tests S-08-1 through S-08-8. Test S-08-1 will be run in place of Test S-07-7 which was originally the baseline test for Series 8 and was to be run as part of Series 7. The initial and boundary conditions for Test S-08-1 will therefore be identical to the conditions specified for Test S-07-7. Test S-08-1 is a non-UHI baseline case to be used as a basis for comparison with the remaining Series 8 tests. The remaining tests in Series 8 will use the UHI emergency core cooling system, and are designed to determine the effect on core thermal response and system hydraulic behavior due to the systematic variation of different UHI parameters which was discussed in Section I.

The initial and boundary conditions for each of the Series 8 tests are shown in Tables IV and V. In addition to the initial pre-blowdown conditions, several important operational parameters have been identified which could significantly influence the Mod-3 system behavior during the integral blowdown and reflood experiments. The parameters include:

(1) Core power versus time
(2) Intact and broken loop pump operating characteristics
(3) Intact and broken loop steam generator characteristics
(4) Pressurizer injection location
(5) Pressure suppression tank conditions.

TABLE IV

INITIAL CONDITIONS AND INTACT AND BROKEN LOOP ECC INJECTION REQUIREMENTS FOR THE UHI TEST GROUP

Break Size	200%
Break Type	Cold Leg
Nominal System Pressure	15510 kPa
Hot Leg Fluid Temperature	594 K ± 0.5 K
Cold Leg Fluid Temperature	557 K ± 0.5 K
Core Temperature Difference	37 K ± 0.5 K
Nominal Core Inlet Flowrate	9.77 kg/s
Total Core Power	2 MW ± 0.05 MW
Power Decay Curve	'on line'/ANS + 20%
Core Radial Power Profile	Flat
Pressurizer Location	Broken Loop Hot Leg
Pressurizer line resistance	5.903×10^{8} $1/m^{4}$
Pressurizer Liquid Mass	10.4 kg
Pressure Suppression System Pressure	135 kPa
Steam Generator Secondary Hot Water level	
Intact Loop	295±5 cm
Broken Loop	998±5 cm

ECC Injection

Intact Loop Accumulator	
Location	Cold Leg
Actuation Pressure	2760 kPa
Liquid Volume	0.060 m^3
Gas Volume	0.031 m^3
Line Resistance	2.461×10^{9} $1/m^{4}$
Temperature	300 K
Injection Rate (Avg)	0.53 kg/s
Intact Loop HPIS	
Location	Cold Leg
Actuation Pressure	12410 kPa
Injection Rate (Avg)	0.062 kg/s
Temperature	300 K
Intact Loop LPIS	
Location	Cold Leg
Actuation Pressure	1030 kPa
Injection Rate (Avg)	0.16 kg/s
Temperature	300 K

TABLE IV (Contd)

Broken Loop Accumulator	
Location	Cold Leg
Actuation Pressure	2758 kPa
Liquid Volume	0.016 m^3
Gas Volume	0.0083 m^3
Line Resistance	2.206×10^{10} $1/m^4$
Temperature	300 K
Injection Rate (Avg)	0.178 kg/s
Broken Loop HPIS	
Location	Cold Leg
Actuation Pressure	12400 kPa
Injection Rate (Avg)	0.0213 kg/s
Temperature	300 K
Broken Loop LPIS	
Location	Cold Leg
Actuation Pressure	1030 kPa
Injection Rate (Avg)	0.053 kg/s
Temperature	300 K

TABLE V

ECC INJECTION REQUIREMENTS FOR THE UHI SYSTEM IN THE UHI TEST GROUP

	S-08-1+	S-08-2	S-08-3	S-08-4	S-08-5	S-08-6	S-08-7	S-08-8
Injection Location -		(1)	(2)	(3)	(4)	(4)	(4)	(4)
Activation Pressure (kPa) -		8618	8618	8618	8618	8618	9653	6895
Initial Upper Head Temp- ature (K) -		557	557	557	557	557	557	557
ECC Tempera- ture (K) -		300	300	300	300	300	300	300
Line Resistance ($1/m^4$) -		$2.69x10^9$	$2.69x10^9$	$2.69x10^9$	$2.92x10^{10}$	$2.69x10^9$	$2.69x10^9$	$2.69x10^9$
Avg. Injection rate (kg/s) -		.81	.81	.81	.405	.81	.81	.81
Liquid Volume (m^3) -		0.0299	0.0299	0.0299	0.0299	0.0299	0.0299	0.0299
Gas Volume (m^3) -		0.0299	0.0299	0.0299	0.0299	0.0299	0.0299	0.0299
Volume of injected (m^3) mass -		0.0166	0.0166	0.0166	0.0166	0.0083	0.0166	0.0166

\+ - UHI will not be used in Test S-08-1
(1) - Entire length of upper head
(2) - Top of upper head
(3) - Bottom of upper head
(4) - To be determined

The importance of these operational parameters were discussed in detail in the EOS Appendix 7 (Reference 1) and therefore will not be discussed here.

The following paragraphs will present the specific differences in system configuration between tests, coolant injection requirements, and the sequence of events to be followed to ensure successful completion of the Series 8 tests.

1. SYSTEM CONFIGURATION REQUIREMENTS

Except for variations in the configuration of the UHI system hardware, all tests in Series 8 will utilize the general system configuration described in Section II. Test S-08-1 will not use UHI accumulator injection. Tests S-08-2 through S-08-4 will require changes in the injection port of the UHI system. Test S-08-2 will use a perforated discharge nozzle which will run the entire length of the upper head. Tests S-08-3 and S-08-4 will have the UHI discharge nozzle located near the top of the upper head and near the bottom of the upper head, respectively. The remaining tests will use the a nozzle geometry to be determined after the results of Tests S-08-2, S-08-3, and S-08-4 have been evaluated.

The pressurizer will be located in spool piece 21 in the broken loop hot leg for all the tests in this series. All tests will be conducted with a flat radial power profile.

2. COOLANT INJECTION REQUIREMENTS

The ECC injection for all tests in Test Series 8 will include HPIS, LPIS, and accumulator injection into both the intact and broken loop cold legs. All Series 8 tests except Test S-08-1 will also have UHI accumulator injection. The UHI accumulator injection rate and water volume will be volumetrically scaled for all tests except Tests S-08-5 and S-08-6. Test S-08-5 will utilize the properly scaled water volume but will require a change in the hydraulic resistance of the UHI line to reduce the injection flow rate to half of its normal value. Test S-08-6 will inject half the scaled UHI accumulator water volume of the first 3 UHI tests, but will have the scaled UHI line resistance. Volume scaling of the ECC parameters was performed using a UHI plant for reference conditions. The scaling calculations and results appear in Addendum 8A. The ECC volumes and injection rate requirements are presented in Tables IV and V.

The activation pressures for each ECC injection system are presented in Tables IV and V. The actuation pressures will be the same as in a typical PWR plant with UHI for all tests except Test S-08-7 and S-08-8, in which the UHI activation pressure will be higher and lower, respectively, than the reference plant. The ECC will be injected into the intact and broken loop cold legs and into the upper head at ambient temperature (300 K).

3. SEQUENCE OF EVENTS

The sequence of events prior to, during, and after rupture for the Series 8 tests is defined in Table VI. While Table VI is not intended to be an all inclusive description of the test procedures to be followed, the steps defined should provide a sequence of events that is necessary for the preparation of detailed test plans and specifications.

The following paragraphs provide detailed information on the actual operations associated with the performance of each event outlined in Table VI and define special operating requirements for each of the integral blowdown and reflood experiments.

<u>TABLE VI</u>

SEQUENCE OF EVENTS
MOD-3 UHI TEST GROUP

Event	Time of Application
1. Fill and vent primary system and establish water chemistry.	Several hours before blowdown
2. Fill suppression tank.	
3. Fill intact and broken loop steam generator secondaries.	
4. Fill intact, broken loop, and UHI accumulators.*	
5. Electronically zero DP cells.	
6. Perform pretest leak test.	
7. Perform Instrumentation systems warmup and checkout.	
8. Perform system warmup and rod thermal behavior repeatability test (at 450 K).	Flow and no-flow DDAPS data at RFI-2 = 300 K, 350 K, 400 K 450 K, 500 K.
9. Continue warmup to initial conditions.	
10. Establish core power level at 2.0 MW and stabilize.	Approximately 10 - 30 minutes before blowdown.
11. Take primary system water sample.	When RFI-2 indicates 557 K.
12. Verify that the specified system initial conditions exist.	At specified core power before blowdown.
13. Adjust core flow rate to achieve required core T.	
14. Reverify that the specified initial system conditions exist prior to blowdown.	Up to 20 seconds before break initiation.
15. Record process instrument readings (hand data).	15 seconds before break initiation.

* The UHI accumulator tank will not be used in Test S-08-1.

TABLE VI (Contd)

Event	Time of Application
16. Turn makeup pump and pressurizer heaters off.	One (1) second before break initiation.
17. Initiate blowdown by bursting rupture discs (Note: valve actuation time is about 200 ms).	Reference time = 0.
17.1 Switch to the specified broken loop transient pump speed.	
17.2 Initiate intact loop pump coast down to 61% of the initial speed.	
17.3 Switch to core power control for decay.	
17.4 Open accumulator injection valves.	
17.5 Trip intact and broken loop steam generator discharge valves and feed-water valves closed.	
18. Initiate ECC injection (automatic).	As specified in Tables II and III.
19. Terminate upper head injection	When specified volume has been injected.
20. Record hand data.	When PV-13 = PB-PSS.
21. Terminate test.	Approximately 300 sec after rupture.
21.1 Trip main core power. 21.2 Terminate ECC injection. 21.3 Trip intact and broken loop pump power.	
22. Drain system from low points.	

3.1 Water Quality

For each of the integral blowdown and reflood experiments, the system will be filled and vented with water conforming to the following water chemistry requirements:

pH	9.0 - 10.5
Conductivity	3-70 μmhos/cm
Lithium	0.3 - 2.2 g/m^3
Chloride	0.15 g/m^3 (maximum)
Flouride	0.10 g/m^3 (maximum)
Oxygen	1.0 x 10^{-4} cc/1 (maximum)
Total gas	100 cc/1 (maximum)

A water sample will be taken just prior to blowdown and analyzed posttest for content. The results of this analysis will be reported in the experimental data report.

3.2 Venting and Location of DP Cells

It is required that all differential pressure (DP) cells and connecting lines be free of air bubbles prior to warmup. The DP cells must be lower than any system ports that connect to the cell.

3.3 Differential Pressure Cell Zeroing and Orientation

With the system full of cold water, all DP cells should read zero prior to each warmup. Wherever practical, the DP cells should be oriented with the high side tap connected to the first number in the instrument identification so that a positive DP will be obtained during normal flow. For example, DI-3-6 should have the high side tap connected to spool 3 and the low side tap connected to spool 6.

3.4 System Leak Test and Pressure Test

In the system leak test, the system is brought from 250 to 15,513 kPa in 5 equal pressure increments. At each pressure point, DDAPS data will be taken. The leak test should be accomplished at no-flow conditions with the system cold and full of water.

3.5 Placement of Calibration Steps in Data

It is required that calibration steps do not occur on the data during or within 2 s of the following events: blowdown, ECC injection, and system drain.

3.6 System Warmup

In the system warmup, the system is brought from ambient conditions to the operating intact loop fluid temperature of 557 K. All data should be recorded and displayed on the DDAPS at intervals specified in Table VI. The intact and broken loop pumps must have the capability of starting at the specified system pressure and temperature. It is required that the system be maintained at 557 K for approximately 10 minutes prior to approach to power to ensure that system piping and fluid temperatures are stabilized.

3.7 Rod Thermal Behavior Repeatability Test

The Mod-3 heater rod thermal characteristics will possibly change over a period of operational cycling. It is therefore necessary to have information on the possible changes in the thermal behavior of the rods from test to test. This information will provide a basis for anticipating a critical situation, such as rod overheating, and possibly provide data for modifying analytical conduction models. Below is an outline of test procedures to be followed in step 8 of the sequence of events, for evaluation of the rod thermal behavior.

(1) The temperature level for switching the core power off will be set at 950 K to ensure no core damage will result from this test.

(2) The system will be heated at 100% flow rate (9.8 Kg/s) until the core inlet temperature reaches 450 K $\pm$ 5 K. There will be no flow in the secondary of either the intact or broken loop steam generators.

(3) The core power will be maintained constant (for longer than 5 minutes) until the core inlet temperature stabilizes within 1 K.

(4) When the core inlet temperature stabilizes, the core power will be step increased to 25% of full power (0.50 MW) for 10 s and then returned to its original level.

(5) The DDAP and analog data systems will record heater rod cladding temperatures, fluid temperatures, flow rates, and pump power for each individual power pulse test, and a magnetic tape will be generated.

3.8 Approach to Power

The maximum core power for Series 8 tests will be 2.0 MW. The approach to power will be accomplished as follows:

Ramp the core power up in successive, discrete steps, permitting sufficient time between steps for the steam generator secondary steam temperature to stabilize. The maximum core power will be attained in the following sequence with data recorded at each step.

0.5 MW - record data
1.2 MW - record data
full power - record data

3.9 Core Power Control Following Blowdown Initiation

Test S-08-1 will use the on-line power control system, which calculates a real time power decay based on system conditions during blowdown and a pre-determined power decay (ANS + 20%) during reflood. During all other tests a specified power decay equal to the power calculated for Test S-08-1 will be used. For both the on-line power control and the specified power decay, heater trip point temperatures have been specified as a linear function of core power level. The heater trip point temperatures are defined by the following relation, based on a maximum total core power of 2.0 MW:

Core Power (%)	Core Trip Temperature (K)
100	950
6	1255

If the core power is tripped by a high heater rod temperature indication prior to the end of the system blowdown, the core power will be tripped to 0.10 MW as long as the hottest heater rod temperature is less than 1255 K. At an indicated temperature of 1255 K, core power will be tripped to zero.

3.10 Intact and Broken Loop Pump Speeds

During system heating to isothermal conditions and approach to power, the intact and broken loop pumps will operate together to produce a core flow rate, indicated by FD-424, of 13.0 l/s. Operation and control of the two pumps prior to blowdown is such that the initial flow split between the two pumps will result in 25% of the total core flow passing through the broken loop, and 75% of the core flow passing through the intact loop. The core flow will then be brought up to initial conditions with the intact loop pump, and the broken loop pump speed will be controlled by monitoring the loop flowrates to maintain the desired flow split.

System warmup will continue until the final value of steady-state core power is achieved. The intact loop pump speed may then require adjustment (with the broken loop pump following) to produce the required value of vessel temperature differential. The required fluid temperature differential (hot leg to cold leg T = RFI-2 minus RFI-17) of 37 K $\pm$ 0.5 K can be achieved by reducing pump speed to increase the temperature differential and by increasing the pump speed to reduce the temperature differential.

The intact and broken loop pump speeds during blowdown have been specified to approximate a reference plant coastdown resulting from pump power trip simultaneous with break initiation. For Series 8 tests, the intact loop pump coastdown will be initiated at the time of break; but, when the pump speed drops to 61% of its initial value, pump coastdown will terminate and the pump speed will be maintained at that level. In the case of the broken loop pump, a pump speed controller will be used to control pump speed. Figure 5 shows the desired pump speed (dashed line), which is the normalized pump speed profile from a typical four-loop PWR. However, to prevent possible damage to the Mod-3 broken loop pump, caused by overspeeding, the pump operation will be specified to follow the normalized pump speed represented in Figure 5 by the solid line.

3.11 Intact and Broken Loop Steam Generators

During steady-state operation preceding the blowdown experiments, the intact and broken loop steam generators function independently of each other to maintain the desired vessel inlet temperature of both loops within the temperature range specified in Table IV. Each of the steam generators is equipped with discharge and feedwater valves which

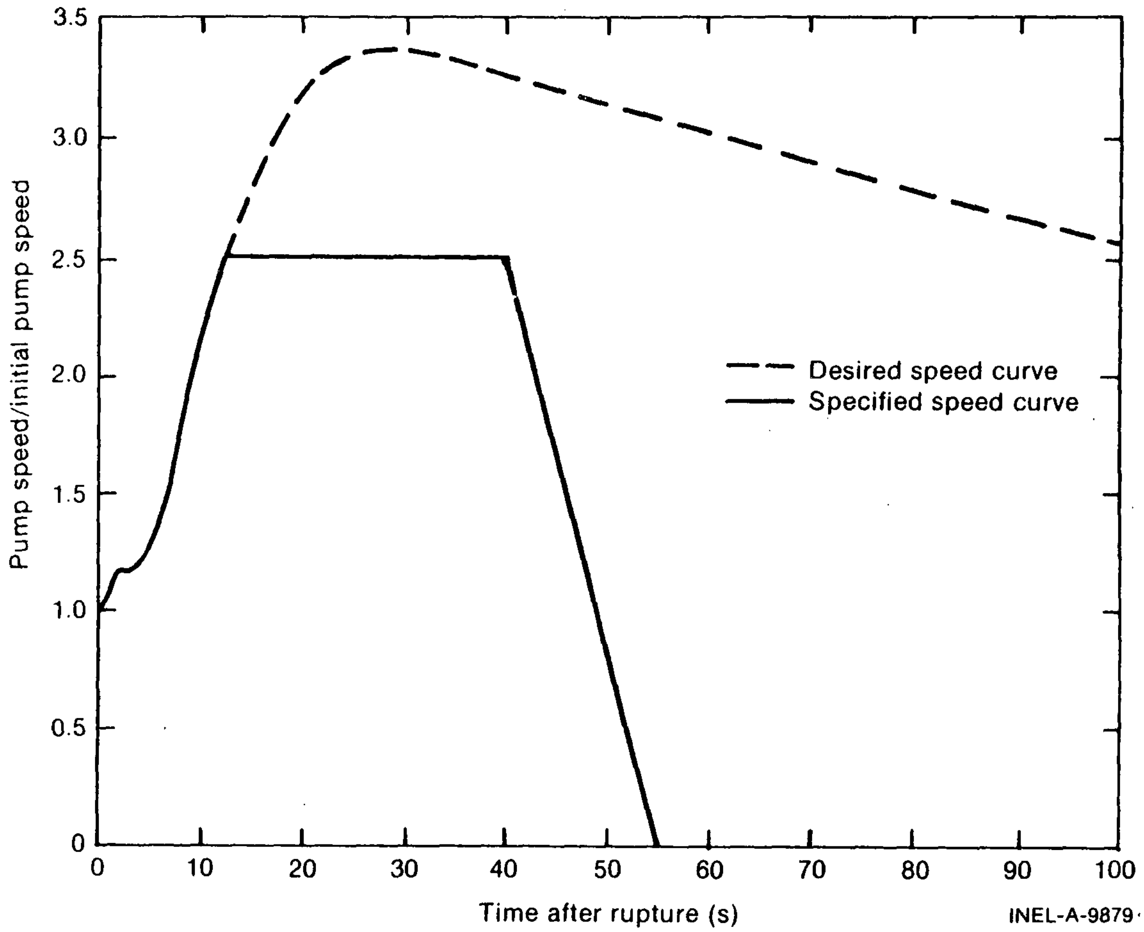

Fig. 5 Semiscale Mod-3 broken loop pump normalized speed control.

are positioned by automatic controllers and control primary cold leg fluid temperature and steam generator secondary water level, respectively. For all of the Series 8 tests, the intact and broken loop steam generator discharge valves are to be tripped closed at rupture. The desired valve closure times is on the order of 0.6 to 1 s. The secondary feedwater valves will be closed simultaneously with the steam valves.

3.12 Intact and Broken Loop Accumulators

For each of the Series 8 tests, the intact and broken loop accumulators will be filled with water to a level corresponding to accumulator liquid volumes specified in Table IV. The intact loop accumulator will inject into cold leg spool 17 with a resistance of 2.46×10^9 1/m^4 and the broken loop accumulator will inject into spool 40 with a resistance of 2.21×10^{10} 1/m^4. These resistances are scaled from the line resistances in a reference UHI plant. The accumulator water is to be injected at ambient temperature (300 K) for all Series 8 tests. The intact and broken loop set point pressures will be 2758 kPa for the UHI integral tests.

3.13 UHI Accumulator

For Test S-08-1 no UHI will be used. In the remaining tests, Tests S-08-2 through S-08-8, the accumulator will be filled with water to a level corresponding to the accumulator liquid volumes specified in Table V. The UHI accumulator will inject into the upper head of the vessel with a line resistance and elevation as specified in Table V. The UHI accumulator resistance is scaled from the line resistance in a reference UHI plant. The UHI accumulator is to be valved off when the specified volume of ECC has been injected.

3.14 Visual Monitoring of the High Power Rod Temperatures

Regardless of the automatic trip function built into Mod-3 core power control, visual readout of the high powered rod temperatures most likely to experience DNB should be supplied with a high speed chart recorder. During the approach to power, an observer with the capability for manual override on core power control should monitor the visual readout for indication of pre-rupture DNB as a backup to the automatic power control system. The rod thermocouples which should be monitored are as follows:

TH-C3-160	TH-C3-211
TH-D2-185	TH-D3-196
TH-B3-184	TH-C3-292

If, during steady-state operation at full power, any one of these thermocouples indicates a temperature above the trip temperature of 950 K without the automatic power trip, the manual override should be implemented.

IV. INSTRUMENTATION SPECIFICATION AND OPERATION

The instrument locations and measurement capabilities are delineated in this section. Included are a discussion of the Mod-3 data acquisition system and tables listing Mod-3 data measuring requirements for Test Series 8. There are approximately 800 measurement locations available; however, the number of measurements which can be recorded is limited by the capacity of the data acquisition system. It is expected that 400 data channels will be available for Series 8 testing. To meet experimental objectives, Mod-3 includes the following types of measurements: momentum flux, volumetric flow, fluid temperatures, metal temperatures, resistance bulb fluid temperatures, liquid level, metal insulation temperatures, core heater rod temperatures, fluid densities, static differential pressures; core power, voltage, and current; and pump speed, torque, and power. Available instrumentation locations are shown in Figure 6.

1. DATA ACQUISITION SYSTEM

The data acquisition system (DAS) consists of an "on line" digital data acquisition processing system (DDAPS) and the analog data acquisition system (ADAS).

At a predetermined time interval, 920 data points are recorded for each data channel. If higher data resolution is required, sequential blocks of 920 data points can be obtained for shorter time durations. Low level amplifiers and preconditioners are available, allowing flexibility in the measurements assigned to these channels. In addition, there are 6 dual-beam gamma densitometers, 3 triple-beam x-ray densitometers, and 22 channels of single-beam gamma densitometers. The ADAS has 80 channel capability and is used for higher response measurements. The frequency response is 0 to 250 Hz with some channels having higher frequency limits.

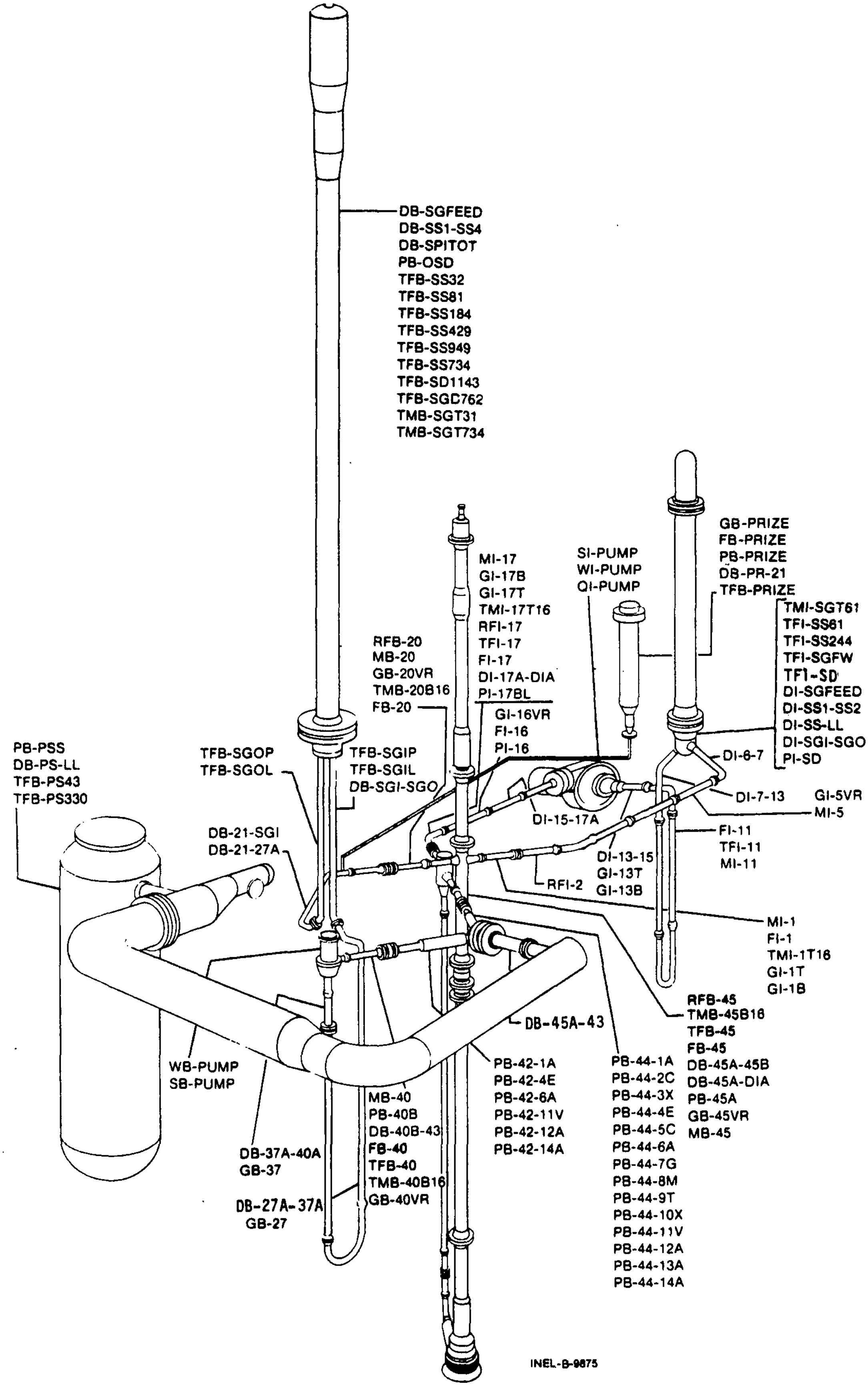

Fig. 6 Semiscale Mod-3 system cold leg noncommunitive break configuration - isometric with available instrumentation locations.

The following engineering units will be used for various measurements and for the calculated flow rates:

Measurement	Type Abbr.	Units
Thermocouple Temperature	T	K
Resistance Bulb Temp.	R	K
Electric Current	A	Amp
Electric Potential	V	Volts
Electric Power	W	Watts
Pump Speed	S	rad/s
Pump Torque	Q	N·M
Differential Pressure	D	kPa
Pressure (Static)	P	kPa
Density	G	kg/m^3
Momentum Flux	M (drag disc)	$kg/m \cdot s^2$
	N (drag screen)	$kg/m \cdot s^2$
Volumetric Flowrate	F	l/s
Liquid Level	L	cm

The DDAPS will be used to monitor instrument output during warmup of the Mod-3 system. At each specified warmup point, data required to analyze instrument and system performance will be sampled. During each test, data will be recorded from -20 to 300 s after LOCA rupture.

Although there is a high degree of detector reliability, some instrument failures are likely to occur. During the system warmup, a committee consisting of representatives from the Semiscale Facilities and Test Operations Branch, and from the Specification and Analysis Branch will evaluate the impact of any instrument failure with respect to test objectives and determine if the test should proceed.

2. MEASUREMENT CAPABILITY AND TEST DATA REQUIREMENTS

Tables VIII through XII give a detailed description of Mod-3 measurement capabilities. The following information is included in the tables:

(1) Detector ID Descriptive Title System. The detector ID consists of a 10 digit alphanumeric group that will appear on the plots received from the DDAPS.

The spool pieces are numbered consecutively starting at the vessel outlet, around the intact loop and back to the downcomer. The numbering is continued at the vessel outlet, through the broken loop and back to the downcomer. The first group of letters will indicate the type of instrumentation and general location in the system. The first letter indicates the type as listed in Section IV.1.

For temperature measurements, one or two additional letters are used to indicate the material being measured as follows:

F-	Fluid Temperature
M-	Metal Temperature
H-	Heater Rod Surface Temperature
IF-	Insulation Gap Fluid Temperature
IM-	Insulator Metal Temperature
GF-	Guide Tube Fluid Temperature
GM-	Guide Tube Metal Temperature
SF-	Support Tube Fluid Temperature
SM-	Support Tube Metal Temperature
CM-	Core Support Metal Temperature

/

In the case of momentum flux one additional letter, G or S, is used to indicate guide tubes or support tubes, respectively.

The next letter, which is not used for core heater rod surface temperatures, indicates the general location in the system as follows:

B	Broken Loop
I	Intact Loop
C	Core
G	Grid Spacers
D	Downcomer
V	Vessel

A second character group, which is unique to the type of measurement and location, will be described in Section IV 2.1.

(2) Range/Response/Accuracy. This part of the table will reflect the range, response (for a step input of 10% of full scale to 90% of full scale), and accuracy of the instruments installed in the Mod-3 system.

(3) Location/Comments. Included are comments related to the location of the instruments.

(4) Test Used On. The furthermost right-hand columns indicate what measurements will be taken for each of the eight tests. The letter 'D' will signify a digital measurement, dashes will indicate a measurement not being taken, and 'A' will denote an analog measurement.

2.1 Instrument Tables.

The following is a discussion of Tables VIII through XII.

The measurements for Test Series 8 have been selected to provide increased monitoring of thermal and hydraulic phenomena in the core, upper plenum, and upperhead regions, while still providing sufficient coverage of the remainder of the system to determine the overall system response.

2.1.1 Table VIII. This table includes a description of the measurement capabilities in the intact loop (see Figure 6). Spool pieces are numbered with the hot leg vessel outlet spool as '1' and continuing through the intact loop (excluding the steam generator and pump) to the cold leg vessel inlet spool number 17. The steam generator measurements include various pressures, differential pressures, fluid temperatures, and metal temperatures. The letters 'SG', 'SD' and 'SGT' refer to the steam generator, steam generator dome, and steam generator tube, respectively. An 'L' at the end of a detector ID indicates a low range measurement at the same location as another similar type measurement. For metal temperature measurements and fluid density measurements following the spool piece number, the following additional labels are used:

B- Bottom, or for gamma densitometer systems, indicates beam through main body

T- Top, or for gamma densitometer systems, indicates beam near tangential position to body

U- For low energy (x-ray) density systems, indicates the upper beam

L- For low energy (x-ray) density systems, indicates the lower beam

M- For low energy (x-ray) density systems, indicates the beam between the U and L beams

HR- Single-beam shot horizontal

VR- Single-beam shot vertical

S- Side, for temperature measurements

C- Indicates a composite of T and B, or U, L, and M density shots

Elevation changes are indicated under location comments.

2.1.2 Table IX. This table describes instrumentation in the Mod-3 broken loop with a cold-leg noncommunicative break configuration. The broken loop consists of a pressurizer in the hot leg, a Type II steam generator, pump, and piping with a noncommunicative break nozzle assembly. Figure 7 presents the spool numbering for the cold leg break configuration. The broken loop descriptive titles are the same as the intact loop.

2.1.3 Table X. This table includes instrumentation in the downcomer, vessel, and core. Numbers in the detector ID define the vertical distance of the measurement in centimeters from the cold leg centerline. A plus sign preceding the numbers refers to the distances above the cold leg centerline and a minus to distance below the cold leg centerline. For vessel measurements the angular displacement using the intact loop cold leg as the reference and rotating clockwise as viewed from the top is shown in Table VII. DIA stands for downcomer inlet annulus. As an example, the differential pressure cell, DD-DIA-170, can be interpreted as a downcomer differential pressure cell with the high tap in the downcomer inlet annulus and the low tap at -170 cm below the cold leg centerline of the vessel.

The heater rod thermocouples and core fluid thermocouples are identified in a manner different from the other vessel instrumentation. As shown in Figure 3, any heater rod in the core can be expressed by two coordinates in terms of columns (letter designated) and rows (number designated). The three digit number

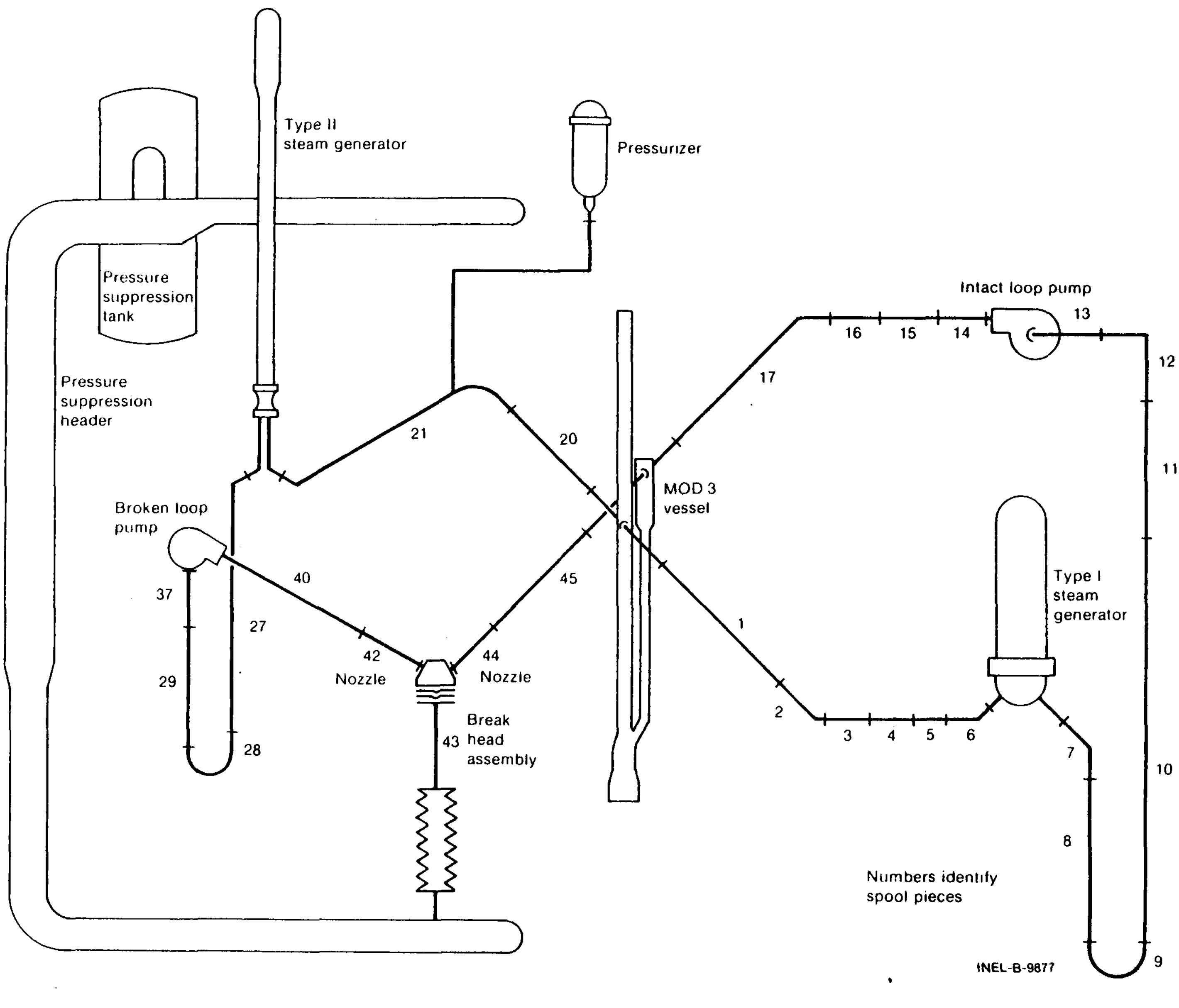

Fig. 7 Semiscale Mod-3 system cold leg noncommunitive break piping arrangement.

following the coordinate location refers to elevation above the bottom of the active core, i.e., TH-A5-198 means heater rod thermocouple at location A5, 198 cm above the bottom of active core.

The core fluid thermocouples are located on the ten grid spacers located in the heated core region. These are numbered consecutively from one to ten with one at the bottom of the core. The first number after 'TGF' represents the grid spacer number while the pairs of letters and numbers give the four adjacent rod positions. The grid spacer fluid thermocouple axial positions are indicated in Figure 8.

2.1.4 Table XI. This table includes pressure suppression system (PSS) instrumentation. 'DB-PSS-LL' represents pressure suppression tank liquid level. For fluid temperatures, all elevations following the 'PS' are in centimeters from the bottom of the tank.

2.1.5 Table XII. This table locates the coolant injection system instrumentation. The following key describes the coolant injection system labeling:

ACC1	Accumulator #1 Emergency Core Coolant
ACC2	Accumulator #2 Emergency Core Coolant
ACC3	Accumulator #3 Emergency Core Coolant
ACC1-LL	Liquid Level Measurement in Accumulator #1
ACC2-LL	Liquid Level Measurement in Accumulator #2
ACC3-LL	Liquid Level Measurement in Accumulator #3
LPIS	Low Pressure Injection System
HPIS	High Pressure Injection System

3. SPECIAL INSTRUMENTATION REQUIREMENTS

The tests in Series 8 will be instrumented sufficiently to provide information on total system behavior during the integral blowdown and reflood experiment. In addition, specific detail is desired in the core, upper plenum and upper head region of the vessel. More rod TC's in the upper half of the core are specified as well as fluid temperatures in the upper plenum and upper head.

The core heater rod cladding temperatures for the entire test series will have the higher resolution setup of the DDAPS. The sampling rate should be at least five samples/second during the first twenty seconds after rupture and normal ($\approx$3 samples/sec) thereafter.

The static pressure taps on the break nozzles will have the higher resolution setup of the DDAPS. The sampling rate shall be the same as for the core heater rod cladding temperature measurements.

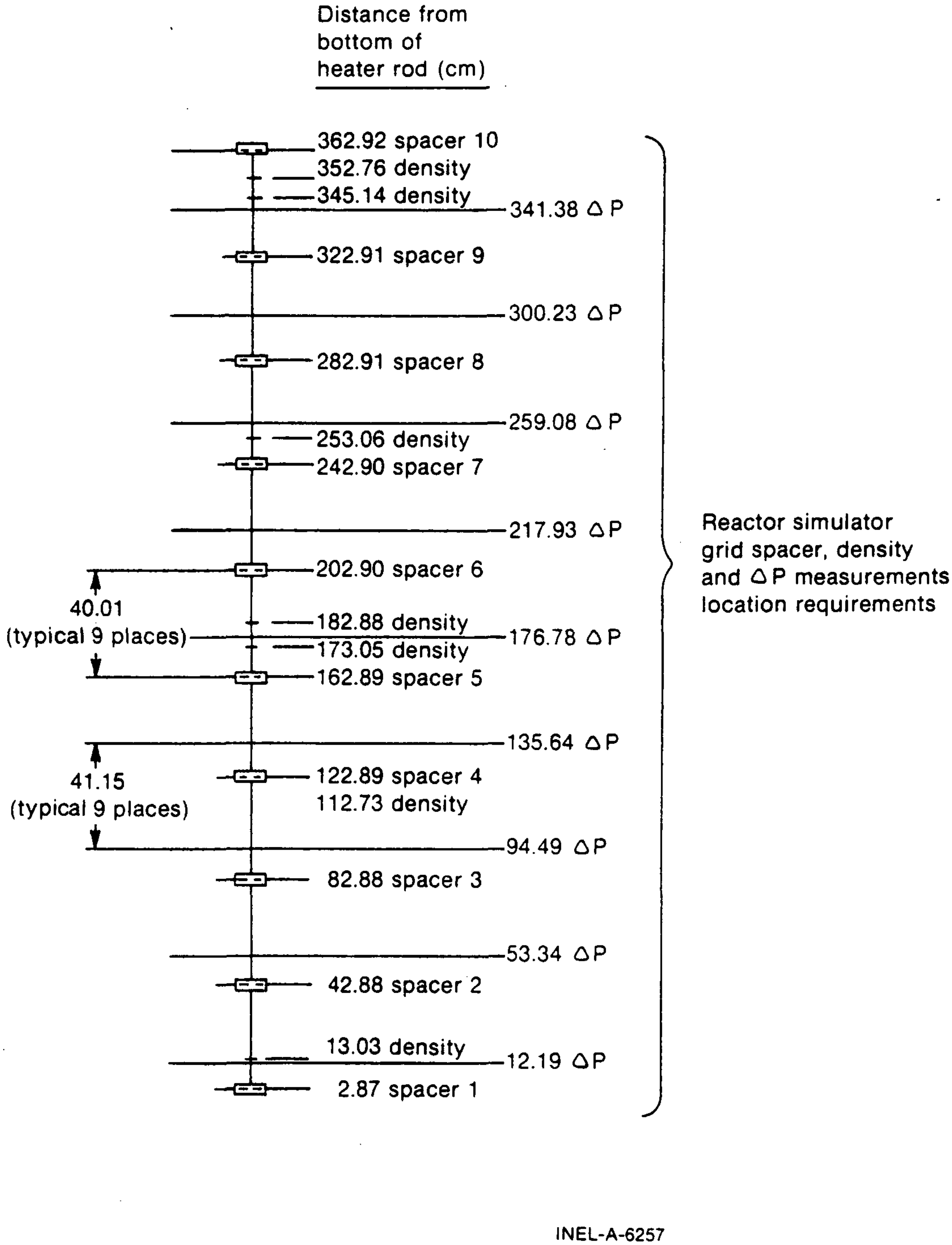

Fig. 8 Semiscale Mod-3 core differential pressure and density measurements and grid spacer locations.

<u>TABLE VII</u>

ANGULAR DISPLACEMENT NOMENCLATURE

A = 0°	I = 120°	R = 240°
B = 15°	J = 135°	S = 255°
C = 30°	L = 150°	T = 270°
D = 45°	L = 165°	U = 285°
E = 60°	M = 180°	V = 300°
F = 75°	N = 195°	W = 315°
G = 90°	P = 210°	X = 330°
H = 105°	Q = 225°	Y = 345°

TABLE VIII

INTACT LOOP

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Static Pressure										
PI-5	0-17240 kPa 20 ms, 1% FS	HLS Spool 5	---	---	---	---	---	---	---	---
PI-7	0-17240 kPa 20 ms, 1% FS	CLS Spool 7	---	---	---	---	---	---	---	---
PI-16	0-17240 kPa 20 ms, 1% FS	CLS Spool 16	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
PI-1A	0-17240 kPa 20 ms, 1% FS	HLS Spool 1 Upstream Tap	---	---	---	---	---	---	---	---
PI-1B	0-17240 kPa 20 ms, 1% FS	HLS Spool 1 Downstream Tap	---	---	---	---	---	---	---	---
PI-11A	0-17240 kPa 20 ms, 1% FS	CLS Spool 11 Upstream Tap	---	---	---	---	---	---	---	---
PI-11B	0-17240 kPa 20 ms, 1% FS	CLS Spool 11 Downstream Tap	---	---	---	---	---	---	---	---
PI-17A	0-17240 kPa 20 ms, 1% FS	CLS Spool 17 Upstream Tap	---	---	---	---	---	---	---	---
PI-17B	0-17240 kPa 20 ms, 1% FS	CLS Spool 17 Downstream Tap	---	---	---	---	---	---	---	---
PI-17AL	0-3447 kPa 20 ms, 1% FS	CLS Spool 17 Upstream Tap Low Range Measurement	---	---	---	---	---	---	---	---

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Static Pressure (contd.)										
PI-17BL	0-3447 kPa 20 ms, 1% FS	CLS Spool 17 Downstream Tap Low Range Measurement	D	D	D	D	D	D	D	D
PI-PRIZE	0-17240 kPa 20 ms, 1% FS	Steam Dome of System Pressurizer	---	---	---	---	---	---	---	---
PI-SD	0-10000 kPa 20 ms, 1% FS	Steam Generator, Secondary Side Steam Dome	D	D	D	D	D	D	D	D

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure										
DI-13V-1A	+12.5 kPa 20 ms, 2% FS	VSL Lower Section of Upper Plenum 13 cm below CLC to HLS 1 22 cm above CLC 142 cm from VSL Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
DI-13V-1AL	+5.0 kPa 20 ms, 2% FS	Low Range Measurement of DI-13V-1A	---	---	---	---	---	---	---	---
DI-1A-6		HLS 1 to HLS 6 near SG Inlet 253 cm from VSL Center	D	D	D	D	D	D	D	D
DI-6-SGI	+25 kPa 20 ms, 2% FS	HLS 6 through Inlet Orifice to SG Inlet Plenum. Tap 46 cm above. HLS 6 Tap.	D*	D*	D*	D*	D*	D*	D*	D*
DI-6-7	+400 kPa 20 ms, 2% FS	HLS 6 across SG to CLS 7 421 cm from DC Center. HLS 6 Tap is 46.4 cm above CLS 7 Tap.	D	D	D	D	D	D	D	D
DI-SGI-SGO	+5 kPa 20 ms, 2% FS	SG Inlet Plenum through Primary Tubes to SG Outlet Plenum Excluding Orifices.	D*	D*	D*	D*	D*	D*	D*	D*
DI-SGI-SG1	+50 kPa 20 ms, 1% FS	SG Inlet Plenum to 1st Tap on Primary Tubes, 61 cm above Inlet Plenum	---	---	---	---	---	---	---	---
DI-SG1-SG2	+5 kPa 20 ms, 1% FS	SG Primary Tubes Tap 1 to Tap 2, 30.5 cm above Tap 1	---	---	---	---	---	---	---	---
DI-SG2-SG3	+12.5 kPa 20 ms, 1% FS	SG Primary Tubes Tap 2 to Tap 3, 61 cm above Tap 2	---	---	---	---	---	---	---	---

* Instrumentation to be connected only if additional data channels are available at time of testing.

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure (contd.)										
DI-SG3-SG4	±25 kPa 20 ms, 1% FS	SG Primary Tubes Tap 3 to Tap 4, 123 cm above Tap 3	---	---	---	---	---	---	---	---
DI-SGO-7	±5 kPa 20 ms, 2% FS	SG Outlet Plenum through Outlet Orifice to CLS 7. SG Outlet Tap is 89 cm above HLS 7.	D*	D*	D*	D*	D*	D*	D*	D*
DI-7-8	±25 kPa 20 ms, 2% FS	CLS 7 to CLS 8 694 cm from DC Center CLS 7 Tap is 226 cm above CLS 8 Tap.	D*	D*	D*	D*	D*	D*	D*	D*
DI-7-13	±25 kPa 20 ms, 2% FS	CLS 7 to CLS 13. CLS 13 Tap is 226 cm above CLS 8 Tap.	D	D	D	D	D	D	D	D
DI-8-9	±5 kPa 20 ms, 2% FS	CLS 8 to CLS 9 658 cm from DC Center. CLS 8 Tap is 31.5 cm above CLS 9 Tap.	D*	D*	D*	D*	D*	D*	D*	D*
DI-9-10		CLS 9 to CLS 10 617 cm from DC Center.	D*	D*	D*	D*	D*	D*	D*	D*
DI-10-13	±25 kPa 20 ms, 2% FS	CLS 10 to CLS 13 328 cm from DC Center. CLS 10 Tap is 31.5 cm above CLS 9 Tap.	D*	D*	D*	D*	D*	D*	D*	D*
DI-13-15	+600 kPa 20 ms, 2% FS	CLS 13 Across Pump to CLS 15. CLS 15 Tap is 25.4 cm above CLS 13 Tap.	D	D	D	D	D	D	D	D
DI-15-17A	±25 kPa 20 ms, 2% FS	CLS 15 Across Cold Leg ECC Injection Point to CLS 17A.	D	D	D	D	D	D	D	D

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure (contd.)										
DI-17A-DIA	±25 kPa 20 ms, 2% FS	CLS 17A to DC Inlet Annulus	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
DI-PR-LL	±12.5 kPa 20 ms, 2% FS	Top To Bottom of Pressurizer for Water Level Measurement Elevation Differential between Taps is 86.4 cm.	---	---	---	---	---	---	---	---
DI-PR-4	±6895 kPa 20 ms, 1% FS	Pressurizer outlet to HLS 4. Elevation Differential between Taps is 267 cm. HLS 4 Tap is 140 cm below Pressurizer Exit.	---	---	---	---	---	---	---	---
DI-SGFEED	±75 kPa 20 ms, 1% FS	SG Feedwater Flow Measurement.	D	D	D	D	D	D	D	D
DI-SG-LL	±125 kPa 20 ms, 1% FS	Top to Bottom of SG Secondary Side for Water Level Measurement. Elevation Difference between Taps is 1067 cm.	D	D	D	D	D	D	D	D
DI-SG-OUT		SG Venturi Steam Flow Measurement.	D	D	D	D	D	D	D	D

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Volume Flow										
FI-1	1.3 to 25.2 l/s(1) 10 ms, 1% FS	Spool 1 Bi-directional	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
FI-11	1.3 to 25.2 l/s(2) 10 ms, 1% FS	Spool 11 Bi-directional	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
FI-16	1.3 to 25.2 l/s(2) 10 ms, 1% FS	Spool 16 Bi-directional	D	D	D	D	D	D	D	D
FI-17	1.3 to 25.2 l/s(3) 10 ms, 1% FS	Spool 17 Bi-directional	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
FI-PRIZE	0.3 to 6.3 l/s 10 ms, 1% FS	Pressurizer Surge Line	---	---	---	---	---	---	---	---

(1) Electronically ranged to 80 l/s
(2) Electronically ranged to 100 l/s
(3) Electronically ranged to 60 l/s

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature										
TFI-1	617 K 100 ms, 1% FS	Intact Loop Fluid Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TFI-11	617 K 100 ms, 1% FS	Intact Loop Fluid Temperature	D	D	D	D	D	D	D	D
TFI-17	617 K 100 ms, 1% FS	Intact Loop Fluid Temperature	D	D	D	D	D	D	D	D
RFI-2	617 K 100 ms, 1% FS	Resistance Bulb Fluid Temperature in HLS 2	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
RFI-17	617 K 100 ms, 1% FS	Resistance Bulb Fluid Temperature in CLS 17	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TFI-SD	617 K 100 ms, 1% FS	SG Steam Dome Temperature	D	D	D	D	D	D	D	D
TFI-SGFW	617 K 100 ms, 1% FS	SG Feedwater Temperature	D	D	D	D	D	D	D	D
TFI-SS30	617 K 100 ms, 1% FS	SG Secondary Fluid Temperature 137 cm above CLC	---	---	---	---	---	---	---	---
TFI-SS61	617 K 100 ms, 1% FS	SG Secondary Fluid Temperature 167 cm above CLC	D	D	D	D	D	D	D	D
TFI-SS114	617 K 100 ms, 1% FS	SG Secondary Fluid Temperature 220 cm above CLC	---	---	---	---	---	---	---	---

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature (contd.)										
TFI-SS244	617 K 100 ms, 1% FS	SG Secondary Fluid Temperature 351 cm above CLC	D*	D*	D*	D*	D*	D*	D*	D*
TFI-PRIZE	617 K 100 ms 1% FS	Pressurizer Fluid Temperature	---	---	---	---	---	---	---	---

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature										
TMI-1T16	617 K 100 ms, 1% FS	Intact Loop Metal Temperature 0.16 cm From Pipe I.D.	D*	D*	D*	D*	D*	D*	D*	D*
TMI-1S16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMI-1B16	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMI-11T16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMI-11S16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMI-11B16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMI-17T16	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMI-17S16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMI-17B16	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature (contd.)										
TMI-SGT30	617 K 100 ms, 1% FS	Steam Generator Tube Metal 137 cm above CLC.	---	---	---	---	---	---	---	---
TMI-SGT61	617 K 100 ms, 1% FS	167	D	D	D	D	D	D	D	D
TMI-SGT114	617 K 100 ms, 1% FS	220	---	---	---	---	---	---	---	---
TMI-SGT244	617 K 100 ms, 1% FS	351	D*	D*	D*	D*	D*	D*	D*	D*

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Density										
GI-1T	0-1000 kg/m^3 (----, ----)	HLS 1, 68 cm from VSL Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
GI-1B	0-1000 kg/m^3 (----, ----)	HLS 1, 68 cm from VSL Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
GI-5VR**	0-1000 kg/m^3 (----, ----)	HLS 5, 228 cm from VSL Center	D	D	D	D	D	D	D	D
GI-13T	0-1000 kg/m^3 (----, ----)	CLS 13, 332 cm from DC Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
GI-13B	0-1000 kg/m^3 (----, ----)	CLS 13, 332 cm from DC Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
GI-16VR	0-1000 kg/m^3 (----, ----)	CLS 16, 129 cm from DC Center	D	D	D	D	D	D	D	D
GI-17T	0-1000 kg/m^3 (----, ----)	CLS 17, 94 cm from DC Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
GI-17B	0-1000 kg/m^3 (----, ----)	CLS 17, 94 cm from DC Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
GI-PRIZE	0-1000 kg/m^3 (----, ----)	Outlet of Pressurizer	---	---	---	---	---	---	---	---
		**VR = Single Beam Shot Vertical HR = Single Beam Shot Horizontal								

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Momentum Flux										
MI-1	0-15000 $kg/m\text{-}s^2$	HLS 1 57 cm from VSL Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
MI-5	0-15000 $kg/m\text{-}s^2$	HLS-5 220 cm from VSL center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
MI-11	0-22000 $kg/m\text{-}s^2$	CLS-11, 442 cm from DC Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
MI-16	0-22000 $kg/m\text{-}s^2$	CLS-16, 130 cm from DC Center	---	---	---	---	---	---	---	---
MI-17	0-22000 $kg/m\text{-}s^2$	CLS-17, 55 cm from DC Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A

TABLE VIII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Pump Measurements										
AI-PUMP	0-150 AMP	Pump Motor Current	---	---	---	---	---	---	---	---
VI-PUMP	0-500 V	Pump Motor Voltage	---	---	---	---	---	---	---	---
WI-PUMP	0-20 kW	Pump Motor Power	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A
SI-PUMP	0-377 rad/sec	Pump Speed	D	D	D	D	D	D	D	D
QI-PUMP	0-340 N-m	Pump Torque	---	---	---	---	---	---	---	---

TABLE IX

BROKEN LOOP

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Static Pressure										
PB-20A	0-17240 kPa 20 ms, 1% FS	HLS 20 Upstream Tap	---	---	---	---	---	---	---	---
PB-20B	0-17240 kPa 20 ms, 1% FS	HLS 20 Downstream Tap	---	---	---	---	---	---	---	---
PB-37A	0-17240 kPa 20 ms, 1% FS	CLS 37 Upstream Tap	---	---	---	---	---	---	---	---
PB-37B	0-17240 kPa 20 ms, 1% FS	CLS 37 Downstream Tap	---	---	---	---	---	---	---	---
PB-40A	0-17240 kPa 20 ms, 1% FS	CLS 40 Upstream Tap	---	---	---	---	---	---	---	---
PB-40B	0-17240 kPa 20 ms, 1% FS	CLS 40 Downstream Tap	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
PB-45A	0-17240 kPa 20 ms, 1% FS	CLS 45 Upstream Tap	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
PB-45B	0-17240 kPa 20 ms, 1% FS	CLS 45 Downstream Tap	---	---	---	---	---	---	---	---

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Static Pressure (contd.)										
PB-42-1A	0-17240 kPa 20 ms, 1% FS	CLS 42	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A
PB-42-4E	0-17240 kPa 20 ms, 1% FS	CLS 42	---	---	---	---	---	---	---	---
PB-42-6A	0-17240 kPa 20 ms, 1% FS	CLS 42	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
PB-42-11V	0-17240 kPa 20 ms, 1% FS	CLS 42	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A
PB-42-12A	0-17240 kPa 20 ms, 1% FS	CLS 42	---	---	---	---	---	---	---	---
PB-42-14A	0-17240 kPa 20 ms, 1% FS	CLS 42	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Static Pressure (contd.)										
PB-44-1A	0-17240 kPa 20 ms, 1% FS	CLS 44	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A
PB-44-2C	0-17240 kPa 20 ms, 1% FS	CLS 44	---	---	---	---	---	---	---	---
PB-44-3X	0-17240 kPa 20 ms, 1% FS	CLS 44	---	---	---	---	---	---	---	---
PB-44-4E	0-17240 kPa 20 ms, 1% FS	CLS 44	---	---	---	---	---	---	---	---
PB-44-5C	0-17240 kPa 20 ms, 1% FS	CLS 44	---	---	---	---	---	---	---	---
PB-44-6A	0-17240 kPa 20 ms, 1% FS	CLS 44	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A
PB-44-7G	0-17240 kPa 20 ms, 1% FS	CLS 44	---	---	---	---	---	---	---	---
PB-44-8M	0-17240 kPa 20 ms, 1% FS	CLS 44	---	---	---	---	---	---	---	---

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Static Pressure (contd.)										
PB-44-9T	0-17240 kPa 20 ms, 1% FS	CLS 44	---	---	---	---	---	---	---	---
PB-44-10X	0-17240 kPa 20 ms, 1% FS	CLS 44	---	---	---	---	---	---	---	---
PB-44-11V	0-17240 kPa 20 ms, 1% FS	CLS 44	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A
PB-44-12A	0-17240 kPa 20 ms, 1% FS	CLS 44	---	---	---	---	---	---	---	---
PB-44-13A	0-17240 kPa 20 ms, 1% FS	CLS 44	---	---	---	---	---	---	---	---
PB-44-14A	0-17240 kPa 20 ms, 1% FS	CLS 44	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A
PB-SGIP1	0-17240 kPa 20 ms, 1% FS	SG Inlet Plenum 200 cm Above CLC	---	---	---	---	---	---	---	---
PB-SGIP2	0-17240 kPa 20 ms, 1% FS	SG Inlet Plenum 211 cm Above CLC	---	---	---	---	---	---	---	---
PB-SGPT1	0-17240 kPa 20 ms, 1% FS	SG Primary Tubes 357 cm Above CLC	---	---	---	---	---	---	---	---

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Static Pressure (contd.)										
PB-SGPT2	0-17240 kPa 20 ms, 1% FS	SG Primary Tubes 730 cm Above CLC	---	---	---	---	---	---	---	---
PB-SGPT3	0-17240 kPa 20 ms, 1% FS	SG Primary Tubes 1104 cm Above CLC	---	---	---	---	---	---	---	---
PB-SGOP2	0-17240 kPa 20 ms, 1% FS	SG Outlet Plenum 211 cm above CLC	D*	D*	D*	D*	D*	D*	D*	D*
PB-SD	0-17240 kPa 20 ms, 1% FS	SG Secondary Side Steam Dome 1409 cm above CLC	D	D	D	D	D	D	D	D
PB-SGIL	0-17240 kPa 20 ms, 1% FS	Steam Generator Inlet Line	---	---	---	---	---	---	---	---
PB-SGOL	0-17240 kPa 20 ms, 1% FS	Steam Generator Outlet Line	---	---	---	---	---	---	---	---
PB-PRIZE	0-17240 kPa 20 ms, 1% FS	Steam Dome of System Pressurizer	D	D	D	D	D	D	D	D

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure										
DB-13V-20B	±200 kPa 20 ms, 1% FS	VSL Lower Section of Upper Plenum 13 cm below CLC to HLS 20, 22 cm above CLC 79 cm from VSL Center.	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
DB-20B-21	±200 kPa 20 ms, 2% FS	HLS 20 to HLS 21 Near SG Inlet 187 cm from VSL center	D	D	D	D	D	D	D	D
DB-21-27A	±1379 kPa 20 ms, 1% FS	HLS 21 across SG to CLS 27A	D	D	D	D	D	D	D	D
DB-21-SGI	±344.7 kPa 20 ms, 1% FS	HLS 21 187 through inlet orifice to SG Inlet, 187 cm from VSL Center. Inlet Tap is 13818 cm above HLS 21 Tap.	D*	D*	D*	D*	D*	D*	D*	D*
DB-SGI-SGO	±1379 kPa 20 ms, 1% FS	SG Inlet through Primary Tubes to SG Outlet, 982 cm from DC Centerline.	D*	D*	D*	D*	D*	D*	D*	D*
DB-SGO-27A	±200 kPa 20 ms, 1% FS	SG Outlet through Outlet Orifice to CLS 27A, 868 cm from DC Center. Outlet Tap is 62.8 cm above CLS 27A Tap.	D*	D*	D*	D*	D*	D*	D*	D*
DB-27A-27B		CLS 27 Upper to Lower Tap, 620 cm from DC Center. Upper Tap is 247.9 cm above Lower Tap.	D*	D*	D*	D*	D*	D*	D*	D*

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure (contd.)										
DB-27A-37A	±1379 kPa 20 ms, 1% FS	CLS 27A to CLS 37A 341 cm from DC Center	---	---	---	---	---	---	---	---
DB-27A-37L	±345 kPa 20 ms, 1% FS	CLS 27A to CLS 37A, 341 cm from DC Center, low range measurement	D	D	D	D	D	D	D	D
DB-27B-28	±125 kPa 20 ms, 2% FS	CLS 27 lower to CLS 28, 584 cm from DC Center. Below CLS 27B Tap is 35.9 cm above CLS 28 Tap.	D*	D*	D*	D*	D*	D*	D*	D*
DB-28-29		CLS 28 to CLS 29 503 cm from DC Center. CLS 28 to 35.9 cm below CLS 29 Tap.	D*	D*	D*	D*	D*	D*	D*	D*
DB-29-37A	±75 kPa 20 ms, 2% FS	CLS 29 to CLS 27, 341 cm from DC Center. CLS 29 Tap is 162 cm below CLS 37 Tap.	D*	D*	D*	D*	D*	D*	D*	D*
DB-37A-40B	±6895 kPa 20 ms, 1% FS	Pump Inlet to Pump Outlet, 219 cm from DC Center. CLS 37 is 65 cm below CLS 40B.	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
DB-37A-40L	± 400 kPa 20 ms, 1% FS	Low Range Pump Inlet to Pump Outlet	D*	D*	D*	D*	D*	D*	D*	D*
DB-40B-45A	± 175 kPa 20 ms, 1% FS	CLS 40 209 cm from DC Center to CLS 45 89 cm from DC Center.	D	D	D	D	D	D	D	D
DB-45A-43	±17240 kPa 20 ms, 1% FS	CLS 43 across NCB Nozzle to CLS 45	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure (contd.)										
DB-45A-DIA	+862 kPa 20 ms, 1% FS	CLS 45 to DC Inlet Annulus 29.2 cm above CLC.	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
DB-40B-43	+17240 kPa 20 ms, 1% FS	CLS 40B across NCB Nozzle to CLS 43	D	D	D	D	D	D	D	D
DB-20A-20B	+25 kPa 20 ms, 2% FS	Upstream Tap across Drag Disc to Downstream Tap on HLS 20	D*	D*	D*	D*	D*	D*	D*	D*
DB-37A-37B		Upstream Tap across Drag Disc to Downstream Tap on CLS 37.	D*	D*	D*	D*	D*	D*	D*	D*
DB-40A-40B		Upstream Tap across Drag Disc to Downstream Tap on CLS 40	D*	D*	D*	D*	D*	D*	D*	D*
DB-45A-45B		Upstream Tap across Drag Disc to Downstream Tap on CLS 45	D*	D*	D*	D*	D*	D*	D*	D*
DB-SS1-SS2	+25 kPa 20 ms, 2% FS	SG Secondary Side Upper Liquid Level Measurement from 1118 cm to 914 cm above Top of Tube Sheet	---	---	---	---	---	---	---	---
DB-SS1-SS4	+344.7 kPa 20 ms, 2% FS	SG Secondary Side Tap 1 near Top of Steam Dome to Tap 4, 1067 cm below Tap 1	D	D	D	D	D	D	D	D
DB-SS2-SS3	+5 kPa 20 ms, 2% FS	SG Secondary Side Liquid Level Measurement from 914 to 864 below Top of Tube Sheet	---	---	---	---	---	---	---	---
DB-SS3-SS4	+75 kPa 20 ms, 2% FS	SG Secondary Side Liquid Level Measurement from 865 to 1067 cm below Top of Tube Sheet	---	---	---	---	---	---	---	---

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure (contd.)										
DB-SGFEED	75 kPa 20 ms, 2% FS	SG Feedwater Measurement	D	D	D	D	D	D	D	D
DB-SGOUT	125 kPa 20 ms, 2% FS	SG Venturi Steam Flow Measurement	---	---	---	---	---	---	---	---
DB-PR-21	+6895 kPa 20 ms, 2% FS	Pressurizer Outlet to HLS 21	D	D	D	D	D	D	D	D
DB-PR-LL	+12.5 kPa 20 ms, 2% FS	Top to bottom of Pressurizer for water level measurement element differential between tops is 86.4 cm.	D	D	D	D	D	D	D	D
DB-SGIL-SG1		SG Inlet Line to SG Primary tubes 357 cm above CLC	---	---	---	---	---	---	---	---
DB-SG1-SG2		SG Primary Tubes 357 cm above CLC to 730 cm above CLC	---	---	---	---	---	---	---	---
DB-SG2-SG3		SG Primary Tubes 730 cm above CLC to 1104 cm above CLC	---	---	---	---	---	---	---	---

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Volumetric Flow										
FB-20	1.3 to 25.2+ l/s 10 ms, 1% FS	HLS 20 Bi-directional	D	D	D	D	D	D	D	D
FB-37	1.3 to 25.2+ l/s 10 ms, 1% FS	CLS 37 Bi-directional	D	D	D	D	D	D	D	D
FB-40	1.3 to 25.2+ l/s 10 ms, 1% FS	CLS 40 Bi-directional	D	D	D	D	D	D	D	D
FB-45	1.3 to 25.2+ l/s 10 ms, 1% FS	CLS 45 Bi-directional	D	D	D	D	D	D	D	D
FB-PRIZE	.3 to 8.2 l/s 10 ms, 1% FS	Pressurizer Surge Line	D	D	D	D	D	D	D	D

+ Electronically ranged to 80 l/s

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature										
TFB-20	617 K 100 ms, 1% FS	Broken Loop Fluid Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TFB-40	617 K 100 ms, 1% FS	↓	D	D	D	D	D	D	D	D
TFB-45	617 K 100 ms, 1% FS	↓	D	D	D	D	D	D	D	D
RFB-20	617 K 100 ms, 1% FS	Resistance Bulb Temperature in Broken Loop	D*	D*	D*	D*	D*	D*	D*	D*

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature (contd.)										
RFB-40	617 K 100 ms, 1% FS	Resistance Bulb Temperature in Broken Loop	---	---	---	---	---	---	---	---
RFB-45	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TFB-SGIL	617 K 100 ms, 1% FS	SG Inlet Line Fluid Temperature 74 cm above CLC	D*	D*	D*	D*	D*	D*	D*	D*
TFB-SGOL	617 K 100 ms, 1% FS	SG Outlet Line Fluid Temperature 74 cm above CLC	D*	D*	D*	D*	D*	D*	D*	D*
TFB-SGIP	617 K 100 ms, 1% FS	SG Inlet Plenum Fluid Temperature 195 cm above CLC	D	D	D	D	D	D	D	D
TFB-SGOP	617 K 100 ms, 1% FS	SG Outlet Plenum Fluid Temperature 195 cm above CLC	D	D	D	D	D	D	D	D
TFB-SS20	617 K 100 ms, 1% FS	SG Secondary Fluid Temperature 286 cm above CLC	---	---	---	---	---	---	---	---

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature (contd.)										
TFB-SS32	617 K 100 ms, 1% FS	SG Secondary Fluid Temperature 297 cm above CLC	D	D	D	D	D	D	D	D
TFB-SS51	617 K 100 ms, 1% FS	316 cm	---	---	---	---	---	---	---	---
TFB-SS64	617 K 100 ms, 1% FS	330 cm	---	---	---	---	---	---	---	---
TFB-SS81	617 K 100 ms, 1% FS	347 cm	D*	D*	D*	D*	D*	D*	D*	D*
TFB-SS111	617 K 100 ms, 1% FS	377 cm	---	---	---	---	---	---	---	---
TFB-SS184	617 K 100 ms, 1% FS	450 cm	D*	D*	D*	D*	D*	D*	D*	D*
TFB-SS245	617 K 100 ms, 1% FS	511 cm	D*	D*	D*	D*	D*	D*	D*	D*
TFB-SS429	617 K 100 ms, 1% FS	695 cm	D*	D*	D*	D*	D*	D*	D*	D*
TFB-SS446	617 K 100 ms, 1% FS	712 cm	---	---	---	---	---	---	---	---

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature (Contd).										
TFB-SS476	617 K 100 ms, 1% FS	SG Secondary Fluid Temperature 742 cm above CLC	---	---	---	---	---	---	---	---
TFB-SS490	617 K 100 ms, 1% FS	756 cm	---	---	---	---	---	---	---	---
TFB-SS507	617 K 100 ms, 1% FS	773 cm	---	---	---	---	---	---	---	---
TFB-SS537	617 K 100 ms, 1% FS	803 cm	---	---	---	---	---	---	---	---
TFB-SS673	617 K 100 ms, 1% FS	939 cm	D*	D*	D*	D*	D*	D*	D*	D*
TFB-SS734	617 K 100 ms, 1% FS	1000 cm	D	D	D	D	D	D	D	D
TFB-SS857	617 K 100 ms, 1% FS	1123 cm	---	---	---	---	---	---	---	---
TFB-SS888	617 K 100 ms, 1% FS	1154 cm	---	---	---	---	---	---	---	---
TFB-SS917	617 K 100 ms, 1% FS	1183 cm	---	---	---	---	---	---	---	---

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature (contd.)										
TFB-SS918	617 K 100 ms, 1% FS	SG Secondary Fluid Temperature 1184 cm above CLC	---	---	---	---	---	---	---	---
TFB-SS949	617 K 100 ms, 1% FS	1215 cm	D*	D*	D*	D*	D*	D*	D*	D*
TFB-SD1119	617 K 100 ms, 1% FS	SG Steam Dome Temperatures at 1385 cm above CLC	---	---	---	---	---	---	---	---
TFB-SD1143	617 K 100 ms, 1% FS	SG Steam Dome Temperature at 1409 cm above CLC	D	D	D	D	D	D	D	D
TFB-SGD152	617 K 100 ms, 1% FS	SG DC Fluid (Secondary) Temperatures 418 cm above CLC	---	---	---	---	---	---	---	---
TFB-SGD305	617 K 100 ms, 1% FS	570	---	---	---	---	---	---	---	---
TFB-SGD457	617 K 100 ms, 1% FS	723	---	---	---	---	---	---	---	---
TFB-SGD609	617 K 100 ms, 1% FS	875	---	---	---	---	---	---	---	---
TFB-SGD762	617 K 100 ms, 1% FS	1028	D	D	D	D	D	D	D	D

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature (contd.)										
TFB-SGD914	617 K 100 ms, 1% FS	SG DC Fluid (Secondary) Temperature 1180 cm above CLC.	---	---	---	---	---	---	---	---
TFB-PRIZE	617 K 100 ms, 1% FS	Pressurizer Fluid Temperature	D	D	D	D	D	D	D	D

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature										
TMB-20T16	617 K 100 ms, 1% FS	Broken Loop Metal Temperature .16 cm From Pipe I.D.	D*	D*	D*	D*	D*	D*	D*	D*
TMB-20S16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMB-20B16	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMB-30T16	617K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMB-30S16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMB-30B16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature (contd.)										
TMB-37T16	617 K 100 ms, 1% FS	Broken Loop Metal Temperature 0.16 cm from Pipe I.D.	---	---	---	---	---	---	---	---
TMB-37S16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMB-37B16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMB-40T16	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMB-40S16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMB-40B16	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMB-45T16	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMB-45S16	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMB-45B16	617 k 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature (contd.)										
TMB-SGTSBG	617 K 100 ms, 1% FS	SG Tube Sheet Bottom (Primary Side) Metal Temperature 90° cw at 218 cm above CLC.	D*	D*	D*	D*	D*	D*	D*	D*
TMB-SGTSBT	617 K 100 ms, 1% FS	SG Tube Sheet Bottom (Primary Side) Metal Temperature 270° cw at 218 cm above CLC.	---	---	---	---	---	---	---	---
TMB-SGTSTG	617 K 100 ms, 1% FS	SG Tube Sheet (Secondary Side) Metal Temperature 90° cw at 266 cm above CLC.	D*	D*	D*	D*	D*	D*	D*	D*
TMB-SGTSTT	617 K 100 ms, 1% FS	SG Tube Sheet Top (Secondary Side) Metal Temperature 270° cw at 266 cm above CLC.	---	---	---	---	---	---	---	---
TMB-SGT31	617 K 100 ms, 1% FS	SG Tube Metal Temperature 297 cm above CLC.	D	D	D	D	D	D	D	D
TMB-SGT184	617 K 100 ms, 1% FS	SG Tube Metal Temperature 450 cm above CLC.	D*	D*	D*	D*	D*	D*	D*	D*
TMB-SGT245	617 K 100 ms, 1% FS	SG Tube Metal Temperature 511 cm above CLC.	D*	D*	D*	D*	D*	D*	D*	D*
TMB-SGT429	617 K 100 ms, 1% FS	SG Tube Metal Temperature 695 cm above CLC.	D*	D*	D*	D*	D*	D*	D*	D*
TMB-SGT673	617 K 100 ms, 1% FS	SG Tube Metal Temperature 939 cm above CLC.	D*	D*	D*	D*	D*	D*	D*	D*

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature (Contd.)										
TMB-SGT734	617 K 100 ms, 1% FS	SG Tube Metal Temperature 1000 cm above CLC.	D	D	D	D	D	D	D	D

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Momentum Flux										
NB-20	0-126,000 $kg/m\text{-}s^2$	HLS 20, 73 cm From VSL Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
NB-37	0-126,000 $kg/m\text{-}s^2$	CLS 37, 335 cm From DC Center	D*	D*	D*	D*	D*	D*	D*	D*
NB-40	0-126,000 $kg/m\text{-}s^2$	CLS 40, 213 cm From DC Center	D	D	D	D	D	D	D	D
NB-45	0-700,000 $kg/m\text{-}s^2$	CLS 45, 85 cm From DC Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Density										
GB-20U	0-1000 kg/m^3	HLS 20, 63 cm From VSL Center, Low Energy (x-ray) system	D	D	D	D	D	D	D	D
GB-20M	0-1000 kg/m^3	↓	D	D	D	D	D	D	D	D
GB-20L	0-1000 kg/m^3	↓	D	D	D	D	D	D	D	D
GB-37	0-1000 kg/m^3	CLS 37, 325 cm From DC Center	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
GB-40U	0-1000 kg/m^3	CLS 40, 225 cm From DC Center, Low Energy (x-ray) system	D	D	D	D	D	D	D	D
GB-40M	0-1000 kg/m^3	↓	D	D	D	D	D	D	D	D
GB-40L	0-1000 kg/m^3	↓	D	D	D	D	D	D	D	D
GB-45U	0-1000 kg/m^3	CLS 45, 74 cm From DC Center, Low Energy (x-ray) system	D	D	D	D	D	D	D	D
GB-45M	0-1000 kg/m^3	↓	D	D	D	D	D	D	D	D
GB-45L	0-1000 kg/m^3	↓	D	D	D	D	D	D	D	D
GB-PRIZE	0-1000 kg/m^3	Outlet of Pressurizer	D	D	D	D	D	D	D	D

TABLE IX (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Pump										
AB-PUMP	0-200A	Pump Motor Current	---	---	---	---	---	---	---	---
VB-PUMP	50-400V	Pump Motor Voltage	---	---	---	---	---	---	---	---
WB-PUMP	0-25 kW	Pump Motor Power	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
SB-PUMP	0-3665 rad/s	Pump Speed	D	D	D	D	D	D	D	D

TABLE X

VESSEL

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Static Pressure										
PD+29	0-17240 kPa 20 ms, 1% FS	Downcomer Inlet Annulus	---	---	---	---	---	---	---	---
PD-81	0-17240 kPa 20 ms, 1% FS	DC Body 81.3 cm below CLC	---	---	---	---	---	---	---	---
PD-170	0-17240 kPa 20 ms, 1% FS	DC Body 169.8 cm below CLC	---	---	---	---	---	---	---	---
PD-347	0-17240 kPa 20 ms, 1% FS	DC Body 346.7 cm below CLC	---	---	---	---	---	---	---	---
PD-446	0-17240 kPa 20 ms, 1% FS	DC Body 446 cm below CLC	---	---	---	---	---	---	---	---
PD-578	0-17240 kPa 20 ms, 1% FS	DC Body 577.6 cm below CLC	---	---	---	---	---	---	---	---
PV+421	0-17240 kPa 20 ms, 1% FS	Vessel 421 cm above CLC	---	---	---	---	---	---	---	---
PV+329	0-17240 kPa 20 ms, 1% FS	Vessel 328.8 cm above CLC	D*	D*	D*	D*	D*	D*	D*	D*
PV+154	0-17240 kPa 20 ms, 1% FS	Vessel 154 cm above CLC	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Static Pressure (contd.)										
PV+135	0-17240 kPa 20 ms, 1% FS	Vessel 135.3 cm above CLC	---	---	---	---	---	---	---	---
PV+30	0-17240 kPa 20 ms, 1% FS	Vessel 30.2 cm above CLC	---	---	---	---	---	---	---	---
PV-13	0-17240 kPa 20 ms, 1% FS	Vessel 12.7 cm below CLC	D	D	D	D	D	D	D	D
PV-105	0-17240 kPa 20 ms, 1% FS	Vessel 105.1 cm below CLC	---	---	---	---	---	---	---	---
PV-154	0-17240 kPa 20 ms, 1% FS	Vessel 154.3 cm below CLC	---	---	---	---	---	---	---	---
PV-278	0-17240 kPa 20 ms, 1% FS	Vessel 277.7 cm below CLC	---	---	---	---	---	---	---	---
PV-442	0-17240 kPa 20 ms, 1% FS	Vessel 442.3 cm below CLC	---	---	---	---	---	---	---	---
PV-501	0-17240 kPa 20 ms, 1% FS	Vessel 500.7 cm below CLC	---	---	---	---	---	---	---	---
PV-578	0-17240 kPa 20 ms, 1% FS	Vessel 578 cm below CLC	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure										
DD-DIA-81	±25 kPa 20 ms, 2% FS	DC Inlet Annulus 29.2 cm above CLC to DC Body 81.3 cm below CLC.	D*	D*	D*	D*	D*	D*	D*	D*
DD-DIA-170	±75 kPa 200 ms, 2% FS	DC Inlet Annulus 29.2 cm above CLC to DC Body 169.8 cm below CLC.	D	D	D	D	D	D	D	D
DD-DIA-578	±125 kPa 200 ms, 2% FS	DC Inlet Annulus 29.2 cm above CLC to Bottom to VSL Lower Plenum, 577.6 cm below CLC	D	D	D	D	D	D	D	D
DD-81-170	±25 kPa 20 ms, 2% FS	DC Body 81.3 cm below CLC to DC Body 169.8 cm below CLC	D*	D*	D*	D*	D*	D*	D*	D*
DD-170-347		DC Body 169.8 cm below CLC to DC Body 346.7 cm below CLC	D*	D*	D*	D*	D*	D*	D*	D*
DD-170-435	±75 kPa 20 ms, 2% FS	DC Body 169.8 cm below CLC to DC Body 446 cm below CLC	D	D	D	D	D	D	D	D
DD-347-435	±25 kPa 20 ms, 2% FS	DC Body 346.7 cm below CLC to DC Body 446 cm below CLC	D*	D*	D*	D*	D*	D*	D*	D*
DD-435-578		DC Body 446 cm below CLC to Bottom of VSL Lower Plenum, 577.6 cm below CLC.	D	D	D	D	D	D	D	D
DV+329+421	±12.5 kPa 20 ms, 2% FS	VSL Upper Head 329 cm above CLC to Upper Head 421 cm above CLC	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure (contd.)										
DV+154+421	±75 kPa 20 ms, 2% FS	VSL Upper Head 154 cm above CLC to Upper Head 421 cm above CLC	D	D	D	D	D	D	D	D
DV+154+329	±25 kPa 20 ms, 2% FS	VSL Upper Head 154 cm above CLC to Upper Head 329 cm above CLC	D	D	D	D	D	D	D	D
DV+135+154	±200 kPa 20 ms, 2% FS	Upper Section of Upper Plenum 135.3 cm above CLC across Upper Head Plate to Upper Head 154 cm above CLC.	D	D	D	D	D	D	D	D
DV+30+135		VSL Upper Section of Upper Plenum 30.2 cm above CLC to Vsl Upper Section of Upper Plenum 135.3 cm above CLC	D	D	D	D	D	D	D	D
DV-13+30	±345 kPa 20 ms, 1% FS	VSL Lower Section of Upper Plenum 127 cm below CLC across Flow Restrictor and Turbine Flowmeter to Upper Section of Upper Plenum 30.2 cm above CLC	D	D	D	D	D	D	D	D
DV-105-13	±75 kPa 20 ms, 2% FS	105.2 cm below CLC through Upper Core Plate to 12.7 below CLC	D	D	D	D	D	D	D	D
DV-154-13	±75 kPa 20 ms, 2% FS	VSL Upper Core Plate to 12.7 cm below CLC	---	---	---	---	---	---	---	---
DV-278-13	±125 kPa 20 ms, 1% FS	Midcore 277.7 cm below CLC to Lower Section of Upper Plenum 12.7 cm below CLC.	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure (contd.)										
DV-501-13	+344.7 kPa 20 ms, 1% FS	VSL Lower Core 500.7 cm below CLC to Lower Section of Upper Plenum 12.7 cm below CLC	D*	D*	D*	D*	D*	D*	D*	D*
DV-154-105	+75 kPa 20 ms, 2% FS	VSL Upper Core 54.3 cm below CLC. To Upper Core Plate 105.2 cm below CLC	D*	D*	D*	D*	D*	D*	D*	D*
DV-501-105	+344.7 kPa 20 ms, 1% FS	VSL Lower Core 500.7 cm below CLC to Upper Core Plate 105.1 cm below CLC	D	D	D	D	D	D	D	D
DV-195-154	+25 kPa 20 ms, 2% FS	VSL Upper Core 195.4 cm below CLC to Upper Core 154.3 cm below CLC	D*	D*	D*	D*	D*	D*	D*	D*
DV-501-154	+344.7 kPa 20 ms, 1% FS	VSL Lower Core 500.7 cm below CLC to Upper Core 154.3 cm below CLC	---	---	---	---	---	---	---	---
DV-278-195	+25 kPa 20 ms, 2% FS	VSL Midcore 277.7 cm below CLC to Upper Core 195.4 cm below CLC	D*	D*	D*	D*	D*	D*	D*	D*
DV-360-278	+75 kPa 20 ms, 2% FS	VSL Midcore 310 cm below CLC to Midcore 277.7 cm below CLC	D*	D*	D*	D*	D*	D*	D*	D*
DV-501-278	+125 kPa 20 ms, 2% FS	VSL Lower Core 500.7 cm below CLC to Midcore 277.7 cm below CLC	D	D	D	D	D	D	D	D
DV-442-360	+75 kPa 20 ms, 2% FS	VSL Lower Core 442.3 cm below CLC to Midcore 360 cm below CLC	D*	D*	D*	D*	D*	D*	D*	D*

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Differential Pressure (contd.)										
DV-578-442	±25 kPa 20 ms, 2% FS	VSL Lower Core 500.7 cm below CLC to Lower Core 442.3 cm below CLC	D*	D*	D*	D*	D*	D*	D*	D*
DV-578-501	±12.5 kPa 20 ms, 2% FS	Bottom of Lower Plenum to VSL Lower Core 500.7 cm below CLC	D	D	D	D	D	D	D	D
DD-DIA-13V	±690 kPa 20 ms, 1% FS	Downcomer Inlet to Upper Core at 0°	D	D	D	D	D	D	D	D
DV+421-DIA		Core Bypass Line - DC Inlet Annulus 292.2 cm above CLC to VSL Upper Head 421 cm above CLC	D	D	D	D	D	D	D	D
DV-278-105		VSL Midcore 277.7 cm below CLC to Upper core 105.1 cm below CLC	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Volume Flow										
FD-424	1.3-25.2^{+} l/s 10 ms, 1% FS	Near Bottom of Downcomer, Bi-directional	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
FV+321	1 - 10 l/s 10 ms, 1% FS	Guide Tube, Bi-directional	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
FV+144D	500-5000 ml/s 10 ms, 1% FS	Support Tubes Bi-directional	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
FV+144Q	500-5000 ml/s 10 ms, 1% FS		D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
FV+1	1.3 - 25.2^{+} l/s 10 ms, 1% FS	Near Hot Leg Outlets, Bi-directional	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
FV-UH-DC	100-1000 ml/s 10 ms, 1% FS	Core By-Pass line	D	D	D	D	D	D	D	D

+ Electronically ranged to 80 l/s

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature										
TFD-18F	617 K 100 ms, 1% FS	Downcomer Fluid Temperatures	D	D	D	D	D	D	D	D
TFD-18Q	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TFD-81	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TFD-152	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TFD-223	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TFD-294	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TFD-364	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TFD-435	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TFV+401Q	617 K 100 ms, 1% FS	Vessel Fluid Temperatures	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature (contd.)										
TFV+373Q	617 K 100 ms, 1% FS	Vessel Fluid Temperatures	D*	D*	D*	D*	D*	D*	D*	D*
TFV+343Q	617 K 100 ms, 1% FS	↓	D	D	D	D	D	D	D	D
TFV+312Q	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*
TFV+280Q	617 K 100 ms, 1% FS	↓	D	D	D	D	D	D	D	D
TFV+252Q	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*
TFV+221Q	617 K 100 ms, 1% FS	↓	D	D	D	D	D	D	D	D
TFV+201Q	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*
TFV+180Q	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*
TFV+160T	617 K 100 ms, 1% FS	↓	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature (contd.)										
TFV+79D	617 K 100 ms, 1% FS	Vessel Fluid Temperatures	D	D	D	D	D	D	D	D
TFV-38R	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TFV-63R	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TFV-572W	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TIFV+401F	617 K 100 ms, 1% FS	Vessel Filler Insulation Gap Temperatures	D*	D*	D*	D*	D*	D*	D*	D*
TIFV+343F	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TIFV+280F	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TIFV+221F	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TIFV+160F	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature (contd.)										
TIFV+79D	617 K 100 ms, 1% FS	Vessel Filler Insulation Gap Temperatures	D	D	D	D	D	D	D	D
TIFV-38R	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TIFV-63R	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TIFV-572	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TGFV+144W	617 K 100 ms, 1% FS	Guide Tube Fluid Temperatures	D	D	D	D	D	D	D	D
TSFV+148D	617 K 100 ms, 1% FS	Support Tube Fluid Temperature	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Fluid Temperature										
TFG-1-AB-45	811 K 100 ms, 0.5%	Core Grid Spacer #1, 5.1 cm Above Bottom of Active Core	D	D	D	D	D	D	D	D
TFG-CD-34	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-1DE-12	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-1AB-12	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-1DE-45	811 K 100 ms, 0.5%	↓	D	D	D	D	D	D	D	D
TFG-2AB-23	811 K 100 ms, 0.5%	Core Grid Spacer #2 45.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-2BC-34	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-2DE-34	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Fluid Temperature (contd.)										
TFG-2AB-45	811 K 100 ms, 0.5%	Core Grid Spacer #2 45.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-2DE-12	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-3AB-34	811 K 100 ms, 0.5%	Core Grid Spacer #3 85.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-3BC-23	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-3DE-45	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-3DE-23	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-3AB-12	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-4AB-23	811 K 100 ms, 0.5%	Core Grid Spacer #4 125.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Fluid Temperature (contd.)										
TFG-4BC-23	811 K 100 ms, 0.5%	Core Grid Spacer #4 125.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-4CD-23	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-4DE-23	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-4AB-34	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-5AB-45	811 K 100 ms, 0.5%	Core Grid Spacer #5, 165.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-5CD-34	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-5DE-12	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-5AB-12	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Fluid Temperature (contd.)										
TFG-5DE-45	811 K 100 ms, 0.5%	Core Grid Spacer #5, 165.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-6AB-23	811 K 100 ms, 0.5%	Core Grid Spacer #6, 205.1 cm Above Bottom of Active Core	D	D	D	D	D	D	D	D
TFG-6BC-34	811 K 100 ms, 0.5%		---	---	---	---	---	---	---	---
TFG-6DE-34	811 K 100 ms, 0.5%		---	---	---	---	---	---	---	---
TFG-6AB-45	811 K 100 ms, 0.5%		---	---	---	---	---	---	---	---
TFG-6DE-12	811 K 100 ms, 0.5%		---	---	---	---	---	---	---	---
TFG-7AB-34	811 K 100 ms, 0.5%	Core Grid Spacer #7, 245.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Fluid Temperature (contd.)										
TFG-7BC-23	811 K 100 ms, 0.5%	Core Grid Spacer #7, 254.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-7DE-45	811 K 100 ms, 0.5%		D	D	D	D	D	D	D	D
TFG-7DE-23	811 K 100 ms, 0.5%		---	---	---	---	---	---	---	---
TFG-7AB-12	811 K 100 ms, 0.5%		---	---	---	---	---	---	---	---
TFG-8AB-23	811 K 100 ms, 0.5%	Core Grid Spacer #8, 285.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-8BC-23	811 K 100 ms, 0.5%		---	---	---	---	---	---	---	---
TFG-8CD-23	811 K 100 ms, 0.5%		---	---	---	---	---	---	---	---
TFG-8DE-23	811 K 100 ms, 0.5%		---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Fluid Temperature (contd.)										
TFG-8AB-34	811 K 100 ms, 0.5%	Core Grid Spacer #8, 285.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-9AB-45	811 K 100 ms, 0.5%	Core Grid Spacer #9, 325.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-9CD-34	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-9DE-12	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-9AB-12	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-9DE-45	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-10AB-23	811 K 100 ms, 0.5%	Core Grid Spacer #10, 365.1 cm Above Bottom of Active Core	---	---	---	---	---	---	---	---
TFG-10BC-34	811 K 100 ms, 0.5%	↓	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Fluid Temperature (contd.)										
TFG-10DE-34	811 K 100 ms, 0.5%	Core Grid Spacer #10, 365.1 cm Above Bottom of Active Core	D	D	D	D	D	D	D	D
TFG-10AB-45	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---
TFG-10DE-12	811 K 100 ms, 0.5%	↓	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature										
TMD-18F	617 K 100 ms, 1% FS	Downcomer Metal Temperature	D	D	D	D	D	D	D	D
TMD-18Q	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TMD-81	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMD-152	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMD-223	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMD-294	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TMD-364	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMD-435	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TIMD-18F	617 K 100 ms, 1% FS	Downcomer Insulator Metal Temperature	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature (contd.)										
TIMD-18Q	617 K 100 ms, 1% FS	Downcomer Insulator Metal Temperature	---	---	---	---	---	---	---	---
TIMD-81	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TIMD-152	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TIMD-223	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TIMD-294	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TIMD-364	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TMV+401F	617 K 100 ms, 1% FS	Vessel Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TMV+343F	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TMV+280F	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature (contd.)										
TMV+221F	617 K 100 ms, 1% FS	Vessel Metal Temperature	D	D	D	D	D	D	D	D
TMV+160F	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*
TMV+79D	617 K 100 ms, 1% FS	↓	D	D	D	D	D	D	D	D
TMV-38R	617 K 100 ms, 1% FS	↓	---	---	---	---	---	---	---	---
TMV-63R	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*
TMV-572Q	617 K 100 ms, 1% FS	↓	---	---	---	---	---	---	---	---
TIMV+401Q	617 K 100 ms, 1% FS	Vessel Insulator Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TIMV+343Q	617 K 100 ms, 1% FS	↓	D	D	D.	D	D	D	D	D
TIMV+280Q	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature (contd.)										
TIMV+221Q	617 K 100 ms, 1% FS	Vessel Insulator Metal Temperature	D	D	D	D	D	D	D	D
TIMV+160T	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TIMV+79D	617 K 100 ms, 1% FS		D	D	D	D	D	D	D	D
TIMV-38R	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TIMV-63R	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TIMV-572W	617 K 100 ms, 1% FS		D*	D*	D*	D*	D*	D*	D*	D*
TIMV+148D	617 K 100 ms, 1% FS		---	---	---	---	---	---	---	---
TCMV+144W	617 K 100 ms, 1% FS	Core support Plate Metal Temperatures	D*	D*	D*	D*	D*	D*	D*	D*
TGMV+280	617 K 100 ms, 1% FS	Guide Tube Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Metal Temperature (contd.)										
TGMV+221	617 K 100 ms, 1% FS	Guide Tube Metal Temperature	D	D	D	D	D	D	D	D
TGMV+164	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*
TGMV+79	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*
TGMV-63	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*
TSMV+164	617 KF 100 ms, 1% FS	Support Metal Temperatures	D*	D*	D*	D*	D*	D*	D*	D*
TSMV+79	617 K 100 ms, 1% FS	Support Tube Metal Temperatures	D	D	D	D	D	D	D	D
TSMV-63	617 K 100 ms, 1% FS	↓	D*	D*	D*	D*	D*	D*	D*	D*

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Density										
GD-72T	0-1000 kg/m^3	Downcomer Dual Beam Density Shots	D	D	D	D	D	D	D	D
GD-72B	0-1000 kg/m^3		D	D	D	D	D	D	D	D
GD-260T	0-1000 kg/m^3		D	D	D	D	D	D	D	D
GD-260B	0-1000 kg/m^3		D	D	D	D	D	D	D	D
GD-456T	0-1000 kg/m^3		D	D	D	D	D	D	D	D
GD-456B	0-1000 kg/m^3		D	D	D	D	D	D	D	D
GV+339	0-1000 kg/m^3	VSL Upper Head Near Top of Guide Tubes	D	D	D	D	D	D	D	D
GV+174	0-1000 kg/m^3	VSL Upper Head Near Top of Support Tubes	D	D	D	D	D	D	D	D
GV-11	0-1000 kg/m^3	VSL Lower Section of Upper Plenum Near Hot Leg Outlets	D	D	D	D	D	D	D	D
GV-154-23	0-1000 kg/m^3	Through Top of Active Core	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
GV-164-AB	0-1000 kg/m^3	Through Top of Active Core 90° to GV-154	D	D	D	D	D	D	D	D
GV-243-23	0-1000 kg/m^3	Through Upper Middle Core	D	D	D	D	D	D	D	D
GV-313-23	0-1000 kg/m^3	Through Mid-core	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Density (contd.)										
GV-323-AB	0-1000 kg/m^3	Through Mid-core 90° to GV-313	D	D	D	D	D	D	D	D
GV-383-23	0-1000 kg/m^3	Through Lower Mid-core	D	D	D	D	D	D	D	D
GV-483-23	0-1000 kg/m^3	Through Bottom of Active Core	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
GV-502-AB	0-1000 kg/m^3	Through Bottom of Core Below Active Section	D	D	D	D	D	D	D	D
GV-546-23	0-1000 kg/m^3	Through Core in Upper Part of Lower Plenum	D	D	D	D	D	D	D	D
GV-588	0-1000 kg/m^3	Diagonal Shot From Bottom to Top of Lower Plenum Outside of Core	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Momentum Flux										
ND-441	0-24000 $kg/m\text{-}s^2$	Lower DC	D*	D*	D*	D*	D*	D*	D*	D*
MGV+330	0-93,000 $kg/m\text{-}s^2$	In VSL Guide Tube Near Inlet	D	D	D	D	D	D	D	D
MSV+153D	0-220,000 $kg/m\text{-}s^2$	VSL Support Tube 45° CW	D	D	D	D	D	D	D	D
MSV+153Q	0-220,000 $kg/m\text{-}s^2$	VSL Support Tube 225° CW	D	D	D	D	D	D	D	D
NV-9	0-18,000 $kg/m\text{-}s^2$	VSL Near Hot Leg Outlet	D	D	D	D	D	D	D	D
NV-499	0-15,000 $kg/m\text{-}s^2$	Just Below Bottom of Active Core.	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heater Measurement										
AH-HI	0-2500 A	Core Current to High Powered Rods	---	---	---	---	---	---	---	---
VH-HI	0-400 V	Core Voltage to High Powered Rods	---	---	---	---	---	---	---	---
WH-HI	0-1.5 MW	Core Power to High Powered Rods	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
AH-LO	0-2000 A	Core Current to Low Powered Rods	---	---	---	---	---	---	---	---
VH-LO	0-400 V	Core Voltage to Low Powered Rods	---	---	---	---	---	---	---	---
WH-LO	0-2 MW	Core Power to Low Powered Rods	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (cont.)										
TH-A2-44	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-A2-112	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-A2-182	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-A2-197	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-A2-227	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-A2-353	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-A3-76	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-A3-137	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating Cladding Temperature (contd.)										
TH-A3-157	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-A3-208	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-A3-228	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-A3-291	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-A4-48	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-A4-115	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-A4-185	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-A4-201	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-A4-231	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-A4-355	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-A5-17	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-A5-139	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-A5-170	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-A5-185	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-A5-256	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-A5-321	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*

<u>TABLE X</u> (Contd)

Detector ID Descriptive Title	**Range Response Accuracy**	**Location Comments**	**S-08 -1**	**S-08 -2**	**S-08 -3**	**S-08 -4**	**S-08 -5**	**S-08 -6**	**S-08 -7**	**S-08 -8**
Core Heating, Cladding Tempera-ture (contd.)										
TH-B1-11	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-B1-137	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-B1-167	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-B1-183	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-B1-253	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-B1-320	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-B2-39	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-B2-107	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-B2-180	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-B2-196	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-B2-227	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-B2-353	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-B3-49	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-B3-114	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-B3-184	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-B3-199	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating Cladding Temperature (contd.)										
TH-B3-229	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-B3-354	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-B4-(-12)	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature (Below Heated Length)	D	D	D	D	D	D	D	D
TH-B4-140	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-B4-170	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-B4-185	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-B4-256	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-B4-322	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating Cladding Temperature (contd.)										
TH-B5-6	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-B5-133	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-B5-164	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-B5-180	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-B5-252	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-B5-325	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-C1-79	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-C1-140	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating Cladding Temperature (contd.)										
TH-C1-160	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-C1-211	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-C1-232	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-C1-292	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-C2-15	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-C2-137	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-C2-168	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-C2-(-64)	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature (Below Heated Length)	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-C2-254	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-C2-321	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-C3-79	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-C3-140	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-C3-160	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-C3-211	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-C3-231	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-C3-292	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-C4-20	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-C4-142	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-C4-172	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-C4-187	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-C4-257	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-C4-323	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-C5-71	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-C5-133	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-C5-(-81)	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature (Below Heated Length)	D	D	D	D	D	D	D	D
TH-C5-207	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-C5-228	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-C5-290	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-D1-5	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-D1-131	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-D1-162	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-D1-178	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-D1-251	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-D1-320	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-D2-16	1366 K 100 ms, 1% F	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D2-138	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D2-169	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D2-185	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-D2-254	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D2-321	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-D3-40	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D3-109	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D3-196	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D3-227	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-D3-354	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-D4-115	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D4-(-60)	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature (Below Heated Length)	D	D	D	D	D	D	D	D
TH-D4-201	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (condt.)										
TH-D4-231	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D4-354	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D5-13	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-D5-139	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-D5-169	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-D5-184	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A,	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-D5-256	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-D5-321	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-E1-21	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-E1-142	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-E1-172	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-E1-187	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-E1-257	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-E1-322	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-E2-41	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-E2-109	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-E2-181	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-E2-197	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-E2-228	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-E2-354	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
TH-E3-81	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-E3-141	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-E3-160	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-E3-211	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-E3-231	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-E3-292	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-E4-45	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-E4-112	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-E4-183	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A	D*,A
TH-E4-199	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D*	D*	D*	D*	D*	D*	D*	D*
TH-E4-230	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-E4-354	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Core Heating, Cladding Temperature (contd.)										
TH-E5-43	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-E5-110	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-E5-181	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-E5-197	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	D	D	D	D	D	D	D	D
TH-E5-227	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---
TH-E5-353	1366 K 100 ms, 1% FS	Heater Pin Metal Temperature	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Liquid Level										
All*			D	D	D	D	D	D	D	D
LV+419	---- 100 ms, ----	Liquid Level Prove in Upper Head Range is from 419 to 159 cm above CLC	---	---	---	---	---	---	---	---
LV+405	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+390	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+376	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+361	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+347	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+332	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+318	---- 100 ms, ----		---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Liquid Level (contd.)										
LV+303	---- 100 ms, ----	Liquid Level Probe in Upper Head Range is from 419 to 159 cm above CLC	---	---	---	---	---	---	---	---
LV+289	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+274	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+260	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+245	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+231	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+216	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+202	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+187	---- 100 ms, ----		---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Liquid Level (contd.)										
LV+173	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+159	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+125	---- 100 ms, ----	Liquid Level Probe in Upper Section of Upper Plenum Range is from 125 to 42 cm above CLC	---	---	---	---	---	---	---	---
LV+116	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+106	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+97	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+88	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+79	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV+70	---- 100 ms, ----		---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Liquid Level (contd.)										
LV+60	---- 100 ms, ----	Liquid Level Probe in Upper Section of Upper Plenum. Range is from 125 to 42 cm above CLC	---	---	---	---	---	---	---	---
LV+51	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV+42	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV-32	---- 100 ms, ----	Liquid Level Probe in Lower Section of Upper Plenum. Range is from 32 to 90 cm below CLC	---	---	---	---	---	---	---	---
LV-40	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV-49	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV-57	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV-65	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV-74	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Liquid Level (contd.)										
LV-80	---- 100 ms, ----	Liquid Level Probe in Lower Section of Upper Plenum. Range is from 32 to 90 cm below CLC.	---	---	---	---	---	---	---	---
LV-90	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV-137	---- 100 ms, ----	Liquid Level Probe in Heated Length of Core, Range is from 137 to 496 cm below CLC.	---	---	---	---	---	---	---	---
LV-161	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV-185	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV-209	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV-233	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---
LV-257	---- 100 ms, ----	↓	---	---	---	---	---	---	---	---

TABLE X (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Liquid Level (contd.)										
LV-281	---- 100 ms, ----	Liquid Level Probe in Heated Length of Core, Range is from 137 to 496 cm below CLC	---	---	---	---	---	---	---	---
LV-305	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV-328	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV-352	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV-376	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV-400	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV-424	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV-448	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV-472	---- 100 ms, ----		---	---	---	---	---	---	---	---
LV-496	---- 100 ms, ----		---	---	---	---	---	---	---	---

TABLE XI

PRESSURE SUPPRESSION SYSTEM

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Pressure										
PB-PSS	0-1724 kPa 20 ms, 1% FS	Suppression Tank Top.	D	D	D	D	D	D	D	D
Differential Pressure										
DB-PSS-LL	±75 kPa 20 ms, 2% FS	Top to Bottom of Pressure Suppression Tank For Fluid Level Measurement. Elevation Difference Between Taps is 338 cm.	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
Fluid Temperature										
TFB-PS0	617 K 100 ms, 1% FS	Temperature in Suppression Tank 0 cm From Bottom	---	---	---	---	---	---	---	---
TFB-PS43	617 K 100 ms, 1%FS	43 cm	D	D	D	D	D	D	D	D
TFB-PS84	617 K 100 ms, 1% FS	84 cm	---	---	---	---	---	---	---	---
TFB-PS122	617 K 100 ms, 1% FS	122 cm	---	---	---	---	---	---	---	---
TFB-PS160	617 K 100 ms, 1% FS	160 cm	---	---	---	---	---	---	---	---

TABLE XI (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Pressure										
TFB-PS330	617 K 100 ms, 1% FS	330 cm	D	D	D	D	D	D	D	D

TABLE XII

COOLANT INJECTION SYSTEM

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Pressure										
PB-ACC2	0-5171 kPa 20 ms, 1% FS	Broken Loop Accumulator	D	D	D	D	D	D	D	D
PI-ACC3	0-5171 kPa 20 ms, 1% FS	Intact Loop Accumulator	D	D	D	D	D	D	D	D
PV-ACC1	0-14.0 kPa 20 ms, 1% FS	Vessel Accumulator	-	D	D	D	D	D	D	D
Differential Pressure										
DB-ACC2-LL	125 kPa 20 ms, 1% FS	Top to Bottom of Broken Loop ECC Accumulator. Elevation Difference between Taps is 193 cm.	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
DI-ACC3-LL	125 kPa 20 ms, 1% FS	Top to Bottom of Intact Loop ECC Accumulator For Liquid Level Measurement. Elevation Difference between Taps is 269 cm	D,A	D,A	D,A	D,A	D,A	D,A	D,A	D,A
DV-ACC1-LL	125 kPa 20 ms, 1% FS	Top to Bottom of Vessel ECC Accumulator. Elevation Difference between Taps is 264 cm.	---	D	D	D	D	D	D	D

TABLE XII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature										
TFI-ECC-17	273-373 K 100 ms, 1% FS	Intact Loop Fluid Injection Temperature	D	D	D	D	D	D	D	D
TFB-ECC-40	273-373 K 100 ms, 1% FS	Broken Loop Fluid Injection Temperature	D	D	D	D	D	D	D	D
TFV-ECC-UH	273-373 K 100 ms, 1% FS	Vessel Fluid Injection Temperature	-	D	D	D	D	D	D	D
Volume Flow										
FB-ACC2	1.3 to 3.2 l/s 10 ms, 1% FS	In 1" Line From ECC Accumulator 2	D	D	D	D	D	D	D	D
FI-ACC3	1.3 to 3.2 l/s 10 ms, 1% FS	In 1" Line From ECC Accumulator 3	D	D	D	D	D	D	D	D
FV-ACC1	1.3 to 3.2 l/s 10 ms, 1% FS	In 1" Line From ECC Accumulator 1	-	D	D	D	D	D	D	D

TABLE XII (Contd)

Detector ID Descriptive Title	Range Response Accuracy	Location Comments	S-08 -1	S-08 -2	S-08 -3	S-08 -4	S-08 -5	S-08 -6	S-08 -7	S-08 -8
Fluid Temperature										
FI-LPIS	0.05 to 0.5 l/s 10 ms, 1% FS	In .5" in Line From LPIS Pump.	D	D	D	D	D	D	D	D
FI-HPIS	0.05 to 0.5 l/s 10 ms, 1% FS	HPIS	D	D	D	D	D	D	D	D
FB-LPIS	0.05 to 0.5 l/s 10 ms, 1% FS	LPIS	D	D	D	D	D	D	D	D
FB-HPIS	0.05 to 0.5 l/s 10 ms, 1% FS	HPIS	D	D	D	D	D	D	D	D

V. REFERENCES

1. Semiscale Program, Semiscale EOS Appendix 7, WR-S-78-002, EG&G Idaho, Inc., (March 1978).

2. System Design Description (SDD-3) for the Mod-3 Semiscale System, EG&G Idaho, Inc., July 1978.

3. System Design Description (SDD-1) for the 1 1/2-Loop Mod-1 Semiscale System, Aerojet Nuclear Company, June 1975.

ADDENDUM 8A

to

APPENDIX 8 OF THE

SEMISCALE EXPERIMENTAL OPERATING SPECIFICATIONS

ANALYSIS OF UHI ACCUMULATOR

PARAMETER SCALING

Addendum 8A

SCALING CRITERIA FOR UHI ECC PARAMETERS IN THE MOD-3 UHI TEST SERIES

I. Introduction

The purpose of this addendum is to discuss the scaling rationale of the UHI emergency core coolant (ECC) parameters used in the Semiscale Mod-3 system during the Series 8 tests. Scaling criteria for broken and intact loop ECC systems are presented in Reference 1.

The testing to be done in Series 8 is to represent conditions in a PWR equipped with a UHI emergency core coolant system in addition to the intact and broken loop injection systems. The ECC injection requirements for the Series 8 tests were scaled from a reference 4-loop PWR plant with UHI. The scaled values for Semiscale Mod-3, which were derived from UHI plant data, are presented in Table 8A-I.

The following paragraphs present the scaling method and discuss the resultant UHI parameters for the Semiscale Mod-3 system.

If the UHI accumulator values are scaled with respect to power from the UHI equipped PWR to the Semiscale Mod-3 system, then:

$$\left(\frac{\dot{m}}{p}\right)_{PWR} = \left(\frac{\dot{m}}{p}\right)_{Mod-3}$$

therefore,

$$\dot{m}_{Mod\text{-}3} = \left(\frac{\dot{m}}{p}\right)_{PWR} \cdot P_{Mod\text{-}3}$$

The pressure drop from the accumulator to the injection port must be equal in the PWR plant and the Mod-3 system. When the density is assumed equal:

$$\rho \cdot \Delta P = (R' \dot{m}^2)_{PWR} = (R' \dot{m}^2)_{Mod\text{-}3}$$

and

$$R'_{Mod\text{-}3} = \frac{(R' p^2)_{PWR}}{(p^2)_{Mod\text{-}3}}$$

Initial liquid and gas volumes were power scaled according to the following relationship:

$$\left(\frac{V}{P}\right)_{PWR} = \left(\frac{V}{P}\right)_{Mod\text{-}3}$$

The resulting scaled volumes for the Semiscale Mod-3 system are shown in Table 8A-I.

TABLE 8-A-I

UHI ACCUMULATOR VALUES

	MOD-3 UPPER HEAD
Total Volume (m^3)	.0597
Gas Volume (m^3)	.0299
Water Volume (m^3)[(a)]	.0299
Flow Area (m^2)	4.64 E-4[(c)]
Average Flow (kg/s)	1.011
Pressure Set Point (kPa)[(b)]	8618
R' $1/m^4$	2.69×10^9

(a) Only 0.0166 m^3 of water is allowed to enter the system from the UHI accumulator. This is done to ensure that no nitrogen from the accumulator enters the upper head.
(b) This is the set point for those plants where the upper head fluid temperature is approximately equal to the cold leg fluid temperature.
(c) One inch schedule 80 pipe.

REFERENCES

1. D. J. Olson Ltr to R. E. Tiller, EOS Appendix 7, Addendum B, March 15, 1978.