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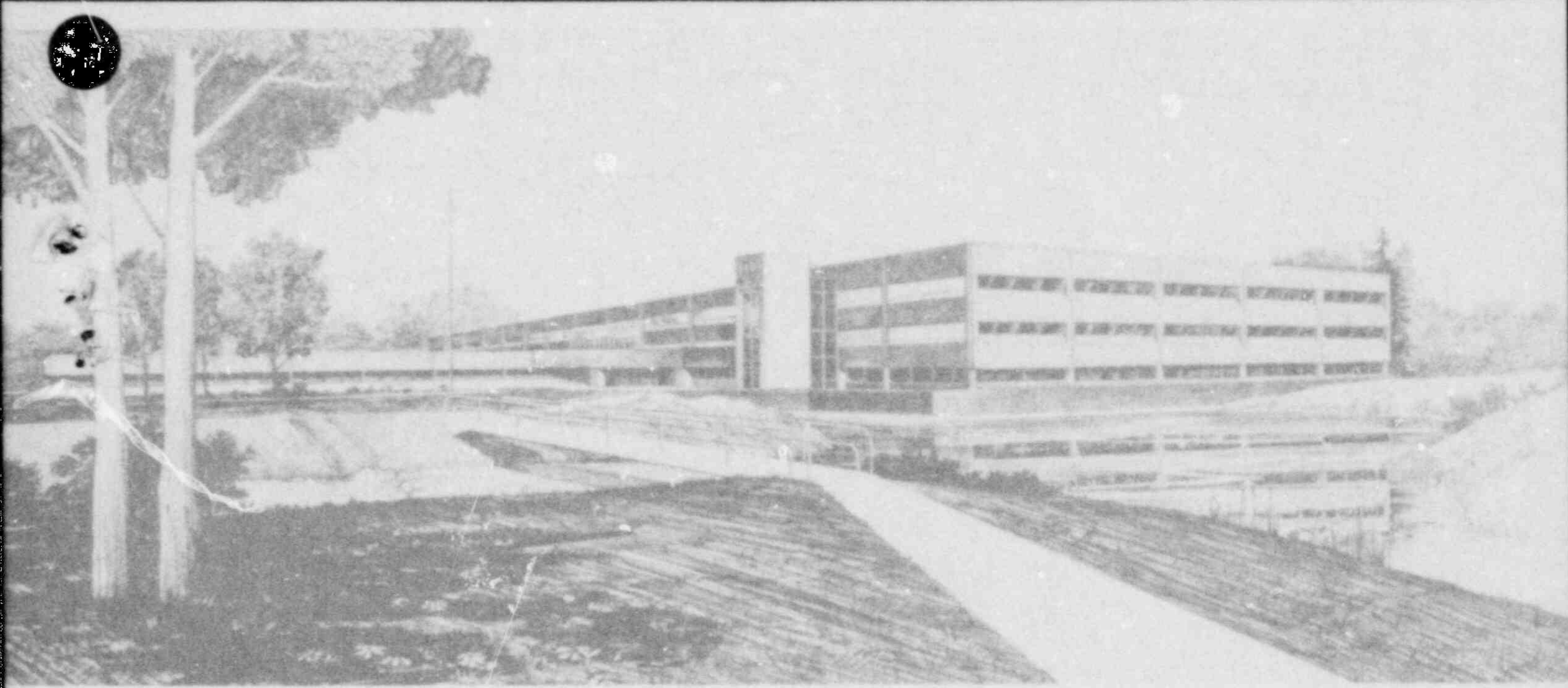

U.S. Department of Energy
Idaho Operations Office • Idaho National Engineering Laboratory

Experiment Data Report for LOFT Intermediate Break Experiment L5-1 and Severe Core Transient Experiment L8-2

Donald B. Jarrell
Janice M. Divine

November 1981

Prepared for the
U.S. Nuclear Regulatory Commission
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EXPERIMENT DATA REPORT FOR LOFT INTERMEDIATE BREAK EXPERIMENT L5-1 AND SEVERE CORE TRANSIENT EXPERIMENT L8-2

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ABSTRACT

This report presents selected, uninterpreted data from the first intermediate-size break loss-of-coolant experiment (designated L5-1), and the second severe core transient experiment (designated L8-2) conducted in the Loss-of-Fluid Test (LOFT) facility. The LOFT facility is a 50-MW(t) pressurized water reactor (PWR) system with extensive instrumentation to measure the thermal-hydraulic conditions during the experiments. The primary system operating fluid conditions of the LOFT system are typical of large [~ 3500 MW(t)], commercial PWR operations.

Experiment L5-1 simulated the rupture of a single, 14-in. accumulator line (one-of-four) in a commercial, four-loop PWR. Accumulator injection pressure was lowered to induce core uncovery at relatively high decay heat levels. Break flow was allowed to continue until the primary coolant system (PCS) pressure was low enough to allow scaled emergency core coolant flow to reflood the partially uncovered core. Cladding thermal limits were not exceeded during the transient.

Experiment L8-2 was identical to Experiment L5-1 except that the accumulator and low-pressure injection system were not allowed to inject fluid into the PCS until after core uncovery had occurred and the PCS pumps had been restarted. PCS pump restart did not produce a moderation in the core thermal transient, and Accumulator A flow was unblocked by the operator at a preselected temperature. All plant protective systems were triggered automatically shortly thereafter, followed by a rapid reflood of the PCS.

NRC FIN No. A6043—LOFT Experimental Instrumentation

SUMMARY

Experiments L5-1 and L8-2 were performed on September 24 and October 12, 1981, respectively, as part of the Loss-of-Fluid Test (LOFT) Experimental Program conducted by EG&G Idaho, Inc., for the U.S. Nuclear Regulatory Commission. Experiment L5-1 is the first experiment in the LOFT Intermediate Break Experiment Series L5, which was designed to identify and evaluate the LOFT system thermal-hydraulic response to intermediate-sized break loss-of-coolant experiments. Experiment L8-2 is the second experiment in the LOFT Severe Core Transient Experiment Series L8, and was designed to evaluate the effect of primary coolant pump restart on core cooling when the primary coolant system (PCS) is highly voided of liquid.

For Experiment L5-1, the broken loop cold leg (BLCL) of the LOFT facility was fitted with a 46.9-mm-diameter, elliptical entrance nozzle to simulate a single, 14-in. accumulator injection line (one-of-four) in a commercial four-loop pressurized water reactor (PWR). The emergency core coolant (ECC) injection line break, defined as an intermediate break, is sized between the hydrostatically controlled small breaks (6 in. or less) and the inertially dominated large breaks (greater than 18 in.) which have been investigated extensively in both the LOFT and Semiscale facilities. Experiment L5-1 was initiated by opening the BLCL quick-opening blowdown valve. A low-pressure scram (14.19 MPa) followed at 0.166 ± 0.01 s, and ECC high-pressure injection to the PCS began at 0.4 ± 0.1 s. Power to the PCS pumps motor-generator sets was manually tripped at 4.0 ± 0.5 s; coastdown was complete at 19.3 ± 0.1 s. The main feed pump was tripped on reactor scram coincident with the steam generator steam control valve beginning to ramp shut; the valve was fully shut at 12.1 ± 0.1 s.

Saturation pressure was reached in the upper plenum at 0.2 ± 0.1 s and in the BLCL at 10.5 ± 0.5 s. Blowdown of the PCS continued with a fuel cladding thermal excursion beginning at 108.4 ± 1.0 s; PCS pressure at that time was 3.6 ± 0.1 MPa.

A maximum fuel cladding temperature of 715 K was reached at 198.0 ± 2.0 s, with scaled ECC flow from the accumulator (commencing at 185.8 ± 0.5 s) and low-pressure injection system (commencing at 201.0 ± 0.5 s) recovering the fuel bundles by 214.0 ± 1.0 s. The transient was terminated 213 ± 1 s following its initiation when all monitored core thermocouples indicated at or below saturation temperature.

During Experiment L5-1 scaled quantities of ECC water were injected into the PCS cold leg.

Experiment L5-1 was initiated from PCS conditions of: hot leg temperature, 579.1 ± 0.9 K; cold leg temperature, 552.3 ± 0.9 K; hot leg pressure, 14.93 ± 0.08 MPa; and intact loop flow rate, 308.2 ± 4.0 kg/s. The preinitiation reactor power output was 45.9 ± 1.2 MW, with a maximum linear heat generation rate of 46.0 ± 3.5 kW/m.

Experiments L8-2 and L5-1 were identical in execution until the time of accumulator injection in Experiment L5-1. Accumulator A (pressurized to 4.5 ± 0.05 MPa in Experiment L8-2) was inhibited from injecting fluid to the PCS, and all core thermocouples indicated thermal transient initiation by 240 ± 2.0 s. PCS pumps were restarted at 234 ± 0.5 s, when the fuel cladding thermocouple setpoint of 811 ± 3.0 K was reached. Fuel cladding temperatures continued to increase without moderation until 950 ± 3.0 K was indicated at 286.0 ± 0.5 s, when Accumulator A (scaled) injection was initiated by operator action. Cladding temperatures continued to increase, reaching the plant protective system (PPS) high temperature trip point (978 K) at 299.2 ± 2.0 s. The maximum recorded temperature of 987 ± 3.0 K occurred at 299.1 ± 0.5 s. The PPS trip initiated ECC flow from the high-pressure injection system and Accumulator B (both unscaled), and core reflood was complete by 306.4 ± 0.5 s.

Experiment L8-2 was initiated from PCS conditions of: hot leg temperature, 579.3 ± 0.8 K; cold leg temperature, 552.4 ± 0.9 K; hot leg pressure, 14.86 ± 0.06 MPa; and intact loop flow rate, 311.1 ± 4.0 kg/s. The preinitiation reactor power output was 46 ± 1.2 MW, with a maximum linear heat generation rate of 45.8 ± 3.5 kW/m.

Experiments L5-1 and L8-2 satisfied the specified objectives. This report presents data in the form of graphs in SI and British units. In conjunction with data obtained from direct measurement, chosen computed variables are included to facilitate the analysis of the system thermal-hydraulic behavior.

ACKNOWLEDGMENTS

We would like to express our appreciation to the Data Systems Branch, particularly to J. B. Marlow for preparation of the data plots. Appreciation is also expressed to the LOFT Data Analysis Branch, particularly to G. D. Lassahn and R. H. Averill for uncertainty analysis and instrument calibration, respectively. Special appreciation is expressed to G. Hammer for the technical editing.

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TABLES

ACRONYMS AND ABBREVIATIONS

ACC	Accumulator
BLCL	Broken loop cold leg
BST	Blowdown suppression tank
BWST	Borated water storage tank
DAVDS	Data acquisition and visual display system
DTT	Drag disc-turbine transducer
ECC	Emergency core cooling or coolant
ECCS	Emergency core cooling system
ESF	Engineered safety features
HPIS	High-pressure injection system
LOCA	Loss-of-coolant accident
LOCE	Loss-of-coolant experiment
LOFT	Loss-of-Fluid Test
LPIS	Low-pressure injection system
NRC	Nuclear Regulatory Commission
ODDS	Operation diagnostic display system
PCP	Primary coolant pump
PCS	Primary coolant system
PORV	Power-operated relief valve
PNA	Pulsed neutron activation
PPS	Plant protective system
PWR	Pressurized water reactor
QOBV	Quick-opening blowdown valve
RABV	Reflood assist bypass valve
RV	Reactor vessel
SCS	Secondary coolant system
SG	Steam generator

EXPERIMENT DATA REPORT FOR LOFT INTERMEDIATE BREAK EXPERIMENT L5-1 AND SEVERE CORE TRANSIENT EXPERIMENT L8-2

1. INTRODUCTION

This report presents selected, uninterpreted data from Experiments L5-1 and L8-2 which were conducted at the Loss-of-Fluid Test (LOFT) facility.

Experiment L5-1, performed on September 24, 1981, was the first loss-of-coolant experiment (LOCE) at LOFT to provide thermal-hydraulic information on an intermediate-size break (LOFT Intermediate Break Experiment Series L5). Experiment L5-1 simulated the rupture of a single, 14-in.-diameter accumulator injection line (one-of-four) in a commercial, four-loop pressurized water reactor (PWR).

Experiment L8-2 was performed on October 12, 1981, and was the second experiment in LOFT Severe Core Transient Experiment Series L8. It investigated the effect of primary coolant pump restart on core cooling when the primary coolant system (PCS) is highly voided of liquid.

The LOFT facility is a 50-MW(t) PWR with instrumentation to measure and provide data on the thermal-hydraulic conditions throughout the system. Operation of the LOFT system is typical of large [~3500 MW(t)] commercial PWR operations. The LOFT facility consists of:

1. A reactor vessel with a nuclear core (Core 1)
2. An intact loop with an active steam generator, pressurizer, and two primary coolant pumps connected in parallel
3. A broken loop with a simulated pump, simulated steam generator, and two quick-opening blowdown valve (QOBV) assemblies
4. A blowdown suppression system consisting of a header, suppression tank, and a spray system
5. An emergency core coolant (ECC) injection system consisting of two low-pressure injection system (LPIS) pumps, two high-pressure injection system (HPIS) pumps, and two accumulators.

Figure 1-1 presents the LOFT piping schematic. For additional information on the LOFT system, refer to Reference 1 and Appendixes A and B of this report.

The data presented are from 605 and 600 of the 624 instruments that provided data during Experiments L5-1 and L8-2, respectively. Only the data considered pertinent to the understanding of this experiment are presented in this report. The data are in an uninterpreted but readily usable form for use by the nuclear community in advance of detailed analysis and interpretation. The data, in the form of graphs in engineering units, have been analyzed only to the extent necessary to ensure that they are reasonable and consistent.

Sections 1.1, 1.2, and 1.3 state, respectively, the LOFT Experimental Program objectives, the Experiment Series L5 and Experiment L5-1 objectives, and the Experiment Series L8 and Experiment L8-2 objectives. Section 2 summarizes the experimental procedures and initial conditions. Sections 3, 4, and 5 present the data for Experiment L5-1, comparison of the two experiments, and Experiment L8-2, respectively, with supporting information for data interpretation. Appendix A describes the LOFT system configuration. Appendix B describes the LOFT instrumentation system and the methods of obtaining various measurements, and contains a list of instruments available for use in Experiments L5-1 and L8-2. Appendix C summarizes the preexperiment calibrations and the methods used to verify the consistency and accuracy of the data.

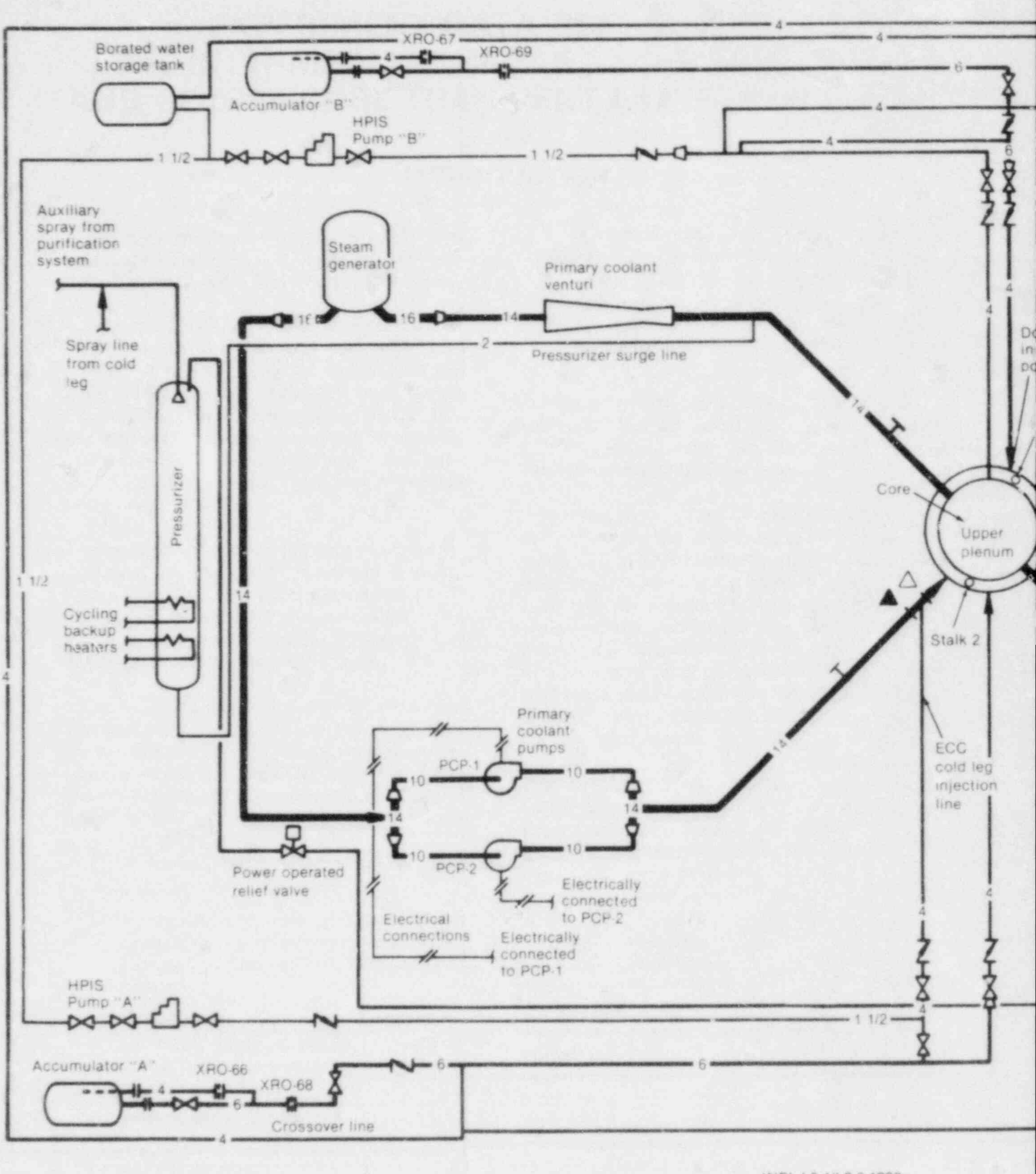
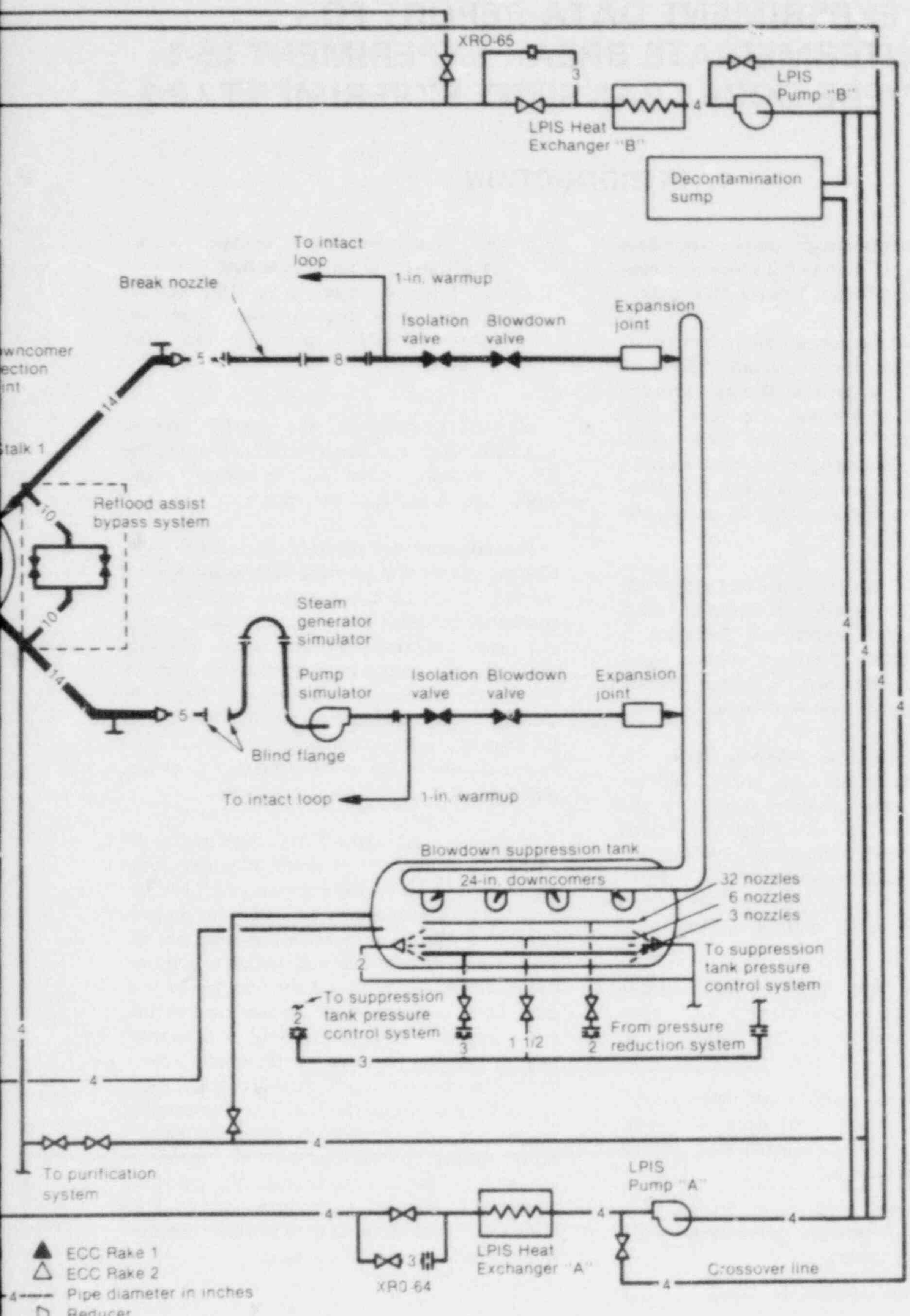


Figure 1-1. LOFT piping sch



XRO-65
3
LPIS Heat Exchanger "B"
4
LPIS Pump "B"
Decontamination sump
To intact loop
1-in. warmup
Break nozzle
Isolation valve
Blowdown valve
Expansion joint
wncomer
ection
int
5
8
14
Stalk 1
10
Reflood assist bypass system
Steam generator simulator
Pump simulator
Isolation valve
Blowdown valve
Expansion joint
Blind flange
To intact loop
1-in. warmup
Blowdown suppression tank
24-in. downcomers
32 nozzles
6 nozzles
3 nozzles
To suppression tank pressure control system
To suppression tank pressure control system
From pressure reduction system
2
3
1 1/2
To purification system
LPIS Pump "A"
LPIS Heat Exchanger "A"
XR0-64
Crossover line
ECC Rake 1
ECC Rake 2
Pipe diameter in inches
Reducer

matic.

1.1 LOFT Experimental Program Objectives

The LOFT integral[a] test facility was designed to simulate the major components of a four-loop, commercial PWR, thereby producing data on the thermal, hydraulic, nuclear, and structural processes expected to occur during a LOCA in a PWR. Reference 2 describes the LOFT facility in detail. The specific objectives of the LOFT Experimental Program are to:

1. Provide data required to evaluate the adequacy of and to improve the analytical methods currently used to predict the response of large PWRs to postulated accident conditions, the performance of engineered safety features (ESF) with particular emphasis on emergency core coolant systems (ECCS), and the quantitative margins of safety inherent in the performance of the ESF

2. Identify and investigate any unexpected event(s) or threshold(s) in the response of either the plant or the ESF and develop analytical techniques that adequately describe and account for the unexpected behavior(s)

3. Evaluate and develop methods to prepare, operate, and recover systems and plant for and from reactor accident conditions

4. Identify and investigate methods by which reactor safety can be enhanced, with emphasis on the interaction of the operator with the plant.

1.2 Experiment Series L5 and Experiment L5-1 Objectives

The LOFT Intermediate Break Experiment Series L5 was designed to identify and evaluate the LOFT system thermal-hydraulic response during an intermediate-size break LOCE. All three components of the plant protective system (PPS) (HPIS, accumulators, and LPIS) are utilized to bring the plant to a safe shutdown condition in this type of break. The programmatic objectives of Experiment L5-1 are to:

1. Determine the effectiveness of degraded ECCSs in an intermediate-size break LOCA, where HPIS is insufficient to maintain primary inventory, but pressure remains above the accumulator/LPIS injection setpoint.

2. Determine and understand the core cooling and system hydraulic behavior for an intermediate-size break which may include characteristics from both small breaks and large breaks, as well as characteristics unique to breaks of this size.

3. Evaluate the capability of RELAP5 to predict pumps-off behavior in an intermediate-size break. Adequate prediction of this behavior would aleviate the need to run a pumps-on experiment for the intermediate-size break.

4. Evaluate the adequacy of two-phase liquid level measurements in the upper plenum and core regions for this type of transient.

5. Prove that LOFT results are applicable by scaling (with RELAP5) to a large plant for an intermediate-size break.

The specific objectives of Experiment L5-1, those which do not require extensive analysis to assess the degree of completion, are to:

1. Obtain sufficient data to characterize the prevalent phenomena caused by an ECCS injection line rupture

2. Generate applicable data for use as a baseline in the future planning of the intermediate-size break LOCEs

3. Provide data for the evaluation of the transient identification algorithms contained in the operation diagnostic and display system (ODDS)

4. Provide data to assess the analytical techniques used to model the principal phenomena of an intermediate-size break.

---

a. The term "integral" is used to describe an experiment combining the nuclear, thermal, hydraulic, and structural processes occurring during a loss-of-coolant accident (LOCA) as distinguished from separate effects, nonnuclear, small-scale, and thermal-hydraulic experiments conducted for loss-of-coolant analysis.

1.3 Experiment Series L8 and Experiment L8-2 Objectives

The objective of LOFT Severe Core Transient Experiment Series L8 is to investigate transients resulting in core uncovery, and ultimately fuel damage, while maintaining the core geometry. Parameters to be investigated include time to core uncovery, cladding ballooning and rupture, and core flow blockage.

The principal objectives of Experiment L8-2 are to identify and evaluate system thermal-hydraulic response during an intermediate-size break LOCE and subsequent primary coolant pump restart. The programmatic objectives of Experiment L8-2 are to:

1. Determine and assess the core cooling and system hydraulic behavior for a transient resulting from an intermediate-size break

2. Determine primary coolant pump restart effectiveness on core cooling in high void conditions

3. Prove that LOFT results are applicable by scaling (with RELAP5) to a large plant for an intermediate-size break

4. Identify code capabilities in predicting core thermal response under degraded core cooling conditions.

The specific objectives of Experiment L8-2, such as those which do not require extensive analysis to assess the degree of completion, are to:

1. Acquire sufficient data to characterize the prevalent phenomena caused by an ECCS injection line rupture, partial ECC failure, and primary coolant pump restart in high void conditions

2. Acquire applicable data for use as a baseline in the future planning of degraded core cooling experiments

3. Provide data for the evaluation of the transient identification methods contained in the ODDS

4. Acquire data required to assess the analytical techniques used to predict system response to degraded core cooling experiments

5. Provide data to assess the repeatability of results between Experiments L5-1 and L8-2 (L8-2 is a repeat of L5-1 up to the time of accumulator flow initiation).

2. EXPERIMENTAL PROCEDURES AND INITIAL CONDITIONS

This section summarizes the experimental procedures and initial conditions specified and established in the LOFT plant for Experiments L5-1 and L8-2.

2.1 Experimental Procedures

Experiments L5-1 and L8-2 were initiated from conditions similar to normal operating conditions in a commercial PWR. Prior to initiating each experiment, data acquisition and visual display system (DAVDS) calibration and data integrity checks were performed. During this period, the initial condition water samples were taken from the PCS, the secondary coolant system (SCS), and the blowdown suppression tank (BST). Just prior to each experiment initiation, the purification lines were closed, and continuous steam generator blowdown flow was stopped. BST recirculation flow was not available for Experiment L5-1, but full flow was established for Experiment L8-2. The DAVDS was activated and started recording data ~7 min prior to each experiment. The experimental procedure and sequence of events for each experiment are summarized in the following subsections.

2.1.1 Experiment L5-1. Initial reactor criticality occurred approximately 44 h prior to Experiment L5-1 initiation. The power level reached 46 ± 1 MW at 36 h prior to the experiment, and was maintained at that level until experiment initiation. A plot of the power level versus time for the 50-h period prior to experiment initiation is given in Figure 2-1. During this time, measurements of power level were performed using a secondary calorimetric calculation. The PCS flow rate was set at 334.6 ± 6.3 kg/s, and adjustment of the SCS was made to maintain the power level. The PCS boron concentration was adjusted to establish the specified reactor vessel cold leg temperature of 552.0 ± 1.1 K, and a hot leg pressure of 14.87 ± 0.10 MPa was maintained.

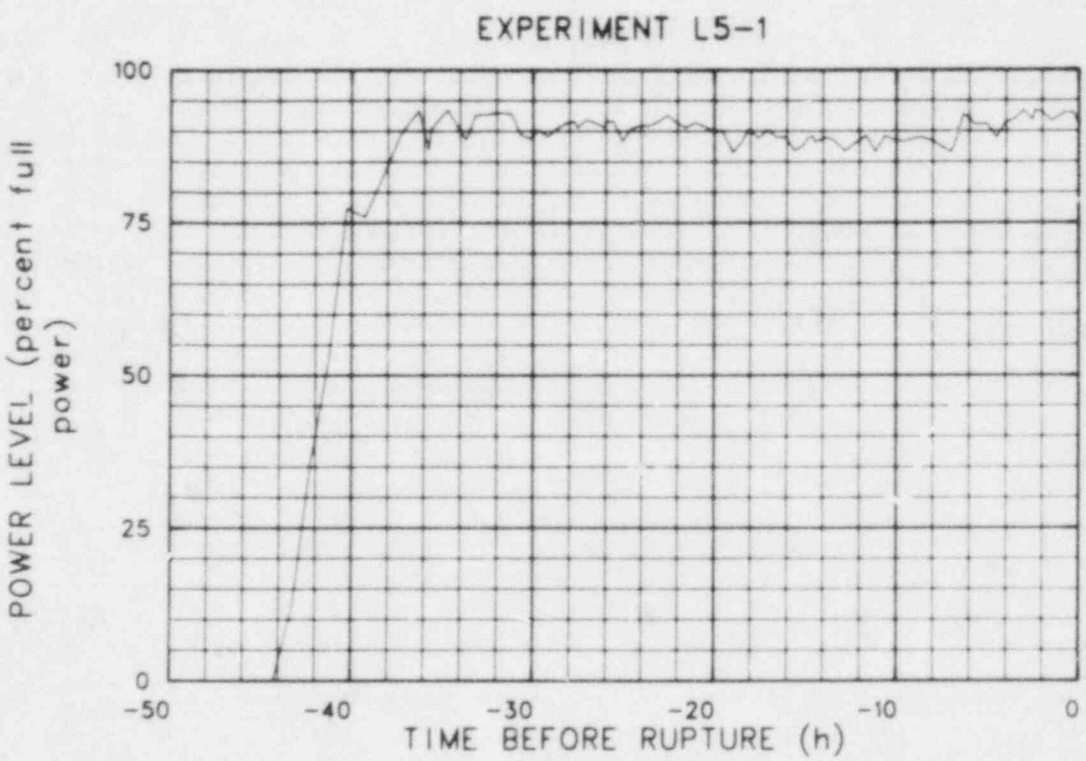


Figure 2-1. LOFT power history prior to Experiment L5-1 initiation [full power = 50 MW(t)].

Experiment L5-1 was initiated by opening the cold leg QOBV. A flow limiting nozzle (1.73 E-3 m^2) provided a break mass flow scaled to a ruptured 14-in. accumulator line in a commercial PWR. The reactor scrammed on low hot leg pressure (14.19 MPa) at 0.17 ± 0.01 s. When the four "rod-bottom lights" energized, indicating that the control rods were fully inserted, the primary coolant pumps (PCPs) were manually tripped (4.0 ± 0.5 s). The PCPs then coasted down under the influence of the flywheel system. Coastdown was completed at 19.3 ± 0.1 s, when the flywheels were decoupled from the PCPs. Instrumentation indicated that PCP loop seals were in a completely voided condition following pump coastdown. HPIS injection, initiated by a hot leg pressure setpoint of 10.6 MPa, commenced at 2.88 ± 0.1 s, delivering a scaled flow of 0.5 ± 0.2 L/s into the intact loop cold leg. The main feed pumps tripped and the steam generator steam control valve commenced to ramp shut on receipt of the reactor scram signal; the steam control valve was fully shut at 12.1 ± 0.2 s. The reactor vessel upper plenum reached saturation and began to void at 0.2 ± 0.1 s, with the broken loop cold leg (BLCL) saturating at 10.5 ± 0.5 s. The pressurizer indicated empty by 15.5 ± 0.5 s. A thermal excursion began at the top of the active core region at 108.4 ± 1.0 s and at a pressure of 3.6 ± 0.1 MPa and continued to move into the core until 184.0 ± 1.0 s. At this time, the PCS pressure had decreased sufficiently (1.66 ± 0.06 MPa) to allow the degraded (scaled to three out of four available) accumulator injection system to commence core reflood. A maximum fuel cladding temperature of 715.0 ± 3 K was reached at 198.0 ± 2.0 s. The core reflood was assisted by the scaled LPIS which began injecting ECC water to the intact loop cold leg when the PCS pressure had decreased to 1.08 ± 0.06 MPa at 201.0 ± 0.5 s. Core reflood was complete and the experiment was terminated at 214.0 ± 1.0 s, when all fuel cladding temperatures indicated at or below the saturation temperature.

The combined sequence of events for Experiments L5-1 and L8-2 is provided in Table 2-1. Figure 2-2 shows the decay heat during Experiment L5-1 which was calculated using the American Nuclear Society Standard 5.1.[3]

2.1.2 Experiment L8-2. Initial reactor criticality occurred approximately 35 h prior to experiment initiation. The power level reached 46 ± 1 MW at 25 h prior to the experiment, and was maintained at that level until experiment initiation. A plot of the power level versus time for the 40-h period prior to experiment initiation is given in Figure 2-3. During this time, measurements of power level were performed using a secondary calorimetric calculation. The PCS flow rate was set at 334.6 ± 6.3 kg/s, and adjustment of the SCS was made to maintain the power level. The PCS boron concentration was adjusted to establish the specified reactor vessel inlet temperature of 552.0 ± 1.1 K, and a hot leg pressure of 14.87 ± 0.10 MPa was maintained.

The procedure for Experiment L8-2 was identical to Experiment L5-1 until the time when the accumulator began injecting water into the PCS in Experiment L5-1. The accumulator was isolated in Experiment L8-2 so that coolant injection would not occur. The cold leg QOBV was opened to initiate Experiment L8-2, and the reactor scrammed at 0.10 ± 0.05 s. The PCPs were shut off manually at 3.2 ± 0.5 s, and completed their coastdown at 19.0 ± 0.1 s. PCP loop seal instrumentation indicated a completely voided condition following pump coastdown. The HPIS began injecting water into the PCS at 3.05 ± 0.1 s, delivering a flow rate of 0.5 ± 0.2 L/s in the intact loop cold leg. The steam flow control valve of the steam gen era tor was fully shut at 12.4 ± 0.1 s. The reactor vessel upper plenum reached saturation at 0.2 ± 0.1 s, followed by the BLCL which saturated at 10.4 ± 0.2 s. The pressurizer indicated empty at 15.5 ± 0.5 s. The fuel cladding thermocouple temperature excursion began at 112.0 ± 0.5 s, and progressed to the lowest thermocouple elevation by 240.0 ± 2.0 s, when the core region was devoid of liquid. The PCPs were restarted when the highest monitored fuel cladding thermocouples reached the 811-K setpoint at 234.5 ± 0.5 s. The highest monitored fuel cladding thermocouples reached 950 ± 3 K at 286.0 ± 0.5 s, whereupon the operators tripped the PCP power (291.0 ± 1.0 s) and initiated Accumulator A injection (294.0 ± 1.0 s). Cladding temperatures continued to rise, and at 299.2 ± 2.0 s reached 978 K, whereupon both HPIS B and Accumulator B injection systems were initiated by automatic PPS function. The core was reflooded by 306.4 ± 0.5 s.

Figure 2-4 shows the decay heat during Experiment L8-2 which was calculated using the American Nuclear Society Standard 5.1.[3]

The BST pressure was not controlled because the back pressure was not expected to affect the blowdown. BST recirculation through the spray

TABLE 2-1. SEQUENCE OF EVENTS FOR EXPERIMENTS L5-1 AND L8-2

Event	Time after Experiment Initiation (s) Experiment L5-1	Experiment L8-2
Cold leg QOBV opened[a]	0.0	0.0
Reactor scrammed	0.17 ± 0.01	0.10 ± 0.05
Main feed pump tripped and steam control valve started to close	0.17 ± 0.02	0.10 ± 0.05
Upper plenum reached saturation	0.2 ± 0.1	0.2 ± 0.1
HPIS trip point reached (10.6 MPa)	0.4 ± 0.1	0.4 ± 0.1
HPIS injection flow initiated	2.88 ± 0.1	3.05 ± 0.1
Primary coolant pump power tripped	4.0 ± 0.5	3.2 ± 0.5
Broken loop cold leg reached saturation	10.5 ± 0.5	10.4 ± 0.2
Steam generator steam control valve closed	12.1 ± 0.1	12.4 ± 0.1
Pressurizer indicated empty	15.5 ± 0.5	15.5 ± 0.5
Primary coolant pump coastdown completed (flywheel decoupled from pump)	19.3 ± 0.1	19.0 ± 0.1
Primary pressure dropped below secondary	53.0 ± 1.0	47.0 ± 1.0
Fuel cladding thermal excursion started	108.4 ± 1.0	112.0 ± 0.5
Lowest in-core thermal excursion level reached	184.0 ± 4.0	240.0 ± 2.0[b]
Accumulator A injection started	185.8 ± 0.5	294.0 ± 1.0
Maximum fuel cladding temperature reached (715 K for Experiment L5-1, 987 K for Experiment L8-2)	198.0 ± 2.0	299.1 ± 0.5
LPIS flow initiated	201.0 ± 0.5	303.0 ± 5.0
PCPs restarted (fuel cladding temperature at 811 K)	N/A[c]	234.5 ± 0.5
Maximum cladding temperature criteria met (950 K)	N/A	286.0 ± 0.5

TABLE 2-1. (continued)

Event	Time after Experiment Initiation (s)	
	Experiment L5-1	Experiment L8-2
PCPs tripped	N/A[c]	291.0 ± 1.0
Plant protection system signal initiated (fuel cladding temperature at 978 K)	N/A	299.2 ± 2.0
Fuel cladding quench started (bottom of core)	N/A	299.5 ± 0.5
HPIS B injection started	N/A	301.7 ± 0.5
Accumulator B injection started	N/A	303.0 ± 1.0
Fuel cladding quench completed at core peak power elevation	202.0 ± 1.0	305.0 ± 0.5
Core reflood completed	214.0 ± 1.0	306.4 ± 0.5

a. Experiment initiation is defined to be the time when the broken loop cold leg pressure began to increase.

b. Designates complete core uncovery in Experiment L8-2.

c. N/A--not applicable for this experiment.

headers took place during Experiment L8-2 at full spray pump capacity throughout the transient to ensure that homogeneous temperatures would be maintained throughout the water volume in the BST.

The DAVDS recorded approximately 20 min of data. An electrical calibration of the DAVDS was performed following each experiment.

2.2 Initial Conditions

The specified initial plant operating conditions (except for the linear heat generation rate) for Experiments L5-1 and L8-2 are presented in Table 2-2 along with the values measured immediately prior to experiment initiation. Tables 2-3 and 2-4 give the linear heat generation rate versus core height for three locations within the LOFT core prior to Experiments L5-1 and L8-2 initiations. The data for Tables 2-3 and 2-4 were obtained from the traversing in-core probe system.

Table 2-5 gives the measured fluid temperatures of the PCS immediately prior to Experiments L5-1 and L8-2.

Tables 2-6 and 2-7 specify the required water chemistry for the PCS, BST, and SCS, and present the results of the water chemistry analyses for preexperiment conditions in these systems for Experiments L5-1 and L8-2.

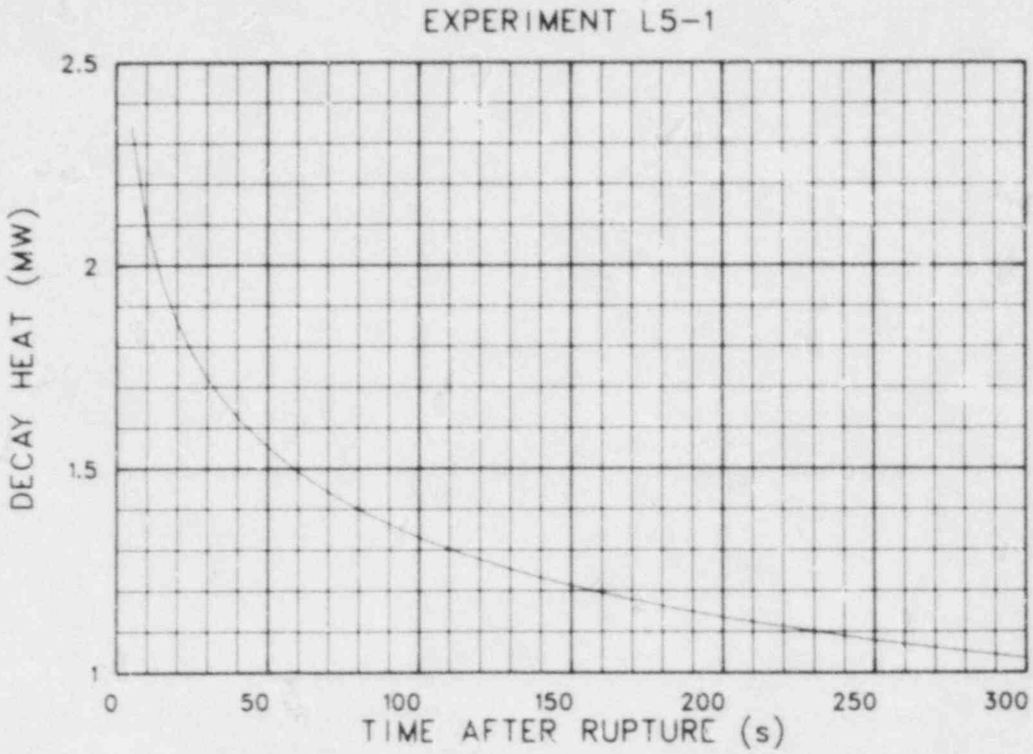


Figure 2-2. LOFT decay heat following Experiment L5-1 initiation.

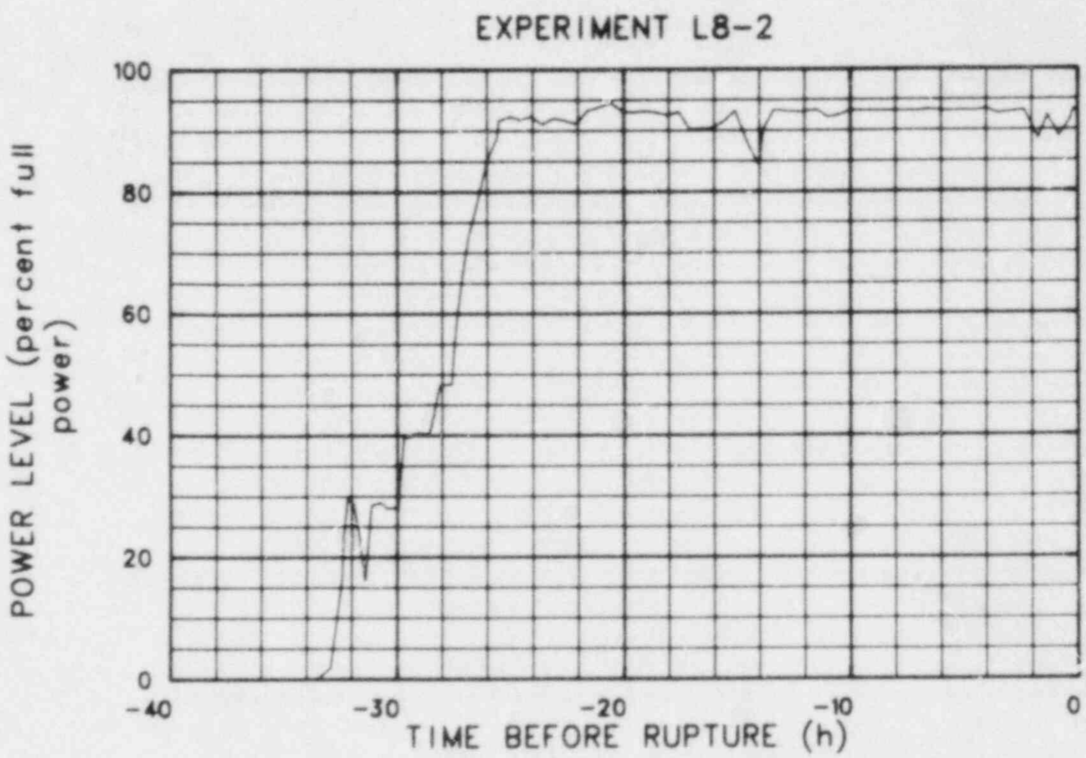


Figure 2-3. LOFT power history prior to Experiment L8-2 initiation [full power = 50 MW(t)].

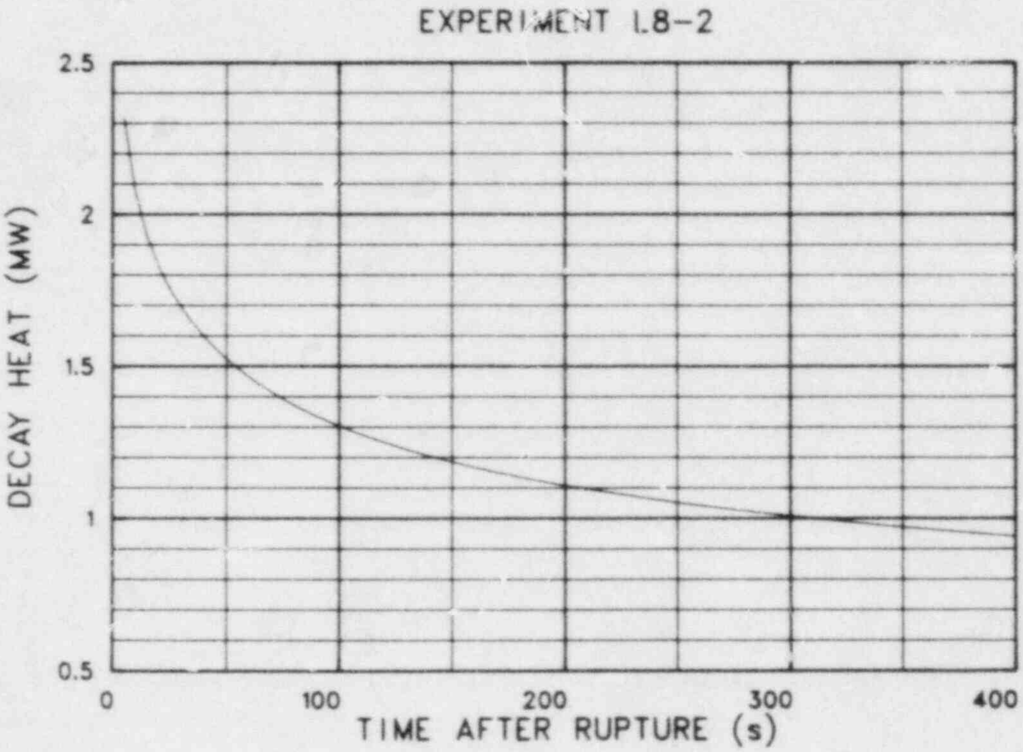


Figure 2-4. LOFT decay heat following Experiment L8-2 initiation.

TABLE 2-2. INITIAL CONDIT...S FOR EXPERIMENTS L5-1 AND L8-2

Parameter	Specified Value	Experiment L5-1 Measured Value	Experiment L8-2 Measured Value
Primary Coolant System			
Mass flow (kg/s)	334.6 ± 6.3	308.2 ± 4.0	311.2 ± 4.0
Hot leg pressure (MPa)[a]	14.87 ± 0.10	14.93 ± 0.08	14.86 ± 0.06
Cold leg temperature (K)	552 ± 1	552.3 ± 0.9	552.4 ± 0.9
Hot leg temperature (K)	--	579.1 ± 0.9	579.3 ± 0.8
Boron concentration (ppm)	As required to maintain temperature	669.0 ± 10	671.0 ± 10.0
Vessel ΔT (K)	28.9 ± 1.7	26.8 ± 1.3[a]	26.9 ± 1.2
Reactor Vessel			
Power level (MW)	47 ± 1	45.9 ± 1.2	46.0 ± 1.2
Maximum linear heat generation rate (kW/m)	--	46.0 ± 3.5	45.8 ± 3.5
Control rod position (above full-in position) (m)	1.42 ± 0.01	1.43 ± 0.01	1.43 ± 0.01
Pressurizer			
Steam volume (m^3)	--	0.33 ± 0.02	0.32 ± 0.02
Liquid volume (m^3)	--	0.60 ± 0.02	0.61 ± 0.02
Liquid temperature (K)	--	615.0 ± 0.4	614.6 ± 0.4
Liquid level (m)[a]	1.12 ± 0.05	1.13 ± 0.03	1.15 ± 0.03
Broken Loop			
Cold leg temperature near reactor vessel (K)	--	549.2 ± 2.6	550.6 ± 1.8
Hot leg temperature near reactor vessel (K)	--	554.3 ± 2.6	554.7 ± 2.6

TABLE 2-2. (continued)

Parameter	Specified Value	Experiment L5-1 Measured Value	Experiment L8-2 Measured Value
Steam Generator Secondary Side			
Liquid level (m)[b]	0.254 ± 0.05	0.27 ± 0.02	0.21 ± 0.02
Liquid temperature (K)	--	537.8 ± 0.8	537.9 ± 0.8
Pressure (MPa)	--	5.05 ± 0.06	5.08 ± 0.06
Mass flow (kg/s)	--	25.3 ± 0.6	25.2 ± 0.6
Blowdown Suppression Tank			
Liquid level (m)	1.27 ± 0.05	1.48 ± 0.02[a]	1.40 ± 0.02[a]
Liquid temperature (K)	--	360.6 ± 0.8	356.3 ± 1.0
Accumulator A			
Liquid level (m)[c]	1.49 ± 0.03[d]	1.54 ± 0.01	2.06 ± 0.01
Pressure (MPa)	1.6 ± 0.3[d]	1.66 ± 0.05	4.50 ± 0.05
Liquid temperature (K)	305.4 ± 2.8[d]	308.2 ± 2.5	305.5 ± 2.5

a. Out of specification, but did not impair results.

b. The liquid level is defined as 0.0 at 2.95 m above the top of the tube sheet.

c. Liquid level is measured from 0.32 m above the bottom of the accumulator vessel.

d. Not specified for Experiment L8-2.

TABLE 2-3. LINEAR HEAT GENERATION RATE PRIOR TO EXPERIMENT L5-1 (Reading Uncertainty ±7.6%)

Height Above Core Bottom (m)	Linear Heat Generation Rate for Core Position (kW/m)		
	1C7	5H8	5M3
0.152	11.34	18.53	18.54
0.292	22.94	36.34	36.81
0.394	25.32	40.11	40.63
0.456	23.92	37.89	38.38
0.503	25.29	40.07	40.58
0.546	28.54	43.26	43.77
0.648	28.66	43.45	43.96
0.749	27.82	42.17	42.67
0.846	24.71	37.45	37.89
0.886	22.78	34.55	34.94
0.953	24.05	36.46	36.89
1.054	21.68	33.39	33.24
1.181	18.95	27.09	27.59
1.257	15.27	21.83	22.23
1.299	12.32	18.67	18.89
1.359	11.85	16.95	17.26
1.511	5.42	9.04	8.49
1.613	2.82	5.10	4.78
1.664	2.15	4.58	4.10

TABLE 2-4. LINEAR HEAT GENERATION RATE PRIOR TO EXPERIMENT L8-2 (Reading Uncertainty ±7.6%)

Height Above Core Bottom (m)	Linear Heat Generation Rate for Core Position (kW/m)		
	1C7	5H8	5M3
0.152	10.77	18.32	18.31
0.292	22.62	35.84	36.30
0.394	25.14	39.83	40.34
0.456	23.70	37.54	38.02
0.503	25.18	39.88	40.39
0.546	27.01	42.78	43.34
0.648	28.49	43.18	43.69
0.749	27.77	42.09	42.58
0.846	24.82	37.62	38.07
0.886	23.02	34.90	35.31
0.953	24.06	36.46	36.89
1.054	21.93	33.24	33.63
1.181	19.32	27.63	28.14
1.257	15.50	22.16	22.57
1.299	12.61	19.11	19.34
1.359	11.51	17.45	17.65
1.511	5.50	9.17	8.62
1.613	2.89	5.23	4.91
1.664	2.24	4.56	4.29

TABLE 2-5. PRIMARY COOLANT TEMPERATURES AT EXPERIMENT INITIATION

		Temperature (K)	
Location	Detector	Experiment L5-1	Experiment L8-2
Intact loop hot leg (near vessel)	TE-PC-002B	579.0 ± 3.1	579.1 ± 3.1
Intact loop steam generator outlet	TE-SG-002	552.0 ± 2.7	553.0 ± 2.7
Intact loop cold leg (near vessel)	TE-PC-005	551.4 ± 3.1	552.1 ± 3.1
Reactor vessel downcomer:			
Instrument Stalk 1	TE-1ST-001	550.3 ± 2.7	550.9 ± 2.7
Instrument Stalk 2	TE-2ST-001	552.4 ± 2.7	553.3 ± 2.7
Reactor vessel lower plenum	TE-1LP-001	552.0 ± 2.7	551.9 ± 2.7
Reactor vessel upper plenum	TE-1UP-001	588.5 ± 2.9	588.0 ± 2.9
	TE-4UP-001	572.0 ± 2.8	573.0 ± 2.8
	TE-5UP-001	593.8 ± 2.9	594.0 ± 2.9
Broken loop hot leg (near vessel)	TE-BL-002B	554.3 ± 2.6	555.0 ± 2.6
Broken loop cold leg (near vessel)	TE-BL-001B	549.2 ± 2.6	550.4 ± 2.6
Intact loop pressurizer (from saturation pressure)	PE-PC-004	615.7 ± 0.1 (15.0 MPa)	614.8 ± 0.1 (15.0 MPa)

TABLE 2-6. WATER CHEMISTRY RESULTS FOR EXPERIMENT L5-1

Parameter	Primary Coolant System		Blowdown Suppression Tank			Secondary Coolant System	
	Specified	Preexperiment[a]	Specified	Preexperiment	Postexperiment	Specified	Preexperiment
pH (each at 298 K)	4.2 to 10.5	5.78	4.2 to 10.5	4.66	4.82	9.0 to 10.2	10.0
Conductivity (μmho/cm^3) (each at 298 K)	60 maximum	2.48	60 maximum	10.18	6.91	2[b] maximum	1.2
Total gas (cm^3/kg)	100 maximum	35.0	--	--	--	--	--
Dissolved oxygen (ppm)	--	--	--	--	--	0.005	0.0046
Chloride (ppm)	0.15 maximum	<0.1	0.15 maximum	<0.1	<0.1	0.15 maximum	<0.1
Undissolved solids (ppm)	1.0 maximum	<0.5	1.0 maximum	<0.5	<0.8	1.0 maximum	1.7
Boron (ppm)	--	669	>3050	3834	3108	--	--
Fluoride (ppm)	0.1 maximum	<0.02	0.1 maximum	<0.02	<0.02	--	--
Hydrogen (cm^3/kg)[c]	10 to 60	16.0	--	--	--	--	--
Total gross activity (μCi/mL)	375 maximum	0.07	--	--	2.3×10^{-3}	--	--
Gross beta and gamma (μCi/mL)	--	1.6×10^{-2}	--	--	2.3×10^{-3}	--	--
^{131}I (μCi/mL)	0.37 maximum	0.0	--	--	0.0	9×10^{-4} maximum	0.0
^{135}I (μCi/mL)	0.76 maximum	0.0	--	--	0.0	-- maximum	0.0

a. Sample taken upstream of the primary coolant system ion exchanger.

b. Cation conductivity.

c. Prior to depressurization.

TABLE 2-7. WATER CHEMISTRY RESULTS FOR EXPERIMENT L8-2

Parameter	Primary Coolant System		Blowdown Suppression Tank			Secondary Coolant System	
	Specified	Preexperiment[a]	Specified	Preexperiment	Postexperiment	Specified	Preexperiment
pH (each at 298 K)	4.2 to 10.5	5.85	4.2 to 10.5	4.99	5.10	9.0 to 10.2	10.03
Conductivity (μmho/cm^3) (each at 298 K)	60 maximum	2.52	60 maximum	12.61	10.04	2[b] maximum	1.9
Total gas (cm^3/kg)	100 maximum	59.0	--	--	--	--	--
Dissolved oxygen (ppm)	--	--	--	--	--	0.005 maximum	0.0
Chloride (ppm)	0.15 maximum	<0.1	0.15 maximum	<0.1	<0.1	0.15 maximum	<0.1
Undissolved solids (ppm)	1.0 maximum	<0.5	1.0 maximum	<0.5	--	1.0 maximum	0.7
Boron (ppm)	--	671	>3050	3888	3230	--	--
Fluoride (ppm)	0.1 maximum	<0.02	0.1 maximum	<0.02	<0.02	--	--
Hydrogen (cm^3/kg)[c]	10 to 60	12.0	--	--	--	--	--
Total gross activity (μCi/mL)	375 maximum	5.2×10^{-2}	--	--	1.6×10^{-2}	--	--
Gross beta and gamma (μCi/mL)	--	1.6×10^{-2}	--	--	1.6×10^{-2}	--	--
^{131}I (μCi/mL)	0.37 maximum	0.0	--	--	0.0	9×10^{-4} maximum	0.0
^{135}I (μCi/mL)	0.76 maximum	0.0	--	--	0.0	--	0.0

a. Sample taken upstream of the primary coolant system ion exchanger.

b. Cation conductivity.

c. Prior to depressurization.

3. DATA PRESENTATION FOR EXPERIMENT L5-1

The data presented in this report are selected, uninterpreted, thermal-hydraulic and nuclear data from LOFT Experiments L5-1 and L8-2. This section presents the data from Experiment L5-1. Section 4 presents comparison data from Experiments L5-1 and L8-2. Section 5 presents data from Experiment L8-2. The data presentation is described in the following paragraphs.

The selected data have been divided into two categories, "Qualified" and "Failed." The "Qualified" designation was applied to measurements that have been found to be within the uncertainty of the instrument. All the data presented in this report are "Qualified." The plot captions contain applicable restrictive statements if the data are invalid or questionable over a portion of the recorded time span. All "Qualified" data, including "Qualified" data that are not presented, are available from the Nuclear Regulatory Commission Reactor Safety Research data bank. The checks on data consistency and instrument performance are discussed in detail in Appendix C. Any information concerning calibration data may be received by contacting the LOFT Data Analysis Branch Manager.

The data were processed and are presented in graphical form in SI and British units. Most of the data were collected at a rate of 50 samples per second. Short-term plots contain approximately 1250 points. Plots of longer time frames were reduced to approximately 2000 points for ease of plotting. This was accomplished by dividing the time span into approximately 1000 constant increments and plotting only the minimum and maximum values in each increment. The resulting plot looks identical to a plot produced by plotting every point because of the finite resolution of the plotting device.

Uncertainties for experimental measurements and computed variables are of the form $\pm\sqrt{(B)^2 + (M \times RD/100)^2}$, where B is the bias (offset) uncertainty, RD is the percentage-of-reading uncertainty, and M is the measurement reading at a particular time. The uncertainties supplied on the plots were calculated for M equal to the maximum data value to ensure that the uncertainties are conservative. Uncertainties for process instruments are of the form $\pm RG/100$, where RG is a percentage-of-range uncertainty. B, RD, and RG are calculated at the 95% confidence level. Uncertainty values are presented in Table B-2 of Appendix B and on each plot.

Uncertainty bands on selected measurements are presented for ease in code comparison. The uncertainties are fixed values calculated at the upper range of the recorded data so as to be conservative. On certain plots, the uncertainty band may exceed a physical limit, such as a density below zero. This is a result of the plotting software and does not represent a real phenomenon.

The design ranges of the instruments are also presented on each plot. In some cases, the instrument range exceeds its design range. Computed variables are calculated from several measurements and thus do not have design ranges.

Table 3-1 lists the selected measurements presented in this report for Experiment L5-1 and gives the detector location and the figure numbers. In addition, this table contains a "Comments" column that gives information pertaining to the qualification of the data. A list of instruments available for Experiments L5-1 and L8-2 is included in Table B-2 of Appendix B.

Table 3-2 lists the variables presented in this report that were computed for Experiments L5-1 and L8-2 from other measurements and geometrical constants. This table also gives the equations used to compute these variables, the figure number, and comments which reflect on the usefulness of the data.

The data presented in this section are divided into four categories with the individual plots in each category being presented in alphanumeric order to facilitate comparison and location of desired variables. These data categories include:

1. Experiment L5-1 Measured Variables, Short-Term Plots (-5 to 20 s), Figures 3S-1 through 3S-27

2. Experiment L5-1 Measured Variables, Long-Term Plots (-25 to 225 s), Figures 3L-1 through 3L-56

3. Experiment L5-1 Computed Variables, Figures 3C-1 through 3C-19

4. Experiment L5-1 Variables with Uncertainty Bands, Figures 3U-1 through 3U-6.

TABLE 3-1. MEASURED VARIABLES PRESENTED FOR EXPERIMENT L5-1

Variable, System, and Detector	Location	Figure Number	Comments
VALVE OPENING			
Secondary Coolant System			
CV-P004-010	Main steam control valve.	3S-1	Qualified.
CHORDAL DENSITY			
Broken Loop			
DE-BL-001A	Cold leg at drag disc-turbine transducer (DTT) flange. Beam A is 14°, 21 min from Beam B [clockwise (CW) looking toward reactor vessel (RV)].	3S-2 3L-1	Qualified.
DE-BL-001B	Cold leg at DTT flange. Beam B is through center-line of pipe 45° from vertical [counterclock-wise (CCW) looking toward RV].	3S-3 3L-2	Qualified.
DE-BL-001C	Cold leg at DTT flange. Beam C is 22°, 7 min from Beam B (CCW looking toward RV).	3S-4 3L-3	Qualified, some large data processing spikes.
DE-BL-002B	Hot leg at DTT flange. Beam B is through center-line of pipe 45° from vertical (CW looking toward RV).	3L-4	Qualified.
DE-BL-002C	Hot leg at DTT flange. Beam C is 22°, 7 min from Beam B (CW looking toward RV).	3L-5	Qualified.
Intact Loop			
DE-PC-001A	Cold leg at DTT flange. Beam A is 14°, 21 min from Beam B (CW looking away from RV).	3S-5 3L-6	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
CHORDAL DENSITY (continued)			
Intact Loop (continued)			
DE-PC-001B	Cold leg at DTT flange. Beam B is through centerline of pipe 45° from vertical (CCW looking away from RV).	3S-6 3L-7	Qualified.
DE-PC-001C	Cold leg at DTT flange. Beam C is 22°, 7 min from Beam B (CCW looking away from RV).	3S-7 3L-8	Qualified.
DE-PC-002B	Hot leg at DTT flange. Beam B is through centerline of pipe 45° from vertical (CCW looking away from RV).	3S-8 3L-9	Qualified.
DE-PC-002C	Hot leg at DTT flange. Beam C is 22°, 7 min from Beam B (CCW looking away from RV).	3S-9 3L-10	Qualified.
DE-PC-003B	Below steam generator (SG) at DTT flange. Beam B is through centerline of pipe.	3S-10 3L-11	Qualified.
FLUID VELOCITY			
Intact Loop			
FE-PC-001B	Cold leg horizontal DTT flange at center of pipe.	3L-12	Qualified.
FE-PC-002A	Hot leg DTT flange at bottom of pipe.	3L-13	Qualified.
FE-PC-002B	Hot leg DTT flange at middle of pipe.	3L-13	Qualified.
FE-PC-002C	Hot leg DTT flange at top of pipe.	3L-13	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
FLOW RATE			
Secondary Coolant System			
FT-P004-012	Inlet to air-cooled condenser inlet header.	3S-11	Qualified, initial conditions only.
FT-P004-72-2	Flow out of main feedwater pump.	3S-12	Qualified.
Emergency Core Cooling System			
FT-P120-085	Low-pressure injection system (LPIS) Pump A in 4-in. line between heat exchanger and orifice.	3L-14	Qualified, no other measurement for direct comparison.
FT-P128-104	High-pressure injection system (HPIS) Pump A discharge.	3S-13 3L-15 3U-3	Qualified.
Intact Loop			
FT-P139-27-2	Hot leg venturi flowmeter (bottom of pipe).	3S-14	Qualified, initial conditions only.
LIQUID LEVEL			
Emergency Core Cooling System			
LE-ECC-01A	Accumulator A.	3L-16	Qualified.
LIT-P120-087	Accumulator A.	3L-17	Qualified.
Blowdown Suppression Tank			
LT-P138-033	Blowdown suppression tank (BST) level on north end of tank.	3L-18	Qualified, not density compensated.
LT-P138-058	BST level on south end of tank.	3L-18	Qualified, not density compensated.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
MOMENTUM FLUX			
Broken Loop			
ME-BL-001A	Cold leg DTT flange at bottom of pipe, high range.	3L-19	Qualified.
ME-BL-001B	Cold leg DTT flange at middle of pipe, high range.	3L-20 3U-4	Qualified.
ME-BL-001C	Cold leg DTT flange at top of pipe, high range.	3L-21	Qualified.
ME-BL-001E	Cold leg DTT flange at middle of pipe, low range.	3L-22	Qualified, narrow range instrument.
ME-BL-001F	Cold leg DTT flange at top of pipe, low range.	3L-23	Qualified, narrow range instrument.
Intact Loop			
ME-PC-001A	Cold leg horizontal DTT flange on far side of pipe as viewed from rake flange.	3L-24	Qualified.
ME-PC-002A	Hot leg DTT flange at bottom of pipe.	3L-25	Qualified.
ME-PC-002B	Hot leg DTT flange at middle of pipe.	3L-26	Qualified.
ME-PC-002C	Hot leg DTT flange at top of pipe.	3L-27	Qualified.
DIFFERENTIAL PRESSURE			
Broken Loop			
PdE-BL-015	Cold leg upstream of nozzle throat.	3S-15	Qualified.
PdE-BL-016	Cold leg upstream of nozzle midplane.	3S-15	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
DIFFERENTIAL PRESSURE (continued)			
Broken Loop (continued)			
PdE-BL-017	Cold leg upstream of nozzle exit.	3S-15	Qualified.
PdE-BL-018	Cold leg across nozzle spoolpiece.	3S-15 3L-28	Qualified.
Intact Loop			
PdE-PC-001	Cold leg across primary coolant pumps (PCPs).	3S-16 3L-29	Qualified.
PdE-PC-002	Across SG.	3S-17	Qualified.
PdE-PC-008	Across pressurizer surge line.	3L-30	Qualified, narrow range instrument, magnitude uncertain.
Reactor Vessel			
PdE-RV-005	Top of RV to intact loop hot leg.	3L-31	Qualified, no other measurement for direct comparison.
Intact Loop			
PdT-P139-030	Across RV just beyond intact loop inlet and outlet nozzles.	3L-32	Qualified, initial conditions only.
PRESSURE			
Broken Loop			
PE-BL-001	Cold leg at DTT flange.	3L-33	Qualified.
PE-BL-009	Cold leg upstream of nozzle.	3L-34	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
PRESSURE (continued)			
Intact Loop			
PE-PC-001	Cold leg at DTT flange.	3L-35	Qualified.
PE-PC-006	Reference pressure between SG outlet and PCP inlet.	3S-18 3L-36 3U-5	Qualified.
Secondary Coolant System			
PE-SGS-001	SG dome pressure.	3L-37	Qualified.
Reactor Vessel			
PE-1UP-001A	Above Fuel Assembly 1 upper end box.	3L-38	Qualified.
Intact Loop			
PT-P139-05-1	Pressurizer, 1.88 m above bottom (vapor space).	3S-19 3L-39	Qualified.
PUMP SPEED			
Intact Loop			
RPE-PC-001	PCP-1.	3L-40	Qualified.
RPE-PC-002	PCP-2.	3L-41	Qualified.
REACTIVITY			
Reactor Vessel			
RE-T-77-1A2	Power range, Channel A level.	3S-20	Qualified.
TEMPERATURE			
Broken Loop			
TE-BL-001B	Cold leg at DTT flange at middle of pipe.	3S-21 3L-42 3U-6	Qualified, possible hot wall effects.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Intact Loop			
TE-PC-001B	Cold leg DTT f‘‑nge at middle of ŗ	3S-22 3L-43	Qualified, possible hot wall effects.
TE-PC-002.,	Hot leg DTT flange at middle of pipe.	3S-23 3L-44	Qualified, possible hot wall effects.
Reactor Vessel			
TE-1LP-001	Fuel Assembly 1 lower end box.	3S-24	Qualified.
TE-1UP-001	Fuel Assembly 1 upper end box.	3S-25	Qualified.
TE-2H13-021	Cladding on Fuel Assembly 2, Row H, Column 13 at 0.53 m above bottom of fuel rod.	3L-45	Qualified.
TE-2H13-049	Cladding on Fuel Assembly 2, Row H, Column 13 at 1.24 m above bottom of fuel rod.	3L-45	Qualified.
TE-2H14-028	Cladding on Fuel Assembly 2, Row H, Column 14 at 0.71 m above bottom of fuel rod.	3L-45	Qualified.
TE-2H14-032	Cladding on Fuel Assembly 2, Row H, Column 14 at 0.81 m above bottom of fuel rod.	3L-45	Qualified.
TE-3B10-037	Claddiꞑg on Fuel Assembly 3, Row B, Column 10 at 0.94 m above bottom of fuel rod.	3L-46	Qualified.
TE-3B11-028	Cladding on Fuel Assembly 3, Row B, Column 11 at 0.71 m above bottom of fuel rod.	3L-46	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-3B11-032	Cladding on Fuel Assembly 3, Row B, Column 11 at 0.81 m above bottom of fuel rod.	3L-46	Qualified.
TE-3B12-026	Cladding on Fuel Assembly 3, Row B, Column 12 at 0.66 m above bottom of fuel rod.	3L-46	Qualified.
TE-3UP-001	Fuel Assembly 3 upper end box.	3S-26 3L-47	Qualified.
TE-3UP-008	Liquid level transducer above Fuel Assembly 3.	3L-47	Qualified.
TE-3UP-010	Liquid level transducer above Fuel Assembly 3.	3L-47	Qualified.
TE-3UP-014	Liquid level transducer above Fuel Assembly 3.	3L-47	Qualified.
TE-4H13-037	Cladding on Fuel Assembly 4, Row H, Column 13 at 0.94 m above bottom of fuel rod.	3L-48	Qualified.
TE-4H14-032	Cladding on Fuel Assembly 4, Row H, Column 14 at 0.81 m above bottom of fuel rod.	3L-48	Qualified.
TE-4H15-026	Cladding on Fuel Assembly 4, Row H, Column 15 at 0.66 m above bottom of fuel rod.	3L-48	Qualified.
TE-4H15-041	Cladding on Fuel Assembly 4, Row H, Column 15 at 1.04 m above bottom of fuel rod.	3L-48	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-5G6-011	Cladding on Fuel Assembly 5, Row G, Column 6 at 0.28 m above bottom of fuel rod.	3L-49	Qualified.
TE-5G6-030	Cladding on Fuel Assembly 5, Row G, Column 6 at 0.76 m above bottom of fuel rod.	3L-49	Qualified.
TE-5G6-045	Cladding on Fuel Assembly 5, Row G, Column 6 at 1.14 m above bottom of fuel rod.	3L-49	Qualified.
TE-5G6-062	Cladding on Fuel Assembly 5, Row G, Column 6 at 1.57 m above bottom of fuel rod.	3L-49	Qualified.
TE-5H6-024	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.61 m above bottom of fuel rod.	3L-50	Qualified.
TE-5H6-028	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.71 m above bottom of fuel rod.	3L-50	Qualified.
TE-5H6-032	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.81 m above bottom of fuel rod.	3L-50	Qualified.
TE-5H6-037	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.94 m above bottom of fuel rod.	3L-50	Qualified.
TE-5LP-001	Fuel Assembly 5 lower end box.	3L-51	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-5LP-003	Fuel Assembly 5 lower end box.	3L-52	Qualified.
TE-5UP-001	Fuel Assembly 5 upper end box.	3S-27 3L-53	Qualified.
TE-5UP-003	Fuel Assembly 5 upper end box.	3L-54	Qualified.
TE-5UP-005	Fuel Assembly 5 upper end box.	3L-55	Qualified.
TE-6G14-011	Cladding on Fuel Assembly 6, Row G, Column 14 at 0.28 m above bottom of fuel rod.	3L-56	Qualified.
TE-6G14-030	Cladding on Fuel Assembly 6, Row G, Column 14 at 0.76 m above bottom of fuel rod.	3L-56	Qualified.
TE-6G14-045	Cladding on Fuel Assembly 6, Row G, Column 14 at 1.14 m above bottom of fuel rod.	3L-56	Qualified.
TE-6I14-021	Cladding on Fuel Assembly 6, Row I, Column 14 at 0.53 m above bottom of fuel rod.	3L-56	Qualified.

TABLE 3-2. COMPUTED VARIABLES FOR EXPERIMENTS L5-1 AND L8-2

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments[a]
DENSITY, AVERAGE		--[b]	Except where the density distribution reduces to an average directly, the following method is used to determine the average density:		The individual beam densities were filtered with a 4-Hz filter prior to being used in the average calculation.
Broken Loop Cold Leg			1. A calculated density profile is determined from an assumed distribution which has been "fit" to each beam measurement. These are optimized as shown below.		
DE-BL-1A (ρ_A) DE-BL-1B (ρ_B) } DE-BL-105 DE-BL-1C (ρ_C)	Mg/m^3	±0.10	2. The least squares curve fits are compared to determine the optimum assumed density profile to fit the data.	3C-1 3C-11 3U-1	Qualified (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).
DE-BL-1B (ρ_B) } DE-BL-125 BE-BL-1C (ρ_C)	Mg/m^3	±0.20	3. The best profile is area averaged to give average density by $\bar{\rho} = 1/A \int \rho(r) dA$ where A = cross-sectional area of the pipe $\rho(r)$ = chordal profile.	5C-1 5C-10	
Intact Loop Cold Leg					
DE-PC-1A (ρ_A) DE-PC-1B (ρ_B) } DE-PC-105 DE-PC-1C (ρ_C)	Mg/m^3	±0.10	4. A weighted average based on chord length is used when only the B and C beams are available.	3C-2 3C-12	Qualified.
Intact Loop Hot Leg					
DE-PC-2B (ρ_B) } DE-PC-225 DE-PC-2C (ρ_C)	Mg/m^3	±0.20	$\bar{\rho} = 0.611 * B + 0.389 * C$ The assumed profiles are as follows: 1. For homogeneous flow, the average results directly in $\bar{\rho} = \frac{(\rho_A + \rho_B + \rho_C)}{3}$ where ρ_A, ρ_B, and ρ_C = density along gamma densitometer Beams A, B, and C.	3C-3 3C-13 3U-2 4C-4 5C-2 5C-11	Qualified (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).

TABLE 3-2. (continued)

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments[a]
DENSITY, AVERAGE (continued)			2. For tilted stratified flow, $\bar{\rho}(r) = \rho_l - \frac{\rho_l - \rho_g}{1 + \exp[-4a(x - b)]}$ where a and b = two adjustable parameters ρ_g and ρ_l = gas and liquid densities x = position in maximum density gradient direction. 3. For annular distribution, $\bar{\rho}(r) = \rho_c$ for $r < R - D$; ρ_l for $r > R - D$ where R = pipe radius ρ_l = density of liquid shell ρ_c = density of vapor core D = thickness of liquid shell. ρ_c and D are two adjustable parameters and are iteratively adjusted to fit the data. 4. Eccentric annular is the same as annular, except that the core region may be vertically displaced from the pipe center. 5. For default calculation if the above distributions do not represent the data, the density is calculated by a beam length weighted average of the chordal average density readings ρ_i: $\bar{\rho} = 0.34485\ \rho_A + 0.40034\ \rho_B + 0.25481\ \rho_C$.		

TABLE 3-2. (continued)

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments[a]
LIQUID LEVEL			The individual conductivity probes are designed to output increasing voltage with increasing fluid void fraction. The bubble plot symbols correspond to the following probe output voltage ranges:		
Downcomer and Lower Plenum					
LE-1ST-1	cm	--[c]		3C-17	Qualified.
LE-1ST-2	cm		Symbol — Voltage Range	5C-15	
Core			(Δ) — 0-2 (o) — 2-8		
LE-3F10	cm		( ) — 8-10	3C-18 5C-16	Qualified.
Upper Plenum			The levels are measured from the bottom of the reactor vessel.		
LE-3UP-1	cm		Because the plots cover a long time period, short-term phenomena tend to be obscured.	3C-19 5C-17	Qualified.
			Liquid level for the loop seal, blowdown suppression tank, and reactor vessel was calculated from the pressure balance for the dP cell using the following equation: $\Delta P = \rho_R gH - \rho_a gL - \rho_v (H - L)$ where ΔP = differential pressure measured (Pa)		
Blowdown Suppression Tank			ρ_R = liquid density in the reference leg (kg/m^3)		
TE-SV-006, TE-SV-011, PdE-SV-001 — LEPdE-SV-161	m	±0.05	g = gravitational acceleration of 9.8 m/s^2 H = liquid height of the reference leg (m) (leg is assumed to be full)	3C-14 5C-12	Qualified (L5-1). Qualified, anomalous spikes at approximately 500 s (L8-2).
TE-SV-006, TE-SV-011, PdE-SV-002 — LEPdE-SV-261	m	±0.05	ρ_a = liquid density in the pipe or vessel (kg/m^3) ρ_v = vapor density in the pipe or vessel L = liquid level to be calculated (m).	3C-15 5C-13	Qualified.

TABLE 3-2. (continued)

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments[a]
LIQUID LEVEL (continued) Pressurizer			Using the liquid temperature from the TE measurement or the system pressure from the PE, depending on whether the liquid being measured is subcooled or saturated, respectively, the steam tables were consulted to give the specific volume of the liquid which, in turn, provided the ρ_s value.		
PdT-P139-007 PE-PC-004 } LEPdT-P139-007	m	±0.06	Using the system pressure, again the steam tables were consulted to get the ρ_v value. The differential pressure transducers for the pressurizer liquid level are calibrated to output the static fluid head in the pressurizer. Pressurizer liquid level is obtained, therefore, from the following relationship. $\Delta P = \rho_\ell gL + \rho_v g (H - L)/1000$ where ΔP = measured differential pressure (kPa) g = gravitational acceleration of 9.8 m/s^2 ρ_ℓ = density of liquid in pressurizer ρ_v = density of vapor in pressurizer H = liquid height of the reference leg (m) L = liquid level to be calculated 1000 = conversion from Pa to kPa. The fluid densities in the pressurizer were obtained from the saturated steam tables using the pressure as the input parameter.	3C-6 4C-2 5C-5	Qualified data valid to 100 s (L5-1). Qualified to 50 s (L8-2).

TABLE 3-2. (continued)

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments[a]
DENSITY COMPENSATED LIQUID LEVEL Steam Generator LT-P004-008A, PE-SGS-001 } LTD-P004-008A	m	±0.08	The measured liquid level was generated using the steady state assumption that fluid densities are not changing in time. To convert the indicated level to the actual liquid level, a density compensation must be made. The ΔP measured by the transducer was calculated from the following pressure balance: $\Delta P = \rho_R gH - \rho_{ls} gl - \rho_{vs} g (H - l)$ where ΔP = differential pressure measured (Pa) ρ_R = liquid density in the reference leg (kg/m^3) g = gravitational acceleration of 9.8 m/s^2 H = liquid height of the reference leg (m) (leg is assumed to be full) ρ_{ls} = steady state liquid density (kg/m^3) ρ_{vs} = steady state vapor density (kg/m^3) l = indicated liquid level (m). The actual liquid level was calculated by rearranging the above equation and substituting in the ΔP and liquid and vapor densities: $L = (\Delta P + \rho_v gH - \rho_R gH)/(\rho_v g - \rho_l g)$ where ρ_l = actual liquid density (kg/m^3) ρ_v = actual vapor density (kg/m^3) L = actual liquid level (m).	3C-7 5C-6	Qualified, magnitude uncertain.

TABLE 3-2. (continued)

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments[a]
DENSITY COMPENSATED LIQUID LEVEL (continued)			Actual densities were obtained from saturated steam tables using a pressure or temperature measurement in the steam generator.		
FLUID SUBCOOLING			The subcooling is defined as $T_{sat} - T$. The saturation temperature was calculated from an average pressure reading from PE-1UP-1A and PE-1UP-1A1 using the following curve fits of steam table data:		
Upper Plenum					
TE-5UP-1 through TE-5UP-8, PE-1UP-1A, PE-1UP-1A1 } SC-5UP-102	K	±6	1. For P < 1.4 MPa, $T_{sat} = 348.225 + 290.13P - 399.543P^2 + 298.730P^3 - 84.196P^4$ 2. For 1.4 MPa $\le$ P $\le$ 12 MPa, $T_{sat} = 419.024 + 42.6705P - 5.63957P^2 + 0.433108P^3 - 0.0130329P^4$ 3. For P > 12 MPa, $T_{sat} = 508.252 + 8.84806P - 0.114572P^2$. The measured temperature is an average of TE-5UP-1 through TE-5UP-8.	3C-8 3C-16 4C-3 5C-7 5C-14	Qualified.
MASS FLOW RATE			The subcooled, break mass flow rate was calculated using nozzle inlet stagnation conditions, the modified Burnell critical flow model, and an empirical subcooling correction factor derived from scaled critical flow testing. The subcooling correction factor may be stated as:		
Broken Loop Cold Leg					
PE-BL-009, TE-BL-002B } FR-BL-CAL	kg/s	±10.0	Subcooling > 30 K = 1.0 Subcooling < 30 K = 1.523 - 0.032 * SC + 0.000497 * SC^2 where SC = subcooling in degrees kelvin. Subcooled breakflow ended at 11 s.	3C-4 5C-3	Qualified to 10.5 s.

TABLE 3-2. (continued)

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments[a]
MASS FLOW RATE (continued)			The mass flow rate was calculated by combining the momentum flux profile with the density profile and integrating over the cross sectional area of the pipe, according to the following equation:		
Broken Loop Cold Leg (continued)					
DE-BL-001A DE-BL-001B DE-BL-001C ME-BL-001A ME-BL-001B ME-BL-001C } FR-BL-BRK	kg/s	±16	Mass flow = $\int_0^A [\rho \times \rho V^2]^{1/2} \, dA$ where ρ = local fluid density (kg/m^3) ρV^2 = local momentum flux ($kg/m \times s^2$) A = cross-sectional area of pipe. The density profile was obtained from the three chordal average densities by the method described for average densities (except DE-BL-105). The momentum flux profile was estimated from the three-point momentum flux measurements using a Prandtl 2/7 power low profile which was distorted to fit the local flux readings.	3C-4 4C-1 4C-5 5C-3	Qualified.
Intact Loop Cold Leg					
DE-PC-105 FE-PC-001 } FR-PC-101	kg/s	±35.0	FR-PC-101 was calculated using densitometer and turbine meter data along with the continuity equation: Flow rate (kg/s) = [average density (Mg/m^3)] * [fluid velocity (m/s)] * [flow area (m^2)] * [1000 (kg/Mg)].	3C-5 5C-4	Qualified.

TABLE 3-2. (continued)

Variable, Location, and Detector		Units	Uncertainty	Calculation Method	Figure	Comments[a]
SATURATION TEMPERATURE						
Broken Loop Cold Leg						
PE-BL-001	ST-BL-101	K	±1.39	The indicated pressure is used to perform a steam table saturation temperature interpolation.	3C-9 5C-8	Qualified.
Upper Plenum						
PE-1UP-001A	ST-1UP-111	K	±1.39		-10 5C-9	Qualified.

a. The comments are the same for Experiments L5-1 and L8-2 unless the experiment is specified.

b. Reference 4.

c. The uncertainty in each conductivity probe for (a) LE-1ST-1 is 4.5% of range, (b) LE-1ST-2 is ±7.1% of range, and (c) LE-3UP-1 is 2.9% of range. All conductivity probes have a response time of 340 ms.

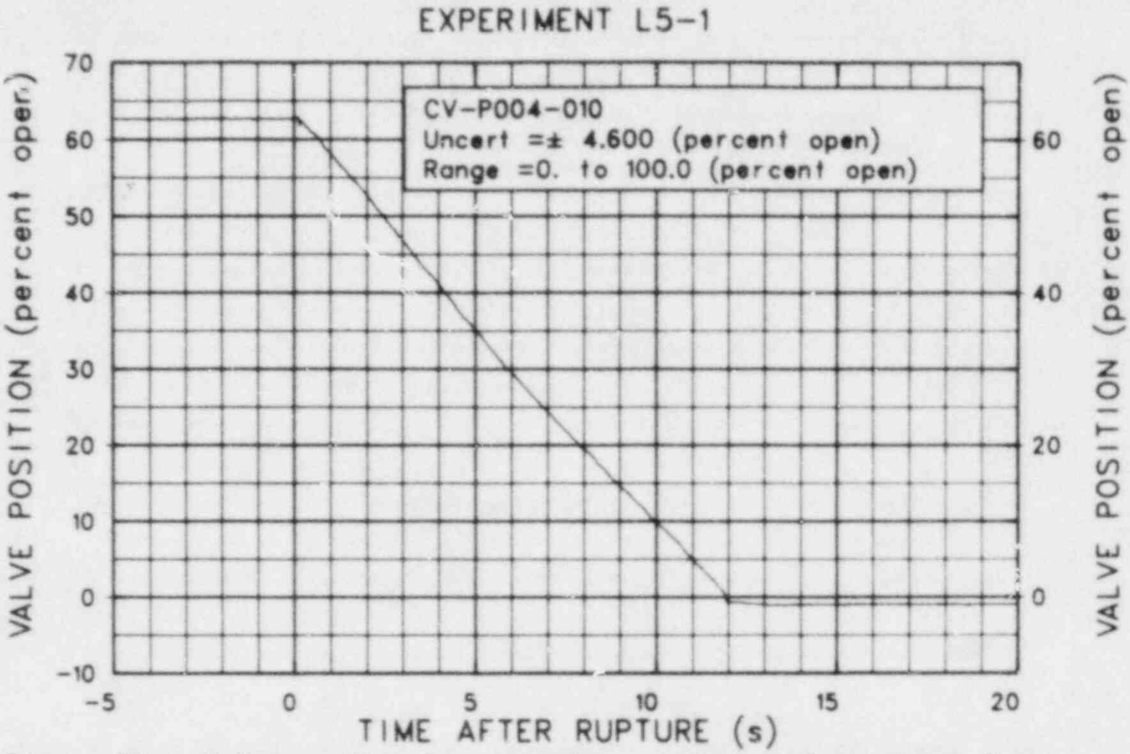


Figure 3S-1. Valve position for secondary coolant system steam flow control valve (CV-P004-010).

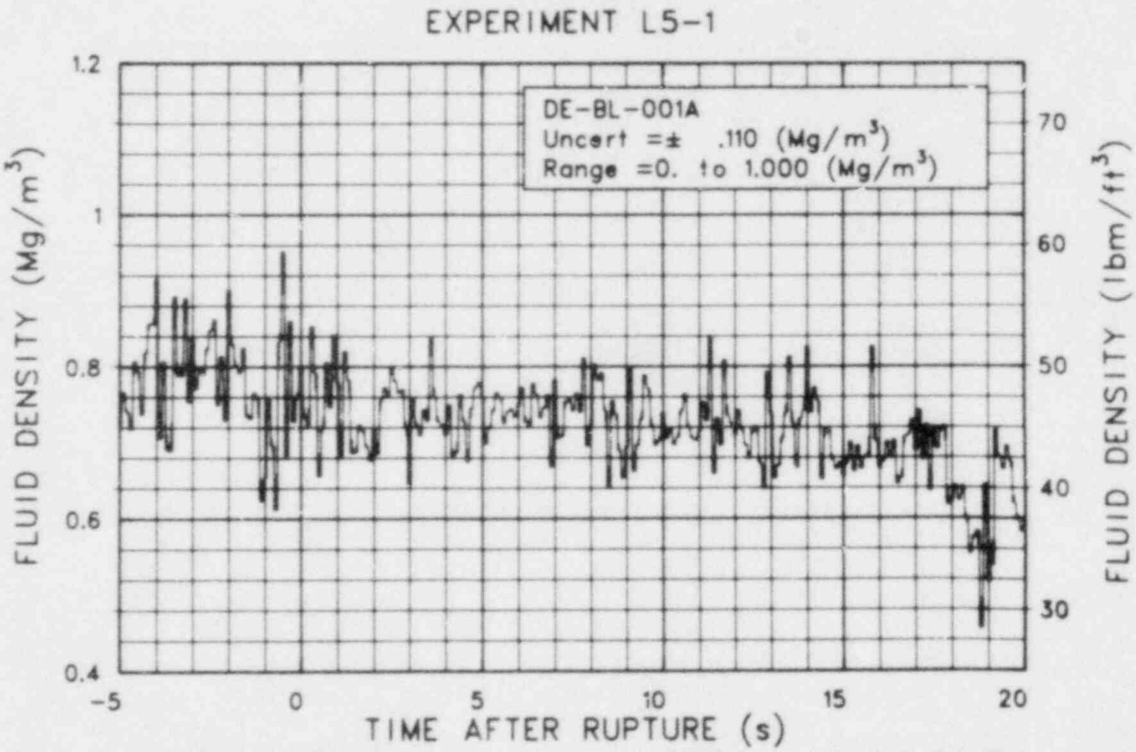


Figure 3S-2. Fluid density in broken loop cold leg, chordal density (DE-BL-001A).

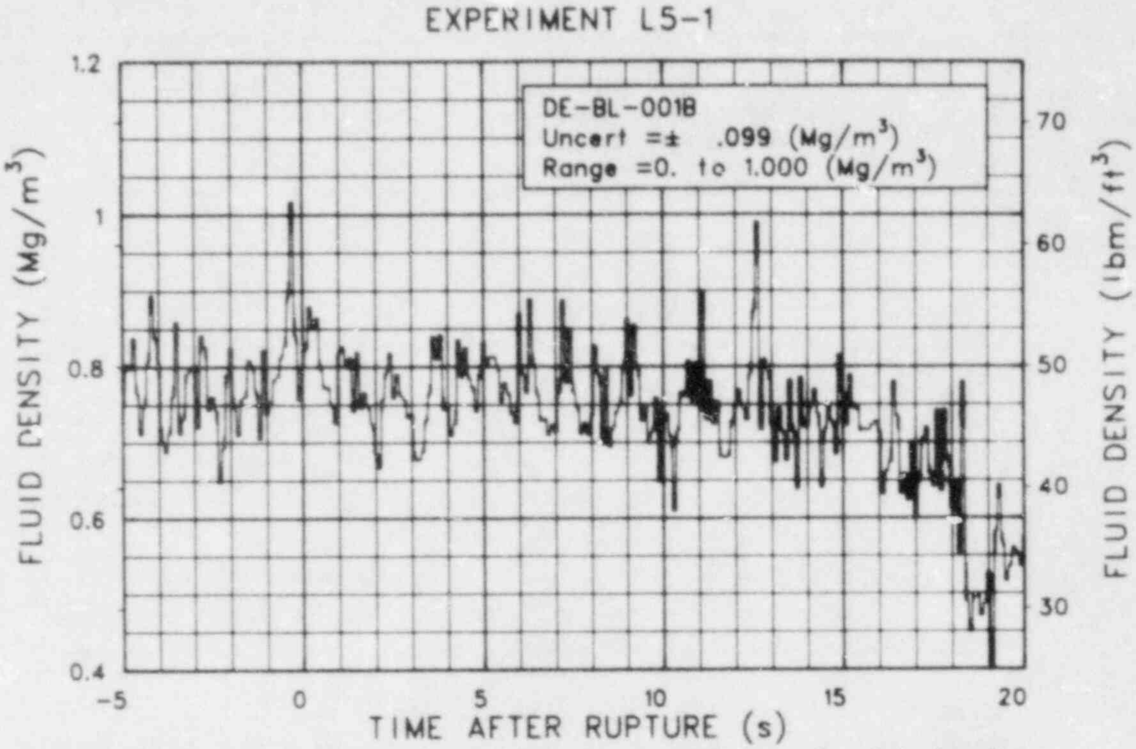


Figure 3S-3. Fluid density in broken loop cold leg, chordal density (DE-BL-001B).

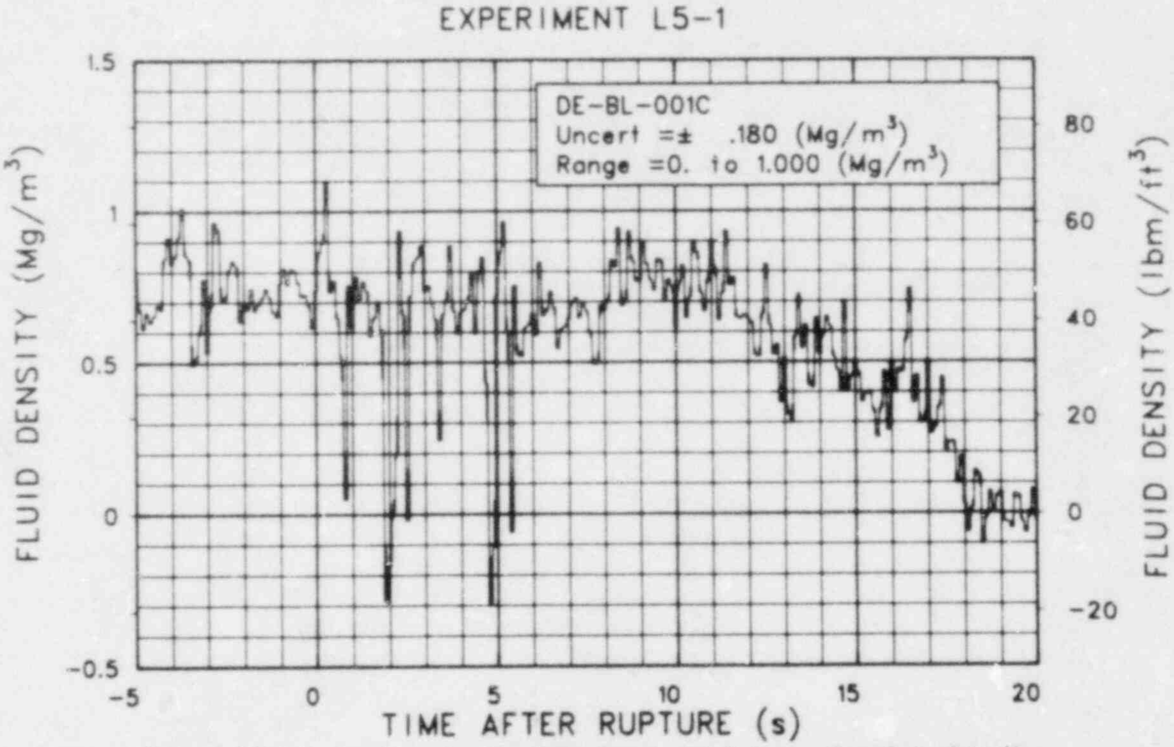


Figure 3S-4. Fluid density in broken loop cold leg, chordal density (DE-BL-001C) (qualified, some large data processing spikes).

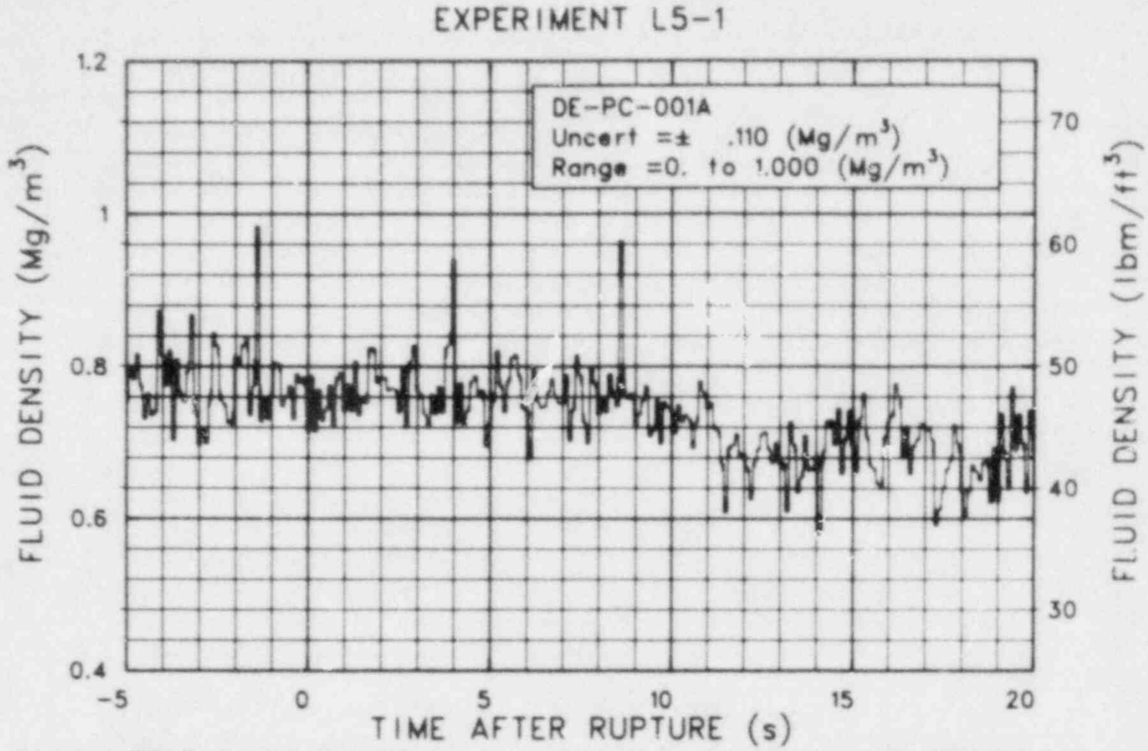


Figure 3S-5. Fluid density in intact loop cold leg, chordal density (DE-PC-001A).

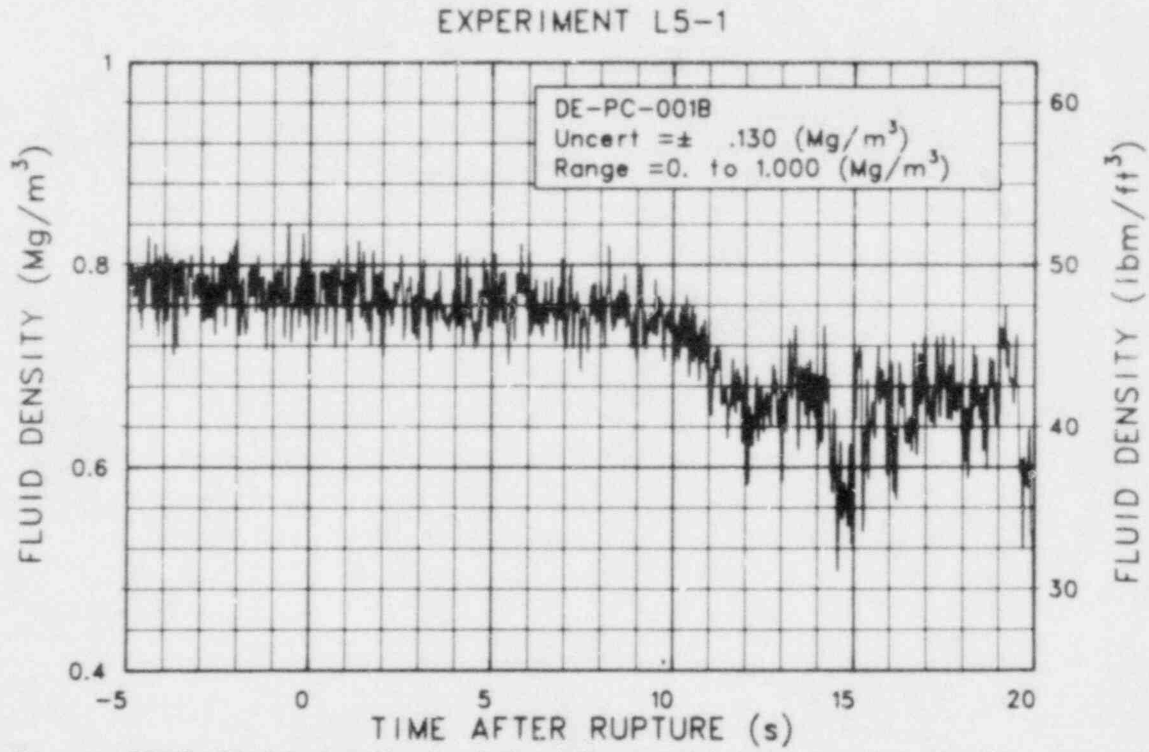


Figure 3S-6. Fluid density in intact loop cold leg, chordal density (DE-PC-001B).

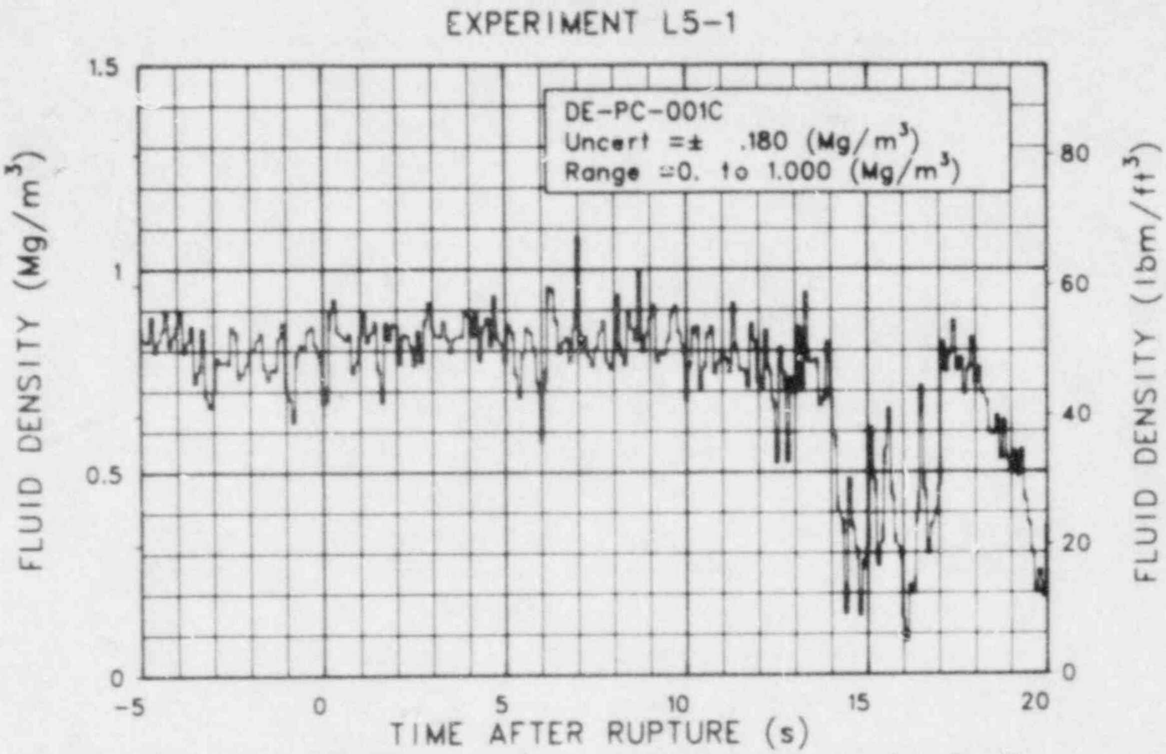


Figure 3S-7. Fluid density in intact loop cold leg, chordal density (DE-PC-001C).

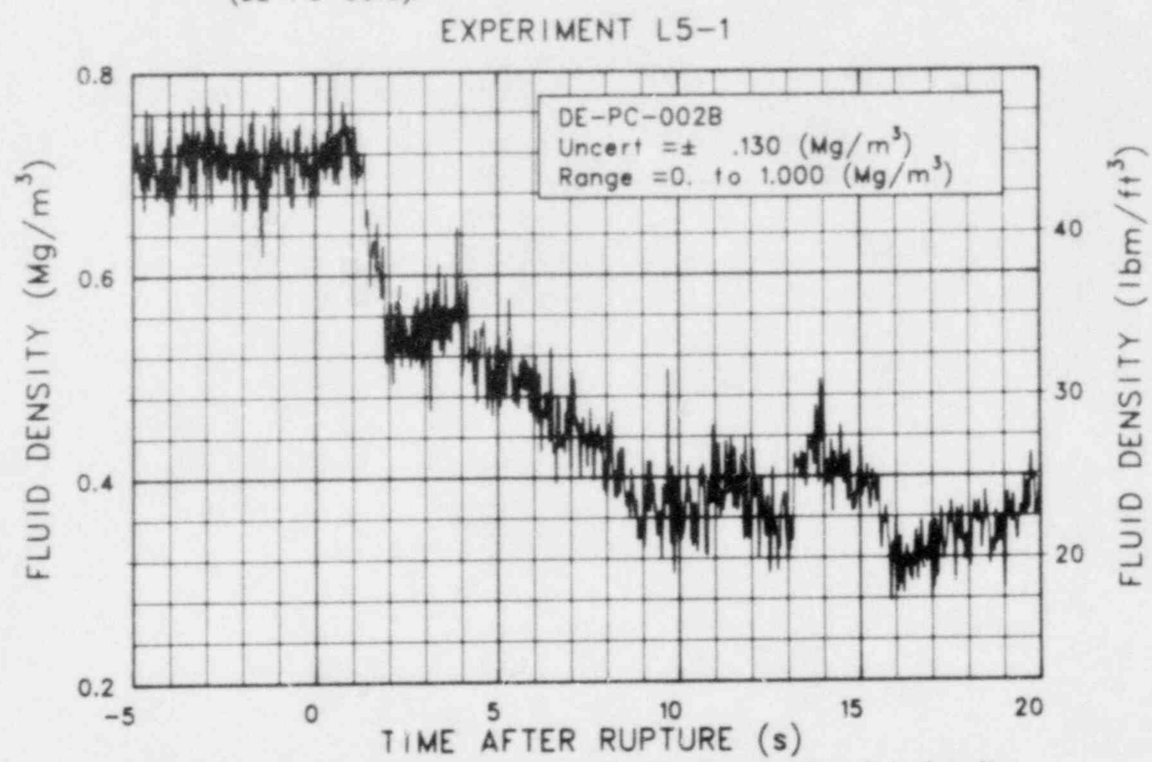


Figure 3S-8. Fluid density in intact loop hot leg, chordal density (DE-PC-002B).

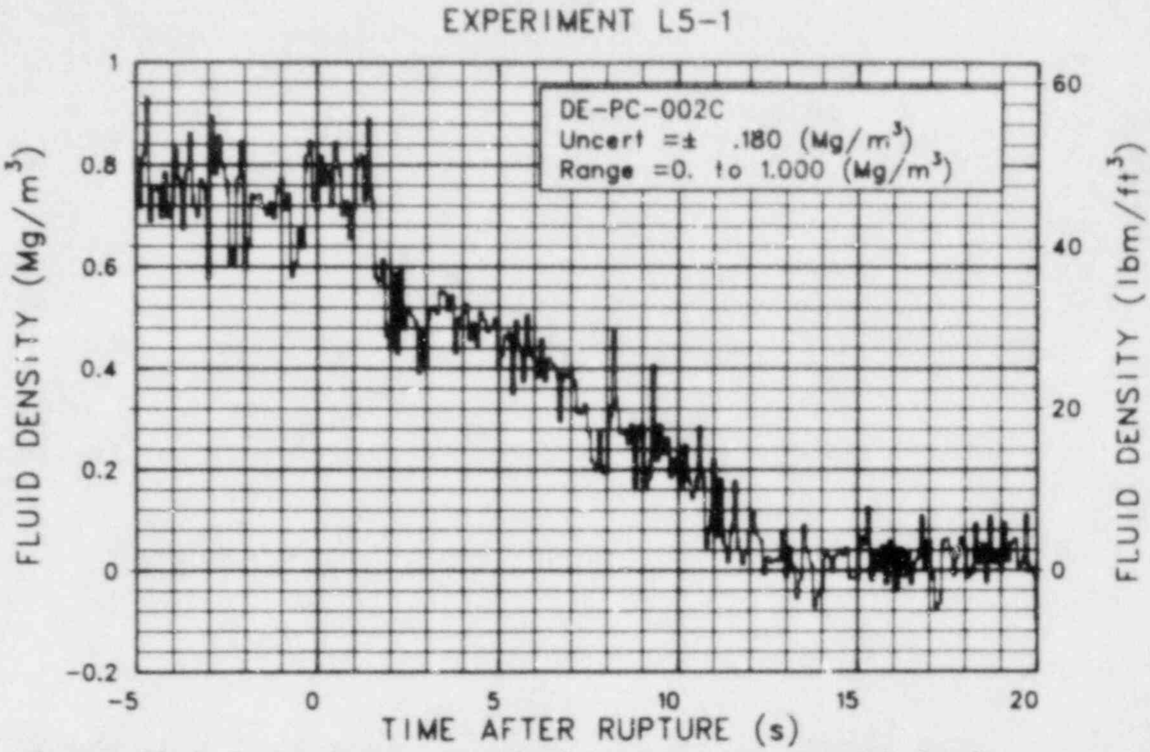


Figure 3S-9. Fluid density in intact loop hot leg, chordal density (DE-PC-002C).

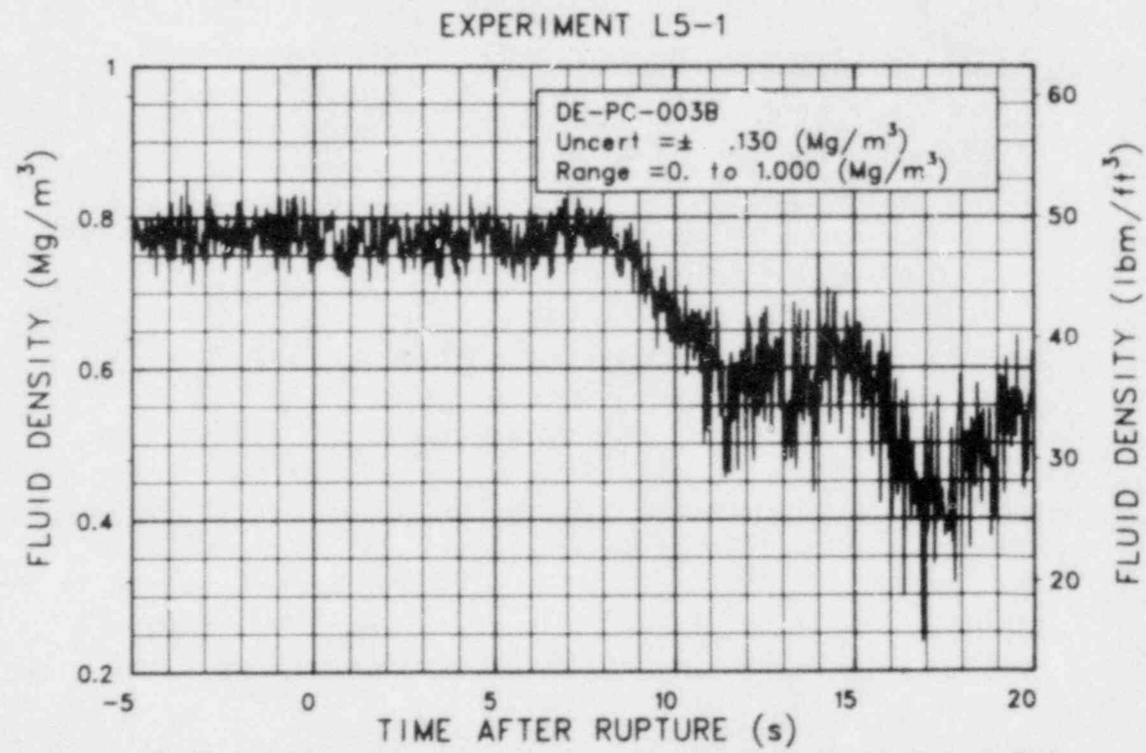


Figure 3S-10. Fluid density in intact loop at steam generator outlet, chordal density (DE-PC-003B).

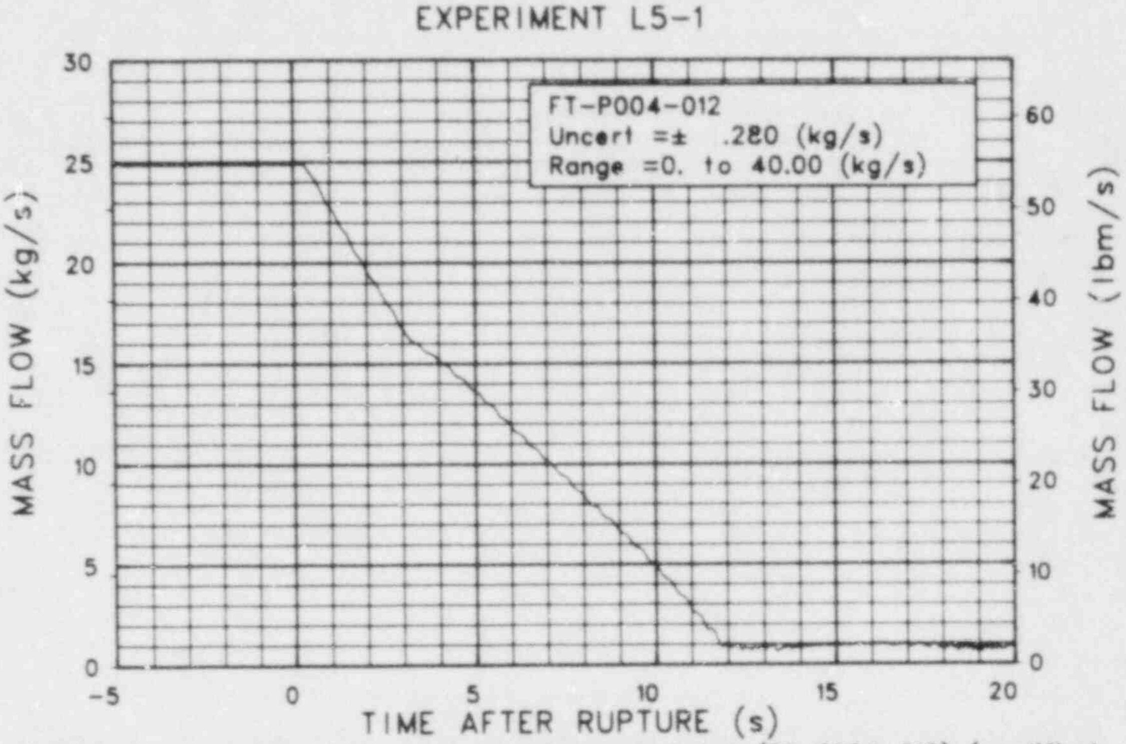


Figure 3S-11. Steam flow rate at condenser inlet (FT-P004-012) (qualified, initial conditions only).

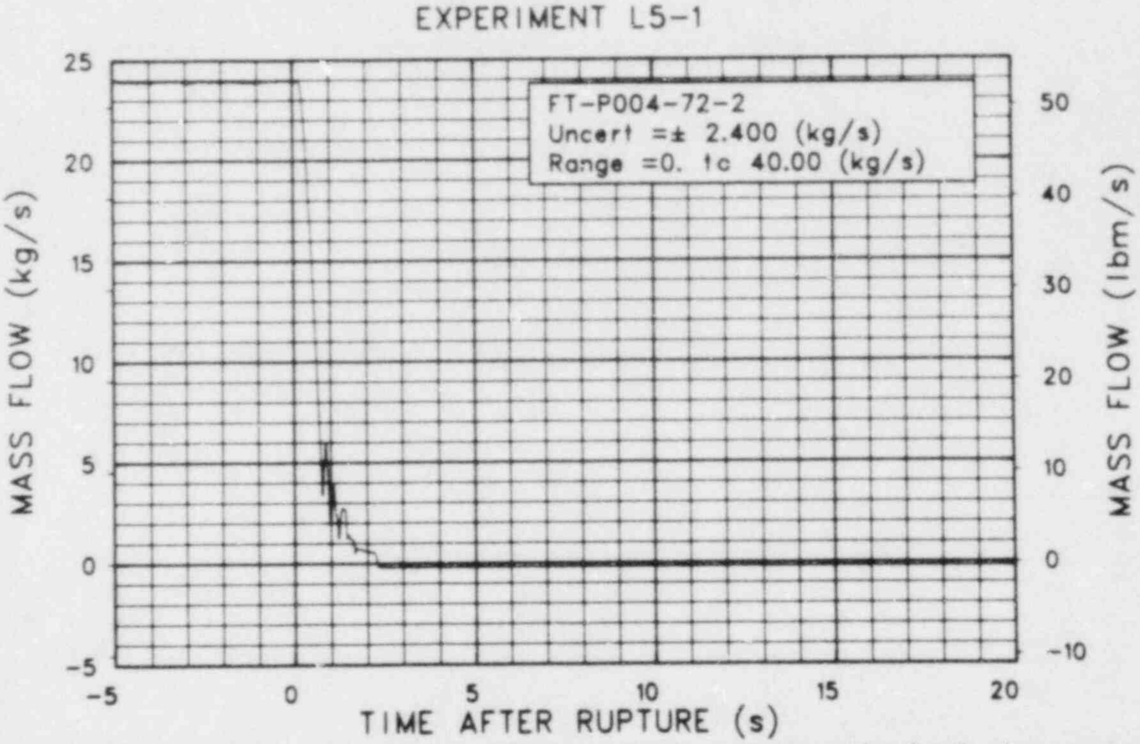


Figure 3S-12. Flow rate in secondary coolant system main feedwater pump (FT-P004-72-2).

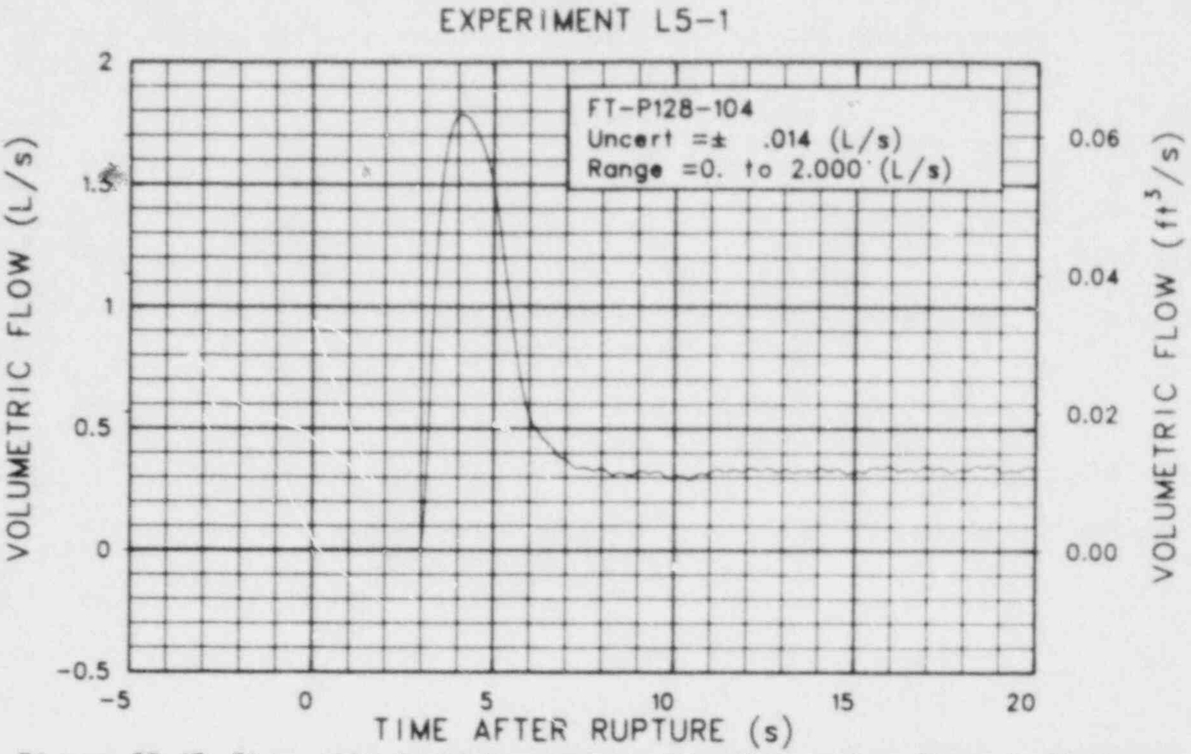


Figure 3S-13. Flow rate in high-pressure injection system Pump A discharge (FT-P128-104).

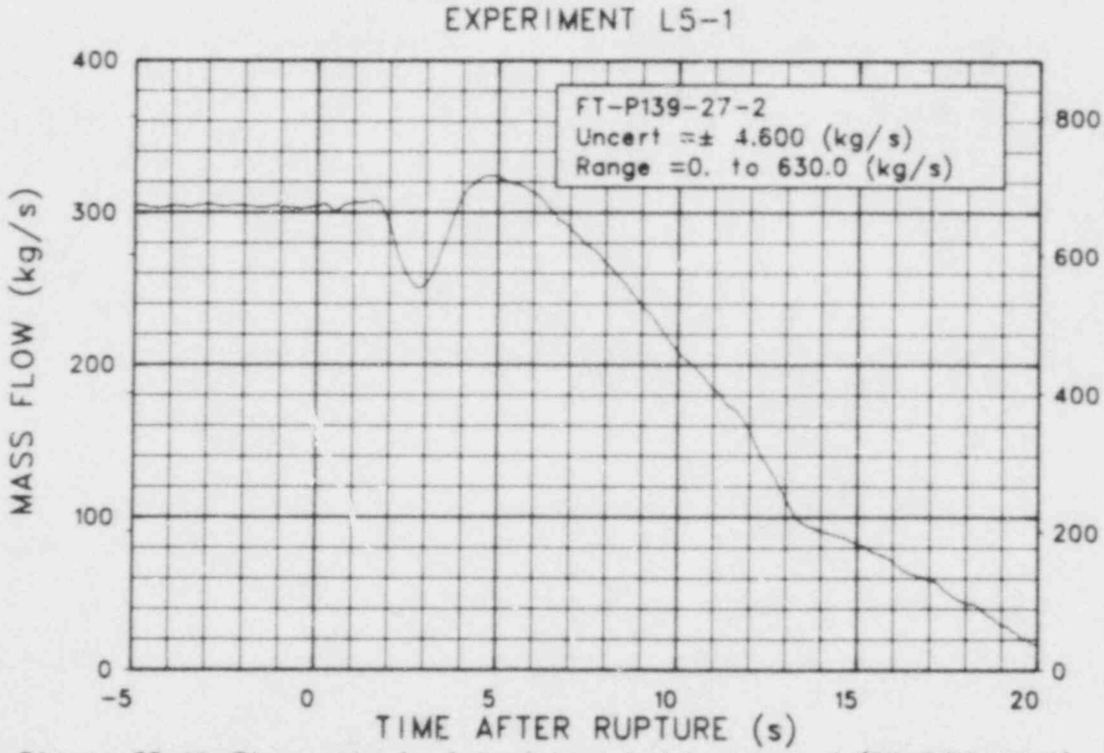


Figure 3S-14. Flow rate in intact loop hot leg venturi (FT-P139-27-2) (qualified, initial conditions only).

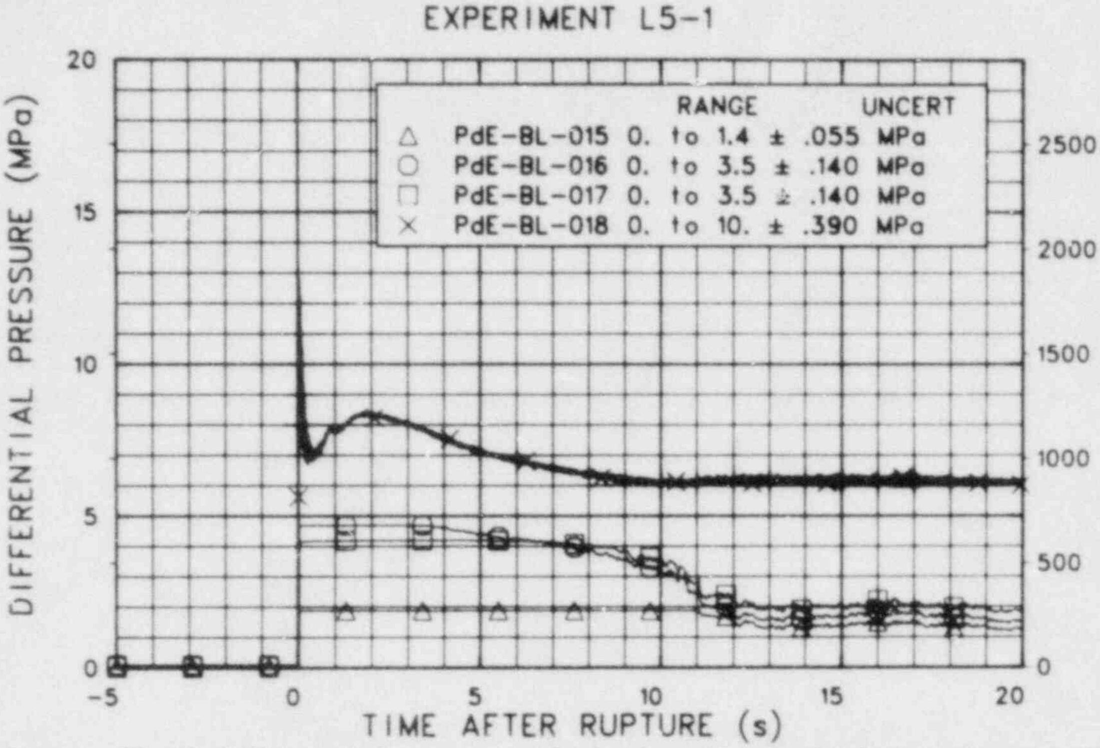


Figure 3S-15. Differential pressure in broken loop cold leg upstream of nozzle throat, midplane, and exit, and across nozzle spoolpiece (PdE-BL-015, -016, -017, and -018).

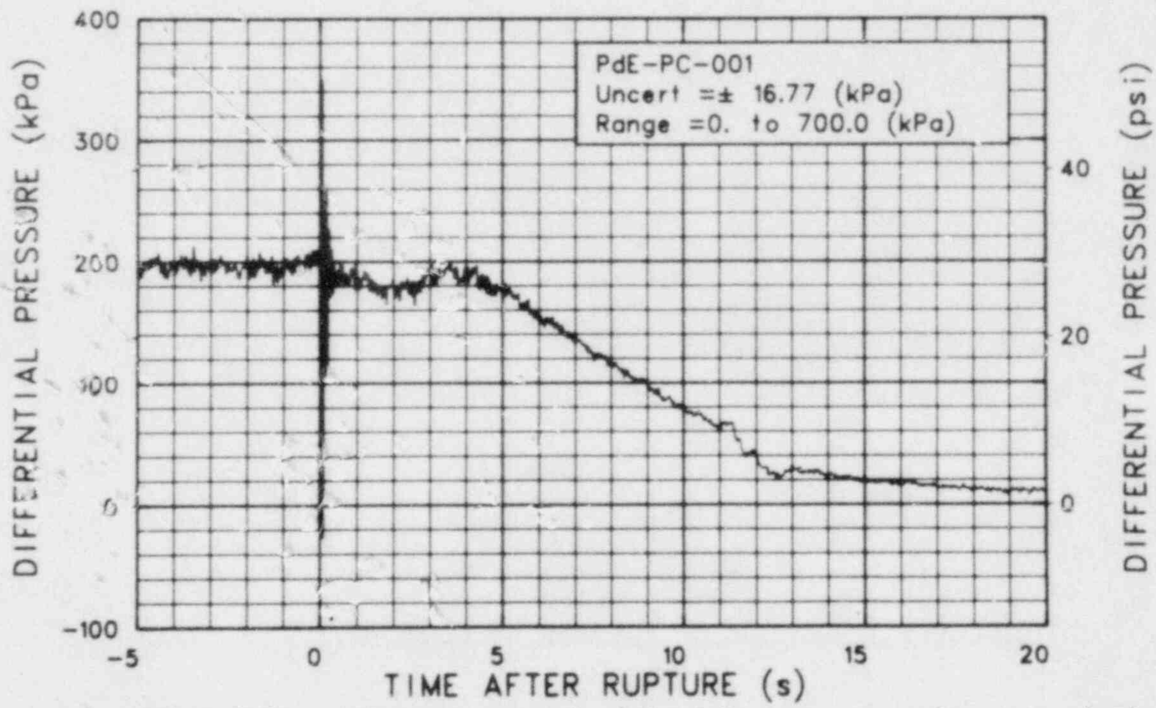


Figure 3S-16. Differential pressure in intact loop across primary coolant Pumps 1 and 2 (PdE-PC-001).

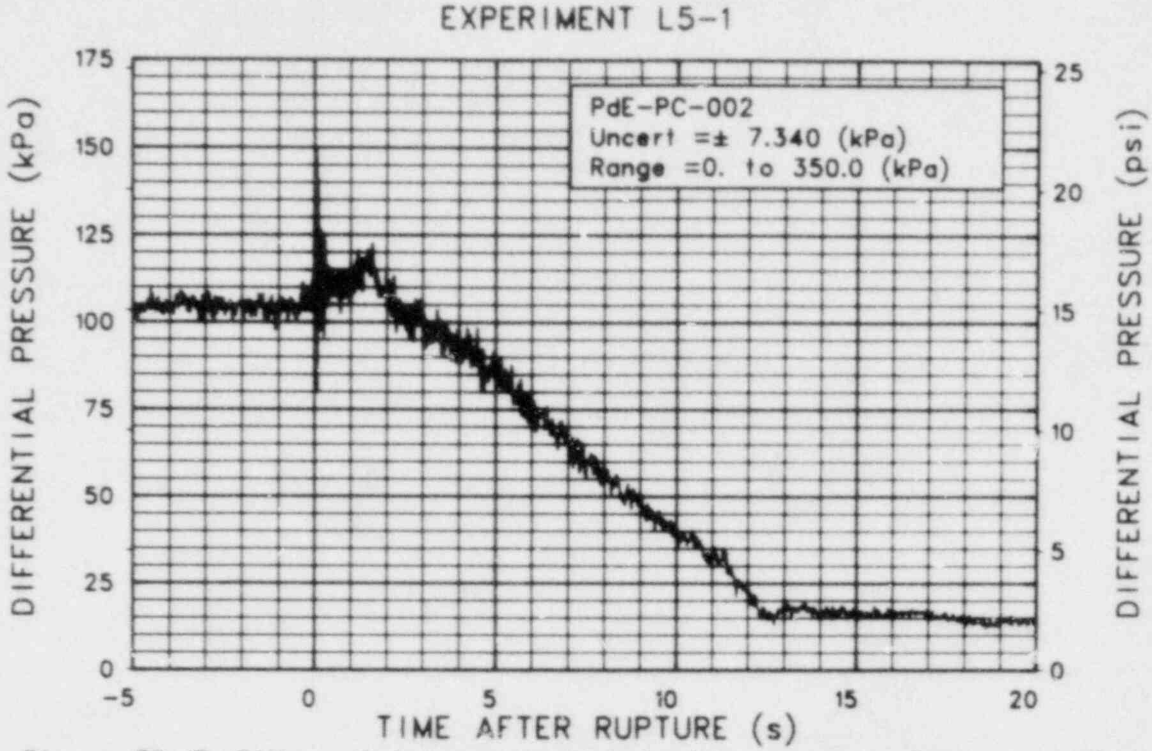


Figure 3S-17. Differential pressure in intact loop across steam generator (PdE-PC-002).

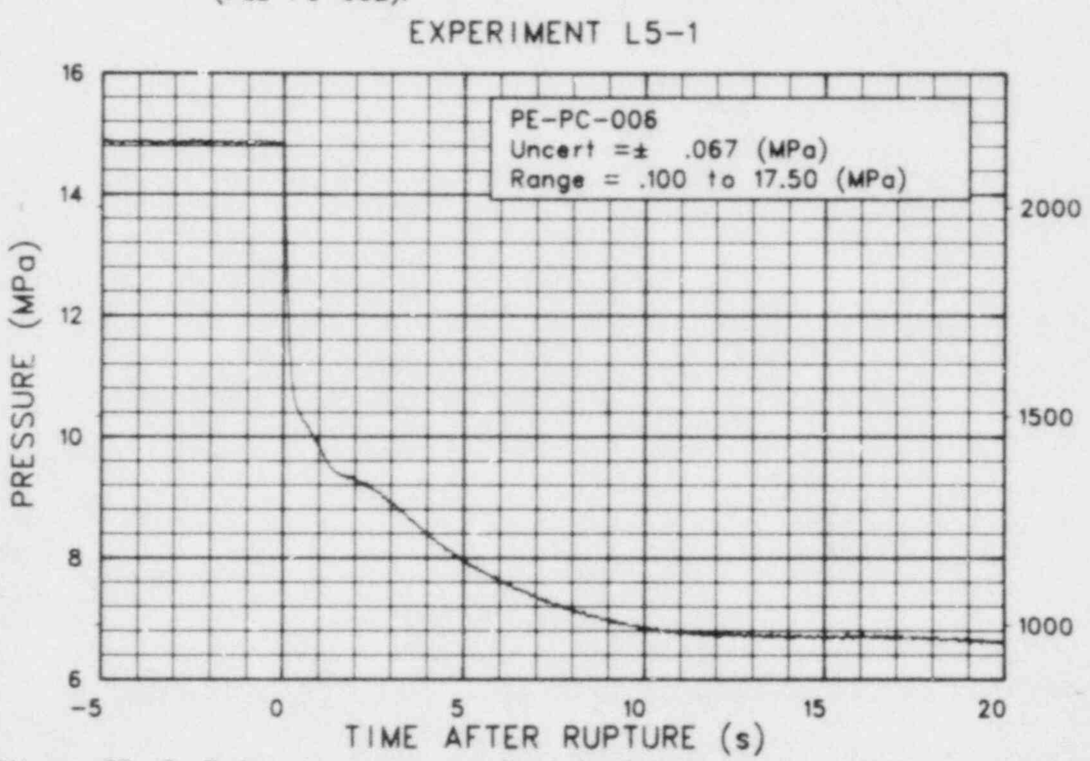


Figure 3S-18. Reference pressure in intact loop between steam generator outlet and pump inlet (PE-PC-006).

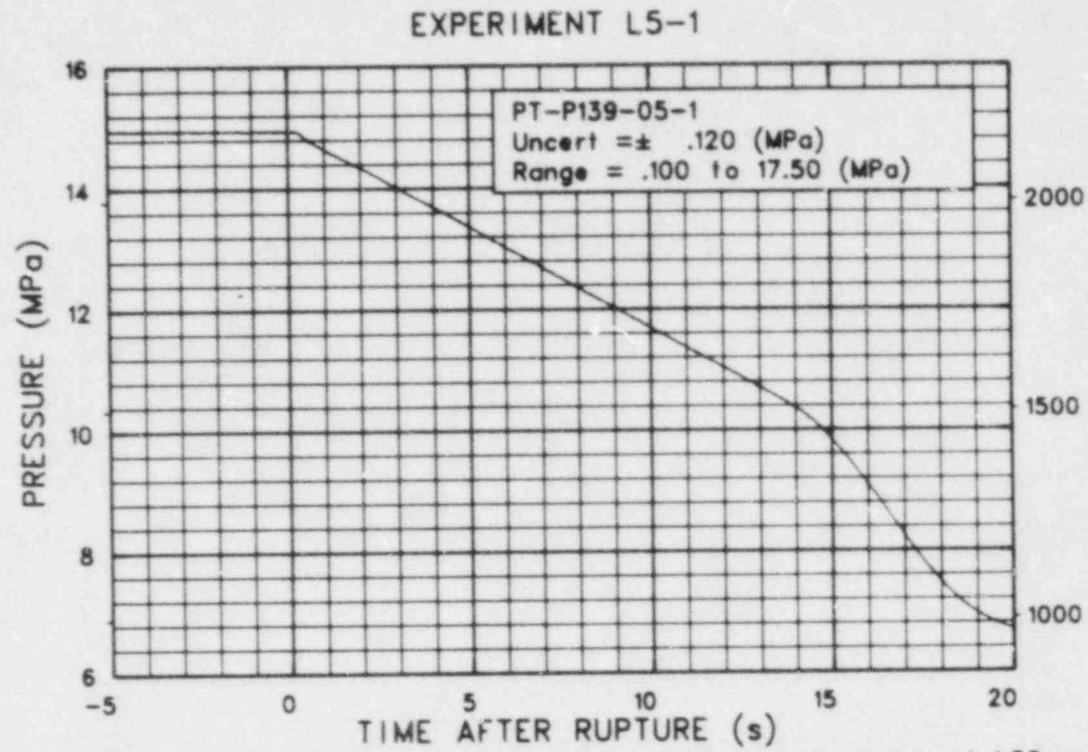


Figure 3S-19. Pressure in intact loop pressurizer vapor space at 1.88 m above bottom (PT-P139-05-1).

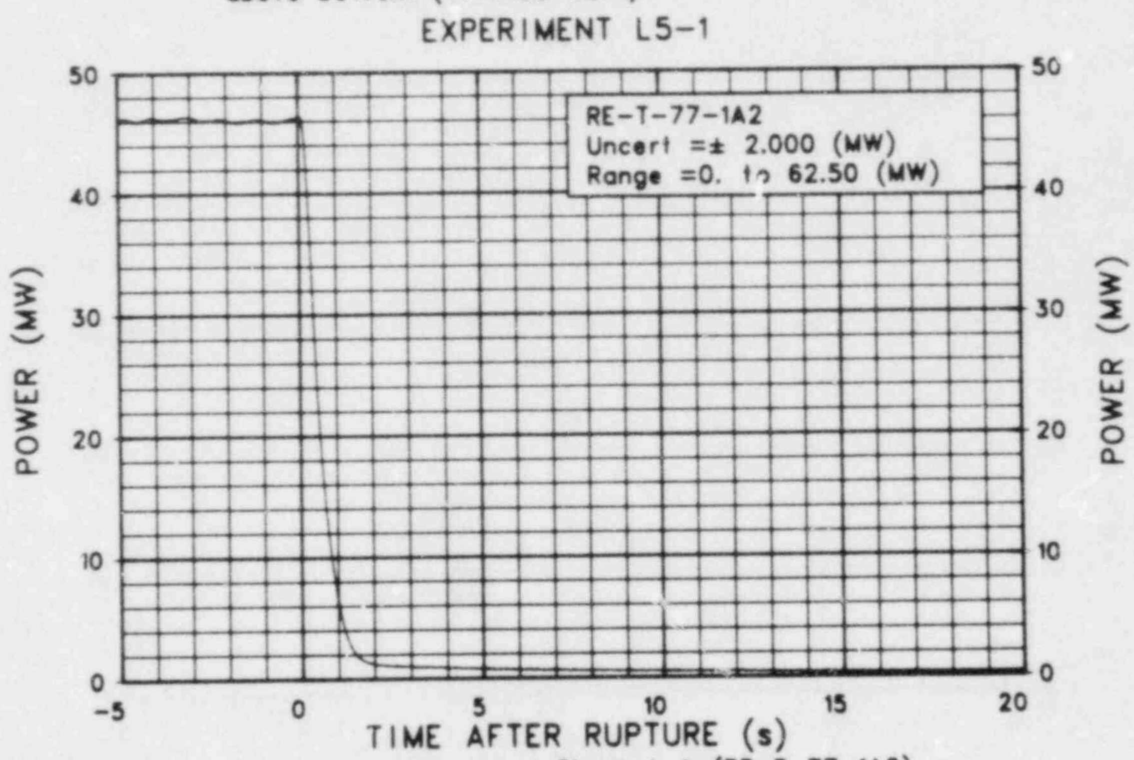


Figure 3S-20. Local average power, Channel A (RE-T-77-1A2).

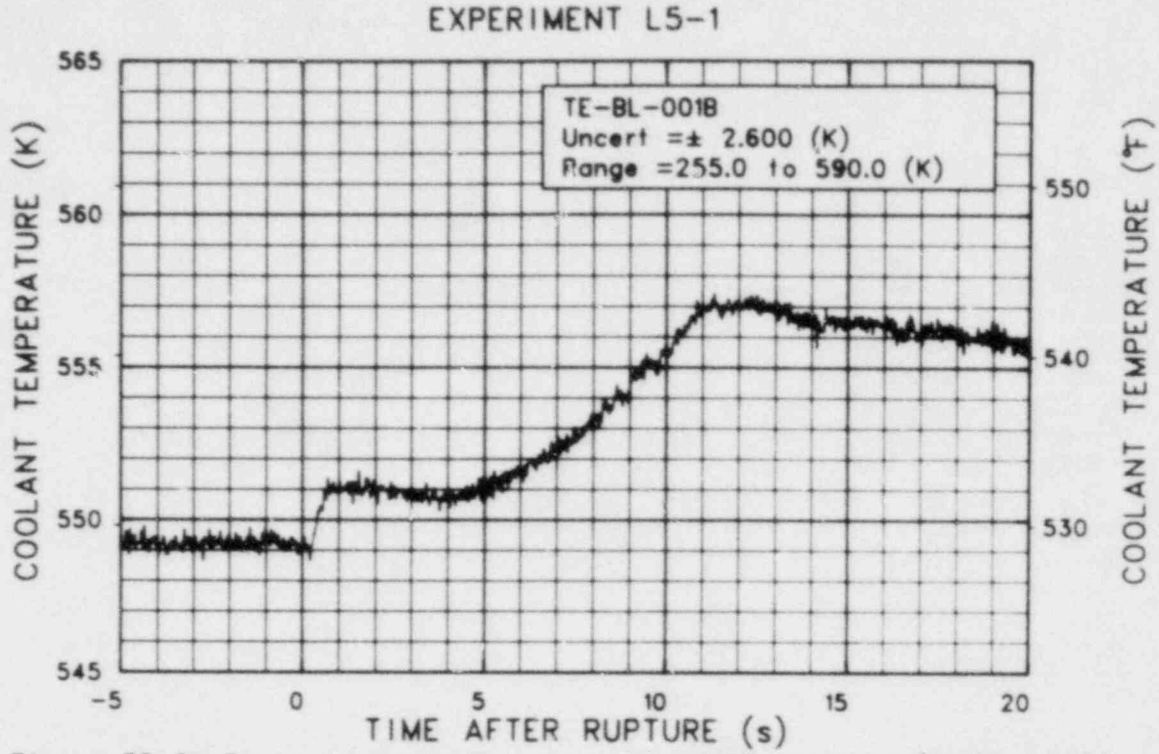


Figure 3S-21. Coolant temperature in broken loop cold leg (TE-BL-001B) (qualified, possible hot wall effects).

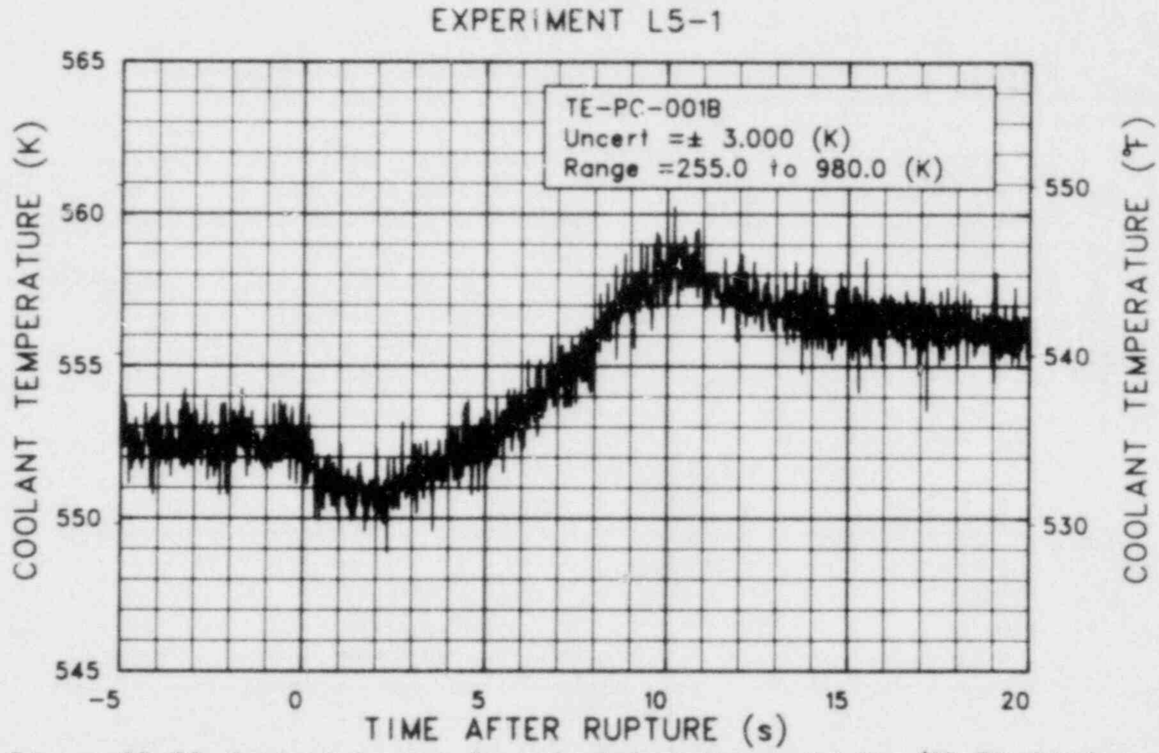


Figure 3S-22. Coolant temperature in intact loop cold leg (TE-PC-001B) (qualified, possible hot wall effects).

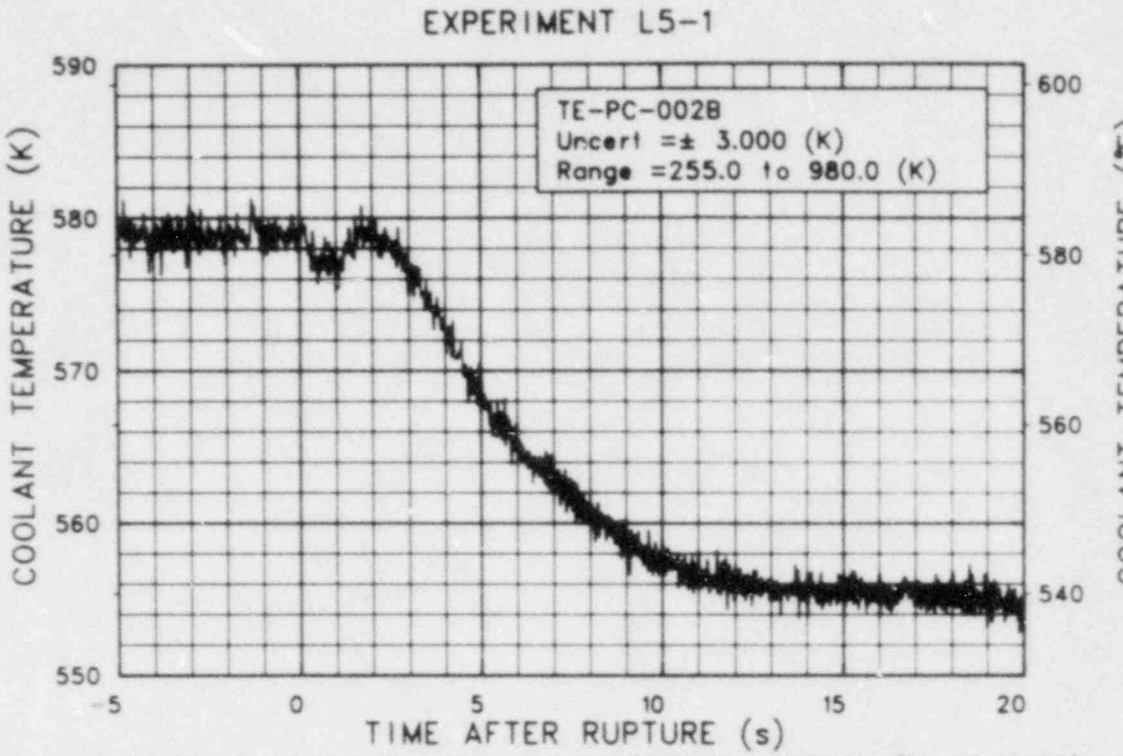


Figure 3S-23. Coolant temperature in intact loop hot leg (TE-PC-002B) (qualified, possible hot wall effects).

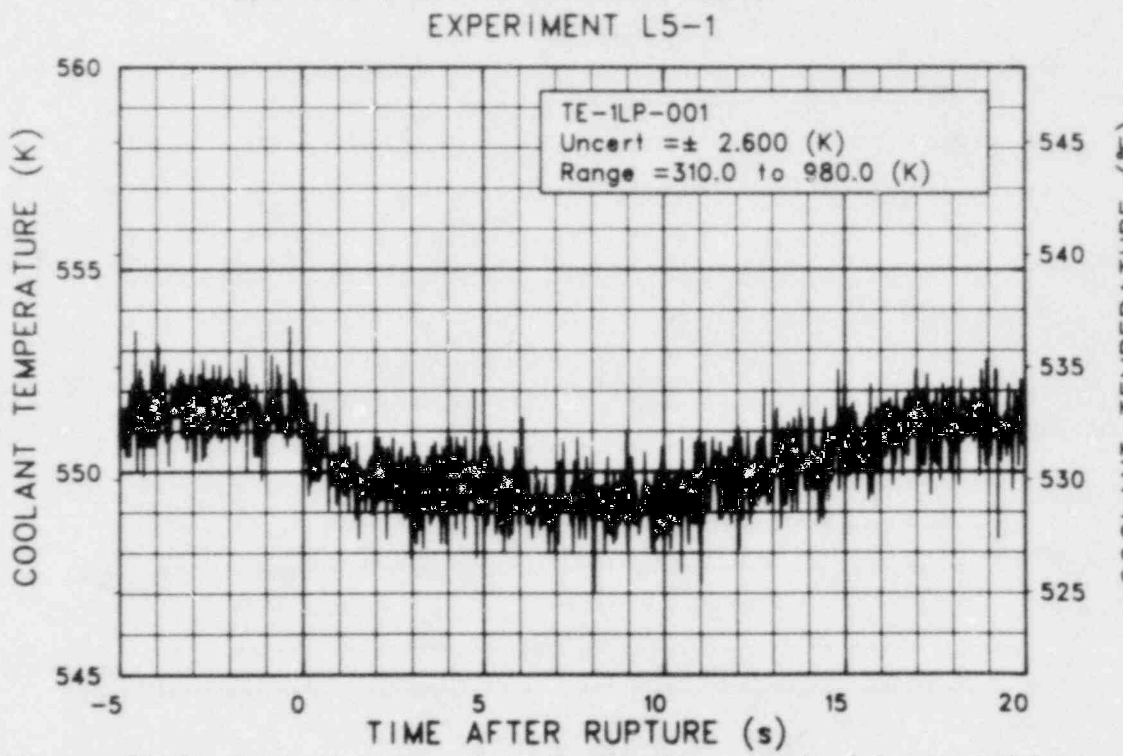


Figure 3S-24. Coolant temperature in reactor vessel at lower end box of Fuel Assembly 1 (TE-1LP-001).

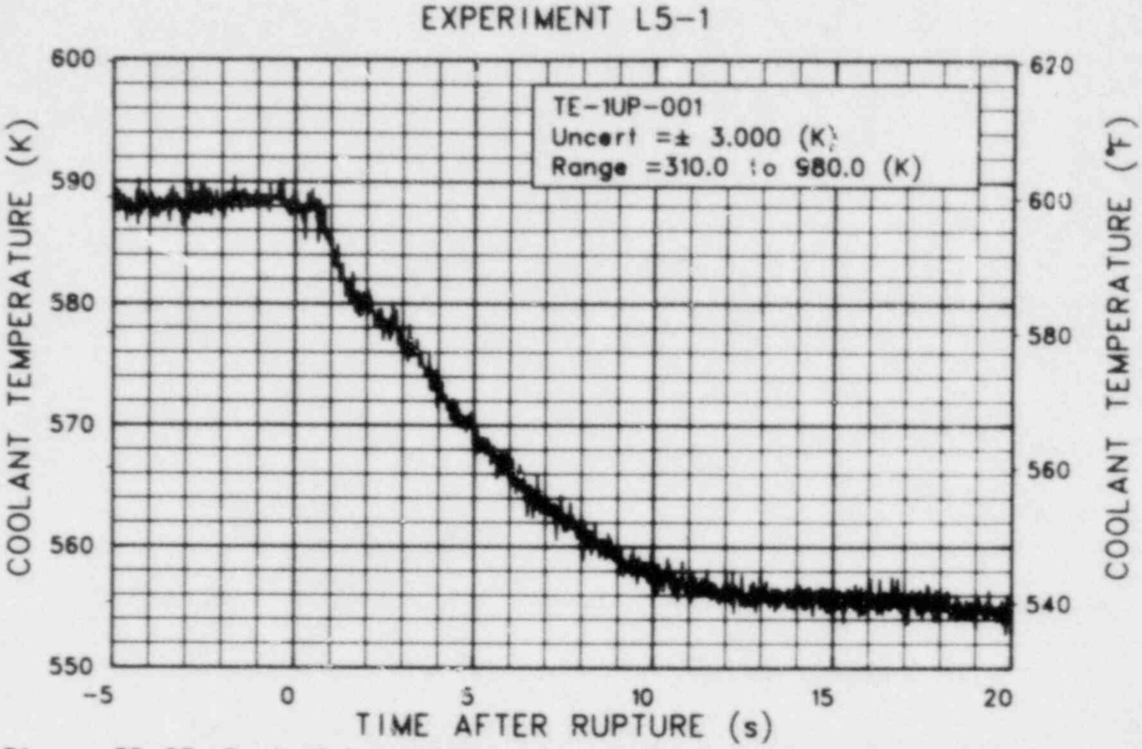


Figure 3S-25. Coolant temperature in reactor vessel at upper end box of Fuel Assembly 1 (TE-1UP-001).

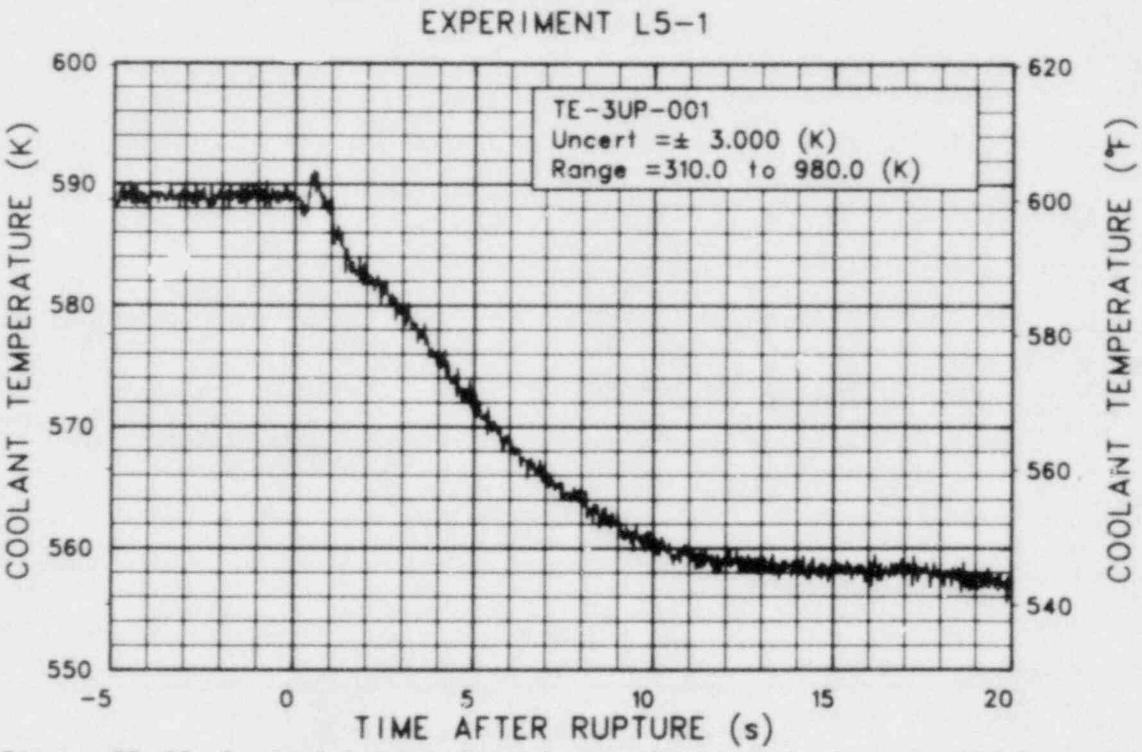


Figure 3S-26. Coolant temperature in reactor vessel at upper end box of Fuel Assembly 3 (TE-3UP-001).

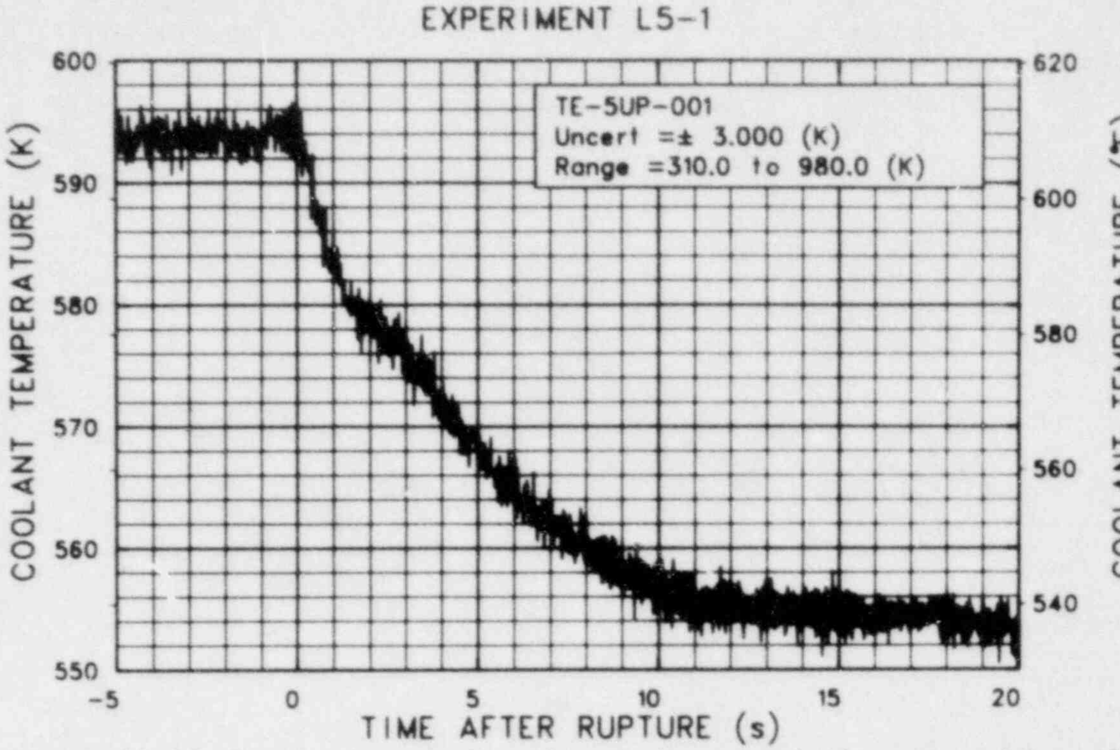


Figure 3S-27. Coolant temperature in reactor vessel at upper end box of Fuel Assembly 5 (TE-5UP-001).

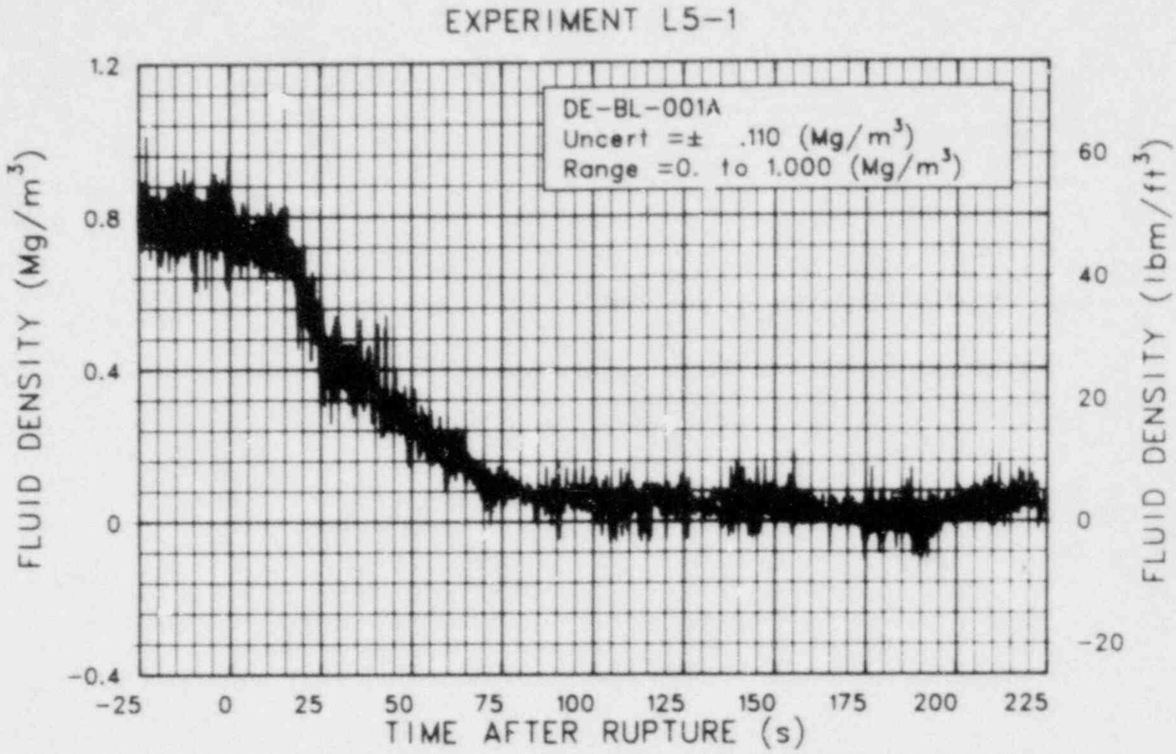


Figure 3L-1. Fluir density in broken loop cold leg, chordal density (DE-BL-001A).

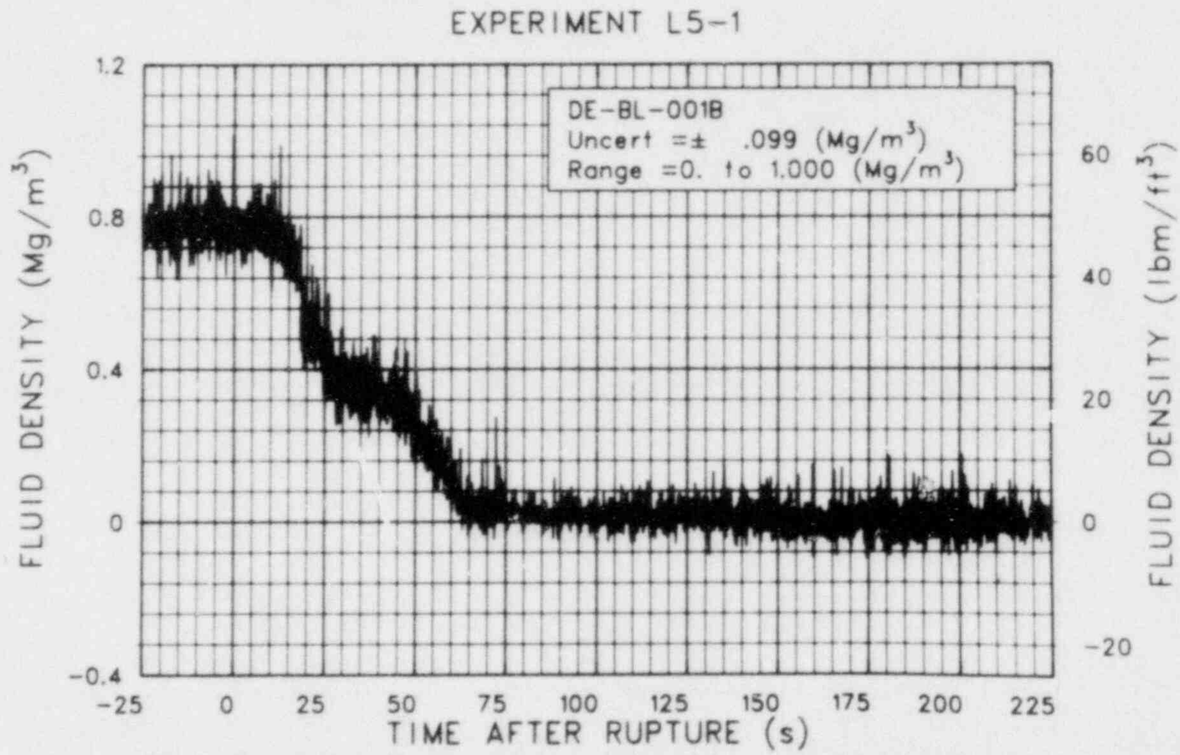


Figure 3L-2. Fluid density in broken loop cold leg, chordal density (DE-BL-001B).

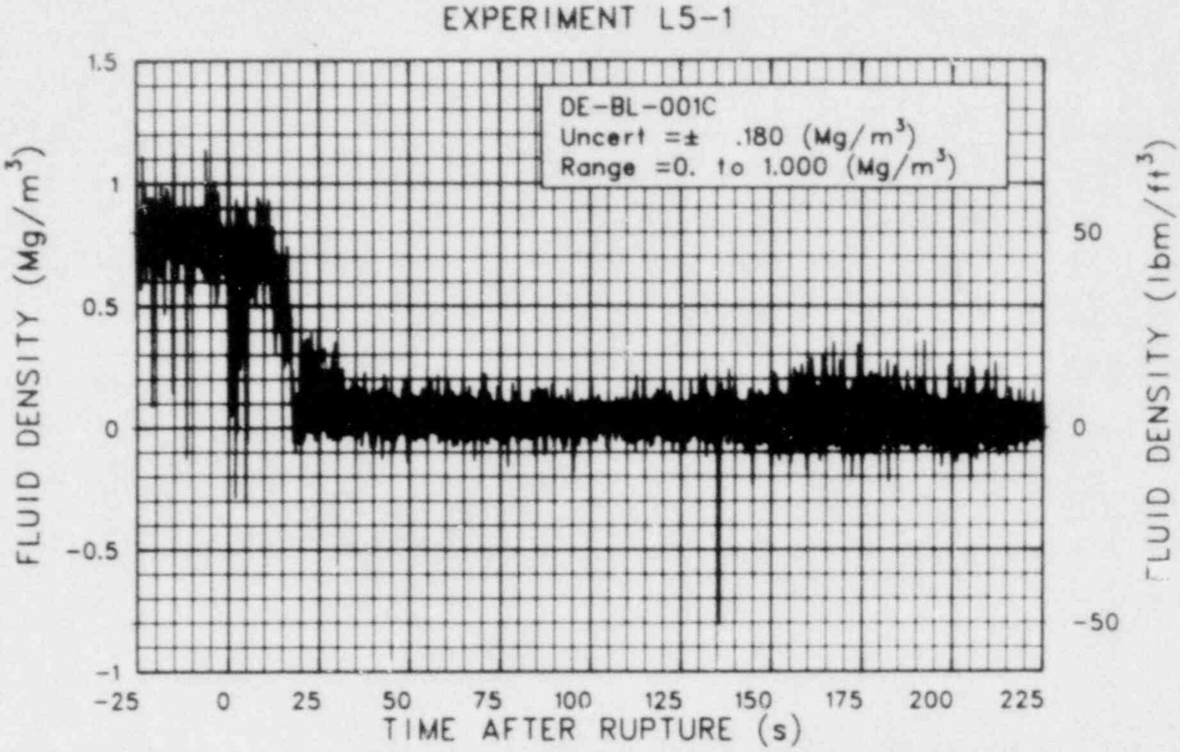


Figure 3L-3. Fluid density in broken loop cold leg, chordal density (DE-BL-001C) (qualified, some large data processing spikes).

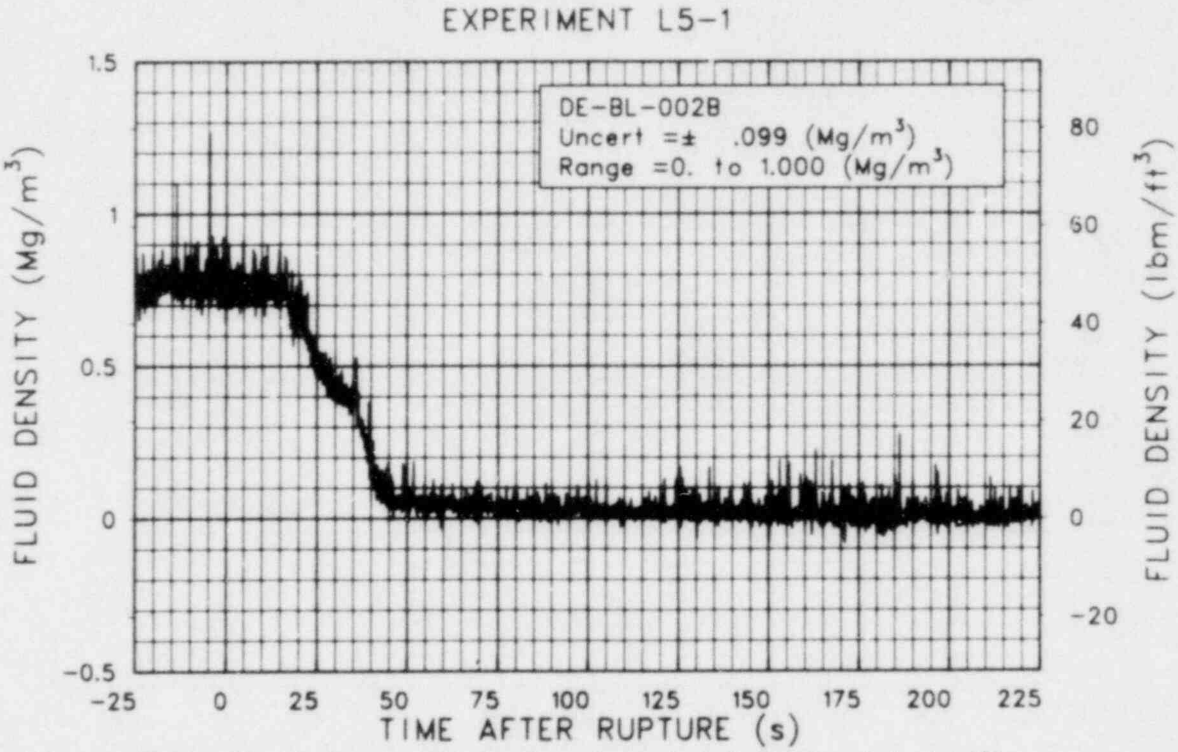


Figure 3L-4. Fluid density in broken loop hot leg, chordal density (DE-BL-002B).

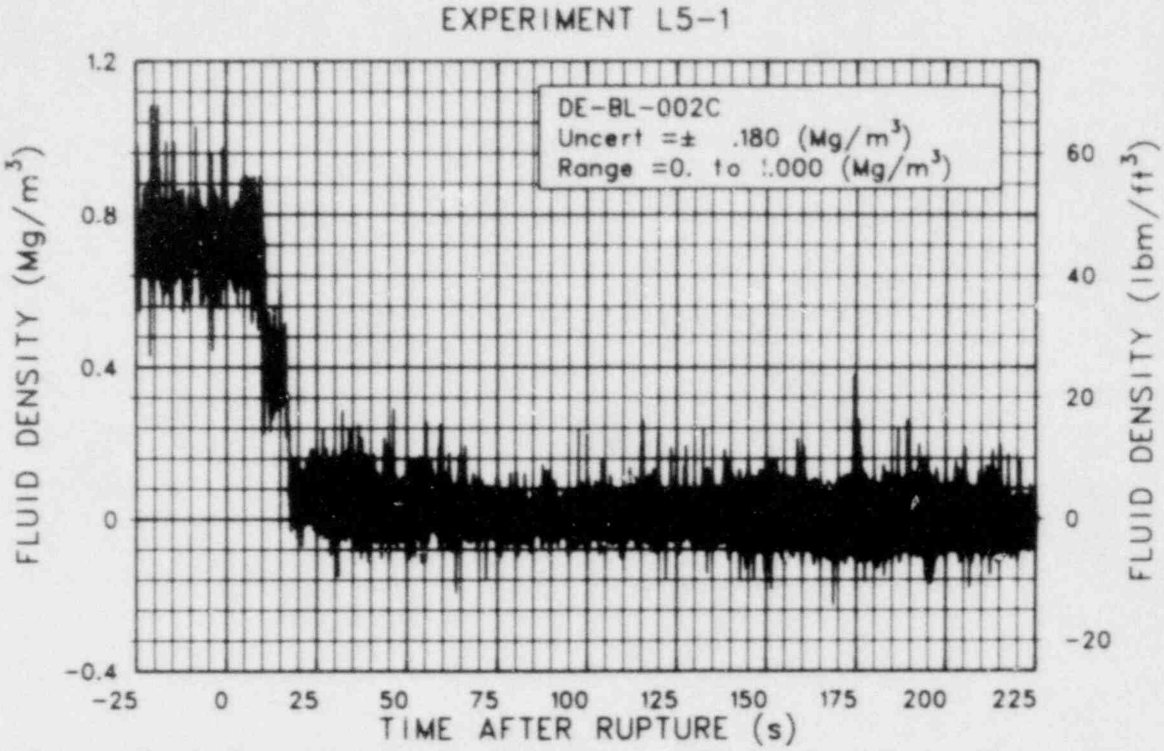


Figure 3L-5. Fluid density in broken loop hot leg, chordal density (DE-BL-002C).

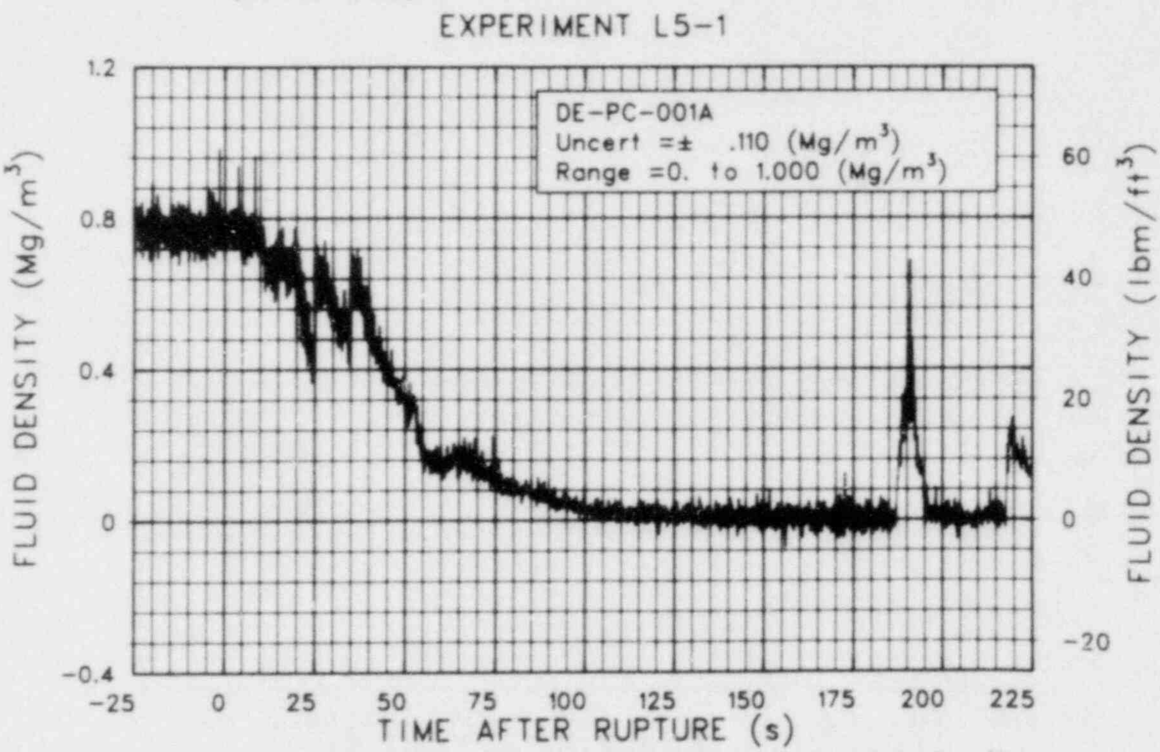


Figure 3L-6. Fluid density in intact loop cold leg, chordal density (DE-PC-001A).

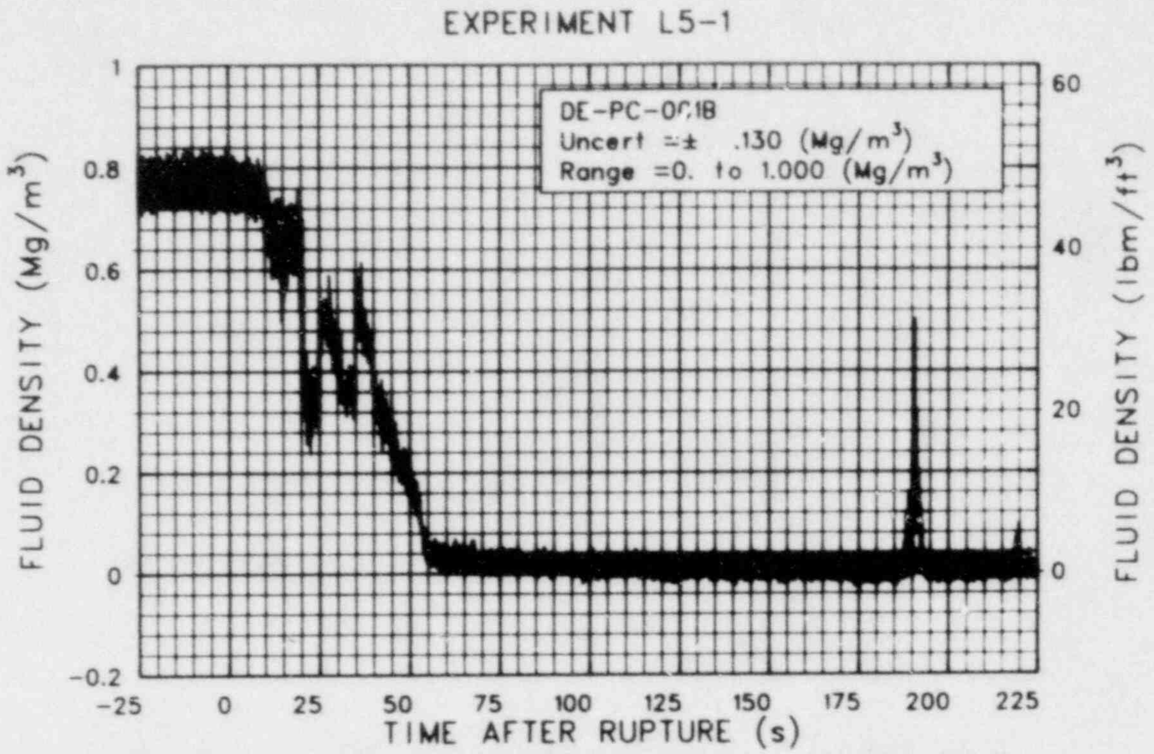


Figure 3L-7. Fluid density in intact loop cold leg, chordal density (DE-PC-001B).

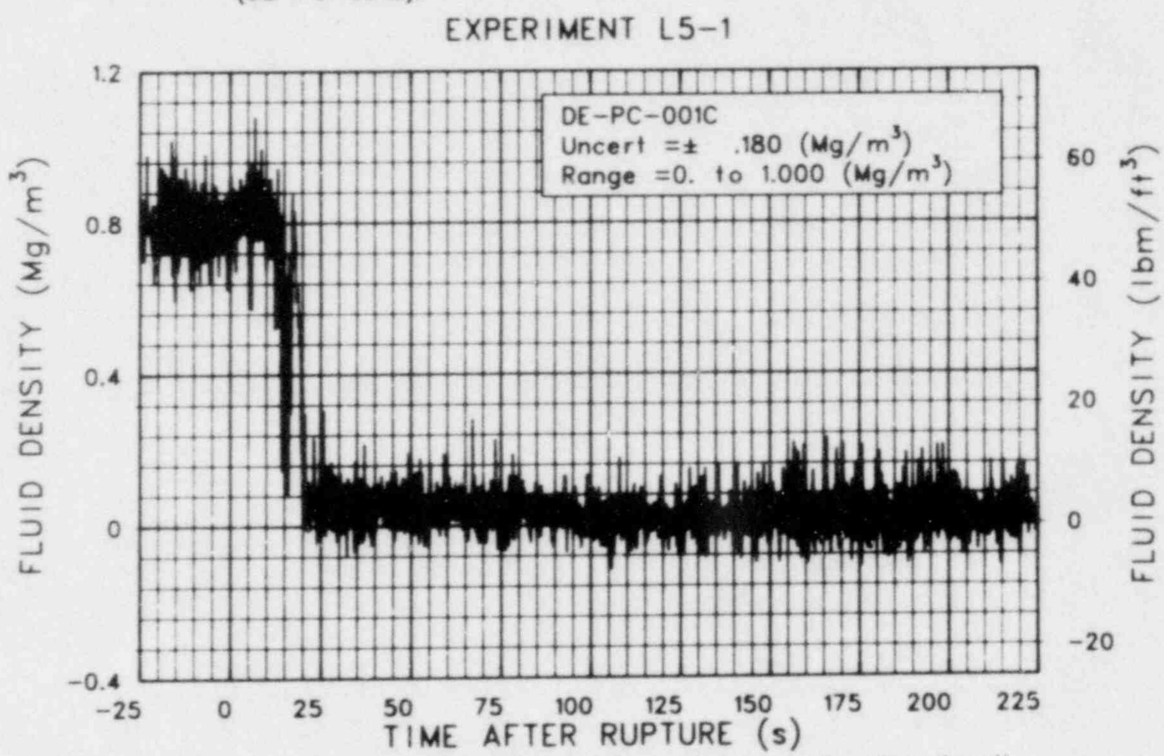


Figure 3L-8. Fluid density in intact loop cold leg, chordal density (DE-PC-001C).

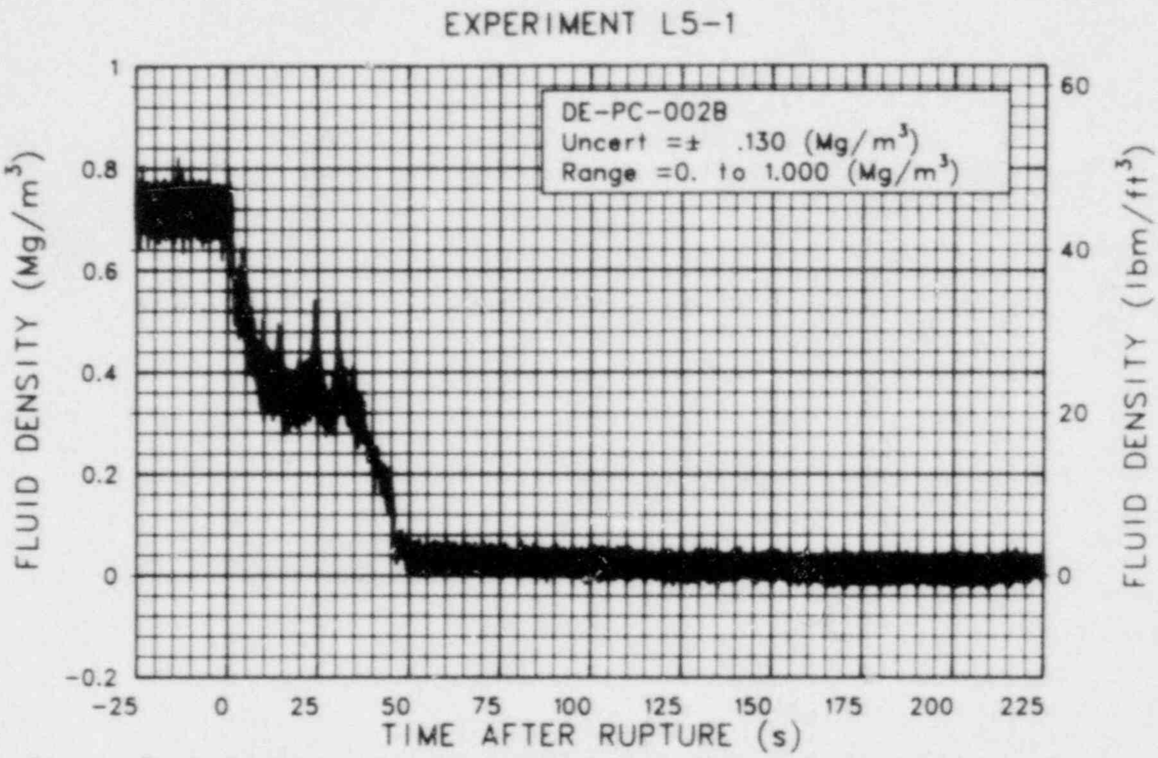


Figure 3L-9. Fluid density in intact loop hot leg, chordal density (DE-PC-002B).

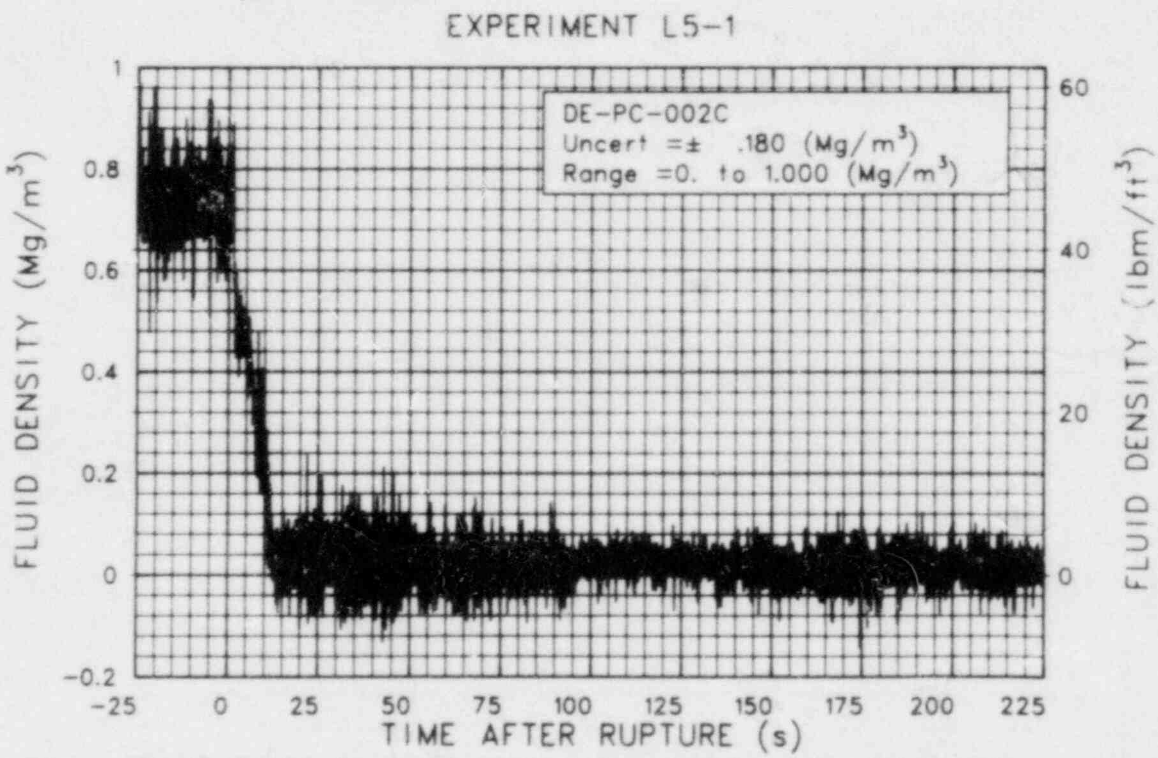


Figure 3L-10. Fluid density in intact loop hot leg, chordal density (DE-PC-002C).

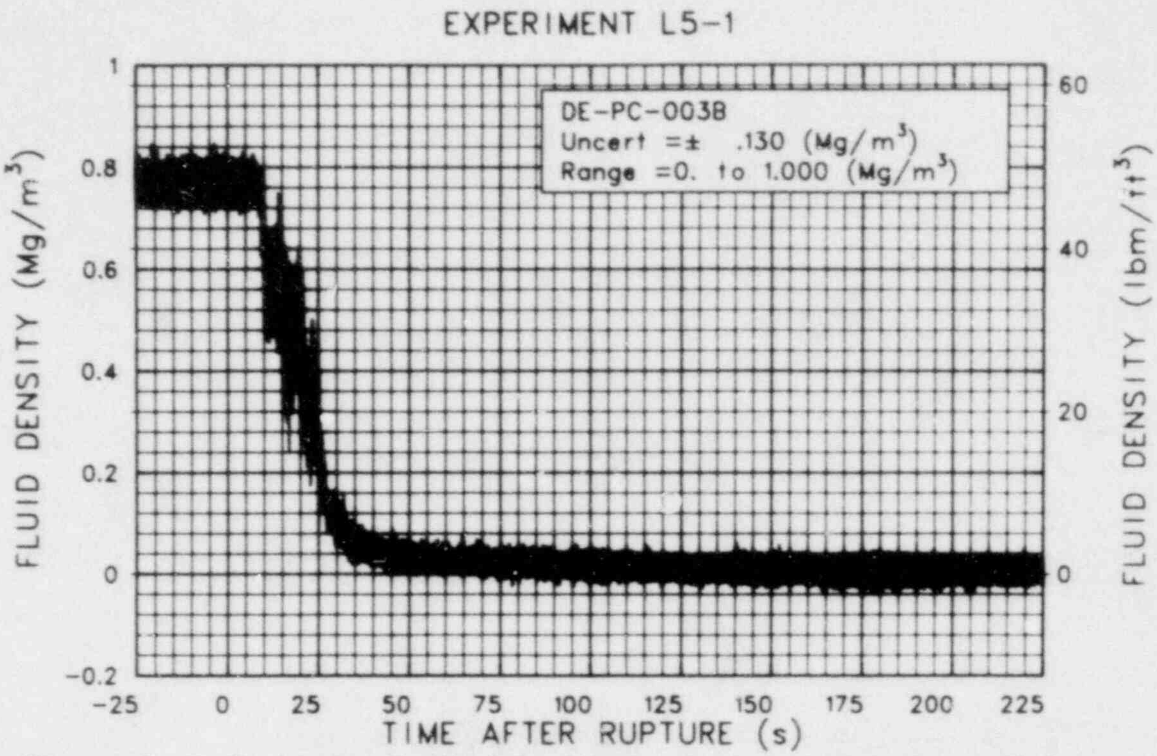


Figure 3L-11. Fluid density in intact loop at steam generator outlet, chordal density (DE-PC-003B).

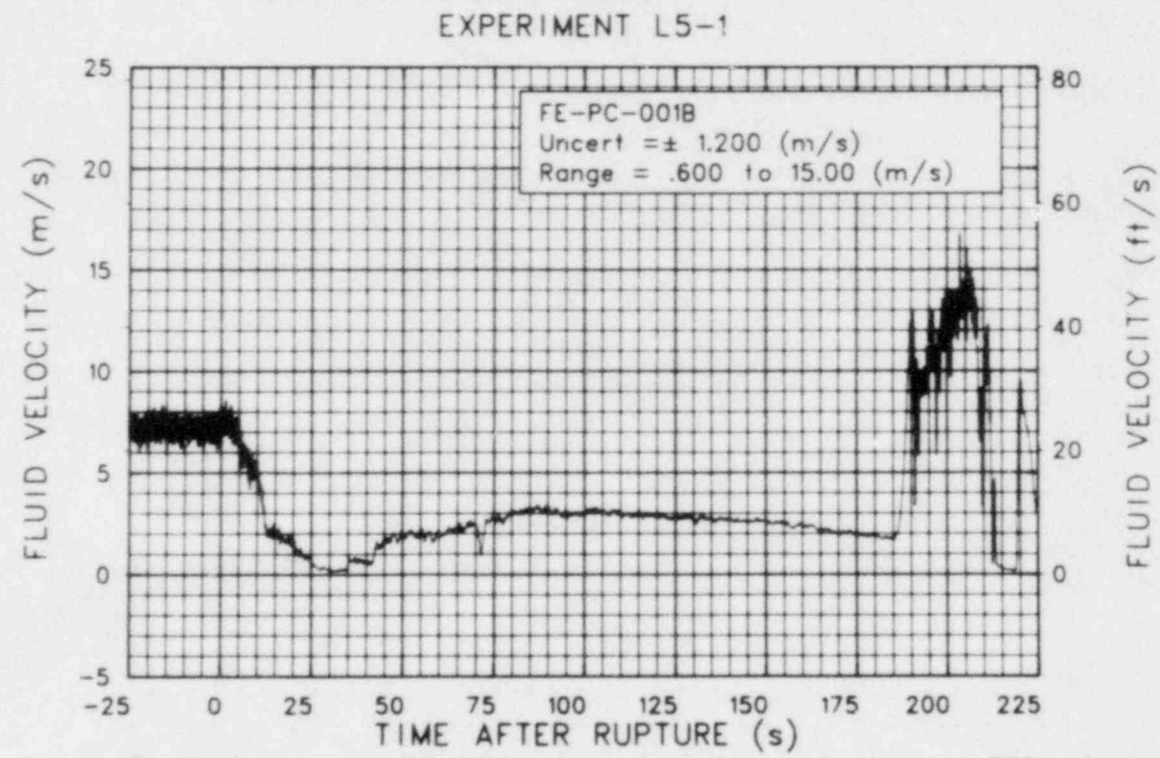


Figure 3L-12. Fluid velocity in intact loop cold leg horizontal DTT rake at center of pipe (FE-PC-001B).

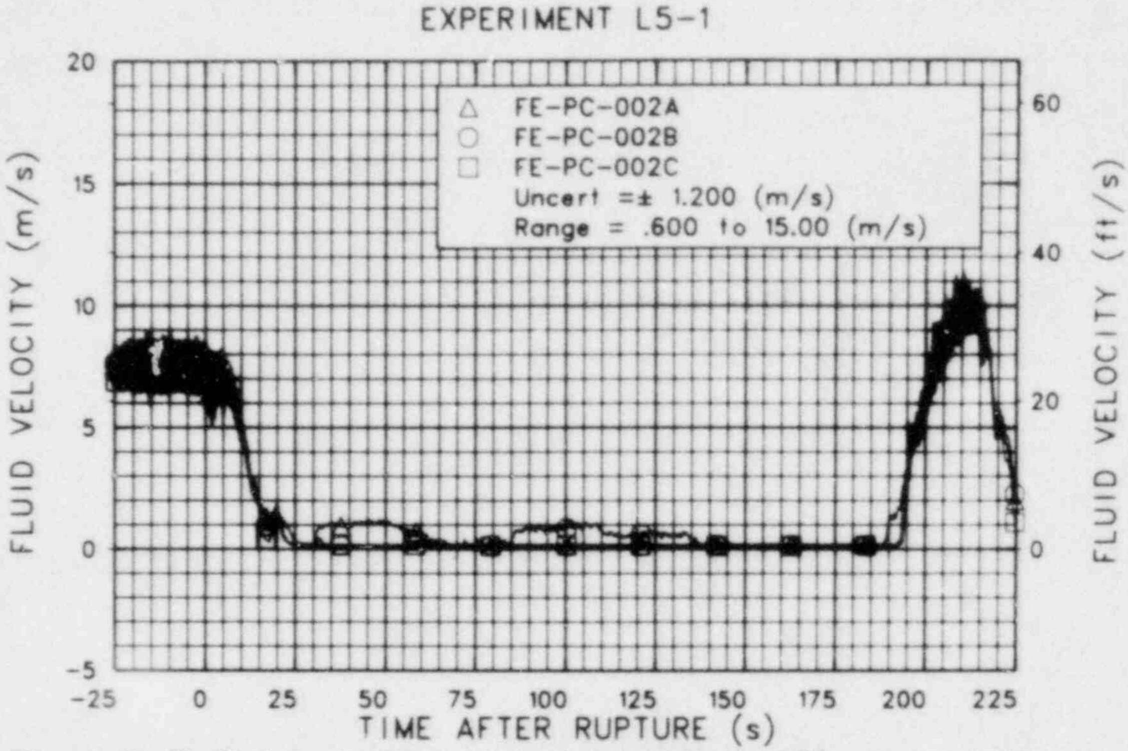


Figure 3L-13. Fluid velocity in intact loop hot leg DTT rake at bottom, middle, and top of pipe (FE-PC-002A, -002B, and -002C).

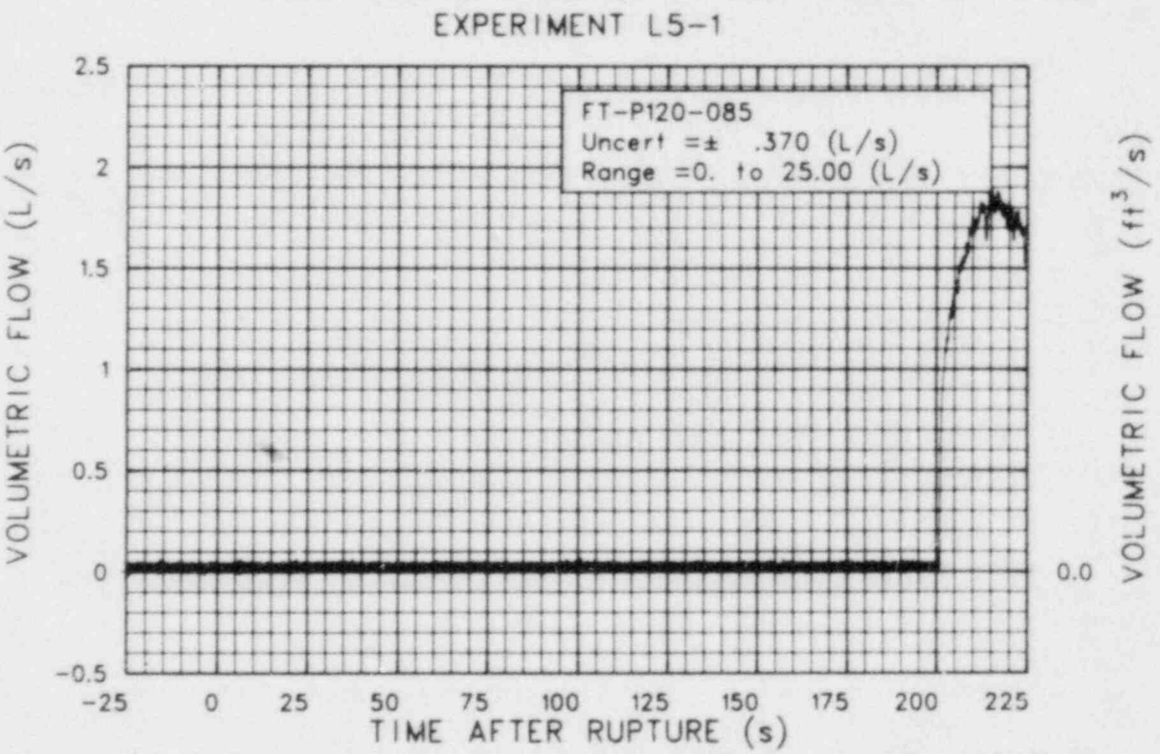


Figure 3L-14. Flow rate in low-pressure injection system Pump A discharge (FT-P120-085) (qualified, no other measurement for direct comparison).

EXPERIMENT L5-1

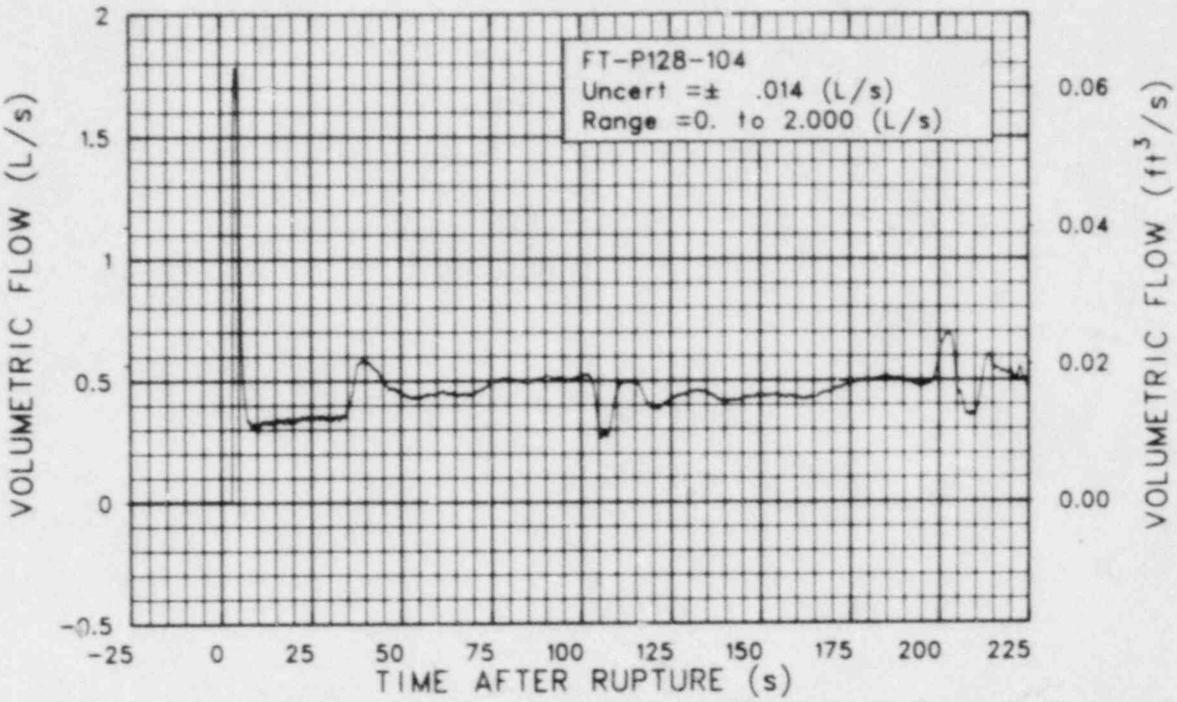


Figure 3L-15. Flow rate in high-pressure injection system Pump A discharge (FT-P128-104).

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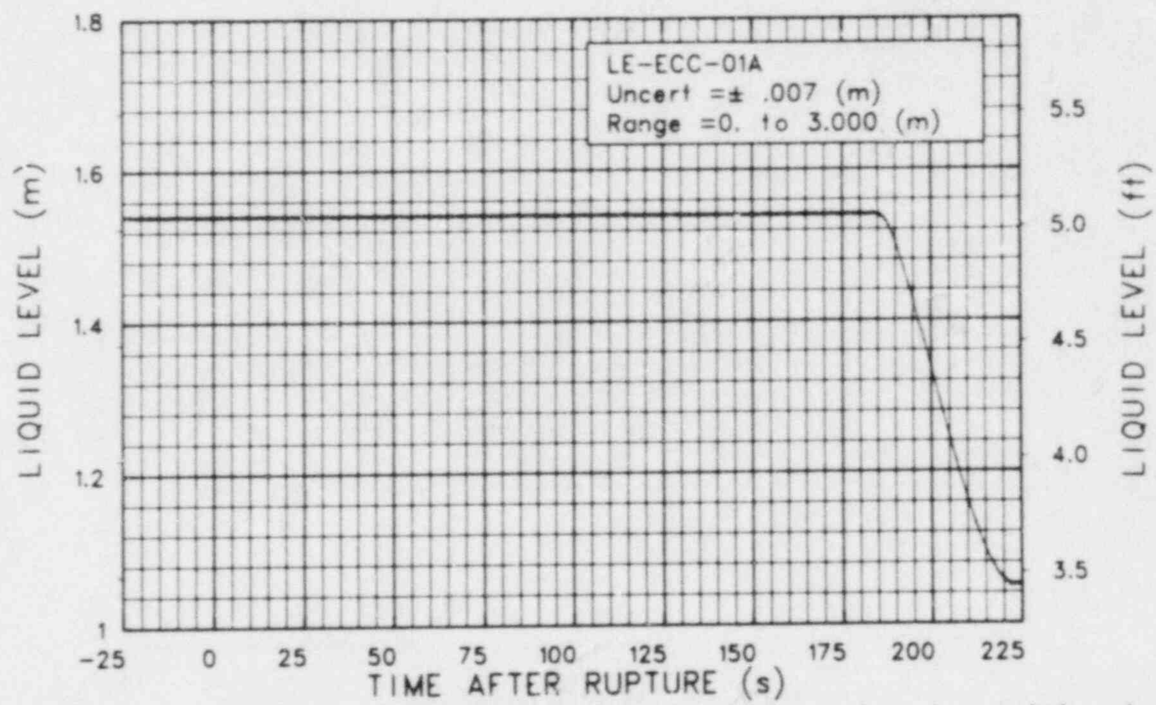

Figure 3L-16. Liquid level in emergency core cooling system Accumulator A (LE-ECC-01A).

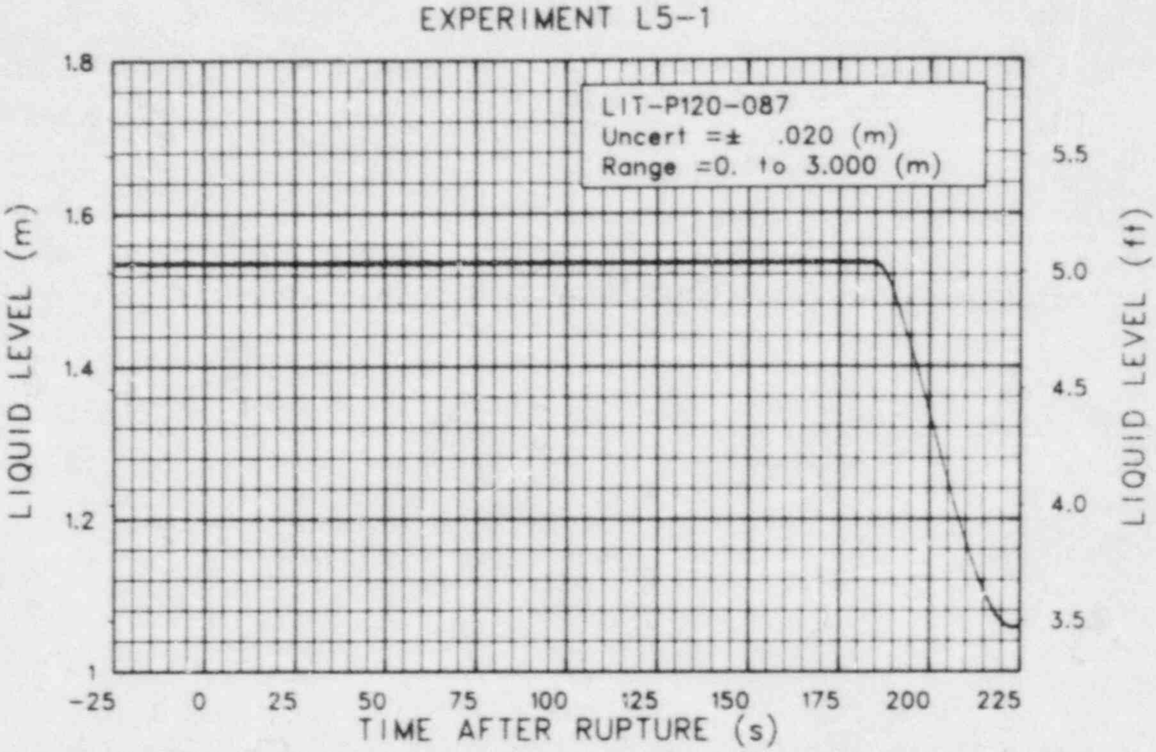

Figure 3L-17. Liquid level in emergency core cooling system Accumulator A (LIT-P120-087).

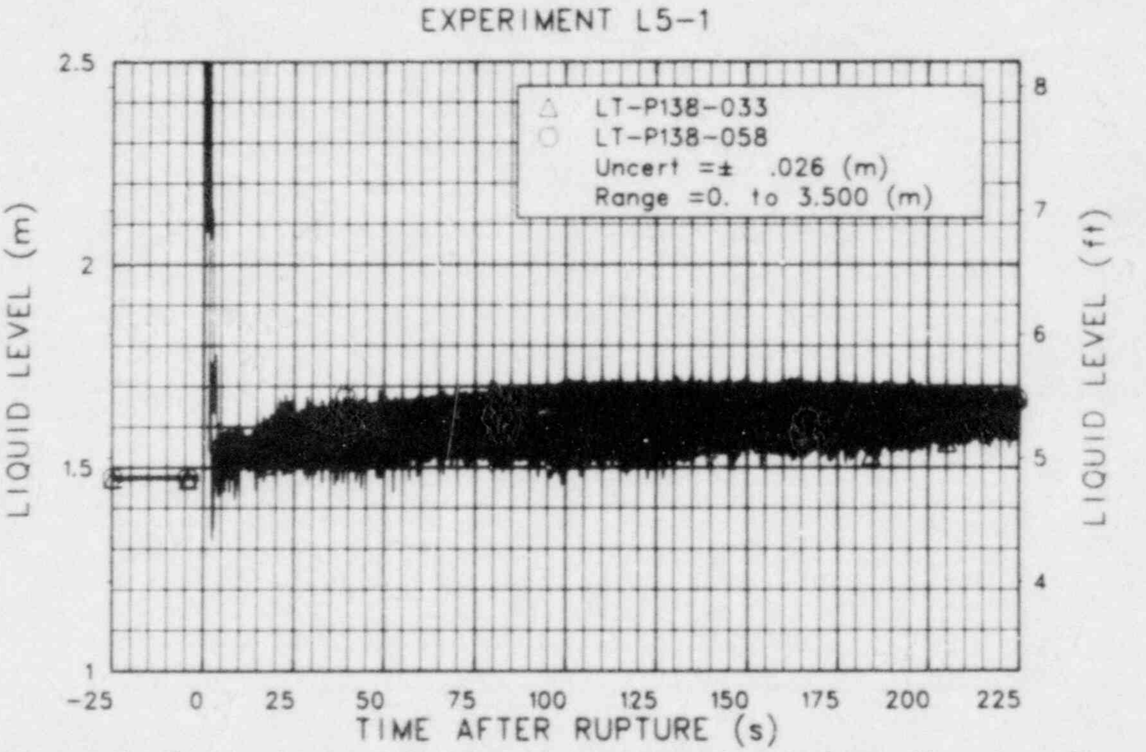

Figure 3L-18. Liquid level in blowdown suppression tank, north and south ends (LT-P138-033 and -058) (qualified, not density compensated).

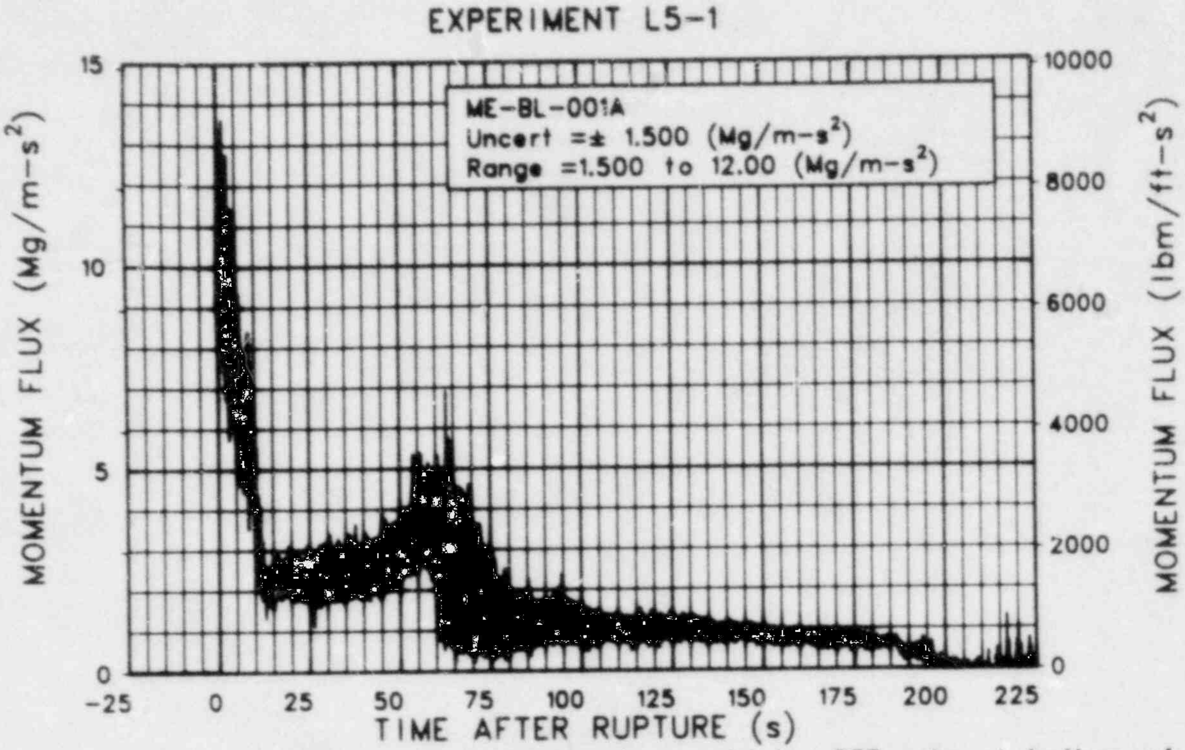

Figure 3L-19. Momentum flux in broken loop cold leg DTT rake at bottom of pipe, high range (ME-BL-001A).

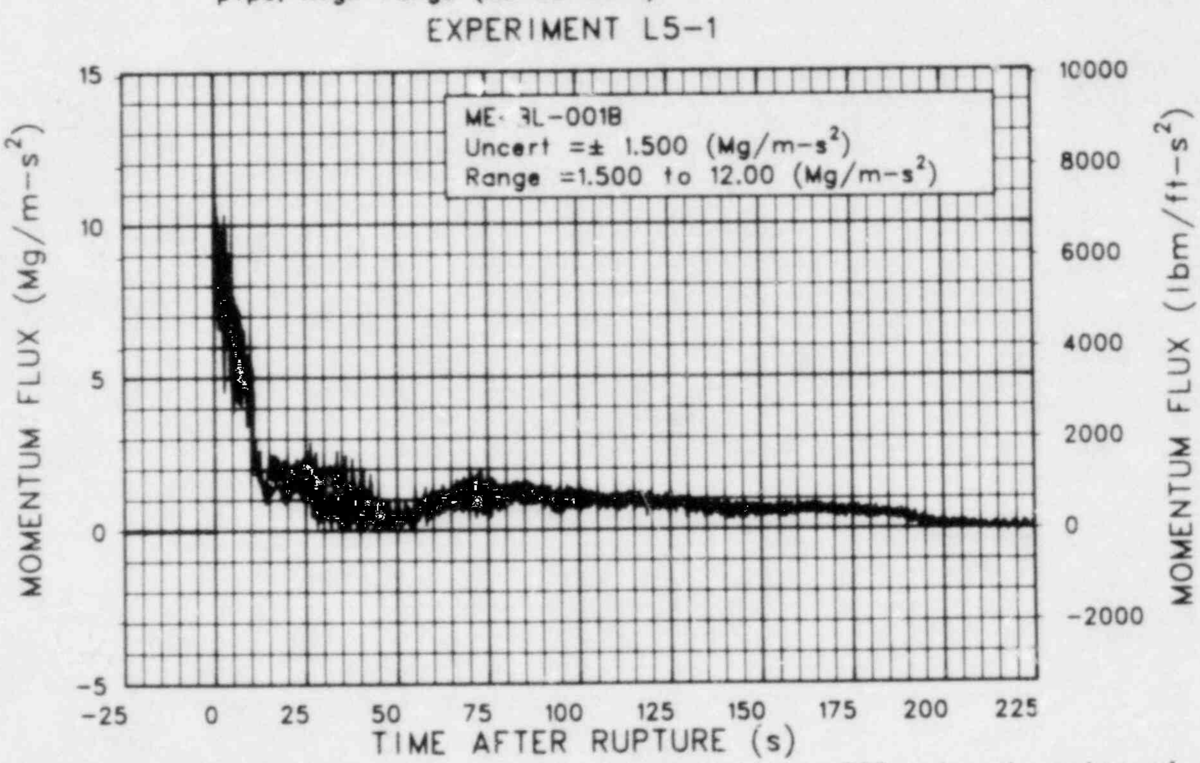

Figure 3L-20. Momentum flux in broken loop cold leg DTT rake at center of pipe, high range (ME-BL-001B).

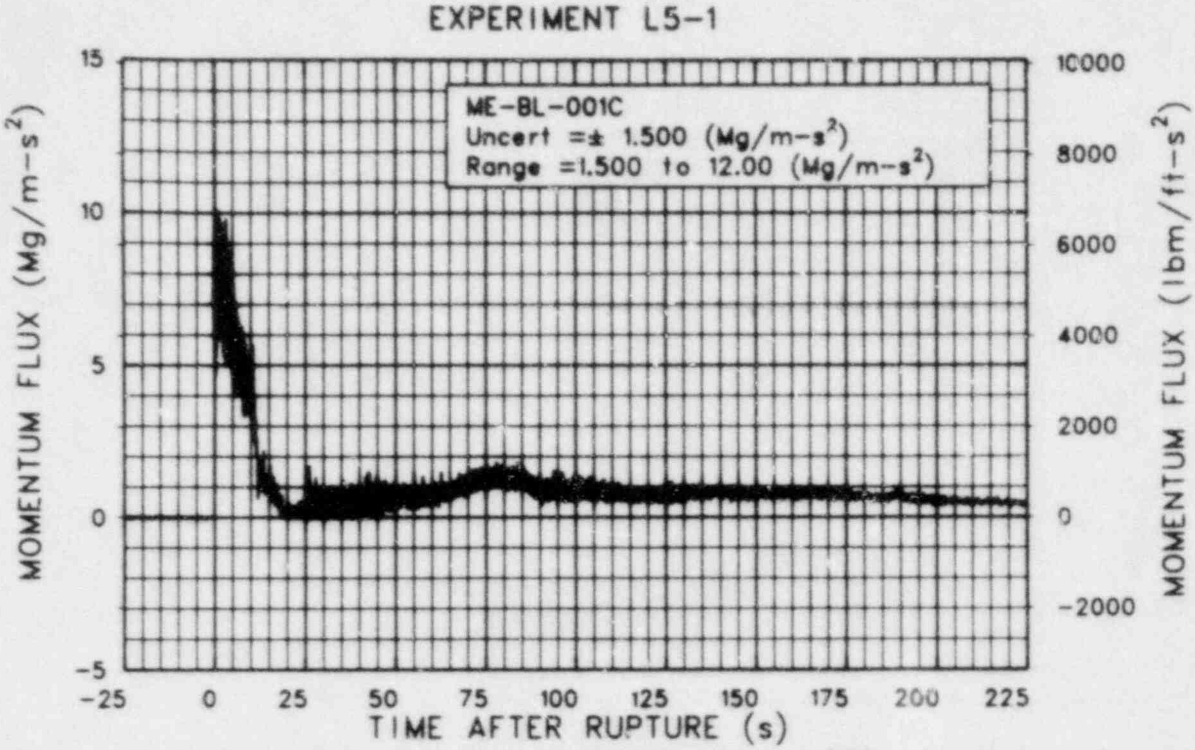

Figure 3L-21. Momentum flux in broken loop cold leg DTT rake at top of pipe, high range (ME-BL-001C).

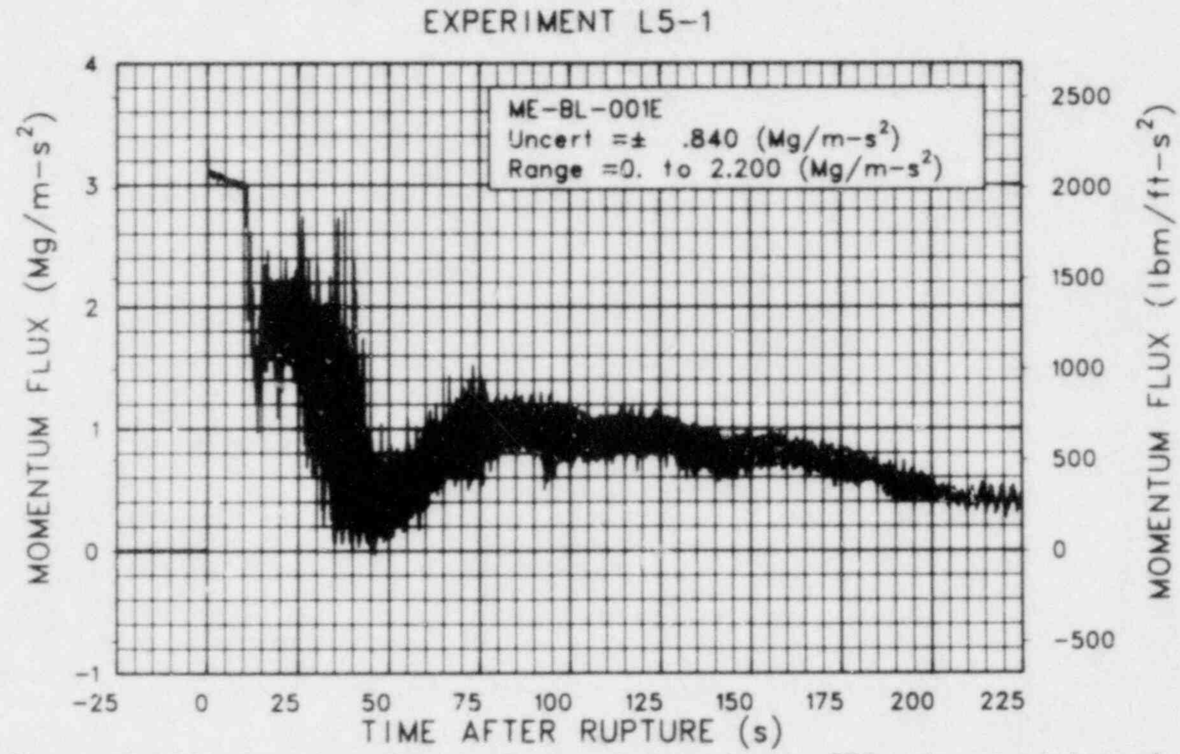

Figure 3L-22. Momentum flux in broken loop cold leg DTT rake at center of pipe, low range (ME-BL-001E) (instrument saturated prior to 12 s) (qualified, narrow range instrument).

EXPERIMENT L5-1

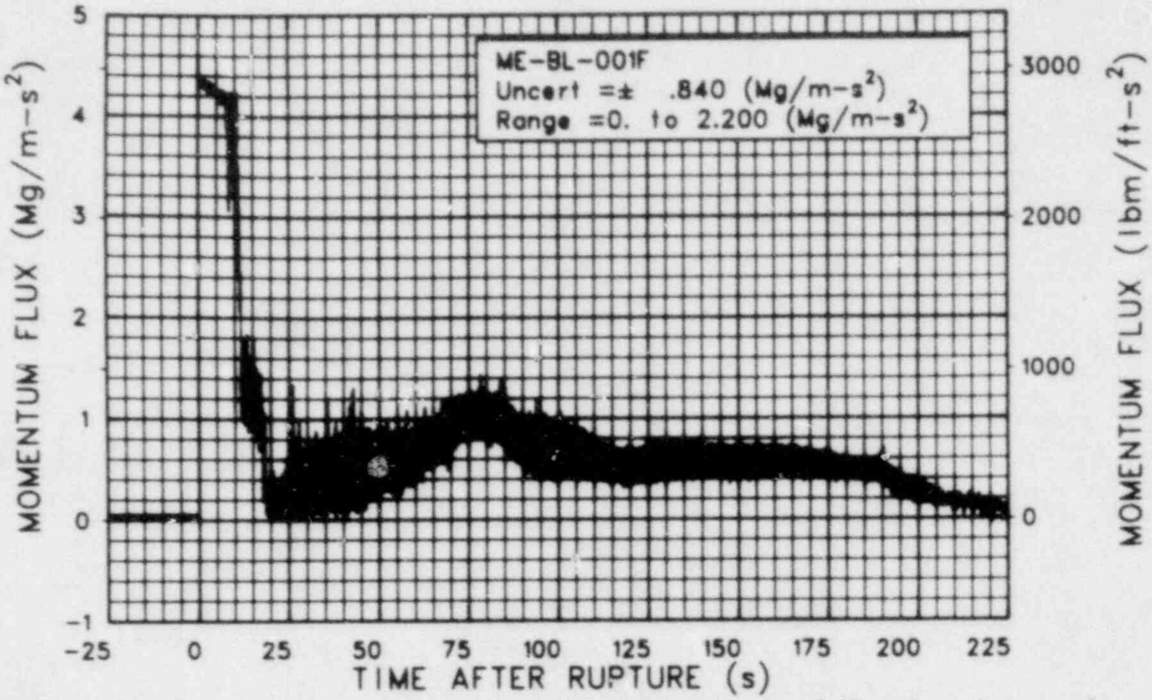

Figure 3L-23. Momentum flux in broken loop cold leg DTT rake at top of pipe, low range (ME-BL-001F) (instrument saturated prior to 12 s) (qualified, narrow range instrument).

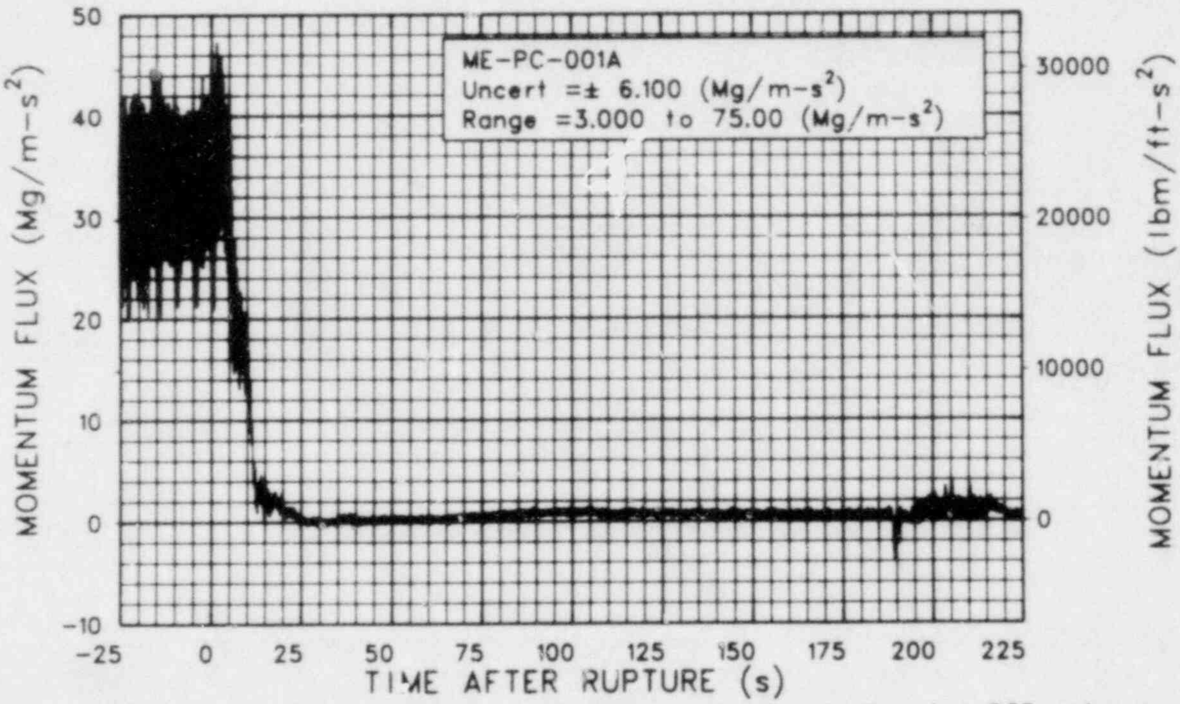

Figure 3L-24. Momentum flux in intact loop cold leg horizontal DTT rake on far side of pipe as viewed from rake flange (ME-PC-001A).

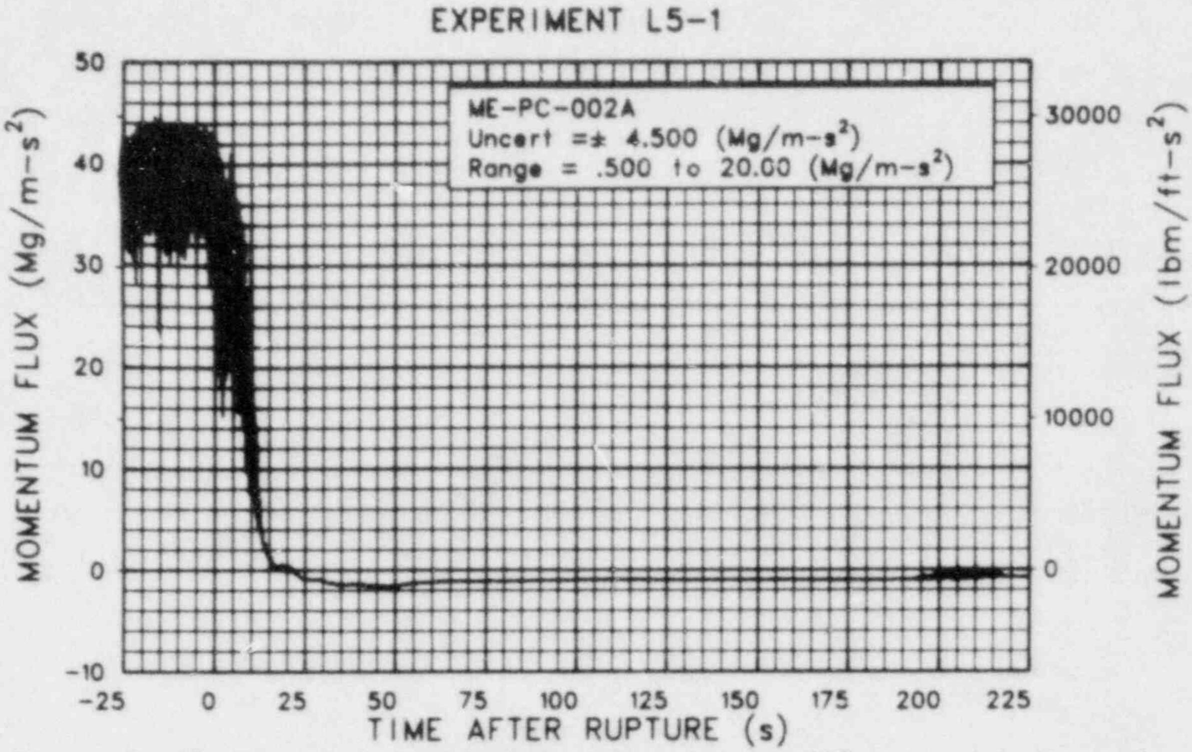

Figure 3L-25. Momentum flux in intact loop hot leg DTT rake at bottom of pipe (ME-PC-002A).

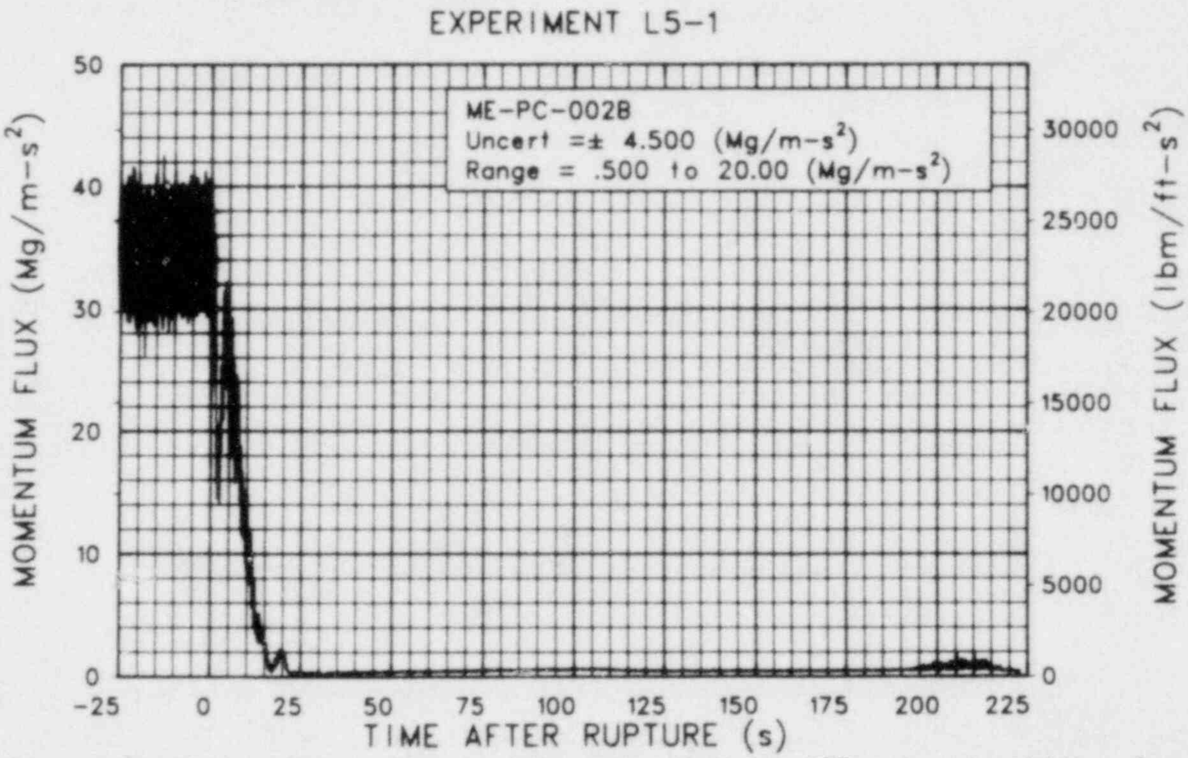

Figure 3L-26. Momentum flux in intact loop hot leg DTT rake at middle of pipe (ME-PC-002B).

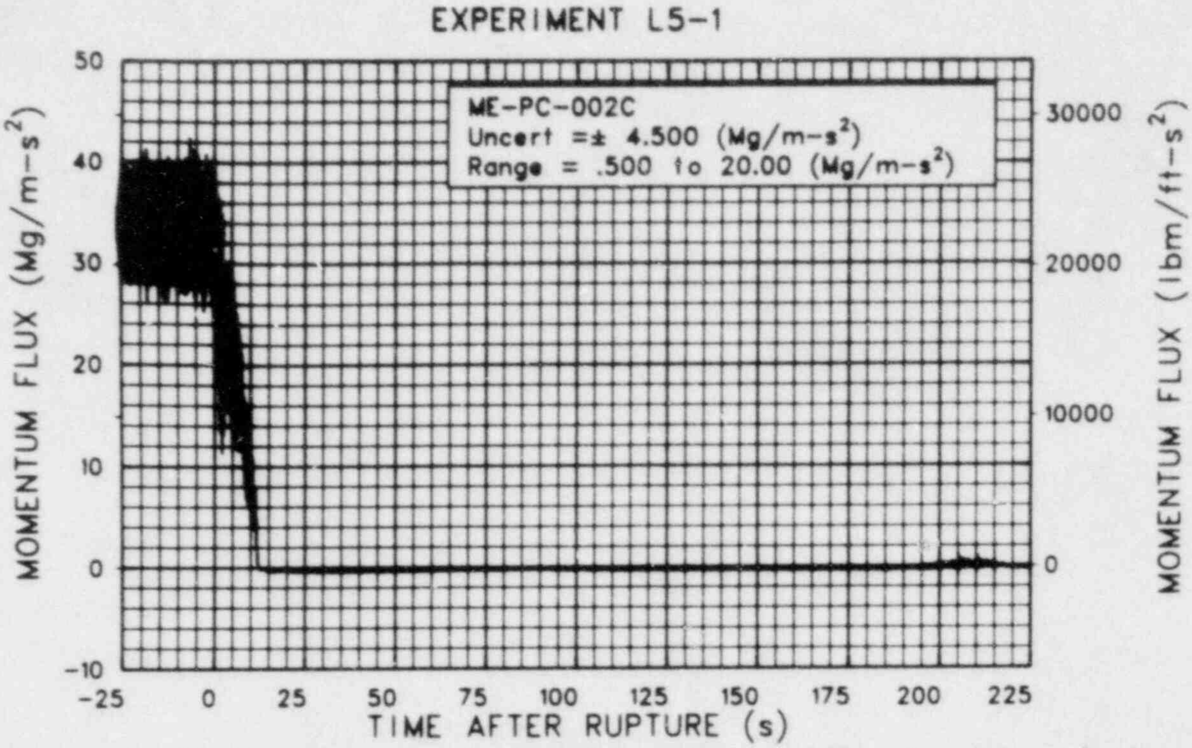

Figure 3L-27. Momentum flux in intact loop hot leg DTT rake at top of pipe (ME-PC-002C).

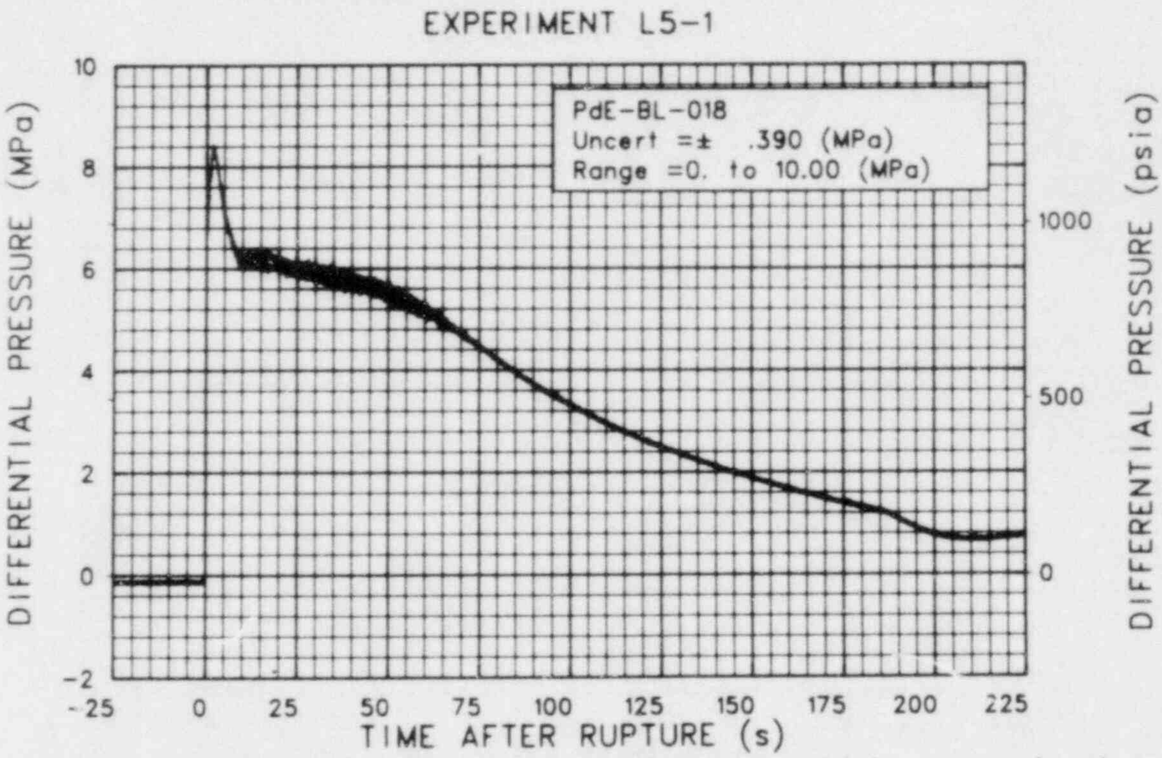

Figure 3L-28. Differential pressure in broken loop cold leg across break nozzle (PdE-BL-018).

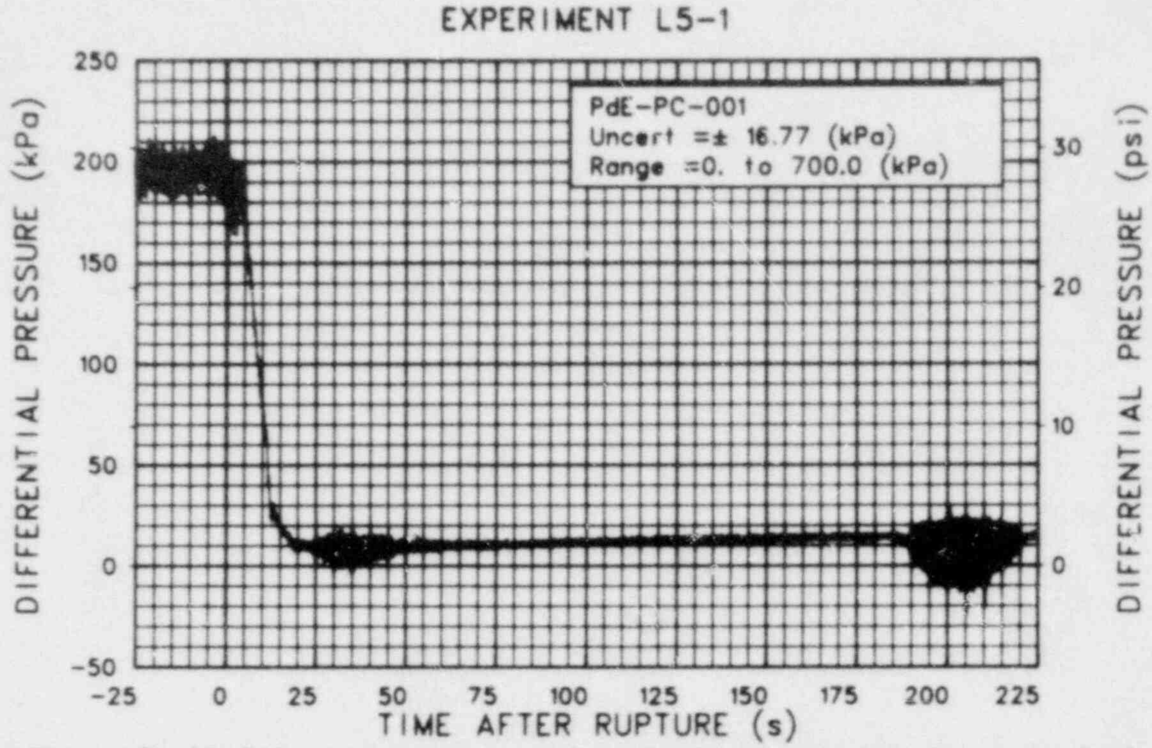

Figure 3L-29. Differential pressure in intact loop across primary coolant Pumps 1 and 2 (PdE-PC-001).

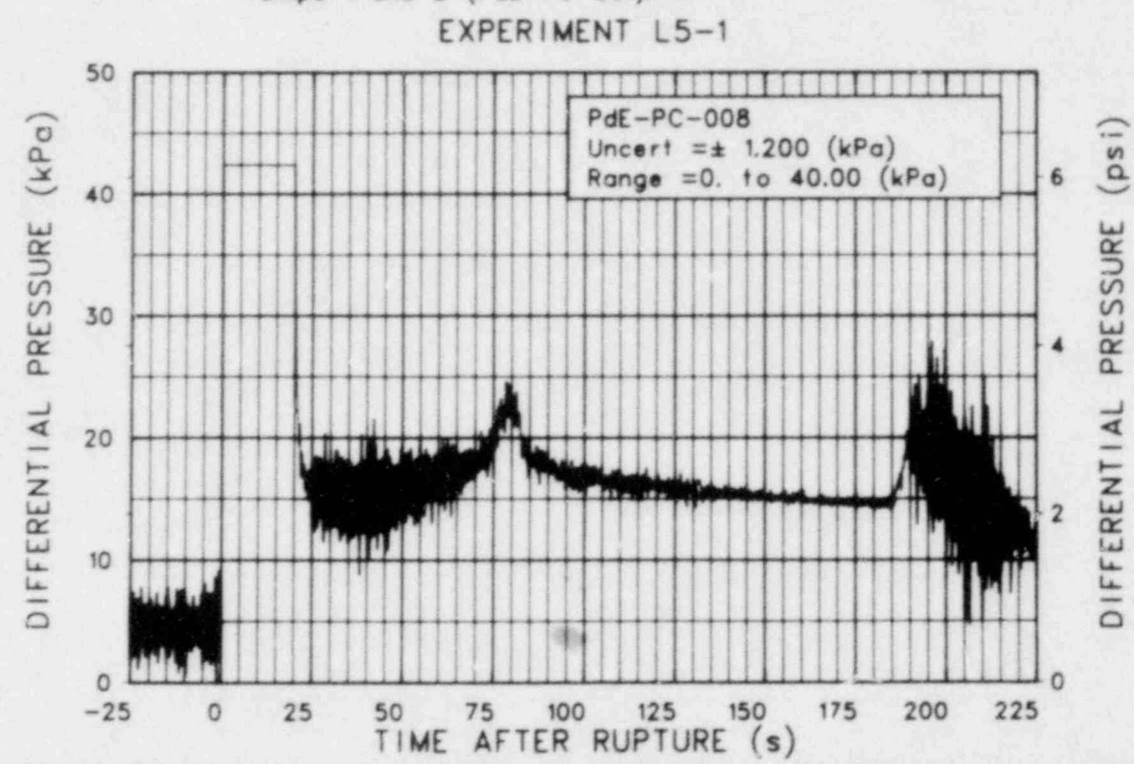

Figure 3L-30. Differential pressure in intact loop across pressurizer surge line (PdE-PC-008) (qualified, narrow range instrument, magnitude uncertain).

EXPERIMENT L5-1

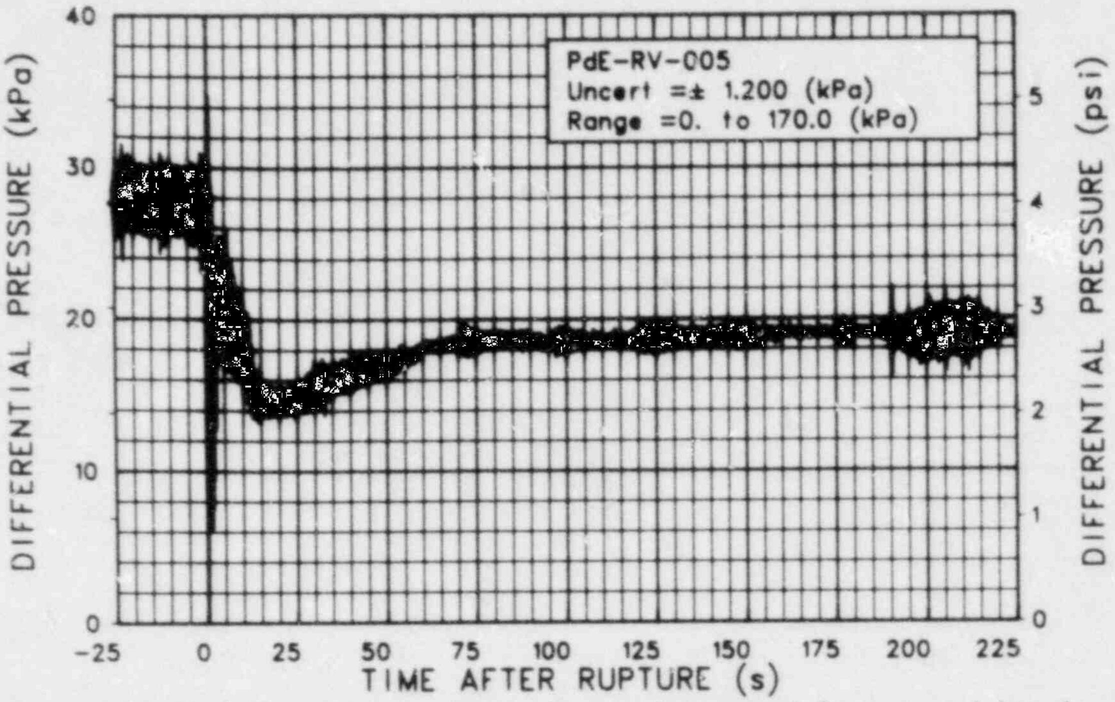

Figure 3L-31. Differential pressure in reactor vessel from vessel top to intact loop hot leg outlet (PdE-RV-005) (qualified, no other measurement for direct comparison).

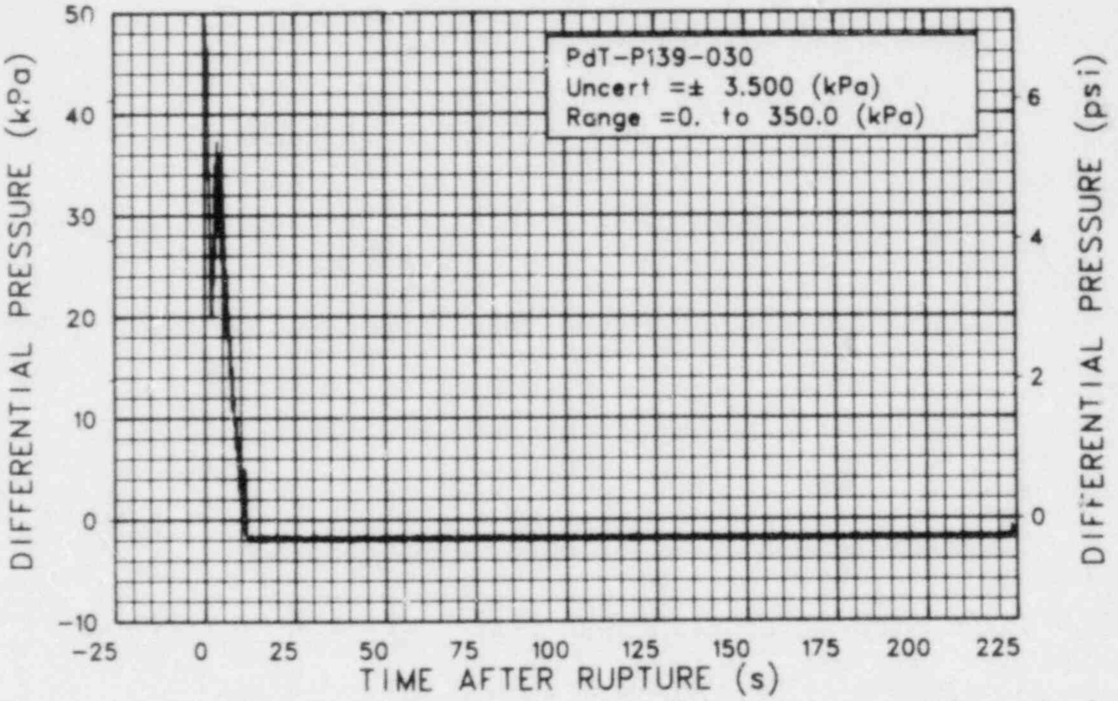

Figure 3L-32. Differential pressure in intact loop across reactor vessel (PdT-P139-030) (qualified, initial conditions only).

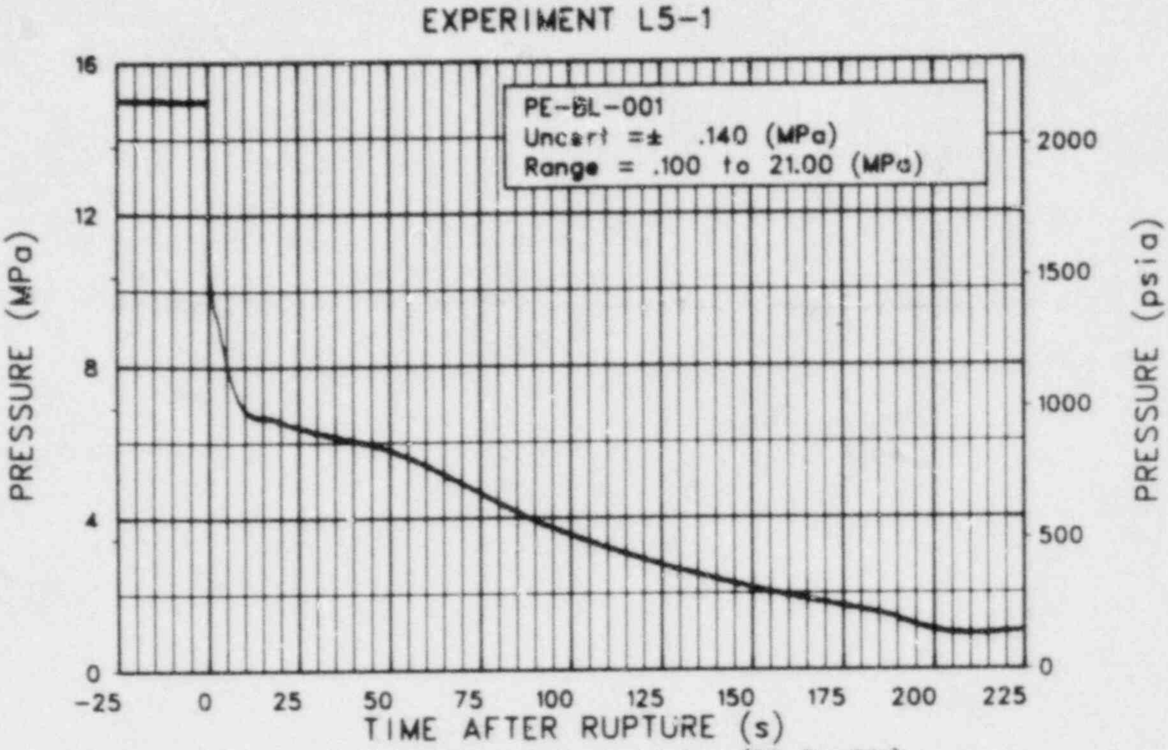

Figure 3L-33. Pressure in broken loop cold leg (PE-BL-001).

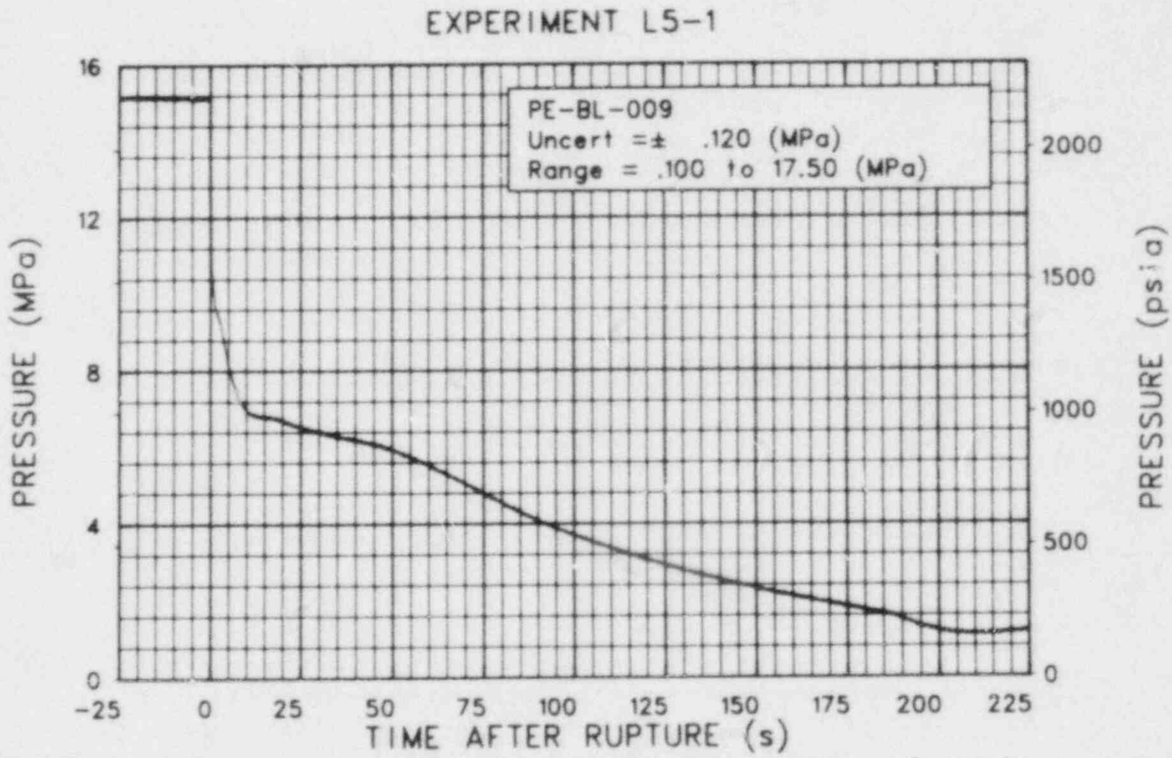

Figure 3L-34. Pressure in broken loop cold leg upstream of nozzle (PE-BL-009).

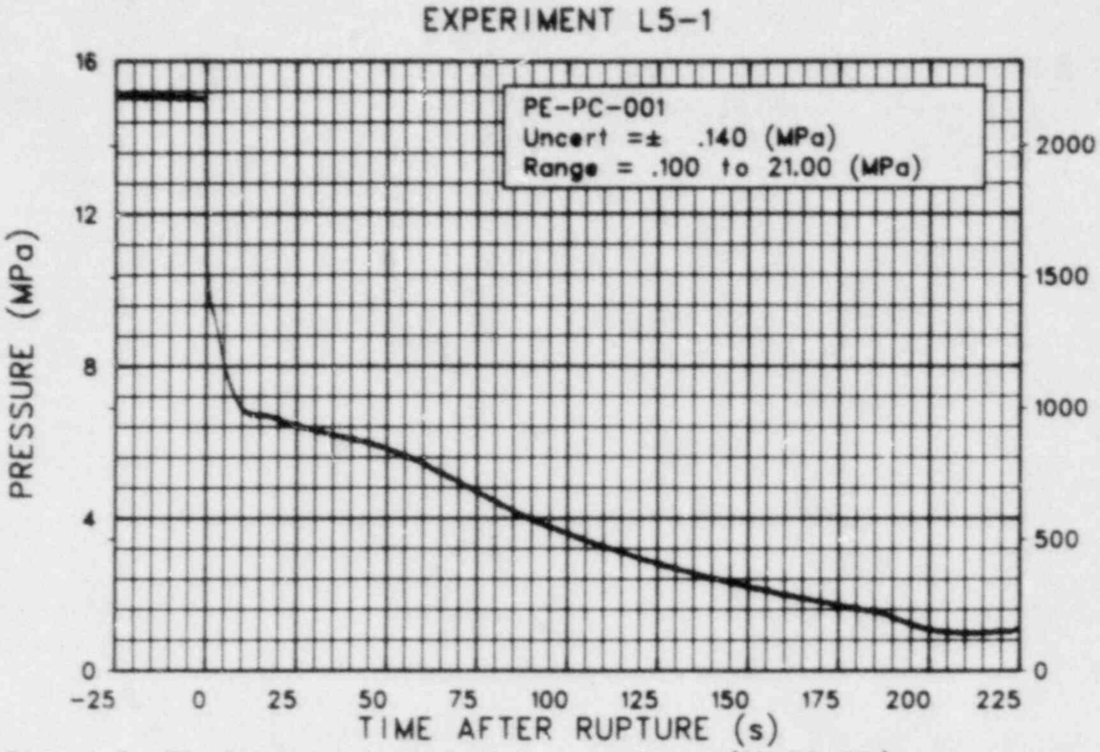

Figure 3L-35. Pressure in intact loop cold leg (PE-PC-001).

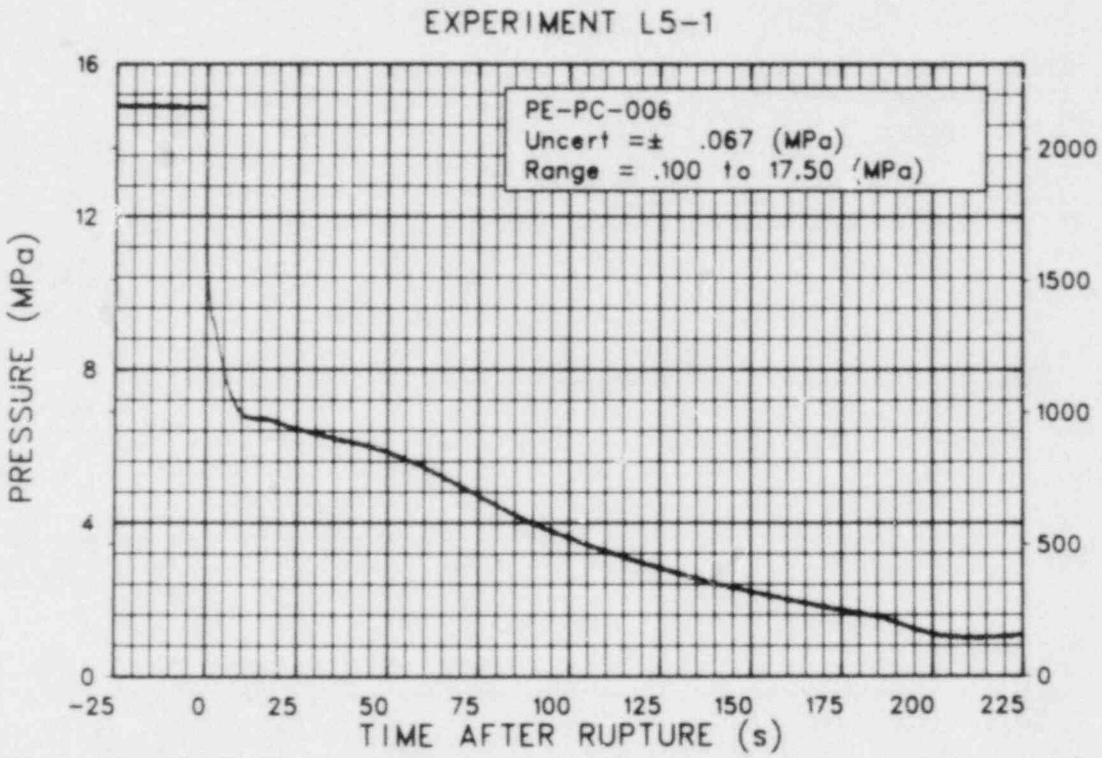

Figure 3L-36. Reference pressure in intact loop between steam generator outlet and pump inlet (PE-PC-006).

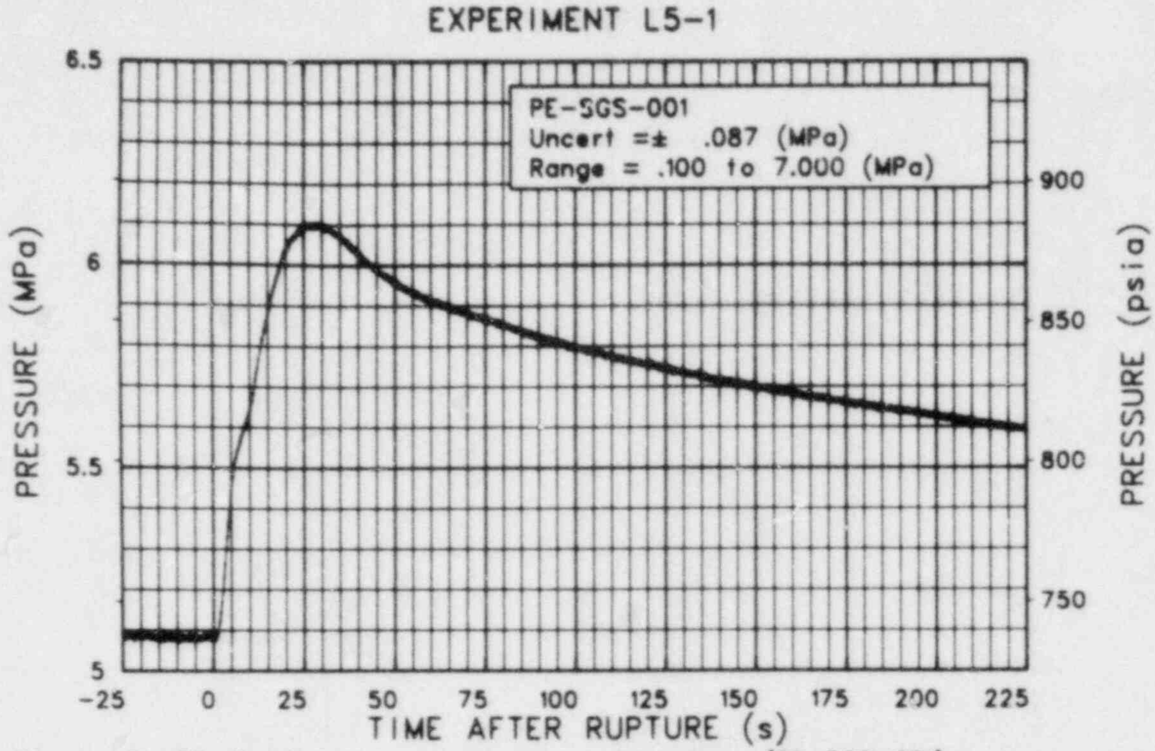

Figure 3L-37. Pressure in steam generator dome (PE-SGS-001).

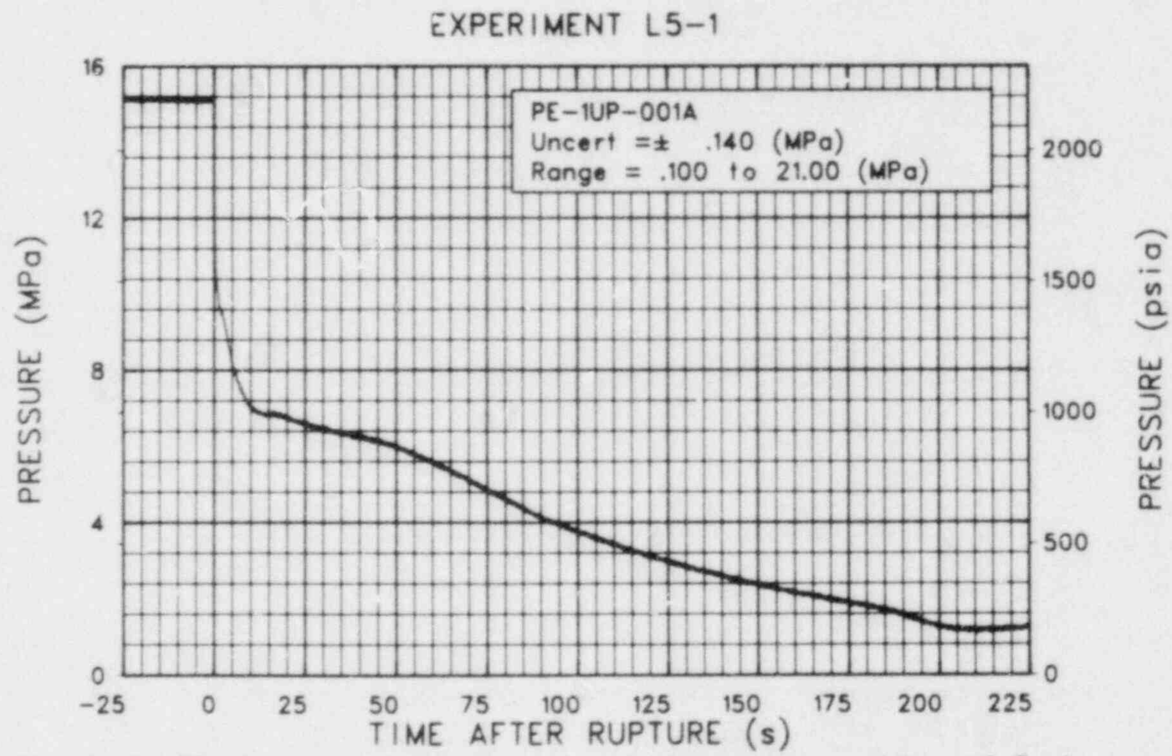

Figure 3L-38. Pressure in reactor vessel above upper end box of Fuel Assembly 1 (PE-1UP-001A).

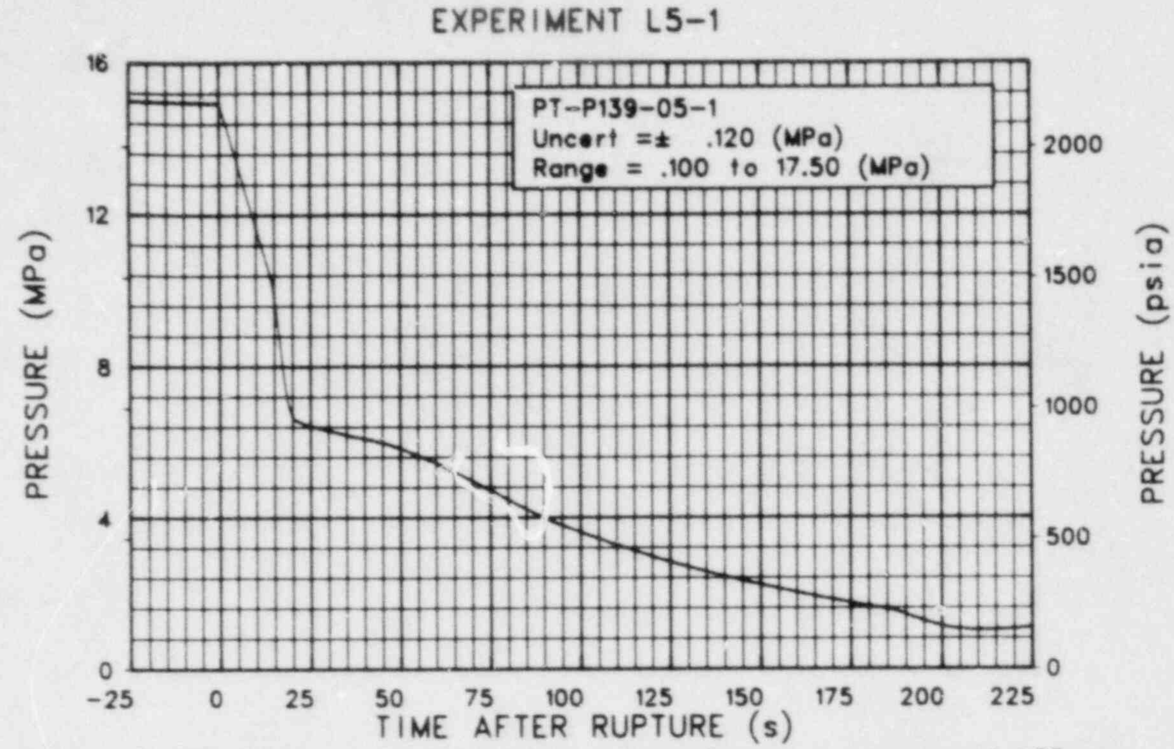

Figure 3L-39. Pressure in intact loop pressurizer vapor space at 1.88 m above bottom (PT-P139-05-1).

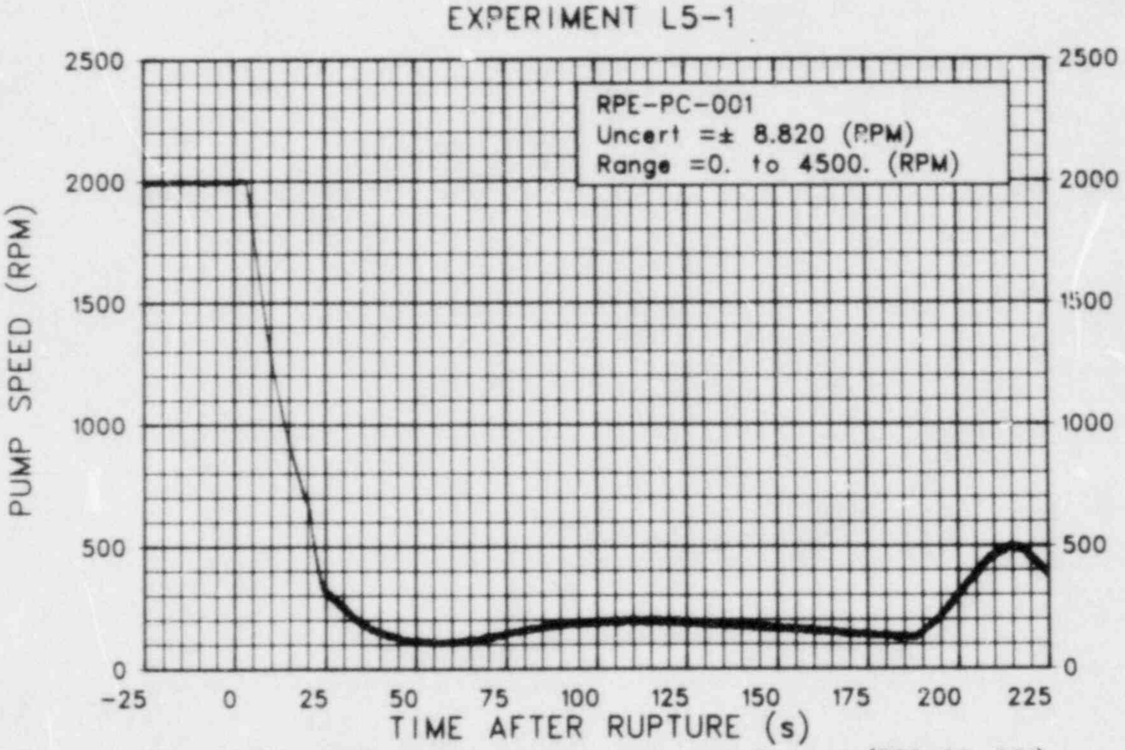

Figure 3L-40. Pump speed for primary coolant Pump 1 (RPE-PC-001).

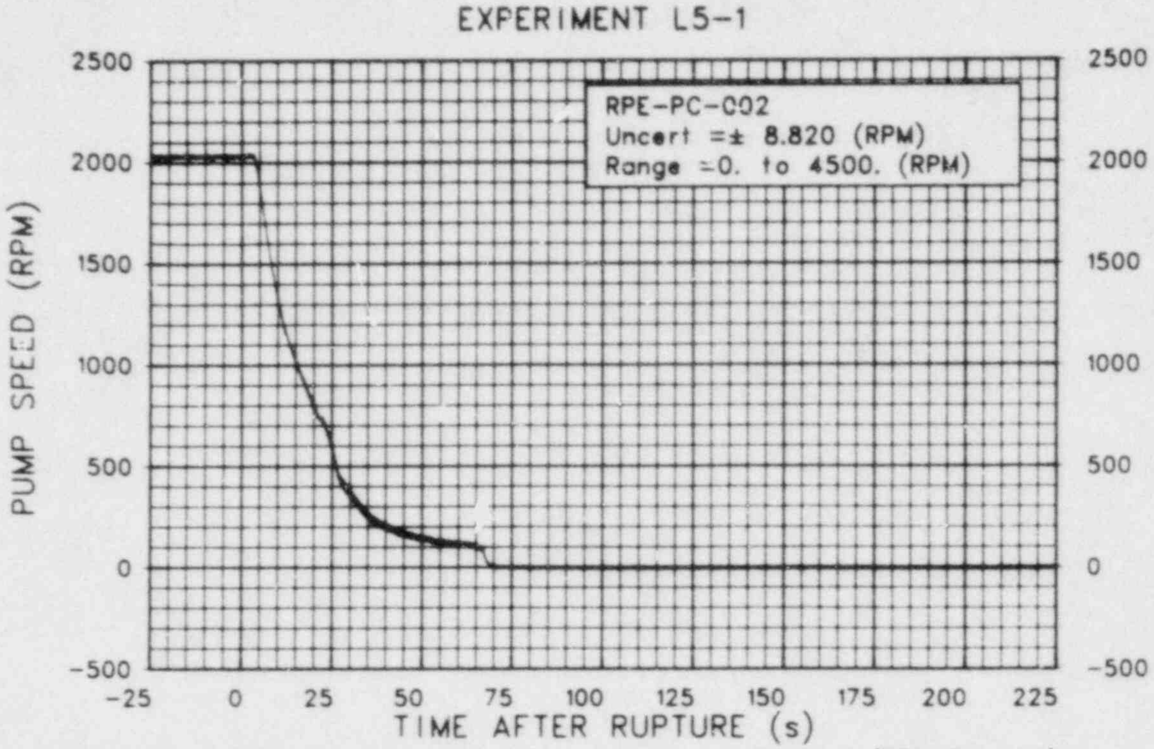

Figure 3L-41. Pump speed for primary coolant Pump 2 (RPE-PC-002).

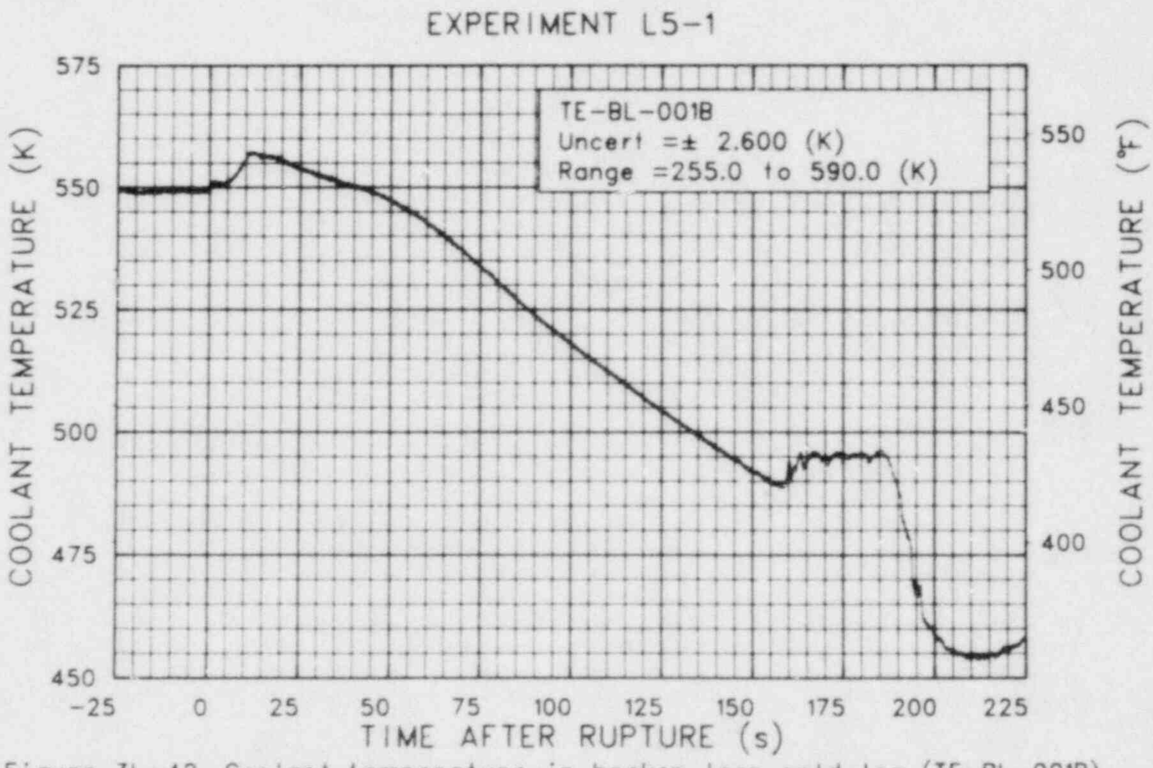

Figure 3L-42. Coolant temperature in broken loop cold leg (TE-BL-001B) (qualified, possible hot wall effects).

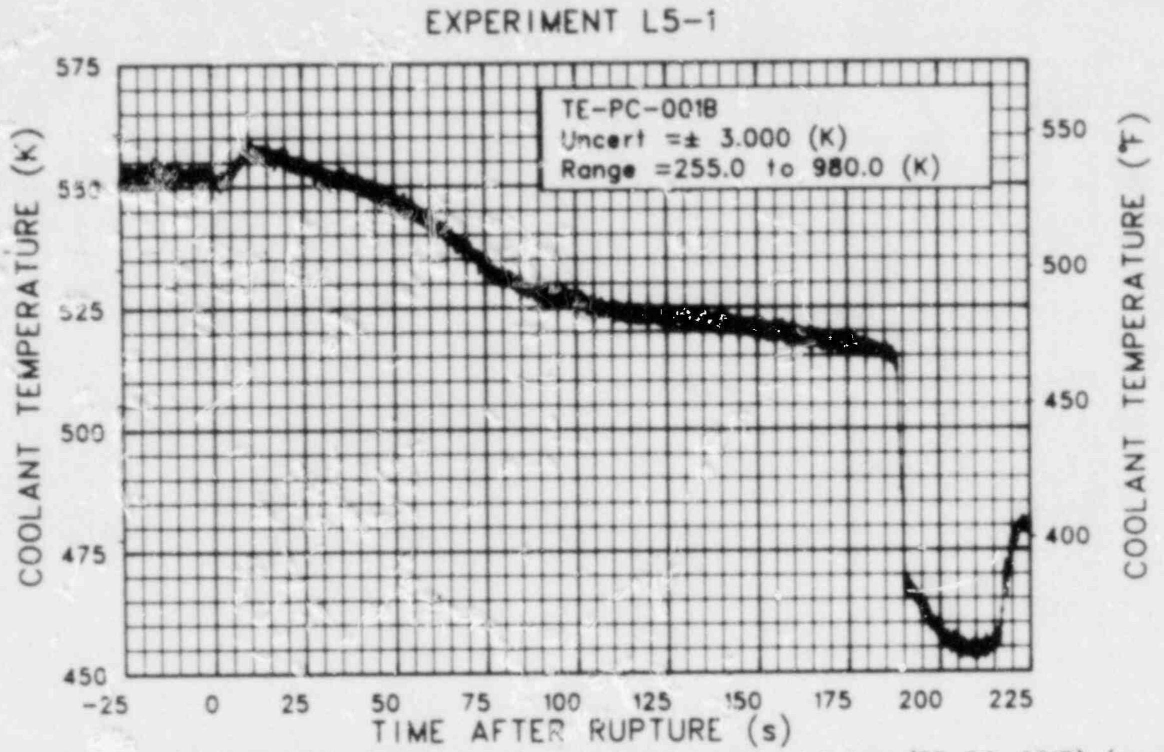

Figure 3L-43. Coolant temperature in intact loop cold leg (TE-PC-001B) (qualified, possible hot wall effects).

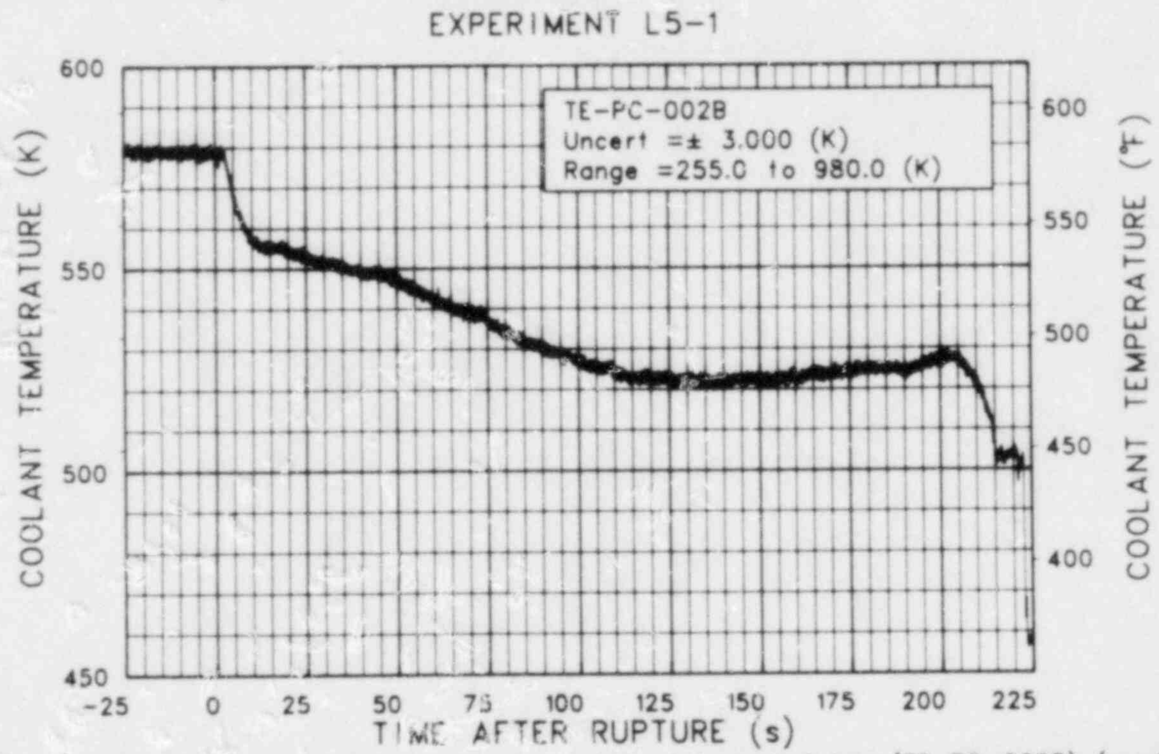

Figure 3L-44. Coolant temperature in intact loop hot leg (TE-PC-002B) (qualified, possible hot wall effects).

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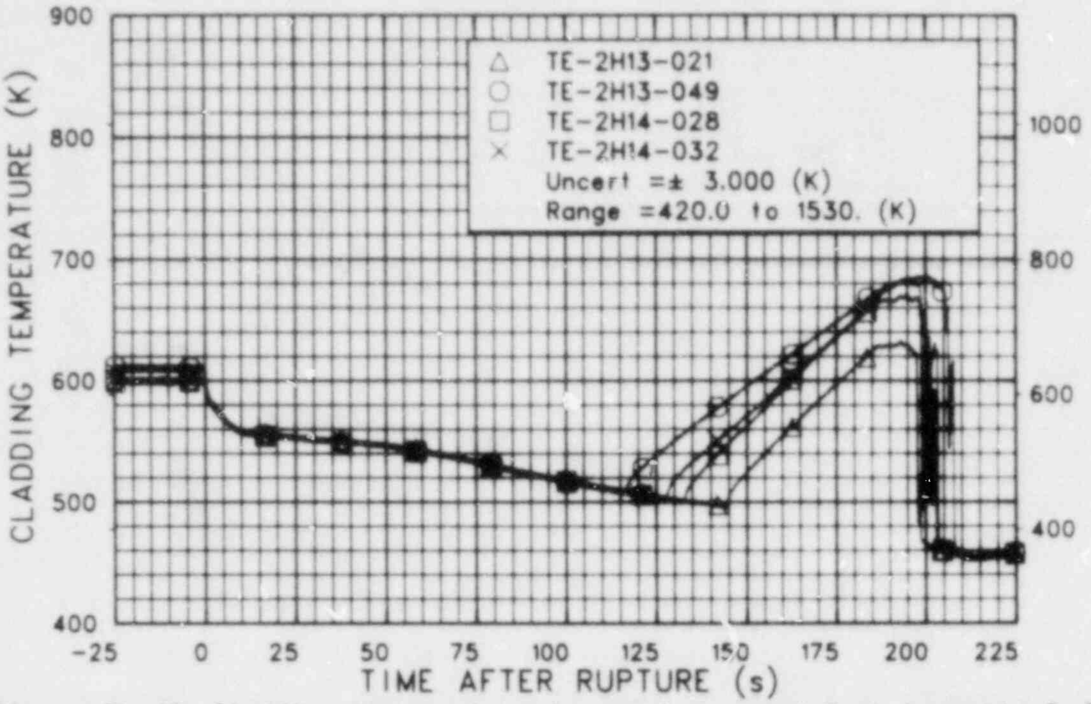


Figure 3L-45. Cladding temperature in reactor vessel Fuel Assembly 2, Row H, Columns 13 and 14, 0.53, 1.24, 0.71, and 0.81 m above bottom of fuel rod (TE-2H13-021, -049, -2H14-028, and -032).

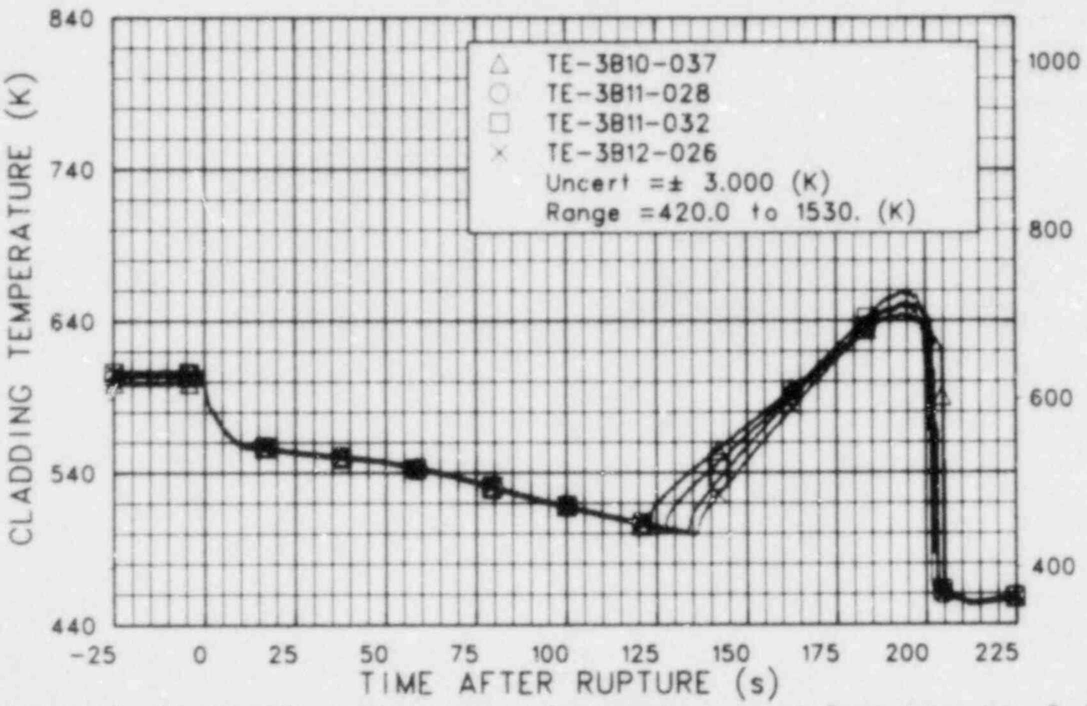


Figure 3L-46. Cladding temperature in reactor vessel Fuel Assembly 3, Row B, Columns 10, 11, and 12, 0.94, 0.71, 0.81, and 0.66 m above bottom of fuel rod (TE-3B10-037, -3B11-028, -032, and -3B12-026).

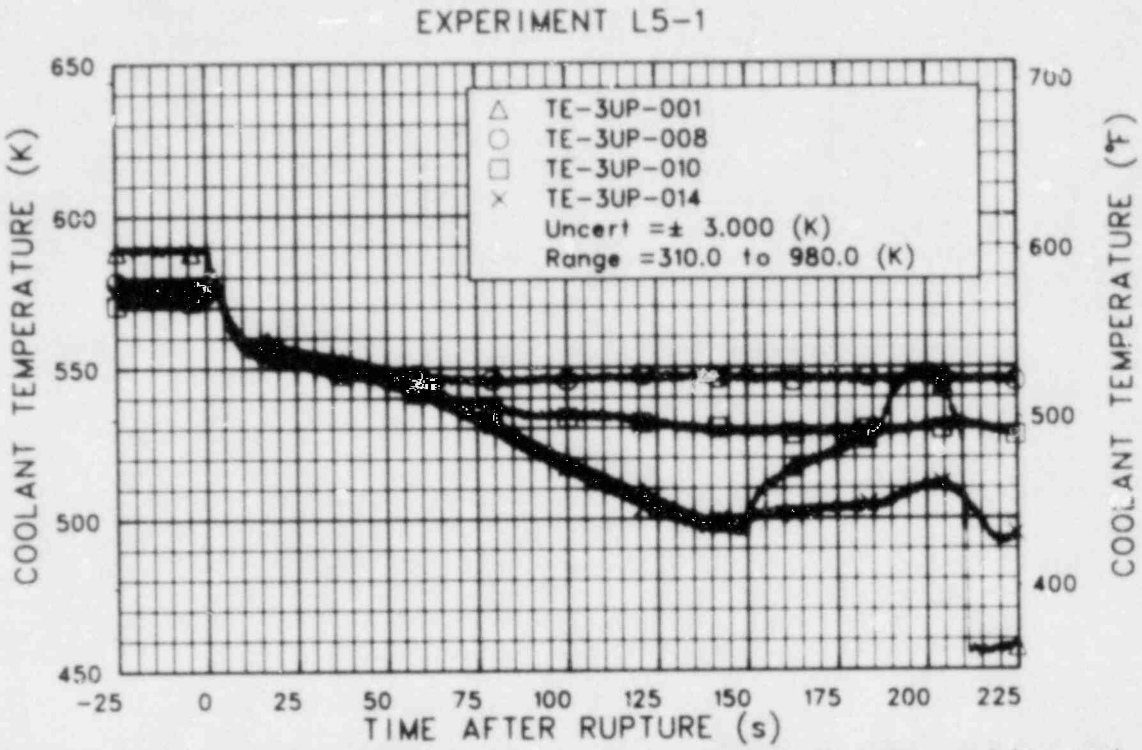


Figure 3L-47. Coolant temperature in reactor vessel at upper end box and liquid level stings above Fuel Assembly 3 (TE-3UP-001, -008, -010, and -014).

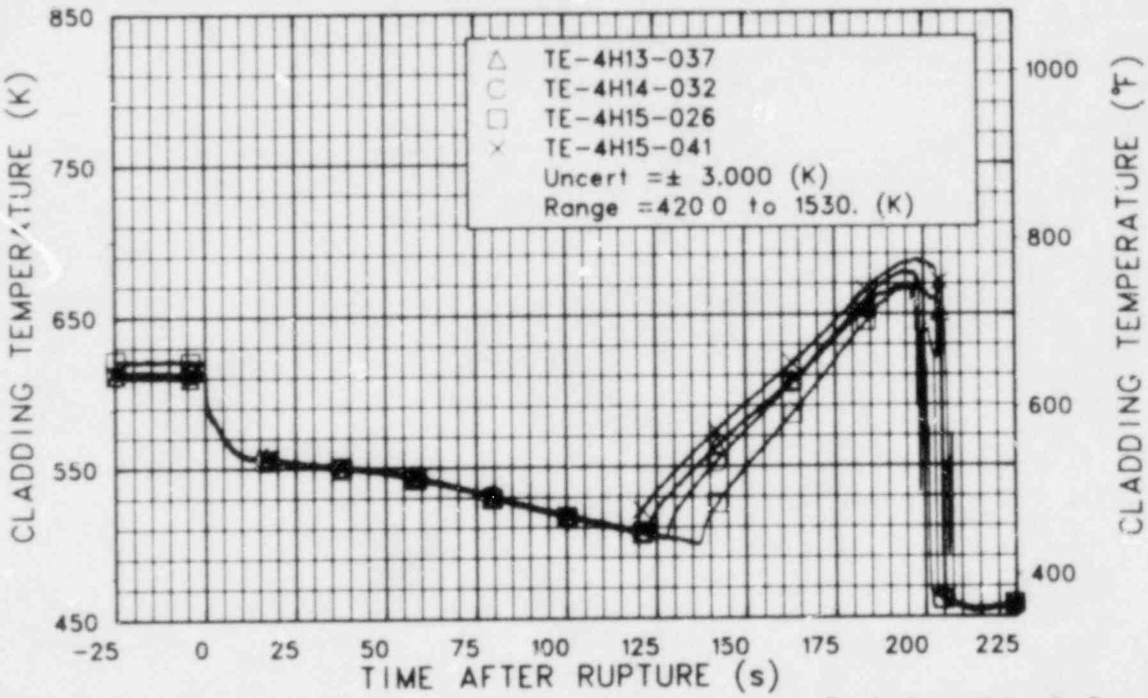


Figure 3L-48. Cladding temperature in reactor vessel Fuel Assembly 4, Row H, Column 13, 14, and 15, 0.94, 0.81, 0.66, and 1.04 m above bottom of fuel rod (TE-4H13-037, -4H14-032, -4H15-026, and -041).

EXPERIMENT L5-1

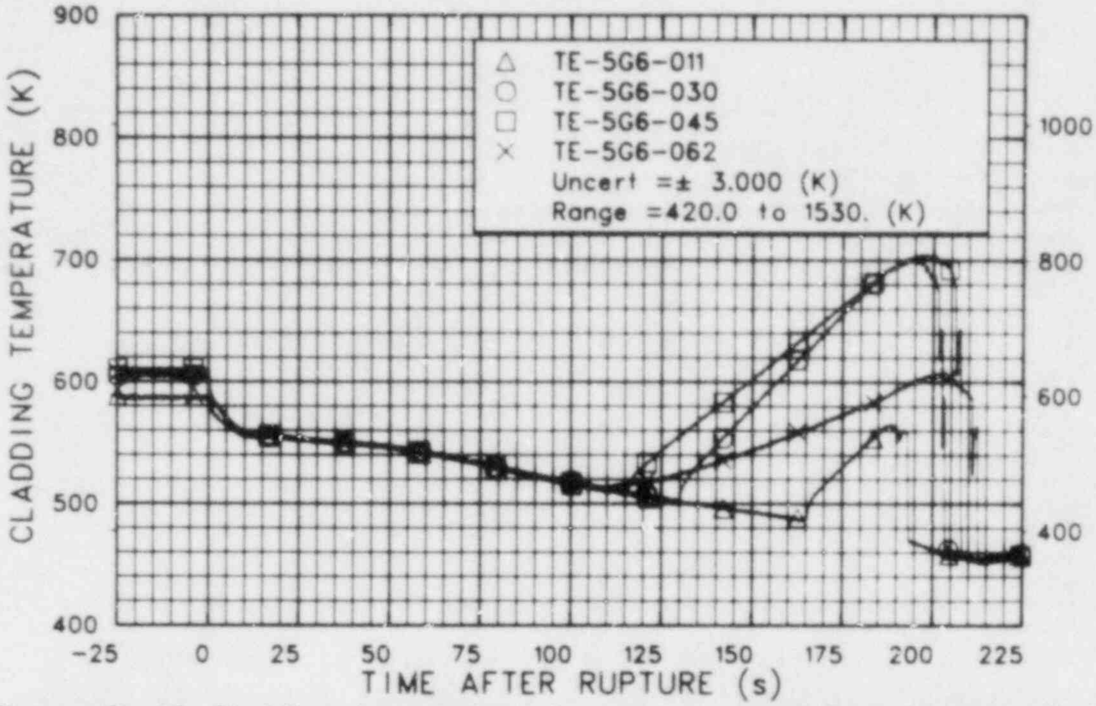


Figure 3L-49. Cladding temperature in reactor vessel Fuel Assembly 5, Row G, Column 6, 0.28, 0.76, 1.14, and 1.57 m above bottom of fuel rod (TE-5G6-011, -030, -045, and -062).

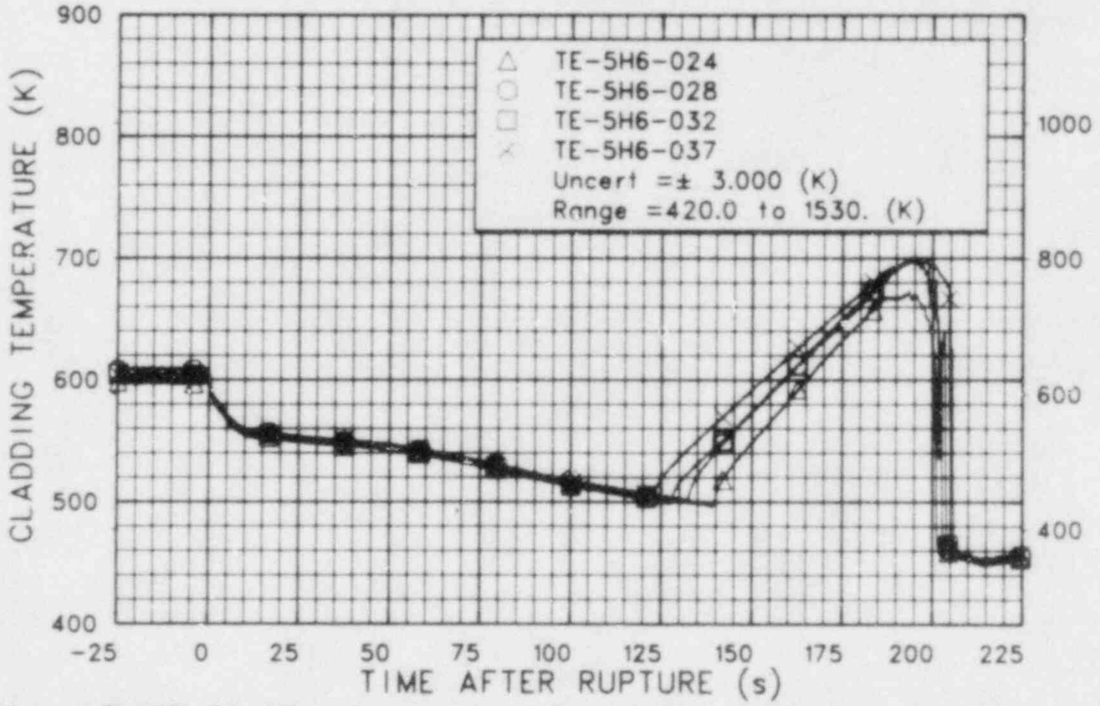


Figure 3L-50. Cladding temperature in reactor vessel Fuel Assembly 5, Row H, Column 6, 0.61, 0.71, 0.81, and 0.94 m above bottom of fuel rod (TE-5H6-024, -028, -032, and -037).

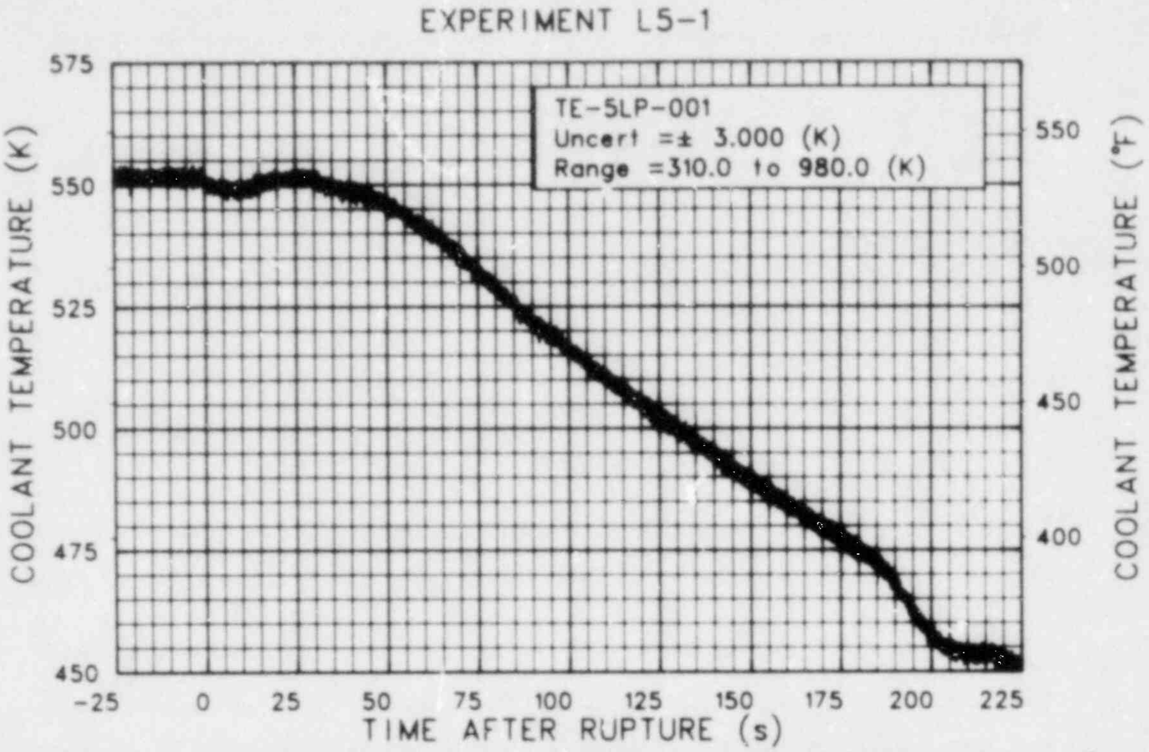


Figure 3L-51. Coolant temperature in reactor vessel at lower end box of Fuel Assembly 5 (TE-5LP-001).

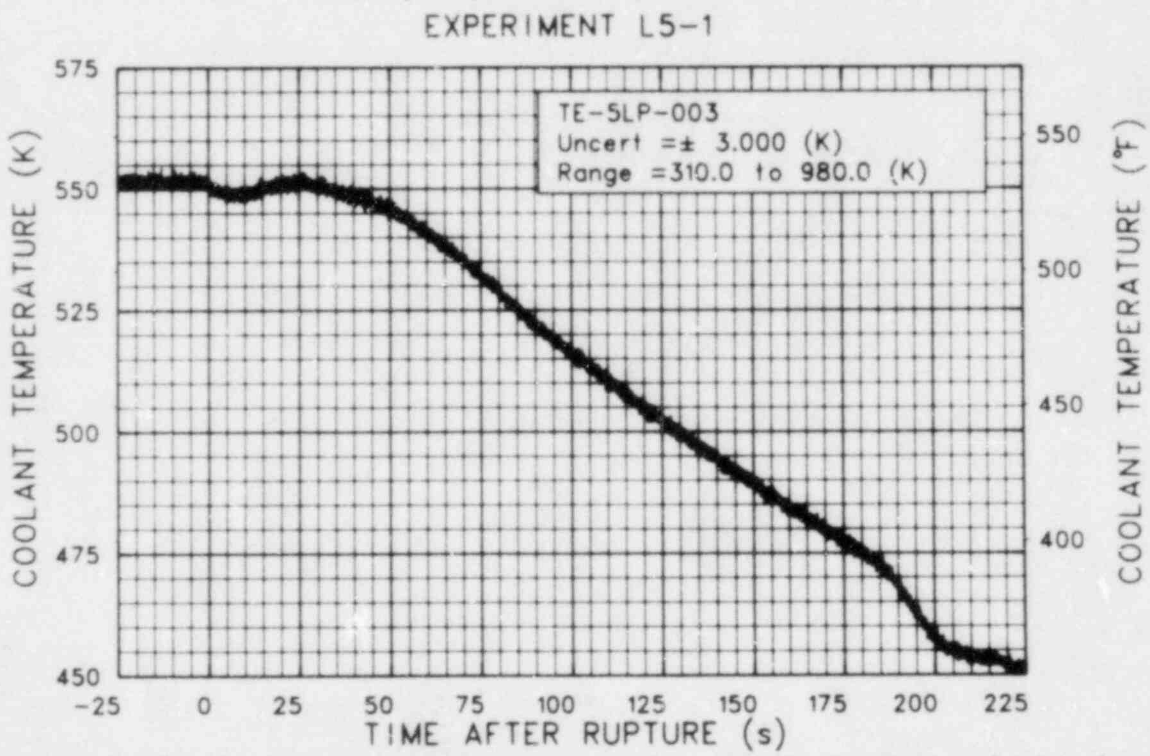


Figure 3L-52. Coolant temperature in reactor vessel at lower end box of Fuel Assembly 5 (TE-5LP-003).

EXPERIMENT L5-1

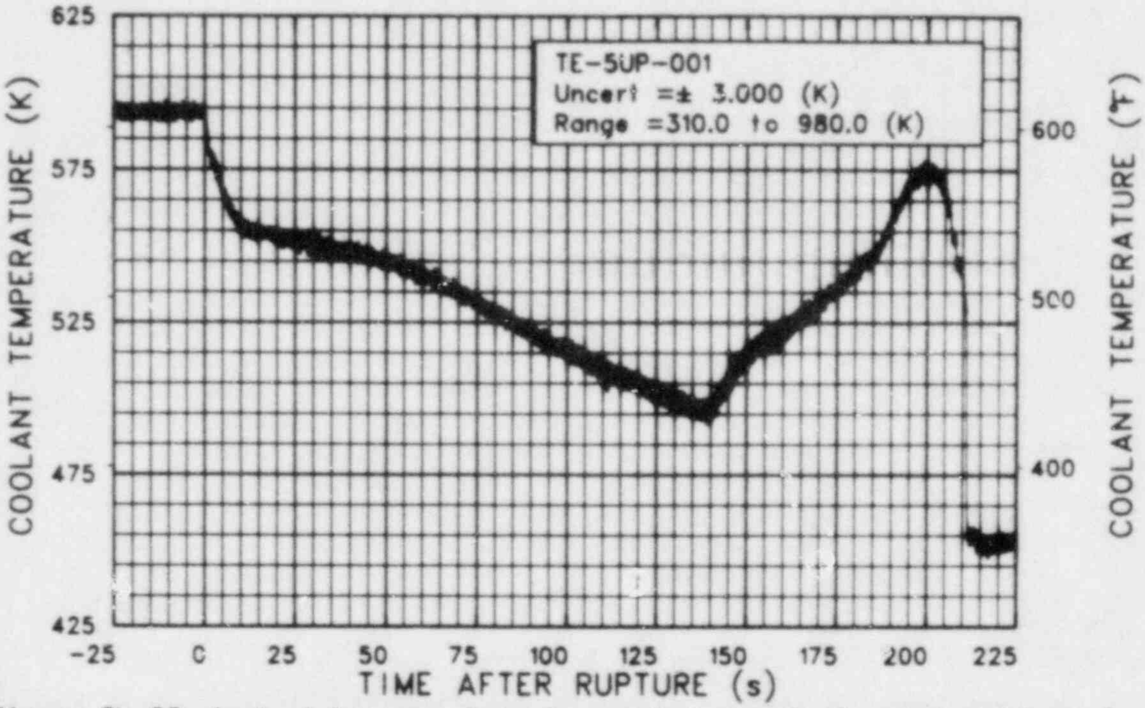


Figure 3L-53. Coolant termperature in reactor vessel at upper end box of Fuel Assembly 5 (TE-5UP-001).

EXPERIMENT L5-1

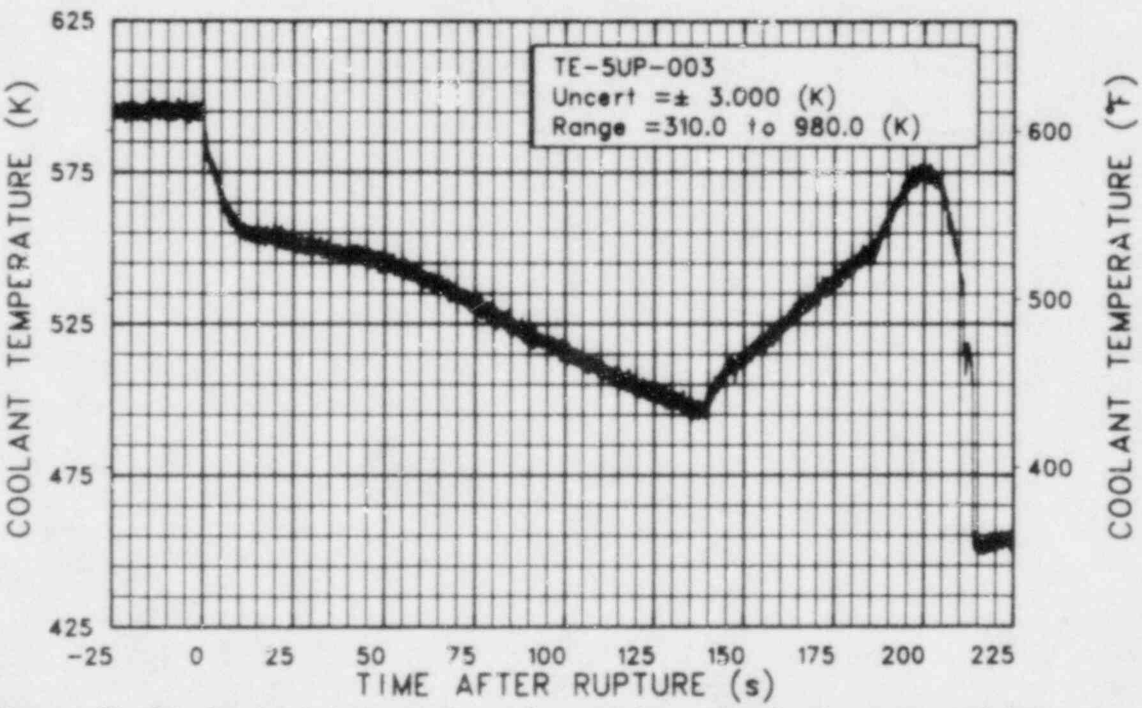


Figure 3L-54. Coolant temperature in reactor vessel at upper end box of Fuel Assembly 5 (TE-5UP-003).

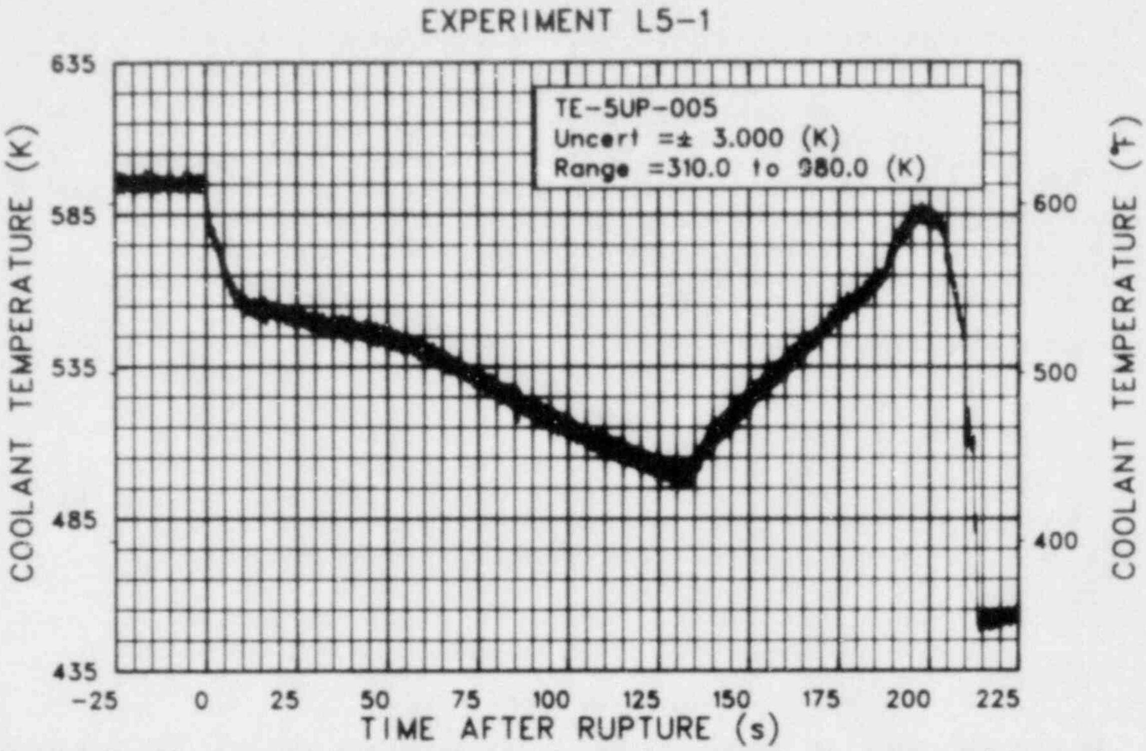


Figure 3L-55. Coolant temperature in reactor vessel at upper end box of Fuel Assembly 5 (TE-5UP-005).

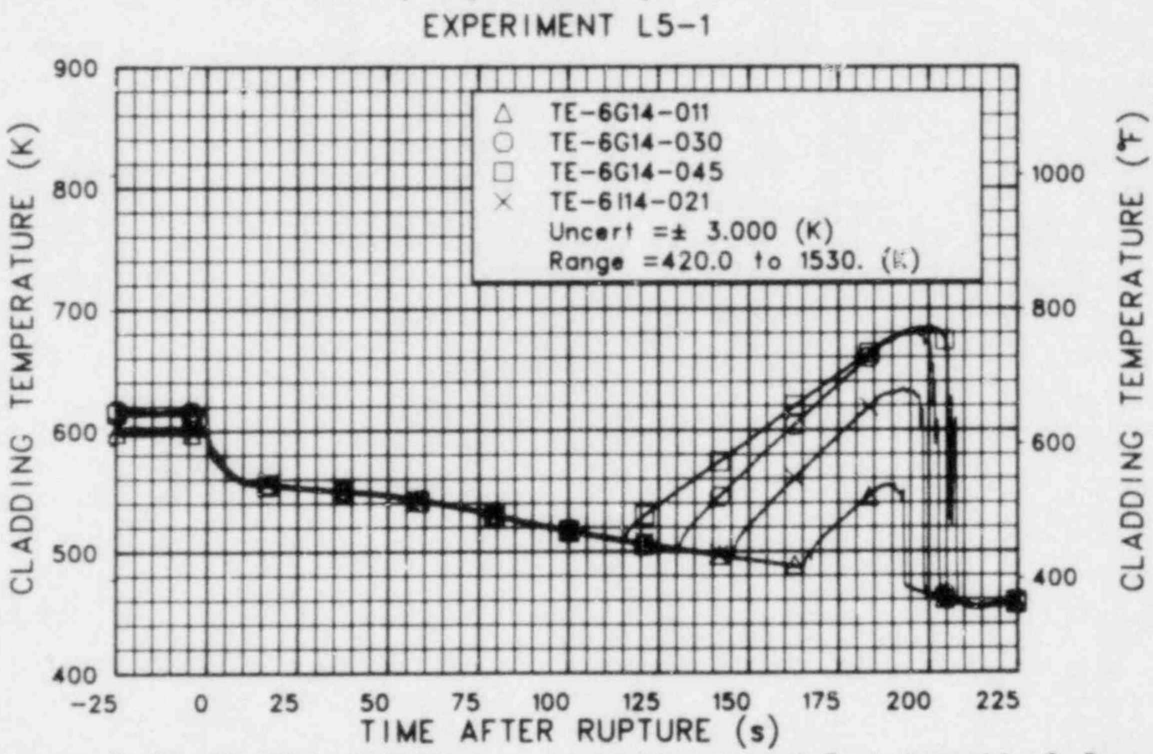


Figure 3L-56. Cladding temperature in reactor vessel Fuel Assembly 6, Rows G and I, Column 14, 0.28, 0.76, 1.14, and 0.53 m above bottom of fuel rod (TE-6G14-011, -030, -045, and -6I14-021).

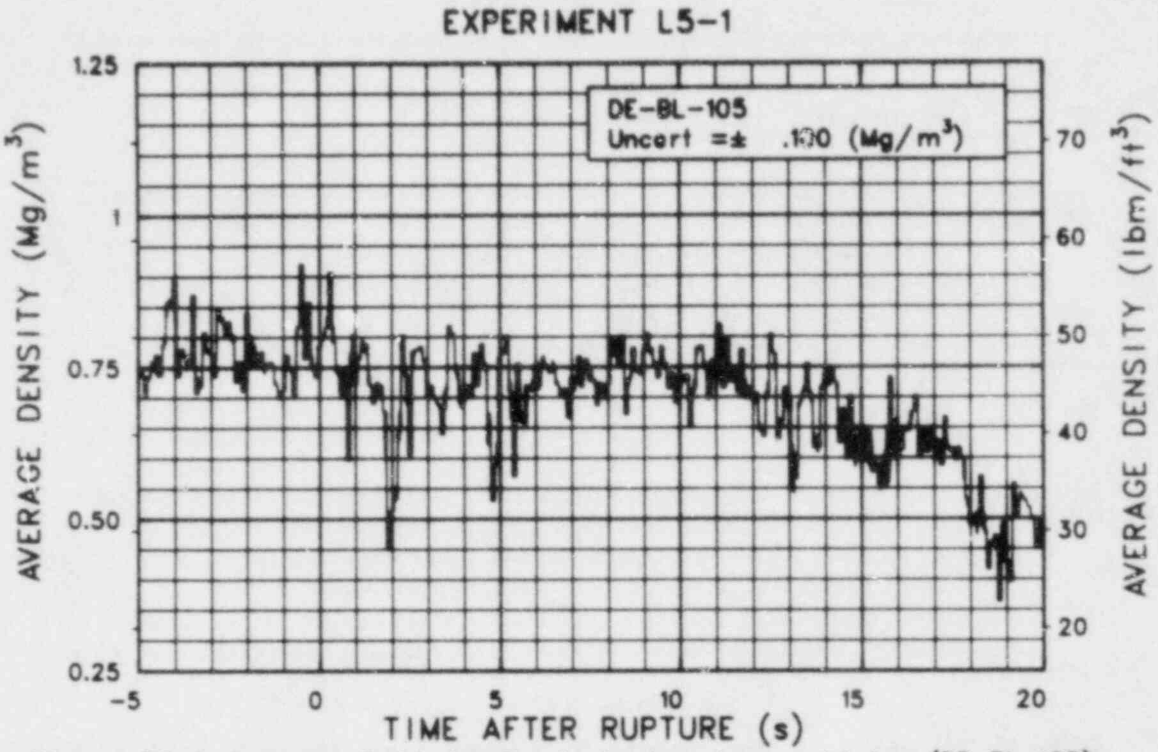


Figure 3C-1. Average fluid density in broken loop cold leg (DE-BL-105).

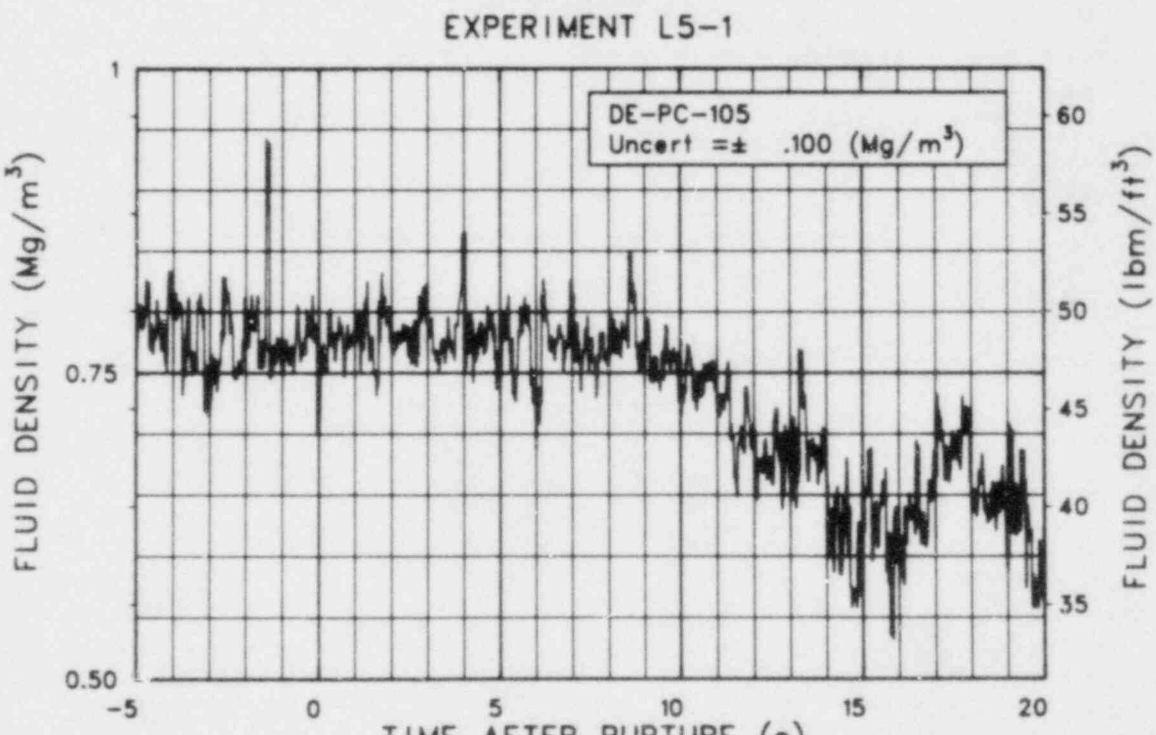


Figure 3C-2. Average fluid density in intact loop cold leg (DE-PC-105).

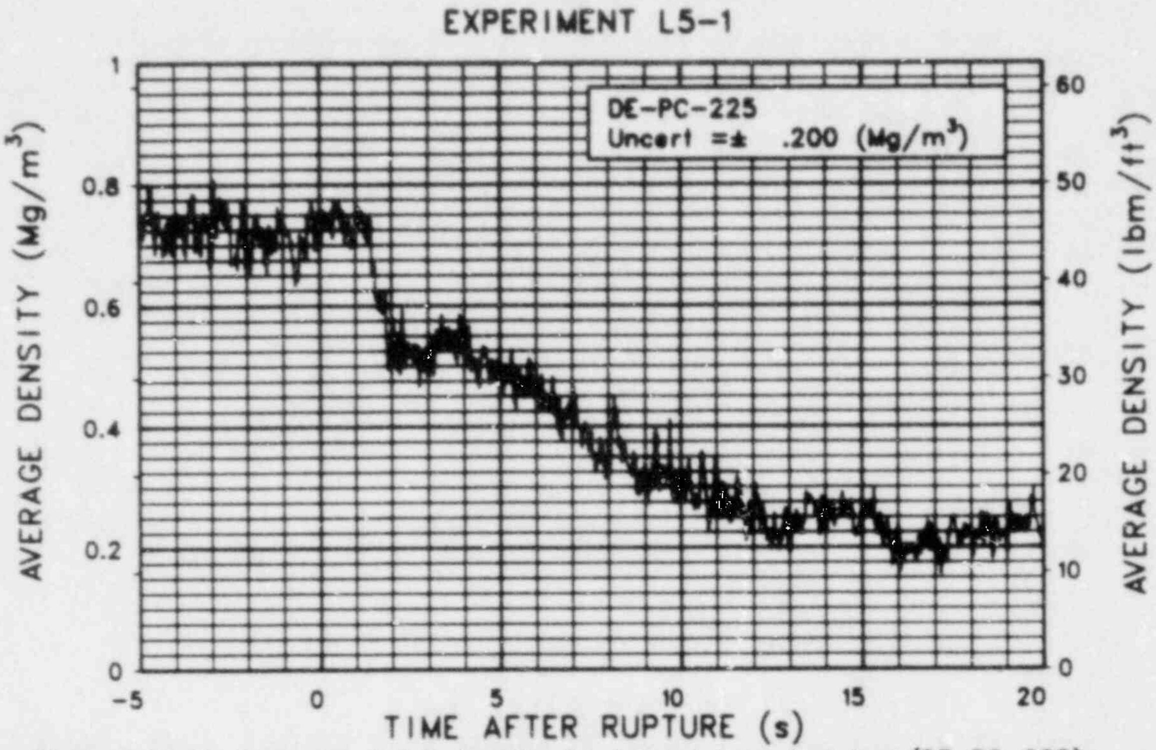


Figure 3C-3. Average fluid density in intact loop hot leg (DE-PC-225).

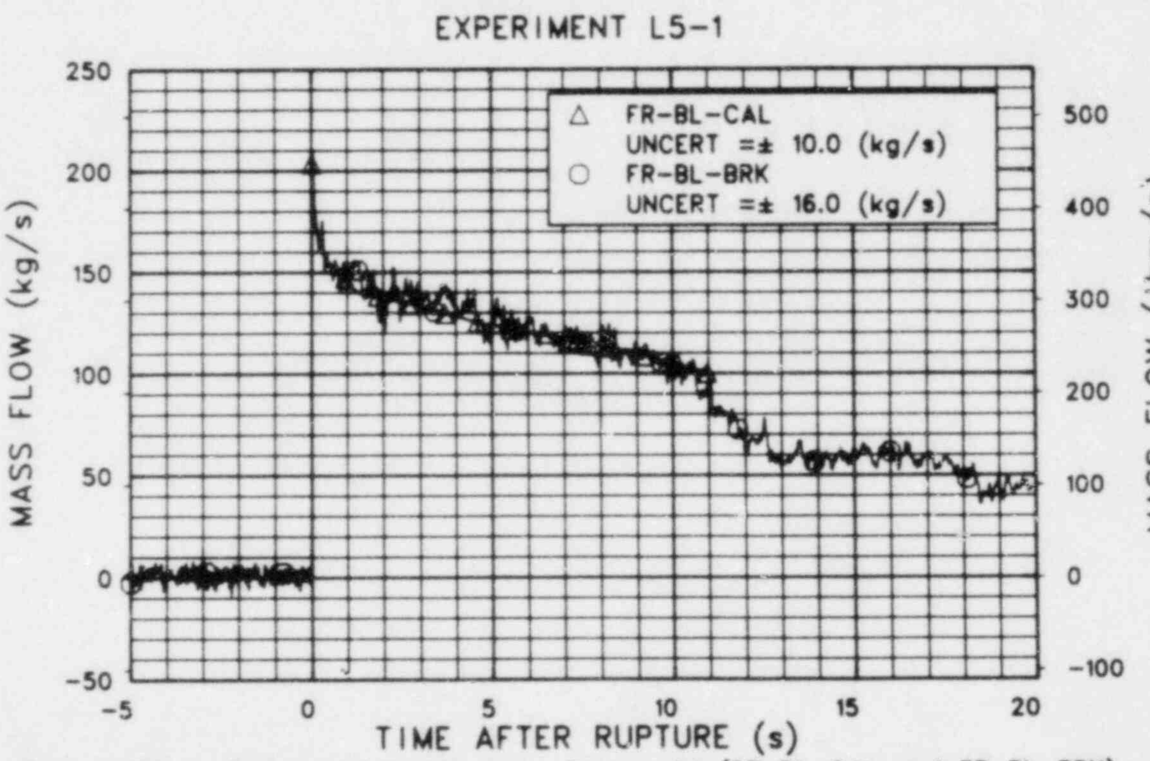


Figure 3C-4. Subcooled break mass flow rate (FR-BL-CAL and FR-BL-BRK) (FR-BL-CAL qualified to 10.5 s).

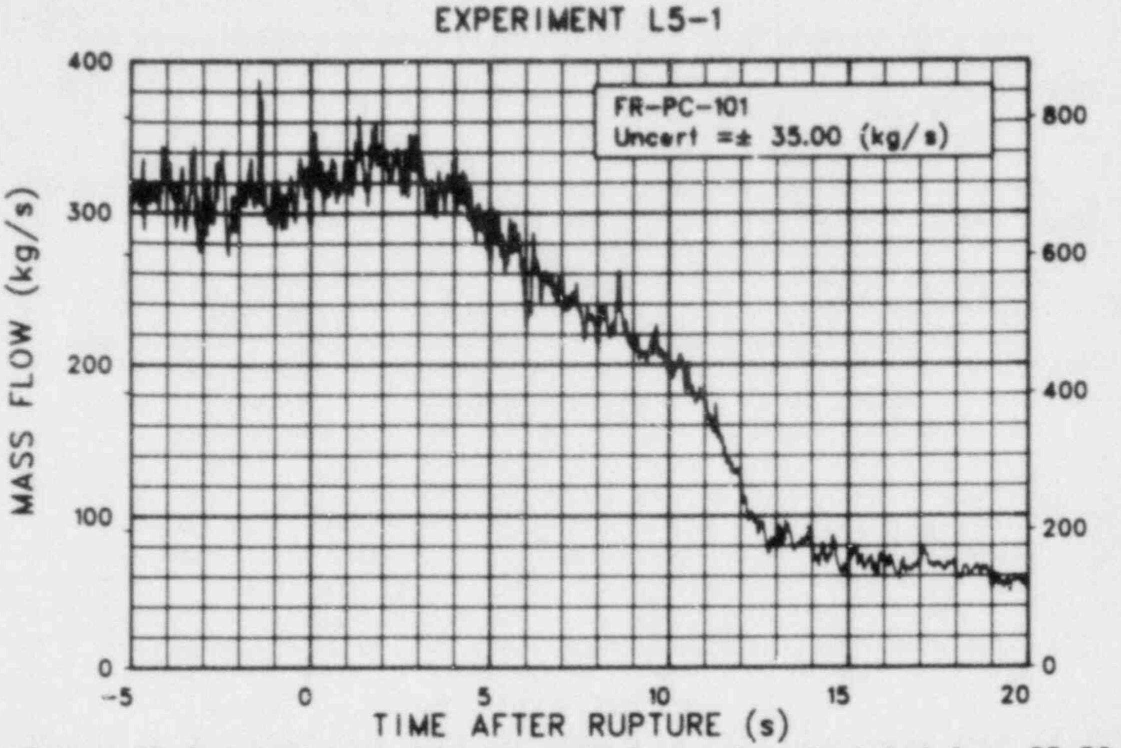


Figure 3C-5. Intact loop cold leg mass flow rate calculated from DE-PC-105 and FE-PC-001 (FR-PC-101).

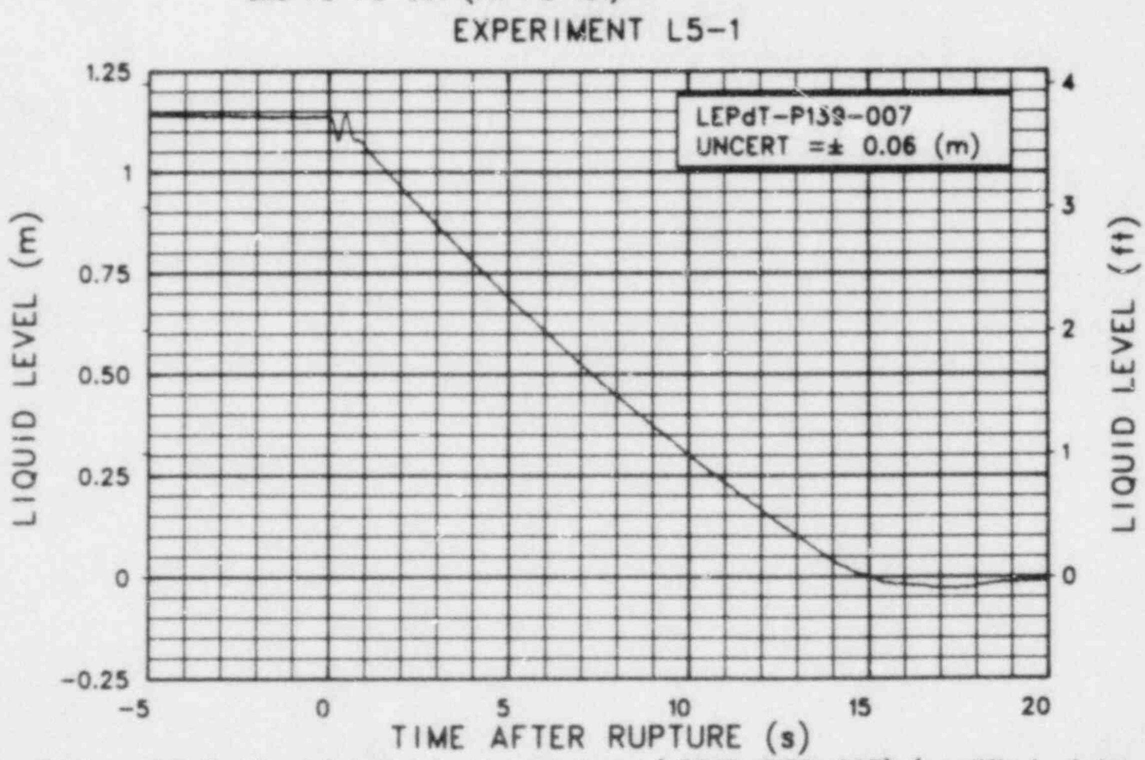


Figure 3C-6. Liquid level in pressurizer (LEPdT-P139-007) (qualified, data valid to 100 s).

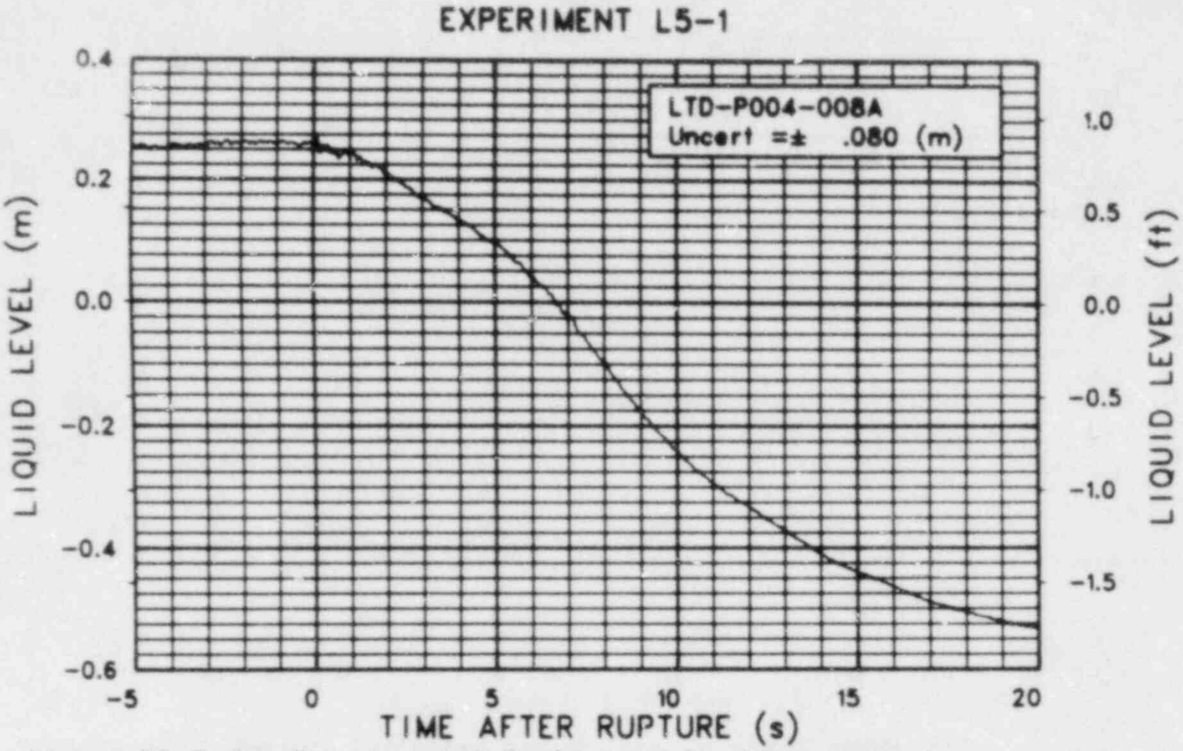


Figure 3C-7. Density corrected liquid level in steam generator (LTD-P004-008A) (qualified, magnitude uncertain).

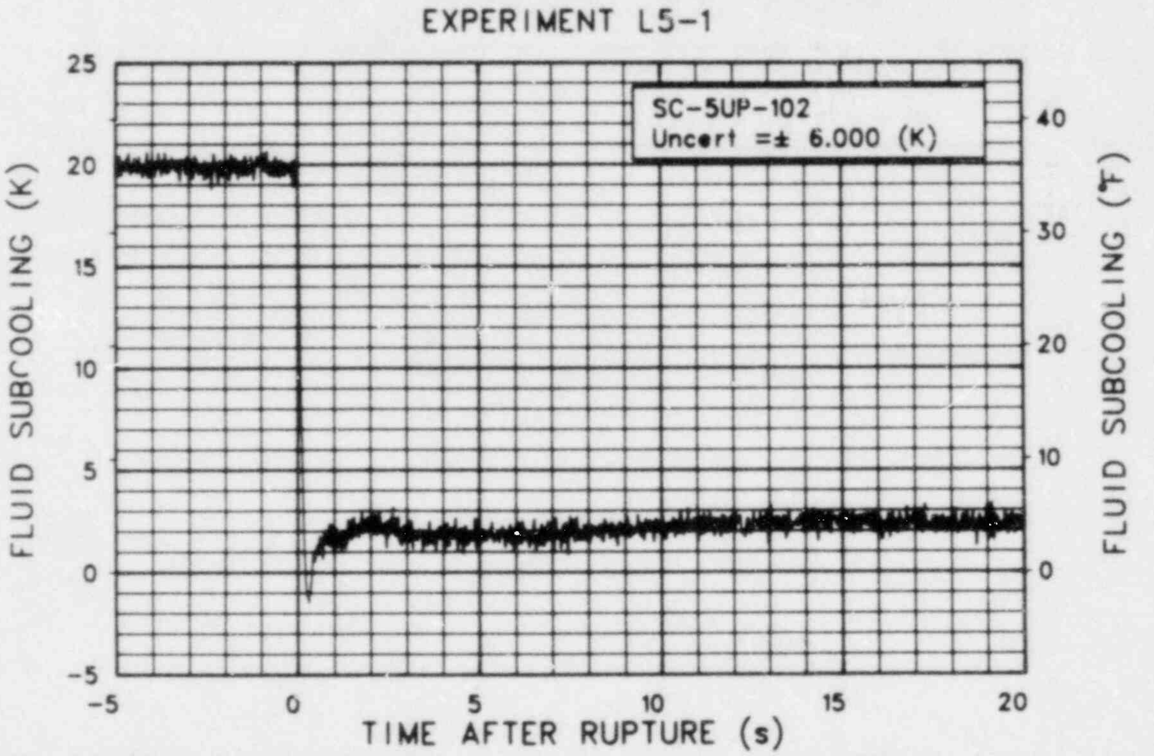


Figure 3C-8. Fluid subcooling in reactor vessel upper plenum (SC-5UP-102).

EXPERIMENT L5-1

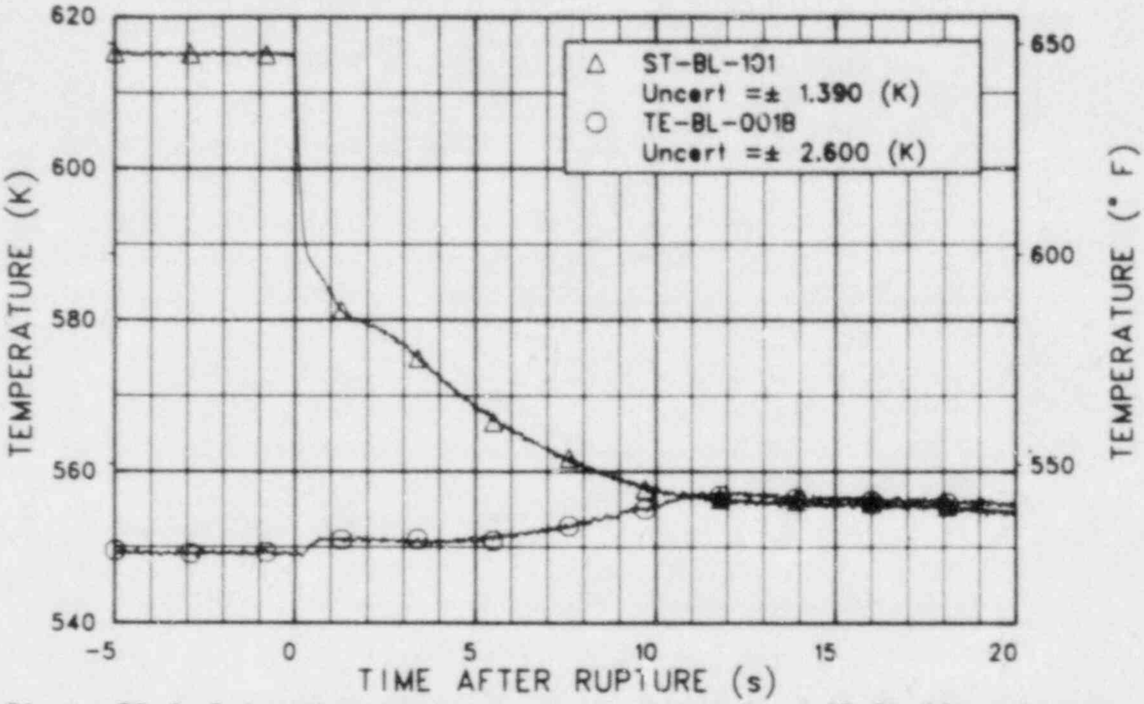


Figure 3C-9. Saturation temperature calculated from PE-BL-001 overlayed with coolant temperature in broken loop cold leg (ST-BL-101 and TE-BL-001B) (qualified, possible hot wall effects TE-BL-001B only).

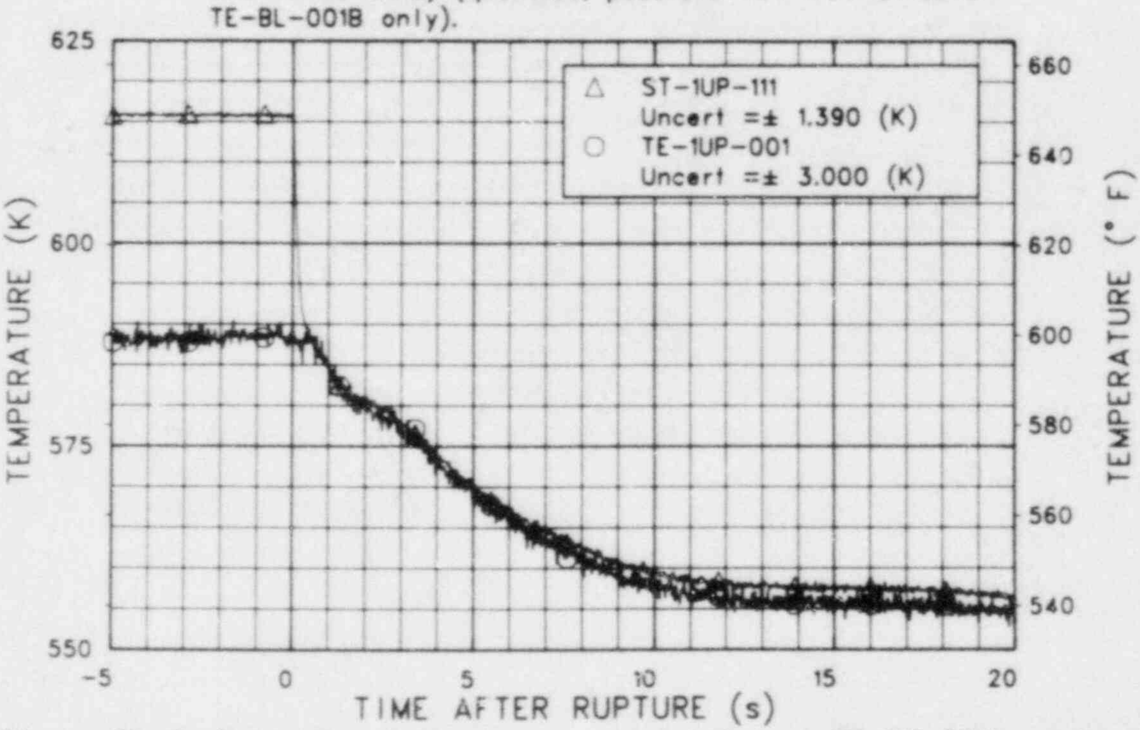


Figure 3C-10. Saturation temperature calculated from PE-1UP-001A overlayed with coolant temperature in reactor vessel at upper end box of Fuel Assembly 1 (ST-1UP-111 and TE-1UP-001).

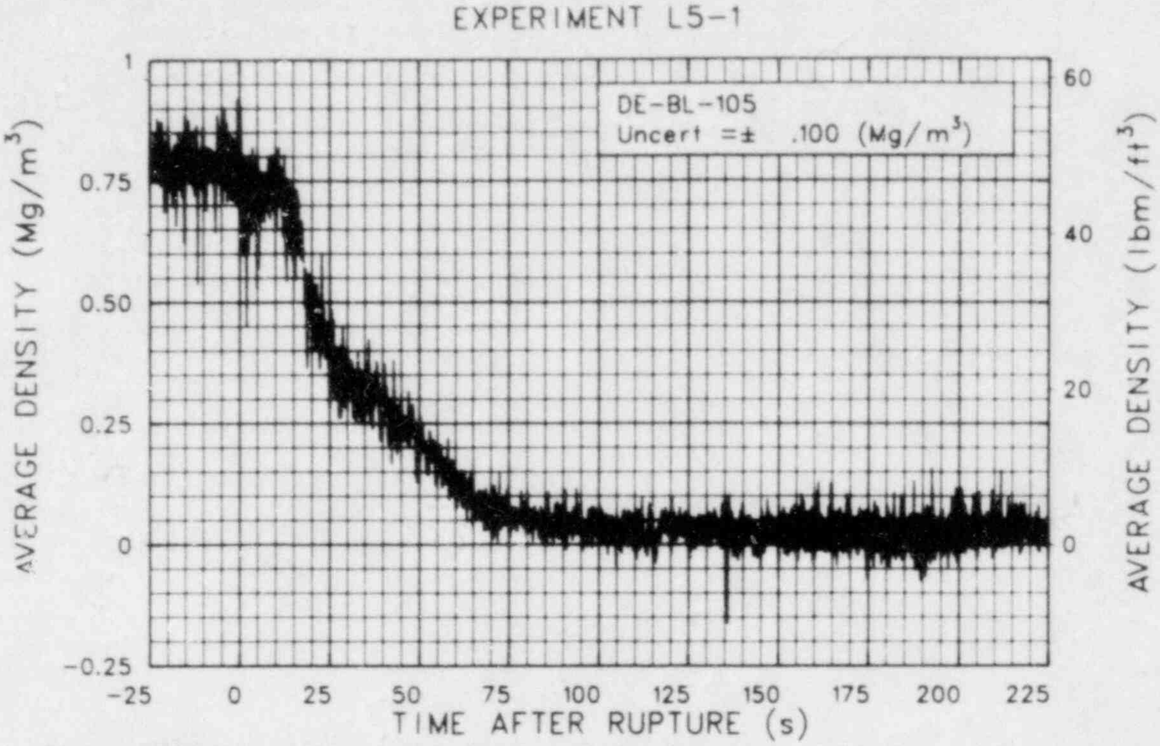


Figure 3C-11. Average fluid density in broken loop cold leg (DE-BL-105).

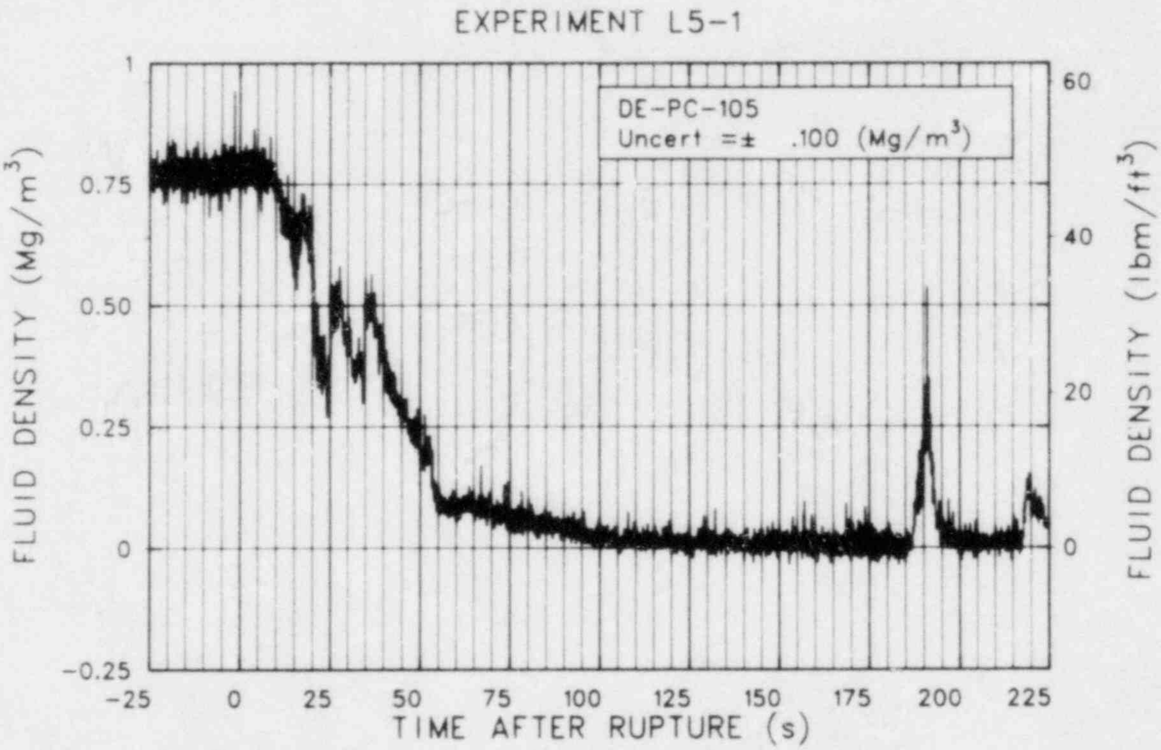


Figure 3C-12. Average fluid density in intact loop cold leg (DE-PC-105).

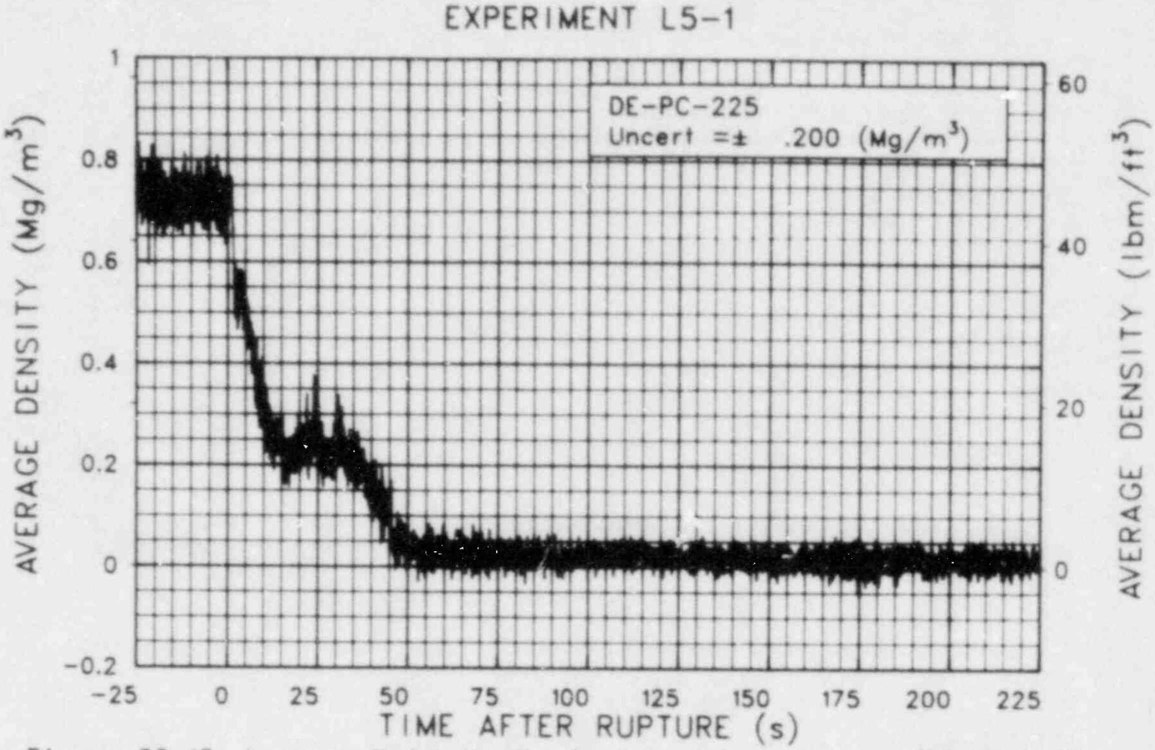


Figure 3C-13. Average fluid density in intact loop hot leg (DE-PC-225).

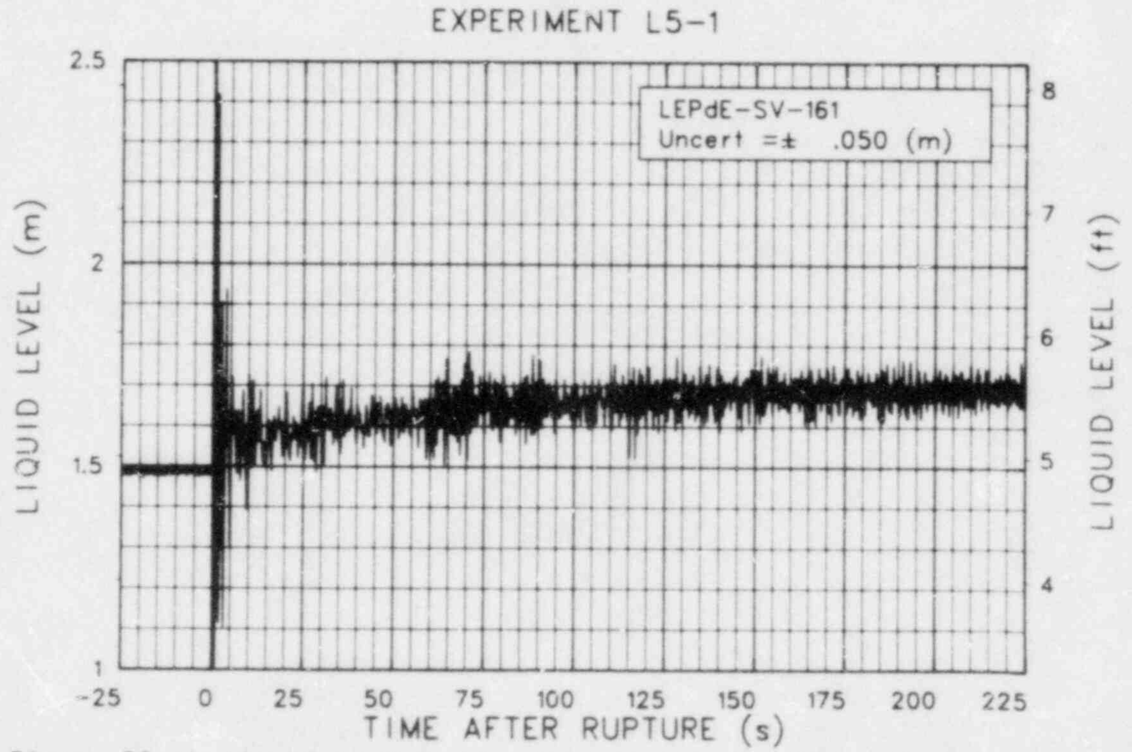


Figure 3C-14. Liquid level in blowdown suppression tank calculated from TE-SV-006, -011, and PdE-SV-001 (LEPdE-SV-161).

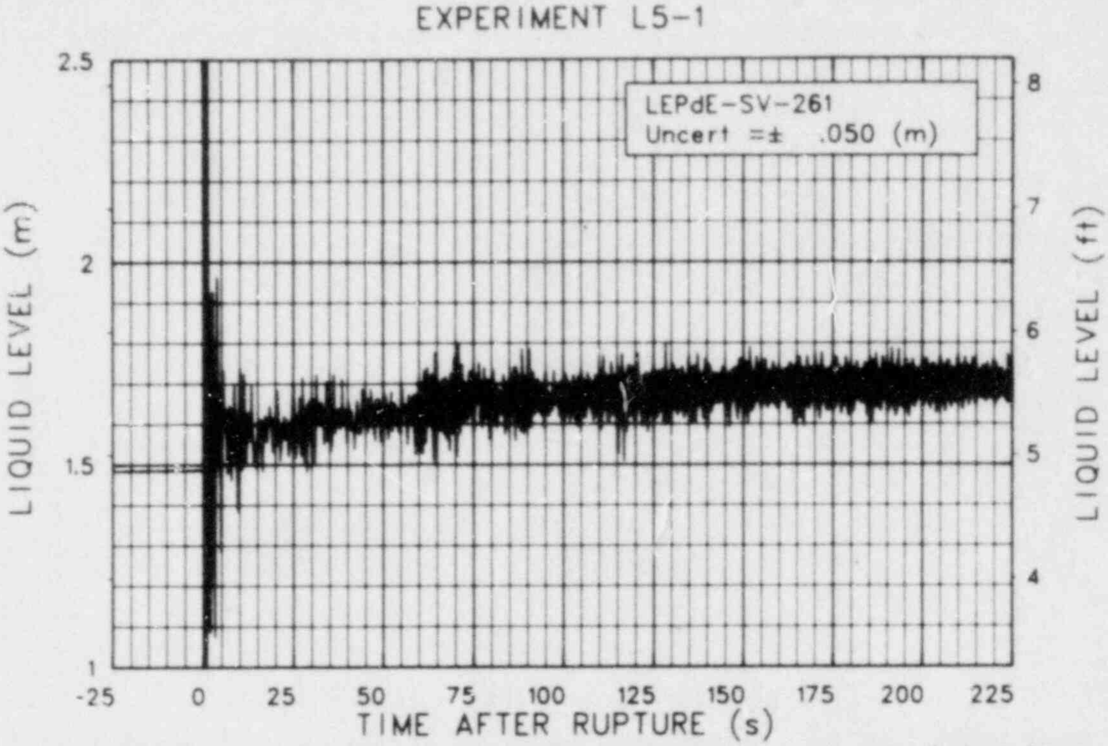


Figure 3C-15. Liquid level in blowdown suppression tank calculated from TE-SV-006, -011, and PdE-SV-002 (LEPdE-SV-261).

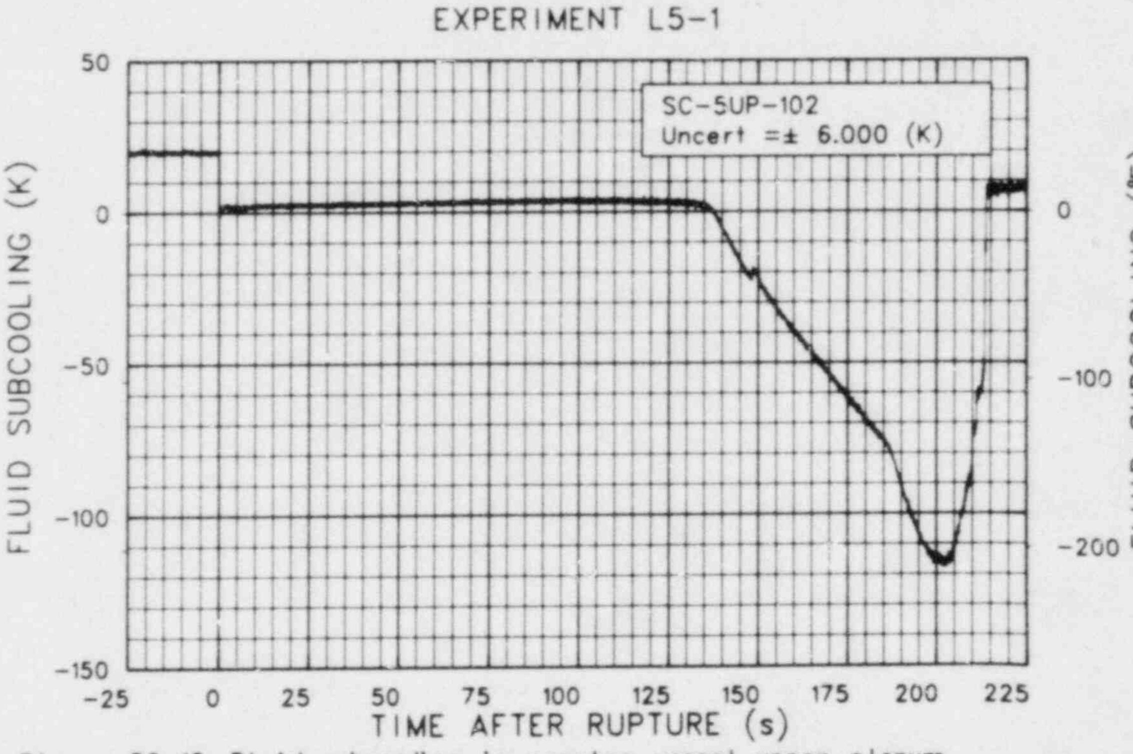


Figure 3C-16. Fluid subcooling in reactor vessel upper plenum (SC-5UP-102).

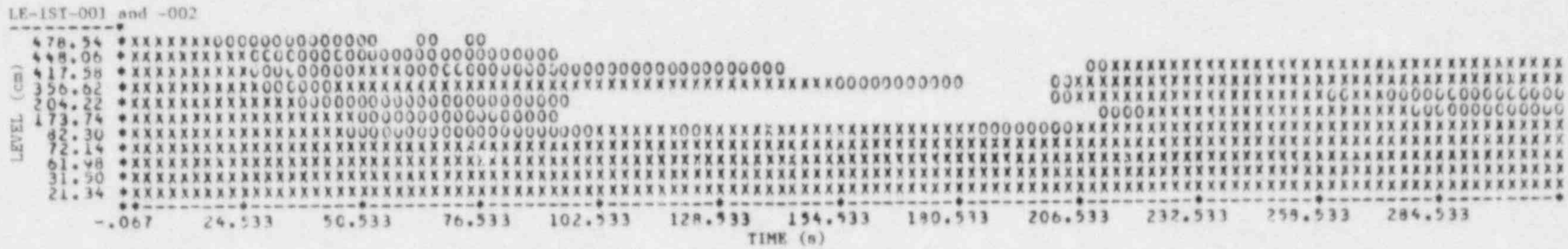


Figure 3C-17. Liquid level in reactor vessel Downcomer Stalk 1, bubble plot (LE-1ST-001 and -002).

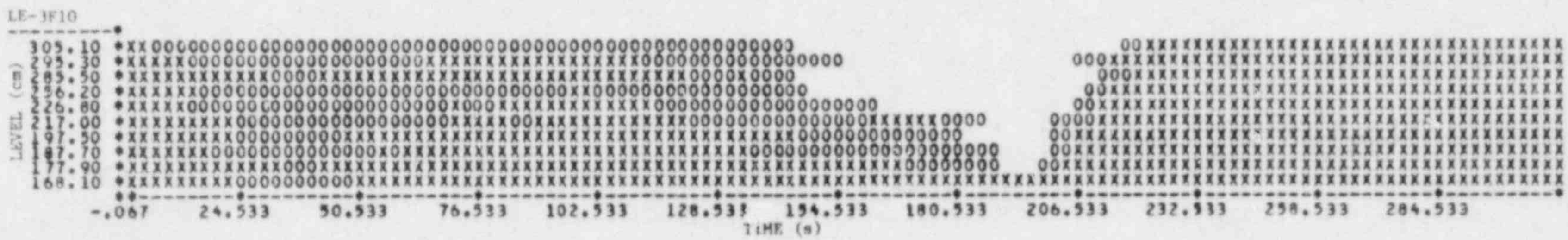


Figure 3C-18. Liquid level in reactor vessel core in Fuel Assembly 3, bubble plot (LE-3F10).

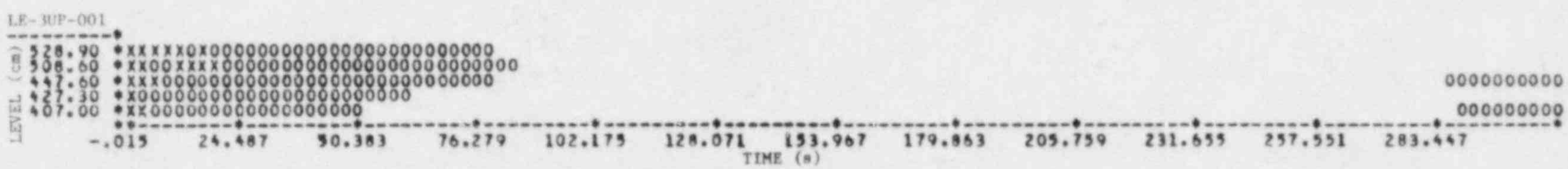


Figure 3C-19. Liquid level in reactor vessel upper plenum above Fuel Assembly 3, bubble plot (LE-3UP-001).

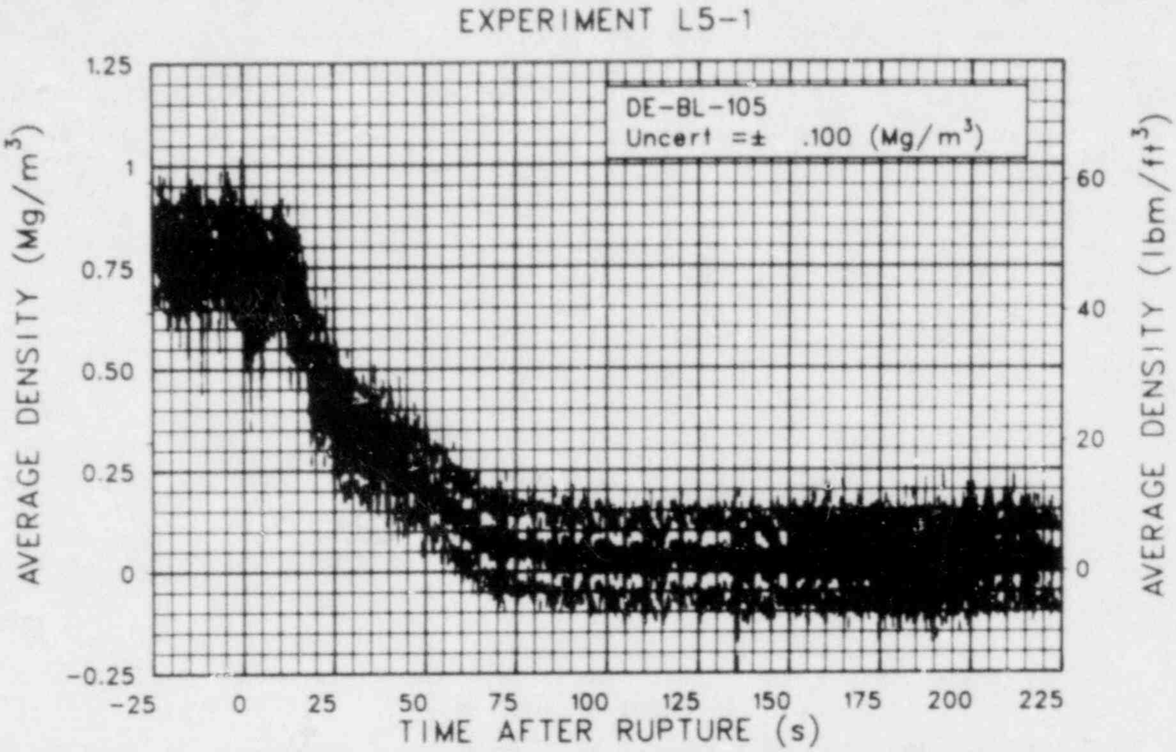


Figure 3U-1. Average fluid density in broken loop cold leg, chordal density (DE-BL-105).

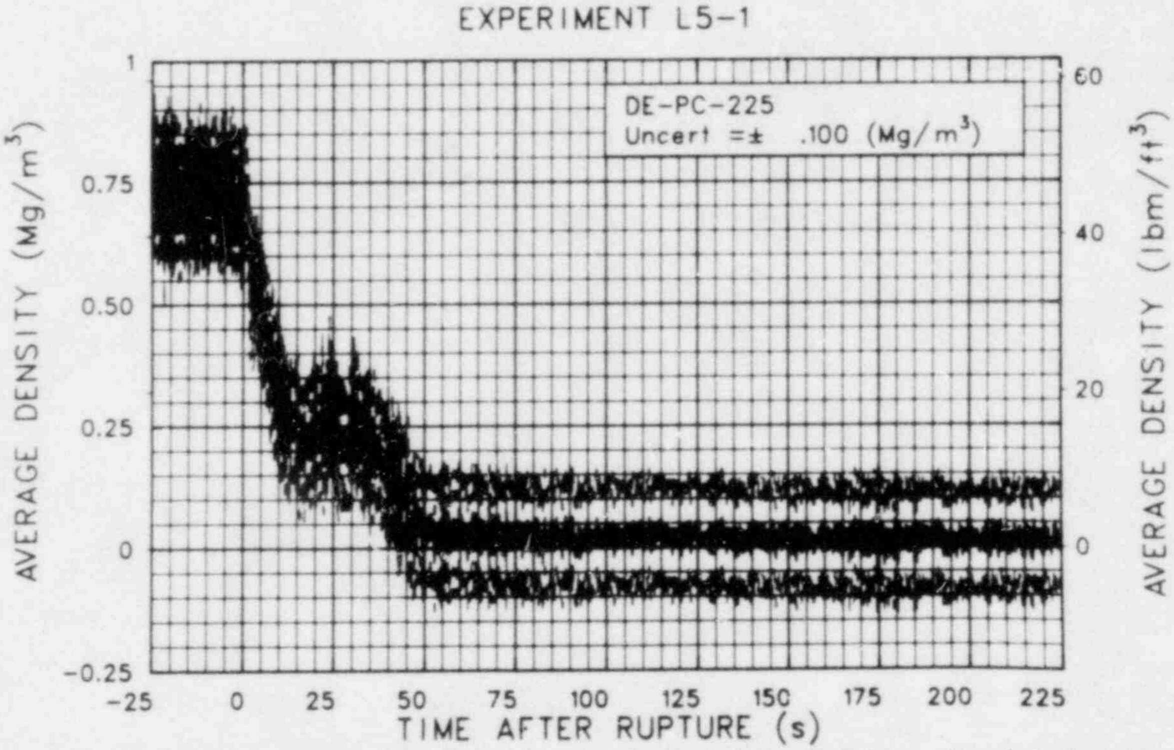


Figure 3U-2. Average fluid density in intact loop hot leg, chordal density (DE-PC-225).

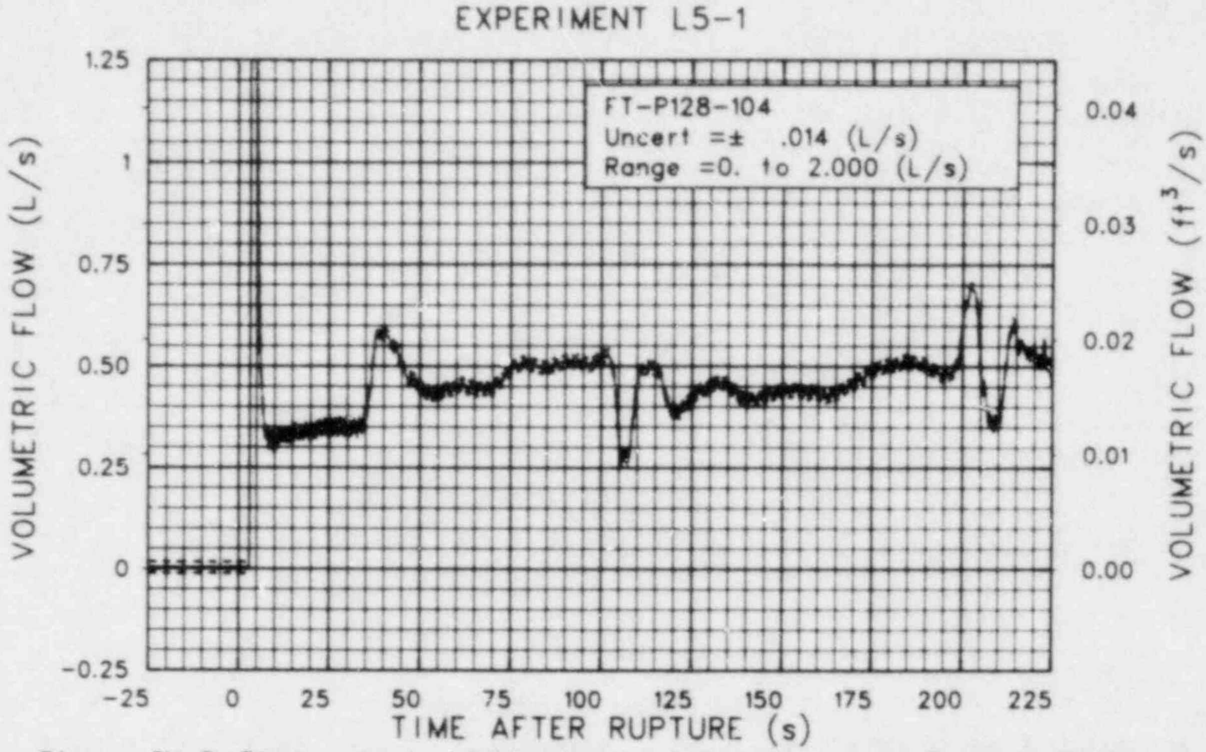


Figure 3U-3. Flow rate in high-pressure injection system Pump A discharge (FT-P128-104).

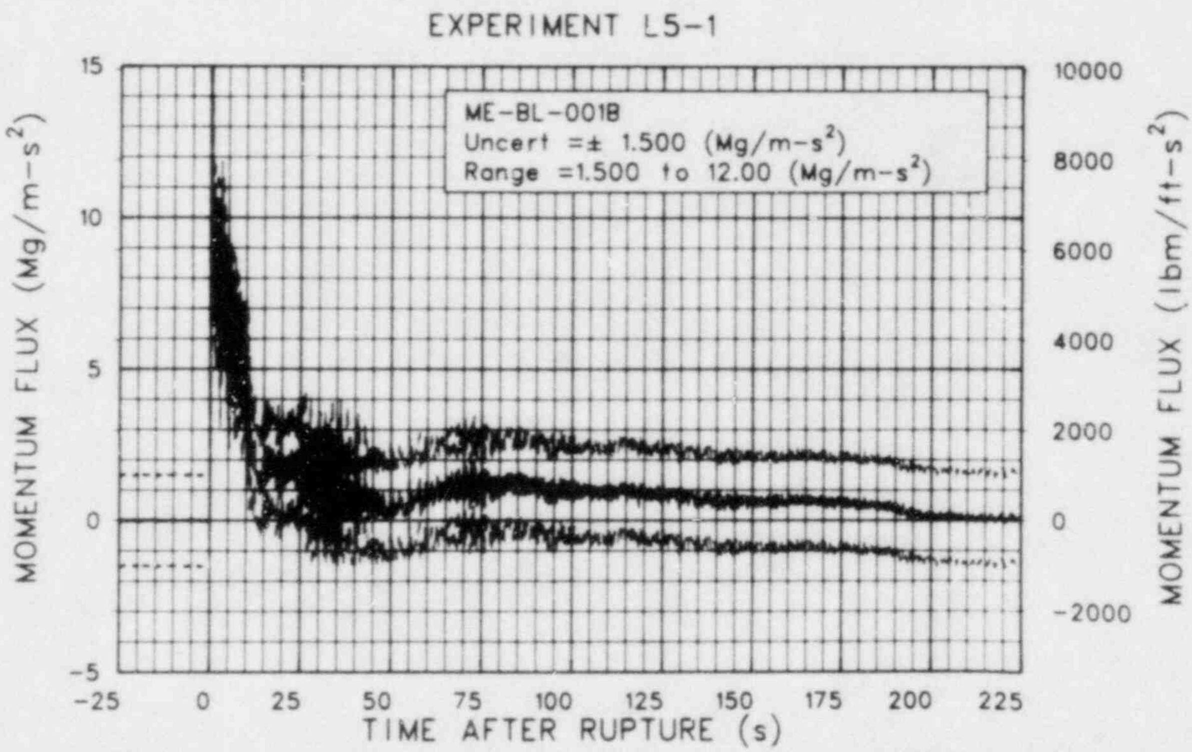


Figure 3U-4. Momentum flux in broken loop cold leg at middle of pipe, high range (ME-BL-001B).

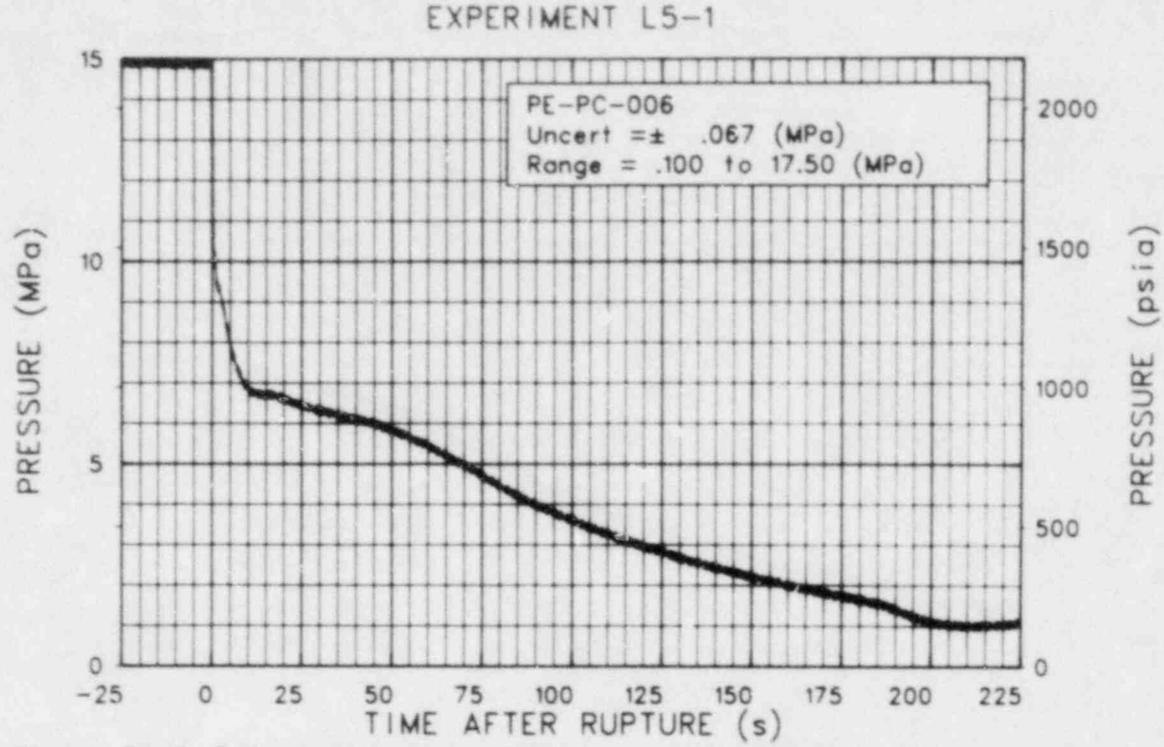


Figure 3U-5. Reference pressure between steam generator outlet and pump inlet (PE-PC-006).

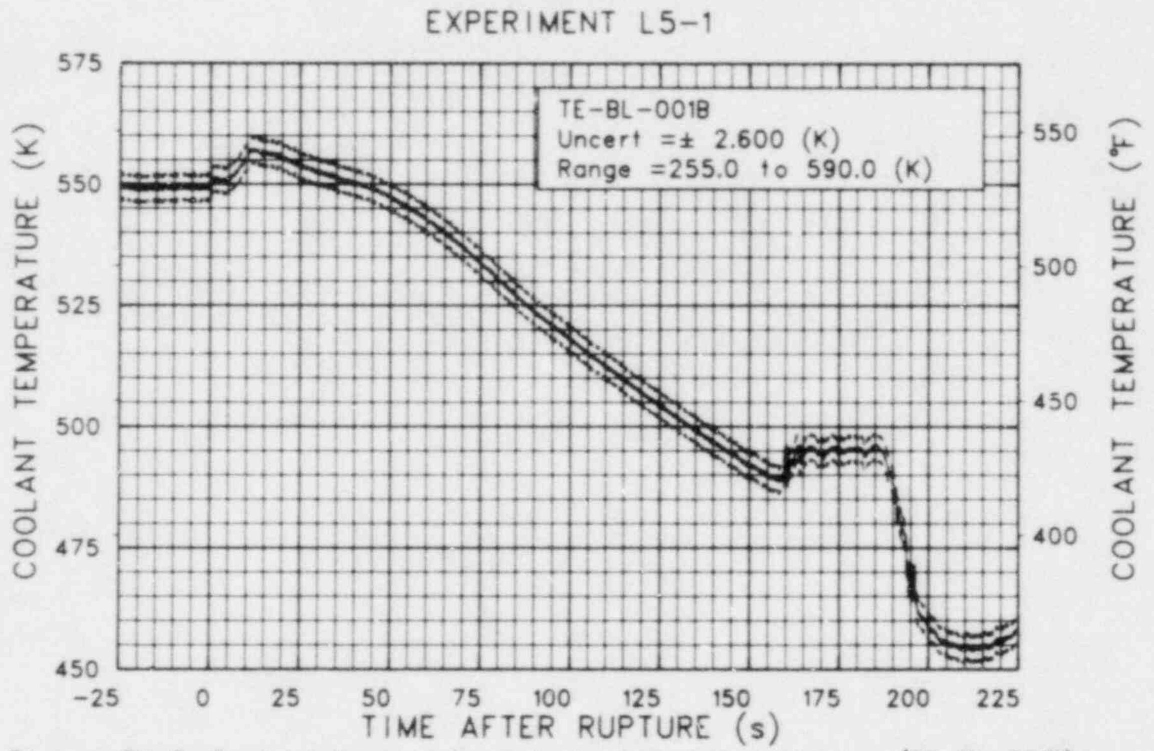


Figure 3U-6. Coolant temperature in broken loop cold leg (TE-BL-001B) (qualified, possible hot wall effects).

4. EXPERIMENTS L5-1 AND L8-2 COMPARISON DATA PRESENTATION

The data presentation in this section are from Experiments L5-1 and L8-2. The data have been overlayed to show the comparison of these two experiments.

Table 4-1 lists the selected measurements presented in this section and gives the detector location and the figure numbers. In addition, this table contains a "Comments" column that gives information pertaining to the usability of the data.

The data are divided into three categories as follows:

1. Experiments L5-1 and L8-2 Measured Variables, Short-Term Plots (-5 to 20 s), Figures 4S-1 through 4S-3
2. Experiments L5-1 and L8-2 Measured Variables, Long-Term Plots (0 to 200 s), Figures 4L-1 through 4L-20
3. Experiments L5-1 and L8-2 Computed Variables, Figures 4C-1 through 4C-5.

TABLE 4-1. MEASURED VARIABLES PRESENTED FOR EXPERIMENTS L5-1 AND L8-2 COMPARISON

Variable, System, and Detector	Location	Figure Number	Comments[a]
VALVE OPENING			
Broken Loop			
CV-P138-001	Quick-opening blowdown valve (QOBV) in cold leg.	4S-1	Qualified.
CHORDAL DENSITY			
Broken Loop			
DE-BL-001B	Cold leg at drag disc-turbine transducer (DTT) flange. Beam B is through centerline of pipe 45° from vertical [counter-clockwise (CCW) looking toward reactor vessel (RV)].	4L-1	Qualified (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).
DE-BL-001C	Cold leg at DTT flange. Beam C is 22°, 7 min from Beam B (CCW looking toward RV).	4L-2	Qualified, some large data processing spikes (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).

TABLE 4-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments[a]
FLUID VELOCITY			
Intact Loop			
FE-PC-001B	Cold leg horizontal DTT flange at center of pipe.	4L-3	Qualified.
FE-PC-002B	Hot leg DTT flange at middle of pipe.	4L-4	Qualified.
MOMENTUM FLUX			
Broken Loop			
ME-BL-001A	Cold leg DTT flange at bottom of pipe, high range.	4L-5	Qualified.
ME-BL-001B	Cold leg DTT flange at middle of pipe, high range.	4L-6	Qualified.
ME-BL-001C	Cold leg DTT flange at top of pipe, high range.	4L-7	Qualified.
Intact Loop			
ME-PC-001A	Cold leg horizontal DTT flange at far side of pipe as viewed from rake flange.	4L-8	Qualified.
ME-PC-002B	Hot leg DTT flange at middle of pipe.	4L-9	Qualified.
NEUTRON DETECTION			
Reactor Vessel			
NE-2H8-26	Neutron detector in Fuel Assembly 2.	4S-2	Qualified (L5-1). Qualified, anomalous spike at approximately 300 s (L8-2).

TABLE 4-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments[a]
DIFFERENTIAL PRESSURE			
Broken Loop			
PdE-BL-018	Cold leg across nozzle spoolpiece.	4L-10	Qualified (L5-1). Qualified, anomalous spikes prior to 110 s (L8-2).
Intact Loop			
PdE-PC-008	Across pressurizer surge line.	4L-11	Qualified, narrow range instrument, magnitude uncertain.
PdT-P139-030	Across RV just beyond intact loop inlet and outlet nozzles.	4S-3	Qualified, initial conditions only.
PRESSURE			
Broken Loop			
PE-BL-001	Cold leg at DTT flange.	4L-12	Qualified.
PE-BL-009	Cold leg upstream of nozzle.	4L-13	Qualified.
Intact Loop			
PE-PC-001	Cold leg at DTT flange.	4L-14	Qualified.
Secondary Coolant System			
PE-SGS-001	SG dome pressure.	4L-15	Qualified.
Reactor Vessel			
PE-1UP-001A	Above Fuel Assembly 1 upper end box.	4L-16	Qualified.

TABLE 4-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments[a]
TEMPERATURE			
Reactor Vessel			
TE-1B10-037	Cladding on Fuel Assembly 1, Row B, Column 10 at 0.94 m above bottom of fuel rod.	4L-17	Qualified.
TE-1B11-028	Cladding on Fuel Assembly 1, Row B, Column 11 at 0.71 m above bottom of fuel rod.	4L-18	Qualified.
TE-1B11-032	Cladding on Fuel Assembly 1, Row B, Column 11 at 0.81 m above bottom of fuel rod.	4L-19	Qualified.
TE-1B12-026	Cladding on Fuel Assembly 1, Row B, Column 12 at 0.66 m above bottom of fuel rod.	4L-20	Qualified.

a. The comments are the same for Experiments L5-1 and L8-2 unless the experiment is specified.

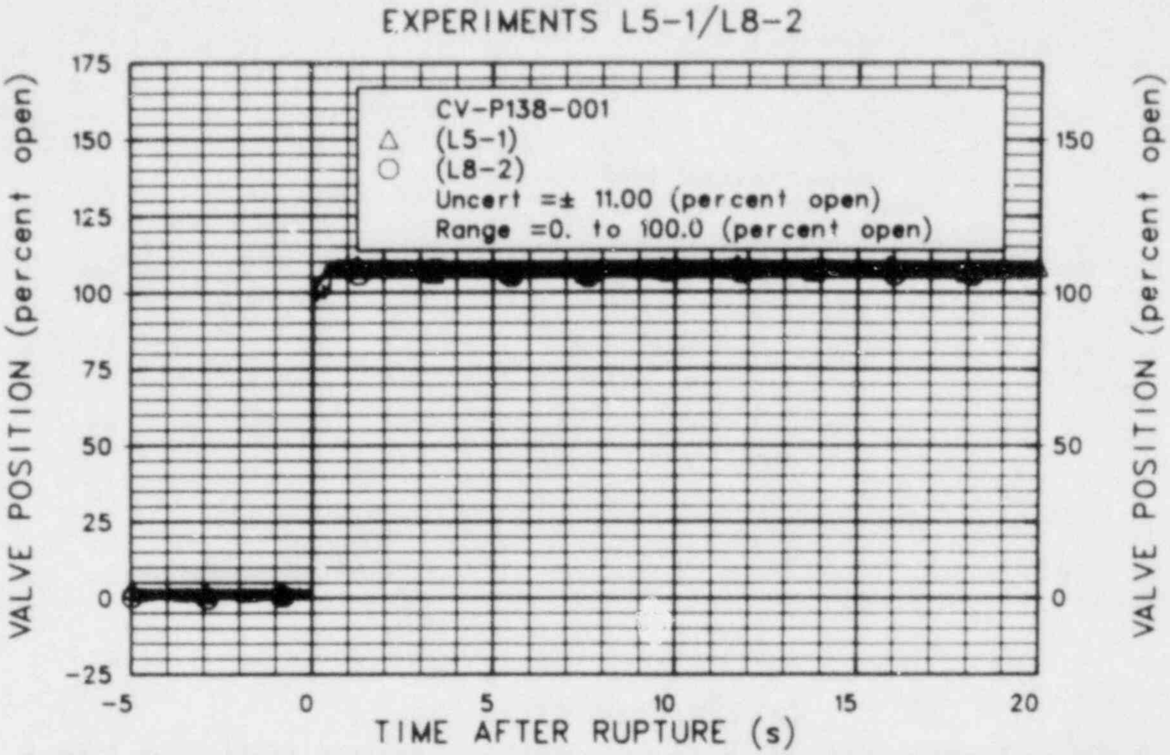


Figure 4S-1. Valve position in broken loop cold leg quick-opening blowdown valve (CV-P138-001).

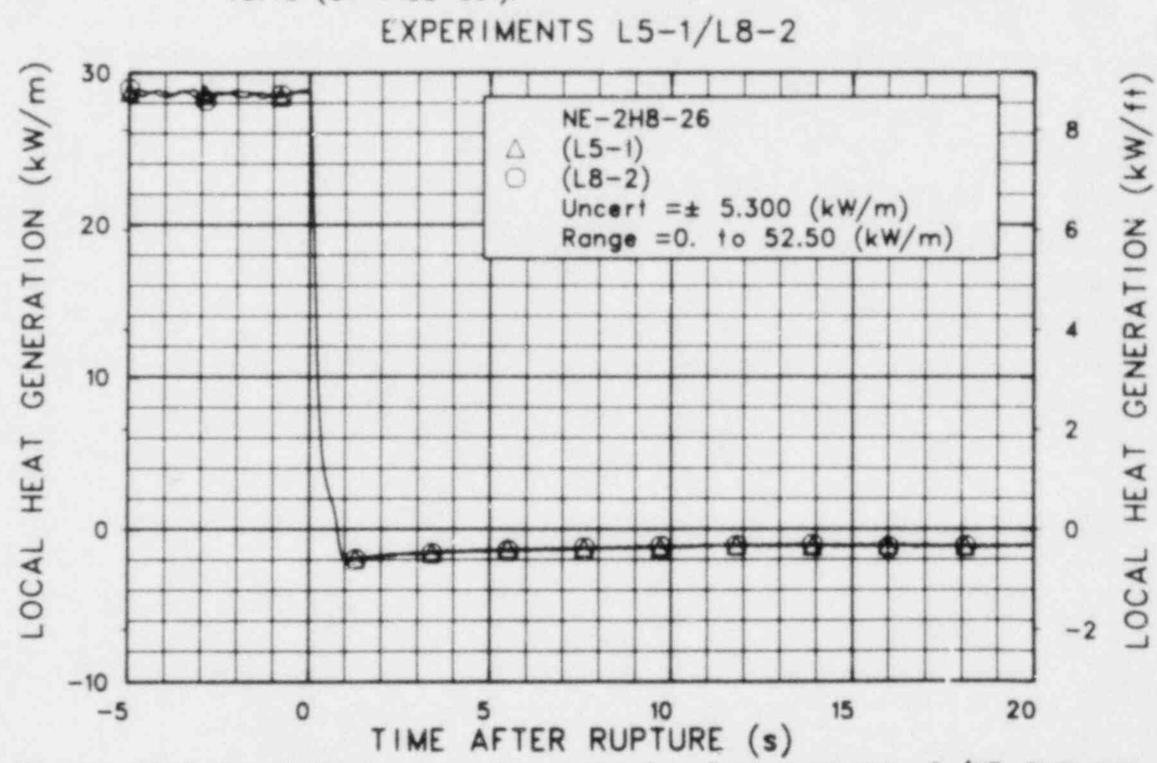


Figure 4S-2. Local heat generation rate for Fuel Assembly ? (NE-2H8-26) (qualified, anomalous spike at approximately 300 s; L8-2).

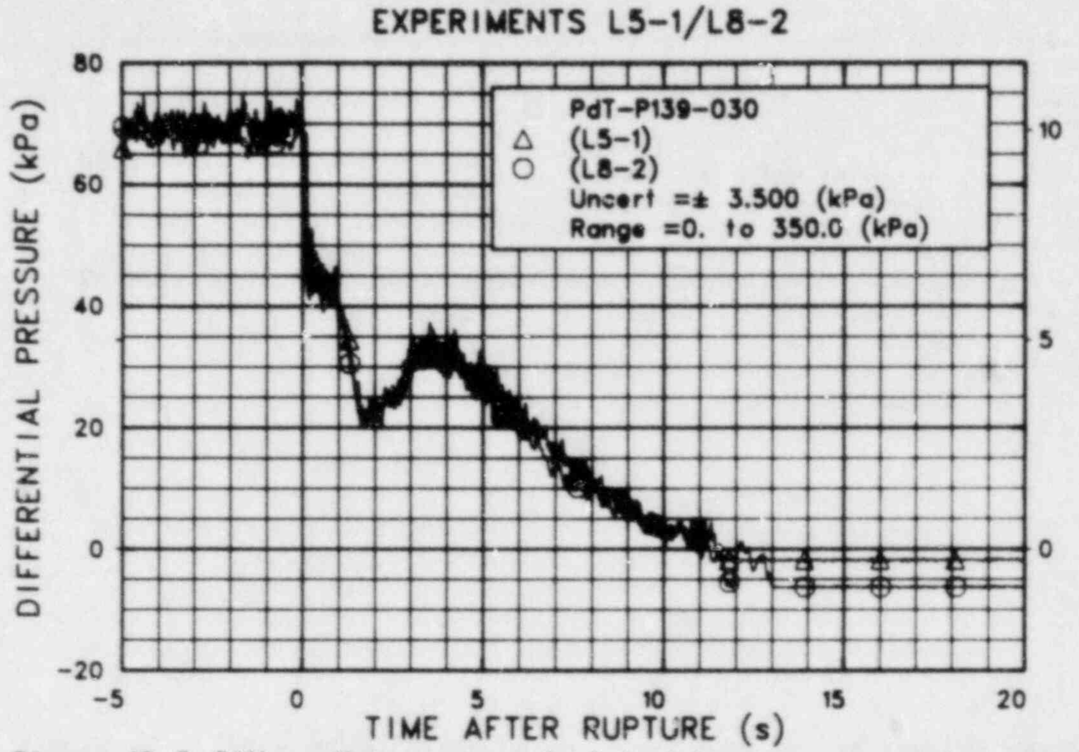


Figure 4S-3. Differential pressure in intact loop across reactor vessel (PdT-P139-030) (qualified, initial conditions only).

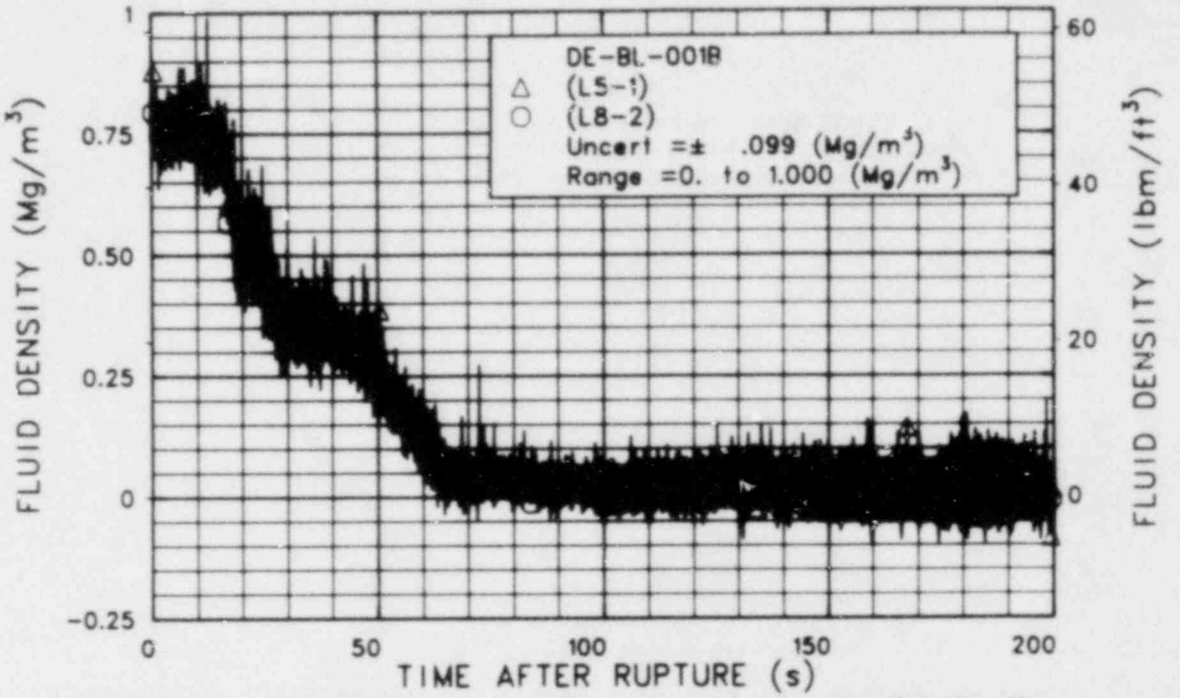


Figure 4L-1. Fluid density in broken loop cold leg, chordal density (DE-BL-001B) (qualified, invalid data between 310 and 360 s, replaced by interpolation; L8-2).

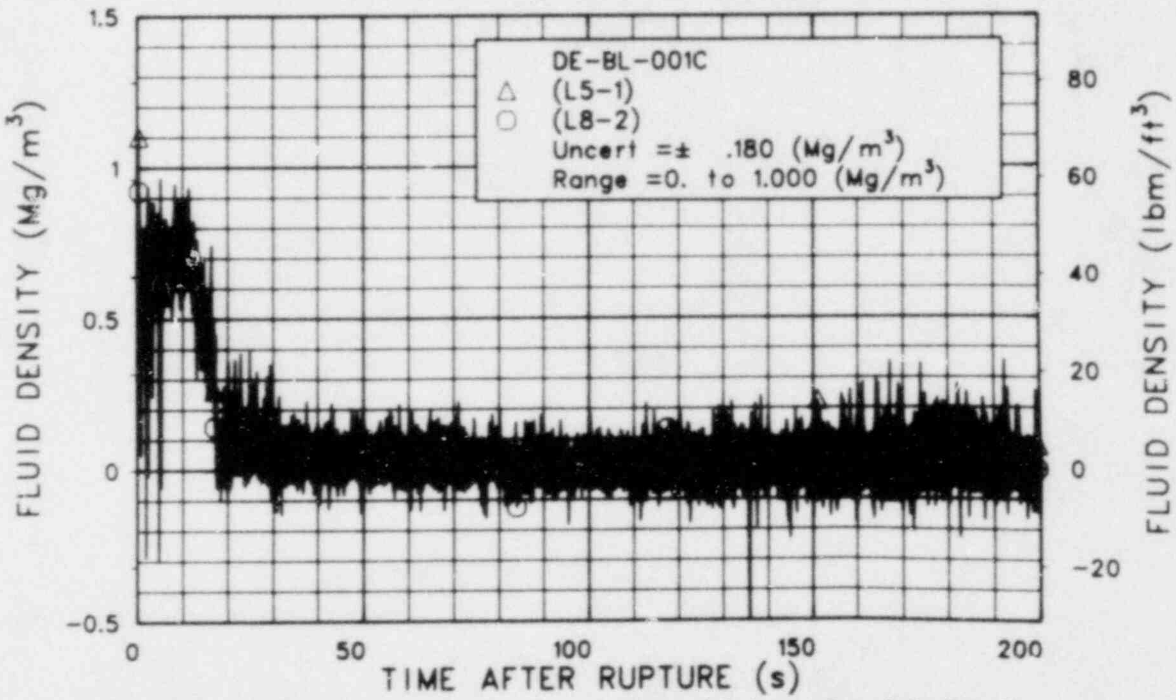


Figure 4L-2. Fluid density in broken loop cold leg, chordal density (DE-BL-001C) (qualified, some large data processing spikes; L5-1 invalid data between 310 and 360 s, replaced by interpolation; L8-2).

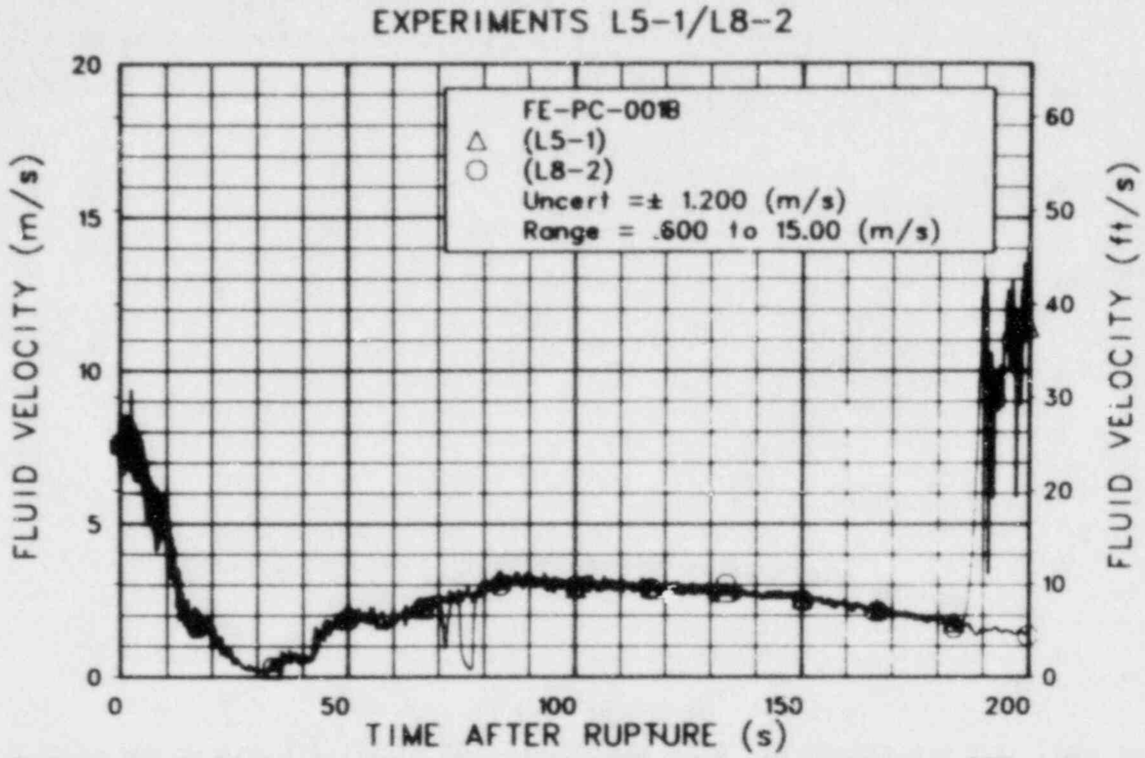


Figure 4L-3. Fluid velocity in intact loop cold leg horizontal DTT rake at center of pipe (FE-PC-001B).

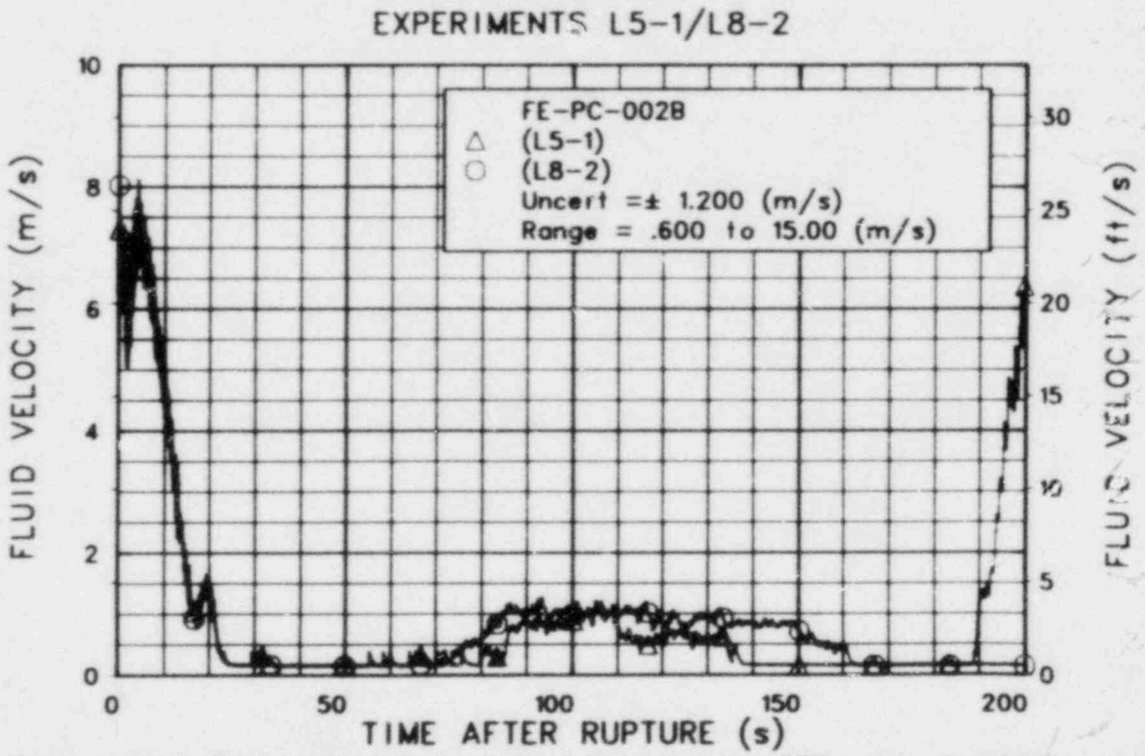


Figure 4L-4. Fluid velocity in intact loop hot leg DTT rake at middle of pipe (FE-PC-002B).

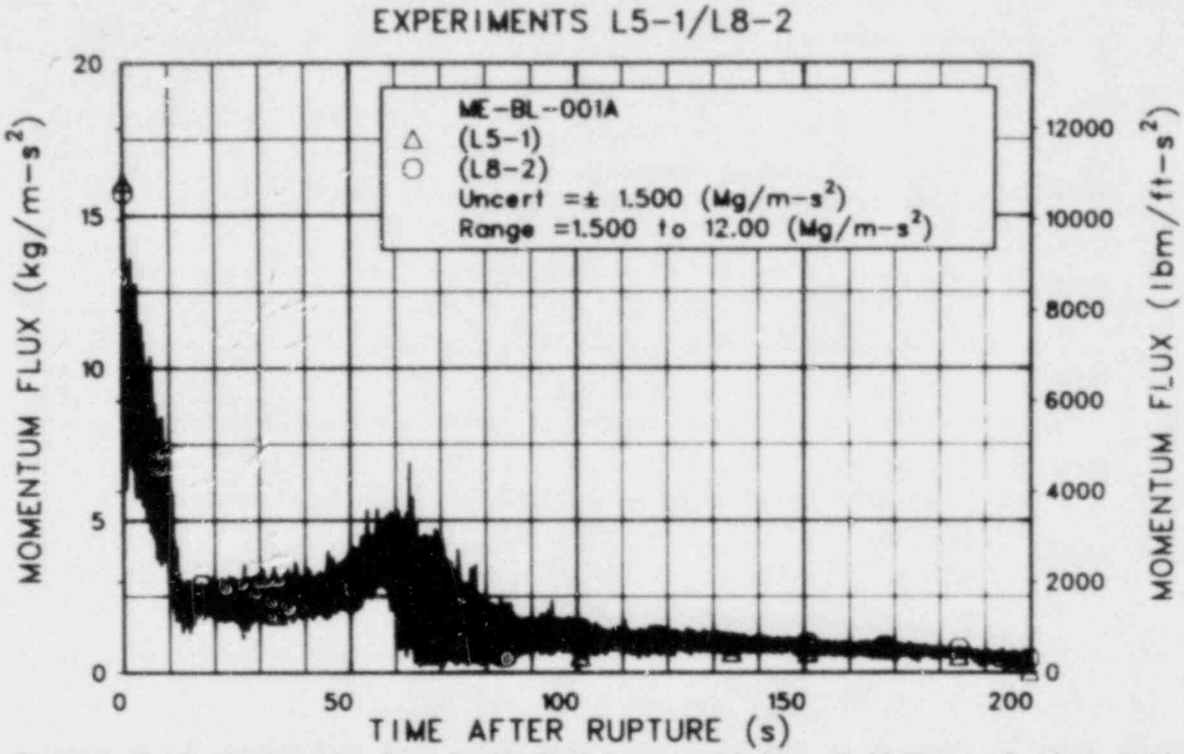


Figure 4L-5. Momentum flux in broken loop cold leg at bottom of pipe, high range (ME-BL-001A).

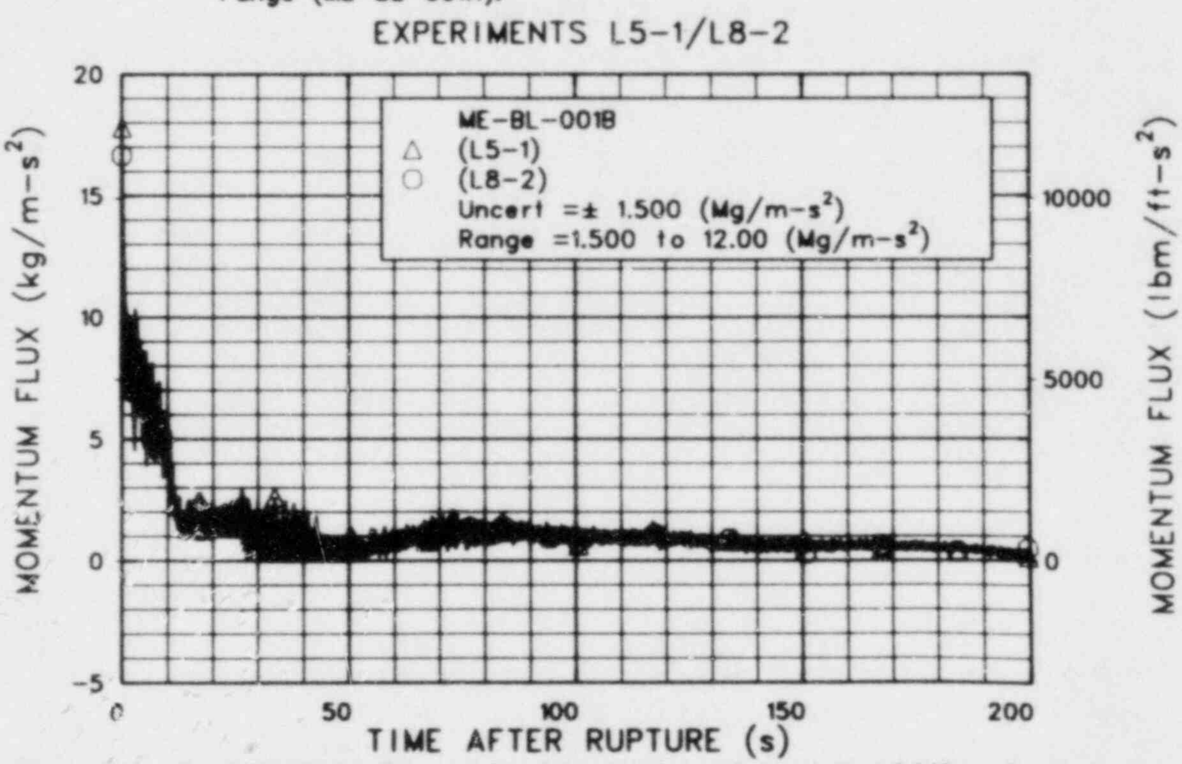


Figure 4L-6. Momentum flux in broken loop cold leg at middle of pipe, high range (ME-BL-001B).

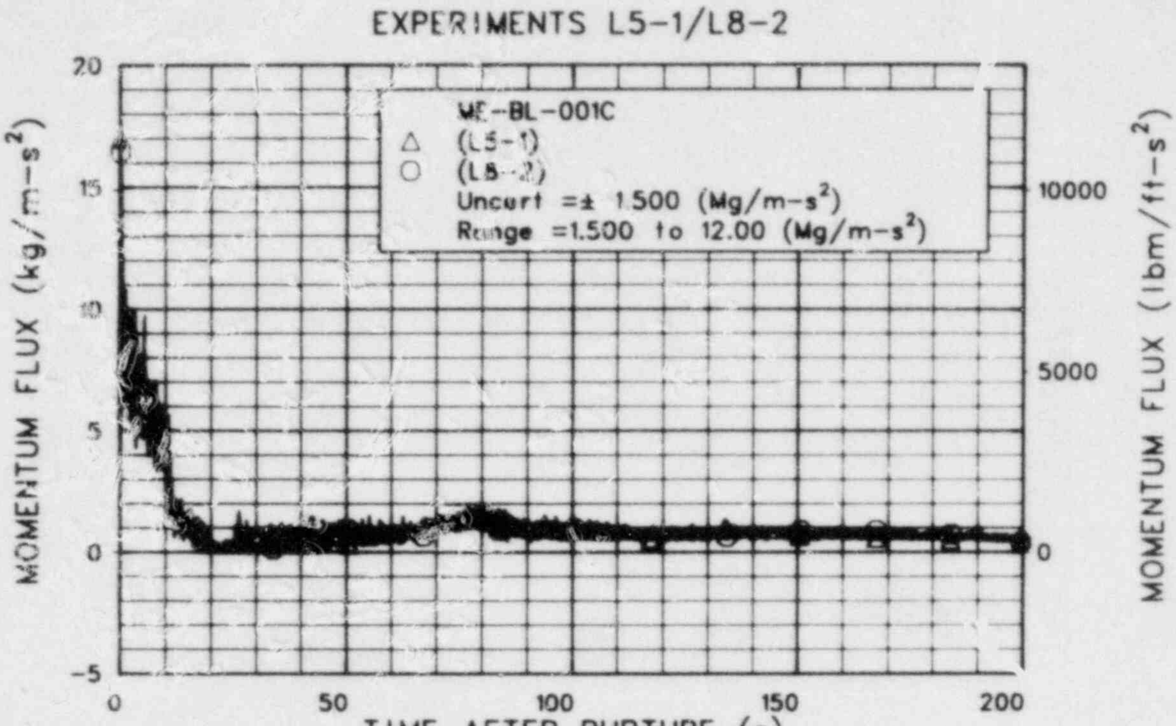


Figure 4L-7. Momentum flux in broken loop cold leg at top of pipe, high range (ME-BL-001C).

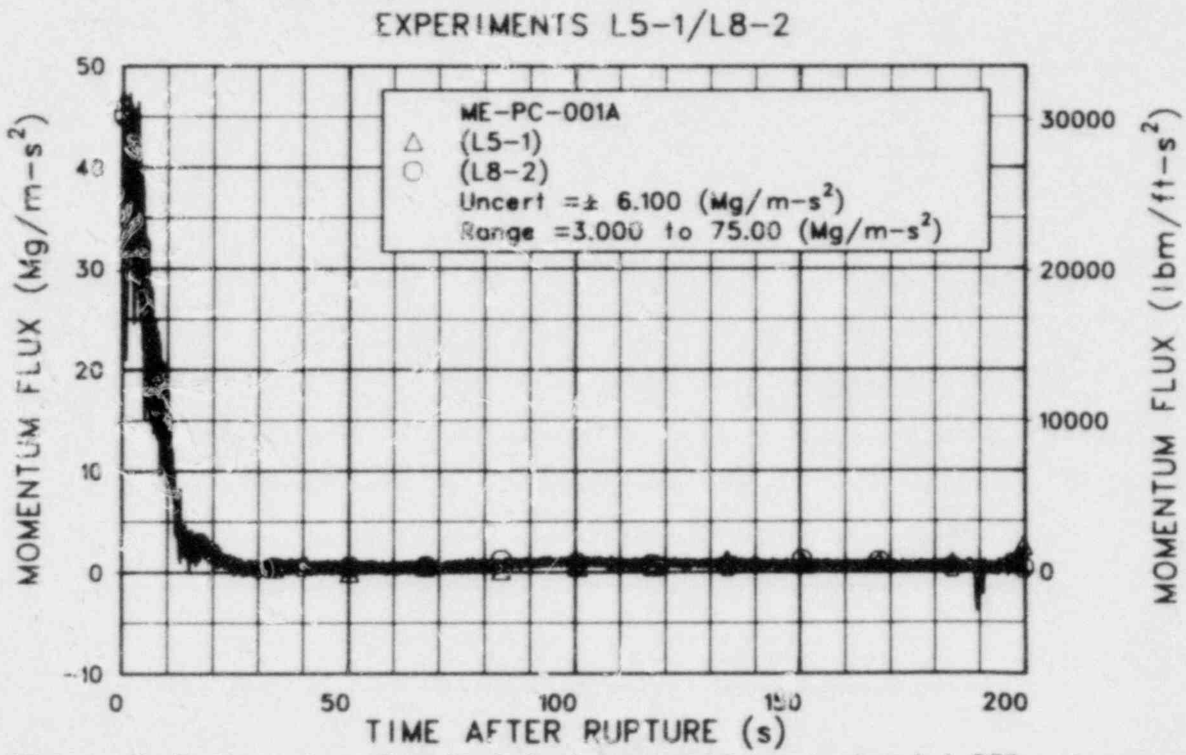


Figure 4L-8. Momentum flux in intact loop cold leg horizontal DTT rake at far side of pipe as viewed from rake flange (ME-PC-001A).

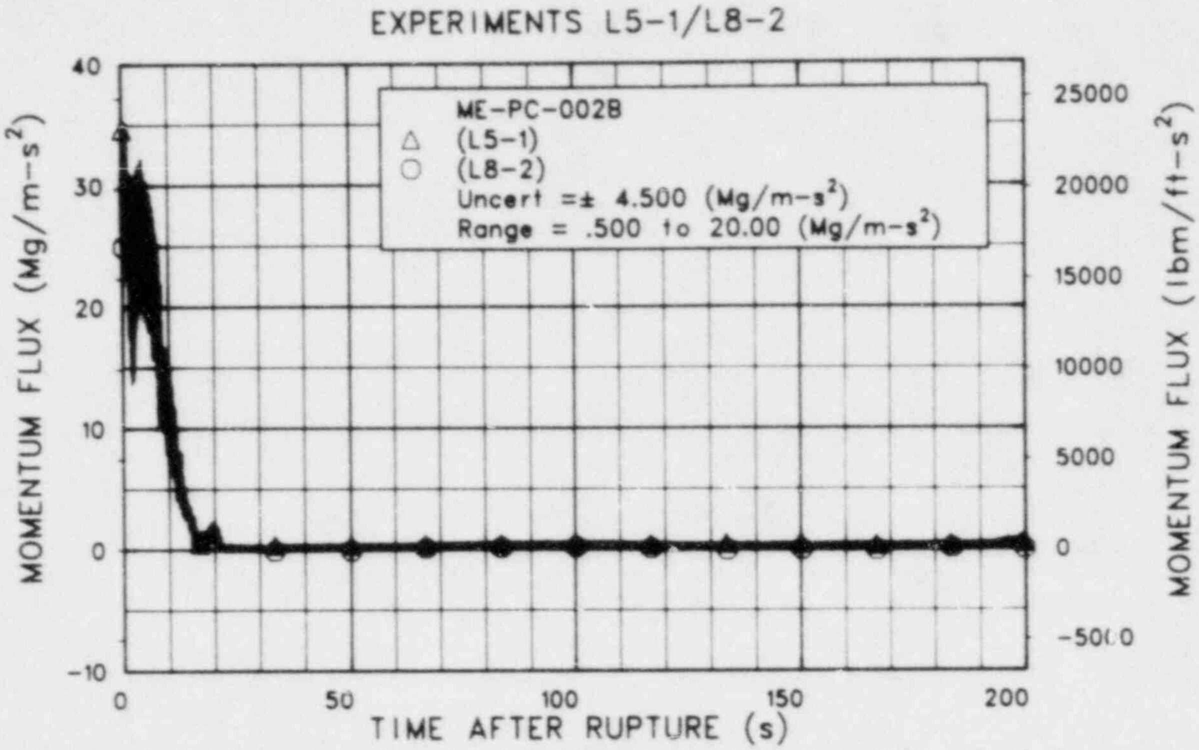


Figure 4L-9. Momentum flux in intact loop hot leg at middle of pipe (ME-PC-002B).

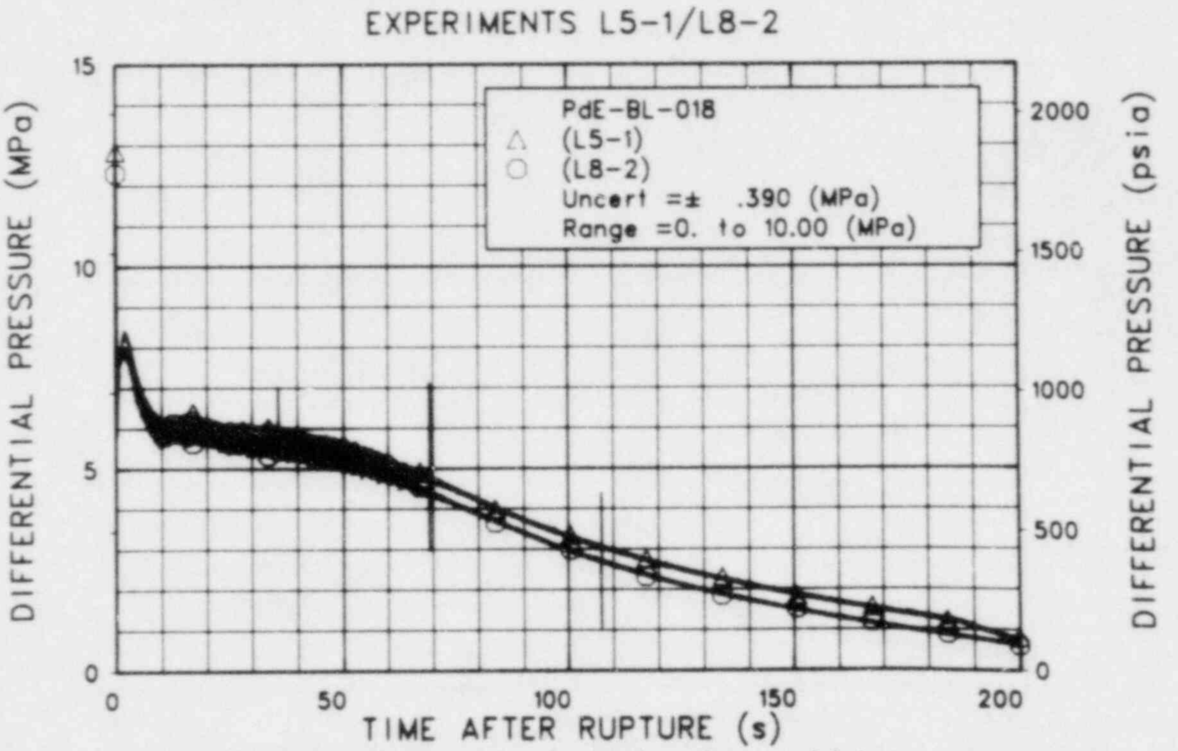


Figure 4L-10. Differential pressure in broken loop cold leg across nozzle spoolpiece (PdE-BL-018) (qualified, anomalous spikes prior to 110 s; L8-2).

EXPERIMENTS L5-1/L8-2

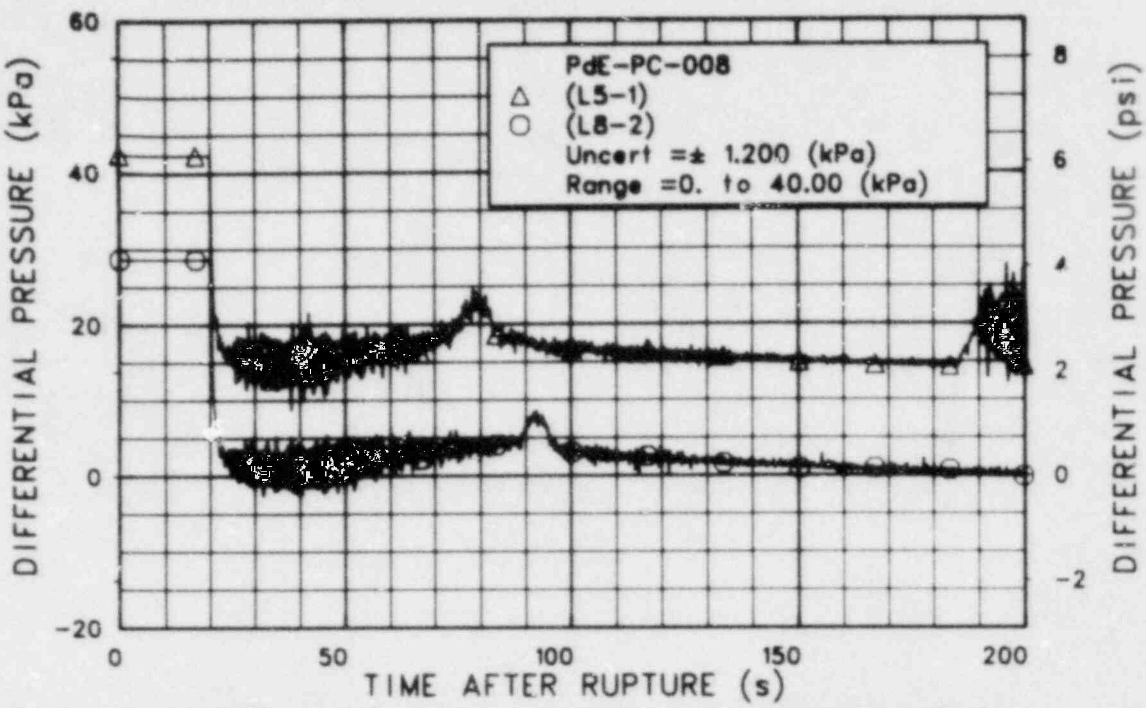


Figure 4L-11. Differential pressure in intact loop across pressurizer surge line (PdE-PC-008) (qualified, narrow range instrument, magnitude uncertain).

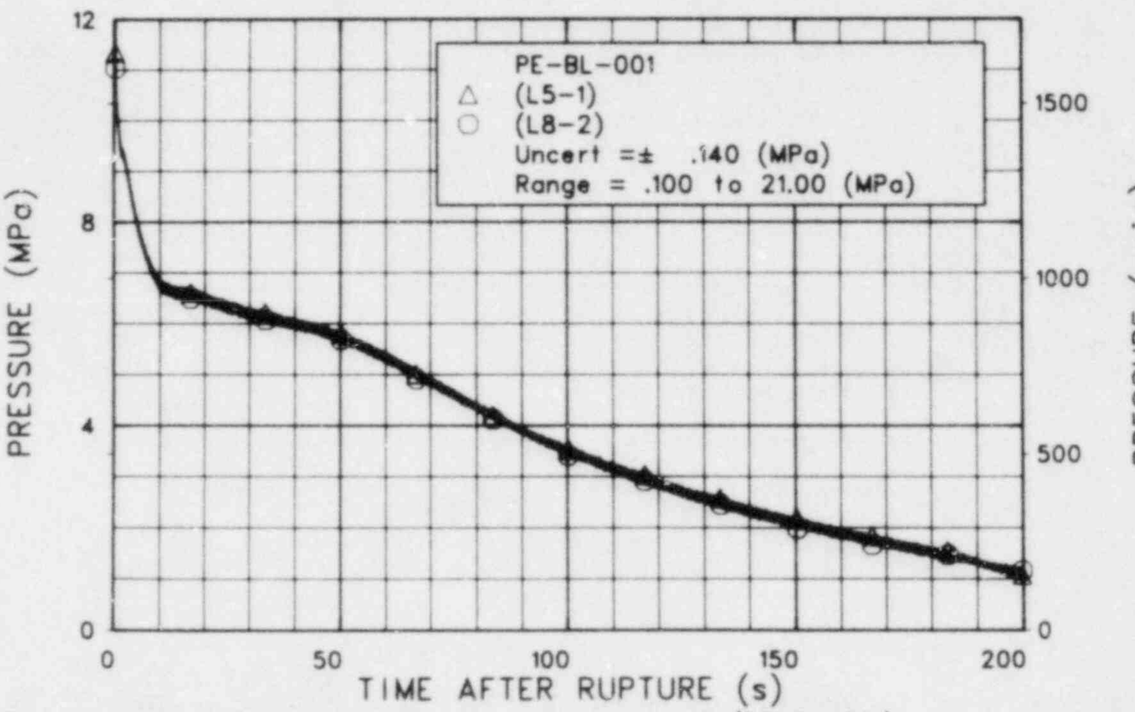


Figure 4L-12. Pressure in broken loop cold leg (PE-BL-001).

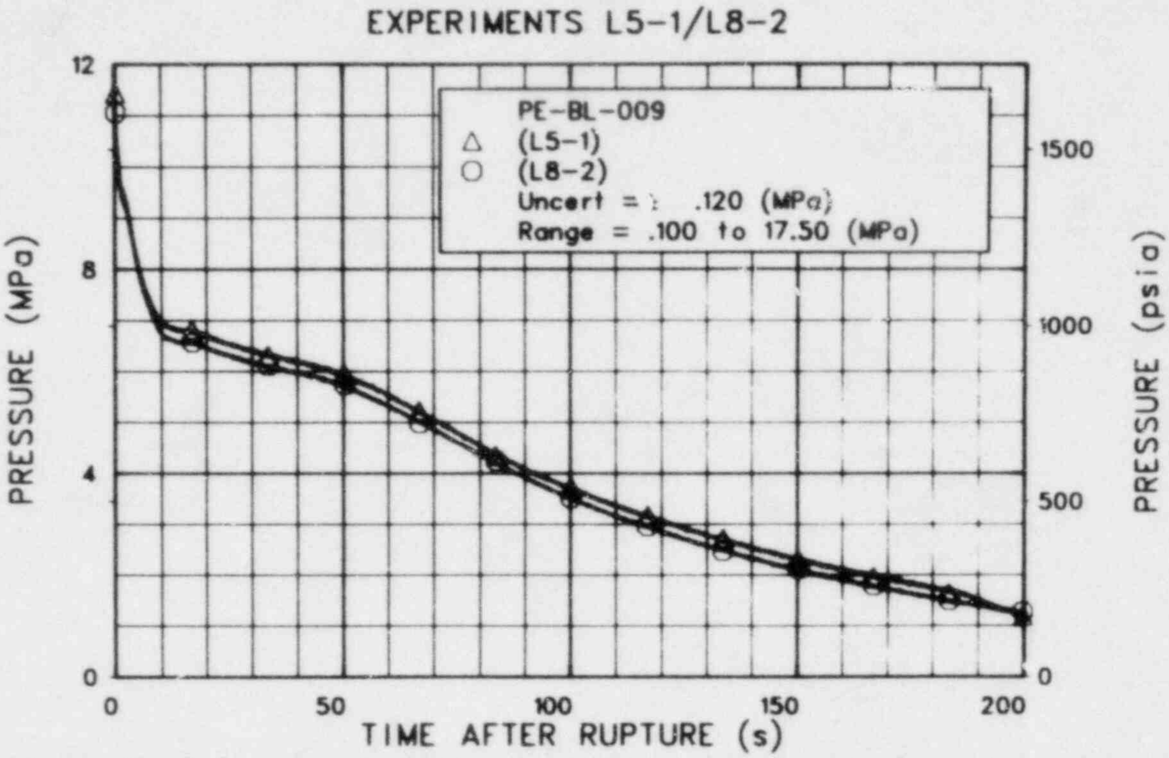


Figure 4L-13. Pressure in broken loop cold leg upstream of nozzle (PE-BL-009).

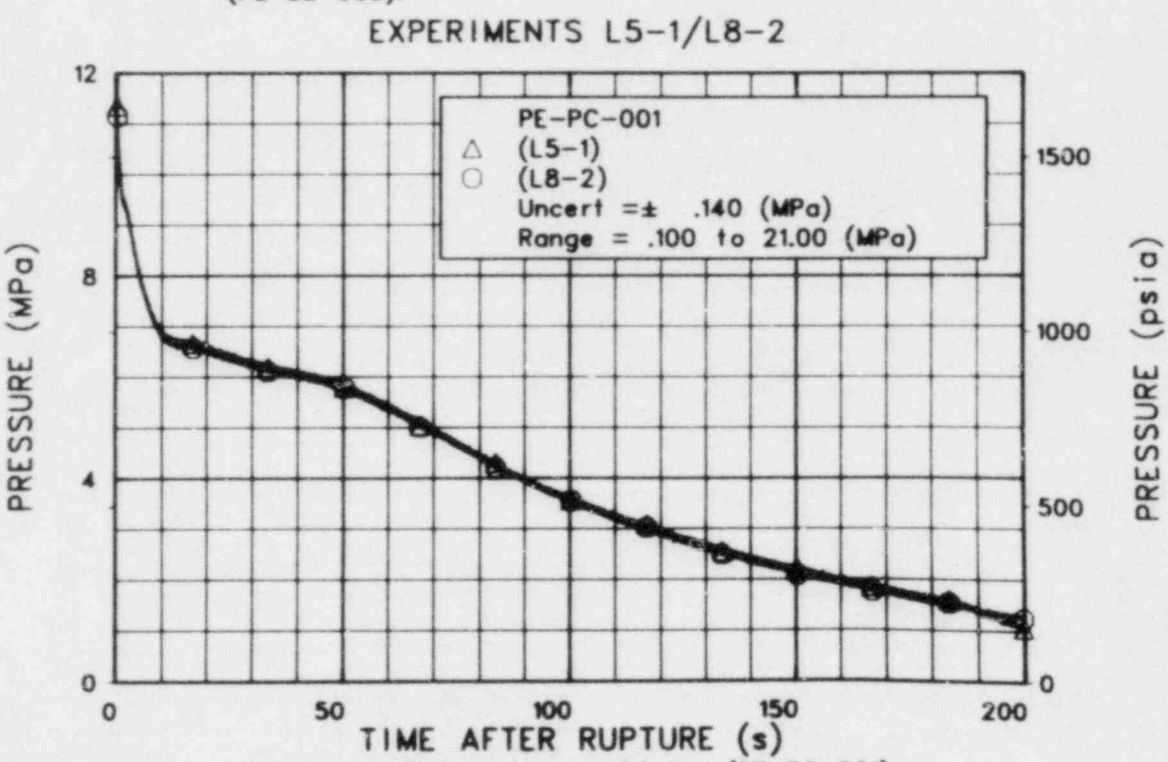


Figure 4L-14. Pressure in intact loop cold leg (PE-PC-001).

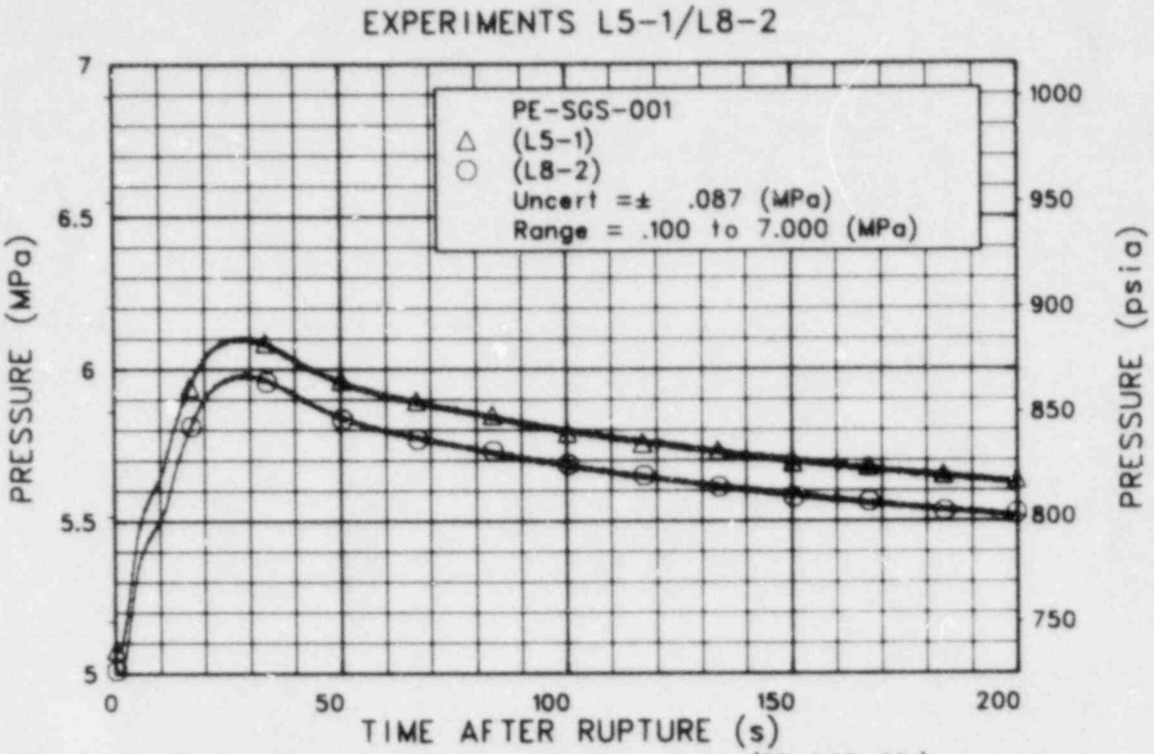


Figure 4L-15. Pressure in steam generator dome (PE-SGS-001).

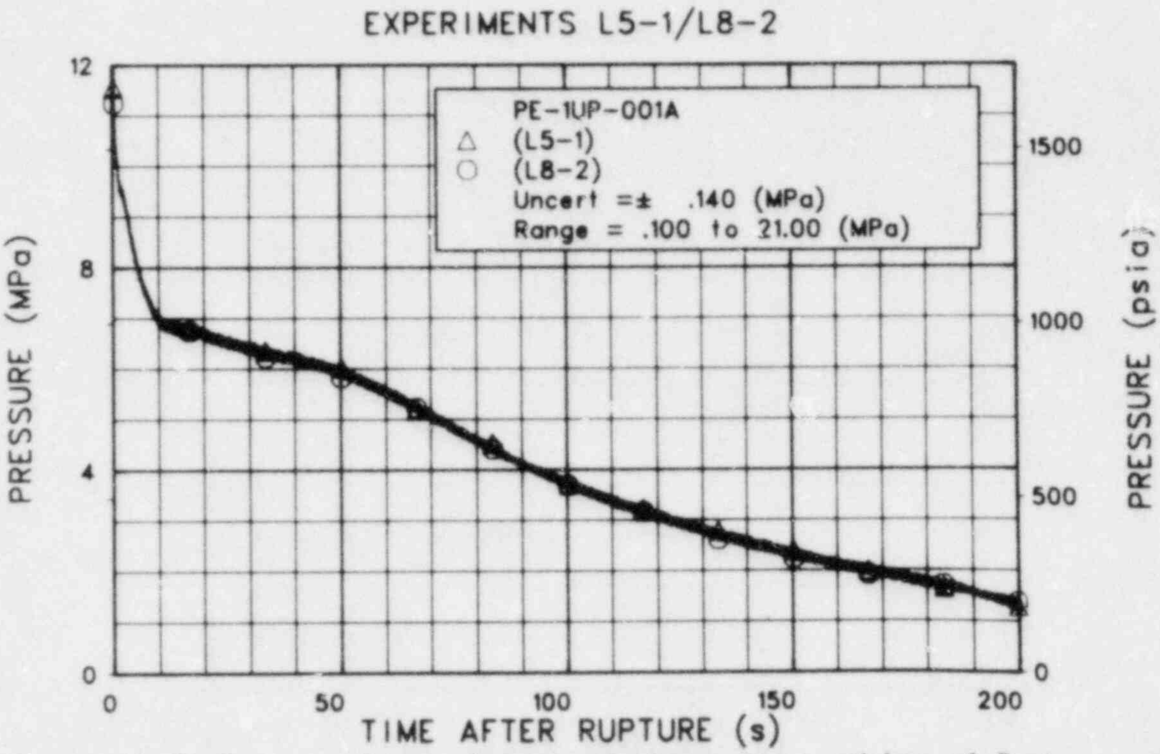


Figure 4L-16. Pressure in reactor vessel above upper end box of Fuel Assembly 1 (PE-1UP-001A).

EXPERIMENTS L5-1/L8-2

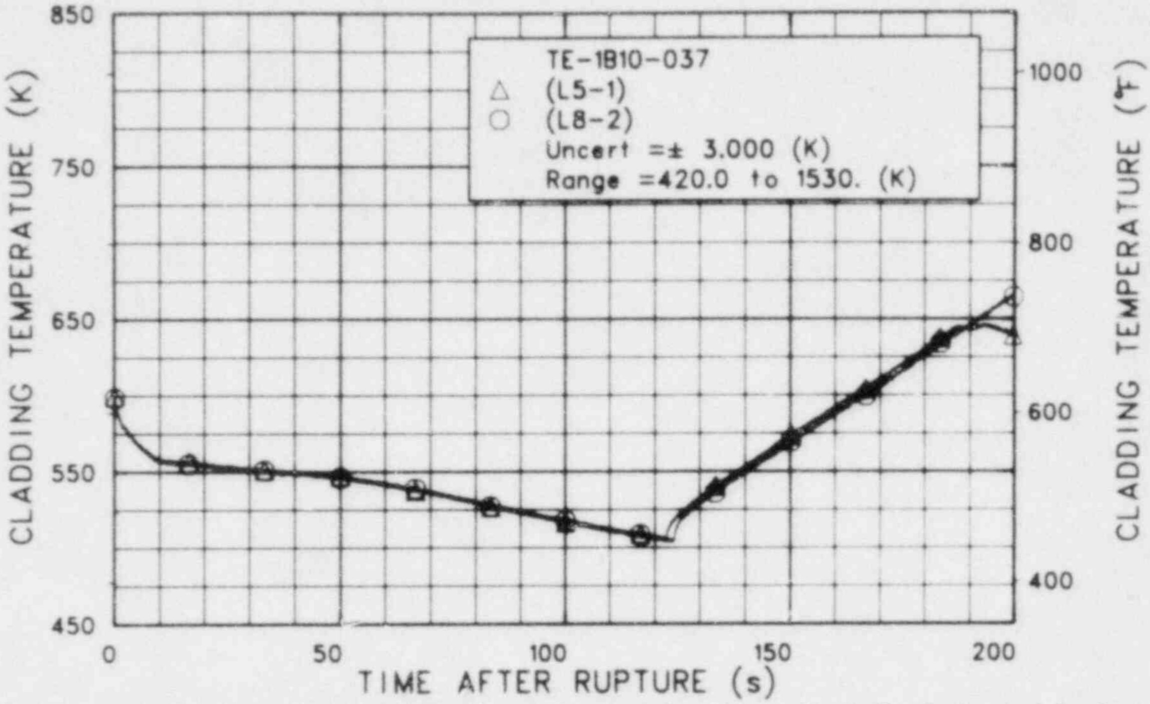


Figure 4L-17. Cladding temperature in reactor vessel at Fuel Assembly 1, Row B, Column 10 at 0.94 m above bottom of fuel rod (TE-1B10-037).

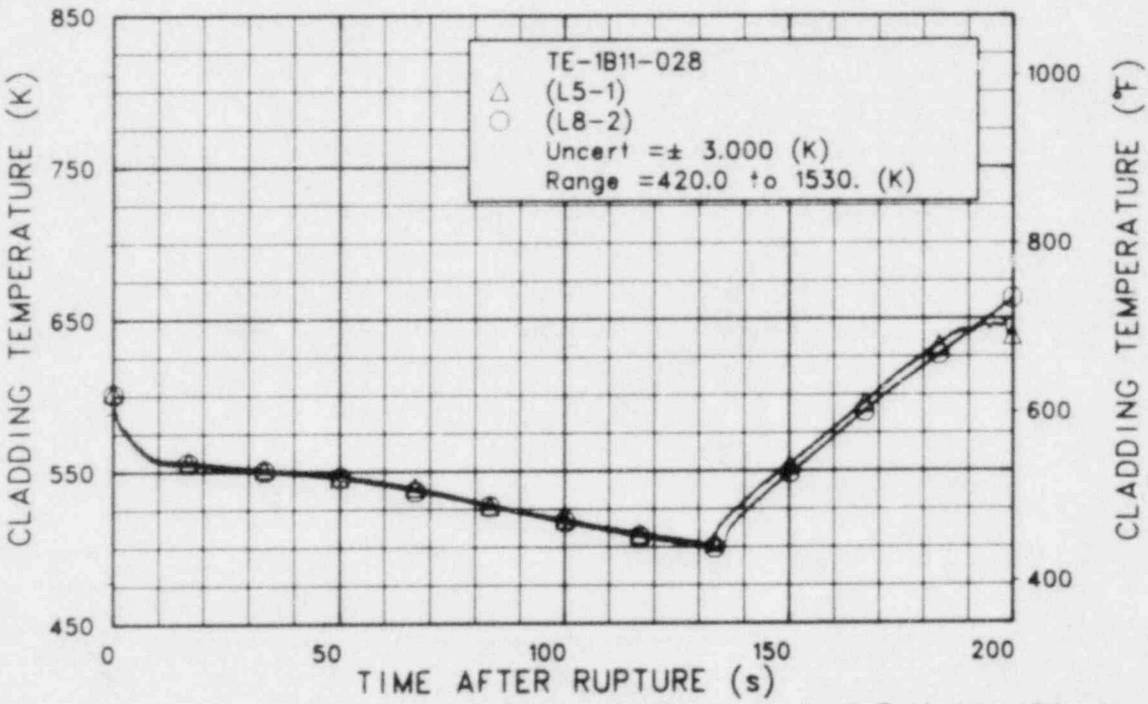


Figure 4L-18. Cladding temperature in reactor vessel at Fuel Assembly 1, Row B, Column 11 at 0.71 m above bottom of fuel rod (TE-1B11-028).

EXPERIMENTS L5-1/L8-2

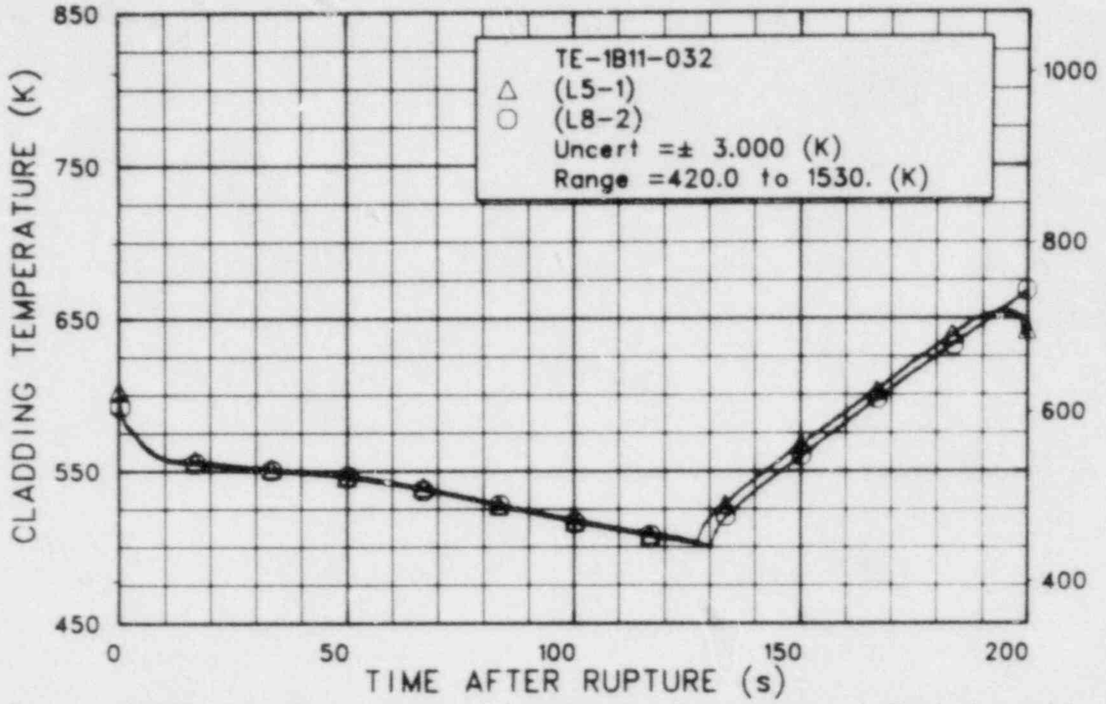


Figure 4L-19. Cladding temperature in reactor vessel at Fuel Assembly 1, Row B, Column 11 at 0.81 m above bottom of fuel rod (TE-1B11-032).

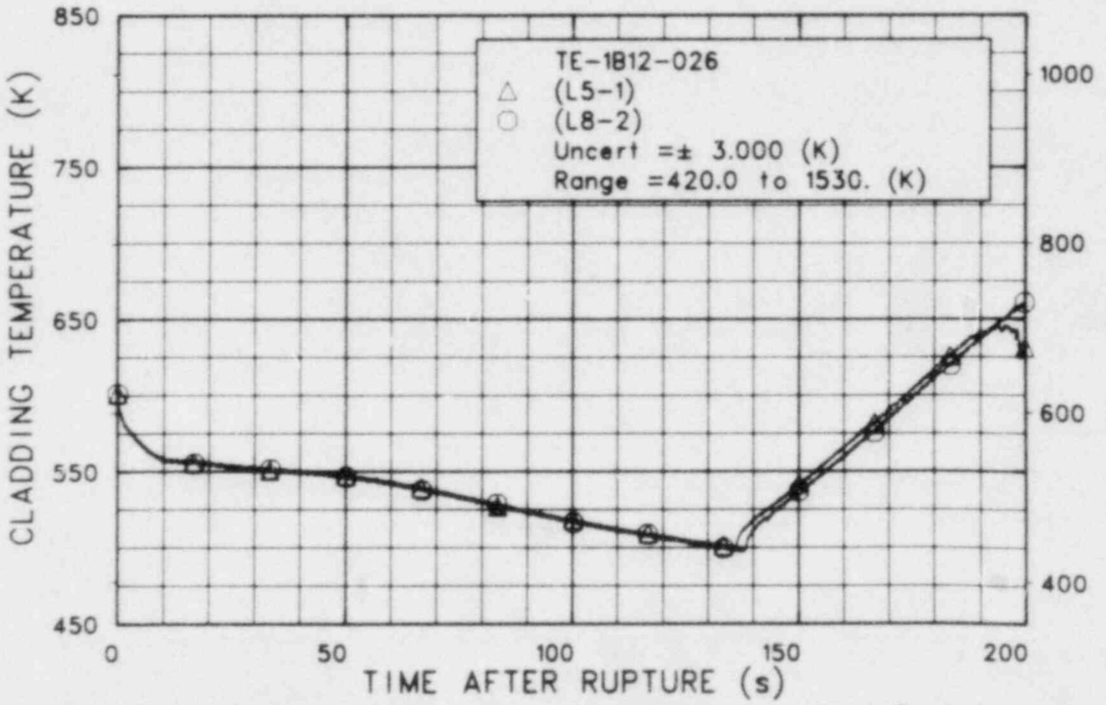


Figure 4L-20. Cladding temperature in reactor vessel at Fuel Assembly 1, Row B, Column 12 at 0.66 m above bottom of fuel rod (TE-1B12-026).

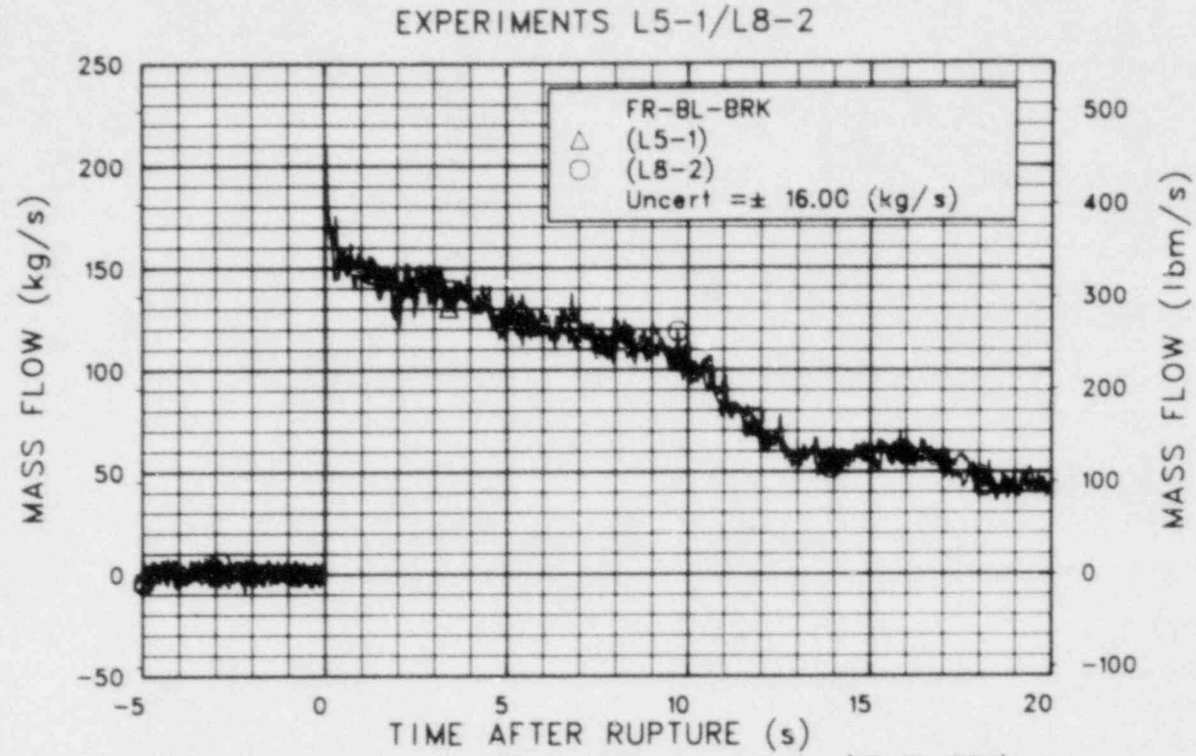


Figure 4C-1. Mass flow rate in broken loop cold leg (FR-BL-BRK).

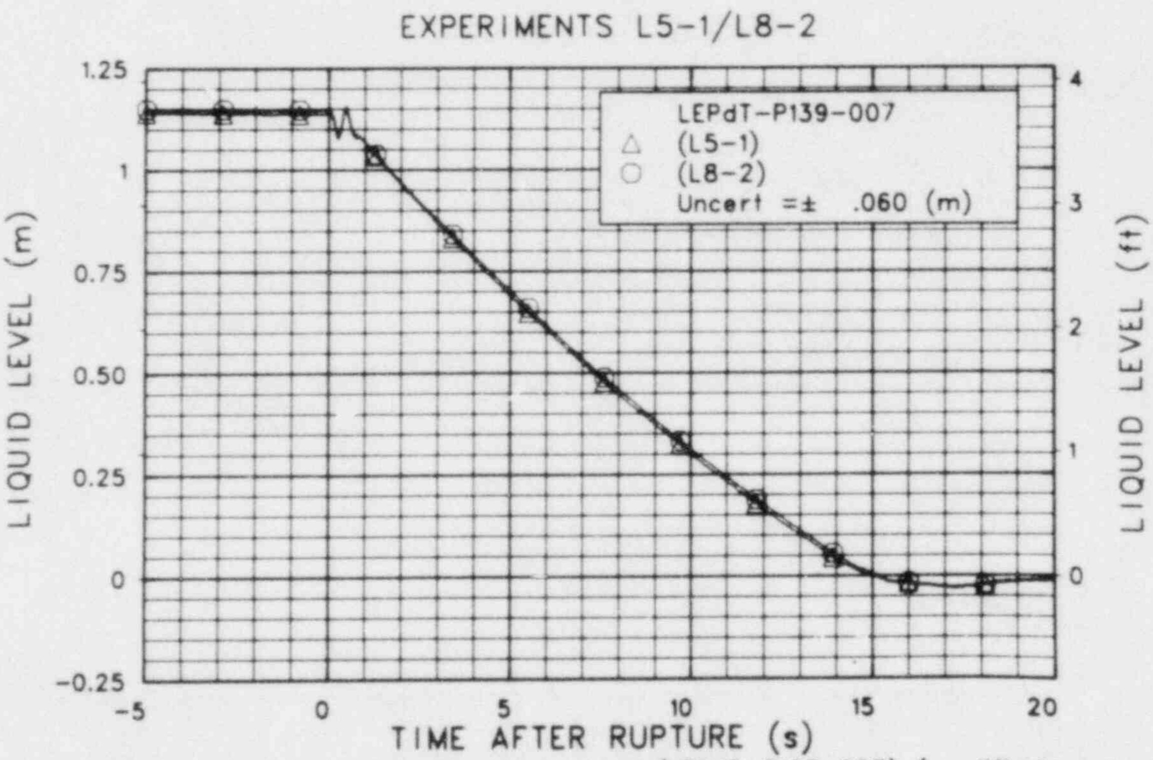


Figure 4C-2. Liquid level in pressurizer (LEPdT-P139-007) (qualified, data valid to 100 s L5-1; qualified to 50 s L8-2).

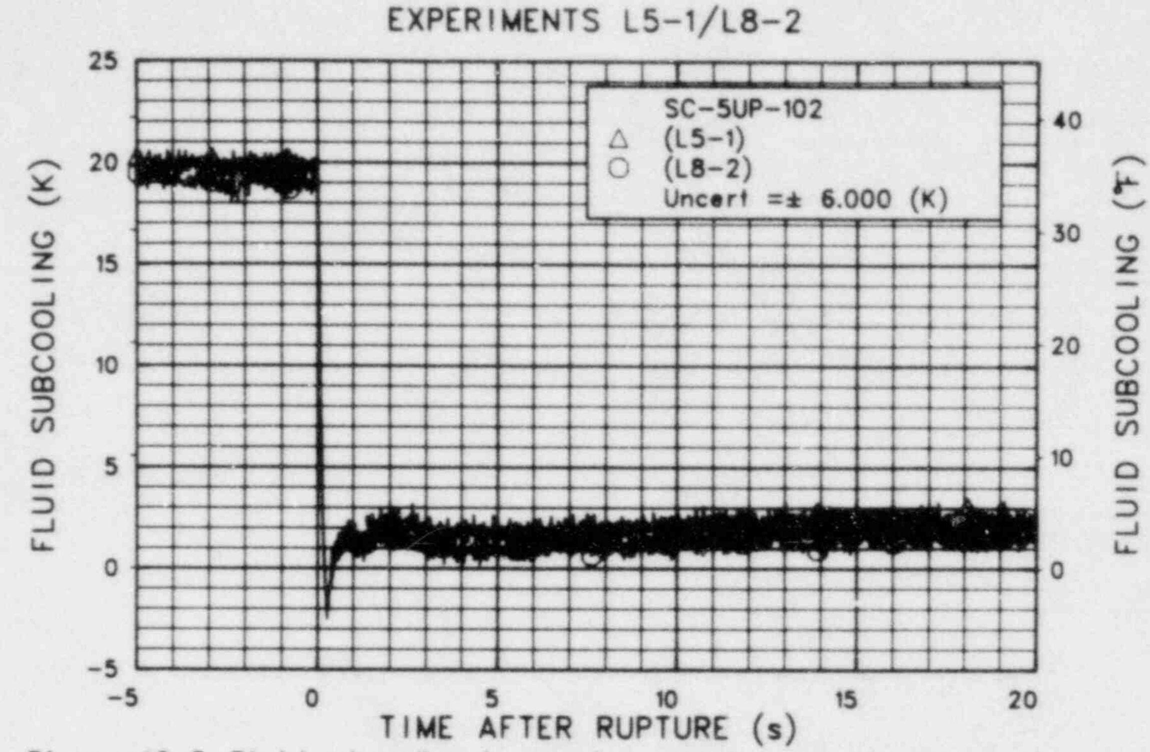


Figure 4C-3. Fluid subcooling in reactor vessel upper plenum (SC-5UP-102).

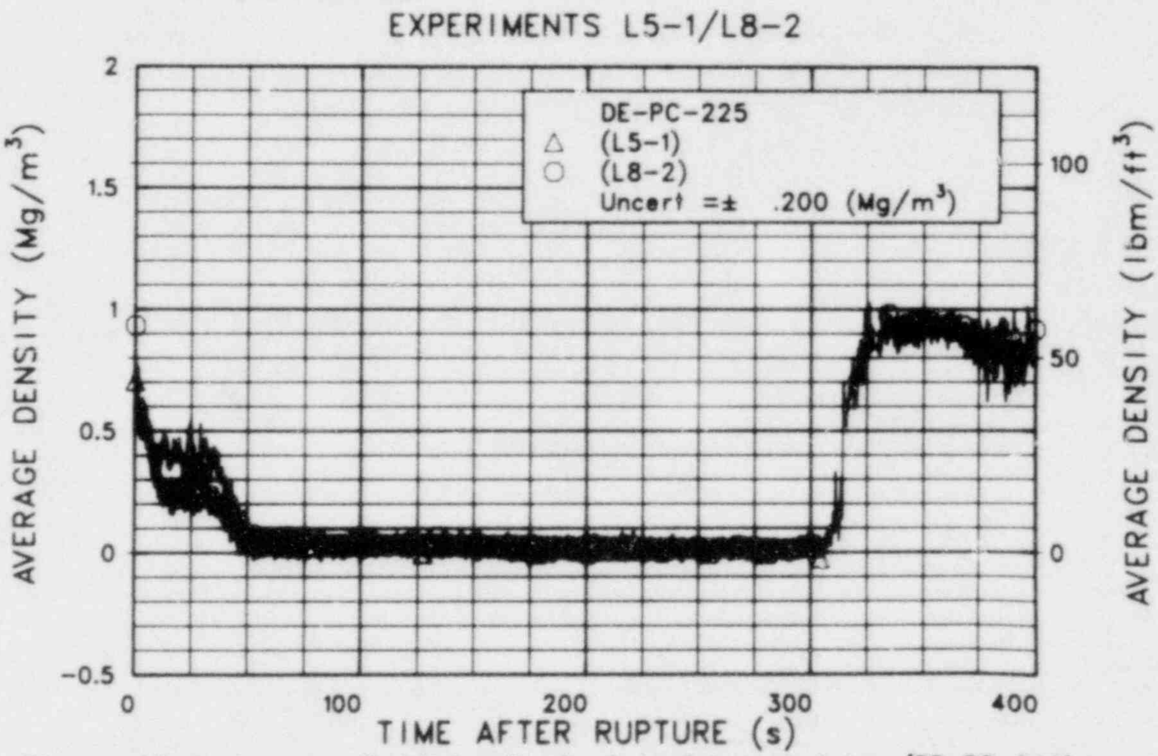


Figure 4C-4. Average fluid density in intact loop hot leg (DE-PC-225) (qualified, invalid data between 310 and 360 s, replaced by interpolation L8-2 only).

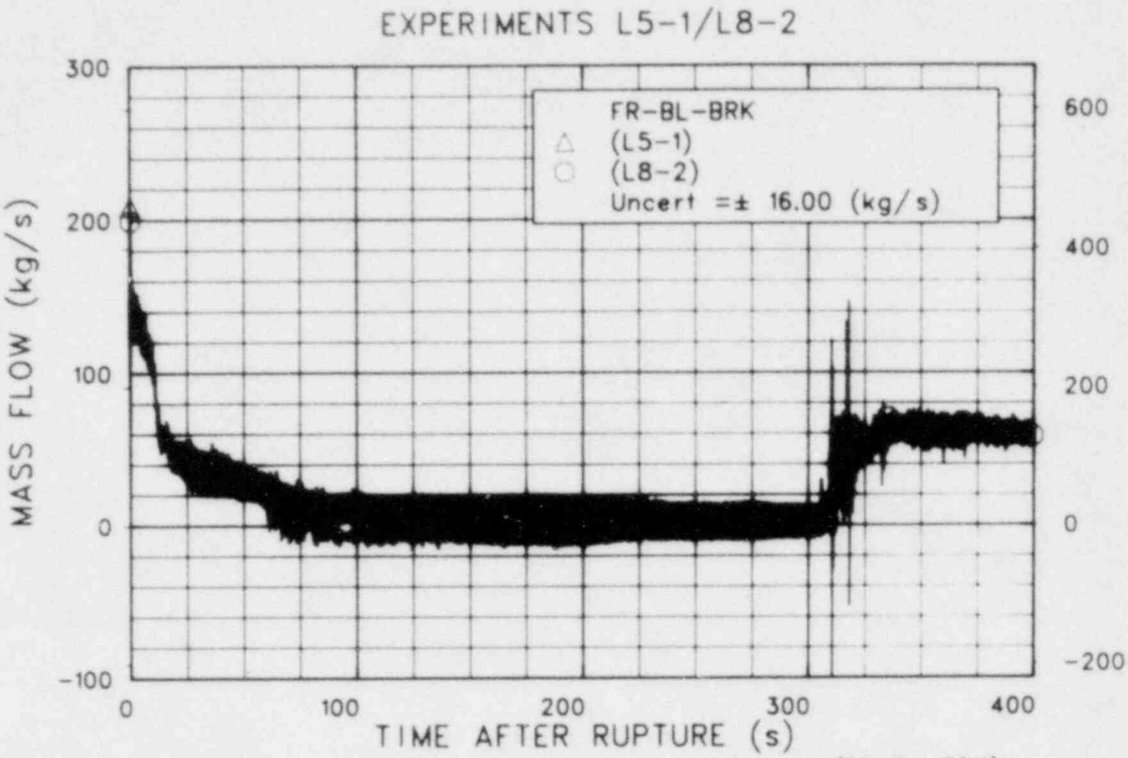


Figure 4C-5. Mass flow rate in broken loop cold leg (FR-BL-BRK).

5. DATA PRESENTATION FOR EXPERIMENT L8-2

The data presented in this section are selected, uninterpreted, thermal-hydraulic and nuclear data from Experiment L8-2.

Table 5-1 lists the selected measurements presented in this section and gives the detector location and the figure numbers. In addition, this table contains a "Comments" column that gives information pertaining to the usability of the data.

The data are divided into three categories as follows:

1. Experiment L8-2 Measured Variables, Long-Term Plots (0 to 400 s), Figures 5L-1 through 5L-65

2. Experiment L8-2 Computed Variables, Figures 5C-1 through 5C-17

3. Experiment L8-2 Variables with Uncertainty Bands, Figures 5U-1 through 5U-5.

TABLE 5-1. MEASURED VARIABLES PRESENTED FOR EXPERIMENT L8-2

Variable, System, and Detector	Location	Figure Number	Comments
CHORDAL DENSITY			
Broken Loop			
DE-BL-001B	Cold leg at drag disc-turbine transducer (DTT) flange. Beam B is through centerline of pipe 45° from vertical [counter-clockwise (CCW) looking toward reactor vessel (RV)].	5L-1 5U-1	Qualified, invalid data between 310 and 360 s replaced by interpolation.
DE-BL-001C	Cold leg at DTT flange. Beam C is 22°, 7 min from Beam B (CCW looking toward RV).	5L-2	Qualified, invalid data between 310 and 360 s replaced by interpolation.
DE-BL-002B	Hot leg at DTT flange. Beam B is through centerline of pipe 45° from vertical [clockwise (CW) looking toward RV].	5L-3	Qualified, invalid data between 310 and 360 s replaced by interpolation.
DE-BL-002C	Hot leg at DTT flange. Beam C is 22°, 7 min from Beam B (CW looking toward RV).	5L-4	Qualified, invalid data between 310 and 360 s replaced by interpolation.

TABLE 5-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
CHORDAL DENSITY (continued)			
Intact Loop			
DE-PC-001B	Cold leg at DTT flange. Beam B is through centerline of pipe 45° from vertical (CCW looking away from RV).	5L-5 5U-2	Qualified, invalid data between 310 and 360 s replaced by interpolation.
DE-PC-002A	Hot leg at DTT flange. Beam A is 14°, 21 min from Beam B (CW looking away from RV).	5L-6	Qualified, invalid data between 310 and 360 s replaced by interpolation.
DE-PC-002B	Hot leg at DTT flange. Beam B is through centerline of pipe 45° from vertical (CCW looking away from RV).	5L-7	Qualified, invalid data between 310 and 360 s replaced by interpolation.
DE-PC-002C	Hot leg at DTT flange. Beam C is 22°, 7 min from Beam B (CCW looking away from RV).	5L-8	Qualified, magnitude uncertain. Invalid data between 310 360 s replaced by interpolation.
DE-PC-003B	Below steam generator (SG) at DTT flange. Beam B is through centerline of pipe.	5L-9	Qualified.
FLUID VELOCITY			
Intact Loop			
FE-PC-001A	Cold leg horizontal DTT flange on far side of pipe as viewed from rake flange.	5L-10	Qualified.
FE-PC-001B	Cold leg horizontal DTT flange at center of pipe.	5L-10	Qualified.

TABLE 5-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
FLUID VELOCITY (continued)			
Intact Loop (continued)			
FE-PC-001C	Cold leg horizontal DTT flange on near side of pipe as viewed from rake flange.	5L-10	Qualified.
FE-PC-002A	Hot leg DTT flange at bottom of pipe.	5L-11	Qualified.
FE-PC-002B	Hot leg DTT flange at middle of pipe.	5L-11	Qualified.
FE-PC-002C	Hot leg DTT flange at top of pipe.	5L-11	Qualified.
FLOW RATE			
Emergency Core Cooling System			
FT-P120-072	Low-pressure injection system (LPIS) Pump B discharge.	5L-12	Qualified.
FT-P120-085	LPIS Pump A discharge.	5L-13	Qualified, spikes at approximately 5 s.
FT-P120-31-5	Accumulator B in 6-in. line downstream of orifice.	5L-14	Qualified.
FT-P128-085	High-pressure injection system (HPIS) Pump B discharge.	5L-15	Qualified.
FT-P128-104	HPIS Pump A discharge.	5L-16	Qualified.

TABLE 5-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
LIQUID LEVEL			
Emergency Core Cooling System			
LE-ECC-01A	Accumulator A.	5L-17	Qualified.
LIT-P120-030	Accumulator B.	5L-18	Qualified.
LIT-P120-044	Accumulator A.	5L-19	Qualified.
Blowdown Suppression Tank			
LT-P138-033	Blowdown suppression tank (BST) level on north end of tank.	5L-20	Qualified, not density compensated.
LT-P138-058	BST level on south end of tank.	5L-20	Qualified, not density compensated.
MOMENTUM FLUX			
Broken Loop			
ME-BL-001A	Cold leg DTT flange at bottom of pipe, high range.	5L-21	Qualified.
ME-BL-001B	Cold leg DTT flange at middle of pipe, high range.	5L-22	Qualified.
ME-BL-001C	Cold leg DTT flange at top of pipe, high range.	5L-23	Qualified.
ME-BL-001D	Cold leg DTT flange at bottom of pipe, low range.	5L-24	Qualified, narrow range instrument.
ME-BL-001E	Cold leg DTT flange at middle of pipe, low range.	5L-25	Qualified, narrow range instrument.
ME-BL-001F	Cold leg DTT flange at top of pipe, low range.	5L-26	Qualified, narrow range instrument.

TABLE 5-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
MOMENTUM FLUX (continued)			
<u>Intact Loop</u>			
ME-PC-001A	Cold leg horizontal DTT flange on far side of pipe as viewed from rake flange.	5L-27	Qualified.
ME-PC-001B	Cold leg horizontal DTT flange at center of pipe.	5L-28	Qualified, magnitudes uncertain.
ME-PC-002A	Hot leg DTT flange at bottom of pipe.	5L-29	Qualified.
ME-PC-002B	Hot leg DTT flange at middle of pipe.	5L-30	Qualified.
ME-PC-002C	Hot leg DTT flange at top of pipe.	5L-31	Qualified.
ELECTRICAL CURRENT			
<u>Intact Loop</u>			
PCP-1-I-RMS	Primary coolant pump (PCP) 1.	5L-32	Qualified, no other measurement for direct comparison.
PCP-2-I-RMS	PCP-2.	5L-35	Qualified, no other measurement for direct comparison.
ELECTRICAL POWER			
<u>Intact Loop</u>			
PCP-1-P	PCP-1.	5L-33	Qualified, no other measurement for direct comparison.
PCP-2-P	PCP-2.	5L-36	Qualified, no other measurement for direct comparison.

TABLE 5-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
ELECTRICAL VOLTAGE			
Intact Loop			
PCP-1-V-RMS	PCP-1.	5L-34	Qualified, no other measurement for direct comparison.
PCP-2-V-RMS	PCP-2.	5L-37	Qualified, no other measurement for direct comparison.
DIFFERENTIAL PRESSURE			
Broken Loop			
PdE-BL-015	Cold leg upstream to nozzle throat.	5L-38	Qualified, over-ranged 0 to 11 s.
PdE-BL-016	Cold leg upstream to nozzle midplane.	5L-38	Qualified, over-ranged 0 to 11 s.
PdE-BL-017	Cold leg upstream to nozzle exit.	5L-38	Qualified, over-ranged 0 to 11 s.
PdE-BL-018	Cold leg across nozzle spoolpiece.	5L-38	Qualified, anomalous spikes prior to 110 s.
Intact Loop			
PdE-PC-001	Cold leg across PCPs.	5L-39	Qualified.
PdE-PC-010	Across PCP-2.	5L-40	Qualified.
Reactor Vessel			
PdE-RV-005	Top of RV to intact loop hot leg.	5U-3	Qualified, magnitude uncertain, no other measurement for direct comparison.

TABLE 5-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
DIFFERENTIAL PRESSURE (continued)			
Intact Loop			
PdT-P139-030	Across RV just beyond intact loop inlet and outlet nozzles.	5L-41	Qualified, initial conditions only.
PRESSURE			
Broken Loop			
PE-BL-001	Cold leg at DTT flange.	5L-42	Qualified.
PE-BL-009	Cold leg upstream of nozzle.	5L-43	Qualified.
Intact Loop			
PE-PC-001	Cold leg at DTT flange.	5L-44	Qualified.
PE-PC-006	Reference pressure between SG outlet and PCP inlet.	5L-45	Qualified.
Secondary Coolant System			
PE-SGS-001	SG dome pressure.	5L-46	Qualified.
Reactor Vessel			
PE-1UP-001A	Above Fuel Assembly 1 upper end box.	5L-47	Qualified.
Intact Loop			
PT-P139-05-1	Pressurizer, 1.88 m above bottom (vapor space).	5L-48	Qualified.
PUMP SPEED			
Intact Loop			
RPE-PC-001	PCP-1.	5L-49	Qualified.
RPE-PC-002	PCP-2.	5L-50	Qualified.

TABLE 5-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE			
Broken Loop			
TE-BL-001B	Cold leg at DTT flange at middle of pipe.	5L-51	Qualified, possible hot wall effects.
TE-BL-002B	Hot leg at DTT flange at middle of pipe.	5L-52	Qualified, possible hot wall effects.
Intact Loop			
TE-PC-001B	Cold leg DTT flange at middle of pipe.	5L-53	Qualified, possible hot wall effects.
TE-PC-002B	Hot leg DTT flange at middle of pipe.	5U-4	Qualified, possible hot wall effects.
Reactor Vessel			
TE-2H13-021	Cladding on Fuel Assembly 2, Row H, Column 13 at 0.53 m above bottom of fuel rod.	5L-54	Qualified.
TE-2H13-049	Cladding on Fuel Assembly 2, Row H, Column 13 at 1.24 m above bottom of fuel rod.	5L-54	Qualified.
TE-2H14-028	Cladding on Fuel Assembly 2, Row H, Column 14 at 0.71 m above bottom of fuel rod.	5L-54	Qualified.
TE-2H14-032	Cladding on Fuel Assembly 2, Row H, Column 14 at 0.81 m above bottom of fuel rod.	5L-54	Qualified.
TE-3B10-037	Cladding on Fuel Assembly 3, Row B, Column 10 at 0.94 m above bottom of fuel rod.	5L-55	Qualified.

TABLE 5-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-3B11-028	Cladding on Fuel Assembly 3, Row B, Column 11 at 0.71 m above bottom of fuel rod.	5L-55	Qualified.
TE-3B11-032	Cladding on Fuel Assembly 3, Row B, Column 11 at 0.81 m above bottom of fuel rod.	5L-55	Qualified.
TE-3B12-026	Cladding on Fuel Assembly 3, Row B, Column 12 at 0.66 m above bottom of fuel rod.	5L-55	Qualified.
TE-3UP-001	Fuel Assembly 3 upper end box.	5L-56	Qualified.
TE-3UP-008	Liquid level transducer above Fuel Assembly 3.	5L-56	Qualified.
TE-3UP-010	Liquid level transducer above Fuel Assembly 3.	5L-56	Qualified.
TE-3UP-014	Liquid level transducer above Fuel Assembly 3.	5L-56	Qualified.
TE-4H13-037	Cladding on Fuel Assembly 4, Row H, Column 13 at 0.94 m above bottom of fuel rod.	5L-57	Qualified.
TE-4H14-032	Cladding on Fuel Assembly 4, Row H, Column 14 at 0.81 m above bottom of fuel rod.	5L-57	Qualified.
TE-4H15-026	Cladding on Fuel Assembly 4, Row H, Column 15 at 0.66 m above bottom of fuel rod.	5L-57	Qualified.

TABLE 5-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-4H15-041	Cladding on Fuel Assembly 4, Row H, Column 15 at 1.04 m above bottom of fuel rod.	5L-57	Qualified.
TE-5G6-011	Cladding on Fuel Assembly 5, Row G, Column 6 at 0.28 m above bottom of fuel rod.	5L-58	Qualified.
TE-5G6-030	Cladding on Fuel Assembly 5, Row G, Column 6 at 0.76 m above bottom of fuel rod.	5L-58	Qualified.
TE-5G6-045	Cladding on Fuel Assembly 5, Row G, Column 6 at 1.14 m above bottom of fuel rod.	5L-58 5U-5	Qualified.
TE-5G6-062	Cladding on Fuel Assembly 5, Row G, Column 6 at 1.57 m above bottom of fuel rod.	5L-58	Qualified.
TE-5H6-024	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.61 m above bottom of fuel rod.	5L-59	Qualified.
TE-5H6-028	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.71 m above bottom of fuel rod.	5L-59	Qualified.
TE-5H6-032	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.81 m above bottom of fuel rod.	5L-59	Qualified.

TABLE 5-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-5H6-037	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.94 m above bottom of fuel rod.	5L-59	Qualified.
TE-5LP-001	Fuel Assembly 5 lower end box.	5L-60	Qualified.
TE-5LP-003	Fuel Assembly 5 lower end box.	5L-61	Qualified.
TE-5UP-001	Fuel Assembly 5 upper end box.	5L-62	Qualified.
TE-5UP-003	Fuel Assembly 5 upper end box.	5L-63	Qualified.
TE-5UP-005	Fuel Assembly 5 upper end box.	5L-64	Qualified.
TE-6G14-011	Cladding on Fuel Assembly 6, Row G, Column 14 at 0.28 m above bottom of fuel rod.	5L-65	Qualified.
TE-6G14-030	Cladding on Fuel Assembly 6, Row G, Column 14 at 0.76 m above bottom of fuel rod.	5L-65	Qualified.
TE-6G14-045	Cladding on Fuel Assembly 6, Row G, Column 14 at 1.14 m above bottom of fuel rod.	5L-65	Qualified.
TE-6I14-021	Cladding on Fuel Assembly 6, Row I, Column 14 at 0.53 m above bottom of fuel rod.	5L-65	Qualified.

EXPERIMENT L8-2

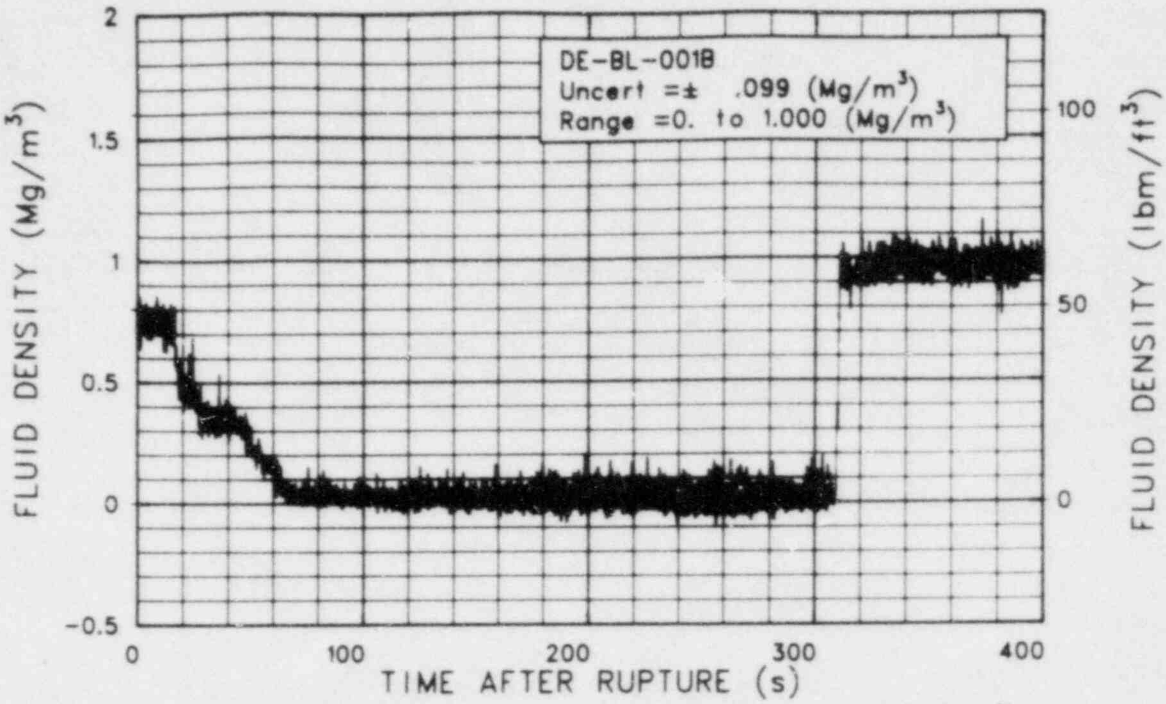


Figure 5L-1. Fluid density in broken loop cold leg, chordal density (DE-BL-001B) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

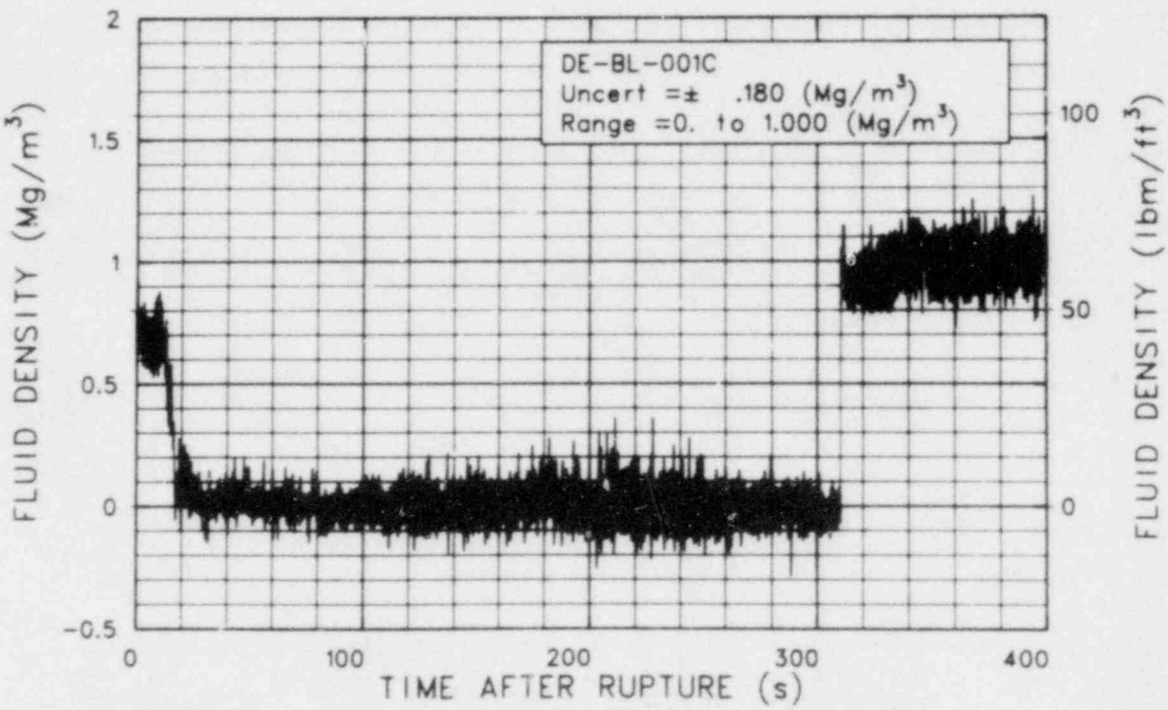


Figure 5L-2. Fluid density in broken loop cold leg, chordal density (DE-BL-001C) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

EXPERIMENT L8-2

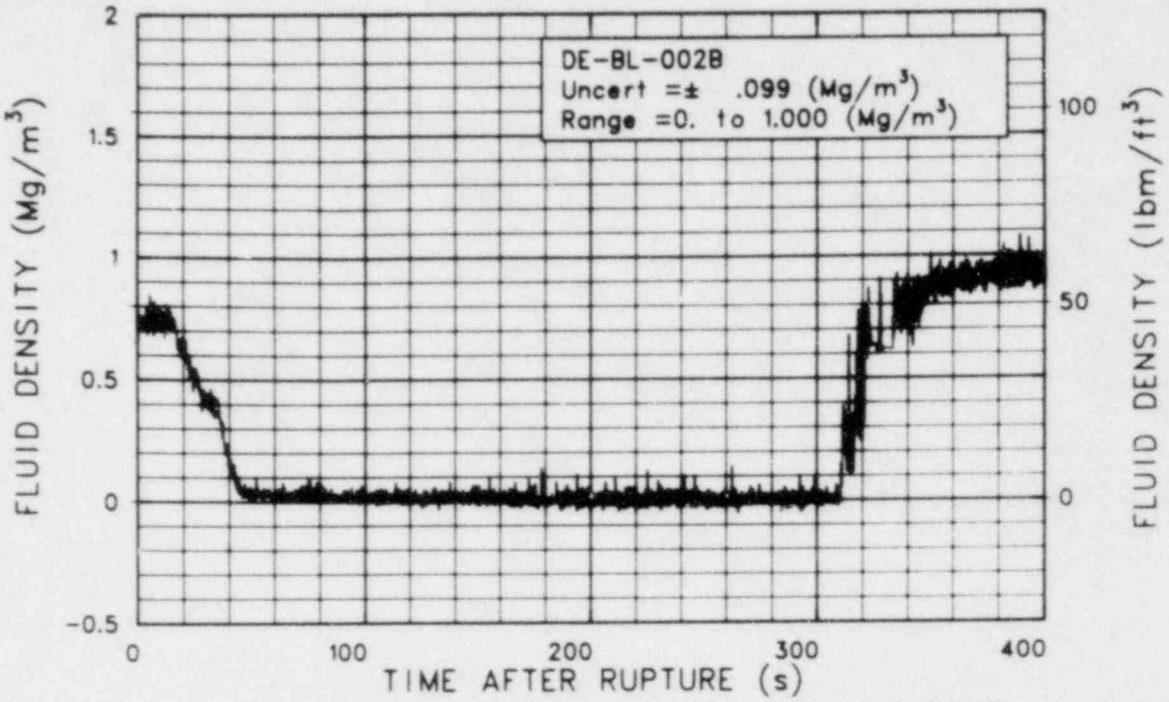


Figure 5L-3. Fluid density in broken loop hot leg, chordal density (DE-BL-002B) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

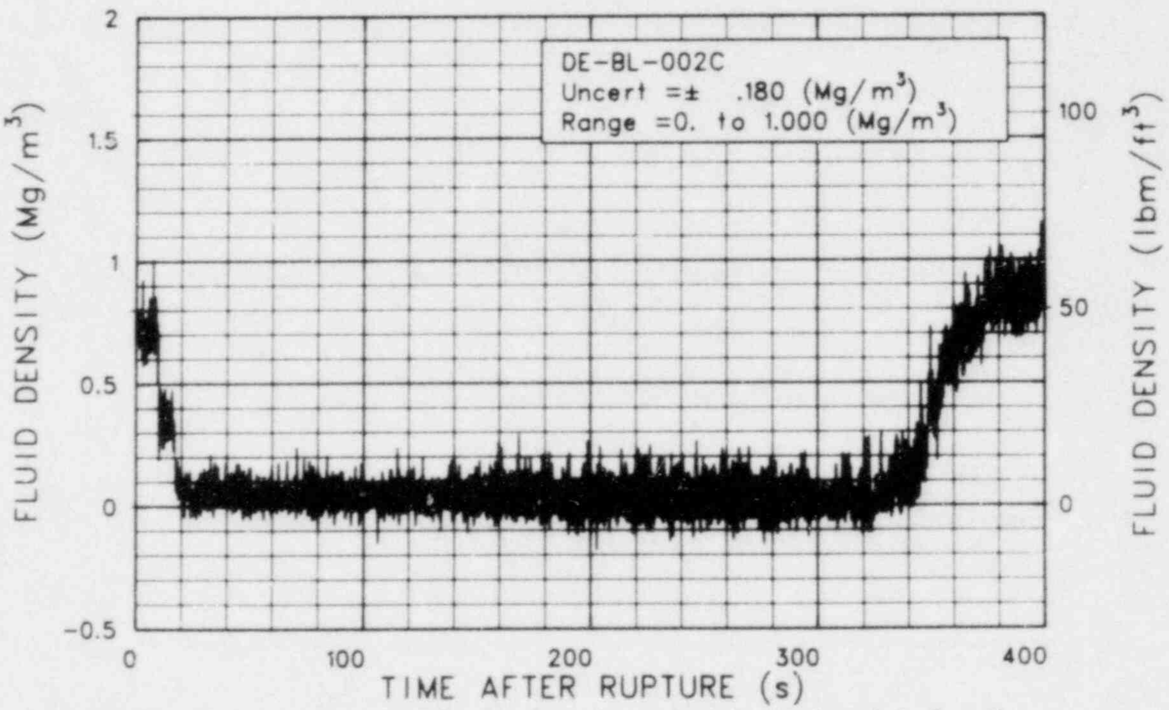


Figure 5L-4. Fluid density in broken loop hot leg, chordal density (DE-BL-002C) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

EXPERIMENT L8-2

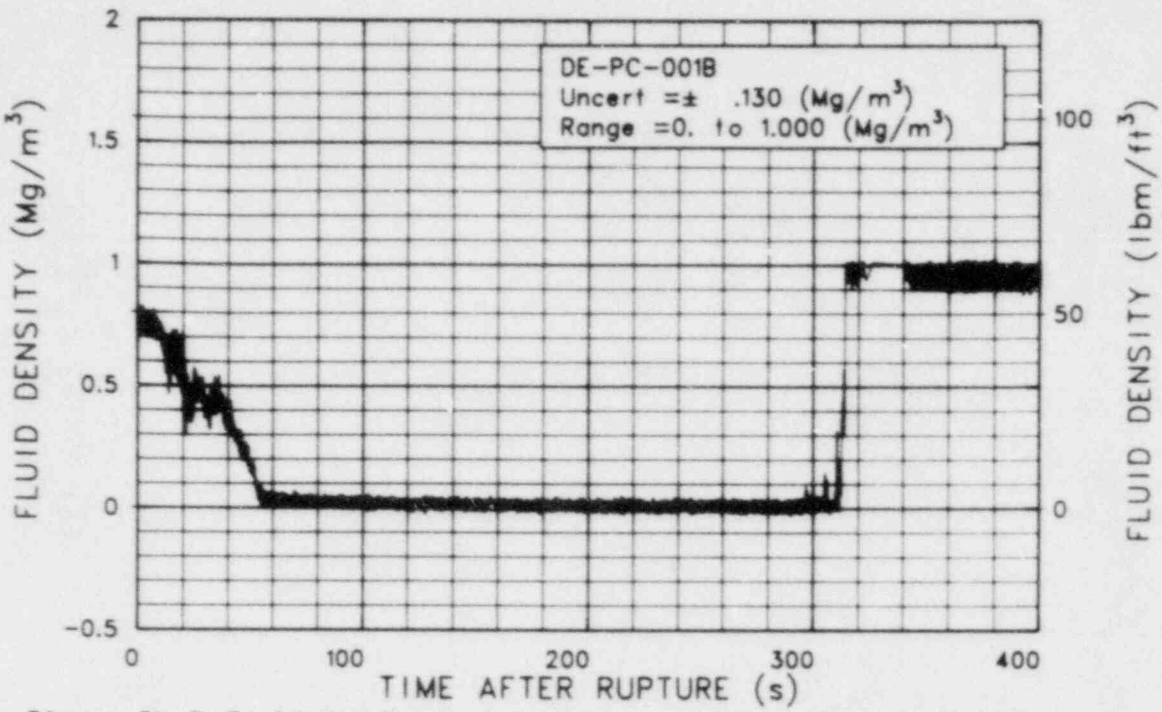


Figure 5L-5. Fluid density in intact loop cold leg, chordal density (DE-PC-001B) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

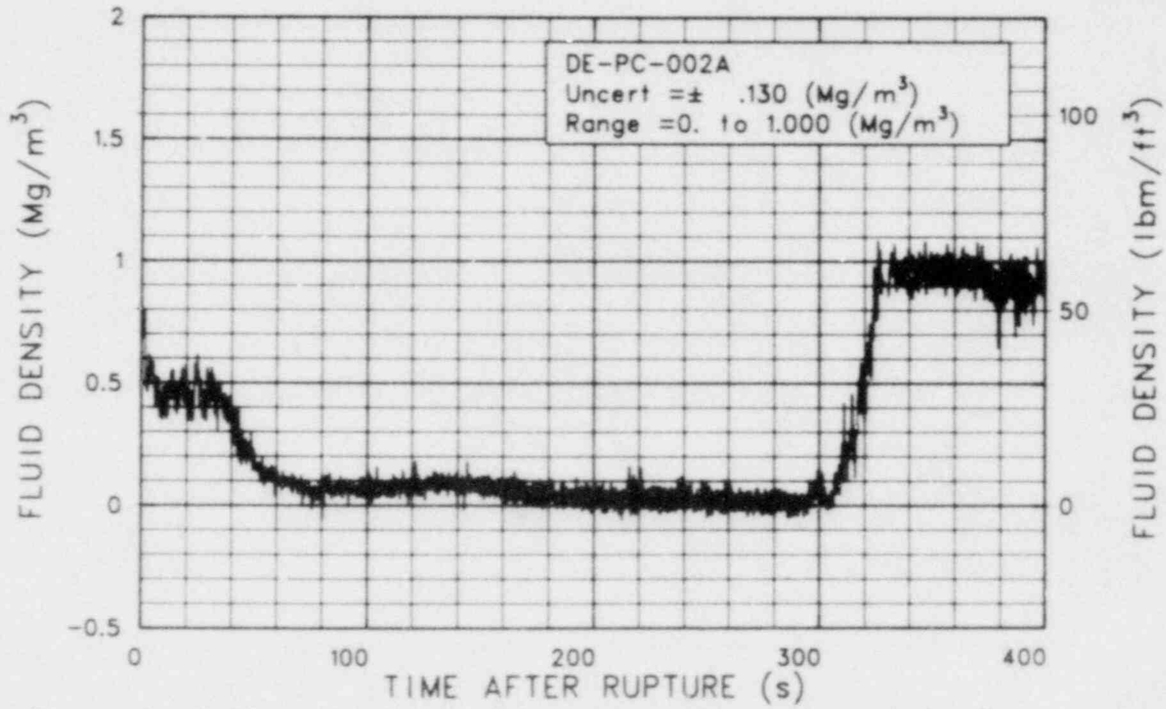


Figure 5L-6. Fluid density in intact loop hot leg, chordal density (DE-PC-002A) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

EXPERIMENT L8-2

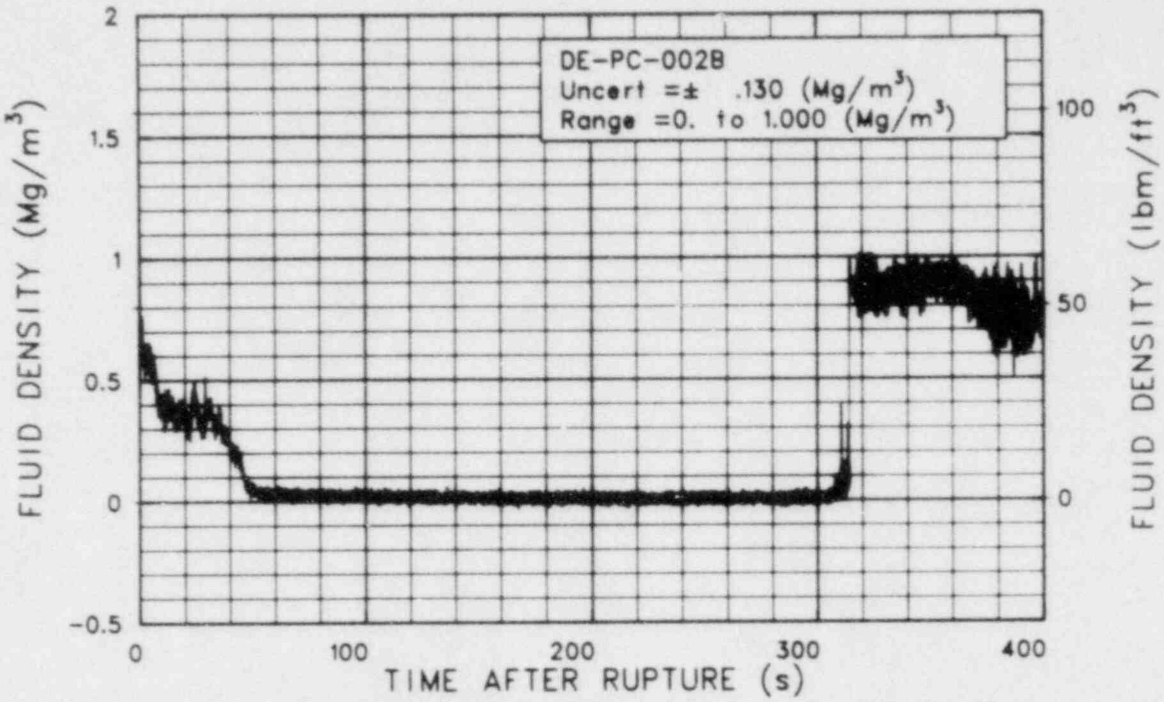


Figure 5L-7. Fluid density in intact loop hot leg, chordal density (DE-PC-002B) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

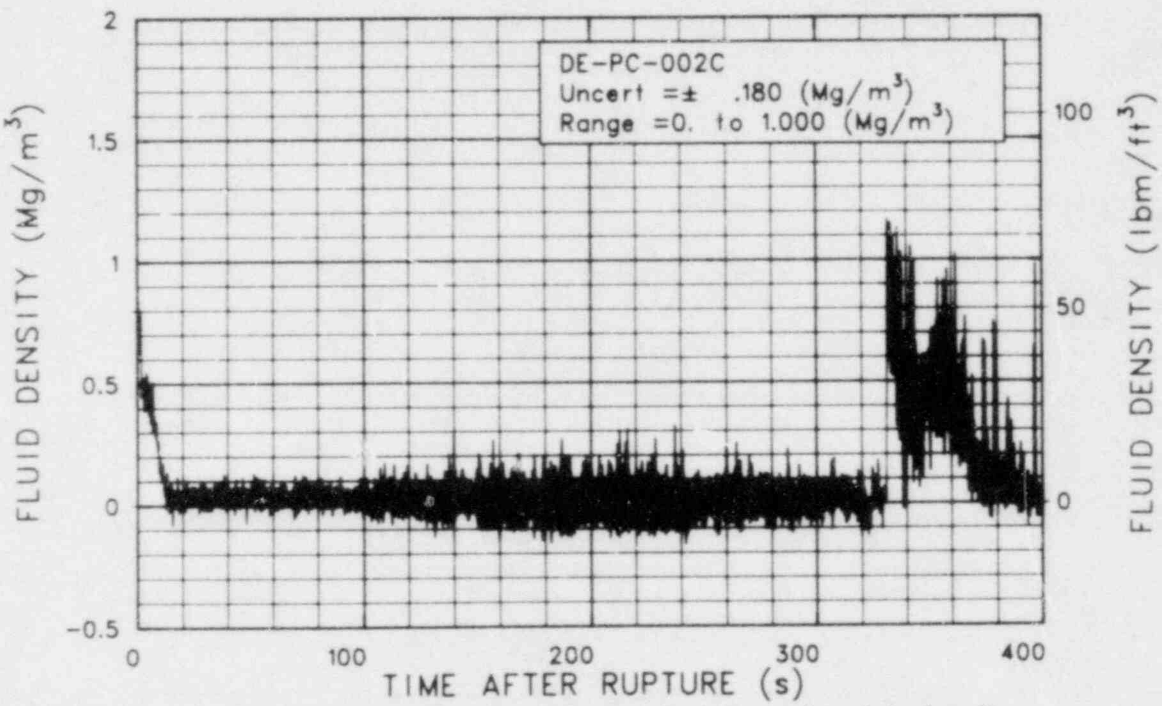


Figure 5L-8. Fluid density in intact loop hot leg, chordal density (DE-PC-002C) (qualified, magnitude uncertain, invalid data between 310 and 360 s, replaced by interpolation).

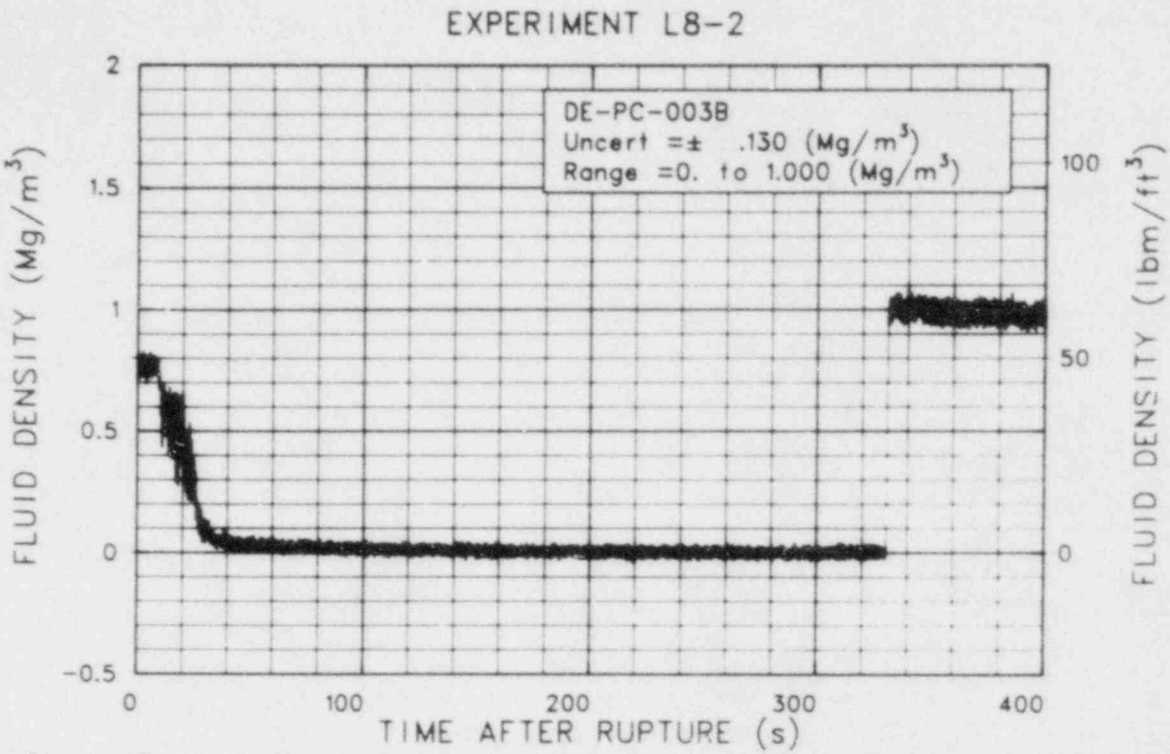


Figure 5L-9. Fluid density in intact loop at steam generator outlet, chordal density (DE-PC-003B).

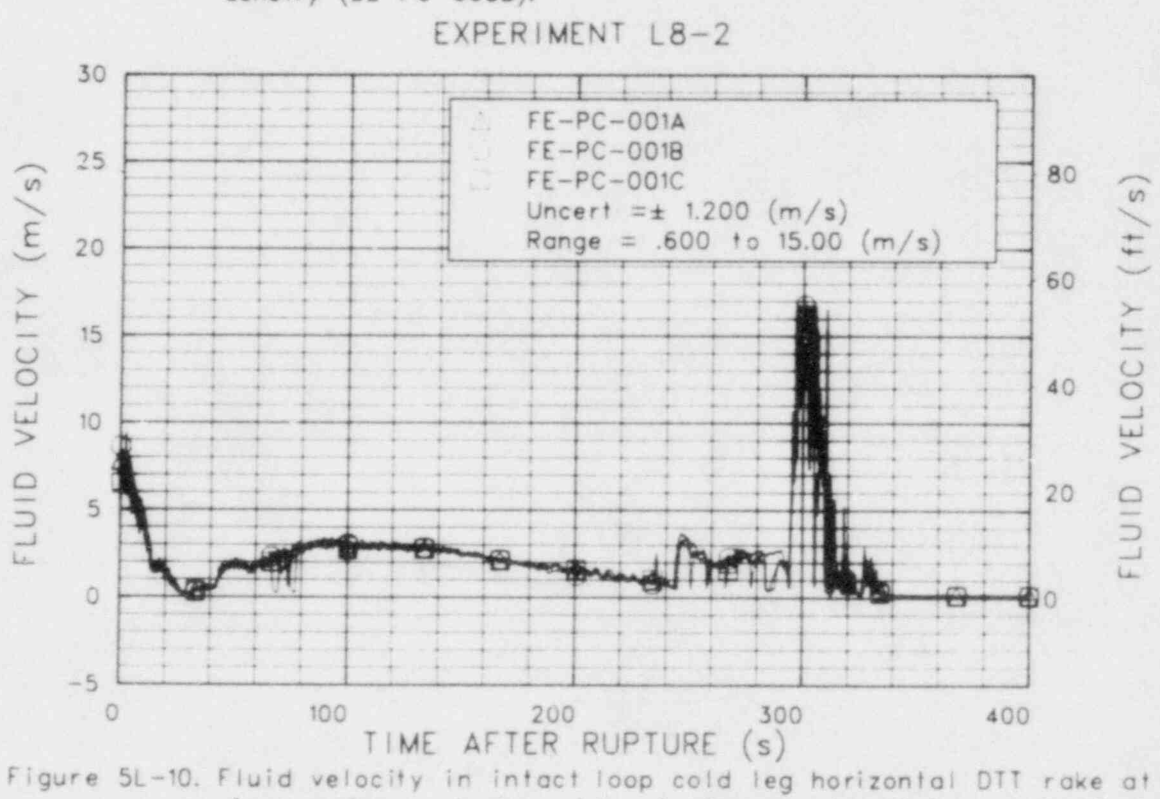


Figure 5L-10. Fluid velocity in intact loop cold leg horizontal DTT rake at far, center, and near side of pipe as viewed from rake flange (FE-PC-001A, -001B, and -001C).

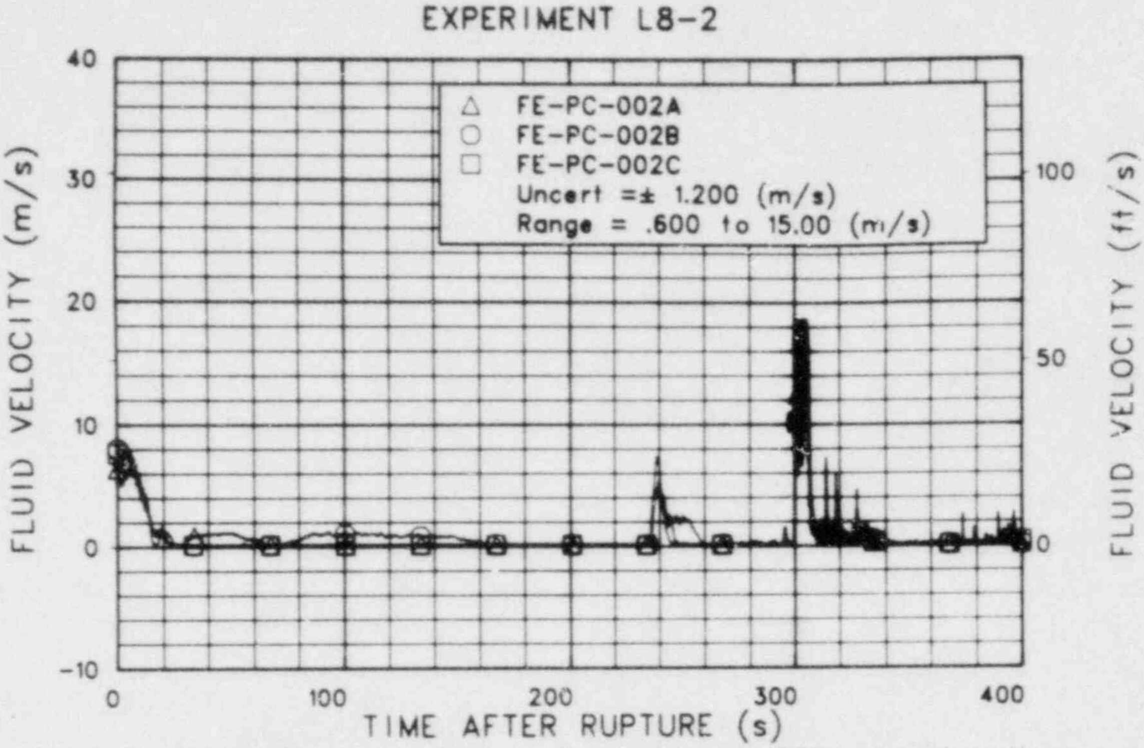


Figure 5L-11. Fluid velocity in intact loop hot leg DTT rake at bottom, middle, and top of pipe (FE-PC-002A, -002B, and -002C).

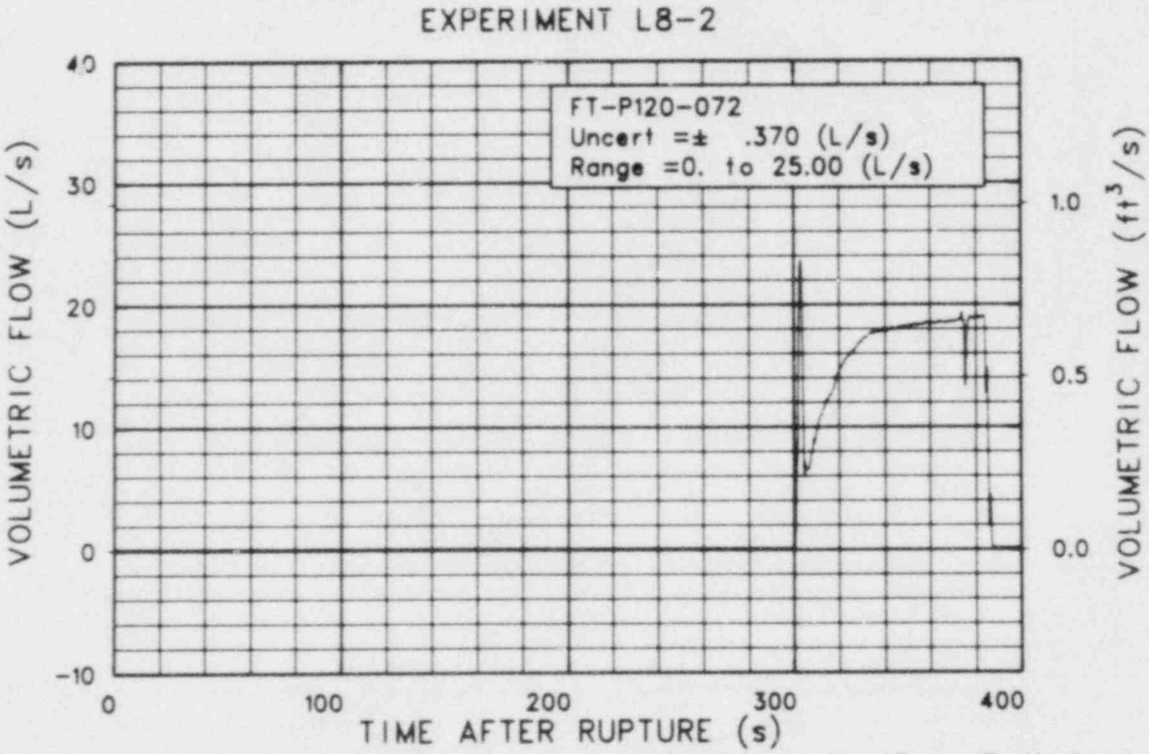


Figure 5L-12. Flow rate in low-pressure injection system Pump B discharge (FT-P120-072).

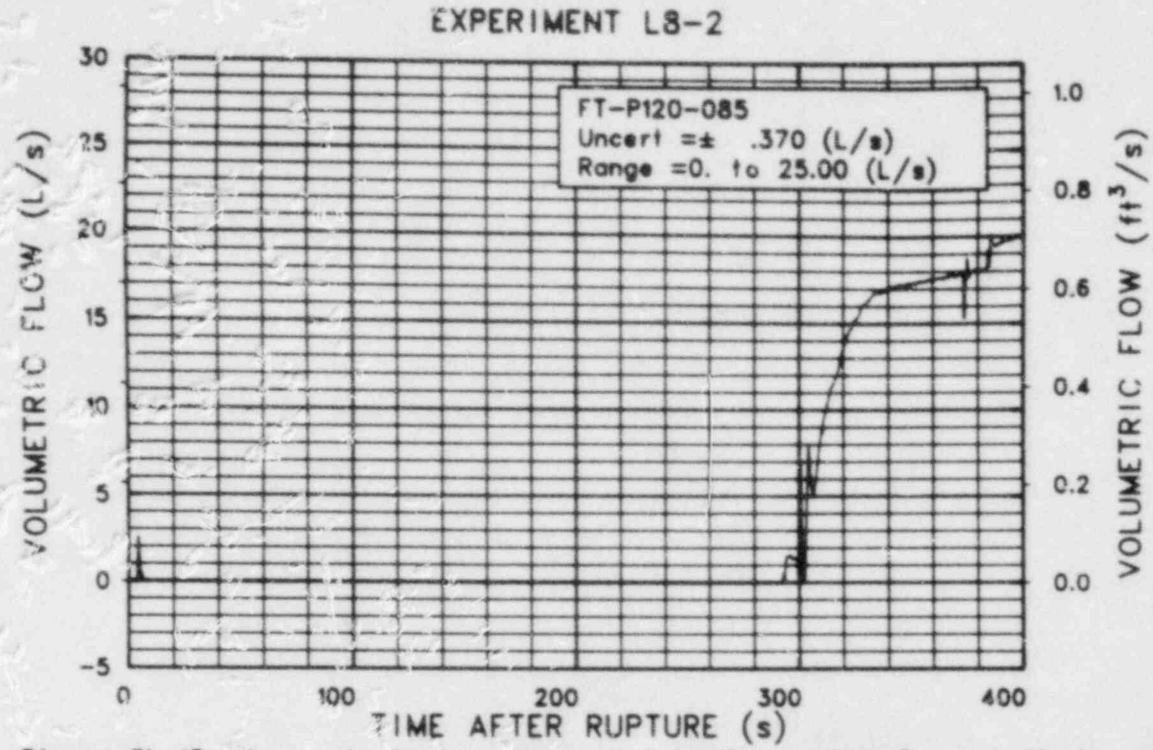


Figure 5L-13. Flow rate in low-pressure injection system Pump A discharge (FT-P120-085) (qualified, spikes at approximately 5 s).

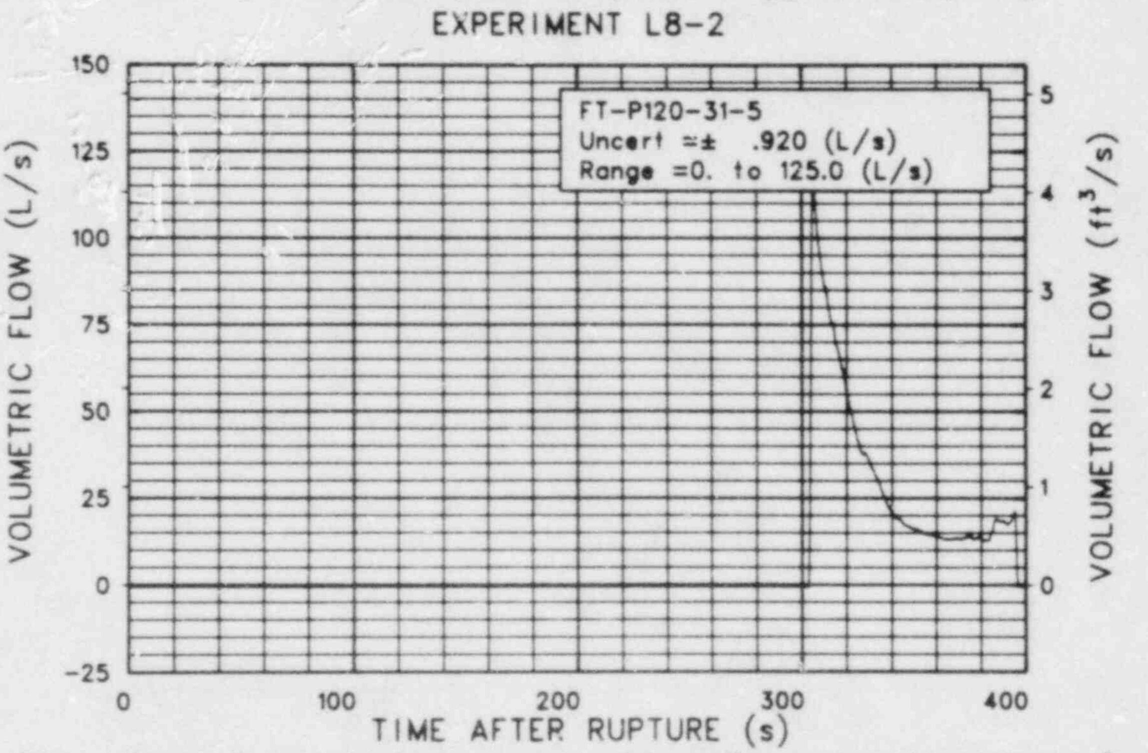


Figure 5L-14. Flow rate in emergency core cooling system Accumulator B discharge (FT-P120-31-5).

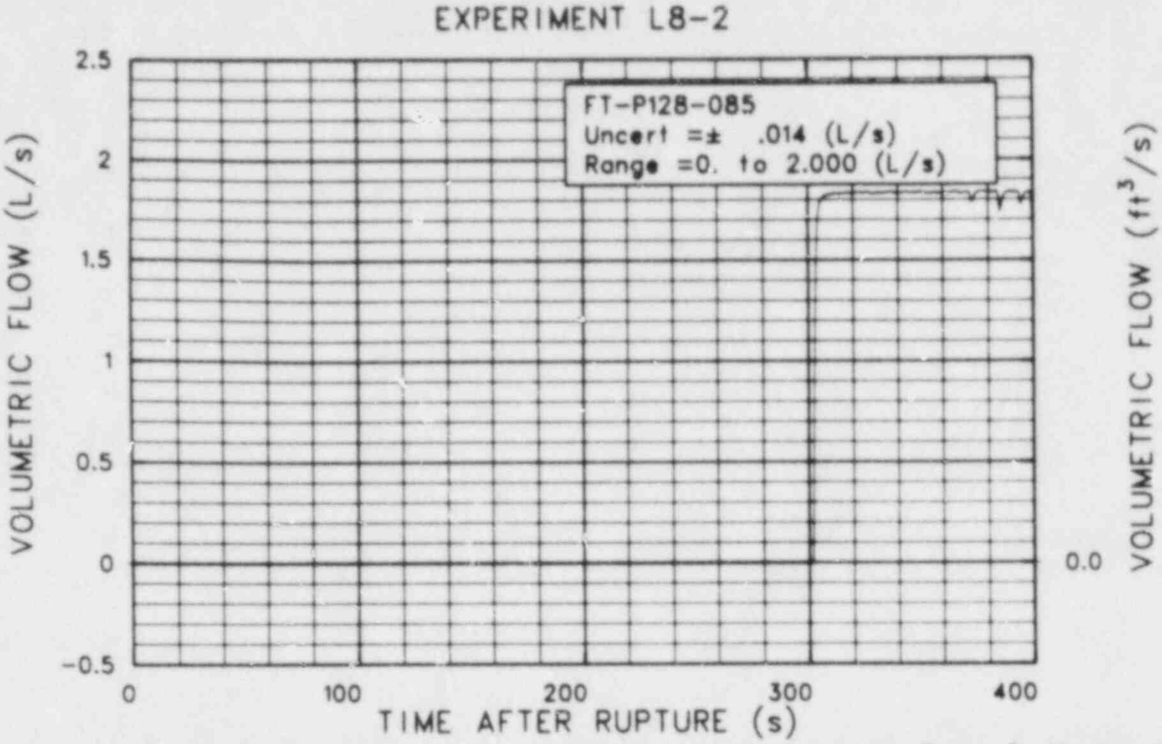


Figure 5L-15. Flow rate in high-pressure injection system Pump B discharge (FT-P128-085).

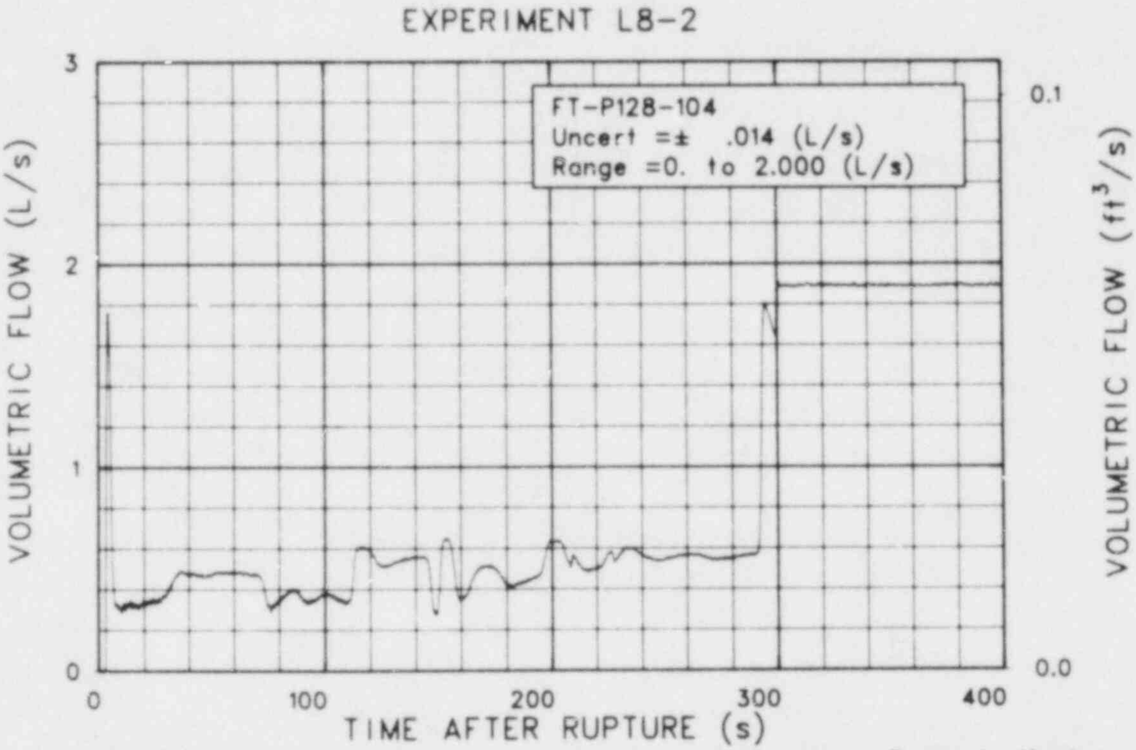


Figure 5L-16. Flow rate in high-pressure injection system Pump A discharge (FT-P128-104).

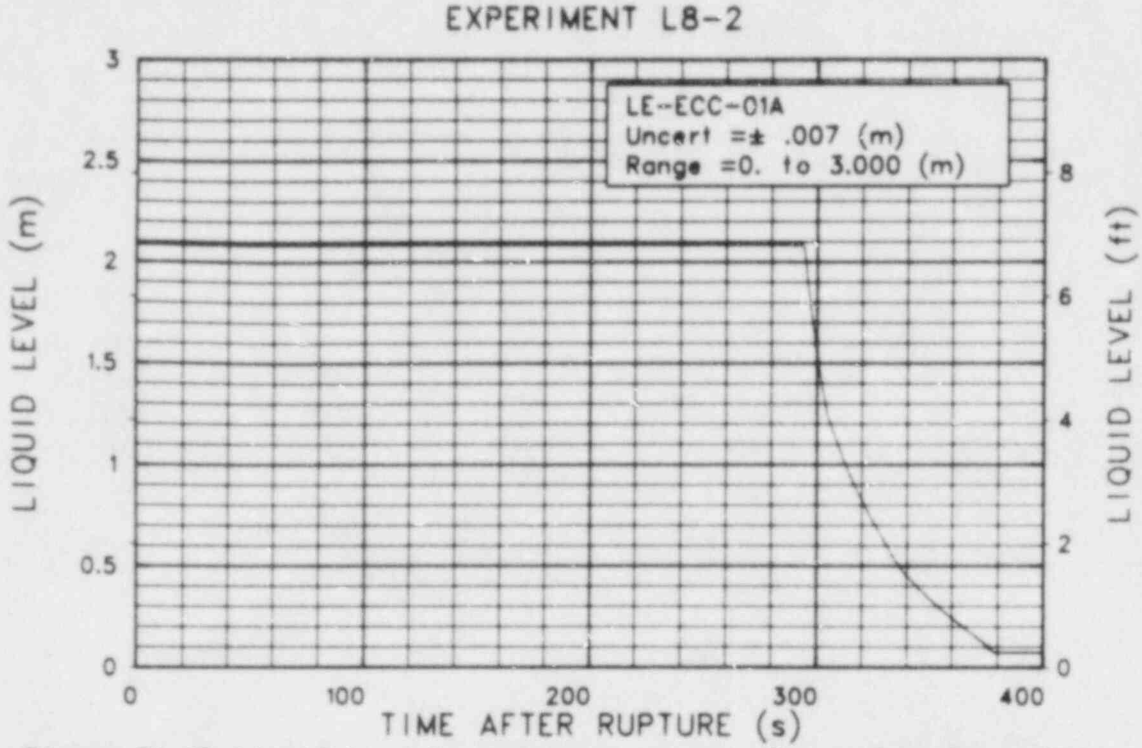


Figure 5L-17. Liquid level in emergency core cooling system Accumulator A (LE-ECC-01A).

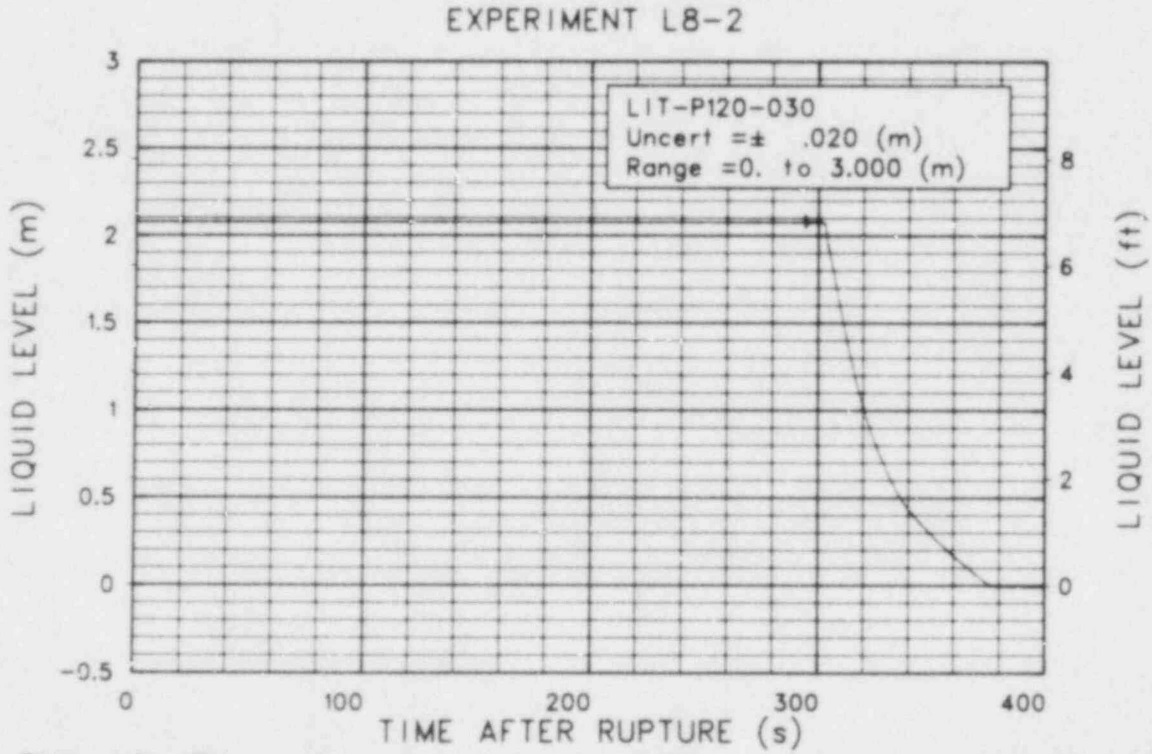


Figure 5L-18. Liquid level in emergency core cooling system Accumulator B (LIT-P120-030).

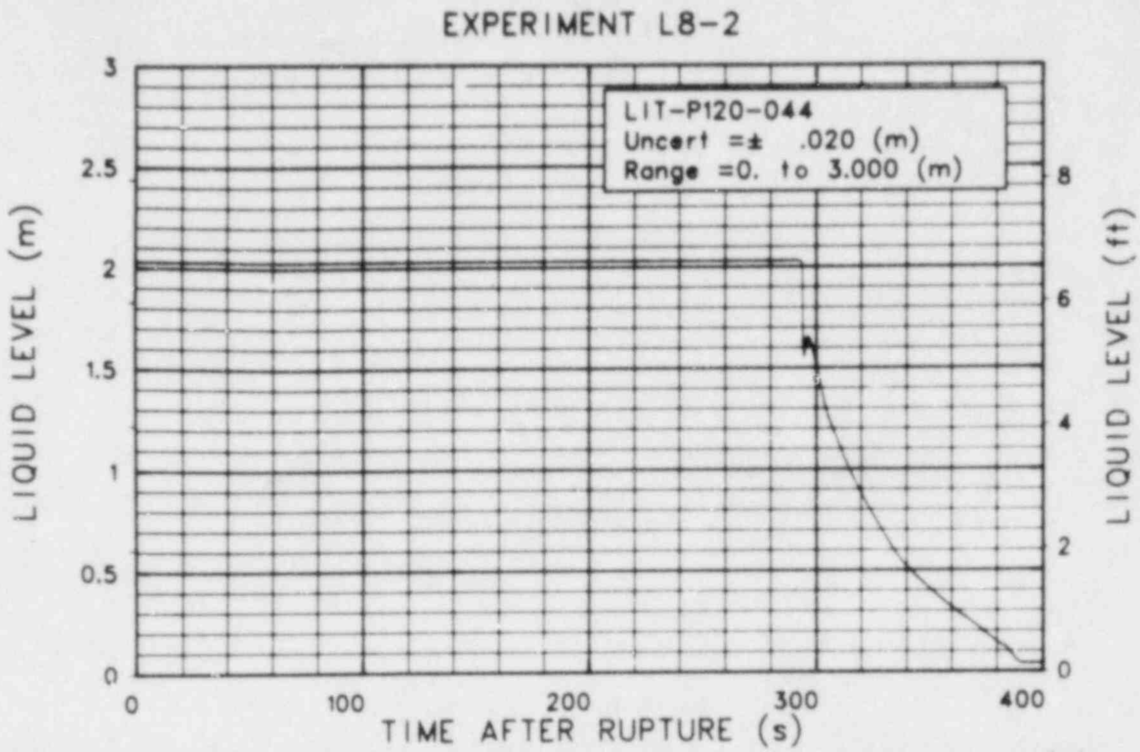


Figure 3L-19. Liquid level in emergency core cooling system Accumulator A (LIT-P120-044).

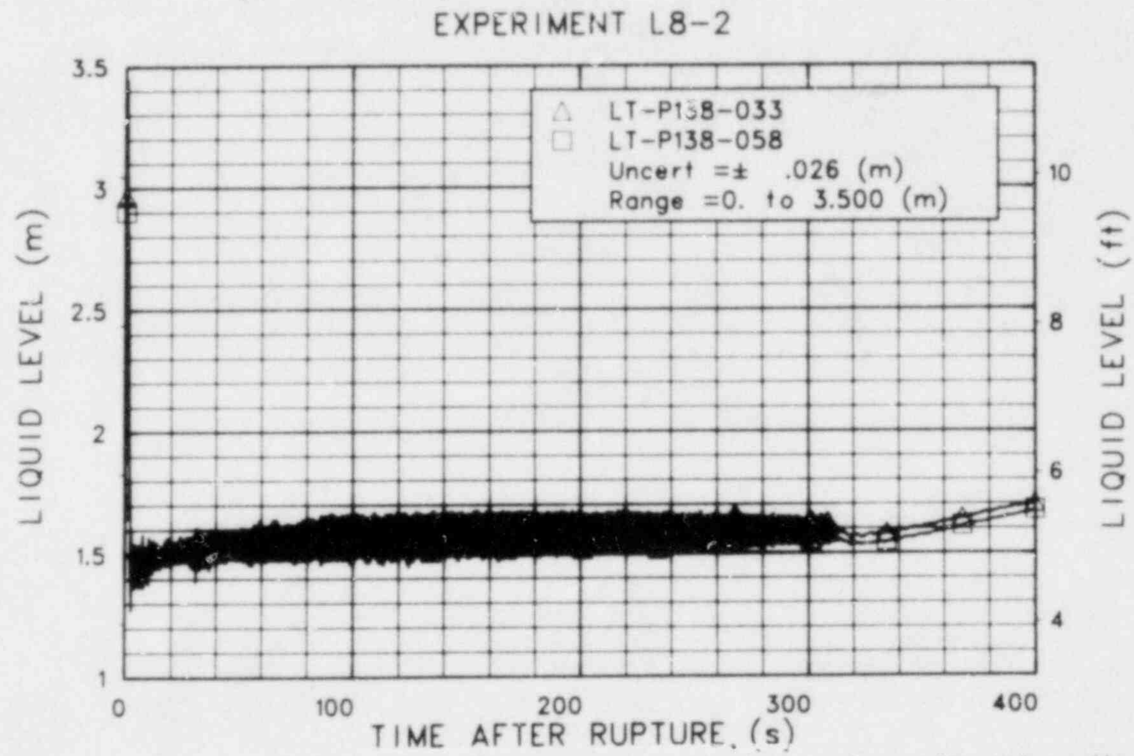


Figure 5L-20. Liquid level in blowdown suppression tank, north and south ends (LT-P138-033 and -058) (qualified, not density compensated).

EXPERIMENT L8-2

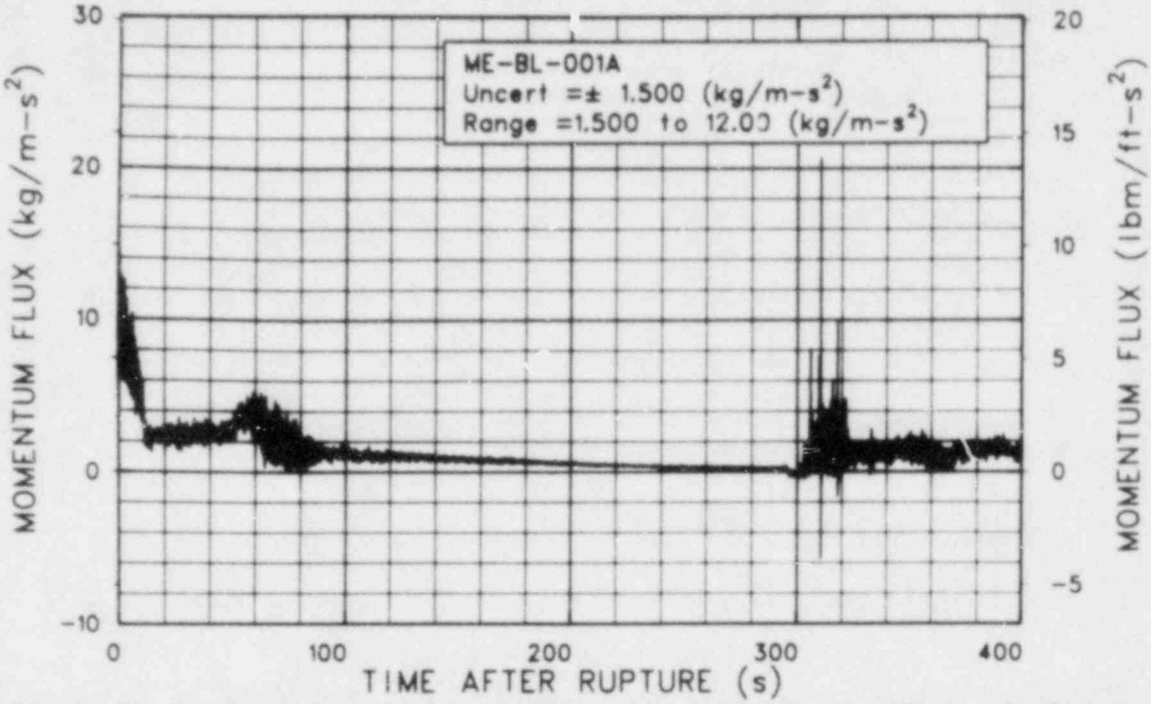


Figure 5L-21. Momentum flux in broken loop cold leg at bottom of pipe, high range (ME-BL-001A).

EXPERIMENT L8-2

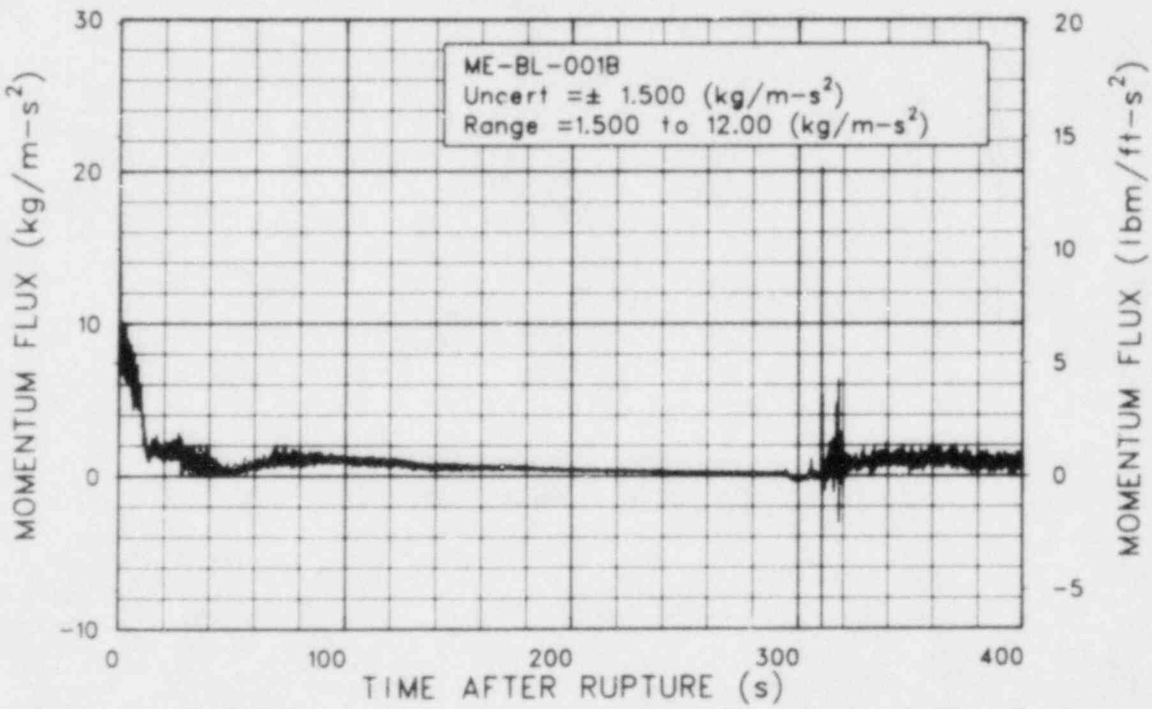


Figure 5L-22. Momentum flux in broken loop cold leg at middle of pipe, high range (ME-BL-001B).

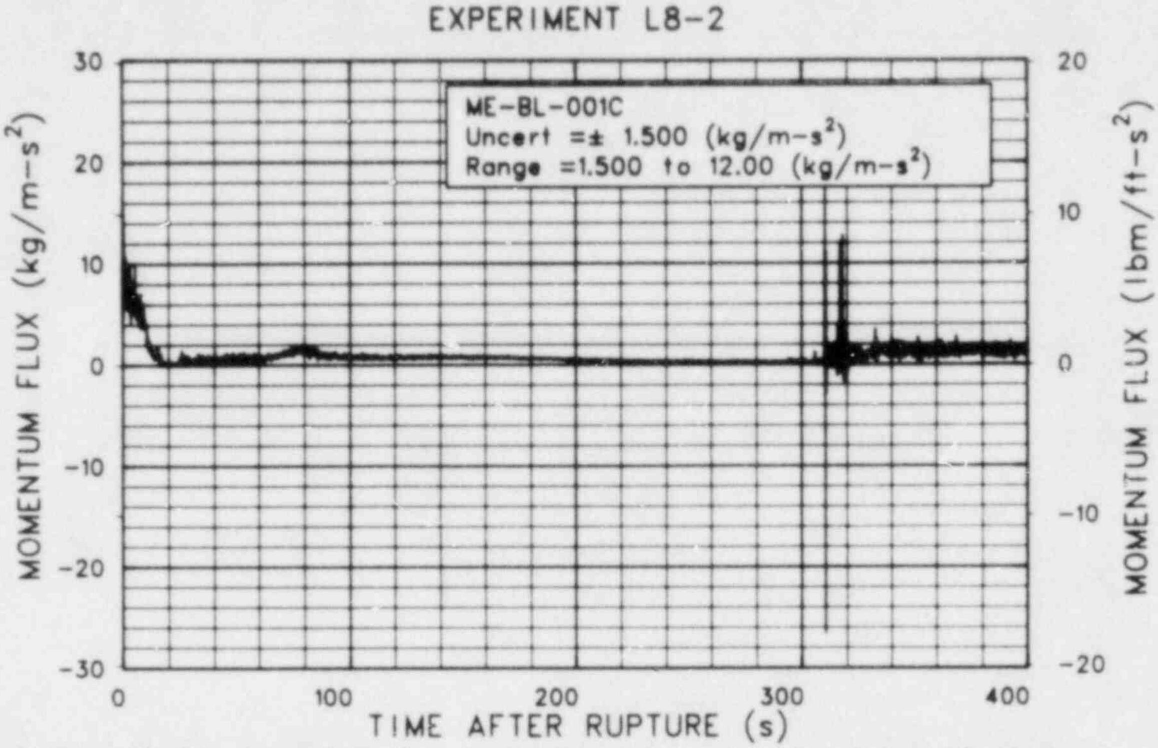


Figure 5L-23. Momentum flux in broken loop cold leg at top of pipe, high range (ME-BL-001C).

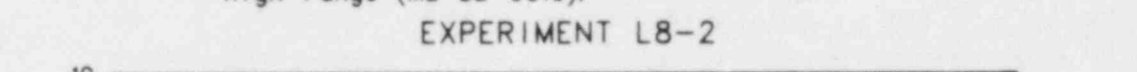


Figure 5L-24. Momentum flux in broken loop cold leg DTT rake at bottom of pipe, low range (ME-BL-001D) (qualified, narrow range instrument).

EXPERIMENT L8-2

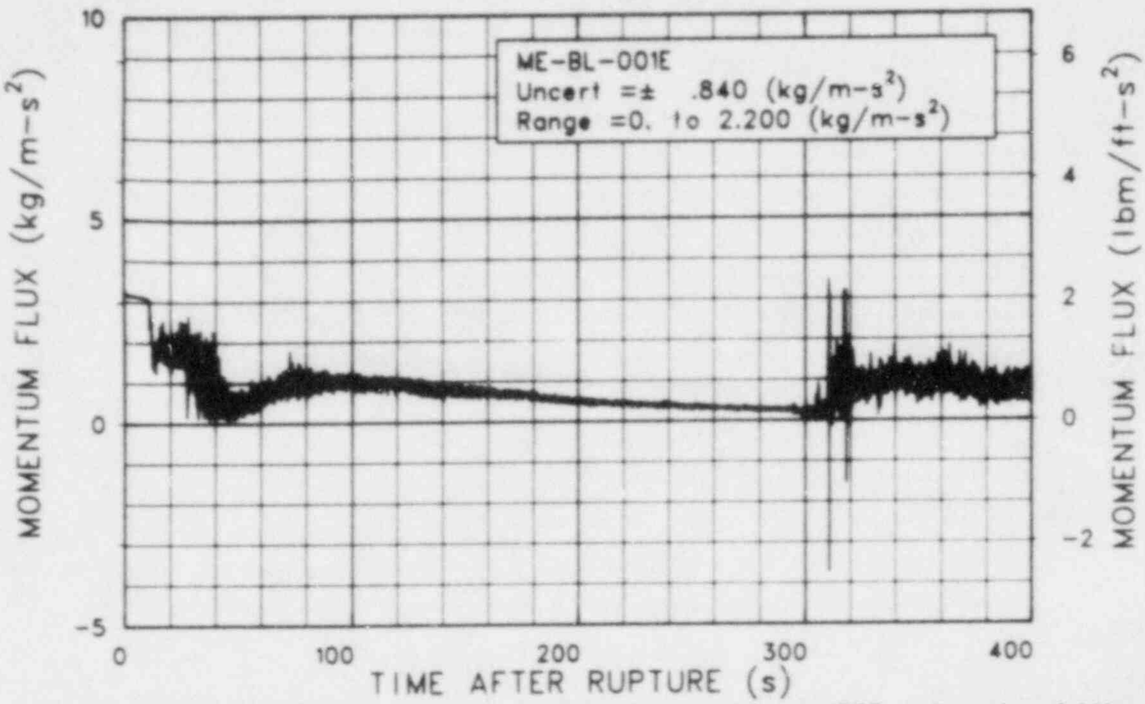


Figure 5L-25. Momentum flux in broken loop cold leg DTT rake at middle of pipe, low range (ME-BL-001E) (qualified, narrow range instrument).

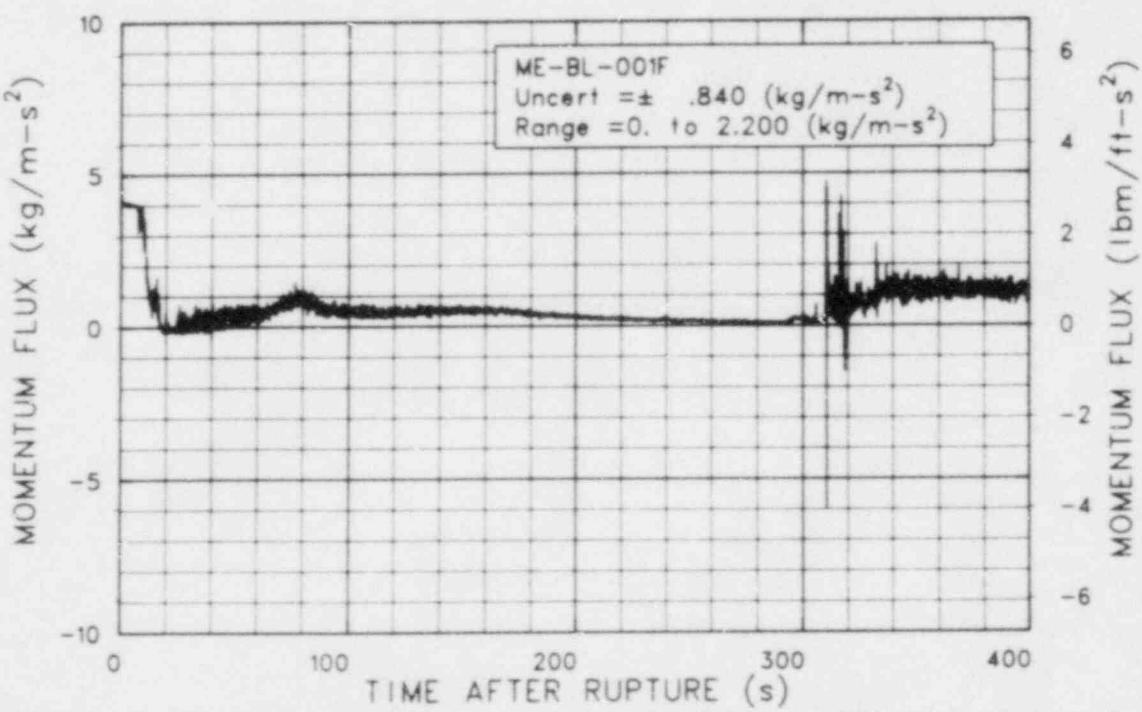


Figure 5L-26. Momentum flux in broken loop cold leg DTT rake at top of pipe, low range (ME-BL-001F) (qualified, narrow range instrument).

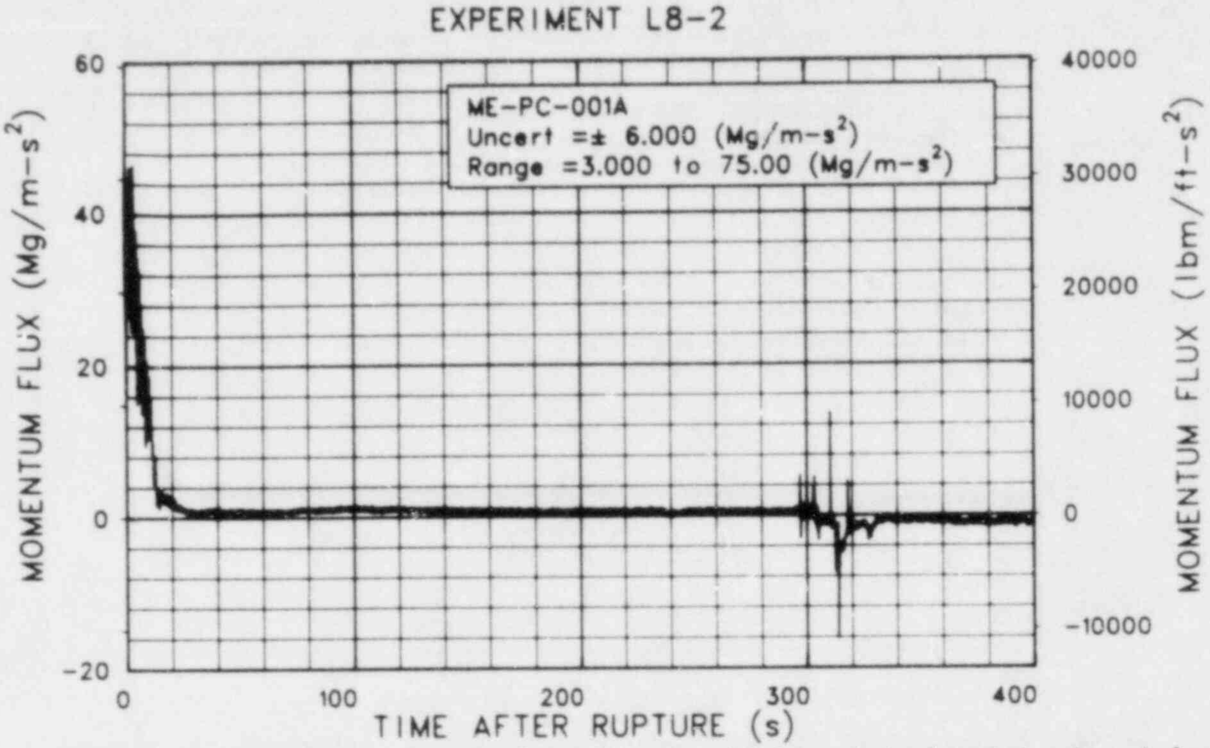


Figure 5L-27. Momentum flux in intact loop cold leg at horizontal rake at far side of pipe as viewed from rake flange (ME-PC-001A).

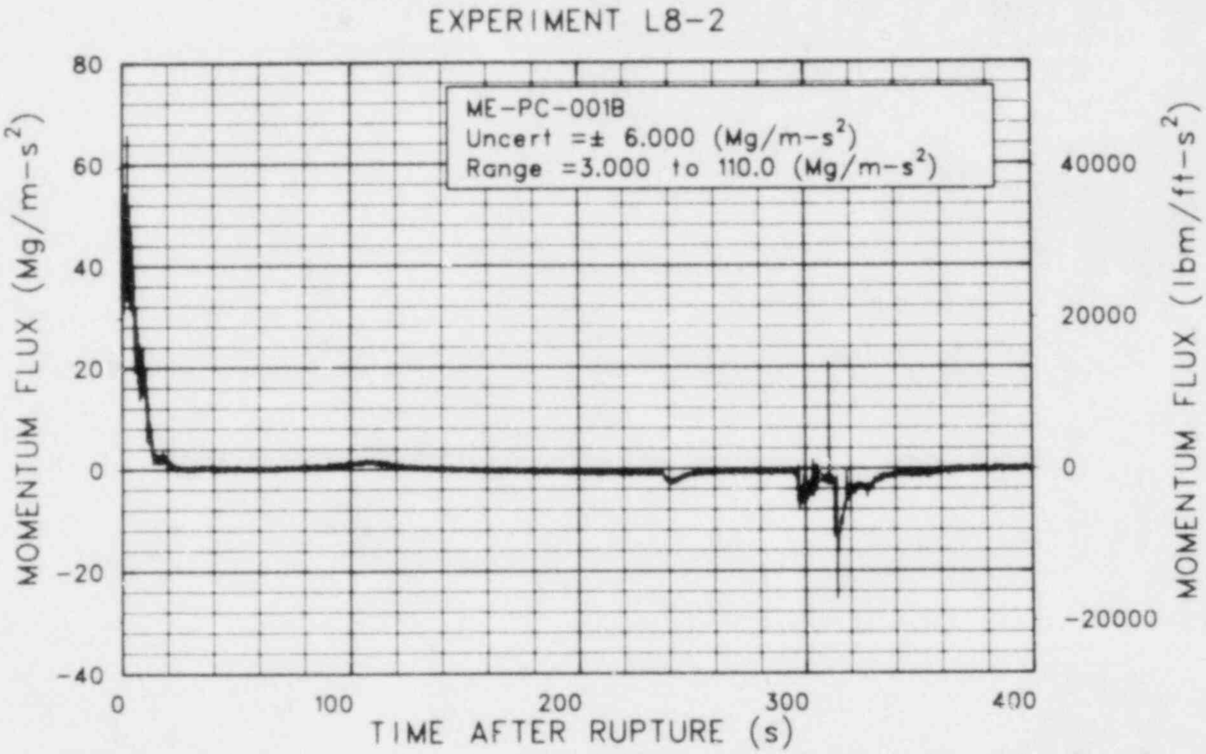


Figure 5L-28. Momentum flux in intact loop cold leg at horizontal rake at center of pipe (ME-PC-001B) (qualified, magnitudes uncertain).

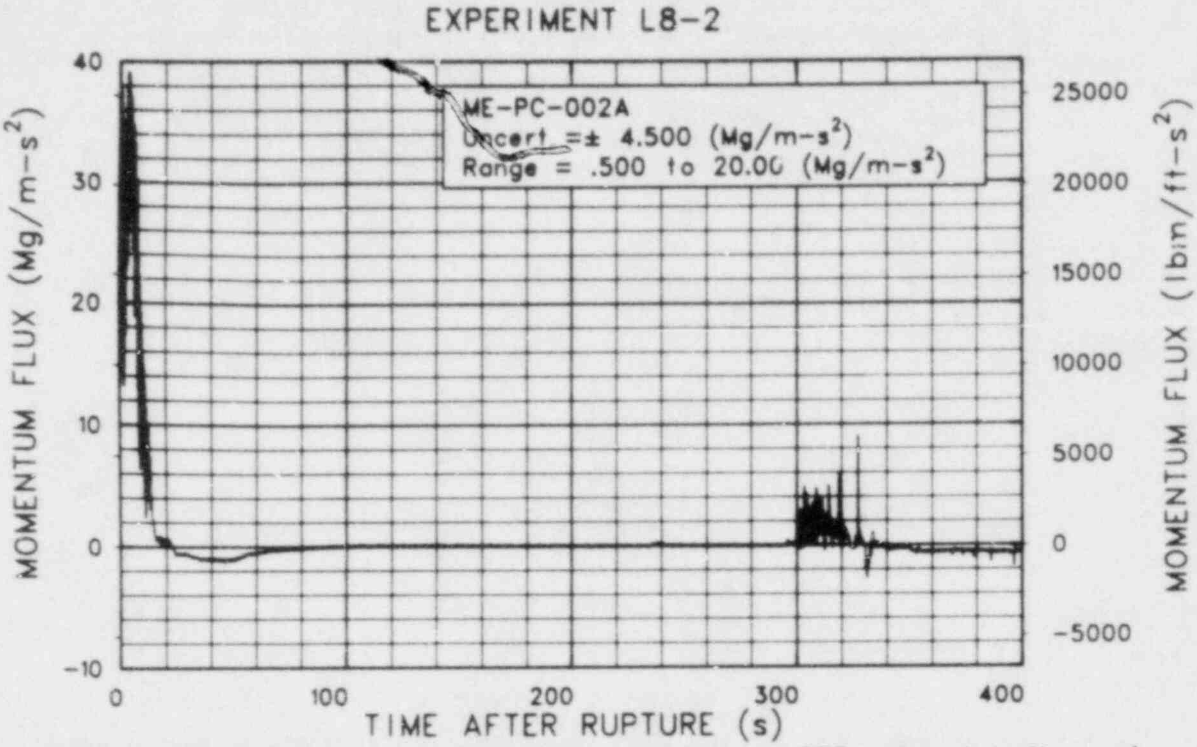


Figure 5L-29. Momentum flux in intact loop hot leg DTT rake at bottom of pipe (ME-PC-002A).

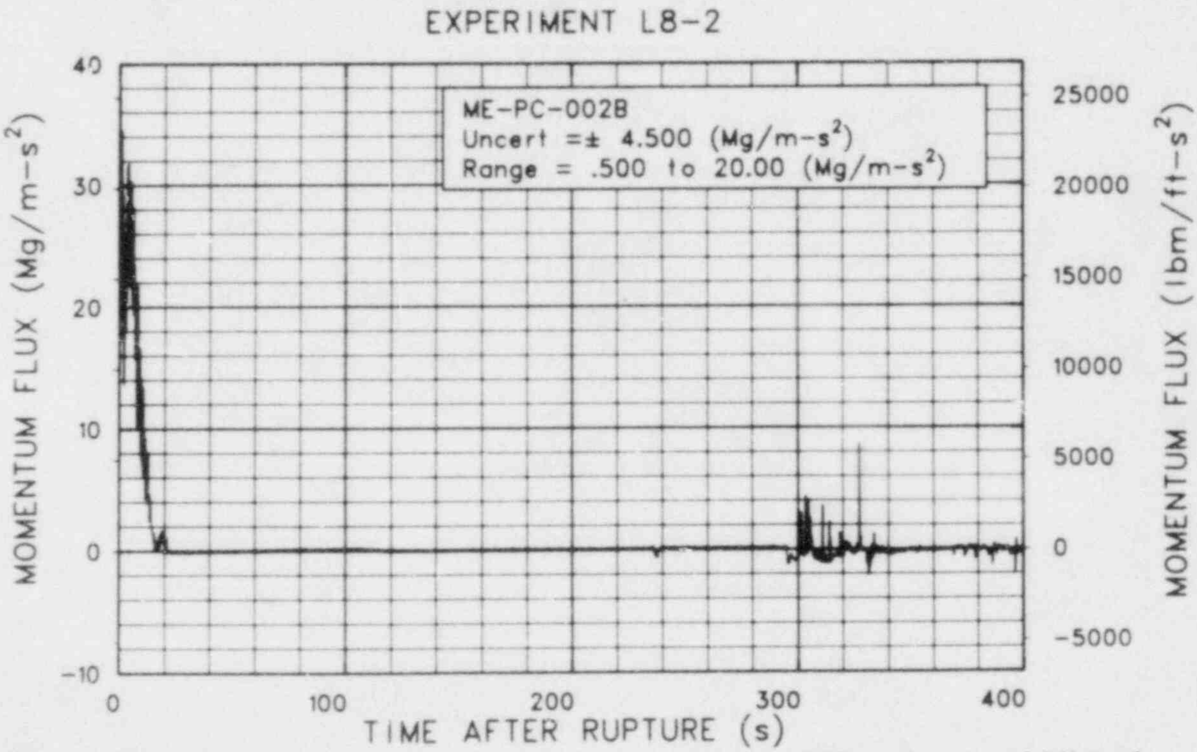


Figure 5L-30. Momentum flux in intact loop hot leg DTT rake at middle of pipe (ME-PC-002B).

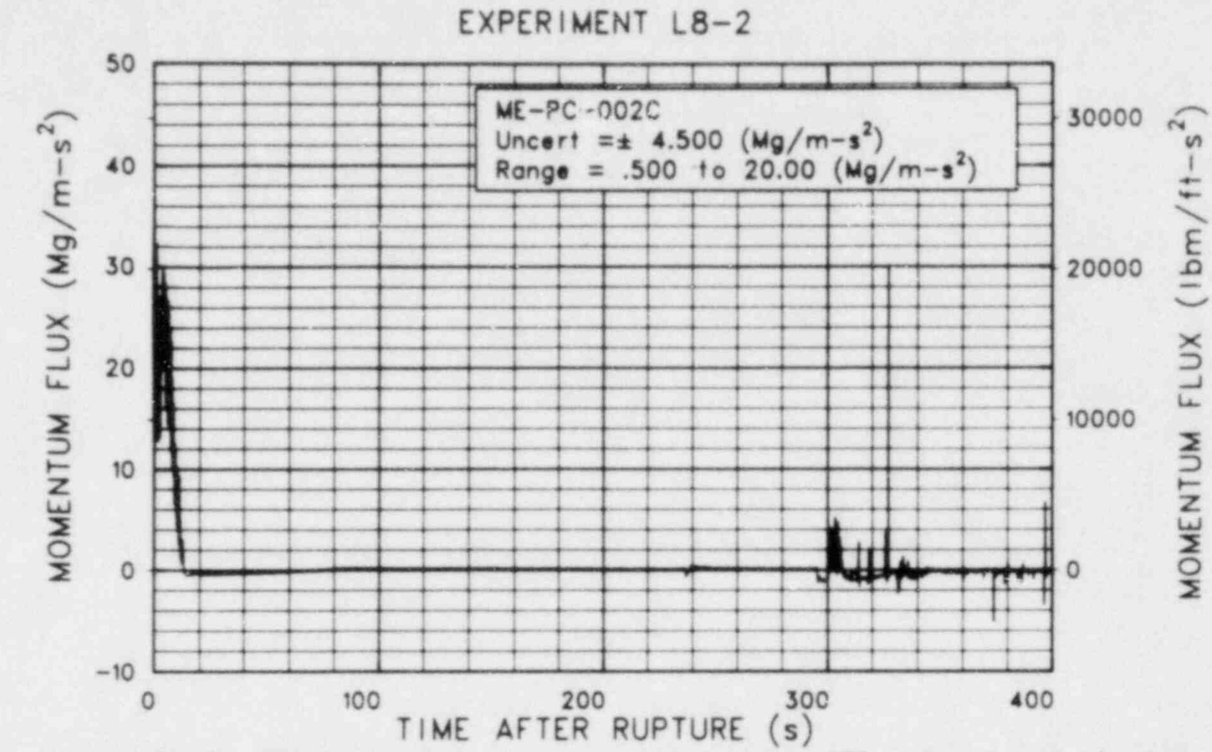


Figure 5L-31. Momentum flux in intact loop hot leg DTT rake at top of pipe (ME-PC-002C).

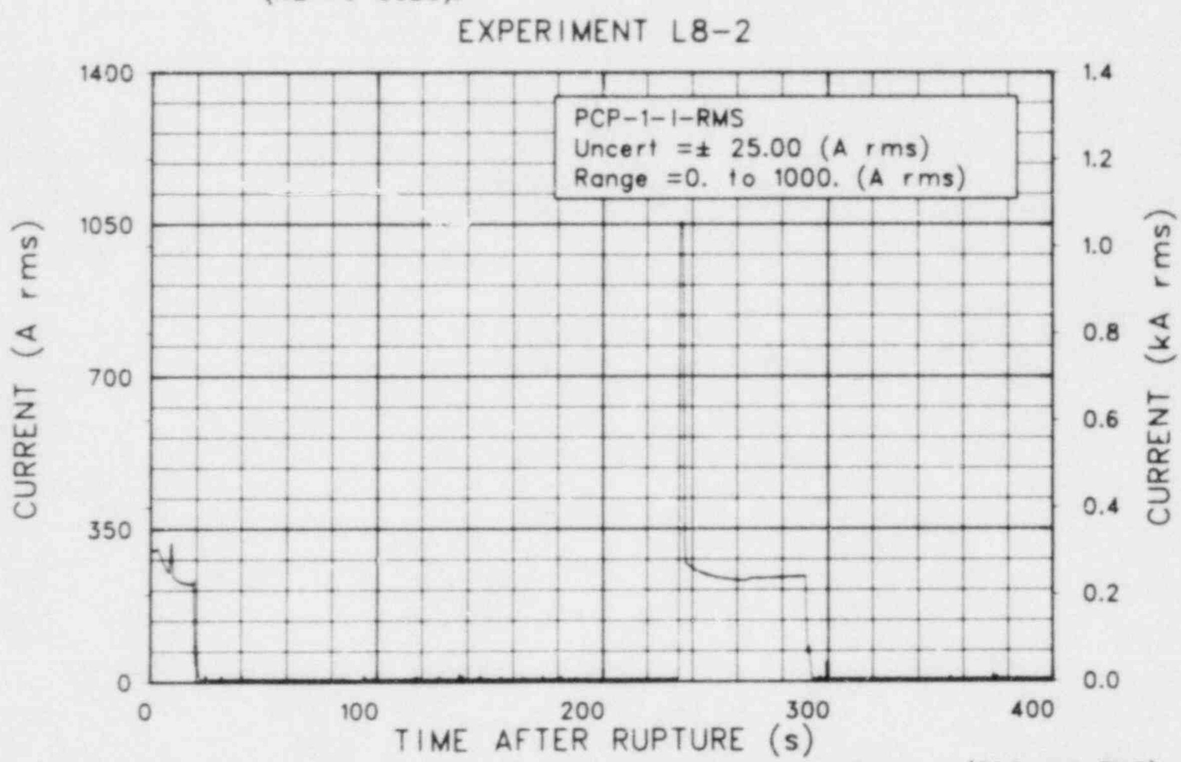


Figure 5L-32. Electrical current for primary coolant Pump 1 (PCP-1-I-RMS) (qualified, no other measurement for direct comparison).

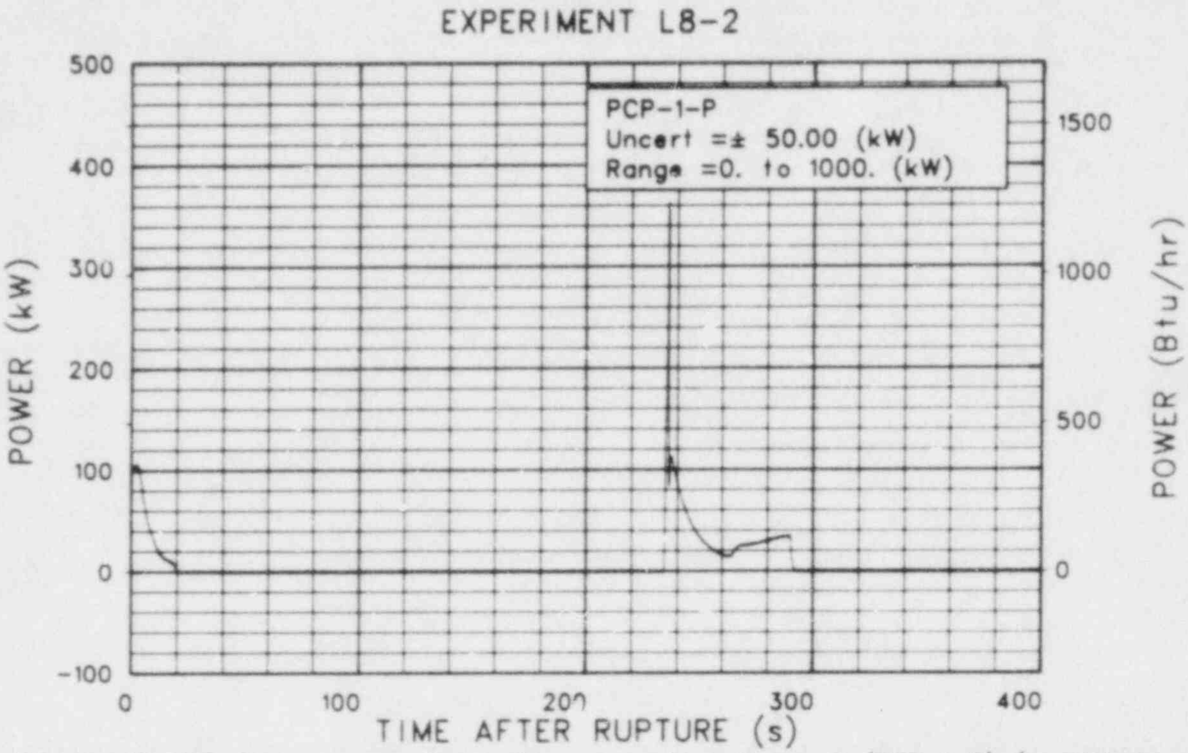


Figure 5L-33. Pump power for primary coolant Pump 2 (PCP-1-P) (qualified, no other measurement for direct comparison).

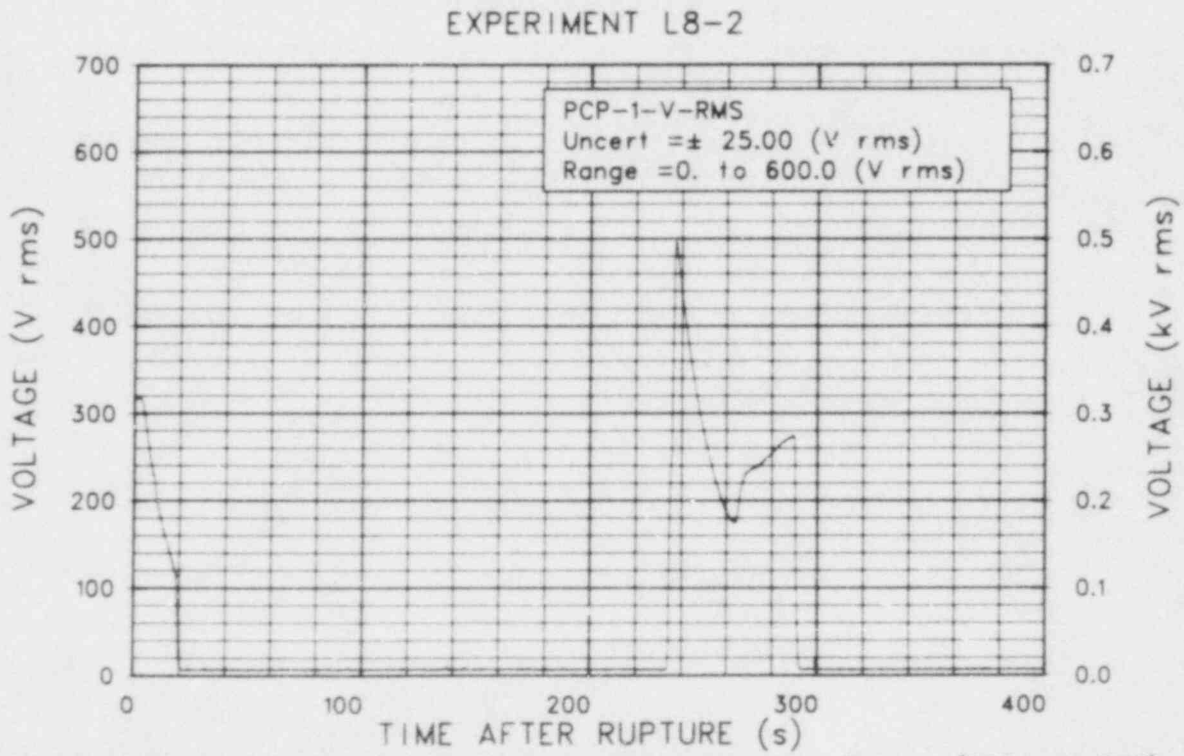


Figure 5L-34. Electrical voltage for primary coolant Pump 1 (PCP-1-V-RMS) (qualified, no other measurement for direct comparison).

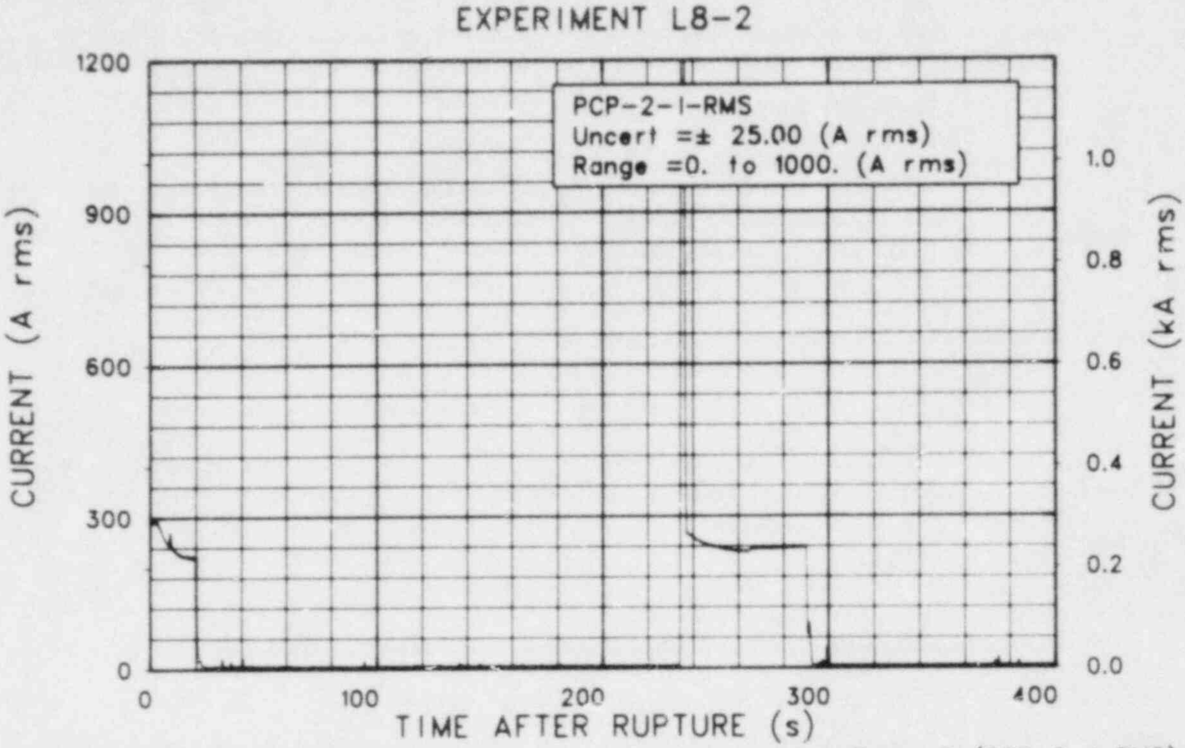


Figure 5L-35. Electrical current for primary coolant Pump 2 (PCP-2-I-RMS) (qualified, no other measurement for direct comparison).

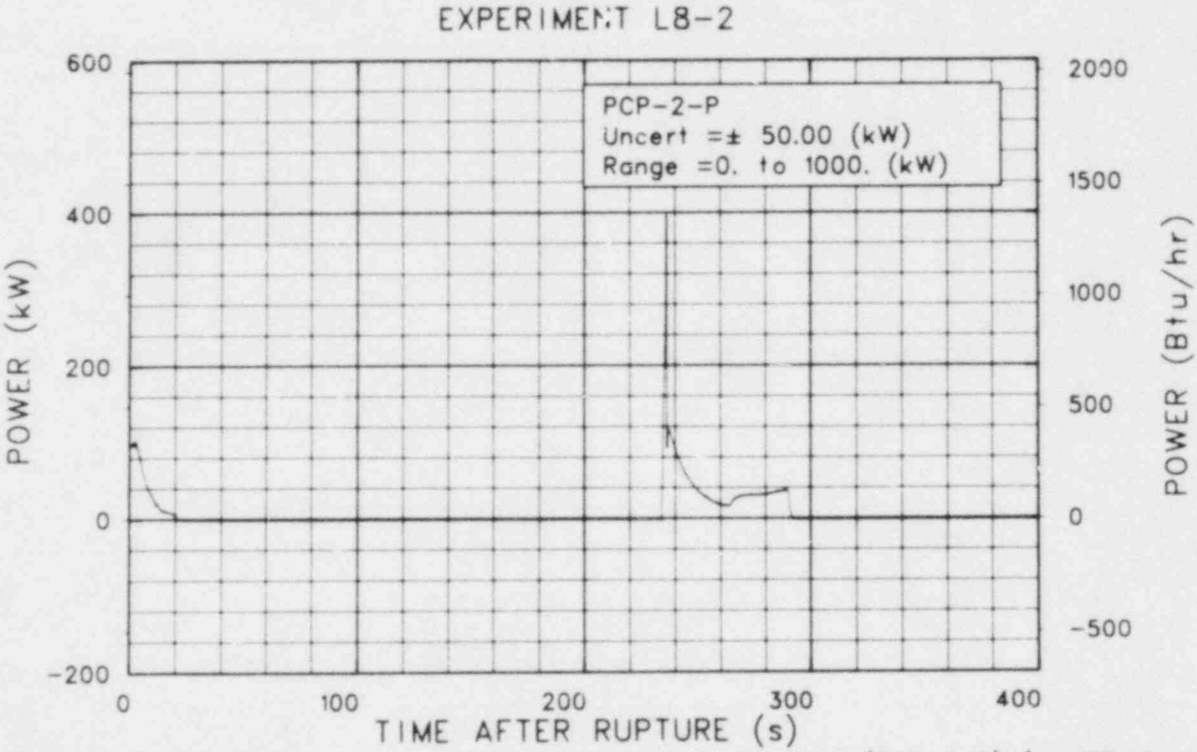


Figure 5L-36. Pump power for primary coolant Pump 2 (PCP-2-P) (qualified, no other measurement for direct comparison).

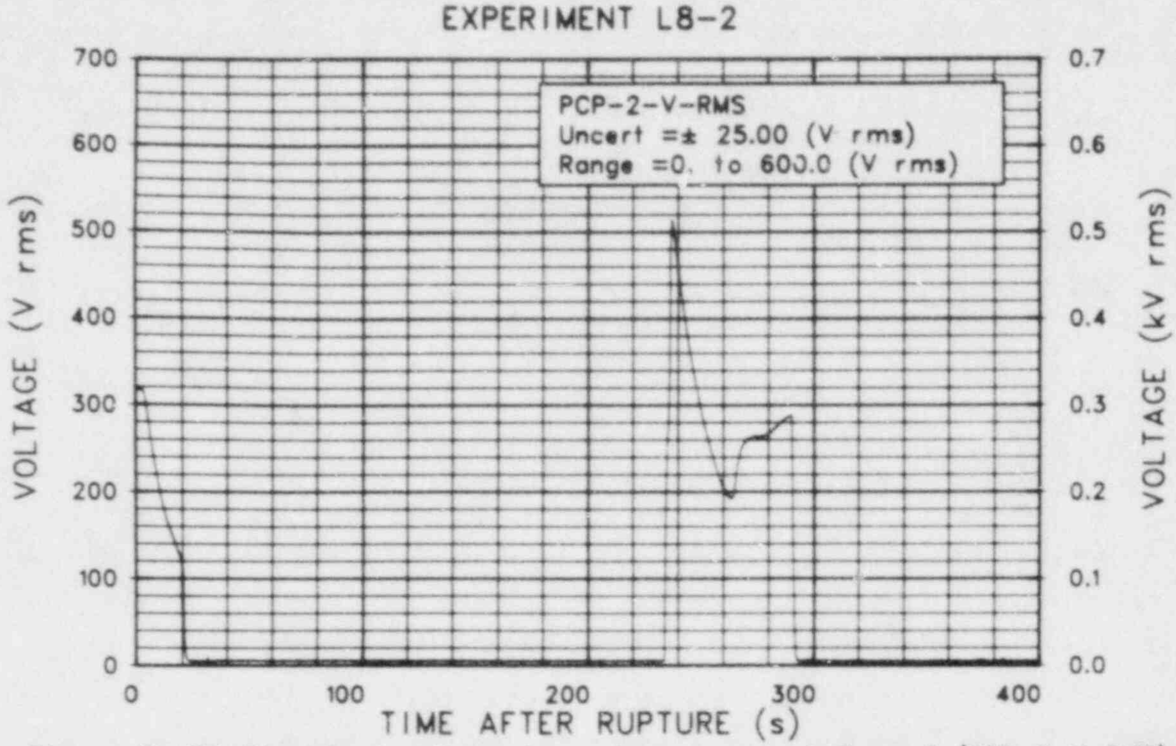


Figure 5L-37. Electrical voltage for primary coolant Pump 2 (PCP-2-V-RMS) (qualified, no other measurement for direct comparison).

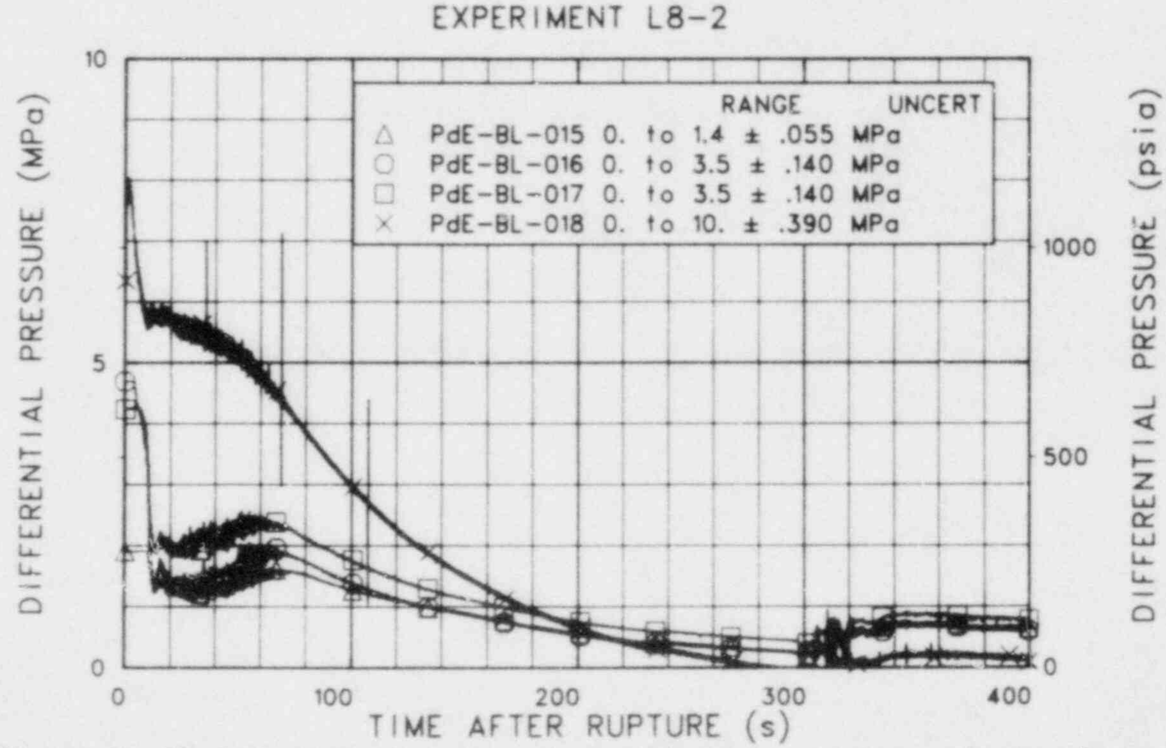


Figure 5L-38. Differential pressure in broken loop cold leg upstream of nozzle throat, midplane, and exit, and across nozzle spoolpiece (PdE-BL-015, -016, -017, and -018) (qualified, overranged 0 to 11 s; -018 anomalous spikes prior to 110 s).

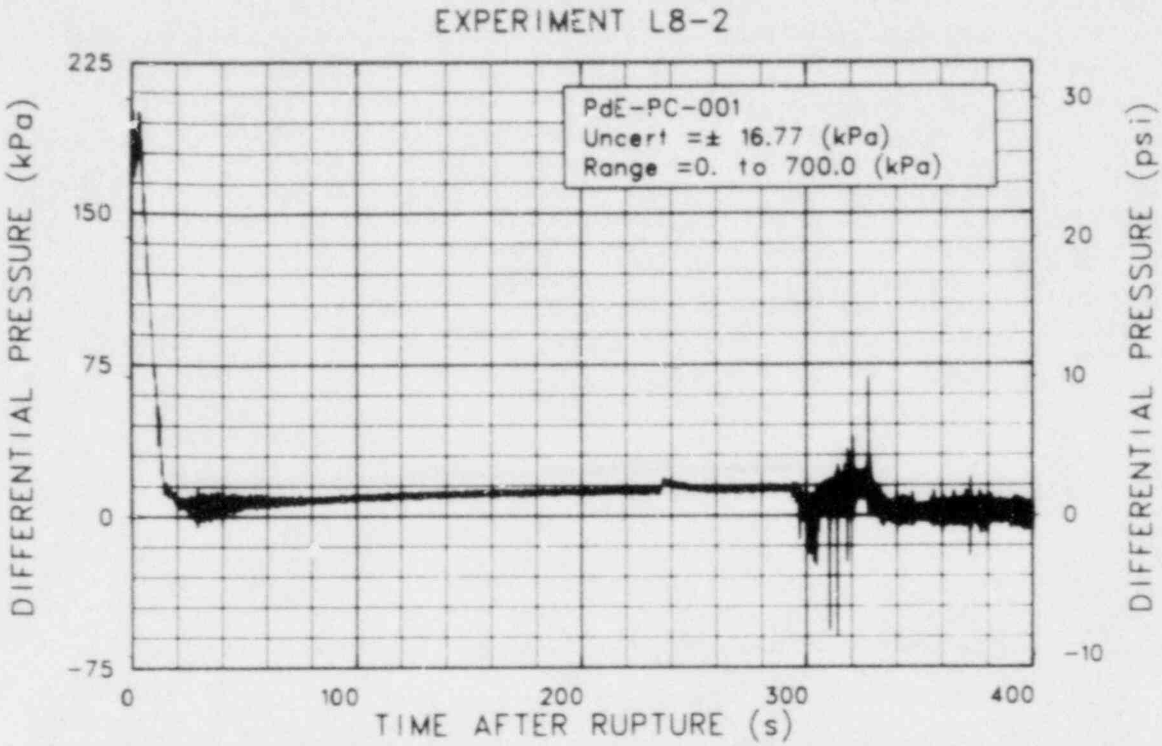


Figure 5L-39. Differential pressure in intact loop across primary coolant Pumps 1 and 2 (PdE-PC-001).

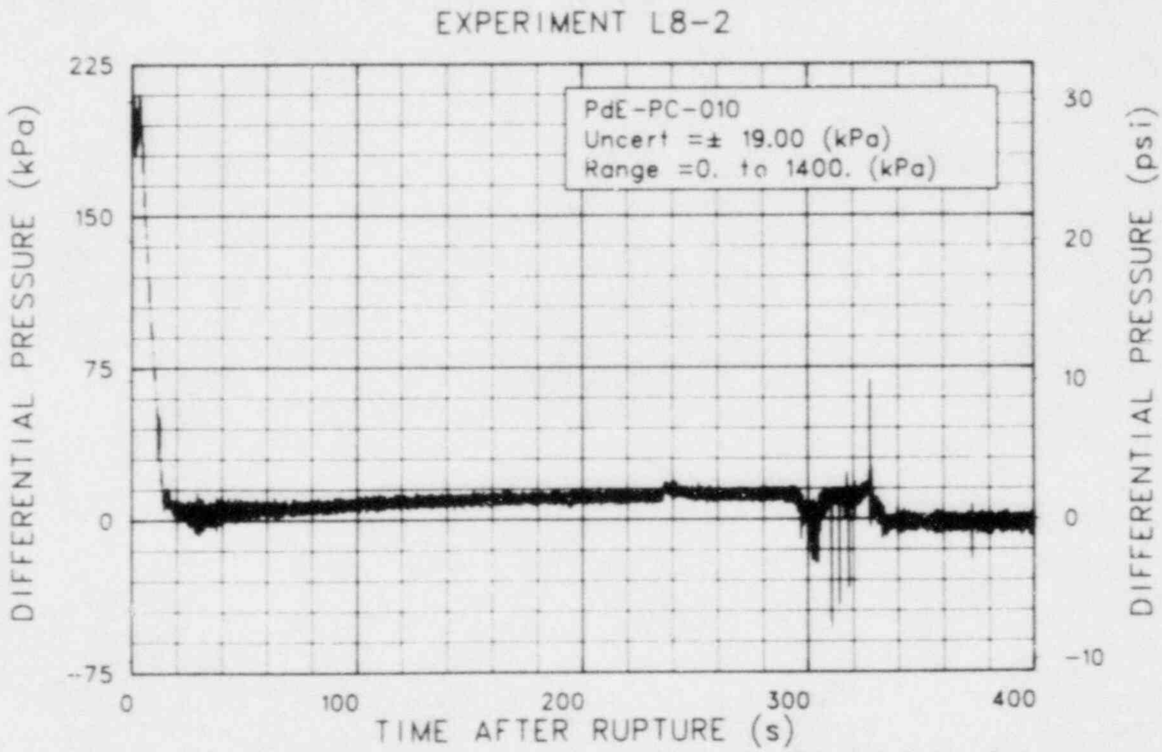


Figure 5L-40. Differential pressure in intact loop across Pump 2 (PdE-PC-010).

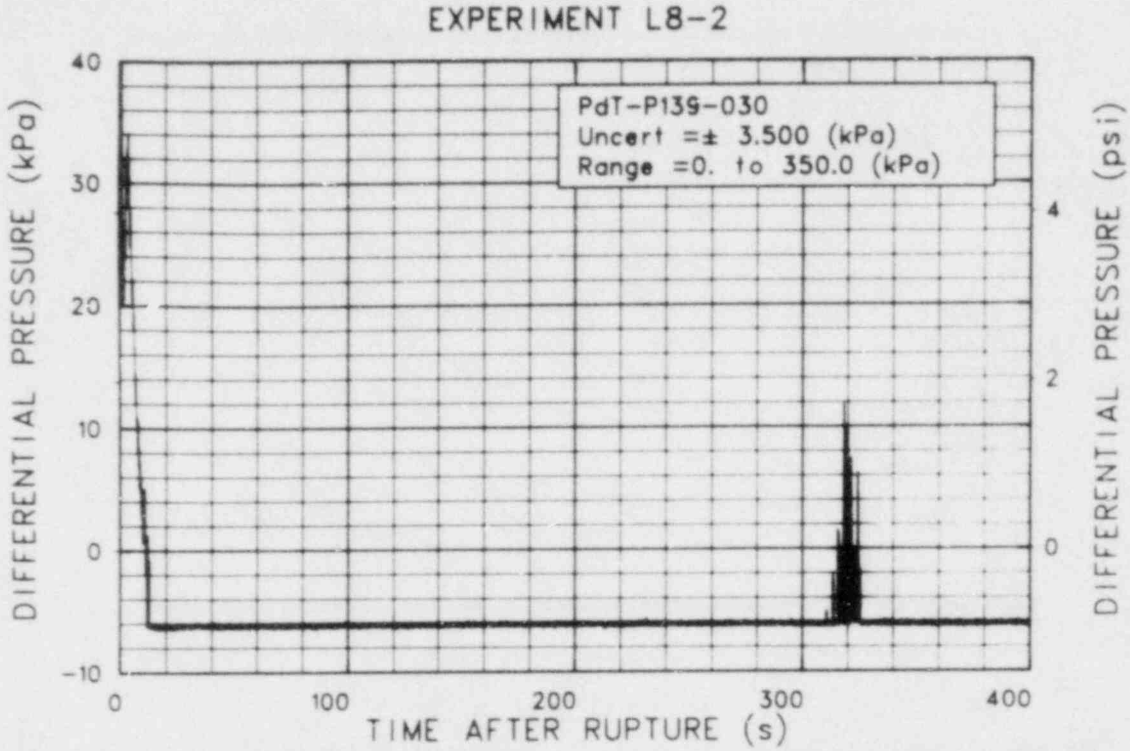


Figure 5L-41. Differential pressure in intact loop across reactor vessel (PdT-P139-030) (qualified, initial conditions only).

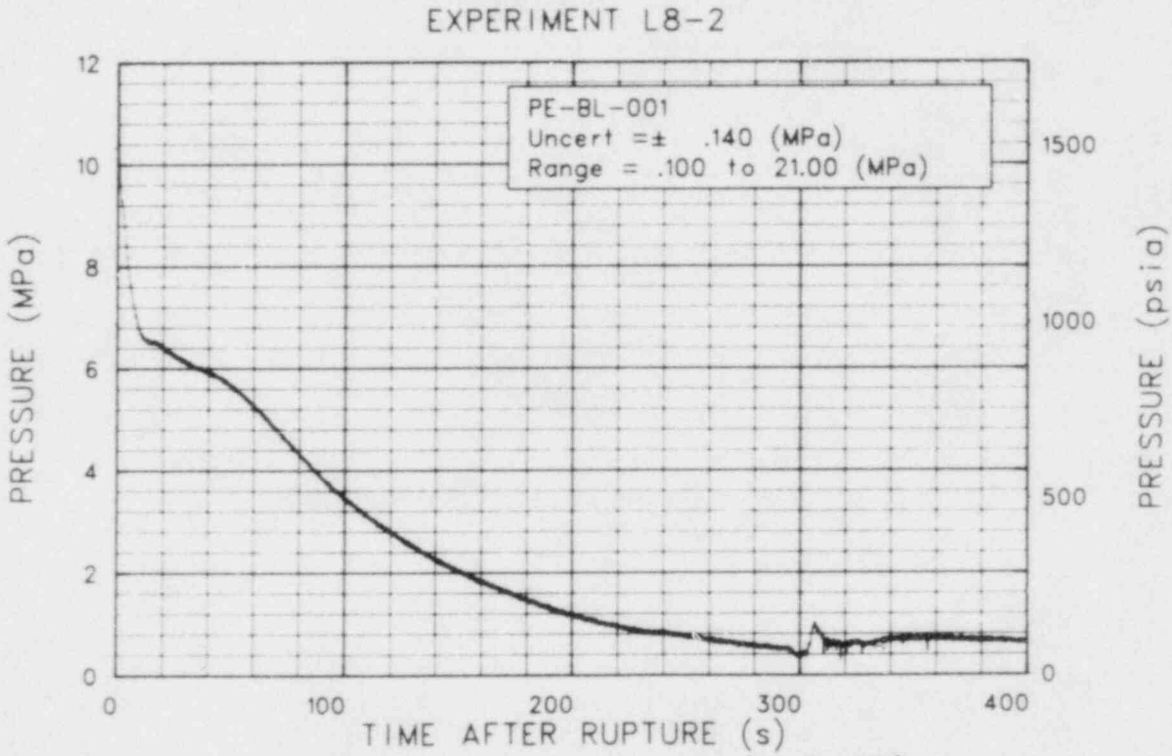


Figure 5L-42. Pressure in broken loop cold leg (PE-BL-001).

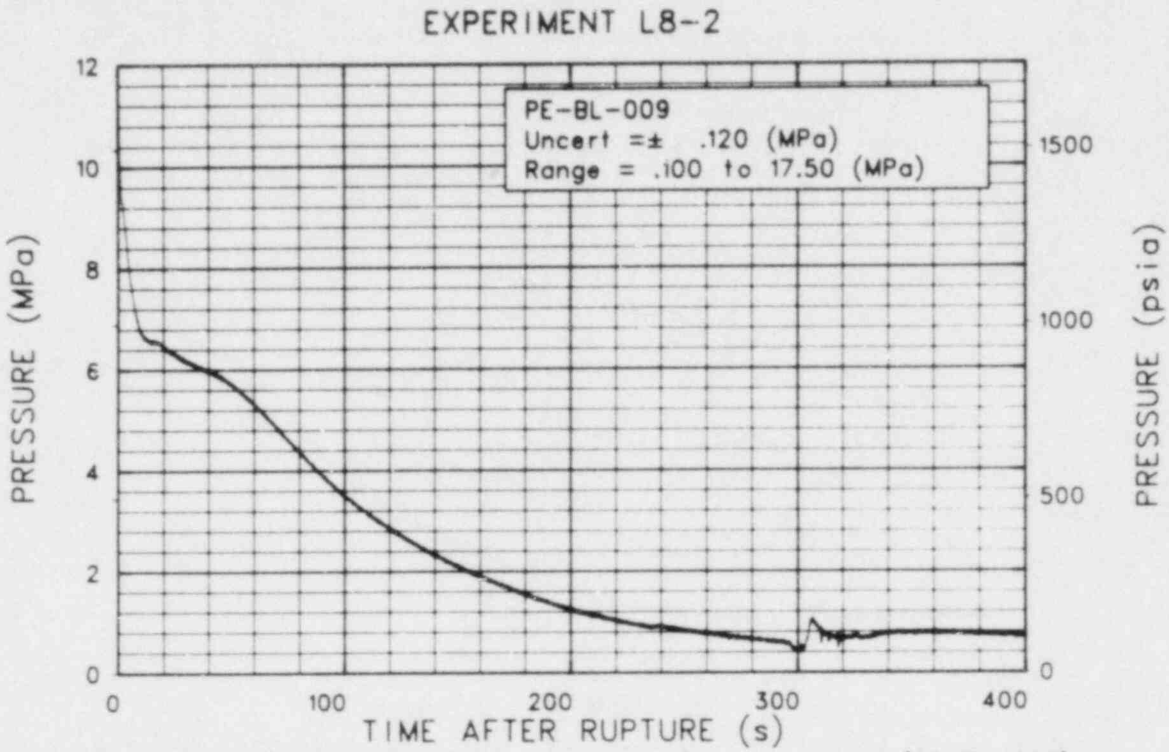


Figure 5L-43. Pressure in broken loop upstream of nozzle (PE-BL-009).

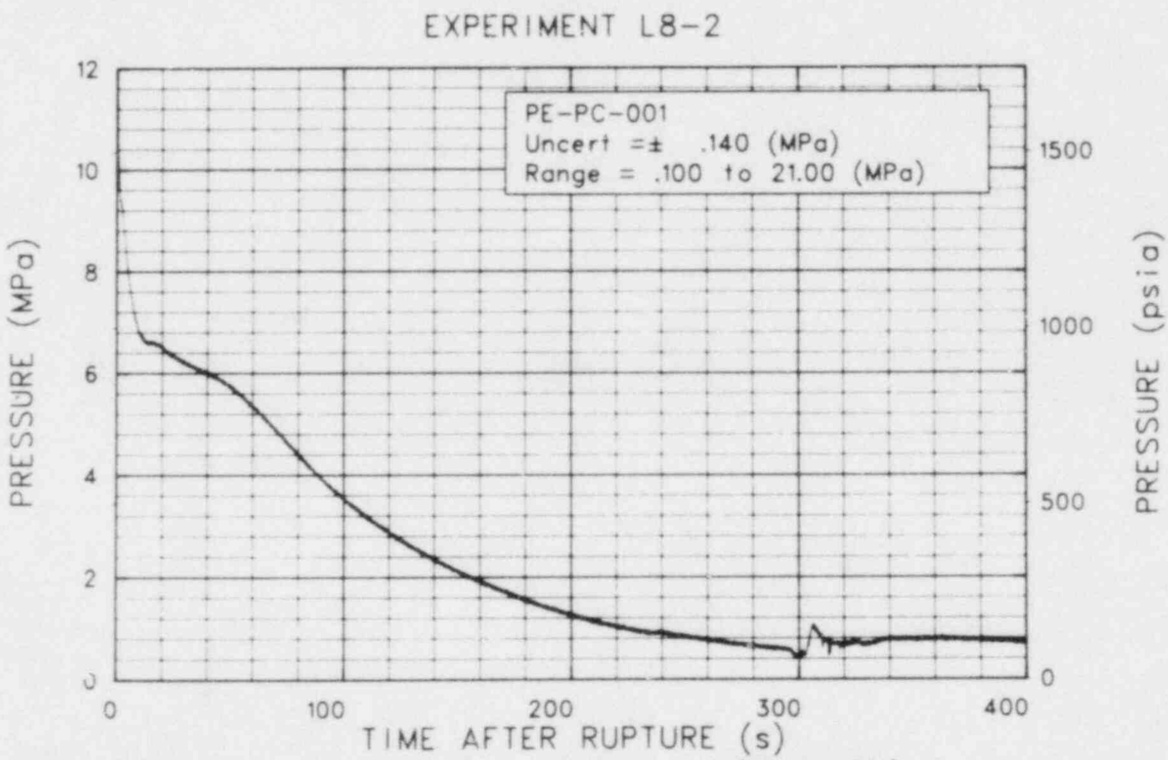


Figure 5L-44. Pressure in intact loop cold leg (PE-PC-001).

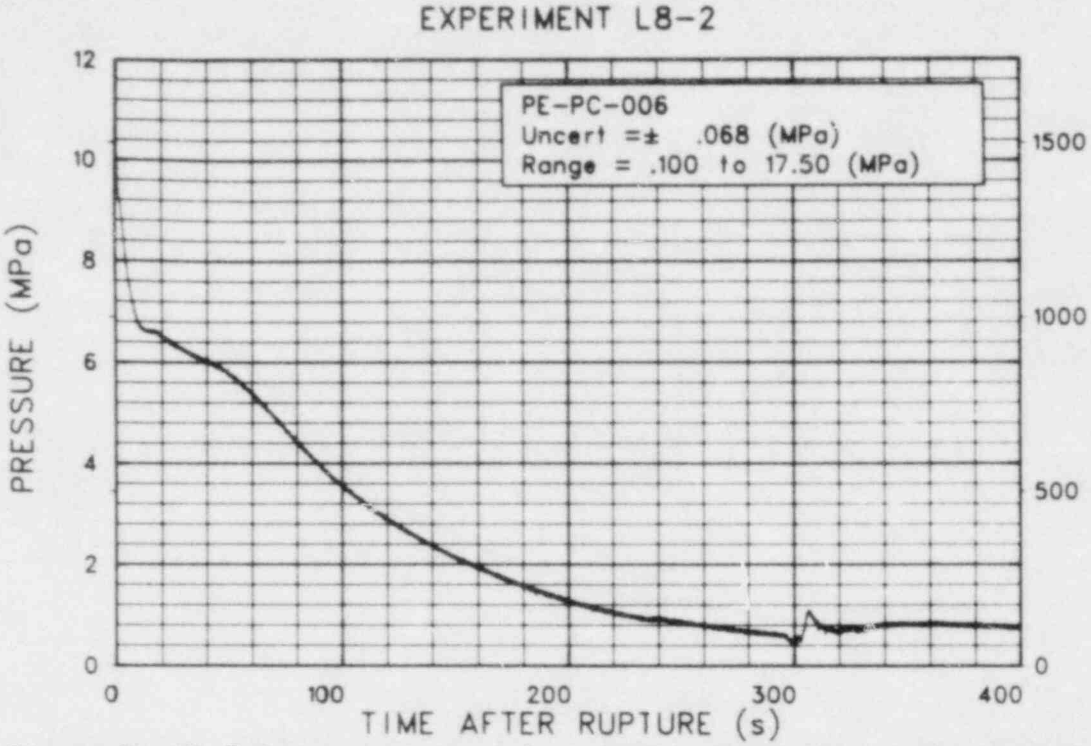


Figure 5L-45. Reference pressure in intact loop between steam generator outlet and pump inlet (FE-PC-006).

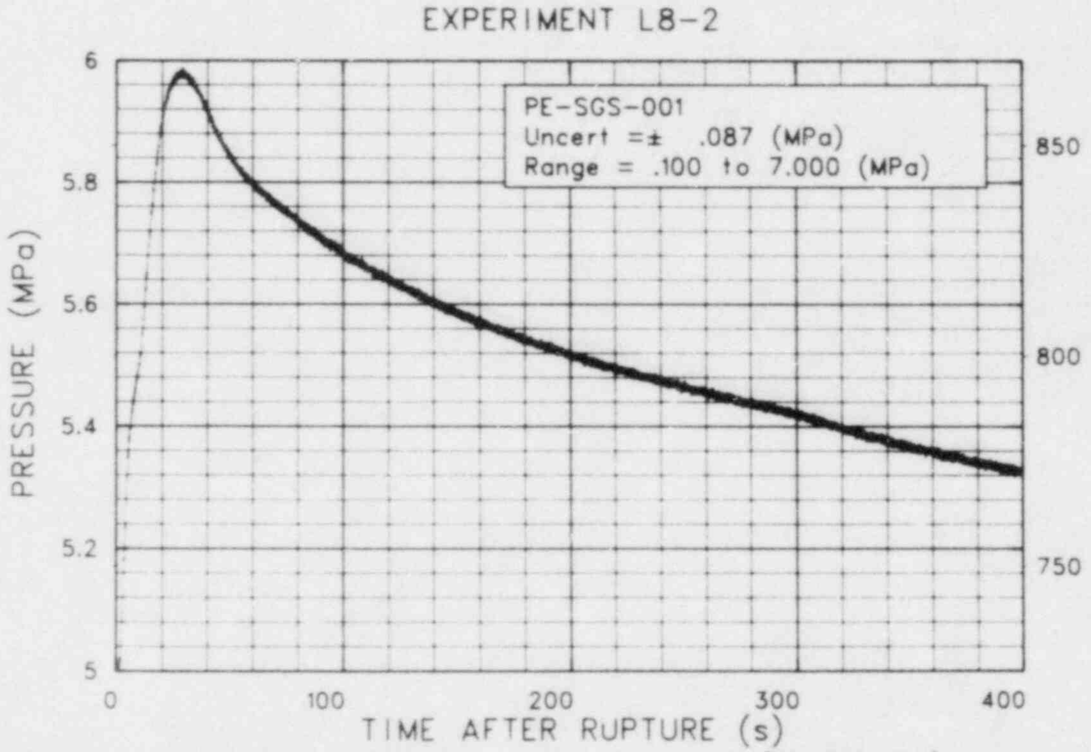


Figure 5L-46. Pressure in steam generator dome (PE-SGS-001).

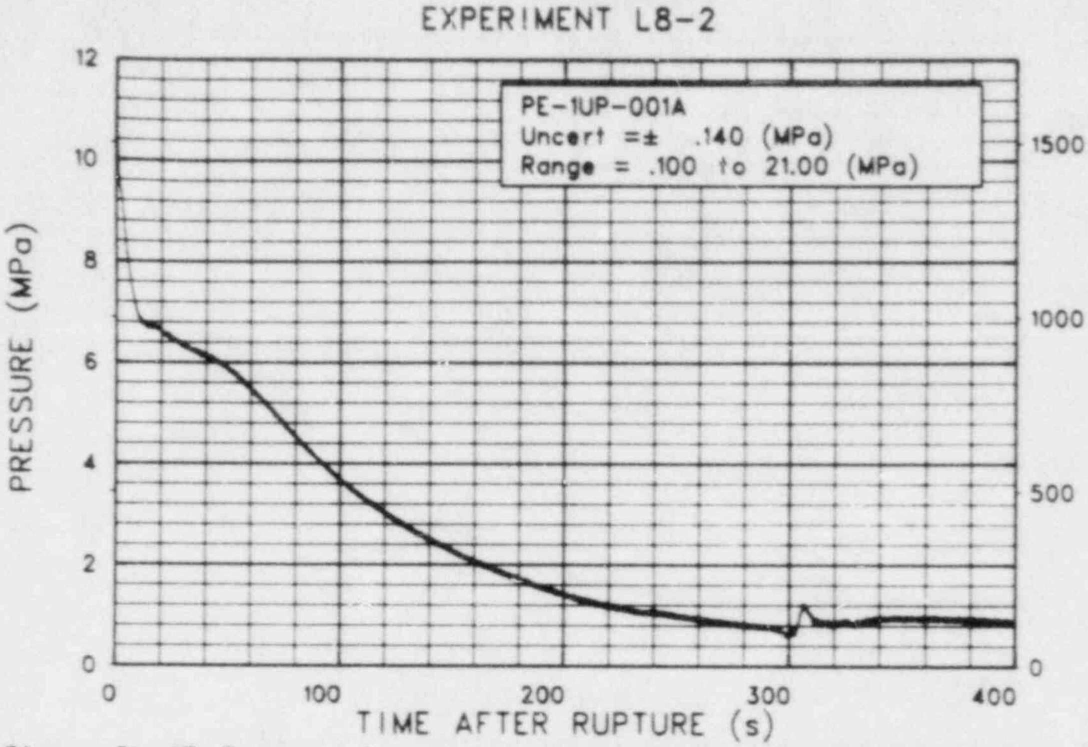


Figure 5L-47. Pressure in reactor vessel above upper end box of Fuel Assembly 1 (PE-1UP-001A).

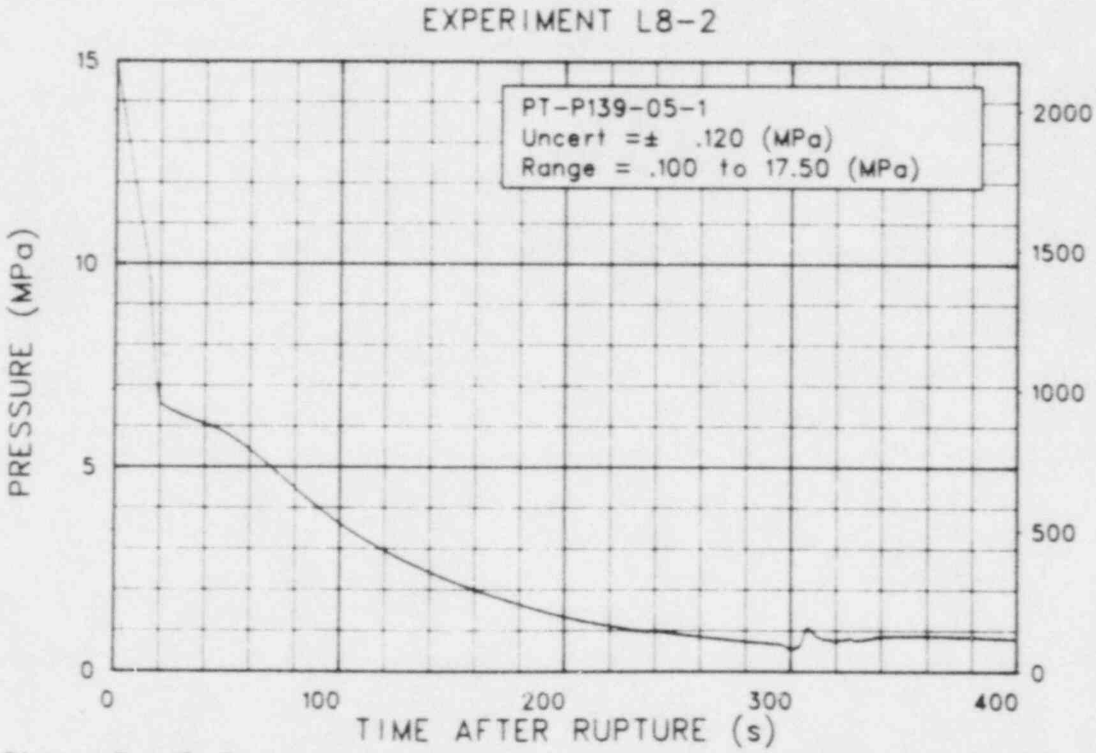


Figure 5L-48. Pressure in intact loop pressurizer vapor space at 1.88 m above bottom (PT-P139-05-1).

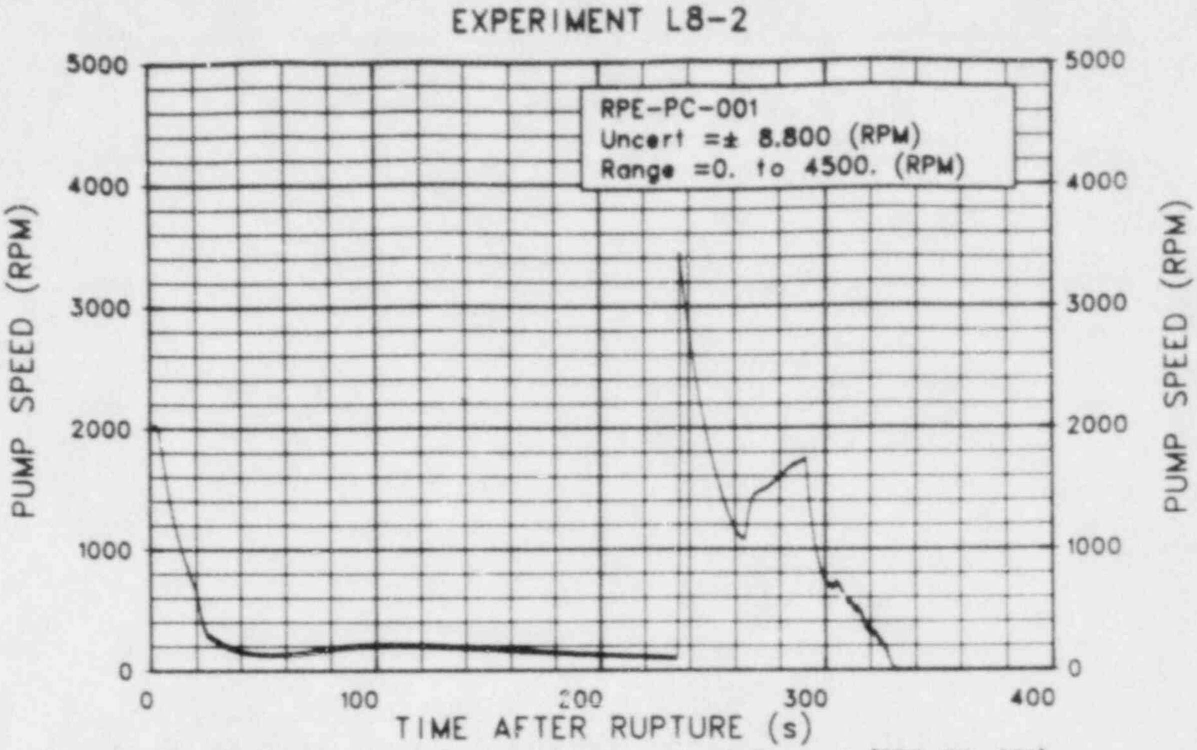


Figure 5L-49. Pump speed for primary coolant Pump 1 (RPE-PC-001).

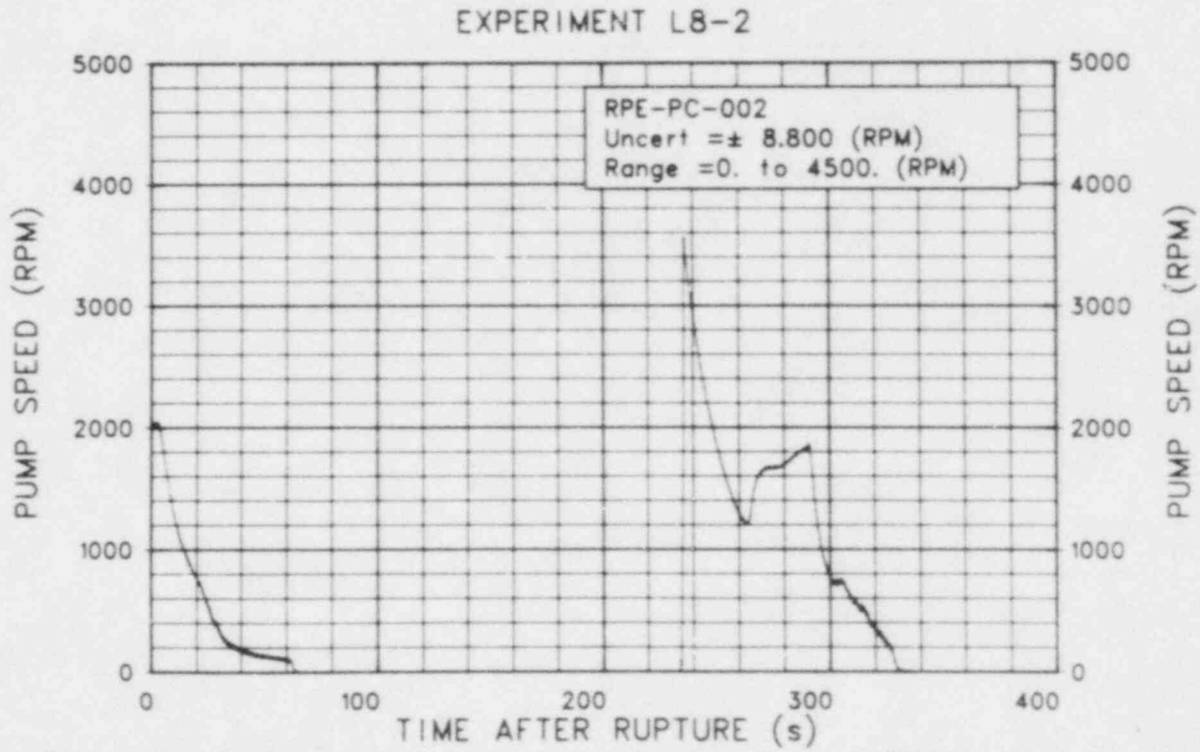


Figure 5L-50. Pump speed for primary coolant Pump 2 (RPE-PC-002).

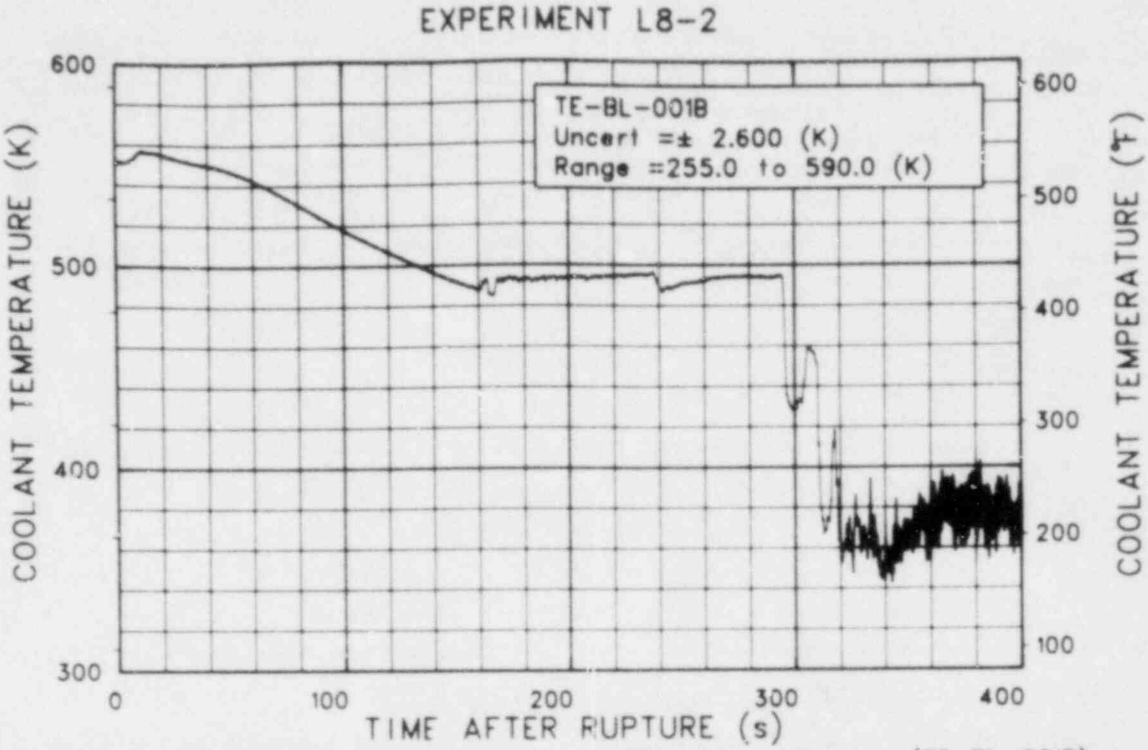


Figure 5L-51. Coolant temperature in broken loop cold leg (TE-BL-001B) (qualified, possible hot wall effects).

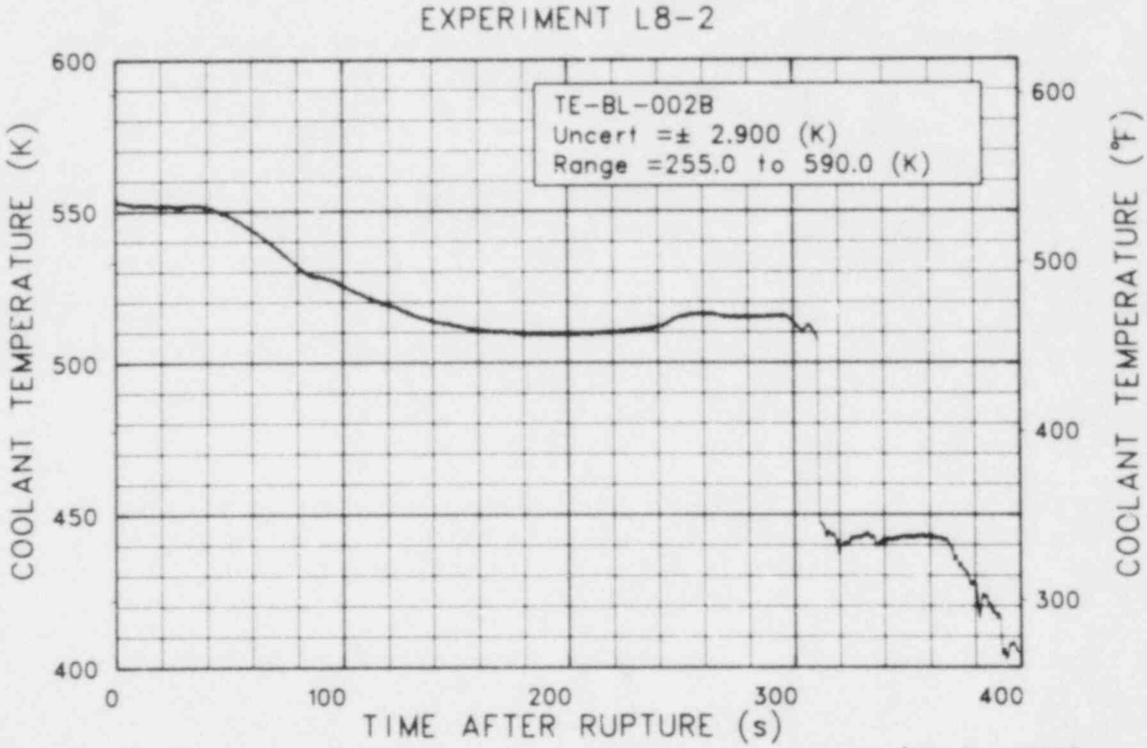


Figure 5L-52. Coolant temperature in broken loop hot leg (TE-BL-002B) (qualified, possible hot wall effects).

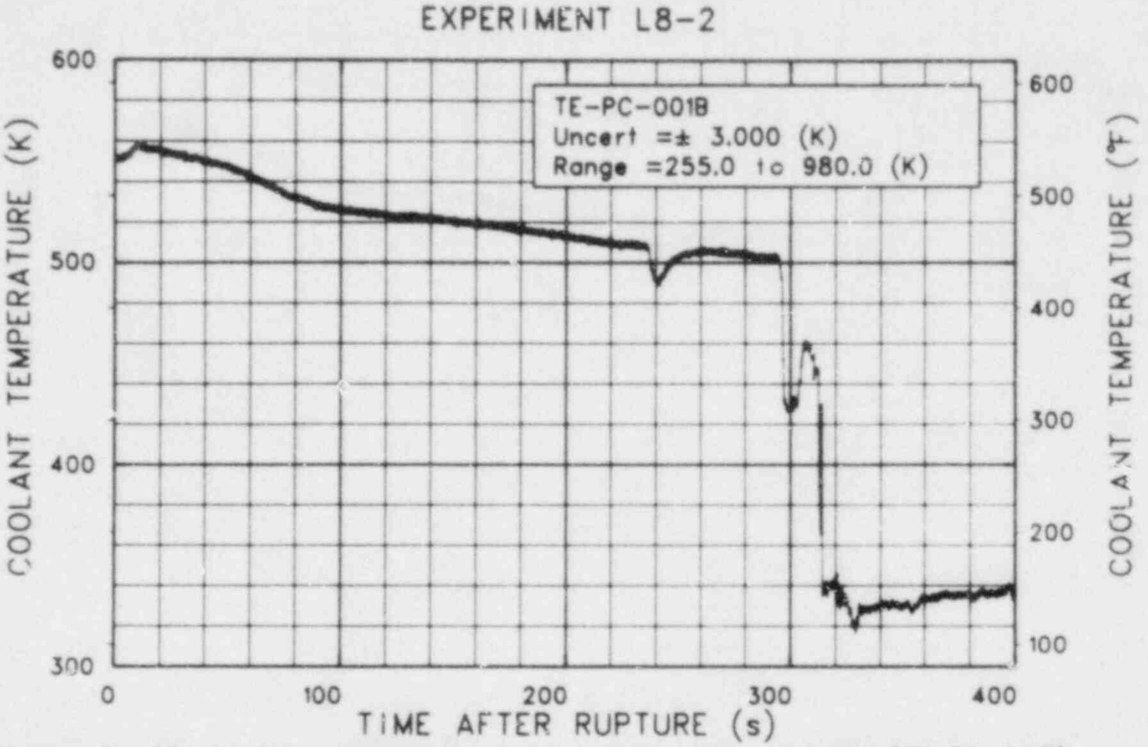


Figure 5L-53. Coolant temperature in intact loop cold leg (TE-PC-001B) (qualified, possible hot wall effects).

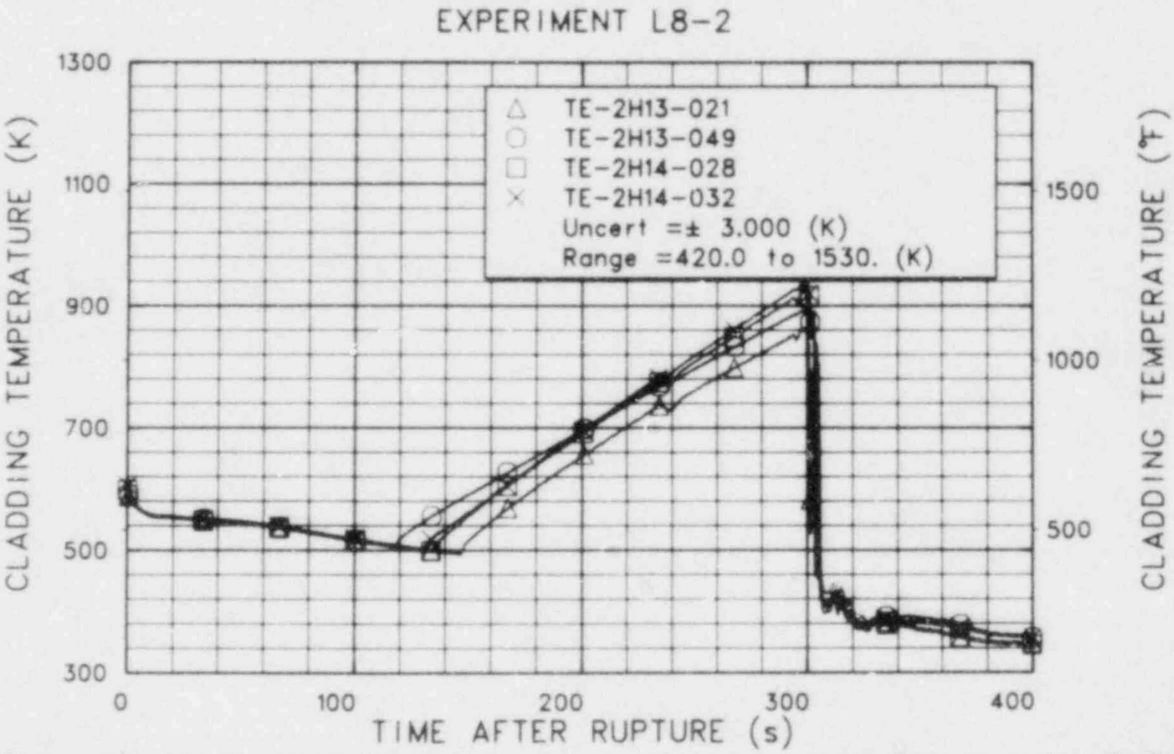


Figure 5L-54. Cladding temperature in reactor vessel at Fuel Assembly 2, Row H, Columns 13 and 14 at 0.53, 1.24, 0.71, and 0.81 m above bottom of fuel rod (TE-2H13-021, -049, -2H14-028, and -032).

EXPERIMENT L8-2

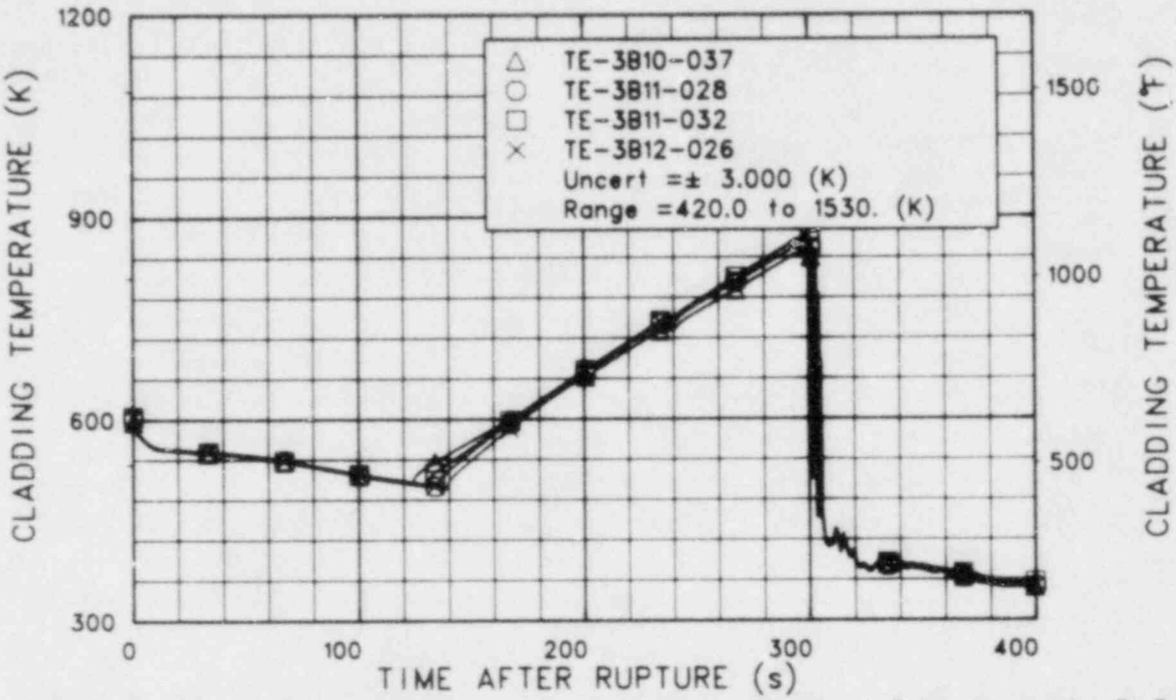


Figure 5L-55. Cladding temperature in reactor vessel at Fuel Assembly 3, Row B, Columns 10, 11, and 12 at 0.94, 0.71, 0.81, and 0.66 m above bottom of fuel rod (TE-3B10-037, -3B11-028, -032, and -3B12-026).

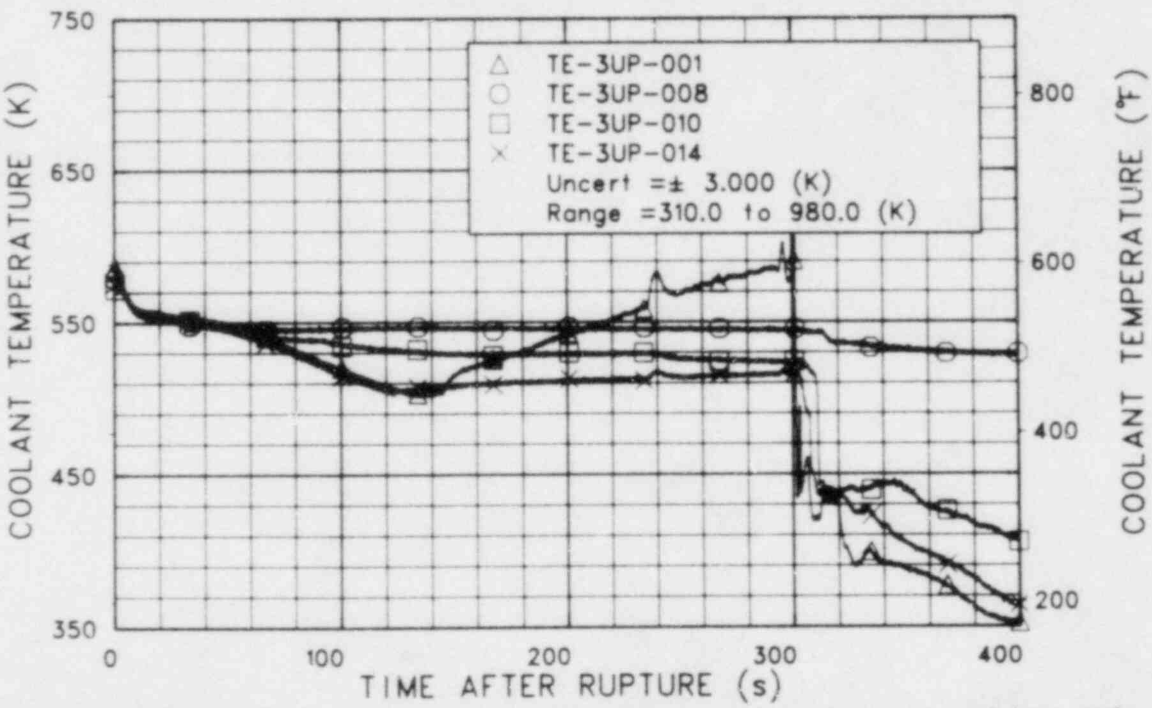


Figure 5L-56. Coolant temperature in reactor vessel at upper end box and liquid level stings above Fuel Assembly 3 (TE-3UP-001, -008, -010, and -014).

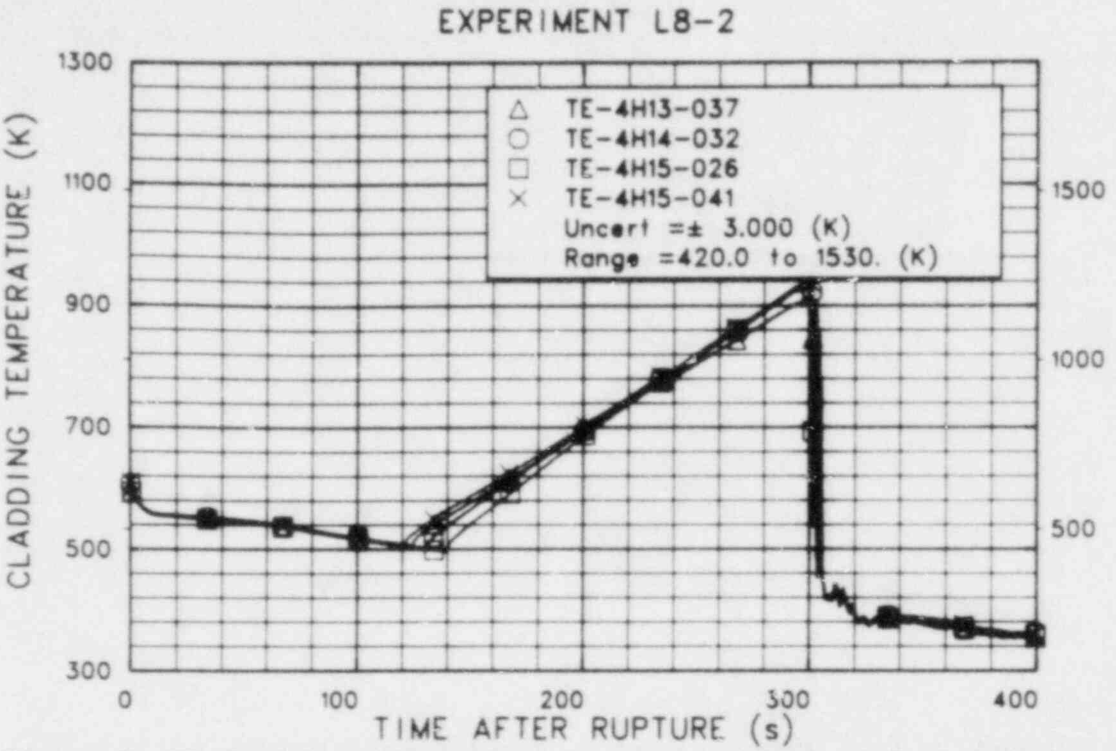


Figure 5L-57. Cladding temperature in reactor vessel at Fuel Assembly 4, Row H, Columns 13, 14, and 15 at 0.94, 0.81, 0.66, and 1.04 m above bottom of fuel rod (TE-4H13-037, -4H14-032, -4H15-026, and -041).

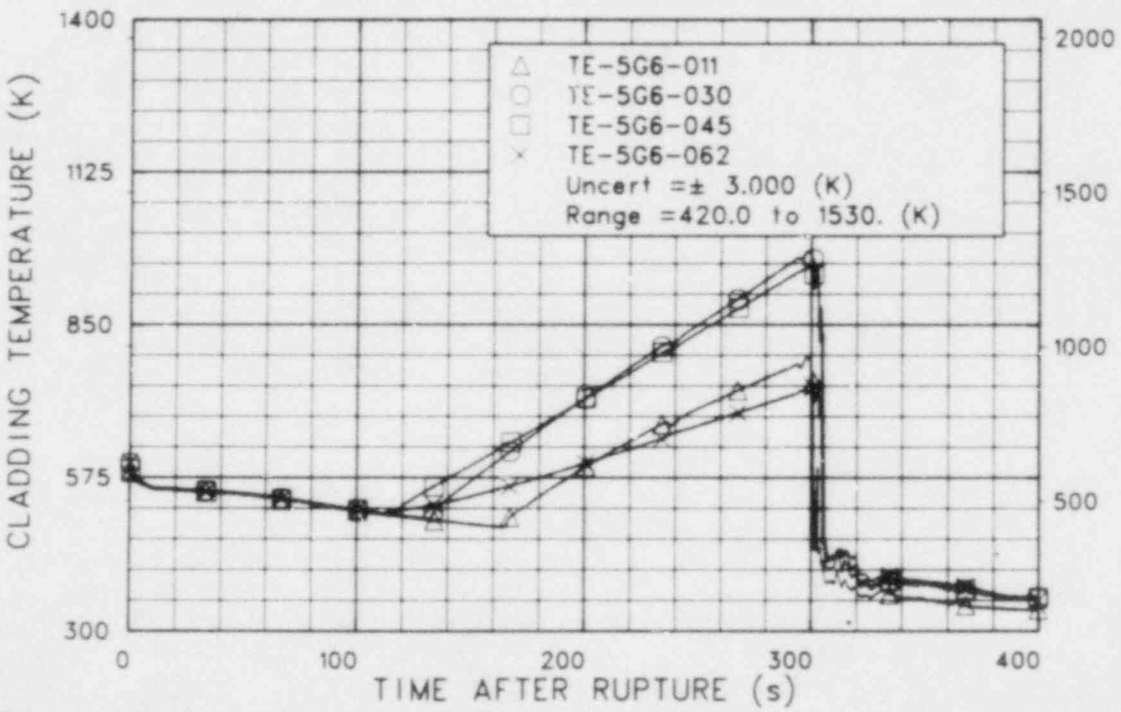


Figure 5L-58. Cladding temperature in reactor vessel at Fuel Assembly 5, Row G, Column 6 at 0.28, 0.76, 1.14, and 1.57 m above bottom of fuel rod (TE-5G6-011, -030, -045, and -062).

EXPERIMENT L8-2

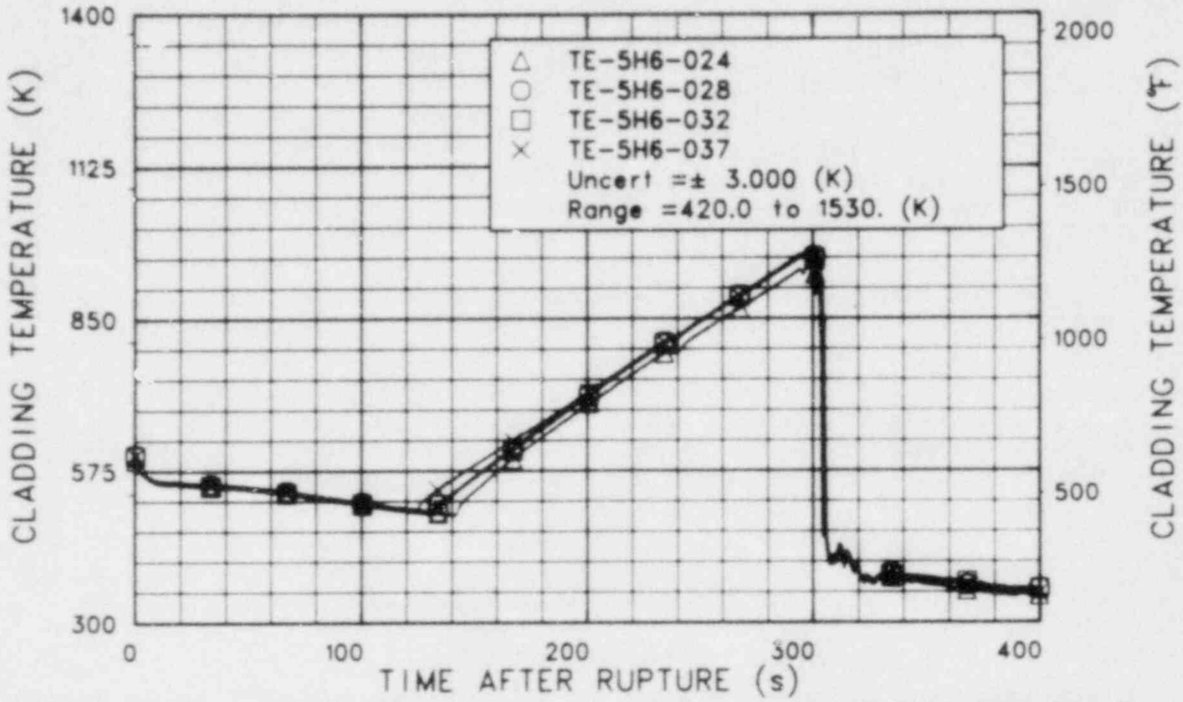


Figure 5L-59. Cladding temperature in reactor vessel at Fuel Assembly 5, Row H, Column 6 at 0.61, 0.71, 0.81, and 0.94 m above bottom of fuel rod (TE-5H6-024, -028, -032, and -037).

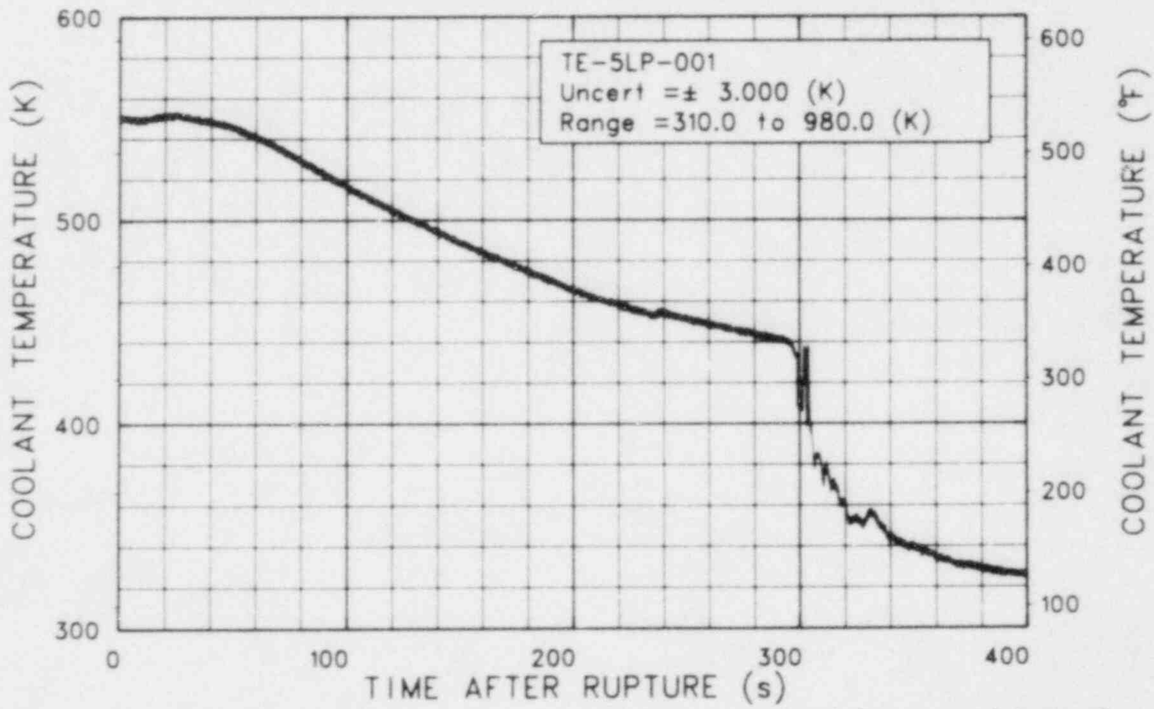


Figure 5L-60. Coolant temperature in reactor vessel at lower end box of Fuel Assembly 5 (TE-5LP-001).

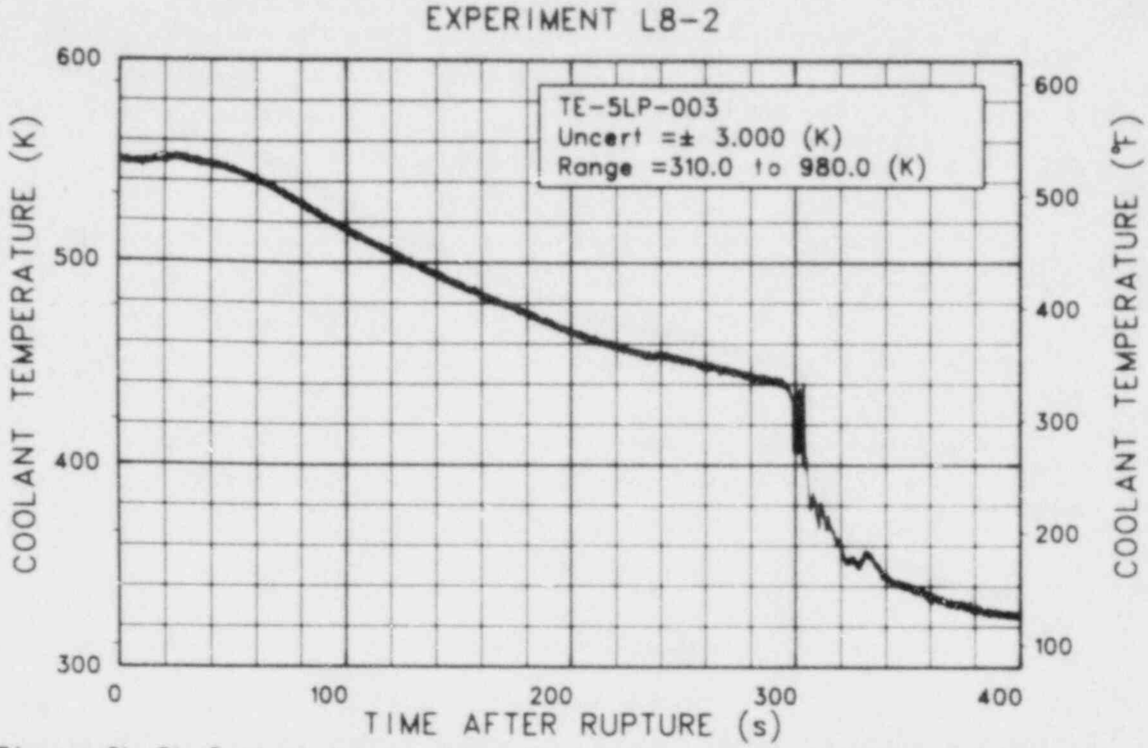


Figure 5L-61. Coolant temperature in reactor vessel at lower end box of Fuel Assembly 5 (TE-5LP-003).

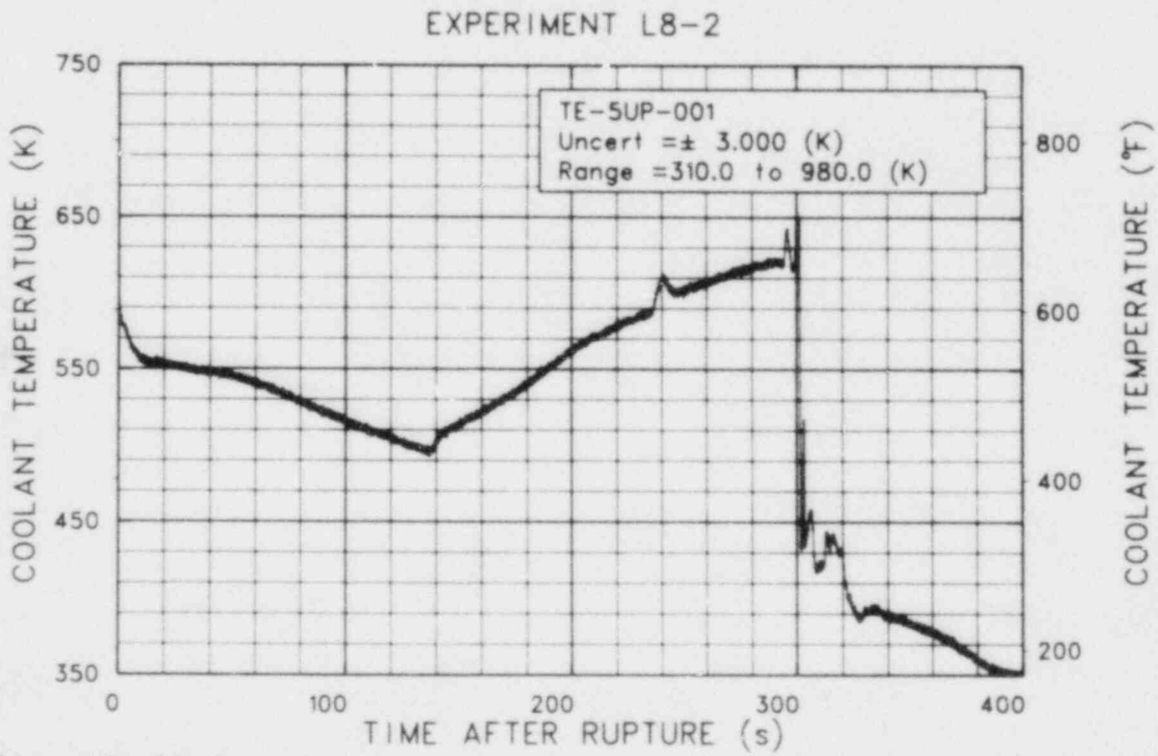


Figure 5L-62. Coolant termperature in reactor vessel at upper end box of Fuel Assembly 5 (TE-5UP-001).

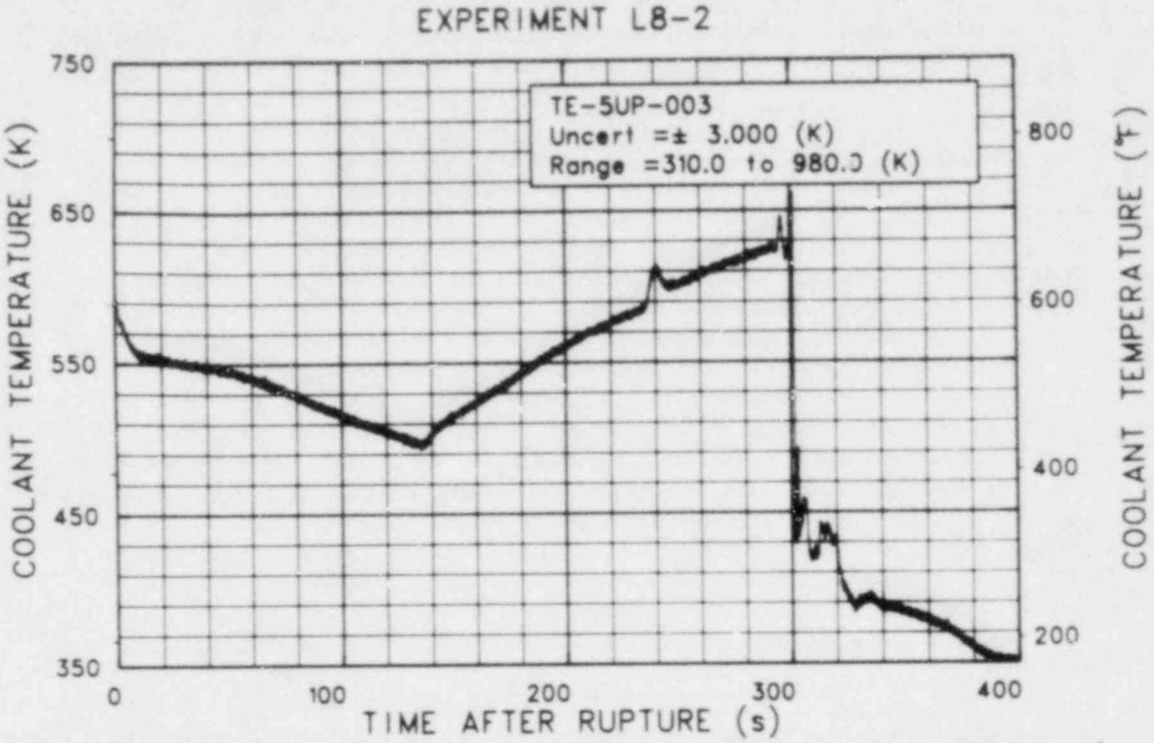


Figure 5L-63. Coolant temperature in reactor vessel at upper end box of Fuel Assembly 5 (TE-5UP-003).

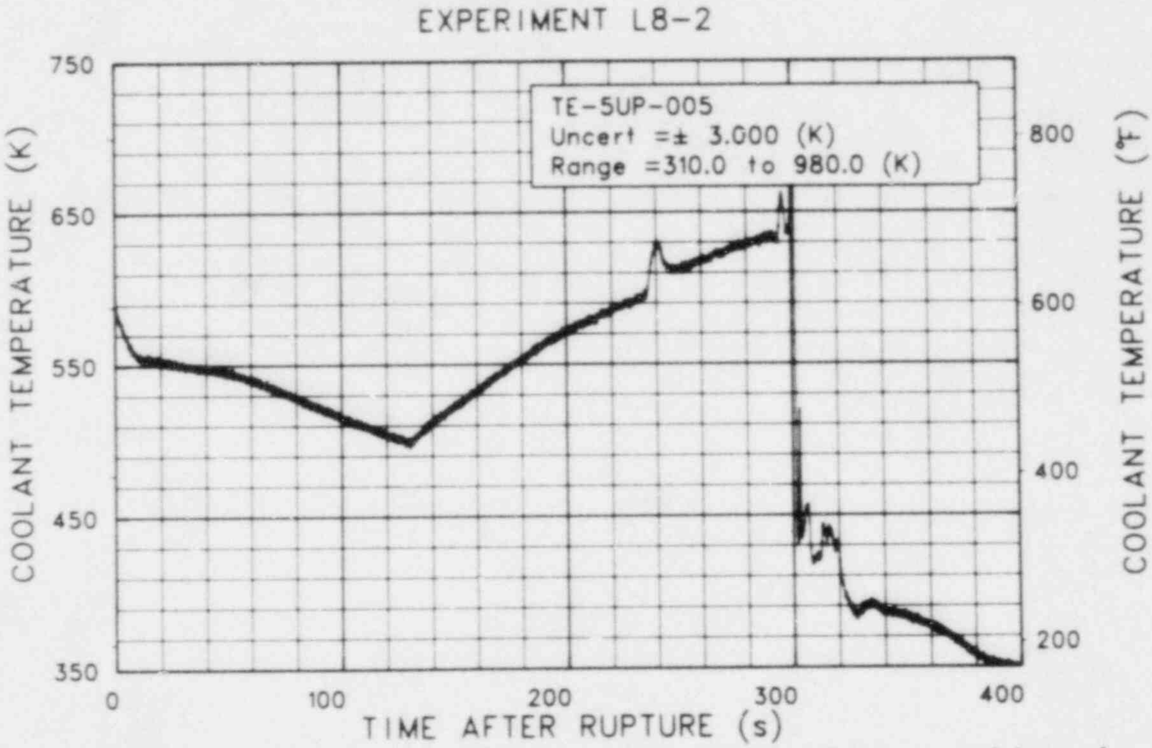


Figure 5L-64. Coolant temperature in reactor vessel at upper end box of Fuel Assembly 5 (TE-5UP-005).

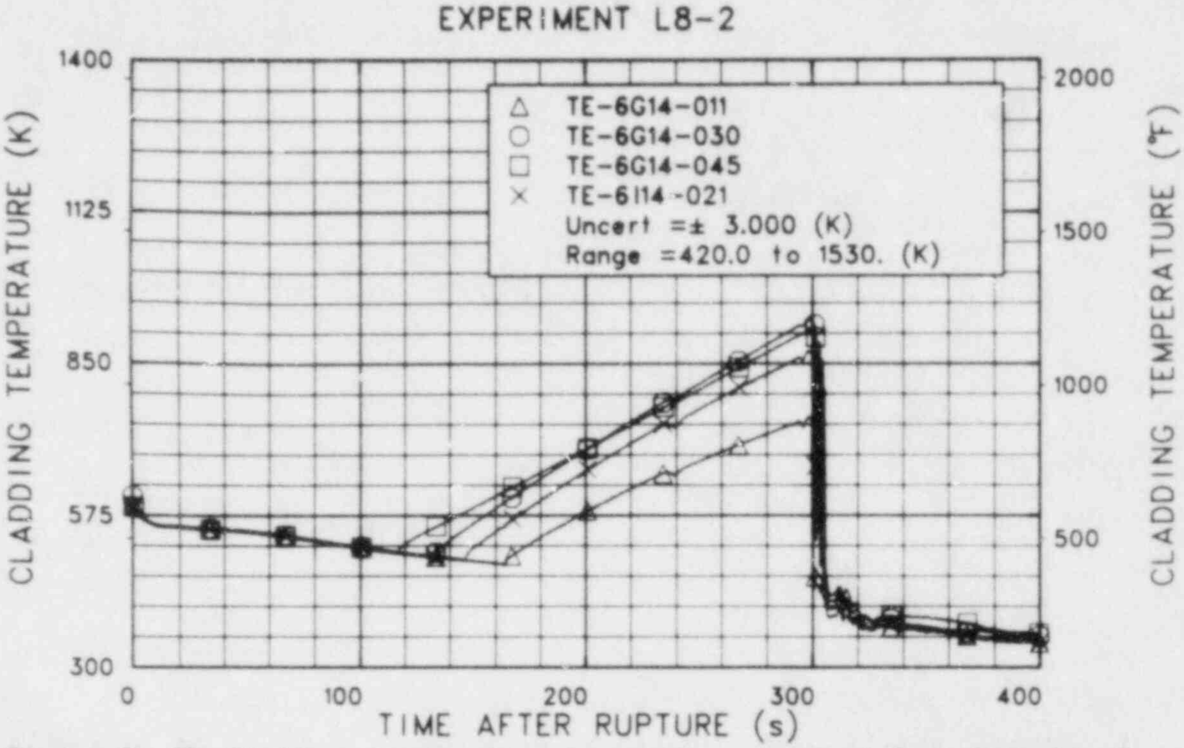


Figure 5L-65. Cladding temperature in reactor vessel at Fuel Assembly 6, Rows G and I, Column 14 at 0.28, 0.76, 1.14, and 0.53 m above bottom of fuel rod (TE-6G14-011, -030, -045, and 6I14-021).

EXPERIMENT L8-2

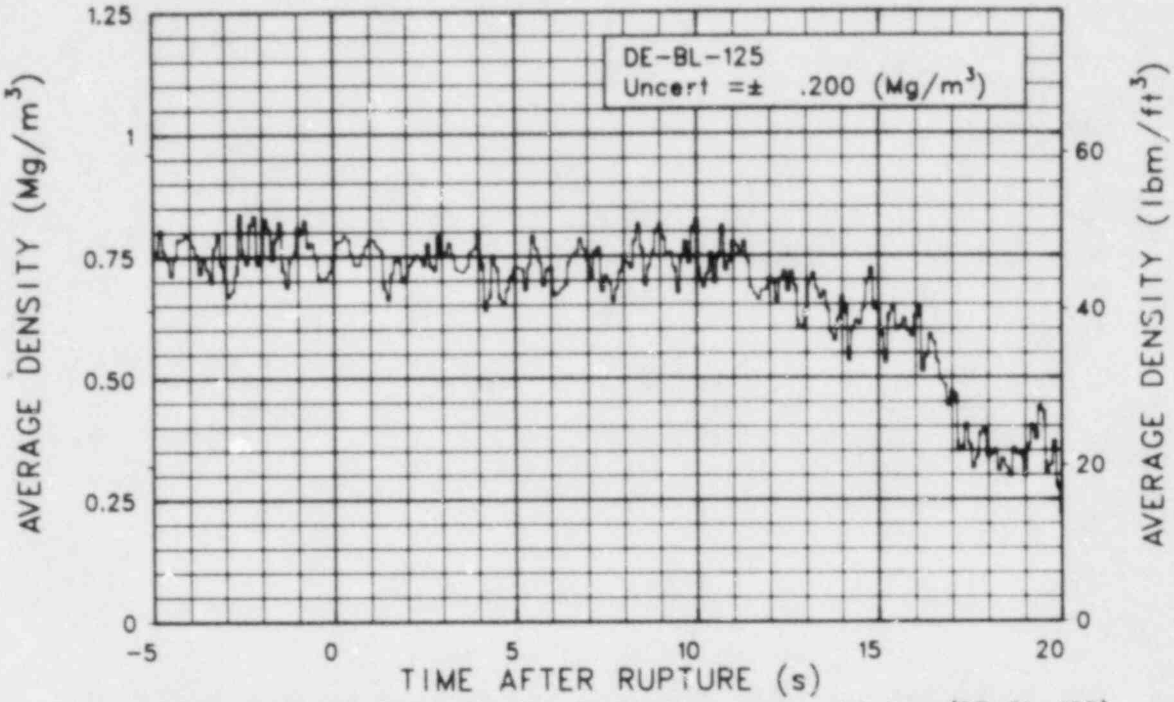


Figure 5C-1. Average fluid density in broken loop cold leg (DE-BL-125) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

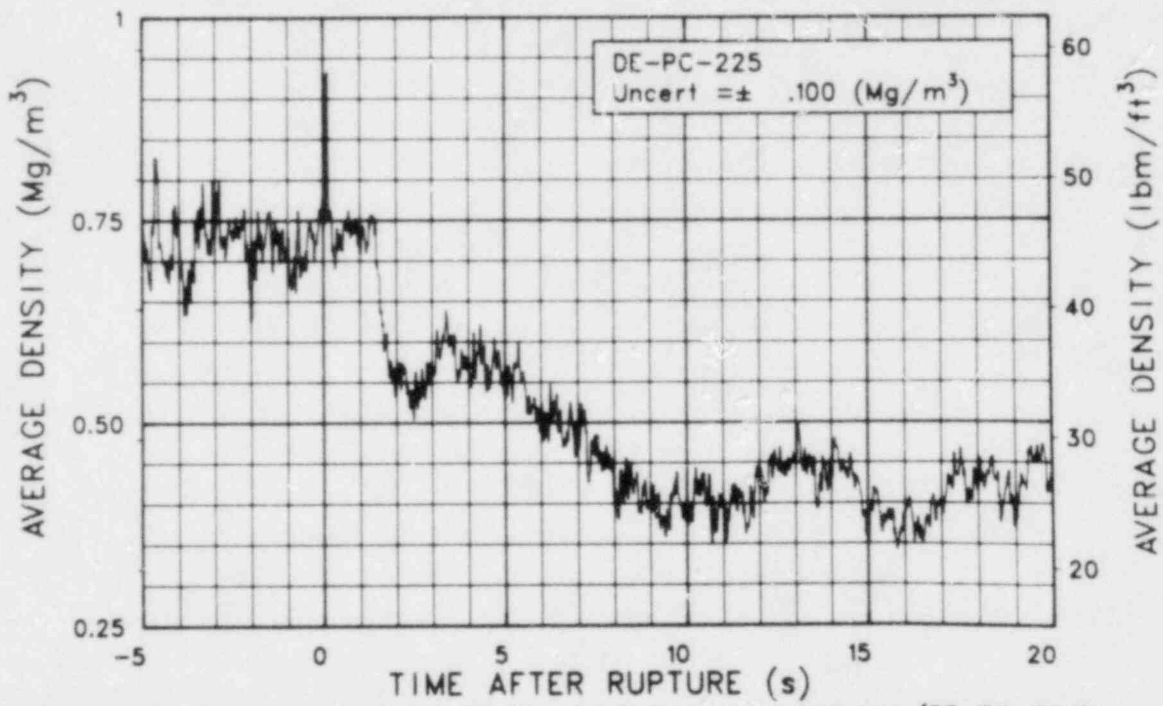


Figure 5C-2. Average fluid density in intact loop hot leg (DE-PC-225) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

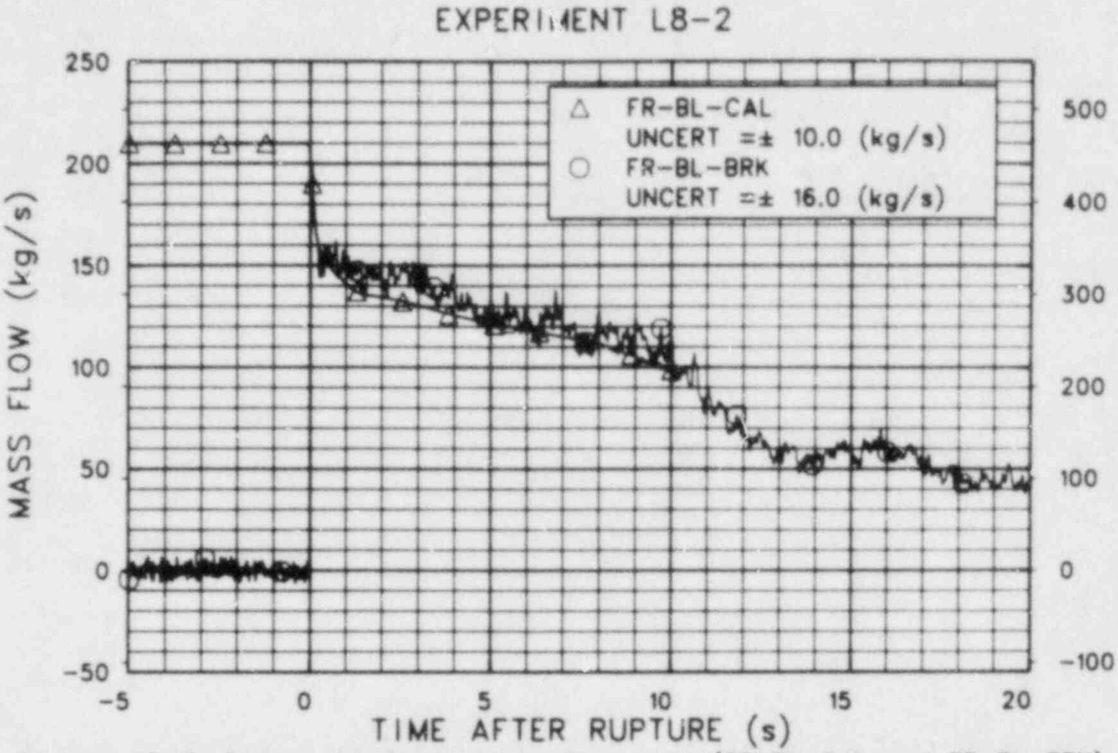


Figure 5C-3. Subcooled break mass flow rate (FR-BL-CAL and FR-BL-BRK) (FR-BL-CAL qualified to 10.5 s).

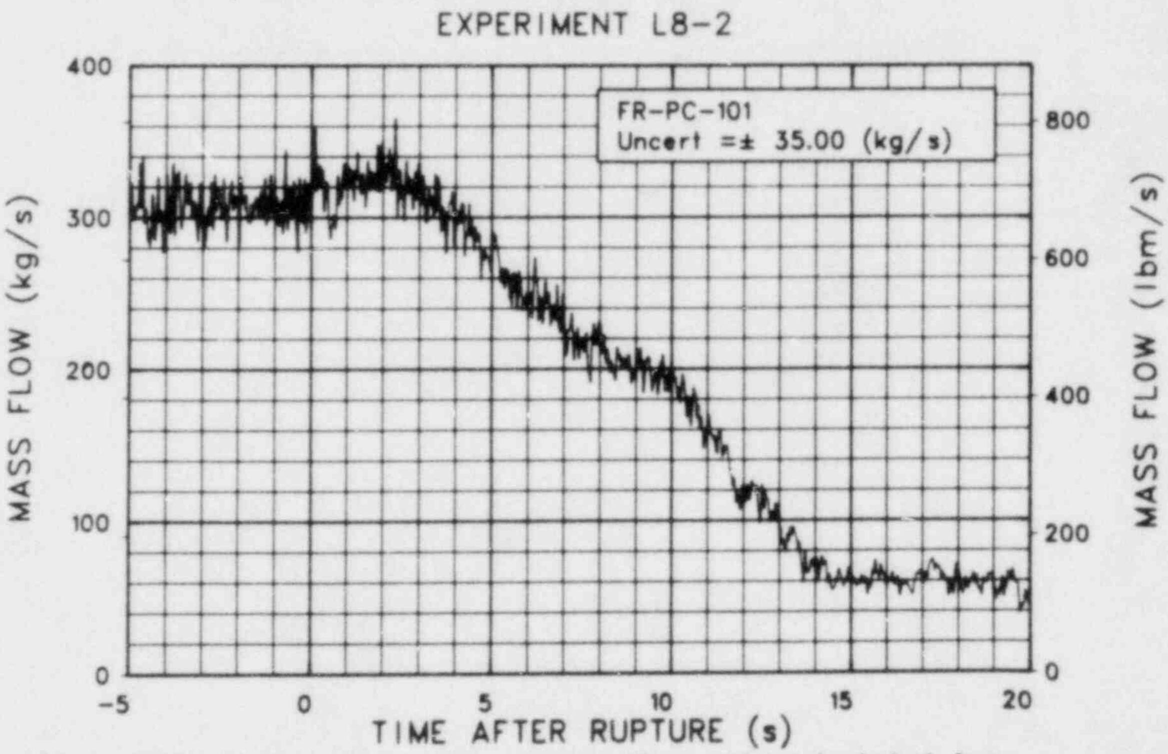


Figure 5C-4. Intact loop cold leg mass flow rate calculated from DE-PC-001B and FE-PC-001 (FR-PC-101).

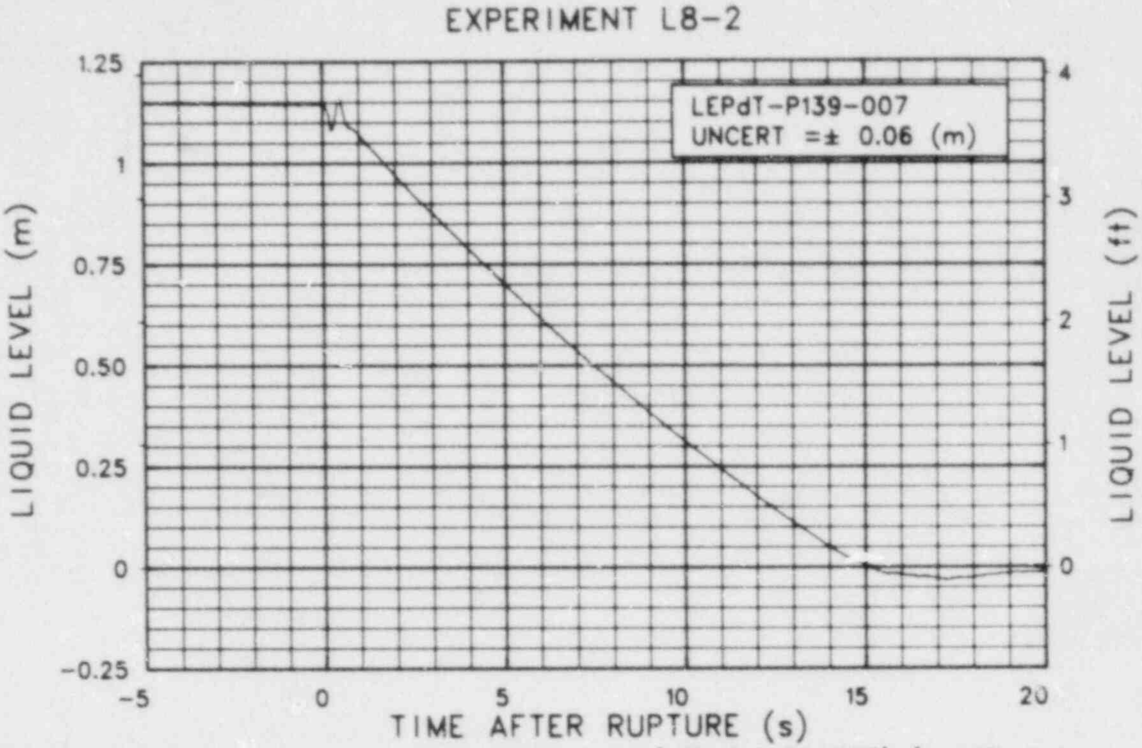


Figure 5C-5. Liquid level in pressurizer (LEPdT-P139-007) (qualified to 50 s).

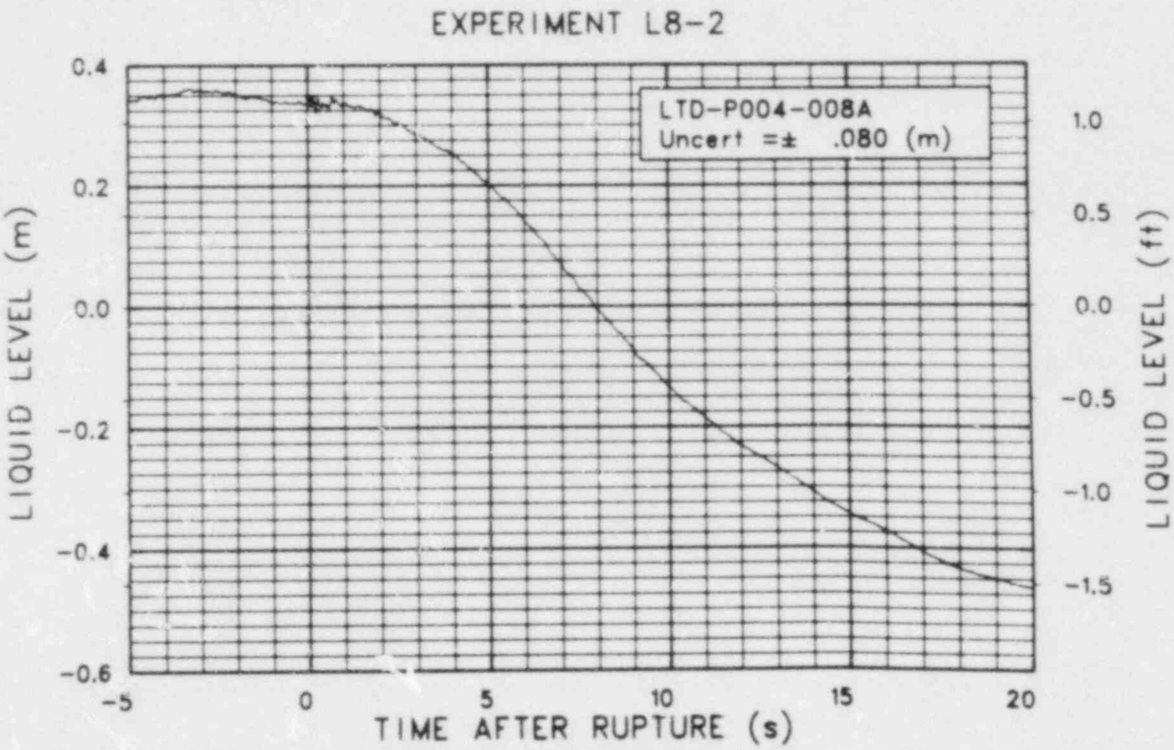


Figure 5C-6. Density corrected liquid level in steam generator (LTD-P004-008A) (qualified, magnitudes uncertain).

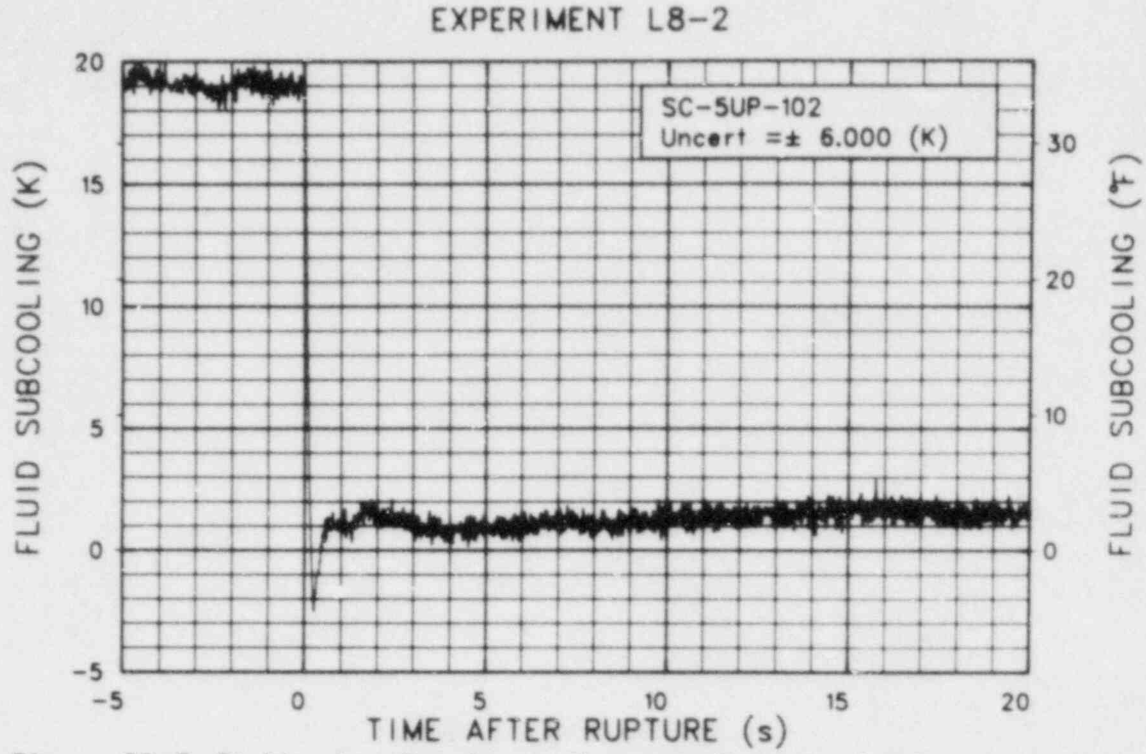


Figure 5C-7. Fluid subcooling in reactor vessel upper plenum (SC-5UP-102).

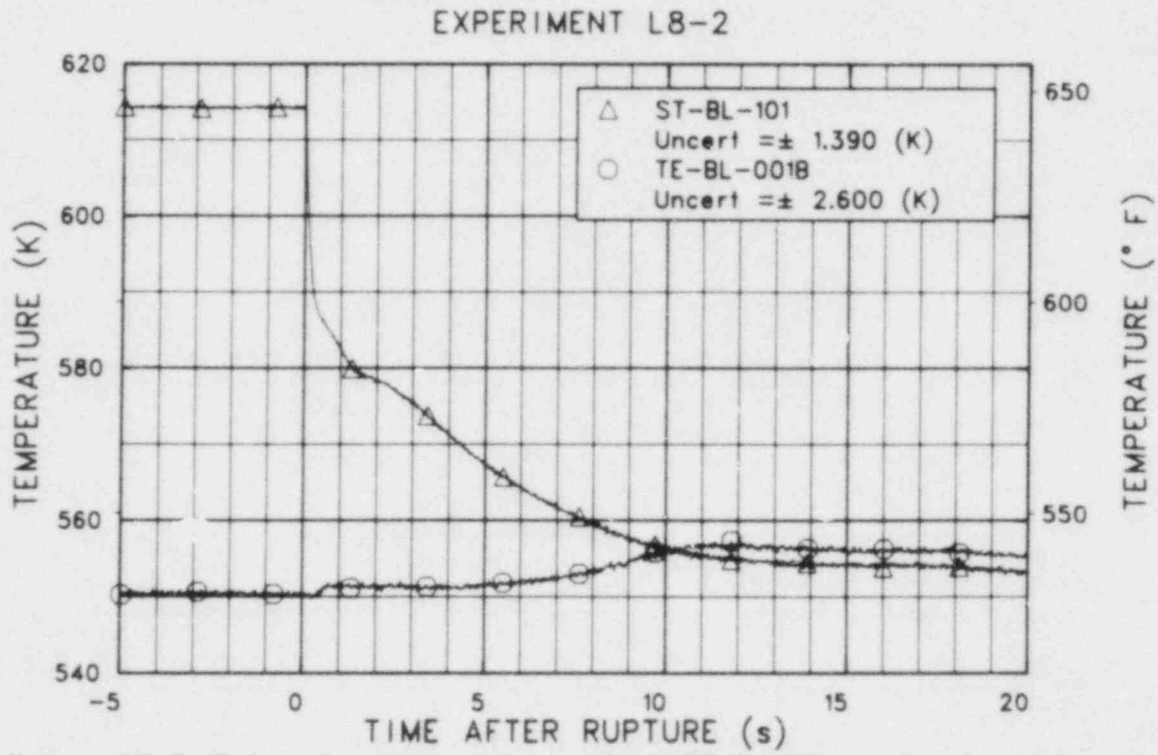


Figure 5C-8. Saturation temperature from PE-BL-001 overlayed with broken loop cold leg temperature (ST-BL-101 and TE-BL-001B) (qualified, possible hot wall effects TE-BL-001B only).

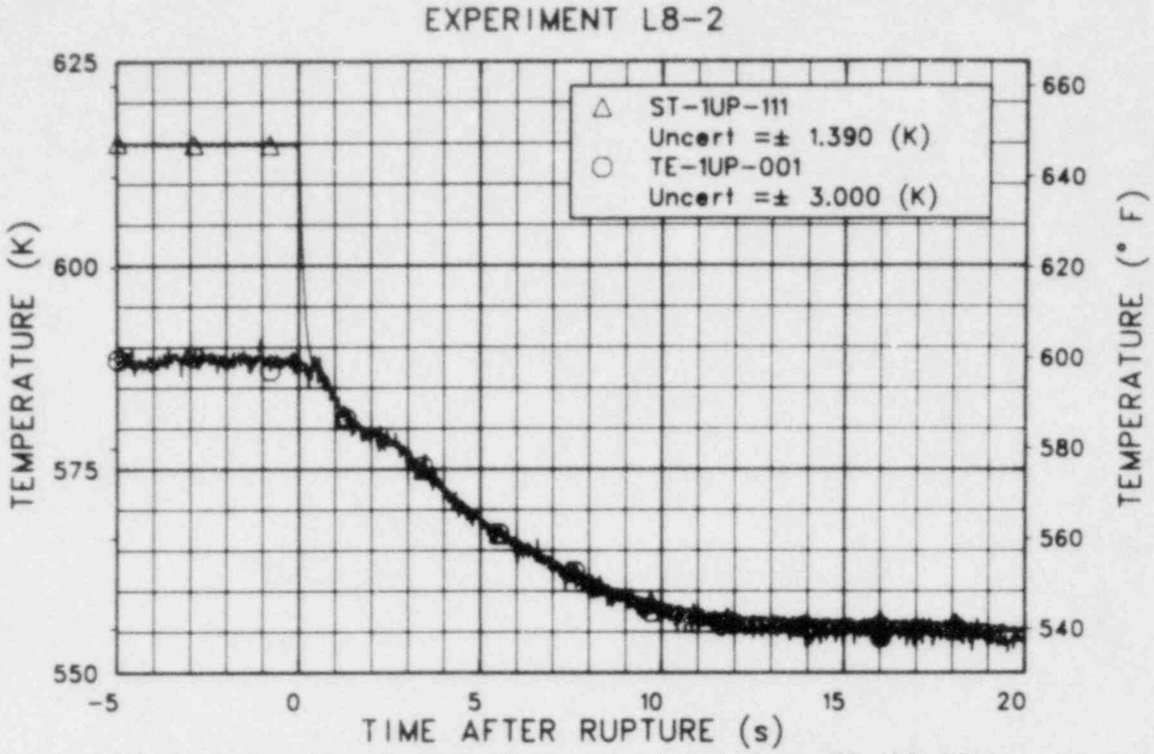


Figure 5C-9. Saturation temperature calculated from PE-1UP-001A overlayed with coolant temperature in reactor vessel at upper end box of Fuel Assembly 1 (ST-1UP-111 and TE-1UP-001).

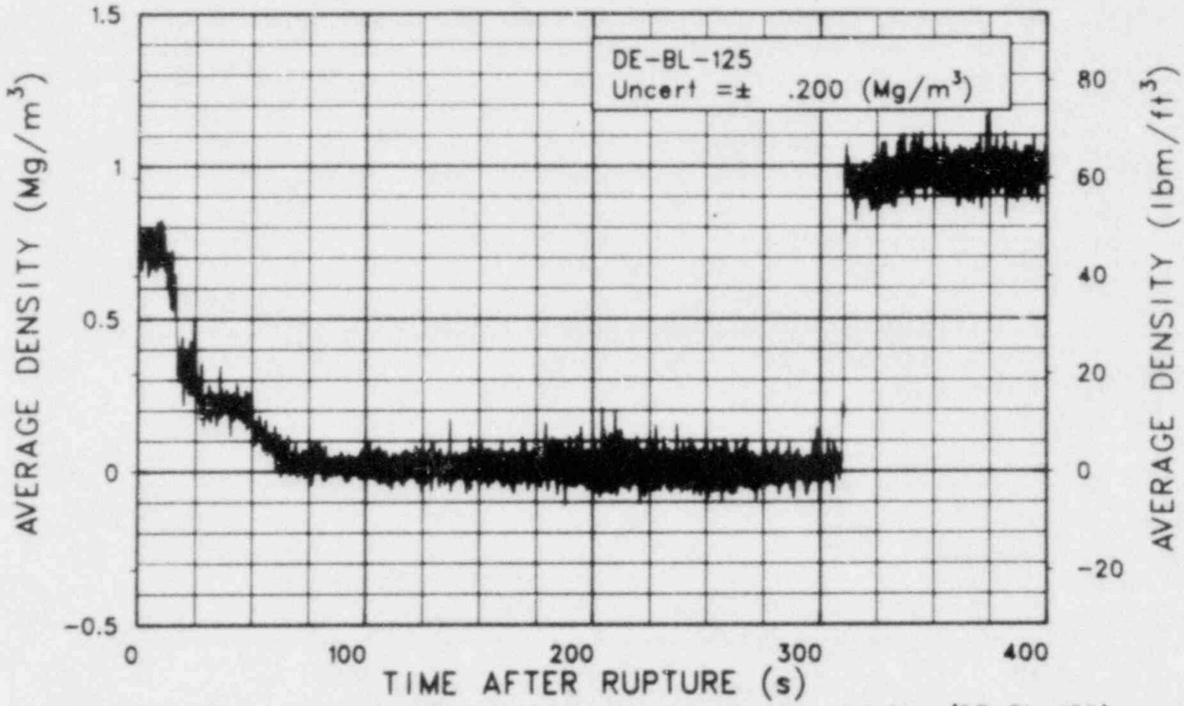


Figure 5C-10. Average fluid density in broken loop cold leg (DE-BL-125) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

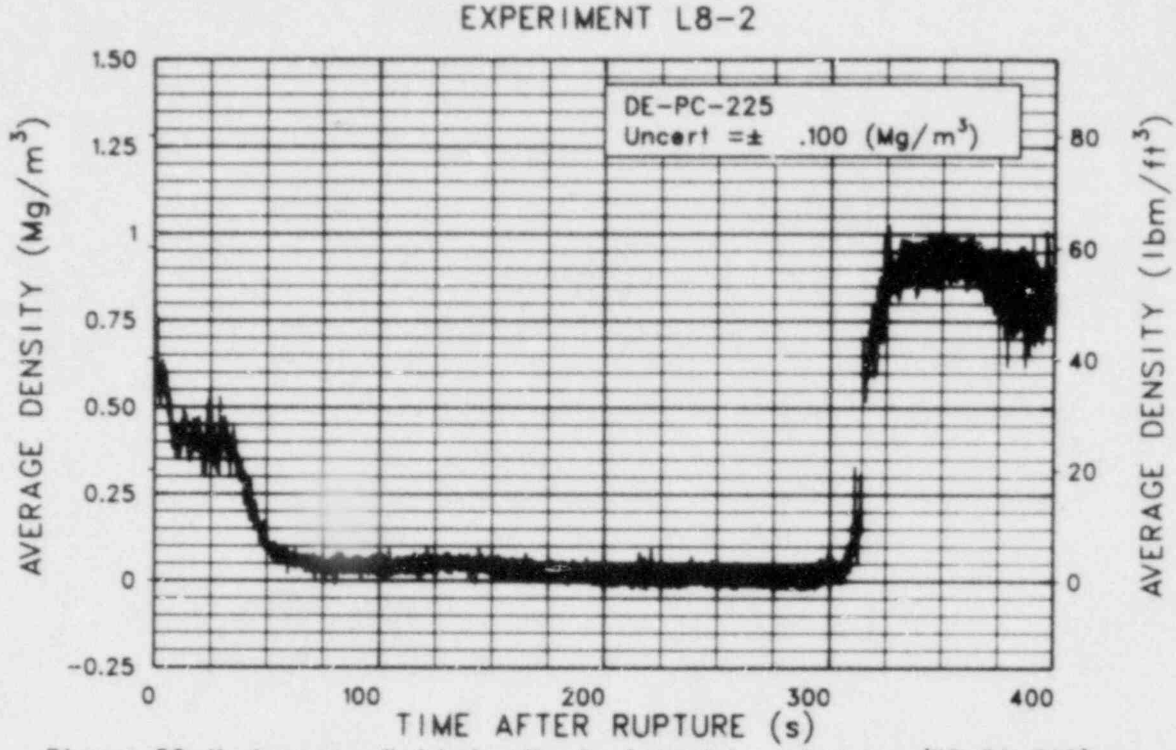


Figure 5C-11. Average fluid density in intact loop hot leg (DE-PC-225) (qualified, invalid data between 310 and 360 s, replaced by interpolation).

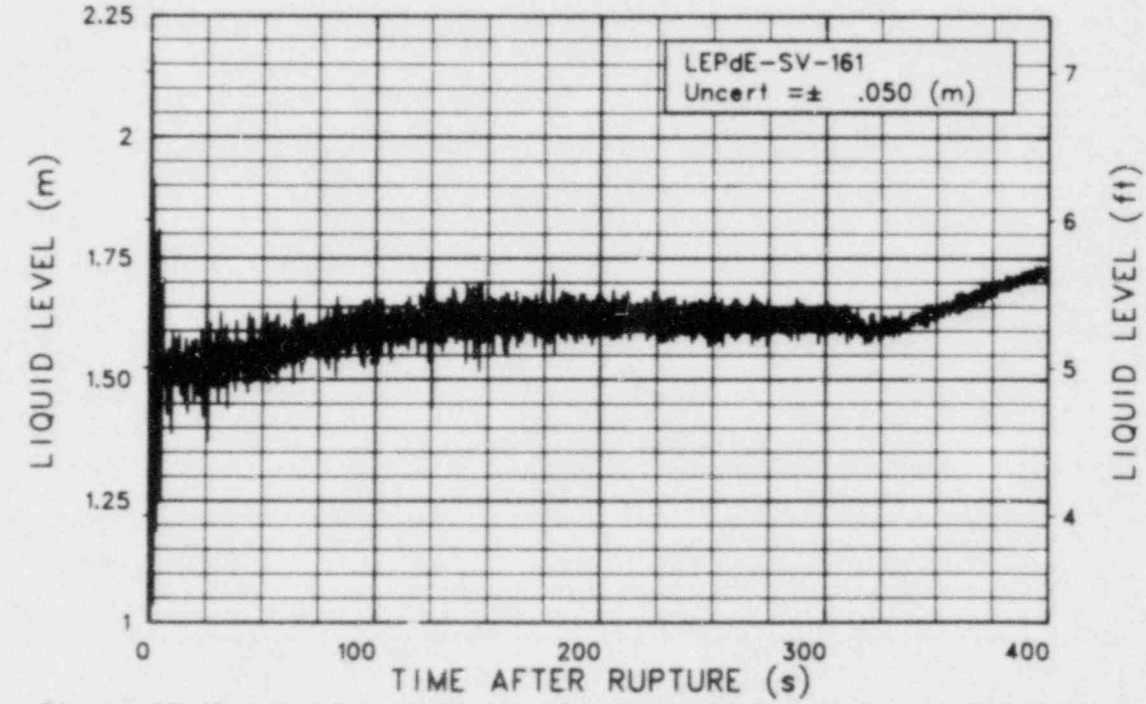


Figure 5C-12. Liquid level in blowdown suppression tank calculated from TE-SV-006, -012 and PdE-SV-001 (LEPdE-SV-161) (qualified, anomalous spikes at approximately 500 s).

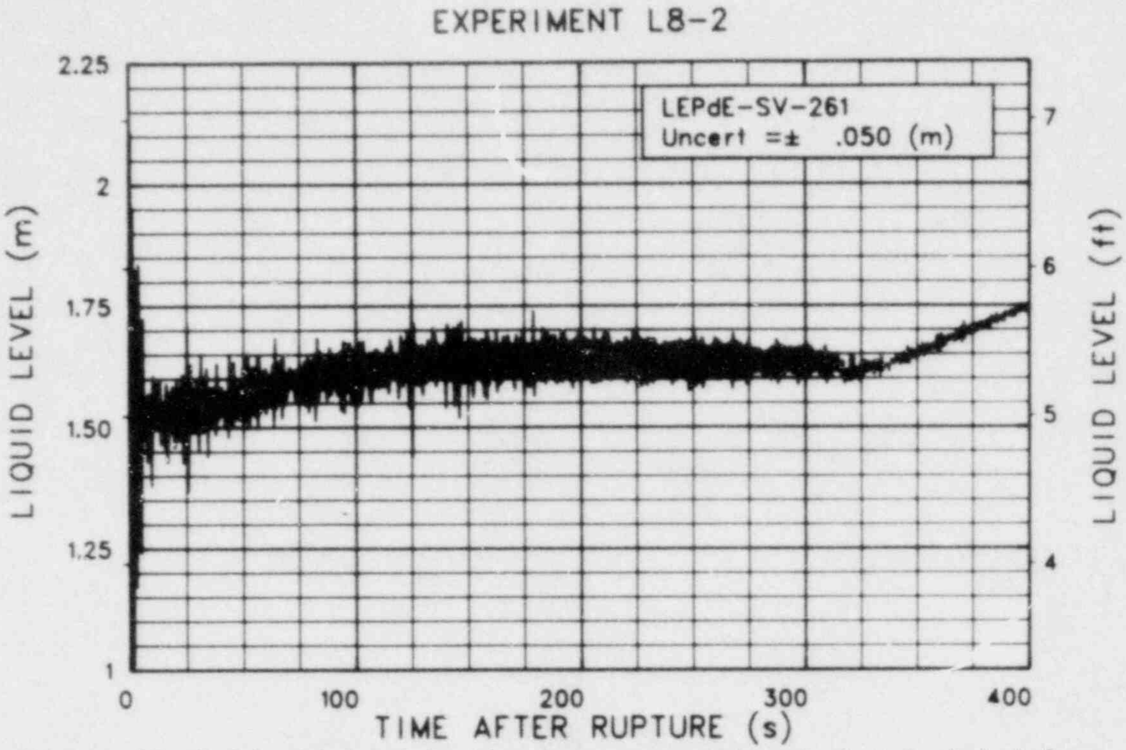


Figure 5C-13. Liquid level in blowdown suppression tank calculated from TE-SV-006, -012 and PdE-SV-002 (LEPdE-SV-261).

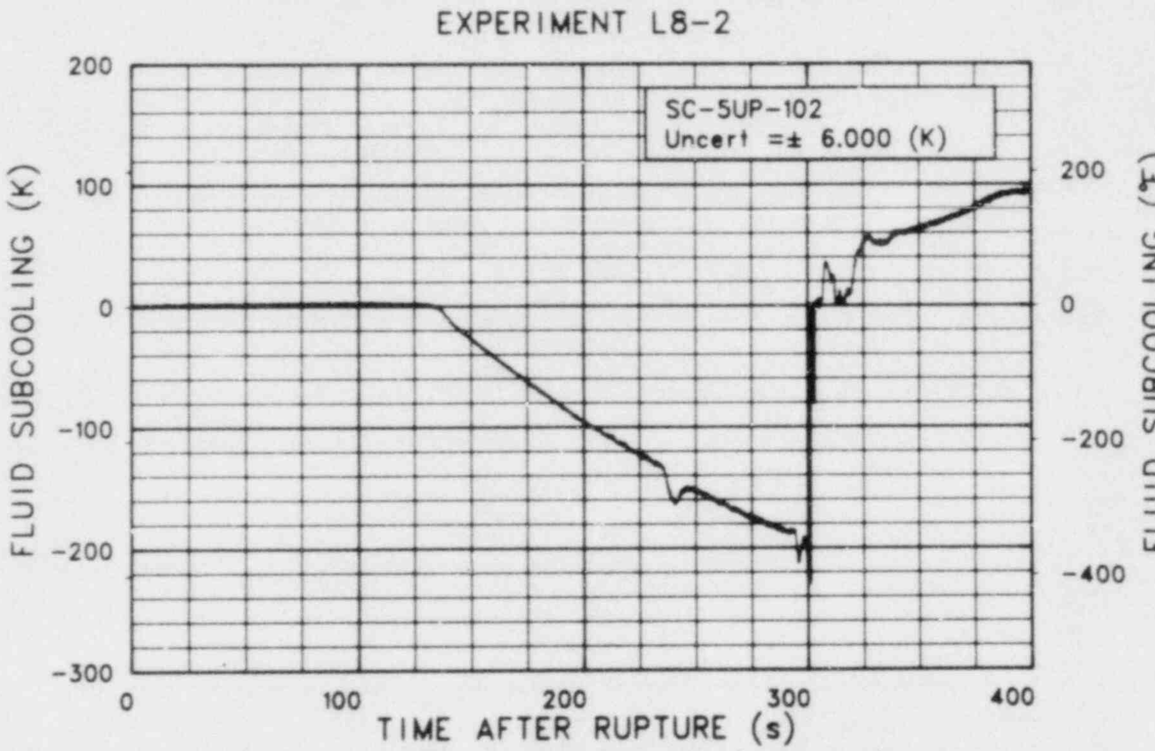


Figure 5C-14. Fluid subcooling in reactor vessel upper plenum (SC-5UP-102).

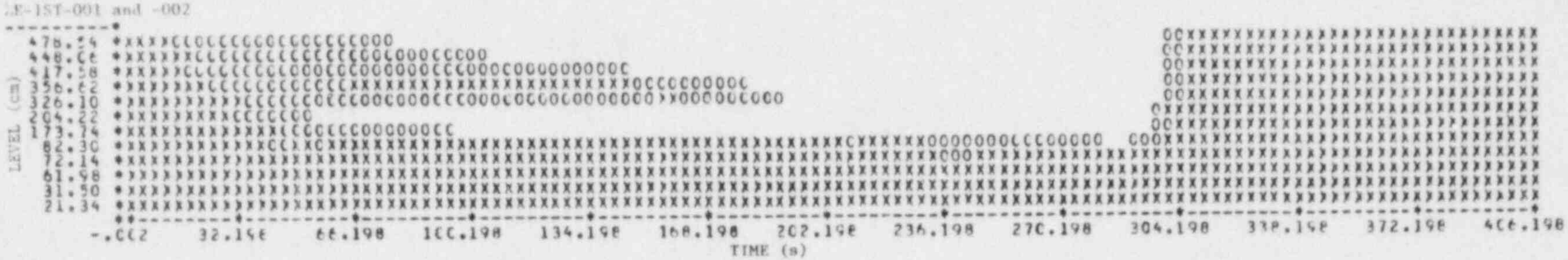


Figure 5C-15. Liquid level in reactor vessel Downcomer Stalk 1, bubble plot (LE-1ST-001 and -002).

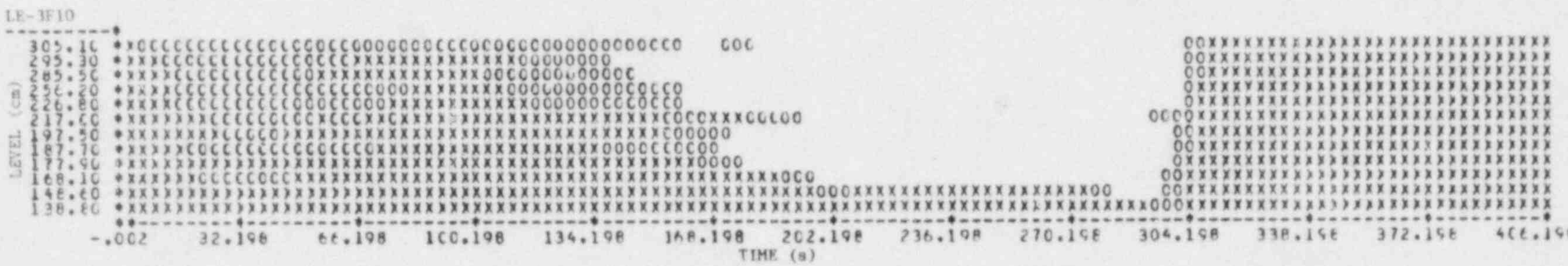


Figure 5C-16. Liquid level in reactor vessel core in Fuel Assembly 3, bubble plot (LE-3F10).

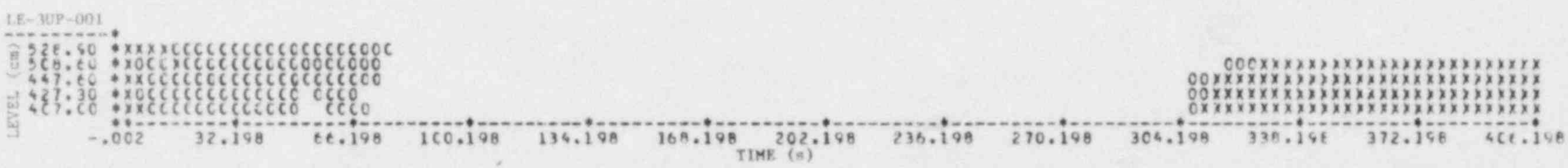


Figure 5C-17. Liquid level in reactor vessel upper plenum above Fuel Assembly 3, bubble plot (LE-3UP-001).

EXPERIMENT L8-2

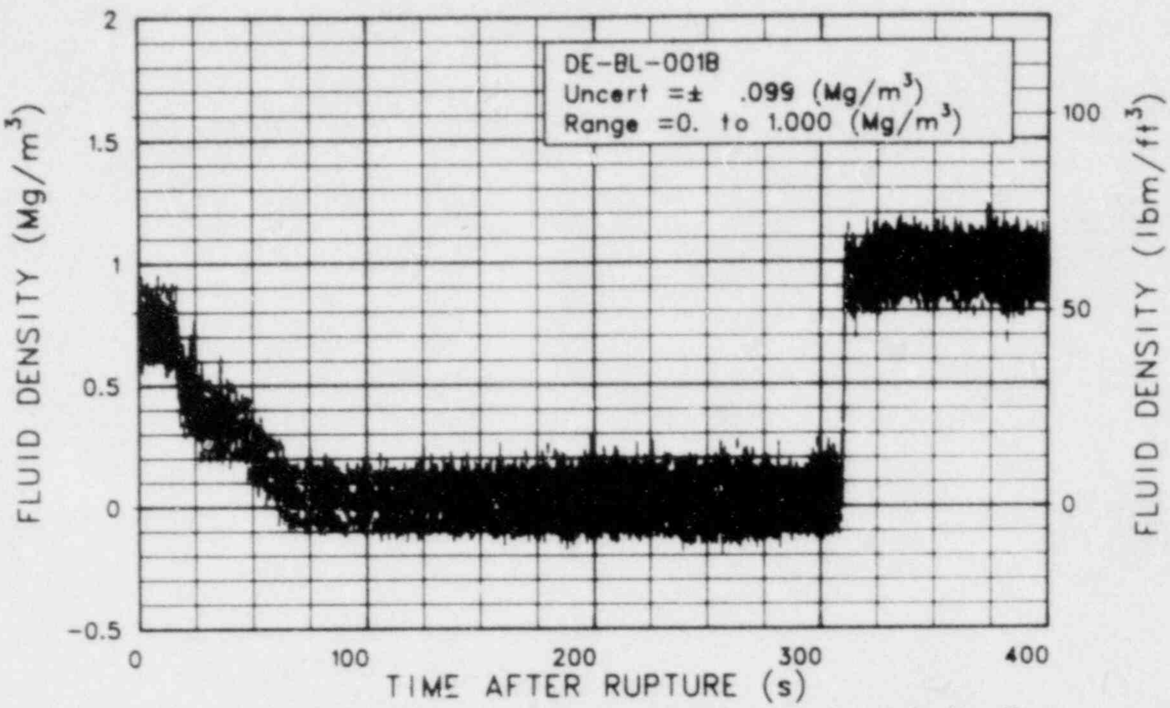


Figure 5U-1. Fluid density in broken loop cold leg, chordal density (DE-BL-001B) (qualified, invalid data between 310 and 360s, replaced by interpolation).

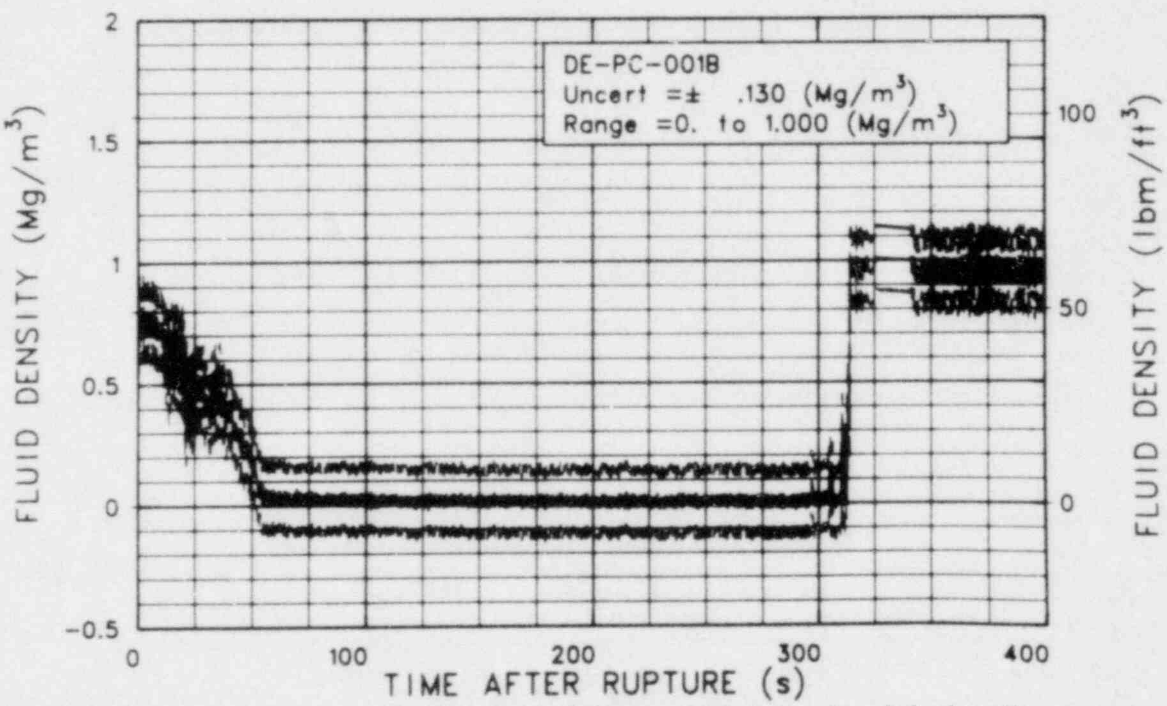


Figure 5U-2. Fluid density in intact loop cold leg, chordal density (DE-PC-001B) (qualified, invalid data between 310 and 360s, replaced by interpolation).

EXPERIMENT L8-2

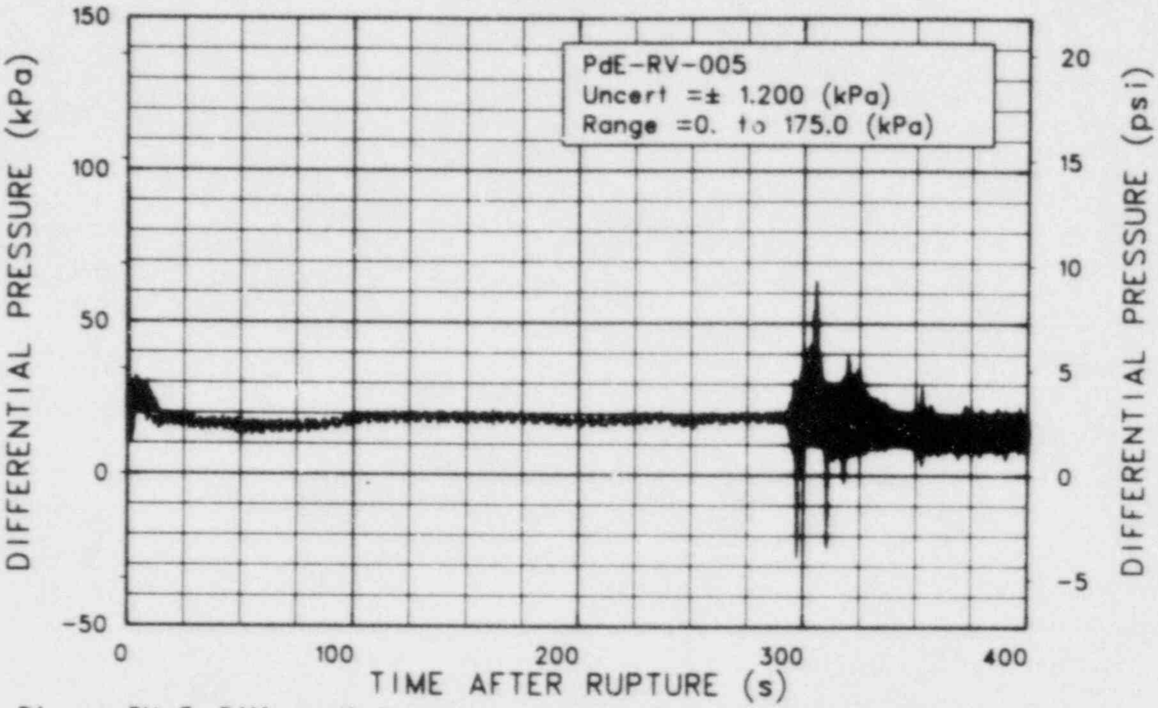


Figure 5U-3. Differential pressure in reactor vessel from vessel top to intact loop hot leg outlet (PdE-RV-005) (qualified, magnitude uncertain, no other measurement for direct comparison)

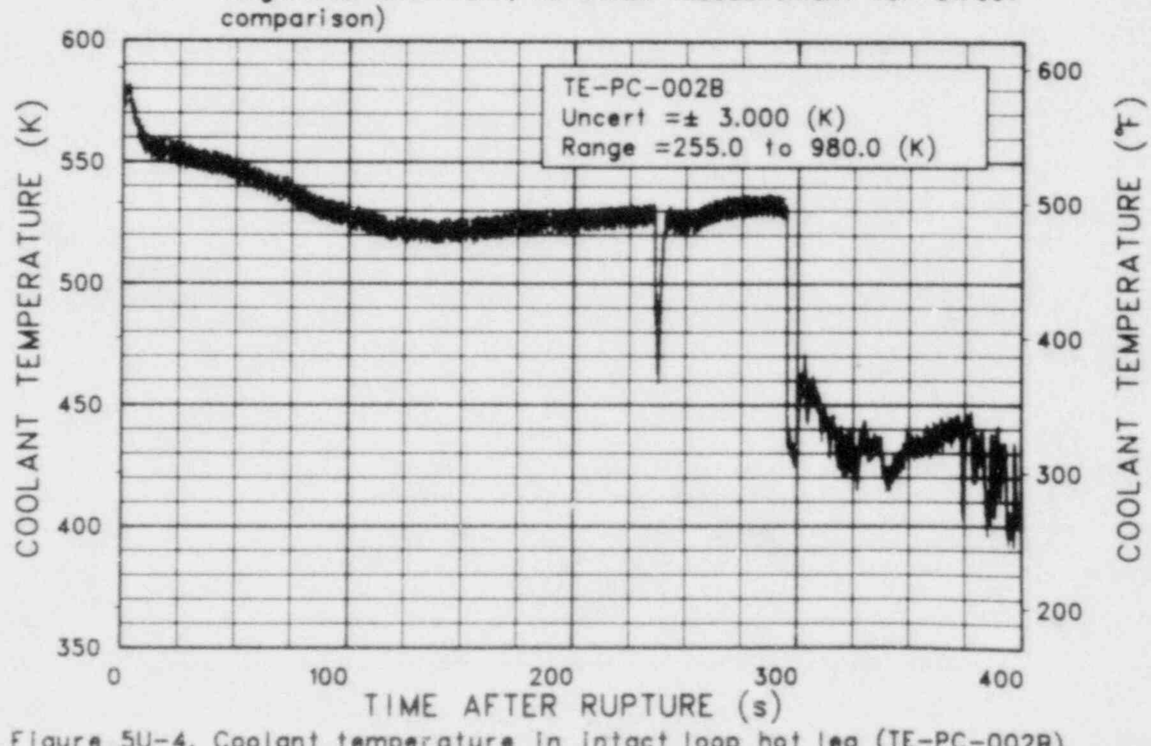


Figure 5U-4. Coolant temperature in intact loop hot leg (TE-PC-002B) (qualified, possible hot wall effects).

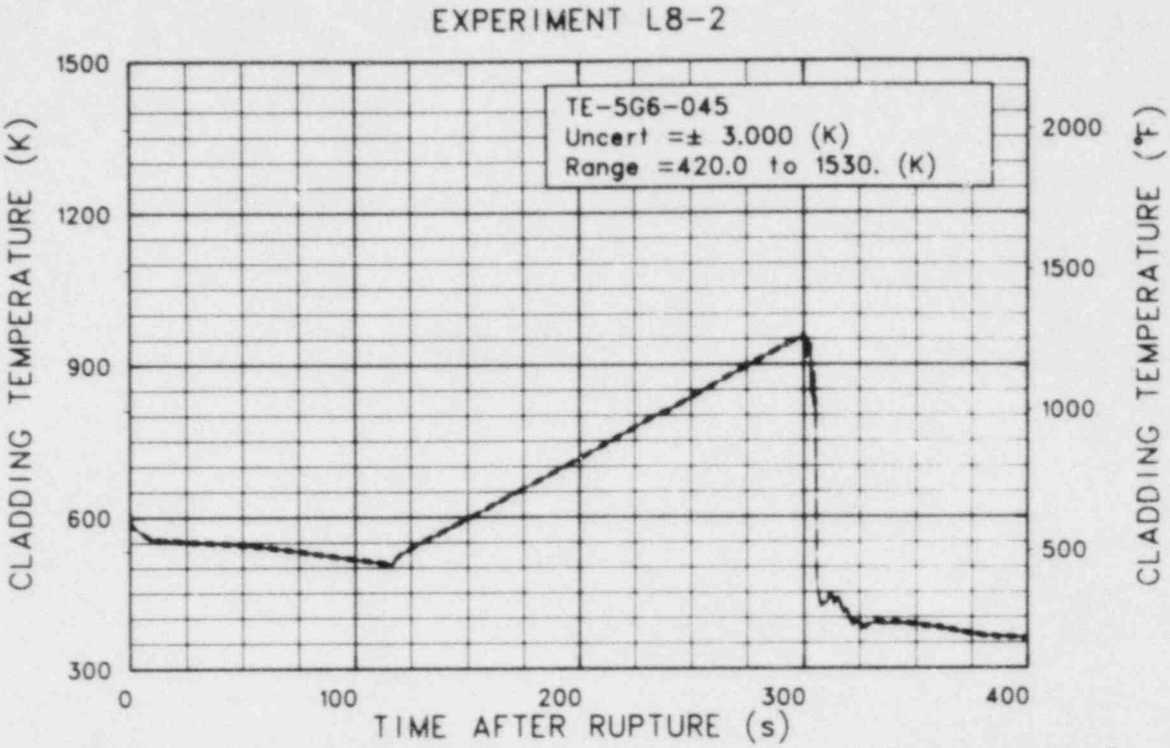


Figure 5U-5. Cladding temperature in reactor vessel at Fuel Assembly 5, Row G, Column 6 at 1.14 m above bottom of fuel rod (TE-5G6-045).

6. REFERENCES

1. D. L. Reeder *LOFT System and Test Description (5.5-ft Nuclear Core 1 LOCEs)*, NUREG/CR-0247, TREE-1208, July 1978.

2. F. S. Miyasaki, *Digital Data Acquisition Program*, ANCR-1250, August 1975.

3. *Proposed ANS Standard 5.1 Decay Heat Power in Light Water Reactors*, September 1978.

4. G. D. Lassahn, *LOFT Experimental Measurements Uncertainty Analyses, Volume XVIII, Radiation-Hardened Gamma Densitometer*, NUREG/CR-0169, EGG-2037, September 1980.

APPENDIX A
SYSTEM CONFIGURATION

APPENDIX A
SYSTEM CONFIGURATION

The Loss-of-Fluid Test (LOFT) facility has been designed to simulate the major components and system responses of a commercial pressurized water reactor (PWR) during a loss-of-coolant accident. The experimental assembly includes five major subsystems which have been instrumented such that system variables can be measured and recorded during a loss-of-coolant experiment. The subsystems include: (a) the reactor vessel, (b) the intact loop, (c) the broken loop, (d) the blowdown suppression system, and (e) the emergency core cooling system (ECCS). The LOFT major components are shown in Figure A-1.

The LOFT reactor vessel has an annular downcomer, a lower plenum, lower core support plates, a nuclear core, and an upper plenum. The downcomer is connected to the cold legs cf the intact and broken loops and contains two instrument stalks. The upper plenum is connected to the hot legs of the intact and broken loops. The core contains 1300 unpressurized nuclear fuel rods arranged in five square (15 x 15 assemblies) and four triangular (corner) fuel modules, shown in Figure A-2 and described in Reference A-1. The center assembly is highly instrumented. Two of the corner and one of the square assemblies are not instrumented. The fuel rods have an active length of 1.67 m and an outside diameter of 10.72 mm.

The fuel consists of UO_2 sintered pellets with an average enrichment of 4.0 wt% fissile uranium (^{235}U) and with a density that is 93% of theoretical density. The fuel pellet diameter and length are 9.29 and 15.24 mm, respectively. Both ends of the pellets are dished with the total dish volume equal to 2% of the pellet volume. The cladding material is zircaloy-4. The cladding inside and outside diameters are 9.48 and 10.72 mm, respectively.

The intact loop simulates three loops of a commercial, four-loop PWR and contains a steam generator, two primary coolant pumps in parallel, a pressurizer, a venturi flowmeter, and connecting piping.

The broken loop consists of a hot leg and a cold leg that are connected to the reactor vessel and the blowdown suppression tank header. Each leg consists of a break plane orifice, a quick-opening blowdown valve, a recirculation line, an isolation valve, and connecting piping. The recirculation lines establish a small flow from the broken loop to the intact loop and are used to warm up the broken loop. The broken loop hot leg also contains a simulated steam generator and a simulated pump. For Experiments L5-1 and L8-2, the steam generator and pump simulator were not attached to the broken loop, but were replaced by a blind flange.

The LOFT ECCS simulates the ECCS of a commercial PWR. It consists of two accumulators, a high-pressure injection system, and a low-pressure injection system. Each system is arranged to inject scaled flow rates of emergency core coolant directly into the primary coolant system.

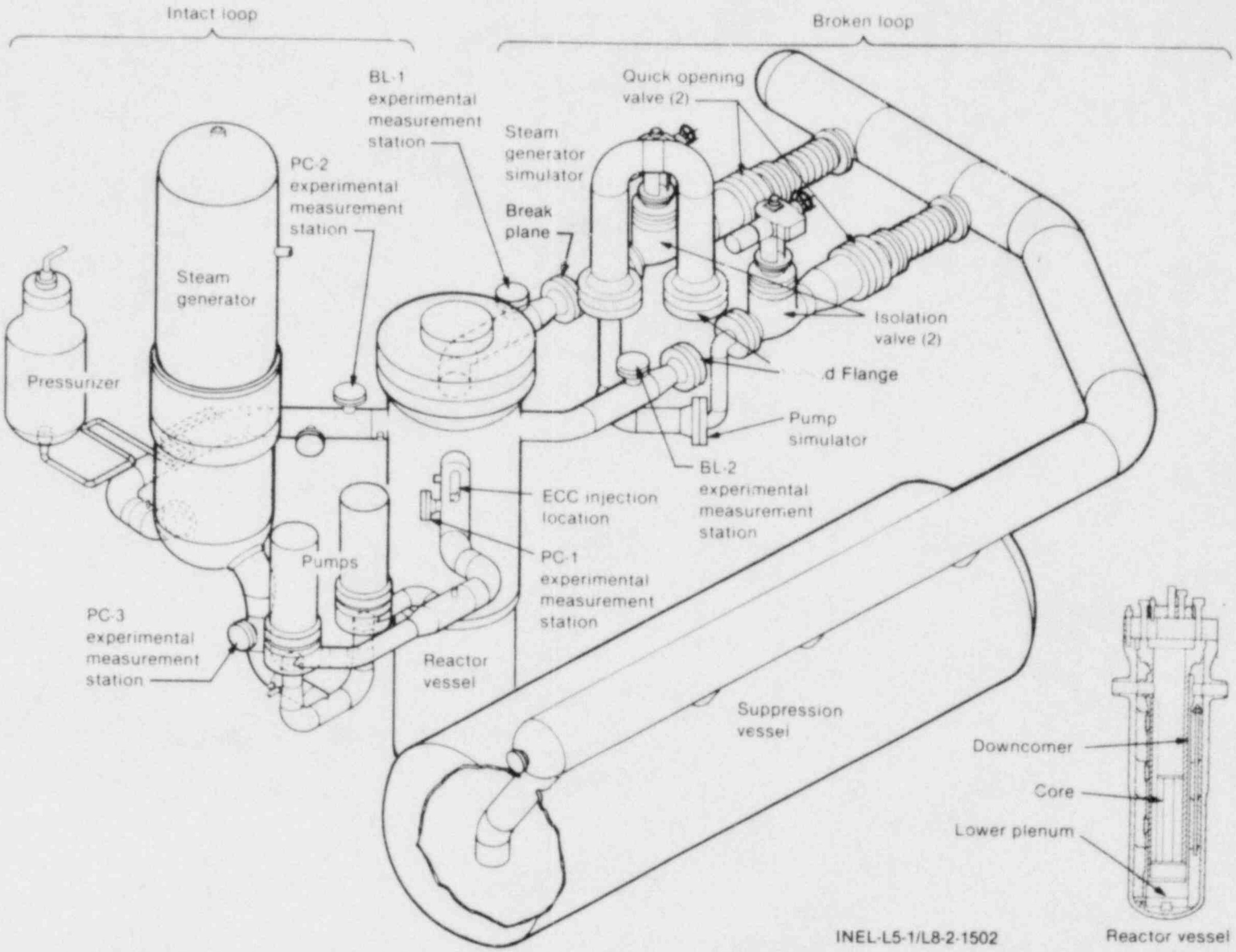


Figure A-1. LOFT major components.

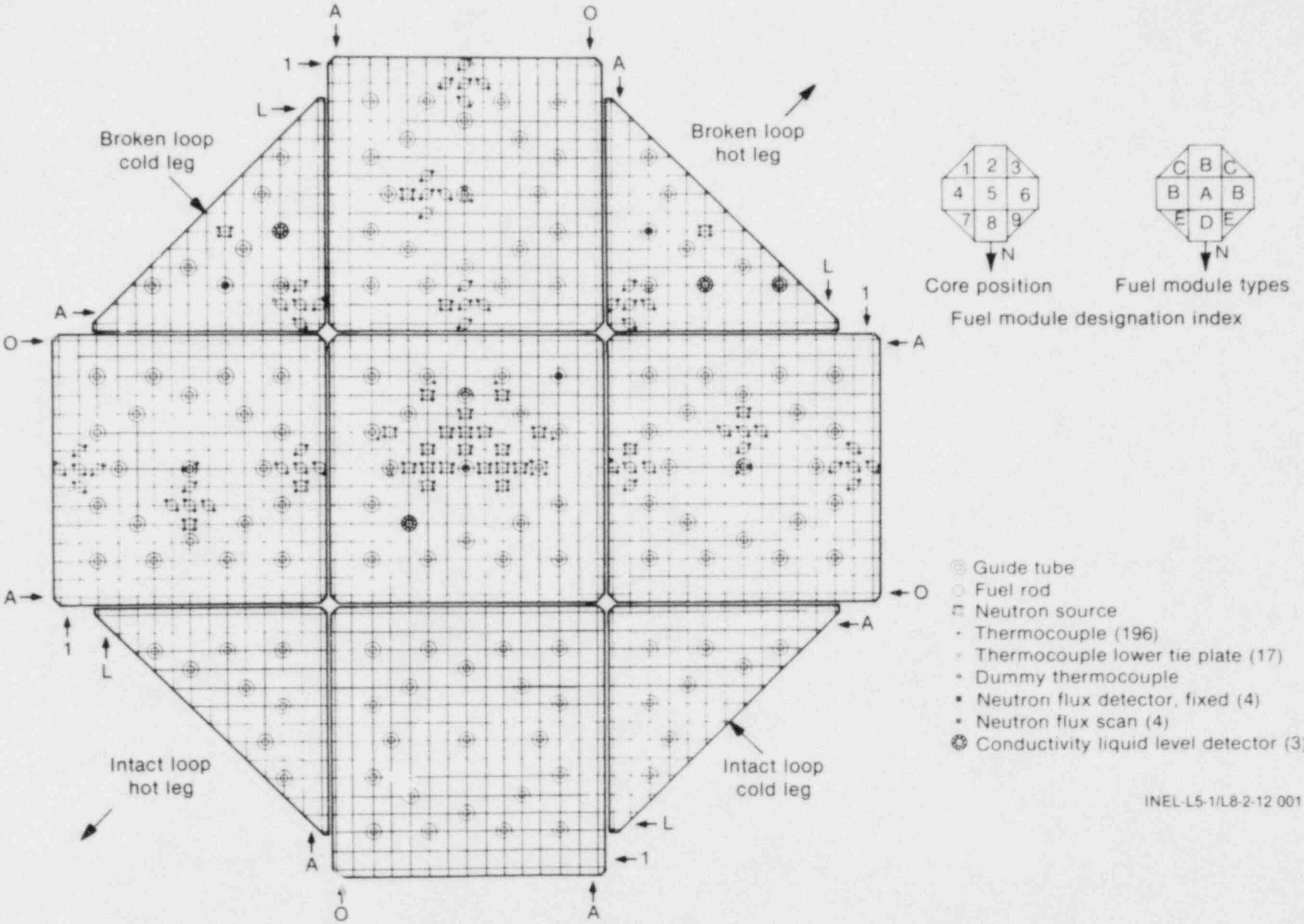


Figure A-2. LOFT Core 1 configuration showing rod designations.

REFERENCE

A-1. M. L. Russell, *LOFT Fuel Modules Design, Characterization, and Fabrication Program*, TREE-NUREG-1131, June 1977.

APPENDIX B
MEASUREMENTS AND INSTRUMENTATION

APPENDIX B
MEASUREMENTS AND INSTRUMENTATION

The Loss-of-Fluid Test (LOFT) instrumentation system is designed to measure and record the important parameters and events that occur during an experiment. The types of instruments used are summarized below:

1. Temperatures at all major locations in the system are obtained from thermocouples and resistance temperature detectors.

2. Pressure measurements are obtained with strain gauge transducers with pressure transmission lines connecting the transducers to the measurement points.

3. Differential pressures are measured by strain gauge transducers with double chambers. The transducers are externally located and connected to the measurement points with pressure transmission lines.

4. Flow velocity is measured by turbine flowmeters.

5. Momentum flux is measured by drag discs. The data presented for fluid velocity and momentum flux are based on the following flow areas at the instrument locations:

Instrument	Flow Area (m^2)
ME-2ST-1	0.141
FE-5UP-1 ME-3UP-1 and ME-5UP-1	0.125
FE-PC-2A, -2B, and -2C ME-PC-2A, -2B, and -2C	0.0634
ME-BL-1A, -1B, -1C, -1D, -1E, and -1F ME-PC-1A, -1B, and -1C FE-PC-1A, -1B, and -1C	0.0634

6. Fluid density is measured by gamma densitometers. All the gamma densitometers consist of a ^{60}Co source and three detectors as shown in Figure B-1. Each of the three detectors sees a collimated gamma ray beam, emitted from a single source, that has passed through the pipe. Each of these densitometers also has a detector (D) located so that it measures background radiation continuously. The attenuation of the gamma rays varies inversely with the density of the fluid in the pipe. The DE-PC-3 densitometer is located in vertical piping; the rest of the densitometers are located in horizontal piping. Figure B-1 shows the gamma densitometer configuration relative to the piping.

7. Liquid levels are obtained by means of (a) differential pressure transducers in the pressurizer, accumulator, steam generator secondary side, pump suction piping, and reactor vessel upper plenum; and (b) liquid detectors which sense the conductivity of the fluid near each of a series of electrical contacts in the reactor vessel.

8. Control rod position is indicated by means of proximity switches. The circuitry associated with the proximity switches controls a set of lamps. Each set of lamps consists of a "rod bottom" lamp and four "rod location" lamps. The rod bottom lamp lights only when the control rod is bottomed. Each rod location lamp lights as the leadscrew on the control rod passes its switch position during withdrawal, and it remains lit whenever the leadscrew is above this position.

9. Valve positions (analog indication from 0 to 100% of opening) are measured by either resistance potentiometers or differential transformers.

10. Mechanical pump speed is measured by an eddy current displacement transducer that uses a slotted metallic target attached to the top of the pump motor shaft. The target contains six asymmetrical slots so that pump speed can be determined. Electrical pump power is measured by a watt transducer.

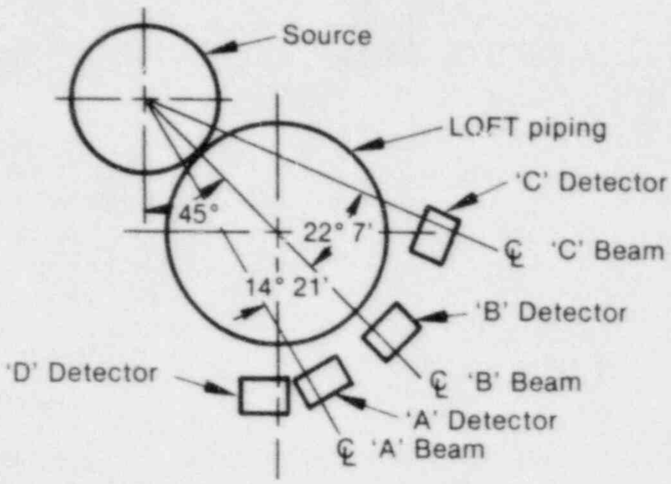


Figure B-1. Relation of source and detectors to pipe for gamma densitometers.

11. The steady state local linear heat generation rate is measured by self-powered neutron detectors and is also determined from neutron flux measurements taken with traversing in-core probes. The two types of instruments are described below:

    a. Each self-powered neutron detector consists of a cylindrical ^{59}Co emitter, a layer of aluminum oxide for electrical insulation, and an outer sheath of Inconel. The cable connected to the detector consists of two Inconel wires in an Inconel sheath with magnesium oxide insulation. One of the wires is connected to the cobalt emitter and the other is open-ended. The open-ended wire gives a background subtraction signal to compensate for the radiation sensitivity of the cable.

    b. A traversing in-core probe measures neutron flux at four guide tube locations in the core. This instrument consists of a ^{235}U fission chamber attached to a flexible cable and its own data recording system. The probe was withdrawn and stored outside the core prior to experiment initiation.

The data acquisition and visual display system is used to record measured data from the various instrumentation systems on a combination of digital recorders, wide-band frequency modulation (FM) tape recorders, and oscillographic recorders.[B-1] Redundant records are made where use dictates more than one recording mode or where an extra measure of assurance is desired for critical measurements.

A digital computer is used to collect the experiment data in a multiplexed format at the LOFT facility and to perform equipment calibrations, posttest data reduction, and plotting.[B-2] The recorded FM data are converted into digital form, and then demultiplexed to be compatible with the CDC CYBER 176 computer system.

The CDC CYBER 176 computer system is used to further reduce the data. Calibration factors are first applied to produce data plots in engineering units so that engineering specialists can examine each channel for discrepancies or unexpected events. Where possible, instrument channel outputs and computed variables are compared with previous experiments, corresponding parameter channels, and calculated quantities. Instruments are labeled as "Qualified" if the measurement comparisons are determined to be within the accuracy of the particular instrument.

Most transducers were calibrated under laboratory conditions prior to installation in the LOFT system. Verification of calibration constants is accomplished by special tests performed during heatup and by analysis of initial conditions data. In addition, post-experiment checks are performed to pinpoint questionable data and to verify data consistency. Appendix C discusses the techniques used to perform data consistency checks.

Figure B-2 shows a piping schematic indicating instrument locations. Table B-1 gives the nomenclature for LOFT experimental and process instrumentation. Both types of instrumentation are included in this report. Thermocouples and neutron flux detectors located in the nuclear core have special identification. Each of these transducers has been given an identification number which identifies the type of transducer and its location within the core as follows:

Transducer location (inches from bottom of fuel rod)
Fuel assembly row
Fuel assembly column
Fuel assembly number
Transducer type

TE-3B11-28

Figures B-3 and B-4 show isometric views of the major system components with instrument locations indicated. Figures B-5 through B-17 give more specific locations for instruments located on individual components. Reference B-3 may be consulted if additional details of instrument design and locations are desired.

Table B-2 lists instruments that were available to be used for LOFT Experiments L5-1 and L8-2. Included are the instrument location, range, recording frequency, initial condition uncertainty, and uncertainty at specific readings. The "Comments" column contains information relative to the usability of the data. No entry under the "Comments" column means that the instrument was recorded, but the data were not reviewed or presented.

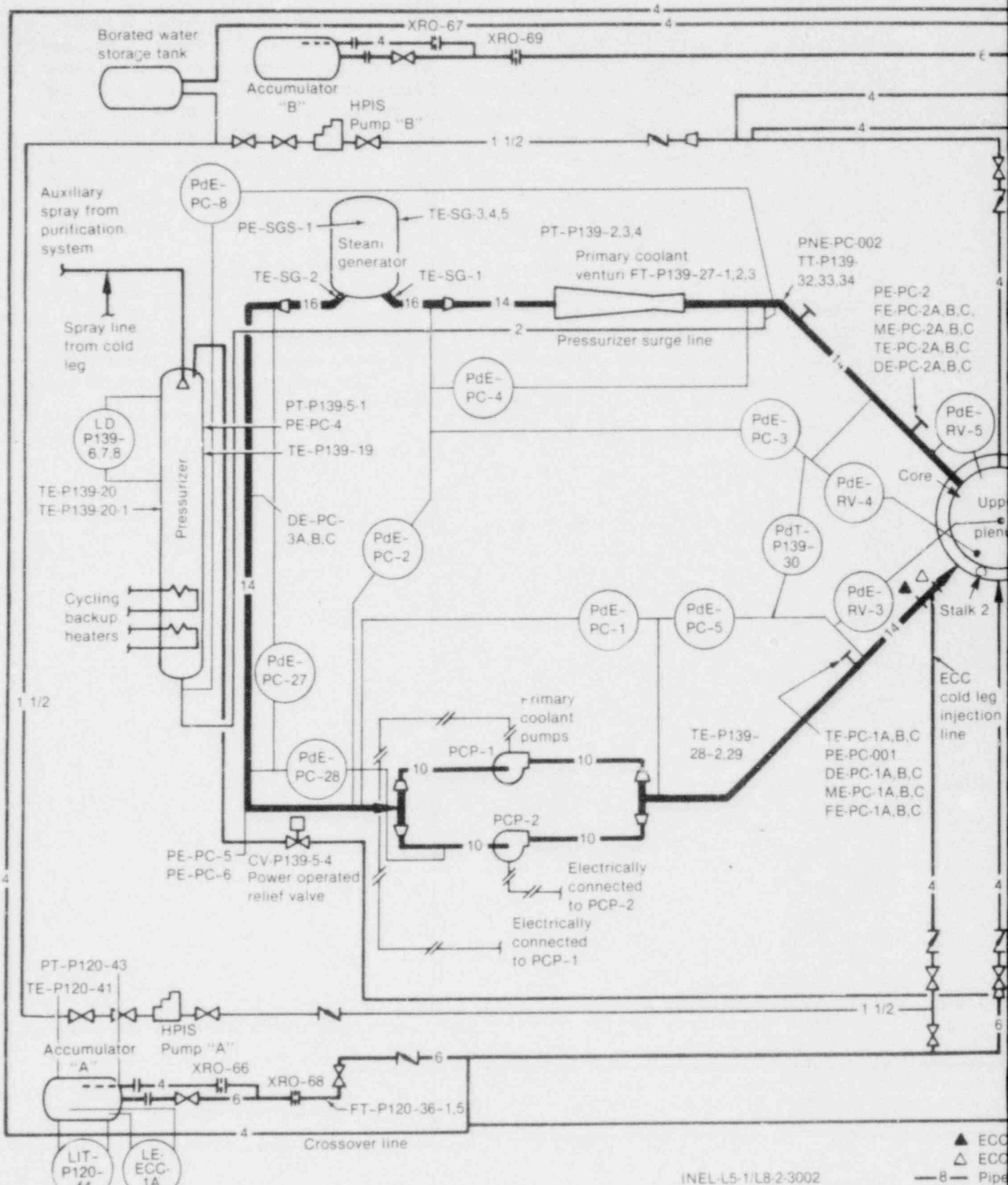
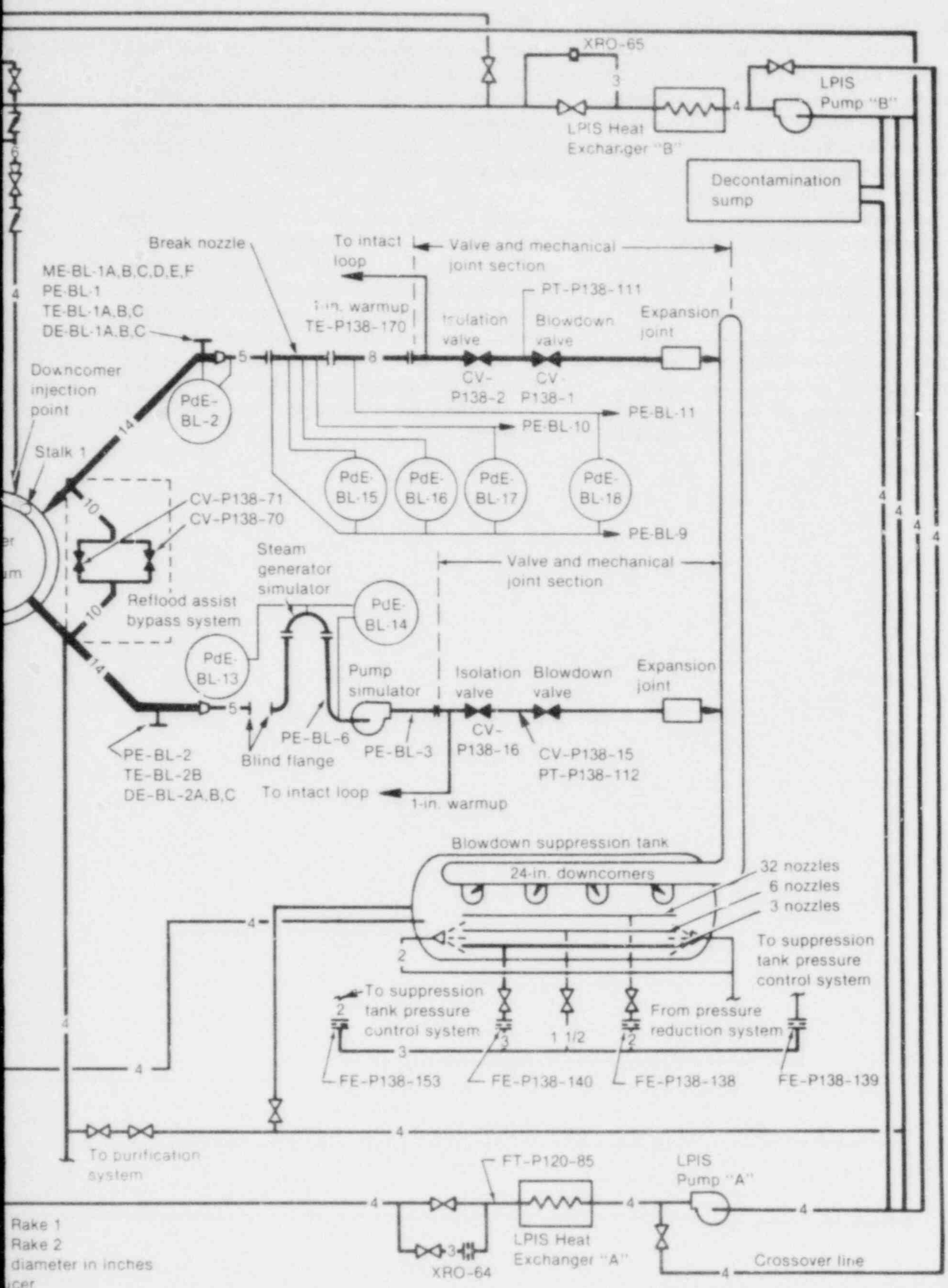


Figure B-2. LOFT piping schematic v



ith instrumentation.

TABLE B-1. NOMENCLATURE FOR LOFT INSTRUMENTATION

Designations for the Different Types of Experimental Instruments	
AE	Accelerometer
DE	Densitometer
DIE	Displacement element
FE	Coolant flow element
LE	Coolant level element
ME	Momentum flux detector
NE	Neutron detector
PCP	Primary coolant pump
PdE	Differential pressure element
PE	Pressure element
RPE	Pump speed element
TE	Temperature element
Designations for the Different Experimental Systems, Except the Core	
BL	Broken loop
LP	Lower plenum
PC	Primary coolant intact loop
RV	Reactor vessel
SG	Steam generator
SGS	Steam generator secondary
1ST	Downcomer Stalk 1
2ST	Downcomer Stalk 2
SV	Suppression tank
UP	Upper plenum
Designations for the Different Types of Process Instruments	
CV	Control valve
FE	Flow element
FT	Flow transmitter
LIT	Level indicating transmitter
LD	Density compensated liquid level element
LT	Liquid level transmitter
PdT	Differential pressure transmitter
PT	Absolute pressure transmitter
RE	Radiation element
TE	Temperature element
TT	Temperature transmitter
Designations for the Different Systems Associated with Process Instruments	
P004	Secondary coolant system
P120	Emergency core cooling system
P128	Primary coolant addition and control system and high-pressure injection system
P138	Broken loop and pressure suppression system
P139	Intact loop
P141	Primary component cooling system
T-77,T-87	Power range

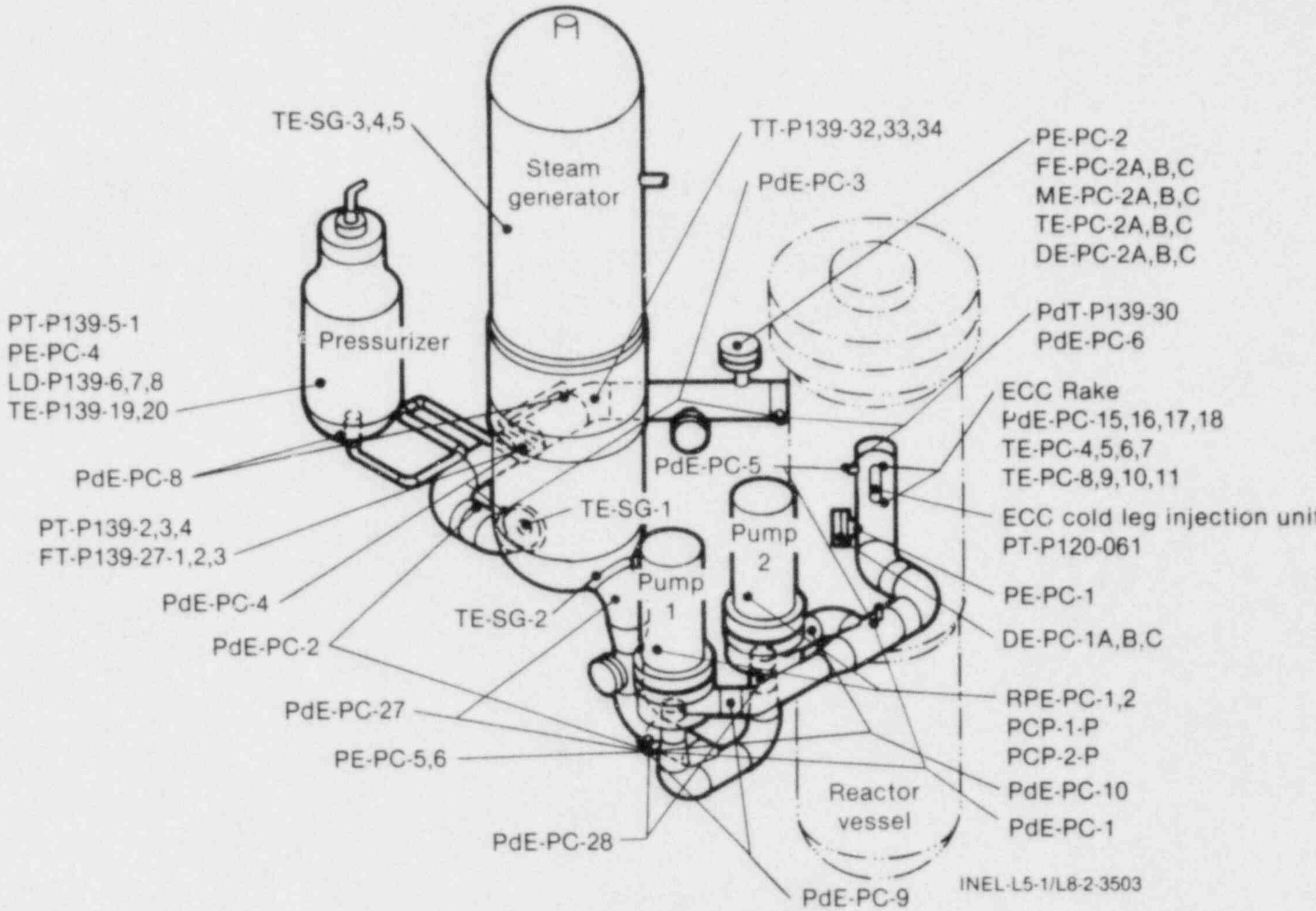


Figure B-3. LOFT thermal-hydraulic instrumentation for intact loop.

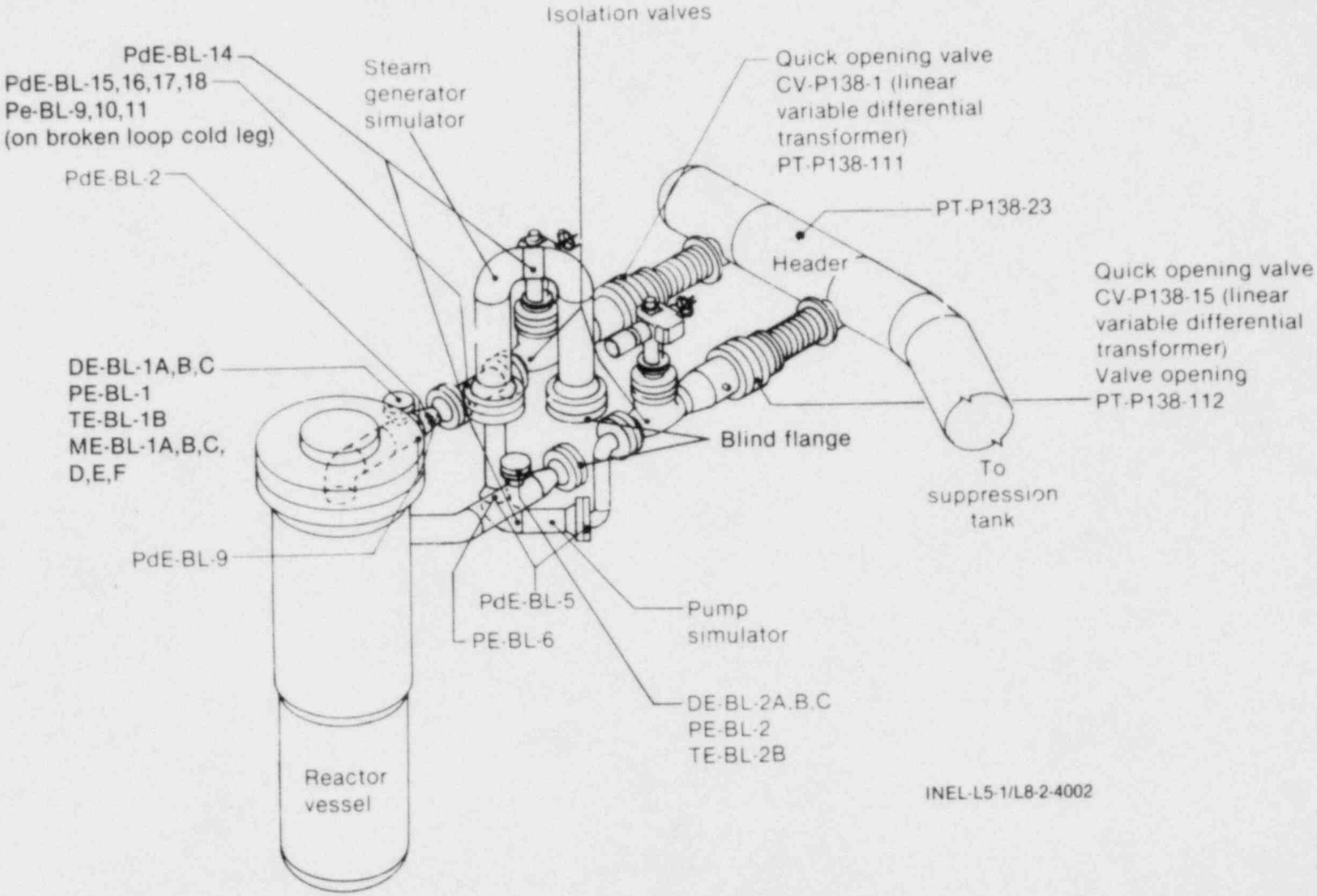


Figure B-4. LOFT thermal-hydraulic instrumentation for broken loop.

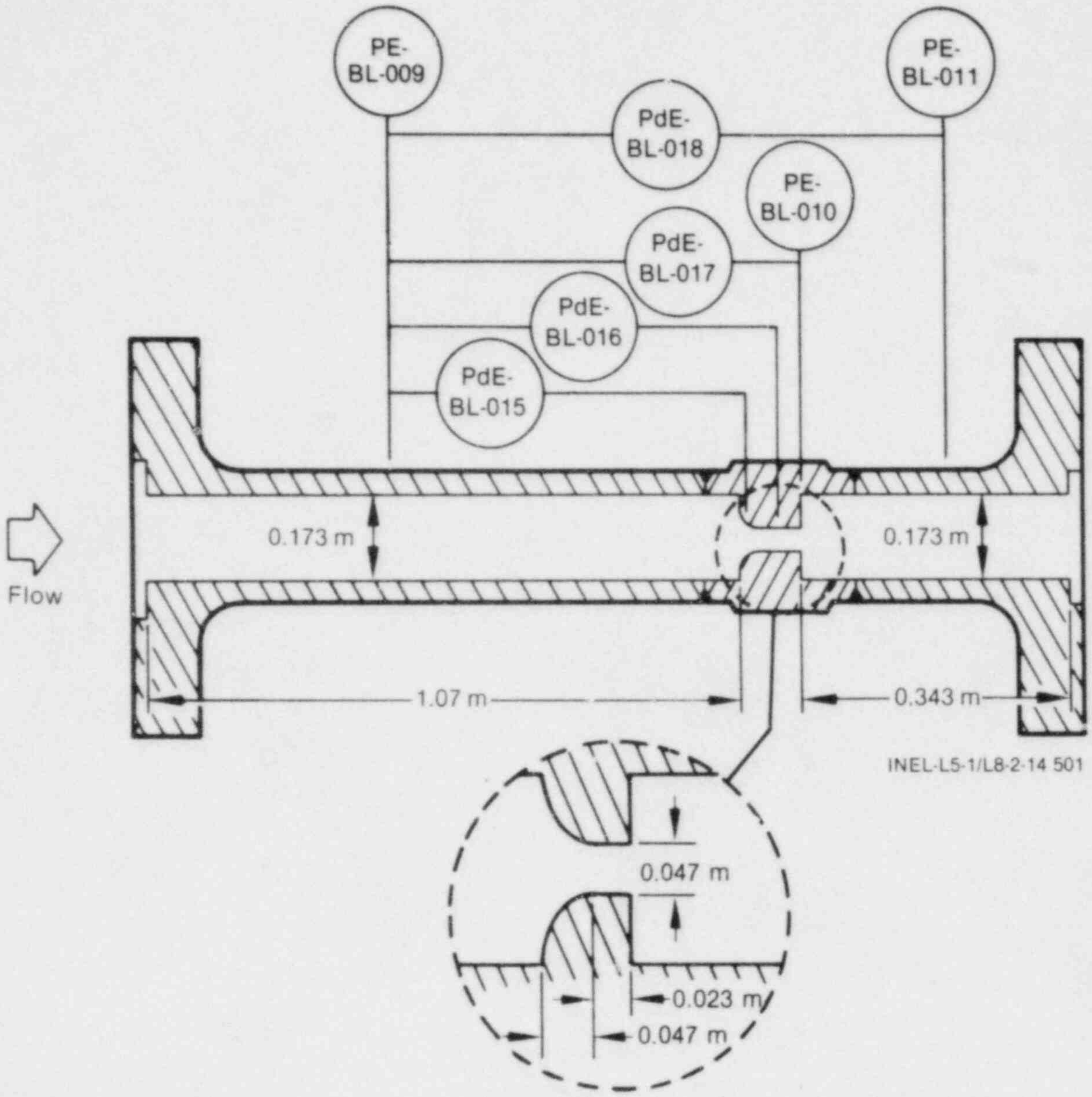
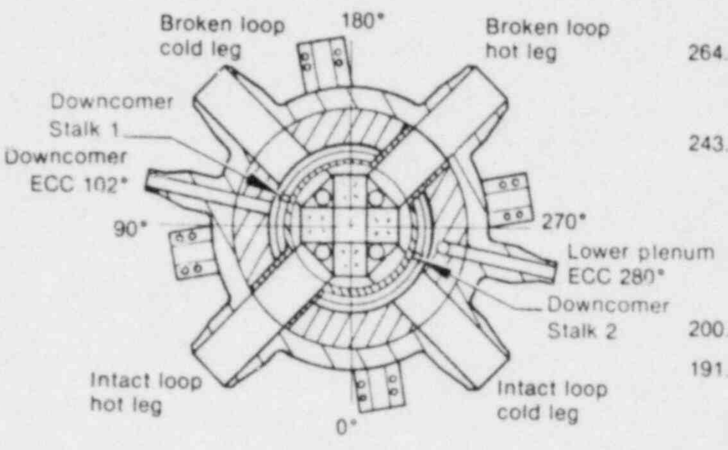
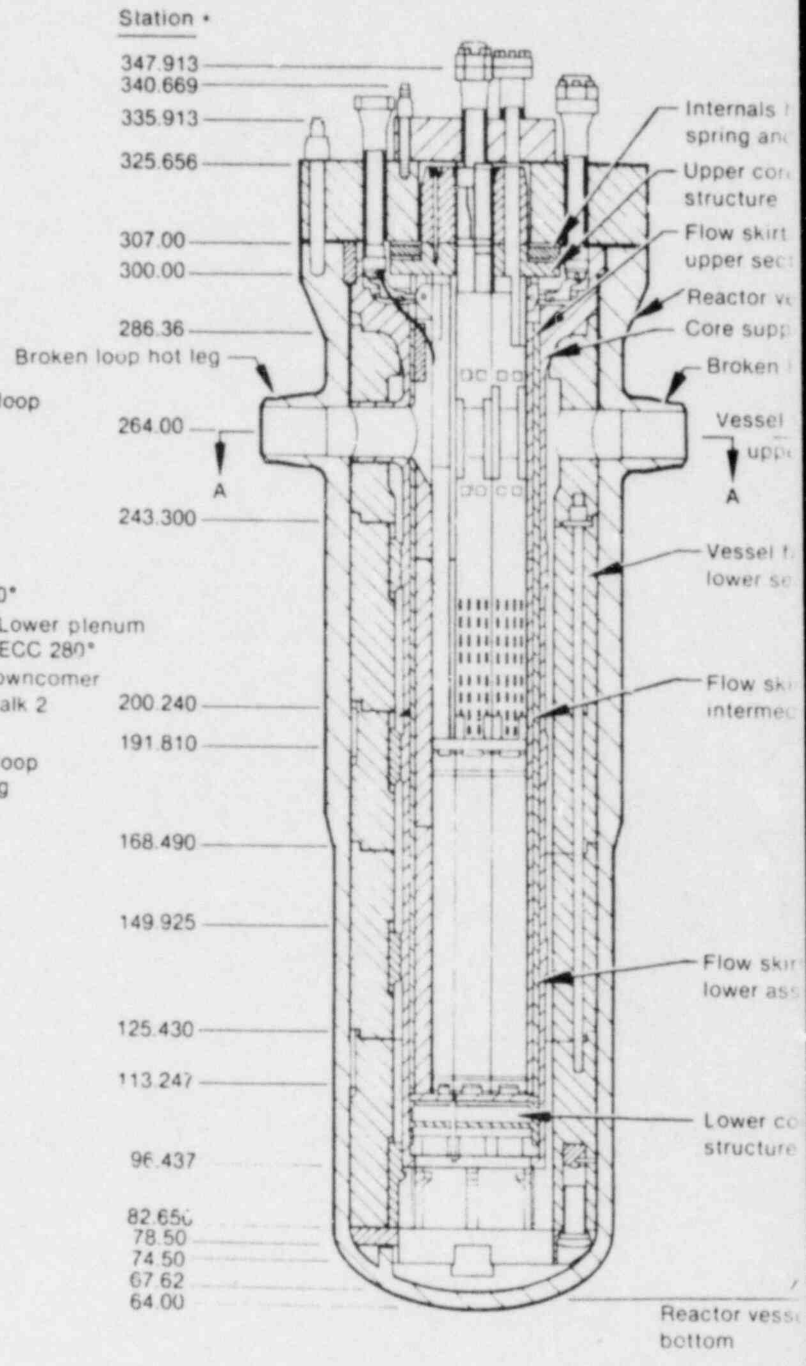


Figure B-5. LOFT broken loop cold leg spoolpiece instrumentation.



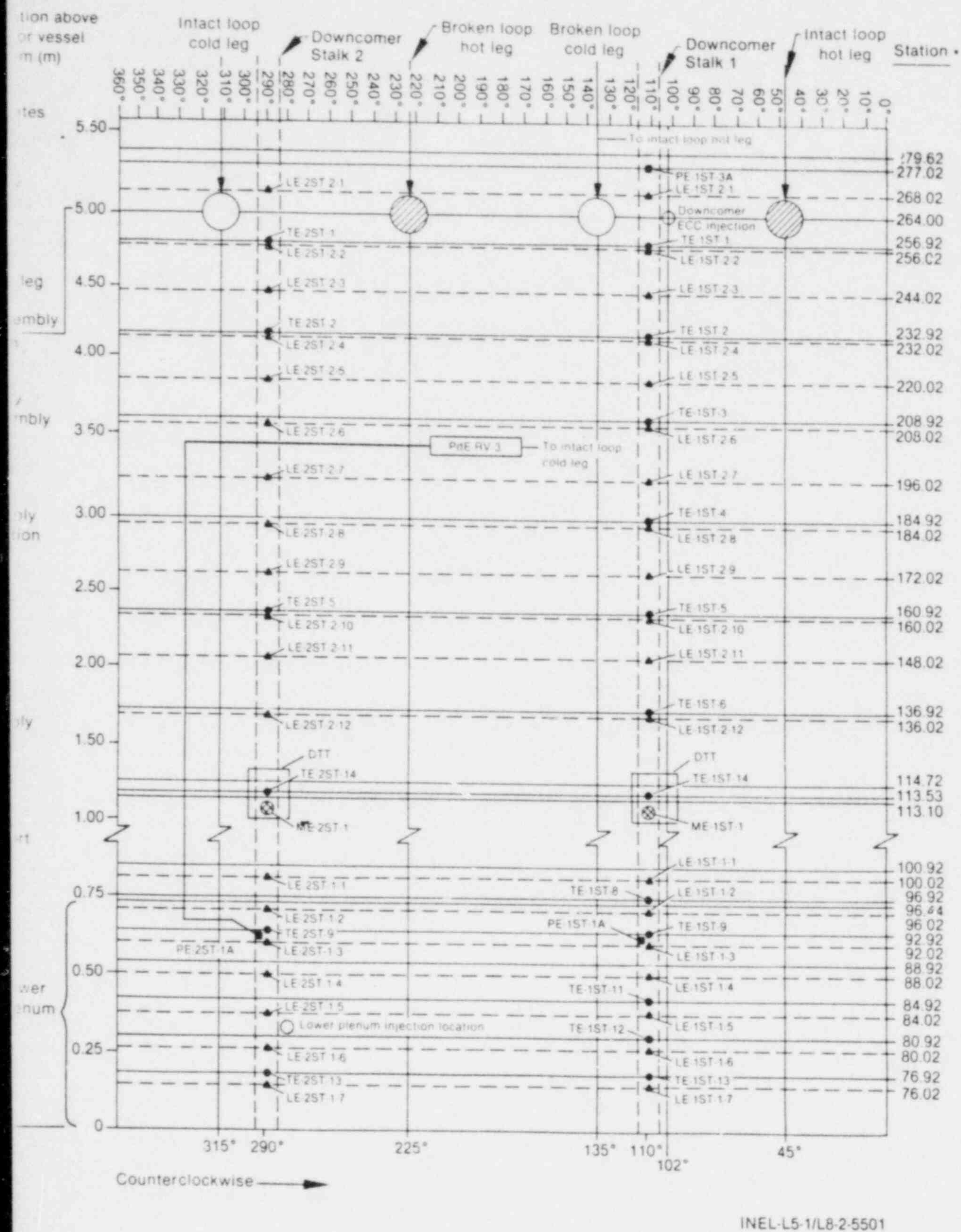
Section A-A



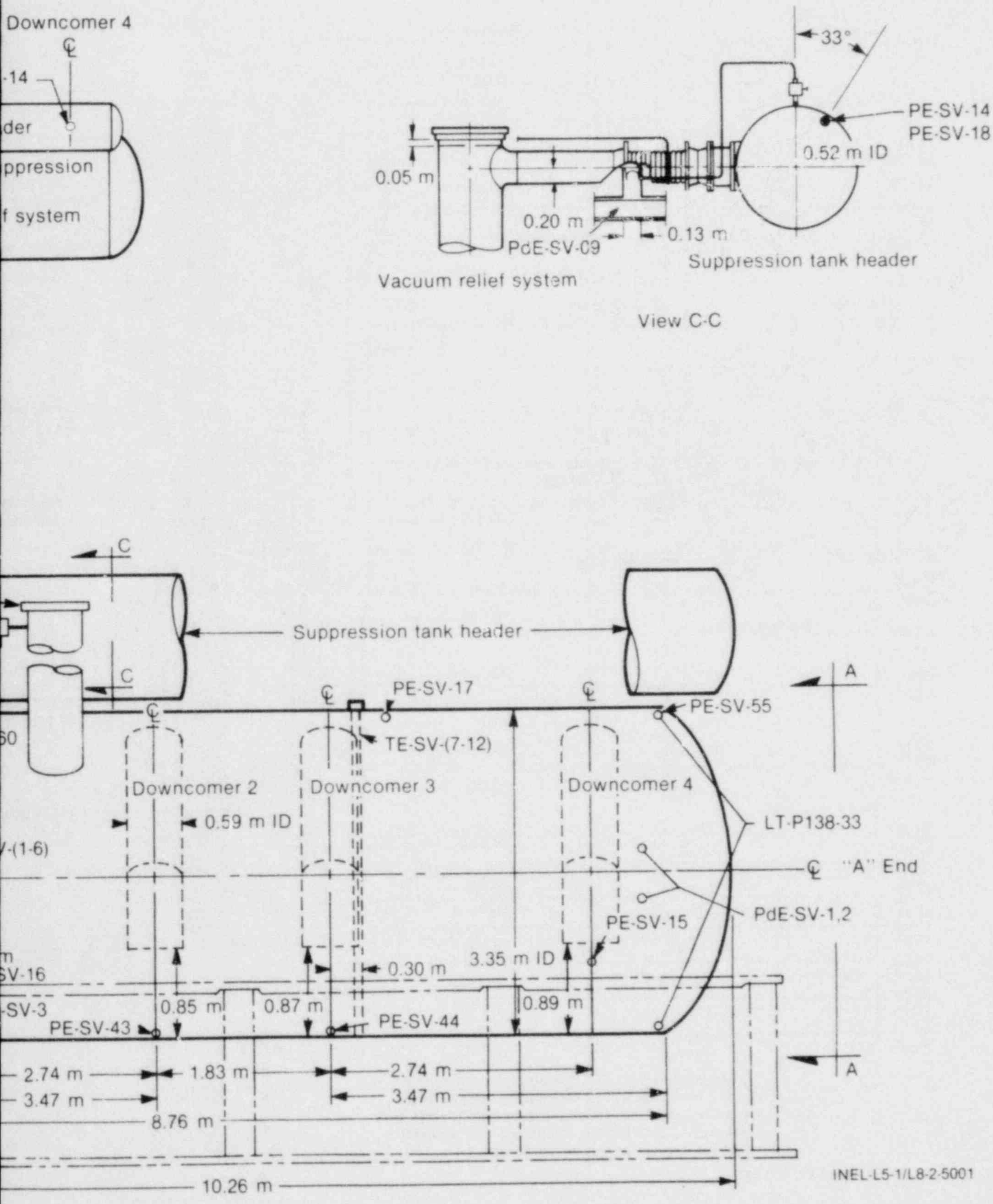
* Station numbers are a dimensionless measure of relative elevation within the reactor vessel. They are assigned in increments of 2.54 centimeters with station 300.00 defined at the core barrel support ledge inside the reactor vessel flange.

● Thermocouples
▲ Liquid level stings
■ Pressure
⊗ Drag discs
▨ Turbinemeter
Drag disc turbinemeter (DTT)

Figure B-7. LOFT reacto



strumentation.



down suppression tank instrumentation.

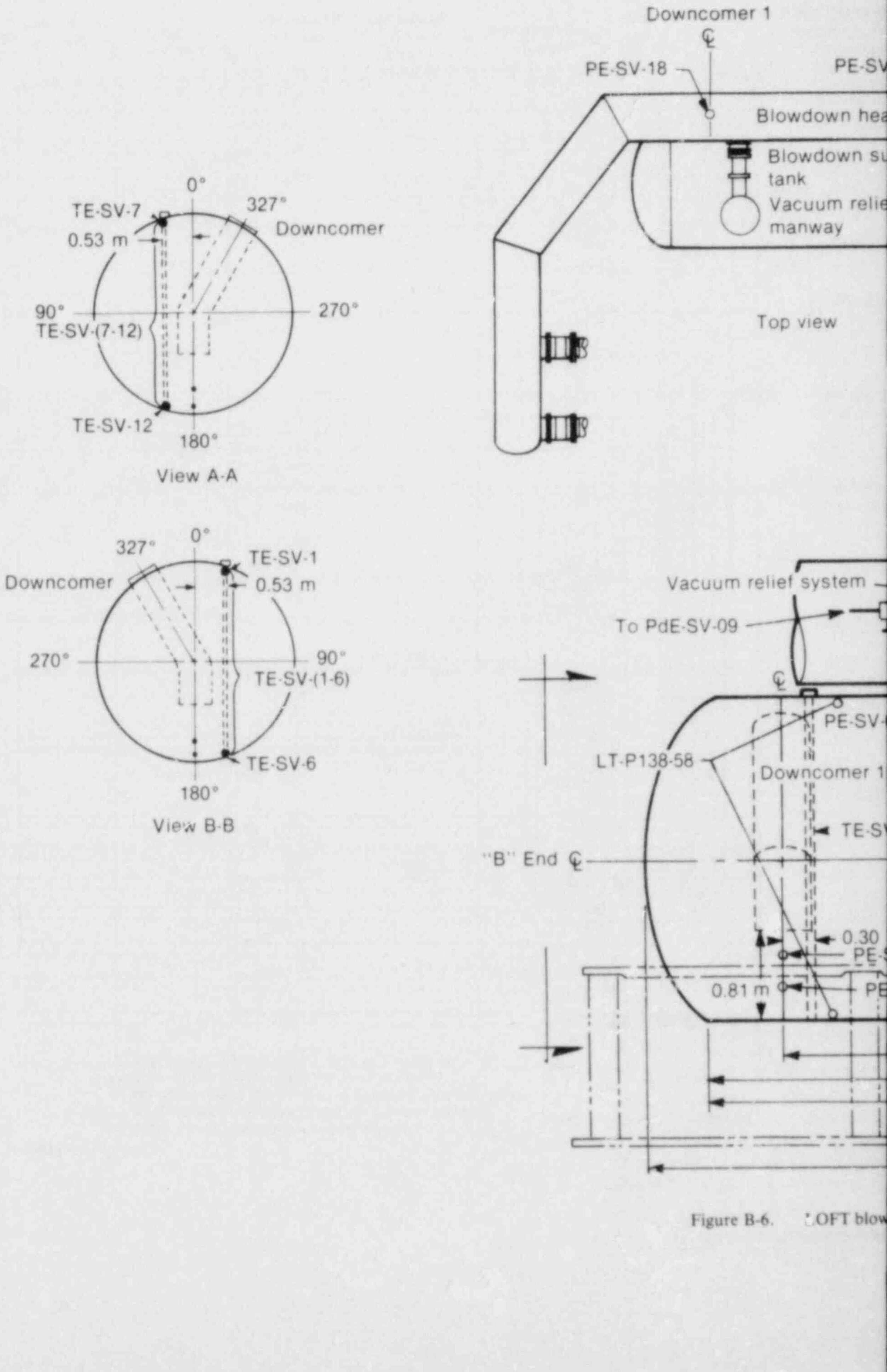


Figure B-6. LOFT blow

* Station numbers are a dimensionless measure of relative elevation within the reactor vessel. They are assigned in increments of 25.4 mm with Station 300.00 defined at the core barrel support ledge inside the reactor vessel flange.

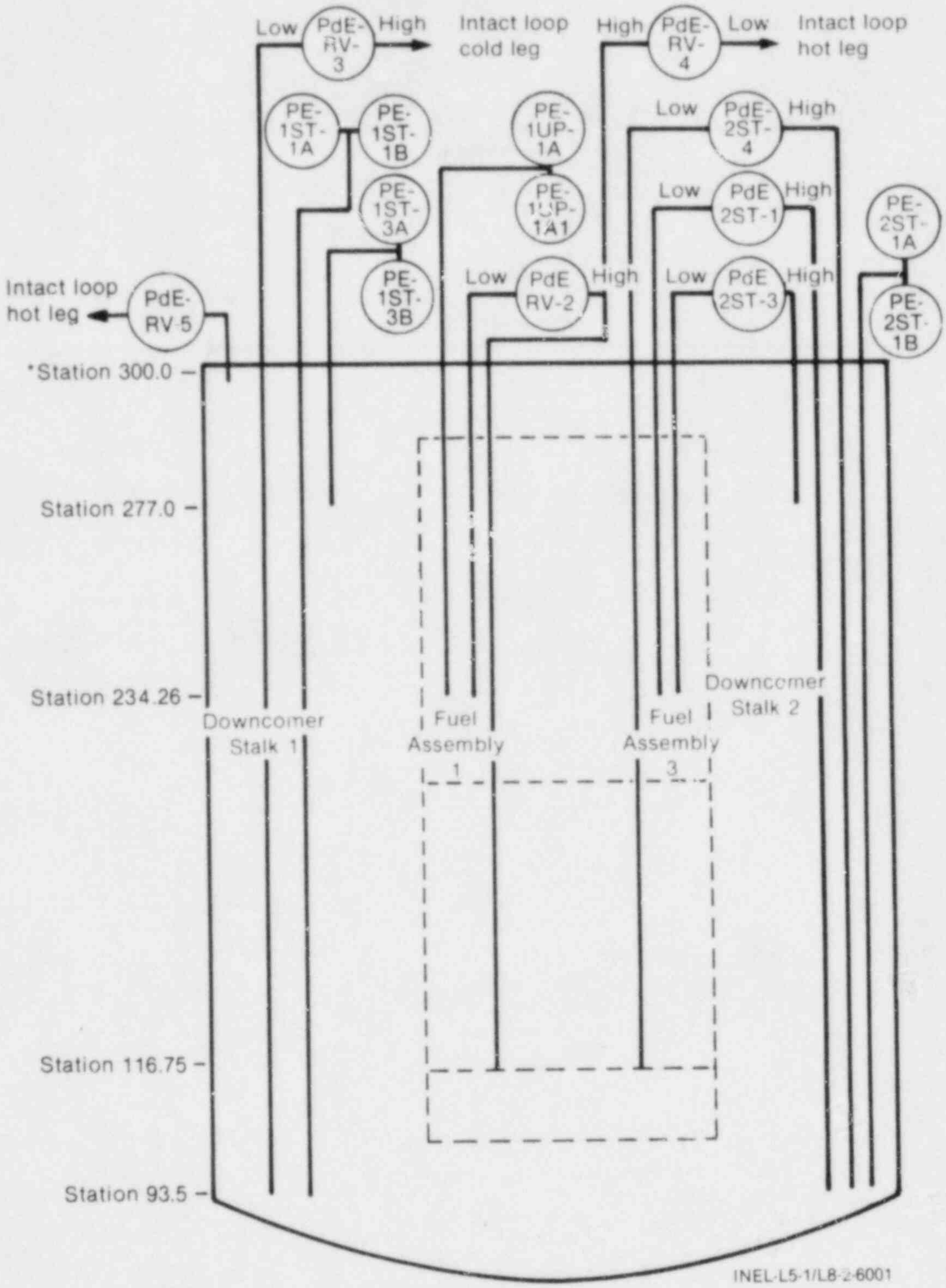
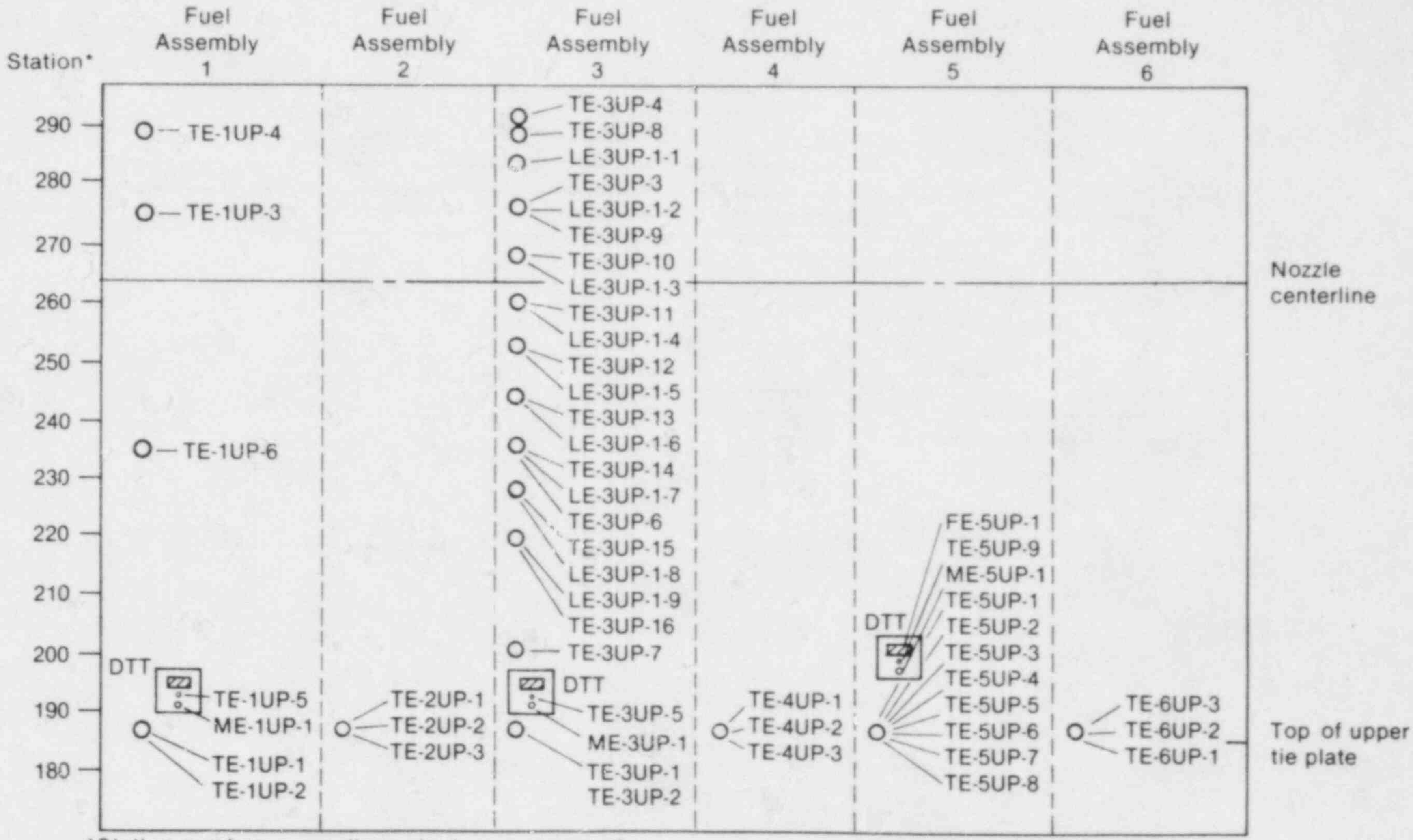


Figure B-8. LOFT reactor vessel pressure and differential pressure instrumentation.



*Station numbers are a dimensionless measure of relative elevation within the reactor vessel. They are assigned in increments of 25.4 mm with station 300.00 defined at the core barrel support ledge inside the reactor vessel flange.

INEL-L5-1/L8-2-6500

Figure B-9. LOFT reactor vessel upper plenum DTT, LE, and TE elevations.

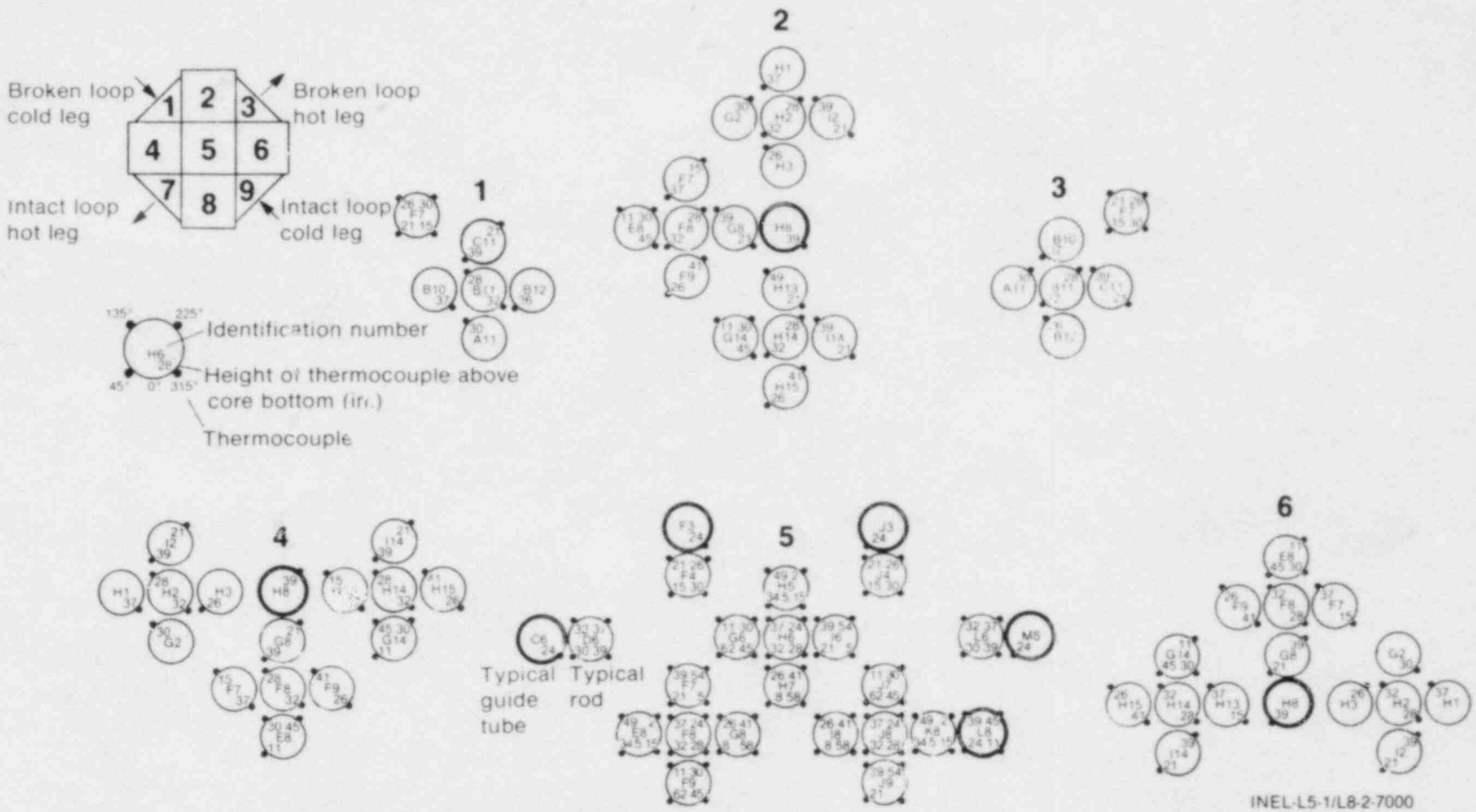


Figure B-10. In-core thermocouple locations for LOFT Core 1.

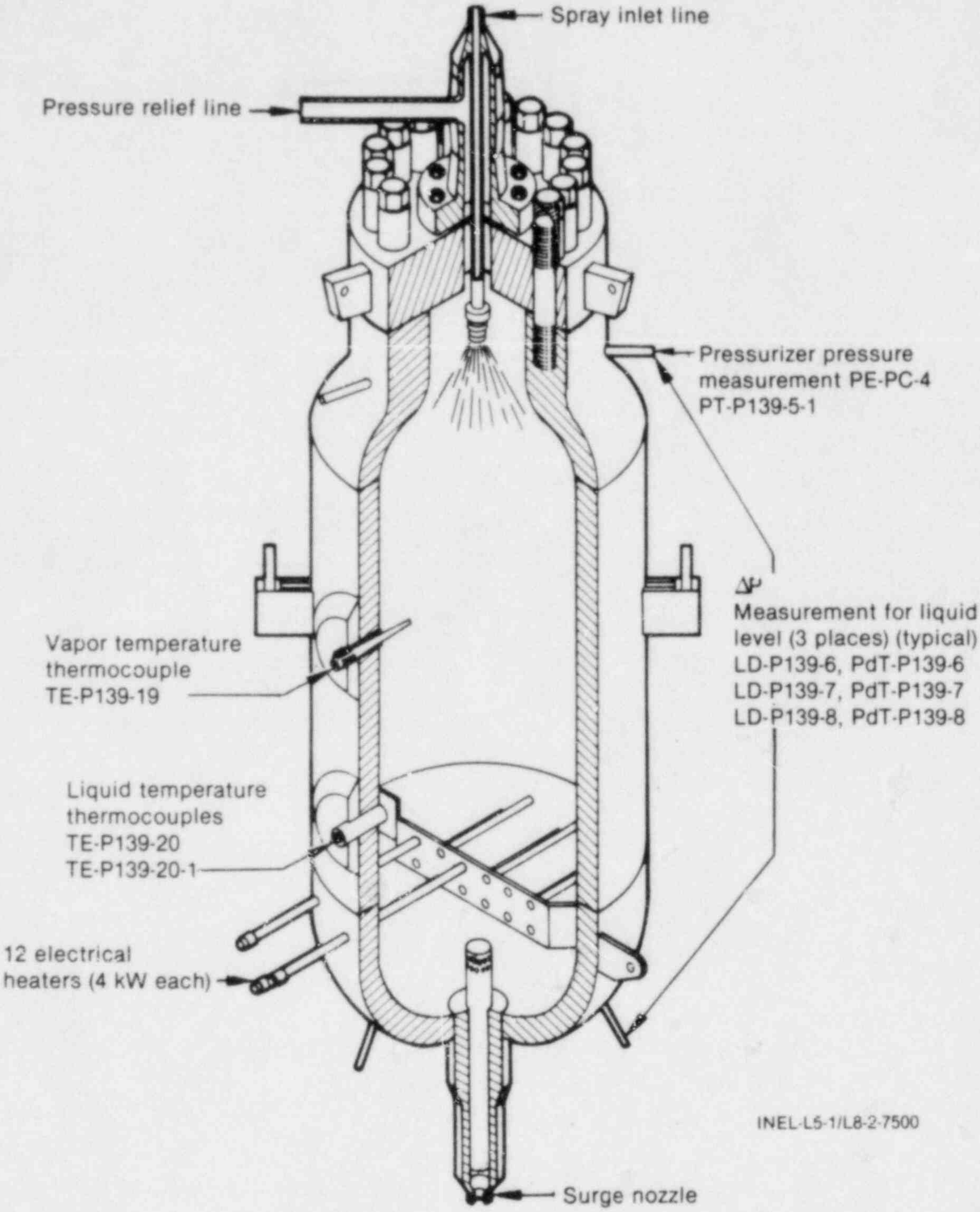


Figure B-11. LOFT pressurizer instrumentation.

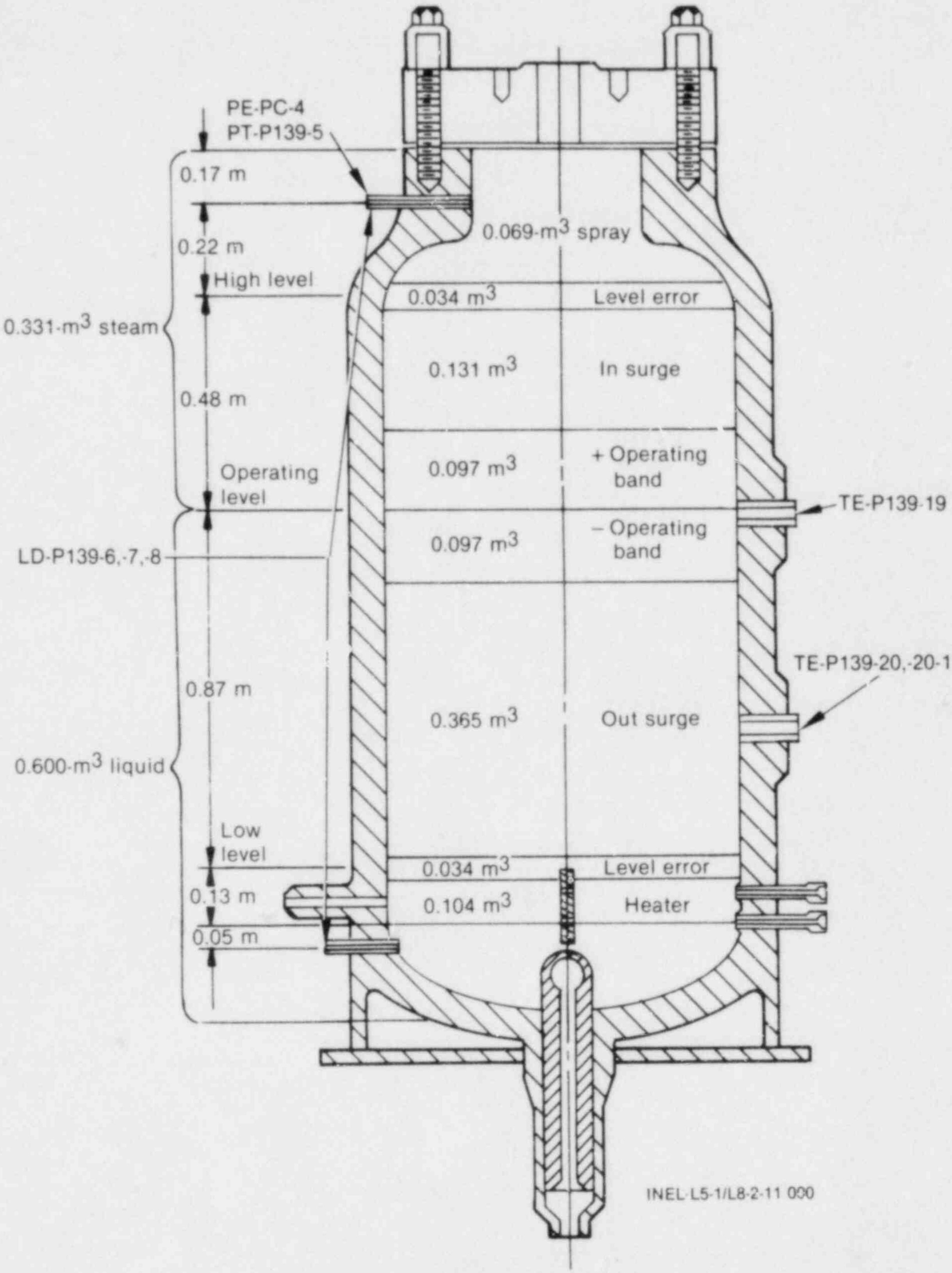


Figure B-12. LOFT pressurizer operating levels and volumes.

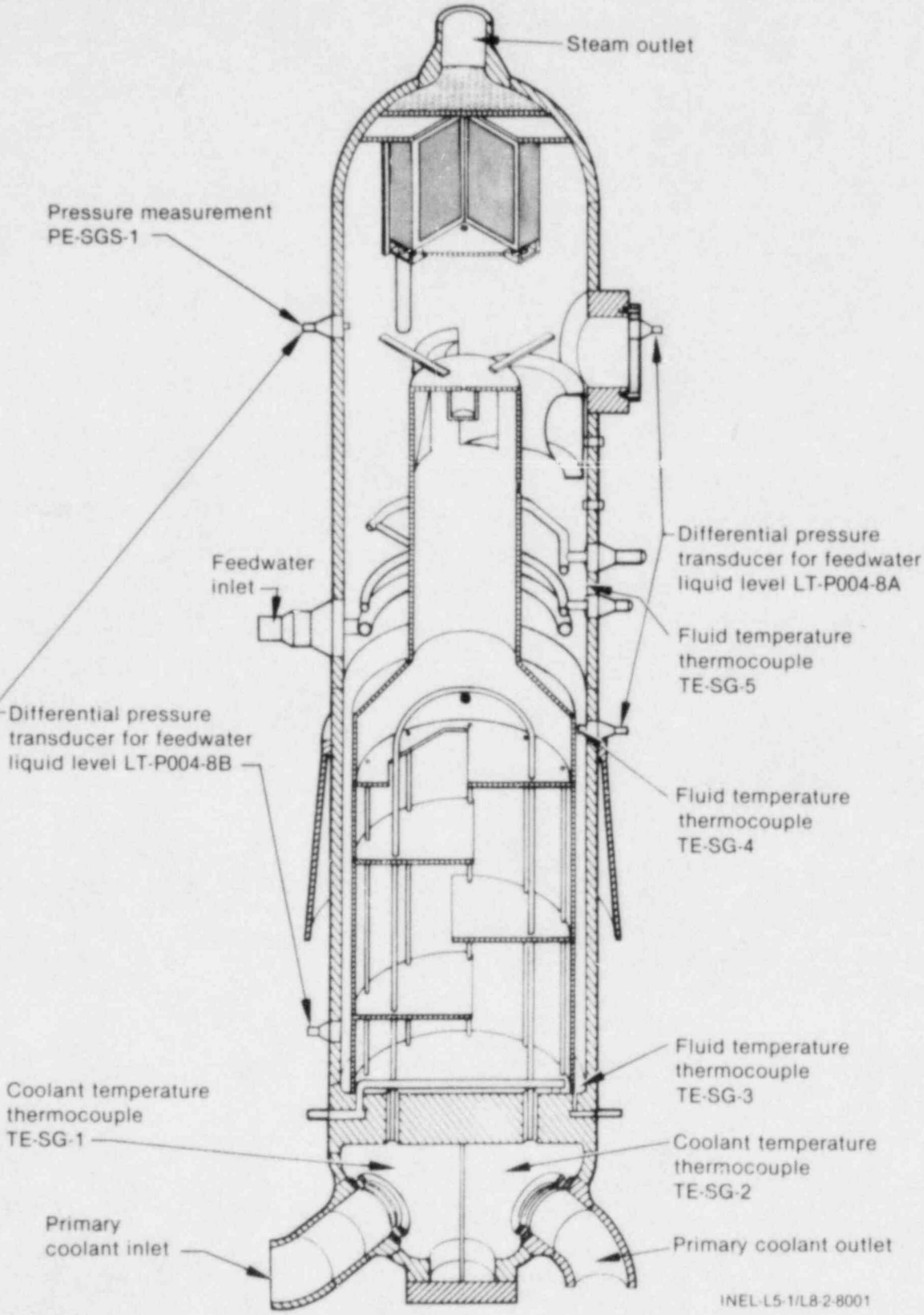


Figure B-13. LOFT steam generator instrumentation.

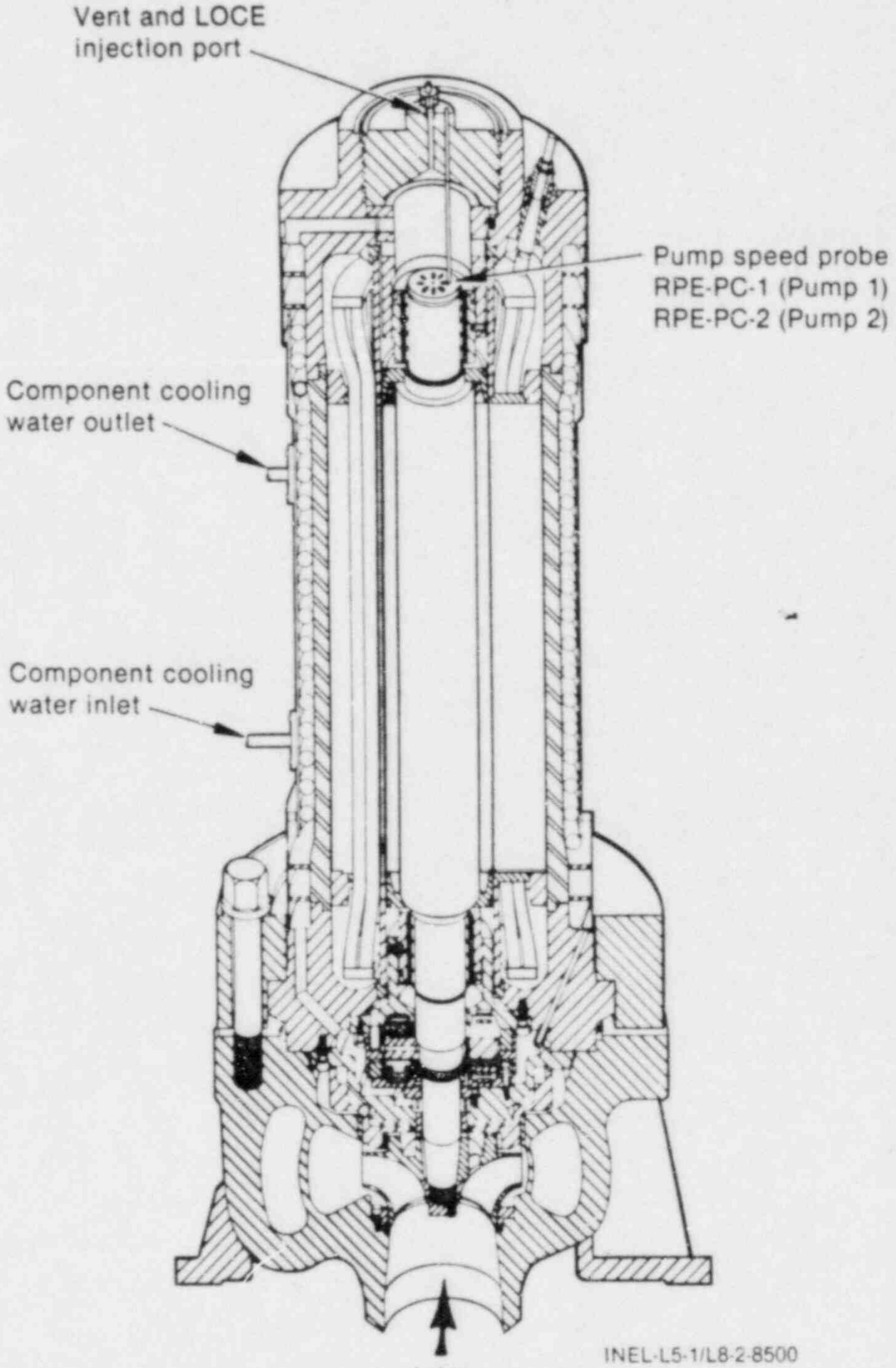


Figure B-14. LOFT primary coolant pump instrumentation.

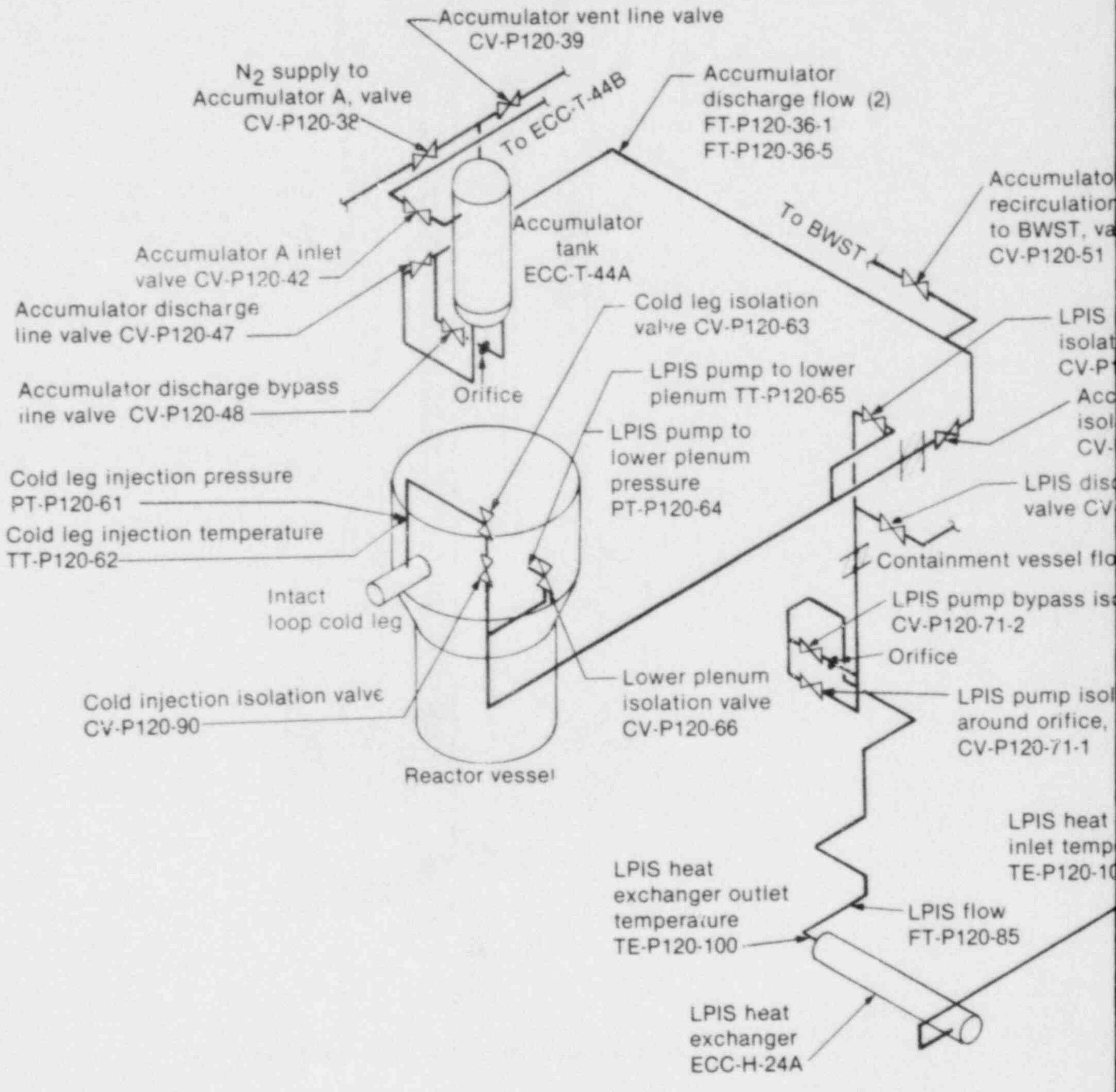
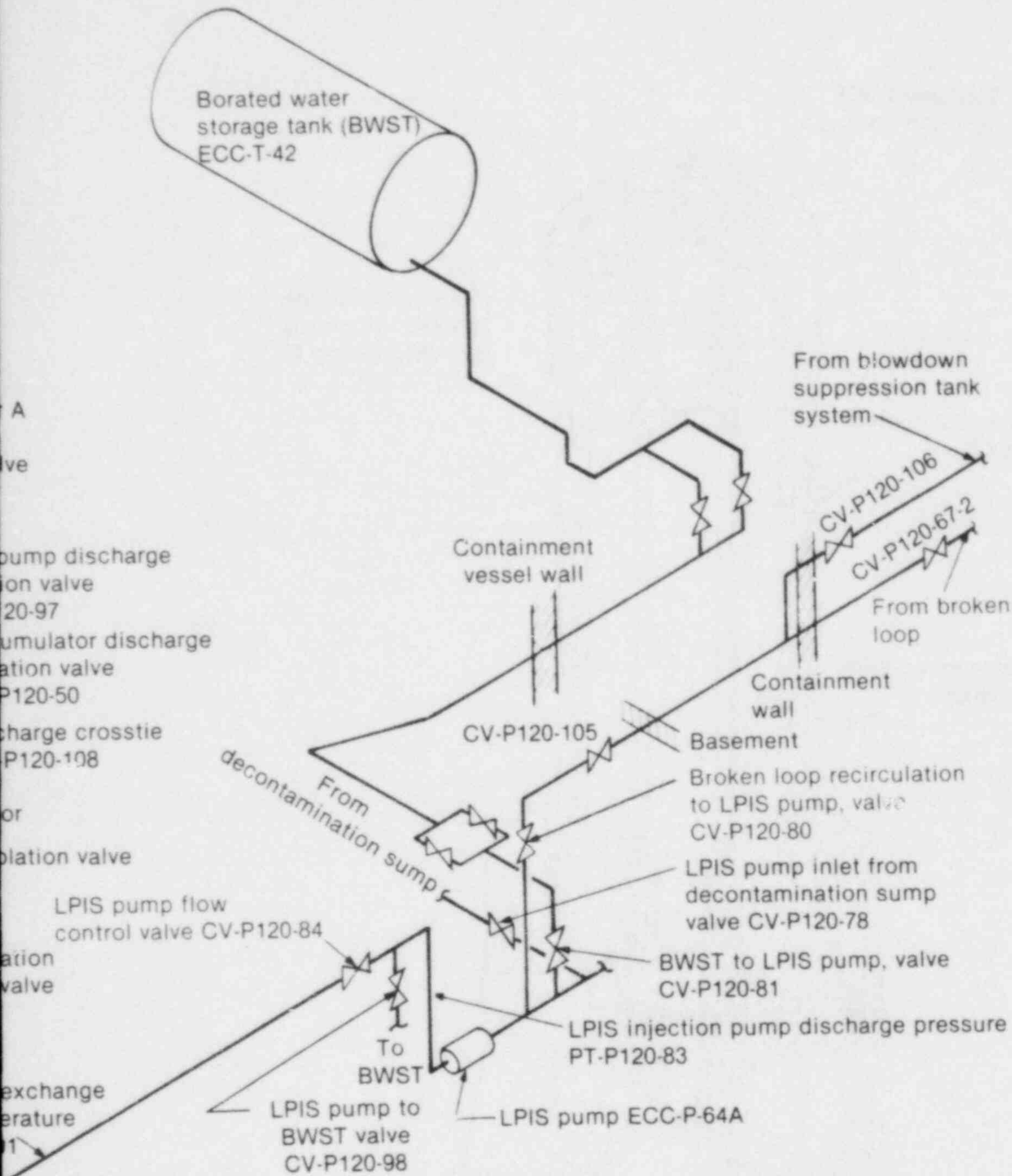


Figure B-15. LOFT ECCS instrum



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entation—A train.

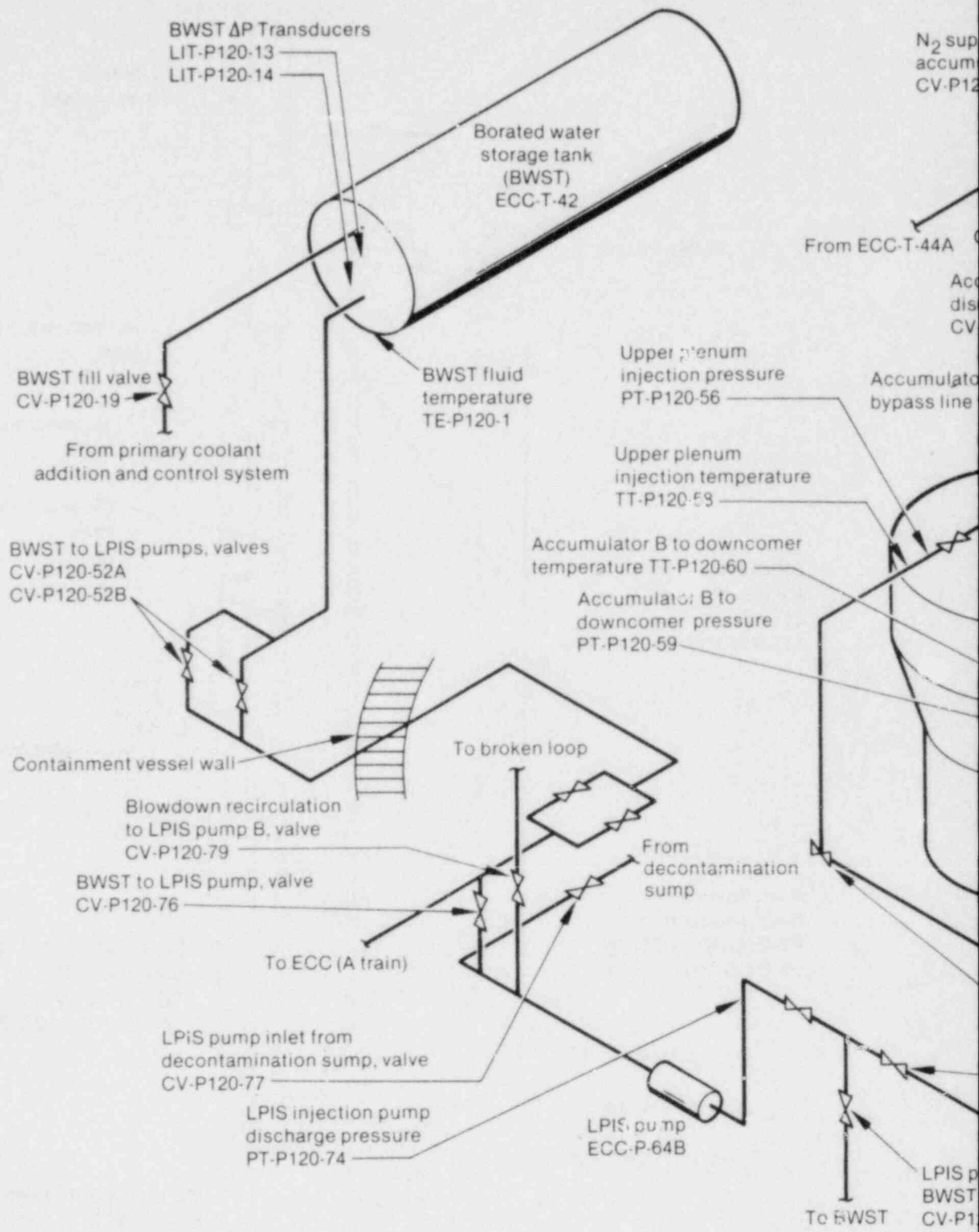
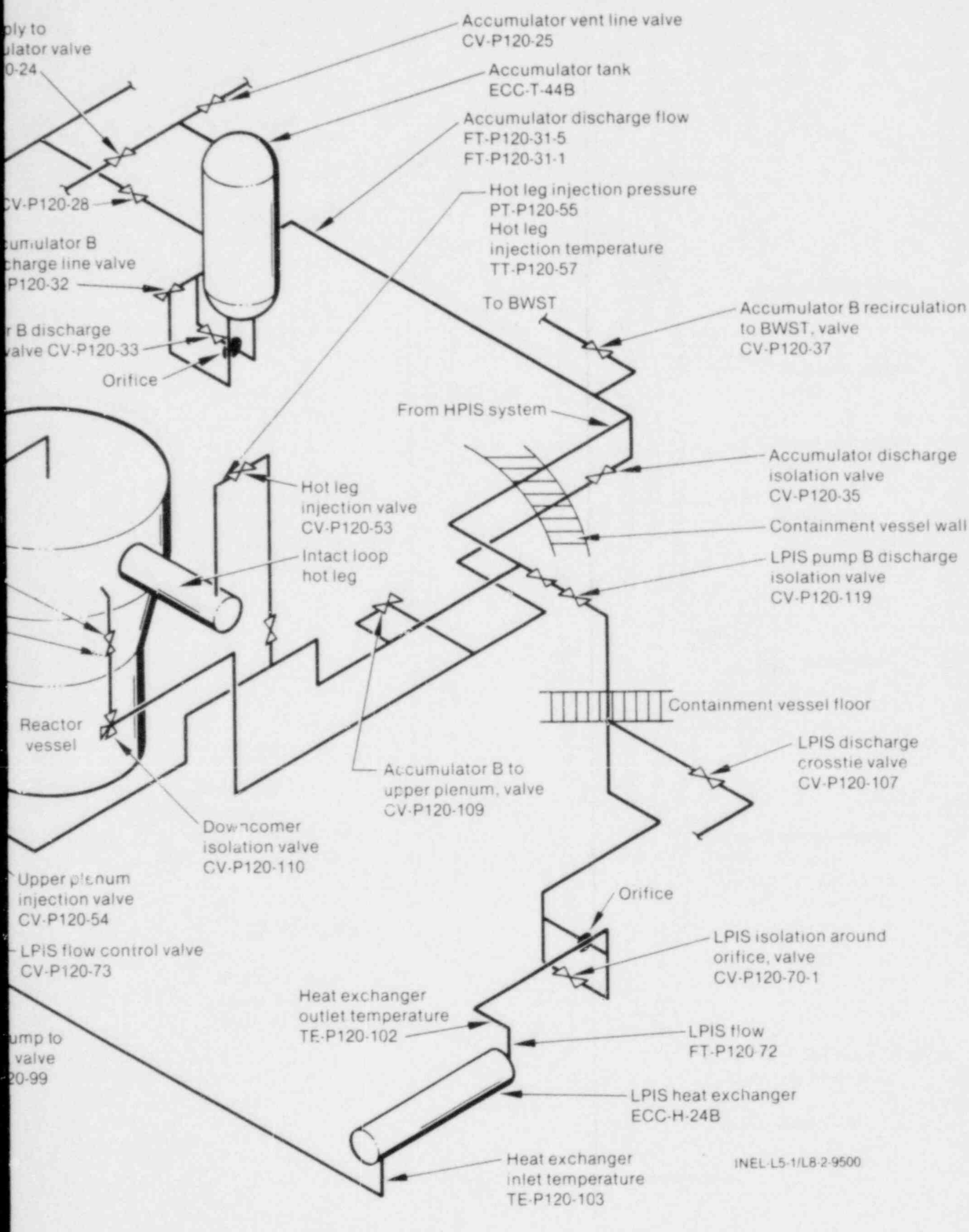


Figure B-16. LOFT



ECCS instrumentation—B train.

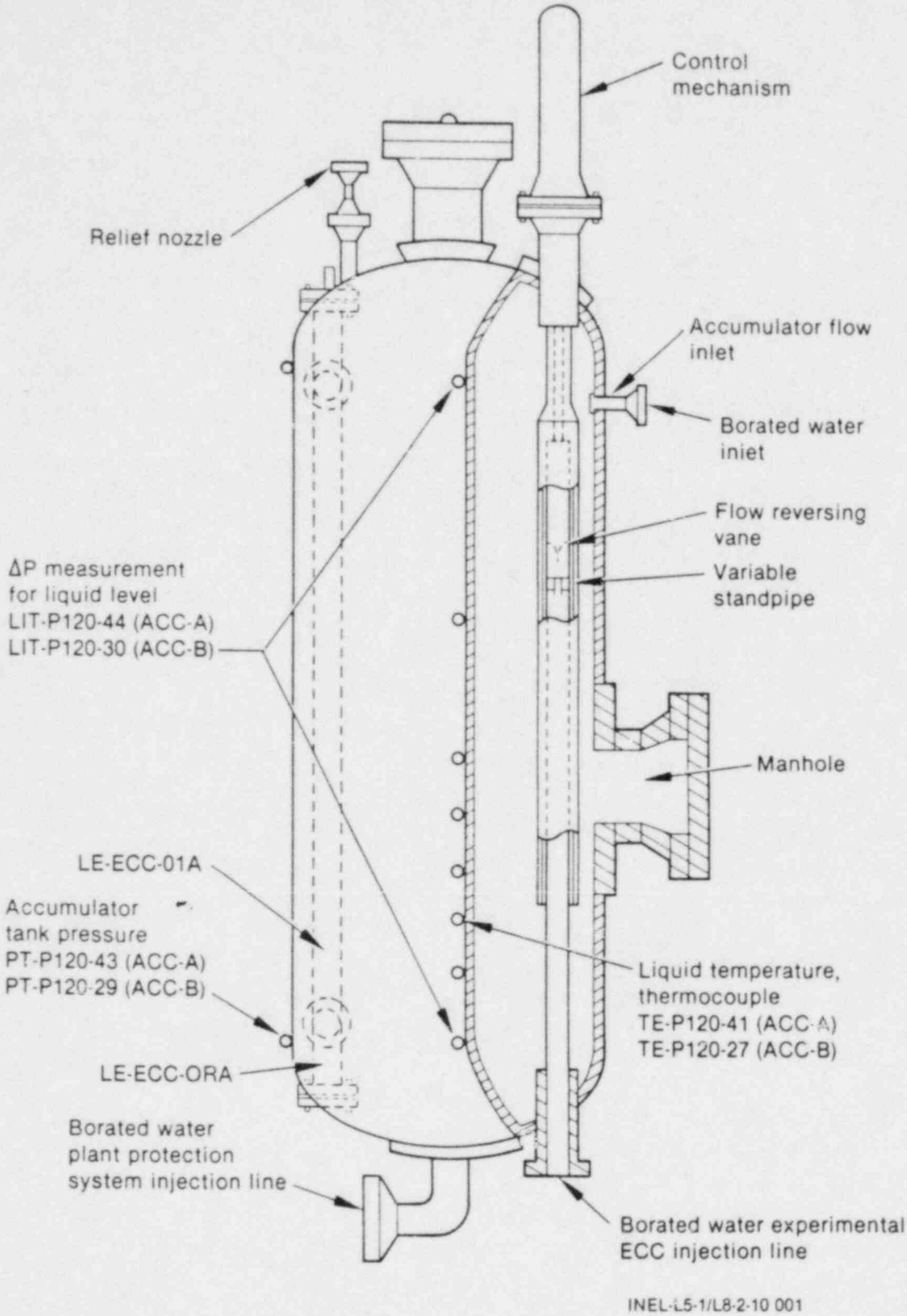


Figure B-17. LOFT accumulator instrumentation.

TABLE B-2. EXPERIMENTS L5-1 AND L8-2 INSTRUMENTATION LIST

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
VALVE OPENING							
Secondary Coolant System							
CV-P004-008	Main feedwater control valve.	0 to 100%	10 Hz	3.5%	0% 25% 50% 100%	3.0% 3.13% 3.47% 4.61%	Not reviewed.
CV-P004-010	Main steam control valve.	0 to 100%	10 Hz	3.7%	0% 25% 50% 100%	3.0% 3.13% 3.47% 4.61%	Qualified.
CV-P004-090	Main steam bypass valve.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.13% 3.47% 4.61%	Not reviewed.
CV-P004-091	Main feedwater bypass valve.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.13% 3.47% 4.61%	Not reviewed.
Broken Loop							
CV-P138-001	Quick opening blowdown valve (QOBV) in cold leg.	0 to 100%	100 Hz	3.0%	0% 25% 50% 100%	3.0% 5.0% 7.0% 11.0%	Qualified.
CV-P138-015	QOBV in hot leg.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.13% 3.47% 4.61%	Not reviewed.
CV-P138-070A	Blowdown system bypass valve.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.13% 3.47% 4.61%	Not reviewed.
CV-P138-071A	Blowdown system bypass valve.	0 to 100%	10 Hz	4.6%	0% 25% 50% 100%	3.0% 3.13% 3.47% 4.61%	Not reviewed.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
VALVE OPENING (continued)							
Blowdown Suppression System							
CV-P138-123	1.3-L/s spray header control valve.	0 to 100%	10 Hz	4.6%	0% 25% 50% 100%	3.0% 3.13% 3.47% 4.61%	Not reviewed.
CV-P138-124	3.8-L/s spray header control valve.	0 to 100%	10 Hz	3.0% (L5-1) 4.5% (L8-2)	0% 25% 50% 100%	3.0% 3.13% 3.47% 4.61%	Not reviewed.
CV-P138-125	13.9-L/s spray header control valve.	0 to 100%	10 Hz	3.0% (L5-1) 4.6% (L8-2)	0% 25% 50% 100%	3.0% 3.13% 3.47% 4.61%	Not reviewed.
CHORDAL DENSITY							
Broken Loop							
DE-BL-001A	Broken loop cold leg at drag disc-turbine transducer (DTT) flange. Beam A is 14° 21 min from Beam B [clockwise (CW) looking toward reactor vessel (RV)].	0 to 1.0 Mg/m^3	10 Hz	0.11 Mg/m^3	--	0.11 Mg/m^3 [d,e]	Qualified (L5-1). Failed (L8-2).
DE-BL-001B	Broken loop cold leg at DTT flange. Beam B through centerline of pipe 45° from vertical [counterclockwise (CCW) looking toward RV].	0 to 1.0 Mg/m^3	10 Hz	0.099 Mg/m^3	--	0.099 Mg/m^3	Qualified (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
CHORDAL DENSITY (continued)							
Broken Loop (continued)							
DE-BL-001C	Broken loop cold leg at DTT flange. Beam C is 22° 7 min from Beam B (CCW looking toward RV).	0 to 1.0 Mg/m^3	10 Hz	0.18 Mg/m^3	--	0.18 Mg/m^3	Qualified, some large data processing spikes (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).
DE-BL-002A	Broken loop hot leg at DTT flange. Beam A is 14° 21 min from Beam B (CCW looking toward RV).	0 to 1.0 Mg/m^3	10 Hz	0.11 Mg/m^3	--	0.11 Mg/m^3	Failed (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).
DE-BL-002B	Broken loop hot leg at DTT flange. Beam B through centerline of pipe 45° from vertical (CW looking toward RV).	0 to 1.0 Mg/m^3	10 Hz	0.099 Mg/m^3	--	0.099 Mg/m^3	Qualified (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).
DE-BL-002C	Broken loop hot leg at DTT flange. Beam C is 22° 7 min from Beam B (CW looking toward RV).	0 to 1.0 Mg/m^3	10 Hz	0.18 Mg/m^3	--	0.18 Mg/m^3	Qualified (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).
Intact Loop							
DE-PC-001A	Intact loop cold leg at DTT flange. Beam A is 14° 21 min from Beam B (CW looking away from RV).	0 to 1.0 Mg/m^3	10 Hz	0.11 Mg/m^3	--	0.11 Mg/m^3	Qualified (L5-1). Failed (L8-2).
DE-PC-001B	Intact loop cold leg at DTT flange. Beam B through centerline of pipe 45° from vertical (CCW looking away from RV).	0 to 1.0 Mg/m^3	10 Hz	0.13 Mg/m^3	--	0.13 Mg/m^3	Qualified (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
CHORDAL DENSITY (continued)							
Intact Loop (continued)							
DE-PC-001C	Intact loop cold leg at DTT flange. Beam C is 22° 7 min from Beam B (CCW looking away from RV).	0 to 1.0 Mg/m^3	10 Hz	0.18 Mg/m^3	--	0.18 Mg/m^3	Qualified (L5-1). Failed (L8-2).
DE-PC-002A	Intact loop hot leg at DTT flange. Beam A is 14° 21 min from Beam B (CW looking away from RV).	0 to 1.0 Mg/m^3	10 Hz	0.13 Mg/m^3	--	0.13 Mg/m^3	Failed (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).
DE-PC-002B	Intact loop hot leg at DTT flange. Beam B through centerline of pipe 45° from vertical (CCW looking away from RV).	0 to 1.0 Mg/m^3	10 Hz	0.13 Mg/m^3	--	0.13 Mg/m^3	Qualified (L5-1). Qualified, invalid data between 310 and 360 s replaced by interpolation (L8-2).
DE-PC-002C	Intact loop hot leg at DTT flange. Beam C is 22° 7 min from Beam B (CCW looking away from RV).	0 to 1.0 Mg/m^3	10 Hz	0.18 Mg/m^3	--	0.18 Mg/m^3	Qualified (L5-1). Qualified, magnitude uncertain; invalid data between 310 and 360 s replaced by interpolation (L8-2).
DE-PC-003B	Intact loop below steam generator (SG) at DTT flange. Beam B is through centerline of pipe 45° from vertical.	0 to 1.0 Mg/m^3	10 Hz	0.13 Mg/m^3	--	0.13 Mg/m^3	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
FUEL ASSEMBLY DISPLACEMENT							
Assembly 5							
DIE-5UP-001	At top center of Fuel Assembly 5.	±12.7 mm	10 Hz	0.3 mm	0 mm 6.35 mm 12.7 mm	0.3 mm[f] 0.33 mm 0.39 mm	Not reviewed.
DIE-5UP-002	At top center of Fuel Assembly 5.	±12.7 mm	10 Hz	0.3 mm	0 mm 6.35 mm 12.7 mm	0.3 mm 0.33 mm 0.39 mm	Not reviewed.
FLUID VELOCITY							
Intact Loop							
FE-PC-001A	Cold leg horizontal DTT flange on far side of pipe as viewed from rake flange.	0.6 to 15 m/s	10 Hz	0.35 m/s			Qualified.
FE-PC-001B	Cold leg horizontal DTT flange at center of pipe.	0.6 to 15 m/s	10 Hz	0.34 m/s	15 m/s 10 m/s 5 m/s 1 m/s	1.5 m/s[g] 1.2 m/s 0.9 m/s 0.6 m/s	Qualified.
FE-PC-001C	Cold leg horizontal DTT flange on near side of pipe as viewed from rake flange.	0.6 to 15 m/s	10 Hz	0.33 m/s			Qualified.
FE-PC-002A	Hot leg DTT flange at bottom of pipe.	0.6 to 15 m/s	10 Hz	0.36 m/s			Qualified.
FE-PC-002B	Hot leg DTT flange at middle of pipe.	0.6 to 15 m/s	10 Hz	0.35 m/s	15 m/s 10 m/s 5 m/s 1 m/s	1.5 m/s 1.2 m/s 0.9 m/s 0.6 m/s	Qualified.
FE-PC-002C	Hot leg DTT flange at top of pipe.	0.6 to 15 m/s	10 Hz	0.35 m/s			Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
FLUID VELOCITY (continued)							
Reactor Vessel							
FE-5UP-001	Above upper end box of Fuel Assembly 5.	0.5 to 10.0 m/s	10 Hz	0.06 m/s	1 m/s 5 m/s 10 m/s	0.06 m/s 0.28 m/s 0.56 m/s	Not reviewed.
FLOW RATE							
Blowdown Suppression Tank Spray System							
FE-P138-138	Blowdown suppression tank (BST) spray flow rate in the 3.79-L/s header.	0 to 6 L/s	10 Hz	--	0 L/s 4 L/s 6 L/s	0.06 L/s 0.23 L/s 0.35 L/s	Not reviewed.
FE-P138-139	BST spray flow rate from pump discharge.	0 to 25 L/s	10 Hz	--	0 L/s 12 L/s 25 L/s	0.25 L/s 0.72 L/s 1.43 L/s	Not reviewed.
FE-P138-140	BST spray flow rate in 13.9-L/s header.	0 to 20 L/s	10 Hz	--	0 L/s 10 L/s 18.9 L/s	0.19 L/s 0.60 L/s 1.08 L/s	Not reviewed.
FE-P138-153	BST spray flow rate in spray pump recirculation line.	0 to 10 L/s	10 Hz	--	0 L/s 5 L/s 9.5 L/s	0.10 L/s 0.30 L/s 0.54 L/s	Not reviewed.
Secondary Coolant System							
FT-P004-012	Inlet to air-cooled condenser inlet header.	0 to 40 kg/s	10 Hz	0.28 kg/s	--	0.28 kg/s	Qualified, initial conditions only (L5-1). Qualified (L8-2).
FT-P004-012A	Inlet to air-cooled condenser inlet header.	0 to 40 kg/s	10 Hz	--	--	--	Not reviewed.
FT-P004-72A	Main feedwater pump discharge flow.	0 to 25 kPa	10 Hz	1.5 kPa	--	1.5 kPa	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
FLOW RATE (continued)							
Secondary Coolant System (coolant)							
FT-P004-72-2	Flow out of main feedwater pump.	0 to 40 kg/s	10 Hz	2.4 kg/s	--	2.4 kg/s	Qualified.
FT-P004-090	Steam flow control valve bypass line.	0 to 4 kg/s	10 Hz	0.082 kg/s	--	0.082 kg/s	Not reviewed.
FT-P004-091	Main feedwater control valve bypass line.	0 to 5 L/s	10 Hz	0.075 L/s	--	0.075 L/s	Not reviewed.
Emergency Core Cooling System							
FT-P120-31-1	Accumulator B in 6-in. line downstream of orifice.	0 to 40 L/s	10 Hz	--	--	0.28 L/s	Not reviewed.
FT-P120-31-5	Accumulator B in 6-in. line downstream of orifice.	0 to 125 L/s	10 Hz	--	--	0.92 L/s	Not reviewed (L5-1). Qualified (L8-2).
FT-P120-36-1	Accumulator A in 6-in. line downstream of orifice.	0 to 125 L/s	10 Hz	--	--	0.92 L/s	Failed.
FT-P120-36-5	Accumulator A in 6-in. line downstream of orifice.	0 to 40 L/s	10 Hz	--	--	0.28 L/s	Failed.
FT-P120-085	Low-pressure injection system (LPIS) Pump A discharge.	0 to 25 L/s	10 Hz	--	--	0.37 L/s	Qualified, no other measurement for direct comparison (L5-1). Qualified, spikes at approximately 5 s (L8-2).

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
FLOW RATE (continued)							
Emergency Core Cooling System (continued)							
FT-P128-085	High-pressure injection system (HPIS) Pump B discharge.	0 to 2 L/s	10 Hz	0.014 L/s	--	0.014 L/s	Not reviewed (L5-1). Qualified (L8-2).
FT-P128-104	HPIS Pump A discharge.	0 to 2 L/s	10 Hz	0.014 L/s	--	0.014 L/s	Qualified.
Intact Loop							
FT-P139-27-1	Intact loop hot leg venturi flowmeter (right side facing SG).	0 to 630 kg/s	10 Hz	4.6 kg/s	--	4.6 kg/s	Qualified, initial conditions only.
FT-P139-27-2	Intact loop hot leg venturi flowmeter (bottom of pipe).	0 to 630 kg/s	10 Hz	4.6 kg/s	--	4.6 kg/s	Qualified, initial conditions only.
FT-P139-27-3	Intact loop hot leg venturi flowmeter (left side facing SG).	0 to 630 kg/s	10 Hz	--	--	4.6 kg/s	Failed.
Primary Component Cooling System							
FT-P141-022	Primary component cooling system.	0 to 22 L/s	10 Hz	--	--	0.16 L/s	Not reviewed.
LIQUID LEVEL							
Intact Loop							
LD-P139-006	Pressurizer liquid level on southeast side.	0 to 1.8 m	10 Hz	--	--	0.06 m	Not reviewed (L5-1). Failed (L8-2).
LD-P139-007	Pressurizer liquid level on southwest side.	0 to 1.8 m	10 Hz	--	--	0.06 m	Not reviewed (L5-1). Failed (L8-2).

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation		Comments[c]
					Reading	Uncertainty (±)	
LIQUID LEVEL (continued)							
Intact Loop (continued)							
LD-P139-008	Pressurizer liquid level on north side.	0 to 1.8 m	10 Hz	--	--	0.06 m	Not reviewed (L5-1). Failed (L8-2).
Emergency Core Cooling System							
LE-ECC-01A	Accumulator A.	0 to 3.0 m	10 Hz	0.007 m	--	0.007 m	Qualified.
LIT-P120-030	Accumulator B.	0 to 3.0 m	10 Hz	0.02 m	--	0.02 m	Not reviewed (L5-1). Qualified (L8-2).
LIT-P120-044	Accumulator A.	0 to 3.0 m	10 Hz	0.02 m	--	0.02 m	Not reviewed (L5-1). Qualified (L8-2).
LIT-P120-087	Accumulator A.	0 to 3.0 m	10 Hz	0.02	--	0.02 m	Qualified.
LIT-P120-089	Accumulator B.	0 to 3.0 m	10 Hz	--	--	0.02 m	Not reviewed (L5-1). Failed (L8-2).
Secondary Coolant System							
LT-P004-008A	SG (narrow range).	-1.0 to 1.5 m[h]	10 Hz	0.025 m	--	0.025 m	Qualified, magnitude uncertain.
LT-P004-008B	SG (wide range).	-3.7 to 1.5 m[h]	10 Hz	0.052 m	--	0.052 m	Qualified, magnitude uncertain.
LT-P004-08BB	SG (wide range).	-3.7 to 1.5 m[h]	10 Hz	0.08 m	--	0.08 m	Not reviewed.
LT-P004-042	Condensate receiver, 1.83 m south of condensate receiver centerline.	0 to 1.2 m	10 Hz	0.1 m	--	0.1 m	Not reviewed.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
LIQUID LEVEL (continued)							
Blowdown Suppression Tank							
LT-P138-033	BST level on north end of tank.	0 to 3.5 m	10 Hz	0.025 m	--	0.025 m	Qualified (L5-1). Qualified, not density compensated (L8-2).
LT-P138-058	BST level on south end of tank.	0 to 3.5 m	10 Hz	0.026 m	--	0.026 m	Qualified (L5-1). Qualified, not density compensated (L8-2).
MOMENTUM FLUX							
Broken Loop							
ME-BL-001A	Cold leg DTT flange at bottom of pipe, high range.	1.5 to 12 Mg/m x s^2	10 Hz	0.3 Mg/m x s^2			Qualified.
ME-BL-001B	Cold leg DTT flange at middle of pipe, high range.	1.5 to 12 Mg/m x s^2	10 Hz	0.3 Mg/m x s^2	10 Mg/m x s^2 5 Mg/m x s^2 1 Mg/m x s^2	2.1 Mg/m x s^2 1.5 Mg/m x s^2 1.0 Mg/m x s^2	Qualified.
ME-BL-001C	Cold leg DTT flange at top of pipe, high range.	1.5 to 12 Mg/m x s^2	10 Hz	0.3 Mg/m x s^2			Qualified.
ME-BL-001D	Cold leg DTT flange at bottom of pipe, low range.	0 to 2.2 Mg/m x s^2	100 Hz	0.2 Mg/m x s^2			Qualified, narrow range instrument.
ME-BL-001E	Cold leg DTT flange at middle of pipe, low range.	0 to 2.2 Mg/m x s^2	10 Hz	0.2 Mg/m x s^2	3 Mg/m x s^2 2 Mg/m x s^2 1 Mg/m x s^2	0.96 Mg/m x s^2 0.84 Mg/m x s^2 0.72 Mg/m x s^2	Qualified, narrow range instrument.
ME-BL-001F	Cold leg DTT flange at top of pipe, low range.	0 to 2.2 Mg/m x s^2	10 Hz	0.2 Mg/m x s^2			Qualified, narrow range instrument.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
MOMENTUM FLUX (continued)							
Intact Loop							
ME-PC-001A	Cold leg horizontal DTT flange on far side of pipe as viewed from rake flange.	3.0 to 75 Mg/m x s^2	10 Hz	3.3 Mg/m x s^2			Qualified.
ME-PC-001B	Cold leg horizontal DTT flange at center of pipe.	3.0 to 75 Mg/m x s^2	10 Hz	3.3 Mg/m x s^2	30 Mg/m x s^2 10 Mg/m x s^2 3 Mg/m x s^2	9.3 Mg/m x s^2 6.9 Mg/m x s^2 6.1 Mg/m x s^2	Not reviewed (L5-1). Qualified, magnitude uncertain (L8-2).
ME-PC-001C	Cold leg horizontal DTT flange on near side of pipe as viewed from rake flange.	3.0 to 75 Mg/m x s^2	10 Hz	3.3 Mg/m x s^2			Not reviewed.
ME-PC-002A	Hot leg DTT flange at bottom of pipe.	0.5 to 20 Mg/m x s^2	10 Hz	3.4 Mg/m x s^2			Qualified.
ME-PC-002B	Hot leg DTT flange at middle of pipe.	0.5 to 20 Mg/m x s^2	10 Hz	3.4 Mg/m x s^2	30 Mg/m x s^2 10 Mg/m x s^2 1 Mg/m x s^2	7.8 Mg/m x s^2 5.4 Mg/m x s^2 4.3 Mg/m x s^2	Qualified.
ME-PC-002C	Hot leg DTT flange at top of pipe.	0.5 to 20 Mg/m x s^2	10 Hz	3.4 Mg/m x s^2			Qualified.
Reactor Vessel							
ME-1ST-001	Downcomer Stalk 1, 1.16 m above RV bottom.	0.3 to 12 Mg/m x s^2	10 Hz	--	--	0.78 Mg/m x s^2	Not reviewed.
ME-2ST-001	Downcomer Stalk 2, 1.16 m above RV bottom.	0.3 to 12 Mg/m x s^2	10 Hz	--	--	0.78 Mg/m x s^2	Not reviewed.
ME-3UP-001	Fuel Assembly 3 above upper end box.	0.3 to 12 Mg/m x s^2	10 Hz	--	--	0.78 Mg/m x s^2	Not reviewed.
ME-5UP-001	Fuel Assembly 5 above upper end box.	0.3 to 12 Mg/m x s^2	10 Hz	--	--	0.78 Mg/m x s^2	Not reviewed.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation		Comments[c]
					Reading	Uncertainty (±)	
NEUTRON DETECTION							
Reactor Vessel							
NE-2H8-26	Neutron detector in Fuel Assembly 2.	0 to 52.5 kW/m (local)	10 Hz	2.03 kW/m	--	5.3 kW/m[i]	Qualified (L5-1). Qualified, anomalous spike at approximately 300 s (L8-2).
NE-4H8-26	Neutron detector in Fuel Assembly 4.	0 to 52.5 kW/m (local)	10 Hz	2.03 kW/m	--	5.3 kW/m	Qualified.
NE-5D8-26	Neutron detector in Fuel Assembly 5.	0 to 52.5 kW/m (local)	10 Hz	--	--	5.3 kW/m	Failed.
NE-6H8-26	Neutron detector in Fuel Assembly 6.	0 to 52.5 kW/m (local)	10 Hz	2.03 kW/m	--	5.3 kW/m	Qualified.
ELECTRICAL CURRENT							
Intact Loop							
PCP-1-I-RMS	Primary coolant pump (PCP) 1.	0 to 1000 amp RMS	10 Hz	15 amp	100 amp 300 amp 600 amp	5 amp 15 amp 30 amp	Not reviewed (L5-1). Qualified, no other measurement for direct comparison (L8-2).
PCP-2-I-RMS	PCP-2.	0 to 1000 amp RMS	10 Hz	15 amp	100 amp 300 amp 600 amp	5 amp 15 amp 30 amp	Not reviewed (L5-1). Qualified, no other measurement for direct comparison (L8-2).
ELECTRICAL FREQUENCY							
Intact Loop							
PCP-1-F	PCP-1.	0 to 75 Hz	10 Hz	0.75 Hz	--	0.75 Hz[j]	Qualified above 12.5 Hz (L5-1). Not reviewed (L8-2).
PCP-2-F	PCP-2.	0 to 75 Hz	10 Hz	0.75 Hz	--	0.75 Hz	Qualified above 12.5 Hz (L5-1). Not reviewed (L8-2).

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
ELECTRICAL POWER							
Intact Loop							
PCP-1-P	PCP-1.	0 to 1 MW	10 Hz	0.05 MW	--	0.05 MW	Not reviewed (L5-1). Qualified, no other measurement for direct comparison (L8-2).
PCP-2-P	PCP-2.	0 to 1 MW	10 Hz	0.05 MW	--	0.05 MW	Not reviewed (L5-1). Qualified, no other measurement for direct comparison (L8-2).
REACTIVE POWER							
Intact Loop							
PCP-1-P-VAR	PCP-1.	0 to 1000 kVAR	10 Hz	--	--	50 kVAR	Not reviewed.
PCP-2-P-VAR	PCP-2.	0 to 1000 kVAR	10 Hz	--	--	50 kVAR	Not reviewed.
ELECTRICAL VOLTAGE							
Intact Loop							
PCP-1-V-RMS	PCP-1.	0 to 600 V RMS	10 Hz	15 V	100 V 300 V 600 V	5 V 15 V 30 V	Not reviewed (L5-1). Qualified, no other measurement for direct comparison (L8-2).
PCP-2-V-RMS	PCP-2.	0 to 600 V RMS	10 Hz	15 V	100 V 300 V 600 V	5 V 15 V 30 V	Not reviewed (L5-1). Qualified, no other measurement for direct comparison (L8-2).

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation		Comments[c]
					Reading	Uncertainty (±)	
DIFFERENTIAL PRESSURE							
Broken Loop							
PdE-BL-015	Cold leg upstream of nozzle throat.	±1400 kPa (differential)	10 Hz	55 kPa	--	55 kPa	Qualified (L5-1). Qualified, overranged 0 to 11 s (L8-2).
PdE-BL-016	Cold leg upstream of nozzle midplane.	±3500 kPa (differential)	10 Hz	140 kPa	--	140 kPa	Qualified (L5-1). Qualified, overranged 0 to 11 s (L8-2).
PdE-BL-017	Cold leg upstream of nozzle exit.	±3500 kPa (differential)	10 Hz	140 kPa	--	140 kPa	Qualified (L5-1). Qualified, overranged 0 to 11 s (L8-2).
PdE-BL-018	Cold leg across nozzle spoolpiece.	±10 000 kPa (differential)	100 Hz	390 kPa	--	390 kPa	Qualified (L5-1). Qualified, anomalous spikes prior to 110 s (L8-2).
Intact Loop							
PdE-PC-001	Intact loop cold leg across PCPs.	±700 kPa (differential)	10 Hz	16.7 kPa	0 kPa 350 kPa 700 kPa	13.0 kPa 19.6 kPa 32.1 kPa	Qualified.
PdE-PC-002	Intact loop across SG.	±350 kPa (differential)	10 Hz	7.8 kPa	0 kPa 150 kPa 350 kPa	5.8 kPa 8.5 kPa 15 kPa	Qualified.
PdE-PC-003	Intact loop hot leg piping, RV to SG inlet.	±175 kPa (differential)	10 Hz	3.2 kPa (L5-1) 3.7 kPa (L8-2)	0 kPa 87 kPa 175 kPa	3.2 kPa 4.9 kPa 8.0 kPa	Qualified.
PdE-PC-005	Intact loop cold leg PCPs to RV nozzle.	±40 kPa (differential)	10 Hz	1.0 kPa	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Qualified.
PdE-PC-008	Intact loop across pressurizer surge line.	±40 kPa (differential)	10 Hz	1.2 kPa (L5-1) 0.9 kPa (L8-2)	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Qualified, narrow range instrument, magnitude uncertain.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
DIFFERENTIAL PRESSURE (continued)							
Intact Loop (continued)							
PdE-PC-009	Intact loop across PCP-1.	±700 kPa (differential)	10 Hz	12.4 kPa (L5-1) 15.6 kPa (L8-2)	0 kPa 350 kPa 700 kPa	7.4 kPa 16 kPa 29 kPa	Failed.
PdE-PC-010	Intact loop across PCP-2.	±1400 kPa (differential)	10 Hz	19.0 kPa	0 kPa 350 kPa 700 kPa	16 kPa 21 kPa 32 kPa	Qualified.
PdE-PC-015	Pitot tube at top of emergency core coolant (ECC) Rake 1 (facing PCP).	±40 kPa (differential)	10 Hz	1.0 kPa	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Qualified.
PdE-PC-016	Pitot tube next to top of ECC Rake 1 (facing PCP).	±40 kPa (differential)	10 Hz	0.9 kPa	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Qualified, magnitude uncertain.
PdE-PC-017	Pitot tube next to bottom of ECC Rake 1 (facing PCP).	±40 kPa (differential)	10 Hz	1.1 kPa	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Qualified.
PdE-PC-018	Pitot tube at bottom of ECC Rake 1 (facing PCP).	±40 kPa (differential)	10 Hz	1.0 kPa	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Qualified.
PdE-PC-027	SG outlet to pump suction (lowest point).	±40 kPa (differential)	10 Hz	1.2 kPa	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Qualified.
PdE-PC-028	Pump suction (lowest point) to PCP-2 inlet.	±40 kPa (differential)	10 Hz	1.2 kPa (L5-1) 1.0 kPa (L8-2)	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	Uncertainty (±)	Comments[c]
DIFFERENTIAL PRESSURE (continued)							
Reactor Vessel							
PdE-RV-002	Fuel Assembly 1 from lower end box to upper end box.	±175 kPa (differential)	10 Hz	11 kPa	0 kPa 100 kPa 175 kPa	11 kPa 12 kPa 13 kPa	Not reviewed.
PdE-RV-003	Intact loop cold leg inlet to bottom of downcomer.	±100 kPa (differential)	10 Hz	0.5 kPa	0 kPa 50 kPa 100 kPa	0.49 kPa 0.50 kPa 0.52 kPa	Not reviewed.
PdE-RV-005	Top of RV to intact loop hot leg.	±175 kPa (differential)	10 Hz	3.9 kPa	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Qualified, no other measurement for direct comparison (L5-1). Qualified, magnitude uncertain, no other measurement for direct comparison (L8-2).
Blowdown Suppression Tank							
PdE-SV-001	BST.	±30 kPa (differential)	10 Hz	0.5 kPa	0 kPa 12 kPa 25 kPa	0.039 kPa 0.043 kPa 0.055 kPa	Qualified (L5-1). Qualified, anomalous spike at approximately 500 s (L8-2).
PdE-SV-002	BST.	±15 kPa (differential)	10 Hz	0.5 kPa	0 kPa 12 kPa 25 kPa	0.19 kPa 0.53 kPa 1.0 kPa	Qualified.
PdE-SV-009	BST across the vacuum breaker line.	±70 kPa (differential)	10 Hz	3.1 kPa (L5-1) 2.9 kPa (L8-2)	0 kPa 30 kPa 70 kPa	2.9 kPa 3.5 kPa 5.5 kPa	Qualified.
Pressurizer							
PdT-P139-006	Pressurizer on southeast side.	0.0 to 17.5 kPa	10 Hz	0.13 kPa	--	0.13 kPa	Qualified to 100 s (L5-1). Qualified to 50 s (L8-2).

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
DIFFERENTIAL PRESSURE (continued)							
Pressurizer (continued)							
PdT-P139-007	Pressurizer on south-west side.	0.0 to 17.5 kPa	10 Hz	0.13 kPa	--	0.13 kPa	Qualified to 100 s (L5-1). Qualified to 50 s (L8-2).
PdT-P139-008	Pressurizer on north side.	0.0 to 17.5 kPa	10 Hz	0.13 kPa	--	0.13 kPa	Qualified to 100 s (L5-1). Qualified to 50 s (L8-2).
Intact Loop							
PdT-P139-27-1	Intact loop venturi, Channel A.	0 to 200 kPa (differential)	10 Hz	2 kPa	--	2 kPa	Qualified.
PdT-P139-27-2	Intact loop venturi, Channel B.	0 to 200 kPa (differential)	10 Hz	2 kPa	--	2 kPa	Qualified.
PdT-P139-27-3	Intact loop venturi, Channel C.	0 to 200 kPa (differential)	10 Hz	2 kPa	--	2 kPa	Qualified.
PdT-P139-030	Across RV just beyond intact loop inlet and outlet nozzles.	0 to 350 kPa (differential)	10 Hz	3.5 kPa	--	3.5 kPa	Qualified, initial conditions only.
PRESSURE[k]							
Broken Loop							
PE-BL-001	Broken loop cold leg at DTT flange.	0.1 to 21 MPa[k]	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.077 MPa 0.096 MPa 0.14 MPa	Qualified.
PE-BL-002	Broken loop hot leg at DTT flange.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.077 MPa 0.096 MPa 0.14 MPa	Qualified.
PE-BL-009	Broken loop cold leg upstream of nozzle.	0.1 to 17.5 MPa	10 Hz	0.11 MPa	0 MPa 10 MPa 17 MPa	0.077 MPa 0.096 MPa 0.12 MPa	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation		Comments[c]
					Reading	Uncertainty (±)	
PRESSURE[k] (continued)							
Broken Loop (continued)							
PE-BL-010	Broken loop cold leg at nozzle exit.	0.1 to 17.5 MPa	10 Hz	0.11 MPa	0 MPa 10 MPa 17 MPa	0.077 MPa 0.096 MPa 0.12 MPa	Qualified.
PE-BL-011	Broken loop cold leg downstream of nozzle.	0.1 to 17.5 MPa	10 Hz	0.11 MPa	0 MPa 10 MPa 17 MPa	0.077 MPa 0.096 MPa 0.12 MPa	Qualified.
Intact Loop							
PE-PC-001	Intact loop cold leg at DTT flange.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.077 MPa 0.096 MPa 0.14 Mpa	Qualified.
PE-PC-002	Intact loop hot leg at DTT flange.	0.1 to 2[illegible]	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.077 MPa 0.096 MPa 0.14 MPa	Qualified.
PE-PC-004	Intact loop pressurizer vapor space.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.077 MPa 0.096 MPa 0.14 MPa	Qualified.
PE-PC-005	Intact loop reference pressure between SG outlet and PCP inlet.	0.1 to 17.5 MPa	10 Hz	0.06 MPa	0 MPa 10 MPa 17 MPa	0.043 MPa 0.052 MPa 0.067 MPa	Qualified.
PE-PC-006	Intact loop reference pressure between SG outlet and PCP inlet.	0.1 to 17.5 MPa	10 Hz	0.06 MPa	0 MPa 10 MPa 20 MPa	0.043 MPa 0.052 MPa 0.067 MPa	Qualified.
Secondary Coolant System							
PE-SGS-001	SG dome pressure.	0.1 to 7.0 MPa	10 Hz	0.084 MPa	0 MPa 3.5 MPa 7 MPa	0.077 MPa 0.080 MPa 0.087 MPa	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation		Comments[c]
					Reading	Uncertainty (±)	
PRESSURE[k] (continued)							
Blowdown Suppression System							
PE-SV-003	BST across from Downcomer 1 (south end), 157.5° from top vertical (CW looking north).	85 to 700 kPa	10 Hz	13 kPa	--	13 kPa	Not reviewed.
PE-SV-014	BST header above Downcomer 4, 327° from top vertical (CW looking north).	85 to 700 kPa	10 Hz	13 kPa	--	13 kPa	Qualified.
PE-SV-016	BST across from Downcomer 1, 230° from top vertical (CW looking north).	85 to 700 kPa	10 Hz	13 kPa	--	13 kPa	Qualified.
PE-SV-017	BST, 1.38 m north of Downcomer 3 centerline, 0° from top vertical (CW looking north).	85 to 700 kPa	10 Hz	13 kPa	--	13 kPa	Qualified.
PE-SV-018	BST header above Downcomer 1.	85 to 700 kPa	10 Hz	13 kPa	--	13 kPa	Qualified.
PE-SV-044	BST bottom under Downcomer 3.	85 to 700 kPa	10 Hz	13 kPa	--	13 kPa	Failed.
PE-SV-055	BST top, 0.15 m north of Downcomer 4 centerline.	85 to 700 kPa	10 Hz	13 kPa	--	13 kPa	Qualified.
PE-SV-060	BST top above Downcomer 1.	85 to 700 kPa	10 Hz	13 kPa	--	13 kPa	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
PRESSURE[k] (continued)							
Reactor Vessel							
PE-1ST-001A	Downcomer Stalk 1, 0.62 m above RV bottom, high range.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.077 MPa 0.096 MPa 0.14 MPa	Qualified.
PE-1ST-001B	Downcomer Stalk 1, 0.62 m above RV bottom, low range.	0.1 to 1.46 MPa	10 Hz	0.048 MPa	--	0.048 MPa	Qualified, narrow range instrument.
PE-1ST-003A	Downcomer Stalk 1, 5.32 m above RV bottom, high range.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.077 MPa 0.096 MPa 0.14 MPa	Qualified.
PE-1ST-003B	Downcomer Stalk 1, 5.32 m above RV bottom, low range.	0.1 to 1.46 MPa	10 Hz	0.048 MPa	--	0.048 MPa	Qualified, narrow range instrument.
PE-1UP-001A	Above Fuel Assembly 1 upper end box.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.077 MPa 0.096 MPa 0.14 MPa	Qualified.
PE-1UP-001A1	Above Fuel Assembly 1 upper end box.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.077 MPa 0.096 MPa 0.14 MPa	Qualified.
PE-2ST-001A	Downcomer Stalk 2, 0.62 m above RV bottom, high range.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.077 MPa 0.096 MPa 0.14 MPa	Not reviewed (L5-1). Qualified (L8-2).
PE-2ST-001B	Downcomer Stalk 2, 0.62 m above RV bottom, low range.	0.1 to 1.46 MPa	10 Hz	0.048 MPa	--	0.048 MPa	Qualified, narrow range instrument.
Secondary Coolant System							
PT-P004-010A	In 10-in. line from SG.	0.1 to 8.3 MPa	10 Hz	0.08 MPa	--	0.08 MPa	Qualified.
PT-P004-034	Downstream of main feedwater pump.	0.1 to 10.3 MPa	10 Hz	0.10 MPa	--	0.10 MPa	Not reviewed.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
PRESSURE[k] (continued)							
Secondary Coolant System (continued)							
PT-P004-085	Upstream of inlet to air-cooled condenser header.	0.1 to 2.8 MPa	10 Hz	0.03 MPa	--	0.03 MPa	Not reviewed.
Emergency Core Cooling System							
PT-P120-029	Accumulator B.	0.1 to 7.0 MPa	10 Hz	0.055 MPa	--	0.055 MPa	Not reviewed (L5-1). Qualified (L8-2).
PT-P120-043	Accumulator A.	0.1 to 7.0 MPa	10 Hz	0.055 MPa	--	0.055 MPa	Qualified.
PT-P120-061	ECC injection.	0.1 to 21 MPa	10 Hz	0.158 MPa	--	0.158 MPa	Not reviewed (L5-1). Qualified (L8-2).
PT-P120-074	LPIS Pump B discharge.	0.1 to 7.0 MPa	10 Hz	0.055 MPa	--	0.055 MPa	Not reviewed (L5-1). Qualified, no other measurement for direct comparison (L8-2).
PT-P120-083	LPIS Pump A discharge.	0.1 to 7.0 MPa	10 Hz	0.055 MPa	--	0.055 MPa	Not reviewed (L5-1). Qualified, no other measurement for direct comparison (L8-2).
Blowdown Suppression Tank							
PT-P138-055	BST top, 1.22 m north of Downcomer 1.	0.1 to 17.0 MPa	10 Hz	0.005 MPa	--	0.005 MPa	Qualified.
PT-P138-056	BST top, 1.24 m north of Downcomer 2.	0.1 to 17.0 MPa	10 Hz	0.005 MPa		0.005 MPa	Qualified.
PT-P138-057	BST vapor space, Channel C.	0.1 to 17.0 MPa	10 Hz	0.005 MPa		0.005 MPa	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
PRESSURE[k] (continued)							
Intact Loop							
PT-P139-002	Intact loop hot leg at venturi on bottom.	0.1 to 21 MPa	10 Hz	0.16 MPa	--	0.16 MPa	Qualified.
PT-P139-003	Intact loop hot leg at venturi on left side when looking toward SG.	0.1 to 21 MPa	10 Hz	0.16 MPa	--	0.16 MPa	Not reviewed (L5-1). Qualified (L8-2).
PT-P139-004	Intact loop hot leg at venturi on right side when looking toward SG.	0.1 to 21 MPa	10 Hz	0.16 MPa	--	0.16 MPa	Qualified.
PT-P139-05-1	Pressurizer, 1.88 m above bottom (vapor space).	0.1 to 17.5 MPa	10 Hz	0.12 MPa	--	0.12 MPa	Qualified.
PUMP SPEED							
Intact Loop							
RPE-PC-001	PCP-1.	0 to 4500 rpm	10 Hz	8.9 rpm	1000 rpm 2000 rpm 3000 rpm 4000 rpm	7.65 rpm 8.83 rpm 10.10 rpm 11.66 rpm	Qualified.
RPE-PC-002	PCP-2.	0 to 4500 rpm	10 Hz	8.9 rpm	1000 rpm 2000 rpm 3000 rpm 4000 rpm	7.65 rpm 8.83 rpm 10.10 rpm 11.66 rpm	Qualified.
REACTIVITY							
Reactor Vessel							
RE-TRM-86-5	Transient reactivity meter in shield tank.	±0.145 Rho	10 Hz	--	--	0.01 Rho	Not reviewed.
RE-TRM-86-6	Transient reactivity meter in shield tank.	±0.145 Rho	10 Hz	--	--	0.01 Rho	Not reviewed.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
REACTIVITY (continued)							
Reactor Vessel (continued)							
RE-T-77-1A2	Power range, Channel A level.	0 to 62.5 kW/m	10 Hz	2.0 kW/m	--	2.0 kW/m	Qualified.
RE-T-77-2A2	Power range, Channel B level.	0 to 62.5 kW/m	10 Hz	2.0 kW/m	--	2.0 kW/m	Qualified.
RE-T-77-3A2	Power range, Channel C level.	0 to 62.5 kW/m	10 Hz	2.0 kW/m	--	2.0 kW/m	Qualified.
RE-T-87-4A2	Power range, Channel D level.	0 to 125% power	10 Hz	2.8%	--	3% power	Failed (L5-1). Qualified (L8-2).
TEMPERATURE							
Broken Loop							
TE-BL-001A	Broken loop cold leg at DTT flange at bottom of pipe.	255 to 590 K	10 Hz	--	350 K 450 K 550 K 600 K	2.4 K 2.5 K 2.5 K 2.9 K	Failed.
TE-BL-001B	Broken loop cold leg DTT flange at middle of pipe.	255 to 590 K	10 Hz	2.6 K	350 K 450 K 550 K 600 K	2.4 K 2.5 K 2.5 K 2.9 K	Qualified, possible hot wall effects.
TE-BL-001C	Broken loop cold leg DTT flange at top of pipe.	255 to 590 K	10 Hz	2.6 K	350 K 450 K 550 K 600 K	2.4 K 2.5 K 2.5 K 2.9 K	Failed (L5-1). Qualified, possible hot wall effects (L8-2).
TE-BL-002B	Broken loop hot leg at middle of DTT flange.	255 to 590 K	10 Hz	2.6 K	350 K 450 K 550 K 600 K	2.4 K 2.5 K 2.5 K 2.9 K	Qualified, possible hot wall effects.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Broken Loop (continued)							
TE-BL-003	Broken loop cold leg in reflood assist bypass system, on outside of pipe.	270 to 590 K	10 Hz	3.0 K	550 K	3.0 K	Qualified, no other measurement for direct comparison.
Intact Loop							
TE-PC-001A	Intact loop cold leg horizontal DTT flange on west side of pipe.	255 to 980 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K	2.8 K 3.2 K 4.7 K 6.2 K	Qualified, possible hot wall effects.
TE-PC-001B	Intact loop cold leg horizontal DTT flange at center of pipe.	255 to 980 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K	2.8 K 3.2 K 4.7 K 6.2 K	Qualified, possible hot wall effects.
TE-PC-001C	Intact loop cold leg horizontal DTT flange on east side of pipe.	255 to 980 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K	2.8 K 3.2 K 4.7 K 6.2 K	Qualified, possible hot wall effects.
TE-PC-002A	Intact loop hot leg DTT flange at bottom of pipe.	255 to 980 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K	2.8 K 3.2 K 4.7 K 6.2 K	Qualified, possible hot wall effects.
TE-PC-002B	Intact loop hot leg DTT flange at middle of pipe.	255 to 980 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K	2.8 K 3.2 K 4.7 K 6.2 K	Qualified, possible hot wall effects.
TE-PC-002C	Intact loop hot leg DTT flange at top of pipe.	255 to 980 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K	2.8 K 3.2 K 4.7 K 6.2 K	Qualified, possible hot wall effects.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Intact Loop (continued)							
TE-PC-004	Bottom of ECC Rake 1 (between PdE-PC-014 and PdE-PC-018).	255 to 590 K	10 Hz	3.1 K	350 K 450 K 550 K 650 K	2.8 K 2.9 K 3.0 K 3.6 K	Qualified, possible hot wall effects.
TE-PC-005	Next to bottom of ECC Rake 1 (between PdE-PC-013 and PdE-PC-017).	255 to 590 K	10 Hz	3.1 K	350 K 450 K 550 K 650 K	2.8 K 2.9 K 3.0 K 3.6 K	Qualified, possible hot wall effects.
TE-PC-006	Next to top of ECC Rake 1 (between PdE-PC-012 and PdE-PC-016).	255 to 590 K	10 Hz	3.1 K	350 K 450 K 550 K 650 K	2.8 K 2.9 K 3.0 K 3.6 K	Qualified, possible hot wall effects.
TE-PC-009	Next to bottom of ECC Rake 2 (between PdE-PC-021 and PdE-PC-025).	255 to 590 K	10 Hz	3.1 K	350 K 450 K 550 K 650 K	2.8 K 2.9 K 3.0 K 3.6 K	Qualified.
TE-PC-010	Next to top of ECC Rake 2 (between PdE-PC-020 and PdE-PC-024).	255 to 590 K	10 Hz	3.1 K	350 K 450 K 550 K 650 K	2.8 K 2.9 K 3.0 K 3.6 K	Qualified.
TE-PC-011	Top of ECC Rake 2 (between PdE-PC-019 and PdE-PC-023).	255 to 590 K	10 Hz	3.1 K	350 K 450 K 550 K 650 K	2.8 K 2.9 K 3.0 K 3.6 K	Qualified.
Secondary Coolant System							
TE-P004-054	Condensate receiver tank.	250 to 500 K	10 Hz	2.5 K	--	2.5 K	Not reviewed.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation		Comments[c]
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Emergency Core Cooling System							
TE-P120-027	Accumulator B temperature.	250 to 370 K	10 Hz	2.5 K	--	2.5 K	Not reviewed (L5-1). Qualified, no other measurement for direct comparison (L8-2).
TE-P120-041	Accumulator A temperature.	250 to 370 K	10 Hz	2.5 K	--	2.5 K	Qualified, no other measurement for direct comparison.
Blowdown Suppression Tank Spray System							
TE-P138-137	Outlet of BST spray system heat exchanger.	250 to 420 K	10 Hz	--	--	0.7 K	Not reviewed.
TE-P138-141	Spray in 3.79-L/s header.	250 to 420 K	10 Hz	--	--	1.3 K	Not reviewed.
TE-P138-142	Spray pump discharge.	250 to 420 K	10 Hz	--	--	1.3 K	Not reviewed.
TE-P138-143	Spray in 13.88-L/s header.	250 to 420 K	10 Hz	--	--	1.3 K	Not reviewed.
Broken Loop							
TE-P138-170	Hot leg warmup line.	73 to 622 K	10 Hz	--	--	2.1 K	Not reviewed.
TE-P138-171	Cold leg warmup line.	172 to 672 K	10 Hz	--	--	0.8 K	Not reviewed.
Intact Loop							
TE-P139-019	Pressurizer vapor space, 0.86 m above heater rods.	280 to 640 K	10 Hz	3.5 K	--	3.5 K	Qualified.
TE-P139-020	Pressurizer liquid volume, 0.36 m above heater rods.	280 to 640 K	10 Hz	3.5 K	--	3.5 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation		Comments[c]
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Intact Loop (continued)							
TE-P139-20-1	Pressurizer liquid volume.	280 to 640 K	10 Hz	3.5 K	--	3.5 K	Qualified.
TE-P139-28-2	Intact loop cold leg.	530 to 620 K	10 Hz	--	--	1.6 K	Failed.
TE-P139-029	Intact loop cold leg.	280 to 620 K	10 Hz	1.6 K	--	1.6 K	Qualified, response limited, possible hot wall effects.
TE-P139-32-1	Intact loop hot leg.	280 to 620 K	10 Hz	1.7 K	--	1.7 K	Not reviewed (L5-1). Qualified, possible hot wall effects, response limited (L8-2).
Primary Component Cooling System							
TE-P141-094	Downstream from primary component cooling system heat exchanger.	275 to 350 K	10 Hz	--	--	0.3 K	Not reviewed.
TE-P141-095	Upstream from primary component cooling system heat exchanger.	275 to 350 K	10 Hz	--	--	0.3 K	Not reviewed.
Intact Loop							
TE-SG-001	Intact loop hot leg SG inlet.	255 to 980 K	10 Hz	--	350 K 450 K 550 K 600 K 980 K	2.5 K 2.6 K 2.7 K 2.9 K 6.0 K	Failed.
TE-SG-002	Intact loop cold leg SG outlet.	255 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 600 K 980 K	2.5 K 2.6 K 2.7 K 2.9 K 6.0 K	Qualified, possible hot wall effects.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Secondary Coolant System							
TE-SG-003	SG secondary side downcomer, 0.25 m above top of tube sheet.	255 to 590 K	10 Hz	2.9 K	--	2.9 K	Qualified.
TE-SG-004	SG secondary side downcomer, 2.12 m above top of tube sheet.	255 to 590 K	10 Hz	2.9 K	--	2.9 K	Qualified.
TE-SG-005	SG secondary side downcomer, 2.92 m above top of tube sheet.	255 to 590 K	10 Hz	2.9 K	--	2.9 K	Qualified.
Blowdown Suppression System							
TE-SV-001	BST, 0.3 m north of Downcomer 1, 0.53 m east of tank centerline, 2.72 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified.
TE-SV-002	BST, 0.3 m north of Downcomer 1, 0.53 m east of tank centerline, 2.36 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified.
TE-SV-003	BST, 0.3 m north of Downcomer 1, 0.53 m east of tank centerline, 1.90 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified.
TE-SV-004	BST, 0.3 m north of Downcomer 1, 0.53 m east of tank centerline, 1.45 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Blowdown Suppression System (continued)							
TE-SV-006	BST, 0.3 m north of Downcomer 1, 0.53 m east of tank centerline, 0.37 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified.
TE-SV-007	BST, 0.3 m north of Downcomer 3, 0.53 m east of tank centerline, 2.72 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified.
TE-SV-008	BST, 0.3 m north of Downcomer 3, 0.53 m east of tank centerline, 2.36 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified.
TE-SV-009	BST, 0.3 m north of Downcomer 3, 0.53 m east of tank centerline, 1.90 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified.
TE-SV-010	BST, 0.3 m north of Downcomer 3, 0.53 m east of tank centerline, 1.45 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified.
TE-SV-011	BST, 0.3 m north of Downcomer 3, 0.53 m east of tank centerline, 0.99 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified (L5-1), Failed (L8-2).
TE-SV-012	BST, 0.3 m north of Downcomer 3, 0.53 m east of tank centerline, 0.37 m from tank bottom.	255 to 480 K	10 Hz	1.1 K	300 K 350 K 400 K	0.9 K 1.0 K 1.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation		Comments[c]
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Reactor Vessel							
TE-1A11-030	Cladding on Fuel Assembly 1, Row A, Column 11, 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-1B10-037	Cladding on Fuel Assembly 1, Row B, Column 10, 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-1B11-028	Cladding on Fuel Assembly 1, Row B, Column 11, at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-1B11-032	Cladding on Fuel Assembly 1, Row B, Column 11, at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-1B12-026	Cladding on Fuel Assembly 1, Row B, Column 12, 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-1C11-021	Cladding on Fuel Assembly 1, Row C, Column 11, 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-1C11-039	Cladding on Fuel Assembly 1, Row C, Column 11, 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-1F7-015	Cladding on Fuel Assembly 1, Row F, Column 7, 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-1F7-021	Cladding on Fuel Assembly 1, Row F, Column 7, 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-1F7-026	Cladding on Fuel Assembly 1, Row F, Column 7, 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-1F7-030	Cladding on Fuel Assembly 1, Row F, Column 7, 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-1LP-001	Fuel Assembly 1 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-1LP-002	Fuel Assembly 1 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-1ST-001	Downcomer Stalk 1, 4.8 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.
TE-1ST-002	Downcomer Stalk 1, 4.2 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.
TE-1ST-003	Downcomer Stalk 1, 3.59 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.
TE-1ST-004	Downcomer Stalk 1, 2.98 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.
TE-1ST-005	Downcomer Stalk 1, 2.37 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-1ST-006	Downcomer Stalk 1, 0.76 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.
TE-1ST-008	Downcomer Stalk 1, 0.74 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.
TE-1ST-009	Downcomer Stalk 1, 0.64 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.
TE-1ST-011	Downcomer Stalk 1, 0.44 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.
TE-1ST-012	Downcomer Stalk 1, 0.34 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.
TE-1ST-013	Downcomer Stalk 1, 0.24 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.7 K 3.3 K 6.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-1UP-001	Fuel Assembly 1 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-1UP-002	Fuel Assembly 1 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-1UP-004	Fuel Assembly 1 support column above RV nozzle.	310 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-1UP-005	DTT FE-1UP-1 above Fuel Assembly 1.	310 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-1UP-006	Fuel Assembly 1 support column.	310 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-2E8-011	Cladding on Fuel Assembly 2, Row E, Column 8 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	 Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-2E8-030	Cladding on Fuel Assembly 2, Row E, Column 8 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2E8-045	Cladding on Fuel Assembly 2, Row E, Column 8 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2F7-015	Cladding on Fuel Assembly 2, Row F, Column 7 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2F7-037	Cladding on Fuel Assembly 2, Row F, Column 7 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2F8-028	Cladding on Fuel Assembly 2, Row F, Column 8 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2F8-032	Cladding on Fuel Assembly 2, Row F, Column 8 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-2F9-026	Cladding on Fuel Assembly 2, Row F, Column 9 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2F9-041	Cladding on Fuel Assembly 2, Row F, Column 9 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2G02-030	Cladding on Fuel Assembly 2, Row G, Column 2 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2G08-021	Cladding on Fuel Assembly 2, Row G, Column 8 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2G08-039	Cladding on Fuel Assembly 2, Row G, Column 8 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2G14-011	Cladding on Fuel Assembly 2, Row G, Column 14 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-2G14-030	Cladding on Fuel Assembly 2, Row G, Column 14 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2G14-045	Cladding on Fuel Assembly 2, Row G, Column 14 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2H01-037	Cladding on Fuel Assembly 2, Row H, Column 1 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	400 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2H02-032	Cladding on Fuel Assembly 2, Row H, Column 2 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	400 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2H03-026	Cladding on Fuel Assembly 2, Row H, Column 3 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	400 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2H08-039	Guide tube for Fuel Assembly 2, Row H, Column 8 at 0.99 m above bottom of guide tube.	420 to 1530 K	10 Hz	3.1 K	400 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-2H13-021	Cladding on Fuel Assembly 2, Row H, Column 13 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2H13-049	Cladding on Fuel Assembly 2, Row H, Column 13 at 1.24 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2H14-028	Cladding on Fuel Assembly 2, Row H, Column 14 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2H14-032	Cladding on Fuel Assembly 2, Row H, Column 14 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2H15-026	Cladding on Fuel Assembly 2, Row H, Column 15 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2H15-041	Cladding on Fuel Assembly 2, Row H, Column 15 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-2I02-021	Cladding on Fuel Assembly 2, Row I, Column 2 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2I02-039	Cladding on Fuel Assembly 2, Row I, Column 2 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2I14-021	Cladding on Fuel Assembly 2, Row I, Column 14 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.7 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-2LP-001	Fuel Assembly 2 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-2LP-002	Fuel Assembly 2 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-2LP-003	Fuel Assembly 2 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-2ST-001	Downcomer Stalk 2, 4.8 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.7 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-2ST-002	Downcomer Stalk 2, 4.20 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.7 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-2ST-005	Downcomer Stalk 2, 2.37 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.7 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-2ST-013	Downcomer Stalk 2, 0.24 m from RV bottom.	255 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.7 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-2UP-001	Fuel Assembly 2 upper end box.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-2UP-002	Fuel Assembly 2 upper end box.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-2UP-003	Fuel Assembly 2 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-3A11-030	Cladding on Fuel Assembly 3, Row A, Column 11 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-3B10-037	Cladding on Fuel Assembly 3, Row B, Column 10 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-3B11-028	Cladding on Fuel Assembly 3, Row B, Column 11 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-3B11-032	Cladding on Fuel Assembly 3, Row B, Column 11 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-3B12-026	Cladding on Fuel Assembly 3, Row B, Column 12 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-3C11-021	Cladding on Fuel Assembly 3, Row C, Column 11 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-3C11-039	Cladding on Fuel Assembly 3, Row C, Column 11 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-3F7-015	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-3F7-021	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-3F7-026	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-3F7-030	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-3LP-001	Fuel Assembly 3 lower end box.	310 to 980 K	10 Hz	2.6 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-3LP-002	Fuel Assembly 3 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-3UP-001	Fuel Assembly 3 upper end box	310 to 980 K	10 Hz	2.9 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-3UP-003	Fuel Assembly 3 support column above RV nozzle.	310 to 980 K	10 Hz	2.7 K	350 K	2.5 K	Not reviewed (L5-1). Qualified (L8-2).
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-3UP-006	Fuel Assembly 3 support column.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-3UP-008	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-3UP-010	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.5 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-3UP-011	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-3UP-012	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-3UP-013	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-3UP-014	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-3UP-015	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation		Comments[c]
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-3UP-016	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-4E8-045	Cladding on Fuel Assembly 4, Row E, Column 8 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-4F7-037	Cladding on Fuel Assembly 4, Row F, Column 7 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-4F8-028	Cladding on Fuel Assembly 4, Row F, Column 8 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-4F8-032	Cladding on Fuel Assembly 4, Row F, Column 8 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-4F9-026	Cladding on Fuel Assembly 4, Row F, Column 9 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-4F9-041	Cladding on Fuel Assembly 4, Row F, Column 9 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-4G02-030	Cladding on Fuel Assembly 4, Row G, Column 2 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-4G08-021	Cladding on Fuel Assembly 4, Row G, Column 8 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-4G08-039	Cladding on Fuel Assembly 4, Row G, Column 8 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K	2.8 K	Qualified (L5-1). Failed (L8-2).
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-4G14-030	Cladding on Fuel Assembly 4, Row G, Column 14 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-4G14-045	Cladding on Fuel Assembly 4, Row G, Column 14 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-4H01-037	Cladding on Fuel Assembly 4, Row H, Column 1 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-4H02-032	Cladding on Fuel Assembly 4, Row H, Column 2 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-4H13-037	Cladding on Fuel Assembly 4, Row H, Column 13 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-4H14-028	Cladding on Fuel Assembly 4, Row H, Column 14 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-4H14-032	Cladding on Fuel Assembly 4, Row H, Column 14 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-4H15-026	Cladding on Fuel Assembly 4, Row H, Column 15 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.4 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-4H15-041	Cladding on Fuel Assembly 4, Row H, Column 15 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-4I02-021	Cladding on Fuel Assembly 4, Row I, Column 2 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-4I02-039	Cladding on Fuel Assembly 4, Row I, Column 2 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-4I14-021	Cladding on Fuel Assembly 4, Row I, Column 14 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-4I14-039	Cladding on Fuel Assembly 4, Row I, Column 14 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-4LP-001	Fuel Assembly 4 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-4LP-002	Fuel Assembly 4 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K	2.5 K	Not reviewed (L5-1). Failed (L8-2).
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-4LP-003	Fuel Assembly 4 lower end box.	310 to 980 K	10 Hz	2.6 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-4UP-001	Fuel Assembly 4 upper end box.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-4UP-002	Fuel Assembly 4 upper end box.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-4UP-003	Fuel Assembly 4 upper end box.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	
TE-4UP-004	Fuel Assembly 4 support column.	310 to 980 K	10 Hz	2.8 K	350 K	2.5 K	Qualified.
					450 K	2.6 K	
					550 K	2.6 K	
					650 K	3.3 K	
					980 K	6.0 K	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation		Comments[c]
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-4UP-005	Fuel Assembly 4 support column.	310 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5C6-024	Guide tube for Fuel Assembly 5, Row C, Column 6 at 0.61 m above bottom of guide tube.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5D6-030	Cladding on Fuel Assembly 5, Row D, Column 6 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5D6-032	Cladding on Fuel Assembly 5, Row D, Column 6 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5D6-037	Cladding on Fuel Assembly 5, Row D, Column 6 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5D6-039	Cladding on Fuel Assembly 5, Row D, Column 6 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5E8-015	Cladding on Fuel Assembly 5, Row E, Column 8 at 0.38 m above bottom of fuel rod.	420 to 1810 K	10 Hz	4.2 K	450 K	3.8 K	Qualified.
					600 K	4.2 K	
					800 K	5.2 K	
					1000 K	6.7 K	
					1800 K	8.0 K	
TE-5E8-034.5	Cladding on Fuel Assembly 5, Row E, Column 8 at 0.88 m above bottom of fuel rod.	420 to 1810 K	10 Hz	4.2 K	450 K	3.8 K	Qualified.
					600 K	4.2 K	
					800 K	5.2 K	
					1000 K	6.7 K	
					1800 K	8.0 K	
TE-5E8-049	Cladding on Fuel Assembly 5, Row E, Column 8 at 1.24 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.3 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-5F3-024	Guide tube for Fuel Assembly 5, Row F, Column 3 at 0.61 m above bottom of guide tube.	420 to 1530 K	10 Hz	3.1 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	
TE-5F4-015	Cladding on Fuel Assembly 5, Row F, Column 4 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K	[illegible].8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.[illegible] K	
					1500 K	10.[illegible] K	
TE-5F4-021	Cladding on Fuel Assembly 5, Row F, Column 4 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K	2.8 K	Qualified.
					600 K	3.2 K	
					800 K	4.7 K	
					1000 K	6.2 K	
					1500 K	10.3 K	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5F4-026	Cladding on Fuel Assembly 5, Row F, Column 4 at 0.66 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5F4-030	Cladding on Fuel Assembly 5, Row F, Column 4 at 0.76 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5F7-005	Cladding on Fuel Assembly 5, Row F, Column 7 at 0.13 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5F8-024	Cladding on Fuel Assembly 5, Row F, Column 8 at 0.61 m above bottom of fuel rod.	420 to 1810 K	10 Hz	4.2 K	450 K 600 K 800 K 1000 K 1800 K	3.8 K 4.2 K 5.2 K 6.7 K 8.0 K	Qualified.
TE-5F8-028	Cladding on Fuel Assembly 5, Row F, Column 8 at 0.71 m above bottom of fuel rod.	420 to 1810 K	10 Hz	4.2 K	450 K 600 K 800 K 1000 K 1800 K	3.8 K 4.2 K 5.2 K 6.7 K 8.0 K	Qualified.
TE-5F8-032	Cladding on Fuel Assembly 5, Row F, Column 8 at 0.81 m above bottom of fuel rod.	420 to 1810 K	10 Hz	4.2 K	450 K 600 K 800 K 1000 K 1800 K	3.8 K 4.2 K 5.2 K 6.7 K 8.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5F9-011	Cladding on Fuel Assembly 5, Row F, Column 9 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5F9-030	Cladding on Fuel Assembly 5, Row F, Column 9 at 0.76 m above bottom of fuel rod.	420 to 1810 K	10 Hz	4.2 K	450 K 600 K 800 K 1000 K 1800 K	3.8 K 4.2 K 5.2 K 6.7 K 8.0 K	Qualified.
TE-5F9-045	Cladding on Fuel Assembly 5, Row F, Column 9 at 1.14 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5F9-062	Cladding on Fuel Assembly 5, Row F, Column 9 at 1.57 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K (L8-2)	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Failed (L5-1). Qualified (L8-2).
TE-5G6-011	Cladding on Fuel Assembly 5, Row G, Column 6 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5G6-030	Cladding on Fuel Assembly 5, Rod G, Column 6 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5G6-045	Cladding on Fuel Assembly 5, Row G, Column 6 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5G6-062	Cladding on Fuel Assembly 5, Row G, Column 6 at 1.57 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5G8-008	Cladding on Fuel Assembly 5, Row G, Column 8 at 0.20 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5G8-026	Cladding on Fuel Assembly 5, Row G, Column 8 at 0.66 m above bottom of fuel rod.	410 to 1820 K	10 Hz	4.2 K	450 K 600 K 800 K 1000 K 1800 K	3.8 K 4.2 K 5.2 K 6.7 K 8.0 K	Qualified.
TE-5G8-041	Cladding on Fuel Assembly 5, Row G, Column 8 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5G8-058	Cladding on Fuel Assembly 5, Row G, Column 8 at 1.47 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5H5-002	Cladding on Fuel Assembly 5, Row H, Column 5 at 0.05 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5H5-015	Cladding on Fuel Assembly 5, Row H, Column 5 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5H5-034.5	Cladding on Fuel Assembly 5, Row H, Column 5 at 0.88 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5H5-049	Cladding on Fuel Assembly 5, Row H, Column 5 at 1.24 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5H6-024	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.61 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5H6-028	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5H6-032	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.81 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5H6-037	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.94 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5H7-008	Cladding on Fuel Assembly 5, Row H, Column 7 at 0.20 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5H7-026	Cladding on Fuel Assembly 5, Row H, Column 7 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5H7-041	Cladding on Fuel Assembly 5, Row H, Column 7 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5H7-058	Cladding on Fuel Assembly 5, Row H, Column 7 at 1.47 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5I6-005	Cladding on Fuel Assembly 5, Row I, Column 6 at 0.13 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5I6-021	Cladding on Fuel Assembly 5, Row I, Column 6 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5I6-039	Cladding on Fuel Assembly 5, Row I, Column 6 at 0.99 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5I6-054	Cladding on Fuel Assembly 5, Row I, Column 6 at 1.37 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5I8-008	Cladding on Fuel Assembly 5, Row I, Column 8 at 0.20 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5I8-026	Cladding on Fuel Assembly 5, Row I, Column 8 at 0.66 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5I8-041	Cladding on Fuel Assembly 5, Row I, Column 8 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5I8-058	Cladding on Fuel Assembly 5, Row I, Column 8 at 1.47 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J3-024	Guide tube for Fuel Assembly 5, Row J, Column 3 at 0.61 m above bottom of guide tube.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J4-015	Cladding on Fuel Assembly 5, Row J, Column 4 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J4-030	Cladding on Fuel Assembly 5, Row J, Column 4 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J7-011	Cladding on Fuel Assembly 5, Row J, Column 7 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5J7-030	Cladding on Fuel Assembly 5, Row J, Column 7 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J7-045	Cladding on Fuel Assembly 5, Row J, Column 7 at 1.14 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J7-062	Cladding on Fuel Assembly 5, Row J, Column 7 at 1.57 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J8-024	Cladding on Fuel Assembly 5, Row J, Column 8 at 0.61 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J8-028	Cladding on Fuel Assembly 5, Row J, Column 8 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J8-032	Cladding on Fuel Assembly 5, Row J, Column 8 at 0.81 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5J8-037	Cladding on Fuel Assembly 5, Row J, Column 8 at 0.94 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J9-005	Cladding on Fuel Assembly 5, Row J, Column 9 at 0.13 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J9-021	Cladding on Fuel Assembly 5, Row J, Column 9 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J9-039	Cladding on Fuel Assembly 5, Row J, Column 9 at 0.99 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5J9-054	Cladding on Fuel Assembly 5, Row J, Column 9 at 1.3[illegible] m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5K8-002	Cladding on Fuel Assembly 5, Row K, Column 8 at 0.05 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5K8-015	Cladding on Fuel Assembly 5, Row K, Column 8 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5K8-034.5	Cladding on Fuel Assembly 5, Row K, Column 8 at 0.88 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5K8-049	Cladding on Fuel Assembly 5, Row K, Column 8 at 1.24 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5LP-001	Fuel Assembly 5 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5LP-002	Fuel Assembly 5 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5LP-003	Fuel Assembly 5 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5LP-004	Fuel Assembly 5 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5L6-030	Cladding on Fuel Assembly 5, Row L, Column 6 at 0.76 m above bottom of fuel rod.	420 to 1530 K	1 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5L6-032	Cladding on Fuel Assembly 5, Row L, Column 6 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5L6-037	Cladding on Fuel Assembly 5, Row L, Column 6 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5L6-039	Cladding on Fuel Assembly 5, Row L, Column 6 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5L8-011	Guide tube for Fuel Assembly 5, Row L, Column 8 at 0.28 m above bottom of guide tube.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5L8-024	Guide tube for Fuel Assembly 5, Row L, Column 8 at 0.61 m above bottom of guide tube.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5L8-039	Guide tube for Fuel Assembly 5, Row L, Column 8 at 0.99 m above bottom of guide tube.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5M6-024	Guide tube for Fuel Assembly 5, Row M, Column 6 at 0.61 m above bottom of guide tube.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-5UP-001	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5UP-002	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5UP-003	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5UP-004	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5UP-005	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5UP-006	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5UP-007	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5UP-008	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-5UP-009	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-6E8-011	Cladding on Fuel Assembly 6, Row E, Column 8 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6E8-030	Cladding on Fuel Assembly 6, Row E, Column 8 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6E8-045	Cladding on Fuel Assembly 6, Row E, Column 8 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6F7-015	Cladding on Fuel Assembly 6, Row F, Column 7 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6F7-037	Cladding on Fuel Assembly 6, Row F, Column 7 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6F8-028	Cladding on Fuel Assembly 6, Row F, Column 8 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	 Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-6F8-032	Cladding on Fuel Assembly 6, Row F, Column 8 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6F9-026	Cladding on Fuel Assembly 6, Row F, Column 9 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6F9-041	Cladding on Fuel Assembly 6, Row F, Column 9 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6G02-030	Cladding on Fuel Assembly 6, Row G, Column 2 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6G08-021	Cladding on Fuel Assembly 6, Row G, Column 8 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6G08-039	Cladding on Fuel Assembly 6, Row G, Column 8 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-6G14-011	Cladding on Fuel Assembly 6, Row G, Column 14 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6G14-030	Cladding on Fuel Assembly 6, Row G, Column 14 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6G14-045	Cladding on Fuel Assembly 6, Row G, Column 14 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6H01-037	Cladding on Fuel Assembly 6, Row H, Column 1 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6H02-028	Cladding on Fuel Assembly 6, Row H, Column 2 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6H02-032	Cladding on Fuel Assembly 6, Row H, Column 2 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-6H03-026	Cladding on Fuel Assembly 6, Row H, Column 3 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6H08-039	Guide tube in Fuel Assembly 6, Row H, Column 8 at 0.99 m above bottom of Guide tube.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6H13-015	Cladding on Fuel Assembly 6, Row H, Column 13 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6H13-037	Cladding on Fuel Assembly 6, Row H, Column 13 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6H14-028	Cladding on Fuel Assembly 6, Row H, Column 14 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6H14-032	Cladding on Fuel Assembly 6, Row H, Column 14 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-6H15-026	Cladding on Fuel Assembly 6, Row H, Column 15 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6H15-041	Cladding on Fuel Assembly 6, Row H, Column 15 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6I02-021	Cladding on Fuel Assembly 6, Row I, Column 2 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.1 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6I02-039	Cladding on Fuel Assembly 6, Row I, Column 2 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.2 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6I14-021	Cladding on Fuel Assembly 6, Row I, Column 14 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.
TE-6I14-039	Cladding on Fuel Assembly 6, Row I, Column 14 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	3.3 K	450 K 600 K 800 K 1000 K 1500 K	2.8 K 3.2 K 4.7 K 6.2 K 10.3 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-6LP-001	Fuel Assembly 6 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-6LP-002	Fuel Assembly 6 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-6LP-003	Fuel Assembly 6 lower end box.	310 to 980 K	10 Hz	2.7 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-6UP-001	Fuel Assembly 6 upper end box.	310 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-6UP-002	Fuel Assembly 6 upper end box.	310 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-6UP-003	Fuel Assembly 6 upper end box.	310 to 980 K	10 Hz	2.9 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-6UP-00[illegible]	Fuel Assembly 6 support column.	310 to 980 K	10 Hz	2.8 K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
TE-6UP-005	Fuel Assembly 6 support column.	310 to 980 K	10 Hz	2.[illegible] K	350 K 450 K 550 K 650 K 980 K	2.5 K 2.6 K 2.6 K 3.3 K 6.0 K	Qualified.
Secondary Coolant System							
TT-P004-004	Secondary coolant system feedwater.	370 to 505 K	10 Hz	1.2 K	--	1.2 K	Qualified, no other measurement for direct comparison.
Emergency Core Cooling System							
TT-P120-062	Cold leg injection in 4-in. line upstream of cold leg injection point.	280 to 620 K	10 Hz	--	--	1.6 K	Not reviewed.
Intact Loop							
TT-P139-032	Intact loop hot leg primary coolant, Channel A.	535 to 620 K	10 Hz	1.7 K	--	1.7 K	Qualified, possible hot wall effects; narrow range instrument, response limited.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)[b]	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments[c]
TEMPERATURE (continued)							
Intact Loop (continued)							
TT-P139-033	Intact loop hot leg primary coolant, Channel B.	535 to 620 K	10 Hz	1.7 K	--	1.7 K	Qualified, possible hot wall effects; narrow range instrument, response limited.
TT-P139-034	Intact loop hot leg primary coolant, Channel C.	535 to 620 K	10 Hz	1.7 K	--	1.7 K	Qualified, possible hot wall effects; narrow range instrument, response limited.

a. Recording frequency is the measurement channel bandwidth at the ±3-dB level.

b. Initial condition uncertainty is the same for Experiments L5-1 and L8-2 unless the experiment is specified.

c. The comments are the same for Experiments L5-1 and L8-2 unless the experiment is specified.

d. Reference B-4.

e. Reference B-5.

f. Reference B-6.

g. Reference B-7.

h. The steam generator liquid level is defined as 0 at 2.95 m above the top of the tube sheet.

i. Reference B-8.

j. Reference B-9.

k. Pressure measurements are presented as absolute values.

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APPENDIX C
PREEXPERIMENT PROCEDURES AND DATA CONSISTENCY CHECKS

APPENDIX C
PREEXPERIMENT PROCEDURES AND DATA CONSISTENCY CHECKS

In preparation for Experiments L5-1 and L8-2, the primary coolant system (PCS) was filled and vented, and the specified system water chemistry was established. Prior to the primary system heatup, several tests were performed on the Loss-of-Fluid Test (LOFT) system. These tests included plant requalification tests, pump coastdown runs, experiment control system checks, and operational verification of newly installed instrumentation. Selected system process instruments were calibrated and an electrical calibration was performed on the data acquisition and visual display system (DAVDS).[C-1]

The PCS pressure was hydrostatically increased to 1.46, 3.53, 6.98, 10.43, 13.87, and 15.60 MPa, and then decreased through the same pressure plateaus, at cold plant temperature and zero flow conditions. The DAVDS recorded 20 s of data at each pressure plateau in both the increasing and decreasing directions to determine the degree of sensitivity of the pressure sensing instruments. The system was concurrently inspected for leakage at the various test pressures. The pumps were operated at 15, 20, 30, 40, 50, and 60 Hz with 20 s of data taken at each frequency. During heatup of the plant, the appropriate initial conditions were established for the blowdown suppression tank (BST), accumulator, and borated water storage tank (BWST).

The plant was stabilized at 422, 489, and 555 K during heatup. At each of these temperatures, 20 s of data were recorded for calibration checks and to determine the degree of instrument temperature sensitivity. In addition, the pumps were operated at 15, 20, 30, 40, 50, and 60 Hz in both increasing and decreasing directions with 20 s of data taken at each frequency. At the 422-K stabilization point, with the pumps off, 20 s of data were taken at 1.46, 3.53, 6.98, 9.74, and 11.12 MPa in both the increasing and decreasing directions. At the 489- and 555-K stabilization points, the pumps were stopped and 20 s of data were recorded during pump coastdown and zero flow conditions. With the pumps off at the 489-K stabilization point, 20 s of data were taken at 12.49, 11.12, 9.74, 6.98, and 3.53 MPa in both the decreasing and increasing directions. With the pumps off at the 555-K stabilization point, the PCS pressure was decreased and then increased through 14.95, 13.87, 12.50, 11.12, and 9.74 MPa, and 20 s of data were obtained at each step. Before the reactor was brought critical, the DAVDS was calibrated and the boron concentrations in the accumulators, BST, and BWST were verified.

The following discussion describes several techniques used to perform consistency checks on the data presented in this report. The purpose of these checks is to establish data integrity and to evaluate the performance of a given transducer.

1. Checks of Preexperiment Data

Prior to the experiment, static pressure, steady state flow, zero flow, pump coastdown, and isothermal tests were conducted on the LOFT system at various temperatures, pressures, and flow rates. Using the data from these tests, the following checks were performed.

1.1 Absolute Pressure Data. During the approach to initial conditions, a series of static pressure tests was performed. After each test, the absolute pressure measurements were compared with two reference pressures (PE-PC-005 and -006). The pressure tests were used to evaluate the slope coefficient of the calibration equations and to evaluate the pressure sensitivity of the transducers.

Prior to the experiment, the BST was vented to the atmosphere and the BST pressure readings were checked against atmospheric pressure.

The steam generator pressures were compared to each other and checked against the temperature in the steam generator by comparing the pressure obtained from the steam tables, using the steam generator temperature, with the pressure transducer readings.

When the accumulator was pressurized, both accumulator pressure transducer readings were checked by comparing one with the other.

1.2 Flow Data. Measurements of fluid flow included pump speed, differential pressure, venturi, turbines and drag discs. The measurements were analyzed primarily to check the zero offset. Turbine and drag disc measurements were also analyzed to check slope coefficient (gain) changes.

1.2.1 Pump Speed Data—The reference measurement for all intact loop flow measurements was primary coolant pump speed, because it is the most accurate and stable of the flow measurements. The pump speed measurement was adjusted using a square wave generator to calibrate the digital-to-analog conversion.

During heatup, the zero reading was checked at every zero flow point; during flow tests, the pump speed was checked against pump frequency. Pump speed measurements were checked for consistency by comparison with pump speed as calculated from the primary system motor-generator frequencies. This check was valid prior to and during the experiment until the primary system motor generator field breakers were opened. Prior to the experiment, the pump speed was further checked by reviewing the agreement with previous LOFT experiments. Pump operating voltages and currents were evaluated prior to the experiment by calculating the pump electrical horsepower input, the pump water power, and finally the combined pump efficiency. These calculated efficiencies were then compared with previously recorded efficiencies determined during pump requalification tests.

1.2.2 Differential Pressure Data—Zero offsets were determined from flow data, static pressure tests, and temperature sensitivity data derived during the heatup. Steady state flow conditions for the PCS were then established, and selected PCS pressure drops were compared with predicted values. At various flow conditions, intact loop flow resistance coefficients were calculated and verified to remain essentially constant and to agree with previously tabulated data. Further consistency checks were performed on the intact loop differential pressure measurements by plotting the square root of the differential pressure against pump speed using data from the pump frequency tests. The results of the curve fits performed on those plots were then used to confirm zero offsets. Both prior to and during the experiment, differential pressure measurements were compared with the differential pressure computed by subtracting appropriate absolute pressure measurements. Pressure closure was calculated for the PCS intact loop.

1.2.3 Venturi Data—Consistency checks were performed by comparing the venturi mass flow rates with each other and venturi mass flow rates from previous LOFT experiments (with the same loop resistance). A comparison of the venturi with the pump speed consisted of performing a least squares fit of the venturi data versus the pump data (derived from the pump speed frequency test). The results were used to correct any zero offset in the venturi. The corrected venturi data were then used to calculate the average fluid velocity and momentum flux of the intact loop. The computed velocity was compared to the differential pressure measured across the pumps, the steam generator, and the reactor vessel.

1.2.4 Drag Disc-Turbine (DTT) Data—Reactor vessel and piping drag disc measurements were compared with values calculated from venturi mass flow, assuming the full flow area. Slope coefficients were calculated, and the effect of temperature on the calibration coefficients was determined.

After the slope coefficients had been verified, the data for a given transducer were plotted against pump speed and a least squares fit performed. The zero offset from this curve fit was used to modify the zero offset of the transducers.

As an independent check, the turbine flowmeter and drag disc data were used to calculate fluid density. These values were then compared to the known single-phase density prior to the experiment. This analysis was performed on all the turbine flowmeter and drag disc measurements with the exception of those that failed.

1.3 Gamma Densitometer Data. To evaluate the PCS average fluid densities, calculations were performed using the gamma densitometers. The densitometers were checked for normal operation by recording and examining data tapes within 8 h before the experiment and by observing spectra, count rate data, and live-time data on the densitometer system display console immediately before and during the experiment.

1.4 Level Measurement Data. Five system level measurements were evaluated: (a) BST liquid level, (b) pressurizer coolant level, (c) pump suction liquid level, (d) reactor vessel coolant level, and (e) steam generator secondary side liquid level. BST liquid level measurements were qualified by comparing the four available measurements. In addition, a site glass measurement was made both prior to and following the experiment. Similarly, pressurizer liquid level was reviewed by redundant level measurements. The pump suction and steam generator liquid levels were checked at zero flow conditions with the plant full of water. The reactor vessel liquid level probes were verified by performing preexperiment conductivity calibrations with the vessel full, under cold and hot plant conditions.

1.5 Thermocouple Data. Temperature measurements were analyzed by comparing them with other temperature data obtained during the isothermal tests. Resistance temperature measurements were used for reference, where they existed. If saturation conditions existed, the temperature was compared with the temperature from the steam tables using pressure measurements as the reference. Temperature measurements outside the primary coolant were compared with any known temperature in the same area.

2. Checks During and After the Experiment

The purpose of these checks was to further establish the data integrity. For each type of measurement, comparable data channels were evaluated and the determination of data consistency was identified. The following is a brief summary of those checks.

2.1 Absolute Pressure Data. During the experiment, the saturated steam temperature was determined from the saturated steam table using pressure transducer data. The computed temperature was compared with the temperature measured by the thermocouple. However, this was valid only during saturation. When complete voiding occurred, the measured temperature increased above the corresponding saturation temperature because of conduction and radiant heating of the detector element by the surrounding warmer environment (pipe walls, etc.).

2.2 Flow Data. Immediately prior to the experiment, flow data were again compared for consistency. In addition, experiment data were compared with previous similar experiments. A summary of the consistency checks for the pump and flow transducer measurements follows.

2.2.1 Pump Speed Data—The field breakers for the primary coolant pump motor generator sets were opened at the end of pump coastdown. Pump speed measurements were compared during pump coastdown.

2.2.2 Differential Pressure Data—Immediately prior to the experiment, when steady state operating conditions had been established, the differential pressure measurements around the intact loop were summed and compared with the differential pressure across the primary coolant pumps.

2.2.3 Venturi Data—The initial conditions data from the venturi were checked for data consistency by comparing them with preexperiment flow test data. The flow venturi was used only for steady state initial conditions information.

2.2.4 Drag Disc-Turbine (DTT) Data—Initial conditions data were checked by calculating momentum flux from the venturi mass flow rate and from the known density for those DTTs that were not overranged. These values were then compared with the measured values from the DTT.

Experiment data were checked by comparing data from previous experiments. An additional check was made by comparing the basic shape of the velocity or momentum flux curves with a differential pressure close to the DTT.

2.3 Gamma Densitometer Data. Checks of the calibration constants were obtained from the all-liquid readings approximately 10 s prior to reactor scram. The fluid densities for the all-vapor condition were determined from the steam tables using temperature and pressure measurements following completion of the blowdown phase of each experiment.

2.4 Liquid Level Data. The steam generator and pressurizer liquid levels were reviewed by redundant level measurements.

2.5 Temperature Data. The temperatures during the experiment were compared with nearby temperatures and with previous experimental data. Initial conditions were also checked by comparing all primary coolant thermocouple and resistance thermometer detector measurements.

3. Reference

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