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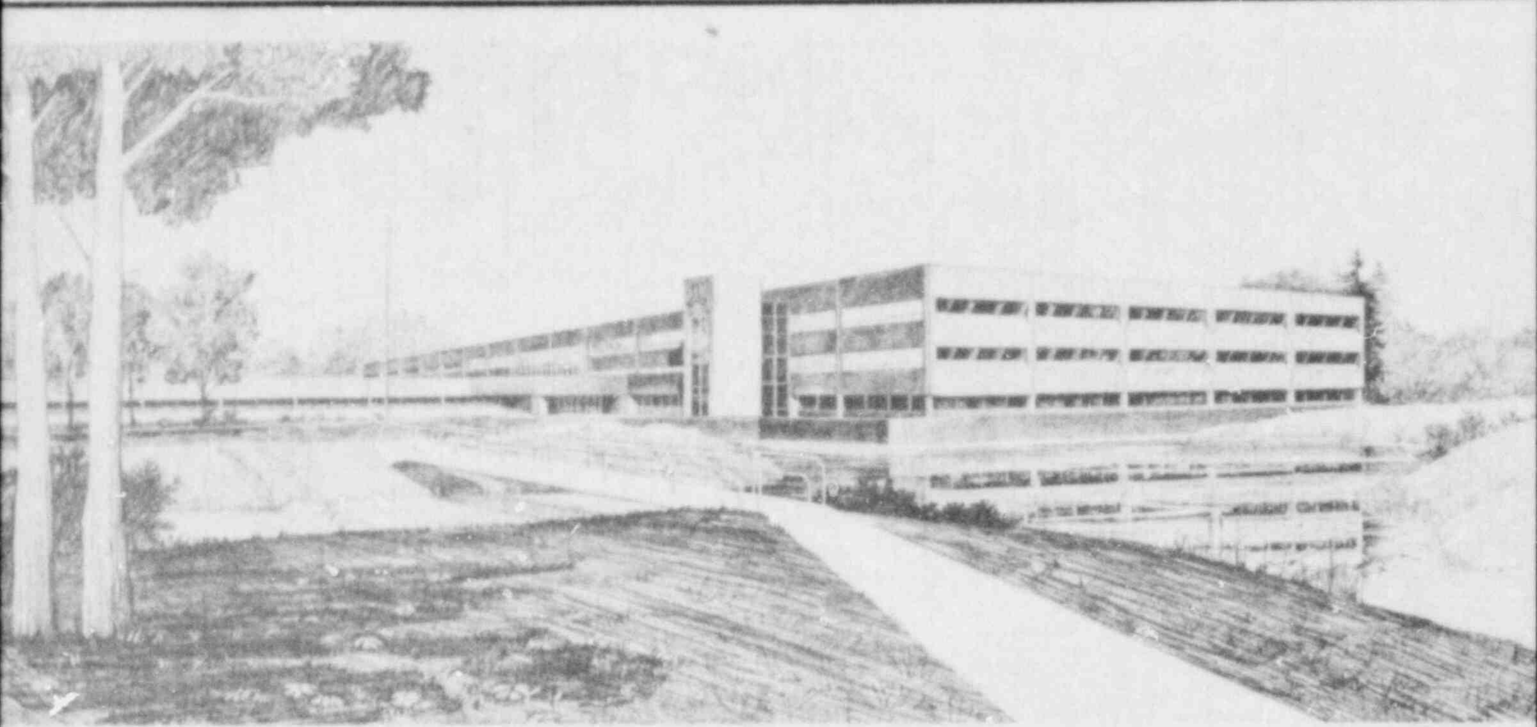

U.S. Department of Energy
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Experiment Data Report for LOFT Large Break Loss-of-Coolant Experiment L2-5

Paul D. Bayless
Janice M. Divine

August 1982

Prepared for the
U.S. Nuclear Regulatory Commission
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EXPERIMENT DATA REPORT FOR LOFT LARGE BREAK LOSS-OF-COOLANT EXPERIMENT L2-5

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FIN No. A6043

ABSTRACT

Selected pertinent and uninterpreted data from the third nuclear large break loss-of-coolant experiment (Experiment L2-5) conducted in the Loss-of-Fluid Test (LOFT) facility are presented. The LOFT facility is a 50-MW(t) pressurized water reactor (PWR) system with instruments that measure and provide data on the system thermal-hydraulic and nuclear conditions. The operation of the LOFT system is typical of large [~ 1000 MW(e)] commercial PWR operations.

Experiment L2-5 simulated a double-ended offset shear of a cold leg in the primary coolant system. The primary coolant pumps were tripped within 1 s after the break initiation, simulating a loss of site power. Consistent with the loss of power, the starting of the high- and low-pressure injection systems was delayed. The peak fuel rod cladding temperature achieved was 1078 ± 13 K. The emergency core cooling system re-covered the core and quenched the cladding. No evidence of core damage was detected.

FIN No. A6043—LOFT Experimental Instrumentation

SUMMARY

Experiment L2-5 was performed June 16, 1982, 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 L2-5 is part of the LOFT Power Ascension Experiment Series L2.

For the performance of Experiment L2-5, the LOFT facility was configured to simulate a double-ended 200% cold leg break. The reactor scrammed and the primary coolant pumps were tripped and decoupled from their flywheels within 1 s after the break initiation. A rewet of the upper portion of the center fuel assembly began at approximately 12 s and ended at approximately 23 s. The injection of high- and low-pressure emergency core coolant (ECC) was delayed until approximately 24 and 37 s, respectively. The fuel rod peak cladding temperature of 1078 ± 13 K occurred at 28.47 ± 0.02 s. The cladding was quenched and the core re-covered within 70 s following the break initiation. The experiment was terminated after approximately 2 min.

Following Experiment L2-5, the ECC injection was stopped to keep the water level below the reactor vessel nozzles. While monitoring the liquid level with upper plenum thermocouples, the core uncovered and heated up. The ECC injection was reinitiated and re-covered the core with liquid. Selected data from this heatup are included in this report.

Experiment L2-5 was initiated from the following primary coolant system initial conditions: hot leg temperature, 589.7 ± 1.6 K; cold leg temperature, 556.6 ± 4.0 K; hot leg pressure, 14.94 ± 0.06 MPa; and intact loop flow rate, 192.4 ± 7.8 kg/s. The preexperiment power level was 36.0 ± 1.2 MW, with a maximum linear heat generation rate of 40.1 ± 3.0 kW/m.

Experiment L2-5 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, selected computed variables are included to facilitate the analysis of the system thermal-hydraulic behavior.

ACKNOWLEDGMENTS

Appreciation is expressed 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 R. H. Averill for uncertainty analysis and instrument calibration. Special appreciation is expressed to G. Hammer for the technical editing.

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ACRONYMS

ACC	Accumulator
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 feature
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
PCP	Primary coolant pump
PCS	Primary coolant 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
XRO	Orifice

EXPERIMENT DATA REPORT FOR LOFT LARGE BREAK LOSS-OF-COOLANT EXPERIMENT L2-5

1. INTRODUCTION

This report presents selected pertinent and uninterpreted data from Experiment L2-5, which was conducted in the Loss-of-Fluid Test (LOFT) facility on June 16, 1982. Experiment L2-5 was the third nuclear large break loss-of-coolant experiment (LOCE) performed at LOFT and simulated an offset shear of a primary coolant system cold leg pipe with an immediate primary coolant pump trip.

The LOFT facility is a 50-MW(t) pressurized water reactor (PWR) with instrumentation to measure and provide data on the thermal-hydraulic and nuclear conditions throughout the system. Operation of the LOFT system is typical of large [~1000 MW(e)] commercial PWR operations. The LOFT facility consists of

1. A reactor vessel with a nuclear core
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 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 Appendix A of this report.

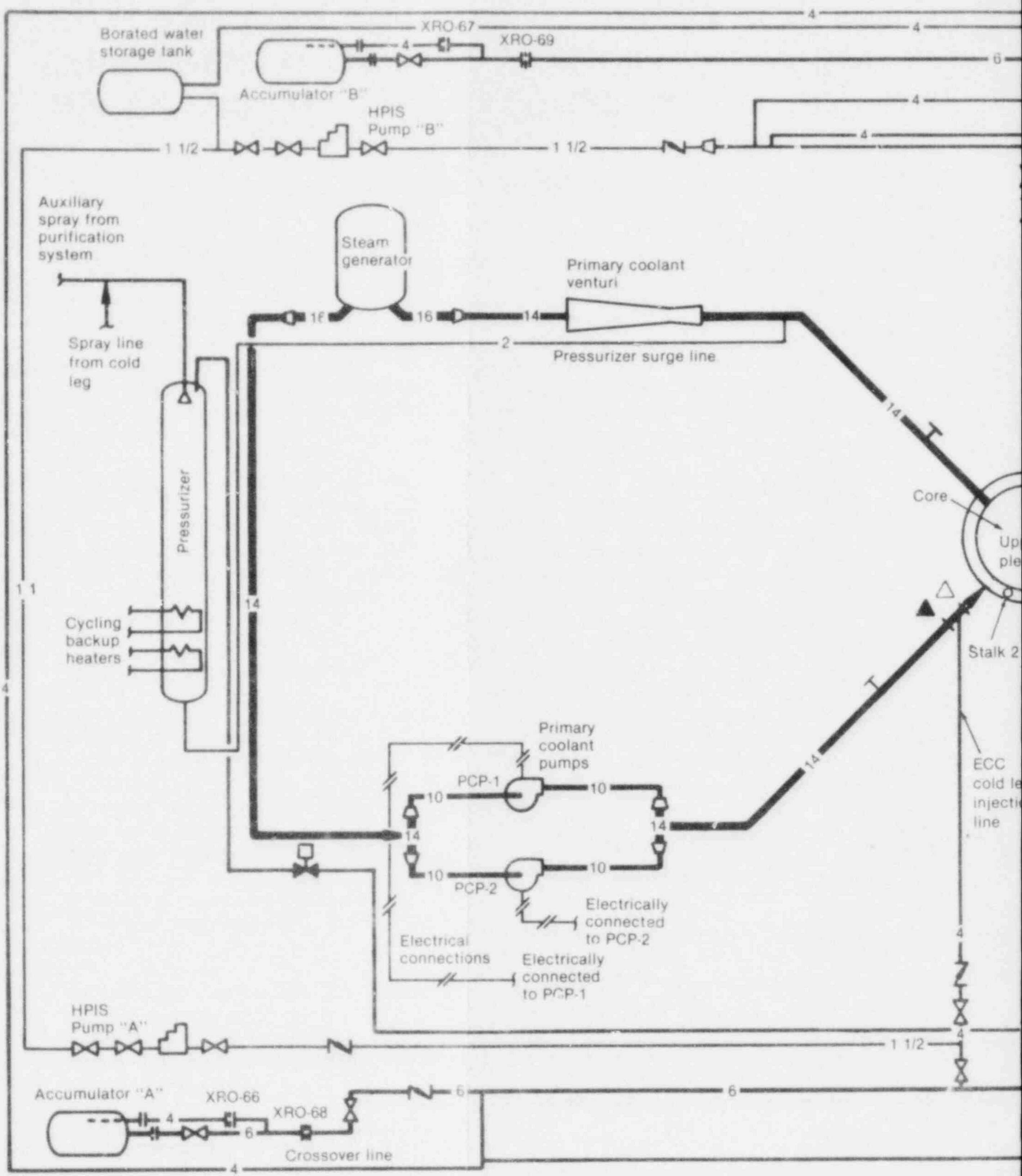
The data presented in this report are from 360 of the 629 instruments that provided data during Experiment L2-5. Only the data considered pertinent to the understanding of this experiment are presented. The data are in an uninterpreted but readily usable form for use by the nuclear community in advance 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 and 1.2 state the LOFT Experimental Program objectives and the Experiment L2-5 objectives, respectively. Section 2 summarizes the experimental procedure and initial conditions. Section 3 presents the data 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 presents a list of instruments available for use in Experiment L2-5. Appendix C summarizes the preexperiment calibrations and the methods used to verify the consistency and accuracy of the data.

1.1 LOFT Experimental Program Objectives

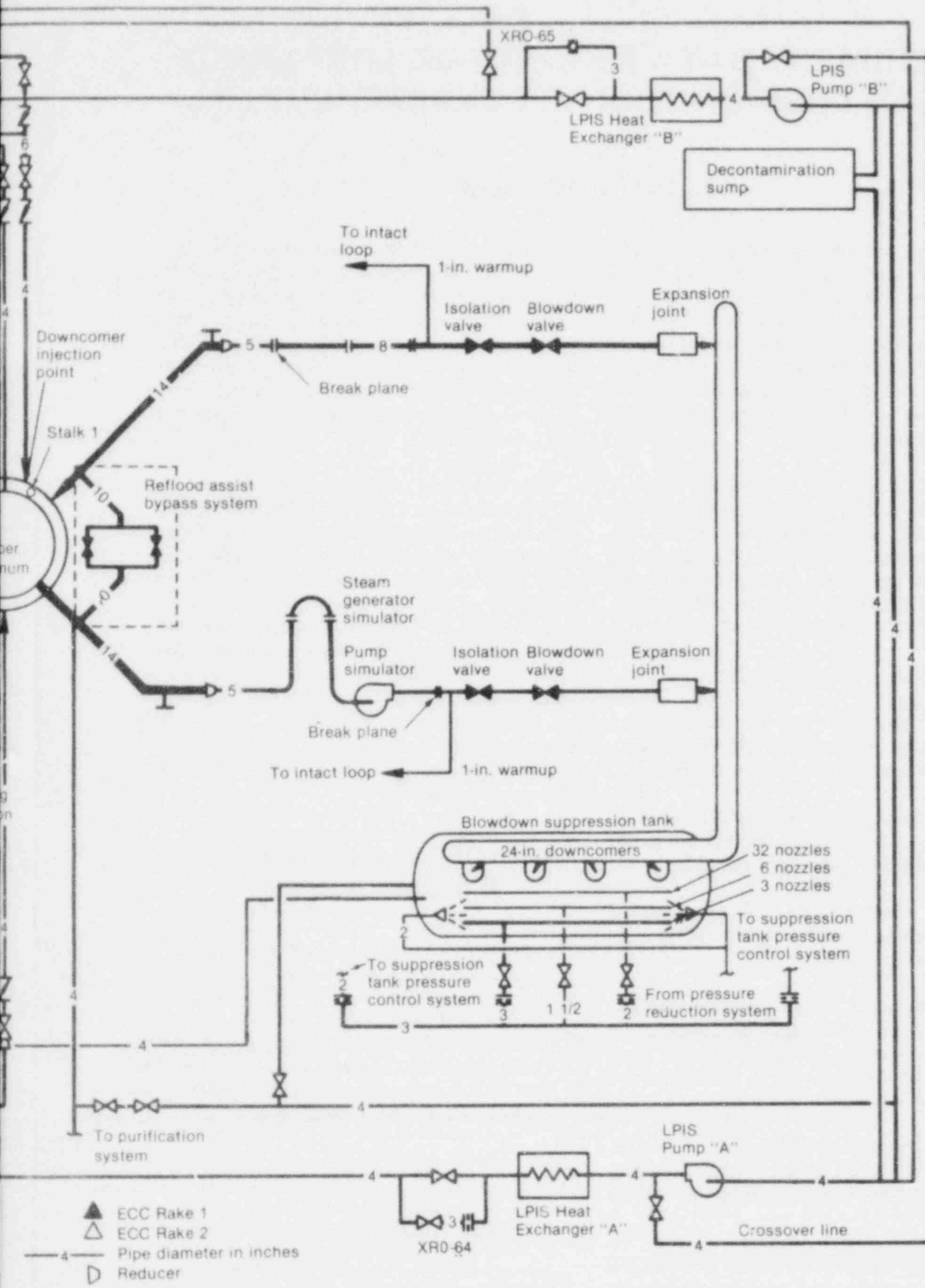
The LOFT integral[a] test facility was designed to simulate the major components of a four-loop, commercial PWR, thereby producing data on the thermal, hydraulic, nuclear, and structural processes expected to occur during a loss-of-coolant accident (LOCA) in a PWR. Reference 1 describes the LOFT facility in detail. The specific objectives of the LOFT Experimental Program are to

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 as distinguished from separate effects, nonnuclear, small-scale, and thermal-hydraulic experiments conducted for loss-of-coolant analysis.



INEL-L2-5-1004

Figure 1-1. LOFT pip



ng schematic.

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 (ESFs) with particular emphasis on emergency core coolant systems (ECCS), and the quantitative margins of safety inherent in the performance of the ESFs

2. Identify and investigate any unexpected event(s) or threshold(s) in the response of either the plant or the ESFs 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 L2-5 Objectives

The programmatic objectives of Experiment L2-5 are to

1. Provide experimental data to demonstrate that Appendix K[2] assumptions result in a conservative prediction of peak clad temperature, even if core hydraulic conditions were to occur in a commercial reactor which precluded the early return to nucleate boiling (rewet)

2. Provide data to confirm that results from early LOFT large break experiments were not being significantly affected by external cladding thermocouples.

To support the programmatic objectives, the specific objectives of Experiment L2-5 are to

1. Determine if early core rewet occurs following a scaled LOFT 200% double-ended cold leg break with immediate primary coolant pump trip

2. Provide data on core thermal response which can be used to evaluate computer code predictions and to compare with acceptance criteria in 10 CFR 50.46[2]

3. Determine system and core response during normal ECC reflood following the double-ended cold leg break transient

4. Evaluate cladding surface thermocouple effects during blowdown and reflood by comparing the responses of LOFT fuel bundle instrumentation.

2. EXPERIMENTAL PROCEDURE AND INITIAL CONDITIONS

This section summarizes the experimental procedure and initial conditions recorded during Experiment L2-5.

2.1 Experimental Procedure

Initial reactor criticality occurred approximately 54 h prior to experiment initiation. The power level reached 36 ± 2 MW at 28 h prior to Experiment L2-5 and was maintained at approximately that level until the experiment began. A plot of the power level versus time for the 60-h period prior to experiment initiation is given in Figure 2-1. These data are an average of the four power-range instruments. Adjustments to these instruments, based on secondary calorimetric calculations, are made as necessary at power levels of approximately 15, 25, and 37.5 MW.

Prior to initiating the experiment, a data acquisition and visual display system (DAVDS)[3] calibration and a data integrity check were performed. During this period, the initial condition water samples were taken from the primary coolant system (PCS), the secondary coolant system (SCS), and the blowdown suppression tank (BST). Just prior to experiment initiation, the purification lines were closed, the BST recirculation pumps were turned on, the broken loop warmup recirculation flow was stopped, and heaters on the broken loop hot leg were turned off. The broken loop isolation valves were opened, and the pressurizer heaters were turned off.

The DAVDS was activated and started recording data ~7 min prior to the experiment. The sequence of events for the experiment is provided in Table 2-1. Figure 2-2 shows the decay heat during the experiment, which was calculated using the American Nuclear Society Standard 5.1.[4]

The experiment was initiated by opening the quick-opening blowdown valves in the broken loop hot and cold legs. The reactor scrammed on low pressure at 0.24 ± 0.01 s. The setpoints for this and other plant trips are presented in Table 2-2. Following the reactor scram, the operators tripped the primary coolant pumps at 0.94 ± 0.01 s. The pumps were not connected to their flywheels during the coastdown.

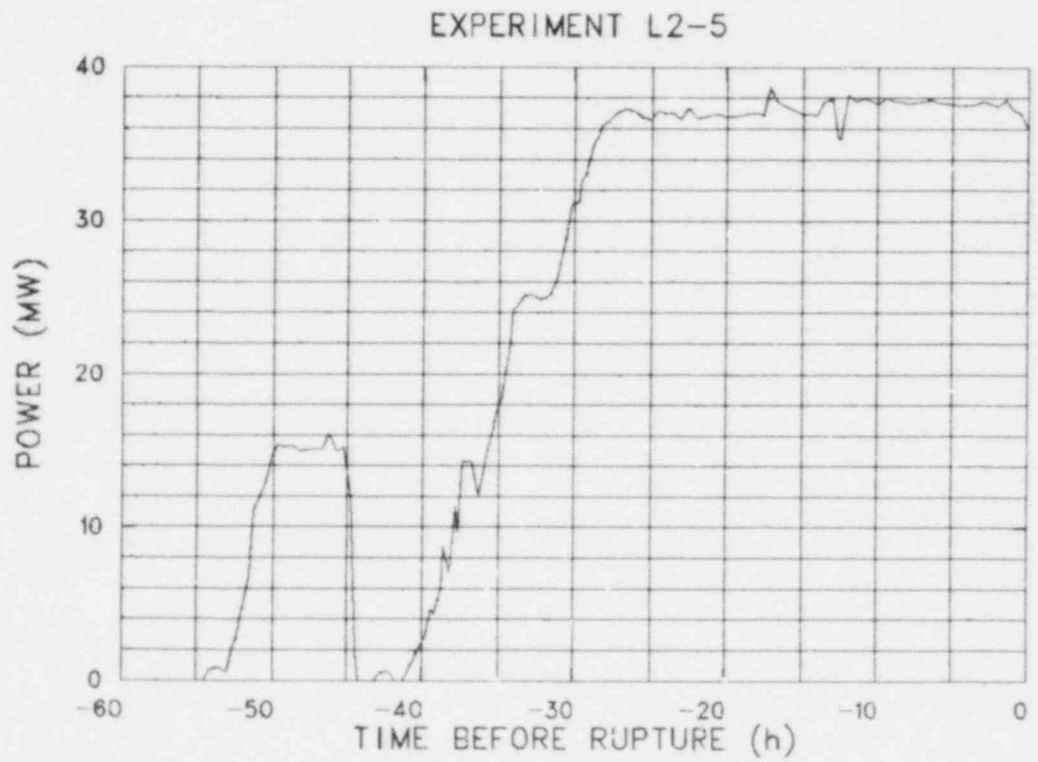


Figure 2-1. LOFT power history prior to Experiment L2-5 initiation.

TABLE 2-1. SEQUENCE OF EVENTS FOR EXPERIMENT L2-5

Event	Time After Experiment Initiation (s)
Experiment L2-5 initiated	0.0
Subcooled blowdown ended	0.043 ± 0.01
Reactor scrammed	0.24 ± 0.01
Cladding temperatures initially deviated from saturation	0.91 ± 0.2
Primary coolant pumps tripped	0.94 ± 0.01
Subcooled break flow ended (cold leg)	3.4 ± 0.5
Partial rewet initiated	12.1 ± 1.0
Pressurizer emptied	15.4 ± 1.0
Accumulator A injection initiated	16.8 ± 0.1
Partial rewet ended	22.7 ± 1.0
HPIS injection initiated	23.90 ± 0.02
Maximum cladding temperature reached	28.47 ± 0.02
LPIS injection initiated	37.32 ± 0.02
Accumulator emptied	49.6 ± 0.1
Core cladding quenched	65 ± 2
BST maximum pressure reached	72.5 ± 1.0
LPIS injection terminated	107.1 ± 0.4[a]

a. The experiment was considered complete by this time.

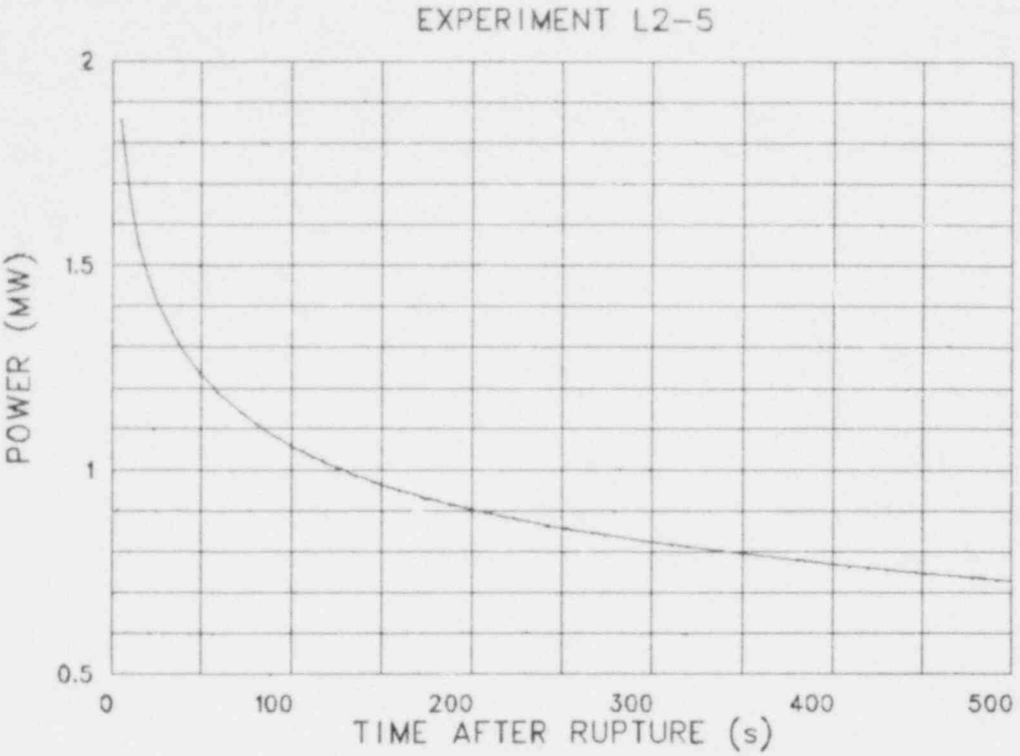


Figure 2-2. LOFT decay heat following Experiment L2-5 initiation.

A rewet of the upper portion of the center fuel assembly began at approximately 12 s and ended at approximately 23 s. Accumulator injection of ECC to the intact loop cold leg began at 16.8 ± 0.1 s. Delayed ECC injection from the HPIS and LPIS began at 23.90 ± 0.02 and 37.32 ± 0.02 s, respectively. The fuel rod peak cladding temperature of 1078 ± 13 K was attained at 28.47 ± 0.02 s. The cladding was quenched at 65 ± 2 s, following the core reflood. The LPIS injection was stopped at 107.1 ± 0.4 s, after the experiment was considered complete.

The BST pressure was automatically controlled by the spray system to simulate the containment back pressure expected during a LOCA in a commercial PWR.

Following Experiment L2-5, an attempt was made to keep the reactor vessel liquid level below the nozzles but above the core. This procedure is being considered for use during the recovery from Experiment L2-6. The liquid level was monitored using upper plenum thermocouples. At approximately 144 s, the HPIS was turned off. The core began to uncover and heat up at approximately 190 s; the upper plenum thermocouples gave no indication of decreasing level. The HPIS and LPIS injections were reinitiated at approximately 274 and 347 s, respectively. The ECC was directed to the lower plenum. The core was completely quenched by 430 s.

The DAVDS recorded approximately 15 min of data after the experiment was initiated. A voltage insertion calibration of the DAVDS was performed following the experiment.

2.2 Initial Conditions

The specified initial plant operating conditions (except for the linear heat generation rate) for Experiment L2-5 are presented in Table 2-3, along with the values measured immediately prior to experiment initiation. Table 2-4 gives the linear heat generation rate versus core height for three locations within the LOFT core prior to experiment initiation. The data for Table 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 experiment initiation.

Table 2-6 specifies the required water chemistry for the PCS, the BST, and the SCS. In addition, the results of the water chemistry analyses are presented for preexperiment conditions in these systems, and for postexperiment conditions in the BST.

TABLE 2-2. PLANT TRIPS FOR EXPERIMENT L2-5

Trip	Setpoint[a]	Measurement Location
Reactor		
Low-pressure scram	14.19 MPa	Intact loop hot leg
Secondary coolant system		
Main steam control valve open	7.12 MPa	Main steam line
Main steam control valve stop opening	6.98 MPa	Main steam line
Main steam control valve close	6.50 MPa	Main steam line
Main steam control valve stop closing	6.57 MPa	Main steam line

a. The trip may vary within the measurement uncertainty of the setpoint, which is typically ±0.21 MPa.

TABLE 2-3. INITIAL CONDITIONS FOR EXPERIMENT L2-5

Parameter	Specified Value	Measured Value
Primary Coolant System		
Mass flow (kg/s)	--	192.4 ± 7.8
Hot leg pressure (MPa)	14.95 ± 0.10	14.94 ± 0.06
Core ΔT (K)	35.8 ± 2.0	33.1 ± 4.3[a]
Cold leg temperature (K)	--	556.6 ± 4.0
Hot leg temperature (K)	592 ± 2	589.7 ± 1.6[a]
Boron concentration (ppm)	--	668 ± 15
Reactor Vessel		
Power level (MW)	37.5 ± 1.0	36.0 ± 1.2[a]
Maximum linear heat generation rate (kW/m)	--	40.1 ± 3.0
Control rod position (above full-in position) (m)	1.372 ± 0.013	1.376 ± 0.010
Pressurizer		
Steam volume (m^3)	--	0.32 ± 0.02
Liquid volume (m^3)	--	0.61 ± 0.02
Liquid temperature (K)	--	615.0 ± 0.3
Liquid level (m)	1.13 ± 0.18	1.14 ± 0.03

TABLE 2-3. (continued)

Parameter	Specified Value	Measured Value
Broken Loop		
Cold leg temperature near reactor vessel (K)	As close as practical to intact loop	554.3 ± 4.2
Hot leg temperature near reactor vessel (K)	As close as practical to intact loop	561.9 ± 4.3
Steam Generator Secondary Side		
Saturation temperature (K)	--	547.1 ± 0.6
Pressure (MPa)	--	5.85 ± 0.06
Mass flow (kg/s)	--	19.1 ± 0.4
Suppression Tank		
Liquid level (m)	1.27 ± 0.127	1.41 ± 0.06[a]
Liquid volume (m^3)	--	33.9 ± 2.1
Gas volume (m^3)	--	51.7 ± 2.1
Liquid temperature (K)	356 ± 5	358.4 ± 3.0
Pressure (gas space)(MPa)	0.08 ± 0.005	0.097 ± 0.007[a]
Accumulator A		
Liquid level (m)	2.045 ± 0.025	2.10 ± 0.01[a]
Liquid volume (m^3)	--	2.92 ± 0.01
Vapor volume (m^3)	--	0.84 ± 0.01
Pressure (MPa)	4.2 ± 0.2	4.29 ± 0.06
Liquid temperature (K)	306 ± 3	303.2 ± 6.1
Boron concentration (ppm)	--	3239 ± 15
Borated Water Storage Tank		
Liquid temperature (K)	303 ± 3	301.7 ± 6.1
Boron concentration (ppm)	--	3232 ± 15

a. Out of specification, but is not believed to significantly affect results.

TABLE 2-4. LINEAR HEAT GENERATION RATE PRIOR TO EXPERIMENT L2-5 (Reading Uncertainty ±7.6%)

Position Height Above Core Bottom (m)	Linear Heat Generation Rate for Core Position (kW/m)		
	1C7	5H8	5M3
0.152	9.78	16.95	16.73
0.292	19.03	32.32	31.91
0.394	20.18	35.01	34.56
0.456	19.41	32.98	32.56
0.503	20.45	34.72	34.28
0.546	22.10	36.00	36.03
0.648	21.78	35.48	35.51
0.749	20.98	33.24	33.67
0.846	18.70	29.61	30.00
0.886	16.90	26.78	27.12
0.953	17.05	26.05	27.36
1.054	15.93	24.15	24.44
1.181	12.84	19.45	19.68
1.257	10.48	15.89	16.07
1.299	8.85	13.41	13.57
1.359	7.61	11.53	11.67
1.511	3.76	6.26	5.88
1.613	1.82	3.37	3.18
1.664	1.34	2.08	1.94

TABLE 2-5. PRIMARY COOLANT TEMPERATURES AT EXPERIMENT L2-5 INITIATION

Location	Measurement Identification	Temperature (K)
Intact loop hot leg (near vessel)	TE-PC-002B	589.5 ± 4.2
Intact loop steam generator outlet	TE-SG-002	555.0 ± 4.0
Intact loop cold leg (near vessel)	TE-PC-005	556.4 ± 4.3
Reactor vessel downcomer (Instrument Stalk 1)	TE-1ST-001	555.0 ± 4.0
Reactor vessel lower plenum	TE-1LP-001	555.7 ± 4.0
Reactor vessel upper plenum	TE-1UP-001	598.8 ± 4.3
	TE-4UP-001	581.5 ± 4.2
	TE-5UP-010	606.5 ± 4.3
Broken loop hot leg (near vessel)	TE-BL-002B	561.9 ± 4.3
Broken loop cold leg (near vessel)	TE-BL-001B	554.3 ± 4.2
Intact loop pressurizer (from saturation pressure)	PE-PC-004	615.6 ± 0.7

TABLE 2-6. WATER CHEMISTRY RESULTS FOR EXPERIMENT L2-5

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	5.83	4.2 to 10.5	4.91	5.01	9.0 to 10.2	10.01
Conductivity (μmho/cm^3) (each at 298 K)	60 maximum	2.71	60 maximum	12.22	9.71	2 maximum[b]	1.3
Total gas (cm^3/kg)	100 maximum	29	--	--	--	--	--
Dissolved oxygen (ppm)	--	--	--	--	--	0.005 maximum	0.004
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	<0.5	1.0 maximum	36.4
Boron (ppm)	--	668	> 3050	3697	3135	--	--
Fluoride (ppm)	0.1 maximum	<0.02	0.1 maximum	<0.02	<0.02	--	--
Hydrogen (cm^3/kg)[c]	10 to 60	16	--	--	--	--	--
Total gross activity (μCi/mL)	375 maximum	0.0055	--	--	--	--	--
Gross beta and gamma (μCi/mL)	--	0.0055	--	--	0.0056	--	--
^{131}I (μCi/mL)	0.37 maximum	0	--	--	0	9×10^{-4} maximum	0
^{135}I (μCi/mL)	0.76 maximum	0	--	--	0	--	--

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

b. Cation conductivity.

c. Prior to depressurization.

3. DATA PRESENTATION

The data presented in this report are selected pertinent and uninterpreted thermal-hydraulic and nuclear data from LOFT Experiment L2-5. The experiment 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. The absence of a comment following the "Qualified" designation indicates that the data are valid (that is, within specified uncertainty bands) over the entire time span recorded. Restrictive statements accompany data that are invalid or questionable over a portion of the recorded time span. All the data presented in this report are "Qualified". The plot captions contain only applicable restrictive statements; if no statement appears, the data are "Qualified". Data that are not presented are available from EG&G Idaho, Inc., upon special request. 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 units. British units and accompanying tick marks are also included. Most of the data were collected at a rate of 50 samples per second. Short-term plots contain 125 or fewer points. Plots of longer time frames were reduced to 2000 or fewer 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 nearly 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. The values B, RD, and RG were 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 were calculated from several measurements and thus do not have a design range.

Table 3-1 lists the Experiment L2-5 measurements that provided the data presented in this report and gives the detector location and the data figure numbers. In addition, this table contains a "Comments" column which gives information pertaining to the qualification of the data. A list of instruments available for Experiment L2-5 is included in Table B-2.

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

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

1. Experiment L2-5 Measured Variables, Short-Term Plots (2 s or less), Figures 3S-1 through 3S-13

2. Experiment L2-5 Measured Variables, Medium-Term Plots (-5 to 30 s), Figures 3M-1 through 3M-100

3. Experiment L2-5 Measured Variables, Long-Term Plots (-20 to 120 s), Figures 3L-1 through 3L-129

4. Experiment L2-5 Computed Variables, Figures 3C-1 through 3C-21

5. Experiment L2-5 Variables with Uncertainty Bands, Figures 3U-1 through 3U-13

6. Post-Experiment L2-5 Measured Variables (150 to 450 s), Figures 3R-1 through 3R-18.

TABLE 3-1. MEASURED VARIABLES FOR EXPERIMENT L2-5

Variable, System, and Detector	Location	Figure Number	Comments
VALVE OPENING			
Secondary Coolant System			
CV-P004-010	Main steam control valve.	3M-1	Qualified.
Broken Loop			
CV-P138-001	Quick-opening blowdown valve (QOBV) in cold leg.	3S-1	Qualified, except for spurious spikes.
CV-P138-015	QOBV in hot leg.	3S-2	Qualified, except for spurious spikes.
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)].	3M-2 3L-1	Qualified.
DE-BL-001B	Cold leg at DTT flange. Beam B is through centerline of pipe 45° from vertical [counterclockwise (CCW) looking toward RV].	3M-3 3L-2 3U-1	Qualified.
DE-BL-001C	Cold leg at DTT flange. Beam C is 22° 7 min from Beam B (CCW looking toward RV).	3M-4 3L-3	Qualified.
DE-BL-002A	Hot leg at DTT flange. Beam A is 14° 21 min from Beam B (CCW looking toward RV).	3M-5 3L-4 3U-2	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
DENSITY (continued)			
Broken Loop (continued)			
DE-BL-002C	Hot leg at DTT flange. Beam C is 22° 7 min from Beam B (CW looking toward RV).	3M-6 3L-5	Qualified, except for spurious spikes.
Intact Loop			
DE-PC-001A	Cold leg at DTT flange. Beam A is 14° 21 min from Beam B (CW looking away from RV).	3M-7 3L-6	Qualified.
DE-PC-001B	Cold leg at DTT flange. Beam B through centerline of pipe 45° from vertical (CCW looking away from RV).	3M-8 3L-7 3U-3	Qualified.
DE-PC-001C	Cold leg at DTT flange. Beam C is 22° 7 min from Beam B (CCW looking away from RV).	3M-9 3L-8	Qualified.
DE-PC-002A	Hot leg at DTT flange. Beam A is 14° 21 min from Beam B (CW looking away from RV).	3M-10 3L-9	Qualified.
DE-PC-002B	Hot leg at DTT flange. Beam B through centerline of pipe 45° from vertical (CCW looking away from RV).	3M-11 3L-10 3U-4	Qualified.
DE-PC-002C	Hot leg at DTT flange. Beam C is 22° 7 min from Beam B (CCW looking away from RV).	3M-12 3L-11	Qualified, except for spurious spikes.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
FUEL ASSEMBLY DISPLACEMENT			
Assembly 5			
DIE-5G13-01	Fuel rod at Row G, Column 13 of Fuel Assembly 5.	3L-12	Qualified, magnitude uncertain.
DIE-5H03-01	Fuel rod at Row H, Column 3 of Fuel Assembly 5.	3L-13	Qualified, magnitude uncertain.
DIE-5I13-01	Fuel rod at Row I, Column 13 of Fuel Assembly 5.	3L-14	Qualified, magnitude uncertain.
DIE-5UP-002	At top center of Fuel Assembly 5.	3L-15	Qualified, magnitude uncertain.
FLUID VELOCITY			
Intact Loop			
FE-PC-001A	Cold leg DTT horizontal flange on west side of pipe.	3M-13 3L-16	Qualified, flow direction not indicated.
FE-PC-001B	Cold leg DTT horizontal flange at center of pipe.	3M-14 3L-17	Qualified, flow direction not indicated.
FE-PC-001C	Cold leg DTT horizontal flange on east side of pipe.	3M-15 3L-18	Qualified, flow direction not indicated.
FE-PC-002A	Hot leg DTT flange at bottom of pipe.	3M-16 3L-19	Qualified, flow direction not indicated.
FE-PC-002B	Hot leg DTT flange at middle of pipe.	3M-17 3L-20	Qualified, flow direction not indicated.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
FLUID VELOCITY (continued)			
Intact Loop (continued)			
FE-PC-002C	Hot leg DTT flange at top of pipe.	3M-18 3L-21	Qualified, flow direction not indicated.
Reactor Vessel			
FE-1ST-001	Downcomer Stalk 1.	3M-19	Qualified, flow direction not indicated.
FE-1ST-002	Downcomer Stalk 1.	3L-22	Qualified, flow direction not indicated, unexplained noise.
FE-5LP-001	Lower end box of Fuel Assembly 5.	3M-20 3L-23	Qualified, flow direction not indicated.
FE-5UP-001	Above upper end box of Fuel Assembly 5.	3M-21 3L-24	Qualified, flow direction not indicated.
FLOW RATE			
Secondary Coolant System			
FT-P004-72-2	Flow out of main feedwater pump.	3M-22	Qualified.
Emergency Core Cooling System			
FT-P120-085	Low-pressure injection system (LPIS) Pump A discharge.	3L-25	Qualified, except for spurious spikes.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
FLOW RATE (continued)			
Emergency Core Cooling System (continued			
FT-P128-104	High-pressure injection system (HPIS) Pump A discharge.	3L-26 3R-2	Qualified.
LIQUID LEVEL			
Emergency Core Cooling System			
LE-ECC-01A	Accumulator A.	3L-27	Qualified.
LIT-P120-044	Accumulator A.	3L-27	Qualified, pressure sensitive after tank emptied.
lowdown Suppression Tank			
LT-P138-033	Blowdown suppression tank (BST) level on north end of tank.	3L-28	Qualified.
LT-P138-058	BST level on south end of tank.	3L-29	Qualified.
MOMENTUM FLUX			
Broken Loop			
ME-BL-001A	Cold leg DTT flange at bottom of pipe, high range.	3M-23 3U-5	Qualified.
ME-BL-001C	Cold leg DTT flange at top of pipe, high range.	3M-24	Qualified.
ME-BL-001D	Cold leg DTT flange at bottom of pipe, low range.	3M-25 3L-30	Qualified, narrow range instrument.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
MOMENTUM FLUX (continued)			
Broken Loop (continued)			
ME-BL-001E	Cold leg DTT flange at middle of pipe, low range.	3M-26 3L-31	Qualified, narrow range instrument.
ME-BL-001F	Cold leg DTT flange at top of pipe, low range.	3M-27 3L-32	Qualified, narrow range instrument.
ME-BL-002A	Hot leg DTT flange at bottom of pipe, high range.	3M-28 3L-33	Qualified.
ME-BL-002B	Hot leg DTT flange at center of pipe, high range.	3M-29 3L-34 3U-6	Qualified.
ME-BL-002C	Hot leg DTT flange at top of pipe, high range.	3M-30 3L-35	Qualified.
ME-BL-002D	Hot leg DTT flange at bottom of pipe, low range.	3L-36	Qualified after 20 s.
ME-BL-002E	Hot leg DTT flange at center of pipe, low range.	3L-37	Qualified after 20 s.
ME-BL-002F	Hot leg DTT flange at top of pipe, low range.	3L-38	Qualified after 20 s.
Intact Loop			
ME-PC-001B	Cold leg horizontal DTT flange at center of pipe.	3M-31 3L-39	Qualified.
ME-PC-001C	Cold leg horizontal DTT flange on east side of pipe.	3M-32 3L-40	Qualified.
ME-PC-002A	Hot leg DTT flange at bottom of pipe.	3M-33 3L-41	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
MOMENTUM FLUX (continued)			
Intact Loop (continued)			
ME-PC-002B	Hot leg DTT flange at middle of pipe.	3M-34 3L-42	Qualified.
Reactor Vessel			
ME-1ST-001	Downcomer Stalk 1, 1.16 m above RV bottom.	3M-35	Qualified.
ME-5LP-002	Fuel Assembly 5, lower end box.	3M-36 3L-43	Qualified.
ME-5UP-001	Fuel Assembly 5 above upper end box.	3M-37 3L-44	Qualified.
NEUTRON DETECTION			
Reactor Vessel			
NE-2H08-26	Neutron detector in Fuel Assembly 2.	3S-3	Qualified, magnitude uncertain.
NE-4H08-26	Neutron detector in Fuel Assembly 4.	3S-3	Qualified, magnitude uncertain.
NE-5D08-11	Neutron detector in Fuel Assembly 5.	3S-4	Qualified, magnitude uncertain.
NE-5D08-27	Neutron detector in Fuel Assembly 5.	3S-3 3S-4	Qualified, magnitude uncertain.
NE-5D08-44	Neutron detector in Fuel Assembly 5.	3S-4	Qualified, magnitude uncertain.
NE-5D08-61	Neutron detector in Fuel Assembly 5.	3S-4	Qualified, magnitude uncertain.
NE-6H08-26	Neutron detector in Fuel Assembly 6.	3S-3	Qualified, magnitude uncertain.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
ELECTRICAL POWER			
Intact Loop			
PCP-1-P	Primary coolant pump (PCP) 1.	3M-38	Qualified.
PCP-2-P	PCP-2.	3M-39	Qualified.
DIFFERENTIAL PRESSURE			
Broken Loop			
PdE-BL-001	Hot leg across 14- to 5-in. contraction.	3L-45	Qualified.
PdE-BL-002	Cold leg across 14- to 5-in. contraction.	3L-46	Qualified.
PdE-BL-003	Cold leg across break plane.	3L-47	Qualified.
PdE-BL-004	Hot leg across break plane.	3L-48	Qualified, no other measurement for direct comparison.
PdE-BL-005	Hot leg across pump simulator.	3L-49	Qualified.
PdE-BL-006	Hot leg across steam generator (SG) simulator outlet flange.	3L-50	Qualified.
PdE-BL-007	Hot leg across SG simulator.	3L-51	Qualified, except for spurious spikes.
PdE-BL-008	Hot leg across SG simulator inlet flange.	3L-52	Qualified.
PdE-BL-009	From 14- to 5-in. contraction to middle of 5-in. pipe.	3L-53	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
DIFFERENTIAL PRESSURE (continued)			
Broken Loop (continued)			
PdE-BL-010	From middle of 5-in. pipe to break plane.	3L-54	Qualified, narrow range instrument, good after 20 s.
PdE-BL-011	Pump simulator outlet to PE-BL-003.	3L-55	Qualified, shares tap with PdE-BL-012, may have common line problems.
PdE-BL-012	From PE-BL-003 to break plane inlet.	3L-56	Qualified, shares tap with PdE-BL-011, may have common line problems.
Intact Loop			
PdE-PC-001	Cold leg across PCPs.	3M-40 3L-57	Qualified.
PdE-PC-002	Across SG.	3M-41 3L-58	Qualified.
PdE-PC-003	Hot leg piping, RV to SG inlet.	3M-42 3L-59	Qualified.
PdE-PC-005	Cold leg piping, PCPs to RV nozzle.	3M-43 3L-60	Qualified.
PdE-PC-006	RV outlet to inlet.	3M-44 3L-61	Qualified.
PdT-P139-030	Across RV just beyond intact loop inlet and outlet nozzles.	3M-45	Qualified, uni-directional instrument.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
PRESSURE			
Broken Loop			
PE-BL-001	Cold leg at DTT flange.	3S-5 3M-46 3L-62	Qualified.
PE-BL-002	Hot leg at DTT flange.	3S-6 3M-47 3L-63	Qualified.
PE-BL-004	Cold leg at inlet of spool piece.	3S-7 3L-62	Qualified.
PE-BL-006	Hot leg at outlet of SG.	3S-8 3L-63	Qualified.
PE-BL-008	Cold leg downstream of break plane.	3S-9 3L-62	Qualified.
Intact Loop			
PE-PC-001	Cold leg at DTT flange.	3S-10 3M-48 3L-64	Qualified.
PE-PC-002	Hot leg at DTT flange.	3S-11 3M-49 3L-65	Qualified.
PE-PC-004	Pressurizer vapor space.	3M-50	Qualified.
PE-PC-005	Reference pressure between SG outlet and PCP inlet.	3M-51	Qualified.
PE-PC-006	Reference pressure between SG outlet and PCP inlet.	3L-66	Qualified.
Secondary Coolant System			
PE-SGS-001	SG dome pressure.	3L-67	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
PRESSURE (continued)			
Blowdown Suppression System			
PE-SV-003	BST across from Downcomer 1 (south end), 157.5° from top vertical (CW looking north).	3L-68	Qualified.
PE-SV-014	BST header above Downcomer 4, 327° from top vertical (CW looking north).	3L-68	Qualified.
PE-SV-018	BST header above Downcomer 1.	3M-52	Qualified.
PE-SV-055	BST bottom under Downcomer 3.	3M-52	Qualified.
PE-SV-060	BST top above Downcomer 1.	3L-68	Qualified.
Reactor Vessel			
PE-1ST-001A	Downcomer Stalk 1, 0.62 m above RV bottom.	3M-53	Qualified.
PE-1ST-003A	Downcomer Stalk 1, 5.32 m above RV bottom.	3L-69	Qualified.
PE-1UP-001A	Above Fuel Assembly 1 upper end box.	3M-54 3U-7	Qualified.
PE-1UP-001A1	Above Fuel Assembly 1 upper end box.	3S-12 3L-70 3R-3	Qualified.
Secondary Coolant System			
PT-P004-010A	In 10-in. line from SG.	3M-55	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
PRESSURE (continued)			
Emergency Core Cooling System			
PT-P120-043	Accumulator A.	3L-71	Qualified, except for spurious spikes.
Intact Loop			
PT-P139-002	Hot leg at venturi on bottom.	3M-56	Qualified, except for spurious spikes, response limited during subcooled blowdown.
PT-P139-003	Hot leg at venturi on left side looking toward SG.	3L-72	Qualified, except for spurious spikes, response limited during subcooled blowdown.
PT-P139-004	Hot leg at venturi on right side looking toward SG.	3L-72	Qualified, except for spurious spikes, response limited during subcooled blowdown.
PT-P139-05-1	Pressurizer, 1.88 m above bottom (vapor space).	3M-50	Qualified.
REACTIVITY			
Reactor Vessel			
RE-T-77-1A2	Power range, Channel A level.	3S-13	Qualified.
RE-T-77-2A2	Power range, Channel B level.	3S-13	Qualified.
RE-T-77-3A2	Power range, Channel C level.	3S-13	Qualified.

TABLE `-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
PUMP SPEED			
Intact Loop			
RPE-PC-001	PCP-1.	3L-73	Qualified.
RPE-PC-002	PCP-2.	3L-73	Qualified.
TEMPERATURE			
Reactor Vessel			
TC-5C07-27	Centerline of Fuel Assembly 5, Row C, Column 7 at 0.69 m above bottom of fuel rod.	3M-57 3L-74 3R-4	Qualified.
TC-5D07-27	Centerline of Fuel Assembly 5, Row D, Column 7 at 0.69 m above bottom of fuel rod.	3M-58 3U-8	Qualified.
TC-5D09-27	Centerline of Fuel Assembly 5, Row D, Column 9 at 0.69 m above bottom of fuel rod.	3M-57 3L-74 3R-4	Qualified.
TC-5D10-27	Centerline of Fuel Assembly 5, Row D, Column 10 at 0.69 m above bottom of fuel rod.	3M-57	Qualified.
Broken Loop			
TE-BL-001A	Cold leg DTT flange at bottom of pipe.	3M-59 3L-75	Qualified, possible hot wall effects.
TE-BL-001B	Cold leg DTT flange at middle of pipe.	3M-59 3L-75	Qualified, possible hot wall effects.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Broken Loop (continued)			
TE-BL-001C	Cold leg DTT flange at top of pipe.	3M-59 3L-75	Qualified, possible hot wall effects.
TE-BL-002B	Hot leg DTT flange at middle of pipe.	3M-60 3L-76	Qualified, possible hot wall effects.
Intact Loop			
TE-PC-001A	Cold leg DTT horizontal flange on west side of pipe.	3M-61 3L-77	Qualified, possible hot wall effects.
TE-PC-001B	Cold leg DTT horizontal flange at center of pipe.	3M-61 3L-77	Qualified, possible hot wall effects.
TE-PC-001C	Cold leg DTT horizontal flange on east side of pipe.	3M-61 3L-77	Qualified, possible hot wall effects.
TE-PC-002A	Hot leg DTT flange at bottom of pipe.	3M-62 3L-78	Qualified, possible hot wall effects.
TE-PC-002B	Hot leg DTT flange at middle of pipe.	3M-62 3L-78	Qualified, possible hot wall effects.
TE-PC-002C	Hot leg DTT flange at top of pipe.	3M-62 3L-78	Qualified, possible hot wall effects.
TE-PC-005	Next to bottom of emergency core coolant (ECC) Rake 1.	3L-79	Qualified, possible hot wall effects.
TE-PC-009	Next to bottom of ECC Rake 2.	3M-63 3L-79	Qualified, possible hot wall effects.
TE-PC-010	Next to top of ECC Rake 2.	3M-63	Qualified, possible hot wall effects.
TE-PC-011	Top of ECC Rake 2.	3M-63	Qualified, possible hot wall effects.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Emergency Core Cooling System			
TE-P120-041	Accumulator A.	3L-80	Qualified.
Intact Loop			
TE-P139-019	Pressurizer vapor space, 0.86 m above heater rods.	3M-64	Qualified, hot wall effects and limited time response.
TE-P139-020	Pressurizer liquid volume, 0.36 m above heater rods.	3M-64	Qualified, hot wall effects and limited time response.
TE-P139-20-1	Pressurizer liquid volume.	3L-81	Qualified, hot wall effects and limited time response.
TE-SG-001	SG inlet plenum.	3M-65	Qualified, possible hot wall effects after 40 s.
TE-SG-001A	SG inlet plenum.	3L-82	Qualified, possible hot wall effects after 40 s.
TE-SG-002	SG outlet plenum.	3M-65	Qualified, possible hot wall effects after 18 s.
TE-SG-002A	SG outlet plenum.	3L-82	Qualified, possible hot wall effects after 18 s.
Secondary Coolant System			
TE-SG-003	SG secondary side downcomer, 0.25 m above top of tube sheet.	3L-83	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Secondary Coolant System (continued)			
TE-SG-005	SG secondary side downcomer, 2.92 m above top of tube sheet.	3L-83	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.	3L-84	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.	3L-84	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.	3L-84	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.	3L-84	Qualified.
TE-SV-006	BST, 0.3 m north of Downcomer 1, 0.53 m east of tank centerline, 0.37 m from tank bottom.	3L-85	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.	3M-66 3L-86	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Blowdown Suppression System (continued)			
TE-SV-008	BST, 0.3 m north of Downcomer 3, 0.53 m east of tank centerline, 2.36 m from tank bottom.	3L-86	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.	3M-66 3L-86	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.	3M-66 3L-86	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.	3M-66 3L-85	Qualified.
Reactor Vessel			
TE-1A11-030	Cladding on Fuel Assembly 1, Row A, Column 11, 0.76 m above bottom of fuel rod.	3M-67	Qualified.
TE-1B10-037	Cladding on Fuel Assembly 1, Row B, Column 10, 0.94 m above bottom of fuel rod.	3L-87	Qualified.
TE-1B11-028	Cladding on Fuel Assembly 1, Row B, Column 11, at 0.71 m above bottom of fuel rod.	3L-87	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-1B11-032	Cladding on Fuel Assembly 1, Row B, Column 11, at 0.81 m above bottom of fuel rod.	3L-87	Qualified.
TE-1B12-026	Cladding on Fuel Assembly 1, Row B, Column 12, 0.66 m above bottom of fuel rod.	3L-87	Qualified.
TE-1C11-021	Cladding on Fuel Assembly 1, Row C, Column 11, 0.53 m above bottom of fuel rod.	3M-67	Qualified.
TE-1C11-039	Cladding on Fuel Assembly 1, Row C, Column 11, 0.99 m above bottom of fuel rod.	3M-67	Qualified.
TE-1F07-015	Fuel Assembly 1, Row F, Column 7, 0.38 m above bottom of fuel rod.	3L-88 3R-5	Qualified.
TE-1F07-021	Fuel Assembly 1, Row F, Column 7, 0.53 m above bottom of fuel rod.	3L-88 3R-5	Qualified.
TE-1F07-026	Fuel Assembly 1, Row F, Column 7, 0.66 m above bottom of fuel rod.	3L-88 3R-5	Qualified.
TE-1F07-030	Fuel Assembly 1, Row F, Column 7, 0.76 m above bottom of fuel rod.	3L-88 3R-5	Qualified.
TE-1LP-001	Fuel Assembly 1, lower end box.	3M-68	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-1LP-002	Fuel Assembly 1, lower end box.	3L-89 3R-6	Qualified.
TE-1ST-001	Downcomer Stalk 1, 4.8 m from RV bottom.	3M-69 3L-90	Qualified.
TE-1ST-002	Downcomer Stalk 1, 4.2 m from RV bottom.	3L-90	Qualified.
TE-1ST-003	Downcomer Stalk 1, 3.59 m from RV bottom.	3L-90	Qualified.
TE-1ST-004	Downcomer Stalk 1, 2.98 m from RV bottom.	3M-69 3L-90	Qualified.
TE-1ST-005	Downcomer Stalk 1, 2.37 m from RV bottom.	3L-91	Qualified.
TE-1ST-006	Downcomer Stalk 1, 1.76 m from RV bottom.	3L-91	Qualified.
TE-1ST-008	Downcomer Stalk 1, 0.74 m from RV bottom.	3L-91	Qualified.
TE-1ST-009	Downcomer Stalk 1, 0.64 m from RV bottom.	3L-92	Qualified.
TE-1ST-010	Downcomer Stalk 1, 0.54 m from RV bottom.	3L-92	Qualified.
TE-1ST-011	Downcomer Stalk 1, 0.44 m from RV bottom.	3M-69	Qualified.
TE-1ST-012	Downcomer Stalk 1, 0.34 m from RV bottom.	3L-92	Qualified.
TE-1ST-013	Downcomer Stalk 1, 0.24 m from RV bottom.	3L-92	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-1ST-014	Downcomer Stalk 1, 1.17 m from RV bottom (inside of DTT).	3L-91	Qualified.
TE-1ST-015	Downcomer Stalk 1, 1 m from RV bottom (inside of DTT).	3M-69	Qualified.
TE-1UP-001	Fuel Assembly 1, upper end box.	3M-70	Qualified.
TE-1UP-002	Fuel Assembly 1, upper end box.	3L-93 3R-7	Qualified.
TE-1UP-006	Fuel Assembly 1, support column.	3L-94	Qualified.
TE-1UP-007	Fuel Assembly 1, support column.	3L-94	Qualified.
TE-2E08-011	Cladding on Fuel Assembly 2, Row E, Column 8 at 0.28 m above bottom of fuel rod.	3M-71	Qualified.
TE-2E08-030	Cladding on Fuel Assembly 2, Row E, Column 8 at 0.76 m above bottom of fuel rod.	3M-71	Qualified.
TE-2E08-045	Cladding on Fuel Assembly 2, Row E, Column 8 at 1.14 m above bottom of fuel rod.	3M-71	Qualified.
TE-2F07-015	Cladding on Fuel Assembly 2, Row F, Column 7 at 0.38 m above bottom of fuel rod.	3M-72	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-2F07-037	Cladding on Fuel Assembly 2, Row F, Column 7 at 0.94 m above bottom of fuel rod.	3M-72	Qualified.
TE-2F08-028	Cladding on Fuel Assembly 2, Row F, Column 8 at 0.71 m above bottom of fuel rod.	3M-72	Qualified.
TE-2F08-032	Cladding on Fuel Assembly 2, Row F, Column 8 at 0.81 m above bottom of fuel rod.	3M-72	Qualified.
TE-2F09-026	Cladding on Fuel Assembly 2, Row F, Column 9 at 0.66 m above bottom of fuel rod.	3M-73	Qualified.
TE-2F09-041	Cladding on Fuel Assembly 2, Row F, Column 9 at 1.04 m above bottom of fuel rod.	3M-73	Qualified.
TE-2G08-021	Cladding on Fuel Assembly 2, Row G, Column 8 at 0.53 m above bottom of fuel rod.	3M-73	Qualified.
TE-2G08-039	Cladding on Fuel Assembly 2, Row G, Column 8 at 0.99 m above bottom of fuel rod.	3M-73	Qualified.
TE-2G14-011	Cladding on Fuel Assembly 2, Row G, Column 14 at 0.28 m above bottom of fuel rod.	3L-95 3R-8	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
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.	3L-95 3R-8	Qualified.
TE-2G14-045	Cladding on Fuel Assembly 2, Row G, Column 14 at 1.14 m above bottom of fuel rod.	3L-95 3R-8	Qualified.
TE-2H02-028	Cladding on Fuel Assembly 2, Row H, Column 2 at 0.71 m above bottom of fuel rod.	3M-74 3L-96	Qualified.
TE-2H08-039	Guide tube for fuel Assembly 2, Row H, Column 8 at 0.99 m above bottom of guide tube.	3M-75 3L-97	Qualified.
TE-2H13-021	Cladding on Fuel Assembly 2, Row H, Column 13 at 0.53 m above bottom of fuel rod.	3L-98	Qualified.
TE-2H13-049	Cladding on Fuel Assembly 2, Row H, Column 13 at 1.24 m above bottom of fuel rod.	3L-98	Qualified.
TE-2H14-028	Cladding on Fuel Assembly 2, Row H, Column 14 at 0.71 m above bottom of fuel rod.	3L-98	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-2H14-032	Cladding on Fuel Assembly 2, Row H, Column 14 at 0.81 m above bottom of fuel rod.	3L-98	Qualified.
TE-2H15-026	Cladding on Fuel Assembly 2, Row H, Column 15 at 0.66 m above bottom of fuel rod.	3L-99	Qualified.
TE-2H15-041	Cladding on Fuel Assembly 2, Row H, Column 15 at 1.04 m above bottom of fuel rod.	3L-99	Qualified.
TE-2I14-021	Cladding on Fuel Assembly 2, Row I, Column 14 at 0.53 m above bottom of fuel rod.	3L-99	Qualified.
TE-2I14-039	Cladding on Fuel Assembly 2, Row I, Column 14 at 0.99 m above bottom of fuel rod.	3L-99	Qualified.
TE-2LP-001	Fuel Assembly 2, lower end box.	3M-68	Qualified.
TE-2UP-001	Fuel Assembly 2, upper end box.	3M-70	Qualified.
TE-2UP-002	Fuel Assembly 2, upper end box.	3L-93 3R-7	Qualified.
TE-2UP-004	Fuel Assembly 2, support column.	3L-100	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-2UP-005	Fuel Assembly 2, support column.	3L-100	Qualified.
TE-3A11-030	Cladding on Fuel Assembly 3, Row A, Column 11 at 0.76 m above bottom of fuel rod.	3L-101 3R-9	Qualified.
TE-3B10-037	Cladding on Fuel Assembly 3, Row B, Column 10 at 0.94 m above bottom of fuel rod.	3M-76	Qualified.
TE-3B11-028	Cladding on Fuel Assembly 3, Row B, Column 11 at 0.71 m above bottom of fuel rod.	3M-74 3M-76 3L-96	Qualified.
TE-3B11-032	Cladding on Fuel Assembly 3, Row B, Column 11 at 0.81 m above bottom of fuel rod.	3M-76	Qualified.
TE-3B12-026	Cladding on Fuel Assembly 3, Row B, Column 12 at 0.66 m above bottom of fuel rod.	3M-76	Qualified.
TE-3C11-021	Cladding on Fuel Assembly 3, Row C, Column 11 at 0.53 m above bottom of fuel rod.	3L-101 3R-9	Qualified.
TE-3C11-039	Cladding on Fuel Assembly 3, Row C, Column 11 at 0.99 m above bottom of fuel rod.	3L-101 3R-9	Qualified.
TE-3F07-015	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.38 m above bottom of fuel rod.	3M-77	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-3F07-021	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.53 m above bottom of fuel rod.	3M-77	Qualified.
TE-3F07-026	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.66 m above bottom of fuel rod.	3M-77	Qualified.
TE-3F07-030	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.76 m above bottom of fuel rod.	3M-77	Qualified.
TE-3LP-001	Fuel Assembly 3, lower end box.	3L-102	Qualified.
TE-3LP-002	Fuel Assembly 3, lower end box.	3L-102	Qualified.
TE-3UP-001	Fuel Assembly 3, upper end box.	3M-70	Qualified.
TE-3UP-008	Liquid level transducer above Fuel Assembly 3.	3L-103	Qualified.
TE-3UP-010	Liquid level transducer above Fuel Assembly 3.	3L-103	Qualified.
TE-3UP-011	Liquid level transducer above Fuel Assembly 3.	3L-103	Qualified.
TE-3UP-012	Liquid level transducer above Fuel Assembly 3.	3L-103	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
<u>Reactor Vessel (continued)</u>			
TE-3UP-013	Liquid level transducer above Fuel Assembly 3.	3L-104	Qualified.
TE-3UP-014	Liquid level transducer above Fuel Assembly 3.	3L-104	Qualified.
TE-3UP-015	Liquid level transducer above Fuel Assembly 3.	3L-104	Qualified.
TE-3UP-016	Liquid level transducer above Fuel Assembly 3.	3L-104	Qualified.
TE-4E08-011	Cladding on Fuel Assembly 4, Row E, Column 8 at 0.28 m above bottom of fuel rod.	3L-105 3R-10	Qualified.
TE-4E08-030	Cladding on Fuel Assembly 4, Row E, Column 8 at 0.76 m above bottom of fuel rod.	3L-105 3R-10	Qualified.
TE-4E08-045	Cladding on Fuel Assembly 4, Row E, Column 8 at 1.14 m above bottom of fuel rod.	3L-105 3R-10	Qualified.
TE-4F07-015	Cladding on Fuel Assembly 4, Row F, Column 7 at 0.38 m above bottom of fuel rod.	3L-106	Qualified.
TE-4F07-037	Cladding on Fuel Assembly 4, Row F, Column 7 at 0.94 m above bottom of fuel rod.	3L-106	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-4F08-028	Cladding on Fuel Assembly 4, Row F, Column 8 at 0.71 m above bottom of fuel rod.	3L-106	Qualified.
TE-4F08-032	Cladding on Fuel Assembly 4, Row F, Column 8 at 0.81 m above bottom of fuel rod.	3L-106	Qualified.
TE-4F09-026	Cladding on Fuel Assembly 4, Row F, Column 9 at 0.66 m above bottom of fuel rod.	3L-107	Qualified.
TE-4F09-041	Cladding on Fuel Assembly 4, Row F, Column 9 at 1.04 m above bottom of fuel rod.	3L-107	Qualified.
TE-4G02-030	Cladding on Fuel Assembly 4, Row G, Column 2 at 0.76 m above bottom of fuel rod.	3M-78	Qualified.
TE-4G08-021	Cladding on Fuel Assembly 4, Row G, Column 8 at 0.53 m above bottom of fuel rod.	3L-107	Qualified.
TE-4G08-039	Cladding on Fuel Assembly 4, Row G, Column 8 at 0.99 m above bottom of fuel rod.	3L-107	Qualified.
TE-4H01-037	Cladding on Fuel Assembly 4, Row H, Column 1 at 0.94 m above bottom of fuel rod.	3M-78	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-4H02-028	Cladding on Fuel Assembly 4, Row H, Column 2 at 0.71 m above bottom of fuel rod.	3M-78	Qualified.
TE-4H02-032	Cladding on Fuel Assembly 4, Row H, Column 2 at 0.81 m above bottom of fuel rod.	3M-78	Qualified.
TE-4H03-026	Cladding on Fuel Assembly 4, Row H, Column 3 at 0.66 m above bottom of fuel rod.	3M-79	Qualified.
TE-4H14-028	Cladding on Fuel Assembly 4, Row H, Column 14 at 0.71 m above bottom of fuel rod.	3M-74 3L-96	Qualified.
TE-4I02-021	Cladding on Fuel Assembly 4, Row I, Column 2 at 0.53 m above bottom of fuel rod.	3M-79	Qualified.
TE-4I02-039	Cladding on Fuel Assembly 4, Row I, Column 2 at 0.99 m above bottom of fuel rod.	3M-79	Qualified.
TE-4LP-001	Fuel Assembly 4, lower end box.	3M-80	Qualified.
TE-4LP-003	Fuel Assembly 4, lower end box.	3M-80	Qualified.
TE-4UP-001	Fuel Assembly 4, upper end box.	3M-70	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-4UP-002	Fuel Assembly 4, upper end box.	3L-93 3R-7	Qualified.
TE-4UP-004	Fuel Assembly 4, support column.	3L-108	Qualified.
TE-4UP-005	Fuel Assembly 4, support column.	3L-108	Qualified.
TE-5C06-024	Guide tube for Fuel Assembly 5, Row C, Column 6 at 0.61 m above bottom of guide tube.	3M-81 3L-109	Qualified.
TE-5C07-027	Cladding on Fuel Assembly 5, Row C, Column 7 at 0.69 m above bottom of fuel rod.	3M-82	Qualified.
TE-5C07-031	Cladding on Fuel Assembly 5, Row C, Column 7 at 0.79 m above bottom of fuel rod.	3M-82	Qualified.
TE-5C07-43.8	Cladding on Fuel Assembly 5, Row C, Column 7 at 1.11 m above bottom of fuel rod.	3M-82	Qualified.
TE-5D06-027	Cladding on Fuel Assembly 5, Row D, Column 6 at 0.69 m above bottom of fuel rod.	3L-110	Qualified.
TE-5D06-031	Cladding on Fuel Assembly 5, Row D, Column 6 at 0.79 m above bottom of fuel rod.	3L-110	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-5D06-43.8	Cladding on Fuel Assembly 5, Row D, Column 6 at 1.11 m above bottom of fuel rod.	3L-110	Qualified.
TE-5D07-027	Cladding on Fuel Assembly 5, Row D, Column 7 at 0.69 m above bottom of fuel rod.	3M-58 3M-83	Qualified.
TE-5D07-031	Cladding on Fuel Assembly 5, Row D, Column 7 at 0.79 m above bottom of fuel rod.	3M-83	Qualified.
TE-5D07-43.8	Cladding on Fuel Assembly 5, Row D, Column 7 at 1.11 m above bottom of fuel rod.	3M-83	Qualified.
TE-5F03-024	Guide tube for Fuel Assembly 5, Row F, Column 3 at 0.61 m above bottom of guide tube.	3M-81 3L-109	Qualified.
TE-5F04-015	Cladding on Fuel Assembly 5, Row F, Column 4 at 0.38 m above bottom of fuel rod.	3M-84	Qualified.
TE-5F04-026	Cladding on Fuel Assembly 5, Row F, Column 4 at 0.65 m above bottom of fuel rod.	3M-84	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-5F04-032	Cladding on Fuel Assembly 5, Row F, Column 4 at 0.81 m above bottom of fuel rod.	3M-84	Qualified.
TE-5F04-062	Cladding on Fuel Assembly 5, Row F, Column 4 at 1.57 m above bottom of fuel rod.	3M-84	Qualified.
TE-5F08-026	Cladding on Fuel Assembly 5, Row F, Column 8 at 0.66 m above bottom of fuel rod.	3M-85 3L-111 3U-9 3R-11	Qualified.
TE-5G06-011	Cladding on Fuel Assembly 5, Row G, Column 6 at 0.28 m above bottom of fuel rod.	3M-86 3L-112 3R-12	Qualified.
TE-5G06-030	Cladding on Fuel Assembly 5, Row G, Column 6 at 0.76 m above bottom of fuel rod.	3M-86 3L-112 3R-12	Qualified.
TE-5G06-045	Cladding on Fuel Assembly 5, Row G, Column 6 at 1.14 m above bottom of fuel rod.	3M-86 3L-112 3R-12	Qualified.
TE-5G06-062	Cladding on Fuel Assembly 5, Row G, Column 6 at 1.57 m above bottom of fuel rod.	3M-86 3L-112 3U-10 3R-12	Qualified.
TE-5H05-002	Cladding on Fuel Assembly 5, Row H, Column 5 at 0.05 m above bottom of fuel rod.	3M-87 3L-113 3R-13	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-5H05-015	Cladding on Fuel Assembly 5, Row H, Column 5 at 0.38 m above bottom of fuel rod.	3M-87 3L-113 3R-13	Qualified.
TE-5H05-049	Cladding on Fuel Assembly 5, Row H, Column 5 at 1.24 m above bottom of fuel rod.	3M-87 3L-113 3R-13	Qualified.
TE-5H06-024	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.61 m above bottom of fuel rod.	3M-88 3L-114 3R-14	Qualified.
TE-5H06-028	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.71 m above bottom of fuel rod.	3M-74 3M-88 3L-96 3L-114 3R-14	Qualified.
TE-5H06-032	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.81 m above bottom of fuel rod.	3M-88 3L-114 3U-11 3R-14	Qualified.
TE-5H06-037	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.94 m above bottom of fuel rod.	3M-88 3L-114 3R-14	Qualified.
TE-5H07-008	Cladding on Fuel Assembly 5, Row H, Column 7 at 0.20 m above bottom of fuel rod.	3M-89 3L-115	Qualified.
TE-5H07-026	Cladding on Fuel Assembly 5, Row H, Column 7 at 0.66 m above bottom of fuel rod.	3M-89 3L-115	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-5H07-041	Cladding on Fuel Assembly 5, Row H, Column 7 at 1.04 m above bottom of fuel rod.	3M-89 3L-115	Qualified.
TE-5H07-058	Cladding on Fuel Assembly 5, Row H, Column 7 at 1.47 m above bottom of fuel rod.	3M-89 3L-115	Qualified.
TE-5I04-027	Cladding on Fuel Assembly 5, Row I, Column 4 at 0.69 m above bottom of fuel rod.	3L-116	Qualified.
TE-5I04-43.8	Cladding on Fuel Assembly 5, Row I, Column 4 at 1.11 m above bottom of fuel rod.	3L-116	Qualified.
TE-5I06-005	Cladding on Fuel Assembly 5, Row I, Column 6 at 0.13 m above bottom of fuel rod.	3M-90 3L-117 3U-12	Qualified.
TE-5I06-021	Cladding on Fuel Assembly 5, Row I, Column 6 at 0.53 m above bottom of fuel rod.	3M-90 3L-117	Qualified.
TE-5I06-039	Cladding on Fuel Assembly 5, Row I, Column 6 at 0.99 m above bottom of fuel rod.	3M-90 3L-117	Qualified.
TE-5I06-054	Cladding on Fuel Assembly 5, Row I, Column 6 at 1.37 m above bottom of fuel rod.	3M-90 3L-117	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-5J03-024	Guide tube for Fuel Assembly 5, Row J, Column 3 at 0.61 m above bottom of guide tube.	3M-81 3L-109	Qualified.
TE-5J04-005	Cladding on Fuel Assembly 5, Row J, Column 4 at 0.13 m above bottom of fuel rod.	3L-118	Qualified.
TE-5J04-021	Cladding on Fuel Assembly 5, Row J, Column 4 at 0.53 m above bottom of fuel rod.	3L-118	Qualified.
TE-5J04-039	Cladding on Fuel Assembly 5, Row J, Column 4 at 0.99 m above bottom of fuel rod.	3L-118	Qualified.
TE-5J04-054	Cladding on Fuel Assembly 5, Row J, Column 4 at 1.37 m above bottom of fuel rod.	3L-118	Qualified.
TE-5J08-026	Cladding on Fuel Assembly 5, Row J, Column 8 at 0.66 m above bottom of fuel rod.	3M-91 3L-119	Qualified.
TE-5LP-001	Fuel Assembly 5, lower end box.	3M-68	Qualified.
TE-5LP-002	Fuel Assembly 5, lower end box.	3L-89 3R-6	Qualified.
TE-5L06-026	Cladding on Fuel Assembly 5, Row L, Column 6 at 0.66 m above bottom of fuel rod.	3L-120	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-5L07-43.8	Cladding on Fuel Assembly 5, Row L, Column 7 at 1.11 m above bottom of fuel rod.	3L-120	Qualified.
TE-5L08-011	Guide tube for Fuel Assembly 5, Row L, Column 8 at 0.28 m above bottom of guide tube.	3M-92 3L-121 3R-15	Qualified.
TE-5L08-024	Guide tube for Fuel Assembly 5, Row L, Column 8 at 0.61 m above bottom of guide tube.	3M-92 3L-121 3R-15	Qualified.
TE-5L08-039	Guide tube for Fuel Assembly 5, Row L, Column 8 at 0.99 m above bottom of guide tube.	3M-92 3L-121 3R-15	Qualified.
TE-5L08-045	Guide tube for Fuel Assembly 5, Row L, Column 8 at 1.14 m above bottom of guide tube.	3M-92 3L-121 3R-15	Qualified.
TE-5M06-024	Guide tube for Fuel Assembly 5, Row M, Column 6 at 0.61 m above bottom of guide tube.	3M-81 3L-109	Qualified.
TE-5M07-015	Cladding on Fuel Assembly 5, Row M, Column 7 at 0.38 m above bottom of fuel rod.	3M-93	Qualified.
TE-5M07-026	Cladding on Fuel Assembly 5, Row M, Column 7 at 0.66 m above bottom of fuel rod.	3M-93	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-5M07-032	Cladding on Fuel Assembly 5, Row M, Column 7 at 0.81 m above bottom of fuel rod.	3M-93	Qualified.
TE-5M07-062	Cladding on Fuel Assembly 5, Row M, Column 7 at 1.57 m above bottom of fuel rod.	3M-93	Qualified.
TE-5UP-003	Fuel Assembly 5, upper end box.	3I-122	Qualified.
TE-5UP-004	Fuel Assembly 5, upper end box.	3L-122 3R-16	Qualified.
TE-5UP-010	Fuel Assembly 5, upper end box.	3L-122 3R-16	Qualified.
TE-5UP-011	Fuel Assembly 5, upper end box.	3L-122 3R-16	Qualified.
TE-5UP-013	Fuel Assembly 5, upper end box.	3M-94	Qualified.
TE-5UP-014	Fuel Assembly 5, upper end box.	3M-94	Qualified.
TE-5UP-015	Fuel Assembly 5, upper end box.	3M-94	Qualified.
TE-5UP-016	Fuel Assembly 5, upper end box.	3M-94	Qualified.
TE-6G02-030	Cladding on Fuel Assembly 6, Row G, Column 2 at 0.76 m above bottom of fuel rod.	3L-123	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
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.	3M-95	Qualified, except for spurious spikes.
TE-6G14-030	Cladding on Fuel Assembly 6, Row G, Column 14 at 0.76 m above bottom of fuel rod.	3M-95	Qualified.
TE-6G14-045	Cladding on Fuel Assembly 6, Row G, Column 14 at 1.14 m above bottom of fuel rod.	3M-95	Qualified.
TE-6H01-037	Cladding on Fuel Assembly 6, Row H, Column 1 at 0.94 m above bottom of fuel rod.	3L-123	Qualified.
TE-6H02-028	Cladding on Fuel Assembly 6, Row H, Column 2 at 0.71 m above bottom of fuel rod.	3L-123	Qualified.
TE-6H02-032	Cladding on Fuel Assembly 6, Row H, Column 2 at 0.81 m above bottom of fuel rod.	3L-123	Qualified.
TE-6H03-026	Cladding on Fuel Assembly 6, Row H, Column 3 at 0.66 m above bottom of fuel rod.	3L-124 3R-17	Qualified.
TE-6H13-015	Cladding on Fuel Assembly 6, Row H, Column 13 at 0.38 m above bottom of fuel rod.	3M-96	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-6H13-037	Cladding on Fuel Assembly 6, Row H, Column 13 at 0.94 m above bottom of fuel rod.	3M-96	Qualified.
TE-6H14-028	Cladding on Fuel Assembly 6, Row H, Column 14 at 0.71 m above bottom of fuel rod.	3M-96	Qualified.
TE-6H14-032	Cladding on Fuel Assembly 6, Row H, Column 14 at 0.81 m above bottom of fuel rod.	3M-96	Qualified.
TE-6H15-026	Cladding on Fuel Assembly 6, Row H, Column 15 at 0.66 m above bottom of fuel rod.	3M-97	Qualified.
TE-6H15-041	Cladding on Fuel Assembly 6, Row H, Column 15 at 1.04 m above bottom of fuel rod.	3M-97	Qualified.
TE-6I02-021	Cladding on Fuel Assembly 6, Row I, Column 2 at 0.53 m above bottom of fuel rod.	3L-124 3R-17	Qualified.
TE-6I02-039	Cladding on Fuel Assembly 6, Row I, Column 2 at 0.99 m above bottom of fuel rod.	3L-124 3R-17	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TE-6I14-021	Cladding on Fuel Assembly 6, Row I, Column 14 at 0.53 m above bottom of fuel rod.	3M-97	Qualified.
TE-6I14-039	Cladding on Fuel Assembly 6, Row I, Column 14 at 0.99 m above bottom of fuel rod.	3M-97	Qualified.
TE-6LP-001	Fuel Assembly 6, lower end box.	3L-125	Qualified.
TE-6LP-002	Fuel Assembly 6, lower end box.	3L-89 3R-6	Qualified.
TE-6LP-003	Fuel Assembly 6, lower end box.	3L-125	Qualified.
TE-6UP-001	Fuel Assembly 6, upper end box.	3M-98	Qualified.
TE-6UP-002	Fuel Assembly 6, upper end box.	3M-98	Qualified.
TE-6UP-003	Fuel Assembly 6, upper end box.	3M-98	Qualified.
TE-6UP-004	Fuel Assembly 6, support column.	3L-126	Qualified.
TE-6UP-005	Fuel Assembly 6, support column.	3L-126	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TF-5F08-26	Pellet at Fuel Assembly 5, Row F, Column 8 at 0.66 m above bottom of fuel rod.	3M-85 3M-99 3L-111 3U-13 3R-11	Qualified.
TF-5F12-26	Pellet at Fuel Assembly 5, Row F, Column 12 at 0.66 m above bottom of fuel rod.	3M-99 3L-127	Qualified.
TF-5H10-26	Pellet at Fuel Assembly 5, Row H, Column 10 at 0.66 m above bottom of fuel rod.	3M-99 3L-127	Qualified.
TF-5I10-26	Pellet at Fuel Assembly 5, Row I, Column 10 at 0.66 m above bottom of fuel rod.	3M-99 3L-127	Qualified.
TF-5J08-26	Pellet at Fuel Assembly 5, Row J, Column 8 at 0.66 m above bottom of fuel rod.	3M-91 3L-119 3L-127	Qualified.
TP-5C09	Plenum of fuel rod at Row C, Column 9 of Fuel Assembly 5.	3M-100	Qualified.
TP-5F09	Plenum of fuel rod at Row F, Column 9 of Fuel Assembly 5.	3M-100	Qualified.
TP-5H02	Plenum of fuel rod at Row H, Column 2 of Fuel Assembly 5.	3M-100	Qualified.

TABLE 3-1. (continued)

Variable, System, and Detector	Location	Figure Number	Comments
TEMPERATURE (continued)			
Reactor Vessel (continued)			
TP-5I04	Plenum of fuel rod at Row I, Column 4 of Fuel Assembly 5.	3M-100 3L-128 3R-18	Qualified.
TP-5I14	Plenum of fuel rod at Row I, Column 14 of Fuel Assembly 5.	3L-128 3R-18	Qualified.
TP-5J09	Plenum of fuel rod at Row J, Column 9 of Fuel Assembly 5.	3L-128 3R-18	Qualified.
TP-5L07	Plenum of fuel rod at Row L, Column 7 of Fuel Assembly 5.	3L-129	Qualified.
TP-5L09	Plenum of fuel rod at Row L, Column 9 of Fuel Assembly 5.	3L-129	Qualified.
TP-5M09	Plenum of fuel rod at Row M, Column 9 of Fuel Assembly 5.	3L-129	Qualified.

TABLE 3-2. COMPUTED VARIABLES FOR EXPERIMENT L2-5

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments
DENSITY, AVERAGE			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					
DE-BL-1A (ρ_A), DE-BL-1B (ρ_B), DE-BL-1C (ρ_C) } DE-BL-105	Mg/m^3	±0.10	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.	3C-1 3C-9	Qualified, except for spurious spikes.
Intact Loop Cold Leg			2. The least squares curve fits are compared to determine the optimum assumed density profile to fit the data.		
DE-PC-1A (ρ_A), DE-PC-1B (ρ_B), DE-PC-1C (ρ_C) } DE-PC-105	Mg/m^3	±0.10	3. The best profile is area averaged to give average density by	3C-2 3C-10	Qualified, except for spurious spikes.
Intact Loop Hot Leg			$\bar{\rho} = 1/A \int \rho(r) dA$ where		
DE-PC-2A (ρ_A), DE-PC-2B (ρ_B), DE-PC-2C (ρ_C) } DE-PC-205	Mg/m^3	±0.10	A = cross-sectional area of the pipe $\rho(r)$ = chordal profile.	3C-3 3C-11	Qualified.

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 beam lines A, B, and C.

2. For tilted stratified flow,

$$\rho(\bar{r}) = \rho_1 - \frac{\rho_1 - \rho_g}{1 + \exp[-4a(x - b)]}$$

where

a and b = two adjustable parameters

ρ_g and ρ_1 = gas and liquid densities

x = position in maximum density gradient direction.

TABLE 3-2. (continued)

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments
DENSITY, AVERAGE (continued)			3. For annular distribution, $\bar{\rho}(r) = \rho_c$ for $r < R - D$ ρ_1 for $r > R - D$ where R = pipe radius ρ_1 = 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. 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: $\bar{\rho} = 0.34485\ \rho_A + 0.40034\ \rho_B + 0.25481\ \rho_C$.		
LIQUID LEVEL					
Pressurizer					
PdT-P139-7, FE-PC-4, TE-P139-19, TE-P139-20 } LEPdT-P139-7	m	±0.06	Liquid level was calculated from the pressure balance for the dP cell: $\Delta P = \rho_R\ gH - \rho_o\ gL - \rho_v\ (S - L)$ where ΔP = the differential pressure measured (Pa) ρ_R = the liquid density in the reference leg ($988\ kg/m^3$)	3C-8	Qualified to 20 s.

TABLE 3-2. (continued)

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments
LIQUID LEVEL (continued)			g = the gravitational acceleration of 9.8 m/s^2		
			H = the liquid height of the reference leg (1.79 m) (leg is assumed to be full)		
			ρ_a = the liquid density in the pipe or vessel (kg/m^3)		
			ρ_v = the vapor density in the pipe or vessel		
			L = the liquid level to be calculated (m).		
			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_a value.		
			Using the system pressure, again the steam tables were consulted to get the ρ_v value.		
Downcomer and Lower Plenum			The individual conductivity probes are designed to output increasing voltage with increasing fluid void fraction.		
LE-1ST-1 and -2	cm	--[a]	The bubble plot symbols correspond to the following probe output voltage ranges:	3C-16	Qualified.
Core			Symbol: Voltage Range		
LE-3F10	cm	--[a]	(x): 0-2	3C-17	Qualified.
LE-5K11	cm	--[a]	(o): 2-8	3C-19	Qualified.
			( ): 8-10		
Upper Plenum					
LE-3UP-1	cm	--[a]	The levels are measured from the bottom of the reactor vessel.	3C-18	Qualified.
			Because the plots cover a long time period, short-term phenomena tend to be obscured.		
DENSITY COMPENSATED LIQUID LEVEL			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:		

TABLE 3-2. (continued)

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments
DENSITY COMPENSATED LIQUID LEVEL (continued)			$\Delta P = \rho_R gH - \rho_{ls} gl - \rho_{vs} g (H - l + C)$ where ΔP = the differential pressure measured (Pa) ρ_R = the liquid density in the reference leg (kg/m^3) g = the gravitational acceleration of 9.8 m/s^2 H = the liquid height of the reference leg (4.15 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) C = height from lower tap to zero level point (2.71 m). The actual liquid level was calculated by rearranging the above equation and substituting in the ΔP and liquid and vapor densities: $L = (\Delta P + \rho_v gH - \rho_R gH)/(\rho_{vg} - \rho_{lg}) - C$ where ρ_l = actual liquid density (kg/m^3) ρ_v = actual vapor density (kg/m^3) L = actual liquid level (m). Actual densities were obtained from saturated steam tables using a pressure measurement in the pressurizer and steam generator and a temperature measurement in the blowdown suppression tank.		
Blowdown Suppression Tank					
LT-P138-33, PE-SV-17 } LTD-P138-33	m	±0.06		3C-20	Qualified.
LT-P138-58, PE-SV-17 } LTD-P138-58	m	±0.06		3C-20	Qualified.

TABLE 3-2. (continued)

Variable, Location, and Detector		Units	Uncertainty	Calculation Method	Figure	Comments
FLUID SUBCOOLING Upper Plenum TE-5UP-3 TE-5UP-4 TE-5UP-9 TE-5UP-10 TE-5UP-11 TE-5UP-13 TE-5UP-14 TE-5UP-15 PE-1UP-1A PE-1UP-1A1	SC-5UP-202	K	±6	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: 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 ≤ P ≤ 12 MPa, $T_{sat} = 419.024 + 42.6705P - 5.63957P^2 + 0.433108P^3 - 0.0130329P^4$ 3. For P > 12 MPa, $T_{sat} = 580.252 + 8.84806P - 0.114572P^2$. The measured temperature is an average of the eight listed temperature measurements.	3C-21	Qualified, suspected hot wall effects after 200 s.
MASS FLOW RATE Broken Loop Cold Leg DE-BL-001A DE-BL-001B DE-BL-001C ME-BL-001A ME-BL-001C ME-BL-001D ME-BL-001E ME-BL-001F	FR-BL-001	kg/s	±62 for t < 5 s ±28 for t ≥ 5 s	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: $\text{Mass flow} = \int_0^A [\rho \times \rho V^2]^{1/2} \, dA$ where ρ = local fluid density (kg/m^3) ρV^2 = local momentum flux (kg/m/s^2) A = cross-sectional area of pipe.	3C-4 3C-12	Qualified to 400 s.

TABLE 3-2. (continued)

Variable, Location, and Detector	Units	Uncertainty	Calculation Method	Figure	Comments
MASS FLOW RATE (continued)			The density profile was obtained from the chordal average densities by the method described for average densities.		
Broken Loop Hot Leg					
DE-BL-002A, DE-BL-002C, ME-BL-002A, ME-BL-002B, ME-BL-002C, ME-BL-002D, ME-BL-002E, ME-BL-002F } FR-BL-002	kg/s	±23 for t < 25 s; ±15 for t ≥ 25 s	The momentum flux profile was estimated from the momentum flux measurement using a Prandtl 2/7 power law profile which was distorted to fit the local flux readings. The high-range drag discs were used to calculate the momentum flux profile until 5 s in the cold leg and until 25 s in the hot leg. The low-range drag discs were used after these times.	3C-5, 3C-13	Qualified to 400 s.
Intact Loop Cold Leg					
DE-PC-001A, DE-PC-001B, DE-PC-001C, FE-PC-001A, FE-PC-001B, FE-PC-001C } FR-PC-101	kg/s	±32	The intact loop flow rates were 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-6, 3C-14	Qualified, flow direction indicated.
Intact Loop Hot Leg					
DE-PC-002A, DE-PC-002B, DE-PC-002C, FE-PC-002A, FE-PC-002B, FE-PC-002C } FR-PC-201	kg/s	±30	The average density was a simple average of the three chordal densities. The fluid velocity was a simple average of the three turbines.	3C-7, 3C-15	Qualified, flow direction not indicated.

a. 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-3F10, LE-3UP-1, and LE-5K11 is 2.9% of range. All conductivity probes have a response time of 340 ms.

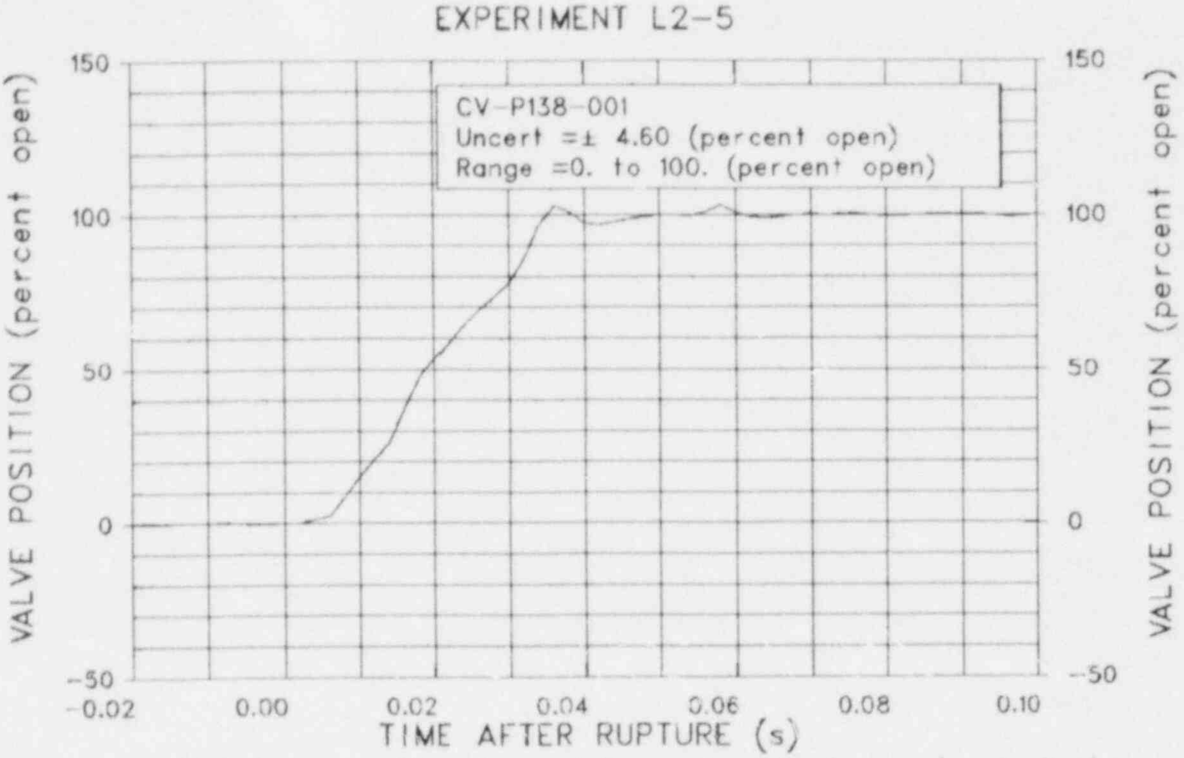


Figure 3S-1. Valve position for quick-opening blowdown valve in broken loop cold leg (CV-P138-001) (qualified, except for spurious spikes).

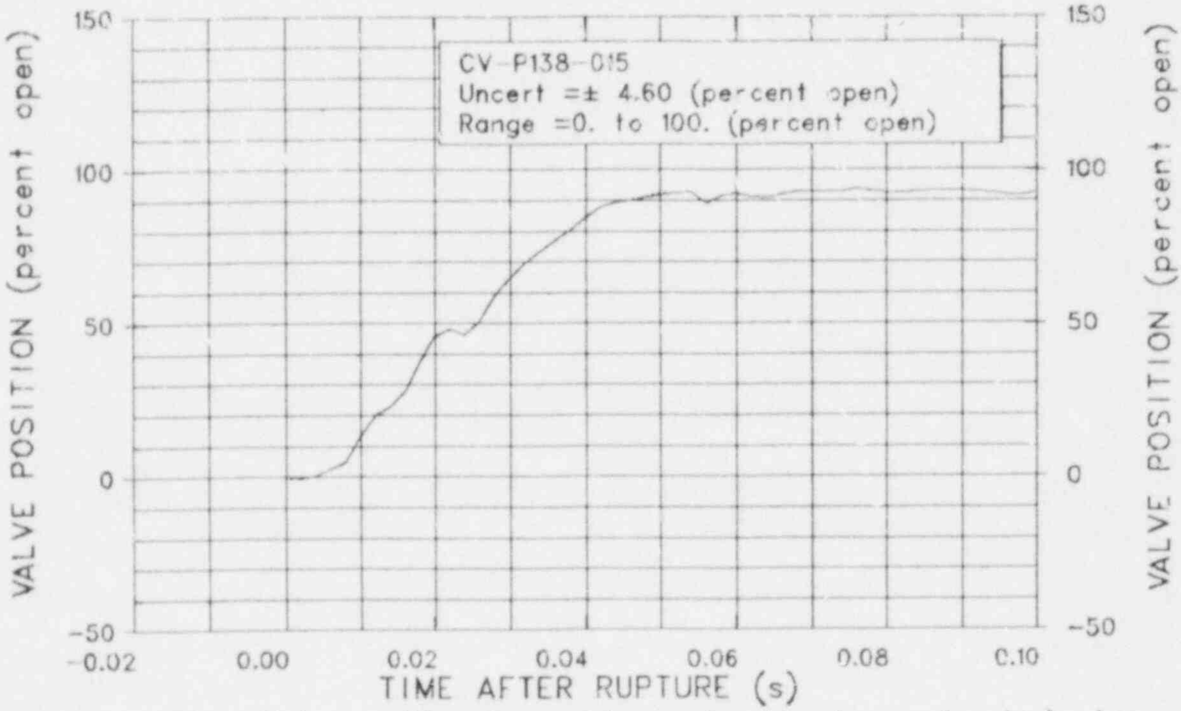


Figure 3S-2. Valve position for quick-opening blowdown valve in broken loop hot leg (CV-P138-015) (qualified, except for spurious spikes).

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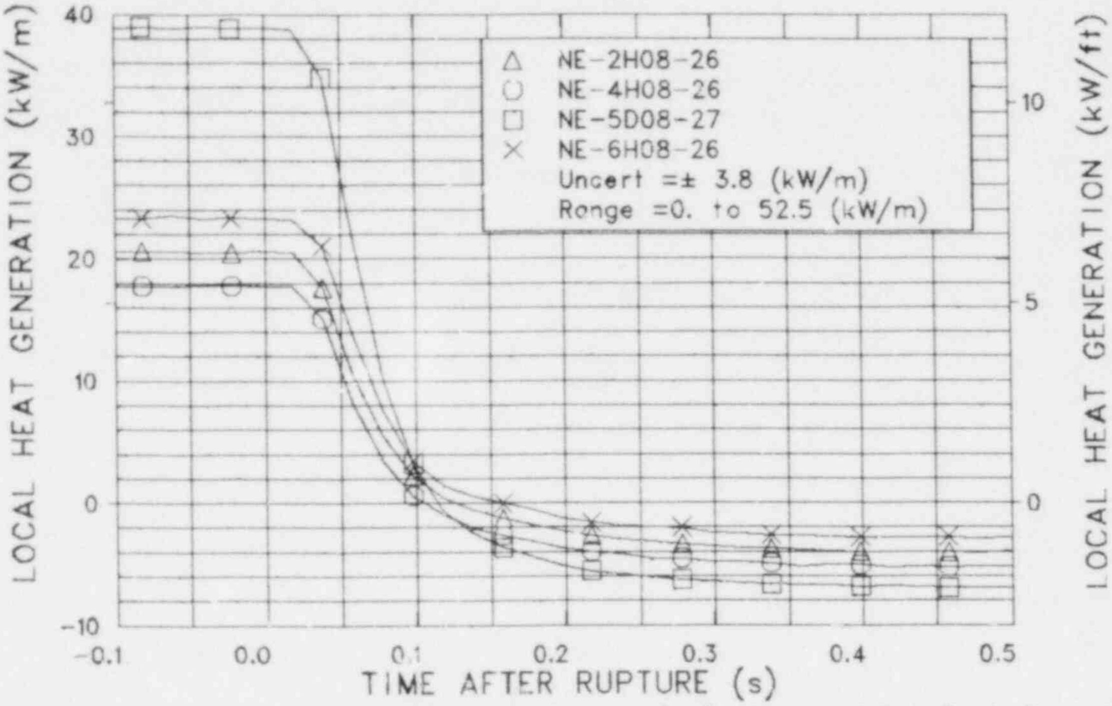

Figure 3S-3. Local heat generation rate in Fuel Assemblies 2, 4, 5, and 6 (NE-2H08-26, -4H08-26, -5D08-27, and -6H08-26) (qualified, magnitude uncertain).

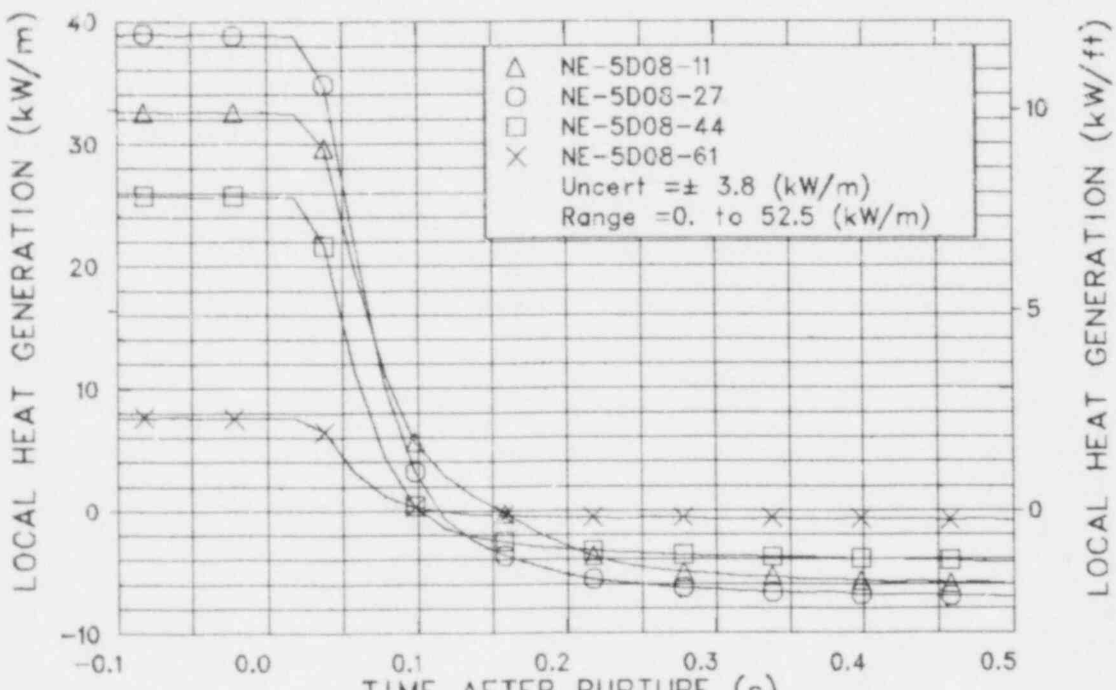

Figure 3S-4. Local heat generation rate in Fuel Assembly 5 (NE-5D08-11, -27, -44, and -61) (qualified, magnitude uncertain).

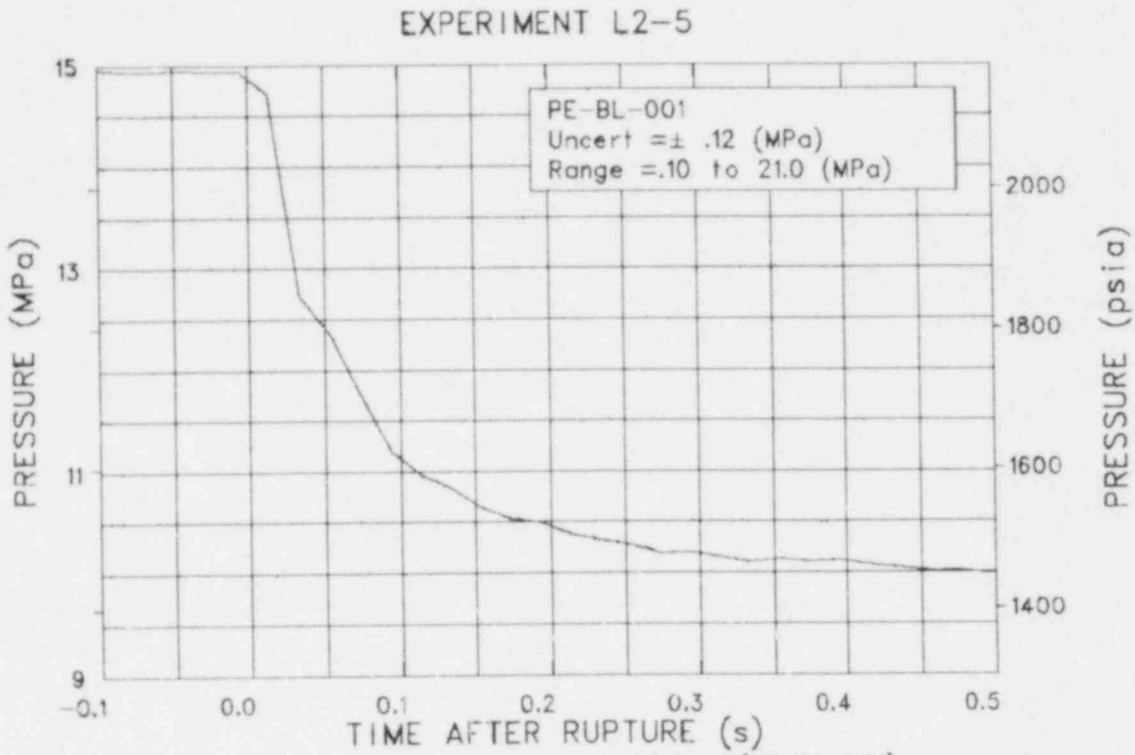

Figure 3S-5. Pressure in broken loop cold leg (PE-BL-001).

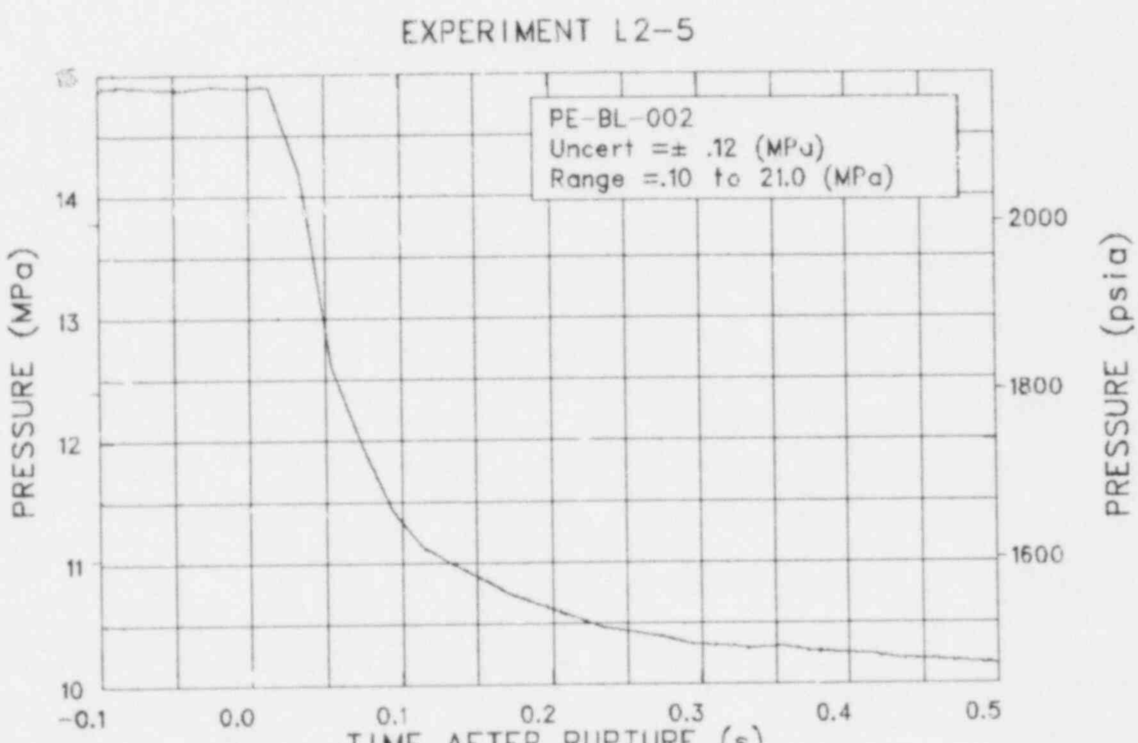

Figure 3S-6. Pressure in broken loop hot leg (PE-BL-002).

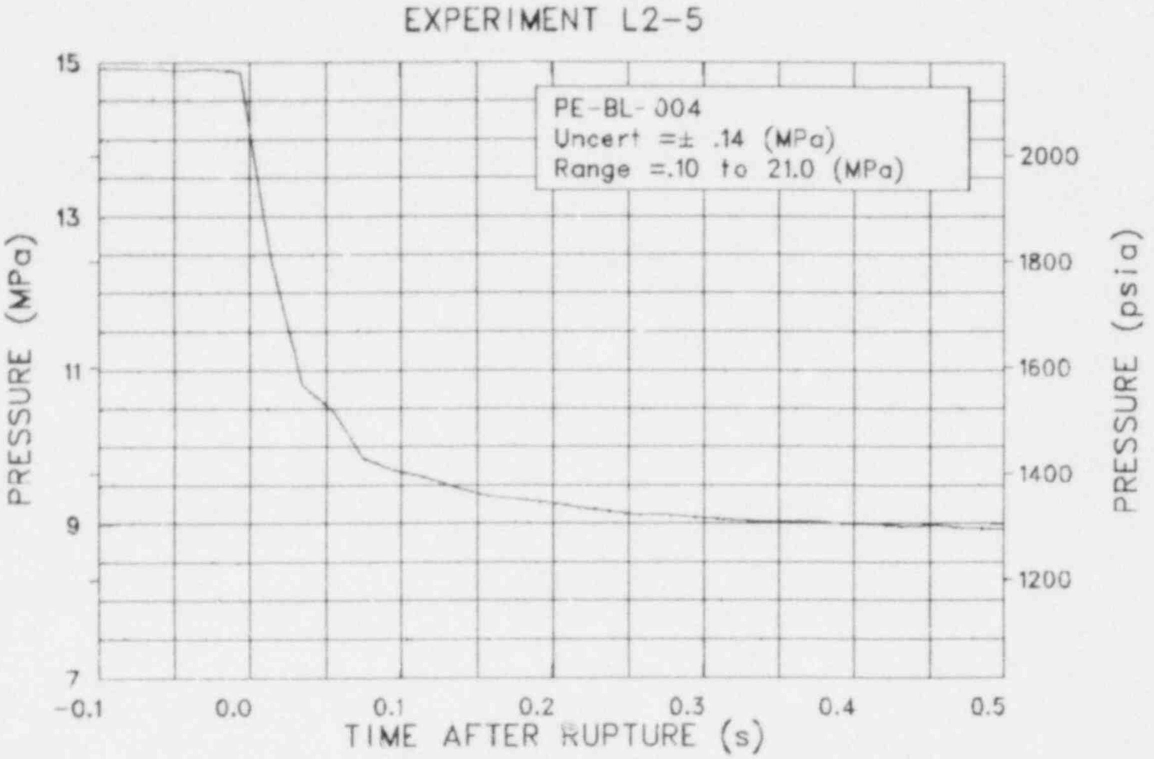

Figure 3S-7. Pressure in broken loop cold leg upstream of break plane (PE-BL-004).

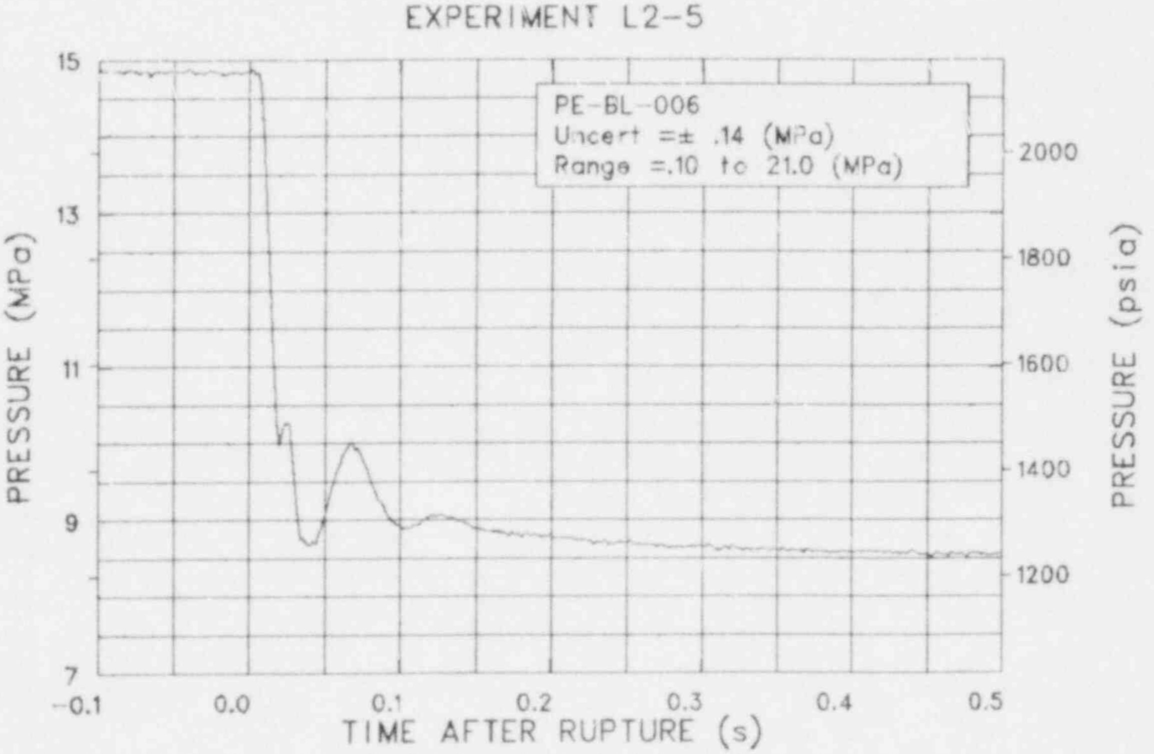

Figure 3S-8. Pressure in broken loop hot leg at steam generator simulator outlet (PE-BL-006).

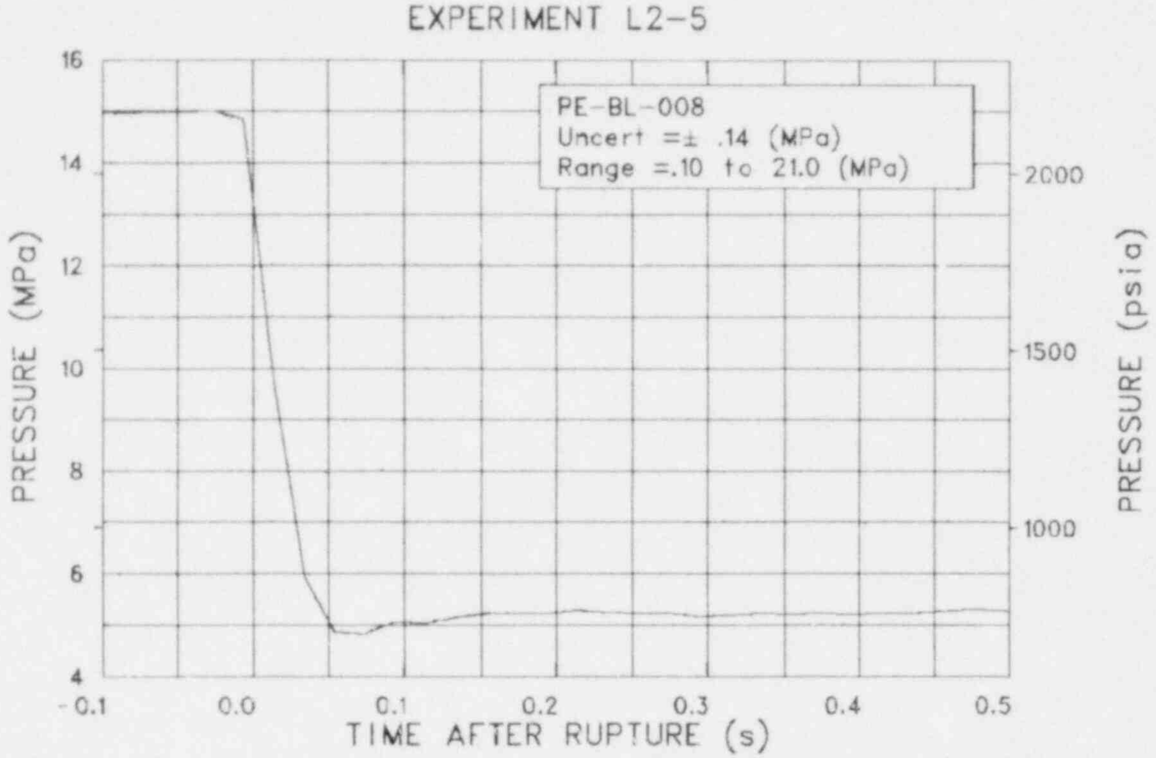

Figure 3S-9. Pressure in broken loop cold leg downstream of break plane (PE-BL-008).

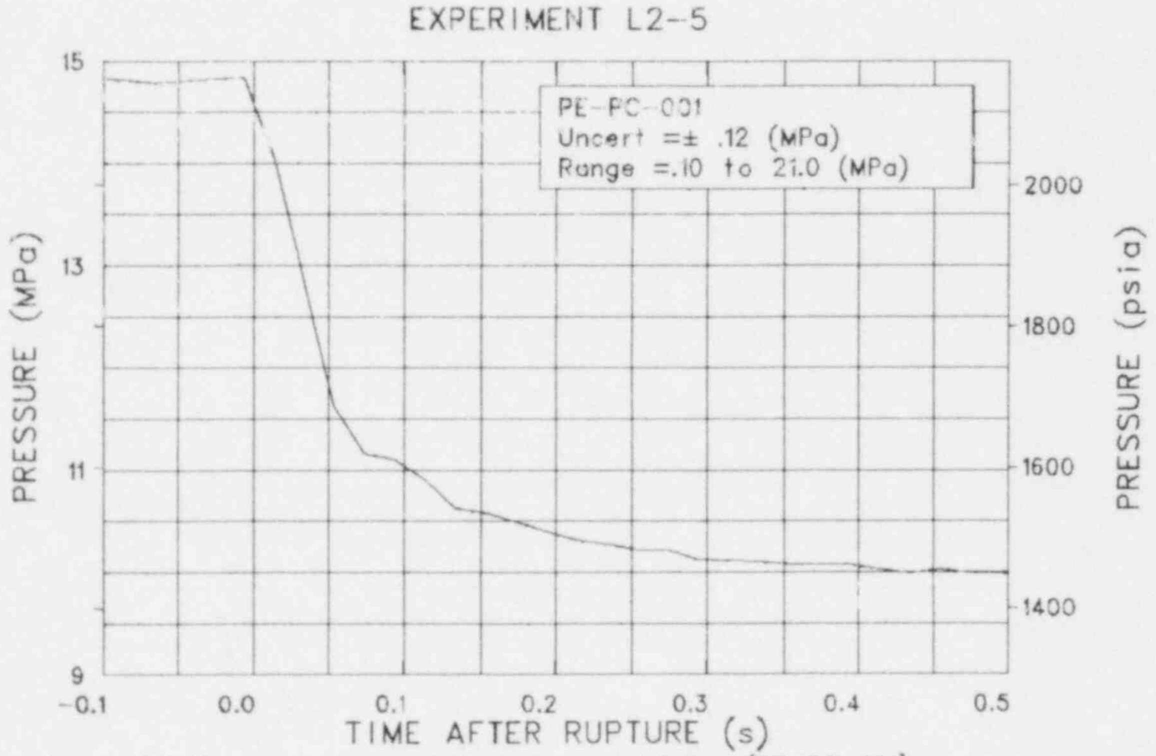

Figure 3S-10. Pressure in intact loop cold leg (PE-PC-001).

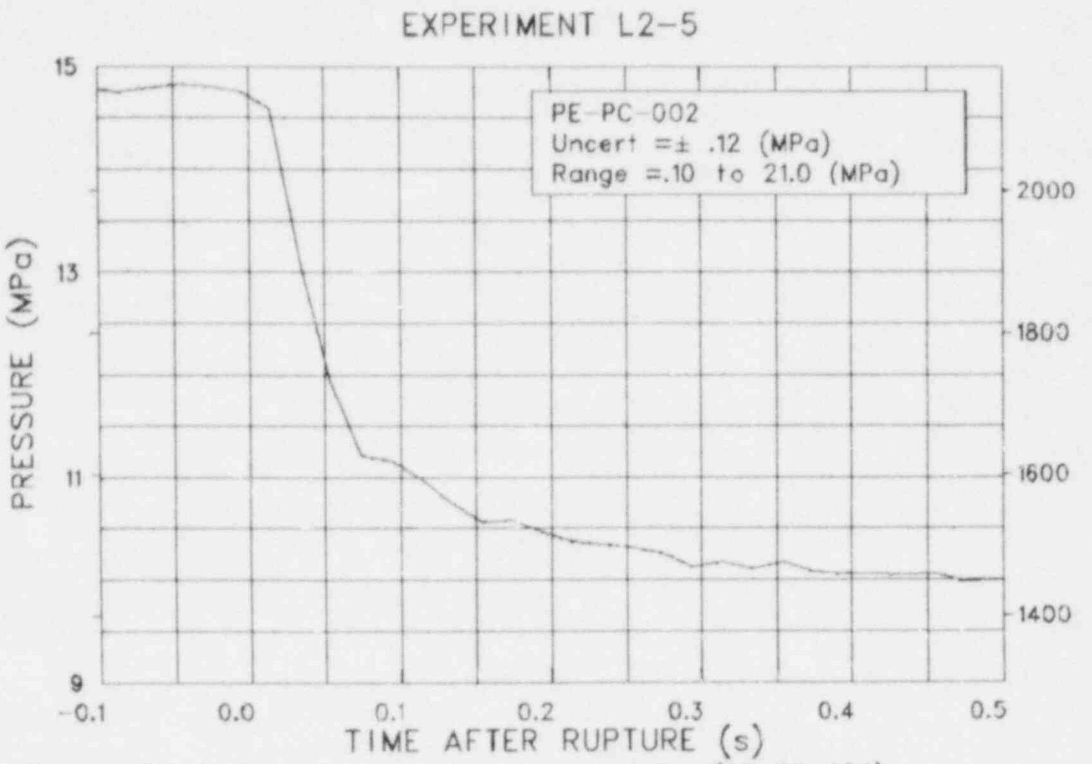

Figure 3S-11. Pressure in intact loop hot leg (PE-PC-002).

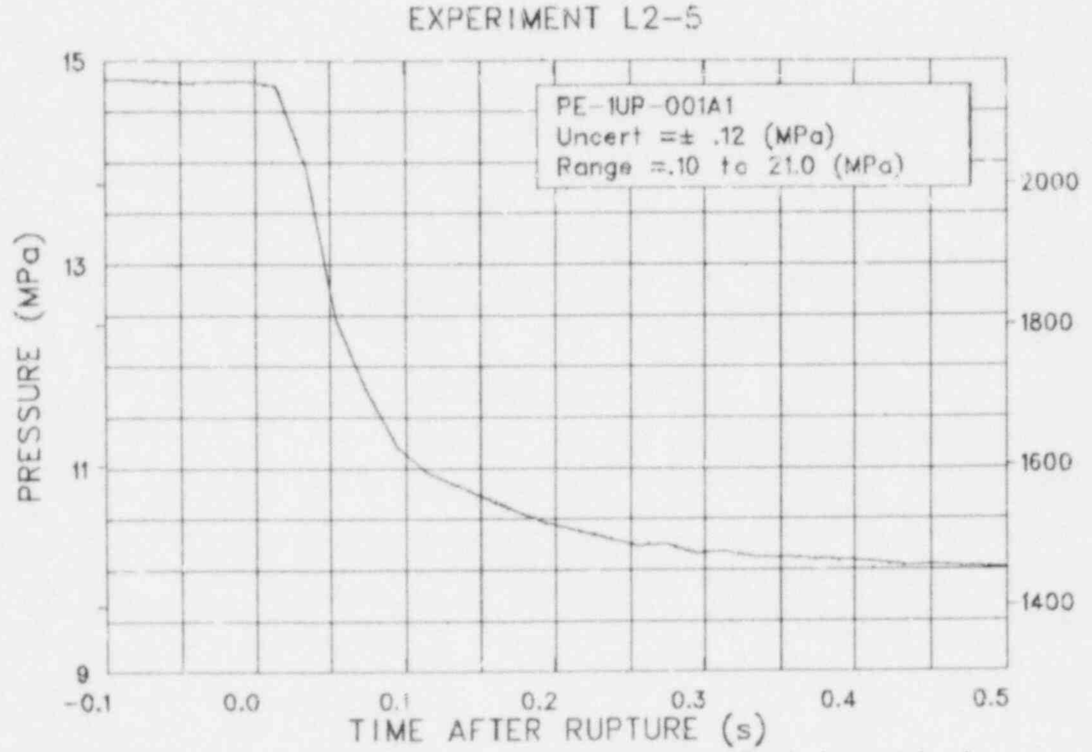

Figure 3S-12. Pressure above upper end box of Fuel Assembly 1 (PE-1UP-001A1).

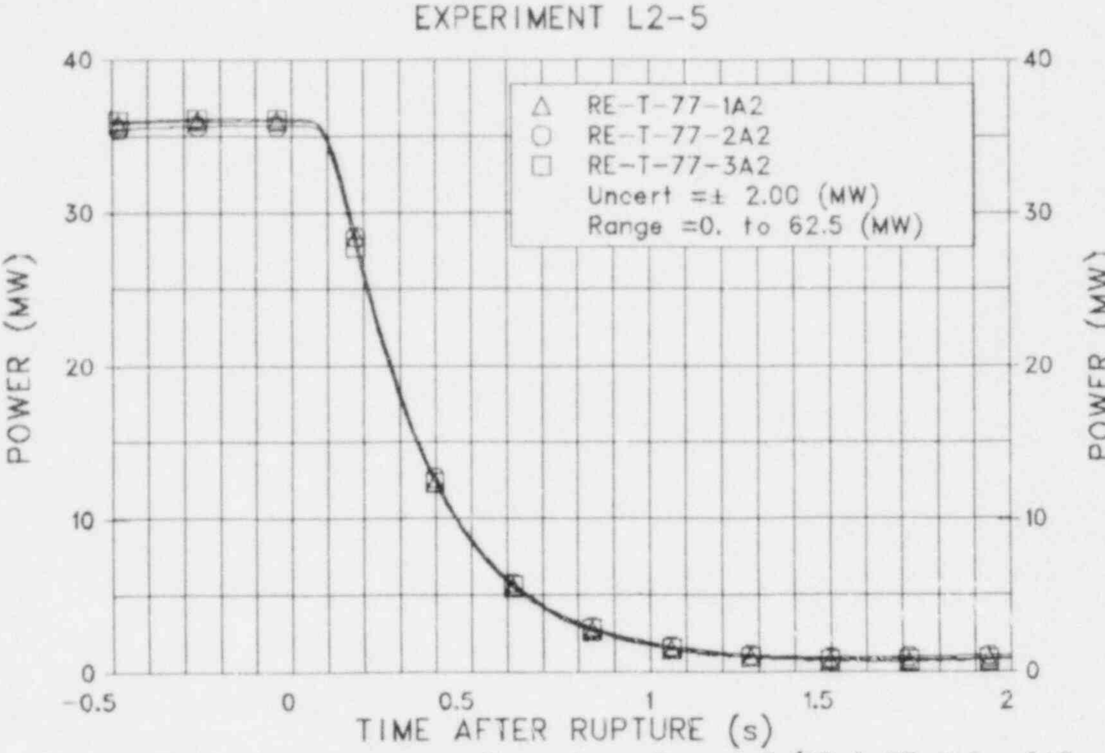

Figure 3S-13. Reactor power, Channels A, B and C (RE-T-77-1A2, -2A2, and -3A2).

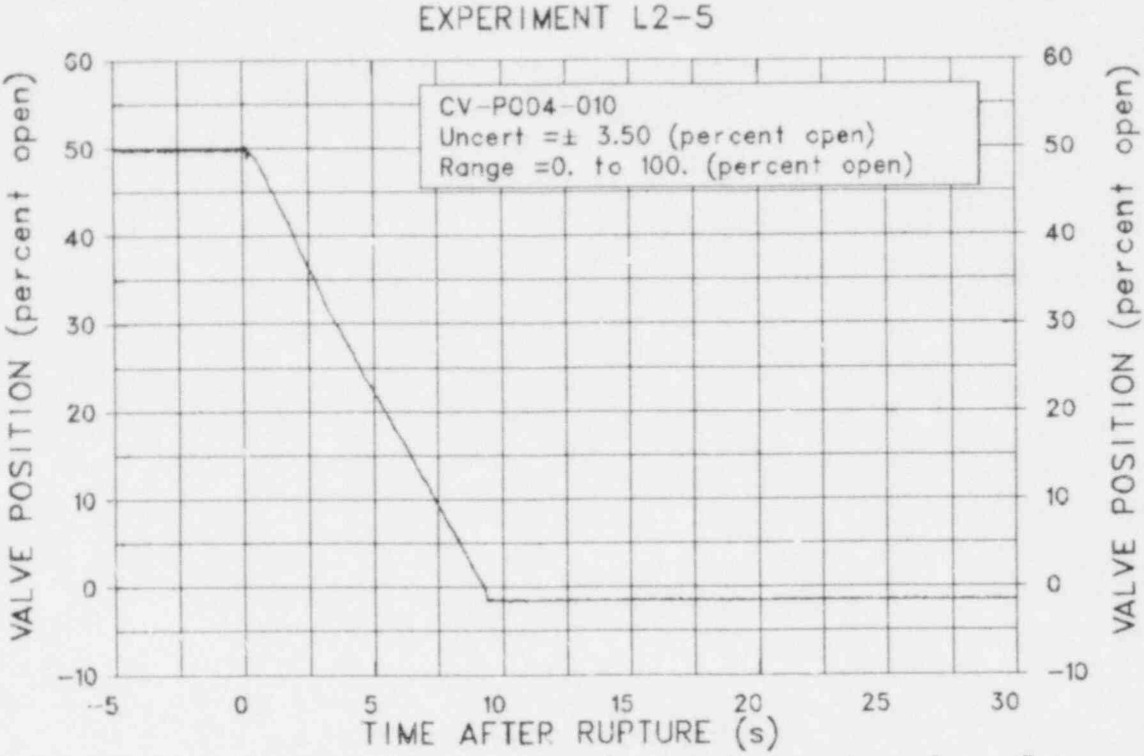

Figure 3M-1. Valve position for secondary coolant system steam flow control valve (CV-P004-010).

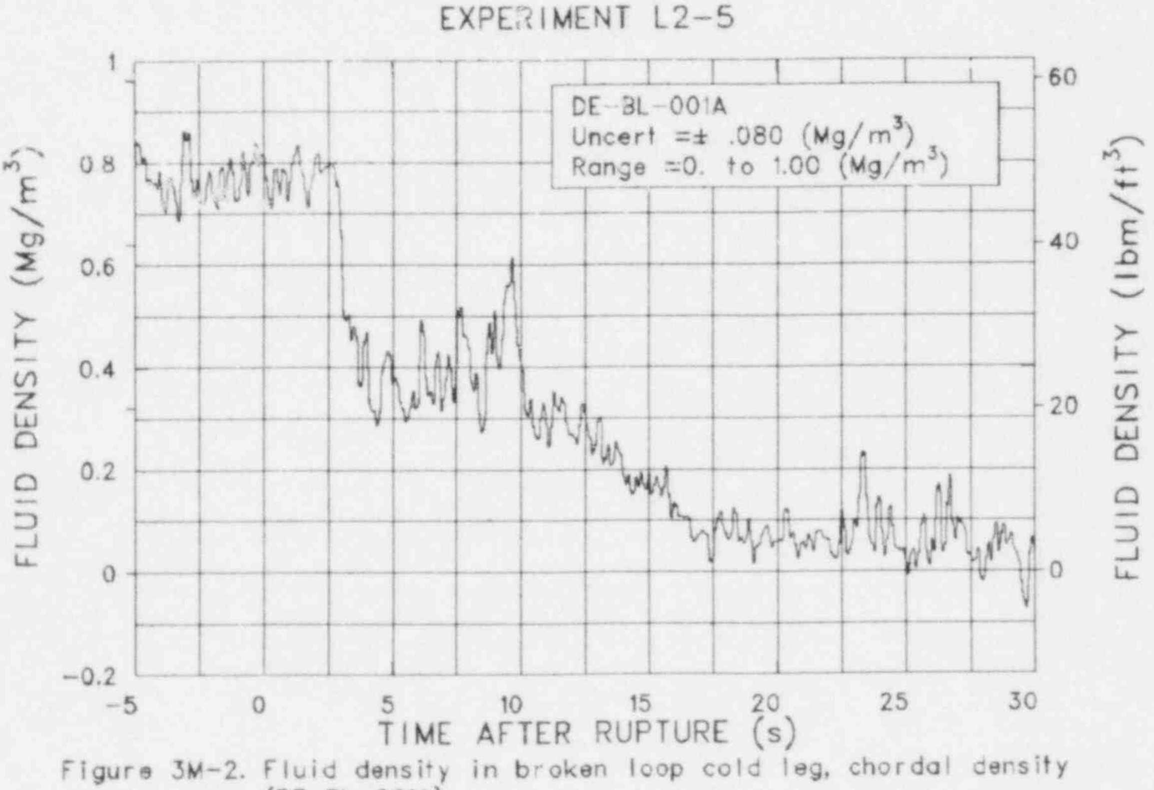

Figure 3M-2. Fluid density in broken loop cold leg, chordal density (DE-BL-001A).

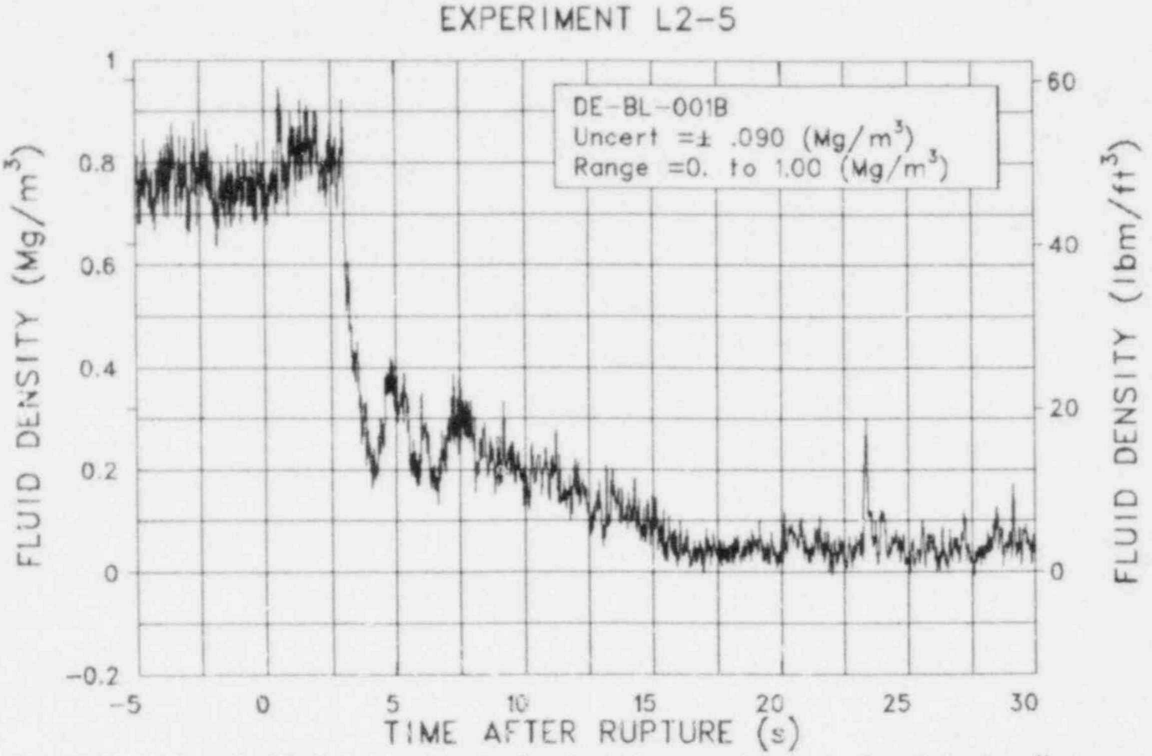

Figure 3M-3. Fluid density in broken loop cold leg, chordal density (DE-BL-001B).

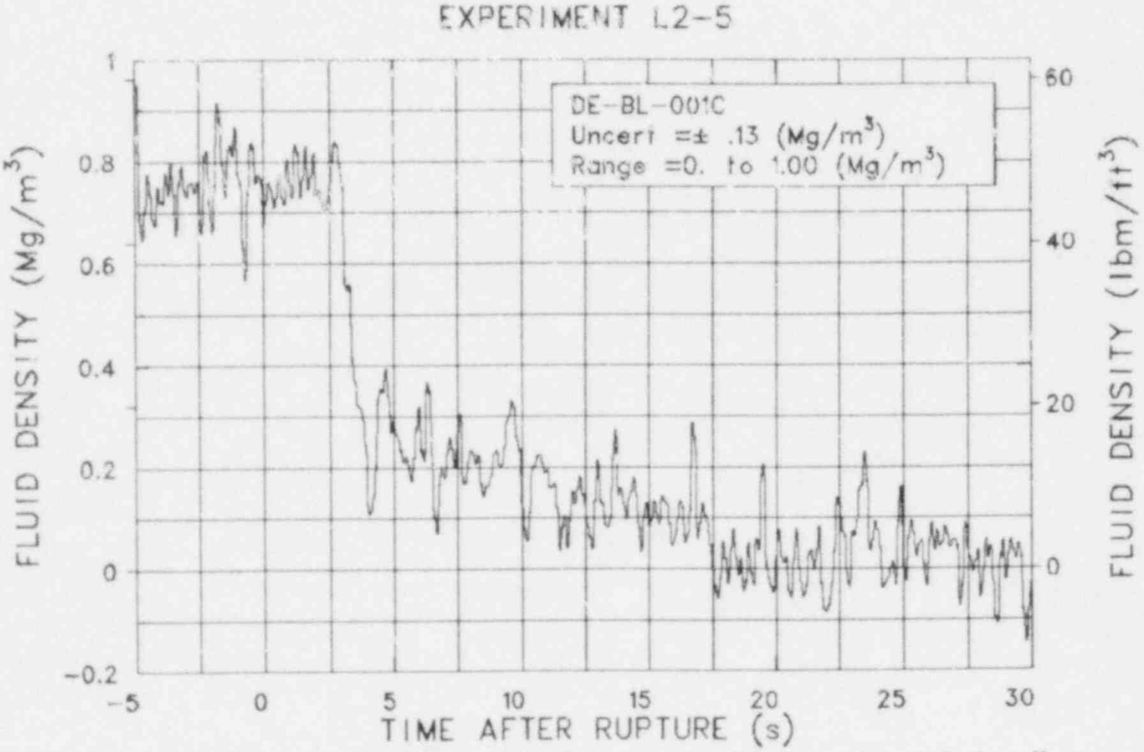

Figure 3M-4. Fluid density in broken loop cold leg, chordal density (DE-BL-001C).

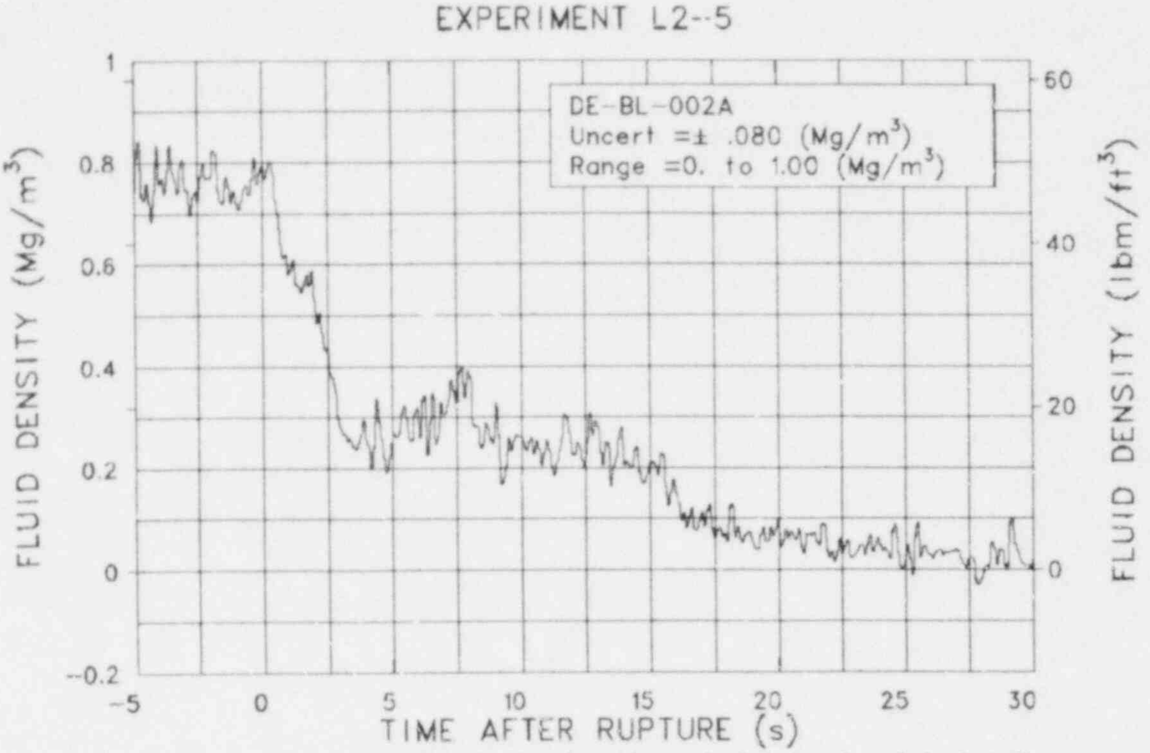

Figure 3M-5. Fluid density in broken loop hot leg, chordal density (DE-BL-002A).

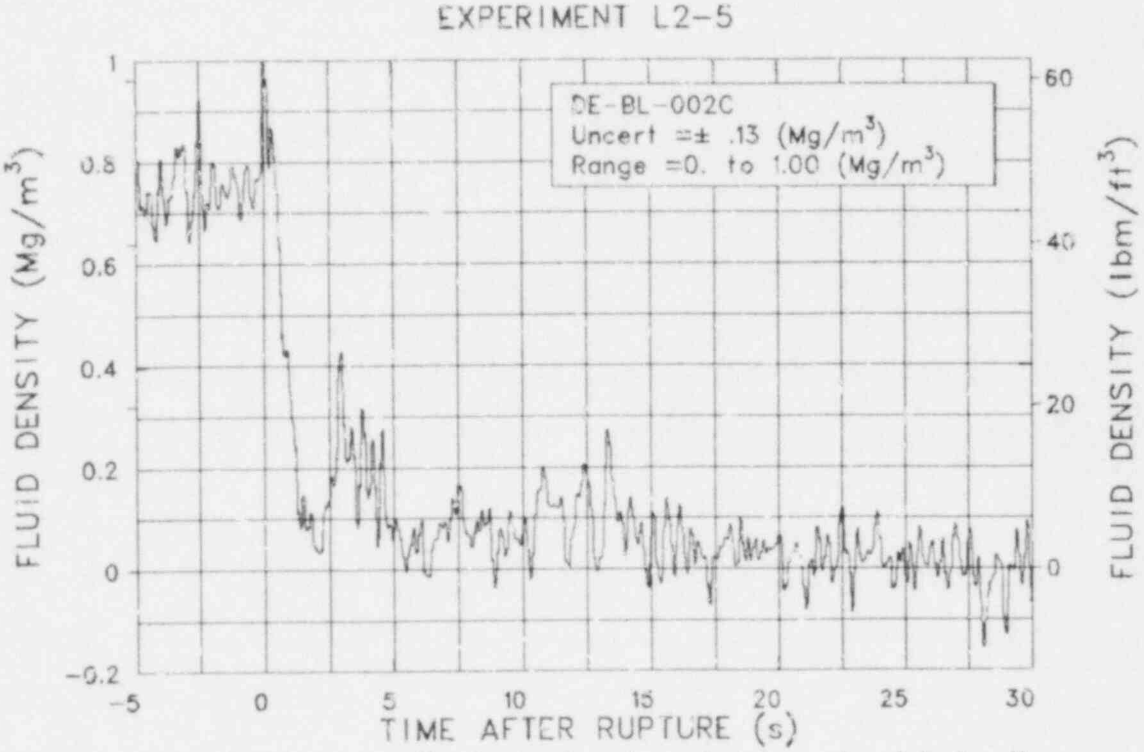

Figure 3M-6. Fluid density in broken loop hot leg, chordal density (DE-BL-002C) (qualified, except for spurious spikes).

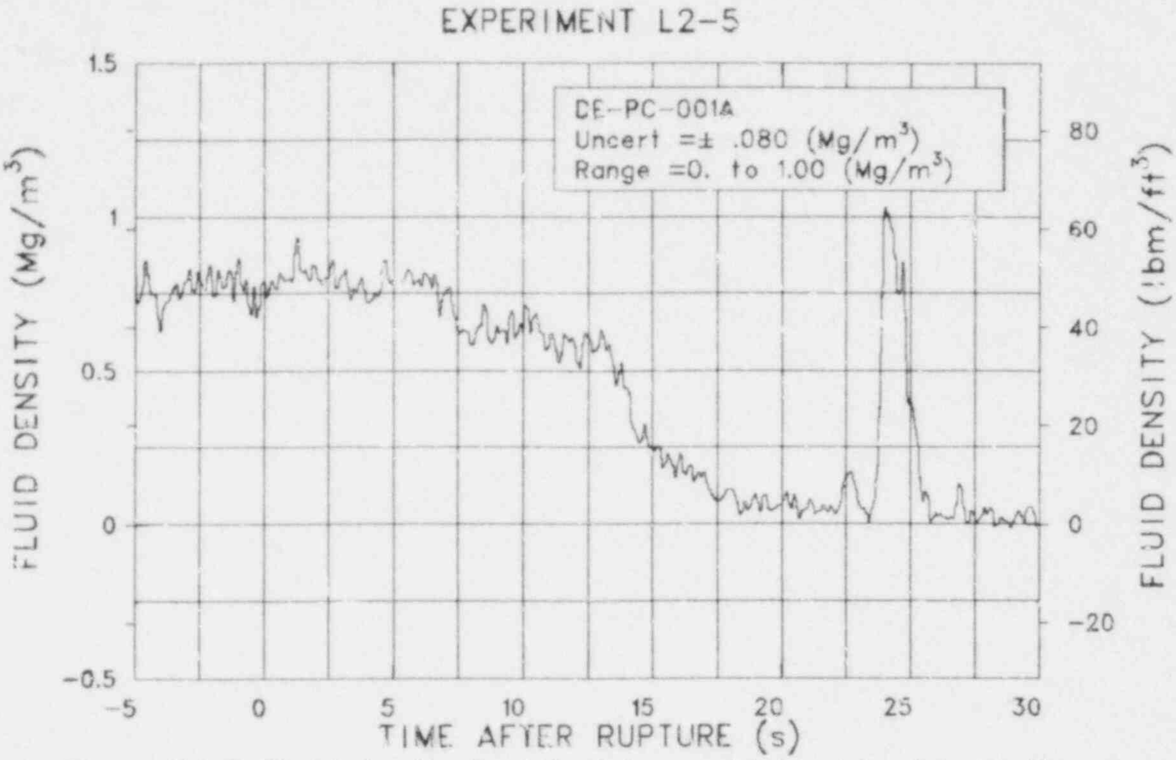

Figure 3M-7. Fluid density in intact loop cold leg, chordal density (DE-PC-001A).

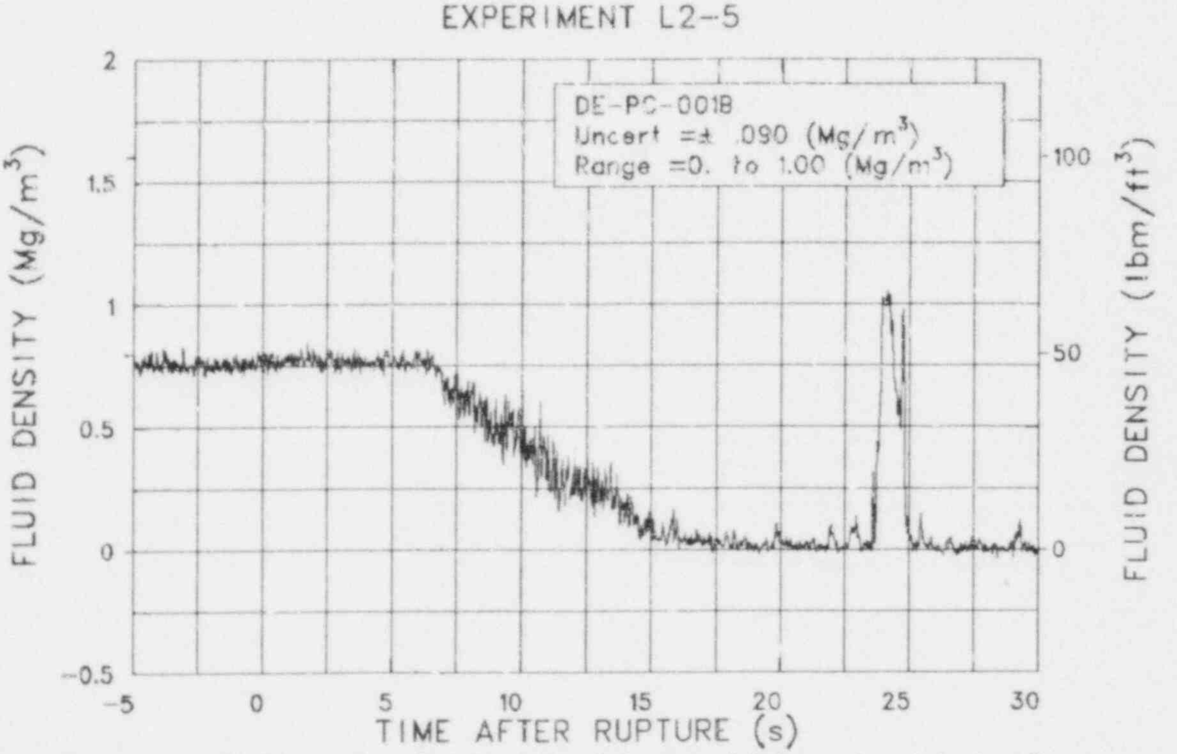

Figure 3M-8. Fluid density in intact loop cold leg, chordal density (DE-PC-001B).

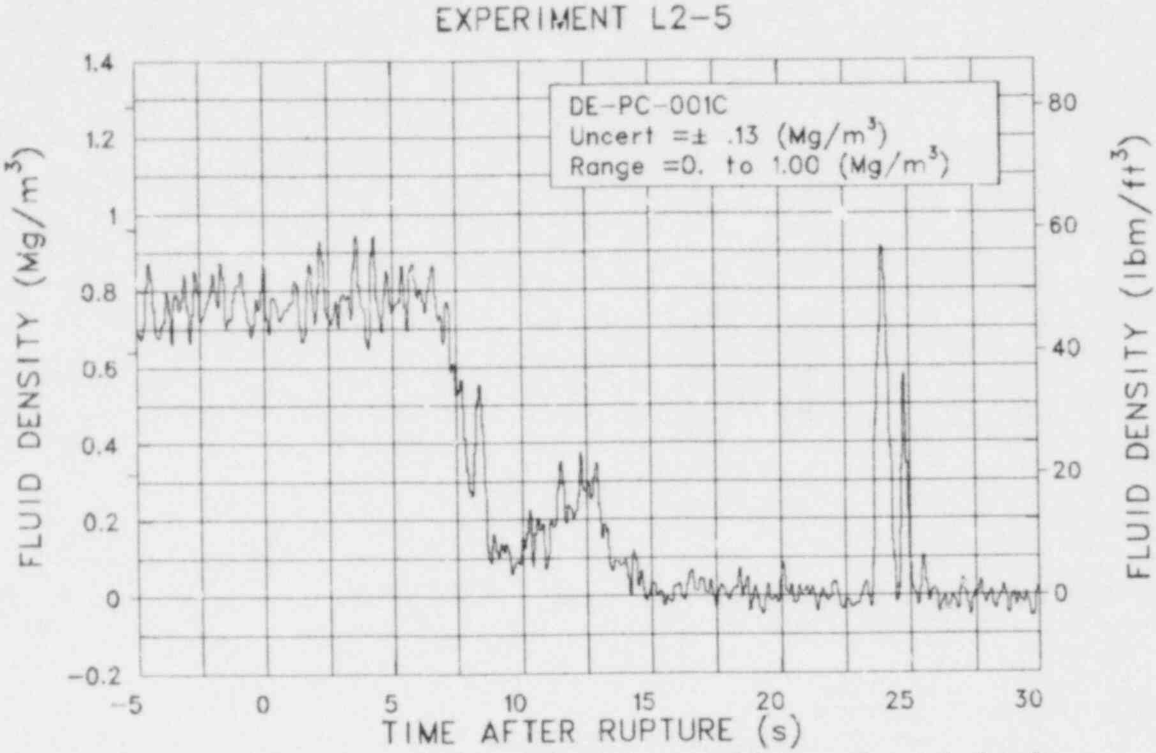

Figure 3M-9. Fluid density in intact loop cold leg, chordal density (DE-PC-001C).

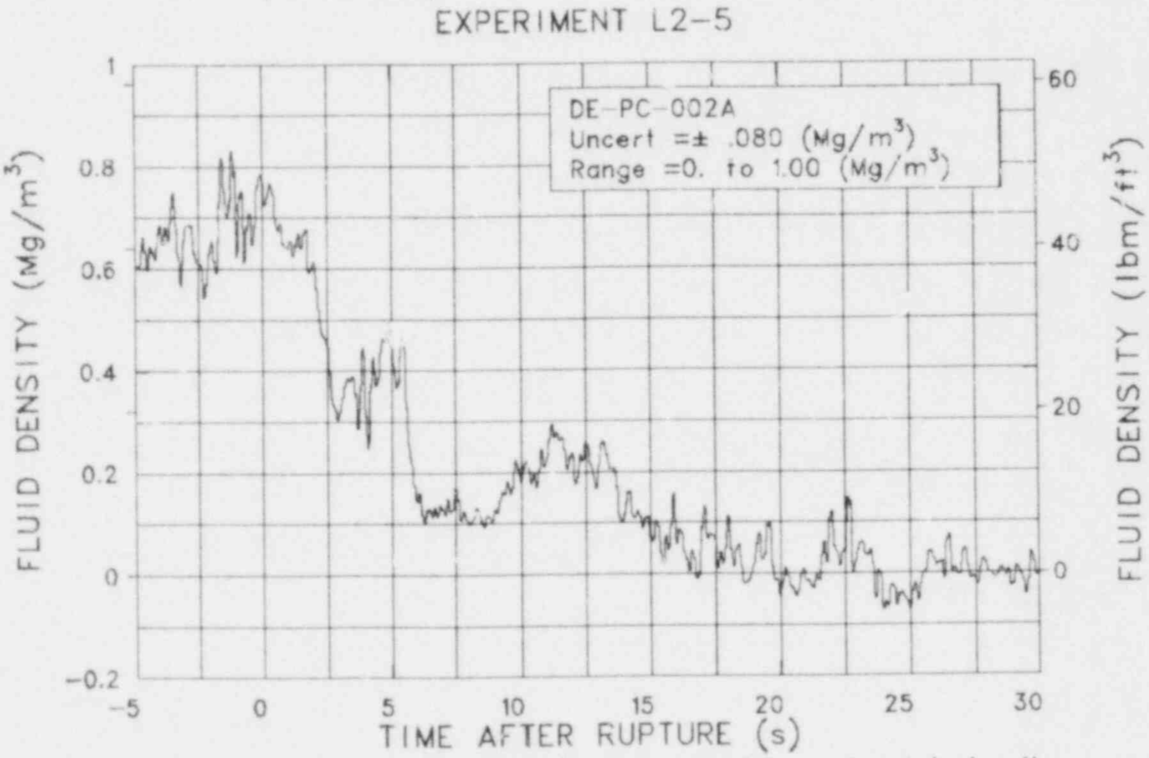

Figure 3M-10. Fluid density in intact loop hot leg, chordal density (DE-PC-002A).

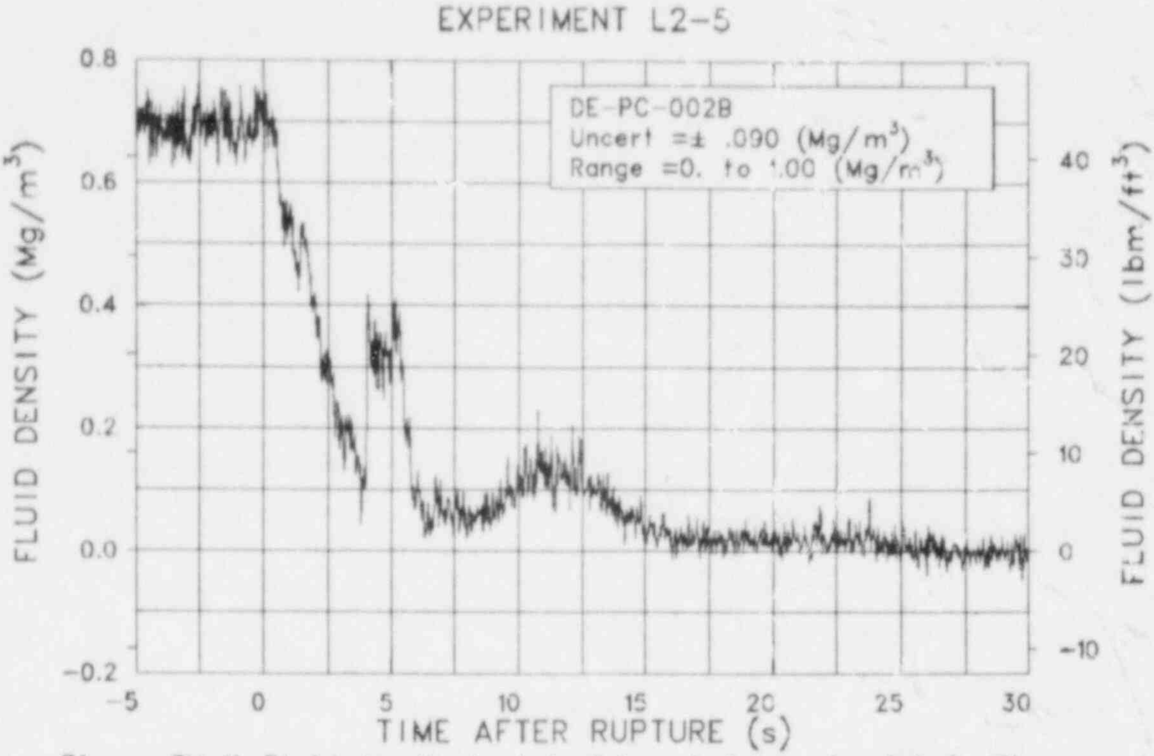

Figure 3M-11. Fluid density in intact loop hot leg, chordal density (DE-PC-002B).

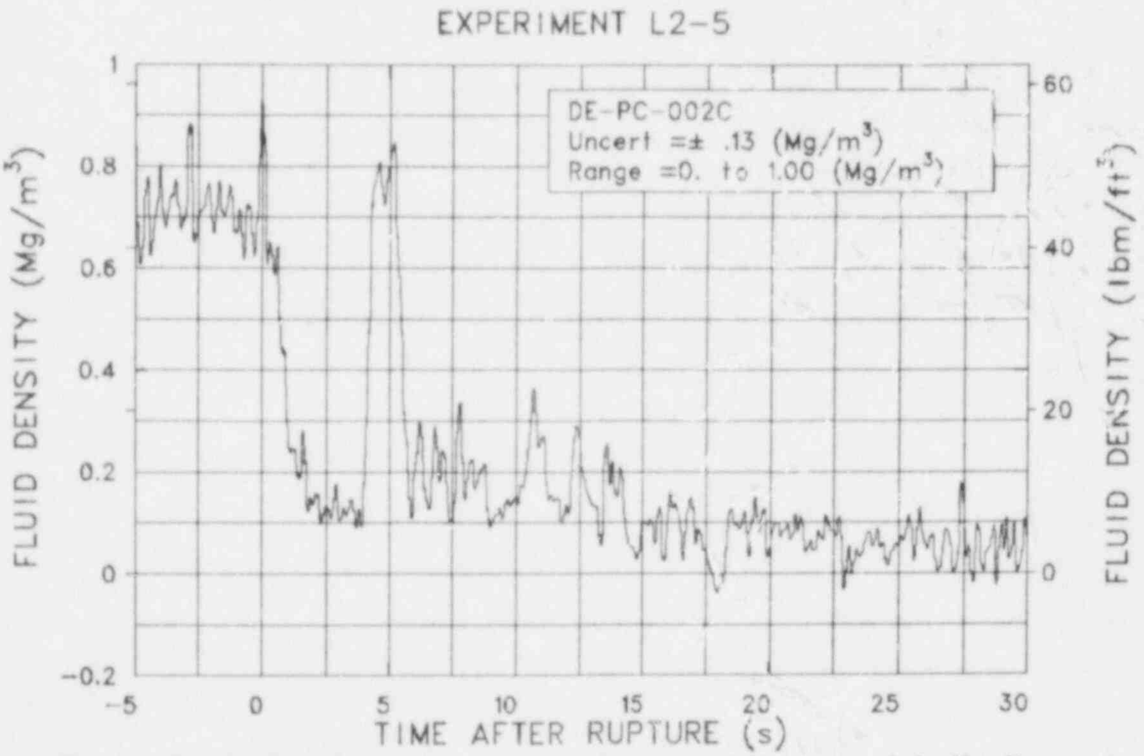

Figure 3M-12. Fluid density in intact loop hot leg, chordal density (DE-PC-002C) (qualified, except for spurious spikes).

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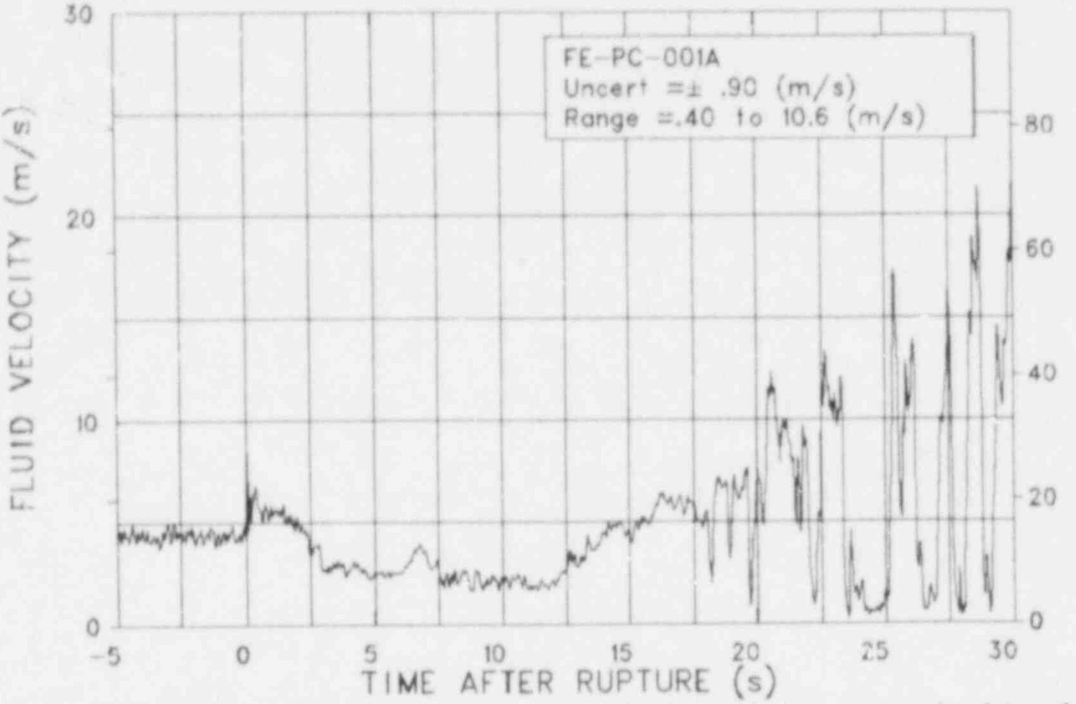

Figure 3M-13. Fluid velocity in intact loop cold leg on west side of pipe (FE-PC-001A) (qualified, flow direction not indicated).

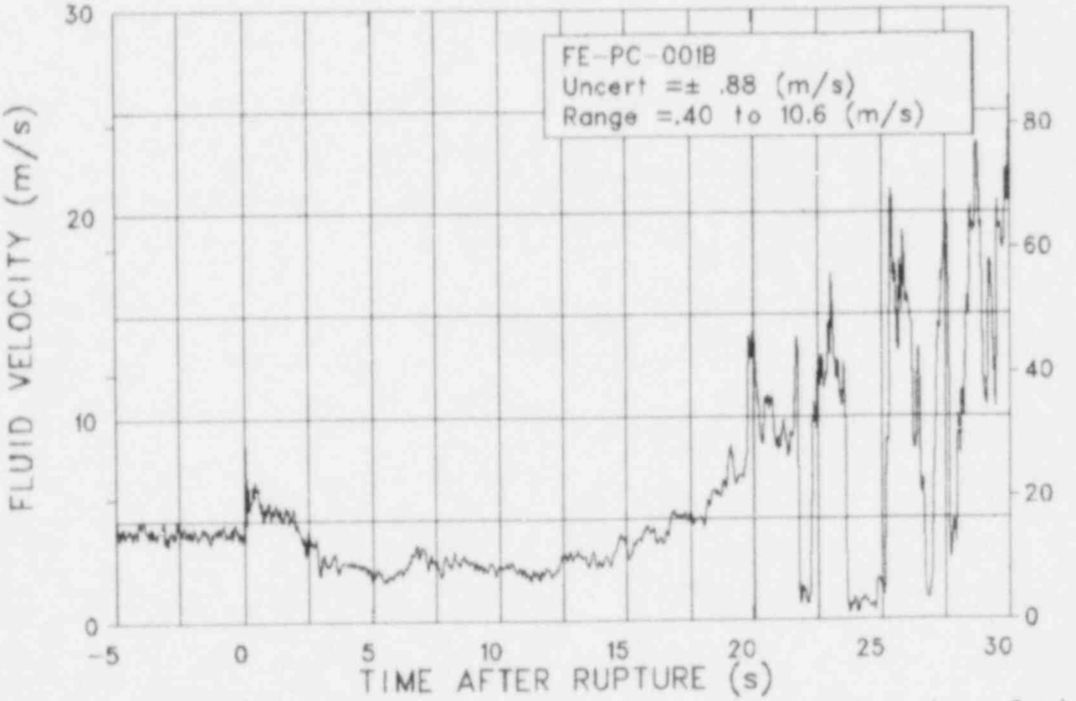

Figure 3M-14. Fluid velocity in intact loop cold leg at center of pipe (FE-PC-001B) (qualified, flow direction not indicated).

EXPERIMENT L2-5

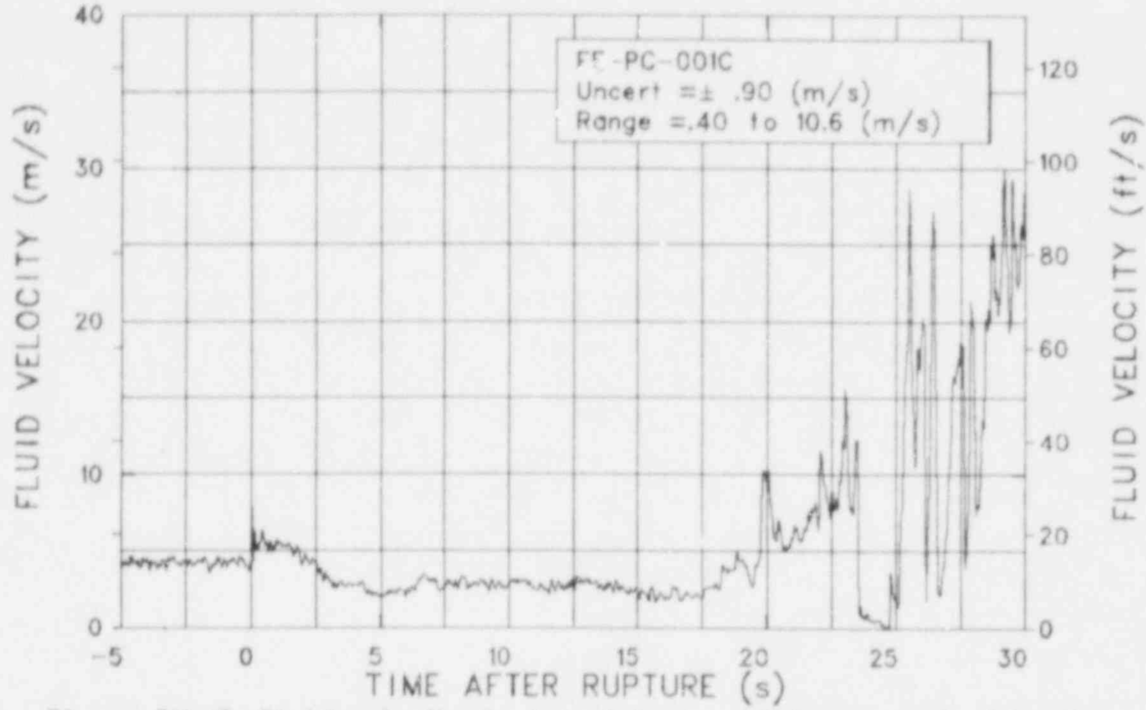

Figure 3M-15. Fluid velocity in intact loop cold leg on east side of pipe (FE-PC-001C) (qualified, flow direction not indicated).

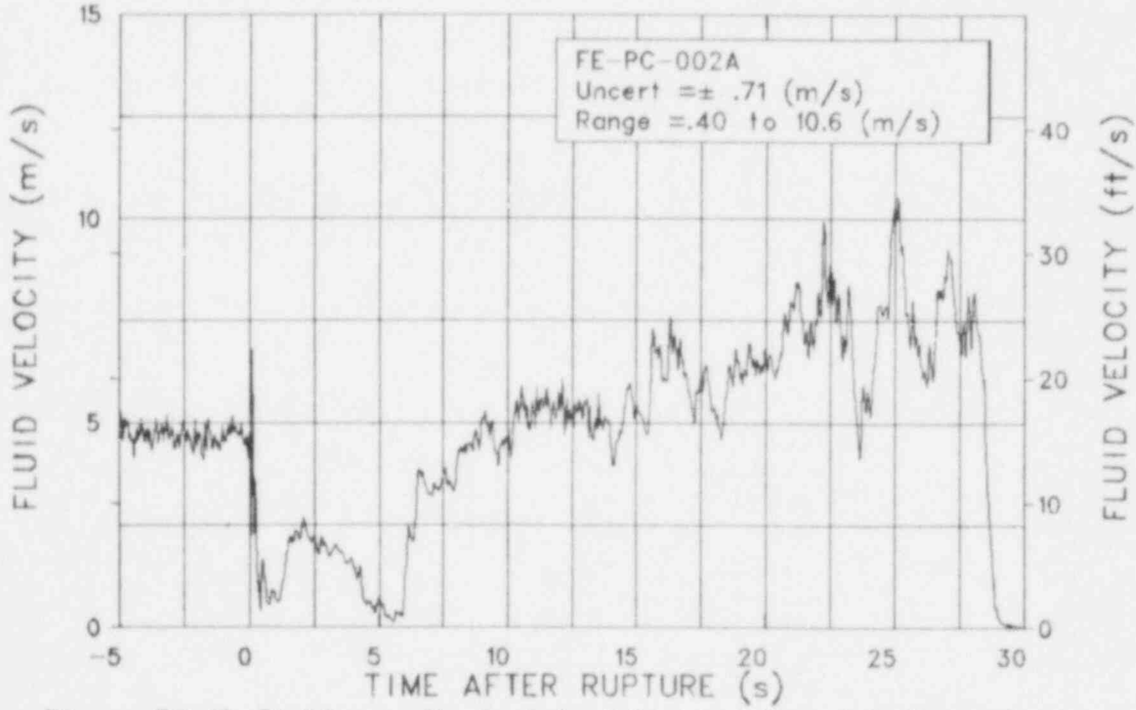

Figure 3M-16. Fluid velocity in intact loop hot leg at bottom of pipe (FE-PC-002A) (qualified, flow direction not indicated).

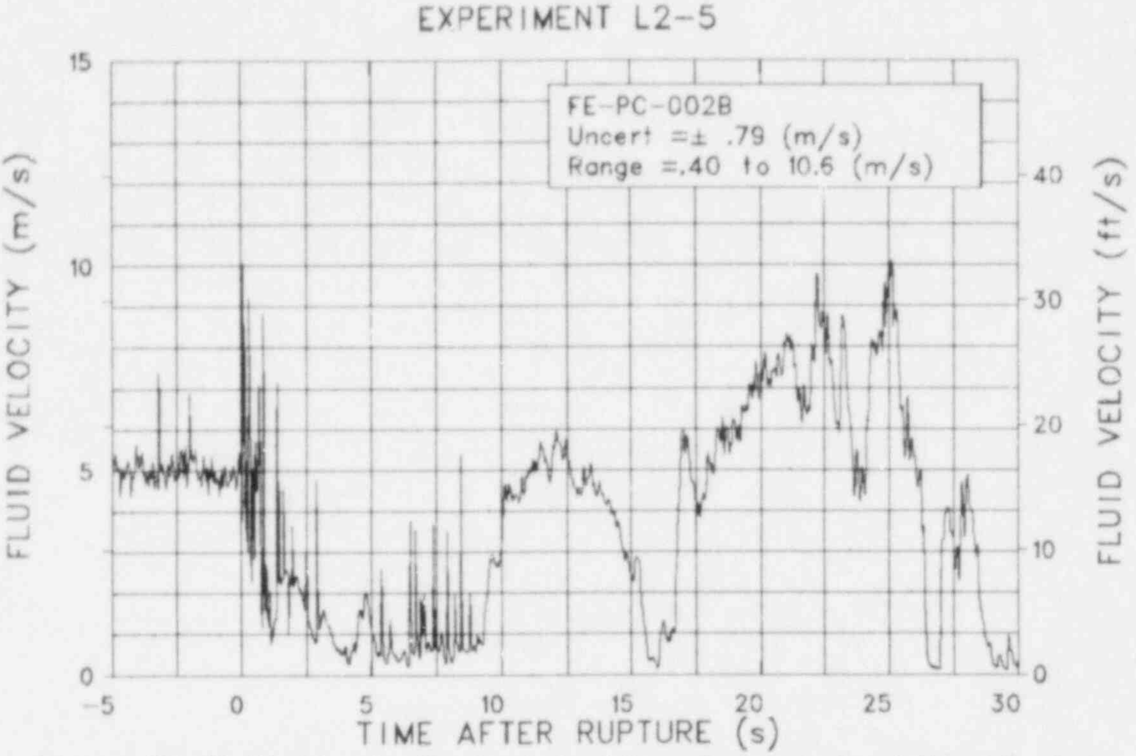

Figure 3M-17. Fluid velocity in intact loop hot leg at middle of pipe (FE-PC-002B) (qualified, flow direction not indicated).

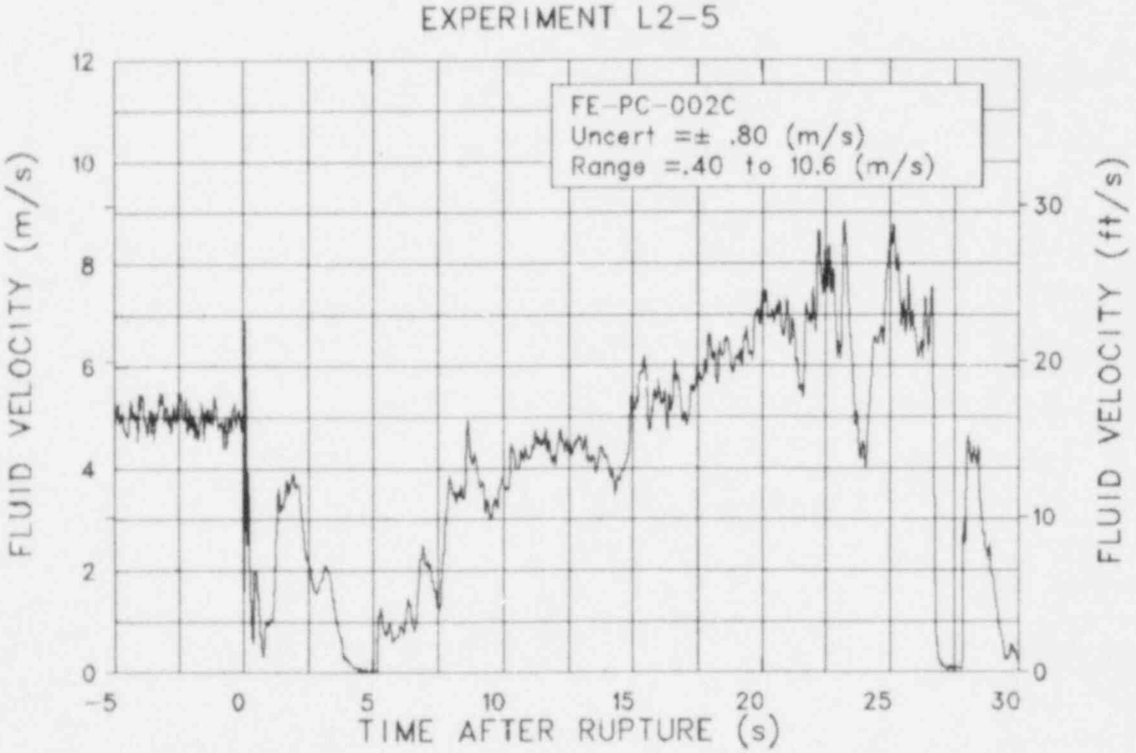

Figure 3M-18. Fluid velocity in intact loop hot leg at top of pipe (FE-PC-002C) (qualified, flow direction not indicated).

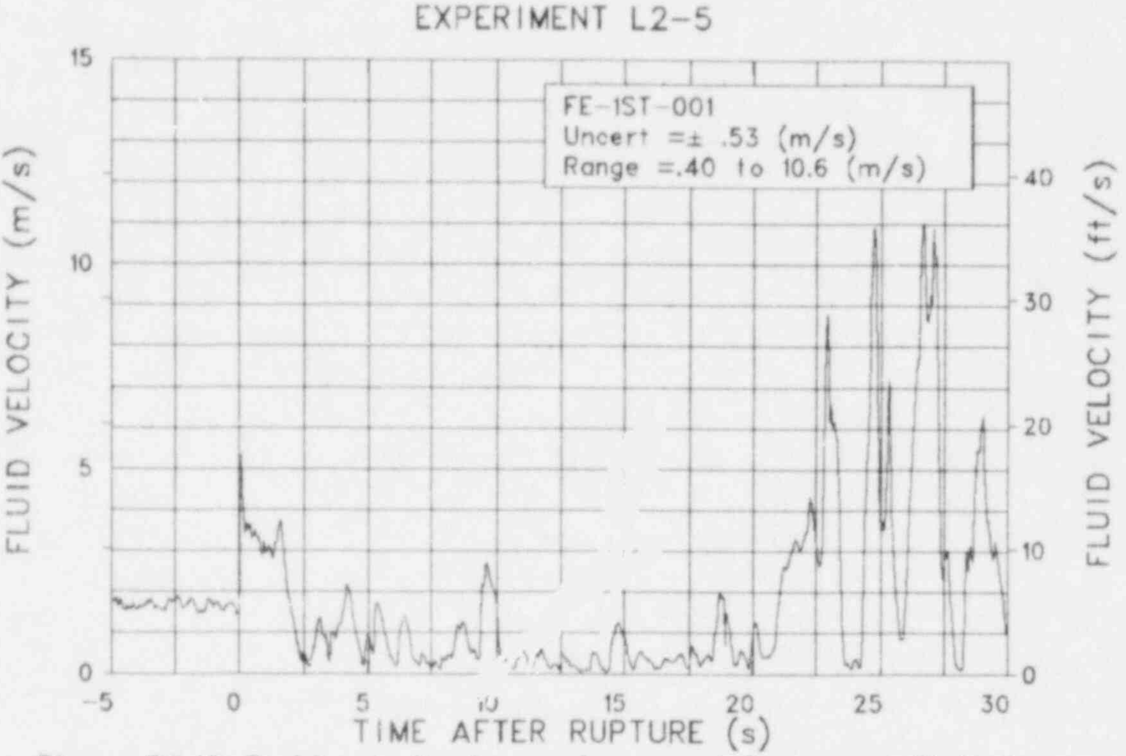

Figure 3M-19. Fluid velocity in reactor vessel Downcomer Stalk 1 (FE-1ST-001) (qualified, flow direction not indicated).

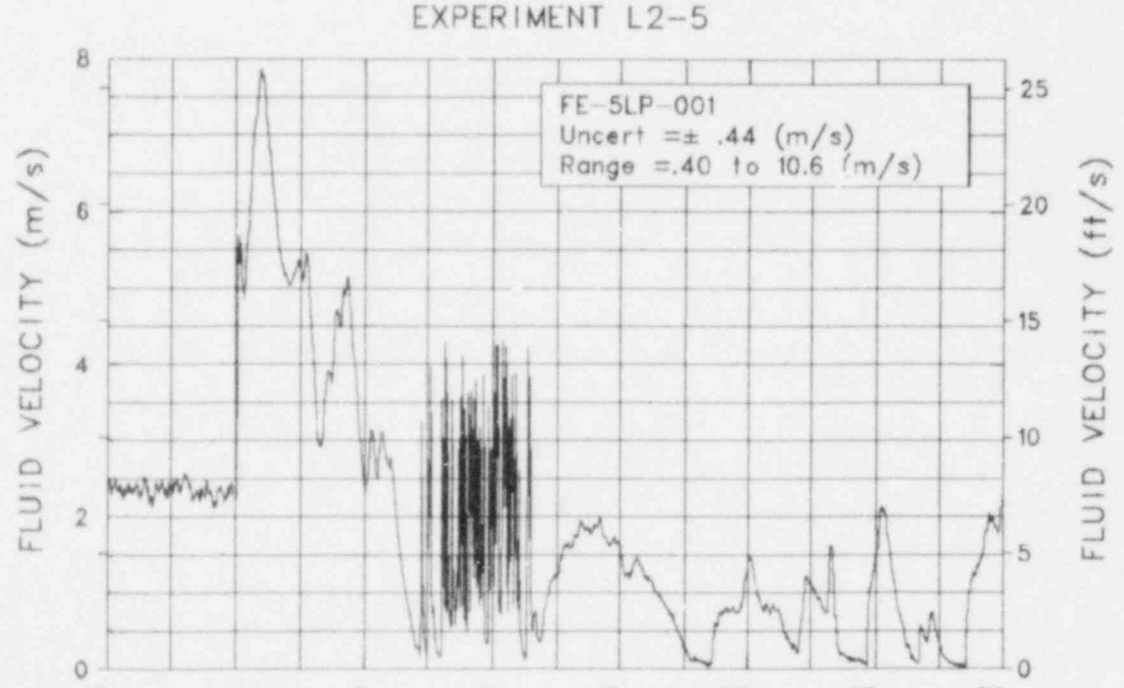

Figure 3M-20. Fluid velocity at lower end box of Fuel Assembly 5 (FE-5LP-001) (qualified, flow direction not indicated).

EXPERIMENT L2-5

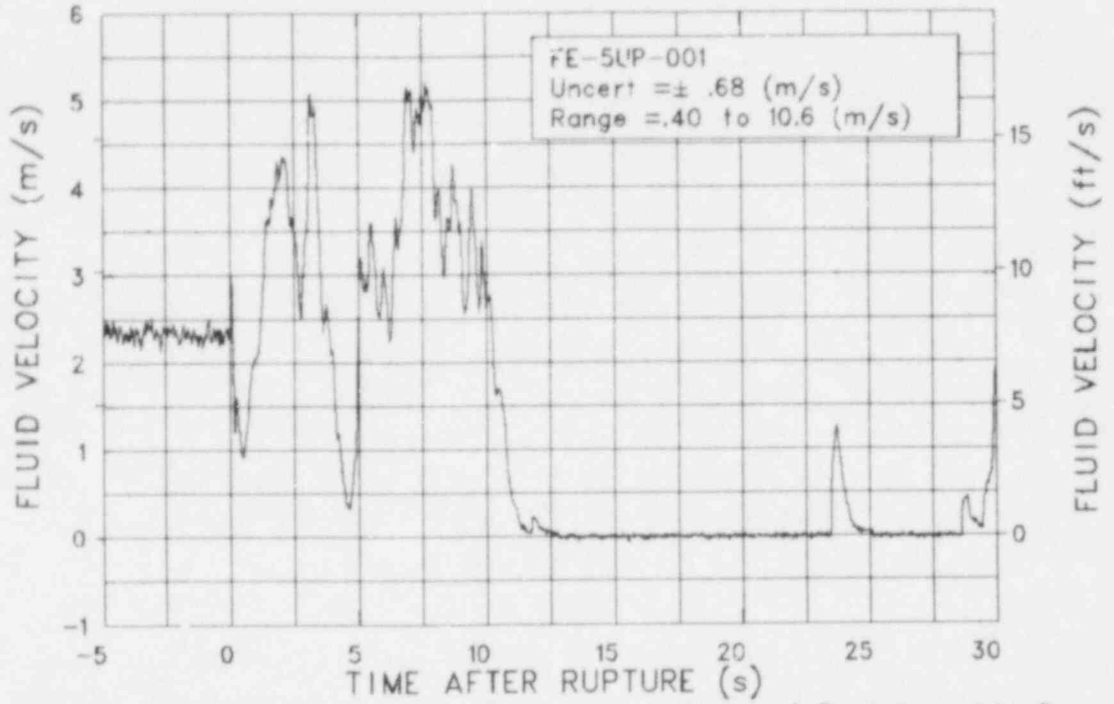

Figure 3M-21. Fluid velocity above upper end box of Fuel Assembly 5 (FE-5UP-001) (qualified, flow direction not indicated).

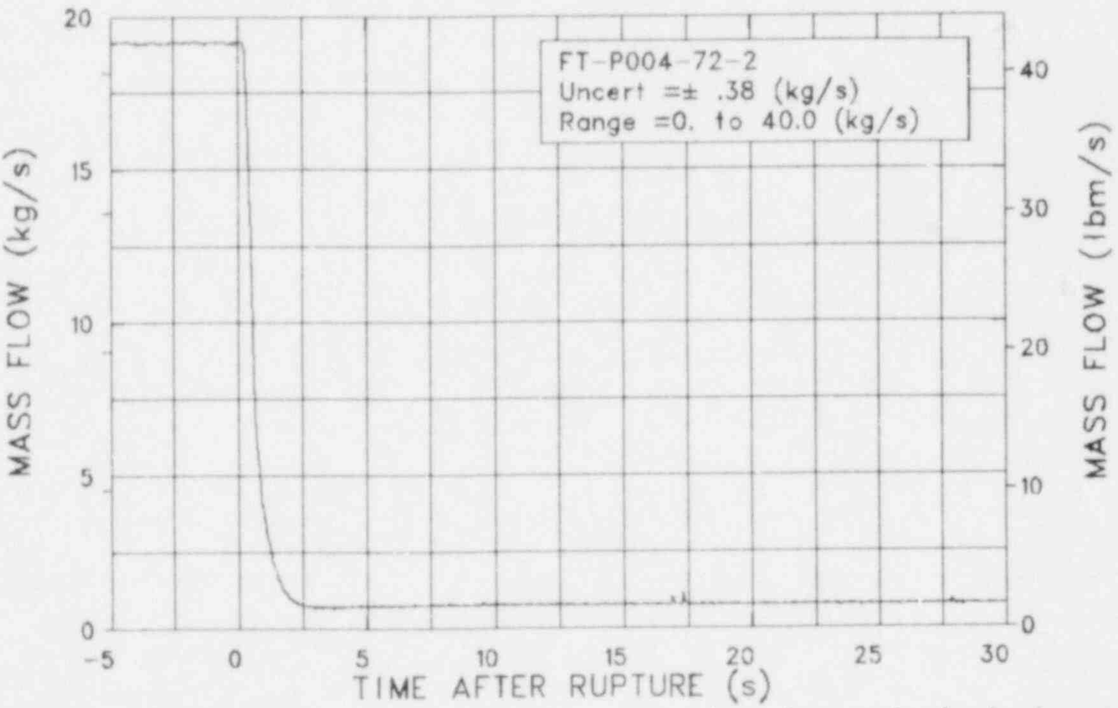

Figure 3M-22. Flow rate in secondary coolant system main feedwater pump discharge (FT-P004-72-2).

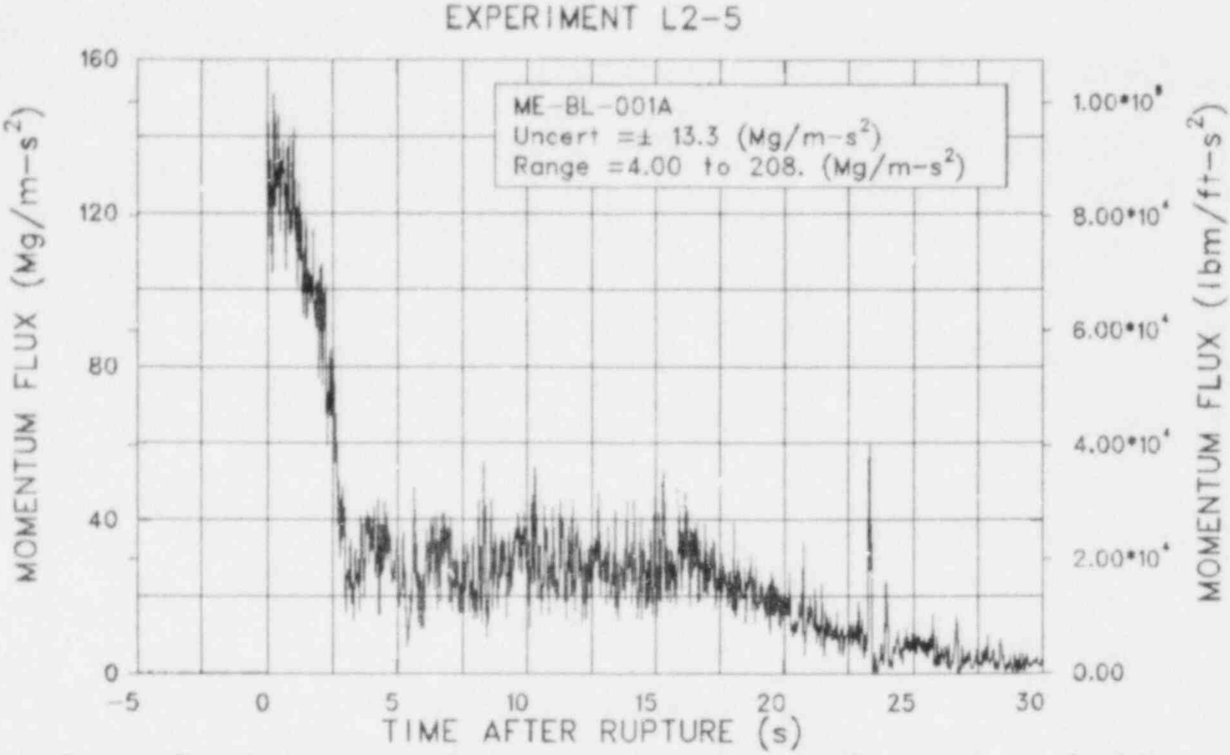

Figure 3M-23. Momentum flux in broken loop cold leg at bottom of pipe, high range (ME-BL-001A).

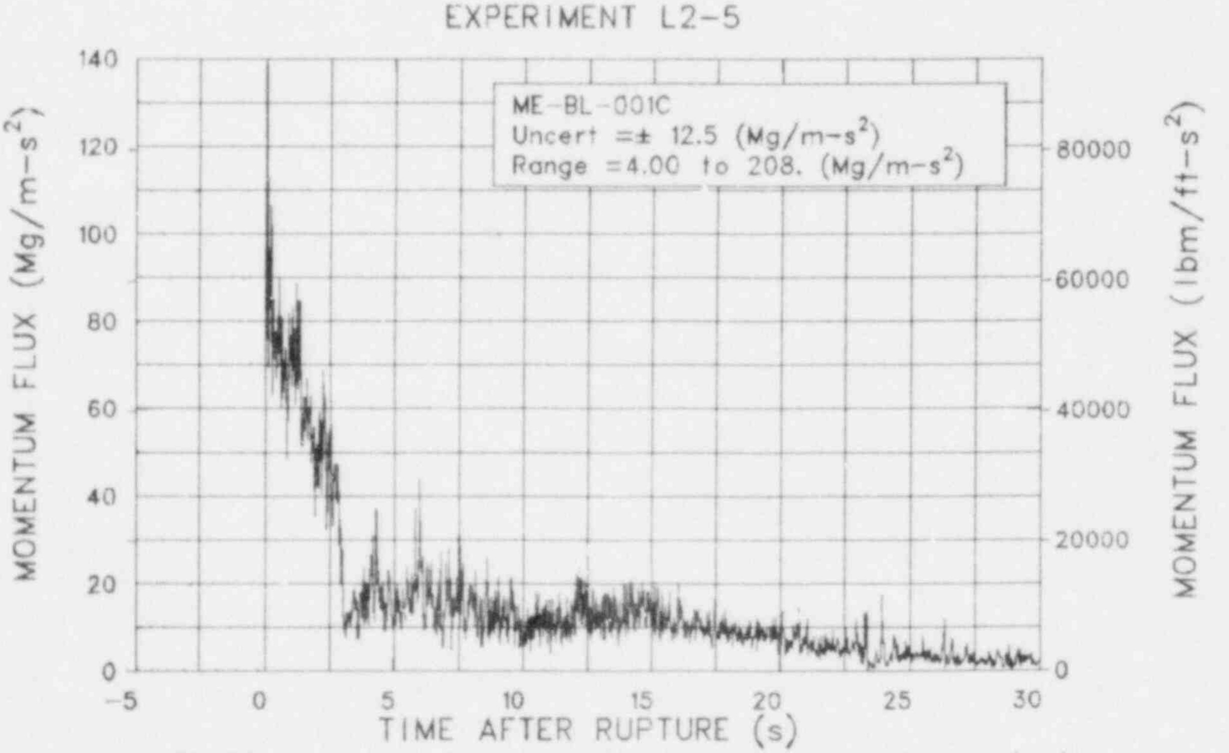

Figure 3M-24. Momentum flux in broken loop cold leg at top of pipe, high range (ME-BL-001C).

EXPERIMENT L2-5

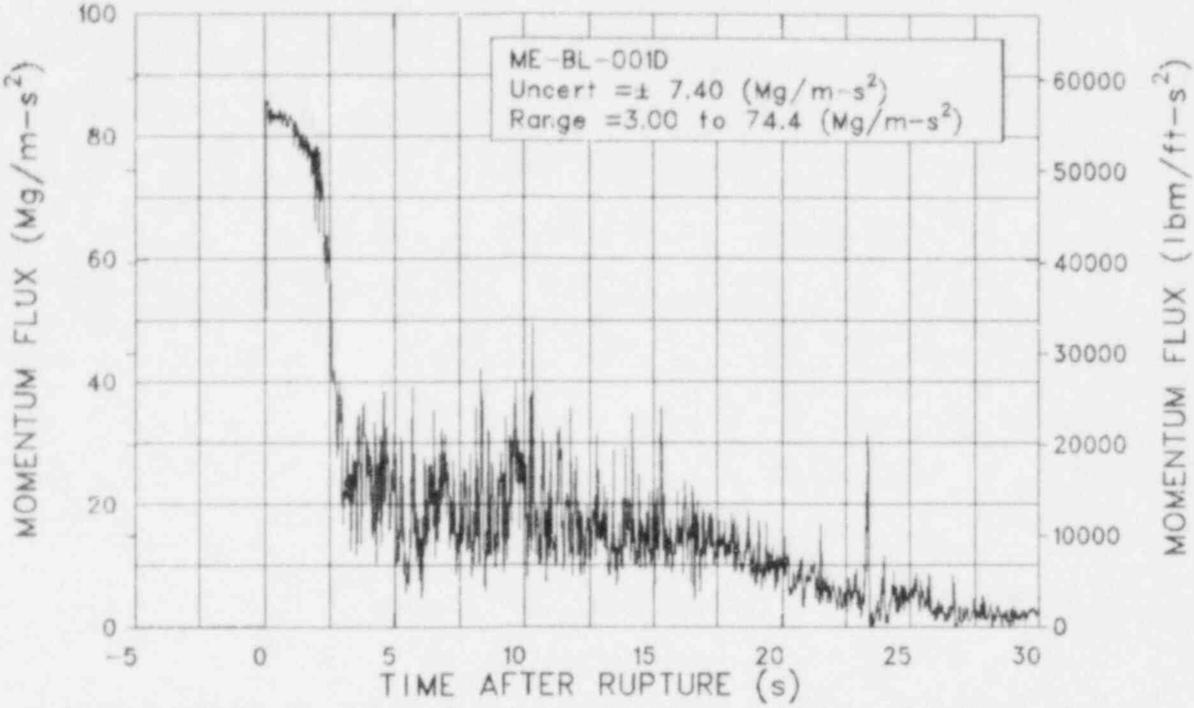

Figure 3M-25. Momentum flux in broken loop cold leg at bottom of pipe, low range (ME-BL-001D) (qualified, narrow range instrument).

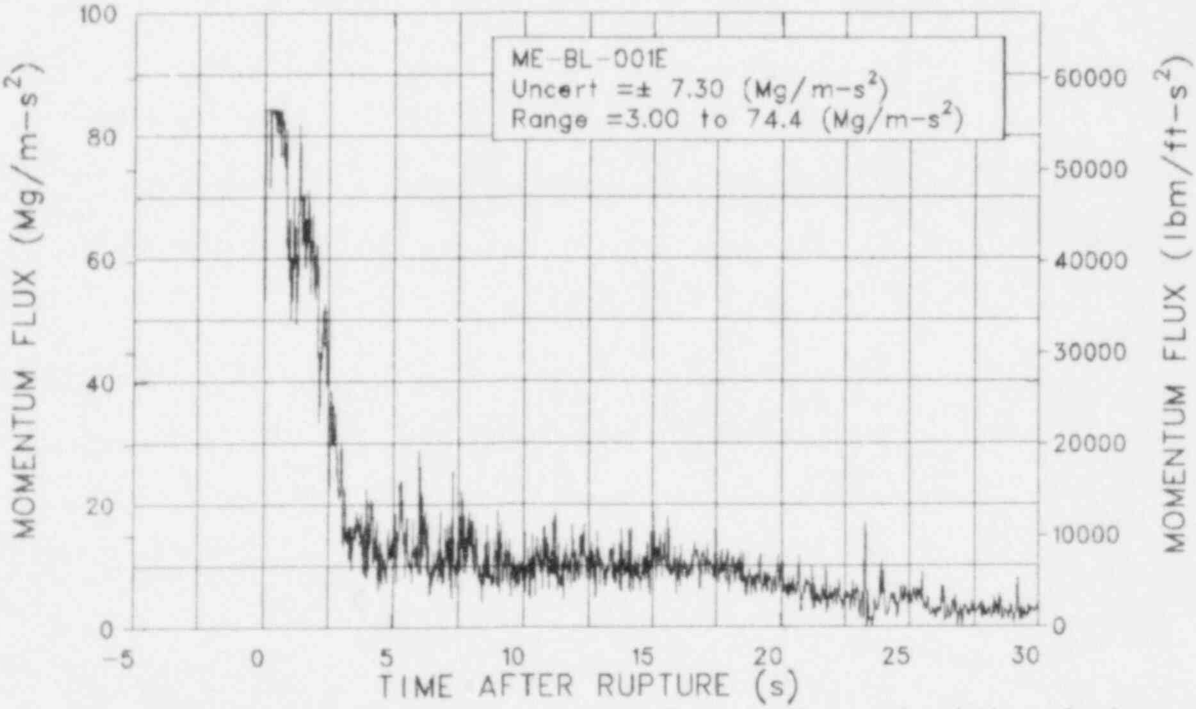

Figure 3M-26. Momentum flux in broken loop cold leg at middle of pipe, low range (ME-BL-001E) (qualified, narrow range instrument).

EXPERIMENT L2-5

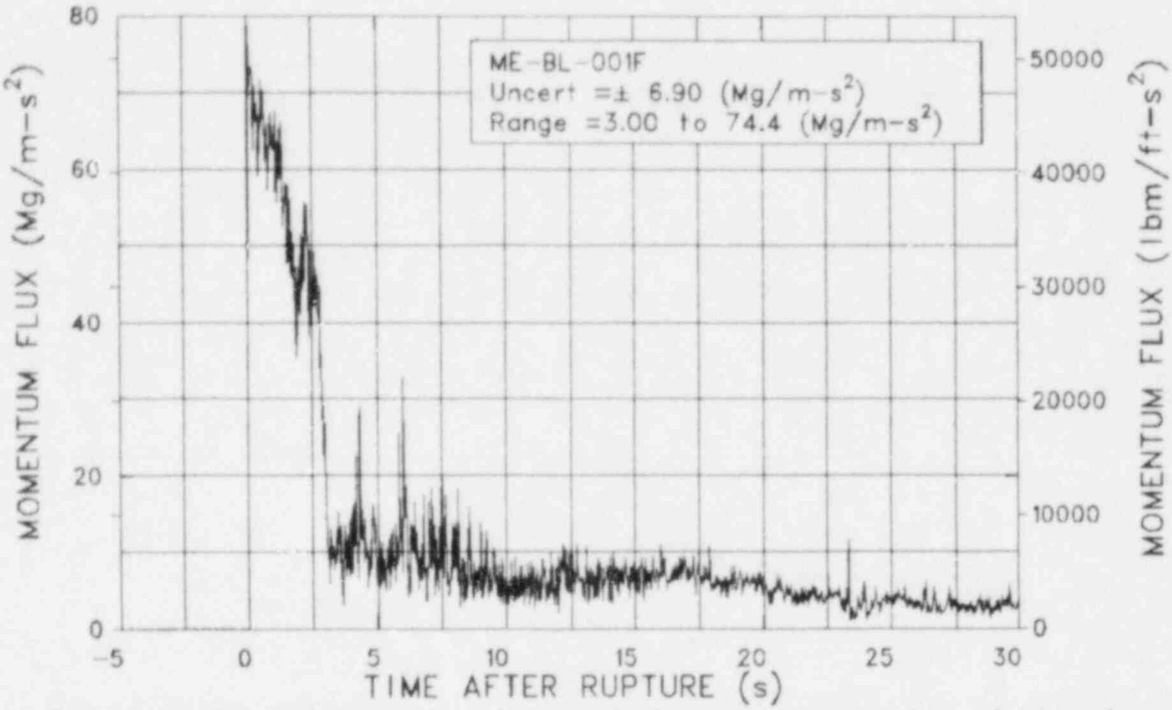

Figure 3M-27. Momentum flux in broken loop cold leg at top of pipe, low range (ME-BL-001F) (qualified, narrow range instrument).

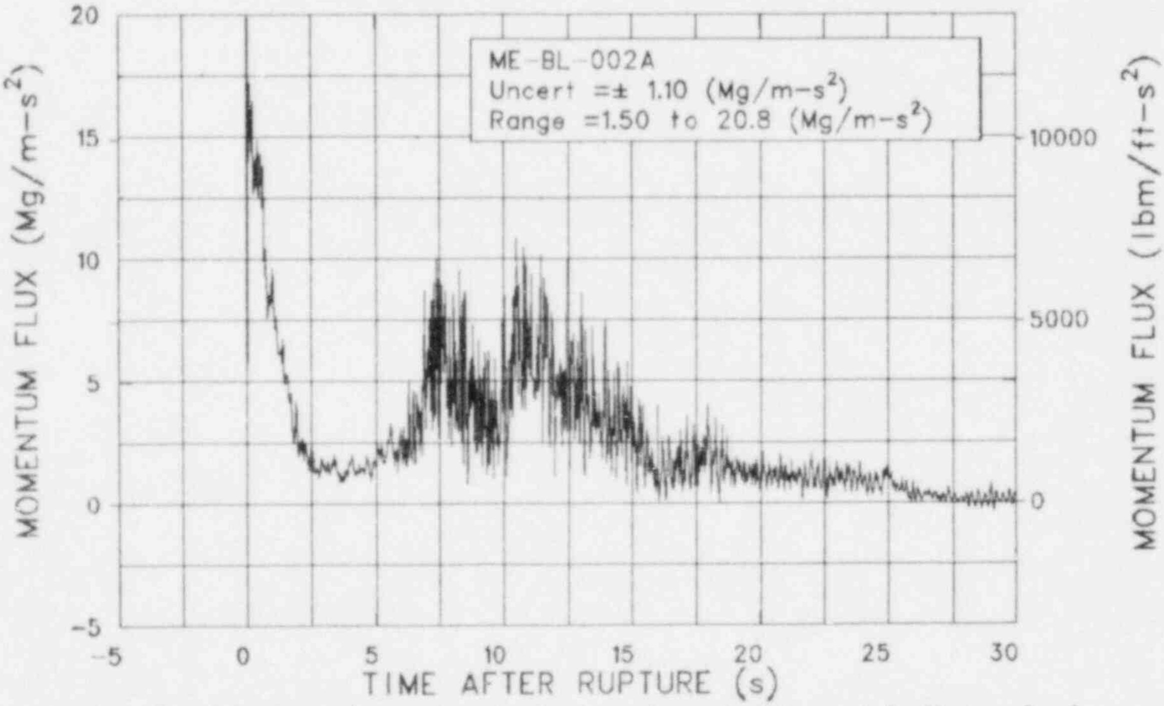

Figure 3M-28. Momentum flux in broken loop hot leg at bottom of pipe, high range (ME-BL-002A).

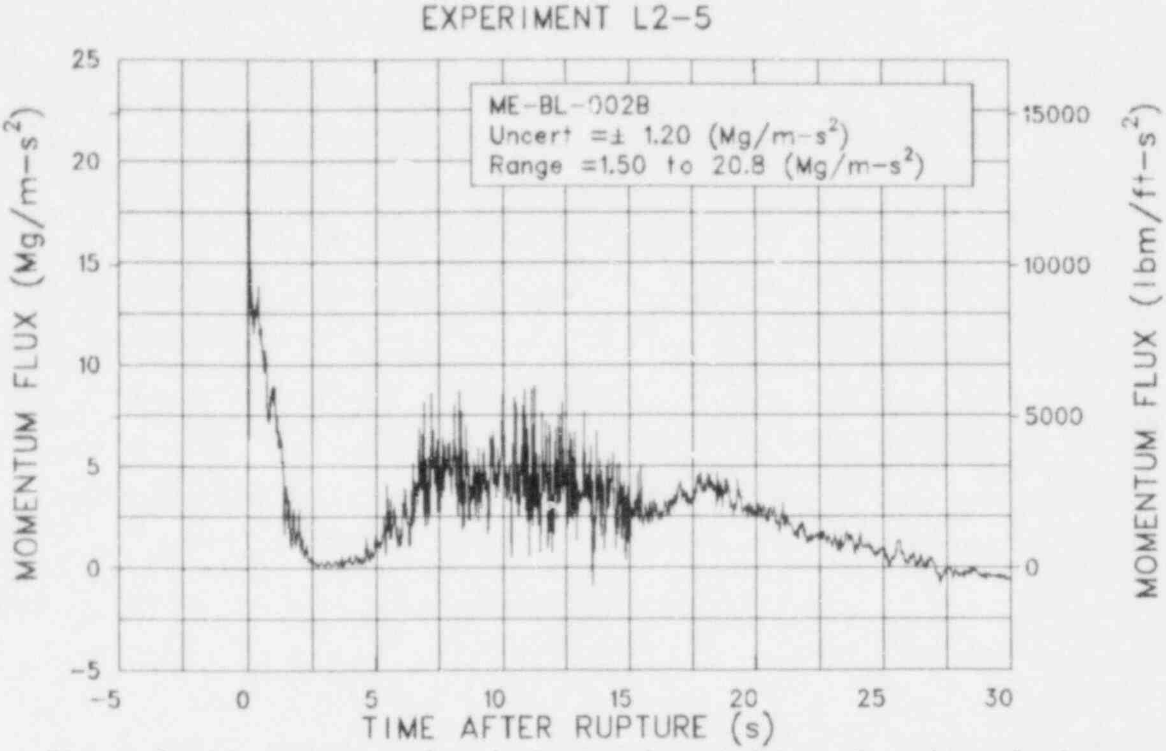

Figure 3M-29. Momentum flux in broken loop hot leg at center of pipe, high range (ME-BL-002B).

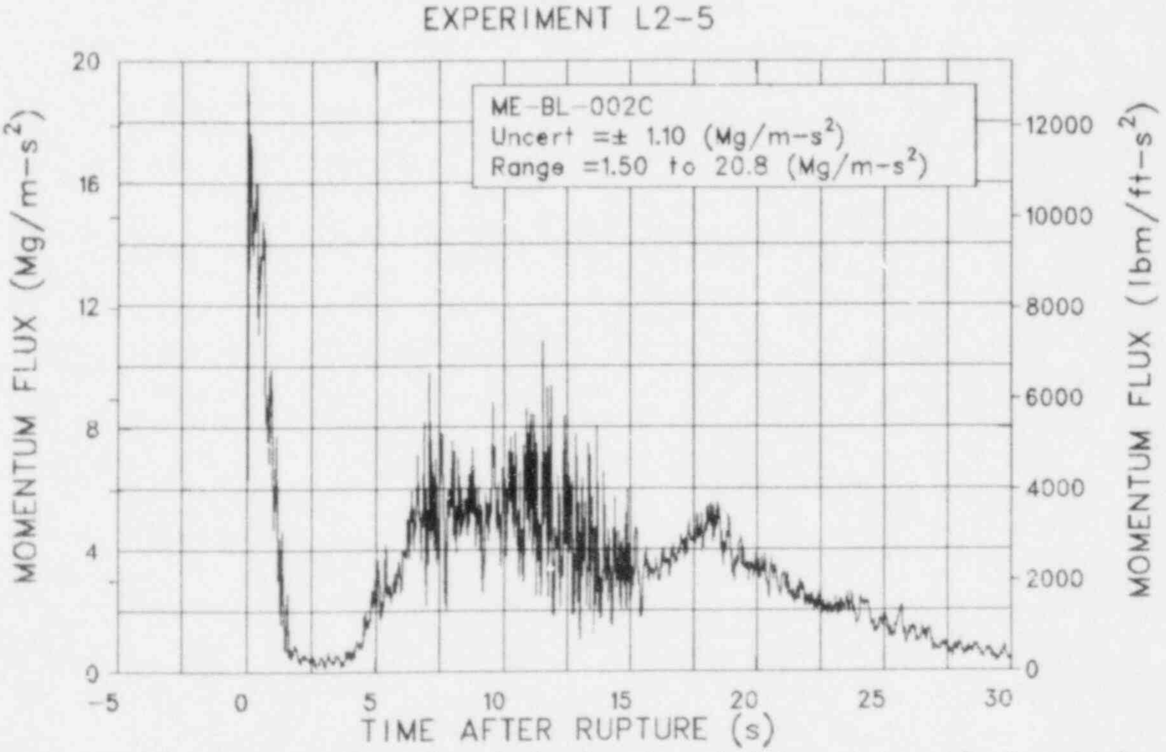

Figure 3M-30. Momentum flux in broken loop hot leg at top of pipe, high range (ME-BL-002C).

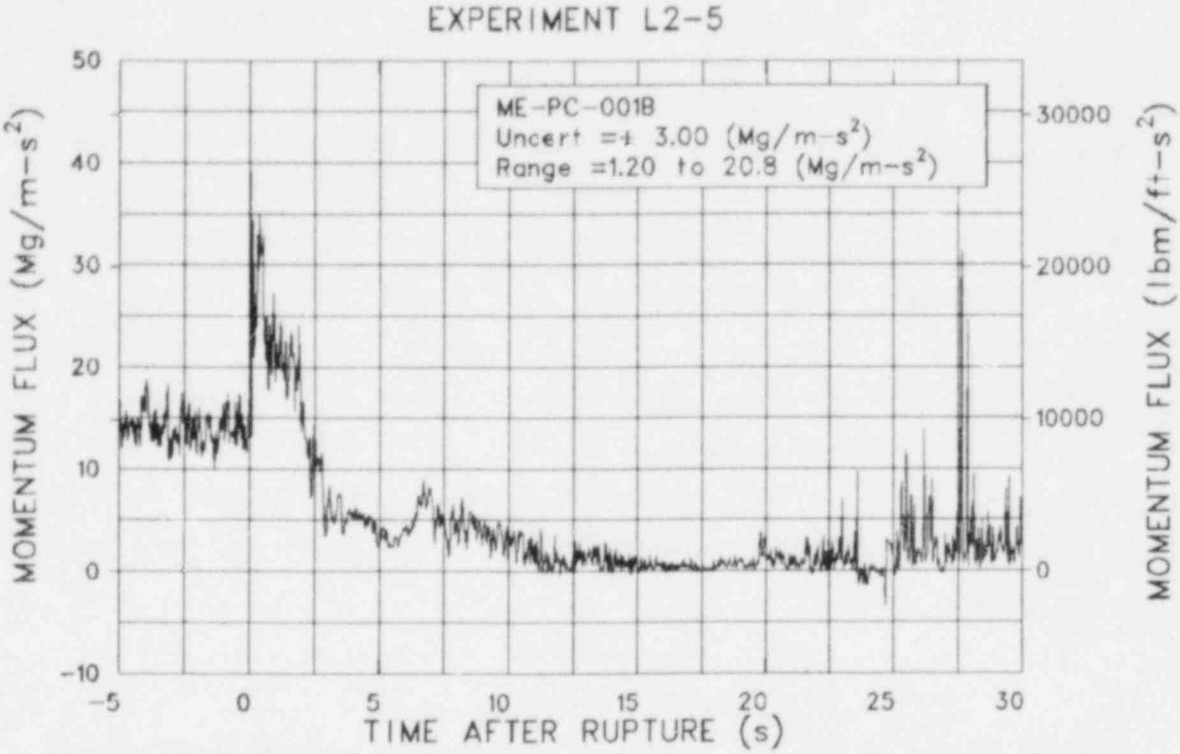

Figure 3M-31. Momentum flux in intact loop cold leg at center of pipe (ME-PC-001B).

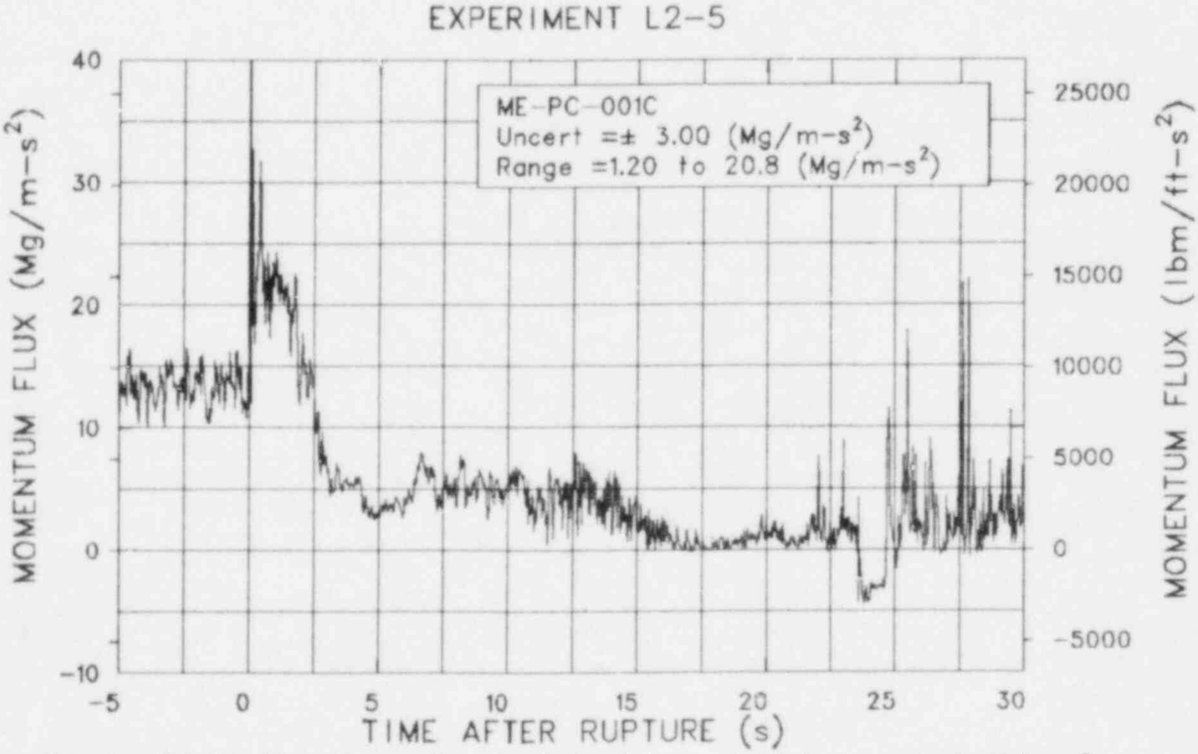

Figure 3M-32. Momentum flux in intact loop cold leg on east side of pipe (ME-PC-001C).

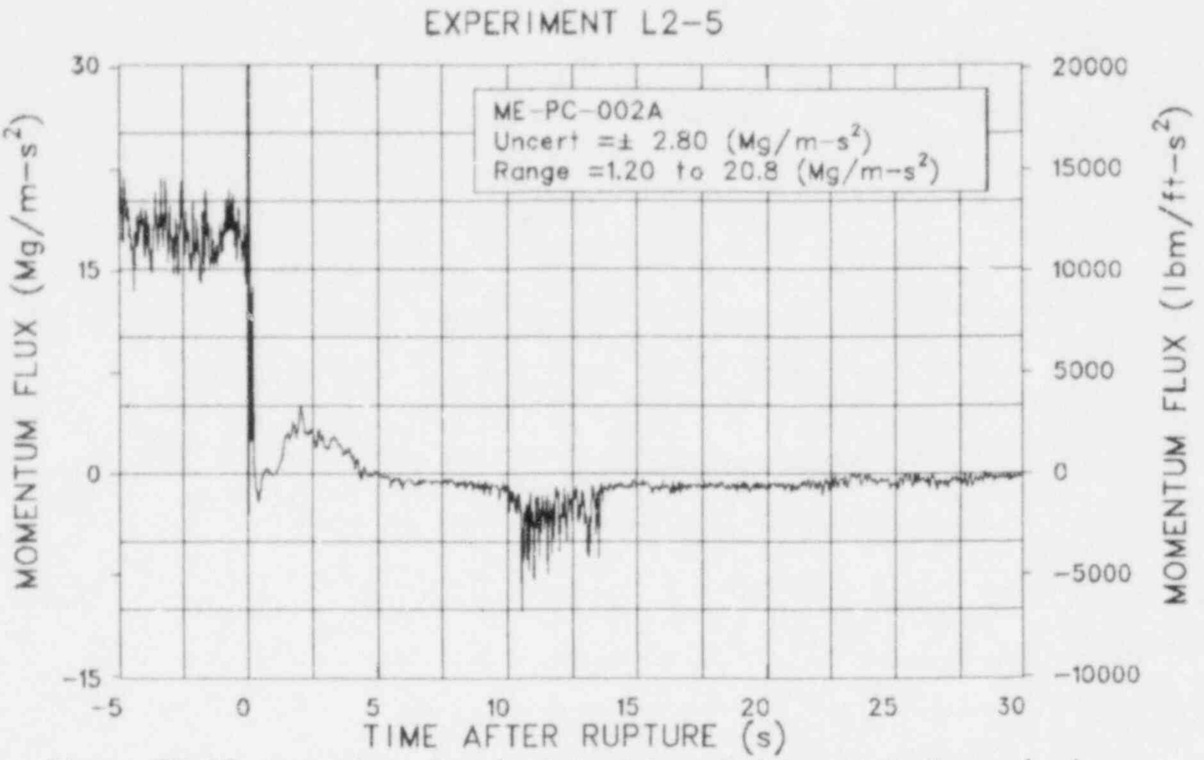

Figure 3M-33. Momentum flux in intact loop hot leg at bottom of pipe (ME-PC-002A).

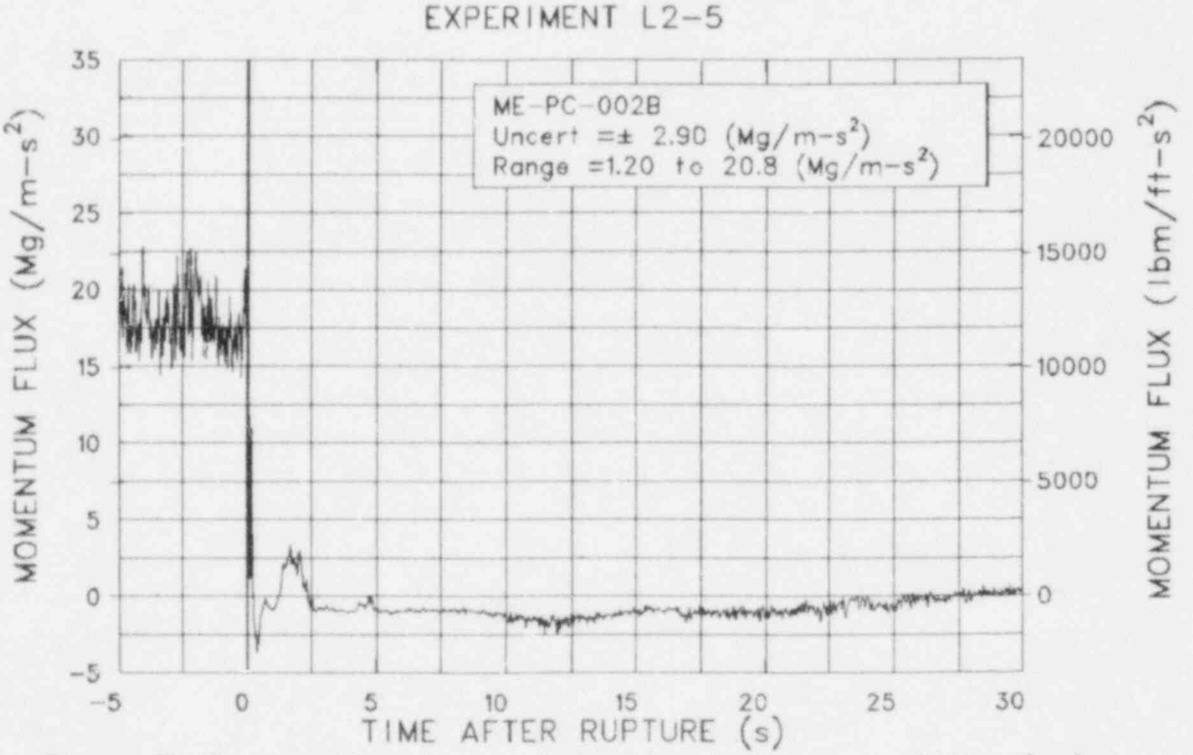

Figure 3M-34. Momentum flux in intact loop hot leg at middle of pipe (ME-PC-002B).

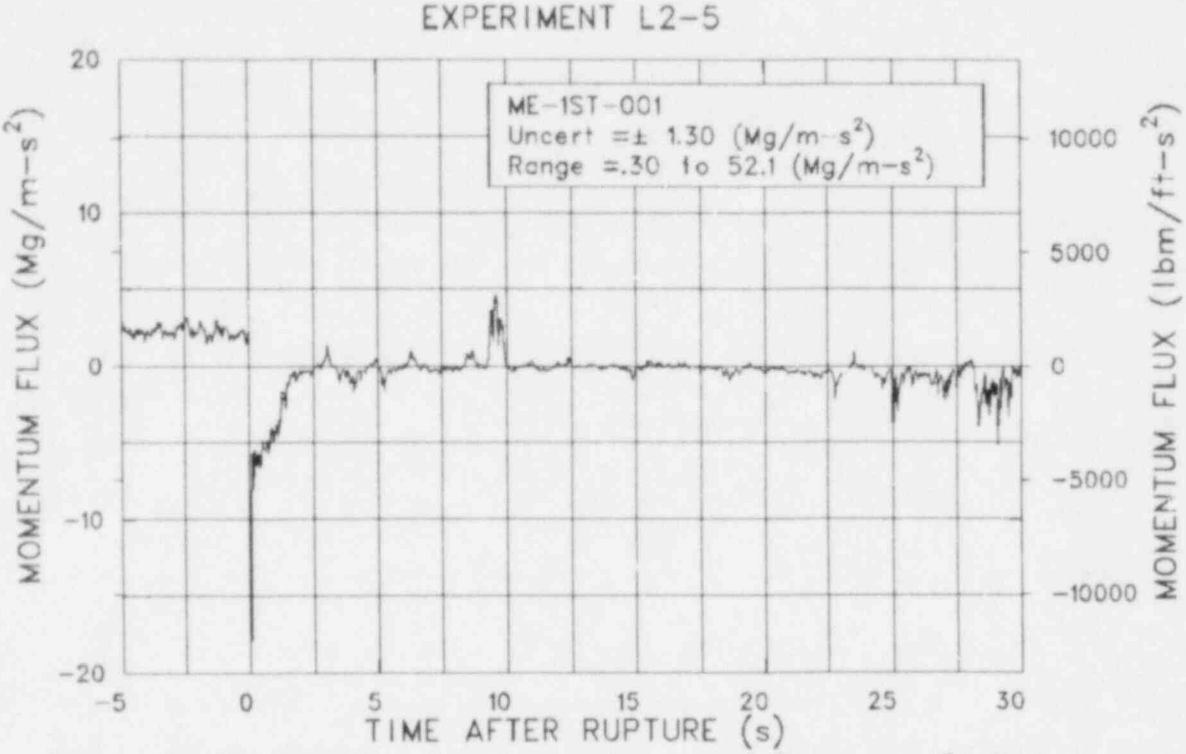

Figure 3M-35. Momentum flux in reactor vessel Downcomer Stalk 1 (ME-1ST-001).

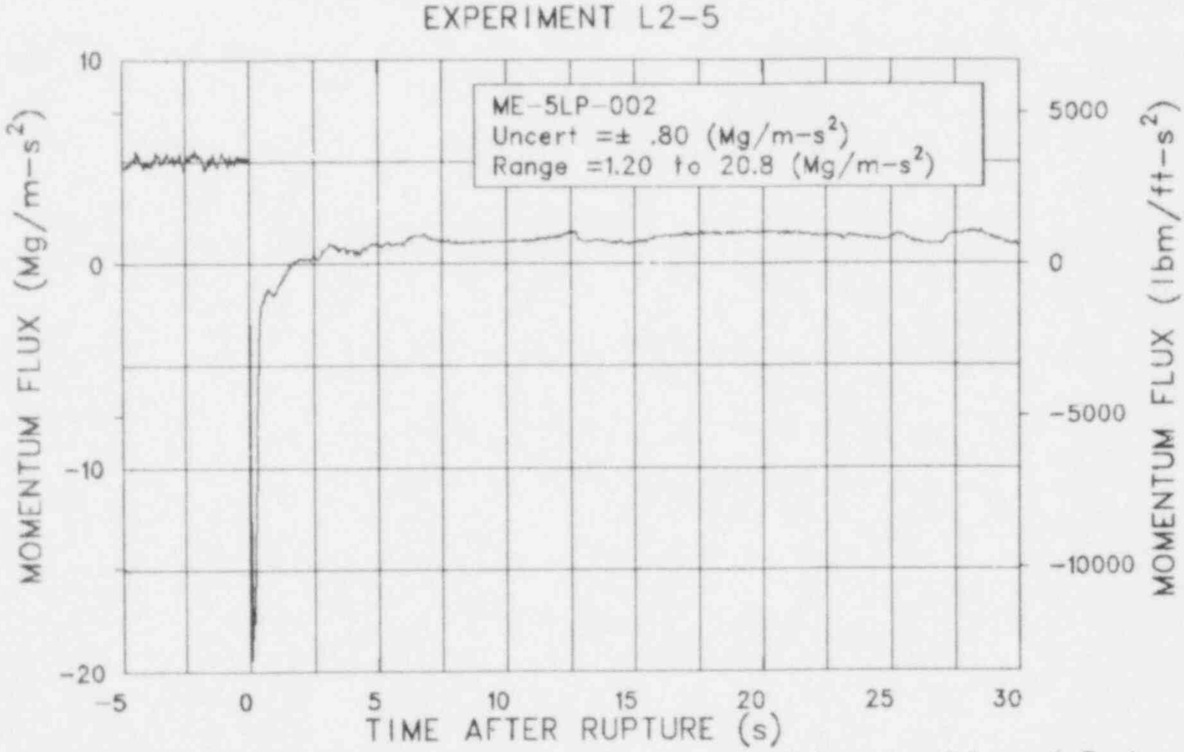

Figure 3M-36. Momentum flux in reactor vessel at lower end box of Fuel Assembly 5 (ME-5LP-002)

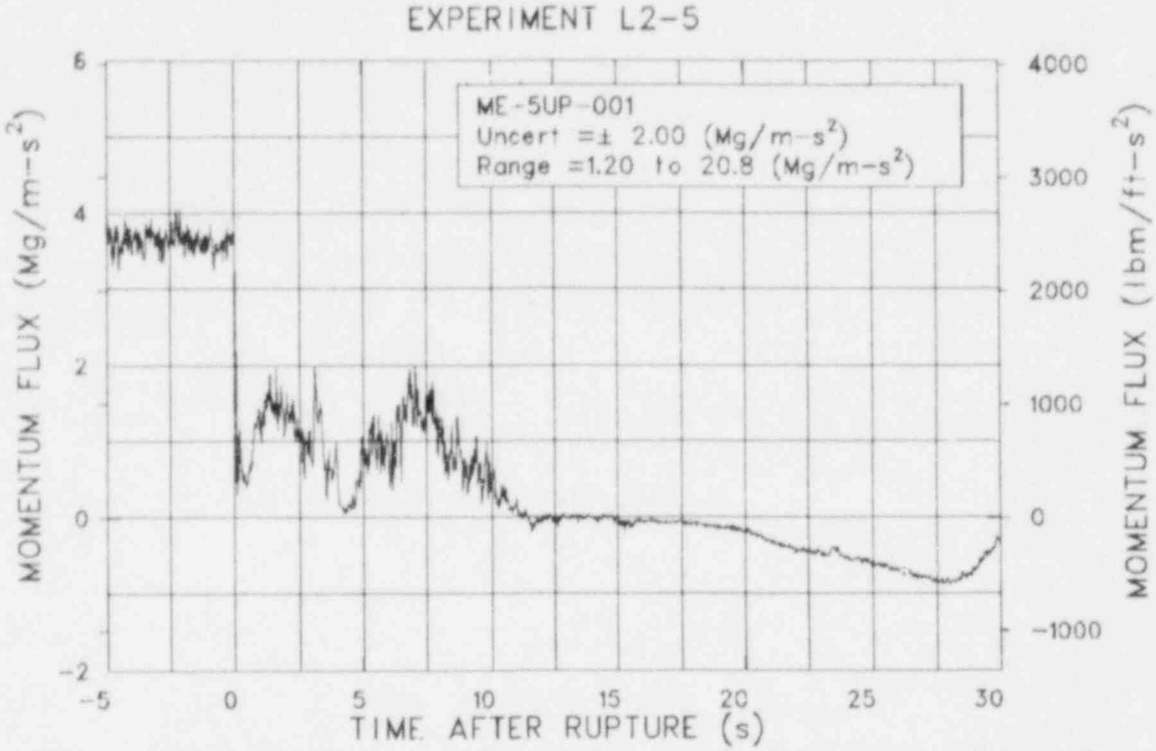

Figure 3M-37. Momentum flux in reactor vessel above upper end box of Fuel Assembly 5 (ME-5UP-001).

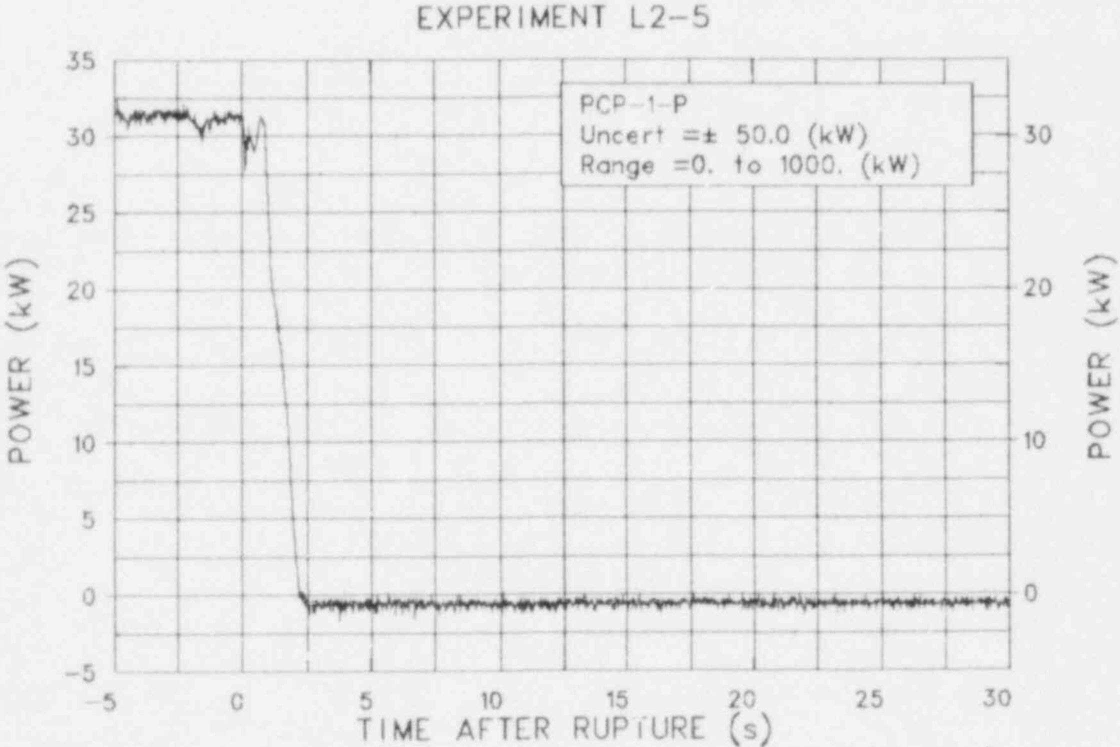

Figure 3M-38. Pump power for primary coolant Pump 1 (PCP-1-P).

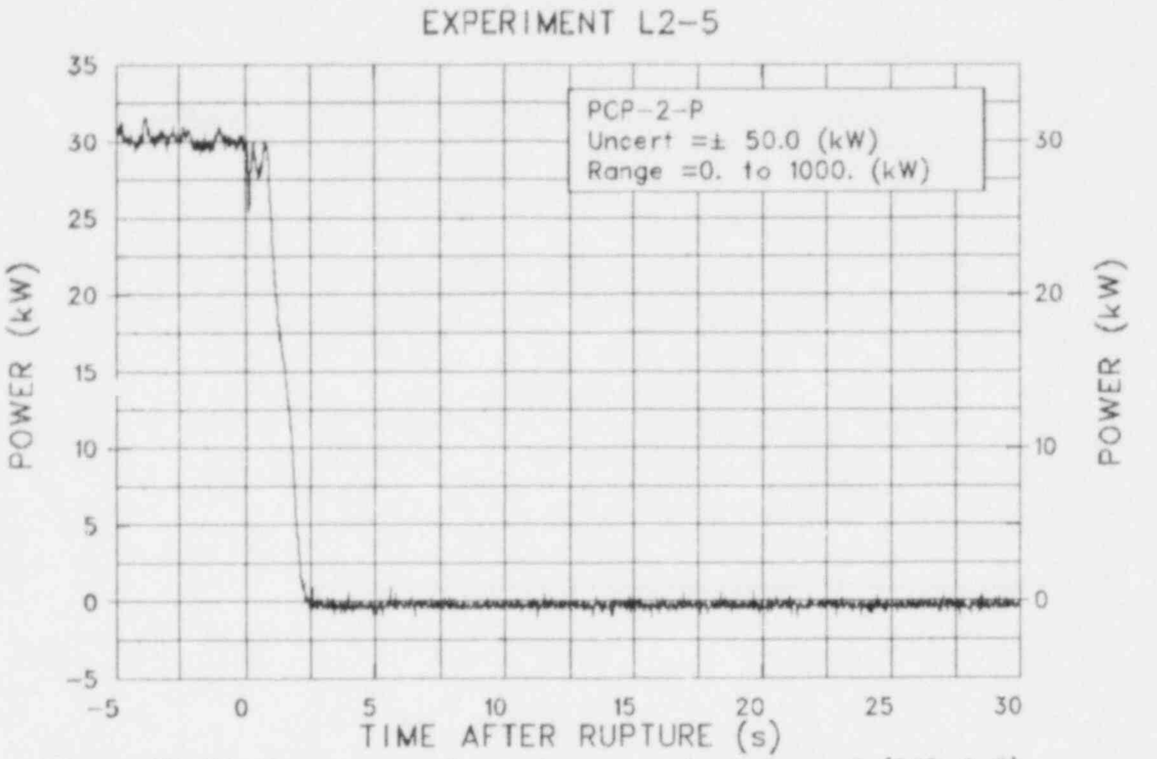

Figure 3M-39. Pump power for primary coolant Pump 2 (PCP-2-P).

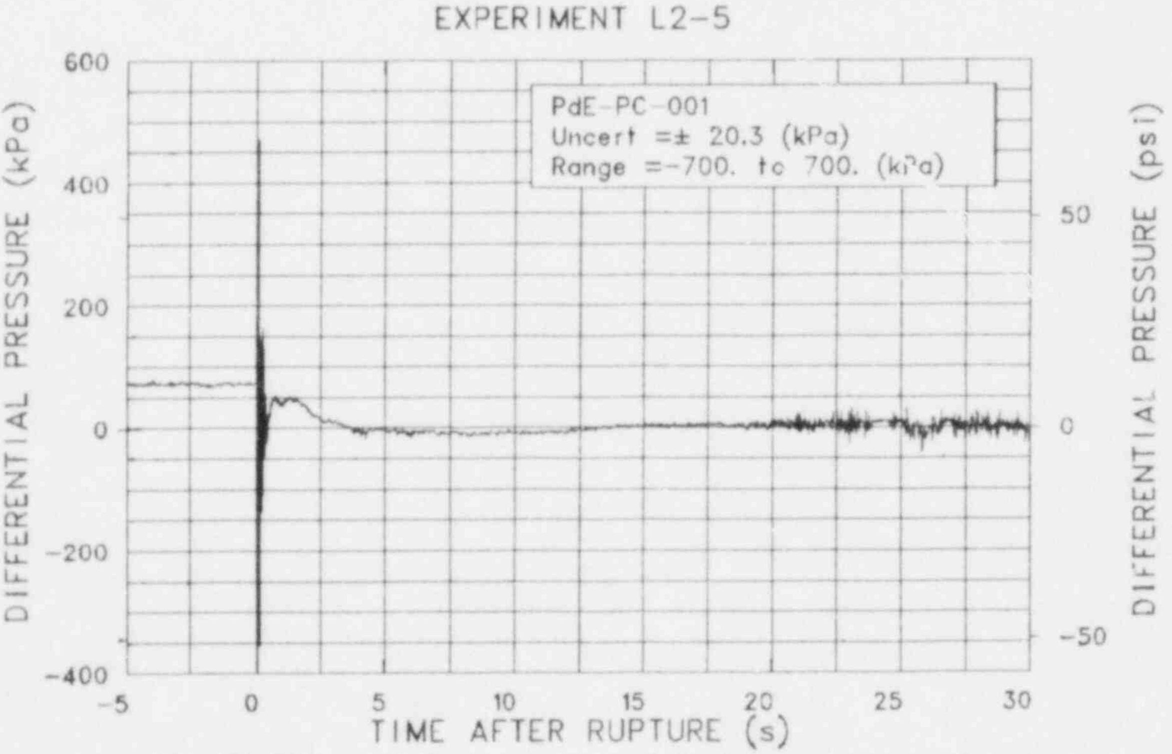

Figure 3M-40. Differential pressure in intact loop across primary coolant Pumps 1 and 2 (PdE-PC-001).

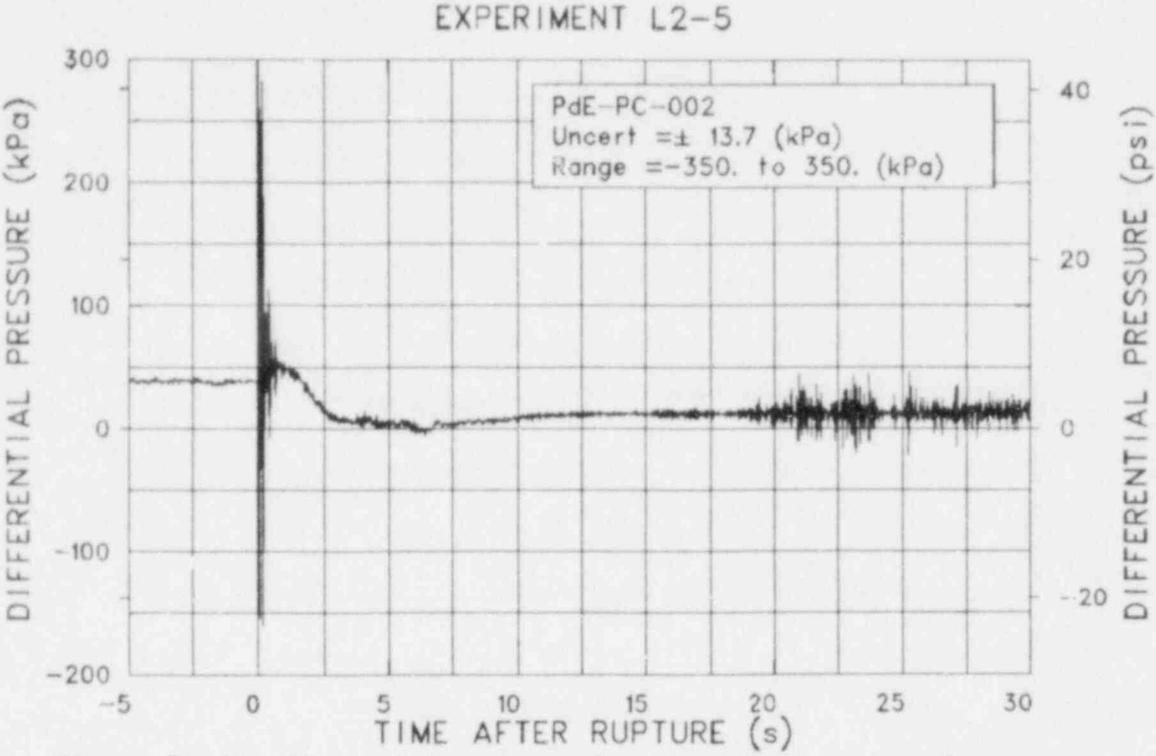

Figure 3M-41. Differential pressure in intact loop across steam generator (PdE-PC-002).

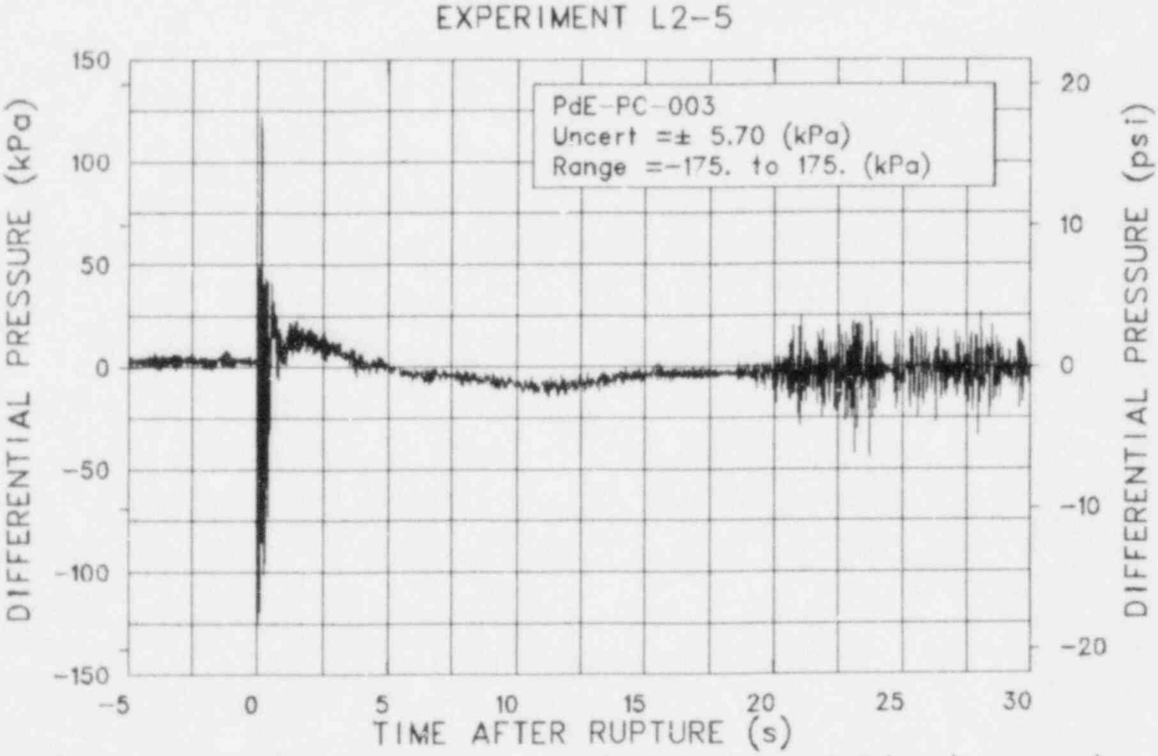

Figure 3M-42. Differential pressure in intact loop hot leg from reactor vessel outlet to steam generator inlet (PdE-PC-003).

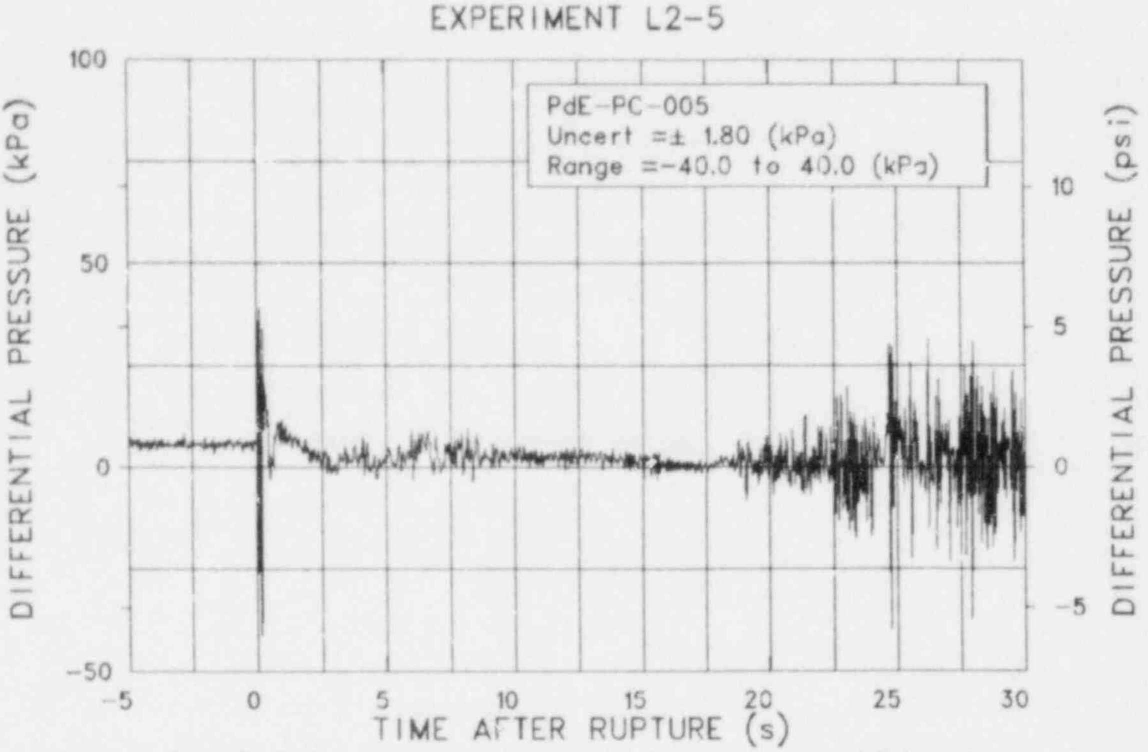

Figure 3M-43. Differential pressure in intact loop cold leg from primary coolant pump discharge to reactor vessel inlet (PdE-PC-005).

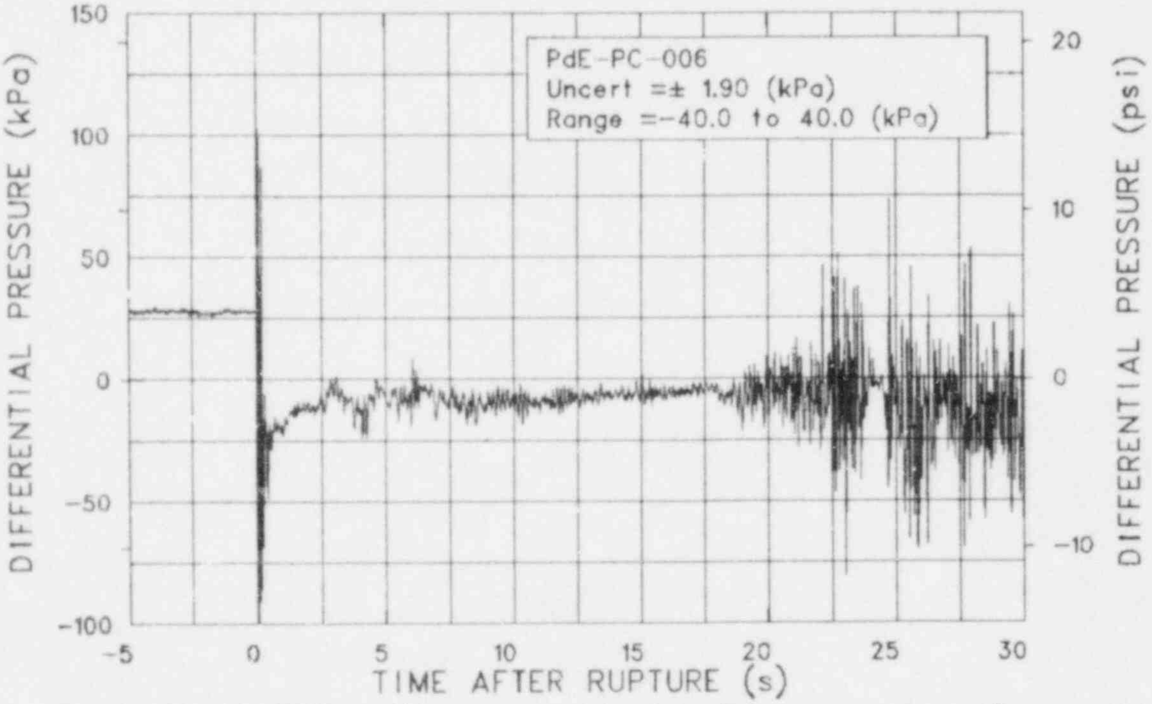

Figure 3M-44. Differential pressure in intact loop across reactor vessel (PdE-PC-006).

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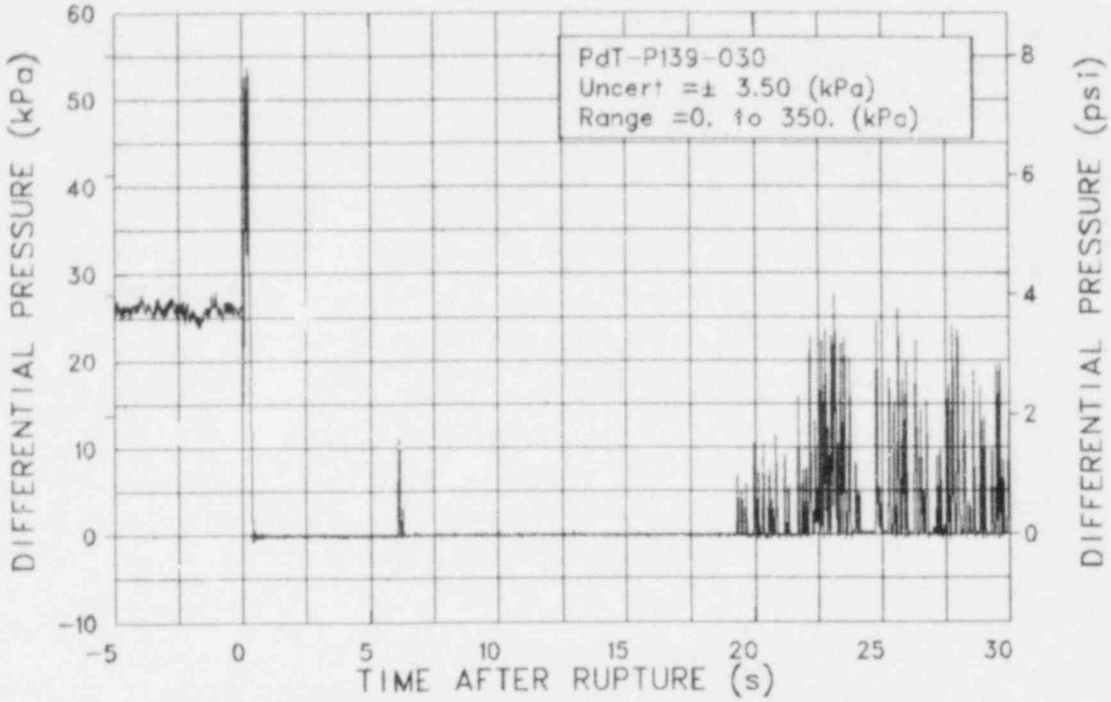

Figure 3M-45. Differential pressure in intact loop across reactor vessel (PdT-P139-030) (qualified, uni-directional instrument).

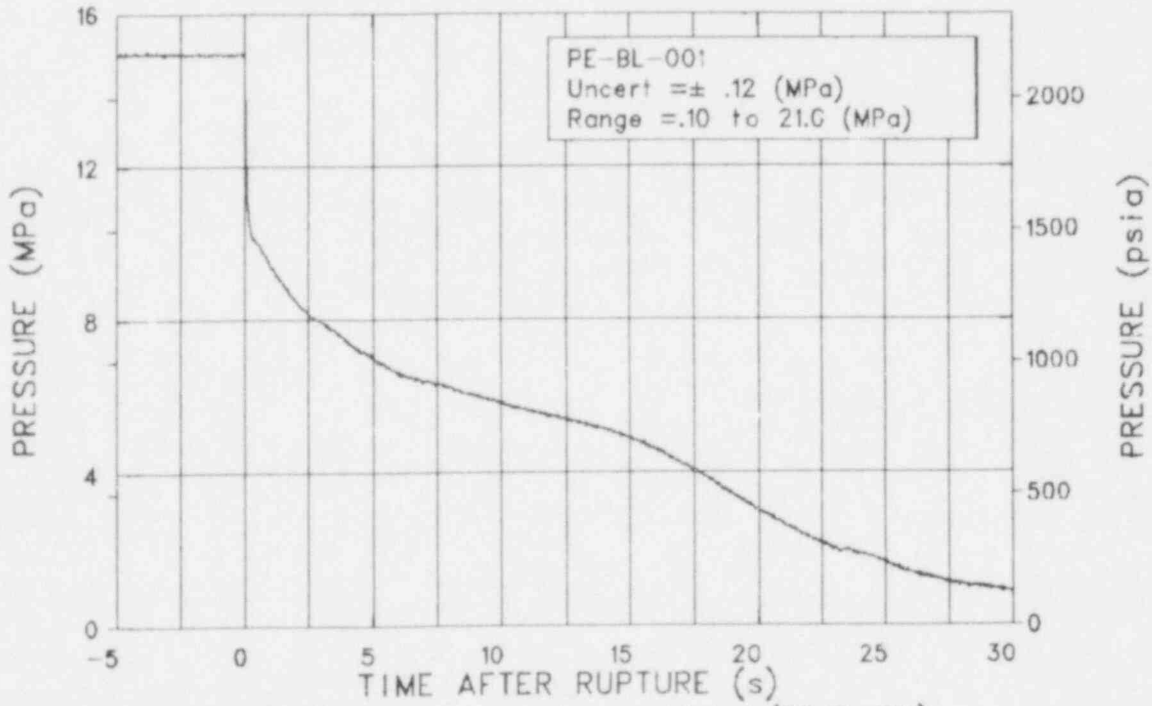

Figure 3M-46. Pressure in broken loop cold leg (PE-BL-001).

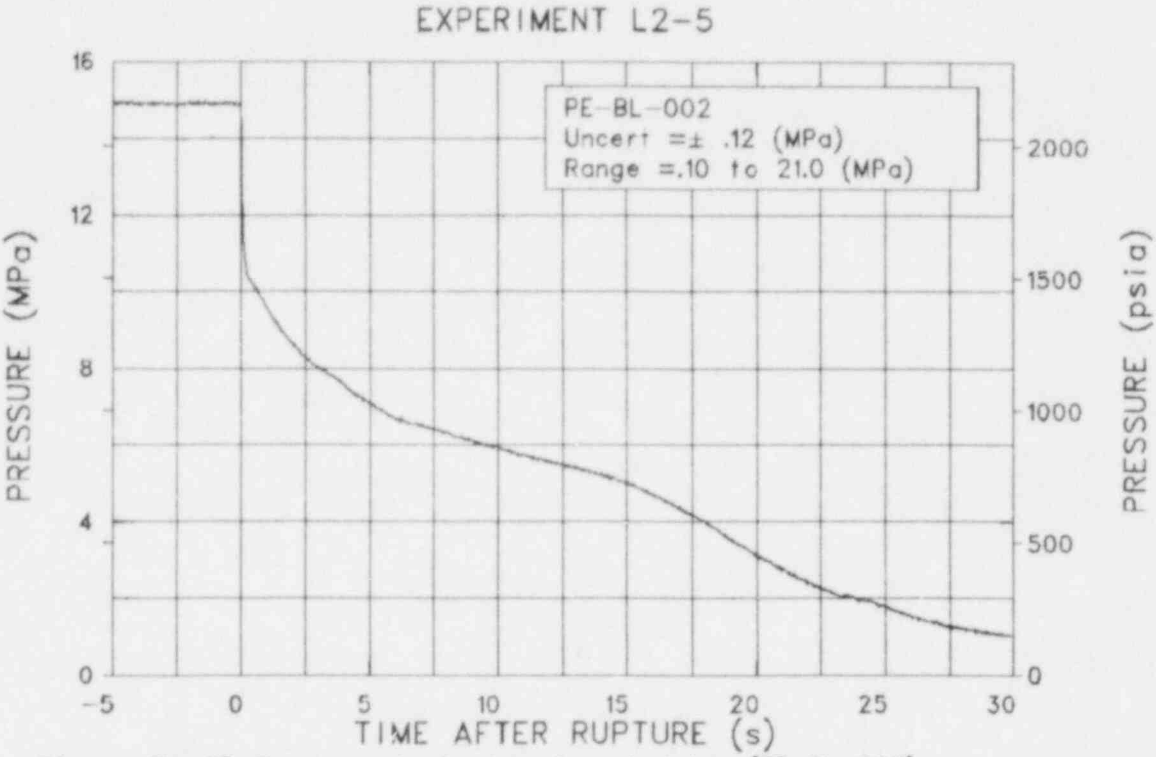

Figure 3M-47. Pressure in broken loop hot leg (PE-BL-002).

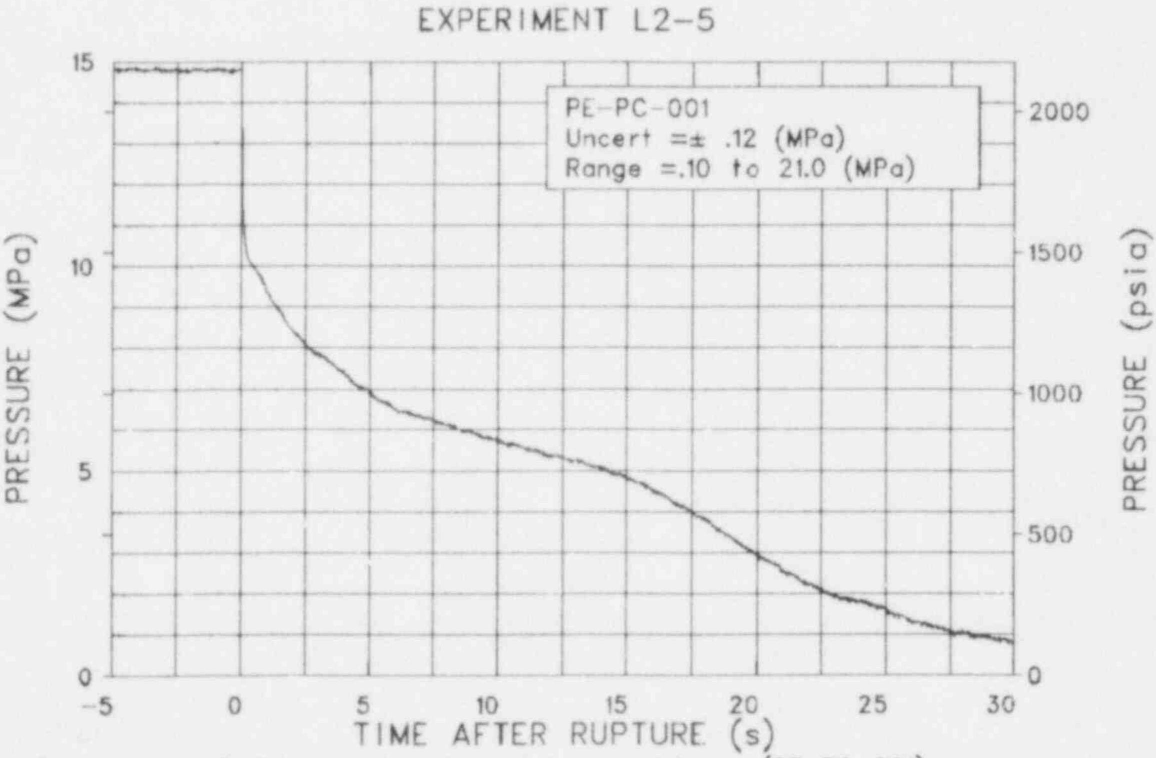

Figure 3M-48. Pressure in intact loop cold leg (PE-PC-001).

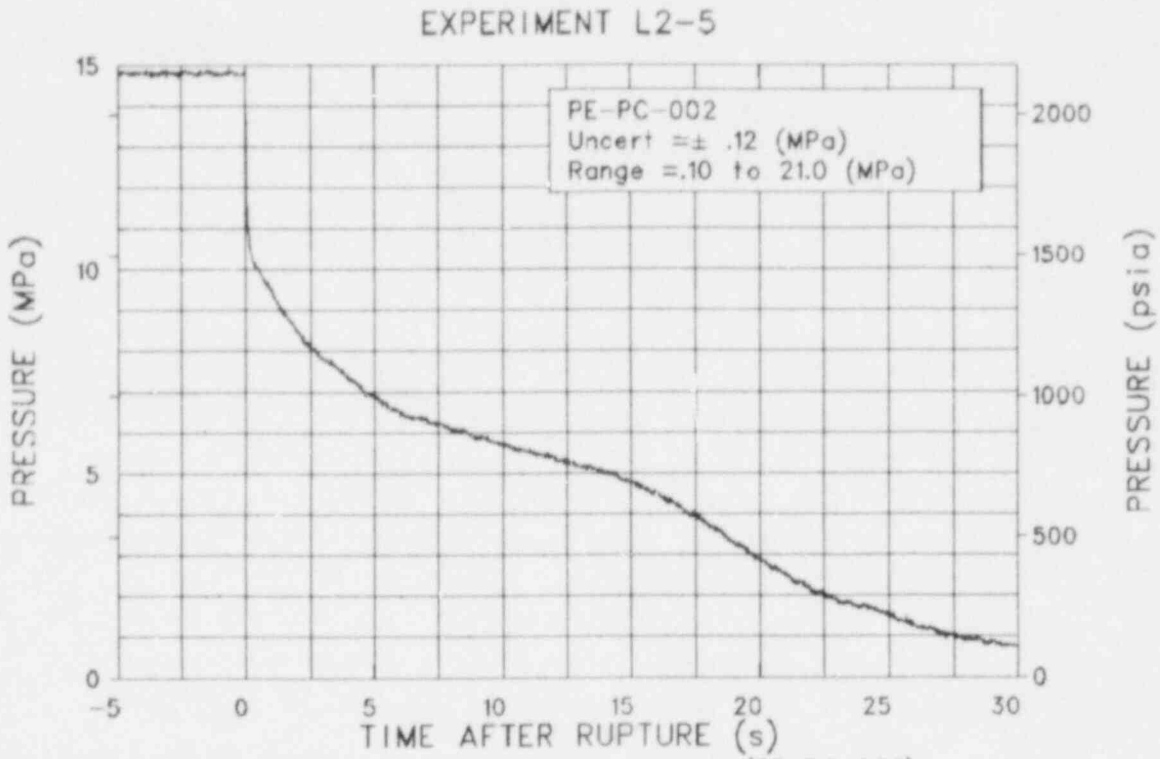

Figure 3M-49. Pressure in intact loop hot leg (PE-PC-002).

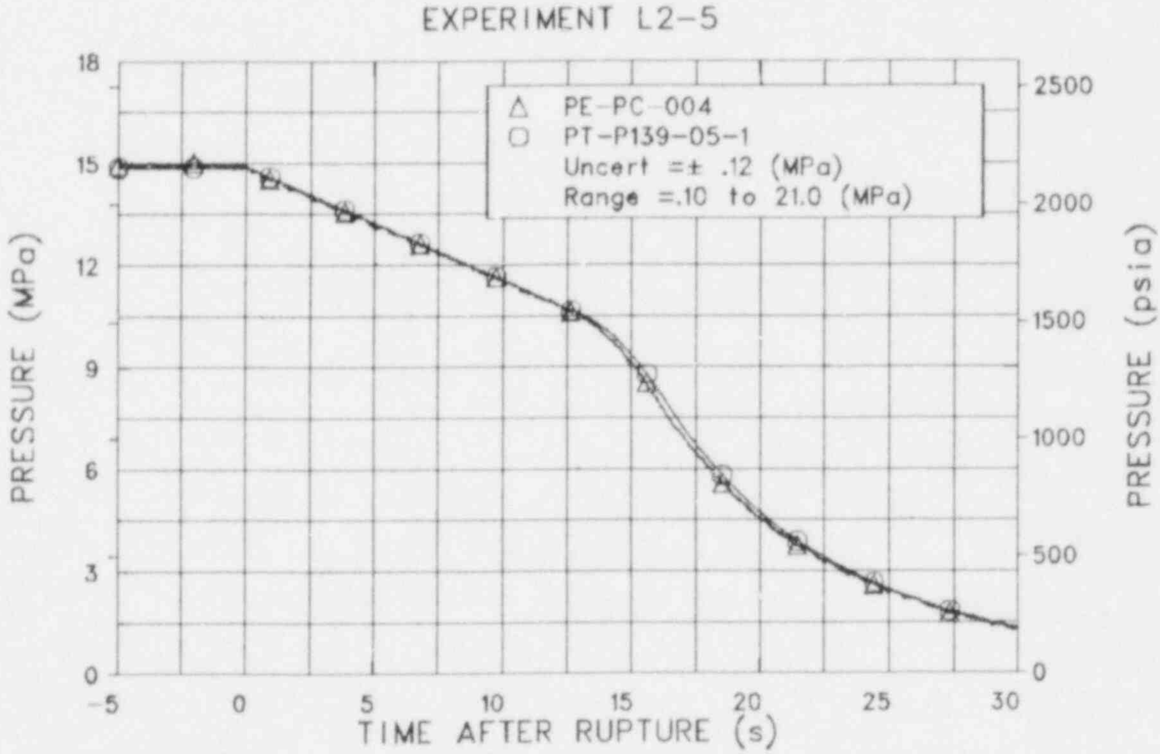

Figure 3M-50. Pressure in intact loop pressurizer vapor space (PE-PC-004 and PT-P139-05-1).

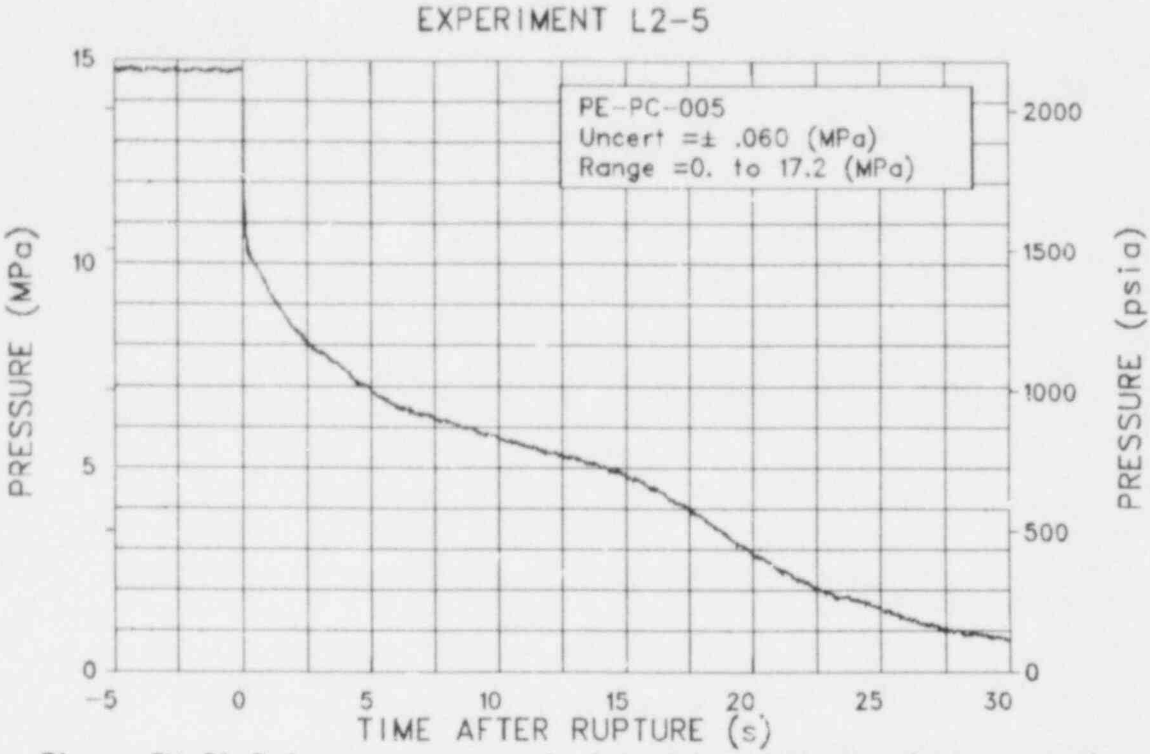

Figure 3M-51. Reference pressure in intact loop between steam generator outlet and primary coolant pump inlet (PE-PC-005).

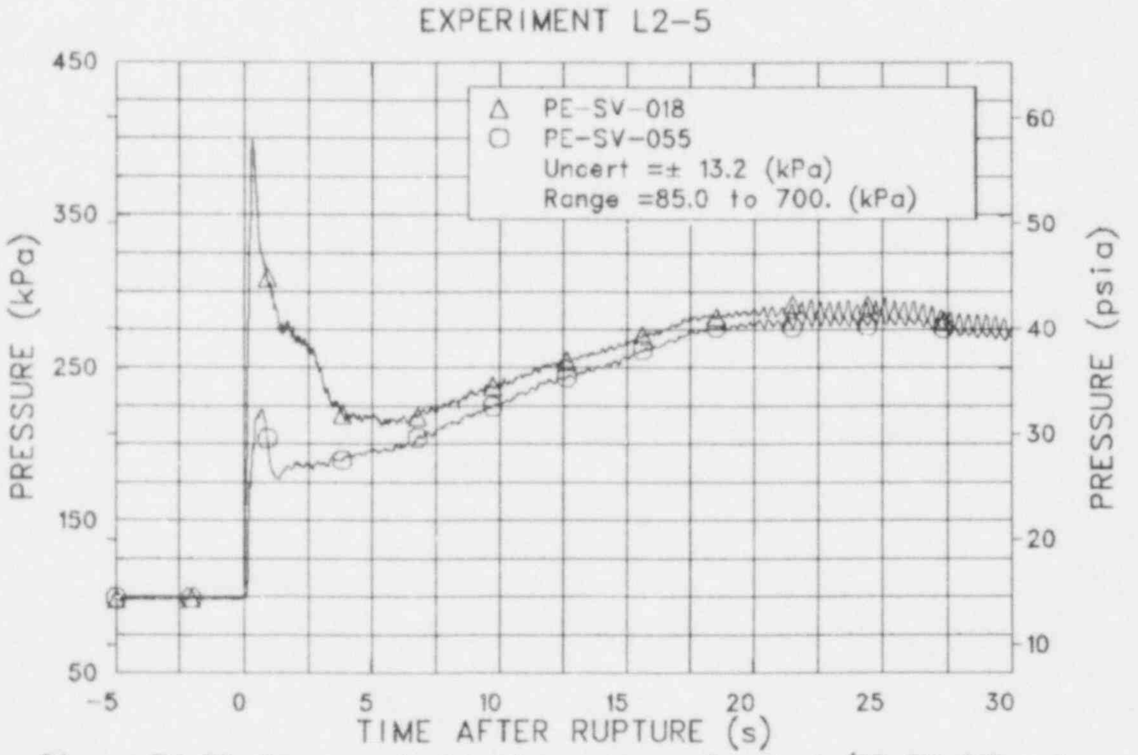

Figure 3M-52. Pressure in blowdown suppression tank (PE-SV-018 and -055).

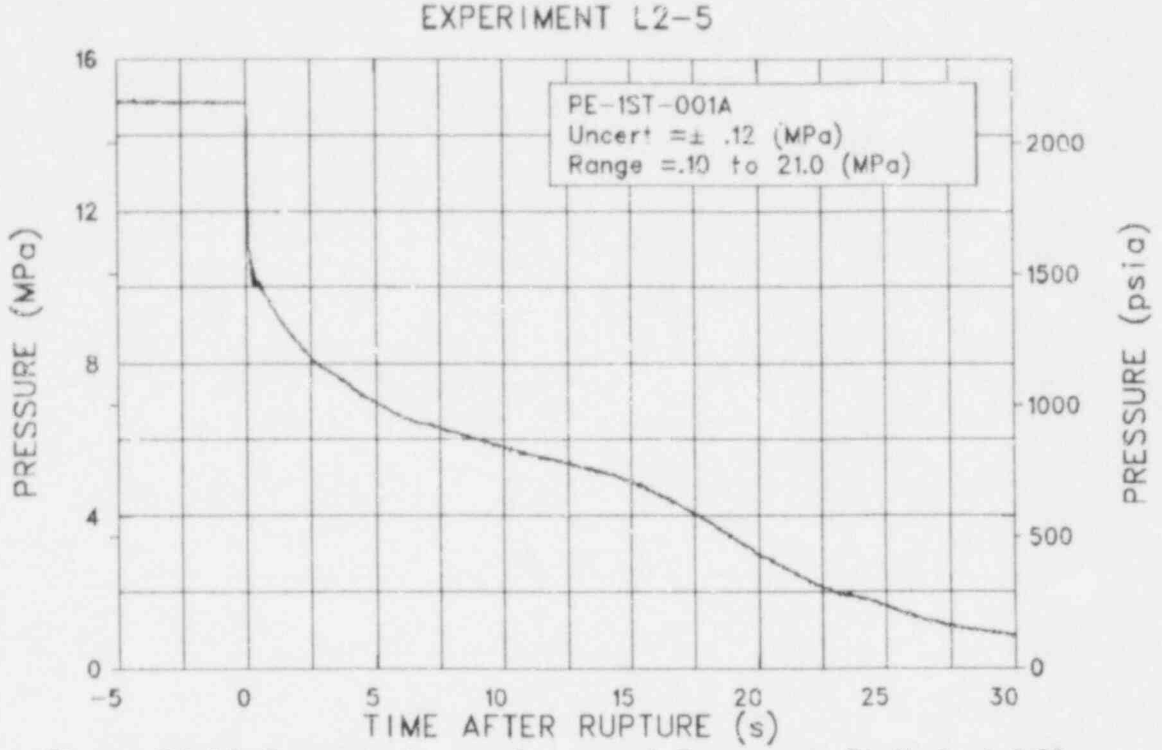

Figure 3M-53. Pressure in reactor vessel Downcomer Stalk 1 at 0.62 m above reactor vessel bottom, wide range (PE-1ST-001A).

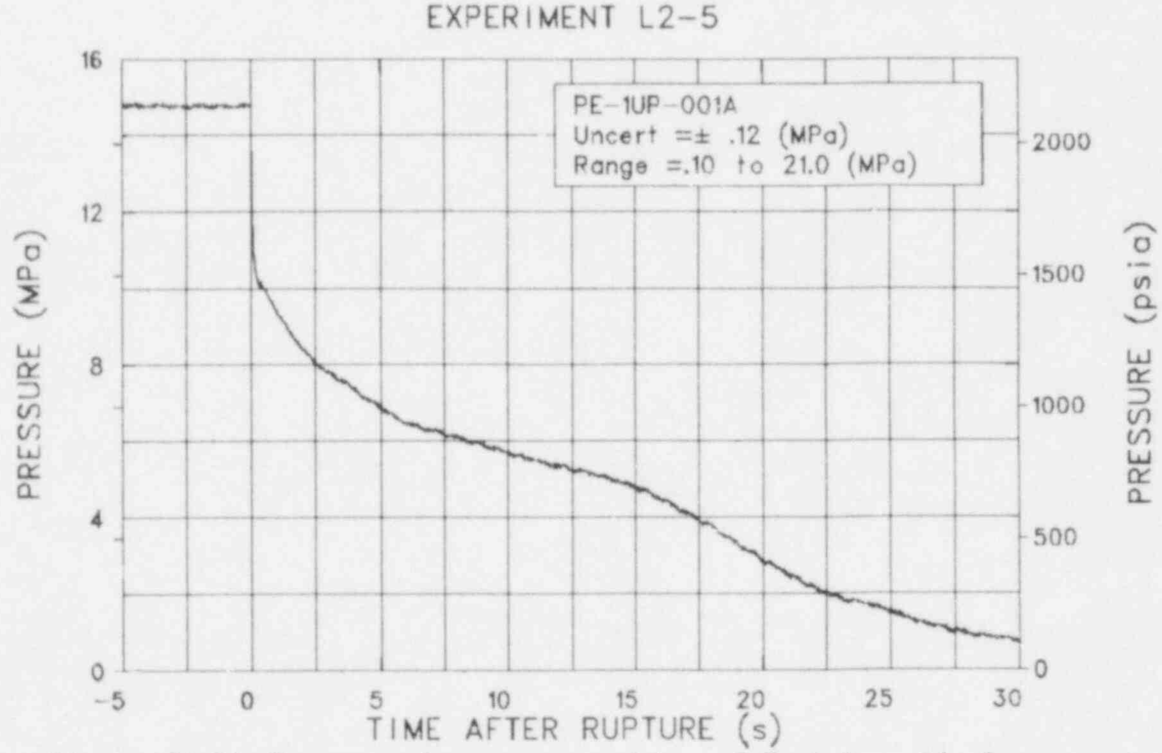

Figure 3M-54. Pressure above upper end box of Fuel Assembly 1 (PE-1UP-001A).

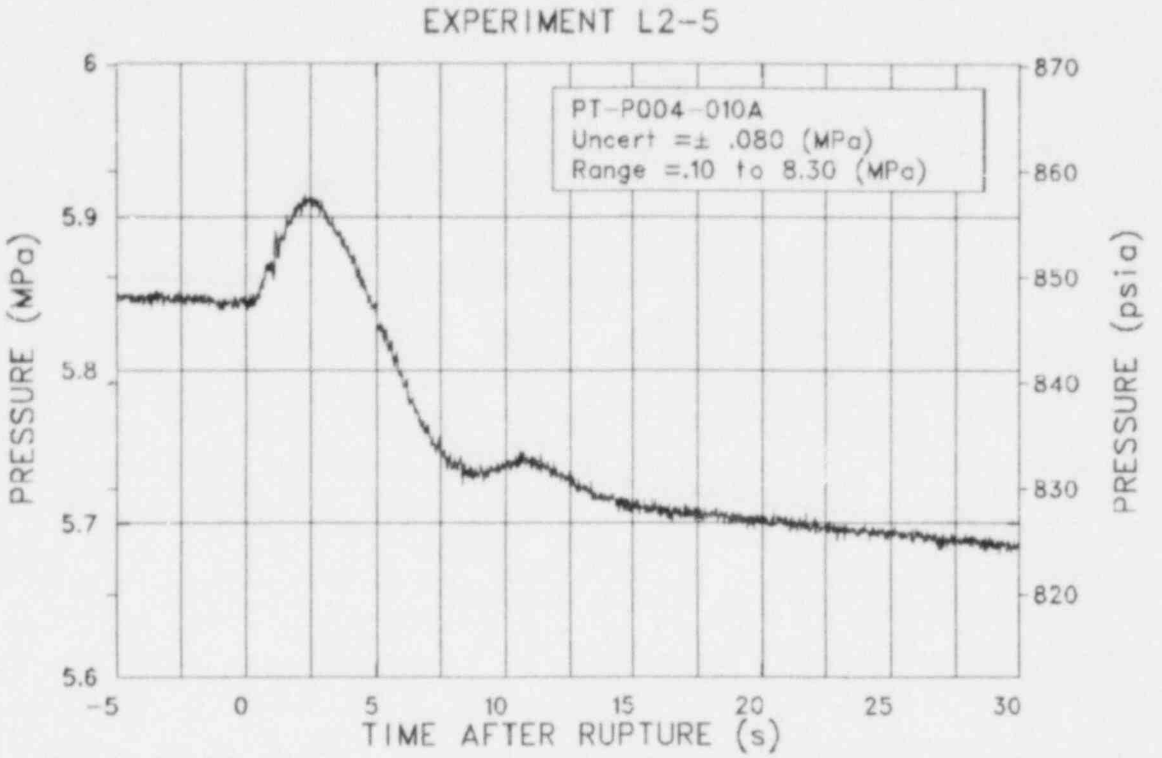

Figure 3M-55. Pressure in steam generator secondary side 10-in. outlet (PT-P004-010A).

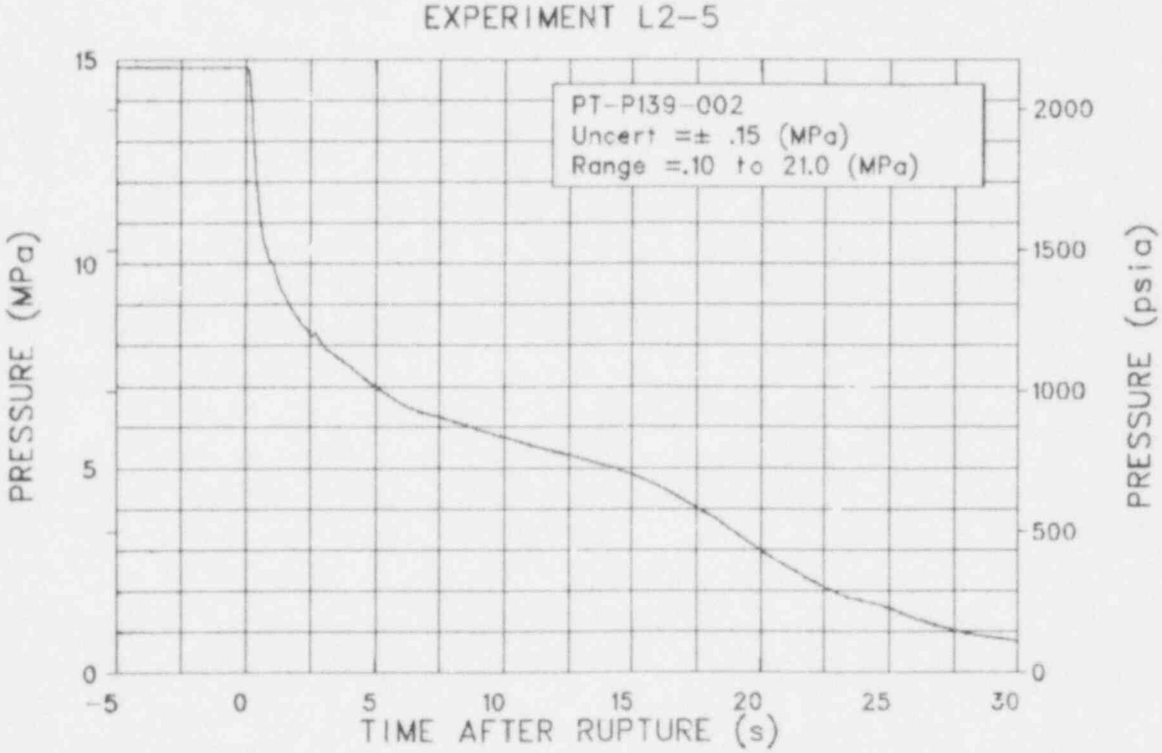

Figure 3M-56. Pressure in intact loop hot leg on bottom of pipe (PT-P139-002) (qualified, except for spurious spikes, response limited during subcooled blowdown).

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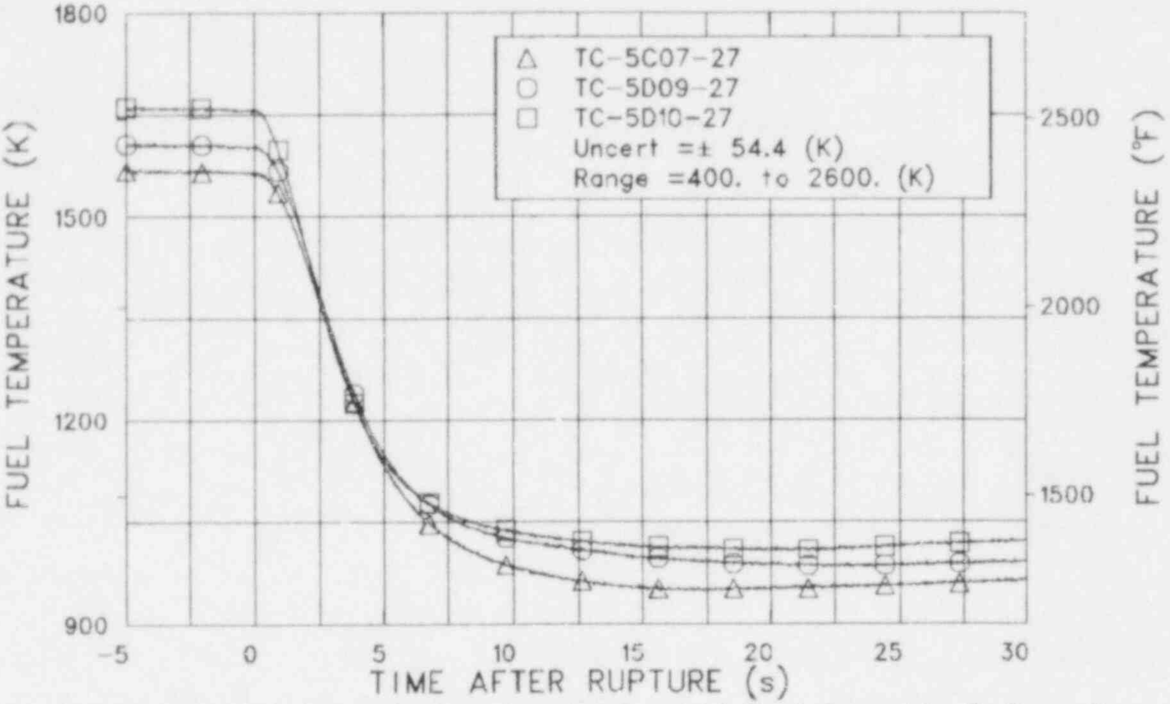

Figure 3M-57. Fuel centerline temperature at Fuel Assembly 5, Rows C and D, Columns 6, 9, and 10 at 0.69 m above bottom of fuel rod (TC-5C07-27, -5D09-27, and -5D10-27).

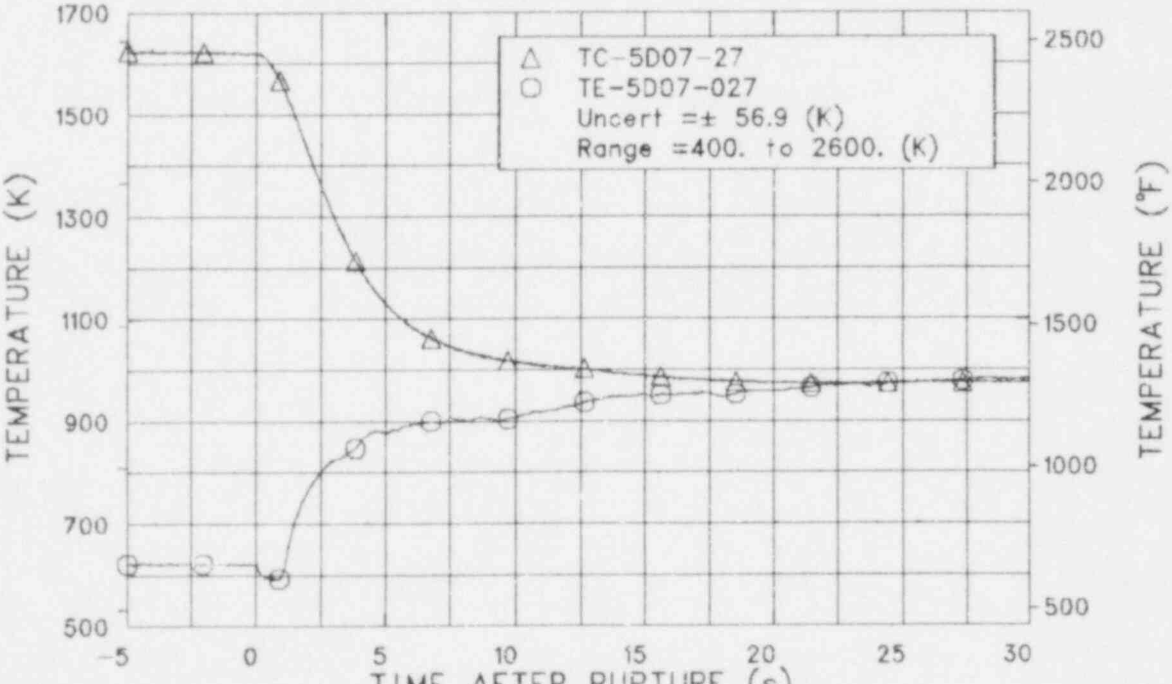

Figure 3M-58. Fuel centerline and cladding temperature at Fuel Assembly 5, Row D, Column 7 at 0.69 m above bottom of fuel rod (TC-5D07-27 and TE-5D07-027).

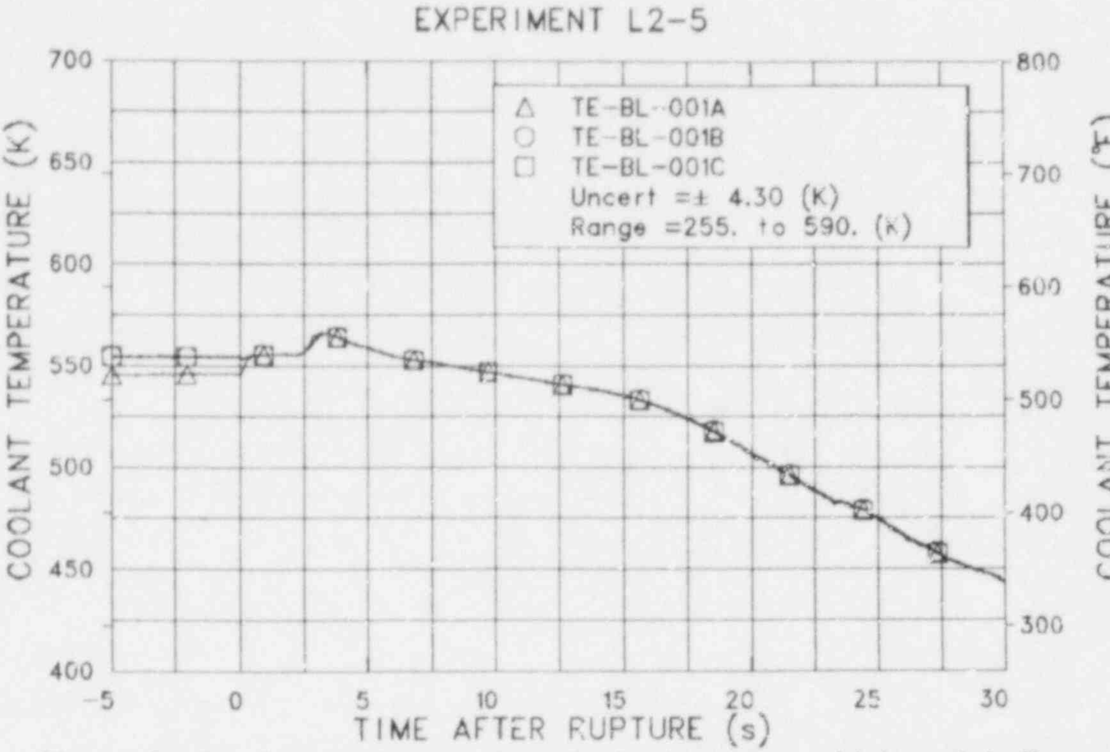

Figure 3M-59. Coolant temperature in broken loop cold leg at bottom, middle, and top of pipe (TE-BL-001A, -001B, and -001C) (qualified, possible hot wall effects).

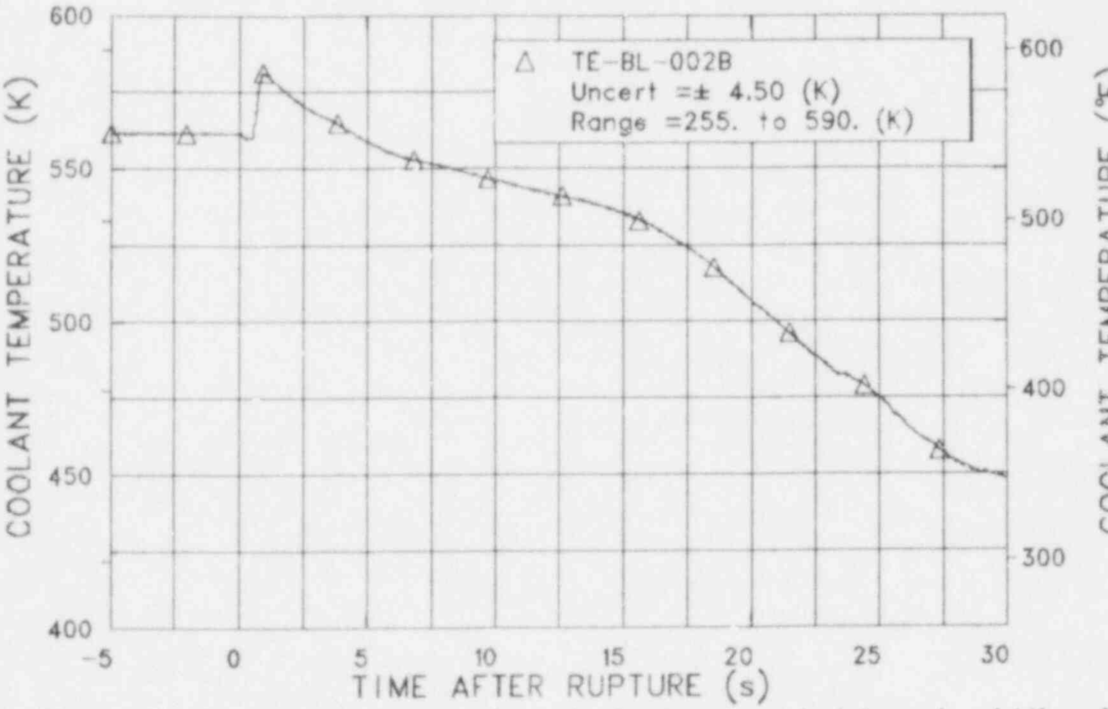

Figure 3M-60. Coolant temperature in broken loop hot leg at middle of pipe (TE-BL-002B) (qualified, possible hot wall effects).

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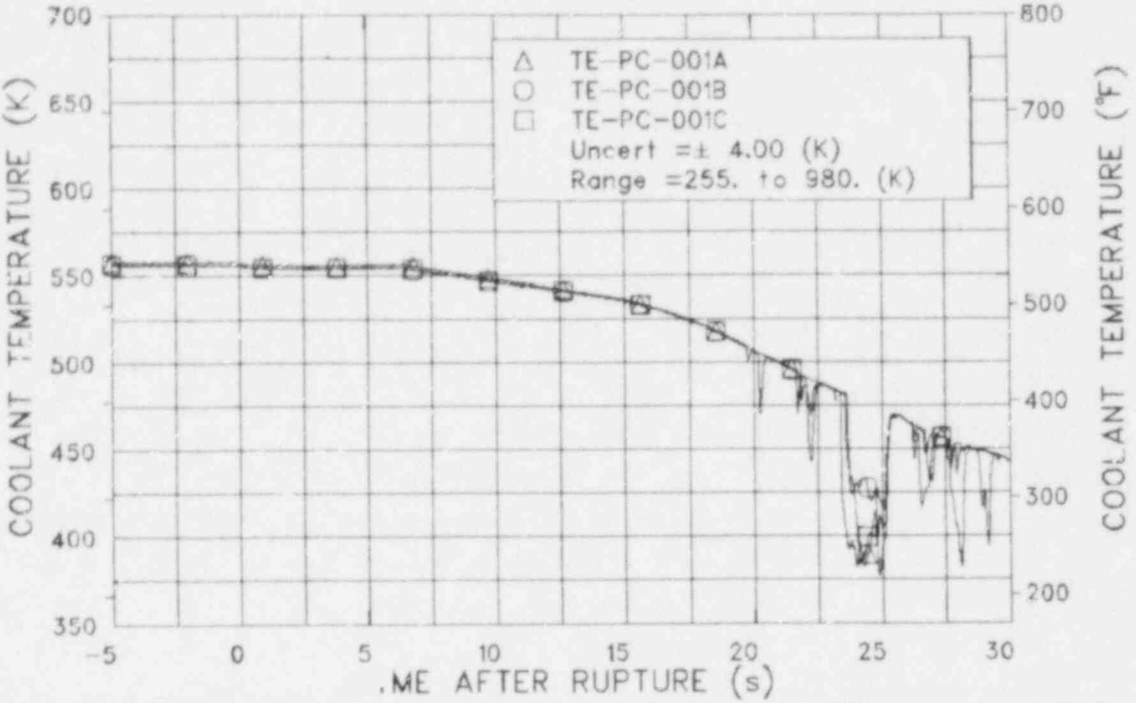

Figure 3M-61. Coolant temperature in intact loop cold leg on west side, center, and east side of pipe (TE-PC-001A, -001B, and -001C) (qualified, possible hot wall effects).

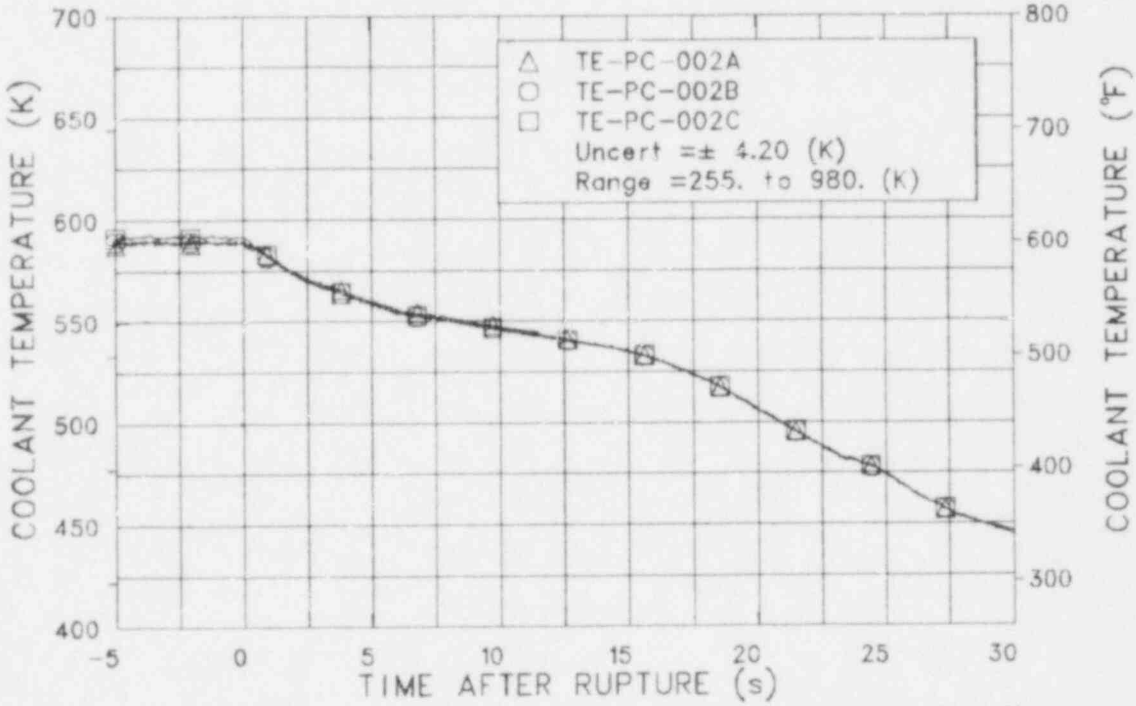

Figure 3M-62. Coolant temperature in intact loop hot leg at bottom, middle, and top of pipe (TE-PC-002A, -002B, and -002C) (qualified, possible hot wall effects).

EXPERIMENT L2-5

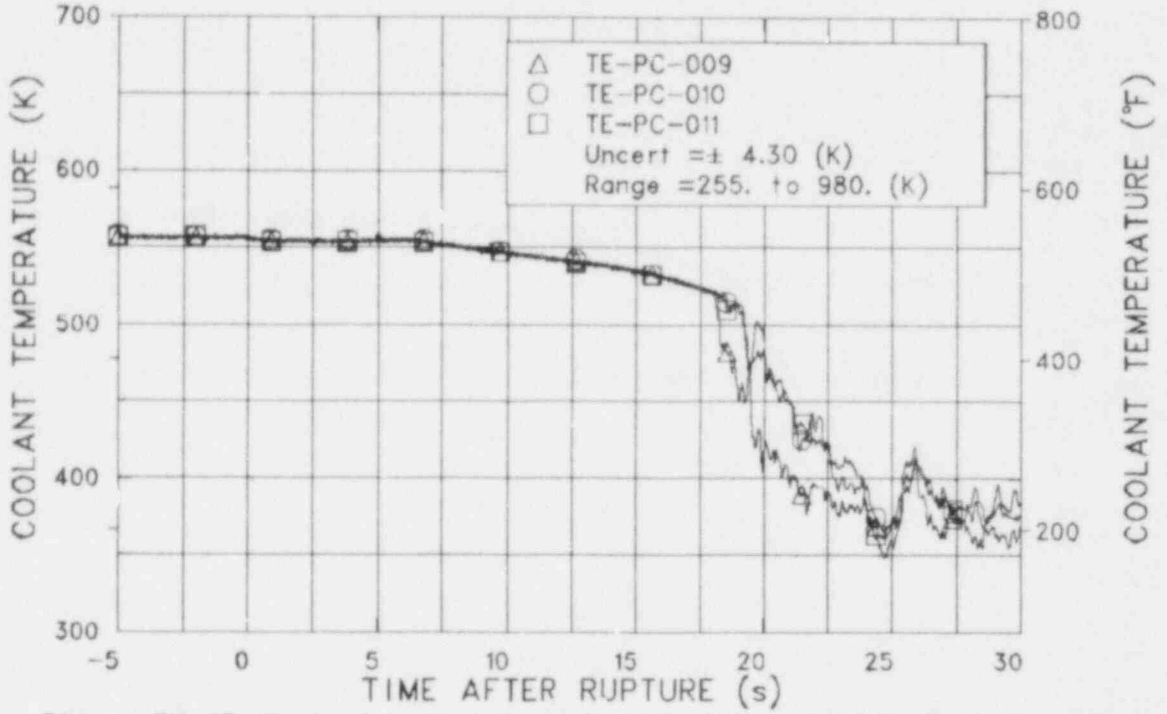

Figure 3M-63. Coolant temperature in intact loop next to bottom, next to top, and at top of ECC Rake 2 (TE-PC-009, -010, and -011) (qualified, possible hot wall effects).

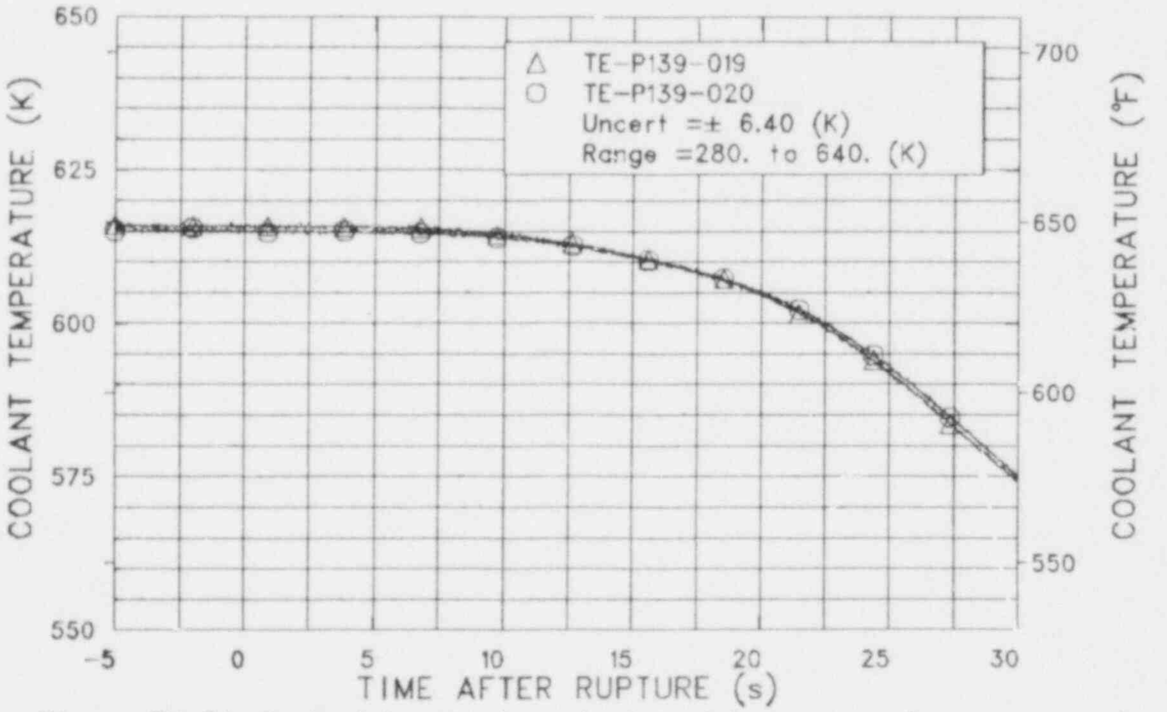

Figure 3M-64. Coolant temperature in intact loop pressurizer vapor and liquid spaces (TE-P139-019 and -020) (qualified, possible hot wall effects and limited time response).

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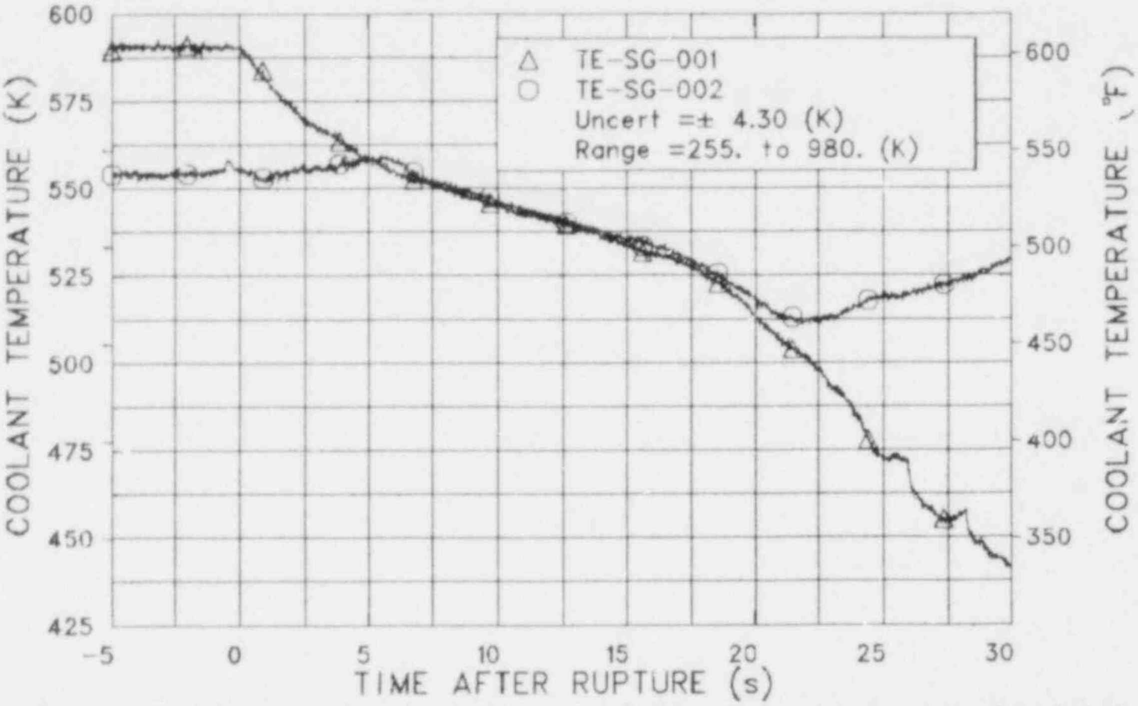

Figure 3M-65. Coolant temperature in intact loop steam generator inlet and outlet plenums (TE-SG-001 and -002) (qualified, possible hot wall effects after 40 and 18 s, respectively).

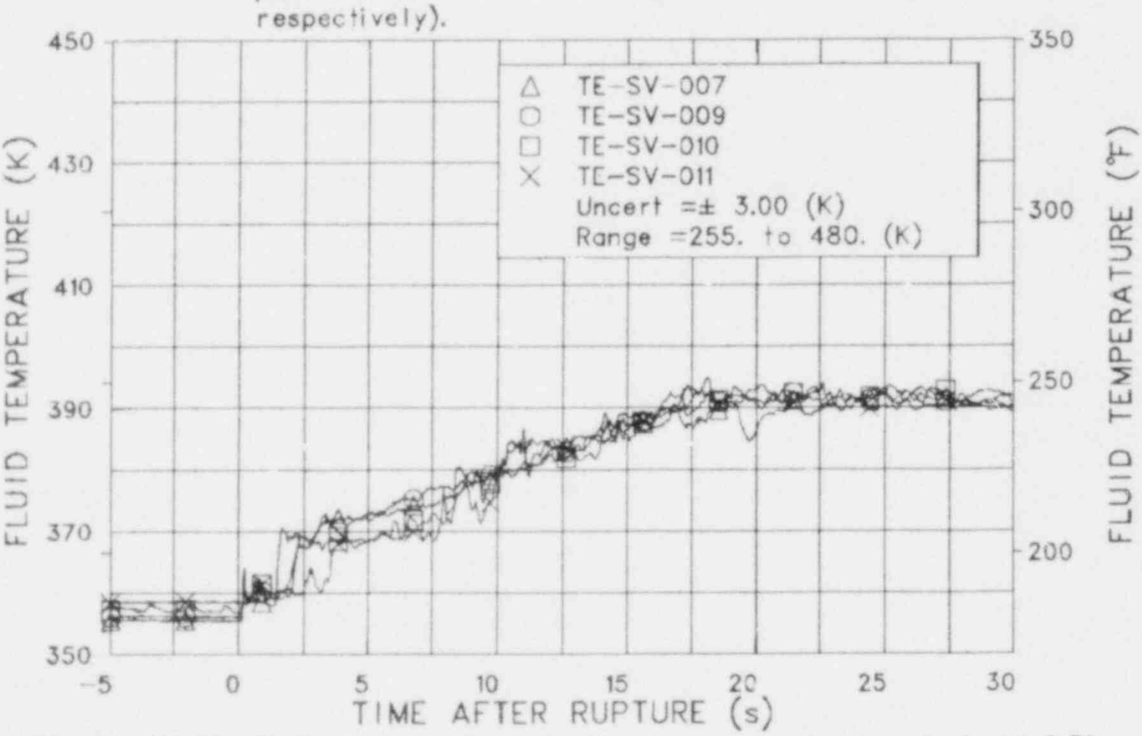

Figure 3M-66. Fluid temperature in blowdown suppression tank at 2.72, 1.90, 1.45, and 0.99 m above tank bottom (TE-SV-007, -009, -010, and -011).

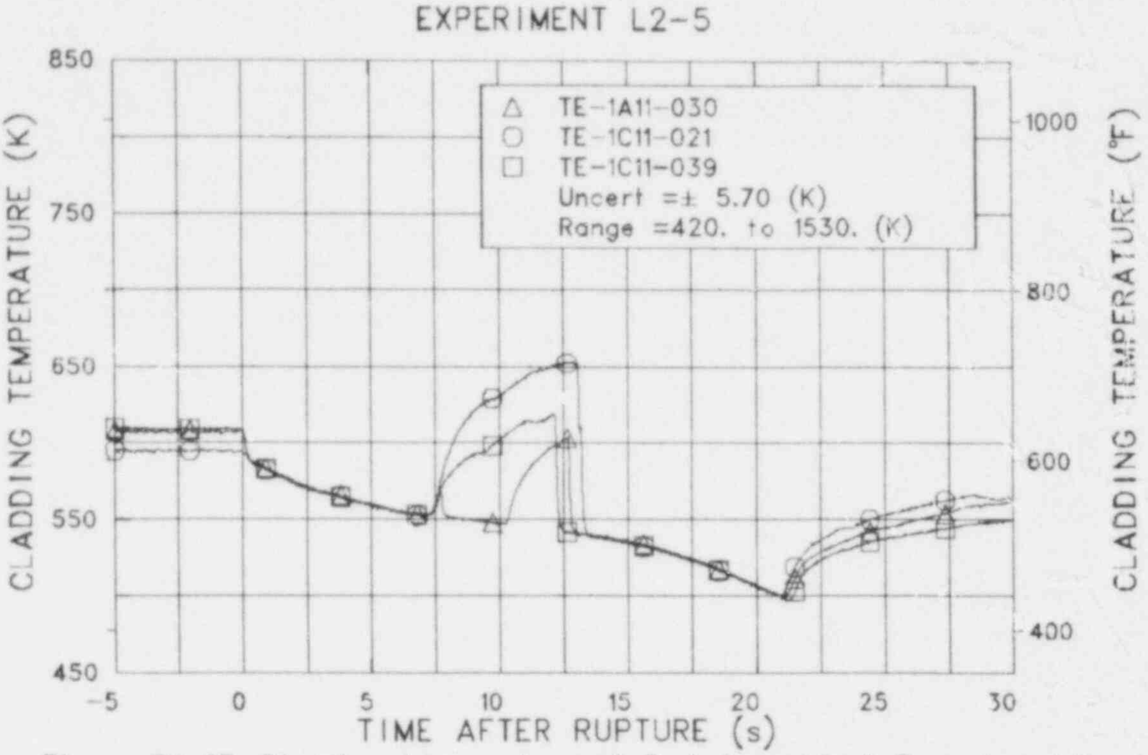

Figure 3M-67. Cladding temperature at Fuel Assembly 1, Rows A and C, Column 11 at 0.76, 0.53, and 0.99 m above bottom of fuel rod (TE-1A11-030, -1C11-021, and -039).

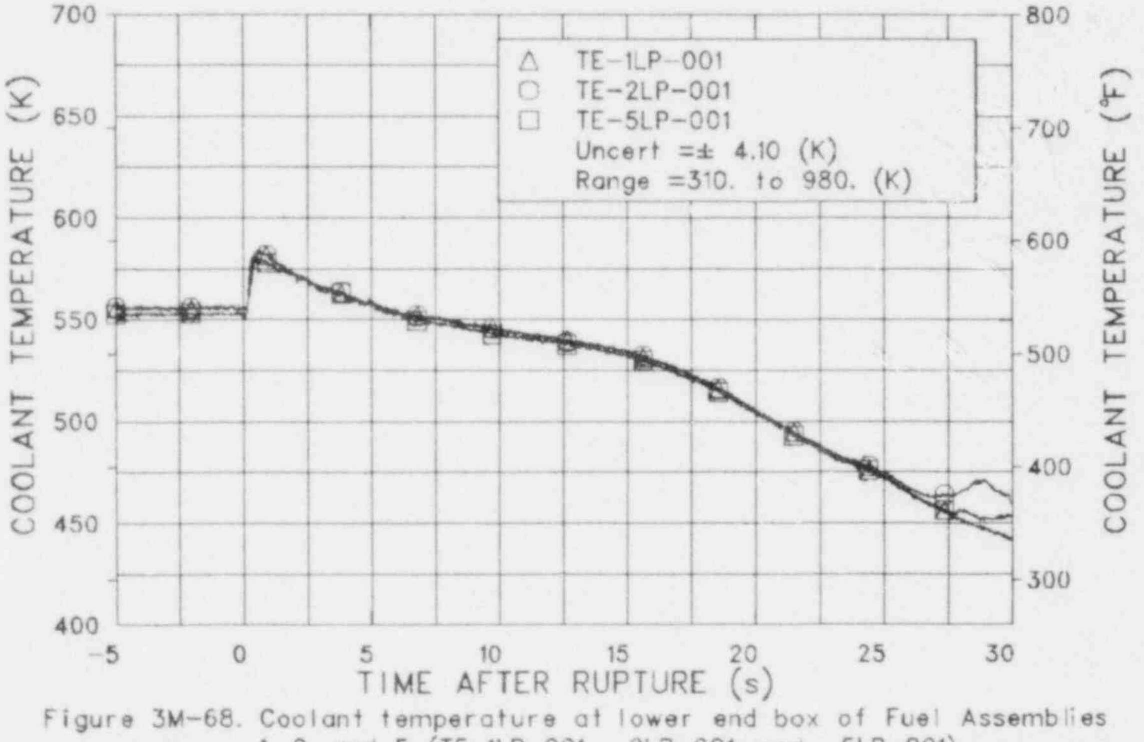

Figure 3M-68. Coolant temperature at lower end box of Fuel Assemblies 1, 2, and 5 (TE-1LP-001, -2LP-001, and -5LP-001).

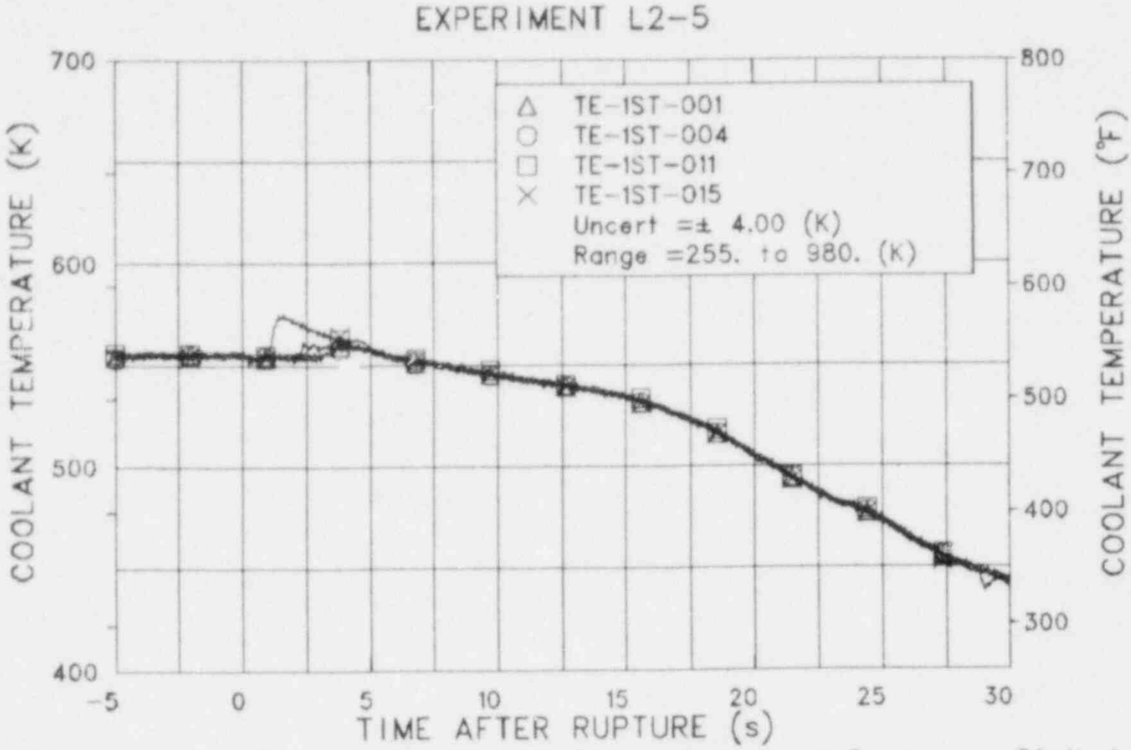

Figure 3M-69. Coolant temperature in reactor vessel Downcomer Stalk 1 at 4.8, 2.98, 0.44, and 1.0 m above reactor vessel bottom (TE-1ST-001, -004, -011, and -015).

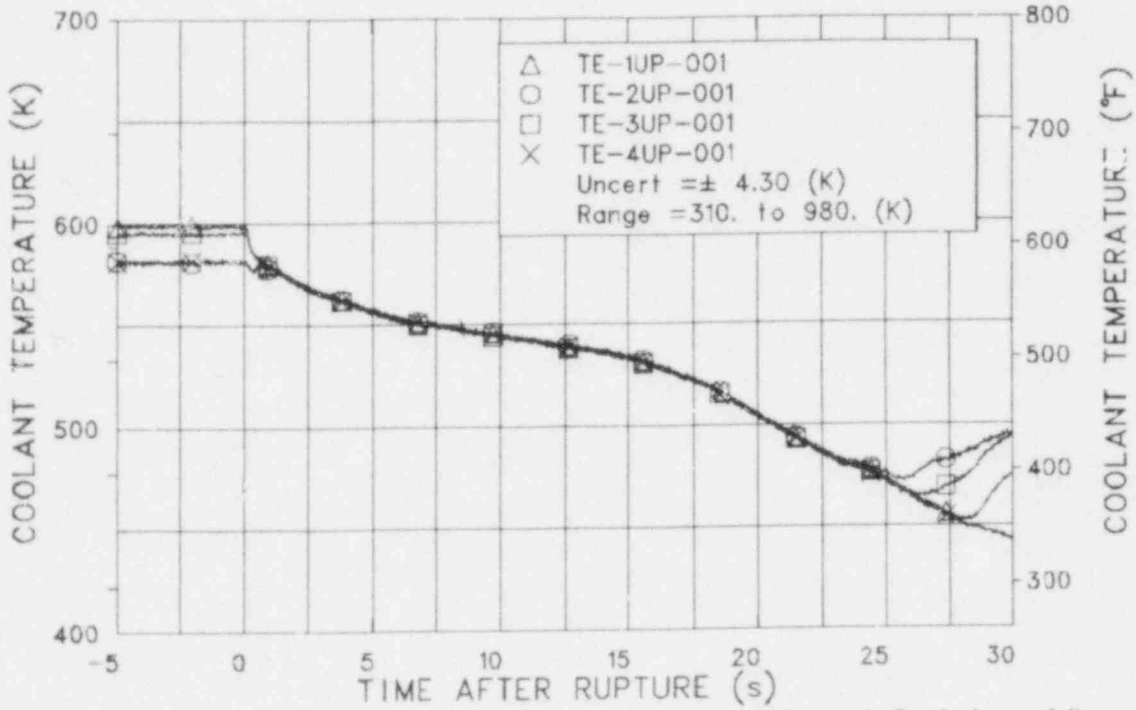

Figure 3M-70. Coolant temperature at upper end box of Fuel Assemblies 1, 2, 3, and 4 (TE-1UP-001, -2UP-001, -3UP-001, and -4UP-001).

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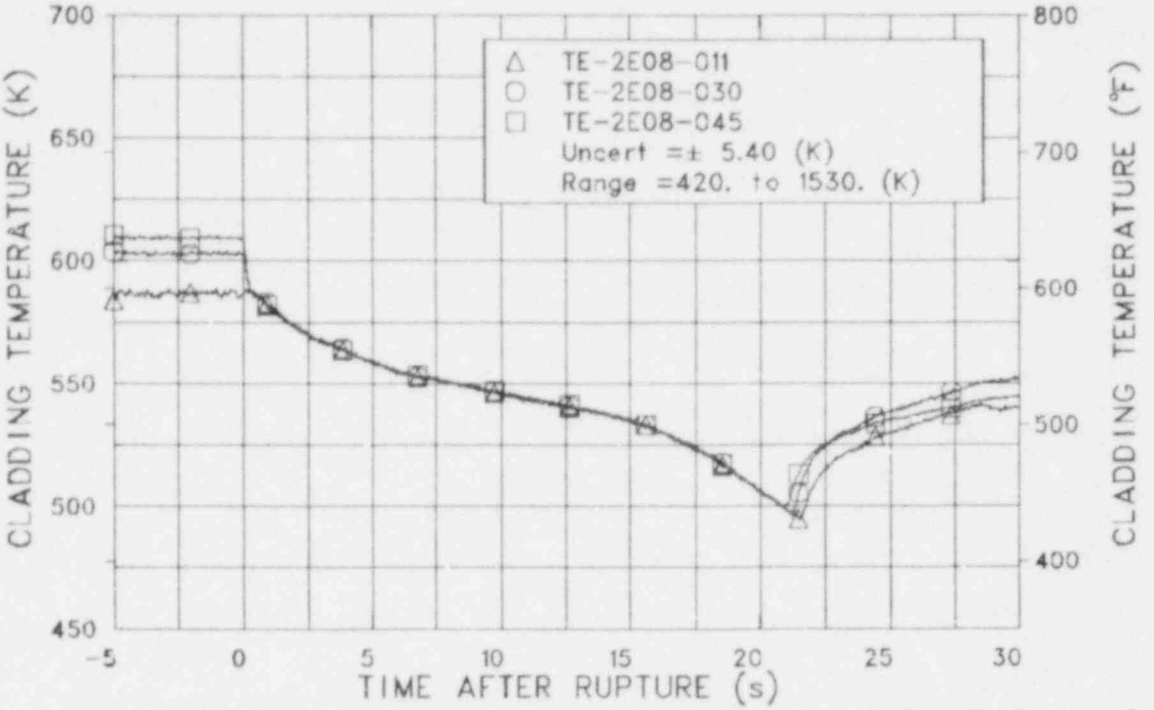

Figure 3M-71. Cladding temperature at Fuel Assembly 2, Row E, Column 8 at 0.28, 0.76, and 1.14 m above bottom of fuel rod (TE-2E08-11, -030, and -045).

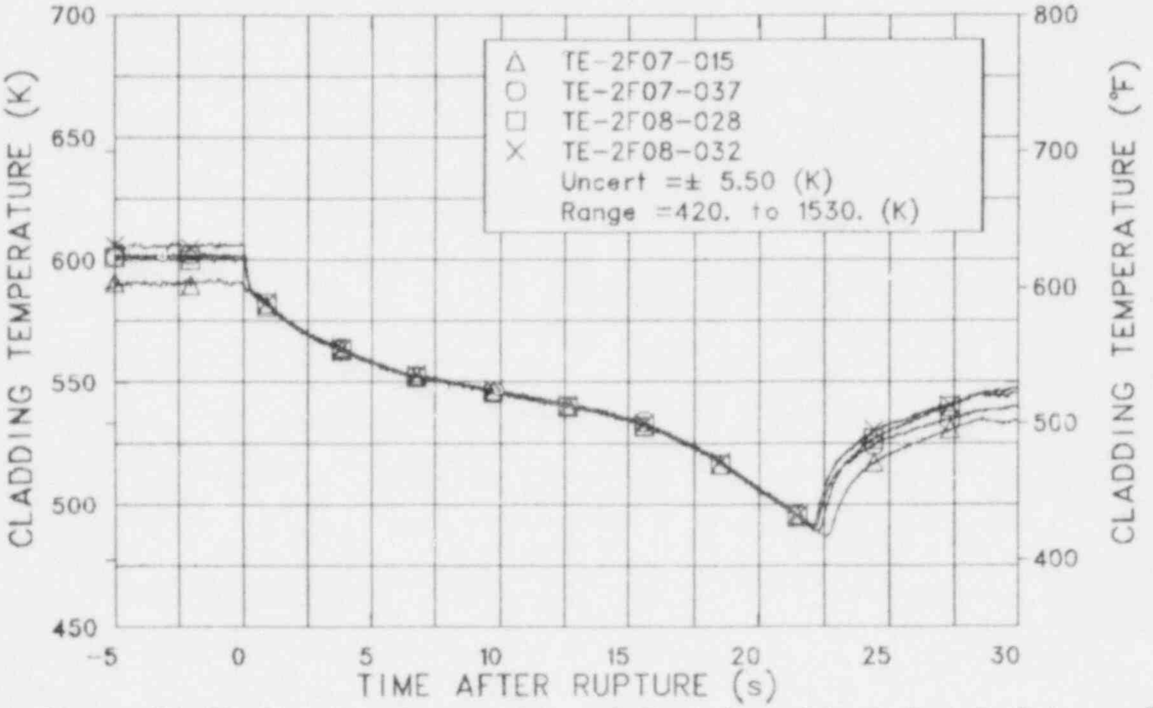

Figure 3M-72. Cladding temperature at Fuel Assembly 2, Row F, Columns 7 and 8 at 0.38, 0.94, 0.71, and 0.81 m above bottom of fuel rod (TE-2F07-015, -037, -2F08-028, and -032).

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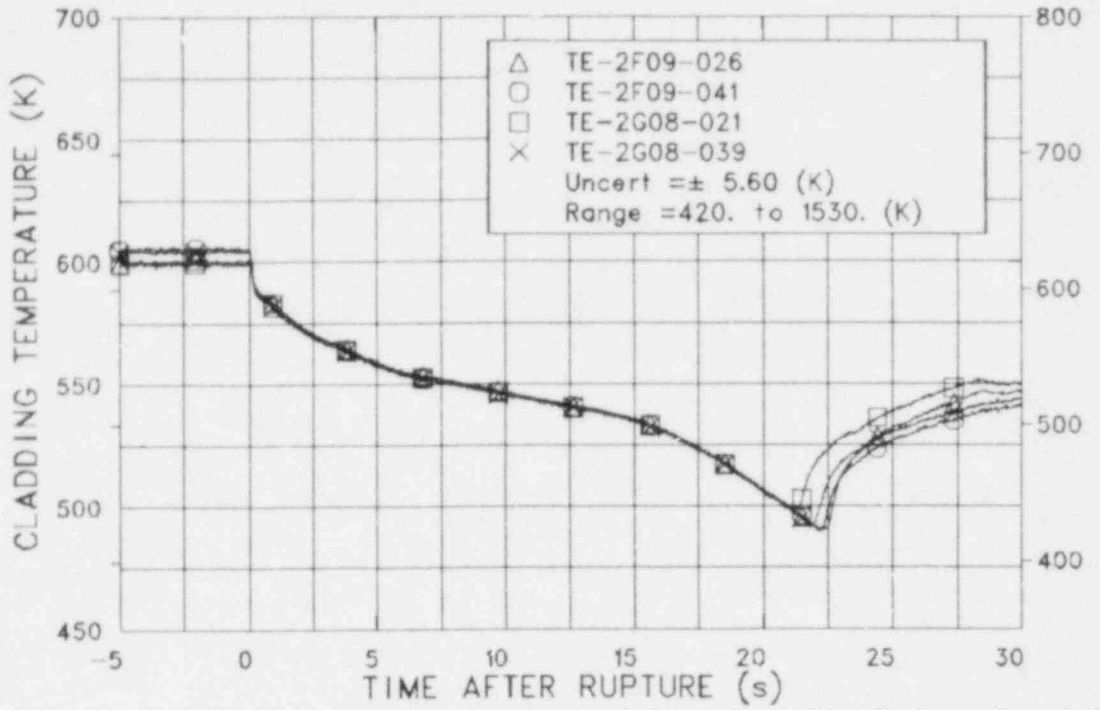

Figure 3M-73. Cladding temperature at Fuel Assembly 2, Rows F and G, Columns 8 and 9 at 0.66, 1.04, 0.53, and 0.99 m above bottom of fuel rod (TE-2F09-026, -041, -2G08-021, and -039).

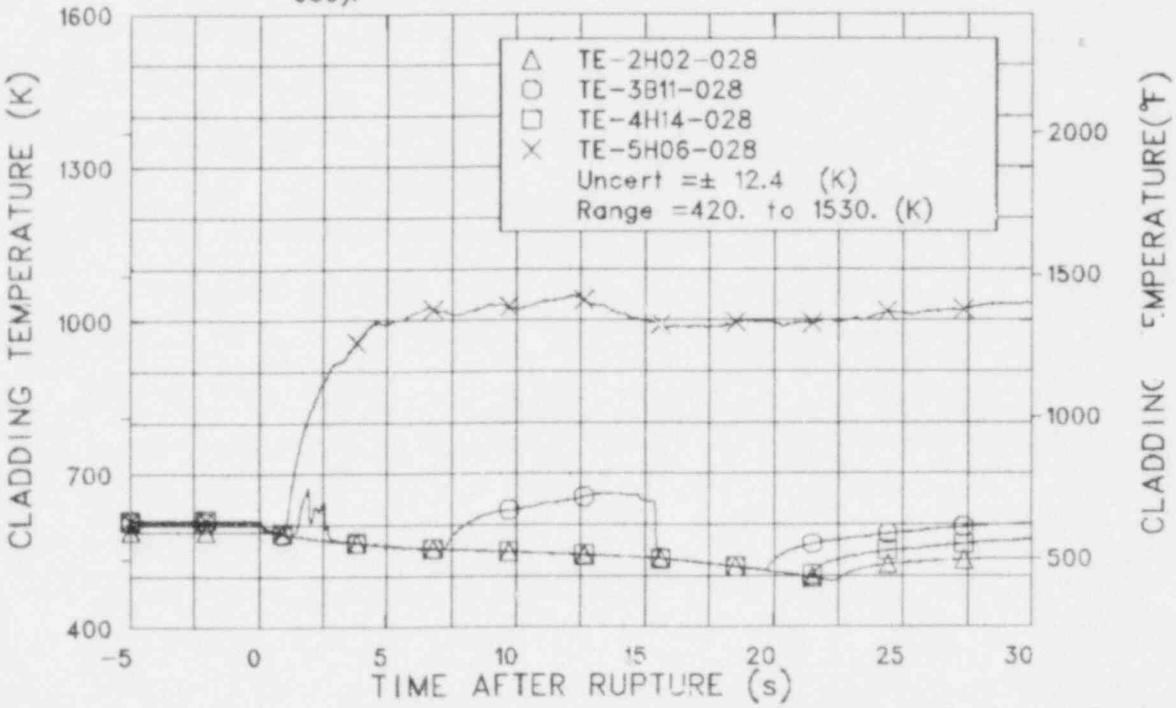

Figure 3M-74. Cladding temperature at Fuel Assemblies 2, 3, 4, and 5 at 0.71 m above bottom of fuel rod (TE-2H02-028, -3B11-028, -4H14-028, and -5H06-028).

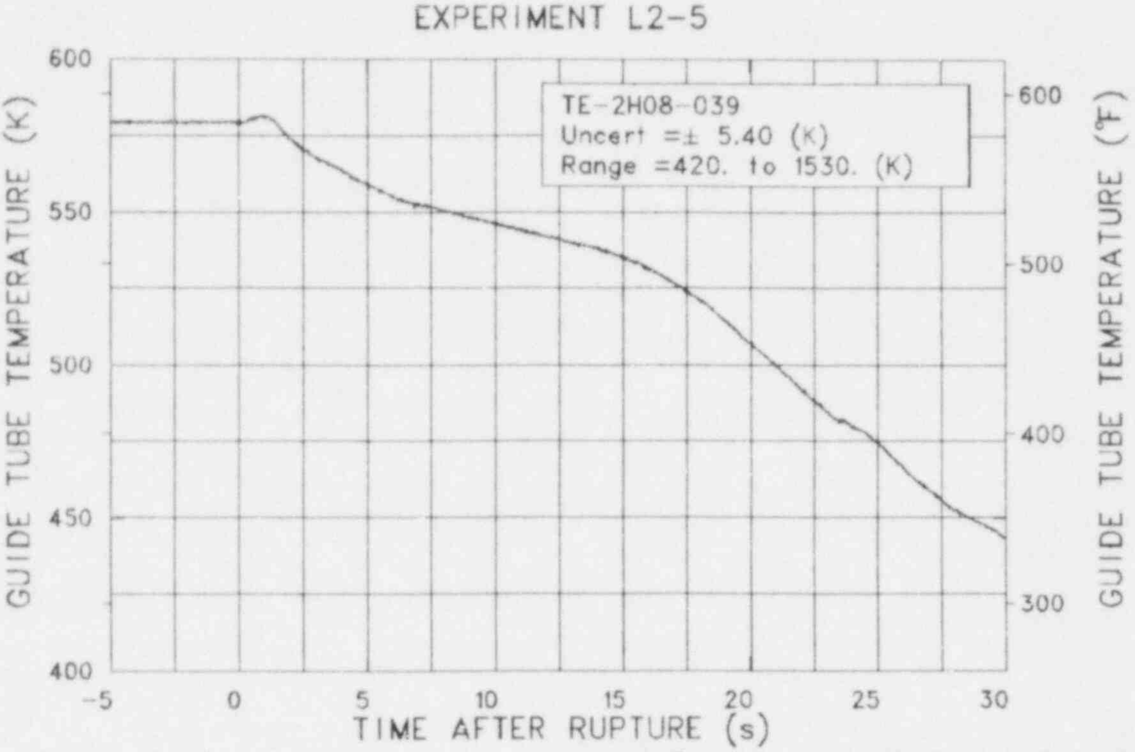

Figure 3M-75. Guide tube temperature at Fuel Assembly 2, Row H, Column 8 at 0.99 m above bottom of guide tube (TE-2H08-039).

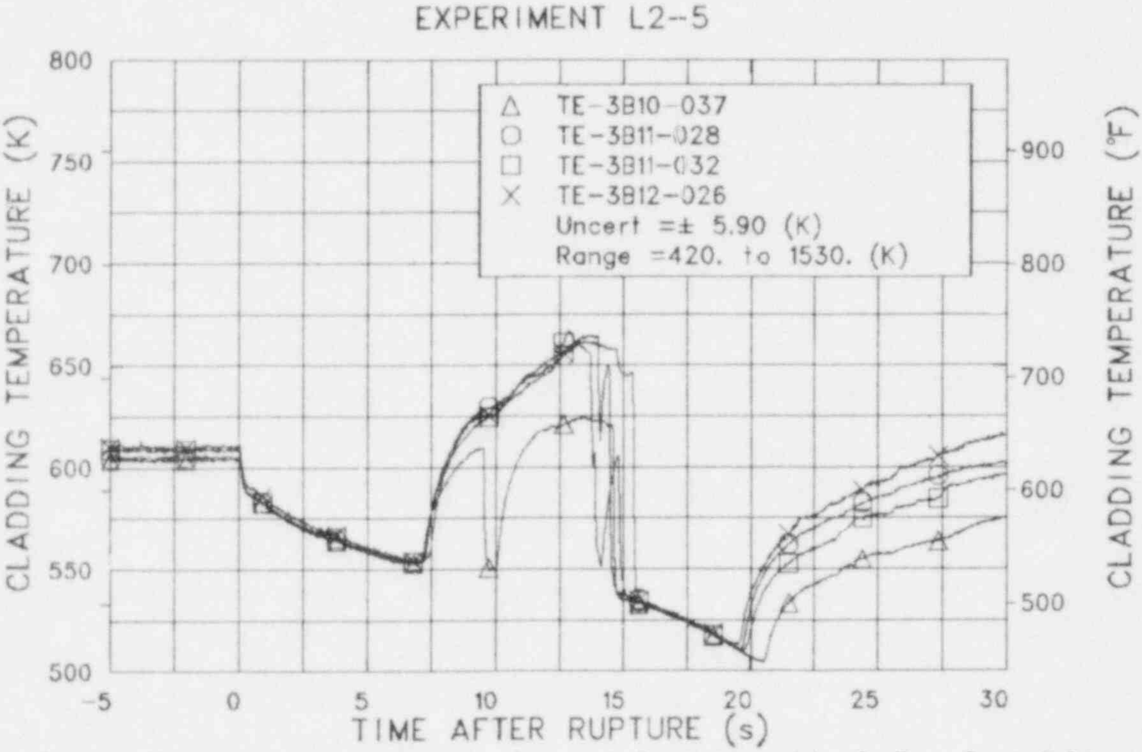

Figure 3M-76. Cladding temperature at Fuel Assembly 3, Row B at 0.94, 0.71, 0.81, and 0.66 m above bottom of fuel rod (TE-3B10-037, -3B11-028, -032, and -3B12-026).

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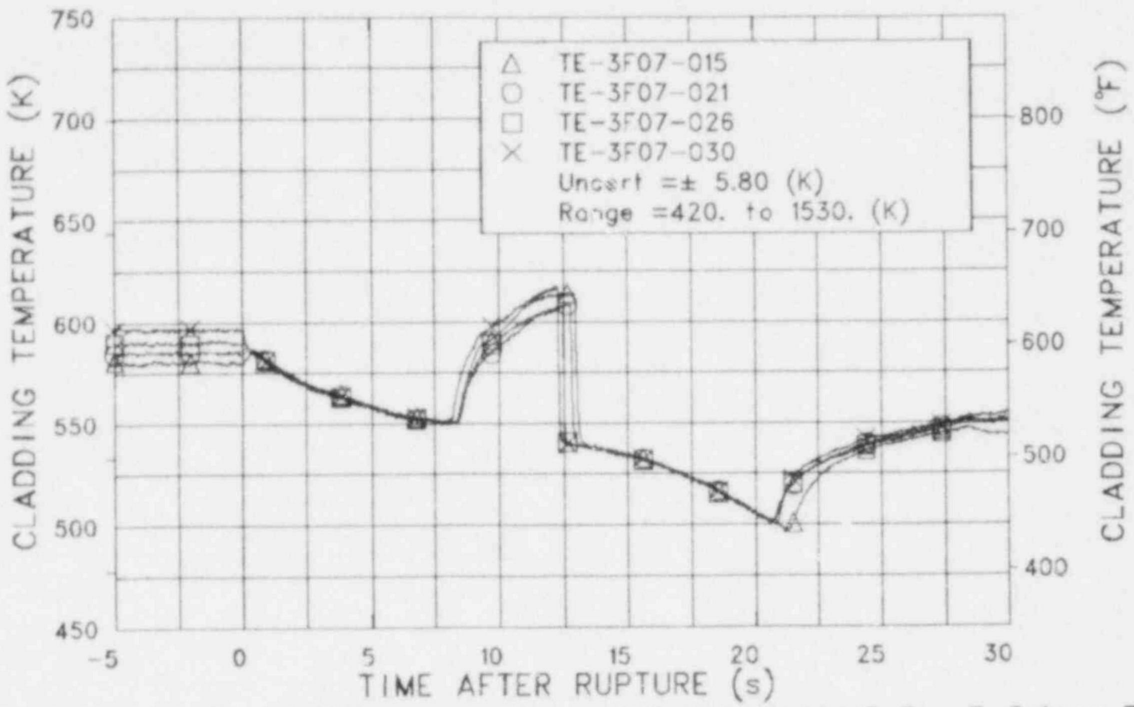

Figure 3M-77. Cladding temperature at Fuel Assembly 3, Row F, Column 7 at 0.38, 0.53, 0.66, and 0.76 m above bottom of fuel rod (TE-3F07-015, -021, -026, and -030).

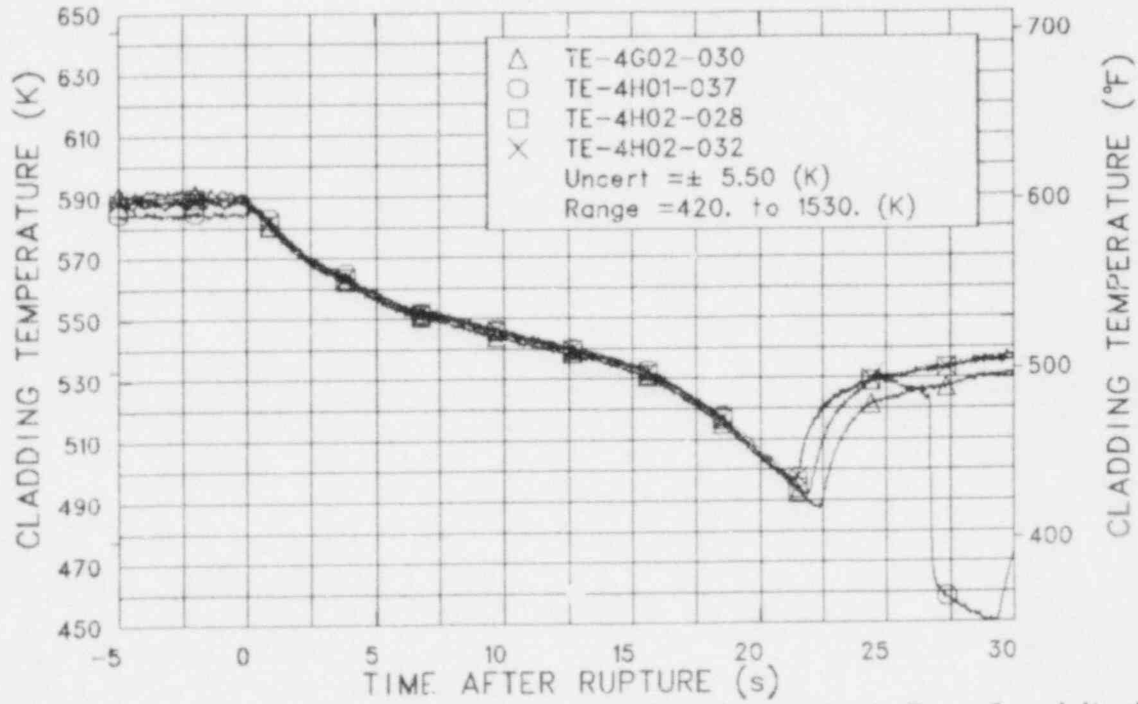

Figure 3M-78. Cladding temperature at Fuel Assembly 4, Rows G and H at 0.76, 0.94, 0.71 and 0.81 m above bottom of fuel rod (TE-4G02-030, -4H01-037, -4H02-028, and -032).

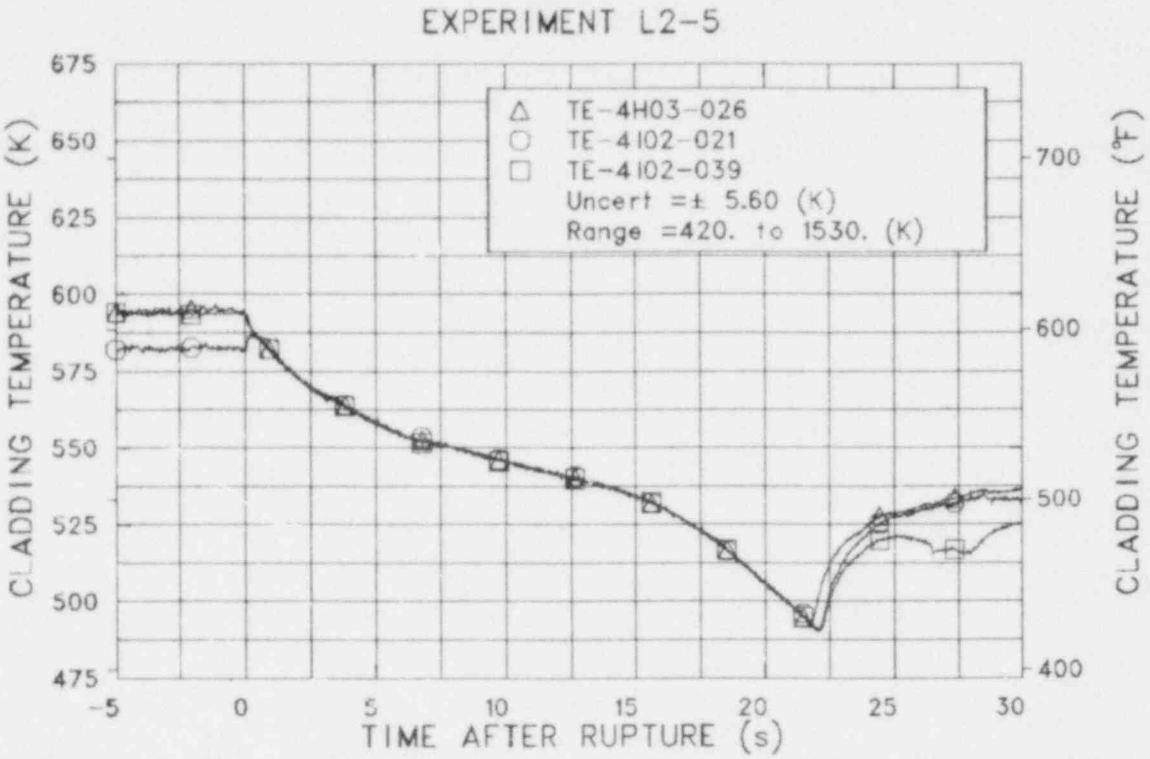

Figure 3M-79. Cladding temperature at Fuel Assembly 4, Rows H and I, Columns 2 and 3 at 0.66, 0.53, and 0.99 m above bottom of fuel rod (TE-4H03-026, -4I02-021, and -039).

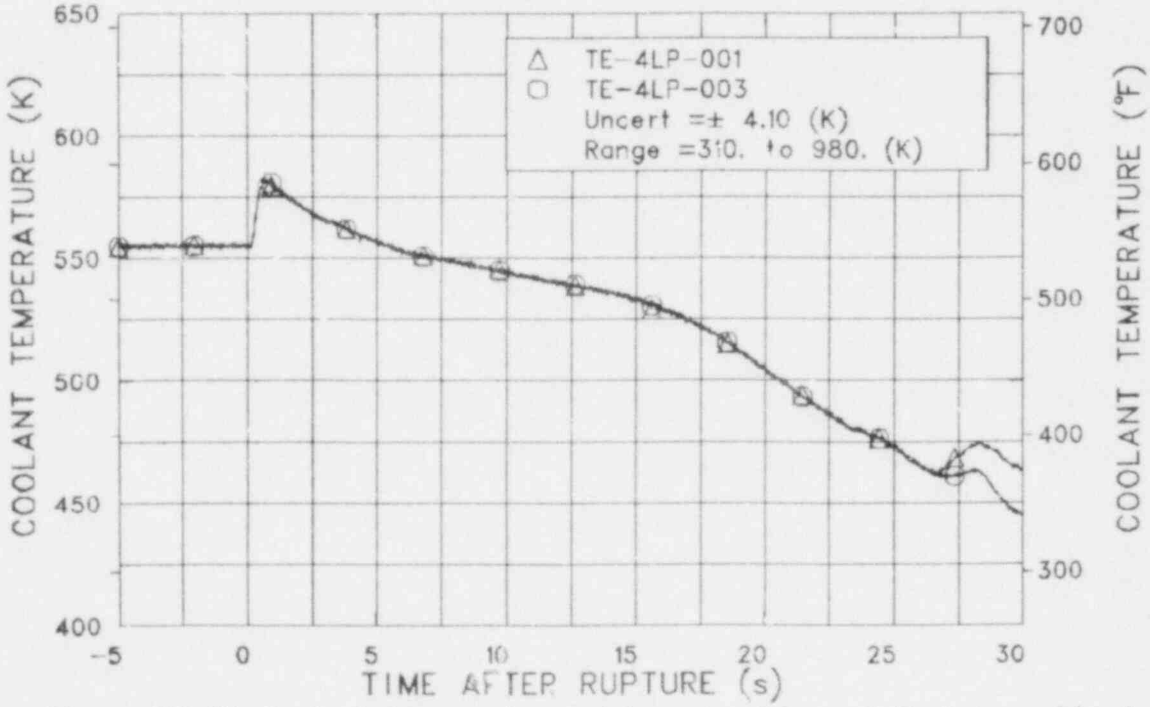

Figure 3M-80. Coolant temperature at lower end box of Fuel Assembly 4 (TE-4LP-001 and -003).

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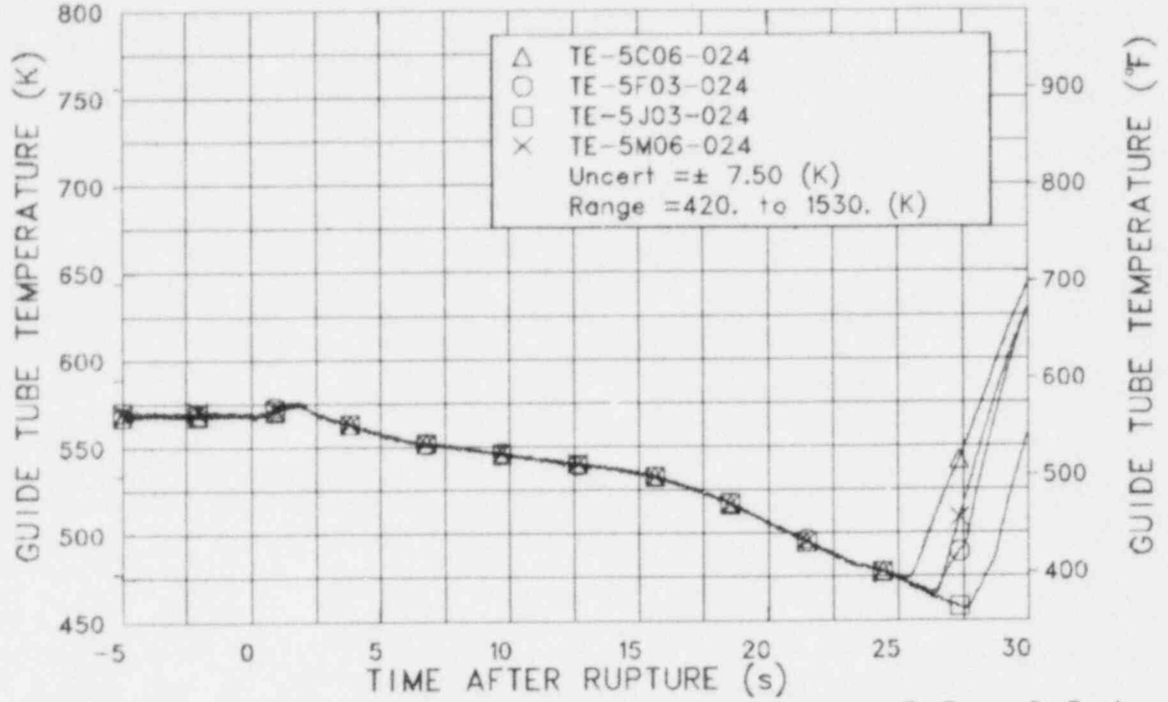

Figure 3M-81. Guide tube temperature at Fuel Assembly 5, Rows C, F, J, and M, Columns 3 and 6 at 0.61 m above bottom of guide tube (TE-5C06-024, -5F03-024, -5J03-024, and -5M06-024).

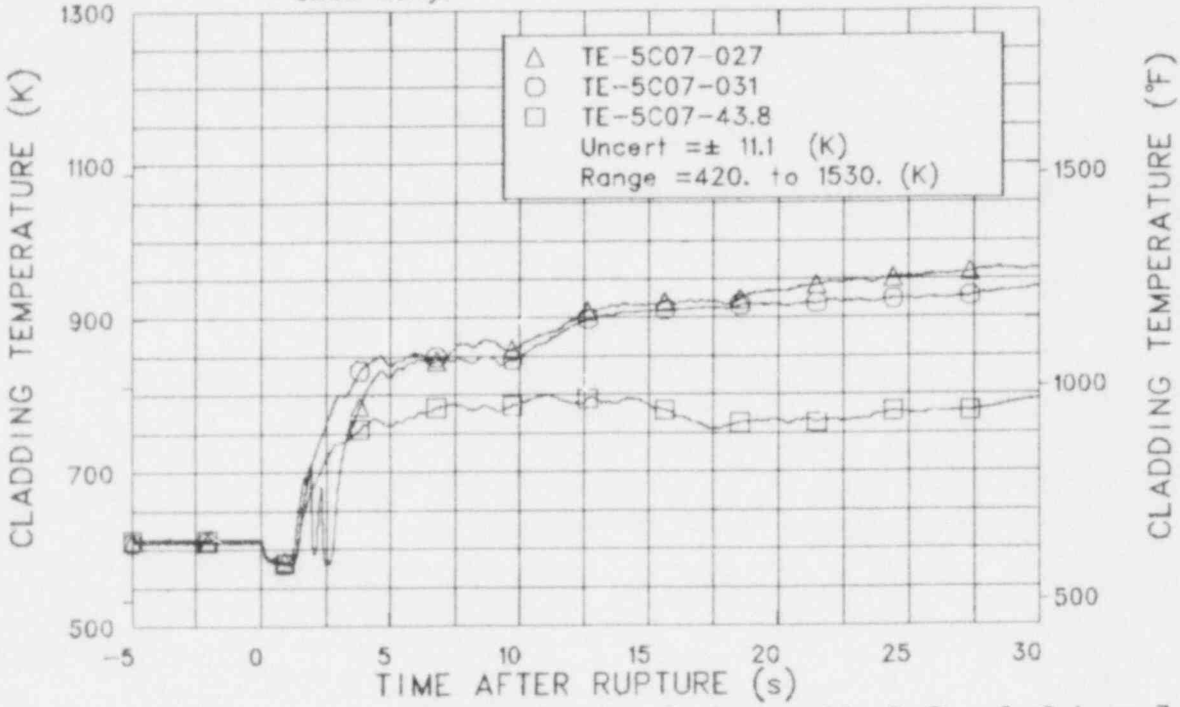

Figure 3M-82. Cladding temperature at Fuel Assembly 5, Row C, Column 7 at 0.69, 0.79, and 1.11 m above bottom of fuel rod (TE-5C07-027, -031, and -43.8).

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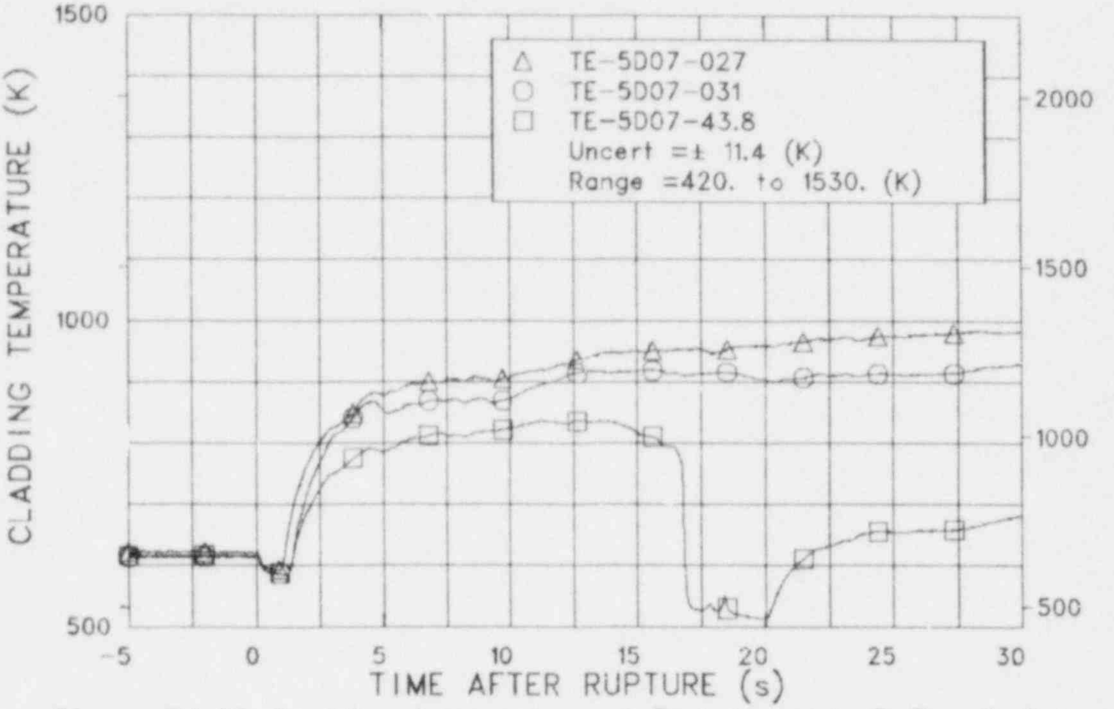

Figure 3M-83. Cladding temperature at Fuel Assembly 5, Row D, Column 7 at 0.69, 0.79, and 1.11 m above bottom of fuel rod (TE-5D07-027, -031, and -43.8).

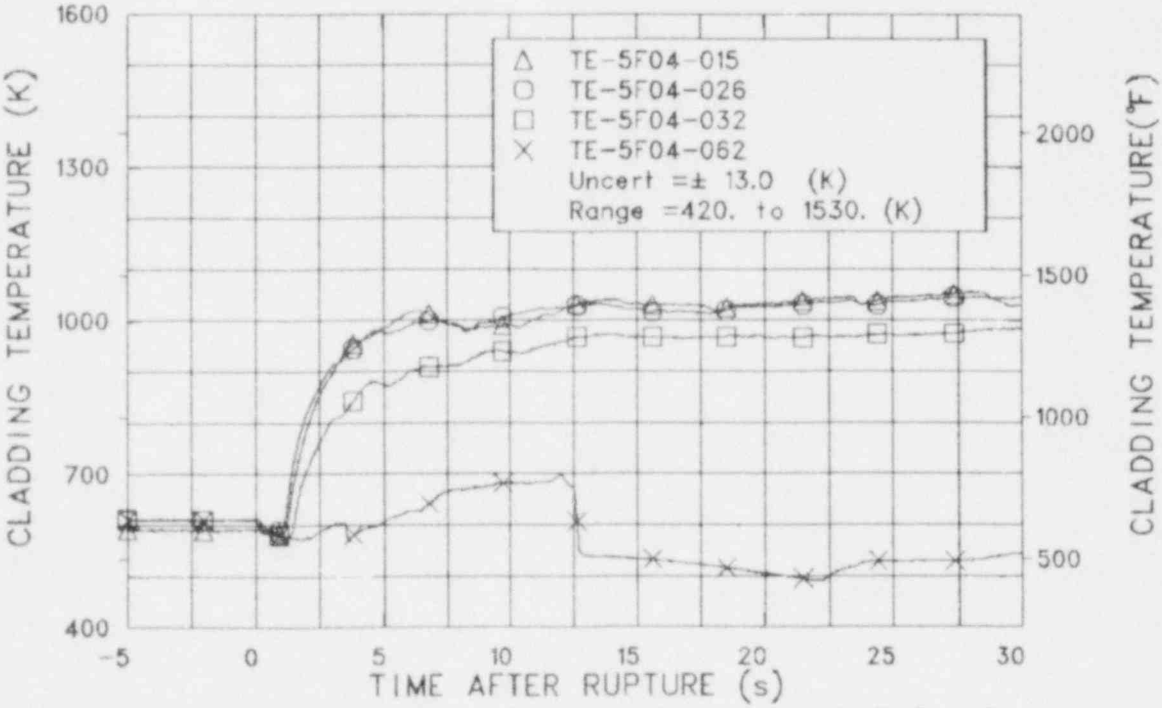

Figure 3M-84. Cladding temperature at Fuel Assembly 5, Row F, Column 4 at 0.38, 0.66, 0.81, and 1.57 m above bottom of fuel rod (TE-5F04-015, -026, -032, and -062).

EXPERIMENT L2-5

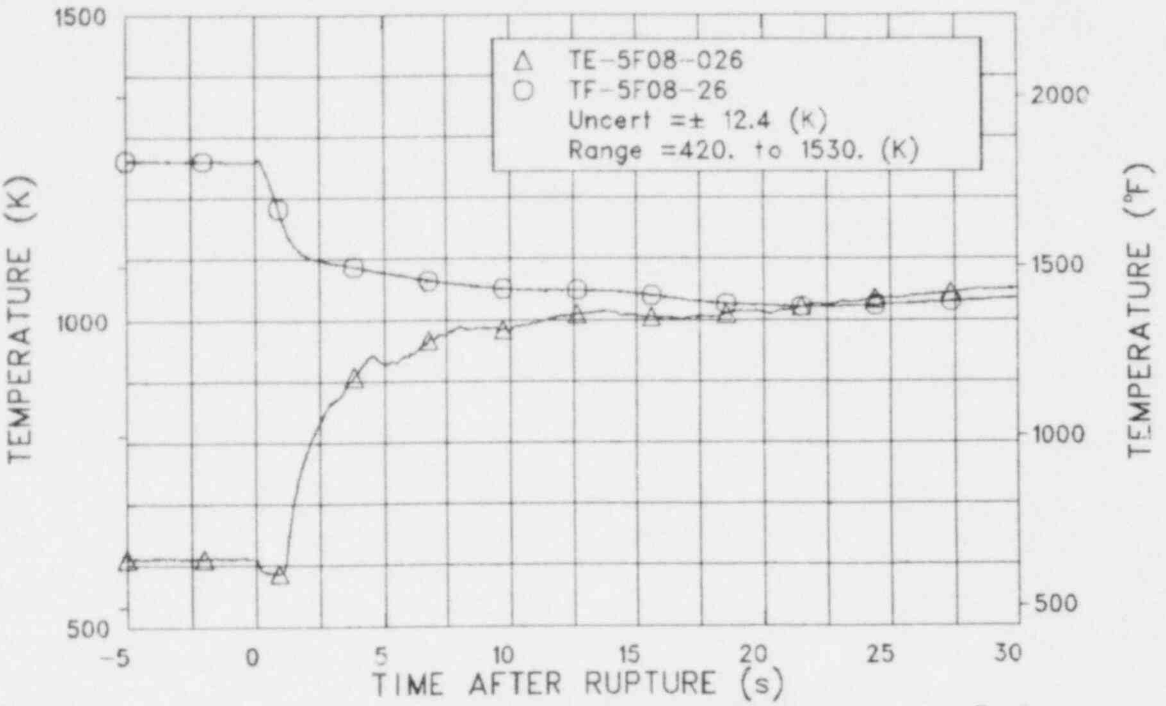

Figure 3M-85. Cladding and pellet off-center temperature at Fuel Assembly 5, Row F, Column 8 at 0.66 m above bottom of fuel rod (TE-5F08-026 and TF-5F08-26).

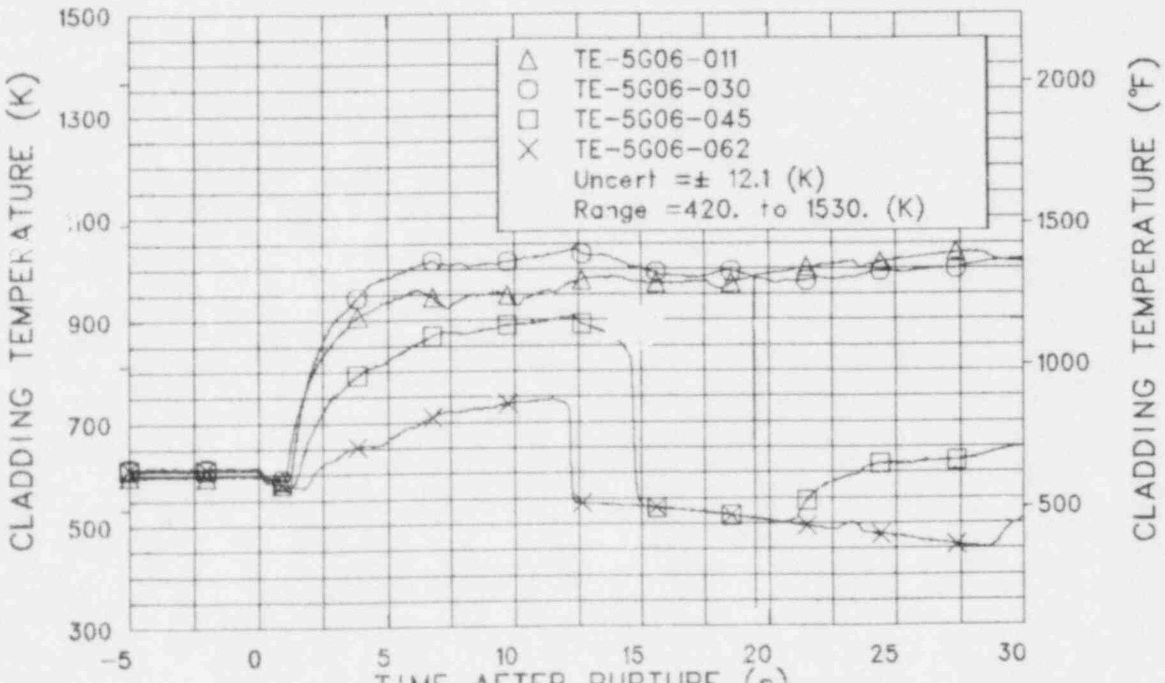

Figure 3M-86. Cladding temperature at Fuel Assembly 5, Row G, Column 6 at 0.28, 0.76, 1.14, and 1.57 m above bottom of fuel rod (TE-5G06-011, -030, -045, and -062).

EXPERIMENT L2-5

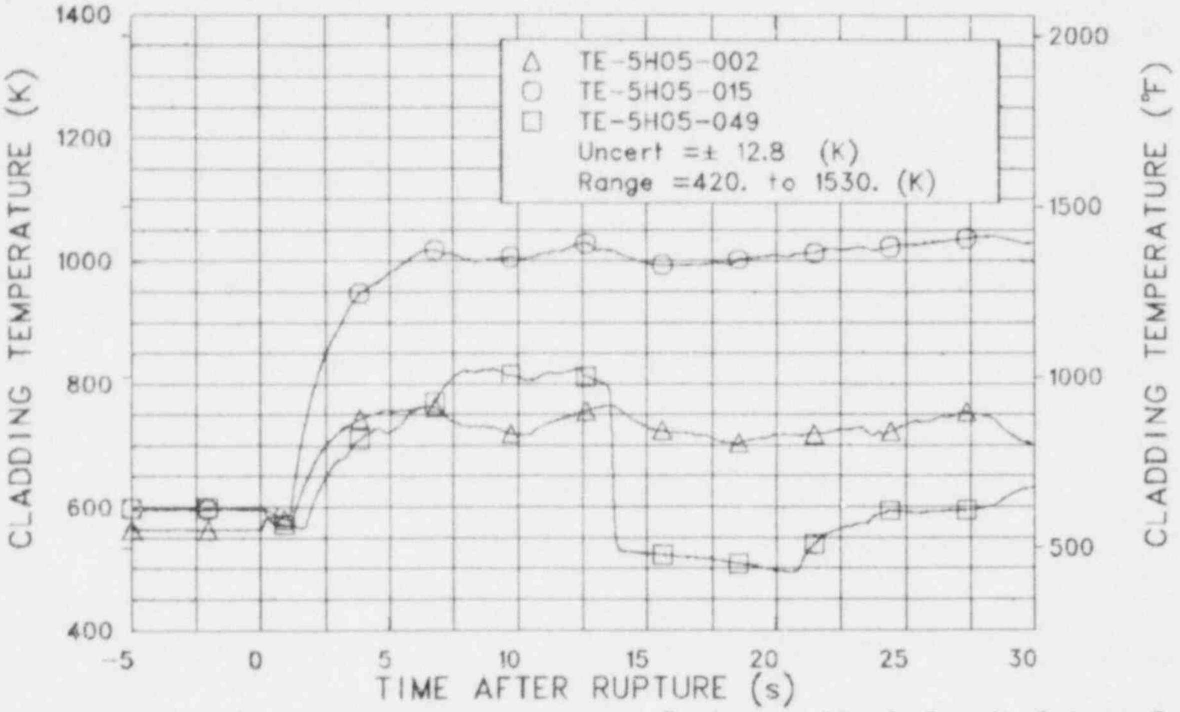

Figure 3M-87. Cladding temperature at Fuel Assembly 5, Row H, Column 5 at 0.05, 0.38, and 1.24 m above bottom of fuel rod (TE-5H05-002, -015, and -049).

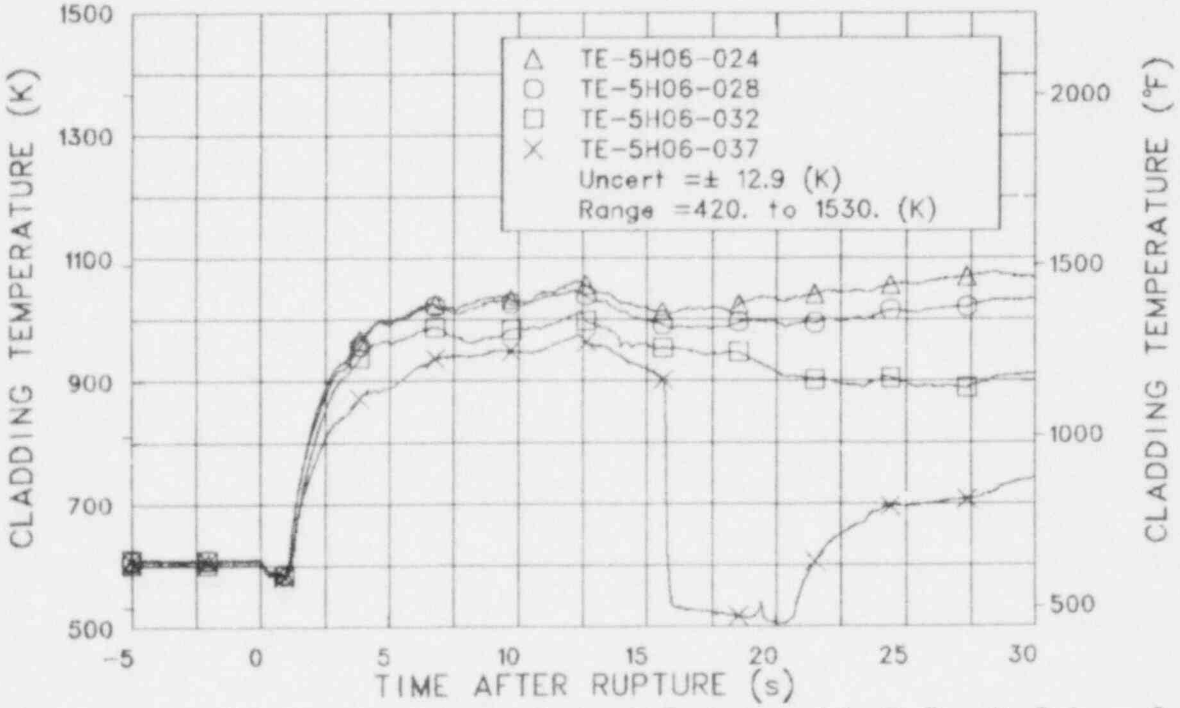

Figure 3M-88. Cladding temperature at Fuel Assembly 5, Row H, Column 6 at 0.61, 0.71, 0.81, and 0.94 m above bottom of fuel rod (TE-5H06-024, -028, -032, and -037).

EXPERIMENT L2-5

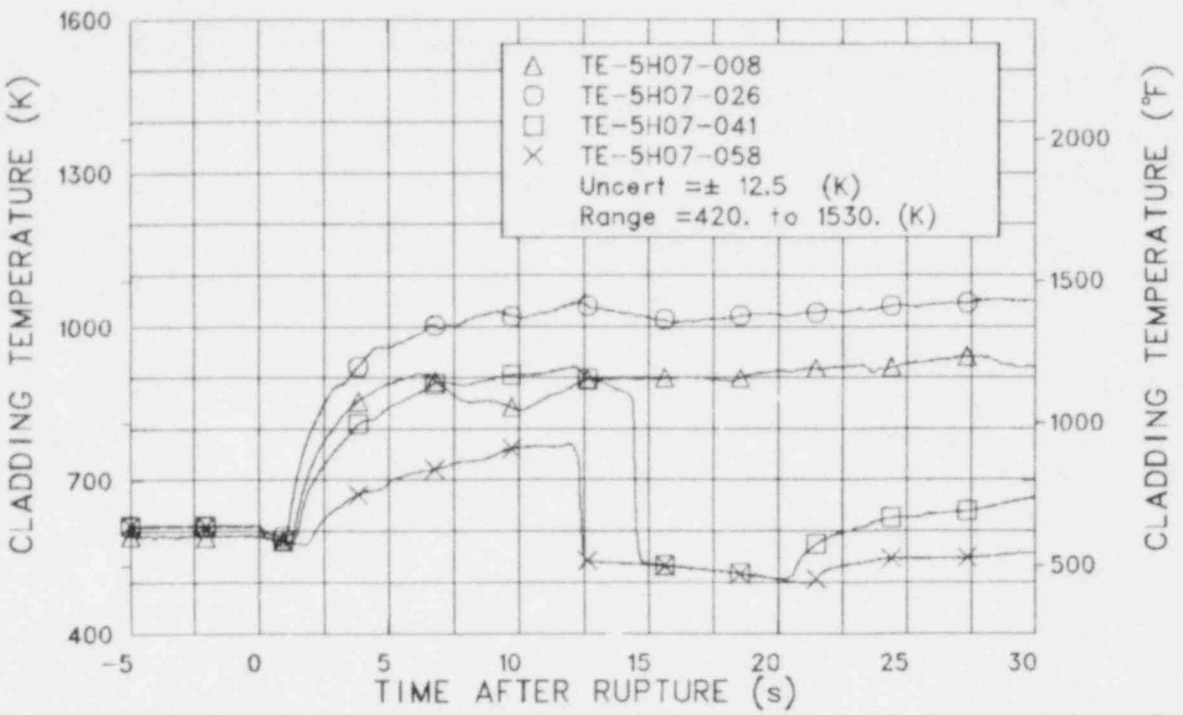

Figure 3M-89. Cladding temperature at Fuel Assembly 5, Row H, Column 7 at 0.20, 0.66, 1.04, and 1.47 m above bottom of fuel rod (TE-5H07-008, -026, -041, and -058).

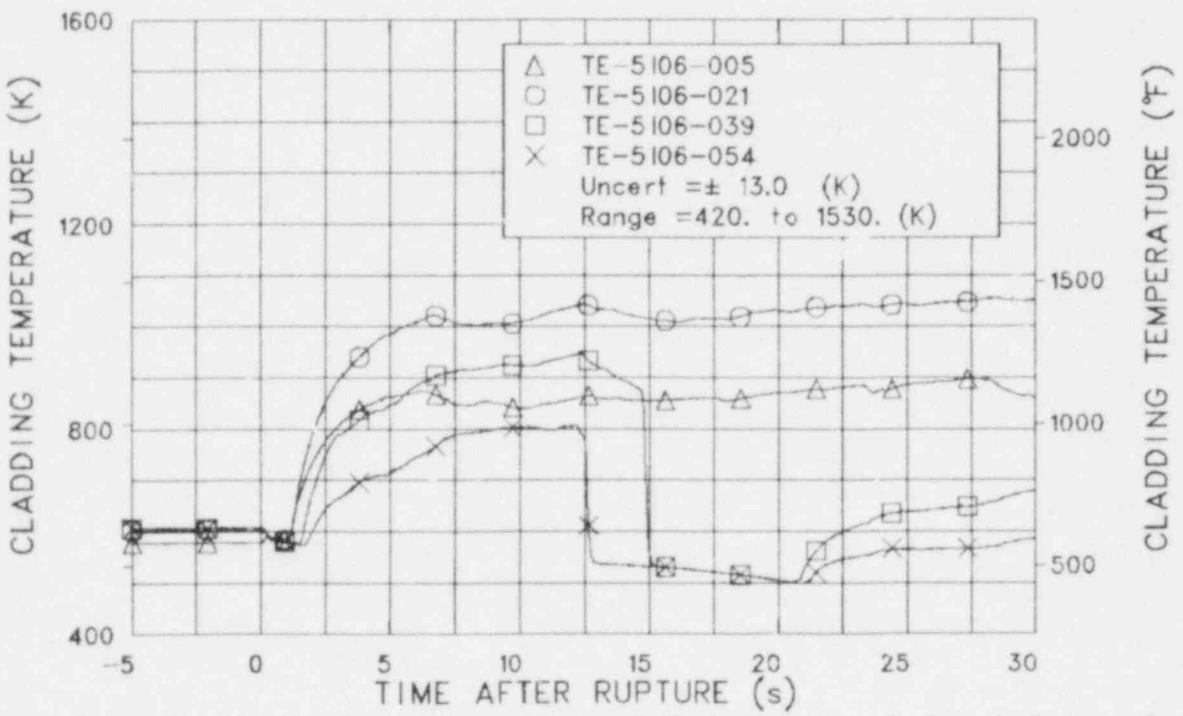

Figure 3M-90. Cladding temperature at Fuel Assembly 5, Row I, Column 6 at 0.13, 0.53, 0.99, and 1.37 m above bottom of fuel rod (TE-5I06-005, -021, -039, and -054).

EXPERIMENT L2-5

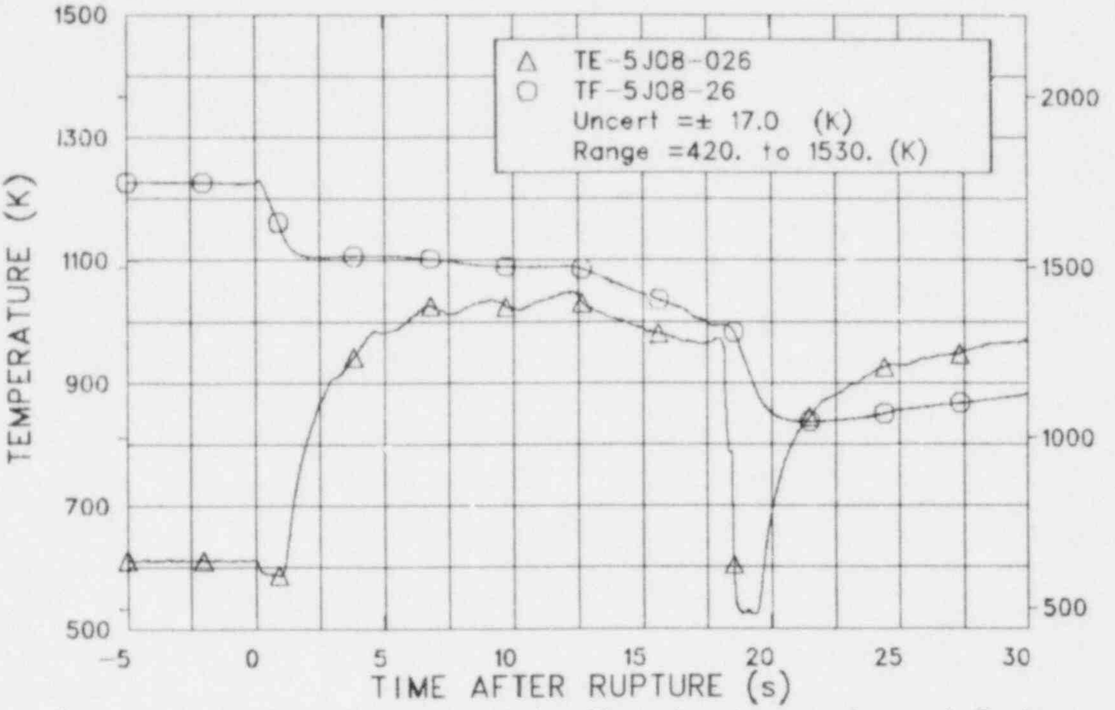

Figure 3M-91. Cladding and pellet off-center temperature at Fuel Assembly 5, Row J, Column 8 at 0.66 m above bottom of fuel rod (TE-5J08-026 and TF-5J08-26).

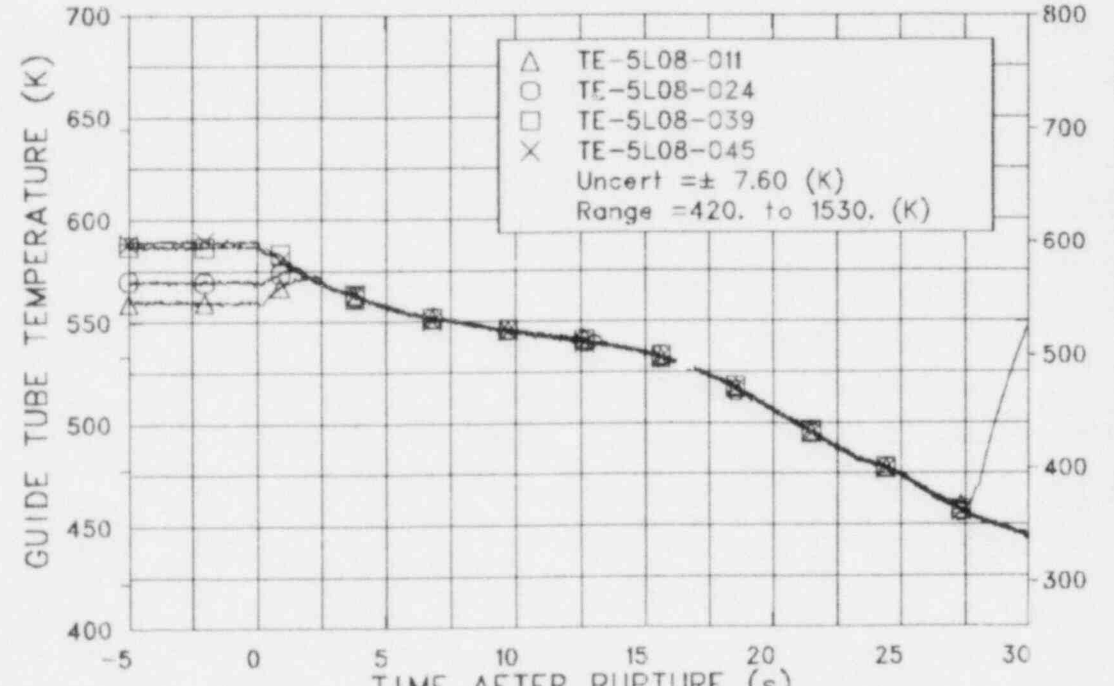

Figure 3M-92. Guide tube temperature at Fuel Assembly 5, Row L, Column 8 at 0.28, 0.61, 0.99, and 1.14 m above bottom of guide tube (TE-5L08-011, -024, -039, and -045).

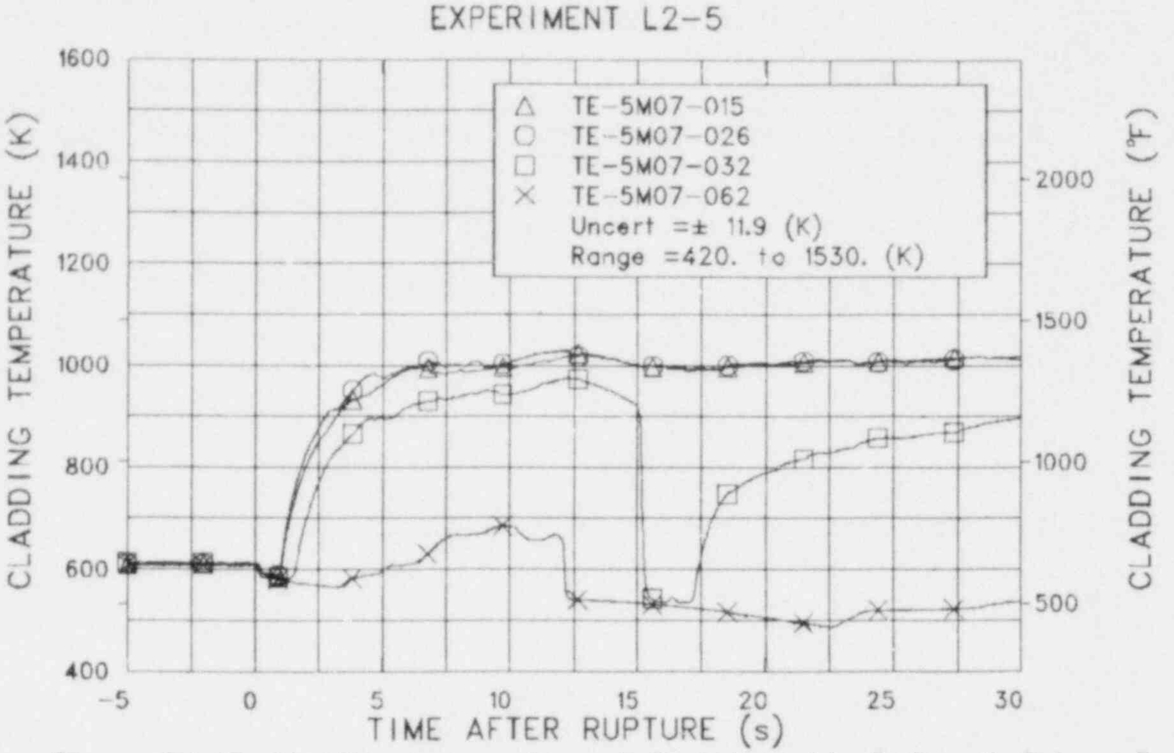

Figure 3M-93. Cladding temperature at Fuel Assembly 5, Row M, Column 7 at 0.38, 0.66, 0.81, and 1.57 m above bottom of fuel rod (TE-5M07-015, -026, -032, and -062).

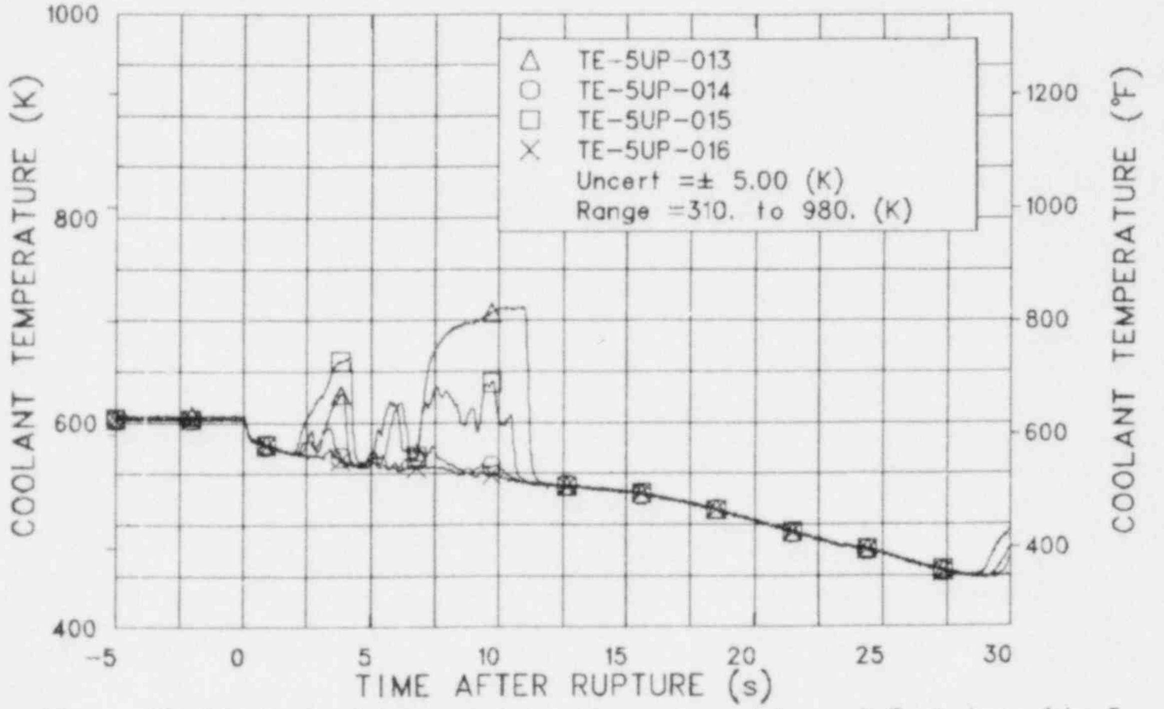

Figure 3M-94. Coolant temperature at upper end box of Fuel Assembly 5 (TE-5UP-013, -014, -015, and -016).

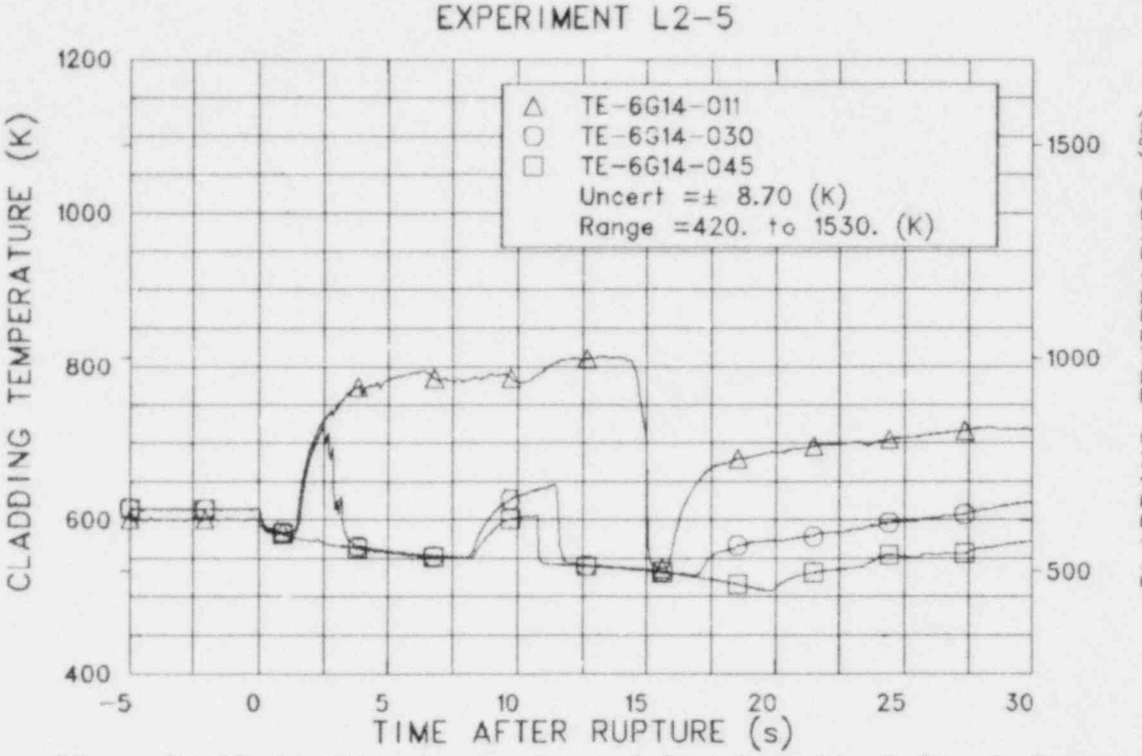

Figure 3M-95. Cladding temperature at Fuel Assembly 6, Row G, Column 14 at 0.28, 0.76, and 1.14 m above bottom of fuel rod (TE-6G14-011, -030, and -045) (TE-6G14-011; qualified, except for spurious spikes).

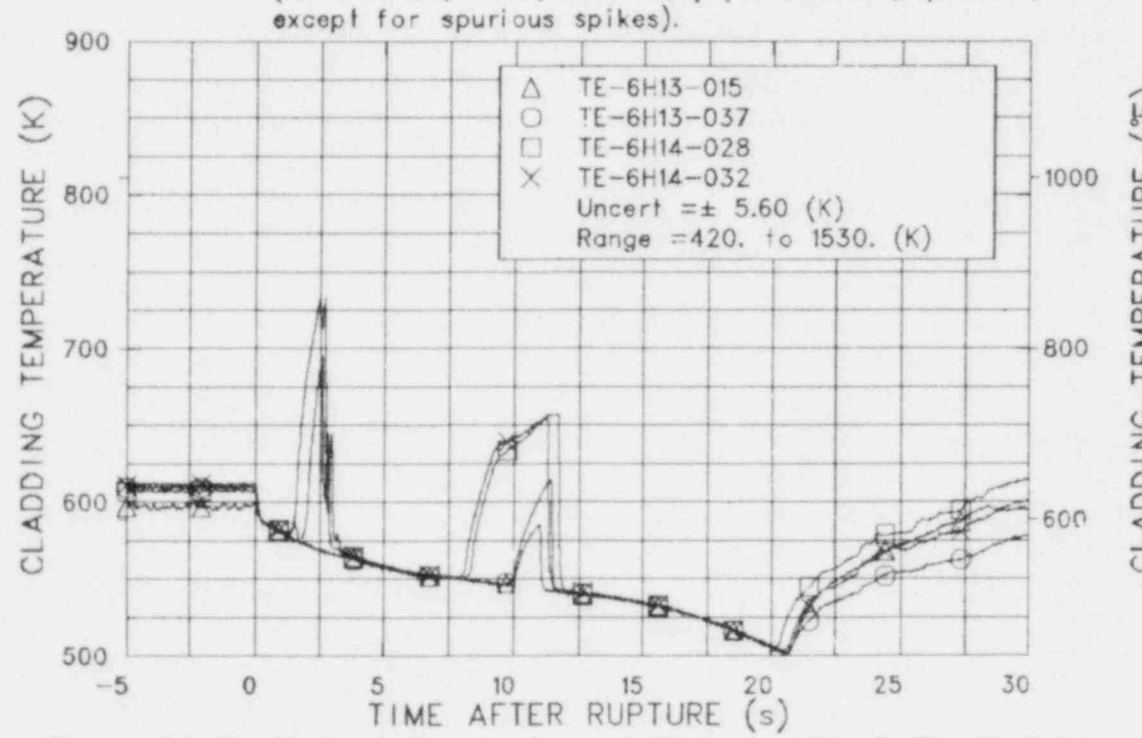

Figure 3M-96. Cladding temperature at Fuel Assembly 6, Row H, Columns 13 and 14 at 0.38, 0.94, 0.71, and 0.81 m above bottom of fuel rod (TE-6H13-015, -037, -6H14-028, and -032).

EXPERIMENT L2-5

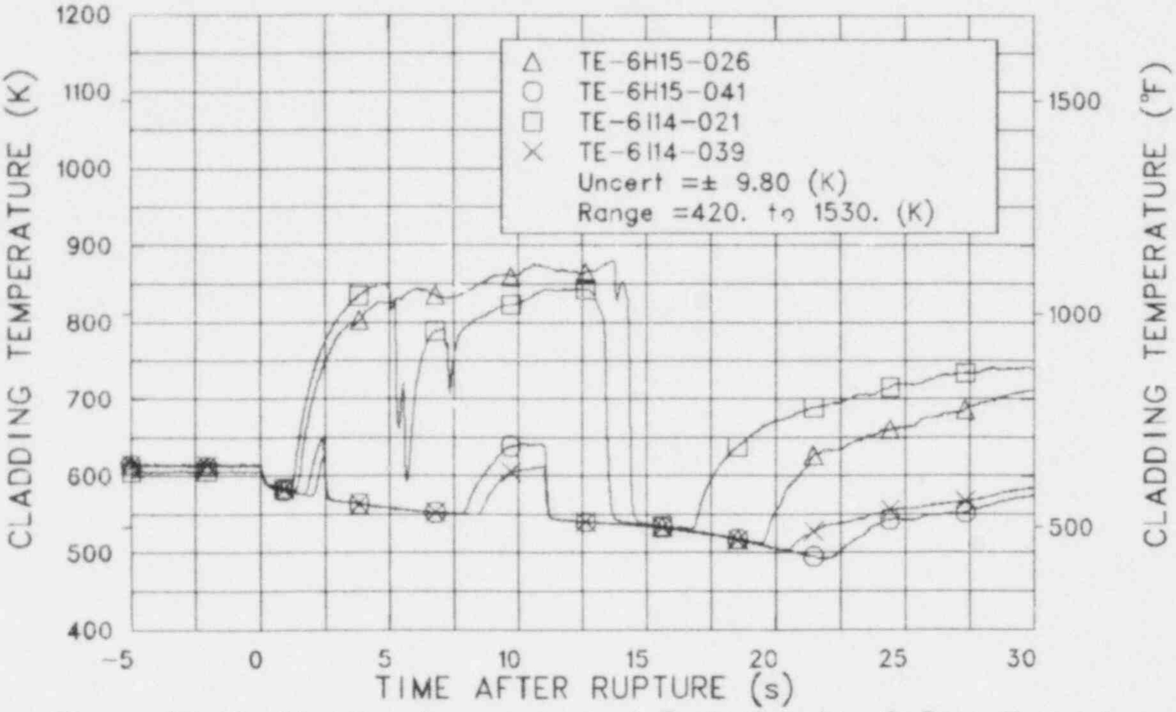

Figure 3M-97. Cladding temperature at Fuel Assembly 6, Rows H and I, Columns 14 and 15 at 0.66, 1.04, 0.53, and 0.99 m above bottom of fuel rod (TE-6H15-026, -041, -6I14-021, and -039).

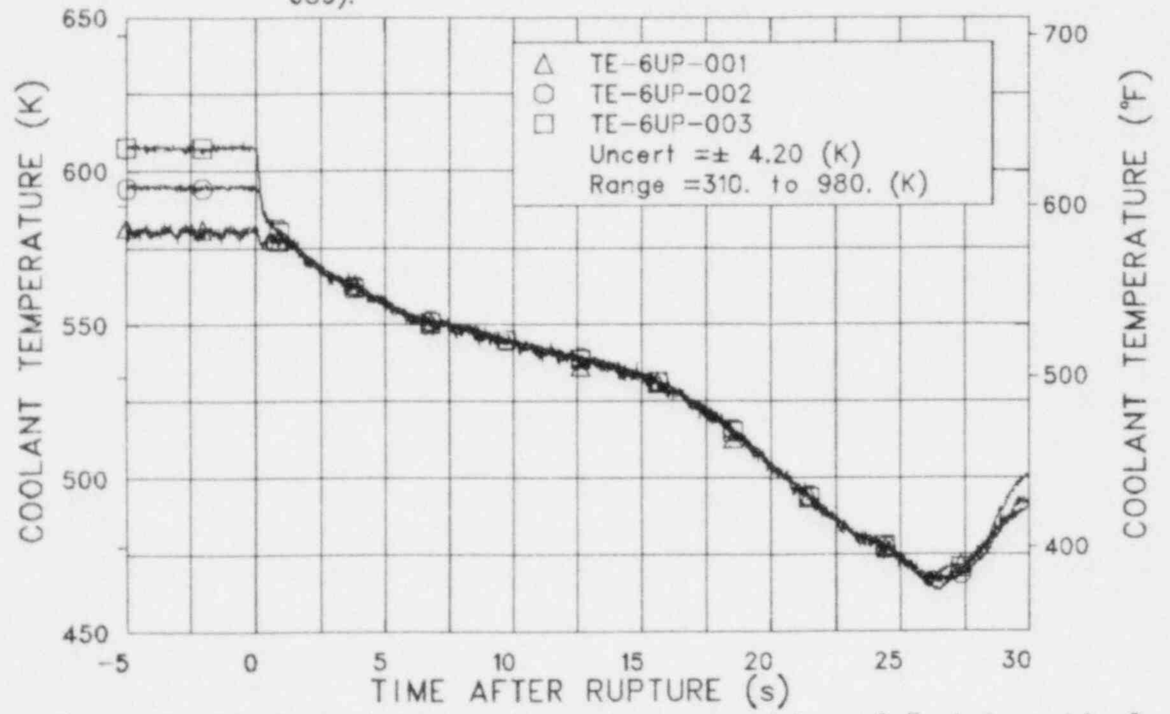

Figure 3M-98. Coolant temperature at upper end box of Fuel Assembly 6 (TE-6UP-001, -002, and -003).

EXPERIMENT L2-5

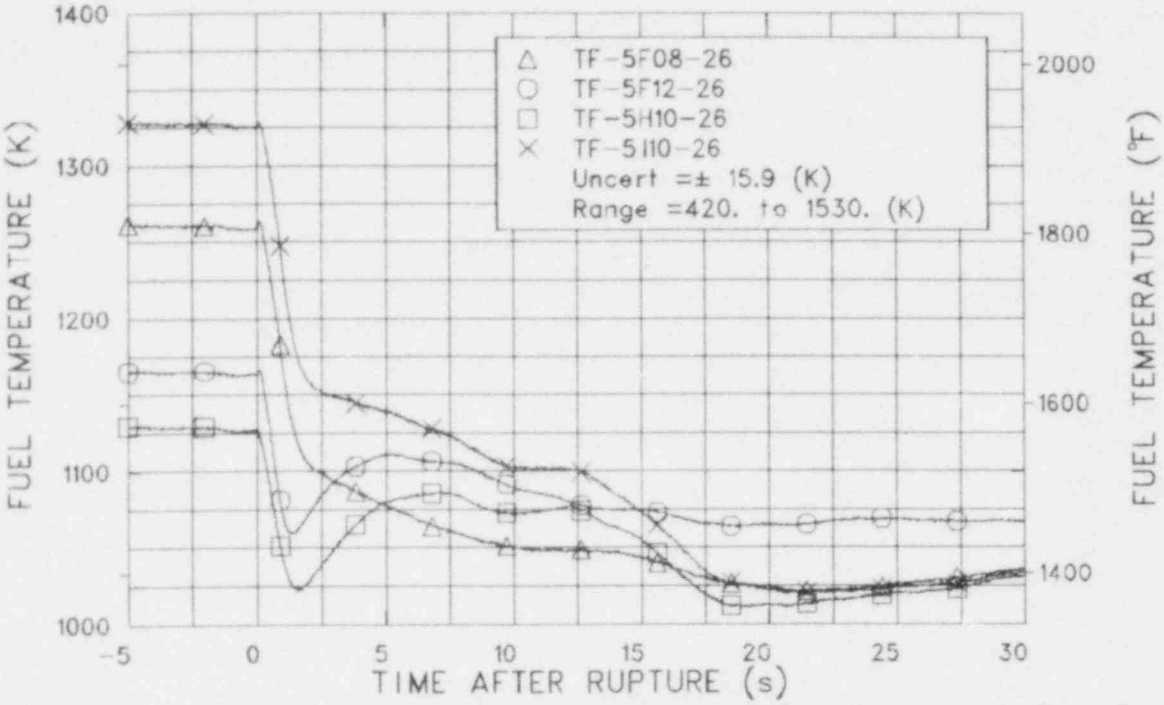

Figure 3M-99. Pellet off-center temperature at Fuel Assembly 5, Rows F, H, and I, Columns 8, 12, and 10 at 0.66 m above bottom of fuel rod (TF-5F08-26, -5F12-26, -5H10-26, and -5I10-26).

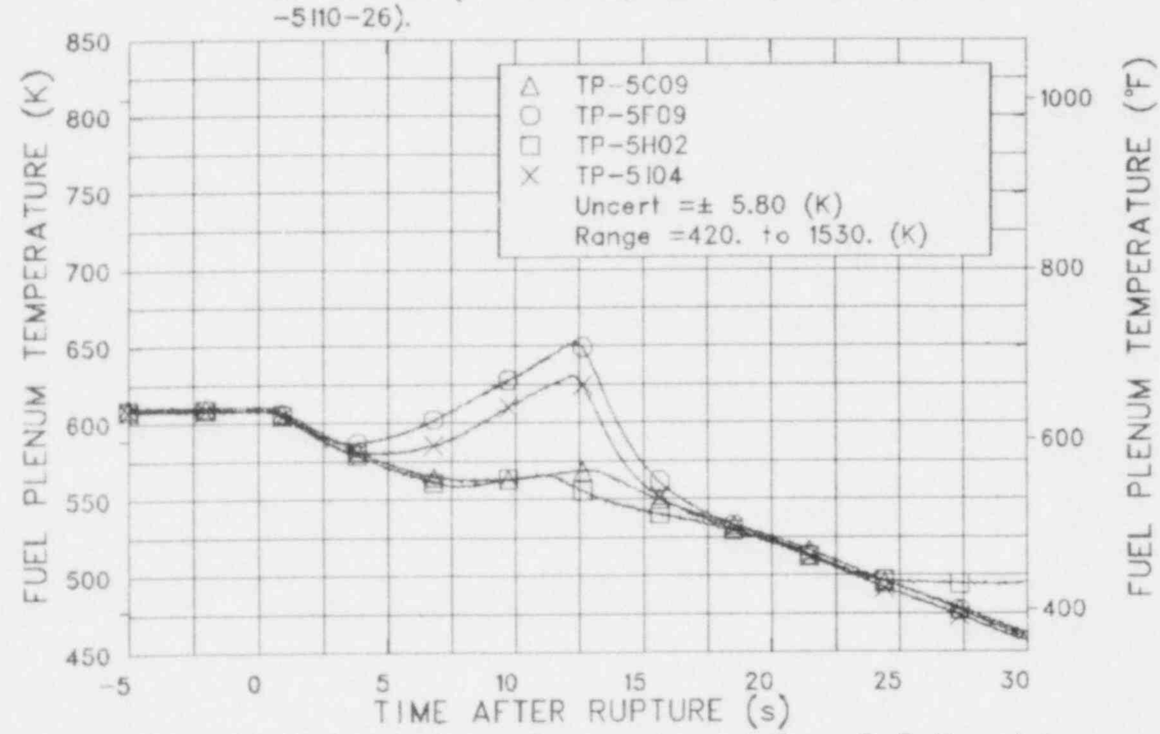

Figure 3M-100. Fuel rod plenum temperature at Rows C, F, H, and I, Columns 9, 2, and 4 of Fuel Assembly 5 (TP-5C09, -5F09, -5H02, and -5I04).

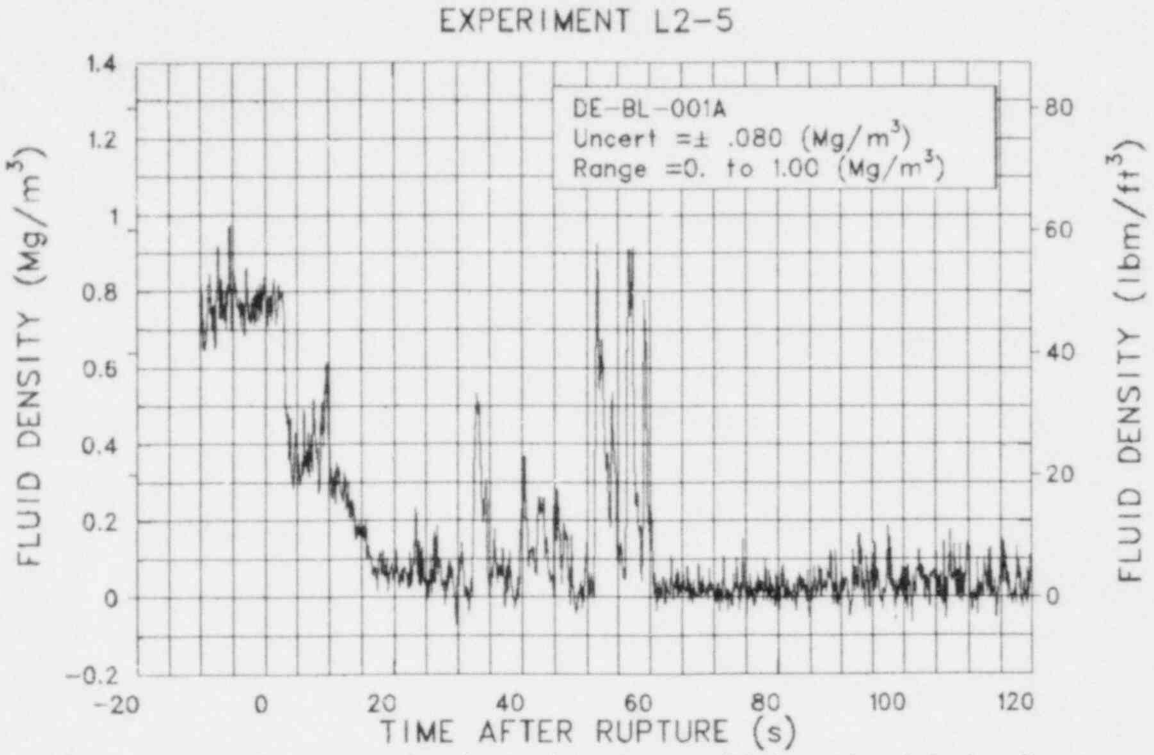

Figure 3L-1. Fluid density in broken loop cold leg, chordal density (DE-BL-001A).

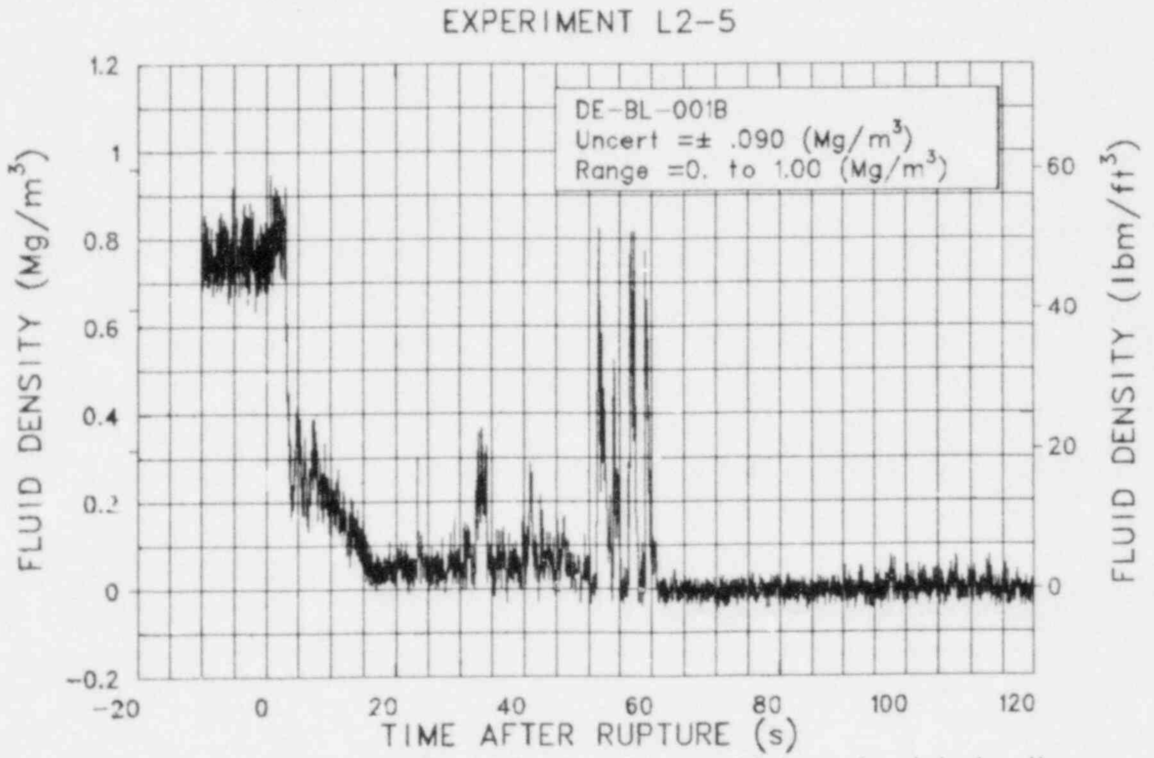

Figure 3L-2. Fluid density in broken loop cold leg, chordal density (DE-BL-001B).

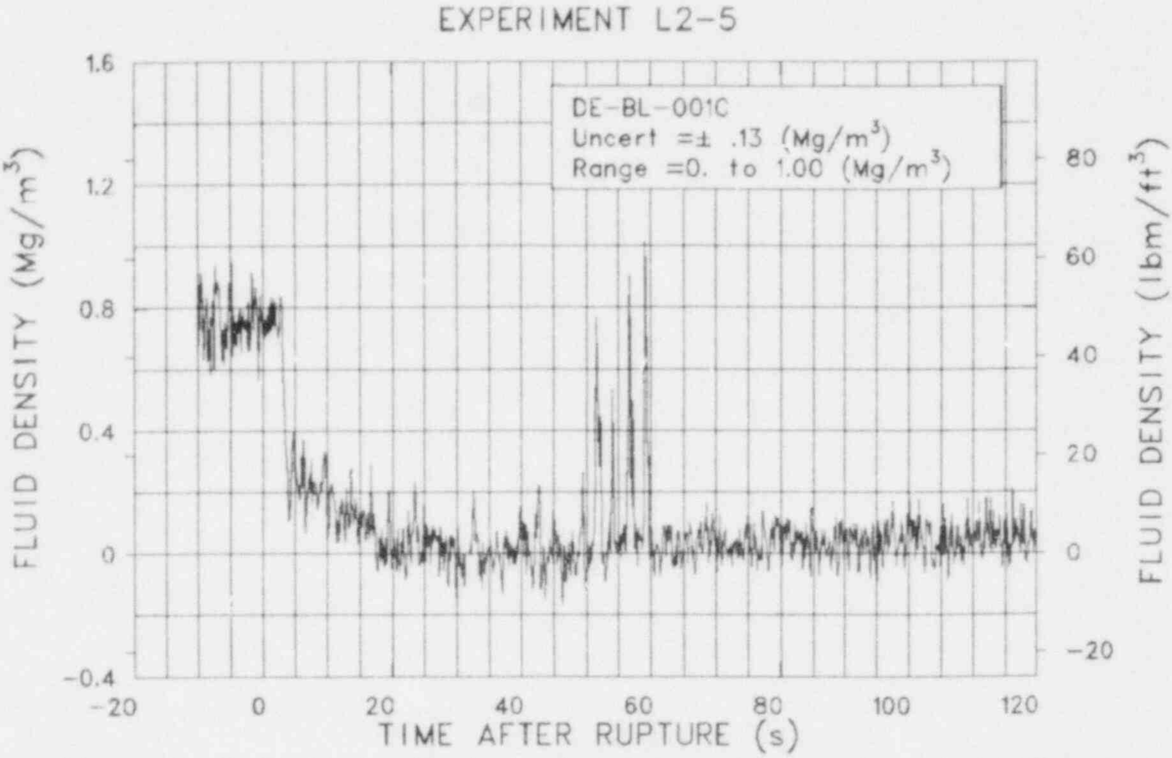

Figure 3L-3. Fluid density in broken loop cold leg, chordal density (DE-BL-001C).

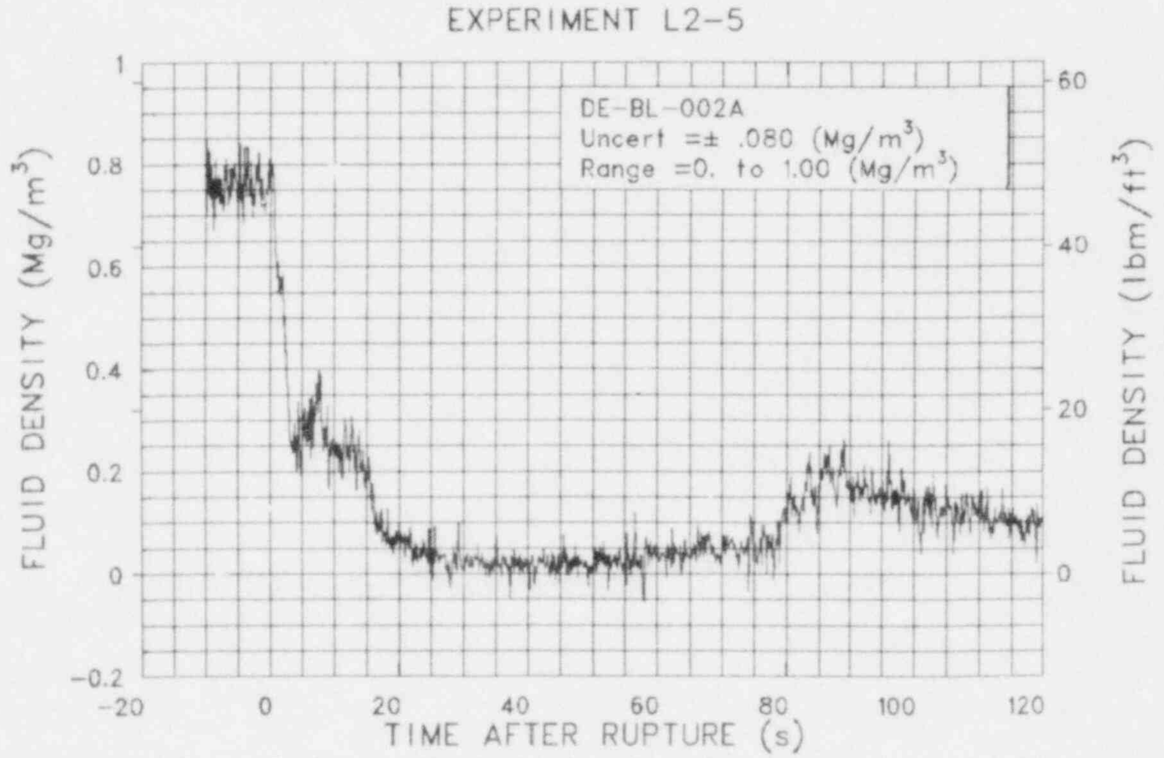

Figure 3L-4. Fluid density in broken loop hot leg, chordal density (DE-BL-002A).

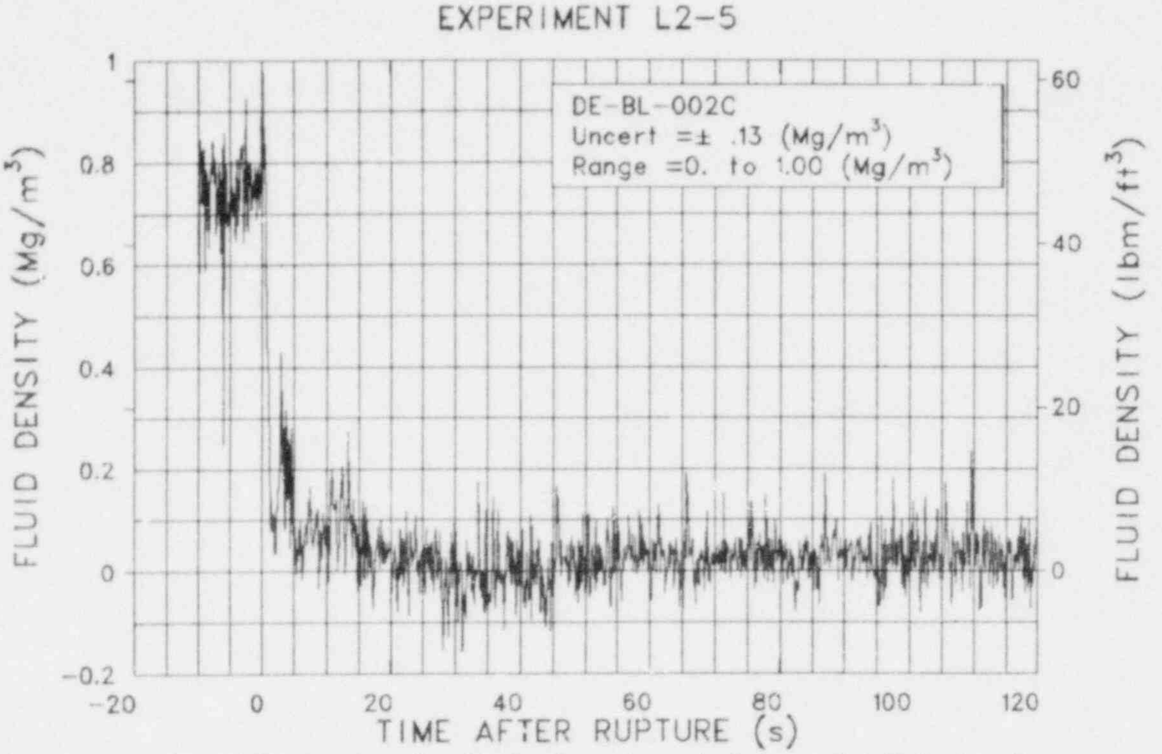

Figure 3L-5. Fluid density in broken loop hot leg, chordal density (DE-BL-002C) (qualified, except for spurious spikes).

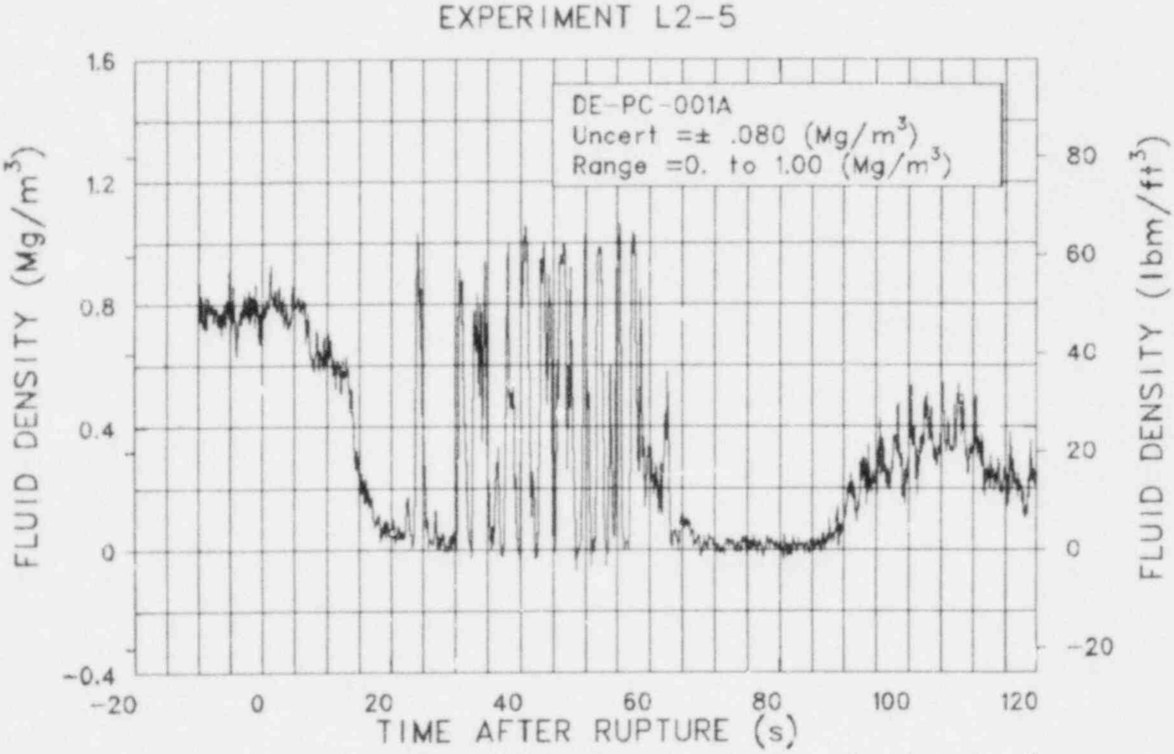

Figure 3L-6. Fluid density in intact loop cold leg, chordal density (DE-PC-001A).

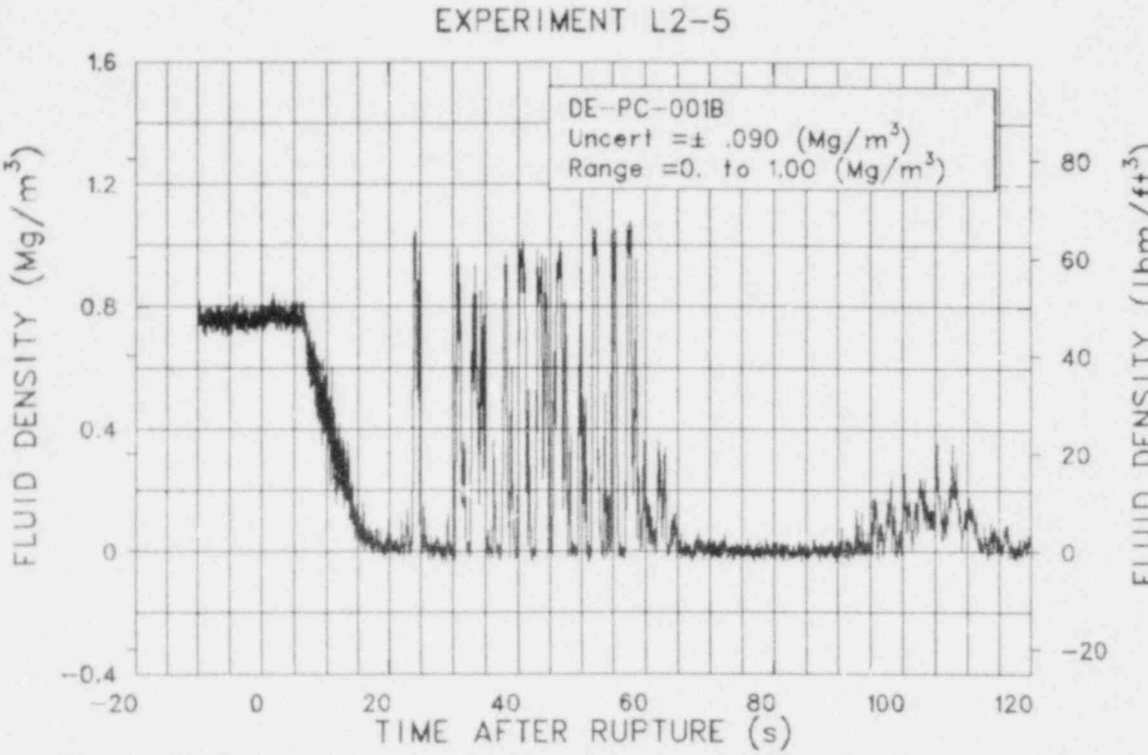

Figure 3L-7. Fluid density in intact loop cold leg, chordal density (DE-PC-001B).

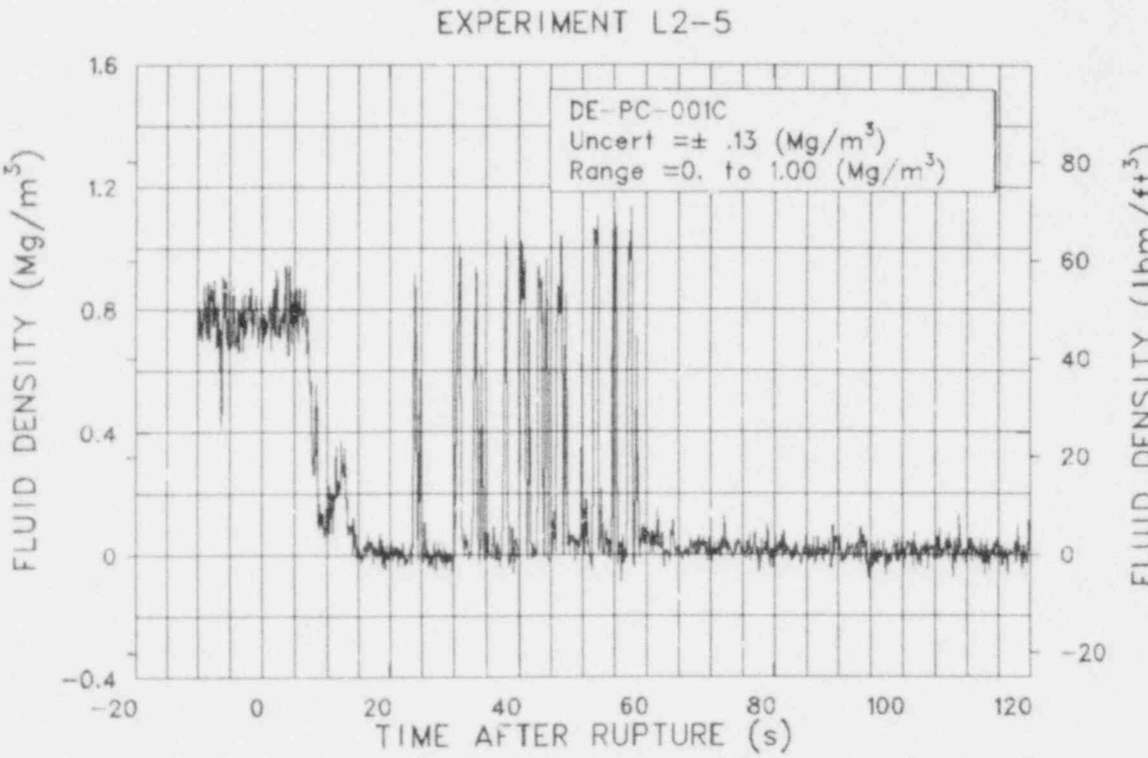

Figure 3L-8. Fluid density in intact loop cold leg, chordal density (DE-PC-001C).

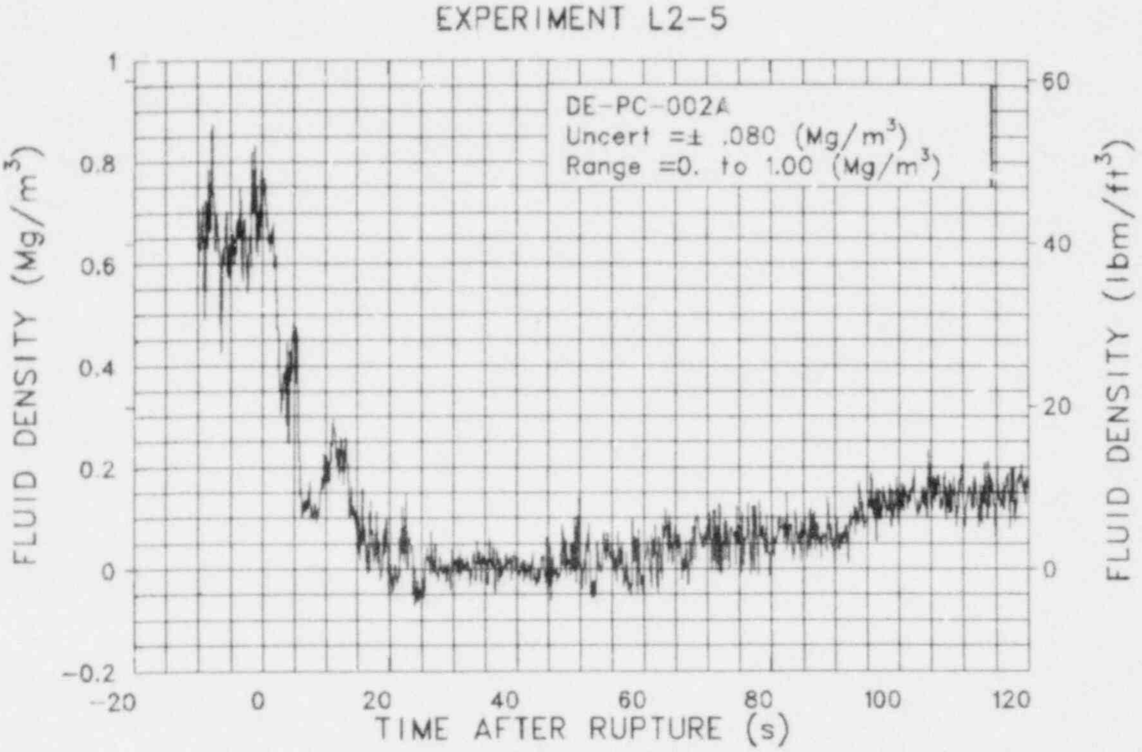

Figure 3L-9. Fluid density in intact loop hot leg, chordal density (DE-PC-002A).

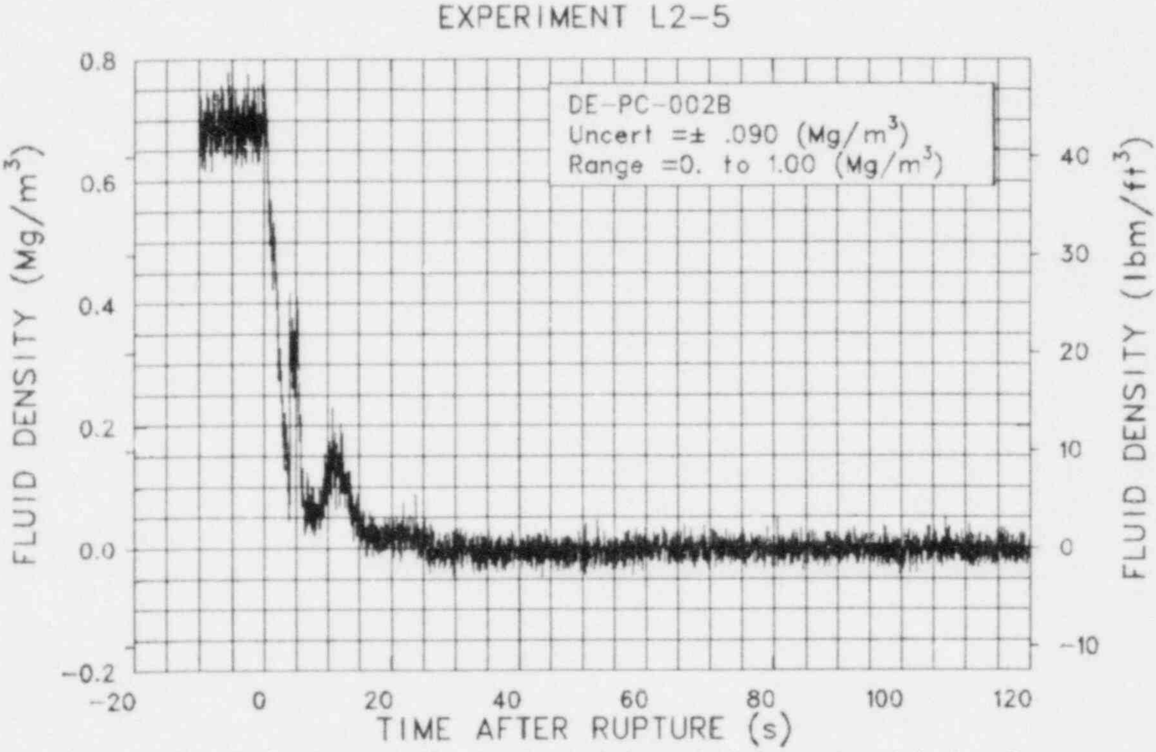

Figure 3L-10. Fluid density in intact loop hot leg, chordal density (DE-PC-002B).

EXPERIMENT L2-5

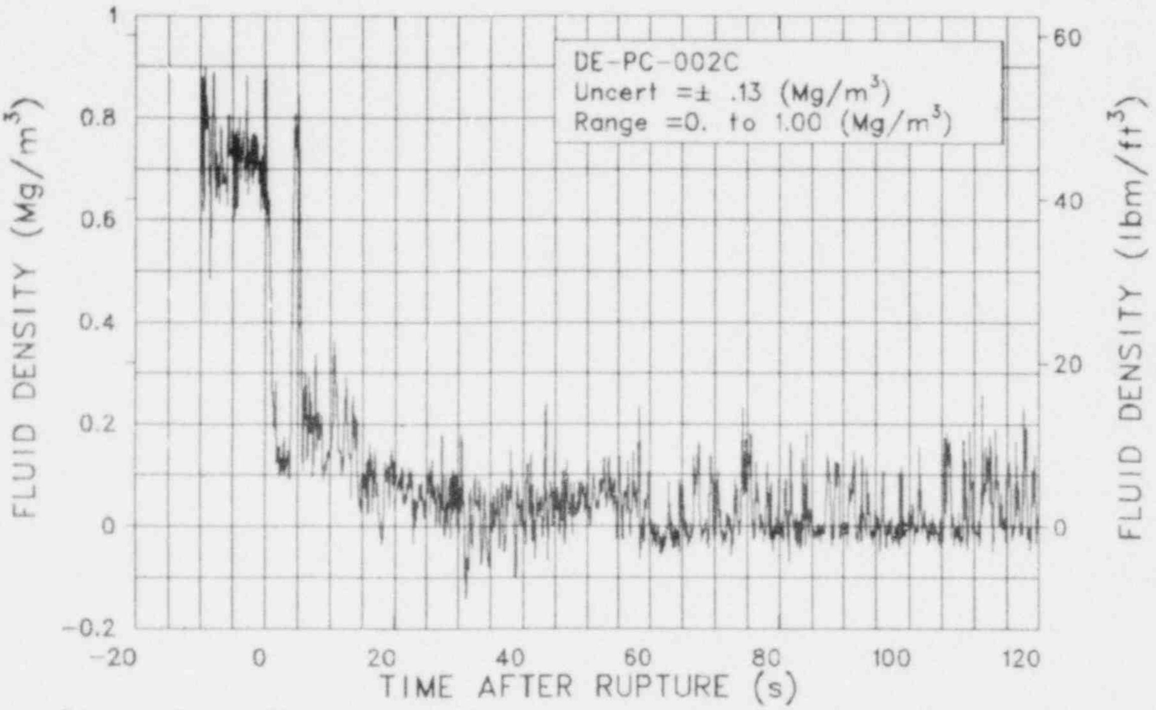

Figure 3L-11. Fluid density in intact loop hot leg, chordal density (DE-PC-002C) (qualified, except for spurious spikes).

EXPERIMENT L2-5

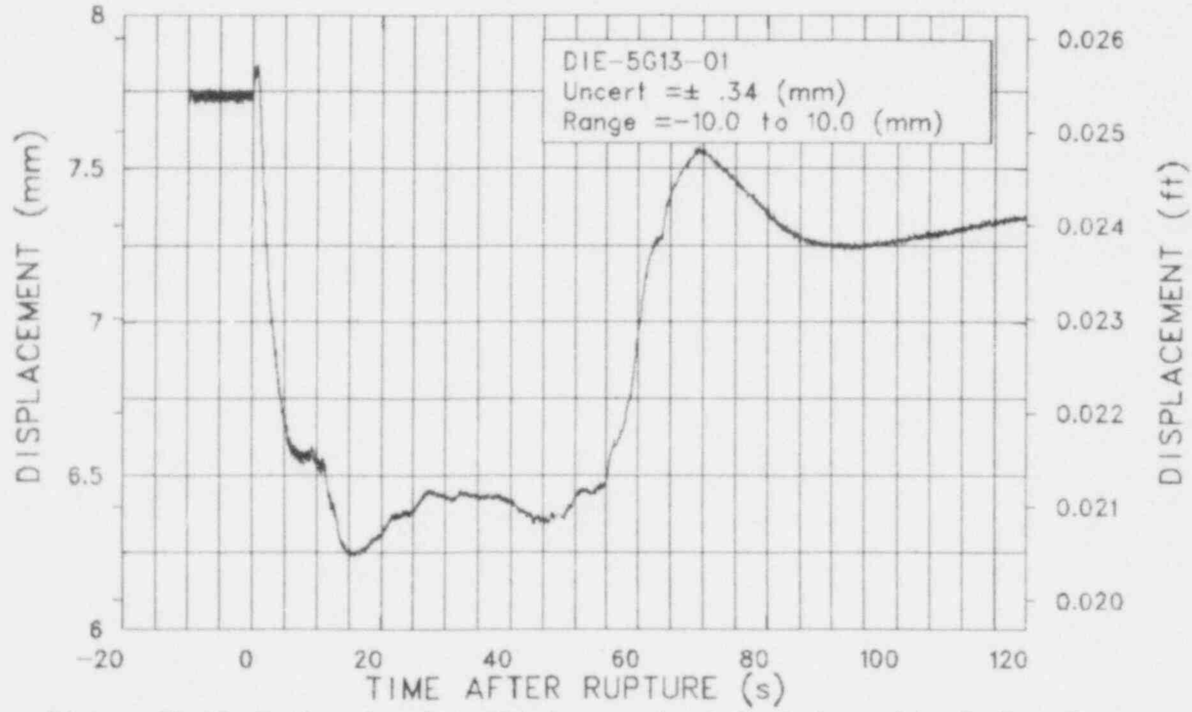

Figure 3L-12. Fuel rod axial displacement at Fuel Assembly 5, Row G, Column 13 (DIE-5G13-01) (qualified, magnitude uncertain).

EXPERIMENT L2-5

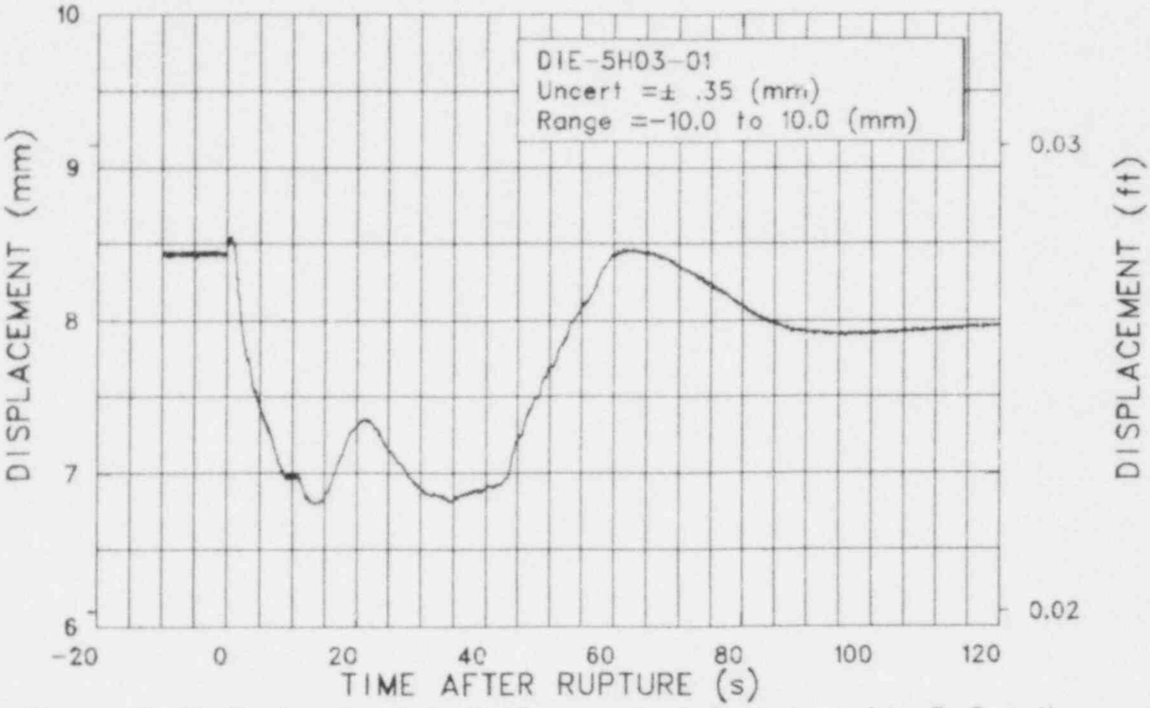

Figure 3L-13. Fuel rod axial displacement at Fuel Assembly 5, Row H, Column 3 (DIE-5H03-01) (qualified, magnitude uncertain).

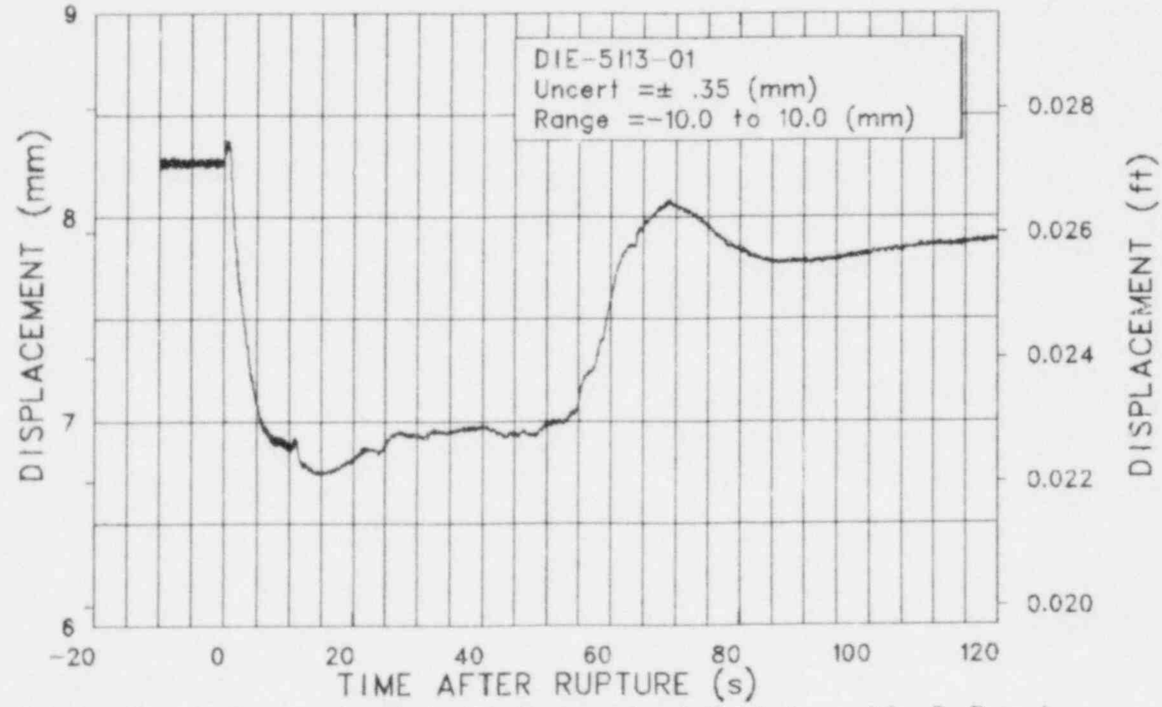

Figure 3L-14. Fuel rod axial displacement at Fuel Assembly 5, Row I, Column 13 (DIE-5I13-01) (qualified, magnitude uncertain).

EXPERIMENT L2-5

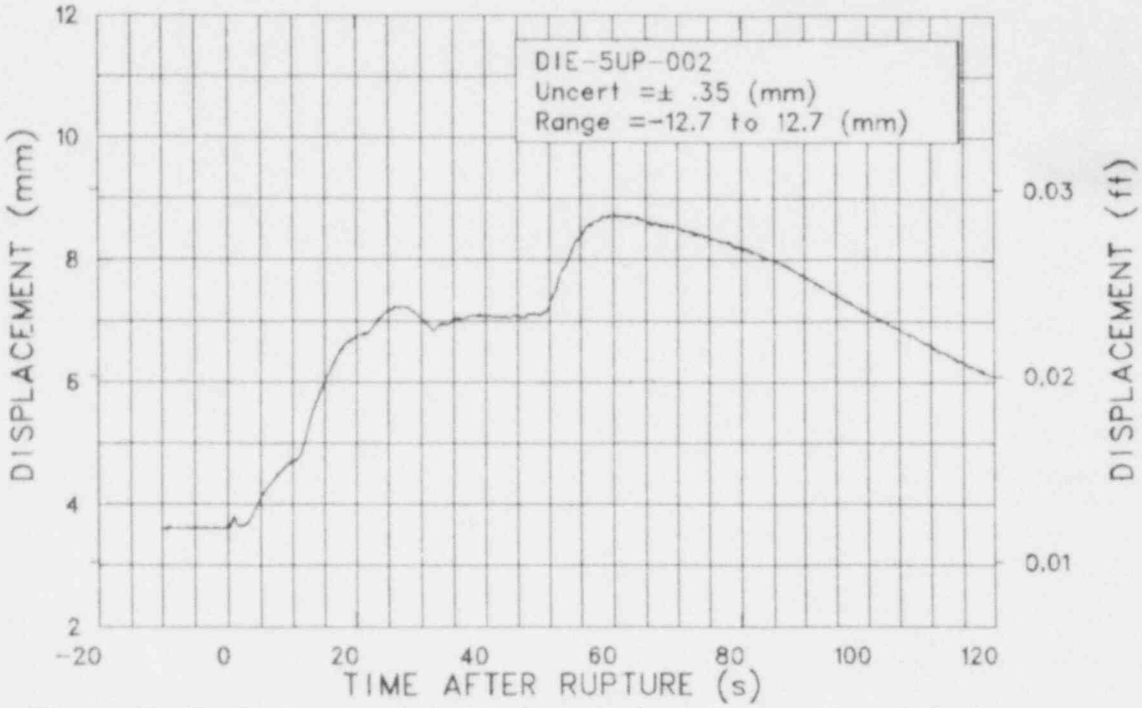

Figure 3L-15. Fuel rod axial displacement at top center of Fuel Assembly 5 (DIE-5UP-002) (qualified, magnitude uncertain).

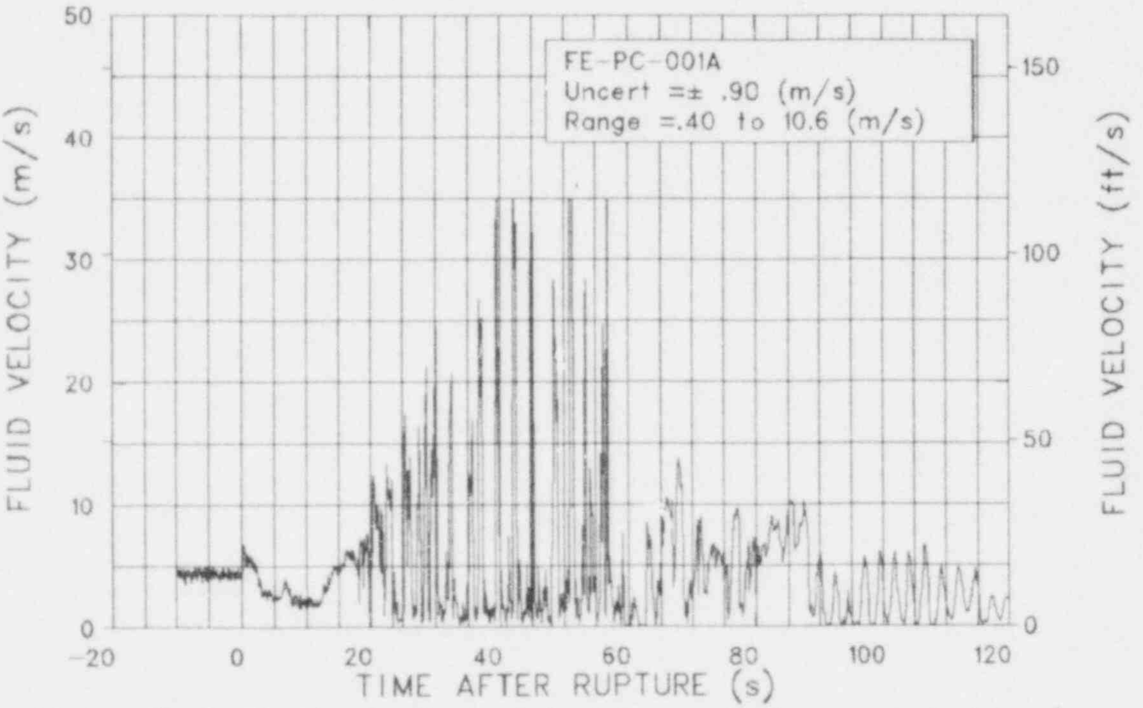

Figure 3L-16. Fluid velocity in intact loop cold leg on west side of pipe (FE-PC-001A) (qualified, flow direction not indicated).

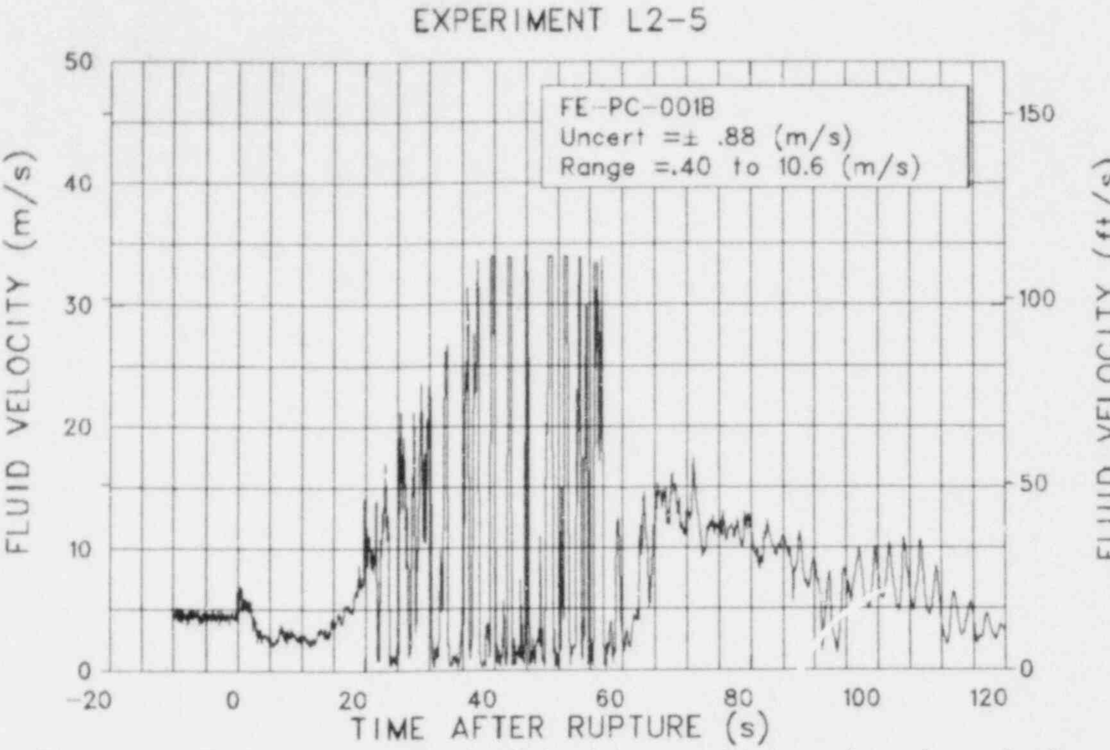

Figure 3L-17. Fluid velocity in intact loop cold leg at center of pipe (FE-PC-001B) (qualified, flow direction not indicated).

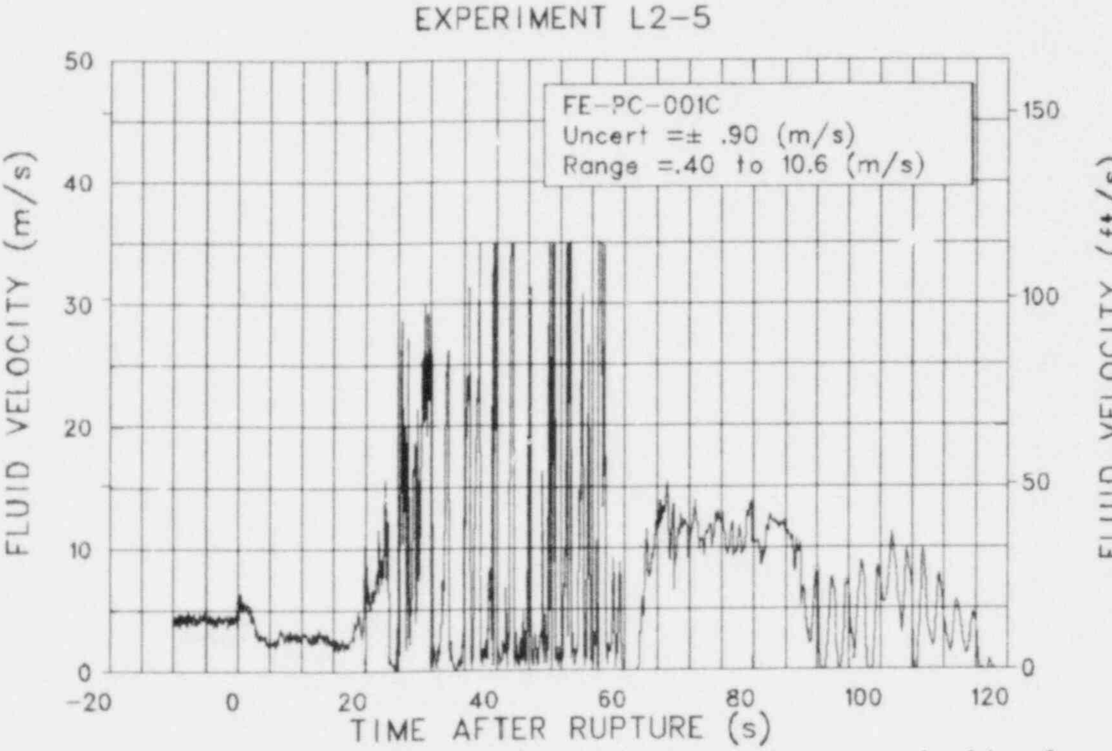

Figure 3L-18. Fluid velocity in intact loop cold leg on east side of pipe (FE-PC-001C) (qualified, flow direction not indicated).

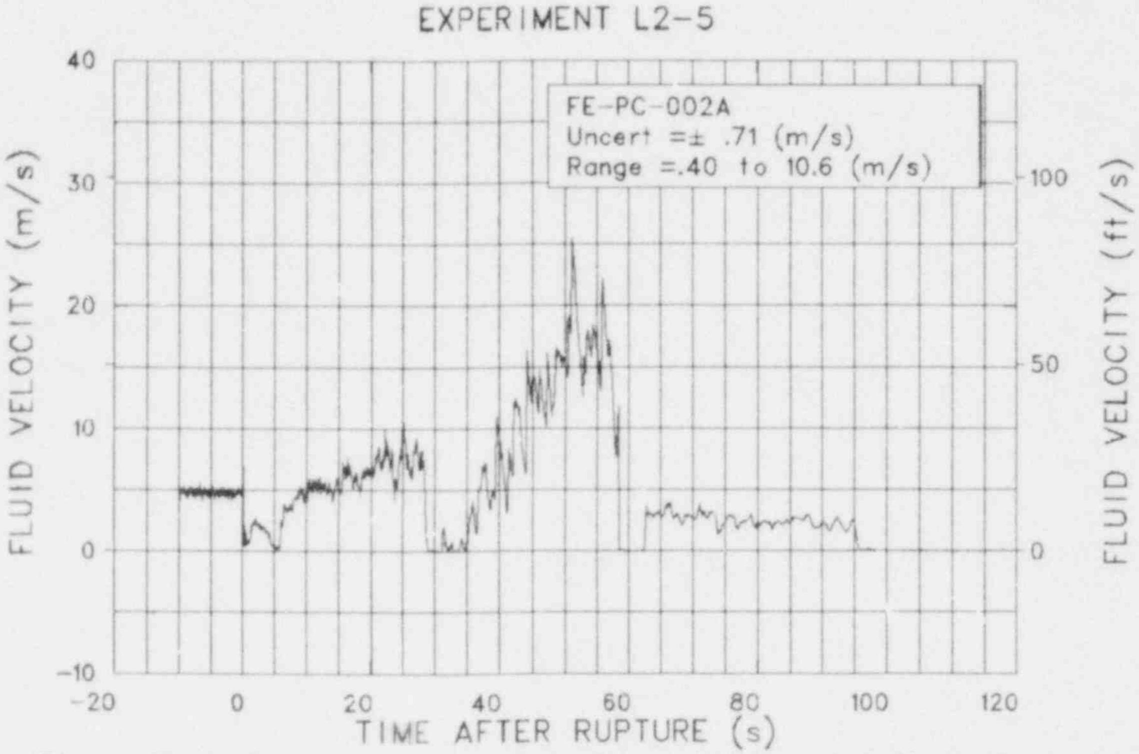

Figure 3L-19. Fluid velocity in intact loop hot leg at bottom of pipe (FE-PC-002A) (qualified, flow direction not indicated).

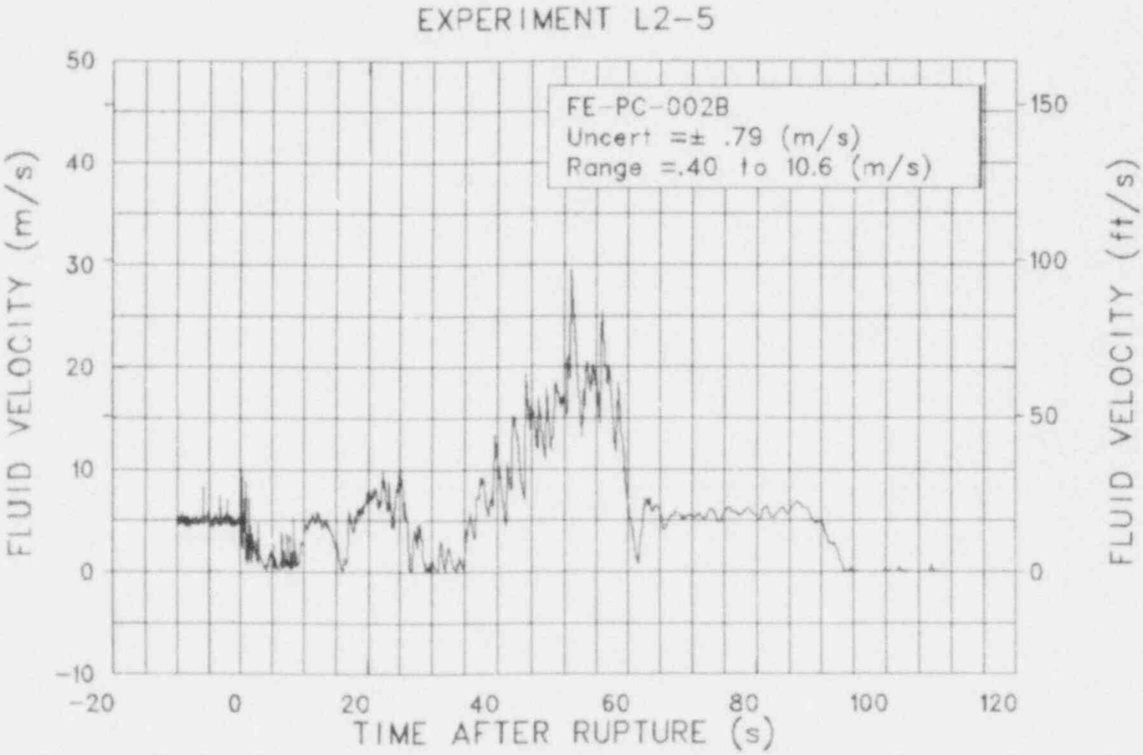

Figure 3L-20. Fluid velocity in intact loop hot leg at middle of pipe (FE-PC-002B) (qualified, flow direction not indicated).

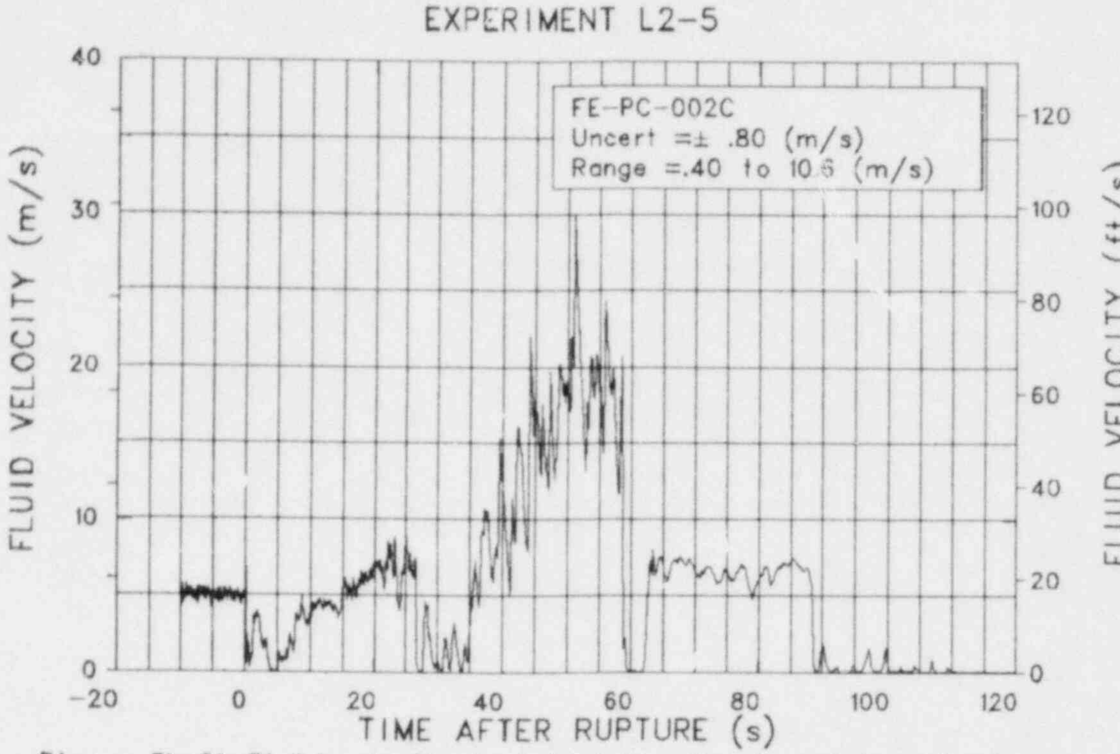

Figure 3L-21. Fluid velocity in intact loop hot leg at top of pipe (FE-PC-002C) (qualified, flow direction not indicated).

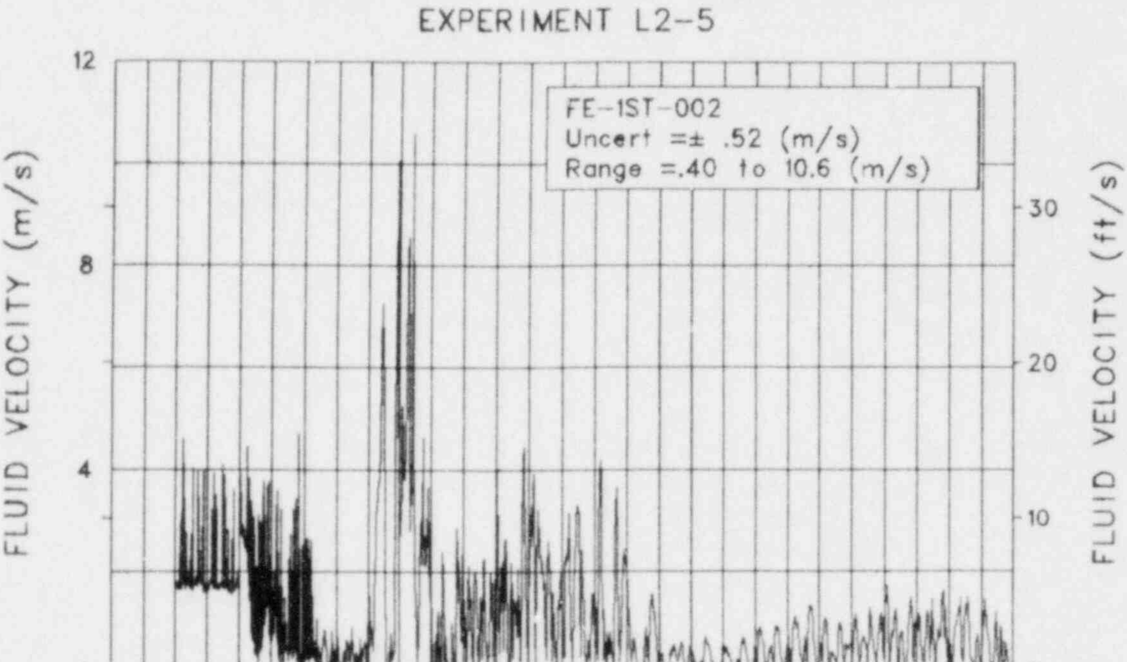

Figure 3L-22. Fluid velocity in reactor vessel Downcomer Stalk 1 (FE-1ST-002) (qualified, flow direction not indicated, unexplained noise).

EXPERIMENT L2-5

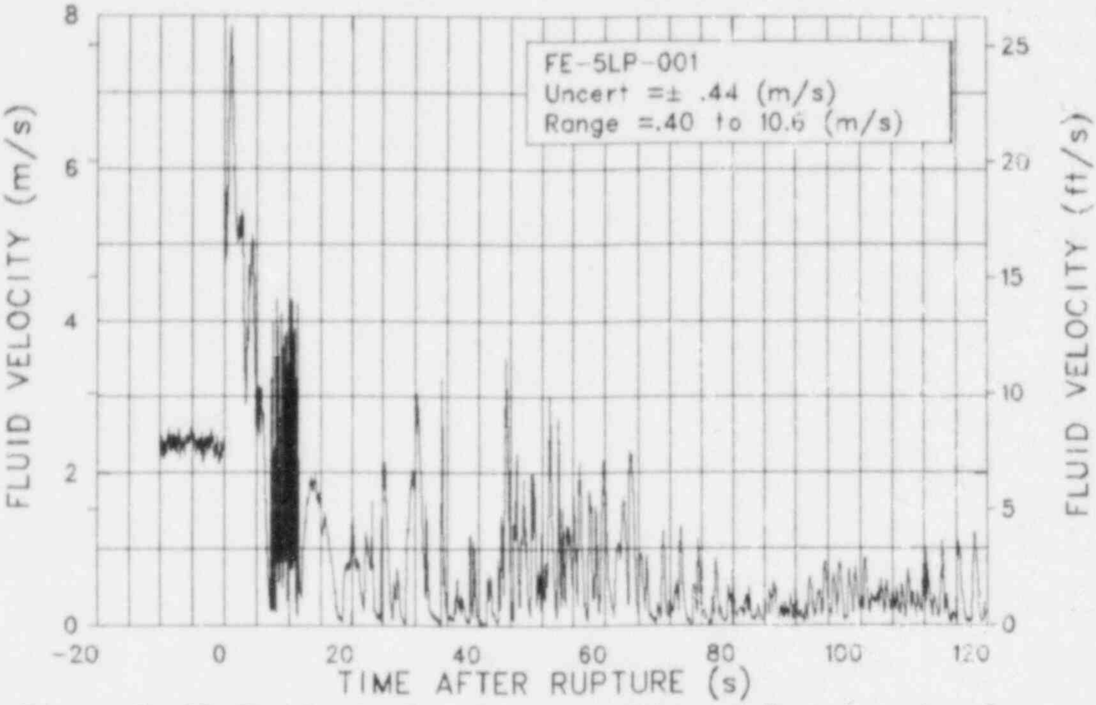

Figure 3L-23. Fluid velocity at lower end box of Fuel Assembly 5 (FE-5LP-001) (qualified, flow direction not indicated).

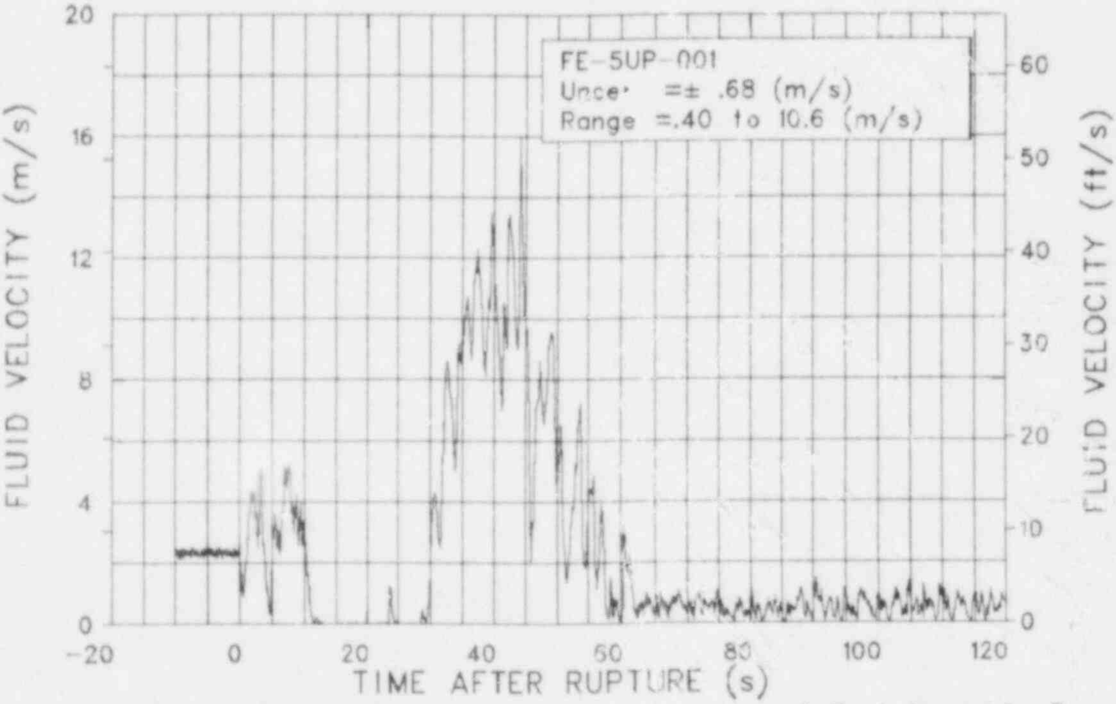

Figure 3L-24. Fluid velocity above upper end box of Fuel Assembly 5 (FE-5UP-001) (qualified, flow direction not indicated).

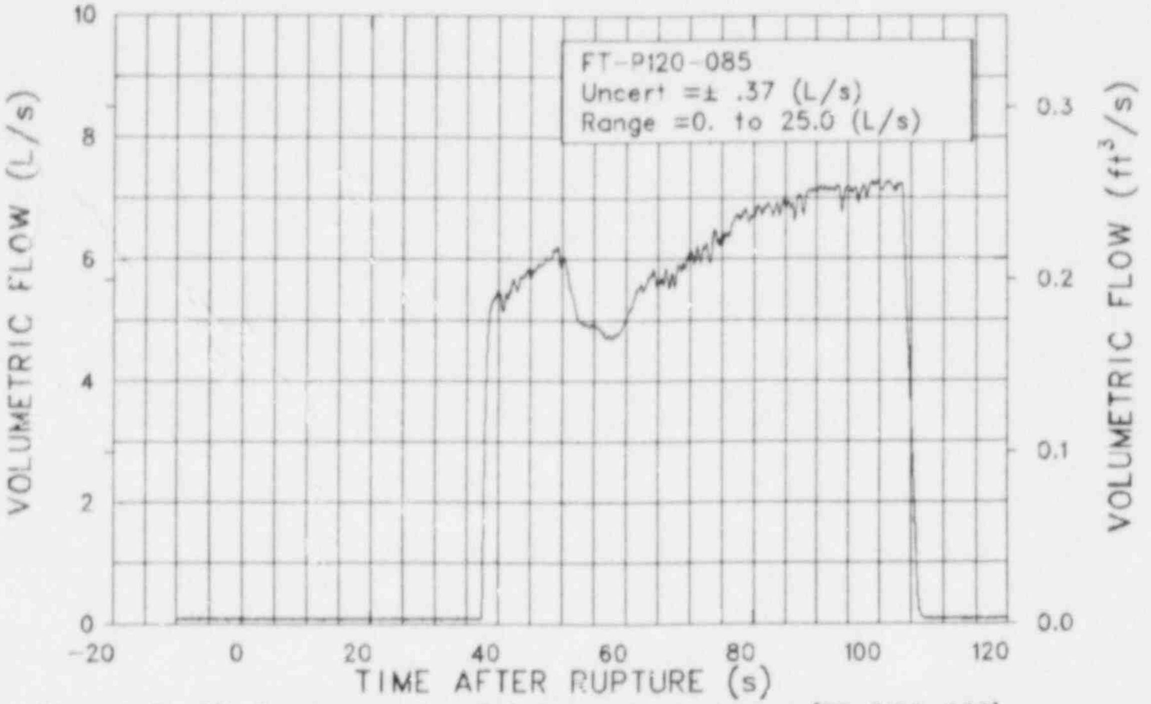

Figure 3L-25. Flow rate in LPIS Pump A discharge (FT-P120-085) (qualified, except for spurious spikes).

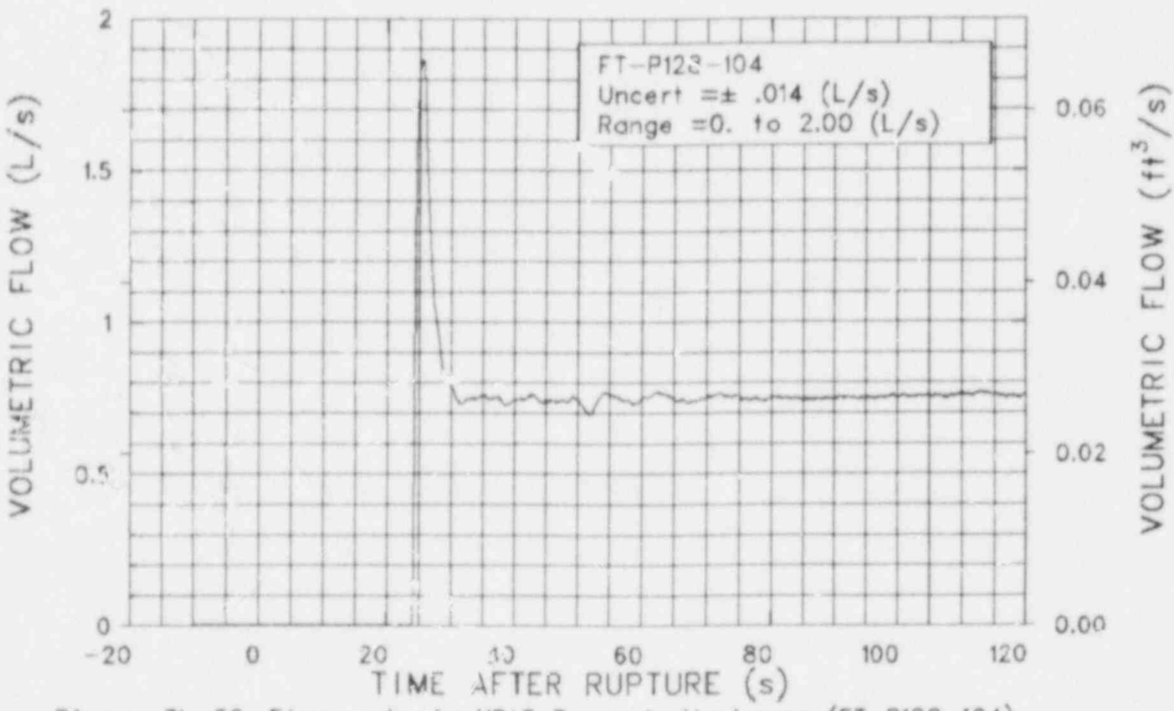

Figure 3L-26. Flow rate in HPIS Pump A discharge (FT-P128-104).

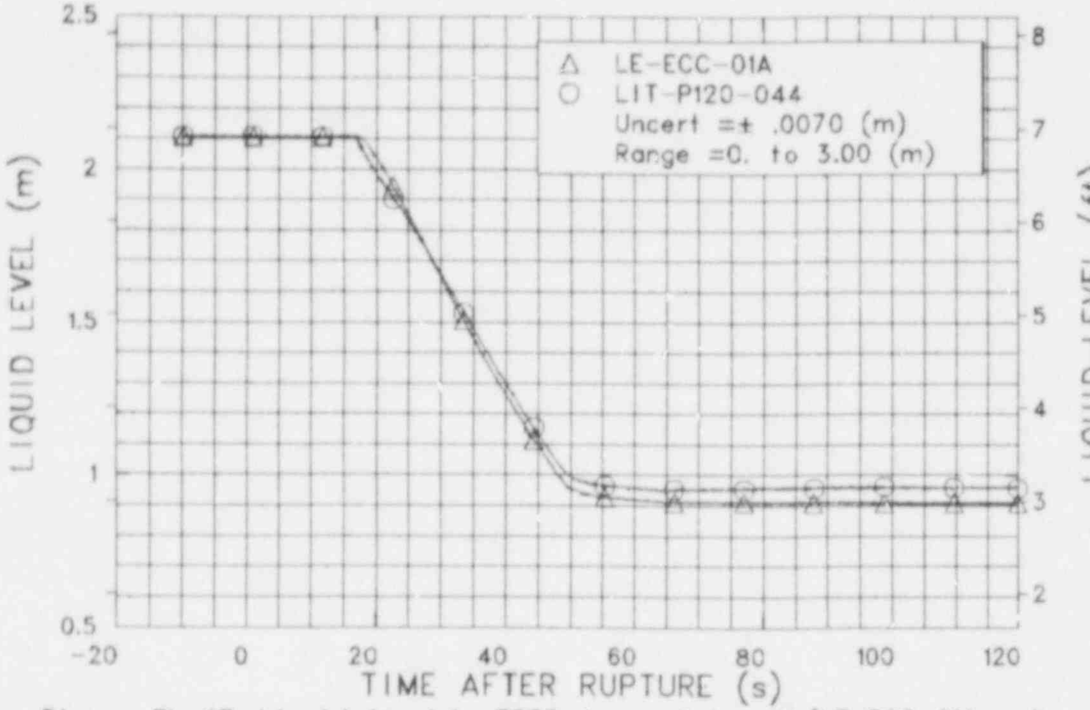

Figure 3L-27. Liquid level in ECCS Accumulator A (LE-ECC-01A and LIT-P120-044) (LIT-P120-044; qualified, pressure sensitive after tank emptied).

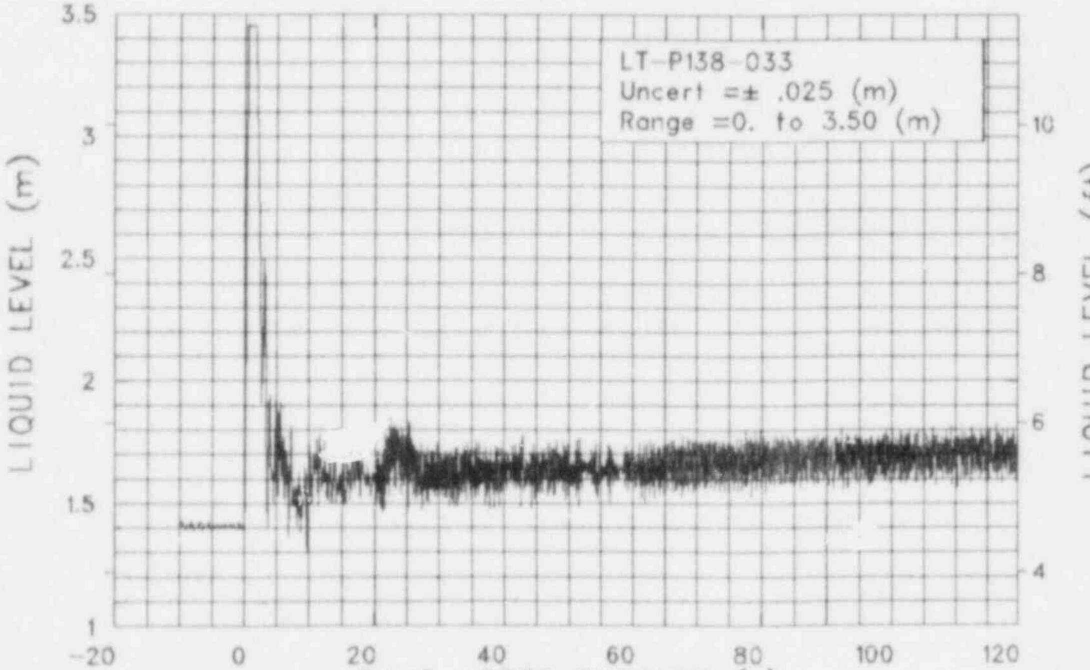

Figure 3L-28. Liquid level in blowdown suppression tank (LT-P138-033).

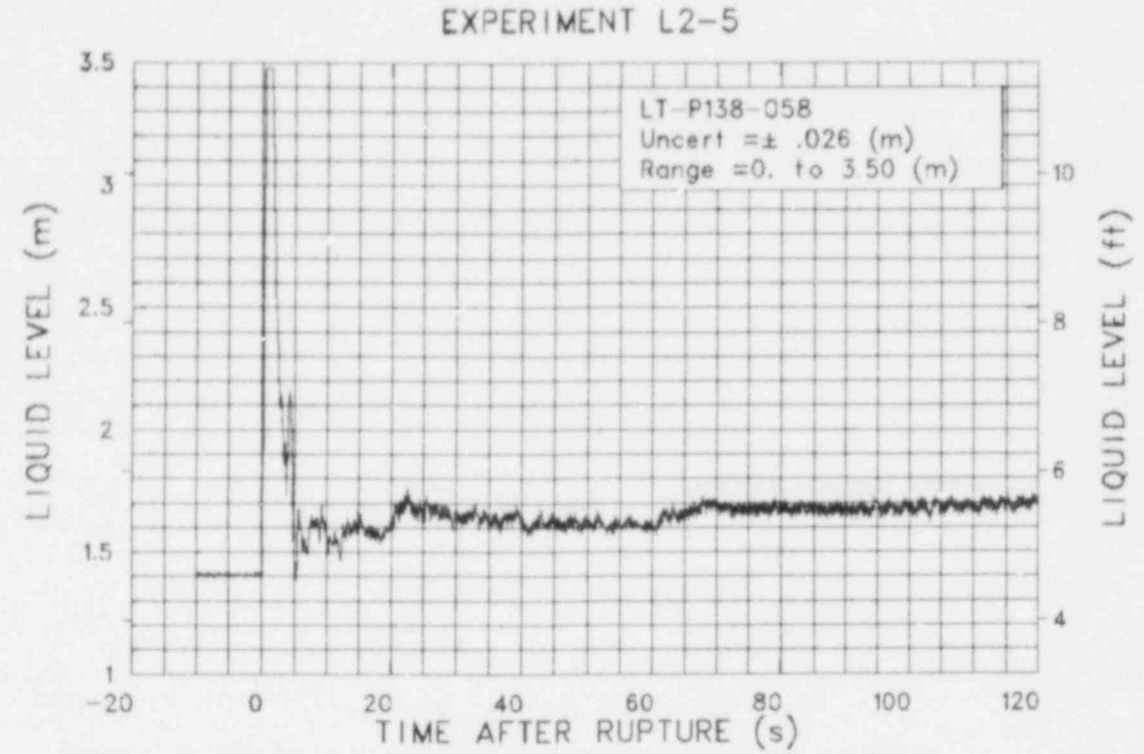

Figure 3L-29. Liquid level in blowdown suppression tank (LT-P138-058).

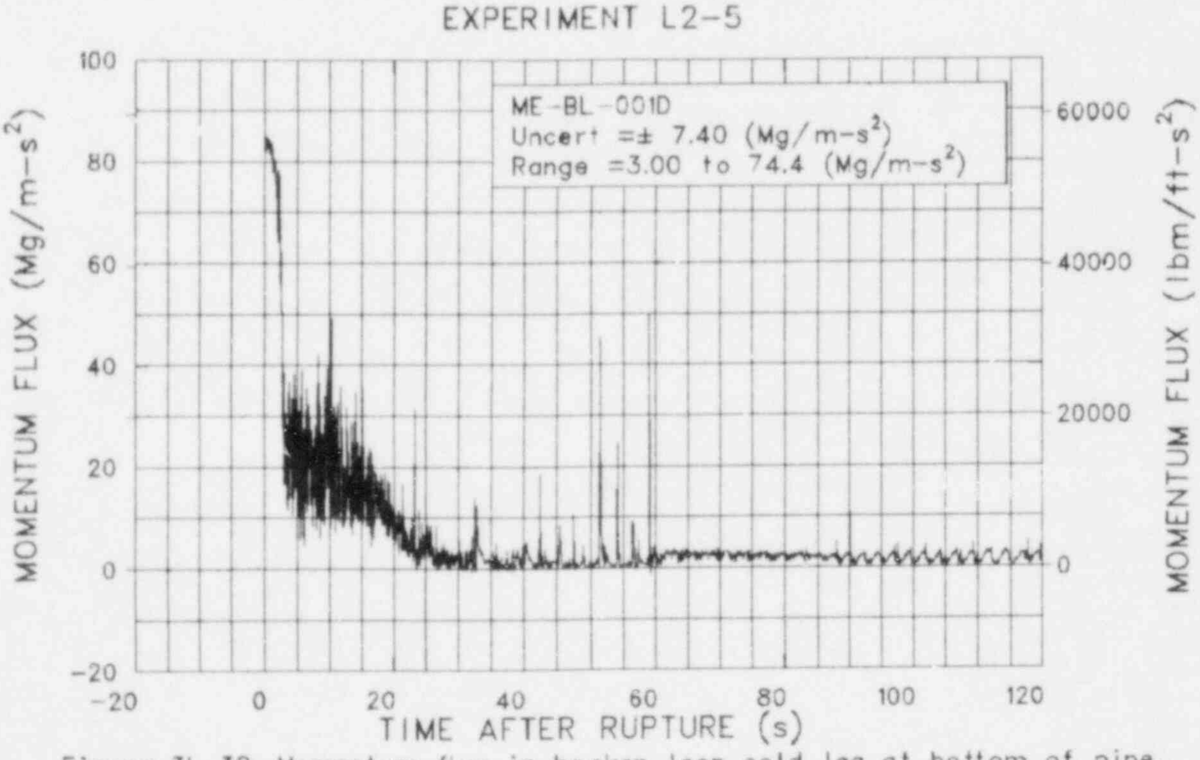

Figure 3L-30. Momentum flux in broken loop cold leg at bottom of pipe, low range (ME-BL-001D) (qualified, narrow range instrument).

EXPERIMENT L2-5

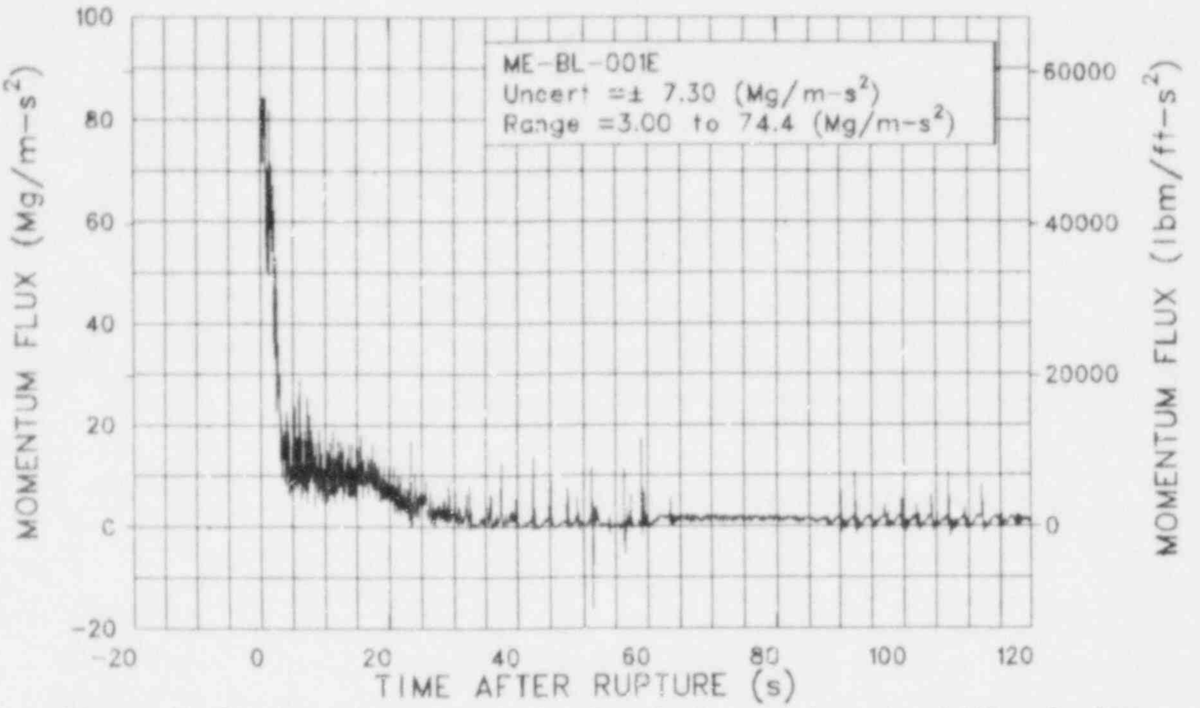

Figure 3L-31. Momentum flux in broken loop cold leg at middle of pipe, low range (ME-BL-001E) (qualified, narrow range instrument).

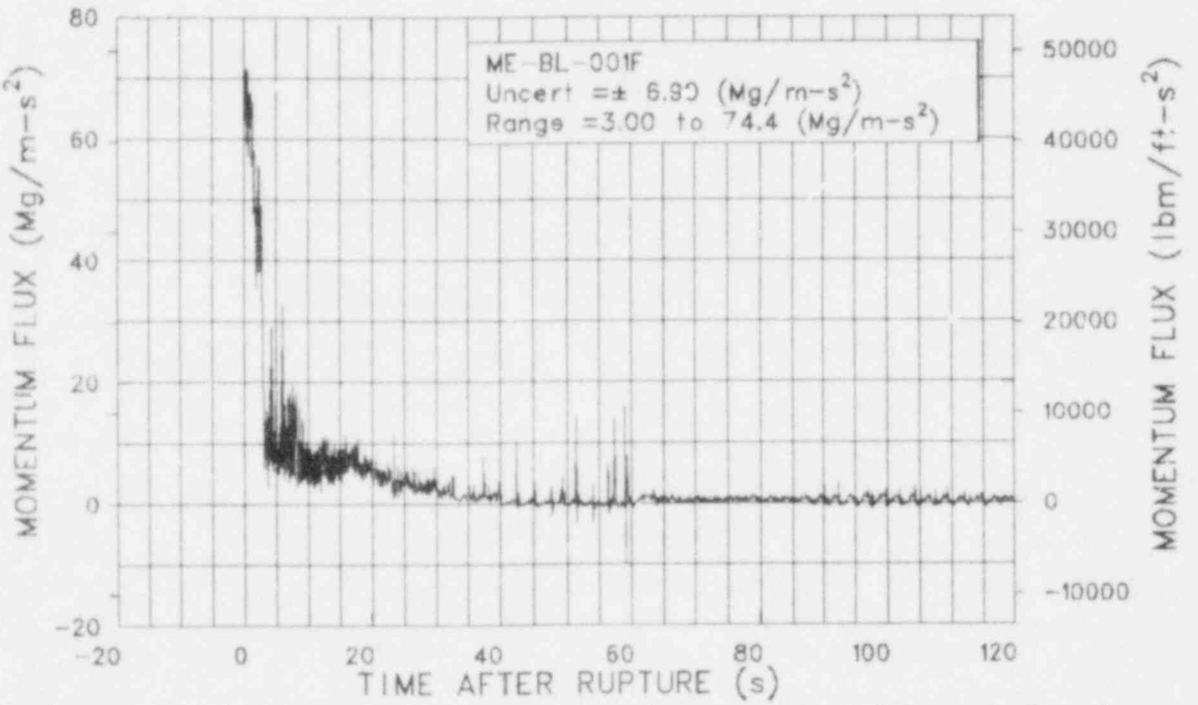

Figure 3L-32. Momentum flux in broken loop cold leg at top of pipe, low range (ME-BL-001F) (qualified, narrow range instrument).

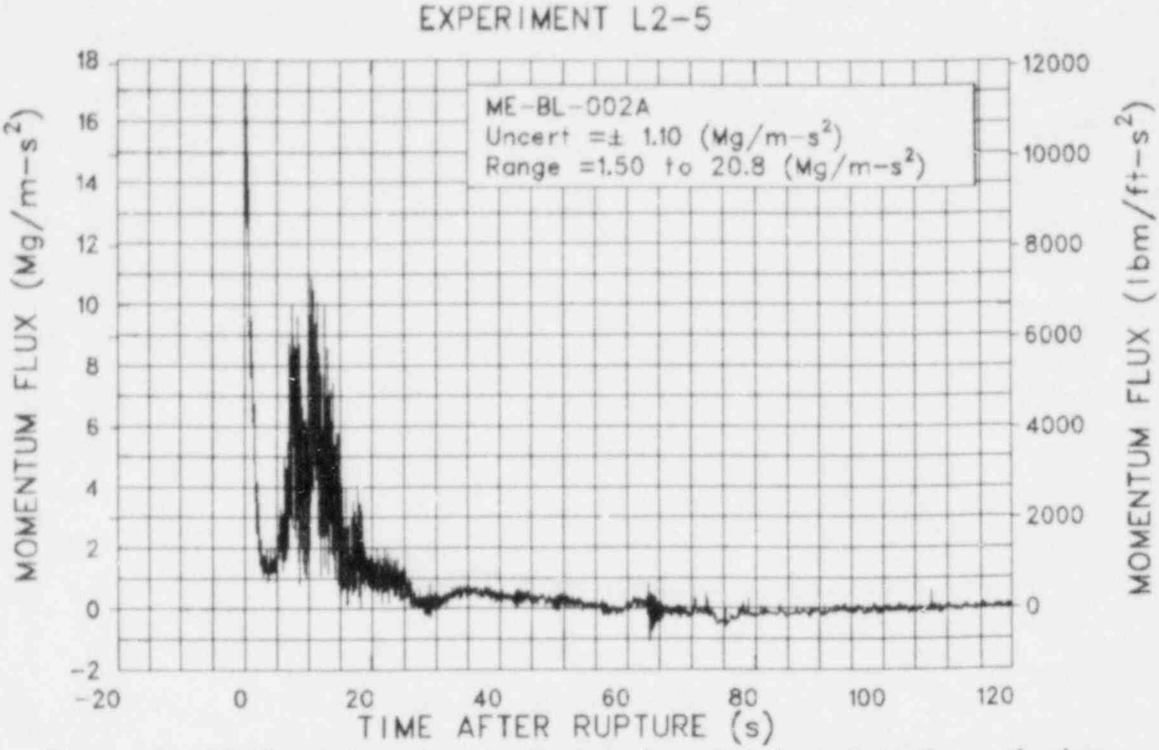

Figure 3L-33. Momentum flux in broken loop hot leg at bottom of pipe, high range (ME-BL-002A).

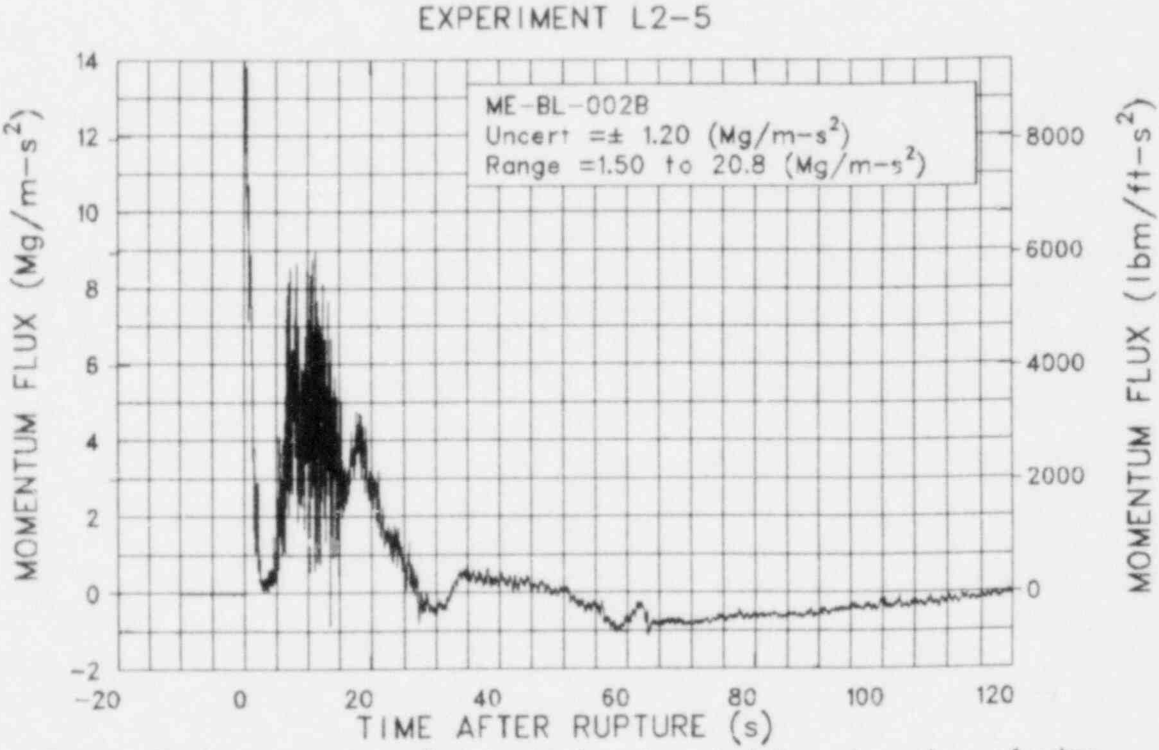

Figure 3L-34. Momentum flux in broken loop hot leg at center of pipe, high range (ME-BL-002B).

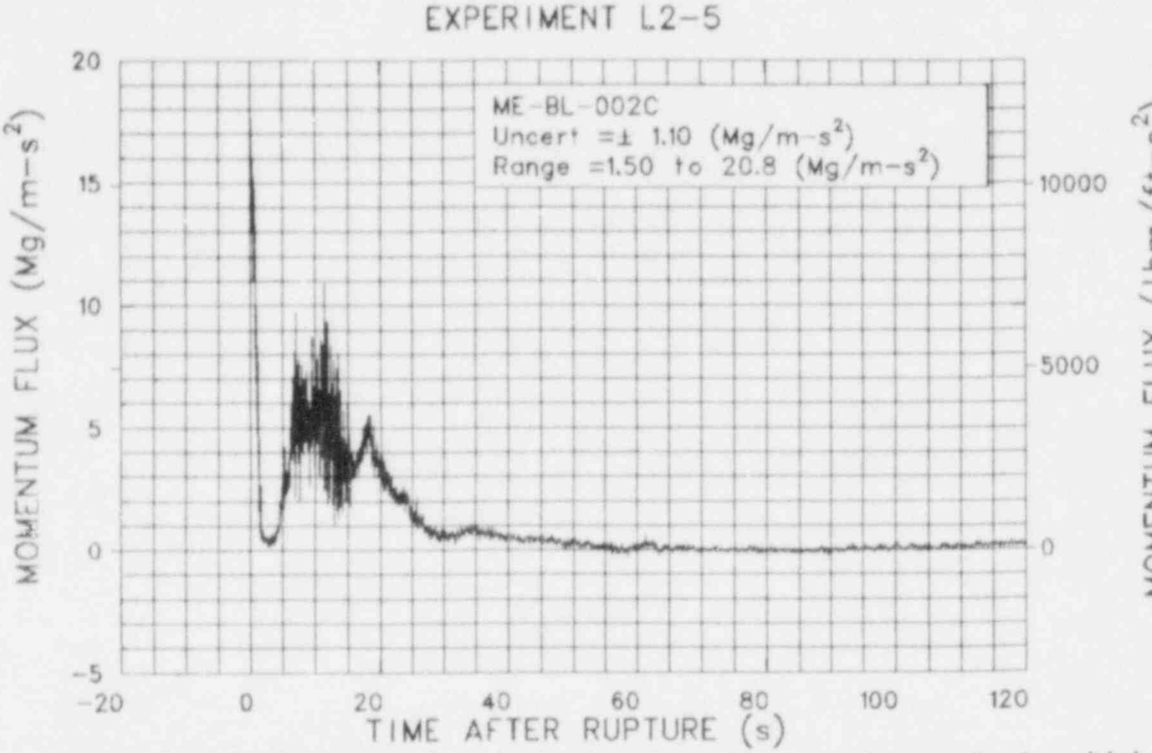

Figure 3L-35. Momentum flux in broken loop hot leg at top of pipe, high range (ME-BL-002C).

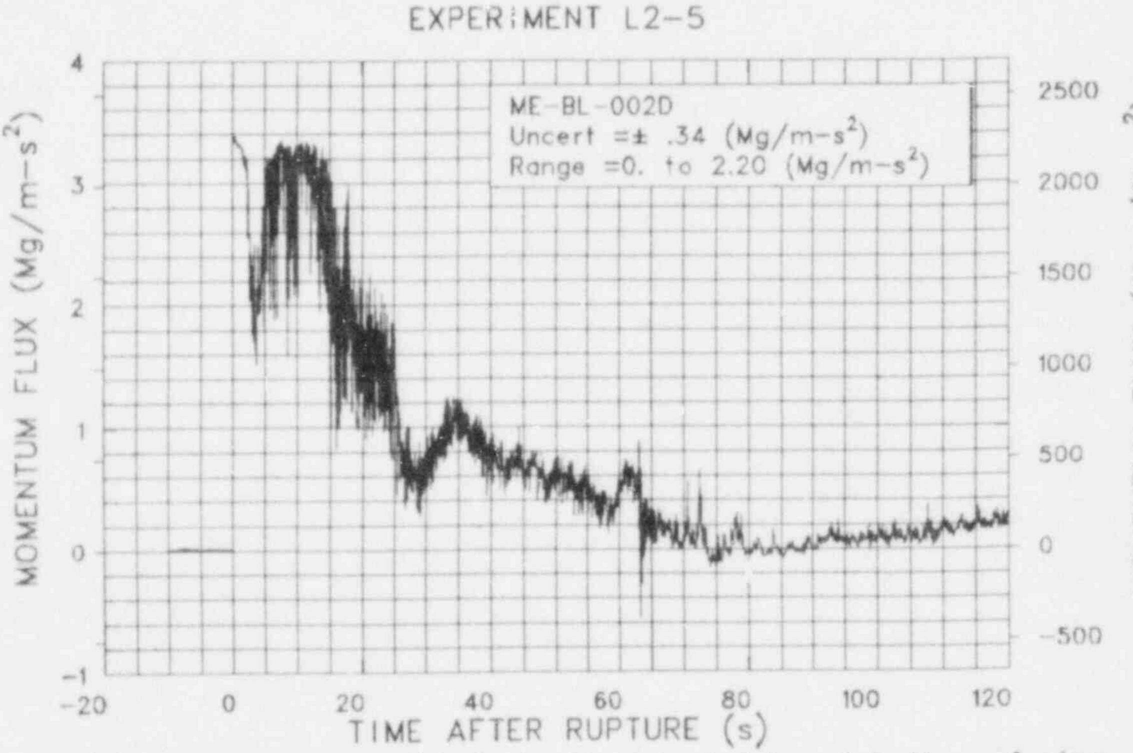

Figure 3L-36. Momentum flux in broken loop hot leg at bottom of pipe, low range (ME-BL-002D) (qualified after 20 s).

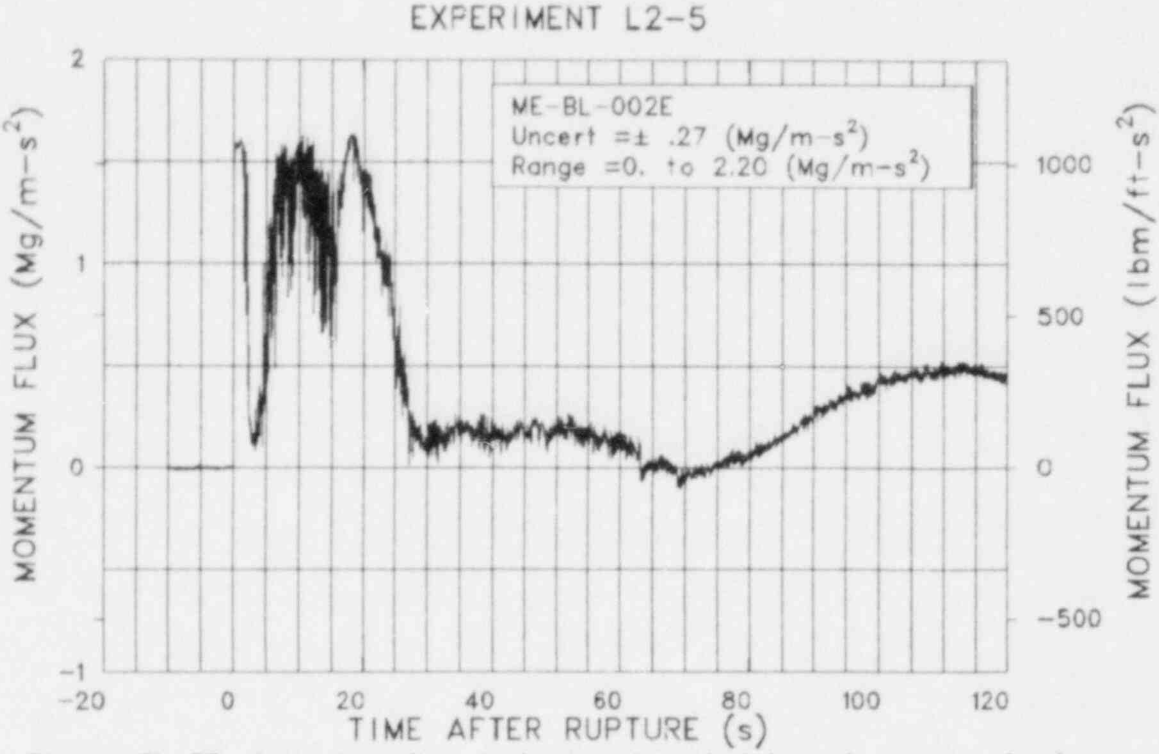

Figure 3L-37. Momentum flux in broken loop hot leg at center of pipe, low range (ME-BL-002E) (qualified after 20 s).

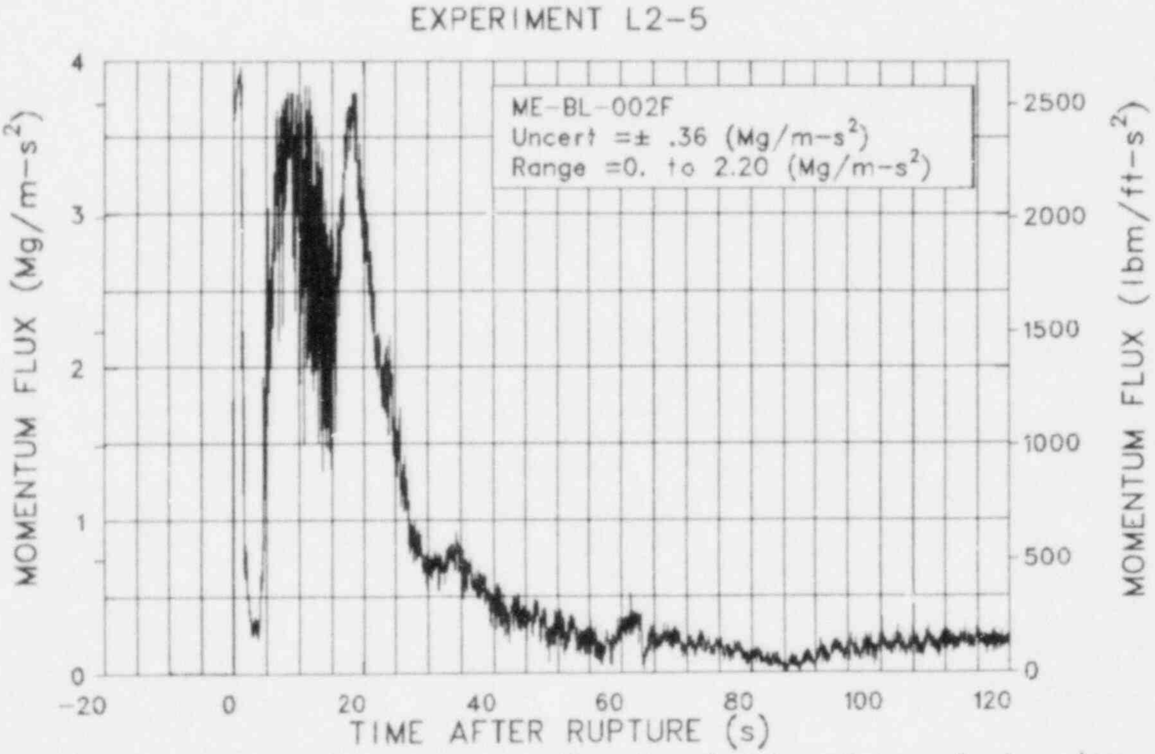

Figure 3L-38. Momentum flux in broken loop hot leg at top of pipe, low range (ME-BL-002F) (qualified after 20 s).

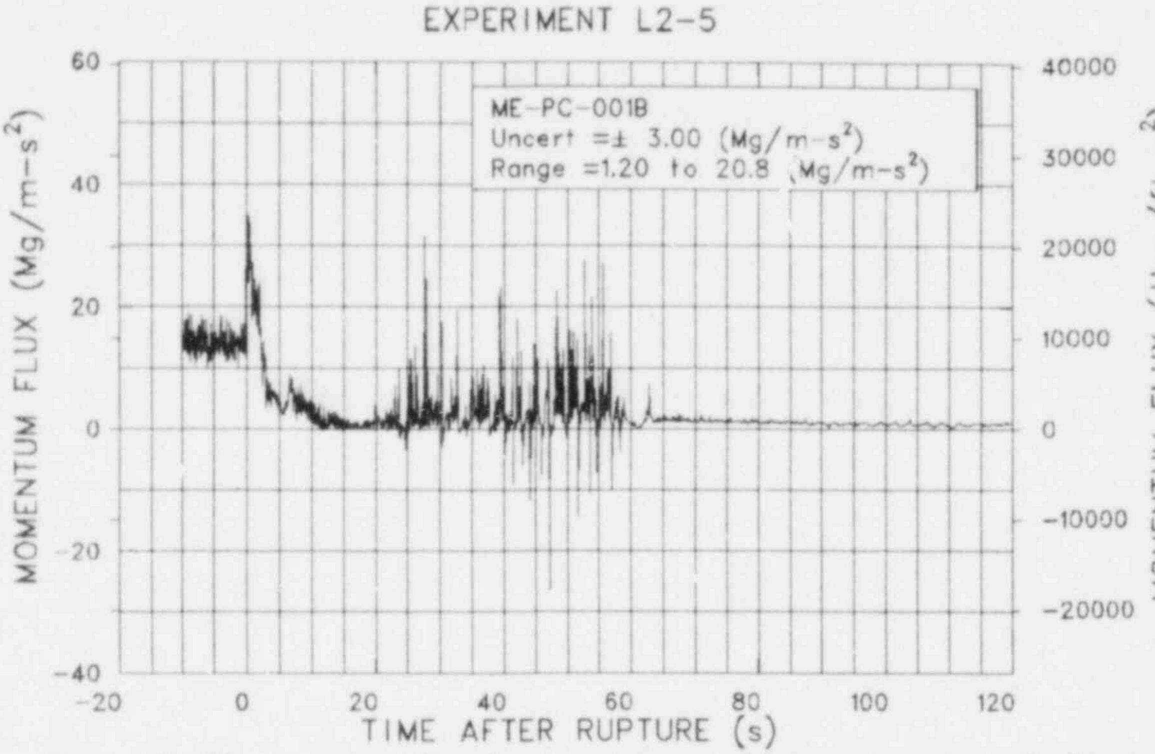

Figure 3L-39. Momentum flux in intact loop cold leg at center of pipe (ME-PC-001B).

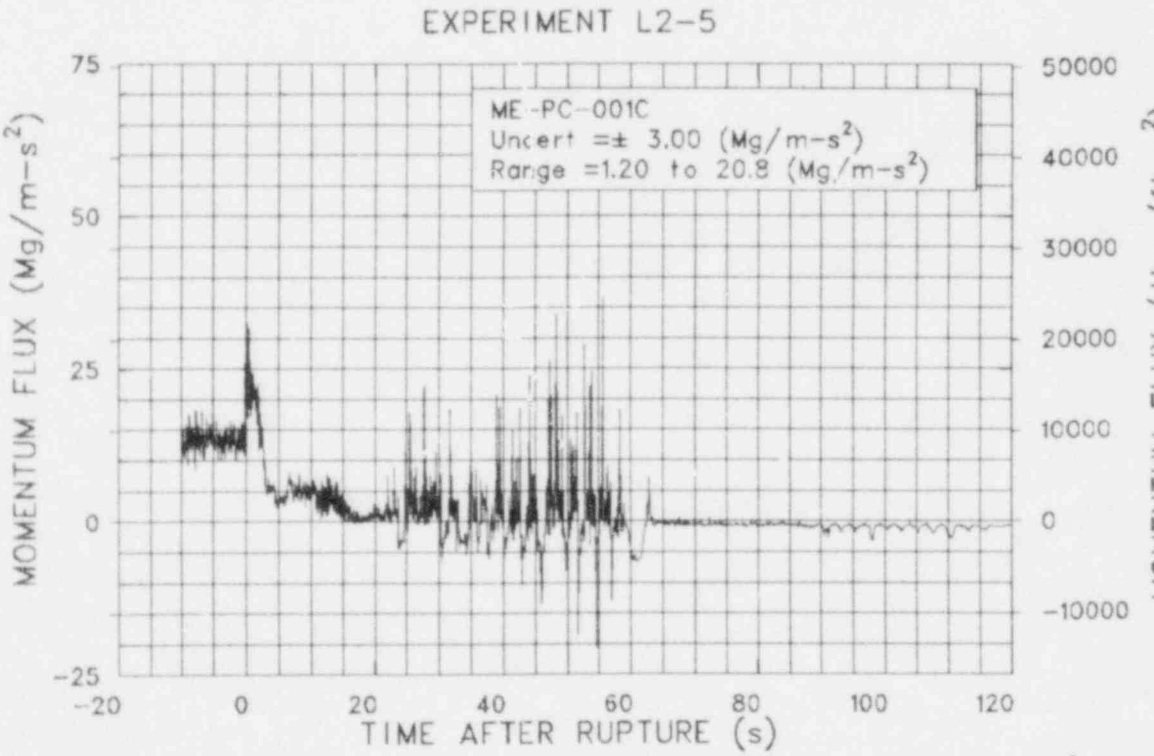

Figure 3L-40. Momentum flux in intact loop cold leg on east side of pipe (ME-PC-001C).

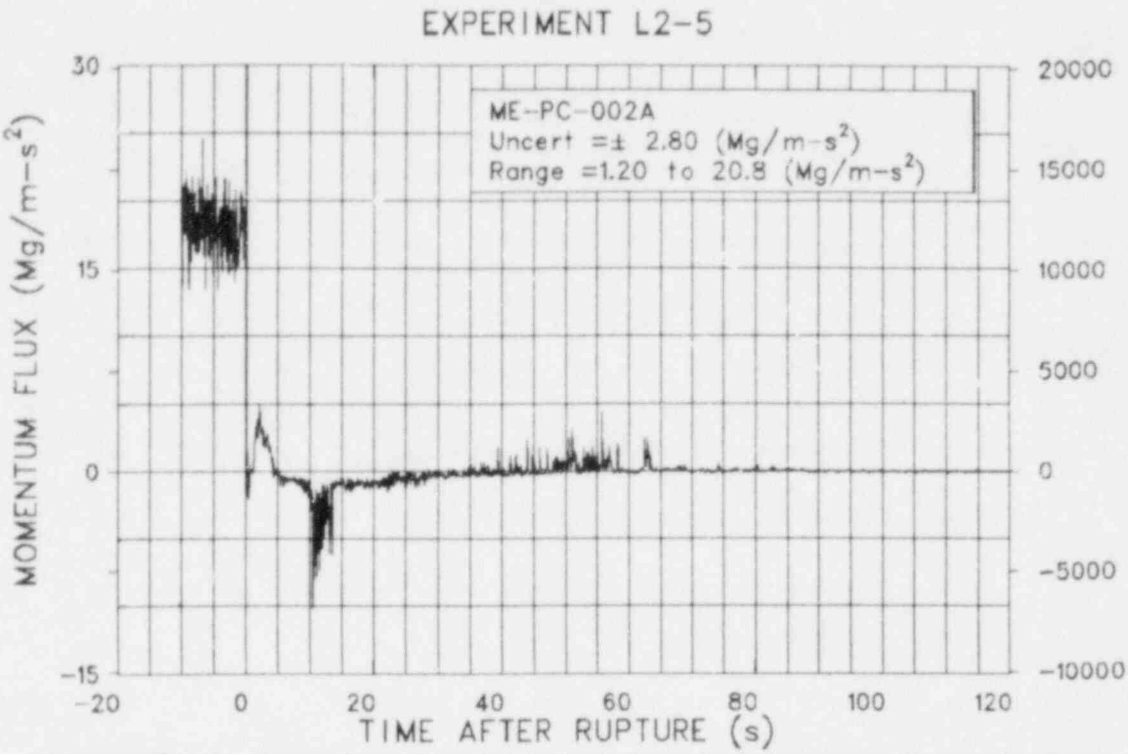

Figure 3L-41. Momentum flux in intact loop hot leg at bottom of pipe (ME-PC-002A).

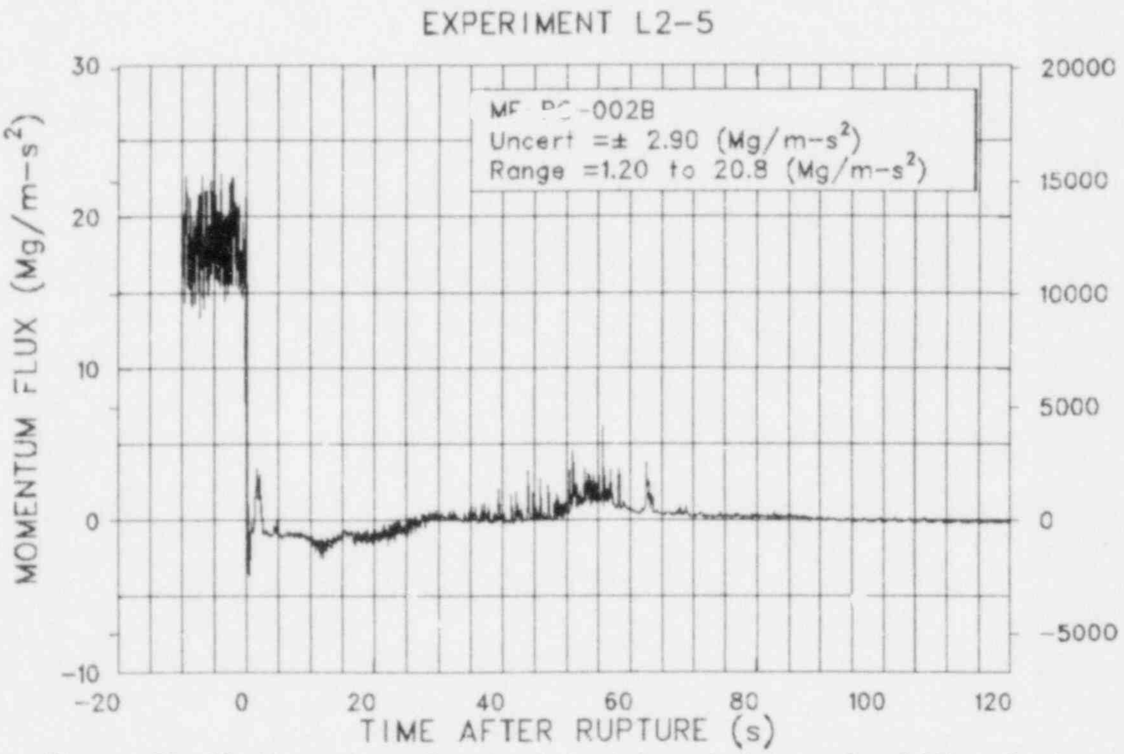

Figure 3L-42. Momentum flux in intact loop hot leg at middle of pipe (ME-PC-002B).

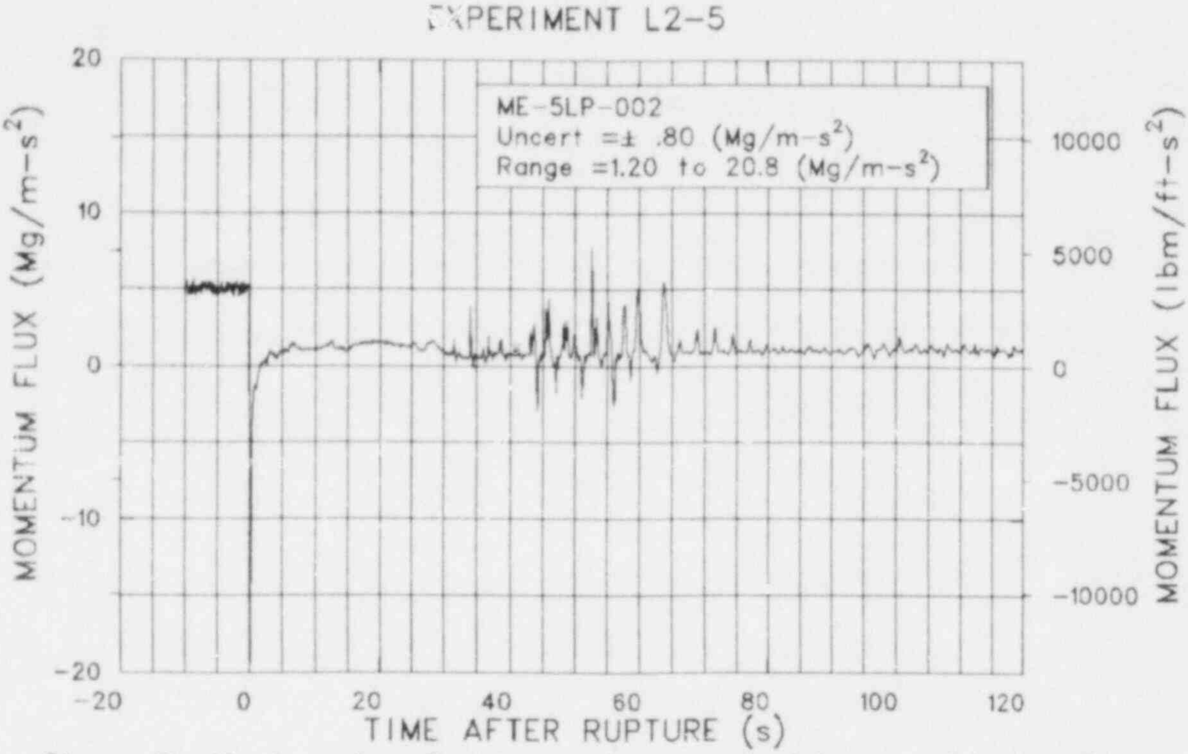

Figure 3L-43. Momentum flux in reactor vessel at lower end box of Fuel Assembly 5 (ME-5LP-002).

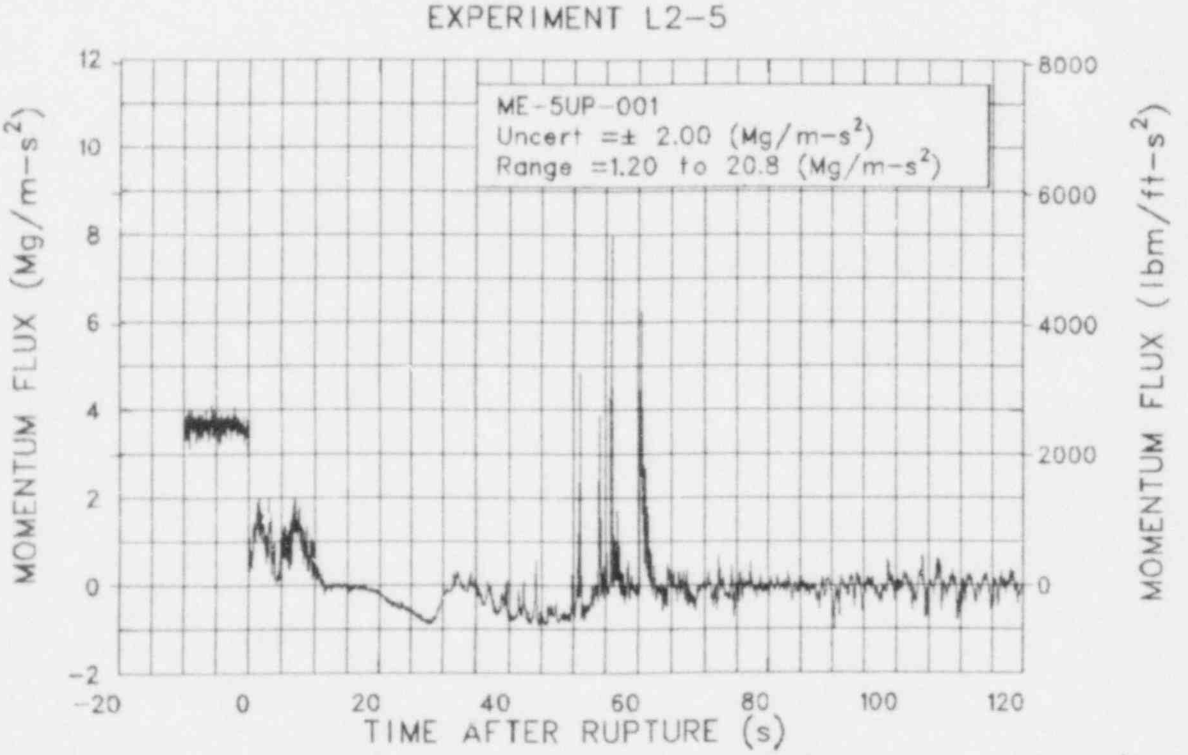

Figure 3L-44. Momentum flux in reactor vessel above upper end box of Fuel Assembly 5 (ME-5UP-001).

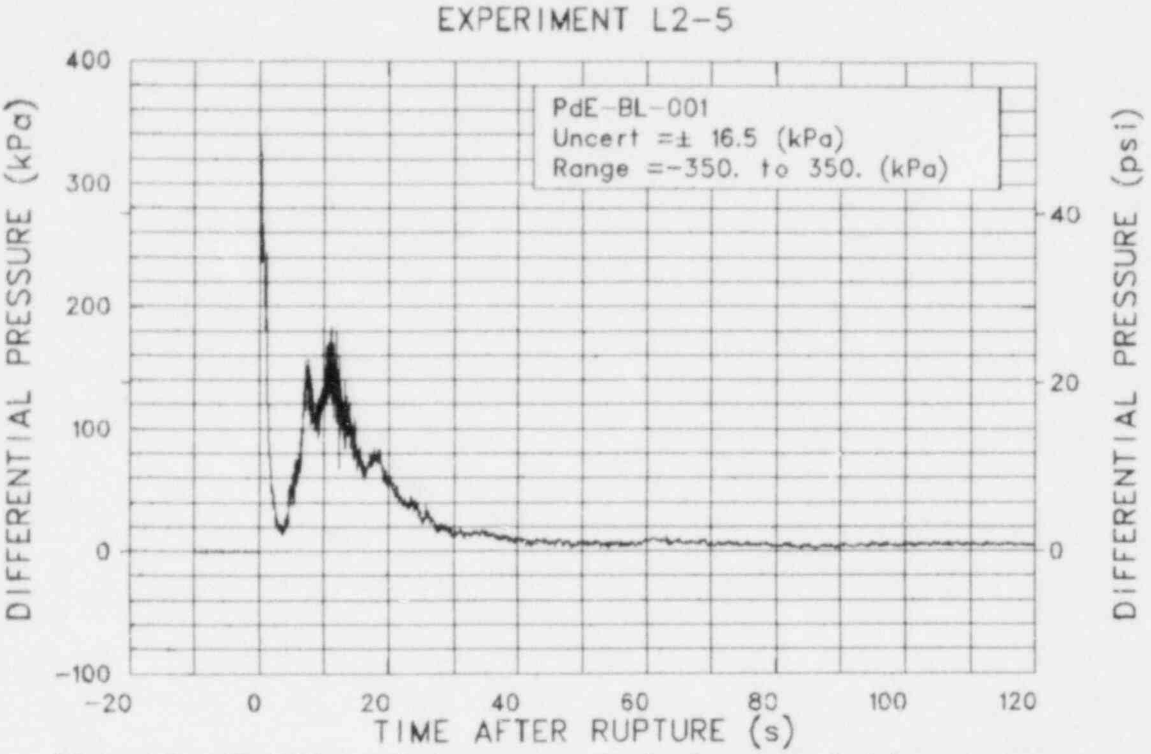

Figure 3L-45. Differential pressure in broken loop hot leg across 14-to-5-in. contraction (PdE-BL-001).

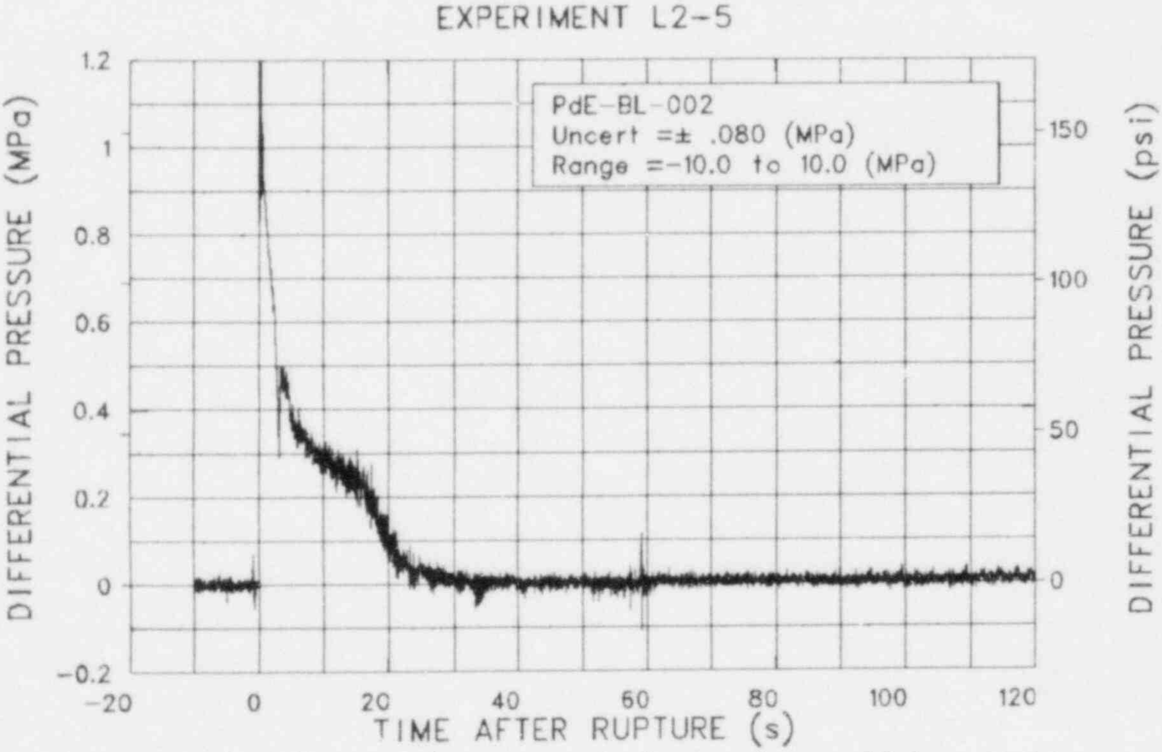

Figure 3L-46. Differential pressure in broken loop cold leg across 14-to-5-in. contraction (PdE-BL-002).

EXPERIMENT L2-5

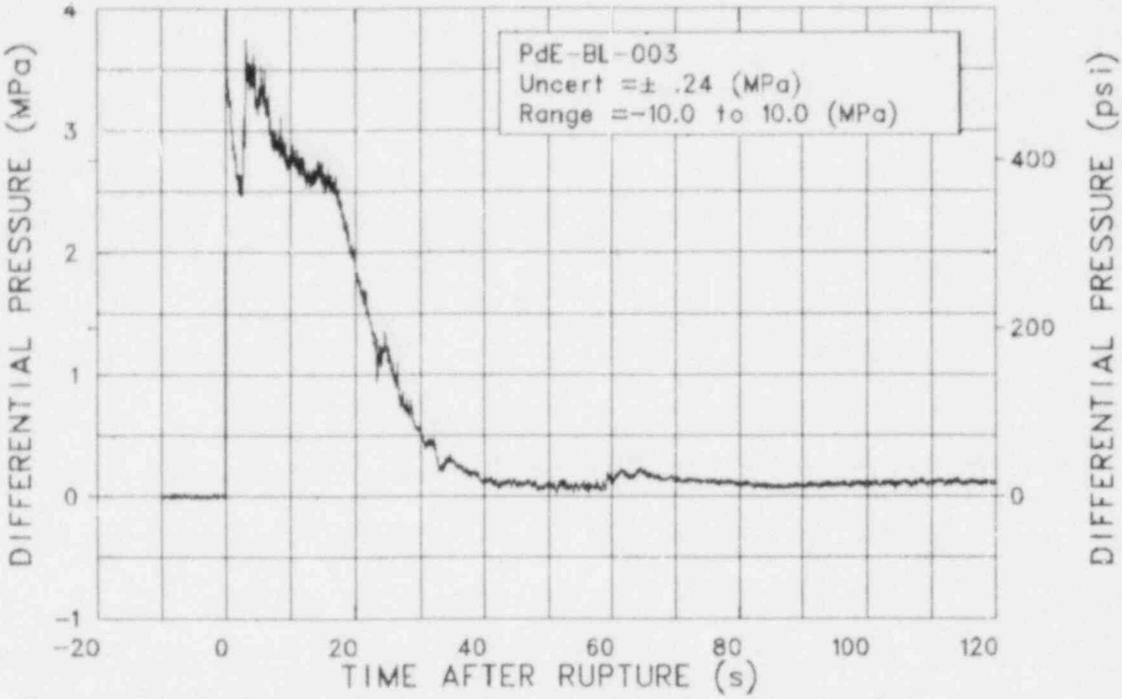

Figure 3L-47. Differential pressure in broken loop cold leg across break plane (PdE-BL-003).

EXPERIMENT L2-5

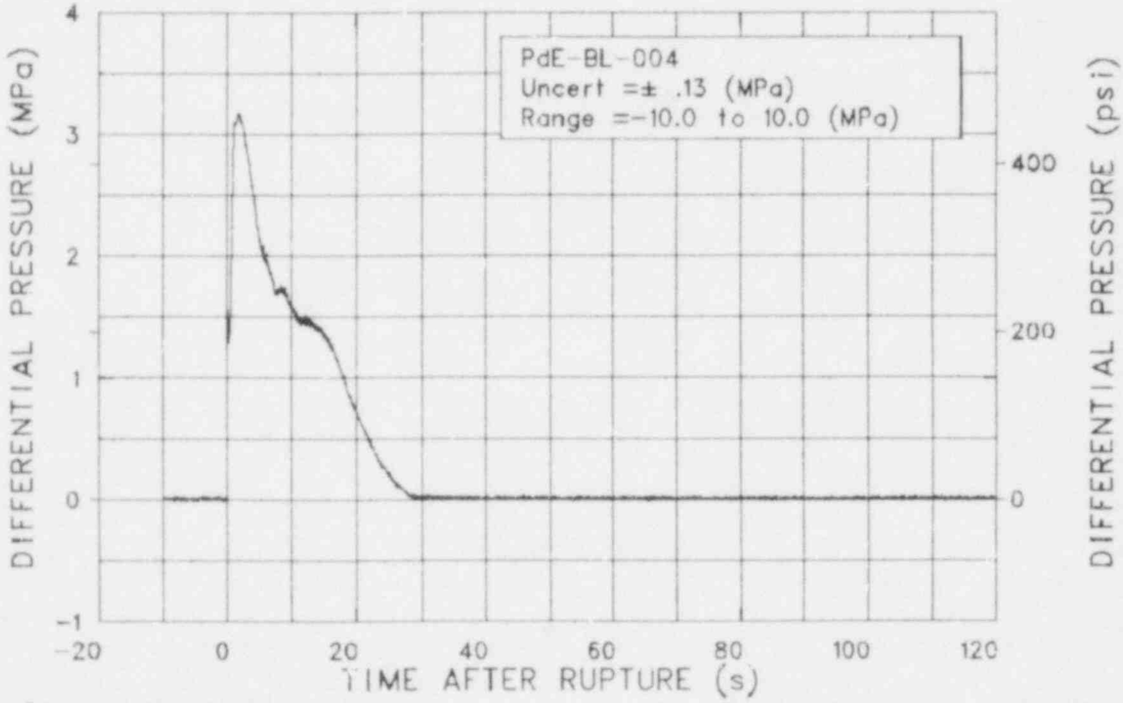

Figure 3L-48. Differential pressure in broken loop hot leg across break plane (PdE-BL-004) (qualified, no other measurement for direct comparison).

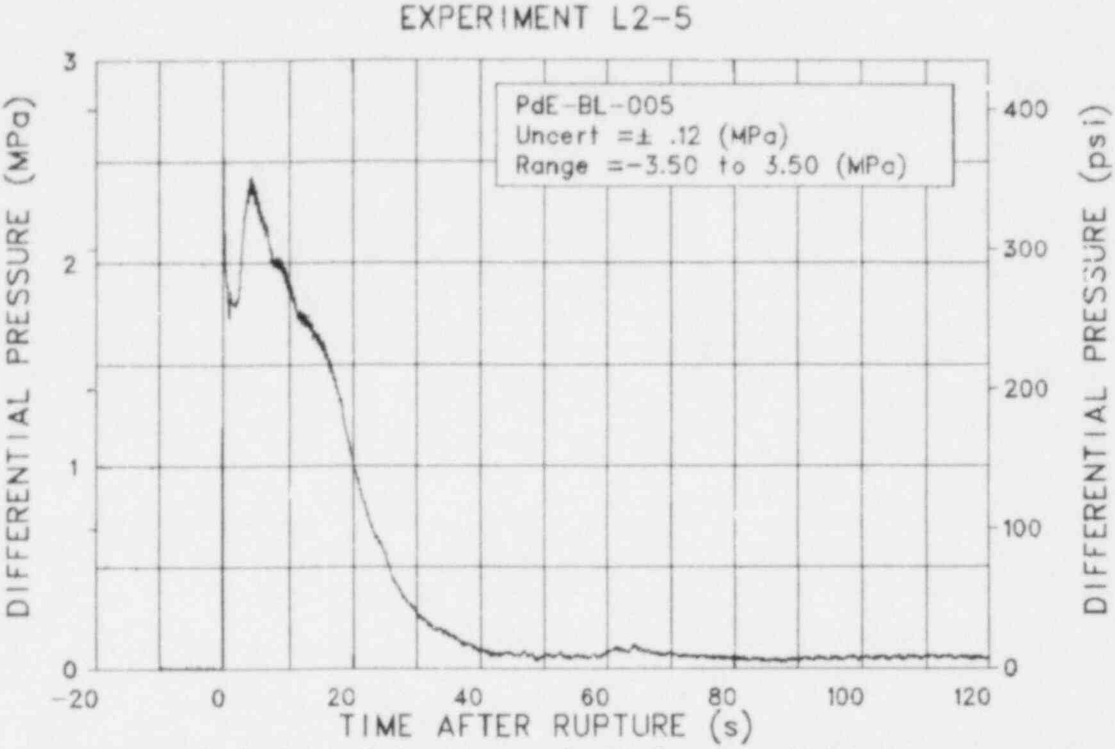

Figure 3L-49. Differential pressure in broken loop hot leg across pump simulator (PdE-BL-005).

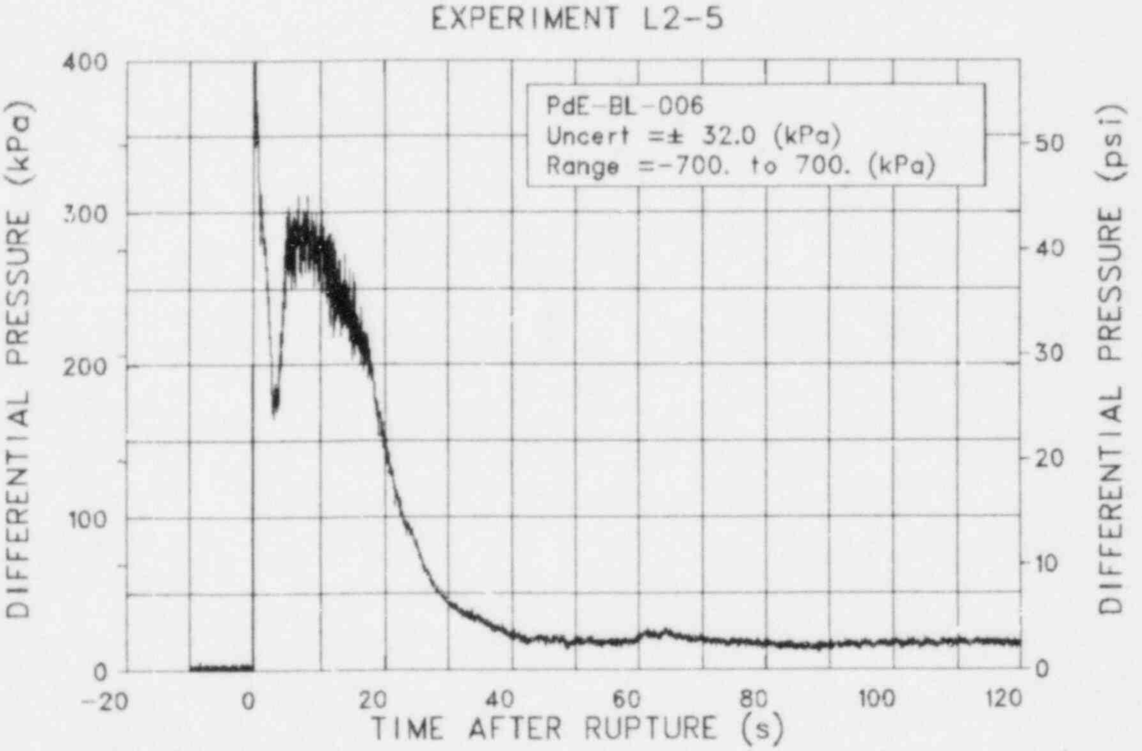

Figure 3L-50. Differential pressure in broken loop hot leg across steam generator outlet flange (PdE-BL-006).

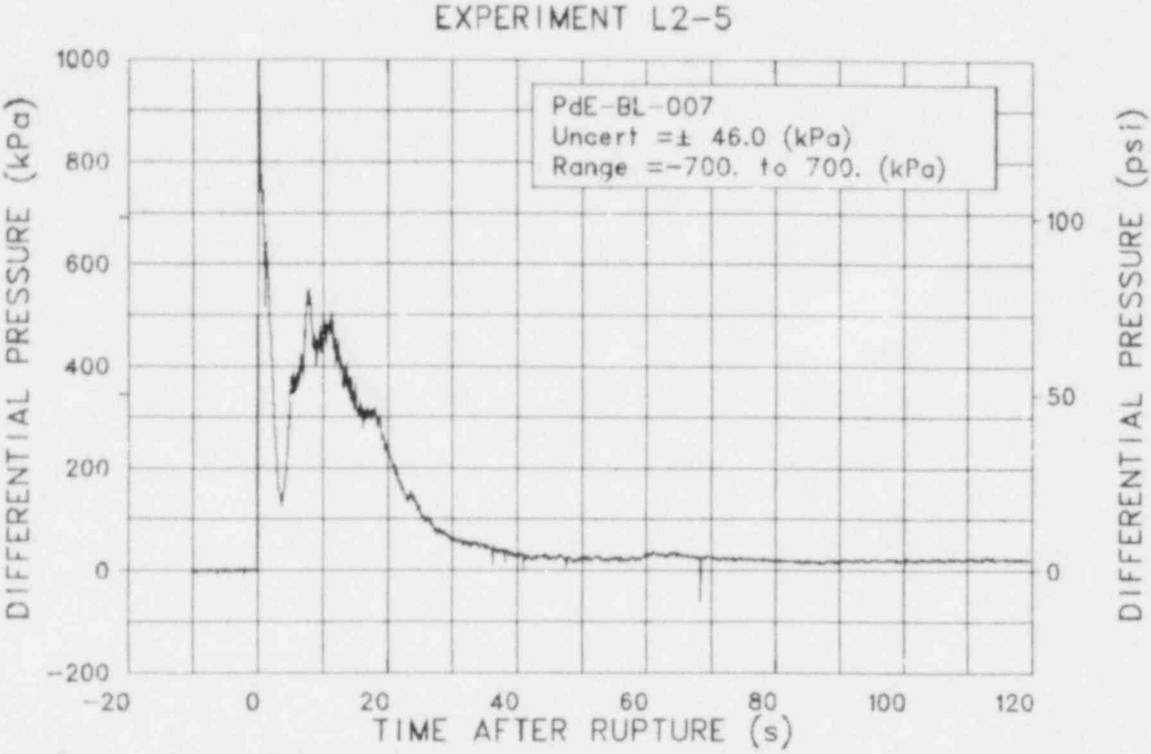

Figure 3L-51. Differential pressure across steam generator simulator (PdE-BL-007) (qualified, except for spurious spikes).

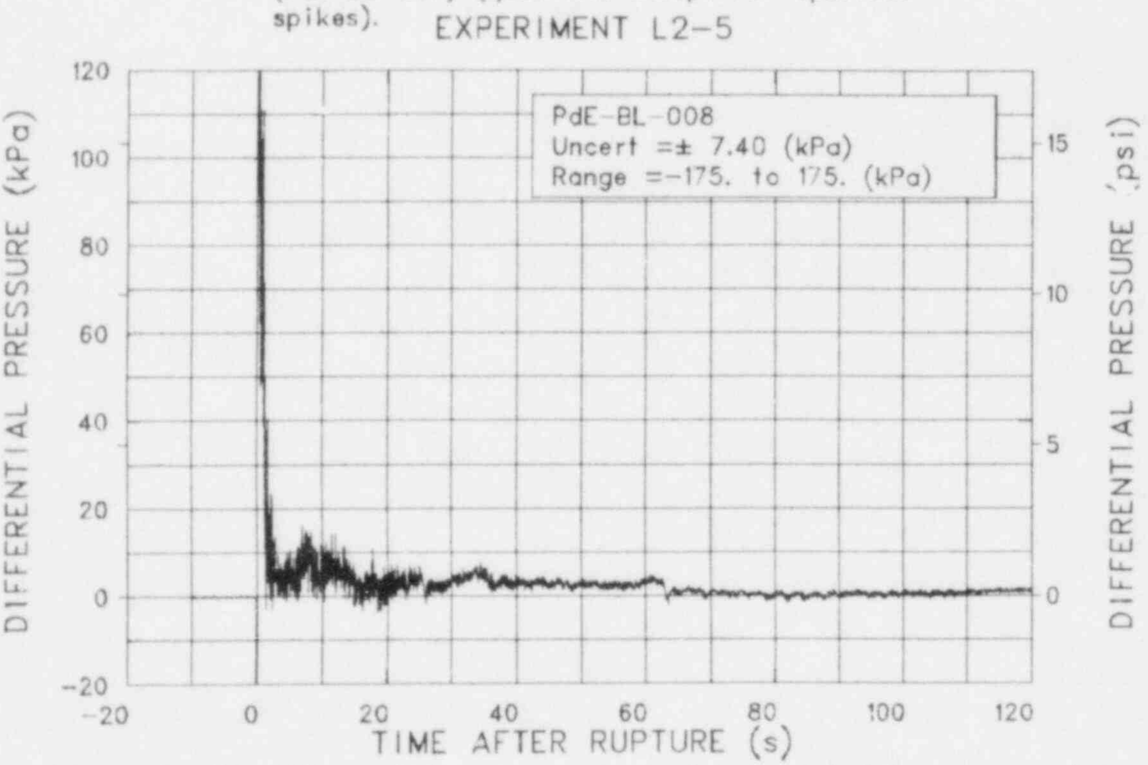

Figure 3L-52. Differential pressure in broken loop hot leg across steam generator simulator inlet flange (PdE-BL-008).

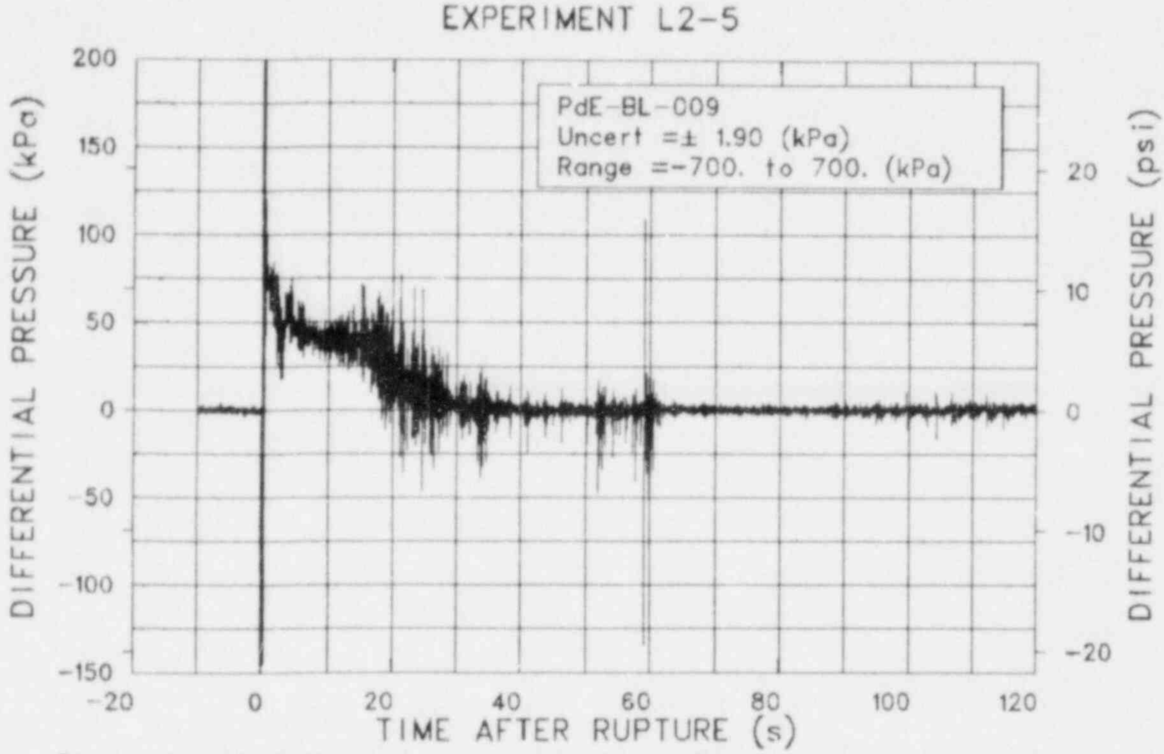

Figure 3L-53. Differential pressure in broken loop from entrance to middle of 5-in. pipe (PdE-BL-009).

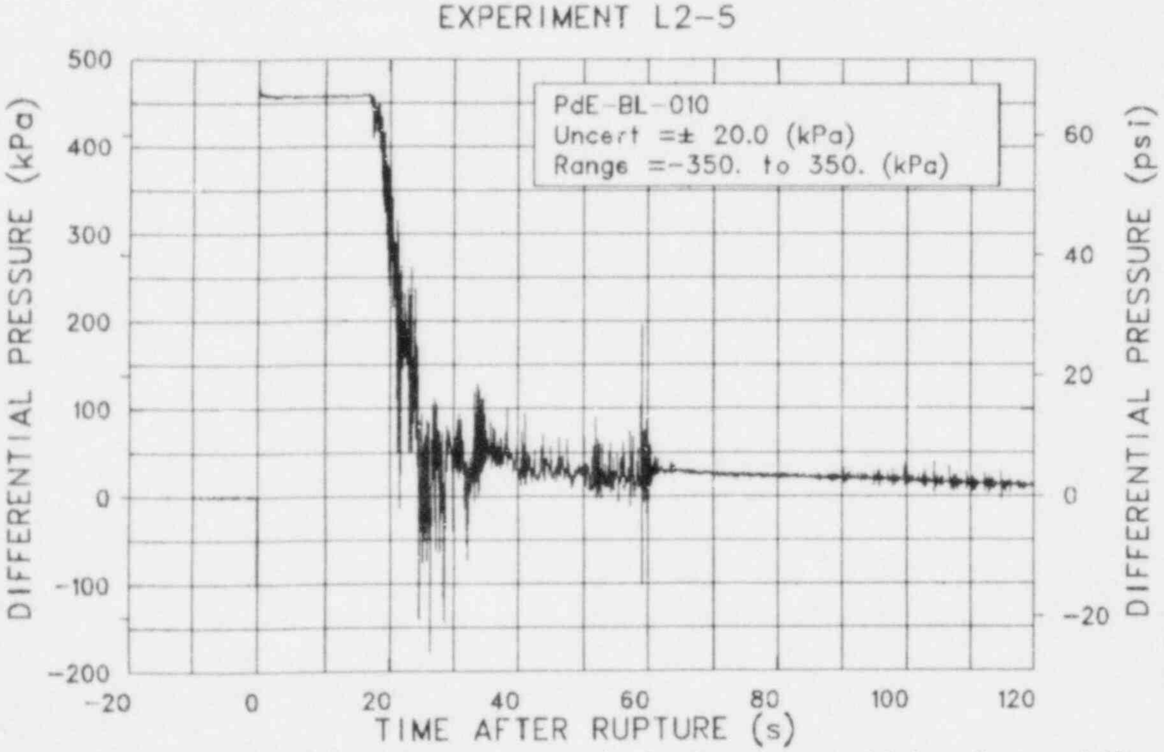

Figure 3L-54. Differential pressure in broken loop cold leg from middle to end of 5-in. pipe (PdE-BL-010) (qualified, narrow range instrument, good after 20 s).

EXPERIMENT L2-5

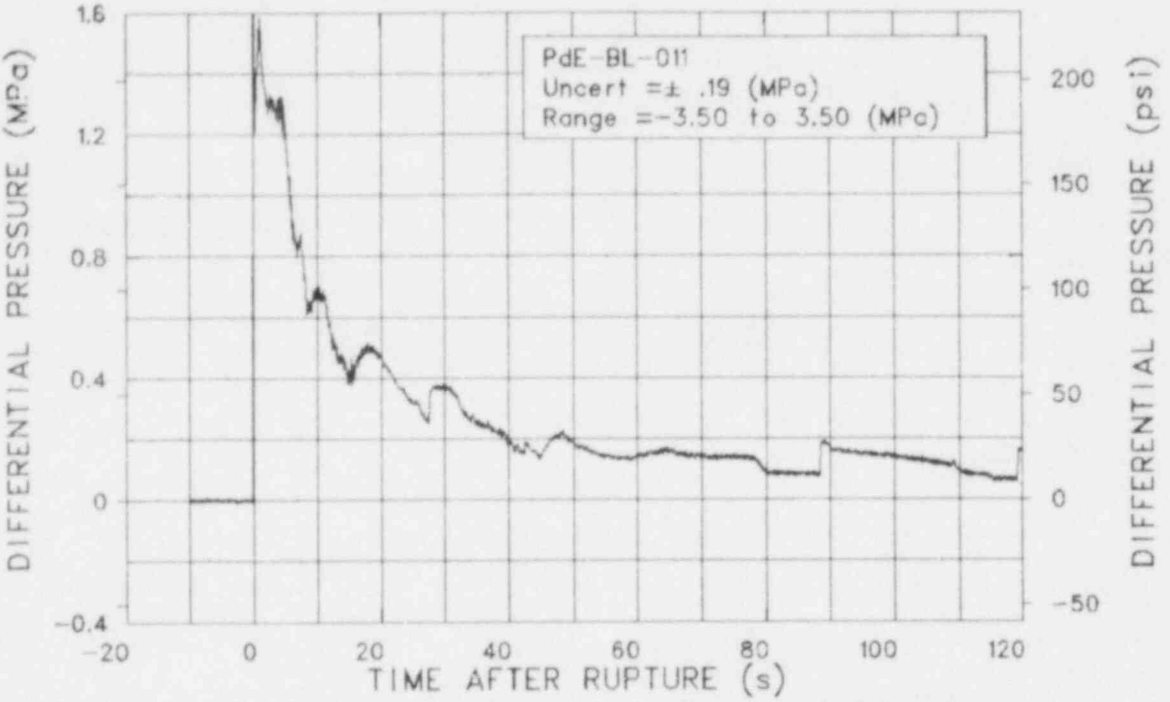

Figure 3L-55. Differential pressure in broken loop hot leg from pump simulator outlet to PE-BL-003 (PdE-BL-011) (qualified, shares tap with PdE-BL-012, may have common line problems).

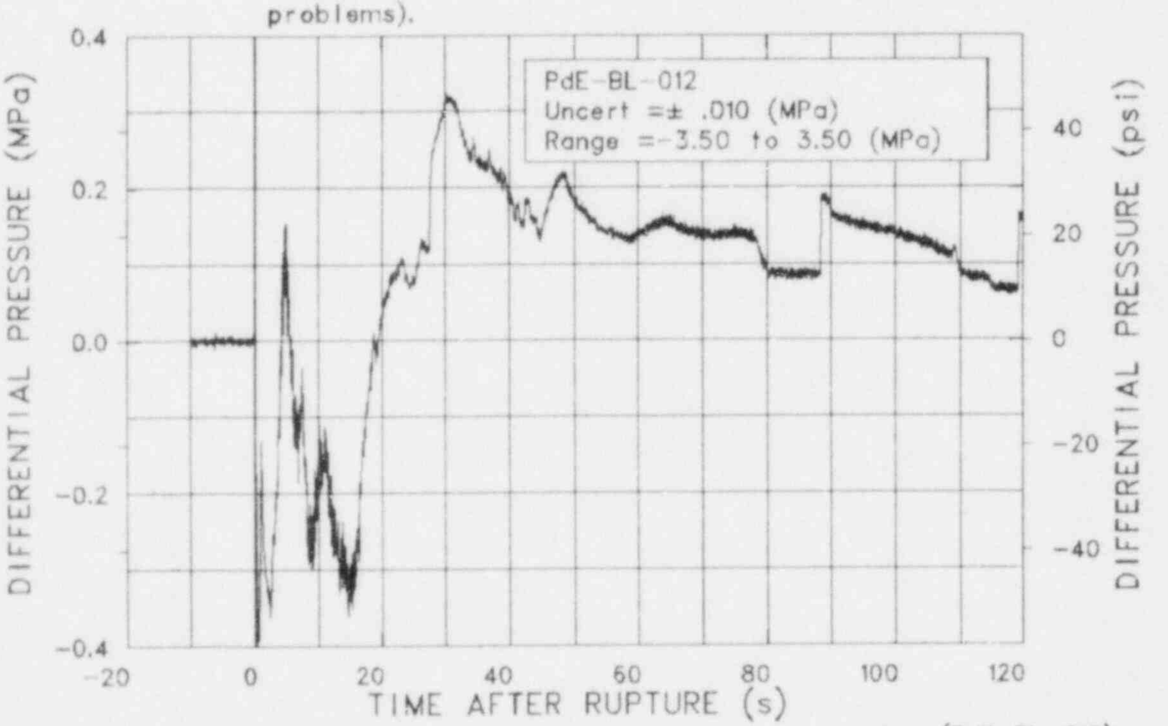

Figure 3L-56. Differential pressure in broken loop hot leg (PdE-BL-012) (qualified, shares tap with PdE-BL-011, may have common line problems).

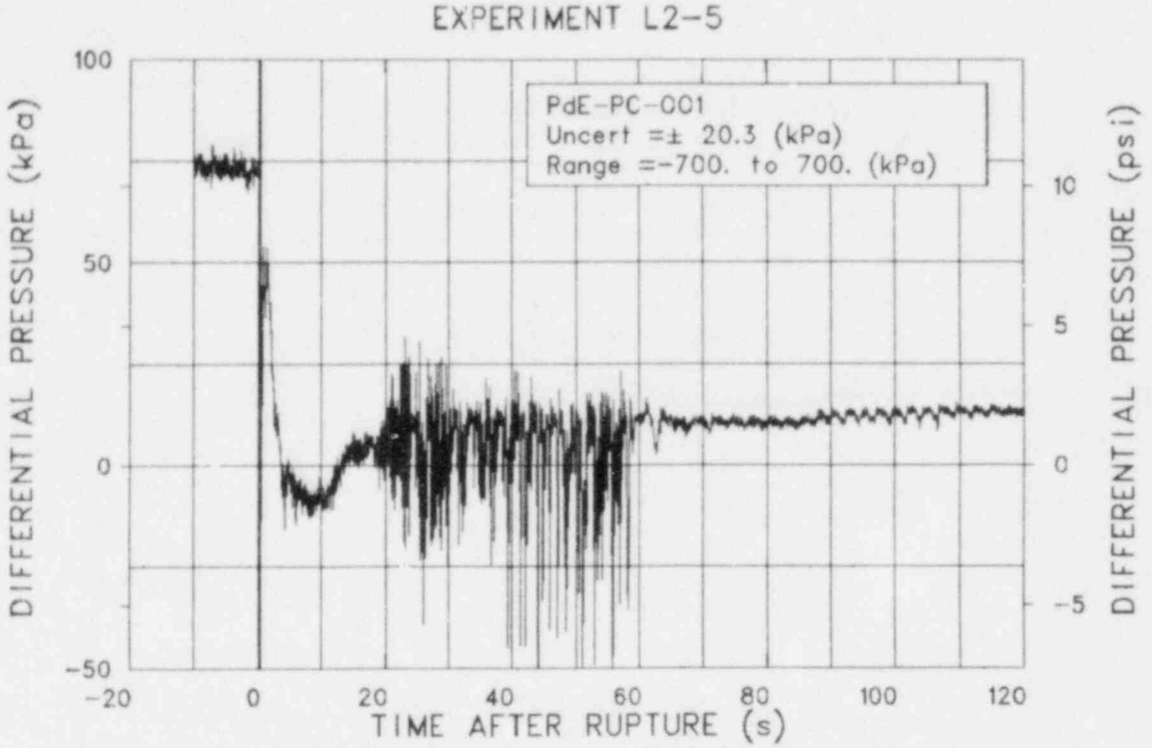

Figure 3L-57. Differential pressure in intact loop across primary coolant Pumps 1 and 2 (PdE-PC-001).

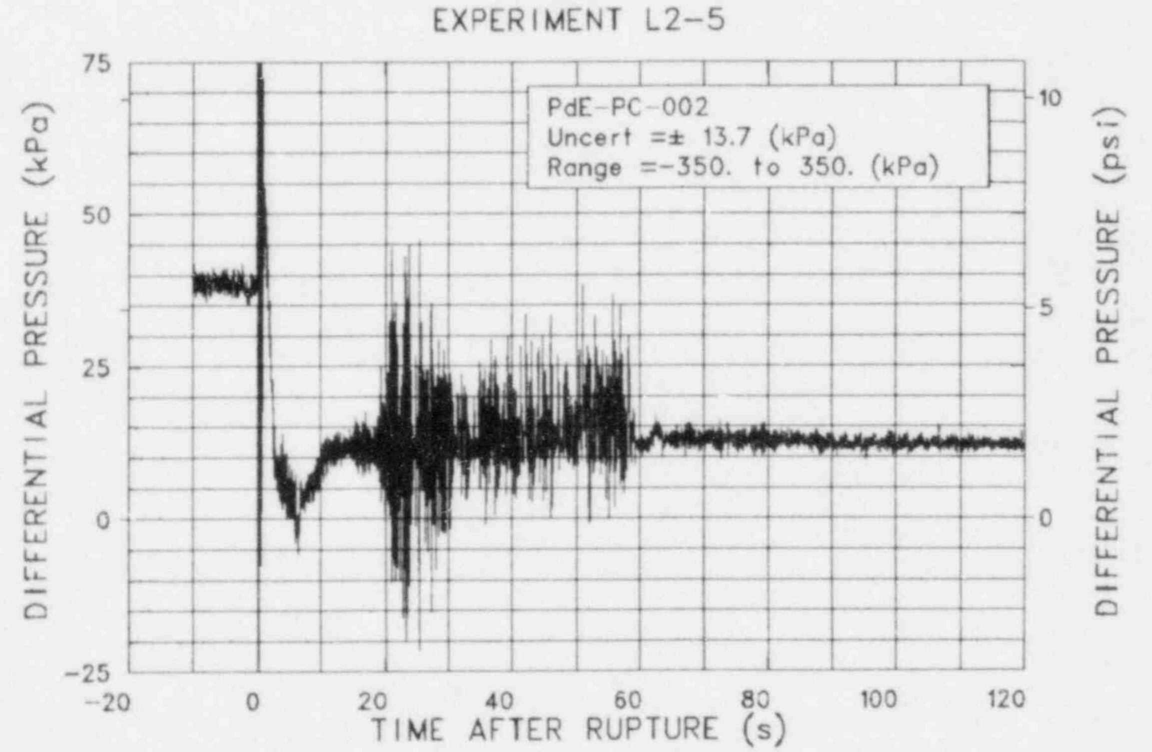

Figure 3L-58. Differential pressure in intact loop across steam generator (PdE-PC-002).

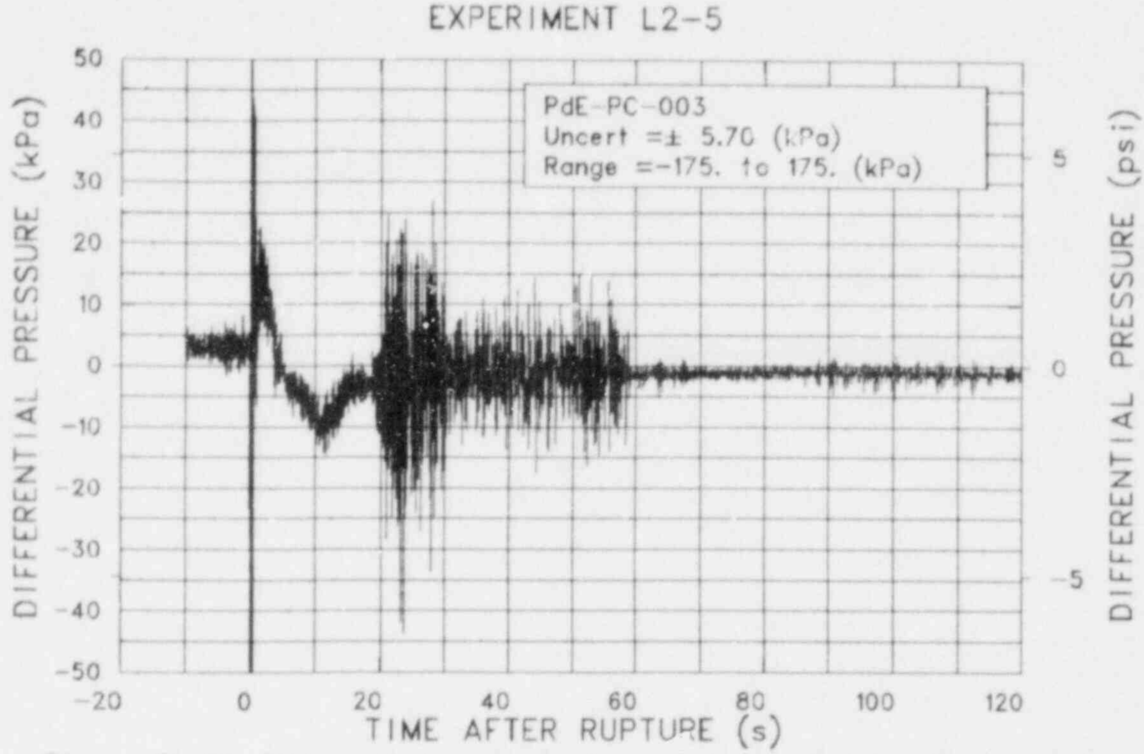

Figure 3L-59. Differential pressure in intact loop hot leg from reactor vessel outlet to steam generator inlet (PdE-PC-003).

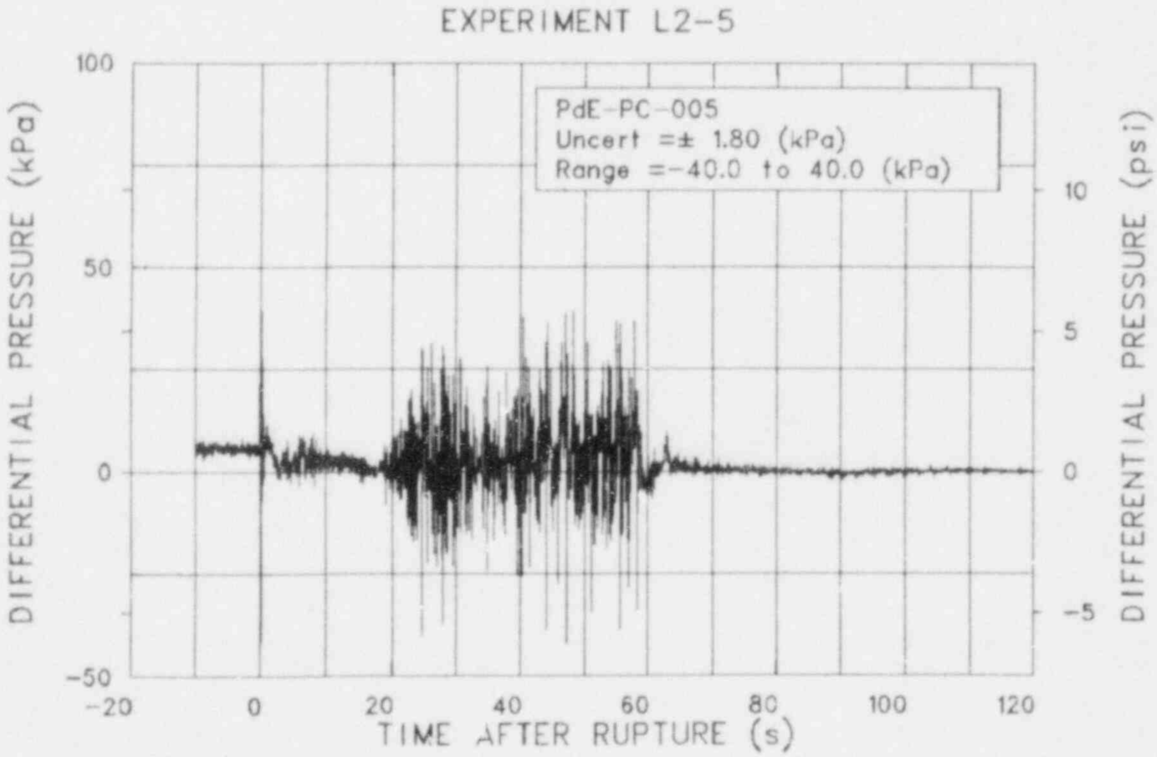

Figure 3L-60. Differential pressure in intact loop cold leg from primary coolant pump discharge to reactor vessel inlet (PdE-PC-005).

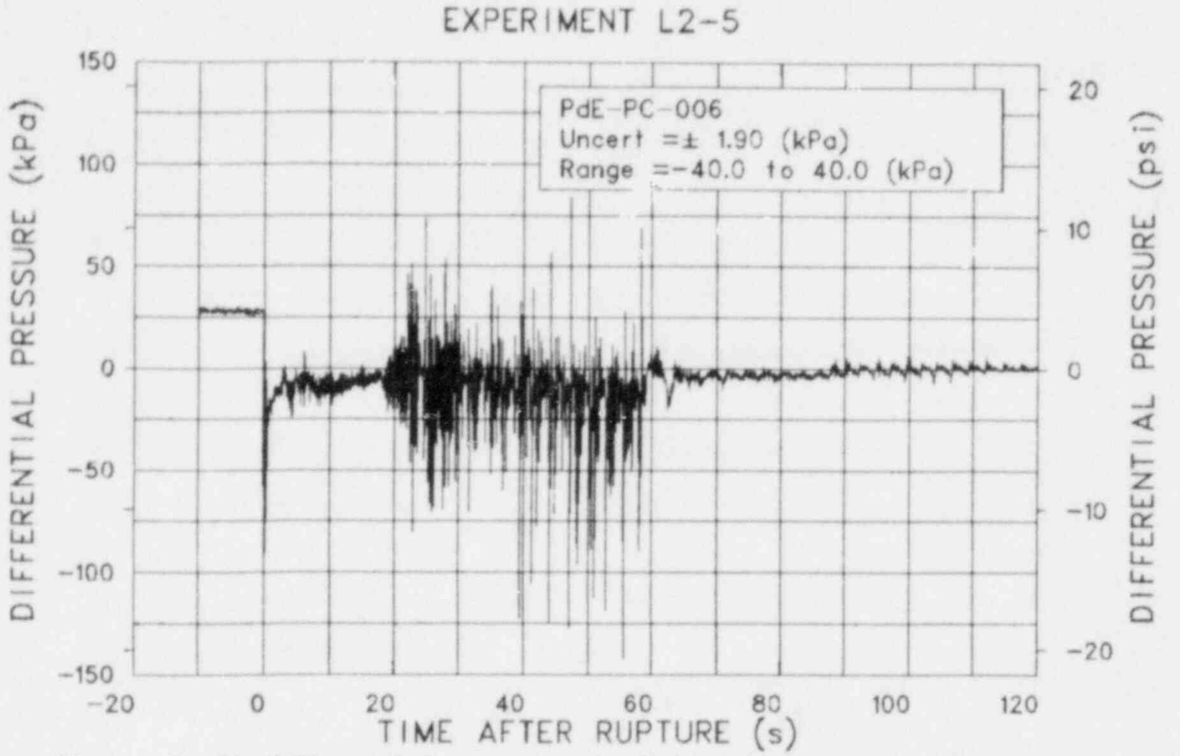

Figure 3L-61. Differential pressure in intact loop across reactor vessel (PdE-PC-006).

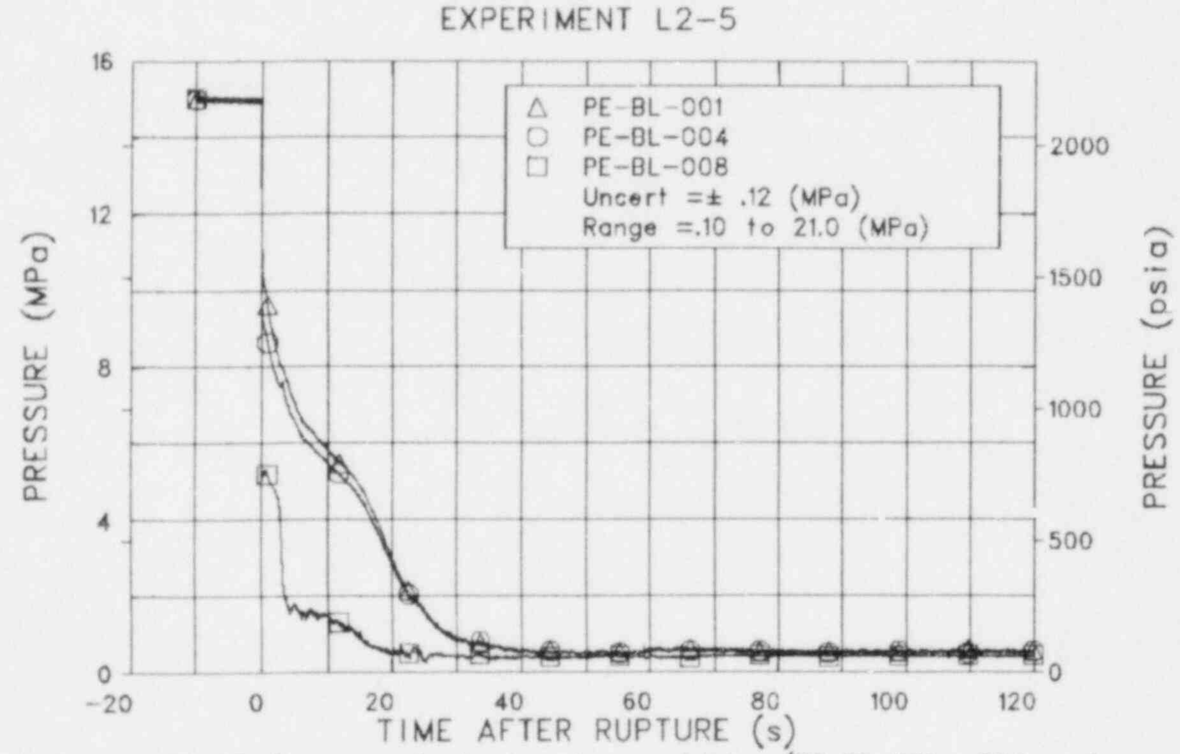

Figure 3L-62. Pressure in broken loop cold leg (PE-BL-001, -004, and -008).

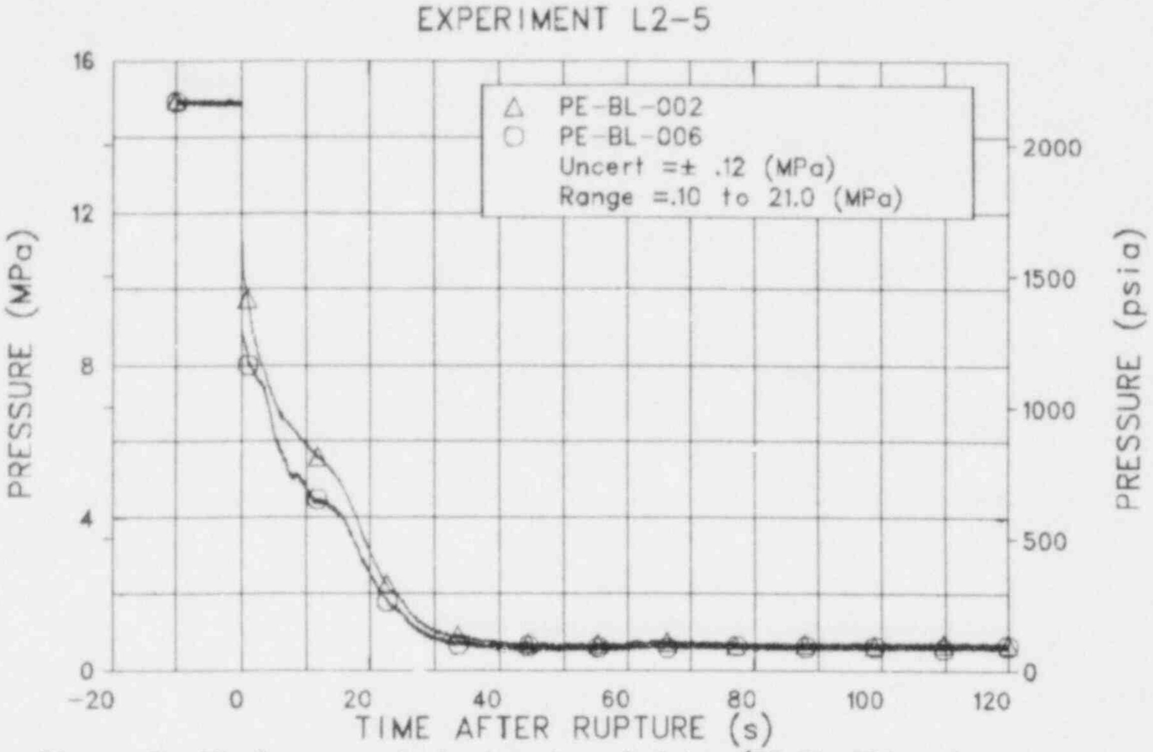

Figure 3L-63. Pressure in broken loop hot leg (PE-BL-002 and -006).

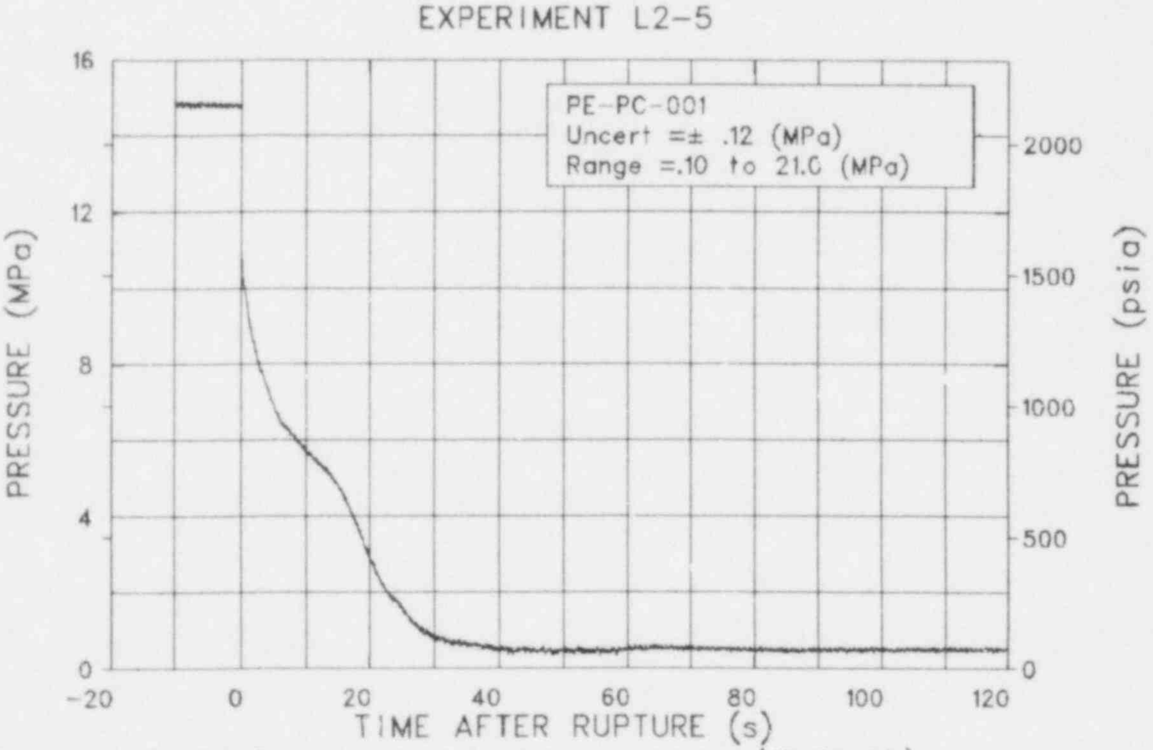

Figure 3L-64. Pressure in intact loop cold leg (PE-PC-001).

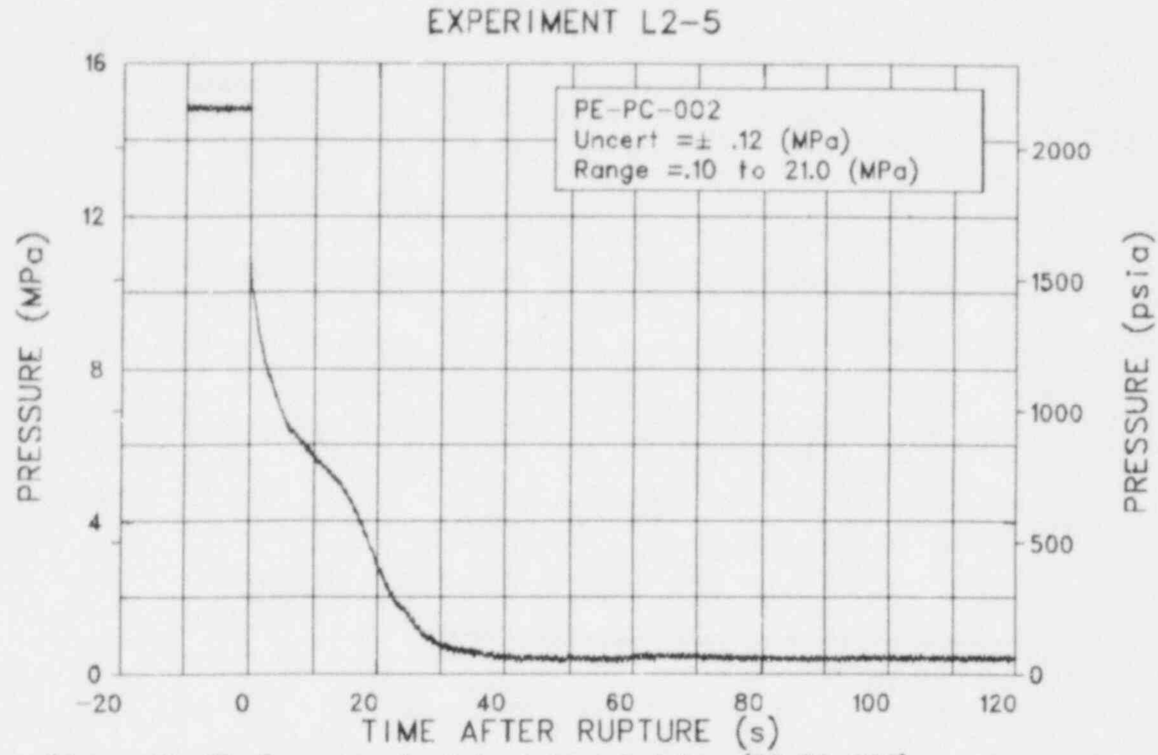

Figure 3L-65. Pressure in intact loop hot leg (PE-PC-002).

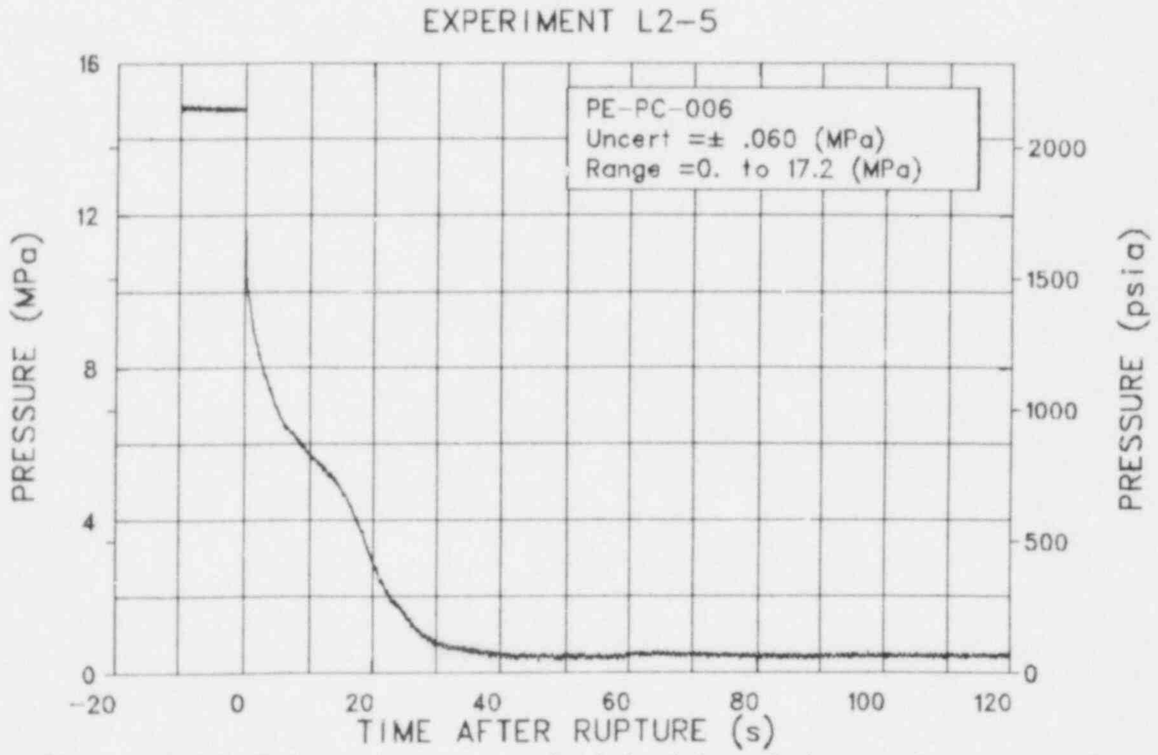

Figure 3L-66. Reference pressure in intact loop between steam generator outlet and primary coolant pump inlet (PE-PC-006).

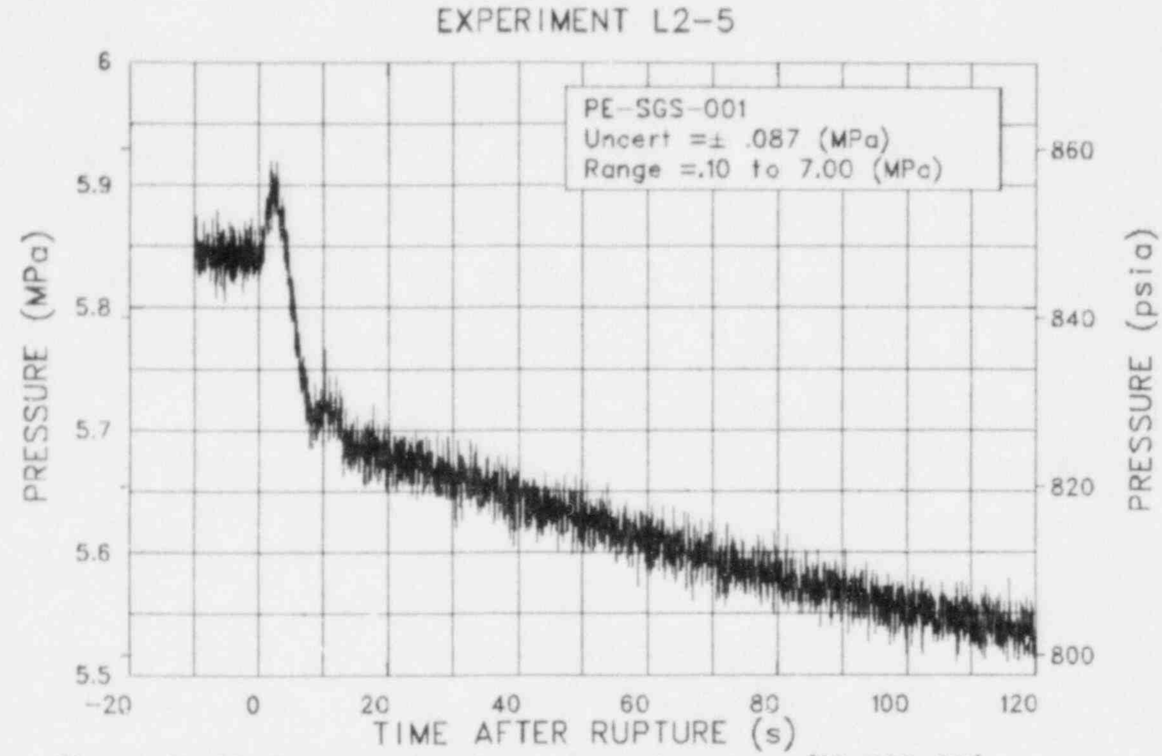

Figure 3L-67. Pressure in steam generator dome (PE-SGS-001).

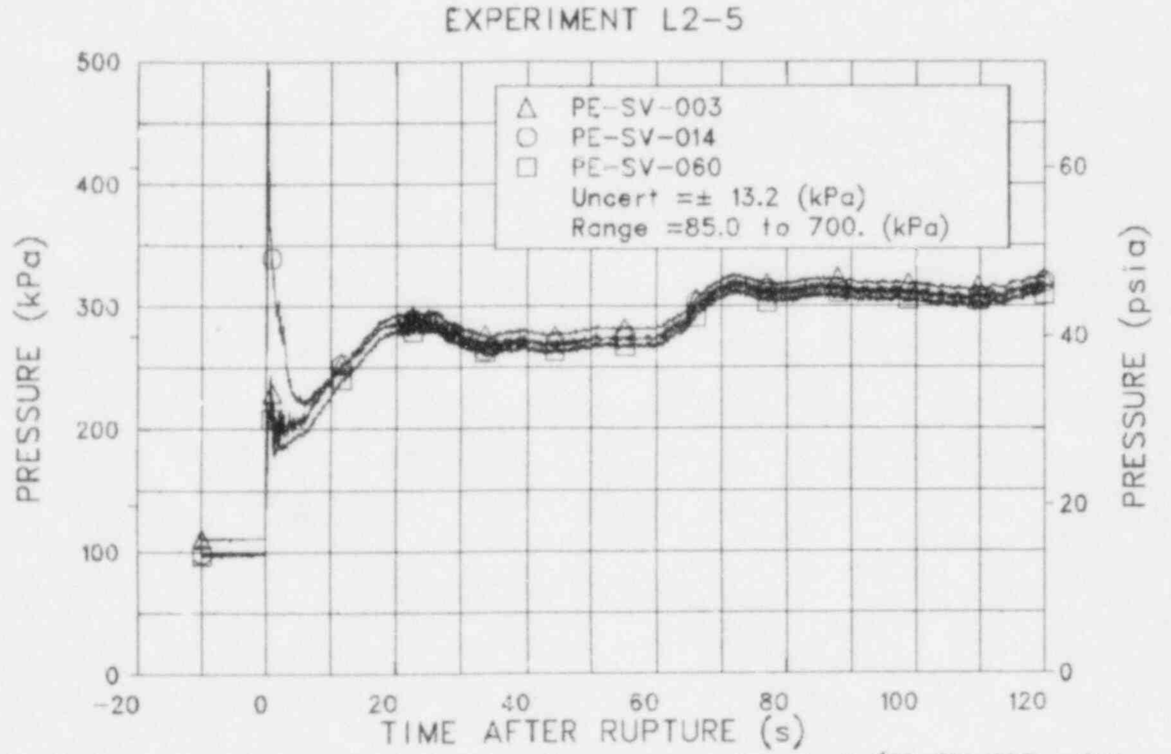

Figure 3L-68. Pressure in blowdown suppression tank (PE-SV-003, -014, and -060).

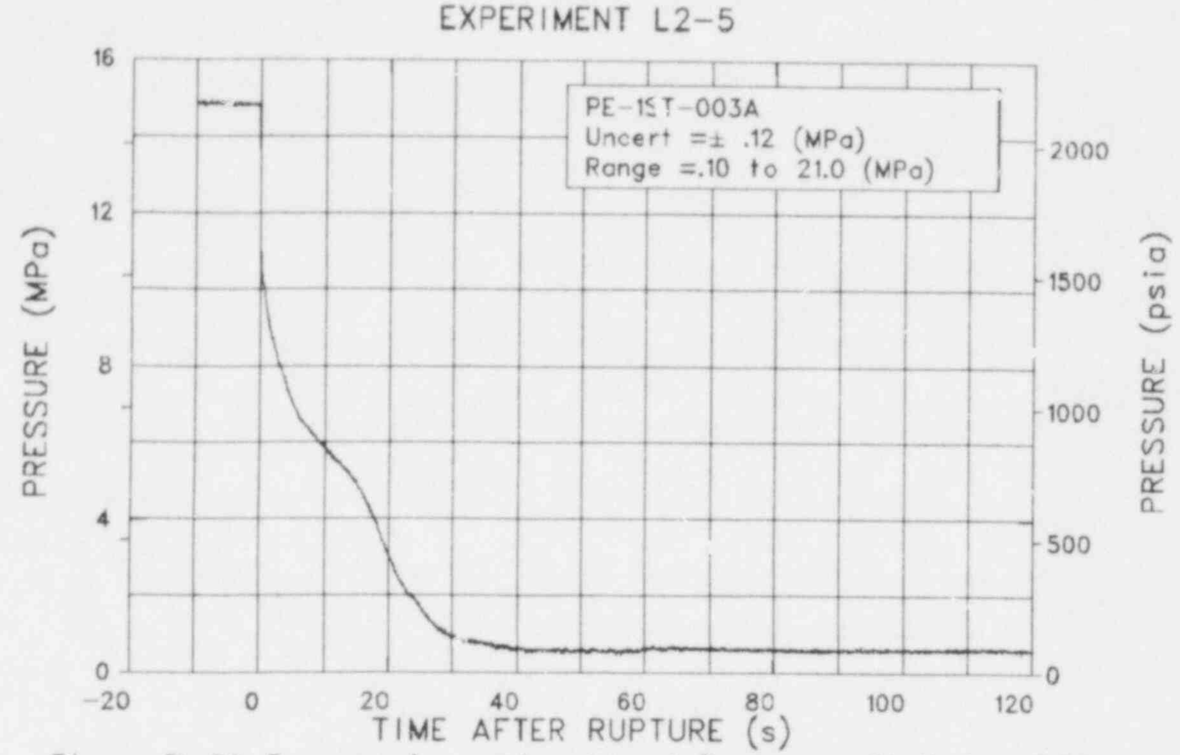

Figure 3L-69. Pressure in reactor vesssel Downcomer Stalk 1 at 5.32 m above reactor vessel bottom, wide range (PE-1ST-003A).

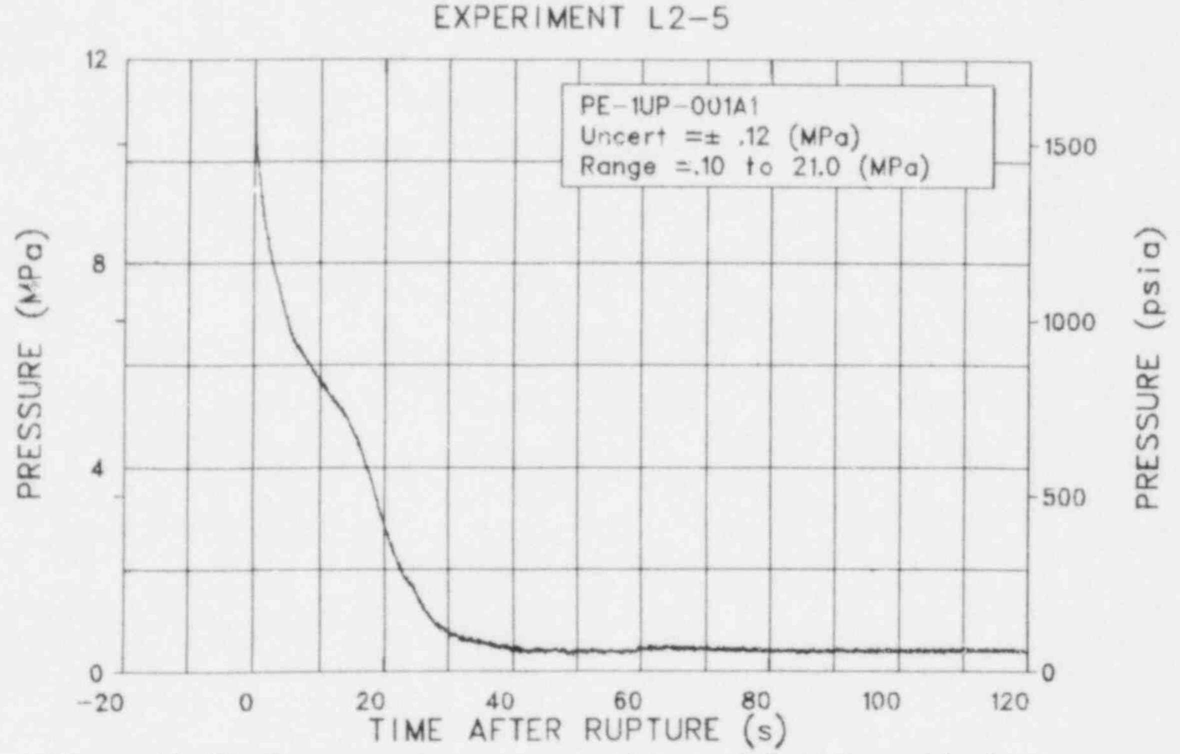

Figure 3L-70. Pressure above upper end box of Fuel Assembly 1 (PE-1UP-001A1).

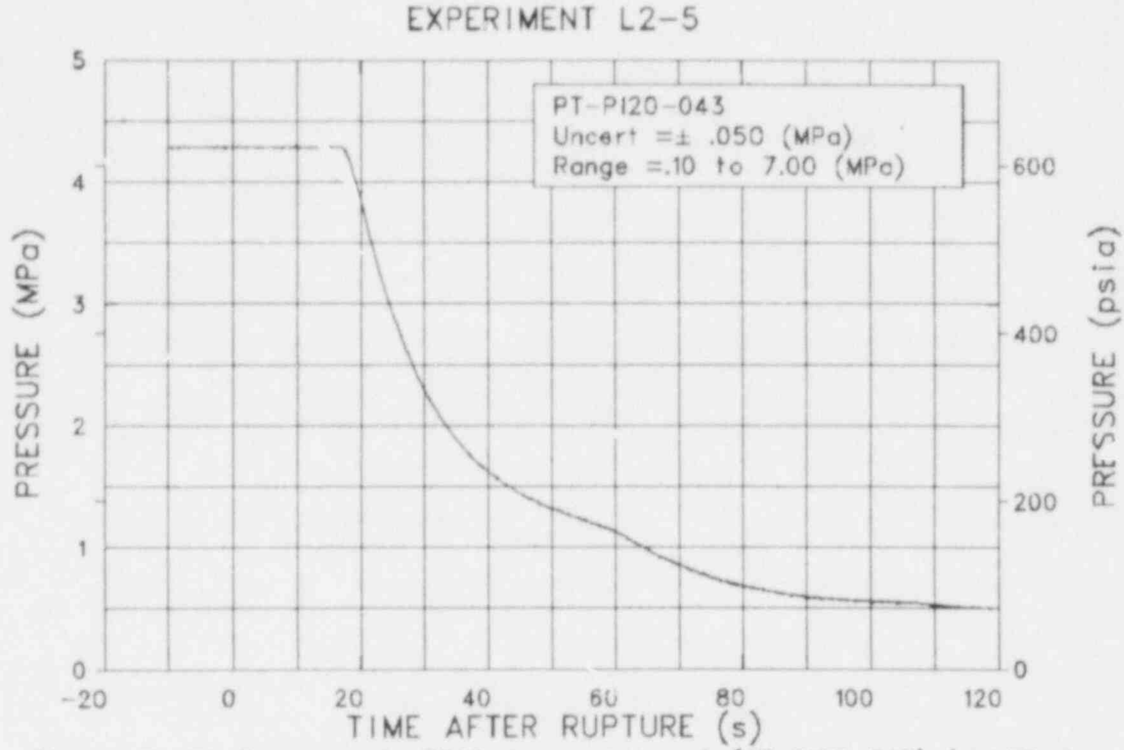

Figure 3L-71. Pressure in ECCS Accumulator A (PT-P120-043) (qualified, except for spurious spikes).

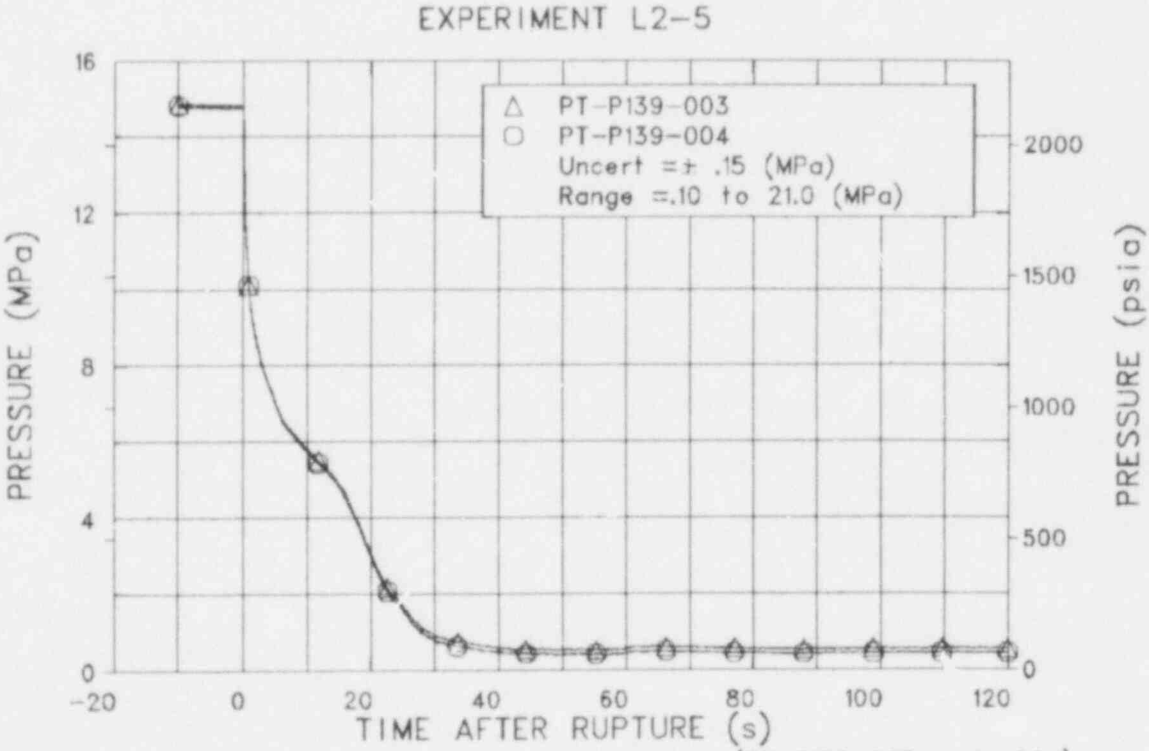

Figure 3L-72. Pressure in intact loop hot leg (PT-P139-003 and -004) (qualified, except for spurious spikes, response limited during subcooled blowdown).

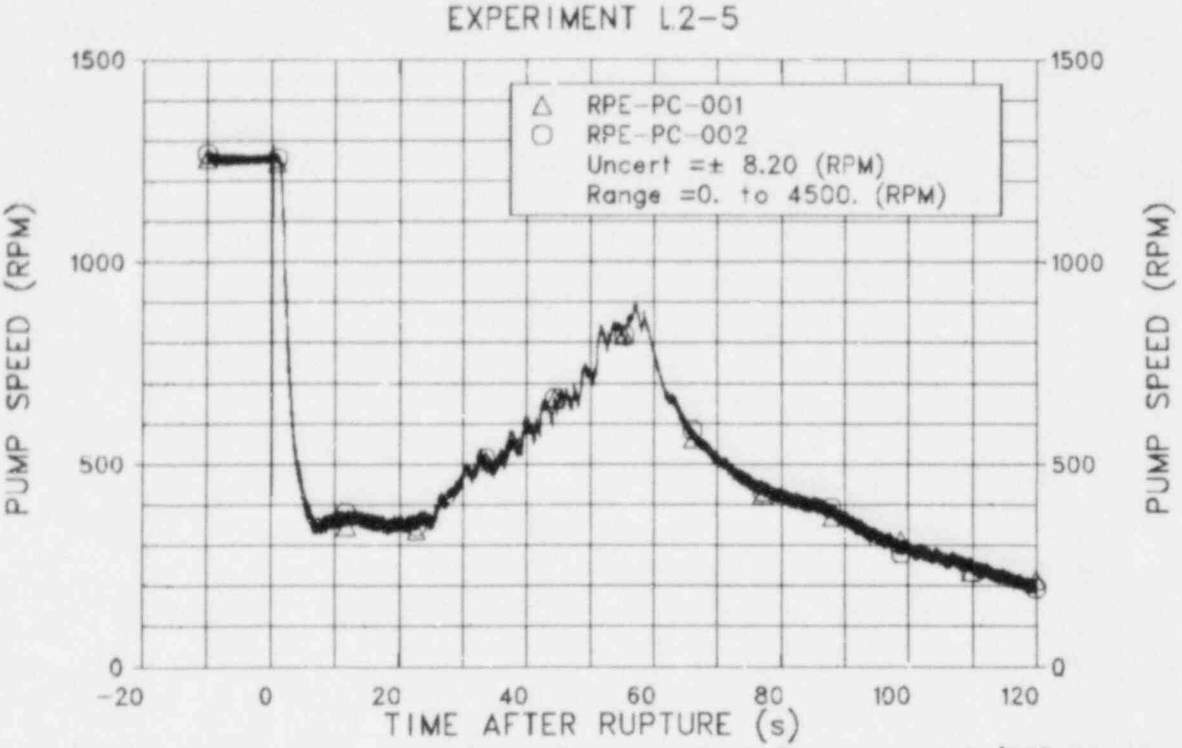

Figure 3L-73. Pump speed for primary coolant Pumps 1 and 2 (RPE-PC-001 and -002).

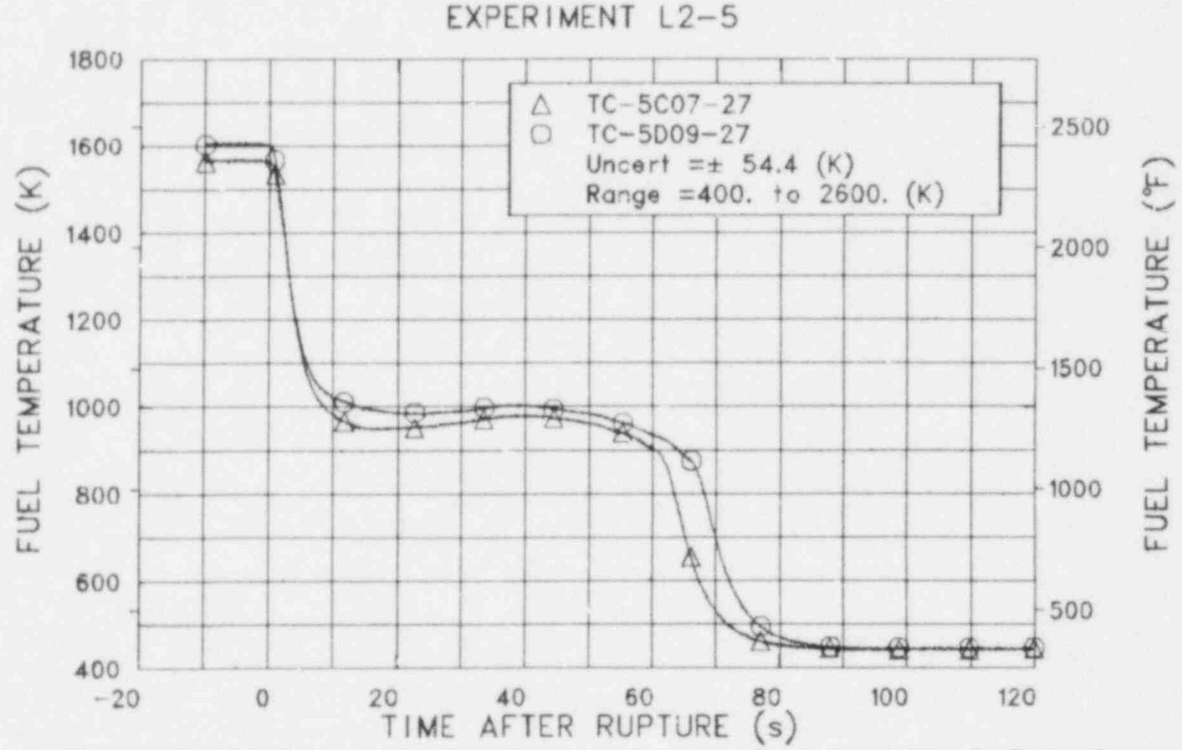

Figure 3L-74. Fuel centerline temperature at Fuel Assembly 5, Rows C and D, Columns 7 and 9 at 0.69 m above bottom of fuel rod (TC-5C07-27 and -5D09-27).

EXPERIMENT L2-5

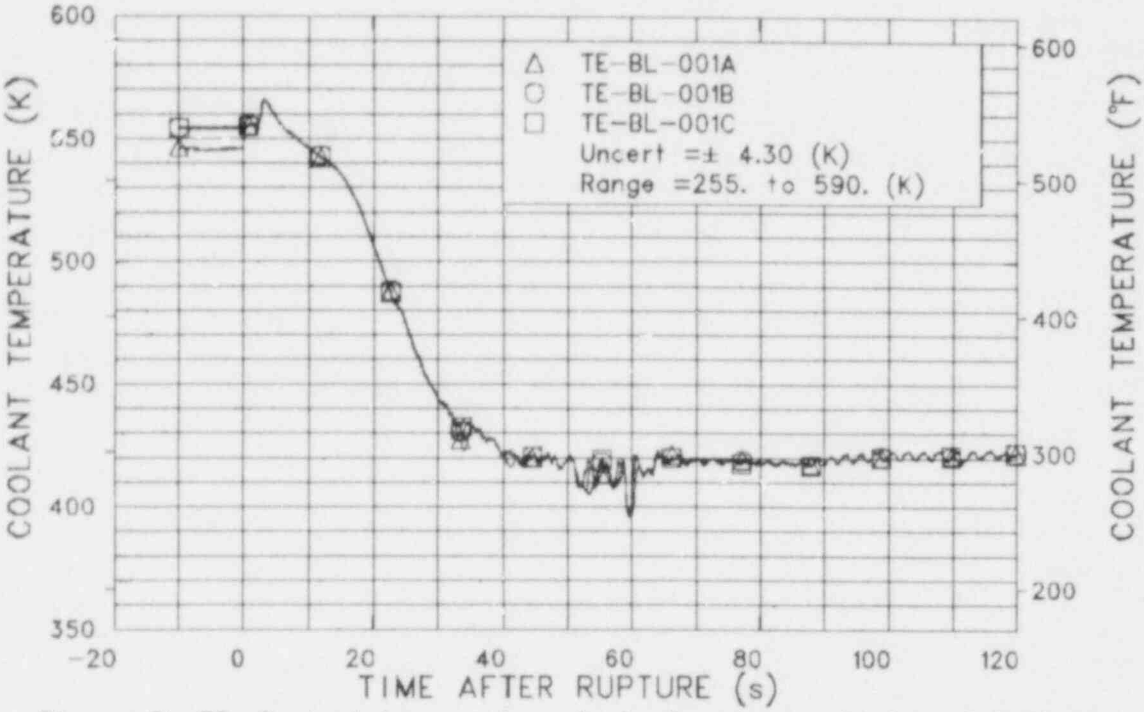

Figure 3L-75. Coolant temperature in broken loop cold leg at bottom, middle, and top of pipe (TE-BL-001A, -001B, and -001C) (qualified, possibile hot wall effects).

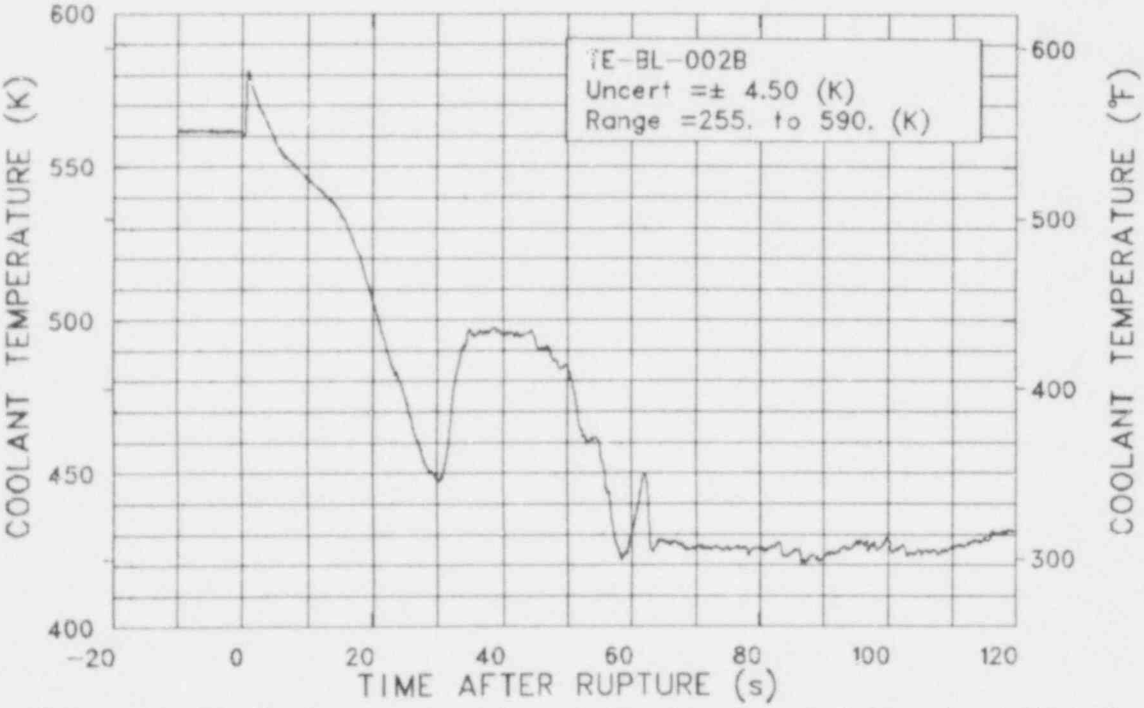

Figure 3L-76. Coolant temperature in broken loop hot leg at middle of pipe (TE-BL-002B) (qualified, possible hot wall effects).

EXPERIMENT L2-5

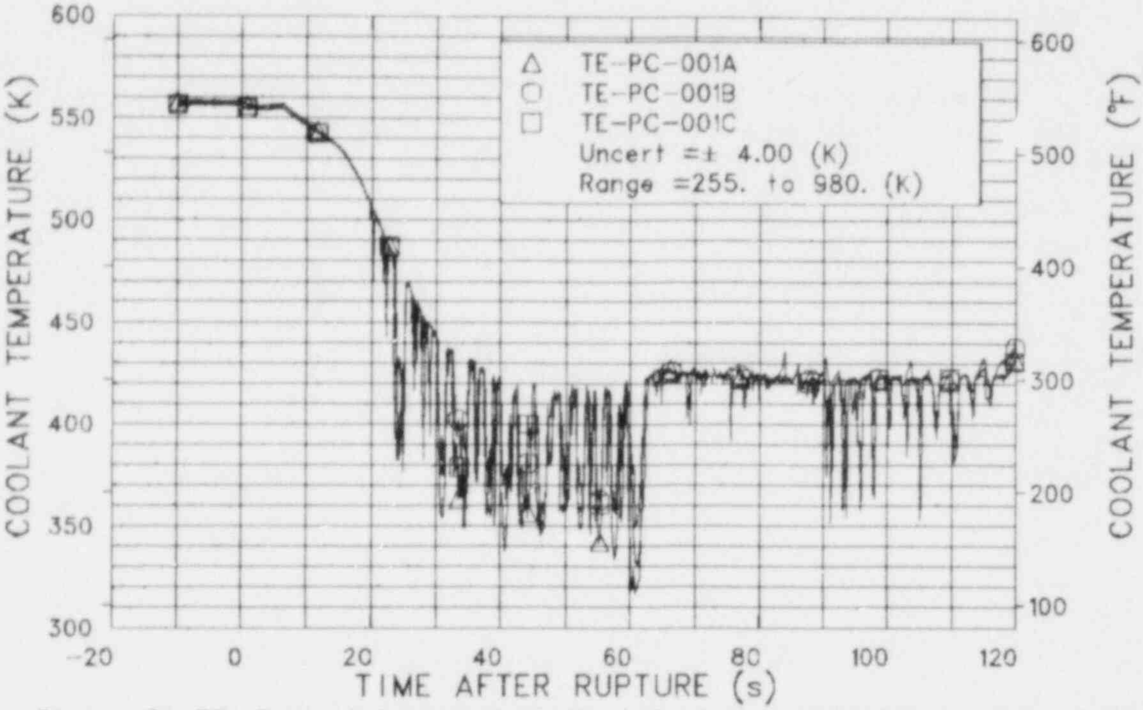

Figure 3L-77. Coolant temperature in intact loop cold leg on west side, center, and east side of pipe (TE-PC-001A, -001B, and -001C) (qualified, possible hot wall effects).

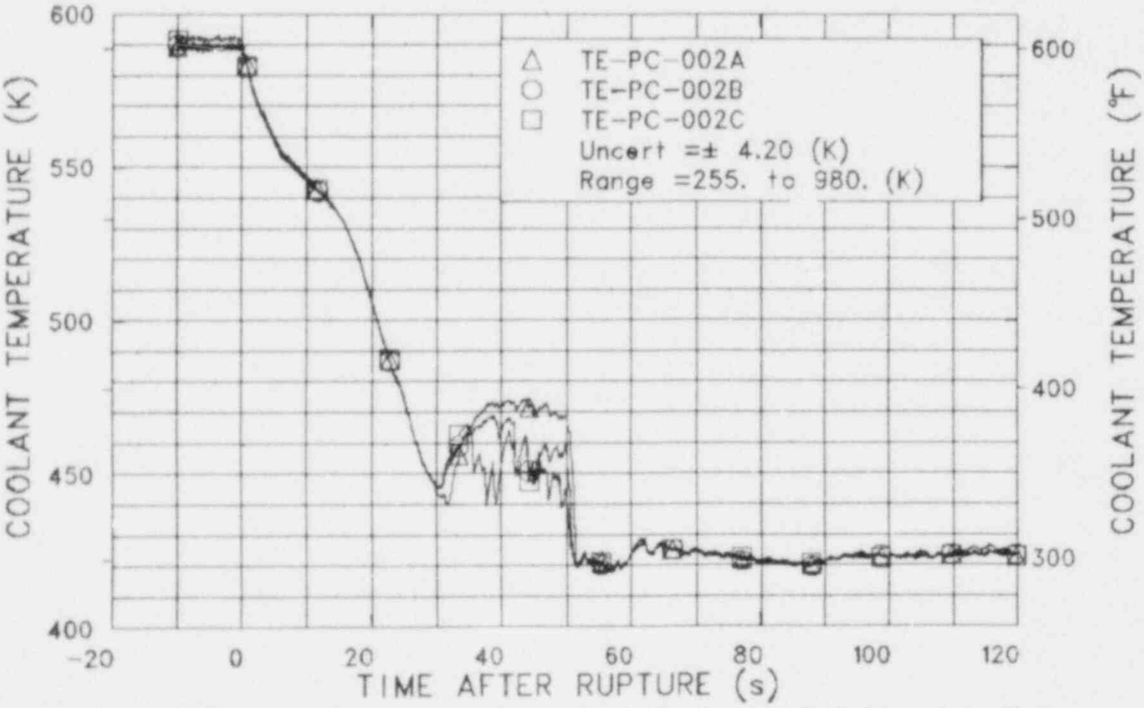

Figure 3L-78. Coolant temperature in intact loop hot leg at bottom, middle, and top of pipe (TE-PC-002A, -002B, and -002C) (qualified, possible hot wall effects).

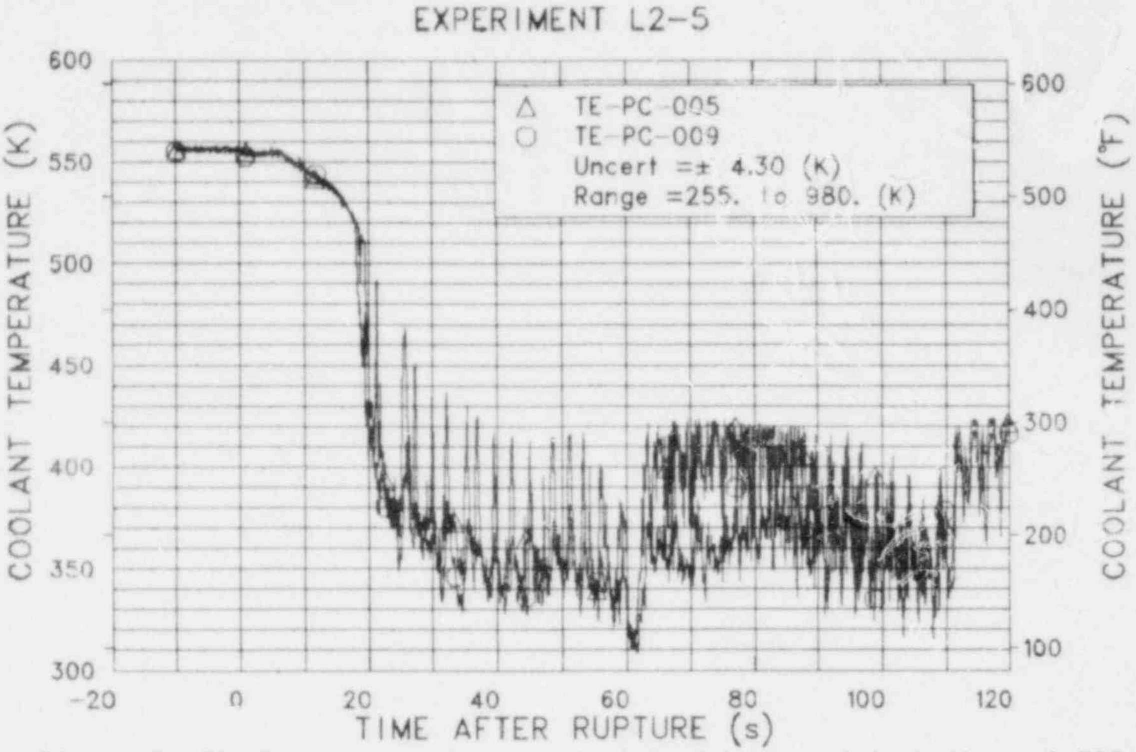

Figure 3L-79. Coolant temperature in intact loop next to bottom of ECC Rakes 1 and 2 (TE-PC-005 and -009) (qualified, possible hot wall effects).

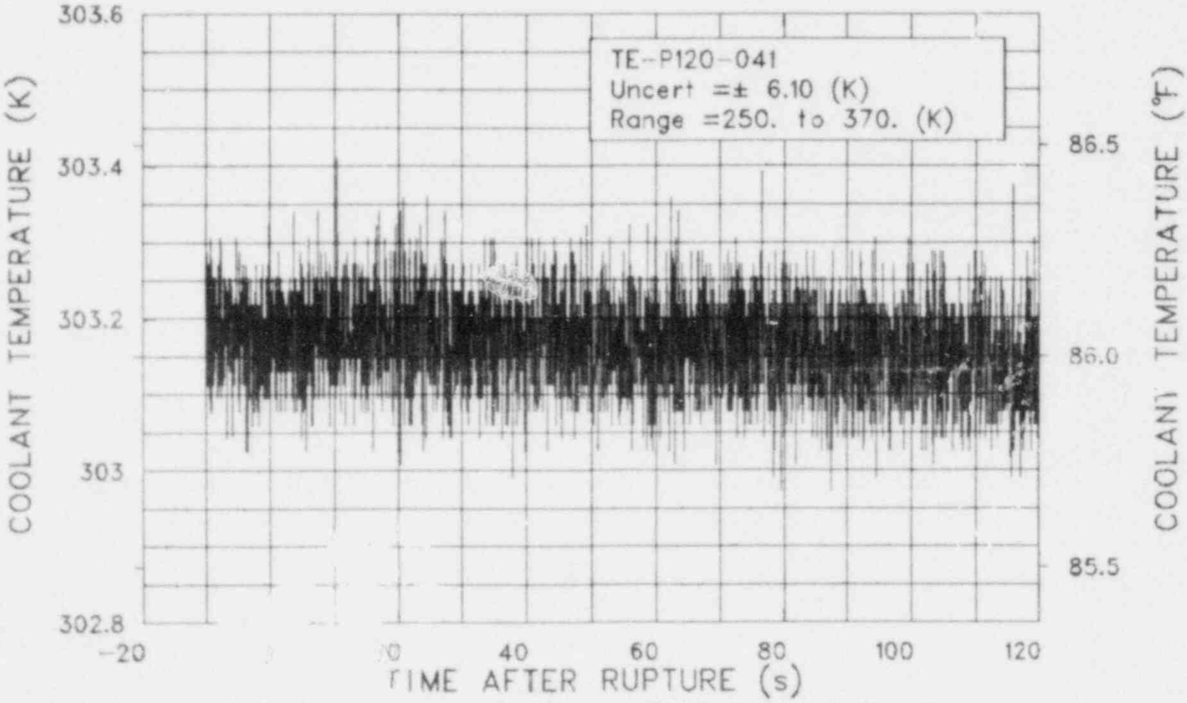

Figure 3L-80. Coolant temperature in ECCS Accumulator A (TE-P120-041).

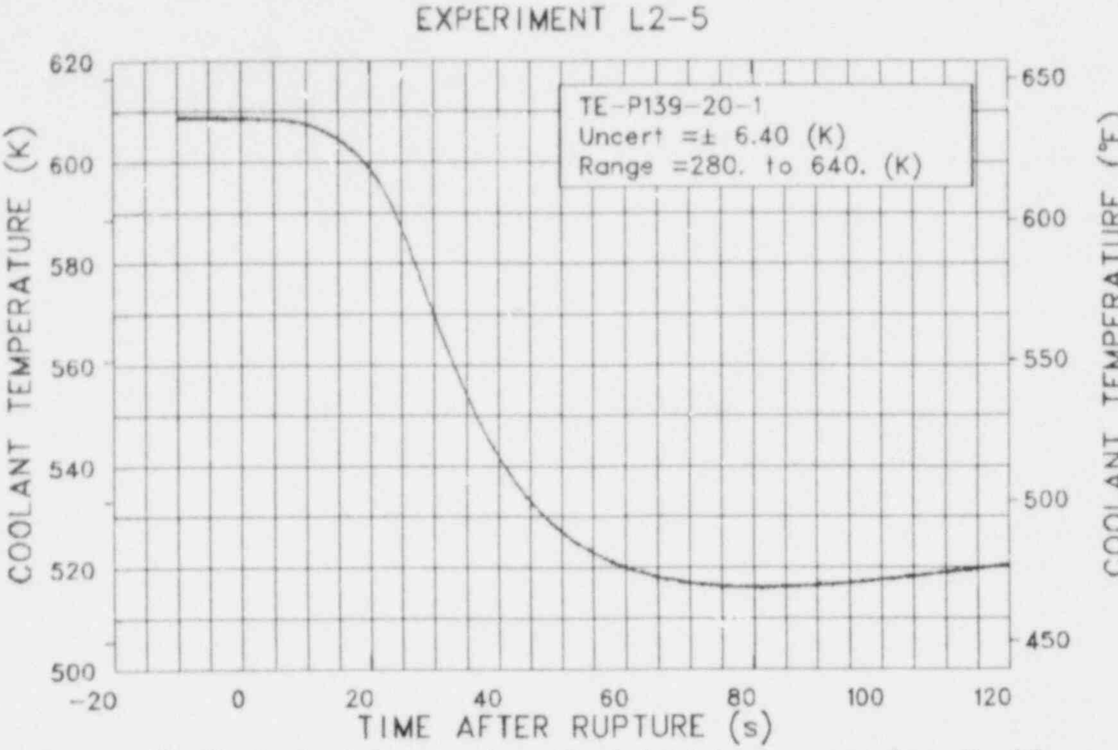

Figure 3L-81. Coolant temperature in intact loop pressurizer liquid volume (TE-P139-20-1) (qualified, hot wall effects and limited time response).

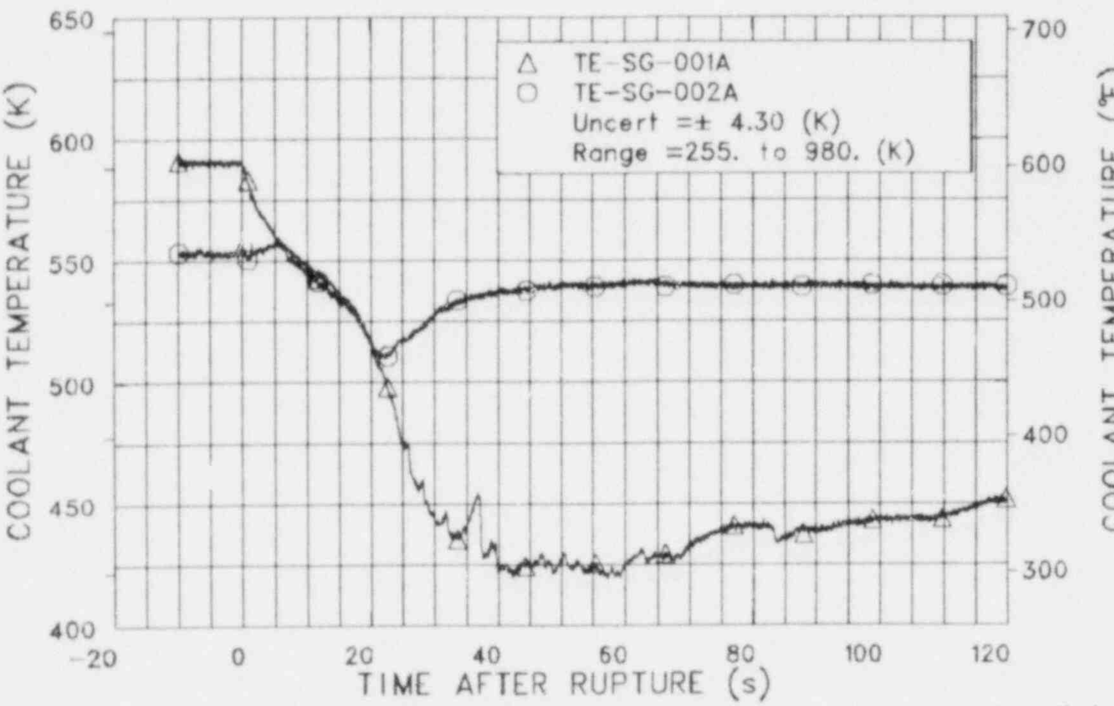

Figure 3L-82. Coolant temperature in steam generator inlet and outlet plenums TE-SG-001A and -002A) (qualified, possible hot wall effects after 40 and 18 s, respectively).

EXPERIMENT L2-5

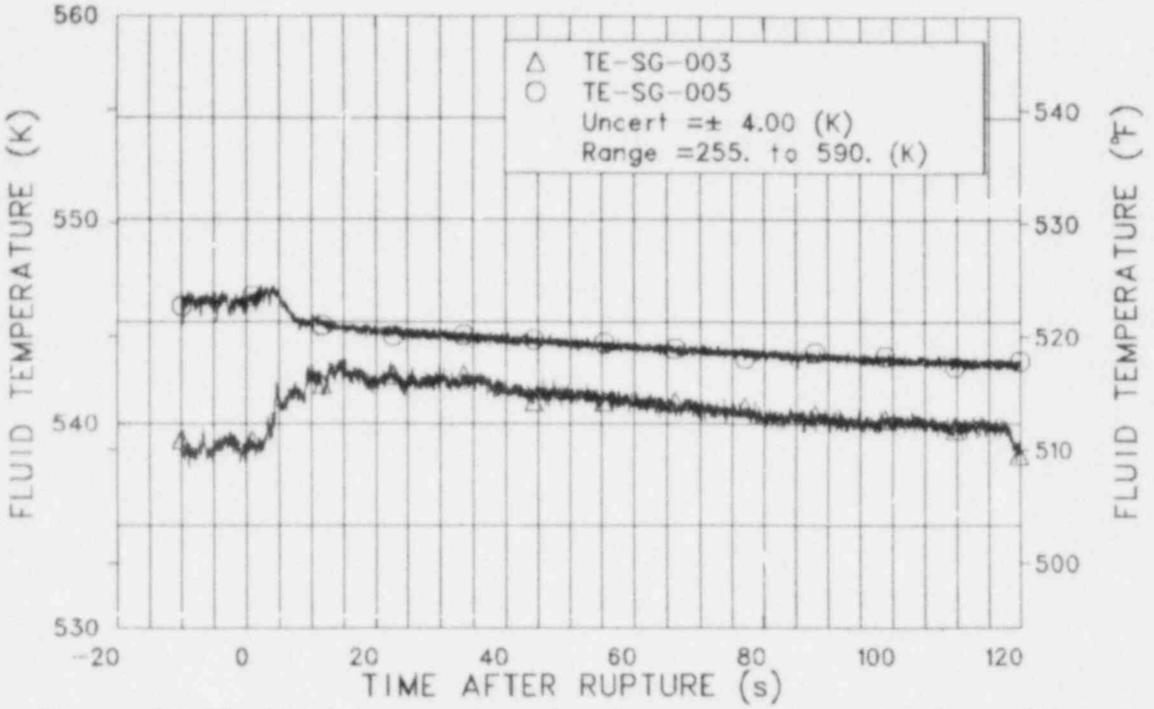

Figure 3L-83. Fluid temperature in steam generator secondary side downcomer at 0.25 and 2.92 m above top of tube sheet (TE-SG-003 and -005).

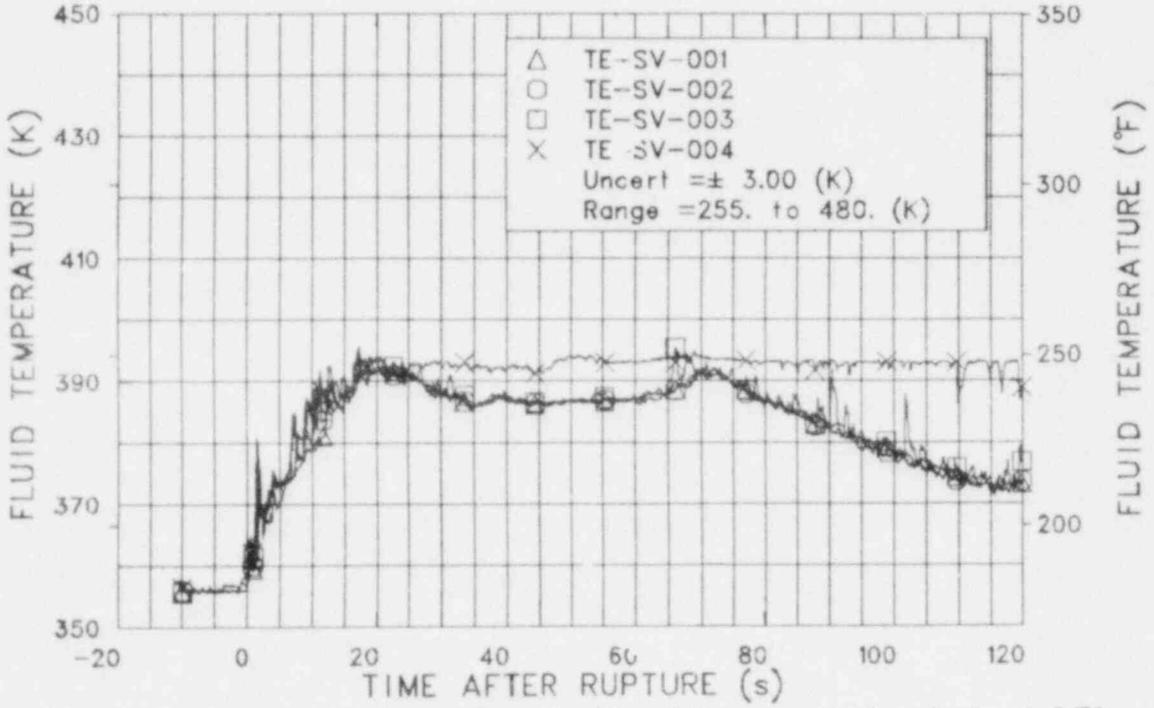

Figure 3L-84. Fluid temperature in blowdown suppression tank at 2.72, 2.36, 1.90, and 1.45 m above tank bottom (TE-SV-001, -002, -003, and -004).

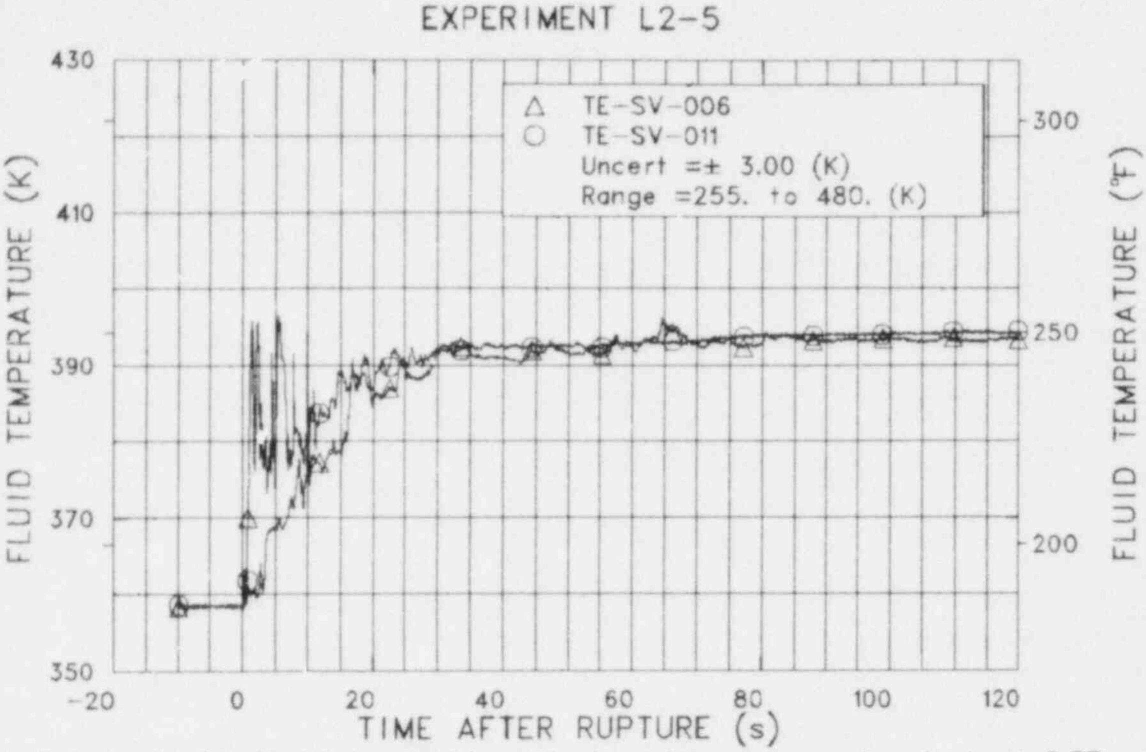

Figure 3L-85. Fluid temperature in blowdown suppression tank at 0.37 and 0.99 m above tank bottom (TE-SV-006 and -011).

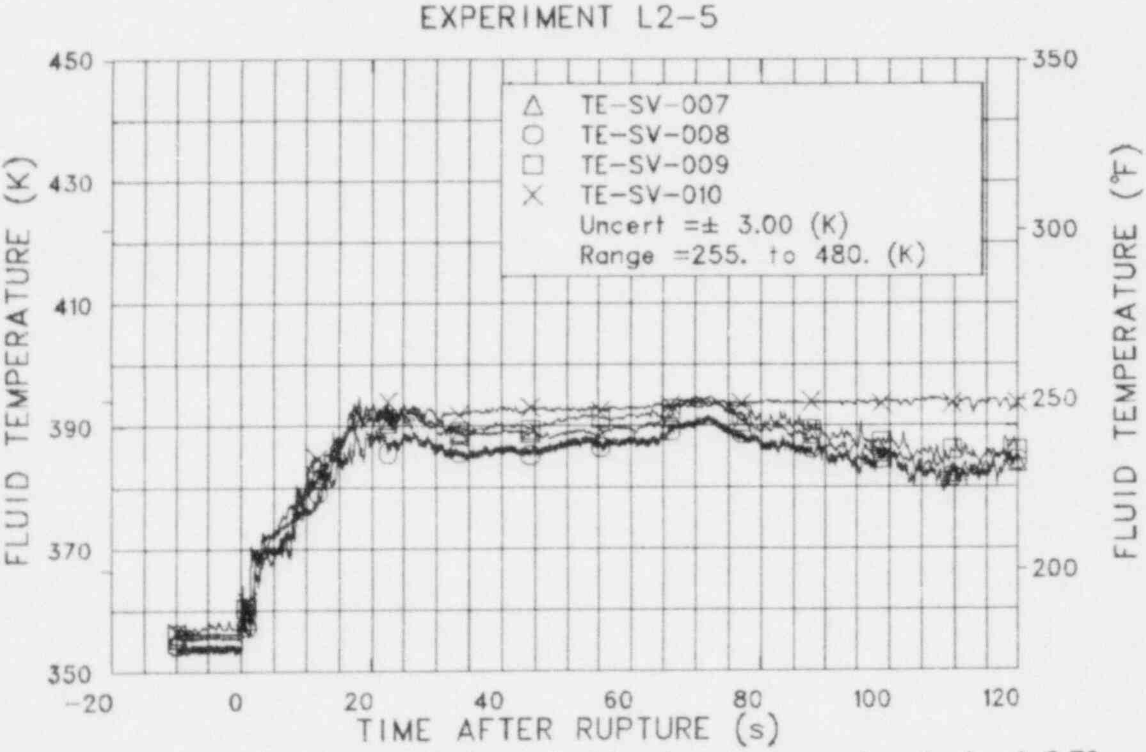

Figure 3L-86. Fluid temperature in blowdown suppression tank at 2.72, 2.36, 1.90, and 1.45 m above tank bottom (TE-SV-007, -008, -009, and -010).

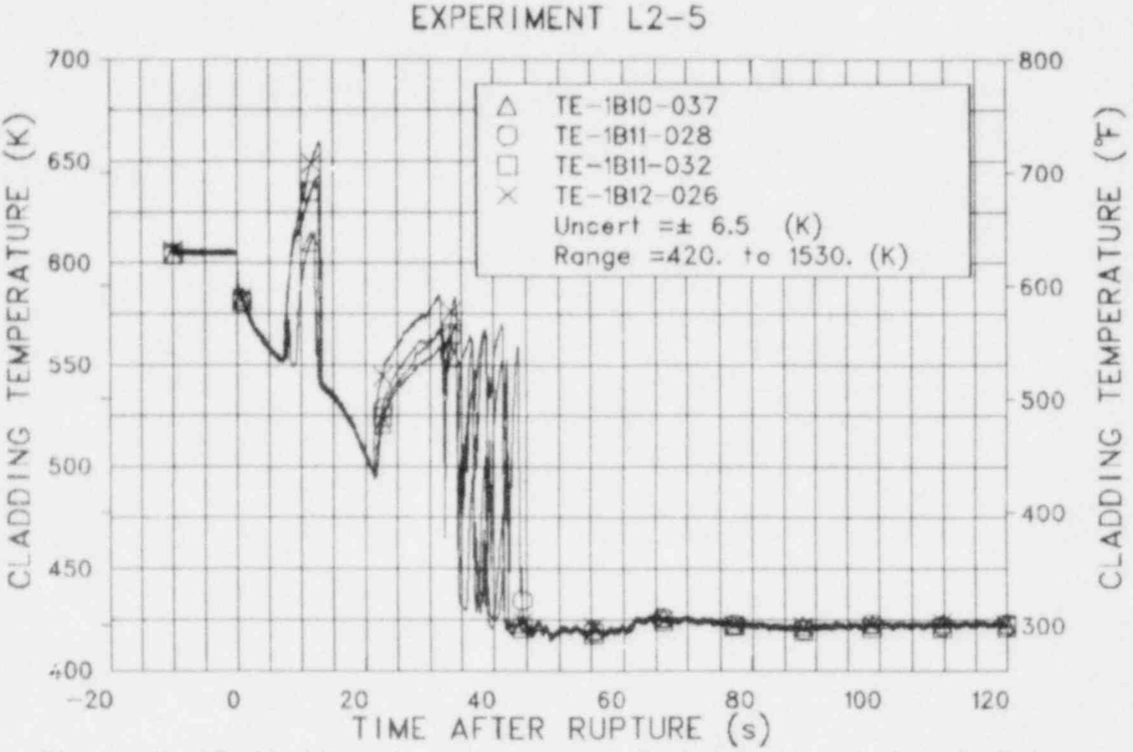

Figure 3L-87. Cladding temperature at Fuel Assembly 1, Row B, Columns 10, 11, and 12 at 0.94, 0.71, 0.81, and 0.66 m above bottom of fuel rod (TE-1B10-037, -1B11-028, -032, and -1B12-026).

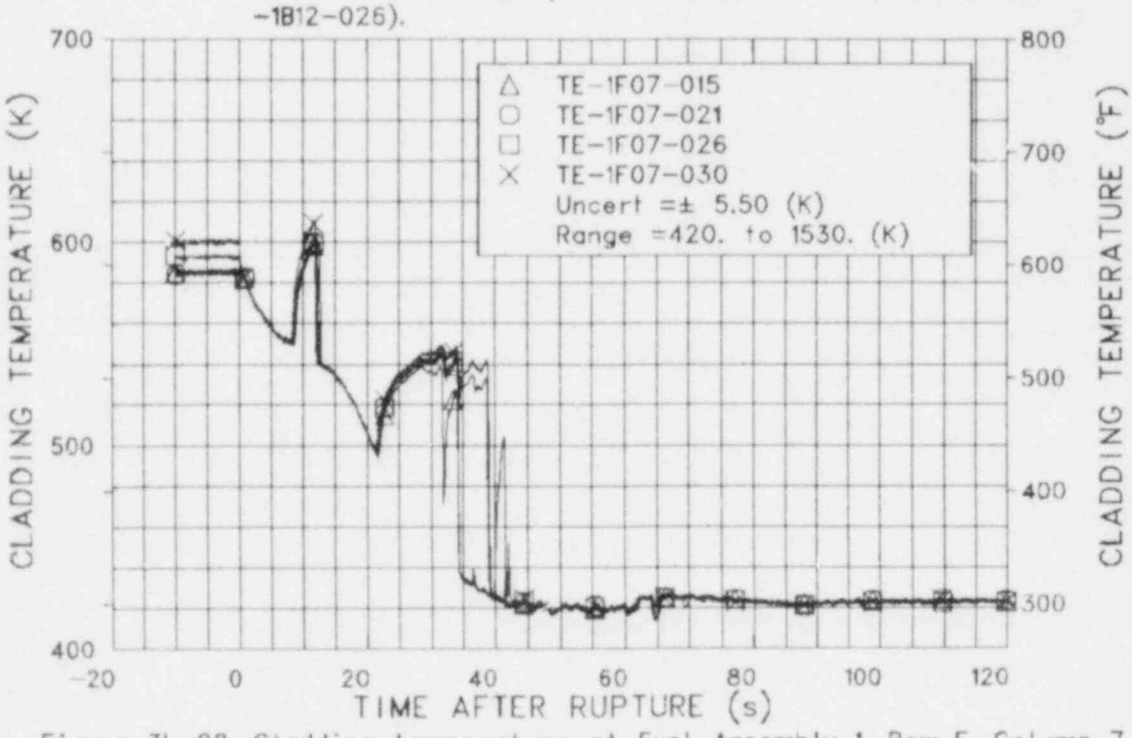

Figure 3L-88. Cladding temperature at Fuel Assembly 1, Row F, Column 7 at 0.38, 0.53, 0.66, and 0.76 m above bottom of fuel rod (TE-1F07-015, -021, -026, and -030).

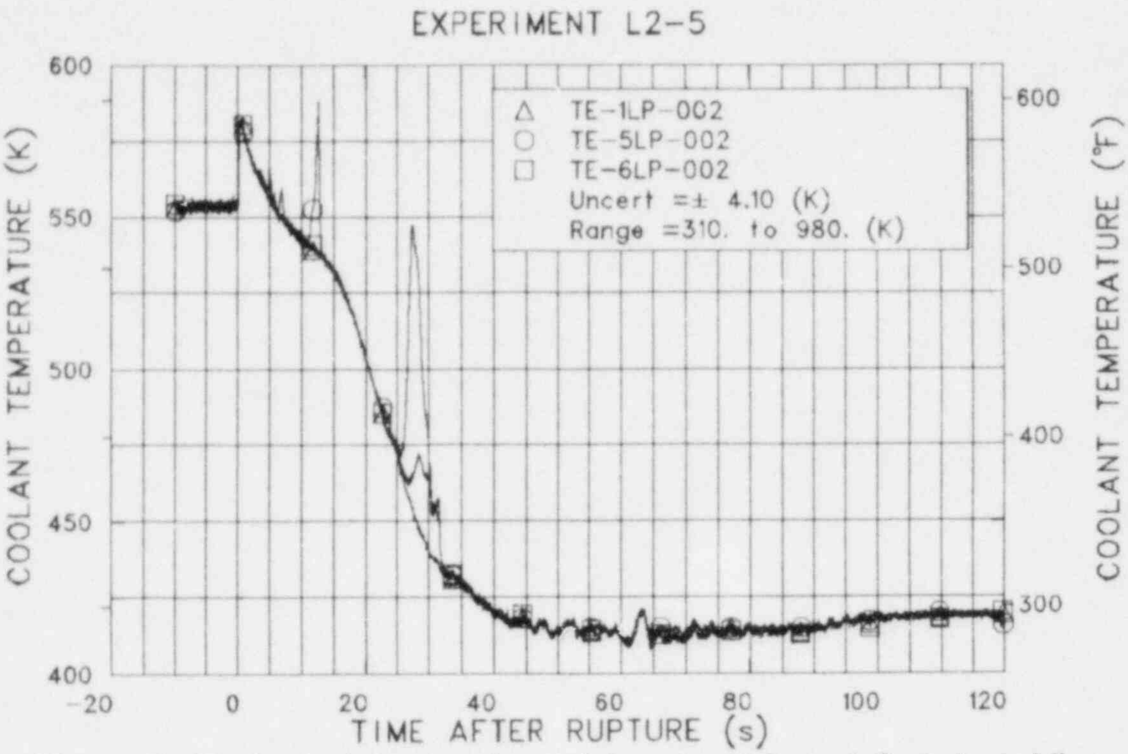

Figure 3L-89. Coolant temperature at lower end box of Fuel Assemblies 1, 5, and 6 (TE-1LP-002, -5LP-002, and -6LP-002).

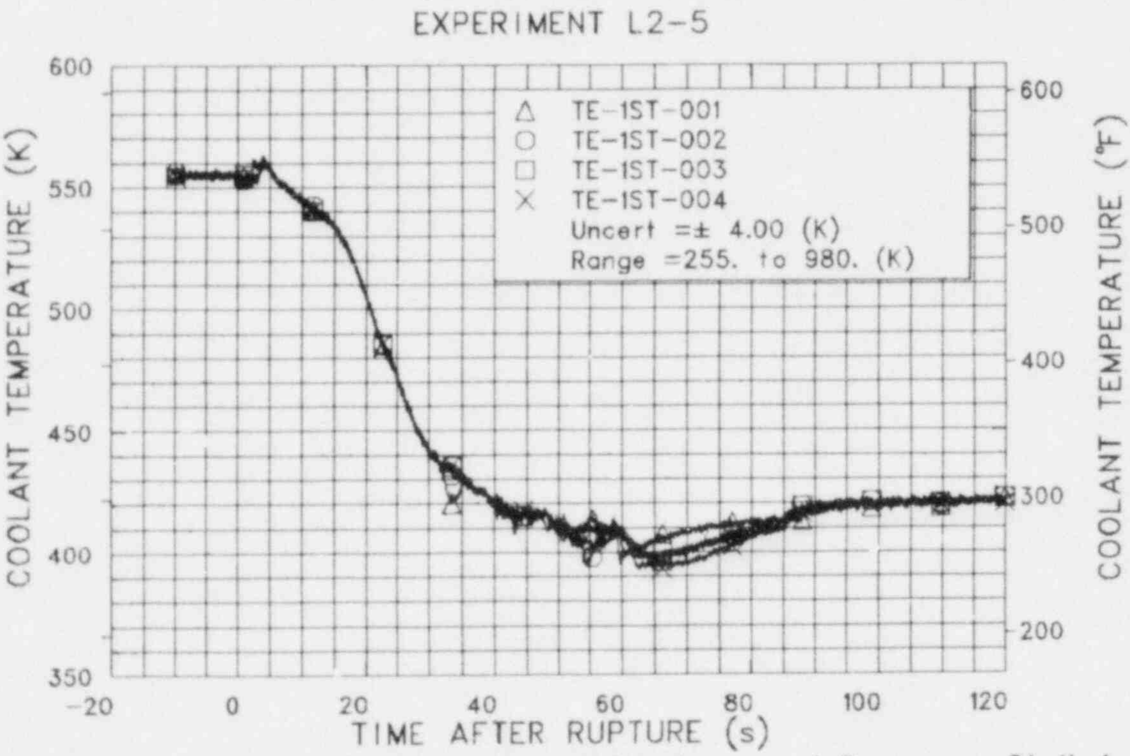

Figure 3L-90. Coolant temperature in reactor vessel Downcomer Stalk 1 at 4.8, 4.2, 3.59, and 2.98 m above reactor vessel bottom (TE-1ST-001, -002, -003, and -004).

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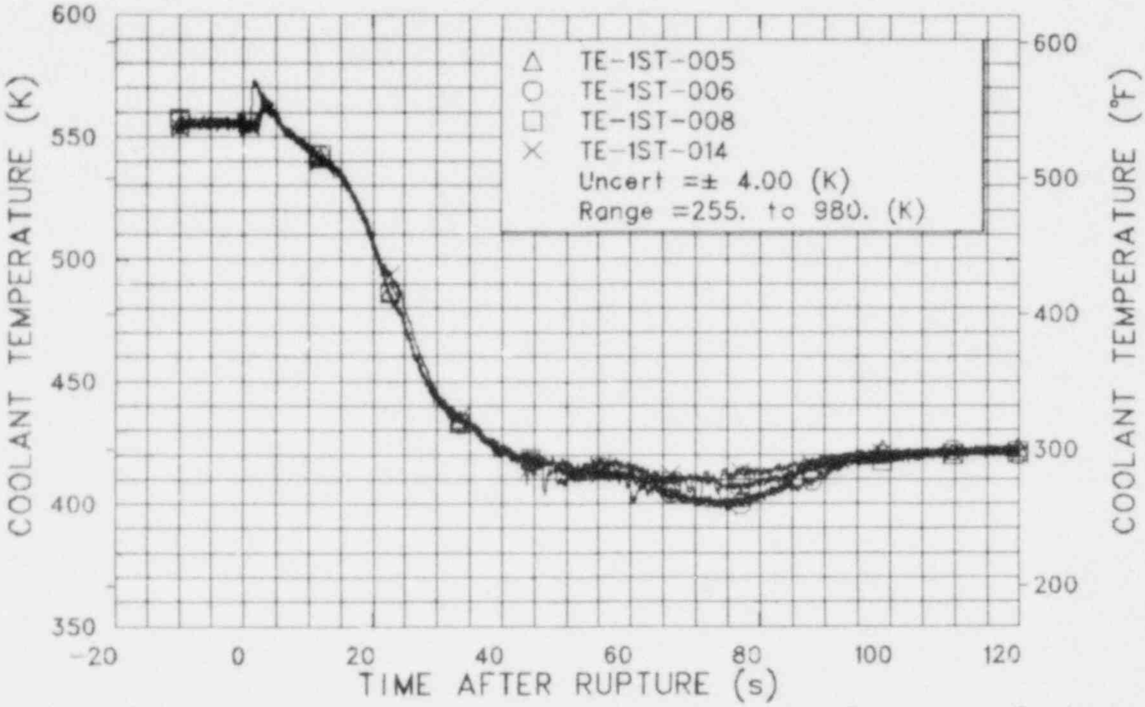


Figure 3L-91. Coolant temperature in reactor vessel Downcomer Stalk 1 at 2.37, 1.76, 0.74, and 1.17 m above reactor vessel bottom (TE-1ST-005, -006, -008, and -014).

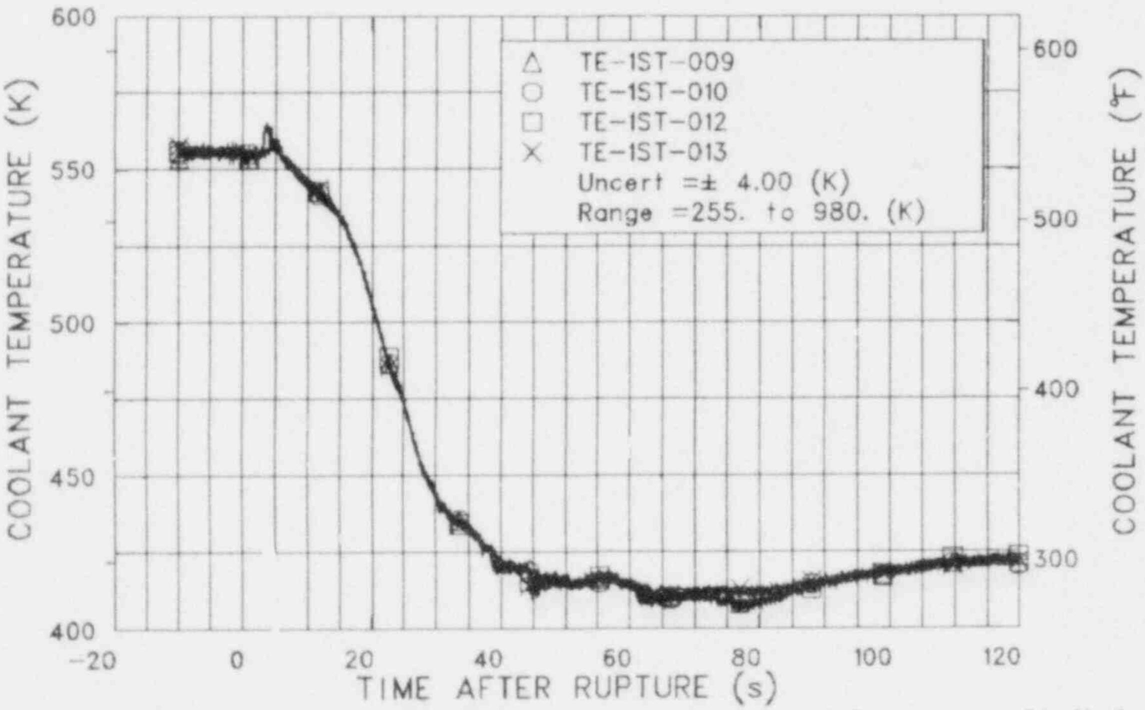


Figure 3L-92. Coolant temperature in reactor vessel Downcomer Stalk 1 at 0.64, 0.54, 0.34, and 0.24 m above reactor vessel bottom (TE-1ST-009, -010, -012, and -013).

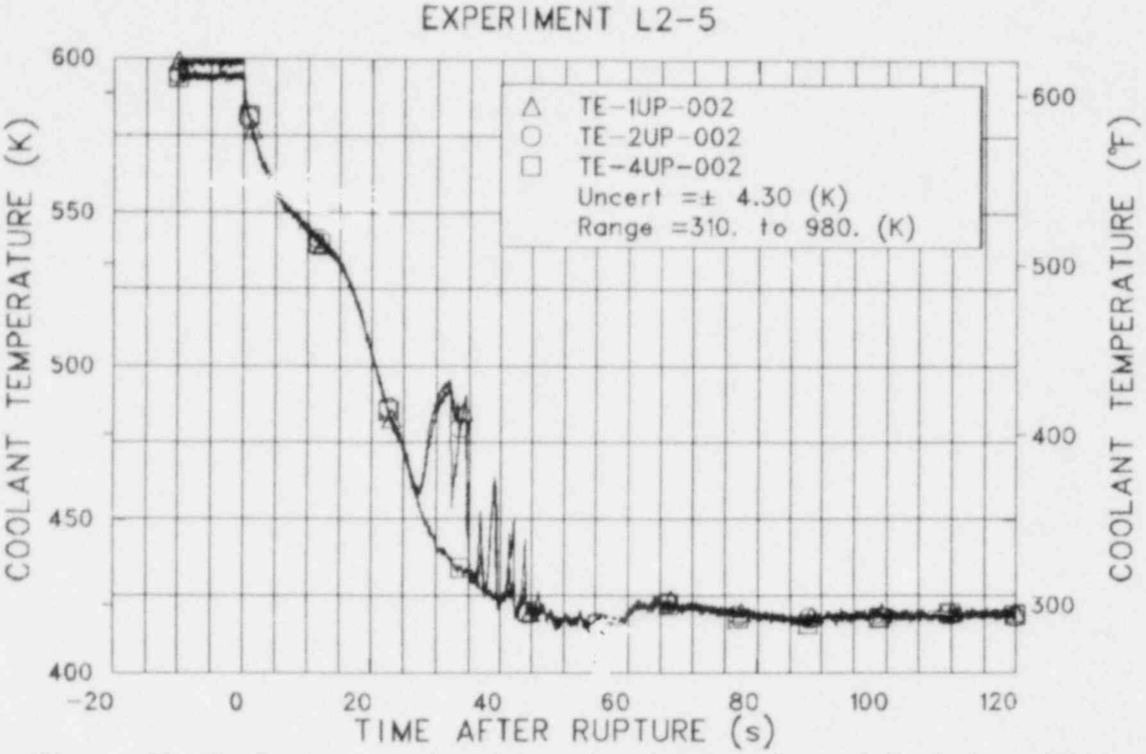


Figure 3L-93. Coolant temperature at upper end box of Fuel Assemblies 1, 2, and 4 (TE-1UP-002, -2UP-002, and -4UP-002).

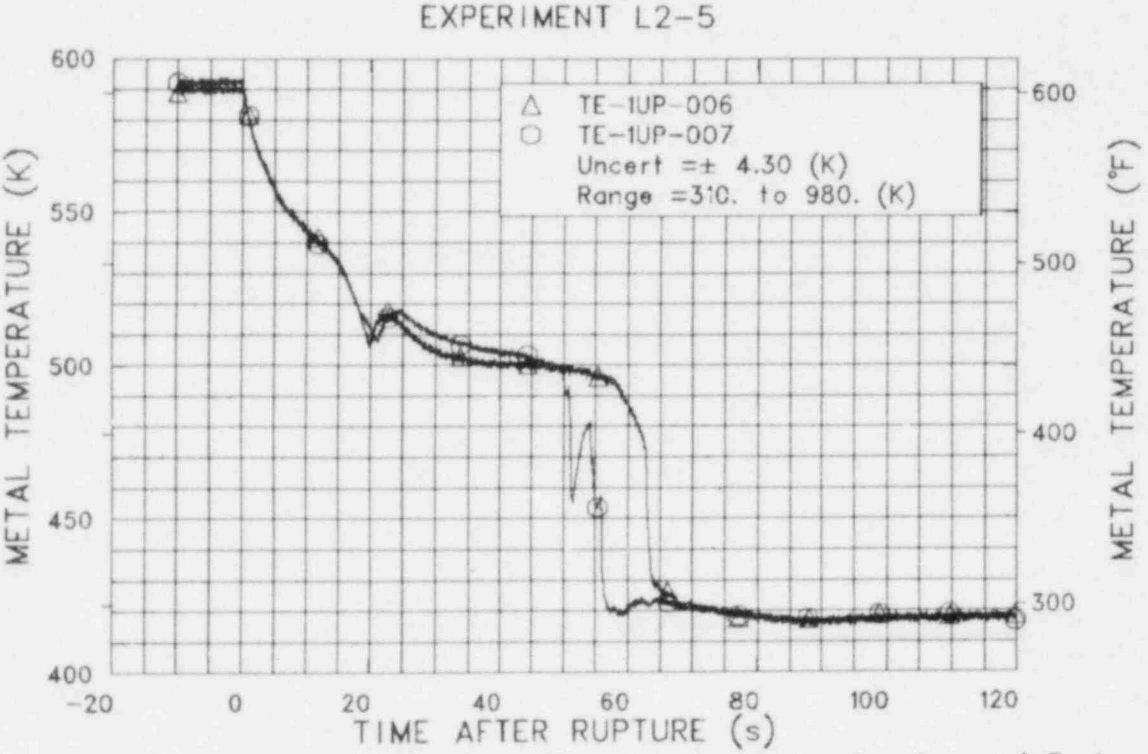


Figure 3L-94. Metal temperature at upper core support column of Fuel Assembly 1 (TE-1UP-006 and -007).

EXPERIMENT L2-5

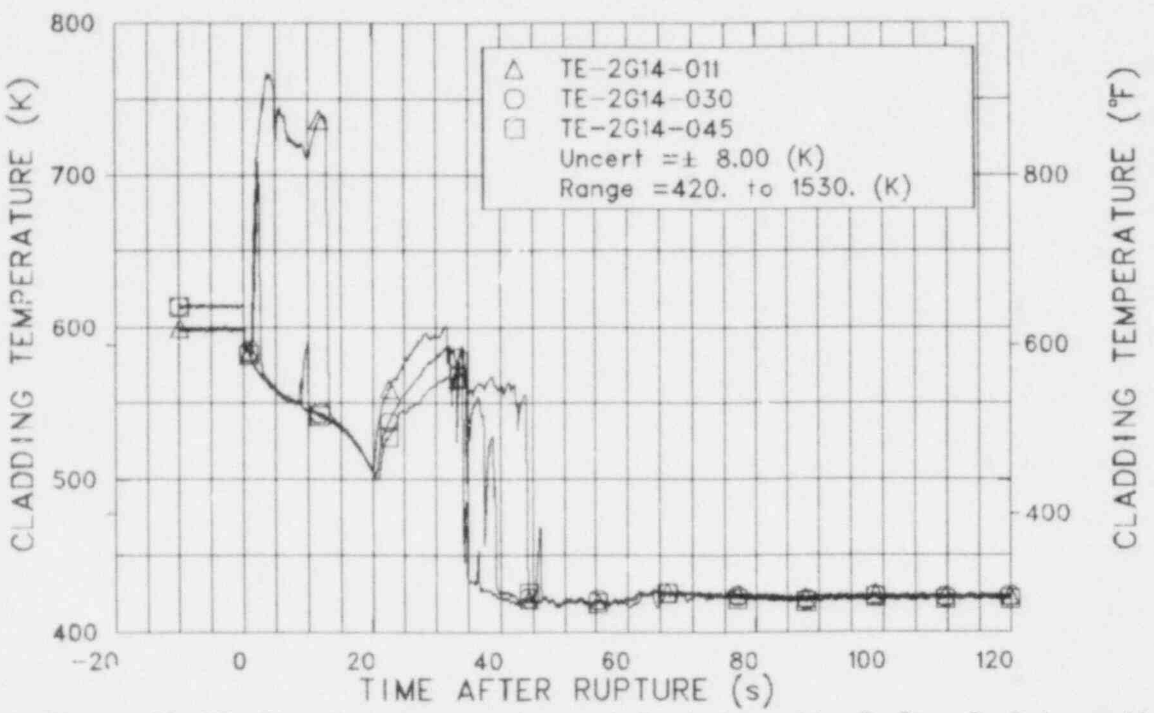


Figure 3L-95. Cladding temperature at Fuel Assembly 2, Row G, Column 14 at 0.28, 0.76, and 1.14 m above bottom of fuel rod (TE-2G14-011, -030, and -045).

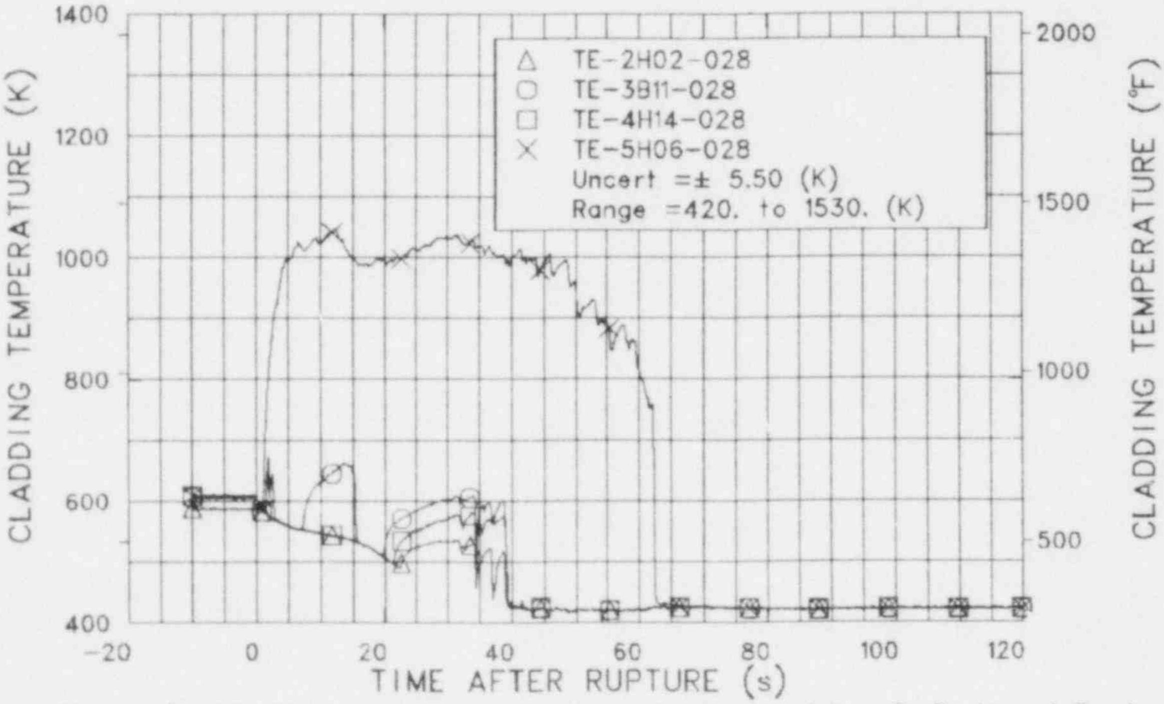


Figure 3L-96. Cladding temperature at Fuel Assemblies 2, 3, 4, and 5 at 0.71 m above bottom of fuel rod (TE-2H02-028, -3B11-028, -4H14-028, and -5H06-028).

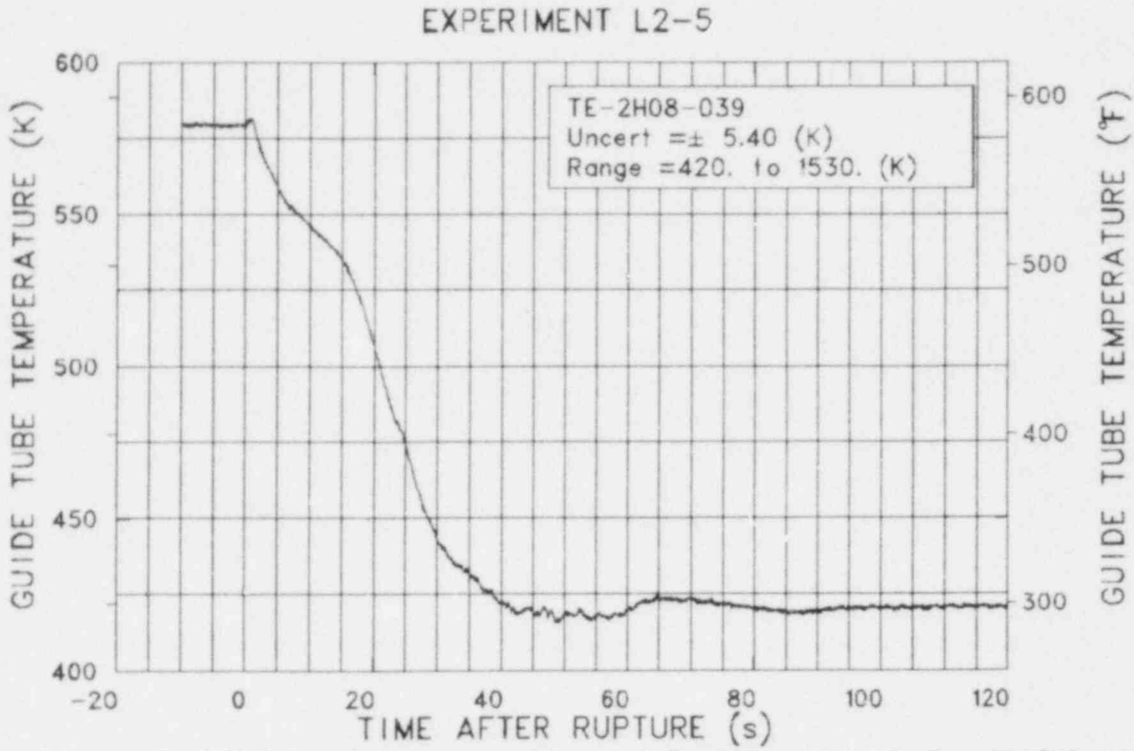


Figure 3L-97. Guide tube temperature at Fuel Assembly 2, Row H, Column 8 at 0.99 m above bottom of guide tube (TE-2H08-039).

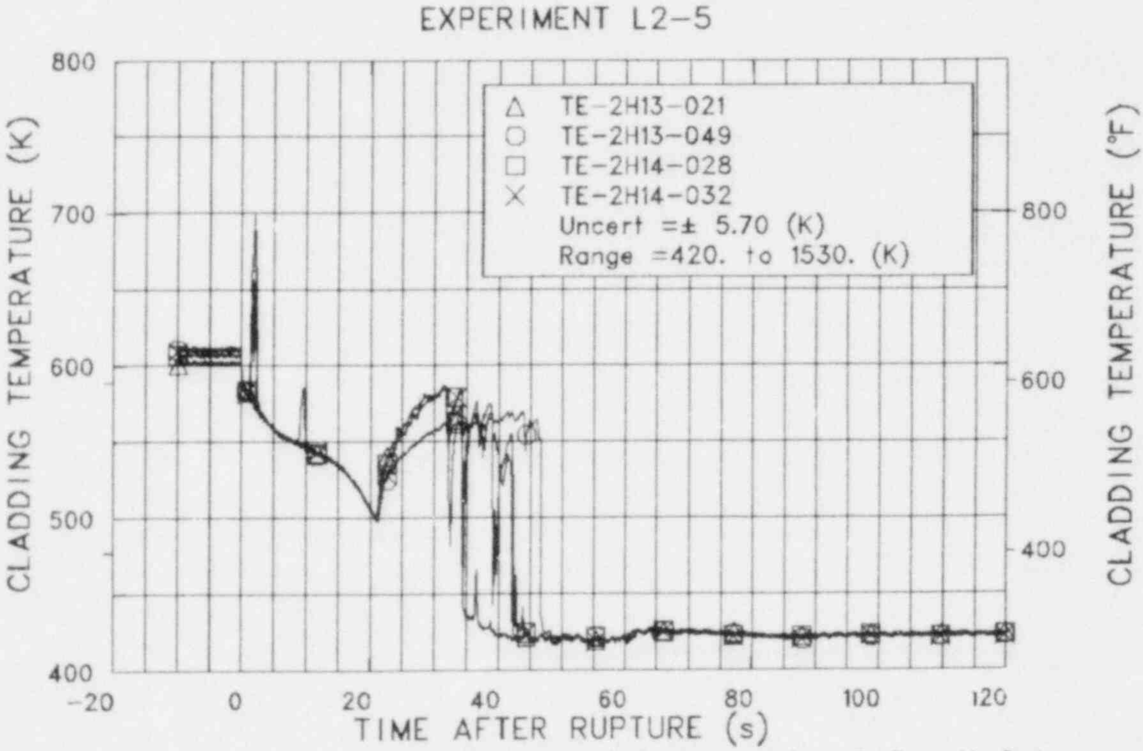


Figure 3L-98. Cladding temperature at Fuel Assembly 2, Row H, Columns 13 and 14 at 0.53, 1.24, 0.71, and 0.81 m above bottom of fuel rod (TE-2H13-021, -049, -2H14-028, and -032).

EXPERIMENT L2-5

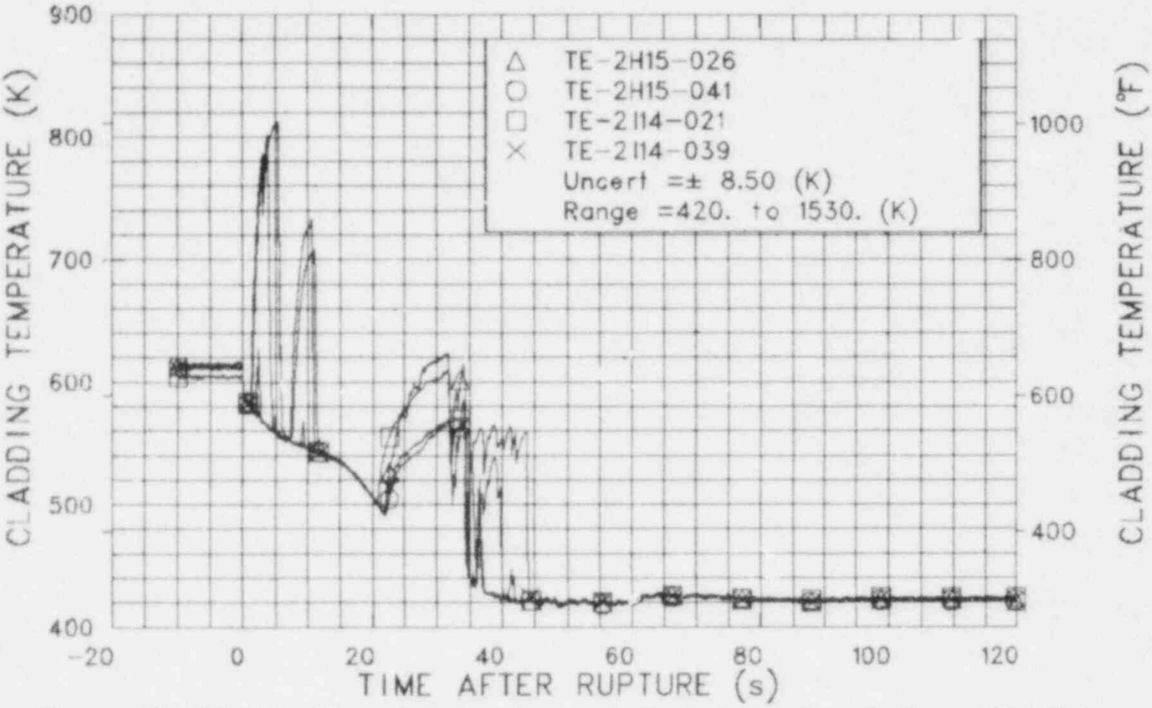


Figure 3L-99. Cladding temperature at Fuel Assembly 2, Rows H and I, Columns 15 and 14 at 0.66, 1.04, 0.53, and 0.99 m above bottom of fuel rod (TE-2H15-026, -041, -2I14-021, and -039).

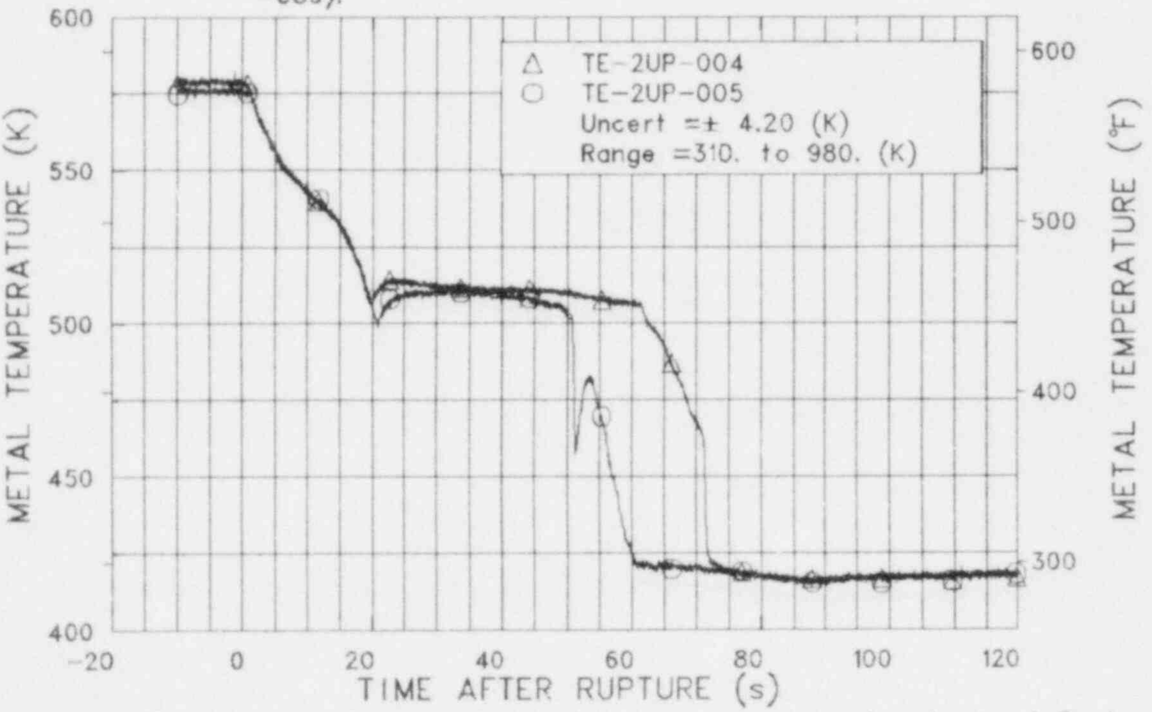


Figure 3L-100. Metal temperature at upper core support column of Fuel Assembly 2 (TE-2UP-004 and -005).

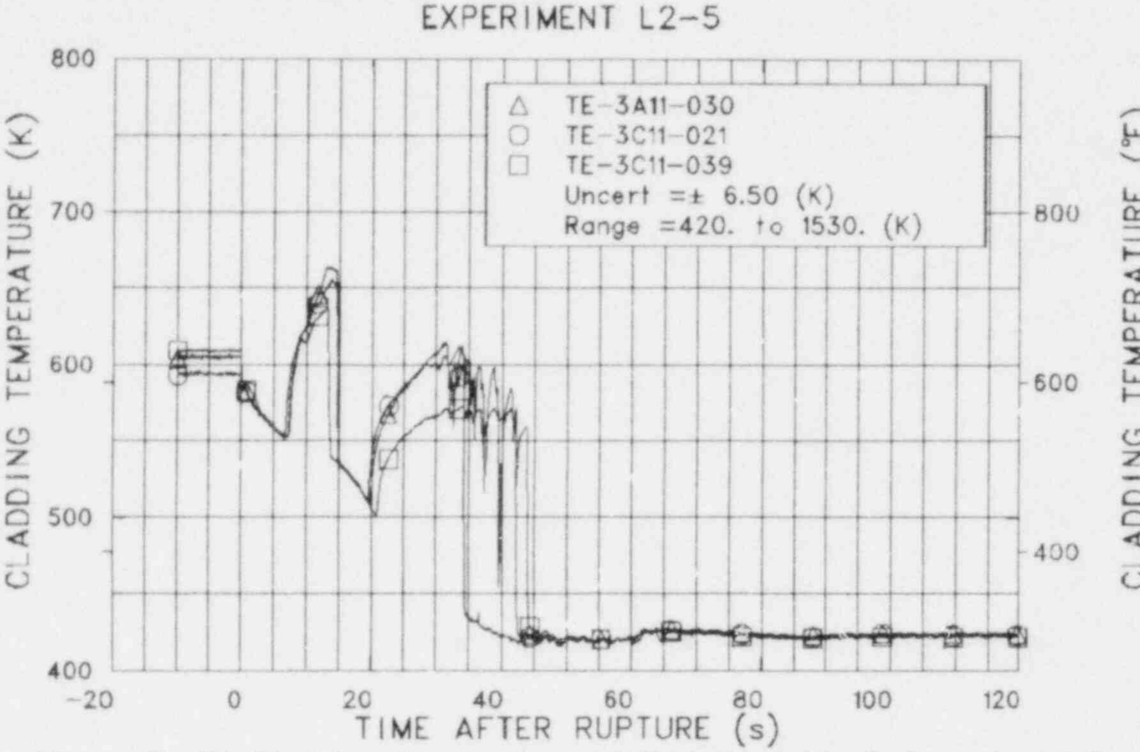


Figure 3L-101. Cladding temperature at Fuel Assembly 3, Rows A and C, Column 11 at 0.76, 0.53, and 0.99 m above bottom of fuel rod (TE-3A11-030, -3C11-021, and -039).

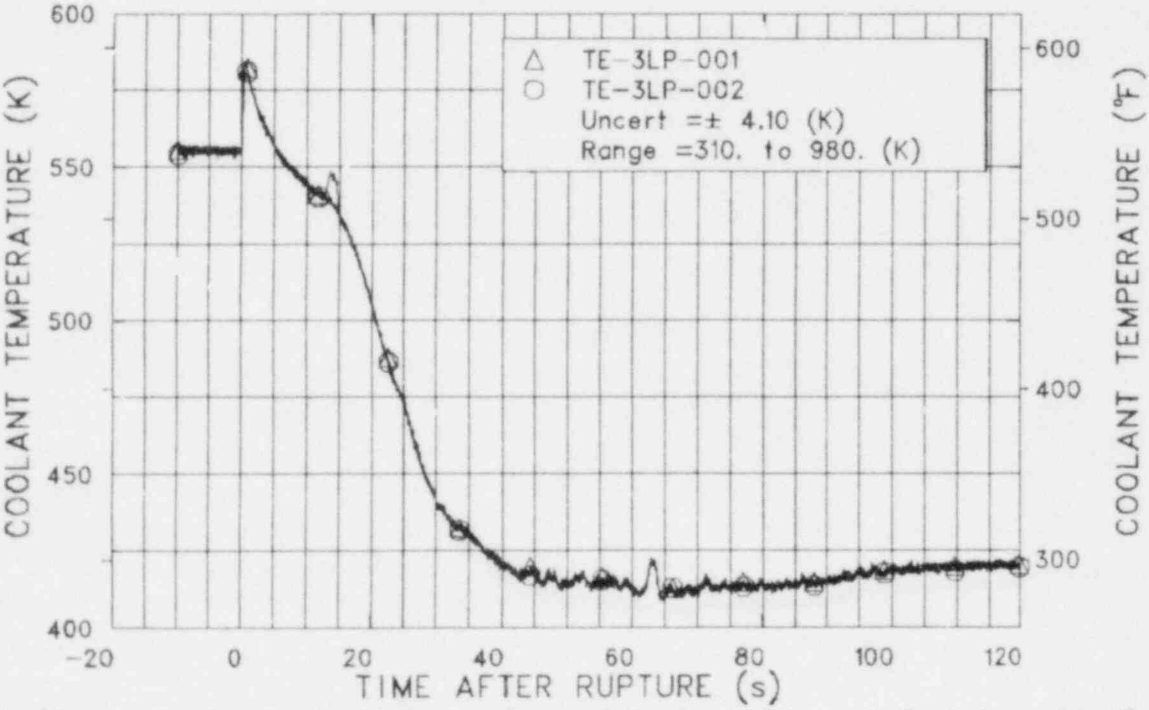


Figure 3L-102. Coolant temperature at lower end box of Fuel Assembly 3 (TE-3LP-001 and -002).

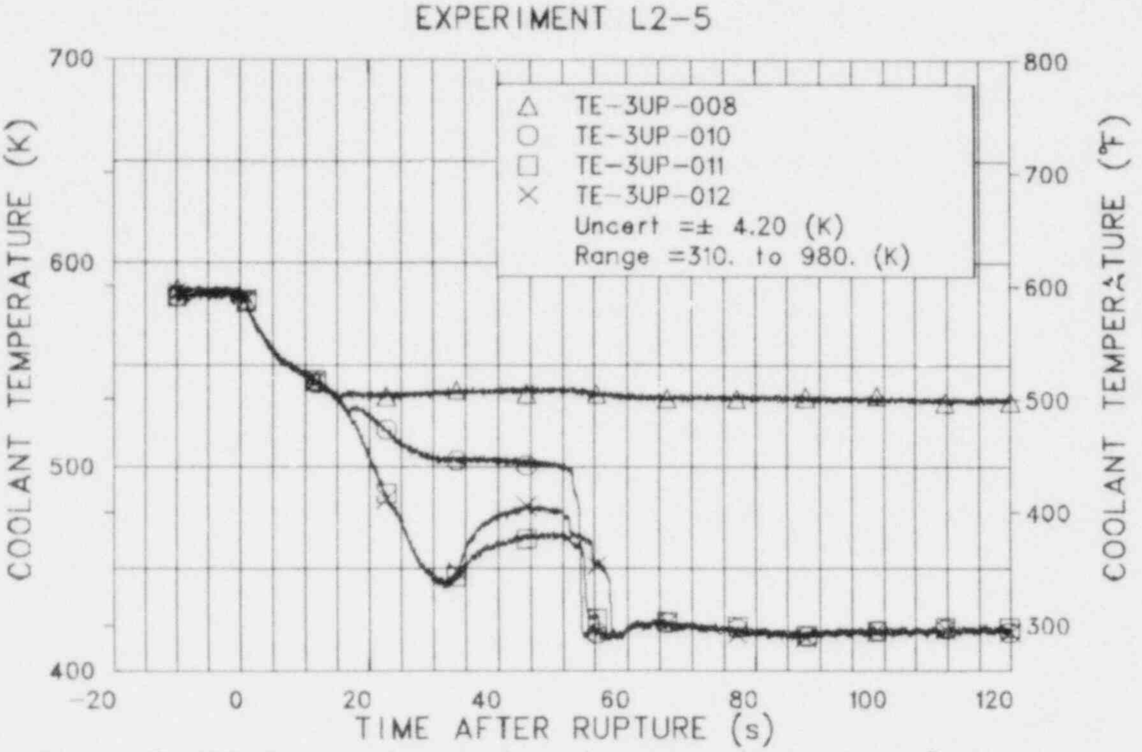


Figure 3L-103. Coolant temperature in upper plenum above Fuel Assembly 3 (TE-3UP-008, -010, 011, and -012).

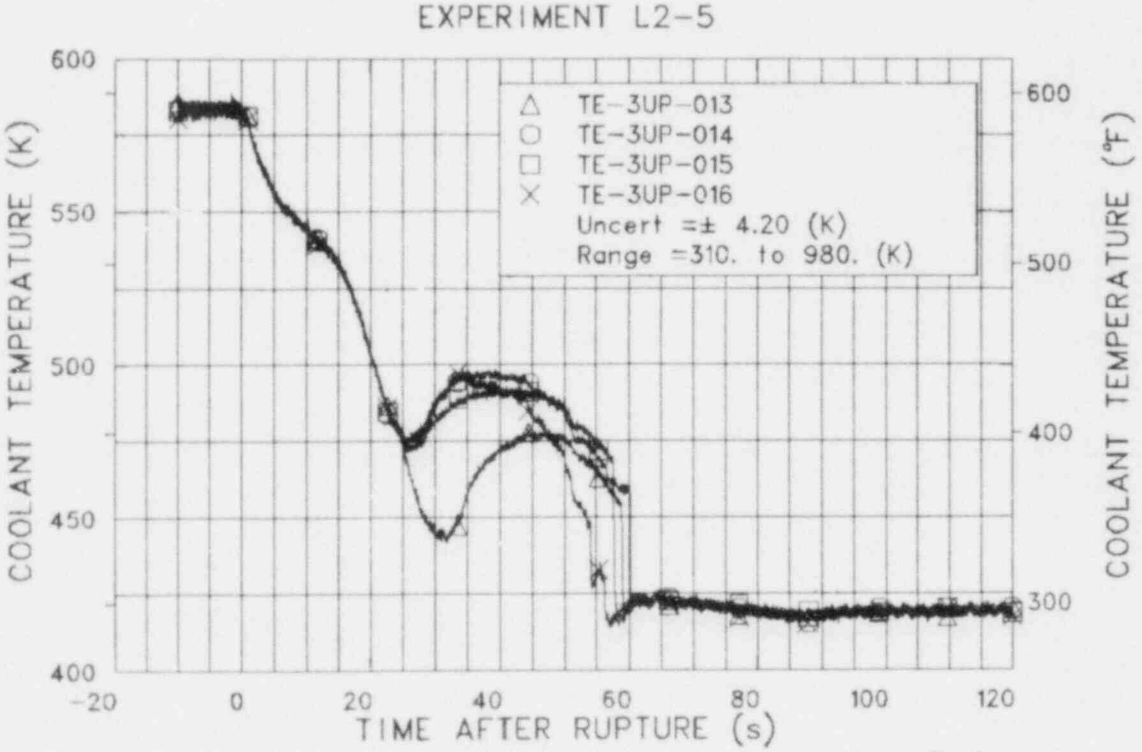


Figure 3L-104. Coolant temperature in upper plenum above Fuel Assembly 3 (TE-3UP-013, -014, -015, and -016).

EXPERIMENT L2-5

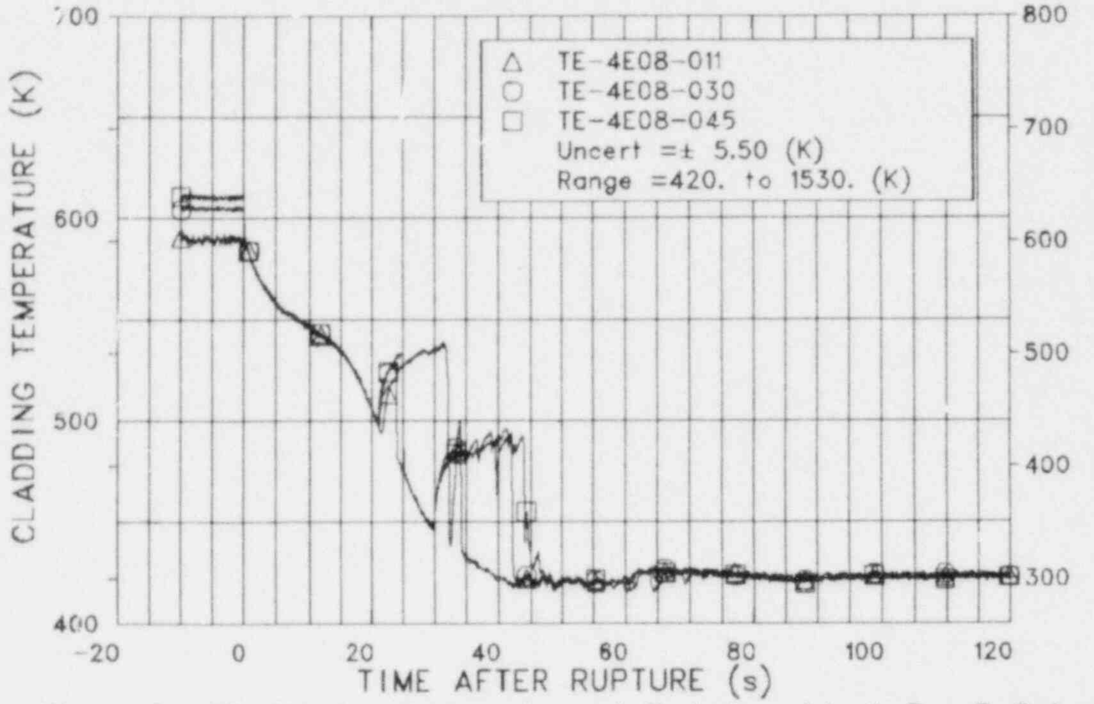


Figure 3L-105. Cladding temperature at Fuel Assembly 4, Row E, Column 8 at 0.28, 0.76, and 1.14 m above bottom of fuel rod (TE-4E08-011, -030, and -045).

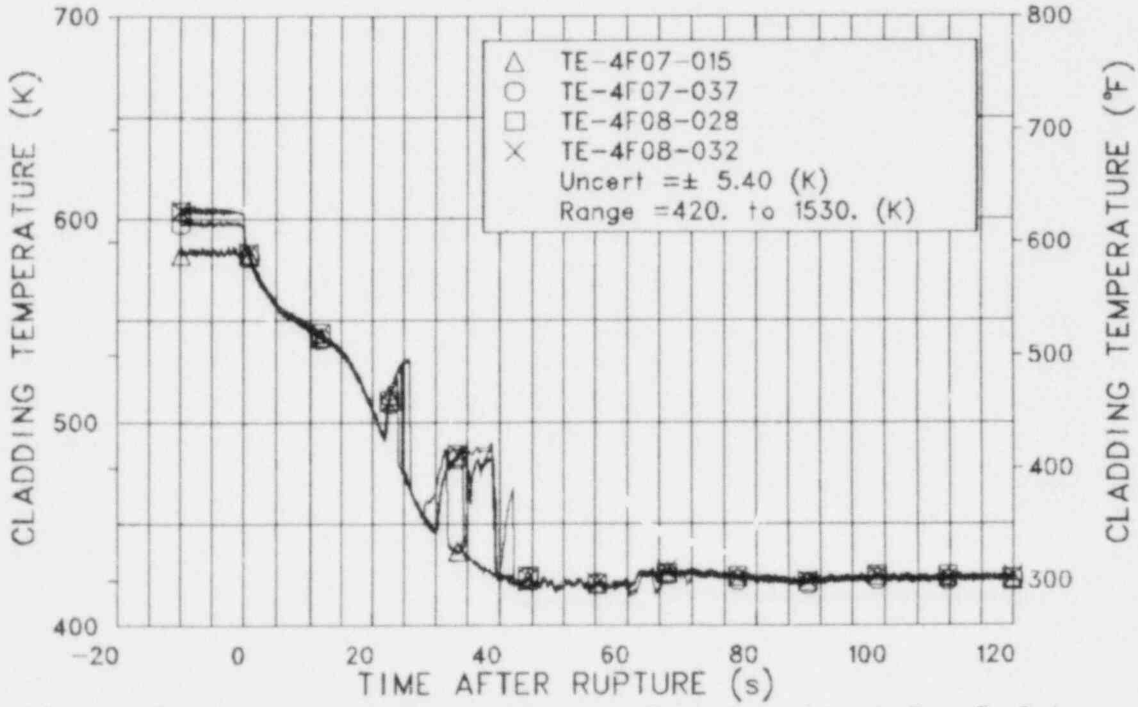


Figure 3L-106. Cladding temperature at Fuel Assembly 4, Row F, Columns 7 and 8 at 0.38, 0.94, 0.71, and 0.81 m above bottom of fuel rod (TE-4F07-015, -037, -4F08-028, and -032).

EXPERIMENT L2-5

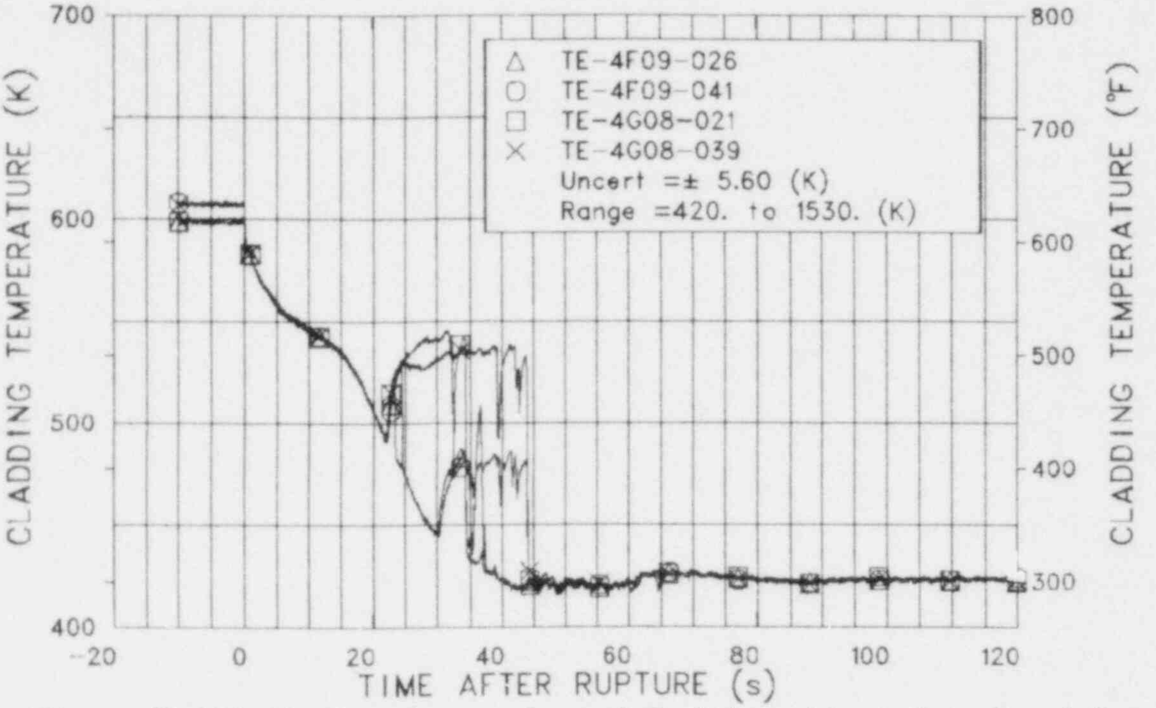


Figure 3L-107. Cladding temperature at Fuel Assembly 4, Rows F and G, Columns 9 and 8 at 0.66, 1.04, 0.53, and 0.99 m above bottom of fuel rod (TE-4F09-026, -041, -4G08-021, and -039).

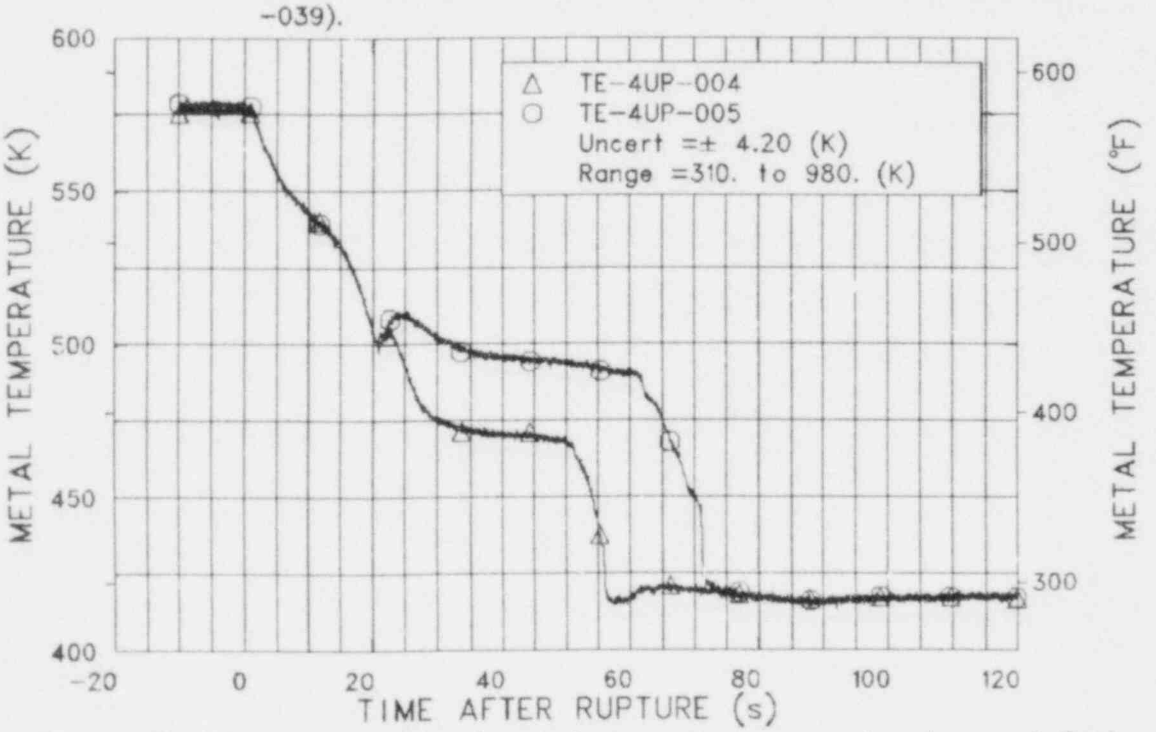


Figure 3L-108. Metal temperature at upper core support column of Fuel Assembly 4 (TE-4UP-004 and -005).

EXPERIMENT L2-5

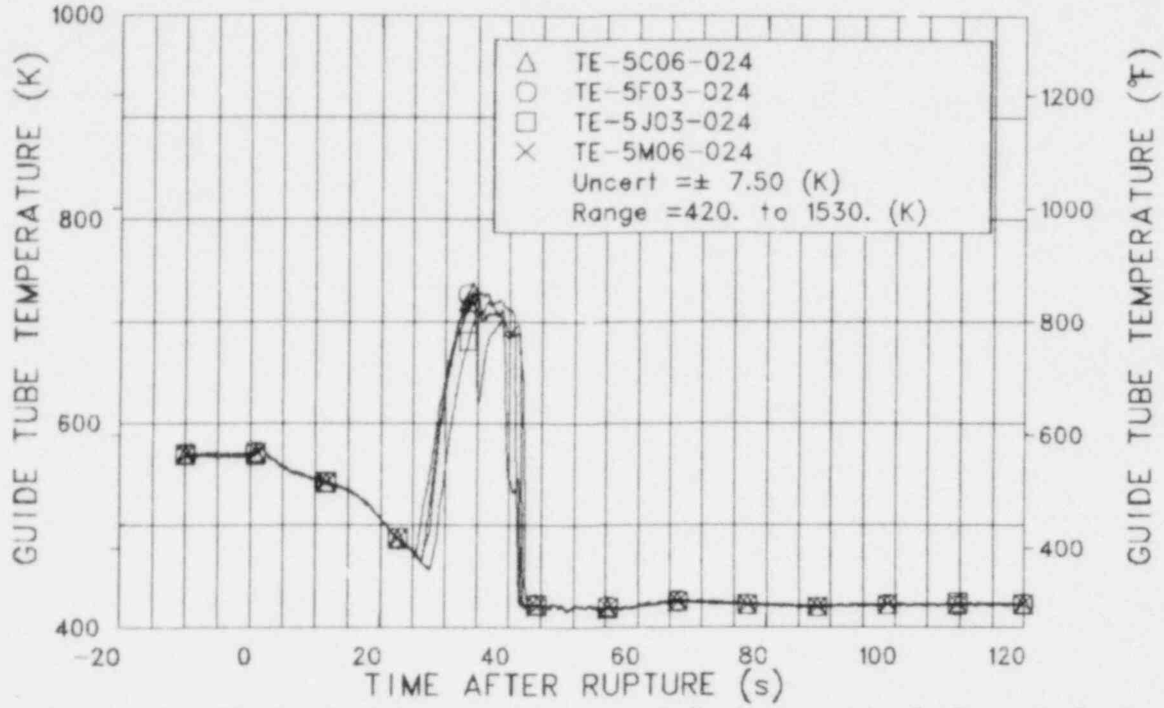


Figure 3L-109. Guide tube temperature at Fuel Assembly 5, Rows C, F, J, and M, Columns 3 and 6 at 0.61 m above bottom of guide tube (TE-5C06-024, -5F03-024, -5J03-024, and -5M06-024).

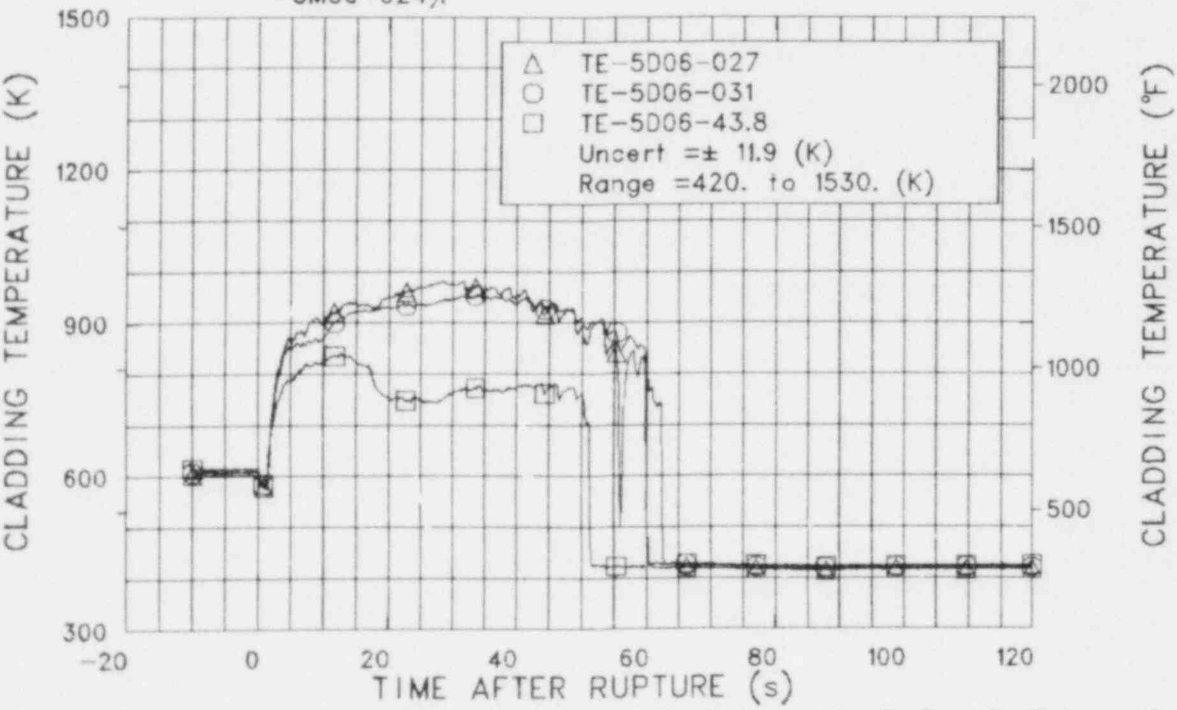


Figure 3L-110. Cladding temperature at Fuel Assembly 5, Row D, Column 6 at 0.69, 0.79, and 1.11 m above bottom of fuel rod (TE-5D06-027, -031, and -43.8).

EXPERIMENT L2-5

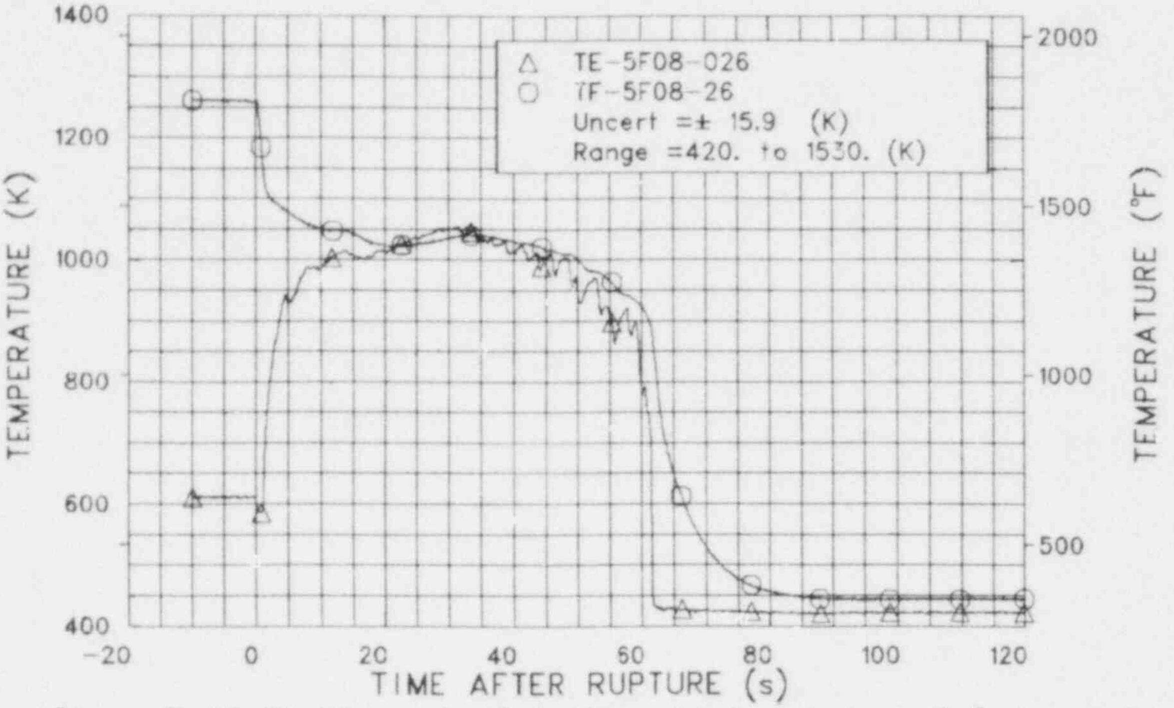


Figure 3L-111. Cladding and pellet off-center temperature at Fuel Assembly 5, Row F, Column 8 at 0.66 m above bottom of fuel rod (TE-5F08-026 and TF-5F08-26).

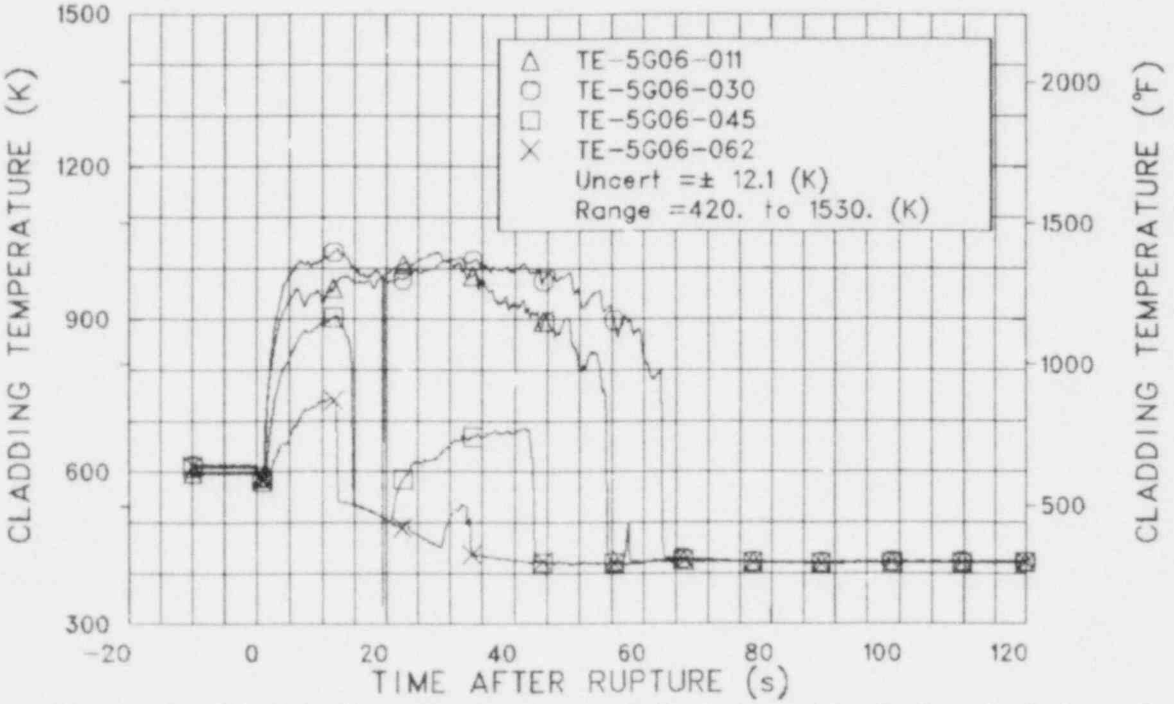


Figure 3L-112. Cladding temperature at Fuel Assembly 5, Row G, Column 6 at 0.28, 0.76, 1.14, and 1.57 m above bottom of fuel rod (TE-5G06-011, -030, -045, and -062).

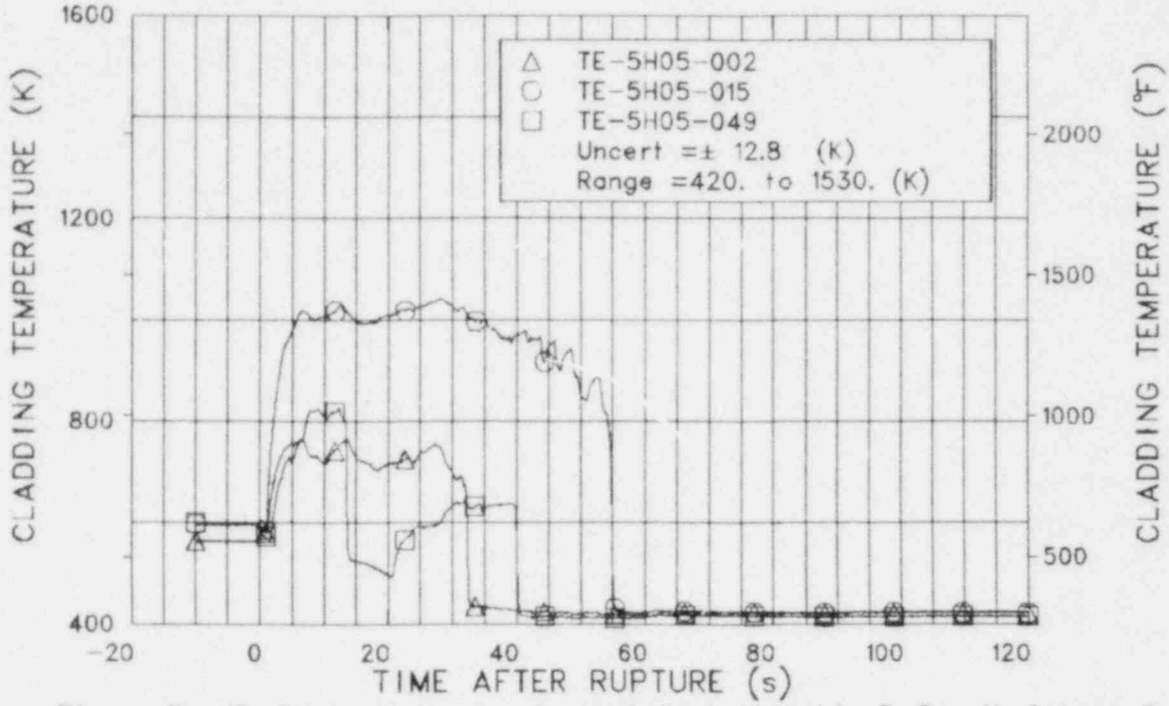


Figure 3L-113. Cladding temperature at Fuel Assembly 5, Row H, Column 5 at 0.05, 0.38, and 1.24 m above bottom of fuel rod (TE-5H05-002, -015, and -049).

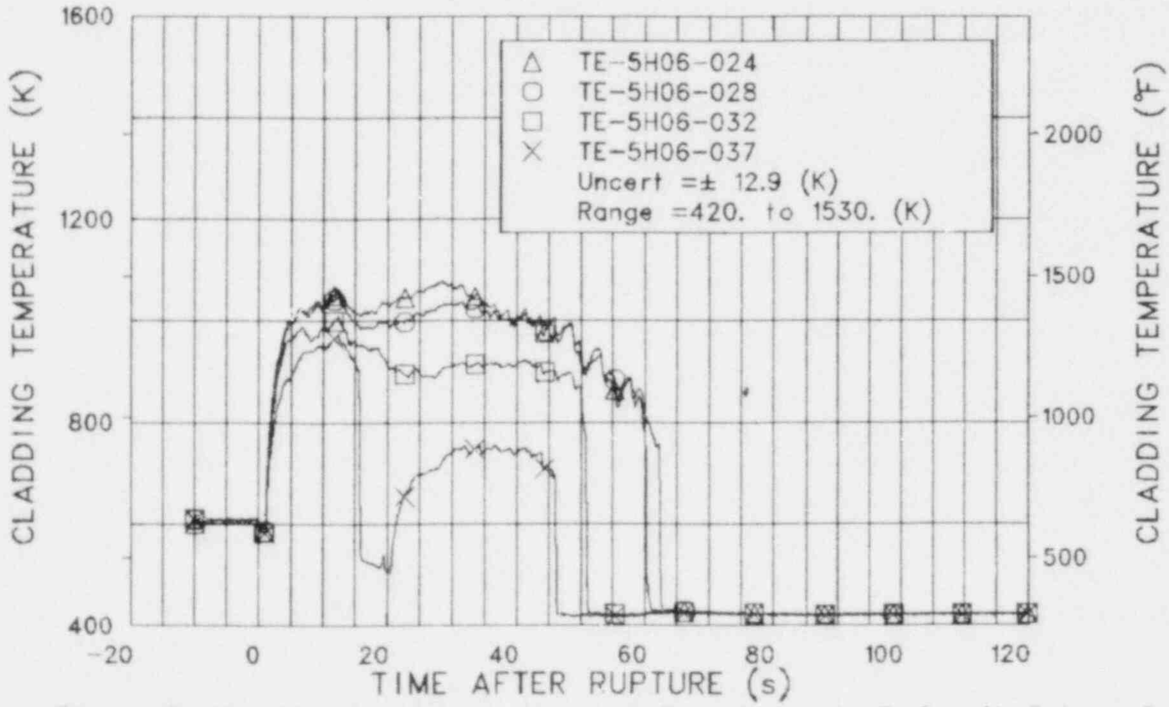


Figure 3L-114. Cladding temperature at Fuel Assembly 5, Row H, Column 6 at 0.61, 0.71, 0.81, and 0.94 m above bottom of fuel rod (TE-5H06-024, -028, -032, and -037).

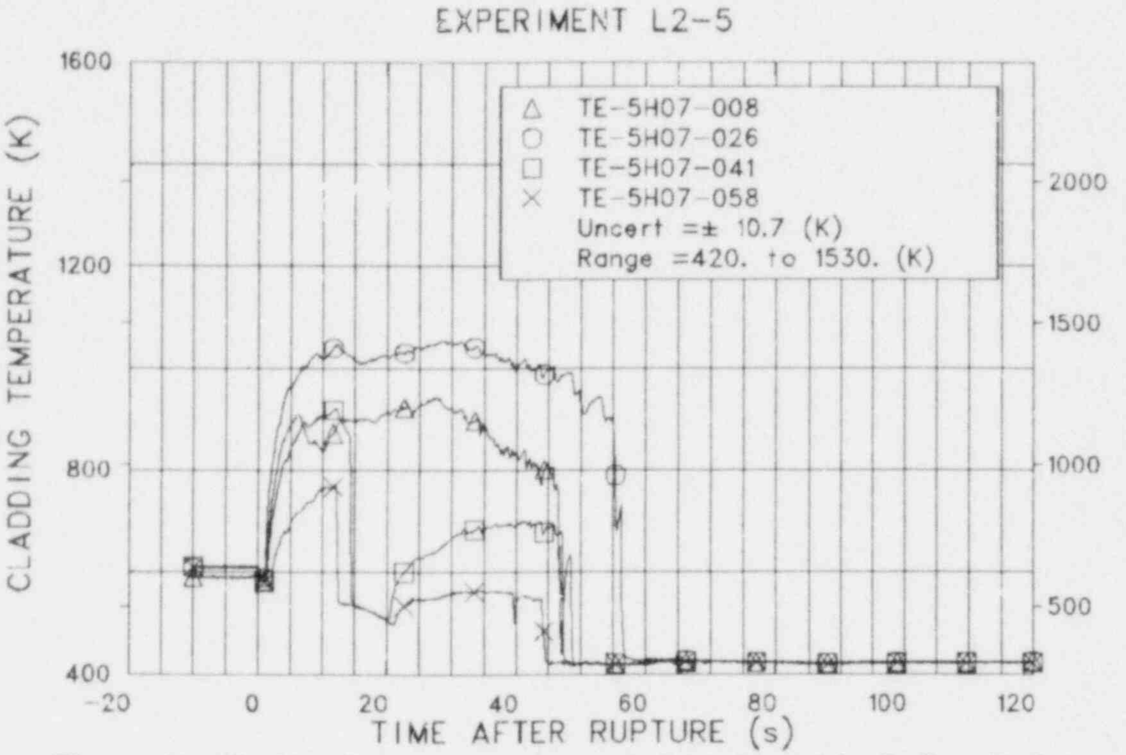


Figure 3L-115. Cladding temperature at Fuel Assembly 5, Row H, Column 7 at 0.20, 0.66, 1.04, and 1.47 m above bottom of fuel rod (TE-5H07-008, -026, -041, and -058).

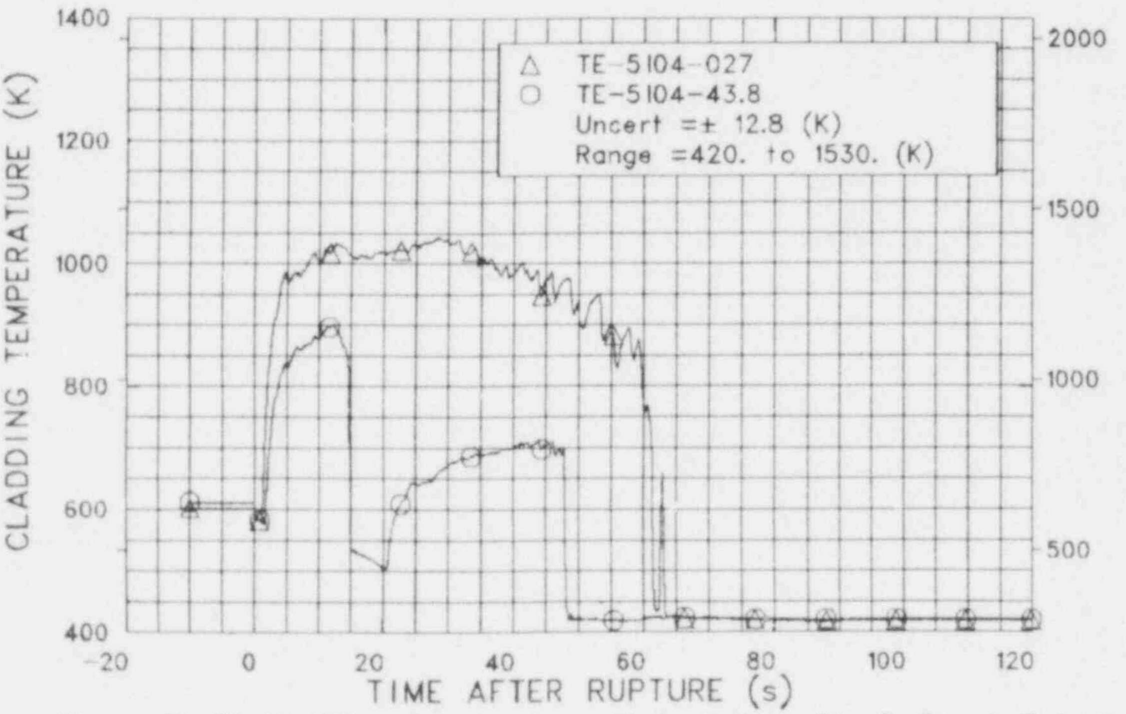


Figure 3L-116. Cladding temperature at Fuel Assembly 5, Row I, Column 4 at 0.69 and 1.11 m above bottom of fuel rod (TE-5I04-027 and -43.8).

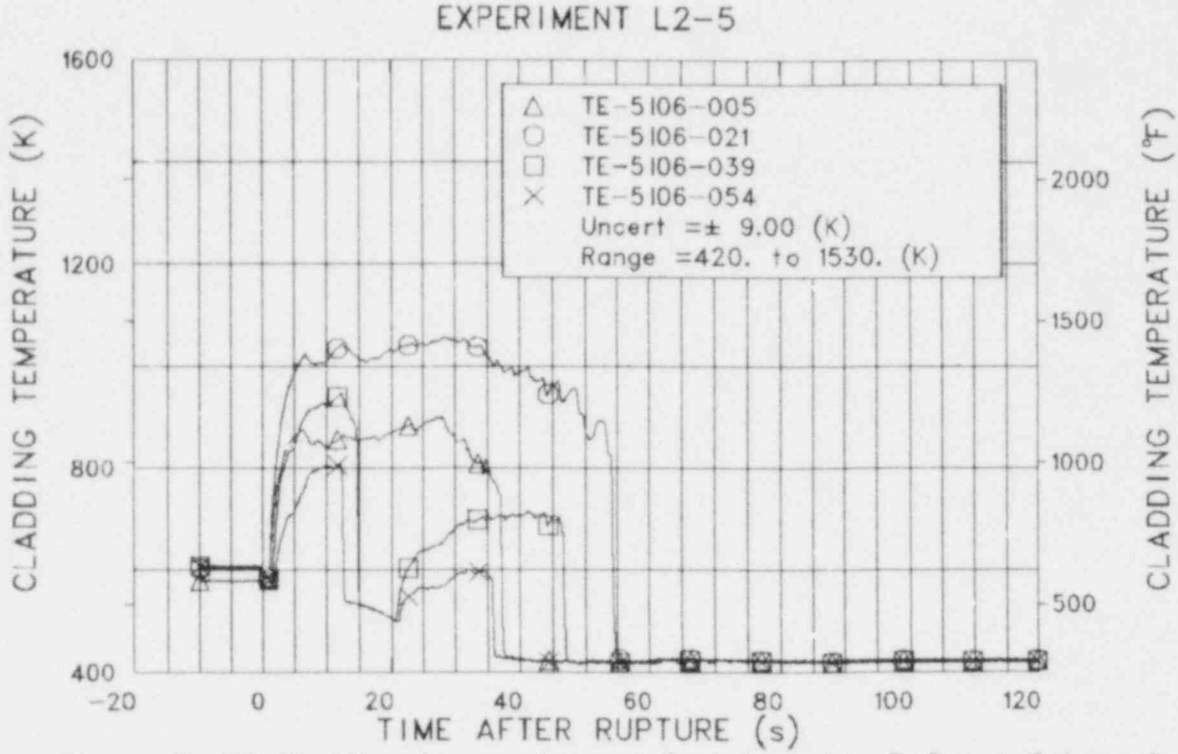


Figure 3L-117. Cladding temperature at Fuel Assembly 5, Row I, Column 6 at 0.13, 0.53, 0.99 and 1.37 m above bottom of fuel rod (TE-5I06-005, -021, -039, and -054).

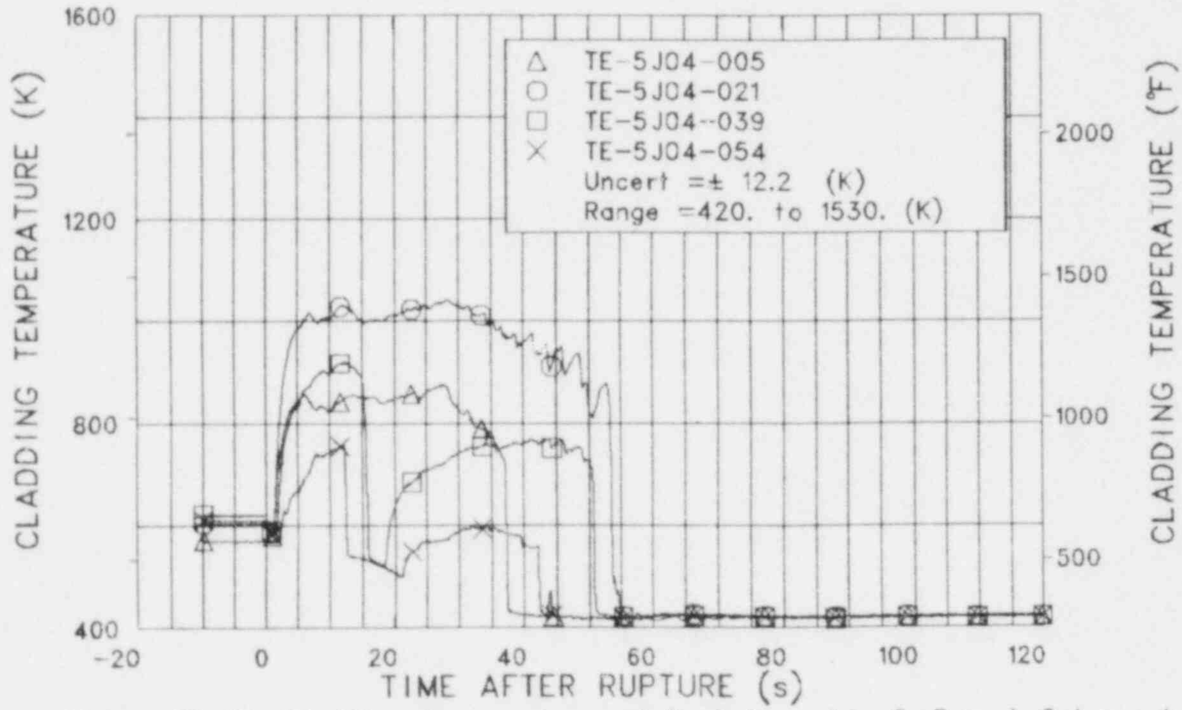


Figure 3L-118. Cladding temperature at Fuel Assembly 5, Row J, Column 4 at 0.13, 0.53, 0.99, and 1.37 m above bottom of fuel rod (TE-5J04-005, -021, -039, and -054).

EXPERIMENT L2-5

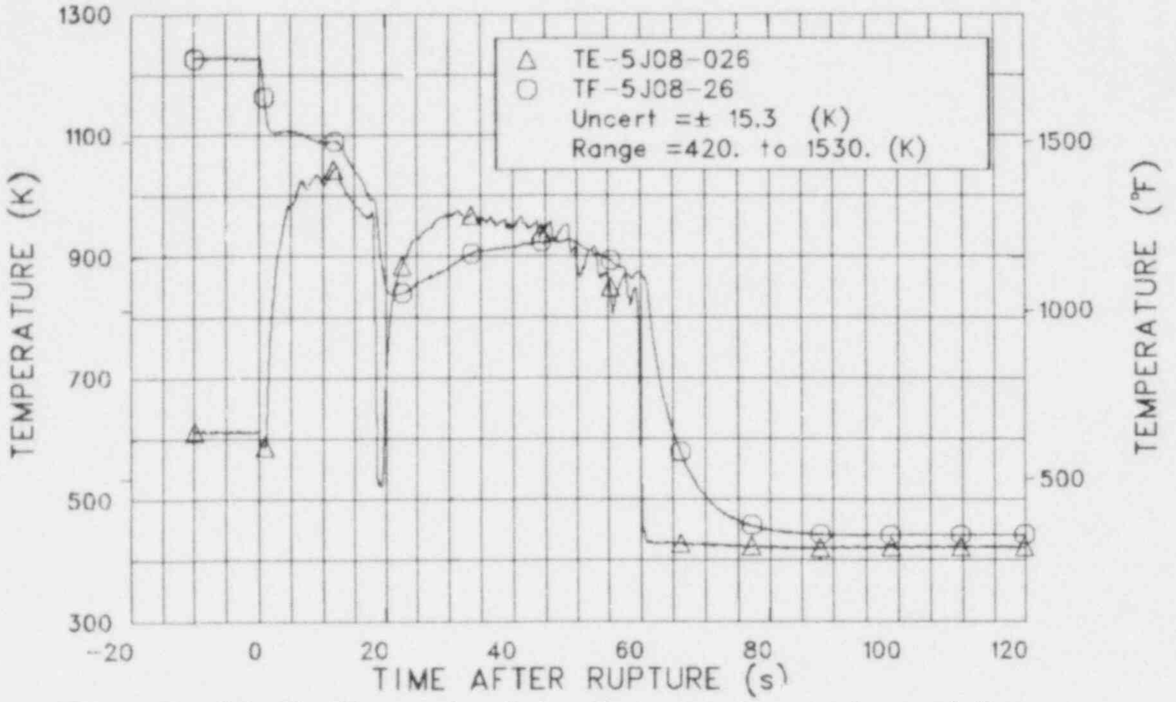


Figure 3L-119. Cladding and pellet off-center temperature at Fuel Assembly 5, Row J, Column 8 at 0.66 m above bottom of fuel rod (TE-5J08-026 and TF-5J08-26).

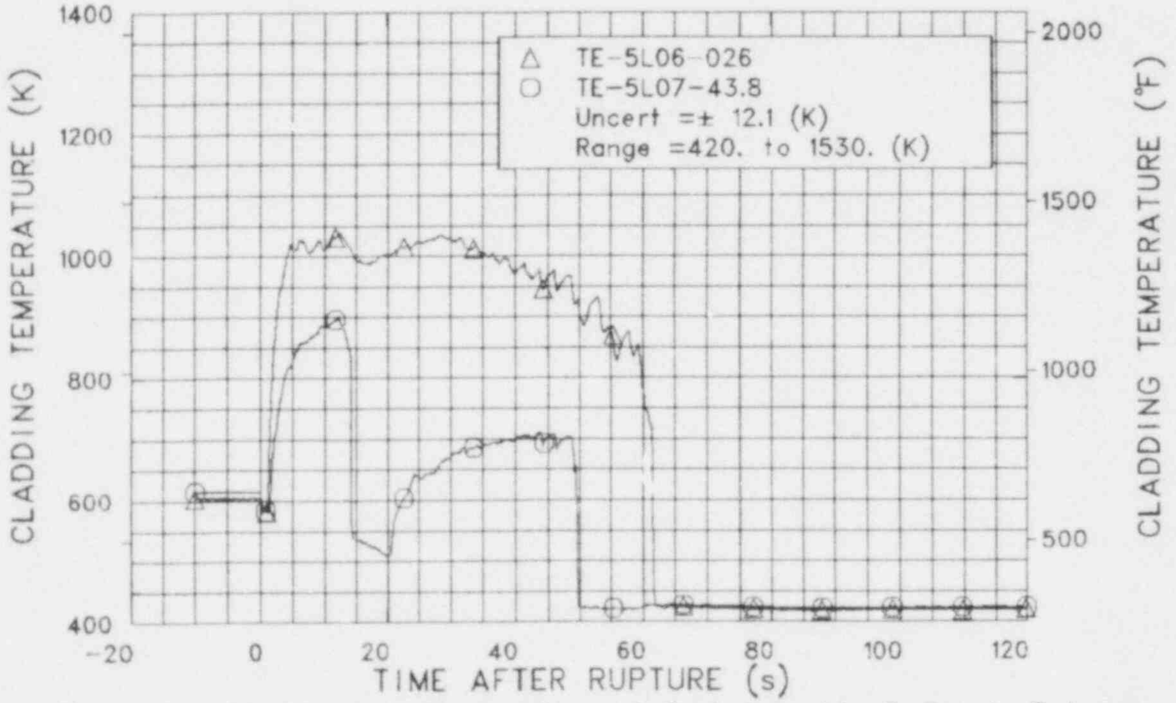


Figure 3L-120. Cladding temperature at Fuel Assembly 5, Row L, Columns 6 and 7 at 0.66 and 1.11 m above bottom of fuel rod (TE-5L06-026 and -5L07-43.8).

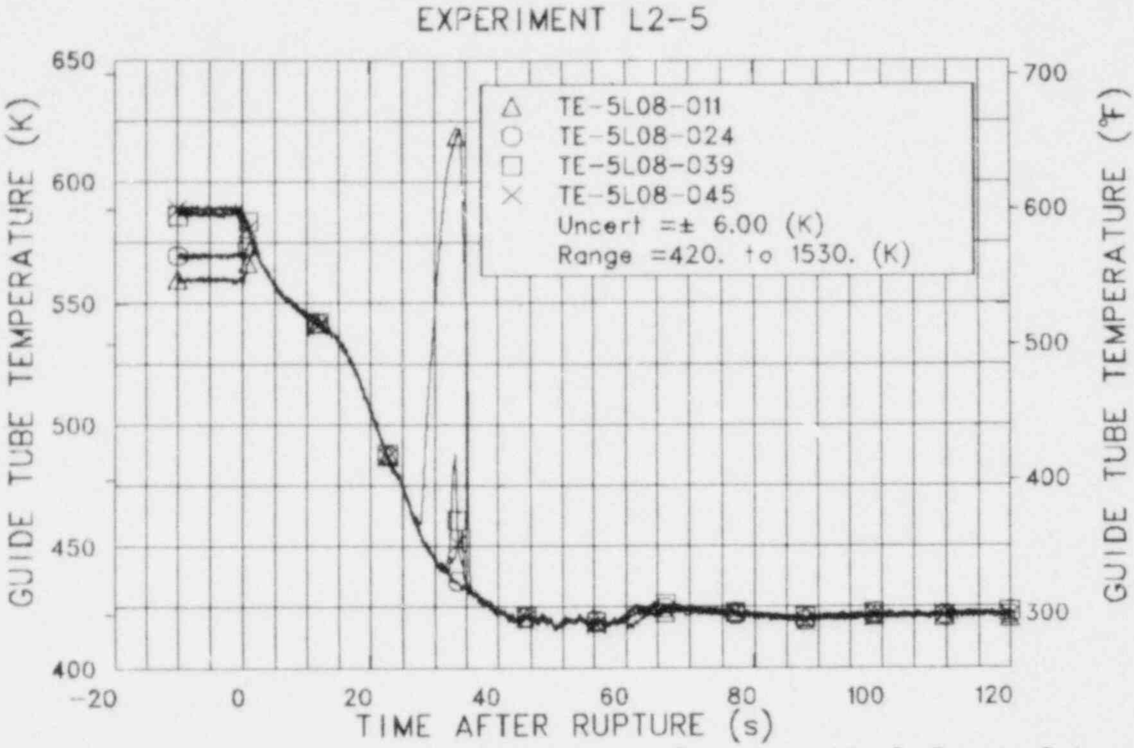


Figure 3L-121. Guide tube temperature at Fuel Assembly 5, Row L, Column 8 at 0.28, 0.61, 0.99 and 1.14 m above bottom of guide tube (TE-5L08-011, -024, -039, and -045).

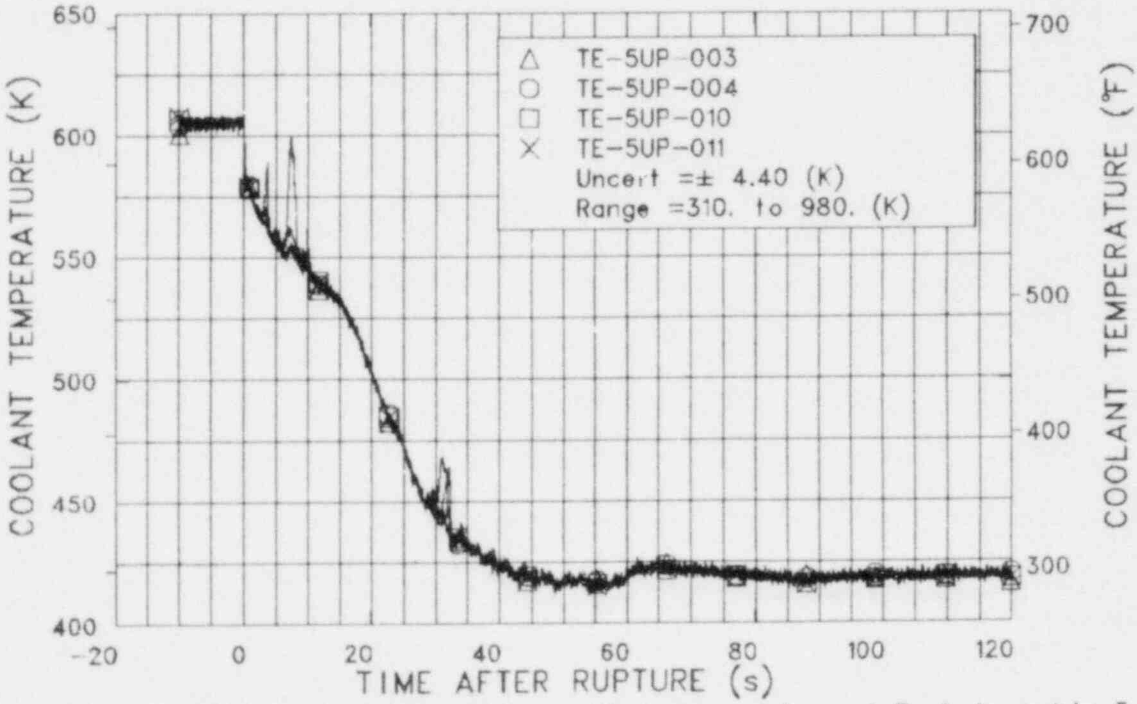


Figure 3L-122. Coolant temperature at upper end box of Fuel Assembly 5 (TE-5UP-003, -004, -010, and -011).

EXPERIMENT L2-5

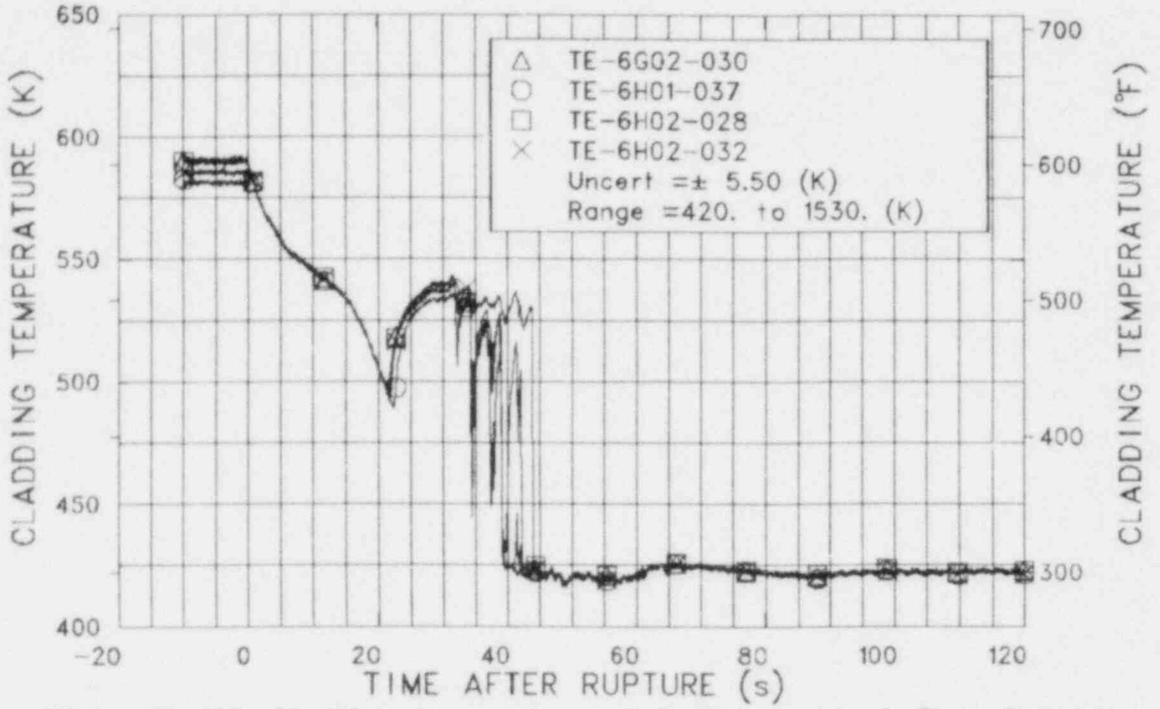


Figure 3L-123. Cladding temperature at Fuel Assembly 6, Rows G and H, Columns 1 and 2 at 0.76, 0.94, 0.71, and 0.81 m above bottom of fuel rod (TE-6G02-030, -6H01-037, -6H02-028, and -032).

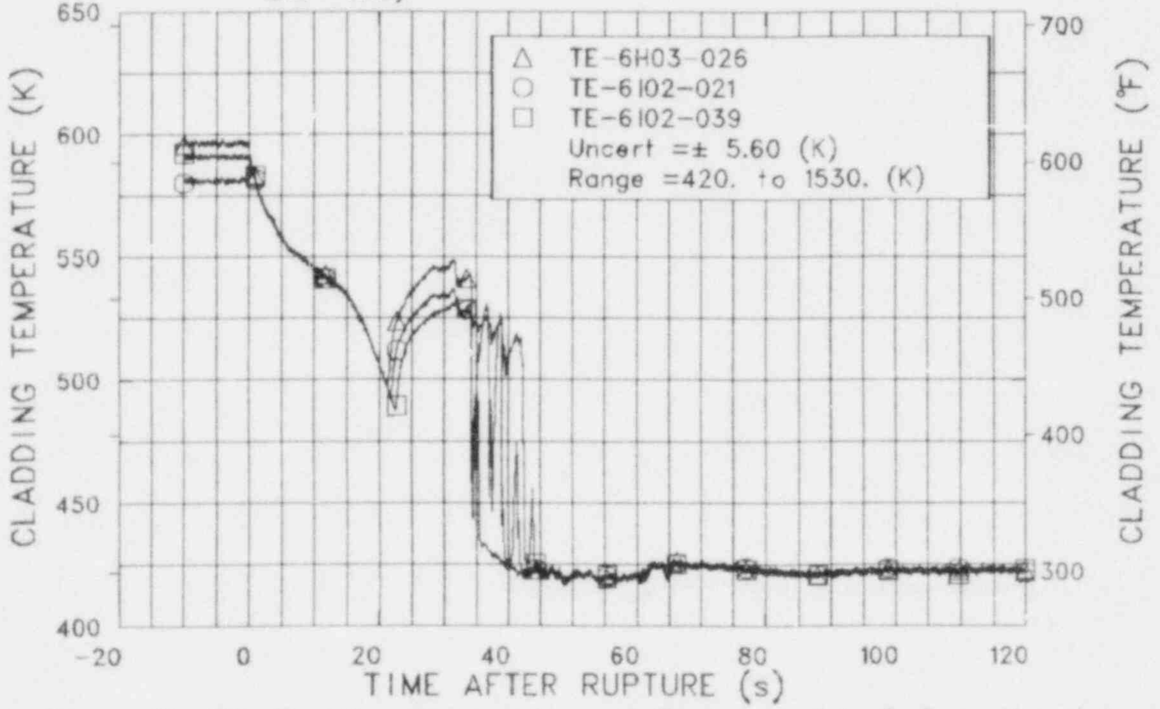


Figure 3L-124. Cladding temperature at Fuel Assembly 6, Rows H and I, Columns 2 and 3 at 0.66, 0.53, and 0.99 m above bottom of fuel rod (TE-6H03-026, -6I02-021, and -039).

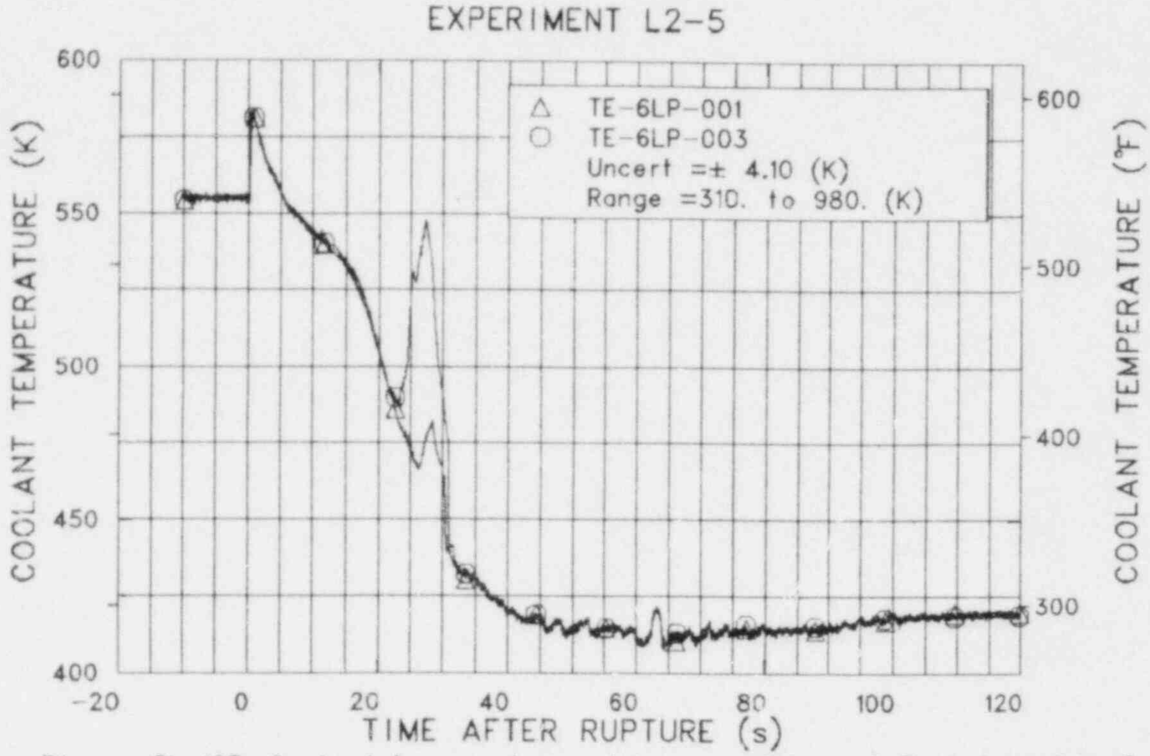


Figure 3L-125. Coolant temperature at lower end box of Fuel Assembly 6 (TE-6LP-001 and -003).

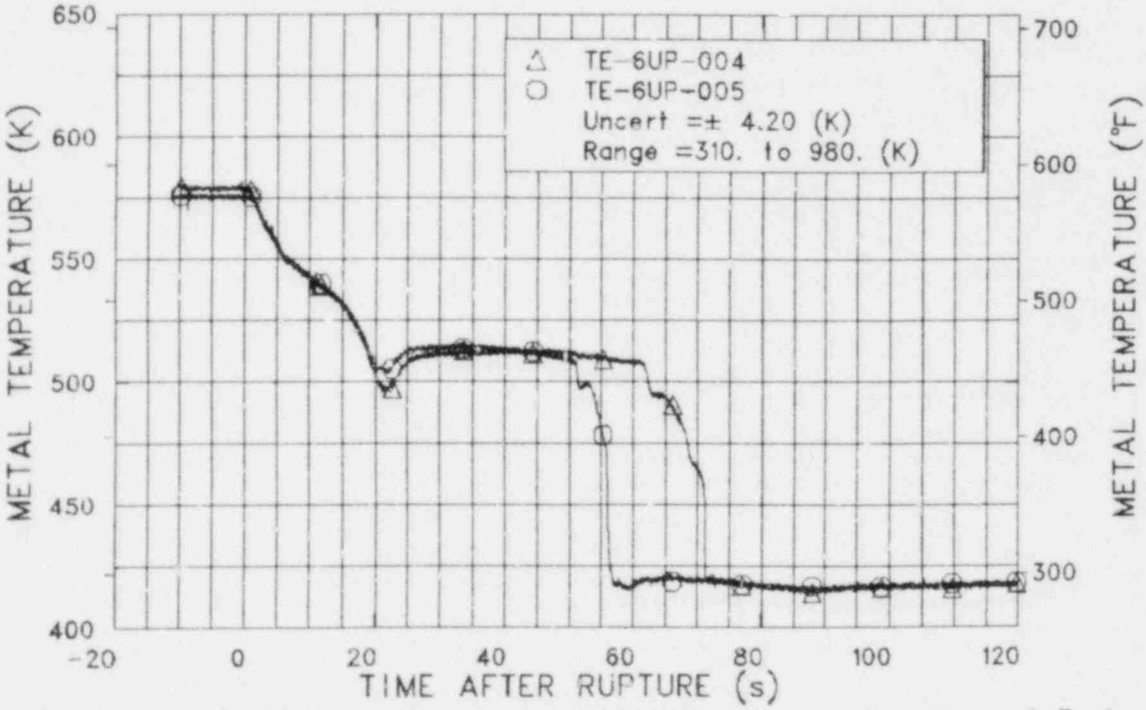


Figure 3L-126. Metal temperature at upper core support column of Fuel Assembly 6 (TE-6UP-004 and -005).

EXPERIMENT L2-5

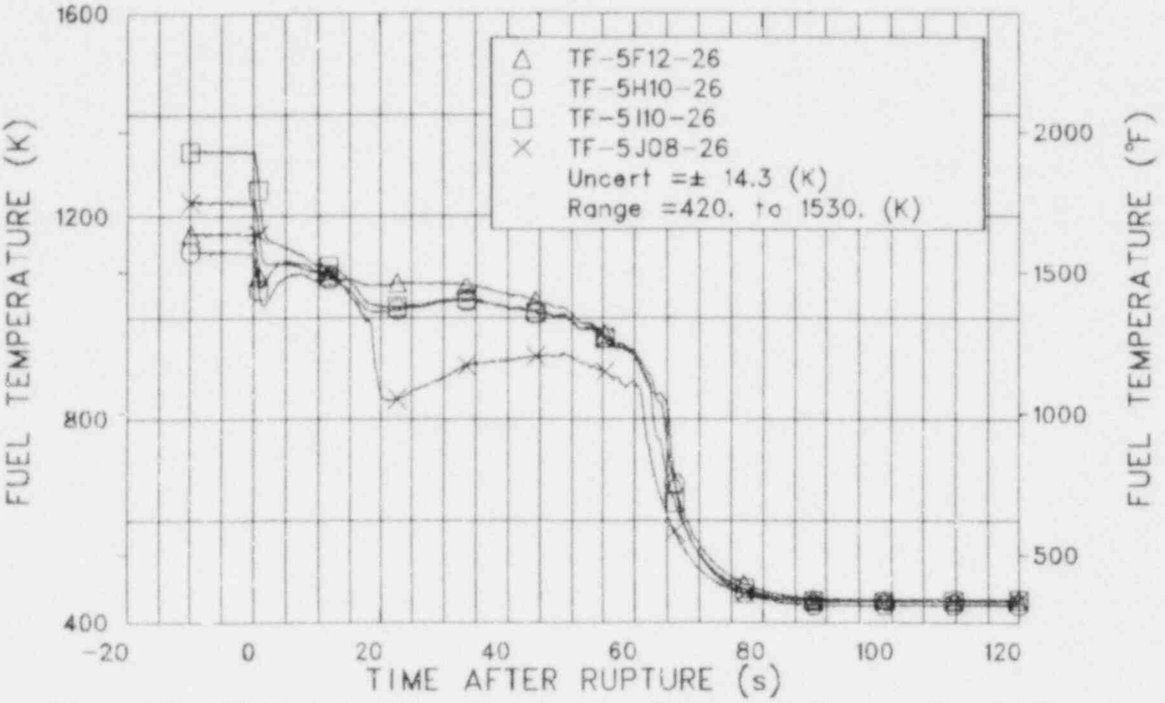


Figure 3L-127. Pellet off-center temperature at Fuel Assembly 5, Rows F, H, I, and J, Columns 12, 10, and 8 at 0.66 m above bottom of fuel rod (TF-5F12-26, -5H10-26, -5I10-26, and -5J08-26).

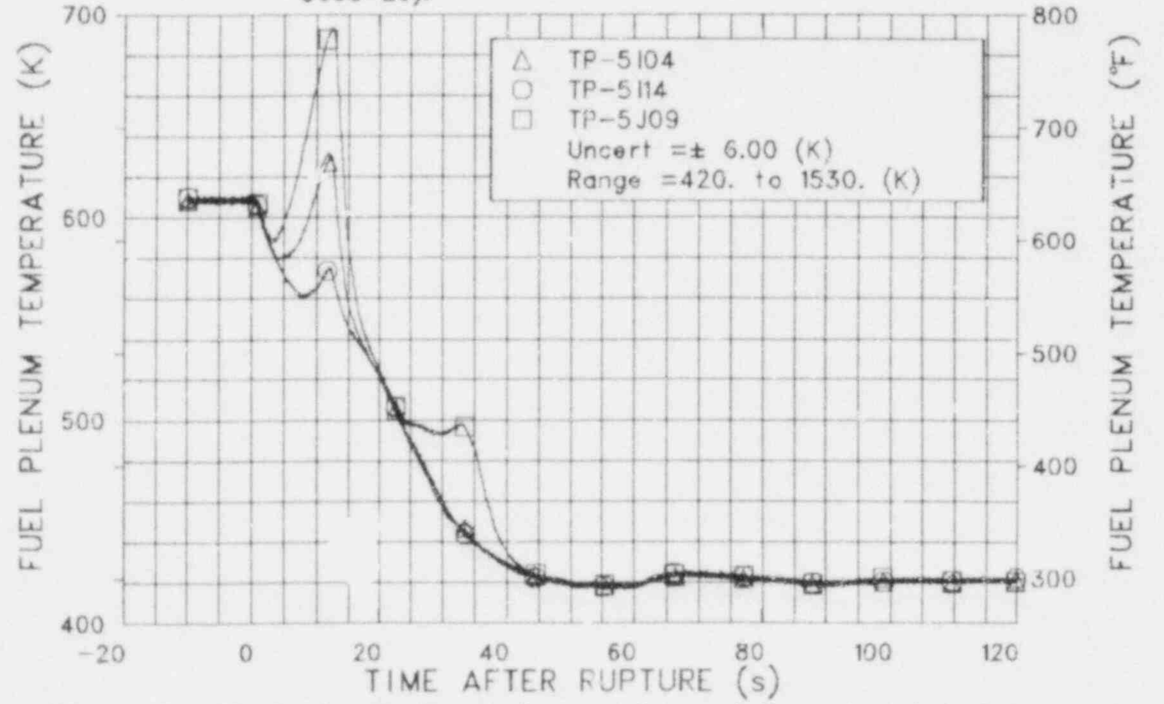


Figure 3L-128. Fuel rod plenum temperature at Rows I and J, Columns 4, 14, and 9 of Fuel Assembly 5 (TP-5I04, -5I14, and -5J09).

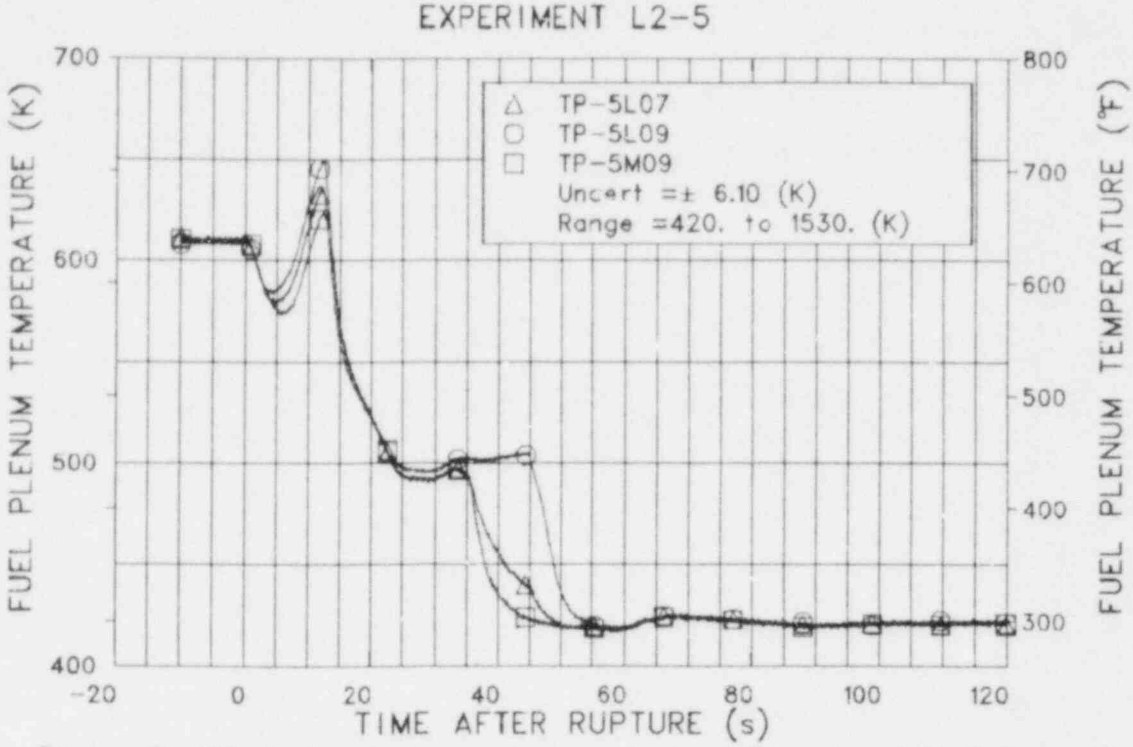


Figure 3L-129. Fuel rod plenum temperature at Rows L and M, Columns 7 and 9 of Fuel Assembly 5 (TP-5L07, -5L09, and -5M09).

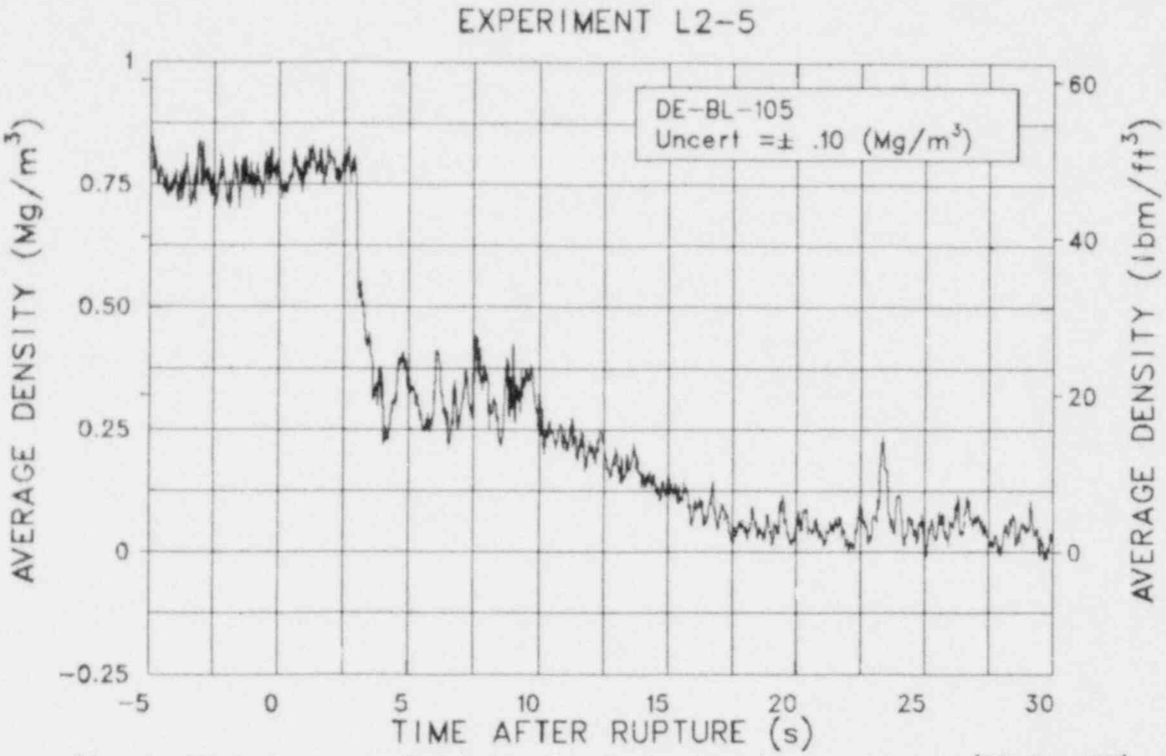


Figure 3C-1. Average fluid density in broken loop cold leg (DE-BL-105) (qualified, except for spurious spikes).

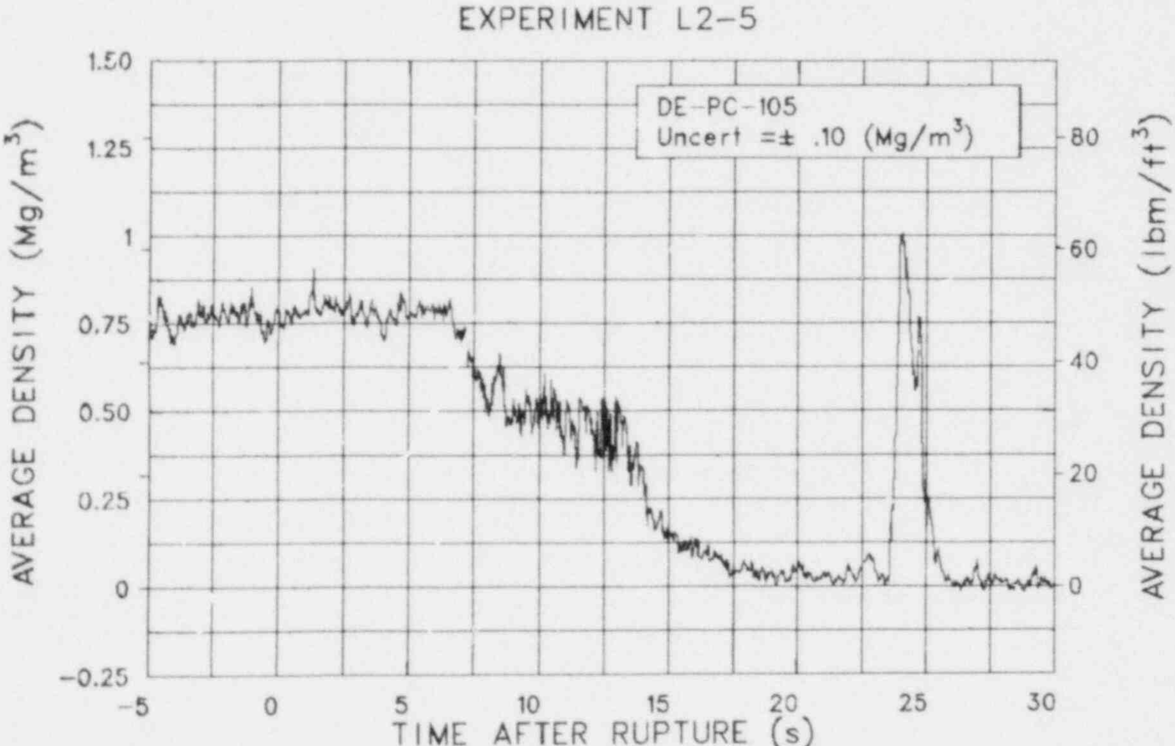


Figure 3C-2. Average fluid density in intact loop cold leg (DE-PC-105) (qualified, except for spurious spikes).

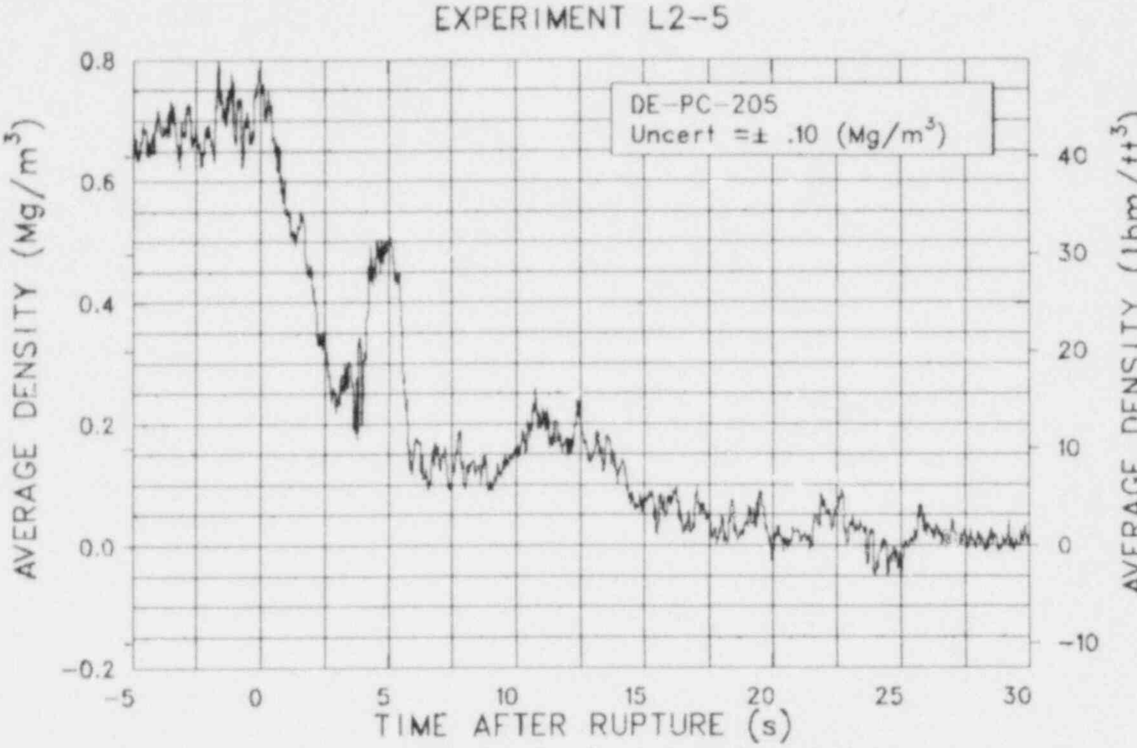


Figure 3C-3. Average fluid density in intact loop hot leg (DE-PC-205).

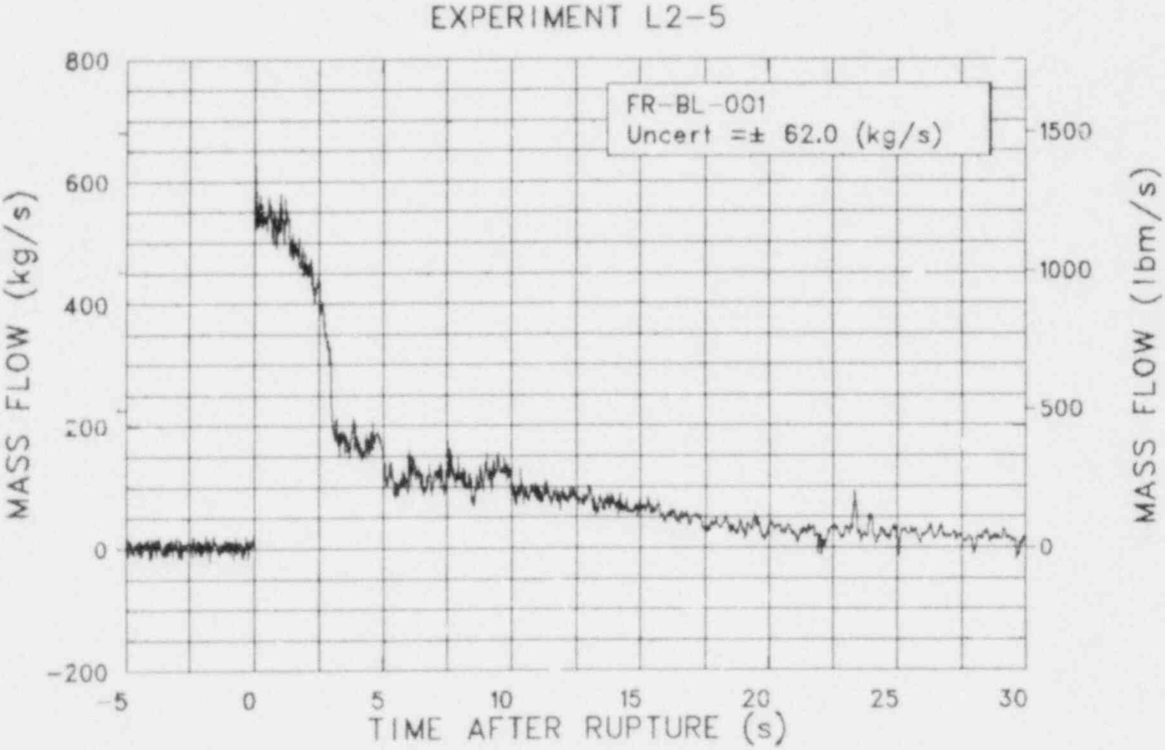


Figure 3C-4. Mass flow rate through break orifice in broken loop cold leg (FR-BL-001) (qualified to 400 s).

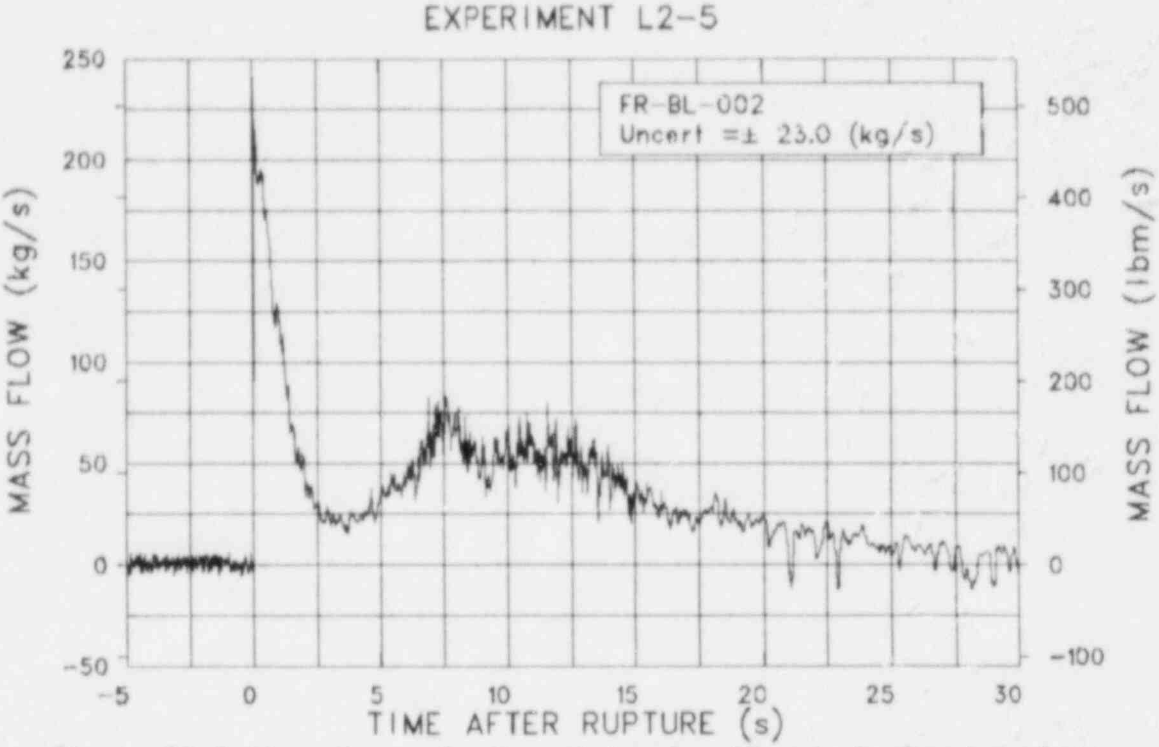


Figure 3C-5. Mass flow rate through break orifice in broken loop hot leg (FR-BL-002) (qualified to 400 s).

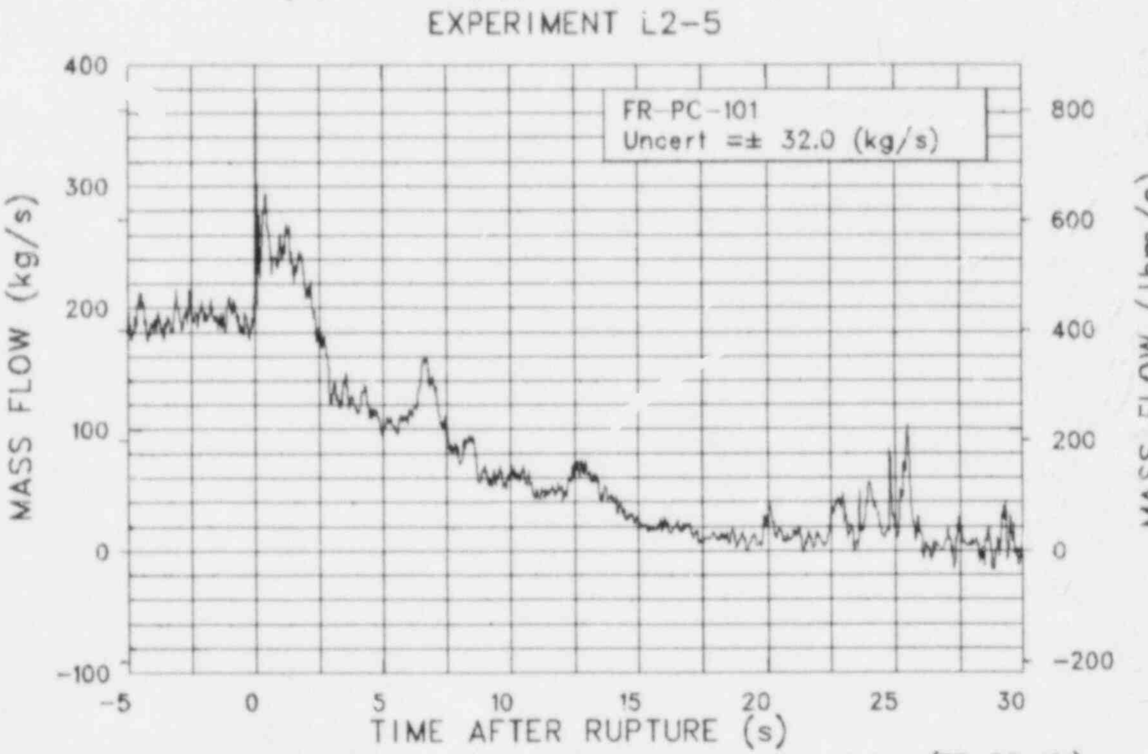


Figure 3C-6. Mass flow rate through intact loop cold leg (FR-PC-101) (qualified, flow direction not indicated).

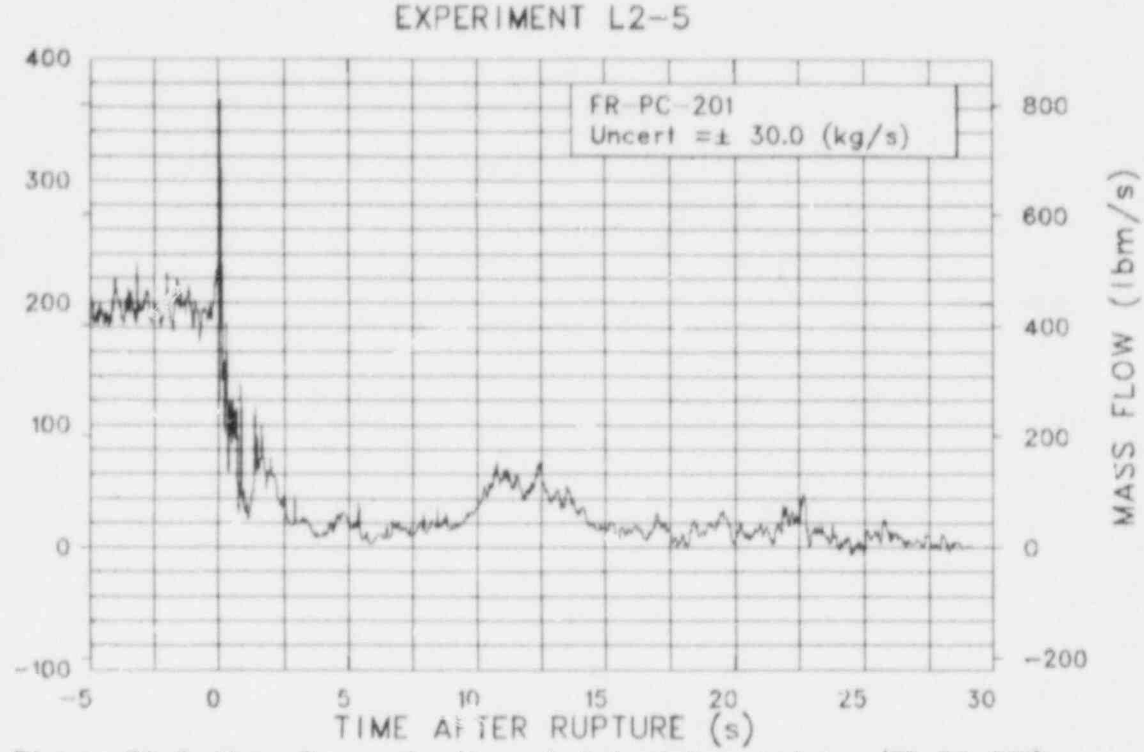


Figure 3C-7. Mass flow rate through intact loop hot leg (FR-PC-201) (qualified, flow direction not indicated).

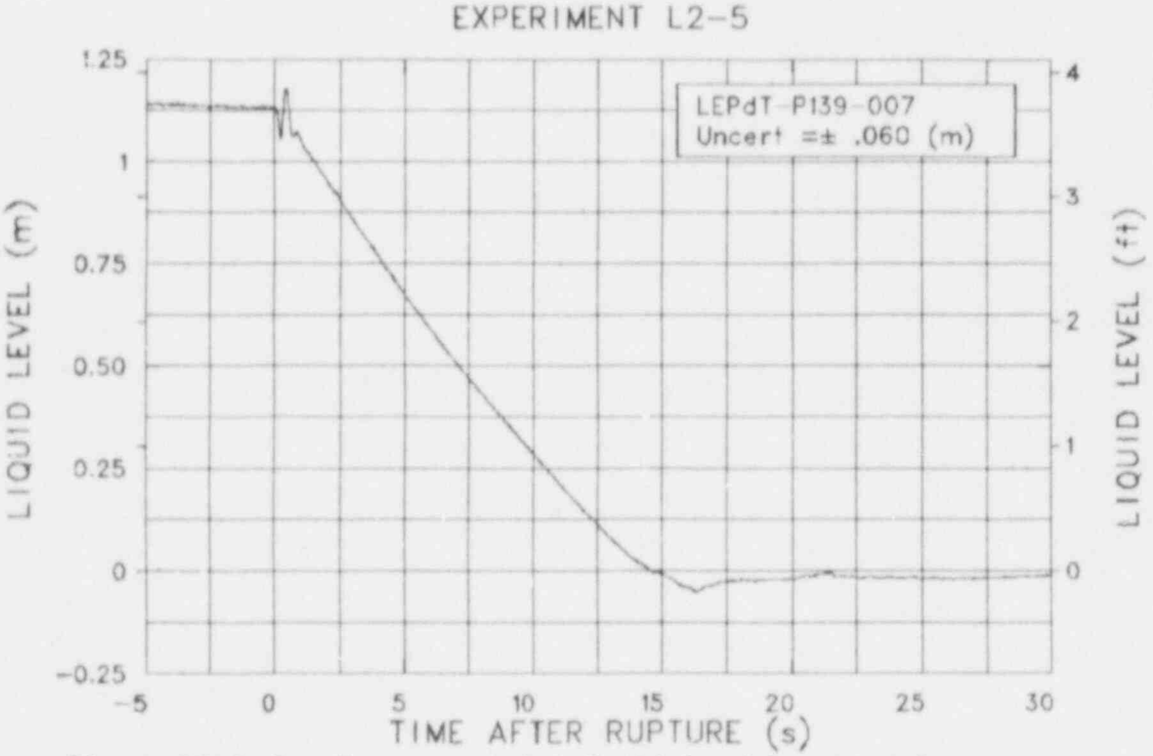


Figure 3C-8. Density compensated liquid level in pressurizer (LEPdT-P139-007) (qualified to 20 s).

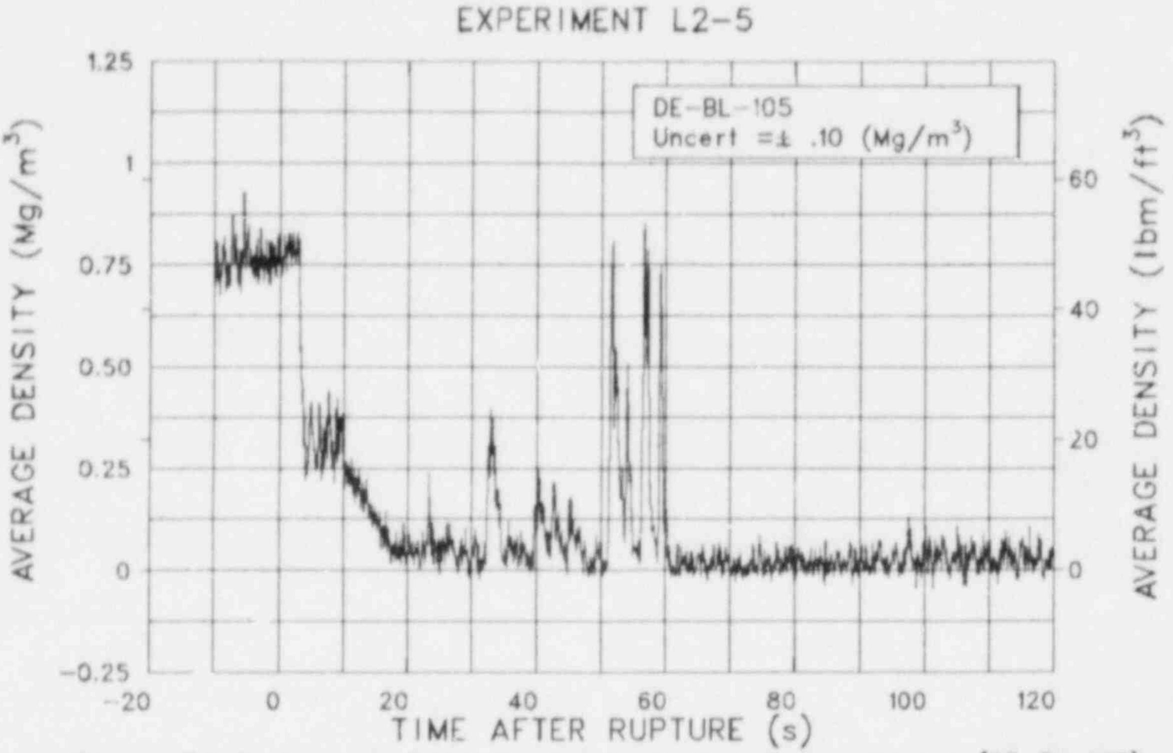


Figure 3C-9. Average fluid density in broken loop cold leg (DE-BL-105) (qualified, except for spurious spikes).

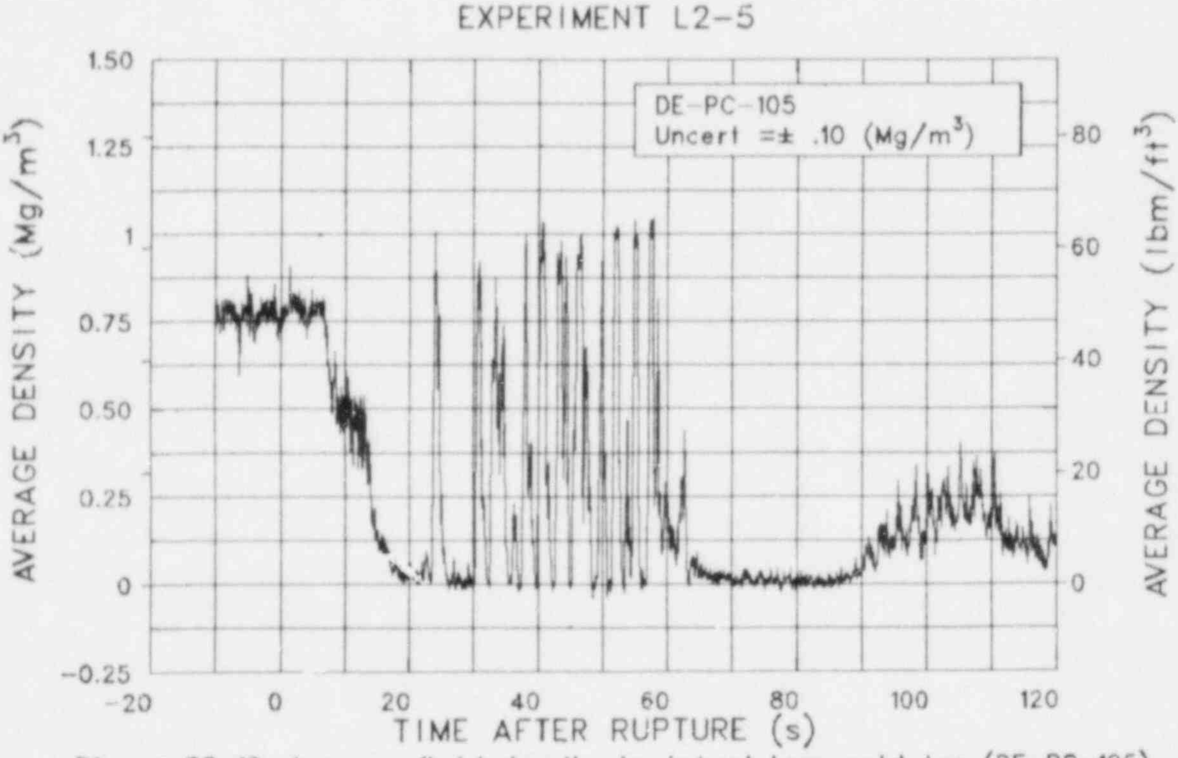


Figure 3C-10. Average fluid density in intact loop cold leg (DE-PC-105) (qualified, except for spurious spikes).

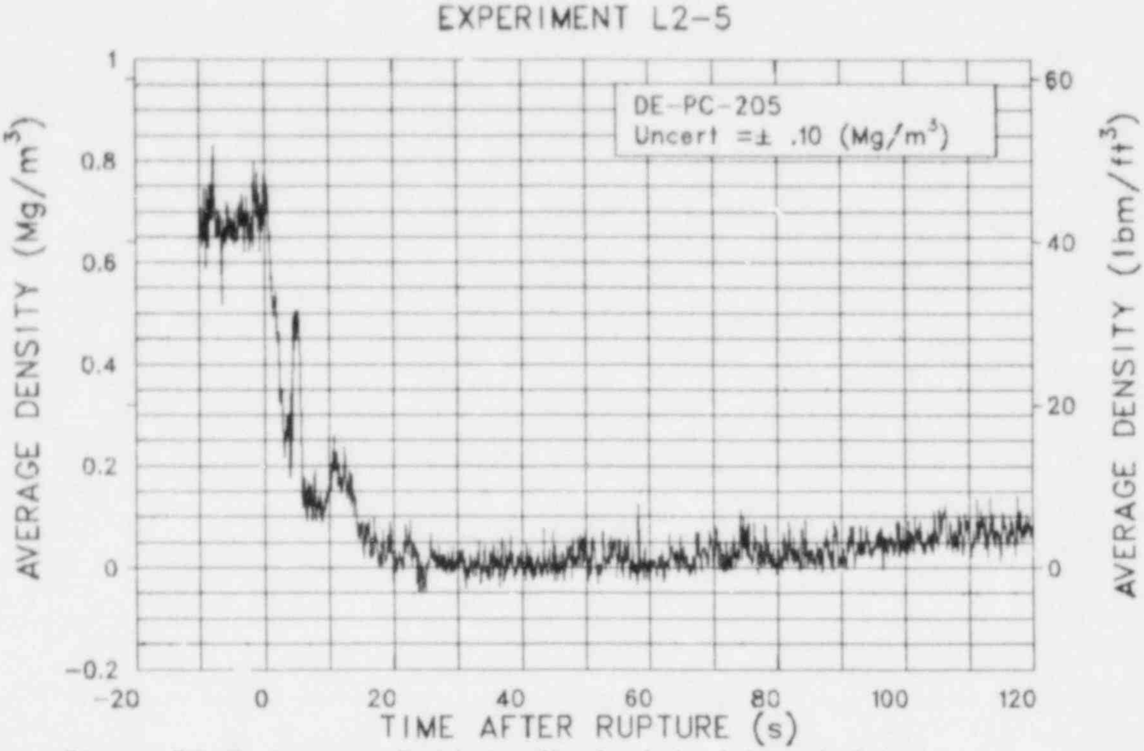


Figure 3C-11. Average fluid density in intact loop hot leg (DE-PC-205).

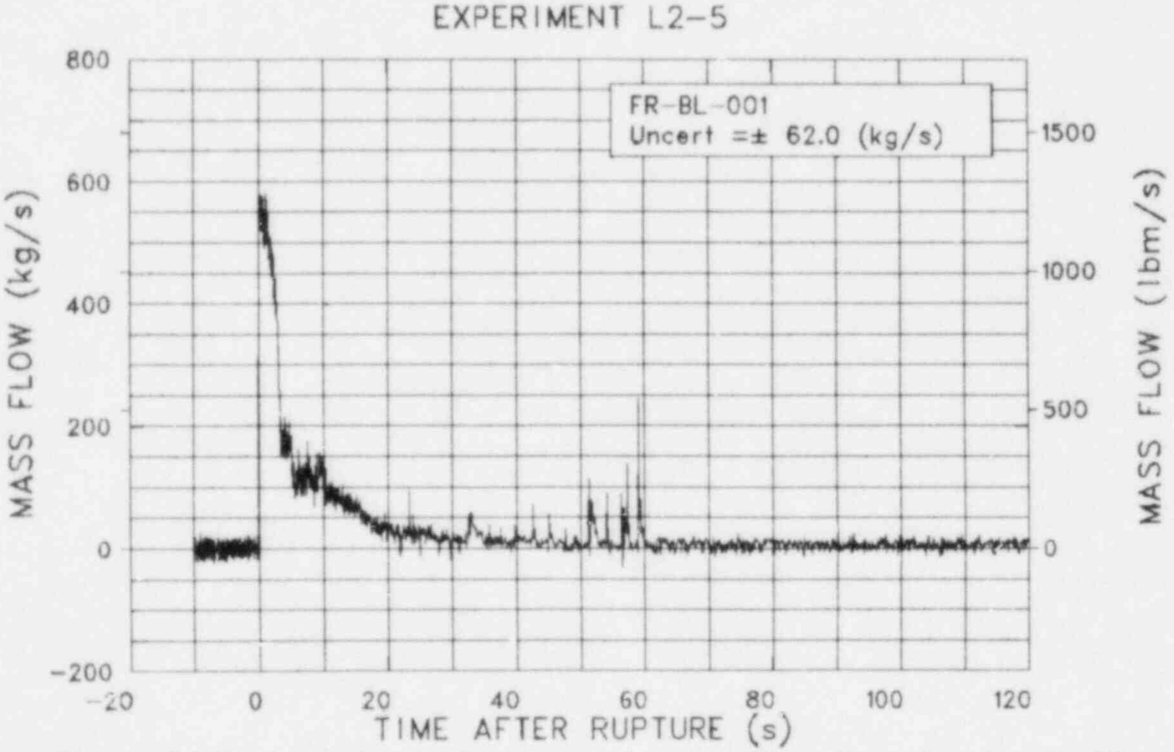


Figure 3C-12. Mass flow rate through break orifice in broken loop cold leg (FR-BL-001) (qualifed to 400 s).

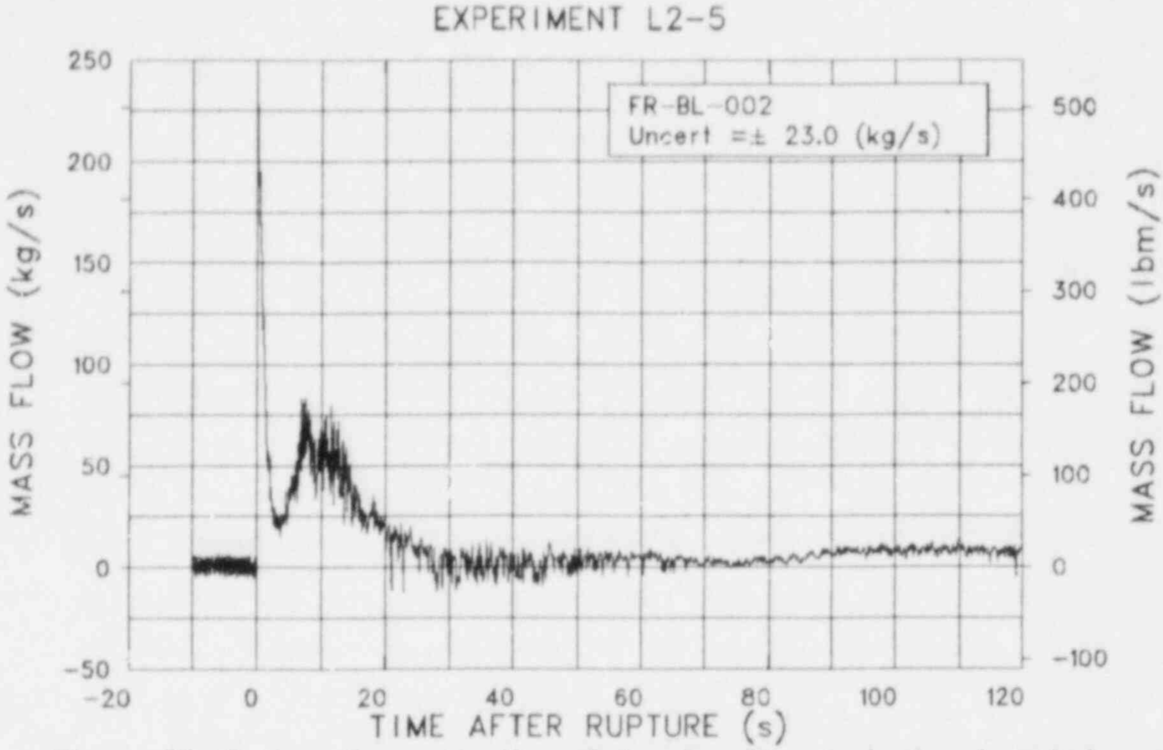


Figure 3C-13. Mass flow rate through break orifice in broken loop hot leg (FR-BL-002) (qualified to 400 s).

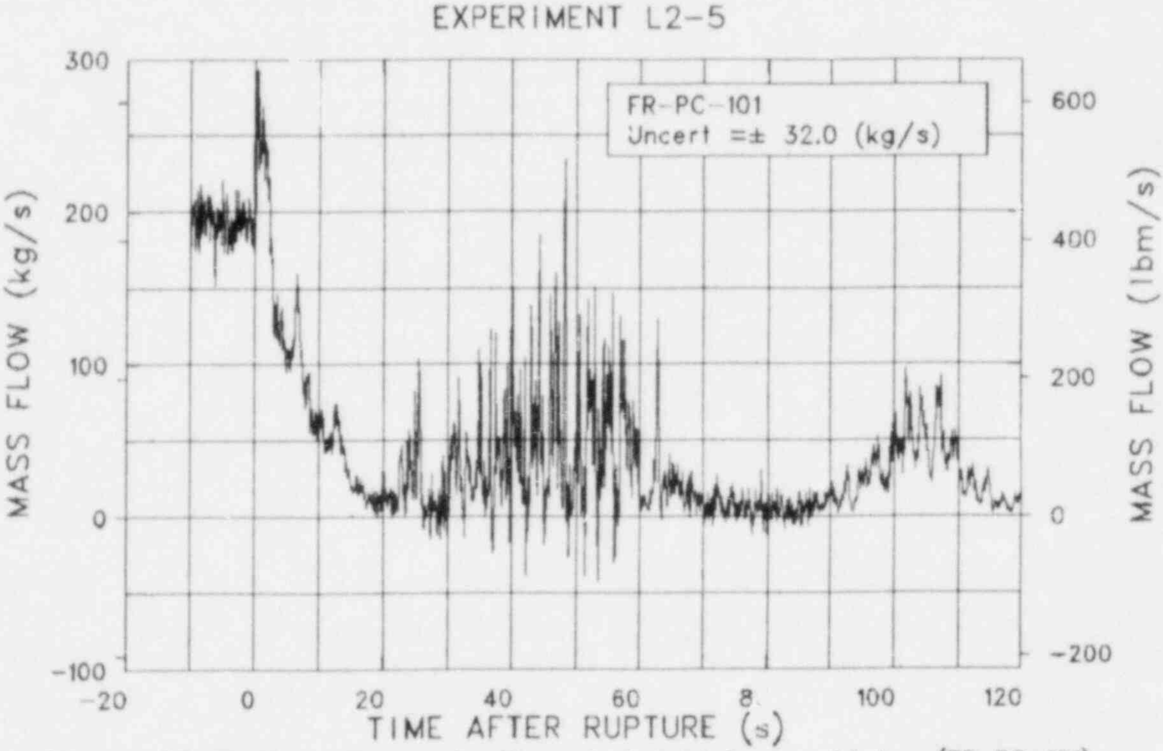


Figure 3C-14. Mass flow rate through intact loop cold leg (FR-PC-101) (qualified, flow direction not indicated).

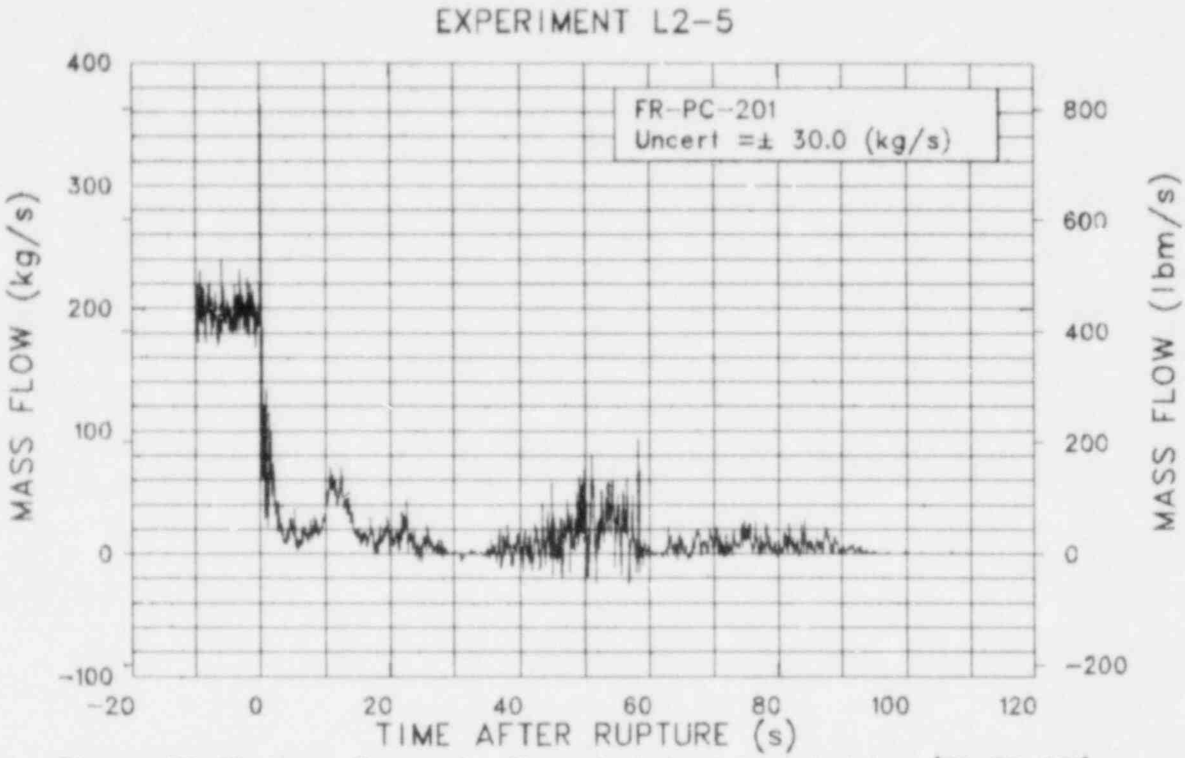


Figure 3C-15. Mass flow rate through intact loop hot leg (FR-PC-201) (qualified, flow direction not indicated).

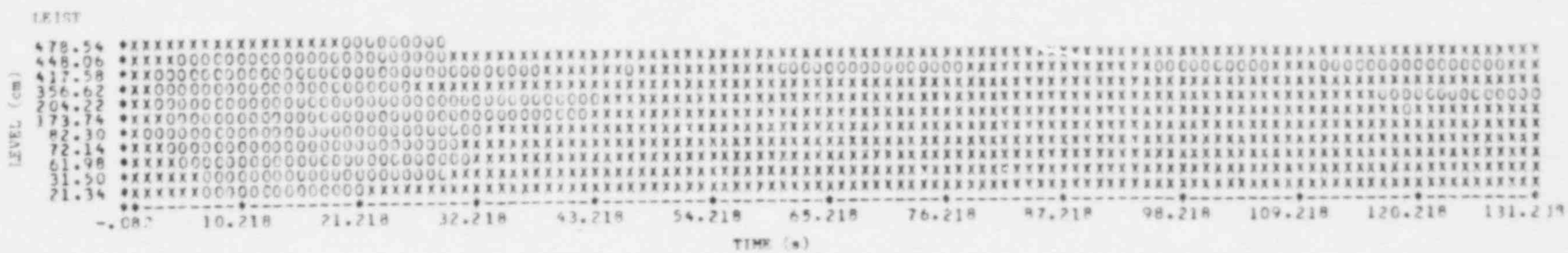


Figure 3C-16. Liquid level in reactor vessel Downcomer Stalk 1, bubble plot (LE-1ST-001 and -002).

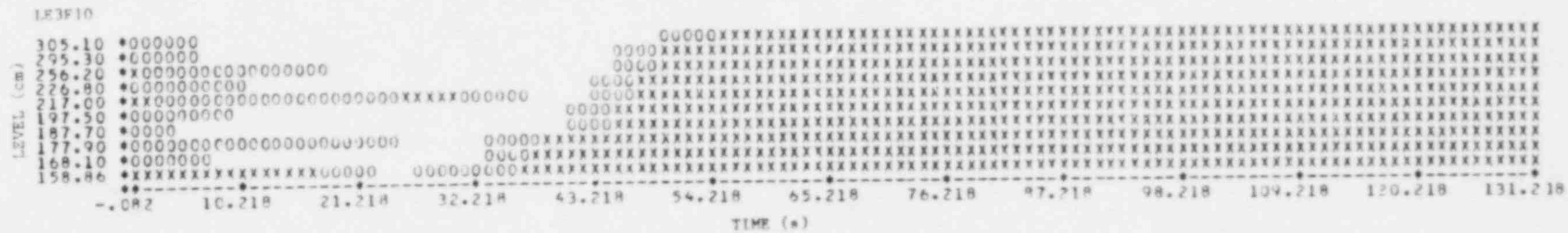


Figure 3C-17. Liquid level in reactor vessel core in Fuel Assembly 3, bubble plot (LE-3F10).

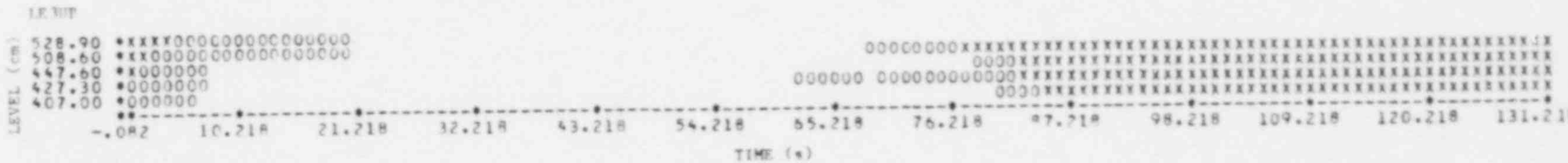


Figure 3C-18. Liquid level in reactor vessel upper plenum above Fuel Assembly 3, bubble plot (LE-3UP-001).

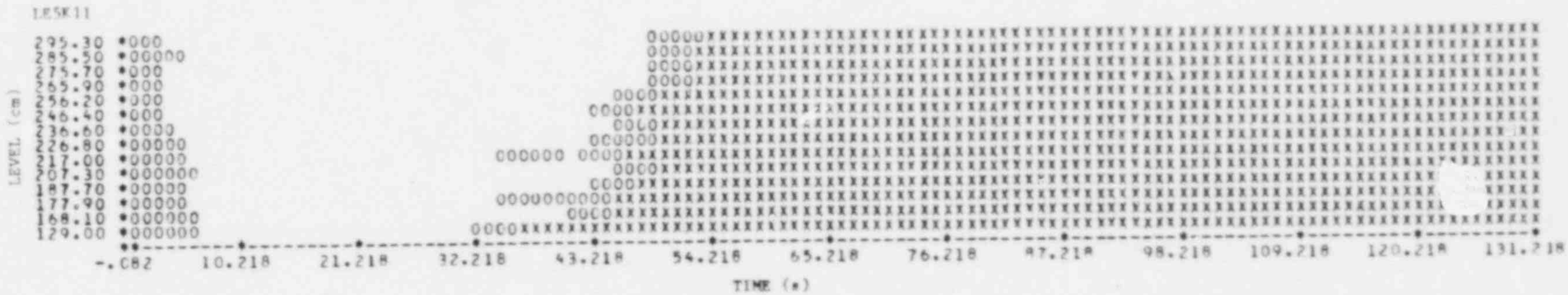


Figure 3C-19. Liquid level in reactor vessel core in Fuel Assembly 5, bubble plot (LE-5K11).

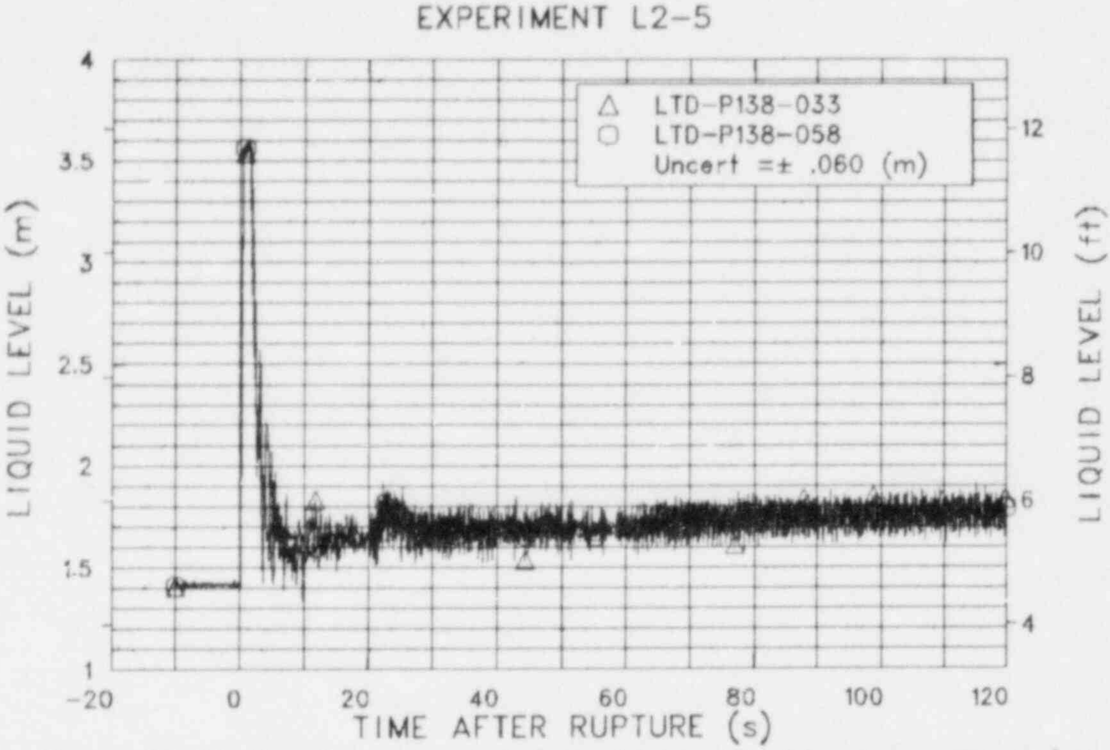


Figure 3C-20. Density compensated liquid level in blowdown suppression tank (LTD-P138-033 and -058).

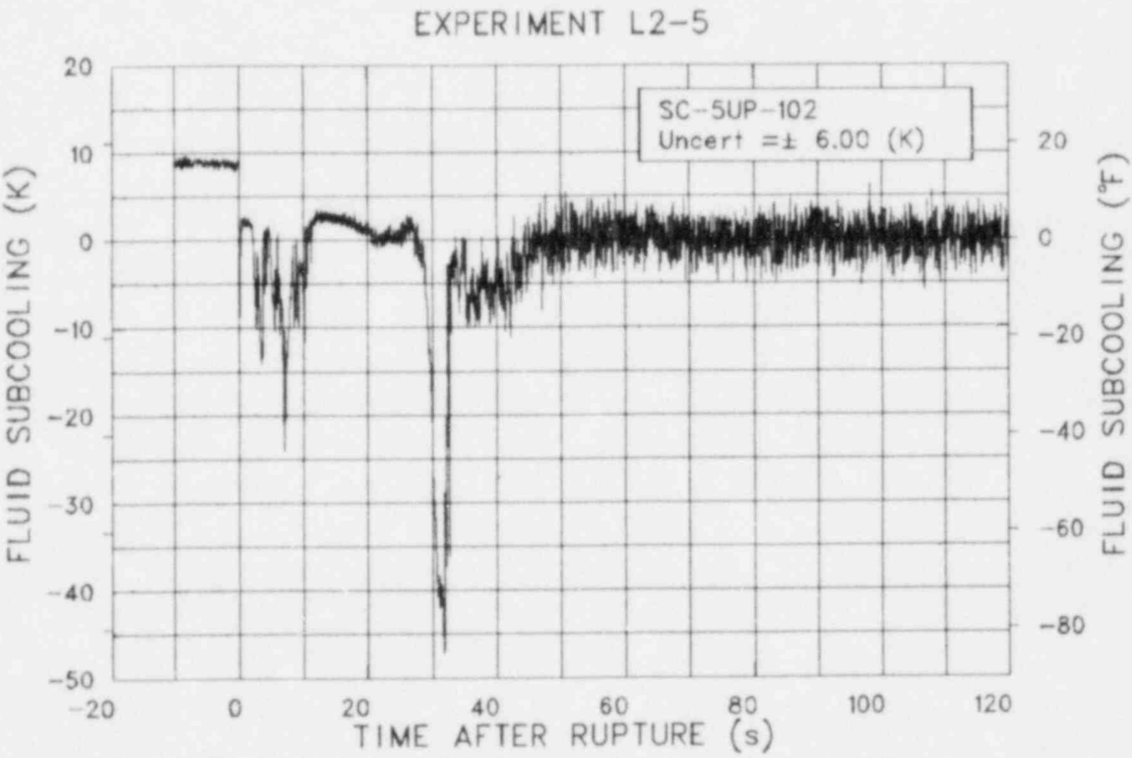


Figure 3C-21. Fluid subcooling in reactor vessel upper plenum (SC-5UP-102) (qualified, suspected hot wall effects after 200 s).

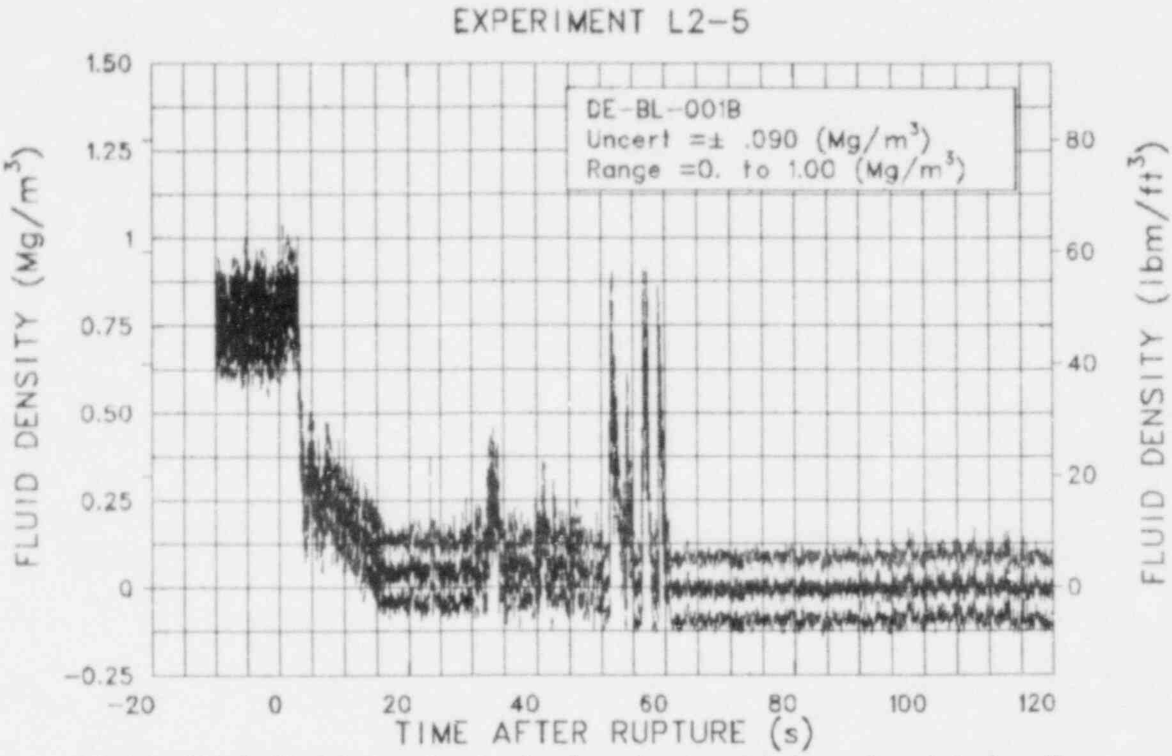


Figure 3U-1. Fluid density in broken loop cold leg, chordal density (DE-BL-001B).

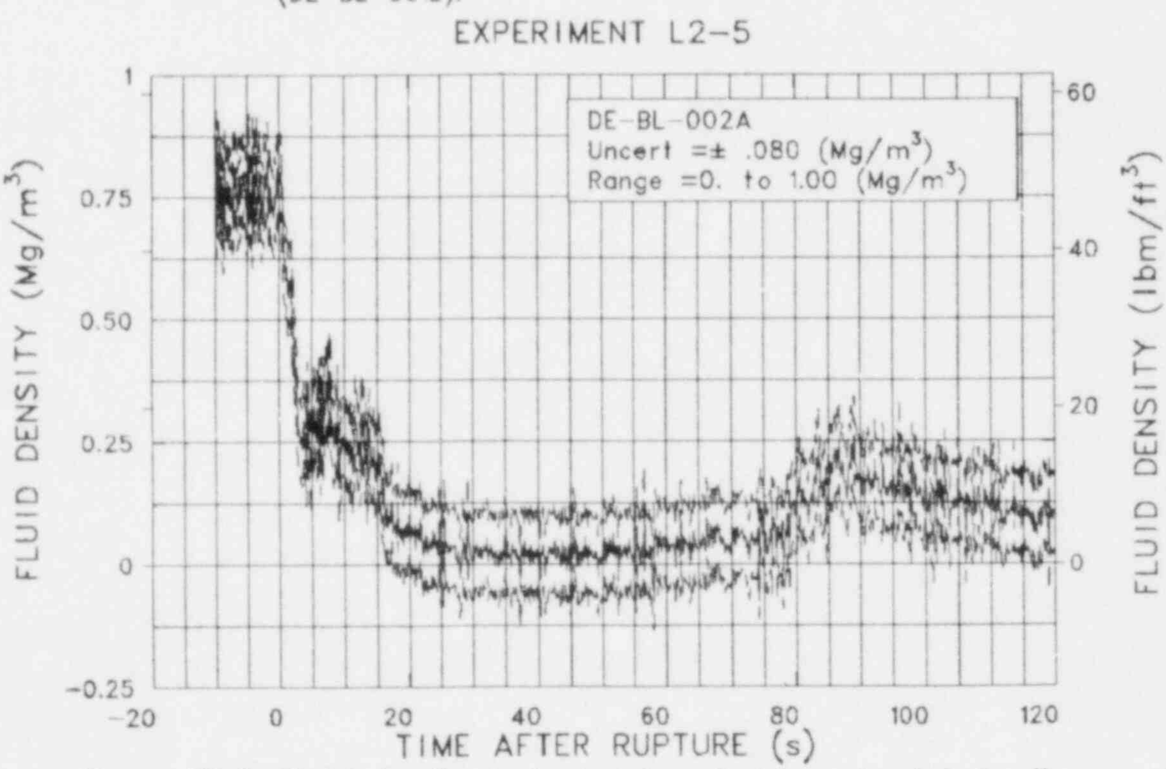


Figure 3U-2. Fluid density in broken loop hot leg, chordal density (DE-BL-002A).

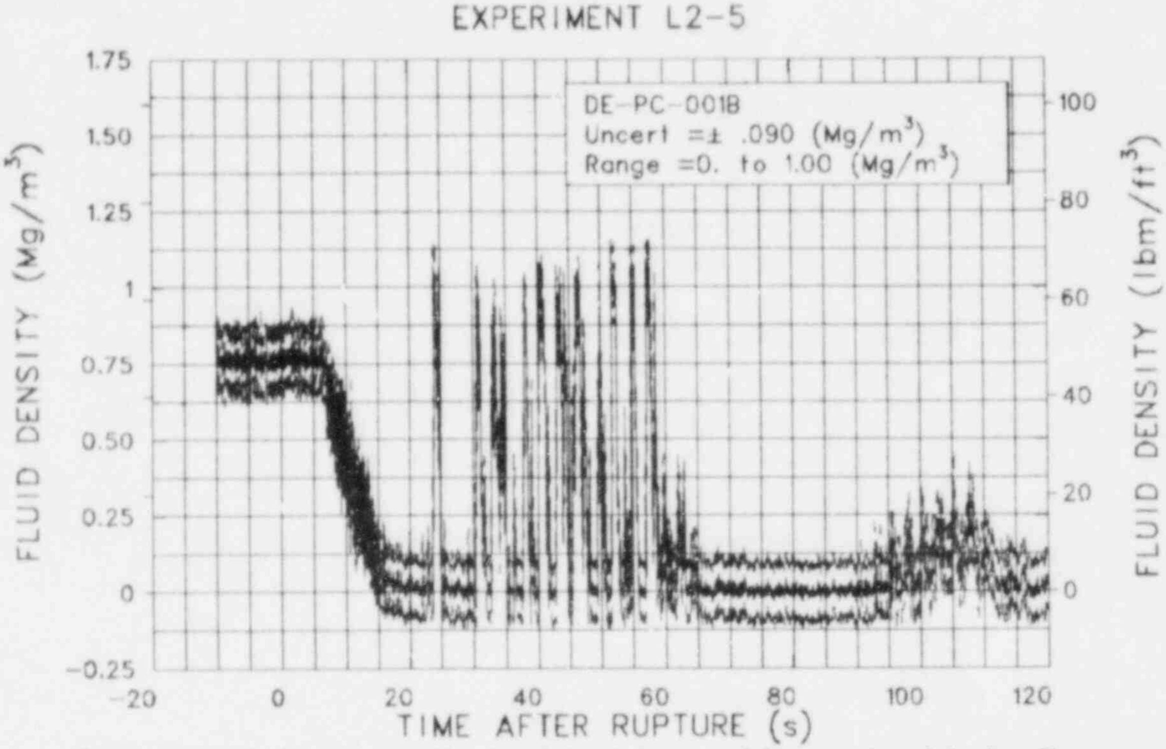


Figure 3U-3. Fluid density in intact loop cold leg, chordal density (DE-PC-001B).

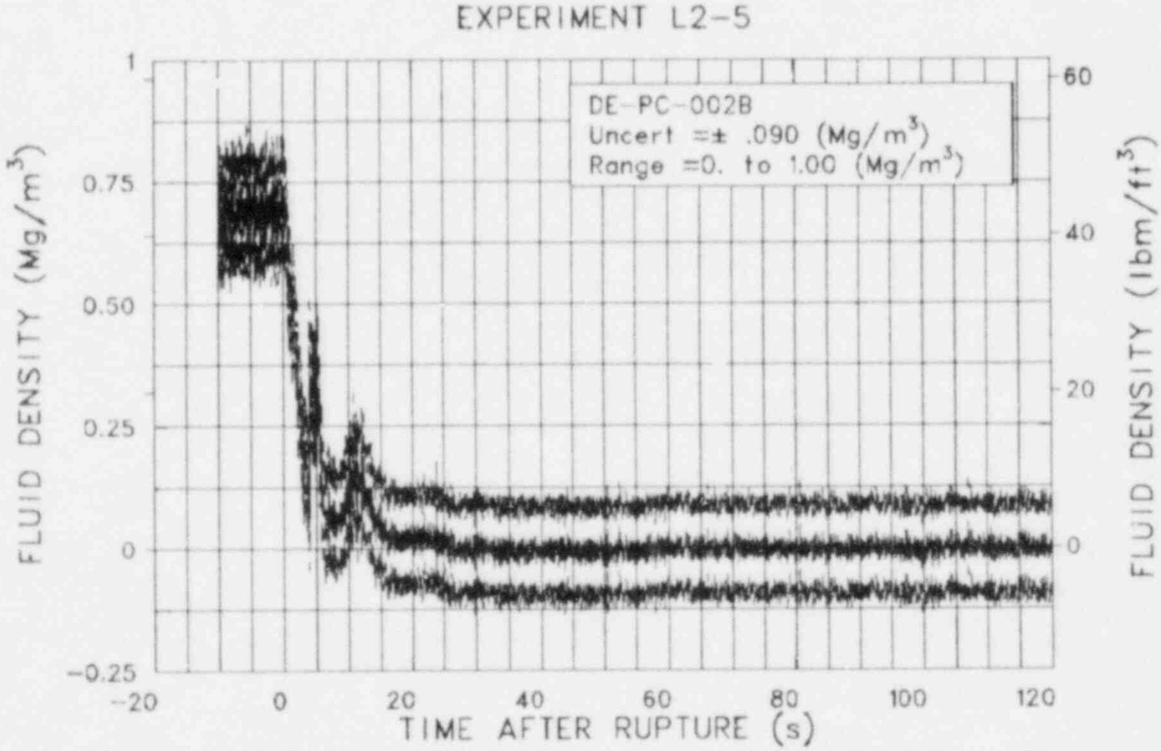


Figure 3U-4. Fluid density in intact loop hot leg, chordal density (DE-PC-002B).

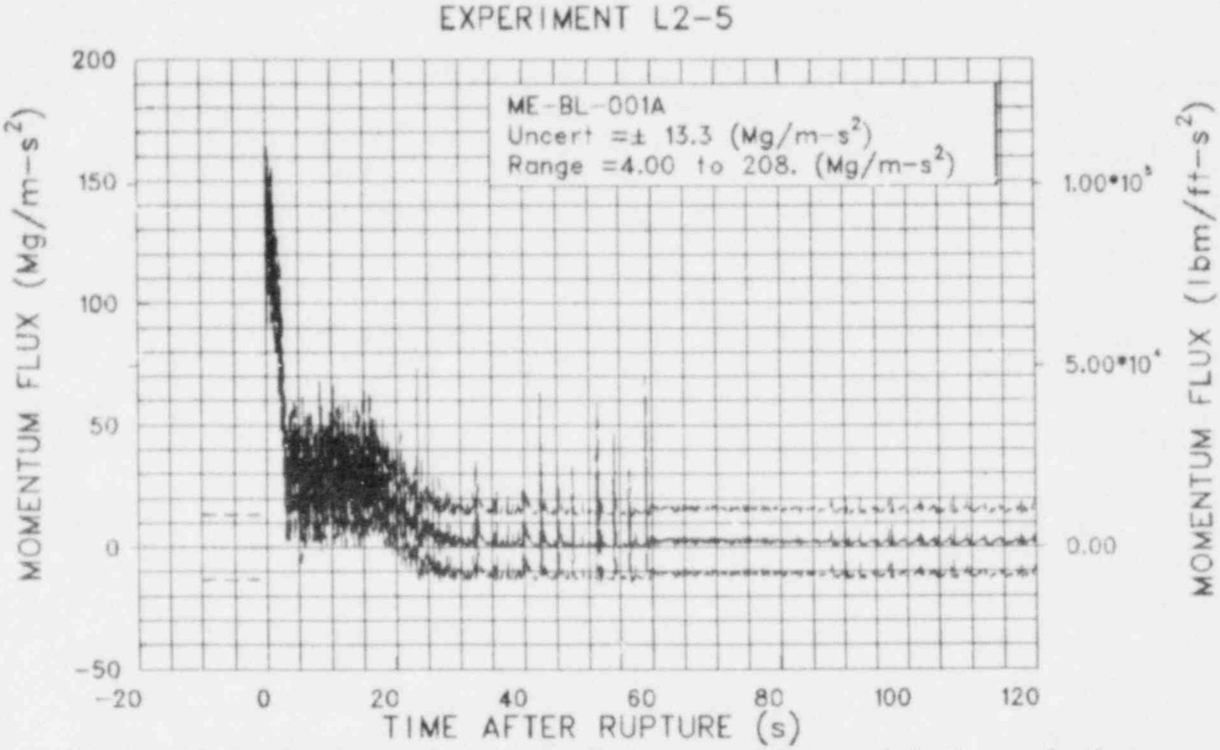


Figure 3U-5. Momentum flux in broken loop cold leg at bottom of pipe, high range (ME-BL-001A).

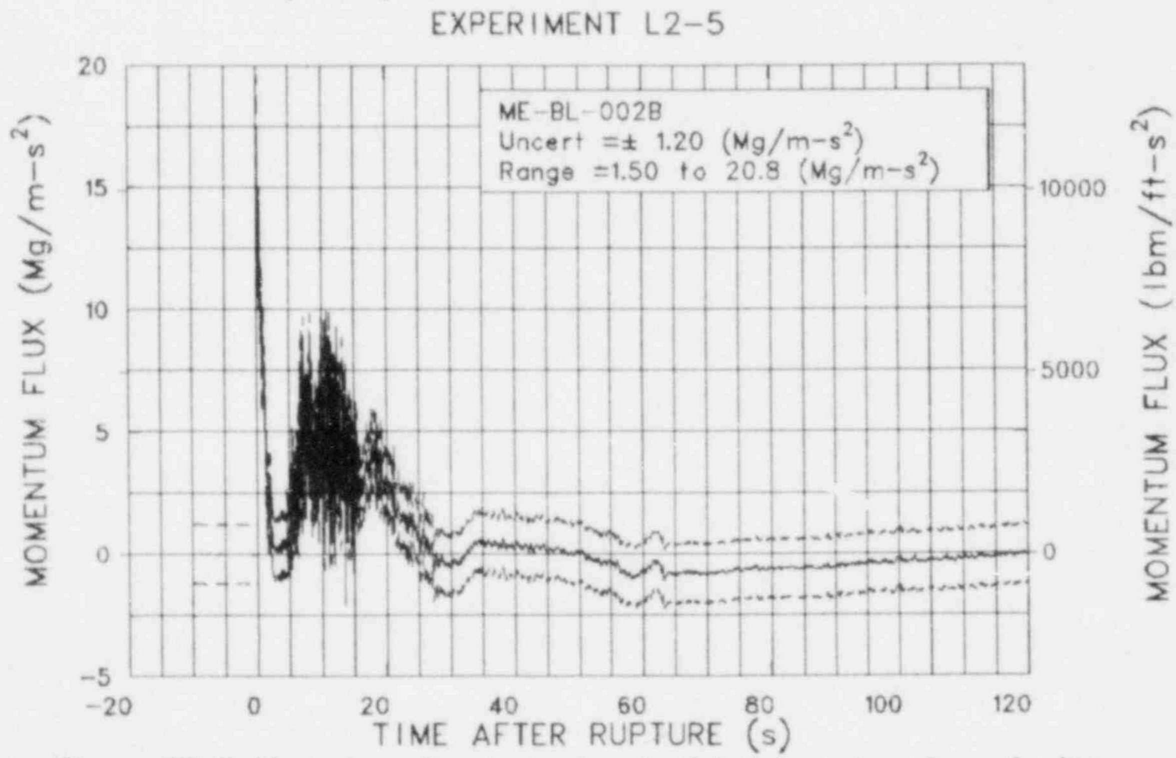


Figure 3U-6. Momentum flux in broken loop hot leg at center of pipe, high range (ME-BL-002B).

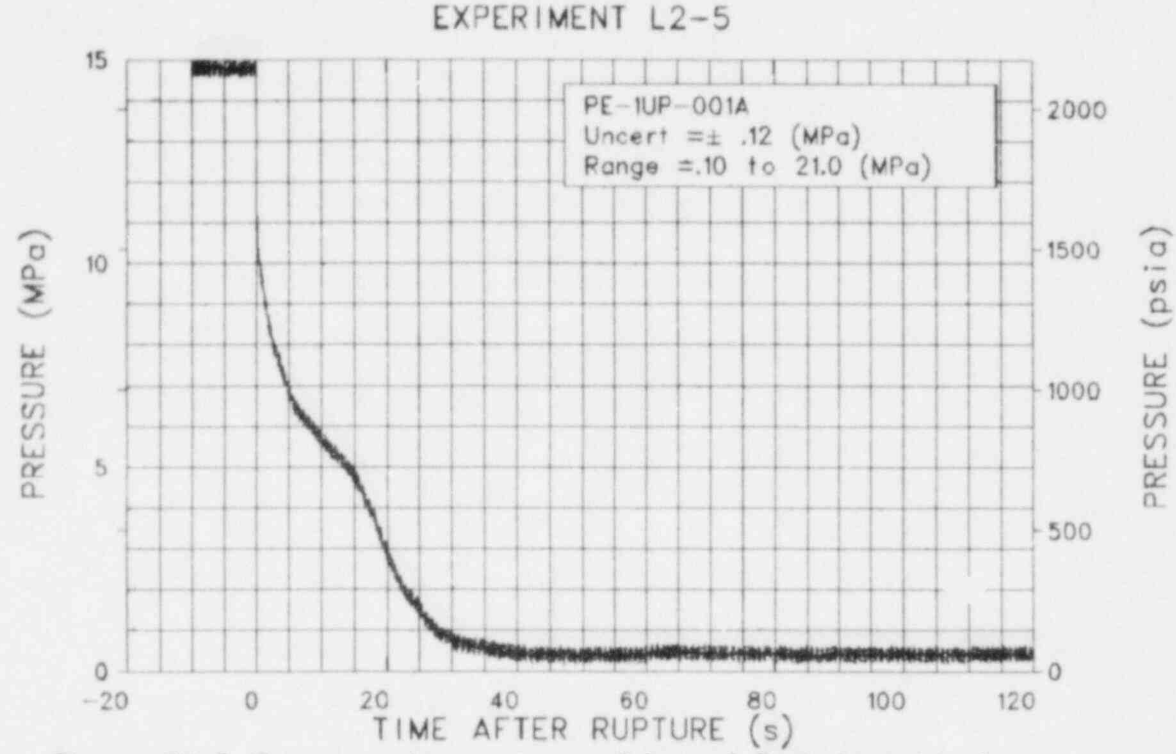


Figure 3U-7. Pressure above upper end box of Fuel Assembly 1 (PE-1UP-001A).

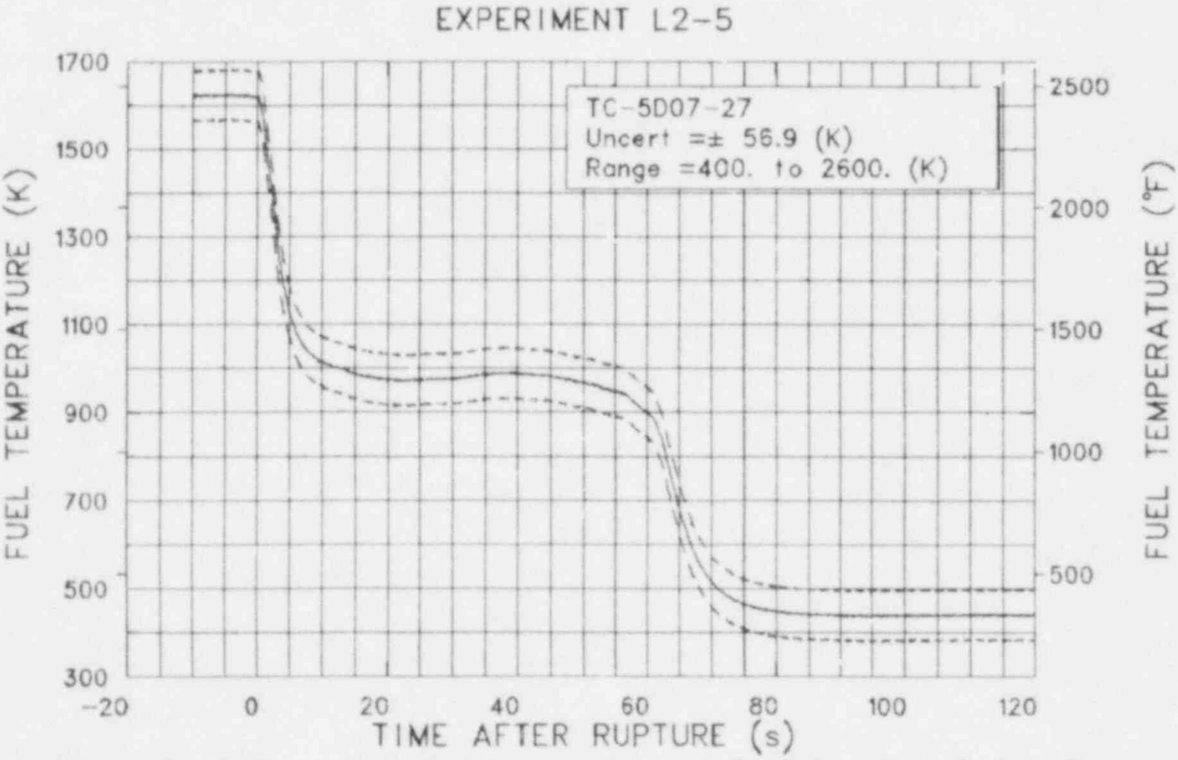


Figure 3U-8. Fuel centerline temperature at Fuel Assembly 5, Row D, Column 7 at 0.69 m above bottom of fuel rod (TC-5D07-27).

EXPERIMENT L2-5

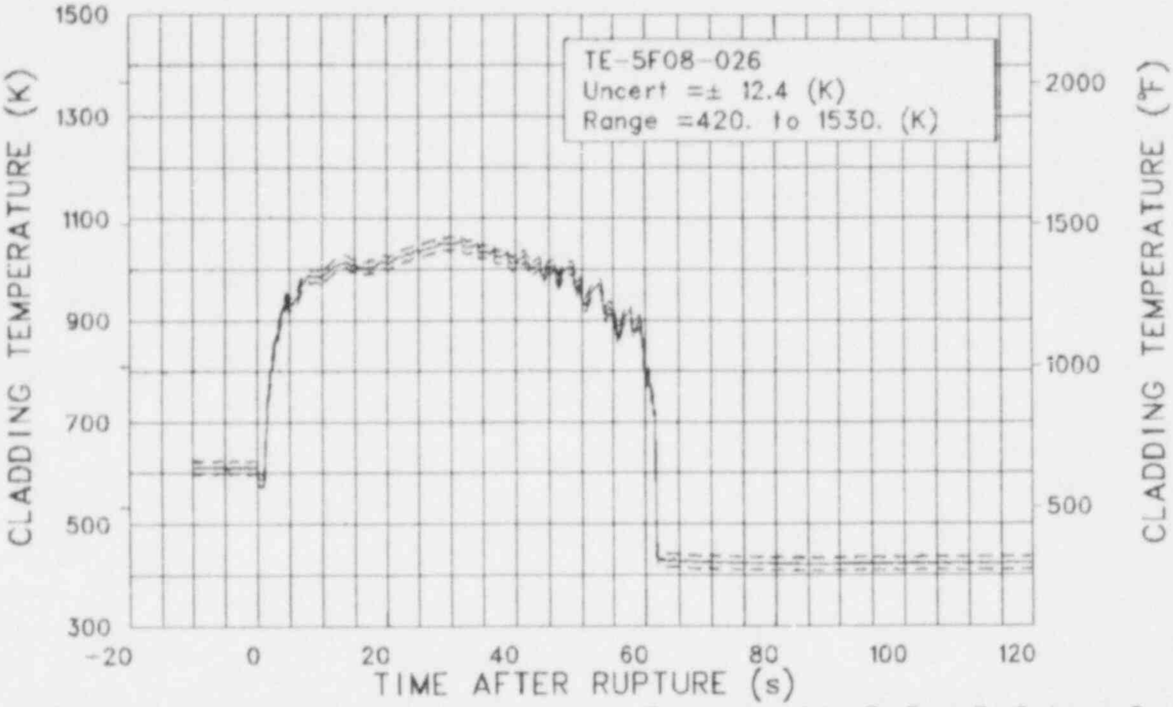


Figure 3U-9. Cladding temperature at Fuel Assembly 5, Row F, Column 8 at 0.66 m above bottom of fuel rod (TE-5F08-026).

EXPERIMENT L2-5

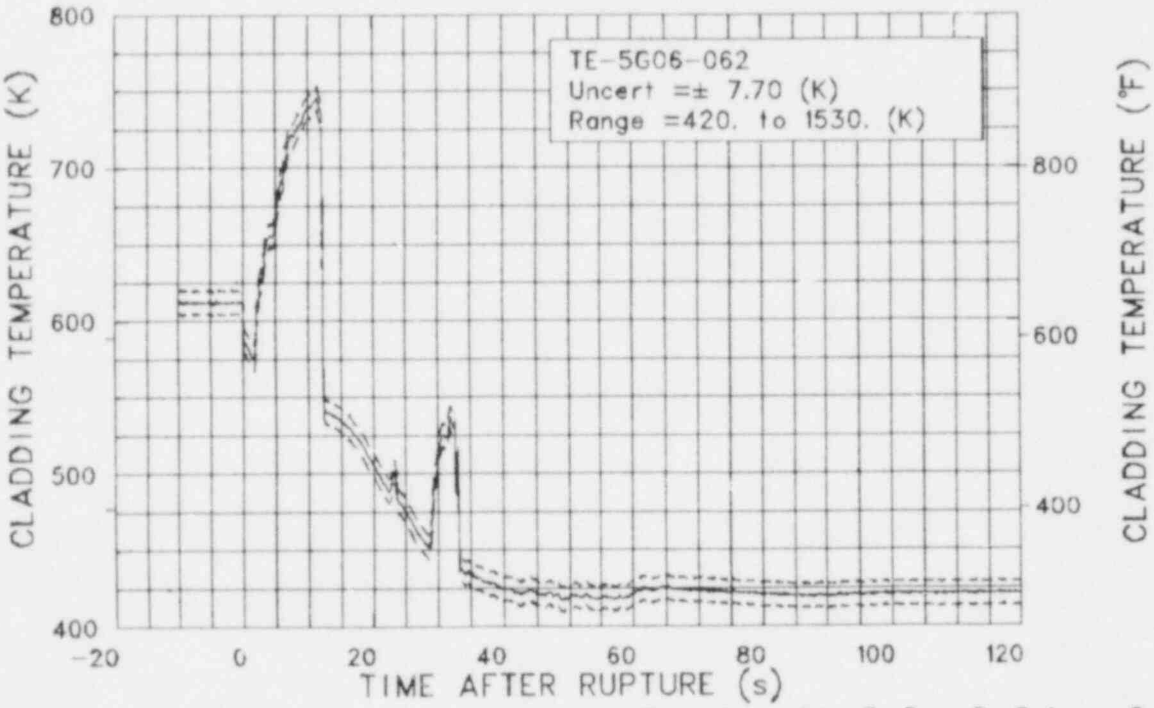


Figure 3U-10. Cladding temperature at Fuel Assembly 5, Row G, Column 6 at 1.57 m above bottom of fuel rod (TE-5G06-062).

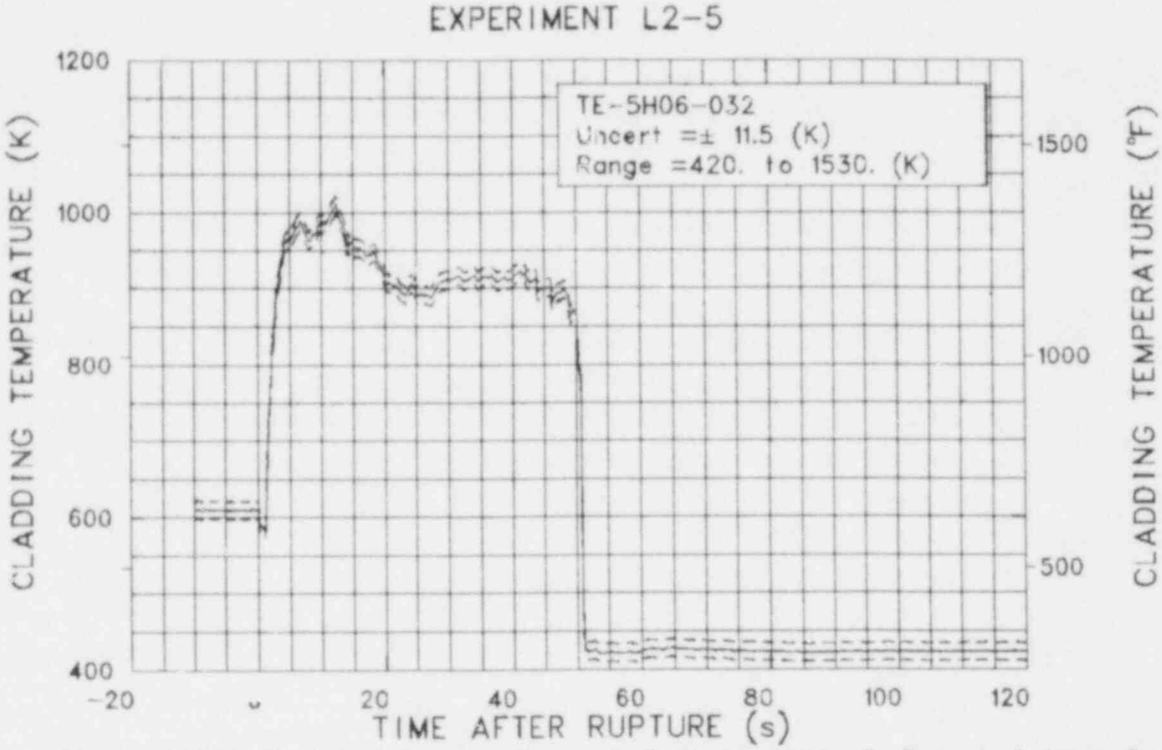


Figure 3U-11. Cladding temperature at Fuel Assembly 5, Row H, Column 6 at 0.81 m above bottom of fuel rod (TE-5H06-032).

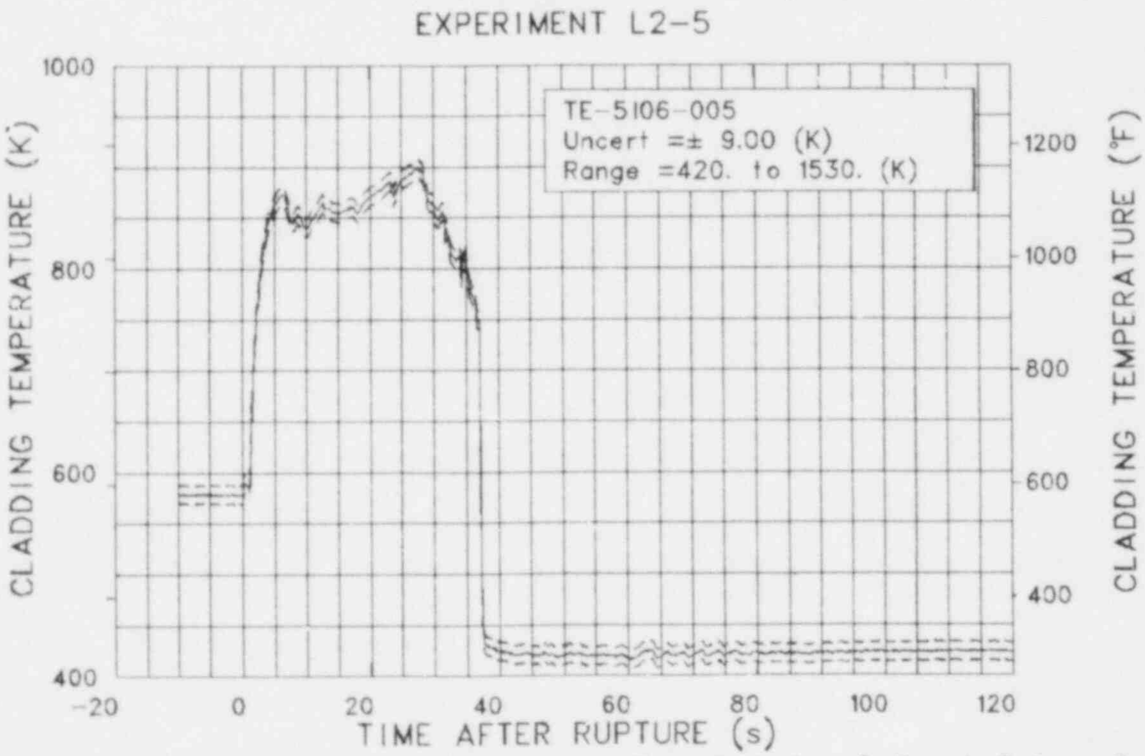


Figure 3U-12. Cladding temperature at Fuel Assembly 5, Row I, Column 6 at 0.13 m above bottom of fuel rod (TE-5I06-005).

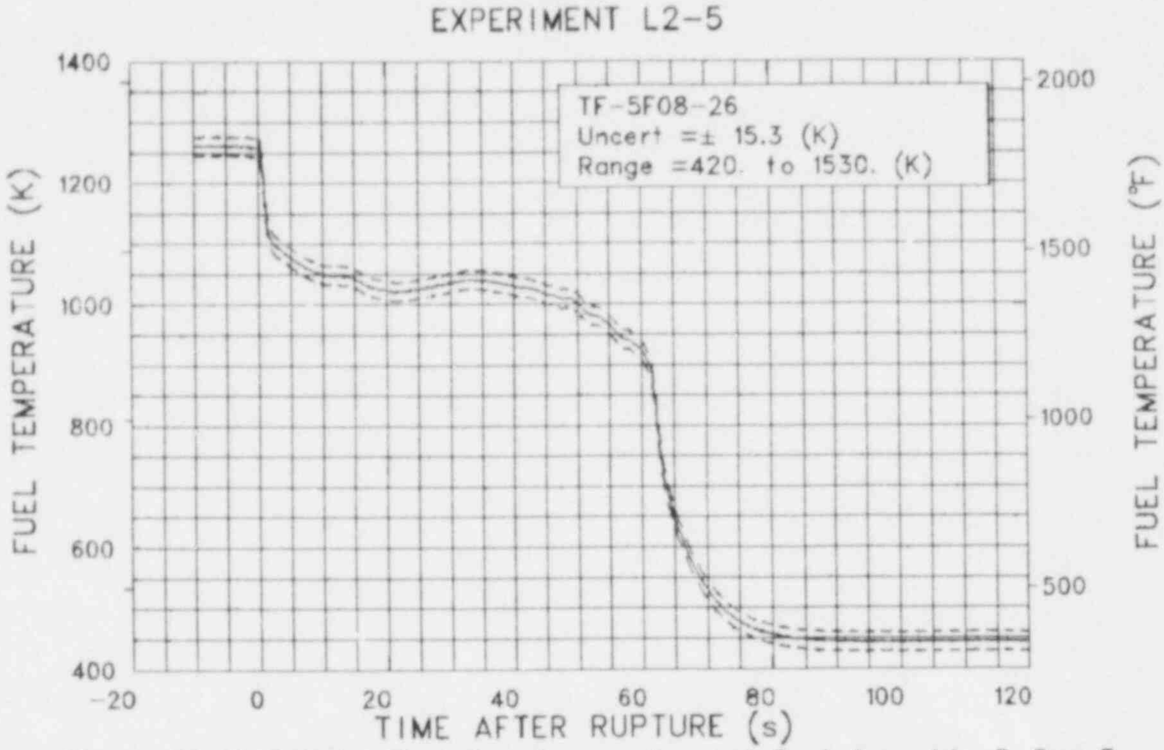


Figure 3U-13. Pellet off-center temperature at Fuel Assembly 5, Row F, Column 8 at 0.66 m above bottom of fuel rod (TF-5F08-26).

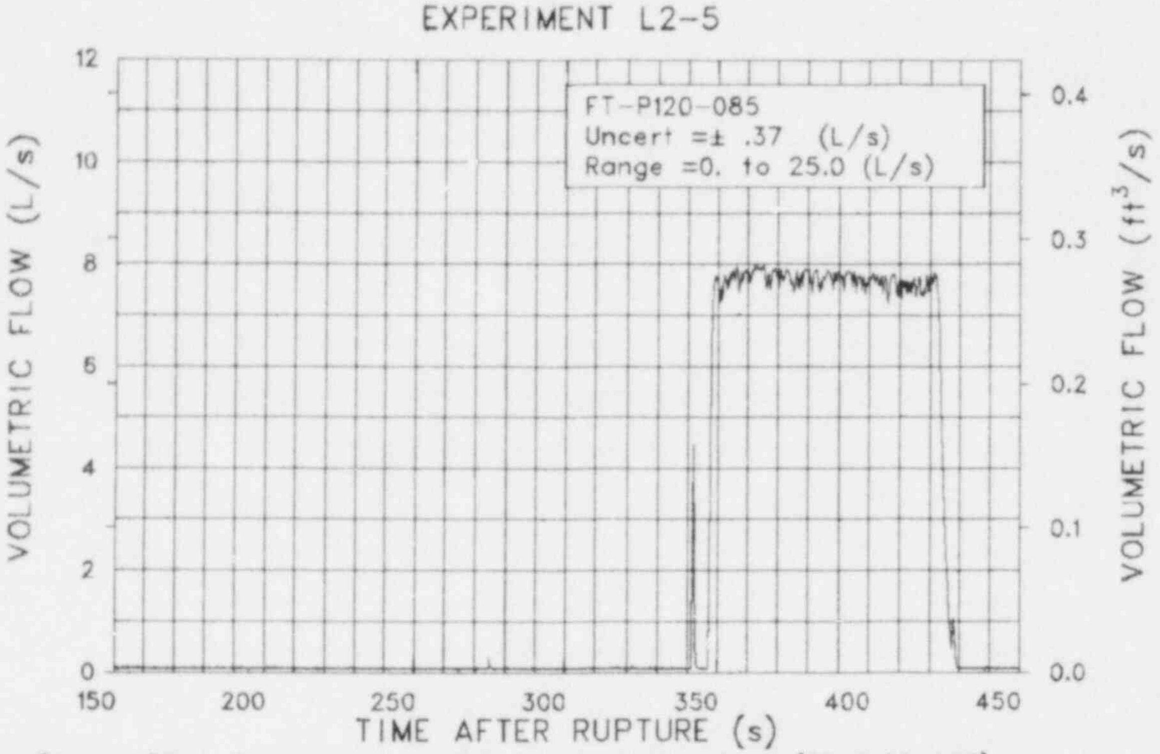


Figure 3R-1. Flow rate in LPIS Pump A discharge (FT-P120-085) (qualified, except for spurious spikes).

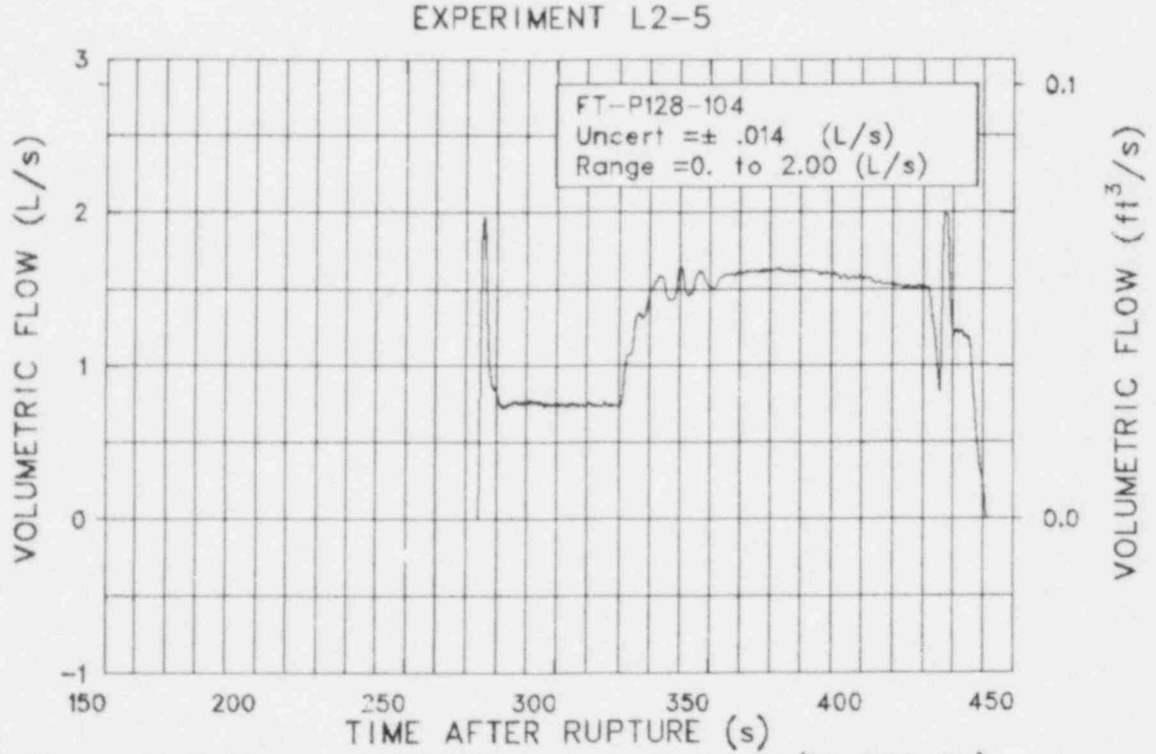


Figure 3R-2. Flow rate in HPIS Pump A discharge (FT-P128-104).

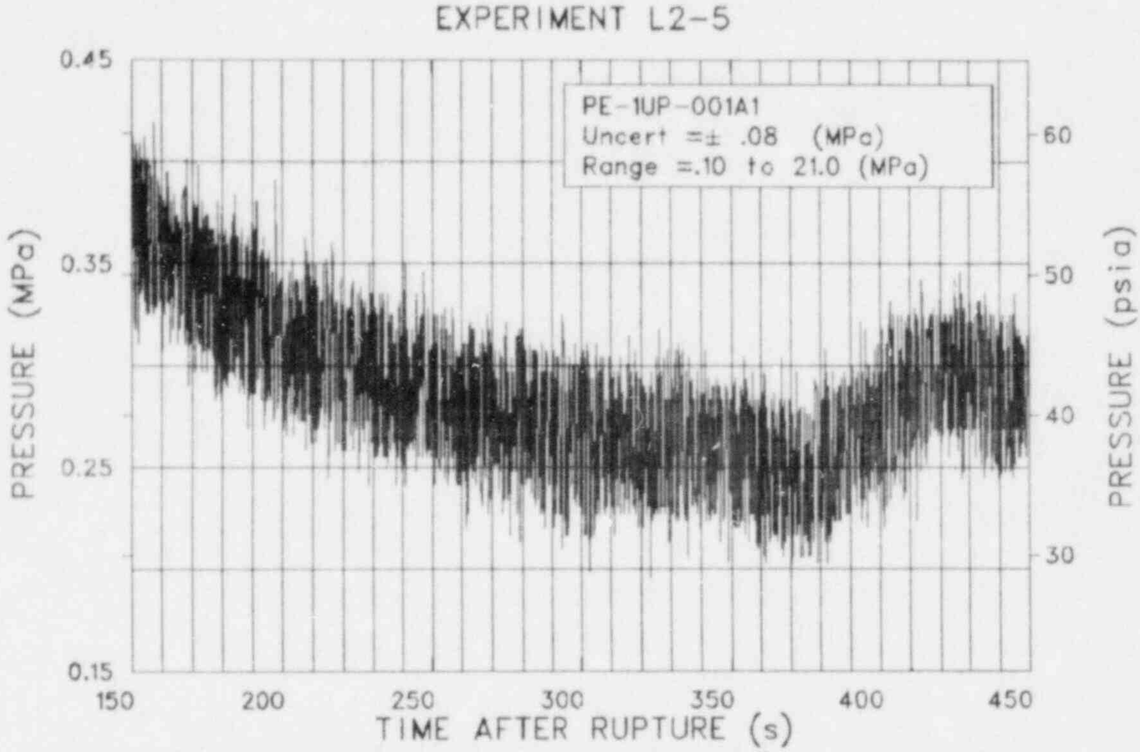


Figure 3R-3. Pressure above upper end box of Fuel Assembly 1 (PE-1UP-001A1).

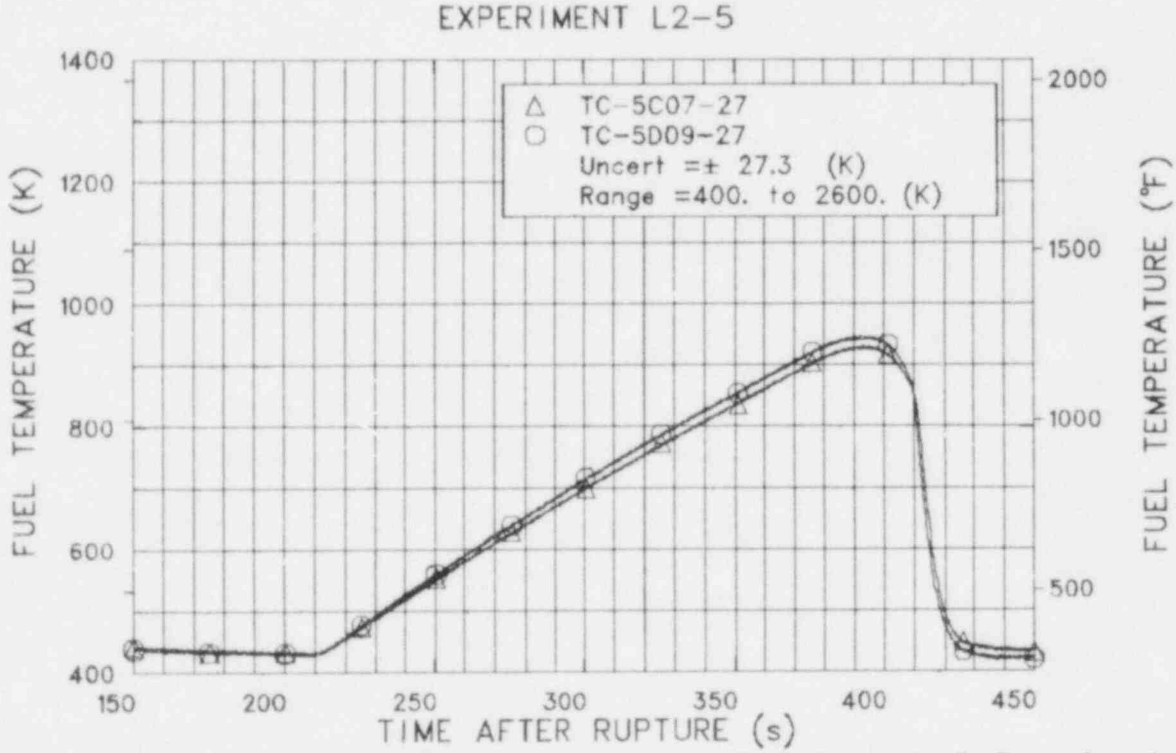


Figure 3R-4. Fuel centerline temperature at Fuel Assembly 5, Rows C and D, Columns 7 and 9 at 0.69 m above bottom of fuel rod (TC-5C07-27 and -5D09-27).

EXPERIMENT L2-5

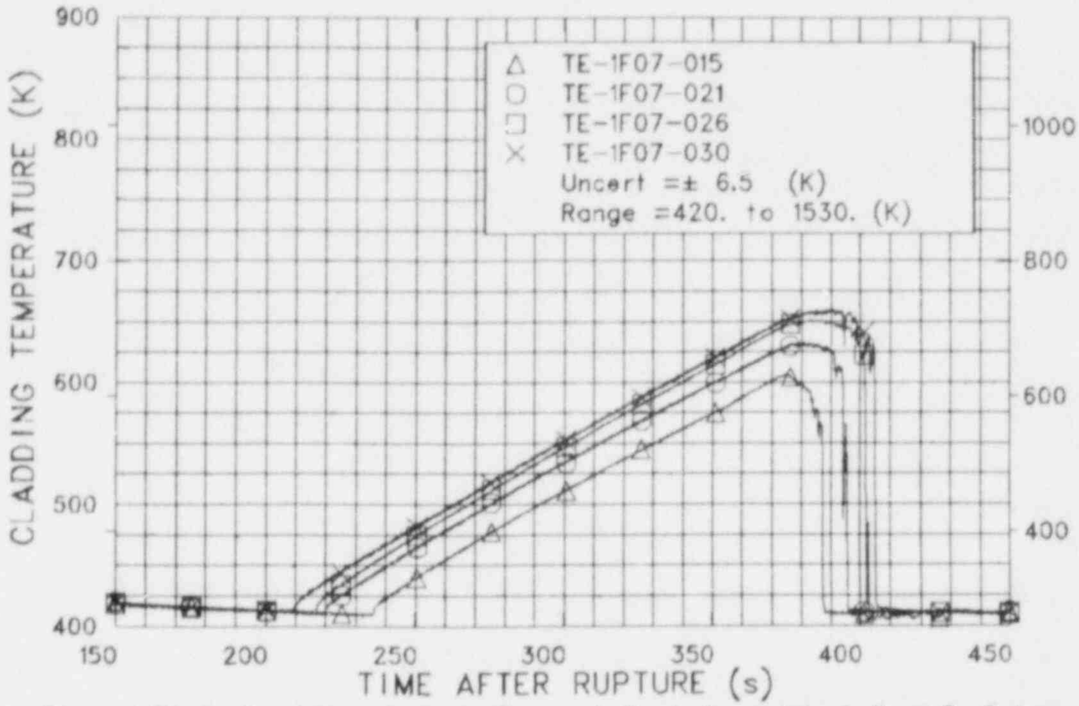


Figure 3R-5. Cladding temperature at Fuel Assembly 1, Row F, Column 7 at 0.38, 0.53, 0.66, and 0.76 m above bottom of fuel rod (TE-1F07-015, -021, -026, and -030).

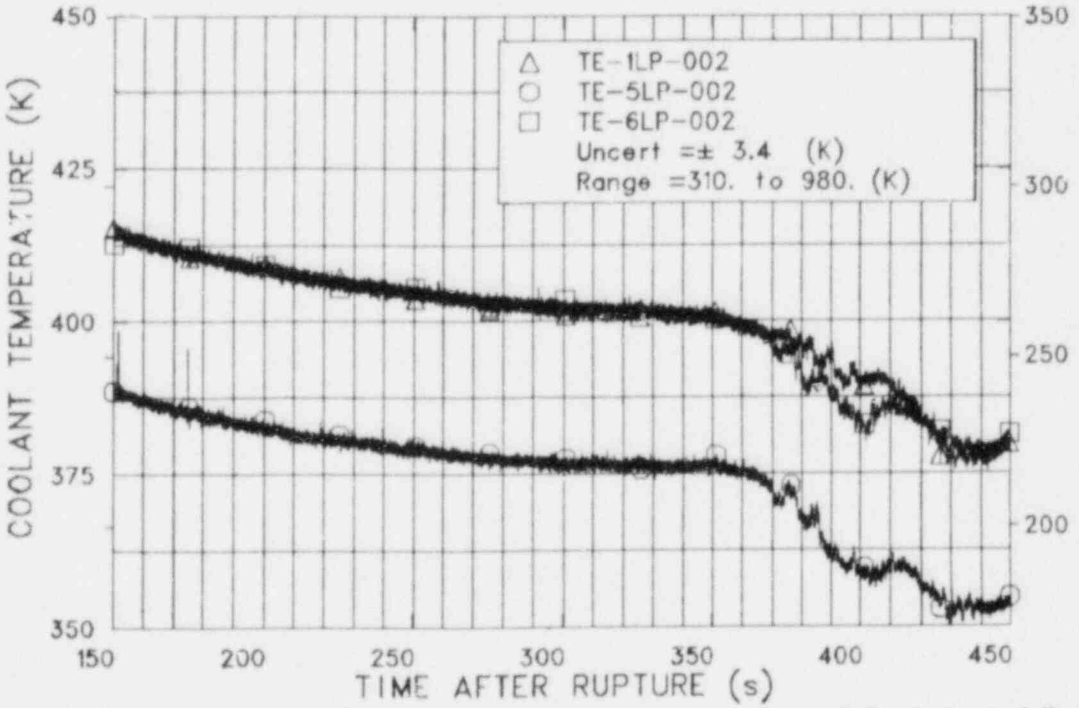


Figure 3R-6. Coolant temperature at lower end box of Fuel Assemblies 1, 5, and 6 (TE-1LP-002, -5LP-002, and -6LP-002).

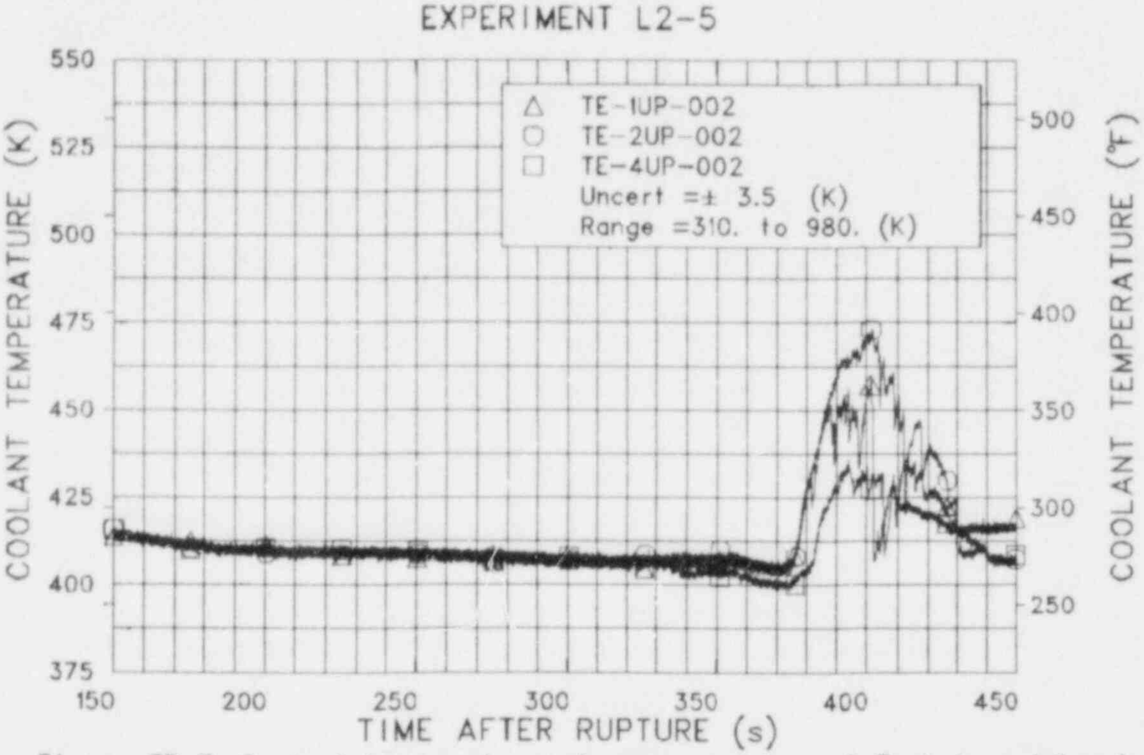


Figure 3R-7. Coolant temperature at upper end box of Fuel Assemblies 1, 2, and 4 (TE-1UP-002, -2UP-002, and -4UP-002).

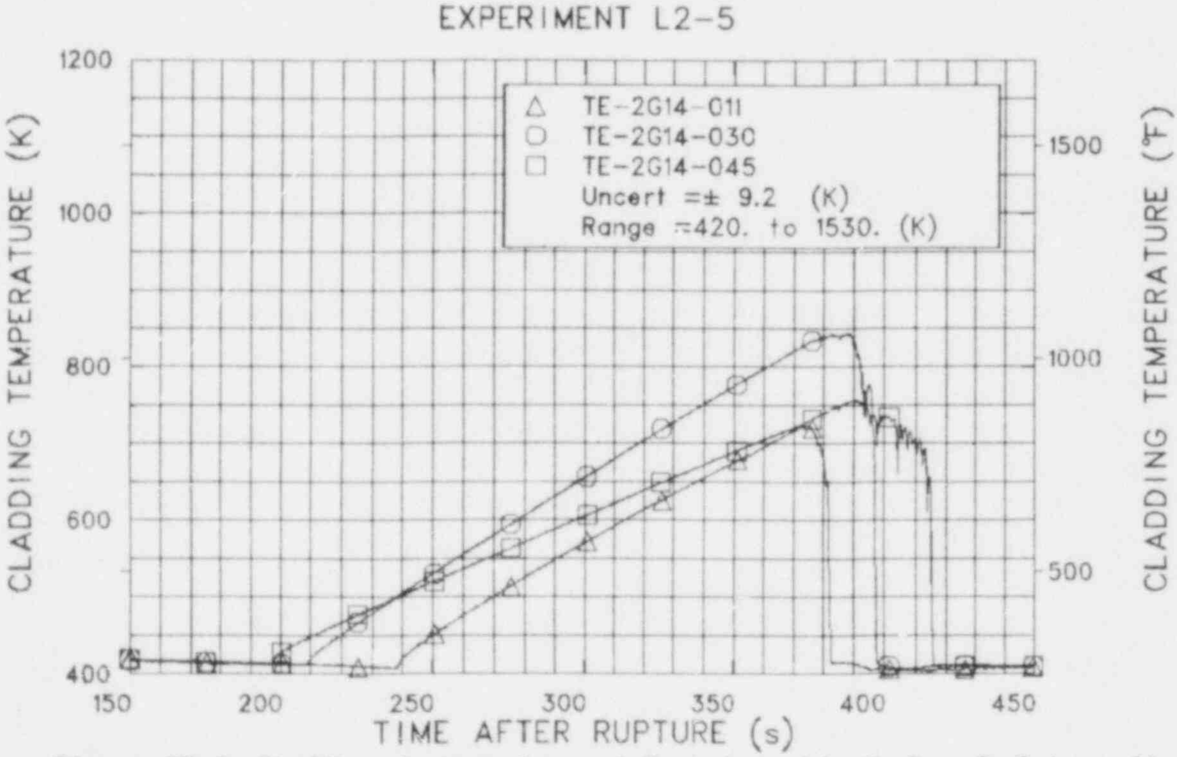


Figure 3R-8. Cladding temperature at Fuel Assembly 2, Row G, Column 14 at 0.28, 0.76, and 1.14 m above bottom of fuel rod (TE-2G14-011, -030, and -045).

EXPERIMENT L2-5

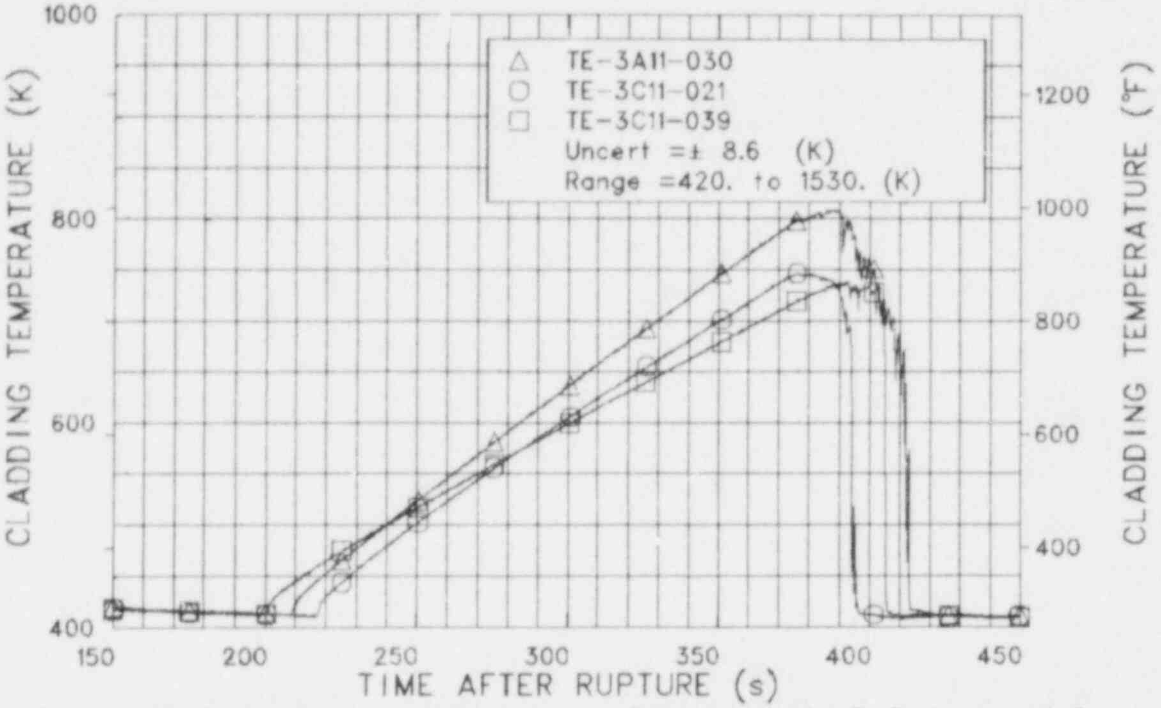


Figure 3R-9. Cladding temperature at Fuel Assembly 3, Rows A and C, Column 11 at 0.76, 0.53, and 0.99 m above bottom of fuel rod (TE-3A11-030, -3C11-021, and -039).

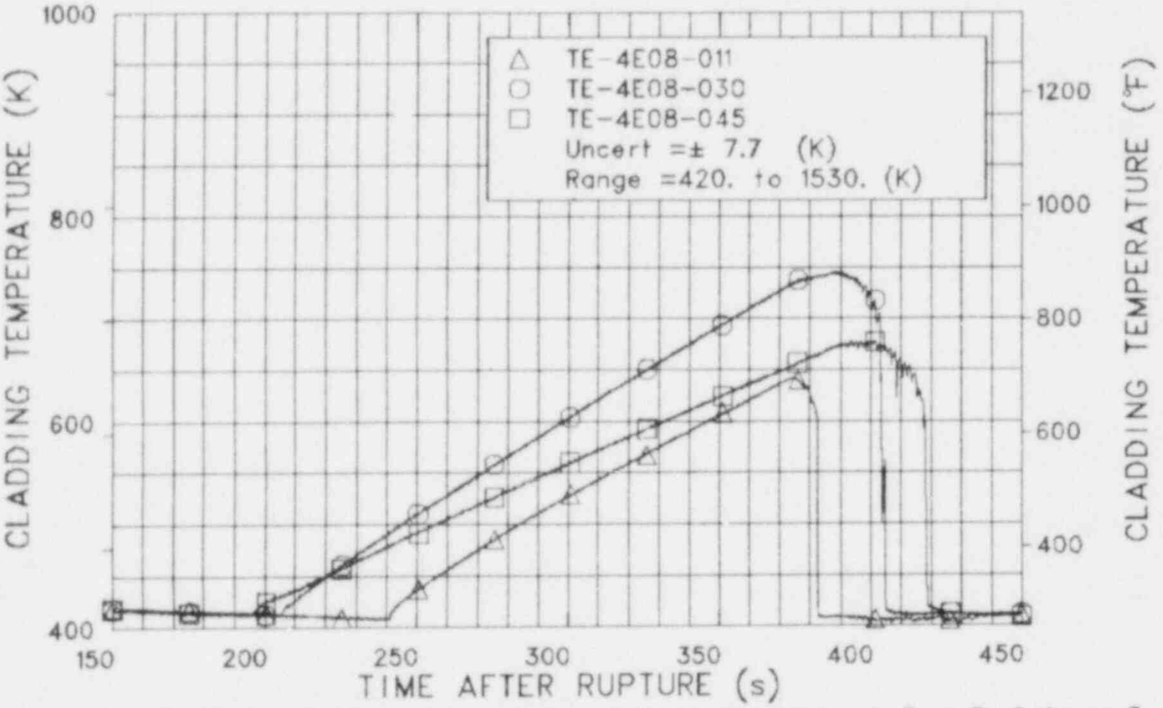


Figure 3R-10. Cladding temperature at Fuel Assembly 4, Row E, Column 8 at 0.28, 0.76, and 1.14 m above bottom of fuel rod (TE-4E08-011, -030, and -045).

EXPERIMENT L2-5

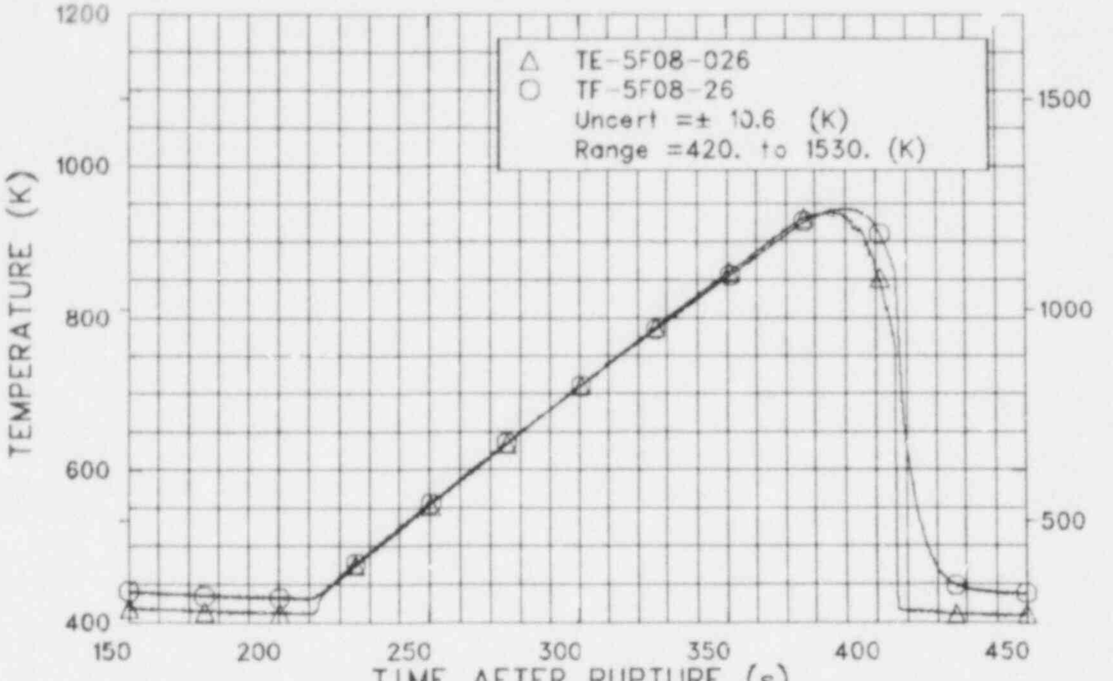


Figure 3R-11. Cladding and pellet off-center temperature at Fuel Assembly 5, Row F, Column 8 at 0.66 m above bottom of fuel rod (TE-5F08-026 and TF-5F08-26).

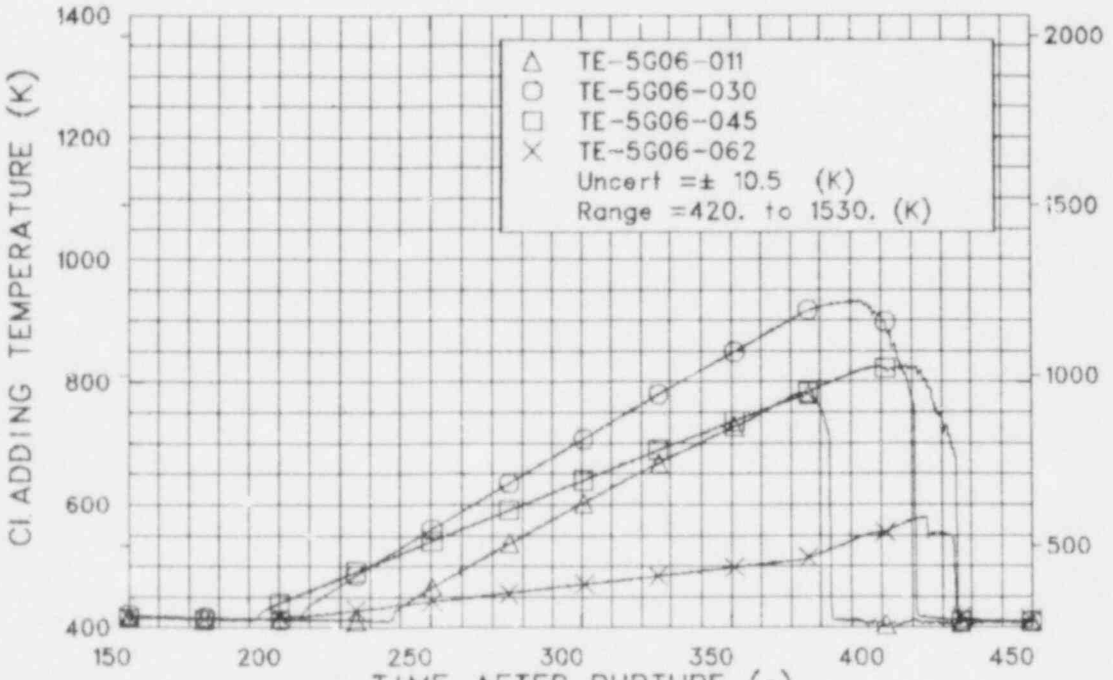


Figure 3R-12. Cladding temperature at Fuel Assembly 5, Row G, Column 6 at 0.28, 0.76, 1.14, and 1.57 m above bottom of fuel rod (TE-5G06-011 -030, -045, and -062).

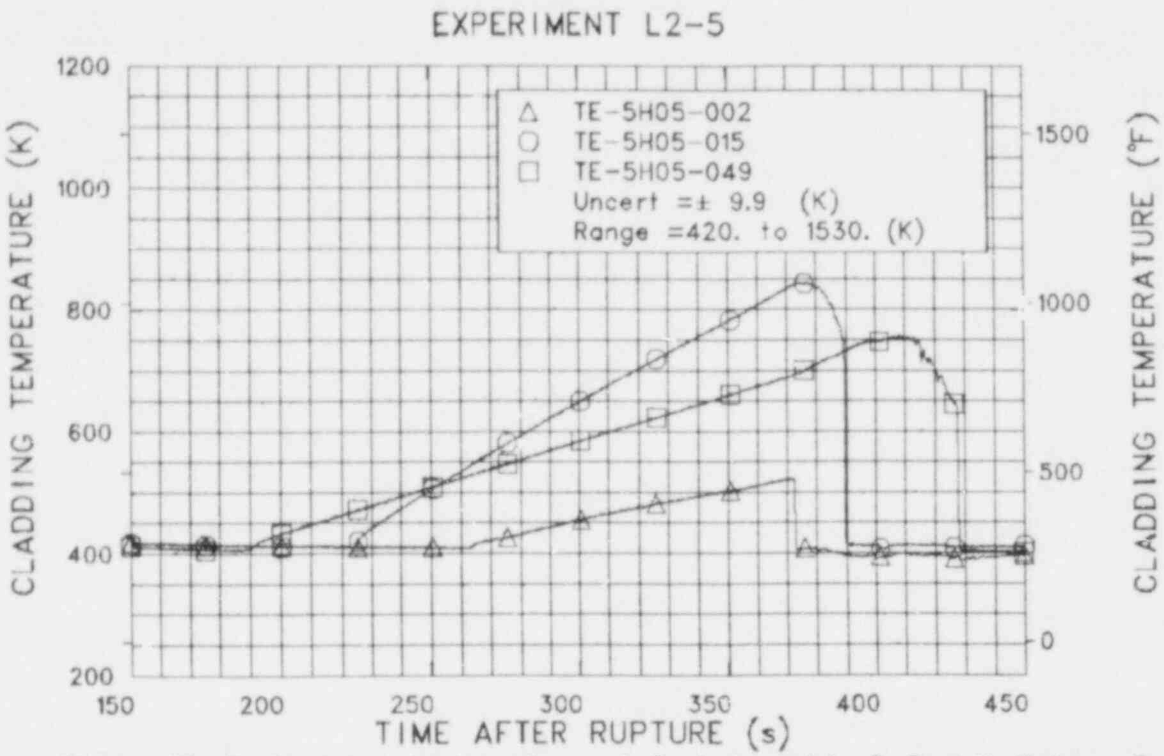


Figure 3R-13. Cladding temperature at Fuel Assembly 5, Row H, Column 5 at 0.05, 0.38, and 1.24 m above bottom of fuel rod (TE-5H05-002, -015, and -049).

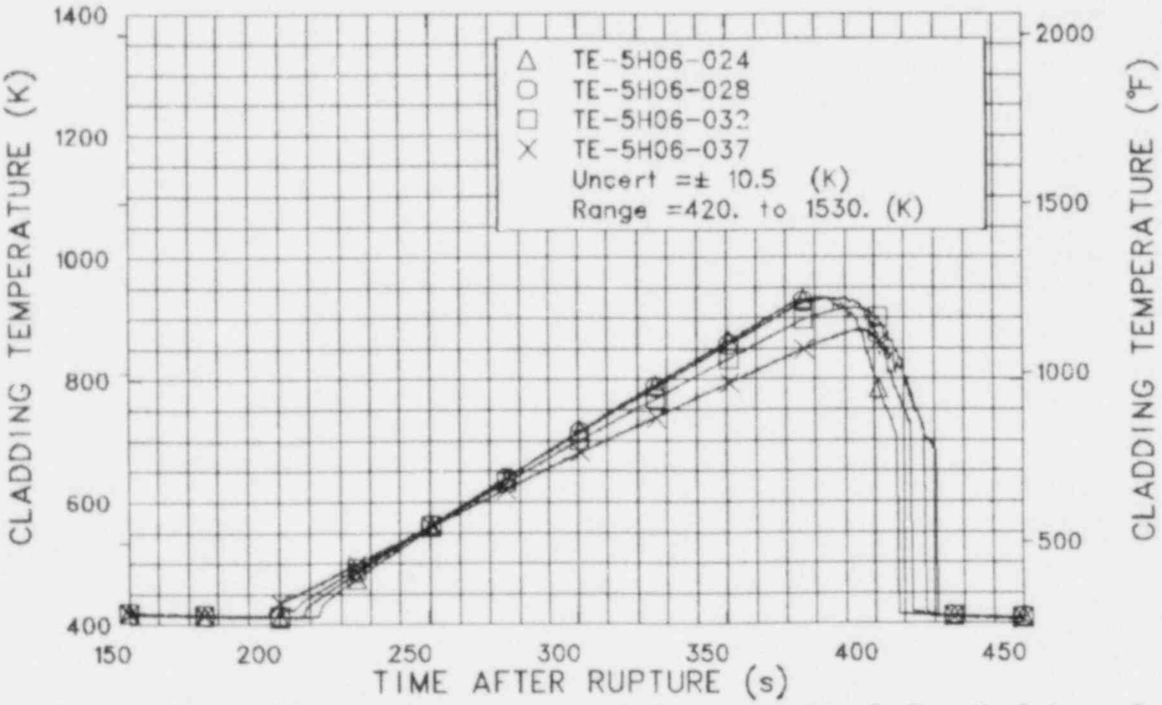


Figure 3R-14. Cladding temperature at Fuel Assembly 5, Row H, Column 6 at 0.61, 0.71, 0.81, and 0.94 m above bottom of fuel rod (TE-5H06-024, -028, -032, and -037).

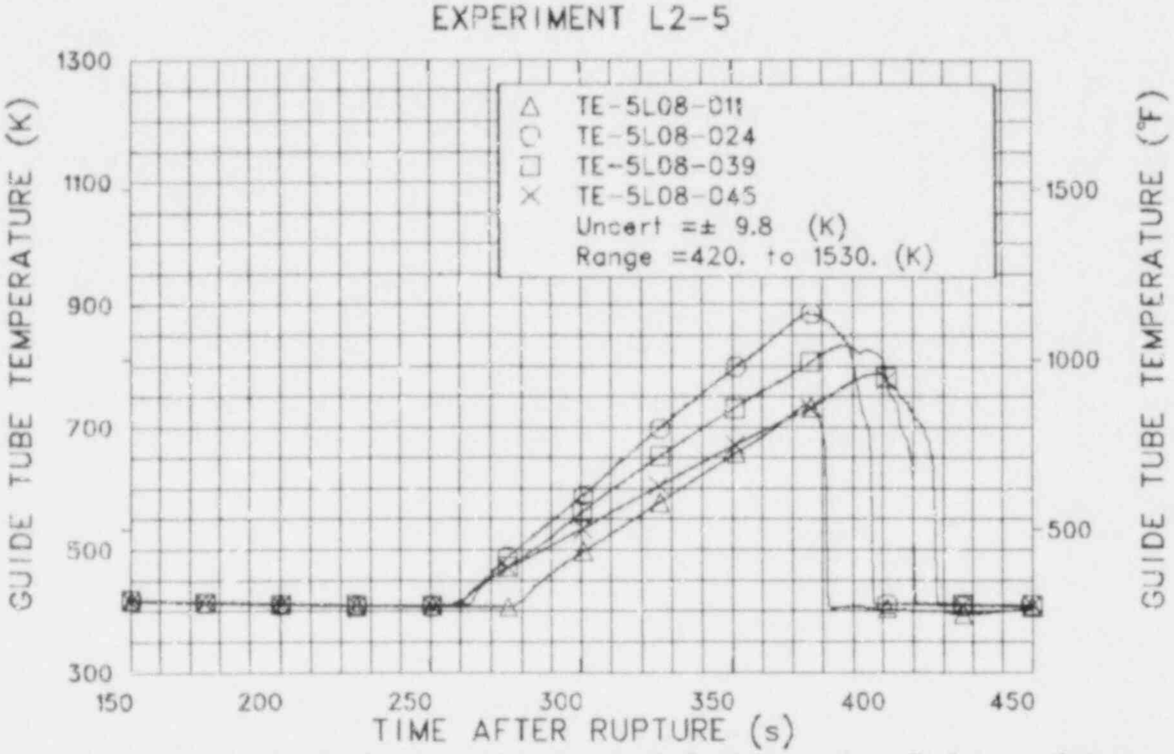


Figure 3R-15. Guide tube temperature at Fuel Assembly 5, Row L, Column 8 at 0.28, 0.61, 0.99, and 1.14 m above bottom of guide tube (TE-5L08-011, -024, -039, and -045).

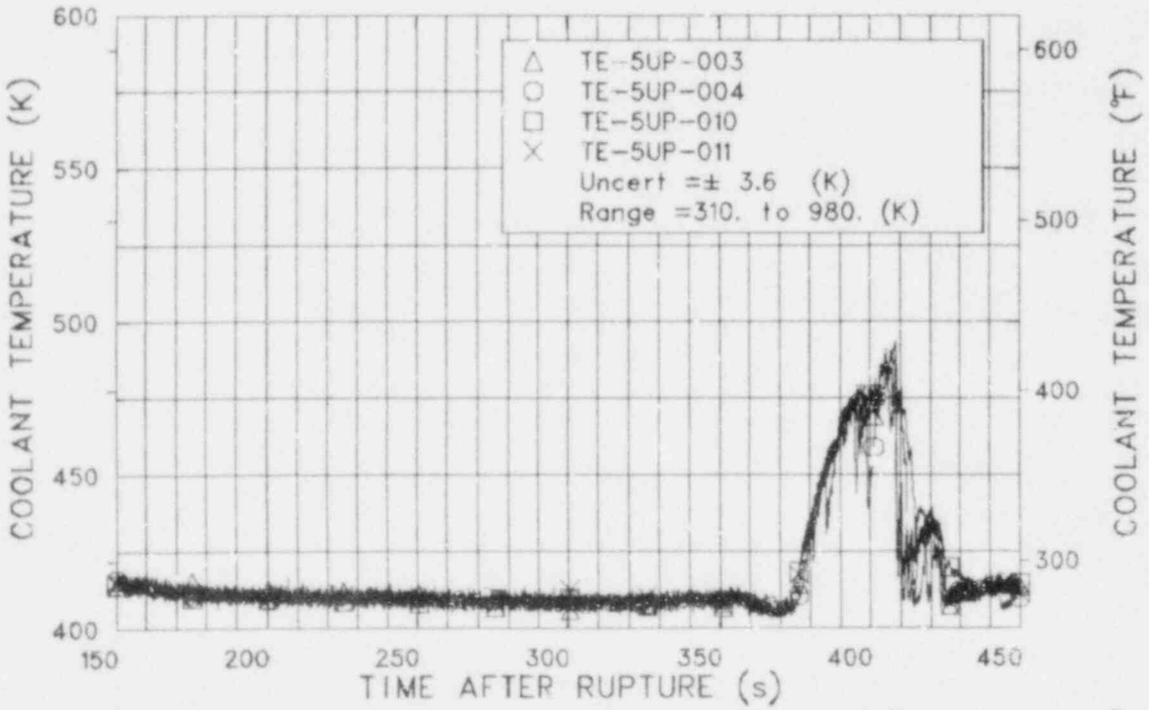


Figure 3R-16. Coolant temperature at upper end box of Fuel Assembly 5 (TE-5UP-003, -004, -010, and -011).

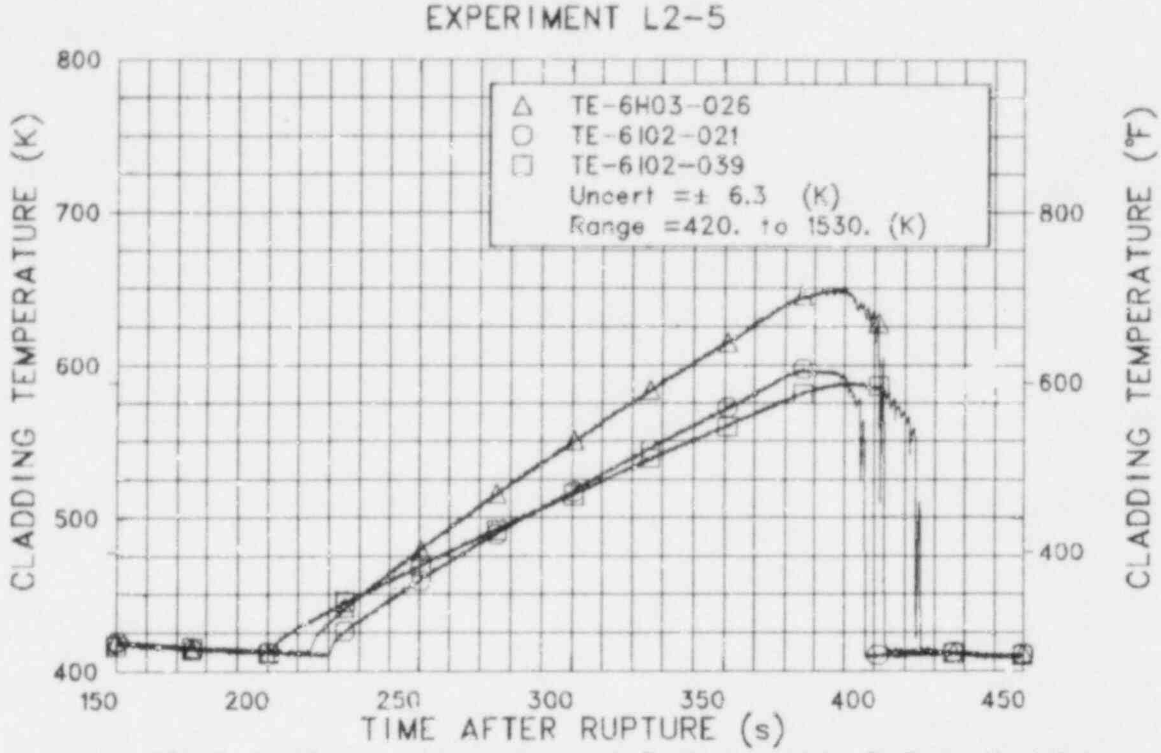


Figure 3R-17. Cladding temperature at Fuel Assembly 6, Rows H and I, Columns 2 and 3 at 0.66, 0.53, and 0.99 m above bottom of fuel rod (TE-6H03-026, -6I02-021, and -039).

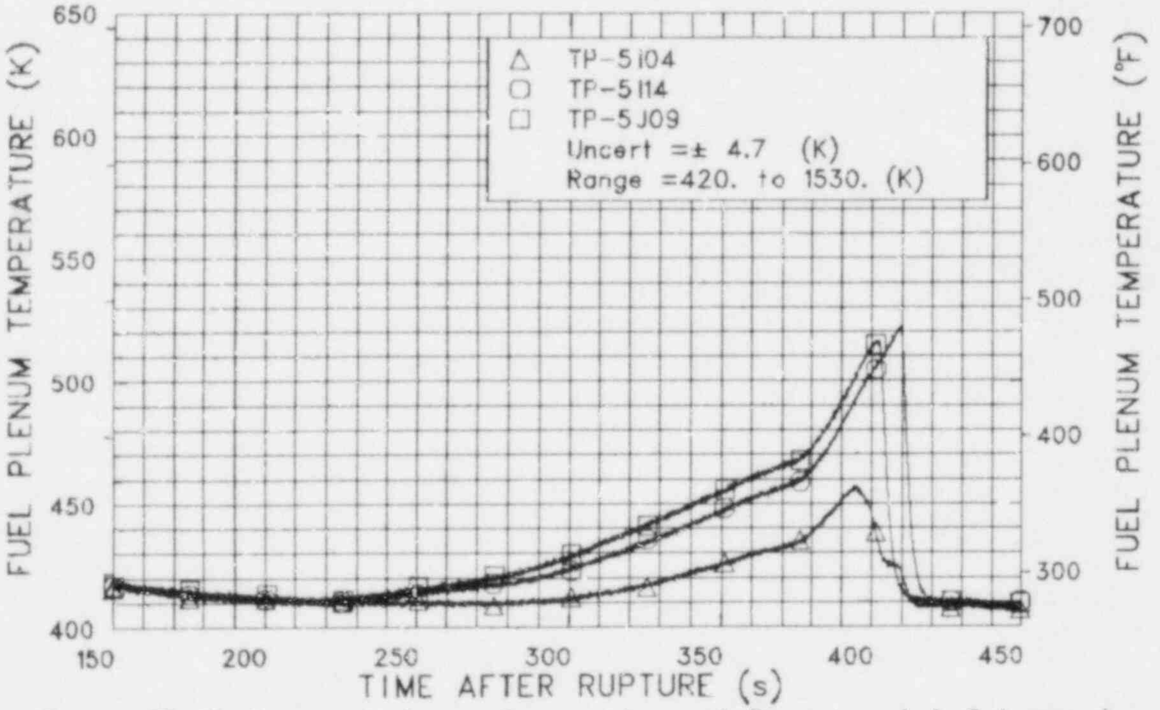


Figure 3R-18. Fuel rod plenum temperature at Rows I and J, Columns 4, 14, and 9 of Fuel Assembly 5 (TP-5I04, -5I14, and -5J09).

4. 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. U.S. Atomic Energy Commission, *Code of Federal Regulations Title 10, Atomic Energy*, Part 50, "Licensing of Production and Utilization Facilities," January 1976.

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

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

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 (LOCA). The experimental assembly includes five major subsystems which have been instrumented such that system variables can be measured and recorded during experiments simulating PWR accident conditions. 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 of 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 nuclear fuel rods arranged in five square (15 x 15 assemblies) and four triangular (corner) fuel modules and is described in Reference A-1. The center assembly is highly instrumented, and its fuel rods were prepressurized to 2.4 MPa. The fuel rods in the peripheral fuel assemblies are unpressurized. 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 (BST) header. Each leg consists of a break plane orifice, a quick-opening blowdown valve (QOBV), 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. These simulators have hydraulic orifice plate assemblies which have similar (passive) resistances to flow as an active steam generator and a pump.

The blowdown suppression system is comprised of the BST header, the BST, the nitrogen pressurization system, and the BST spray system. The BST header is connected to downcomers which extend inside the BST below the water level. The header is also directly connected to the BST vapor space to allow pressure equilibration. The nitrogen pressurization system is supplied by the LOFT inert gas system and uses a remote controlled pressure regulator to establish and maintain the specified BST initial pressure. The spray system consists of a centrifugal pump that discharges through a heatup heat exchanger and any of three spray headers or a pump recirculation line that contains a cooldown heat exchanger. The spray pump suction can be aligned to either the BST or the borated water storage tank (BWST). The three spray headers have flow rate capacities of 1.3, 3.8, and 13.9 L/s, respectively, and are located in the BST along the upper centerline. The BST spray pump suction was connected to the BWST and the liquid was sprayed into the BST so that the BST pressure simulated the containment back pressure expected during a LOCA.

The LOFT ECCS simulates the ECCS of a commercial PWR. It consists of two accumulators, a high-pressure injection system (HPIS), and a low-pressure injection system (LPIS). Each system is arranged to inject scaled flow rates of emergency core coolant (ECC) directly into the primary coolant system. All ECC flow was directed to the intact loop cold leg during Experiment L2-5. The

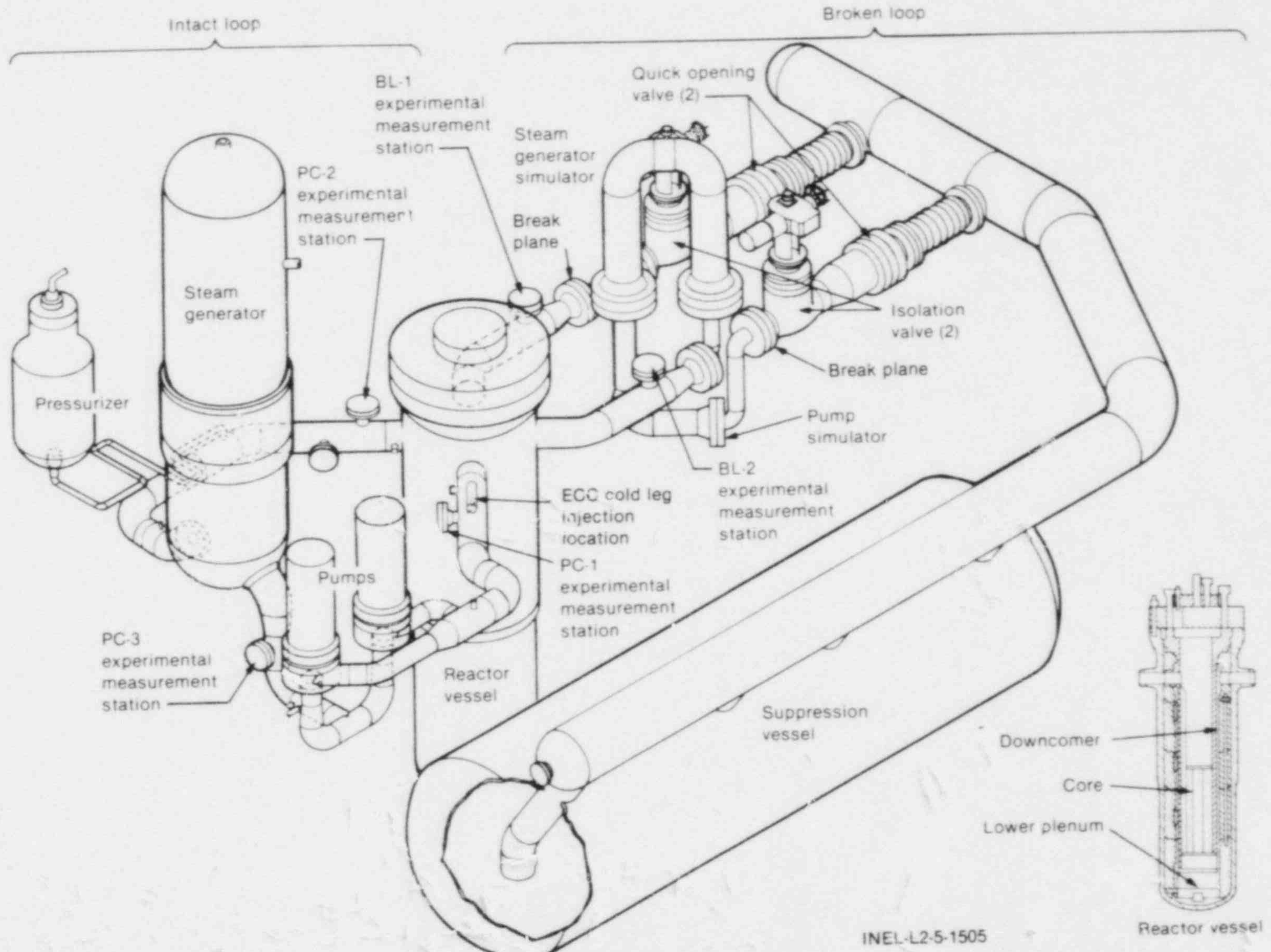


Figure A-1. LOFT major components.

HPIS injection was delayed until 23.90 ± 0.02 s, and the LPIS injection was delayed until 37.32 ± 0.02 s. Both of these injection systems drew suction from the BWST. During the recovery, ECC was injected into the reactor vessel lower plenum.

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 primarily from strain gauge transducers with pressure transmission lines connecting the transducers to the measurement points. Fuel plenum pressures are measured by eddy current transducers that measure the displacement of a target in the fuel rod.

3. Differential pressures are measured by strain gauge transducers with double chambers. The transducers are externally located and connected to the measurement points by 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)
FE-1ST-1 and -2 ME-1ST-1 and -2	0.141
FE-5LP-1 and 2 ME-5LP-1 and 2	0.106
FE-5UP-1 ME-3UP-1 and ME-5UP-1	0.125
ME-BL-1A, -1B, -1C, -1D, -1E, and -1F ME-BL-2A, -2B, -2C, -2D, -2E, and -2F FE-PC-1A, -1B, and -1C ME-PC-1A, -1B, and -1C FE-PC-2A, -2B, and -2C ME-PC-2A, -2B, and -2C	0.0634

6. Fluid density is measured by gamma densitometers. Each densitometer consists 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, except DE-PC-3, also has a

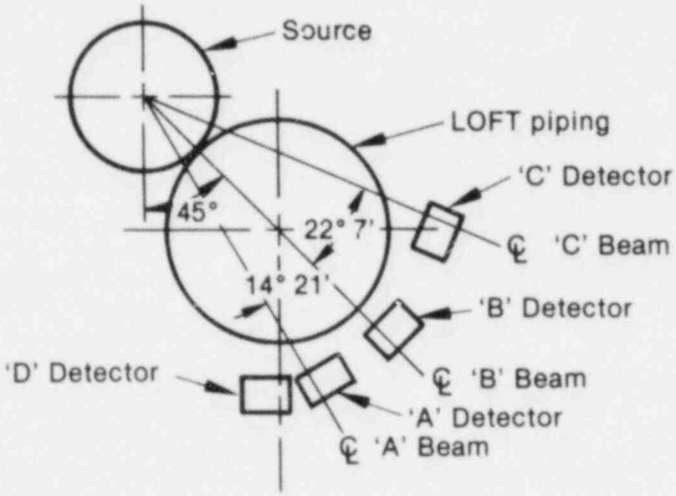


Figure B-1. Relation of source and detectors to pipe for gamma densitometers.

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, reactor vessel upper plenum, and blowdown suppression tank (BST); 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.

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.

12. Reactor power is measured by uncompensated ionization chambers located in the shield tank.

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, postexperiment 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. Most of these transducers have been given identification numbers which identify the type of transducer and the 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

The fuel plenum temperature and pressure measurement identification numbers do not include the height above the bottom of the fuel rod.

Figures B-3 and B-4 show isometric views of the major system components with instrument locations indicated. Figures B-5 through B-16 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 for use in LOFT Experiment L2-5. 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.

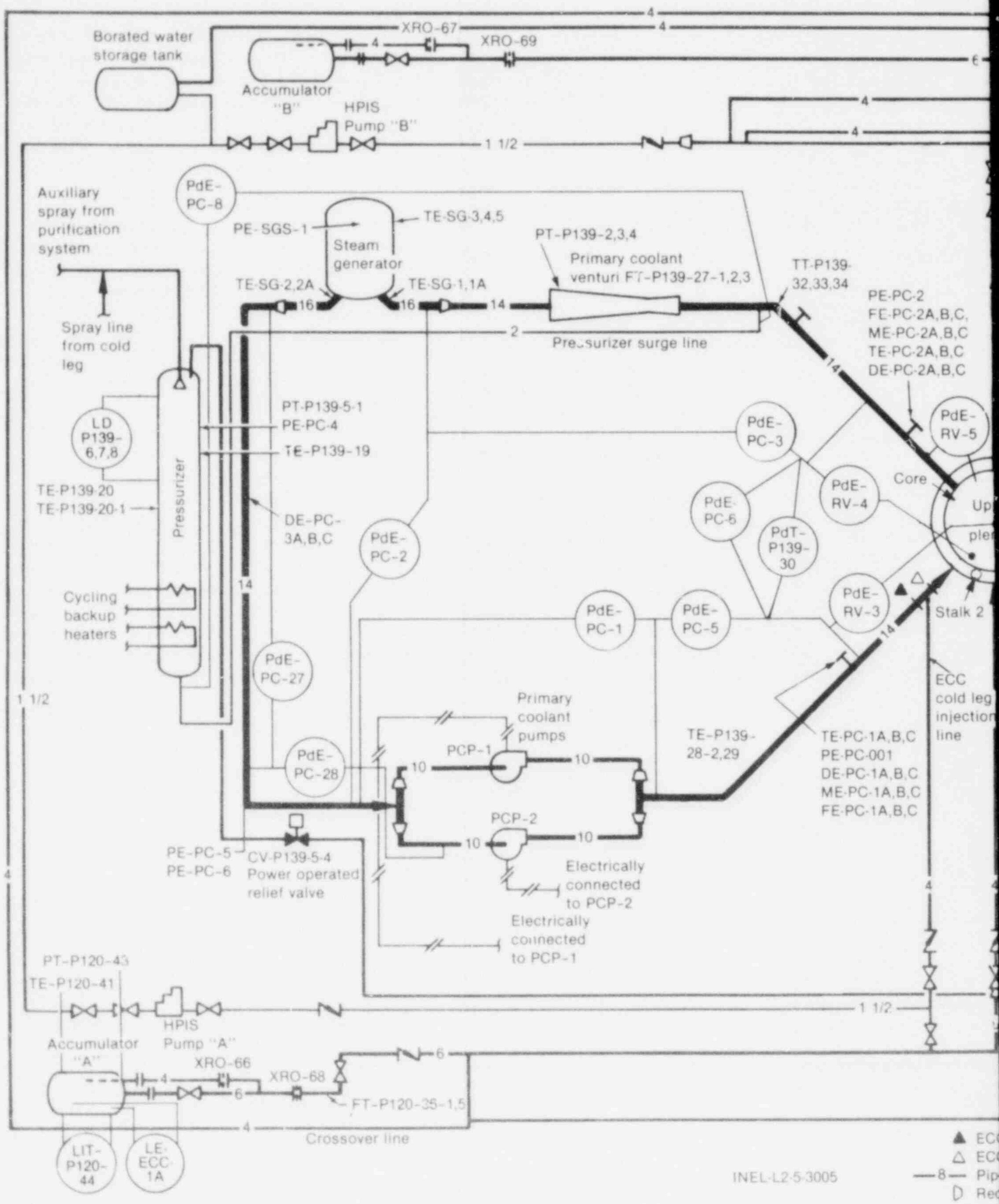
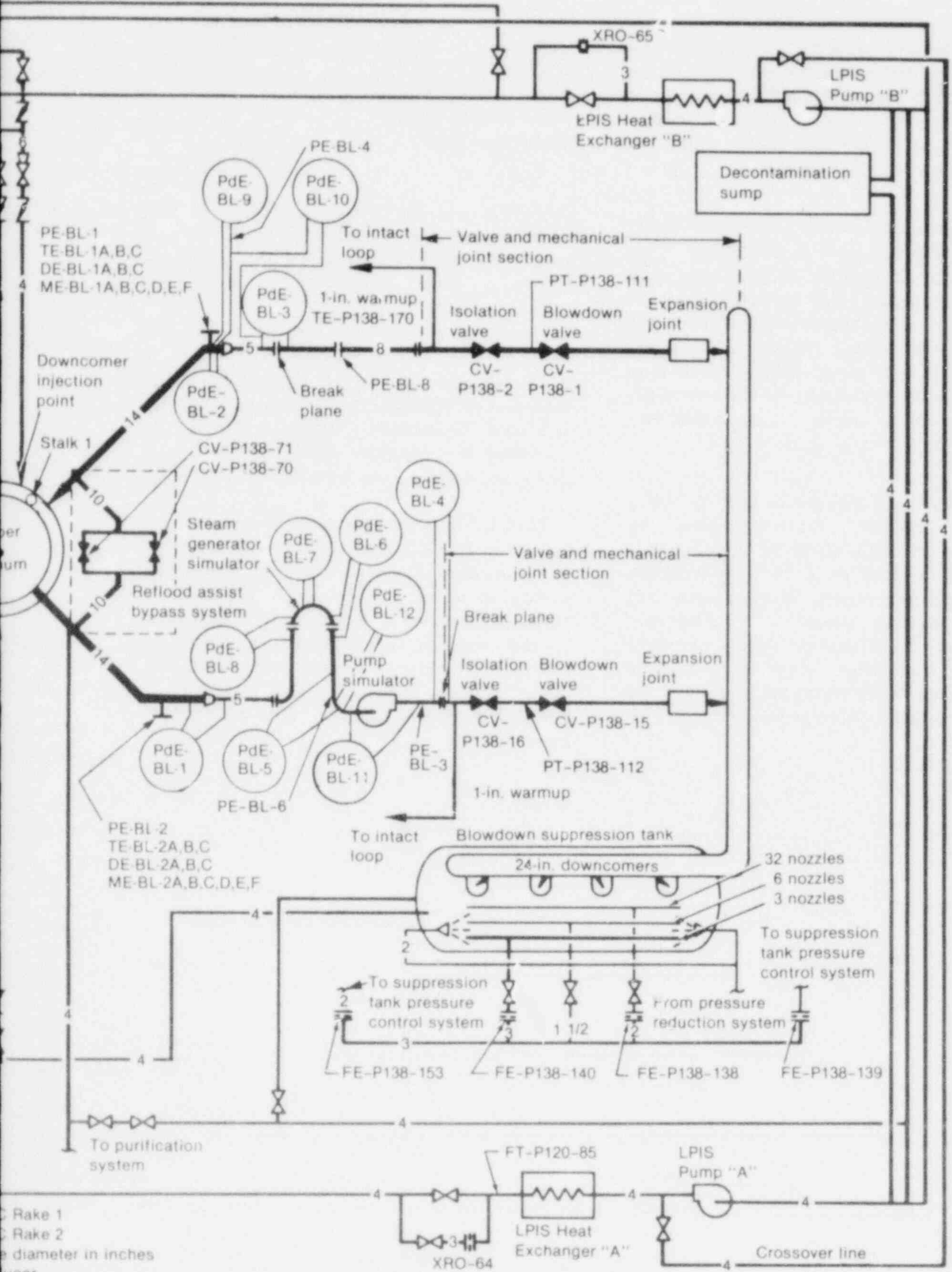


Figure B-2. LOFT piping schemati



with instrumentation.

TABLE B-1. NOMENCLATURE FOR LOFT INSTRUMENTATION

Designations for the Different Types of Experimental Instruments	
AE	Accelerometer
DE	Gamma 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
TC,TE,TF,TM, TP	Temperature element
UDE	Ultrasonic densitometer
Designations for the Different Experimental Systems, Except the Core	
BL	Broken loop
LP	Lower plenum
PC	Primary coolant intact loop
PC-S	Spool piece in pressure relief line
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
LD	Density-compensated liquid level element
LIT	Level-indicating transmitter (not density compensated)
LT	Liquid level transmitter (not density compensated)
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

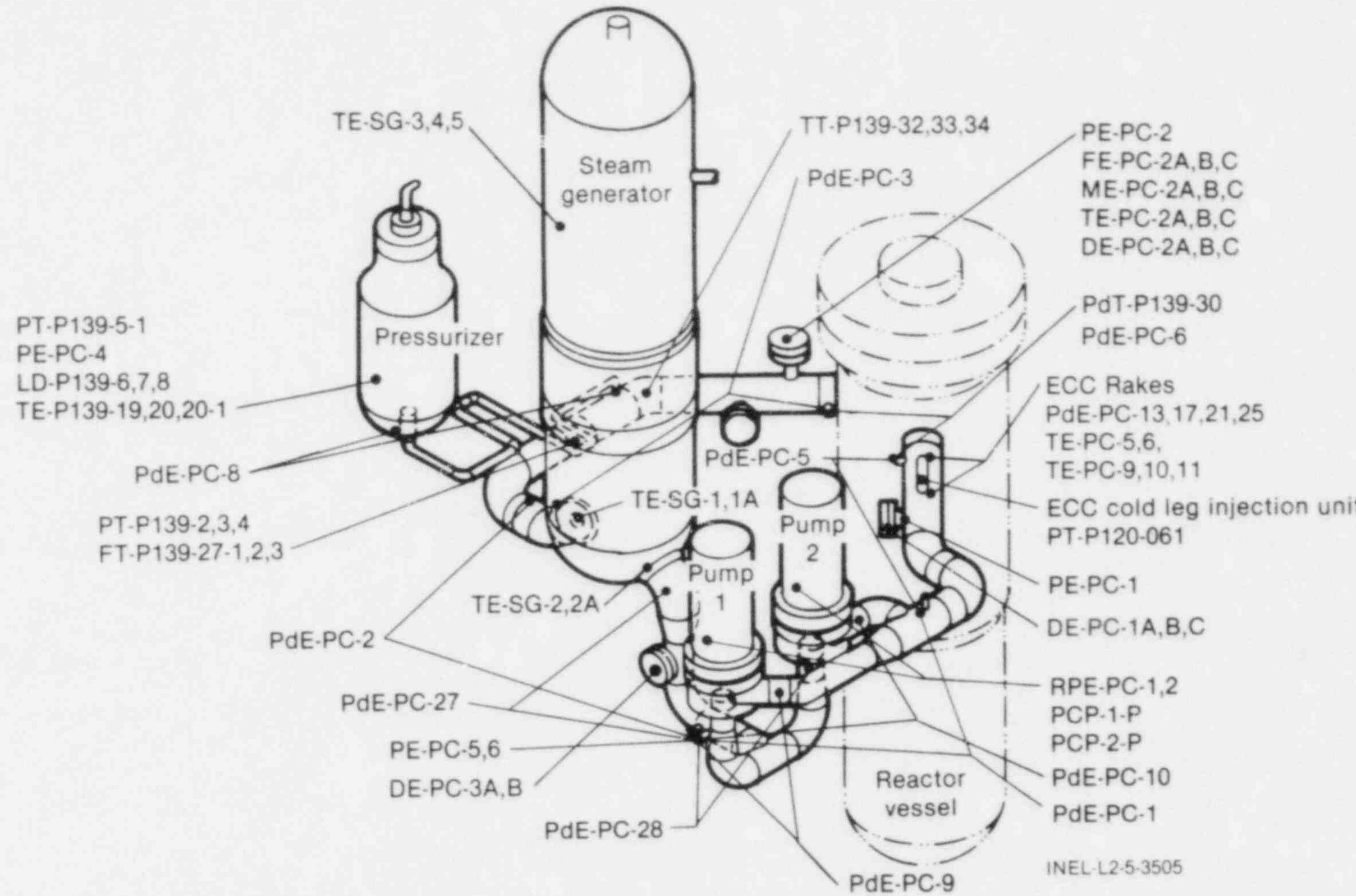


Figure B-3. LOFT thermal-hydraulic instrumentation for intact loop.

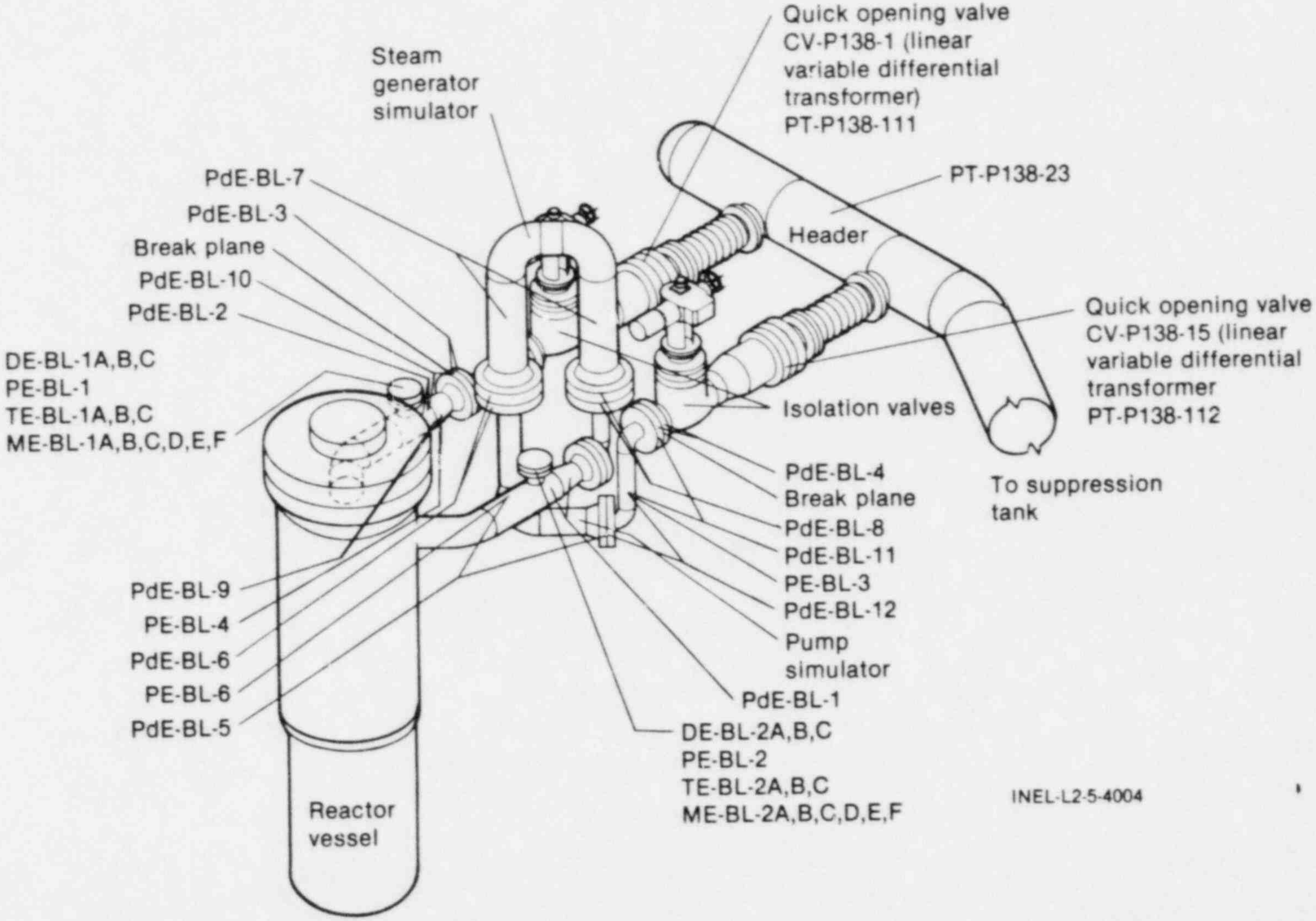


Figure B-4. LOFT thermal-hydraulic instrumentation for broken loop.

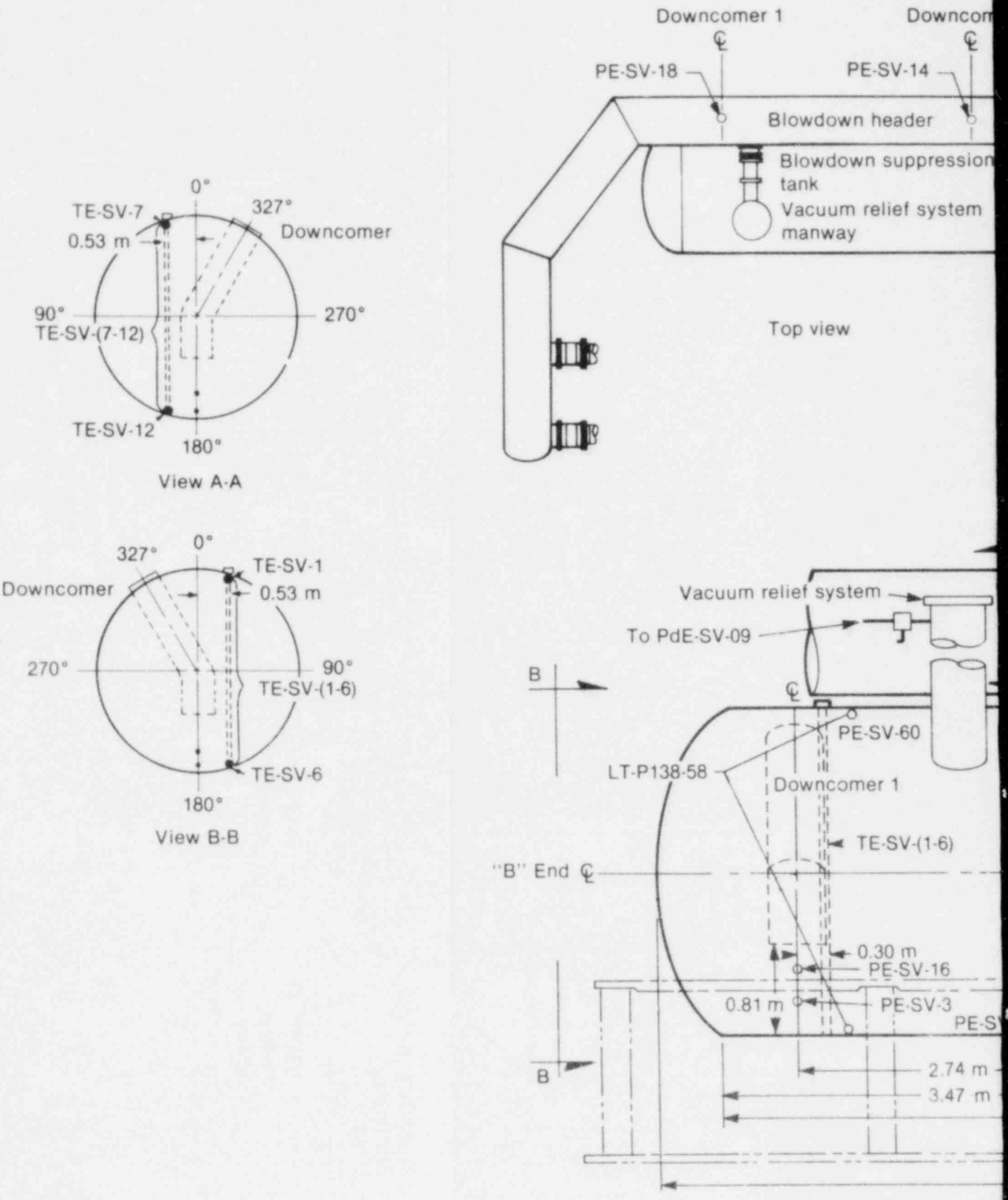
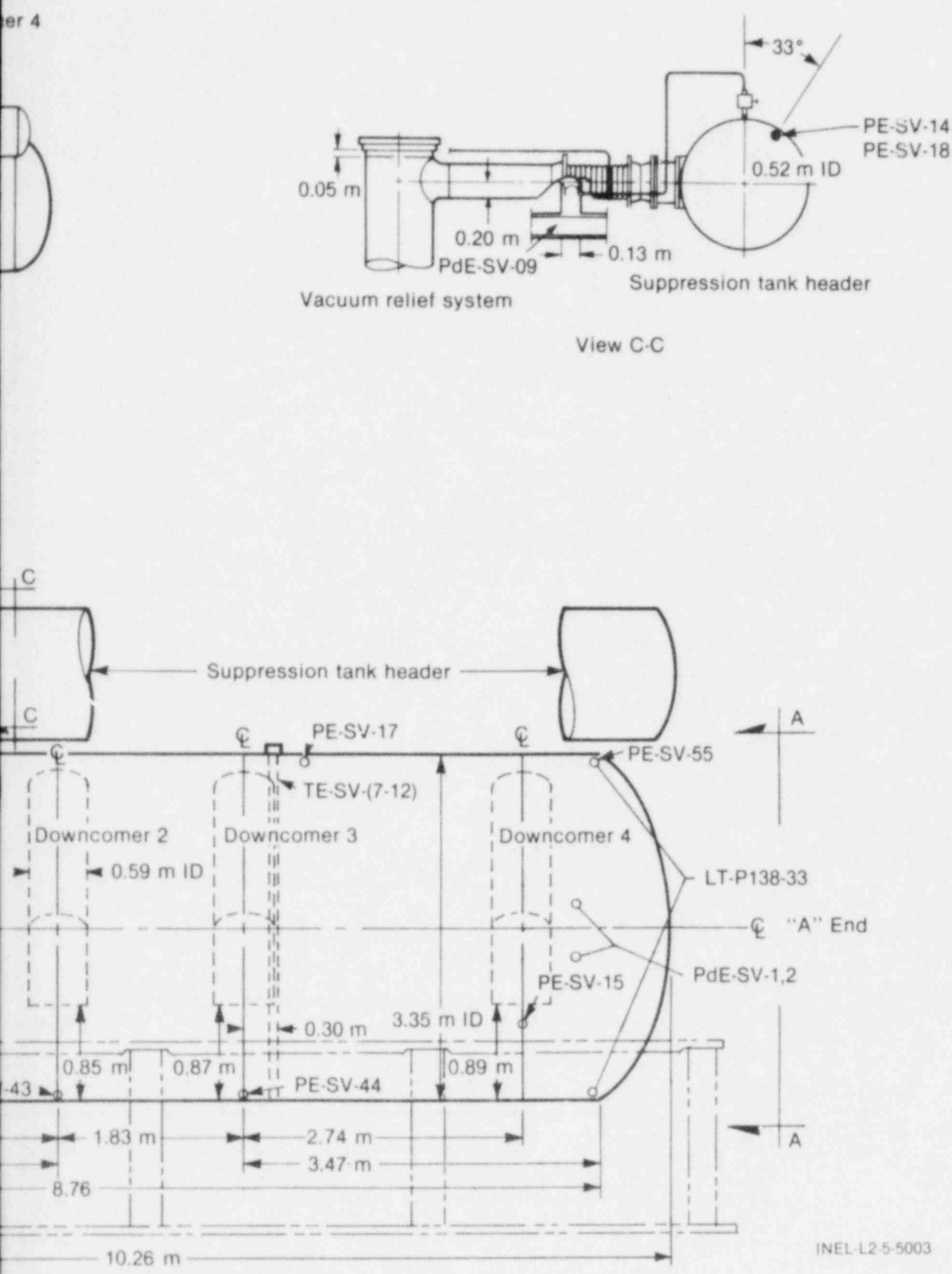
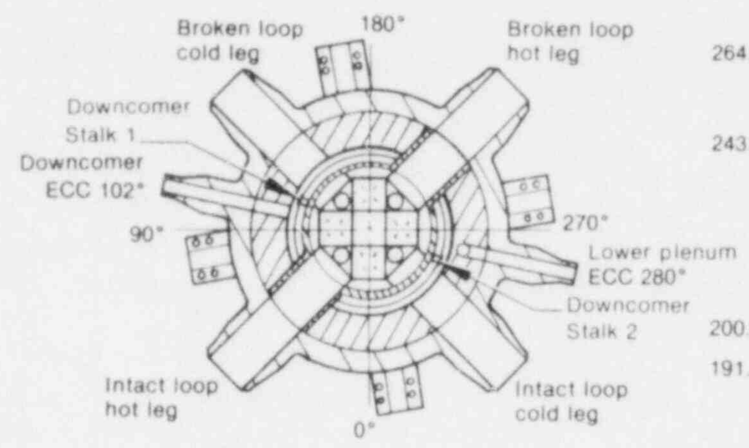


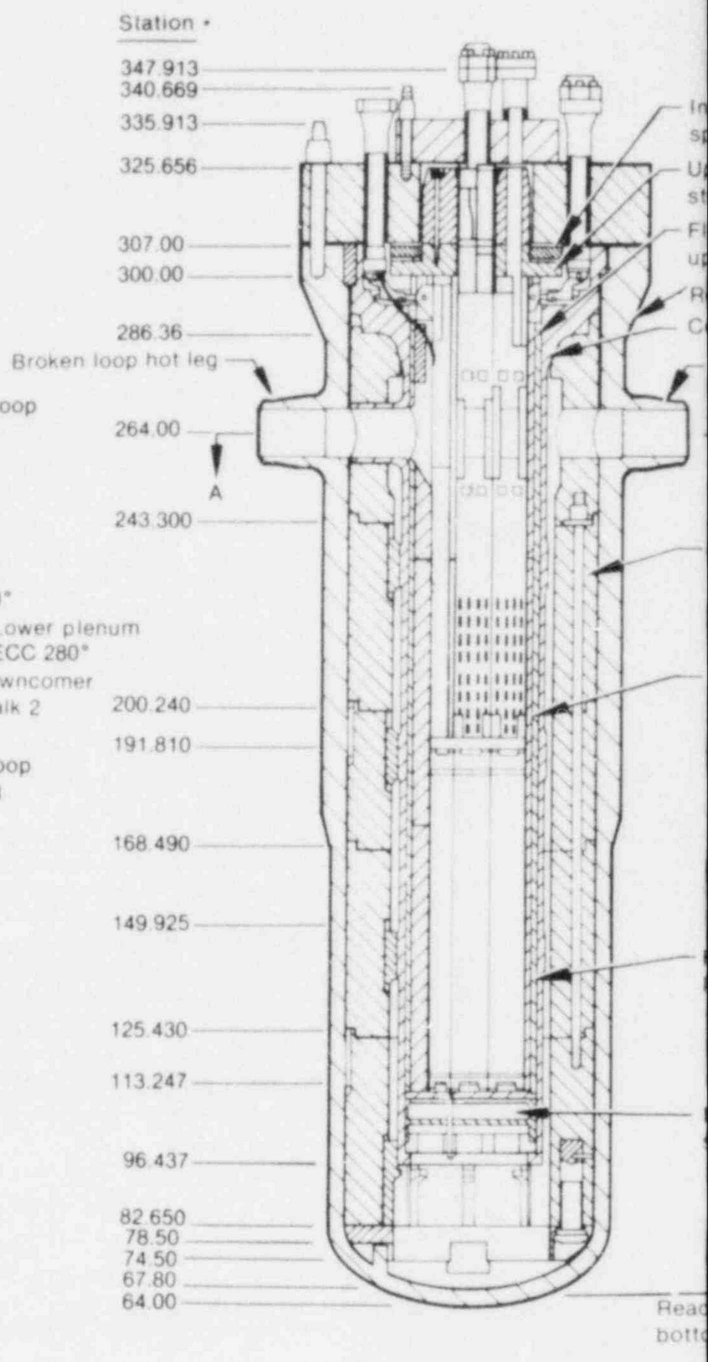
Figure B-5. LOFT blowdown suppres



ion tank instrumentation.

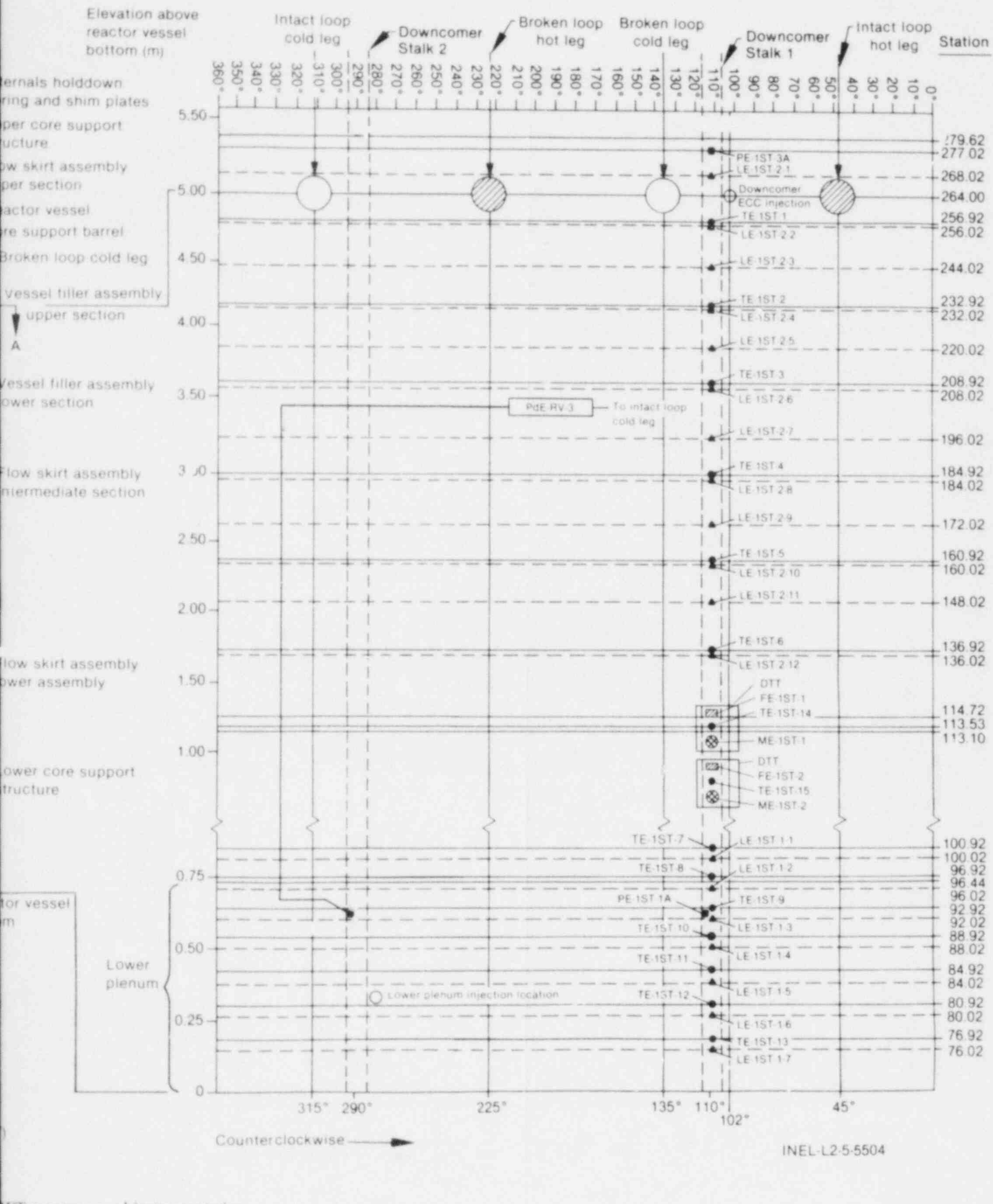


Section A-A

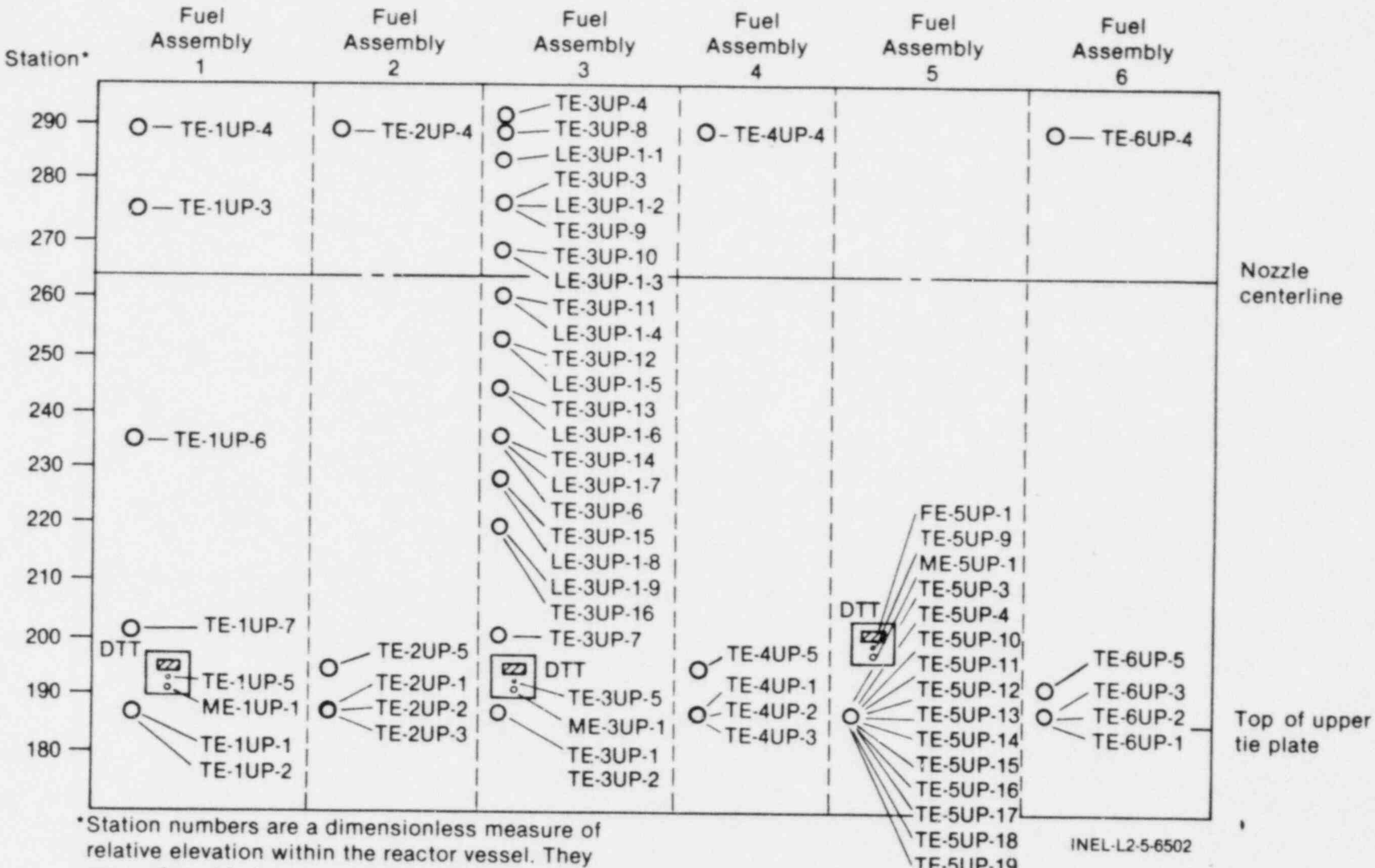


* Station numbers are a dimensionless measure of relative elevation within the reactor vessel. They are assigned in increments of 2.54 centimeters with station 300.00 defined at the core barrel support ledge inside the reactor vessel flange.

Figure B-6. L



FT reactor vessel 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.

Figure B-7. LOFT reactor vessel upper plenum DTT, LE, and TE elevations.

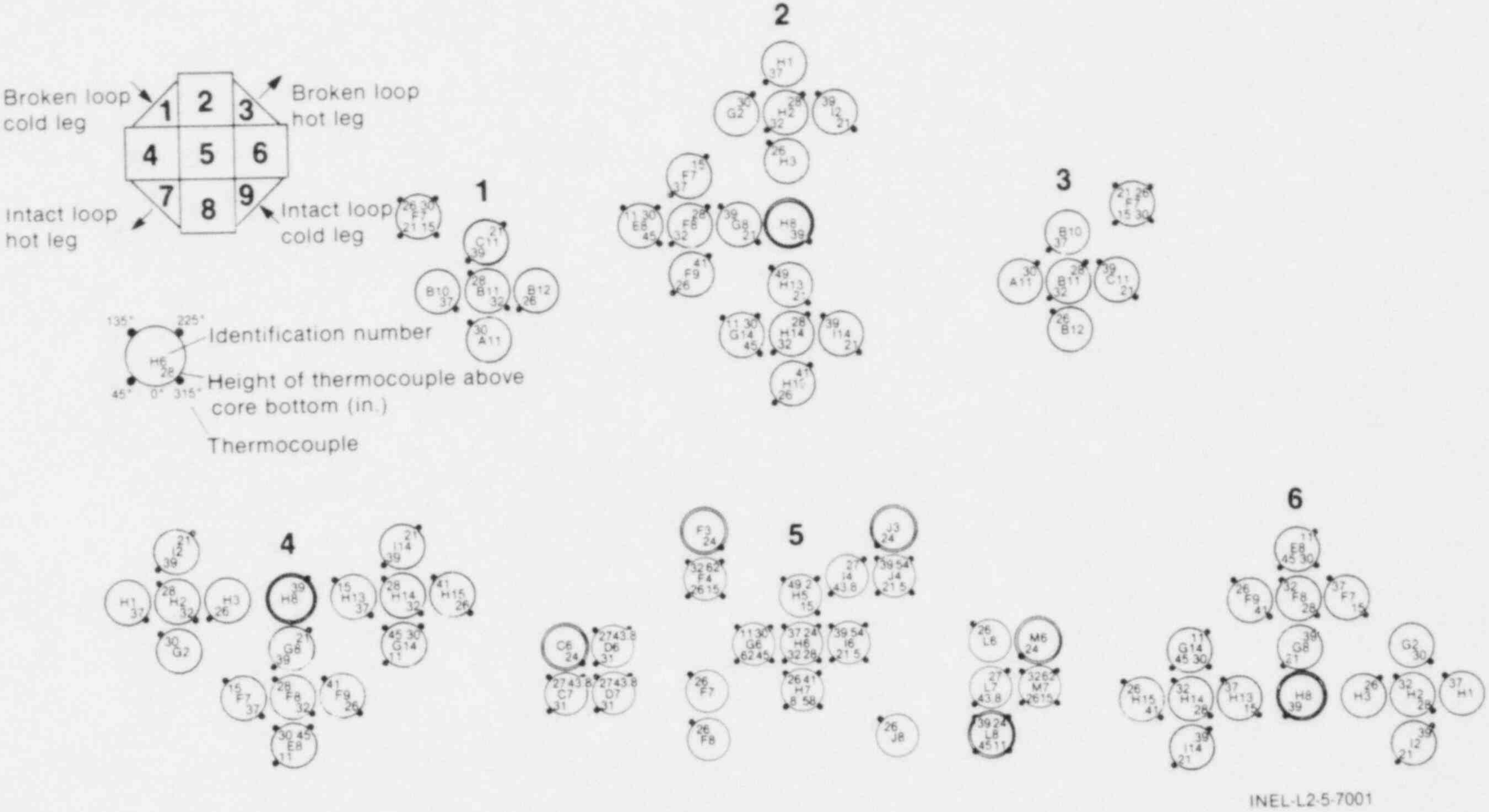


Figure B-8. Cladding surface thermocouple locations for LOFT core.

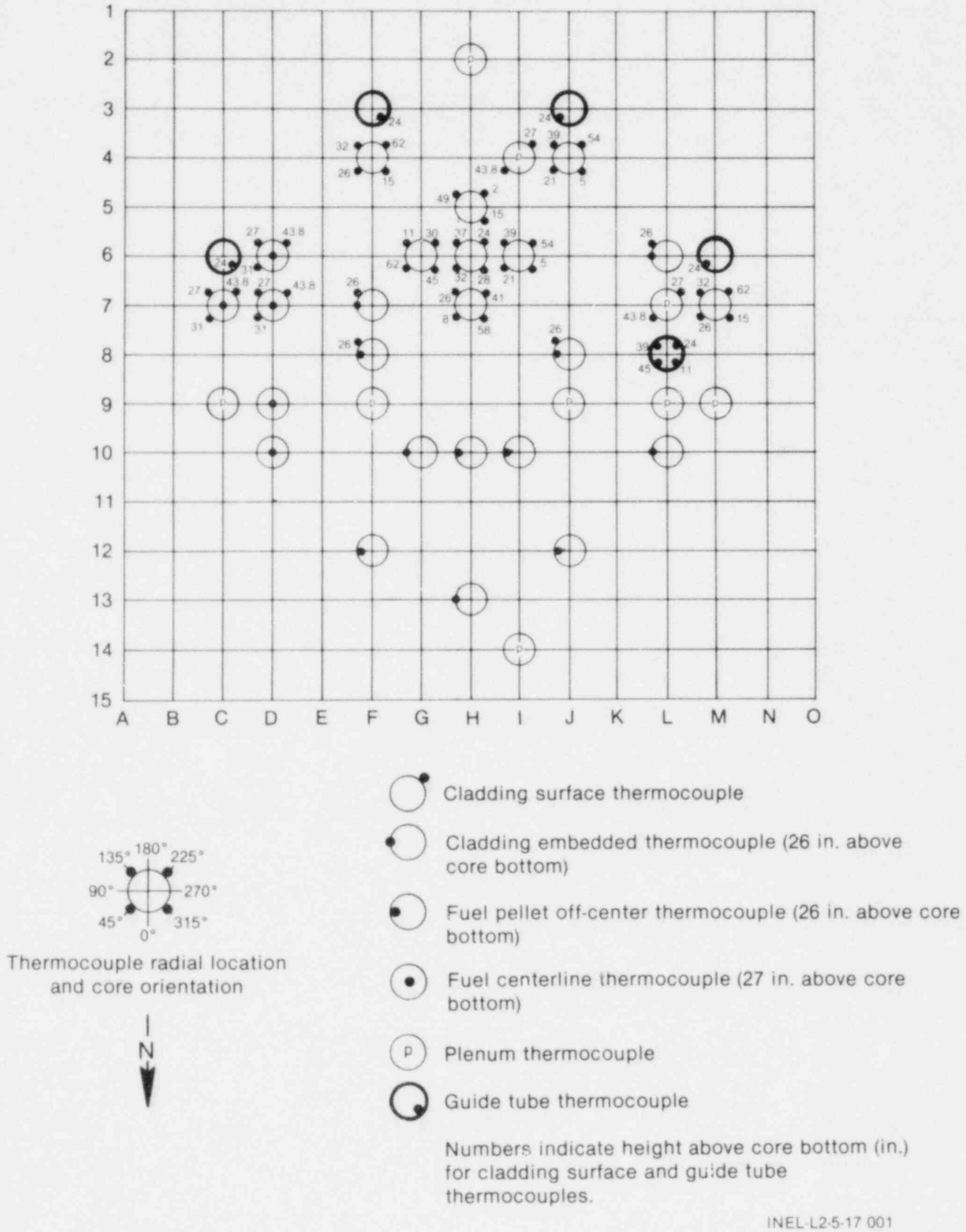


Figure B-9. In-core thermocouple locations for center fuel assembly.

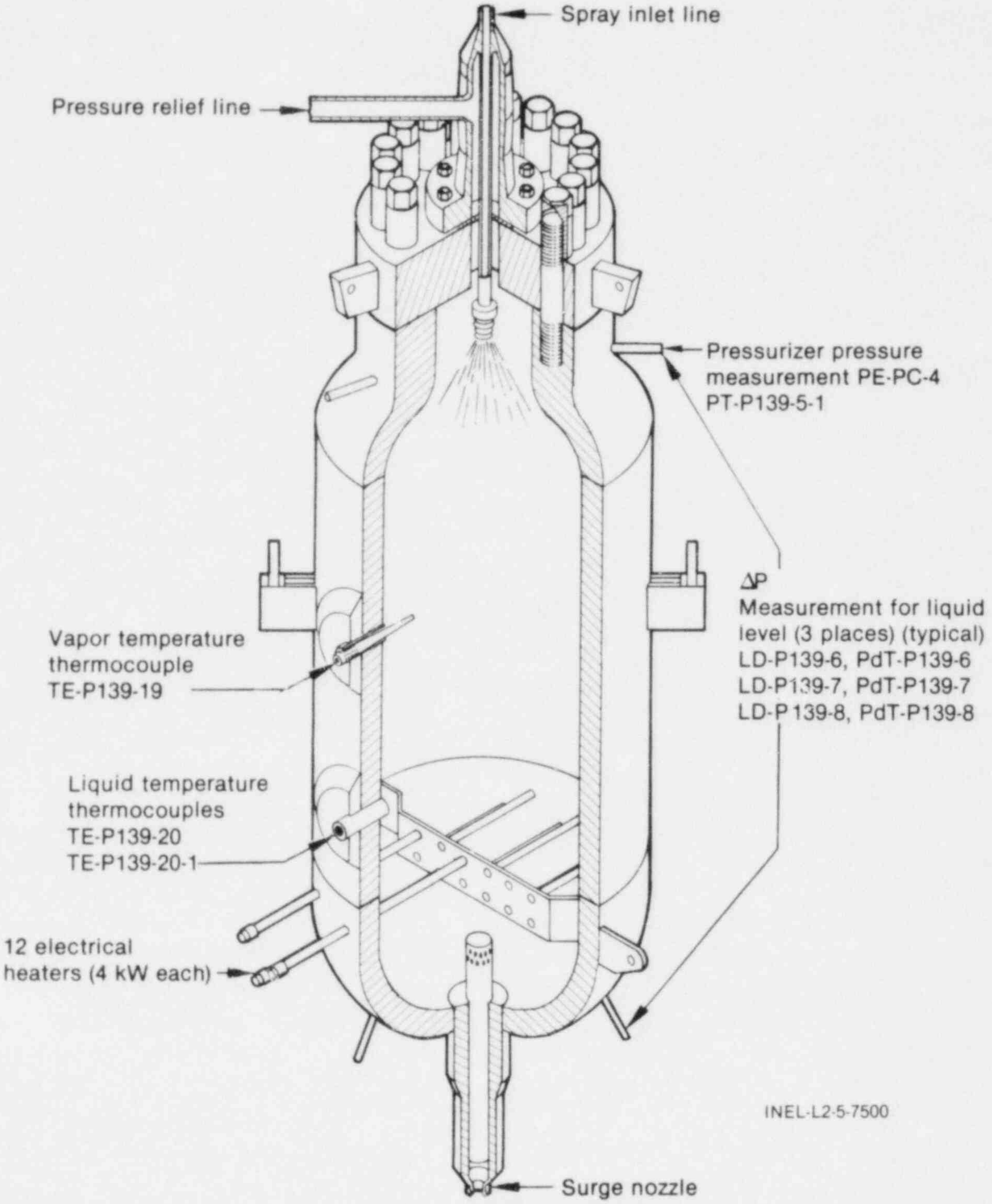


Figure B-10. LOFT pressurizer instrumentation.

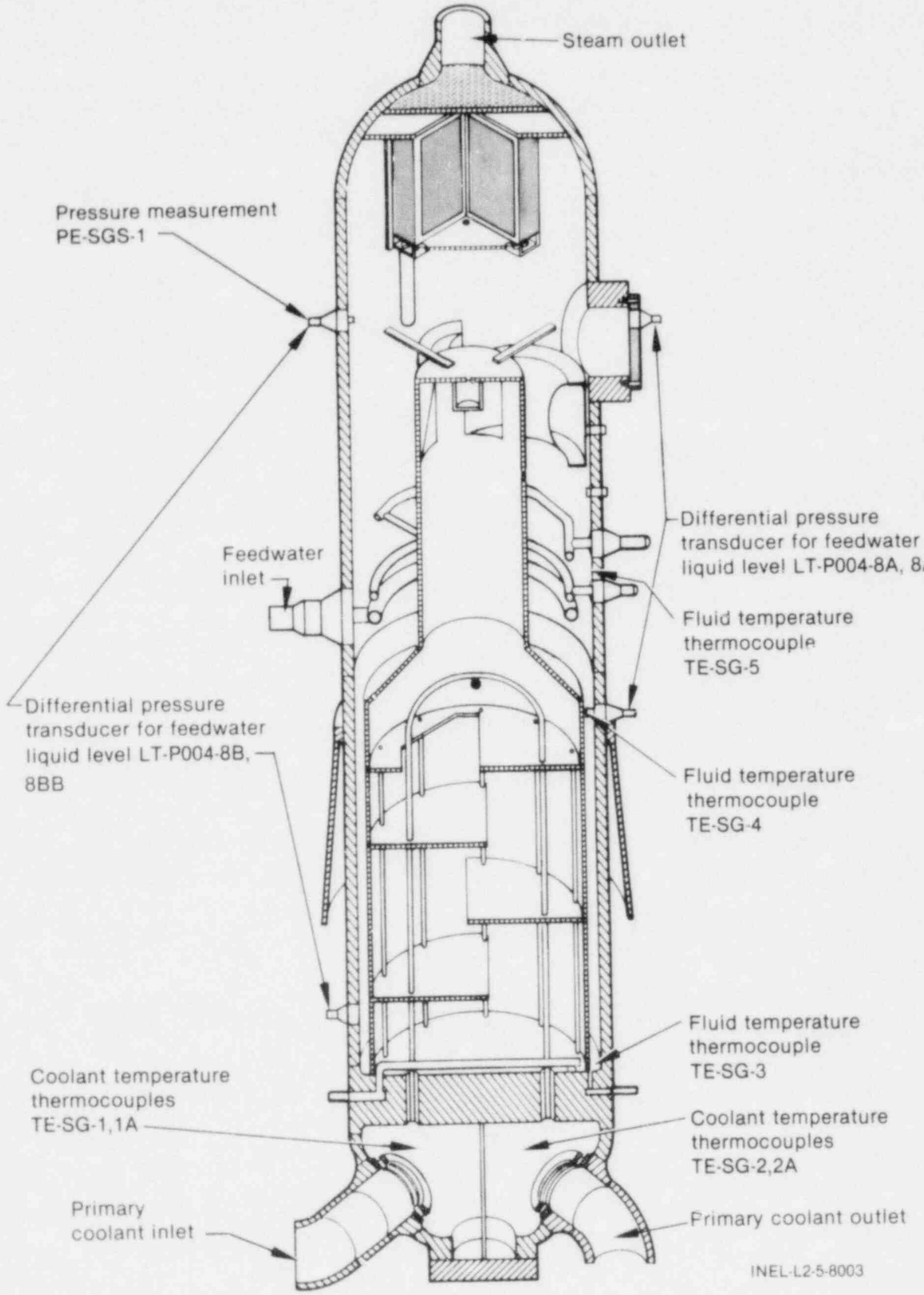


Figure B-11. LOFT steam generator instrumentation.

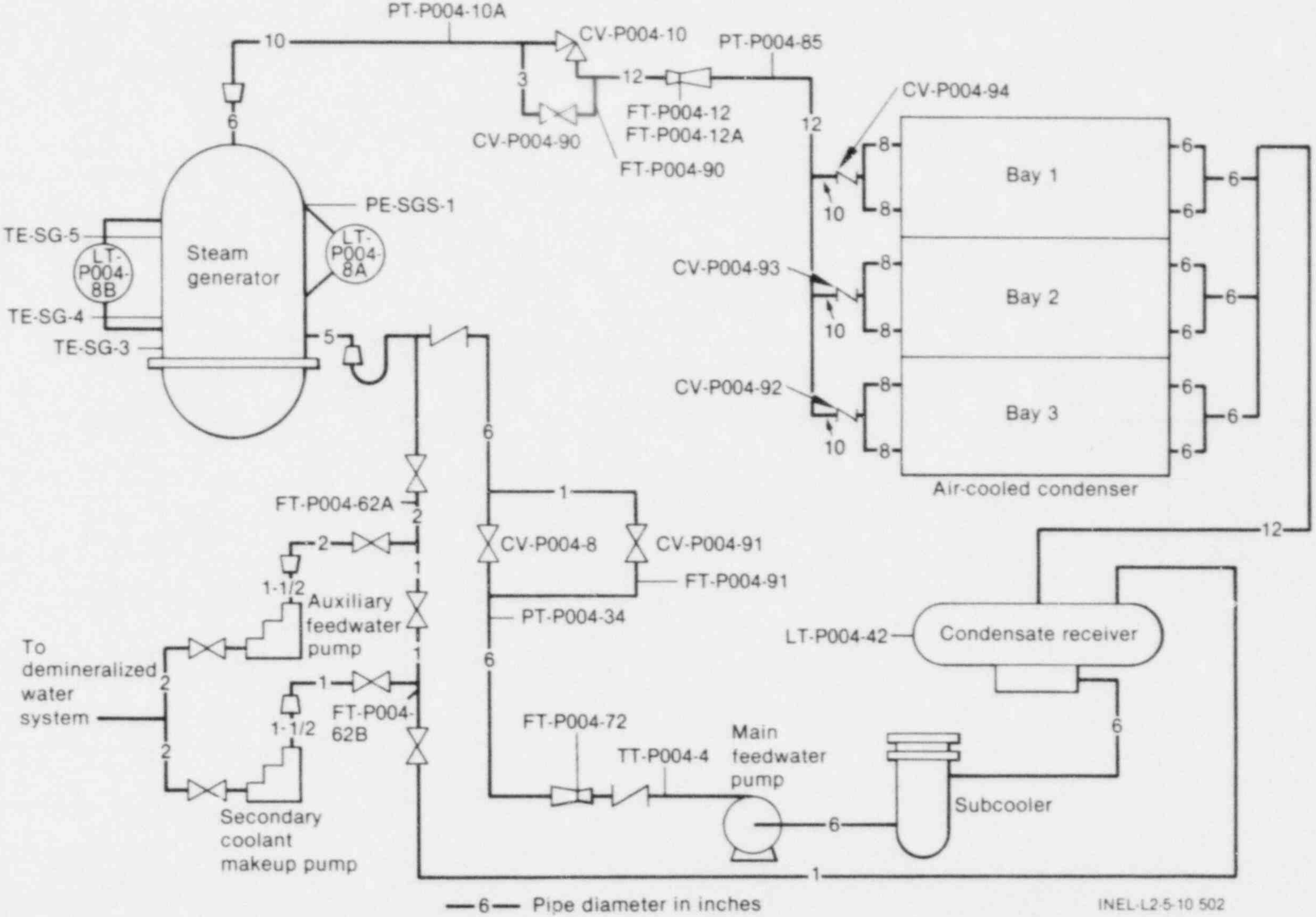


Figure B-12. LOFT secondary coolant system instrumentation.

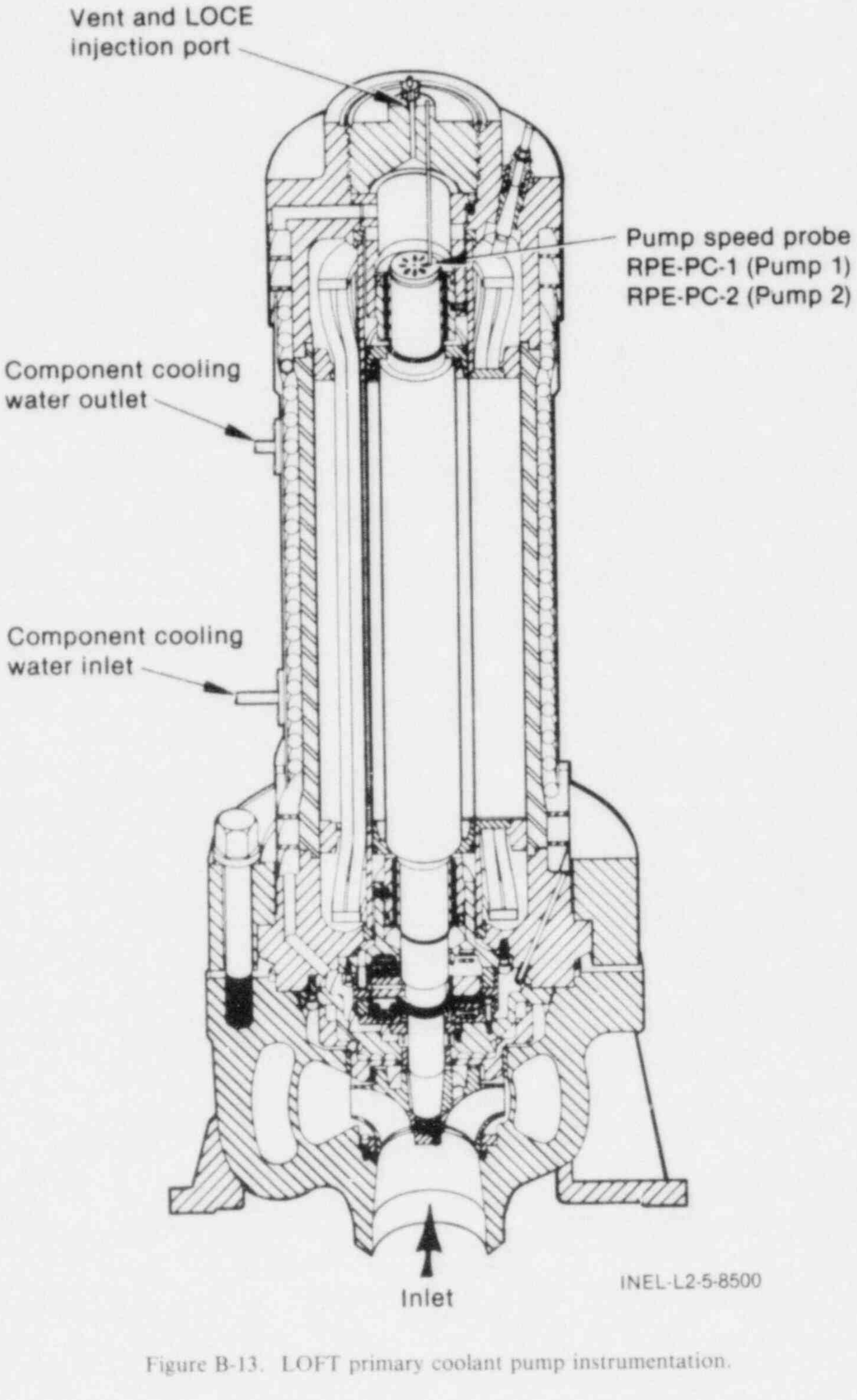


Figure B-13. LOFT primary coolant pump instrumentation.

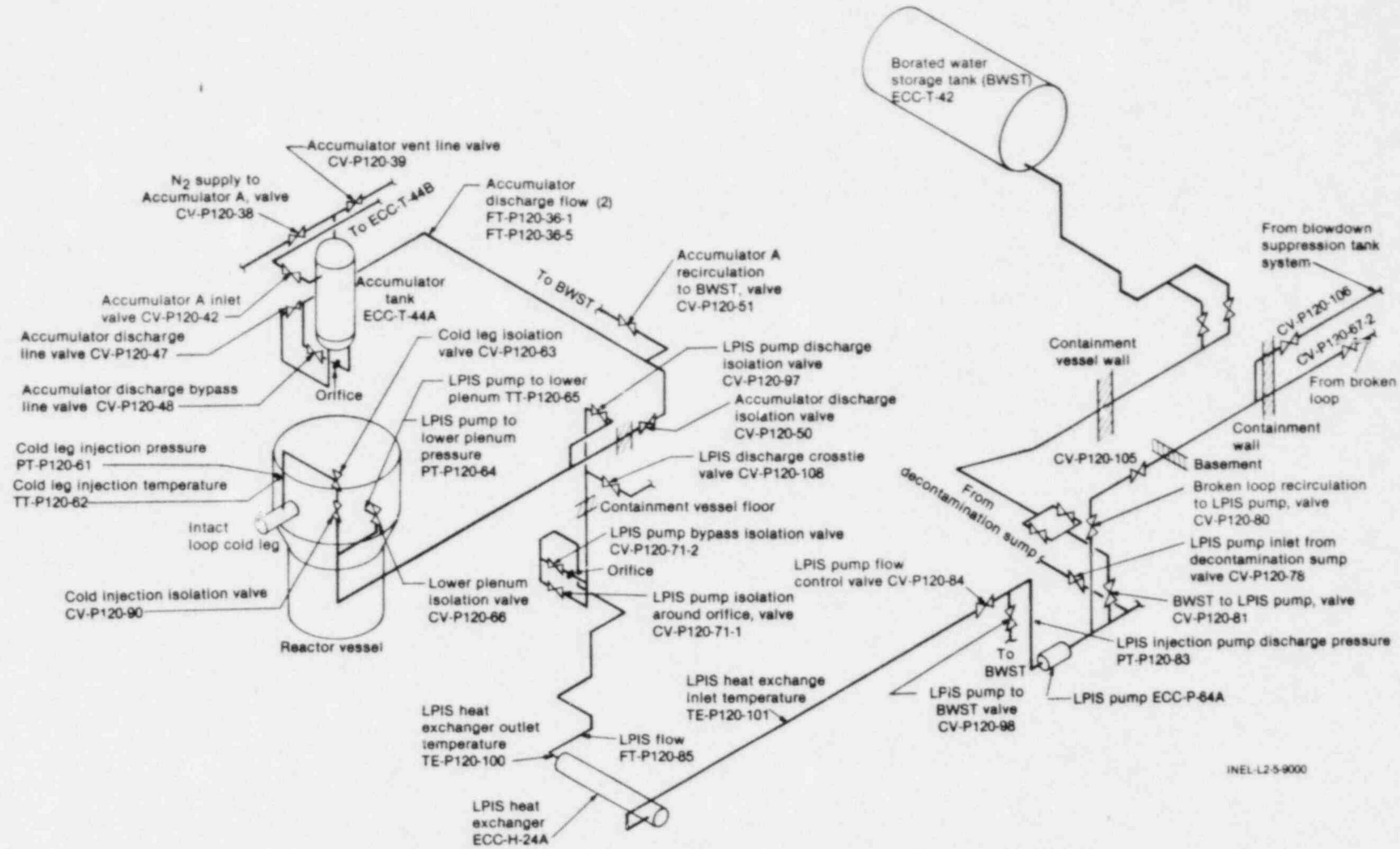


Figure B-14. LOFT ECCS instrumentation—A train.

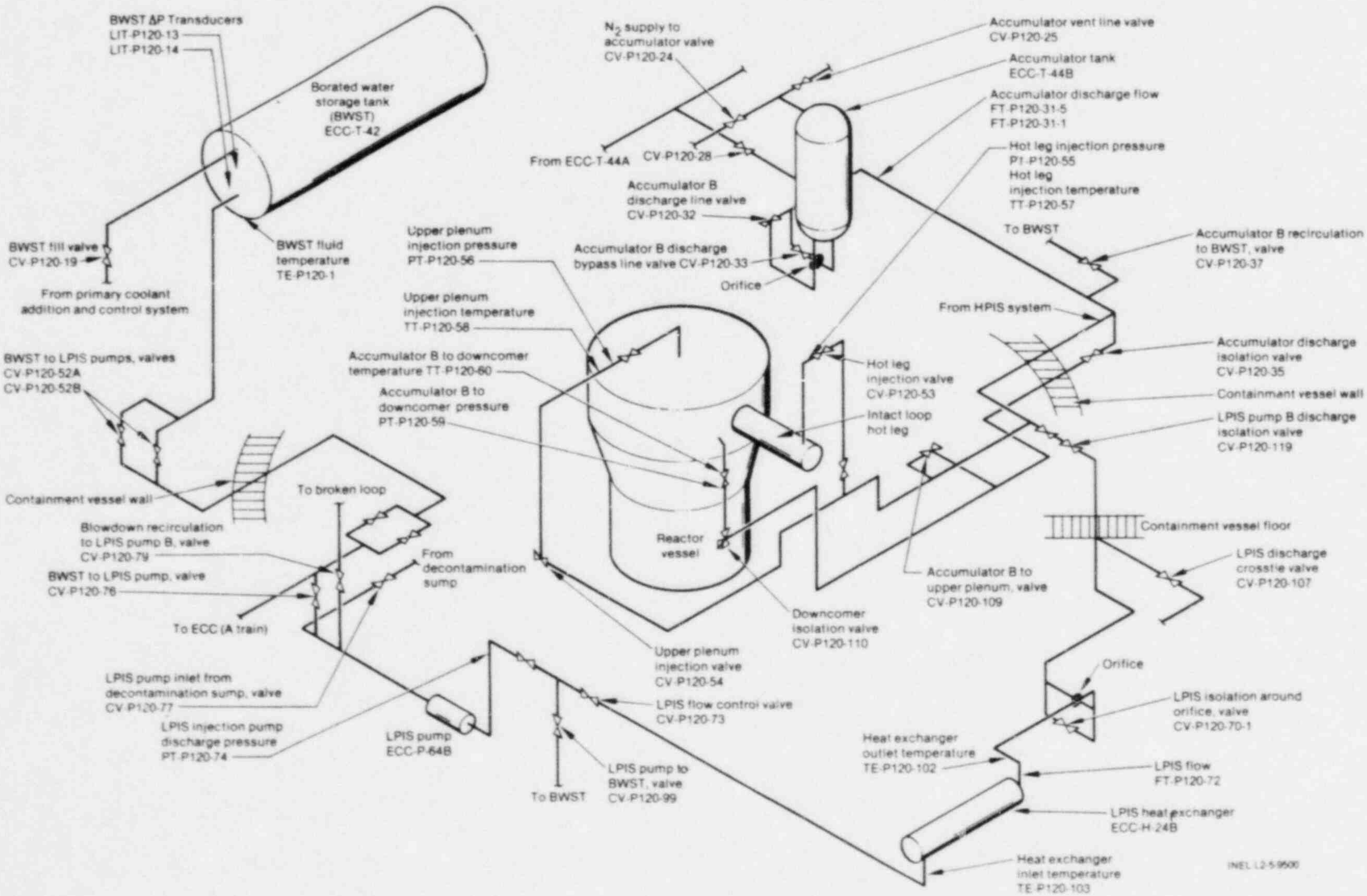


Figure B-15. LOFT ECCS instrumentation—B train.

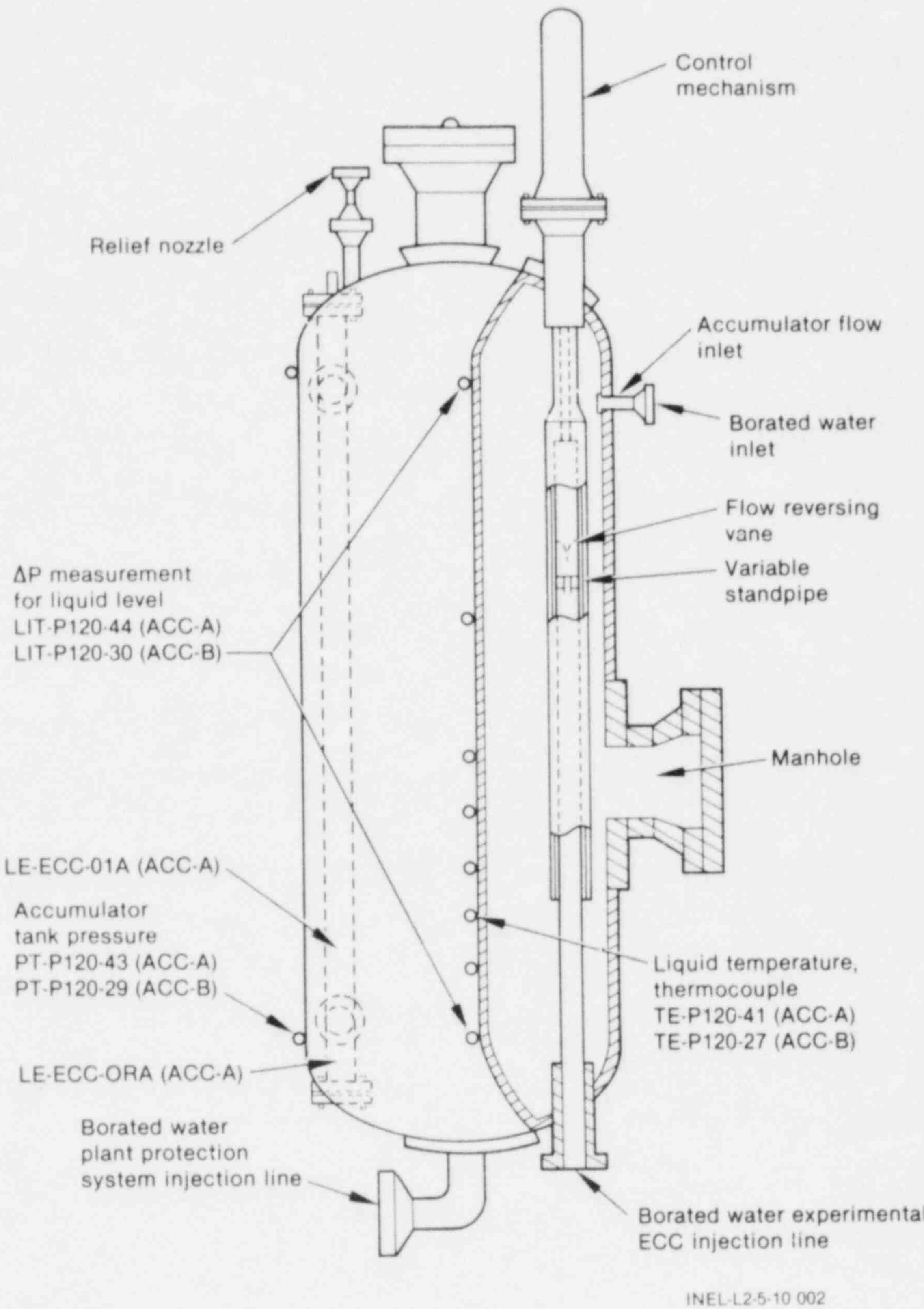


Figure B-16. LOFT accumulator instrumentation.

TABLE B-2. EXPERIMENT L2-5 INSTRUMENTATION LIST

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
VALVE OPENING							
Secondary Coolant System							
CV-P004-008	Main feedwater control valve.	0 to 100%	10 Hz	3.2%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	
CV-P004-010	Main steam control valve.	0 to 100%	10 Hz	3.5%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified.
CV-P004-090	Main steam bypass valve.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified, spike at approximately 500 s, spurious noise.
CV-P004-091	Main feedwater bypass valve.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified.
Broken Loop							
CV-P138-001	Quick-opening blowdown valve (QOBV) in cold leg.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified, except for spurious spikes.
CV-P138-015	QOBV in hot leg.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified, except for spurious spikes.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
VALVE OPENING (continued)							
Broken Loop (continued)							
CV-P138-070A	Blowdown system bypass valve.	0 to 100%	10 Hz	4.6%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified.
CV-P138-071A	Blowdown system bypass valve.	0 to 100%	10 Hz	4.6%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified.
Blowdown Suppression System							
CV-P138-123	1.3-L/s spray header control valve.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified, except for spurious spikes.
CV-P138-124	3.8-L/s spray header control valve.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified, except for spurious spikes.
CV-P138-125	13.9-L/s spray header control valve.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified, except for spurious spikes.
Intact Loop							
CV-P139-05-1	Pressurizer spray valve.	0 to 100%	10 Hz	3.0%	0% 25% 50% 100%	3.0% 3.1% 3.5% 4.6%	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
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	0.08 Mg/m^3	--	0.08 Mg/m^3 [b,c]	Qualified.
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	0.09 Mg/m^3	--	0.09 Mg/m^3	Qualified.
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	0.13 Mg/m^3	--	0.13 Mg/m^3	Qualified.
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	0.08 Mg/m^3	--	0.08 Mg/m^3	Qualified.
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	--	--	--	Failed.
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	0.13 Mg/m^3	--	0.13 Mg/m^3	Qualified, except for spurious spikes.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
DENSITY (continued)							
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	0.08 Mg/m^3	--	0.08 Mg/m^3	Qualified.
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	0.09 Mg/m^3	--	0.09 Mg/m^3	Qualified.
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	0.13 Mg/m^3	--	0.13 Mg/m^3	Qualified.
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	0.08 Mg/m^3	--	0.08 Mg/m^3	Qualified.
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	0.09 Mg/m^3	--	0.09 Mg/m^3	Qualified.
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	0.13 Mg/m^3	--	0.13 Mg/m^3	Qualified, except for spurious spikes.

away from RV).

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
DENSITY (continued)							
Intact Loop (continued)							
DE-PC-003A	Intact loop below steam generator (SG) at DTT flange. Beam A is 14° 21 min from Beam B.	0 to 1.0 Mg/m^3	10 Hz	--	--	--	Failed.
DE-PC-003B	Intact loop below SG at DTT flange. Beam B is through centerline of pipe 45° from vertical.	0 to 1.0 Mg/m^3	10 Hz	--	--	--	Failed.
FUEL ASSEMBLY DISPLACEMENT							
Assembly 5							
DIE-5G13-01	Fuel rod at Row G, Column 13 of Fuel Assembly 5.	±10 mm	10 Hz	0.34 mm	0 mm 5 mm 10 mm	0.3 mm[d] 0.32 mm 0.36 mm	Qualified, magnitude uncertain.
DIE-5H03-01	Fuel rod at Row H, Column 3 of Fuel Assembly 5.	±10 mm	10 Hz	0.35 mm	0 mm 5 mm 10 mm	0.3 mm 0.37 mm 0.36 mm	Qualified, magnitude uncertain.
DIE-5I13-01	Fuel rod at Row I, Colum[illegible] of Fuel Asse[illegible].	±10 mm	10 Hz	0.35 mm	0 mm 5 mm 10 mm	0.3 mm 0.32 mm 0.36 mm	Qualified, magnitude uncertain.
DIE-5UP-001	A[illegible]nter of Fuel As[illegible] 5.	±12.7 mm	10 Hz	--	0 mm 6.35 mm 12.7 mm	0.3 mm 0.33 mm 0.39 mm	Failed.
DIE-5UP-002	At top center of Fuel Assembly 5.	±12.7 mm	10 Hz	0.32 mm	0 mm 6.35 mm 12.7 mm	0.3 mm 0.33 mm 0.39 mm	Qualified, magnitude uncertain.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
FLUID VELOCITY							
Intact Loop							
FE-PC-001A	Cold leg DTT horizontal flange on west side of pipe.	0.4 to 10.6 m/s	10 Hz	0.29 m/s	1 m/s 5 m/s 10 m/s	0.22 m/s[e,f] 0.30 m/s 0.40 m/s	Qualified, flow direction not indicated.
FE-PC-001B	Cold leg DTT horizontal flange at center of pipe.	0.4 to 10.6 m/s	10 Hz	0.29 m/s	1 m/s 5 m/s 10 m/s	0.22 m/s 0.30 m/s 0.40 m/s	Qualified, flow direction not indicated.
FE-PC-001C	Cold leg DTT horizontal flange on east side of pipe.	0.4 to 10.6 m/s	10 Hz	0.29 m/s	1 m/s 5 m/s 10 m/s	0.22 m/s 0.30 m/s 0.40 m/s	Qualified, flow direction not indicated.
FE-PC-002A	Hot leg DTT flange at bottom of pipe.	0.4 to 10.6 m/s	10 Hz	0.29 m/s	1 m/s 5 m/s 10 m/s	0.22 m/s 0.30 m/s 0.40 m/s	Qualified, flow direction not indicated.
FE-PC-002B	Hot leg DTT flange at middle of pipe.	0.4 to 10.6 m/s	10 Hz	0.30 m/s	1 m/s 5 m/s 10 m/s	0.22 m/s 0.30 m/s 0.40 m/s	Qualified, flow direction not indicated.
FE-PC-002C	Hot leg DTT flange at top of pipe.	0.4 to 10.6 m/s	10 Hz	0.30 m/s	1 m/s 5 m/s 10 m/s	0.22 m/s 0.30 m/s 0.40 m/s	Qualified, flow direction not indicated.
Reactor Vessel							
FE-1ST-001	Downcomer Stalk 1.	0.4 to 10.6 m/s	10 Hz	0.25 m/s	1 m/s 5 m/s 10 m/s	0.23 m/s 0.35 m/s 0.50 m/s	Qualified, flow direction not indicated.
FE-1ST-002	Downcomer Stalk 1.	0.4 to 10.6 m/s	10 Hz	0.25 m/s	1 m/s 5 m/s 10 m/s	0.23 m/s 0.35 m/s 0.50 m/s	Qualified, flow direction not indicated, unexplained noise.
FE-5LP-001	Lower end box of Fuel Assembly 5.	0.4 to 10.6 m/s	10 Hz	0.25 m/s	1 m/s 5 m/s 10 m/s	0.23 m/r 0.35 m/s 0.50 m/s	Qualified, flow direction not indicated.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
FLUID VELOCITY (continued)							
Reactor Vessel (continued)							
FE-5LP-002	Lower end box of Fuel Assembly 5.	0.4 to 10.6 m/s	10 Hz	--	1 m/s 5 m/s 10 m/s	0.23 m/s 0.35 m/s 0.50 m/s	Failed.
FE-5UP-001	Above upper end box of Fuel Assembly 5.	0.4 to 10.6 m/s	10 Hz	0.25	1 m/s 5 m/s 10 m/s	0.23 m/s 0.35 m/s 0.50 m/s	Qualified, flow direction not indicated.
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	--	--	0.17 L/s	Failed.
FE-P138-139	BST spray flow rate from pump discharge.	0 to 25 L/s	10 Hz	0.33 L/s	--	0.33 L/s	Qualified, no instrument for direct comparison.
FE-P138-140	BST spray flow rate in 13.9-L/s header.	0 to 20 L/s	10 Hz	0.25 L/s	--	0.25 L/s	
FE-P138-153	BST spray flow rate in spray pump recirculation line.	0 to 10 L/s	10 Hz	--	--	0.33 L/s	Failed.
Secondary Coolant System							
FT-P004-012	Inlet to air-cooled condenser inlet header.	0 to 40 kg/s	10 Hz	1.1 kg/s	--	1.1 kg/s	
FT-P004-012A	Inlet to air-cooled condenser inlet header.	0 to 4 kg/s	10 Hz	0.20 kg/s	--	0.20 kg/s	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
FLOW RATE (continued)							
Secondary Coolant System (continued)							
FT-P004-062A	Auxiliary feedwater and makeup pumps discharge flow to steam generator.	0 to 1.3 L/s	10 Hz	0.065 L/s	--	0.065 L/s	Qualified, except for spurious spikes.
FT-P004-062B	Makeup pump discharge flow.	0 to 1.3 L/s	10 Hz	0.065 L/s	--	0.065 L/s	Qualified.
FT-P004-72A	Main feedwater pump discharge flow.	0 to 25 kPa	10 Hz	0.8 kPa	5 kPa 15 kPa 25 kPa	0.3 kPa 0.9 kPa 1.5 kPa	
FT-P004-72-2	Flow out of main feedwater pump.	0 to 40 kg/s	10 Hz	1.1 kg/s	--	1.1 kg/s	Qualified.
FT-P004-090	Steam flow control valve bypass line.	0 to 4 kg/s	10 Hz	--	--	0.082 kg/s	Failed.
FT-P004-091	Main feedwater control valve bypass line.	0 to 5 L/s	10 Hz	0.075 L/s	--	0.075 L/s	
Emergency Core Cooling System							
FT-P120-31-1	Accumulator B in 6-in. line downstream from orifice.	0 to 40 L/s	10 Hz	0.28 L/s	--	0.28 L/s	
FT-P120-31-5	Accumulator B in 6-in. line downstream from orifice.	0 to 125 L/s	10 Hz	0.92 L/s	--	0.92 L/s	
FT-P120-36-1	Accumulator A in 6-in. line downstream from orifice.	0 to 125 L/s	10 Hz	--	--	0.92 L/s	Failed.
FT-P120-36-5	Accumulator A in 6-in. line downstream from orifice.	0 to 40 L/s	10 Hz	--	--	0.28 L/s	Failed.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
FLOW RATE (continued)							
Emergency Core Cooling System (continued)							
FT-P120-072	Low-pressure injection system (LPIS) Pump B discharge.	0 to 25 L/s	10 Hz	0.37 L/s	--	0.37 L/s	
FT-P120-085	LPIS Pump A discharge.	0 to 25 L/s	10 Hz	0.37 L/s	--	0.37 L/s	Qualified, except for spurious spikes.
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	
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	
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	--	0.16 L/s	
LIQUID LEVEL							
Intact Loop							
LD-P139-006	Pressurizer liquid level on southeast side.	0 to 1.8 m	10 Hz	--	--	0.06 m	Failed.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
LIQUID LEVEL (continued)							
Intact Loop (continued)							
LD-P139-007	Pressurizer liquid level on southwest side.	0 to 1.8 m	10 Hz	--	--	0.06 m	Failed.
LD-P139-008	Pressurizer liquid level on north side.	0 to 1.8 m	10 Hz	--	--	0.06 m	Failed.
Emergency Core Cooling System							
LE-ECC-01A	Accumulator A.	0 to 3.0 m	10 Hz	0.007 m	--	0.007 m	Qualified.
LIT-P120-013	Borated water storage tank (BWST).	0 to 2.5 m	10 Hz	0.019 m	--	0.019 m	
LIT-P120-030	Accumulator B.	0 to 3.0 m	10 Hz	0.02 m	--	0.02 m	Qualified.
LIT-P120-044	Accumulator A.	0 to 3.0 m	10 Hz	0.02 m	--	0.02 m	Qualified, pressure sensitive after tank emptied.
LIT-P120-087	Accumulator A.	0 to 3.0 m	10 Hz	0.02 m	--	0.02 m	Qualified, pressure sensitive after tank emptied.
LIT-P120-089	Accumulator B.	0 to 3.0 m	10 Hz	--	--	0.02 m	Failed.
Secondary Coolant System							
LT-P004-008A	SG (narrow range).	-1.0 to 1.5 m[g]	10 Hz	--	--	0.127 m	Failed.
LT-P004-008B	SG (wide range).	-3.7 to 1.5 m	10 Hz	--	--	0.127 m	Failed.
LT-P004-08AA	SG (narrow range).	-1.0 to 1.5 m	10 Hz	--	--	0.127 m	Failed.
LT-P004-08BB	SG (wide range).	-3.7 to 1.5 m	10 Hz	--	--	9.127 m	Failed.
LT-P004-042	Condensate receiver, 1.83 m south of condensate receiver centerline.	0 to 1.2 m	10 Hz	0.01 m	--	0.01 m	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
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.
LT-P138-058	BST level on south end of tank.	0 to 3.5 m	10 Hz	0.026 m	--	0.026 m	Qualified.
MOMENTUM FLUX							
Broken Loop							
ME-BL-001A	Cold leg DTT flange at bottom of pipe, high range.	4 to 208 $Mg/m \cdot s^2$	10 Hz	3.0 $Mg/m \cdot s^2$	5 $Mg/m \cdot s^2$ 100 $Mg/m \cdot s^2$ 200 $Mg/m \cdot s^2$	3.3 $Mg/m \cdot s^2$ 8.0 $Mg/m \cdot s^2$ 13.0 $Mg/m \cdot s^2$	Qualified.
ME-BL-001B	Cold leg DTT flange at middle of pipe, high range.	4 to 208 $Mg/m \cdot s^2$	10 Hz	--	5 $Mg/m \cdot s^2$ 100 $Mg/m \cdot s^2$ 200 $Mg/m \cdot s^2$	3.3 $Mg/m \cdot s^2$ 8.0 $Mg/m \cdot s^2$ 13.0 $Mg/m \cdot s^2$	Failed.
ME-BL-001C	Cold leg DTT flange at top of pipe, high range.	4 to 208 $Mg/m \cdot s^2$	10 Hz	3.0 $Mg/m \cdot s^2$	5 $Mg/m \cdot s^2$ 100 $Mg/m \cdot s^2$ 200 $Mg/m \cdot s^2$	3.3 $Mg/m \cdot s^2$ 8.0 $Mg/m \cdot s^2$ 13.0 $Mg/m \cdot s^2$	Qualified.
ME-BL-001D	Cold leg DTT flange at middle of pipe, low range.	3 to 74.4 $Mg/m \cdot s^2$	10 Hz	1.5 $Mg/m \cdot s^2$	5 $Mg/m \cdot s^2$ 40 $Mg/m \cdot s^2$ 70 $Mg/m \cdot s^2$	1.8 $Mg/m \cdot s^2$ 3.5 $Mg/m \cdot s^2$ 5.0 $Mg/m \cdot s^2$	Qualified, narrow range instrument.
ME-BL-001E	Cold leg DTT flange at middle of pipe, low range.	3 to 74.4 $Mg/m \cdot s^2$	10 Hz	1.5 $Mg/m \cdot s^2$	5 $Mg/m \cdot s^2$ 40 $Mg/m \cdot s^2$ 70 $Mg/m \cdot s^2$	1.8 $Mg/m \cdot s^2$ 3.5 $Mg/m \cdot s^2$ 5.0 $Mg/m \cdot s^2$	Qualified, narrow range instrument.
ME-BL-001F	Cold leg DTT flange at top of pipe, low range.	3 to 74.4 $Mg/m \cdot s^2$	10 Hz	1.5 $Mg/m \cdot s^2$	5 $Mg/m \cdot s^2$ 40 $Mg/m \cdot s^2$ 70 $Mg/m \cdot s^2$	1.8 $Mg/m \cdot s^2$ 3.5 $Mg/m \cdot s^2$ 5.0 $Mg/m \cdot s^2$	Qualified, narrow range instrument.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
MOMENTUM FLUX (continued)							
Broken Loop (continued)							
ME-BL-002A	Hot leg DTT flange at bottom of pipe, high range.	1.5 to 20.8 Mg/m·s^2	10 Hz	0.3 Mg/m·s^2	1.5 Mg/m·s^2 10 Mg/m·s^2 20 Mg/m·s^2	0.4 Mg/m·s^2 0.7 Mg/m·s^2 1.1 Mg/m·s^2	Qualified.
ME-BL-002B	Hot leg DTT flange at center of pipe, high range.	1.5 to 20.8 Mg/m·s^2	10 Hz	0.3 Mg/m·s^2	1.5 Mg/m·s^2 10 Mg/m·s^2 20 Mg/m·s^2	0.4 Mg/m·s^2 0.7 Mg/m·s^2 1.1 Mg/m·s^2	Qualified.
ME-BL-002C	Hot leg DTT flange at top of pipe, high range.	1.5 to 20.8 Mg/m·s^2	10 Hz	0.3 Mg/m·s^2	1.5 Mg/m·s^2 10 Mg/m·s^2 20 Mg/m·s^2	0.4 Mg/m·s^2 0.7 Mg/m·s^2 1.1 Mg/m·s^2	Qualified.
ME-BL-002D	Hot leg DTT flange at bottom of pipe, low range.	0 to 2.2 Mg/m·s^2	10 Hz	0.2 Mg/m·s^2	0 Mg/m·s^2 2.0 Mg/m·s^2	0.2 Mg/m·s^2 0.3 Mg/m·s^2	Qualified after 20 s.
ME-BL-002E	Hot leg DTT flange at center of pipe, low range.	0 to 2.2 Mg/m·s^2	10 Hz	0.2 Mg/m·s^2	0 Mg/m·s^2 2.0 Mg/m·s^2	0.2 Mg/m·s^2 0.3 Mg/m·s^2	Qualified after 20 s.
ME-BL-002F	Hot leg DTT flange at top of pipe, low range.	0 to 2.2 Mg/m·s^2	10 Hz	0.2 Mg/m·s^2	0 Mg/m·s^2 2.0 Mg/m·s^2	0.2 Mg/m·s^2 0.3 Mg/m·s^2	Qualified after 20 s.
Intact Loop							
ME-PC-001A	Cold leg DTT horizontal flange on west side of pipe.	1.2 to 20.8 Mg/m·s^2	10 Hz	--	1.0 Mg/m·s^2 10 Mg/m·s^2 20 Mg/m·s^2	1.4 Mg/m·s^2 1.8 Mg/m·s^2 2.2 Mg/m·s^2	Failed.
ME-PC-001B	Cold leg DTT horizontal flange at center of pipe.	1.2 to 20.8 Mg/m·s^2	10 Hz	2.0 Mg/m·s^2	1.0 Mg/m·s^2 10 Mg/m·s^2 20 Mg/m·s^2	1.4 Mg/m·s^2 1.8 Mg/m·s^2 2.2 Mg/m·s^2	Qualified.
ME-PC-001C	Cold leg DTT horizontal flange on east side of pipe.	1.2 to 20.8 Mg/m·s^2	10 Hz	1.9 Mg/m·s^2	1.0 Mg/m·s^2 10 Mg/m·s^2 20 Mg/m·s^2	1.4 Mg/m·s^2 1.8 Mg/m·s^2 2.2 Mg/m·s^2	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
MOMENTUM FLUX (continued)							
Intact Loop (continued)							
ME-PC-002A	Hot leg DTT flange at bottom of pipe.	1.2 to 20.8 $Mg/m \cdot s^2$	10 Hz	2.1 $Mg/m \cdot s^2$	1.0 $Mg/m \cdot s^2$ 10 $Mg/m \cdot s^2$ 20 $Mg/m \cdot s^2$	1.4 $Mg/m \cdot s^2$ 1.8 $Mg/m \cdot s^2$ 2.2 $Mg/m \cdot s^2$	Qualified.
ME-PC-002B	Hot leg DTT flange at middle of pipe.	1.2 to 20.8 $Mg/m \cdot s^2$	10 Hz	2.1 $Mg/m \cdot s^2$	1.0 $Mg/m \cdot s^2$ 10 $Mg/m \cdot s^2$ 20 $Mg/m \cdot s^2$	1.4 $Mg/m \cdot s^2$ 1.8 $Mg/m \cdot s^2$ 2.2 $Mg/m \cdot s^2$	Qualified.
ME-PC-002C	Hot leg DTT flange at top of pipe.	1.2 to 20.8 $Mg/m \cdot s^2$	10 Hz	--	1.0 $Mg/m \cdot s^2$ 10 $Mg/m \cdot s^2$ 20 $Mg/m \cdot s^2$	1.4 $Mg/m \cdot s^2$ 1.8 $Mg/m \cdot s^2$ 2.2 $Mg/m \cdot s^2$	Failed.
Reactor Vessel							
ME-1ST-001	Downcomer Stalk 1, 1.16 m above RV bottom.	0.3 to 52.1 $Mg/m \cdot s^2$	10 Hz	0.6 $Mg/m \cdot s^2$	0.5 $Mg/m \cdot s^2$ 25 $Mg/m \cdot s^2$ 50 $Mg/m \cdot s^2$	0.5 $Mg/m \cdot s^2$ 1.5 $Mg/m \cdot s^2$ 2.2 $Mg/m \cdot s^2$	Qualified.
ME-1ST-002	Downcomer Stalk 1, 1.16 m above RV bottom.	0.3 to 52.1 $Mg/m \cdot s^2$	10 Hz	--	--	8.3 $Mg/m \cdot s^2$	Failed.
ME-3UP-001	Fuel Assembly 3 above upper end box.	0.3 to 12 $Mg/m \cdot s^2$	10 Hz	--	--	0.78 $Mg/m \cdot s^2$	Failed.
Me[illegible]-001	Fuel Assembly 5 lower end box.	1.2 to 20.8 $Mg/m \cdot s^2$	10 Hz	--	--	3.3 $Mg/m \cdot s^2$	Failed.
ME-5LP-002	Fuel Assembly 5 lower end box.	1.2 to 20.8 $Mg/m \cdot s^2$	10 Hz	1.0 $Mg/m \cdot s^2$	1.0 $Mg/m \cdot s^2$ 10 $Mg/m \cdot s^2$ 20 $Mg/m \cdot s^2$	0.8 $Mg/m \cdot s^2$ 1.2 $Mg/m \cdot s^2$ 1.6 $Mg/m \cdot s^2$	Qualified.
ME-5UP-001	Fuel Assembly 5 above upper end box.	1.2 to 20.8 $Mg/m \cdot s^2$	10 Hz	0.6 $Mg/m \cdot s^2$	1.0 $Mg/m \cdot s^2$ 10 $Mg/m \cdot s^2$ 20 $Mg/m \cdot s^2$	0.5 $Mg/m \cdot s^2$ 0.9 $Mg/m \cdot s^2$ 1.3 $Mg/m \cdot s^2$	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
NEUTRON DETECTION							
Reactor Vessel							
NE-2H08-26	Neutron detector in Fuel Assembly 2.	0 to 52.5 kW/m (local)	10 Hz	2.0 kW/m	5 kW/m 25 kW/m 52.5 kW/m	0.48 kW/m[h] 2.4 kW/m 5.0 kW/m	Qualified, magnitude uncertain.
NE-4H08-26	Neutron detector in Fuel Assembly 4.	0 to 52.5 kW/m (local)	10 Hz	1.7 kW/m	5 kW/m 25 kW/m 52.5 kW/m	0.48 kW/m 2.4 kW/m 5.0 kW/m	Qualified, magnitude uncertain.
NE-5D08-11	Neutron detector in Fuel Assembly 5.	0 to 52.5 kW/m (local)	10 Hz	3.1 kW/m	5 kW/m 25 kW/m 52.5 kW/m	0.48 kW/m 2.4 kW/m 5.0 kW/m	Qualified, magnitude uncertain.
NE-5D08-27	Neutron detector in Fuel Assembly 5.	0 to 52.5 kW/m (local)	10 Hz	3.7 kW/m	5 kW/m 25 kW/m 52.5 kW/m	0.48 kW/m 2.4 kW/m 5.0 kW/m	Qualified, magnitude uncertain.
NE-5D08-44	Neutron detector in Fuel Assembly 5.	0 to 52.5 kW/m (local)	10 Hz	2.5 kW/m	5 kW/m 25 kW/m 52.5 kW/m	0.48 kW/m 2.4 kW/m 5.0 kW/m	Qualified, magnitude uncertain.
NE-5D08-61	Neutron detector in Fuel Assembly 5.	0 to 52.5 kW/m (local)	10 Hz	0.7 kW/m	5 kW/m 25 kW/m 52.5 kW/m	0.48 kW/m 2.4 kW/m 5.0 kW/m	Qualified, magnitude uncertain.
NE-6H08-26	Neutron detector in Fuel Assembly 6.	0 to 52.5 kW/m (local)	10 Hz	2.3 kW/m	5 kW/m 25 kW/m 52.5 kW/m	0.48 kW/m 2.4 kW/m 5.0 kW/m	Qualified, magnitude uncertain.
ELECTRICAL FREQUENCY							
Intact Loop							
PCP-1-F	Primary coolant pump (PCP) 1.	0 to 75 Hz	10 Hz	0.75 Hz	--	0.75 Hz[i]	Qualified, for initial conditions only.
PCP-2-F	PCP-2.	0 to 75 Hz	10 Hz	0.75 Hz	--	0.75 Hz	Qualified, for initial conditions only.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
ELECTRICAL CURRENT							
Intact Loop							
PCP-1-I-RMS	PCP-1.	0 to 1000 amp RMS	10 Hz	12 amp	100 amp 300 amp 600 amp	5 amp 15 amp 30 amp	Qualified.
PCP-2-I-RMS	PCP-2.	0 to 1000 amp RMS	10 Hz	12 amp	100 amp 300 amp 600 amp	5 amp 15 amp 30 amp	Qualified.
ELECTRICAL POWER							
Intact Loop							
PCP-1-P	PCP-1.	0 to 1 MW	10 Hz	0.05 MW	--	0.05 MW	Qualified.
PCP-2-P	PCP-2.	0 to 1 MW	10 Hz	0.05 MW	--	0.05 MW	Qualified.
REACTIVE POWER							
Intact Loop							
PCP-1-P-VAR	PCP-1.	0 to 1000 kVAR	10 Hz	50 kVAR	--	50 kVAR	Qualified, for initial conditions only.
PCP-2-P-VAR	PCP-2.	0 to 1000 kVAR	10 Hz	50 kVAR	--	50 kVAR	Qualified, for initial conditions only.
ELECTRICAL VOLTAGE							
Intact Loop							
PCP-1-V-RMS	PCP-1.	0 to 600 V RMS	10 Hz	10 V	100 V 300 V 600 V	5 V 15 V 30 V	Qualified.
PCP-2-V-RMS	PCP-2.	0 to 600 V RMS	10 Hz	10 V	100 V 300 V 600 V	5 V 15 V 30 V	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
DIFFERENTIAL PRESSURE							
Broken Loop							
PdE-BL-001	Hot leg across 14- to 5-in. contraction.	±350 kPa	10 Hz	5.8 kPa	0 kPa 200 kPa 350 kPa	5.8 kPa 10.0 kPa 15.5 kPa	Qualified.
PdE-BL-002	Cold leg across 14- to 5-in. contraction.	±10 MPa	10 Hz	0.05 MPa	0 MPa 5 MPa 10 MPa	0.05 MPa 0.20 MPa 0.39 MPa	Qualified.
PdE-BL-003	Cold leg across break plane.	±10 MPa	10 Hz	0.05 MPa	0 MPa 5 MPa 10 MPa	0.05 MPa 0.20 MPa 0.39 MPa	Qualified.
PdE-BL-004	Hot leg across break plane.	±10 MPa	10 Hz	0.05 MPa	0 MPa 5 MPa 10 MPa	0.05 MPa 0.20 MPa 0.39 MPa	Qualified, no other measurement for direct comparison.
PdE-BL-005	Hot leg across pump simulator.	±3.5 MPa	10 Hz	0.03 MPa	0 MPa 2 MPa 3.5 MPa	0.03 MPa 0.08 MPa 0.14 MPa	Qualified.
PdE-BL-006	Hot leg across SG simulator outlet flange.	±700 kPa	10 Hz	7.4 kPa	0 kPa 350 kPa 700 kPa	7.4 kPa 16 kPa 29 kPa	Qualified.
PdE-BL-007	Hot leg across SG simulator.	±700 kPa	10 Hz	7.4 kPa	0 kPa 350 kPa 700 kPa	7.4 kPa 16 kPa 29 kPa	Qualified, except for spurious spikes.
PdE-BL-008	Hot leg across SG simulator inlet flange.	±175 kPa	10 Hz	2.9 kPa	0 kPa 100 kPa 175 kPa	2.9 kPa 4.9 kPa 7.6 kPa	Qualified.
PdE-BL-009	Across 14- to 5-in. contraction to middle of 5-in. pipe.	±700 kPa	10 Hz	1.7 kPa	0 kPa 350 kPa 700 kPa	1.7 kPa 1.7 kPa 1.9 kPa	Qualified.
PdE-BL-010	From middle of 5-in. pipe to break plane.	±350 kPa	10 Hz	5.8 kPa	0 kPa 200 kPa 350 kPa	5.8 kPa 10.0 kPa 15.5 kPa	Qualified, narrow range instrument, good after 20 s.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
DIFFERENTIAL PRESSURE (continued)							
Broken Loop (continued)							
PdE-BL-011	Pump simulator outlet to PE-BL-003.	±3.5 MPa	10 Hz	0.03 MPa	0 MPa 2 MPa 3.5 MPa	0.03 MPa 0.08 MPa 0.14 MPa	Qualified, shares tap with PdE-BL-012, may have common line problems.
PdE-BL-012	From PE-BL-003 to break plane.	±3.5 MPa	10 Hz	0.01 MPa	--	0.01 MPa	Qualified, shares tap with PdE-BL-011, may have common line problems.
Intact Loop							
PdE-PC-001	Intact loop cold leg across PCPs.	±700 kPa	10 Hz	9.2 kPa	0 kPa 350 kPa 700 kPa	7.4 kPa 15.8 kPa 28.9 kPa	Qualified.
PdE-PC-002	Intact loop across SG.	±350 kPa	10 Hz	2.8 kPa	0 kPa 150 kPa 350 kPa	0.84 kPa 6.2 kPa 14.0 kPa	Qualified.
PdE-PC-003	Intact loop hot leg piping, RV to SG inlet.	±175 kPa	10 Hz	3.0 kPa	0 kPa 87 kPa 175 kPa	2.9 kPa 4.5 kPa 7.6 kPa	Qualified.
PdE-PC-005	Intact loop cold leg, PCPs to RV nozzle.	±27.4 kPa	10 Hz	1.0 kPa	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Qualified.
PdE-PC-006	RV outlet to inlet.	±40 kPa	10 Hz	1.4 kPa	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 (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
DIFFERENTIAL PRESSURE (continued)							
Intact Loop (continued)							
PdE-PC-008	Intact loop across pressurizer surge line.	±40 kPa	10 Hz	0.9 kPa	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa [illegible]	
PdE-PC-009	Intact loop across PCP-1.	±700 kPa	10 Hz	--	0 kPa 350 kPa 700 kPa	16 kPa 21 kPa 32 kPa	Failed.
PdE-PC-010	Intact loop across PCP-2.	±1400 kPa	10 Hz	17.0 kPa	0 kPa 350 kPa 700 kPa	16 kPa 21 kPa 32 kPa	Qualified.
PdE-PC-013	Pitot tube next to bottom of emergency core coolant (ECC) Rake 1 (facing RV).	±40 kPa	10 Hz	--	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Failed.
PdE-PC-017	Pitot tube next to bottom of ECC Rake 1 (facing PCP).	±40 kPa	10 Hz	--	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Failed.
PdE-PC-021	Pitot tube next to bottom of ECC Rake 2 (facing RV).	±40 kPa	10 Hz	--	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Failed.
PdE-PC-025	Pitot tube next to bottom of ECC Rake 2 (facing PCP).	±40 kPa	10 Hz	--	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	Failed.
PdE-PC-027	SG outlet to pump suction (lowest point).	±40 kPa	10 Hz	1.2 kPa	0 kPa 20 kPa [illegible]	0.84 kPa 1.2 kPa 1.8 kPa	
PdE-PC-028	Pump suction (lowest point) to PCP-2 inlet.	±40 kPa	10 Hz	0.85 kPa	0 kPa 20 kPa 40 kPa	0.84 kPa 1.2 kPa 1.8 kPa	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
DIFFERENTIAL PRESSURE (continued)							
Reactor Vessel							
PdE-RV-002	Fuel Assembly 1 from lower end box to upper end box.	±175 kPa	10 Hz	11 kPa	0 kPa 100 kPa 175 kPa	11 kPa 12 kPa 13 kPa	
PdE-RV-003	Intact loop cold leg inlet to bottom of downcomer.	±175 kPa	10 Hz	11.1 kPa	0 kPa 100 kPa 175 kPa	11 kPa 12 kPa 13 kPa	
PdE-RV-005	Top of RV to intact loop hot leg.	±40 kPa	10 Hz	3.0 kPa	0 kPa 20 kPa 40 kPa	3.0 kPa 3.1 kPa 3.4 kPa	
Blowdown Suppression Tank							
PdE-[illegible]-001	BST.	±25 kPa	10 Hz	0.64 kPa	0 kPa 12 kPa 25 kPa	0.50 kPa 0.69 kPa 1.12 kPa	Qualified.
PdE-SV-002	BST.	±15 kPa	10 Hz	0.63 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	10 Hz	3.0 kPa	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	0.05 kPa	5 kPa 10 kPa 17.5 kPa	0.04 kPa 0.07 kPa [illegible] kPa	Qualified, good to 20 s.
PdT-P139-007	Pressurizer on southwest side.	0.0 [illegible] kPa	10 Hz	0.05 kPa	5 kPa 10 kPa 17.5 kPa	0.04 kPa 0.07 kPa 0.13 kPa	Qualified, good to 20 s.
PdT-P139-008	Pressurizer on north side.	0.0 to 17.5 kPa	10 Hz	0.05 kPa	5 kPa 10 kPa 17.5 kPa	0.04 kPa 0.07 kPa 0.13 kPa	Qualified, good to 20 s.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
DIFFERENTIAL PRESSURE (continued)							
Intact Loop							
PdT-P139-27-1	Intact loop venturi, Channel A.	0 to 200 kPa	10 Hz	2 kPa	--	2 kPa	Qualified.
PdT-P139-27-2	Intact loop venturi, Channel B.	0 to 200 kPa	10 Hz	2 kPa	--	2 kPa	Qualified.
PdT-P139-27-3	Intact loop venturi, Channel C.	0 to 200 kPa	10 Hz	2 kPa	--	2 kPa	
PdT-P139-030	Across RV just beyond intact loop inlet and outlet nozzles.	0 to 350 kPa	10 Hz	3.5 kPa	--	3.5 kPa	Qualified, unidirectional instrument.
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	0.08 MPa[l] 0.10 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	0.08 MPa 0.10 MPa 0.14 MPa	Qualified.
PE-BL-003	Broken loop hot leg downstream of pump simulator.	0.1 to 21 MPa	10 Hz	--	0 MPa 10 MPa 20 MPa	0.08 MPa 0.10 MPa 0.14 MPa	Failed.
PE-BL-004	Broken loop cold leg at inlet of spool piece.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.08 MPa 0.10 MPa 0.14 MPa	Qualified.
PE-BL-006	Broken loop hot leg downstream of break plane.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.08 MPa 0.10 MPa 0.14 MPa	Qualified.
PE-BL-008	Broken loop hot leg downstream of break plane.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.08 MPa 0.10 MPa 0.14 MPa	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
PRESSURE (continued)							
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	0.08 MPa 0.10 MPa 0.14 Mpa	Qualified.
PE-PC-002	Intact loop hot leg at DTT flange.	0.1 to 21 MPa	10 Hz	0.12 MPa	0 MPa 10 MPa 20 MPa	0.08 MPa 0.10 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	0.08 MPa 0.10 MPa 0.14 MPa	Qualified.
PE-PC-005	Intact loop reference pressure between SG outlet and PCP inlet.	0 to 17.2 MPa	10 Hz	0.06 MPa	0 MPa 10 MPa 17 MPa	0.04 MPa 0.05 MPa 0.07 MPa	Qualified.
PE-PC-006	Intact loop reference pressure between SG outlet and PCP inlet.	0 to 17.2 MPa	10 Hz	0.06 MPa	0 MPa 10 MPa 17 MPa	0.04 MPa 0.05 MPa 0.07 MPa	Qualified.
Secondary Coolant System							
PE-SGS-001	SG dome pressure.	0.1 to 7.0 MPa	10 Hz	0.085 MPa	0 MPa 3.5 MPa 7 MPa	0.077 MPa 0.080 MPa 0.087 MPa	Qualified.
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	85 kPa 200 kPa 700 kPa	13.0 kPa 13.0 kPa 13.4 kPa	Qualified.
PE-SV-014	BST header above Downcomer 4, 327° from top vertical (CW looking north).	85 to 700 kPa	10 Hz	13 kPa	85 kPa 200 kPa 700 kPa	13.0 kPa 13.0 kPa 13.4 kPa	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
PRESSURE (continued)							
Blowdown Suppression System (continued)							
PE-SV-016	BST across from Downcomer ., 230° from top vertical (CW looking north).	85 to 700 kPa	10 Hz	13 kPa	85 kPa 200 kPa 700 kPa	13.0 kPa 13.0 kPa 13.4 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	85 kPa 200 kPa 700 kPa	13.0 kPa 13.0 kPa 13.4 kPa	Qualified.
PE-SV-018	BST header above Downcomer 1.	85 to 700 kPa	10 Hz	13 kPa	85 kPa 200 kPa 700 kPa	13.0 kPa 13.0 kPa 13.4 kPa	Qualified.
PE-SV-044	BST bottom under Downcomer 3.	85 to 700 kPa	10 Hz	13 kPa	85 kPa 200 kPa 700 kPa	13.0 kPa 13.0 kPa 13.4 kPa	
PE-SV-055	BST top, 0.15 m north of Downcomer 4 centerline.	85 to 700 kPa	10 Hz	13 kPa	85 kPa 200 kPa 700 kPa	13.0 kPa 13.0 kPa 13.4 kPa	Qualified.
PE-SV-060	BST top above Downcomer 1.	85 to 700 kPa	10 Hz	13 kPa	85 kPa 200 kPa 700 kP	13.0 kPa 13.0 kPa 13.4 kPa	Qualified.
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	0.08 MPa 0.10 MPa 0.14 MPa	Qualified.
PE-1ST-001B	Downcomer Stalk 1, 0.62 m above RV bottom, low range.	0.1 to 1.4 MPa	10 Hz	0.05 MPa	--	0.05 MPa	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
PRESSURE (continued)							
Reactor Vessel (continued)							
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	0.08 MPa 0.10 MPa 0.14 MPa	Qualified.
PE-1ST-003B	Downcomer Stalk 1, 5.32 m above RV bottom, low range.	0.1 to 1.4 MPa	10 Hz	0.05 MPa	--	0.05 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	0.08 MPa 0.10 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	0.08 MPa 0.10 MPa 0.14 MPa	Qualified.
PE-5C09-P	Plenum of fuel rod at Row C, Column 9 of Fuel Assembly 5.	0.8 to 17.2 MPa	10 Hz	--	0 MPa 10 MPa 17 MPa	0.21 MPa 0.24 MPa 0.27 MPa	
PE-5F09-P	Plenum of fuel rod at Row F, Column 9 of Fuel Assembly 5.	0.8 to 17.2 MPa	10 Hz	--	0 MPa 10 MPa 17 MPa	0.21 MPa 0.24 MPa 0.27 MPa	
PE-5G04-P	Plenum of fuel rod at Row G, Column 4 of Fuel Assembly 5.	0.8 to 17.2 MPa	10 Hz	--	0 MPa 10 MPa 17 MPa	0.21 MPa 0.24 MPa 0.27 MPa	
PE-5H02-P	Plenum of fuel rod at Row H, Column 2 of Fuel Assembly 5.	0.8 to 17.2 MPa	10 Hz	--	0 MPa 10 MPa 17 MPa	0.21 MPa 0.24 KPa 0.27 MPa	
PE-5I04-P	Plenum of fuel rod at Row I, Column 4 of Fuel Assembly 5.	0.8 to 17.2 MPa	10 Hz	--	0 MPa 10 MPa 17 MPa	0.21 MPa 0.24 MPa 0.27 MPa	
PE-5I14-P	Plenum of fuel rod at Row I, Column 14 of Fuel Assembly 5.	0.8 to 17.2 MPa	10 Hz	--	0 MPa 10 MPa 17 MPa	0.21 MPa 0.24 MPa 0.27 MPa	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
PRESSURE (continued)							
Reactor Vessel (continued)							
PE-5J09-P	Plenum of fuel rod at Row J, Column 9 of Fuel Assembly 5.	0.8 to 17.2 MPa	10 Hz	--	0 MPa 10 MPa 17 MPa	0.21 MPa 0.24 MPa 0.27 MPa	
PE-5L07-P	Plenum of fuel rod at Row L, Column 7 of Fuel Assembly 5.	0.8 to 17.2 MPa	10 Hz	--	0 MPa 10 MPa 17 MPa	0.21 MPa 0.24 MPa 0.27 MPa	
PE-5L09-P	Plenum of fuel rod at Row L, Column 9 of Fuel Assembly 5.	0.8 to 17.2 MPa	10 Hz	--	0 MPa 10 MPa 17 MPa	0.21 MPa 0.24 MPa 0.27 MPa	
PE-5M09-P	Plenum of fuel rod at Row M, Column 9 of Fuel Assembly 5.	0.8 to 17.2 MPa	10 Hz	--	0 MPa 10 MPa 17 MPa	0.21 MPa 0.24 MPa 0.27 MPa	
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-P004-022	Condensate receiver upstream from inlet to air-cooled condenser header.	0.1 to 2.8 MPa	10 Hz	0.03 MPa		0.03 MPa	Qualified, except for spurious spikes.
PT-P004-034	Downstream from main feedwater pump.	0.1 to 10.3 MPa	10 Hz	0.10 MPa	--	0.10 MPa	Qualified.
PT-P004-085	Upstream from inlet to air-cooled condenser header.	0.1 to 2.8 MPa	10 Hz	0.03 MPa	--	0.03 MPa	Qualified.
Emergency Core Cooling System							
PT-P120-029	Accumulator B.	0.1 to 7.0 MPa	10 Hz	0.05 MPa	--	0.05 MPa	Qualified.
PT-P120-043	Accumulator A.	0.1 to 7.0 MPa	10 Hz	0.05 MPa	--	0.05 MPa	Qualified, except for spurious spikes.
PT-P120-061	ECC injection.	0.1 to 21 MPa	10 Hz	0.15 MPa	--	0.15 MPa	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
PRESSURE (continued)							
Emergency Core Cooling System (continued)							
PT-P120-074	LPIS Pump B discharge.	0.1 to 7.0 MPa	10 Hz	0.05 MPa	--	0.05 MPa	
PT-P120-083	LPIS Pump A discharge.	0.1 to 7.0 MPa	10 Hz	0.05 MPa	--	0.05 MPa	Qualified, except for spurious spikes.
Blowdown Suppression Tank							
PT-P138-055	BST top, 1.22 m north of Downcomer 1.	80 to 700 kPa	10 Hz	5.0 kPa	--	5.0 kPa	Qualified.
PT-P138-056	BST top, 1.24 m north of Downcomer 2.	80 to 700 kPa	10 Hz	5.0 kPa	--	5.0 kPa	Qualified.
PT-P138-057	BST vapor space, Channel C.	80 to 700 kPa	10 Hz	5.0 kPa	--	5.0 kPa	Qualified.
PT-P138-111	Cold leg QOBV outlet, transient pressure.	0.1 to 14 MPa	100 Hz	--	--	--	Qualified, only used in determining experiment initiation.
PT-P138-112	Hot leg QOBV outlet, transient pressure.	0.1 to 14 MPa	100 Hz	--	--	--	Qualified, only used in determining experiment initiation.
Intact Loop							
PT-P139-002	Intact loop hot leg at venturi on bottom.	0.1 to 21 MPa	10 Hz	0.15 MPa	--	0.15 MPa	Qualified, except for spurious spikes, response limited during subcooled blowdown.
PT-P139-003	Intact loop hot leg at venturi on left side when looking toward SG.	0.1 to 21 MPa	10 Hz	0.15 MPa	--	0.15 MPa	Qualified, except for spurious spikes, response limited during subcooled blowdown.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading[b]	After Experiment Initiation: Uncertainty (±)	Comments
PRESSURE (continued)							
Intact Loop (continued)							
PT-P139-006	Intact loop hot leg at venturi on right side when looking toward SG.	0.1 to 21 MPa	10 Hz	0.15 MPa	--	0.15 MPa	Qualified, except for spurious spikes, response limited during subcooled blowdown.
PT-P139-041	Containment.	0 to 200 MPa	10 Hz	1.4 kPa	--	1.4 kPa	Qualified.
PT-P139-05-1	Pressurizer, 1.88 m above bottom (vapor space).	0.1 to 17.2 MPa	10 Hz	0.12 MPa	--	0.12 MPa	Qualified.
REACTIVITY							
Reactor Vessel							
RE-TRM-86-5	Transient reactivity meter in shield tank.	±0.145 Rho	10 Hz	0.01 Rho	--	0.01 Rho	
RE-TRM-86-6	Transient reactivity meter in shield tank.	±0.145 Rho	10 Hz	0.01 Rho	--	0.01 Rho	
POWER							
Reactor Vessel							
RE-T-77-1A2	Power range, Channel A level.	0 to 62.5 MW	10 Hz	2.0 MW	--	2.0 MW	Qualified.
RE-T-77-2A2	Power range, Channel B level.	0 to 62.5 MW	10 Hz	2.0 MW	--	2.0 MW	Qualified.
RE-T-77-3A2	Power range, Channel C level.	0 to 62.5 MW	10 Hz	2.0 MW	--	2.0 MW	Qualified.
RE-T-87-4A2	Power range, Channel D level.	0 to 125% power	10 Hz	4% power	--	4% power	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
PUMP SPEED							
Intact Loop							
RPE-PC-001	PCP-1.	0 to 4500 rpm	10 Hz	8.2 rpm	1000 rpm 2000 rpm 3000 rpm 4000 rpm	8.0 rpm 8.9 rpm 10.1 rpm 11.7 rpm	Qualified.
RPE-PC-002	PCP-2.	0 to 4500 rpm	10 Hz	8.2 rpm	1000 rpm 2000 rpm 3000 rpm 4000 rpm	8.0 rpm 8.9 rpm 10.1 rpm 11.7 rpm	Qualified.
TEMPERATURE							
Reactor Vessel							
TC-5C07-27	Centerline of Fuel Assembly 5, Row C, Column 7 at 0.69 m above bottom of fuel rod.	400 to 2600 K	10 Hz	52.9 K	600 K 1200 K 1800 K 2400 K	13.0 K[m] 37.5 K 62.5 K 87.0 K	Qualified.
TC-5D06-27	Centerline of Fuel Assembly 5, Row D, Column 6 at 0.69 m above bottom of fuel rod.	400 to 2600 K	10 Hz	--	600 K 1200 K 1800 K 2400 K	13.0 K 37.5 K 62.5 K 87.0 K	Failed.
TC-5D07-27	Centerline of Fuel Assembly 5, Row D, Column 7 at 0.69 m above bottom of fuel rod.	400 to 2600 K	10 Hz	55.3 K	600 K 1200 K 1800 K 2400 K	13.0 K 37.5 K 62.5 K 87.0 K	Qualified.
TC-5D09-27	Centerline of Fuel Assembly 5, Row D, Column 9 at 0.69 m above bottom of fuel rod.	400 to 2600 K	10 Hz	54.5 K	600 K 1200 K 1800 K 2400 K	13.0 K 37.5 K 62.5 K 87.0 K	Qualified.
TC-5D10-27	Centerline of Fuel Assembly 5, Row D, Column 10 at 0.69 m above bottom of fuel rod.	400 to 2600 K	10 Hz	56.8 K	600 K 1200 K 1800 K 2400 K	13.0 K 37.5 K 62.5 K 87.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Broken Loop							
TE-BL-001A	Broken loop cold leg DTT flange at bottom of pipe.	255 to 590 K	10 Hz	4.2 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Qualified, possible hot wall effects.
TE-BL-001B	Broken loop cold leg DTT flange at middle of pipe.	255 to 590 K	10 Hz	4.2 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 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	4.2 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Qualified, possible hot wall effects.
TE-BL-002A	Broken loop hot leg DTT flange at bottom of pipe.	255 to 590 K	10 Hz	--	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Failed.
TE-BL-002B	Broken loop hot leg at middle of DTT flange.	255 to 590 K	10 Hz	4.3 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Qualified, possible hot wall effects.
TE-BL-002C	Broken loop hot leg DTT flange at top pipe.	255 to 590 K	10 Hz	--	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Failed.
TE-BL-003	Broken loop in reflood assist bypass system, on outside of pipe.	255 to 590 K	10 Hz	4.2 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	
Intact Loop							
TE-PC-001A	Intact loop cold leg DTT horizontal flange on west side of pipe.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified, possible hot wall effects.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Intact Loop (continued)							
TE-PC-001B	Intact loop cold leg DTT horizontal flange at center of pipe.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified, possible hot wall effects.
TE-PC-001C	Intact loop cold leg DTT horizontal flange on east side of pipe.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 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	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 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	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 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	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified, possible hot wall effects.
TE-PC-005	Next to bottom of ECC Rake 1.	255 to 590 K	10 Hz	4.2 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Qualified, possible hot wall effects.
TE-PC-006	Next to top of ECC Rake 1.	255 to 590 K	10 Hz	--	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Failed.
TE-PC-009	Next to bottom of ECC Rake 2.	255 to 590 K	10 Hz	4.3 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Qualified, possible hot wall effects.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Intact Loop (continued)							
TE-PC-010	Next to top of ECC Rake 2.	255 to 590 K	10 Hz	4.3 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Qualified, possible hot wall effects.
TE-PC-011	Top of ECC Rake 2.	255 to 590 K	10 Hz	4.3 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Qualified, possible hot wall effects.
Secondary Coolant System							
TE-P004-054	Condensate receiver.	250 to 500 K	10 Hz	6.3 K	250 K 350 K 500 K	6.0 K 6.1 K 6.3 K	Qualified.
Emergency Core Cooling System							
TE-P120-001	BWST.	250 to 370 K	10 Hz	6.0 K	250 K 370 K	6.0 K 6.1 K	Qualified, except for spurious spikes.
TE-P120-027	Accumulator B.	250 to 370 K	10 Hz	6.0 K	250 K 370 K	6.0 K 6.1 K	Qualified.
TE-P120-041	Accumulator A.	250 to 370 K	10 Hz	6.0 K	250 K 370 K	6.0 K 6.1 K	Qualified.
TE-P120-102	LPIS Heat Exchanger B outlet.	255 to 480 K	10 Hz	4.4 K	--	4.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Blowdown Suppression Tank Spray System							
TE-P138-034	BST.	250 to 420 K	10 Hz	6.1 K	250 K 350 K 420 K	6.0 K 6.1 K 6.2 K	Qualified.
TE-P138-137	Outlet of BST spray system heat exchanger.	250 to 420 K	10 Hz	6.1 K	250 K 350 K 420 K	6.0 K 6.1 K 6.2 K	
TE-P138-141	Spray in 3.79-L/s header.	250 to 420 K	10 Hz	6.1 K	250 K 350 K 420 K	6.0 K 6.1 K 6.2 K	Qualified, no other measurement for direct comparison.
TE-P138-142	Spray pump discharge.	250 to 420 K	10 Hz	--	250 K 350 K 420 K	6.0 K 6.1 K 6.2 K	Failed.
TE-P138-143	Spray in 13.88-L/s header.	250 to 420 K	10 Hz	6.1 K	250 K 350 K 420 K	6.0 K 6.1 K 6.2 K	Qualified, no other measurement for direct comparison.
Broken Loop							
TE-P138-170	Hot leg warmup line.	73 to 622 K	10 Hz	6.4 K	300 K 500 K 600 K	6.1 K 6.3 K 6.4 K	
TE-P138-171	Cold leg warmup line.	172 to 672 K	10 Hz	6.3 K	300 K 500 K 600 K	6.1 K 6.3 K 6.4 K	
Intact Loop							
TE-P139-019	Pressurizer vapor space, 0.86 m above heater rods.	280 to 640 K	10 Hz	6.4 K	450 K 550 K 650 K	6.2 K 6.3 K 6.4 K	Qualified, hot wall effects and limited time response.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation		Comments
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Intact Loop (continued)							
TE-P139-020	Pressurizer liquid volume, 0.36 m above heater rods.	280 to 640 K	10 Hz	6.4 K	450 K 550 K 650 K	6.2 K 6.3 K 6.4 K	Qualified, hot wall effects and limited time response.
TE-P139-20-1	Pressurizer liquid volume.	280 to 640 K	10 Hz	6.4 K	450 K 550 K 650 K	6.2 K 6.3 K 6.4 K	Qualified, hot wall effects and limited time response.
TE-P139-28-2	Intact loop cold leg.	530 to 620 K	10 Hz	1.6 K	--	1.6 K	
TE-P139-029	Intact loop cold leg.	280 to 620 K	10 Hz	1.6 K	--	1.6 K	
TE-P139-32-1	Intact loop hot leg.	280 to 620 K	10 Hz	1.7 K	--	1.7 K	Qualified, initial conditions only.
Primary Component Cooling System							
TE-P141-094	Downstream from primary component cooling system heat exchanger.	275 to 350 K	10 Hz	0.3 K	--	0.3 K	
TE-P141-095	Upstream from primary component cooling system heat exchanger.	275 to 350 K	10 Hz	0.3 K	--	0.3 K	
Intact Loop							
TE-SG-001	Intact loop SG inlet plenum.	255 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified, possible hot wall effects after 40 s.
TE-SG-001A	Intact loop SG inlet plenum.	255 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified, possible hot wall effects after 40 s.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Intact Loop (continued)							
TE-SG-002	Intact loop SG outlet plenum.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified, possible hot wall effects after 18 s.
TE-SG-002A	Intact loop SG outlet plenum.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified, possible hot wall effects after 18 s.
Secondary Coolant System							
TE-SG-003	SG secondary side downcomer, 0.25 m above top of tube sheet.	255 to 590 K	10 Hz	4.2 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Qualified.
TE-SG-004	SG secondary side downcomer, 2.12 m above top of tube sheet.	255 to 590 K	10 Hz	--	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 K	Failed.
TE-SG-005	SG secondary side downcomer, 2.92 m above top of tube sheet.	255 to 590 K	10 Hz	4.2 K	400 K 500 K 550 K 600 K	3.8 K 4.0 K 4.2 K 4.7 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	3.0 K	--	3.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Blowdown Suppression System (continued)							
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	3.0 K	--	3.0 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	3.0 K	--	3.0 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	3.0 K	--	3.0 K	Qualified.
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	3.0 K	--	3.0 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	3.0 K	--	3.0 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	3.0 K	--	3.0 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	3.0 K	--	3.0 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Blowdown Suppression System (continued)							
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	3.0 K	--	3.0 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	3.0 K	--	3.0 K	Qualified.
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	3.0 K	--	3.0 K	Failed.
TE-T055-002	Containment.	255 to 400 K	10 Hz	0.4 K	--	0.4 K	Qualified.
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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-1F07-015	Cladding on Fuel Assembly 1, Row F, Column 7, 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-1F07-021	Cladding on Fuel Assembly 1, Row F, Column 7, 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-1F07-026	Cladding on Fuel Assembly 1, Row F, Column 7, 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-1F07-030	Cladding on Fuel Assembly 1, Row F, Column 7, 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-1LP-001	Fuel Assembly 1 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-1LP-002	Fuel Assembly 1 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-001	Downcomer Stalk 1, 4.8 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-002	Downcomer Stalk 1, 4.2 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-003	Downcomer Stalk 1, 3.59 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-004	Downcomer Stalk 1, 2.98 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-005	Downcomer Stalk 1, 2.37 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-006	Downcomer Stalk 1, 1.76 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-007	Downcomer Stalk 1, 0.85 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-1ST-008	Downcomer Stalk 1, 0.74 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-009	Downcomer Stalk 1, 0.64 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-010	Downcomer Stalk 1, 0.54 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-011	Downcomer Stalk 1, 0.44 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-012	Downcomer Stalk 1, 0.34 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-013	Downcomer Stalk 1, 0.24 m from RV bottom.	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-014	Downcomer Stalk 1, 1.17 m from RV bottom (inside of DTT).	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-1ST-015	Downcomer Stalk 1, 1 m from RV bottom (inside of DTT).	255 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-1UP-001	Fuel Assembly 1 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-1UP-002	Fuel Assembly 1 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-1UP-004	Fuel Assembly 1 support column above RV nozzle.	310 to 980 K	10 Hz	4.2 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-1UP-005	DTT FE-1UP-1 above Fuel Assembly 1.	310 to 980 K	10 Hz	4.2 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-1UP-006	Fuel Assembly 1 support column.	310 to 980 K	10 Hz	4.2 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-1UP-007	Fuel Assembly 1 support column.	310 to 980 K	10 Hz	4.3 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-2E08-011	Cladding on Fuel Assembly 2, Row E, Column 8 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.5 K	450 K	4.0 K	Qualified.
					600 K	5.6 K	
					900 K	10.0 K	
					1500 K	19.4 K	
TE-2E08-030	Cladding on Fuel Assembly 2, Row E, Column 8 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K	4.0 K	Qualified.
					600 K	5.6 K	
					900 K	10.0 K	
					1500 K	19.4 K	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-2E08-045	Cladding on Fuel Assembly 2, Row E, Column 8 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-2F07-015	Cladding on Fuel Assembly 2, Row F, Column 7 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-2F07-037	Cladding on Fuel Assembly 2, Row F, Column 7 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-2F08-028	Cladding on Fuel Assembly 2, Row F, Column 8 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-2F08-032	Cladding on Fuel Assembly 2, Row F, Column 8 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-2F09-026	Cladding on Fuel Assembly 2, Row F, Column 9 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-2F09-041	Cladding on Fuel Assembly 2, Row F, Column 9 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation		Comments
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Reactor Vessel (continued)							
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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-2H02-028	Cladding on Fuel Assembly 2, Row H, Column 2 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-2I14-039	Cladding on Fuel Assembly 2, Row I, Column 14 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-2LP-001	Fuel Assembly 2 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-2LP-002	Fuel Assembly 2 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-2LP-003	Fuel Assembly 2 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation		Comments
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-2UP-001	Fuel Assembly 2 upper end box.	310 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-2UP-002	Fuel Assembly 2 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-2UP-003	Fuel Assembly 2 upper end box.	310 to 980 K	10 Hz	4.4 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-2UP-004	Fuel Assembly 2 support column.	310 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-2UP-005	Fuel Assembly 2 support column.	310 to 980 K	10 Hz	4.1 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	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.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-3F07-015	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-3F07-021	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-3F07-026	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-3F07-030	Cladding on Fuel Assembly 3, Row F, Column 7 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation		Comments
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-3LP-001	Fuel Assembly 3 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-3LP-002	Fuel Assembly 3 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-3UP-001	Fuel Assembly 3 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-3UP-006	Fuel Assembly 3 support column.	310 to 980 K	10 Hz	4.2 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-3UP-008	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	4.2 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-3UP-010	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	4.2 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-3UP-011	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	4.2 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-3UP-012	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	4.2 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-3UP-013	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-3UP-014	Liquid level transoucer above Fuel Assembly 3.	310 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-3UP-015	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-3UP-016	Liquid level transducer above Fuel Assembly 3.	310 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-4E08-011	Cladding on Fuel Assembly 4, Row E, Column 8 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-4E08-030	Cladding on Fuel Assembly 4, Row E, Column 8 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-4E08-045	Cladding on Fuel Assembly 4, Row E, Column 8 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-4F07-015	Cladding on Fuel Assembly 4, Row F, Column 7 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.4 K	150 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-4F07-037	Cladding on Fuel Assembly 4, Row F, Column 7 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-4F08-028	Cladding on Fuel Assembly 4, Row F, Column 8 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-4F08-032	Cladding on Fuel Assembly 4, Row F, Column 8 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-4F09-026	Cladding on Fuel Assembly 4, Row F, Column 9 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-4F09-041	Cladding on Fuel Assembly 4, Row F, Column 9 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation		Comments
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-4G14-011	Cladding on Fuel Assembly 4, Row G, Column 14 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-4H02-028	Cladding on Fuel Assembly 4, Row H, Column 2 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-4H03-026	Cladding on Fuel Assembly 4, Row H, Column 3 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-4H13-015	Cladding on Fuel Assembly 4, Row H, Column 13 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
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	5.8 K	450 K	4.0 K	Qualified.
					600 K	5.6 K	
					900 K	10.0 K	
					1500 K	19.4 K	
TE-4LP-001	Fuel Assembly 4 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-4LP-003	Fuel Assembly 4 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-4UP-001	Fuel Assembly 4 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-4UP-002	Fuel Assembly 4 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-4UP-003	Fuel Assembly 4 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-4UP-004	Fuel Assembly 4 support column.	310 to 980 K	10 Hz	4.1 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	
TE-4UP-005	Fuel Assembly 4 support column.	310 to 980 K	10 Hz	4.1 K	400 K	3.3 K	Qualified.
					500 K	3.6 K	
					600 K	4.3 K	
					1000 K	6.8 K	

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5C06-024	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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5C07-027	Cladding on Fuel Assembly 5, Row C, Column 7 at 0.69 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5C07-031	Cladding on Fuel Assembly 5, Row C, Column 7 at 0.79 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5C07-43.8	Cladding on Fuel Assembly 5, Row C, Column 7 at 1.11 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5D06-027	Cladding on Fuel Assembly 5, Row D, Column 6 at 0.69 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.5 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5D06-031	Cladding on Fuel Assembly 5, Row D, Column 6 at 0.79 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.6 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5D06-43.8	Cladding on Fuel Assembly 5, Row D, Column 6 at 1.11 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.7 K	450 K 500 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5D07-027	Cladding on Fuel Assembly 5, Row D, Column 7 at 0.69 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.9 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5D07-031	Cladding on Fuel Assembly 5, Row D, Column [illegible] at 0.79 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.7 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5D07-43.8	Cladding on Fuel Assembly 5, Row D, Column 7 at 1.11 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5F03-024	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	5.2 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5F04-015	Cladding on Fuel Assembly 5, Row F, Column 4 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.4 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5F04-026	Cladding on Fuel Assembly 5, Row F, Column 4 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.7 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5F04-032	Cladding on Fuel Assembly 5, Row F, Column 4 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.7 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5F04-062	Cladding on Fuel Assembly 5, Row F, Column 4 at 1.57 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5F07-026	Cladding on Fuel Assembly 5, Row F, Column 7 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5F08-026	Cladding on Fuel Assembly 5, Row F, Column 8 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5G06-011	Cladding on Fuel Assembly 5, Row G, Column 6 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.) K 19.4 K	Qualified.
TE-5G06-030	Cladding on Fuel Assembly 5, Rod G, Column 6 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5G06-045	Cladding on Fuel Assembly 5, Row G, Column 6 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.6 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5G06-062	Cladding on Fuel Assembly 5, Row G, Column 6 at 1.57 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5H05-002	Cladding on Fuel Assembly 5, Row H, Column 5 at 0.05 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.2 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5H05-015	Cladding on Fuel Assembly 5, Row H, Column 5 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.6 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5H05-	Cladding on Fuel Assembly 5, Row H, Column 5 at 1.24 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.5 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5H06-024	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.61 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5H06-028	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5H06-032	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5H06-037	Cladding on Fuel Assembly 5, Row H, Column 6 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5H07-008	Cladding on Fuel Assembly 5, Row H, Column 7 at 0.20 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5H07-026	Cladding on Fuel Assembly 5, Row H, Column 7 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5H07-041	Cladding on Fuel Assembly 5, Row H, Column 7 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5H07-058	Cladding on Fuel Assembly 5, Row H, Column 7 at 1.47 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5I04-027	Cladding on Fuel Assembly 5, Row I, Column 4 at 0.69 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.5 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5I04-43.8	Cladding on Fuel Assembly 5, Row I, Column 4 at 1.11 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.7 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5I06-005	Cladding on Fuel Assembly 5, Row I, Column 6, at 0.13 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5I06-021	Cladding on Fuel Assembly 5, Row I, Column 6, at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.6 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5I06-039	Cladding on Fuel Assembly 5, Row [illegible], Column 6 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.6 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5I06-05[illegible]	Cladding on Fuel Assembly 5, Row I, Column 6 at 1.37 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.6 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5J03-024	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	5.3 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5J04-005	Cladding on Fuel Assembly 5, Row J, Column 4 at 0.13 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.3 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5J04-021	Cladding on Fuel Assembly 5, Row J, Column 4 at 0.53 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.6 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5J04-039	Cladding on Fuel Assembly 5, Row J, Column 4 at 0.99 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.8 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5J04-054	Cladding on Fuel Assembly 5, Row J, Column 4 at 1.37 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.6 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5J08-026	Cladding on Fuel Assembly 5, Row J, Column 8 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5LP-001	Fuel Assembly 5 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5LP-002	Fuel Assembly 5 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5LP-003	Fuel Assembly 5 lower end box.	310 to 980 K	10 Hz	--	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Failed.
TE-5LP-004	Fuel Assembly 5 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5L06-026	Cladding on Fuel Assembly 5, Row L, Column 6 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.6 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5L07-43.8	Cladding on Fuel Assembly 5, Row L, Column 7 at 1.11 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5L08-011	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	5.2 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5L08-024	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	5.3 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5L08-039	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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5L08-045	Guide tube for Fuel Assembly 5, Row L, Column 8 at 1.14 m above bottom of guide tube.	420 to 1530 K	10 Hz	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5M06-024	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	5.3 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.7 K 19.4 K	Qualified.
TE-5M07-015	Cladding on Fuel Assembly 5, Row M, Column 7 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recordin Freque	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5M07-026	Cladding on Fuel Assembly 5, Row M, Column 7 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5M07-032	Cladding on Fuel Assembly 5, Row M, Column 7 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	6.7 K	450 K 600 K 900 K 1500 K	5.2 K 6.5 K 10.6 K 19.9 K	Qualified.
TE-5M07-062	Cladding on Fuel Assembly 5, Row M, Column 7 at 1.57 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-5UP-003	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5UP-004	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5UP-009	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5UP-010	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5UP-011	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	 Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-5UP-013	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5UP-014	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5UP-015	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5UP-016	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5UP-019	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-5UP-020	Fuel Assembly 5 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-6E08-011	Cladding on Fuel Assembly 6, Row E, Column 8 at 0.28 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-6E08-030	Cladding on Fuel Assembly 6, Row E, Column 8 at 0.76 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-6E08-045	Cladding on Fuel Assembly 6, Row E, Column 8 at 1.14 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-6F07-015	Cladding on Fuel Assembly 6, Row F, Column 7 at 0.38 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-6F07-037	Cladding on Fuel Assembly 6, Row F, Column 7 at 0.94 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-6F08-028	Cladding on Fuel Assembly 6, Row F, Column 8 at 0.71 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.7 K 19.4 K	Qualified.
TE-6F08-032	Cladding on Fuel Assembly 6, Row F, Column 8 at 0.81 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-6F09-026	Cladding on Fuel Assembly 6, Row F, Column 9 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-6F09-041	Cladding on Fuel Assembly 6, Row F, Column 9 at 1.04 m above bottom of fuel rod.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation		Comments
					Reading	Uncertainty (±)	
TEMPERATURE (continued)							
Reactor Vessel (continued)							
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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified, except for spurious spikes.
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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
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	5.4 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.5 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TE-6LP-001	Fuel Assembly 6 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-6LP-002	Fuel Assembly 6 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-6LP-003	Fuel Assembly 6 lower end box.	310 to 980 K	10 Hz	4.0 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation Reading	After Experiment Initiation Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TE-6UP-001	Fuel Assembly 6 upper end box.	310 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-6UP-002	Fuel Assembly 6 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-6UP-003	Fuel Assembly 6 upper end box.	310 to 980 K	10 Hz	4.3 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-6UP-004	Fuel Assembly 6 support column.	310 to 980 K	10 Hz	4.2 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TE-6UP-005	Fuel Assembly 6 support column.	310 to 980 K	10 Hz	4.1 K	400 K 500 K 600 K 1000 K	3.3 K 3.6 K 4.3 K 6.8 K	Qualified.
TF-5F08-26	Pellet at Fuel Assembly 5, Row F, Column 8 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	15.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TF-5F12-26	Pellet at Fuel Assembly 5, Row F, Column 12 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	14.2 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TF-5H10-26	Pellet at Fuel Assembly 5, Row H, Column 10 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	13.6 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TF-5I10-26	Pellet at Fuel Assembly 5, Row I, Column 10 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	16.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TF-5J08-26	Pellet at Fuel Assembly 5, Row J, Column 8 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	15.1 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TF-5J12-26	Pellet at Fuel Assembly 5, Row J, Column 12 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	--	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Failed.
TM-5F07-26	Embedded in cladding of Fuel Assembly 5, Row F, Column 7 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	--	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Failed.
TM-5G10-26	Embedded in cladding of Fuel Assembly 5, Row G, Column 10 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	--	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Failed.
TM-5H13-26	Embedded in cladding of Fuel Assembly 5, Row H, Column 13 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	--	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Failed.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TM-5L06-26	Embedded in cladding of Fuel Assembly 5, Row L, Column 6 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	--	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Failed.
TM-5L10-26	Embedded in cladding of Fuel Assembly 5, Row L, Column 10 at 0.66 m above bottom of fuel rod.	420 to 1530 K	10 Hz	--	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Failed.
TP-5C09	Plenum of fuel rod at Row C, Column 9 of Fuel Assembly 5.	420 to 1530 K	10 Hz	5.8 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TP-5F09	Plenum of fuel rod at Row F, Column 9 of Fuel Assembly 5.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TP-5H02	Plenum of fuel rod at Row H, Column 2 of Fuel Assembly 5.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TP-5I04	Plenum of fuel rod at Row I, Column 4 of Fuel Assembly 5.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TP-5I14	Plenum of fuel rod at Row I, Column 14 of Fuel Assembly 5.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
Reactor Vessel (continued)							
TP-5J09	Plenum of fuel rod at Row J, Column 9 of Fuel Assembly 5.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TP-5L07	Plenum of fuel rod at Row L, Column 7 of Fuel Assembly 5.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TP-5L09	Plenum of fuel rod at Row L, Column 9 of Fuel Assembly 5.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 K	Qualified.
TP-5M09	Plenum of fuel rod at Row M, Column 9 of Fuel Assembly 5.	420 to 1530 K	10 Hz	5.7 K	450 K 600 K 900 K 1500 K	4.0 K 5.6 K 10.0 K 19.4 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.
Emergency Core Cooling System							
TT-P120-062	Cold leg injection in 4-in. line upstream from cold leg injection point.	280 to 620 K	10 Hz	1.6 K	--	1.6 K	Qualified.
TT-P120-065	Lower plenum injection line.	280 to 620 K	10 Hz	1.6 K	--	1.6 K	Qualified, except for spurious spikes.

TABLE B-2. (continued)

Variable, System, and Detector	Location	Measurement Range	Recording Frequency[a]	Initial Condition Uncertainty (±)	After Experiment Initiation: Reading	After Experiment Initiation: Uncertainty (±)	Comments
TEMPERATURE (continued)							
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, initial conditions only.
TT-P139-033	Intact loop hot leg primary coolant, Channel B.	535 to 620 K	10 Hz	1.7 K	--	1.7 K	Qualified, initial conditions only.
TT-P139-034	Intact loop hot leg primary coolant, Channel C.	535 to 620 K	10 Hz	1.7 K	--	1.7 K	Qualified, initial conditions only.

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

b. Reference B-4.

c. Reference B-5.

d. Reference B-6.

e. Reference B-7.

f. The turbines can exceed their design range when operating in steam. The uncertainties can be extrapolated in these circumstances.

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

h. Reference B-8.

i. Reference B-9.

j. Reference B-10.

k. Pressure measurements are presented as absolute values.

l. Reference B-11.

m. Reference B-12.

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APPENDIX C

PREEXPERIMENT PROCEDURES AND DATA CONSISTENCY CHECKS

APPENDIX C

PREEXPERIMENT PROCEDURES AND DATA CONSISTENCY CHECKS

In preparation for Experiment L2-5, 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 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 20 Hz with 20 s of data taken. At the 555-K stabilization point, the pumps were stopped and 20 s of data were recorded during pump coastdown and zero flow conditions. With the pumps off at the 555-K stabilization point, 20 s of data were taken. Before the reactor was brought critical, the DAVDS was calibrated and the boron concentration in the accumulators, BST, and BWST was 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, isothermal, and high-pressure injection system (HPIS) flow 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 static pressure test was performed at cold plant temperature. After this 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, and 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 and 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.

In addition, the computed fluid velocity and the momentum flux were compared to the output of the turbines and drag discs in the reactor vessel.

1.2.4 Drag Disc-Turbine Transducer (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.

HPIS flow through the pressure relief line was used to verify the slope coefficients for the break line DTT. The calculated mass flow from the DTT was compared with the mass flow rate from the HPIS flow venturi and the mass flow rate into the BST.

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 approximately 1 day before the experiment and by observing spectra, count rate data, and live-time data on the densitometer system display console during and immediately before the experiment.

1.4 Level Measurement Data. Four system level measurements were evaluated: (a) BST liquid level, (b) pressurizer coolant level, (c) reactor vessel coolant level, and (d) steam generator secondary side liquid level. BST liquid-level measurements were qualified by comparing the four available measurements. In addition, a sightglass measurement was made prior to the experiment. Similarly, pressurizer liquid level was reviewed by redundant level measurements. 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 corresponding data from previous similar experiments. A summary of the consistency checks for the pump and flow transducer measurements follows.

2.2.1 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.

2.2.2 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.

2.2.3 Drag Disc-Turbine Transducer (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 a few seconds prior to the experiment and from all-steam readings during the experiment.

2.4 Liquid Level Data. The BST liquid level was evaluated by comparing four independent level measurements (LT-P138-33 and -58 and LEPdE-SV-1 and -2). Similarly, the steam generator and pressurizer liquid levels were reviewed by redundant level measurements. The reactor vessel liquid level measurements were compared with nearby thermocouples.

2.5 Temperature Data. The temperatures during the experiment were compared with saturation temperatures from the steam tables using pressure data and with previous experimental data. Initial conditions were also checked by comparing all primary coolant thermocouple and resistance thermometer detector measurements. Suppression tank thermocouple measurements were compared in a like manner.

3. Reference

C-1. F. S. Miyasaki, *Digital Data Acquisition Program*, ANCR-1250, August 1975.

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