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EXPERIMENT DATA REPORT FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A (BLOWDOWN HEAT TRANSFER TESTS)

PREPARED BY AEROJET NUCLEAR COMPANY FOR
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
IDAHO OPERATIONS OFFICE UNDER CONTRACT E(10-1) -1375

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EXPERIMENT DATA REPORT FOR SEMISCALE MOD-1

TESTS S-02-9 AND S-02-9A
(Blowdown Heat Transfer Tests)

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ABSTRACT

Recorded test data are presented for Tests S-02-9 and S-02-9A of the Semiscale Mod-1 blowdown heat transfer test series. These tests are among several Semiscale Mod-1 experiments conducted to investigate the thermal and hydraulic phenomena accompanying a hypothesized loss-of-coolant accident in a water-cooled nuclear reactor system and to provide data for the assessment of the Loss-of-Fluid Test (LOFT) design basis.

Tests S-02-9 and S-02-9A were conducted from initial cold leg fluid temperatures of 542 and 544°F, respectively, and initial pressures of 2,253 and 2,263 psia, respectively. A simulated double-ended offset shear cold leg break was used to investigate the system response to a depressurization transient with full core power (1.6 MW). An electrically heated core was used in the pressure vessel to simulate the effects of a nuclear core. System flow was set to achieve full core temperature differential (66°F). The flow resistance of the intact loop was based on core area scaling. During system depressurization, core power was reduced from the initial level of 1.6 MW in such a manner as to simulate the surface heat flux response of the LOFT nuclear fuel rods until such time that departure from nucleate boiling occurs. Both tests were conducted with a flat radial power profile. Blowdown to the pressure suppression system was accompanied by simulated emergency core cooling injection into both the intact and broken loops. However, pressure suppression system coolant spray was not used.

The purpose of this report is to make available the uninterpreted data from Tests S-02-9 and S-02-9A for future data analyses and test results reporting activities. The data, presented in the form of graphs in engineering units, have been analyzed only to the extent necessary to assure that they are reasonable and consistent.

SUMMARY

Tests S-02-9 and S-02-9A were performed as part of the Semiscale Mod-1 portion of the Semiscale Program conducted by Aerojet Nuclear Company for the United States Government. These tests were part of the Semiscale Mod-1 tests (Test Series 2) performed with an electrically heated core in place of the core simulator used in previous isothermal tests (Test Series 1). Hardware configuration and test parameters were selected to yield a system response that simulates the response of a pressurized water reactor to a hypothesized loss-of-coolant accident.

Test S-02-9A was an initial attempt at Test S-02-9 in which, contrary to test specifications, a valve in the emergency core coolant (ECC) line to the lower plenum was inadvertently left open during the test. This event did not adversely affect the acquisition of satisfactory data during the blowdown phase of the test, but it invalidated the boundary conditions for the reflood portion of the test needed to establish baseline conditions for the next test series in the Semiscale program. Comparisons of the results from both tests are included to indicate the repeatability of system phenomena.

Tests S-02-9 and S-02-9A utilized a pressure vessel with internals; an intact loop with active pump, steam generator, and pressurizer; a broken loop with simulated pump, simulated steam generator, and rupture assemblies; and a pressure suppression system with header and pressure suppression tank. The electrically heated core consisted of 38 heater rods with a maximum total power capacity of 1.6 MW. For these tests, core power was initially 1.6 MW and was subsequently reduced to simulate the surface heat flux response of Loss-of-Fluid Test nuclear fuel rods until such time as departure from nucleate boiling occurs. A postblowdown power transient similar to that used on Test S-02-5 was used for Tests S-02-9 and S-02-9A; however, in contrast to Test S-02-5, radial power peaking was not used. The test objectives specific to Tests S-02-9 and S-02-9A were (a) to determine the effects of the more severe core power transient on the temperature response and heat transfer characteristics of the Mod-1 core while operating at the design power level without radial power peaking and (b) to investigate the effects of simulated ECC injection under the given system conditions to aid in establishing the boundary conditions and test parameters for future test series. Tests S-02-9 and S-02-9A were conducted from initial conditions of approximately 2,260 psia and 544°F (cold inlet) with a simulated full size (200%) double-ended offset shear of the cold leg broken loop piping at an initial core power level of 1.6 MW with an initial core inlet flow rate of approximately 150 gpm. The instantaneous offset shear of the broken loop cold leg piping was simulated by simultaneous actuation (within 10 milliseconds) of the rupture assemblies.

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TESTS S-02-9 AND S-02-9A
(Blowdown Heat Transfer Tests)

I. INTRODUCTION

The Semiscale Mod-1 experiments represent the current phase of the Semiscale Program conducted by Aerojet Nuclear Company for the United States Government. The program, which is sponsored by the Nuclear Regulatory Commission through the Energy Research and Development Administration, is part of the overall program designed to investigate the response of a water-cooled nuclear reactor system to a hypothesized loss-of-coolant accident (LOCA). The underlying objectives of the Semiscale project are to quantify the physical processes controlling system behavior during a LOCA and to provide an experimental data base for assessing reactor safety evaluation models. The Semiscale Mod-1 program has the further objective of providing support to other experimental programs in the form of instrumentation assessment, optimization of test series, selection of test parameters, and evaluation of test results.

Tests S-02-9 and S-02-9A were conducted in the Semiscale Mod-1 system as part of a series of tests (Test Series 2) to obtain thermal-hydraulic response data from a blowdown transient in a simulated nuclear reactor with a heated core to provide an experimental basis for analytical model development and verification. The tests were also conducted to obtain data to aid in assessing the Loss-of-Fluid Test (LOFT) design basis and in planning LOFT experiments.

For Tests S-02-9 and S-02-9A, a 38-rod electrically heated core was used. (The heater array can accommodate 40 rods, but one location was used for a water level detector, and one rod had a burned out heater element.) The initial core power level was set at the maximum design power of 1.6 MW. The radial power profile was flat, with all heater rods having a maximum power density of 12.15 kW/ft. During the blowdown, the core heater power was adjusted to simulate the thermal response characteristics of nuclear-heated rods prior to departure from nucleate boiling (DNB) using an improved power transient based on the results of previous Semiscale tests. The pipe break configuration simulated a full size (200%) double-ended break in the cold leg broken loop piping.

The purpose of this report is to present the test data in an uninterpreted, but readily usable, form for use by the nuclear community in advance of detailed analysis and interpretation. Section II briefly describes the system configuration, procedures, initial test conditions, and events that are applicable to Tests S-02-9 and S-02-9A; Section III presents the data graphs and provides comments and supporting information necessary for interpretation of the data. A description of the overall Semiscale program and test series, a more detailed description of the Semiscale Mod-1 system, and a description of the measurement and data processing techniques and uncertainties can be found in Reference 1.

II. SYSTEM, PROCEDURES, CONDITIONS, AND EVENTS FOR TESTS S-02-9 AND S-02-9A

The following system configuration, procedures, initial test conditions, and events are specific to Tests S-02-9 and S-02-9A.

1. SYSTEM CONFIGURATION AND TEST PROCEDURES

The Semiscale Mod-1 system used for Tests S-02-9 and S-02-9A consisted of a pressure vessel with internals; an intact loop with steam generator, pump, and pressurizer; a blowdown loop with simulated steam generator, simulated pump, and two rupture assemblies; a 38-rod electrically heated core; coolant injection accumulators for both the intact and blowdown loops; low-pressure injection pumps for both the intact and blowdown loops; and a pressure suppression system with a suppression tank and header. The Semiscale Mod-1 experimental system is described in greater detail in Reference 1.

For Tests S-02-9 and S-02-9A, the intact loop steam generator was maintained in the active condition, in which the steam generator secondary pressure and water level are automatically adjusted to control the water temperature in the cold leg of the intact loop.

In preparation for Tests S-02-9 and S-02-9A, the system was filled with treated demineralized water and vented at strategic points to assure a liquid full system. Prior to warmup, the system was pressurized to check for leakage. Warmup to initial test conditions was accomplished with the heaters in the vessel core. Heatup of the broken loop piping was accomplished with bypass lines which served to allow circulation through the broken loop. During warmup, the purification and sampling systems were valved into the primary system to maintain water chemistry requirements and to provide a water sample at system conditions for subsequent analysis.

At 100-degree temperature intervals during warmup, detector readings were sampled to allow the integrity of the measurement instrumentation and the operability of the data acquisition system to be checked. After the core power was increased to about 1.6 MW, initial test conditions were held for about 20 minutes to establish equilibrium in the system. At the end of this period, all auxiliary systems including the bypass lines were isolated to prevent blowdown through those systems.

The system was successfully subjected to a simulated double-ended cold leg pipe break through two rupture assemblies and two blowdown nozzles, each nozzle having a break area of 0.00262 ft^2. Pressure to operate the rupture assemblies and initiate blowdown was taken from an accumulator system filled with water and pressurized to 2,250 psig with gaseous nitrogen. Immediately following initiation of blowdown (0.02 second after initiation of blowdown), the lines to the accumulator were again isolated. The effluent from the primary system was ejected into the pressure suppression system. At blowdown, power to the primary coolant circulation pump was reduced, and the pump was allowed to coast down to a speed of 1,600 rpm which was maintained for the duration of the test. A flywheel mounted on the pump motor shaft provided a simulation of the predicted coastdown of the LOFT pumps. During the blowdown transient, power to the electrically heated core was automatically controlled to simulate the thermal response of the nuclear-heated LOFT fuel rods until such time as DNB occurred (Reference 1). The core power transient used in Tests S-02-9 and S-02-9A was made more severe than the transients used in previous tests in order to more closely simulate nuclear fuel rod heat flux response. After the system was depressurized to 600 psig, coolant injection was initiated into both the intact and broken loops from separate accumulators. At approximately 150 psig, low-pressure injection was initiated from the intact and broken loop low-pressure injection system (LPIS) pumps into the same injection points used for the accumulators.

2. INITIAL TEST CONDITIONS AND SEQUENCE OF EVENTS

Conditions in the Semiscale Mod-1 system at initiation of blowdown are given in Tables I and II; the primary system water chemistry prior to blowdown is given in Table III; and the sequence of events relative to rupture is given in Table IV.

TABLE I

CONDITIONS AT BLOWDOWN INITIATION

	Measured[a]		Specified	
	S-02-9	S-02-9A	S-02-9	S-02-9A
Core Power	1.555 MW	1.560 MW	1.56 ± 0.0 MW	1.56 ± 0.01 MW
Intact Loop Cold Leg Fluid Temperature	542°F	544°F	544 ± 2°F	544 ± 2°F
Hot Leg to Cold Leg Temperature Differential	68°F	65°F	66 ± 1°F	66 ± 1°F
Pressurizer Pressure	2,253 psia	2,263 psia	2,263 ± 5 psia	2,263 ± 5 psia
Pressurizer Water Volume	0.56 ft^3	0.56 ft^3	[b]	[b]
Steam Generator Feedwater Temperature	429°F	439°F	435 ± 10°F	435 ± 10°F
Steam Generator Liquid Level (from bottom of tube sheet)	116 in.	116 in.	116 ± 2 in.	116 ± 2 in.
Fluid Temperature in Broken Loop (pump side)	601°F	602°F	605 ± 5°F	605 ± 5°F
Intact Loop Cold Leg Flow	146 gpm	148 gpm	[c]	[c]
Pressure Suppression Tank Water Level[d]	34.5 in.	65.4 in.	34.5 ± 5 in.	65.4 ± 2 in.
Pressure Suppression Tank Pressure	17.6 psia	20.3 psia	5.23 ± 2 psig	7.25 ± 1 psig
Pressure Suppression Tank Water Temperature	168°F	65°F	168 ± 2°F	<75°F

[a] Measured initial conditions are taken from process instrumentation read just prior to blowdown. Those measured conditons which did not meet the specified initial conditons were considered acceptable for analysis purposes within the test objectives.

[b] Pressurizer water volume was specified in terms of differential pressure in the level measuring systems.

[c] Flow is not specified, since it must be adjusted to achieve the required differential temperature across the core.

[d] PSS water level is set mechanically prior to the test.

TABLE II

PRIMARY COOLANT TEMPERATURE DISTRIBUTION AT RUPTURE[a]

	Detector	Temperature (°F) S-02-9	Temperature (°F) S-02-9A
Vessel Lower Plenum (lower portion)	TFV-LP-7-1/2	541	541
Vessel Lower Plenum (upper portion)	TFV-LP-27-1/2	542	544
Hot Leg, Intact Loop (near vessel)	RBU-2	609	609
Hot Leg, Intact Loop (104 in. from vessel center)	TFU-5	608	608
Hot Leg, Intact Loop (near pump inlet)	TFU-10	538	539
Cold Leg, Intact Loop	RBU-14A	542	542
Cold Leg, Broken Loop (near nozzle)	TFB-23	536	535
Hot Leg, Broken Loop (near vessel)	TFB-30	601	602
Cold Leg, Broken Loop (near nozzle)	TFB-42	591	586

[a] Data taken from final digital scan, approximately two minutes before blowdown.

TABLE III

WATER CHEMISTRY PRIOR TO BLOWDOWN[a]

	S-02-9	S-02-9A
ph	9.9	10.6
Conductivity (umhos/cm)	39.9	83.0
Lithium (ppm)	1.9	2.8
Chlorides (ppm)	<0.1	<0.5
Fluorides (ppm)	<0.4	<0.34
Oxygen (ppm)	0.12	0.1
Total Gas (cc/l)	183	225.6

[a] Water sample taken at a system pressure of 2,250 psig and a system temperature of 544 °F (cold leg).

TABLE IV

SEQUENCE OF EVENTS DURING TEST[a]

Event	Time Relative to Rupture	
	S-02-9	S-02-9A
Established Core Power Level	-23 min	-17 min
Bypass Lines Valved Out of System	-2.5 sec	-2.5 sec
Initiation of Blowdown	0	0
Reduced Pump Power	0	0
Steam Generator Feedwater and Discharge Valves Closed	+1 sec	+1 sec
Valve in ECC Accumulators[b]	+5 sec	+5 sec
Start LPIS Pumps[b]	+5 sec	+5 sec
Core Power Tripped Off[c]	+63.5 sec	+54.3 sec

[a] A time-controlled sequencer was used to control critical events during the test.

[b] Injection from ECC accumulators and LPIS pumps does not start until system pressure drops below accumulator or pump pressure, respectively.

[c] Core power tripped manually when GV-150 indicated all liquid.

III. DATA PRESENTATION

The data from Semiscale Mod-1 Tests S-02-9 and S-02-9A are presented with brief comment. Processing analysis has been performed only to the extent necessary to obtain appropriate engineering units and to assure that the data are reasonable and consistent. In all cases, in converting transducer output to engineering units, a homogeneous fluid was assumed. Further interpretation and analysis should consider that sudden decompression processes such as those occurring during blowdown may have subjected the measurement devices to nonhomogeneous fluid conditions.

The performance of the system during Tests S-02-9 and S-02-9A was monitored by about 220 detectors. The data obtained were recorded on both digital and analog data acquisition systems. The digital system was used to process the data presented in this report. The analog system was used primarily to provide redundancy.

The data are presented, in many instances, in the form of composite graphs to facilitate comparison of the values of a given variable for the two tests reported. The scales selected for the graphs do no reflect the obtainable resolution of the data. (The data processing techniques are described in greater detail in Reference 1.) Data are presented for the two test until the point in time at which core power was terminated.

Figures 1 through 6 and Table V provide supporting information for interpretation of the data graphs shown in Figures 7 through 241. Figures 1 through 6 show the relative locations of all detectors used during the Mod-1 blowdown heat transfer test series. Table V groups the measurements taken during Tests S-02-9 and S-02-9A according to measurement type; identifies the specific measurement location and the range of the detector and actual recording range of the data acquisition system; provides brief comments regarding the data; and references the measurements and comments to the corresponding figure. Figures 7 through 241 present all the blowdown data obtained. Time zero on the graphs is the time of rupture initiation.

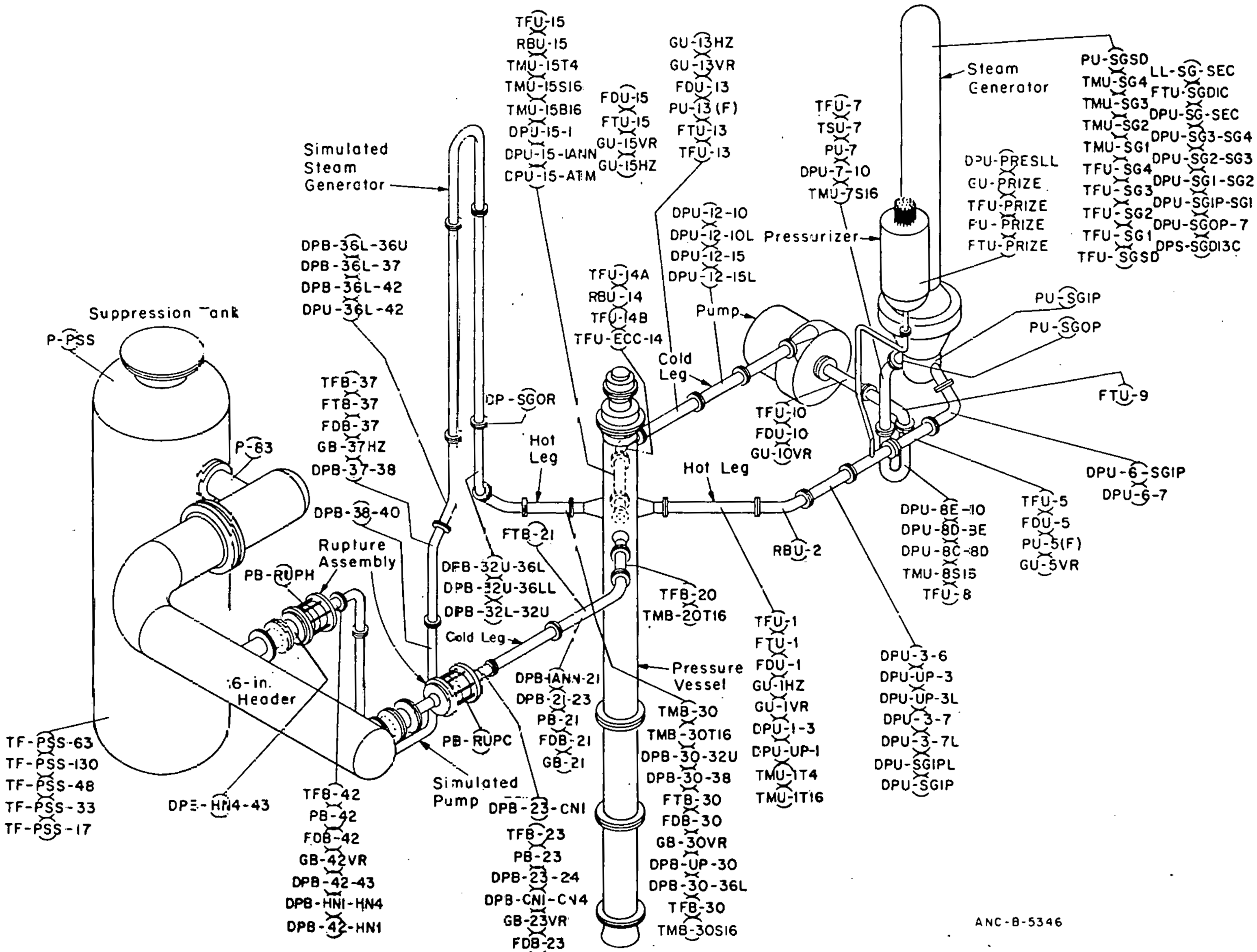

Fig. 1 Semiscale Mod-1 system and instrumentation cold leg break configuration -- isometric.

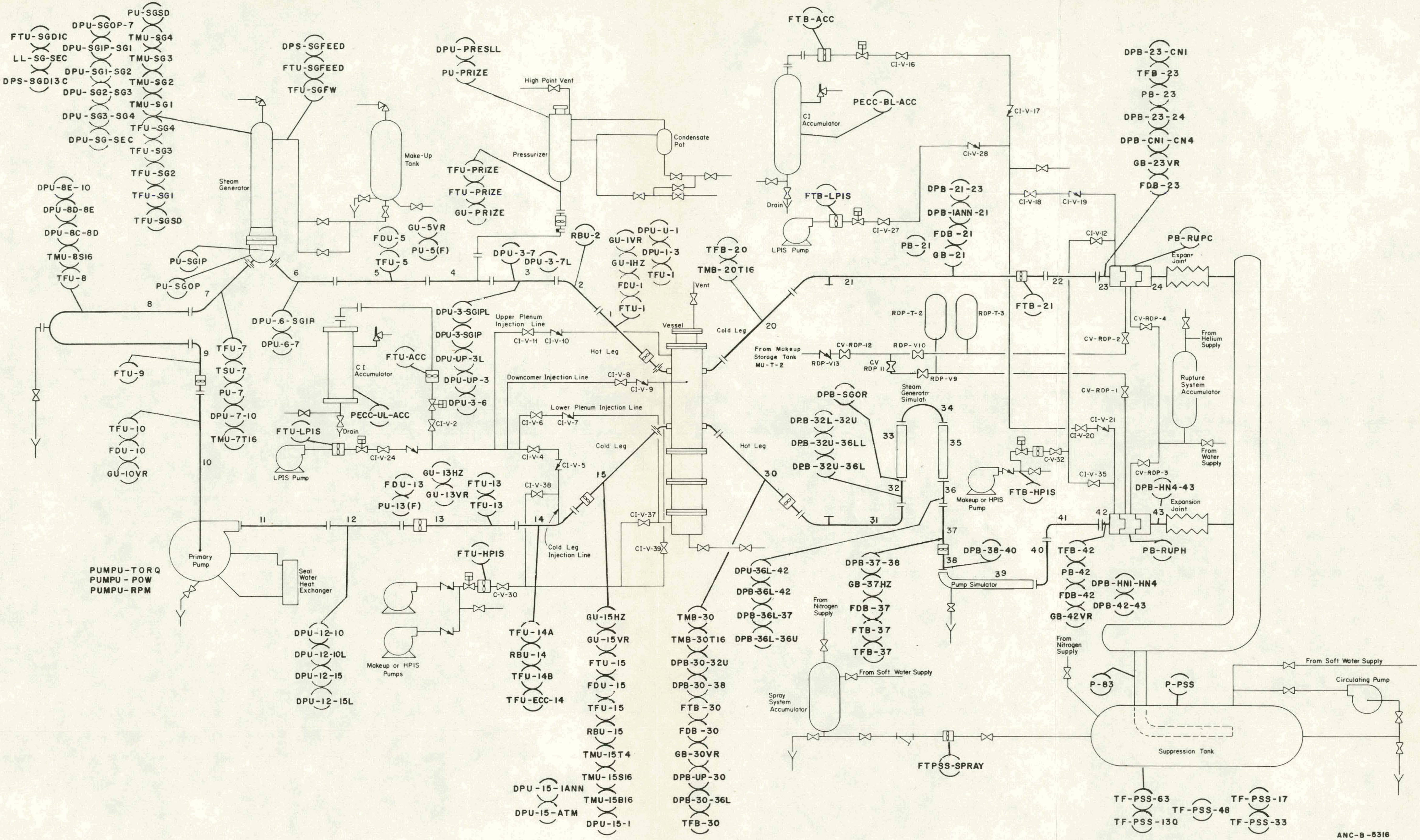

Fig. 2 Semiscale Mod-1 system and instrumentation for cold leg break configuration -- schematic.

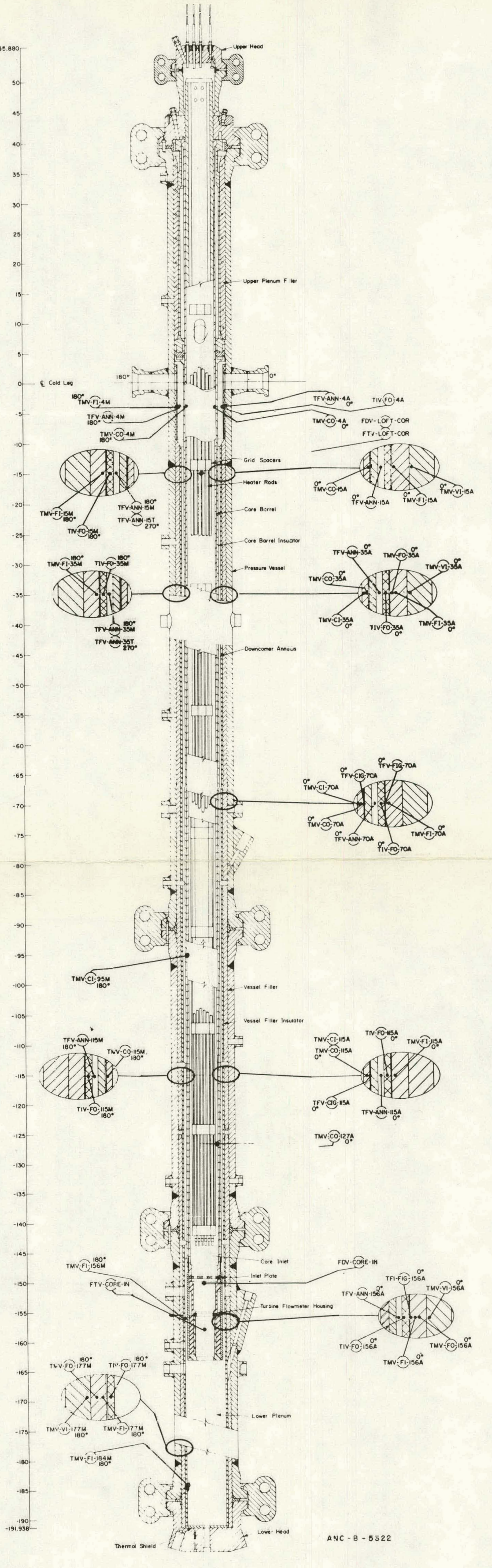

Fig. 3 Semiscale Mod-1 pressure vessel -- cross section showing instrumentation.

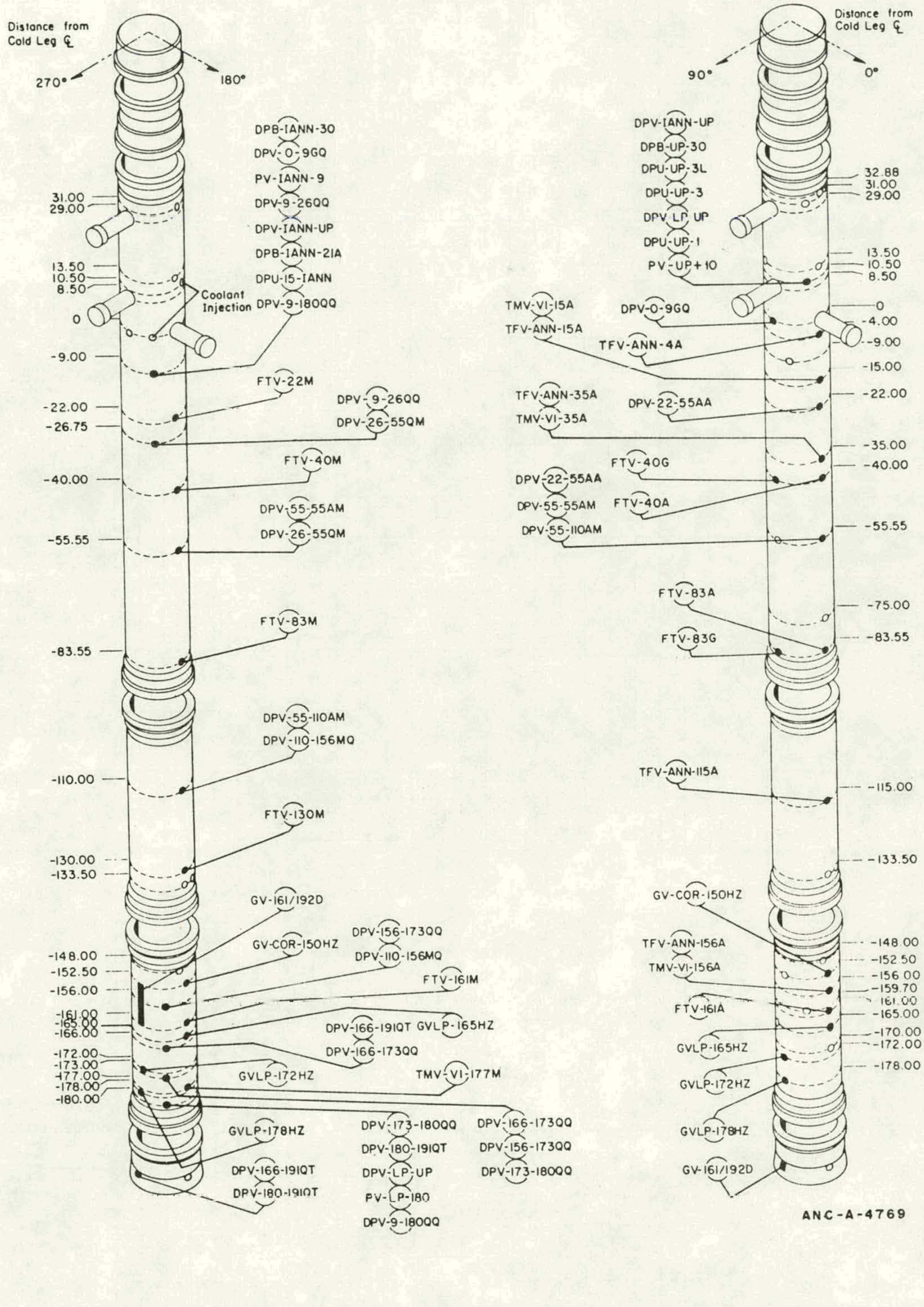

Fig. 4 Semiscale Mod-1 pressure vessel -- isometric showing instrumentation.

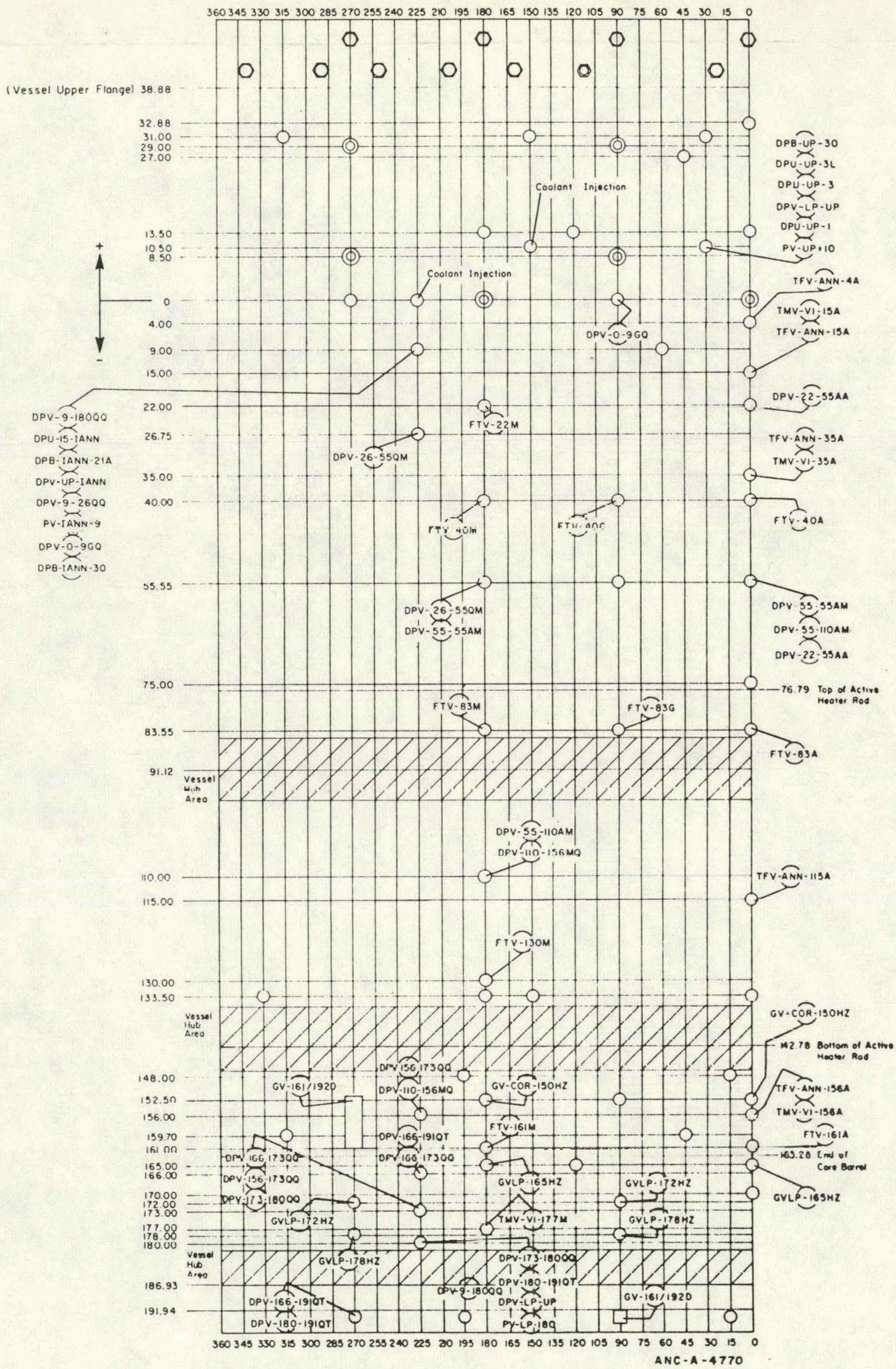

Fig. 5 Semiscale Mod-1 pressure vessel -- penetrations and instrumentation.

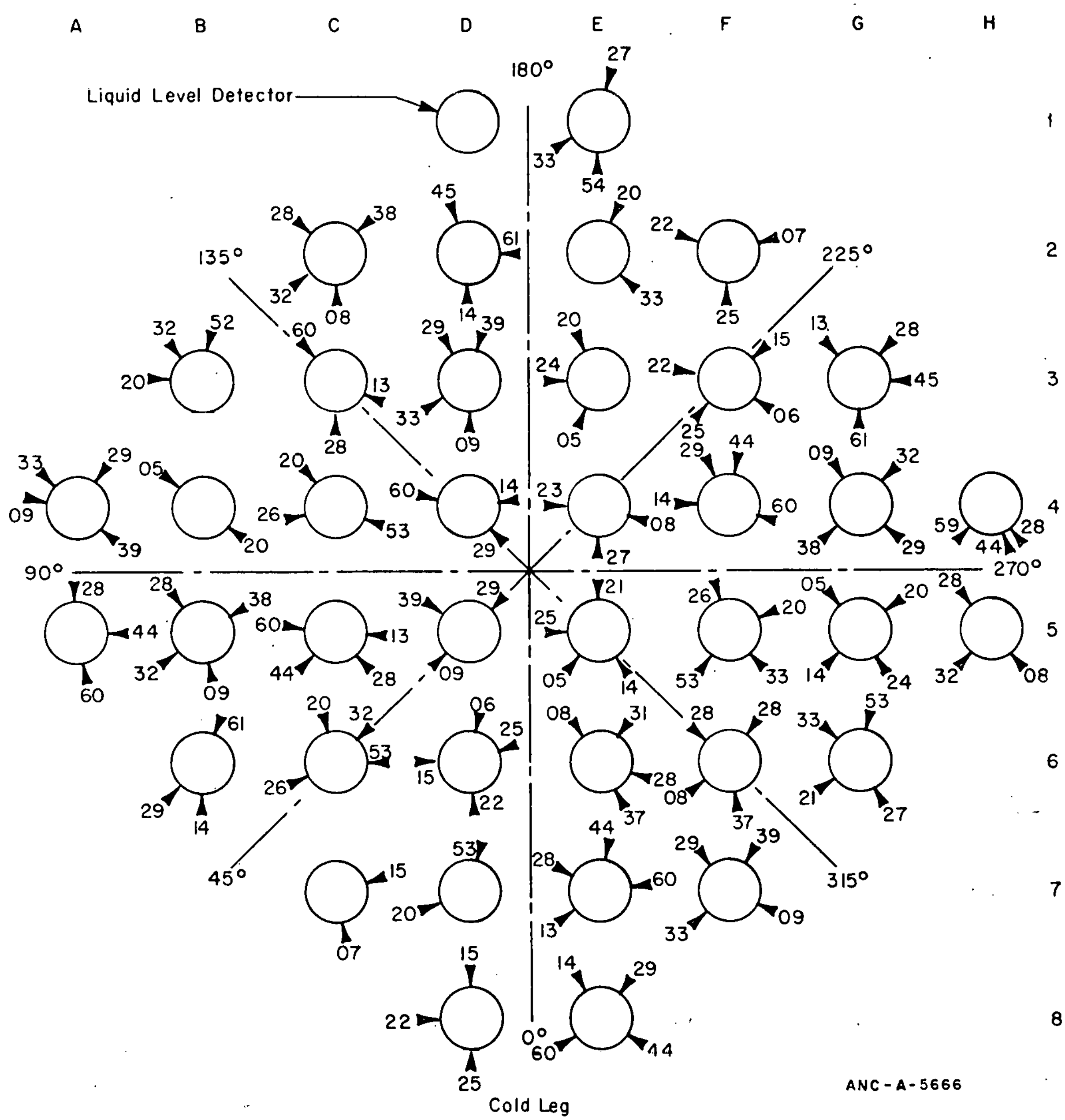

Fig. 6 Semiscale Mod-1 heated core, plan view.

TABLE V

DATA PRESENTATION FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
FLUID TEMPERATURE	Chromel-Alumel thermocouples unless specified otherwise	0-2300°F	0-1017°F		
Intact Loop					
RBU-2	Hot leg, Spool 2, 46 in. from vessel center (platinum resistance bulb)	0-1000°F	0-1000°F	7	
TFU-5	Hot leg, Spool 5, 104 in. from vessel center			8	
TFU-10	Cold leg, Spool 10, 144 in. from vessel center			9	
TFU-13	Cold leg, Spool 13, 51 in. from vessel center		0-591°F	10	
RBU-14A	Cold leg, Spool 14, 43 in. from vessel center, upstream of cold leg injection port (platinum resistance bulb)	0-1000°F	0-1000°F	11	
TFU-14B	Cold leg, Spool 14, 39 in. from vessel center, downstream of cold leg injection port		0-591°F	12	
Broken Loop		0-2300°F			
TFB-20	Cold leg, Spool 20, 21 in. from vessel center		0-591°F	13	
TFB-23	Cold leg, Spool 23, 91 in. from vessel center, upstream of vessel-side nozzle			14	
TFB-30	Hot leg, Spool 30, 16 in. from vessel center		0-1017°F	15	
TFB-42	Cold leg, Spool 42, 414 in. from vessel center along cold leg, upstream of pump-side nozzle		0-1017°F	16	Open circuit from t=0 to t=20.5 on Test S-02-9A
Downcomer Annulus	Centered in annulus, Type J iron-constantan thermocouples	0-1400°F	0-803°F		
TFV-ANN-15M	15 in. below cold leg centerline, 180°			17	
TFV-ANN-35A	35 in. below cold leg centerline, 0°			18	
TFV-ANN-35T	35 in. below cold leg centerline, 270°			19	
TFV-ANN-115A	115 in. below cold leg centerline, 0°			20	
TFV-ANN-115M	115 in. below cold leg centerline, 180°			21	
Upper Plenum		0-2300°F	0-1017°F	22	
TFV-UP113	In upper plenum 13.5 in. above cold leg centerline at 180°				
Lower Plenum	On fluid thermocouple rack, 1 in. from vessel center, 45°	0-2300°F	0-1017°F		
TFV-LP-7-1/2	7.5 in. from bottom			23	
TFV-LP-14-1/2	14.5 in. from bottom			24	
TFV-LP-27-1/2	27.5 in. from bottom			25	
Core Grid Spacers		0-2300°F	0-238[illegible]°F		
Grid Spacer 5	55 in. below cold leg centerline, 21.5 in. above top of heated length				
TFG-5CD-45	Thermocouple in space defined by Columns C and D, Rows 4 and 5			26	
Grid Spacer 6	76 in. below cold leg centerline, 1/2 in. above top of heated length				
TFG-6AB-45	Thermocouple in space defined by Columns A and B, Rows 4 and 5			27	
TFG-6CD-45	Thermocouple in space defined by Columns C and D, Rows 4 and 5			28	
TFG-6DE-45 -67	Thermocouples in space defined by Columns D and E, Rows 4 and 5, and 6 and 7			29, 30	
TFG-6GH-45	Thermocouple in space defined by Column G and H, Rows 4 and 5			31	

TABLE V (contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
FLUID TEMPERATURE (contd.)					
Core Grid Spacers (contd.)					
Grid Spacer 8	109 in. below cold leg centerline at center of heated length	0-2300°F	0-2382°F		
TFG-8CD-45	Thermocouple in space defined by Columns C and D, Rows 4 and 5			32	
TFG-8DE-23 -67	Thermocouples in space defined by Columns D and E, Rows 2 and 3, and 6 and 7			33, 34	
TFG-8EF-45	Thermocouple in space defined by Columns E and F, Rows 4 and 5			35	
Grid Spacer 10	143 in. below cold leg centerline at bottom of heated length				
TFG-10CD-45	Thermocouple in space defined by Columns C and D, Rows 4 and 5			36	
TFG-10DE-67	Thermocouple in space defined by Columns D and E, Rows 6 and 7			37	
TFG-10EF-45	Thermocouple in space defined by Columns E and F, Rows 4 and 5			38	
TFG-10GH-45	Thermocouple in space defined by Columns G and H, Rows 4 and 5			39	
ECC System		0-2300°F	0-591°F		
TFU-ECC-14	On centerline of ECC line at junction with Spool 14			40	
TFB-ECC-42	In line leading to Spool 42			41	
Steam Generator		0-2300°F	0-591°F		
TFU-SGFW	In feedwater line leading to steam generator			42	
TFU-SGSD	In steam dome, 129.5 in. from bottom of tube sheet			43	
TFU-SG1	Secondary side, 12 in. above bottom of tube sheet			44	
TFU-SG2	Secondary side, 24 in. above bottom of tube sheet			45	
TFU-SG3	Secondary side, 48 in. above bottom of tube sheet			46	
TFU-SG4	Secondary side, 96 in. above bottom of tube sheet			47	
Pressurizer		0-2300°F	0-1017°F	48	
TFU-PRIZE	In surge line, near pressurizer exit, between turbine flowmeter and pressurizer				
Pressure Suppression System		0-2300°F	0-591°F		
TF-PSS-33	33 in. from bottom of tank			49	
TF-PSS-130	130 in. from bottom of tank			50	
MATERIAL TEMPERATURE	Chromel-Alumel thermocouples unless specified otherwise	0-2300°F	0-591°F		
Intact Loop					
TMU-7S16	Cold leg, Spool 7, side, 1/16 in. from pipe ID, 242 in. from vessel center (vertical pipe)			51	
TMU-8S16	Cold leg, Spool 8, side, in pump trap, 1/16 in. from pipe ID, 195 in. from vessel center			52	
Broken Loop		0-2300°F	0-1017°F		
TMB-20T16	Cold leg, Spool 20, top, 1/16 in. from pipe ID, 21 in. from vessel center		0-591°F	53	
TMB-30T4	Hot leg, Spool 30, top, 1/4 in. from pipe ID, 16 in. from vessel center			54	
TMB-30T16	Hot leg, Spool 30, top, 1/16 in. from pipe ID, 16 in. from vessel center			55	

TABLE V (contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
MATERIAL TEMPERATURE (contd.)					
Vessel Wall	1/8 in. from vessel ID	0-2300°F	0-591°F		
TMV-VI-15A	15 in. below cold leg centerline, 0°			56	
Vessel Filler	Type J iron-constantan thermocouples	0-1400°F	0-803°F		
TMV-FO-35A	35 in. below cold leg centerline, 0.65 in. from filler ID, 0°			57	
TMV-FI-35A	35 in. below cold leg centerline, 1/16 in. from filler ID, 180°			58	
Vessel Filler Insulator	Outer surface of insulator, Type J iron constantan thermocouples	0-1400°F	0-803°F	59	
TIV-FO-35A	35 in. below cold leg centerline, 0°				
Core Barrel	Type J iron-constantan thermocouples	0-1400°F	0-803°F		
TMV-CO-35A	35 in. below cold leg centerline, 1/16 in. from core barrel OD, 0°			60	
TMV-CI-35A	35 in. below cold leg centerline, 1/16 in. from core barrel ID, 0°			61	
Core Heater Cladding Temperatures		0-2300°F	0-2382°F		
High Power Heaters					
TH-D4-14 -29 -60	Heater at Column D Row 4. Thermocouples 14 in. (270°), 29 in. (315°), and 60 in. (105°) above bottom of core			62, 63, 64	
TH-D5-09 -29 -39	Heater at Column D Row 5. Thermocouples 9 in. (45°), 29 in. (225°), and 39 in. (135°) above bottom of core			65, 66, 67	
TH-E4-23 -27	Heater at Column E Row 4. Thermocouples 23 in. (90°) and 27 in. 0° above bottom of core			68, 69	
TH-E5-14 -21 -25	Heater at Column E Row 5. Thermocouples 14 in. (330°), 21 in. (180°), and 25 in. (90°) above bottom of core			70, 71, 72	
Low Power Heaters		0-2300°F	0-2382°F		
TH-A4-09 -29 -33 -39	Heater at Column A Row 4. Thermocouples 9 in. (105°), 29 in. (240°), 33 in. (135°), and 39 in. (300°) above bottom of core			73, 74, 75 76	Spikes in TH-A4-33 data probably due to intermittent thermocouple operation
TH-A5-29	Heater at Column A Row 5. Thermocouple 29 in. (180°) above bottom of core			77	
TH-B3-32	Heater at Column B Row 3. Thermocouple 32 in. (135°) above bottom of core			78	
TH-B5-29	Heater at Column B Row 5. Thermocouple 29 in. (150°) above bottom of core			79	
TH-B6-29	Heater at Column B Row 6. Thermocouple 29 in. (45°) above bottom of core			80	
TH-C2-28	Heater at Column C Row 2. Thermocouple 28 in. (135°) above bottom of core			81	
TH-C3-13 -28 -60	Heater at Column C Row 3. Thermocouples 13 in. (285°), 28 in. (0°), and 60 in. (150°) above bottom of core			82, 83, 84	
TH-C4-26	Heater at Column C Row 4. Thermocouple 26 in. (75°) above bottom of core			85	
TH-C5-28	Heater at Column C Row 5. Thermocouple 28 in. (315°) above bottom of core			86	
TH-C6-32	Heater at Column C Row 6. Thermocouple. 32 in. (225°) above bottom of core			87	
TH-C7-15	Heater at Column C Row 7. Thermocouple 15 in. (255°) above bottom of core			88	

TABLE V (contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A

		Range[a]			
Measurement	Location and Comments[a]	Detector	Data Acquisition System	Figure[a]	Measurement Comments[b]
MATERIAL TEMPERATURE (contd.)					
Low Power Heaters (contd.)					
TH-D2-14	Heater at Column D Row 2. Thermocouple 14 in. (0°) above bottom of core			89	
TH-D3-29	Heater at Column D Row 3. Thermocouple 29 in. (150°) above bottom of core			90	
TH-D6-15 -25	Heater at Column D Row 6. Thermocouples 15 in. (90°) and 25 in. (225°) above bottom of core			91, 92	
TH-D7-20	Heater at Column D Row 7. Thermocouple 20 in. (60°) above bottom of core			93	
TH-D8-25	Heater at Column D Row 8. Thermocouple 25 in. (0°) above bottom of core			94	
TH-E1-27 -33	Heater at Column E Row 1. Thermocouples 27 in. (195°) and 33 in. (60°) above bottom of core			95, 96	
TH-E2-21 -33	Heater at Column E Row 2. Thermocouples 21 in. (210°) and 33 in. (315°) above bottom of core			97, 98	
TH-E3-05 -20	Heater at Column E Row 3. Thermocouples 5 in. (15°) and 20 in. (165°) above bottom of core			99, 100	
TH-E6-08 -28 -31 -37	Heater at Column E Row 6. Thermocouples 8 in. (150°), 28 in. (285°), 31 in. (225°), and 37 in. (330°) above bottom of core			101, 102, 103, 104	
TH-E7-13 -29 -44	Heater at Column E Row 7. Thermocouples 13 in. (45°), 29 in. (120°), and 44 in. (195°) above bottom of core			105, 106, 107	
TH-E8-14 -29 -45	Heater at Column E Row 8. Thermocouples 14 in. (150°), 29 in. (225°), and 45 in. (300°) above bottom of core			108, 109, 110	
TH-F2-22 -25	Heater at Column F Row 2. Thermocouples 22 in. (105°) and 25 in. (0°) above bottom of core			111, 112	
TH-F3-22 -25	Heater at Column F Row 3. Thermocouples 22 in. (105°) and 25 in. (30°) above bottom of core			113, 114	
TH-F4-14 -28	Heater at Column F Row 4. Thermocouples 14 in. (90°) and 28 in. (165°) above bottom of core			115, 116	
TH-F5-20 -26 -33 -53	Heater at Column F Row 5. Thermocouples 20 in. (255°), 26 in. (165°), 33 in. (315°), and 53 in. (30°) above bottom of core			117, 118, 119, 120	
TH-F6-08 -28 -28	Heater at Column F Row 6. Thermocouples 8 in. (60°), 28 in. (135°), and 28 in. (210°) above bottom of core			121, 122, 123	
TH-F7-29 -33 -39	Heater at Column F Row 7. Thermocouple 29 in. (150°), 33 in. (45°), and 39 in. (210°) above bottom of core			124, 125, 126	
TH-G4-33	Heater at Column G Row 5. Thermocouple 33 in. (225°) above bottom of core			127	
TH-G5-14 -24	Heater at Column G Row 5. Thermocouples 14 in. (45°) and 24 in. (330°) above bottom of core			128, 129	
TH-G6-21 -33 -53	Heater at Column G Row 6. Thermocouples 21 in. (60°), 33 in. (135°), and 53 in. (195°) above bottom of core			130, 131, 132	
TH-H4-28	Heater at Column H Row 4. Thermocouple 28 in. (315°) above bottom of core			133	

TABLE V (contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A

Measurement	Location and Comments[a]	Range[a]		Figure[a]	Measurement Comments[b]
		Detector	Data Acquisition System		
PRESSURE					
Intact Loop		0-3000 psi			
PU-5(F)	Hot leg, Spool 5, 100 in. from vessel center (Flush mount)		0-4676 psia	134	
PU-7	Cold leg, Spool 7, 240 in. from vessel center		0-4955 psia	135	
PU-13(F)	Cold leg, Spool 13, 54 in. from vessel center (flush mount)		0-4384 psia	136	
Broken Loop		0-3000 psi			
PB-23	Cold leg, Spool 23, 92 in. from vessel center, upstream of vessel-side nozzle (tee off DP tap)		0-4837 psia	137	
PB-CN1	Vessel-side nozzle, nozzle throat, [illegible] in. from vessel center, (tee off DP tap)		0-4658 psia	138	
PB-42	Cold leg, Spool 42, 415 in. from vessel center along hot leg, upstream of pump-side nozzle (tee off DP tap)		0-4351 psia	139	
PB-HN1	Pump-side nozzle, nozzle throat, 419 in. from vessel center along hot leg (tee off DP tap)		0-4624 psia	140	
Vessel		0-3000 psi			
PV-UP+10	In upper plenum, 10 in. above cold leg centerline, mounted on standoff, 30°		0-3397 psia	141	
PV-LP-180	In upper part of lower plenum, 180 in. below cold leg centerline, mounted on standoff, 225°		0-2563 psia	142	
ECC System		0-750 psi			
PECC-UL-ACC	In intact loop accumulator		0-720 psia	143	
PECC-BL-ACC	In broken loop accumulator		0-746 psia	144	
Steam Generator		0-3000 psi			
PU-SGSD	Secondary side, steam dome		0-2080 psia	145	
PU-SGIP	Inlet plenum, 13 in. below bottom of tube sheet (flush mount)		0-4603 psia	146	
Pressurizer		0-3000 psi	0-4810 psia	147	
PU-PRIZE	Steam dome				
Pressure Suppression System		0-10			
P-PSS-HD	In suppression tank header	0-200 psi	0-380 psia	148	Measurement affected by high velocity fluid
P-83	In suppression tank header outlet 6 in. from entrance to suppression tank	0-750 psi	0-772 psia	149	
P-PSS	Suppression tank top	0-750 psi	0-321.1 psia	150	
DIFFERENTIAL PRESSURE	Elevation difference between transducer taps is zero unless otherwise specified				
Intact Loop					
DPU-UP-1	Upper plenum 10.5 in. above cold leg centerline at 30° to hot leg, Spool 1, 31 in. from vessel center, upper plenum tap approximately 2 in. above Spool 1 tap	±100 in. water	±5.0 psid	151	
DPU-1-3	Hot leg Spool 1, 31 in. from vessel center to hot leg Spool 3, 62 in. from vessel center	±20 in. water	±1.0 psid	152	
DPU-3-6	Hot leg Spool 3, 62 in. from vessel center to hot leg Spool 6, 114 in. from vessel center	±20 in. water	±1.0 psid	153	Transducer saturated from t=0 to t=3 sec
DPU-6-7	Hot leg Spool 6, 114 in. from vessel center, across steam generator, to cold leg Spool 7, 231 in. from vessel center. Spool 6 tap is 17 in. above Spool 7 tap	±500 in. water	±25 psid	154	

TABLE V (contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
DIFFERENTIAL PRESSURE (contd.)					
Intact Loop (contd.)					
DPU-SGOP-7	From steam generator outlet plenum, 269 in. from vessel center along cold leg to cold leg Spool 7, 231 in. from vessel center, including orifice, Spool 7 tap is 35 in. below SGOP tap	±500 in. water	±25 psid	155	
DPU-7-10	Steam generator outlet to pump inlet, cold leg Spool 7, 231 in. from vessel center to cold leg Spool 10, 141 in. from vessel center	±500 in. water	±2.5 psid	156	
DPU-12-10	Pump outlet to pump inlet, cold leg Spool 12, 75 in. from vessel center to cold leg Spool 10, 141 in. from vessel center, Spool 10 tap is 10 in. below Spool 12 tap	±100 psid	±100 psid	157	
DPU-12-10L	Pump outlet to pump inlet, cold leg Spool 12, 75 in. from vessel center to cold leg Spool 10, 141 in. from vessel center, Spool 10 tap is 10 in. below Spool 12 tap (low range)	±100 in. water	±5.0 psid	158	Transducer saturated to t=7 sec
DPU-12-15	Across cold leg injection point, cold leg Spool 12, 75 in. from vessel center to cold leg Spool 15, 16 in. from vessel center	±100 in. water	±10 psid	159	
DPU-15-1	Cold leg to hot leg, cold leg Spool 15, 16 in. from vessel center to hot leg Spool 1, 31 in. from vessel center, Spool 15 tap is 8.5 in. below Spool 1 tap	±500 in. water	±25 psid	160	
DPU-15-IANN	Cold leg Spool 15, 16 in. from vessel center to inlet annulus 9 in. below cold leg centerline at 225°, Spool 15 tap is 9 in. above inlet annulus tap	±100 in. water	±5.0 psid	161	
DPU-15-ATM	Cold leg Spool 15, 16 in. from vessel center to atmosphere	±500 psid	±500 psid	162	Transducer saturated to t=18 sec
DPU-PRESLL	Pressurizer water level, elevation difference between taps is 34 in., lower tap is approximately 3.5 in. above pressurizer exit	±50 in. water	±2.5 psid	163	
Broken Loop					
DPB-CN1-CN4	Vessel-side nozzle, nozzle throat, 96 in. from vessel center to nozzle divergent section, 101 in. from vessel center	±1000 psid	±1000 psid	164	
DPB-30-36L	Across entire simulated steam generator assembly, hot leg Spool 30, 18 in. from vessel center to cold leg Spool 36 lower tap, 242 in. from vessel center. Spool 30 tap is 19 in. below Spool 36 lower tap	±500 psid	±500 psid	165	
DPB-32U-36L	Across simulated steam generator orifice assembly, hot leg Spool 32 upper tap, 73 in. from vessel center to Spool 36 lower tap, 242 in. from vessel center, Spool 32 upper tap is 16 in. above Spool 36 lower tap	±500 psid	±500 psid	166	
DPB-38-40	Across simulated pump, cold leg Spool 38, 305 in. from vessel center along hot leg to cold leg Spool 40, 365 in. from vessel center along hot leg	±1000 psid	±1000 psid	167	
Vessel					
DPV-IANN-UP	Inlet annulus, 9 in. below cold leg centerline at 225° to upper plenum, 10.5 in. above cold leg centerline at 30°, elevation difference between taps is 19 in.	±500 in. water	±25 psid	168	
DPV-9-180QQ	Inlet annulus, 9 in. below cold leg centerline at 225° to lower plenum, 180 in. below cold leg centerline at 225°, elevation difference between taps is 171 in.	±300 in. water	±15 psid	169	
DPV-26-55QM	Across part of downcomer, 26 in. (225°) to 55 in. (180°) below centerline of cold leg, elevation difference between taps is 29 in.	±50 in. water	±2.5 psid	170	

TABLE V (contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
DIFFERENTIAL PRESSURE (contd.)					
Vessel (contd.)					
DPV-156-173QQ	Across downcomer exit, 7 in. above exit to 10 in. below exit, taps at 156 in. (225°) and 173 in. (225°) below cold leg centerline, elevation difference between taps is 17 in.	±20 in. water	±1.0 psid	171	
DPV-166-191QT	Across lower plenum, 166 in. (225°) to 191 in. (270°) below cold leg centerline, elevation difference between taps is 25 in.	±50 in. water	±2.5 psid	172	
DPV-LP-UP	Lower plenum, 180 in. below cold leg centerline at 225° to upper plenum 10.5 in. above cold leg centerline at 30°, elevation difference between taps is 191 in.	±300 in. water	±15 psid	173	
DPU-UP-1	Upper plenum, 10.5 in. above cold leg centerline at 30° to intact loop hot leg Spool 1, 31 in. from vessel center, upper plenum tap is approximately 2 in. above Spool 1 tap	±100 in. water	±5.0 psid	151	
DPU-15-IANN	Cold leg Spool 15, 16 in. from vessel center to inlet annulus 9 in. below cold leg centerline at 225°, Spool 15 tap is 9 in. above inlet annulus tap	±100 in. water	±5.0 psid	161	
Vessel Core					
DPVC-83W-UP	Upper segment of active core region 83 in. below cold leg centerline (315°) to upper plenum core tube 10.5 in. above cold leg centerline (30°). Elevation difference between taps is 100 in.	±300 in. water	±15 psid	174	
Steam Generator					
DPS-SGFEED	In steam generator feed line	±100 in. water	±5.0 psid	175	Transducer saturated to t=2 sec
DPS-SGDISC	In steam generator discharge line	±100 in. water	±5.0 psid	176	Transducer saturated to t=1 sec
DPU-SGOP-7	Outlet plenum to intact loop hot leg Spool 7, including orifice, [illegible] tap is 7 in. above Spool 7 tap	±500 in. water	±25 psid	155	
DPU-SG-SEC	Secondary side. differential pressure taps at 45 and 126 in. above bottom of tube sheet, elevation difference between taps is 81 in.	±100 in. water	±5.0 psid	177	
Pressurizer					
DPU-PRESLL	Pressurizer water level, elevation difference between taps is 34 in., lower tap is 3.5 in. above pressurizer exit	±50 in. water	±2.5 psid	163	
VOLUMETRIC FLOW RATE	Turbine flowmeter, bidirectional				
Intact Loop	3-in. Schedule 160 pipe				
FTU-1	Hot leg, Spool 1, 18 in. from vessel center	±20-±400 gpm	±800 gpm	178	Transducer saturated at t=52 sec on Test S-02-9A
FTU-9	Cold leg, Spool 9, 154 in. from vessel center	±20-±400 gpm	±800 gpm	179	Transducer saturated intermittently from t=47 to t=51 sec on Test S-02-9A
FTU-13	Cold leg, Spool 13, 64 in. from vessel center	±20-±400 gpm	±800 gpm	180	Transducer saturated intermittently from t=42 to t=50 sec on Test S-02-9A
FTU-15	Cold leg, Spool 15, 29 in. from vessel center	±10-±200 gpm	±300 gpm	181	Transducer saturated intermittently from t=52 to t=54 sec on Test S-02-9A
Broken Loop	All measurements bidirectional, Schedule 160 pipe				
FTB-21	Cold leg, Spool 21, 58 in. from vessel center, 3-in. pipe	±20-±400 gpm	±1500 gpm	182	
FTB-30	Hot leg, Spool 30, 25 in. from vessel center, 3-in. pipe	±20-±400 gpm	±700 gpm	183	
Core					
FTV-CORE-IN	Entrance to core, approximately 158 in. below cold leg centerline	±20-±400 gpm	±400 gpm	184	Transducer saturated at t=37 sec on Test S-02-9A

TABLE V (contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
VOLUMETRIC FLOW RATE (contd.)					
ECC System					
FTU-LPIS	In line leading from LPIS for intact loop, 1/2-in. line	±0.5–±5 gpm	±5 gpm	185	Indicated reading at t<26 sec due to AC interference
FTB-LPIS	In line leading from LPIS for broken loop, 3/4-in. line	±0.5–±5 gpm	±2 gpm	186	Indicated reading at t<26 sec due to AC interference
FTU-ACC	In line immediately after intact loop accumulator, 1-in. line	±5–±60 gpm	±75 gpm	187	Spikes at t=3 sec due to valve operation
FTB-ACC	In line immediately after broken loop accumulator, 1-in. line	±5–±60 gpm	±35 gpm	188	
Pressurizer	1-1/2-in. turbine	±5–±100 gpm	±75 gpm	189	
FTU-PRIZE	Surge line				
FLUID VELOCITY	Turbine flowmeter, bidirectional				
Downcomer Gap					
FTV-40A	40 in. below cold leg centerline, 0°	±2.5–±50 ft/sec	±70 ft/sec	190	
FTV-40M	40 in. below cold leg centerline, 180°	±2.5–±50 ft/sec	±50 ft/sec	191	
FTV-83M	83 in. below cold leg centerline, 180°	±2.5–±50 ft/sec	±40 ft/sec	192	Measurement recorded for Test S-02-9 only. Output is unidirectional due to failure of one pickup probe
MOMENTUM FLUX	Drag-disc bidirectional. Computer conversion of voltage output to momentum flux is unidirectional and therefore shows magnitude only				
Intact Loop	3-in. pipe				
FDU-1	Hot leg, Spool 1, 29 in. from vessel center, target size 1.0 in.	±1–±2000 lbm/ft-sec^2	±4256 lbm/ft-sec^2	193	
FDU-5	Hot leg, Spool 5, 100 in. from vessel center, target size 1.0 in.	±1–±2000 lbm/ft-sec^2	±3250 lbm/ft-sec^2	194	
FDU-10	Cold leg, Spool 10, 137 in. from vessel center, target size 0.875 in.	±200–±104,000 lbm/ft-sec^2	±21,000 lbm/ft-sec^2	195	
FDU-13	Cold leg, Spool 13, 54 in. from vessel center, target size 0.875 in.	±200–±14,800 lbm/ft-sec^2	±18,750 lbm/ft-sec^2	196	
FDU-15	Cold leg, Spool 15, 19 in. from vessel center, target size 0.875 in.	±200–±14,500 lbm/ft-sec^2	±18,770 lbm/ft-sec^2	197	
Broken Loop					
FDB-21	Cold leg, Spool 21, 53 in. from vessel center, 3-in. pipe, target size 0.406 in.	±200–±70,500 lbm/ft-sec^2	±87,940 lbm/ft-sec^2	198	
FDB-23	Cold leg, Spool 23, 93 in. from vessel center, upstream of vessel-side nozzle, downstream of injection point, 2-in. pipe, target size 0.406 in.	±200–±125,000 lbm/ft-sec^2	±125,320 lbm/ft-sec^2	199	
FDB-30	Hot leg, Spool 30, 21 in. from vessel center, 3-in. pipe, target size 0.656 in.	±200–±60,000 lbm/ft-sec^2	±44,250 lbm/ft-sec^2	200	
FDB-42	Cold leg, Spool 42, 416 in. from vessel center along hot leg, upstream of pump-side nozzle, downstream of injection point, 2-in. pipe, target size 0.406 in.	±200–±116,000 lbm/ft-sec^2	±131,340 lbm/ft-sec^2	201	
Vessel					
FDV-CORE-IN	In core flow mixer box, 150 in. below cold leg centerline, target size 1.0 in.	±200–±5000 lbm/ft-sec^2	±1500 lbm/ft-sec^2	202	
DENSITY					
Intact Loop		0.1-100 lbm/ft^3	0-100 lbm/ft^3		
GU-1VR	Hot leg, Spool 1, 24 in. from vessel center, vertical			203	
GU-1HZ	Hot leg, Spool 1, 26 in. from vessel center, horizontal			204	
GU-5VR	Hot leg, Spool 5, 96 in. from vessel center, vertical			205	

TABLE V (contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
DENSITY (contd.)					
Intact Loop (contd.)					
GU-10VR	Cold leg, Spool 10, 141 in. from vessel center, vertical			206	
GU-13VR	Cold leg, Spool 13, 59 in. from vessel center, vertical			207	
GU-15HZ	Cold leg, Spool 15, 20 in. from vessel center, horizontal			208	
GU-15VR	Cold leg, Spool 15, 23 in. from vessel center, vertical			209	
Broken Loop		0.1-100 lbm/ft^3	0-100 lbm/ft^3		
GB-21VR	Cold leg, Spool 21, 49 in. from vessel center, vertical			210	
GB-23VR	Cold leg, Spool 23, 92 in. from vessel center, vertical			211	
GB-30VR	Hot leg, Spool 30, 18 in. from vessel center, vertical			212	
GB-42VR	Cold leg, Spool 42, 415 in. from vessel center along hot leg, vertical			213	Apparent non linearily in data for Test S029 at density above 55 lbm/ft^3.
Vessel		0.1-100 lbm/ft^3	0-100 lbm/ft^3		
GV-COR-150HZ	Core flow mixer box, 152 in. below cold leg centerline, horizontal, 0-180°			214	
GV-161/192D	Lower plenum 161 in. below cold leg centerline (270°) to 192 in. below cold leg centerline (90°), 31 in. vertical 32.2 in. diagonal			215	
GVLP-165HZ	Upper part of lower plenum, 165 in. below cold leg centerline, 1.724 in. below downcomer exit, horizontal, 0-180°			216	
GVLP-172HZ	Lower plenum, 172 in. below cold leg centerline, 8.729 in. below downcomer exit, horizontal, 90-270°			217	
Pressurizer		0.1-100 lbm/ft^3	0-100 lbm/ft^3	218	
GU-PRIZE	Surge line				
LIQUID LEVEL					
Steam Generator		±100 in. water	±15.0 psid	177	
DPU-SG-SEC	Secondary side. differential pressure taps at 45 and 126 in. above tube sheet, elevation difference between taps is 81 in.				
Pressurizer		±50 in. water	±2.5 psid	163	
DPU-PRESLL	Pressurizer water level, elevation difference between taps is 34 in., lower tap is approximately 3.5 in. above pressurizer exit				
MASS FLOW RATE	Mass flow rate obtained by combining density (gamma attenuation technique) with volumetric flow rate (turbine flowmeter) or momentum flux (drag disc)	Range for mass flow is determined from range of individual detectors used in calculation			
Intact Loop					
FDU-1 GU-1VR FTU-1 GU-1VR	Hot leg, Spool 1			219 220	
FDU-5 GU-5VR	Hot leg, Spool 5			221	
FTU-9 GU-10VR	Cold leg, Spool 9			222	
FDU-10 GU-10VR	Cold leg, Spool 10			223	
FDU-13 GU-13VR FTU-13 GU-13VR	Cold leg, Spool 13			224 225	
FDU-15 GU-15VR FTU-15 GU-15VR	Cold leg, Spool 15			226 227	
FTU-PRIZE GU-PRIZE	Pressurizer surge line			228	

TABLE V (contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TESTS S-02-9 AND S-02-9A

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
MASS FLOW RATE (contd.)					
Broken Loop					
FDB-21 GB-21VR FTB-21 GB-21VR	Cold leg, Spool 21			229 230	Discrepancies in mass flow measurements from FDB-21 and FTB-21 may be due to changes in the calibration factors due to the combined effects of two phase flow and complex geometries not accounted for in present calibration techniques
FDB-23 GB-23VR	Cold leg, Spool 23			231	
FDB-30 GB-30VR FTB-30 GB-30VR	Hot leg, Spool 30			232 233	
FDB-42 GB-42VR	Cold leg, Spool 42			234	
Vessel					
FTV-CORE-IN GV-COR-150HZ	Entrance to core			235	
FDV-CORE-IN GV-COR-150HZ	Entrance to core			236	
CORE CHARACTERISTICS					
PWRCOR T-1	Core power		1600 kW	237	
PWRCOR T-2	Core power		1600 kW	238	
VOLTCORE-T	Core voltage		200 V	239	Measurement recorded for Test S-02-9A only
PUMP CHARACTERISTICS					
PUMPU-TORQ	Pump torque	0-500 in.-lb	0-500 in.-lb	240	
PUMPU-RPM	Pump speed	0-3600 rpm	0-3600 rpm	241	

[a] Statements at the beginning of a measurement category regarding location and comments, range, and figure apply to all subsequent measurements within the given category unless specified otherwise.

[b] Detectors which were subjected to overrange conditions during portions of the test were capable of withstanding these conditions without change in operating or measuring characteristics when the physical conditions were again within the detector range.

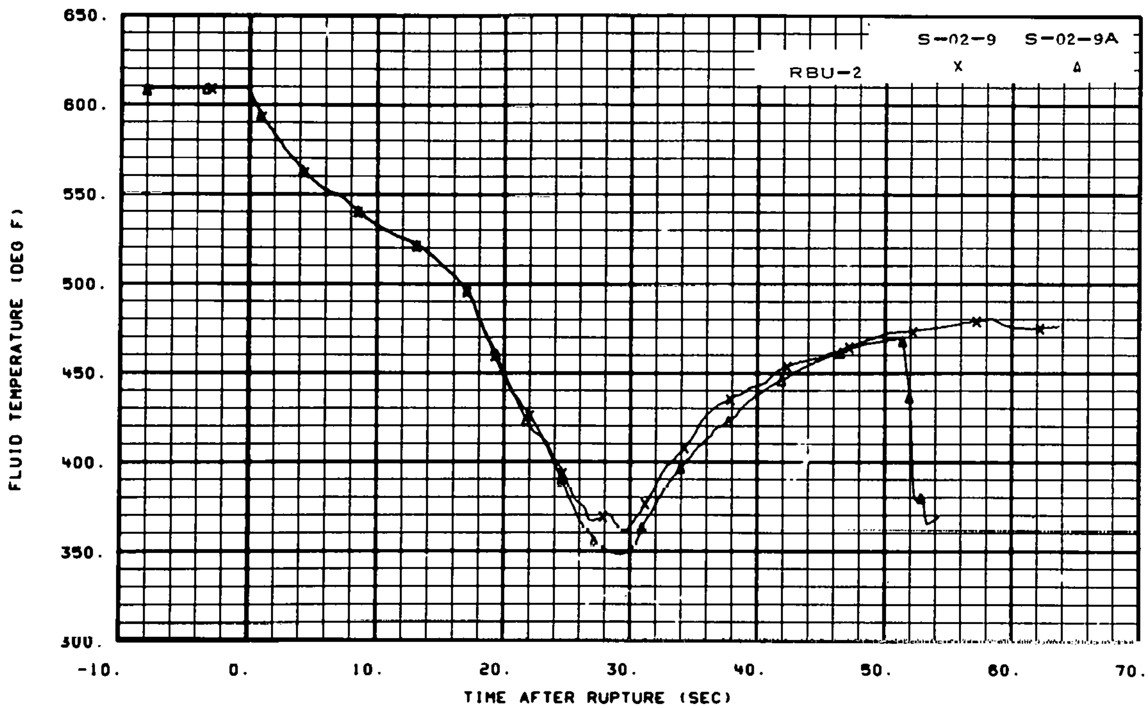

Fig. 7 Fluid temperature in intact loop, Spool 2.

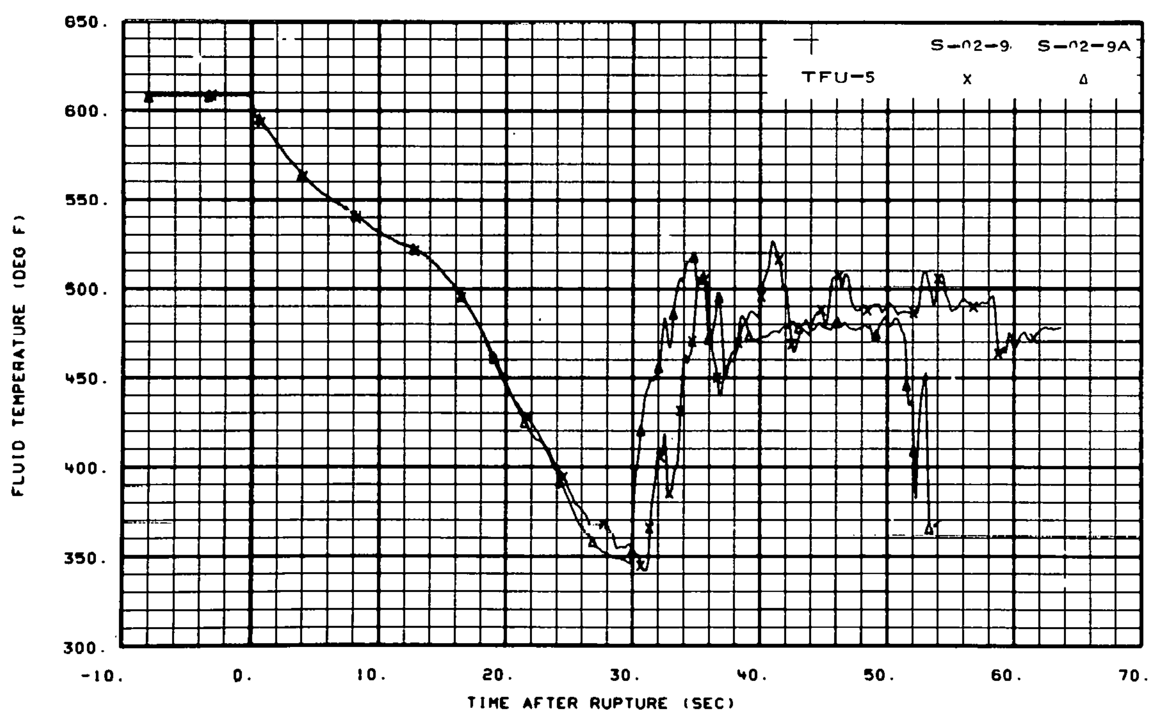

Fig. 8 Fluid temperature in intact loop, Spool 5.

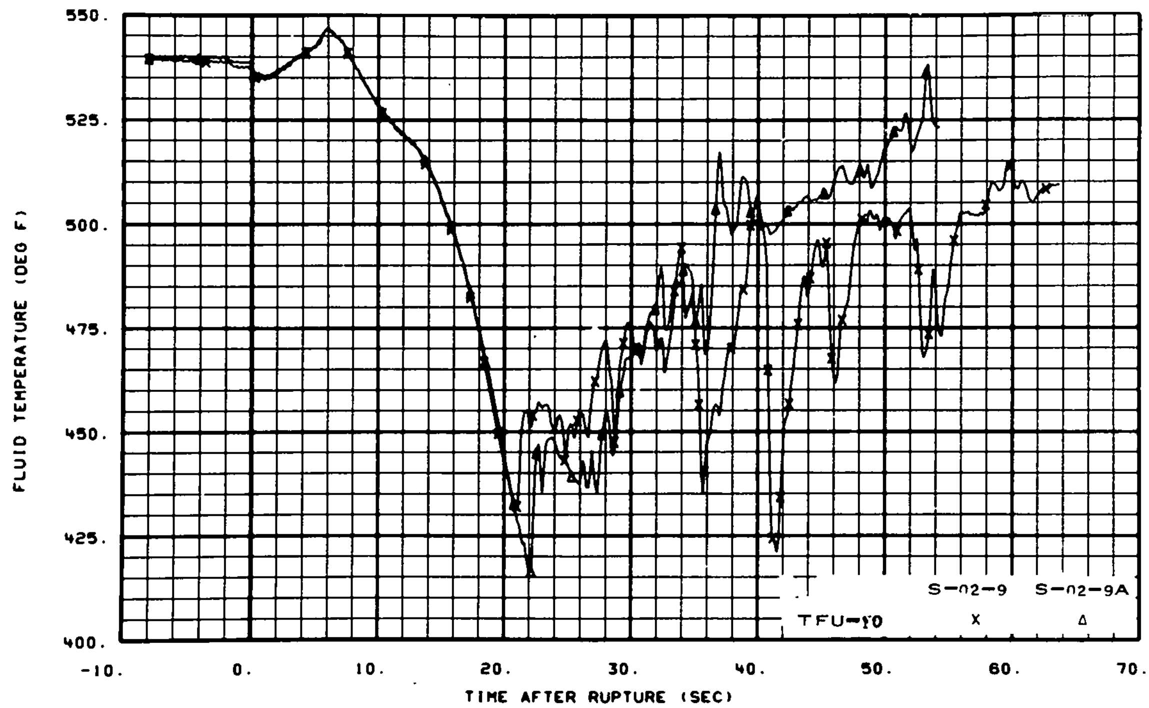

Fig. 9 Fluid temperature in intact loop, Spool 10.

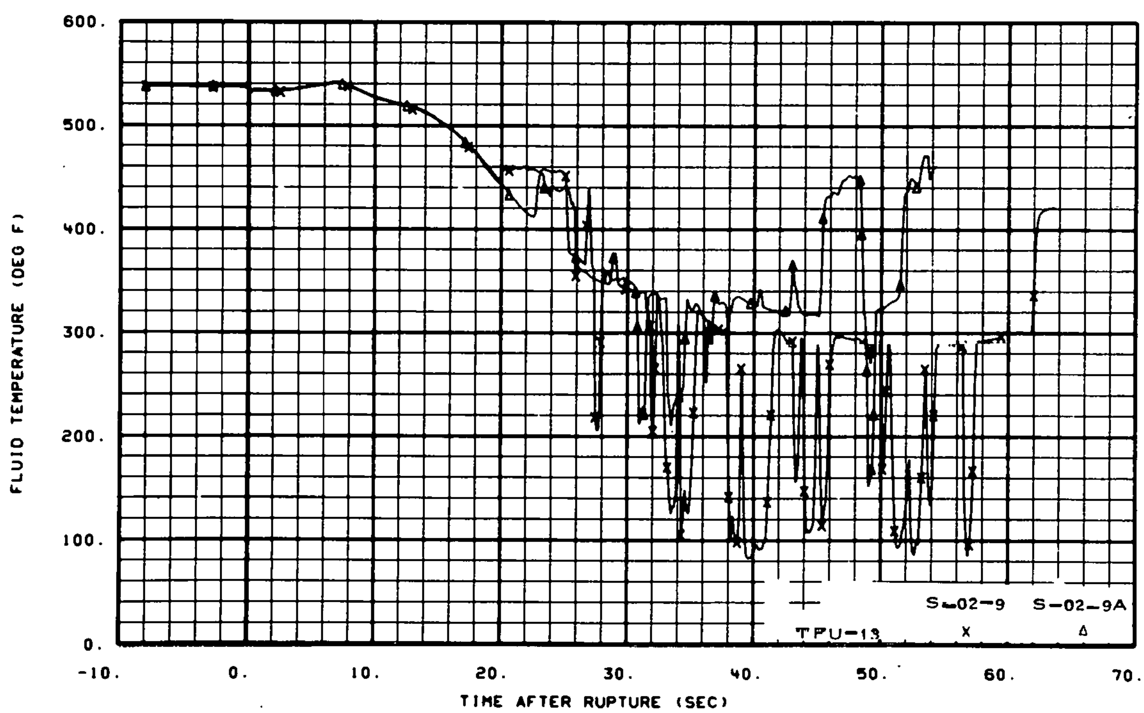

Fig. 10 Fluid temperature in intact loop, Spool 13.

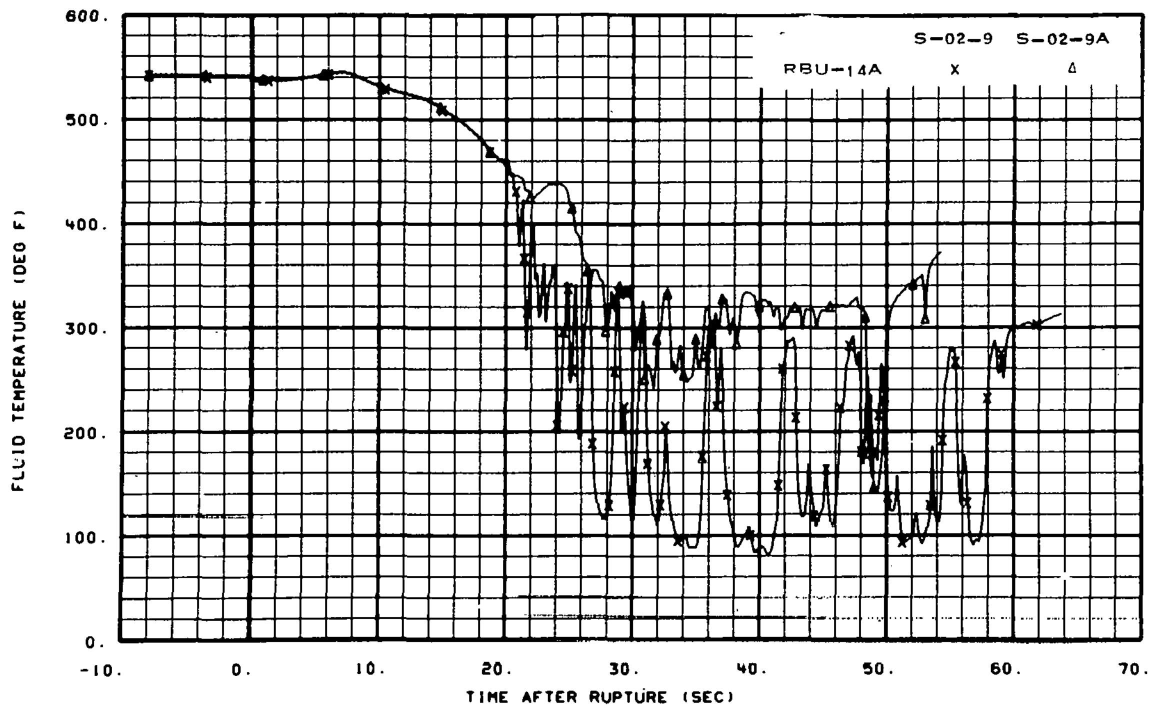

Fig. 11 Fluid temperature in intact loop, Spool 14 (RBU-14A).

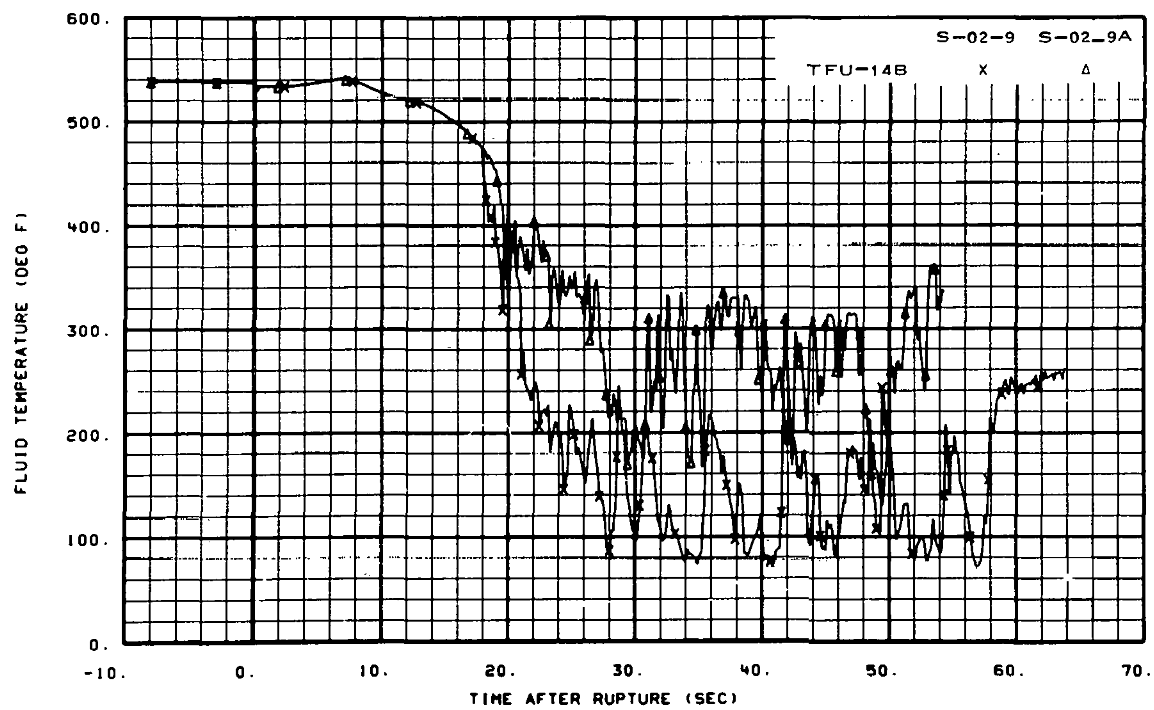

Fig. 12 Fluid temperature in intact loop, Spool 14 (TFU-14B).

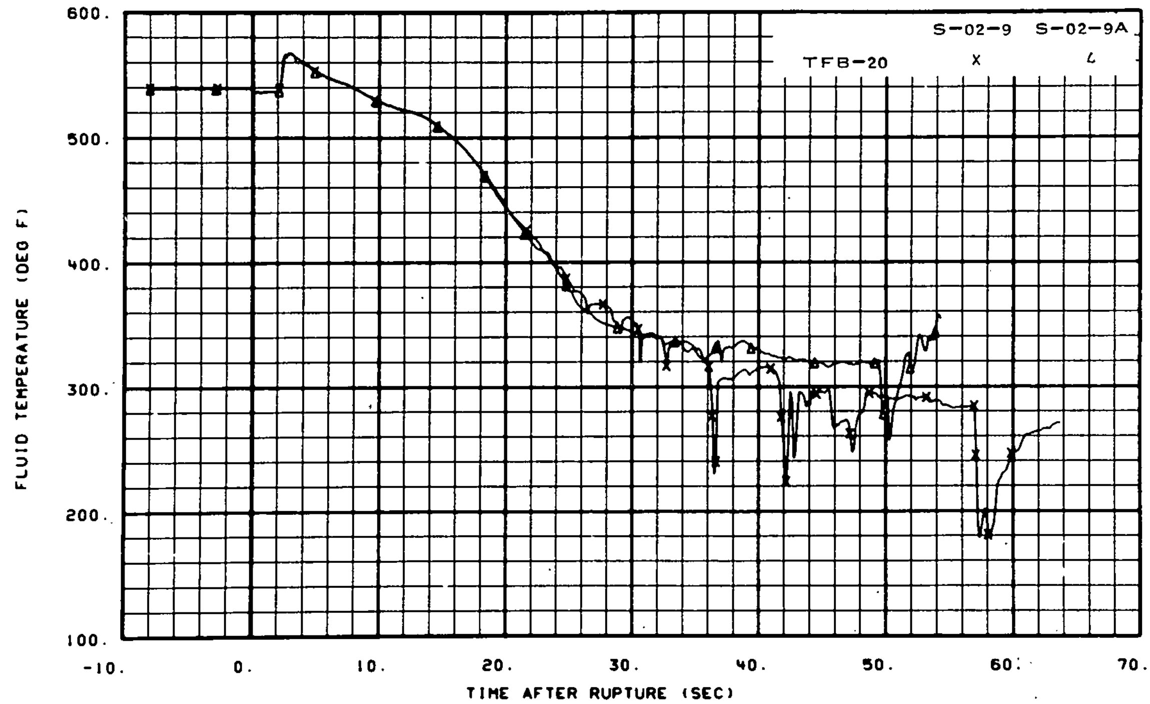

Fig. 13 Fluid temperature in broken loop, Spool 20.

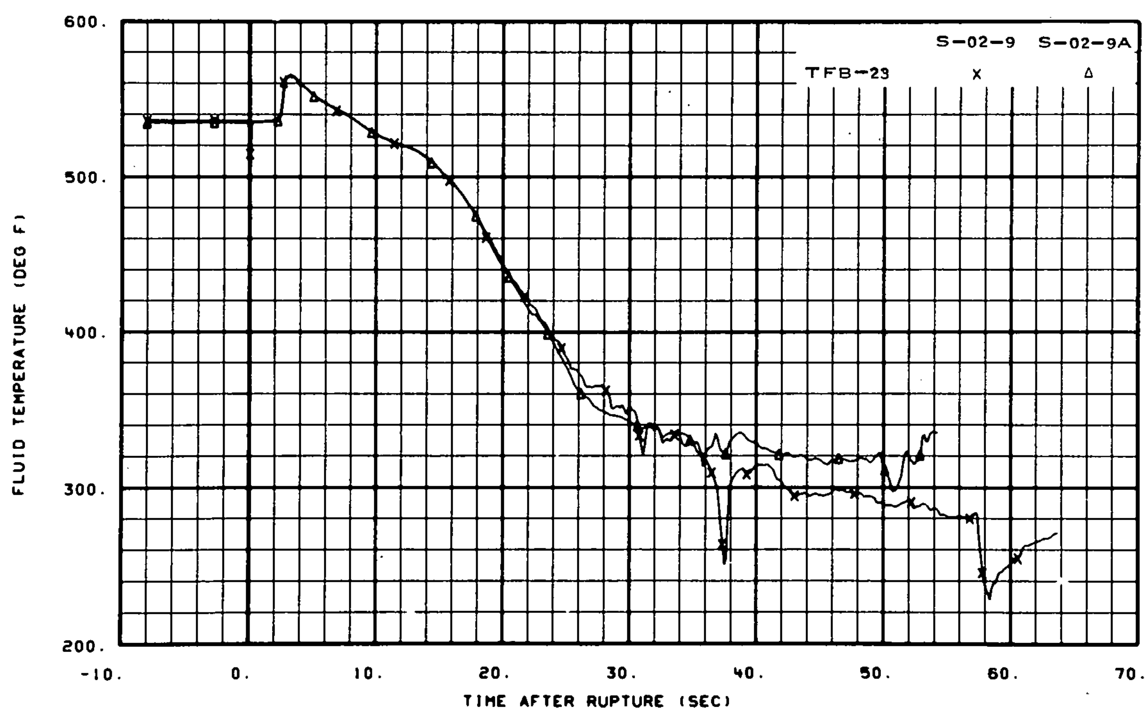

Fig. 14 Fluid temperature in broken loop, Spool 23.

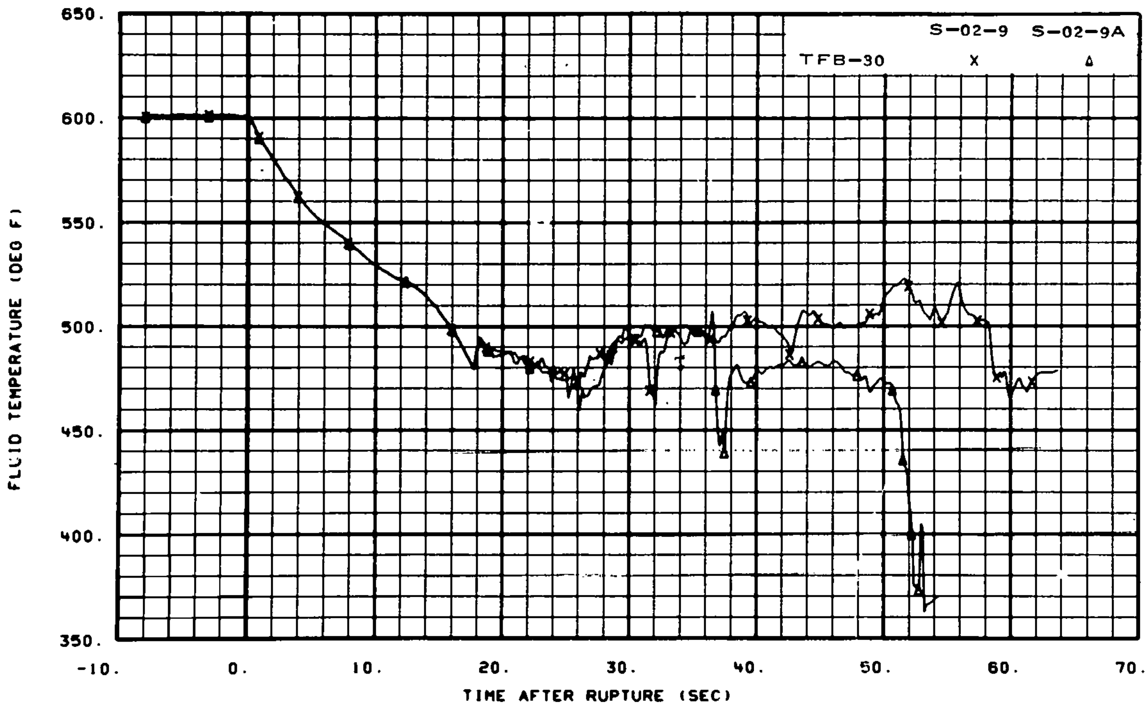

Fig. 15 Fluid temperature in broken loop, Spool 30.

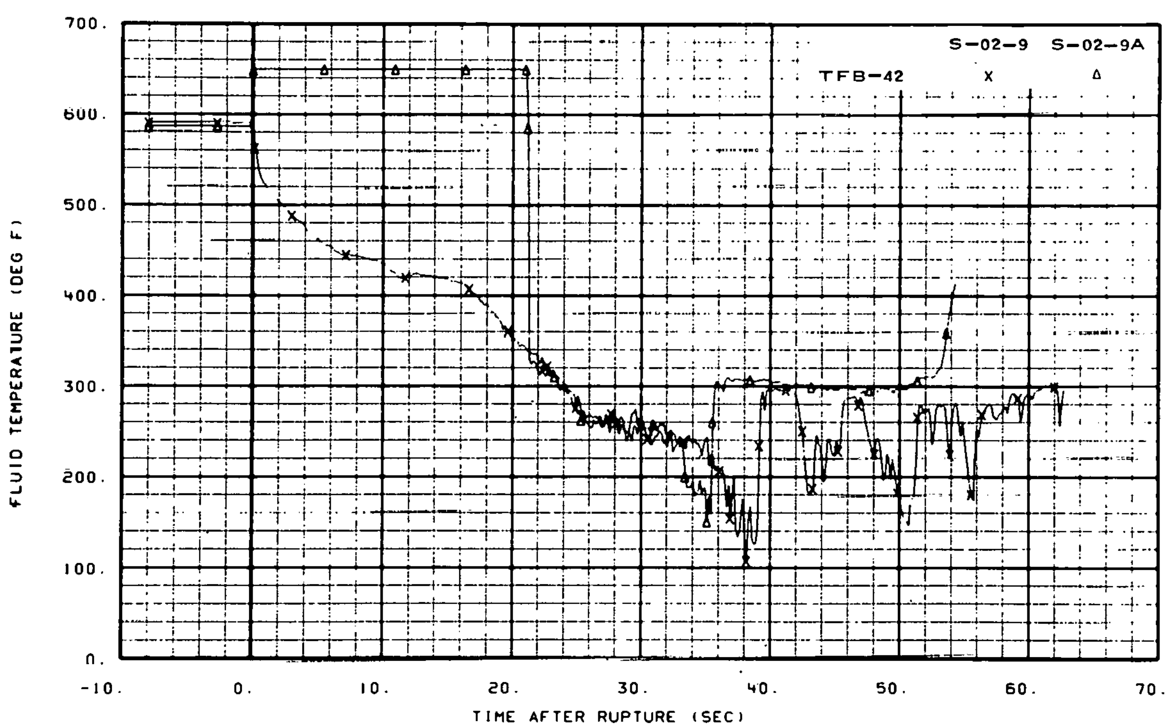

Fig. 16 Fluid temperature in broken loop, Spool 42.

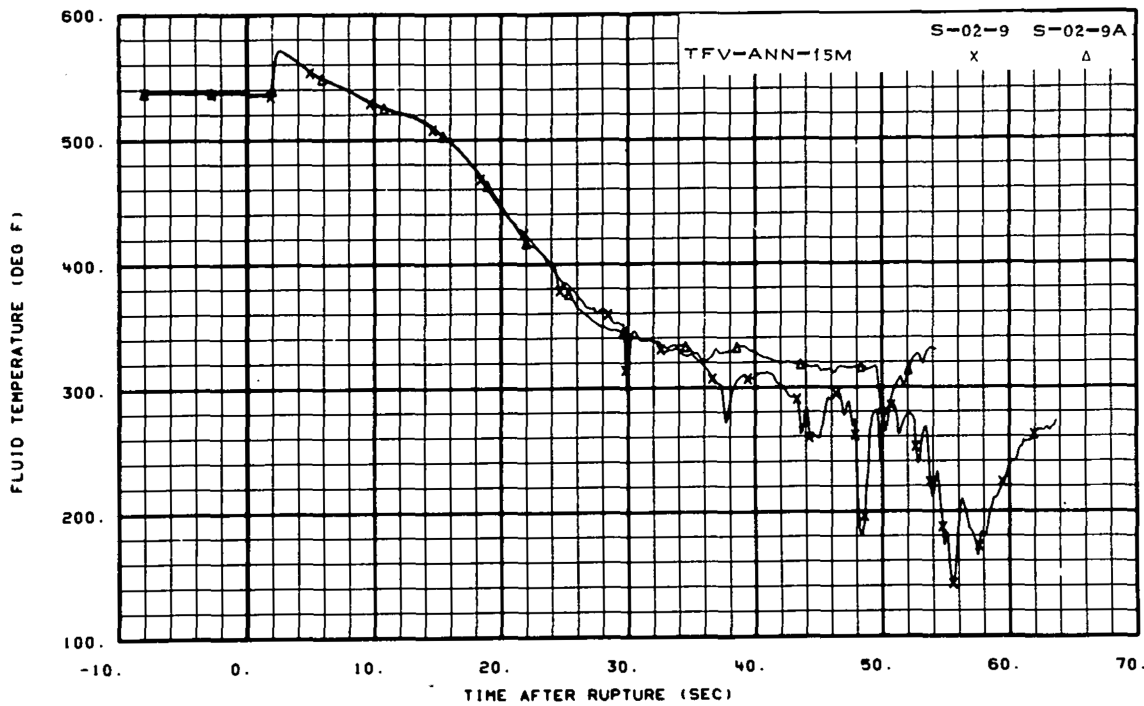

Fig. 17 Fluid temperature in downcomer annulus (TFV-ANN-15M).

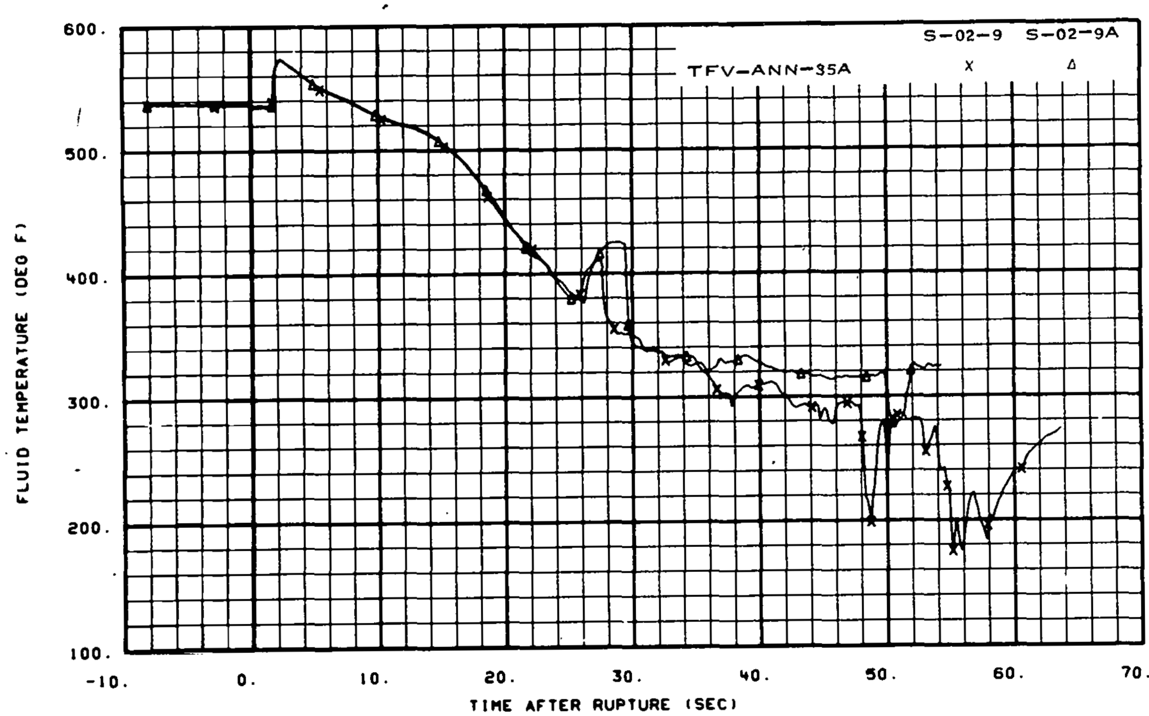

Fig. 18 Fluid temperature in downcomer annulus (TFV-ANN-35A).

Fig. 19 Fluid temperature in downcomer annulus (TFV-ANN-35T).

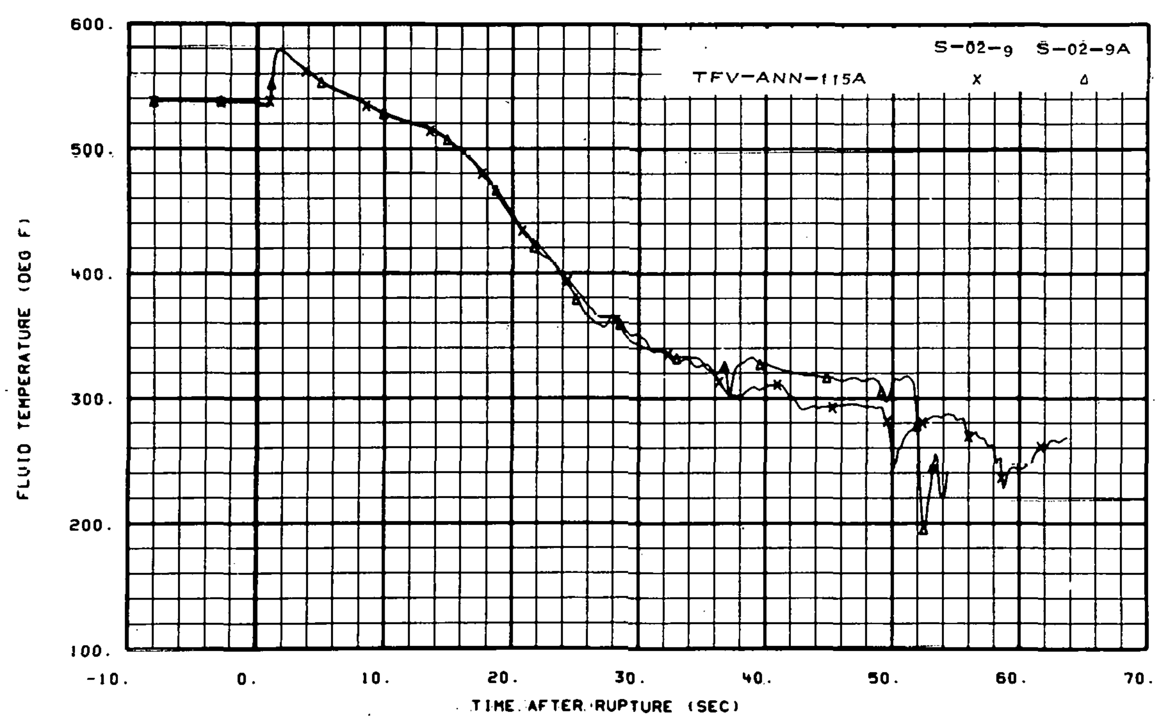

Fig. 20 Fluid temperature in downcomer annulus (TFV-ANN-115A).

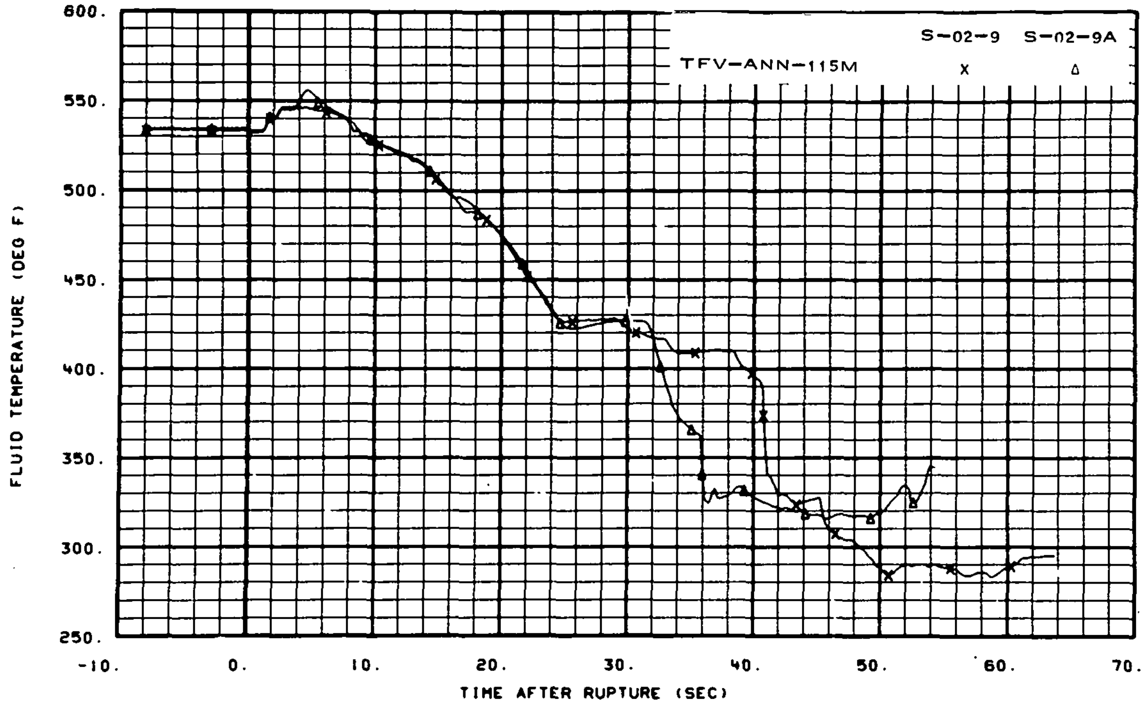

Fig. 21 Fluid temperature in downcomer annulus (TFV-ANN-115M).

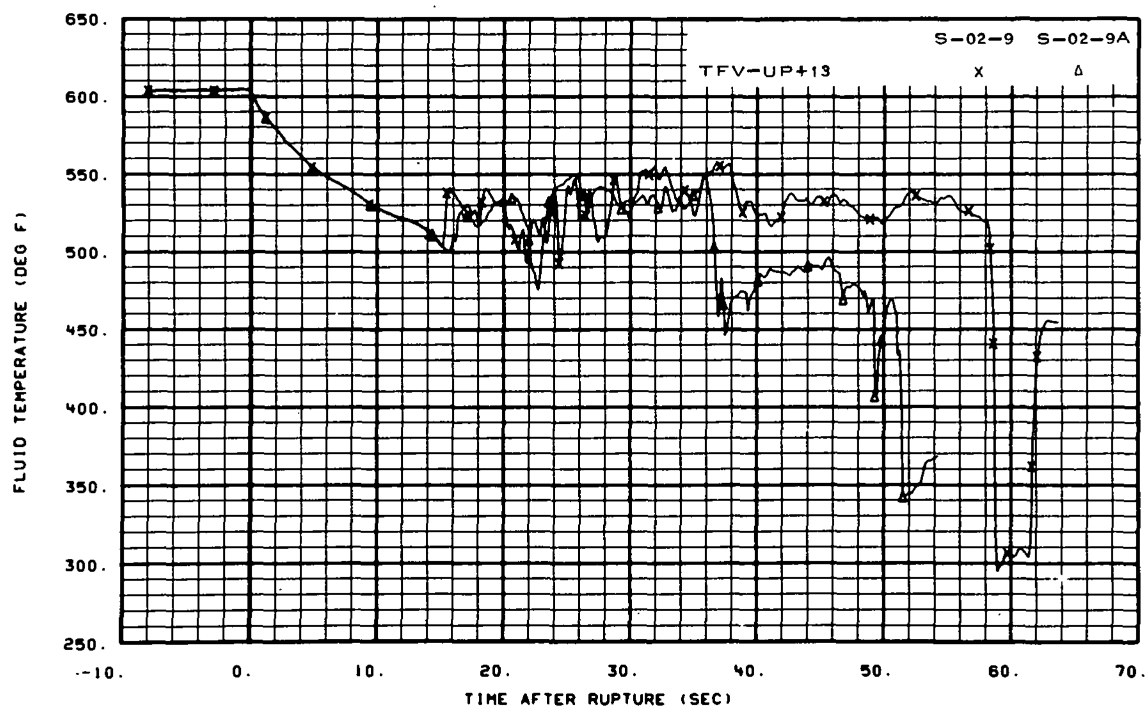

Fig. 22 Fluid temperature in upper plenum.

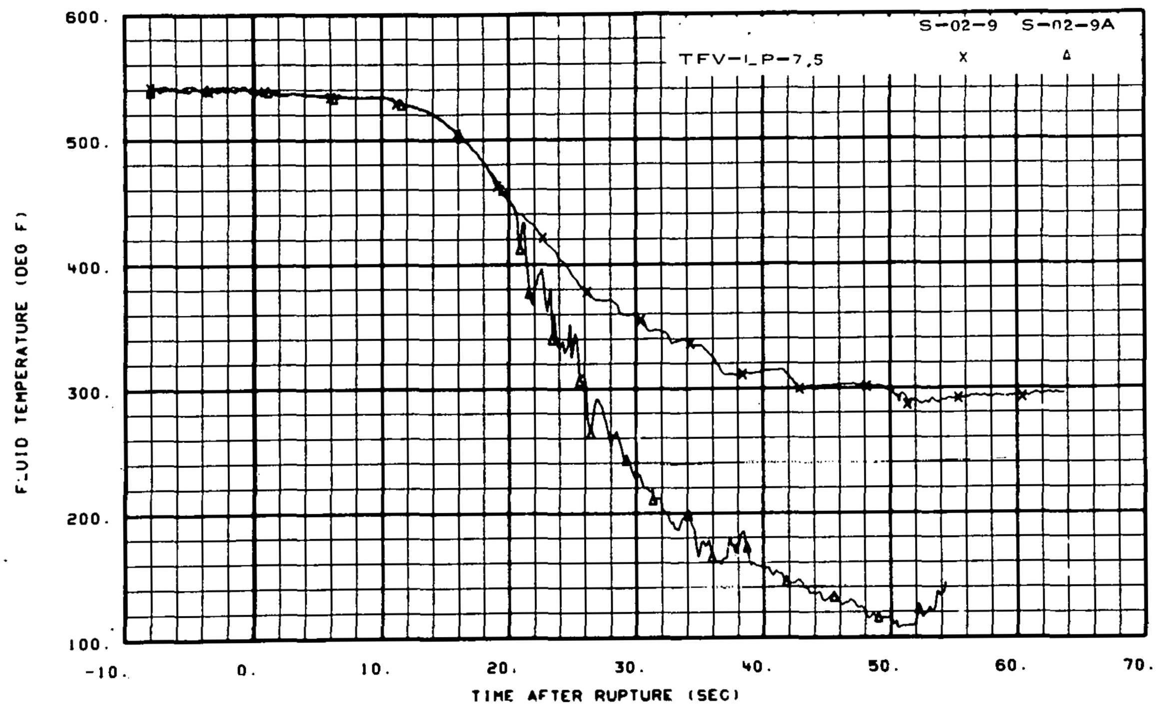

Fig. 23 Fluid temperature in lower plenum (TFV-LP-7.5).

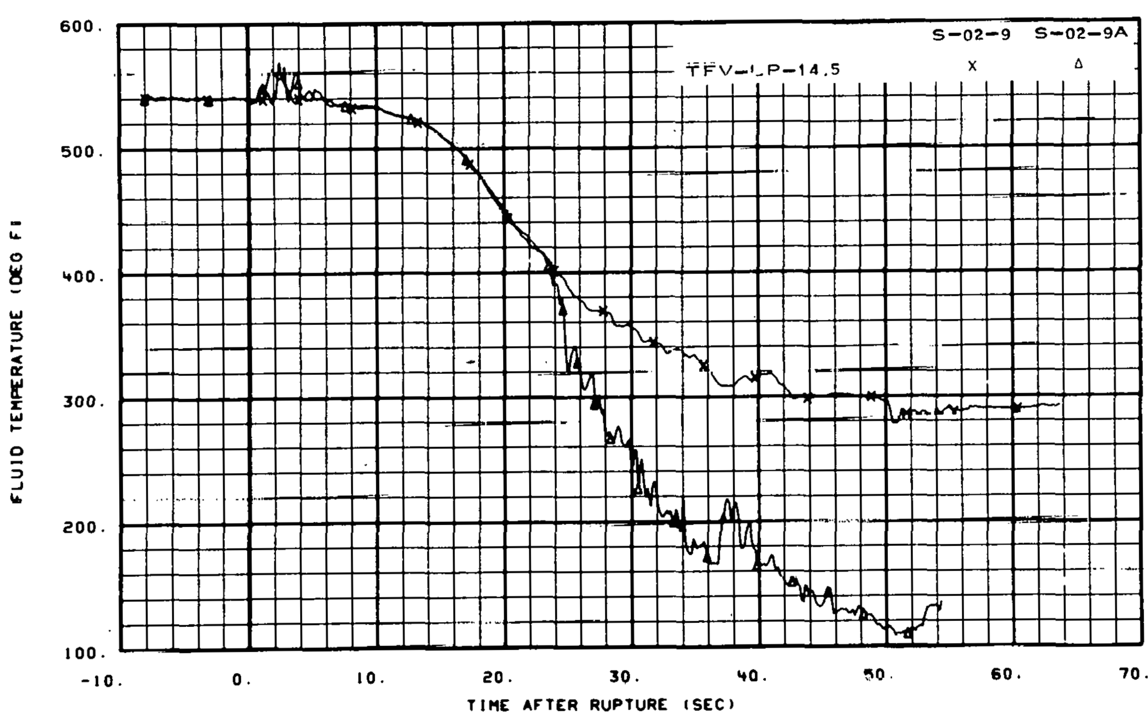

Fig. 24 Fluid temperature in lower plenum (TFV-LP-14.5).

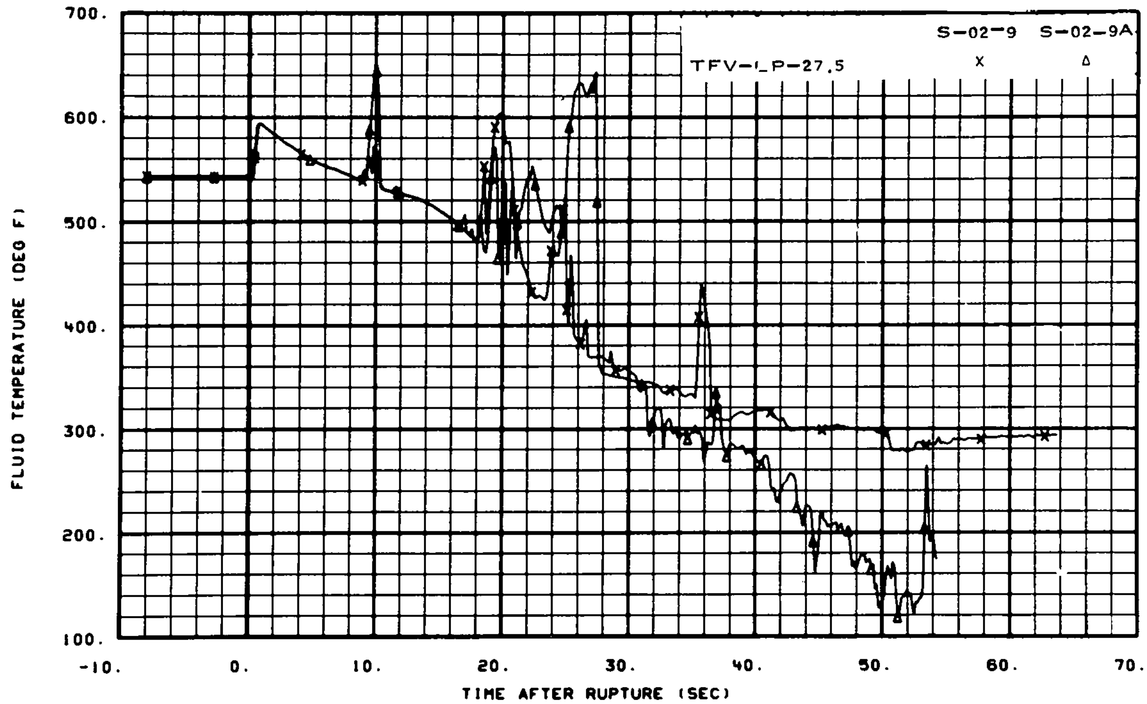

Fig. 25 Fluid temperature in lower plenum (TFV-LP-27.5).

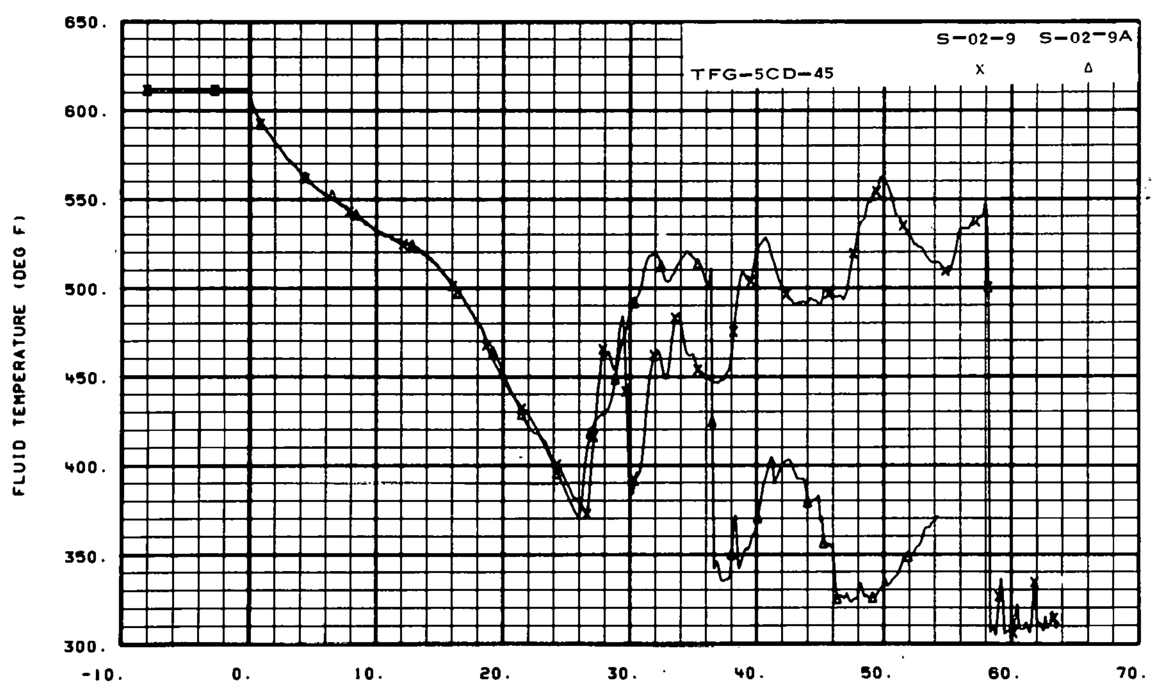

Fig. 26 Fluid temperature in core, Grid Spacer 5 (CD-45).

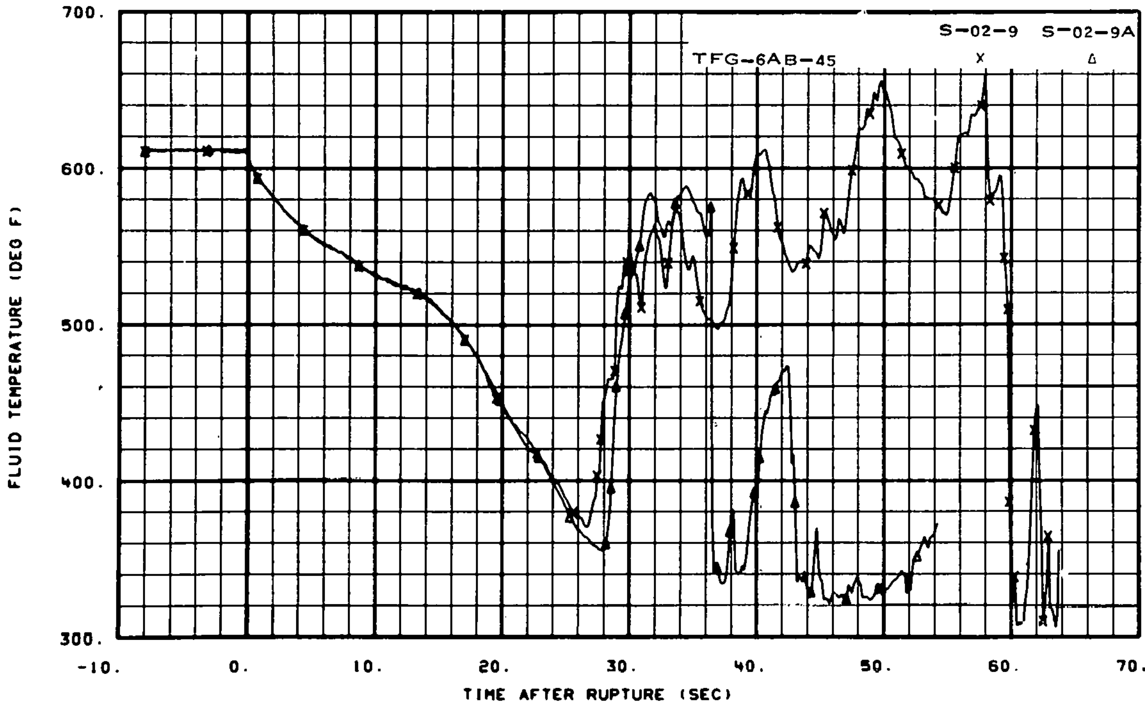

Fig. 27 Fluid temperature in core, Grid Spacer 6 (AB-45).

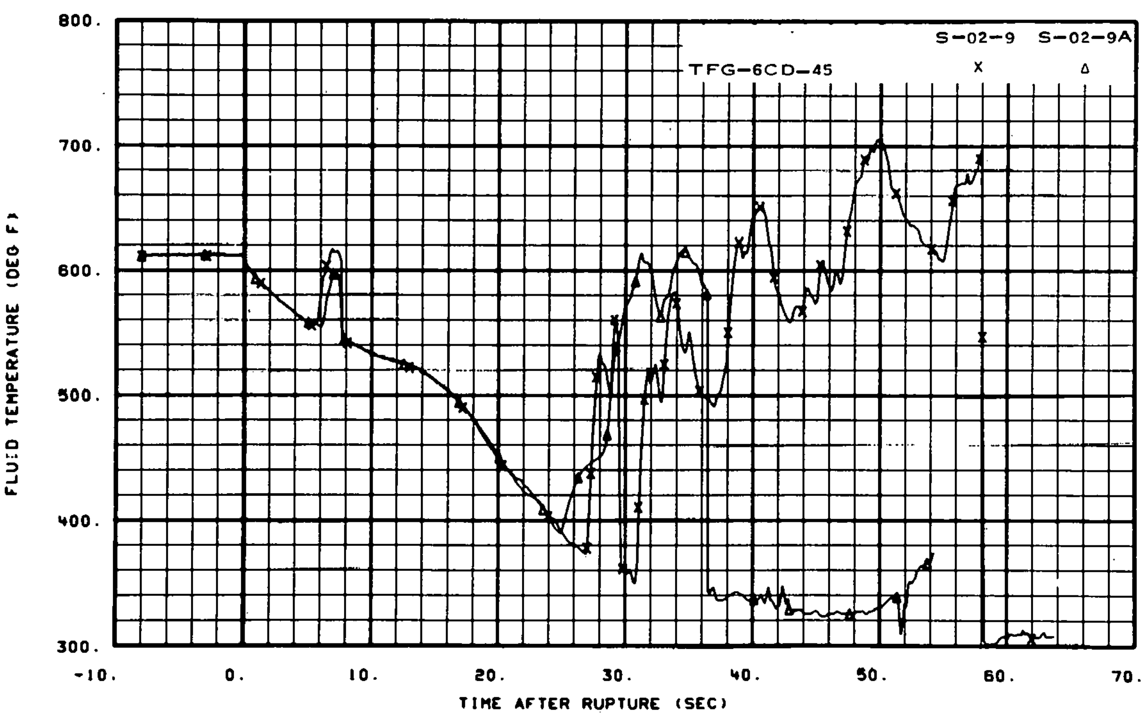

Fig. 28 Fluid temperature in core, Grid Spacer 6 (CD-45).

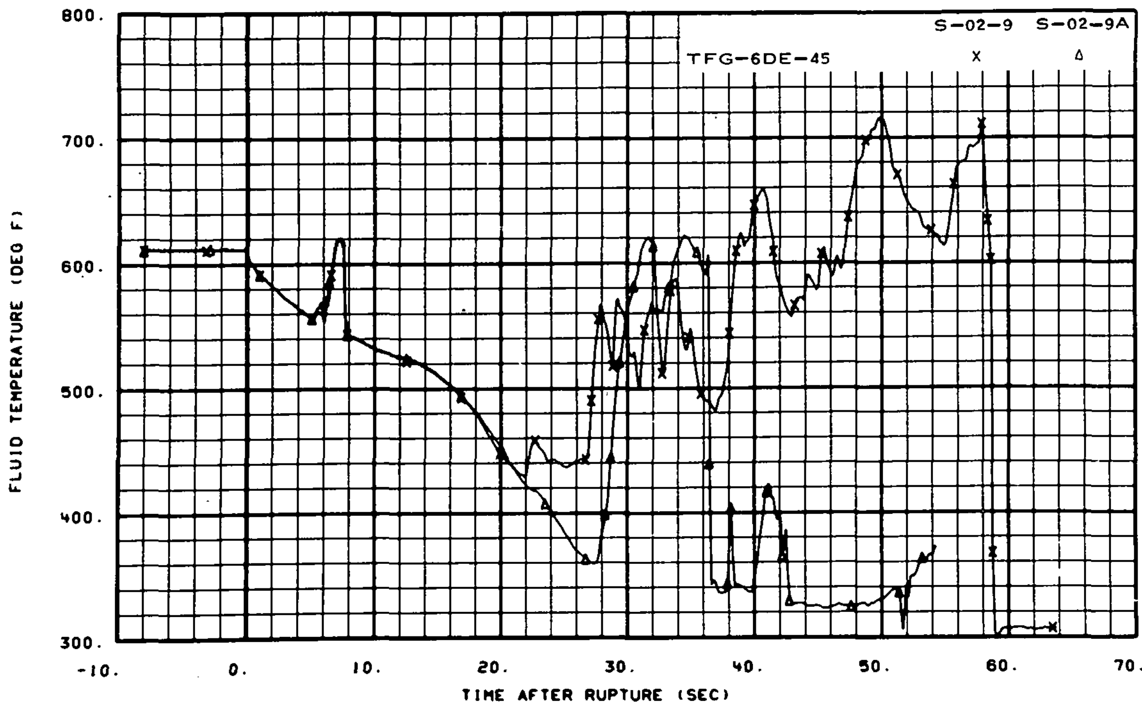

Fig. 29 Fluid temperature in core, Grid Spacer 6 (DE-45).

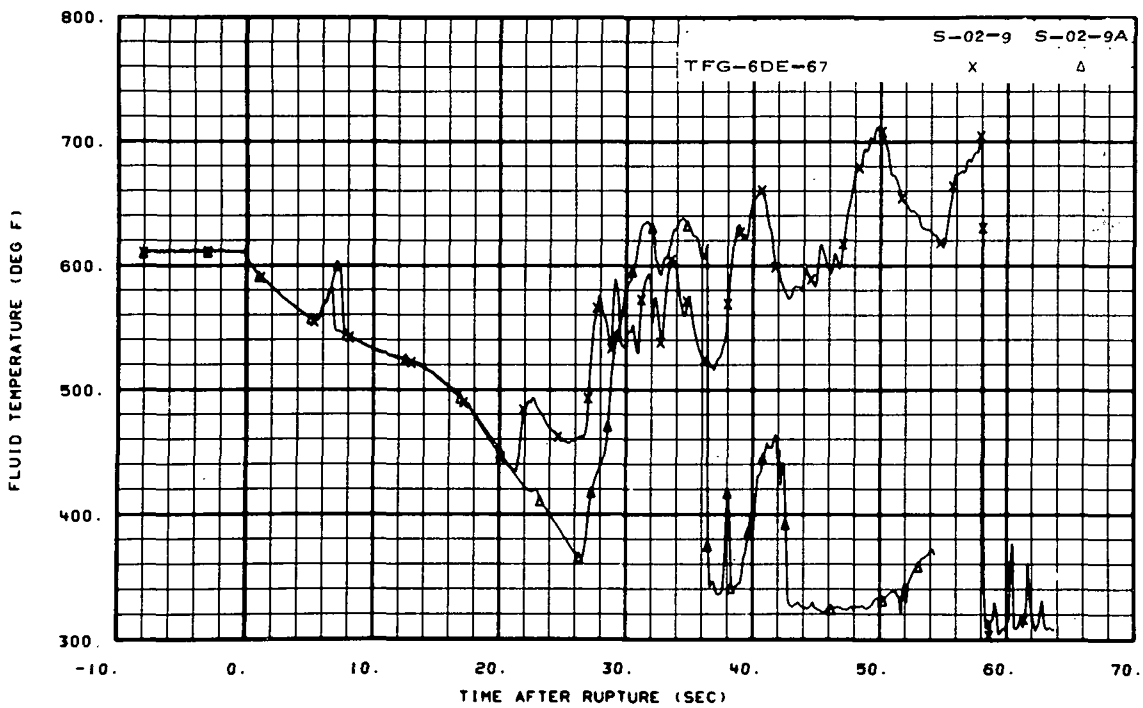

Fig. 30 Fluid temperature in core, Grid Spacer 6 (DE-67).

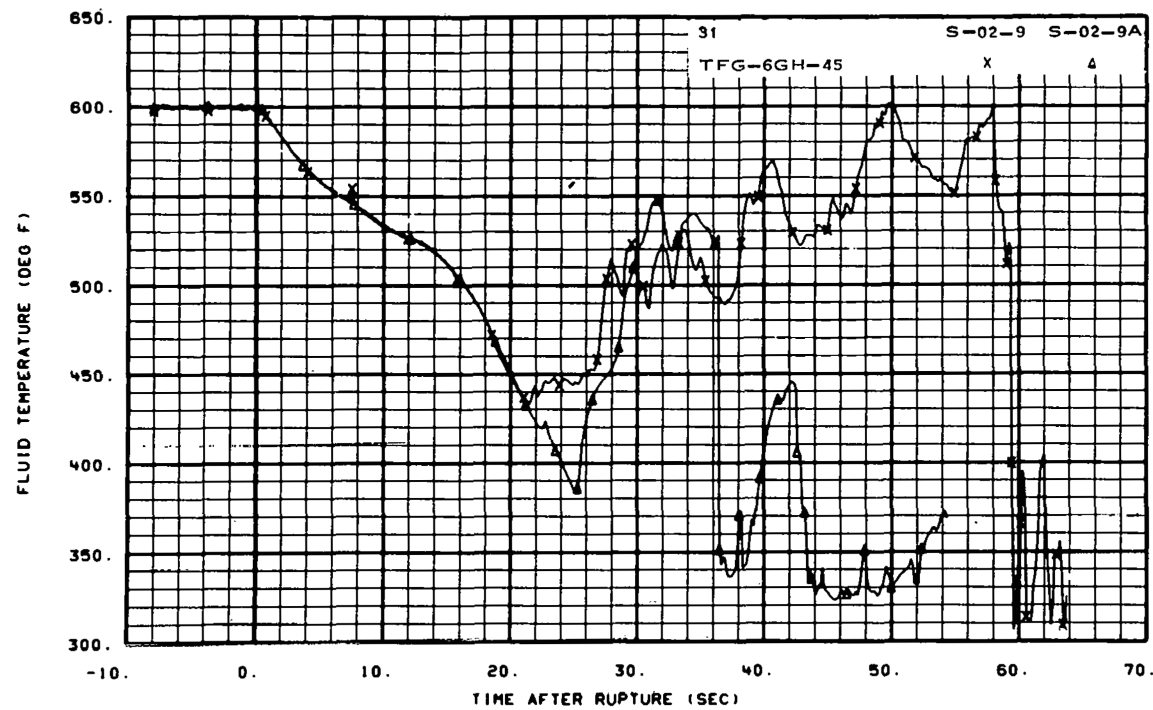

Fig. 31 Fluid temperature in core, Grid Spacer 6 (GH-45).

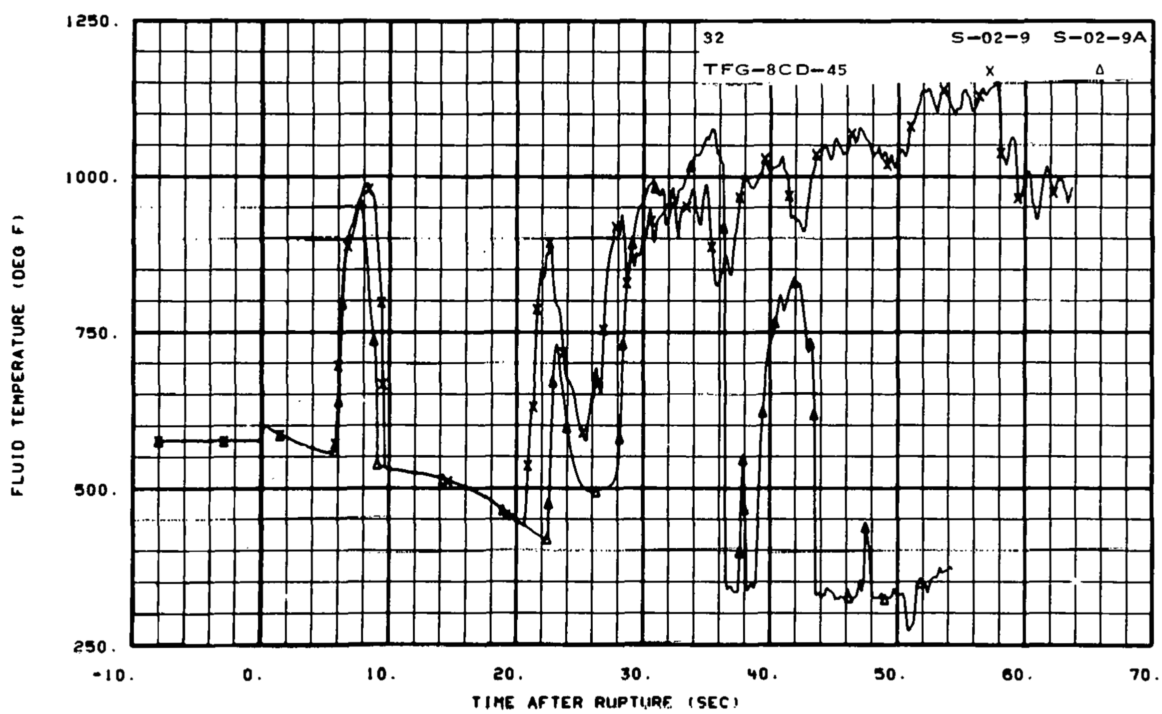

Fig. 32 Fluid temperature in core, Grid Spacer 8 (CD-45).

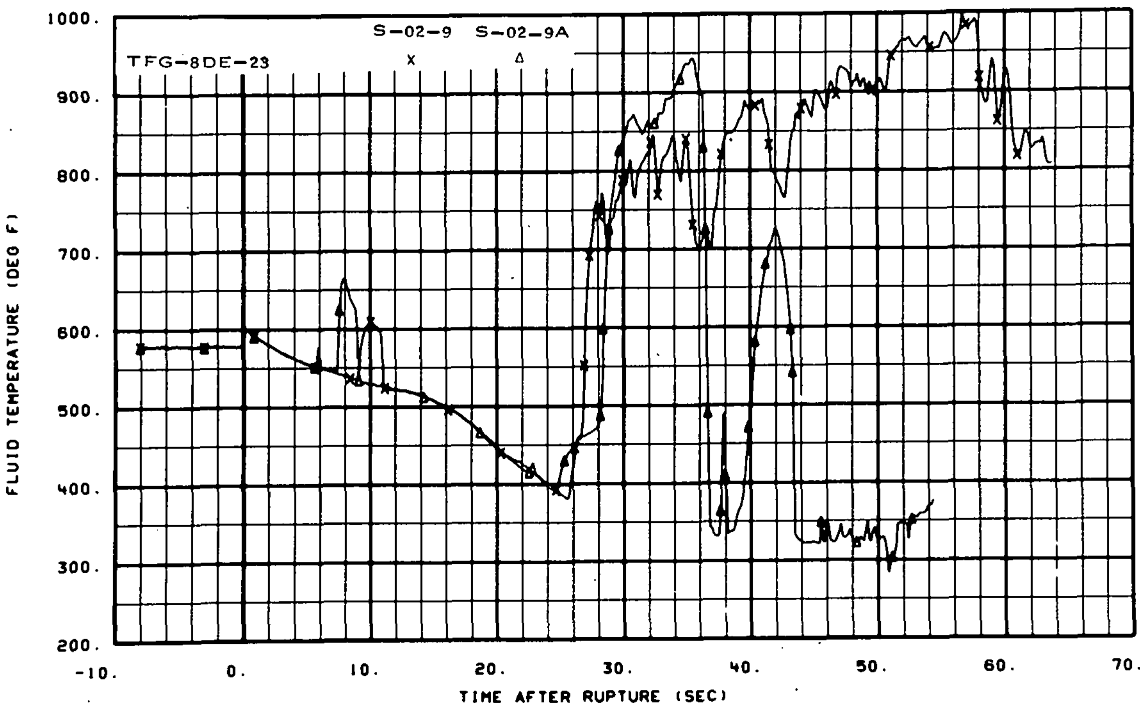

Fig. 33 Fluid temperature in core, Grid Spacer 8 (DE-23).

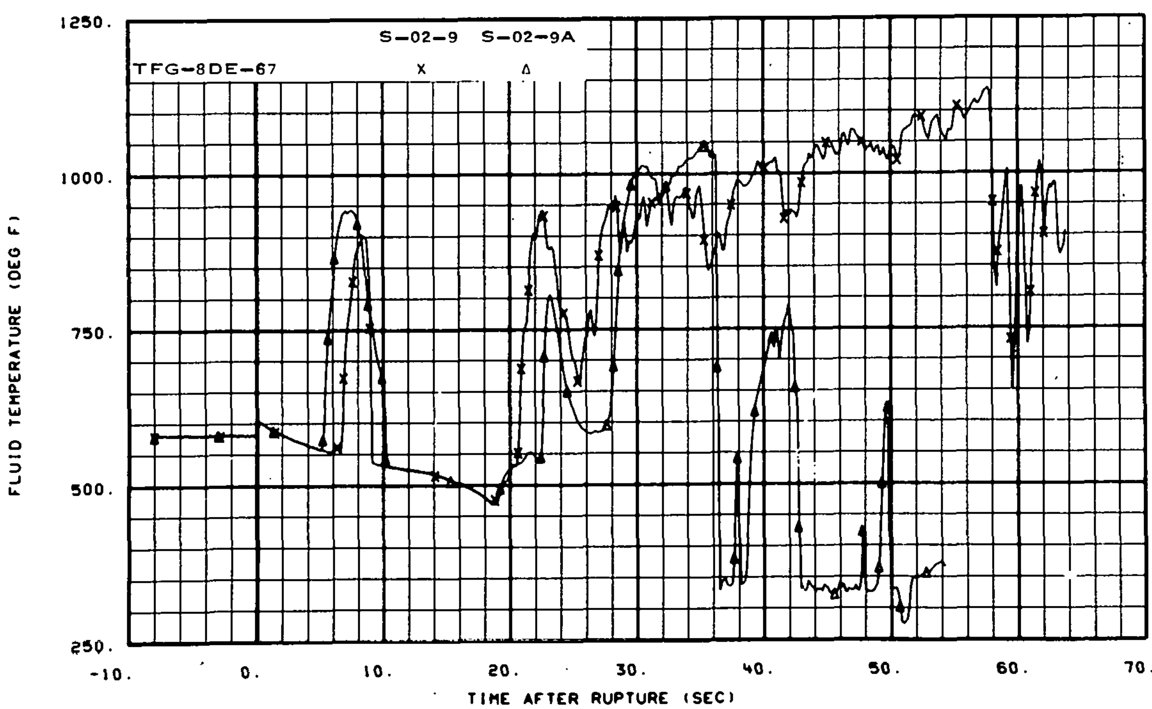

Fig. 34 Fluid temperature in core, Grid Spacer 8 (DE-67).

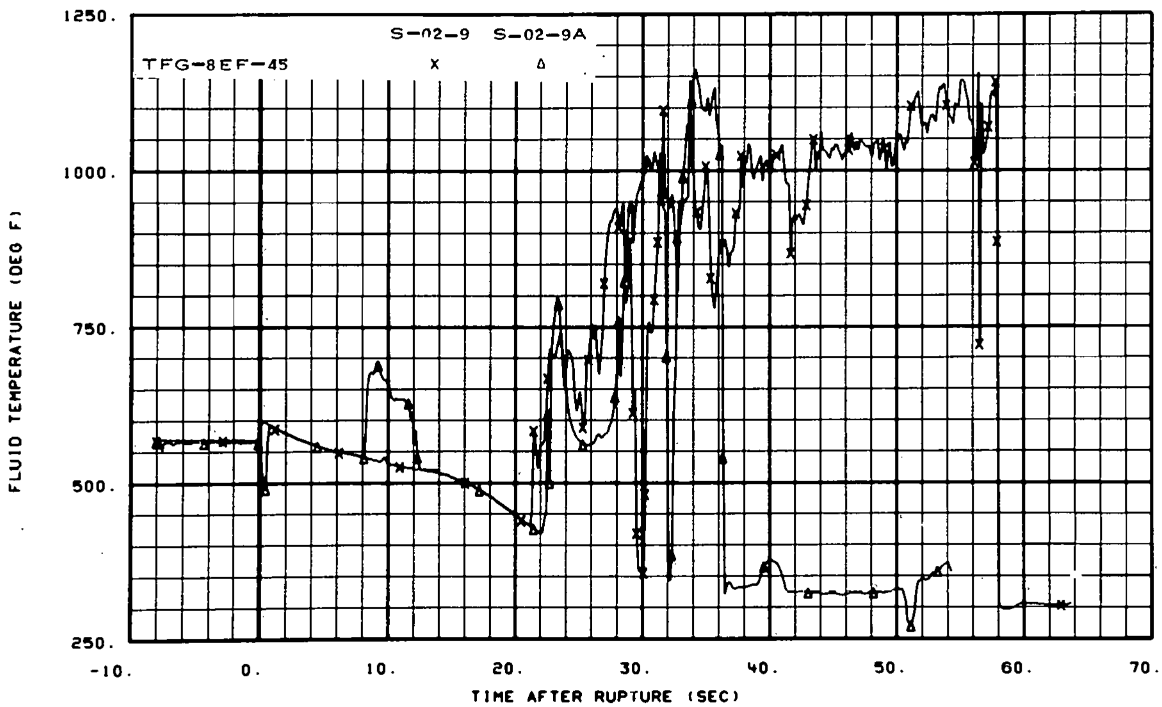

Fig. 35 Fluid temperature in core, Grid Spacer 8 (EF-45).

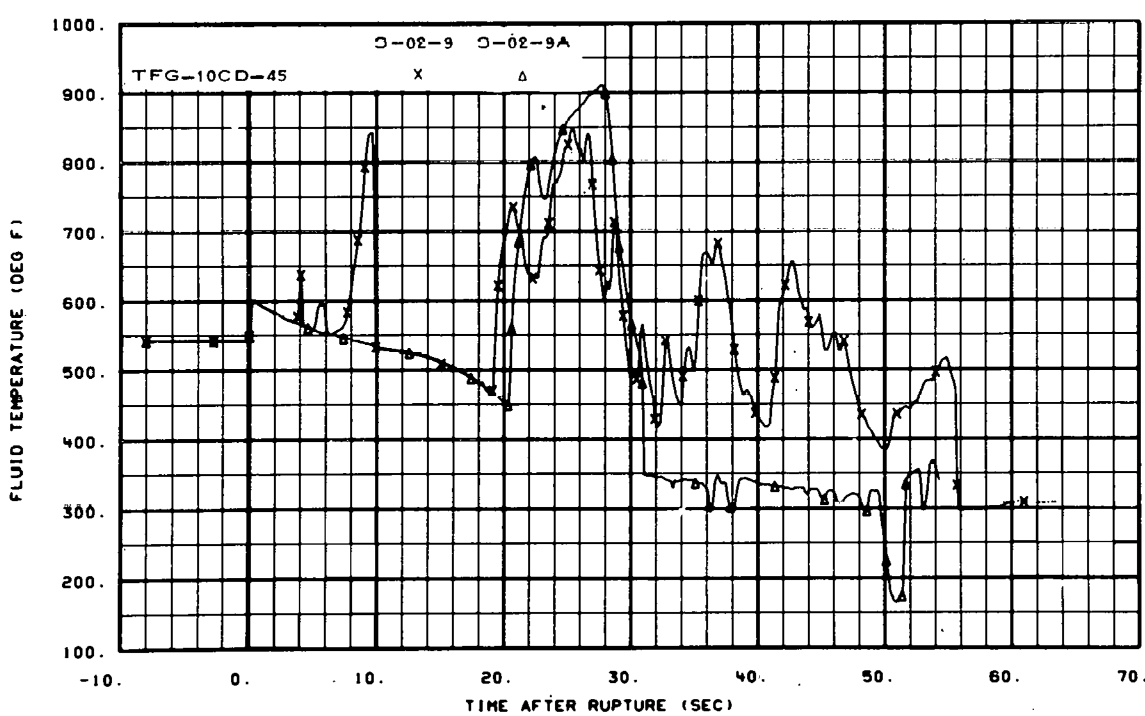

Fig. 36 Fluid temperature in core, Grid Spacer 10 (CD-45).

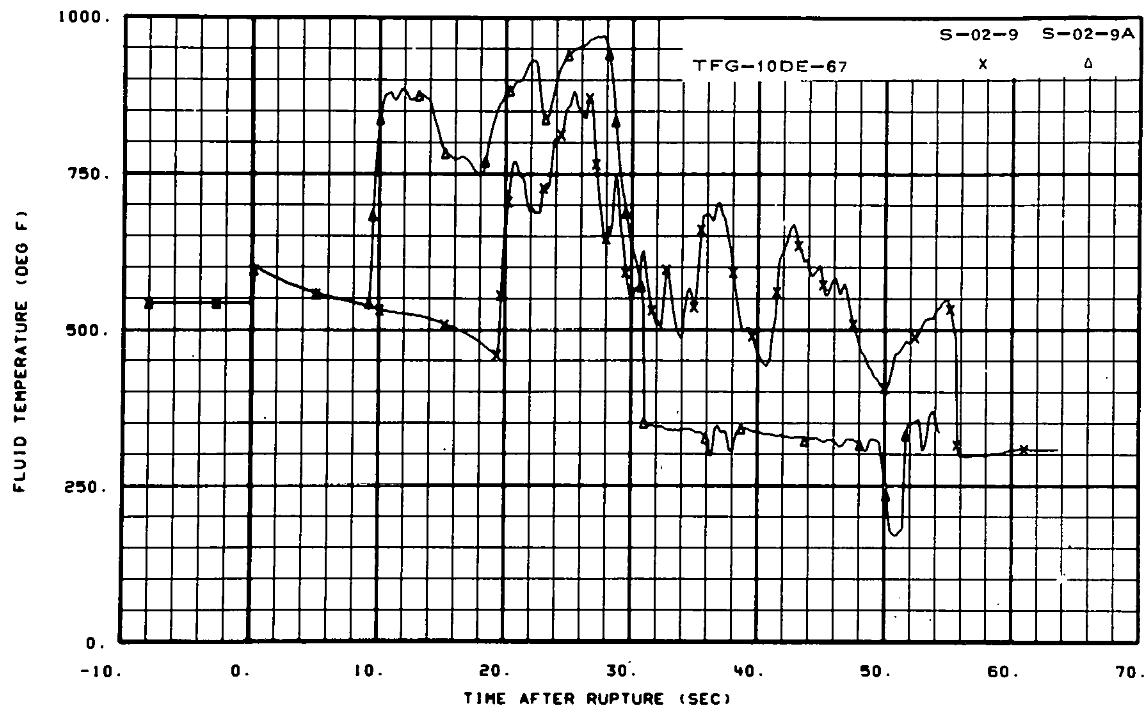

Fig. 37 Fluid temperature in core, Grid Spacer 10 (DE-67).

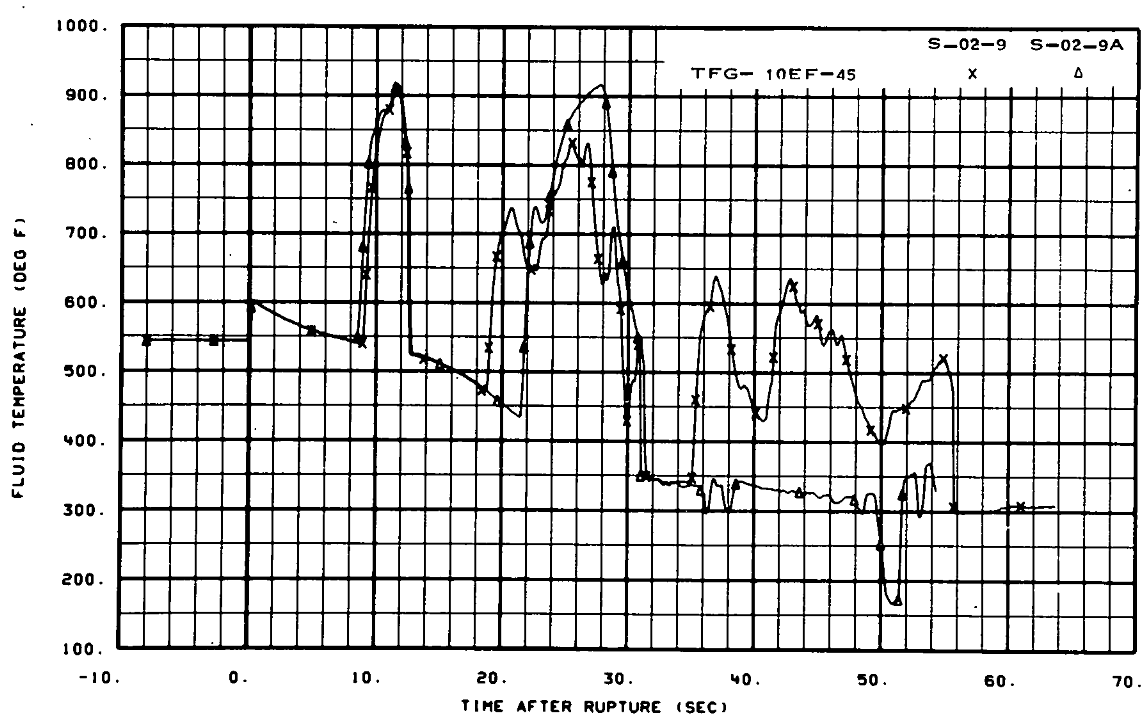

Fig. 38 Fluid temperature in core, Grid Spacer 10 (EF-45).

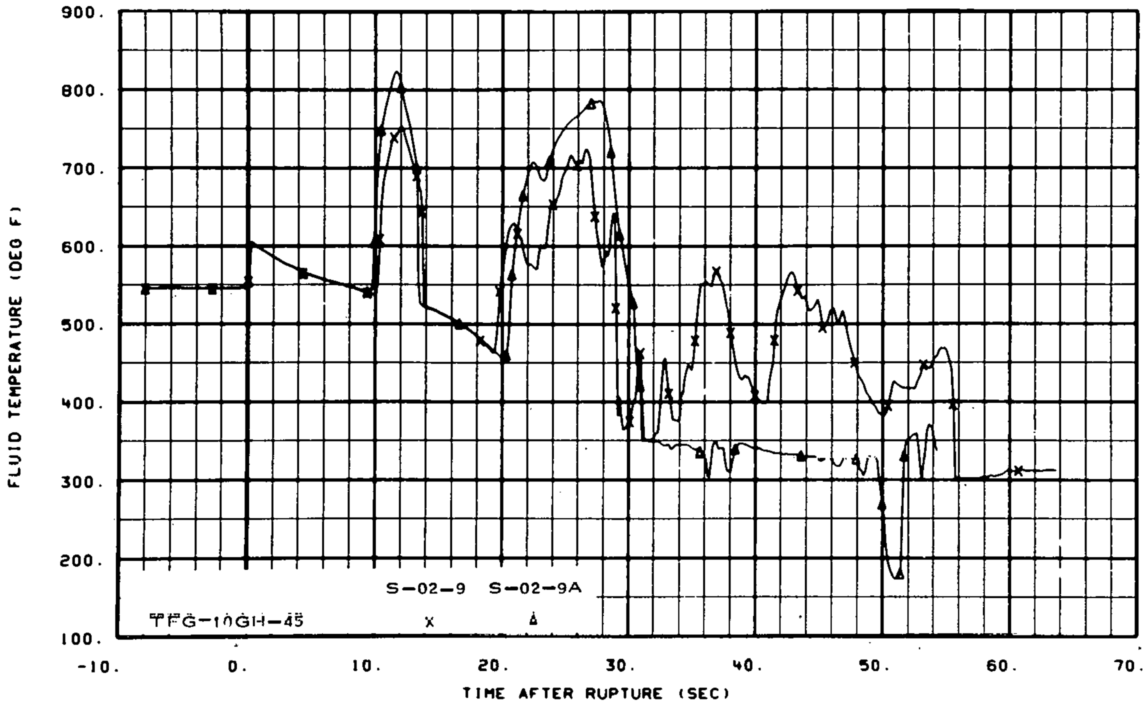

Fig. 39 Fluid temperature in core, Grid Spacer 10 (GH-45).

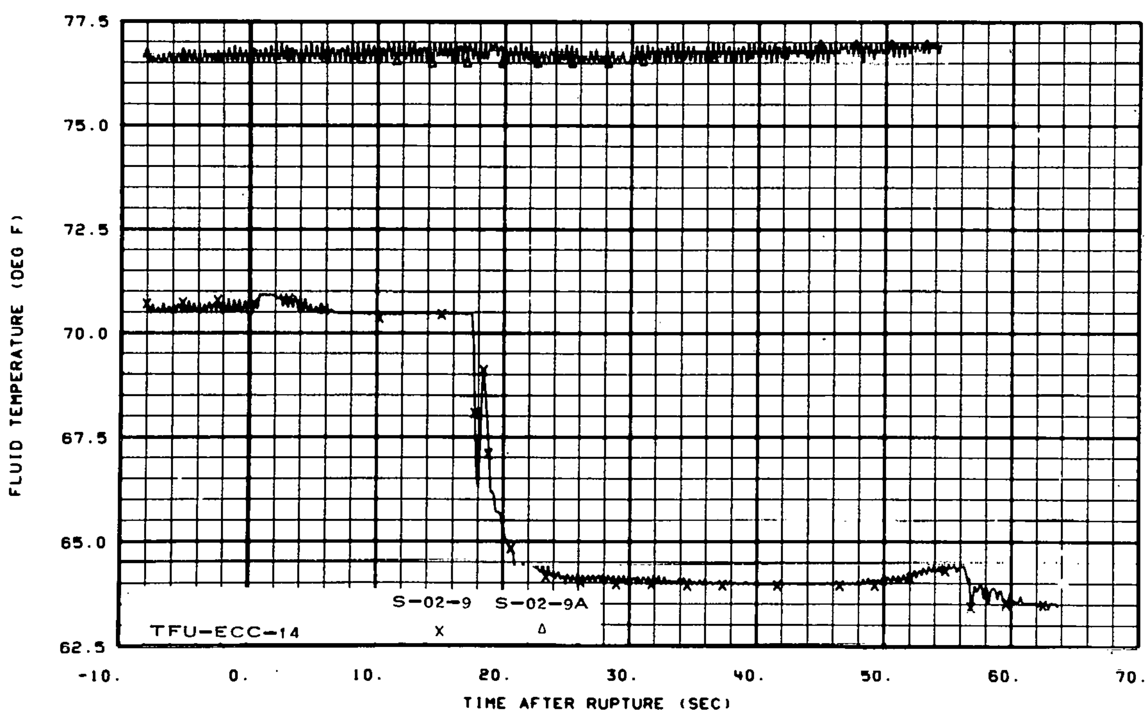

Fig. 40 Fluid temperature in intact loop coolant injection line (at Spool 14).

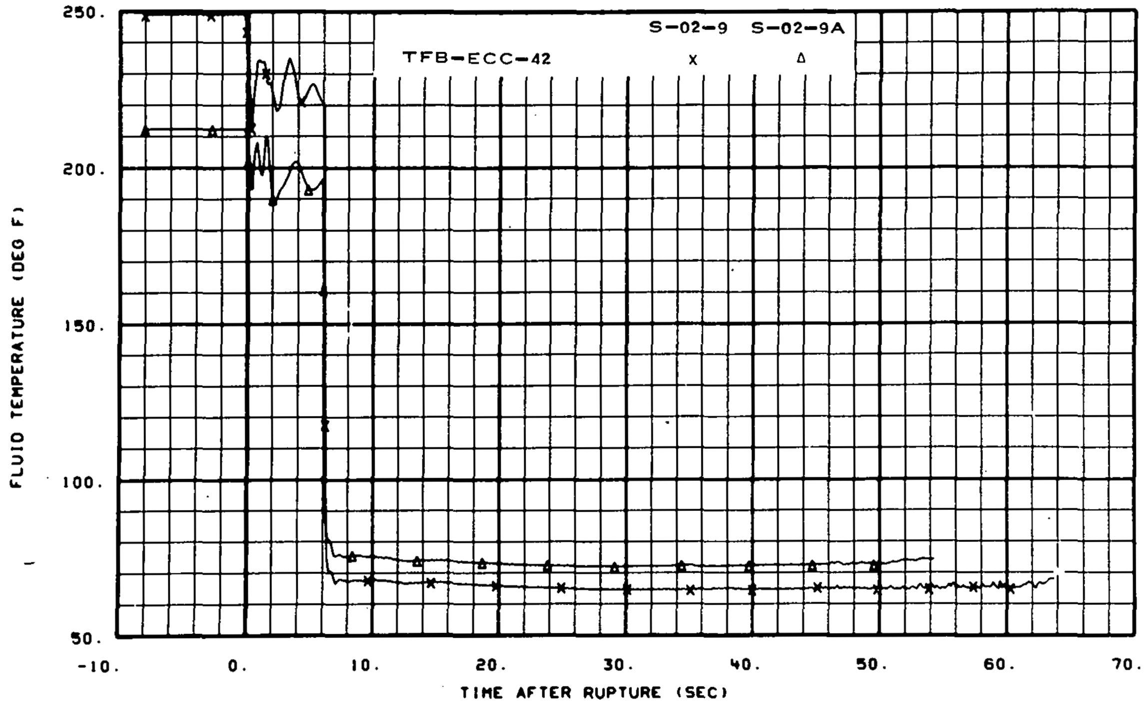

Fig. 41 Fluid temperature in broken loop coolant injection line (at Spool 42).

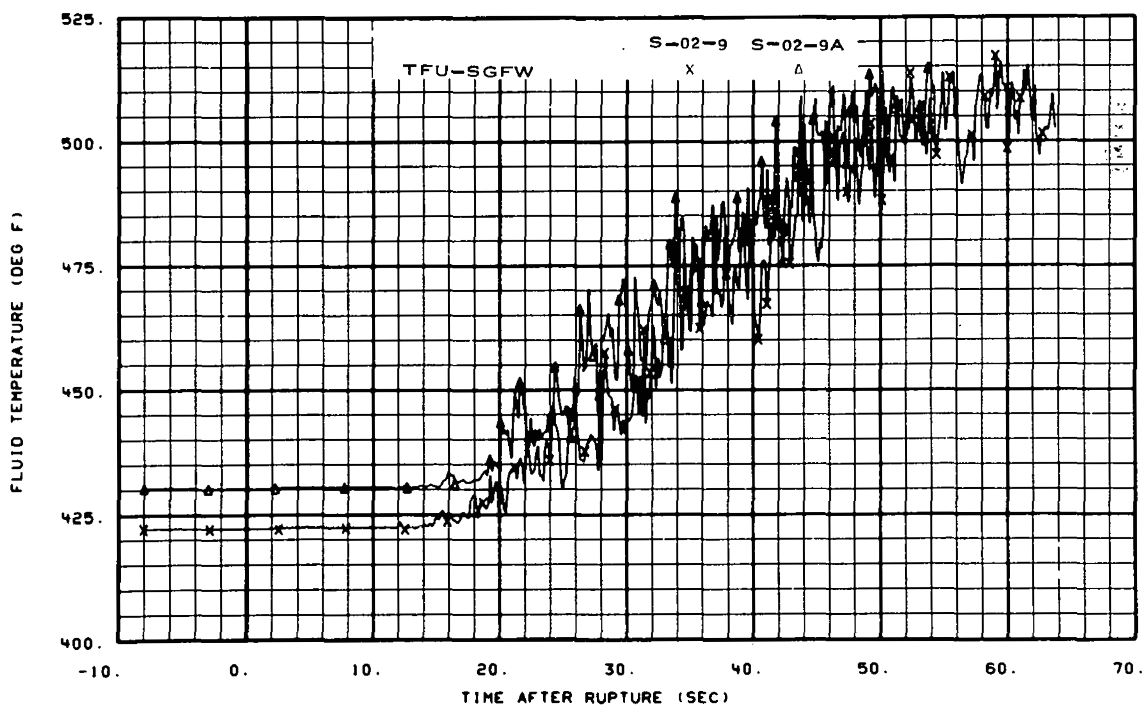

Fig. 42 Fluid temperature in steam generator feedwater line.

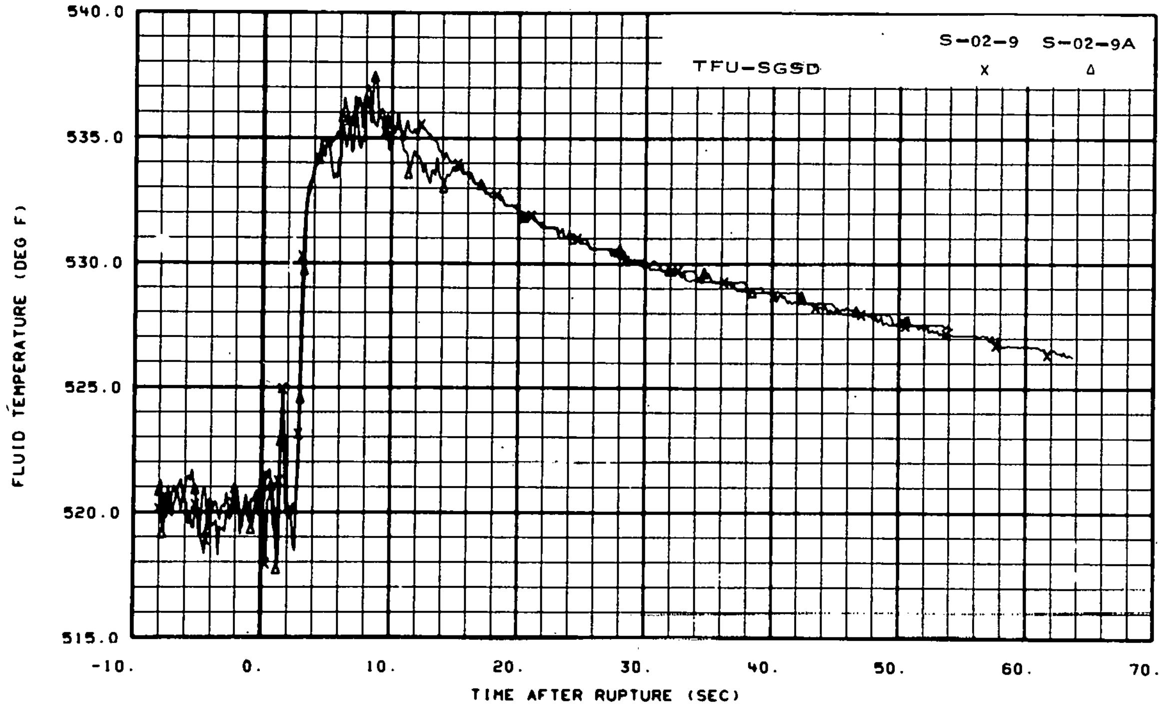

Fig. 43 Fluid temperature in steam generator steam dome.

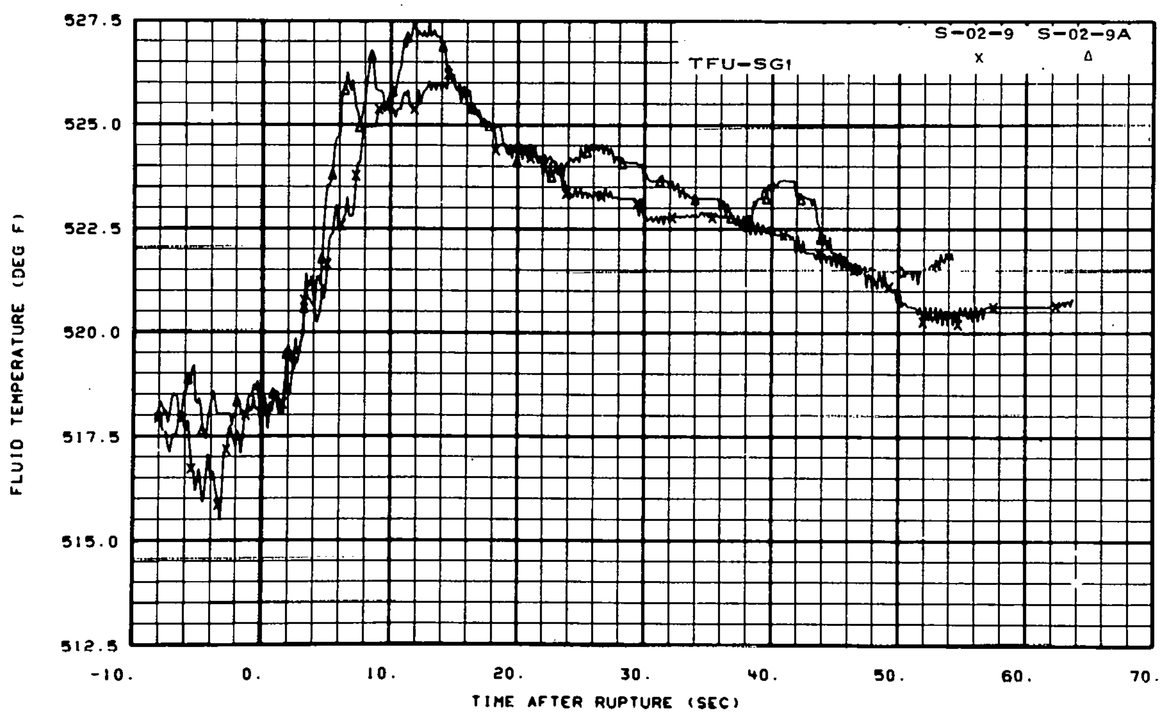

Fig. 44 Fluid temperature in steam generator (TFU-SGI).

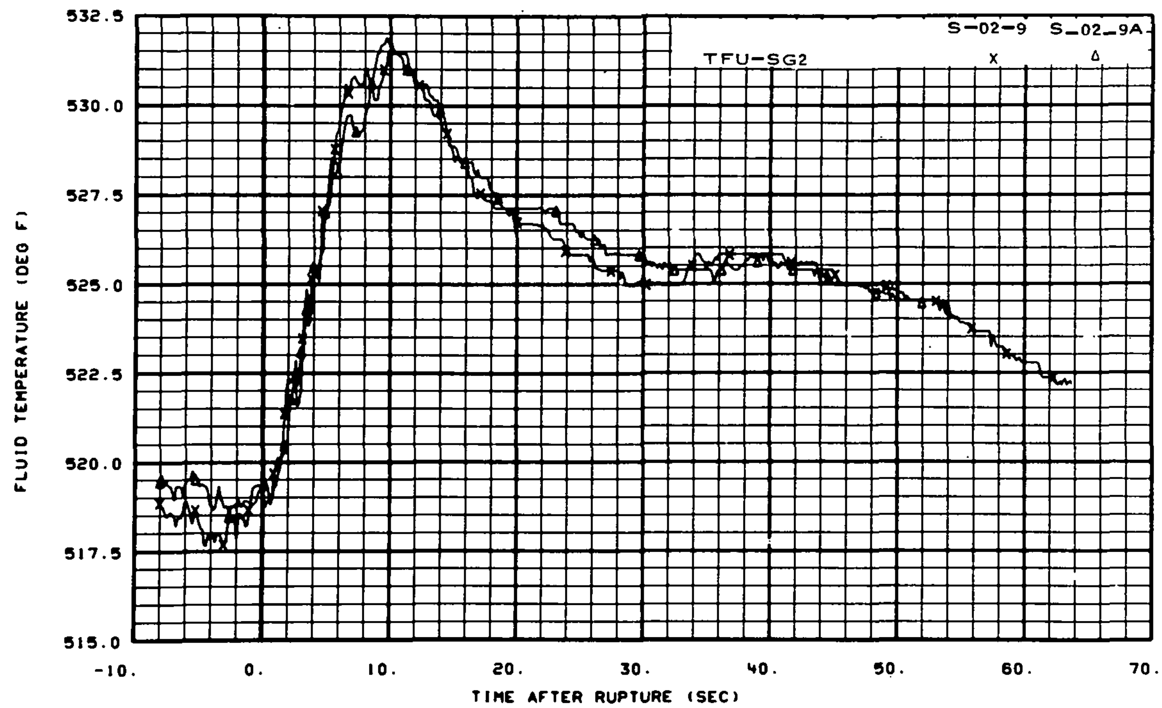

Fig. 45 Fluid temperature in steam generator (TFU-SG2).

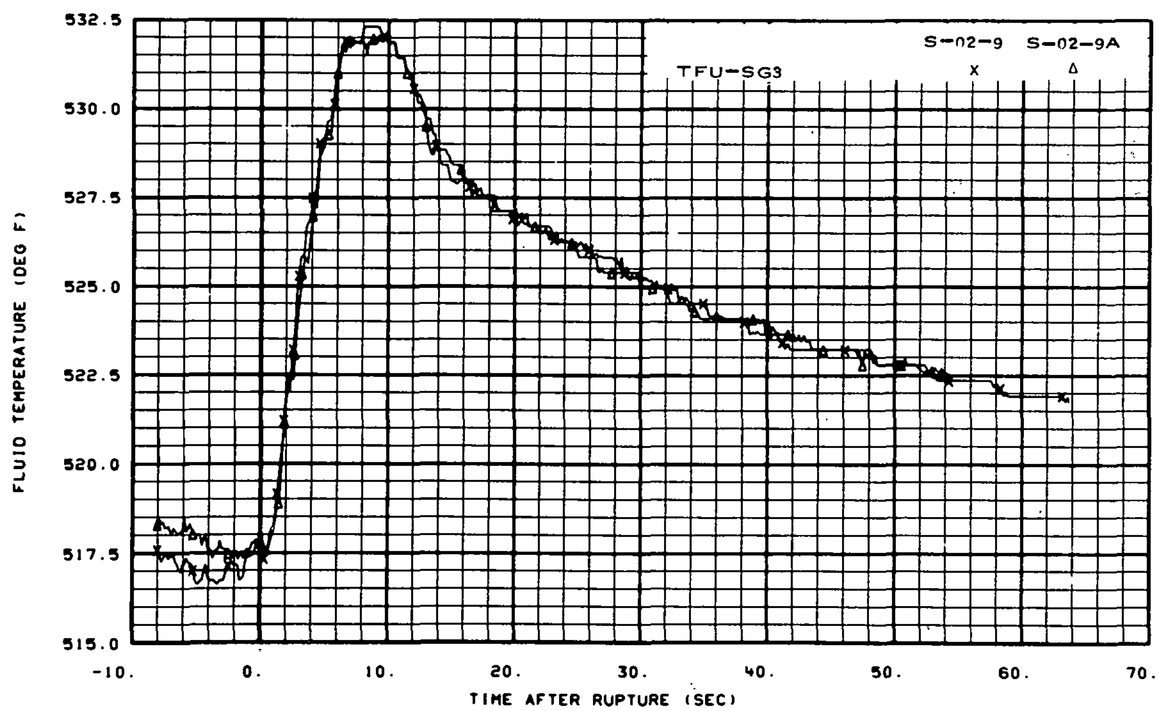

Fig. 46 Fluid temperature in steam generator (TFU-SG3).

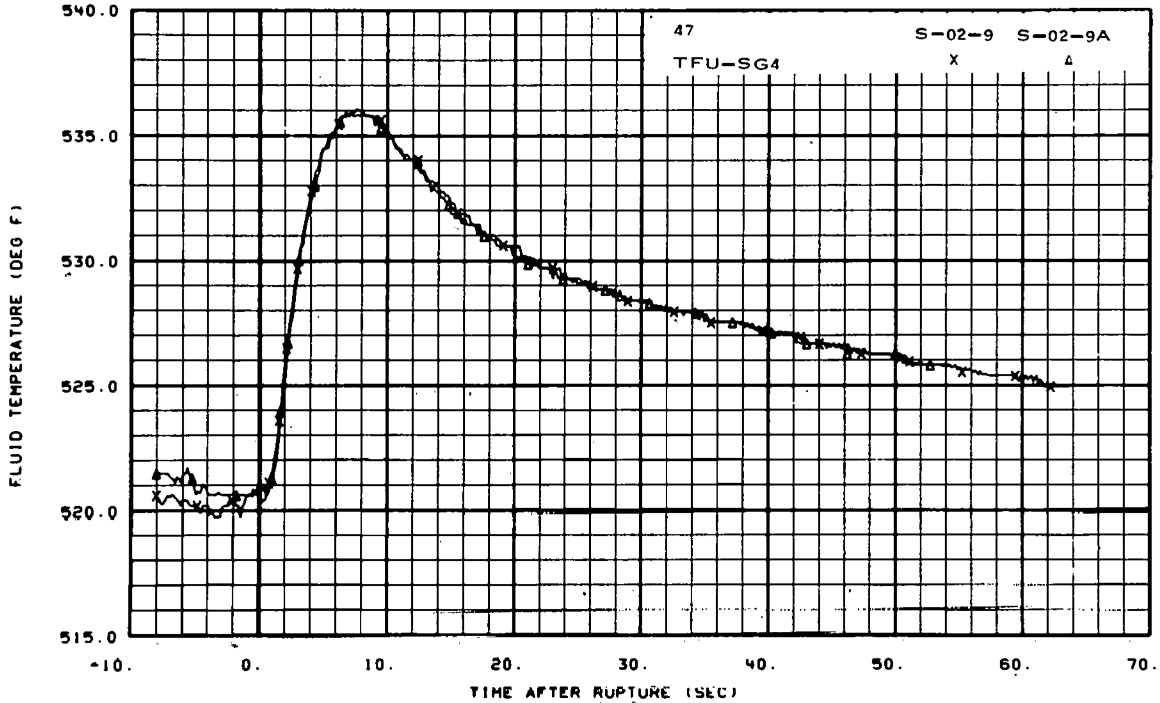

Fig. 47 Fluid temperature in steam generator (TFU-SG4).

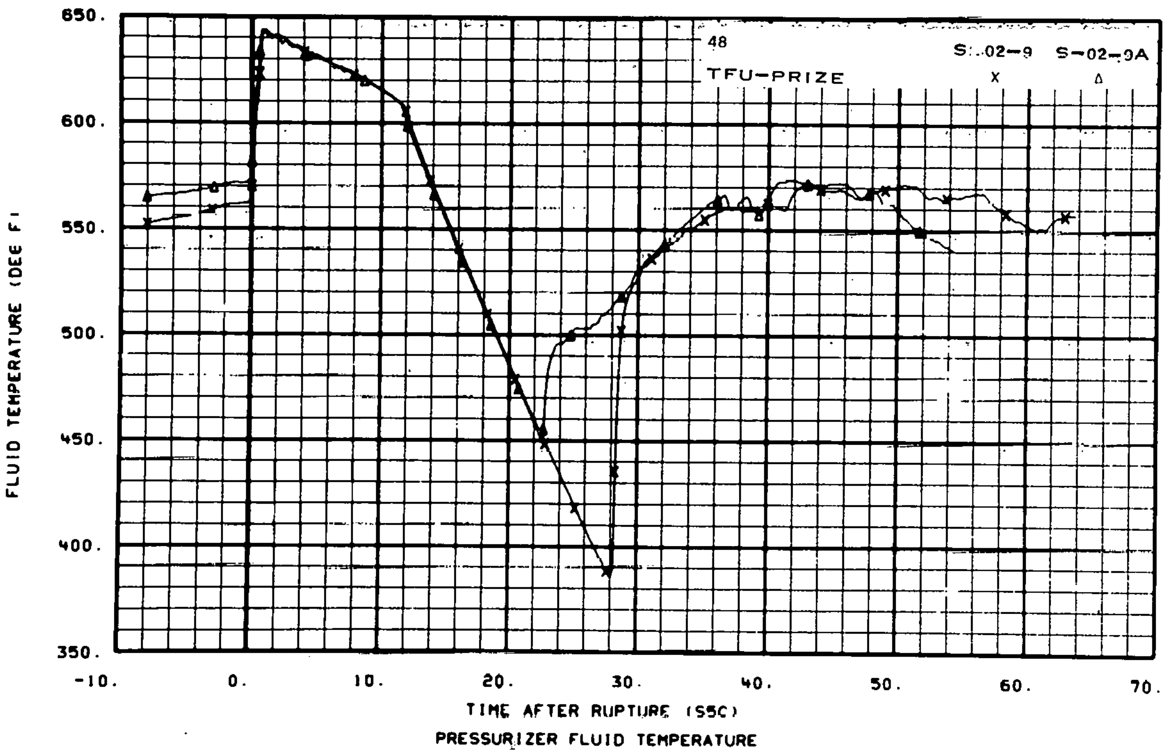

Fig. 48 Fluid temperature in pressurizer surge line.

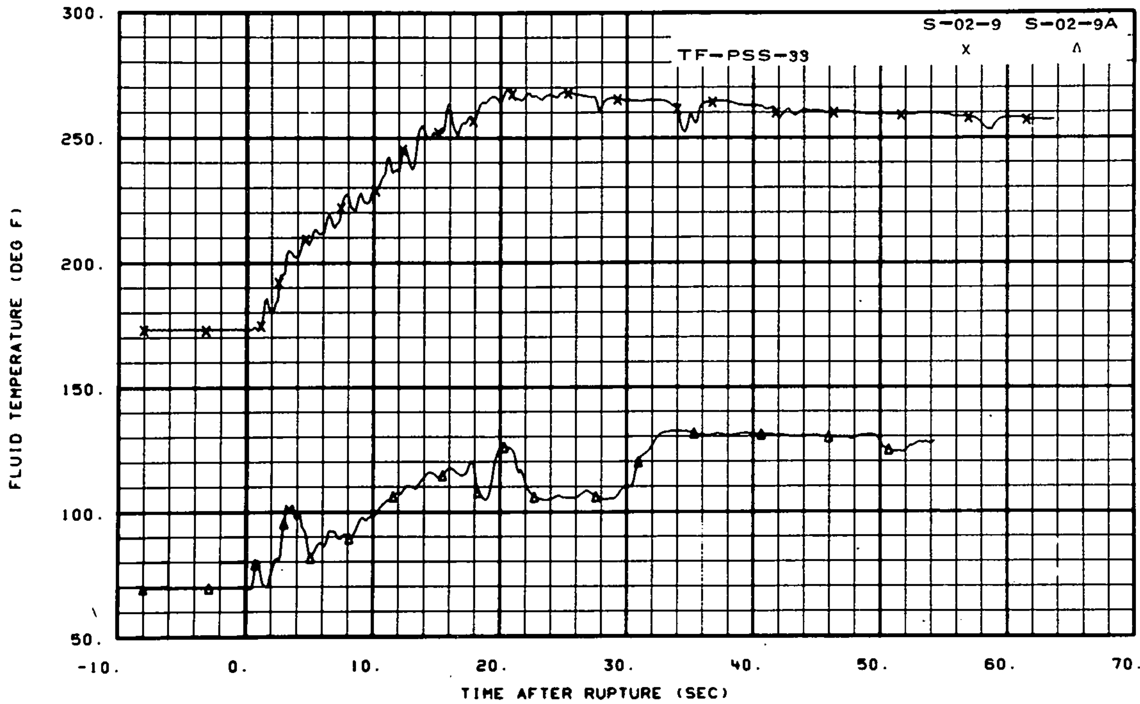

Fig. 49 Fluid temperature in pressure suppression tank (TF-PSS-33).

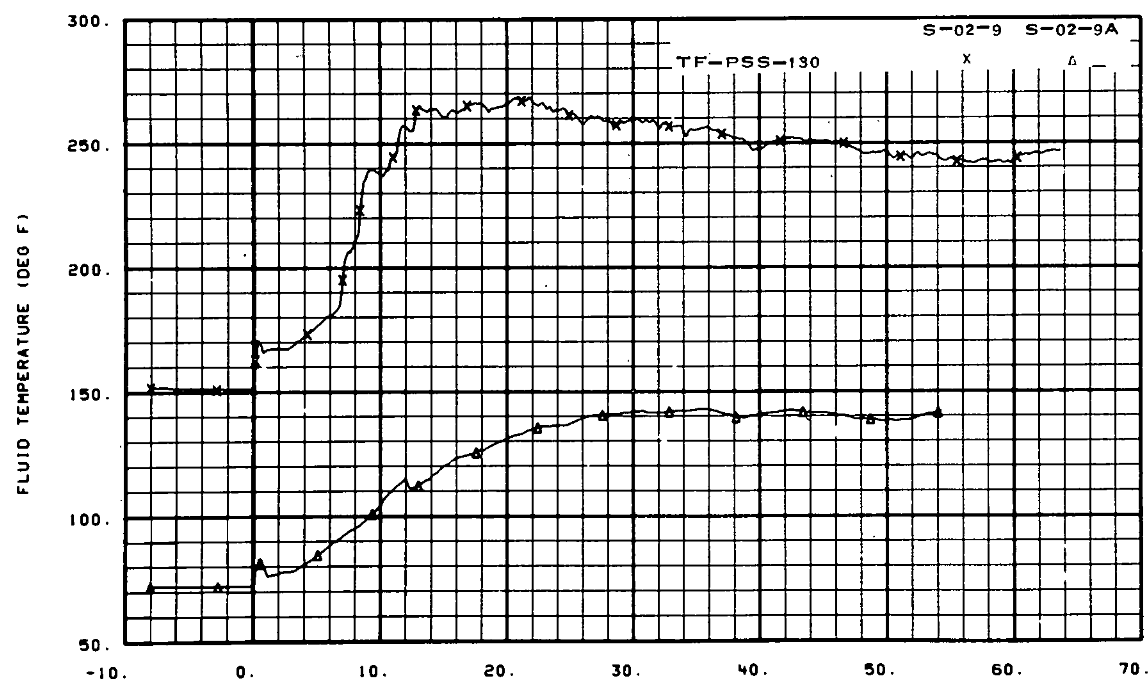

Fig. 50 Fluid temperature in pressure suppression tank (TF-PSS-130).

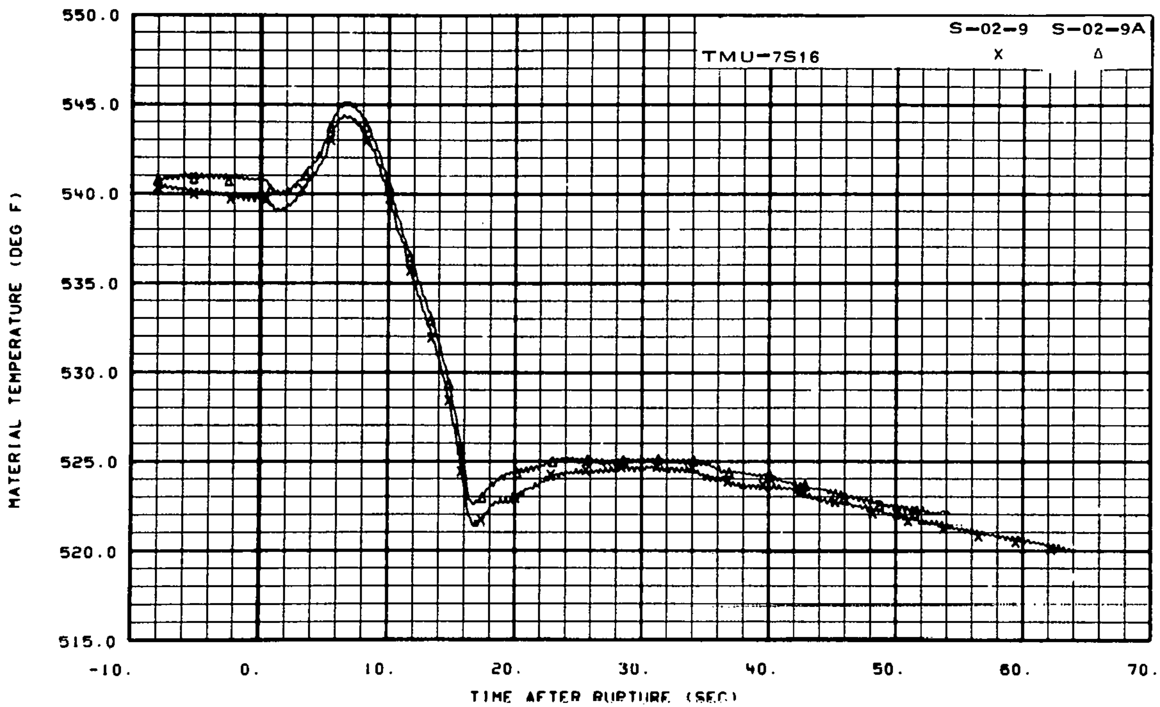

Fig. 51 Material temperature in intact loop, Spool 7.

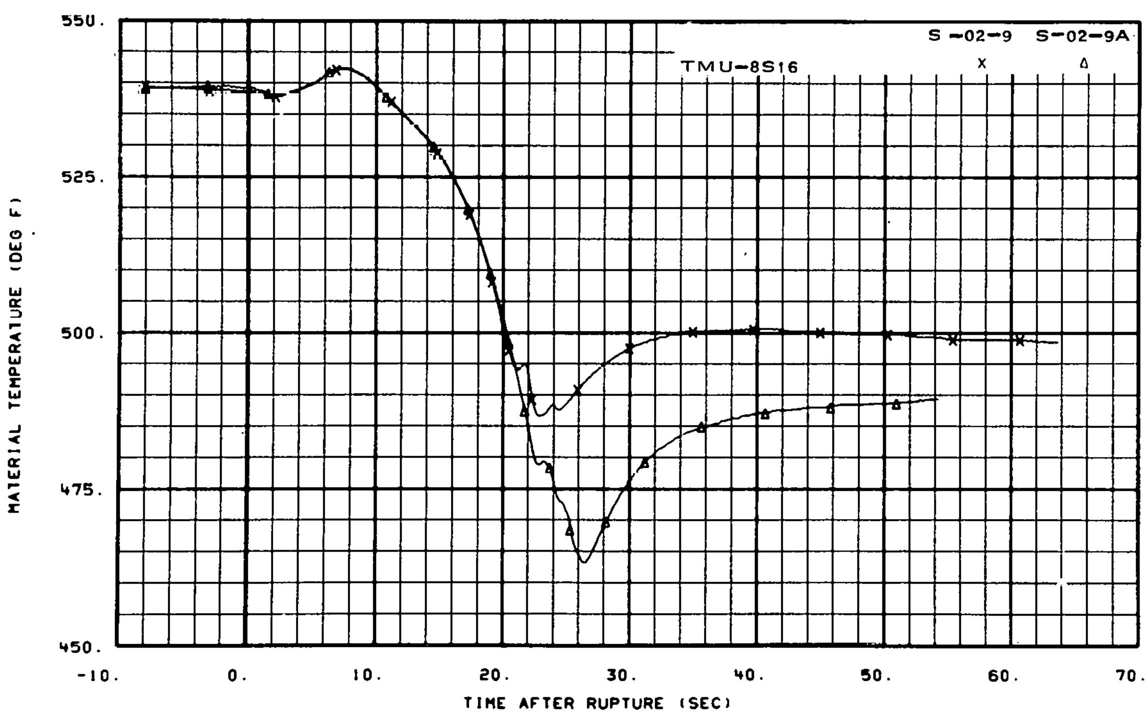

Fig. 52 Material temperature in intact loop, Spool 8.

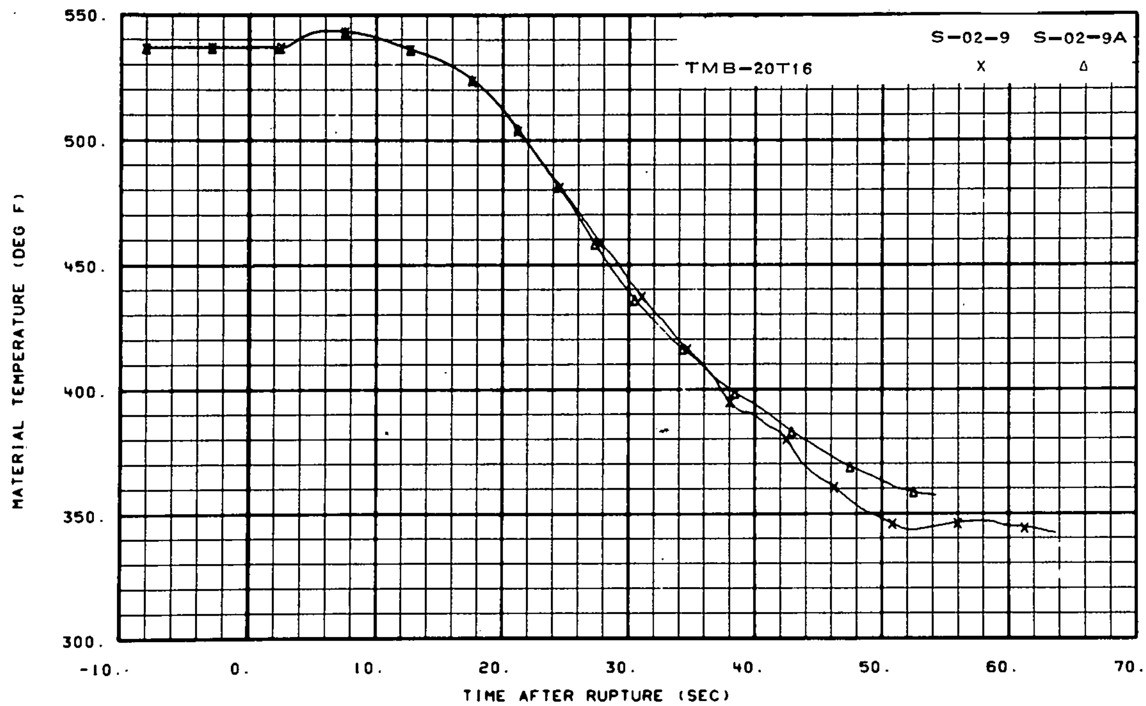

Fig. 53 Material temperature in broken loop, Spool 20.

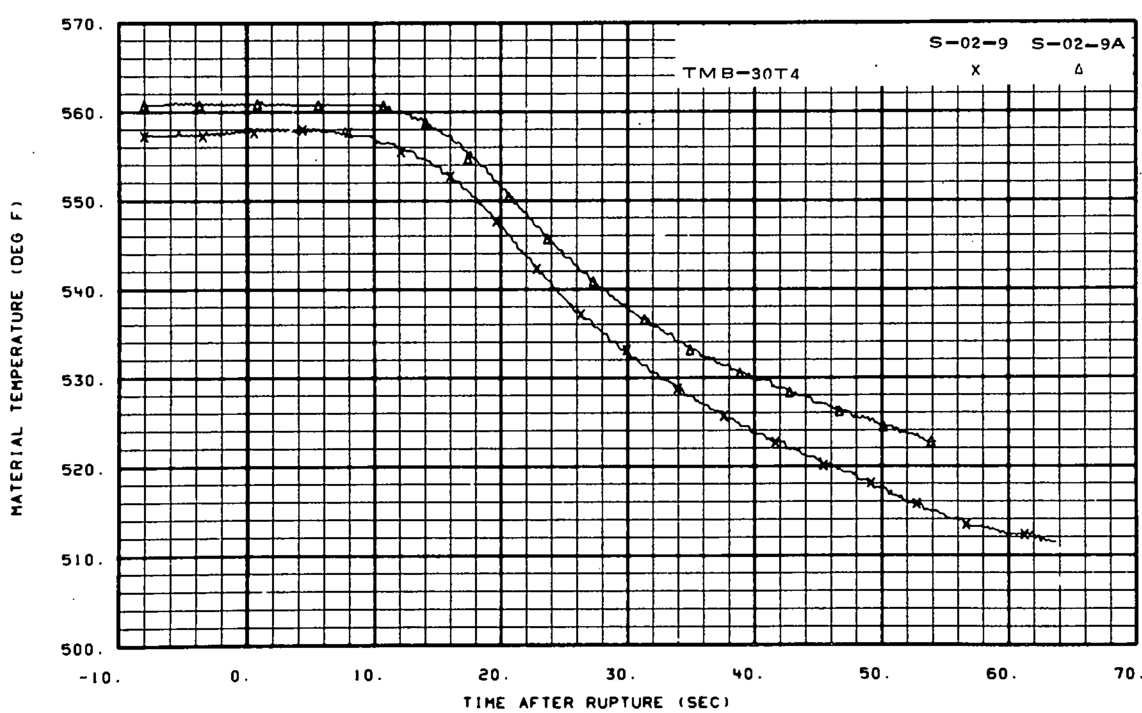

Fig. 54 Material temperature in broken loop, Spool 30 (TMB-30T4).

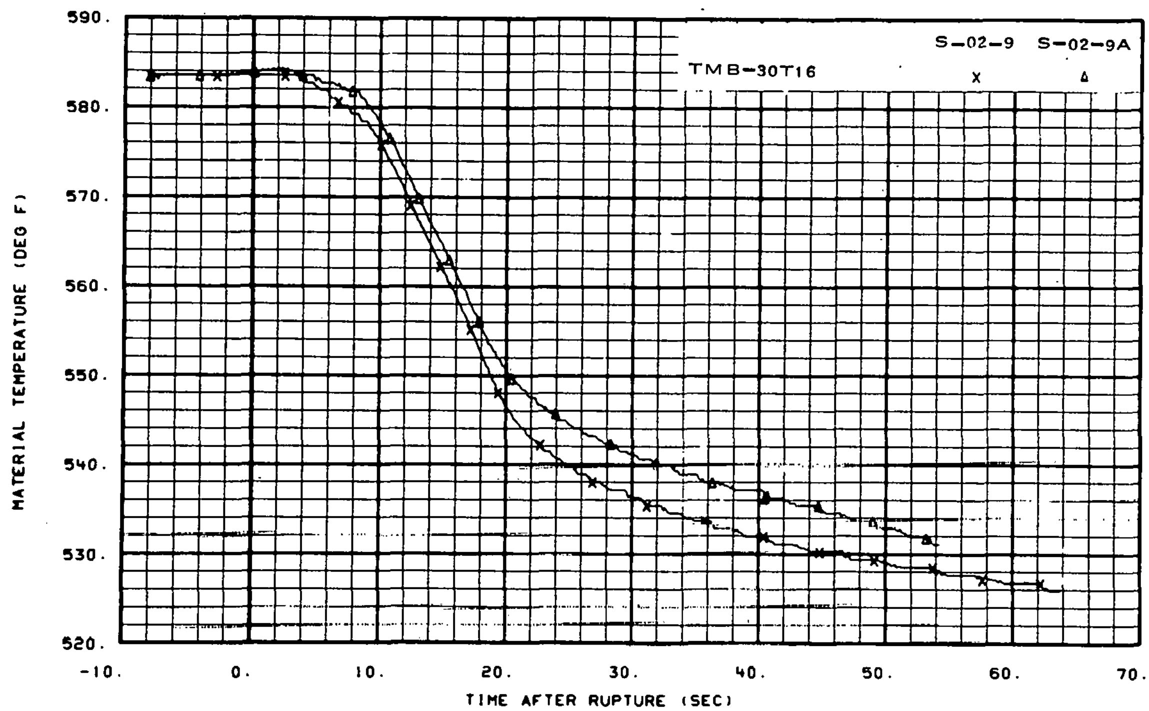

Fig. 55 Material temperature in broken loop, Spool 30 (TMB-30T16).

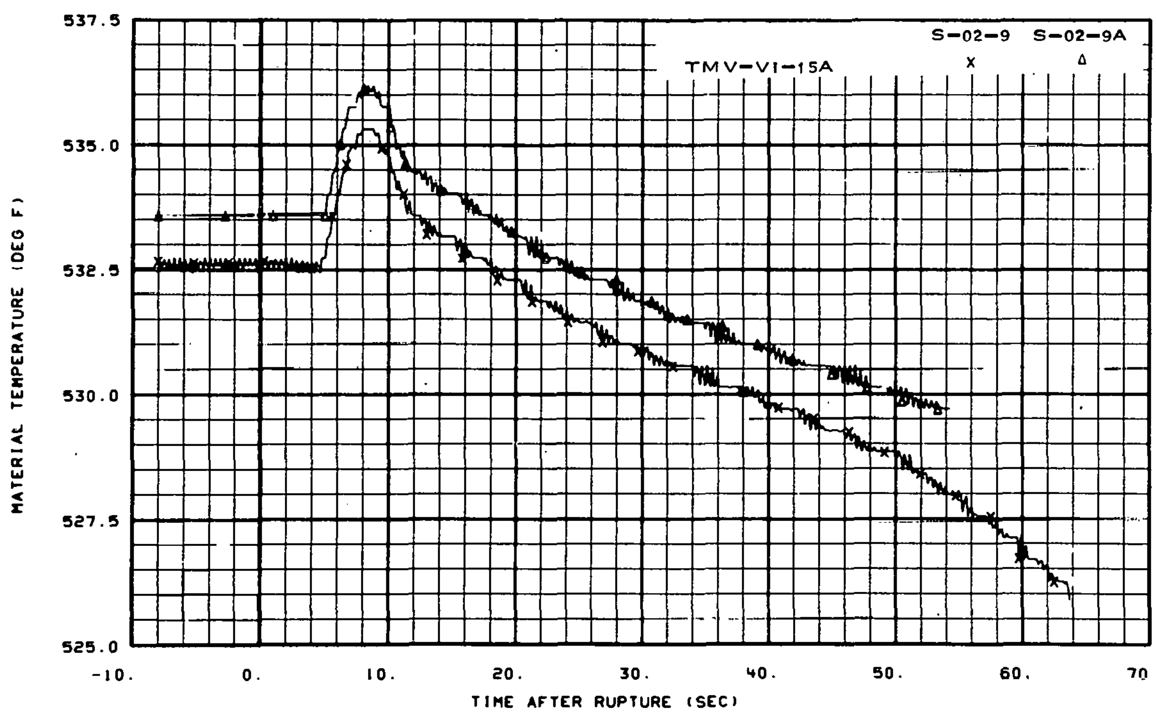

Fig. 56 Material temperature in vessel wall.

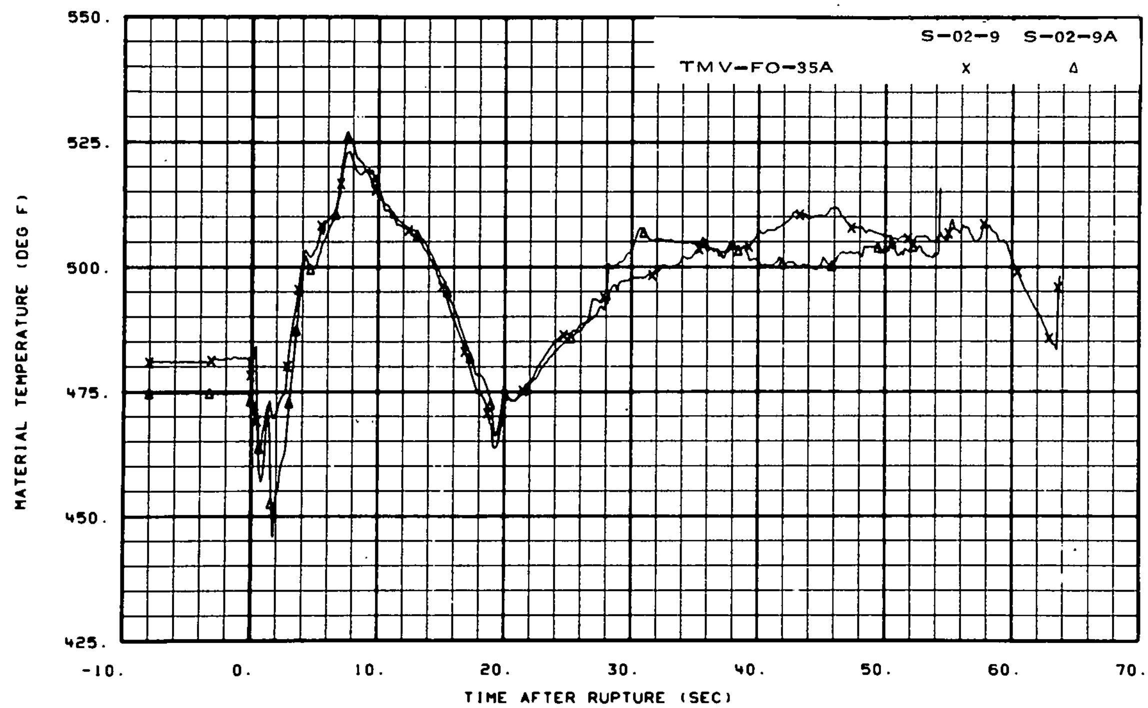

Fig. 57 Material temperature in vessel filler (TMV-FO-35A).

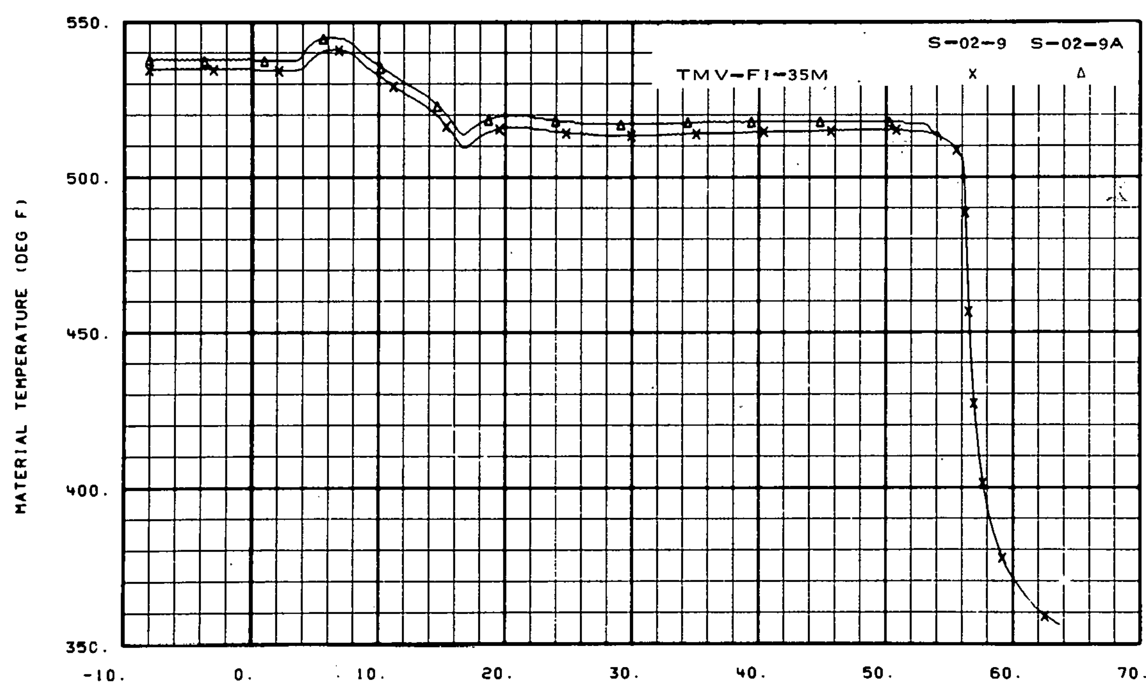

Fig. 58 Material temperature in vessel filler (TMV-FI-35M).

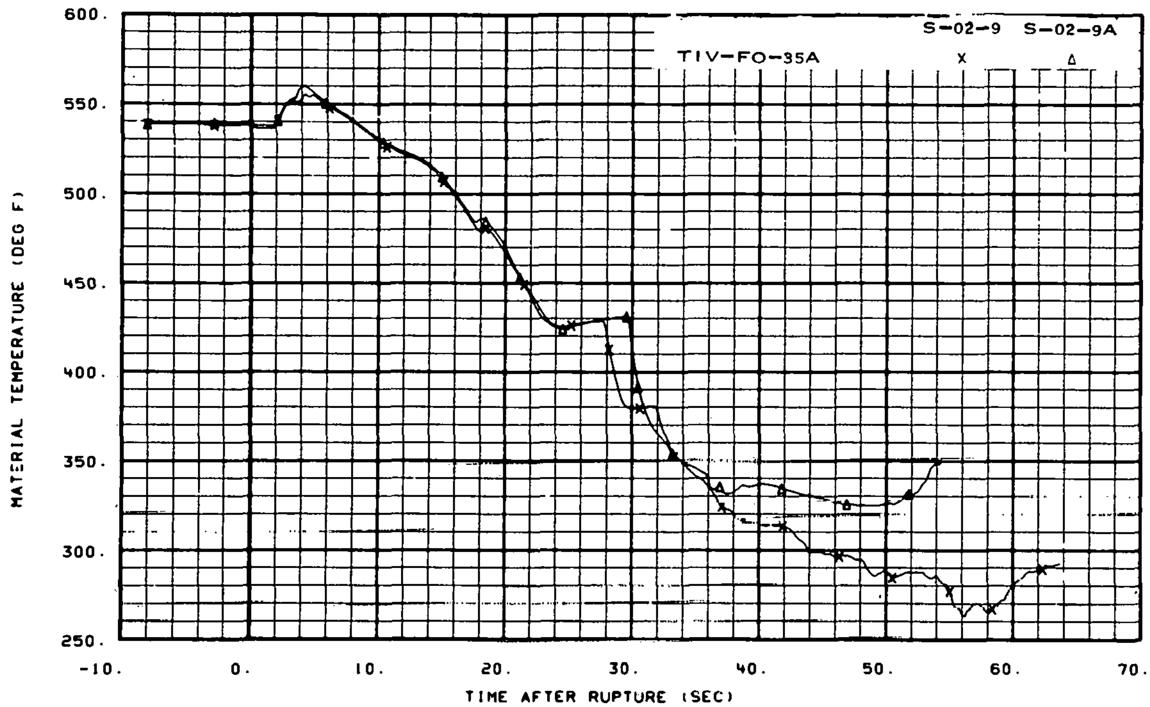

Fig. 59 Material temperature in vessel filler insulator.

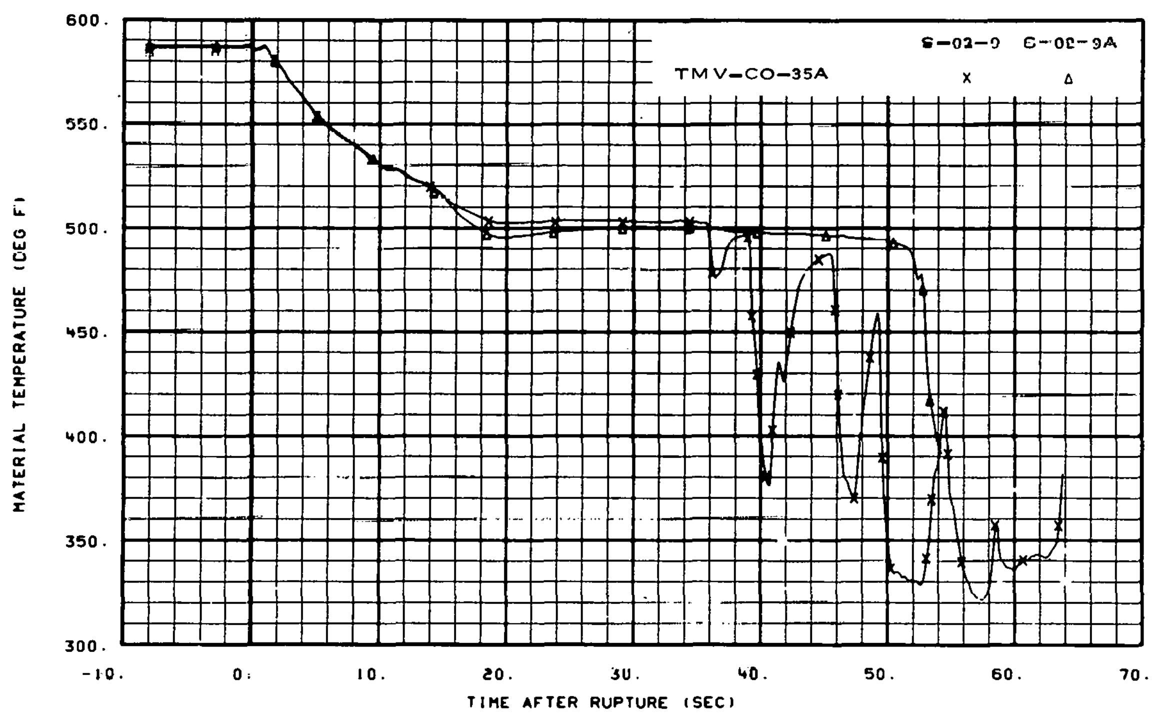

Fig. 60 Material temperature in core barrel (TMV-CO-35A).

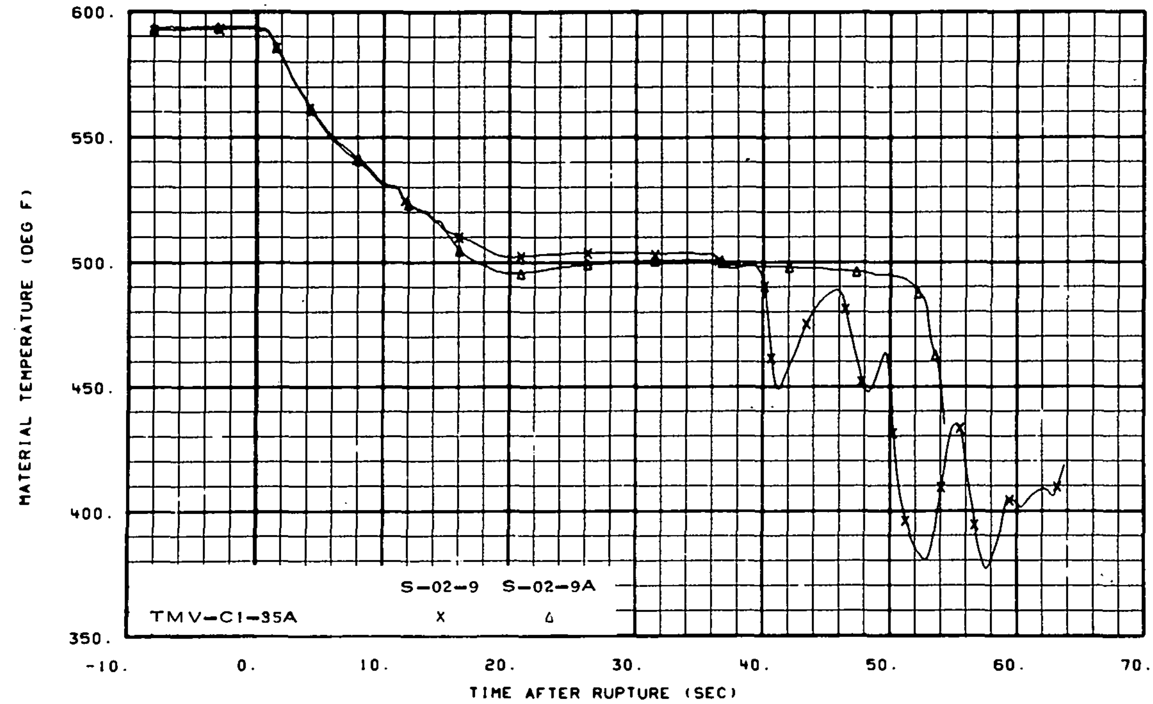

Fig. 61 Material temperature in core barrel (TMV-CI-35A).

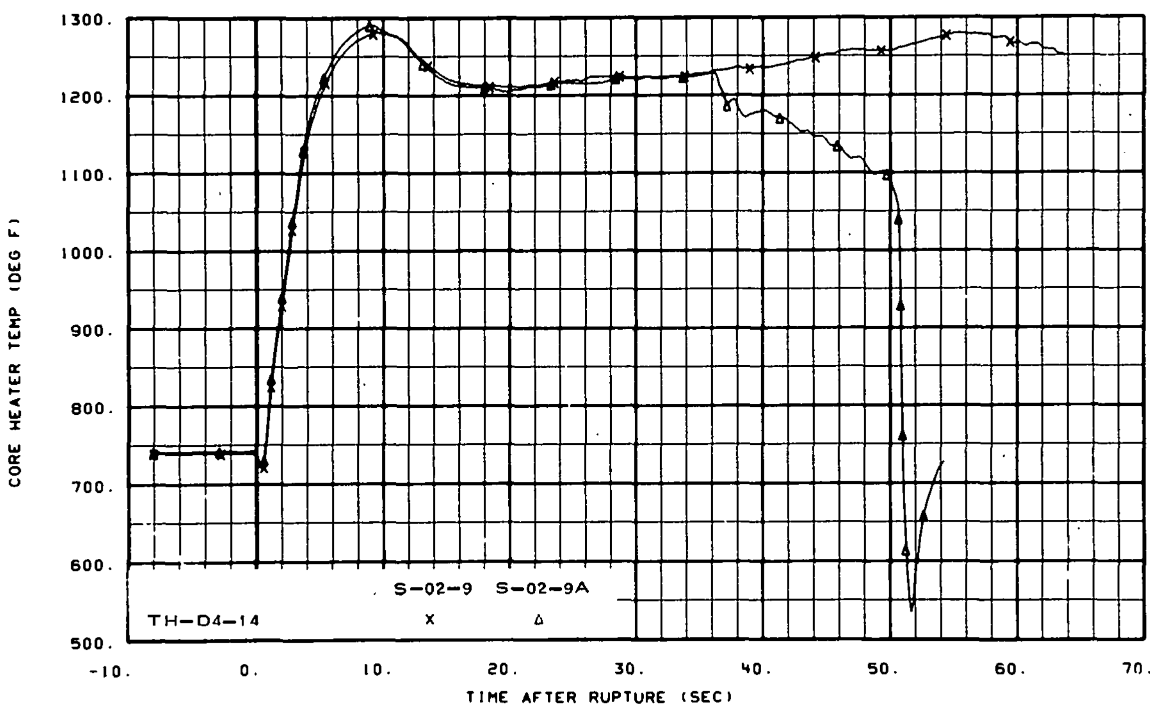

Fig. 62 Core heater temperature, Rod D-4 (TH-D4-14).

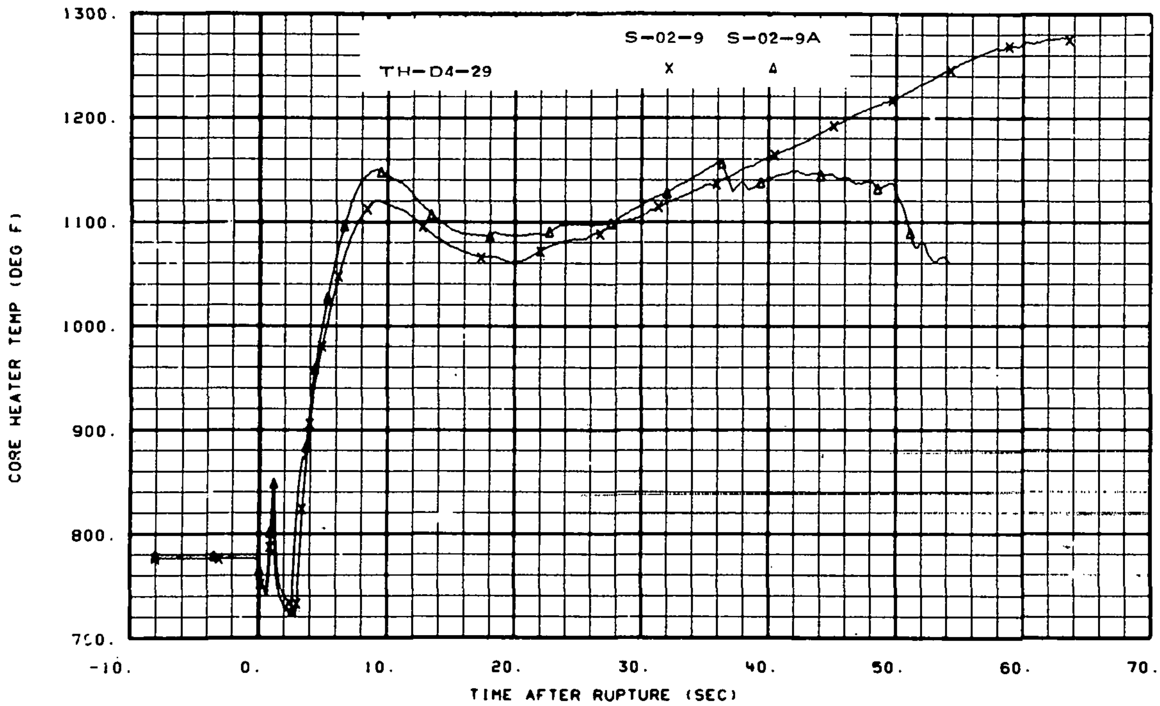

Fig. 63 Core heater temperature, Rod D-4 (TH-D4-29).

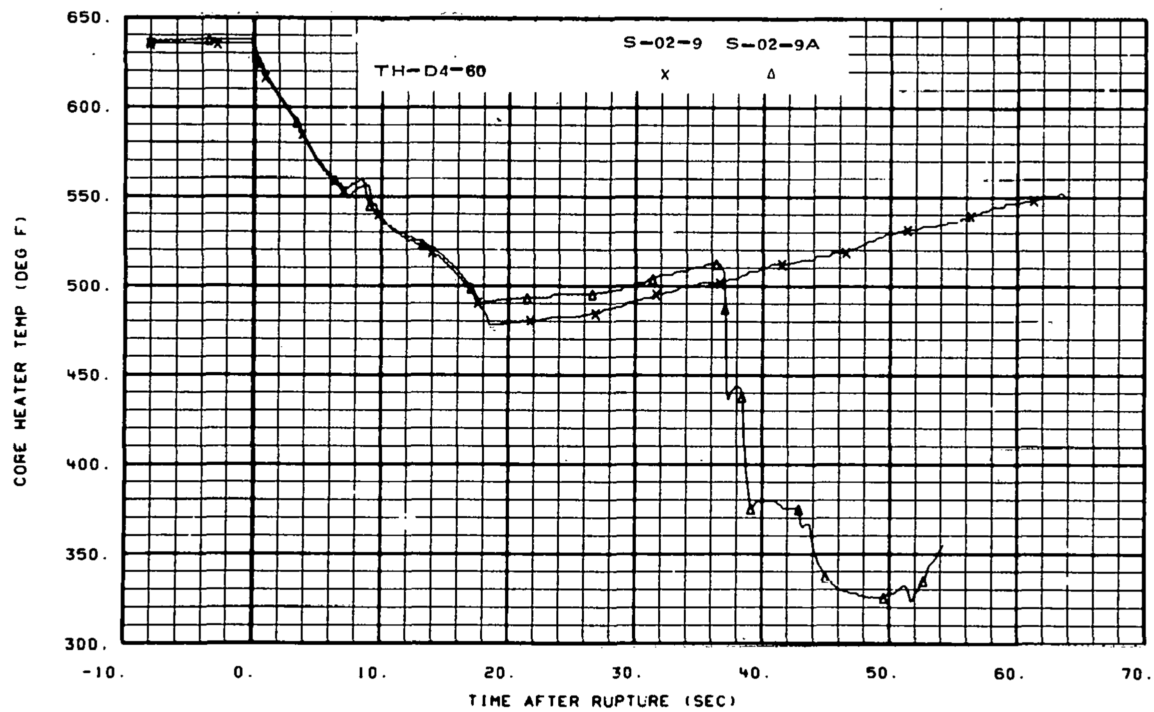

Fig. 64 Core heater temperature, Rod D-4 (TH-D4-60).

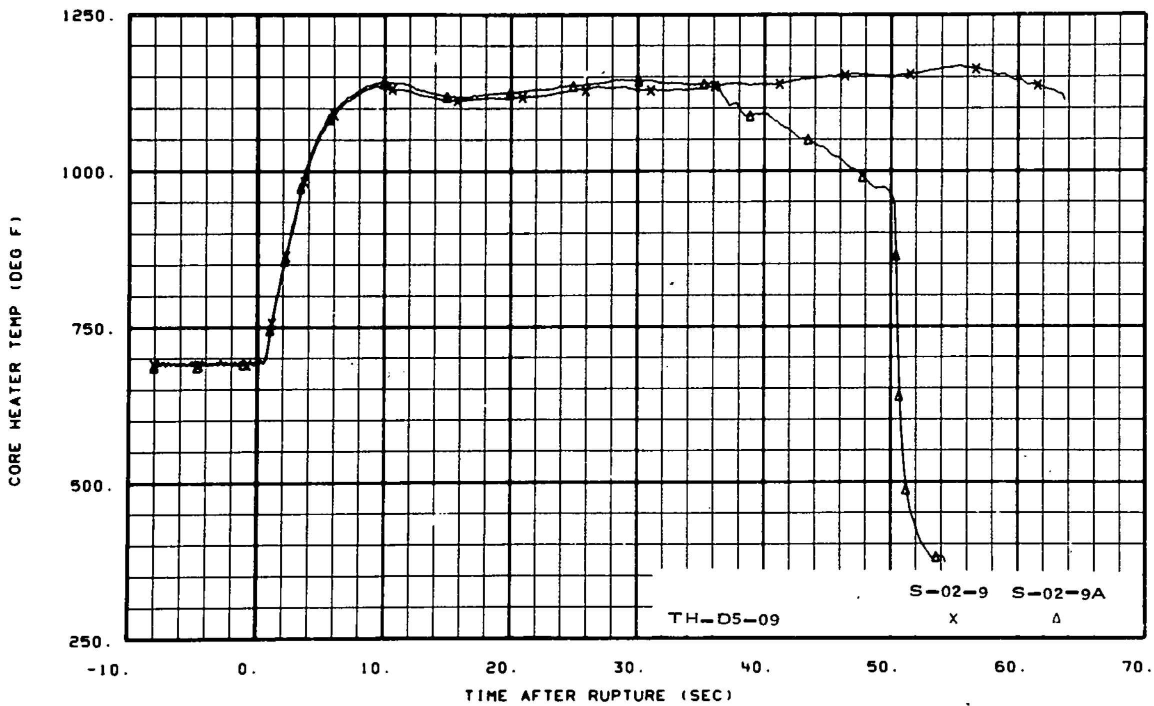

Fig. 65 Core heater temperature, Rod D-5 (TH-D5-09).

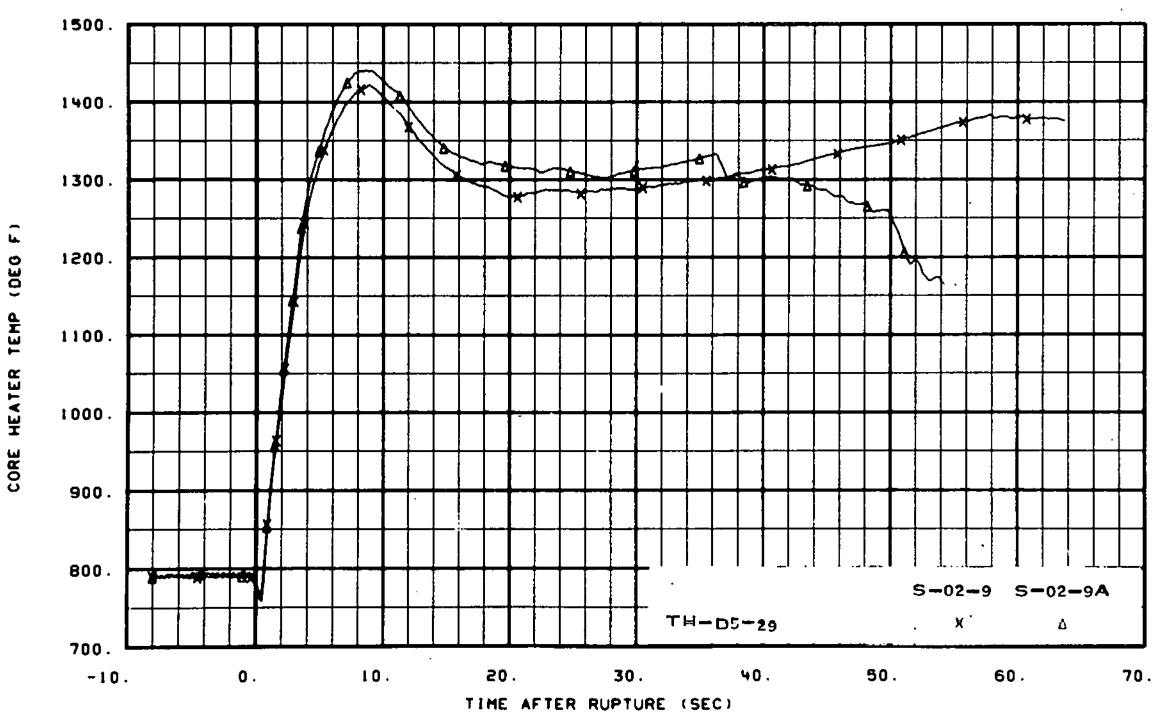

Fig. 66 Core heater temperature, Rod D-5 (TH-D5-29).

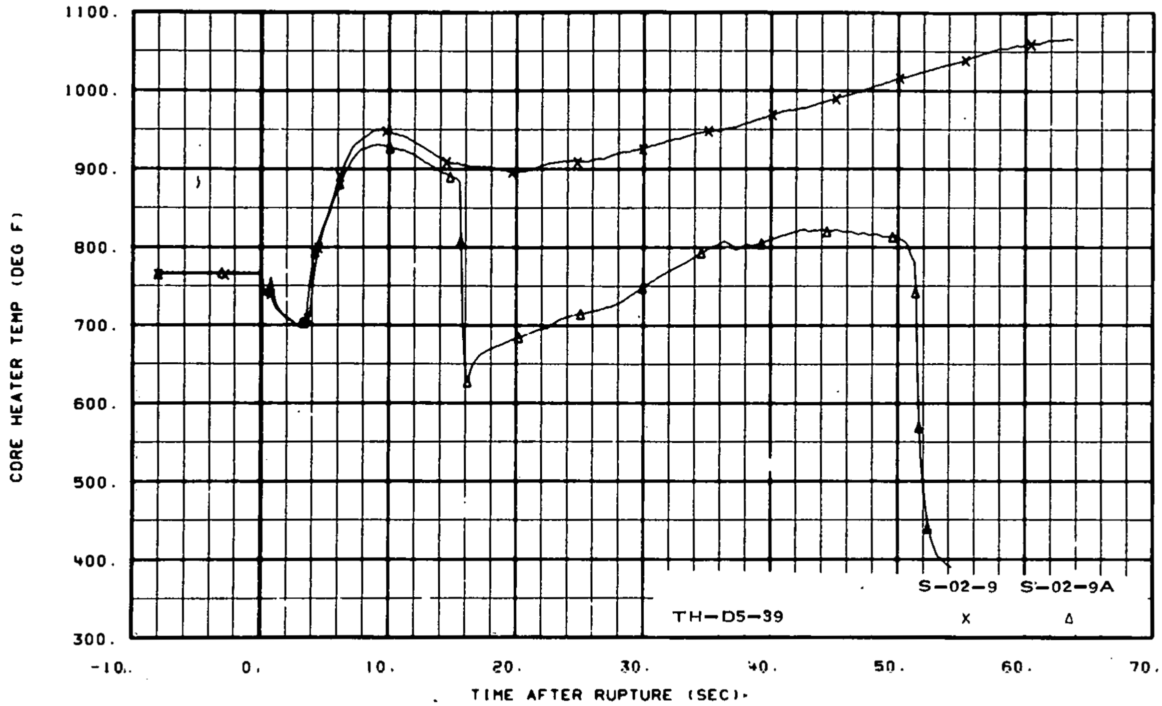

Fig. 67 Core heater temperature, Rod D-5 (TH-D5-39).

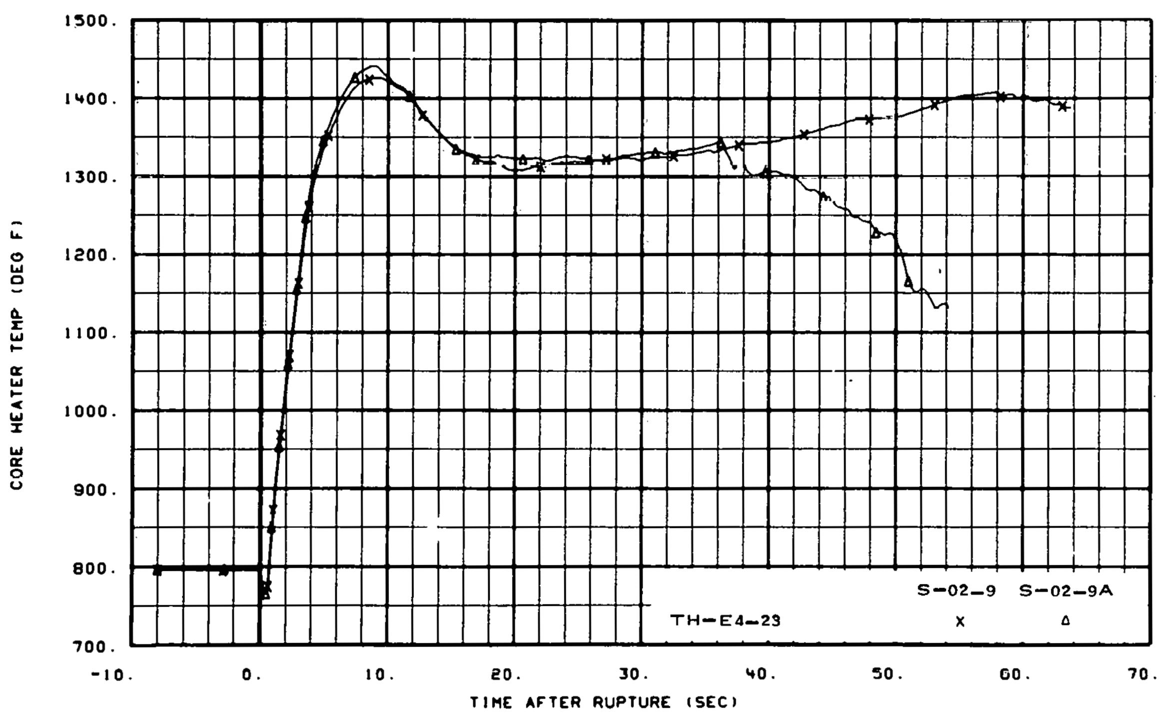

Fig. 68 Core heater temperature, Rod E-4 (TH-E4-23).

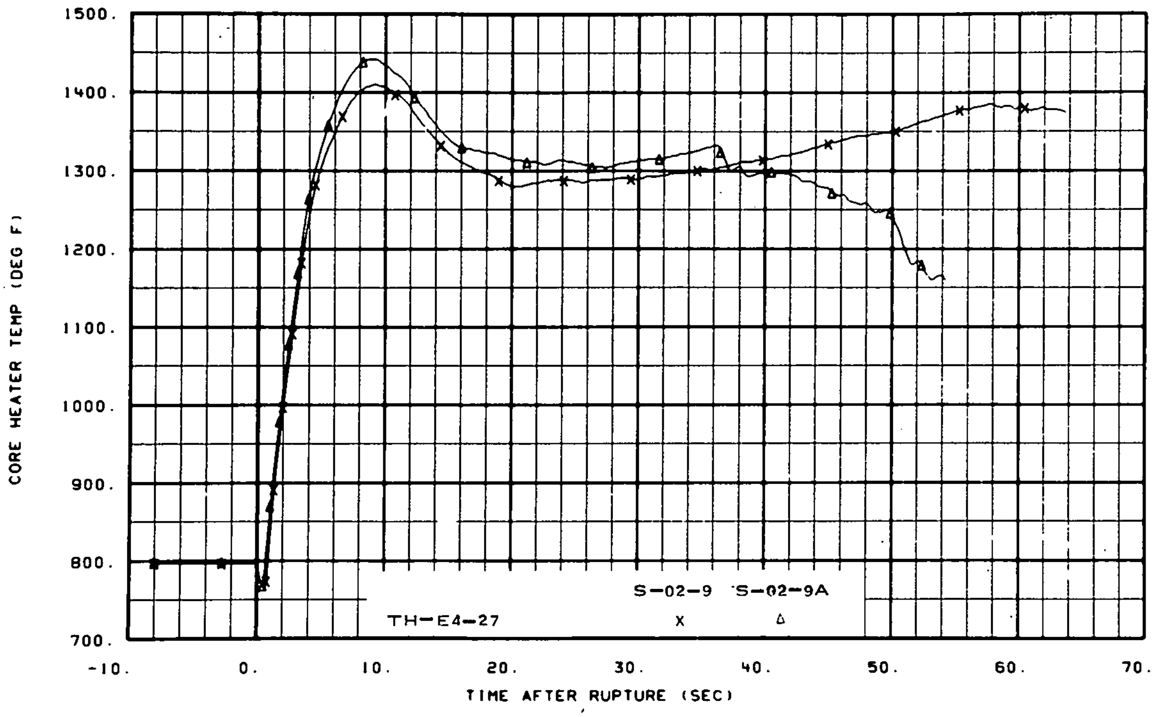

Fig. 69 Core heater temperature, Rod E-4 (TH-E4-27).

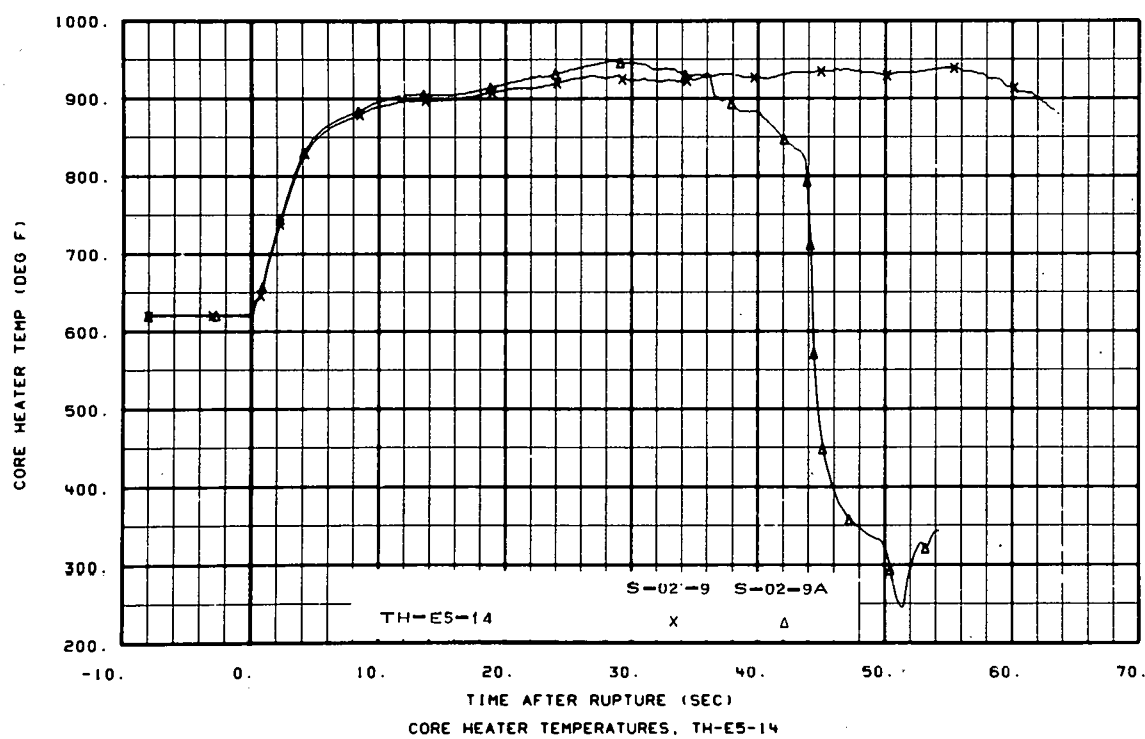

Fig. 70 Core heater temperature, Rod E-5 (TH-E5-14).

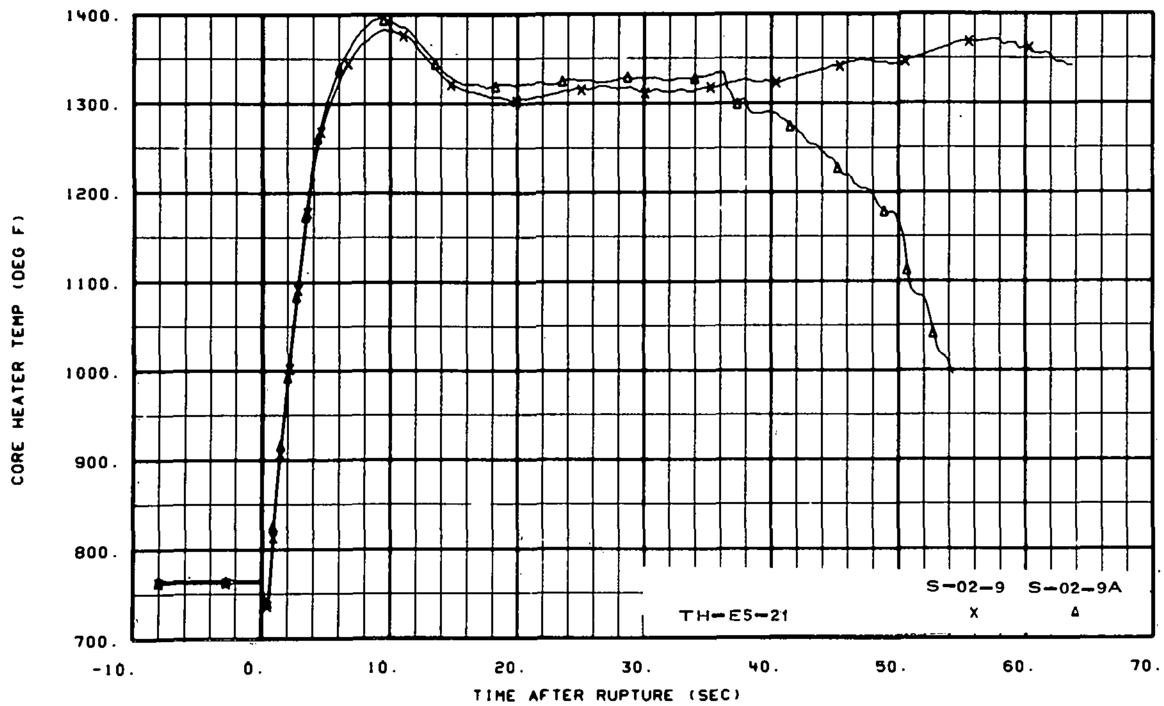

Fig. 71 Core heater temperature, Rod E-5 (TH-E5-21).

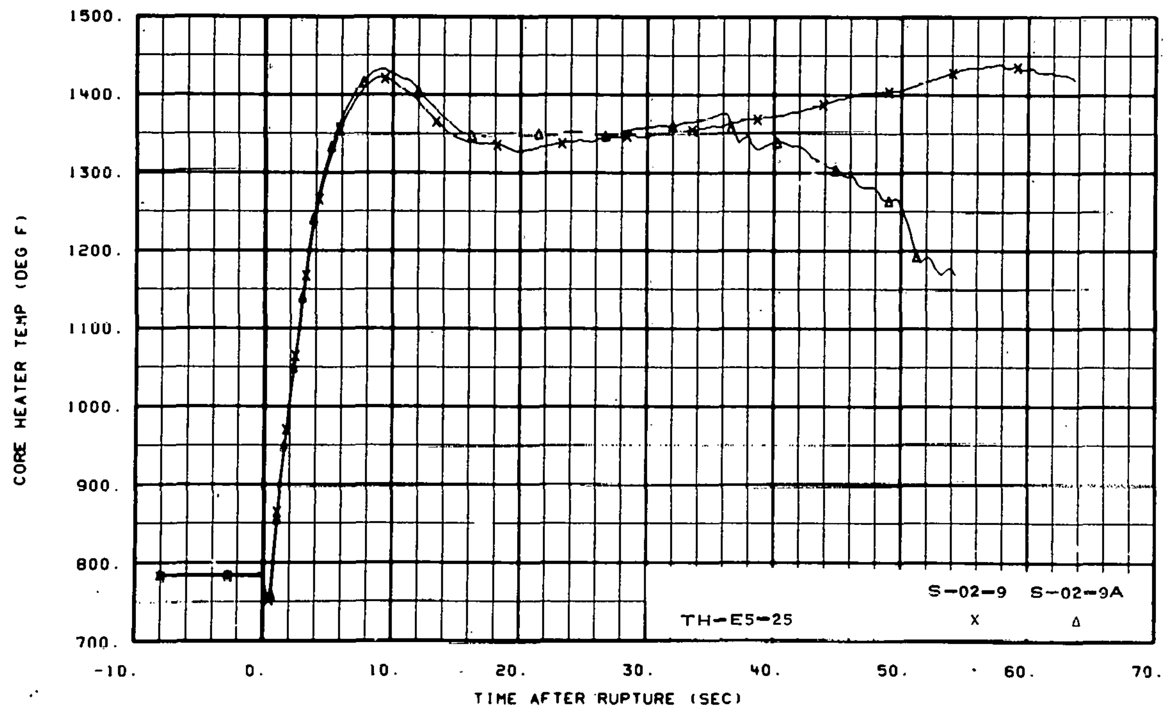

Fig. 72 Core heater temperature, Rod E-5 (TH-E5-25).

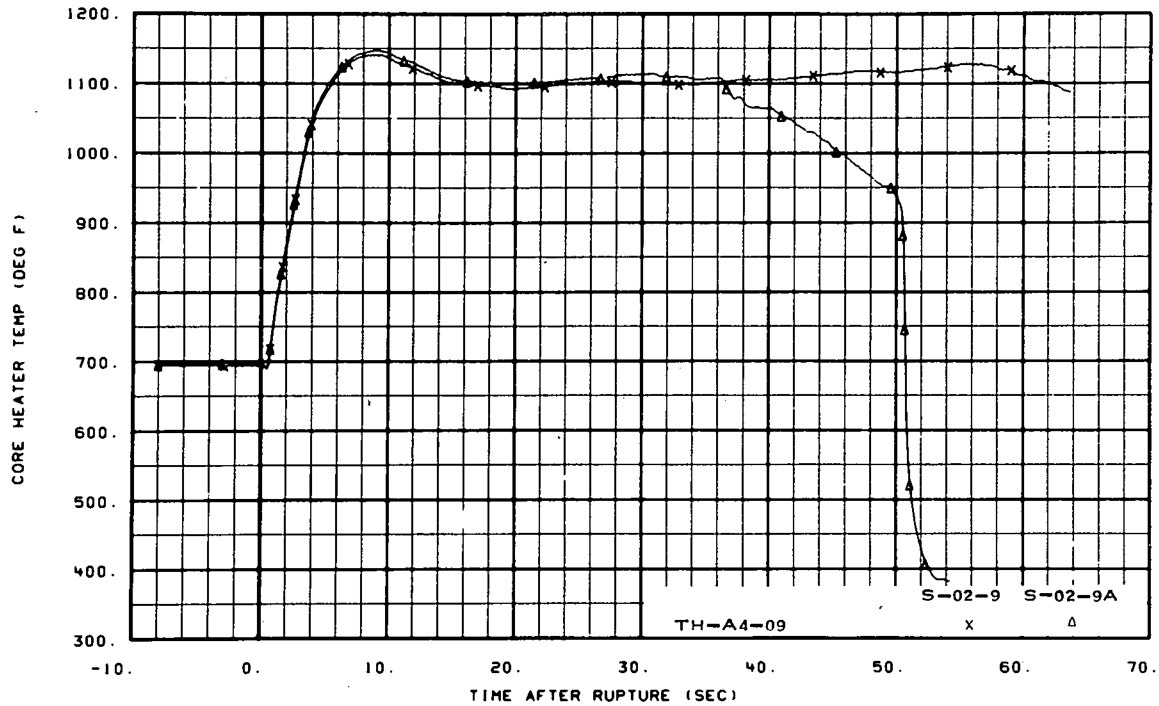

Fig. 73 Core heater temperature, Rod A-4 (TH-A4-09).

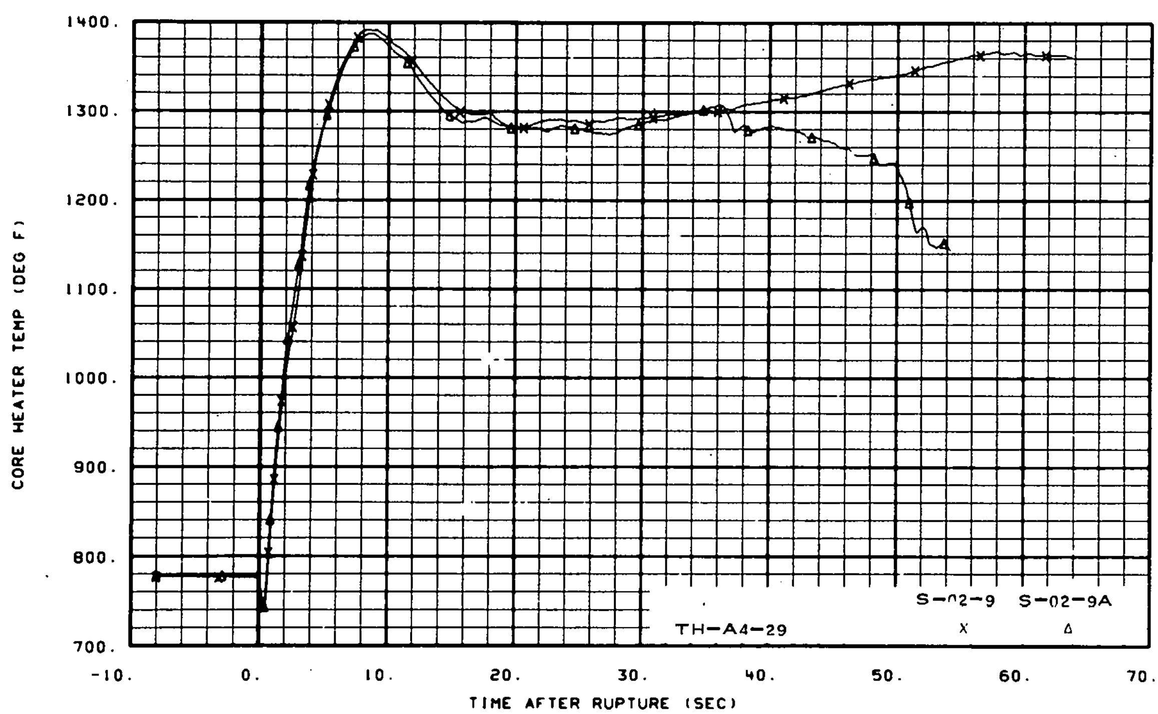

Fig. 74 Core heater temperature, Rod A-4 (TH-A4-29).

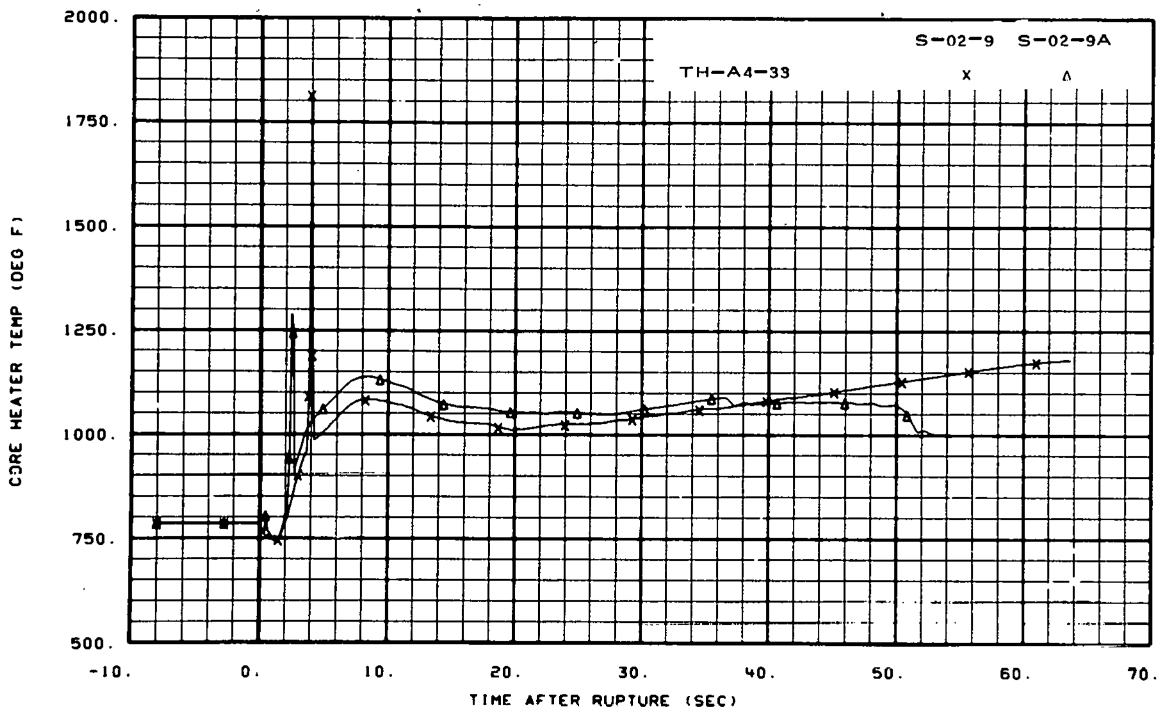

Fig. 75 Core heater temperature, Rod A-4 (TH-A4-33).

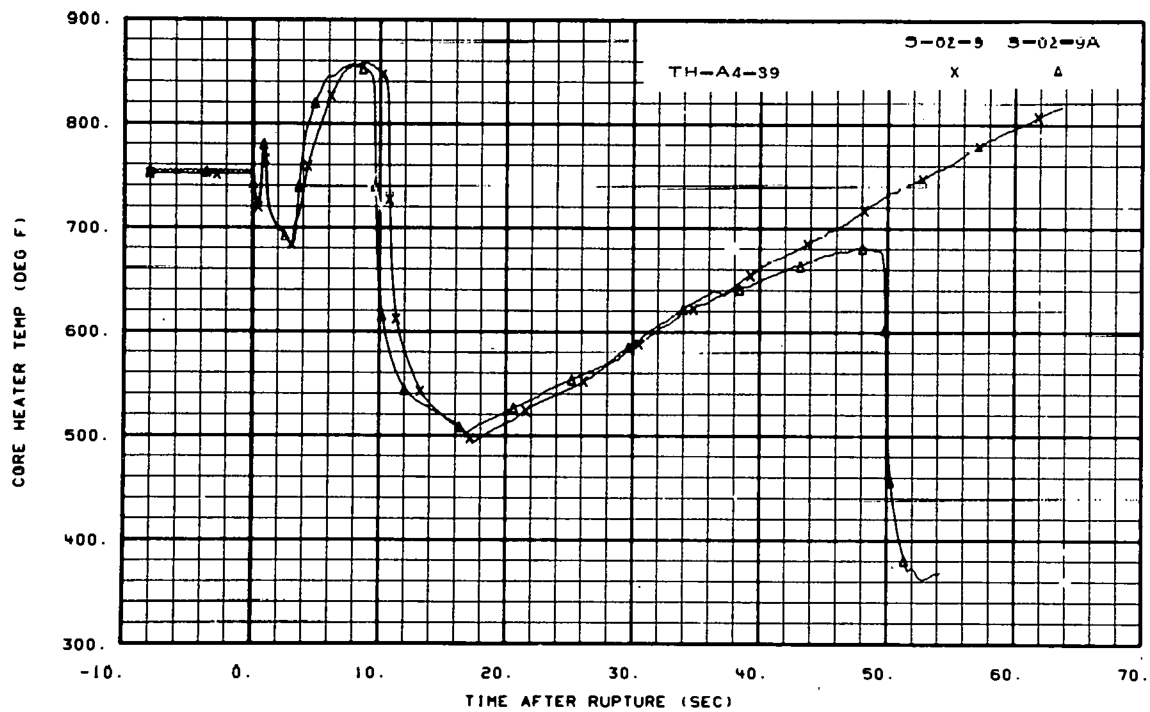

Fig. 76 Core heater temperature, Rod A-4 (TH-A4-39).

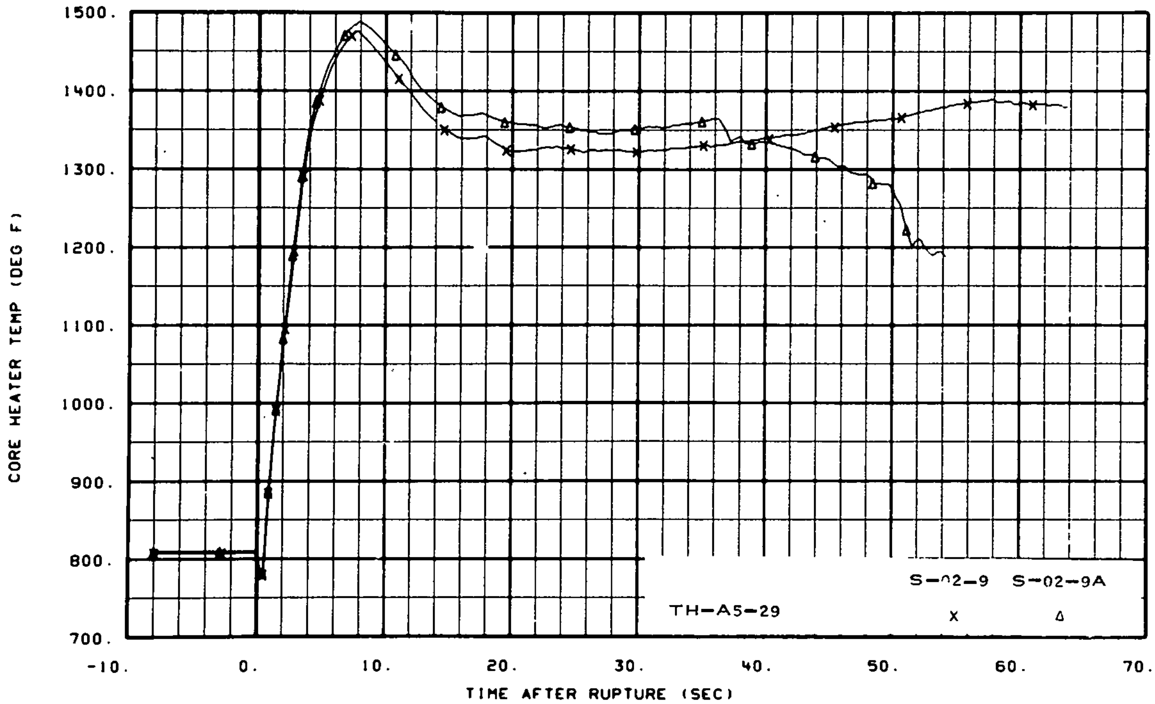

Fig. 77 Core heater temperature, Rod A-5.

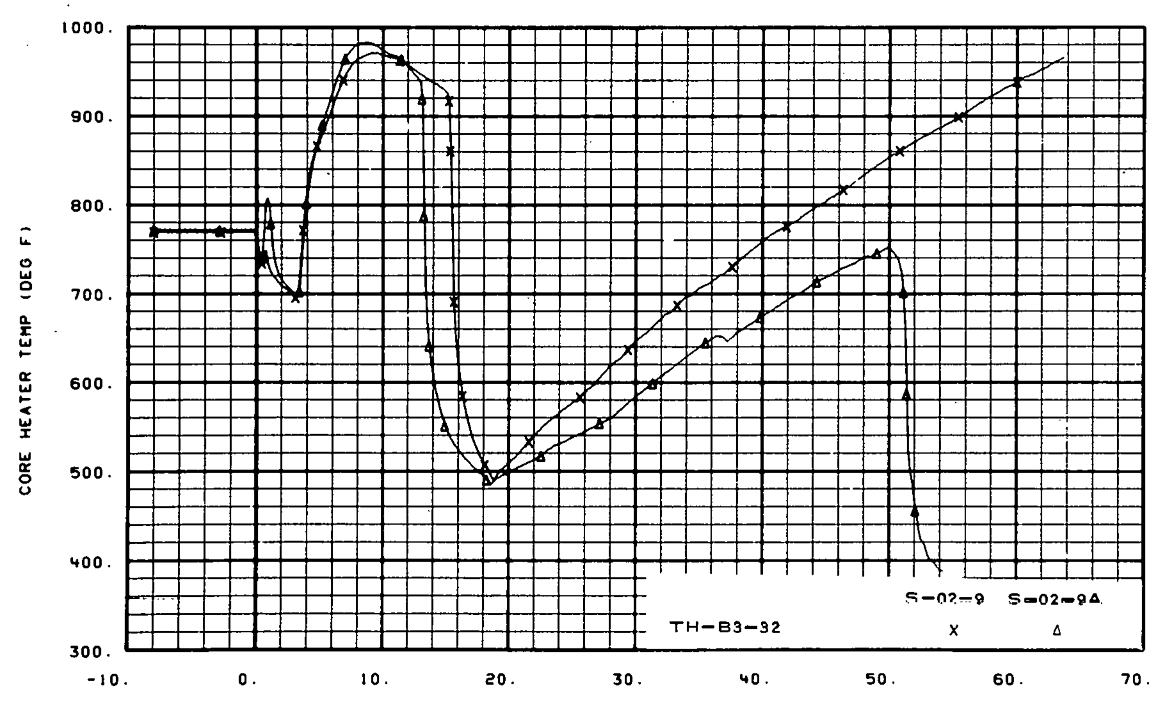

Fig. 78 Core heater temperature, Rod B-3.

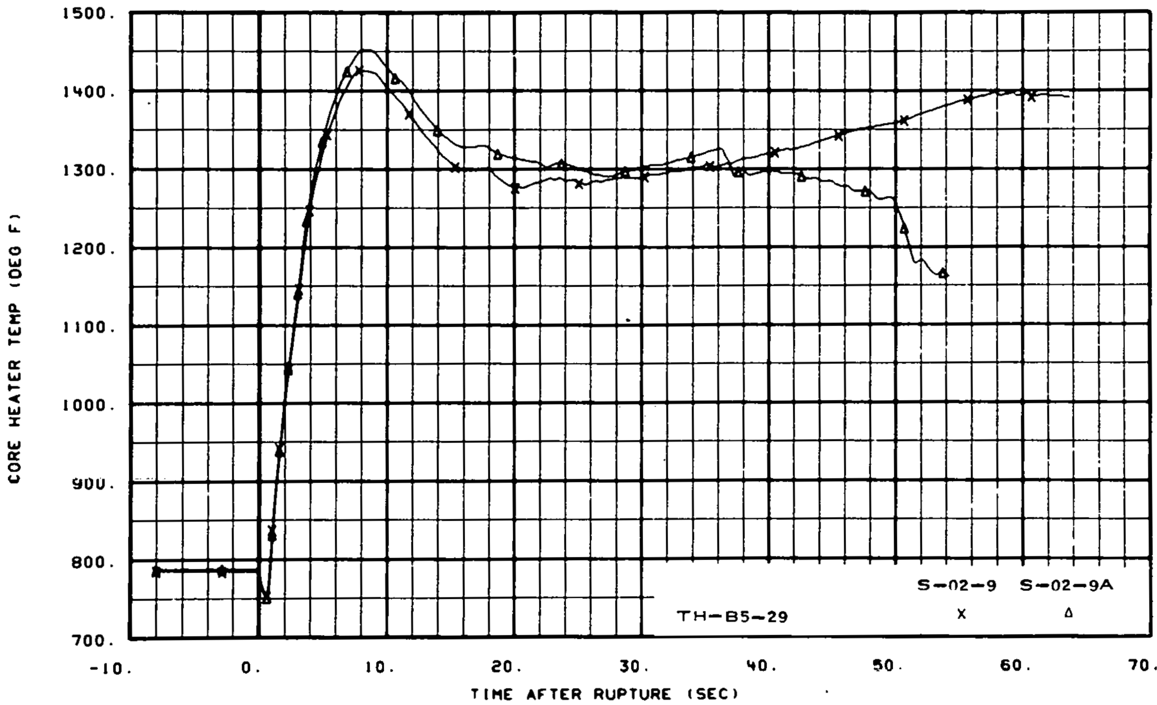

Fig. 79 Core heater temperature, Rod B-5.

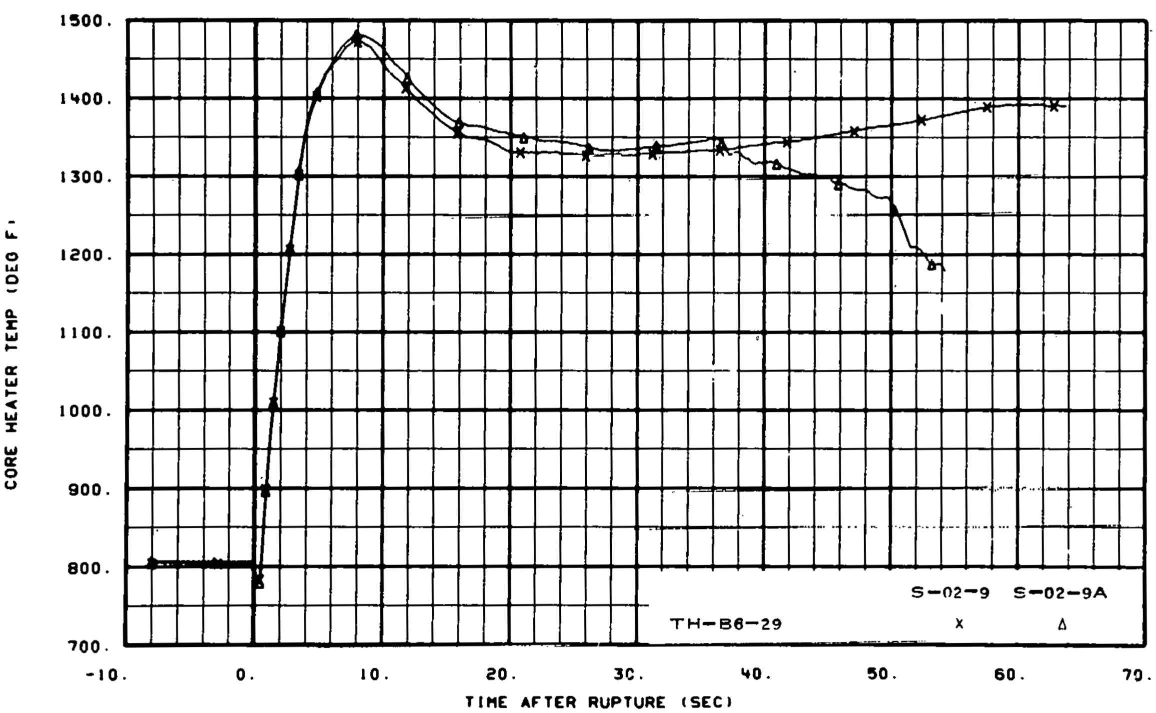

Fig. 80 Core heater temperature, Rod B-6.

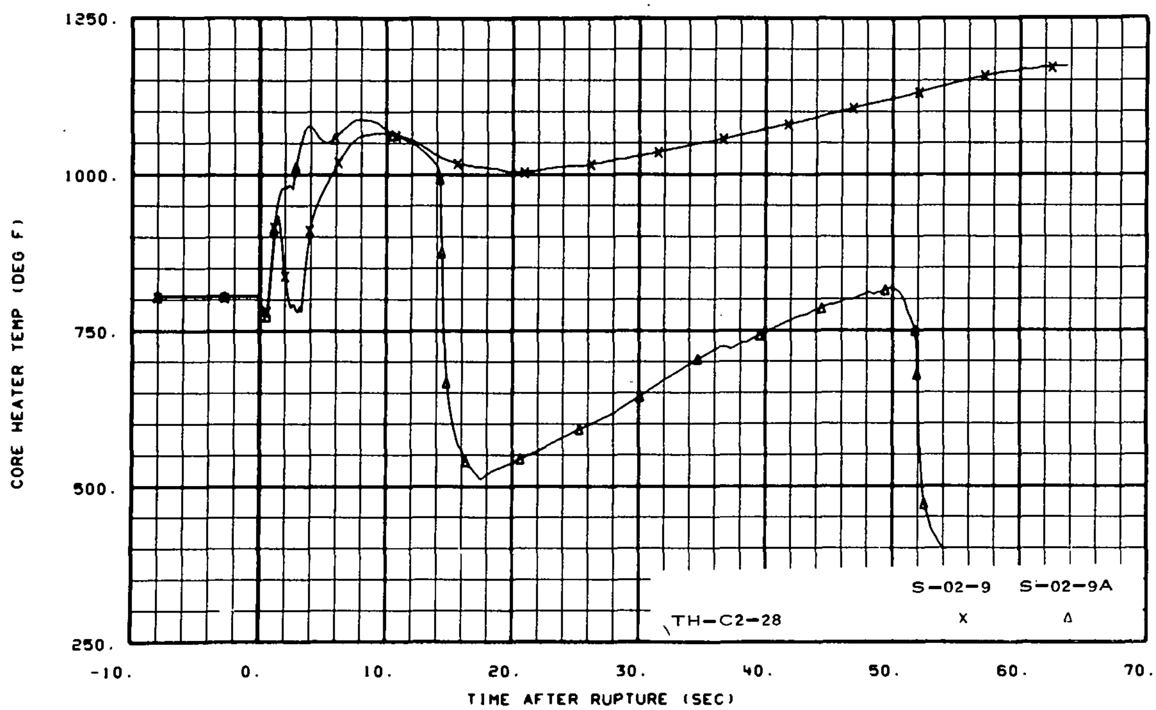

Fig. 81 Core heater temperature, Rod C-2.

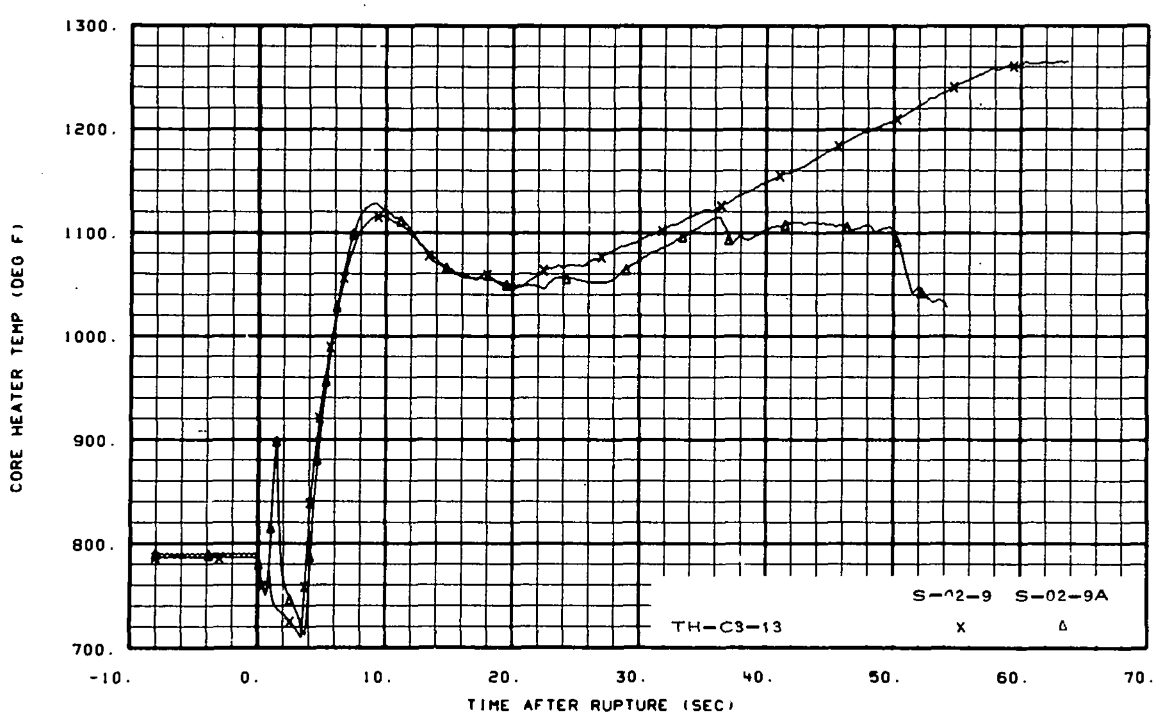

Fig. 82 Core heater temperature, Rod C-3 (TH-C3-13).

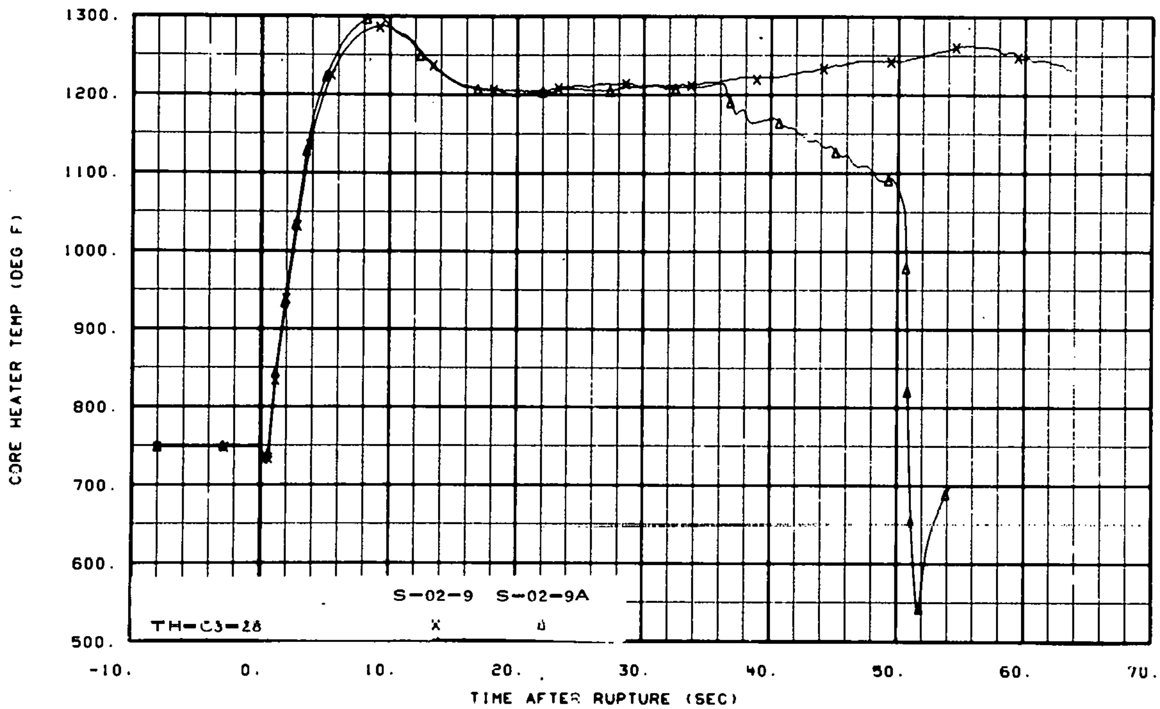

Fig. 83 Core heater temperature, Rod C-3 (TH-C3-28).

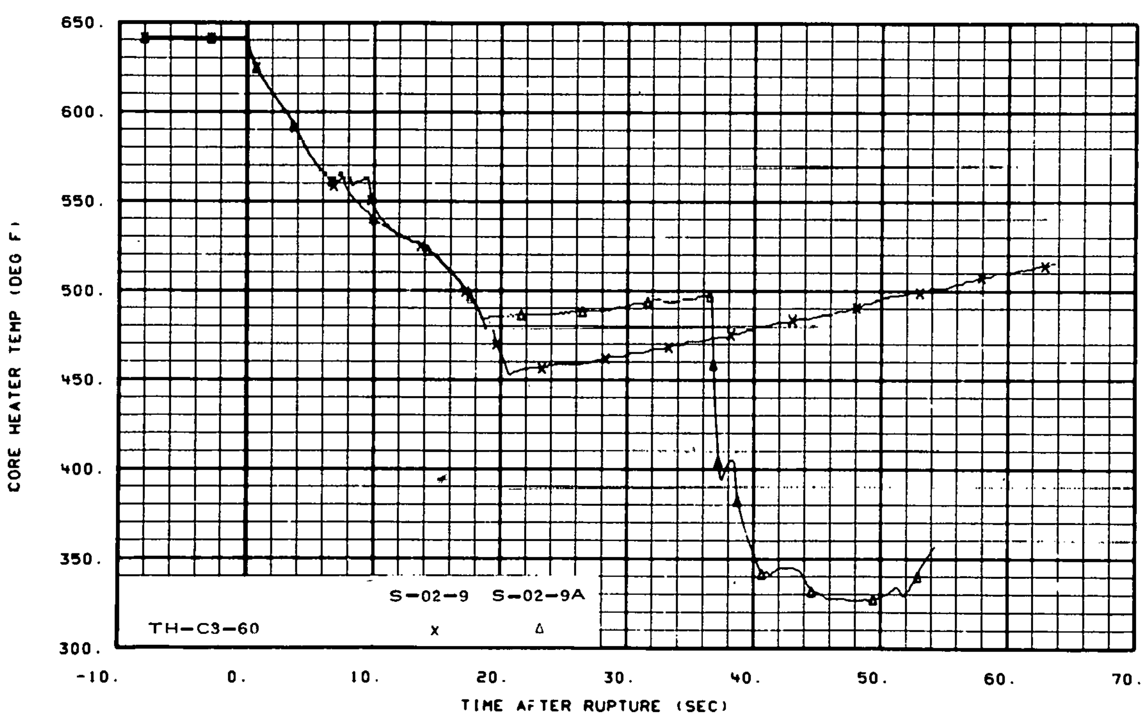

Fig. 84 Core heater temperature, Rod C-3 (TH-C3-60).

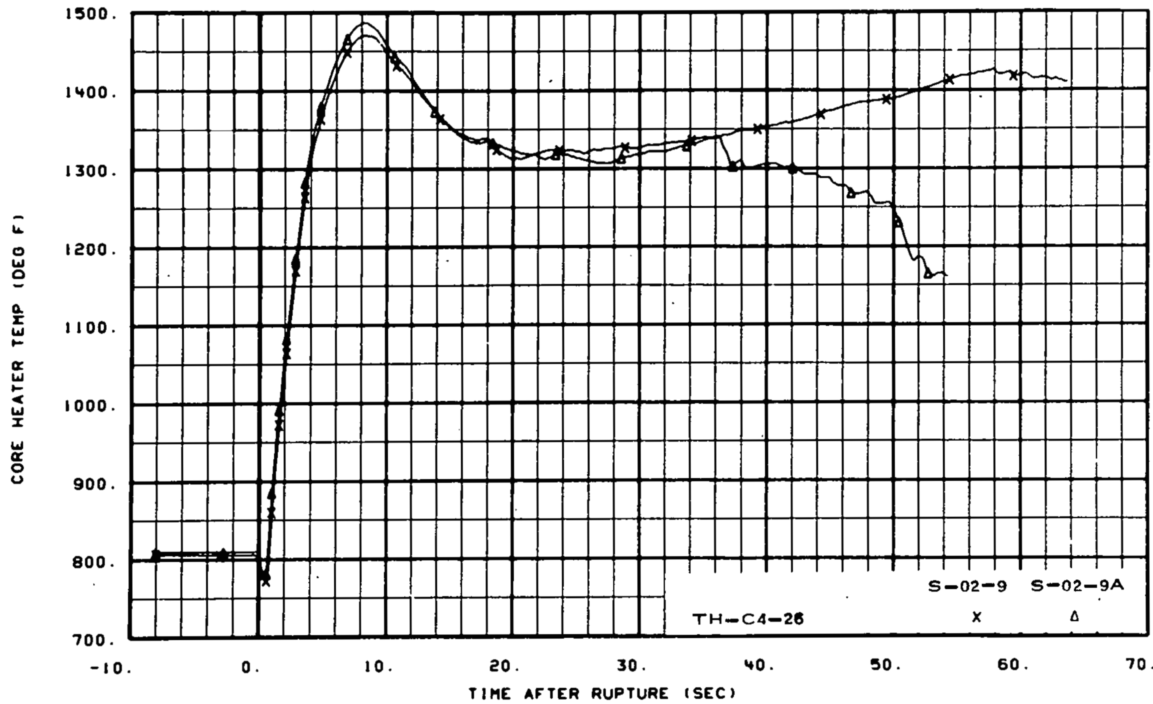

Fig. 85 Core heater temperature, Rod C-4.

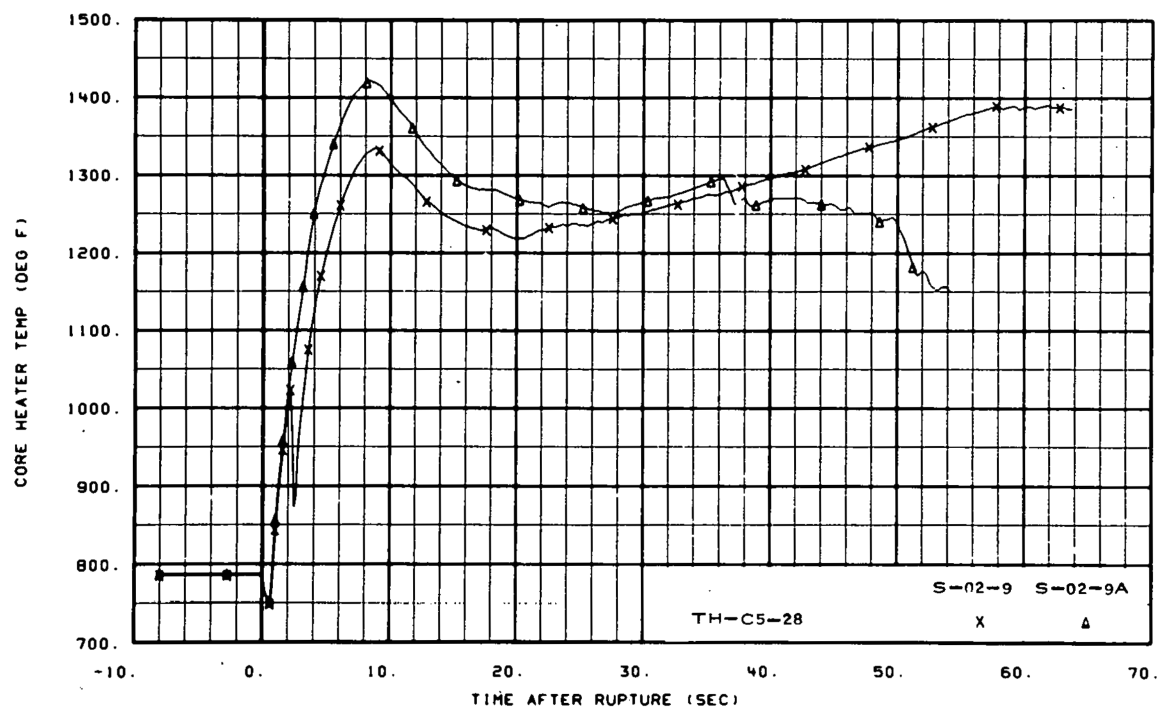

Fig. 86 Core heater temperature, Rod C-5.

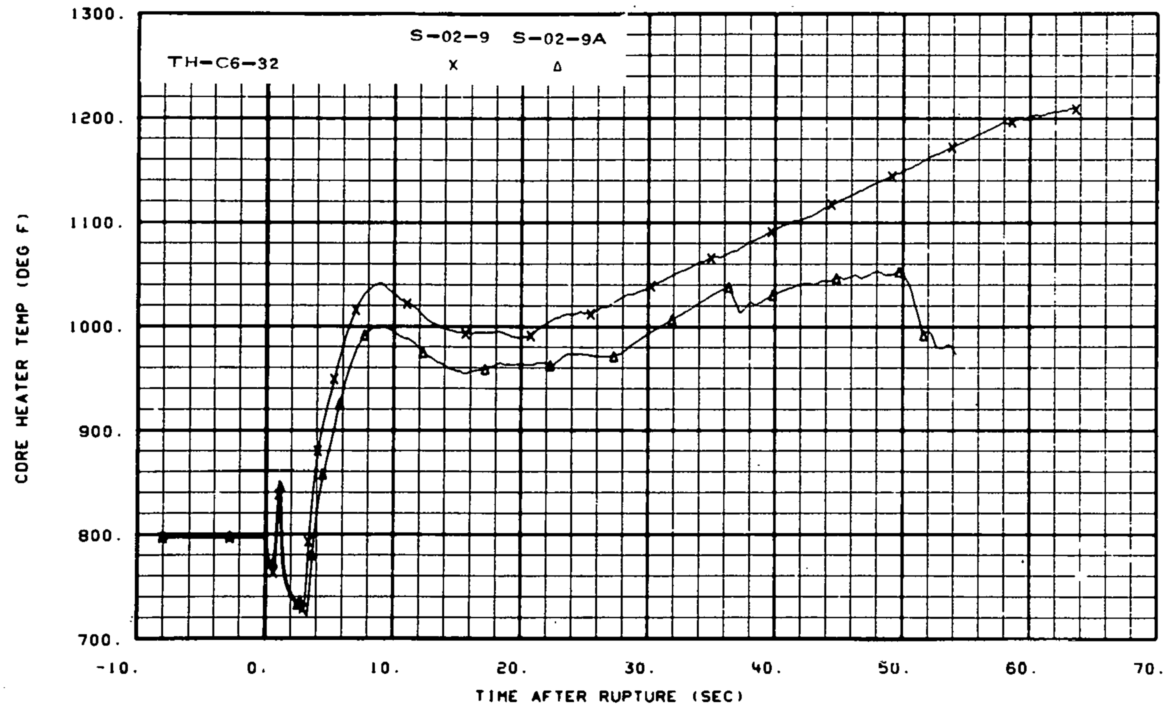

Fig. 87 Core heater temperature, Rod C-6.

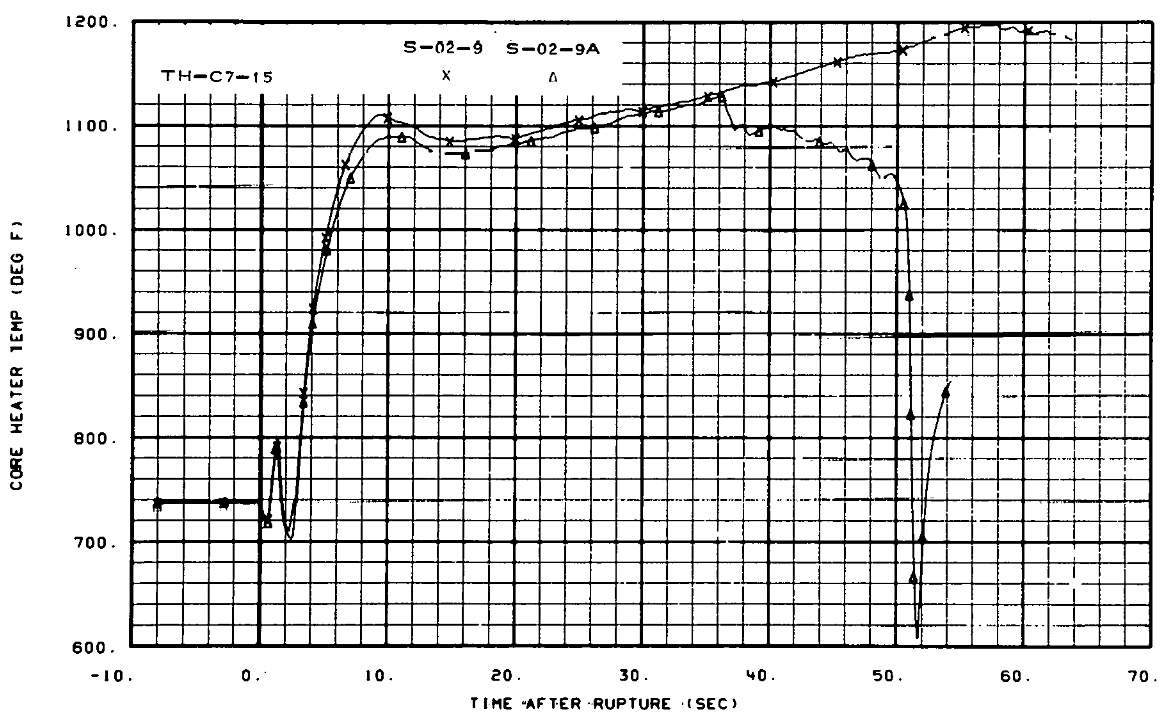

Fig. 88 Core heater temperature, Rod C-7.

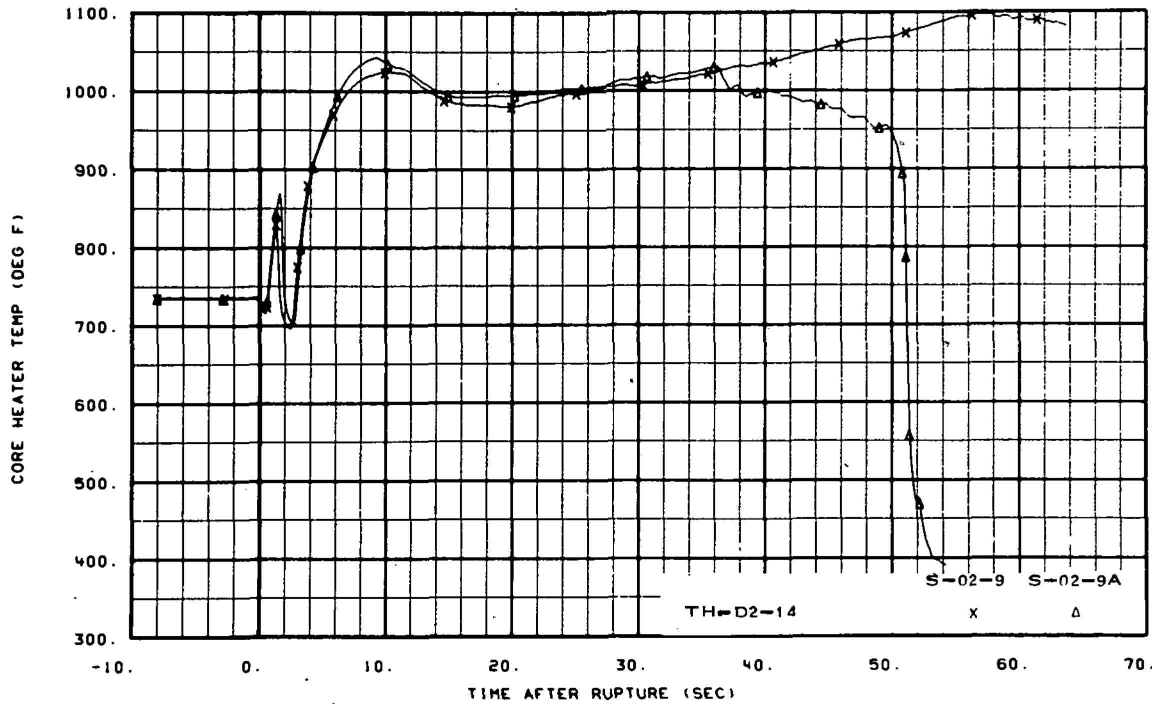

Fig. 89 Core heater temperature, Rod D-2.

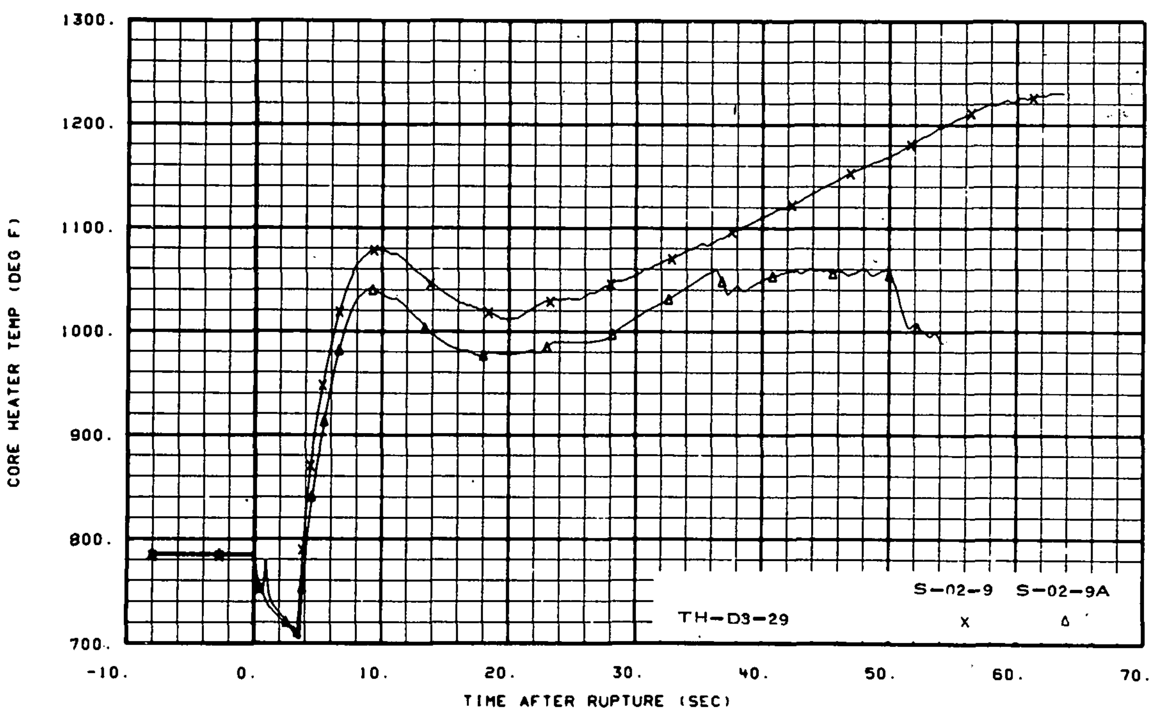

Fig. 90 Core heater temperature, Rod D-3.

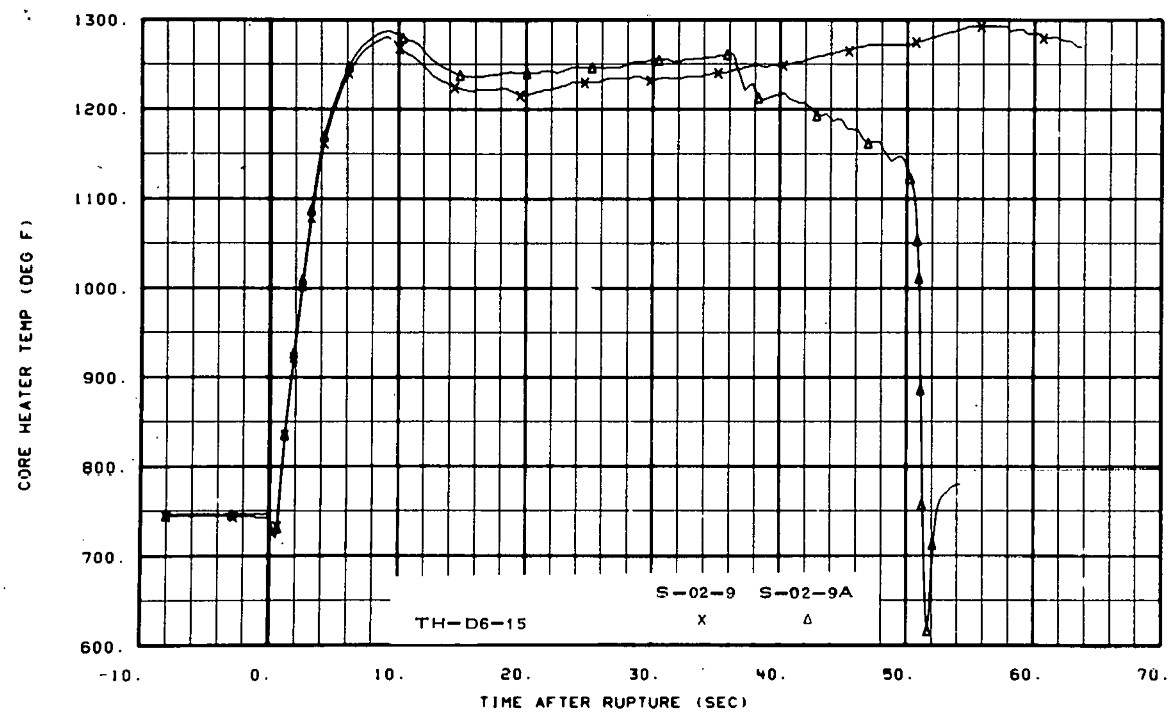

Fig. 91 Core heater temperature, Rod D-6 (TH-D6-15).

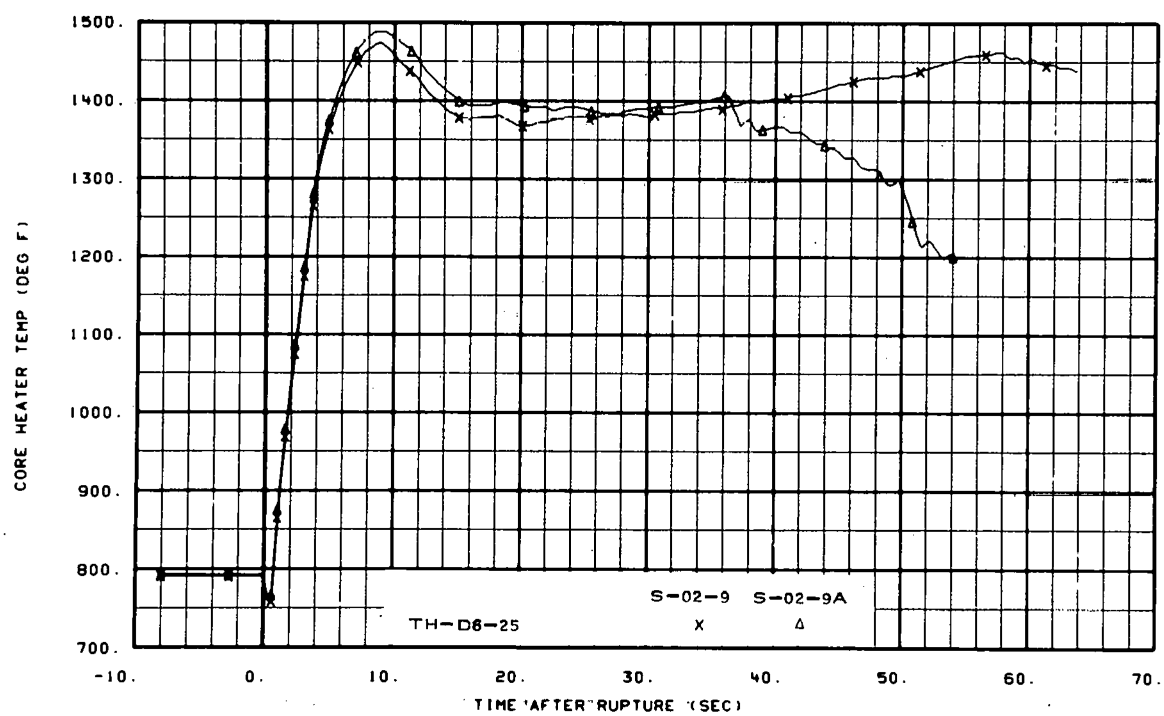

Fig. 92 Core heater temperature, Rod D-6 (TH-D6-25).

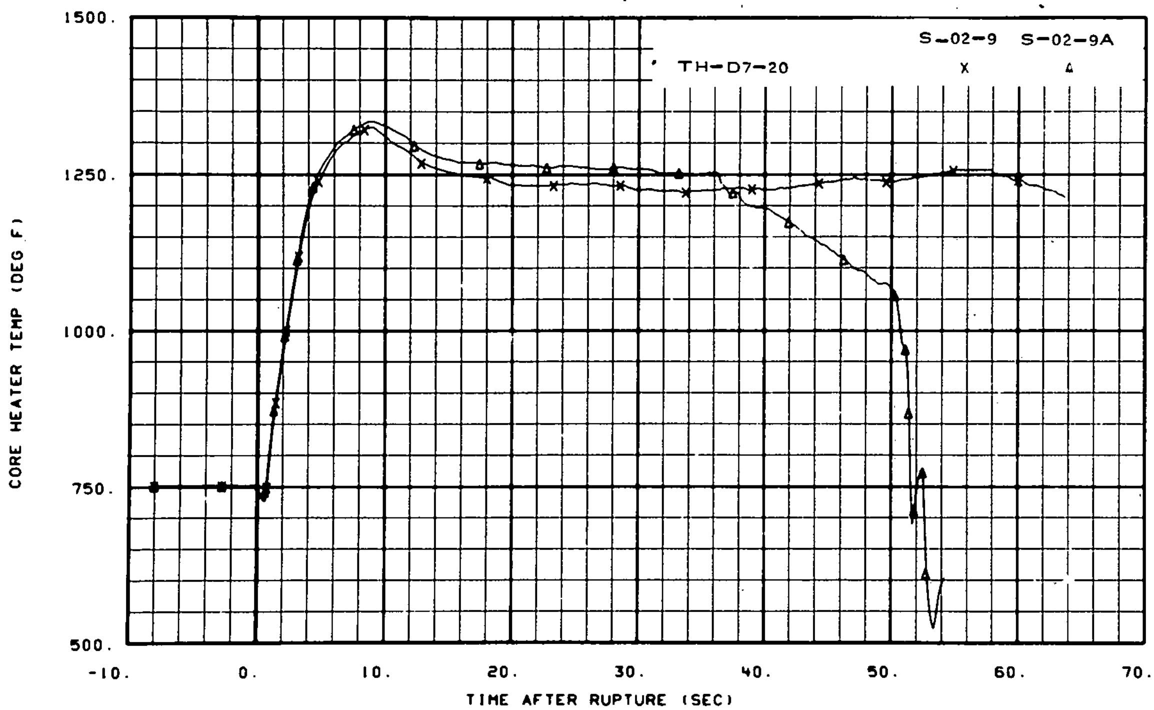

Fig. 93 Core heater temperature, Rod D-7.

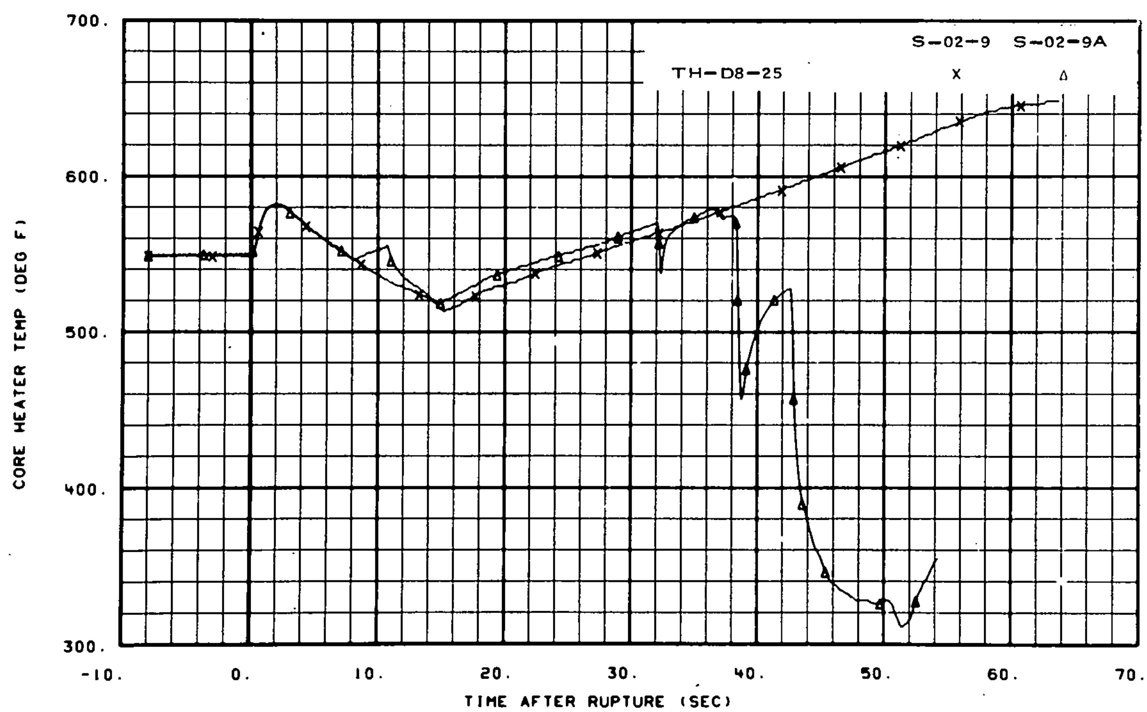

Fig. 94 Core heater temperature, Rod D-8.

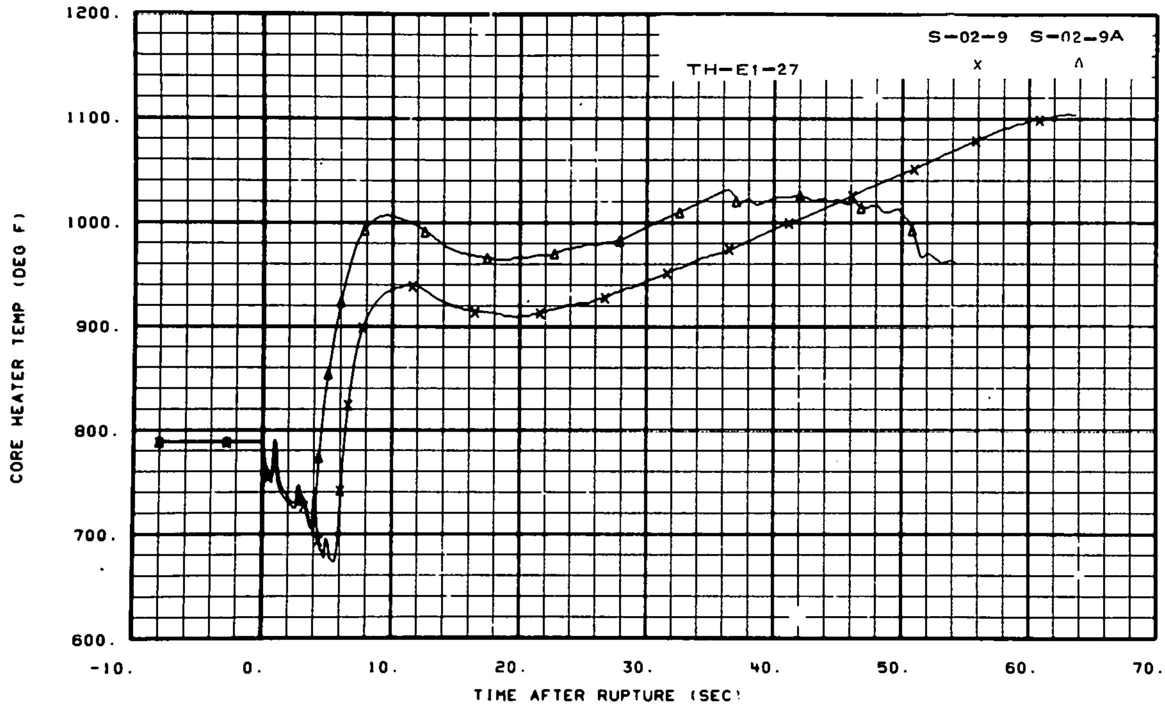

Fig. 95 Core heater temperature, Rod E-1 (TH-E1-27).

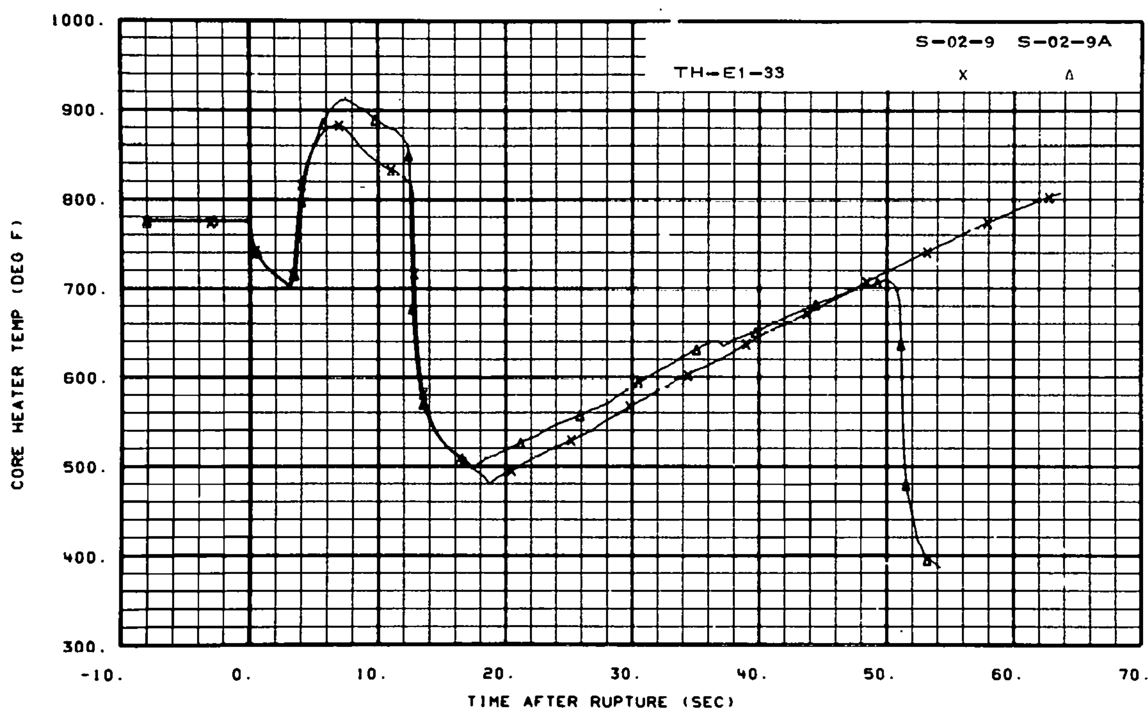

Fig. 96 Core heater temperature, Rod E-1 (TH-E1-33).

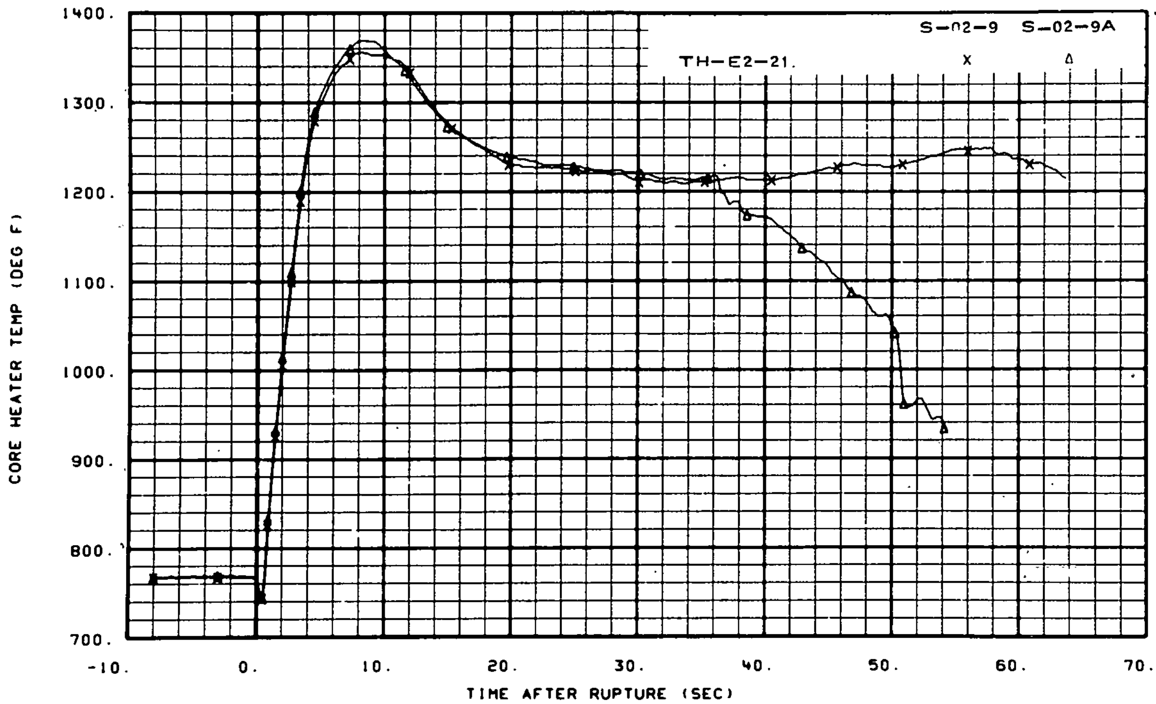

Fig. 97 Core heater temperature, Rod E-2 (TH-E2-21).

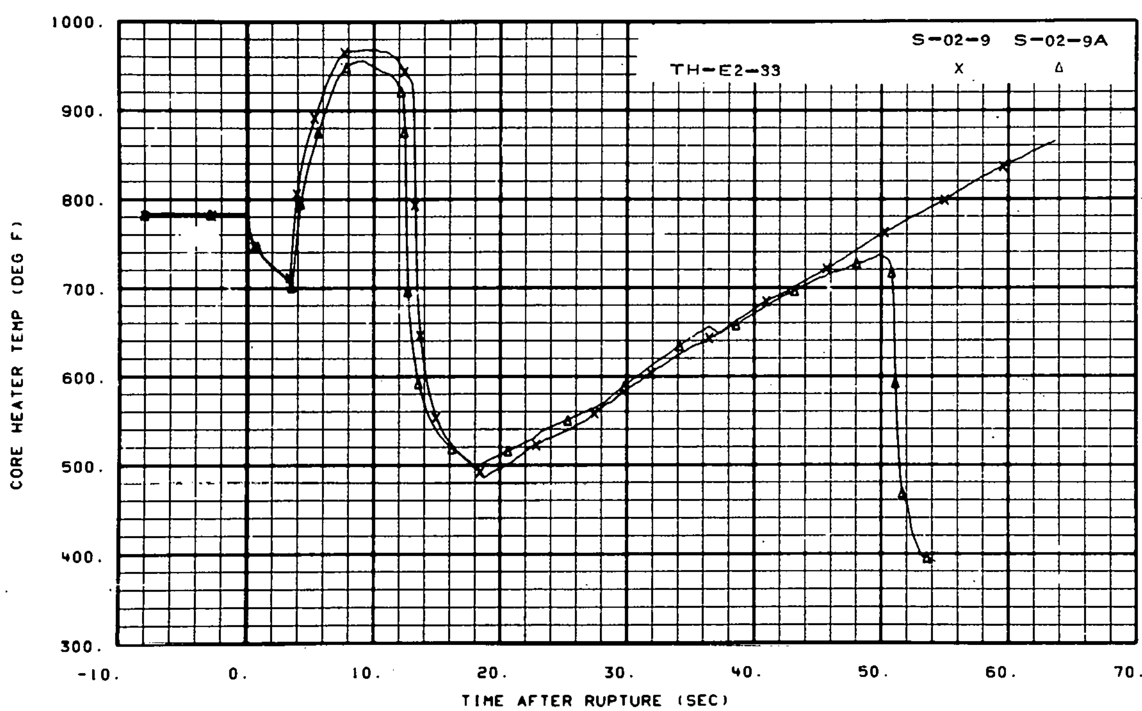

Fig. 98 Core heater temperature, Rod E-2 (TH-E2-33).

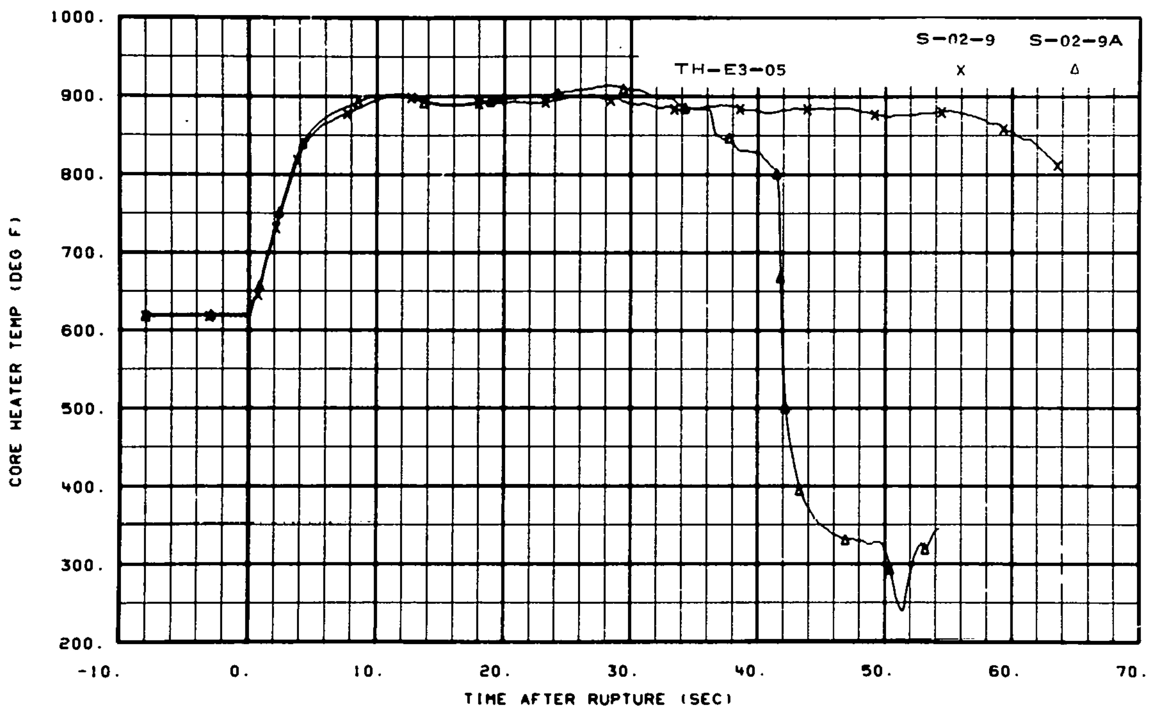

Fig. 99 Core heater temperature, Rod E-3 (TH-E3-05).

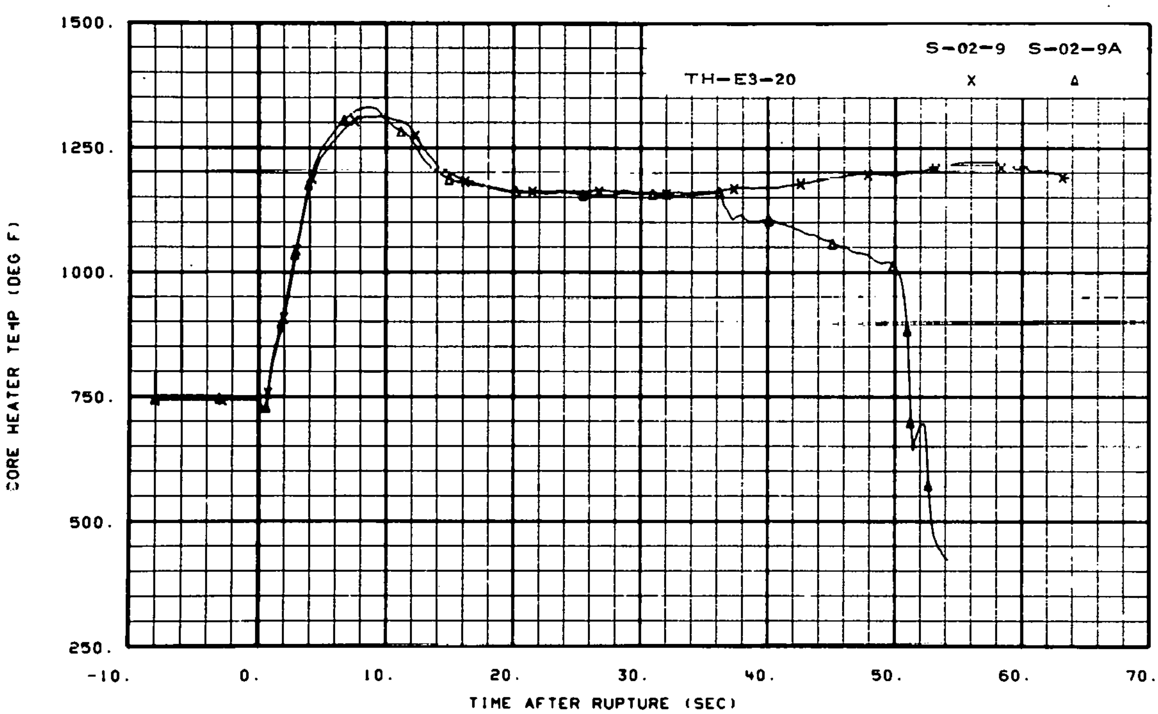

Fig. 100 Core heater temperature, Rod E-3 (TH-E3-20).

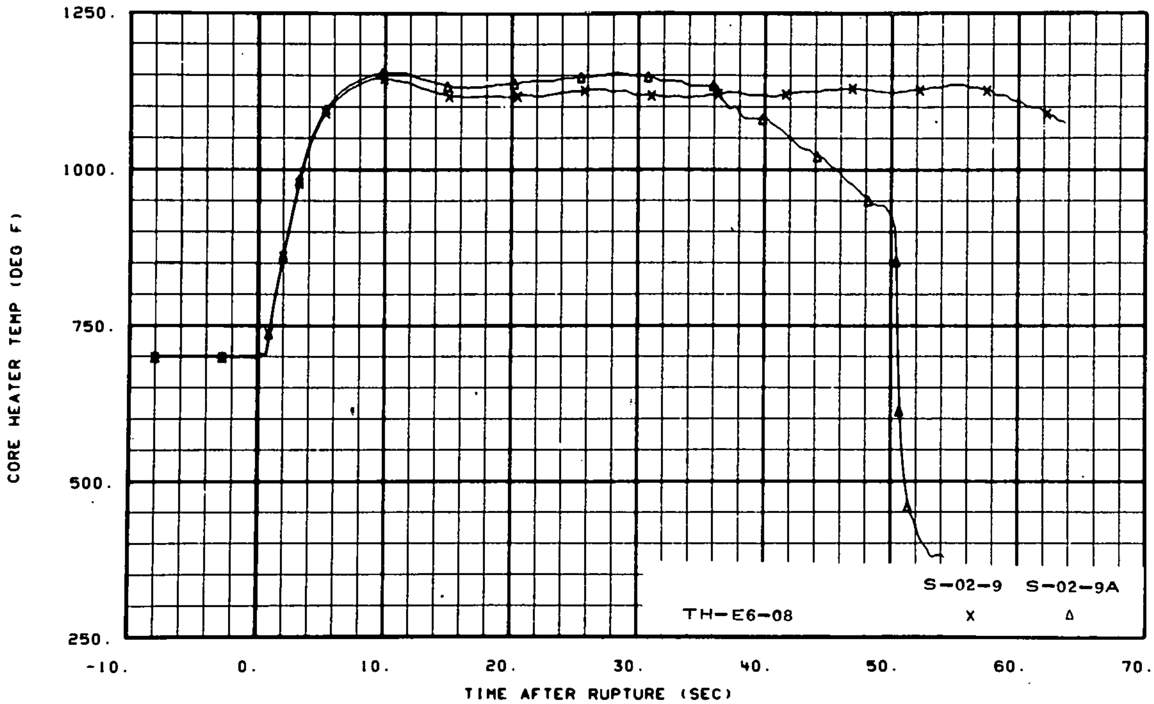

Fig. 101 Core heater temperature, Rod E-6 (TH-E6-08).

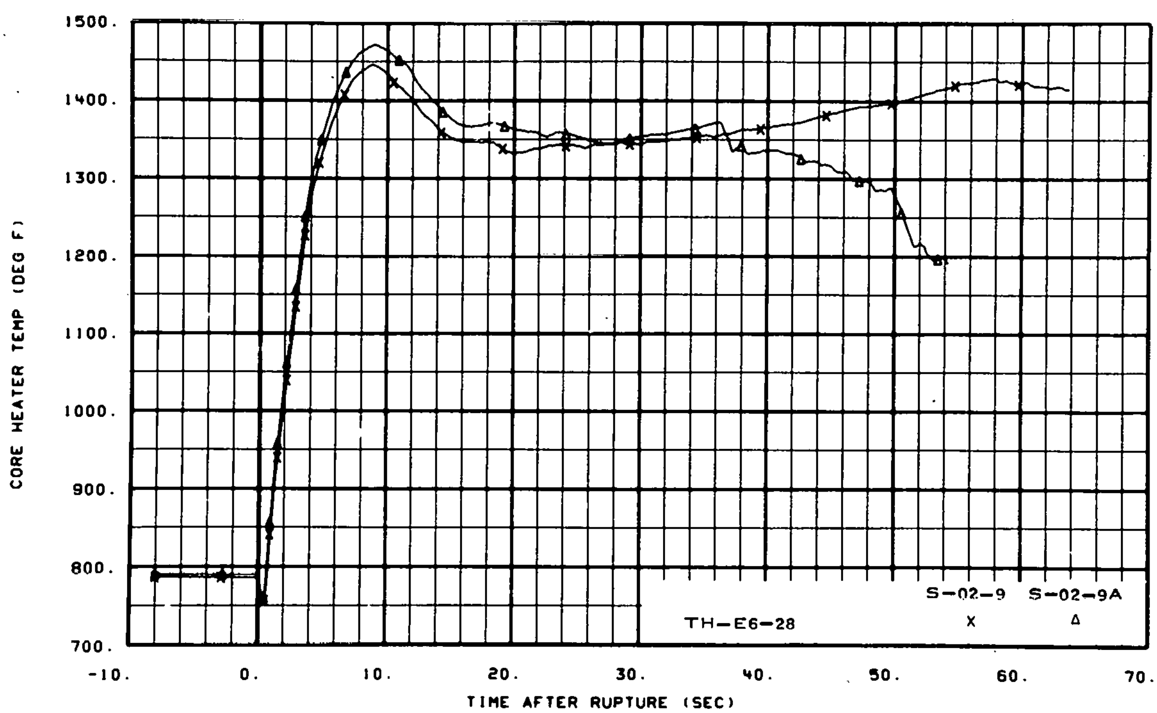

Fig. 102 Core heater temperature, Rod E-6 (TH-E6-28).

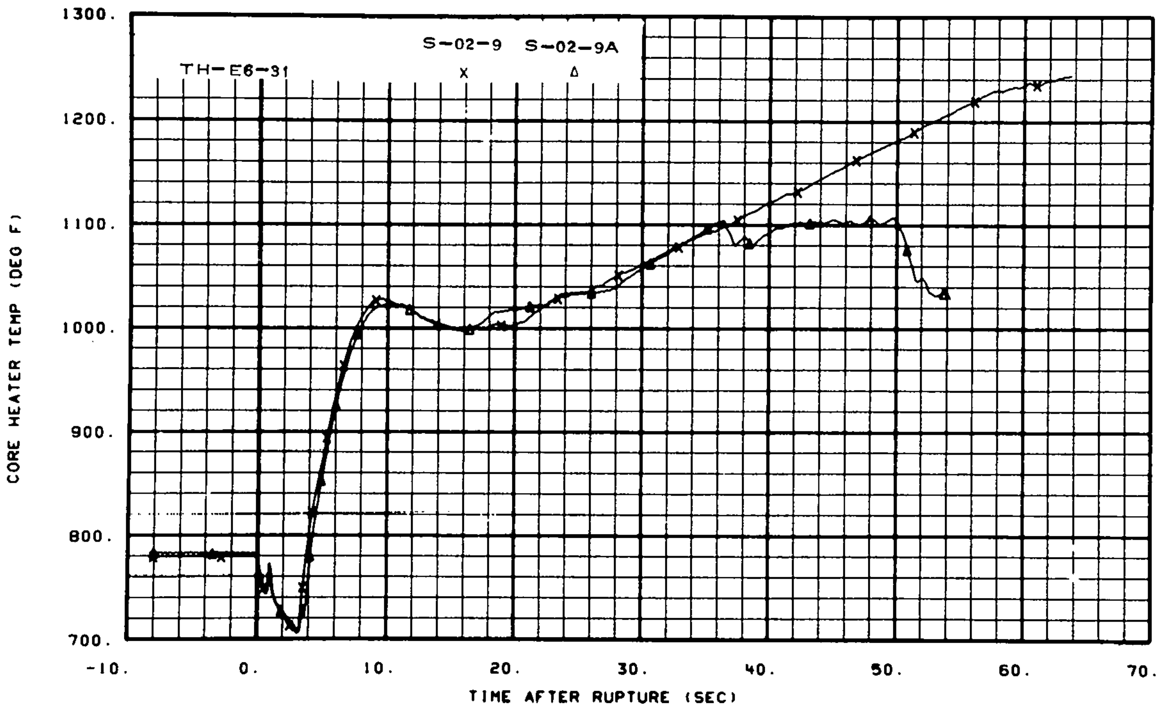

Fig. 103 Core heater temperature, Rod E-6 (TH-E6-31).

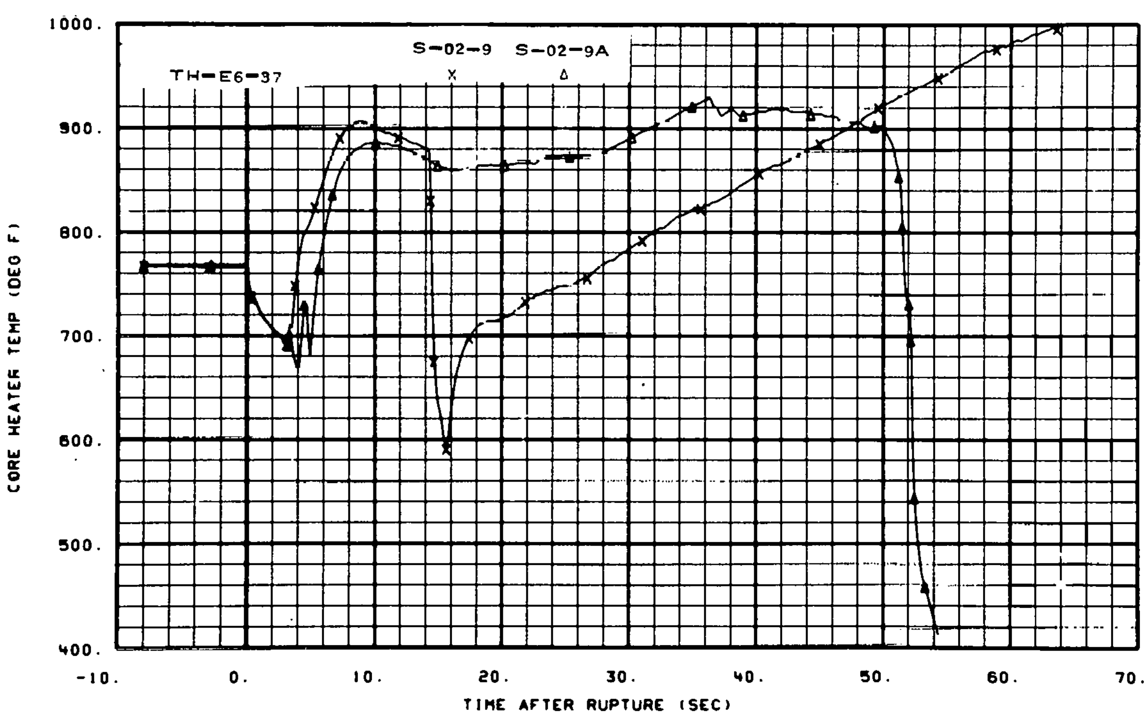

Fig. 104 Core heater temperature, Rod E-6 (TH-E6-37).

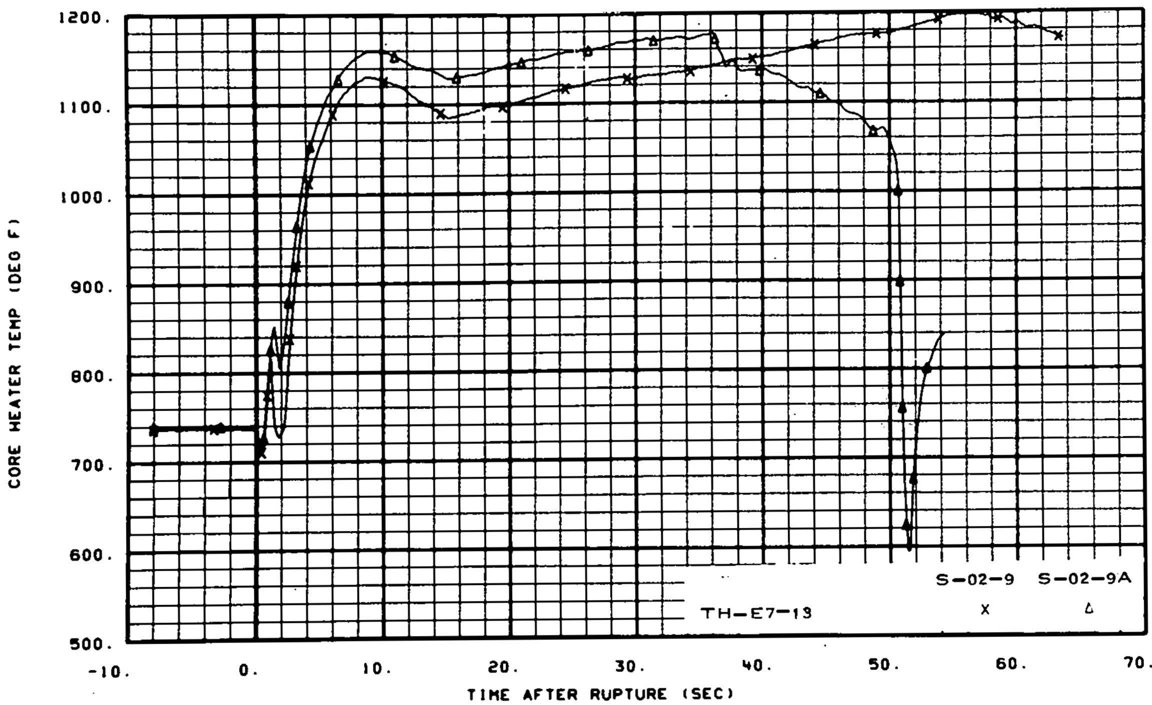

Fig. 105 Core heater temperature, Rod E-7 (TH-E7-13).

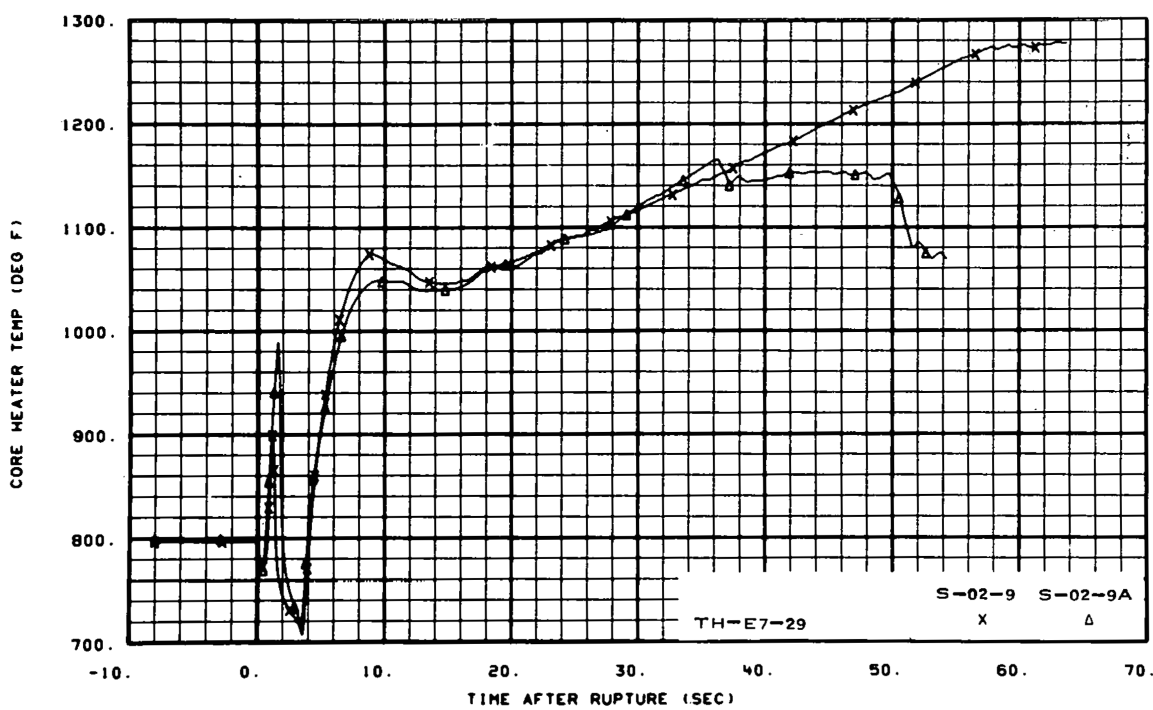

Fig. 106 Core heater temperature, Rod E-7 (TH-E7-29).

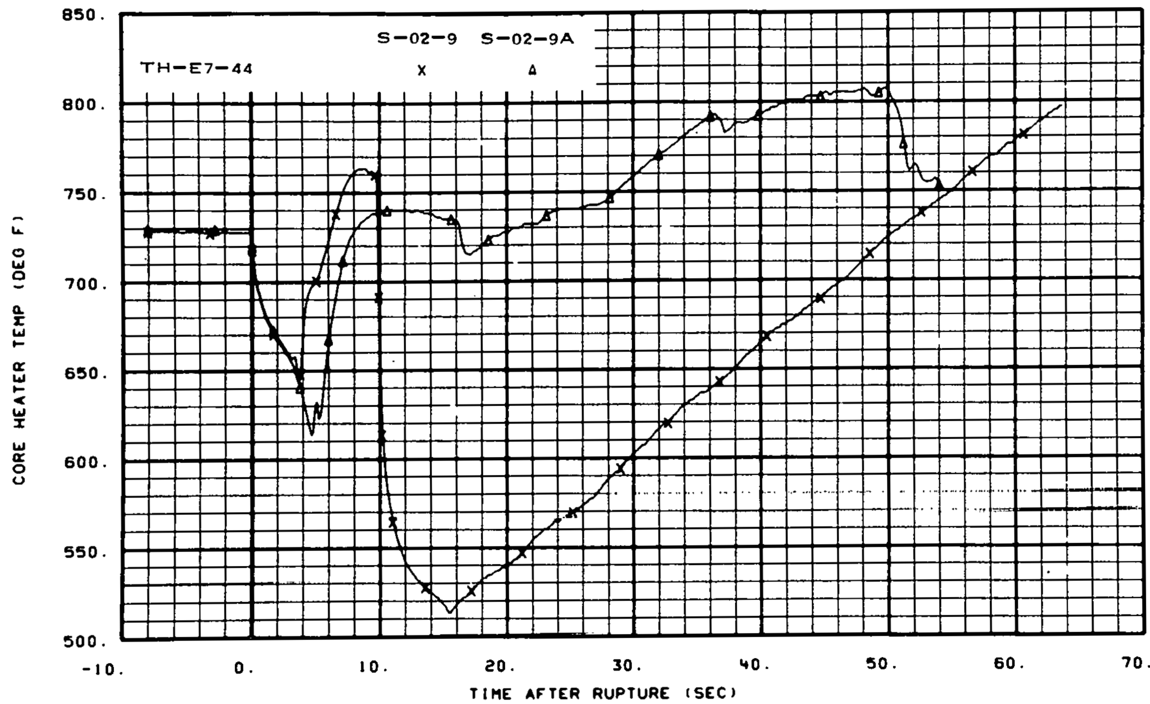

Fig. 107 Core heater temperature, Rod E-7 (TH-E7-44).

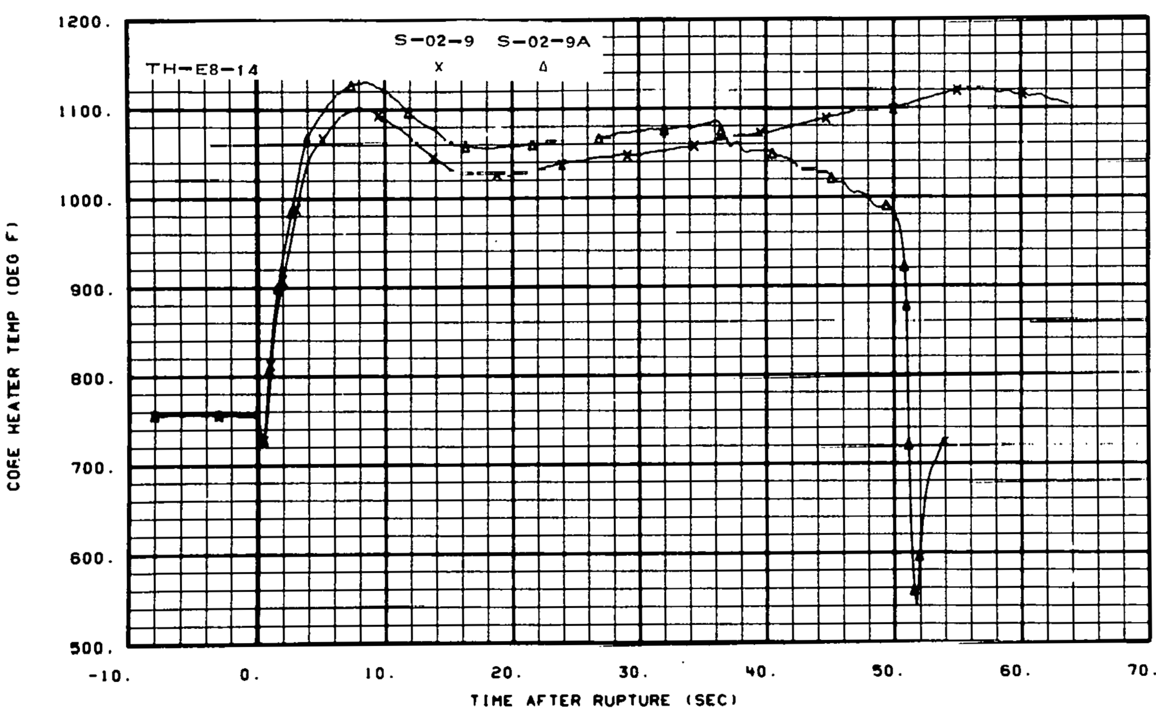

Fig. 108 Core heater temperature, Rod E-8 (TH-E8-14).

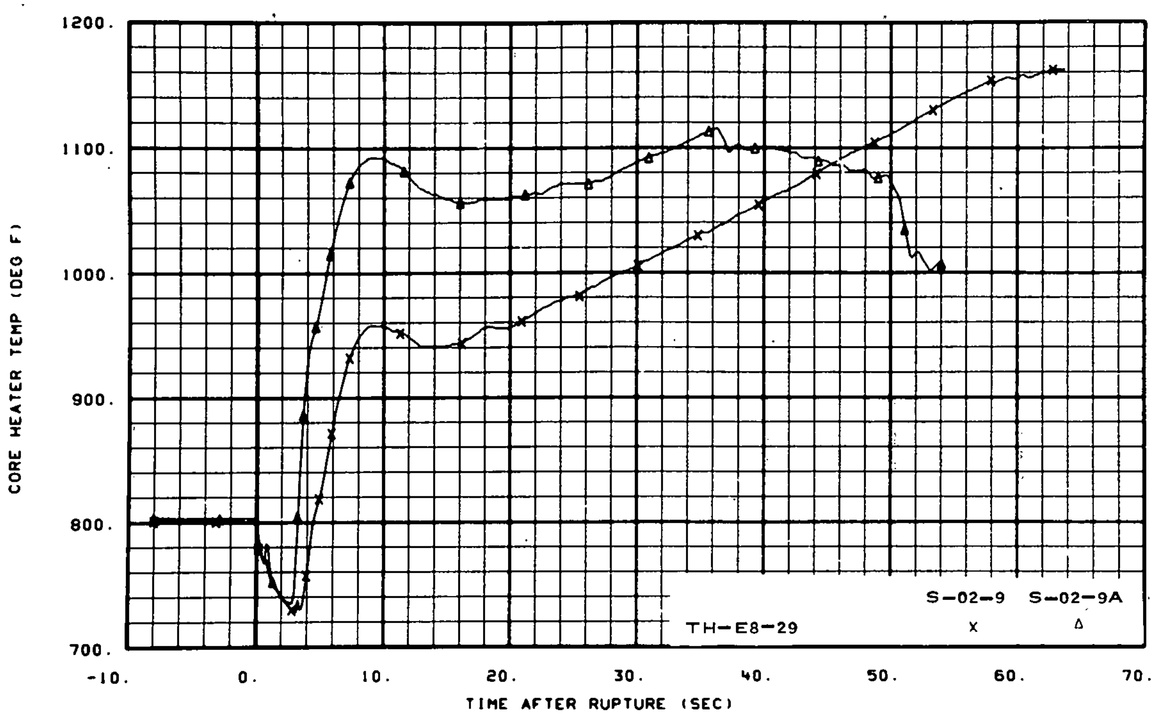

Fig. 109 Core heater temperature, Rod E-8 (TH-E8-29).

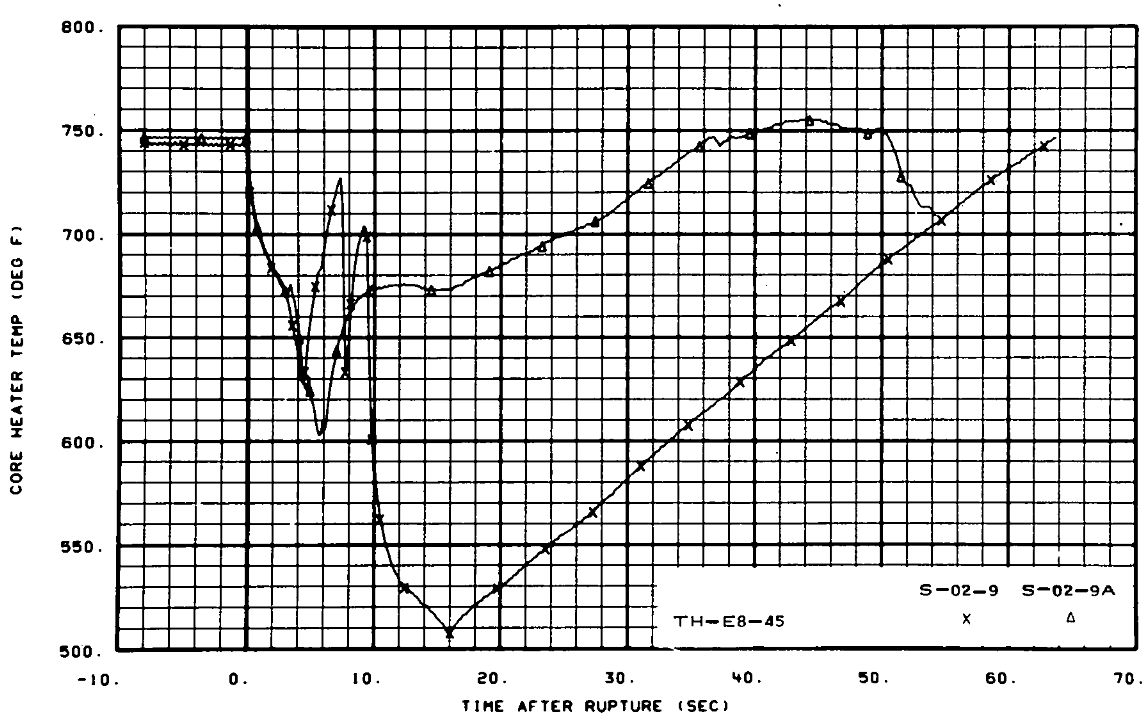

Fig. 110 Core heater temperature, Rod E-8 (TH-E8-45).

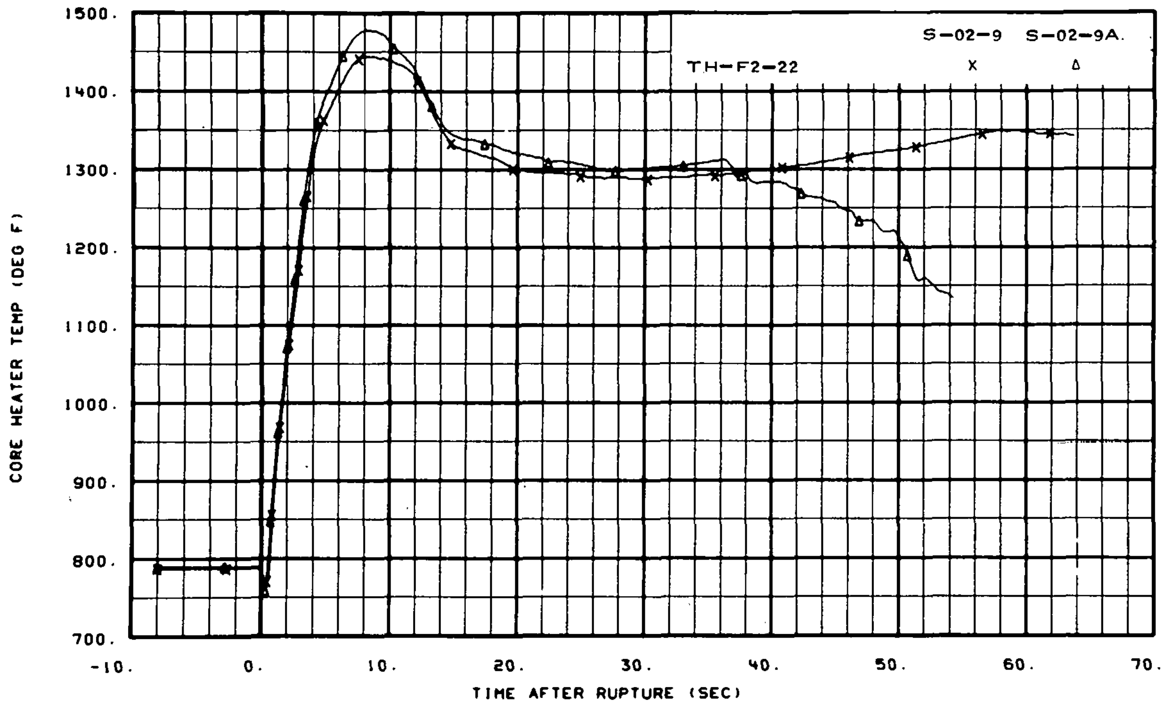

Fig. 111 Core heater temperature, Rod F-2 (TH-F2-22).

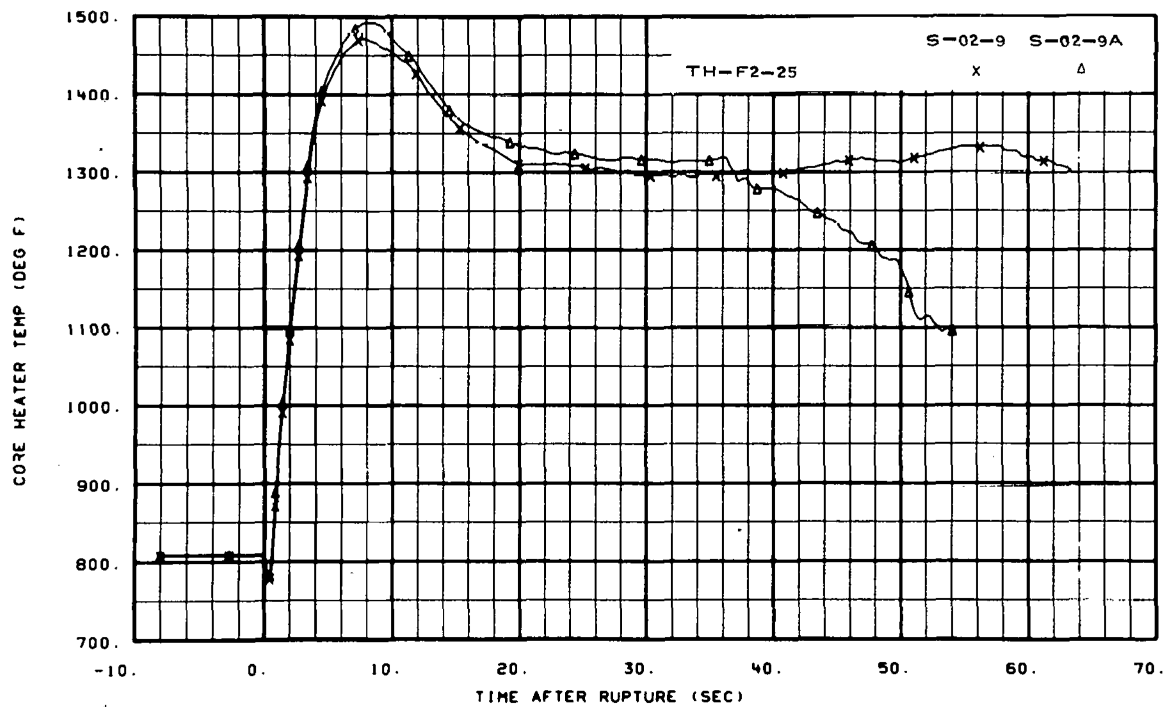

Fig. 112 Core heater temperature, Rod F-2 (TH-F2-25).

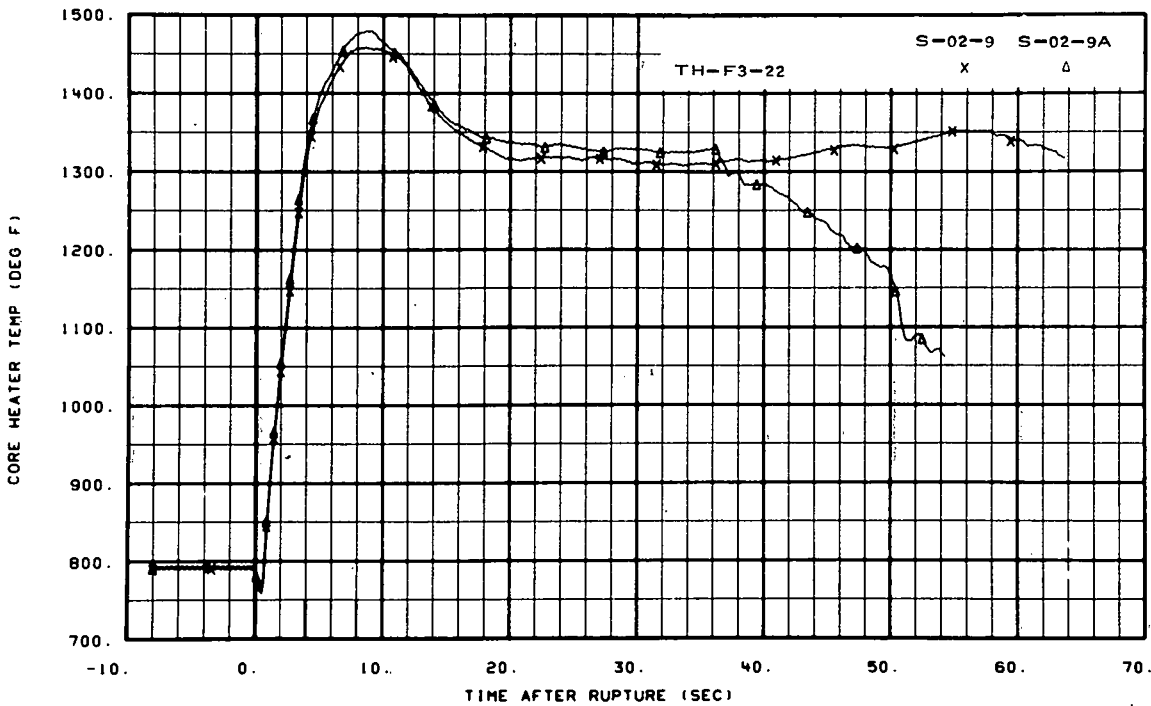

Fig. 113 Core heater temperature, Rod F-3 (TH-F3-22).

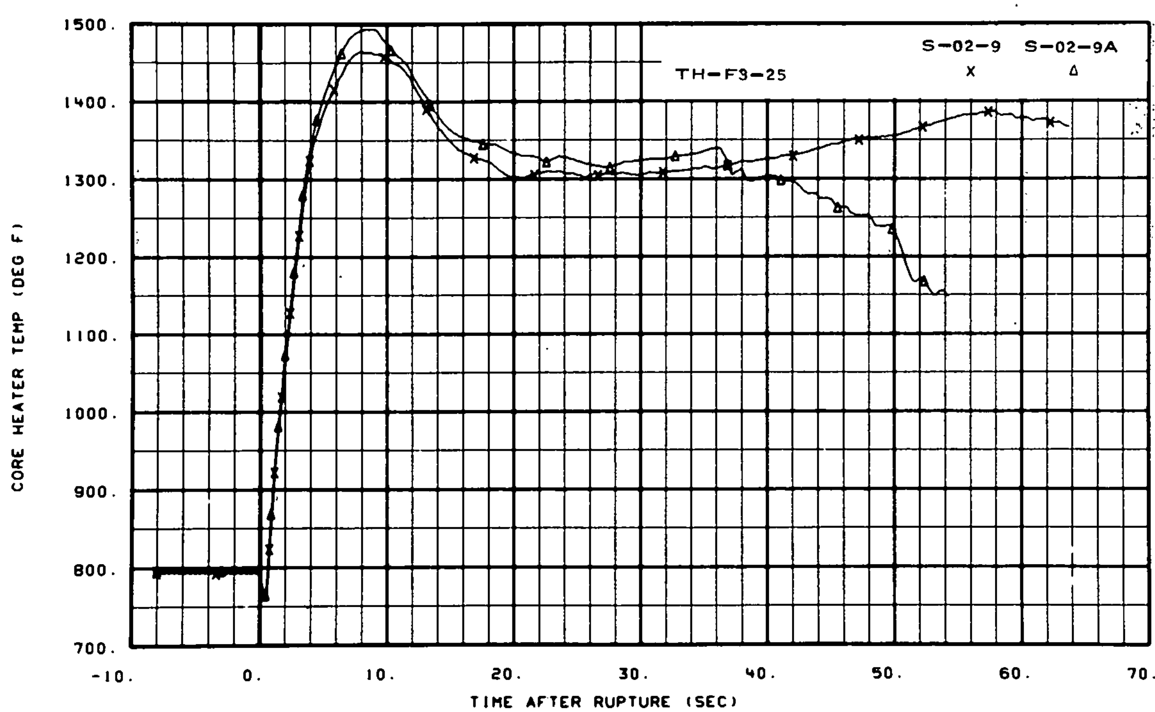

Fig. 114 Core heater temperature, Rod F-3 (TH-F3-25).

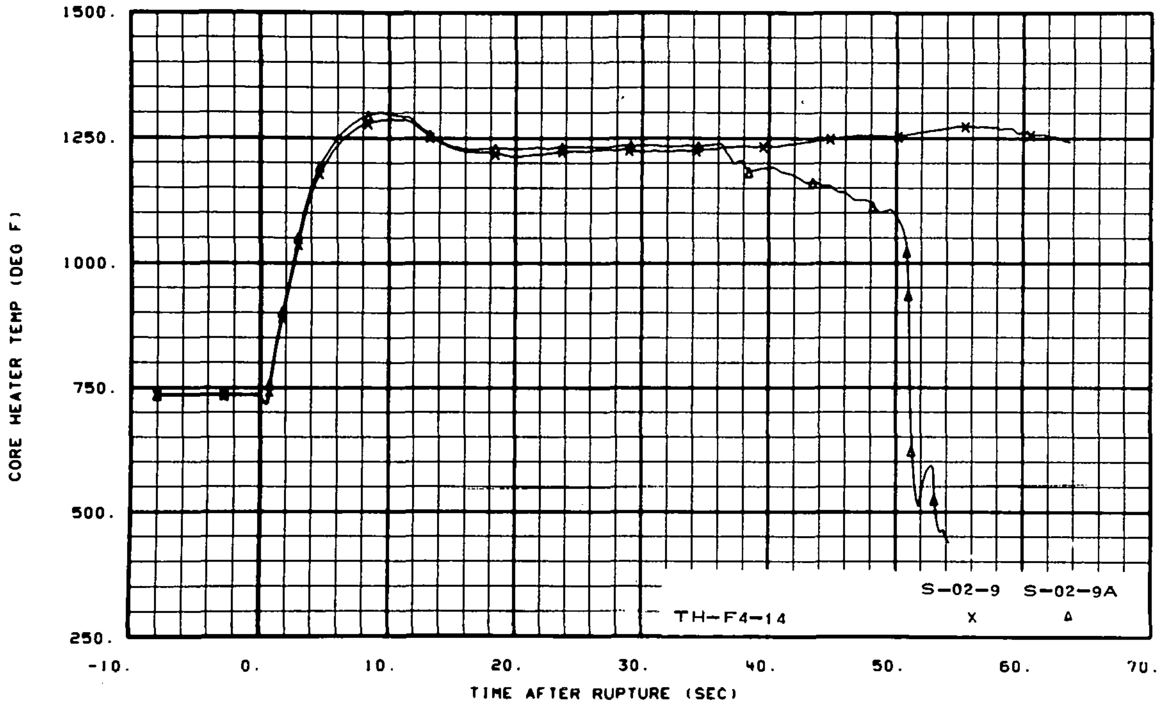

Fig. 115 Core heater temperature, Rod F-4 (TH-F4-14).

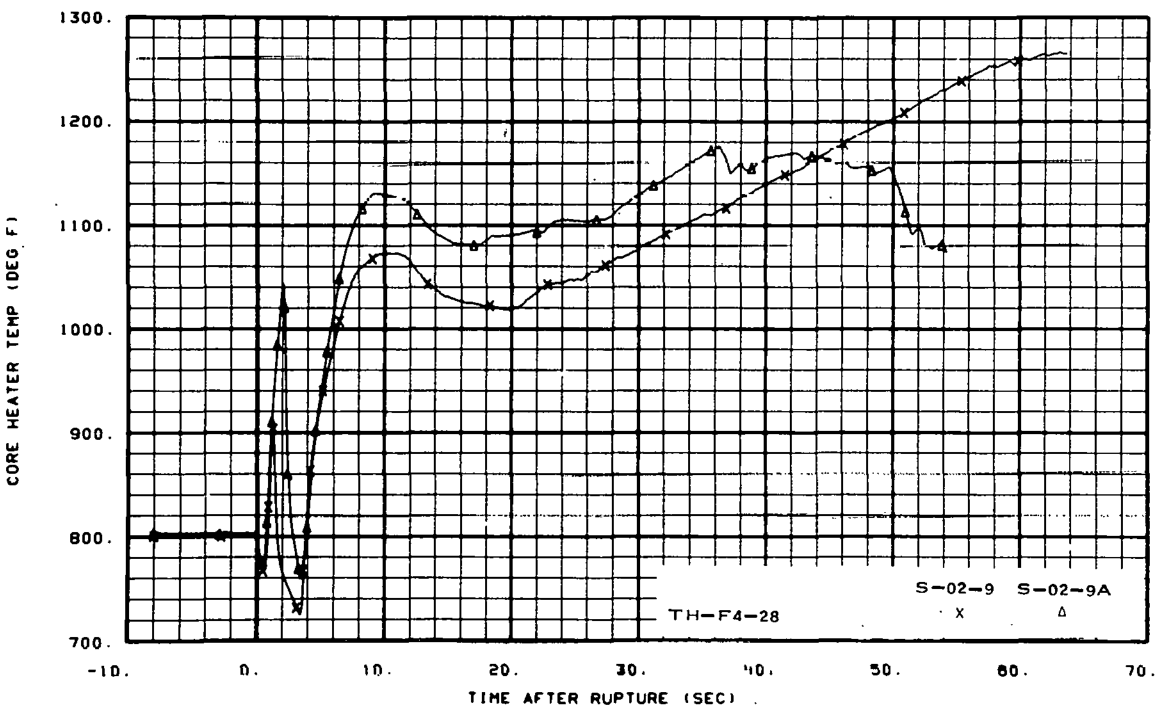

Fig. 116 Core heater temperature, Rod F-4 (TH-F4-28).

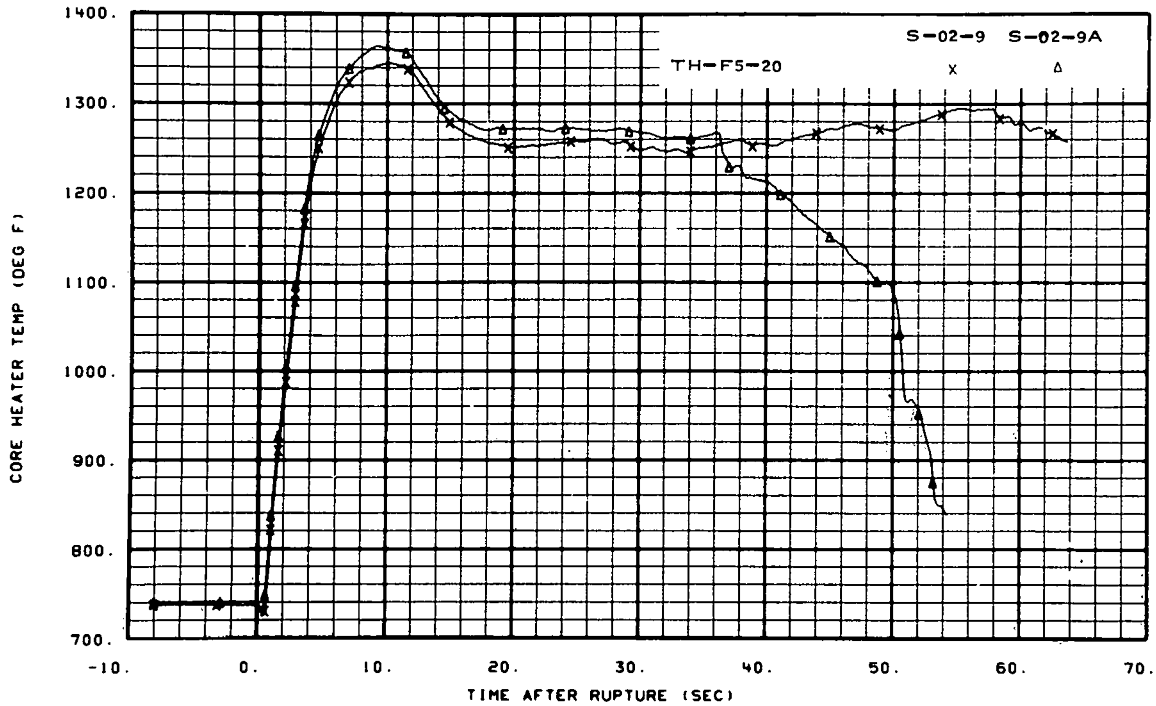

Fig. 117 Core heater temperature, Rod F-5 (TH-F5-20).

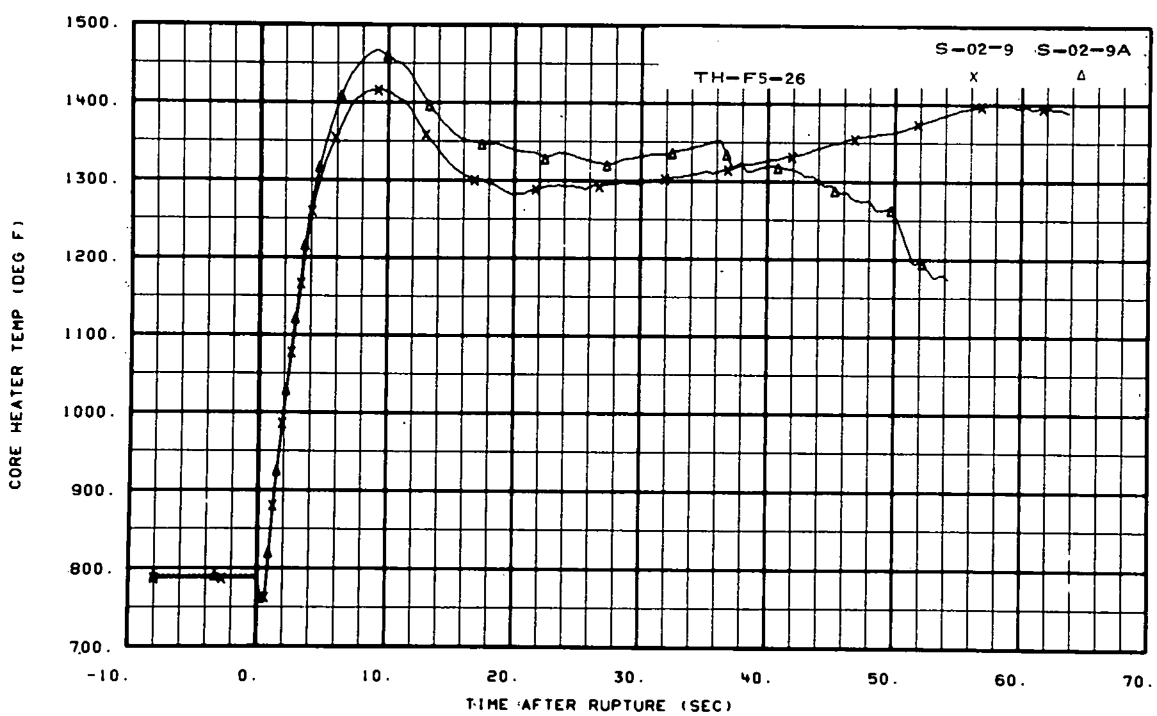

Fig. 118 Core heater temperature, Rod F-5 (TH-F5-26).

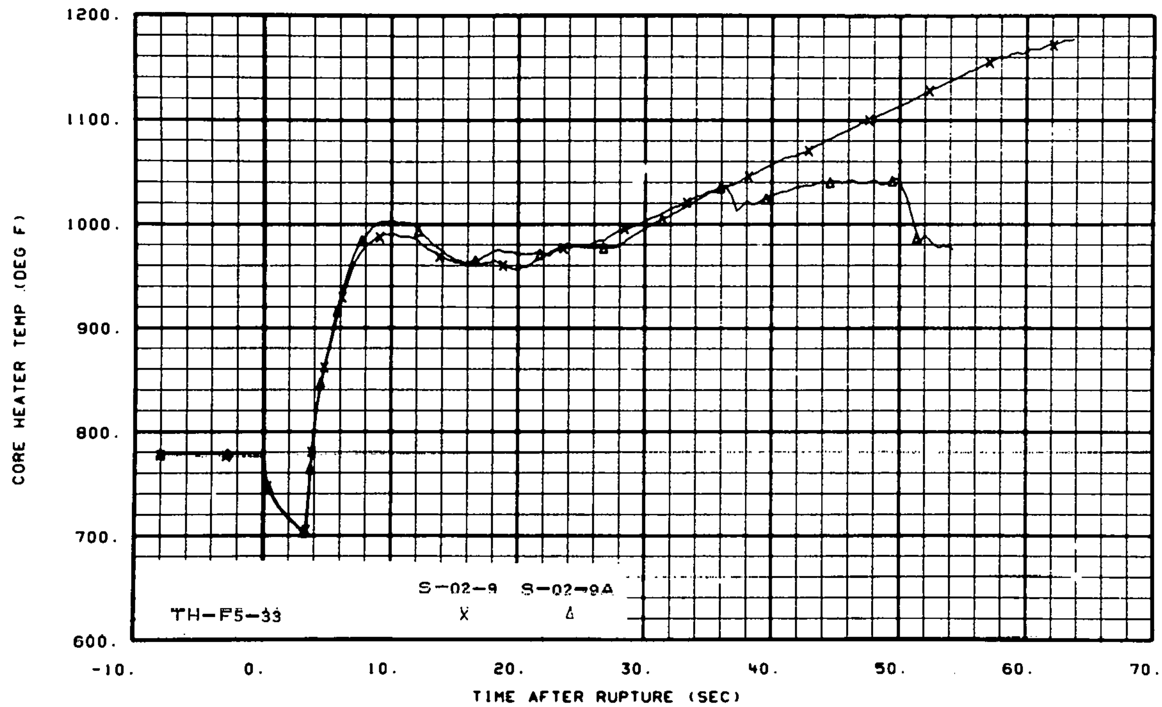

Fig. 119 Core heater temperature, Rod F-5 (TH-F5-33).

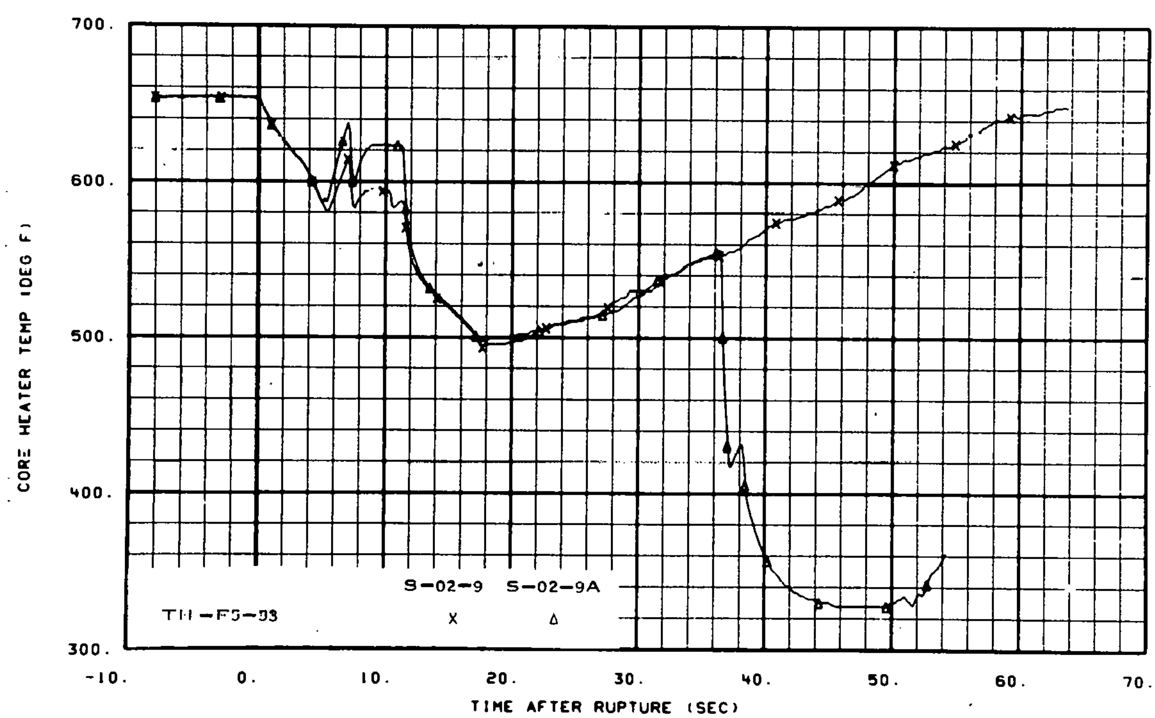

Fig. 120 Core heater temperature, Rod F-5 (TH-F5-53).

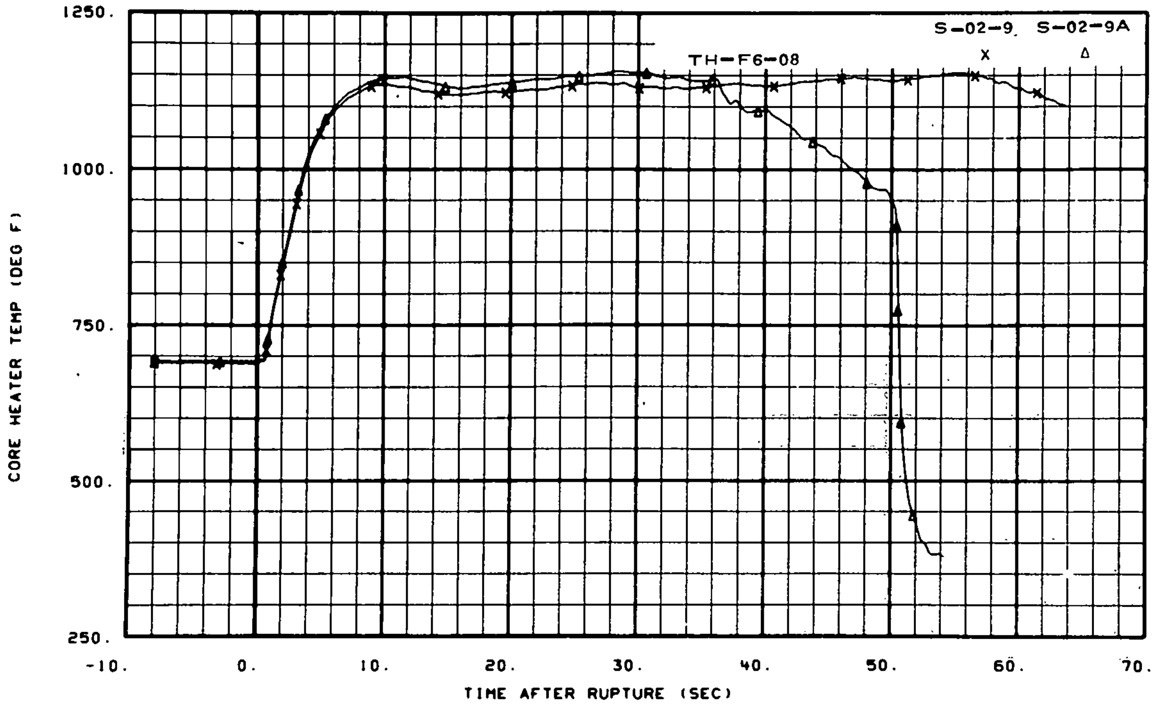

Fig. 121 Core heater temperature, Rod F-6 (TH-F6-08).

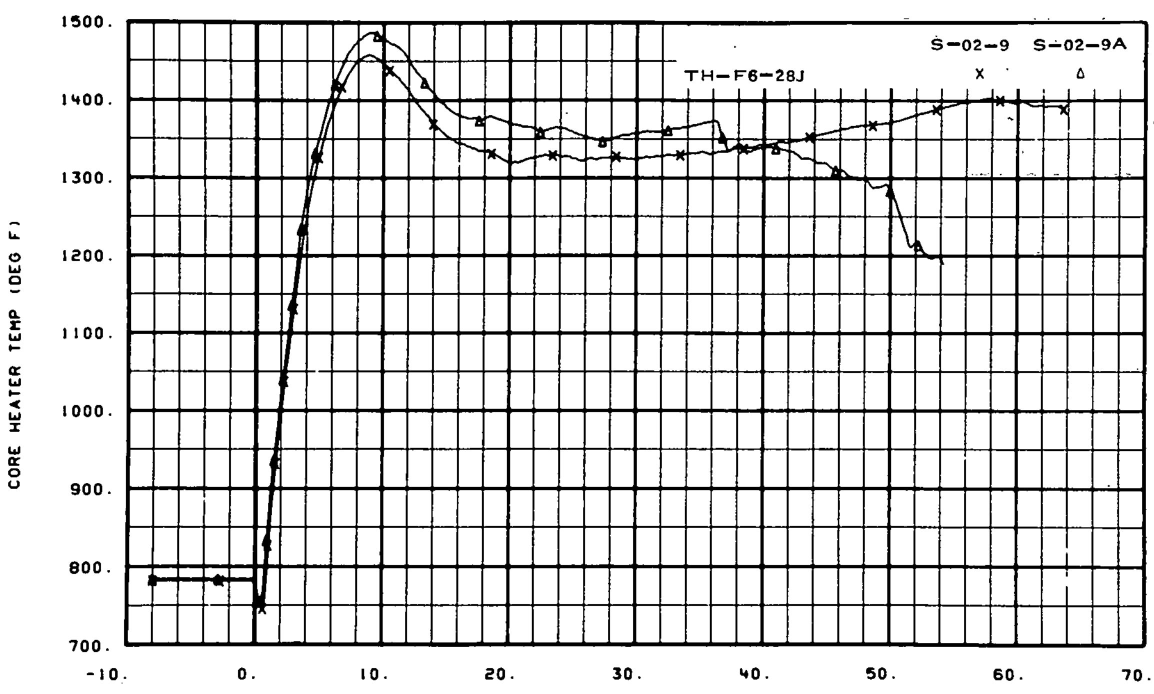

Fig. 122 Core heater temperature, Rod F-6 (TH-F6-28J).

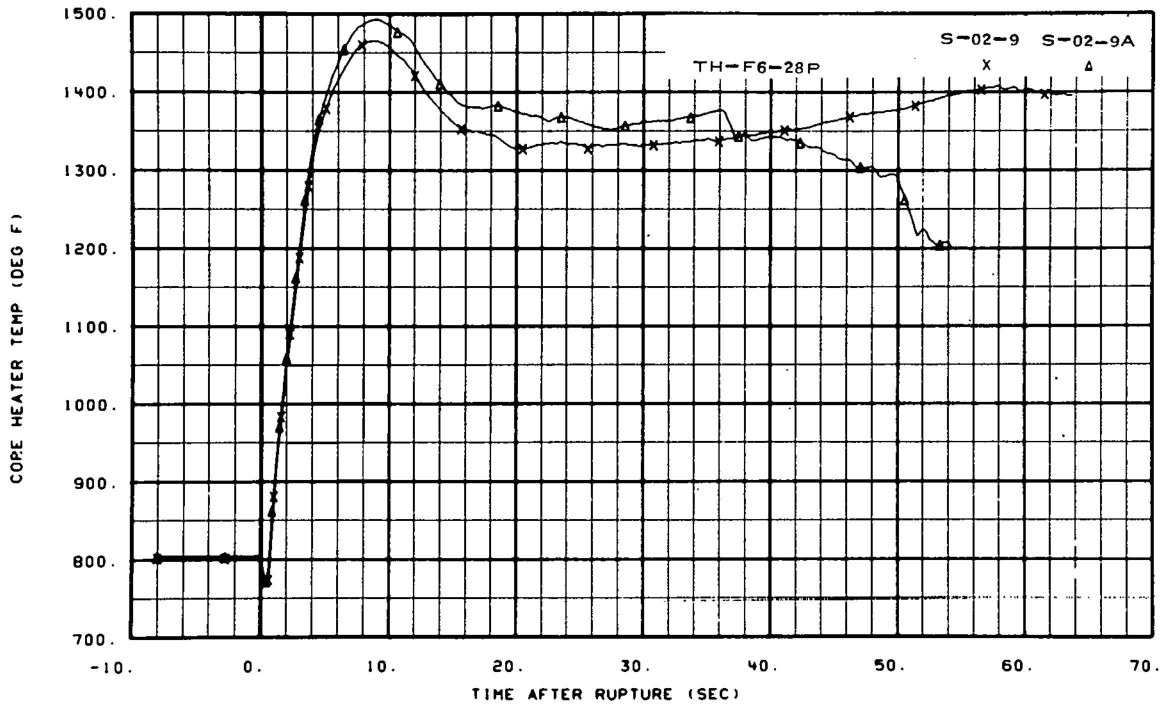

Fig. 123 Core heater temperature, Rod F-6 (TH-F6-28P).

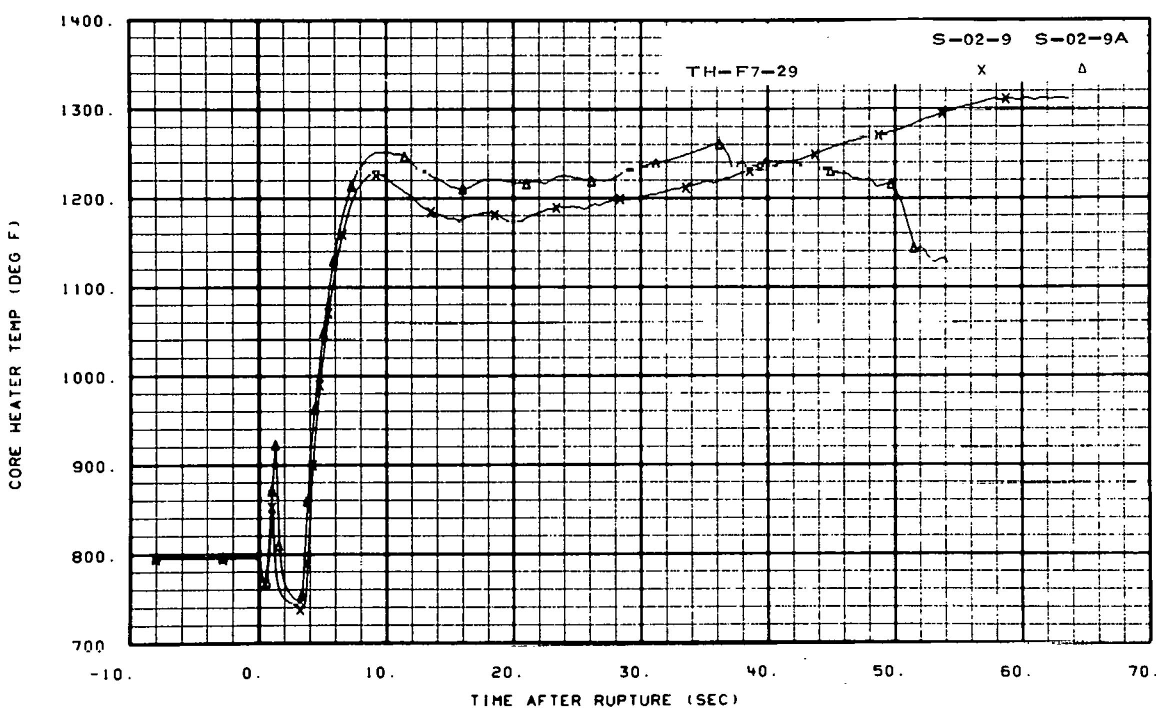

Fig. 124 Core heater temperature, Rod F-7 (TH-F7-29).

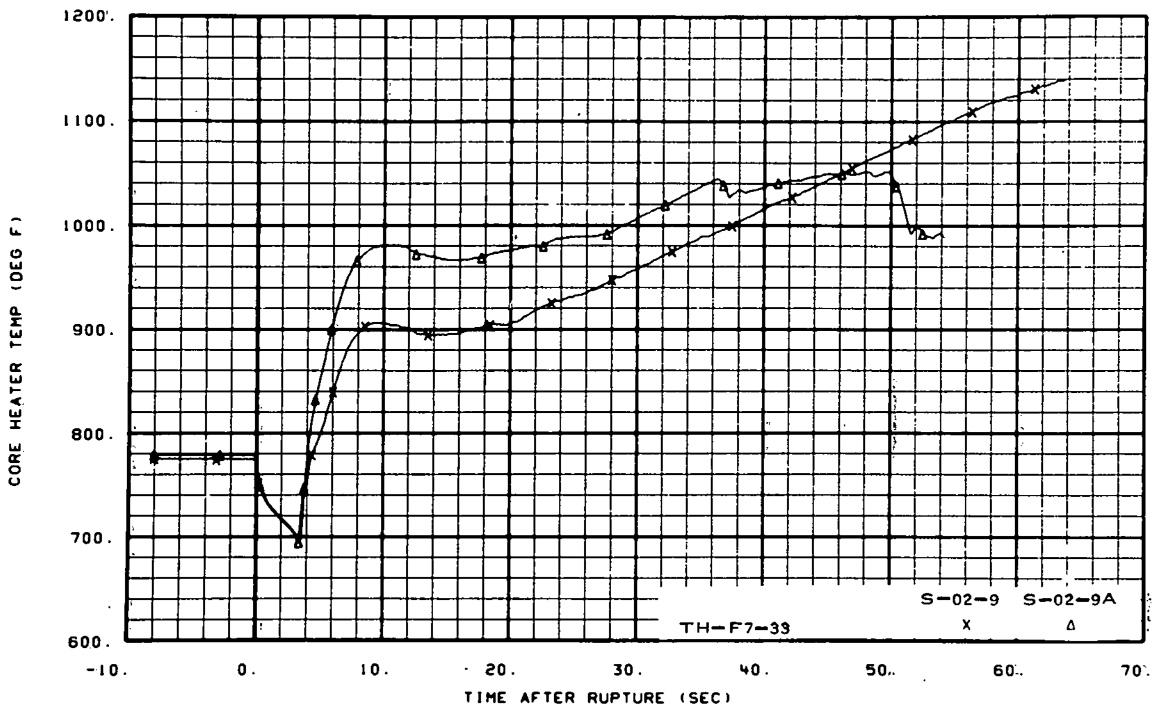

Fig. 125 Core heater temperature, Rod F-7 (TH-F7-33).

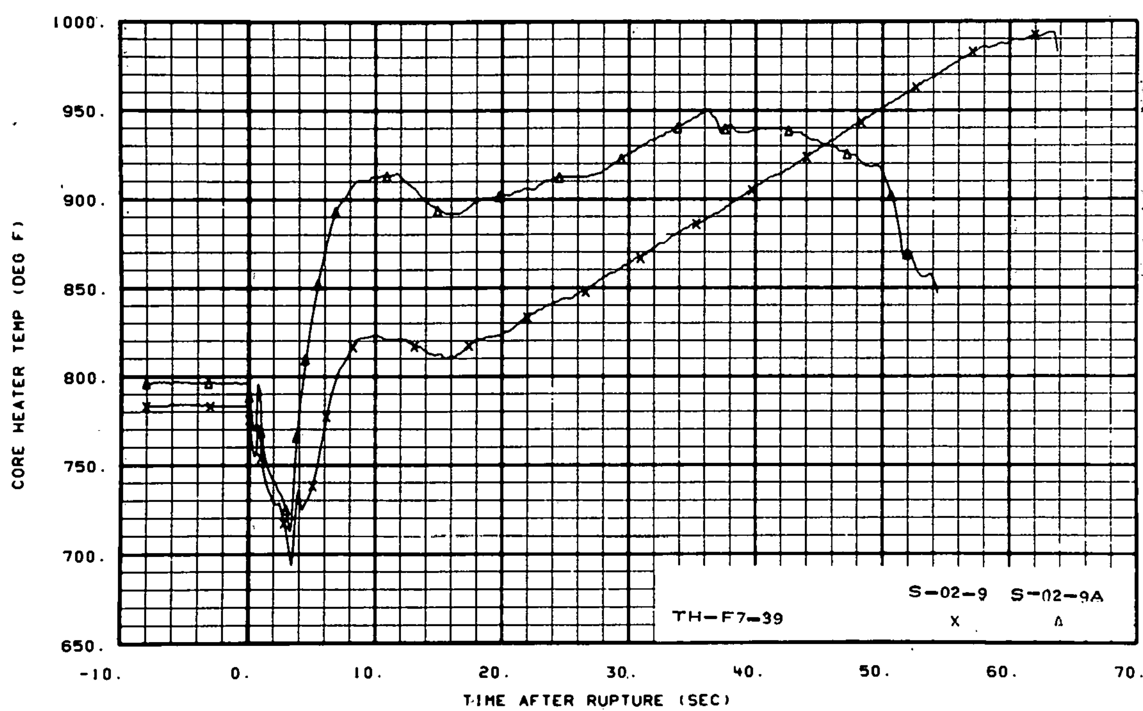

Fig. 126 Core heater temperature, Rod F-7 (TH-F7-39).

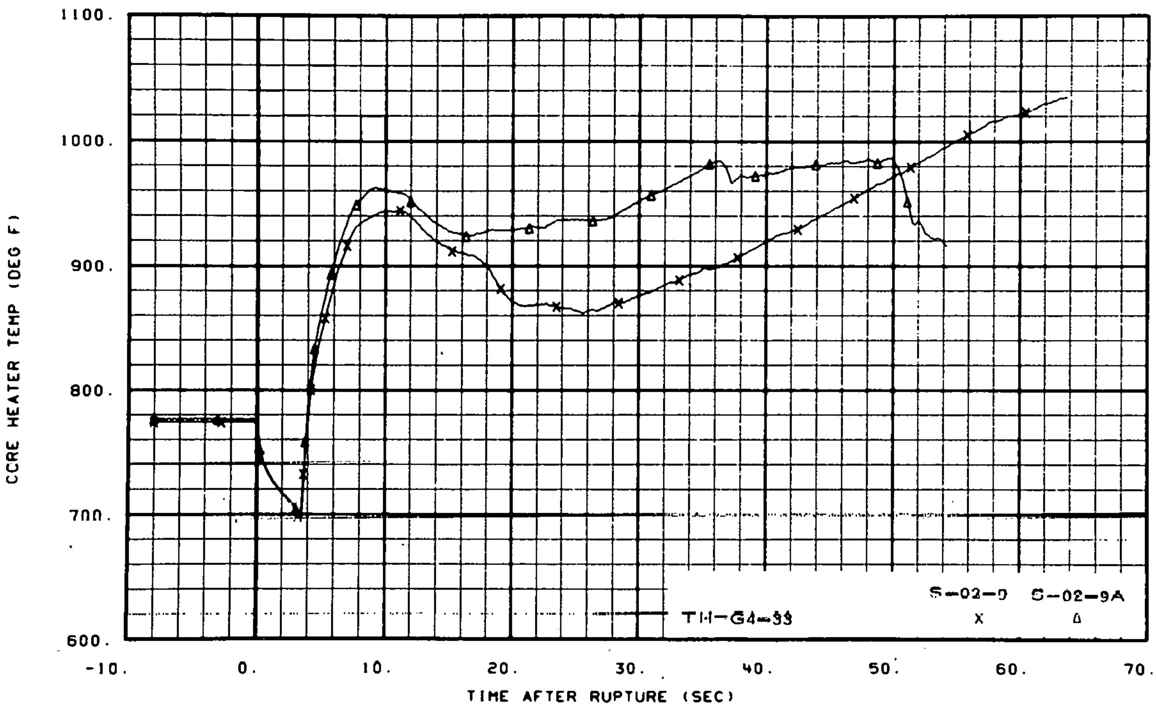

Fig. 127 Core heater temperature, Rod G-4.

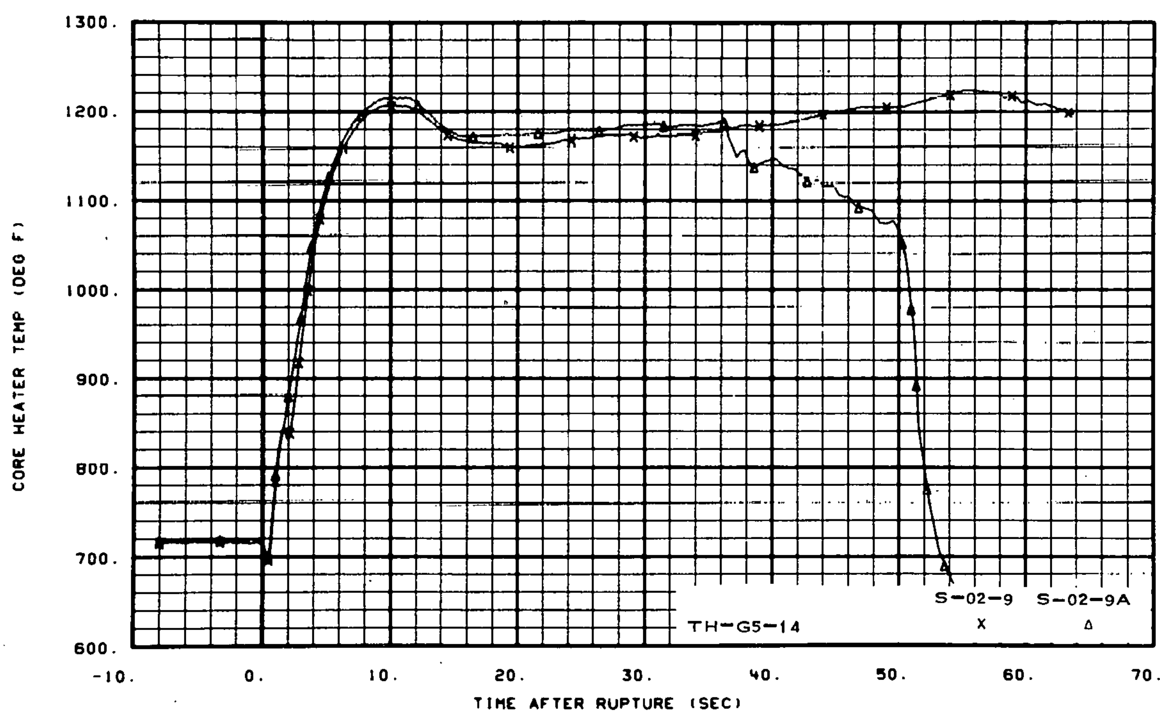

Fig. 128 Core heater temperature, Rod G-5 (TH-G5-14).

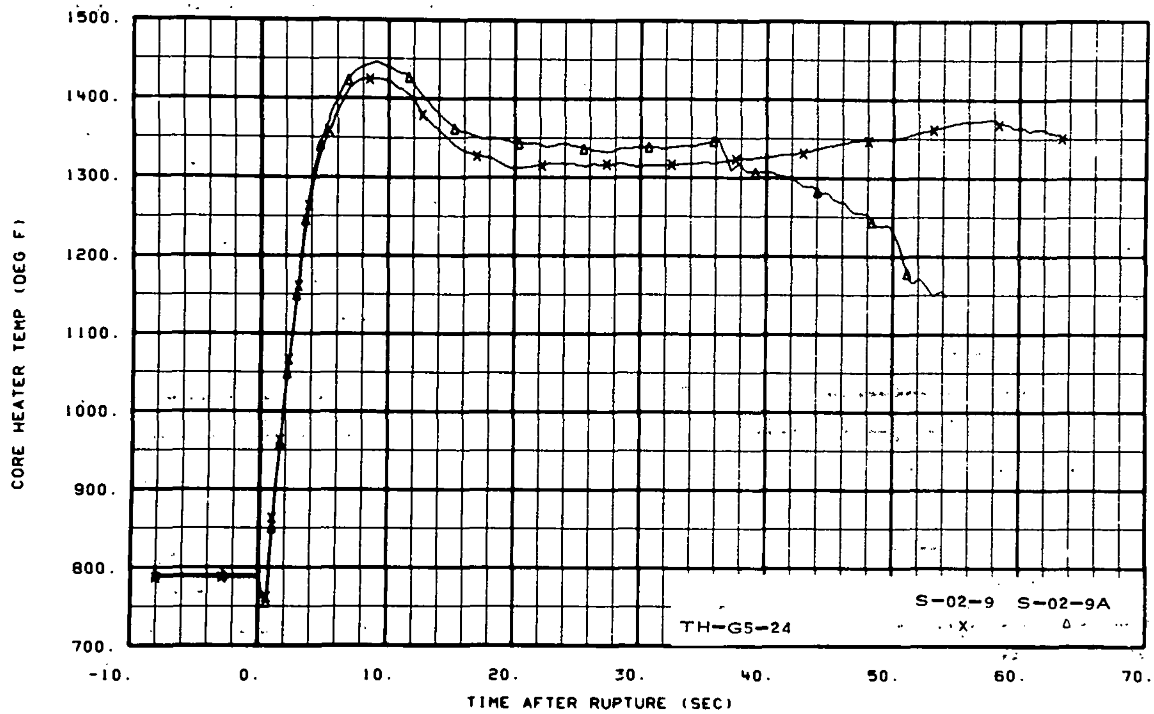

Fig. 129 Core heater temperature, Rod G-5 (TH-G5-24).

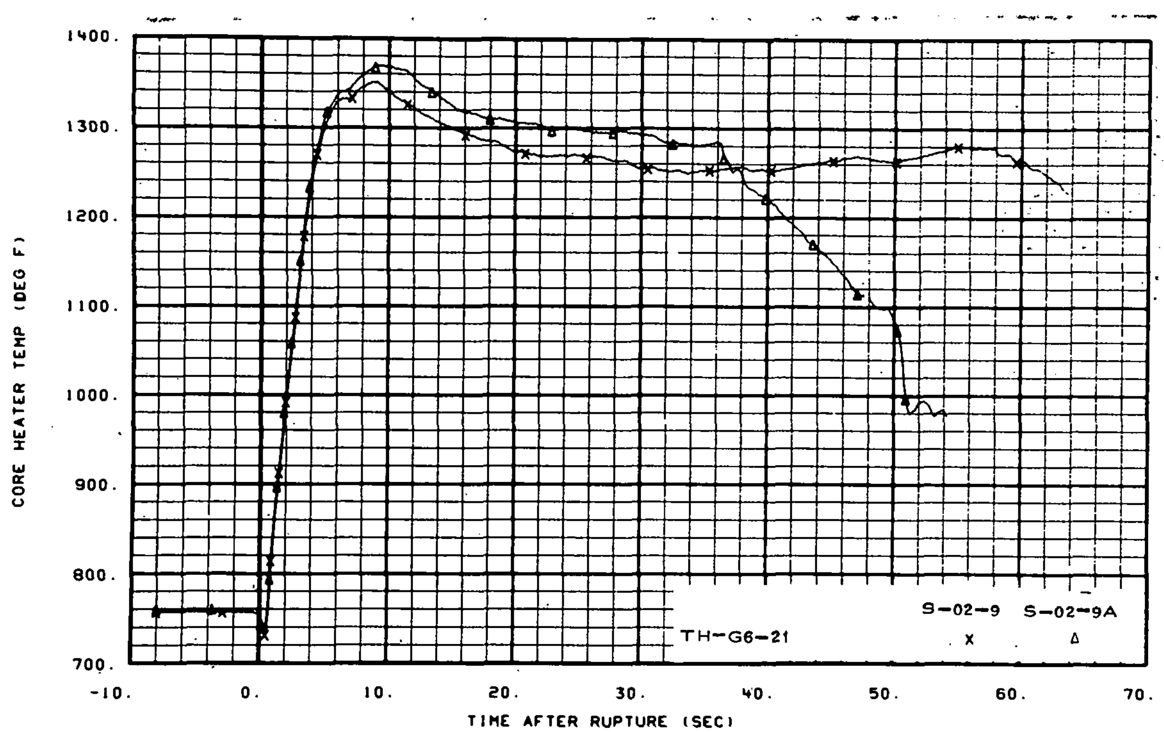

Fig. 130 Core heater temperature, Rod G-6 (TH-G6-21).

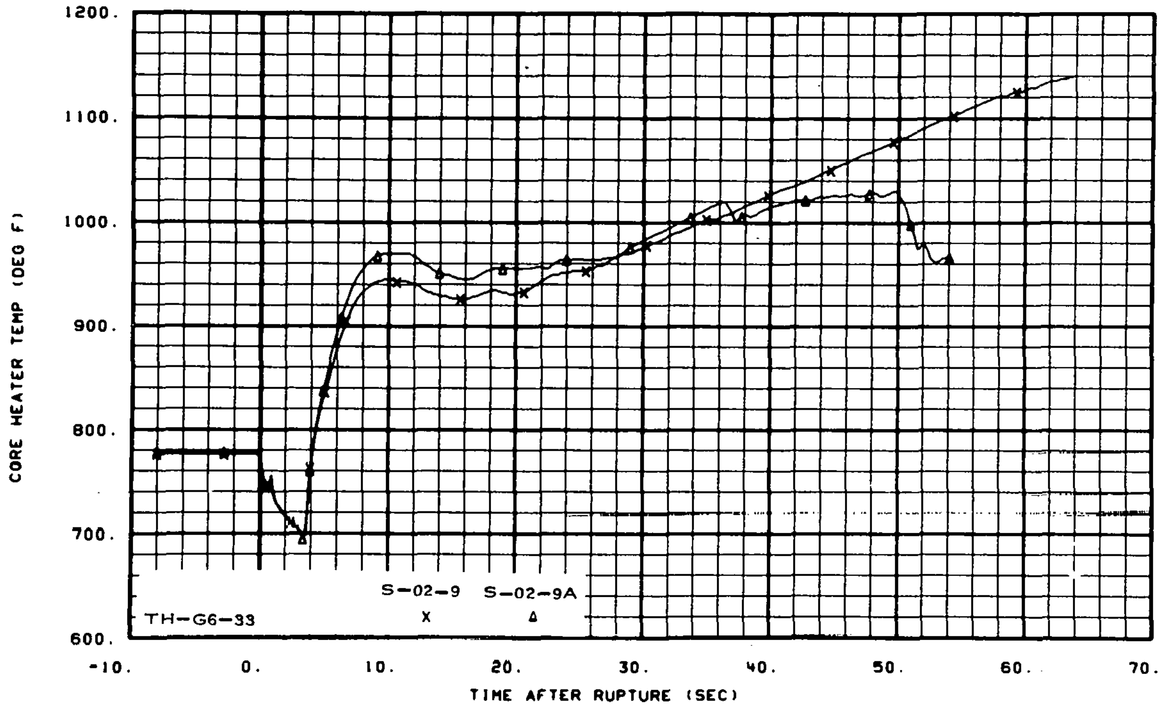

Fig. 131 Core heater temperature, Rod G-6 (TH-G6-33).

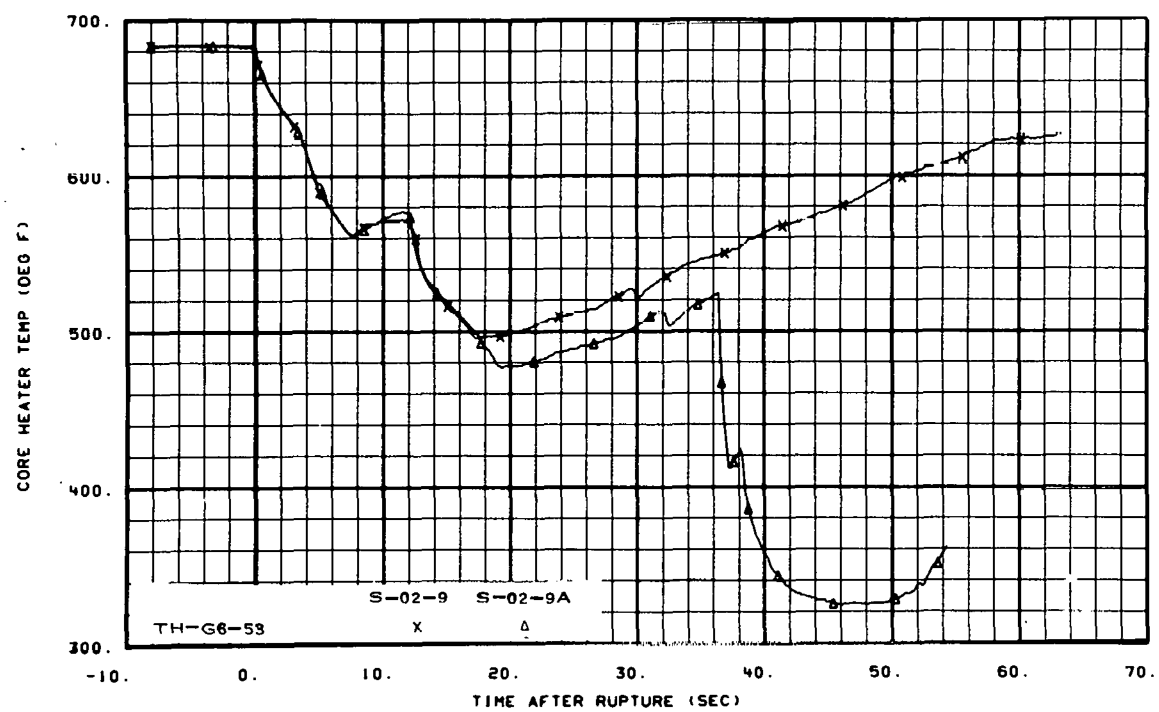

Fig. 132 Core heater temperature, Rod G-6 (TH-G6-53).

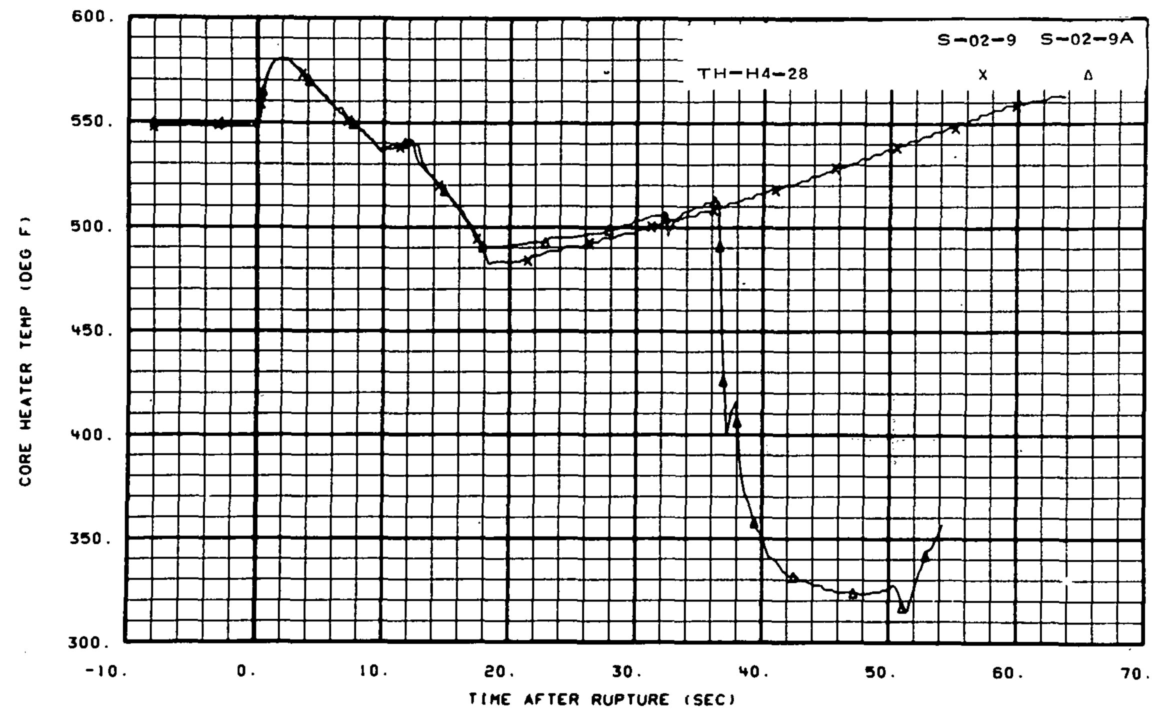

Fig. 133 Core heater temperature, Rod H-4.

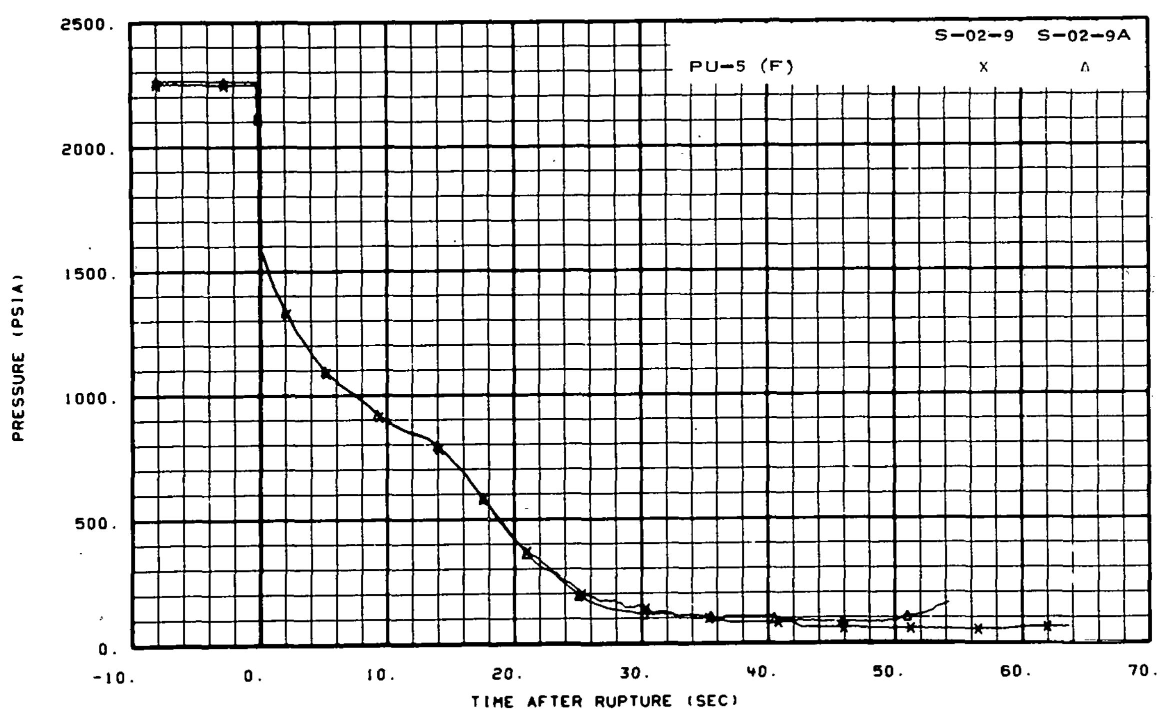

Fig. 134 Pressure in intact loop, Spool 5.

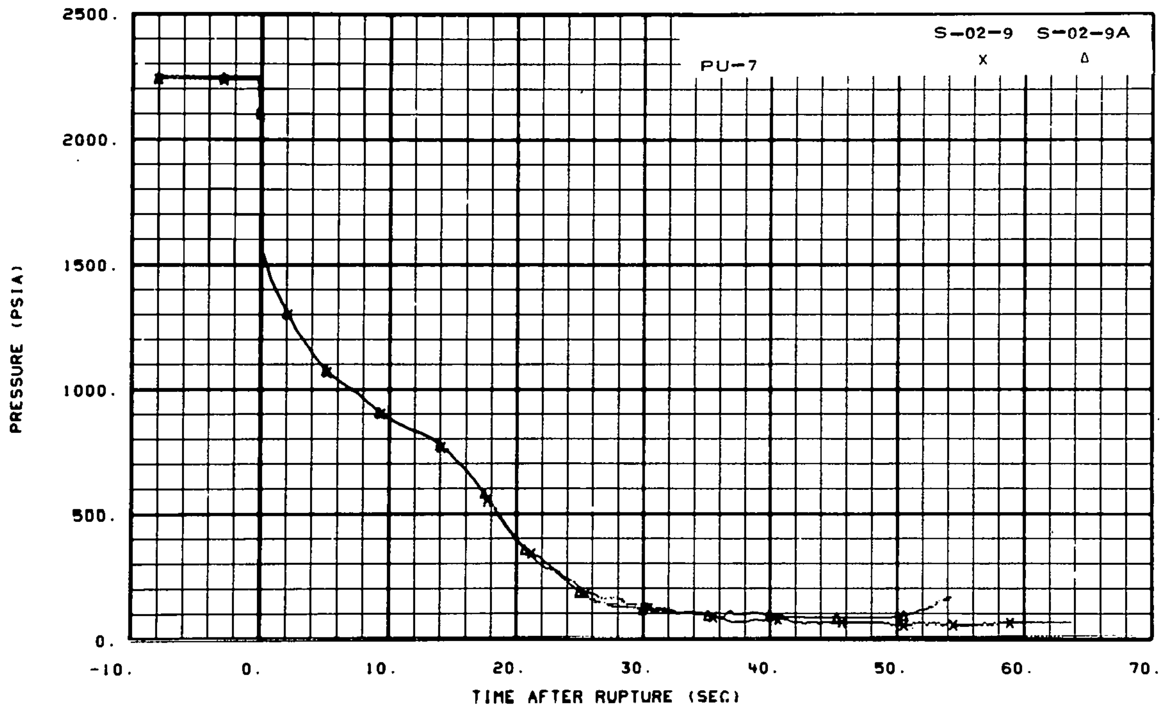

Fig. 135 Pressure in intact loop, Spool 7.

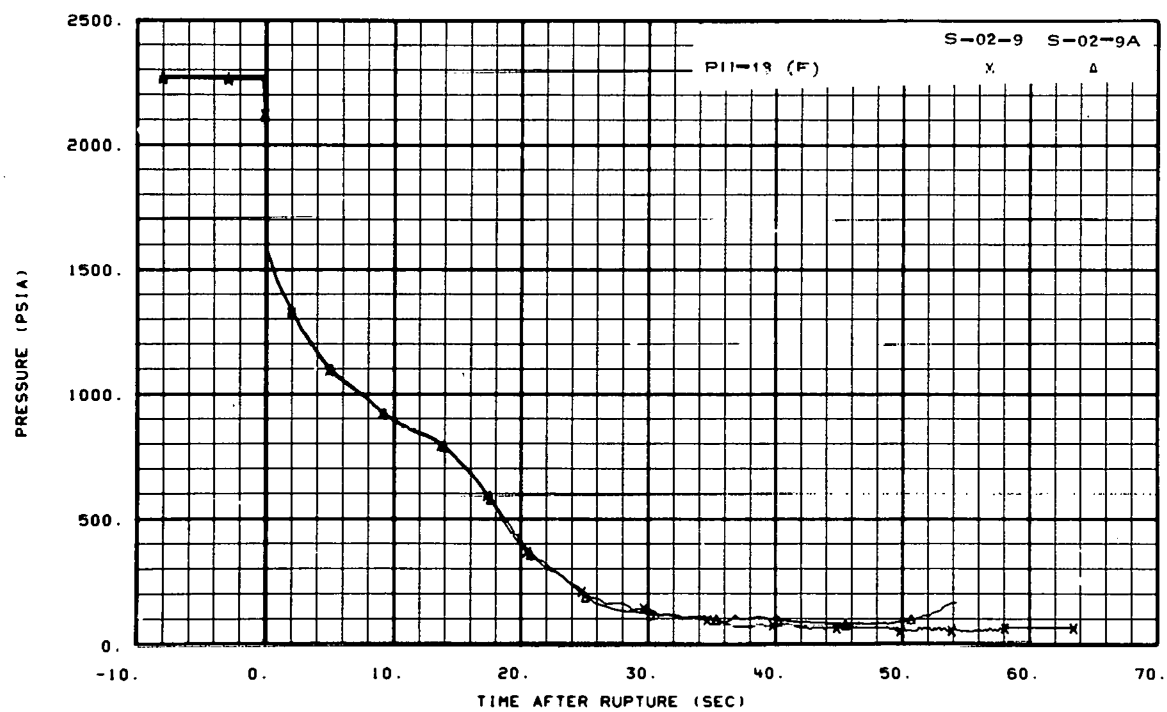

Fig. 136 Pressure in intact loop, Spool 13.

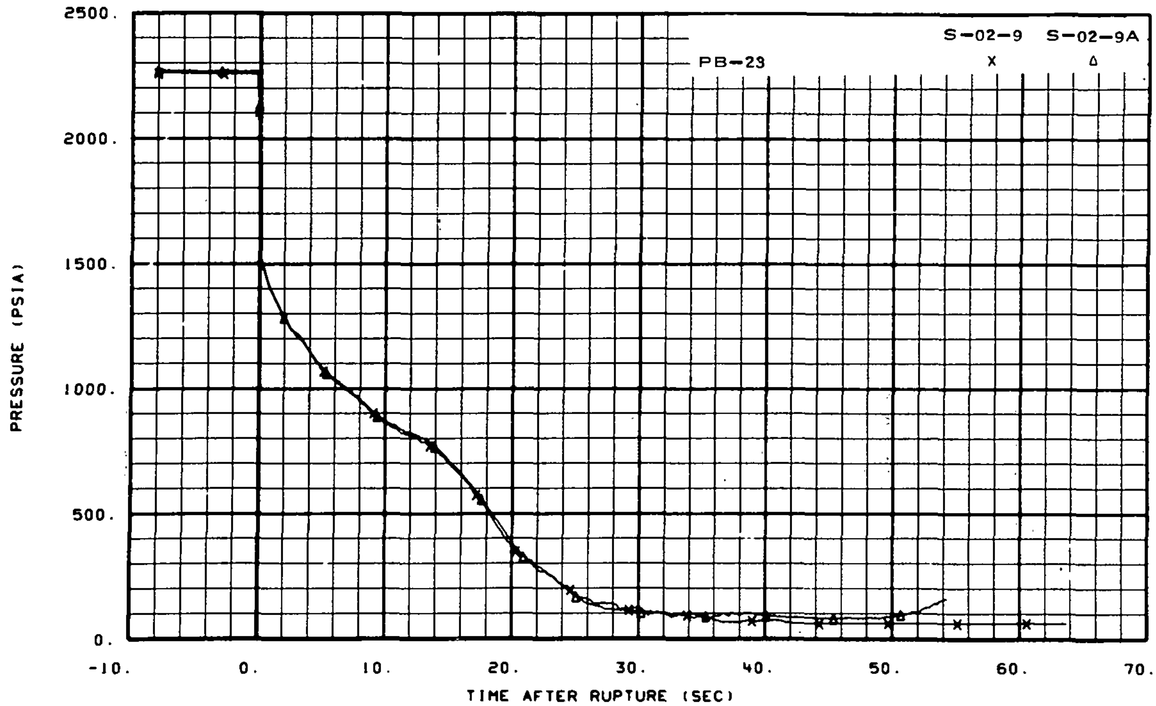

Fig. 137 Pressure in broken loop, Spool 23.

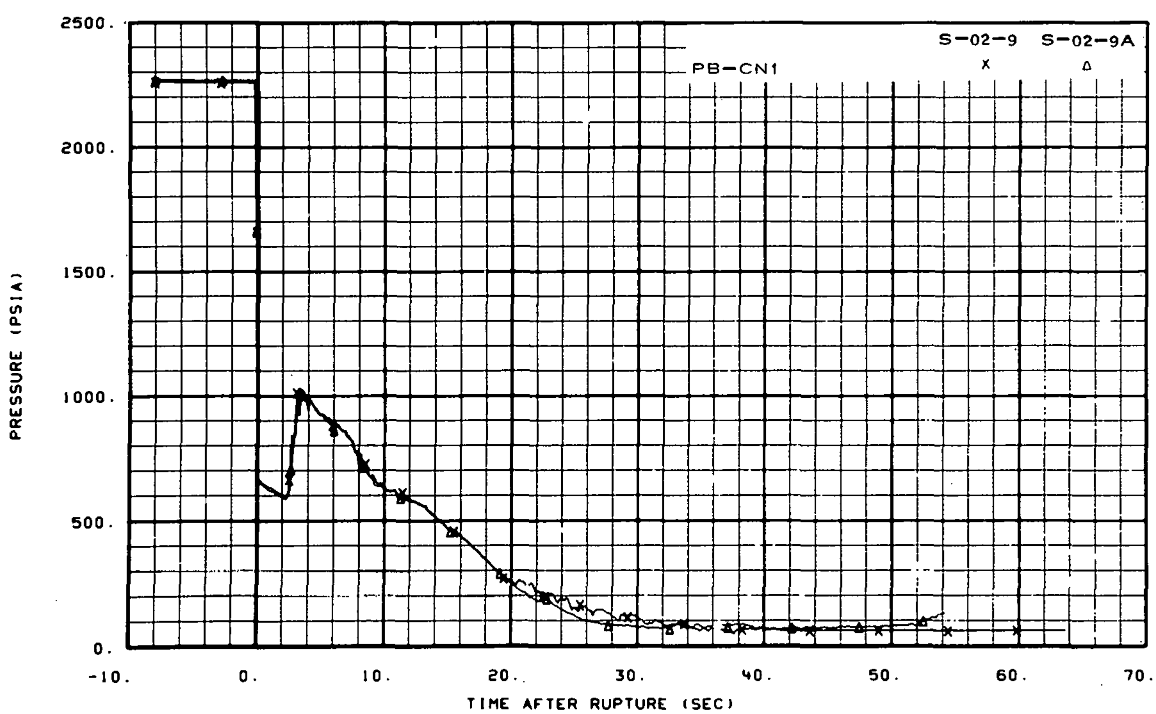

Fig. 138 Pressure in broken loop, vessel-side nozzle throat.

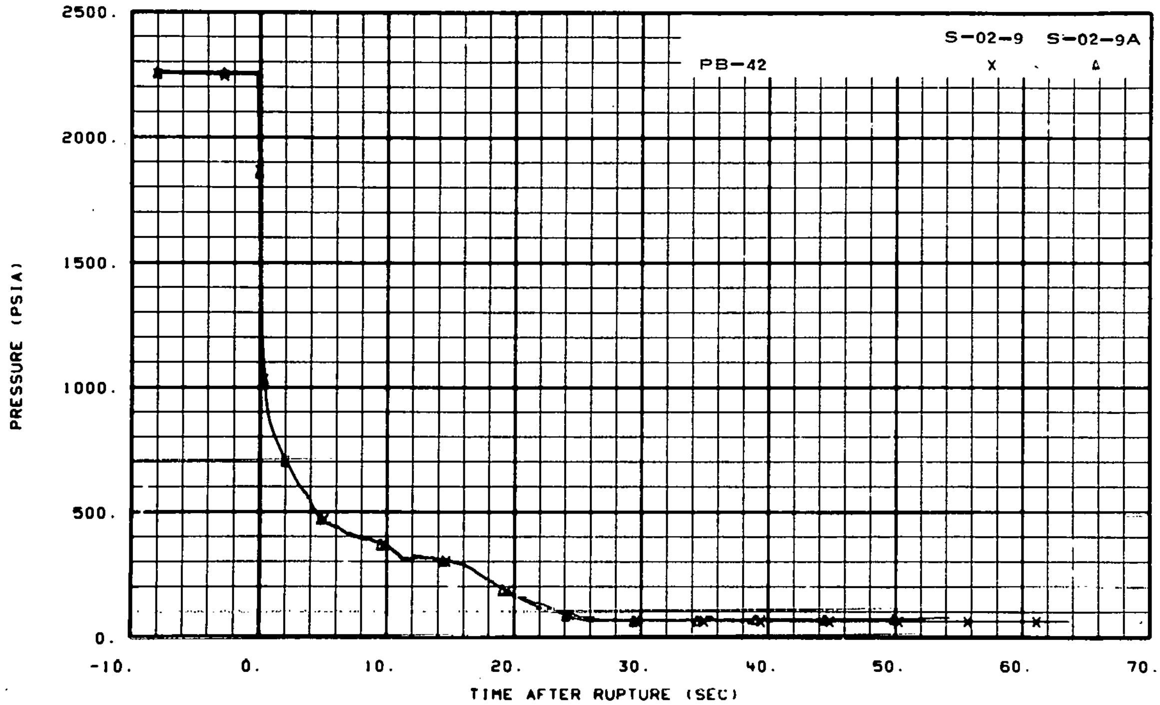

Fig. 139 Pressure in broken loop, Spool 42.

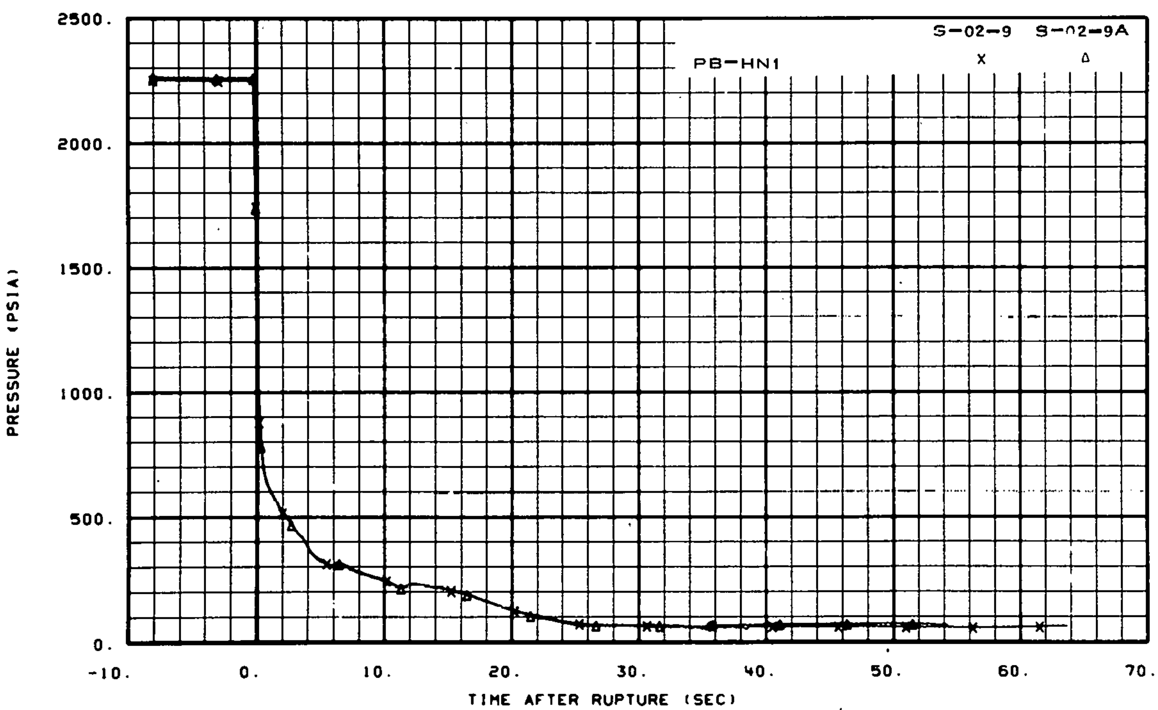

Fig. 140 Pressure in broken loop, pump-side nozzle throat.

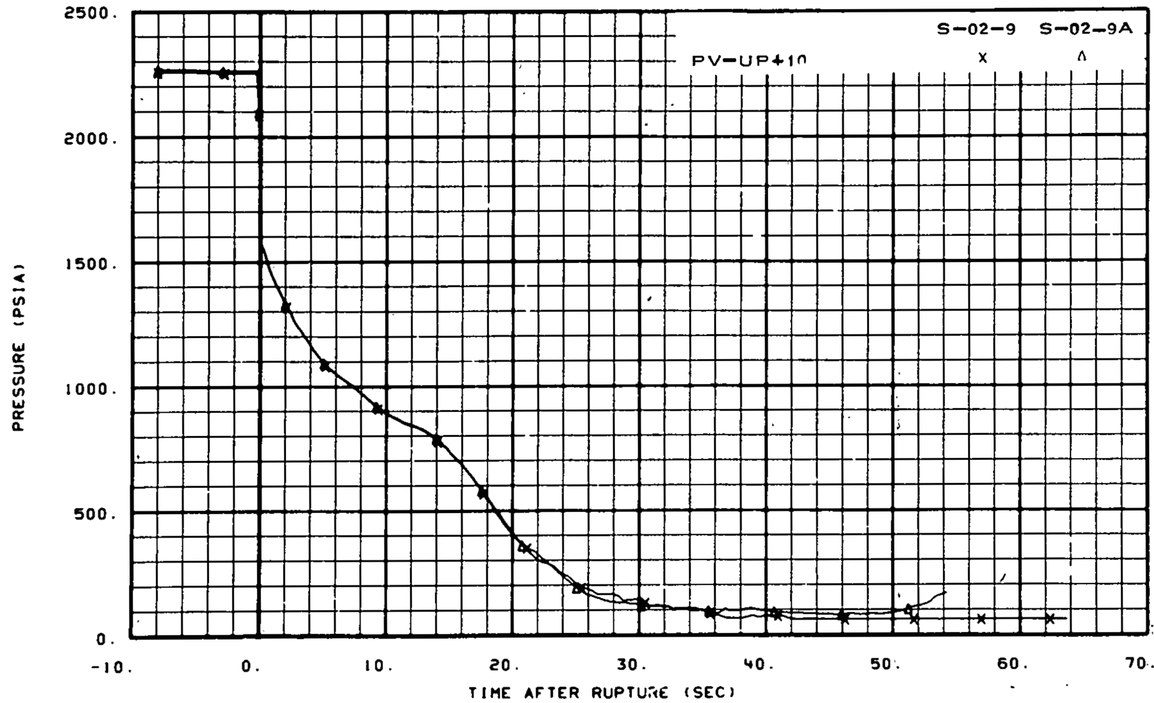

Fig. 141 Pressure in vessel upper plenum.

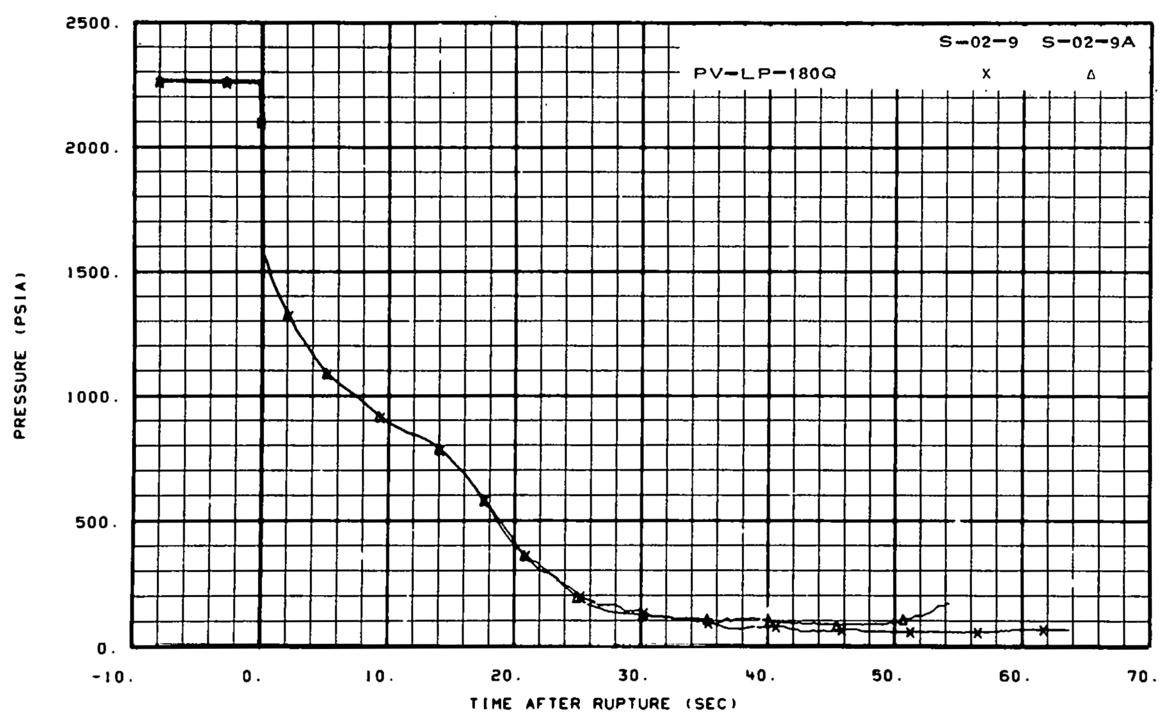

Fig. 142 Pressure in vessel lower plenum.

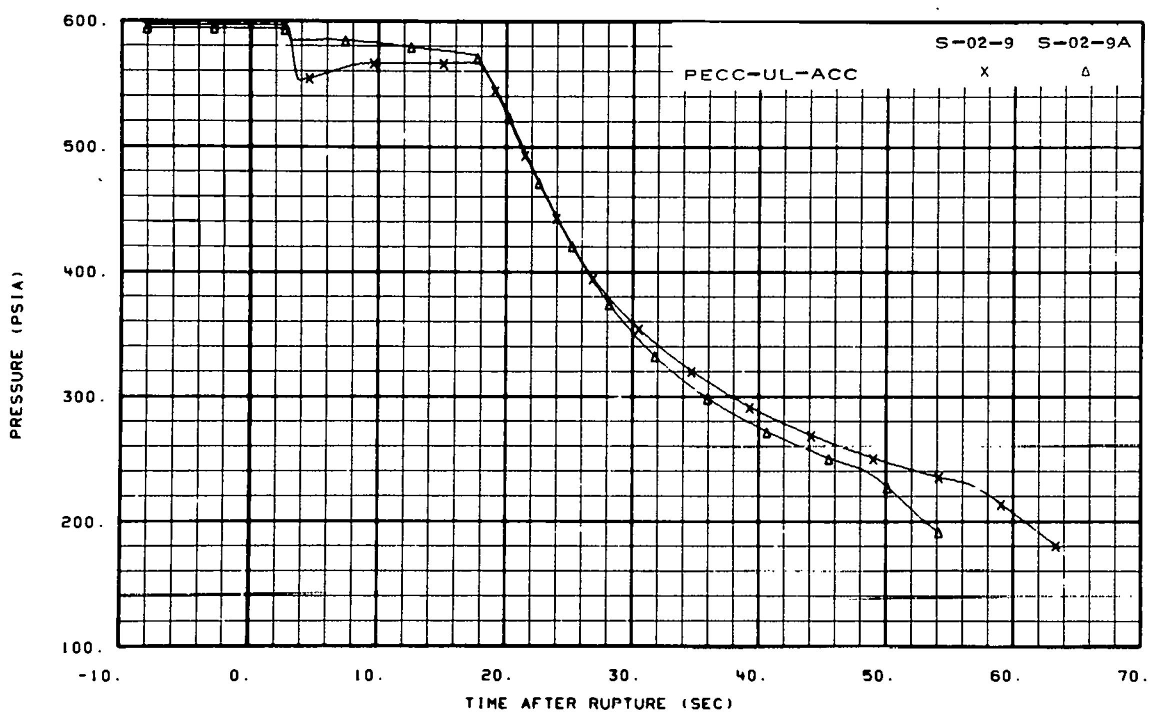

Fig. 143 Pressure in intact loop accumulator.

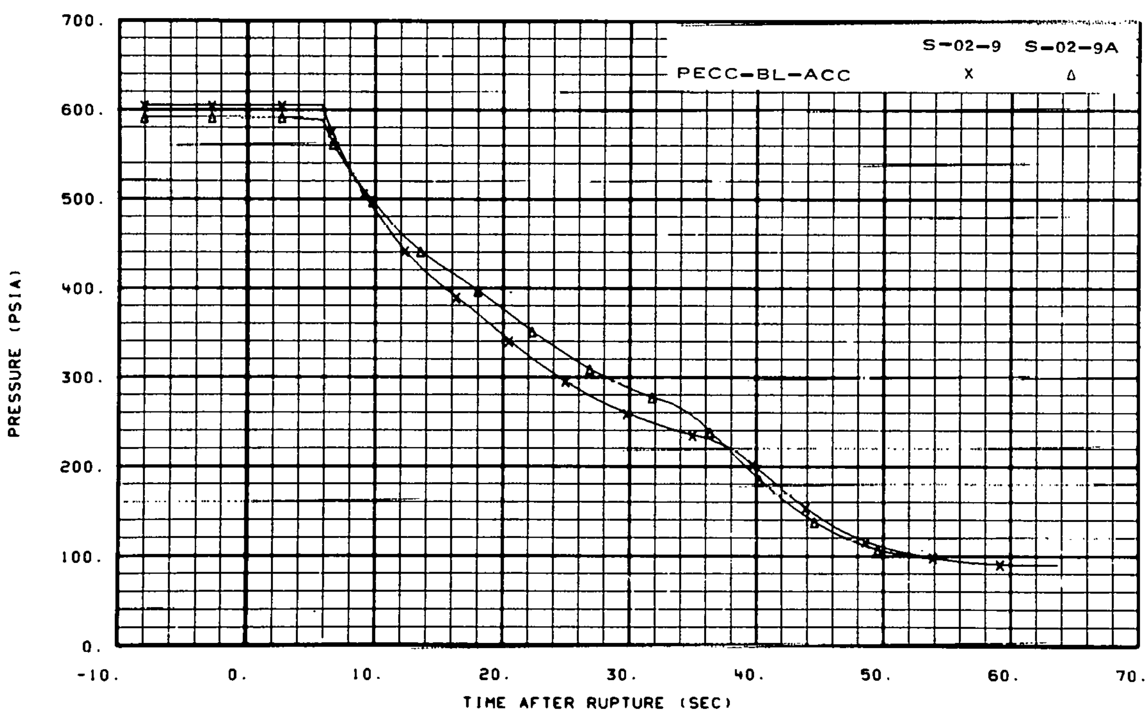

Fig. 144 Pressure in broken loop accumulator.

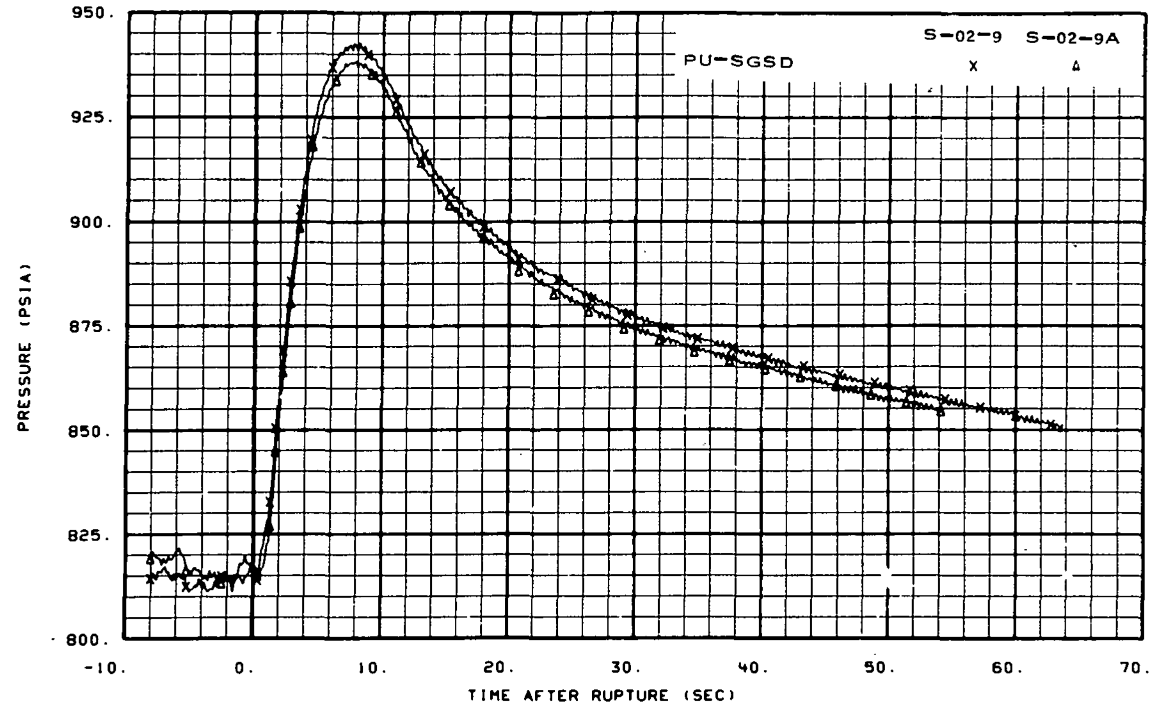

Fig. 145 Pressure in steam generator, secondary side.

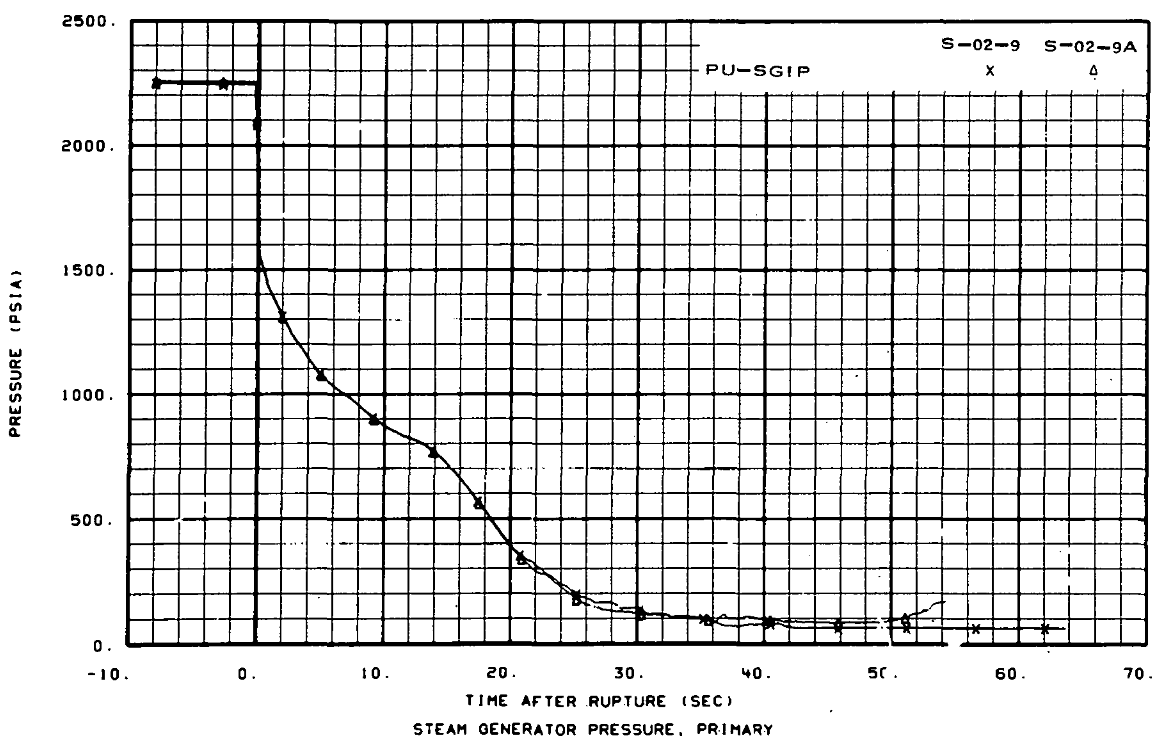

Fig. 146 Pressure in steam generator, primary side.

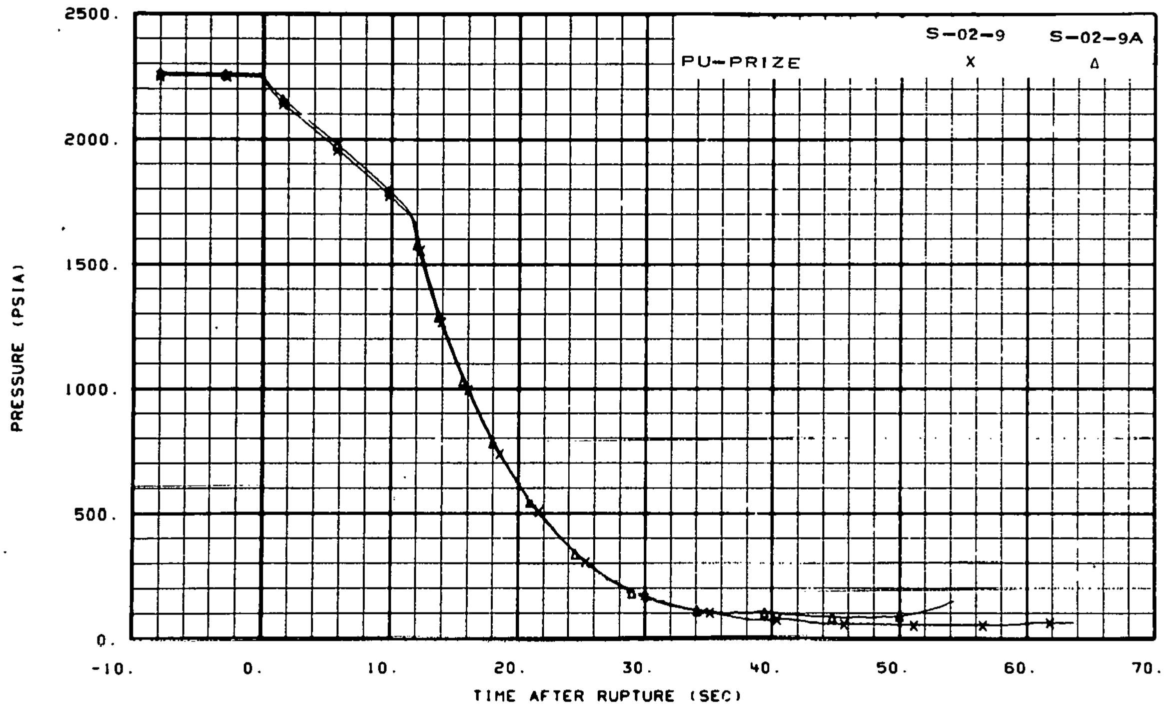

Fig. 147 Pressure in pressurizer.

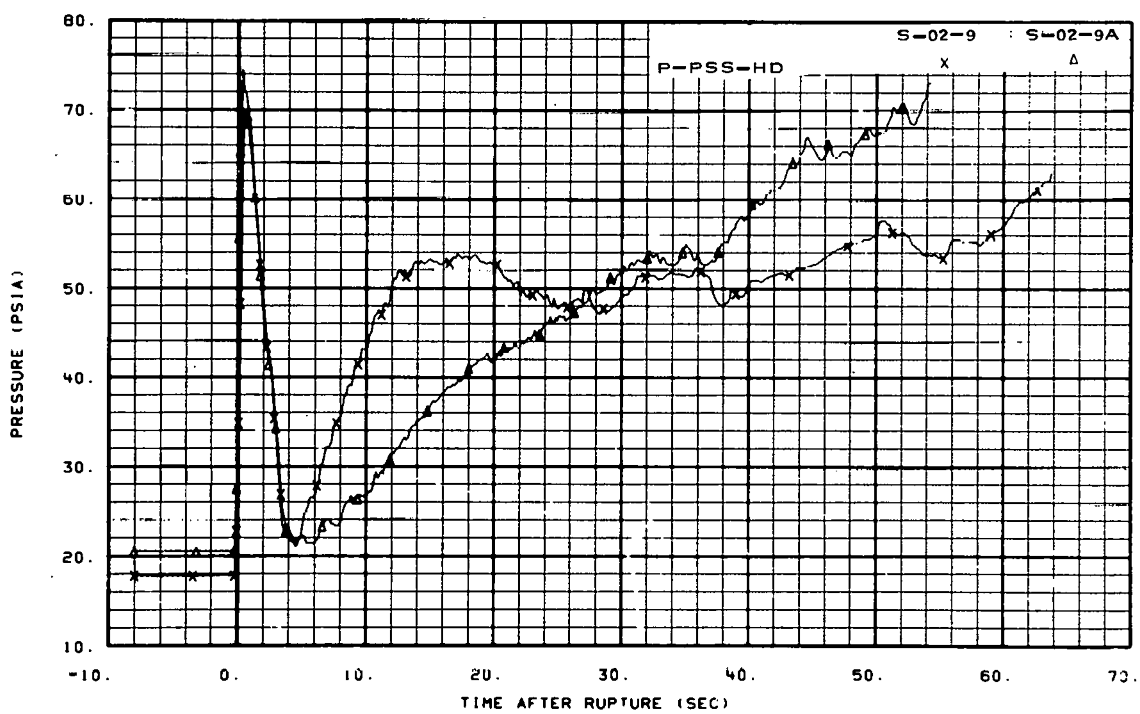

Fig. 148 Pressure in pressure suppression header.

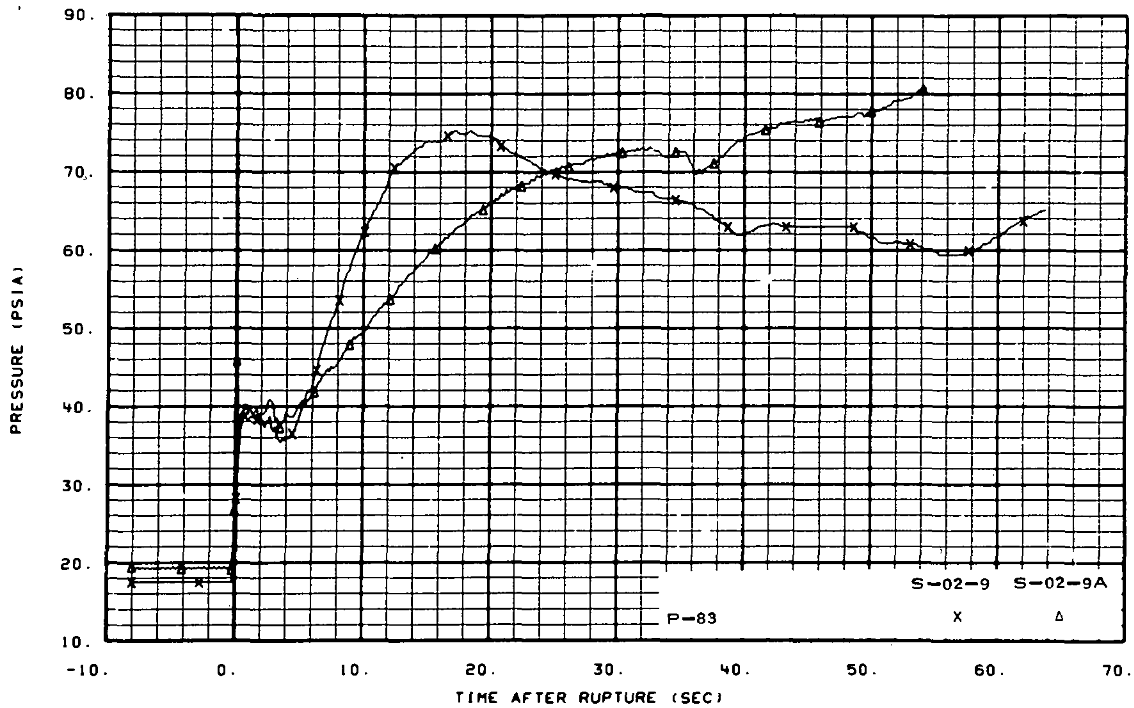

Fig. 149 Pressure in pressure suppression header outlet.

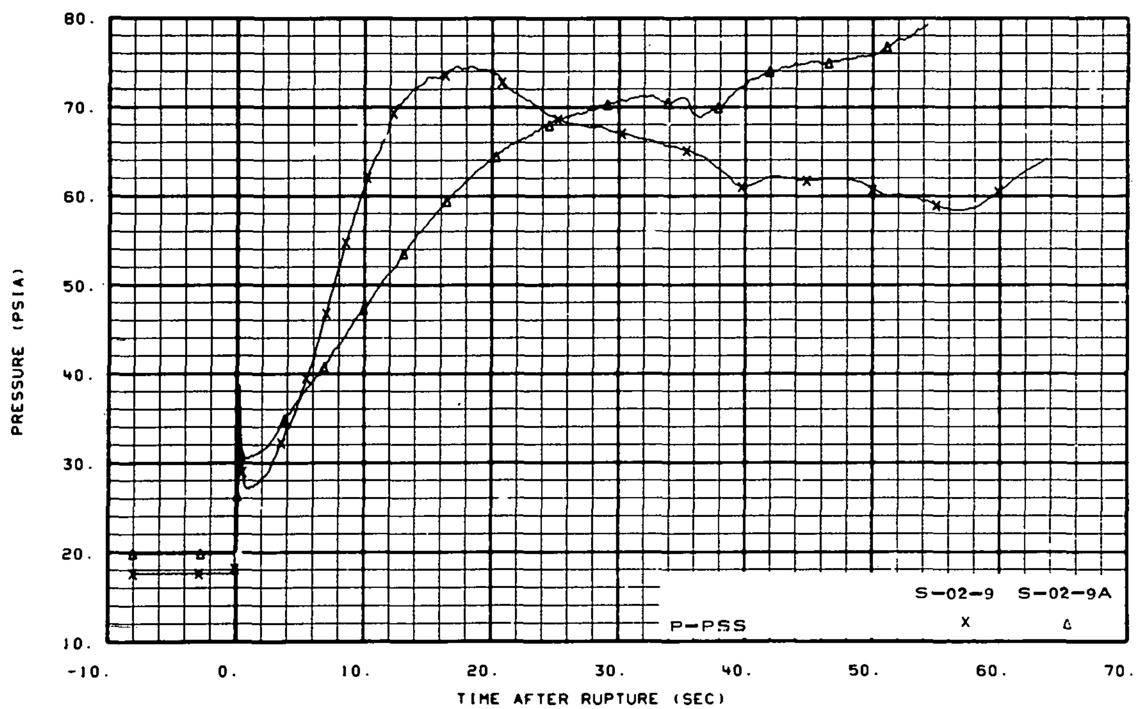

Fig. 150 Pressure in pressure suppression tank.

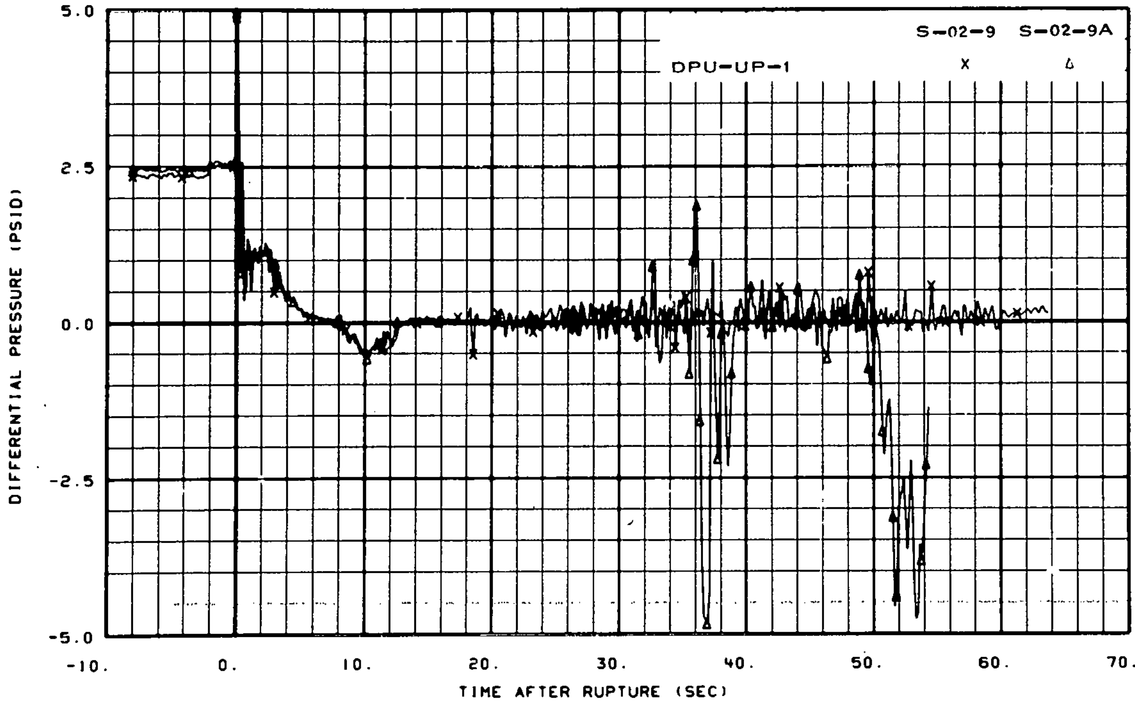

Fig. 151 Differential pressure in intact loop (upper plenum to Spool 1).

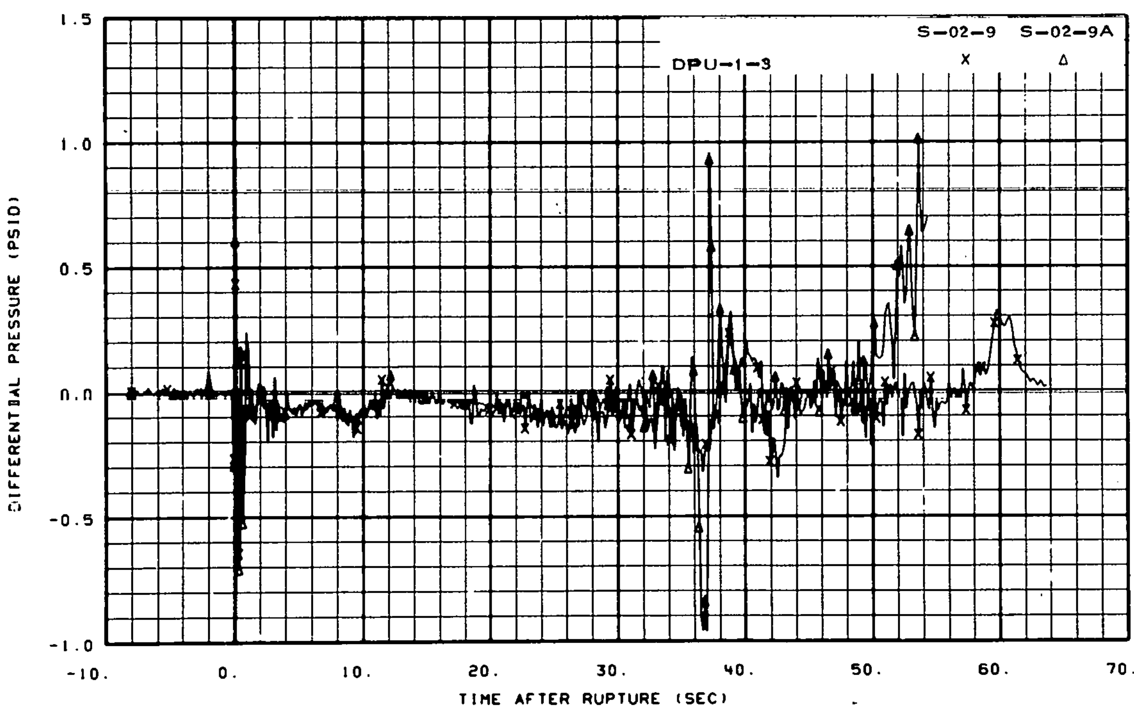

Fig. 152 Differential pressure in intact loop (Spool 1 to Spool 3).

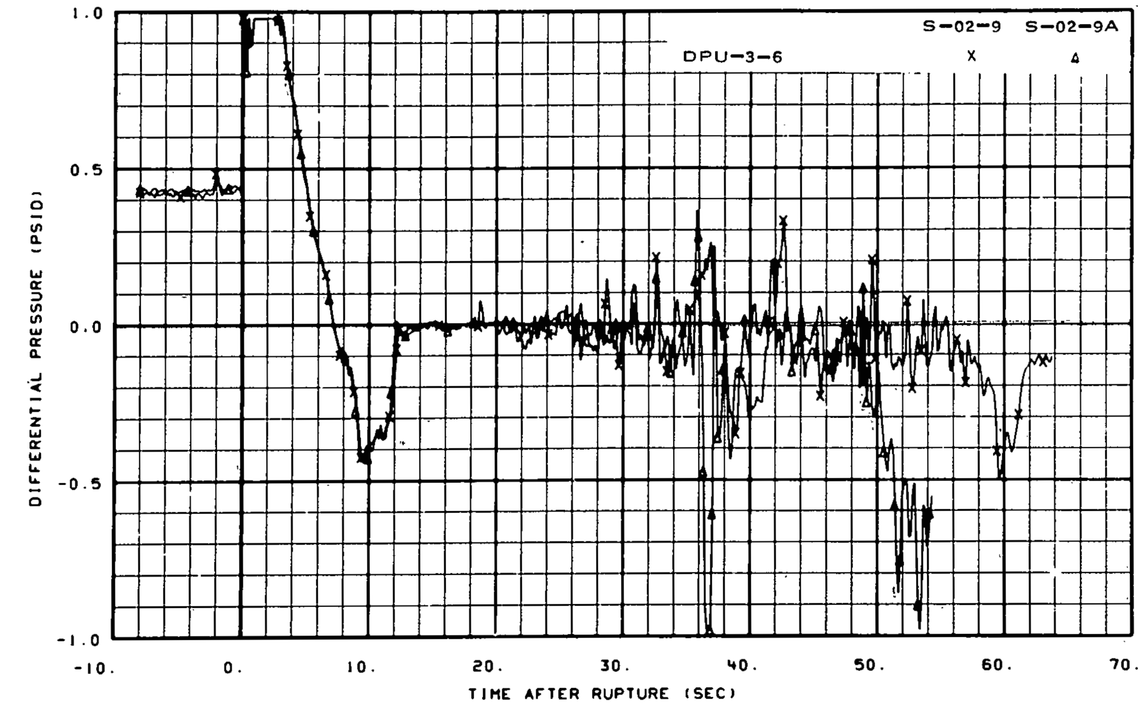

Fig. 153 Differential pressure in intact loop (Spool 3 to Spool 6).

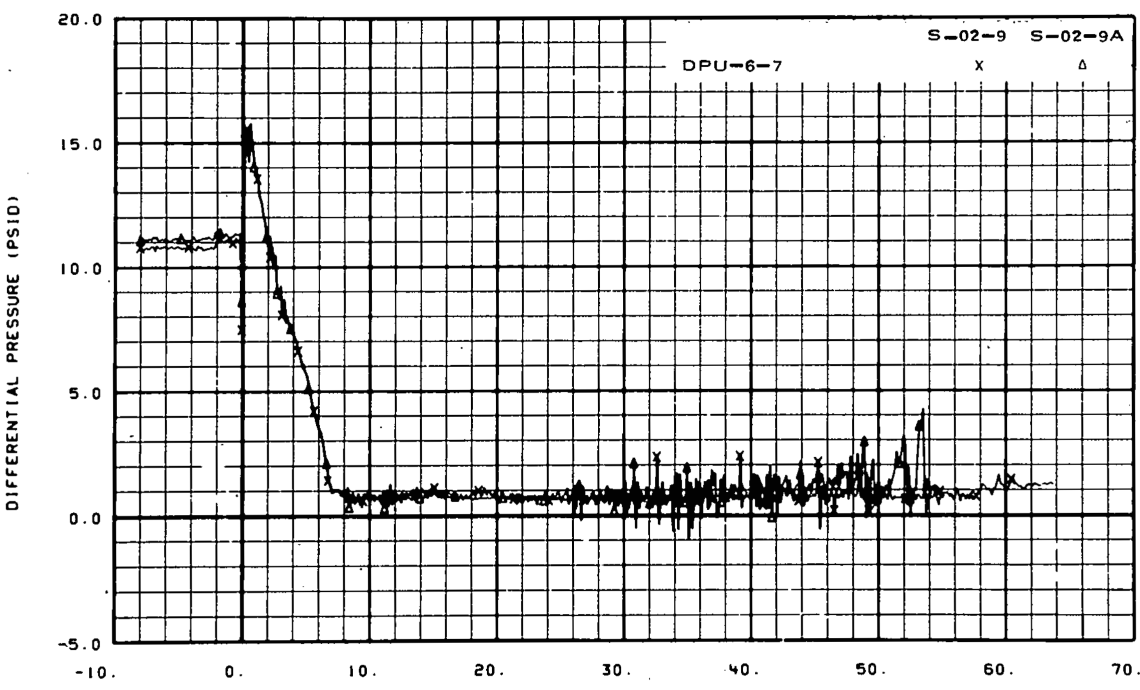

Fig. 154 Differential pressure in intact loop (Spool 6 to Spool 7).

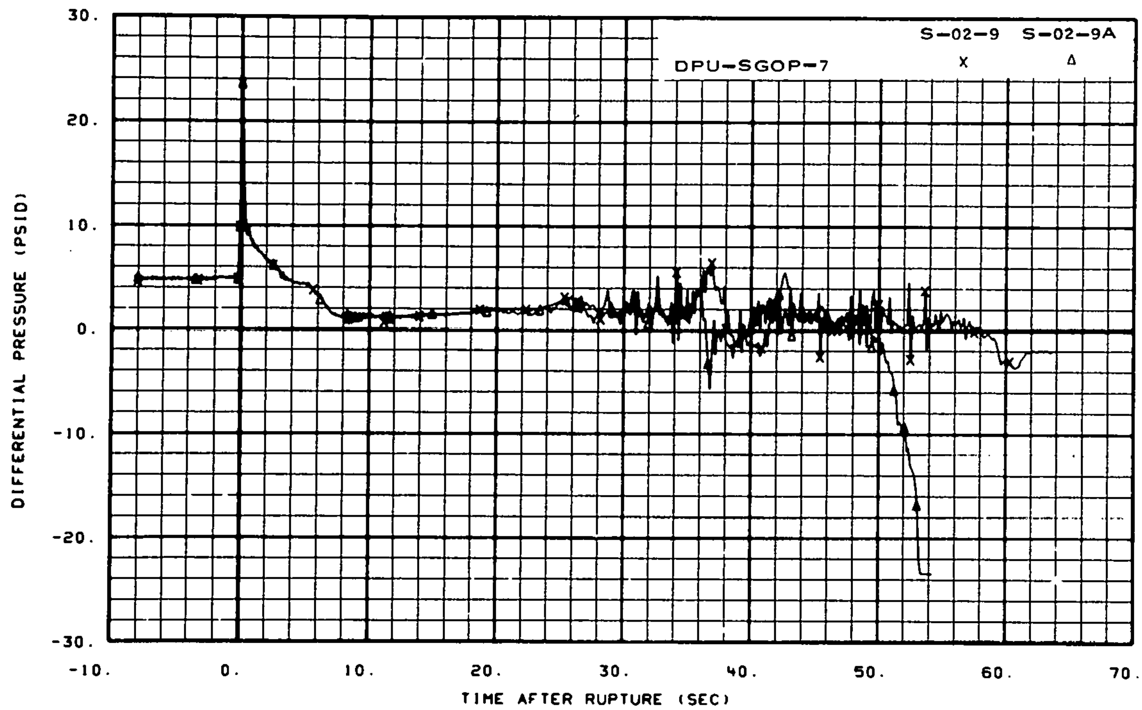

Fig. 155 Differential pressure in intact loop (steam generator outlet plenum to Spool 7).

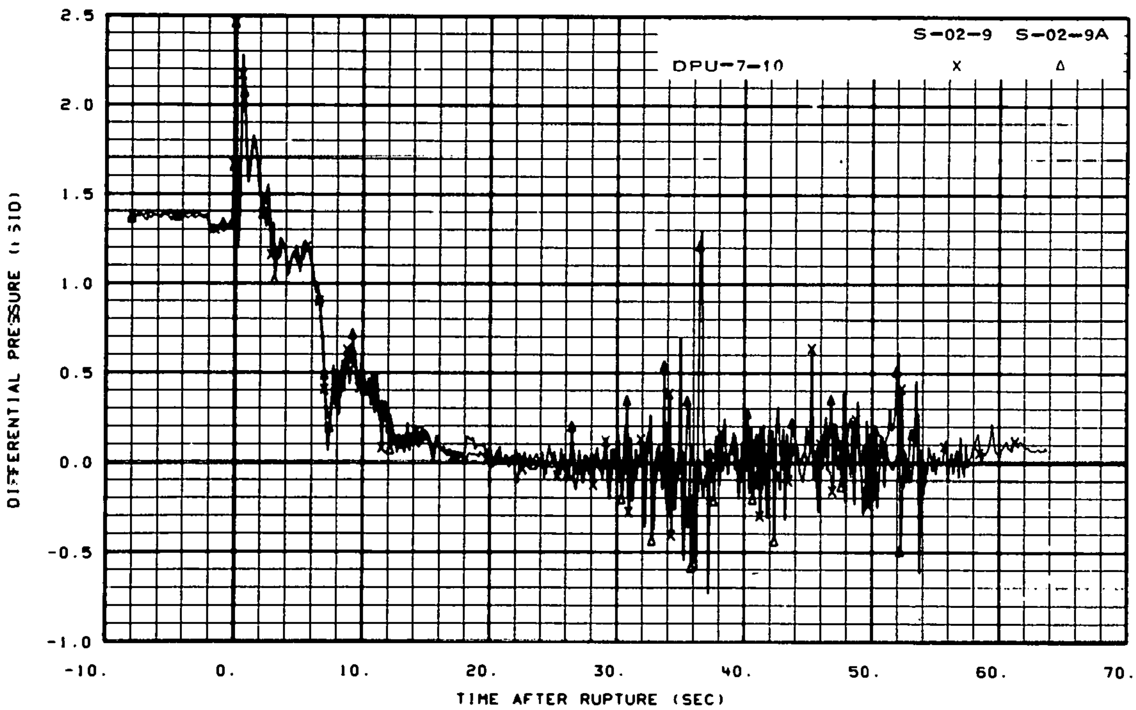

Fig. 156 Differential pressure in intact loop (Spool 7 to Spool 10).

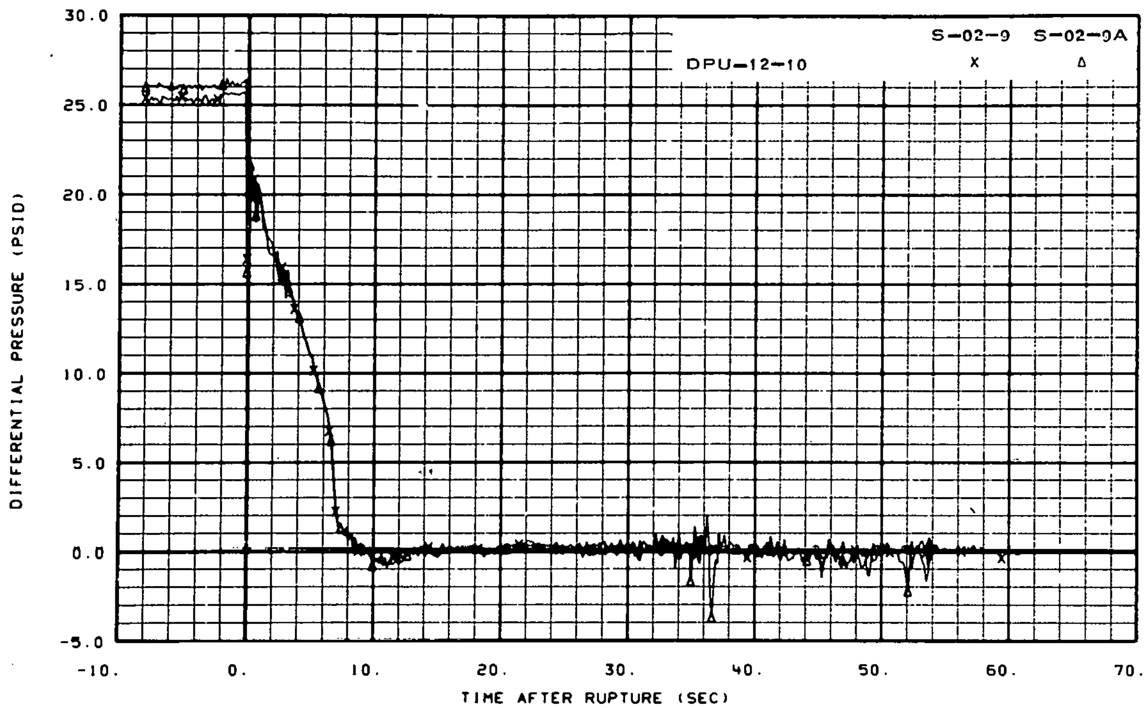

Fig. 157 Differential pressure in intact loop (Spool 12 to Spool 10).

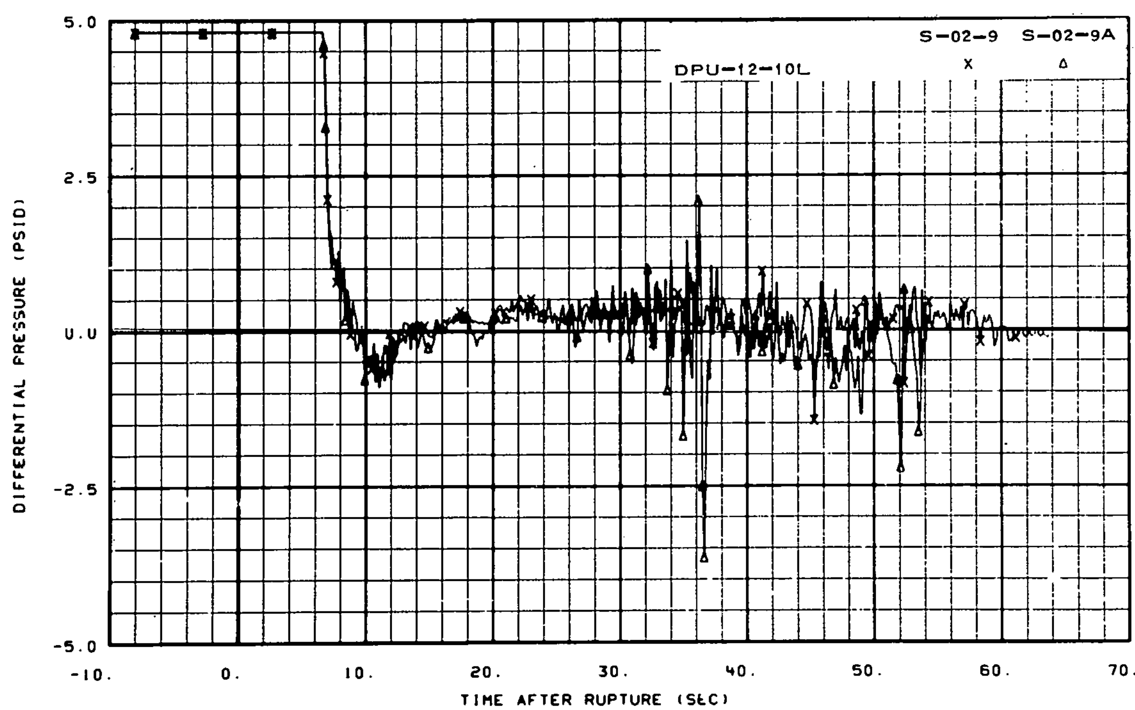

Fig. 158 Differential pressure in intact loop, low range (Spool 12 to Spool 10).

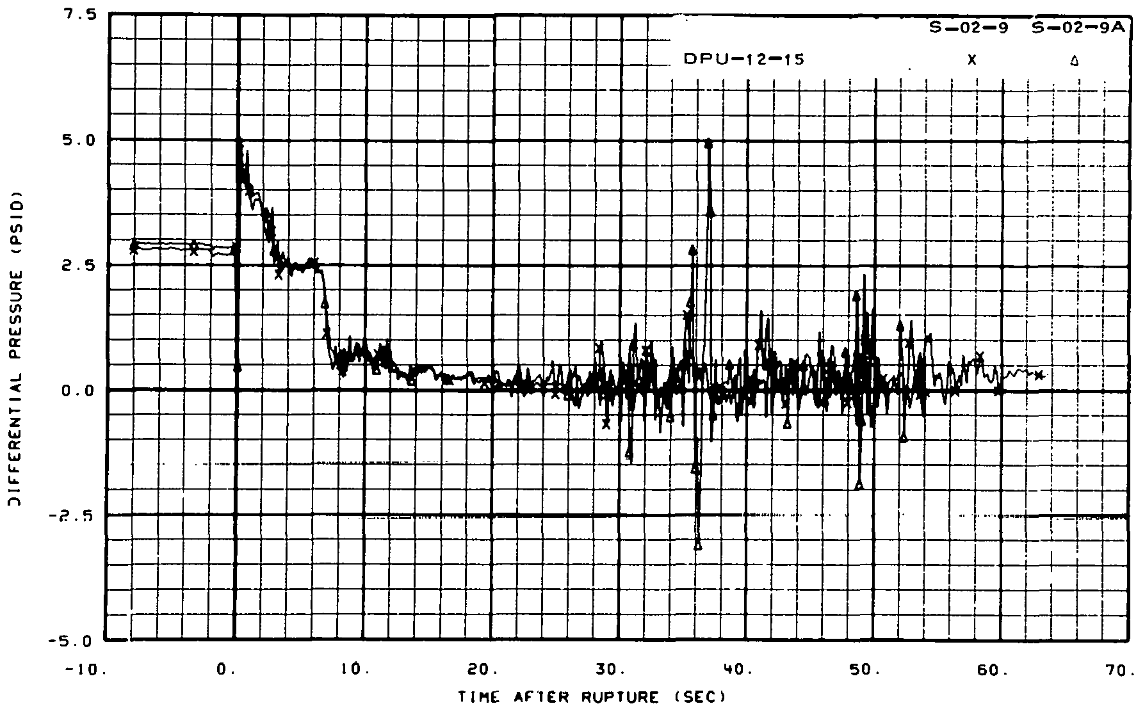

Fig. 159 Differential pressure in intact loop (Spool 12 to Spool 15).

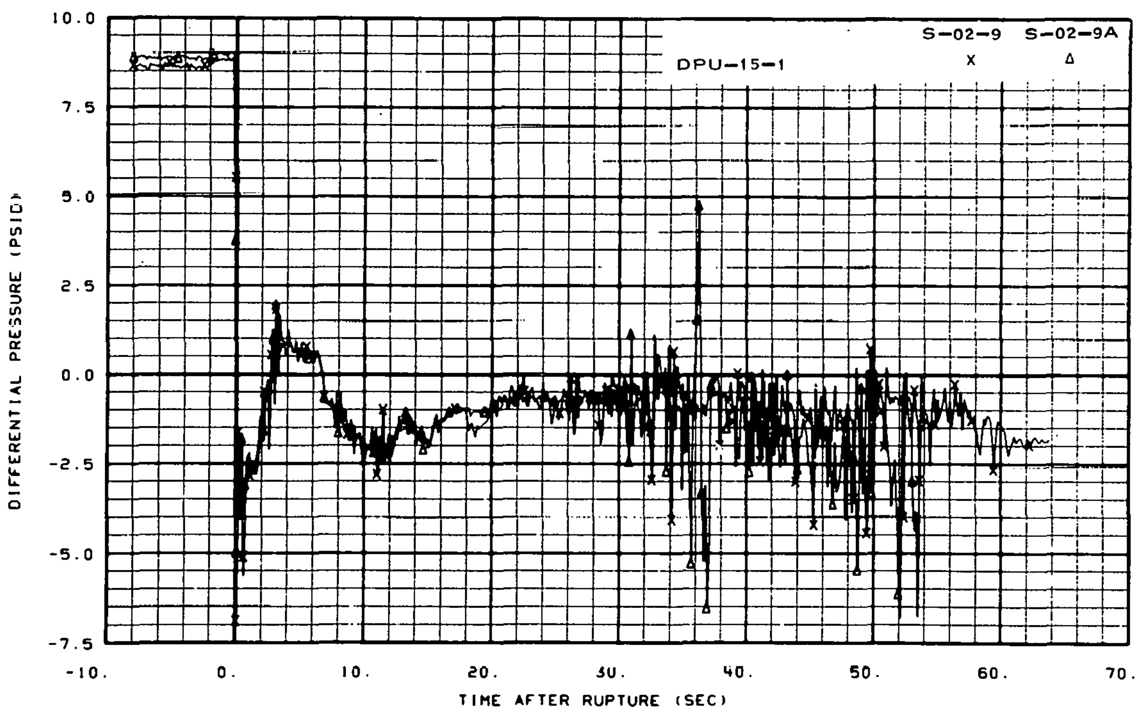

Fig. 160 Differential pressure in intact loop (Spool 15 to Spool 1).

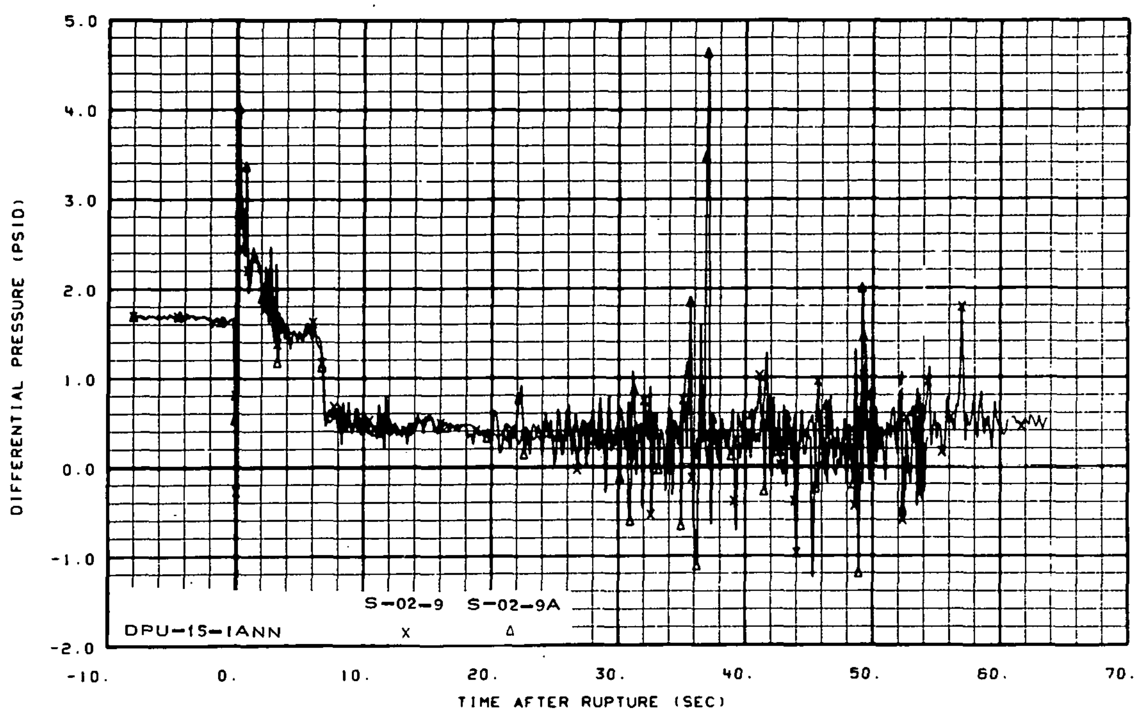

Fig. 161 Differential pressure in intact loop (Spool 15 to vessel inlet annulus).

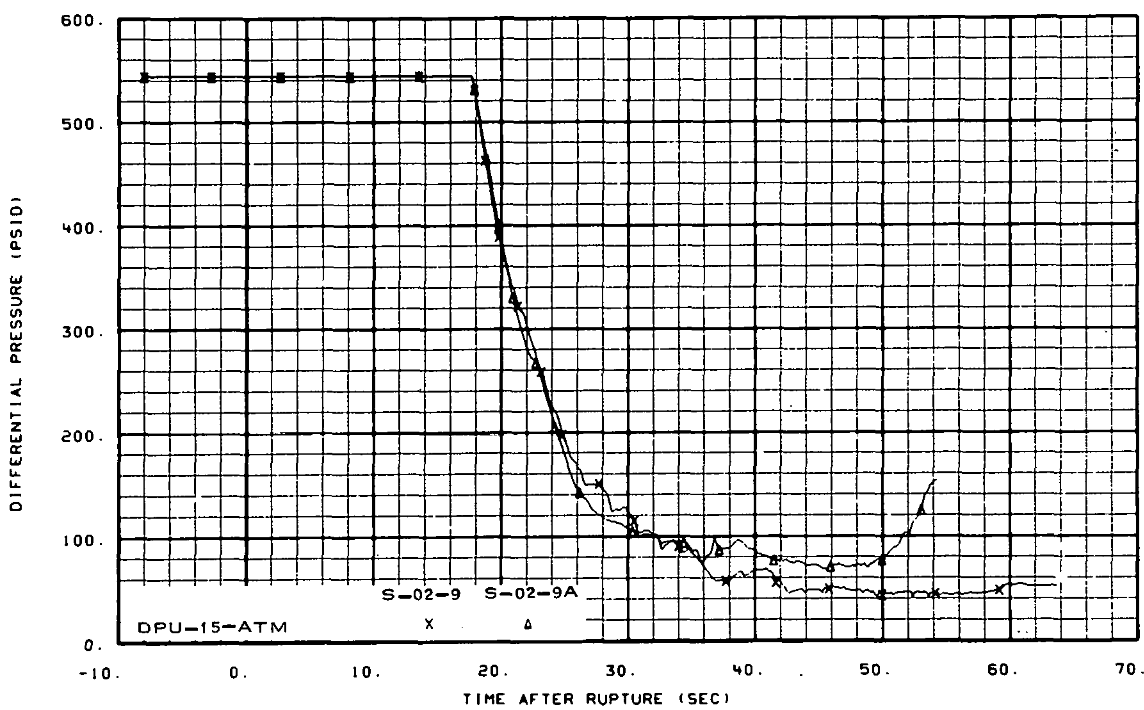

Fig. 162 Differential pressure in intact loop (Spool 15 to atmosphere).

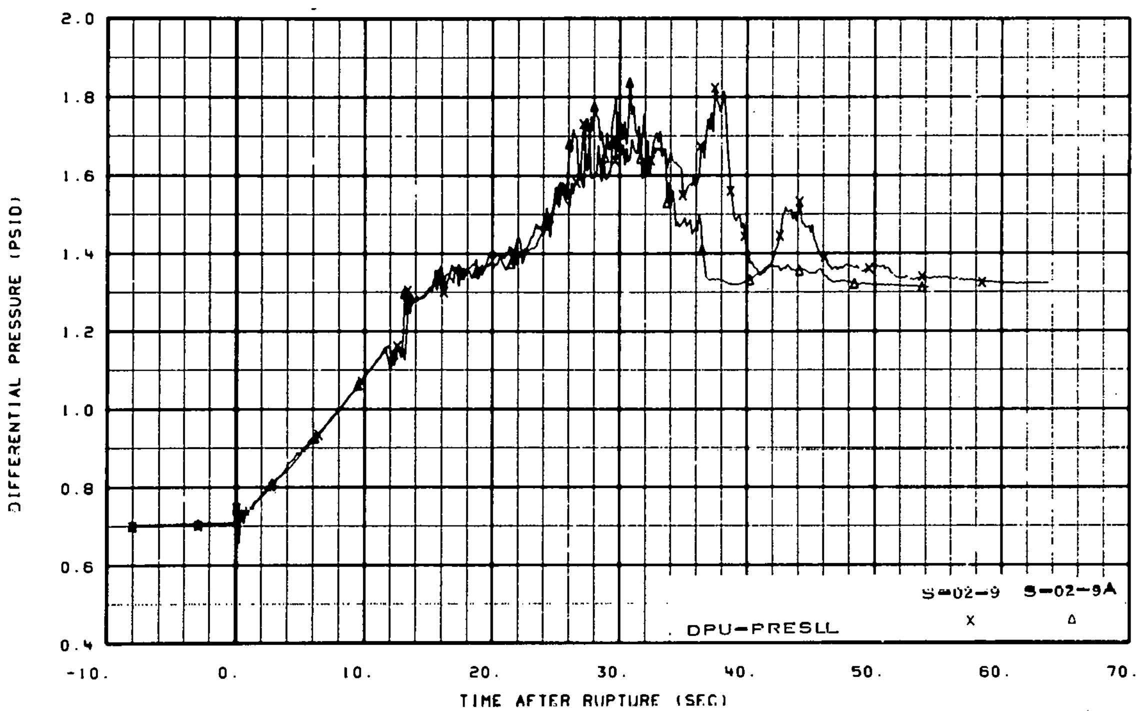

Fig. 163 Differential pressure in intact loop (pressurizer liquid level).

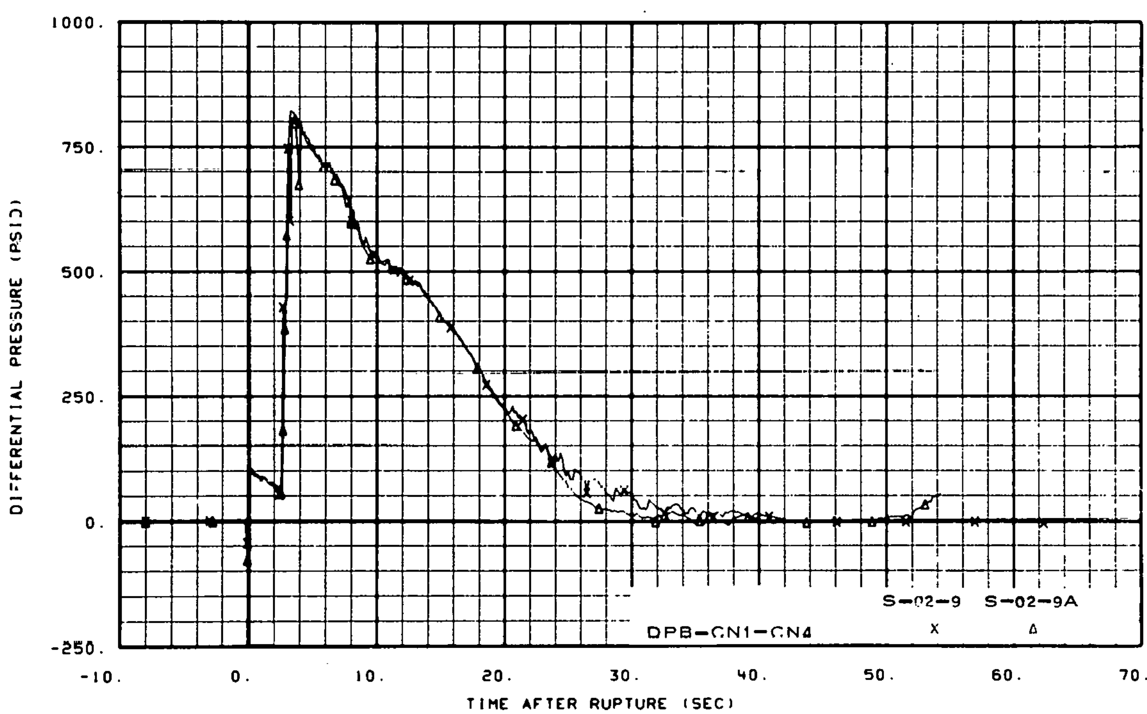

Fig. 164 Differential pressure in broken loop (vessel-side nozzel throat to divergent section).

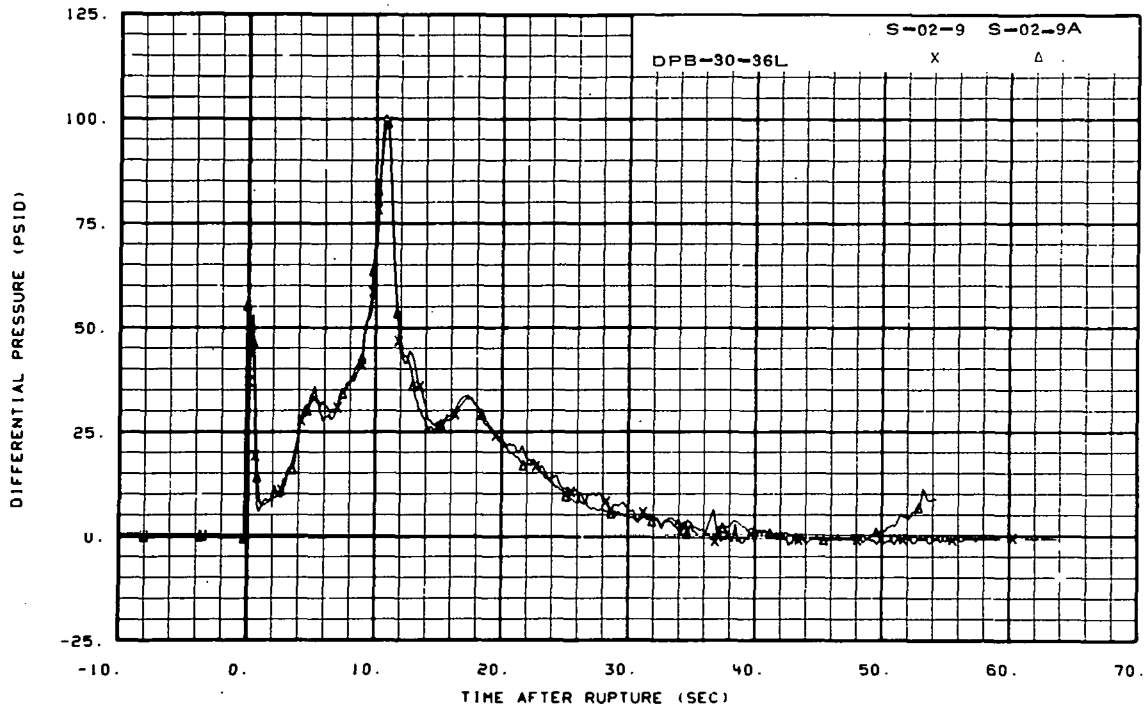

Fig. 165 Differential pressure in broken loop (Spool 30 to Spool 36L).

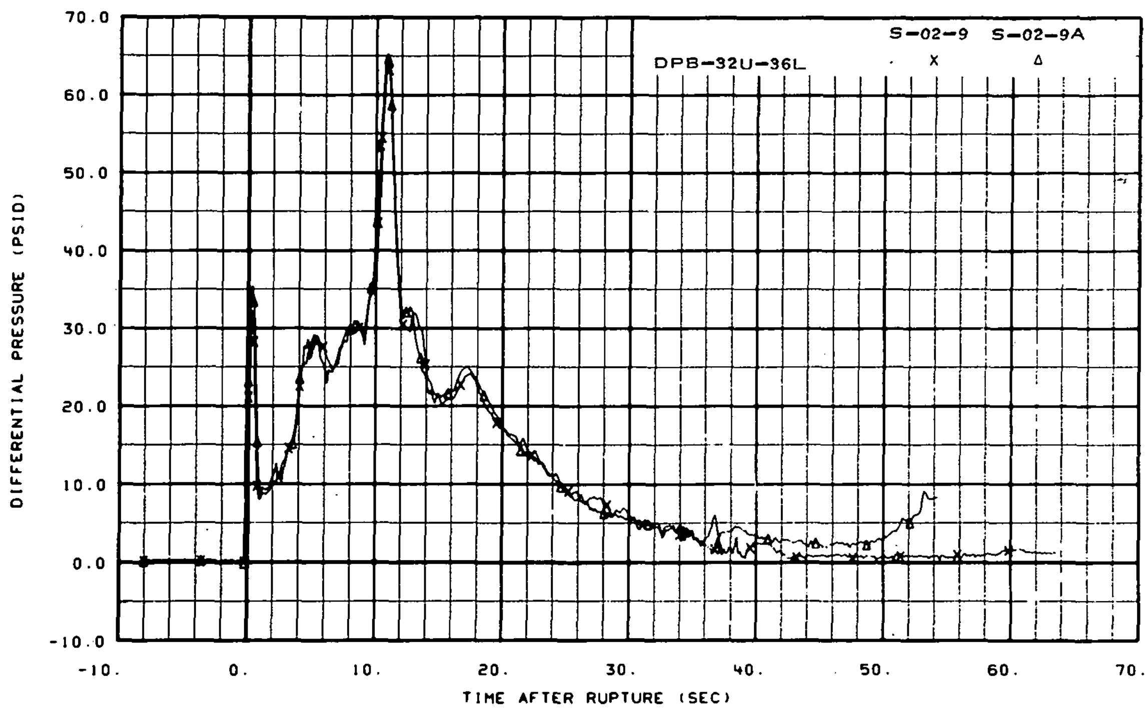

Fig. 166 Differential pressure in broken loop (Spool 32U to Spool 36L).

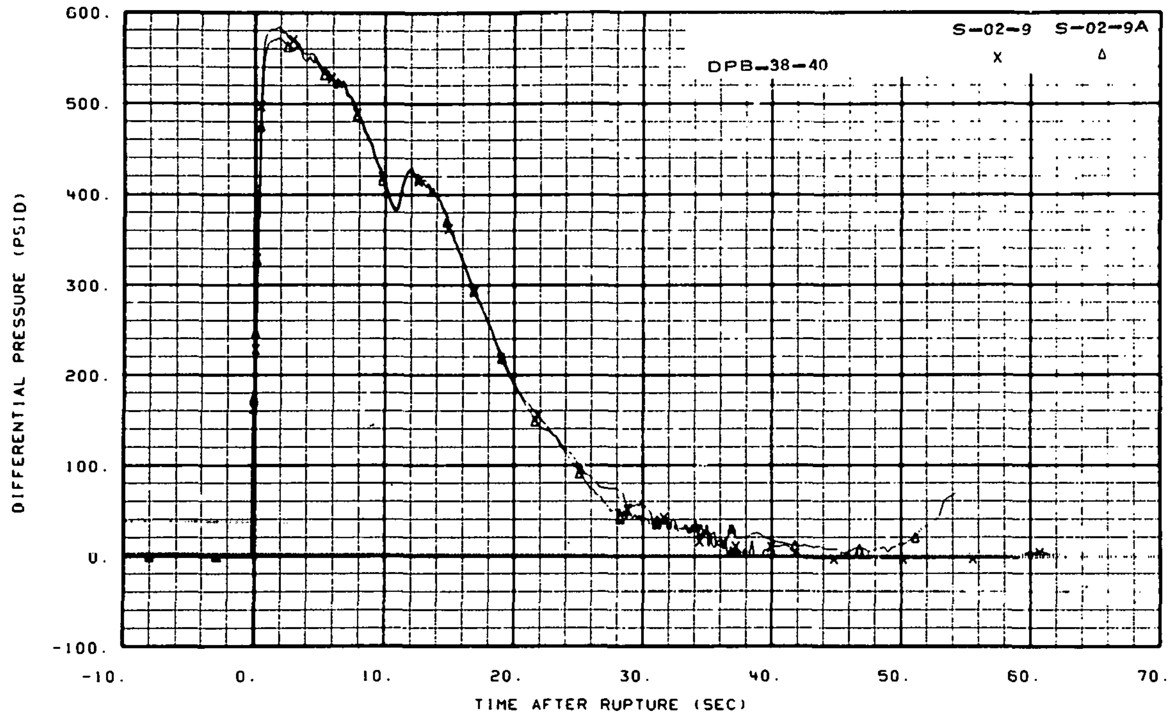

Fig. 167 Differential pressure in broken loop (Spool 38 to Spool 40).

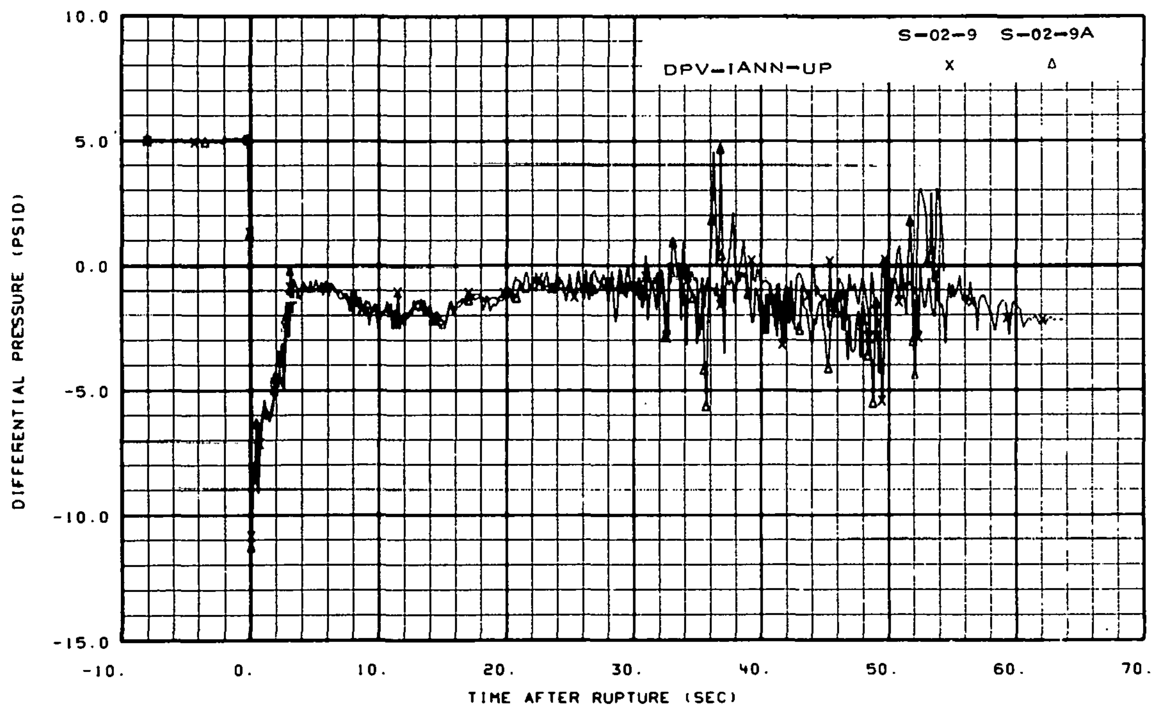

Fig. 168 Differential pressure in vessel (inlet annulus to upper plenum).

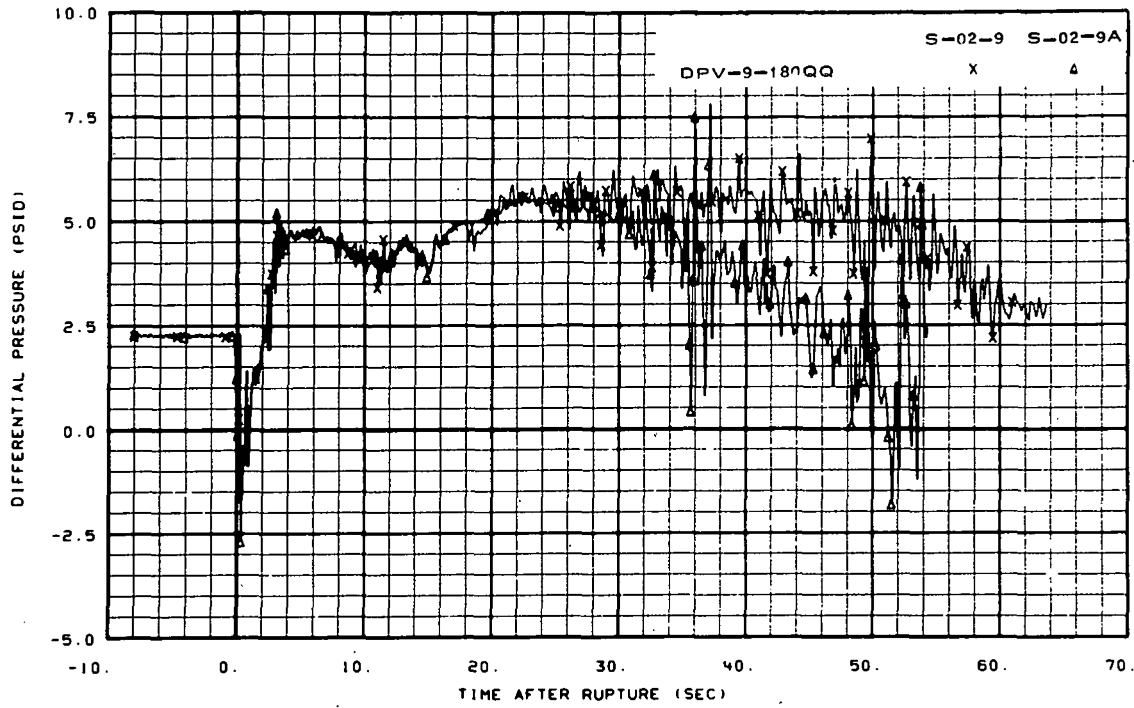

Fig. 169 Differential pressure in vessel (DPV-9-180QQ).

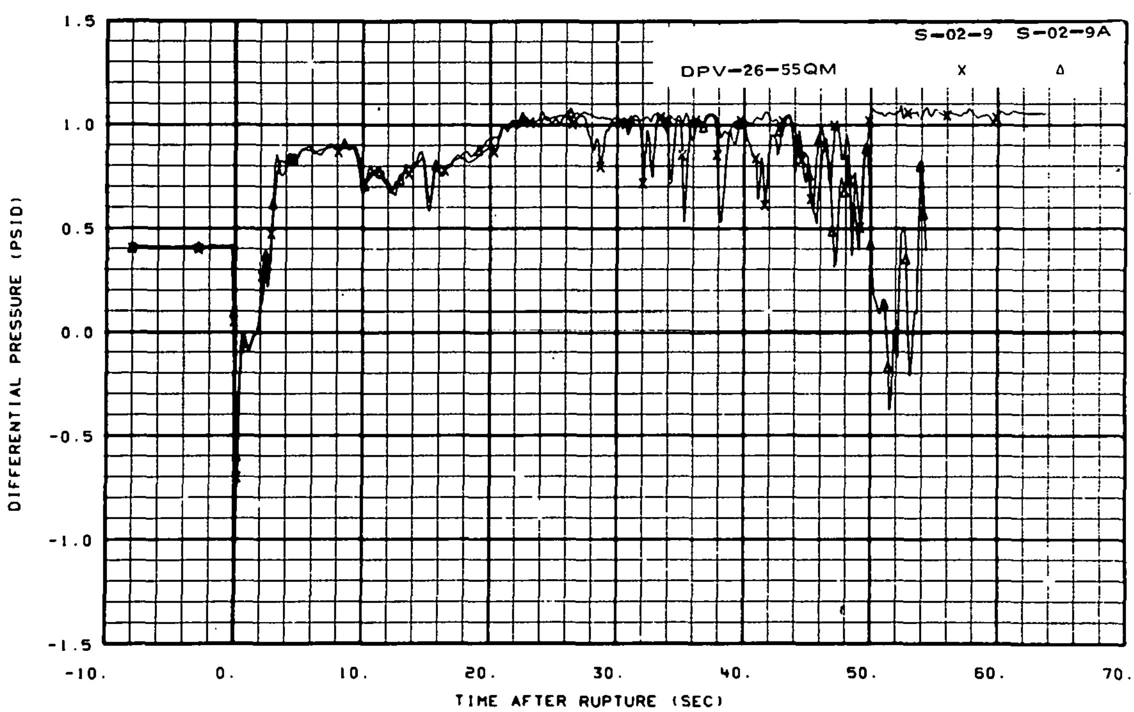

Fig. 170 Differential pressure in vessel (DPV-26-55QM).

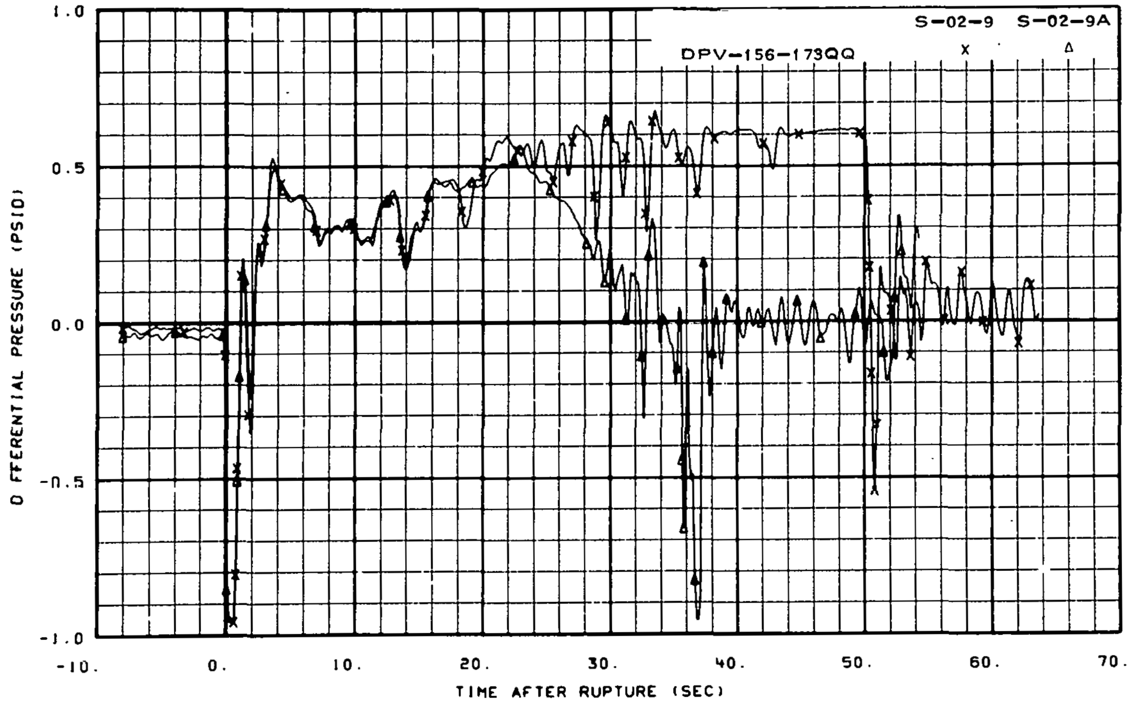

Fig. 171 Differential pressure in vessel (DPV-156-173QQ).

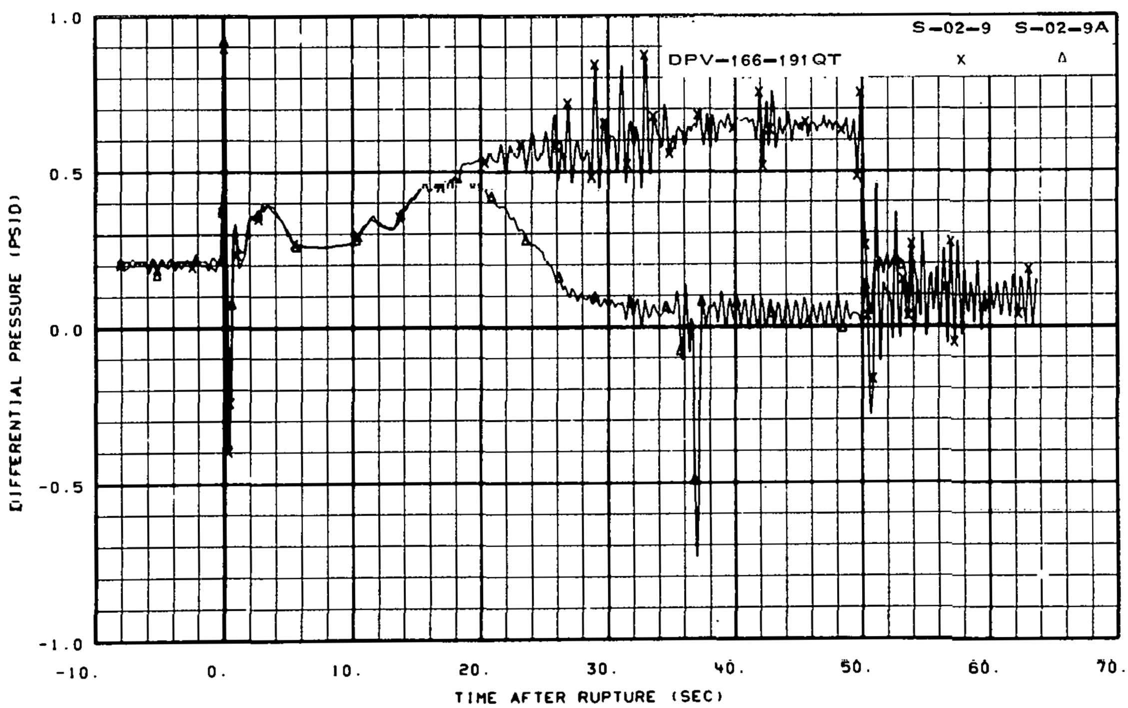

Fig. 172 Differential pressure in vessel (DPV-166-191QT).

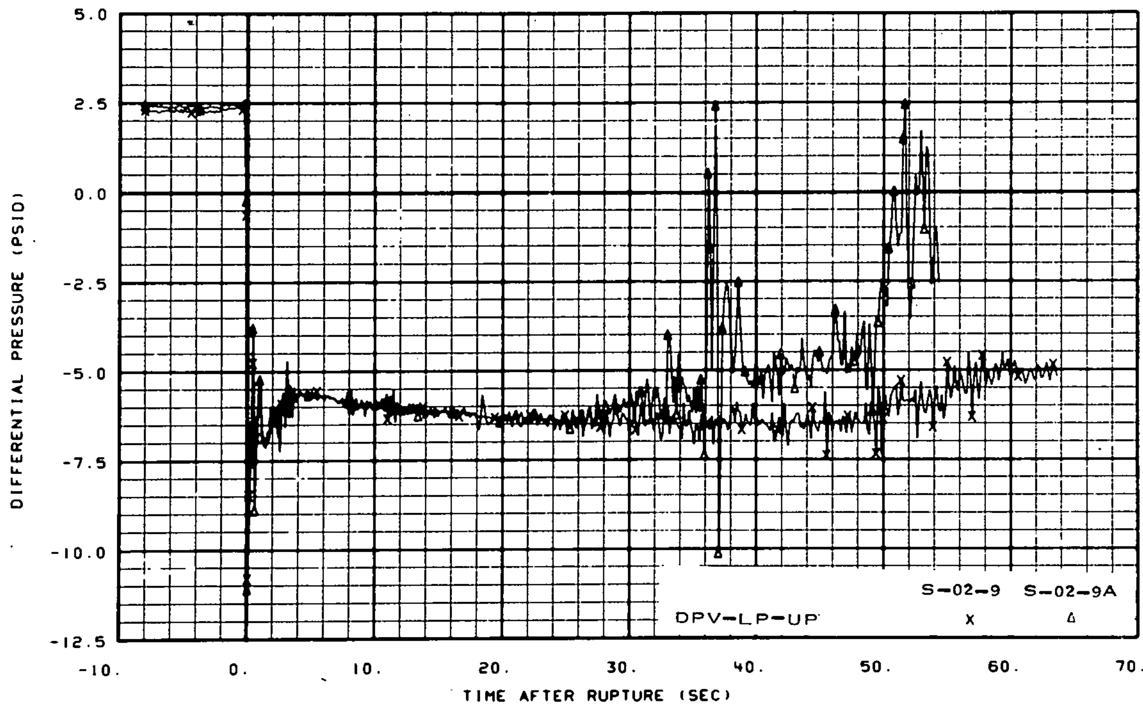

Fig. 173 Differential pressure in vessel (DPV-LP-UP).

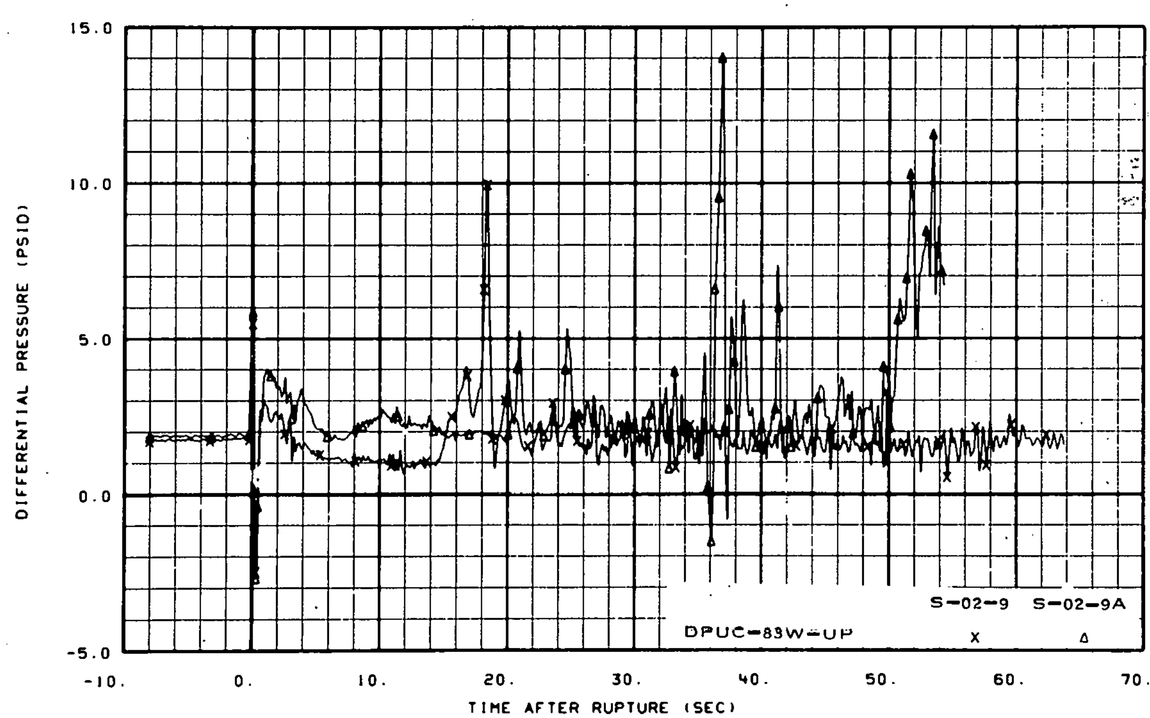

Fig. 174 Differential pressure in vessel core.

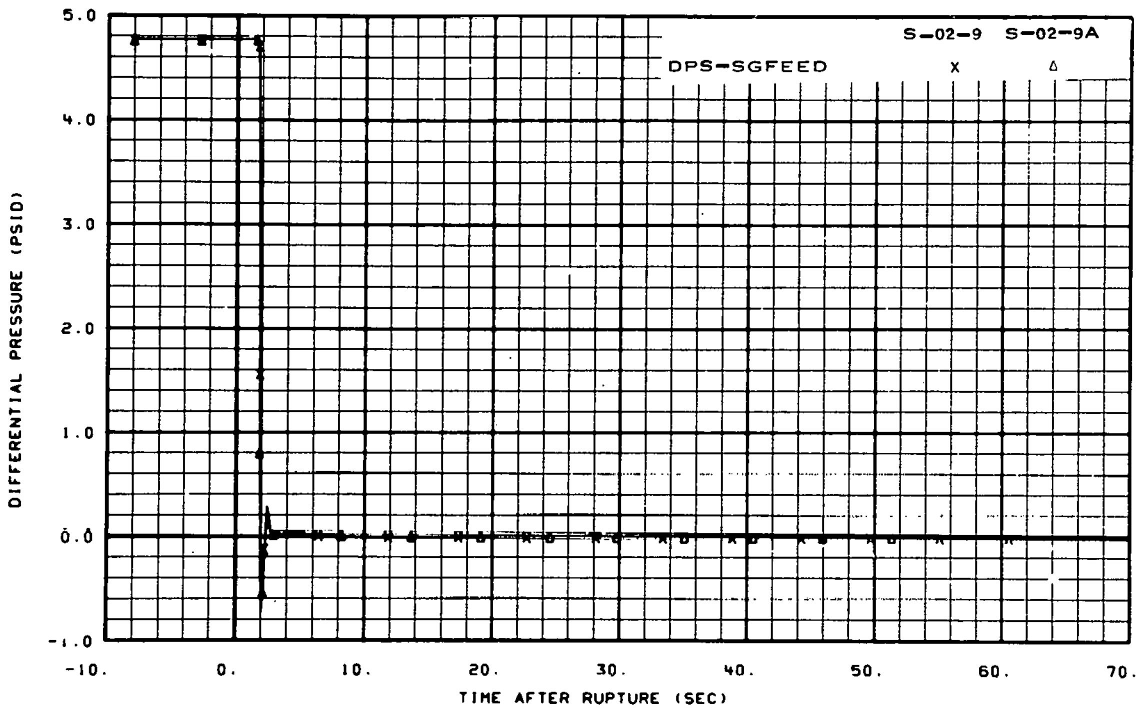

Fig. 175 Differential pressure across steam generator feedwater inlet orifice.

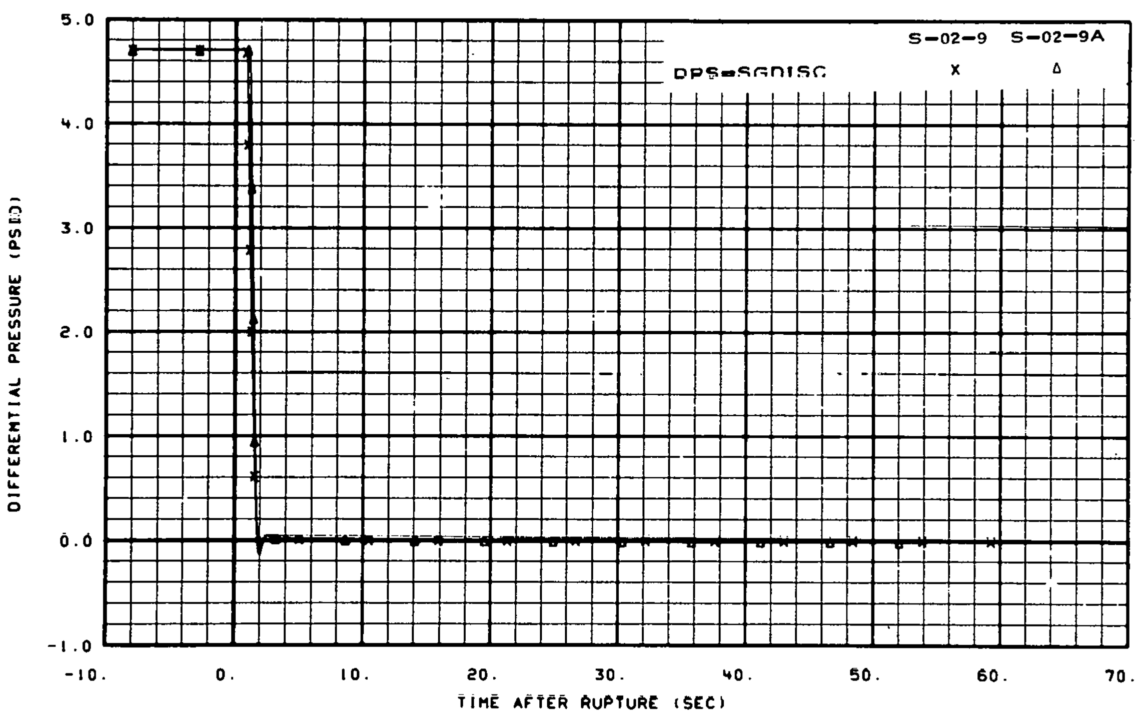

Fig. 176 Differential pressure across steam generator discharge outlet orifice.

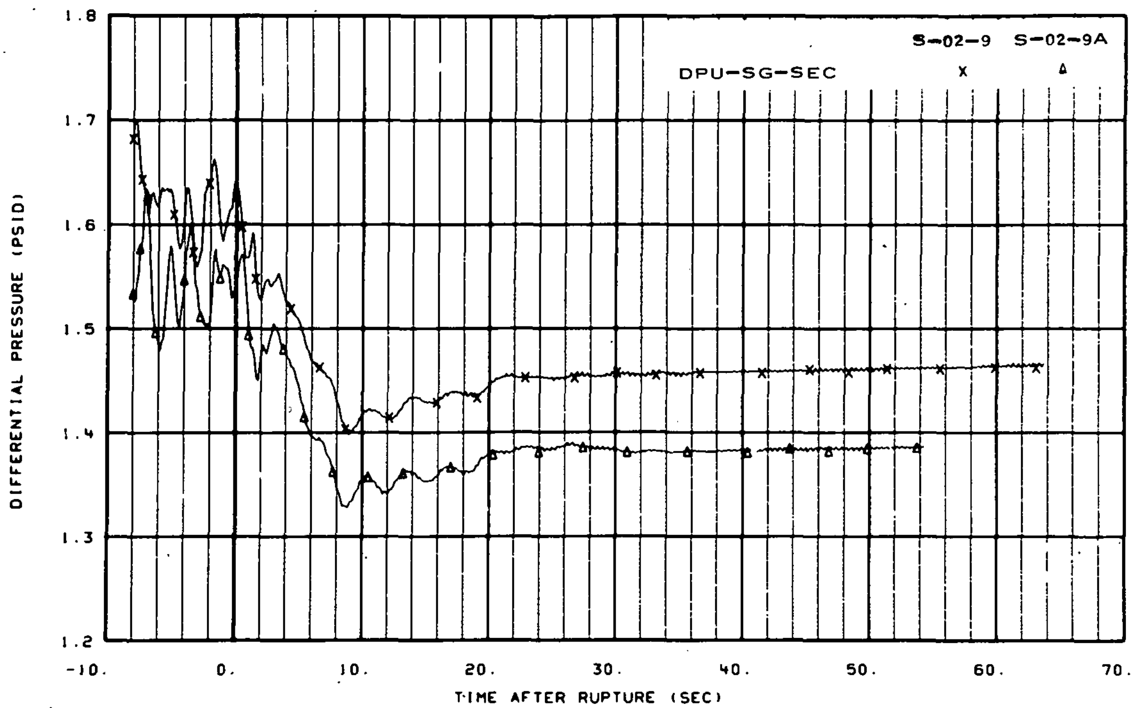

Fig. 177 Differential pressure in steam generator secondary.

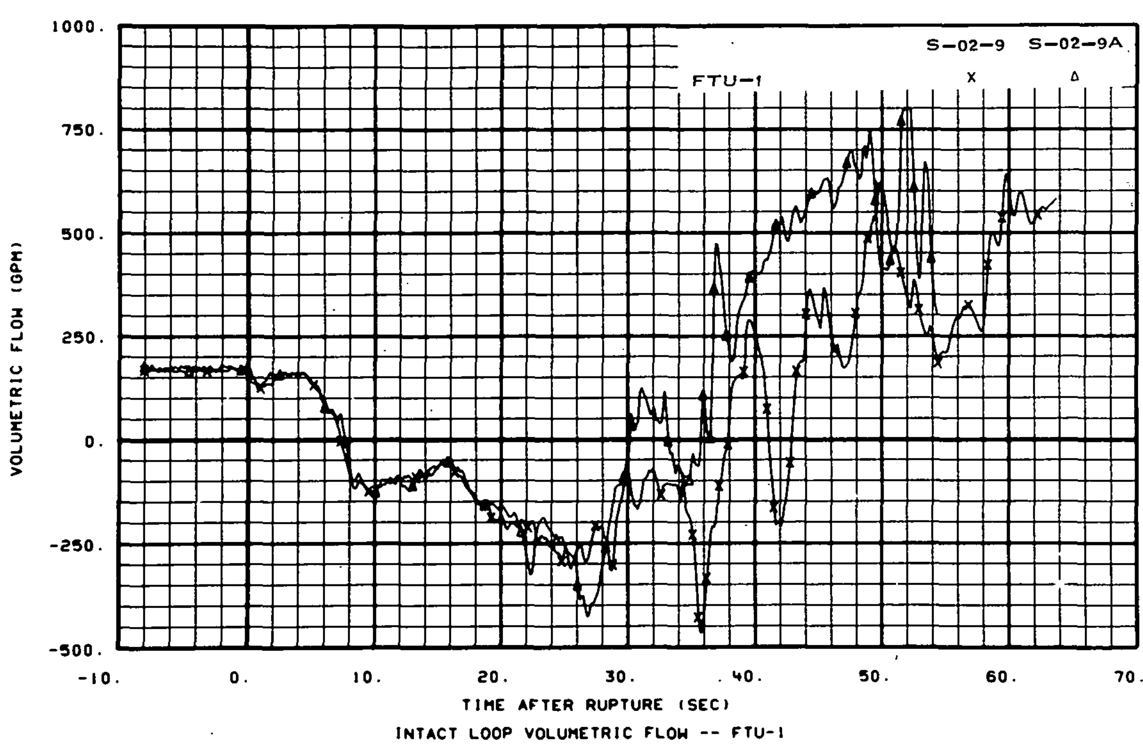

Fig. 178 Volumetric flow in intact loop (FTU-1).

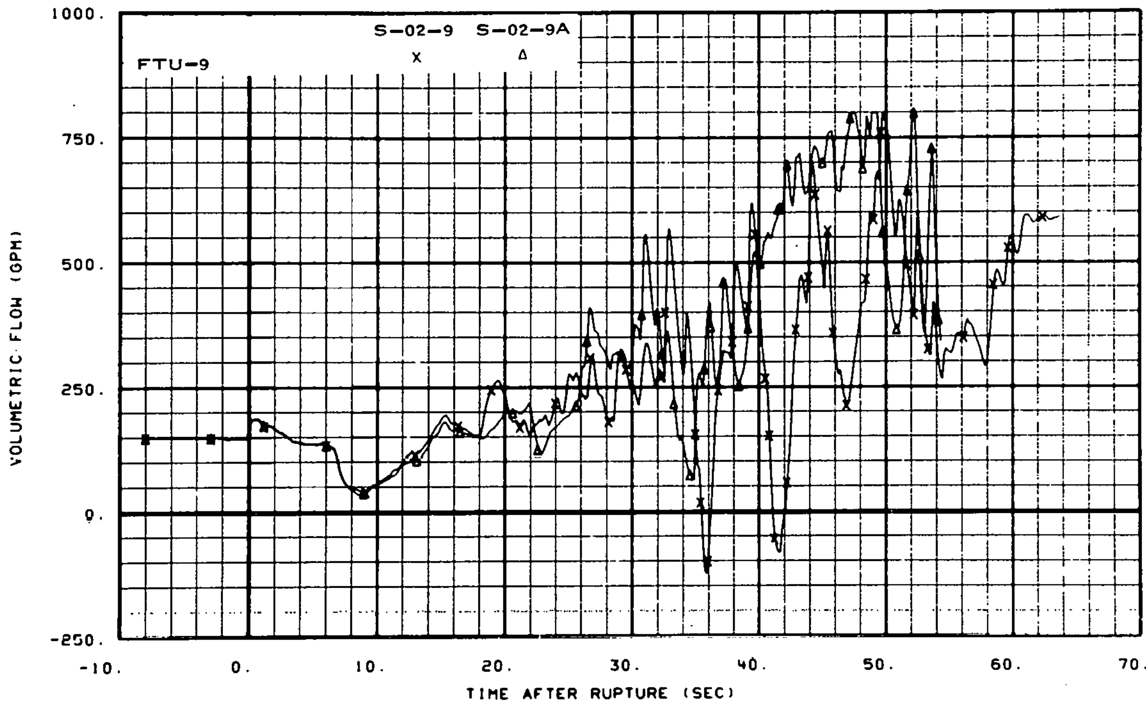

Fig. 179 Volumetric flow in intact loop (FTU-9).

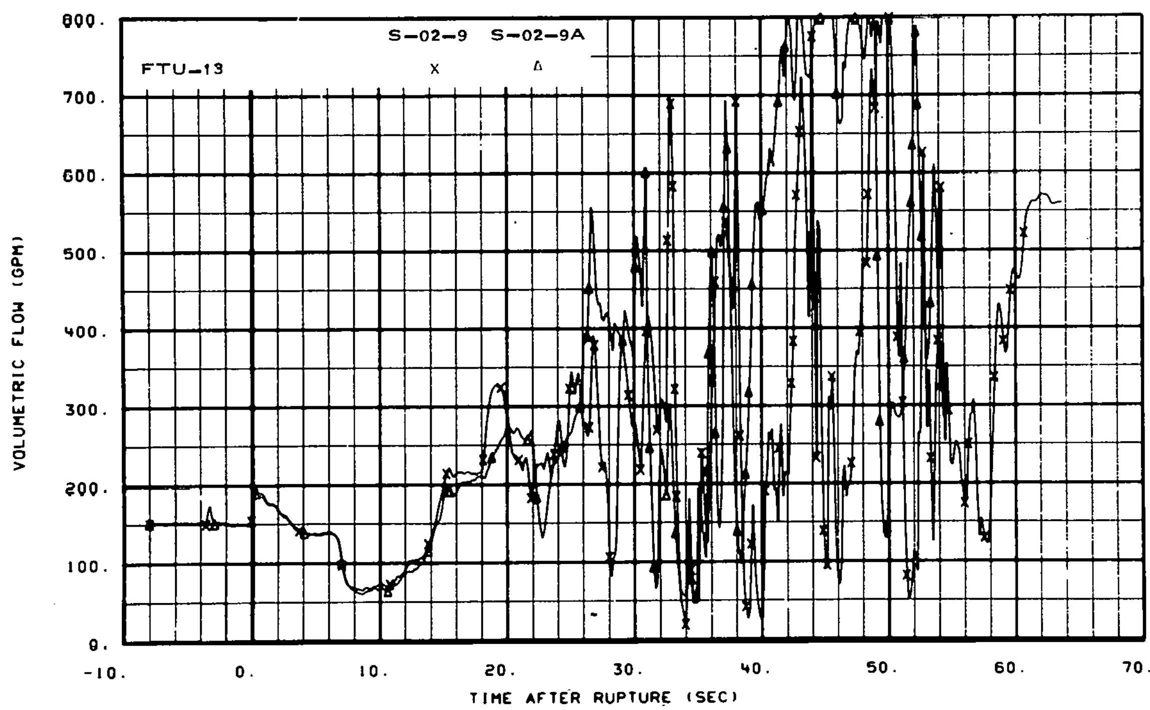

Fig. 180 Volumetric flow in intact loop (FTU-13).

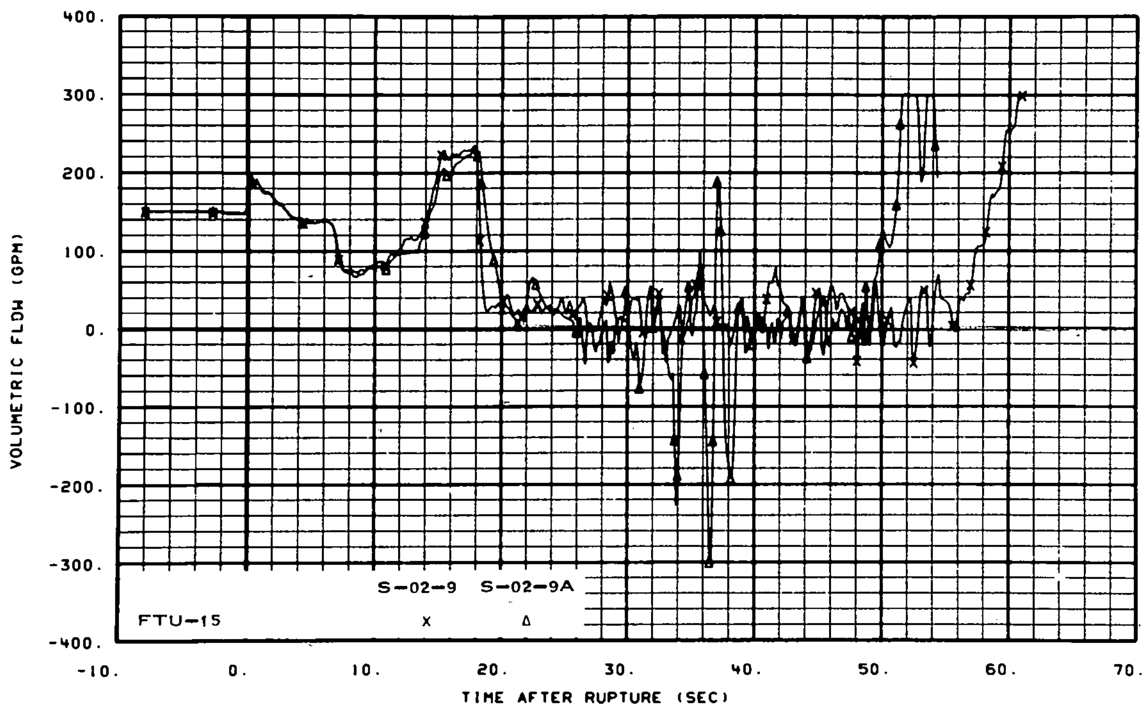

Fig. 181 Volumetric flow in intact loop (FTU-15).

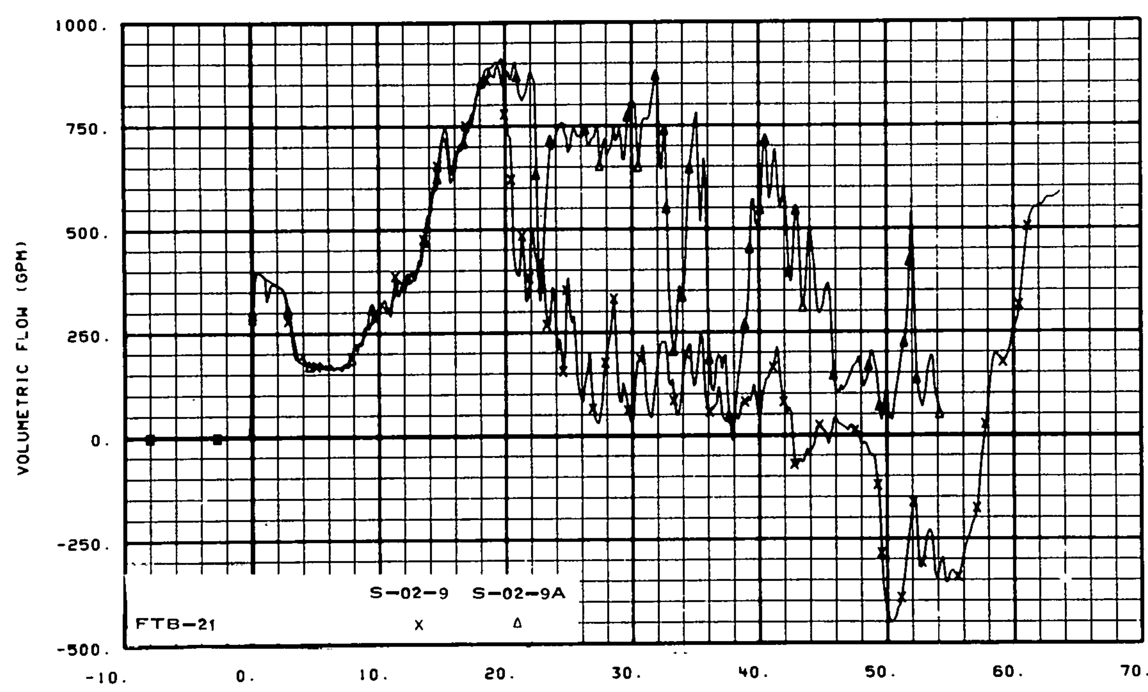

Fig. 182 Volumetric flow in broken loop (FTB-21).

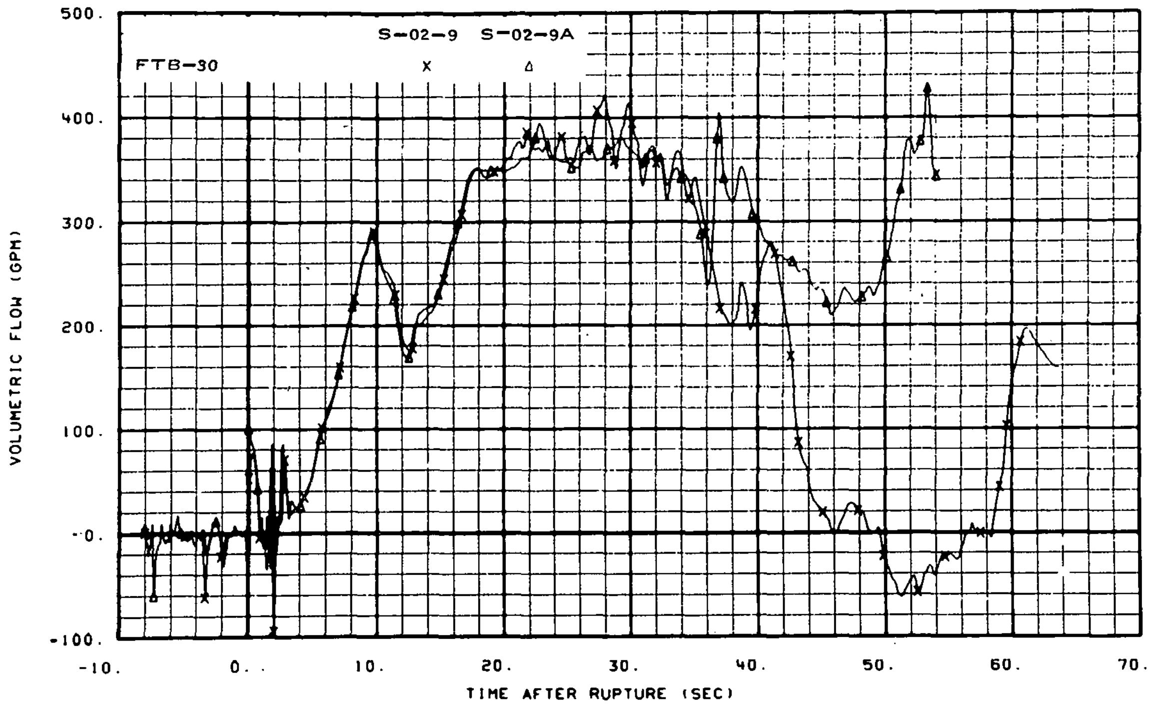

Fig. 183 Volumetric flow in broken loop (FTB-30).

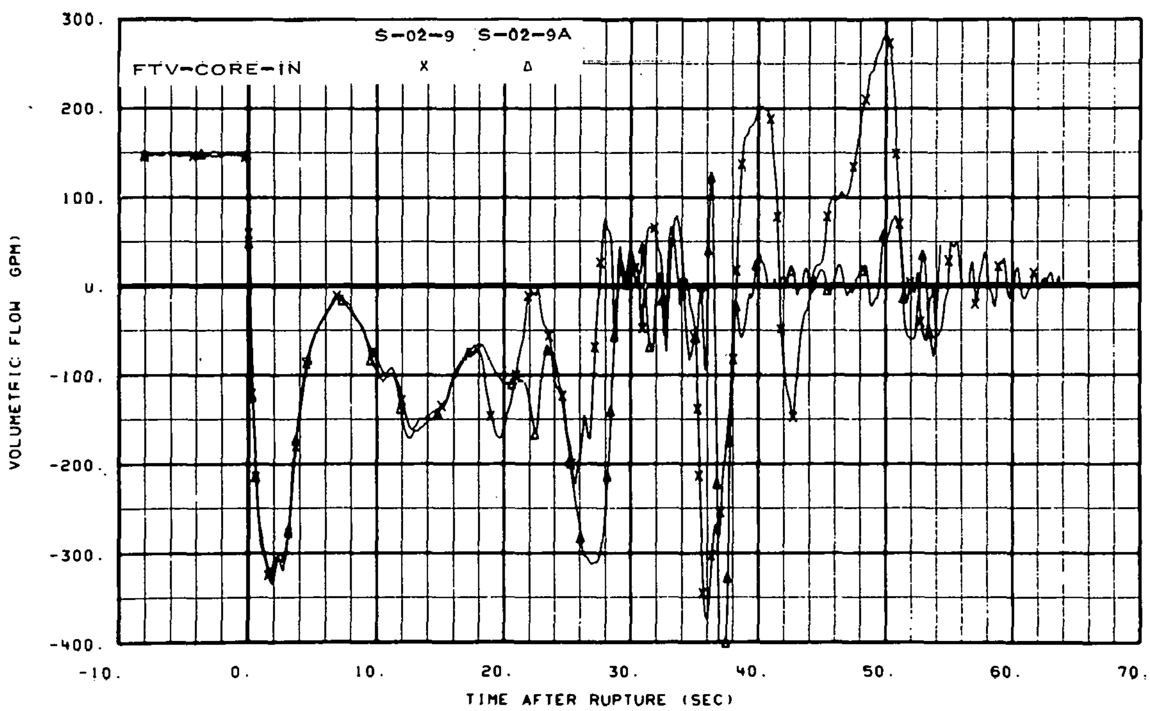

Fig. 184 Volumetric flow in core entrance.

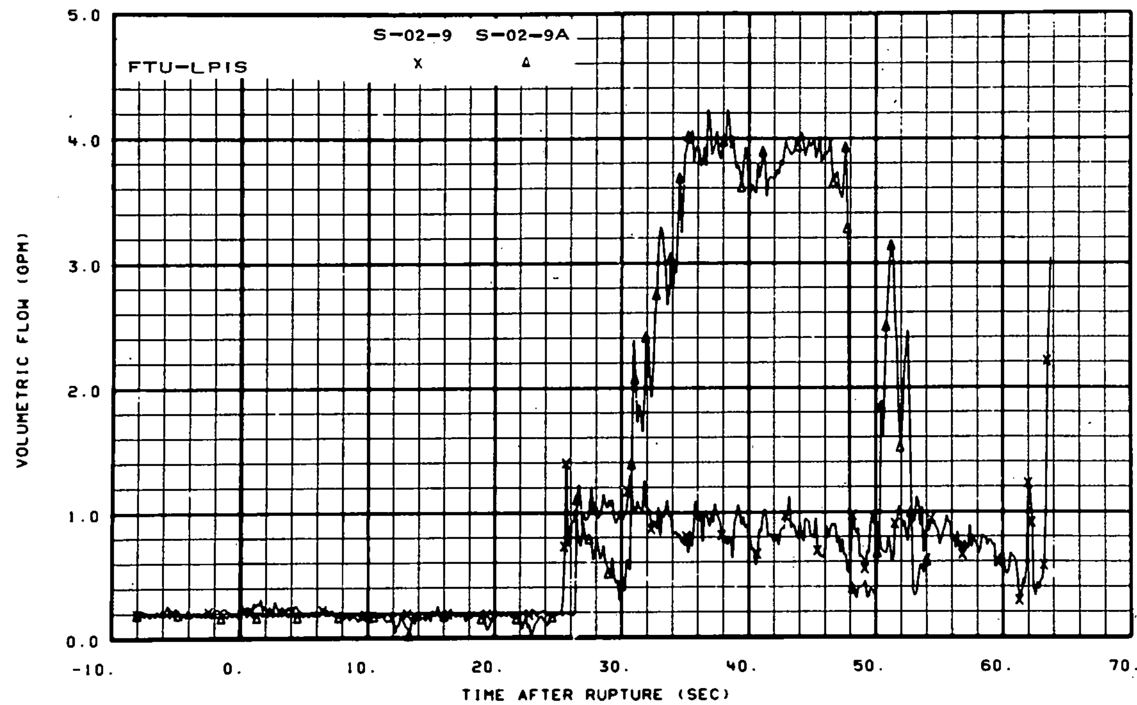

Fig. 185 Volumetric flow in low-pressure injection line (intact loop).

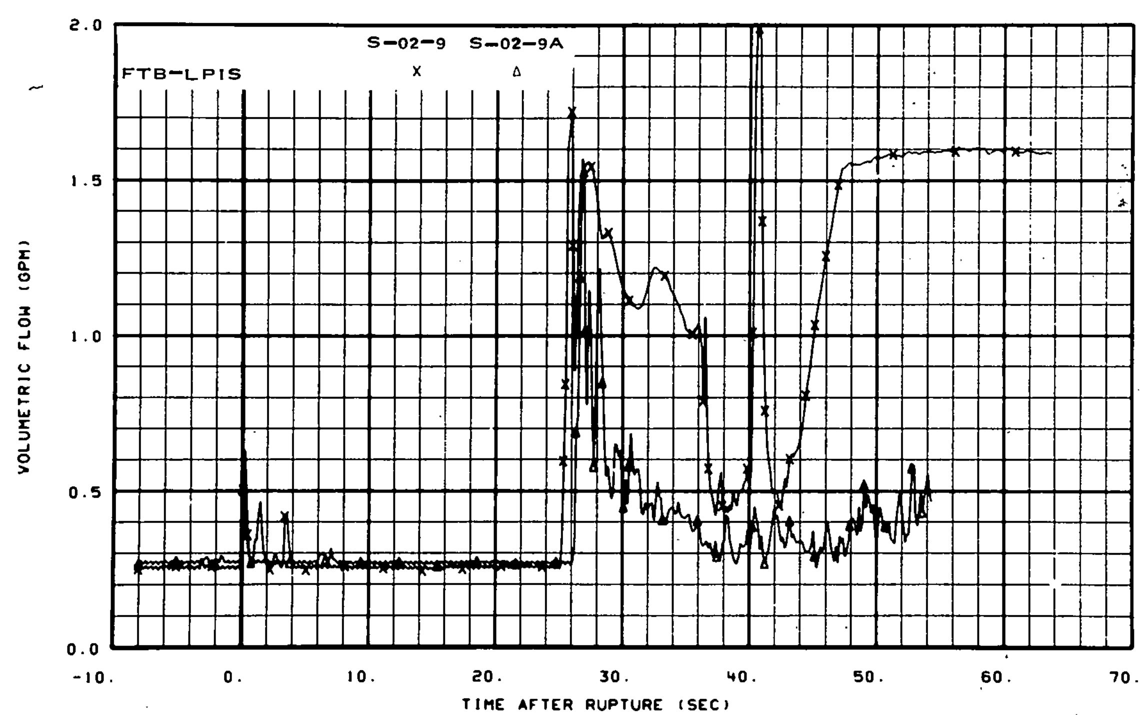

Fig. 186 Volumetric flow in low-pressure injection line (broken loop).

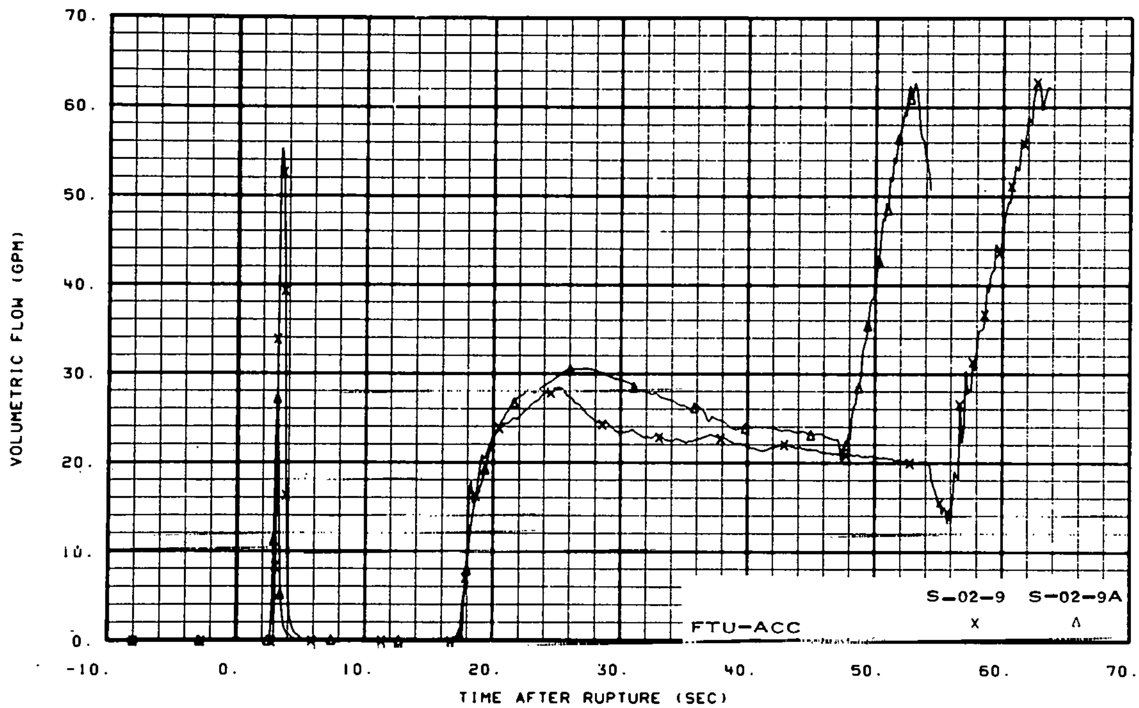

Fig. 187 Volumetric flow in accumulator discharge line (intact loop).

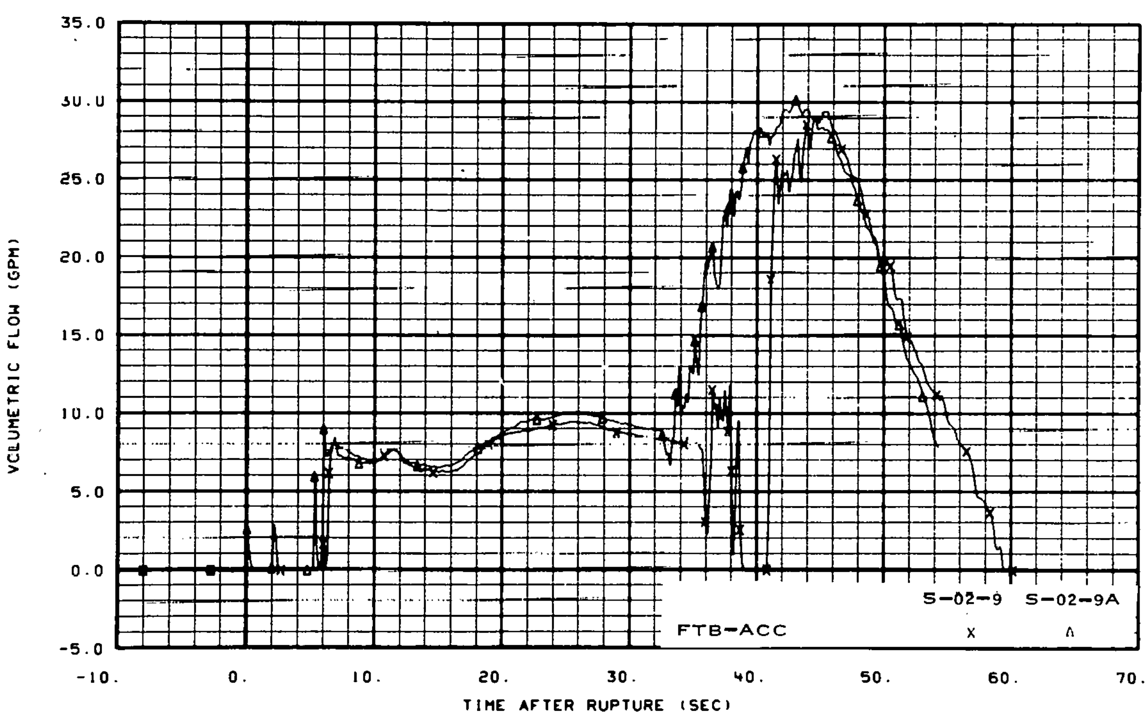

Fig. 188 Volumetric flow in accumulator discharge line (broken loop).

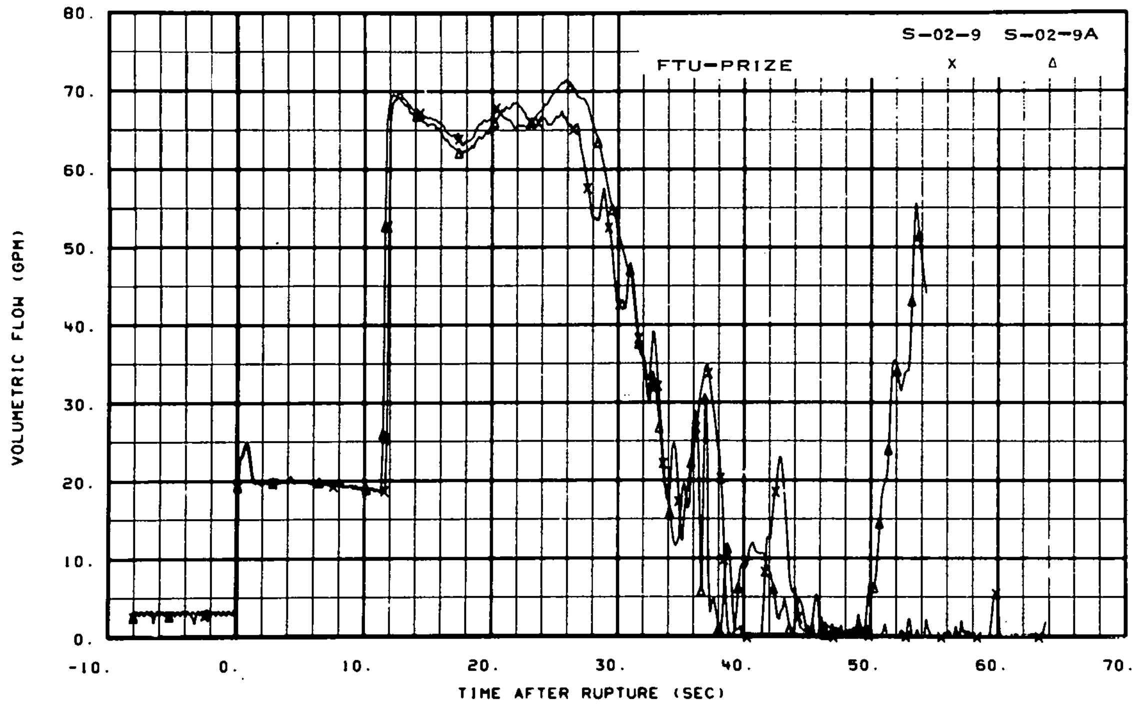

Fig. 189 Volumetric flow in pressurizer surge line.

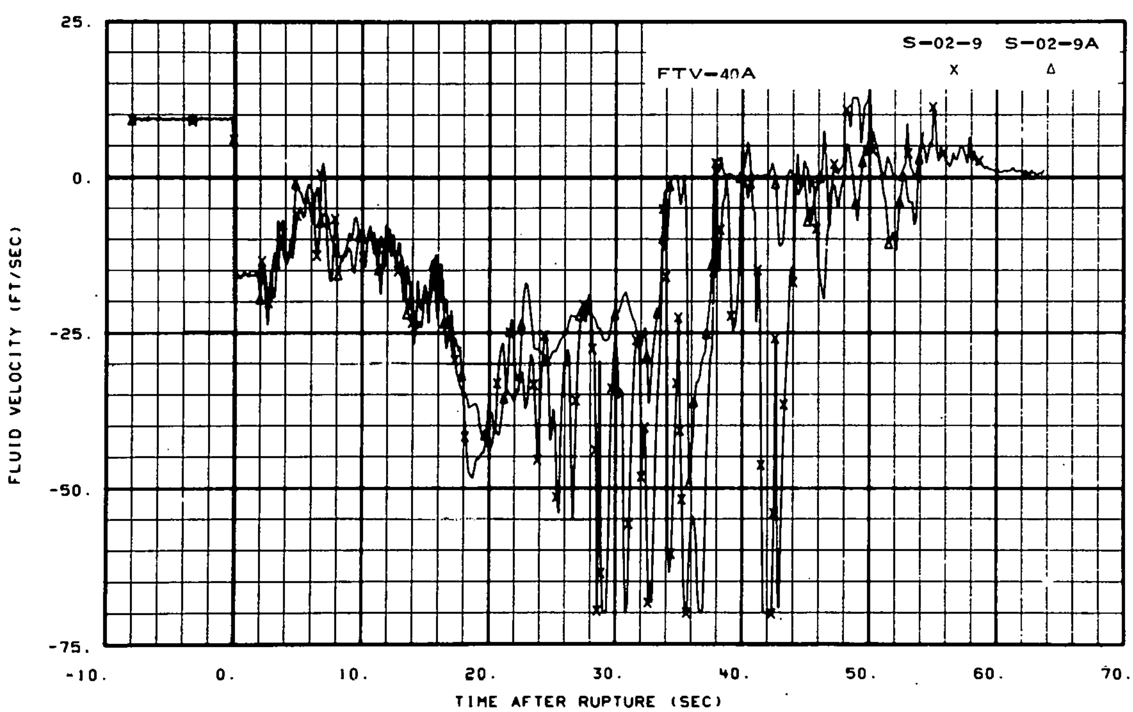

Fig. 190 Fluid velocity in vessel (FTV-40A).

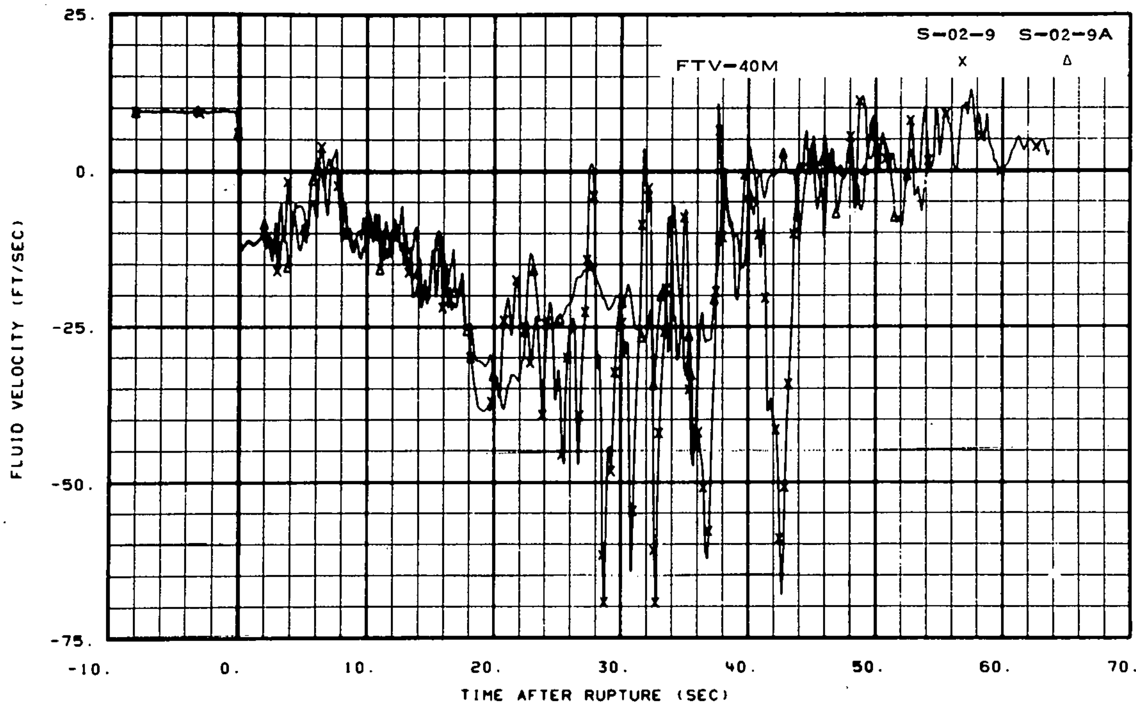

Fig. 191 Fluid velocity in vessel (FTV-40M).

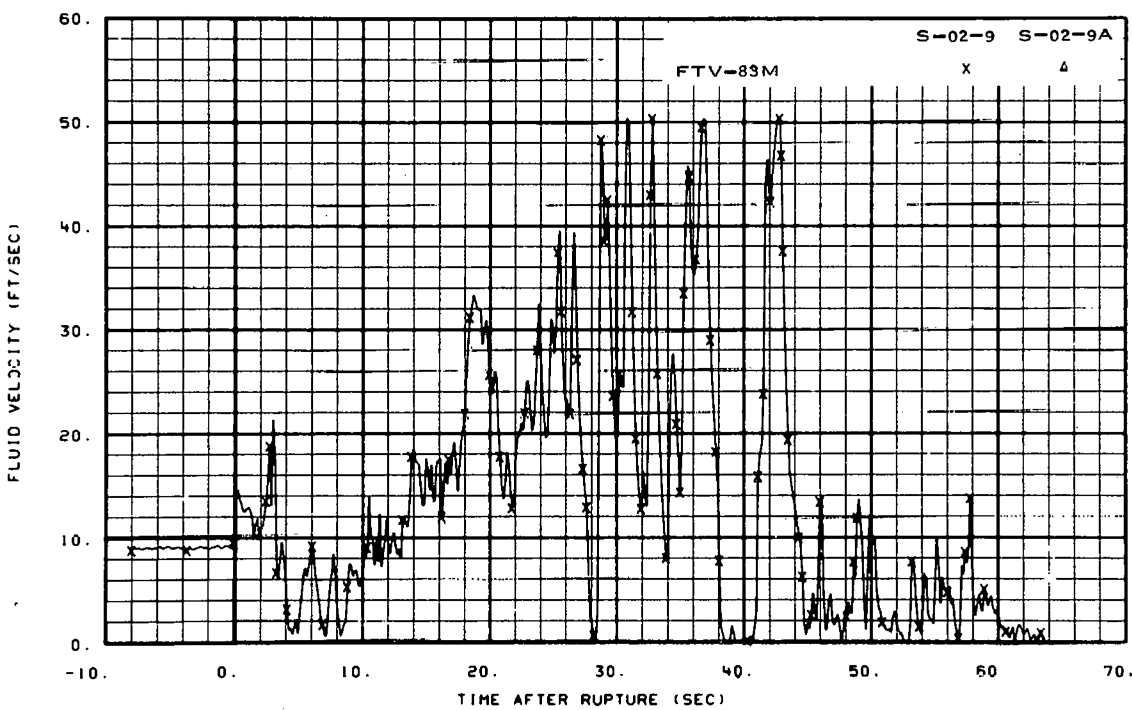

Fig. 192 Fluid velocity in vessel (FTV-83M).

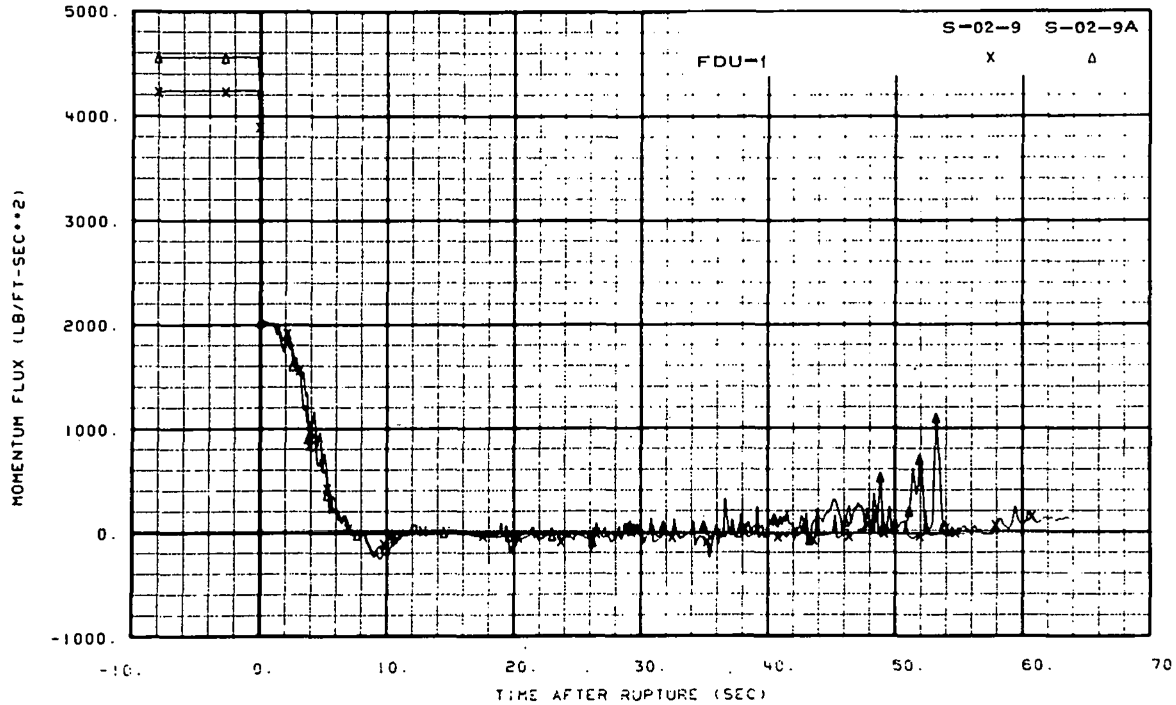

Fig. 193 Momentum flux in intact loop (Spool 1).

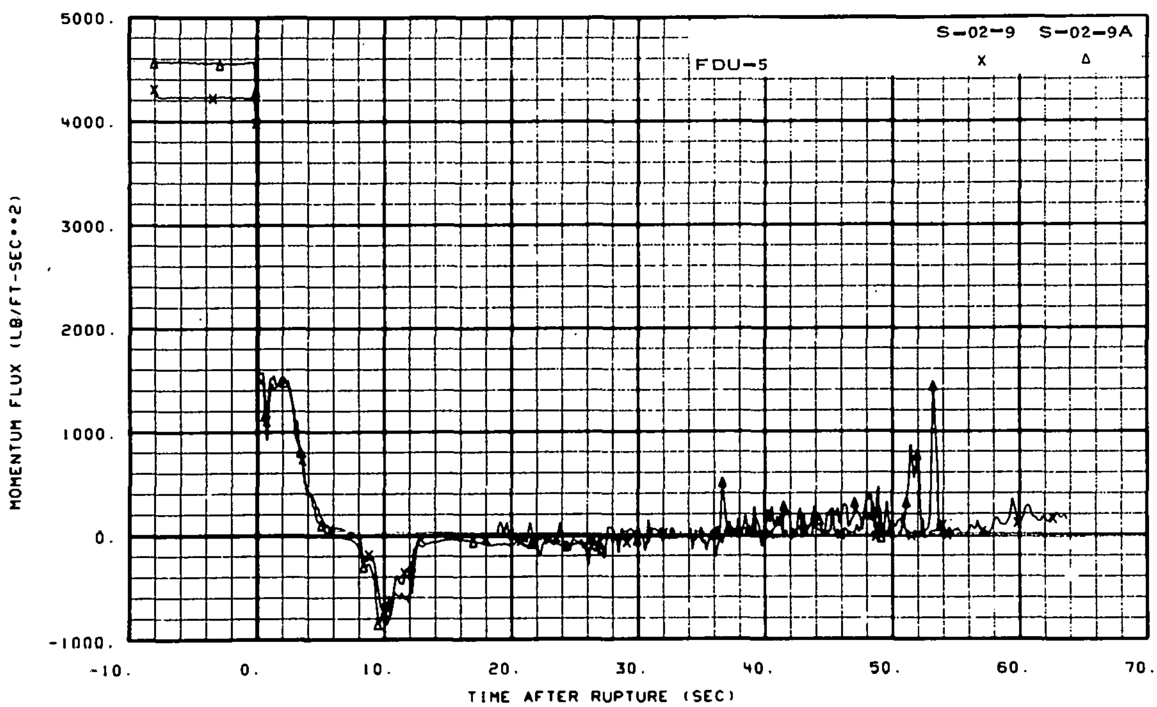

Fig. 194 Momentum flux in intact loop (Spool 5).

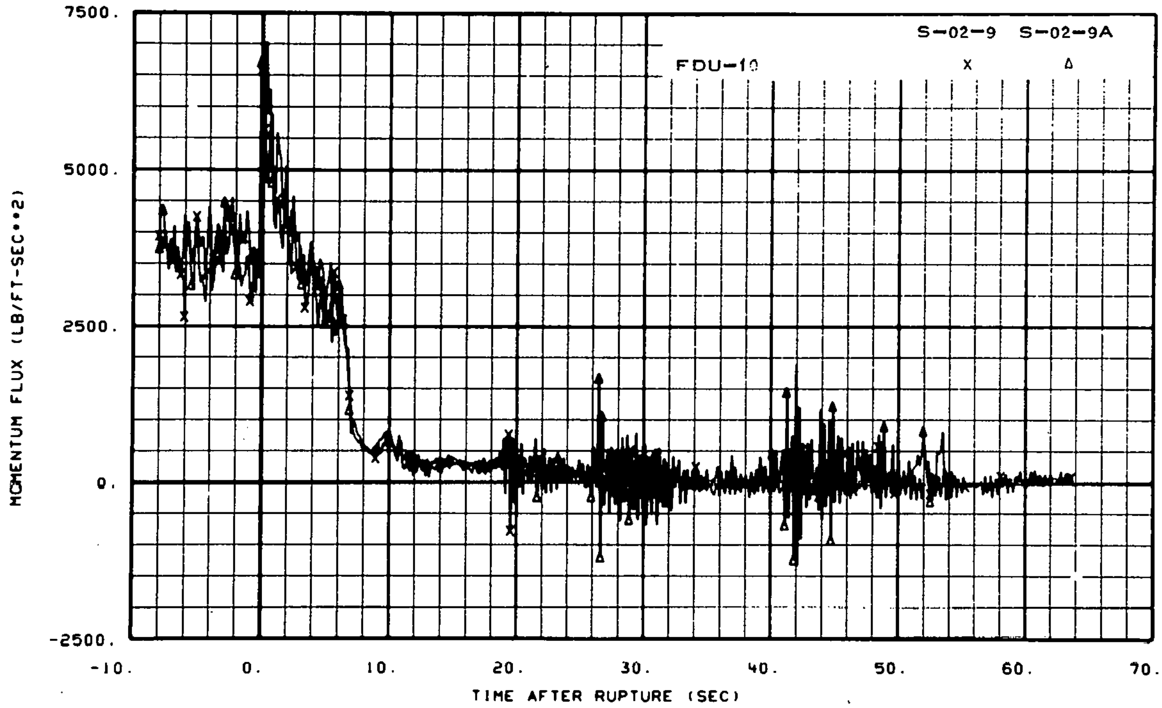

Fig. 195 Momentum flux in intact loop (Spool 10).

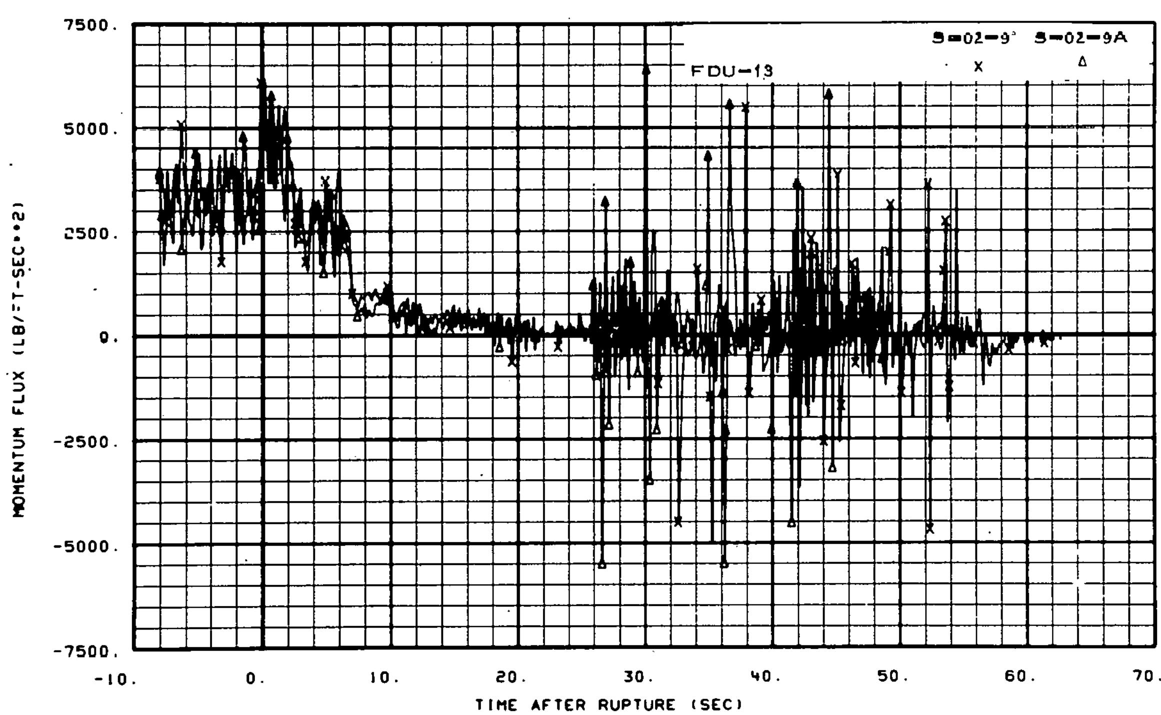

Fig. 196 Momentum flux in intact loop (Spool 13).

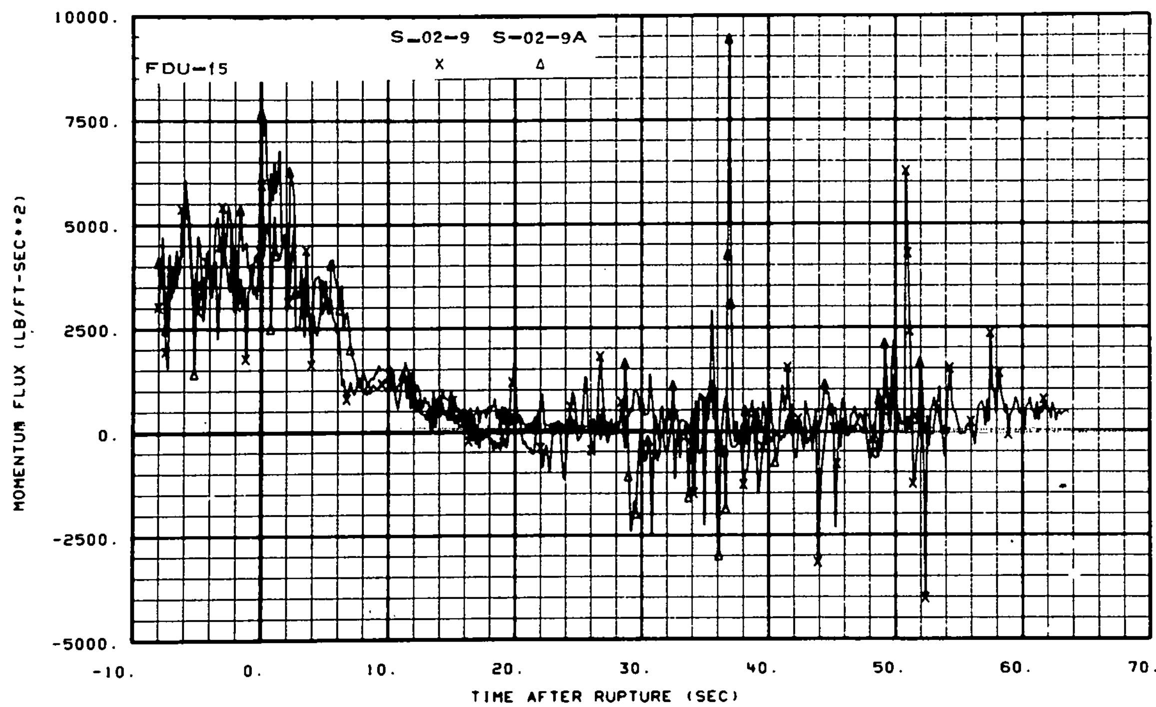

Fig. 197 Momentum flux in intact loop (Spool 15).

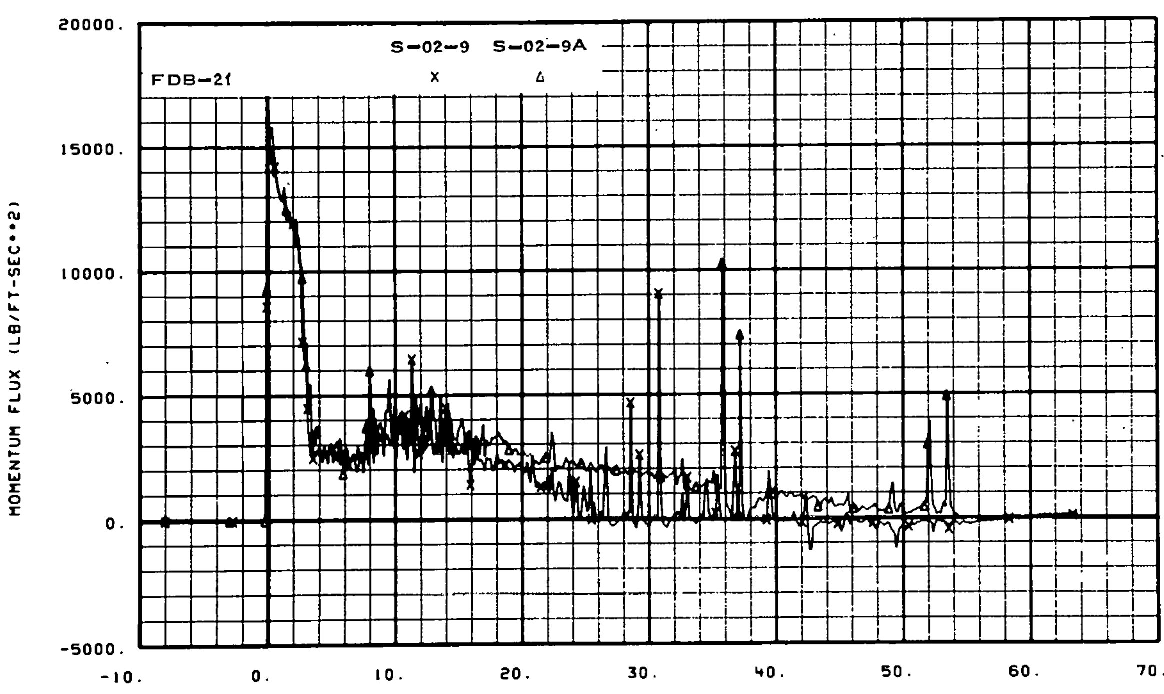

Fig. 198 Momentum flux in broken loop (Spool 21).

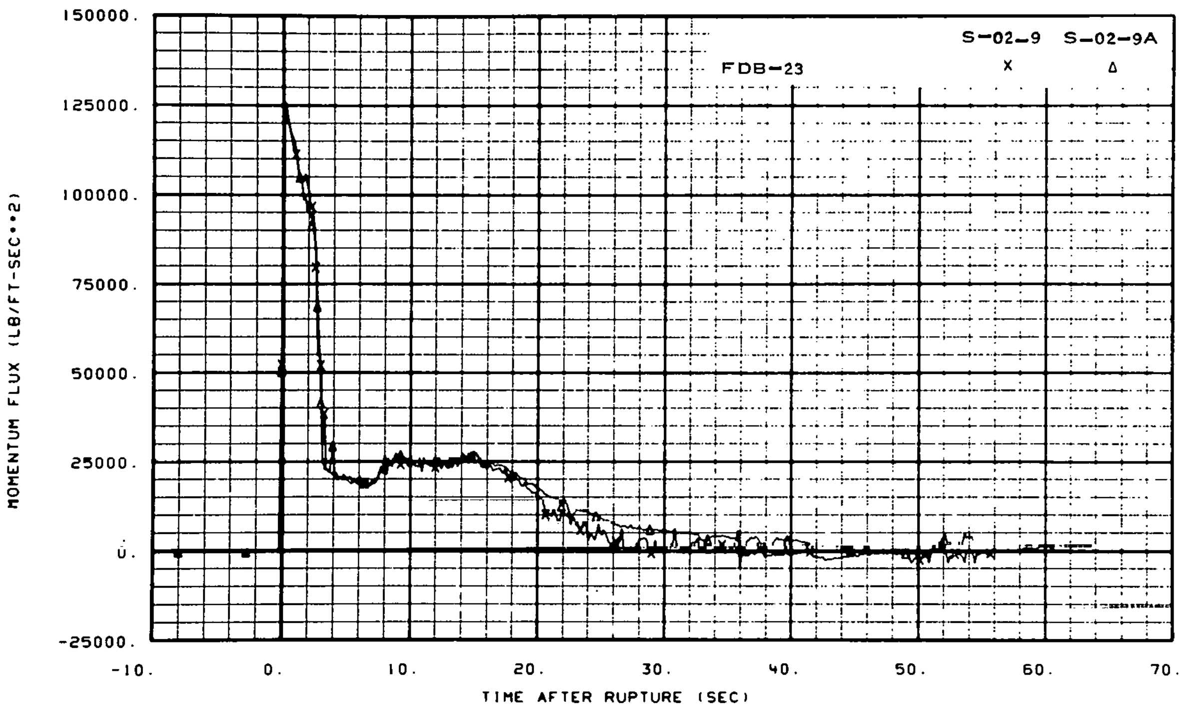

Fig. 199 Momentum flux in broken loop (Spool 23).

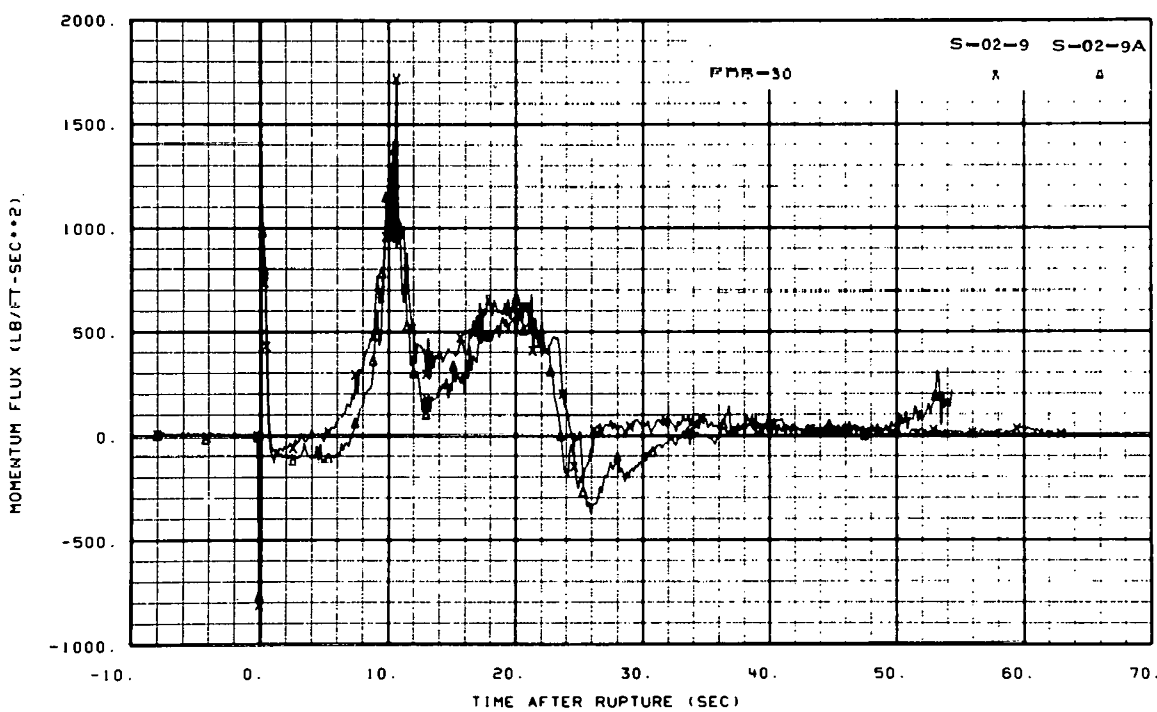

Fig. 200 Momentum flux in broken loop (Spool 30).

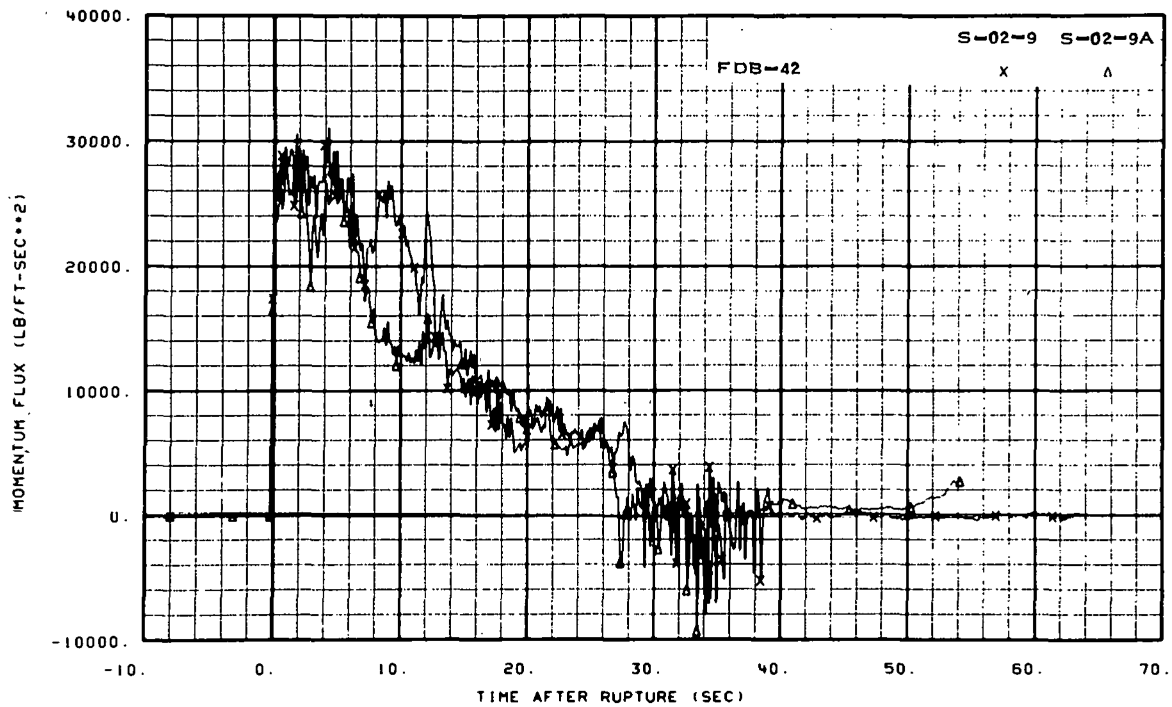

Fig. 201 Momentum flux in broken loop (Spool 42).

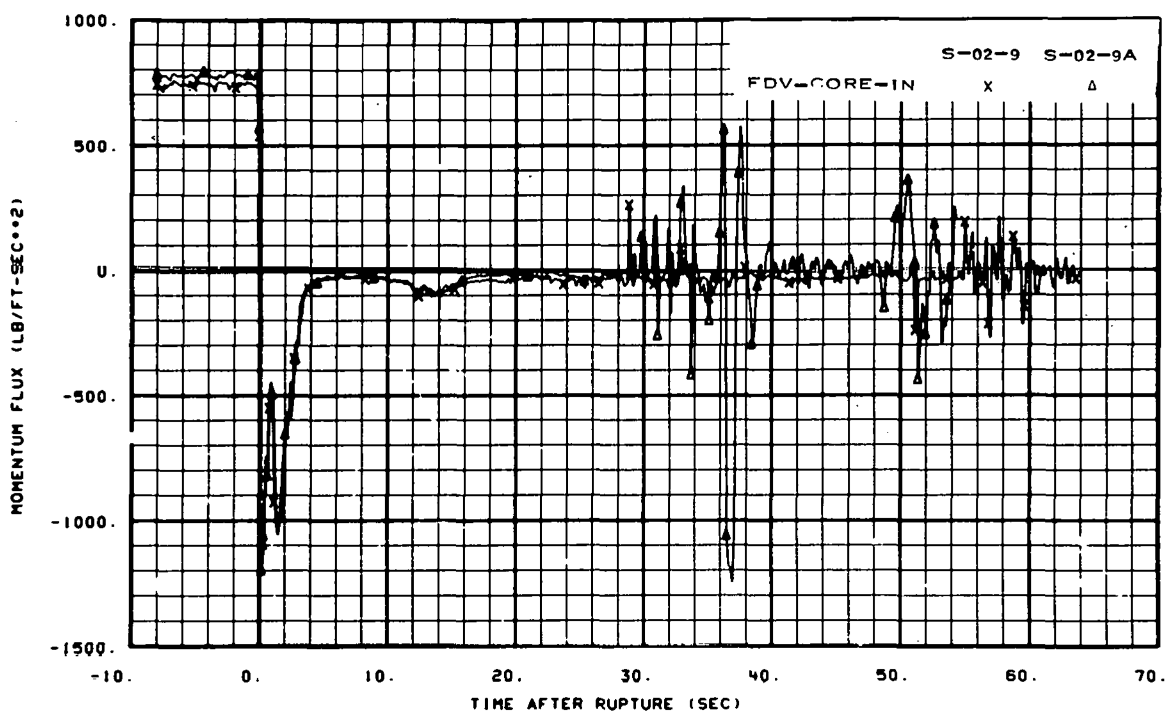

Fig. 202 Momentum flux in core entrance.

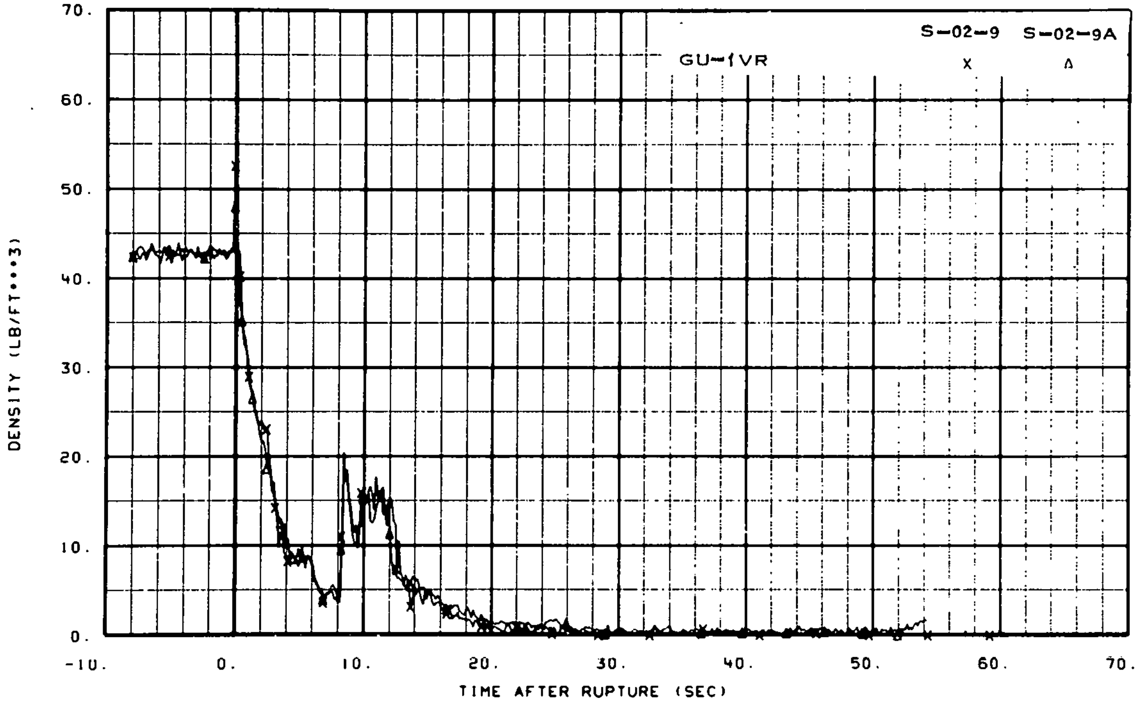

Fig. 203 Density in intact loop (GU-1VR).

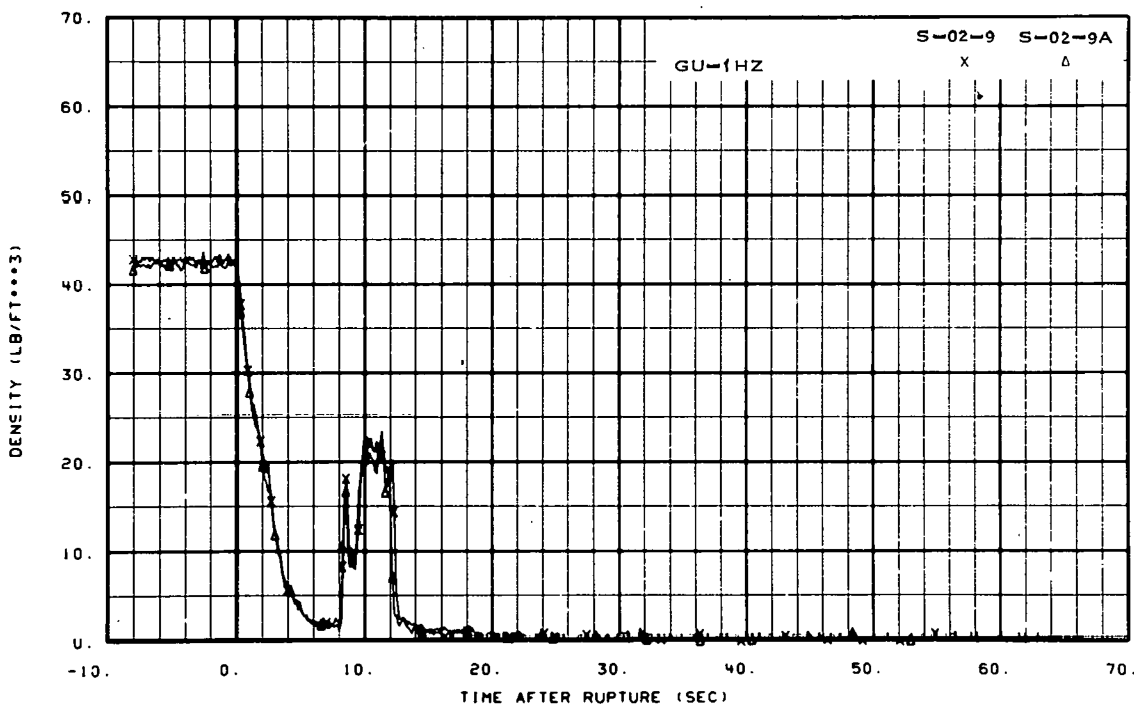

Fig. 204 Density in intact loop (GU-1HZ).

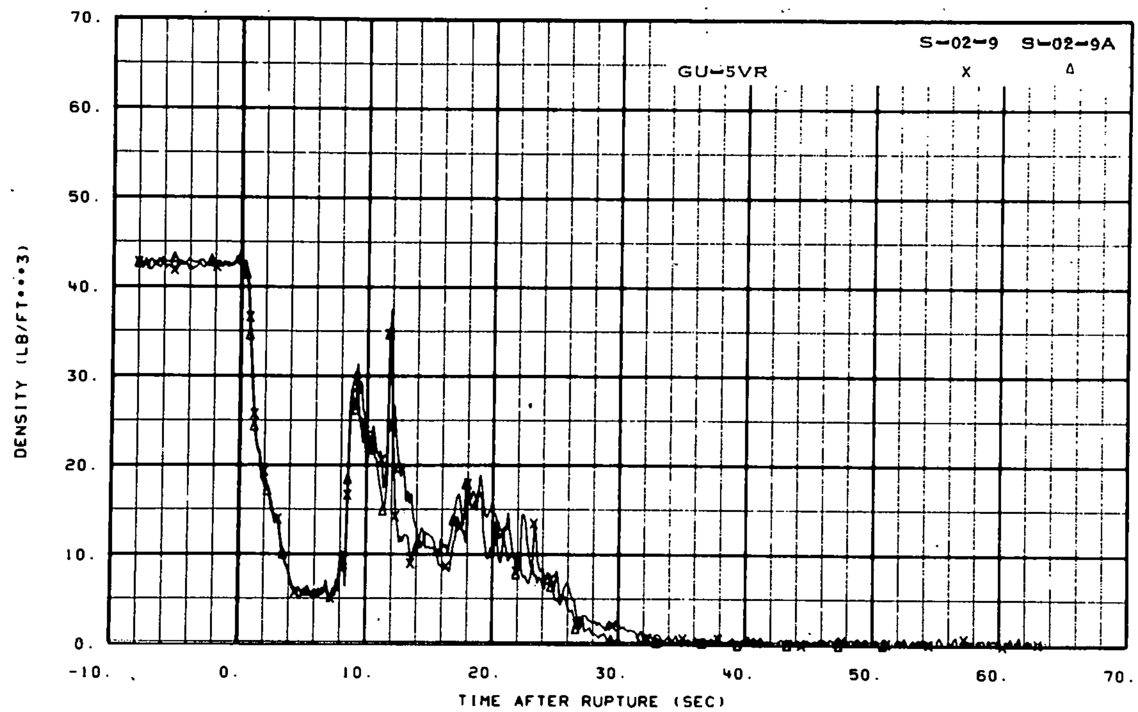

Fig. 205 Density in intact loop (GU-5VR).

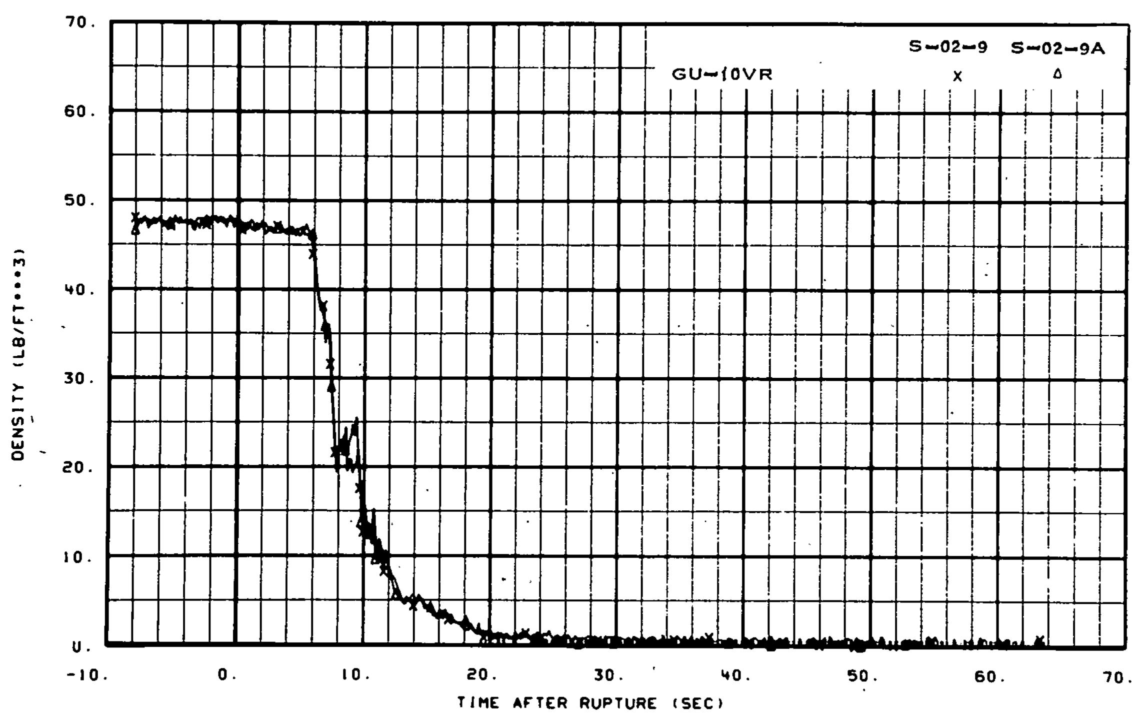

Fig. 206 Density in intact loop (GU-10VR).

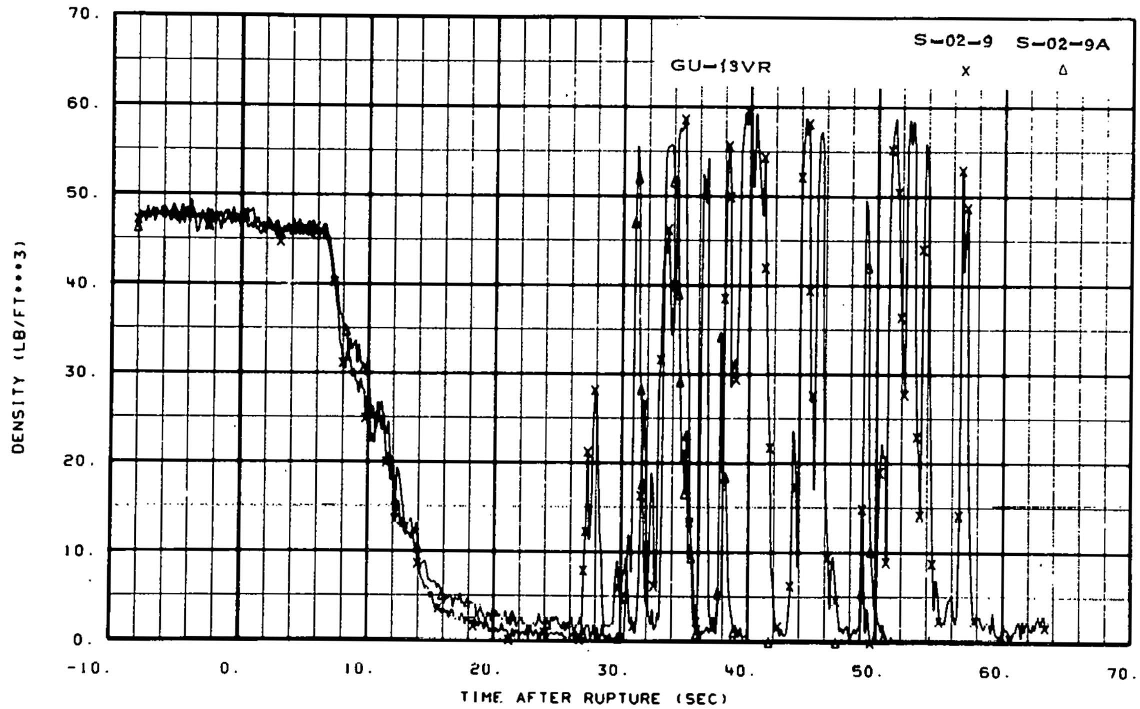

Fig. 207 Density in intact loop (GU-13VR).

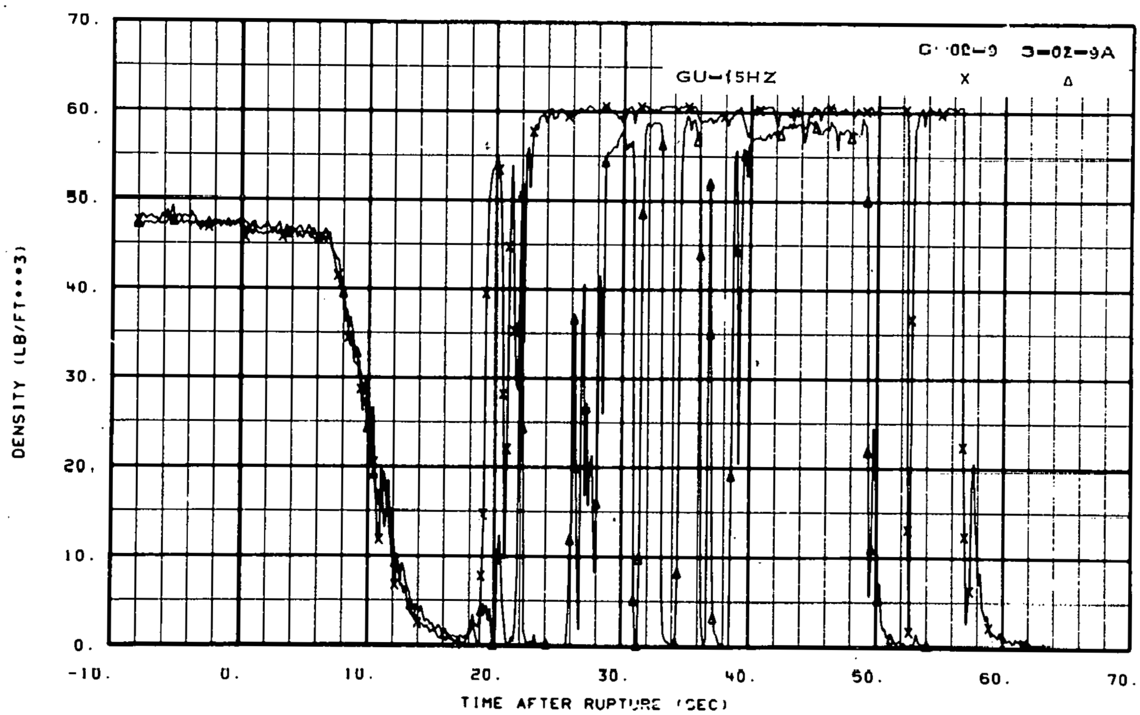

Fig. 208 Density in intact loop (GU-15HZ).

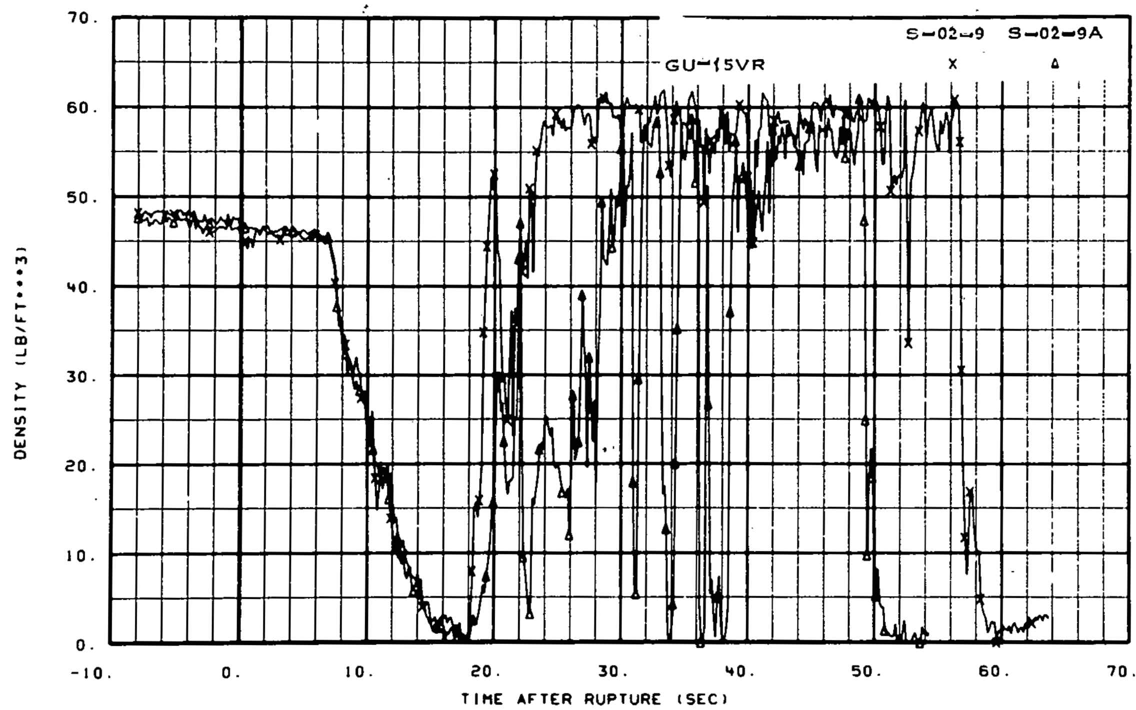

Fig. 209 Density in intact loop (GU-15VR).

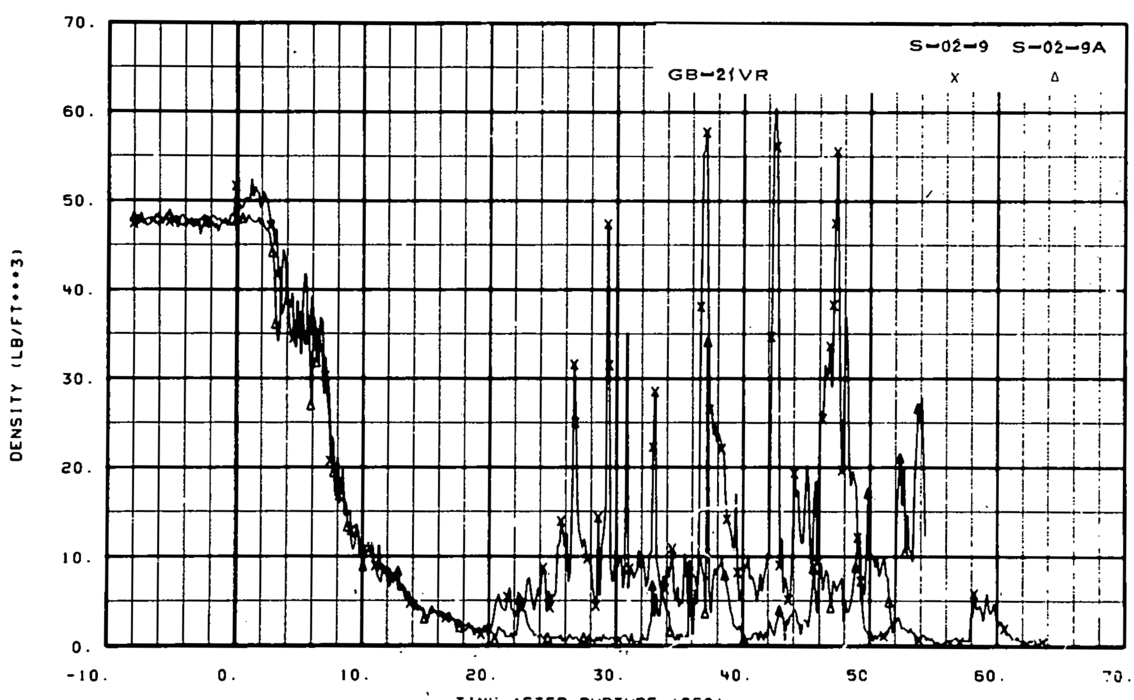

Fig. 210 Density in broken loop (GB-21VR).

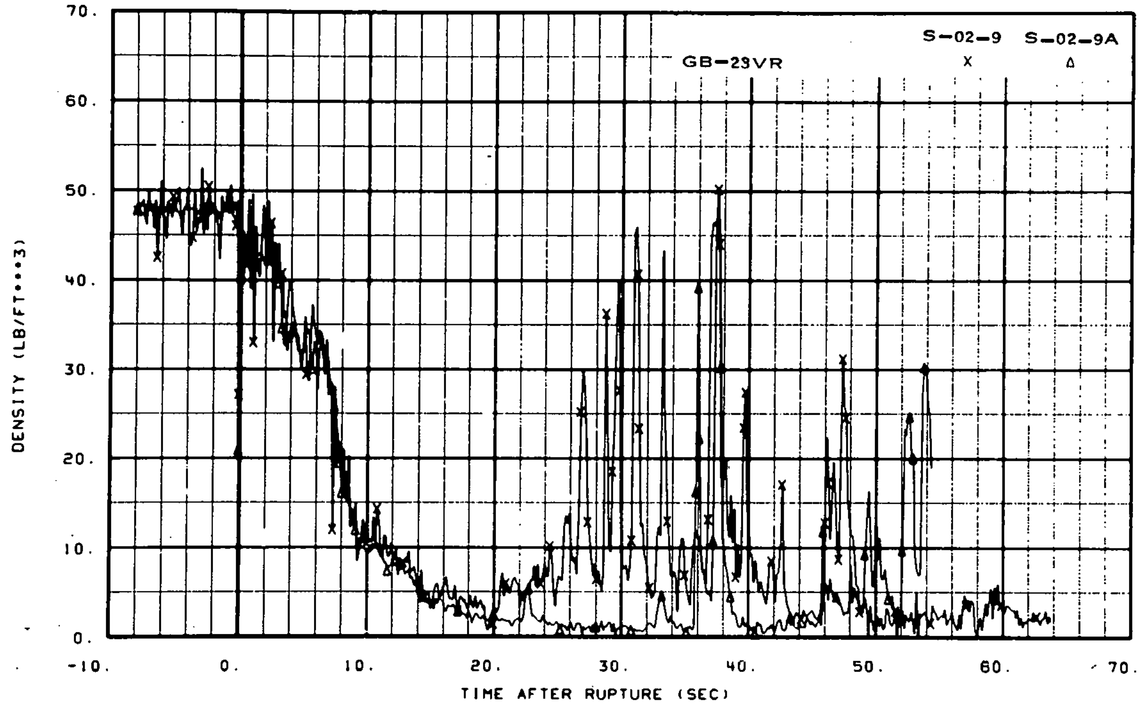

Fig. 211 Density in broken loop (GB-23VR).

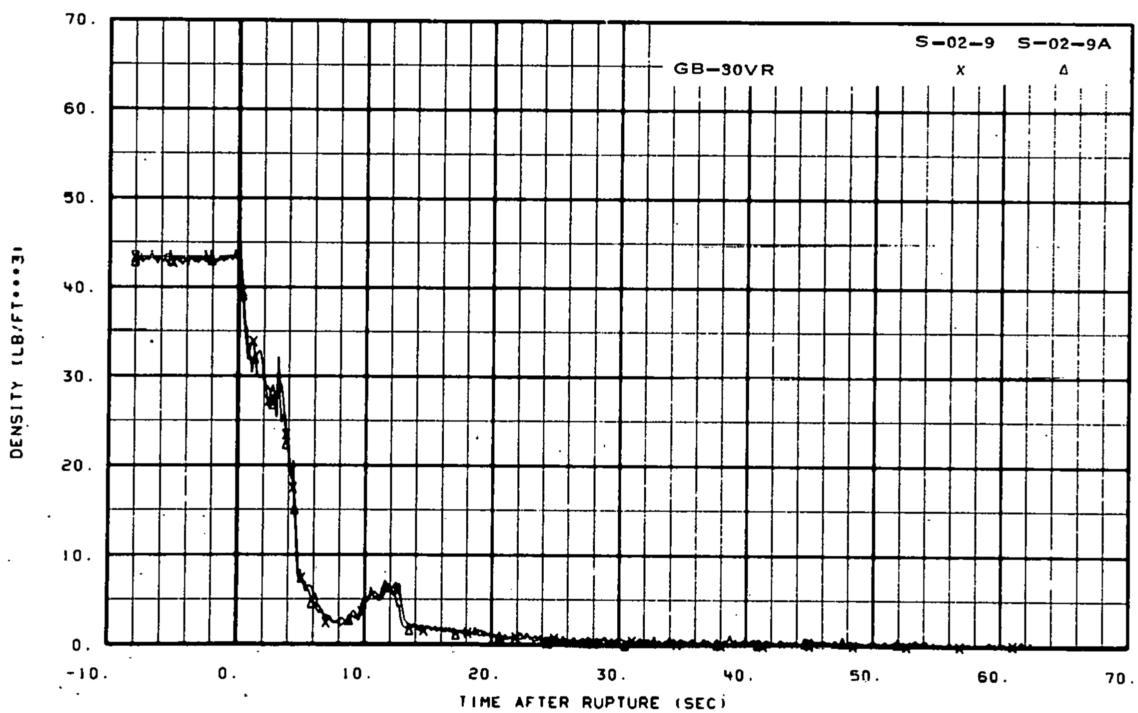

Fig. 212 Density in broken loop (GB-30VR).

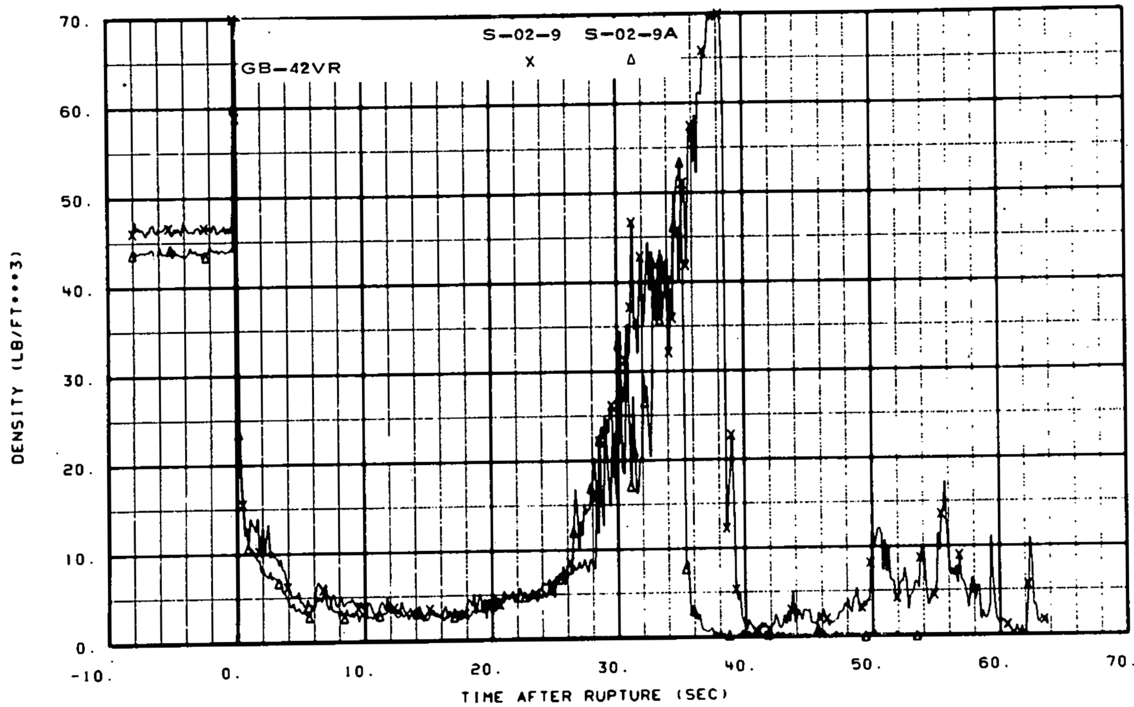

Fig. 213 Density in broken loop (GB-42VR).

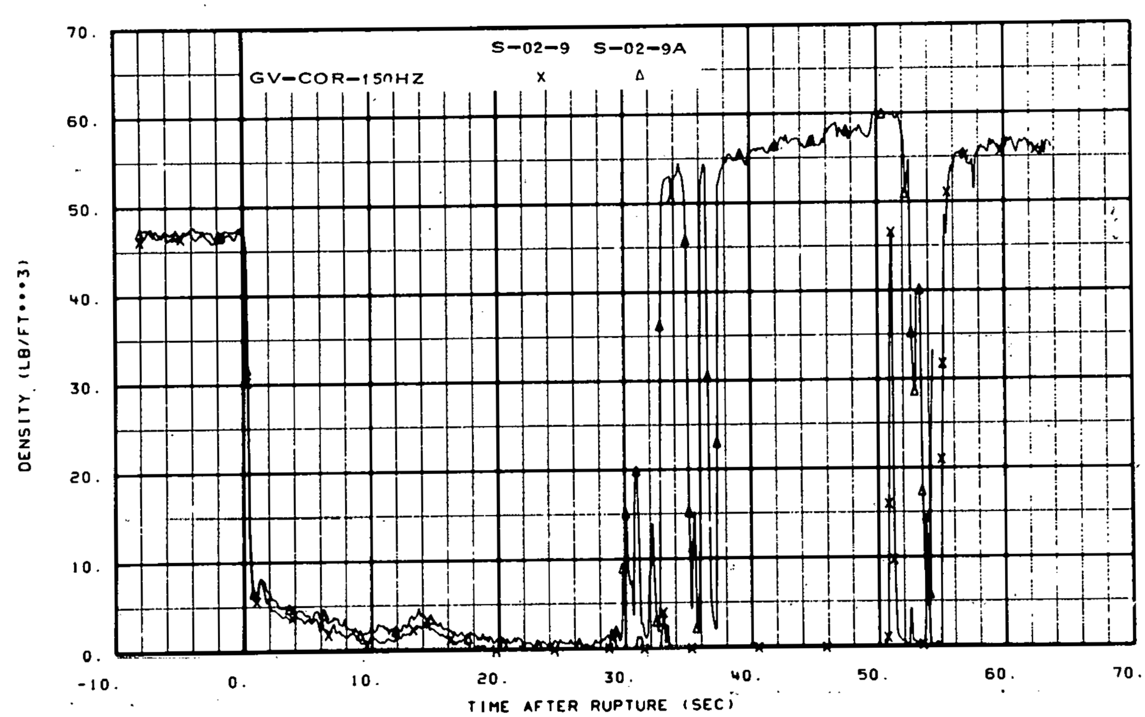

Fig. 214 Density in vessel (GV-COR-150HZ).

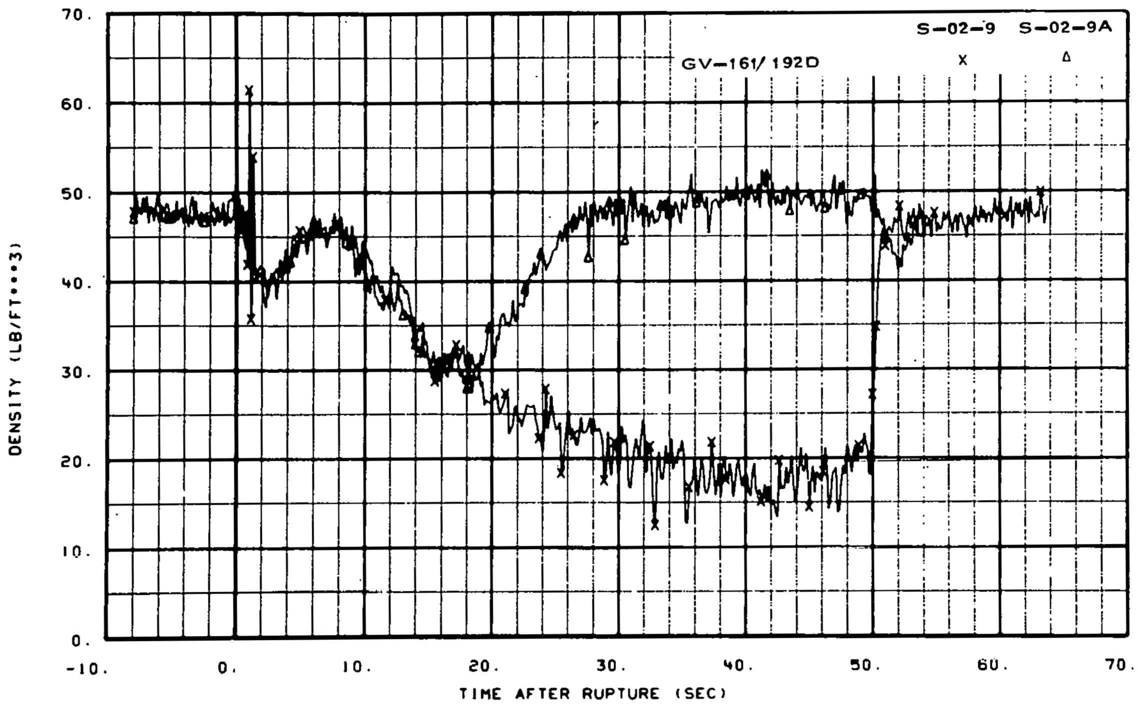

Fig. 215 Density in vessel (GV-161/192).

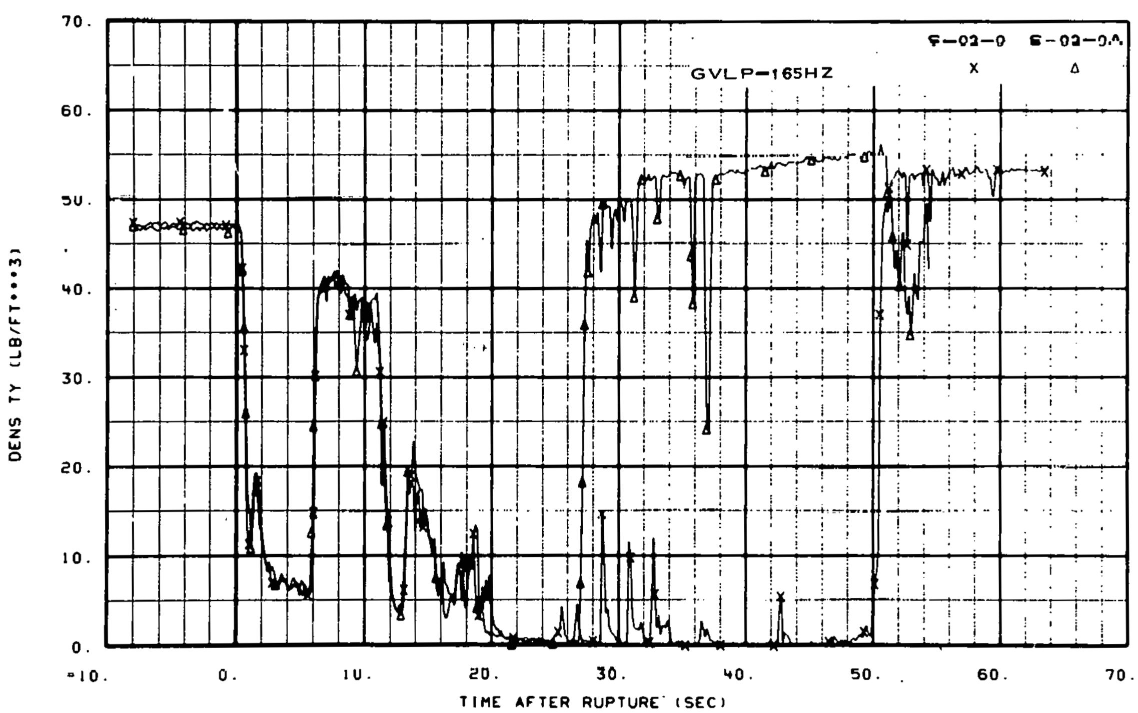

Fig. 216 Density in vessel (GVLP-165HZ).

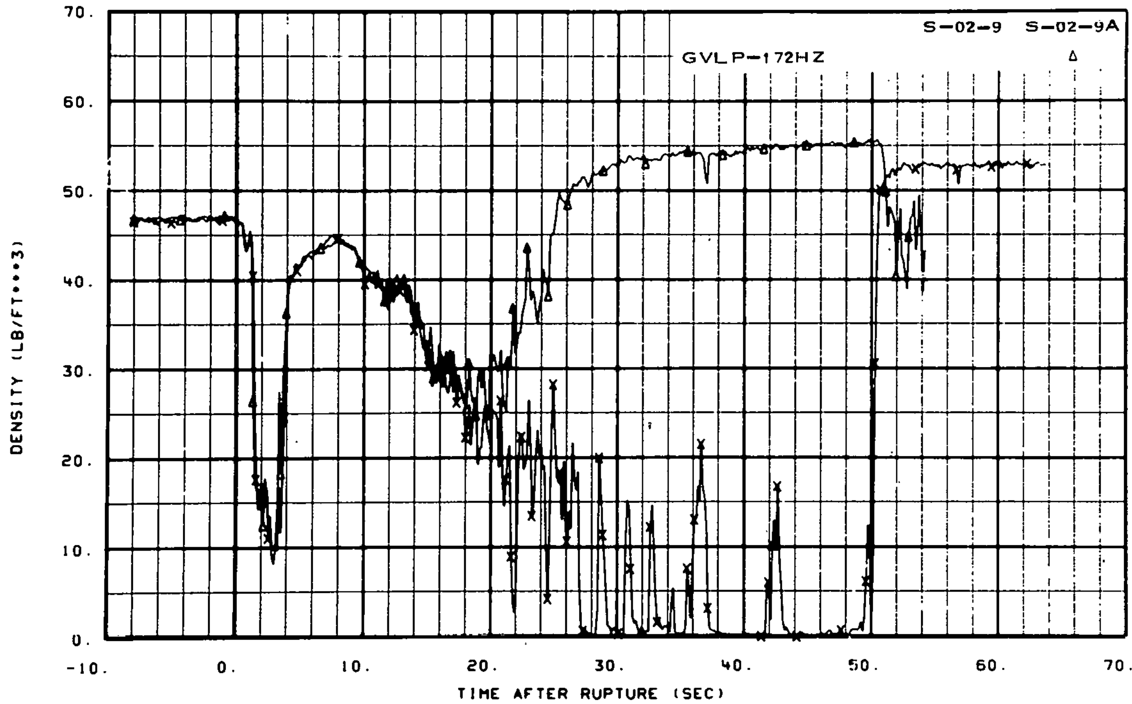

Fig. 217 Density in vessel (GVLP-172HZ).

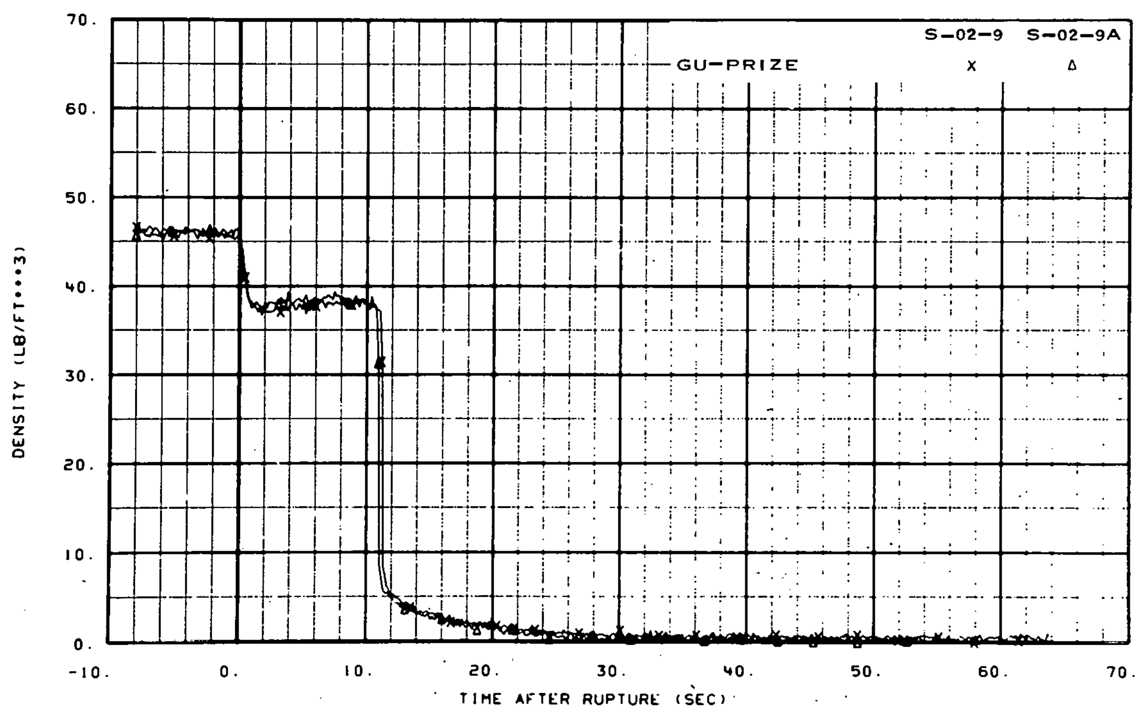

Fig. 218 Density in pressurizer.

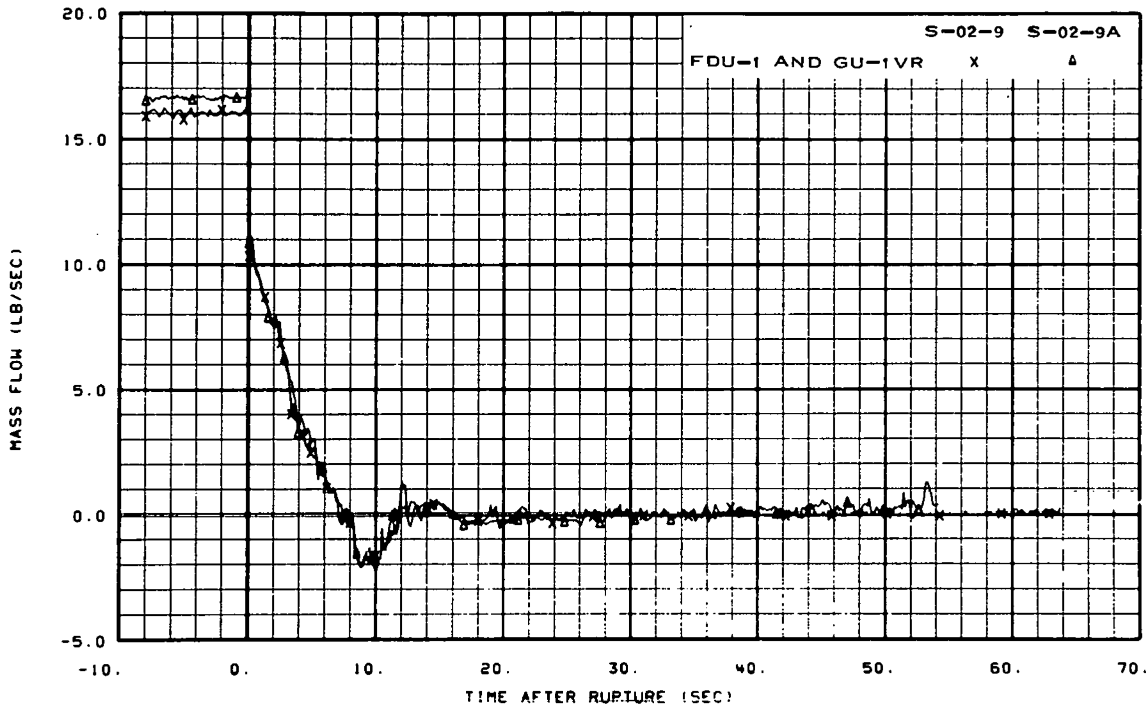

Fig. 219 Mass flow in intact loop (FDU-1 and GU-1VR).

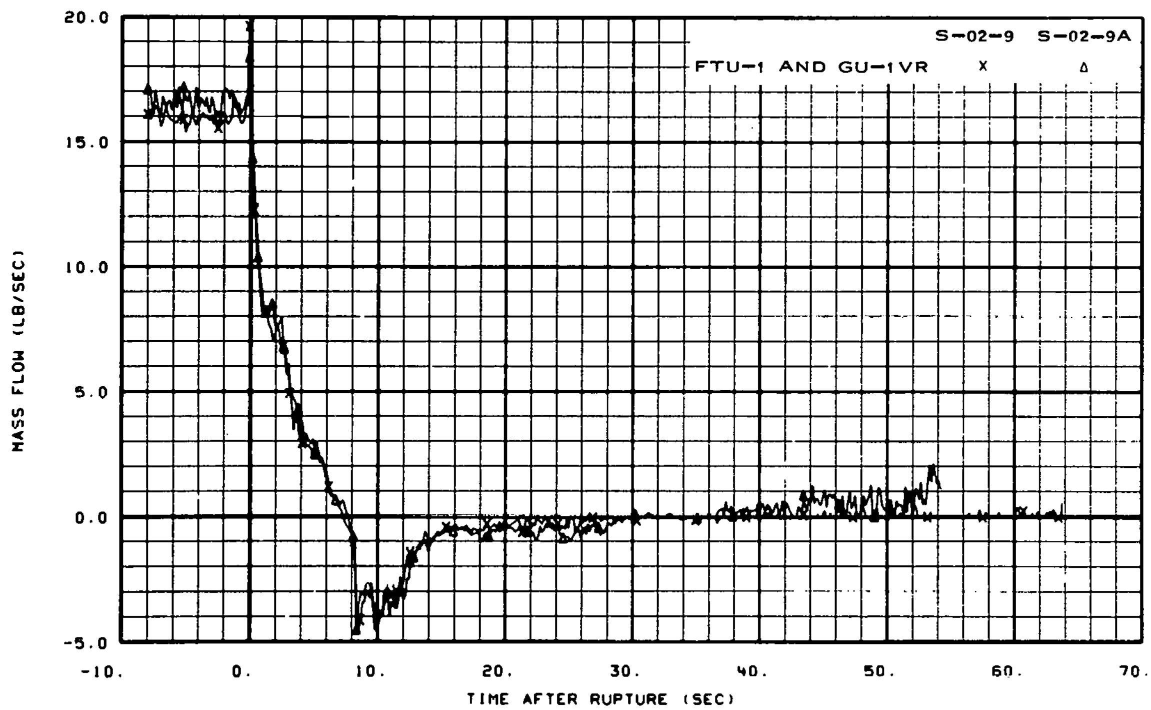

Fig. 220 Mass flow in intact loop (FTU-1 and GU-1VR).

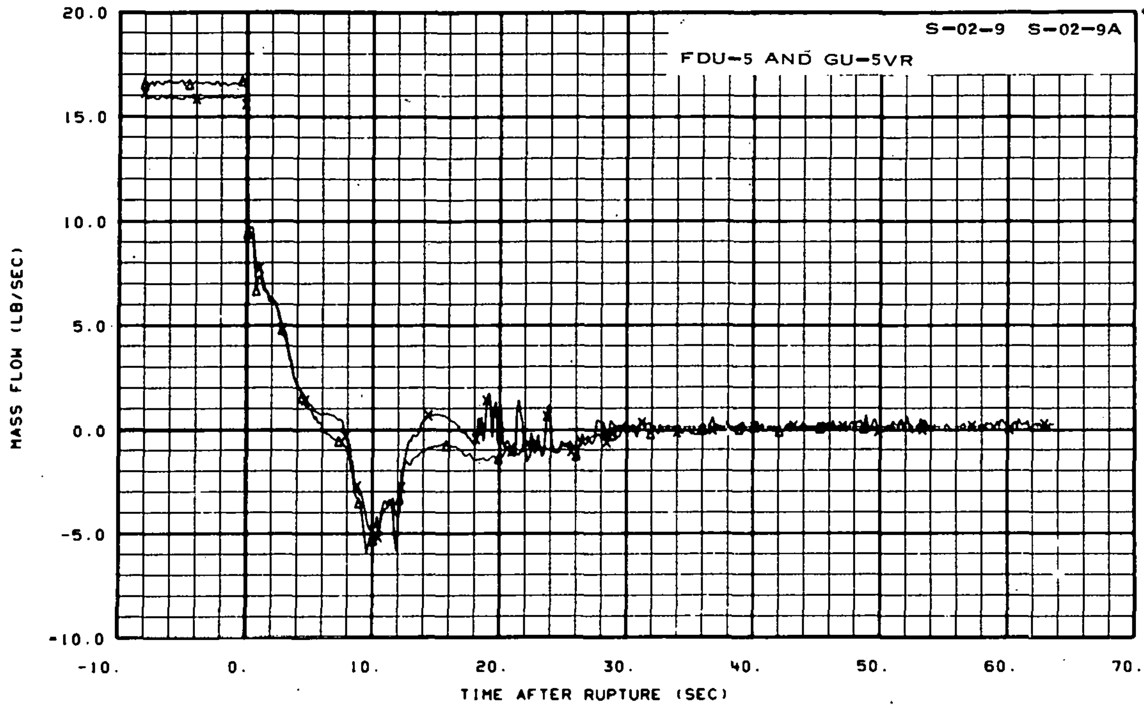

Fig. 221 Mass flow in intact loop (FDU-5 and GU-5VR).

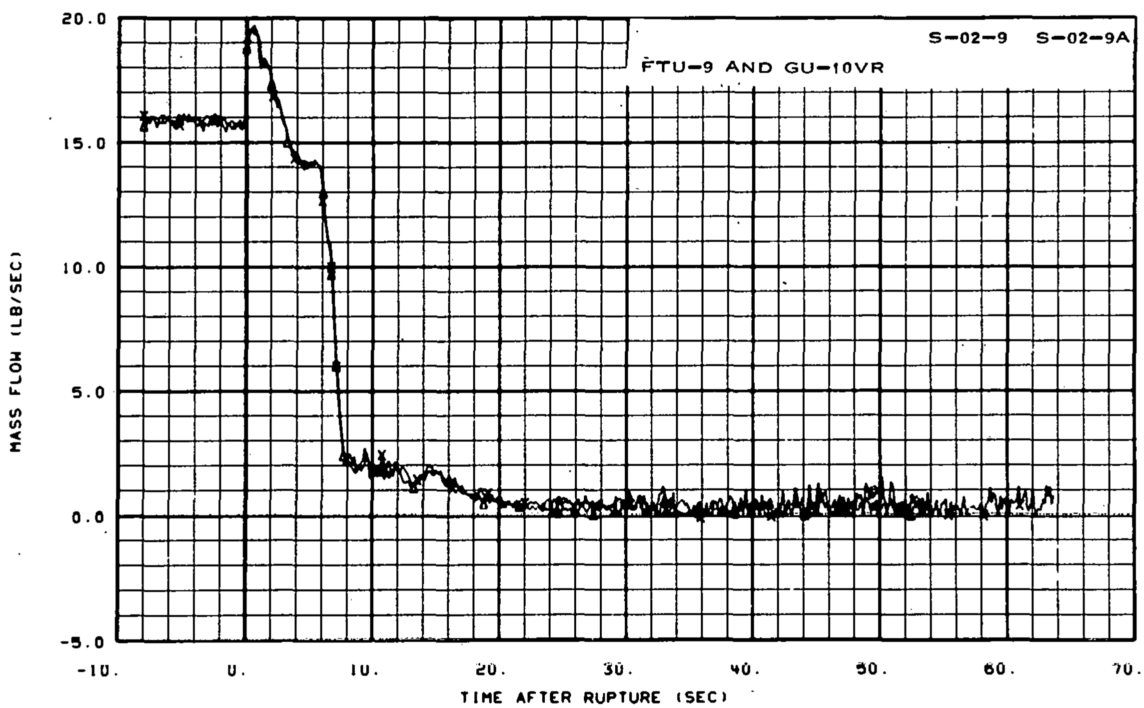

Fig. 222 Mass flow in intact loop (FTU-9 and GU-10VR).

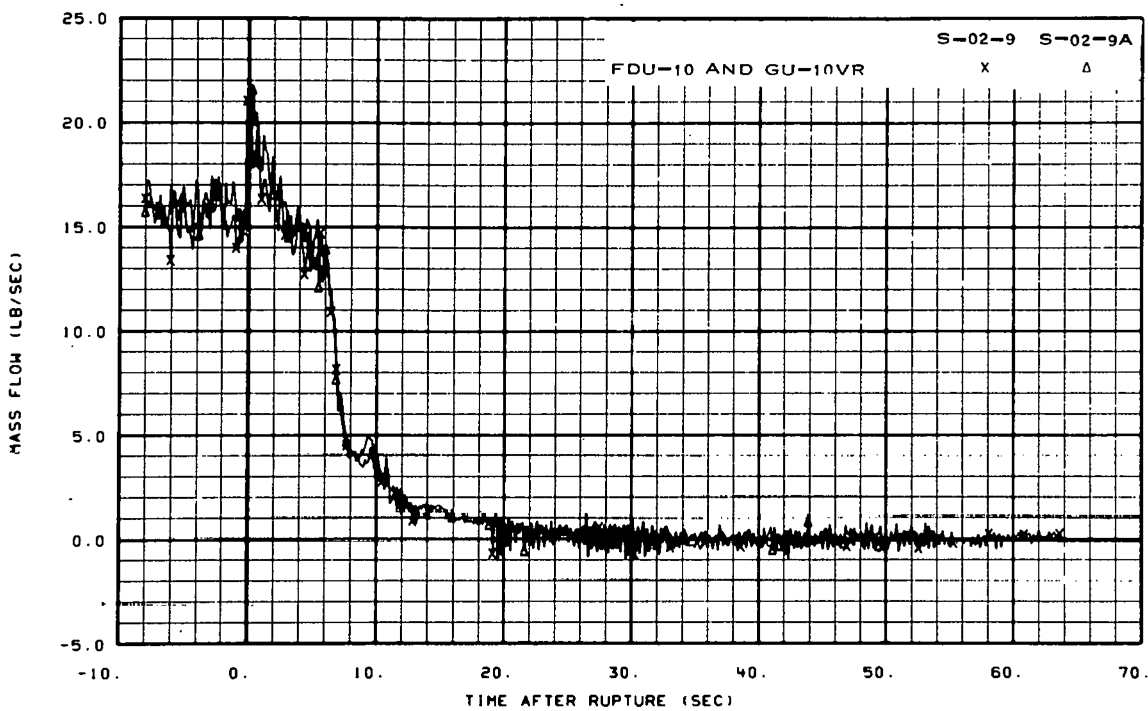

Fig. 223 Mass flow in intact loop (FDU-10 and GU-10VR).

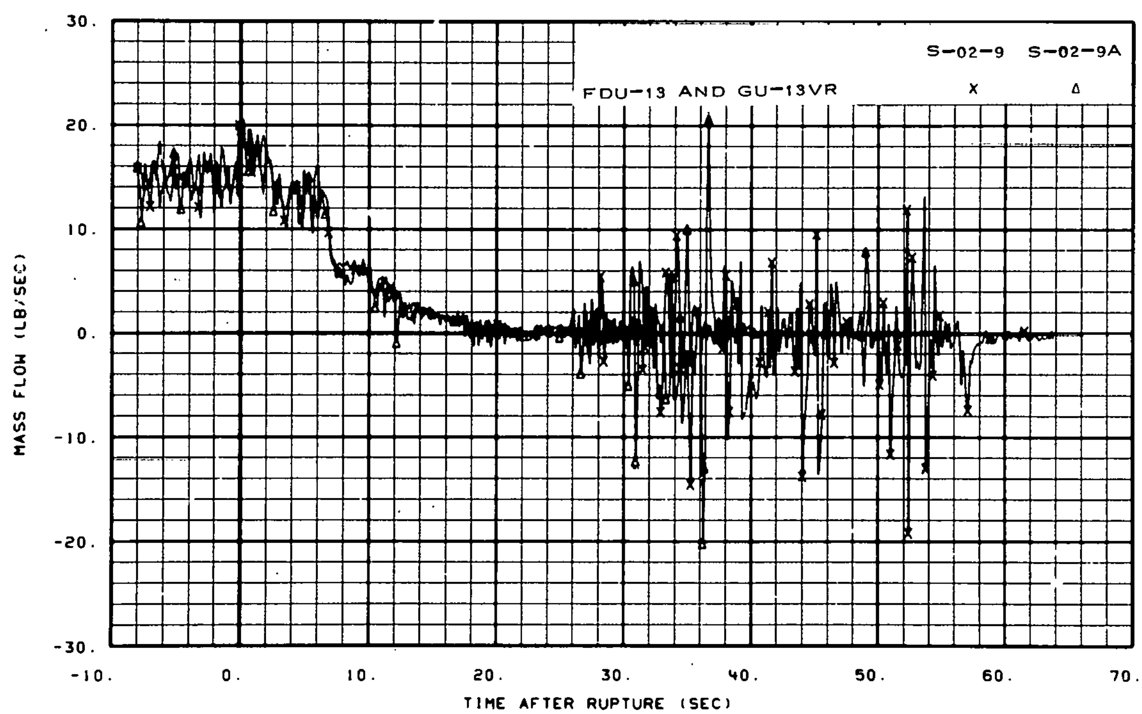

Fig. 224 Mass flow in intact loop (FDU-13 and GU-13VR).

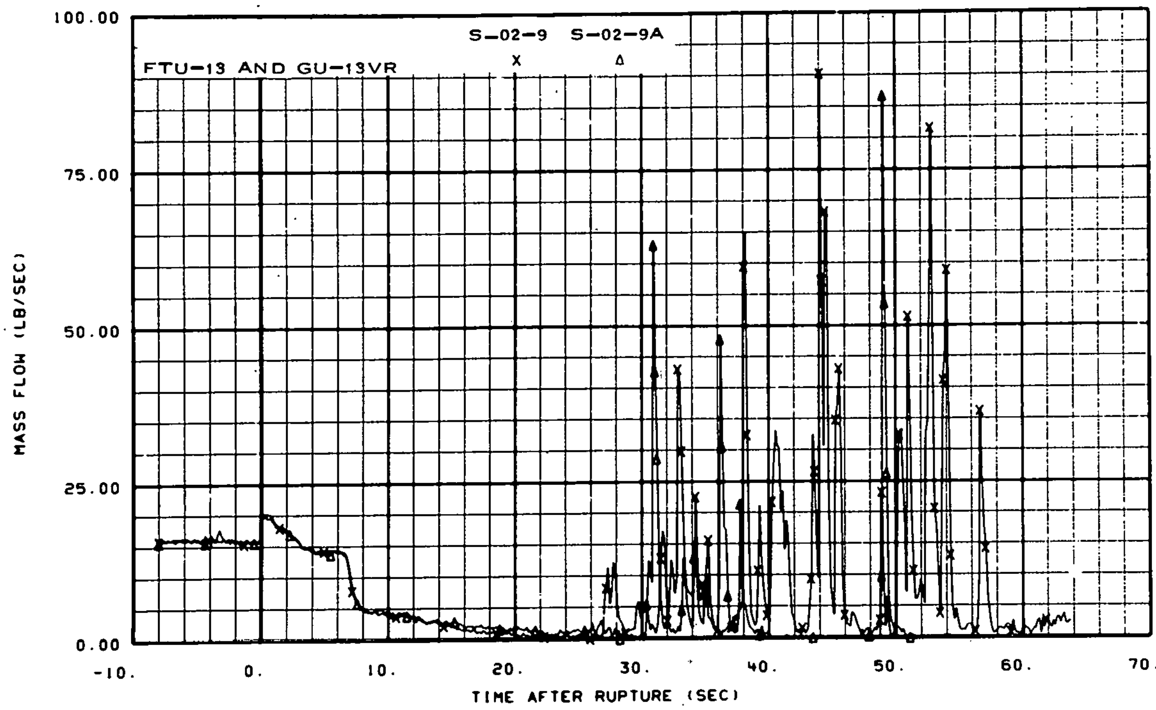

Fig. 225 Mass flow in intact loop (FTU-13 and GU-13VR).

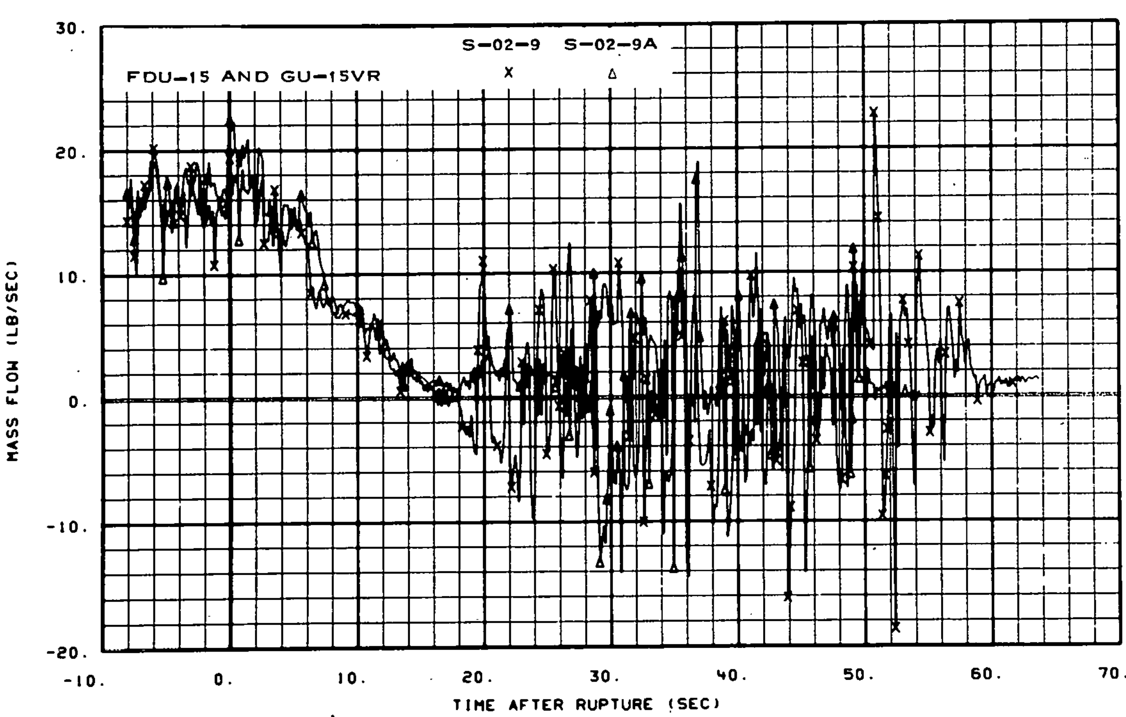

Fig. 226 Mass flow in intact loop (FDU-15 and GU-15VR).

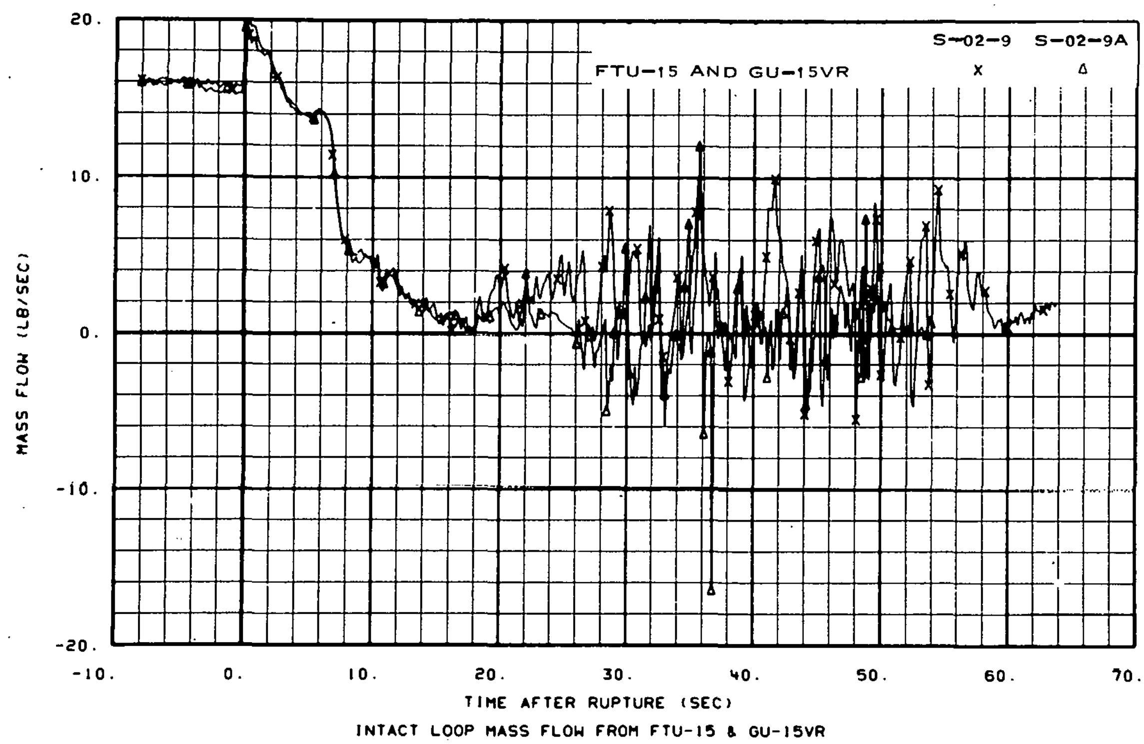

Fig. 227 Mass flow in intact loop (FTU-15 and GU-15VR).

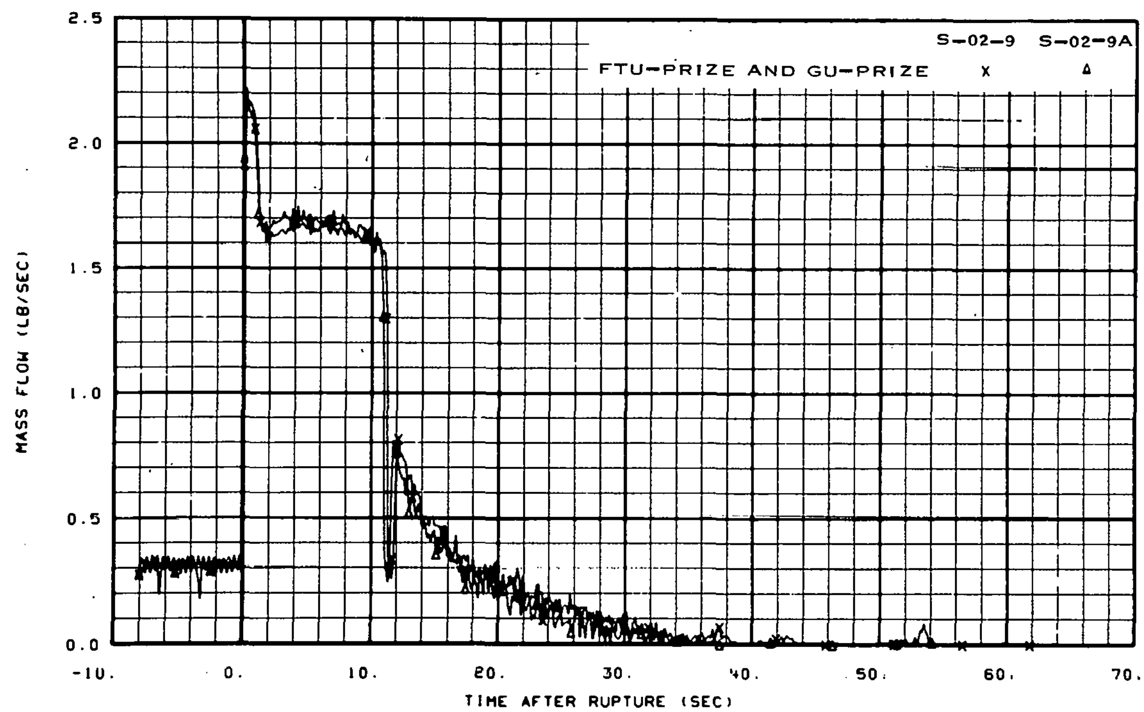

Fig. 228 Mass flow in pressurizer surge line (FTU-PRIZE and GU-PRIZE).

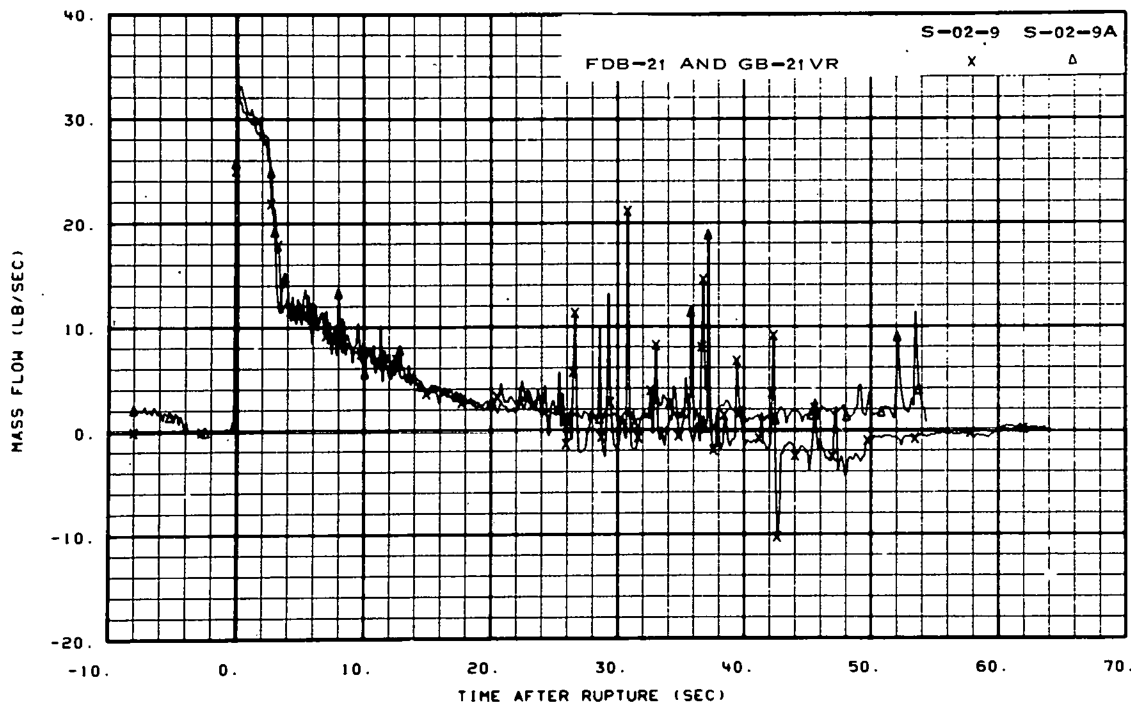

Fig. 229 Mass flow in broken loop (FDB-21 and GB-21VR).

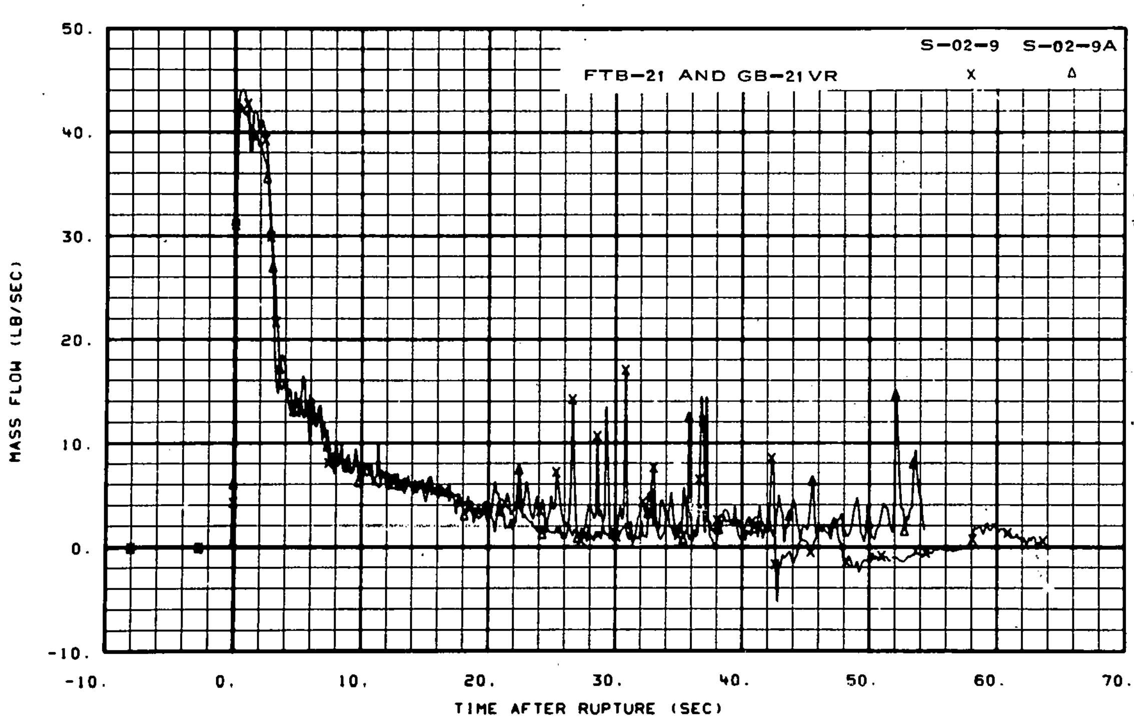

Fig. 230 Mass flow in broken loop (FTB-21 and GB-21VR).

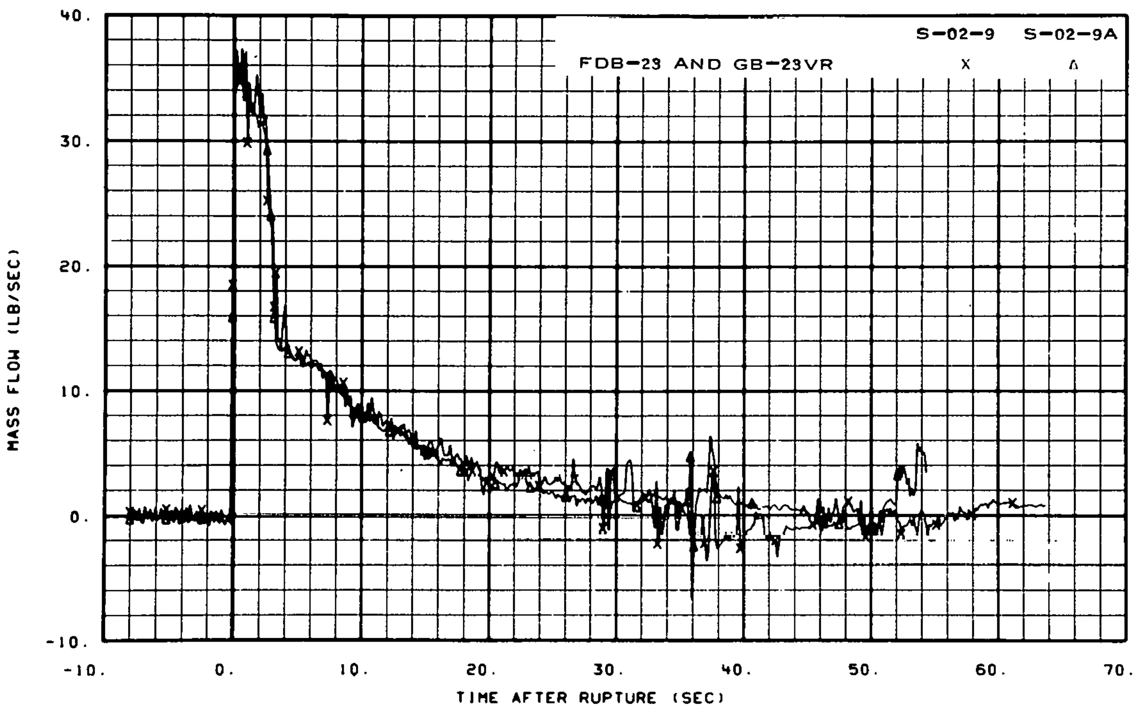

Fig. 231 Mass flow in broken loop (FDB-23 and GB-23VR).

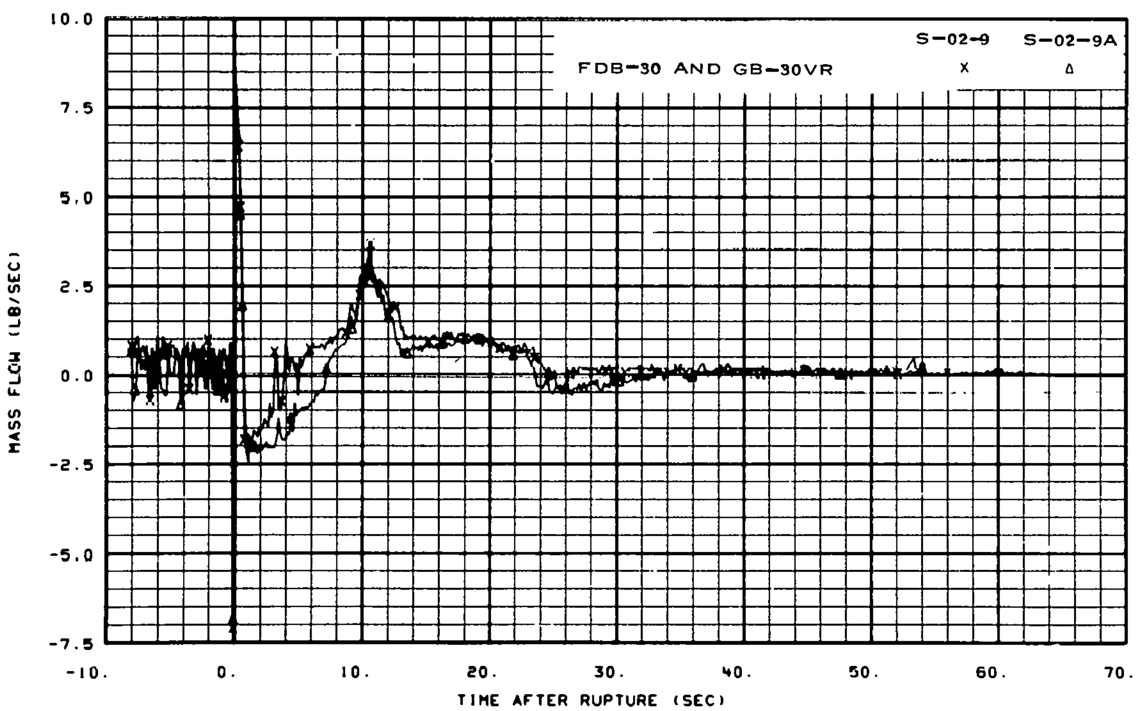

Fig. 232 Mass flow in broken loop (FDB-30 and GB-30VR).

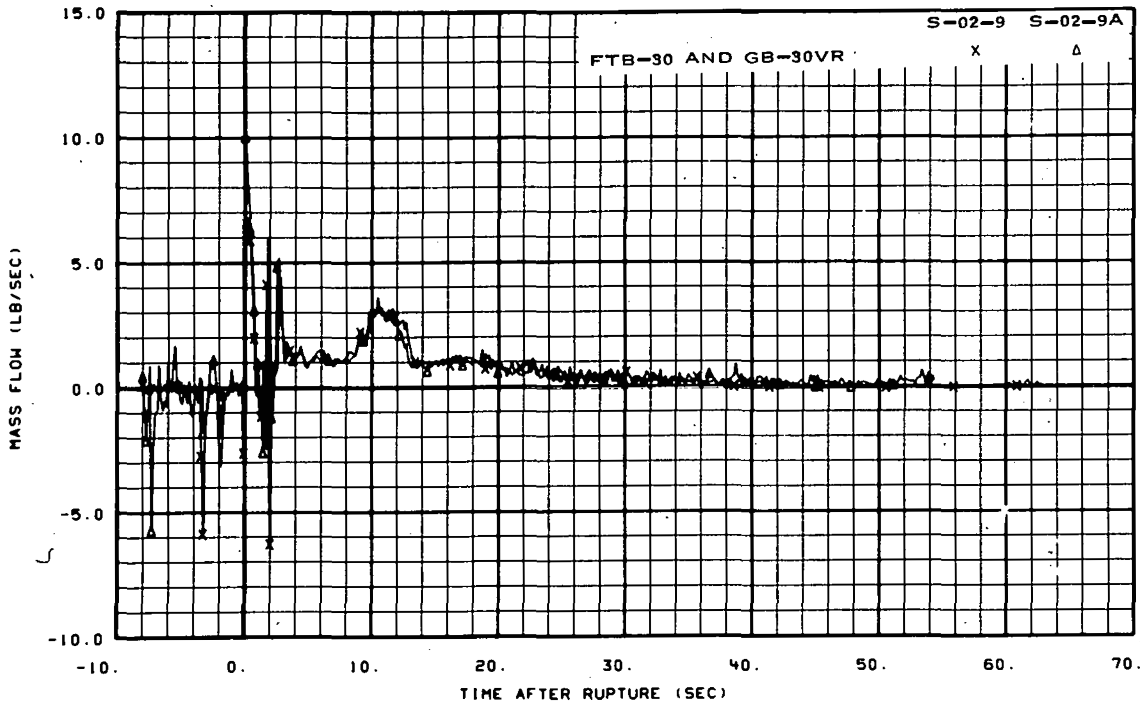

Fig. 233 Mass flow in broken loop (FTB-30 and GB-30VR).

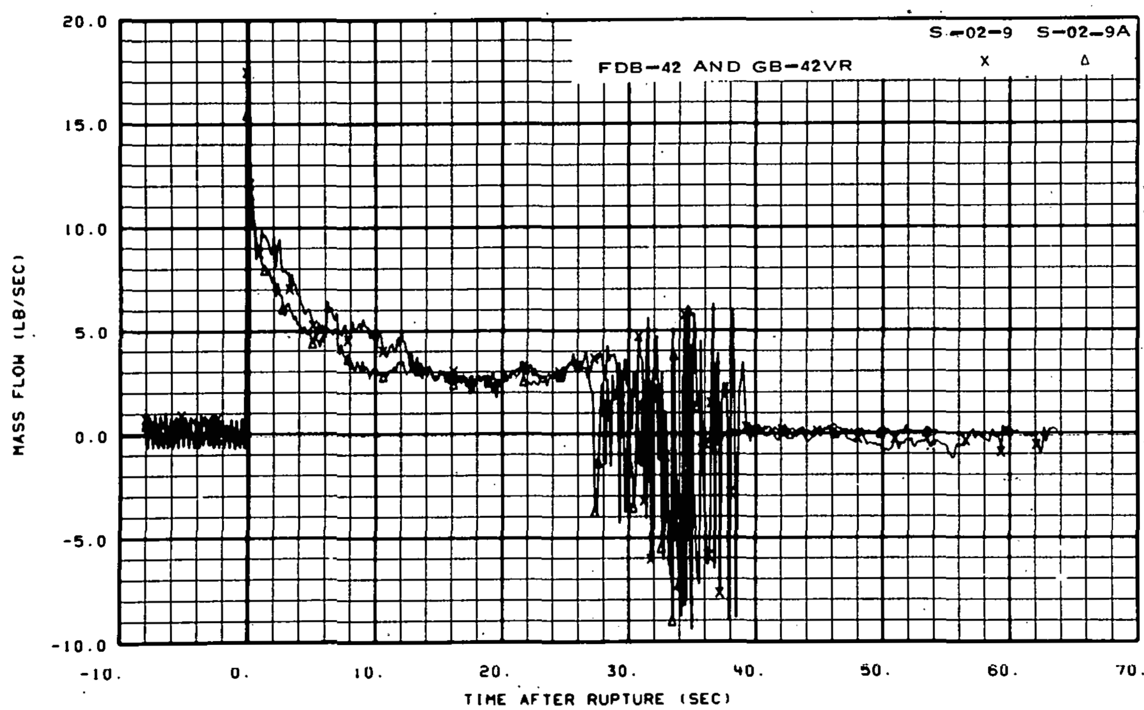

Fig. 234 Mass flow in broken loop (FDB-42 and GB-42VR).

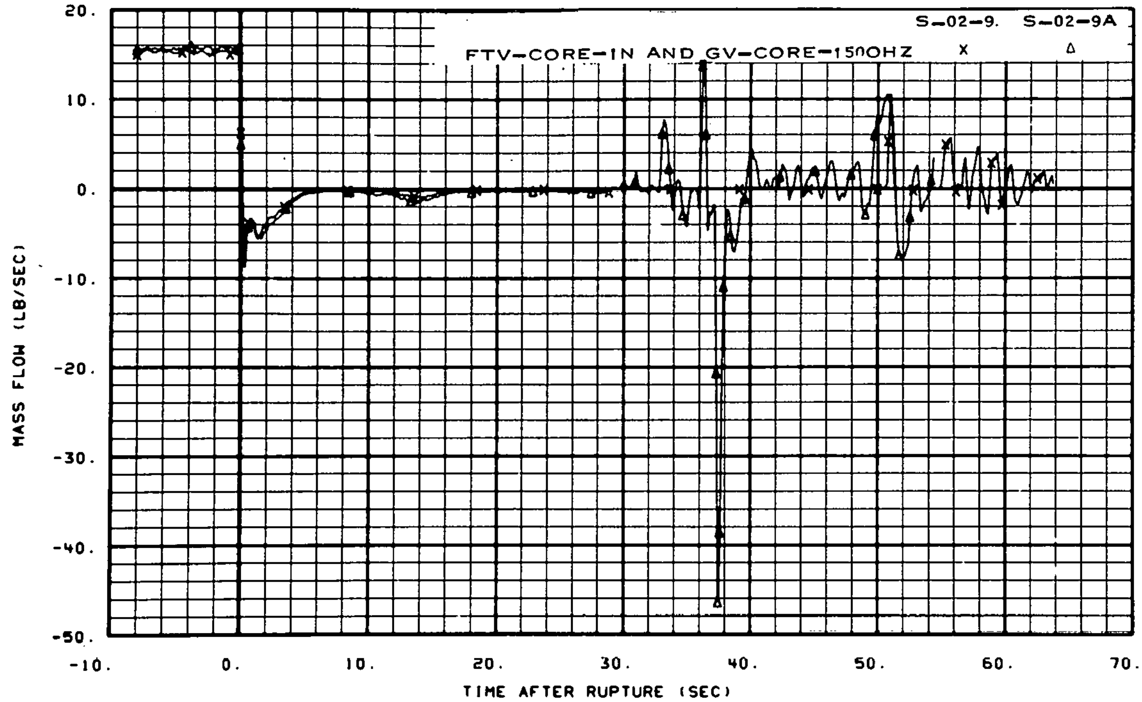

Fig. 235 Mass flow in vessel (FTV-CORE-IN and GV-COR-150HZ).

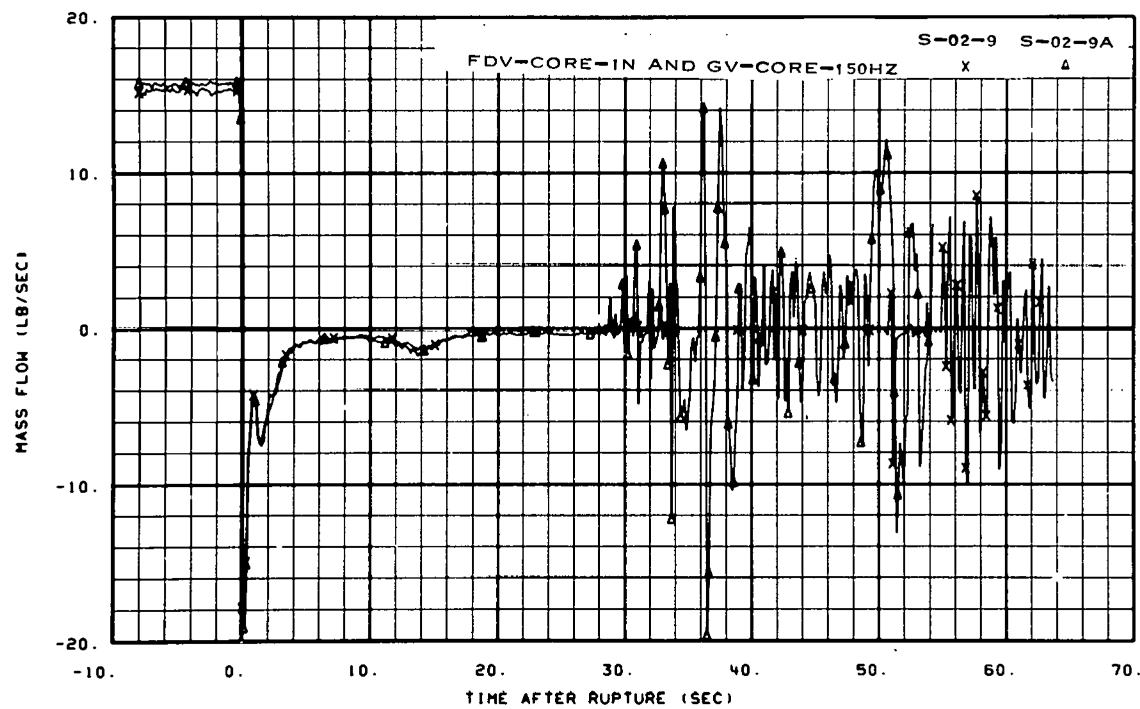

Fig. 236 Mass flow in vessel (FDV-CORE-IN and GV-Cor-150HZ).

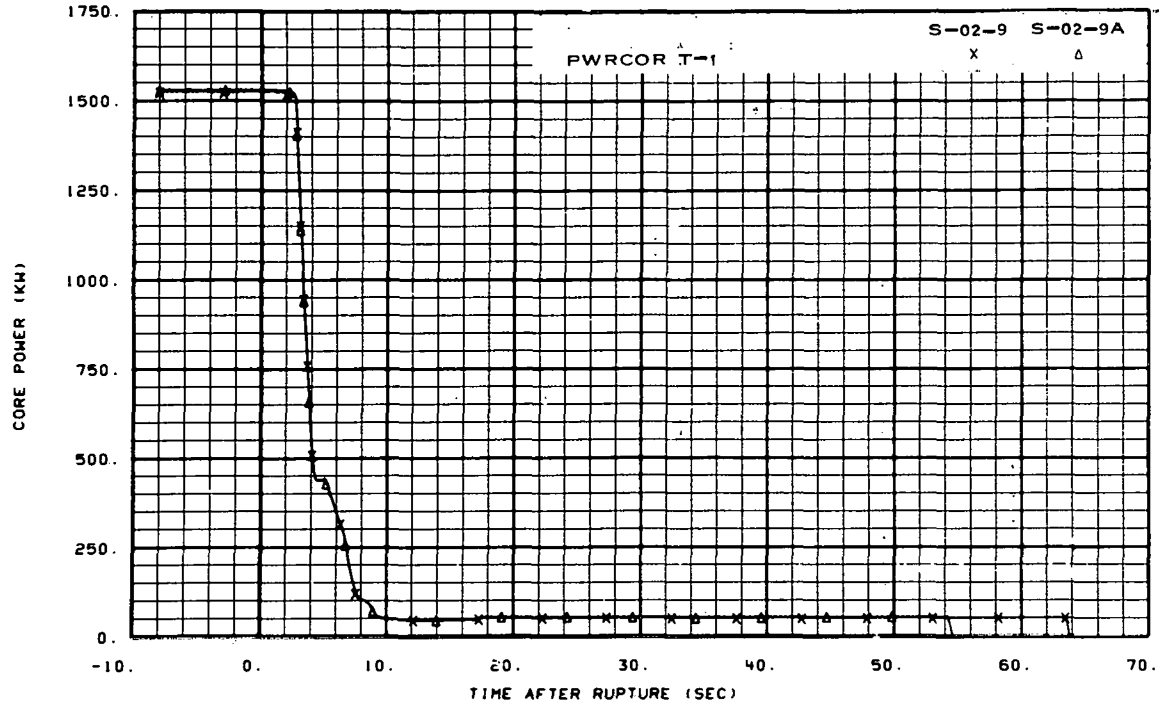

Fig. 237 Core heater pin total power (PWRCOR T-1).

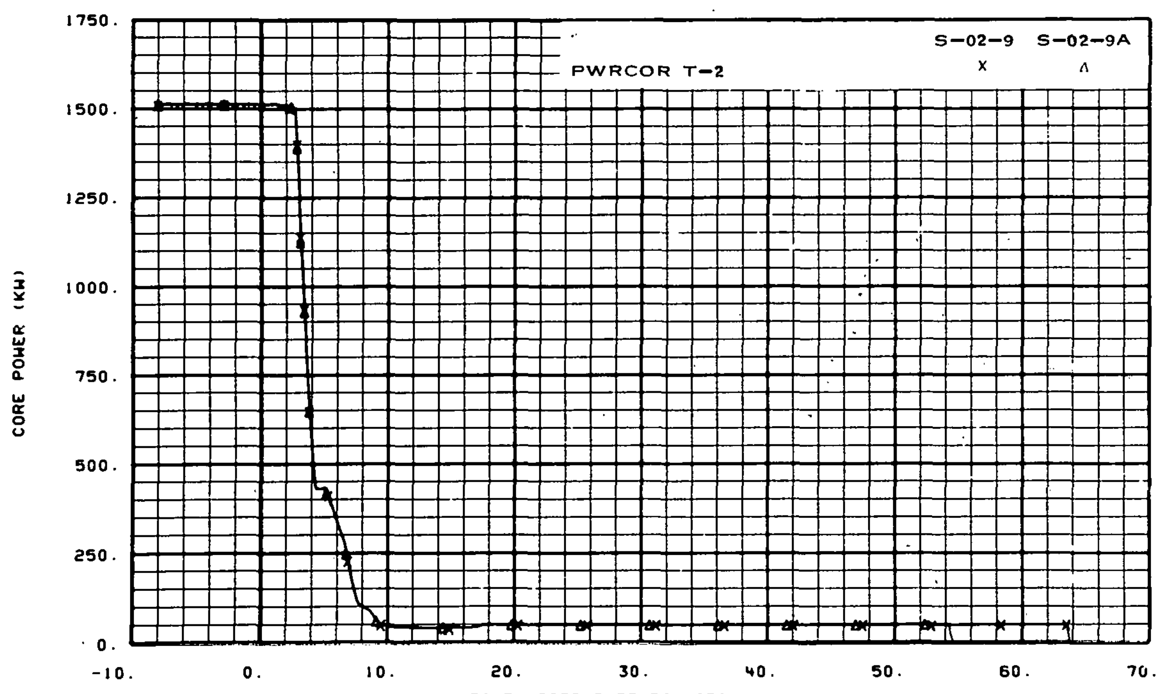

Fig. 238 Core heater pin total power (PWRCOR T-2).

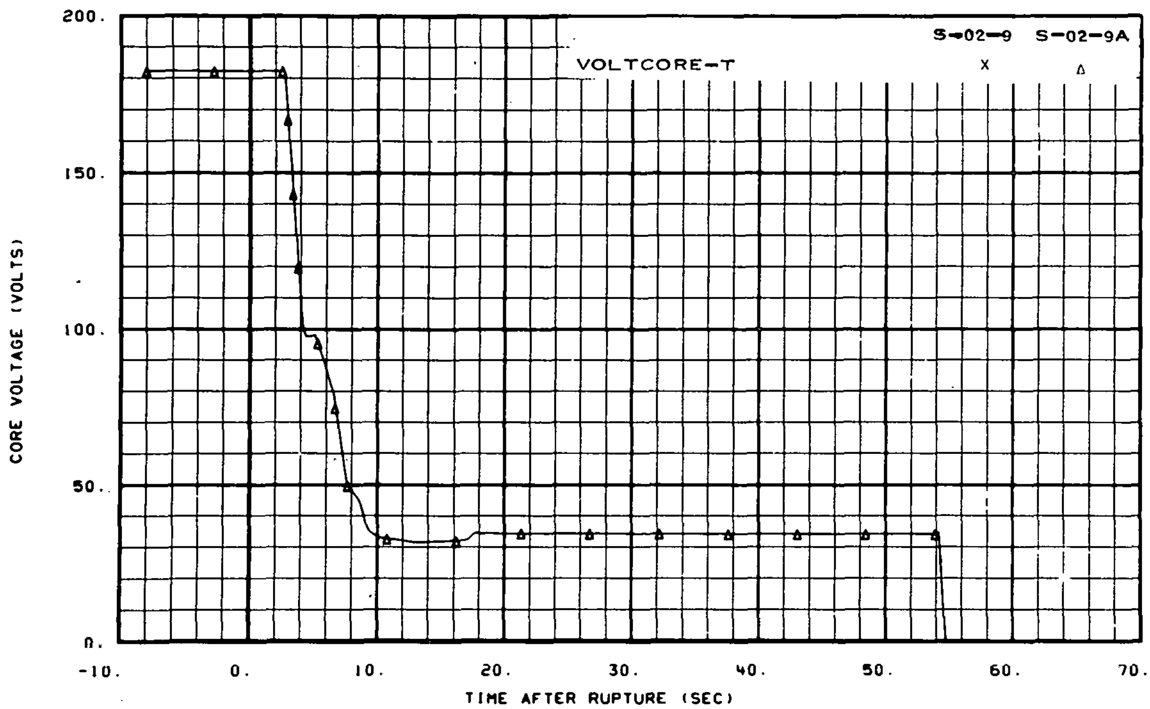

Fig. 239 Core heater voltage.

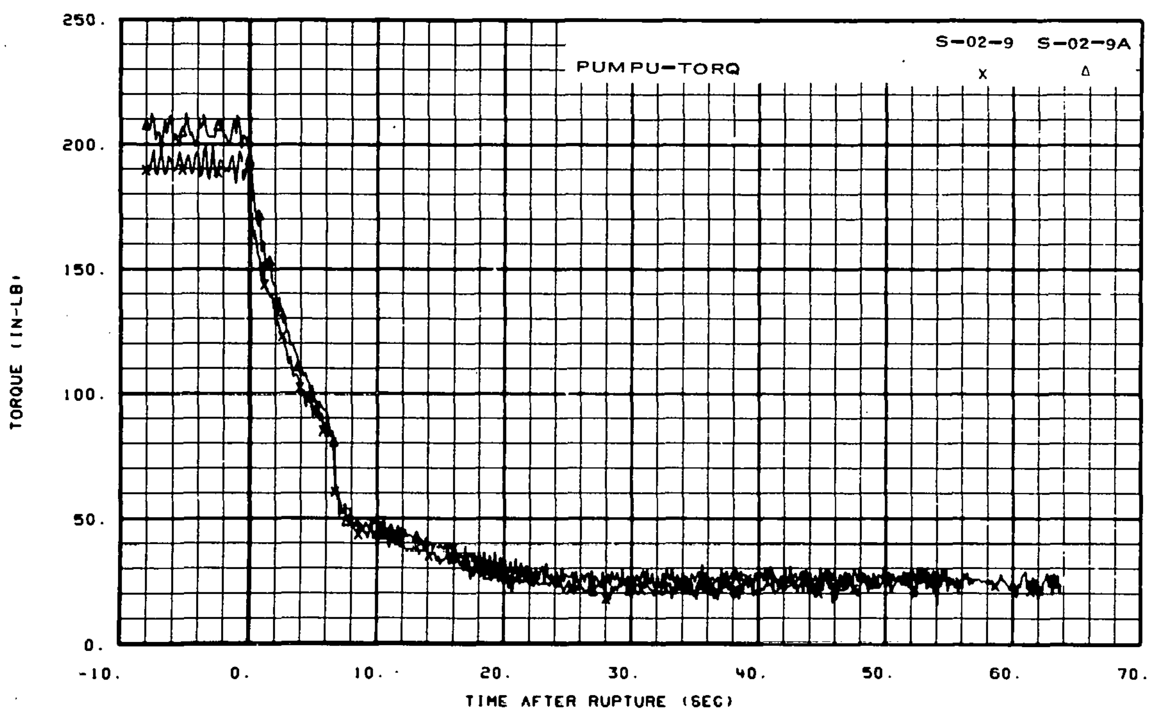

Fig. 240 Primary pump torque.

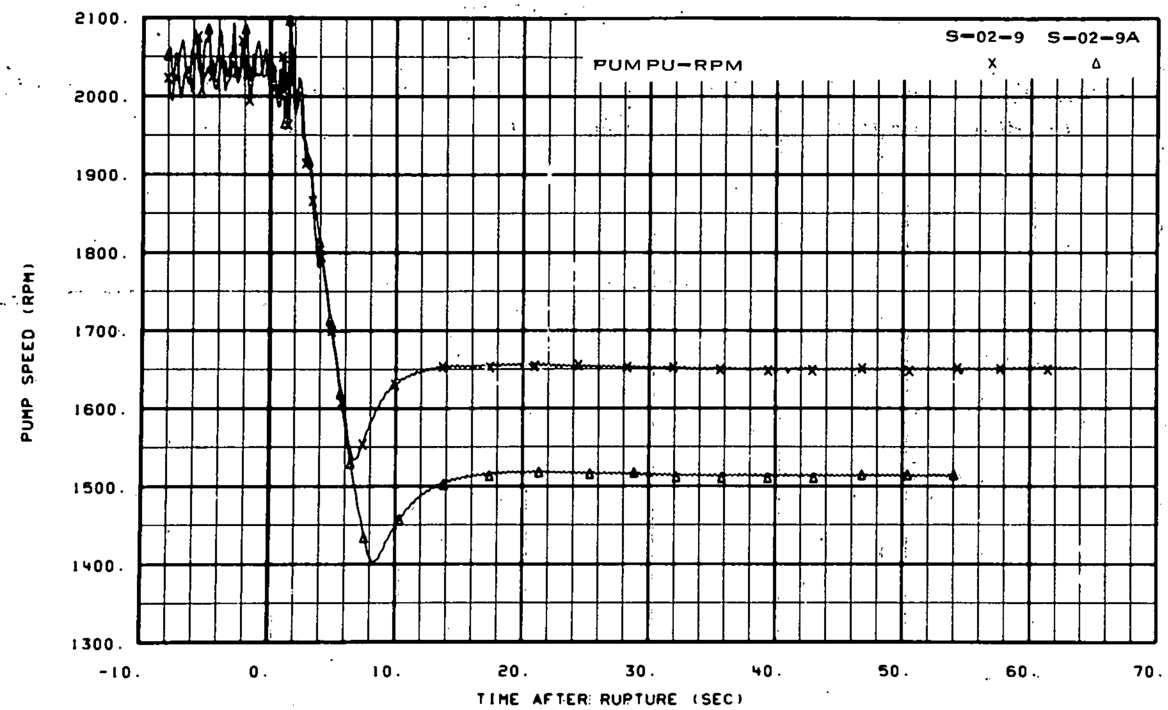

Fig. 241 Primary pump speed.

IV. REFERENCE

1. E. M. Feldman and D. J. Olson, *Semiscale Mod-1 Program and System Description for the Blowdown Heat Transfer Tests (Test Series 2)*, ANCR-1230 (August 1975).

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