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EXPERIMENT DATA REPORT FOR SEMISCALE MOD-1 TEST S-29-3 (INTEGRAL TEST FROM REDUCED INITIAL PRESSURE)

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

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ABSTRACT

Recorded test data are presented for Test S-29-3 of the Semiscale Mod-1 special heat transfer test series. This test is among several Semiscale Mod-1 experiments conducted to investigate the thermal and hydraulic phenomena accompanying a hypothesized loss-of-coolant accident in a pressurized water reactor system.

Test S-29-3 was conducted from an initial cold leg fluid temperature of 544°F and an initial pressure of 1,760 psia. A simulated double-ended offset shear cold leg break was used to investigate the system response to a depressurization transient starting from a lower initial pressure than that usually associated with pressurized water reactor operation. System flow was set to achieve a full core fluid temperature differential of 66°F at full core power of 1.6 MW. The flow resistance of the intact loop was based on core area scaling. An electrically heated core with a peaked radial power profile was used in the pressure vessel to simulate the effects of a nuclear core. During system depressurization, core power was reduced from the initial level of 1.6 MW to simulate the surface heat flux response of nuclear fuel rods until such time that departure from nucleate boiling might occur.

Blowdown to the pressure suppression system was accompanied by simulated emergency core cooling injection into both the intact and broken loops. Coolant injection was continued until test termination at 200 seconds after initiation of blowdown.

The purpose of this report is to make available the uninterpreted data from Test S-29-3 for future data analysis 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

Test S-29-3 was performed as part of the Semiscale Mod-1 portion of the Semiscale Program conducted by Aerojet Nuclear Company for the United States Government. This test was part of the special Semiscale Mod-1 test series (Test Series 29), performed to investigate the response of the Mod-1 system to specific individual variations in test conditions. 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 with subsequent refill and reflood.

Test S-29-3 utilized the Semiscale Mod-1 system, equipped as follows: 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, pressure suppression tank, and a heated steam supply system. A low pressure coolant injection pump and coolant injection accumulator were provided for each system loop. The electrically heated core consisted of 40 heater rods with a maximum total power capacity of 1.6 MW. Of the 40 heater rods, 39 were active, Rod H-5 having failed prior to the start of the test. The test objectives specific to Test S-29-3 were: (a) to determine the effects of reduced initial pressure on the blowdown heat transfer characteristics of the Mod-1 core, and (b) to investigate the response of the Mod-1 system to a combined blowdown and reflood transient with radial power peaking in the heated core. The test was conducted from initial conditions of approximately 1,760 psia and 544°F (at the intact loop cold leg vessel 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 and an initial core inlet flow rate of 148 gpm. The instantaneous offset shear of the broken loop cold leg piping was simulated by simultaneous actuation (within 10 milliseconds) of the rupture assemblies. After initiation of blowdown, power to the heated core was reduced to simulate the heat flux response of nuclear fuel rods until such time as departure from nucleate boiling might occur. Blowdown was accompanied by simulated emergency core coolant injection into the cold leg piping of both the intact and broken loops.

Test S-29-3 was generally conducted as specified. Conditions which did not conform to the specified test configuration were considered acceptable for analysis purposes within the test objectives. The instrumentation used in Test S-29-3 generally functioned as intended. Of 215 measurements attempted, all produced usable data:

CONTENTS

FIGURES

TABLES

EXPERIMENT DATA REPORT FOR SEMISCALE MOD-1
TEST S-29-3
(INTEGRAL TEST FROM REDUCED INITIAL PRESSURE)

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 pressurized water 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.

Test S-29-3 was conducted on May 7, 1976, in the Semiscale Mod-1 system as part of a series of special tests (Test Series 29), which was designed to obtain thermal-hydraulic response data from blowdown and reflood transients to allow the effects of individually varied system parameters to be studied. Test S-29-3 was conducted in a cold-leg break configuration, with the initial pressure (prior to blowdown) reduced from 2,260 psia (specified for previous tests), to 1,760 psia, in order to determine the effects of reduced initial pressure on core heat transfer response during blowdown. The pressure vessel was equipped with a 40-electric-heater-rod heated core, of which 39 rods were active (rod H-5, of the original 40-rod core, failed prior to the start of the test; see Figure 6). The core power supply was set to yield a peaked radial power profile with the four center rods having a peak power density of 14.25 kW/ft, and the 35 peripheral rods having a peak power density of 11.54 kW/ft. Prior to blowdown, the core was operated at its maximum design power level of 1.6 MW.

During blowdown the core heater power was adjusted to simulate the thermal response characteristics of nuclear-heated rods prior to departure from nucleate boiling. Blowdown was also accompanied by simulated emergency core coolant injection into the cold leg sides of the intact and broken loops from coolant injection accumulators and low pressure injection pumps. Coolant injection was continued until test termination at 200 seconds after initiation of blowdown.

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 Test S-29-3; 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 TEST S-29-3

The following system configuration, procedures, initial test conditions, and events are specific to Test S-29-3.

1. SYSTEM CONFIGURATION AND TEST PROCEDURES

The Semiscale Mod-1 system used for the test consisted of a pressure vessel with internals, including a 40-rod core with 39 electrically heated rods; an intact loop with steam generator, pump, and pressurizer; a broken loop with simulated steam generator, simulated pump, and two rupture assemblies; coolant injection accumulators for both the intact and broken loops; low pressure injection pumps for both the intact and broken loops; and a pressure suppression system with a suppression tank, header, and a heated steam supply system.

For Test S-29-3, 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 the test, the intact and broken loop accumulators were filled with treated demineralized water at ambient temperature, drained to the specified initial level, and pressurized with nitrogen to 600 psig. 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, system instrumentation was checked, and transducer readings were initialized. 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.

Prior to establishing the initial core power level, the pressure suppression system was pressurized to 35 psia with saturated steam from the steam supply system. After the core power was increased to 1.6 MW, initial test conditions were held for sixteen 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 break through two rupture assemblies and two blowdown nozzles, each 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 (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, which was vented to maintain a constant pressure of 35 psia. 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 Loss-of-Fluid Test Pumps. During the blowdown transient, power to the electrically heated core was automatically controlled to simulate the thermal response of the nuclear-heated fuel rods. 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 pumps into the same injection points (at Spool 14 and Spool 42) used for the accumulators. Coolant injection was continued until the test was terminated at 200 seconds after initiation of blowdown.

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
Core power (MW)	1.59	1.60 ± 0.03
Intact loop cold leg fluid temperature (°F)	544	544 ± 2
Hot leg to cold leg temperature differential (°F)	66	66 ± 1
Pressurizer pressure (psia)	1,760	1,763 ± 25
Pressurizer water level (in.)[b]	23.5	25.5 ± 2
Steam generator feedwater temperature (°F)	440	435 ± 10
Steam generator liquid level (from bottom of tube sheet) (in.)	116	116 ± 2
Fluid temperature in broken loop (pump side) (°F)	591	605 ± 5
Intact loop cold leg flow (gpm)	148	[c]
Pressure suppression tank water level (in.)[d]	47.5	47.5
Pressure suppression tank pressure (psia)	[e]	35 ± 1
Pressure suppression tank water temperature (°F)	74	< 75

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

[b] Pressurizer water level measured from bottom of hemispherical section. Measured level shown corresponds to a pressurizer system volume of 0.66 ft^3 (including surge line).

[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.

[e] PSS tank pressure not available on process instrumentation.

TABLE II

PRIMARY COOLANT TEMPERATURE DISTRIBUTION AT RUPTURE[a]

	Detector	Temperature (°F)
Vessel lower plenum (lower portion)	TFV-LP-7.5	534
Vessel lower plenum (upper portion)	TFV-LP-27.5	540
Hot leg, intact loop (near vessel)	RBU-2	608
Cold leg, intact loop (near pump inlet)	TFU-10	540
Cold leg, intact loop (near vessel	RBU-14A	540
Cold leg, broken loop (near nozzle)	TFB-23	538
Hot leg, broken loop (near vessel)	TFB-30	598
Cold leg, broken loop (near nozzle)	TFB-42	590

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

TABLE III

WATER CHEMISTRY PRIOR TO BLOWDOWN[a]

ph	10.70
Conductivity (μmhos/cm)	128.0
Lithium (ppm)	3.5
Chlorides (ppm)	<0.1
Fluorides (ppm)	<0.4[b]
Oxygen (ppm)	0.05
Total gas (cc/l)	144.1
Suspended solids (ppm)	1.37

[a] Water sample taken at a system pressure of 1,760 psig and a system temperature of 540°F (cold leg).

[b] Present analytical methods prevent accurate determination of fluorides at concentrations of less than 0.4 ppm.

TABLE IV

SEQUENCE OF EVENTS DURING TEST[a]

Event	Time Relative To Rupture
Established core power level (min)	-16.0
Bypass lines valved out of system (sec)	- 2.5
Blowdown initiated (sec)	0.0
Pump power reduced (sec)	0.0
Core power decay transient started (sec)	0.0
Steam generator feedwater and discharge valves closed (sec)	1.0
ECC accumulators valved in (sec)[b]	5.0
LPIS pumps started (sec)[b]	26.0
Core power tripped off (sec)[c]	200.0

[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 at termination of test.

III. DATA PRESENTATION

The data from Semiscale Mod-1 Test S-29-3 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 the test 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 to provide better resolution capability (needed as input to various data analysis codes) and to provide redundancy.

The data are presented, in many instances, in the form of composite graphs to facilitate comparison of the values of given variables at several locations. The scales selected for the graphs do not reflect the obtainable resolution of the data (the data processing techniques are described in greater detail in Reference 1).

Figures 1 through 6 and Table V provide supporting information for interpretation of the data graphs shown in Figures 7 through 305. Figures 1 through 6 show the relative locations of all detectors used during Test S-29-3.

Table V groups the measurements 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 305 present all of the blowdown and reflood data obtained. Time zero on the graphs is the time of rupture initiation.

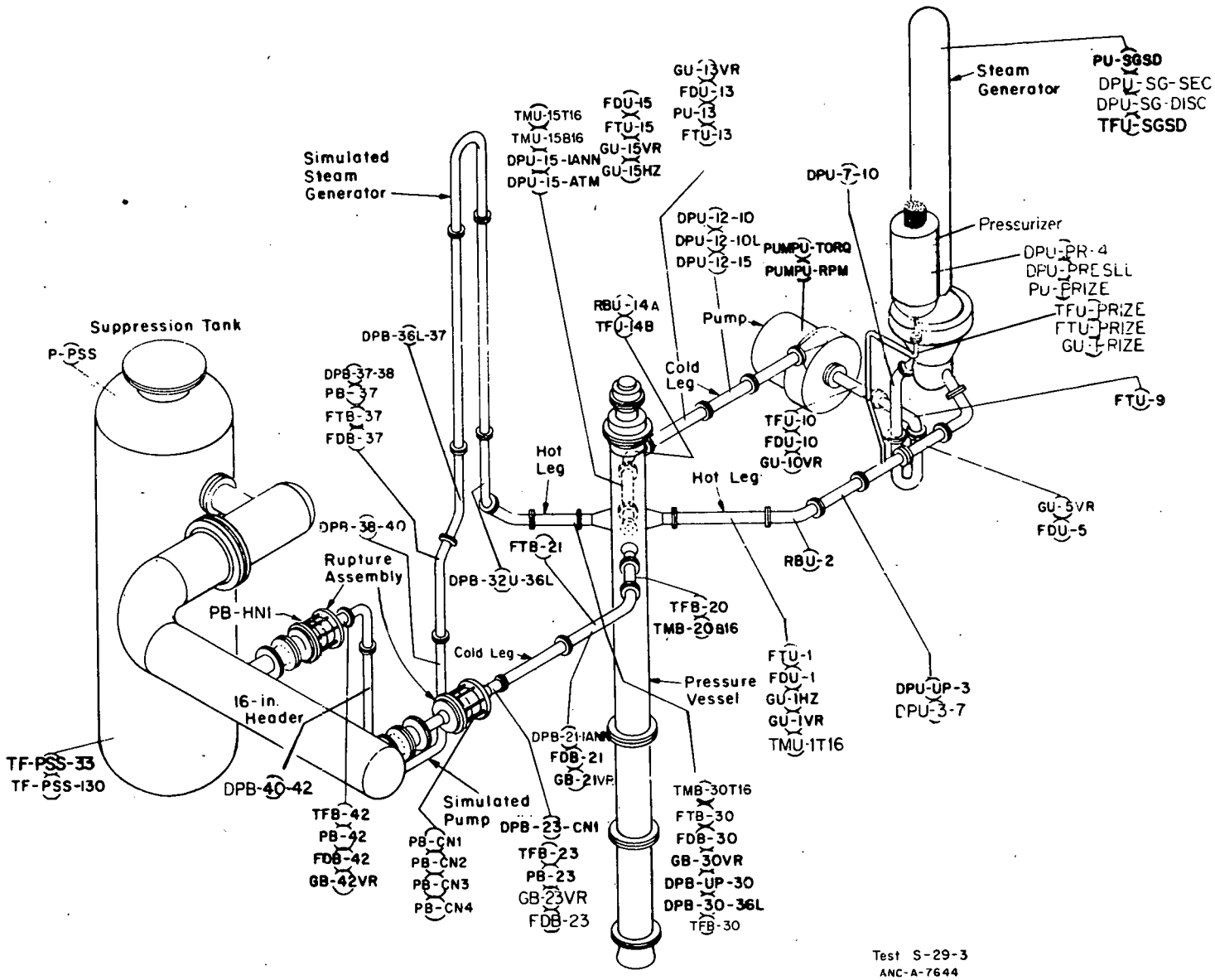


Fig. 1 Semiscale Mod-1 system and instrumentation for cold leg break configuration -- isometric.

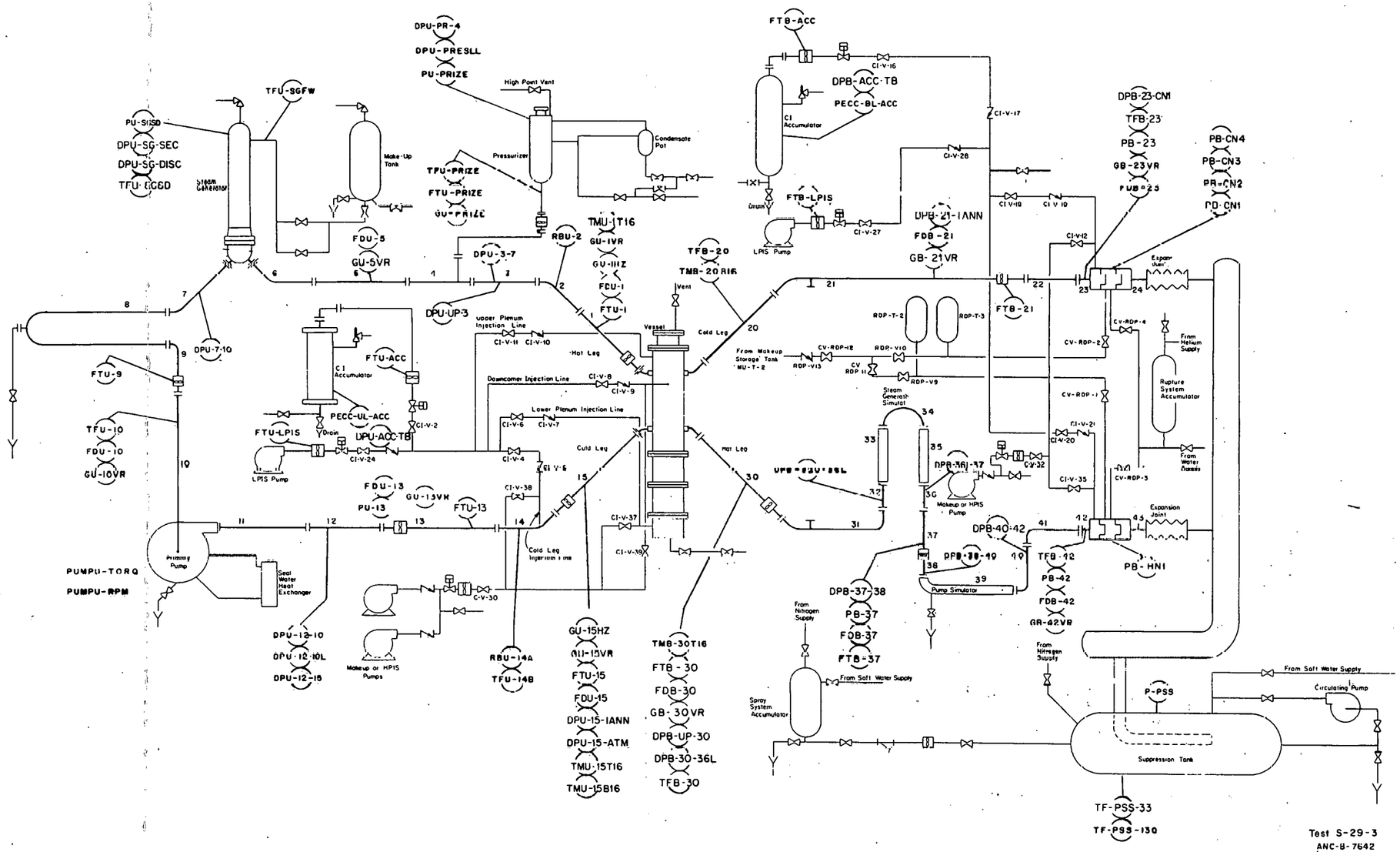


Fig. 2 Semiscale Mod-1 system and instrumentation for cold leg break configuration -- schematic.

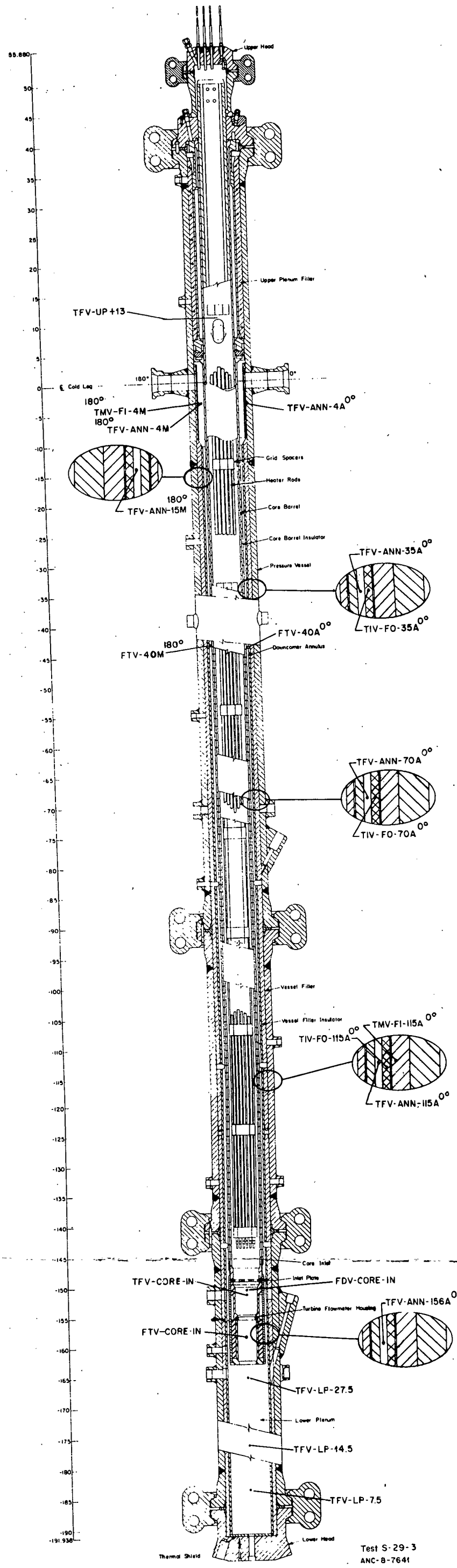


Fig. 3 Semiscale Mod-1 pressure vessel -- cross section showing instrumentation.

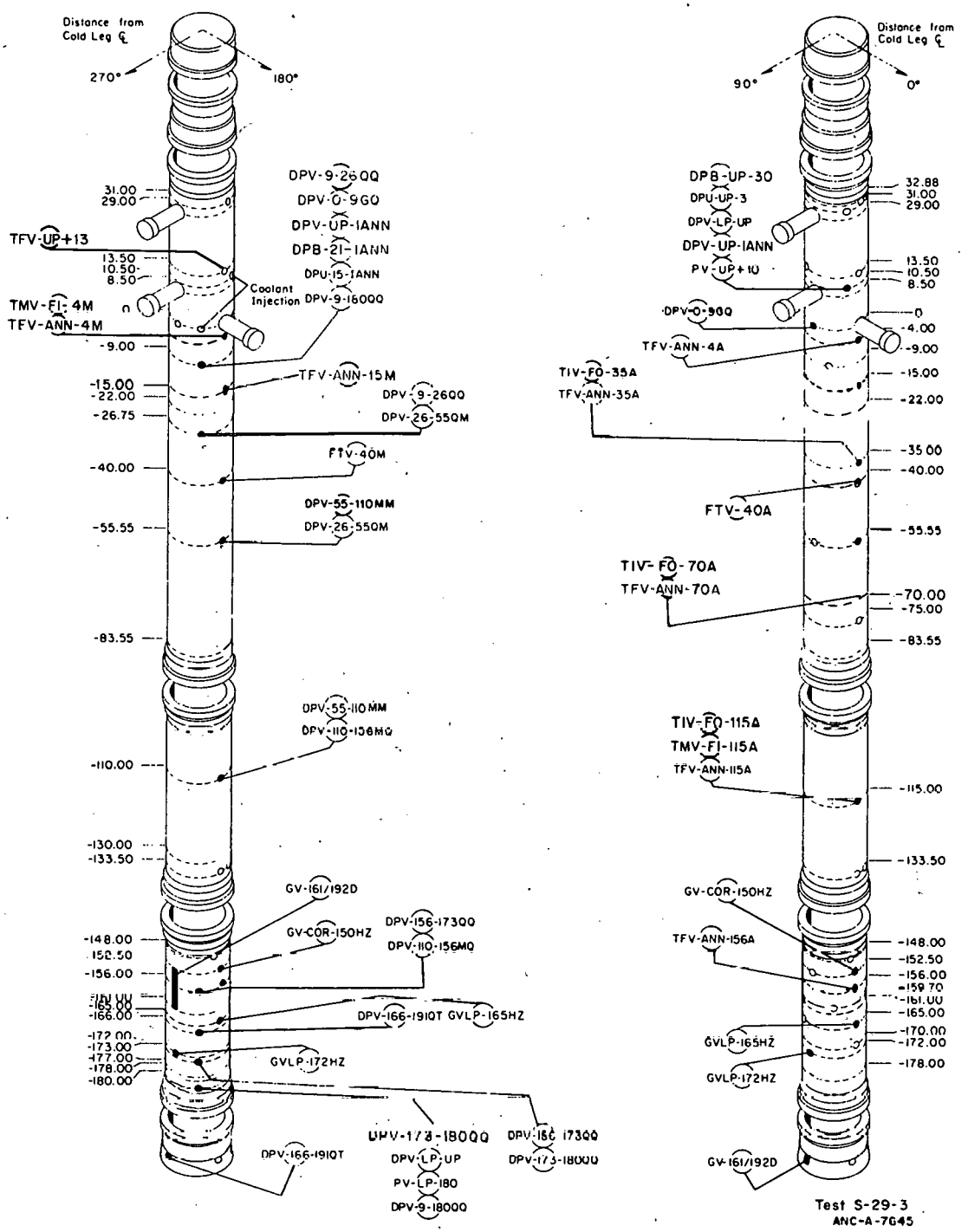


Fig. 4 Semiscale Mod-1 pressure vessel -- isometric showing instrumentation.

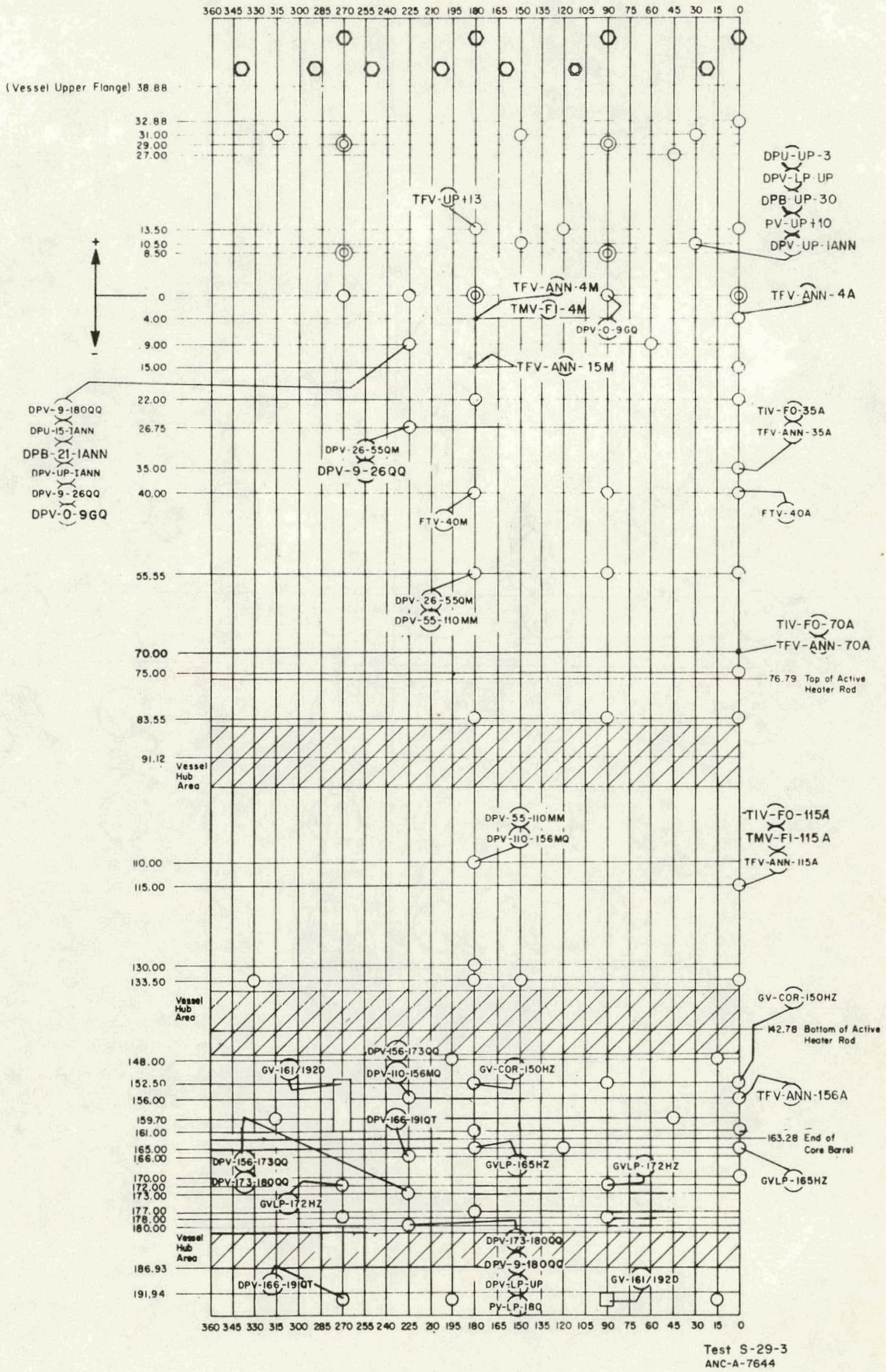


Fig. 5 Semiscale Mod-1 pressure vessel -- penetrations and instrumentation.

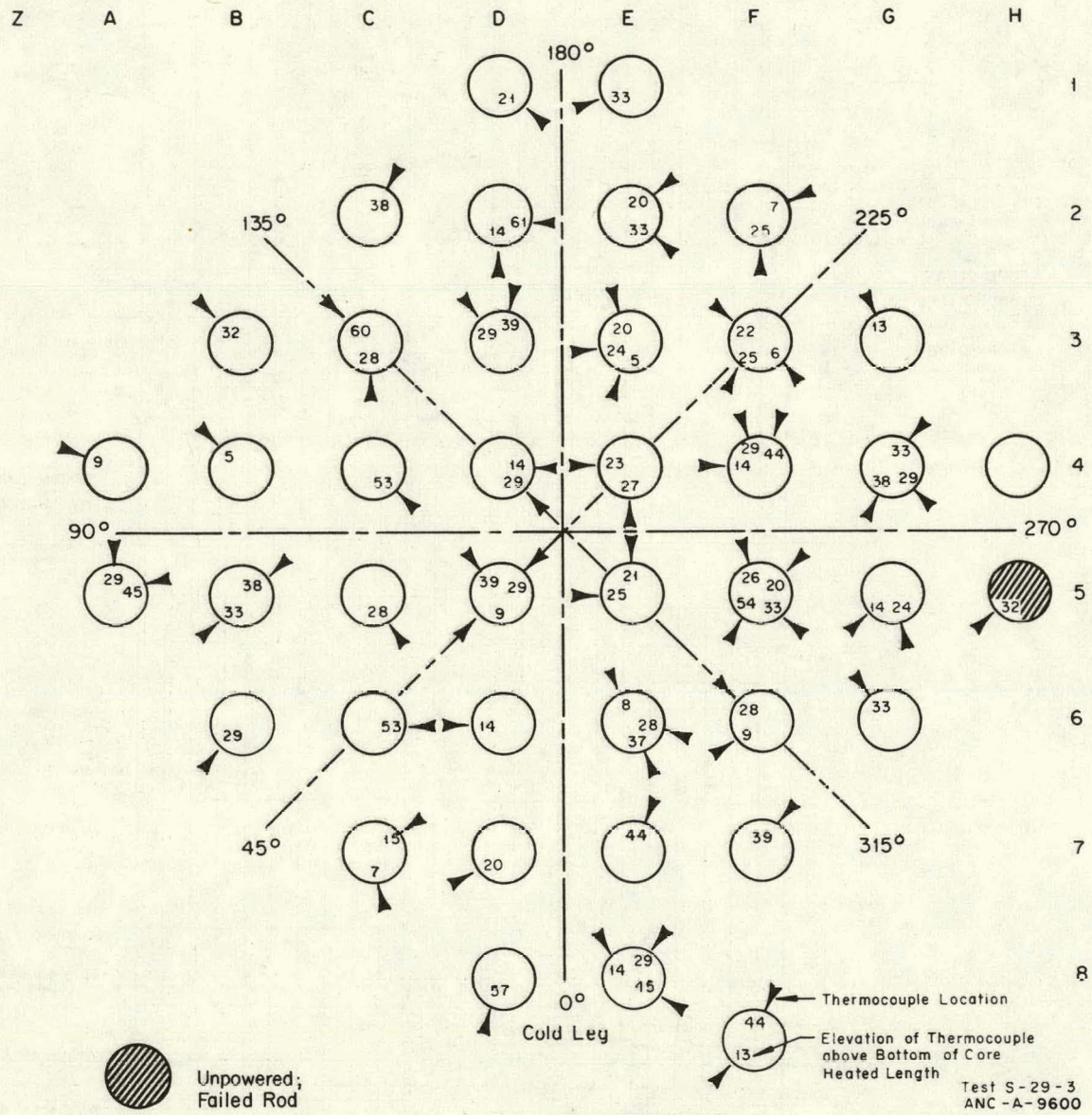


Fig. 6 Semiscale Mod-1 heated core -- plan view.

TABLE V

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-29-3

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.				
Intact Loop		0-2,300°F	0-591°F		
RBU-2	Hot leg, Spool 2, 46 in. from vessel center (plantinum resistance bulb).	0-1,000°F	0-1,000°F	7,8	
TFU-10	Cold leg, Spool 10, 144 in. from vessel center.			9,10	
RBU-14A	Cold leg, Spool 14, 43 in. from vessel center, upstream of cold leg injection port (platinum resistance bulb).	0-1,000°F	0-1,000°F	9,10	
TFU-14B	Cold leg, Spool 14, 39 in. from vessel center, downstream of cold leg injection port.			9,10	
Broken Loop		0-2,300°F	0-1,017°F		
TFB-20	Cold leg, Spool 20, 21 in. from vessel center.			11,12	
TFB-23	Cold leg, Spool 23, 91 in. from vessel center, upstream of vessel-side nozzle.			11,12	
TFB-30	Hot leg, Spool 30, 16 in. from vessel center.			13,14	
TFB-42	Cold leg, Spool 42, 414 in. from vessel center along hot leg, upstream of pump-side nozzle.			13,14	
Inlet Annulus	4 in. below cold leg centerline, 0.2 in. from vessel wall, Type J iron-constantan.	0-1,400°F	0-803°F		
TFV-ANN-4A	0°			15,16	
TFV-ANN-4M	180°			19,20	
Downcomer Annulus	Centered in annulus, Type J iron-constantan.	0-1,400°F	0-803°F		
TFV-ANN-15M	15 in. below cold leg centerline, 180°.			19,20	
TFV-ANN-35A	35 in. below cold leg centerline, 0°.			15,16	
TFV-ANN-70A	70 in. below cold leg centerline, 0°.			15,16	
TFV-ANN-115A	115 in. below cold leg centerline, 0°.			17,18	
TFV-ANN-156A	156 in. below cold leg centerline, 0°.			17,18	Noisy thermocouple.
Upper Plenum		0-2,300°F	0-1,017°F		
TFV-UP+13	In upper plenum, 13.5 in. above cold leg centerline at 180°.			21,22	
Lower Plenum	On fluid thermocouple rack, 1 in. from vessel center, 45°.	0-2,300°F	0-591°F		
TFV-LP-7.5	7.5 in. from bottom.			23,24	
TFV-LP-14.5	14.5 in. from bottom.			23,24	
TFV-LP-27.5	27.5 in. from bottom.			23,24	
Core					
TFV-CORE-IN	In core flow mixer box, 150 in. below cold leg centerline. (A part of FDV-CORE-IN).	0-2,300°F	0-591°F	25,26	Data acquisition system saturated near t=0 and t=25 sec.
Core Grid Spacers		0-2,300°F	0-2,382°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.			27,28	
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.			29,30	
TFG-6DE-45 TFG-6DE-67	Thermocouple in space defined by Columns D and E, Rows 4 and 5, and 6 and 7.			29,30	

TABLE V (contd.)

Measurement	Location and Comments[b]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
Grid Spacer 8	109 in. below cold leg centerline at center of heated length.				
TFG-8CD-45	Thermocouple in space defined by Columns C and D, Rows 4 and 5.			31,32	
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.			33,34	
TFG-10DE-67	Thermocouple in space defined by Columns D and E, Rows 6 and 7.			33,34	
TFG-10EF-45	Thermocouple in space defined by Columns E and F, Rows 4 and 5.			33,34	
TFG-10GH-45	Thermocouple in space defined by Columns G and H, Rows 4 and 5.			33,34	
Steam Generator		0-2,300°F	0-591°F		
TFU-SGFW	In feedwater line leading to steam generator.			35,36	
TFU-SGSD	In steam dome, 129.5 in. from bottom of tube sheet.			35,36	
Pressurizer		0-2,300°F	0-1,017°F		
TFU-PRIZE	In surge line, near pressurizer exit, between turbine flowmeter and pressurizer.			37,38	
Pressure Suppression System		0-2,300°F	0-591°F		
TF-PSS-33	33 in. from bottom of tank.			39,40	
TF-PSS-130	130 in. from bottom of tank.			39,40	
MATERIAL TEMPERATURE	Chromel-Alumel thermocouples unless specified otherwise	0-2,300°F	0-591°F		
Intact Loop					
TMU-1T16	Hot leg, Spool 1, top, 1/16 in. from pipe ID, 29 in. from vessel center.		0-1,017°F	41,42	
TMU-15B16	Cold leg, Spool 15, bottom, 1/16 in. from pipe ID, 17 in. from vessel center.			41,42	
TMU-15T16	Cold leg, Spool 15, top, 1/16 in. from pipe ID, 17 in. from vessel center.			41,42	
Broken Loop		0-2,300°F	0-591°F		
TMB-20B16	Cold leg, Spool 20, bottom, 1/16 in. from pipe ID, 21 in. from vessel center.			43,44	
TMB-30T16	Hot leg, Spool 30, top, 1/16 in. from pipe ID, 16 in. from vessel center.		0-1,017°F	43,44	
Vessel Filler	Type J iron-constantan.	0-1,400°F	0-803°F	45,46	
TMV-FI-4M	4 in. below cold leg centerline, 1/16 in. from filler ID, 180°.				
TMV-FI-115A	115 in. below cod leg centerline, 1/16 in. from filler ID, 0°.			45,46	
Vessel Filler Insulator	Type J iron-constantan	0-1,400°F	0-803°F		
TIV-FO-35A	35 in. below cold leg centerline, 0°.			47,48	
TIV-FO-70A	70 in. below cold leg centerline, 0°.			47,48	
TIV-FO-115A	115 in. below cold leg centerline, 0°.			47,48	
CORE HEATER CLADDING TEMPERATURES	Chromel-Alumel thermocouples				
High Power Heaters		0-2,300°F	0-2,382°F		
TH-D4-14 TH-D4-29	Heater at Column D, Row 4. Thermocouples 14 in. (225°) and 29 in. (315°) above bottom of core.			49,50	
TH-D5-09 TH-D5-29 TH-D5-39	Heater at Column D, Row 5. Thermocouples 9 in. (45°), 29 in. (225°), and 39 in. (135°) above bottom of core.			51,52	

TABLE V (contd.)

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
High Power Heaters (contd.)					
TH-E4-23 TH-E4-27	Heater at Column E, Row 4. Thermocouples 23 in. (90°) and 27 in. (0°) above bottom of core.			53, 54	
TH-E5-21 TH-E5-25	Heater at Column E, Row 5. Thermocouples 21 in. (180°) and 25 in. (90°) above bottom of core.			55,56	
Low Power Heaters		0-2,300°F	0-2,382°F		
TH-A4-09	Heater at Column A, Row 4. Thermocouple 9 in. (105°) above bottom of core.			57,58	Noisy thermocouple.
TH-A5-29 TH-A5-45	Heater at Column A, Row 5. Thermocouples 29 in. (180°) and 45 in. (255°) above bottom of core.			59,60	
TH-B3-32	Heater at Column B, Row 3. Thermocouple 32 in. (135°) above bottom of core.			61,62	
TH-B4-05	Heater at Column B, Row 4. Thermocouple 5 in. (135°) above bottom of core.				
TH-B5-33 TH-B5-38	Heater at Column B, Row 5. Thermocouples 33 in. (45°) and 38 in. (240°) above bottom of core.			63,64	
TH-B6-29	Heater at Column B, Row 6. Thermocouple 29 in. (45°) above bottom of core.			65,66	
TH-C2-38	Heater at Column C, Row 2. Thermocouple 38 in. (225°) above bottom of core.			67,68	
TH-C3-28 TH-C3-60	Heater at Column C, Row 3. Thermocouples 28 in. (0°) and 60 in. (135°) above bottom of core.			69,70	
TH-C4-53	Heater at Column C, Row 4. Thermocouple 53 in. (300°) above bottom of core.			71,72	
TH-C5-28	Heater at Column C, Row 5. Thermocouple 28 in. (315°) above bottom of core.			73,74	
TH-C6-53	Heater at Column C, Row 6. Thermocouple 53 in. (270°) above bottom of core.			75,76	
TH-C7-07 TH-C7-15	Heater at Column C, Row 7. Thermocouples 7 in. (345°) and 15 in. (255°) above bottom of core.			77,78	
TH-D1-21	Heater at Column D, Row 1. Thermocouple 21 in. (330°) above bottom of core.			79,80	
TH-D2-14 TH-D2-61	Heater at Column D, Row 2. Thermocouples 14 in. (0°) and 61 in. (270°) above bottom of core.			81,82	
TH-D3-29 TH-D3-39	Heater at Column D, Row 3. Thermocouples 29 in. (150°) and 39 in. (210°) above bottom of core.			83,84	
TH-D6-14	Heater at Column D, Row 6. Thermocouple 14 in. (90°) above bottom of core.			85,86	
TH-D7-20	Heater at Column D, Row 7. Thermocouple 20 in. (60°) above bottom of core.			87,88	
TH-D8-57	Heater at Column D, Row 8. Thermocouple 57 in. (15°) above bottom of core.			89,90	
TH-E1-33	Heater at Column E, Row 1. Thermocouple 33 in. (60°) above bottom of core.			91,92	
TH-E2-20 TH-E2-33	Heater at Column E, Row 2. Thermocouples 20 in. (210°) and 33 in. (315°) above bottom of core.			93,94	
TH-E3-05 TH-E3-20 TH-E3-24	Heater at Column E, Row 3. Thermocouples 5 in. (15°), 20 in. (165°), and 24 in. (75°) above bottom of core.			95,96	
TH-E6-08 TH-E6-28 TH-E6-37	Heater at Column E, Row 6. Thermocouples 8 in. (150°), 28 in. (285°), and 37 in. (330°) above bottom of core.			97,98	

TABLE V (contd.)

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
Low Power Heaters (contd.)					
TH-E7-14	Heater at Column E, Row 7. Thermocouple 44 in. (195°) above bottom of core.			99,100	
TH-E8-14 TH-E8-29 TH-E8-45	Heater at Column E, Row 8. Thermocouples 14 in. (150°), 29 in. (225°), and 45 in. (300°) above bottom of core.			101,102	
TH-F2-07 TH-F2-25	Heater at Column F, Row 2. Thermocouples 7 in. (255°) and 25 in. (0°) above bottom of core.			103,104	
TH-F3-06 TH-F3-22 TH-F3-25	Heater at Column F, Row 3. Thermocouples 6 in. (315°), 22 in. (105°), and 25 in. (30°) above bottom of core.			105,106	
TH-F4-14 TH-F4-29 TH-F4-44	Heater at Column F, Row 4. Thermocouples 14 in. (90°), 29 in. (165°), and 44 in. (210°) above bottom of core.			107,108	
TH-F5-20 TH-F5-26 TH-F5-33 TH-F5-54	Heater at Column F, Row 5. Thermocouples 20 in. (255°), 26 in. (165°), 33 in. (315°), and 54 in. (30°) above bottom of core.			109,110	
TH-F6-09 TH-F6-28	Heater at Column F, Row 6. Thermocouples 9 in. (0°) and 29 in. (135°) above bottom of core.			111,112	
TH-F7-39	Heater at Column F, Row 7. Thermocouple 39 in. (210°) above bottom of core.			113,114	
TH-G3-13	Heater at Column G, Row 3. Thermocouple 13 in. (150°) above bottom of core.			115,116	
TH-G4-29 TH-G4-33 TH-G4-38	Heater at Column G, Row 4. Thermocouples 29 in. (300°), 33 in. (225°), and 38 in. (30°) above bottom of core.			117,118	
TH-G5-14 TH-G5-24	Heater at Column G, Row 5. Thermocouples 14 in. (45°) and 24 in. (330°) above bottom of core.			119,120	
TH-G6-33	Heater at Column G, Row 6. Thermocouple 33 in. (135°) above bottom of core.			121,122	Data invalid from t=3 to t=0 seconds due to intermittent operation of thermocouple.
TH-H5-32	Heater at Column H, Row 5. Thermocouple 32 in. (45°) above bottom of core.			123,124	
PRESSURE					
Intact Loop		0-3,000 psi			
PU-13	Cold leg, Spool 13, 54 in. from vessel center.		0-4,397 psia	125,126	
Broken Loop		0-3,000 psi			
PB-23	Cold leg, Spool 23, 92 in. from vessel center, upstream of nozzle (tee off DP tap).		0-4,362 psia	127,128	
PB-37	Cold leg, Spool 37, 282 in. from vessel center along hot leg.		0-4,274 psia	129,130	
PB-42	Cold leg, Spool 42, 415 in. from vessel center along hot leg, upstream of pump-side nozzle (tee off DP tap).		0-4,839 psia	129,130	
PB-HN1	Pump-side nozzle, nozzle throat, 419 in. from vessel center along hot leg (tee off DP tap).		0-4,397 psia	131,132	
PB-CN1	Cold leg, Spool 23, vessel-side nozzle, nozzle throat, 96 in. from vessel center along cold leg, 45°.		0-2,258 psia	133,134	
PB-CN2	Cold leg, Spool 23, vessel-side nozzle, nozzle throat, 96 in. from vessel center along cold leg, 315°.		0-2,499 psia	133,134	

TABLE V (contd.)

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
Broken Loop (contd.)					
PB-CN3	Cold leg, Spool 23, vessel-side nozzle at beginning of nozzle divergent section, 97 in. from vessel center along cold leg, 0°.		0-2,499 psia	135,136	
PB-CN4	Cold leg, Spool 23, vessel-side nozzle, nozzle divergent section 101 in. from vessel center along cold leg, 0°.		0-2,512 psia	135,136	
Vessel		0-3,000 psi			
PV-UP+10	In upper plenum, 10 in. above cold leg centerline, mounted on standoff, 30°.		0-4,687 psia	137,138	
PV-LP-180	In upper part of lower plenum 180 in. below cold leg centerline, mounted on standoff, 225°.		0-2,575 psia	137,138	
ECC System		0-750 psi			
PECC-UL-ACC	In intact loop accumulator.		0-739 psia	139,140	
PECC-BL-ACC	In broken loop accumulator.		0-743 psia	139,140	
Steam Generator					
PU-SGSD	Secondary side steam dome.	0-3,000 psi	0-2,084 psia	141,142	
Pressurizer					
PU-PRIZE	Steam dome.	0-3,000 psi	0-4,576 psia	143,144	
Pressure Suppression System					
P-PSS	Suppression tank top.	0-250 psi	0-341 psia	145,146	
DIFFERENTIAL PRESSURE	Elevation difference between transducer taps is zero unless otherwise specified.				
Intact Loop					
DPU-UP-3	Upper plenum, 10.5 in. above cold leg centerline at 30° to hot leg, Spool 3, 62 in. from vessel center. Upper plenum tap is approximately 2 in. above Spool 3 tap.	±50 in. water	±2.5 psid	147,148	
DPU-3-7	Across steam generator; hot leg, Spool 3, 62 in. from vessel center to cold leg Spool 7, 231 in. from vessel center. Spool 3 tap is approximately 18 in. above Spool 7 tap.	±500 in. water	±25. psid	149,150	
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.	±50 in. water	±2.5 psid	151,152	
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.	±50 psi	±50 psid	153,154	
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	155,156	Detector 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	±5.0 psid	157,158	
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	159,160	
DPU-15-ATM	Cold leg Spool 15, 16 in. from vessel center; to atmosphere.	±500 psi	±500 psid	161,162	Detector saturated to t=18 sec.

TABLE V (contd.)

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
Intact Loop (contd.)					
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	163,164	Liquid may have boiled from sense lines.
DPU-PR-4	Pressurizer top to Spool 4. Elevation difference between taps is 105 in. Spool 4 tap is 55 in. below pressurizer exit.	±1,000 psi	±1,336 psid	165,166	
Broken Loop					
DPB-UP-30	Vessel upper plenum, 10.5 in. above cold leg centerline at 30° to hot leg Spool 30, 18 in. from vessel center. Upper plenum tap is 2 in. above Spool 30 tap.	±100 in. water	±5.0 psid	167,168	
DPB-21-IANN	Cold leg Spool 21, 49 in. from vessel center to vessel inlet annulus, 9 in. below cold leg centerline at 225°. Inlet annulus tap is 9 in. below Spool 21 tap.	±100 in. water	±5.0 psid	169,170	
DPB-23-CN1	Cold leg Spool 23, 92 in. from vessel center to vessel-side nozzle throat, 96 in. from vessel center.	±500 psi	±500 psid	171,172	
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 psi	±500 psid	173,174	
DPB-32U-36L	Across simulated steam generator orifice assembly; hot leg Spool 32 upper tap, 75 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 psi	±500 psid	175,176	
DPB-36L-37	Across nozzle assembly; Spool 36 lower tap, 242 in. from vessel center along hot leg to Spool 37, 282 in. from vessel center along hot leg. Spool 37 tap is 40 in. below Spool 37 upper tap.	±50 psi	±50 psid	177,178	
DPB-37-38	Across turbine flowmeter and drag disc; cold leg Spool 37, 282 in. from vessel center along hot leg to cold leg Spool 38, 305 in. from vessel center along hot leg. Spool 37 tap is 23 in. above Spool 38 tap.	±50 in. water	±2.5 psid	179,180	
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.	±1,000 psi	±1,338 psid	181,182	
DPB-40-42	Across elbow leading to spool upstream of pump-side nozzle; cold leg Spool 40, 365 in. from vessel center along hot leg to Spool 42, 415 in. from vessel center along hot leg. Spool 40 tap is 40 in. below Spool 42 tap.	±50 in. water	±2.5 psid	183,184	Data acquisition system saturated near 160 sec.
Vessel					
DPV-UP-IANN	Upper plenum, 10.5 in. above cold leg centerline at 30° to inlet annulus, 9 in. below cold leg centerline at 225°. Elevation difference between taps is 19 in.	±300 in. water	±15 psid	185,186	
DPV-0-9GQ	Inlet annulus cold leg centerline at 90° to 9 in. below cold leg centerline at 225°. Elevation difference between taps is 9 in.	±20 in. water	±1.0 psid	187,188	
DPV-9-26QQ	Inlet annulus, 9 in. below cold leg centerline at 225° to downcomer gap, 26 in. below cold leg centerline at 225°. Elevation difference between taps is 17 in.	±20 in. water	±1.0 psid	189,190	

TABLE V (contd.)

Measurements	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
Vessel (contd.)					
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	191,192	
DPV-26-55QM	Across part of downcomer, 26 in. (225°) to 55 in. (180°) below cold leg centerline. Elevation difference between taps is 29 in.	±50 in. water	±2.5 psid	193,194	
DPV-55-110MM	Across part of downcomer, 55 in. (180°) to 110 in. (180°) below cold leg centerline. Elevation difference between taps is 55 in.	±100 in. water	±5.0 psid	195,196	
DPV-110-156MQ	Across part of downcomer, 110 in. (180°) to 156 in. (225°) below cold leg centerline. Elevation difference between taps is 46 in.	±100 in. water	±5.0 psid	197,198	
DPV-156-173QQ	Across downcomer exit, 7 in. above exit to 10 in. below exit, taps at 156 (225°) and 173 in. (225°) below cold leg centerline. Elevation difference between taps is 17 in.	±20 in. water	±1.0 psid	199,200	
DPV-173-180QQ	Across part of lower plenum, 173 in. (225°) to 180 in. (225°) below cold leg centerline. Elevation difference between taps is 7 in.	±20 in. water	±1.0 psid	201,202	
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	203,204	
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	205,206	
DPU-UP-3	Vessel upper plenum, 10.5 in. above cold leg centerline at 30° to intact loop hot leg Spool 3, 62 in. from vessel center. Upper plenum tap is ~2 in. above Spool 3 tap.	±50 in. water	±2.5 psid	147,148	
DPB-21-1ANN	Cold leg Spool 21, 49 in. from vessel center to vessel inlet annulus, 9 in. below cold leg centerline at 225°. Inlet annulus tap is 9 in. below Spool 21 tap.	±100 in. water	±5.0 psid	169,170	
Vessel Core					Liquid may have boiled from sense lines; questionable data.
DPVC-89W-UP	Upper segment of active core region, 89 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.	±500 in. water	±25 psid	207,208	
DPVC-89-106WQ	In active core region, upper segment, 89 in. below cold leg centerline (315°) to 106 in. below cold leg centerline (225°). Elevation difference between taps is 17 in.	±50 in. water	±2.5 psid	209,210	
DPVC-106-122QJ	Across center segment of active core region, 106 in. below cold leg centerline (225°) to 122 in. below cold leg centerline (135°). Elevation difference between taps is 16 in.	±100 in. water	±5.0 psid	211,212	

TABLE V (contd.)

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
Vessel Core (contd.)					
DPVC-122-140JD	In active core region, lower segment, 122 in. below cold leg centerline (135°) to 140 in. below cold leg centerline (45°). Elevation difference between taps is 18 in.	±100 in. water	±5.0 psid	213,124	Detector saturated intermittently at 5 psid.
DPVC-140-191DT	Lower segment of active core region, 140 in. below cold leg centerline (45°) to 191 in. below cold leg centerline (270°). Elevation difference between taps is 51 in.	±300 in. water	±15 psid	215,216	
ECC SYSTEM					
Intact Loop					
DPU-ACC-TB	Top to bottom of intact loop accumulator tank. Elevation difference between taps is 117 in.	±100 in. water	±5.0 psid	217,218	
Broken Loop					
DPB-ACC-TB	Top to bottom of broken loop accumulator tank. Elevation difference between taps is 84 in.	±50 in. water	±2.5 psid	219,220	
Steam Generator					
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	221,222	
DPU-SG-DISC	Across Venturi, 66 in. downstream from steam generator discharge.	±500 in. water	±25 psid	223,224	Data acquisition system saturated intermittently prior to t=1 sec.
VOLUMETRIC FLOW RATE	Turbine flowmeter, bidirectional.				Data acquisition system range may exceed rated detector range; however, turbine response is linear to flow rates well beyond rated range.
Intact Loop	3-in. Schedule 160 pipe.				
FTU-1	Hot leg, Spool 1, 18 in. from vessel center.	±5 - ±1,200 gpm	±600 gpm	225,226	
FTU-9	Cold leg, Spool 9, 154 in. from vessel center.	±10 - ±1,200 gpm	±600 gpm	225,226	
FTU-13	Cold leg, Spool 13, 64 in. from vessel Center.	±10 - ±1,200 gpm	±600 gpm	227,228	
FTU-15	Cold leg, Spool 15, 29 in. from vessel center.	±10 - ±200 gpm	±300 gpm	227,228	
Broken Loop					
FTB-21	Cold leg, Spool 21, 58 in. from vessel center, 3-in. pipe.	±20 - ±1,200 gpm	±1,200 gpm	229,230	
FTB-30	Hot leg, Spool 30, 25 in. from vessel center, 3-in. pipe.	±20 - ±1,200 gpm	±800 gpm	231,232	
FTB-27	Cold leg, Spool 27, 290 in. from vessel center along hot leg, 2-in. pipe.	±20 - ±1,200 gpm	±800 gpm	231,232	
Core					
FTV-CORE-IN	Entrance to core, ~158 in. below cold leg centerline.	±4 - ±200 gpm	±400 gpm	233,234	
ECC System					
FTU-LPIS	In line leading from LPIS for intact loop; 1/2 in. line.	±0.75 - ±7.5 gpm	±5.0 gpm	235,236	
FTB-LPIS	In line leading from LPIS for broken loop; 3/4 in. line.	±0.75 - ±7.5 gpm	±2.0 gpm	237,238	
FTU-ACC	In line immediately after intact loop accumulator; 1 in. line.	±5 - ±60 gpm	±75 gpm	239,240	Data acquisition system saturated from t=70 to t=75 sec.
FTB-ACC	In line immediately after broken loop accumulator; 1 in. line.	±5 - ±60 gpm	±35 gpm	241,242	
Pressurizer	1-1/2 in. turbine.				
FTU-PRIZE	Surge line.	±2 - ±20 gpm	±100 gpm	243	Data invalid after t=33 seconds due to ac interference.

TABLE V (contd.)

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
FLUID VELOCITY	Turbine flowmeter, bidirectional.				
Downcomer Gap					
FTV-40A	40 in. below cold leg centerline, 0°.	±2.5 - ±50 ft./sec.	±50 ft./sec.	244,245	
FTV-40M	40 in. below cold leg centerline, 180°.	±2.5 - ±50 ft./sec.	±50 ft./sec.	244,245	
MOMENTUM FLUX	Drag disc, bidirectional.				Momentum flux reported only for -6 to 42 sec, except as noted. Drag disc data may exhibit significant temperature dependence. Use drag disc data only for short term transient response.
Intact Loop	3-in. pipe.				
FDU-1	Hot leg, Spool 1, 29 in. from vessel center; target size 0.875 in.	±200 - ±11,500 lbm/ft-sec^2	±23,000 lbm/ft-sec^2	246	
FDU-5	Hot leg, Spool 5, 100 in. from vessel center; target size 1.0 in.	±1 - ±2,000 lbm/ft-sec^2	±4,090 lbm/ft-sec^2	247	Detector saturated for t < 1.5 sec.
FDU-10	Cold leg, Spool 10, 137 in. from vessel center; target size 0.875 in.	±200 - ±18,000 lbm/ft-sec^2	±23,750 lbm/ft-sec^2	248	
FDU-13	Cold leg, Spool 13, 54 in. from vessel center; target size 0.875 in.	±200 - ±12,800 lbm/ft-sec^2	±20,700 lbm/ft-sec^2	249	
FDU-15	Cold leg, Spool 15, 19 in. from vessel center; target size 0.875 in.	±200 - ±14,500 lbm/ft-sec	±20,250 lbm/ft-sec^2	250	
Broken Loop					
FDB-21	Cold leg, Spool 21, 53 in. from vessel center, 3-in. pipe; target size 0.875 in.	±200 - ±18,800 lbm/ft-sec^2	±25,000 lbm/ft-sec^2	251	Data acquisition system saturated immediately after 5=0 sec.
FDB-23	Cold leg, Spool 23, 93 in. from vessle center, upstream of vessel-side nozzle 2-in. pipe; target size 0.406 in.	±200 - ±35,600 lbm/ft-sec^2	±118,000 lbm/ft-sec^2	252	
FDB-30	Hot leg, Spool 30, 21 in. from vessel center, 3-in. pipe; target size 0.656 in.	±200 - ±23,000 lbm/ft-sec^2	±30,000 lbm/ft-sec^2	253	
FDB-37	Cold leg, Spool 37, 284 in. from vessel center along hot leg, steam generator outlet vertical pipe, 2-in. pipe; target size 0.406 in.	±200 - ±45,000 lbm/ft-sec^2	±247,000 lbm/ft-sec^2	254	
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 - ±84,000 lbm/ft-sec^2	±112,400 lbm/ft-sec^2	255	
Vessel					
FDV-CORE-IN	In core flow mixer box, 150 in. below cold leg centerline; target size 1.0 in.	±200 - ±500 lbm/ft-sec^2	±900 lbm/ft-sec^2	256,257	Figure 256 is long term plot (-25 - +200 sec); detector overranged for t<0 sec.
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.			258,259	
GU-1HZ	Hot leg, Spool 1, 26 in. from vessel center, horizontal.			258,259	
GU-5VR	Hot leg, Spool 5, 96 in. from vessel center, vertical.			260,261	
GU-10VR	Cold leg, Spool 10, 141 in. from vessel center, vertical.			260,261	
GU-13VR	Cold leg, Spool 13, 59 in. from vessel center, vertical.			262,263	
GU-15HZ	Cold leg, Spool 15, 20 in. from vessel center, horizontal.			264,265	
GU-15VR	Cold leg, Spool 15, 23 in. from vessel center, vertical.			264,265	
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.			266,267	
GB-23VR	Cold leg, Spool 23, 92 in. from vessel center, vertical.			266,267	

TABLE V (contd.)

Measurement	Location and Comments[a]	Range[a] Detector	Range[a] Data Acquisition System	Figure[a]	Measurement Comments[b]
Broken Loop (contd.)					
GB-30VR	Hot leg, Spool 30, 18 in. from vessel center, vertical.			266,267	
GB-42VR	Cold leg, Spool 42, 415 in. from vessel center along hot leg, vertical.			268,269	
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°.			270,271	
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.			270,271	
GVLP-165HZ	Upper part of lower plenum, 165 in. below cold leg centerline, 1.724 in. below downcomer exit, horizontal, 0-180°.			272,273	
GVLP-172HZ	Lower plenum, 172 in. below cold leg centerline, 8.729 in. below downcomer exit, horizontal, 90-270°.			272,273	
Pressurizer					
GU-PRIZE	Surge line.	0.1 - 100 lbm/ft^3	0 - 100 lbm/ft^3	274,275	
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.			Mass flow rate reported only for -6 to 42 sec, except as noted; see comments on individual detectors.
Intact Loop					
FDU-1, GU-1VR FTU-1, GU-1VR	Hot leg, Spool 1.			276 277	
FDU-5, GU-5VR	Hot leg, Spool 5.			278	
FTU-9, GU-10VR	Cold leg, Spool 9.			279	
FDU-10, GU-10VR	Cold leg, Spool 10.			280	
FDU-13, GU-13VR FTU-13, GU-13VR	Cold leg, Spool 13.			281 282	
FDU-15, GU-15VR FTU-15, GU-15VR	Cold leg, Spool 15.			283 284	
Broken Loop					
FDB-21, GB-21VR FTB-21, GB-21VR	Cold leg, Spool 21.			285 286	
FDB-23, GB-23VR	Cold leg, Spool 23.			287	
FDB-30, GB-30VR FTB-30, GB-30VR	Hot leg, Spool 30.			288 289	
FDB-42, GB-42 VR	Cold leg, Spool 42.			290	
Vessel					Long term (-24 to 200 sec) plots.
FDV-CORE-IN, GV-COR-150HZ	Entrance to core.			291,292	
FTV-CORE-IN, GV-COR-150HZ	Entrance to core.			293,294	
PRESSURIZER					
FTU-PRIZE, GU-PRIZE	Pressurizer surge line.			295	
CORE CHARACTERISTICS					
PWRCOR T-1	Core Power.		1,600 kW	296,297	
PWRCOR T-2	Core Power.		1,600 kW	296,297	
VOLTCOR T	Core Voltage.		0 - 200 Vdc	298,299	
AMPCOR T	Core Current.		0 - 10,000 A	300,301	
PUMP CHARACTERISTICS					
PUMPU-TORQ	Pump torque.		0 - 500 in-lb.	302,303	
PUMPU-RPM	Pump speed.		0 - 3,600 rpm	304,305	

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

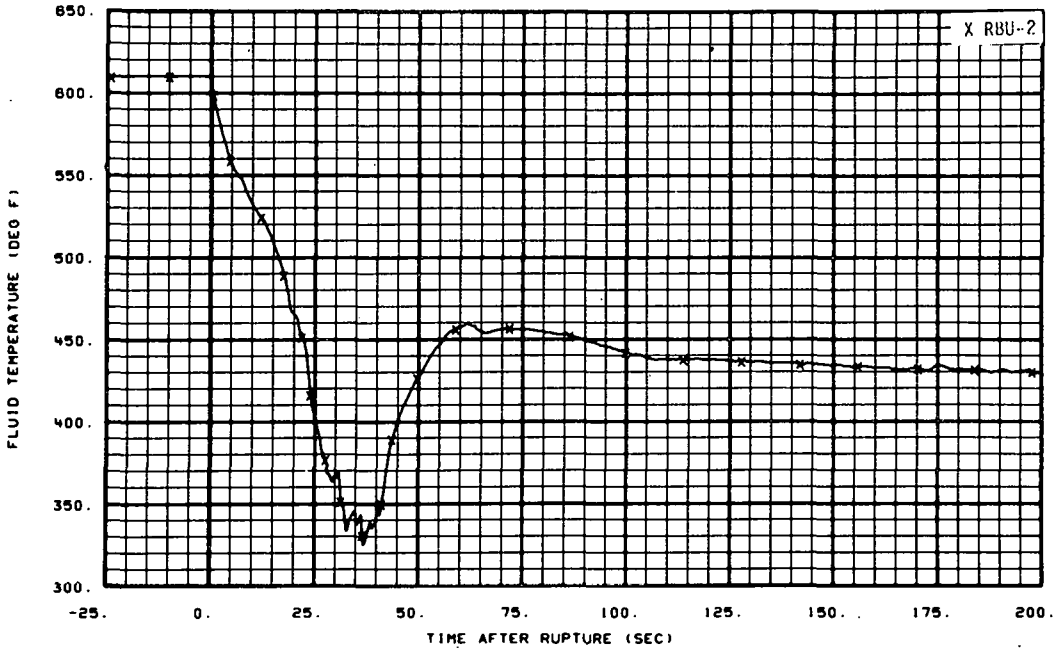


Fig. 7 Fluid temperature in intact loop hot leg (RBU-2), from -24 to 200 seconds.

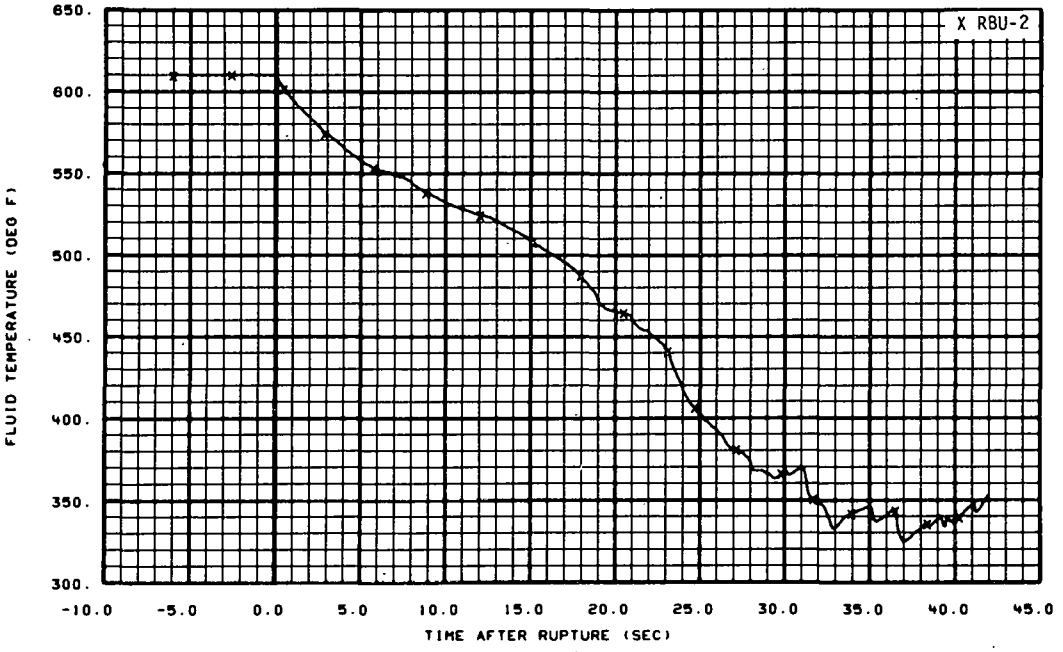


Fig. 8 Fluid temperature in intact loop hot leg (RBU-2), from -6 to 42 seconds.

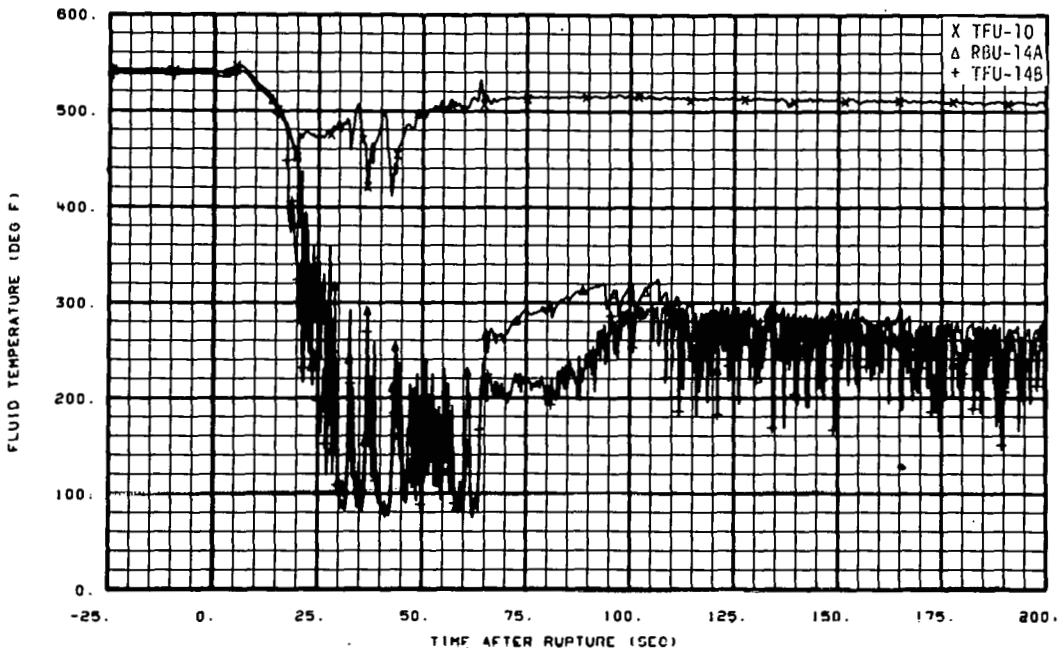


Fig. 9 Fluid temperature in intact loop cold leg (TFU-10, RBU-14A, TFU-14B), from -24 to 200 seconds.

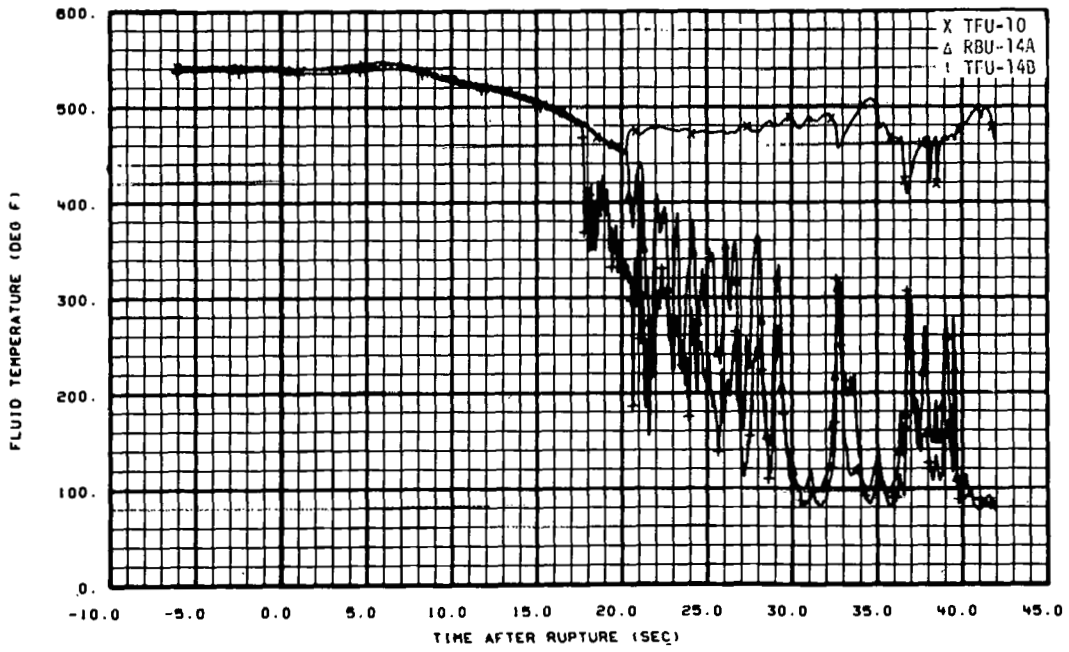


Fig. 10 Fluid temperature in intact loop cold leg (TFU-10, RBU-14A,TFU-14B), from -6 to 42 seconds.

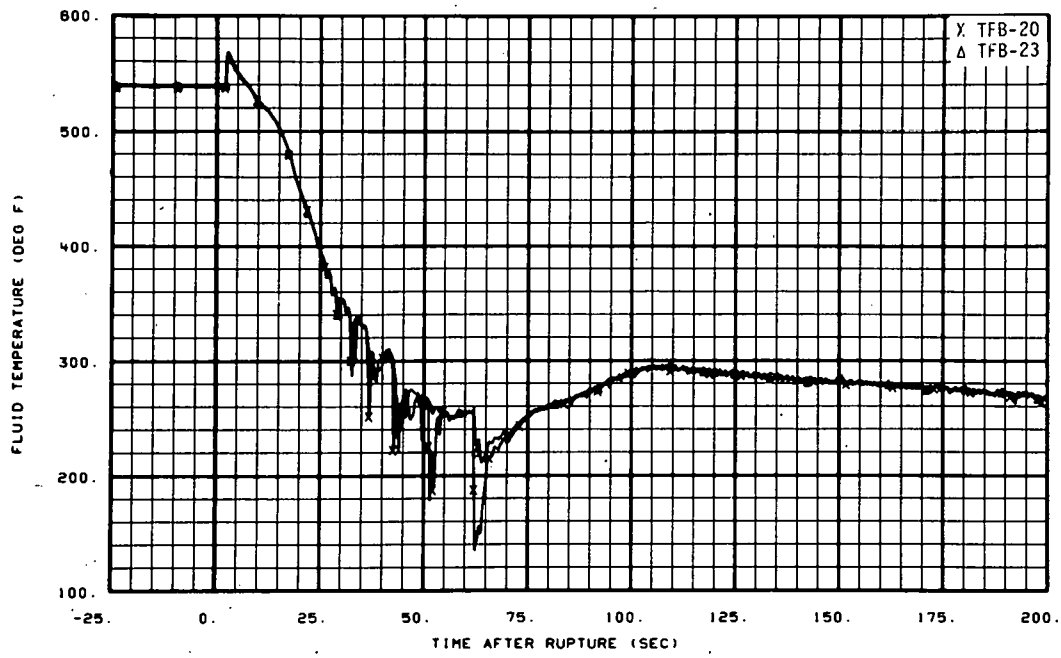


Fig. 11 Fluid temperature in broken loop, vessel side (TFB-20, TFB-23), from -24 to 200 seconds.

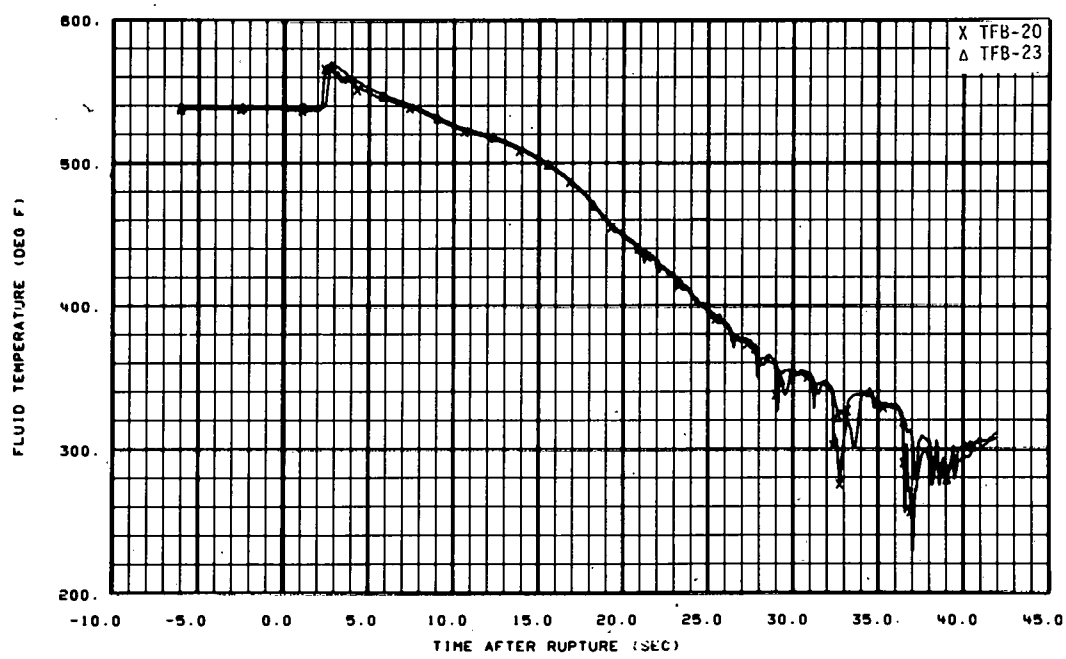


Fig. 12 Fluid temperature in broken loop, vessel side (TFB-20, TFB-23), from -6 to 42 seconds.

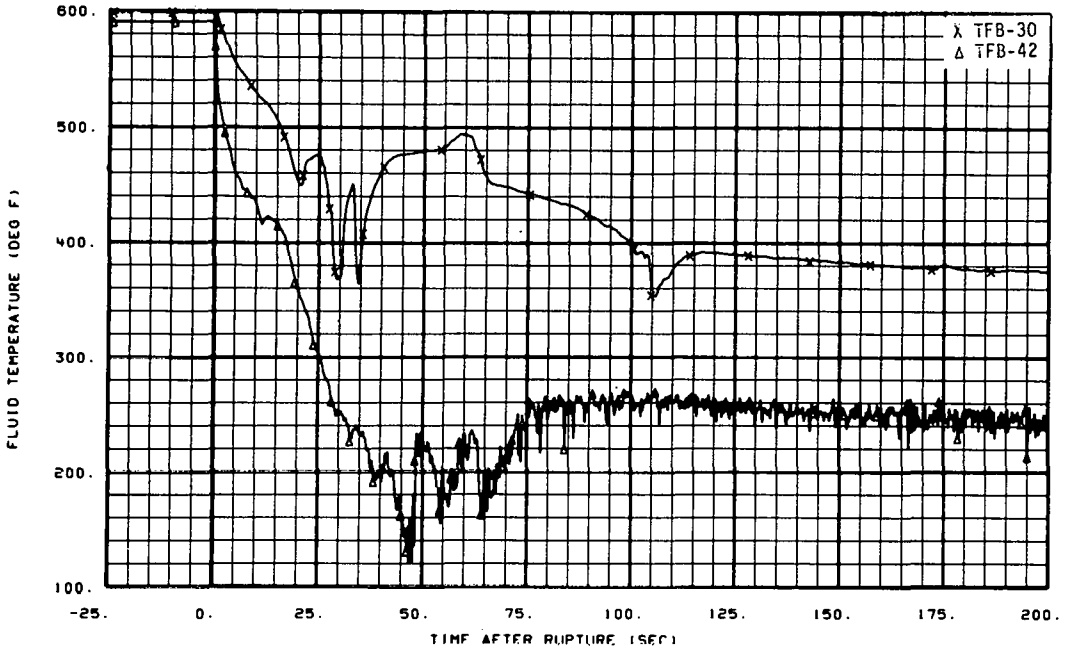


Fig. 13 Fluid temperature in broken loop, pump side (TFB-30, TFB-42), from -24 to 200 seconds.

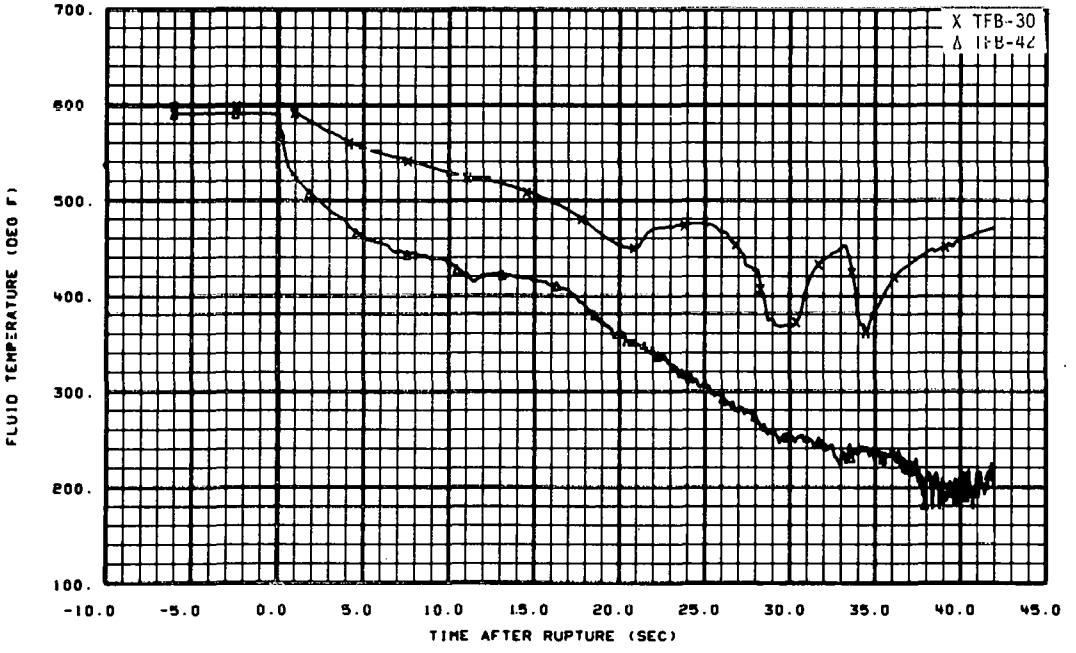


Fig. 14 Fluid temperature in broken loop, pump side (TFB-30, TFB-42), from -6 to 42 seconds.

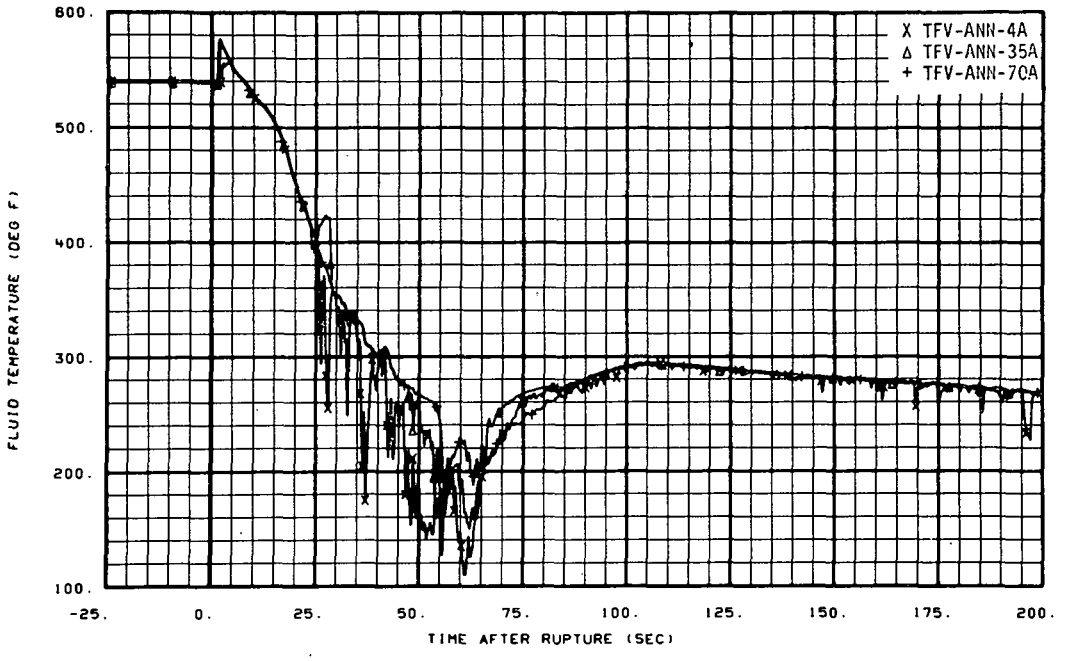


Fig. 15 Fluid temperature in downcomer annulus (TFV-ANN-4A, TFV-ANN-35A, TFV-ANN-70A), from -24 to 200 seconds.

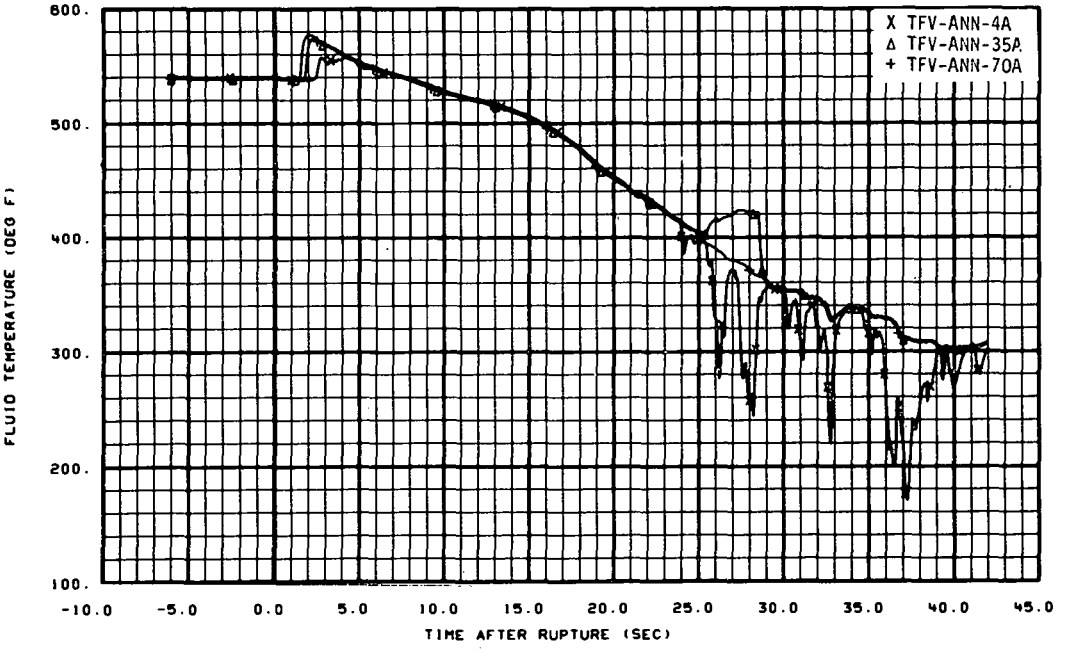


Fig. 16 Fluid temperature in downcomer annulus (TFV-ANN-4A, TFV-ANN-35A, TFV-ANN-70A), from -6 to 42 seconds.

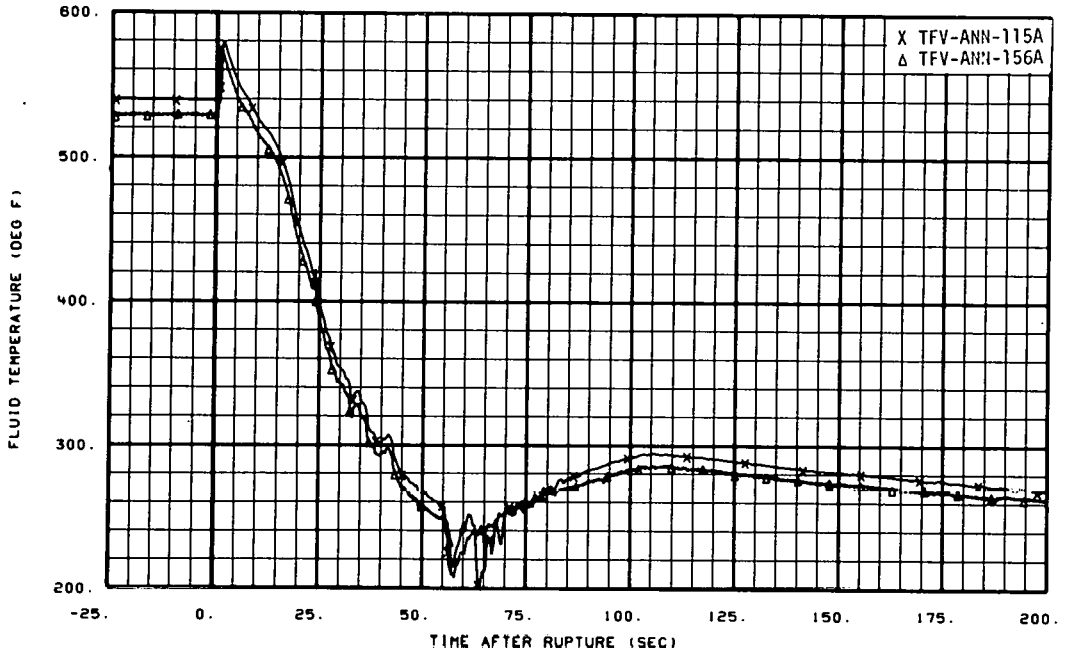


Fig. 17 Fluid temperature in downcomer annulus (TFV-ANN-115A, TFV-ANN-156A), from -24 to 200 seconds.

Fig. 18 Fluid temperature in downcomer annulus (TFV-ANN-115A, TFV-ANN-156A), from -6 to 42 seconds.

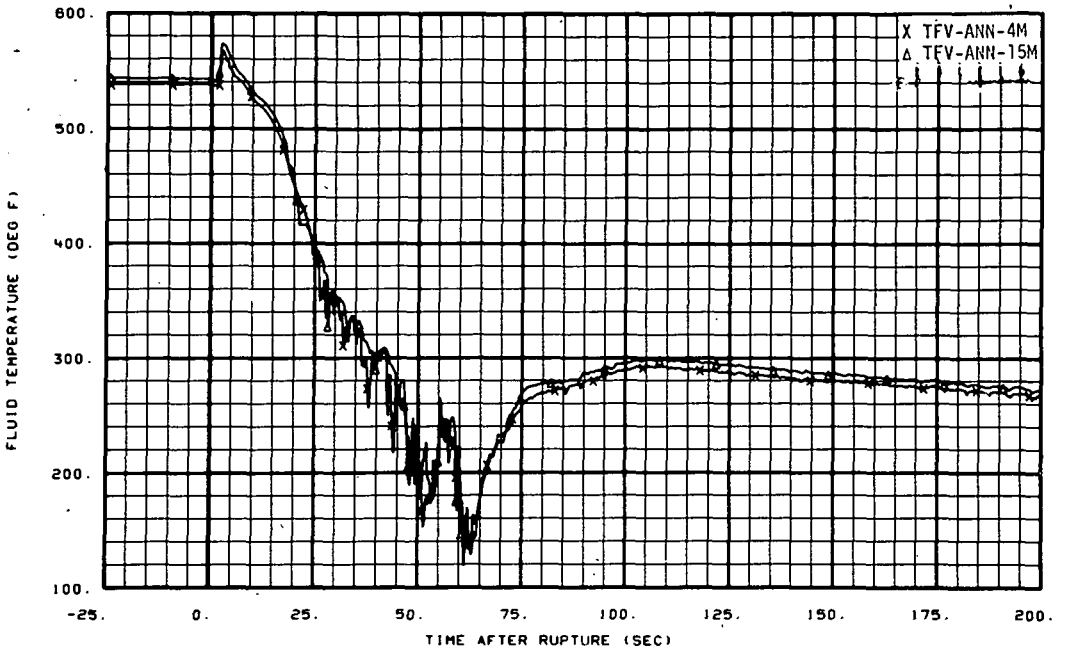


Fig. 19 Fluid temperature in downcomer annulus (TFV-ANN-4M, TFV-ANN-15M), from -24 to 200 seconds.

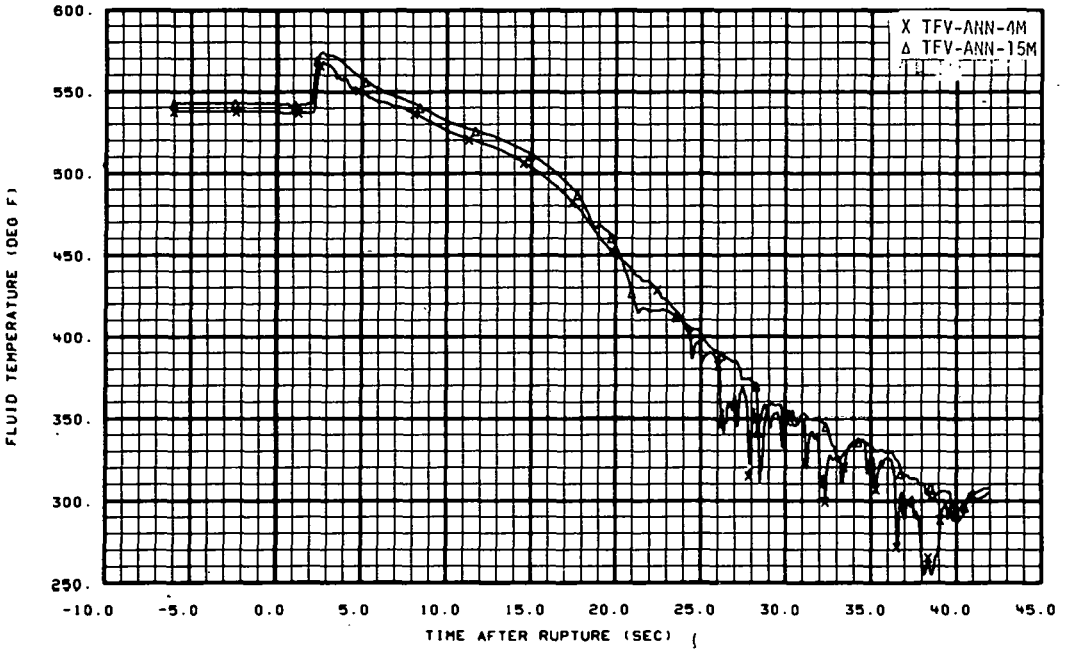


Fig. 20 Fluid temperature in downcomer annulus (TFV-ANN-4M, TFV-ANN-15M), from -6 to 42 seconds.

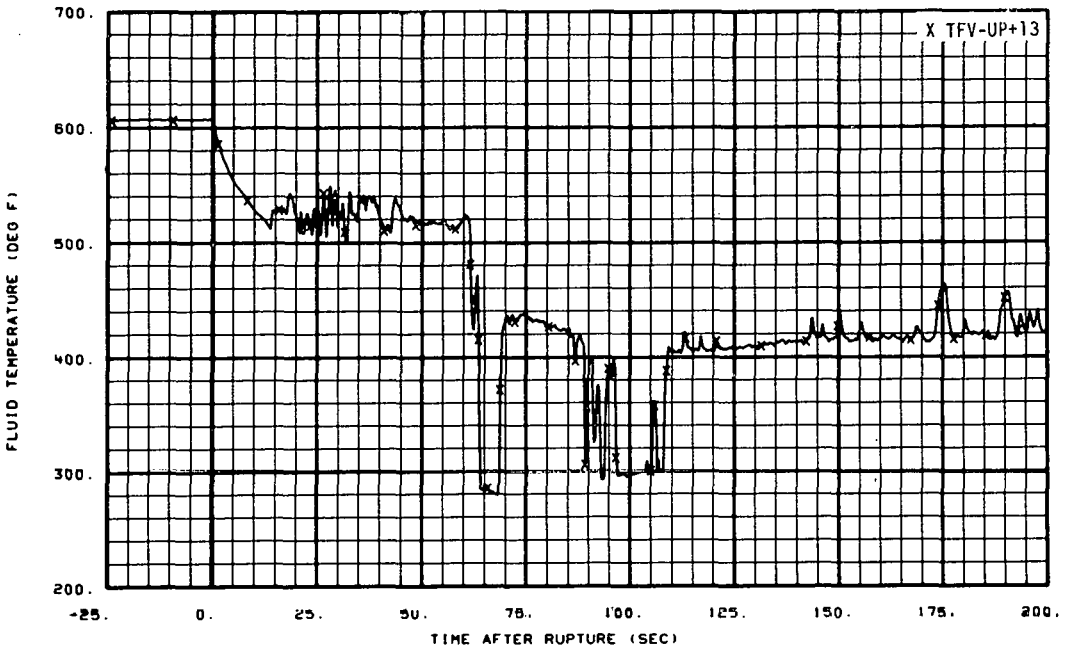


Fig. 21 Fluid temperature in upper plenum (TFV-UP+13), from -24 to 200 seconds.

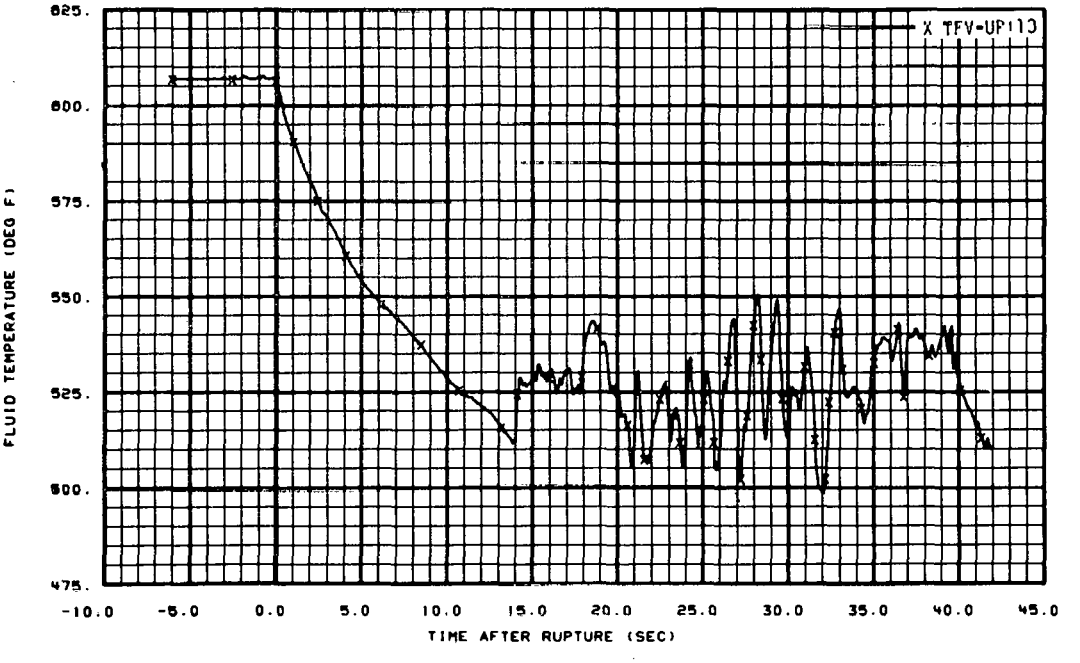


Fig. 22 Fluid temperature in upper plenum (TFV-UP+13), from -6 to 42 seconds.

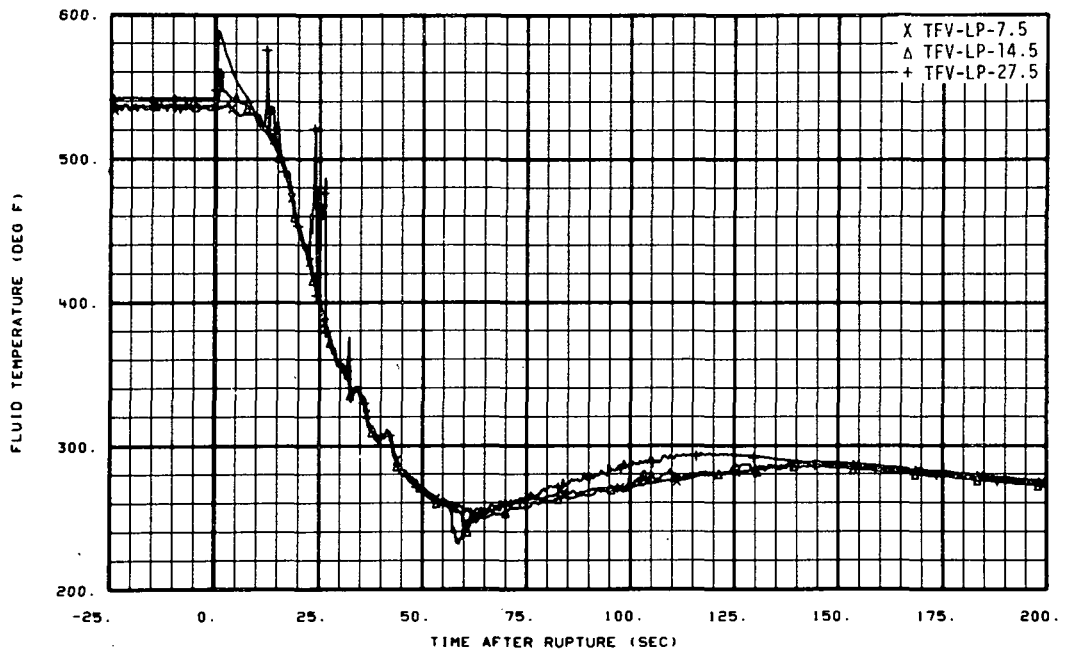


Fig. 23 Fluid temperature in lower plenum (TFV-LP-7.5, TFV-LP-14.5, TFV-LP-27.5), from -24 to 200 seconds.

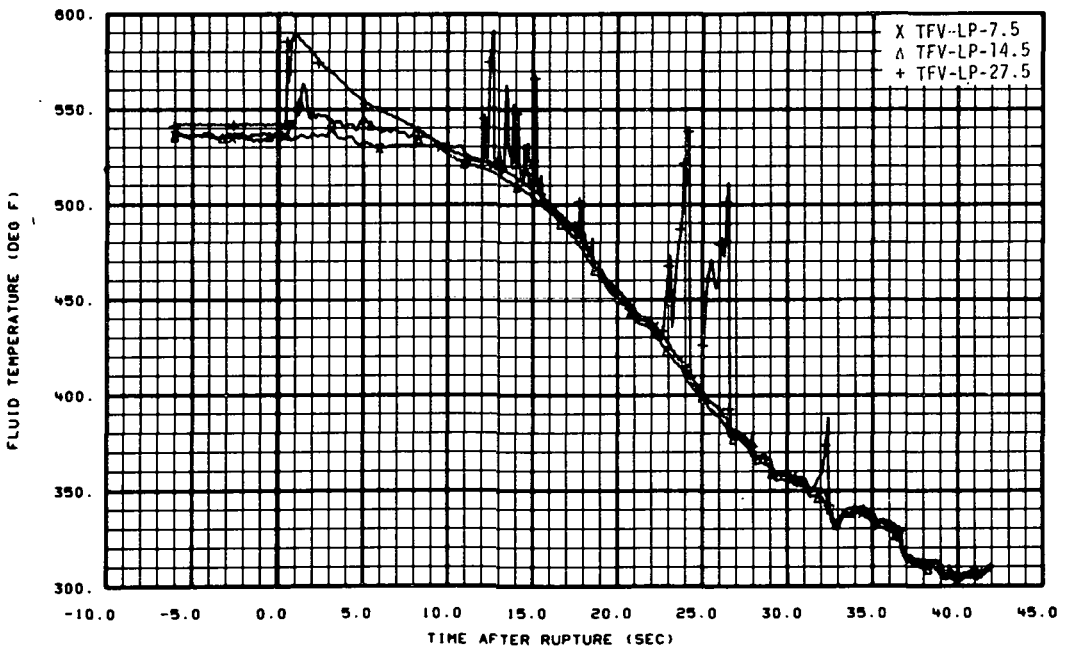


Fig. 24 Fluid temperature in lower plenum (TFV-LP-7.5, TFV-LP-14.5, TFV-LP-27.5), from -6 to 42 seconds.

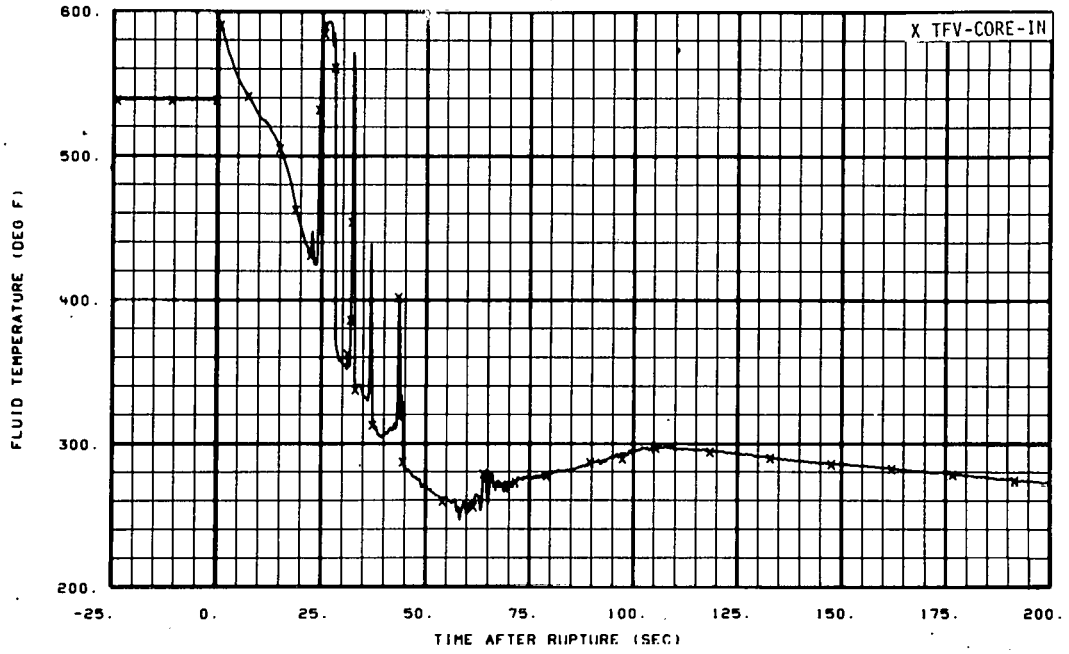


Fig. 25 Fluid temperature in core inlet (TFV-CORE-IN), from -24 to 200 seconds.

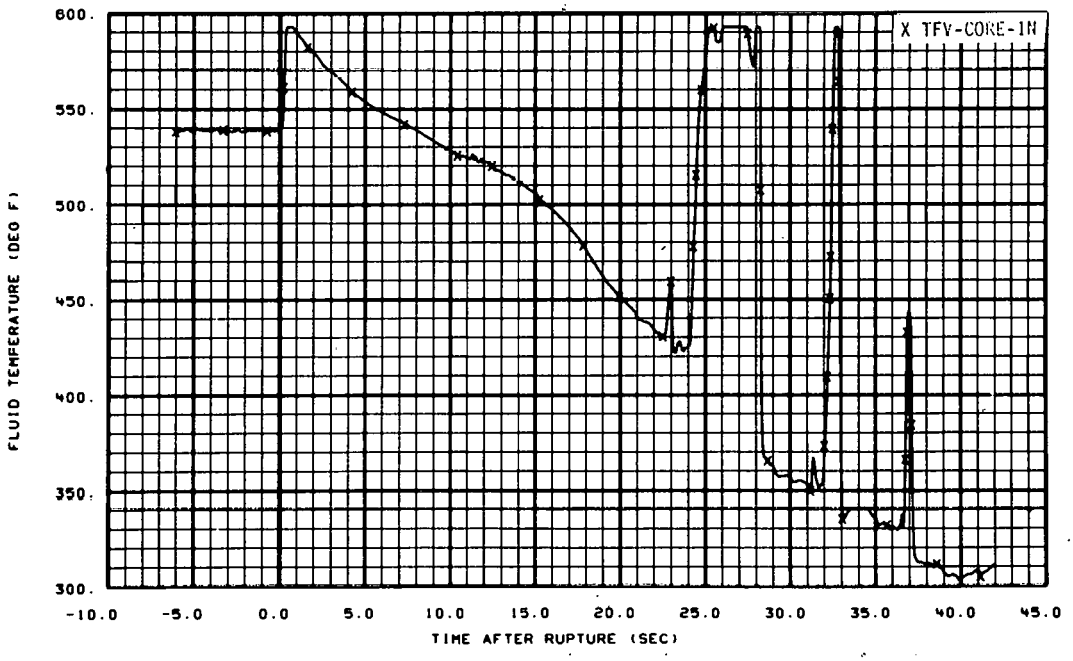


Fig. 26 Fluid temperature in core inlet (TFV-CORE-IN), from -6 to 42 seconds.

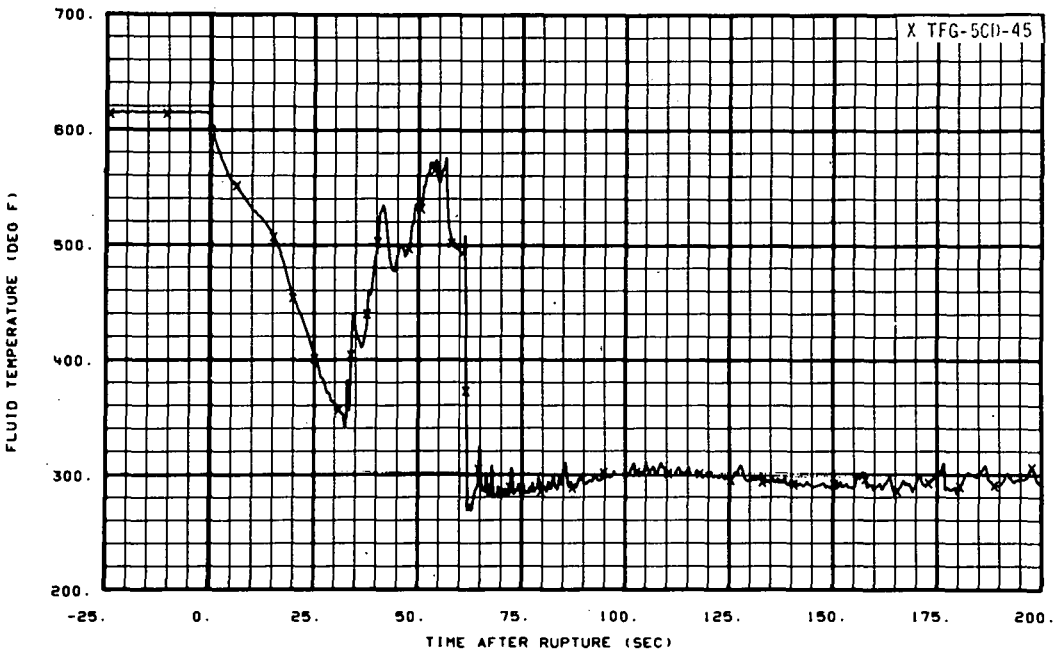


Fig. 27 Fluid temperature in core, Grid Spacer 5 (TFG-5CD-45), from -24 to 200 seconds.

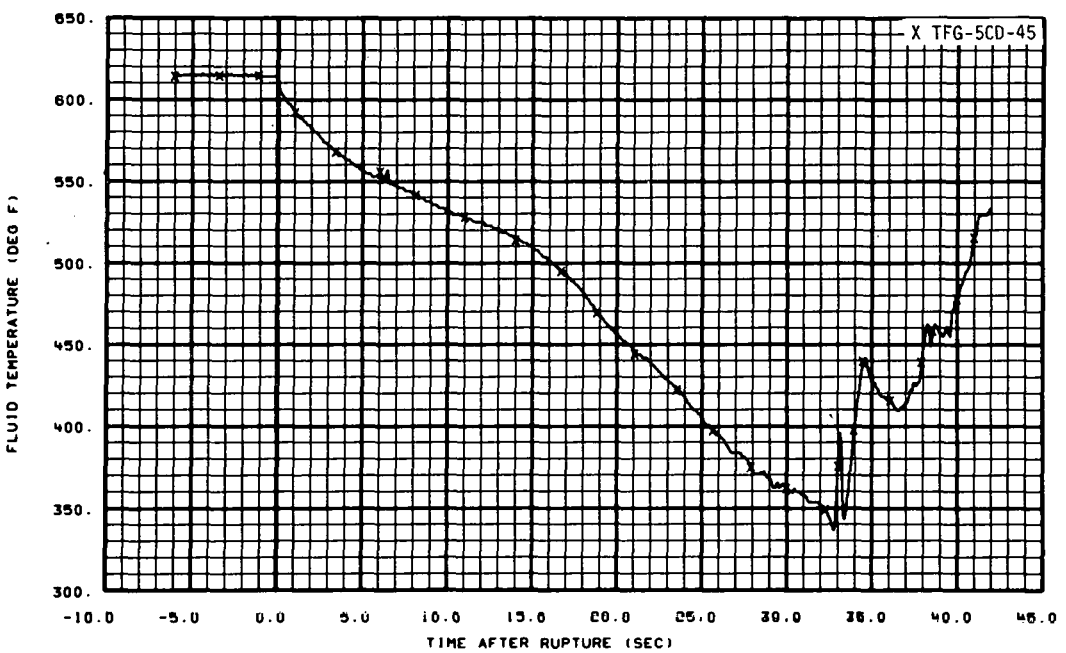


Fig. 28 Fluid temperature in core, Grid Spacer 5 (TFG-5CD-45), from -6 to 42 seconds.

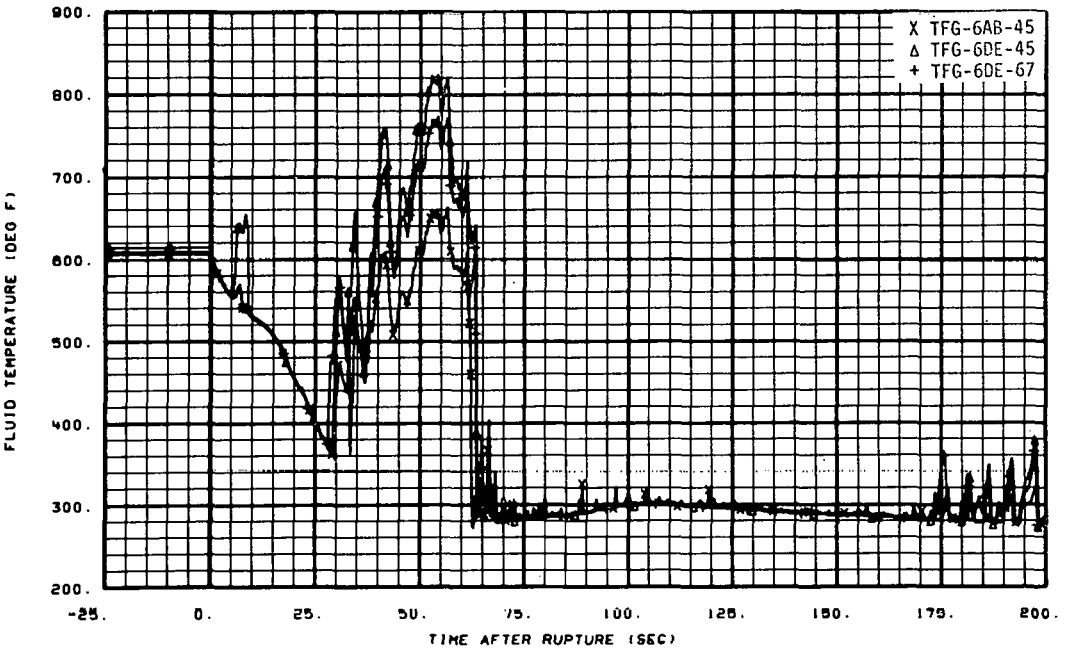


Fig. 29 Fluid temperature in core, Grid Spacer 6 (TFG-6AB-45, TFG-6DE-45, TFG-6DE-67), from -24 to 200 seconds.

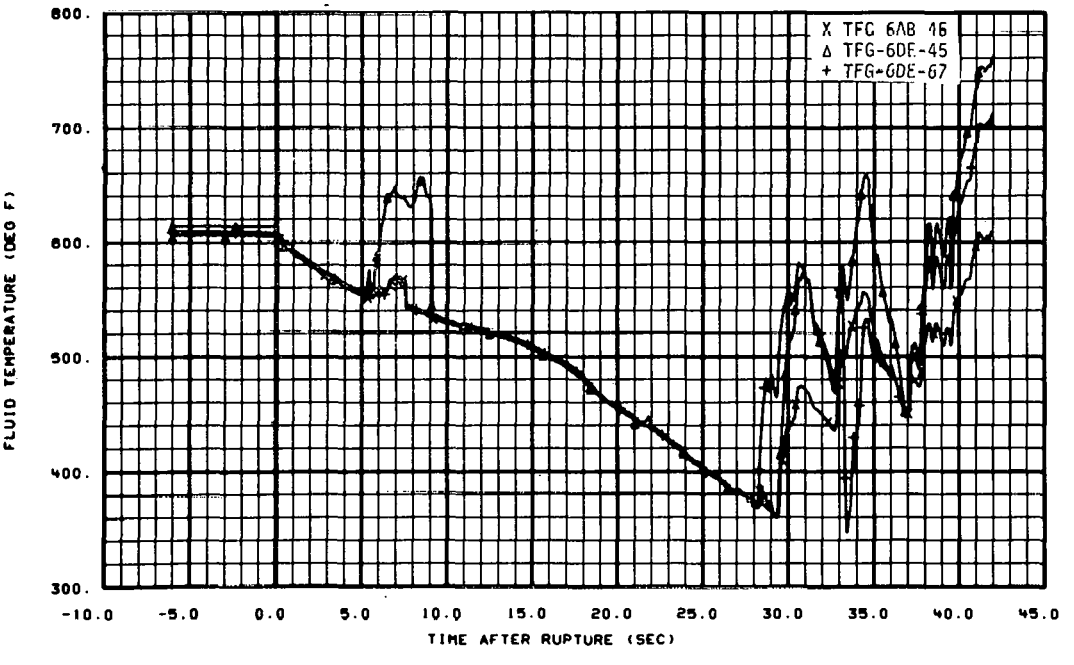


Fig. 30 Fluid temperature in core, Grid Spacer 6 (TFG-6AB-45, TFG-6DE-45, TFG-6DE-67), from -6 to 42 seconds.

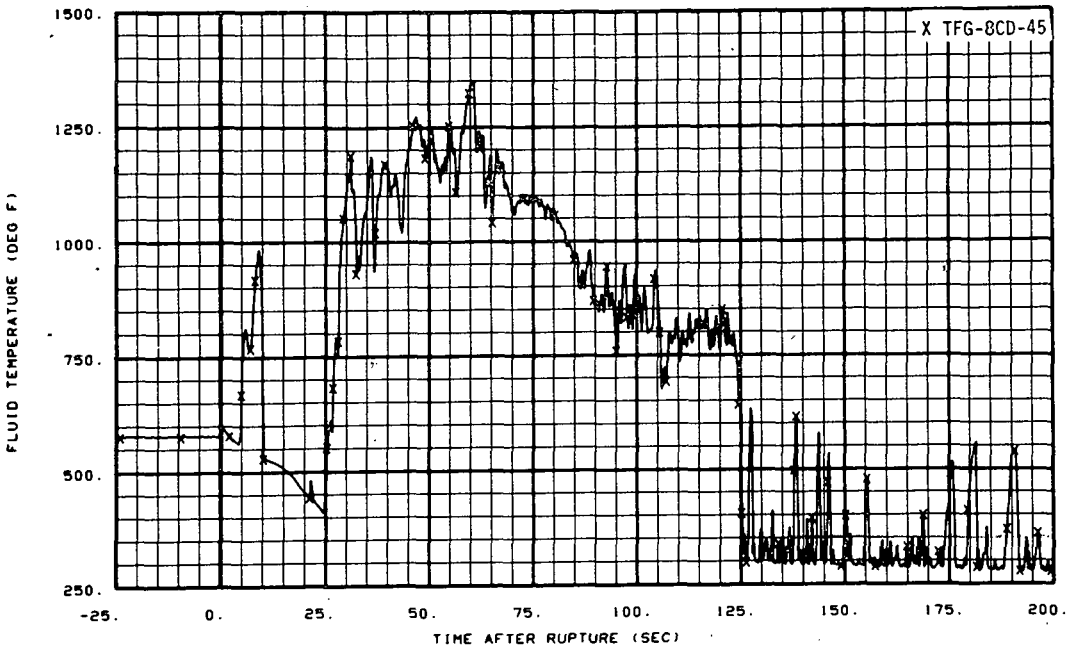


Fig. 31 Fluid temperature in core, Grid Spacer 8 (TFG-8CD-45), from -24 to 200 seconds.

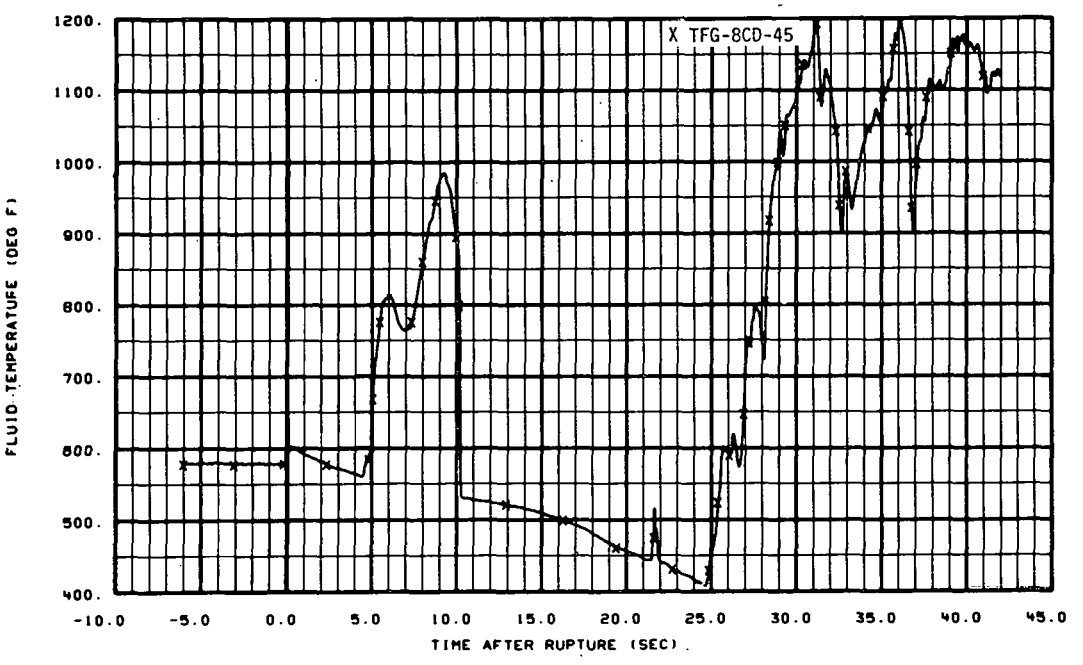


Fig. 32 Fluid temperature in core, Grid Spacer 8 (TFG-8CD-45), from -6 to 42 seconds.

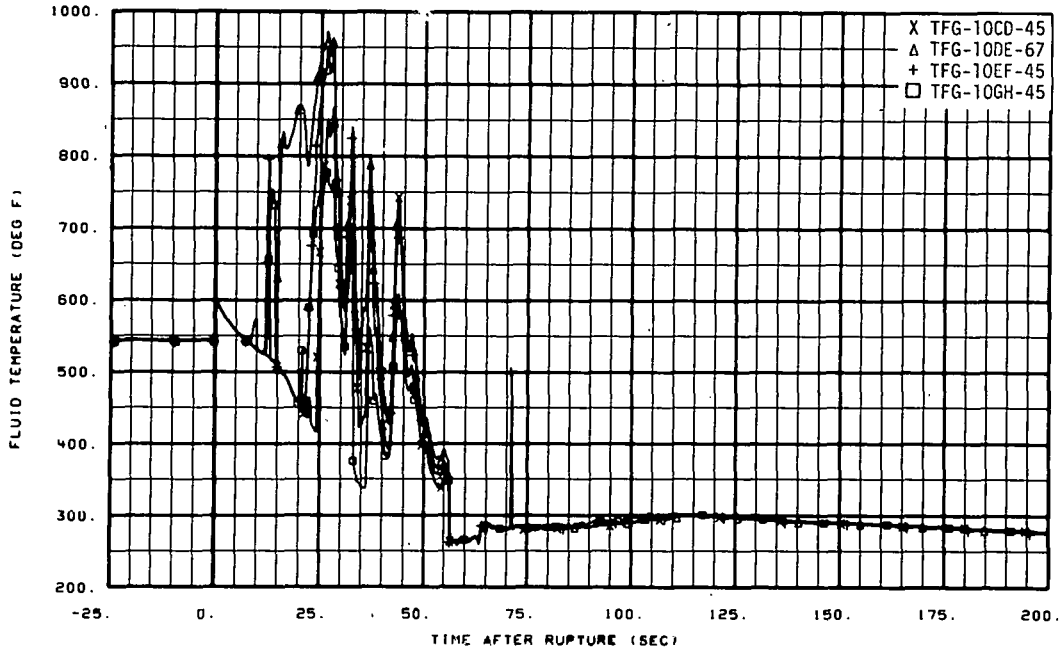


Fig. 33 Fluid temperature in core, Grid Spacer 10 (TFG-10CD-45, TFG-10DE-67, TFG-10EF-45, TFG-10GH-45), from -24 to 200 seconds.

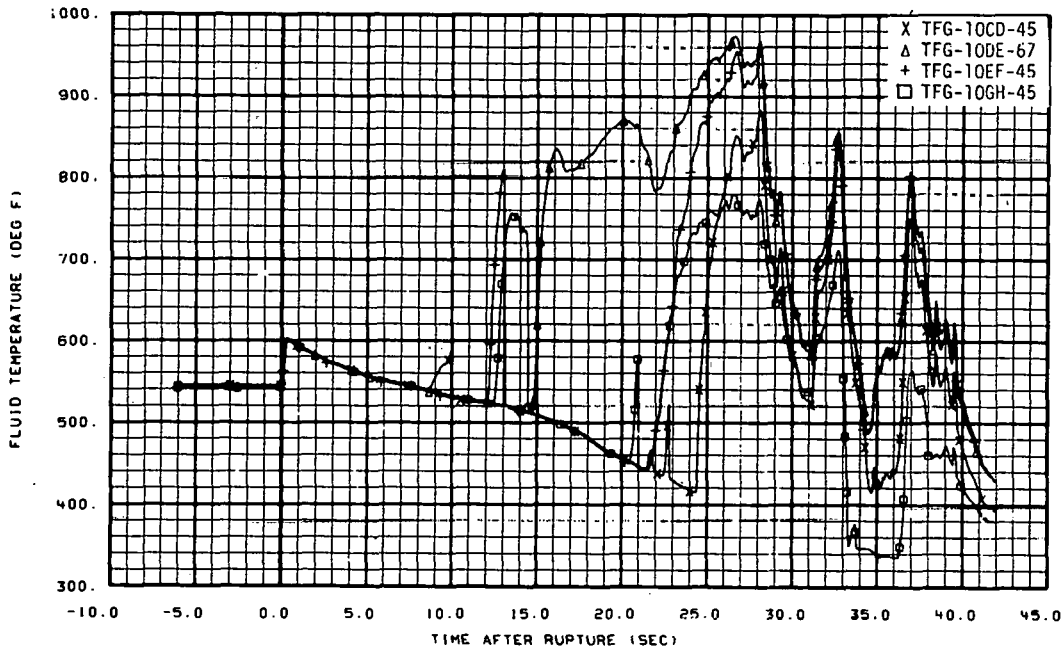


Fig. 34 Fluid temperature in core, Grid Spacer 10 (TFG-10CD-45, TFG-10DE-67, TFG-10EF-45, TFG-10GH-45), from -6 to 42 seconds.

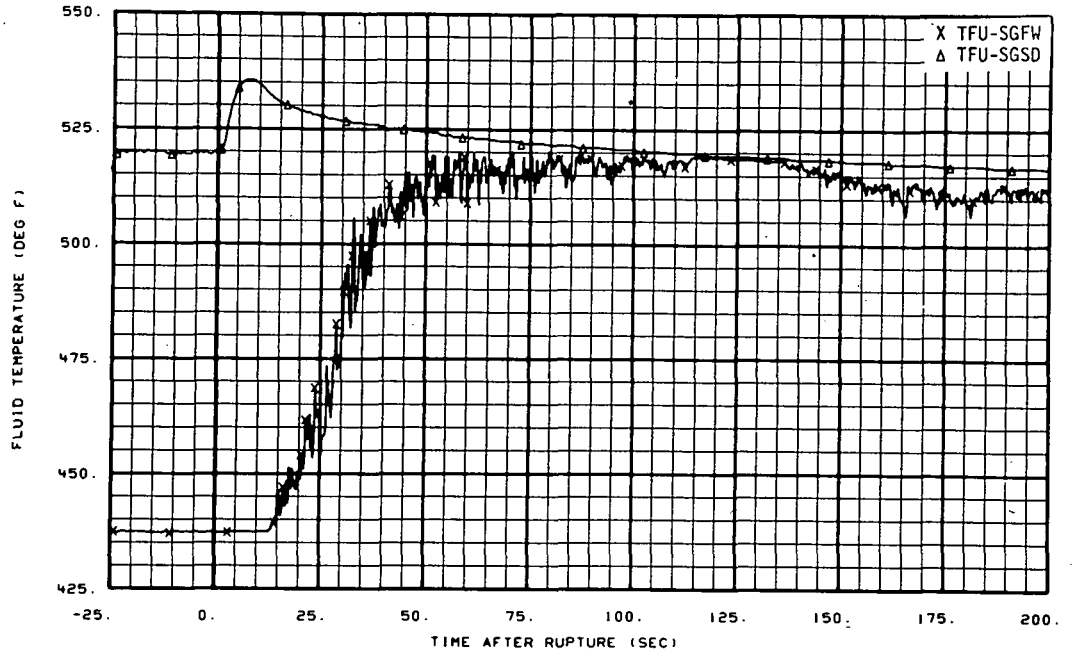


Fig. 35 Fluid temperature in steam generator (TFU-SGFW, TFU-SGSD), from -24 to 200 seconds.

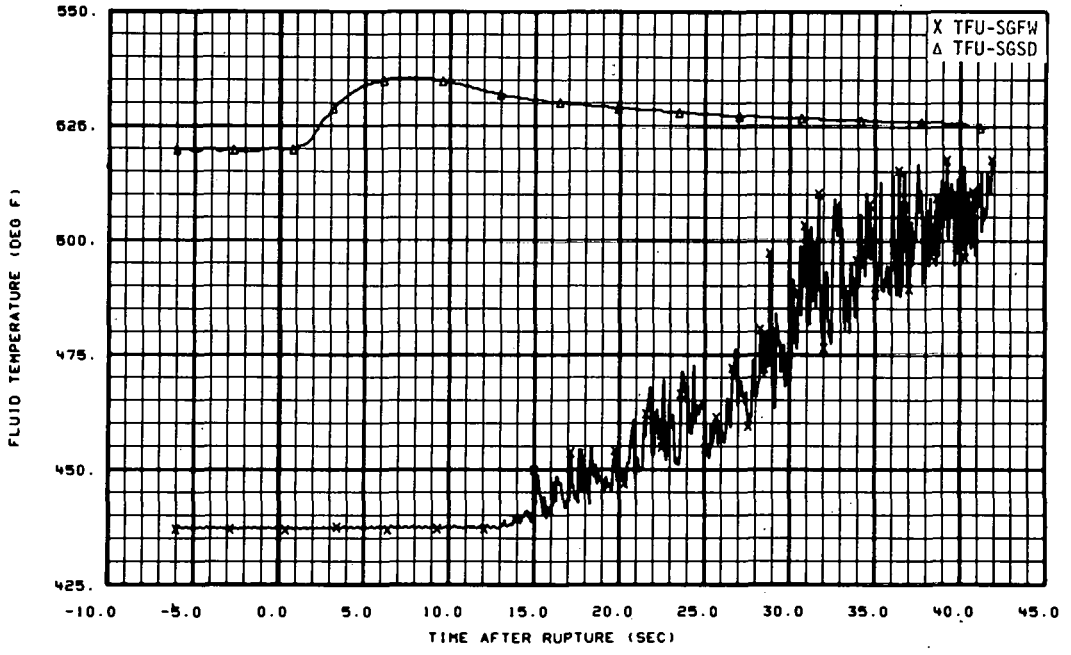


Fig. 36 Fluid temperature in steam generator (TFU-SGFW, TFU-SGSD), from -6 to 42 seconds.

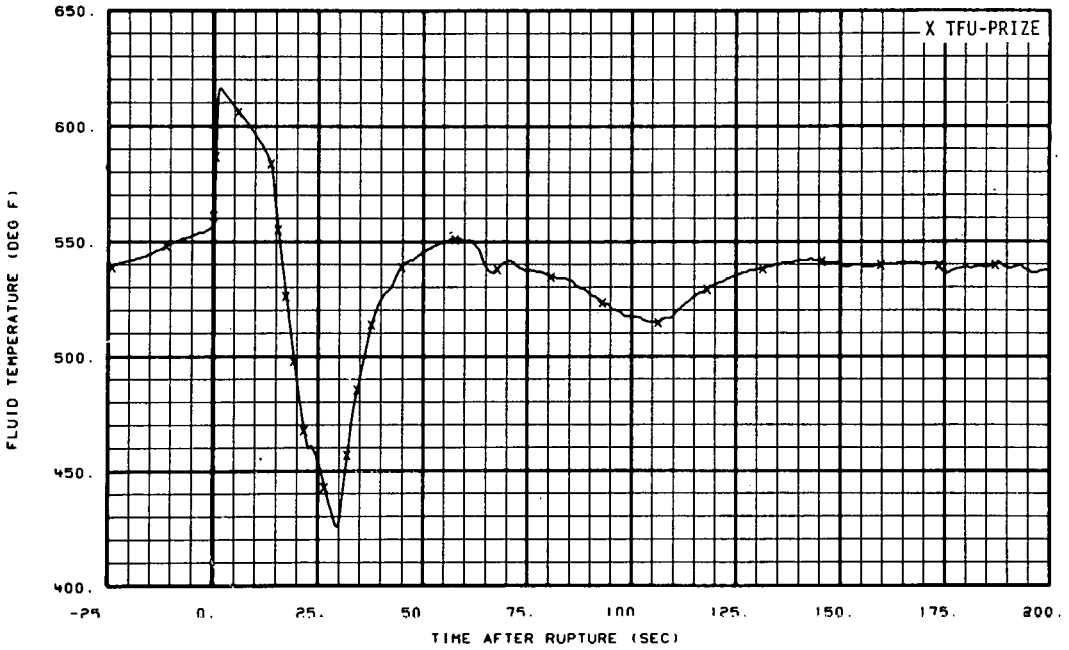


Fig. 37 Fluid temperature in pressurizer surge line (TFU-PRIZE), from -24 to 200 seconds.

Fig. 38 Fluid temperature in pressurizer surge line (TFU-PRIZE), from -6 to 42 seconds.

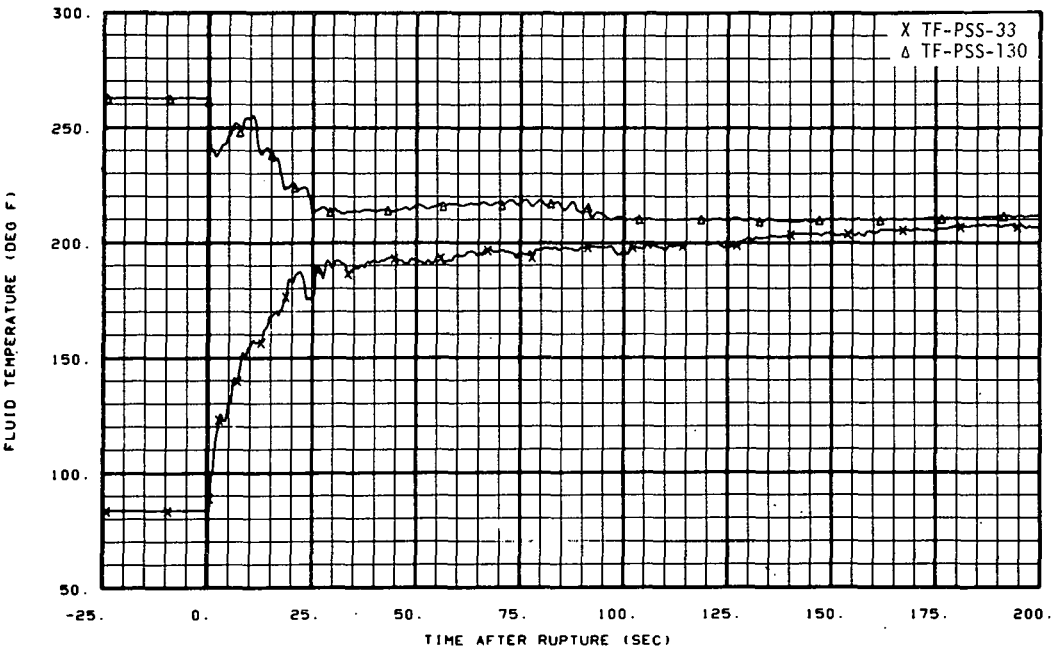


Fig. 39 Fluid temperature in pressure suppression tank (TF-PSS-33, TF-PSS-130), from -24 to 200 seconds.

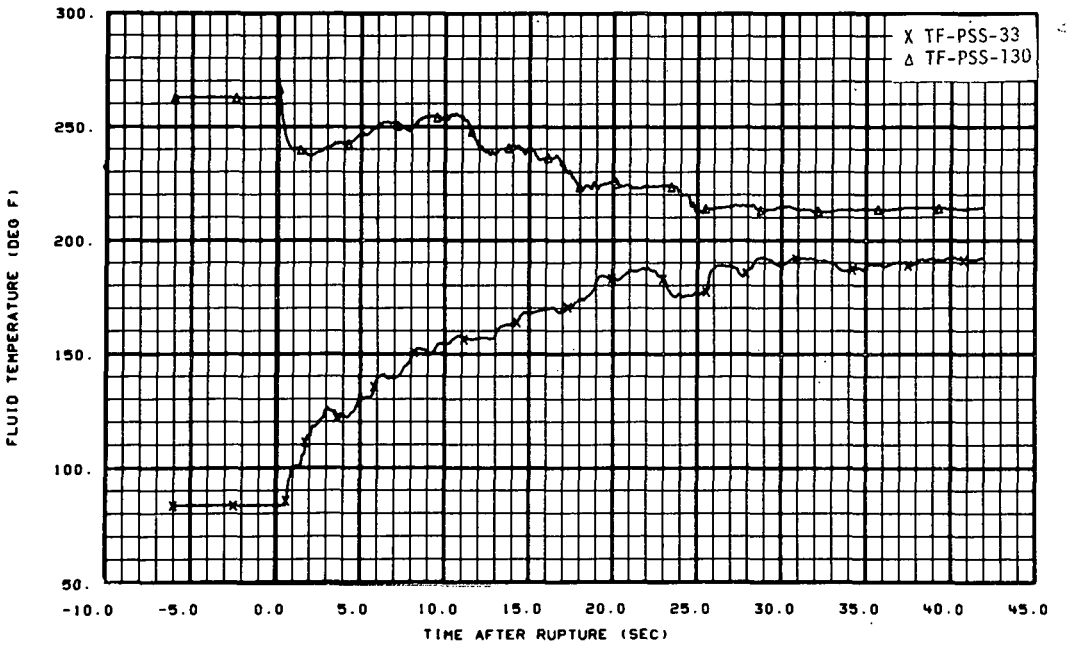


Fig. 40 Fluid temperature in pressure suppression tank (TF-PSS-33, TF-PSS-130), from -6 to 42 seconds.

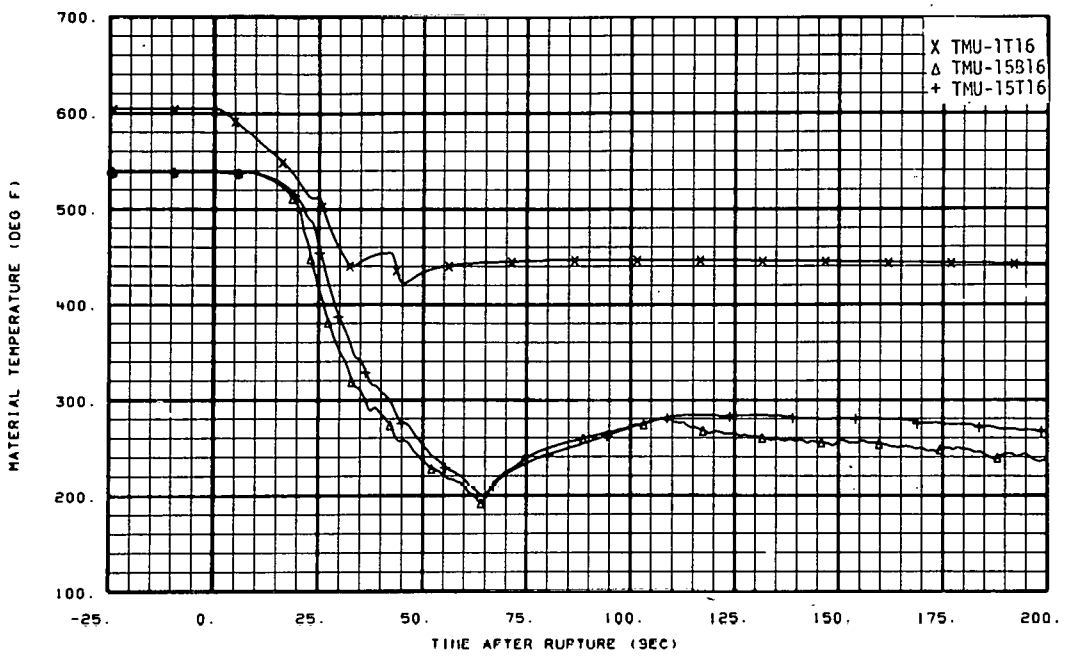


Fig. 41 Material temperature in intact loop (TMU-1T16, TMU-15B16, TMU-15T16), from -24 to 200 seconds.

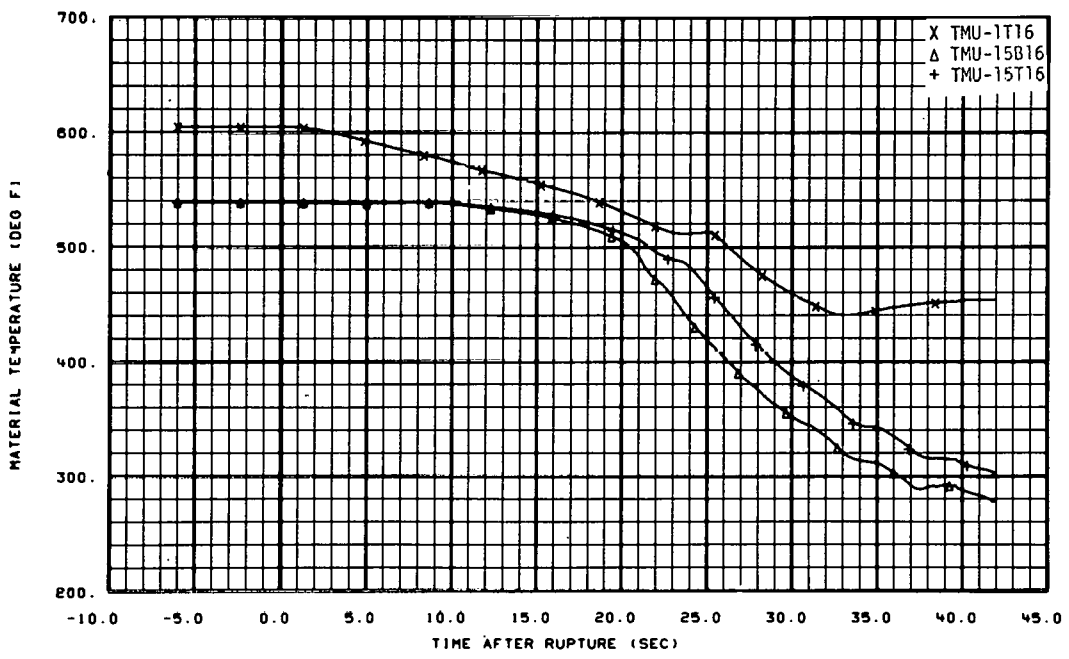


Fig. 42 Material temperature in intact loop (TMU-1T16, TMU-15B16, TMU-15T16), from -6 to 42 seconds.

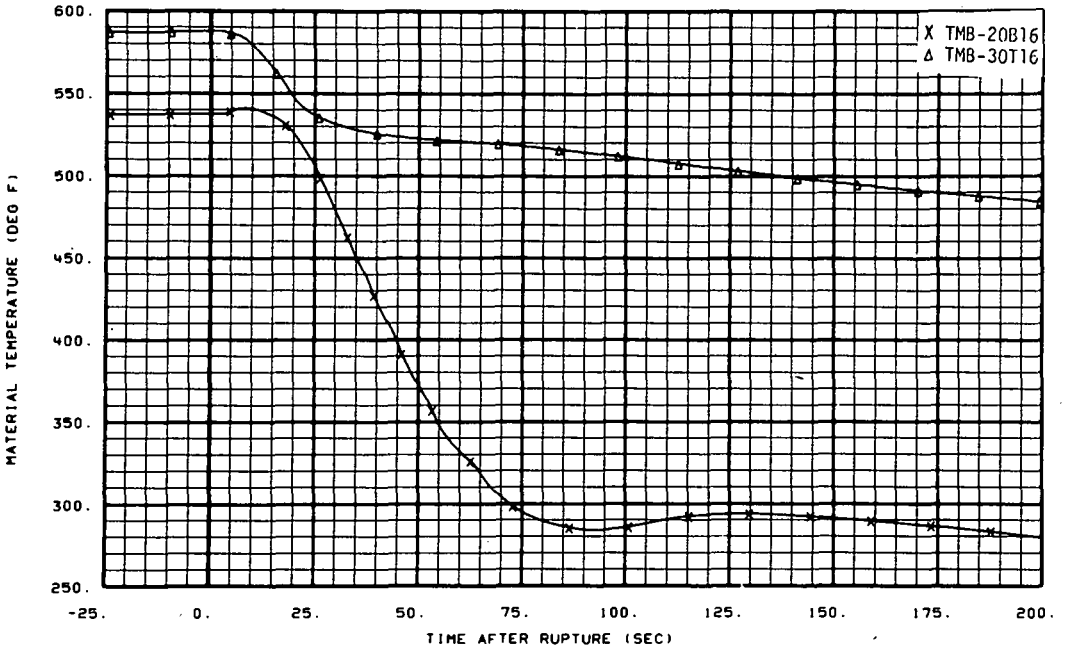


Fig. 43 Material temperature in broken loop (TMB-20B16, TMB-30T16), from -24 to 200 seconds.

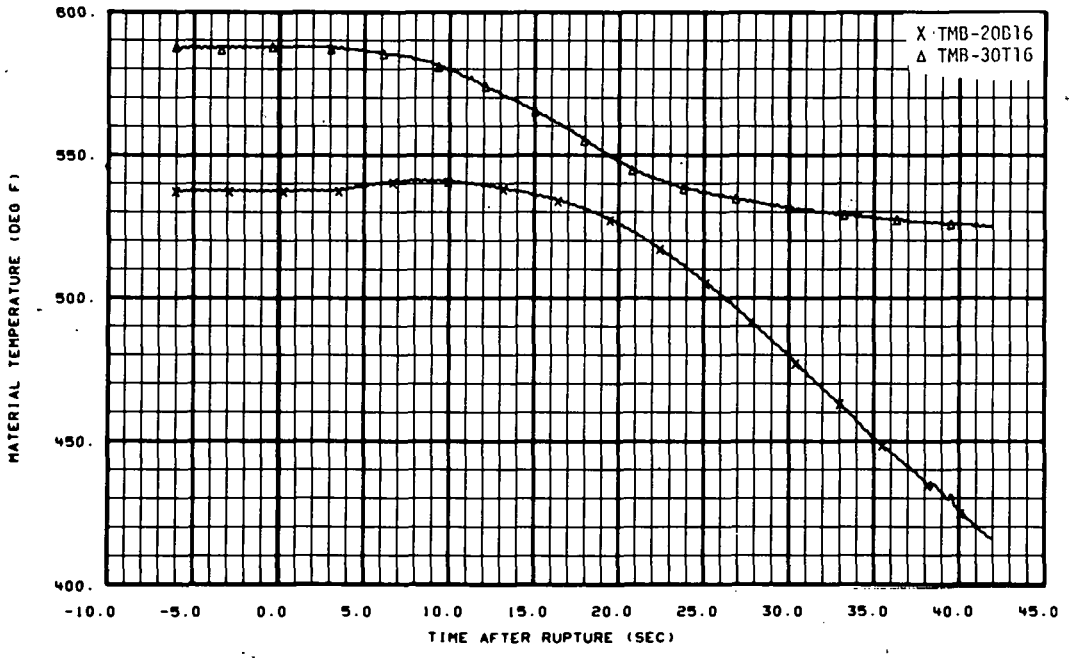


Fig. 44 Material temperature in broken loop (TMB-20B16, TMB-30T16), from -6 to 42 seconds.

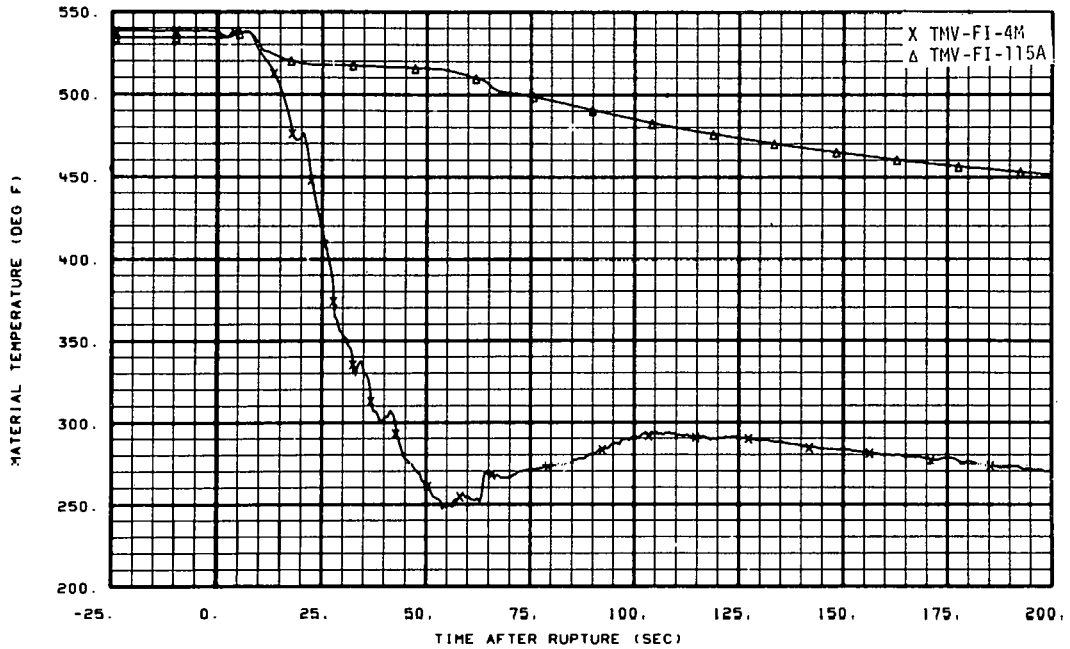


Fig. 45 Material temperature in vessel filler (TMV-FI-4M, TMV-FI-115A), from -24 to 200 seconds.

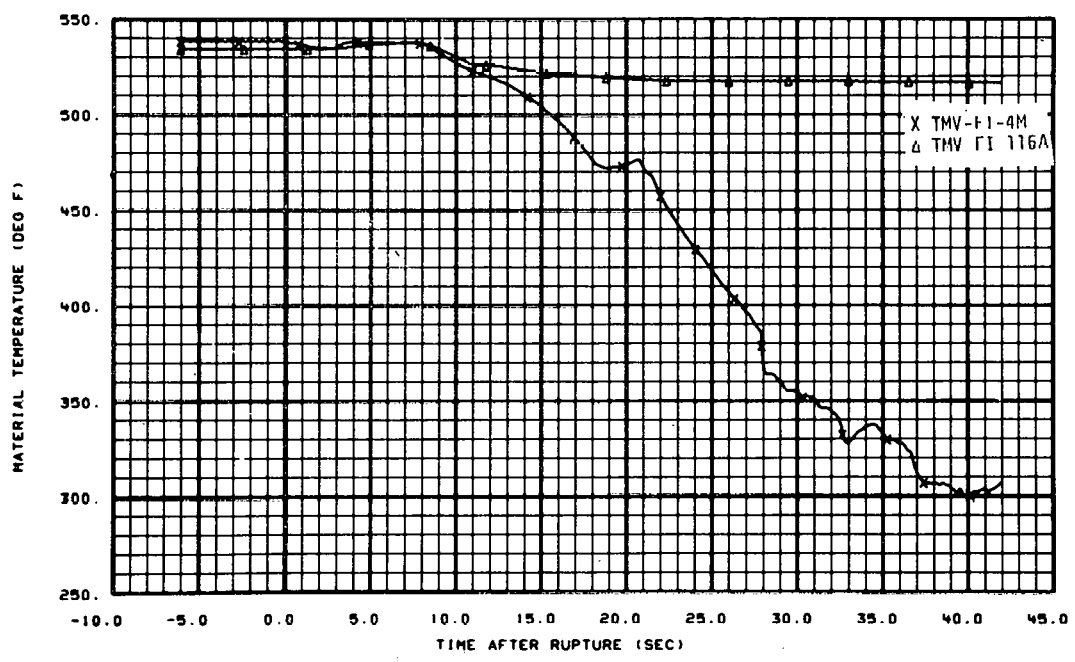


Fig. 46 Material temperature in vessel filler (TMV-FI-4M, TMV-FI-115A), from -6 to 42 seconds.

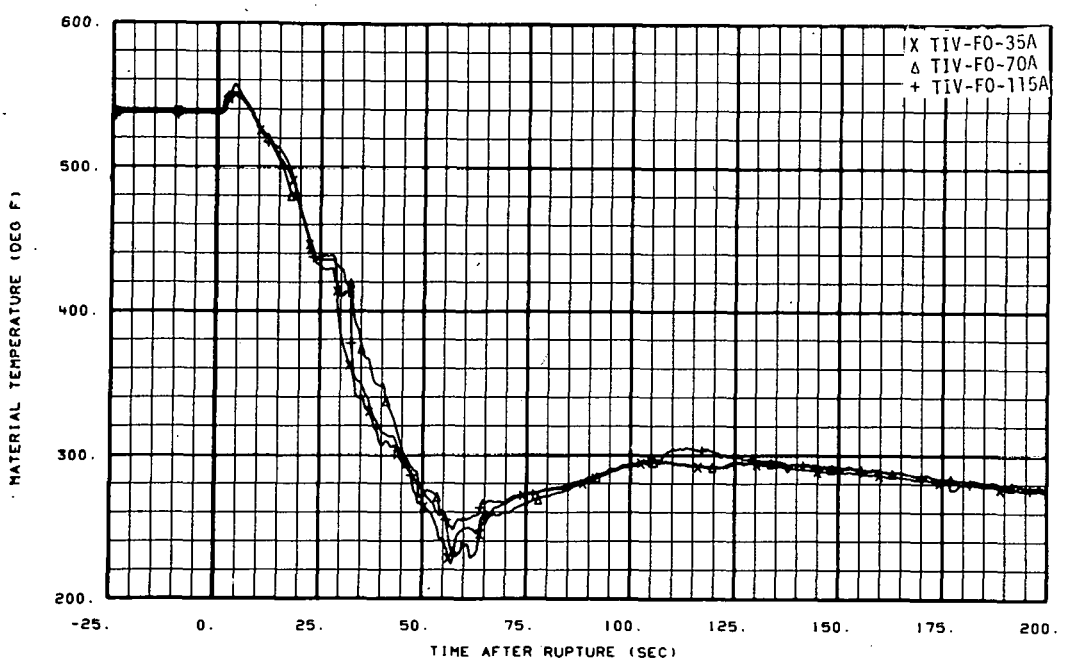


Fig. 47 Material temperature in vessel filler insulator (TIV-FO-35A, TIV-FO-70A, TIV-FO-115A), from -24 to 200 seconds.

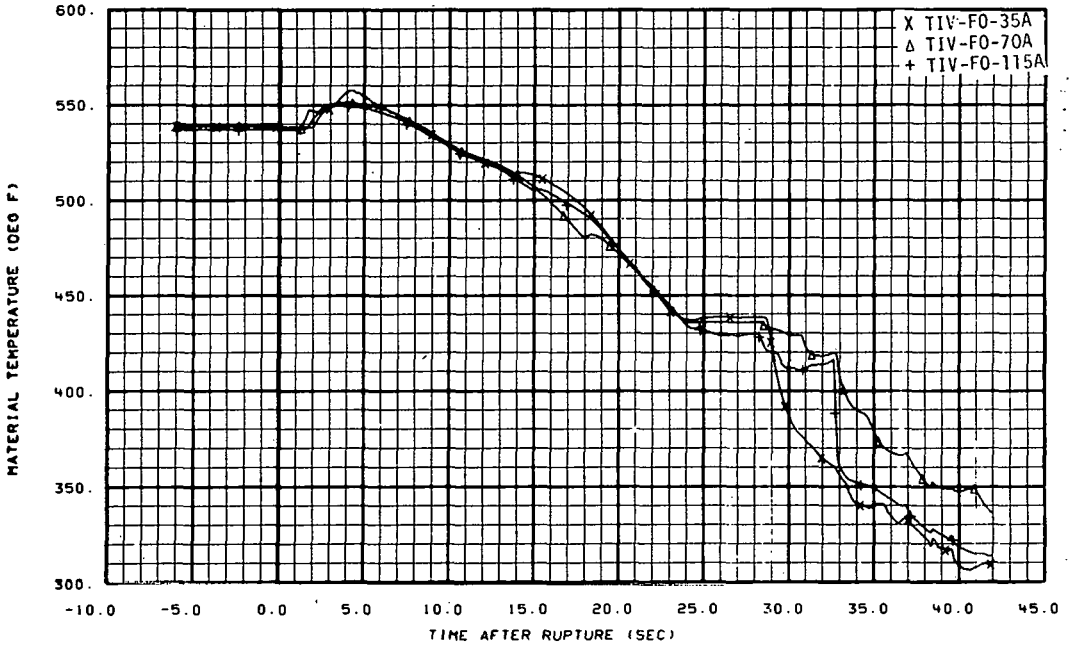


Fig. 48 Material temperature in vessel filler insulator (TIV-FO-35A, TIV-FO-70A, TIV-FO-115A), from -6 to 42 seconds.

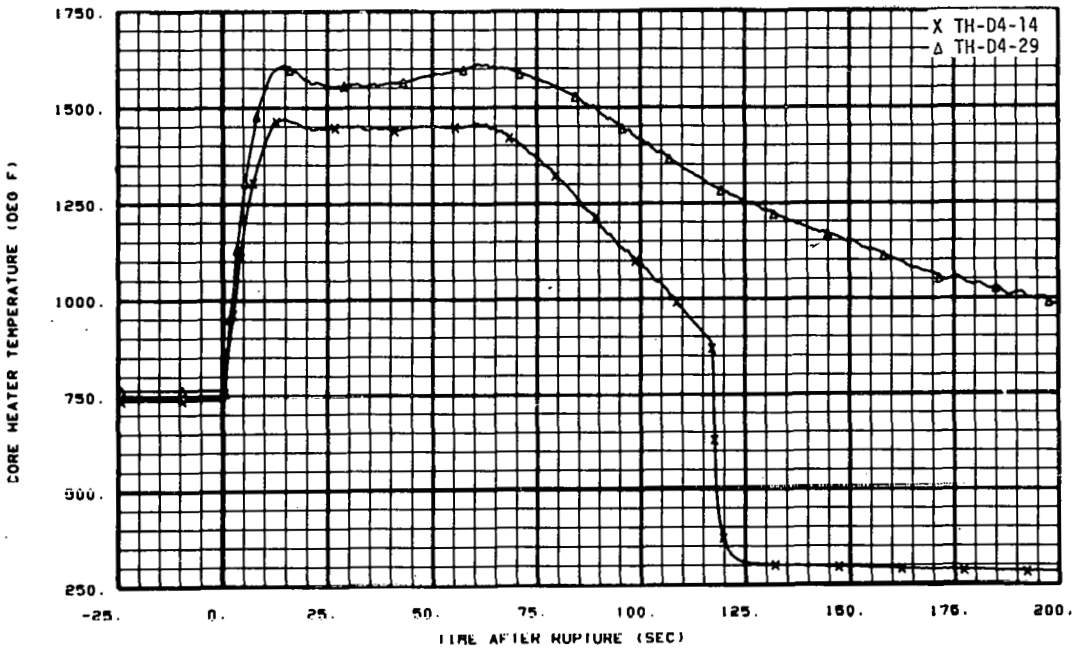


Fig. 49 Core heater temperature, Rod D-4 (TH-D4-14, TH-D4-29), from -24 to 200 seconds.

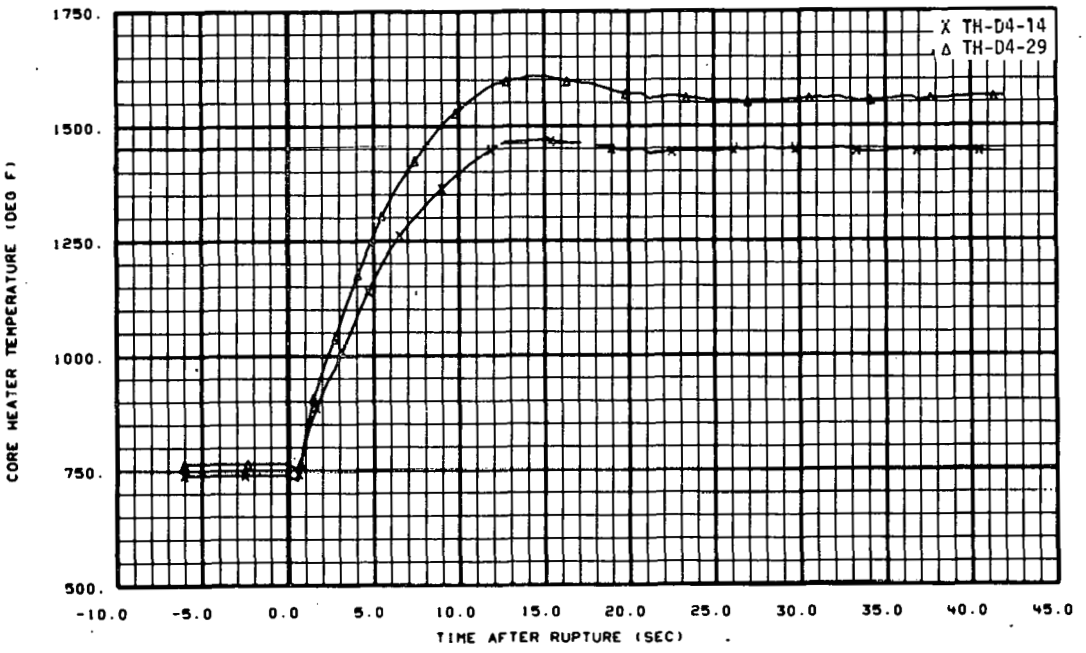


Fig. 50 Core heater temperature, Rod D-4 (TH-D4-14, TH-D4-29), from -6 to 42 seconds.

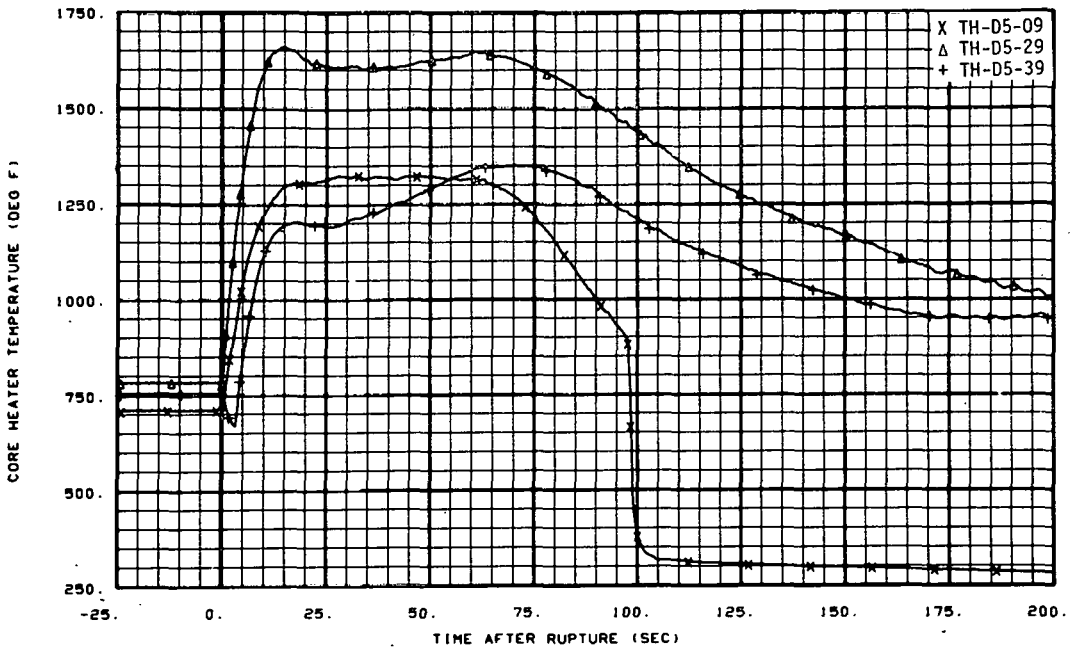


Fig. 51 Core heater temperature, Rod D-5 (TH-D5-09, TH-D5-29, TH-D5-39), from -24 to 200 seconds.

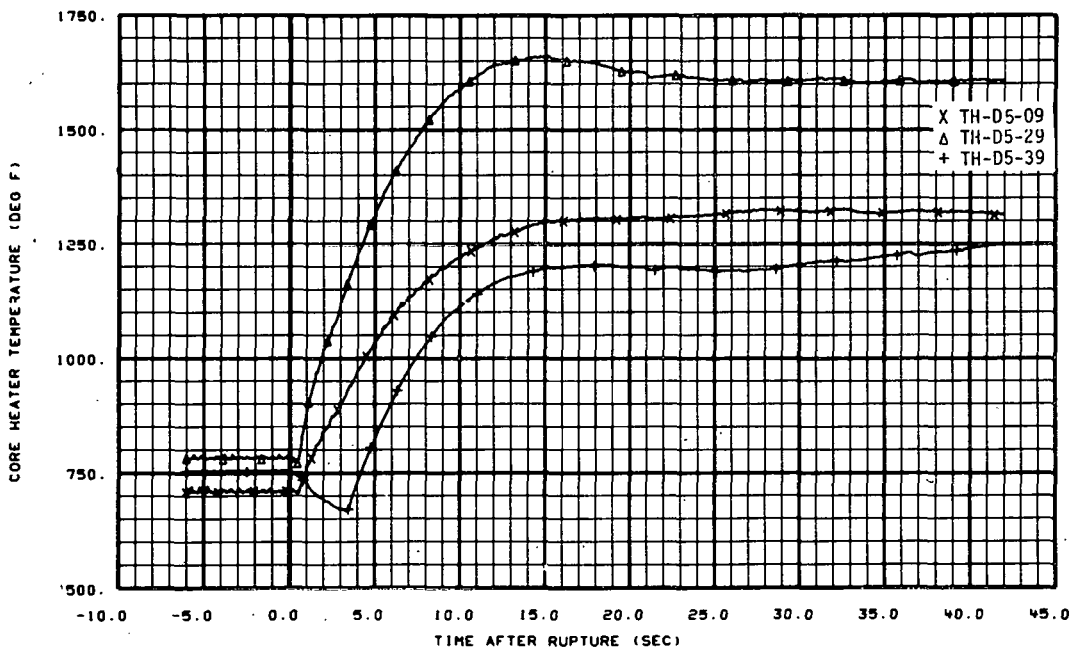


Fig. 52 Core heater temperature, Rod D-5 (TH-D5-09, TH-D5-29, TH-D5-39), from -6 to 42 seconds.

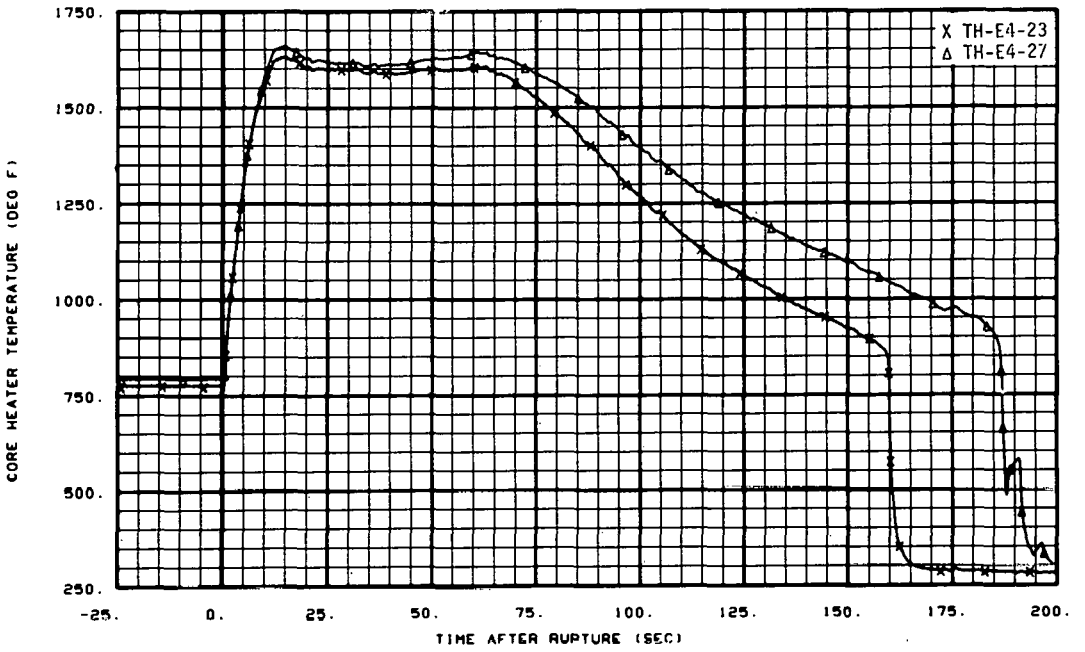


Fig. 53 Core heater temperature, Rod E-4 (TH-E4-23, TH-E4-27), from -24 to 200 seconds.

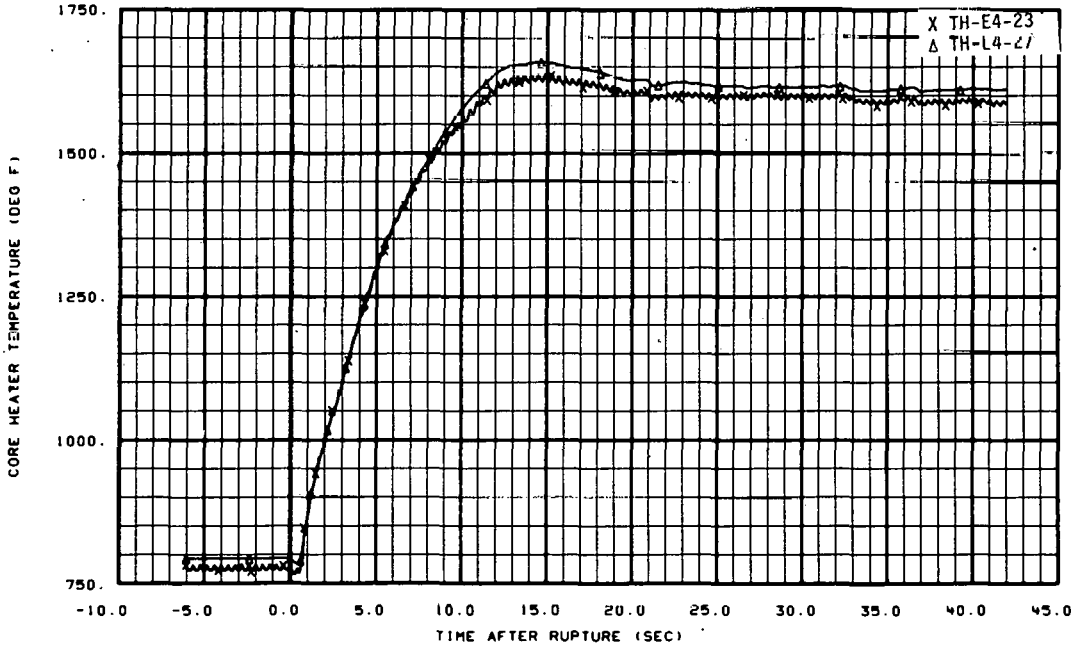


Fig. 54 Core heater temperature, Rod E-4 (TH-E4-23, TH-E4-27), from -6 to 42 seconds.

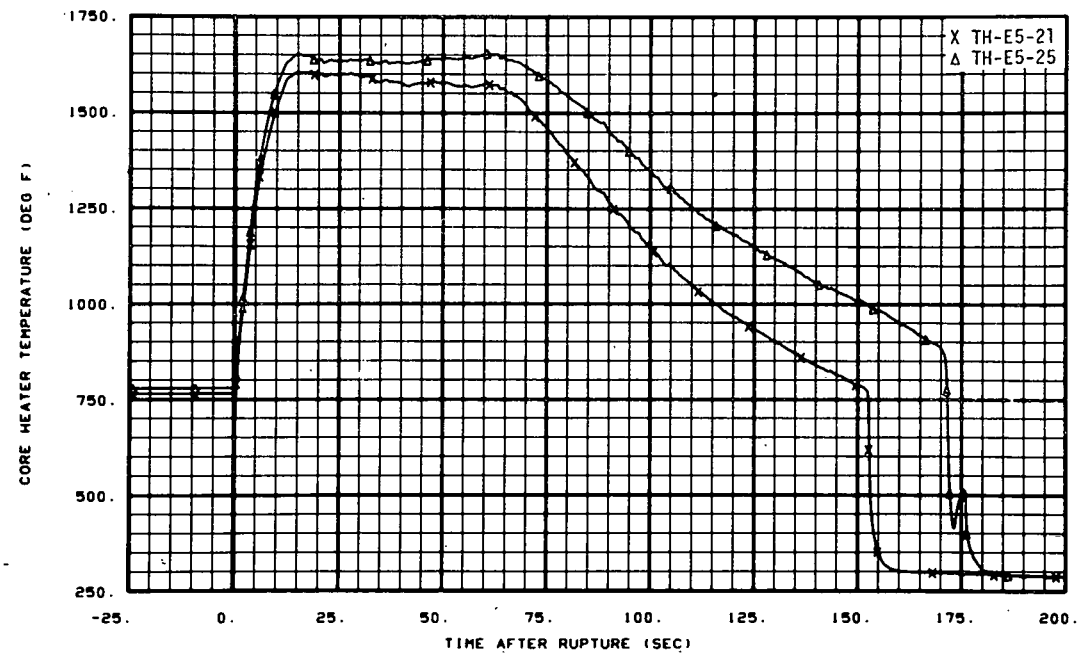


Fig. 55 Core heater temperature, Rod E-5 (TH-E5-21, TH-E5-25), from -24 to 200 seconds.

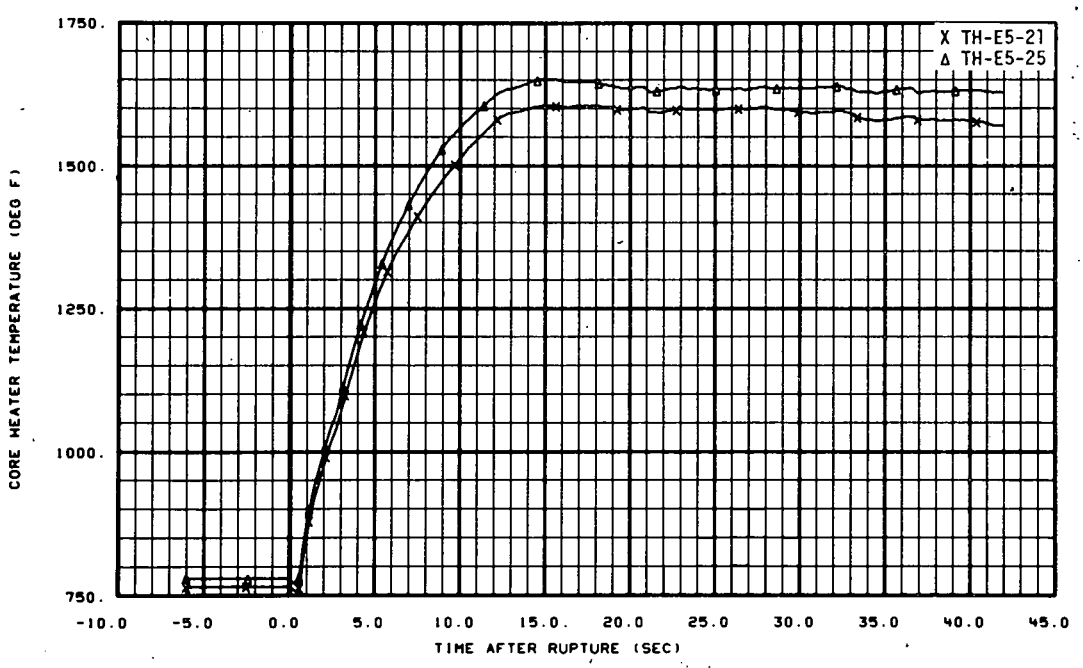


Fig. 56 Core heater temperature, Rod E-5 (TH-E5-21, TH-E5-25), from -6 to 42 seconds.

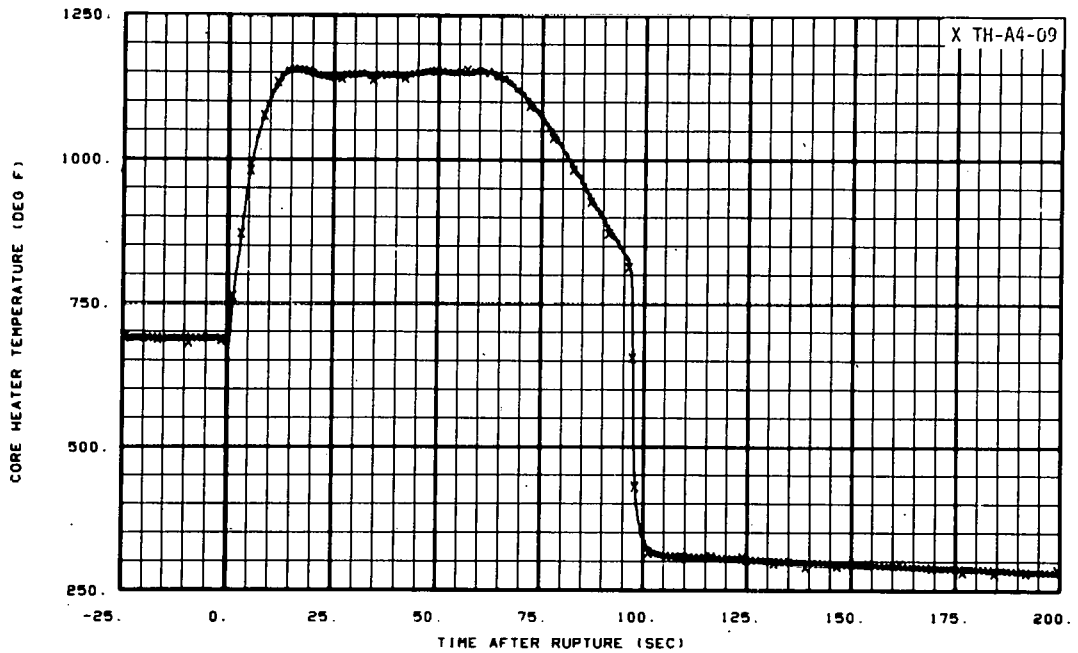


Fig. 57 Core heater temperature, Rod A-4 (TH-A4-09), from -24 to 200 seconds.

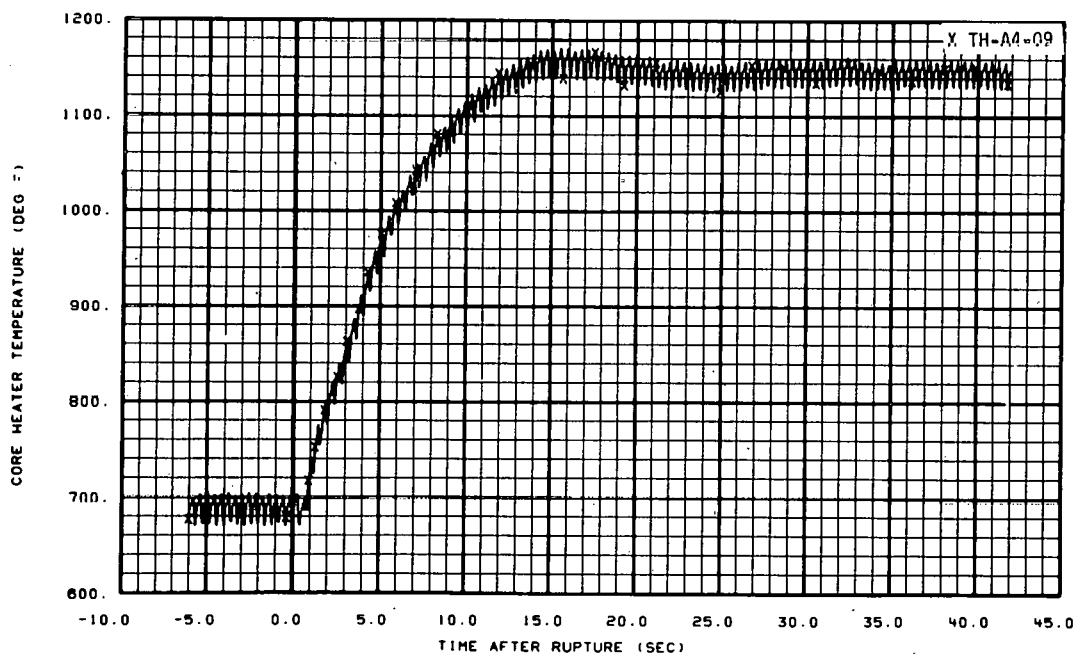


Fig. 58 Core heater temperature, Rod A-4 (TH-A4-09), from -6 to 42 seconds.

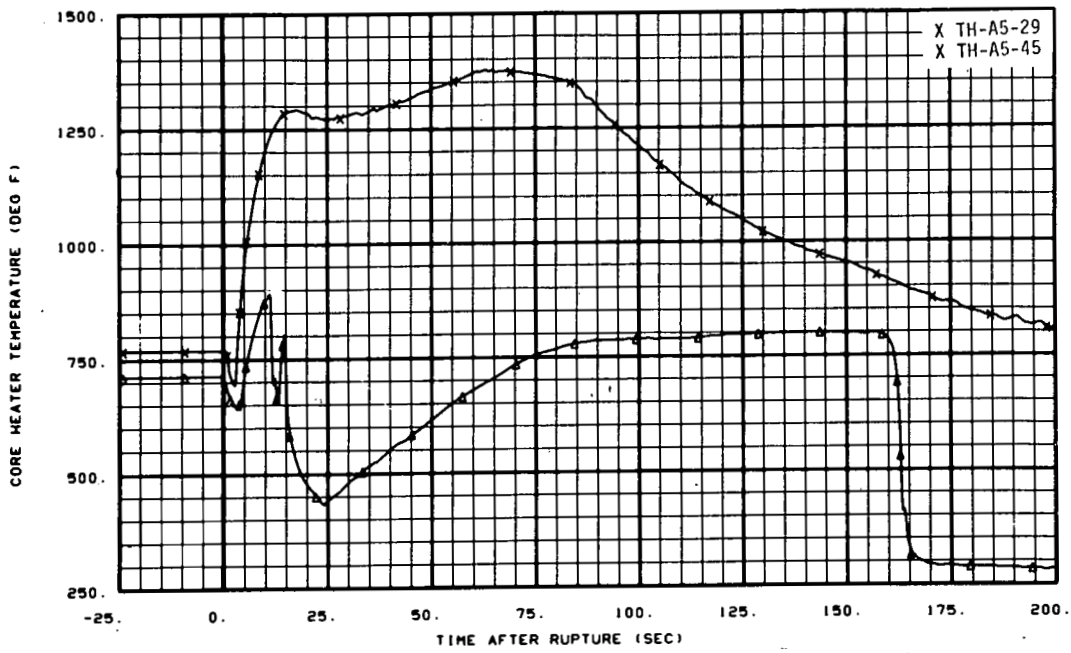


Fig. 59 Core heater temperature, Rod A-5 (TH-A5-29, TH-A5-45), from -24 to 200 seconds.

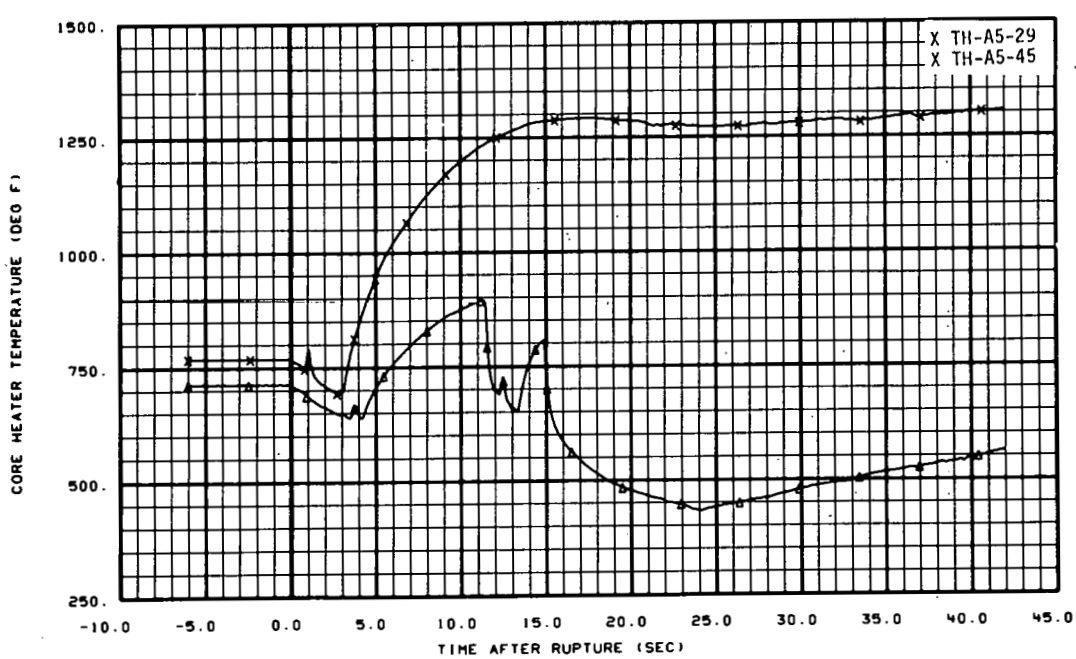


Fig. 60 Core heater temperature, Rod A-5 (TH-A5-29, TH-A5-45), from -6 to 42 seconds.

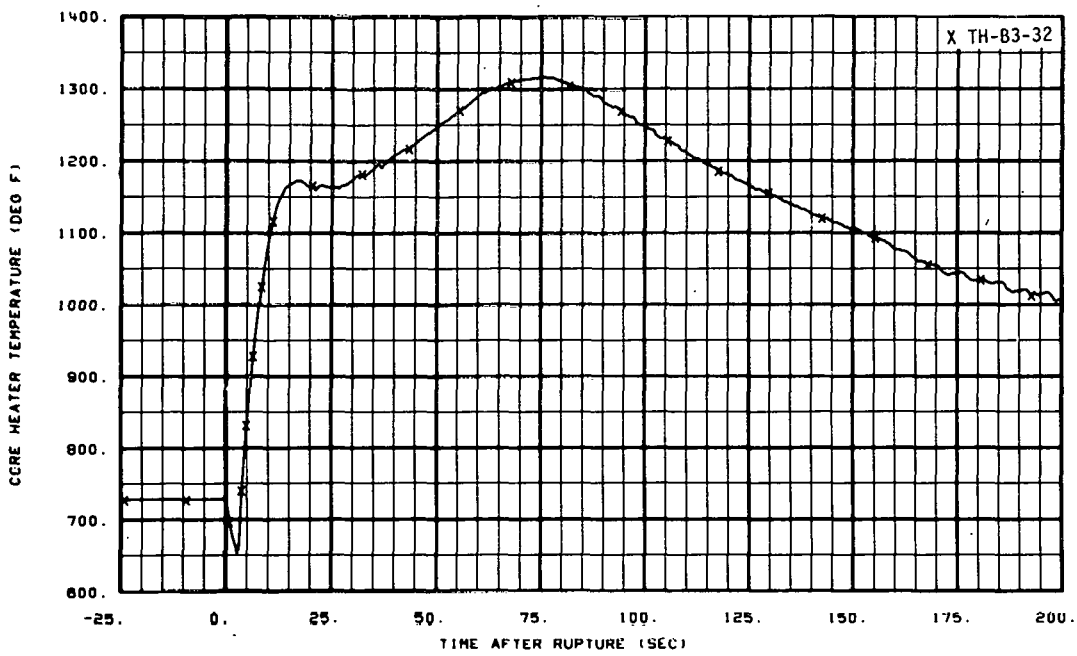


Fig. 61 Core heater temperature, Rod B-3 (TH-B3-32), from -24 to 200 seconds.

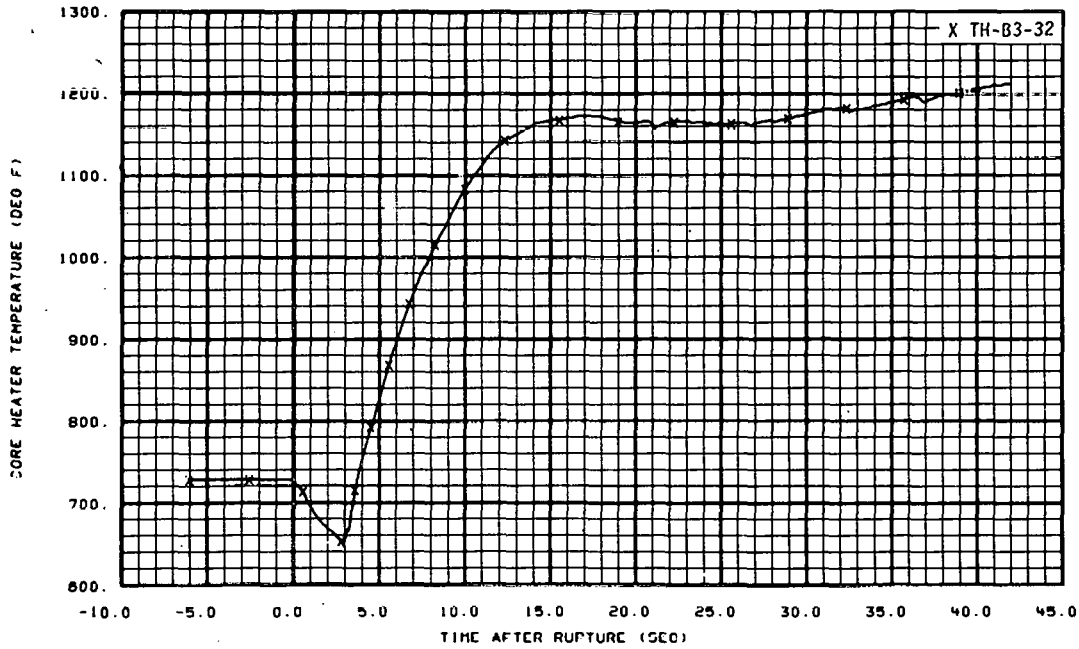


Fig. 62 Core heater temperature, Rod B-3 (TH-B3-32), from -6 to 42 seconds.

Fig. 63 Core heater temperature, Rod B-5 (TH-B5-33, TH-B5-38), from -24 to 200 seconds.

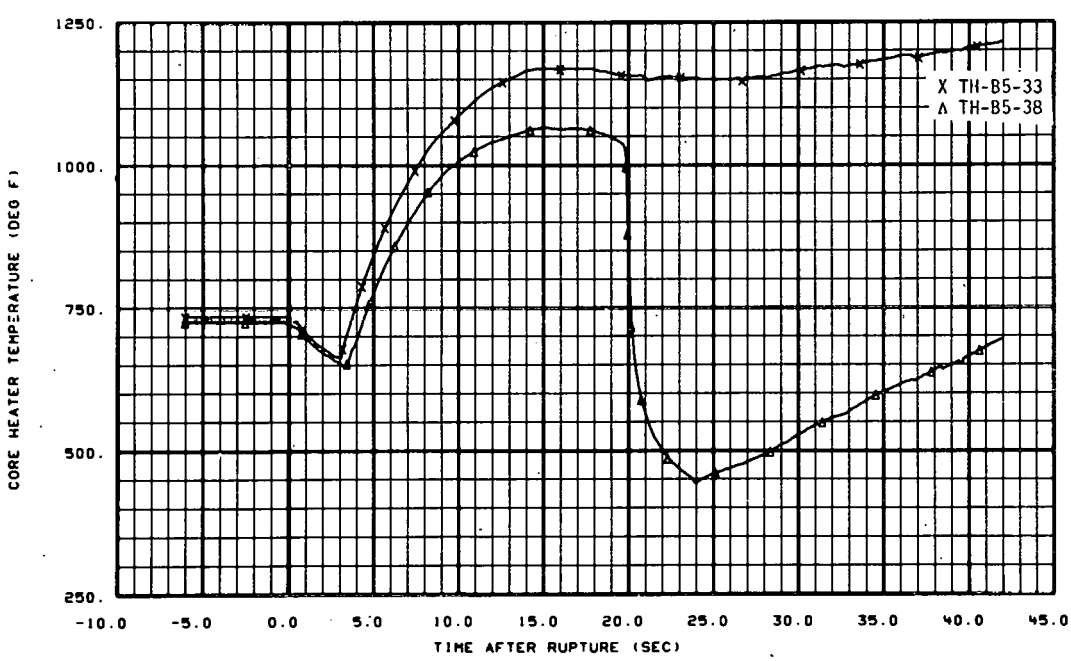


Fig. 64 Core heater temperature, Rod B-5 (TH-B5-33, TH-B5-38), from -6 to 42 seconds.

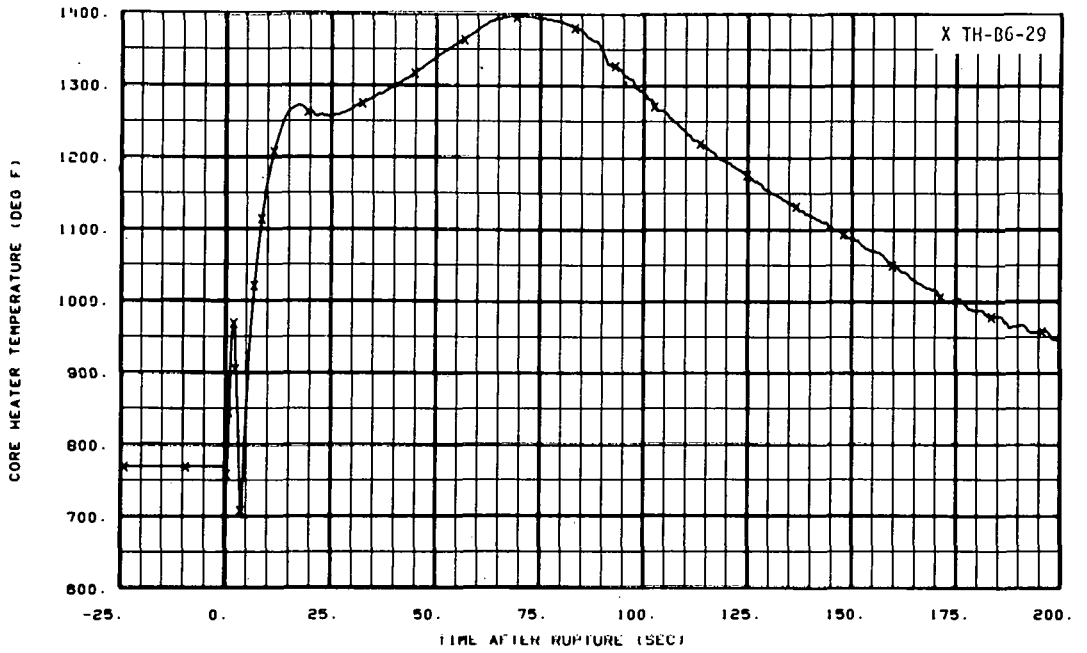


Fig. 65 Core heater temperature, Rod B-6 (TH-B6-29), from -24 to 200 seconds.

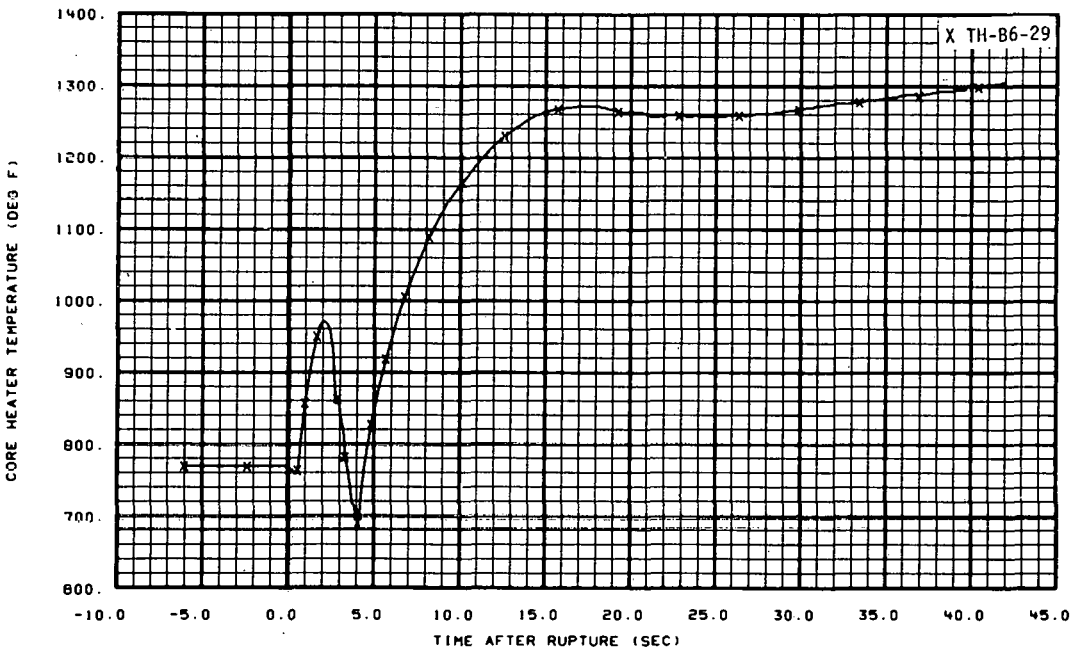


Fig. 66 Core heater temperature, Rod B-6 (TH-B6-29), from -6 to 42 seconds.

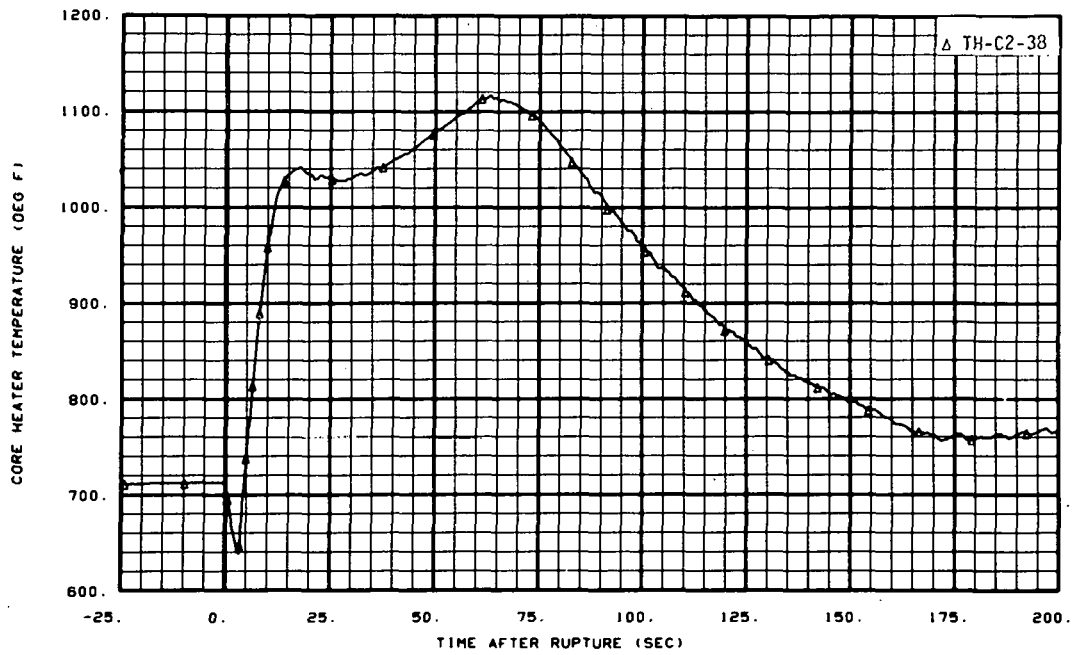


Fig. 67 Core heater temperature, Rod C-2 (TH-C2-38), from -24 to 200 seconds.

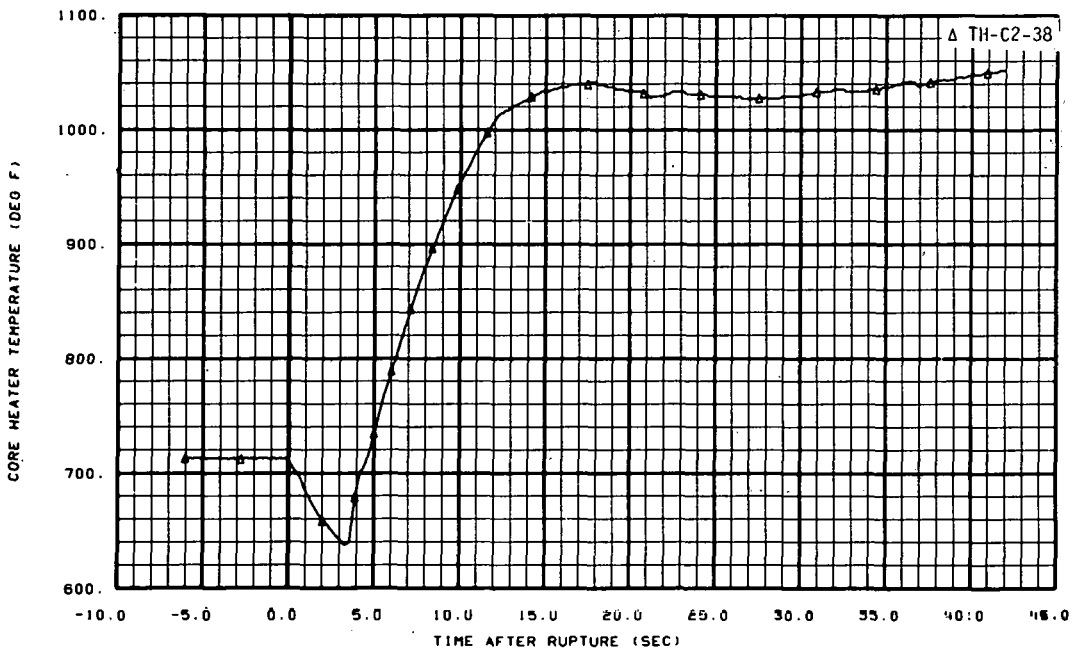


Fig. 68 Core heater temperature, Rod C-2 (TH-C2-38), from -6 to 42 seconds.

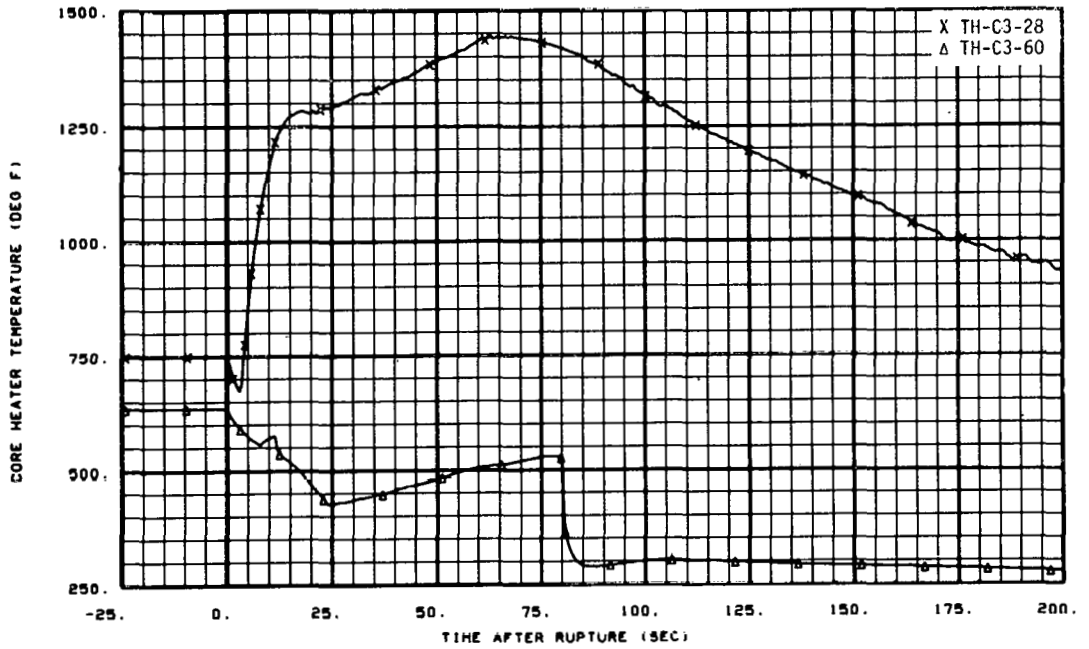


Fig. 69 Core heater temperature, Rod C-3 (TH-C3-28, TH-C3-60), from -24 to 200 seconds.

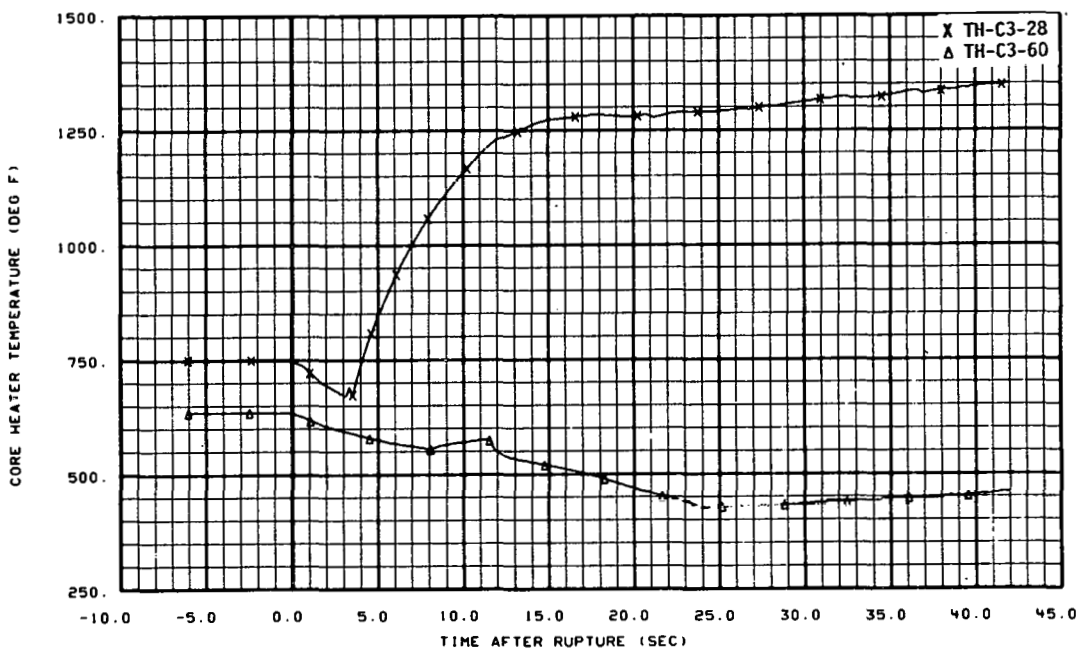


Fig. 70 Core heater temperature, Rod C-3 (TH-C3-28, TH-C3-60), from -6 to 42 seconds.

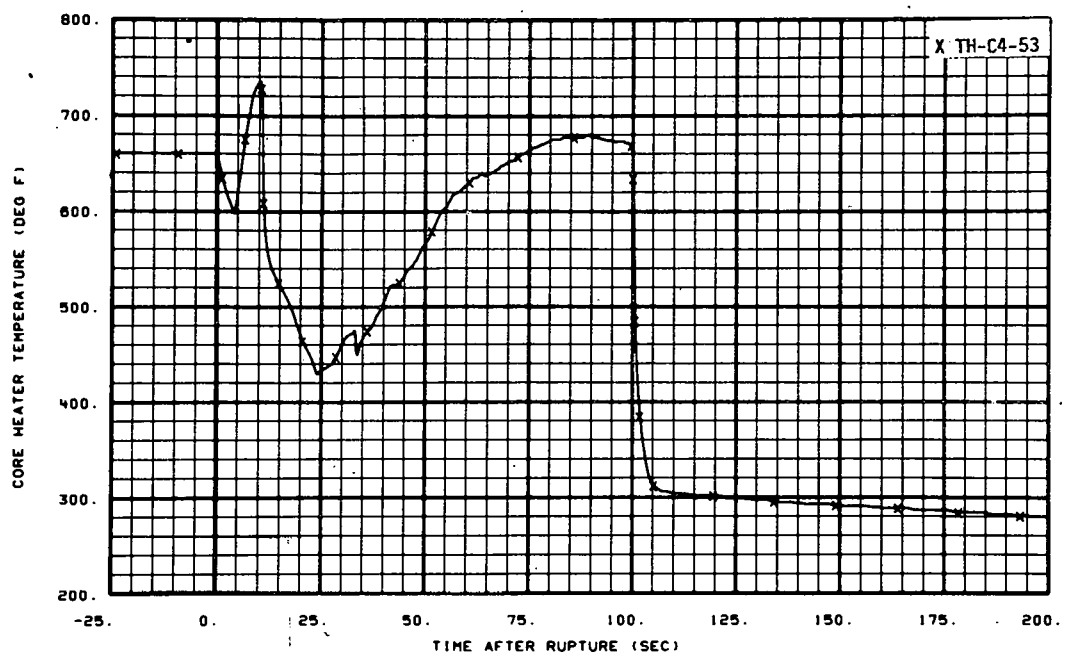


Fig. 71 Core heater temperature, Rod C-4 (TH-C4-53), from -24 to 200 seconds.

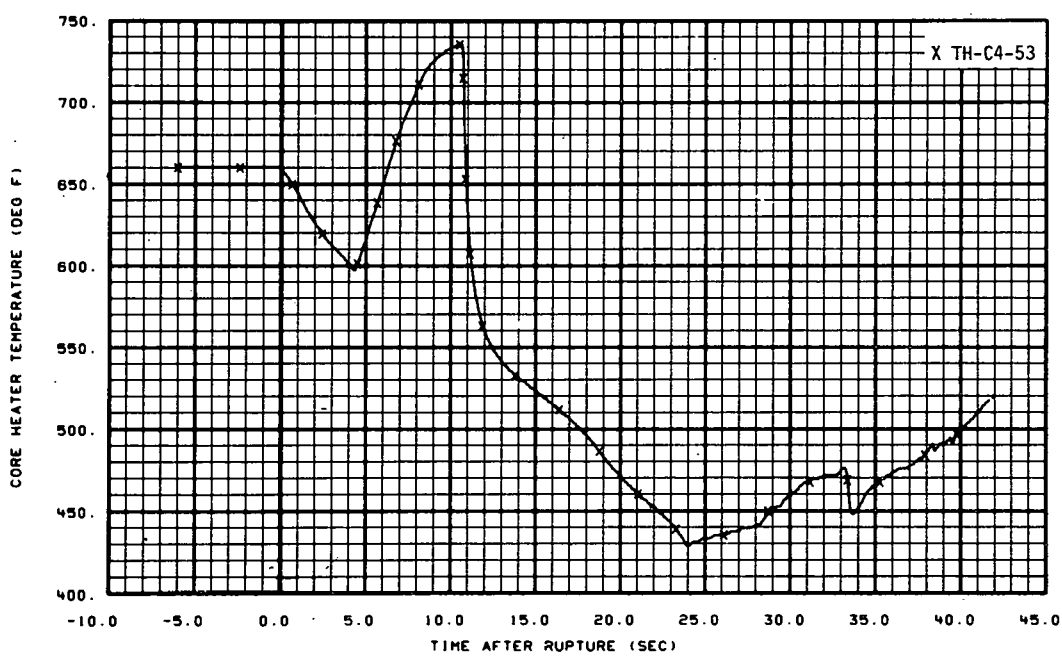


Fig. 72 Core heater temperature, Rod C-4 (TH-C4-53), from -6 to 42 seconds.

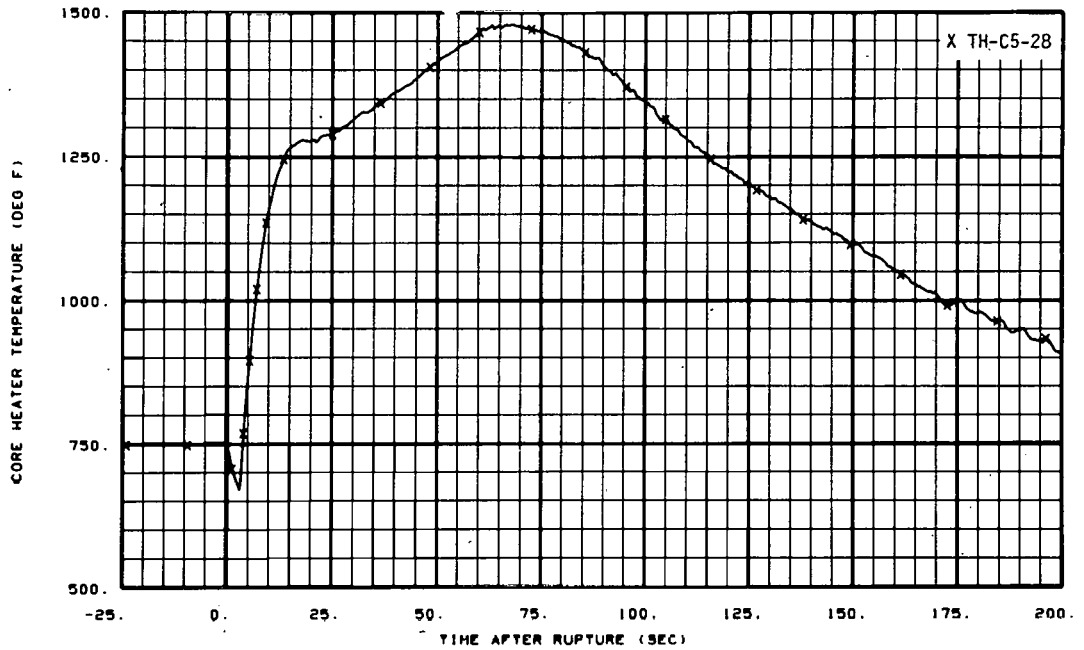


Fig. 73 Core heater temperature, Rod C-5 (TH-C5-28), from -24 to 200 seconds.

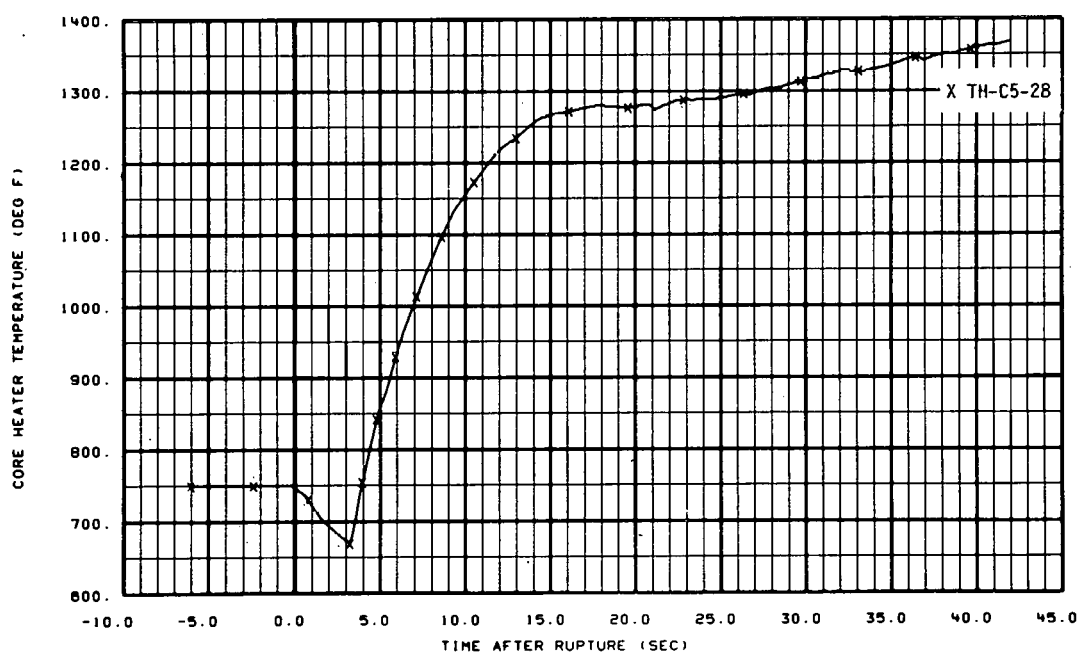


Fig. 74 Core heater temperature, Rod C-5 (TH-C5-28), from -6 to 42 seconds.

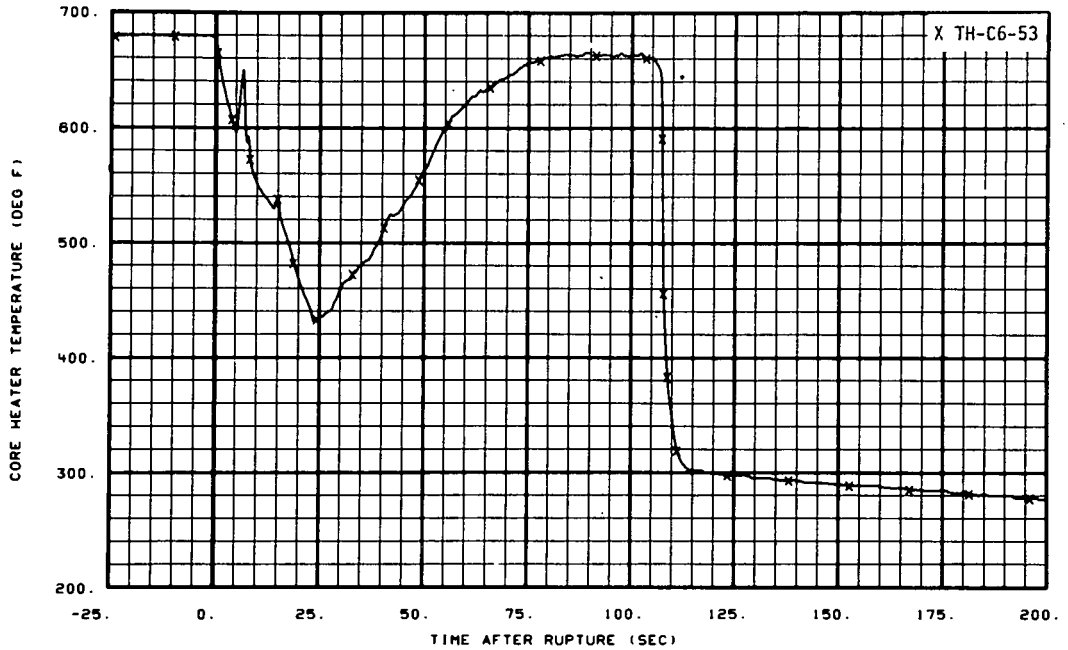


Fig. 75 Core heater temperature, Rod C-6 (TH-C6-53), from -24 to 200 seconds.

Fig. 76 Core heater temperature, Rod C-6 (TH-C6-53), from -6 to 42 seconds.

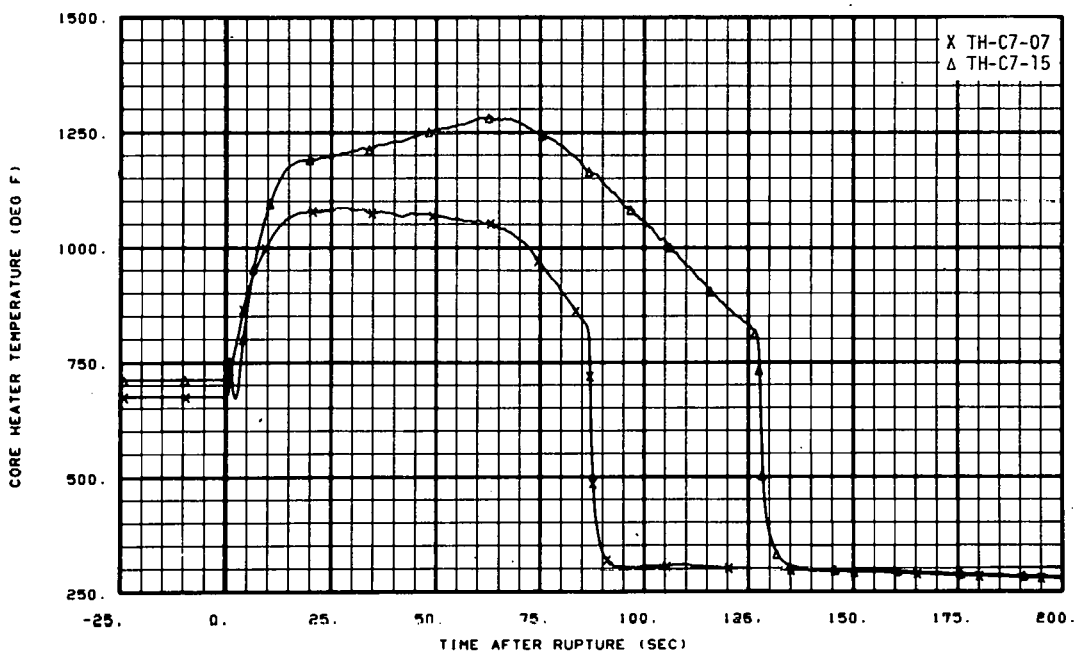


Fig. 77 Core heater temperature, Rod C-7 (TH-C7-07, TH-C7-15), from -24 to 200 seconds.

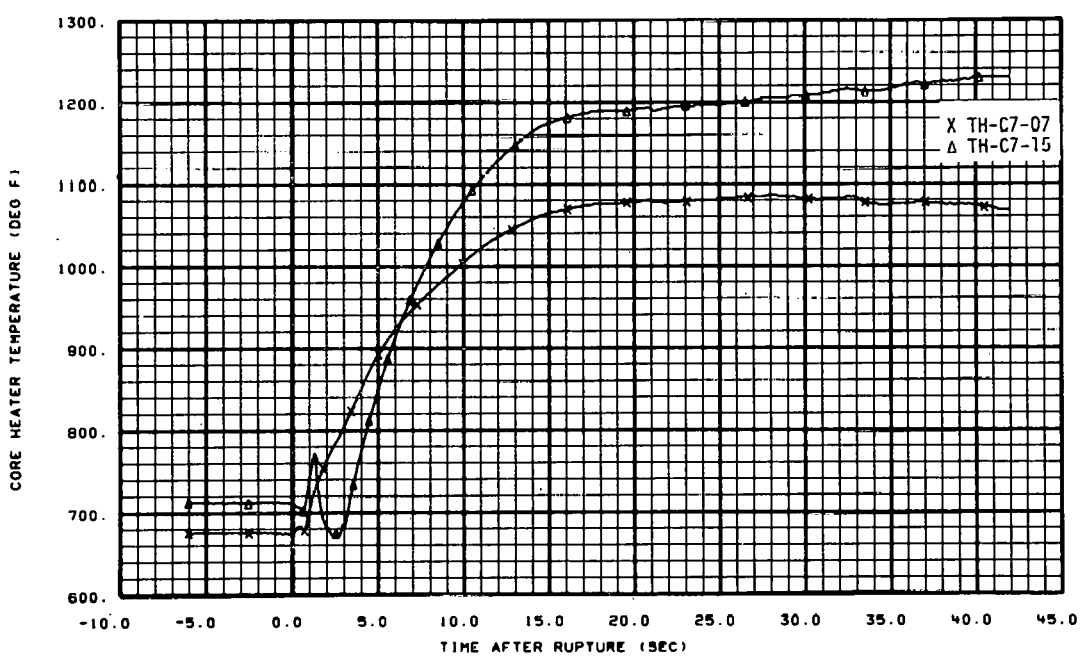


Fig. 78 Core heater temperature, Rod C-7 (TH-C7-07, TH-C7-15), from -6 to 42 seconds.

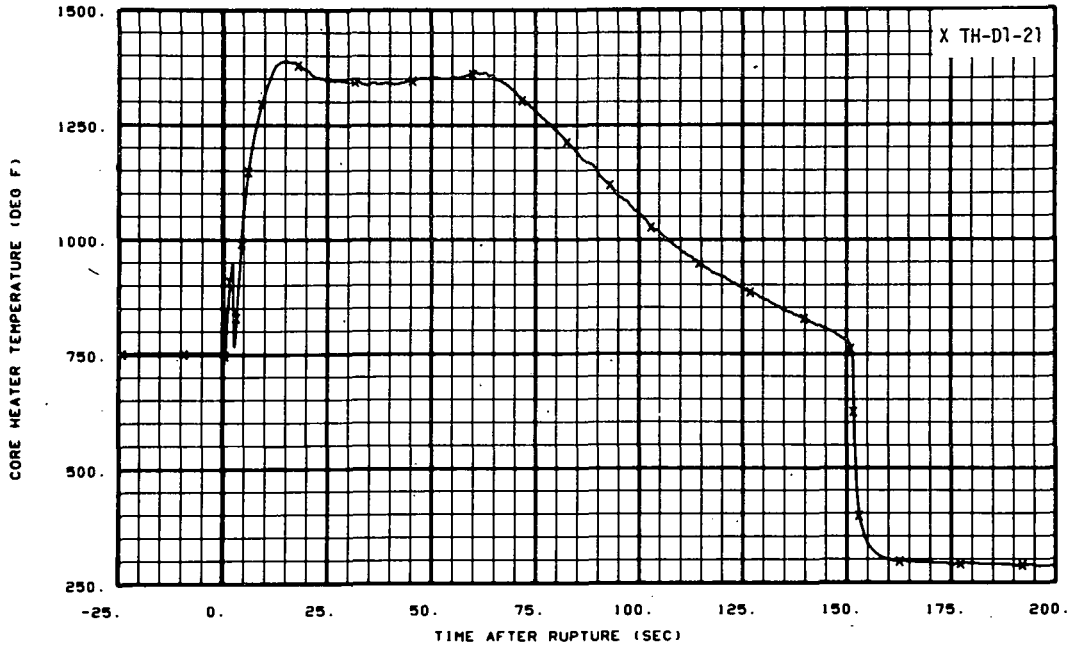


Fig. 79 Core heater temperature, Rod D-1 (TH-D1-21), from -24 to 200 seconds.

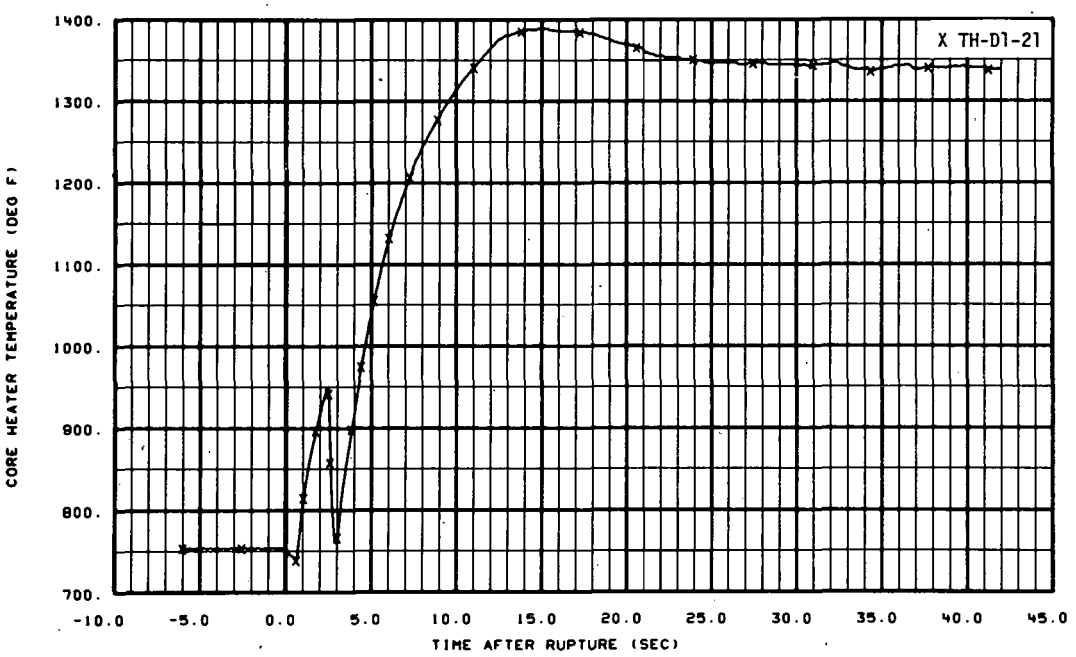


Fig. 80 Core heater temperature, Rod D-1 (TH-D1-21), from -6 to 42 seconds.

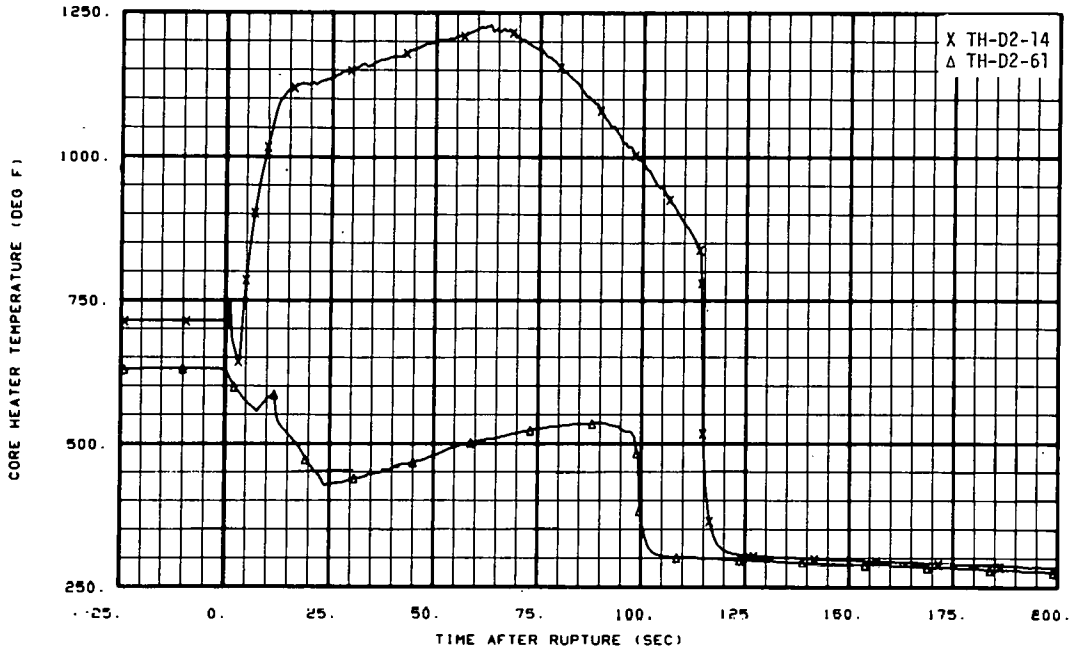


Fig. 81 Core heater temperature, Rod D-2 (TH-D2-14, TH-D2-61), from -24 to 200 seconds.

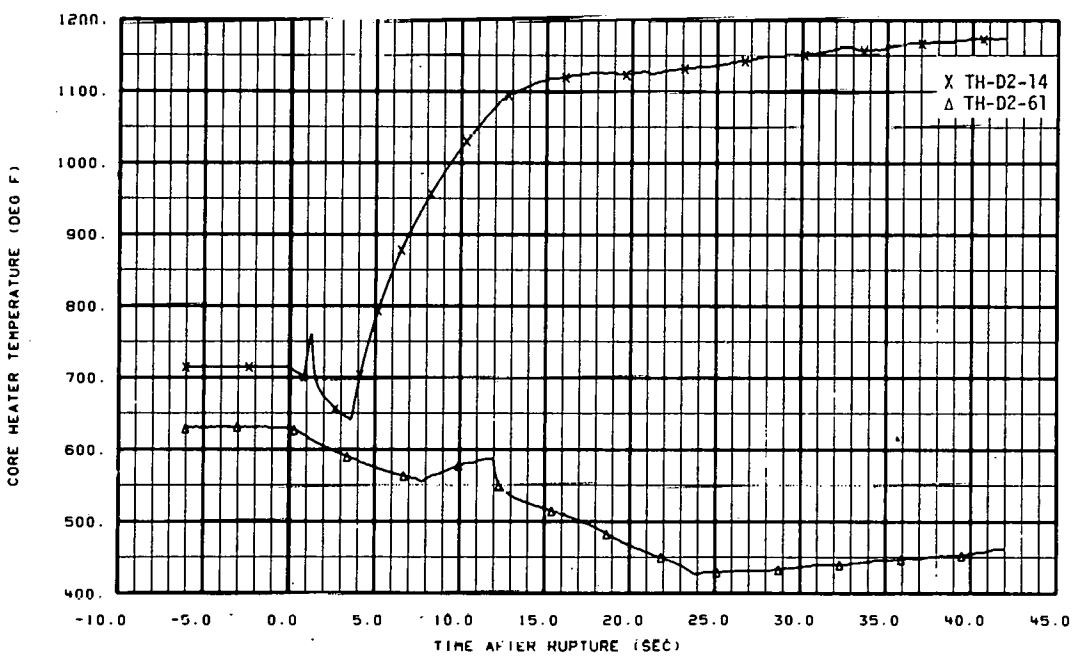


Fig. 82 Core heater temperature, Rod D-2 (TH-D2-14, TH-D2-61), from -6 to 42 seconds.

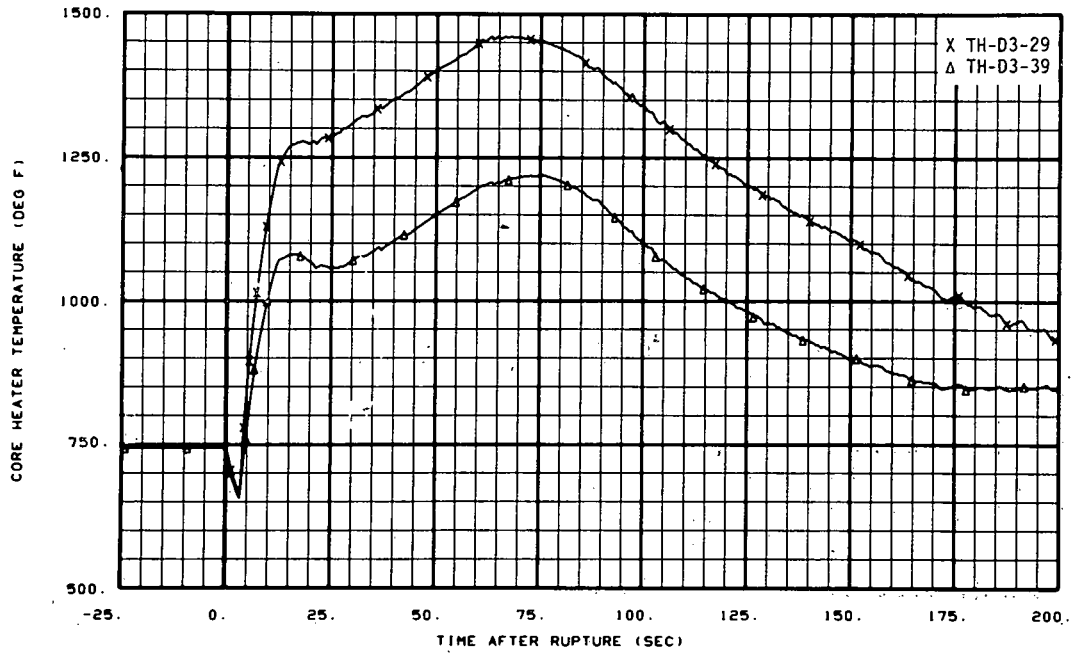


Fig. 83 Core heater temperature, Rod D-3 (TH-D3-29, TH-D3-39), from -24 to 200 seconds.

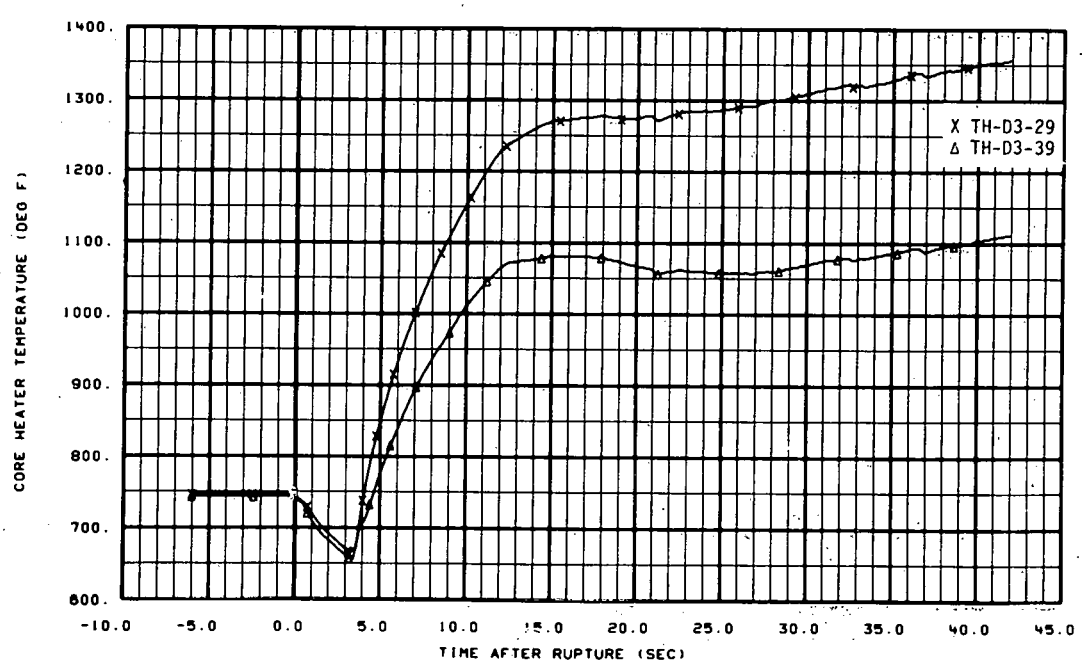


Fig. 84 Core heater temperature, Rod D-3 (TH-D3-29, TH-D3-39), from -6 to 42 seconds.

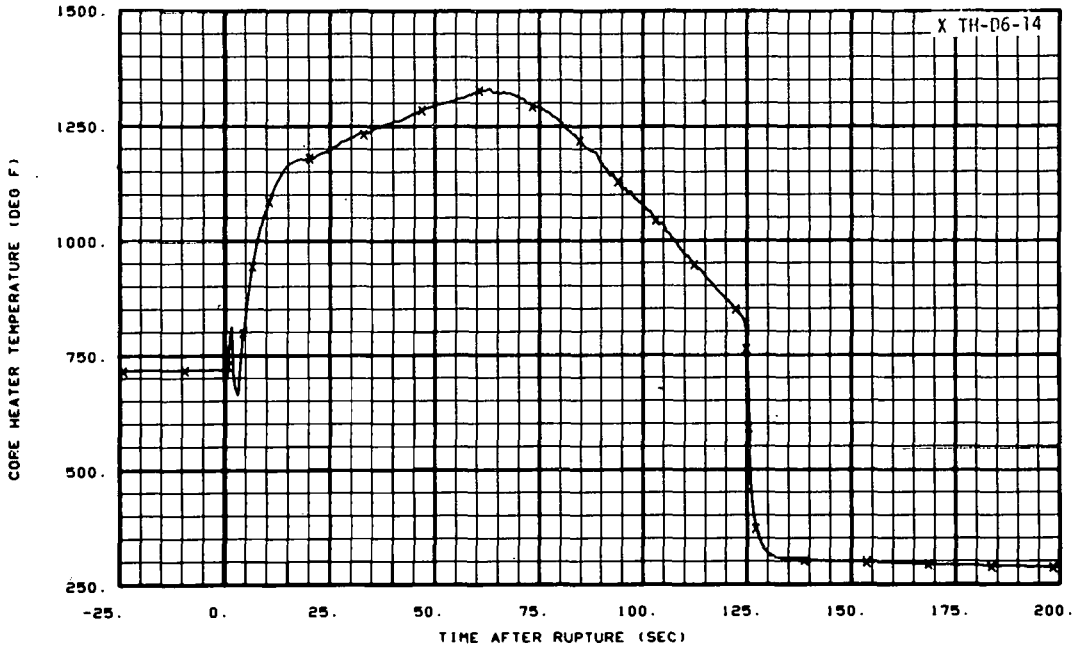


Fig. 85 Core heater temperature, Rod D-6 (TH-D6-14), from -24 to 200 seconds.

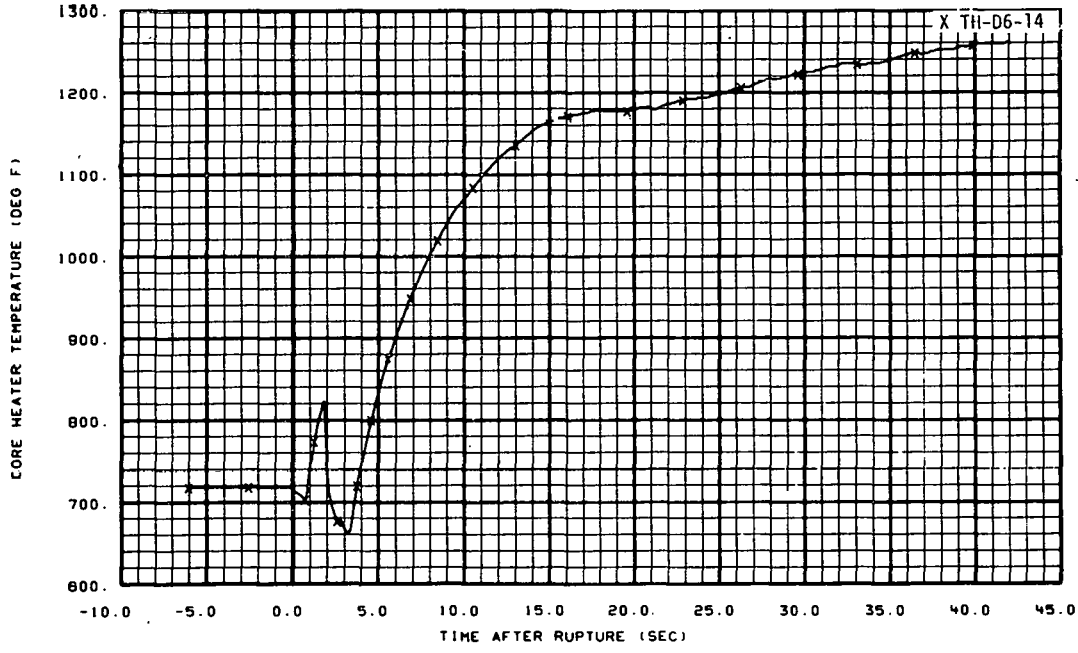


Fig. 86 Core heater temperature, Rod D-6 (TH-D6-14), from -6 to 42 seconds.

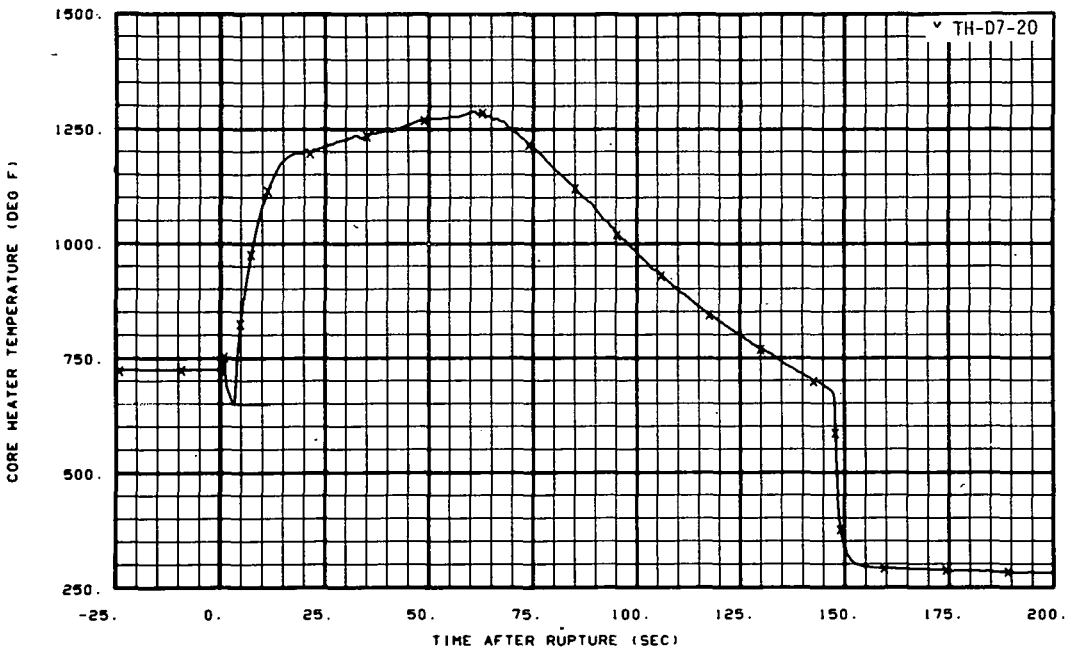


Fig. 87 Core heater temperature, Rod D-7 (TH-D7-20), from -24 to 200 seconds.

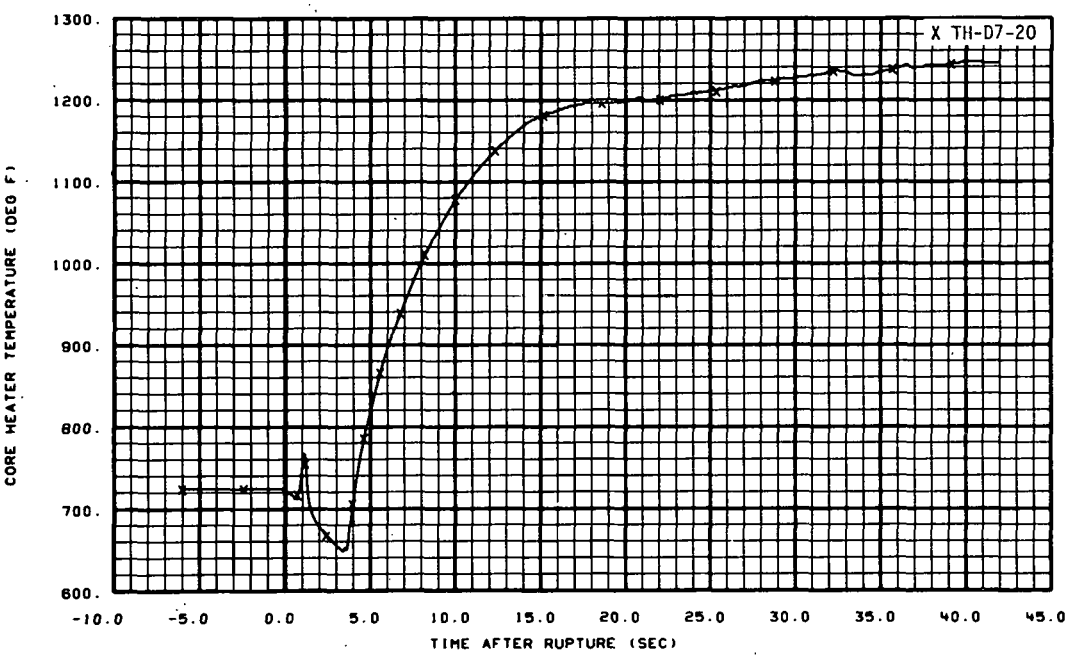


Fig. 88 Core heater temperature, Rod D-7 (TH-D7-20), from -6 to 42 seconds.

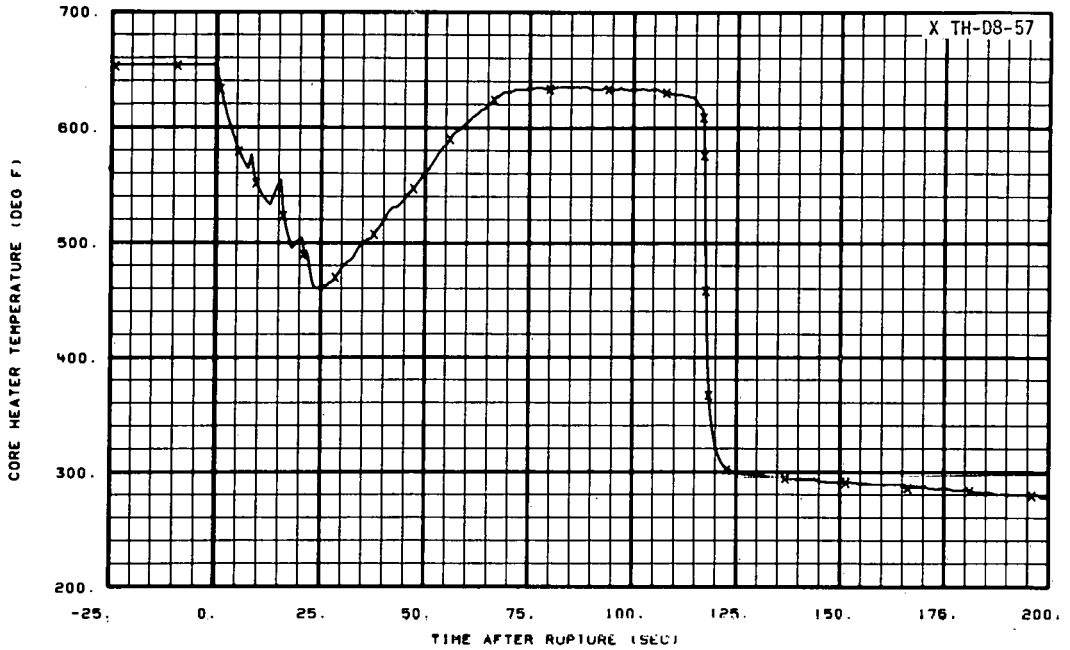


Fig. 89 Core heater temperature, Rod D-8 (TH-D8-57), from -24 to 200 seconds.

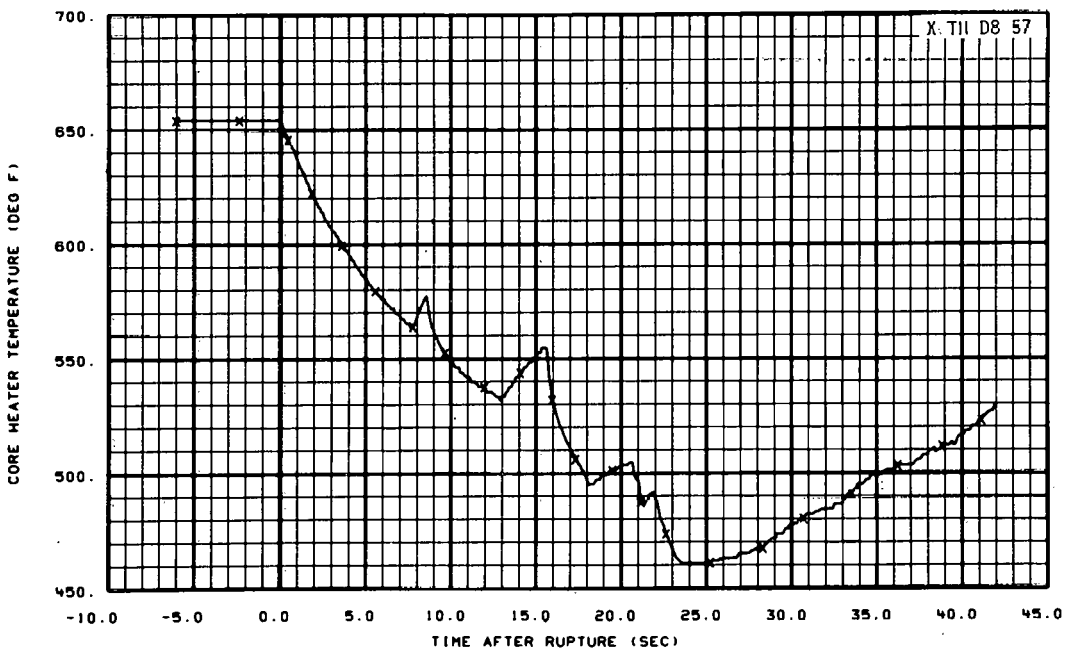


Fig. 90 Core heater temperature, Rod D-8 (TH-D8-57), from -6 to 42 seconds.

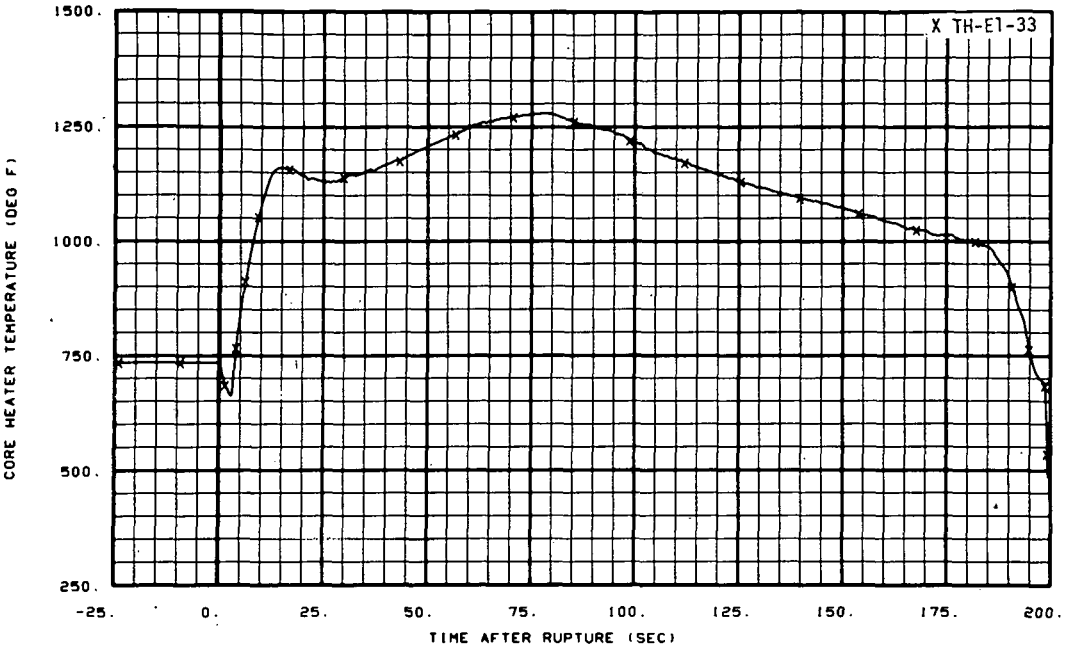


Fig. 91 Core heater temperature, Rod E-1 (TH-E1-33), from -24 to 200 seconds.

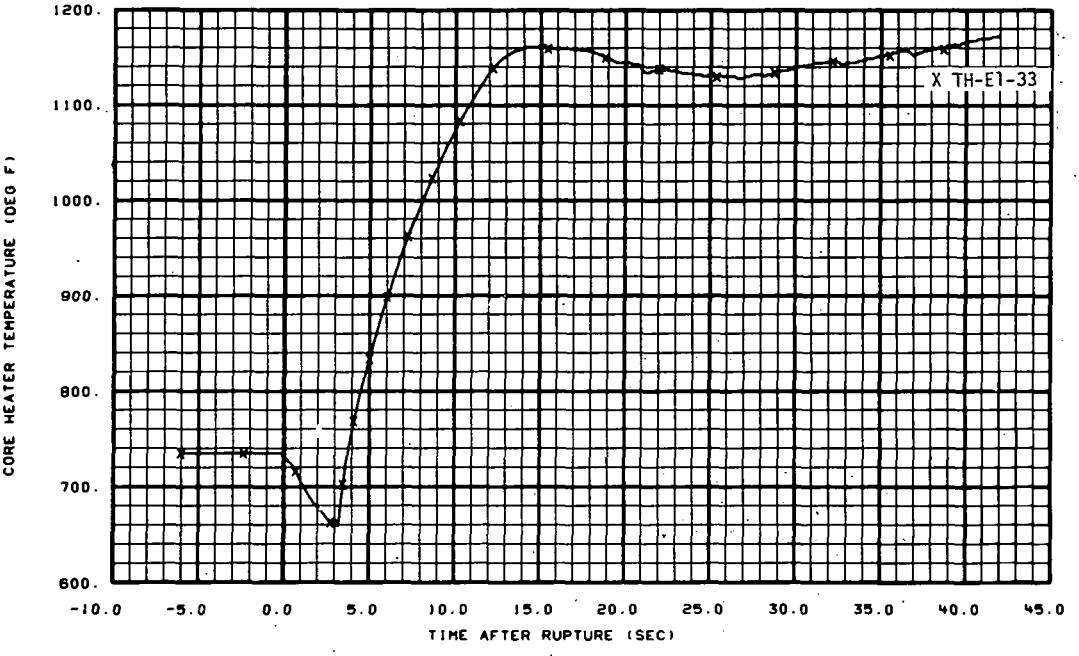


Fig. 92 Core heater temperature, Rod E-1 (TH-E1-33), from -6 to 42 seconds.

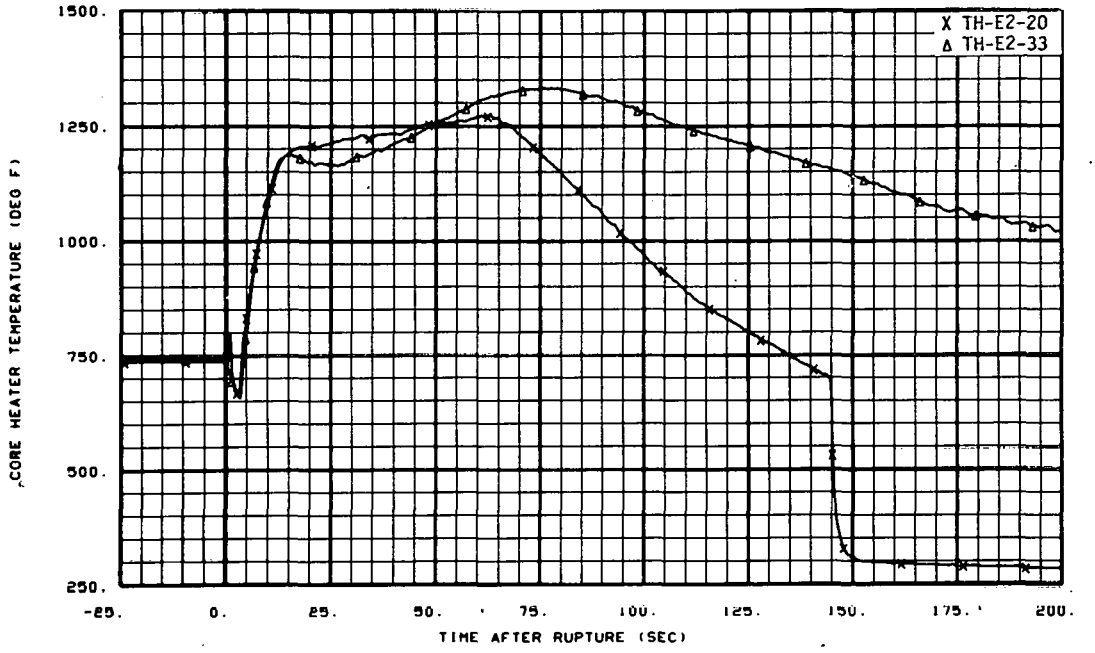


Fig. 93 Core heater temperature, Rod E-2 (TH-E2-20, TH-E2-33), from -24 to 200 seconds.

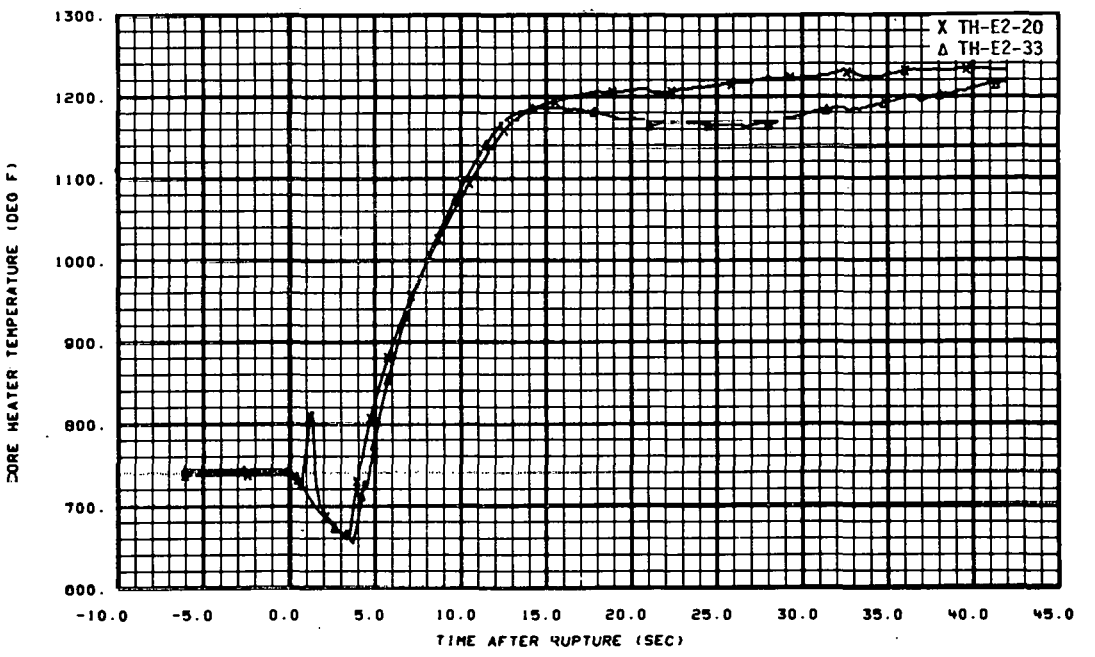


Fig. 94 Core heater temperature, Rod E-2 (TH-E2-20, TH-E2-33), from -6 to 42 seconds.

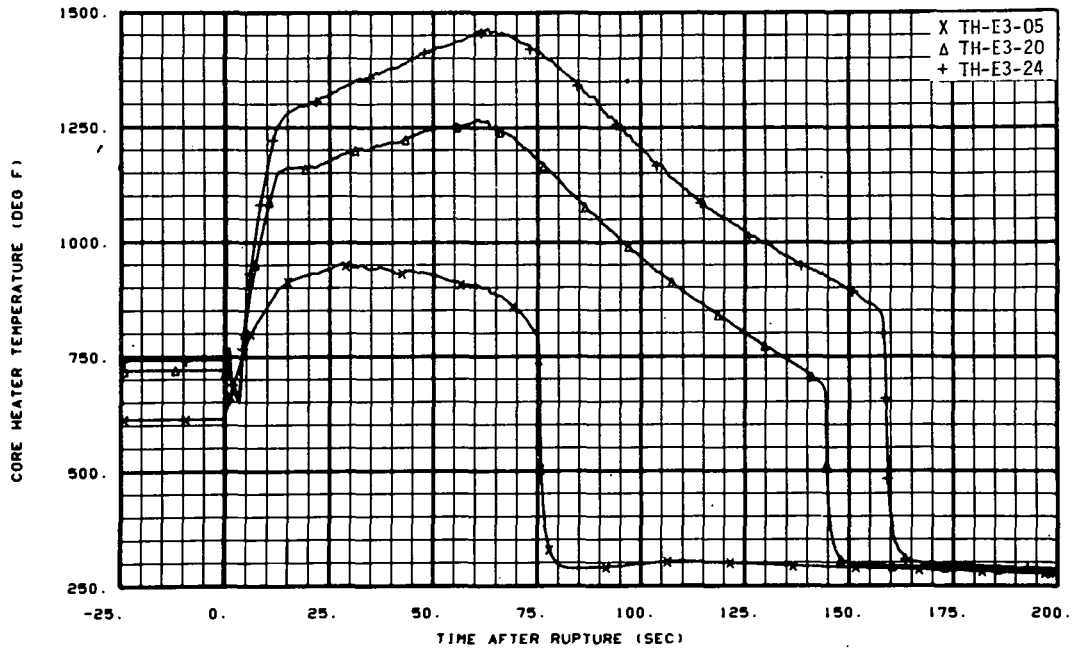


Fig. 95 Core heater temperature, Rod E-3 (TH-E3-05, TH-E3-20, TH-E3-24), from -24 to 200 seconds.

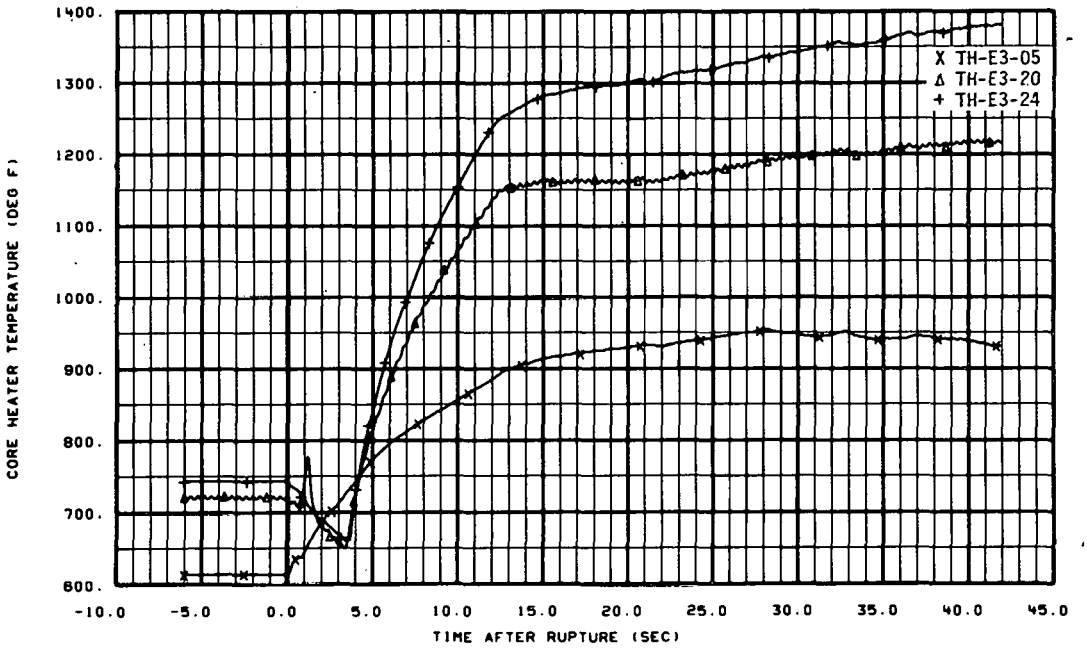


Fig. 96 Core heater temperature, Rod E-3 (TH-E3-05, TH-E3-20, TH-E3-24), from -6 to 42 seconds.

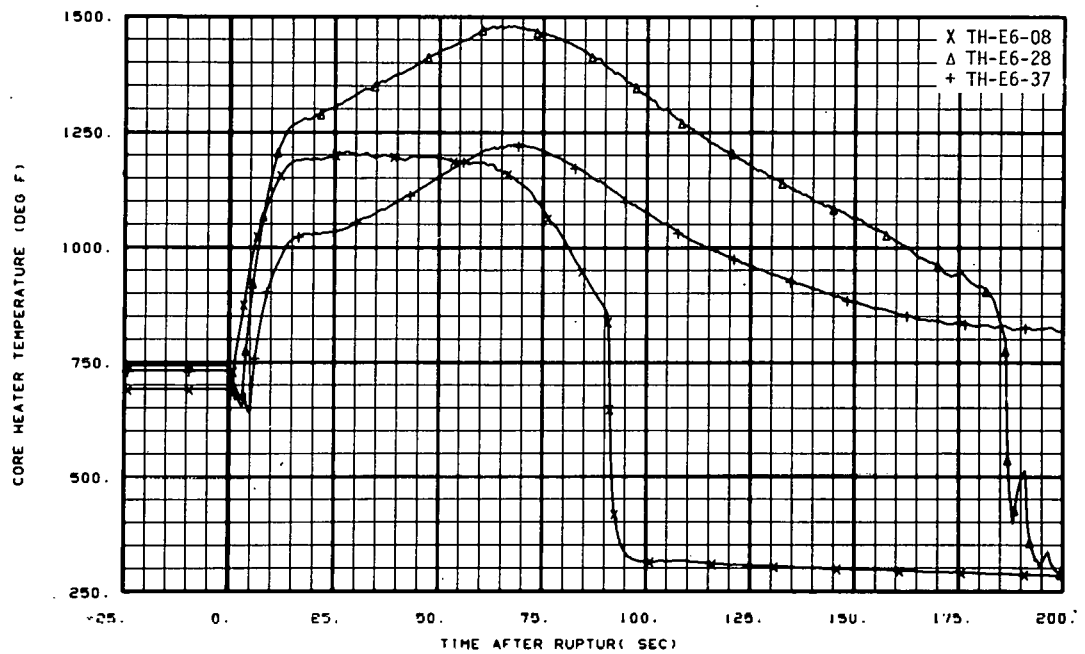


Fig. 97 Core heater temperature, Rod E-6 (TH-E6-08, TH-E6-28, TH-E6-37), from -24 to 200 seconds.

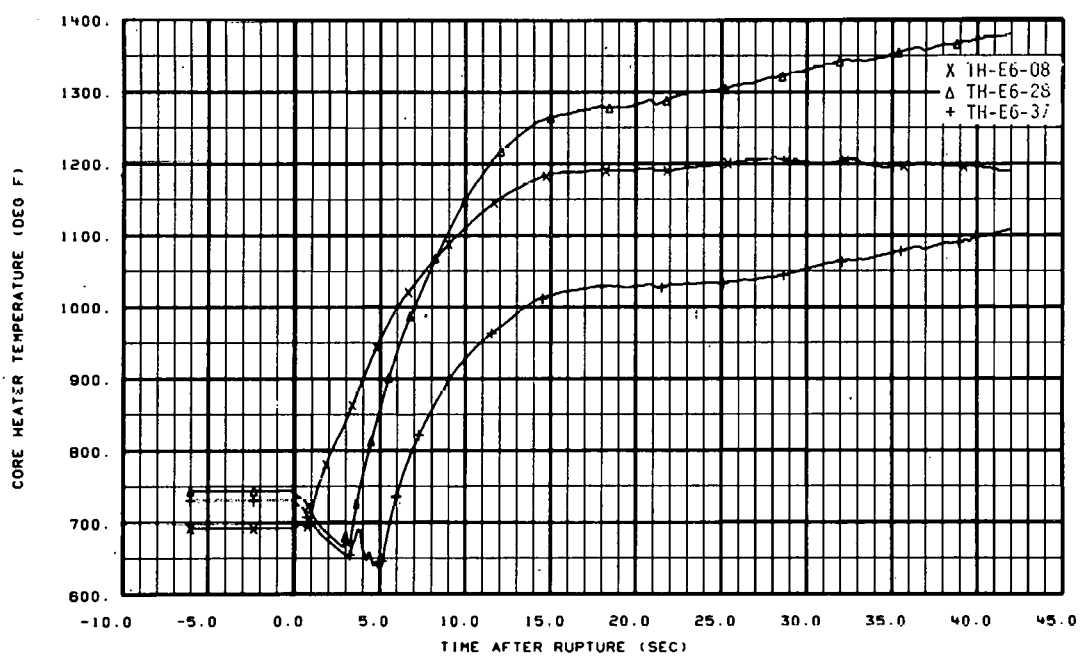


Fig. 98 Core heater temperature, Rod E-6 (TH-E6-08, TH-E6-28, TH-E6-37), from -6 to 42 seconds.

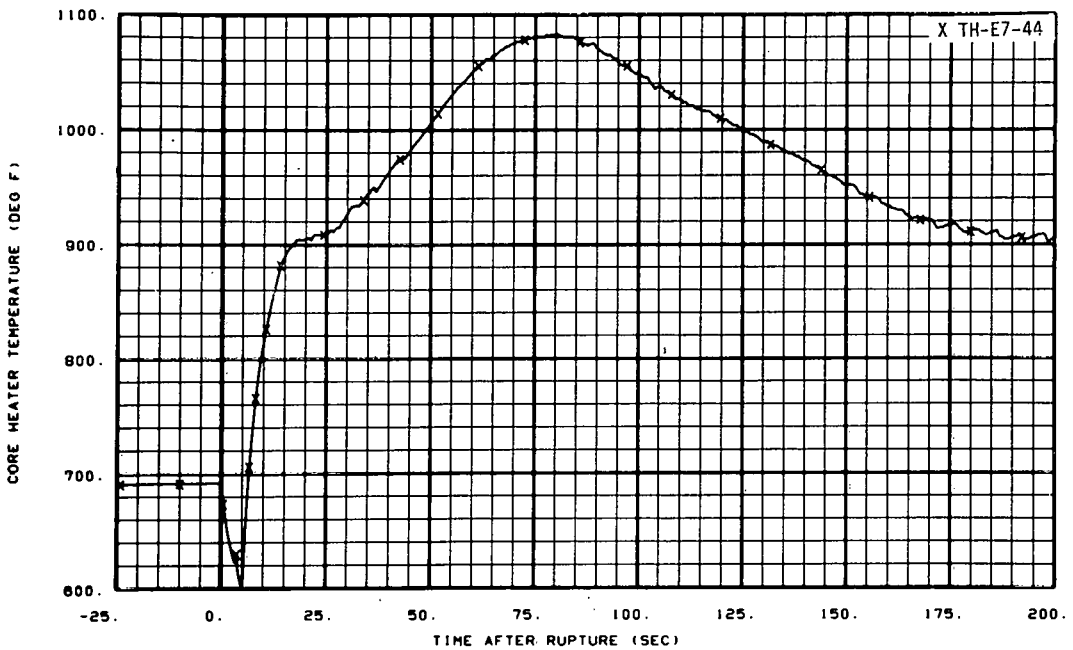


Fig. 99 Core heater temperature, Rod E-7 (TH-E7-44), from -24 to 200 seconds.

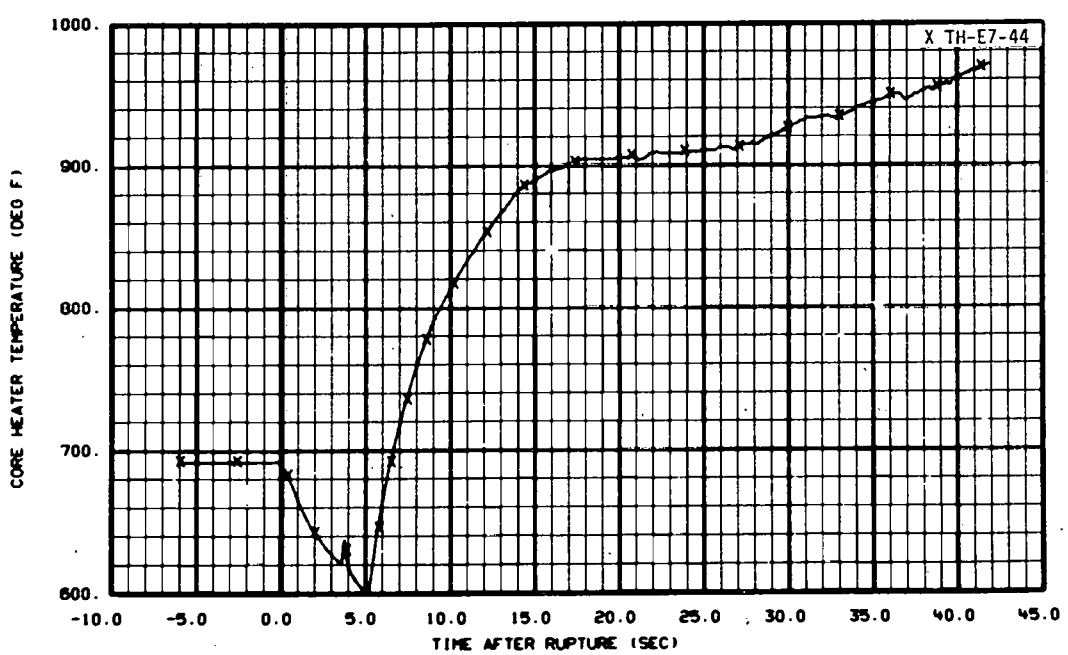


Fig. 100 Core heater temperature, Rod E-7 (TH-E7-44), from -6 to 42 seconds.

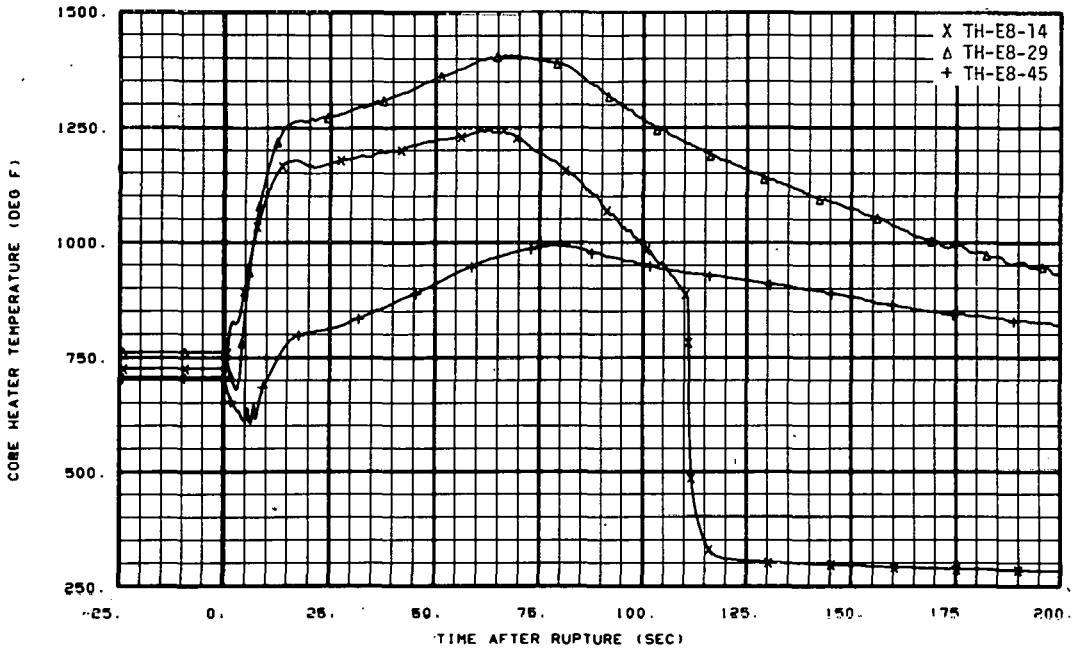


Fig. 101 Core heater temperature, Rod E-8 (TH-E8-14, TH-E8-29, TH-E8-45), from -24 to 200 seconds.

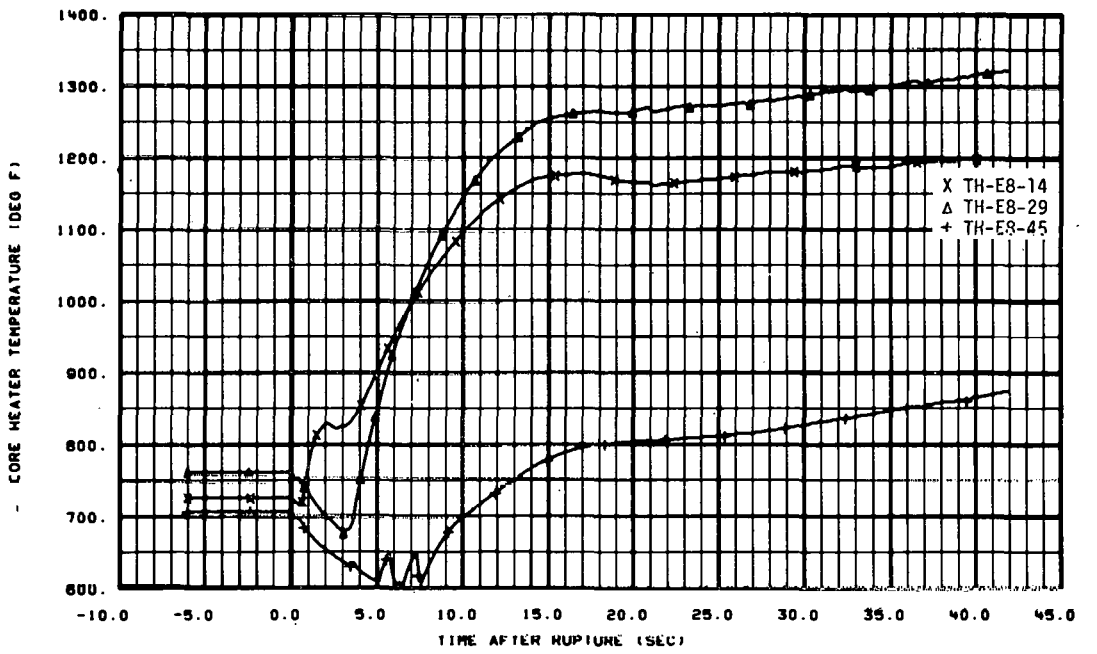


Fig. 102 Core heater temperature, Rod E-8 (TH-E8-14, TH-E8-29, TH-E8-45), from -6 to 42 seconds.

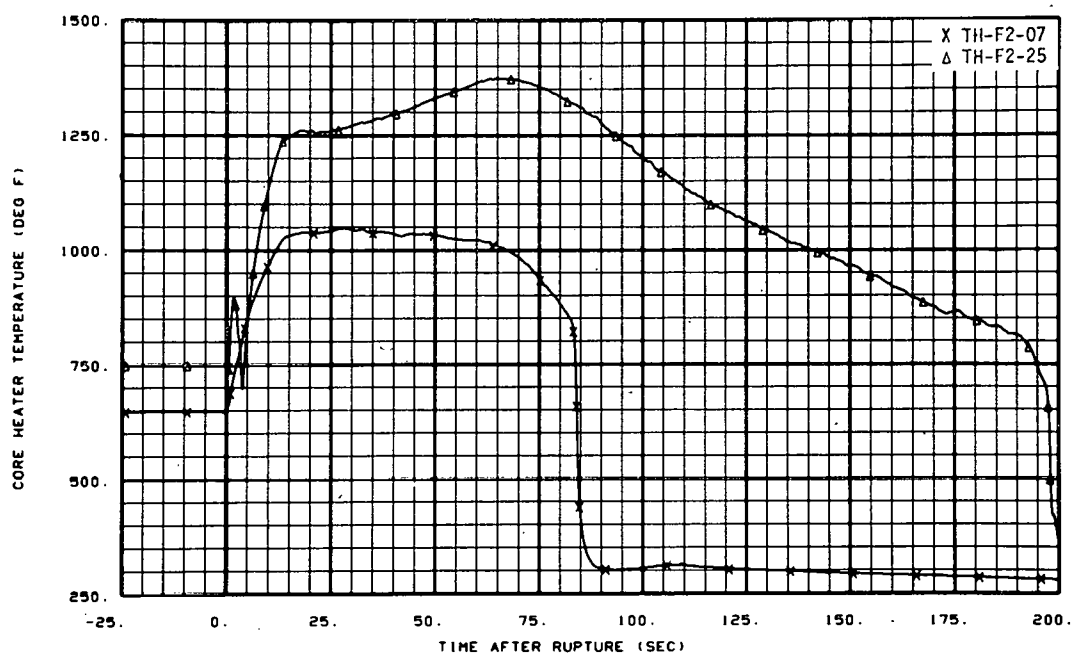


Fig. 103 Core heater temperature, Rod F-2 (TH-F2-07, TH-F2-25), from -24 to 200 seconds.

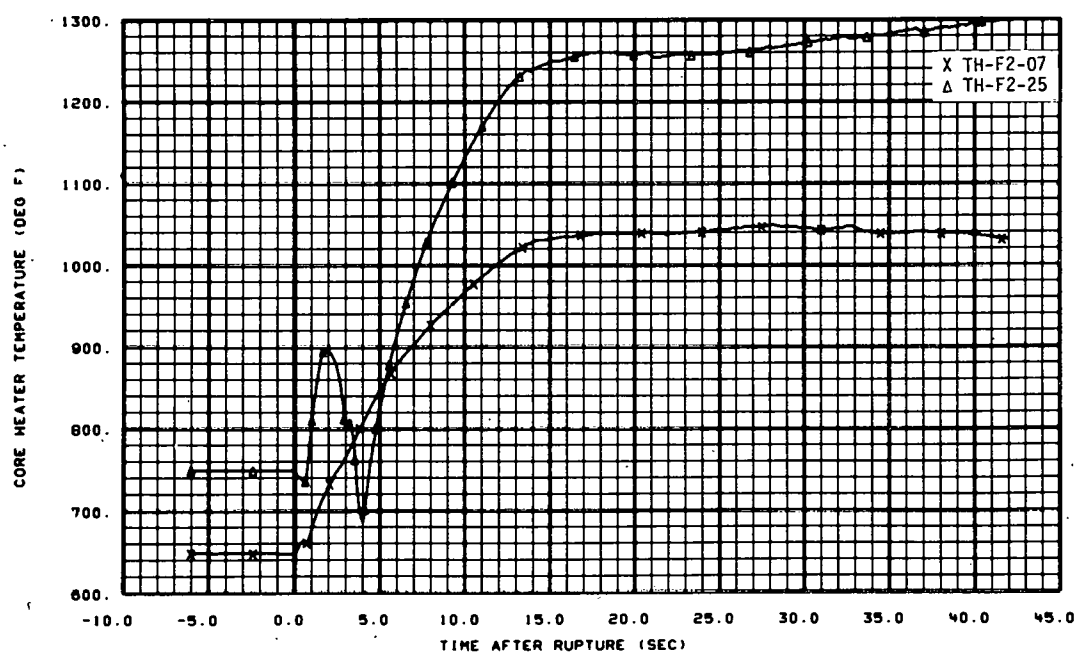


Fig. 104 Core heater temperature, Rod F-2 (TH-F2-07, TH-F2-25), from -6 to 42 seconds.

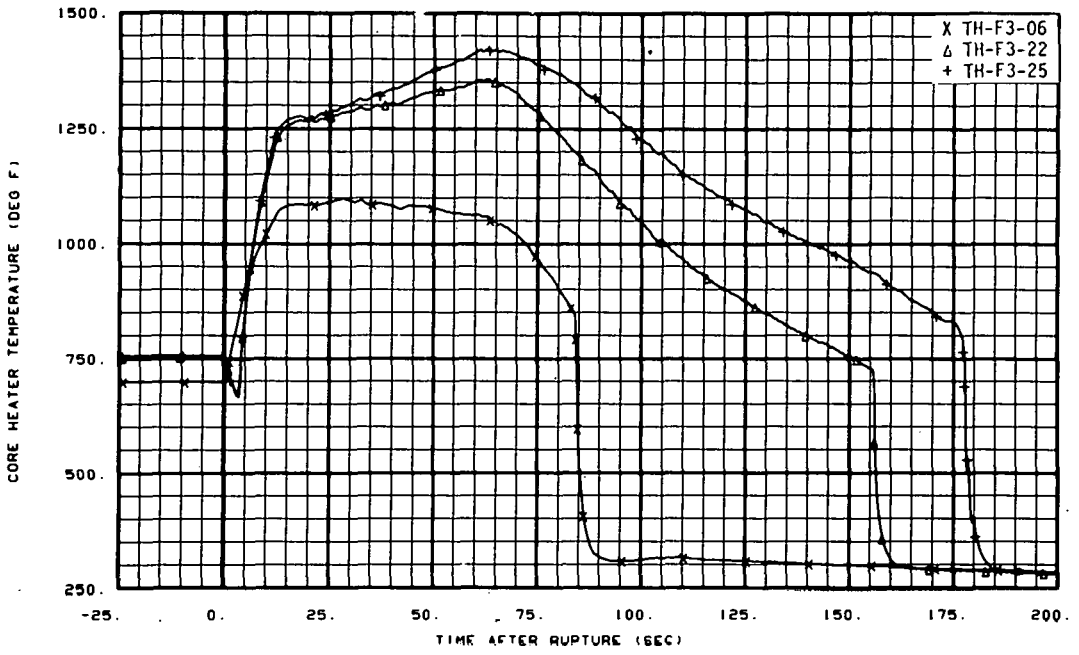


Fig. 105 Core heater temperature, Rod F-3 (TH-F3-06, TH-F3-22, TH-F3-25), from -24 to 200 seconds.

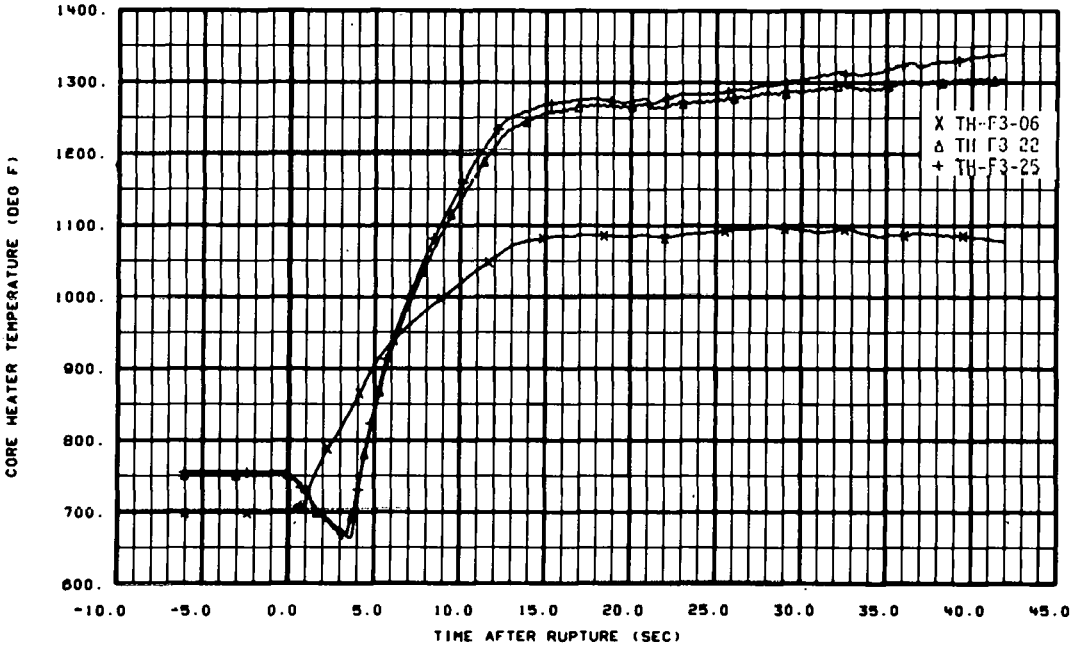


Fig. 106 Core heater temperature, Rod F-3 (TH-F3-06, TH-F3-22, TH-F3-25), from -6 to 42 seconds.

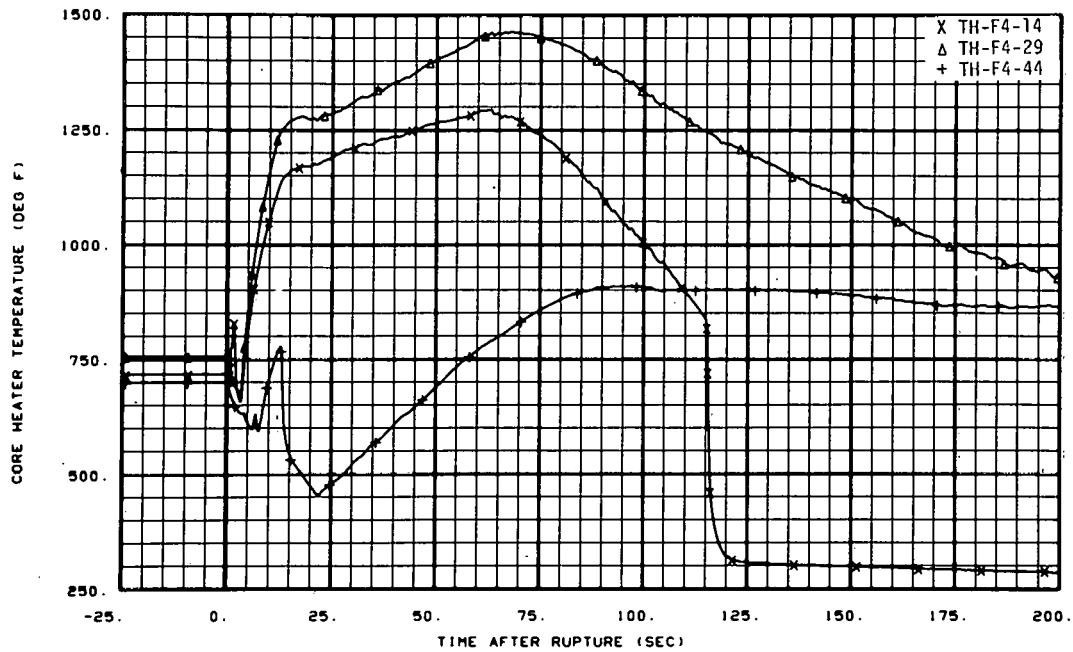


Fig. 107 Core heater temperature, Rod F-4 (TH-F4-14, TH-F4-29, TH-F4-44), from -24 to 200 seconds.

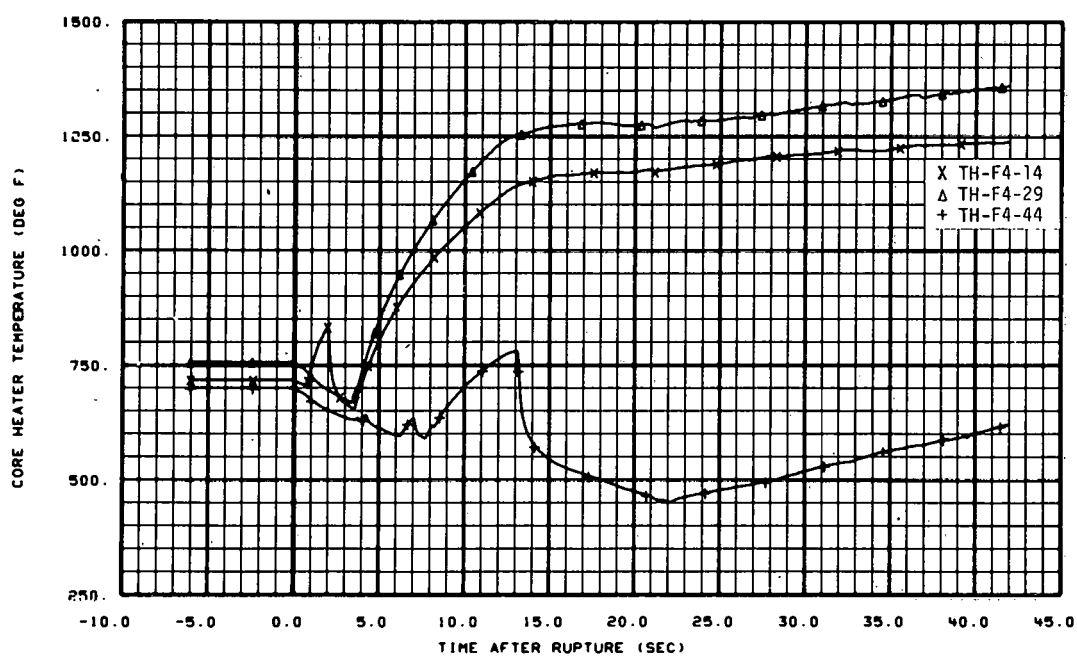


Fig. 108 Core heater temperature, Rod F-4 (TH-F4-14, TH-F4-29, TH-F4-44), from -6 to 42 seconds.

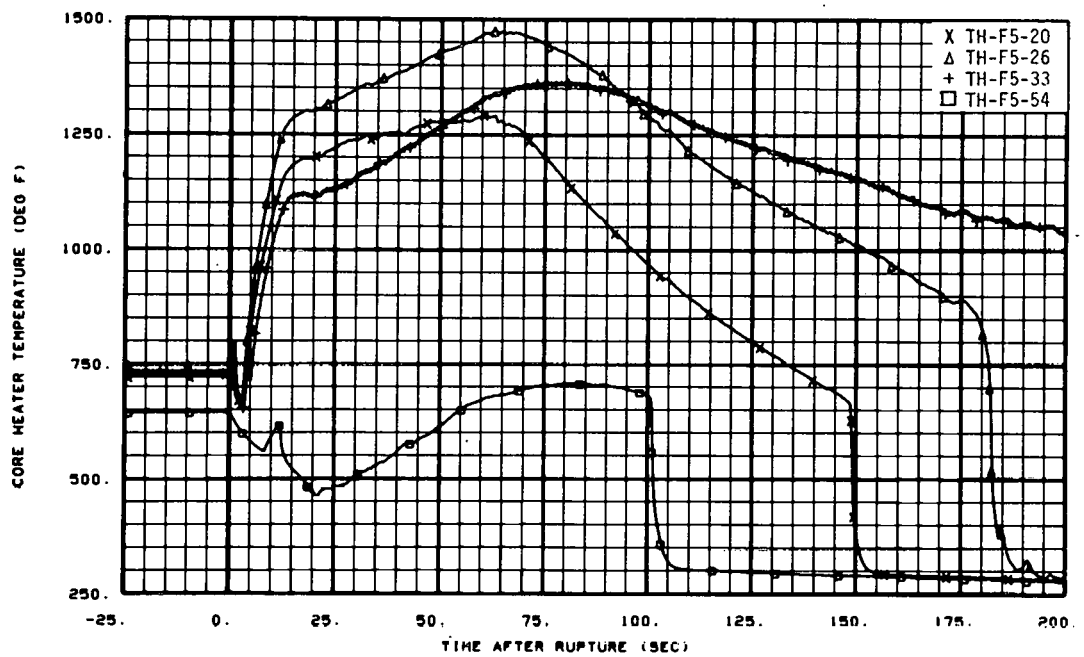


Fig. 109 Core heater temperature, Rod F-5 (TH-F5-20, TH-F5-26, TH-F5-33, TH-F5-54), from -24 to 200 seconds.

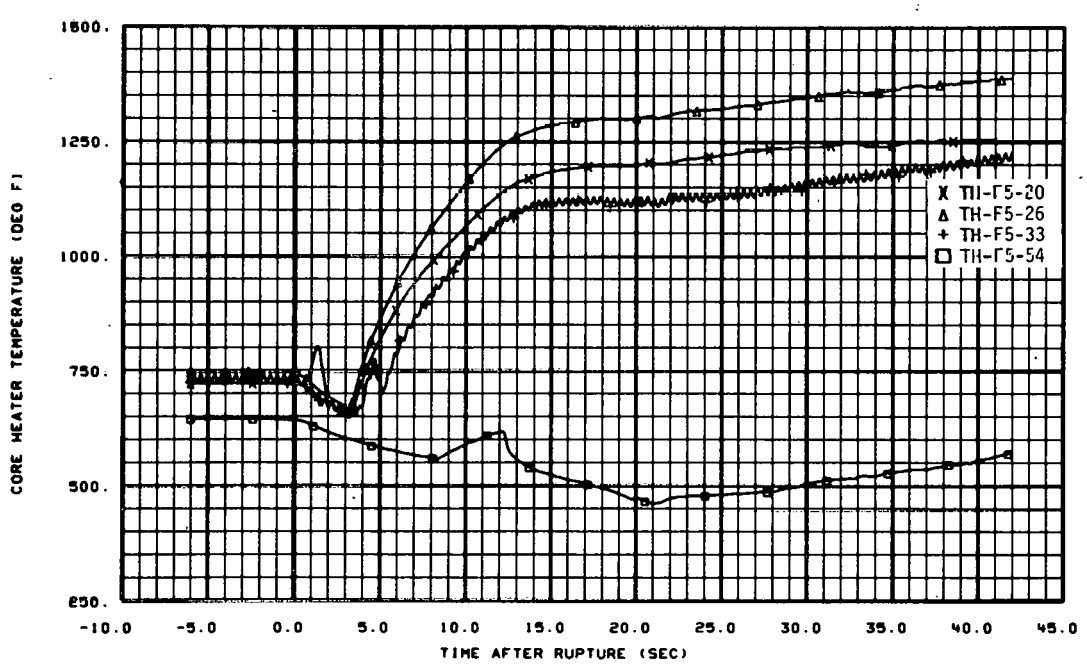


Fig. 110 Core heater temperature, Rod F-5 (TH-F5-20, TH-F5-26, TH-F5-33, TH-F5-54), from -6 to 42 seconds.

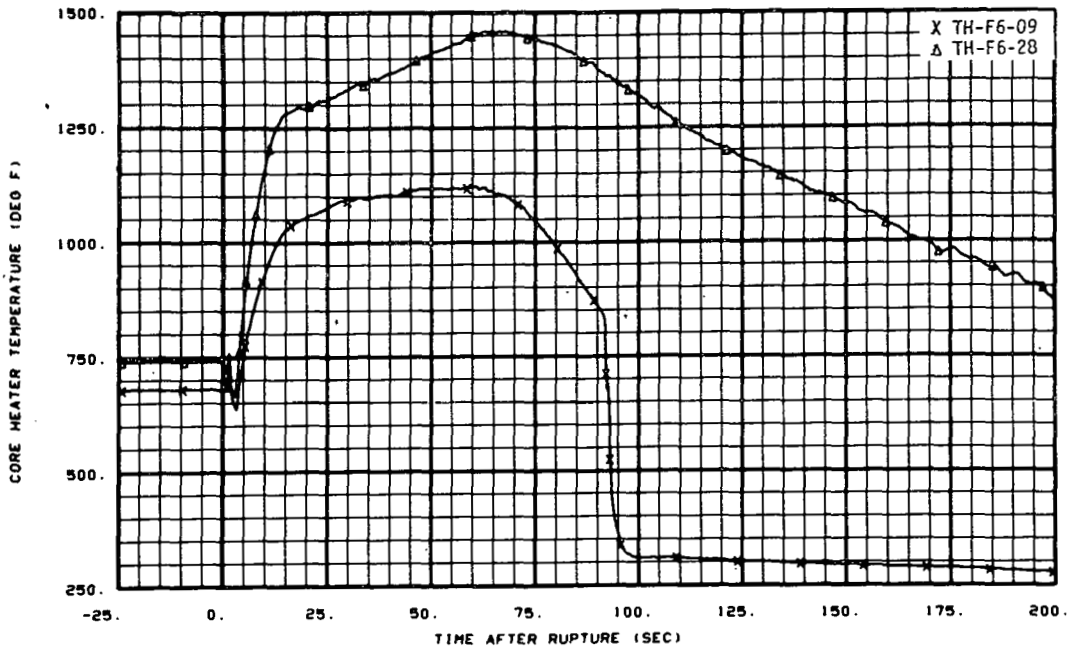


Fig. 111 Core heater temperature, Rod F-6 (TH-F6-09, TH-F6-28), from -24 to 200 seconds.

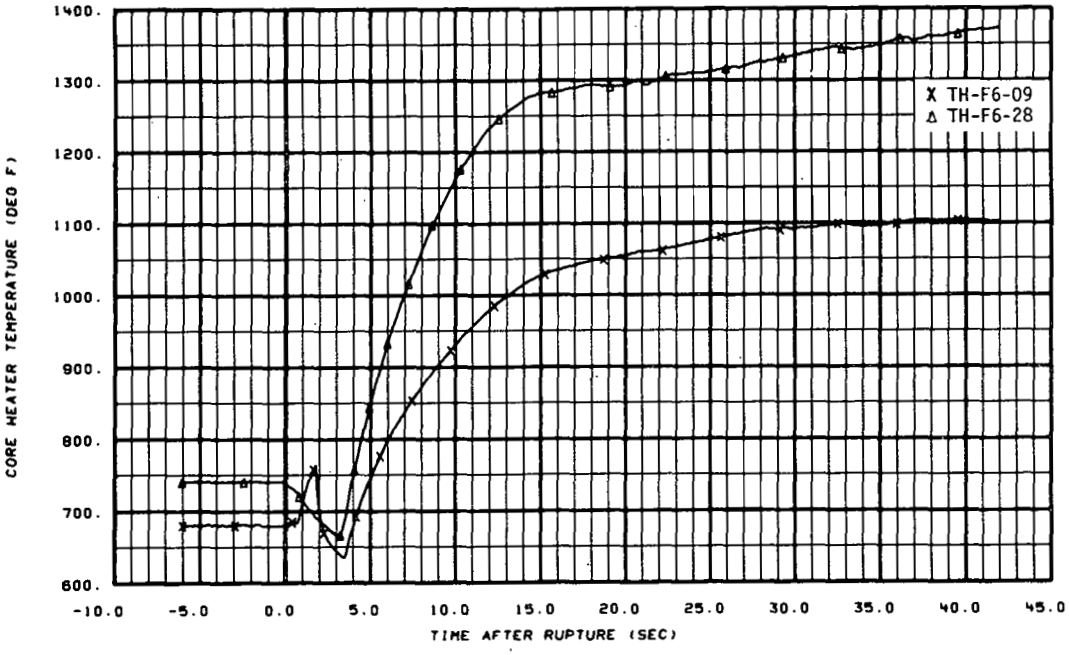


Fig. 112 Core heater temperature, Rod F-6 (TH-F6-09, TH-F6-28), from -6 to 42 seconds.

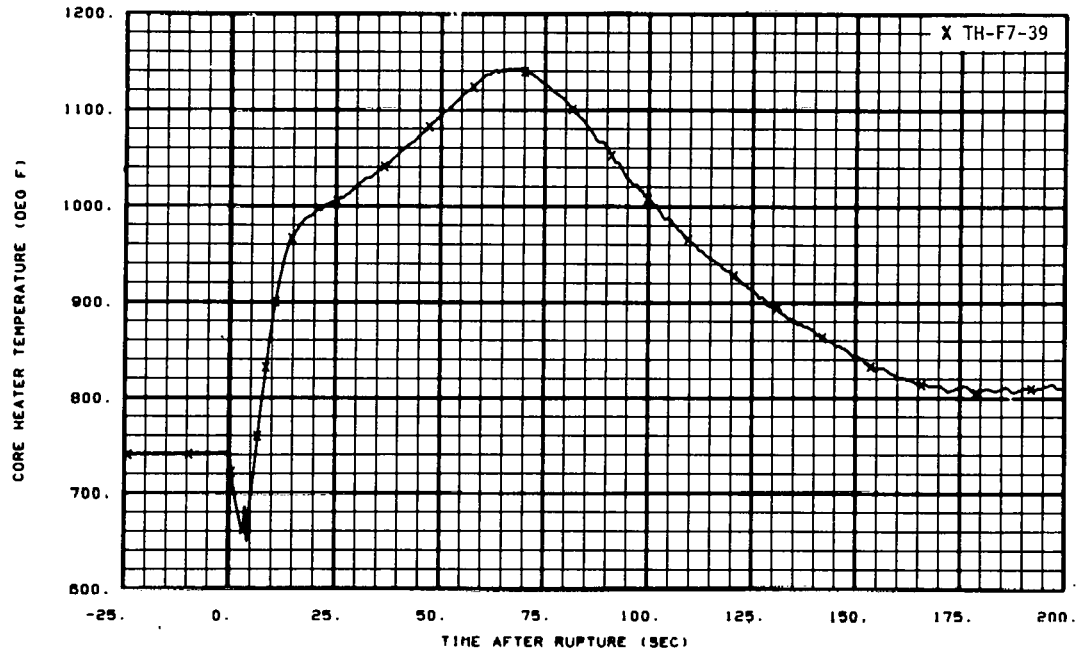


Fig. 113 Core heater temperature, Rod F-7 (TH-F7-39), from -24 to 200 seconds.

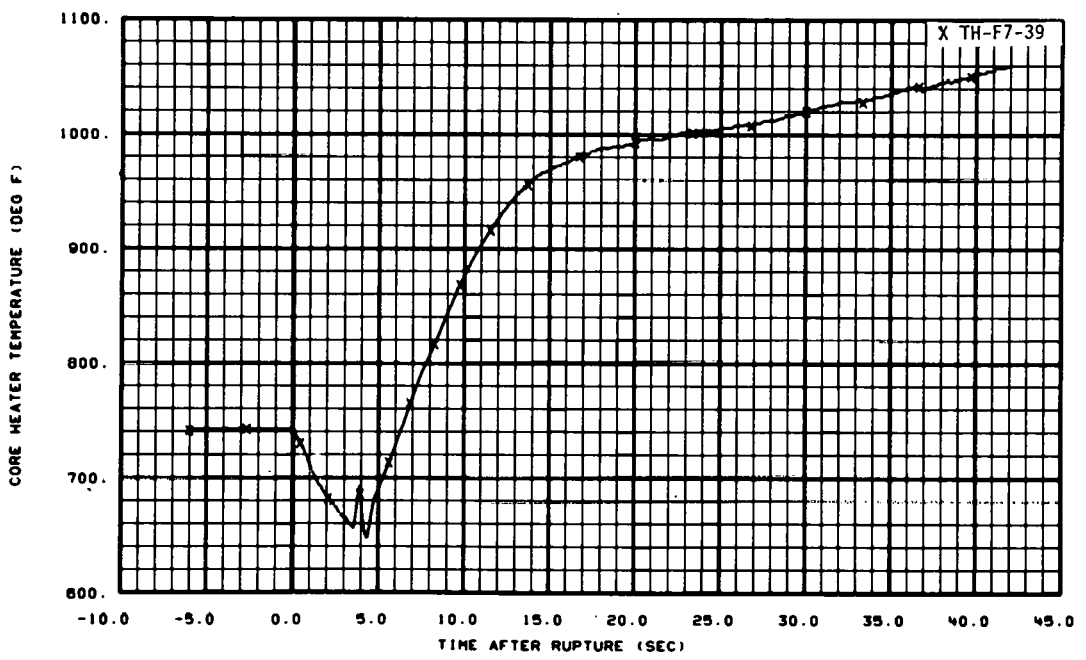


Fig. 114 Core heater temperature, Rod F-7 (TH-F7-39), from -6 to 42 seconds.

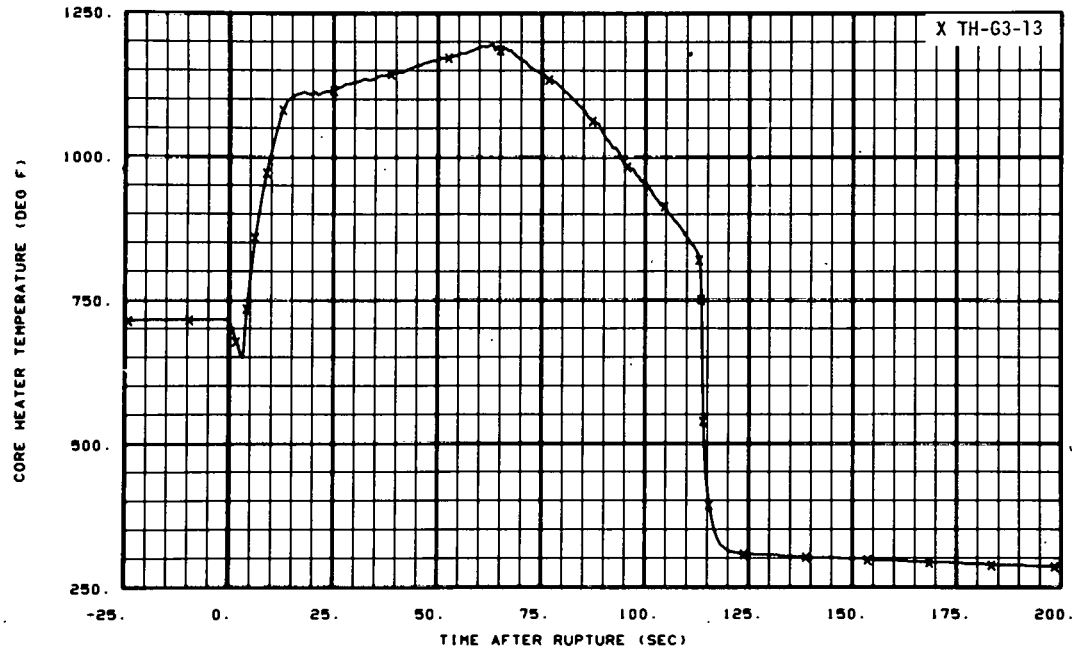


Fig. 115 Core heater temperature, Rod G-3 (TH-G3-13), from -24 to 200 seconds.

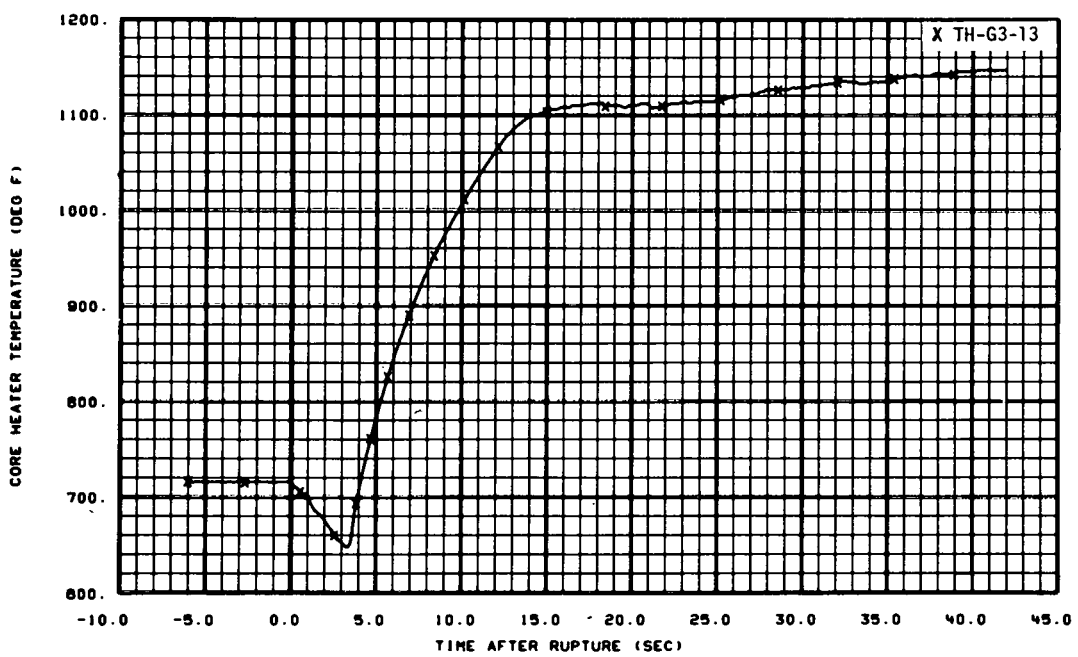


Fig. 116 Core heater temperature, Rod G-3 (TH-G3-13), from -6 to 42 seconds.

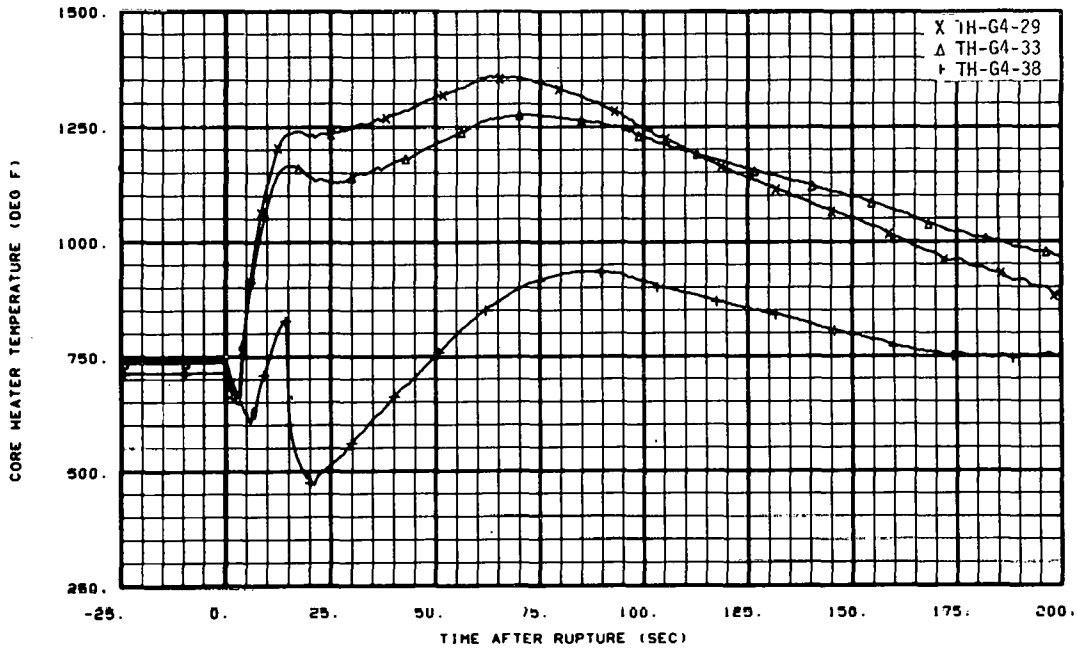


Fig. 117 Core heater temperature, Rod G-4 (TH-G4-29, TH-G4-33, TH-G4-38), from -24 to 200 seconds.

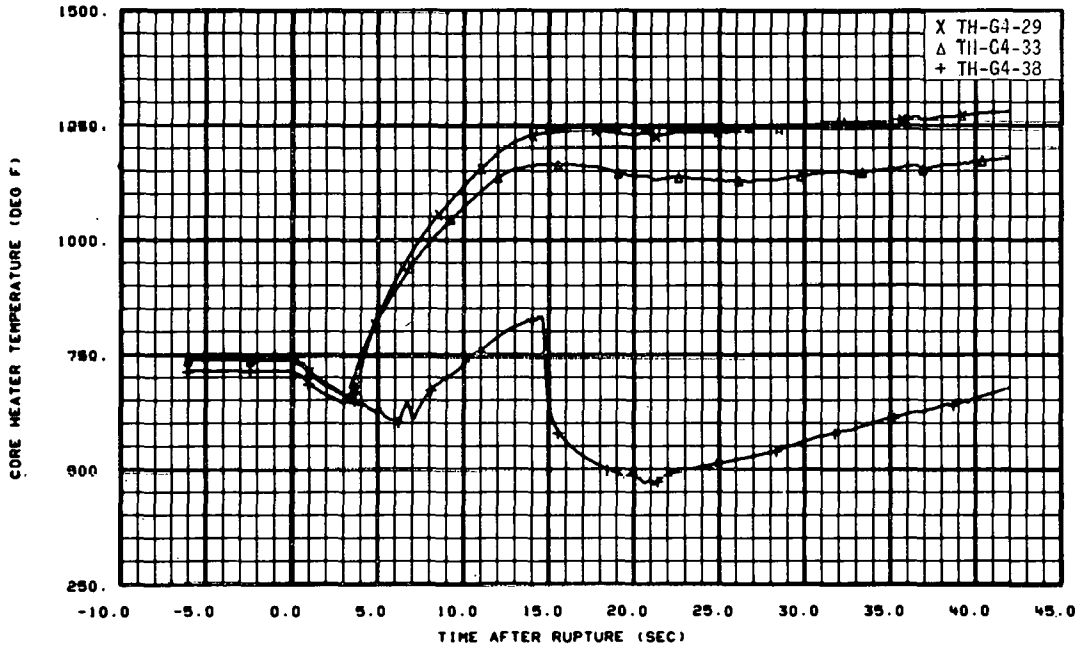


Fig. 118 Core heater temperature, Rod G-4 (TH-G4-29, TH-G4-33, TH-G4-38), from -6 to 42 seconds.

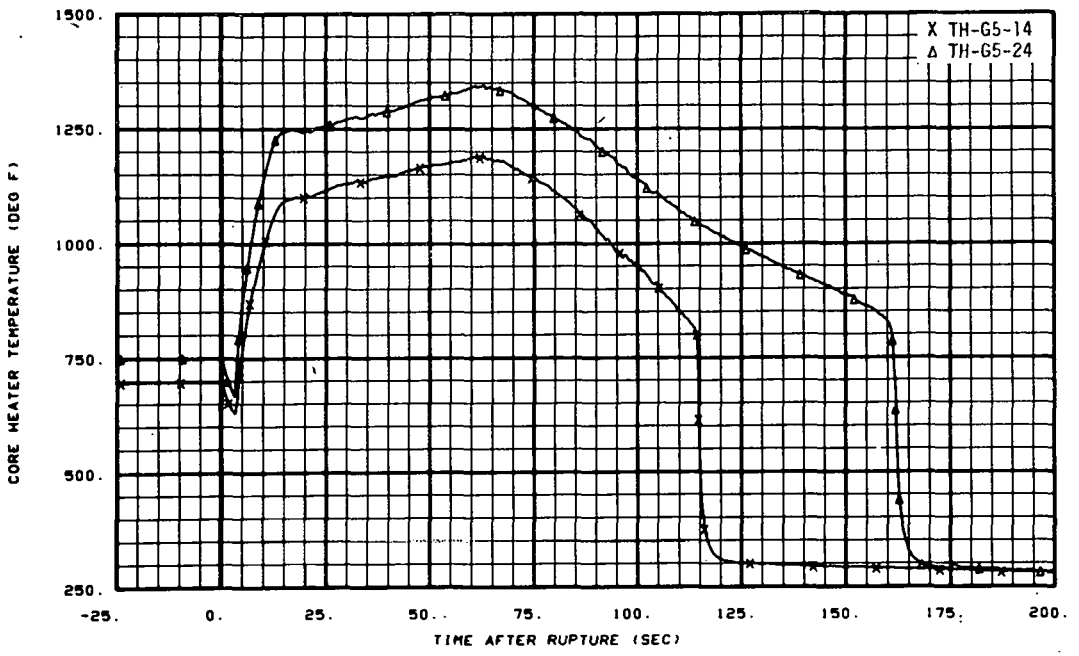


Fig. 119 Core heater temperature, Rod G-5 (TH-G5-14, TH-G5-24), from -24 to 200 seconds.

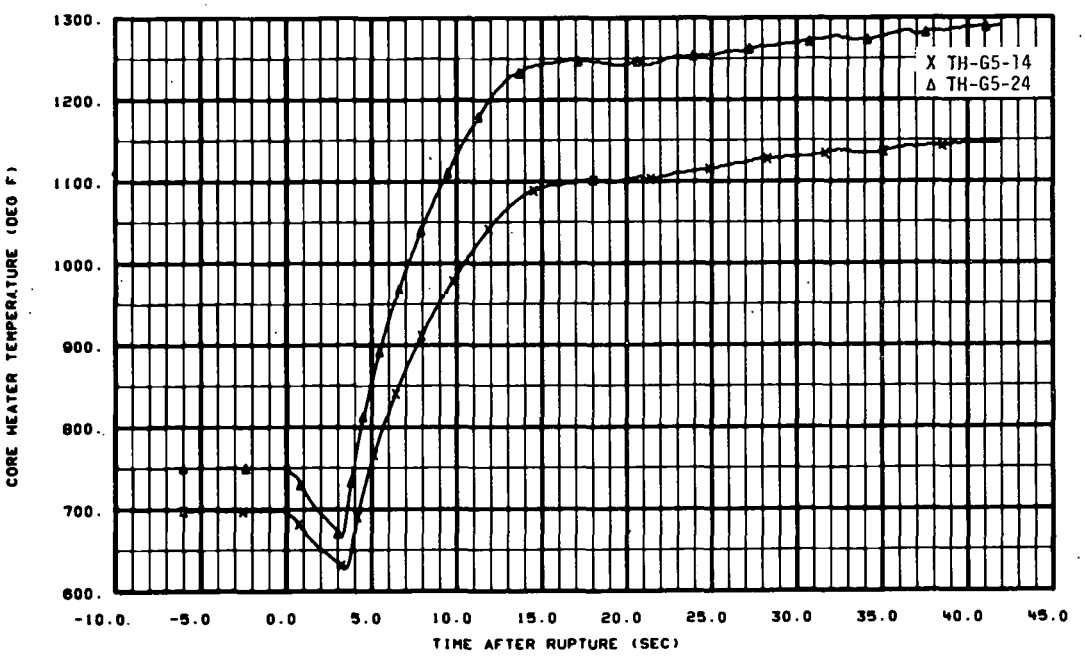


Fig. 120 Core heater temperature, Rod G-5 (TH-G5-14, TH-G5-24), from -6 to 42 seconds.

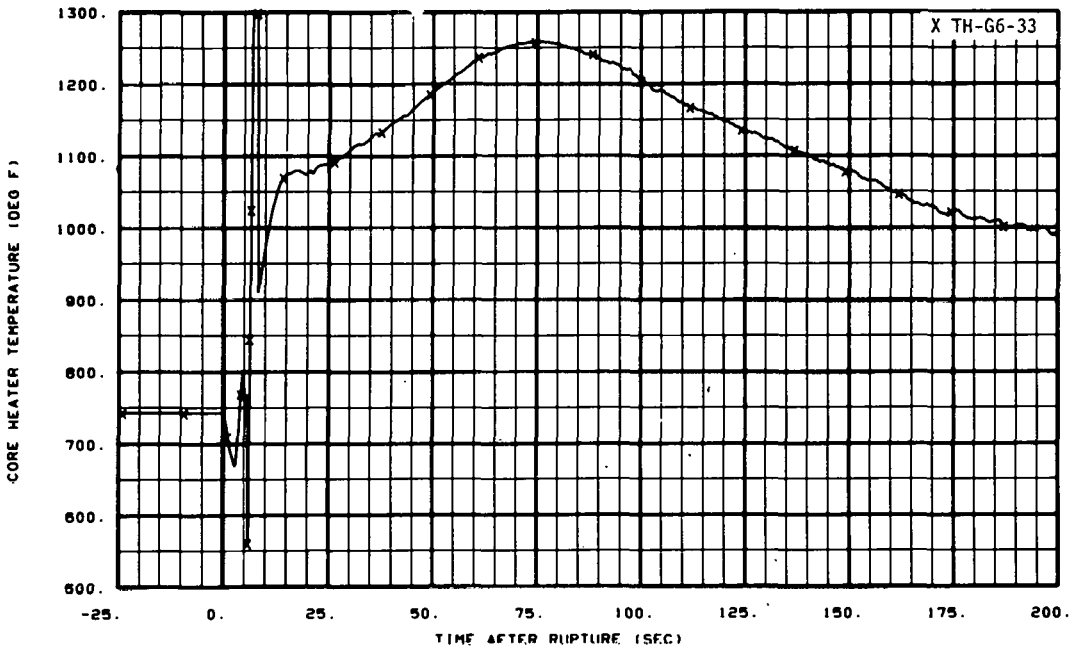


Fig. 121 Core heater temperature, Rod G-6 (TH-G6-33), from -24 to 200 seconds.

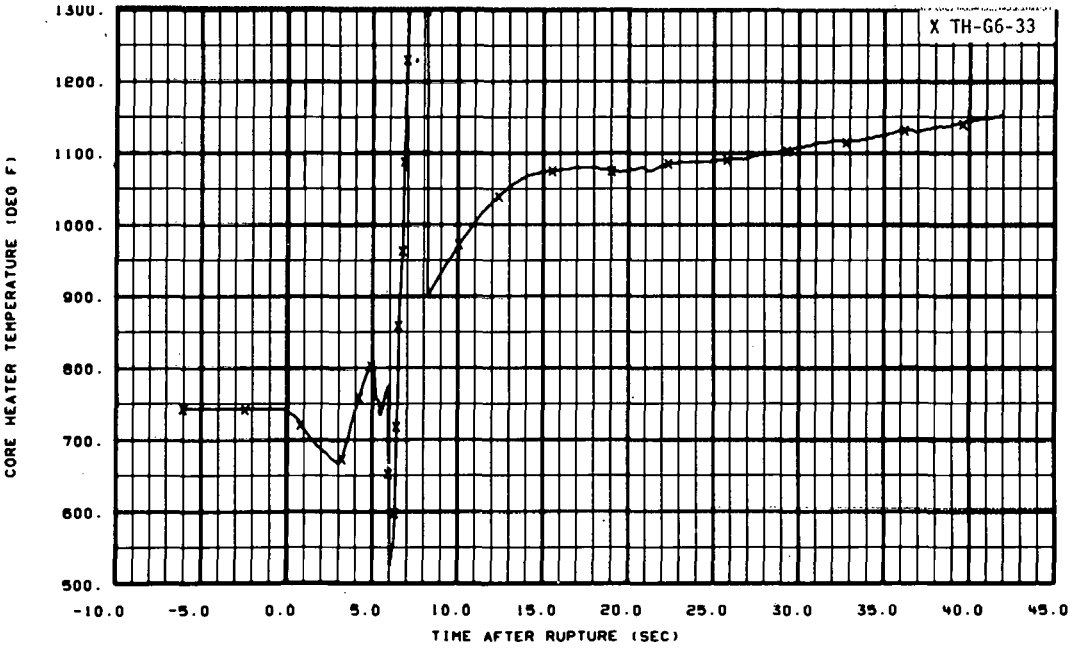


Fig. 122 Core heater temperature, Rod G-6 (TH-G6-33), from -6 to 42 seconds.

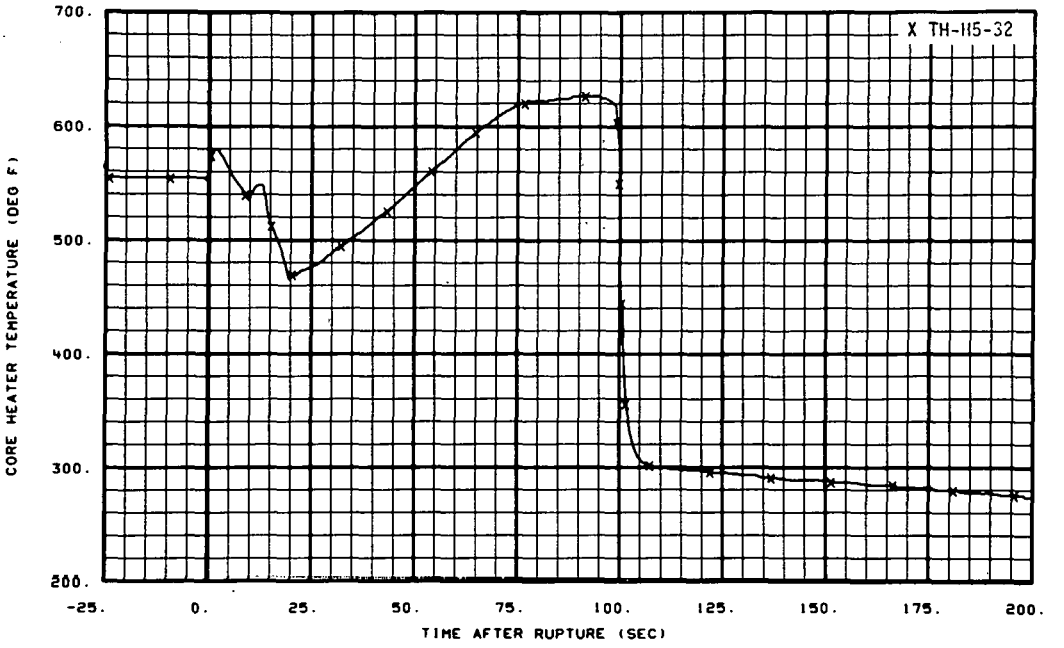


Fig. 123 Core heater temperature, Rod H-5 (TH-H5-32), from -24 to 200 seconds.

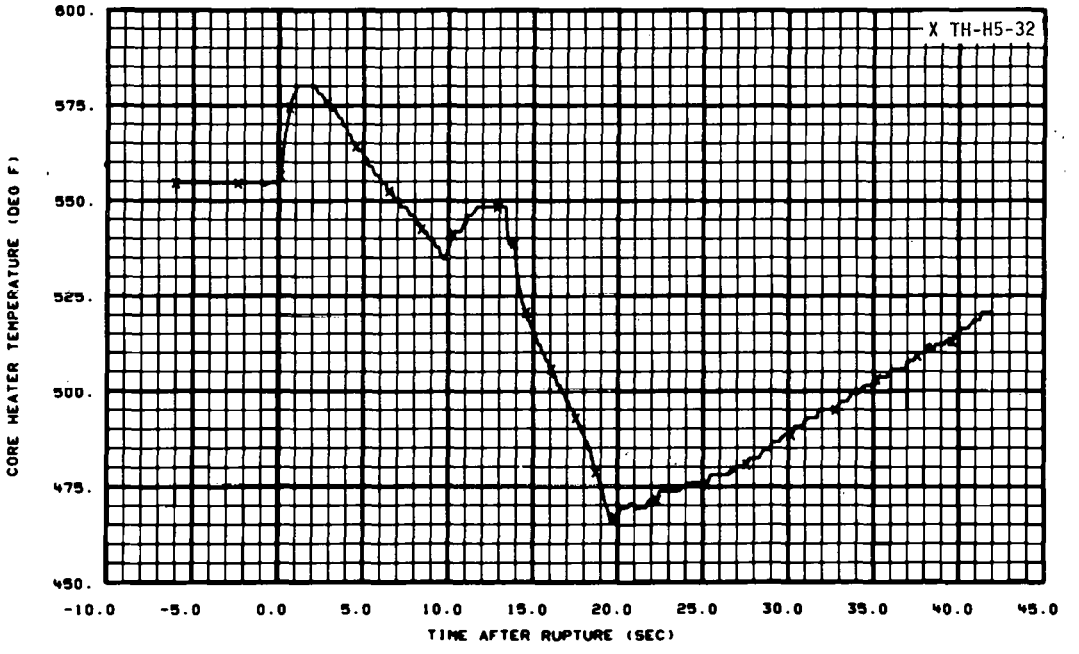


Fig. 124 Core heater temperature, Rod H-5 (TH-H5-32), from -6 to 42 seconds.

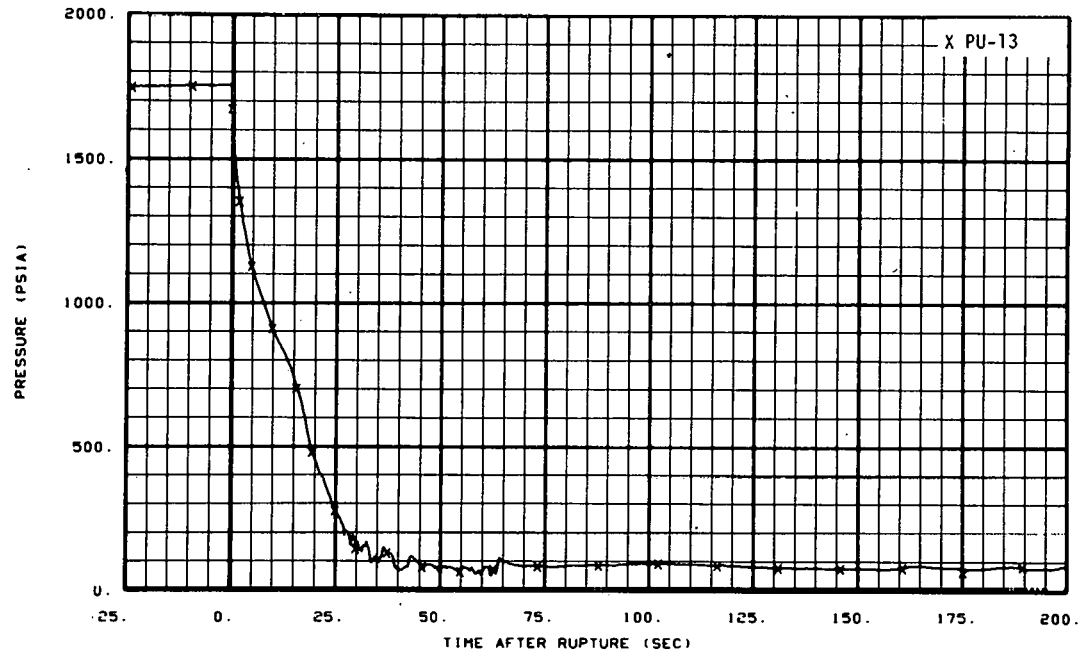


Fig. 125 Pressure in intact loop, Spool 13 (PU-13), from -24 to 200 seconds.

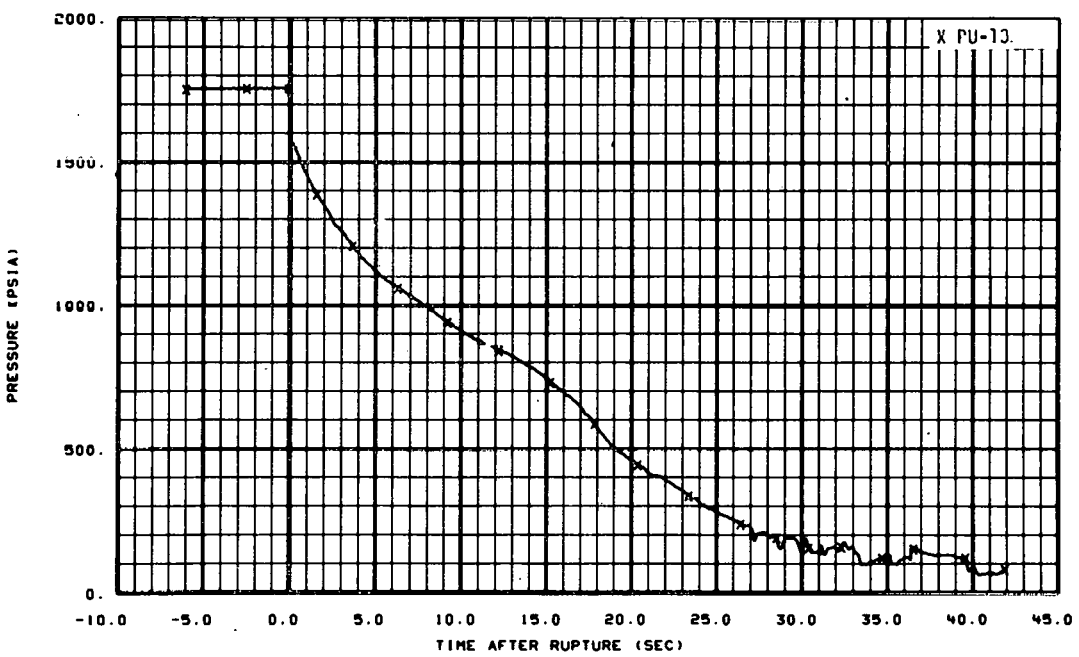


Fig. 126 Pressure in intact loop, Spool 13 (PU-13), from -6 to 42 seconds.

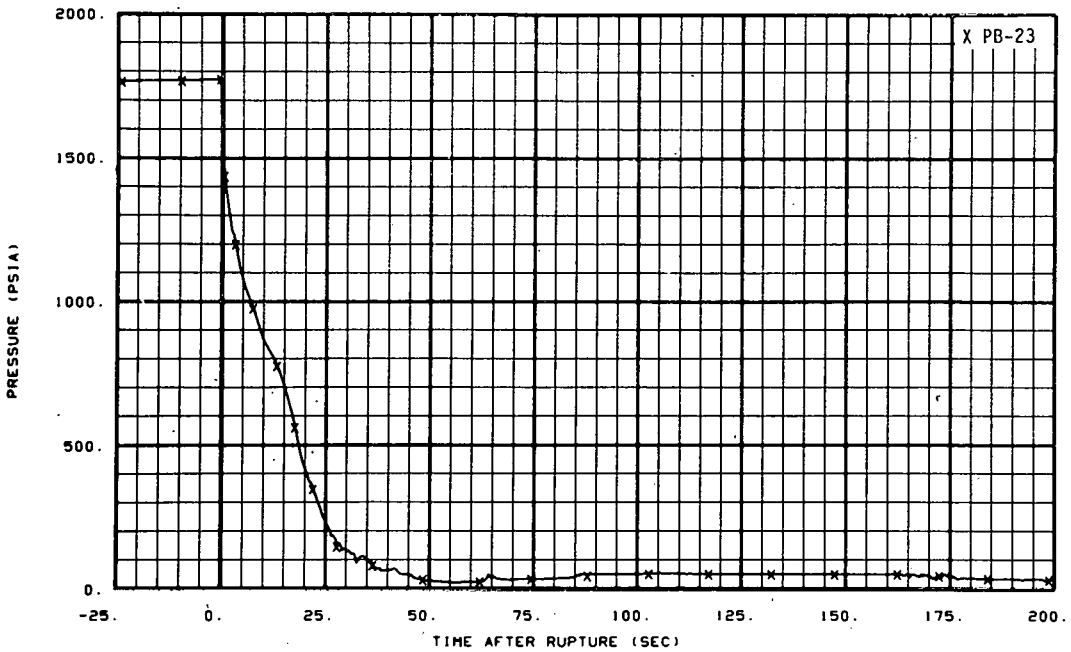


Fig. 127 Pressure in broken loop, Spool 23 (PB-23), from -24 to 200 seconds.

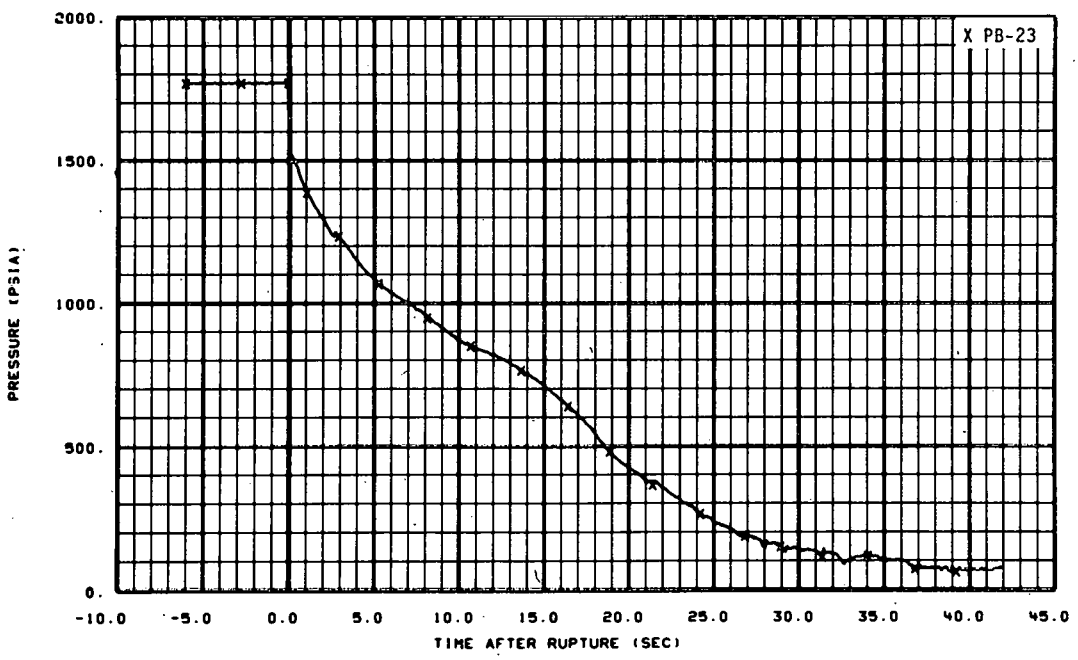


Fig. 128 Pressure in broken loop, Spool 23 (PB-23), from -6 to 42 seconds.

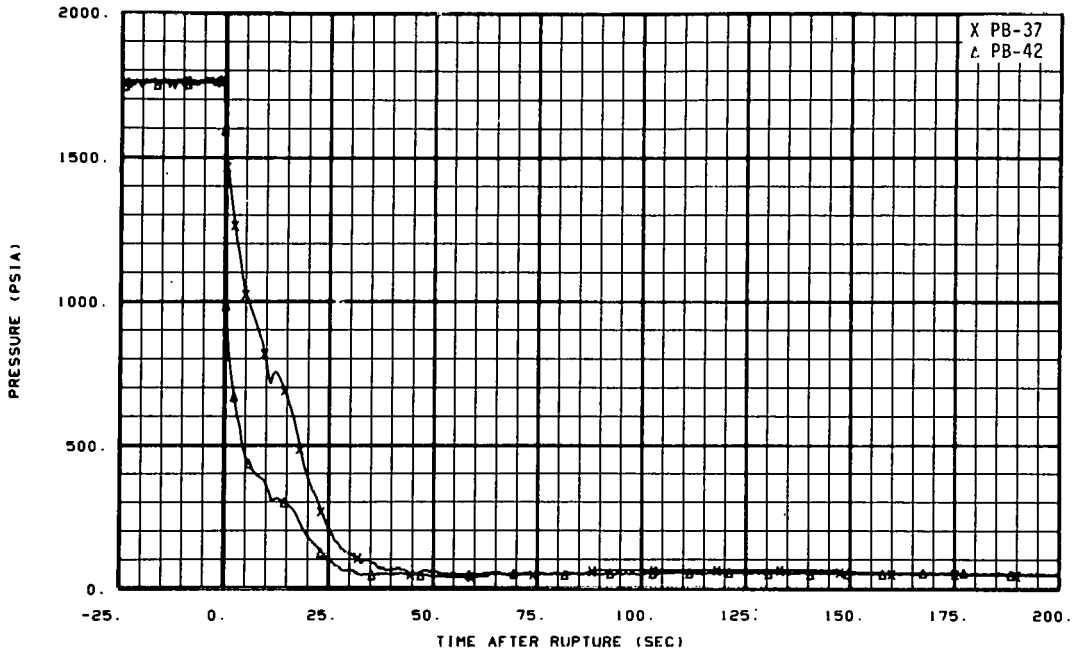


Fig. 129 Pressure in broken loop, near break (PB-37, PB-42), from -24 to 200 seconds.

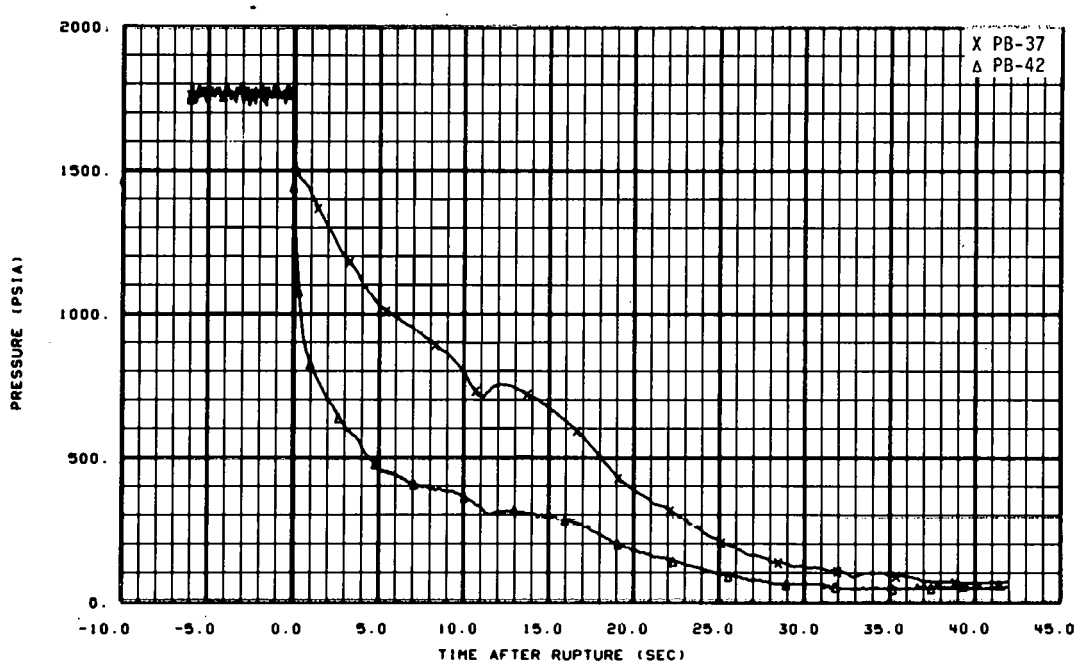


Fig. 130 Pressure in broken loop, near break (PB-37, PB-42), from -6 to 42 seconds.

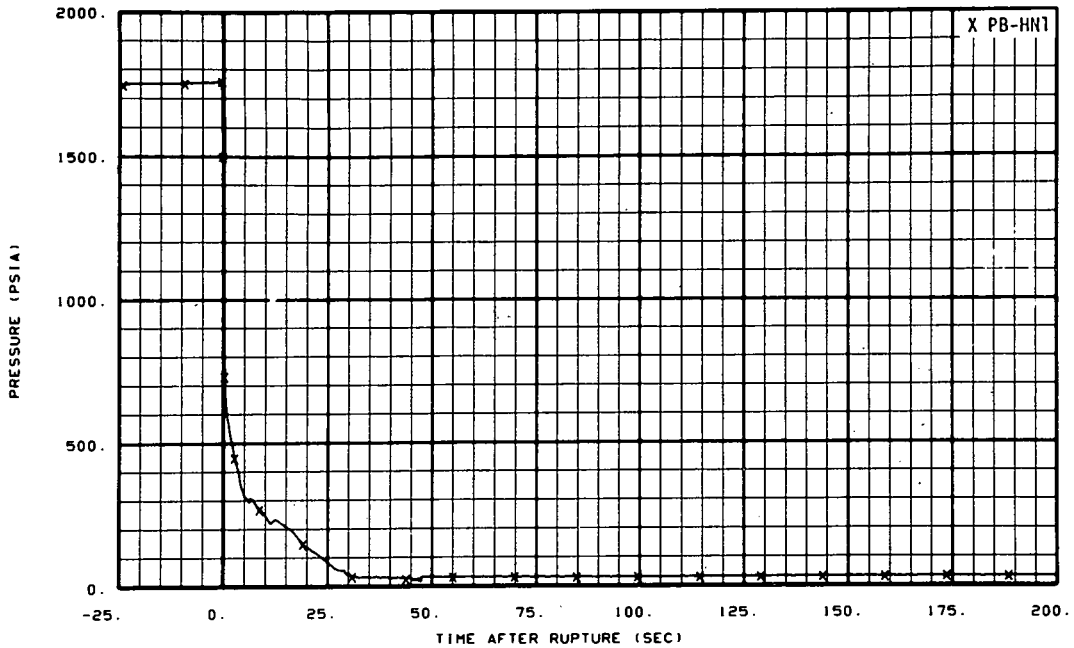


Fig. 131 Pressure in broken loop, pump-side nozzle (PB-HN1), from -24 to 200 seconds.

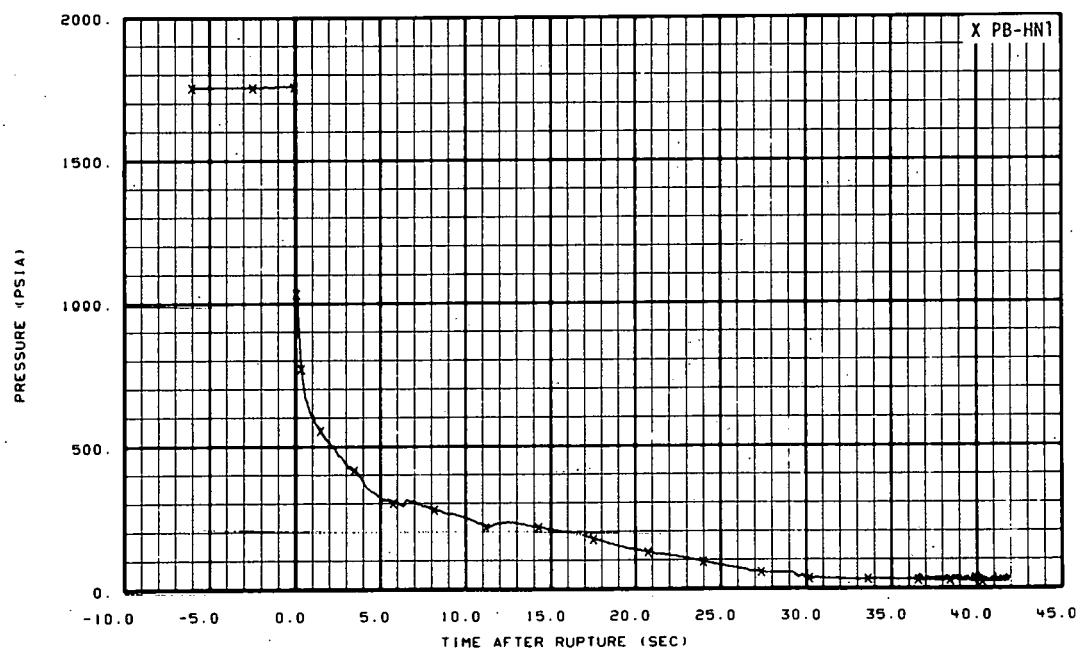


Fig. 132 Pressure in broken loop, pump-side nozzle (PB-HN1), from -6 to 42 seconds.

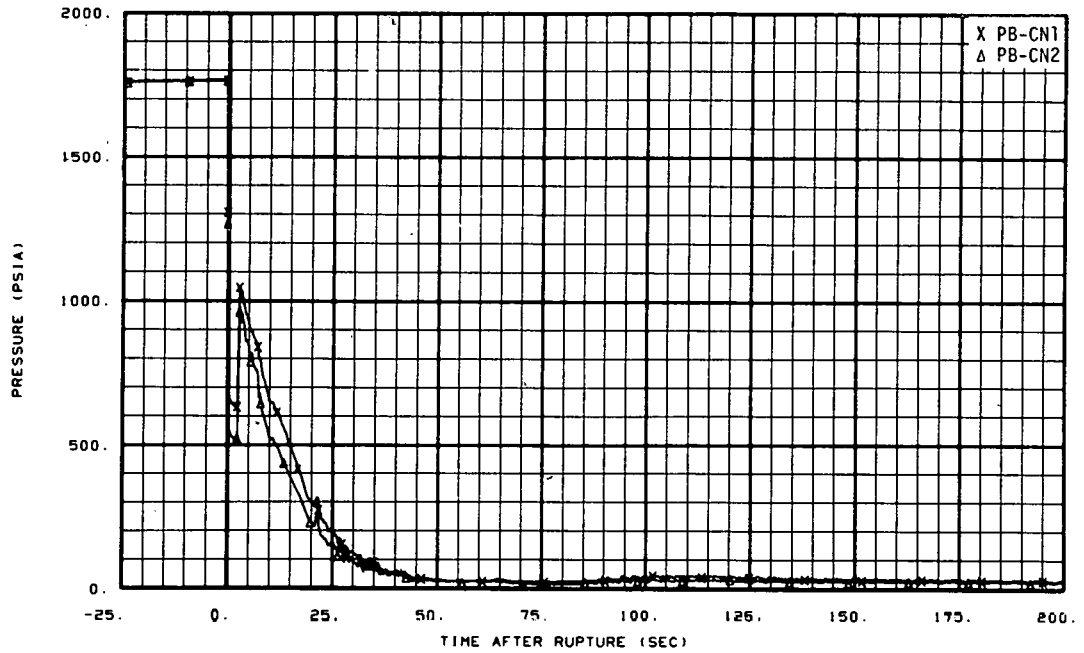


Fig. 133 Pressure in broken loop, vessel-side nozzle (PB-CN1, PB-CN2), from -24 to 200 seconds.

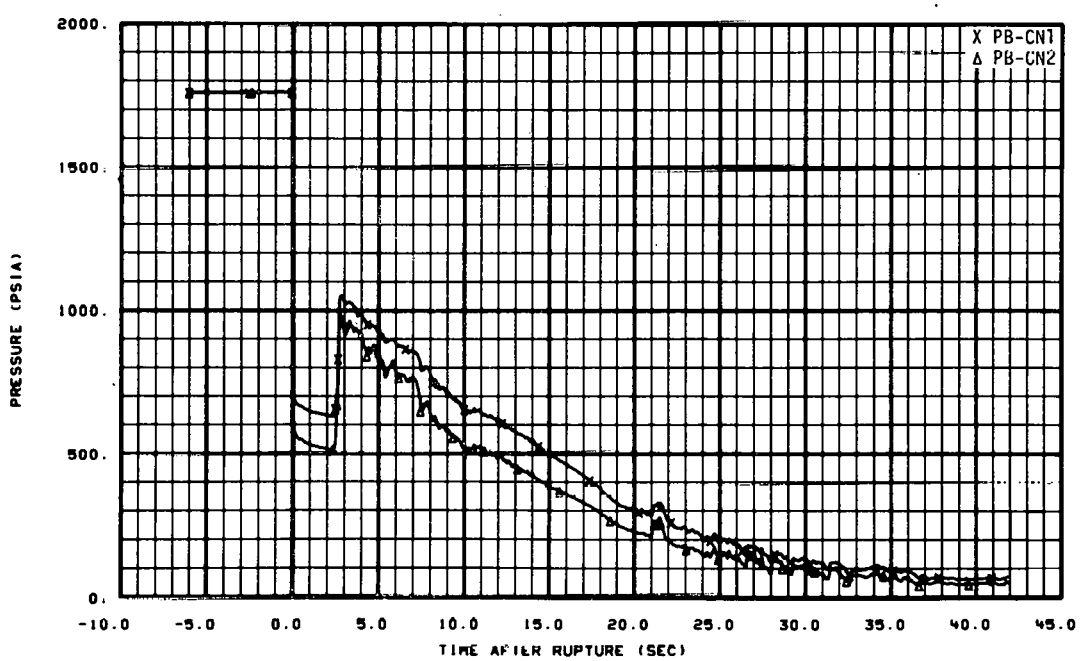


Fig. 134 Pressure in broken loop, vessel-side nozzle (PB-CN1, PB-CN2), from -6 to 42 seconds.

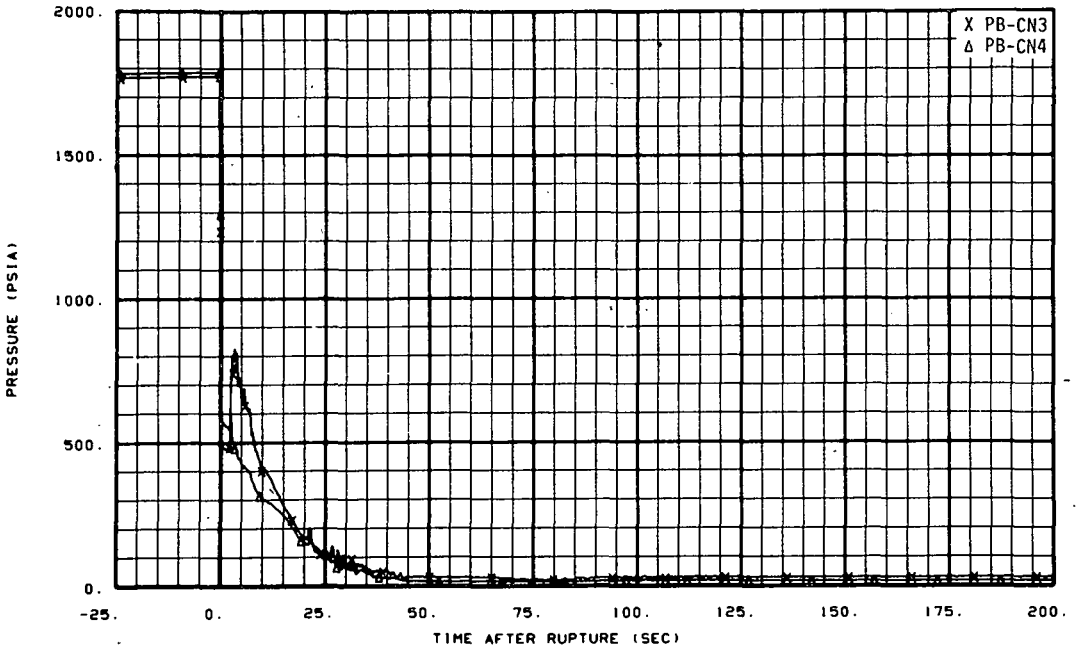


Fig. 135 Pressure in broken loop, vessel-side nozzle (PB-CN3, PB-CN4), from -24 to 200 seconds.

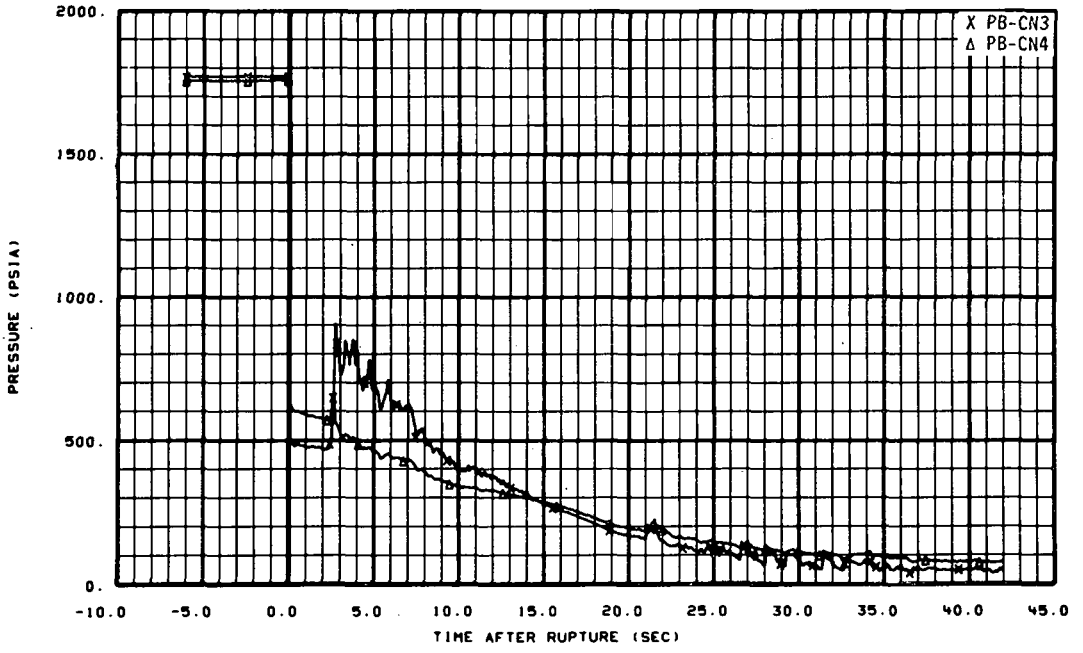


Fig. 136 Pressure in broken loop, vessel-side nozzle (PB-CN3, PB-CN4), from -6 to 42 seconds.

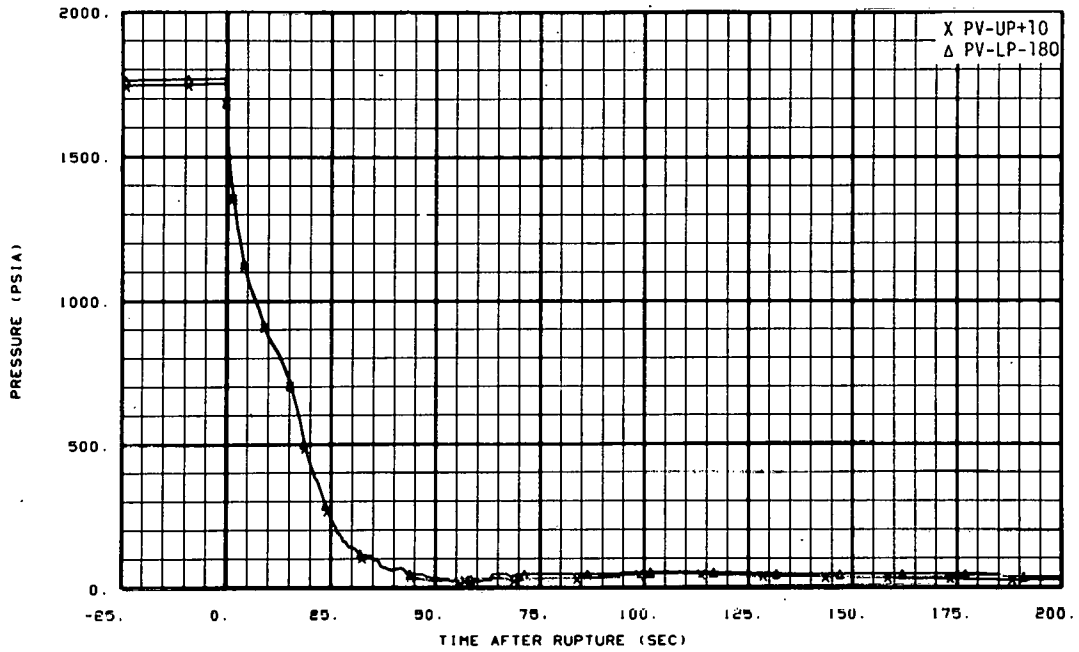


Fig. 137 Pressure in vessel (PV-UP+10, PV-LP-180), from -24 to 200 seconds.

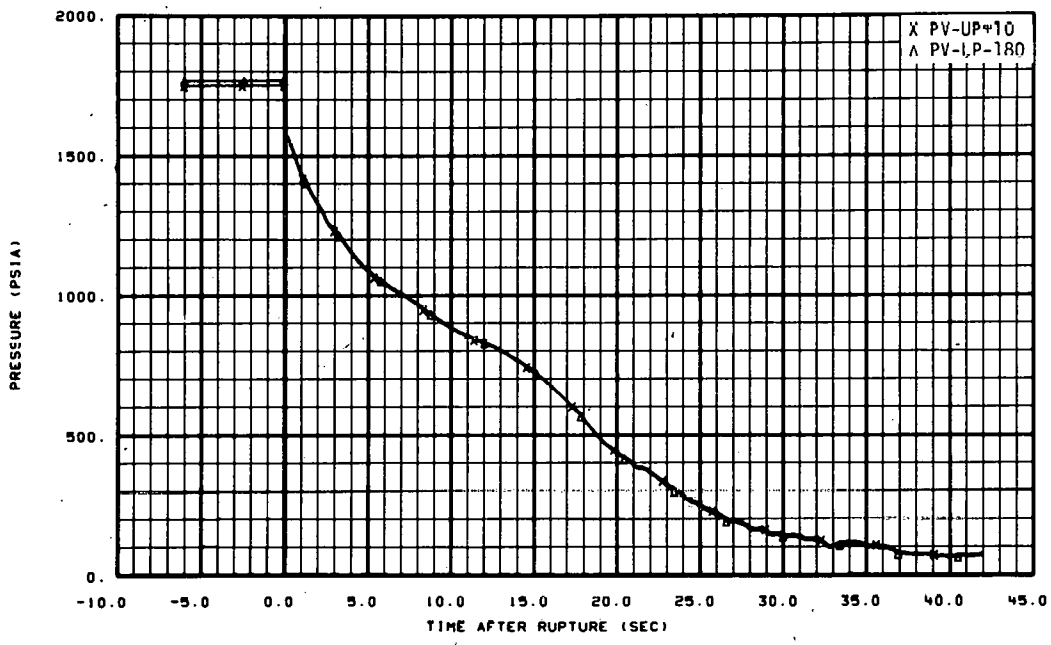


Fig. 138 Pressure in vessel (PV-UP+10, PV-LP-180), from -6 to 24 seconds.

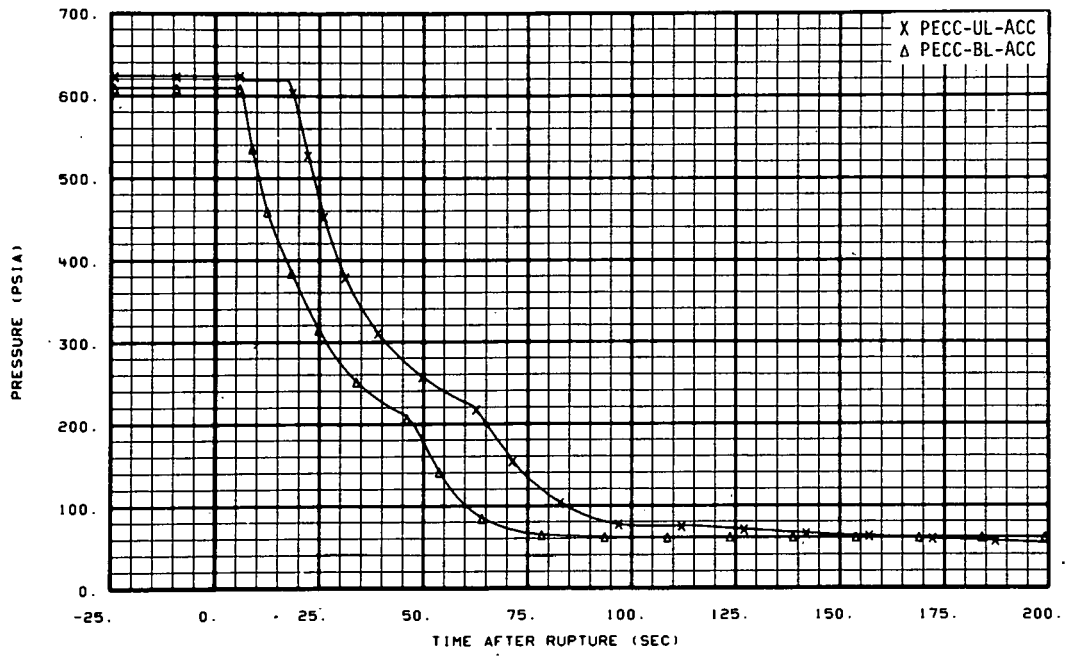


Fig. 139 Pressure in accumulator (PECC-UL-ACC, PECC-BL-ACC), from -24 to 200 seconds.

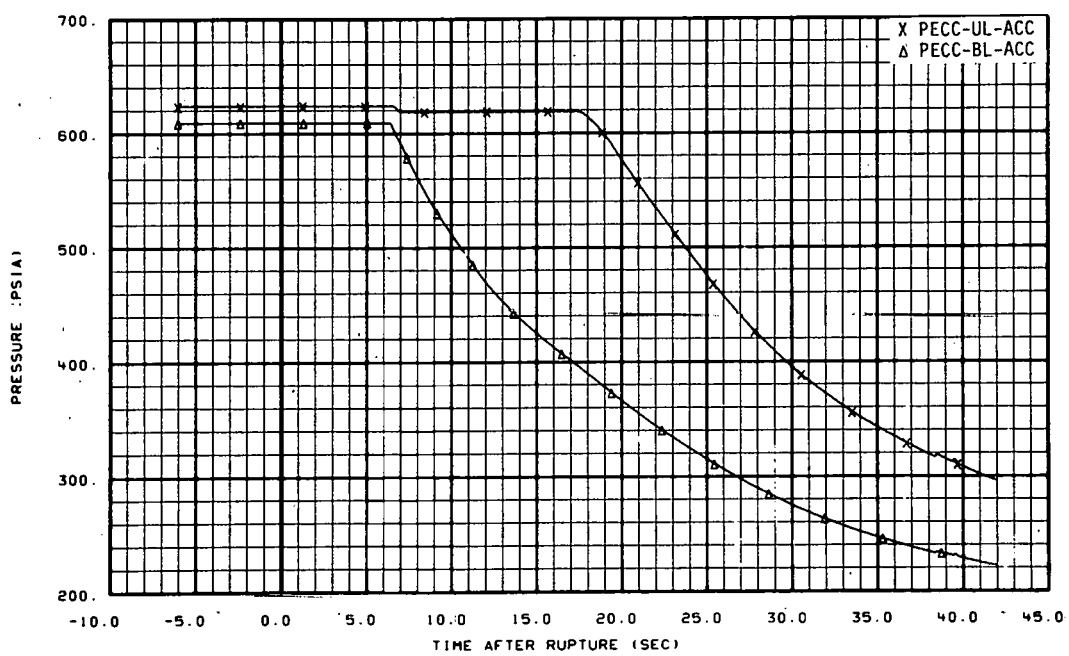


Fig. 140 Pressure in accumulator (PECC-UL-ACC, PECC-BL-ACC), from -6 to 42 seconds.

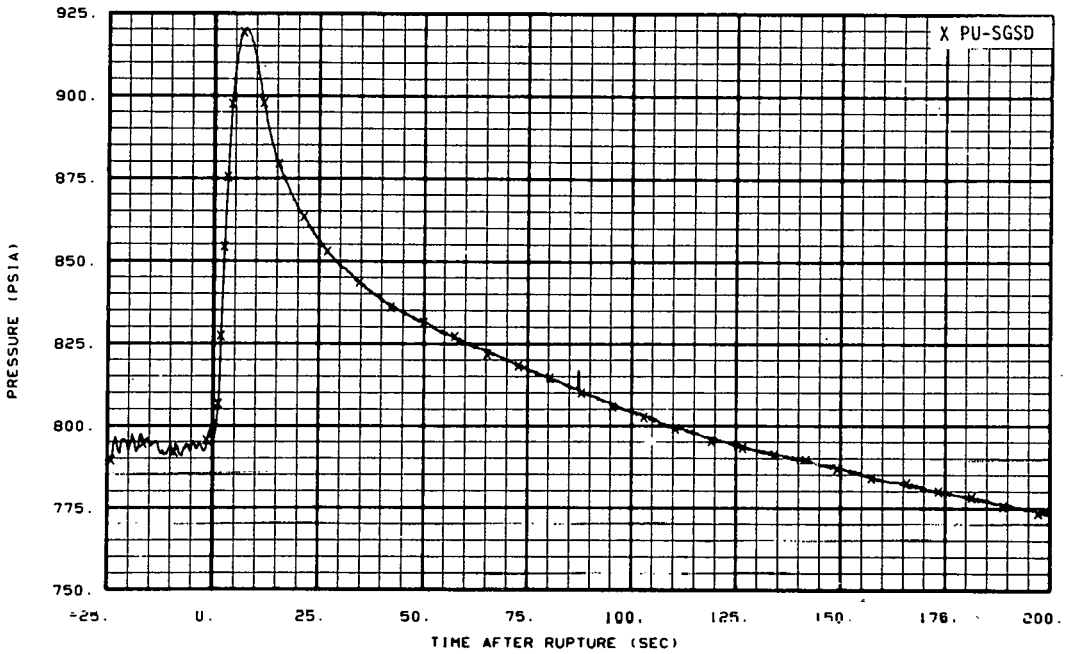


Fig. 141 Pressure in steam generator, secondary side (PU-SGSD), from -24 to 200 seconds.

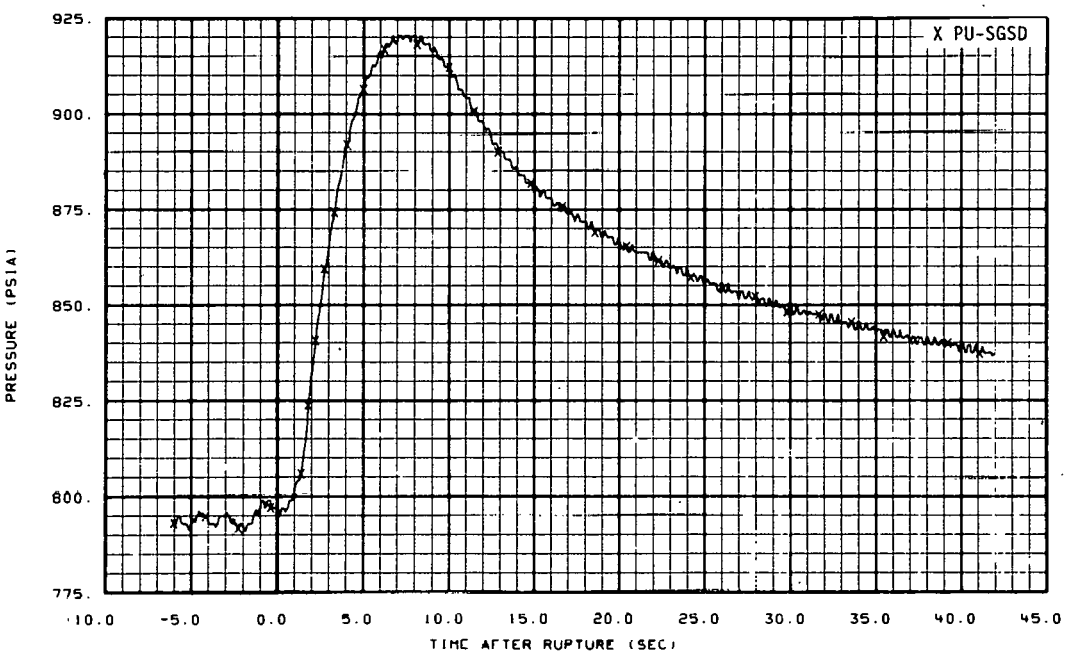


Fig. 142 Pressure in steam generator, secondary side (PU-SGSD), from -6 to 42 seconds.

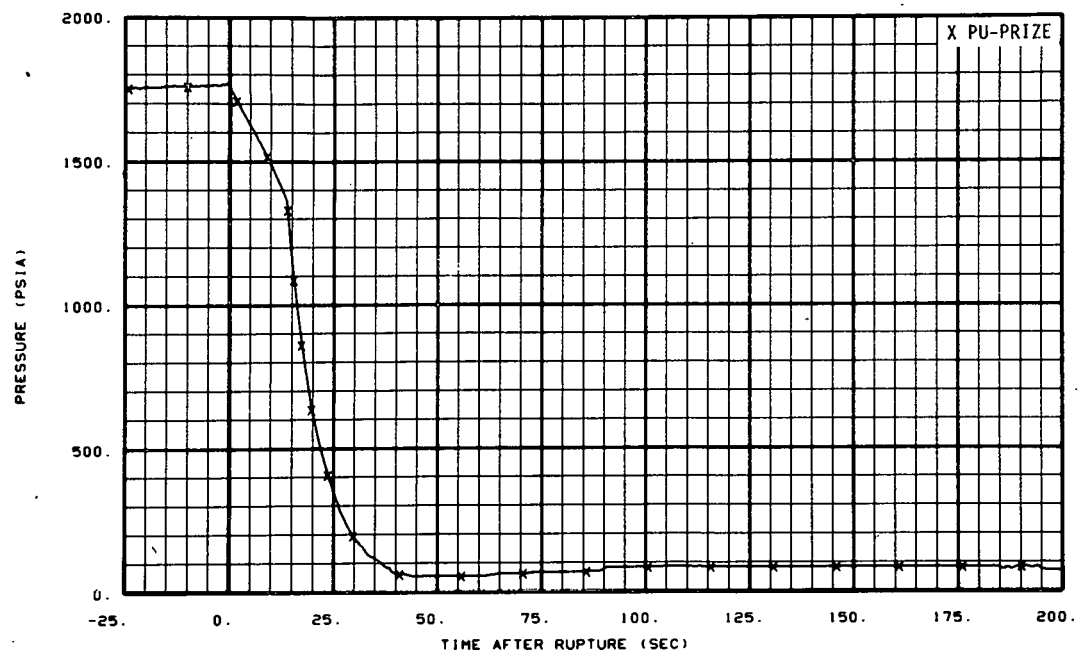


Fig. 143 Pressure in pressurizer (PU-PRIZE), from -24 to 200 seconds.

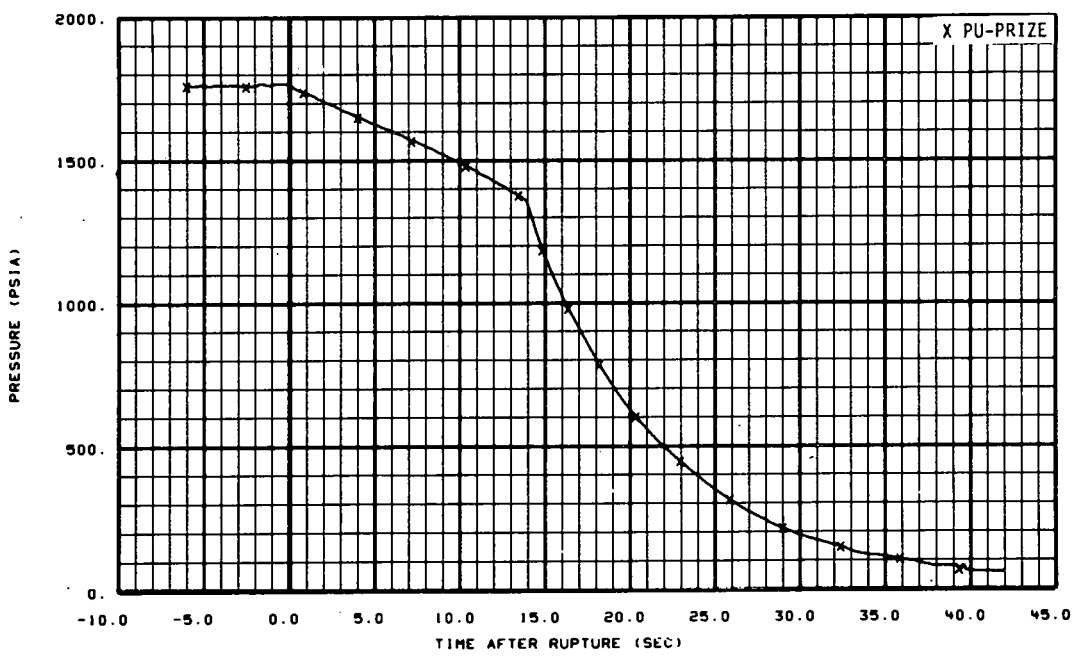


Fig. 144 Pressure in pressurizer (PU-PRIZE), from -6 to 42 seconds.

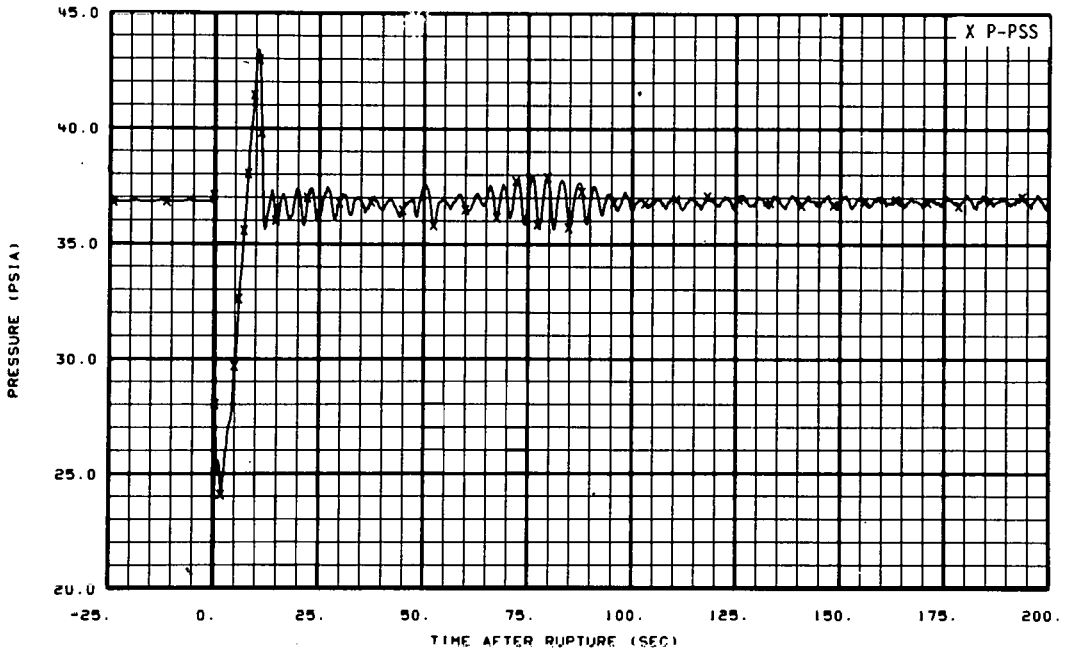


Fig. 145 Pressure in pressure suppression tank (P-PSS), from -24 to 200 seconds.

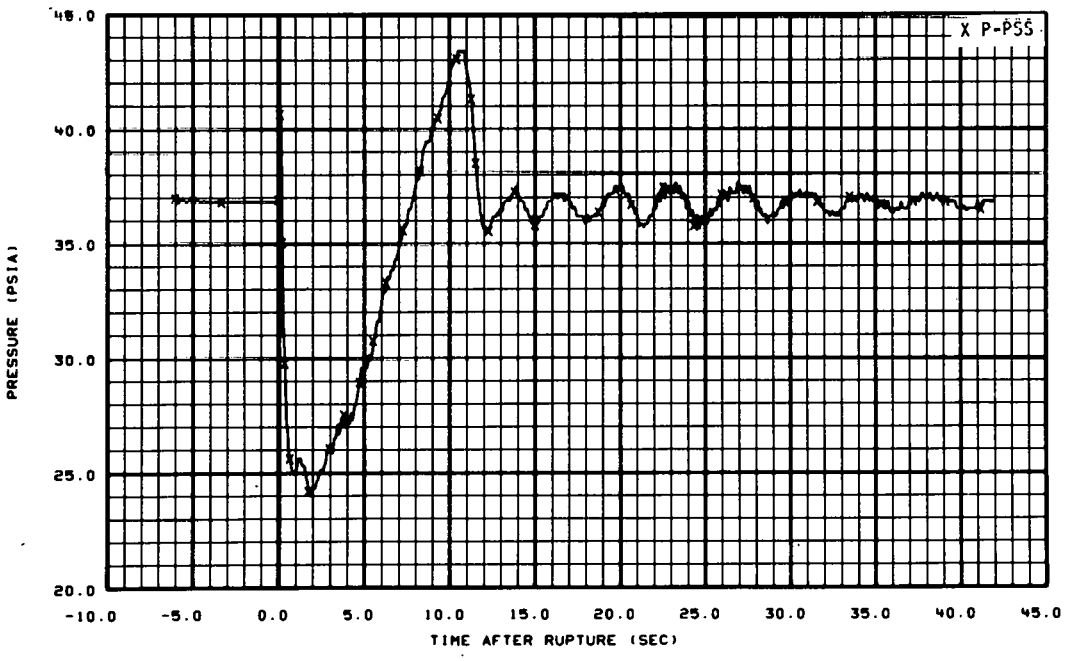


Fig. 146 Pressure in pressure suppression tank (P-PSS), from -6 to 42 seconds.

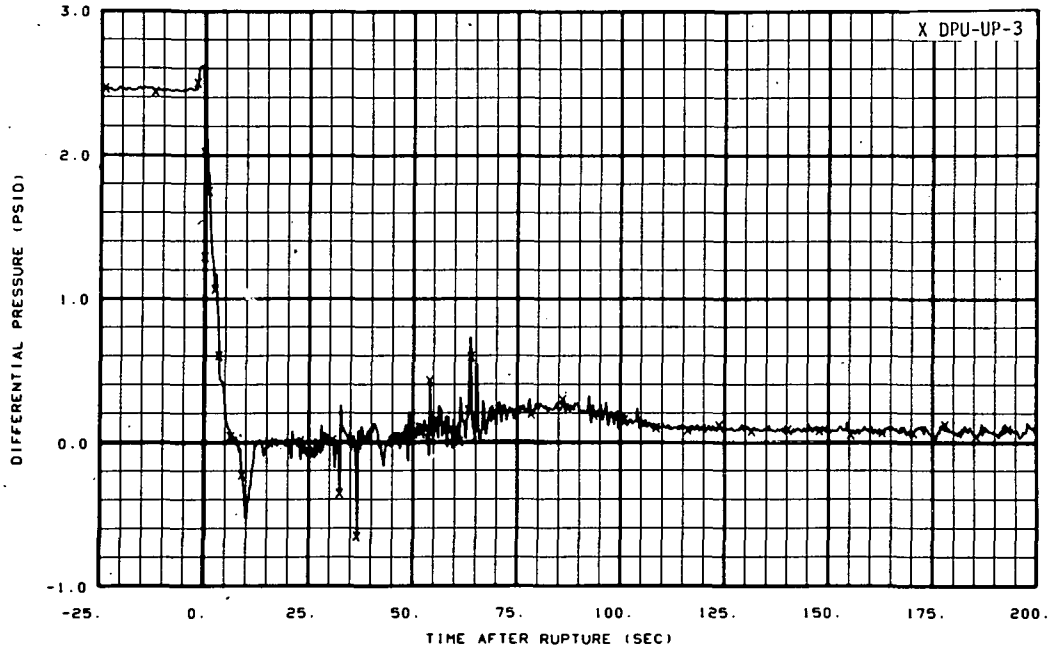


Fig. 147 Differential pressure in intact loop (DPU-UP-3), from -24 to 200 seconds.

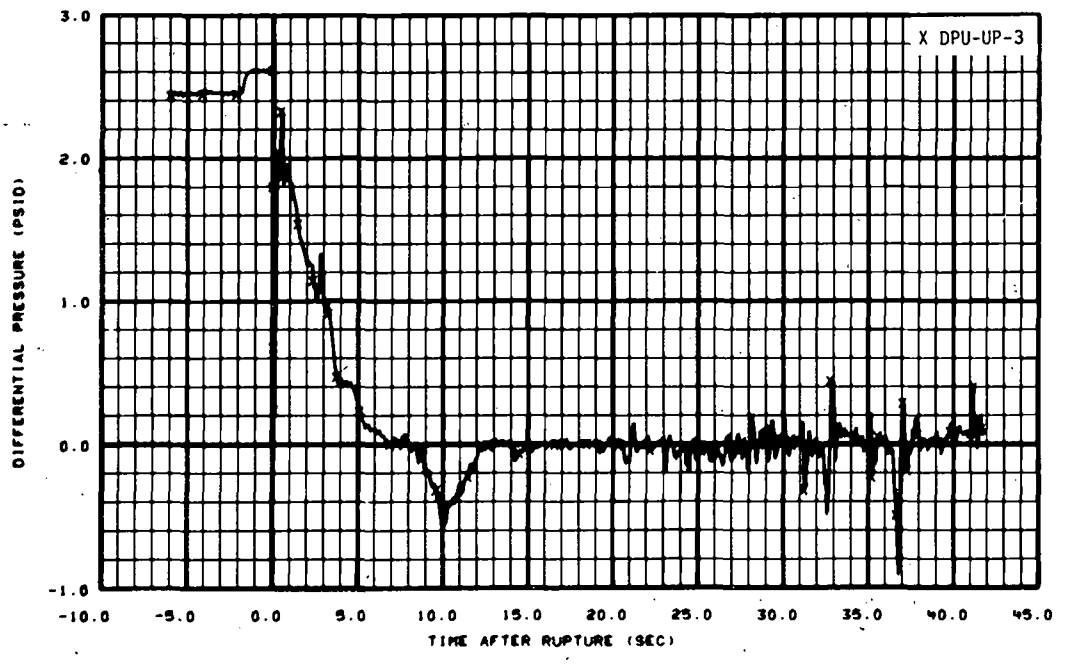


Fig. 148 Differential pressure in intact loop (DPU-UP-3), from -6 to 42 seconds.

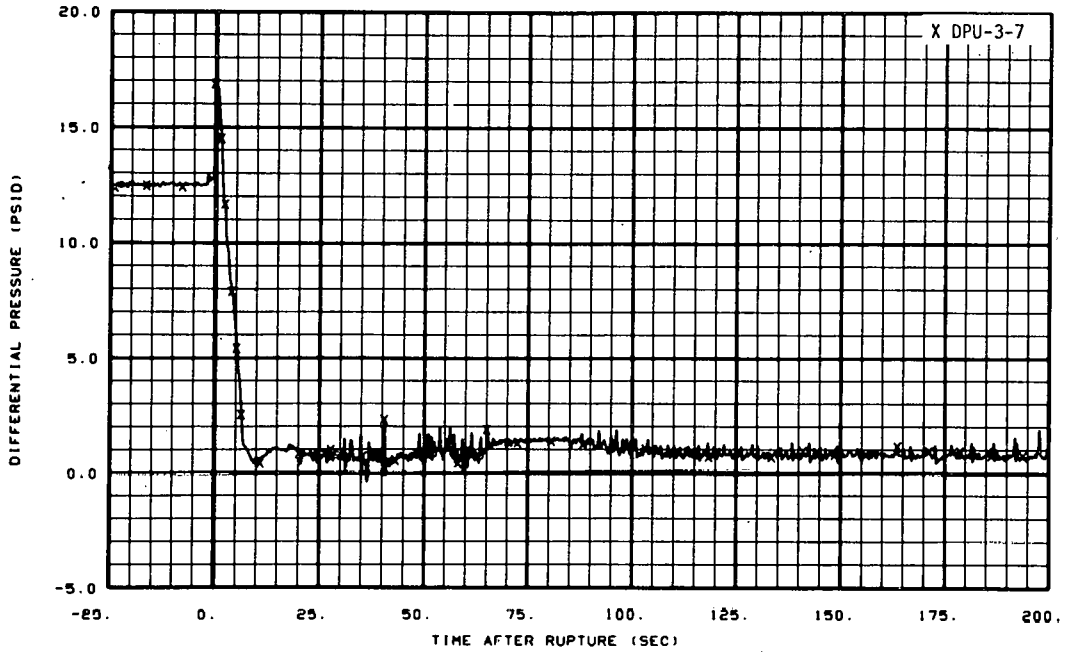


Fig. 149 Differential pressure in intact loop (DPU-3-7), from -24 to 200 seconds.

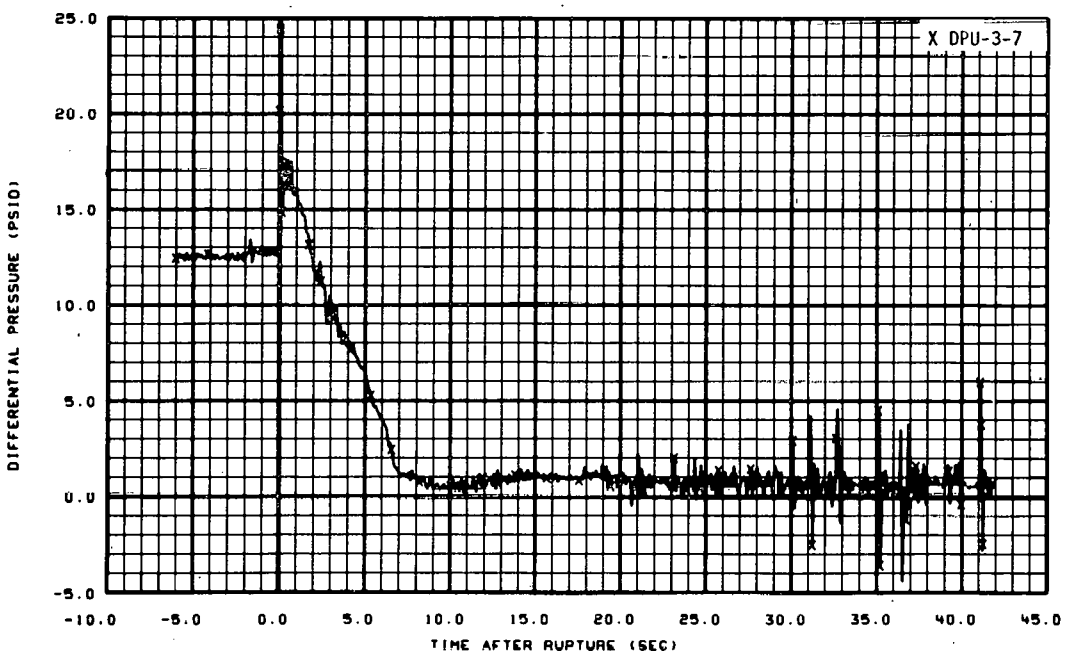


Fig. 150 Differential pressure in intact loop (DPU-3-7), from -6 to 42 seconds.

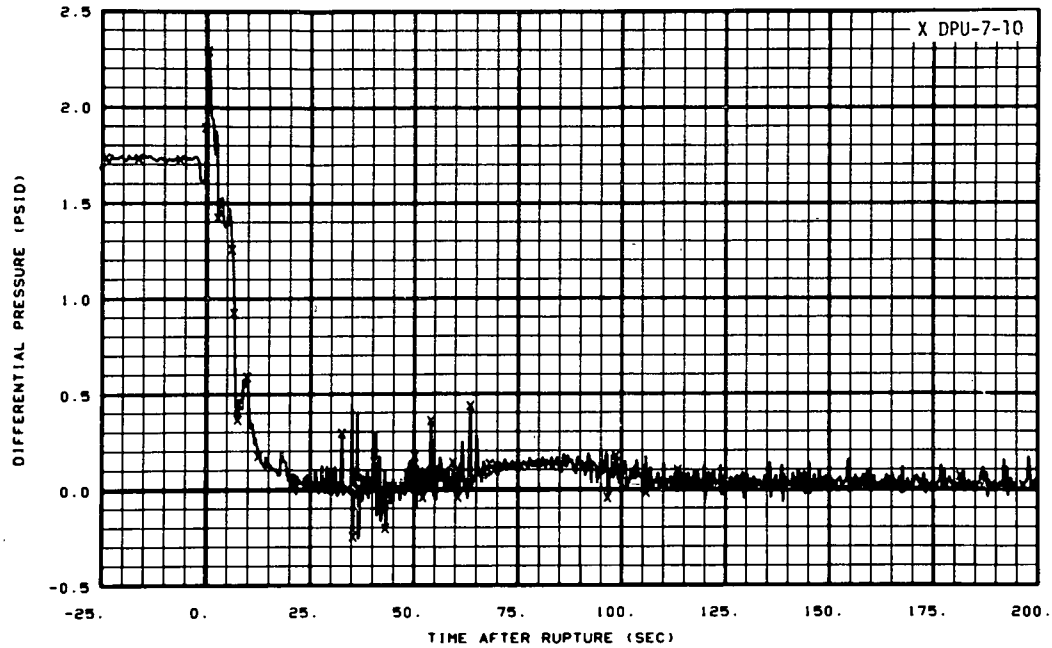


Fig. 151 Differential pressure in intact loop (DPU-7-10), from -24 to 200 seconds.

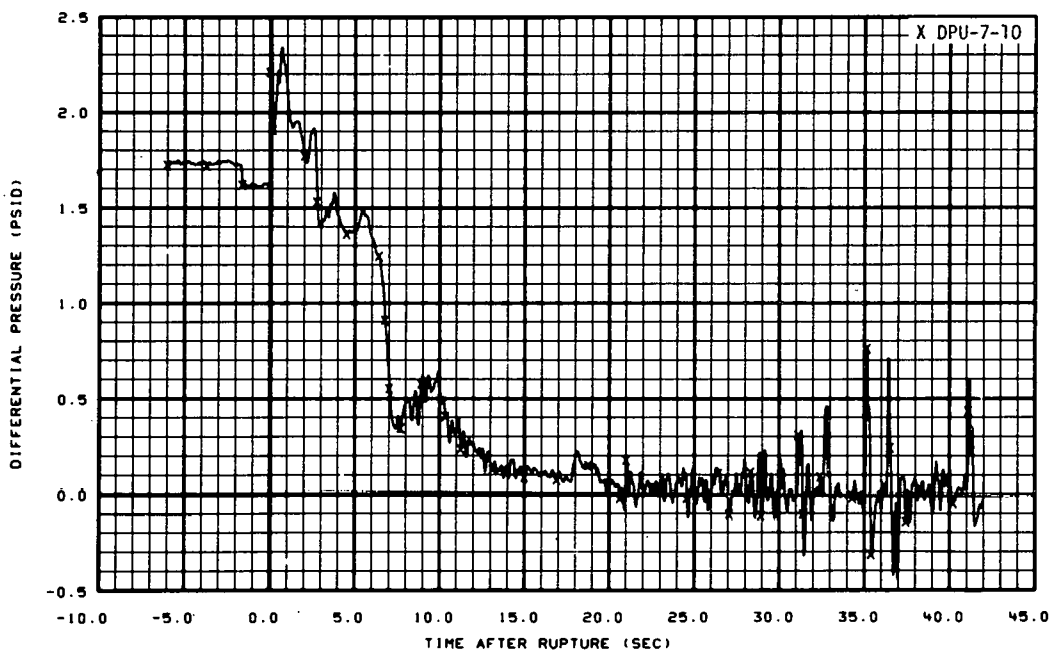


Fig. 152 Differential pressure in intact loop (DPU-7-10), from -6 to 42 seconds.

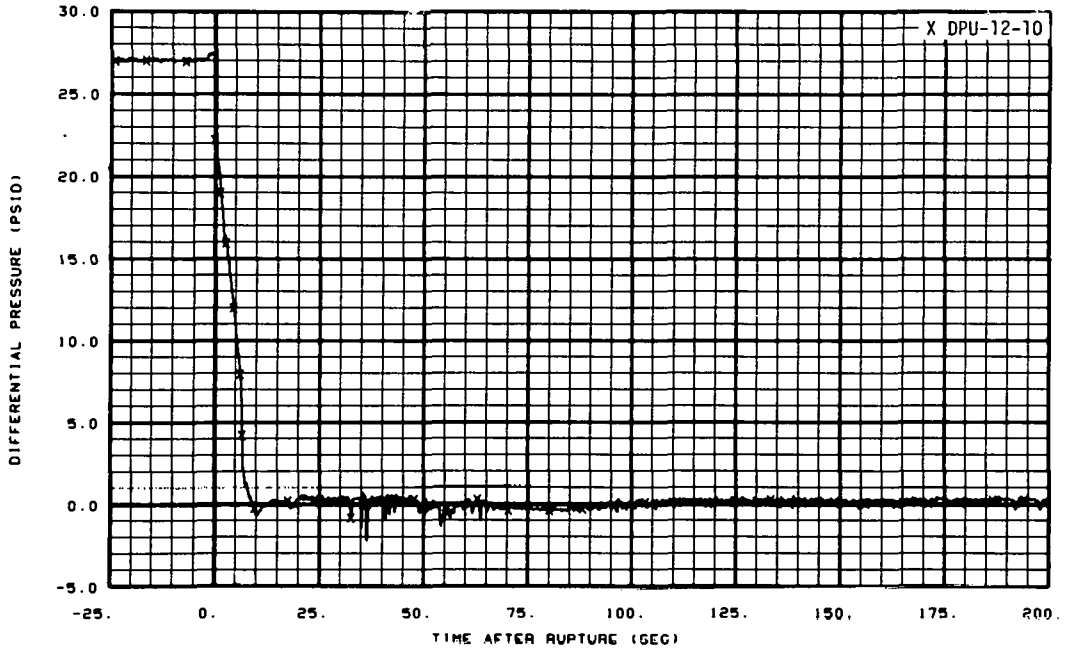


Fig. 153 Differential pressure in intact loop (DPU-12-10), from -24 to 200 seconds.

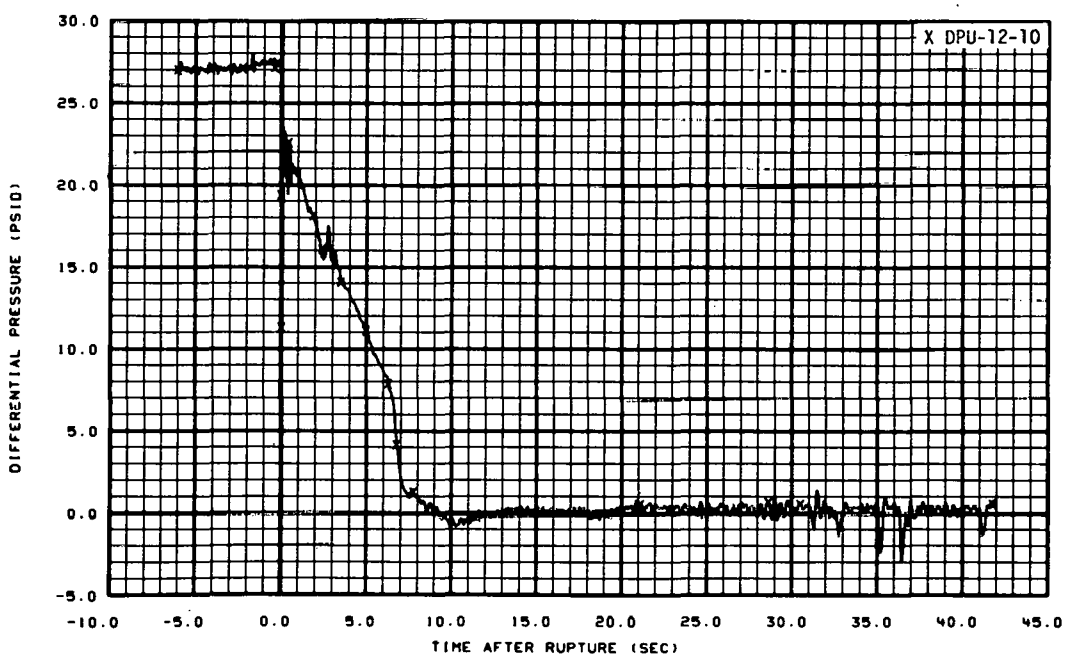


Fig. 154 Differential pressure in intact loop (DPU-12-10), from -6 to 42 seconds.

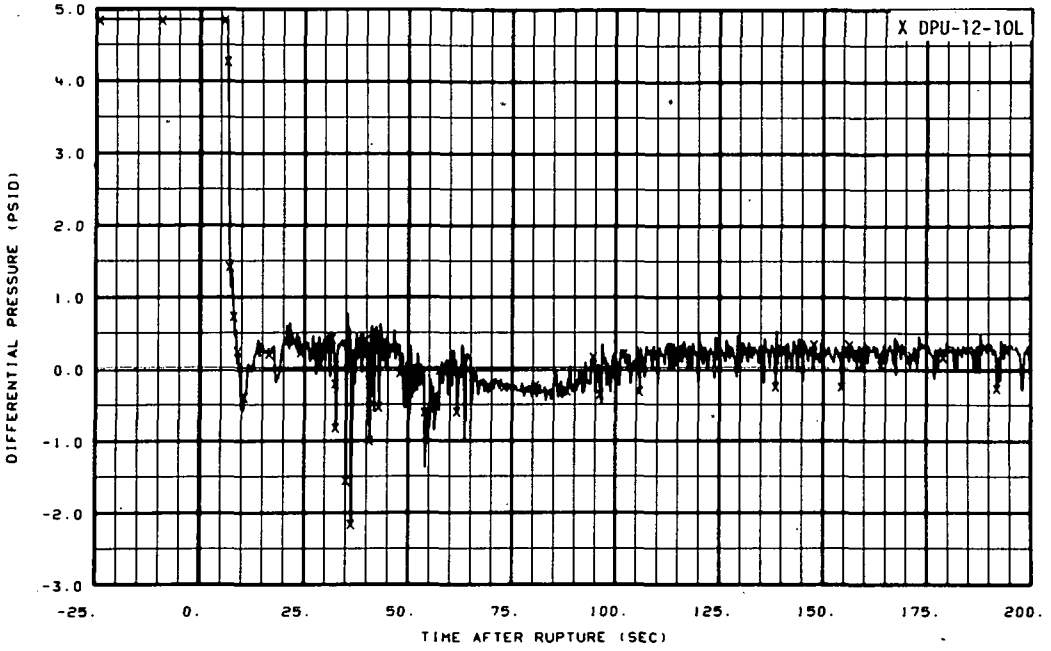


Fig. 155 Differential pressure in intact loop, low range (DPU-12-10L), from -24 to 200 seconds.

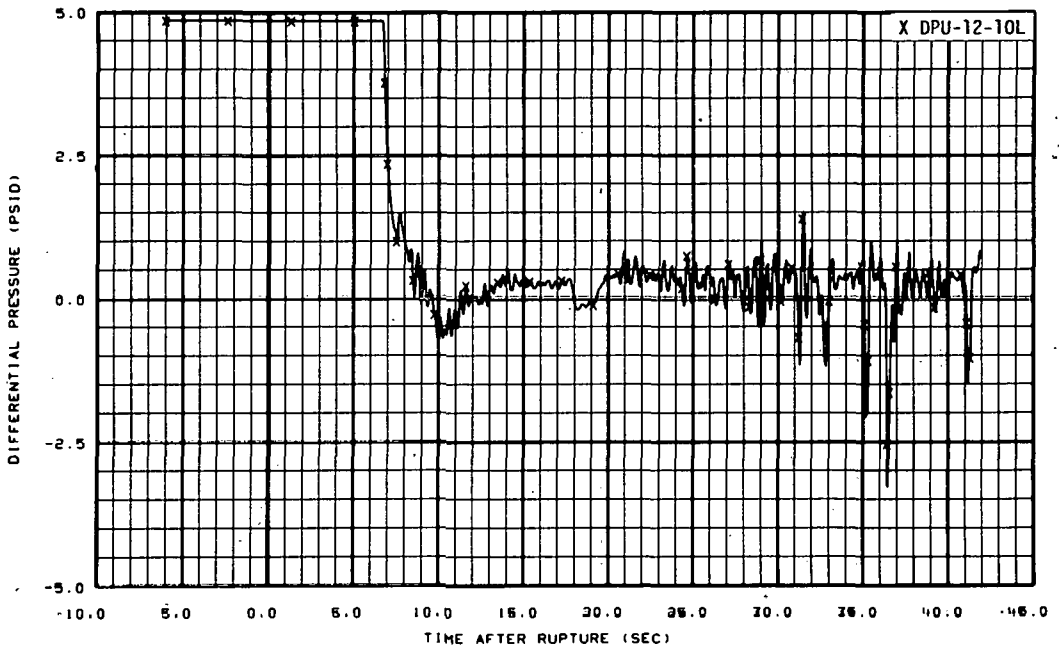


Fig. 156 Differential pressure in intact loop, low range (DPU-12-10L), from -6 to 42 seconds.

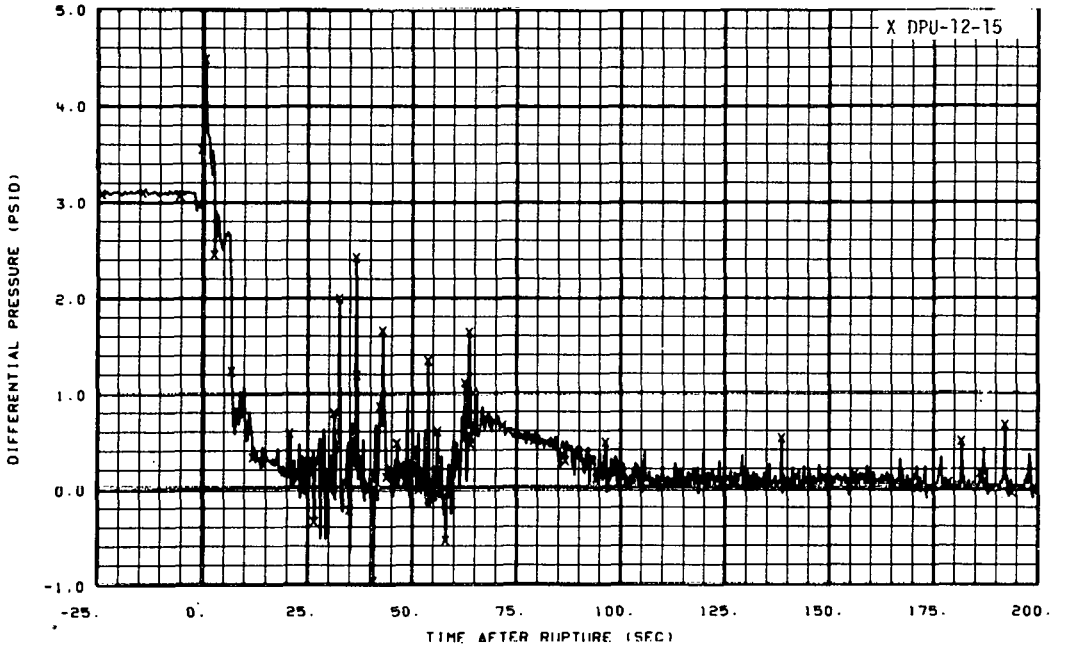


Fig. 157 Differential pressure in intact loop, (DPU-12-15), from -24 to 200 seconds.

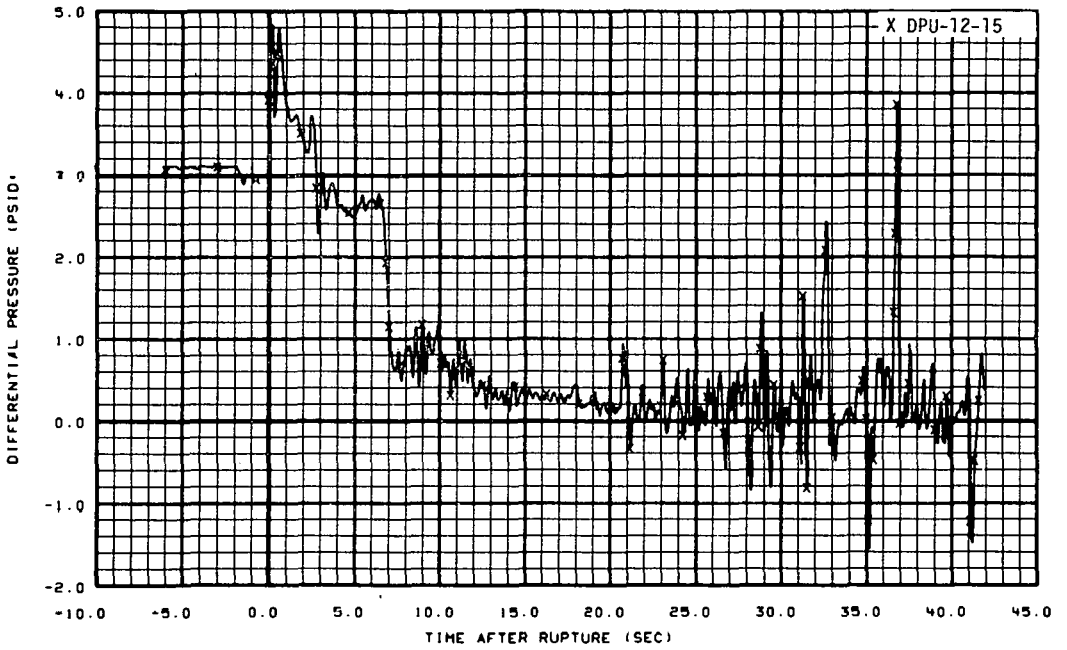


Fig. 158 Differential pressure in intact loop, (DPU-12-15), from -6 to 42 seconds.

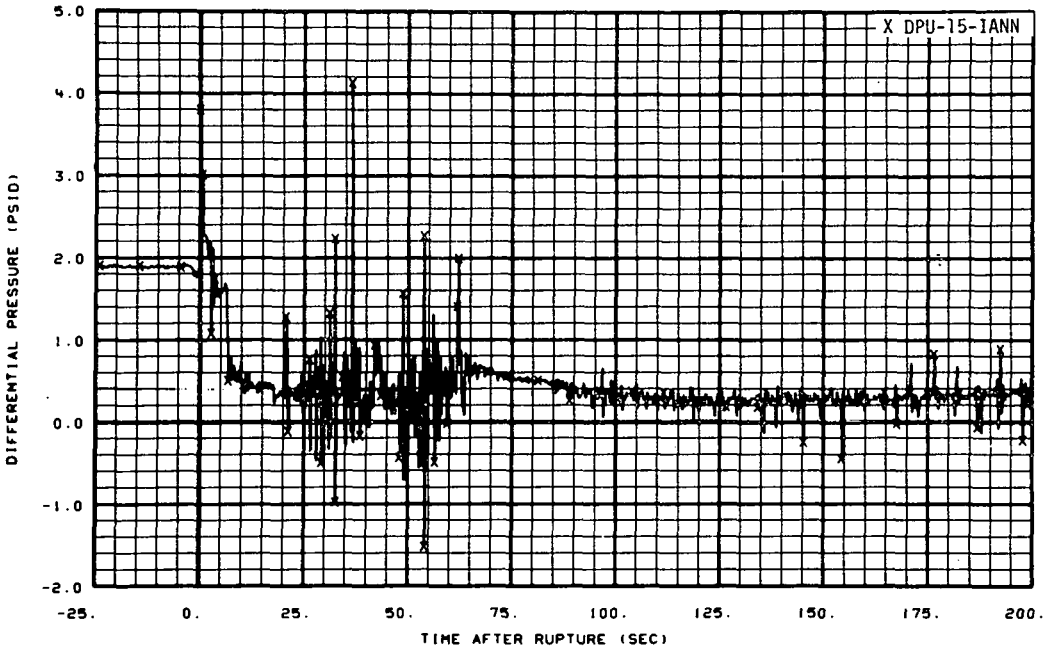


Fig. 159 Differential pressure in intact loop (DPU-15-IANN), from -24 to 200 seconds.

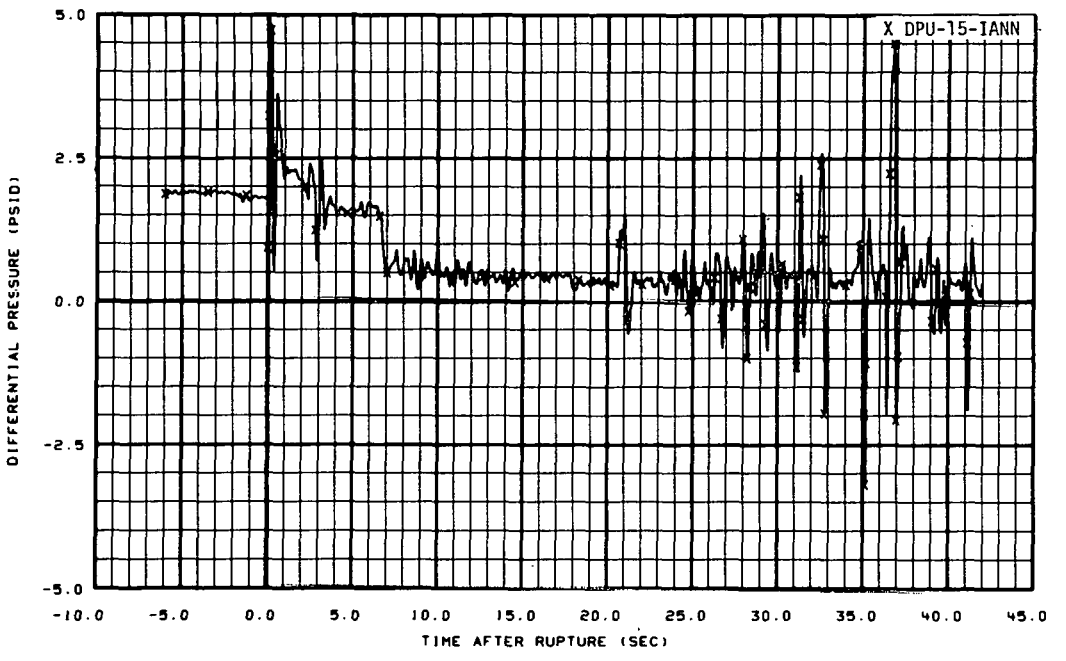


Fig. 160 Differential pressure in intact loop (DPU-15-IANN), from -6 to 42 seconds.

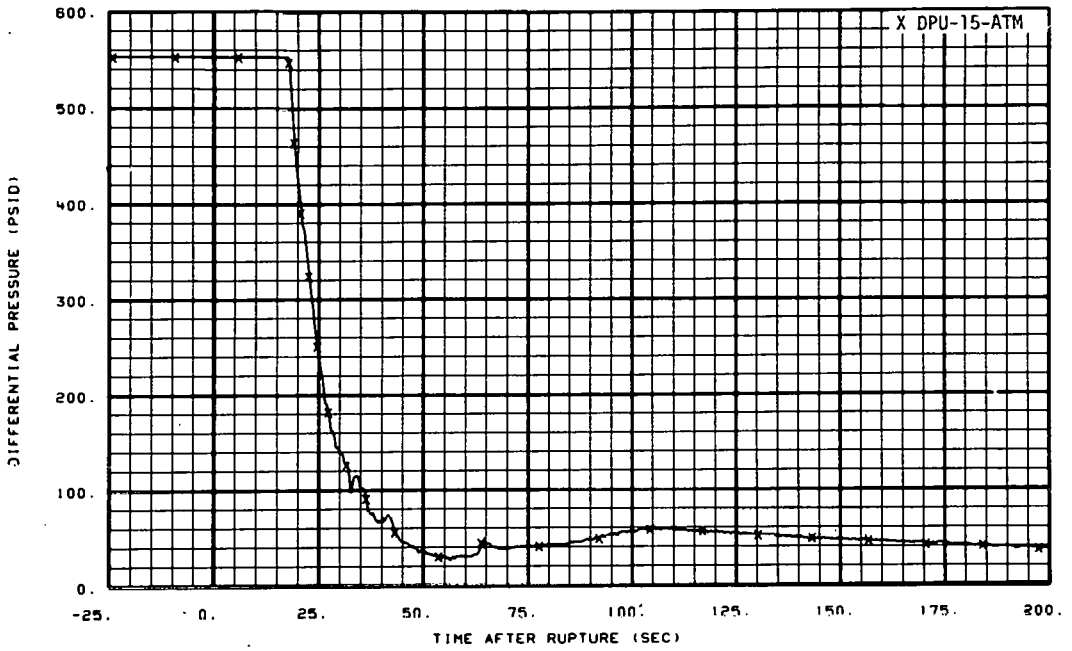


Fig. 161 Differential pressure in intact loop (DPU-15-ATM), from -24 to 200 seconds.

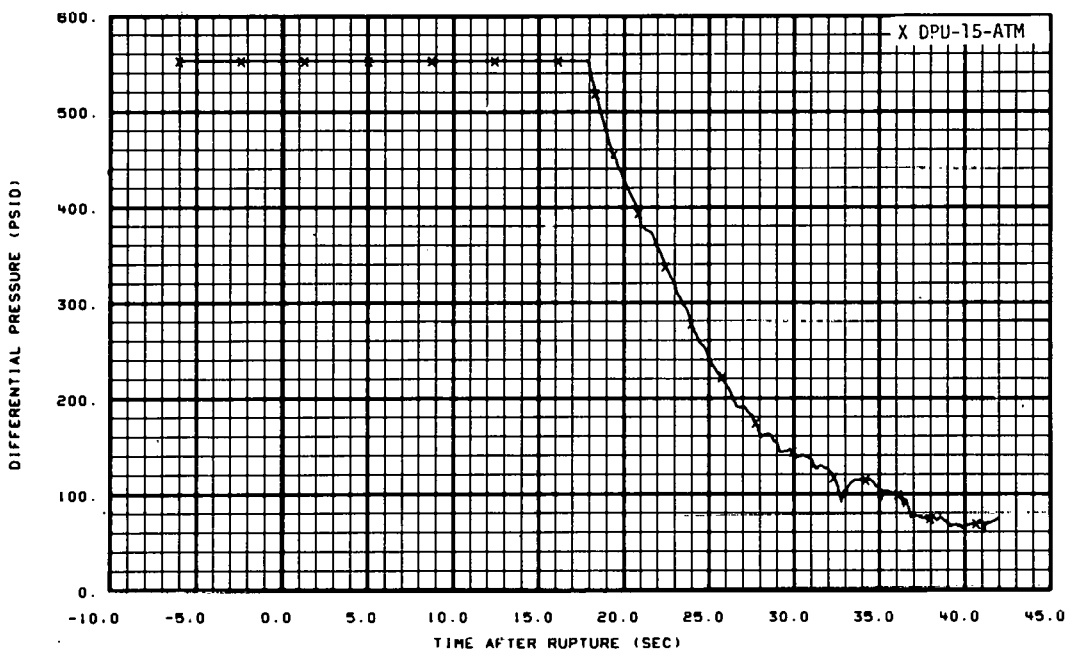


Fig. 162 Differential pressure in intact loop (DPU-15-ATM), from -6 to 42 seconds.

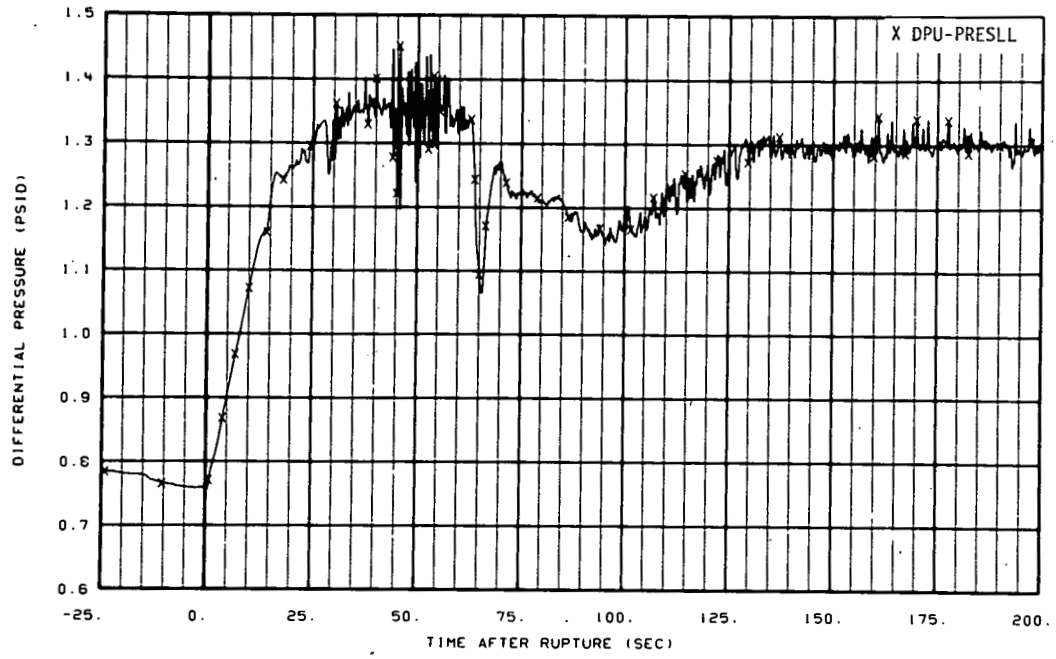


Fig. 163 Differential pressure in intact loop (DPU-PRESLL), from -24 to 200 seconds.

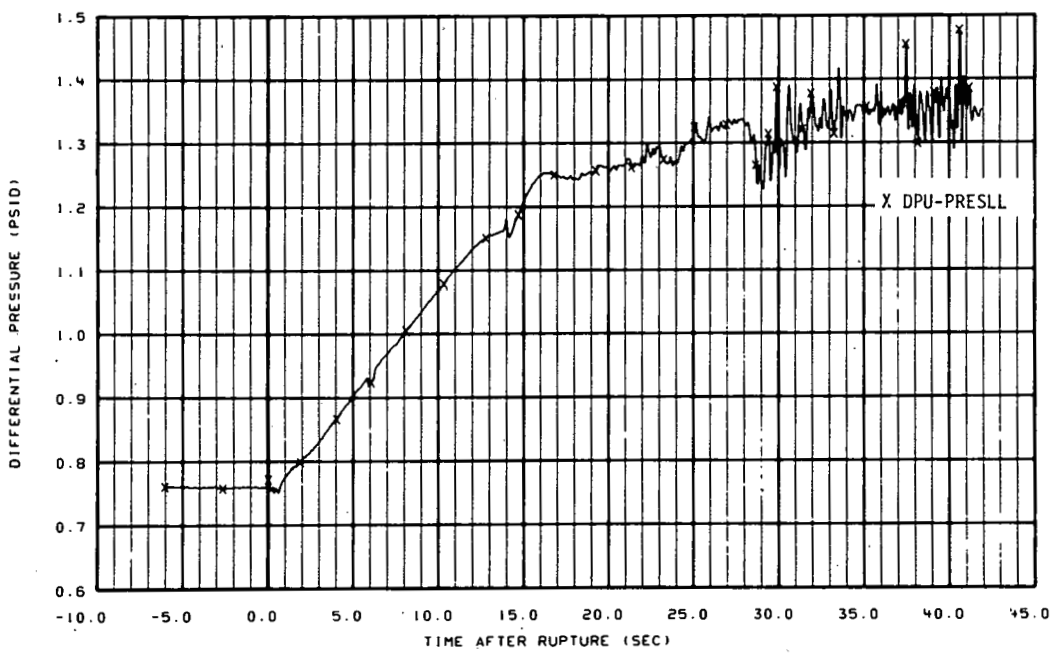


Fig. 164 Differential pressure in intact loop (DPU-PRESLL), from -6 to 42 seconds.

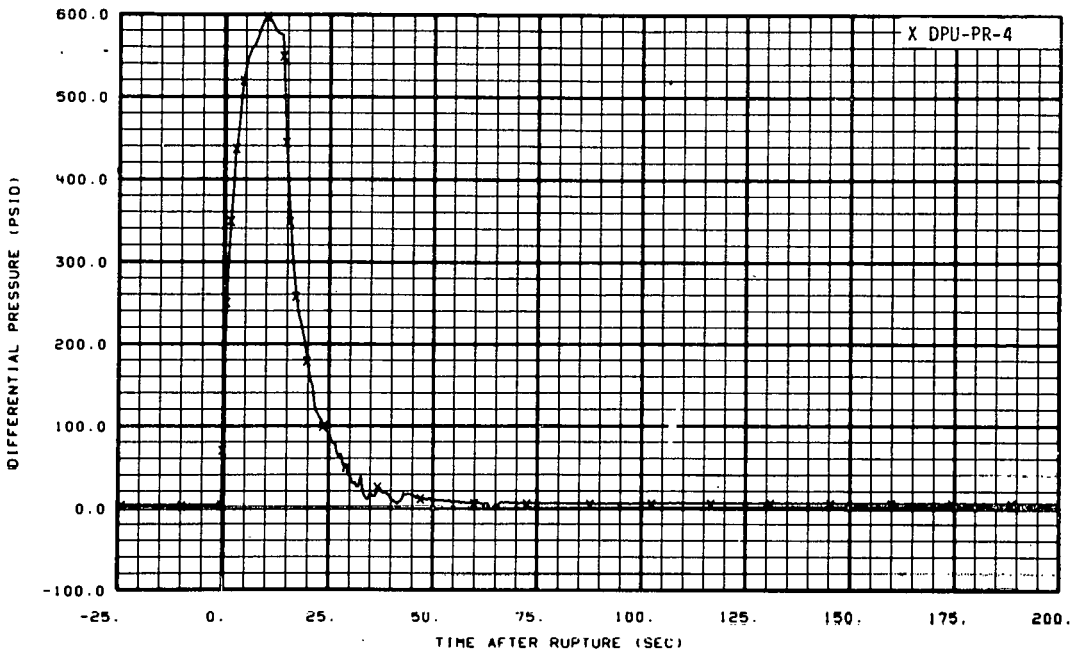


Fig. 165 Differential pressure in intact loop (DPU-PR-4), from -24 to 200 seconds.

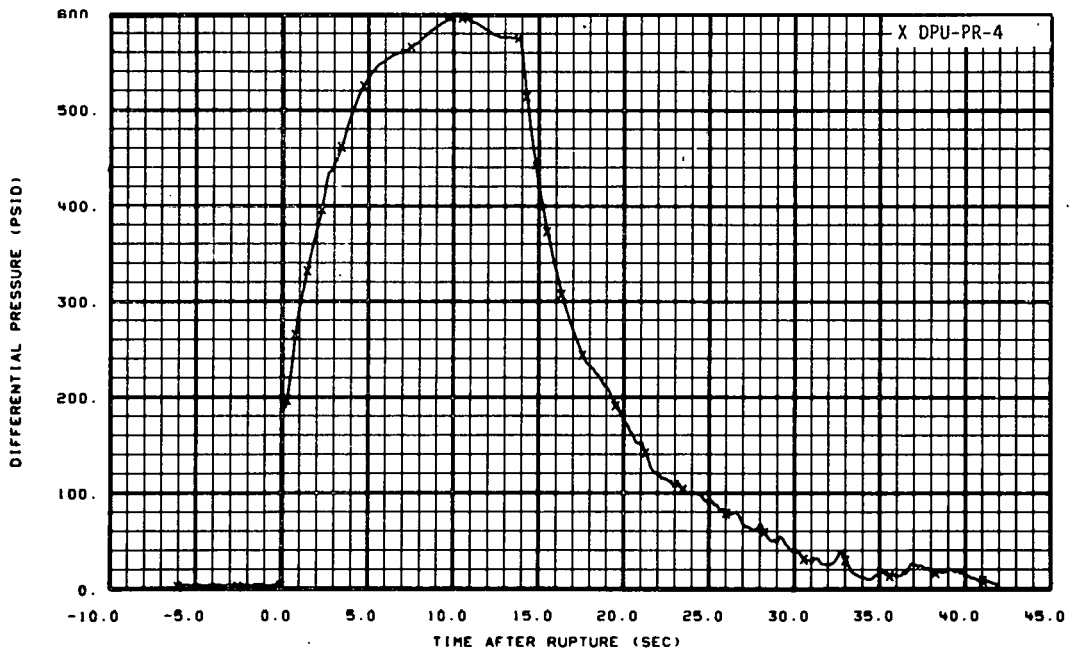


Fig. 166 Differential pressure in intact loop (DPU-PR-4), from -6 to 42 seconds.

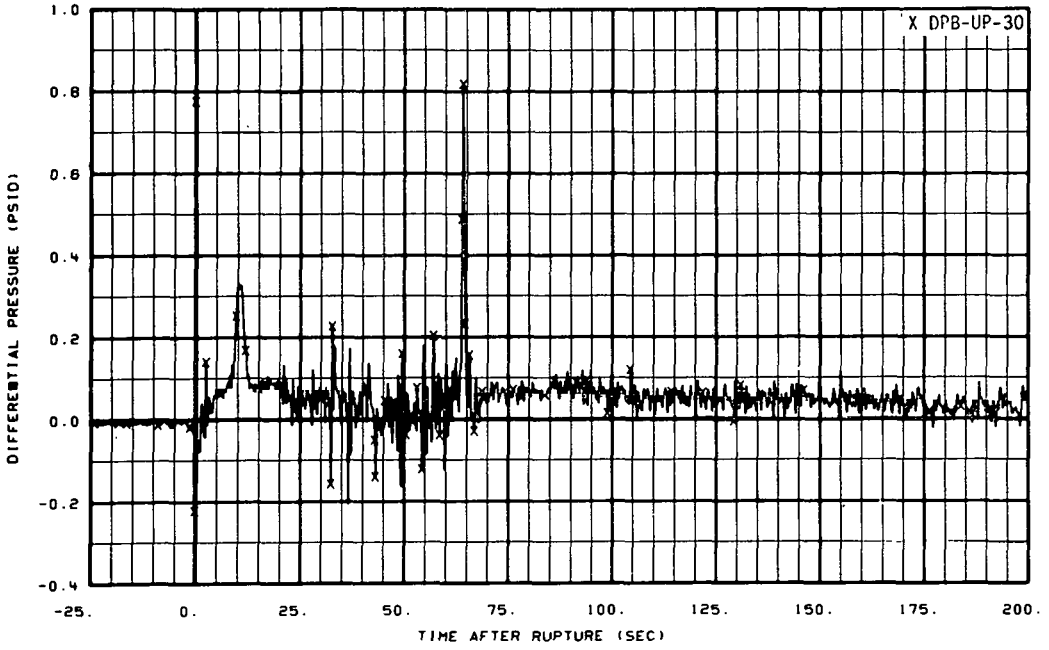


Fig. 167 Differential pressure in broken loop (DPB-UP-30), from -24 to 200 seconds.

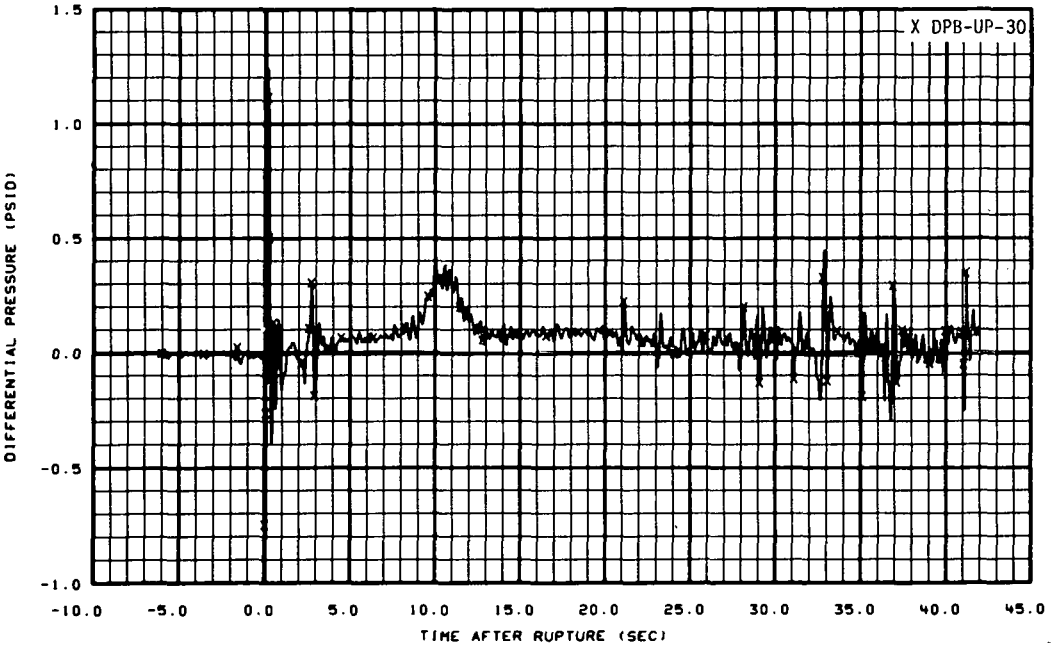


Fig. 168 Differential pressure in broken loop (DPB-UP-30), from -6 to 42 seconds.

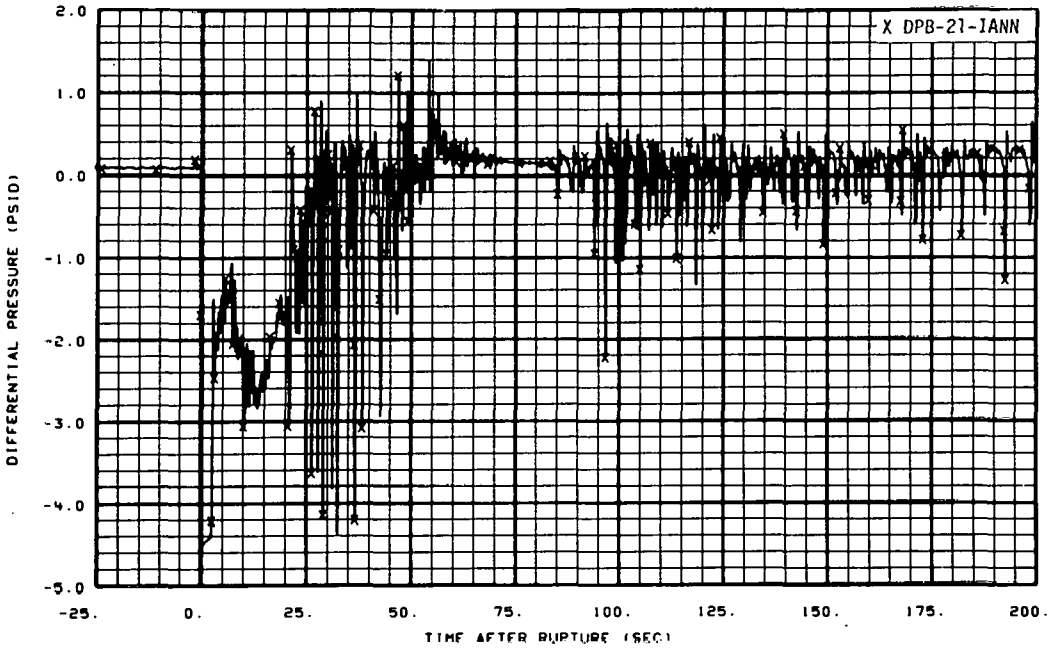


Fig. 169 Differential pressure in broken loop (DPB-21-IANN), from -24 to 200 seconds.

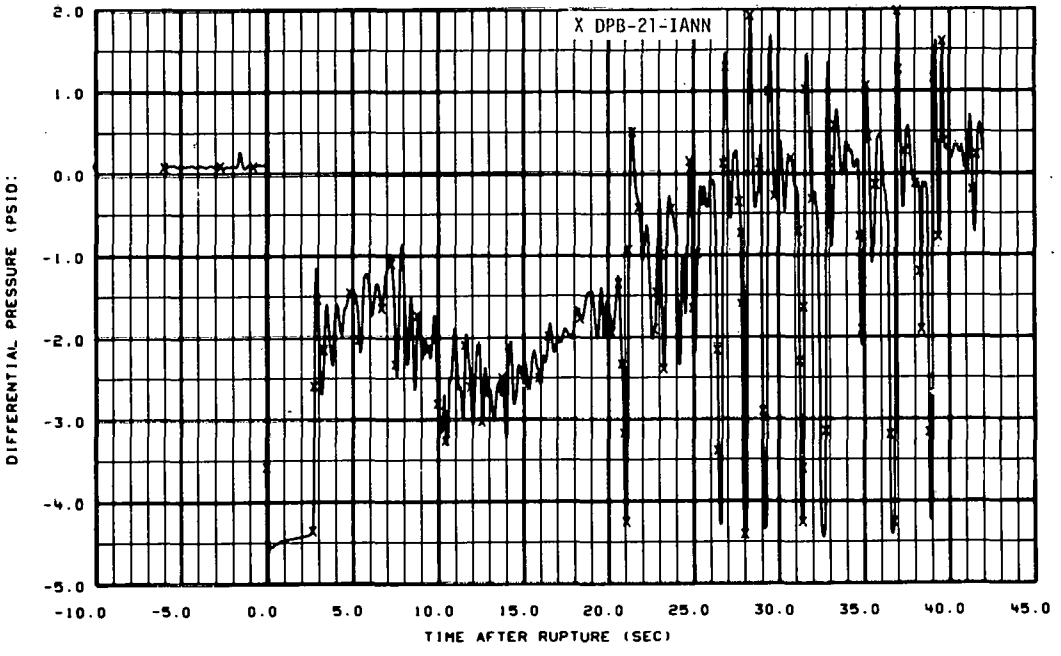


Fig. 170 Differential pressure in broken loop (DPB-21-IANN), from -6 to 42 seconds.

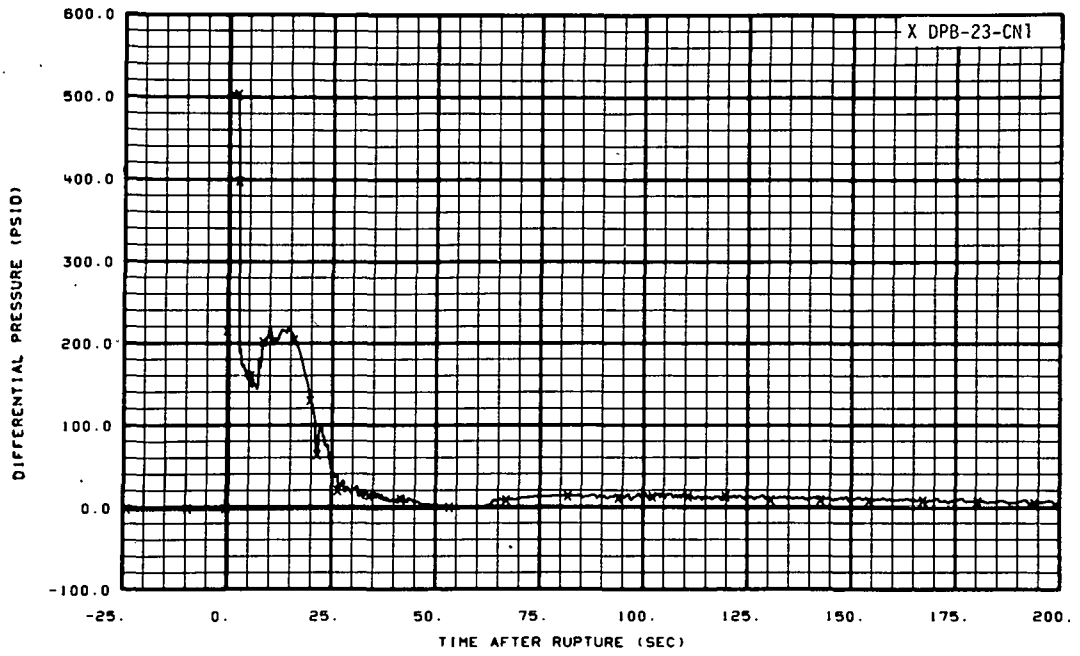


Fig. 171 Differential pressure in broken loop (DPB-23-CN1), from -24 to 200 seconds.

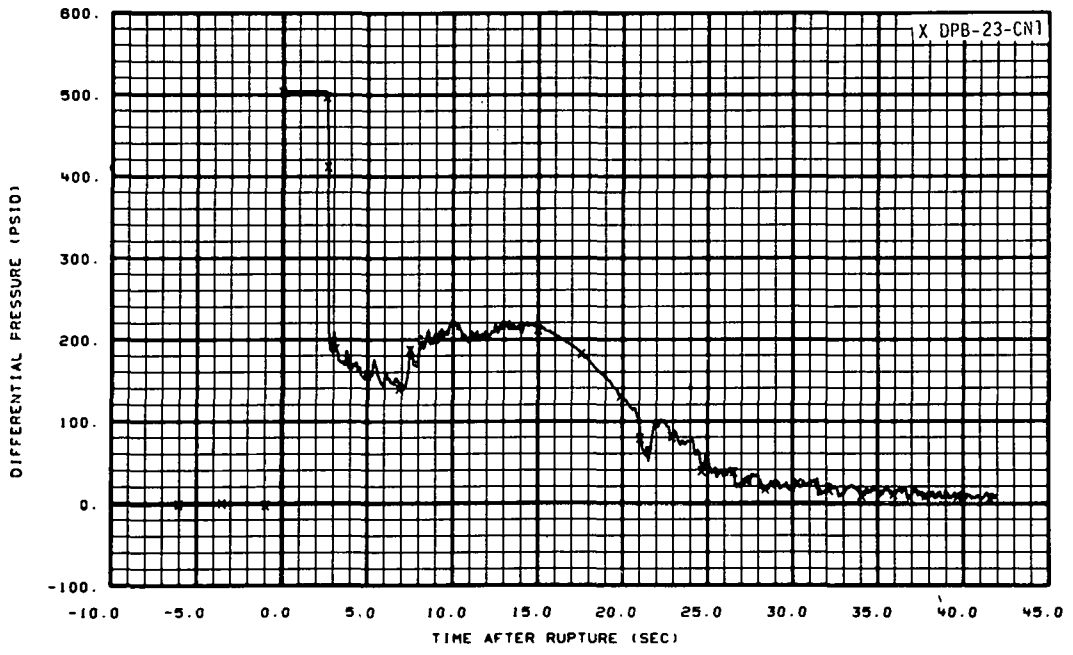


Fig. 172 Differential pressure in broken loop (DPB-23-CN1), from -6 to 42 seconds.

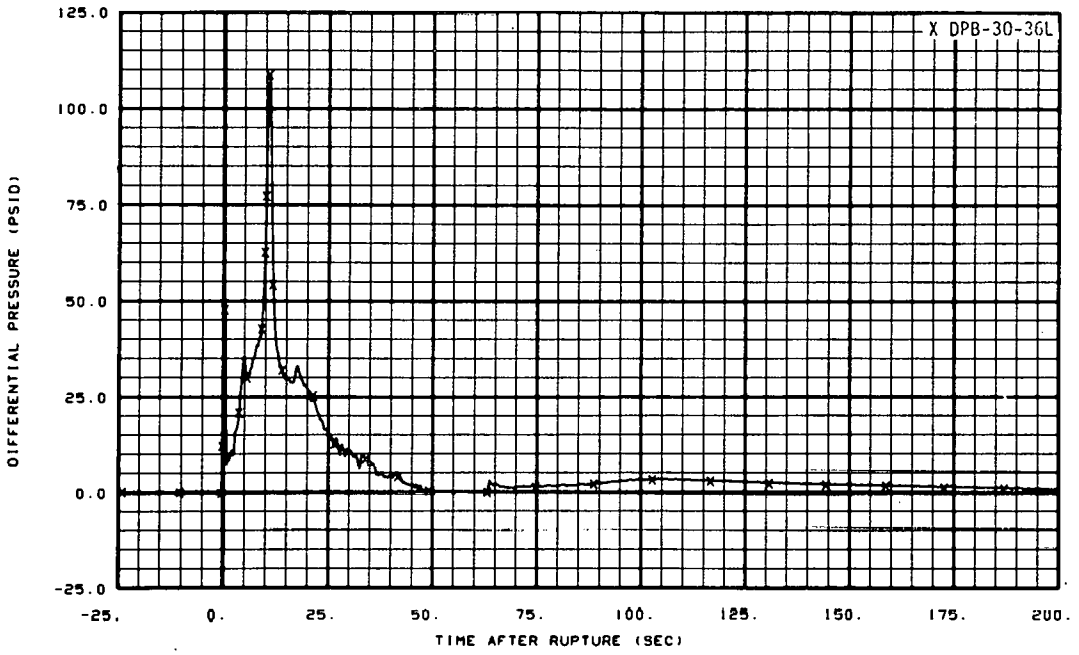


Fig. 173 Differential pressure in broken loop (DPB-30-36L), from -24 to 200 seconds.

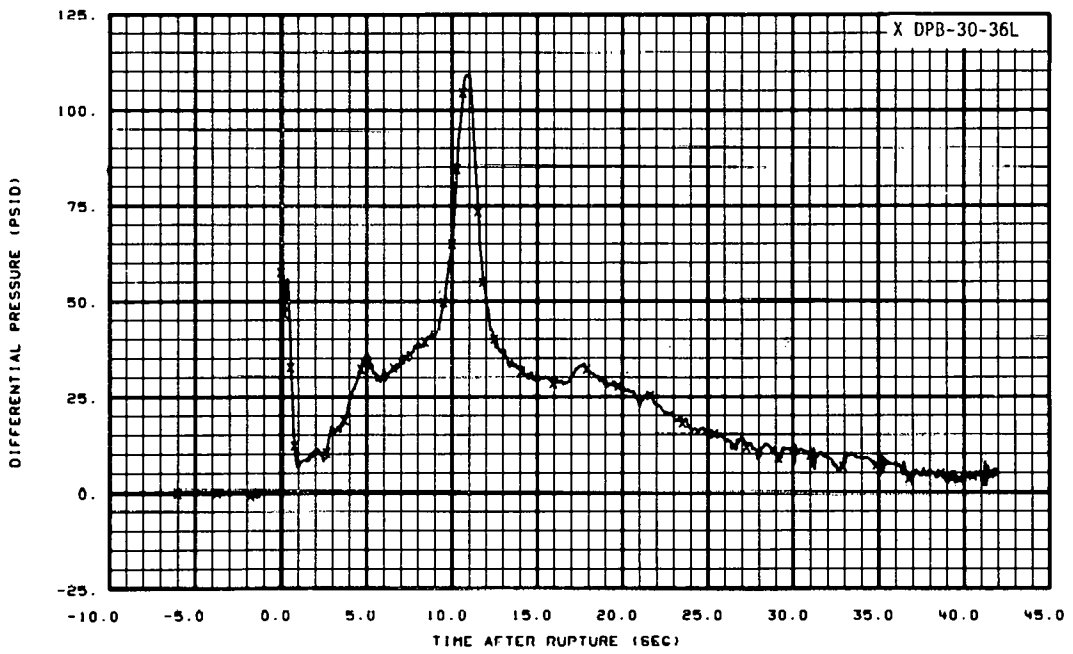


Fig. 174 Differential pressure in broken loop (DPB-30-36L), from -6 to 42 seconds.

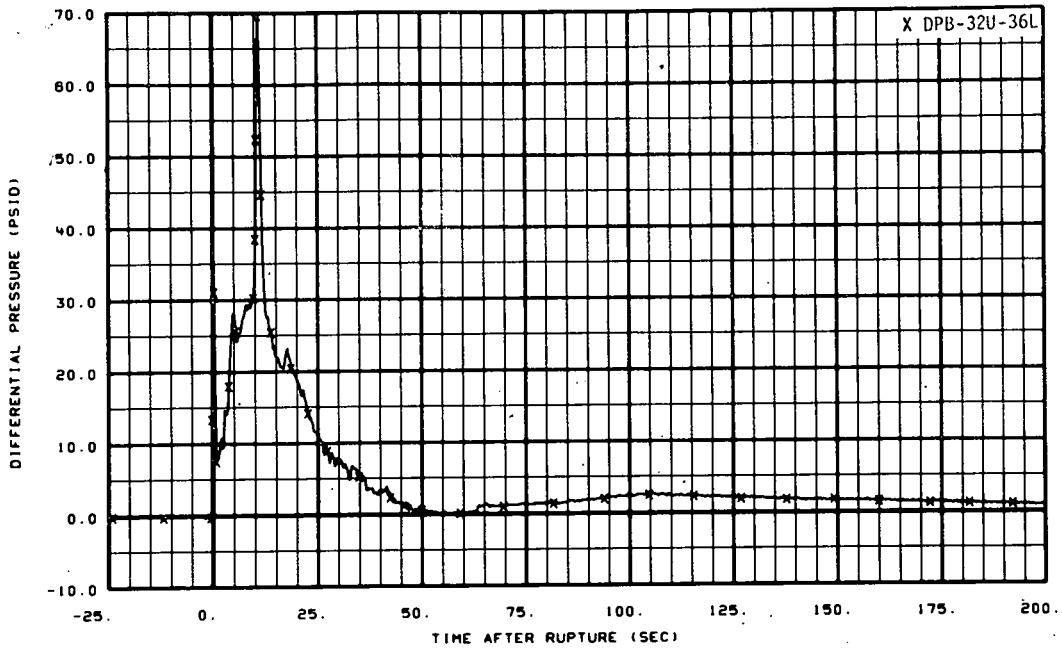


Fig. 175 Differential pressure in broken loop (DPB-32U-36L), from -24 to 200 seconds.

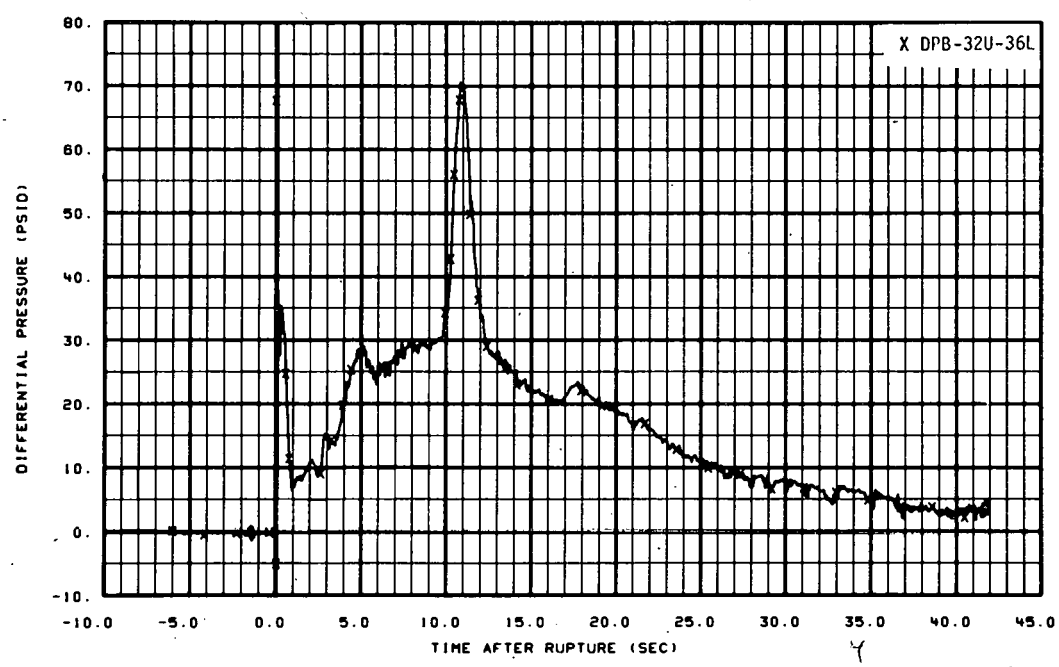


Fig. 176 Differential pressure in broken loop (DPB-32U-36L), from -6 to 42 seconds.

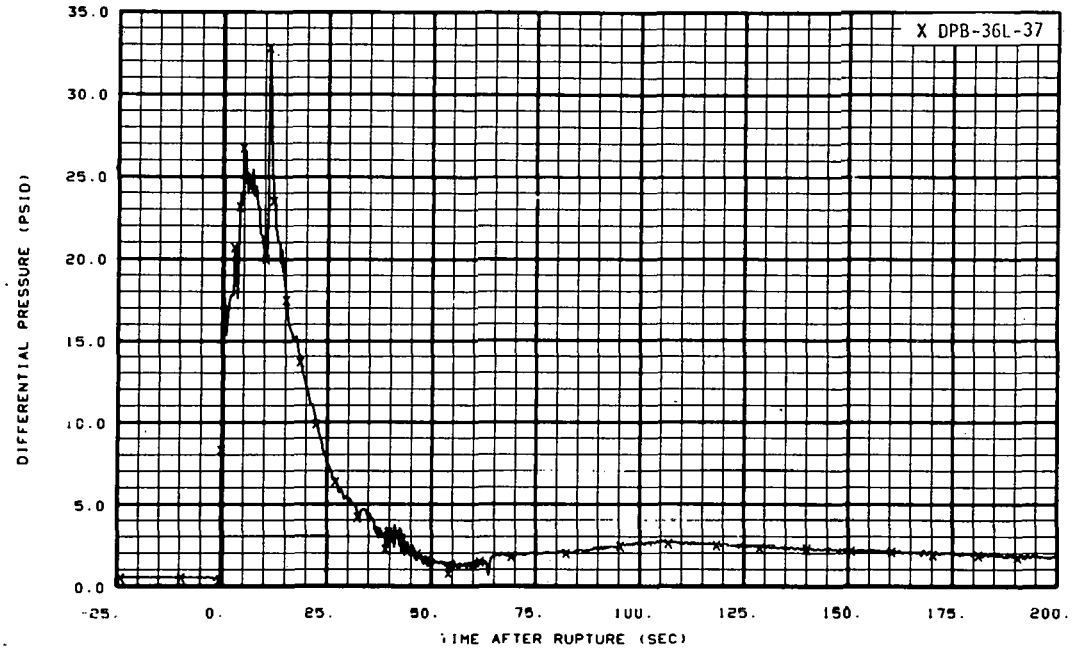


Fig. 177 Differential pressure in broken loop (DPB-36L-37), from -24 to 200 seconds.

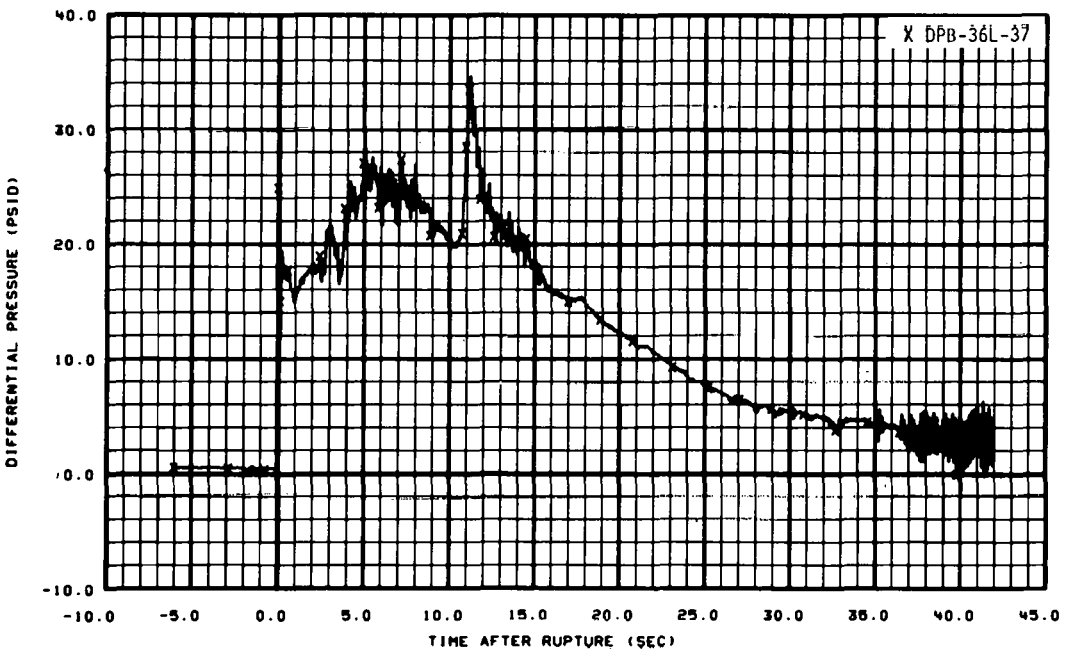


Fig. 178 Differential pressure in broken loop (DPB-36L-37), from -6 to 42 seconds.

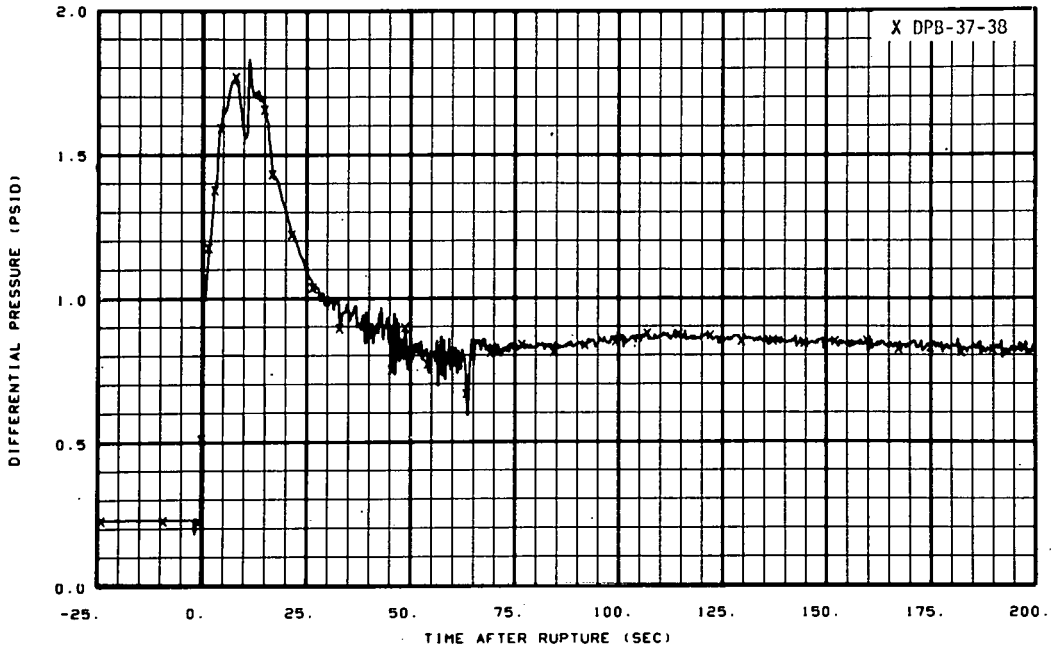


Fig. 179 Differential pressure in broken loop (DPB-37-38), from -24 to 200 seconds.

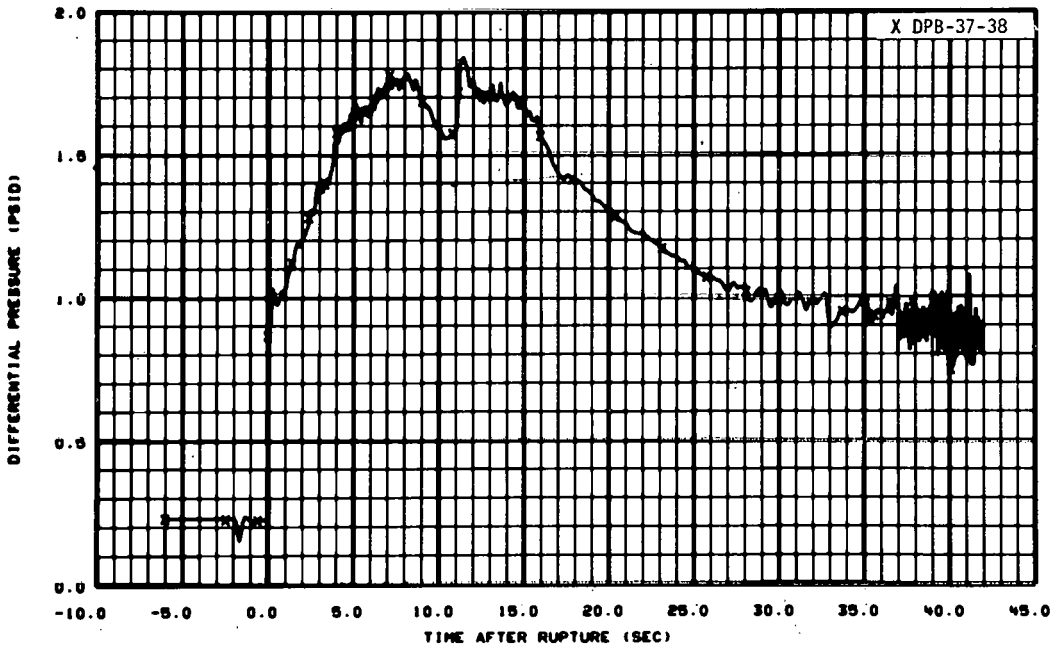


Fig. 180 Differential pressure in broken loop (DPB-37-38), from -6 to 42 seconds.

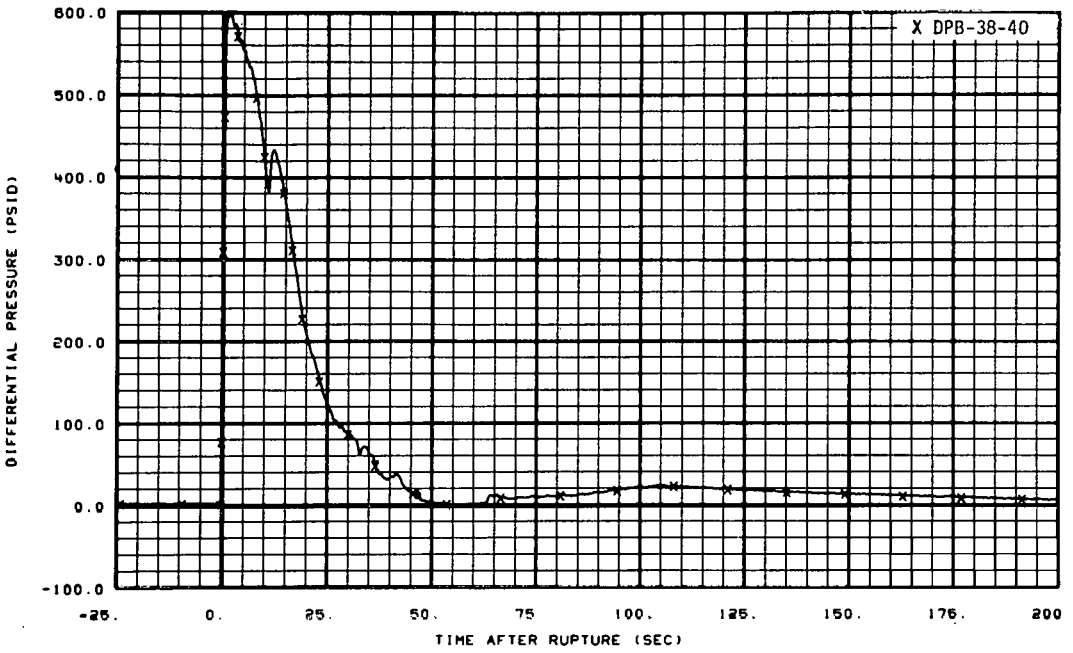


Fig. 181 Differential pressure in broken loop (DPB-38-40), from -24 to 200 seconds.

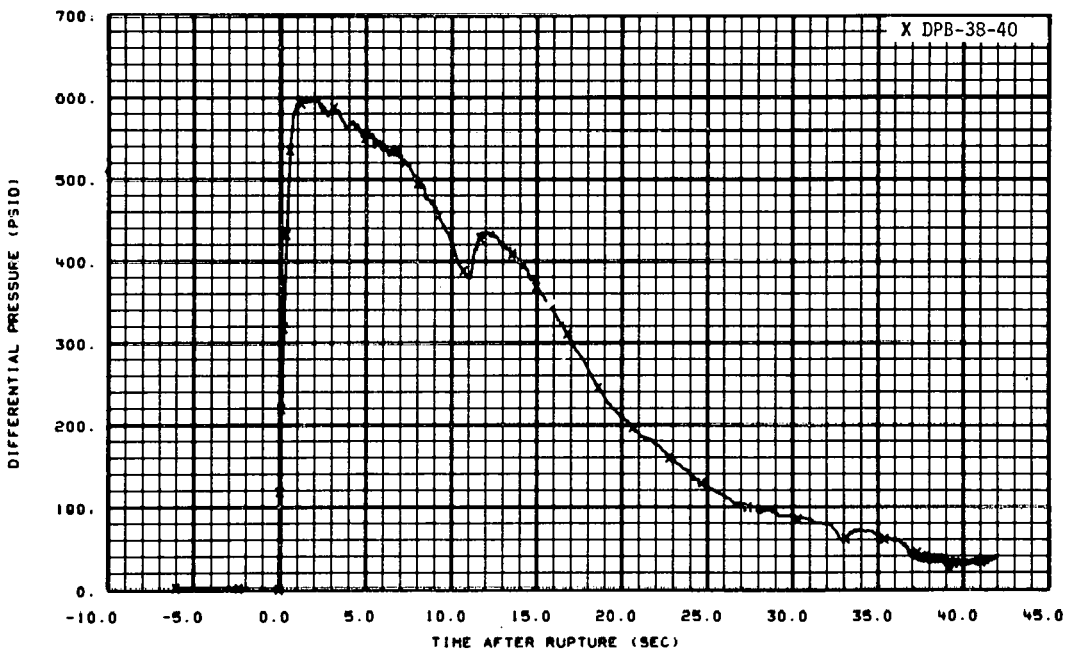


Fig. 182 Differential pressure in broken loop (DPB-38-40), from -6 to 42 seconds.

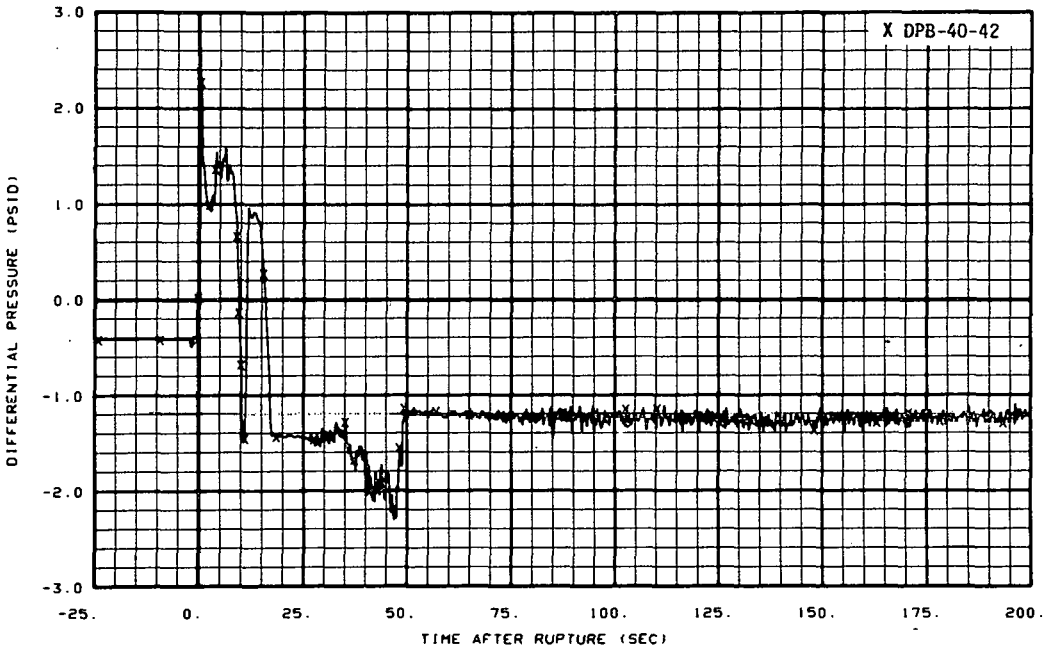


Fig. 183 Differential pressure in broken loop (DPB-40-42), from -24 to 200 seconds.

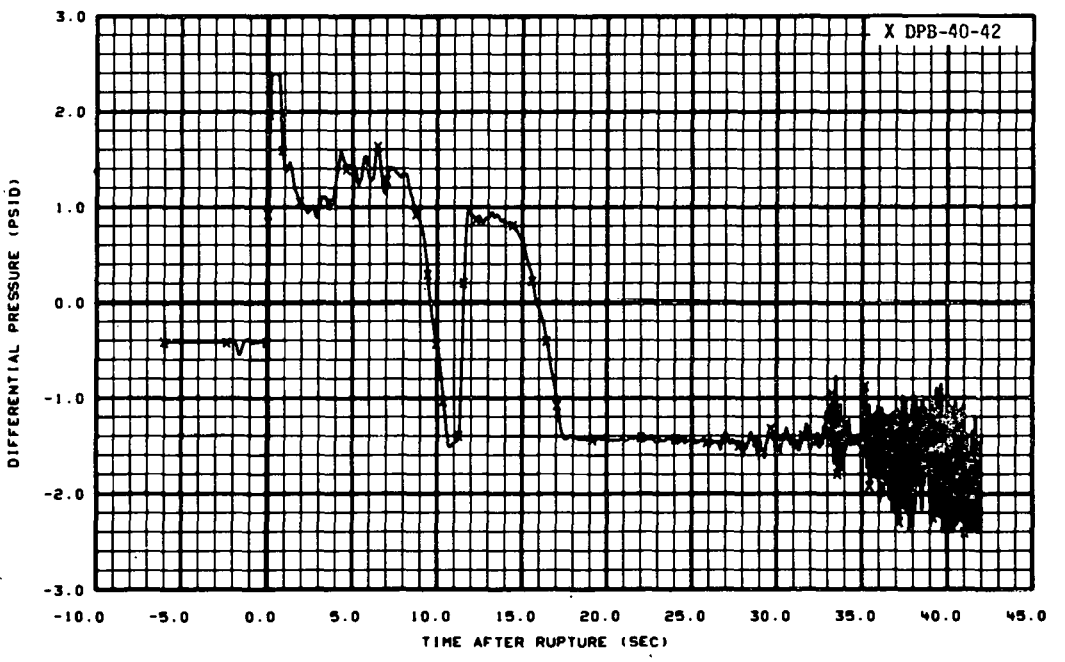


Fig. 184 Differential pressure in broken loop (DPB-40-42), from -6 to 42 seconds.

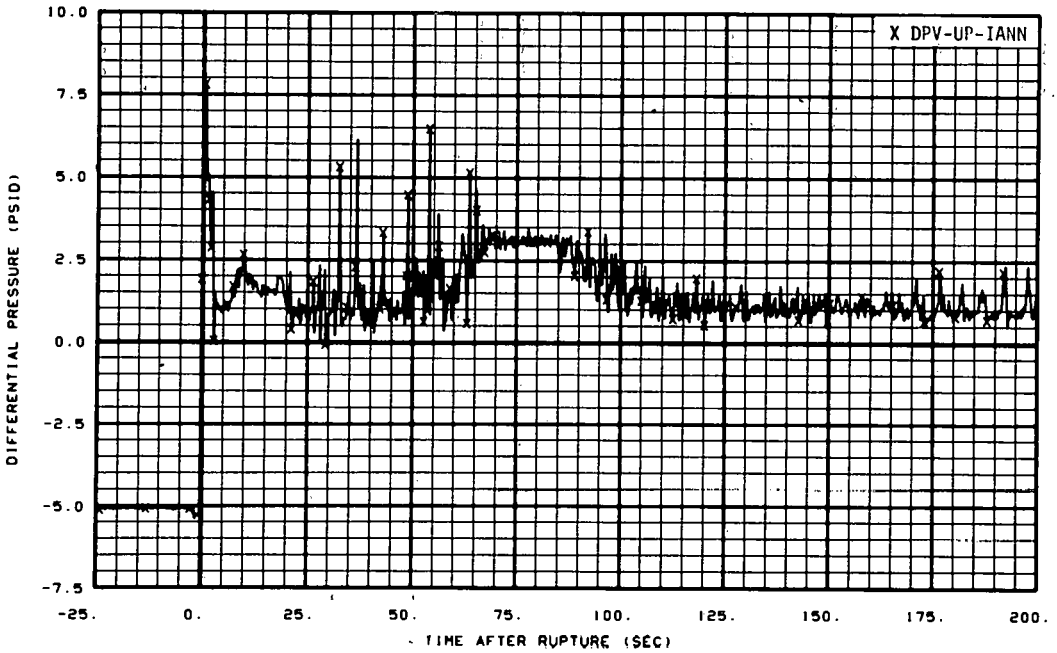


Fig. 185 Differential pressure in vessel (DPV-UP-IANN), from -24 to 200 seconds.

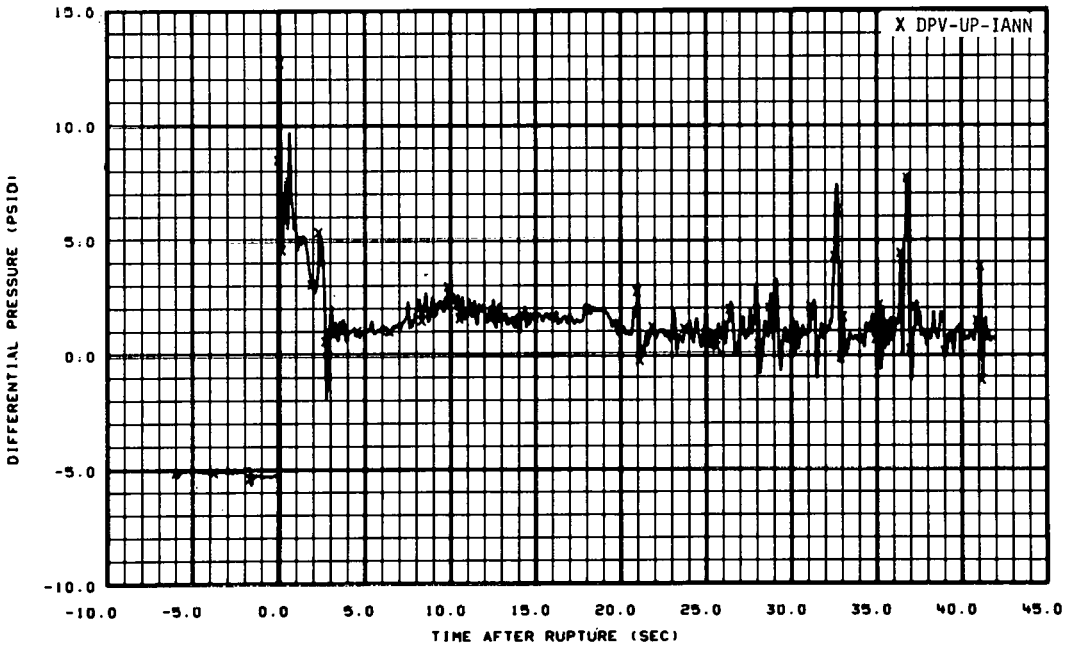


Fig. 186 Differential pressure in vessel (DPV-UP-IANN), from -6 to 42 seconds.

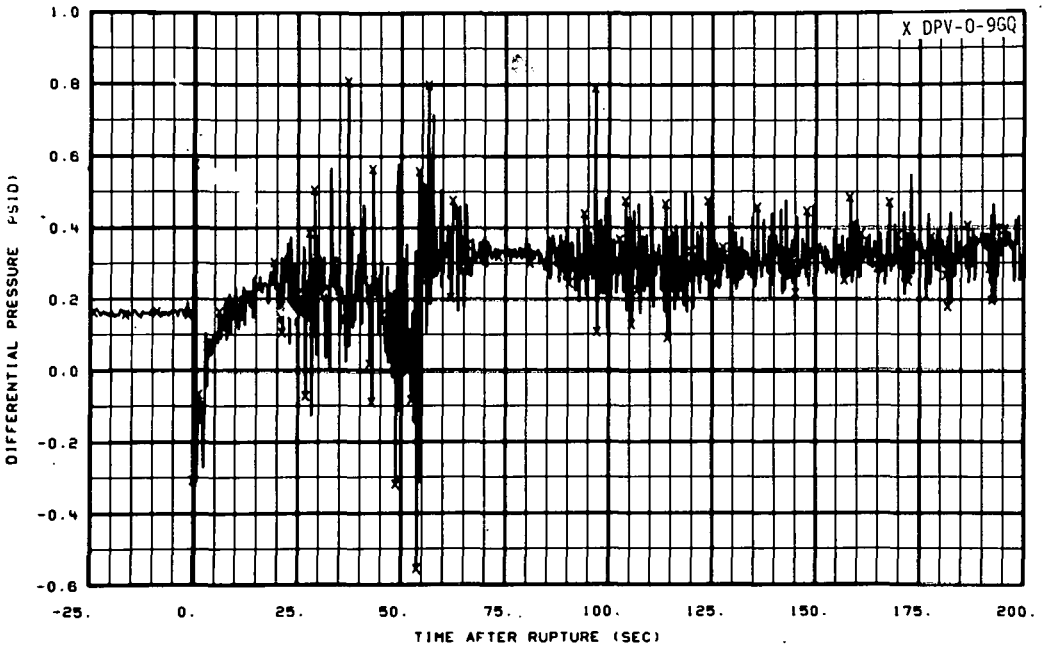


Fig. 187 Differential pressure in vessel (DPV-0-9GQ), from -24 to 200 seconds.

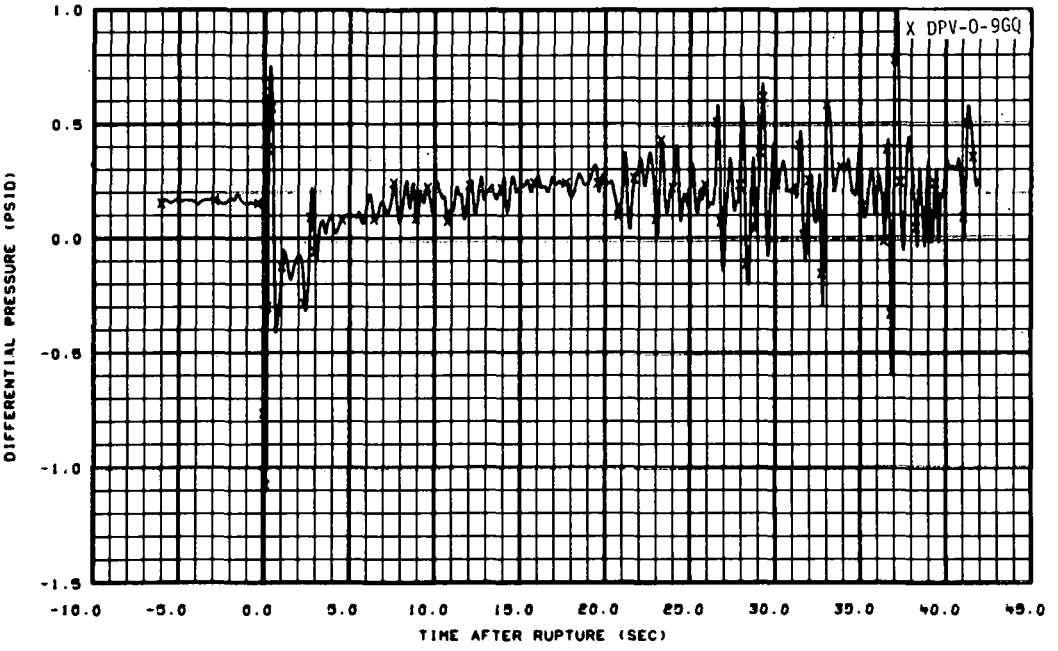


Fig. 188 Differential pressure in vessel (DPV-0-9GQ), from -6 to 42 seconds.

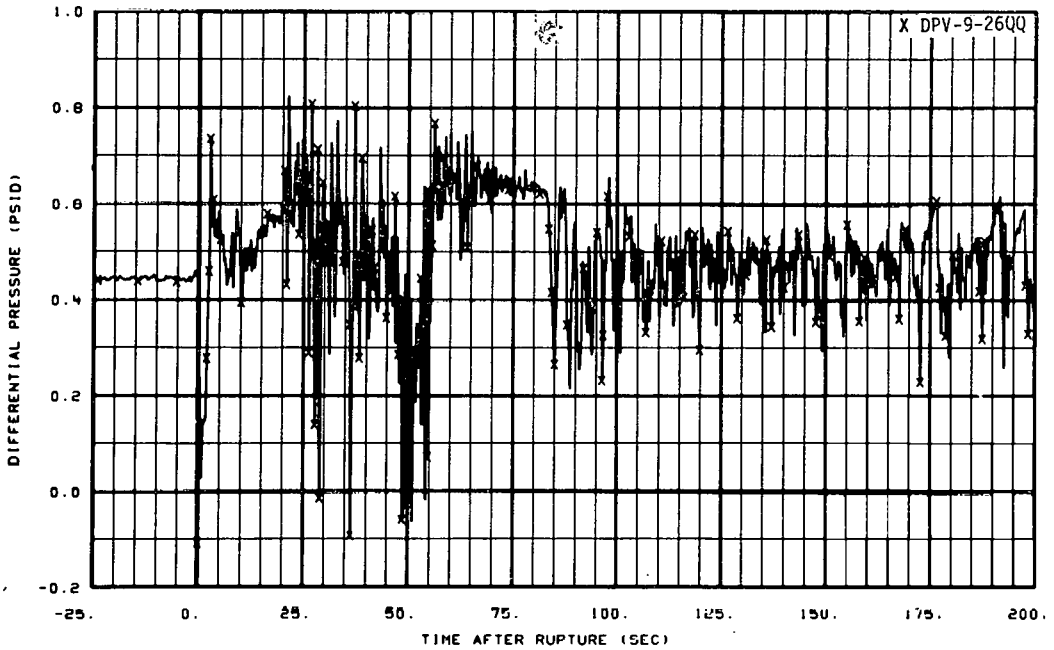


Fig. 189 Differential pressure in vessel (DPV-9-26QQ), from -24 to 200 seconds.

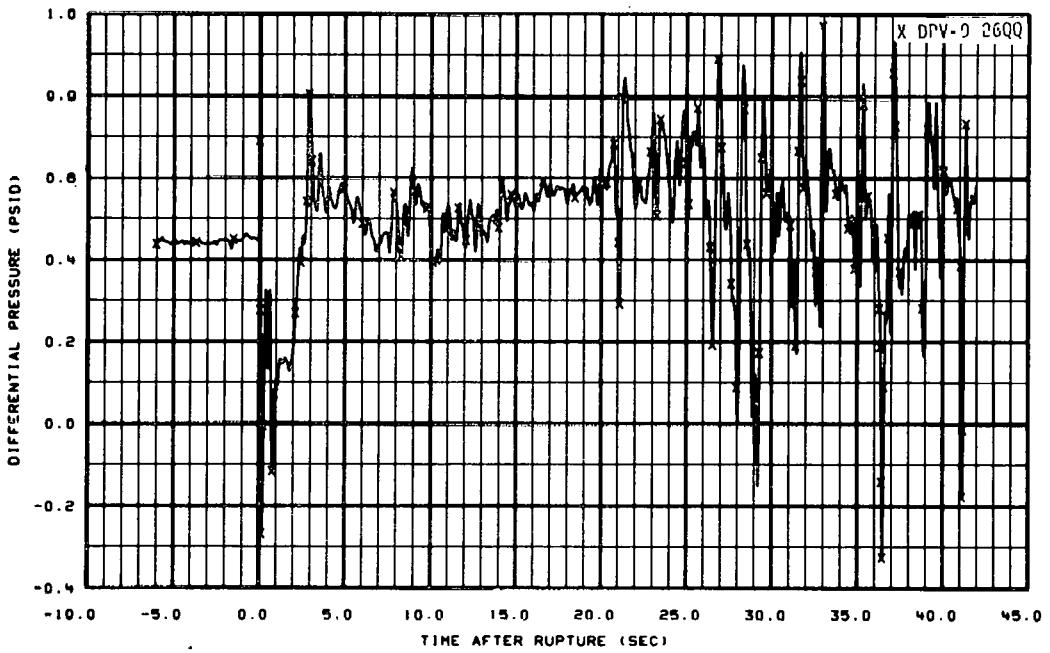


Fig. 190 Differential pressure in vessel (DPV-9-26QQ), from -6 to 42 seconds.

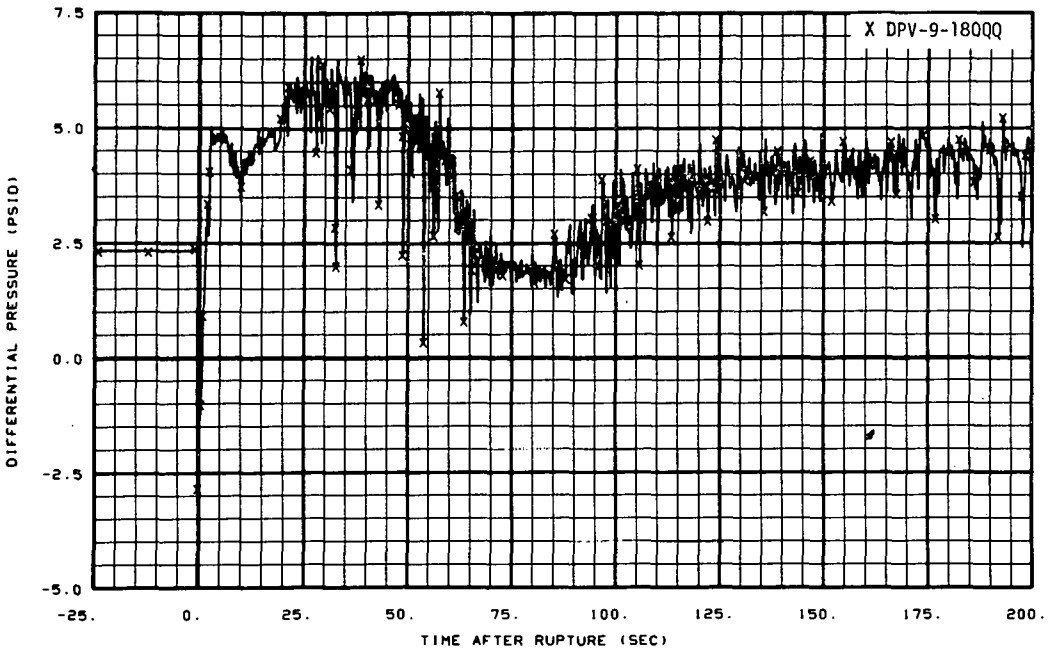


Fig. 191 Differential pressure in vessel (DPV-9-1800Q), from -24 to 200 seconds.

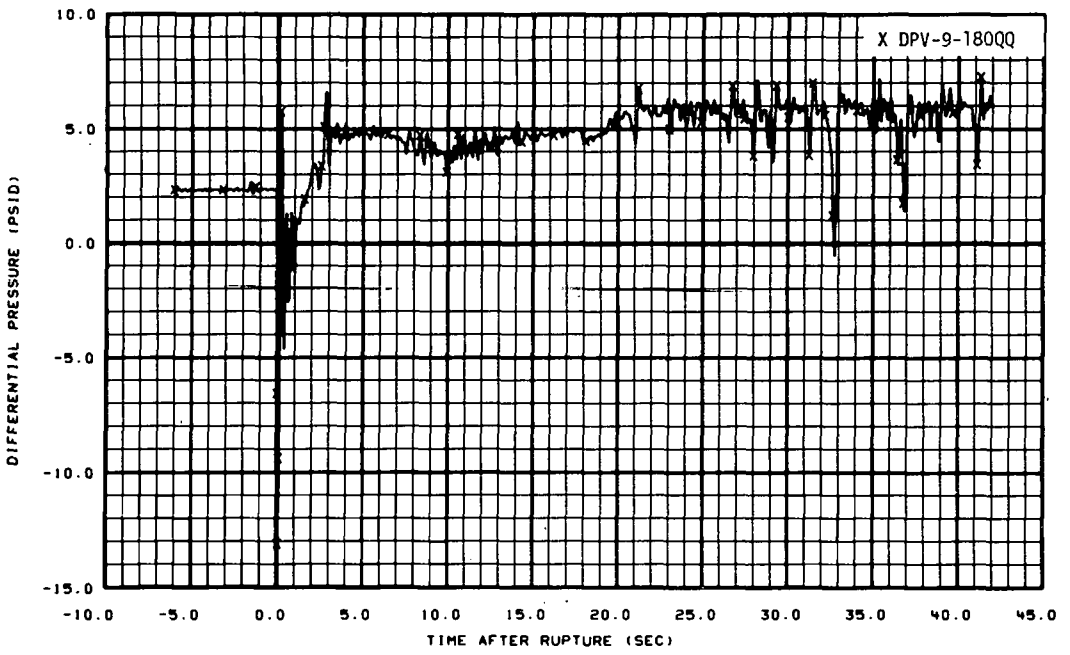


Fig. 192 Differential pressure in vessel (DPV-9-1800Q), from -6 to 42 seconds.

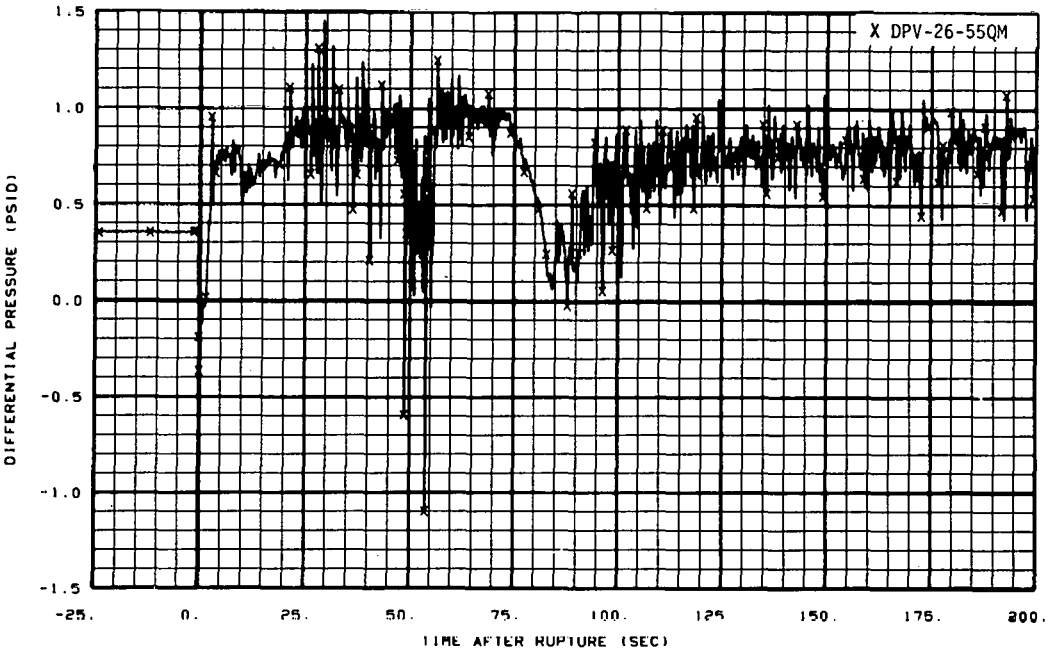


Fig. 193 Differential pressure in vessel (DPV-26-55QM), from -24 to 200 seconds.

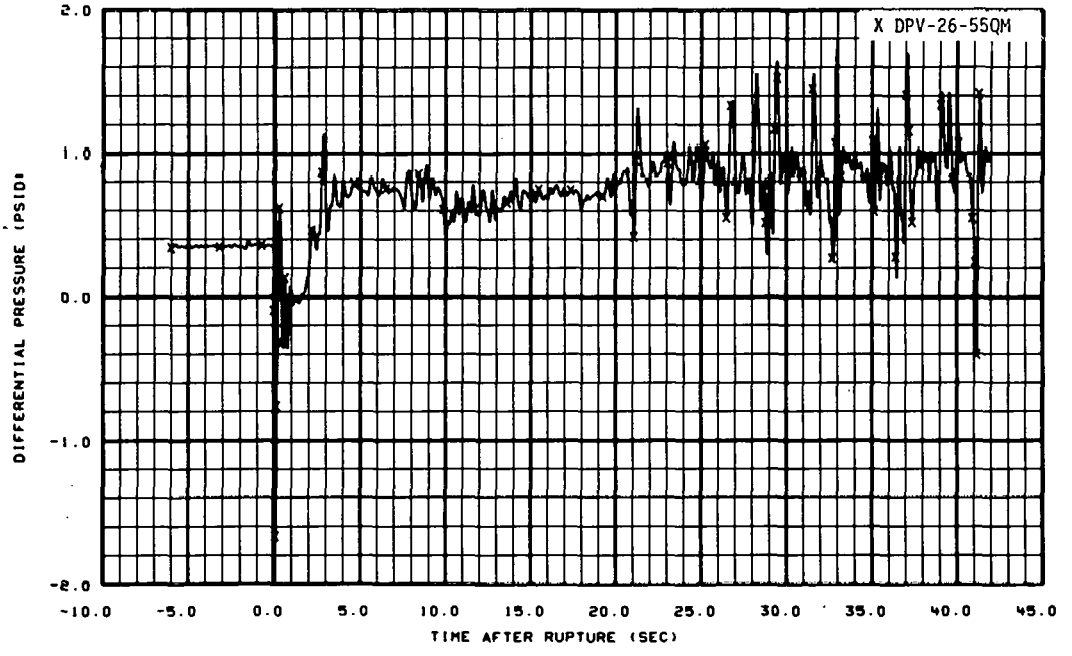


Fig. 194 Differential pressure in vessel (DPV-26-55QM), from -6 to 42 seconds.

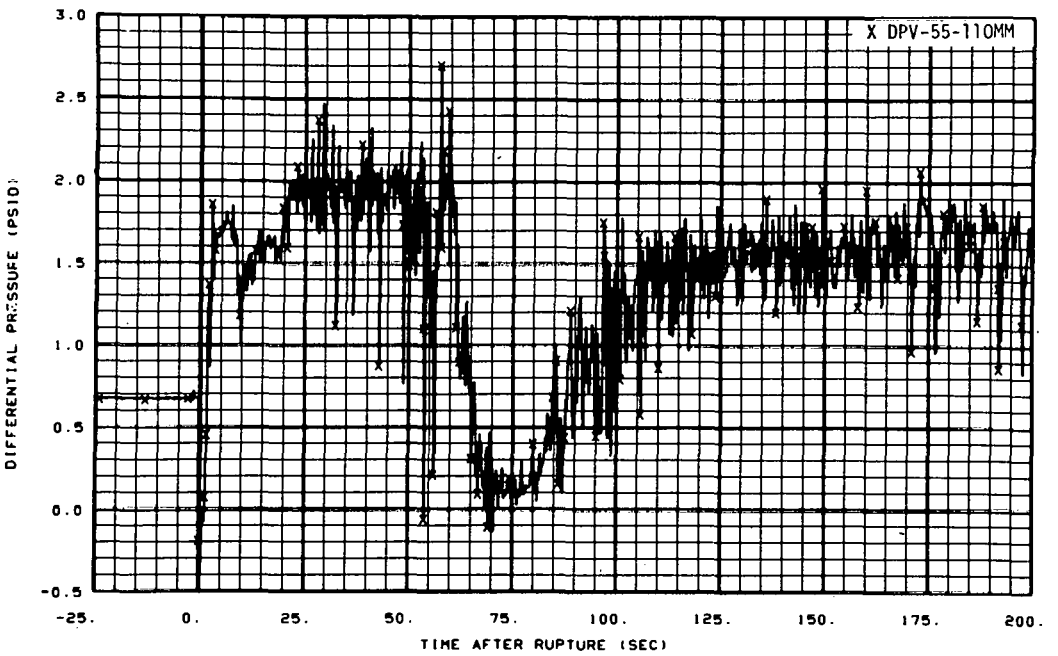


Fig. 195 Differential pressure in vessel (DPV-55-110MM), from -24 to 200 seconds.

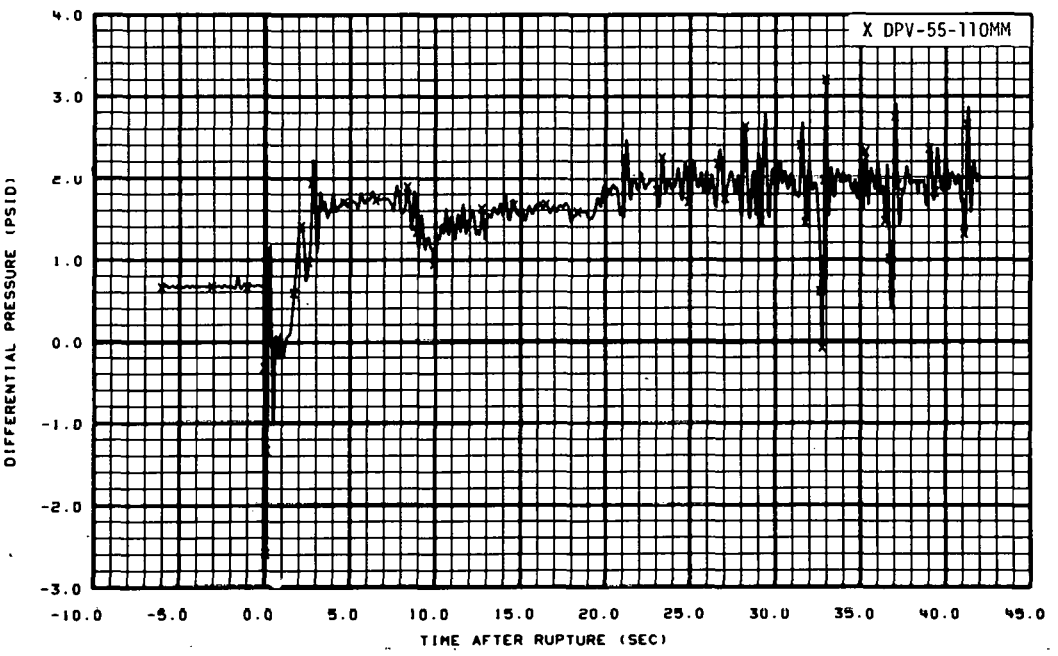


Fig. 196 Differential pressure in vessel (DPV-55-110MM), from -6 to 42 seconds.

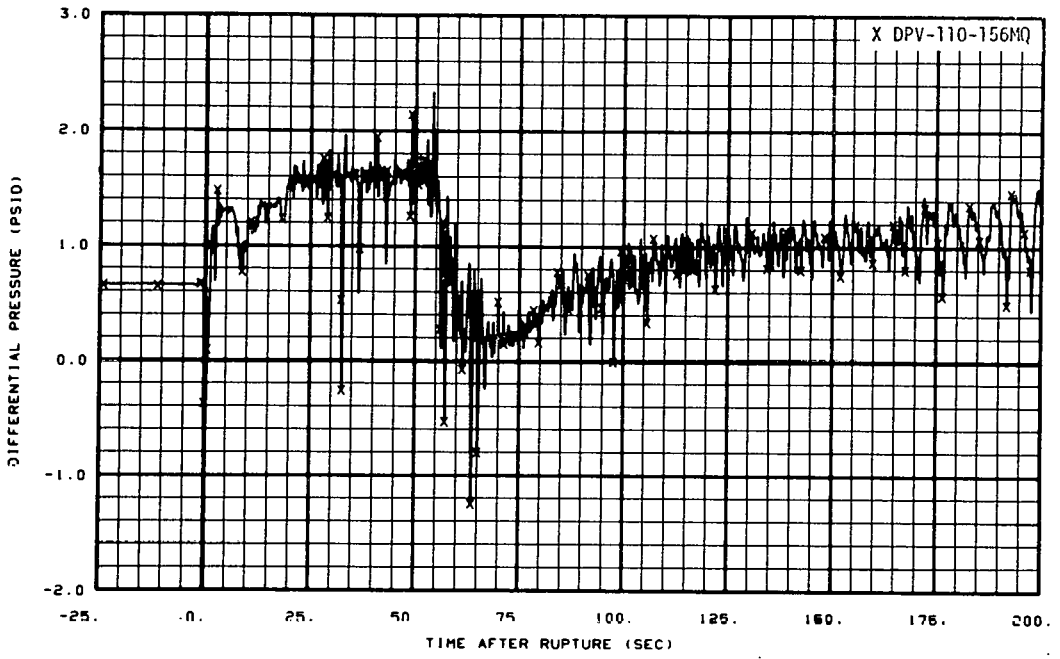


Fig. 197 Differential pressure in vessel (DPV-110-156MQ), from -24 to 200 seconds.

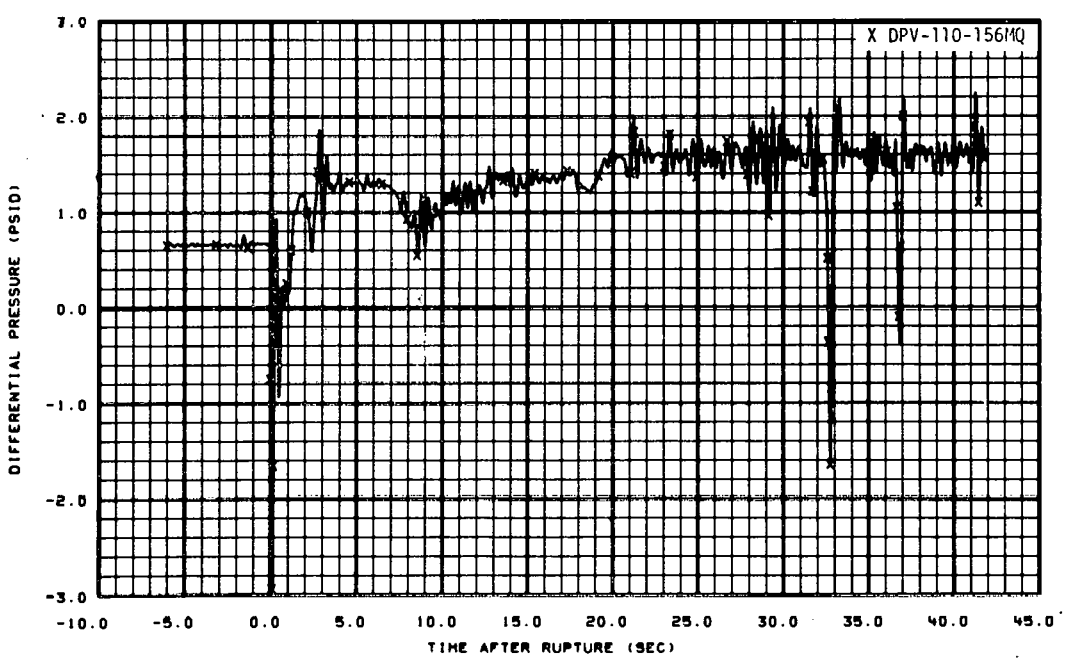


Fig. 198 Differential pressure in vessel (DPV-110-156MQ), from -6 to 42 seconds.

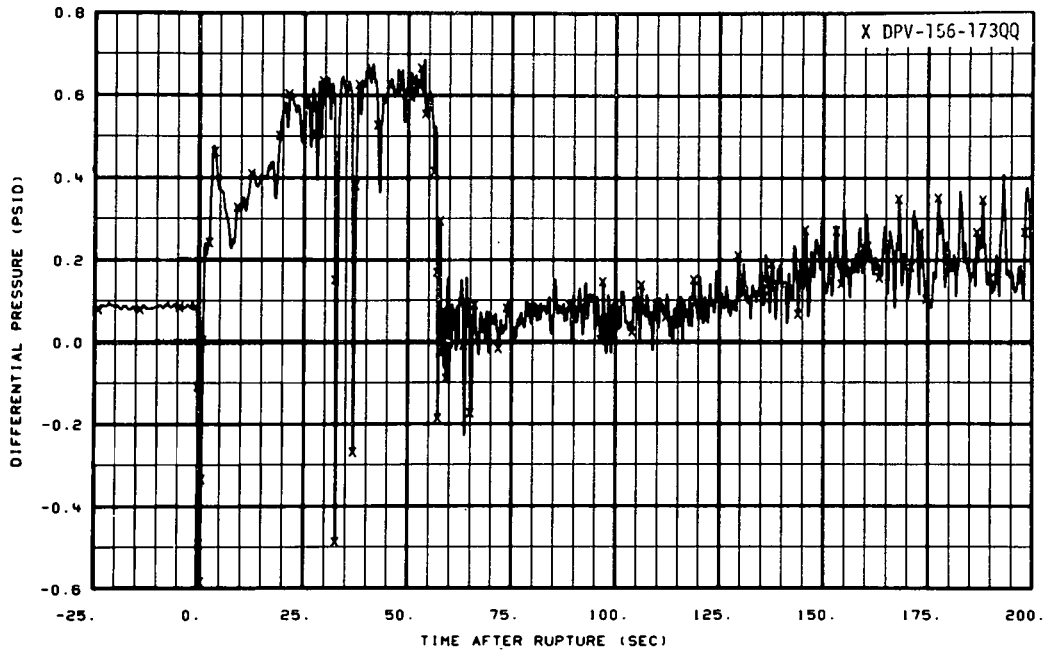


Fig. 199 Differential pressure in vessel (DPV-156-173QQ), from -24 to 200 seconds.

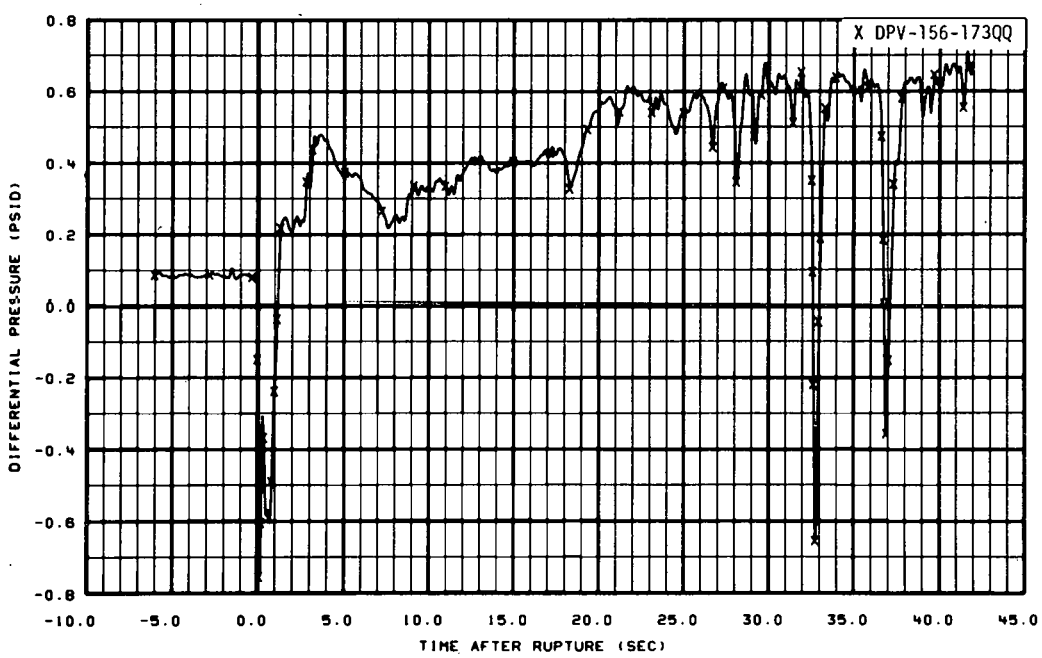


Fig. 200 Differential pressure in vessel (DPV-156-173QQ), from -6 to 42 seconds.

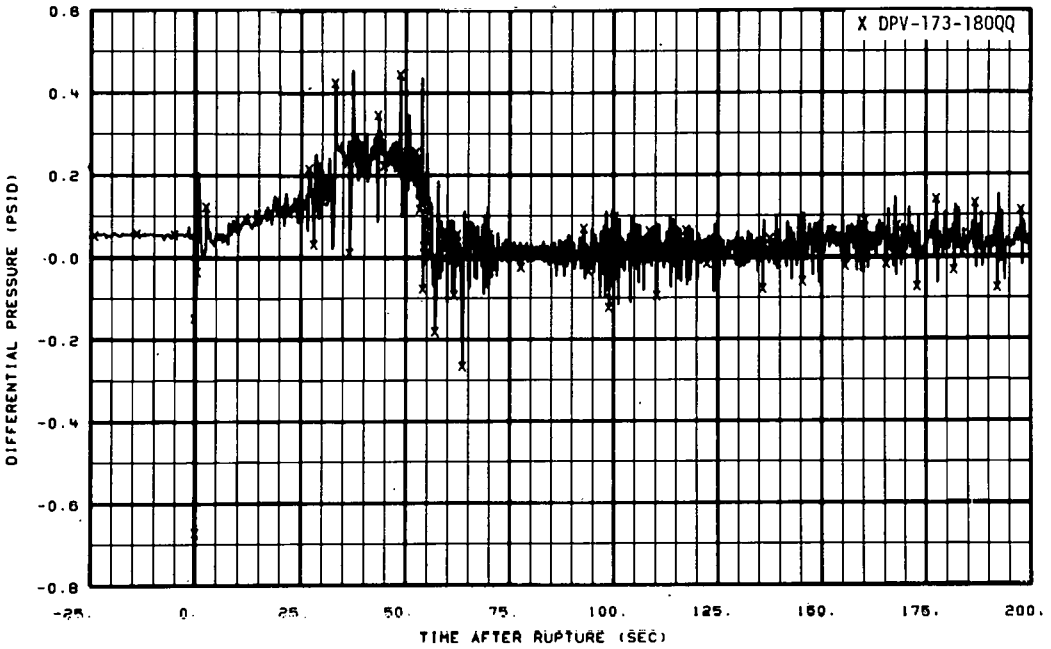


Fig. 201 Differential pressure in vessel (DPV-173-180QQ), from -24 to 200 seconds.

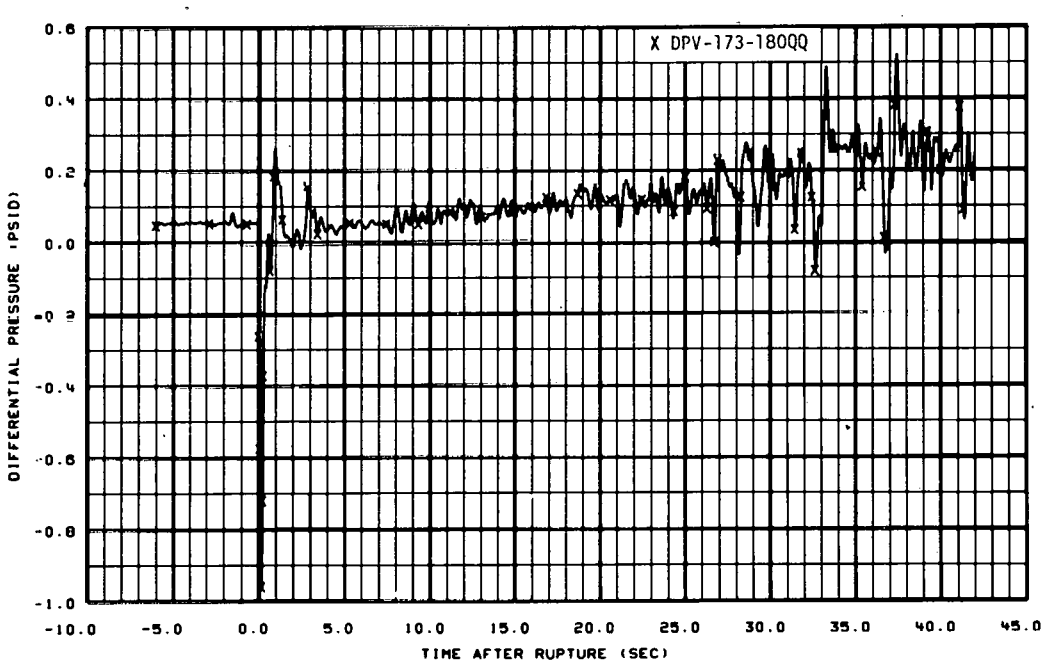


Fig. 202 Differential pressure in vessel (DPV-173-180QQ), from -6 to 42 seconds.

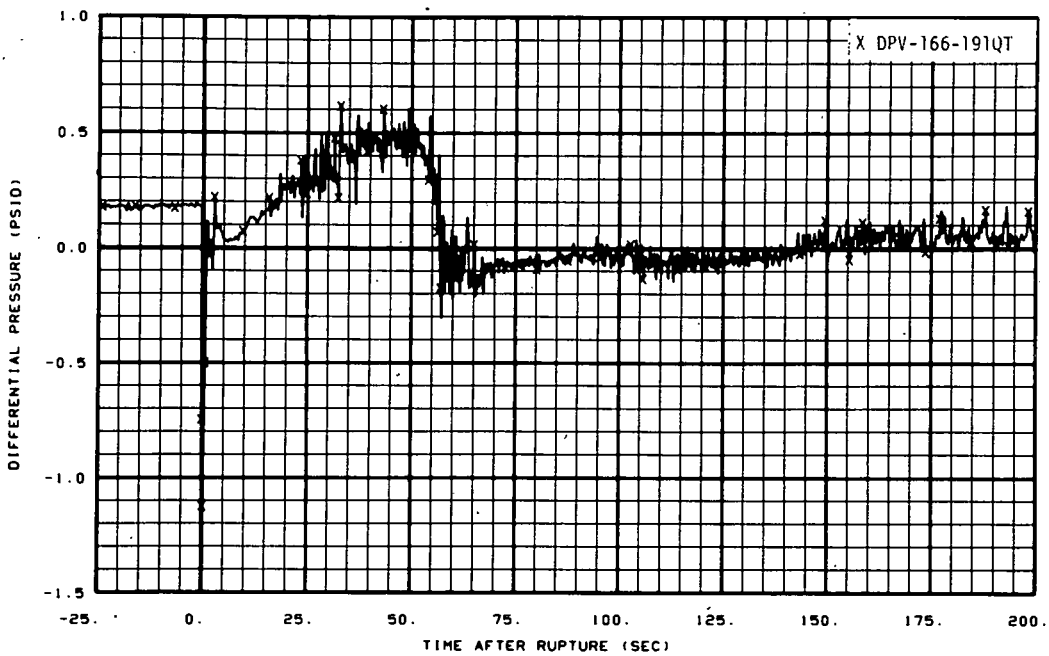


Fig. 203 Differential pressure in vessel (DPV-166-191QT), from -24 to 200 seconds.

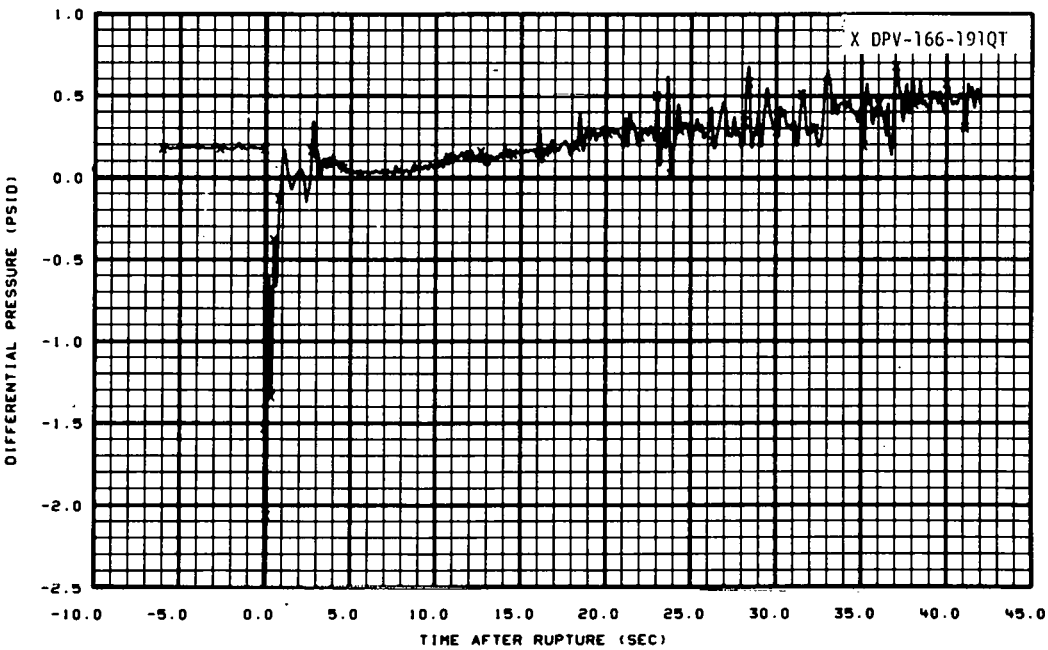


Fig. 204 Differential pressure in vessel (DPV-166-191QT), from -6 to 42 seconds.

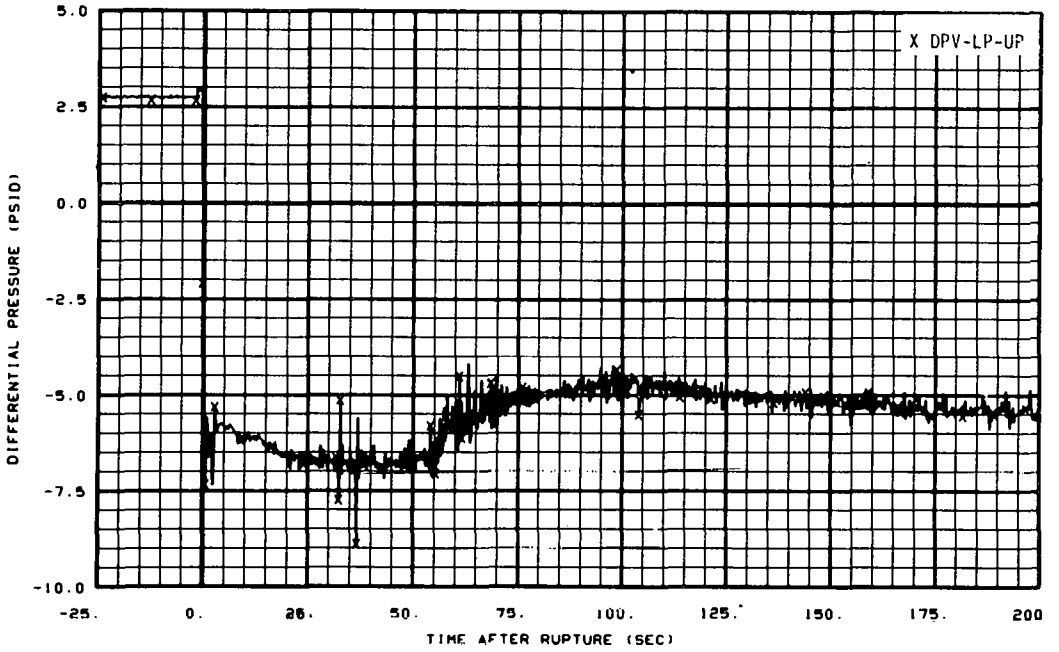


Fig. 205 Differential pressure in vessel (DPV-LP-UP), from -24 to 200 seconds.

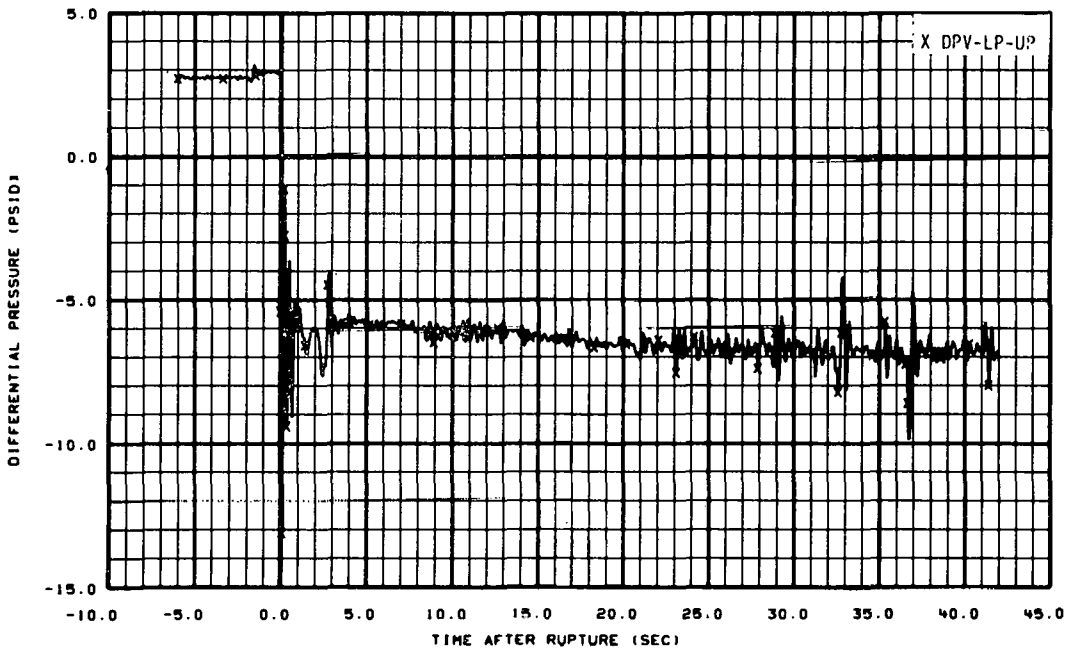


Fig. 206 Differential pressure in vessel (DPV-LP-UP), from -6 to 42 seconds.

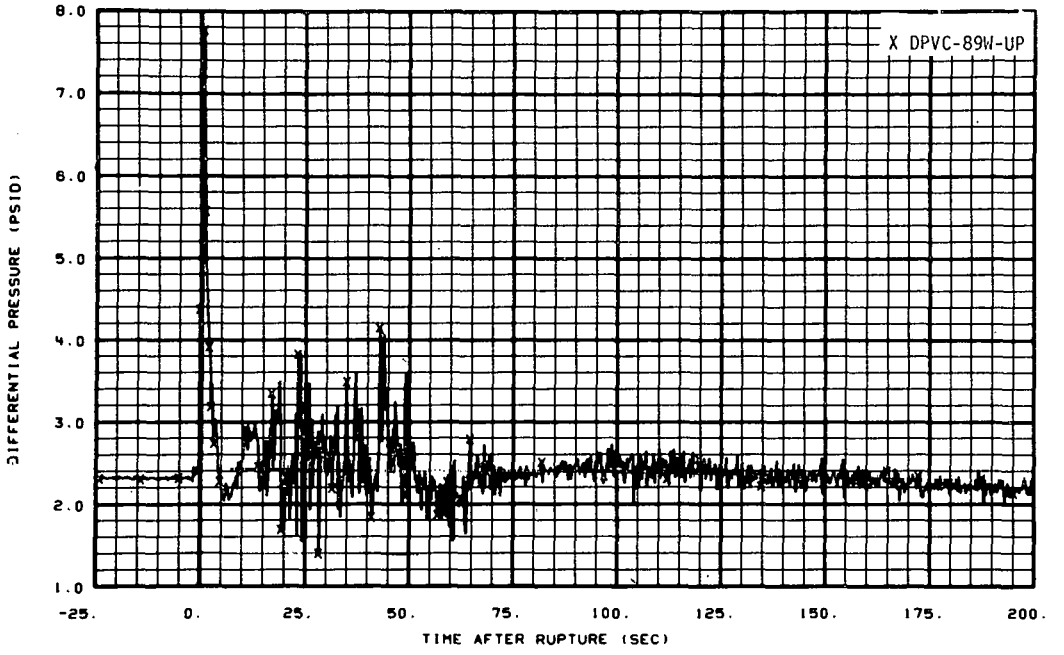


Fig. 207 Differential pressure in vessel core (DPVC-89W-UP), from -24 to 200 seconds.

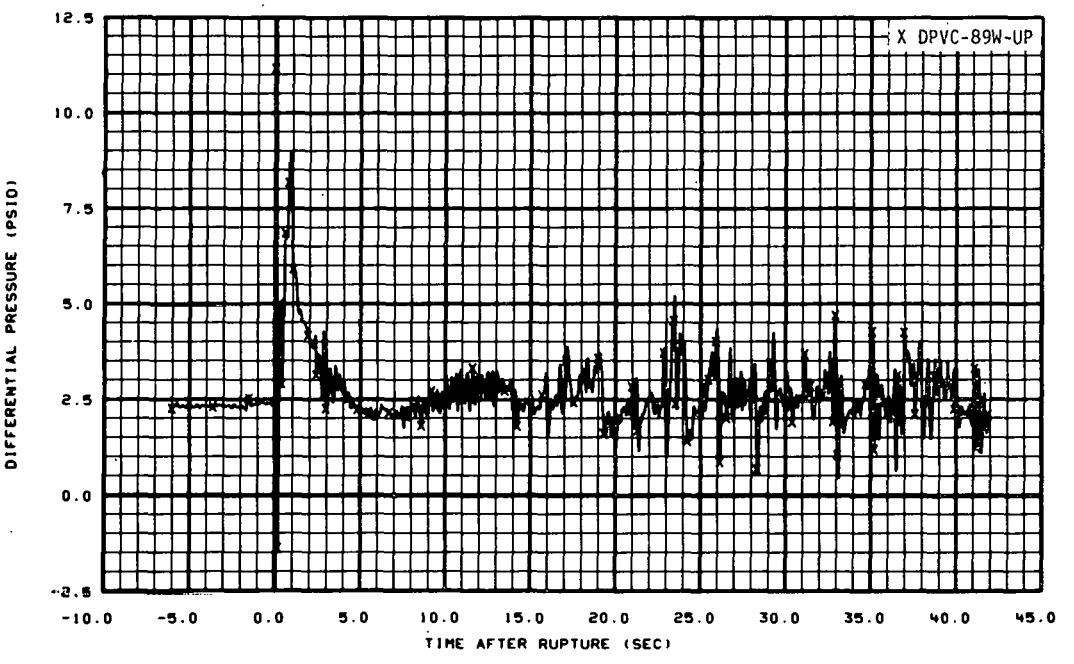


Fig. 208 Differential pressure in vessel core (DPVC-89W-UP), from -6 to 42 seconds.

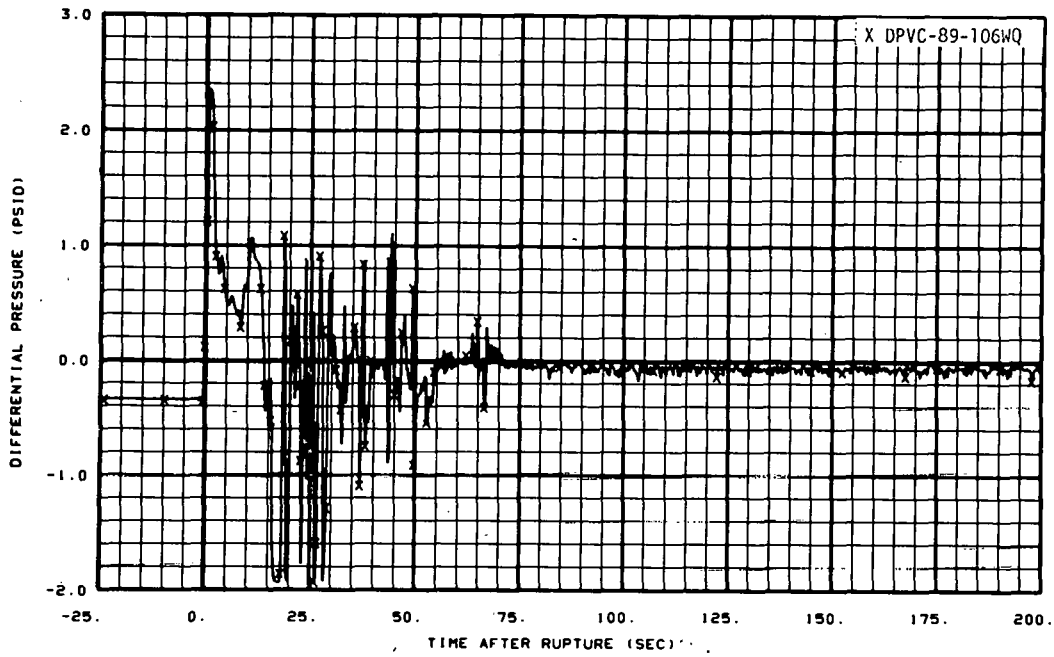


Fig. 209 Differential pressure in vessel core (DPVC-89-106WQ), from -24 to 200 seconds.

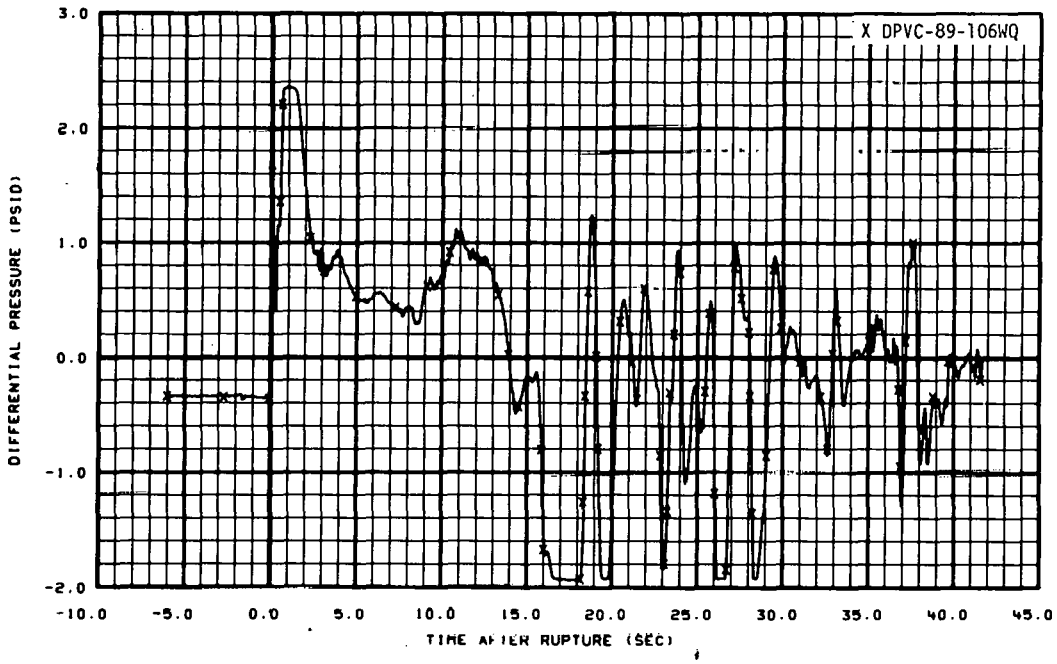


Fig. 210 Differential pressure in vessel core (DPVC-89-106WQ), from -6 to 42 seconds.

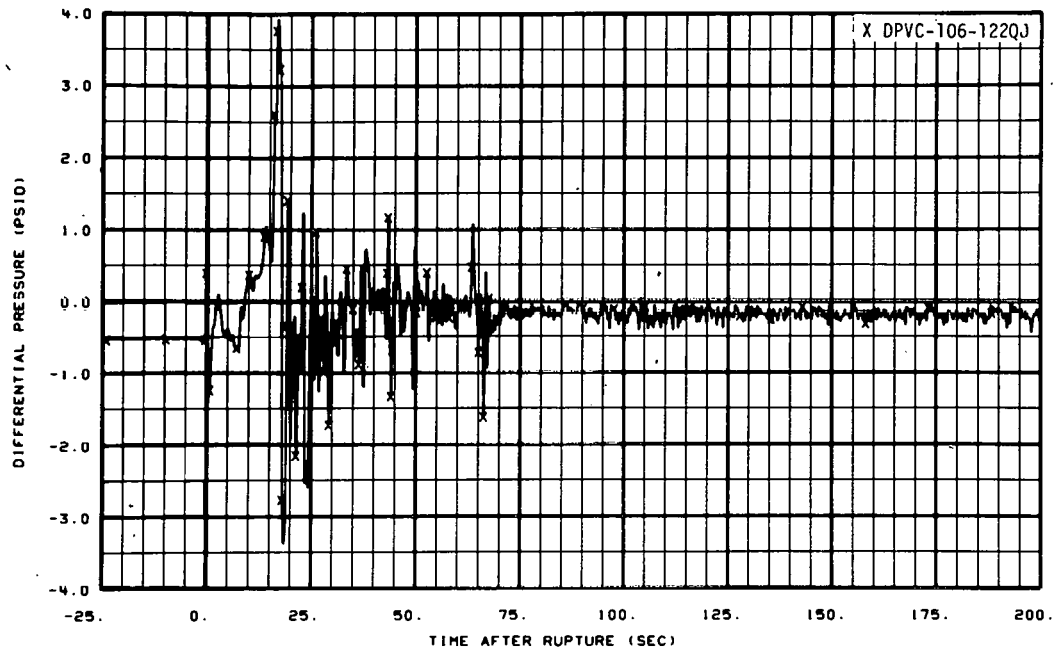


Fig. 211 Differential pressure in vessel core (DPVC-106-1220J), from -24 to 200 seconds.

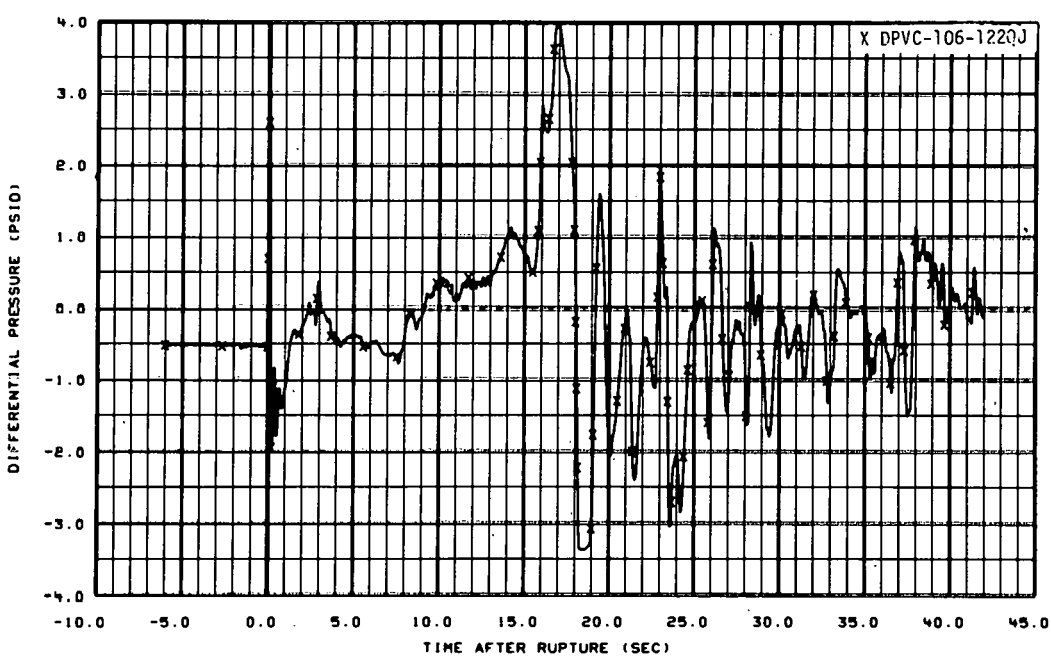


Fig. 212 Differential pressure in vessel core (DPVC-106-1220J), from -6 to 42 seconds.

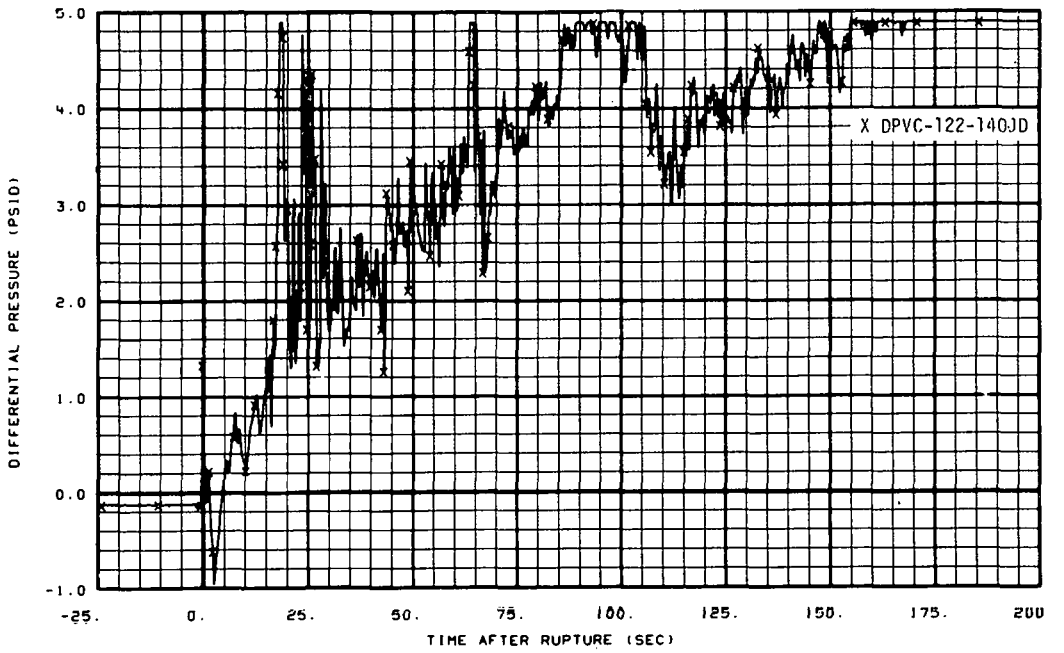


Fig. 213 Differential pressure in vessel core (DPVC-122-140JD), from -24 to 200 seconds.

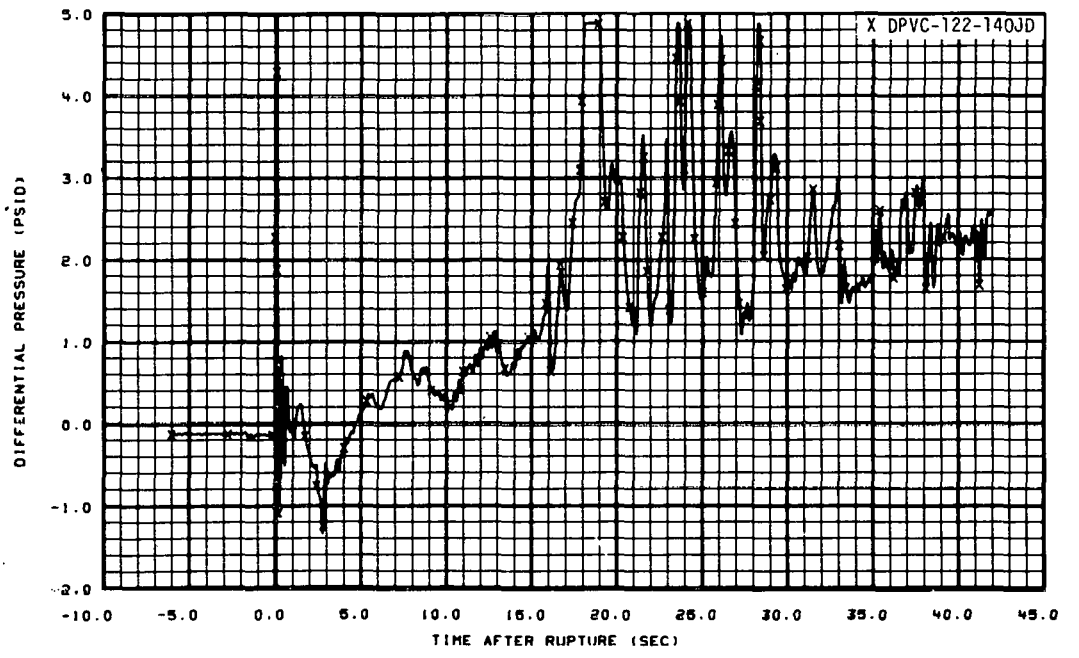


Fig. 214 Differential pressure in vessel core (DPVC-122-140JD), from -6 to 42 seconds.

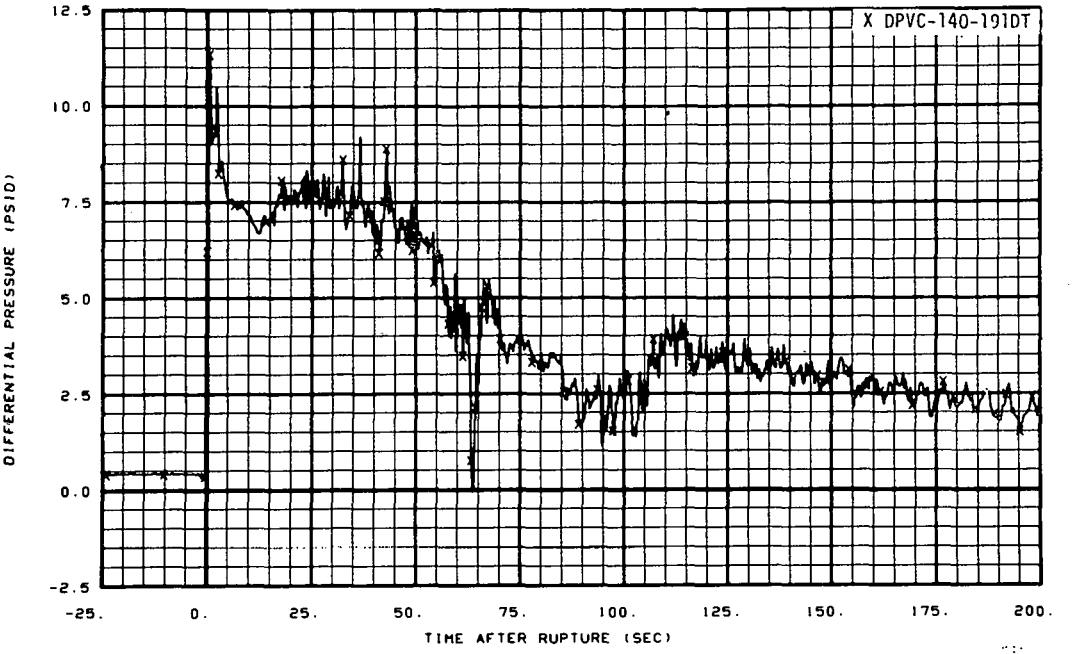


Fig. 215 Differential pressure in vessel core (DPVC-140-191DT), from -24 to 200 seconds.

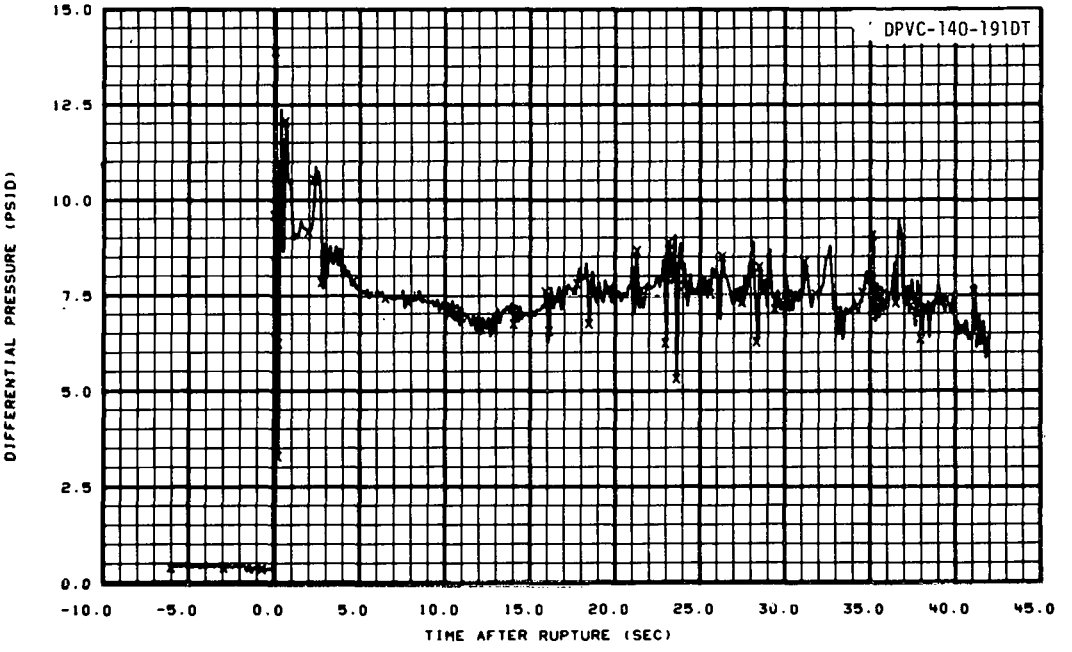


Fig. 216 Differential pressure in vessel core (DPVC-140-191DT), from -6 to 42 seconds.

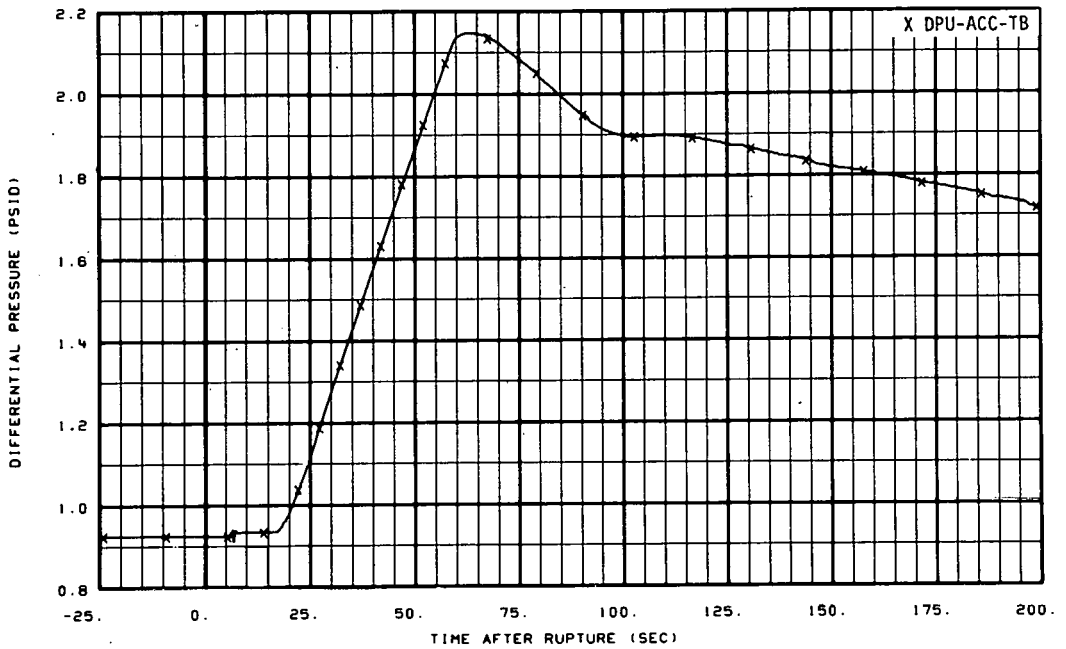


Fig. 217 Differential pressure in intact loop accumulator (DPU-ACC-TB), from -24 to 200 seconds.

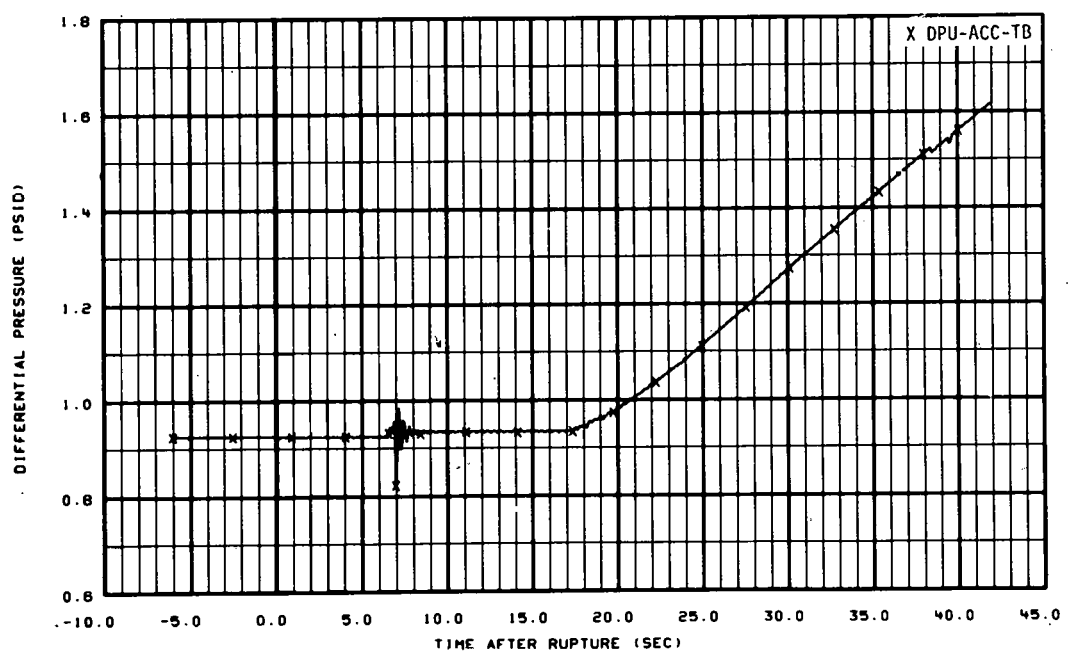


Fig. 218 Differential pressure in intact loop accumulator (DPU-ACC-TB), from -6 to 42 seconds.

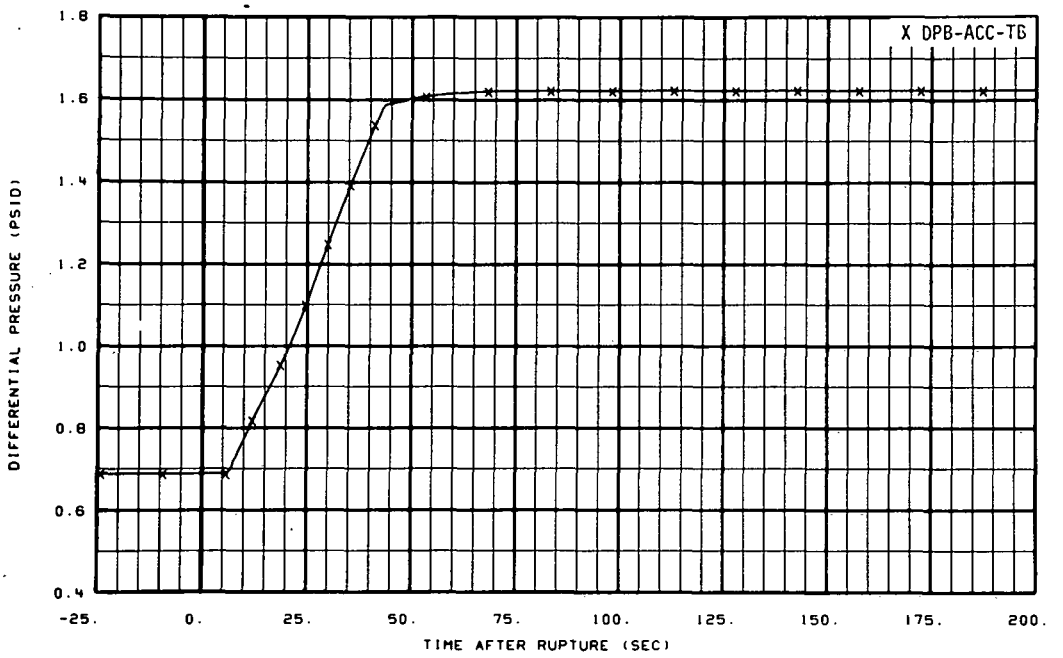


Fig. 219 Differential pressure in broken loop accumulator (DPB-ACC-TB), from -24 to 200 seconds.

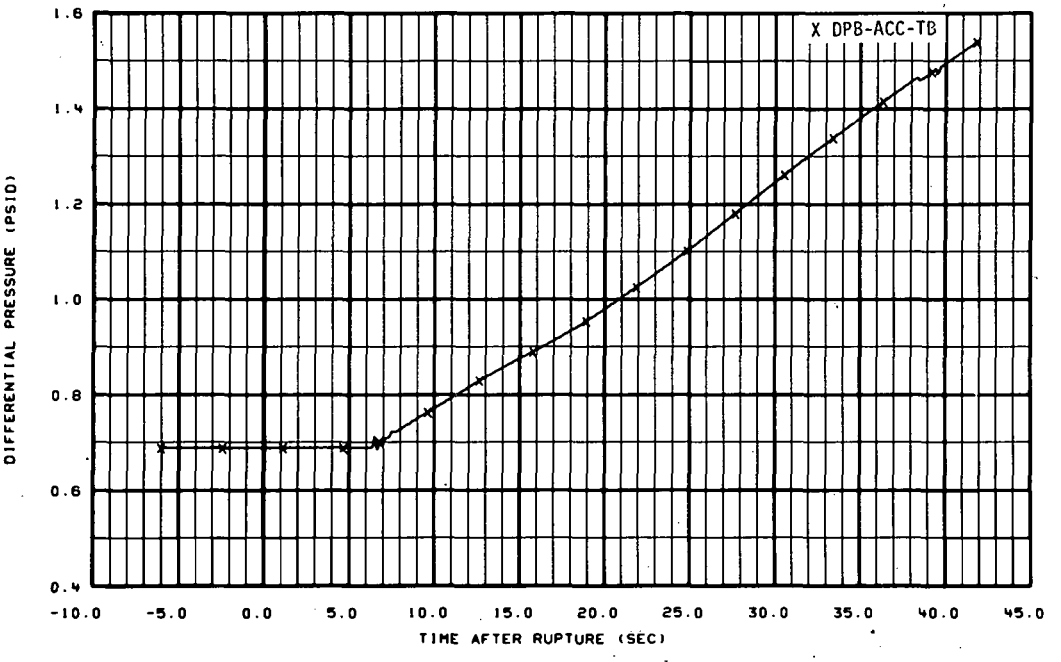


Fig. 220 Differential pressure in broken loop accumulator (DPB-ACC-TB), from -6 to 42 seconds.

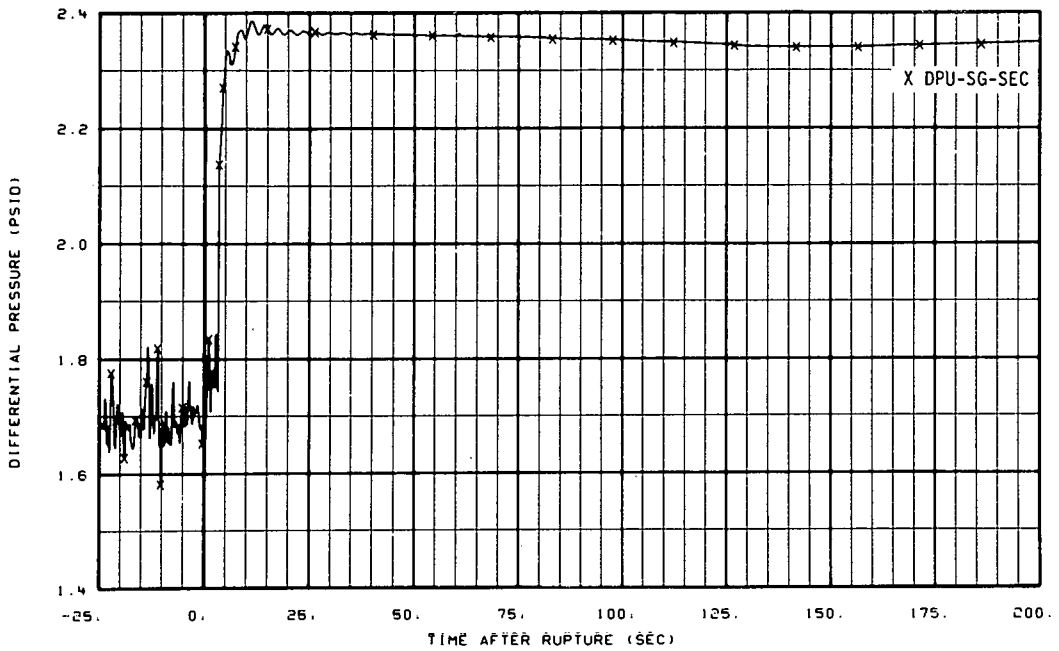


Fig. 221 Differential pressure in steam generator secondary (DPU-SG-SEC), from -24 to 200 seconds.

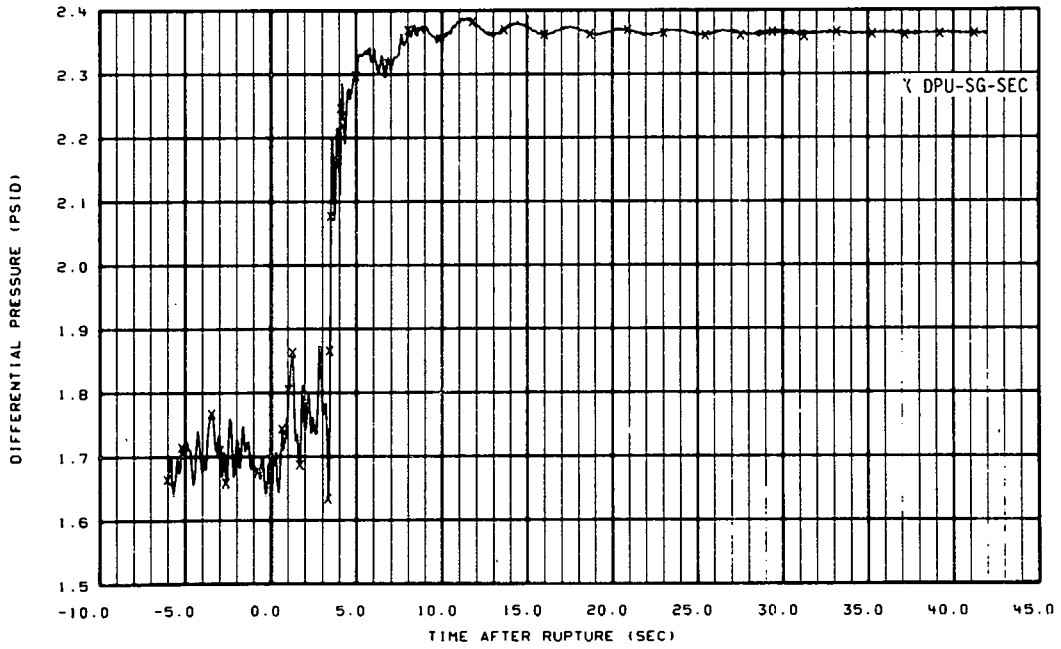


Fig. 222 Differential pressure in steam generator secondary (DPU-SG-SEC), from -6 to 42 seconds.

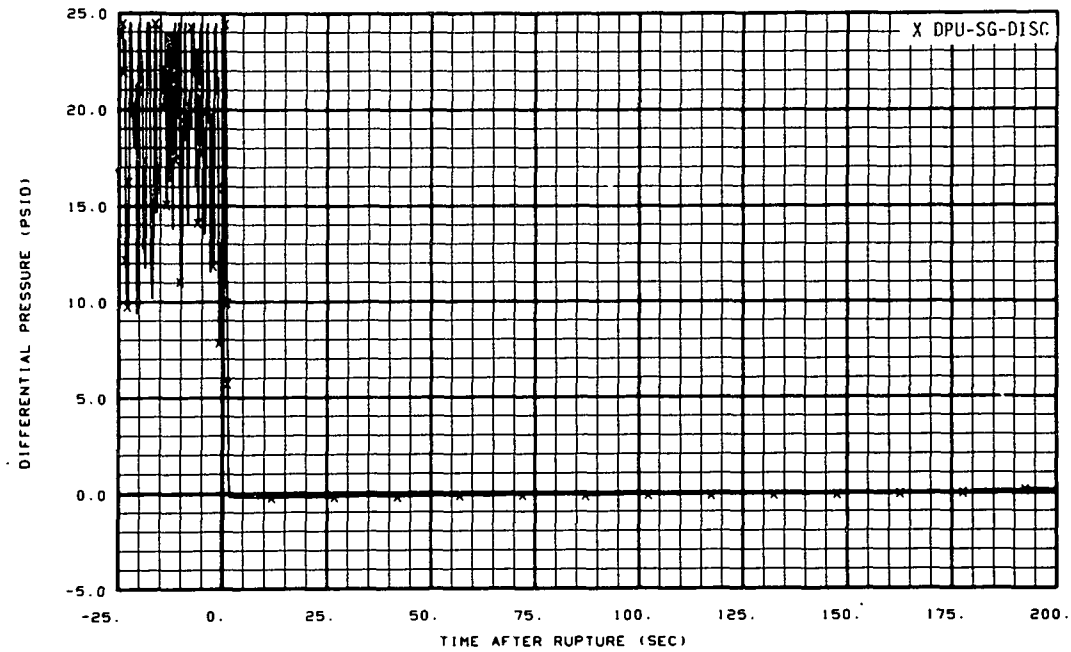


Fig. 223 Differential pressure across steam generator outlet orifice (DPU-SG-DISC), -24 to 200 seconds.

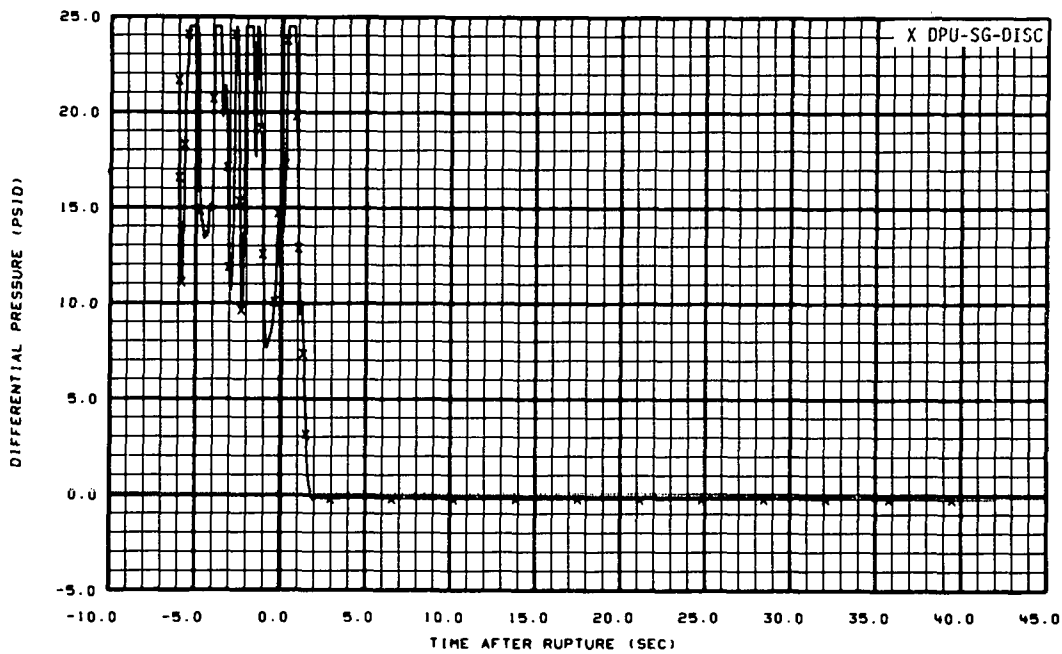


Fig. 224 Differential pressure across steam generator outlet orifice (DPU-SG-DISC), from -6 to 42 seconds.

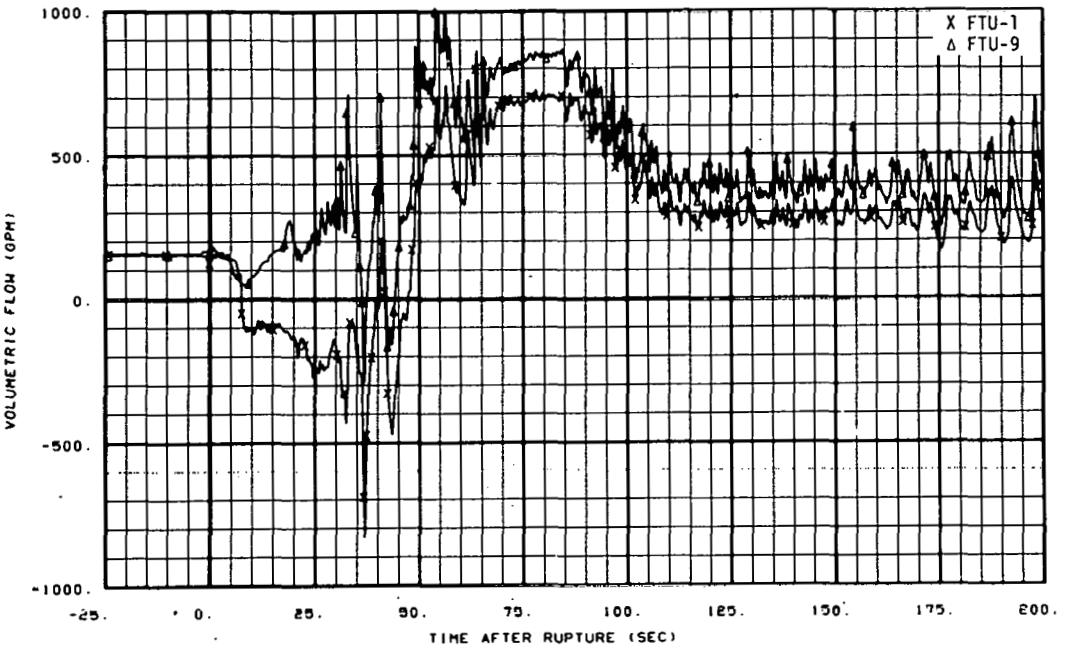


Fig. 225 Volumetric flow in intact loop (FTU-1, FTU-9), from -24 to 200 seconds.

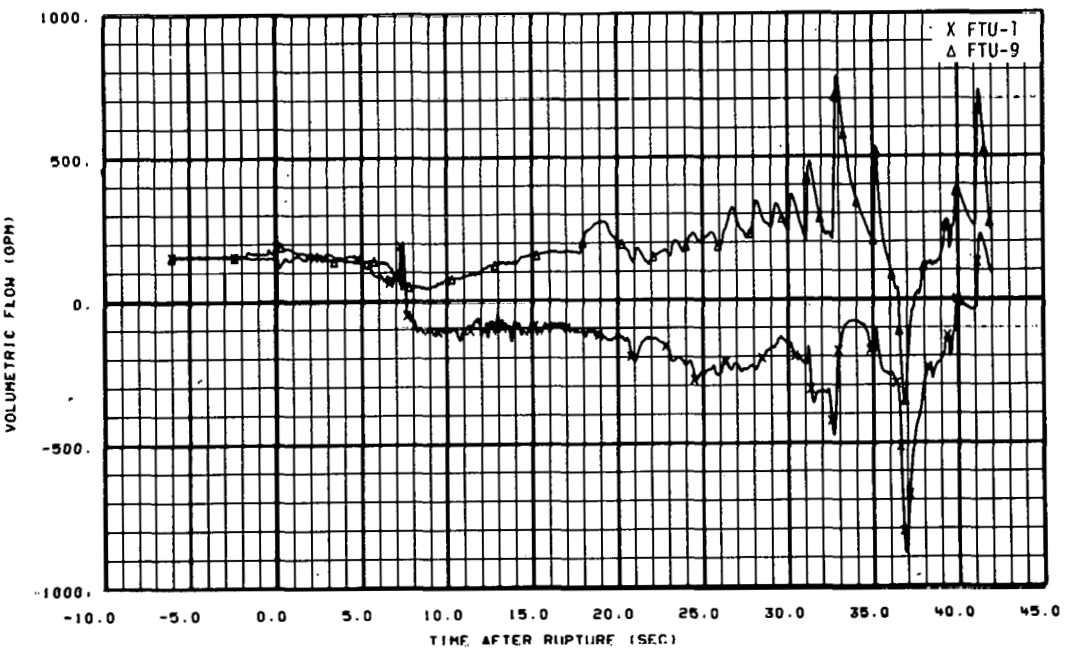


Fig. 226 Volumetric flow in intact loop (FTU-1, FTU-9), from -6 to 42 seconds.

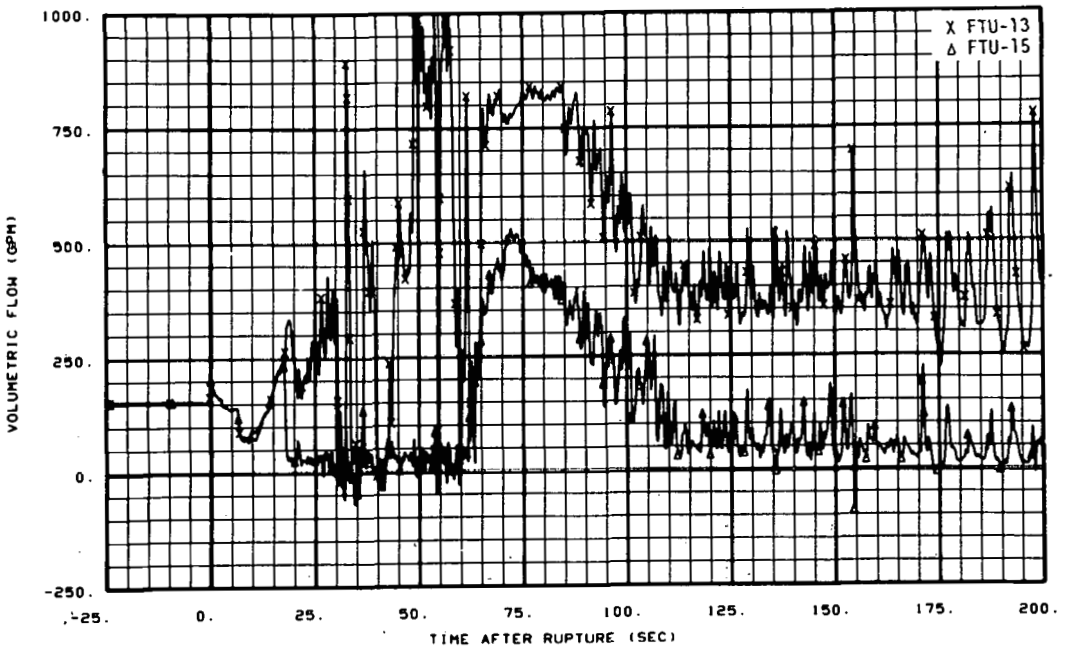


Fig. 227 Volumetric flow in intact loop (FTU-13, FTU-15), from -24 to 200 seconds.

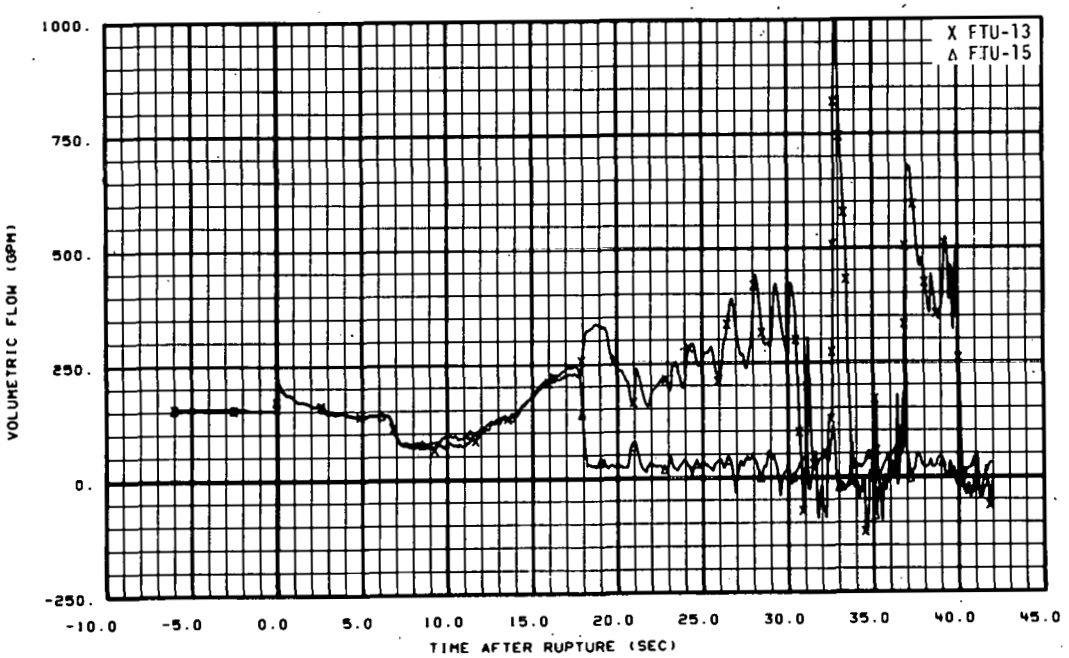


Fig. 228 Volumetric flow in intact loop (FTU-13, FTU-15), from -6 to 42 seconds.

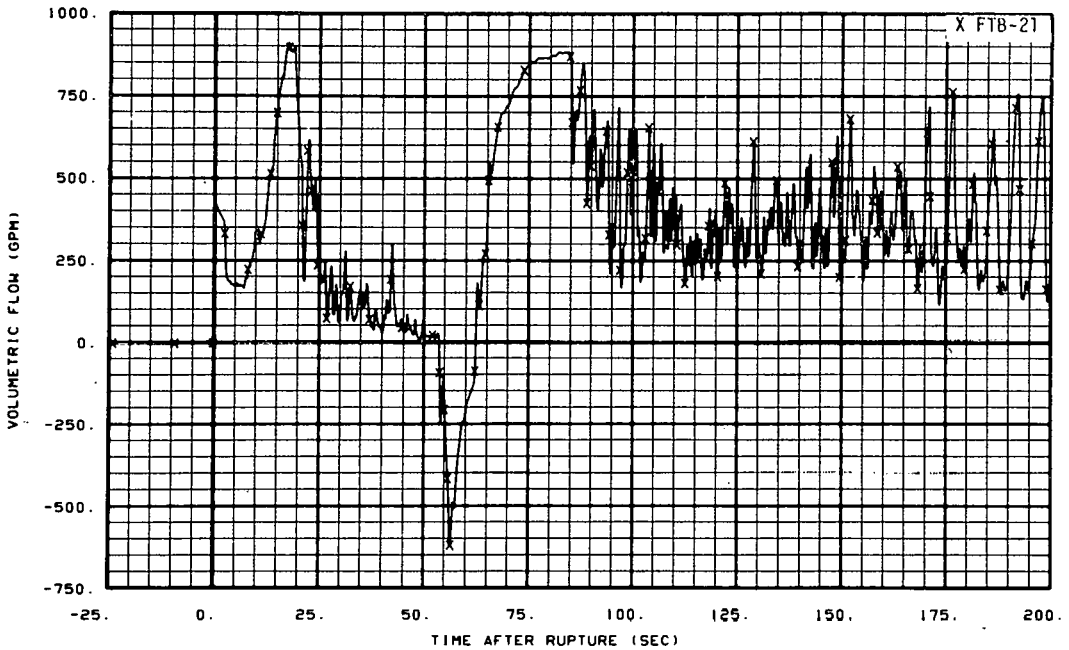


Fig. 229 Volumetric flow in broken loop (FTB-21), from -24 to 200 secon

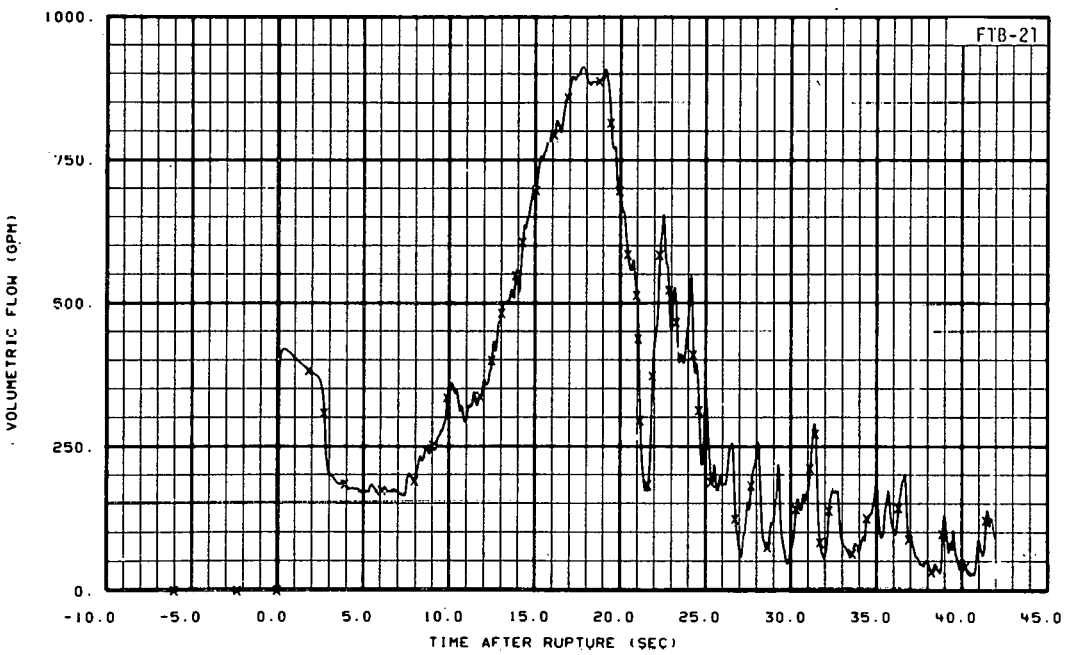


Fig. 230 Volumetric flow in broken loop (FTB-21), from -6 to 42 seconds.

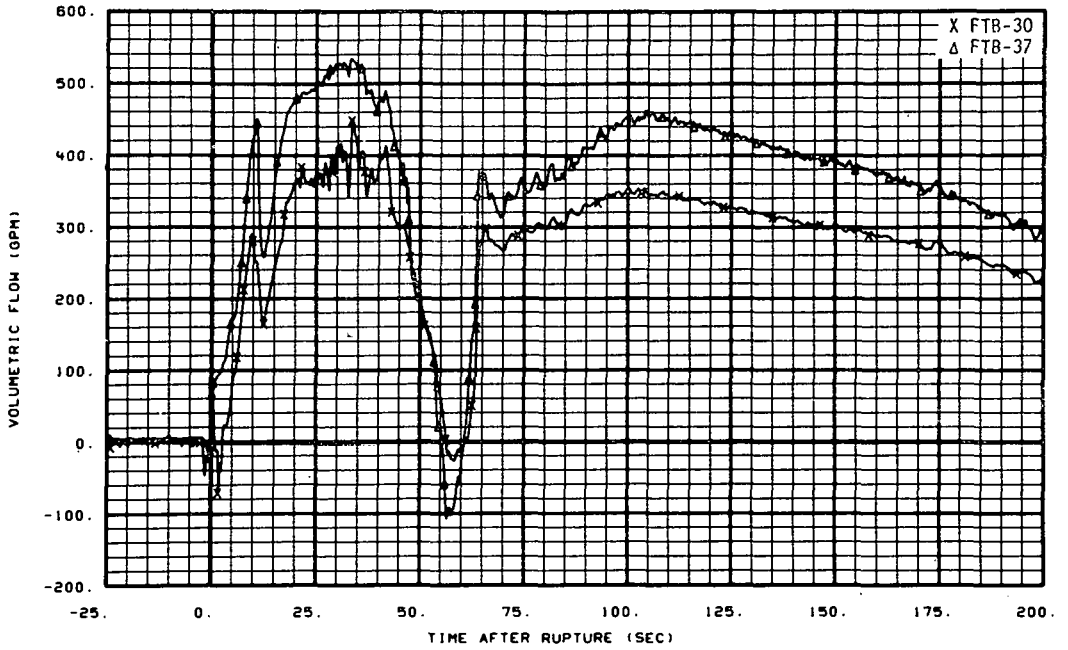


Fig. 231 Volumetric flow in broken loop (FTB-30, FTB-37), from -24 to 200 seconds.

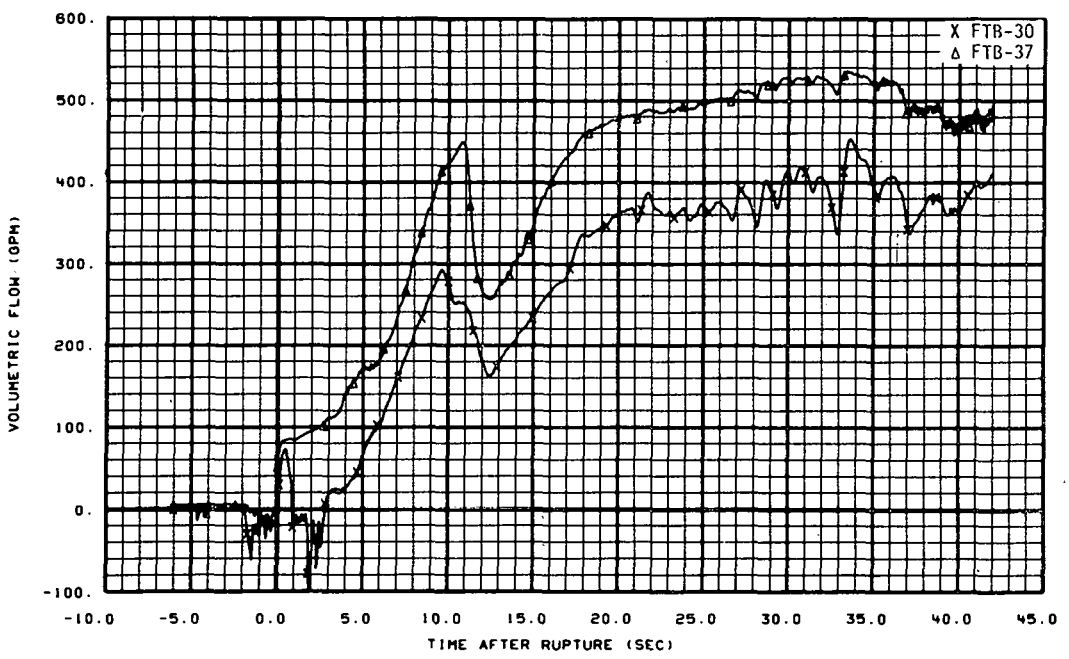


Fig. 232 Volumetric flow in broken loop (FTB-30, FTB-37), from -6 to 42 seconds.

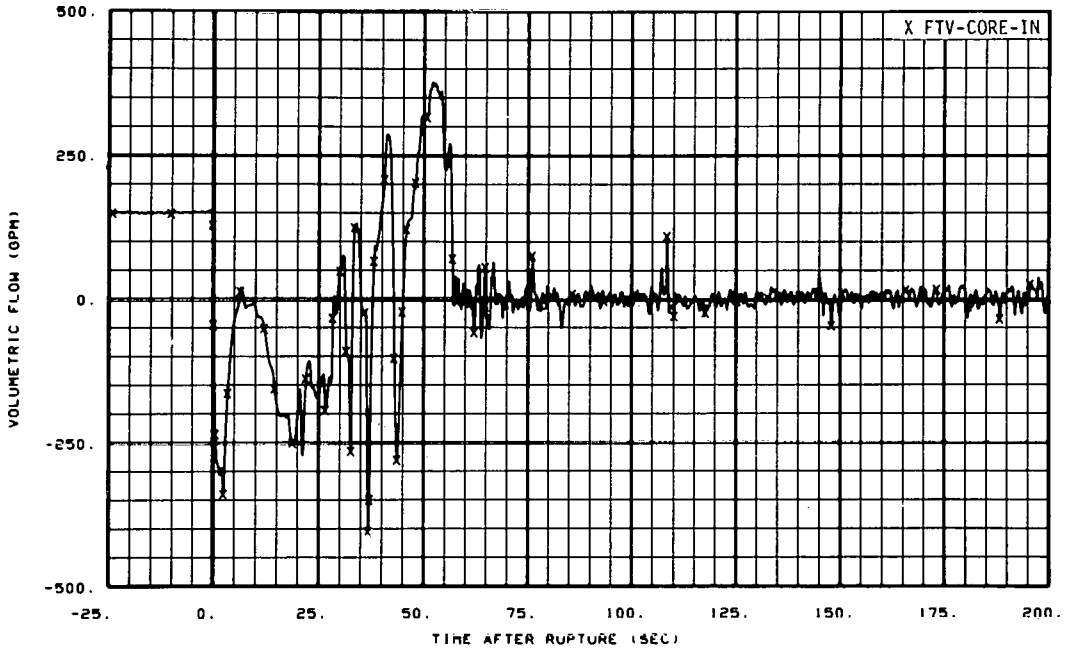


Fig. 233 Volumetric flow in core entrance (FTV-CORE-IN), from -24 to 200 seconds.

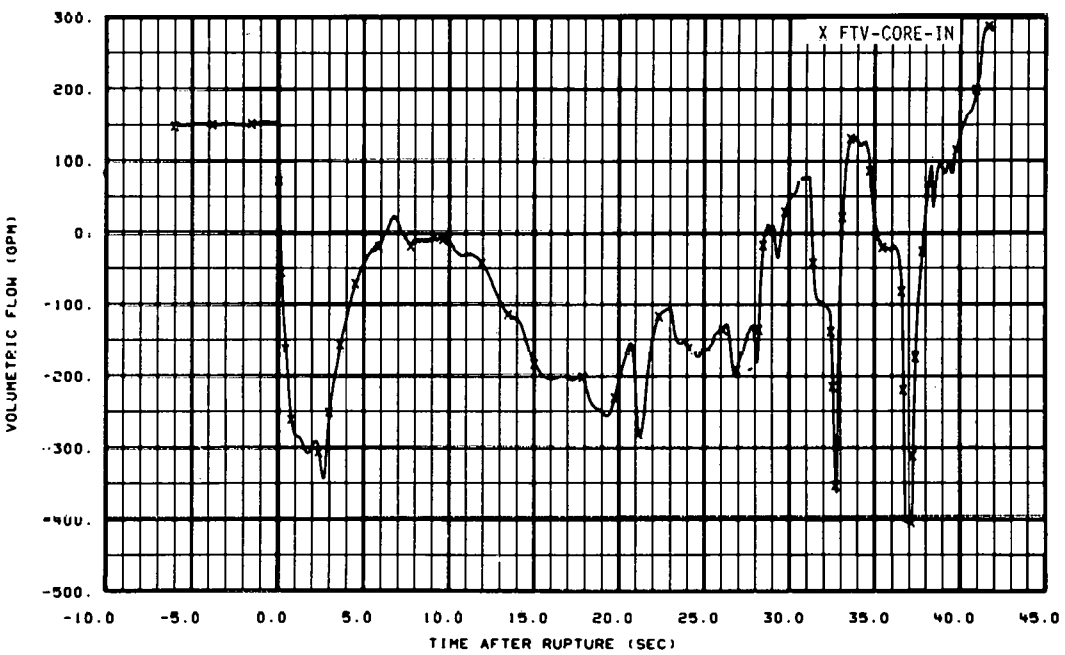


Fig. 234 Volumetric flow in core entrance (FTV-CORE-IN), from -6 to 42 seconds.

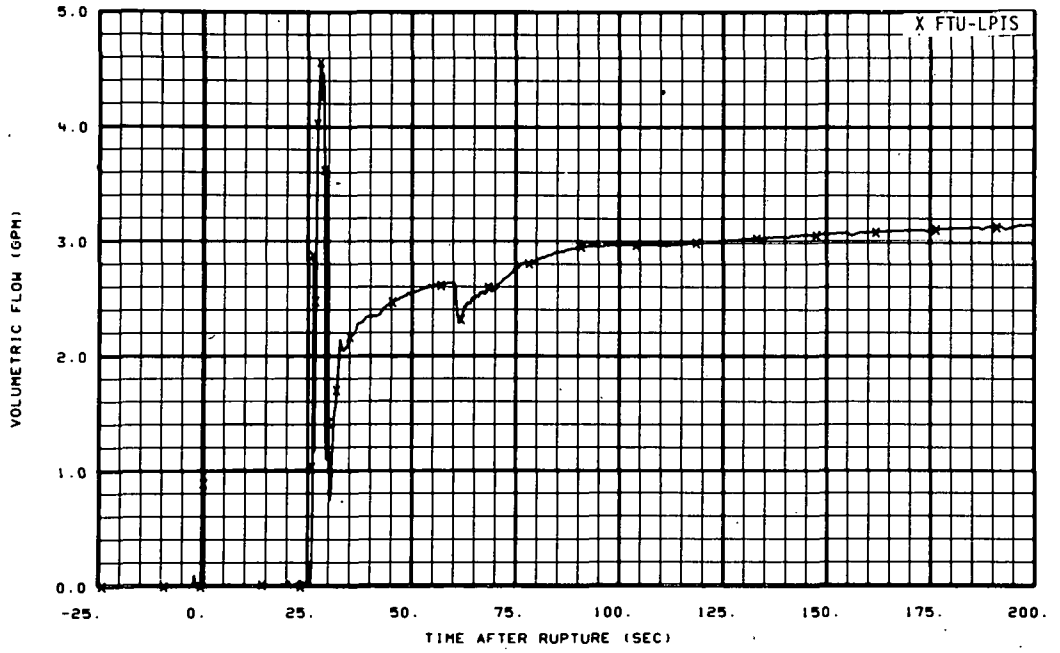


Fig. 235 Volumetric flow in intact loop low pressure injection line (FTU-LPIS), from -24 to 200 seconds.

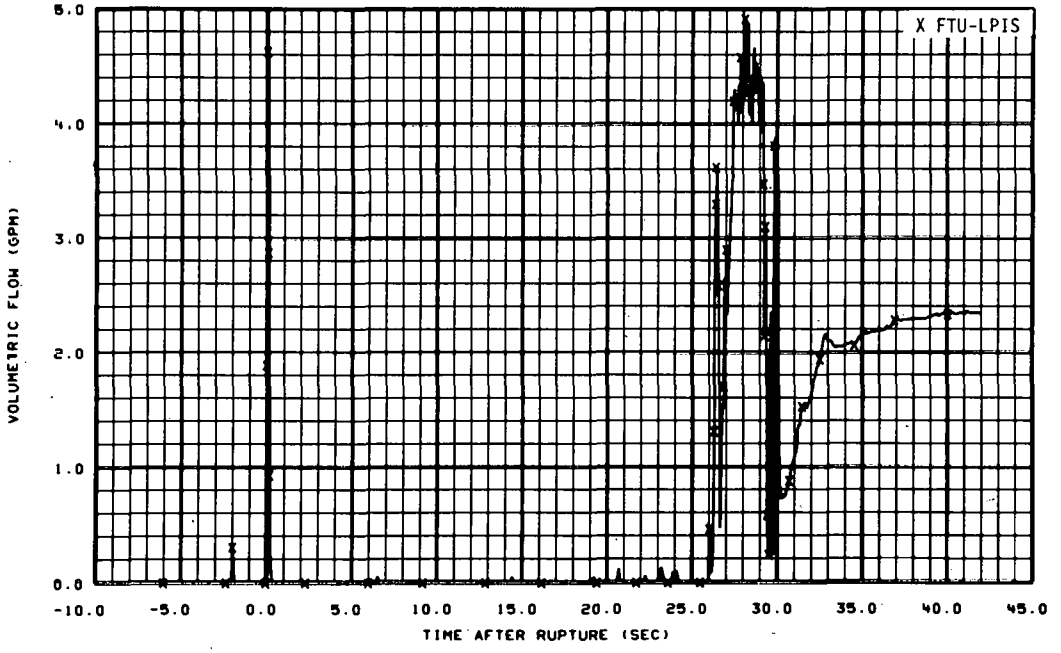


Fig. 236 Volumetric flow in intact loop low pressure injection line (FTU-LPIS), from -6 to 42 seconds.

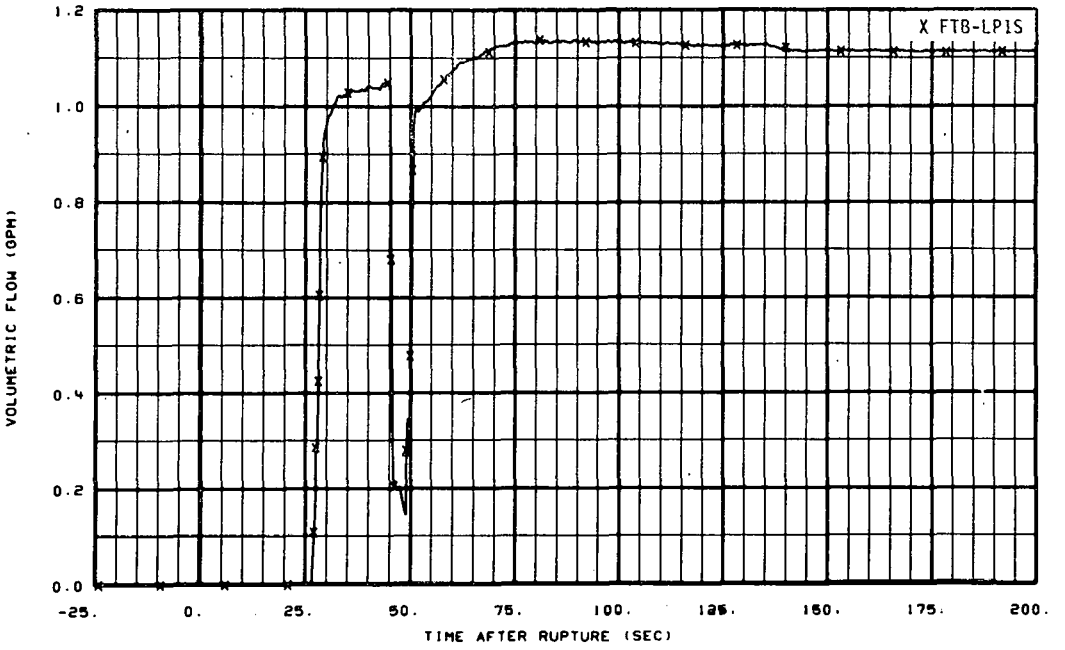


Fig. 237 Volumetric flow in broken loop low pressure injection line (FTB-LPIS), from -6 to 42 seconds.

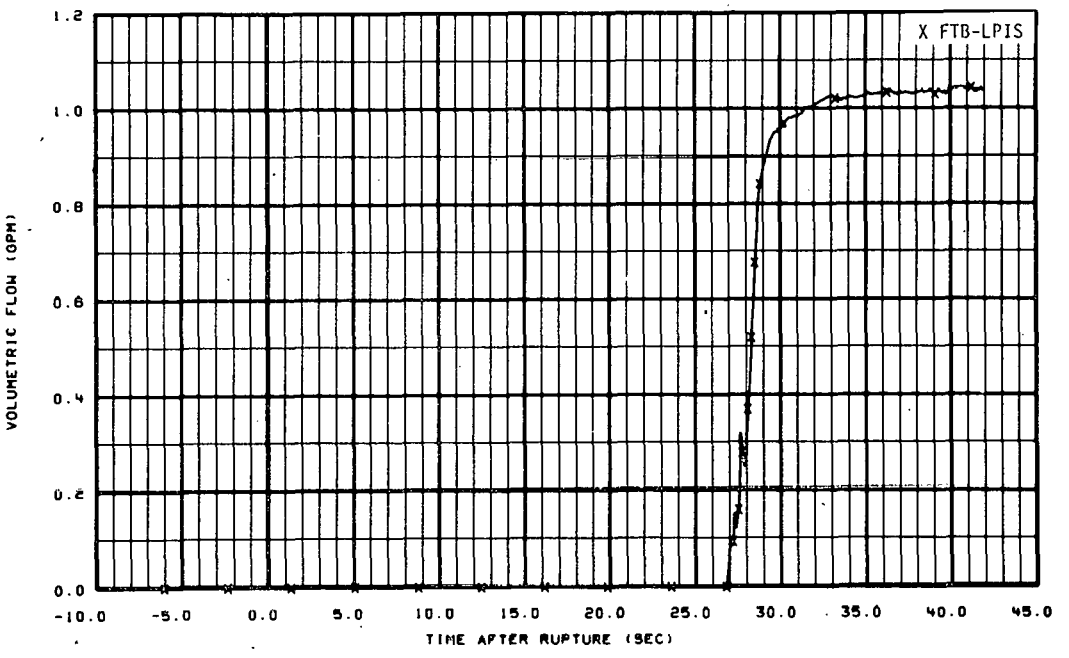


Fig. 238 Volumetric flow in broken loop low pressure injection line (FTB-LPIS), from -6 to 42 seconds.

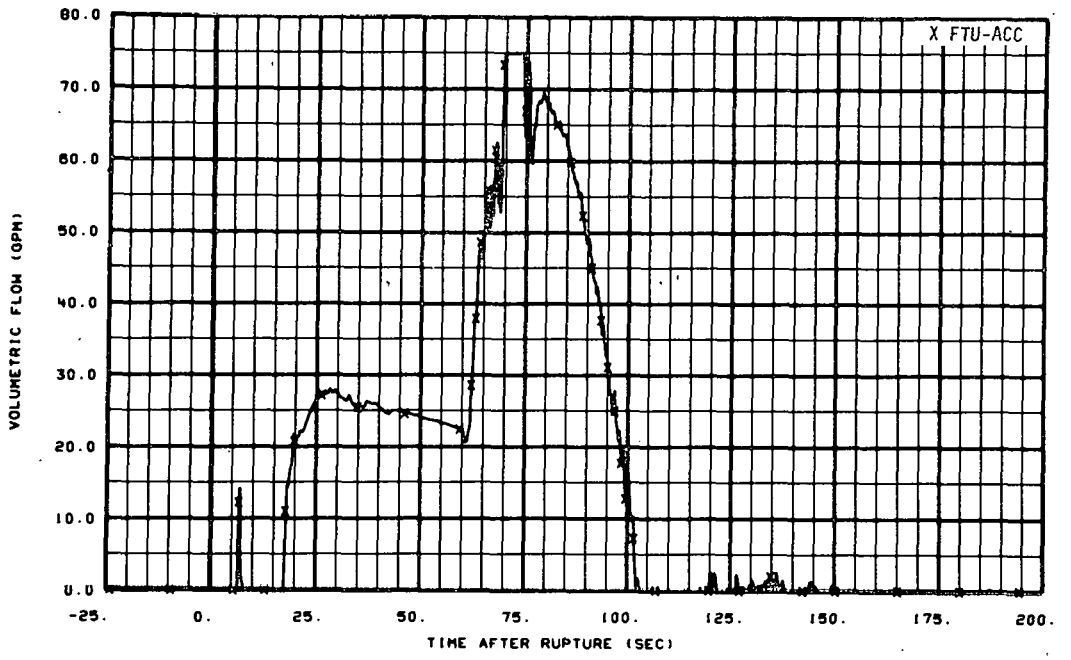


Fig. 239 Volumetric flow in intact loop accumulator discharge line (FTU-ACC), from -24 to 200 seconds.

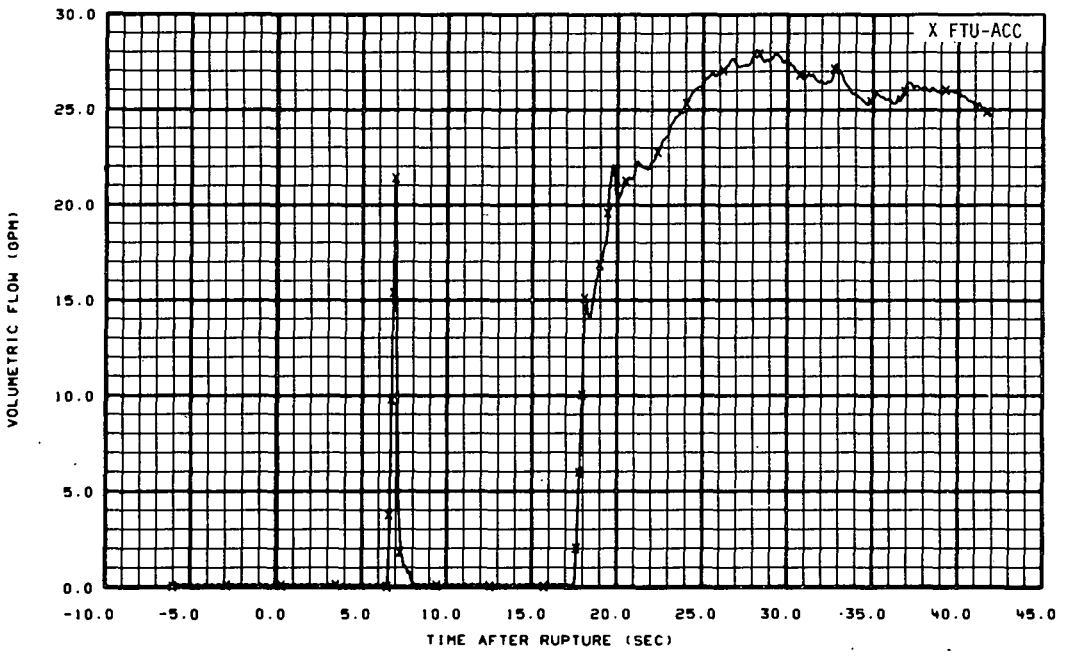


Fig. 240 Volumetric slow in intact loop accumulator discharge line (FTU-ACC), from -6 to 42 seconds.

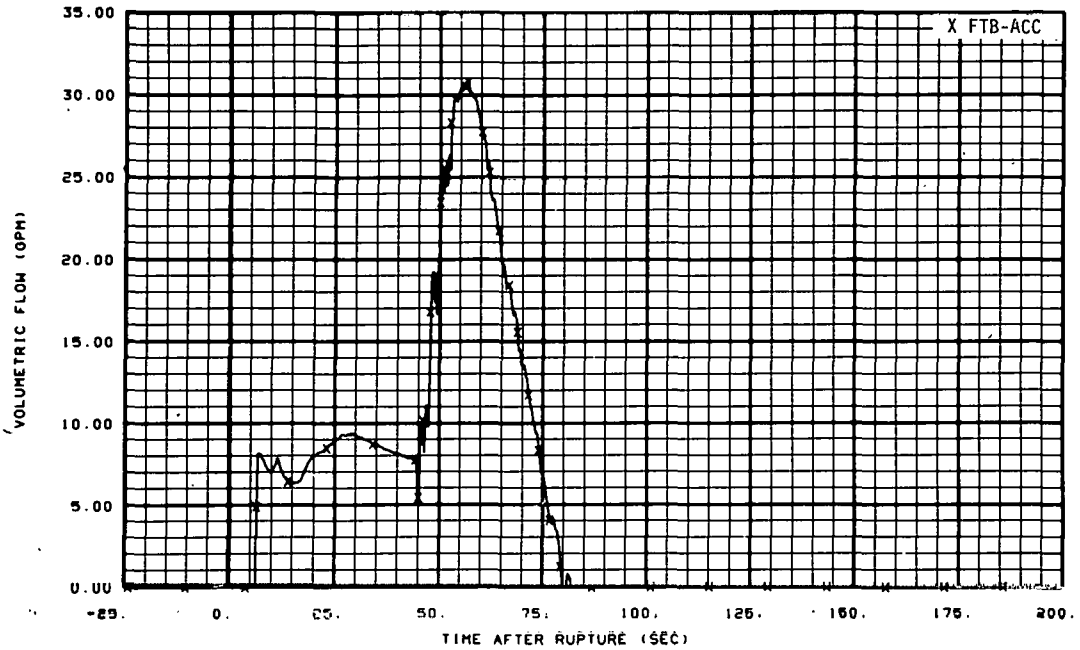


Fig. 241 Volumetric flow in broken loop accumulator discharge line (FTB-ACC), from -24 to 200 seconds.

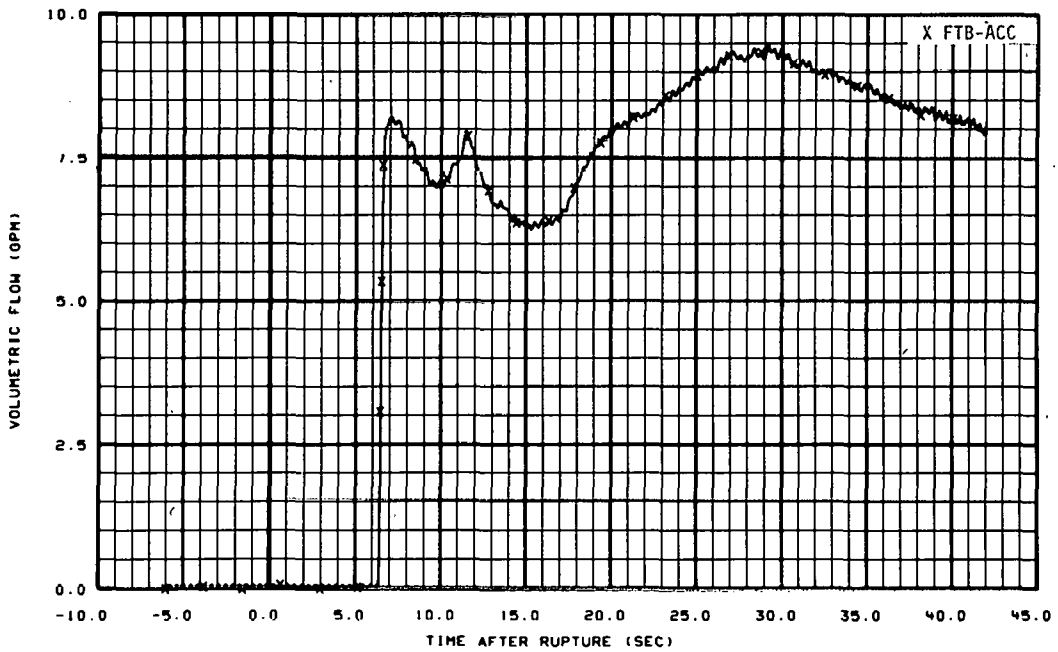


Fig. 242 Volumetric flow in broken loop accumulator discharge line (FTB-ACC), from -6 to 42 seconds.

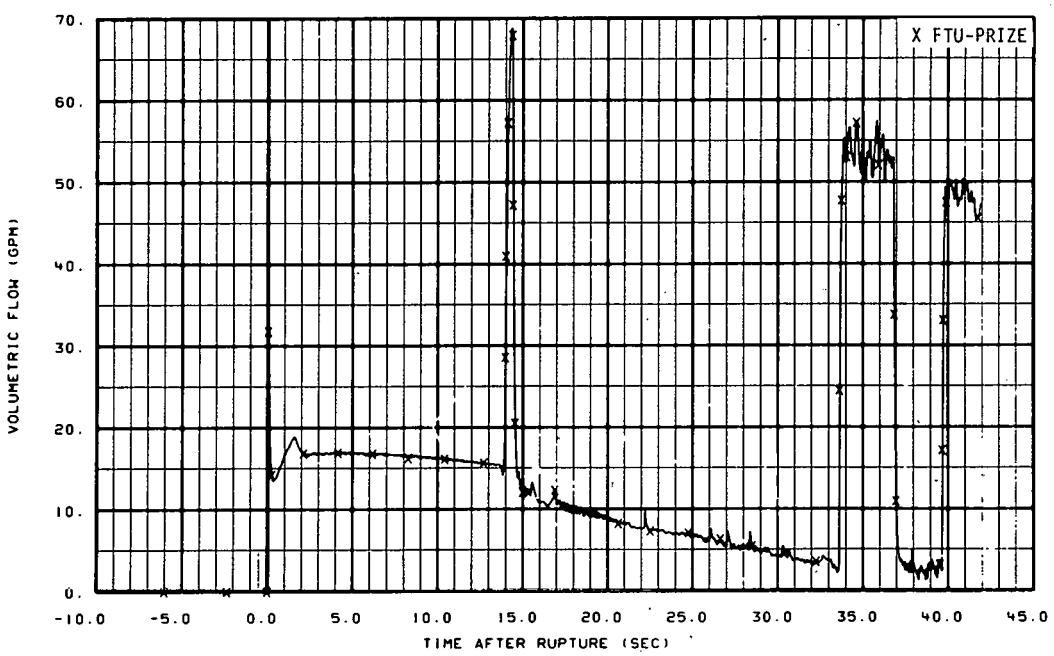


Fig. 243 Volumetric flow from pressurizer (FTU-PRIZE), from -6 to 42 seconds.

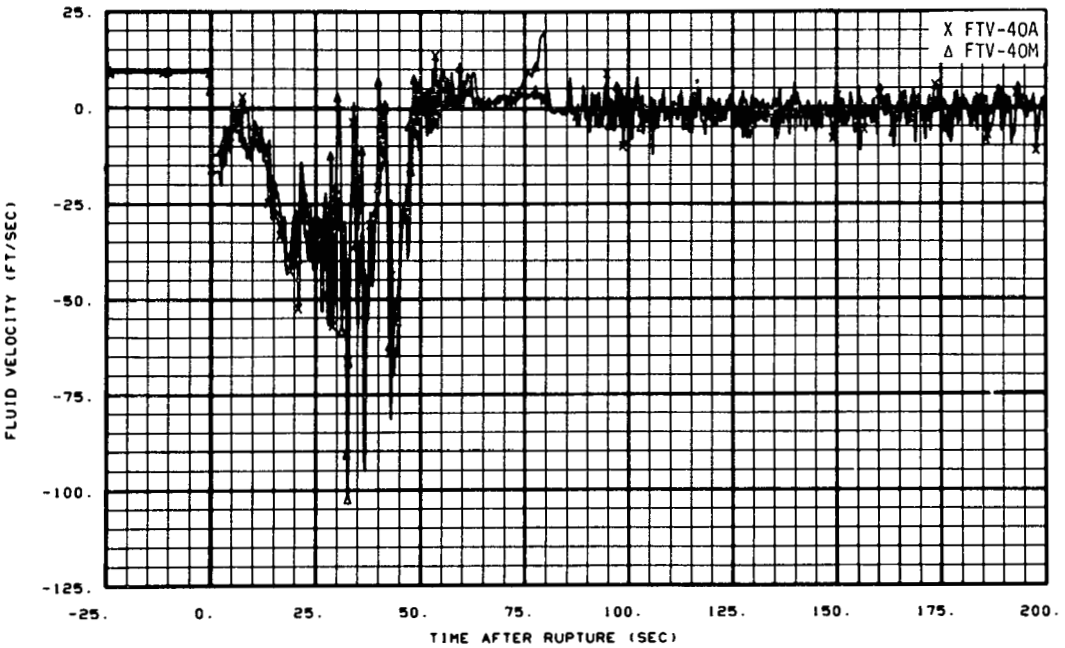


Fig. 244 Fluid velocity in vessel (FTV-40A, FTV-40M), from -24 to 200 seconds.

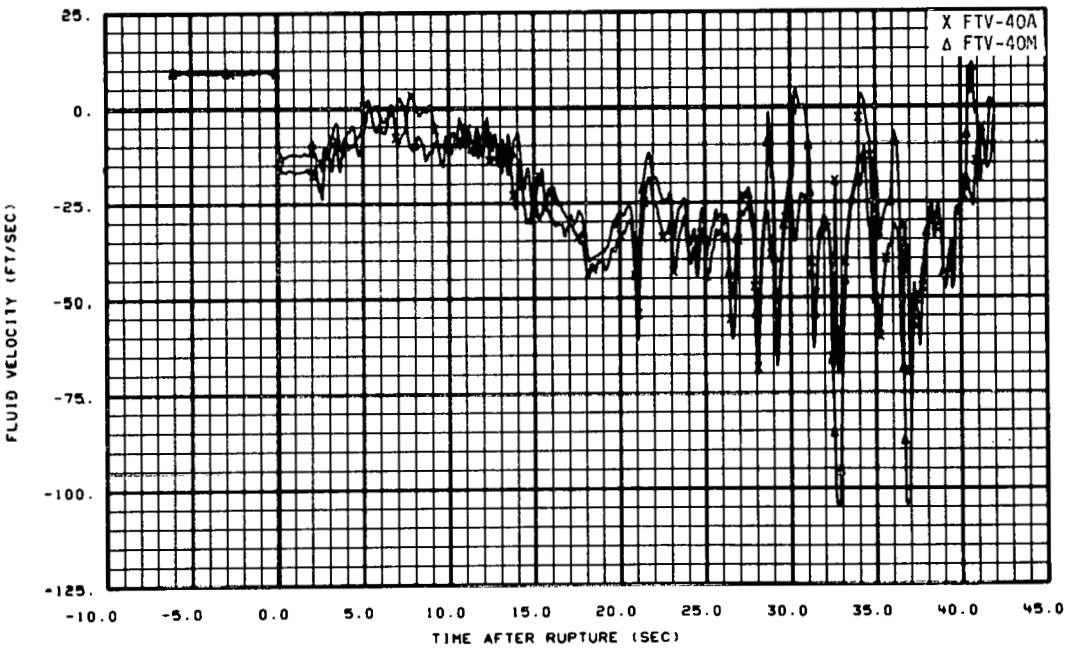


Fig. 245 Fluid velocity in vessel (FTV-40A, FTV-40M), from -6 to 42 seconds.

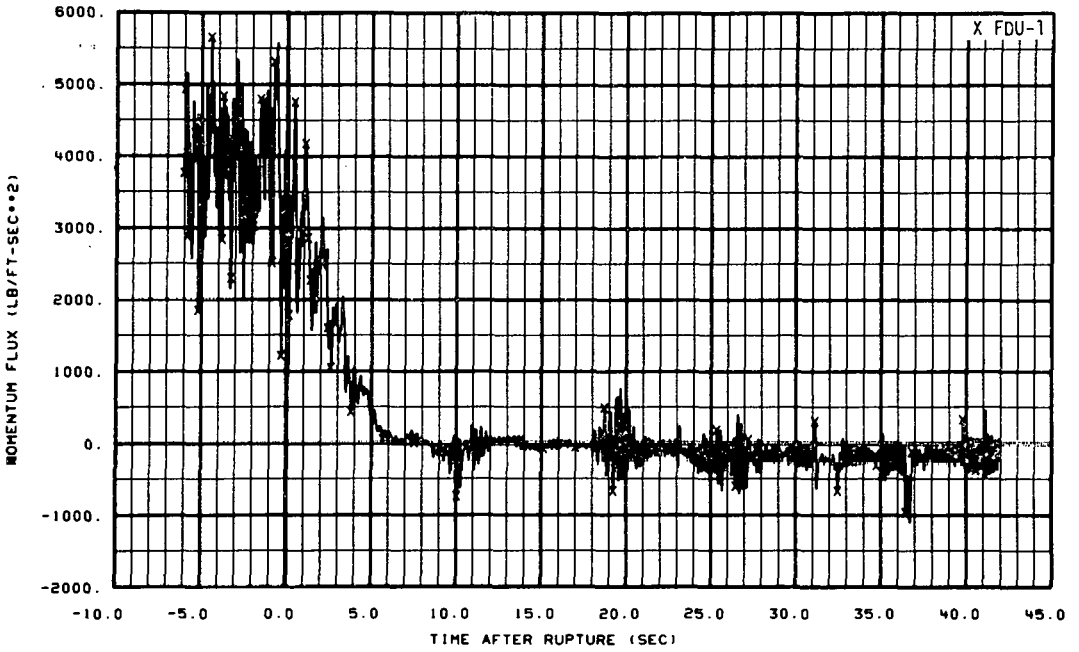


Fig. 246 Momentum flux in intact loop (FDU-1), from -6 to 42 seconds.

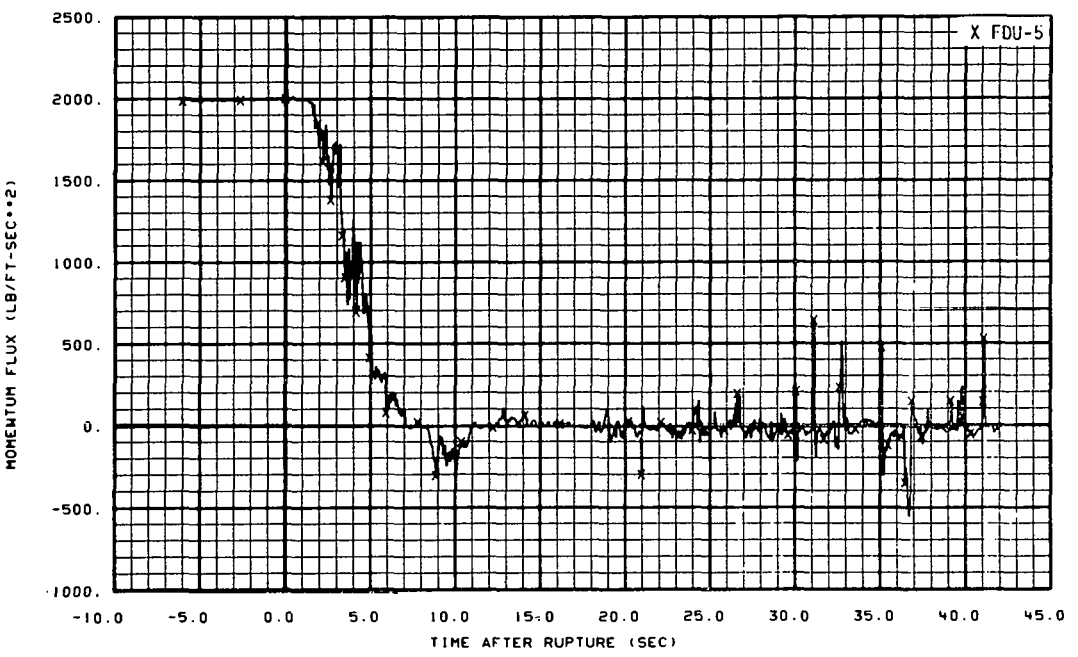


Fig. 247 Momentum flux in intact loop (FDU-5), from -6 to 42 seconds.

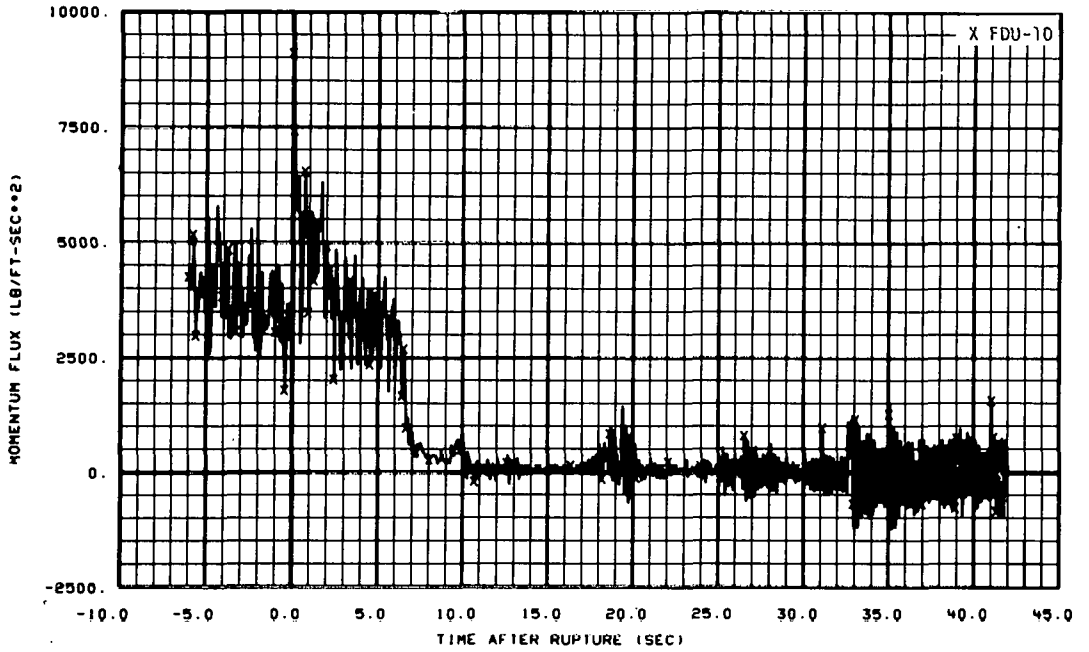


Fig. 248 Momentum flux in intact loop (FDU-10) from -6 to 42 seconds.

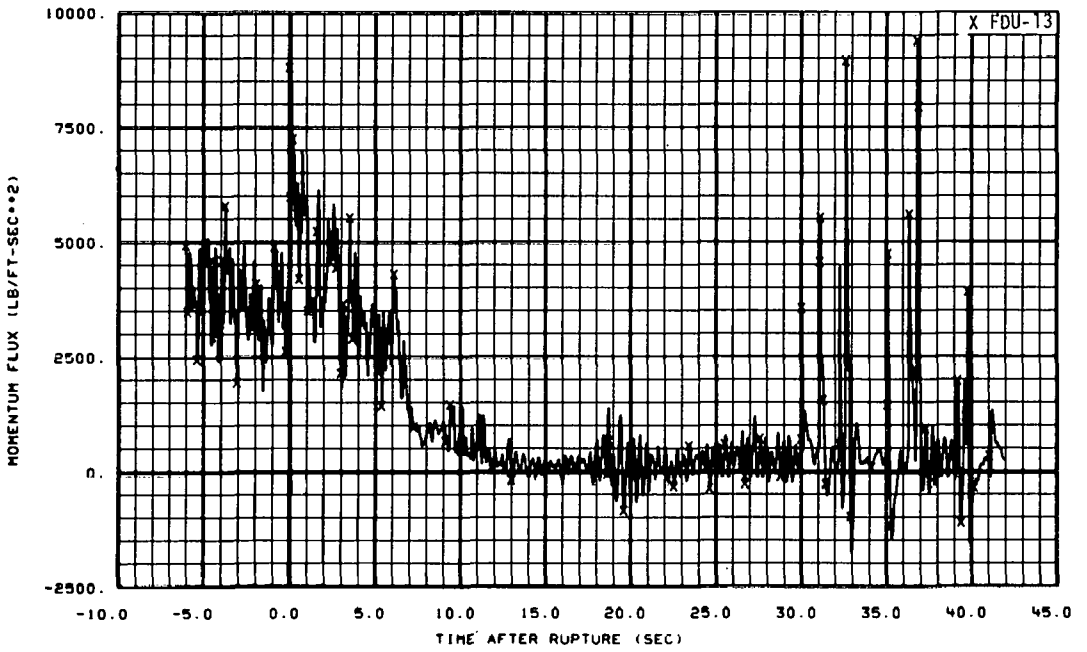


Fig. 249 Momentum flux in intact loop (FDU-13), from -6 to 42 seconds.

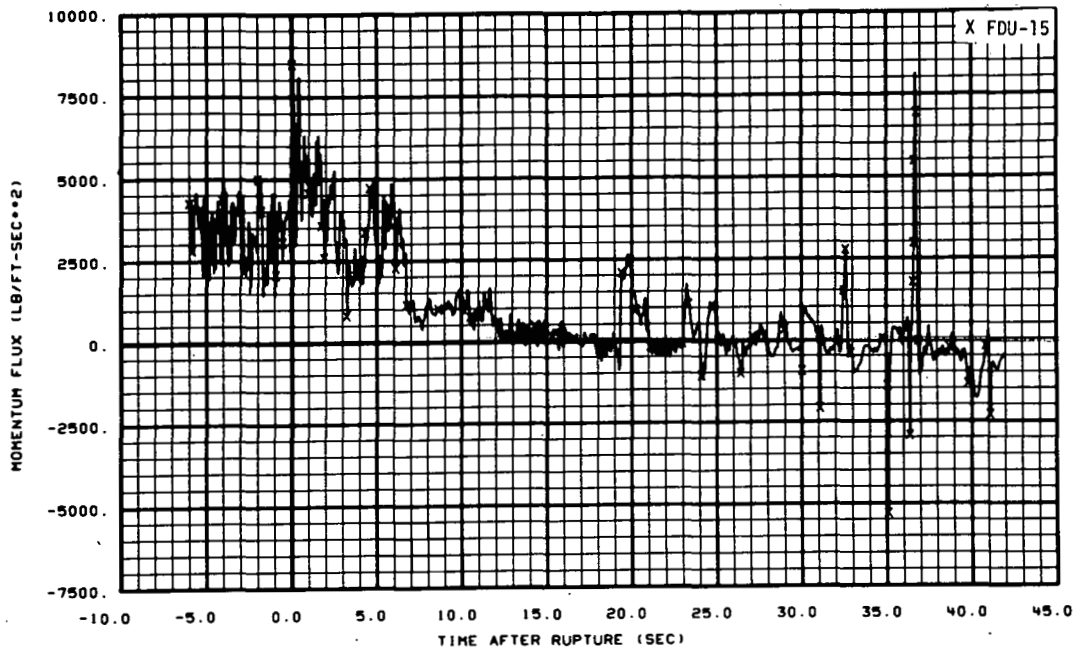


Fig. 250 Momentum flux in intact loop (FDU-15), from -6 to 42 seconds.

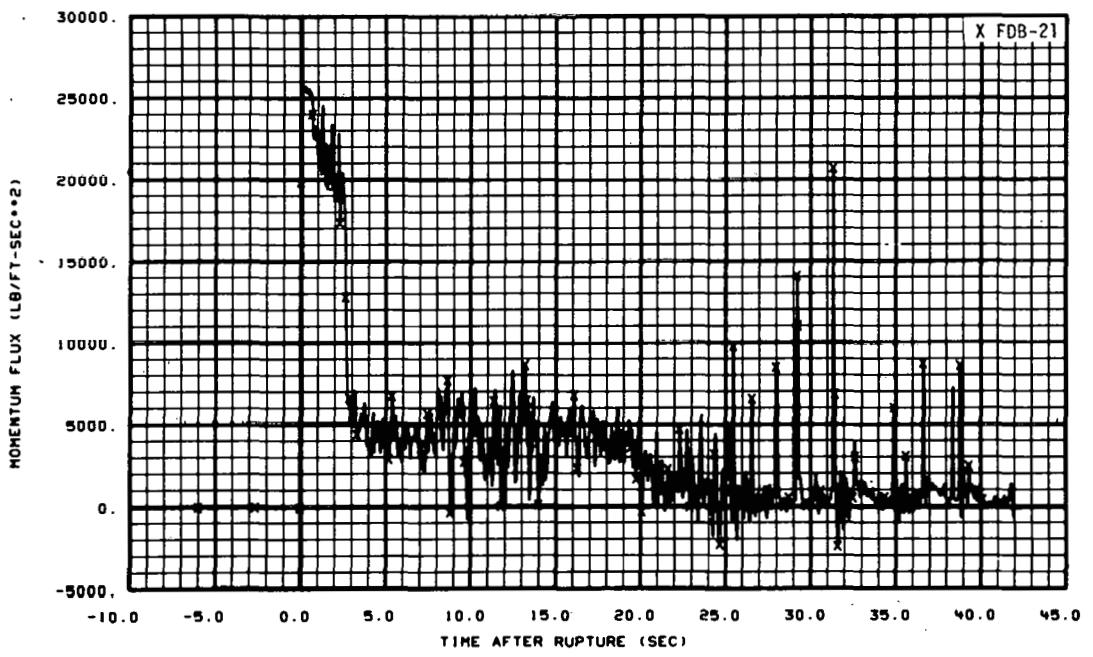


Fig. 251 Momentum flux in broken loop (FDB-21), from -6 to 42 seconds.

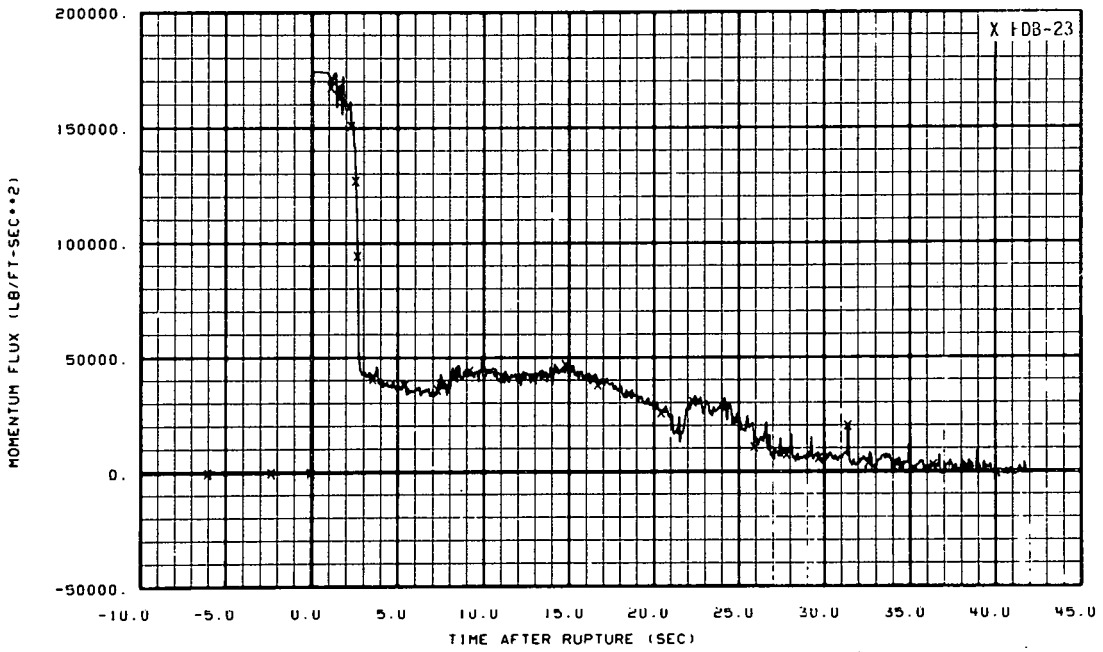


Fig. 252 Momentum flux in broken loop (FDB-23), from -6 to 42 seconds.

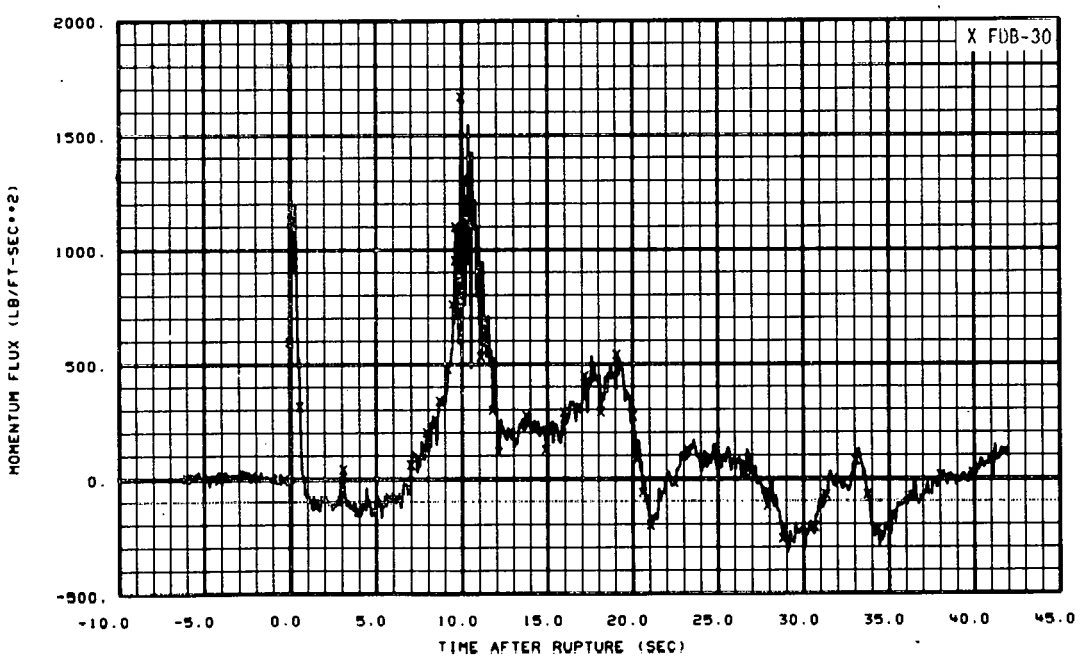


Fig. 253 Momentum flux in broken loop (FDB-30), from -6 to 42 seconds.

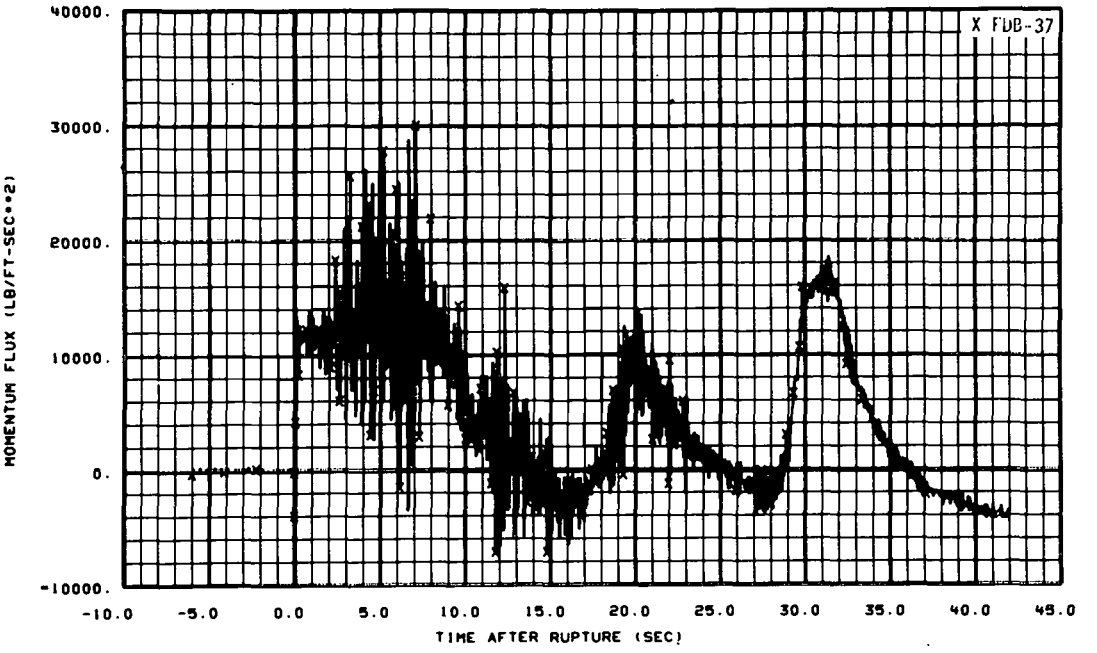


Fig. 254 Momentum flux in broken loop (FDB-37), from -6 to 42 seconds.

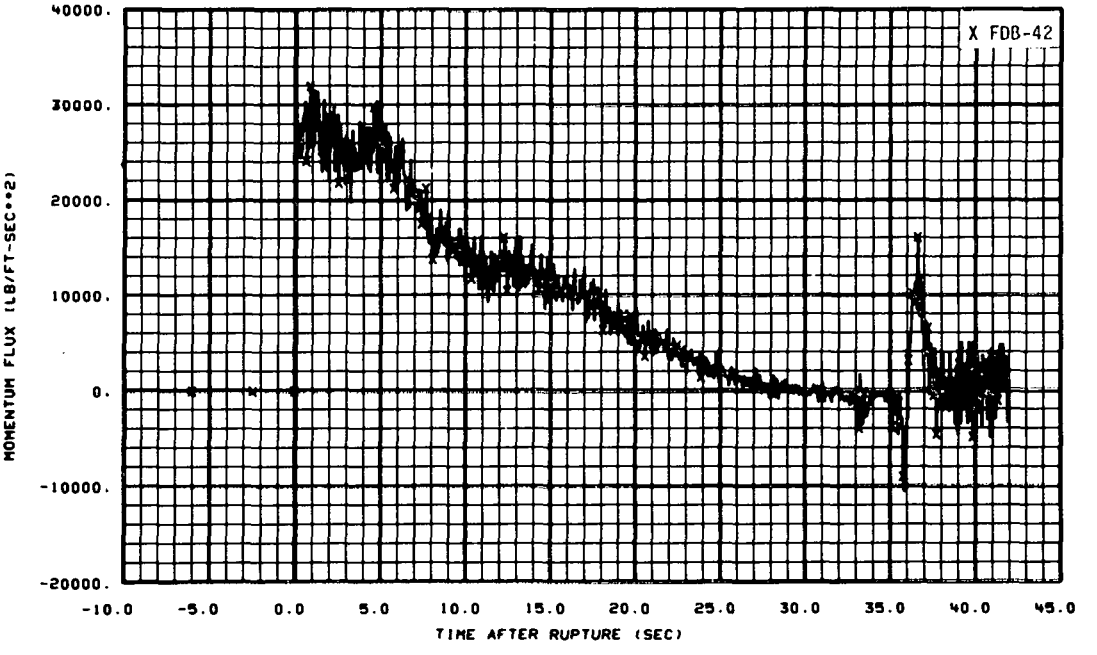


Fig. 255 Momentum flux in broken loop (FDB-42), from -6 to 42 seconds.

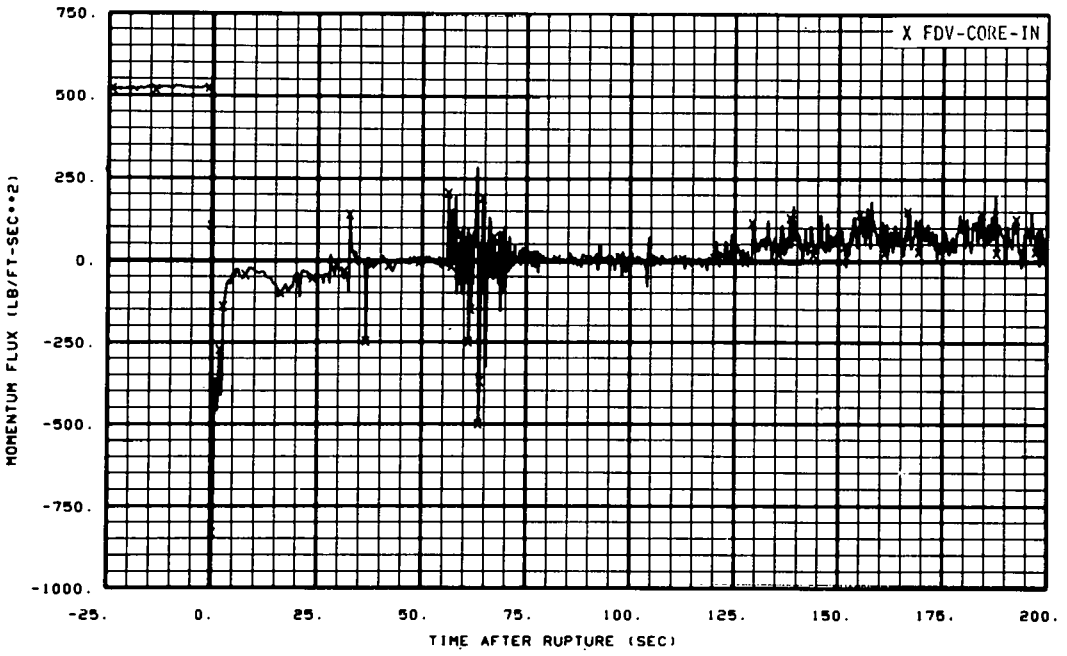


Fig. 256 Momentum flux in core entrance (FDV-CORE-IN), from -24 to 200 seconds.

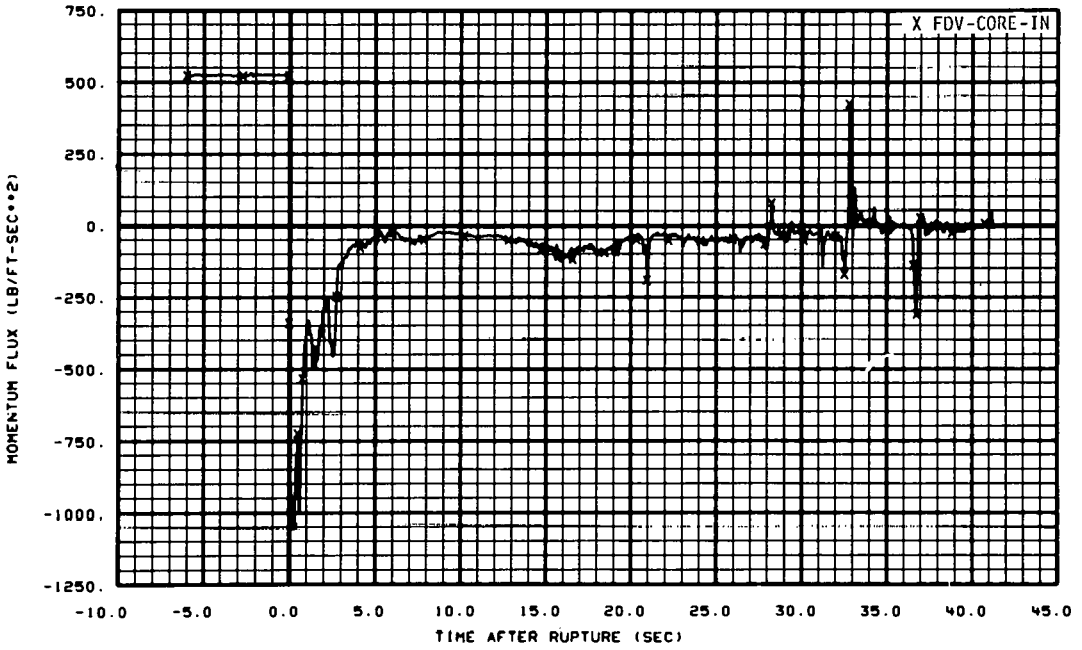


Fig. 257 Momentum flux in core entrance (FDV-CORE-IN), from -6 to 42 seconds.

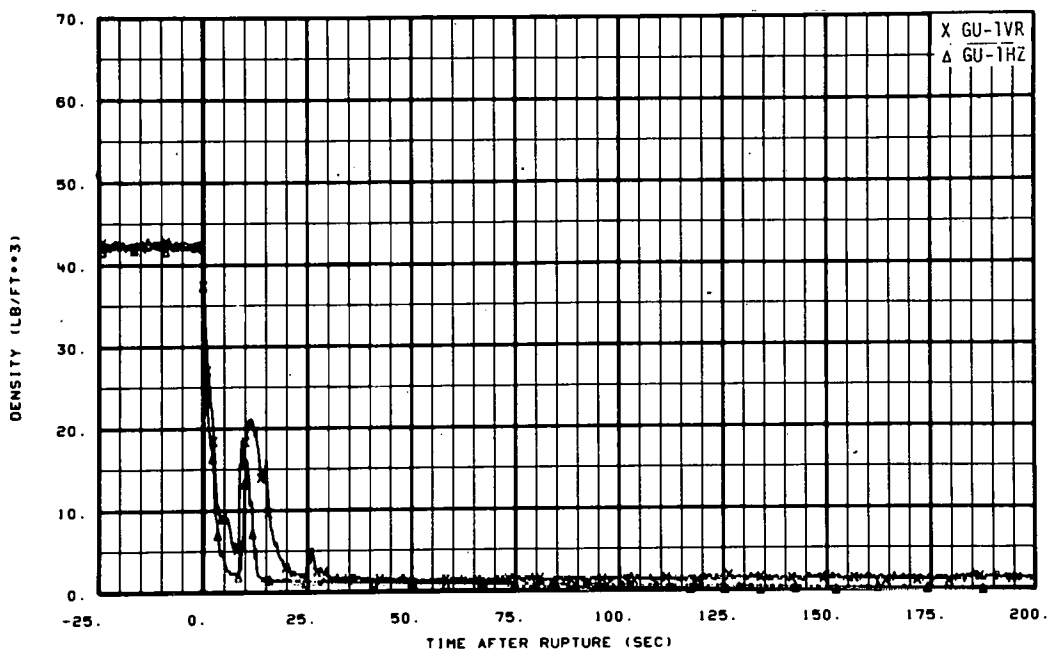


Fig 258 Density in intact loop (GU-1VR, GU-1HZ), from -24 to 200 seconds.

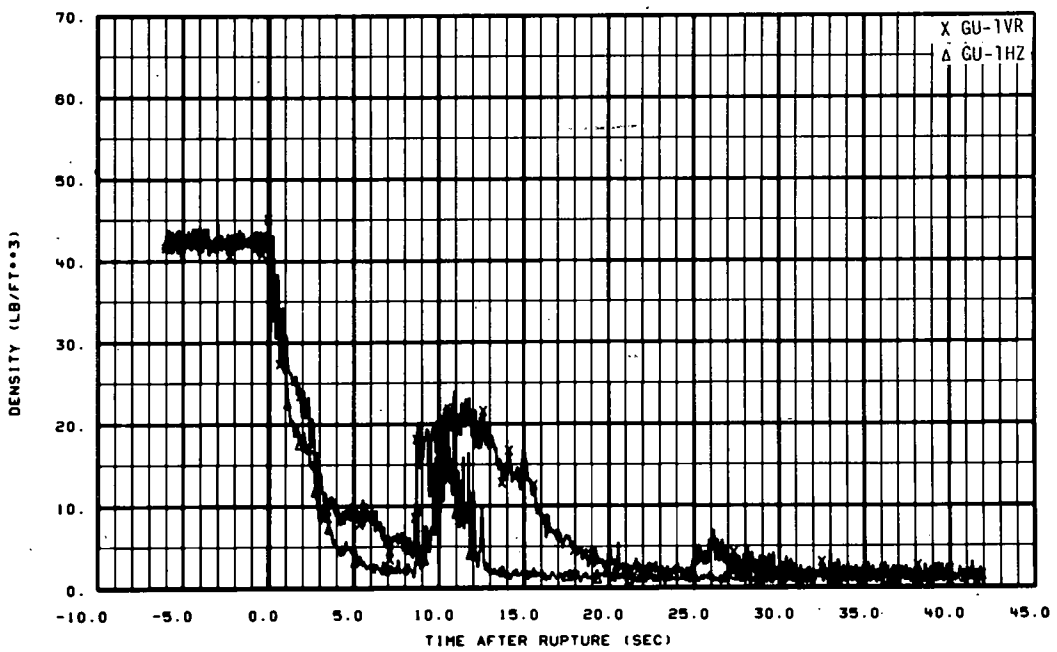


Fig. 259 Density in intact loop (GU-1VR, GU-1HZ), from -6 to 42 seconds.

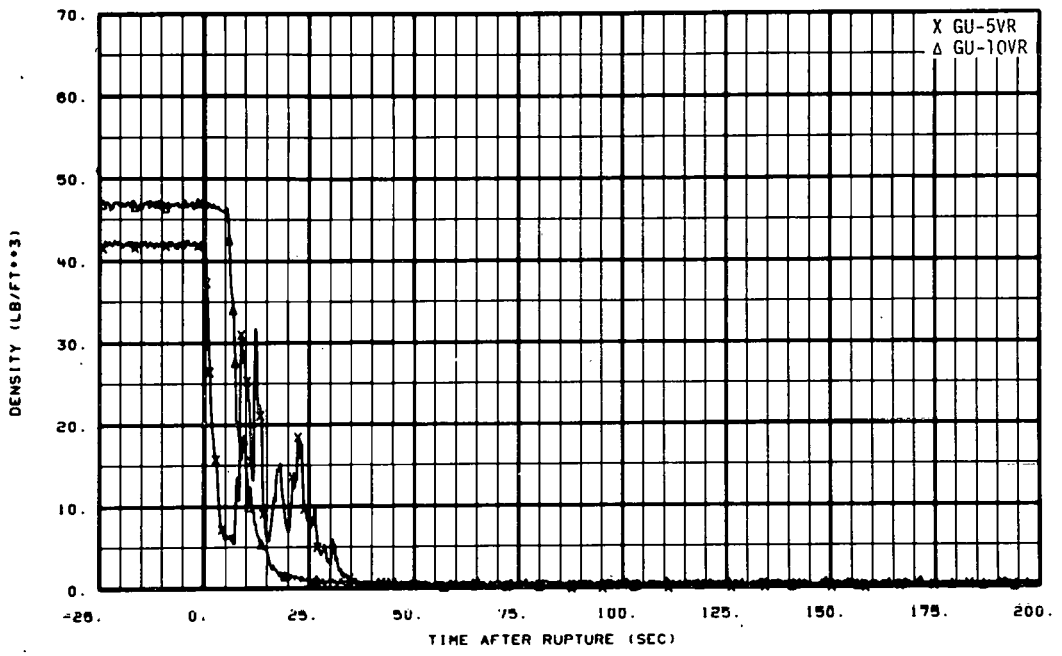


Fig. 260 Denisty in intact loop (GU-5VR, GU-10VR), from -24 to 200 seconds.

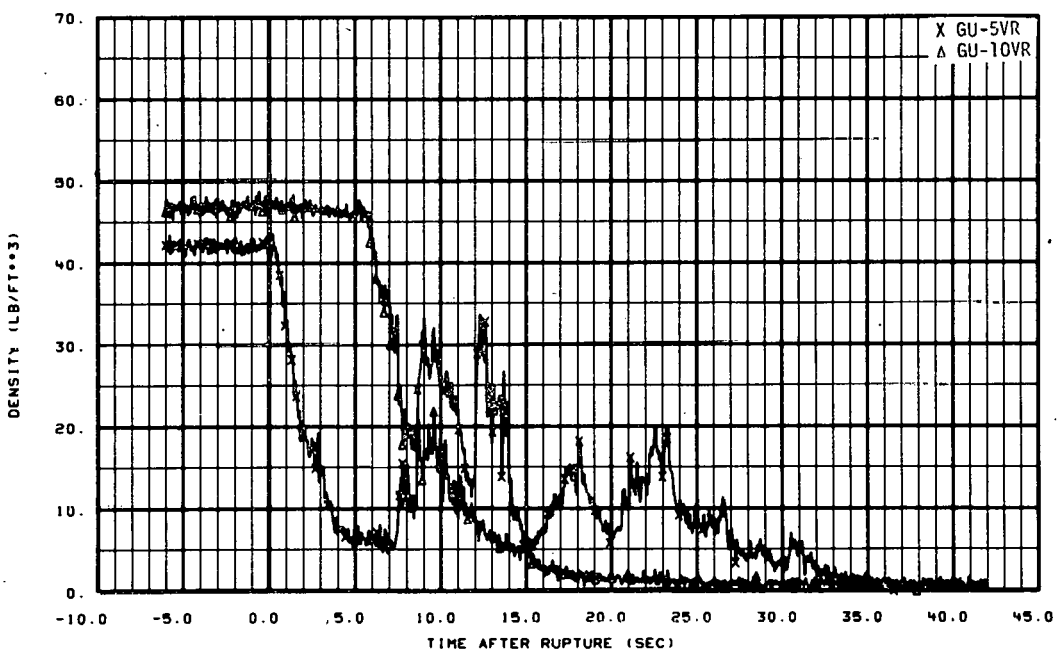
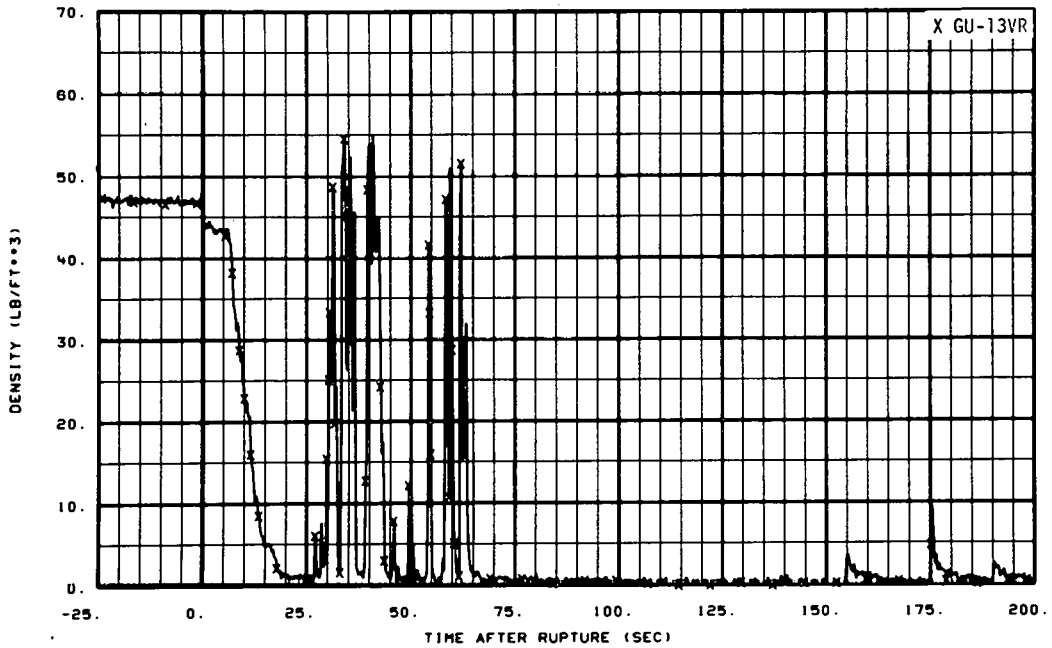


Fig. 261 Density in intact loop (GU-5VR, GU-10VR), from -6 to 42 seconds.



ig. 262 Density in intact loop (GU-13VR), from -24 to 200 seconds.

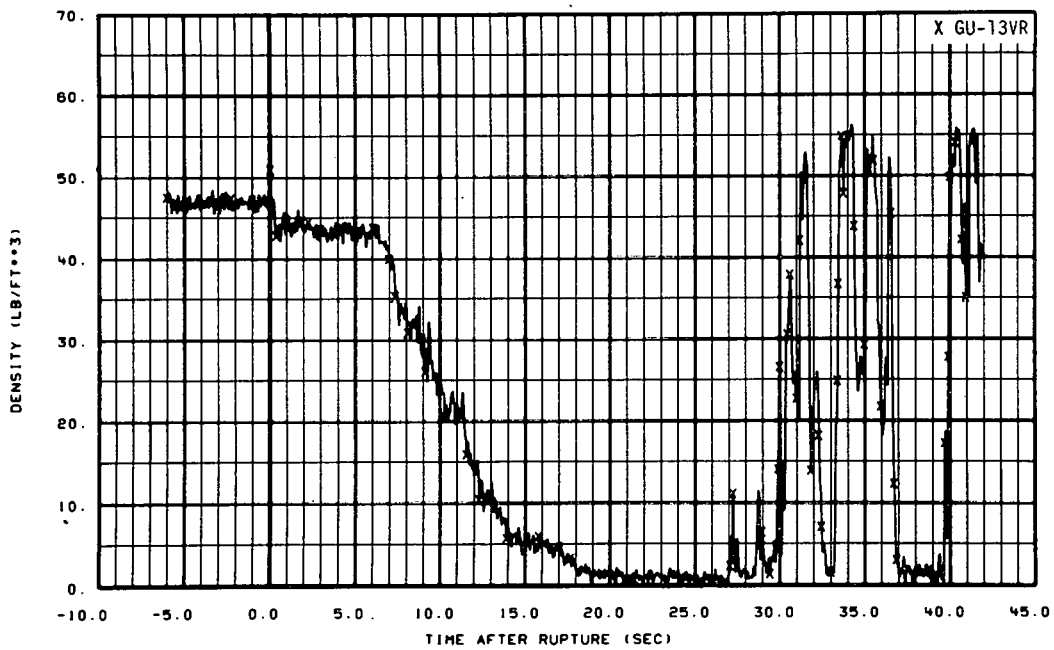


Fig. 263 Density in intact loop (GU-13VR), from -6 to 42 seconds.

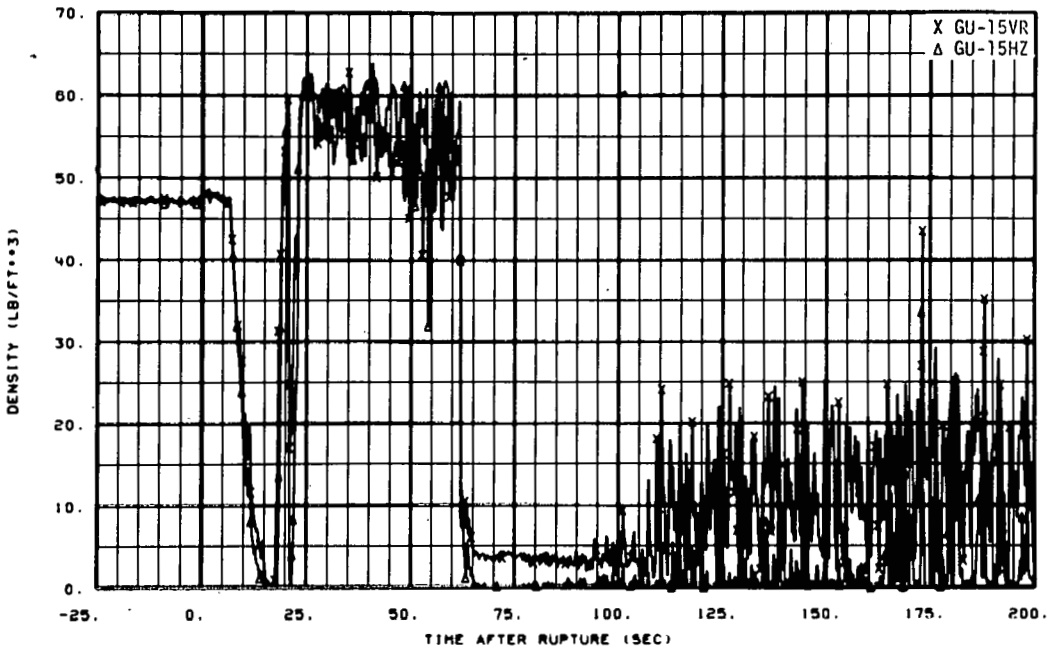


Fig. 264 Density in intact loop (GU-15VR, GU-15HZ), from -24 to 200 seconds.

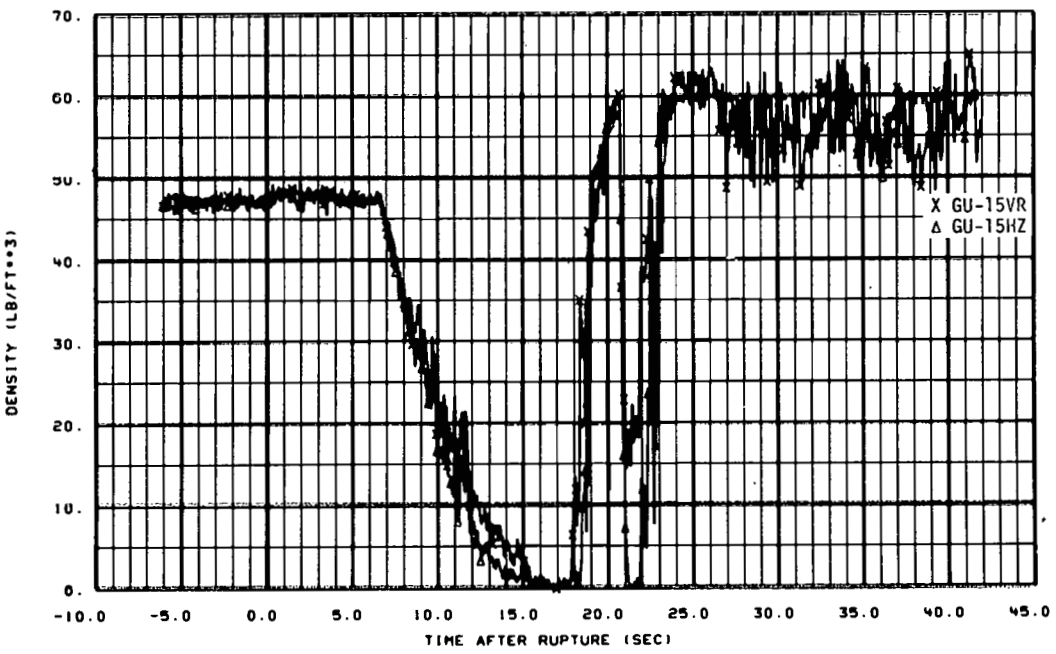


Fig. 265 Density in intact loop (GU-15VR, GU-15HZ), from -6 to 42 seconds.

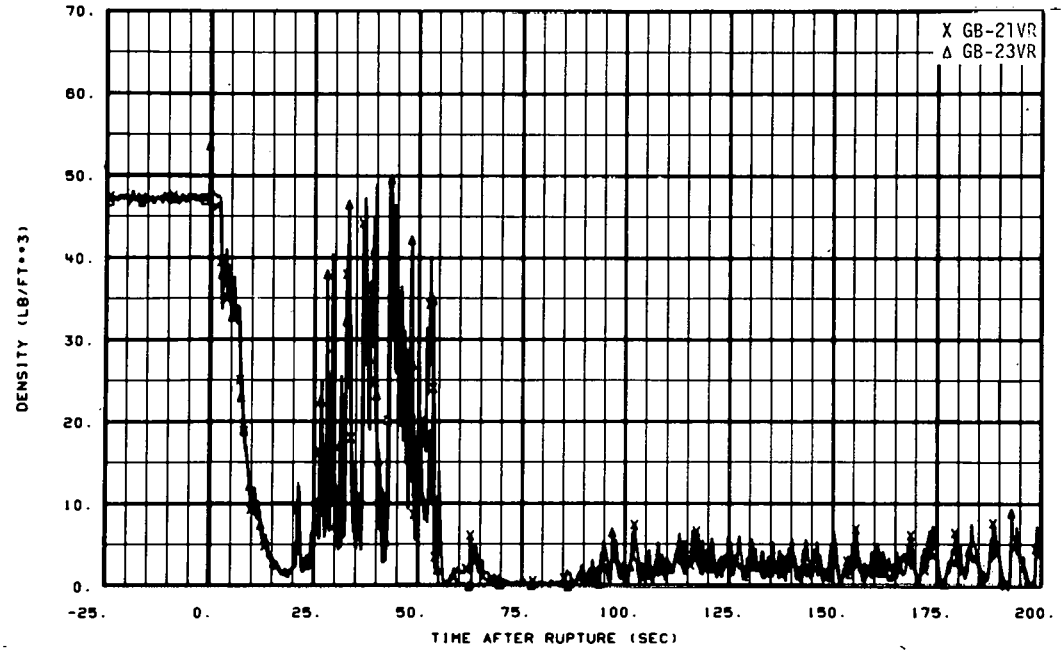


Fig. 266 Density in broken loop (GB-21VR, GB-23VR), from -24 to 200 seconds.

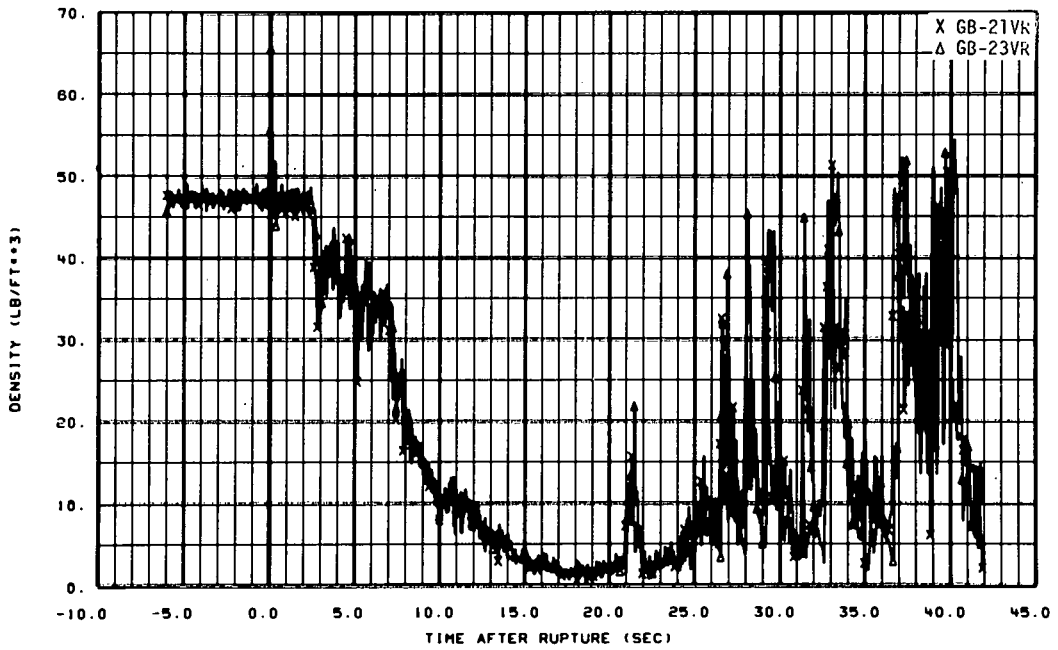


Fig. 267 Density in broken loop (GB-21VR, GB-23VR), from -6 to 42 seconds.

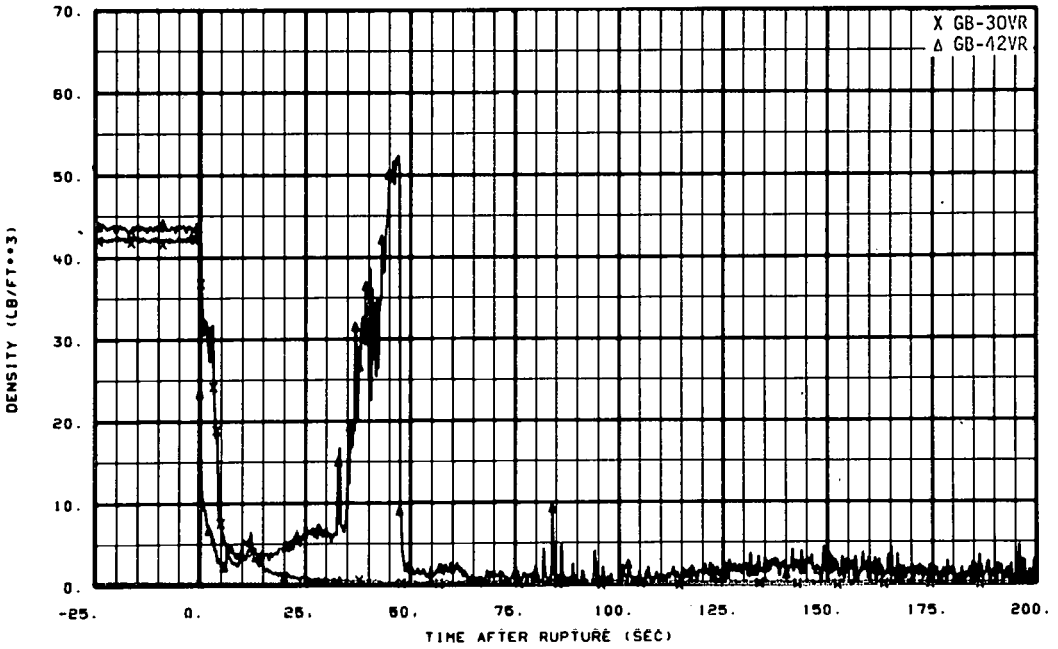


Fig. 268 Density in broken loop (GB-30VR, GB-42VR), from -24 to 200 seconds.

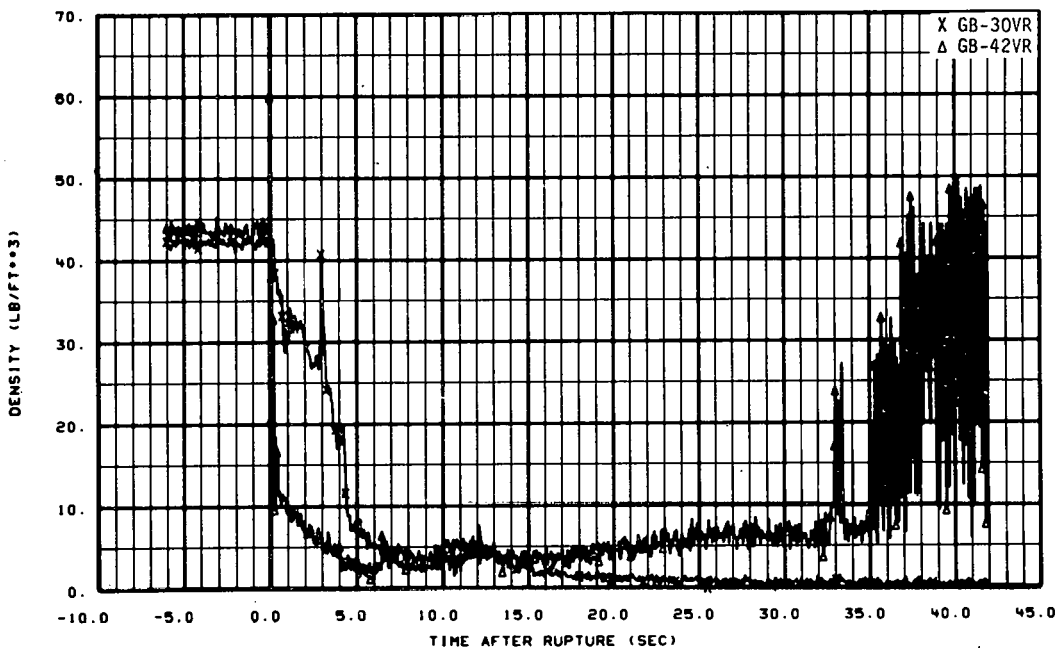


Fig. 269 Density in broken loop (GB-30VR, GB-42VR), from -6 to 42 seconds.

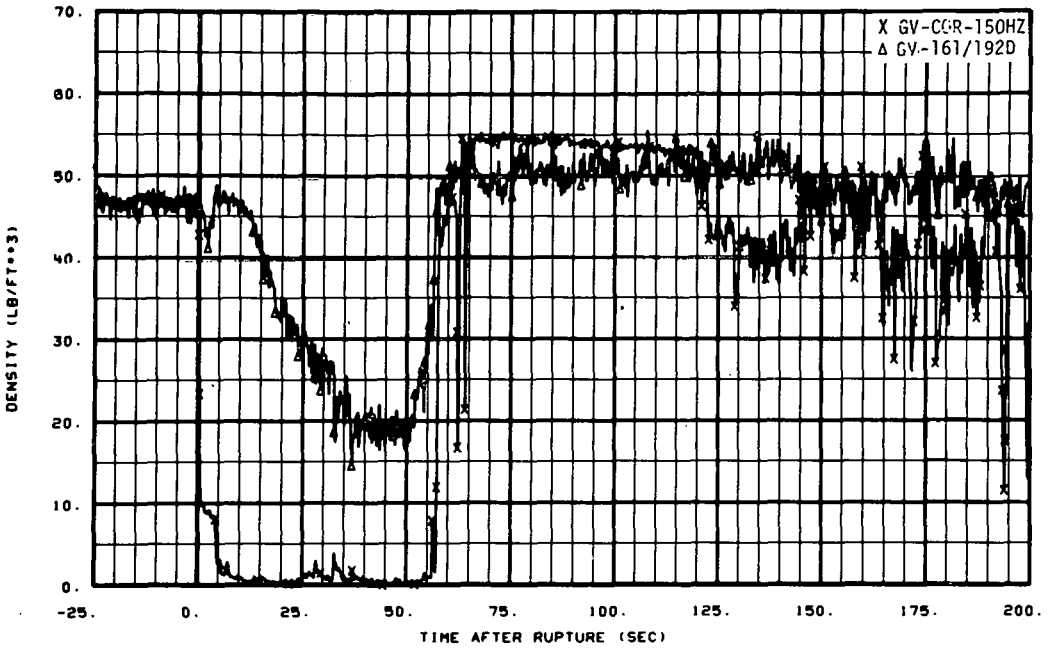


Fig. 270 Density in vessel (GV-COR-150HZ, GV-161/192D), from -24 to 200 seconds.

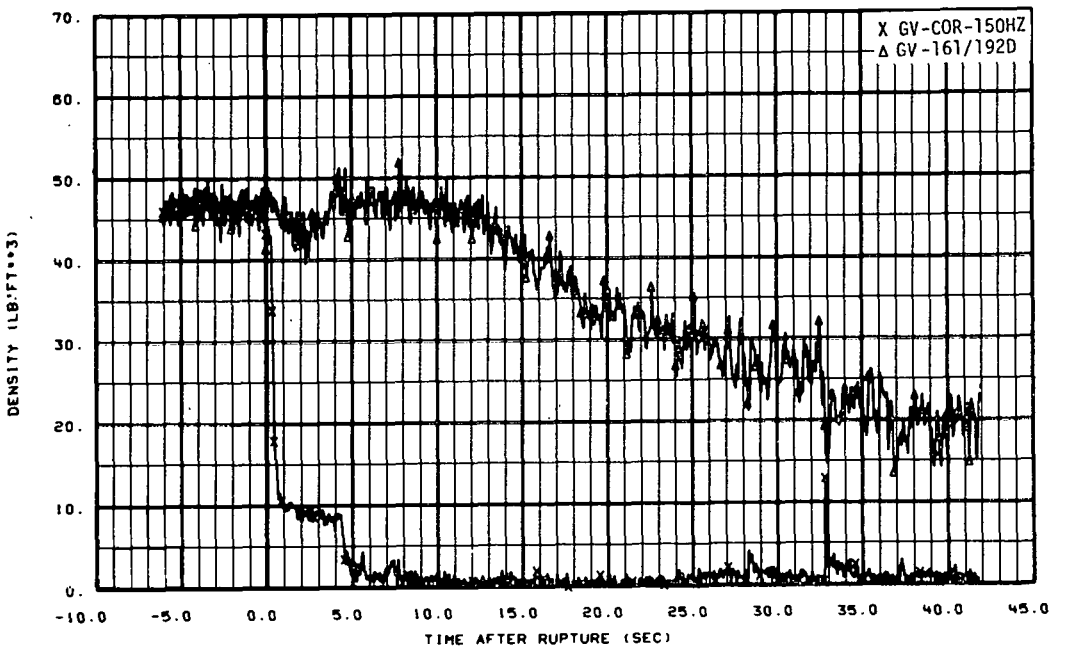


Fig. 271 Density in vessel (GV-COR-150HZ, GV-161/192D), from -6 to 42 seconds.

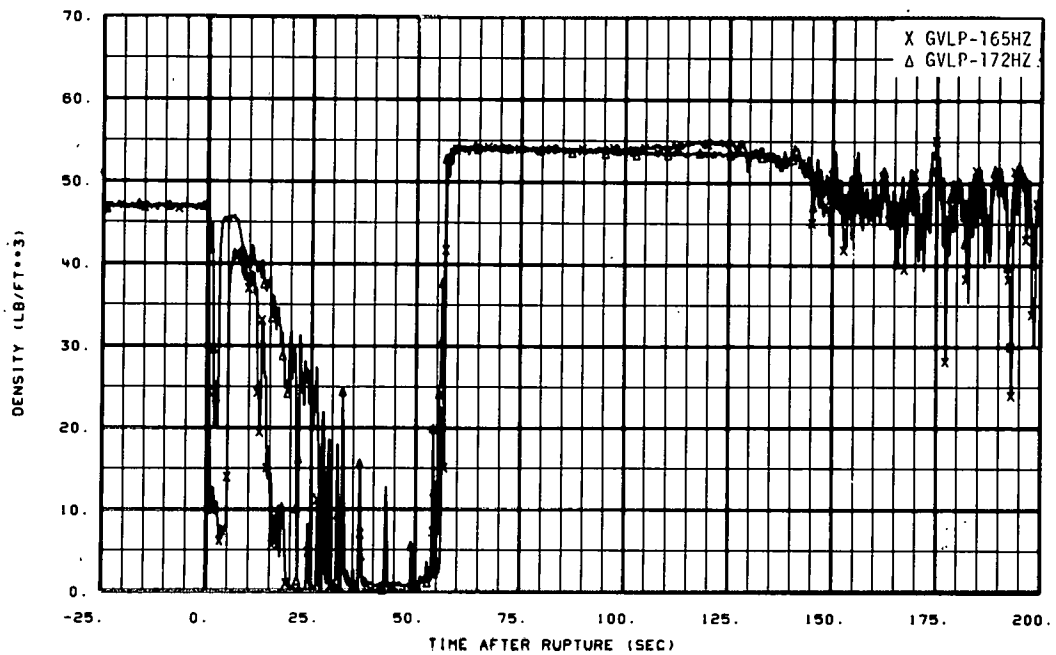


Fig. 272 Density in vessel (GVLP-165HZ, GVLP-172HZ), from -24 to 200 seconds.

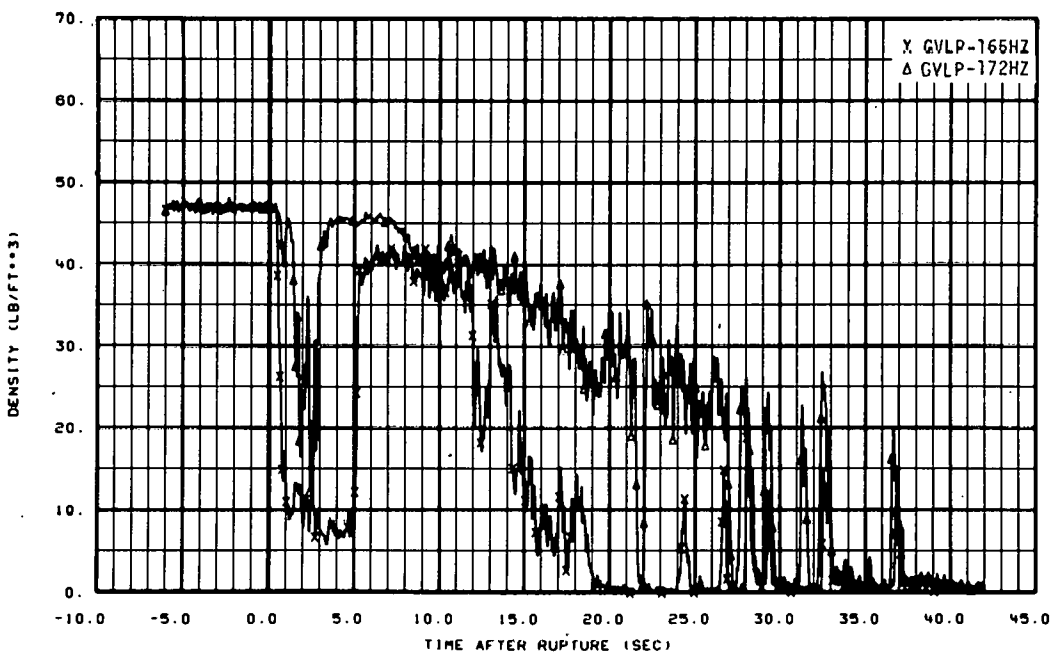


Fig. 273 Density in vessel (GVLP-165HZ, GVLP-172HZ), from -6 to 42 seconds.

3

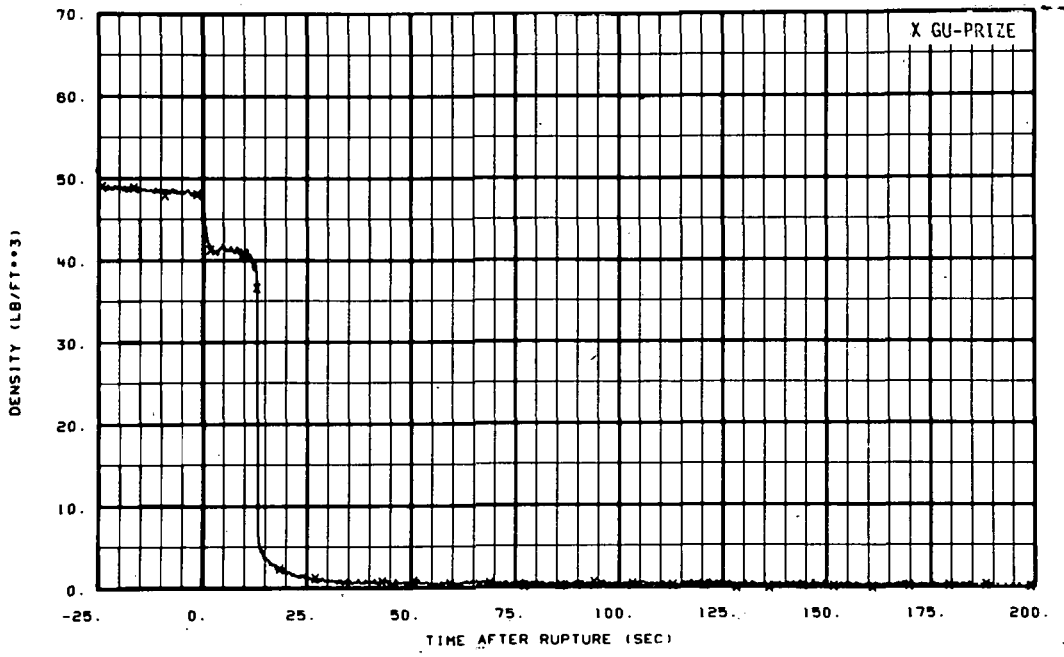


Fig. 274 Density in pressurizer surge line (GU-PRIZE), from -24 to 200 seconds.

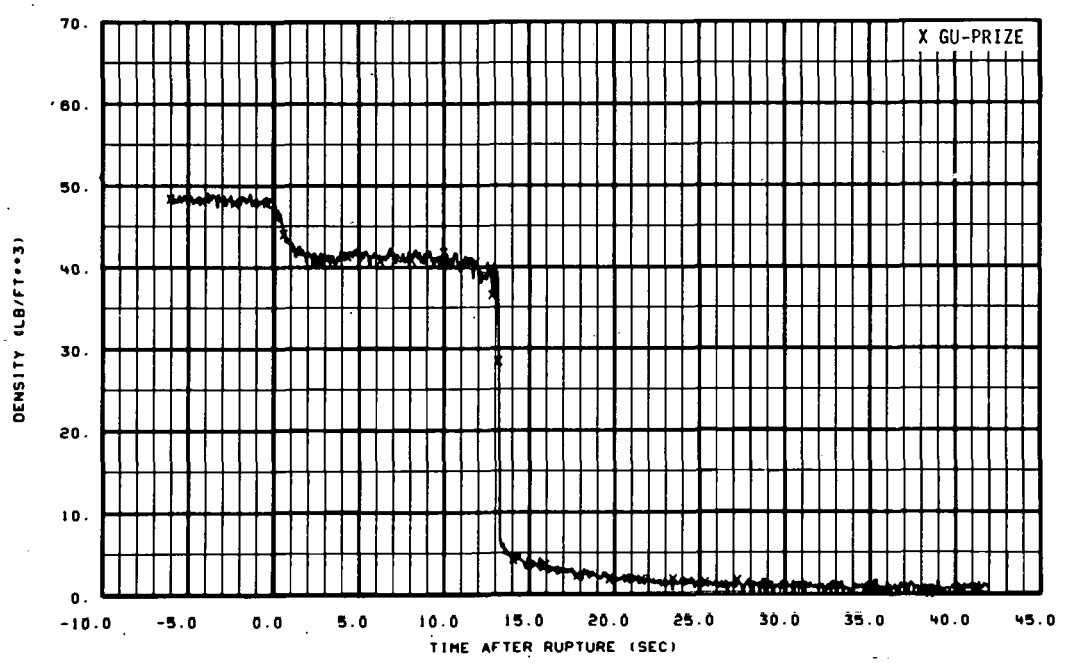


Fig. 275 Density in pressurizer surge line (GU-PRIZE), from -6 to 42 seconds.

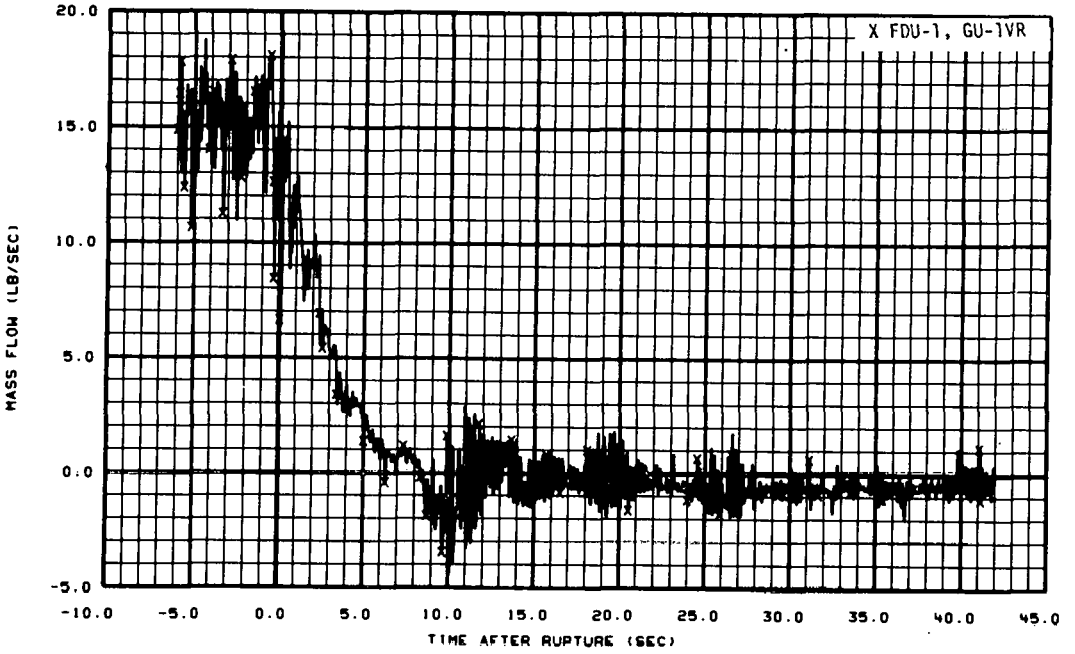


Fig. 276 Mass flow in intact loop (FDU-1, GU-1VR), from -6 to 42 seconds.

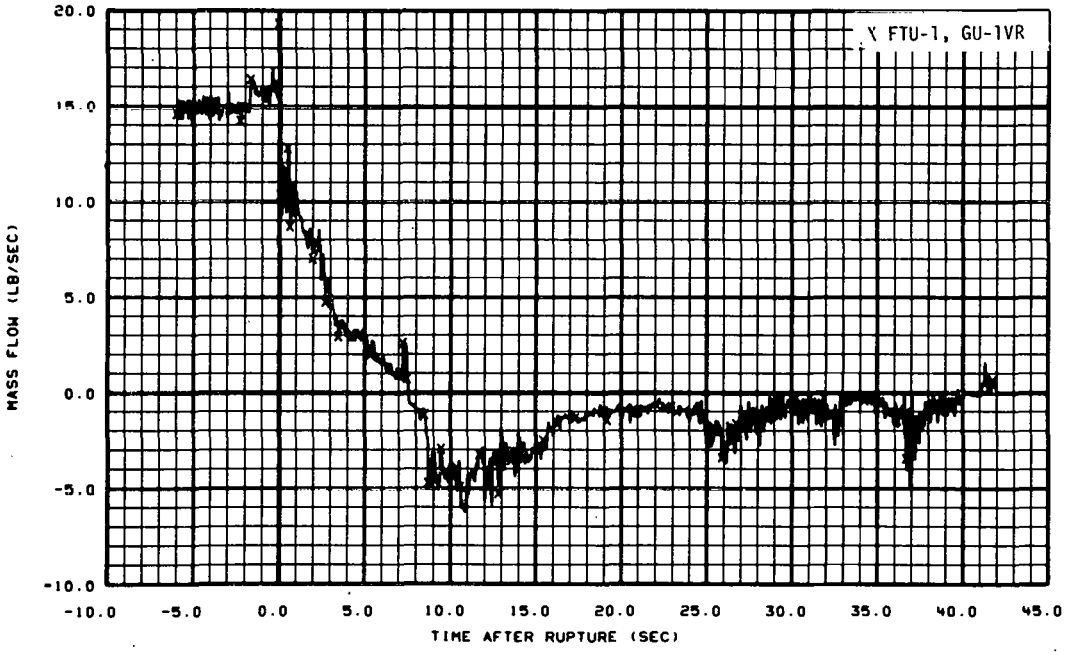


Fig. 277 Mass flow in intact loop (FTU-1, GU-1VR), from -6 to 42 seconds.

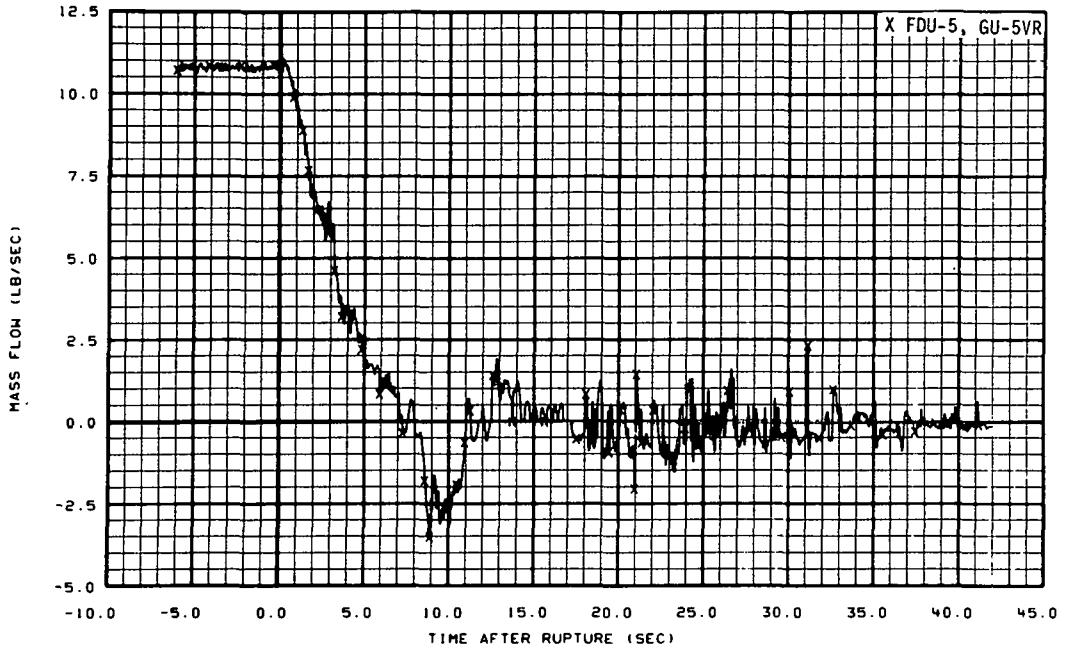


Fig. 278 Mass flow in intact loop (FDU-5, GU-5VR), from -6 to 42 seconds.

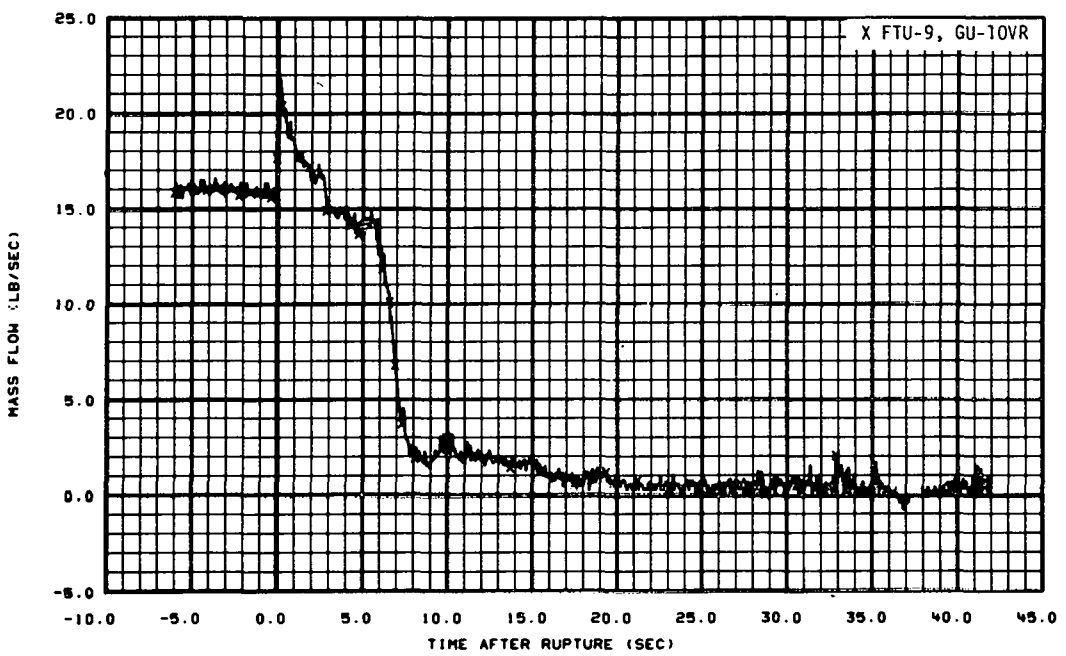


Fig. 279 Mass flow in intact loop (FTU-9, GU-10VR), from -6 to 42 seconds.

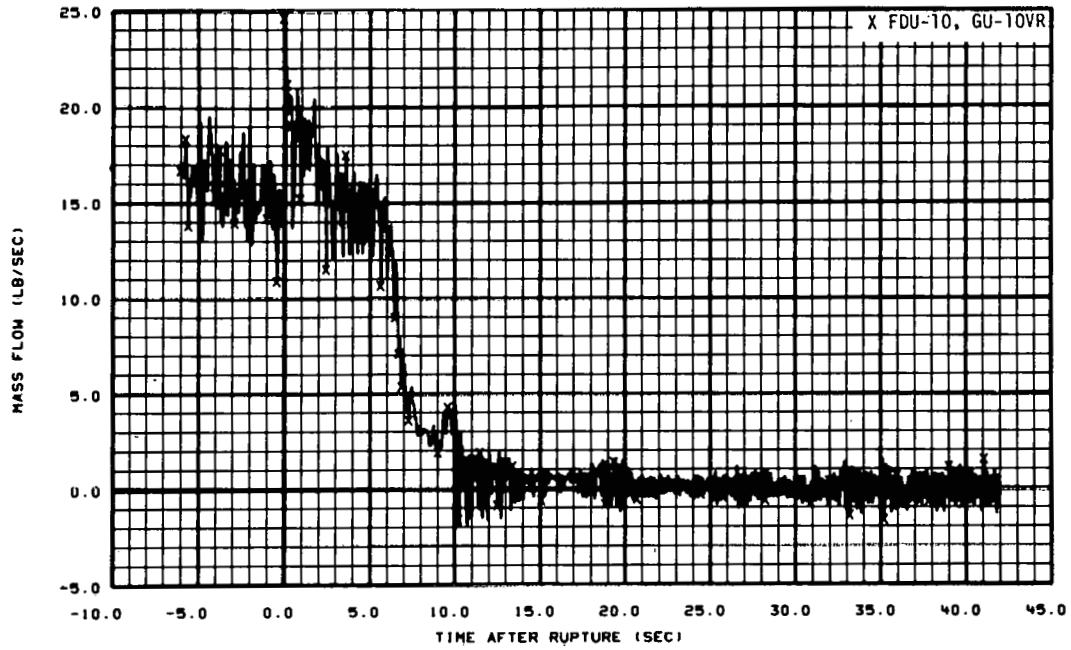


Fig. 280 Mass flow in intact loop (FDU-10, GU-10VR), from -6 to 42 seconds.

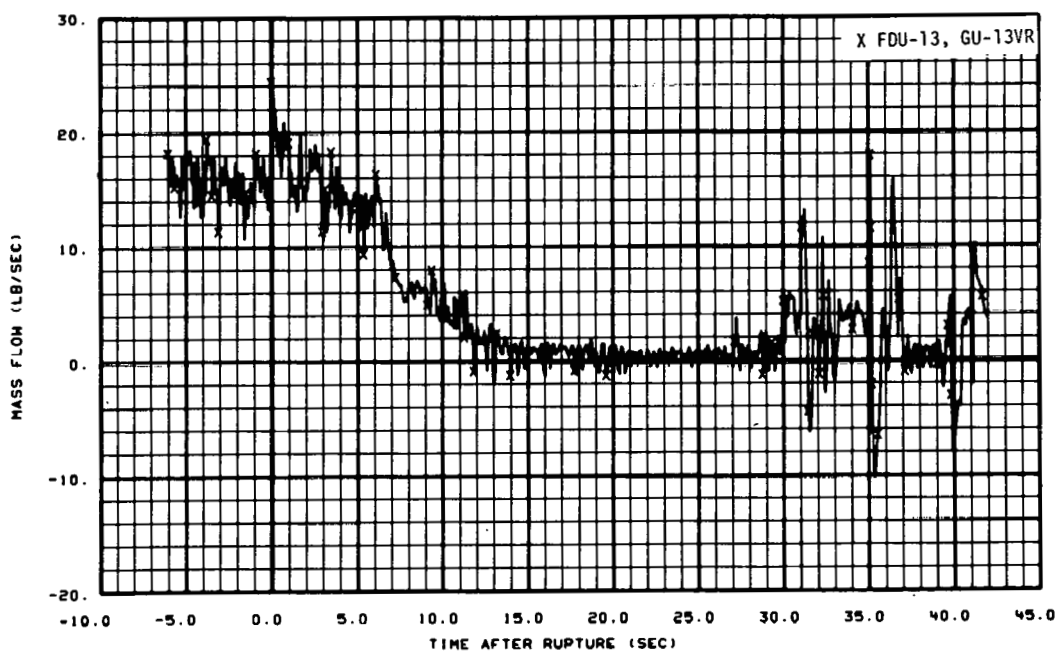


Fig. 281 Mass flow in intact loop (FDU-13, GU-13VR), from -6 to 42 seconds.

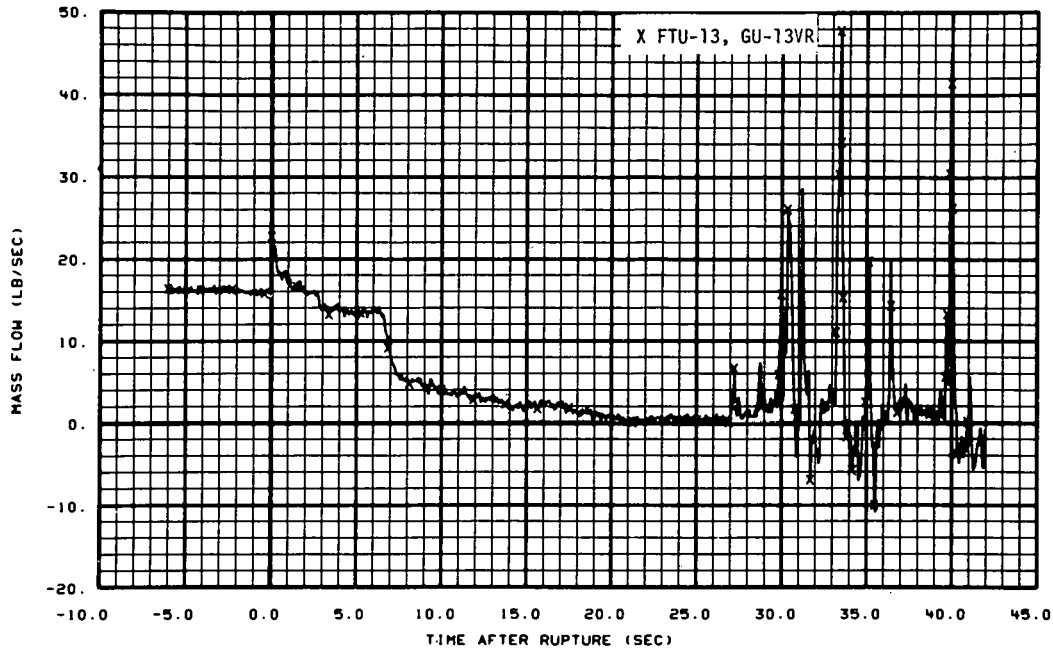


Fig. 282 Mass flow in intact loop (FTU-13, GU-13VR), from -6 to 42 seconds.

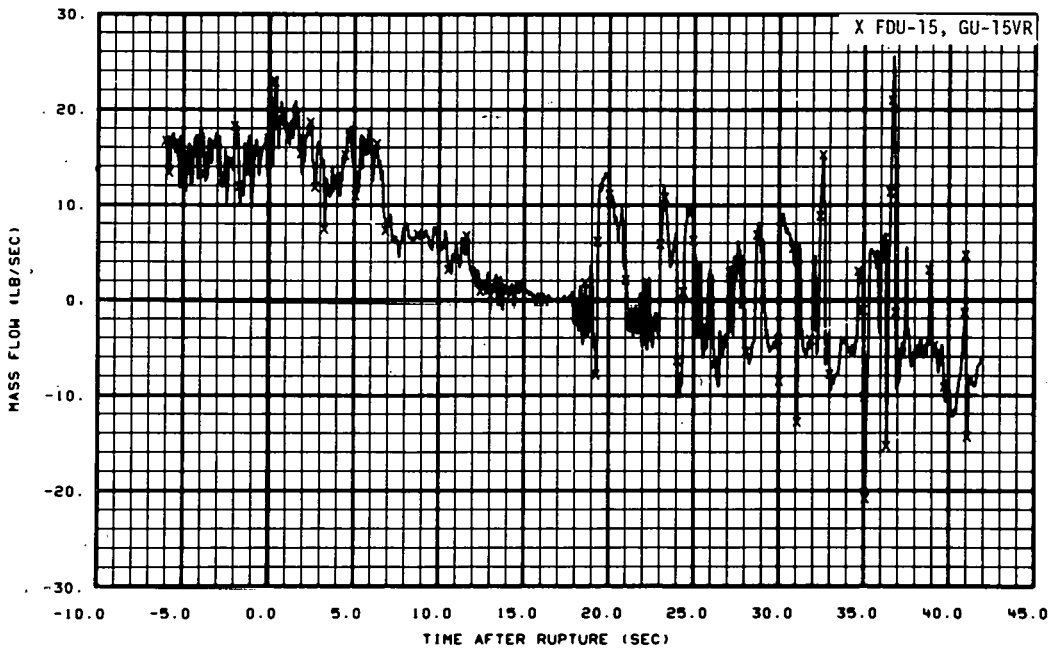


Fig. 283 Mass flow in intact loop (FDU-15, GU-15VR), from -6 to 42 seconds.

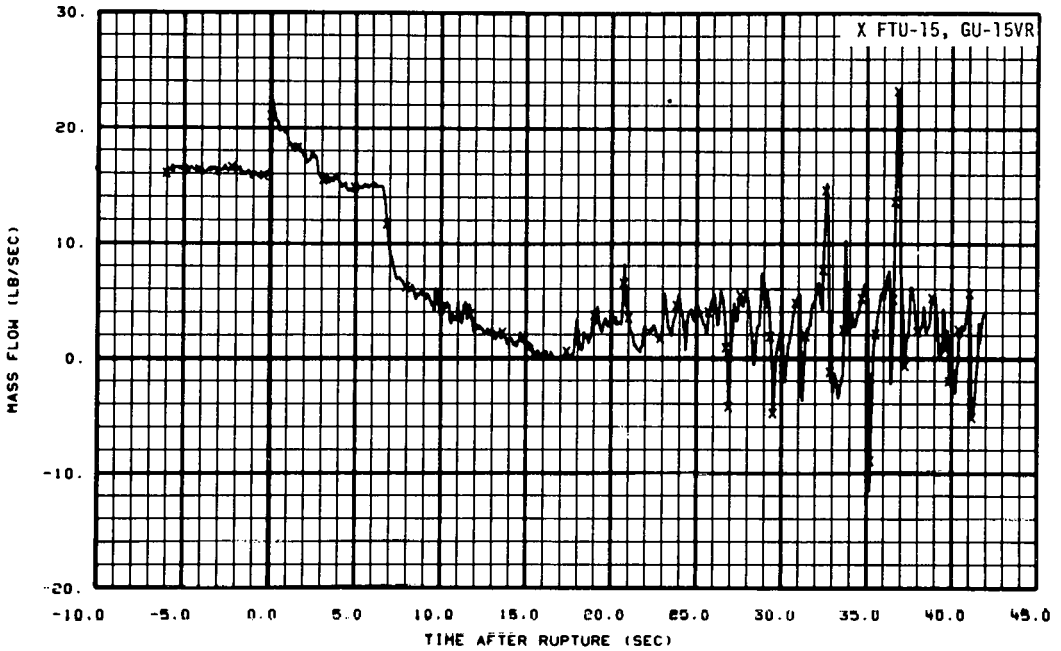


Fig. 284 Mass flow in intact loop (FTU-15, GU-15VR), from -6 to 42 seconds.

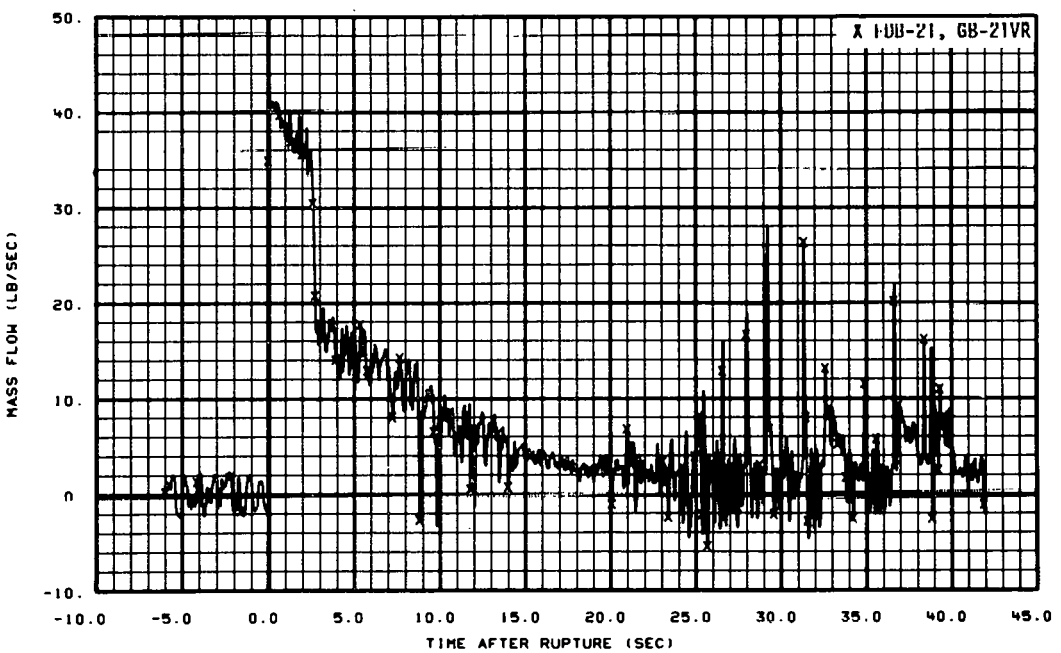


Fig. 285 Mass flow in broken loop (FDB-21, GB-21VR), from -6 to 42 seconds.

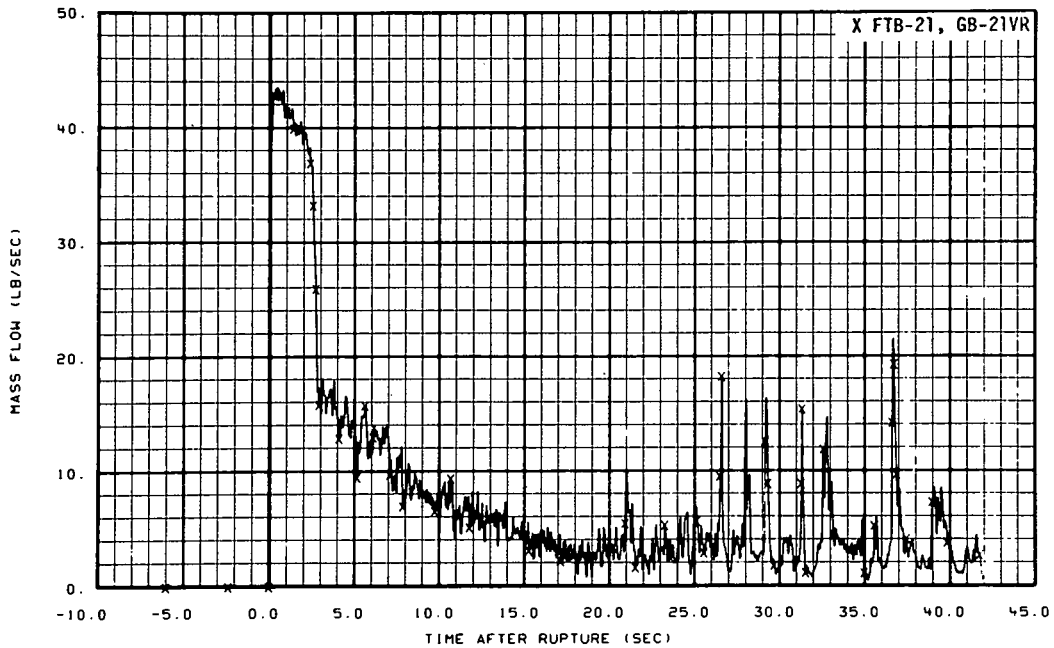


Fig. 286 Mass flow in broken loop (FTB-21, GB-21VR), from -6 to 42 seconds.

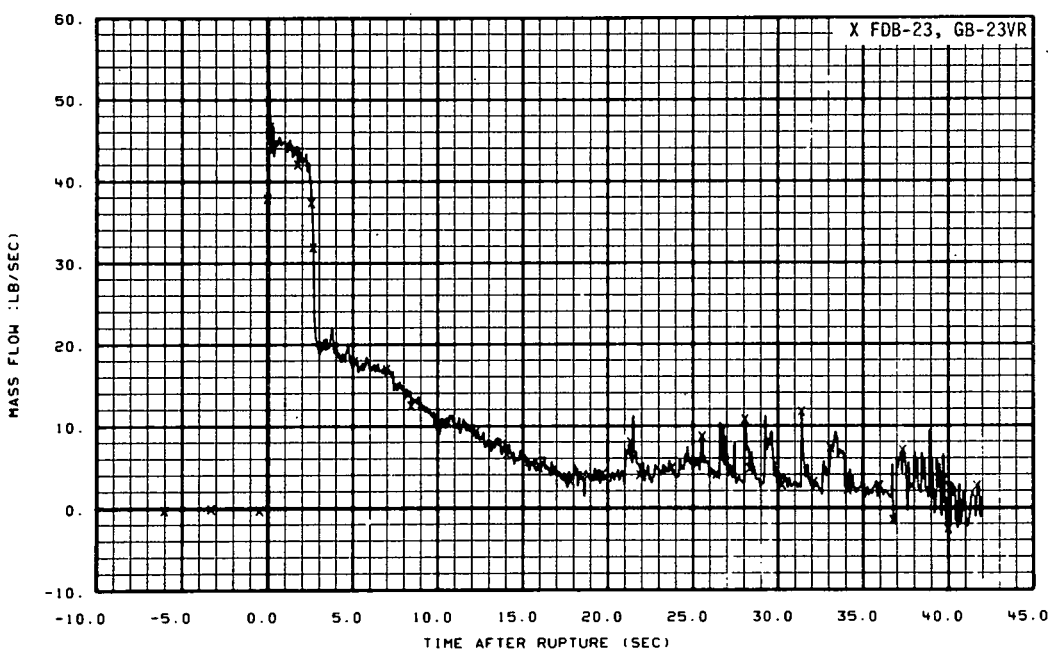


Fig. 287 Mass flow in broken loop (FDB-23, GB-23VR), from -6 to 42 seconds.

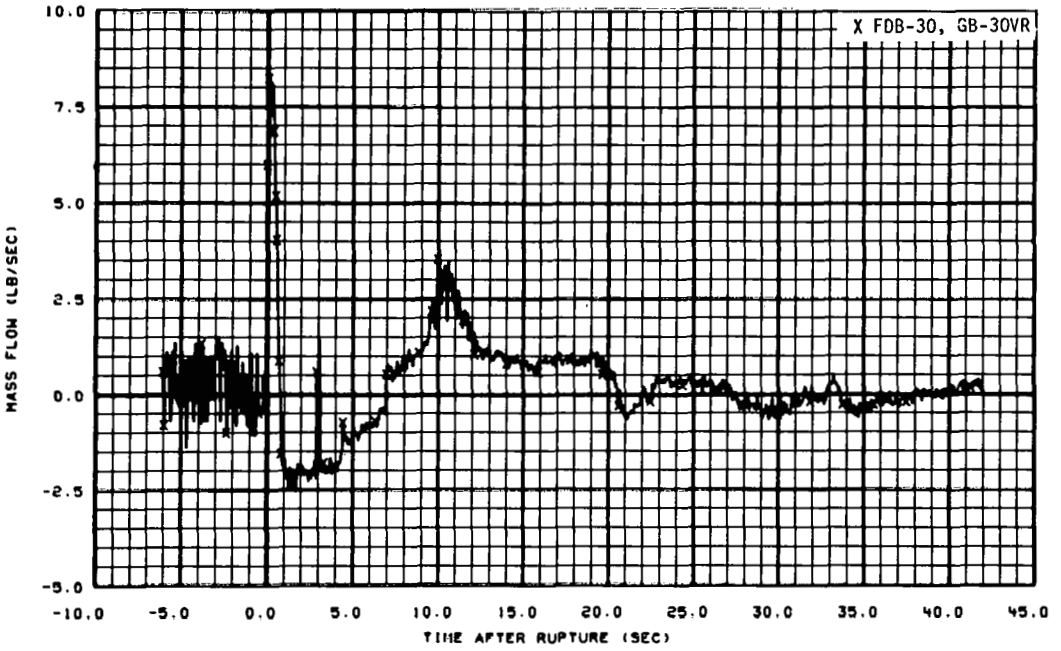


Fig. 288 Mass flow in broken loop (FDB-30, GB-30VR), from -6 to 42 seconds.

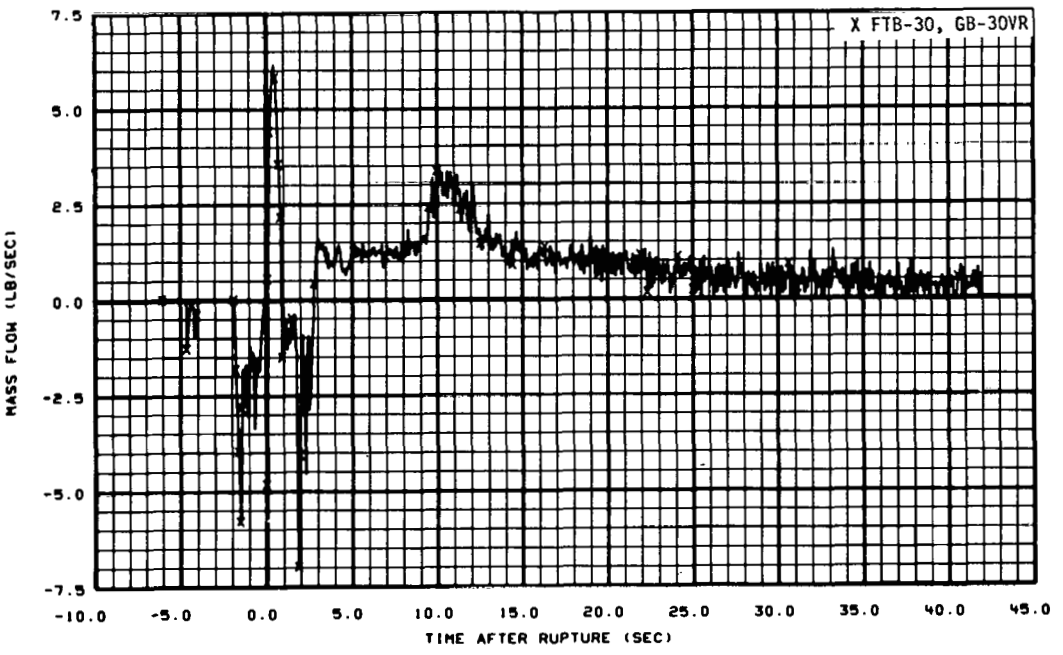


Fig. 289 Mass flow in broken loop (FTB-30, GB-30VR), from -6 to 42 seconds.

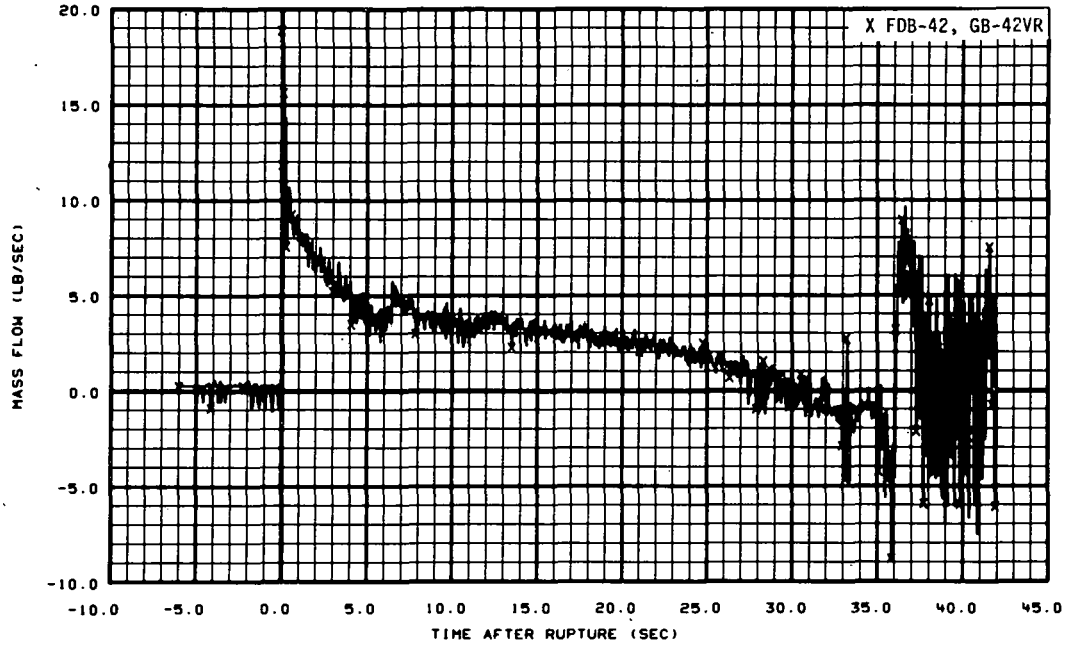


Fig. 290 Mass flow in broken loop (FDB-42, GB-42VR), from -6 to 42 seconds.

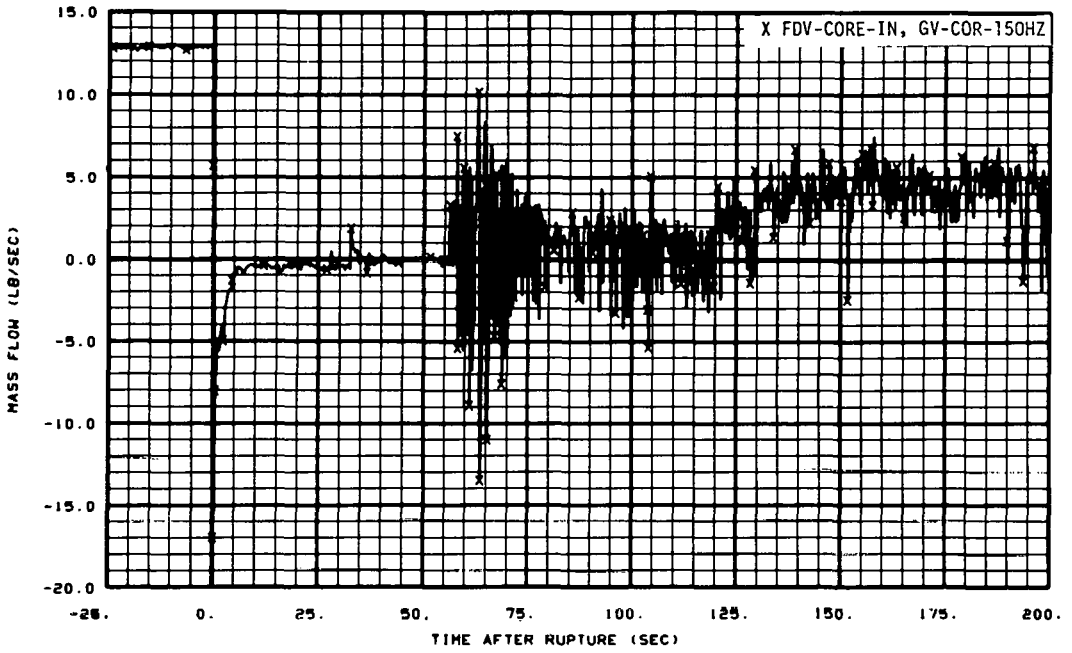


Fig. 291 Mass flow in vessel (FDV-CORE-IN, GV-COR-150HZ), from -24 to 200 seconds.

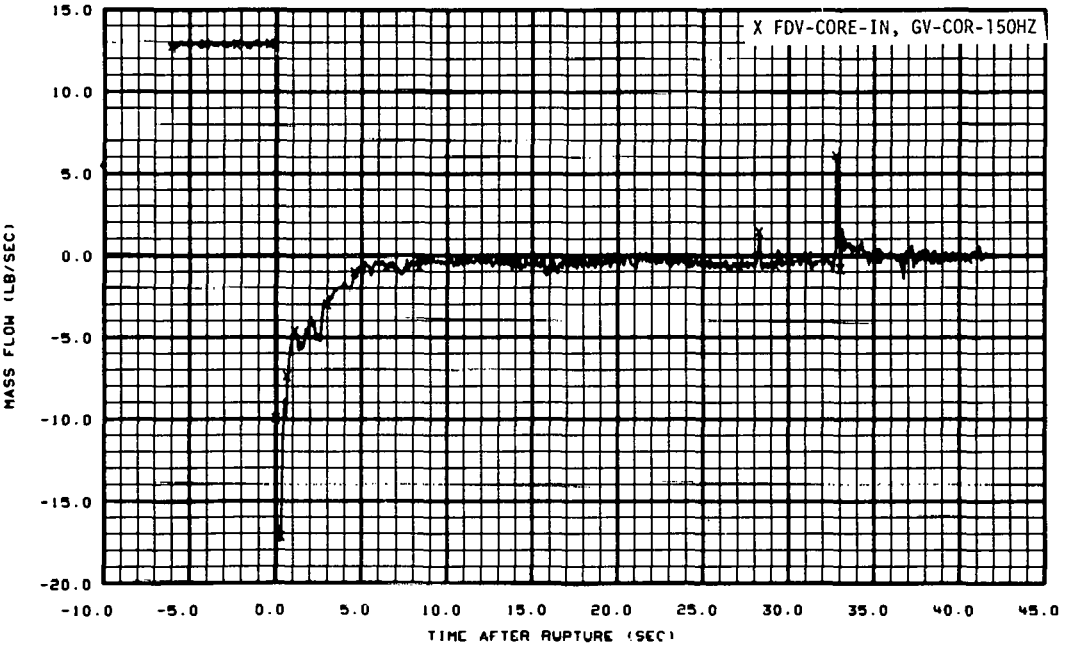


Fig. 292 Mass flow in vessel (FDV-CORE-IN, GV-COR-150HZ), from -6 to 42 seconds.

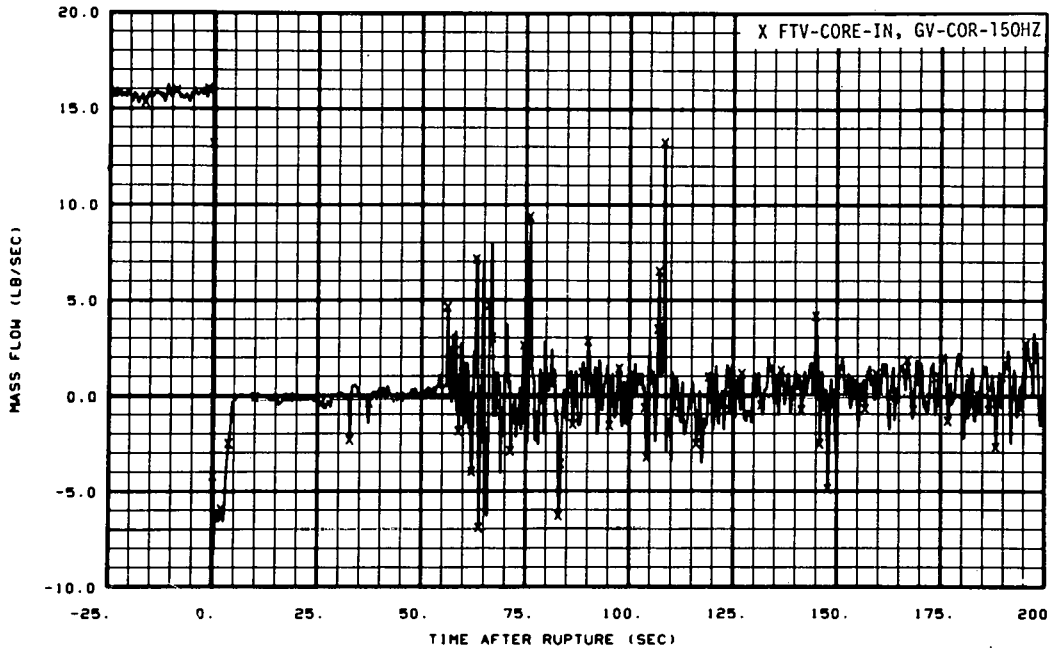


Fig. 293 Mass flow in vessel (FTV-CORE-IN, GV-COR-150HZ), from -24 to 200 seconds.

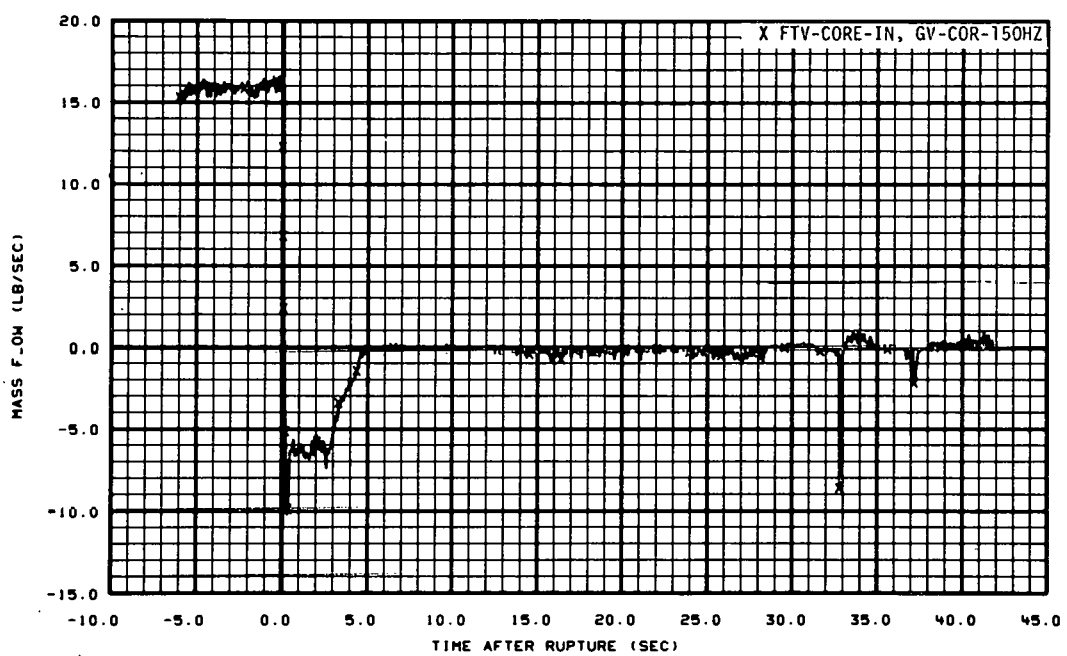


Fig. 294 Mass flow in vessel (FTV-CORE-IN, GV-COR-150HZ), from -6 to 42 seconds.

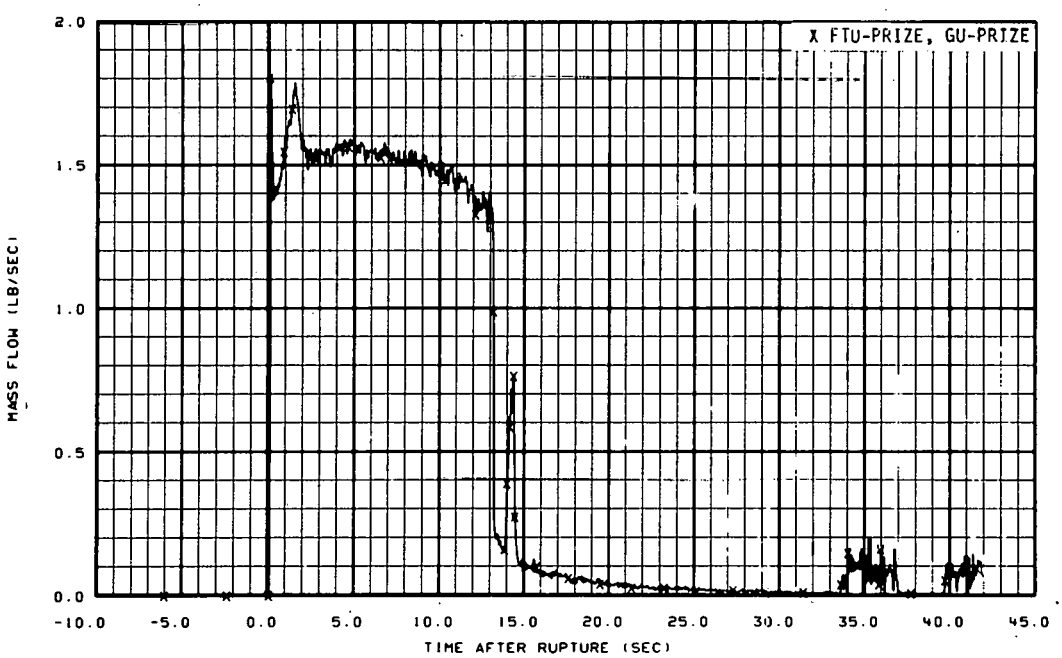


Fig. 295 Mass flow in pressurizer surge line (FTU-PRIZE, GU-PRIZE), from -6 to 42 seconds.

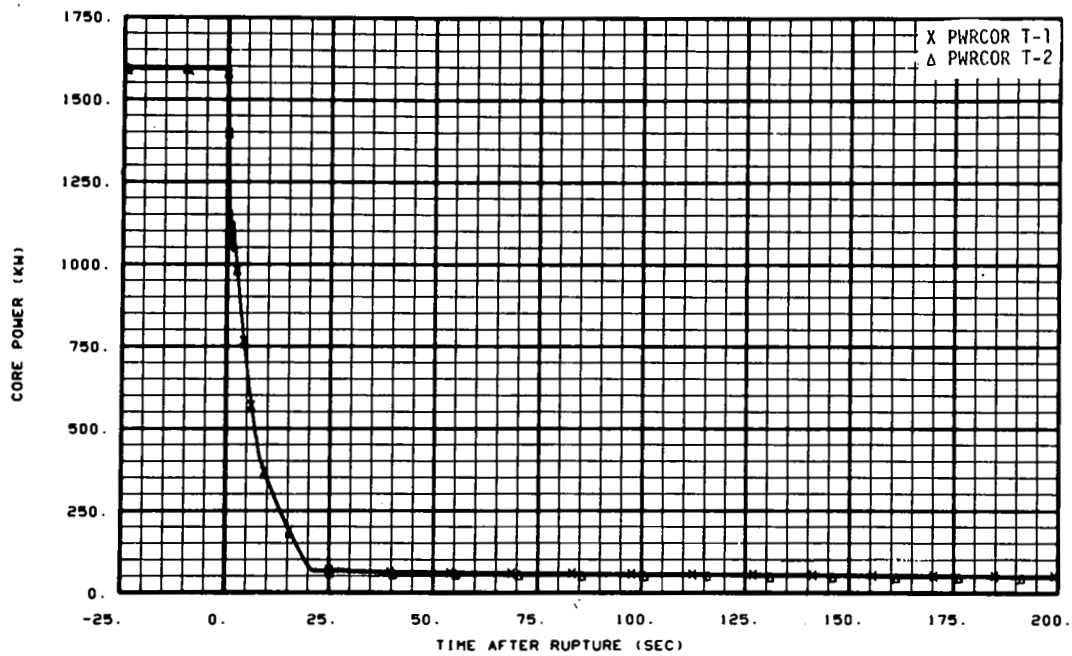


Fig. 296 Total power in heated core (PWRCOR T-1, PWRCOR T-2), from -24 to 200 seconds.

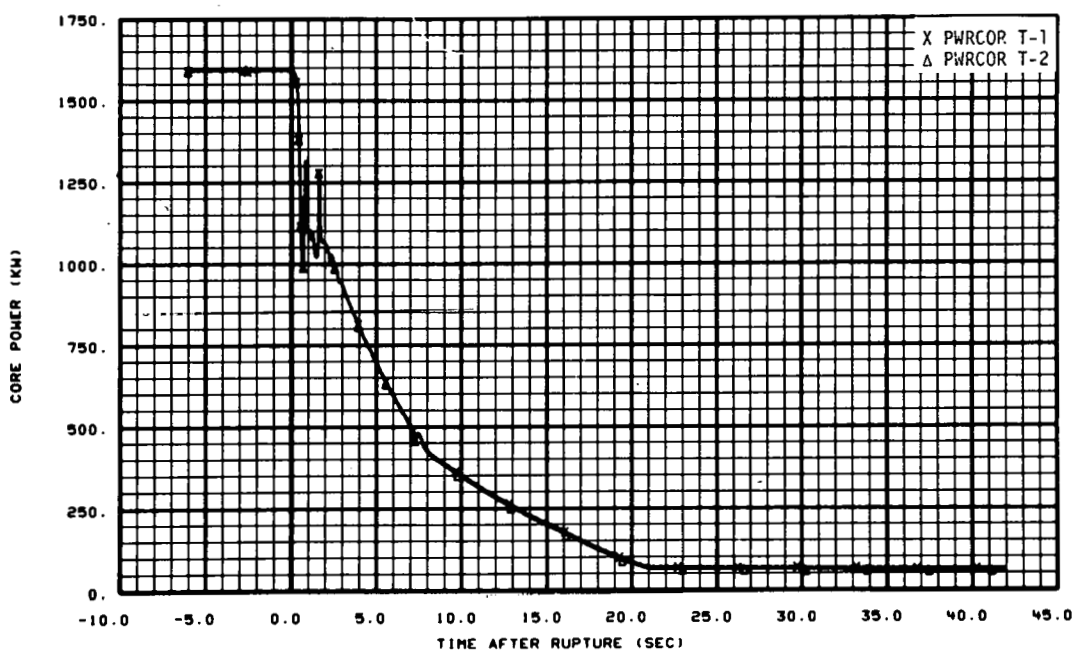


Fig. 297 Total power in heated core (PWRCOR T-1, PWRCOR T-2), from -6 to 42 seconds.

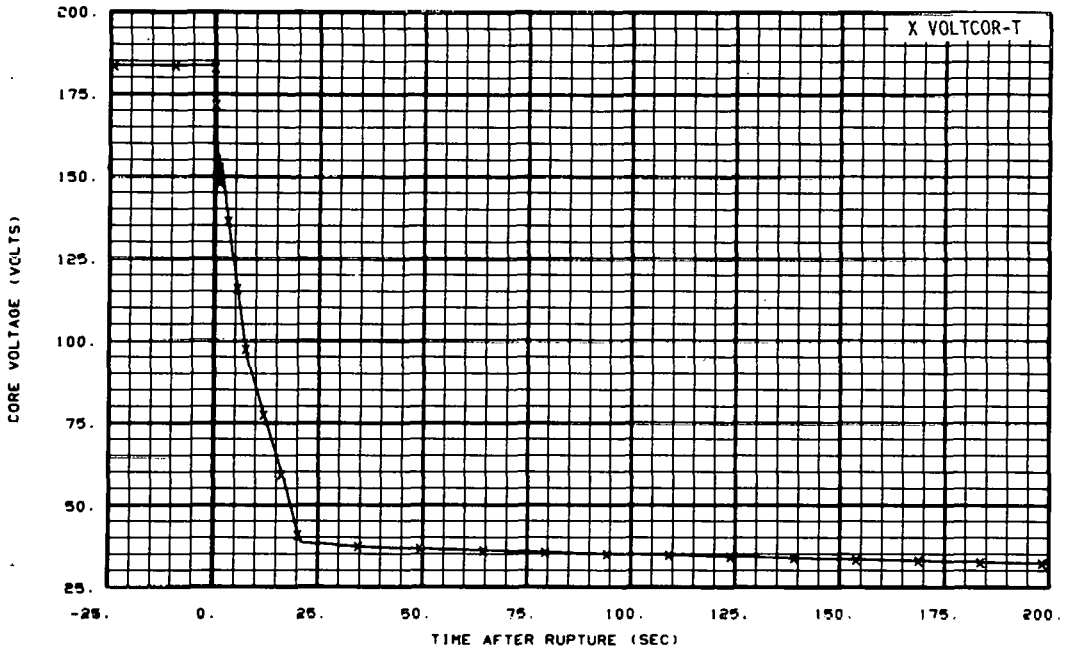


Fig. 298 Voltage to heated core (VOLTCOR-T), from -24 to 200 seconds.

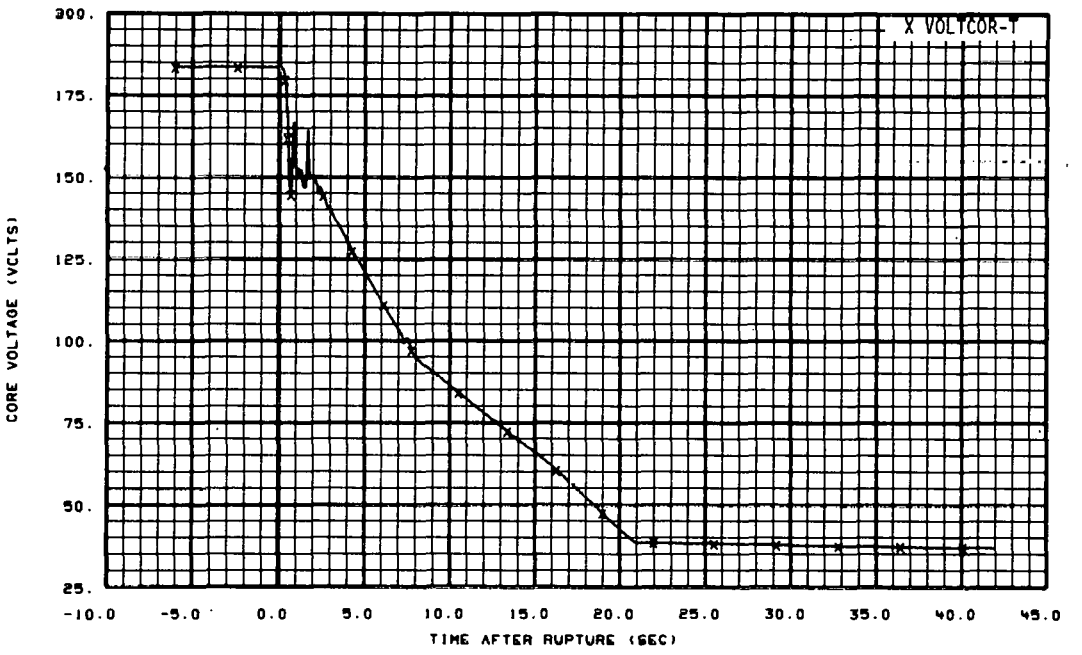


Fig. 299 Voltage to heated core (VOLTCOR-T), from -6 to 42 seconds.

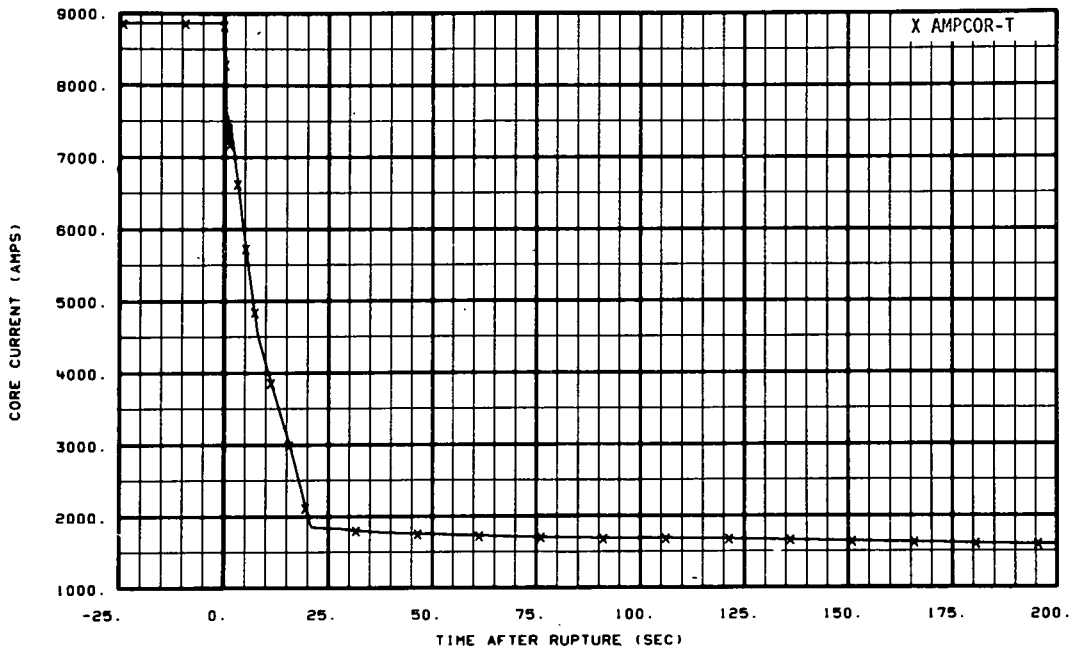


Fig. 300 Current to heated core (AMPCOR-T), from -24 to 200 seconds.

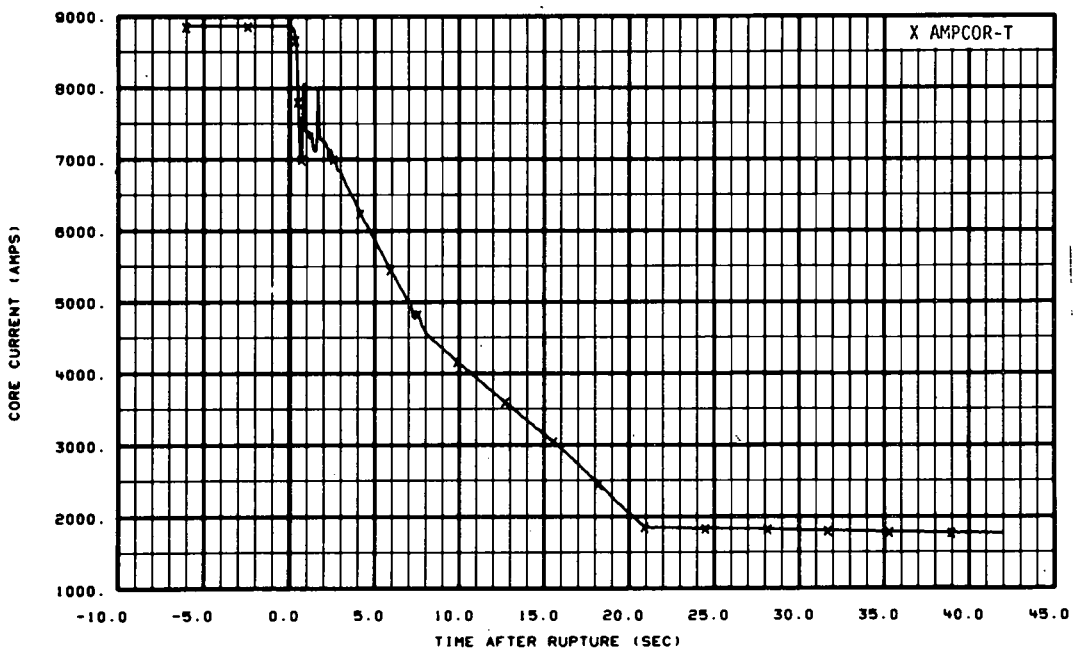


Fig. 301 Current to heated core (AMPCOR-T), from -6 to 42 seconds.

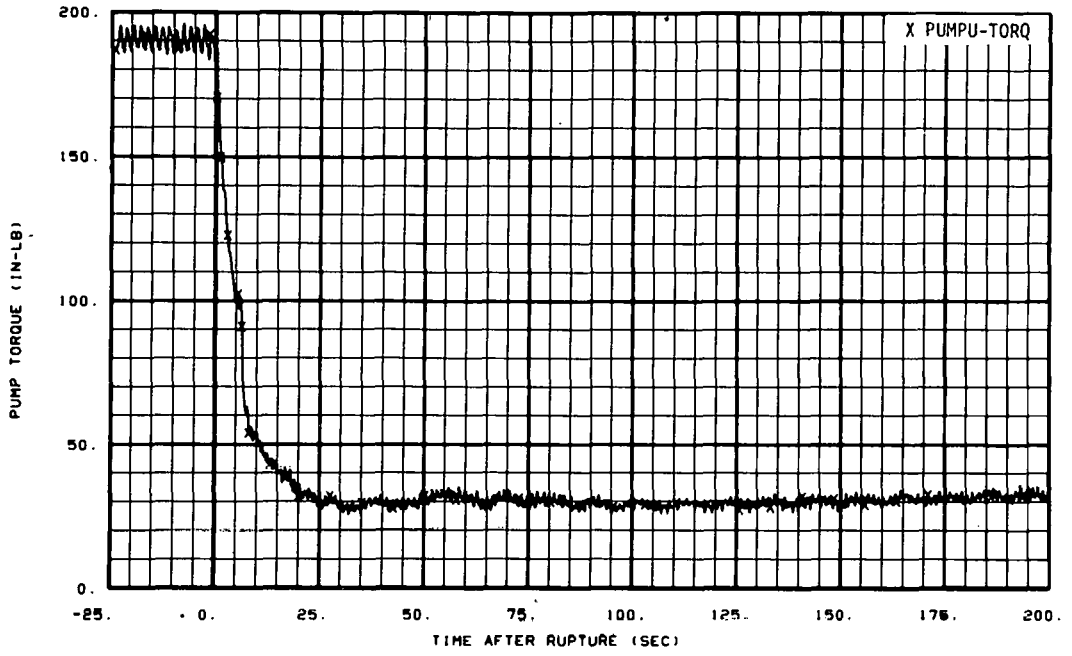


Fig. 302 Primary pump torque (PUMPU-TORQ), from -24 to 200 seconds.

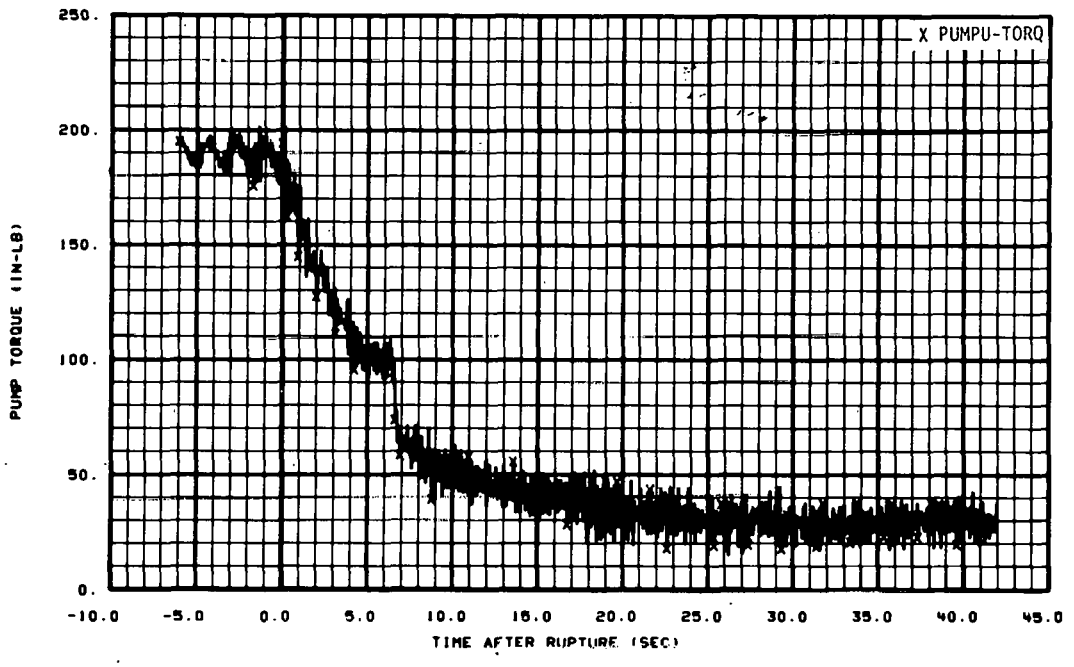


Fig. 303 Primary pump torque (PUMPU-TORQ), from -6 to 42 seconds.

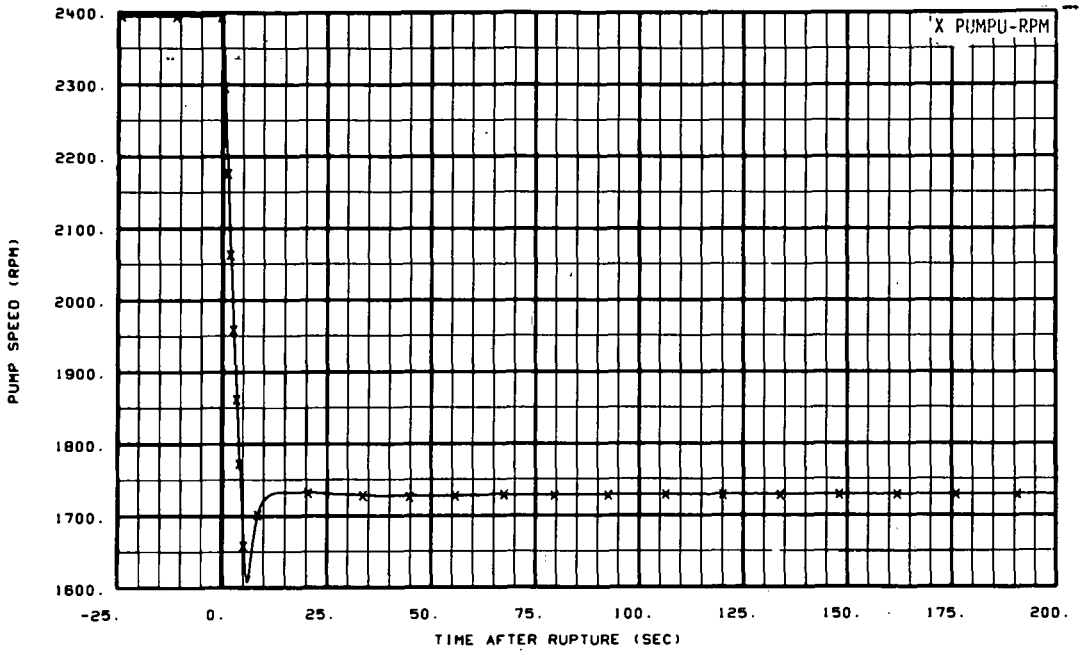


Fig. 304 Primary pump speed (PUMPU-RPM), from -24 to 200 seconds.

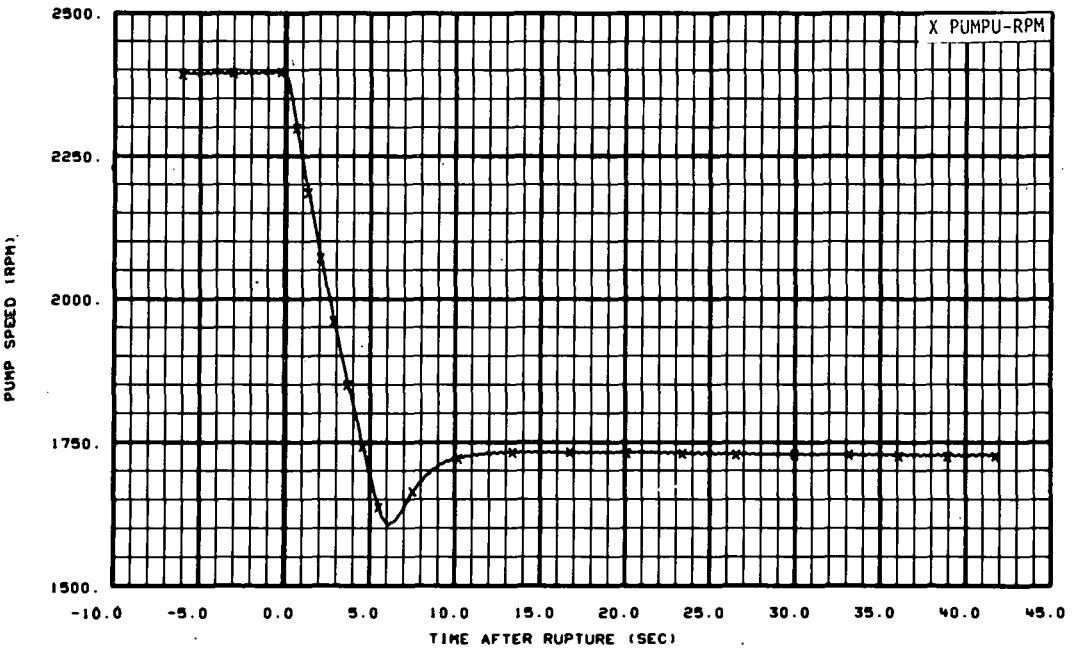


Fig. 305 Primary pump speed (PUMPU-RPM), from -6 to 42 seconds.

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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