Pump Two-Phase Performance Program
Volume 6: Transient Data

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Prepared by
Combustion Engineering, Inc.
Windsor, Connecticut

EPRI PERSPECTIVE

PROJECT DESCRIPTION

This final report under RP301 documents the findings of an experimental research effort to develop a data base on reactor coolant pump single- and two-phase performance behavior. Tests were performed on a geometrically scaled model of an actual reactor coolant pump. Both steady-state and transient blowdown tests were performed over sufficiently large ranges of thermal-hydraulic operating conditions and typical pump performance parameters to cover calculated hypothetical loss-of-coolant accident (LOCA) conditions.

PROJECT OBJECTIVES

Current analytic pump models used in LOCA analyses are based on a limited amount of experimental data. The goals of this project were (1) to establish a sufficiently large data base of steady-state and transient pump performance data to substantiate, and ultimately improve, analytic pump models currently used for reactor coolant pump LOCA analysis; and (2) to obtain data on pump characteristics under two-phase transient blowdown conditions to aid the evaluation of reactor coolant pump overspeed.

PROJECT RESULTS

The pump data base collected in this project is considered sufficiently large and diverse to cover a significant range of pump performance of primary importance to LOCA analysis. Initial evaluation of the test results indicates that pump-rated head and torque degrade significantly under two-phase flow conditions. Pump free-wheeling speed (pump motor power off) is closely coupled to the volumetric flow rate through the pump during a blowdown transient. The maximum free-wheeling speed observed was near twice the rated speed for a discharge break equal to the flow area of the pump. For smaller-size discharge breaks, the peak speed observed was less than twice the rated speed. With electric power to the pump drive motor on throughout the blowdown, however, the pump speed was maintained at an almost constant value.

Additional reduction and analysis of this data base is required before it can be used to support the development of an improved analytic model for pump two-phase performance.

This final report consists of eight volumes, as presented in the table of contents in this first volume. Volumes 1, 2, 3, 4, and 7 present the results and conclusions, as well as substantial discussion and description, of the entire project and the test data. Volumes 5 and 6 present the tabulated test data in computer printout and graphic format, which will be useful for further analyses. Volume 8 contains a description of the data processing methods. Volumes 2 through 8 are available from the Research Reports Center* upon request.

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ABSTRACT

The primary objective of the C-E/EPRI Pump Two-Phase Performance Program was to obtain sufficient steady-state and transient two-phase empirical data to substantiate and ultimately improve the reactor coolant pump analytical model currently used for LOCA analysis. A one-fifth scale pump, which geometrically models a reactor coolant pump, was tested in steady-state runs with single- and two-phase mixtures of water and steam over ranges of operating conditions representative of postulated loss-of-coolant accidents. Transient tests were also run to evaluate the applicability of the steady-state-based calculational models to transient conditions.

This project has produced test data which can appropriately be utilized for reactor coolant pump modeling in LOCA analyses. The steady-state test data show general coherence of the test results and overall pump performance trends for a model pump that should be representative of a reactor coolant pump to the extent that scaling laws apply. Both head and torque data correlate well in the form of homologous curves. Two-phase head degradation curves are approximately comparable to head degradation curves obtained in other test programs. Two-phase torque degradation curves have also been developed. The collected data should be useful for analytical model development.

Volume VI - Transient Data

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Section 1

INTRODUCTION

This volume contains plots of the transient data and derived parameters obtained for each of the sixteen blowdown experiments conducted during the CE/EPRI pump project. Summary descriptions of each of the sixteen blowdown experiments are provided in Tables 1-1 and 1-2. A portion of the data contained in this volume was reviewed and discussed extensively in Volume III. Definitions of sign conventions are given in Volume II. Supporting material which describes the facility, the measurements, the data acquisition system, and the data processing methods used to produce the data in this volume is included in Volumes VII and VIII.

The data presented are in English engineering units and are of two basic types: (1) measured data and (2) calculated data. The measured data include 39 channels recorded on the FM system and either 8 or 9 channels recorded on the scanner system for each transient. The calculated data are obtained from combinations of measured data.

The first two transient tests in the test series (Test 246 and Test 252) were basically system shakedown tests. The results of these tests contain several irregularities attributable to calibration and operation procedures which had not been completely refined. Therefore, the data from these two tests should be used with extreme caution.

The data from the remaining fourteen transient tests (tests numbered 475 and above) have been given a preliminary review but as presented have not been completely qualified and verified. Accordingly, the user is advised to be cautious in direct application of the data. In order to assist the user in avoiding difficulty with application of the data the following paragraphs provide general comments on generic items which are apparent as anomalies in several or all tests. Additional comments which apply to specific tests appear on the system configuration page which precedes the set of data plots for each test.

Generally all of the data contain fluctuations. The fluctuations in the measured data are attributable to both electronic noise and physical phenomena. The

Table 1-1

SUMMARY OF PHASE I TRANSIENT TESTS

Test No.	Pre-Blowdown Conditions†			Break Size* (%)	Break Location	Pump Mode	Mixing Plate
	Suction Pressure (PSIA)	Suction Norm. Flow Rate ν	Normalized Pump Speed α_N				
246	1050	0.00	0.00	36	Discharge	Locked Rotor	In
252	925	0.60	1.00	36	Discharge	Free-Wheeling	In
475	1160	0.00	0.00	57	Suction	Locked Rotor	Out
497	945	0.80	0.98	29	Suction	Free-Wheeling	Out
676	960	0.98	1.02	57	Discharge	Free-Wheeling	In
701	970	1.08	1.00	57	Discharge	Free-Wheeling	Out
846	965	0.94	1.00	57	Discharge	Constant Speed	Out

† Pre-blowdown conditions on the table indicate steady-state conditions prior to initiation of the blowdown sequence. The blowdown sequence for most of the tests included interruption of the flow by closing the return line valve (HPSW-1) just before rupture.

* Break size is a percentage of the 6" diameter inlet (or exit) area of the test pump.

Table 1-2

SUMMARY OF PHASE II TRANSIENT TESTS

Test No.	Pre-Blowdown Conditions† Suction Pressure (PSIA)	Suction Norm. Flow Rate ν	Normalized Pump Speed α_N	Break Size* (%)	Break Location	Pump Mode	Mixing Plate
1156	945	0.95	1.00	57	Discharge	Free-Wheeling	Out
1179	975	0.75	1.00	34	Discharge	Free-Wheeling	Out
1211	1010	0.95	1.00	5	Discharge	Constant Speed	Out
1267	1000	0.00	0.00	100	Discharge	Locked Rotor	Out
1319	950	1.00	1.00	100	Discharge	Free-Wheeling	Out
1351	1000	0.70	0.75	100	Discharge	Constant Speed	Out
1380	950	0.50	1.00	5	Discharge	Free-Wheeling	Out
1465	985	0.00	0.00	100	Suction	Locked Rotor	Out
1511	1030	0.40	0.20	15	Suction	Free-Wheeling	Out

† Pre-blowdown conditions on the table indicate steady-state conditions prior to initiation of the blowdown sequence. The blowdown sequence for most of the tests included interruption of the flow by closing the return line valve (HPSW-1) just before rupture.

* Break size is a percentage of the 6" diameter inlet (or exit) area of the test pump.

electronic noise was usually very low level and did not significantly distort the measurements. The fluctuations caused by physical phenomena are apparent during all or portions of several transients and are manifested to a greater or lesser extent in the various measurements. The fluctuations in the measured data also appear and may even be amplified in the calculated data due to the analytic methods used. The scale on some plots makes these fluctuations more visible than they would be if the plot scale included the entire range of the measuring device.

Pressure Measurements. The transient pressure measurements are generally reliable and of good quality. The spike in the pressure curves at the initiation of some transient tests indicates a pressure rise to pump shut-off conditions which occurred when the recirculation valve was closed just prior to rupture of the diaphragm as indicated in the Chronology of Events for each test.

Temperature Measurements. The transient temperature measurements are generally reliable and of good quality but may contain some minor offsets. The transient temperature measurements were made with grounded junction thermocouples calibrated against RTDs. The specified initial temperature such as shown in Section 3 on the table of initial conditions for each test is the recorded RTD value during the period before the initiation of the transient.

Turbine Meter Measurements. The plots of turbine meter data in many cases show apparent increases in flow during the time between closure of the recirculation valve and initiation of the test when it would have been expected that the flow indication would go to zero. The reason for the anomaly in the plotted data has not been resolved.

The sign convention for volumetric flow as measured by the turbine meters was defined in Volume II to be positive for flow from normal suction to normal discharge. However, in the transient plots, the data are presented as follows:

1. Flow is presented as positive when the initial flow is from normal suction to normal discharge of the pump and the test includes a discharge break.

2. Flow is presented as positive reversing to negative when the initial flow is from normal suction to normal discharge of the pump and the test includes a suction break.

3. In contrast, flow is presented as positive when the initial conditions include zero flow through the pump and the test includes a suction break.

Density Measurements. Gamma densitometer devices were used to measure fluid density. The accuracy of fluid density measurements obtained from these devices is sensitive to the calibration methods used and can be limited by intrinsic characteristics of the devices. The calibration data were normally consistent. However, since test procedures and conditions necessarily varied from test to test, some inconsistent calibration data were obtained. Accordingly, the goodness of the fluid density data varied from test to test. An indication of the accuracy of a given fluid density plot can be drawn from a comparison of the density plot with measured initial conditions and estimated final conditions.

Momentum Flow Measurements. All drag disc momentum flux data are presented as positive during the major portion of the test, regardless of the break location. Any exception to this convention is noted among the data comments for each test.

Pump Speed Measurements. Pump speed data are not presented for reverse flow, locked rotor tests.

Section 2

FORMAT OF DATA PRESENTATION

Section 2

FORMAT OF DATA PRESENTATION

Section 3 consists of subsections which contain all of the data presented for each transient test. Each subsection contains:

1. A tabulation of the system configuration and comments on the data. These comments include any instrument malfunctions, instruments that were not installed, and deviations from the standard plot package (Tables 4-6, 4-7 and 4-8 of Volume III) for the specific test.

2. A tabulation of the system initial conditions prior to the start of the blowdown sequence. The initial condition data values are taken from the steady state data values which are presented in Volume V. A consecutive sequence of five values which were recorded by the data scanner immediately prior to initiation of the transient test were averaged to obtain the initial condition value for each parameter. The reference time recorded for the initial conditions is the time at which the third or middle scan was taken.

   The temperature values are the averages of the RTD data values. The fluid densities are the averages of the densities calculated from the energy balance equations, as averaged over the five data scans. The high pressure drum level was computed from the recorded differential pressure.

3. A chronology of significant events associated with the test. The blowdown start times given in this chronology can be used to correlate zero time on the FM plots with the time at which initial conditions were recorded by the scanner system. In Test 246, for example, the third of the five scans used to establish the initial conditions was recorded 15 seconds after the scanner system was started. This is presented on the scanner plots as t=15 sec. The time at which blowdown started is presented as t=120 sec on the scanner plots and t=1.5 sec on the FM plots. Therefore initial conditions were recorded at t=-103.5 sec on the FM plots.

4. An index listing of the FM data plots.

5. The FM data plots.

6. An index listing of the scanner data plots.

7. The scanner data plots.

Additionally, a detailed discussion of the scanner data plots provided in this volume is provided in Appendix A.

Section 3

DATA

SYSTEM CONFIGURATION

Test Number 246

Break Location	Discharge
Break Size	10.13 in^2
	36 % of 6 in. diameter inlet area of pump
Mixing Plate	In
Pump Mode	Locked Rotor

COMMENTS

1. Malfunctioning or Inoperable Instruments: Pump Discharge Turbine Meter (HI)
2. Other Comments: None
3. Affected FM Data Plots: 29 - Normalized Volumetric Flow Rate
   35 - Momentum Flux
   52 - Mass Flow Rate
   56 - Integrated Mass

INITIAL CONDITIONS

t = 15 Sec[a]

Test Number 246

System Pressures

High Pressure Drum	1092.3	psia
Suction Instrument Spool	1097.7	psia
Discharge Instrument Spool	1105.5	psia

Fluid Temperatures

Suction Instrument Spool	558.6	°F
Discharge Instrument Spool	558.3	°F

Fluid Density

Suction Instrument Spool	45.29	lbm/ft^3
Discharge Instrument Spool	45.42	lbm/ft^3

System Flows

Mass Flow Rate	-23	lb/sec
Suction Volumetric Flow Rate	-225	gpm
Discharge Volumetric Flow Rate	-238	gpm
Suction Normalized Volumetric Flow Rate	-0.06	
Discharge Normalized Volumetric Flow Rate	-0.07	
Suction Fluid Velocity	-2.76	ft/sec
Discharge Fluid Velocity	-2.93	ft/sec
Suction Momentum Flux	346	$lbm/ft\ sec^2$
Discharge Momentum Flux	391	$lbm/ft\ sec^2$

Pump Performance

Pump head	-0.16	psi
	-0.5	ft
Pump Speed	Locked Rotor	
Pump Shaft Torque	-96.8	ft lb
Pump Hydraulic Torque	-98.1	ft lb

System Mass (t = 115 Sec)[a]

High Pressure Drum Level	37.1	in[b]
Fluid Mass Upstream of Test Pump	10,973	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 246

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-6.0	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	c	c
HPSW-1 Closed	c	c
Pump Power Trip	-	-
Initiate Rupture Mechanism	c	c
Blowdown Starts	1.5	120
End of Digitized Data 20 s/sec	629.0	-
200 s/sec	304.0	-
FM Recording System Off	667.0	-
Scanner System Off	-	295

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

Index Listing
of
FM DATA PLOTS
Test Number (246)

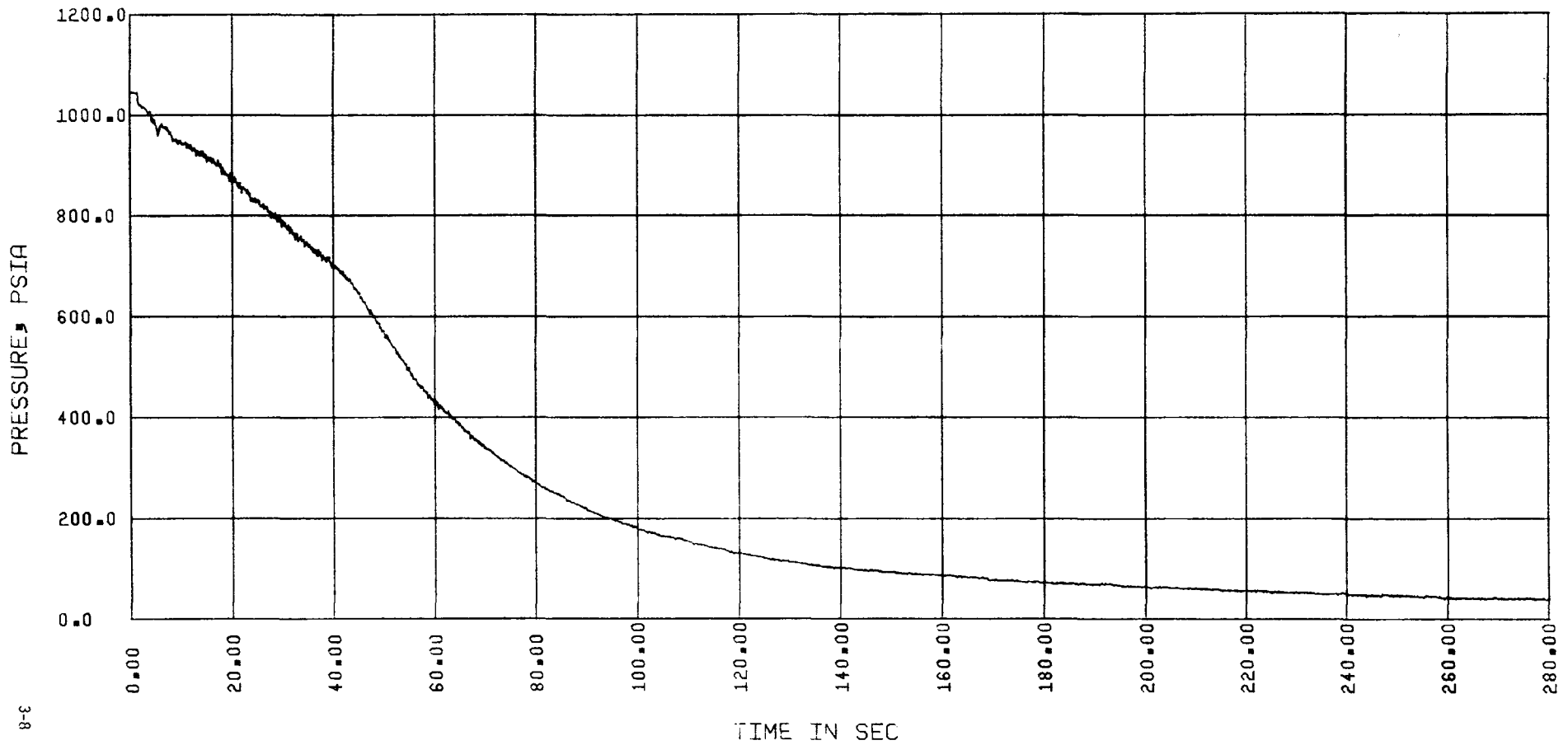
Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 SUC.
25	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 DISCH.
26	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 SUC.
27	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 DISCH.
28	L-28	Norm. Vol. Flow Rate HI-TM Suction
29	L-29	Norm. Vol. Flow Rate HI-TM Discharge

Index Listing
of
FM DATA PLOTS (Cont'd.)

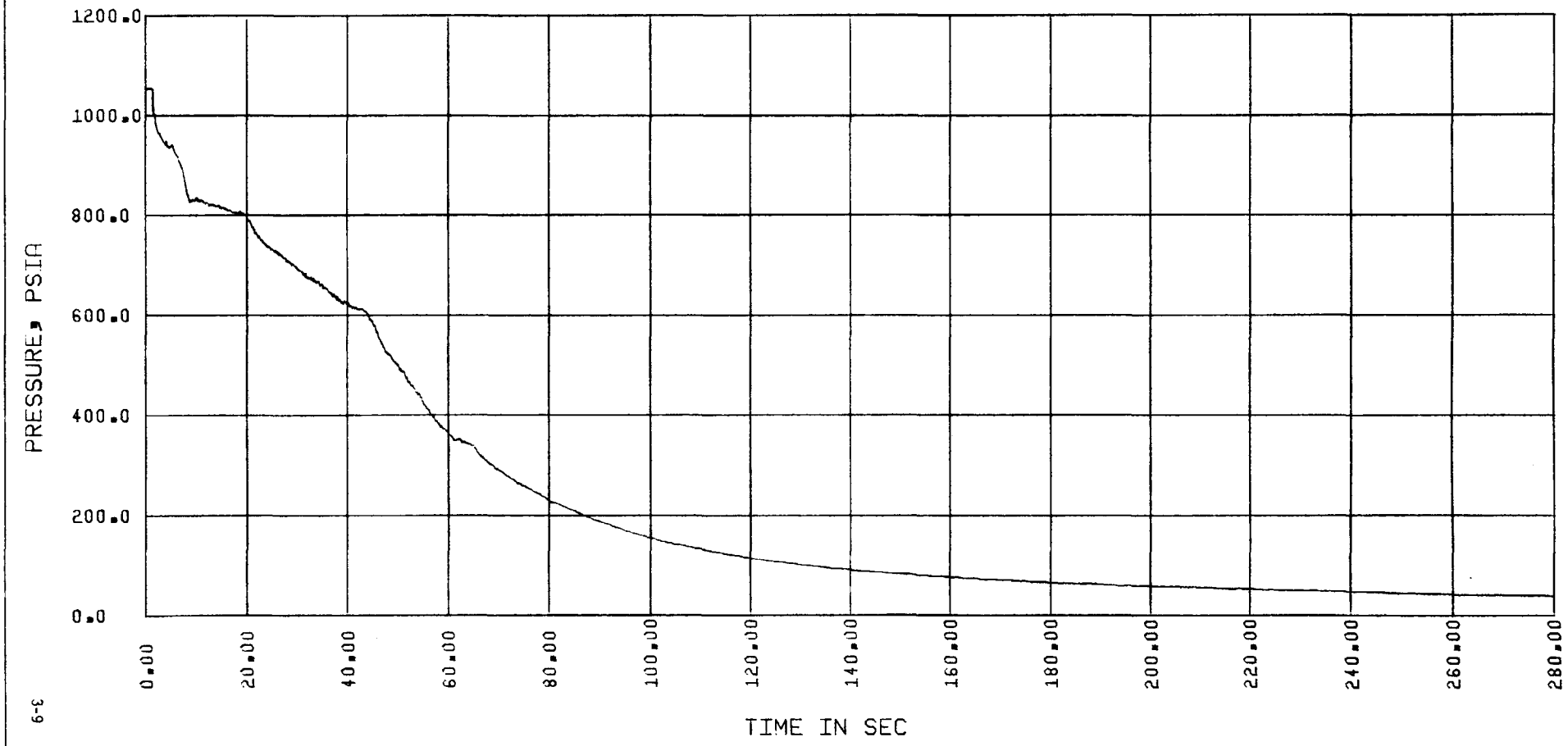
Test Number (246)

Plot Number	Location Number	Description of Parameter
30	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
31	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
32	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
33	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
34	L-16/L-28	Momentum Flux GD2/HI-TM Suction
35	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
36	L-1	Momentum Flux HI-DD Suction
37	L-2	Momentum Flux HI-DD Discharge
38	L-26	Momentum Flux LO-DD Suction
39	L-27	Momentum Flux LO-DD Discharge
40	L-7	Pump Head in Psi
43	L-12	Norm. Pump Speed
44	L-11	Norm. Pump Shaft Torque
45	L-11/L-12	Norm. Pump Hydraulic Torque
46	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
47	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
48	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
49	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
51	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
52	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
55	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
56	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge

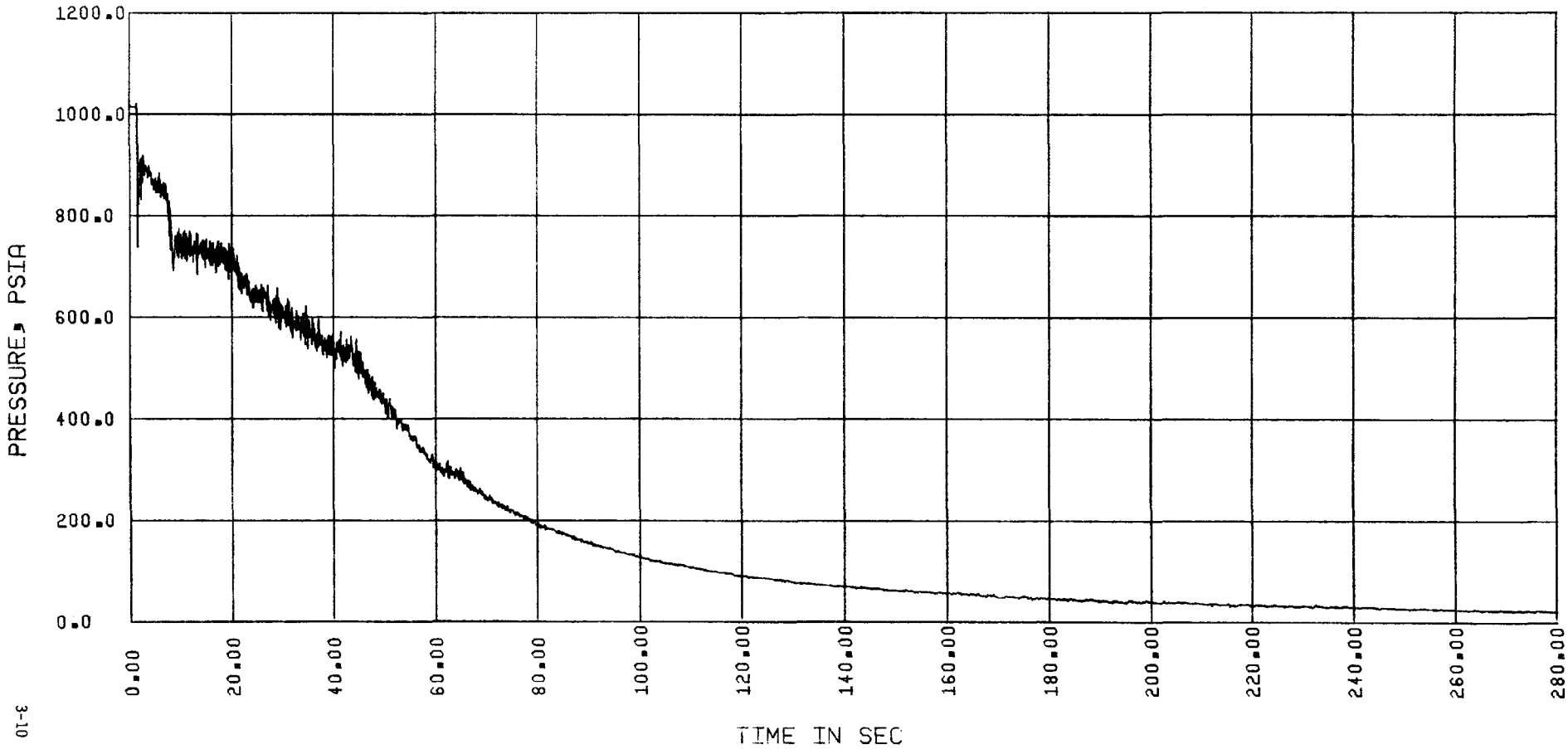
TEST 246/1000 PSIA LR FWD BDN
PUMP SUCTION PRESSURE
PLOT NO.1



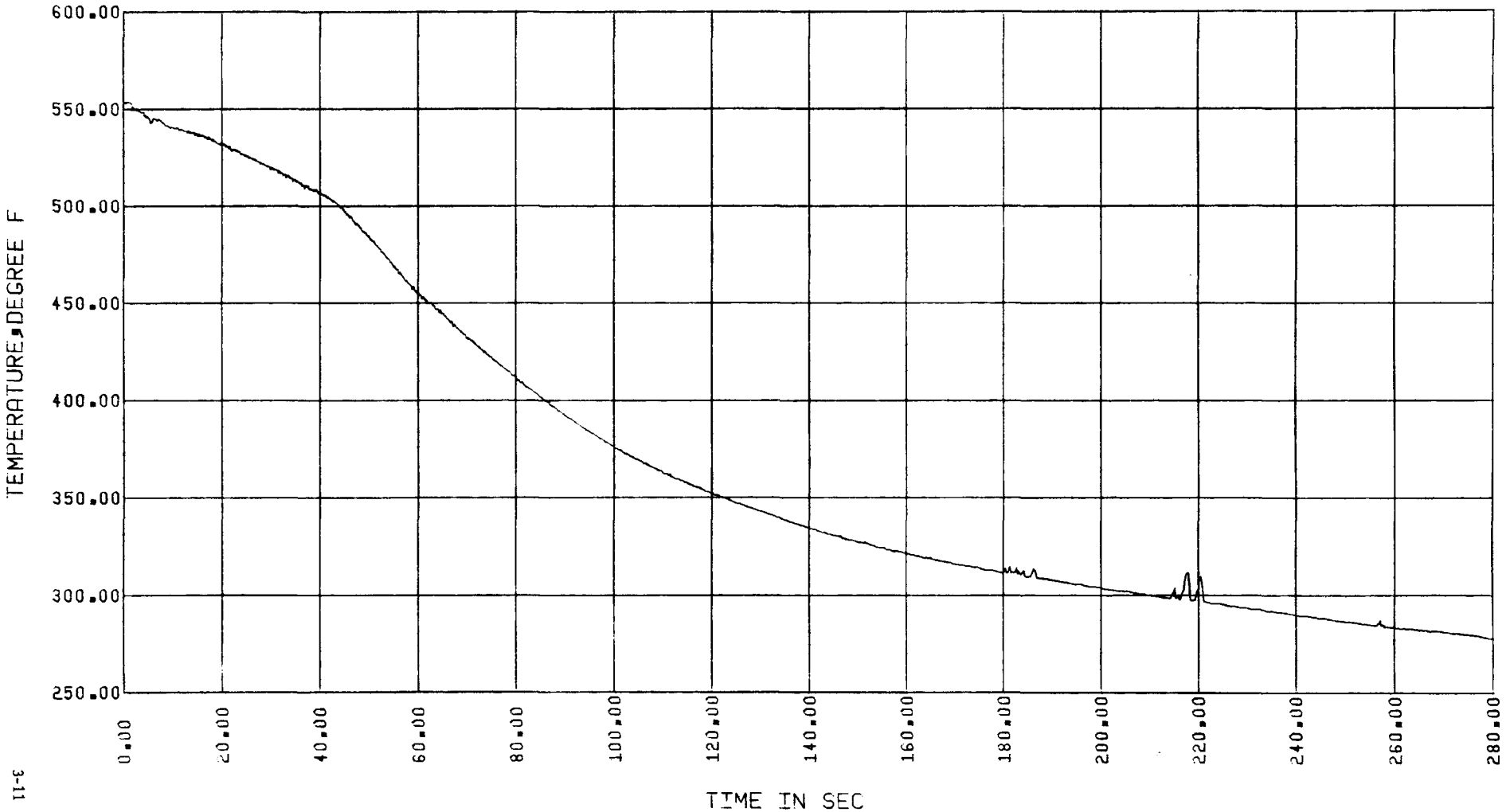
TEST 246/1000 PSIA LR FWD BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2



TEST 246/1000 PSIA LR FWD BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



TEST 246/1000 PSIA LR FWD BDN
PUMP SUCTION TEMPERATURE
PLOT NO.4



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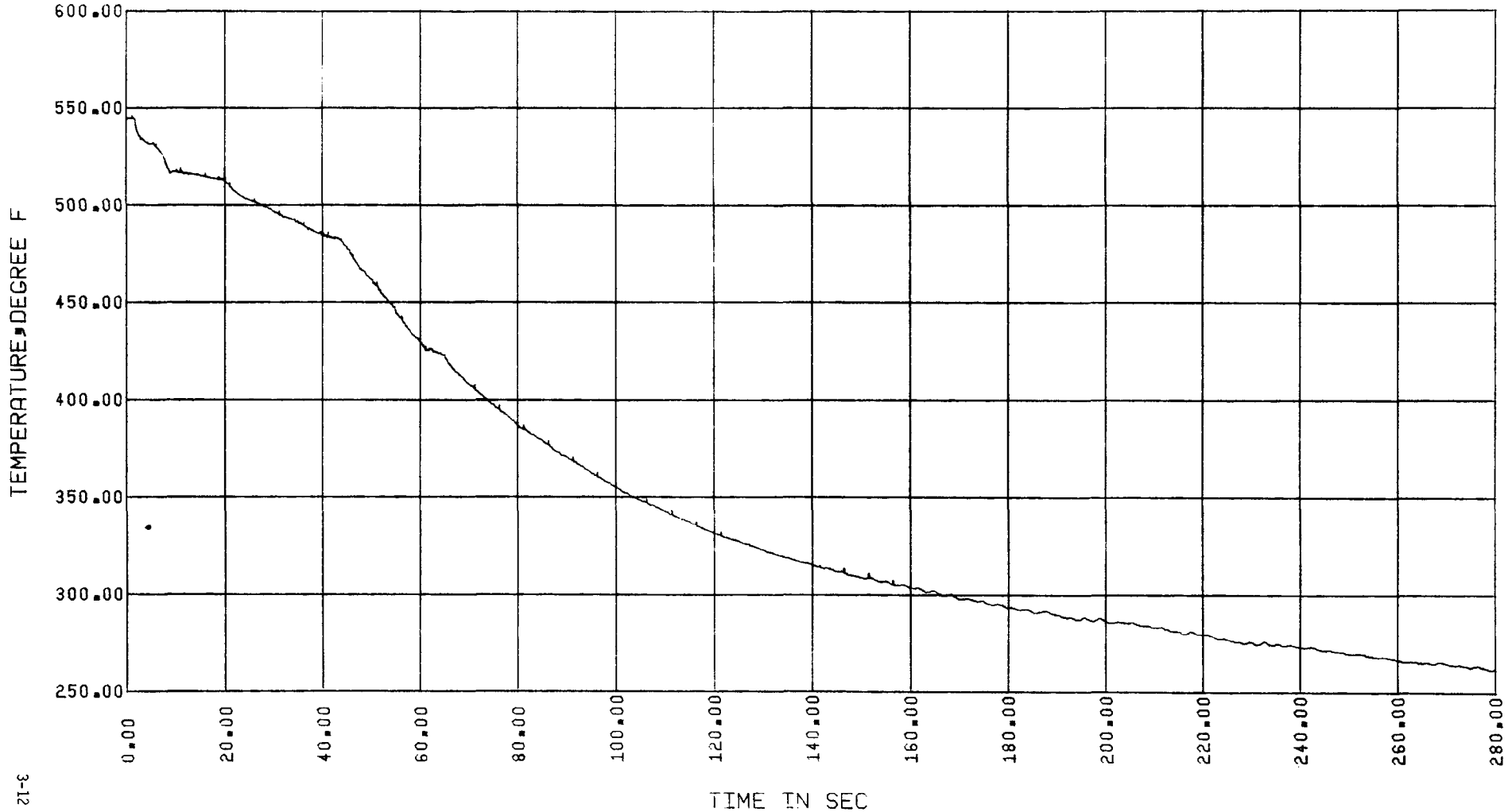
PUMP DISCHARGE TEMPERATURE
PLOT NO.5



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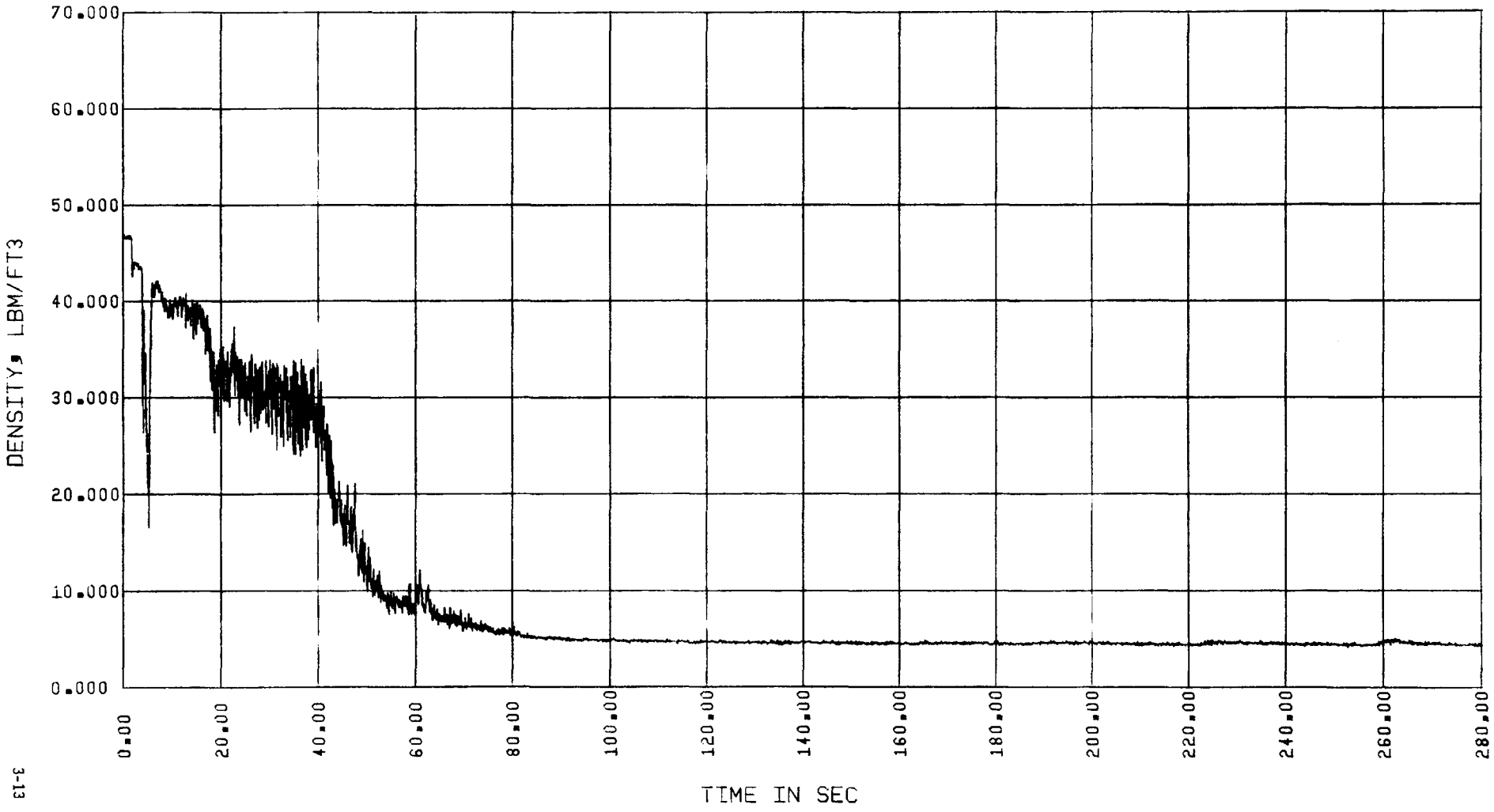
DENSITY BEAM1 GD SUCTION
PLOT NO.6



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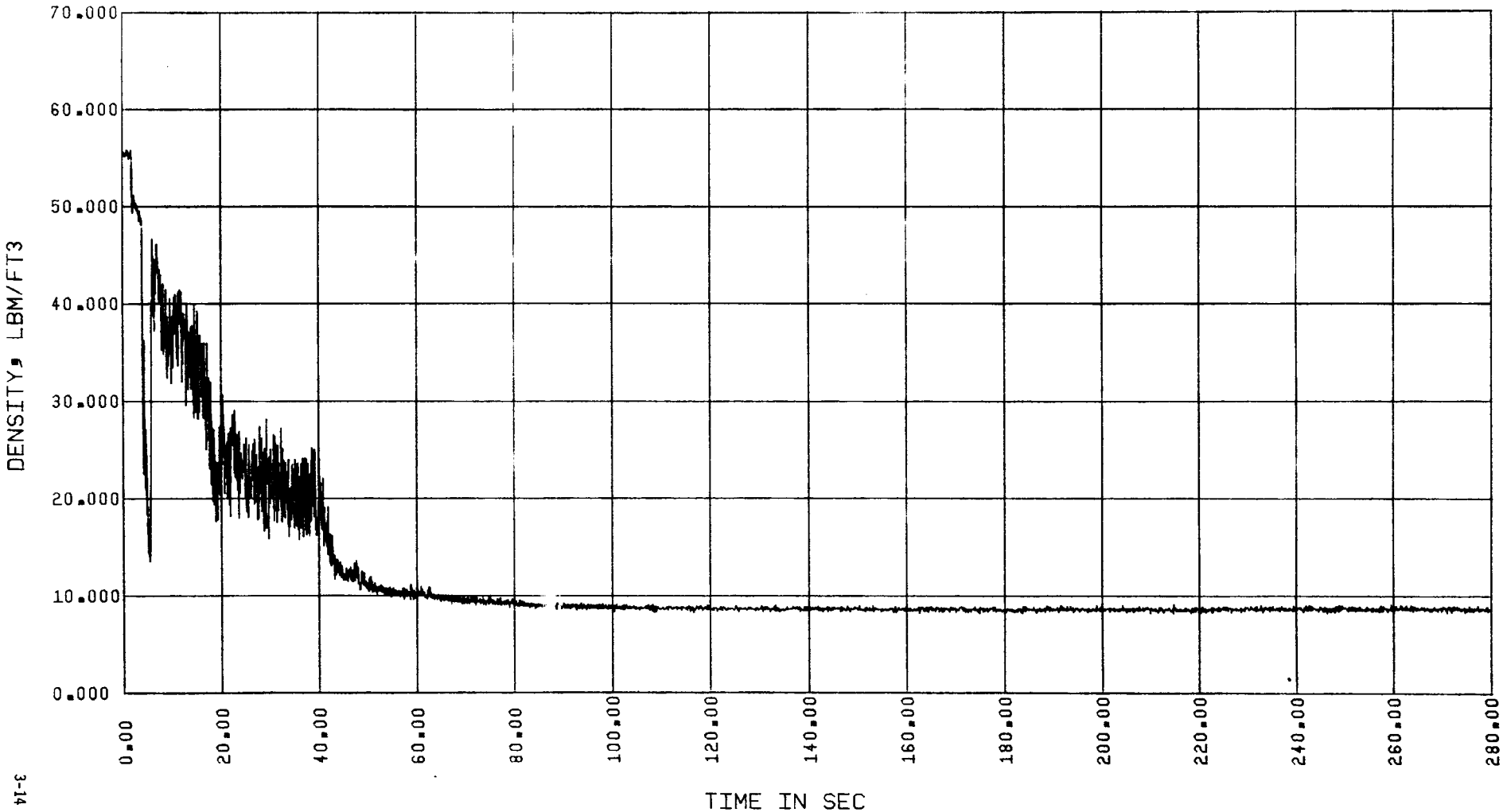
DENSITY BEAM2 GD SUCTION
PLOT NO.7



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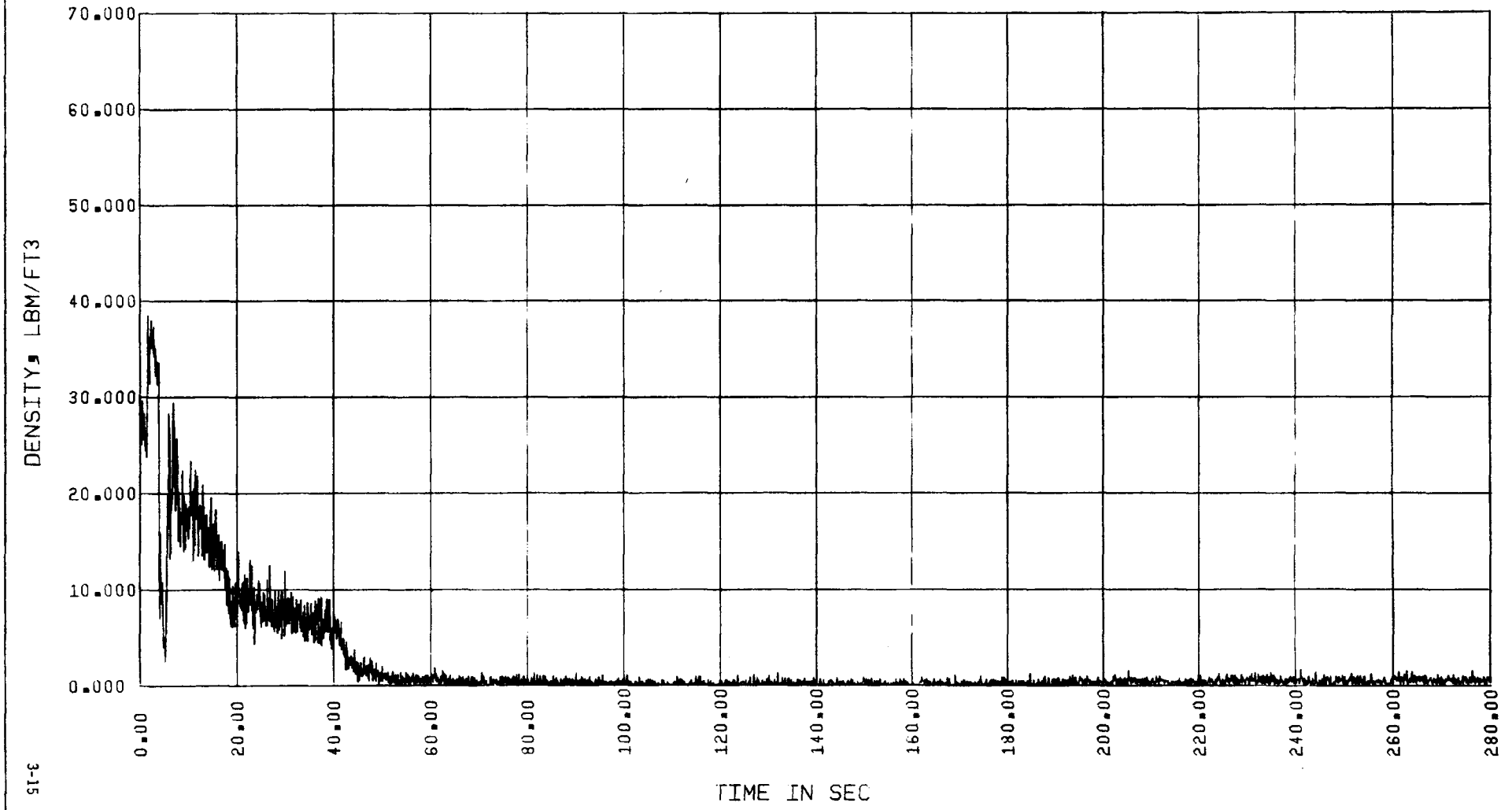

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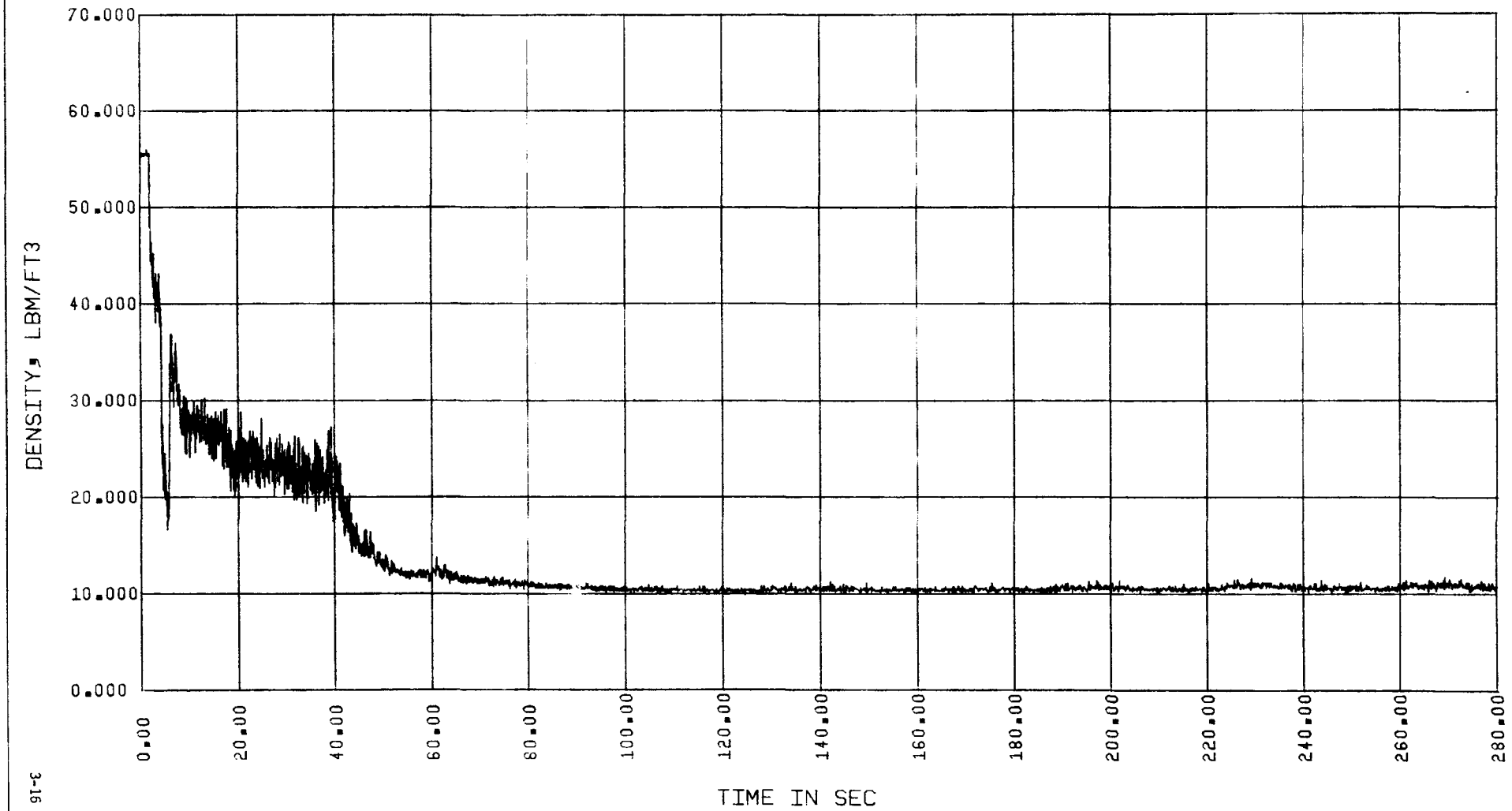
PLOT NO.9



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DENSITY BEAM2 GD DISCHARGE
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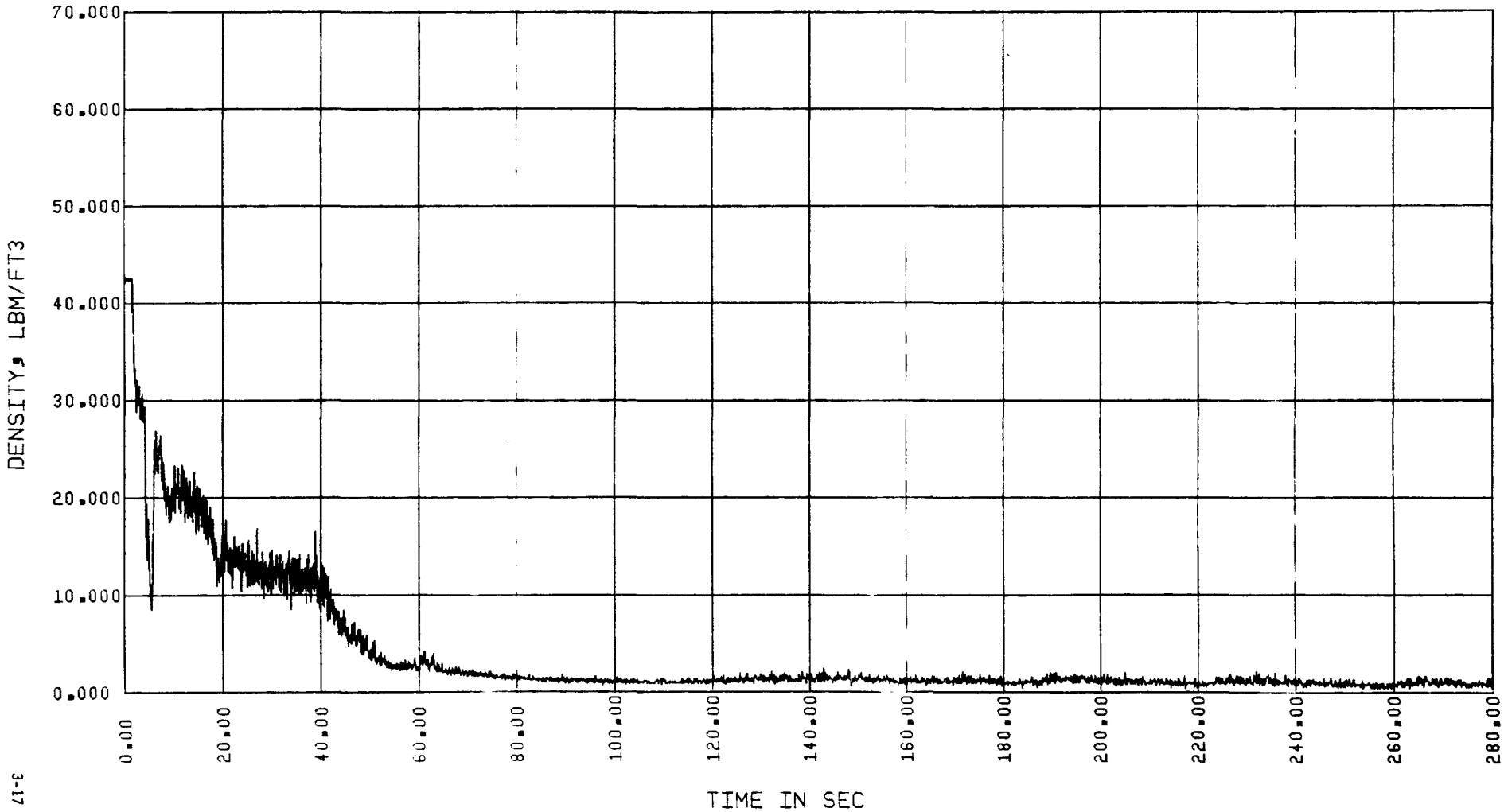

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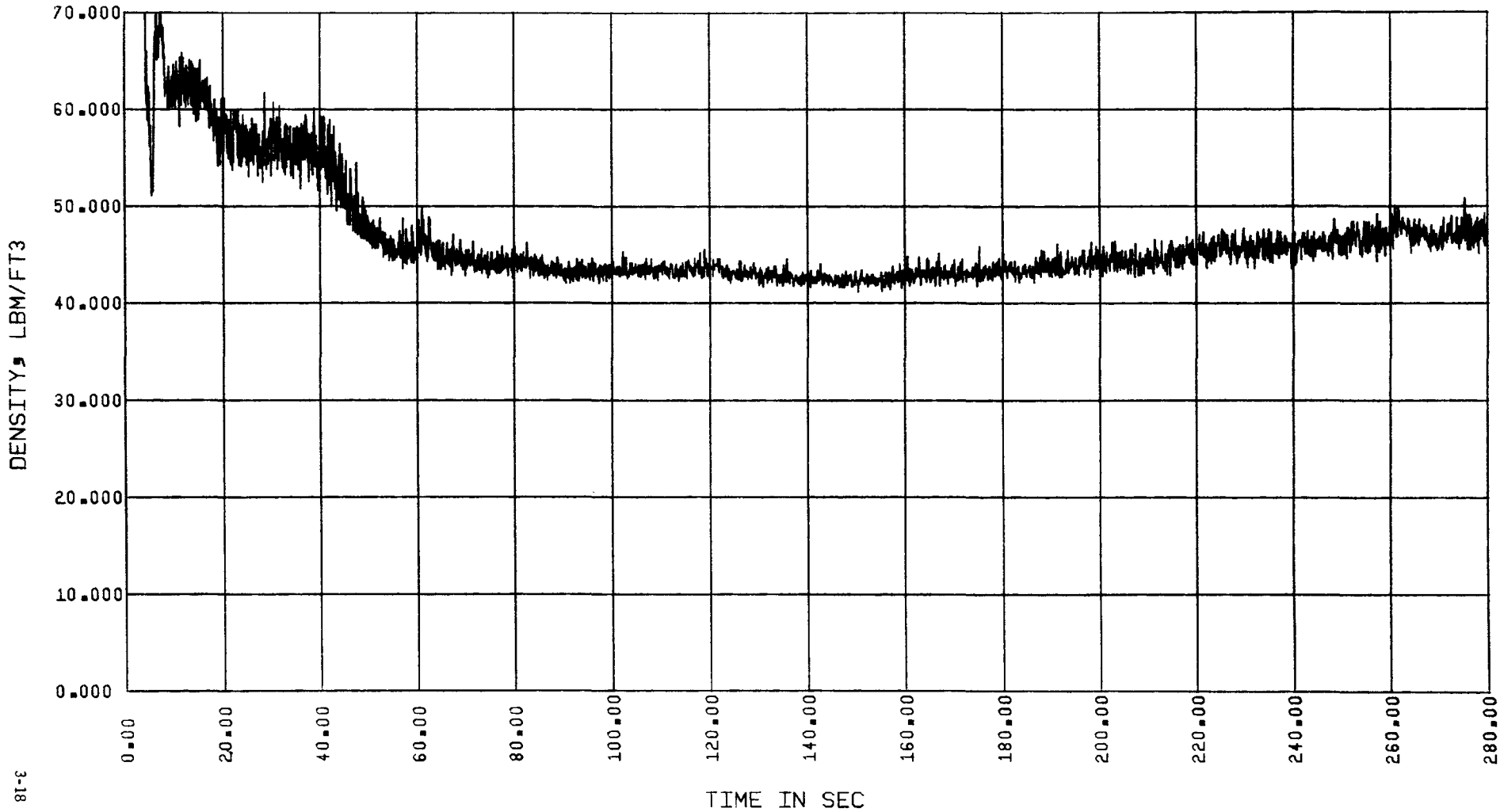
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11



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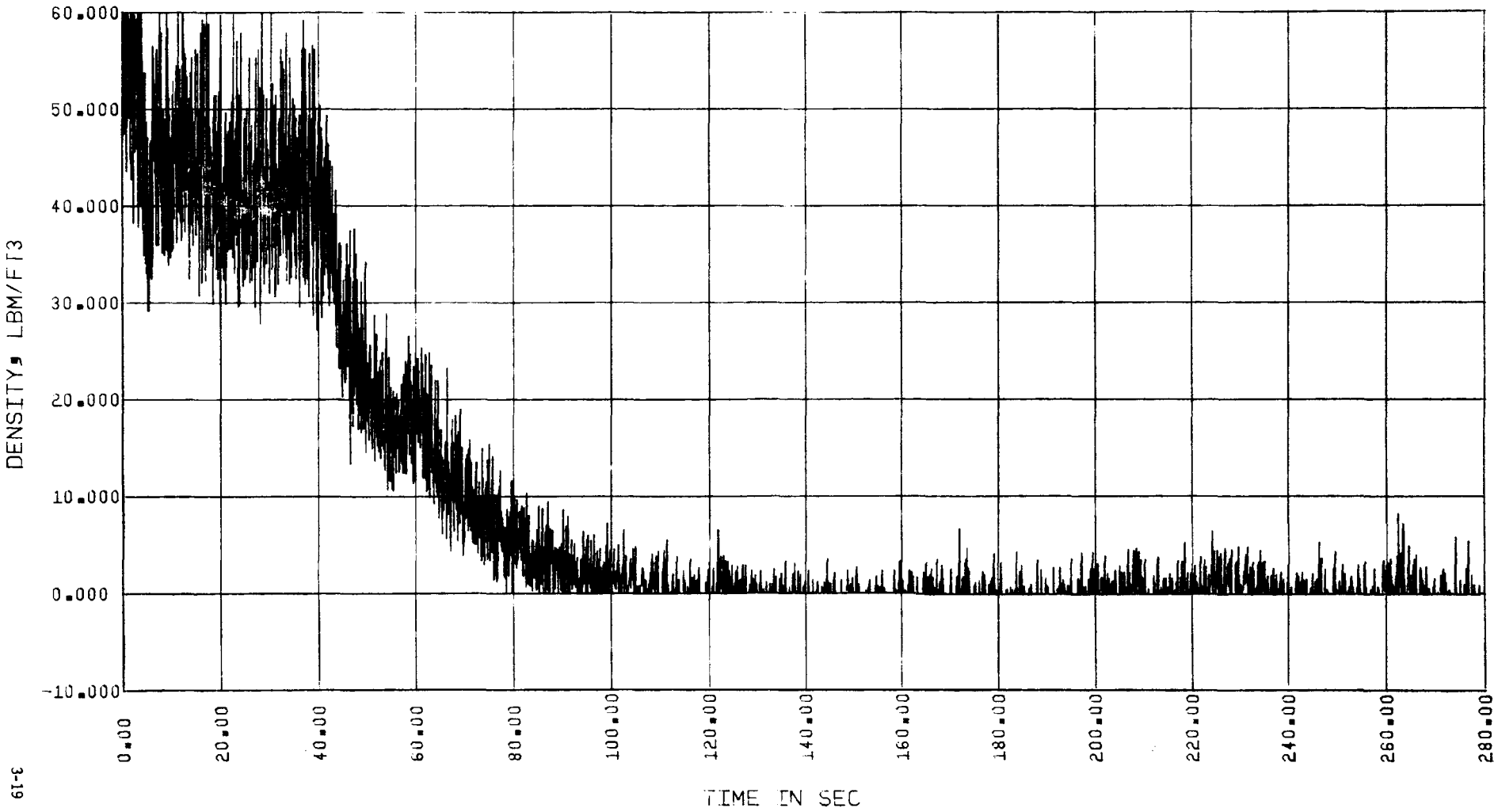
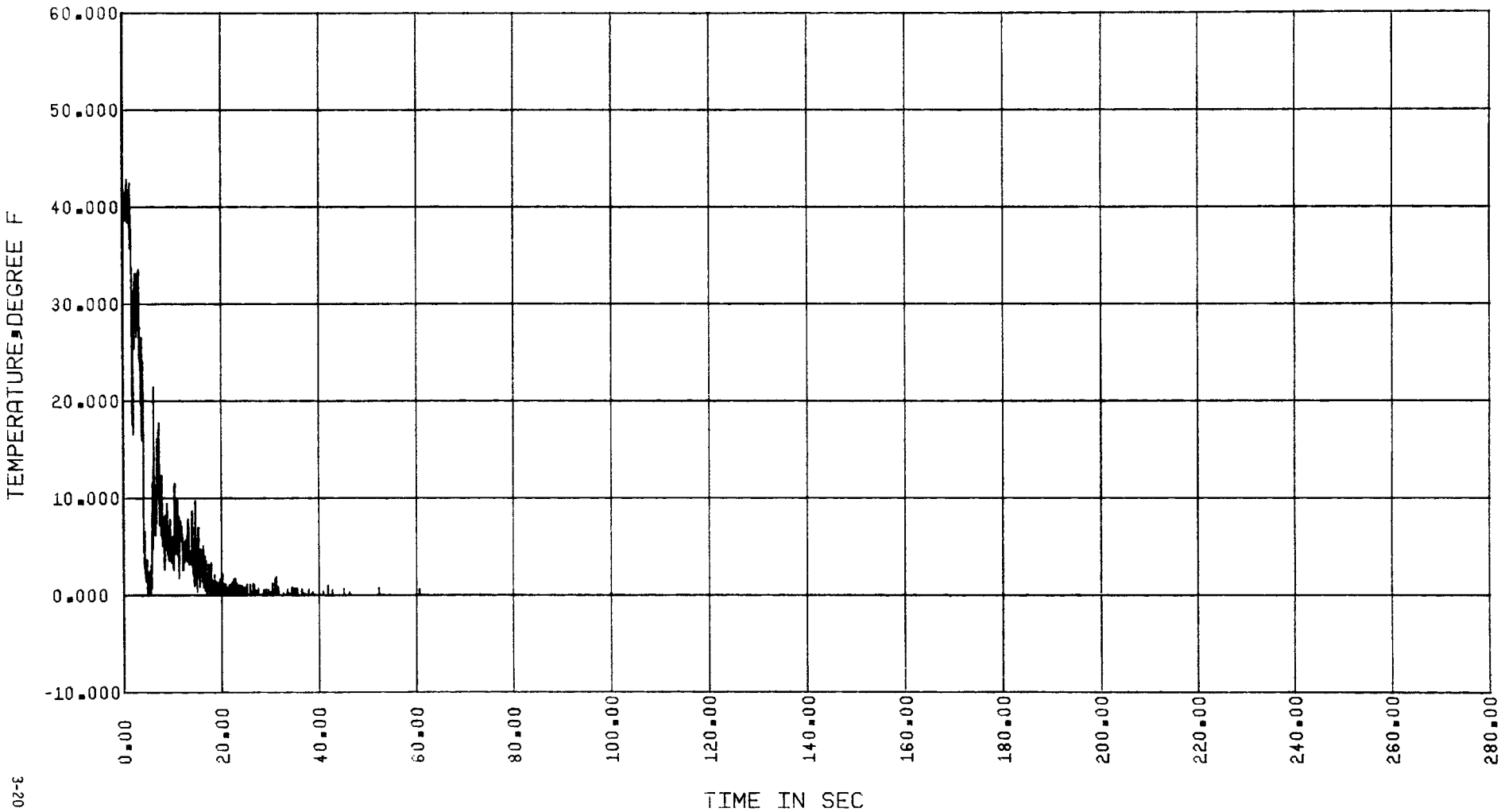
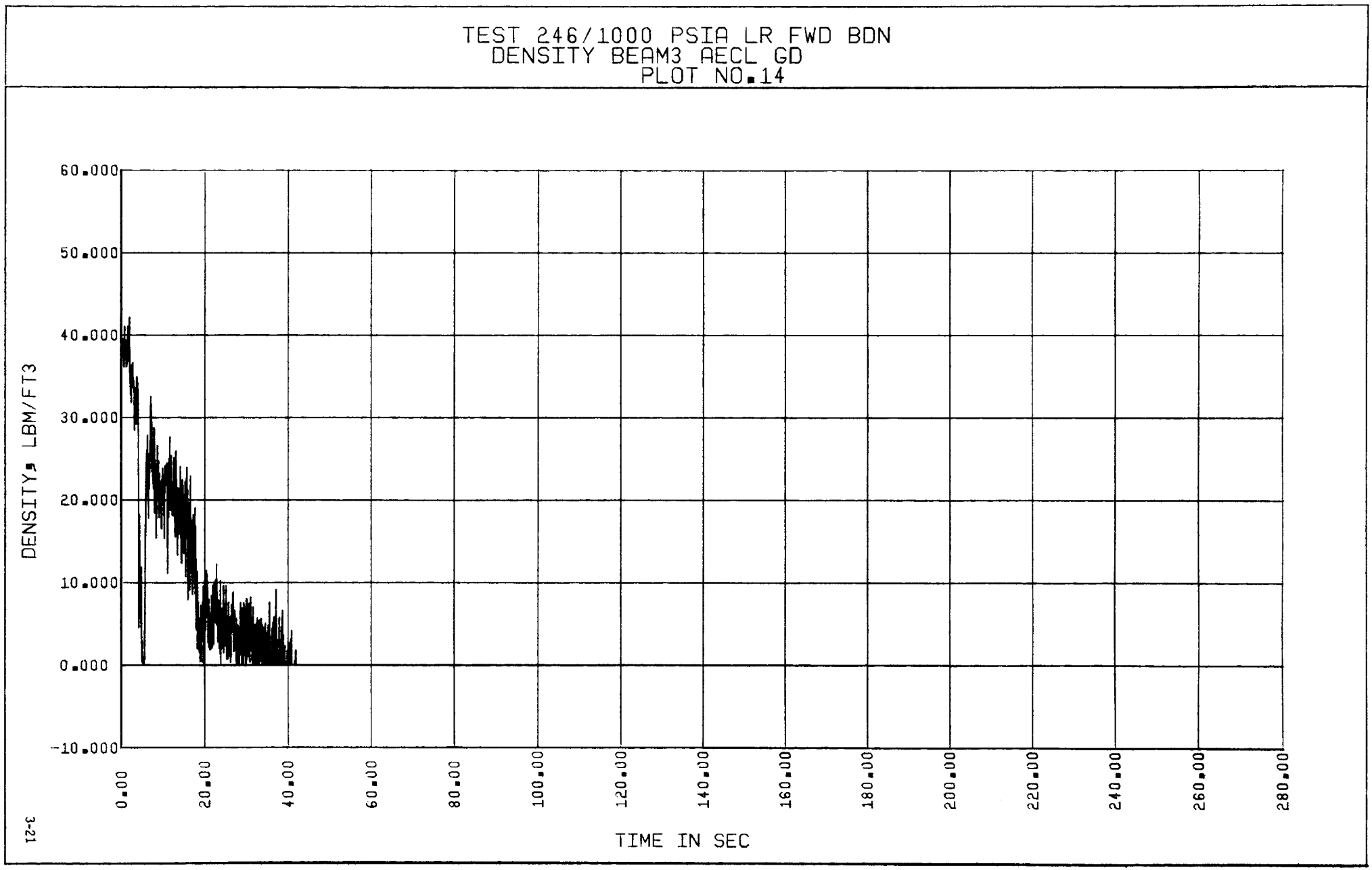
DENSITY BEAM1 AECL GD
PLOT NO. 12

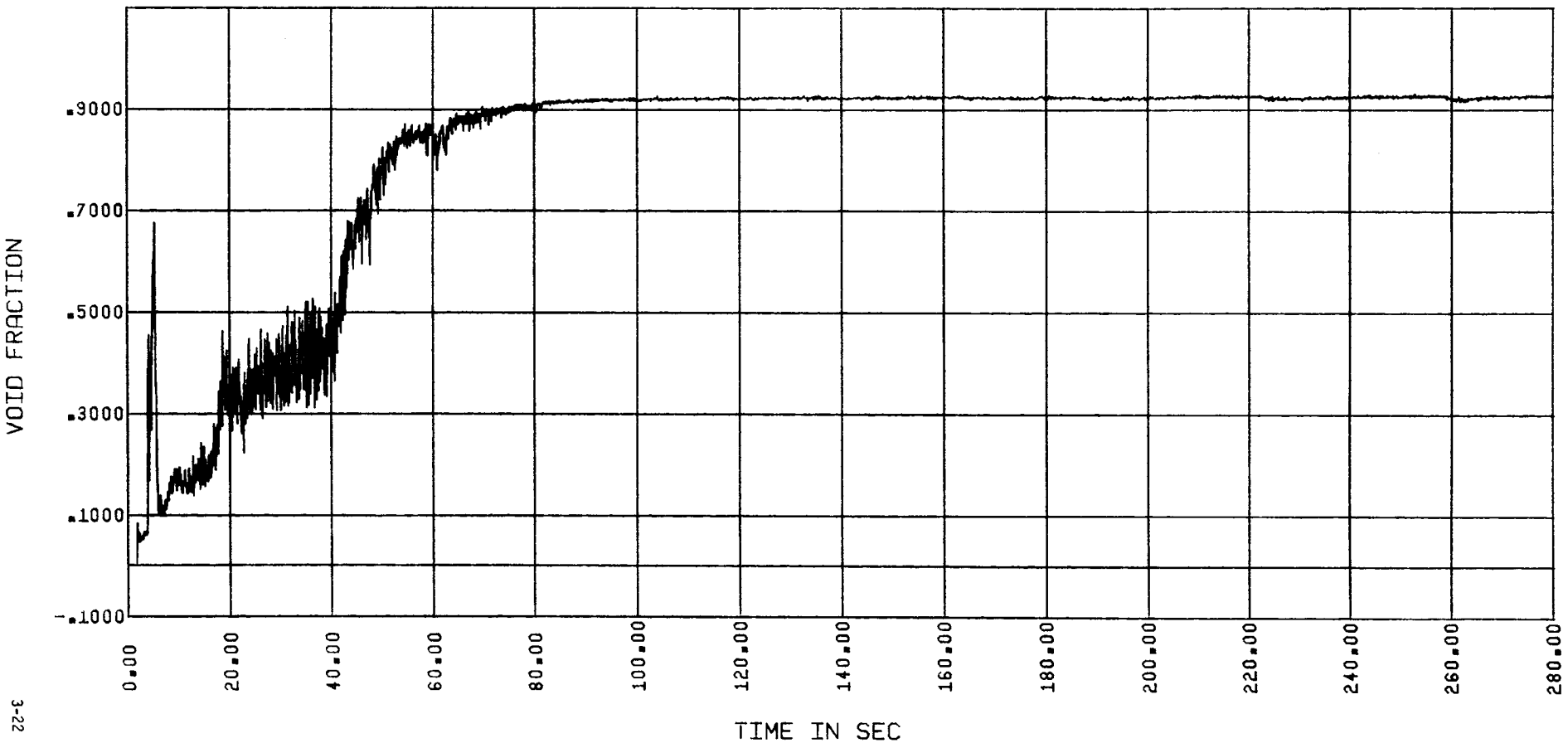


TEST 246/1000 PSIA LR FWD BDN
DENSITY BEAM2 AECL GD
PLOT NO.13

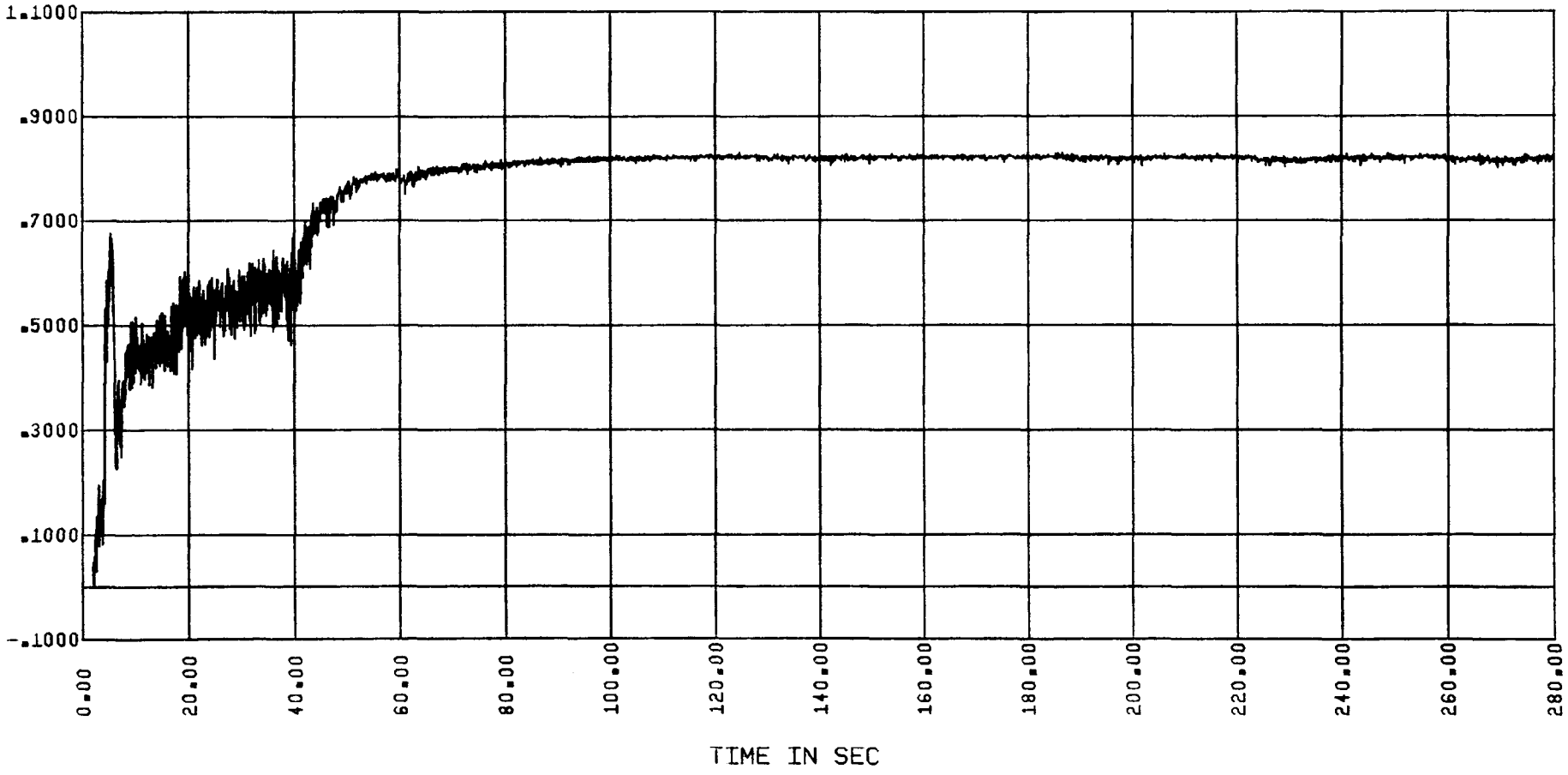


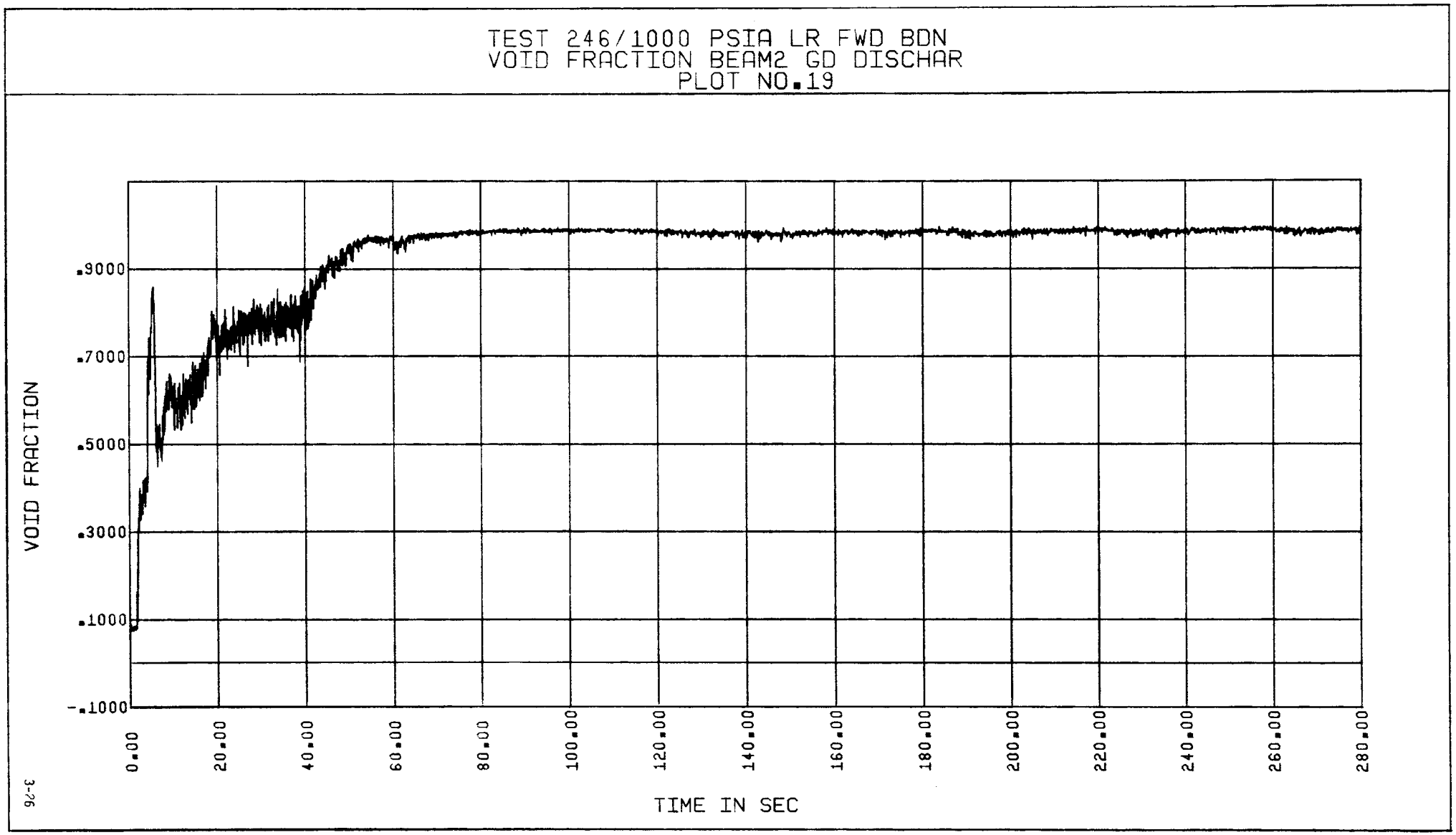

TEST 246/1000 PSIA LR FWD BDN
DENSITY BEAM3 AECL GD
PLOT NO.14
60.000
50.000
40.000
30.000
20.000
10.000
0.000
-10.000
DENSITY, LBM/FT3
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

TEST 246/1000 PSIA LR FWD BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15

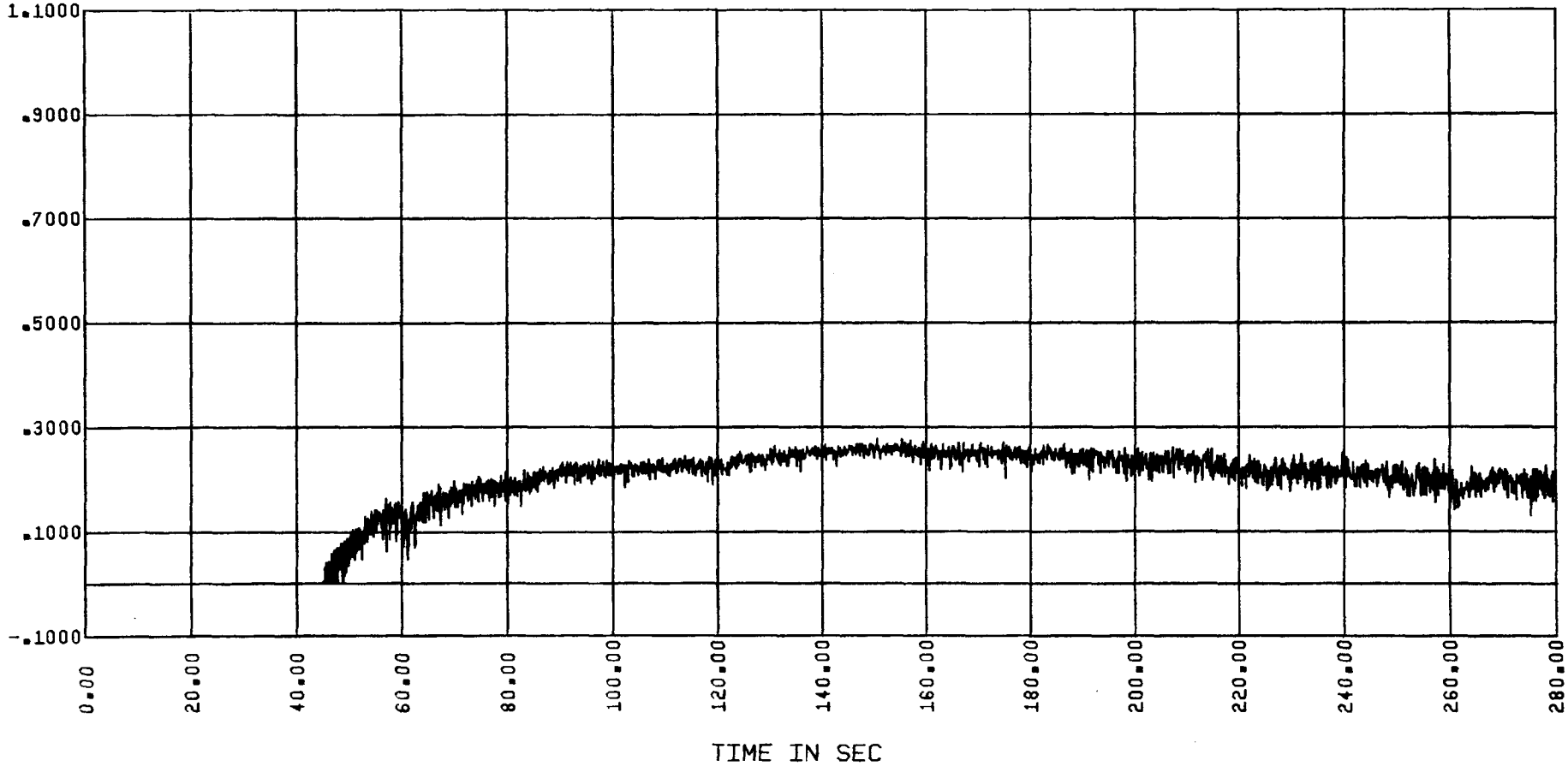


TEST 246/1000 PSIA LR FWD BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18

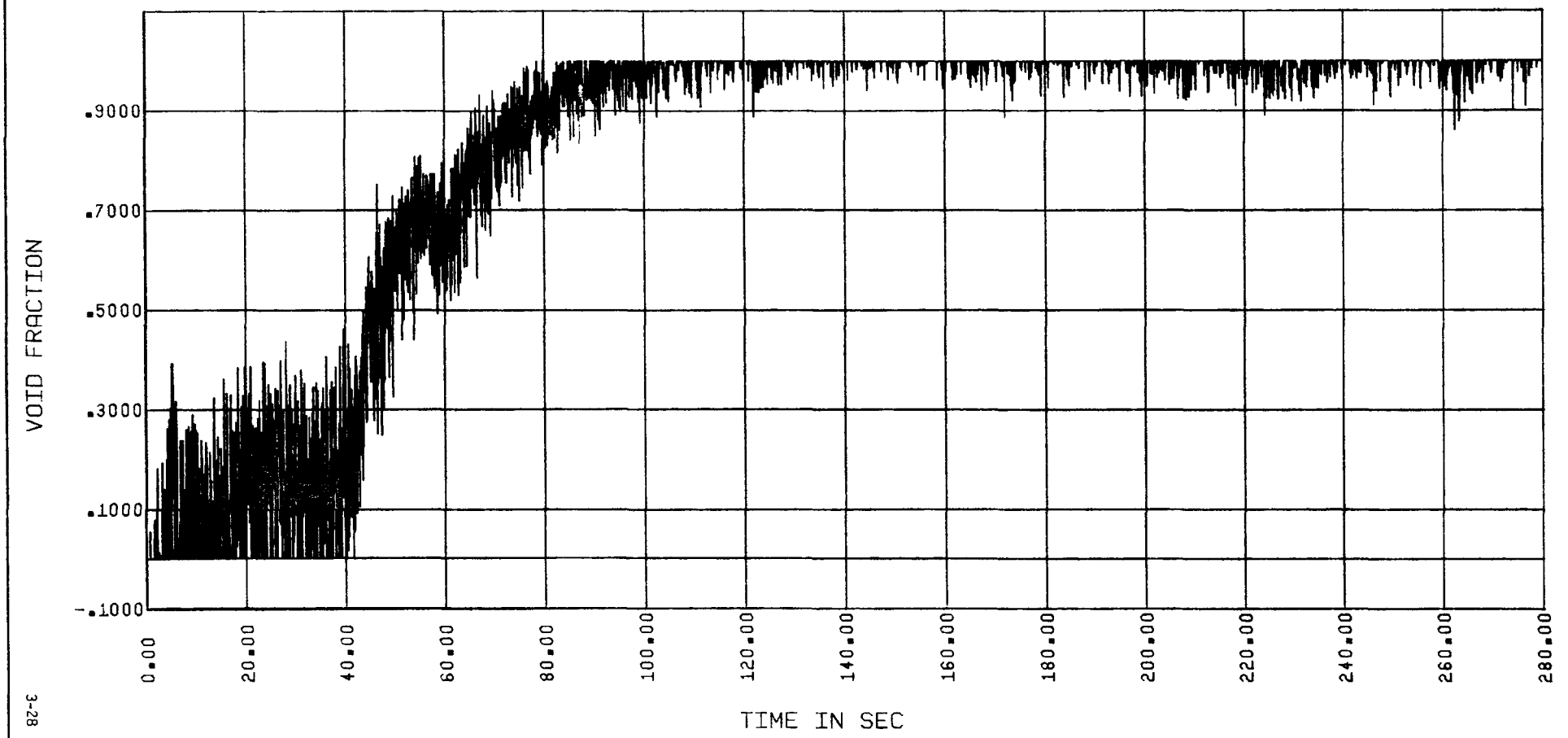



TEST 246/1000 PSIA LR FWD BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

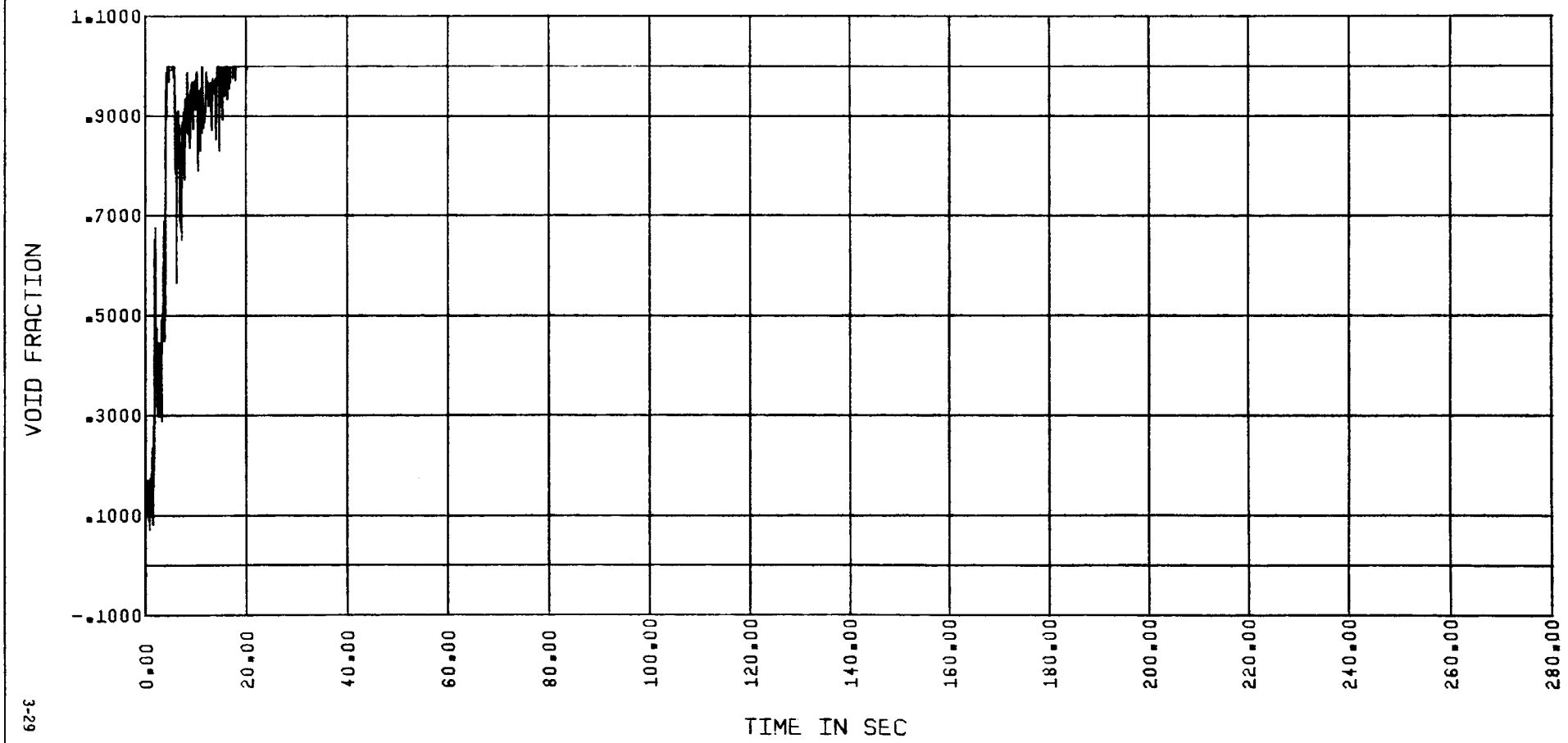
TEST 246/1000 PSIA LR FWD BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20



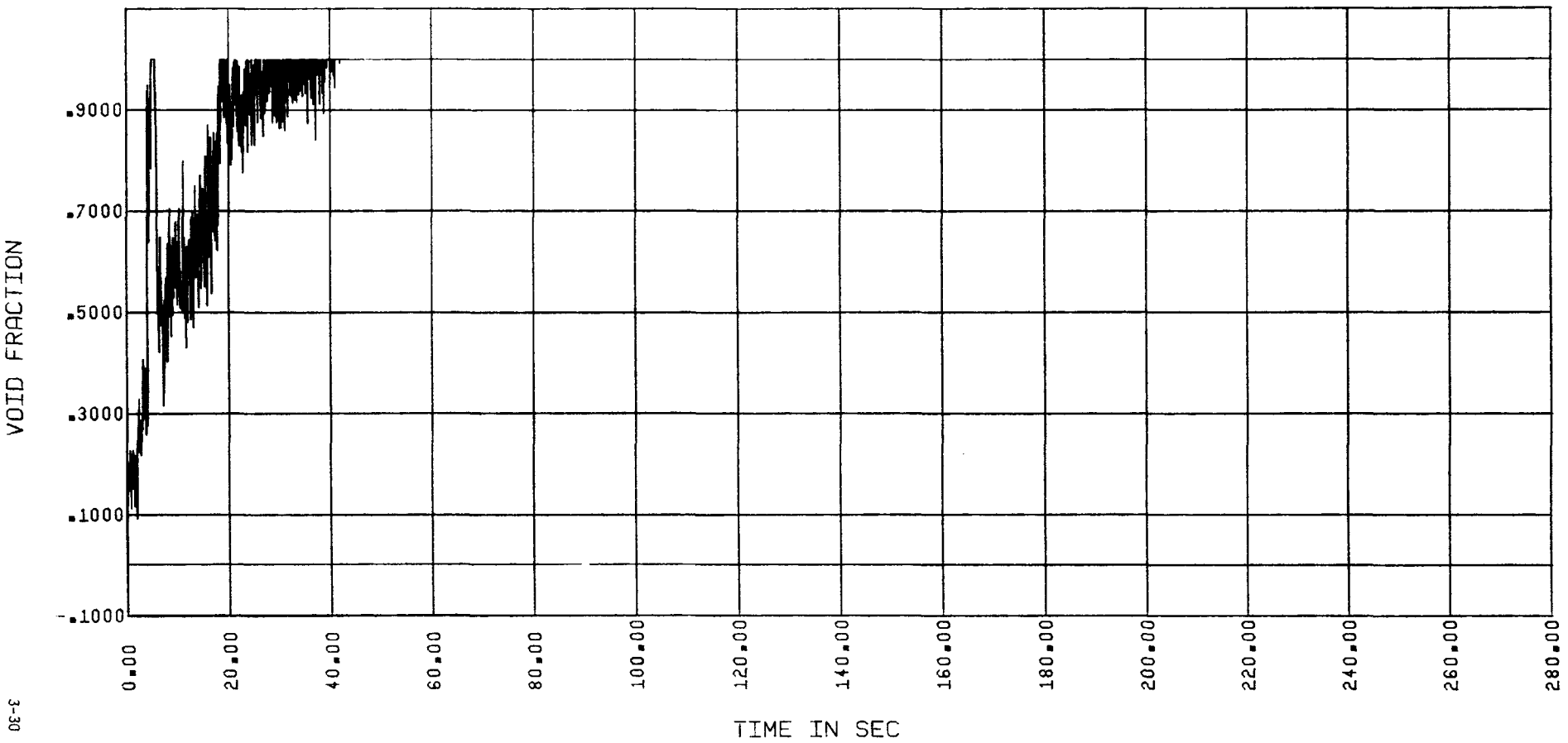
TEST 246/1000 PSIA LR FWD BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21



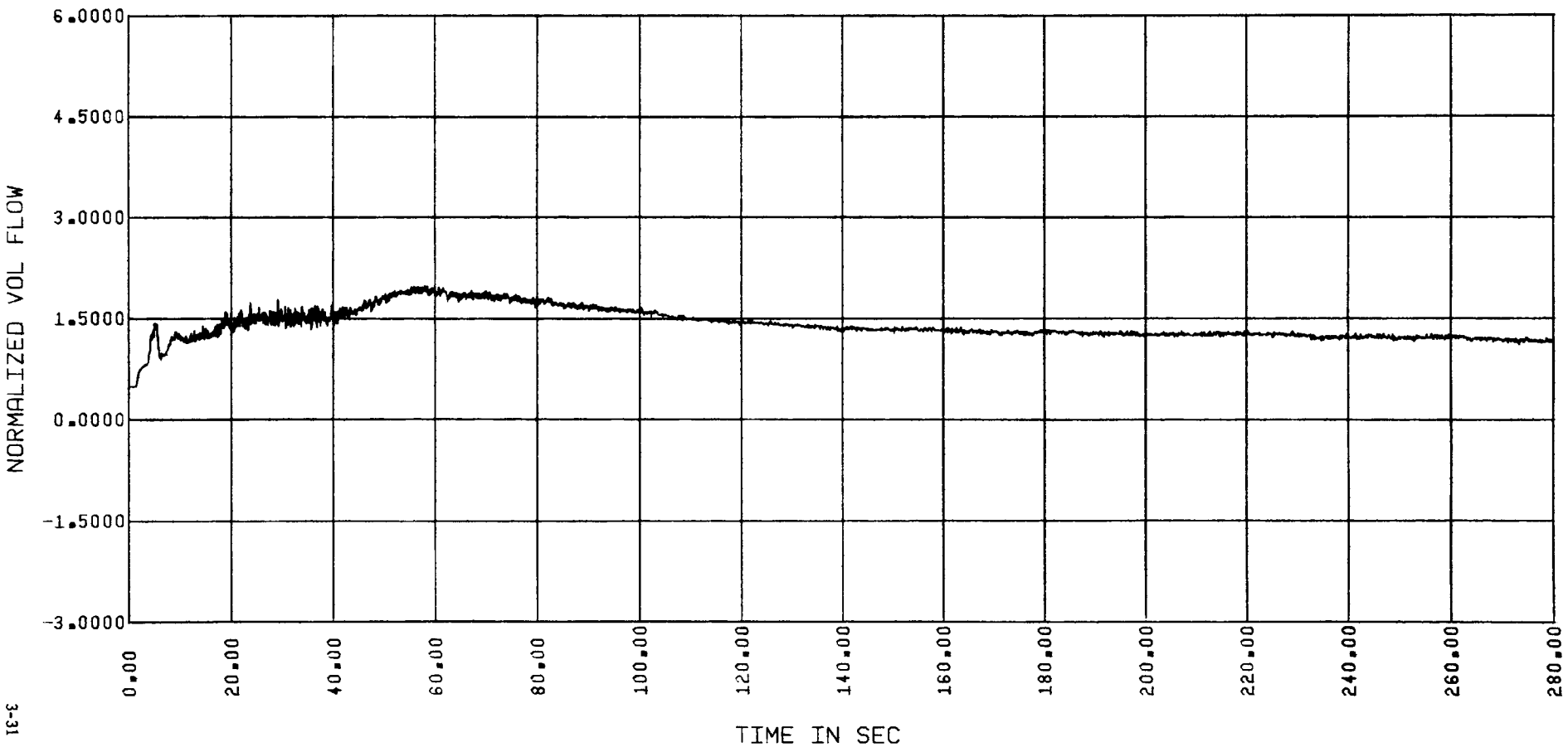
TEST 246/1000 PSIA LR FWD BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22



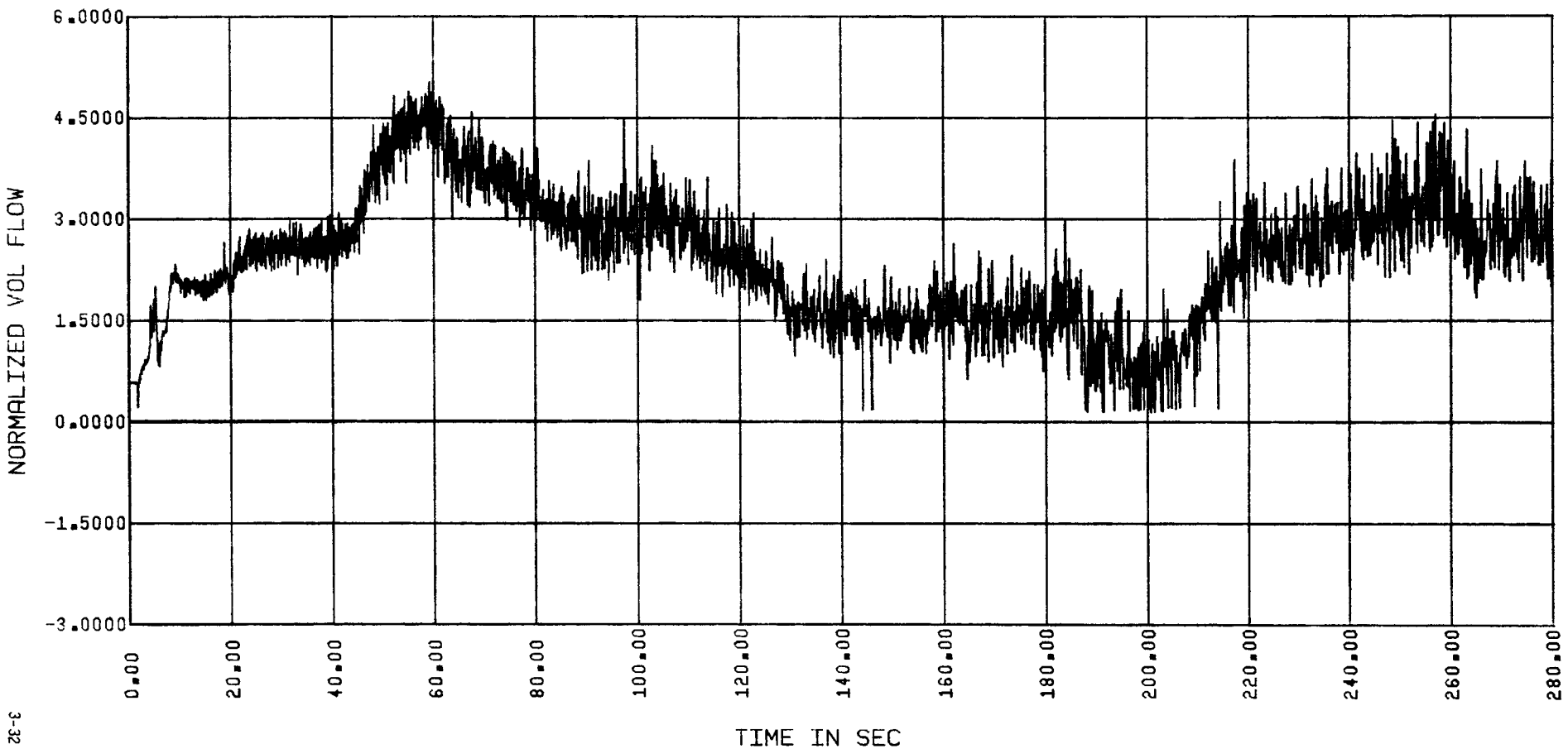
TEST 246/1000 PSIA LR FWD BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23

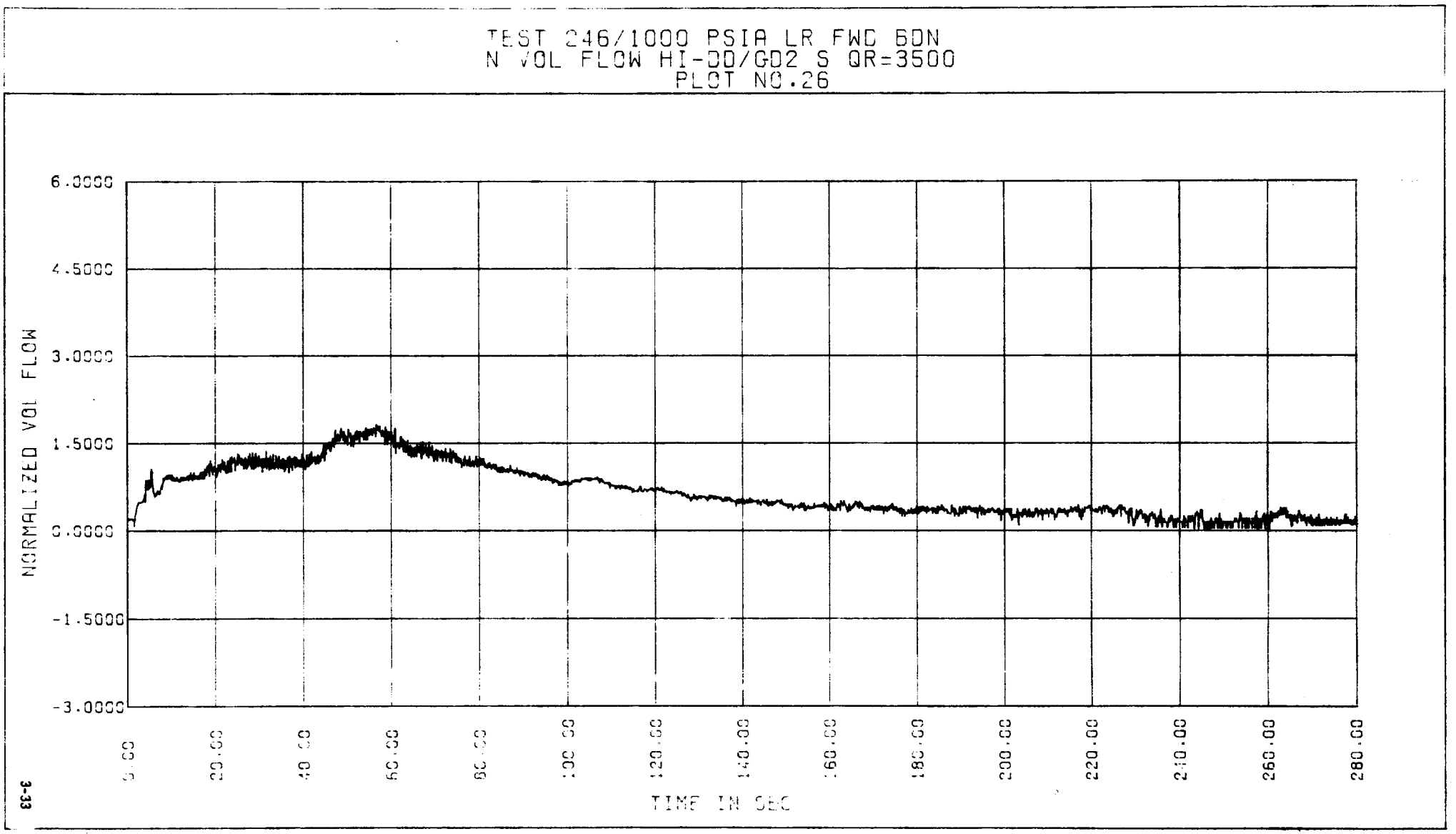


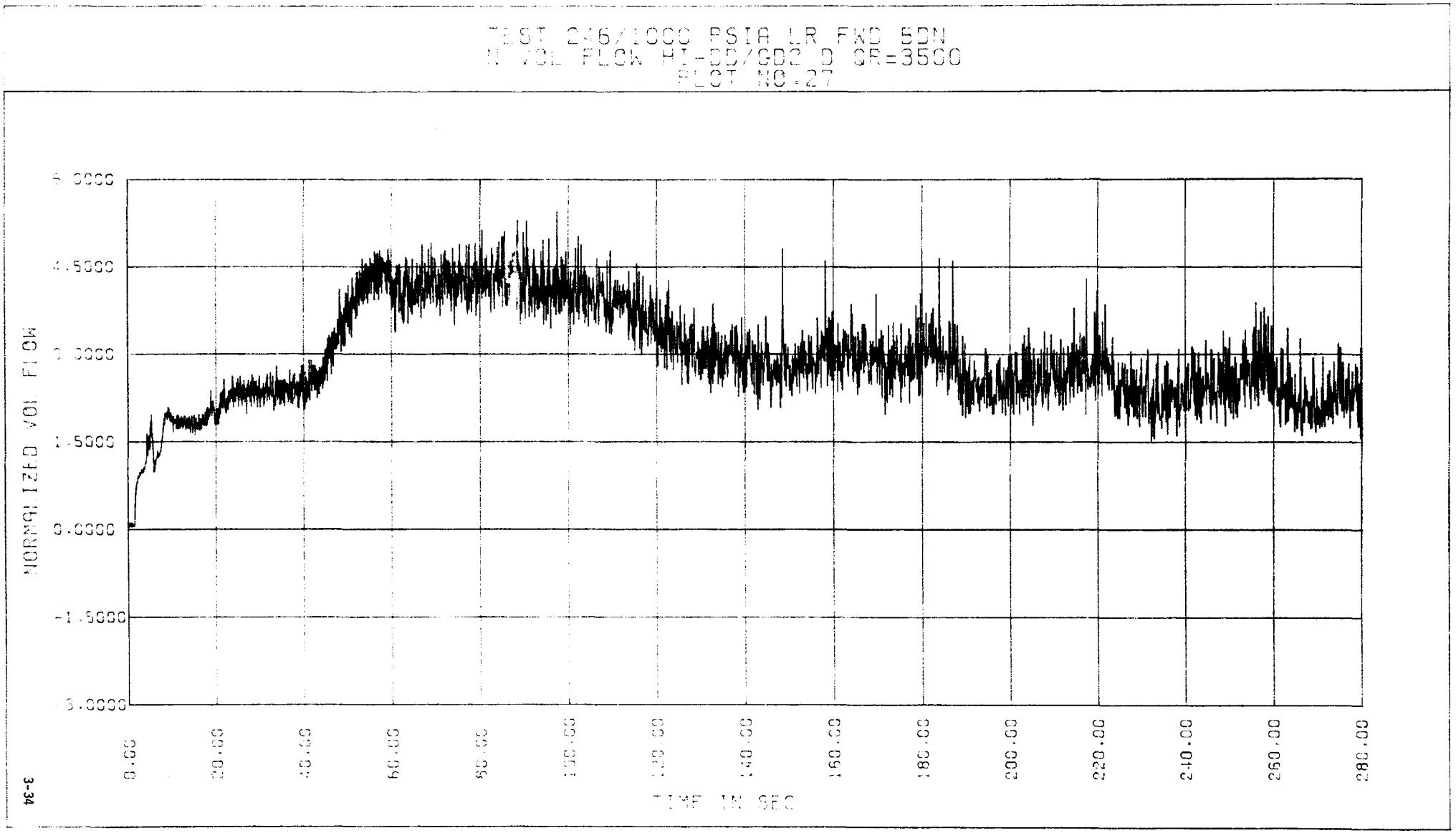
TEST 246/1000 PSIA LR FWD BDN
N VOL FLOW LO-DD/GD2 S QR=3500
PLOT NO.24



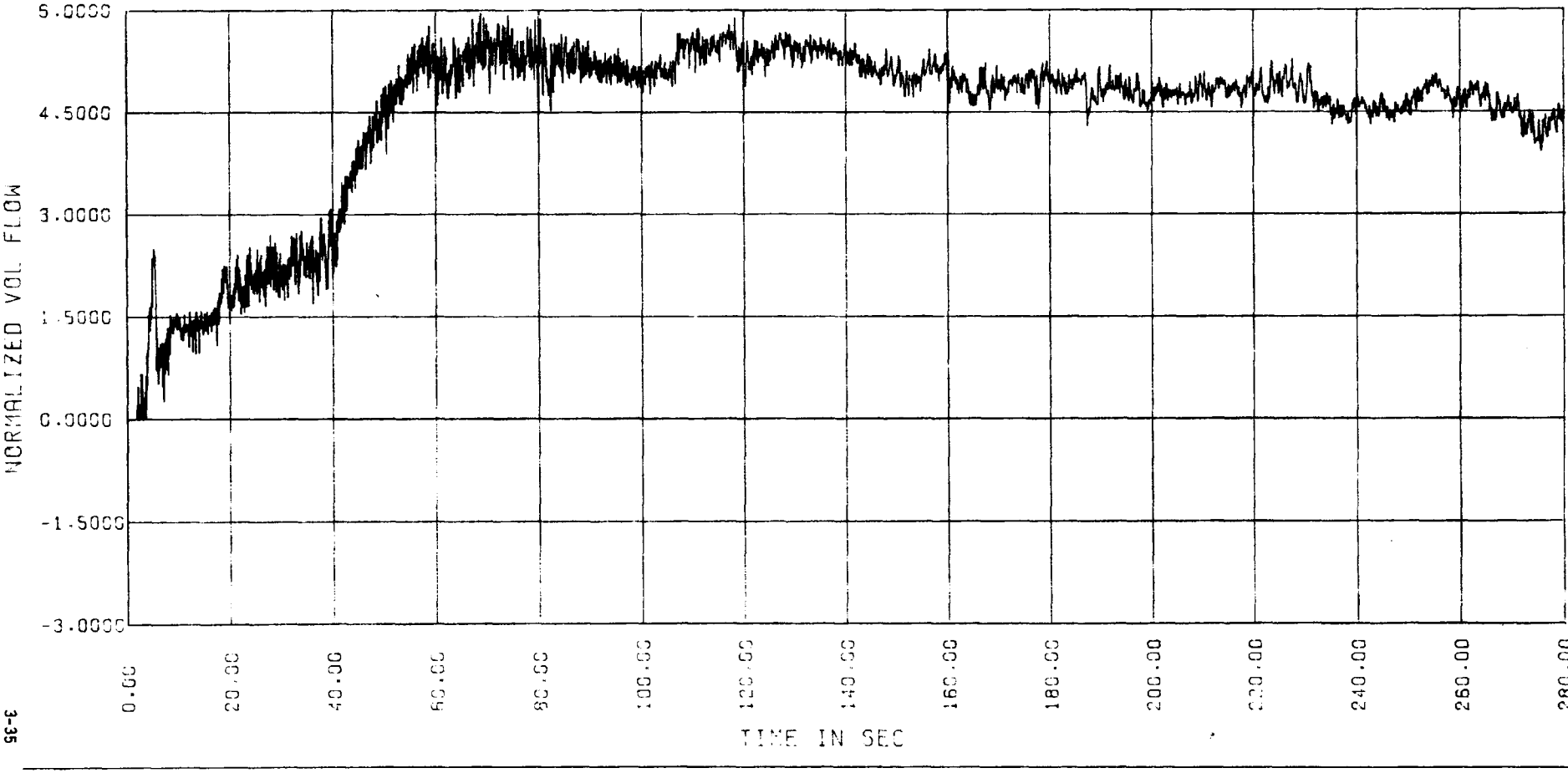
TEST 246/1000 PSIA LR FWD BDN
N VOL FLOW LO-DD/GD2 D QR=3500
PLOT NO.25



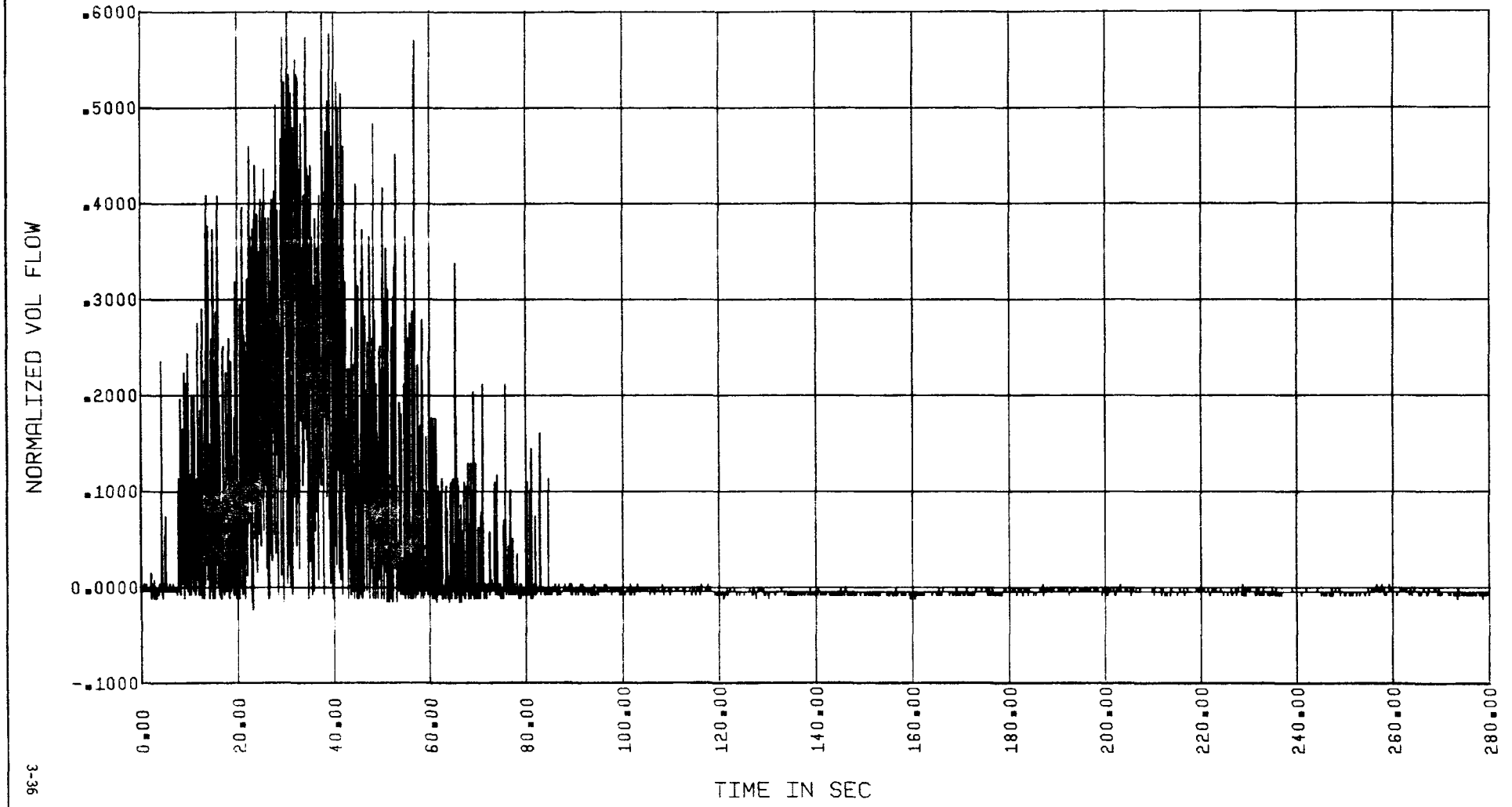

TEST 246/1000 PSIA LR FWD BDN
N VOL FLOW HI-DD/GD2 S QR=3500
PLOT NO.26
NORMALIZED VOL FLOW
6.0000
4.5000
3.0000
1.5000
0.0000
-1.5000
-3.0000
20.00
40.00
60.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC


NORMALIZED VOL FLOW
TIME IN SEC
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00

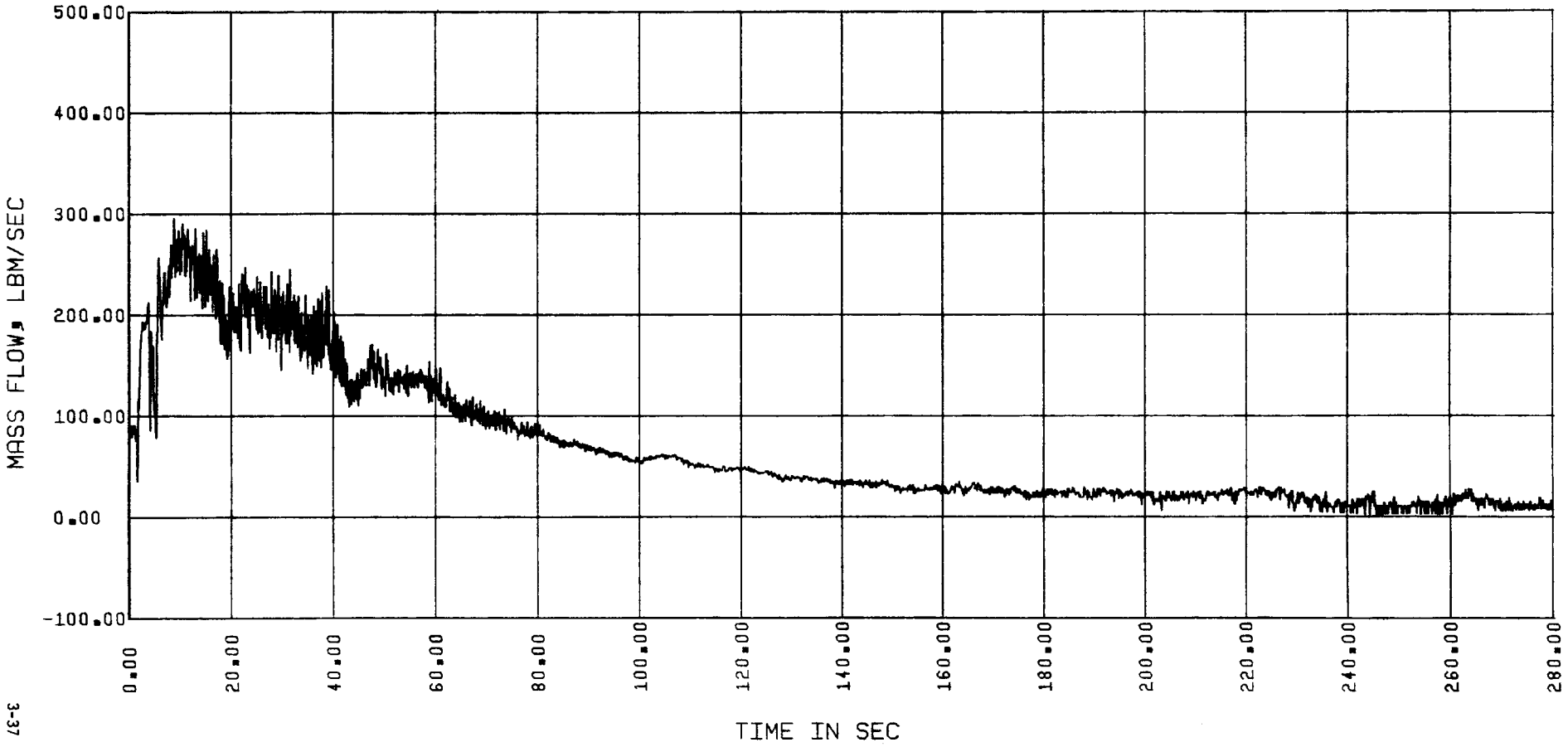
TEST 246/1000 PSIA LR FWD BDN
N VOL FLOW LO-TM SUCT QR=3500
PLOT NO.28



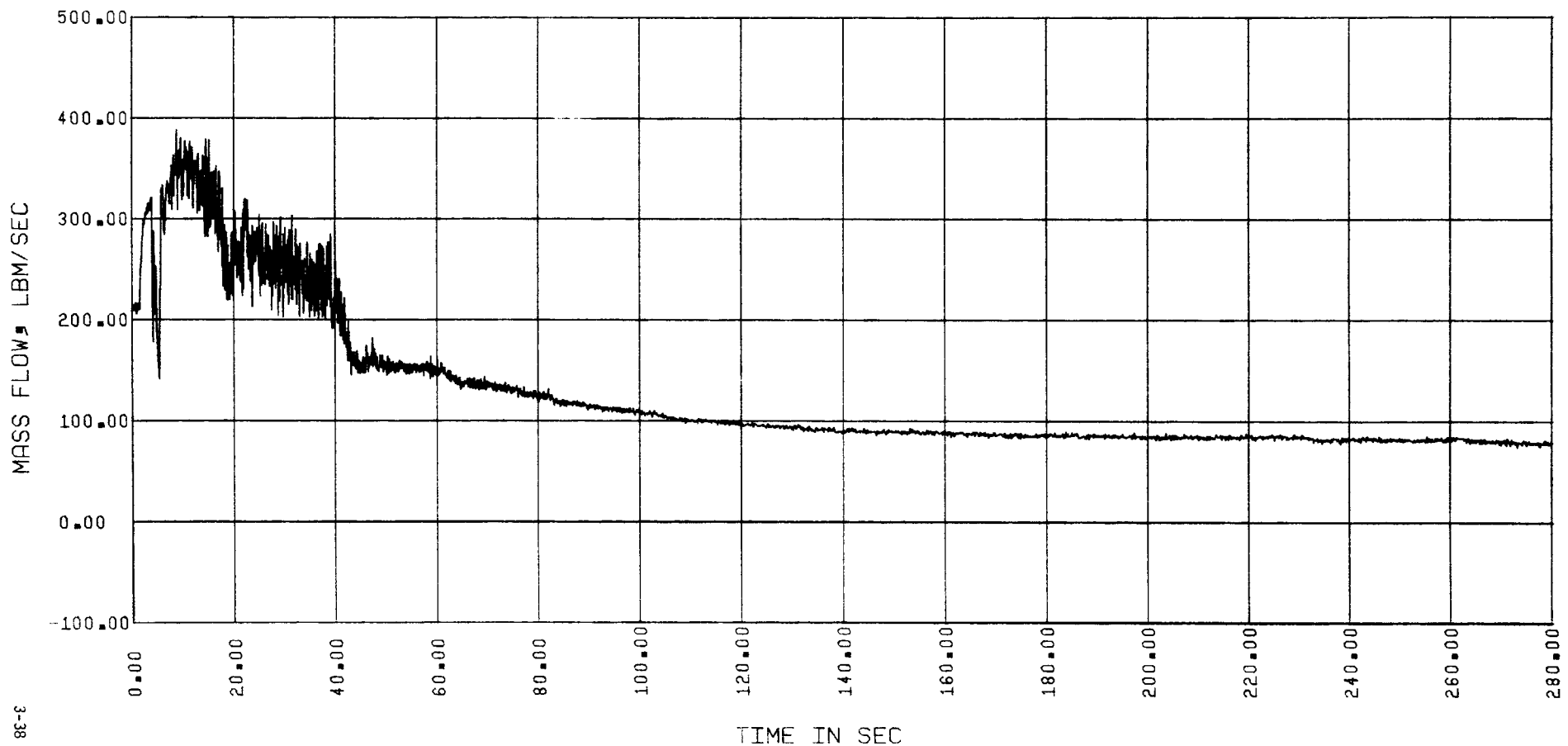
TEST 246/1000 PSIA LR FWD BDN
N VOL FLOW HI-TM DISCH QR=3500
PLOT NO.29



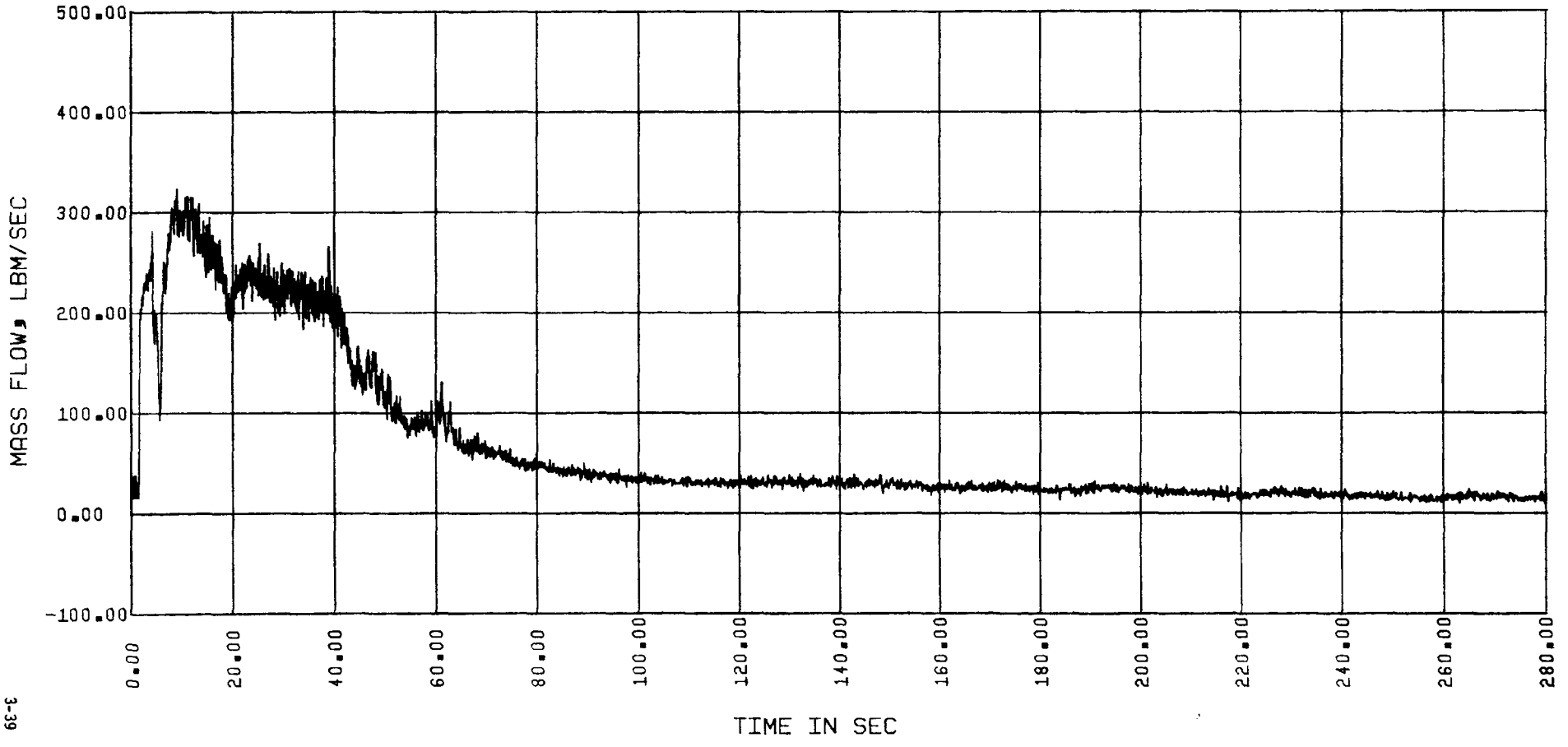
TEST 246/1000 PSIA LR FWD BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.30



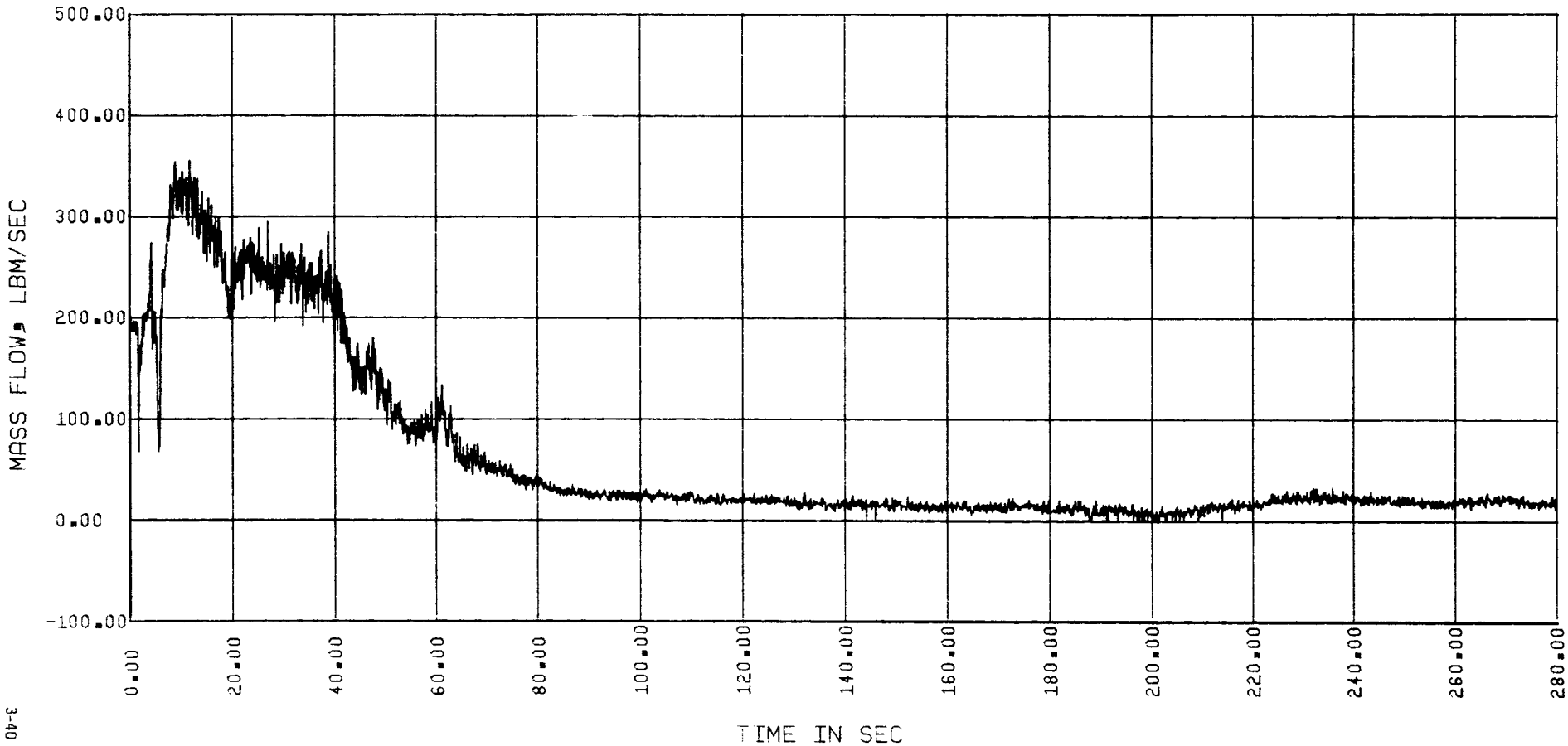
TEST 246/1000 PSIA LR FWD BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.31

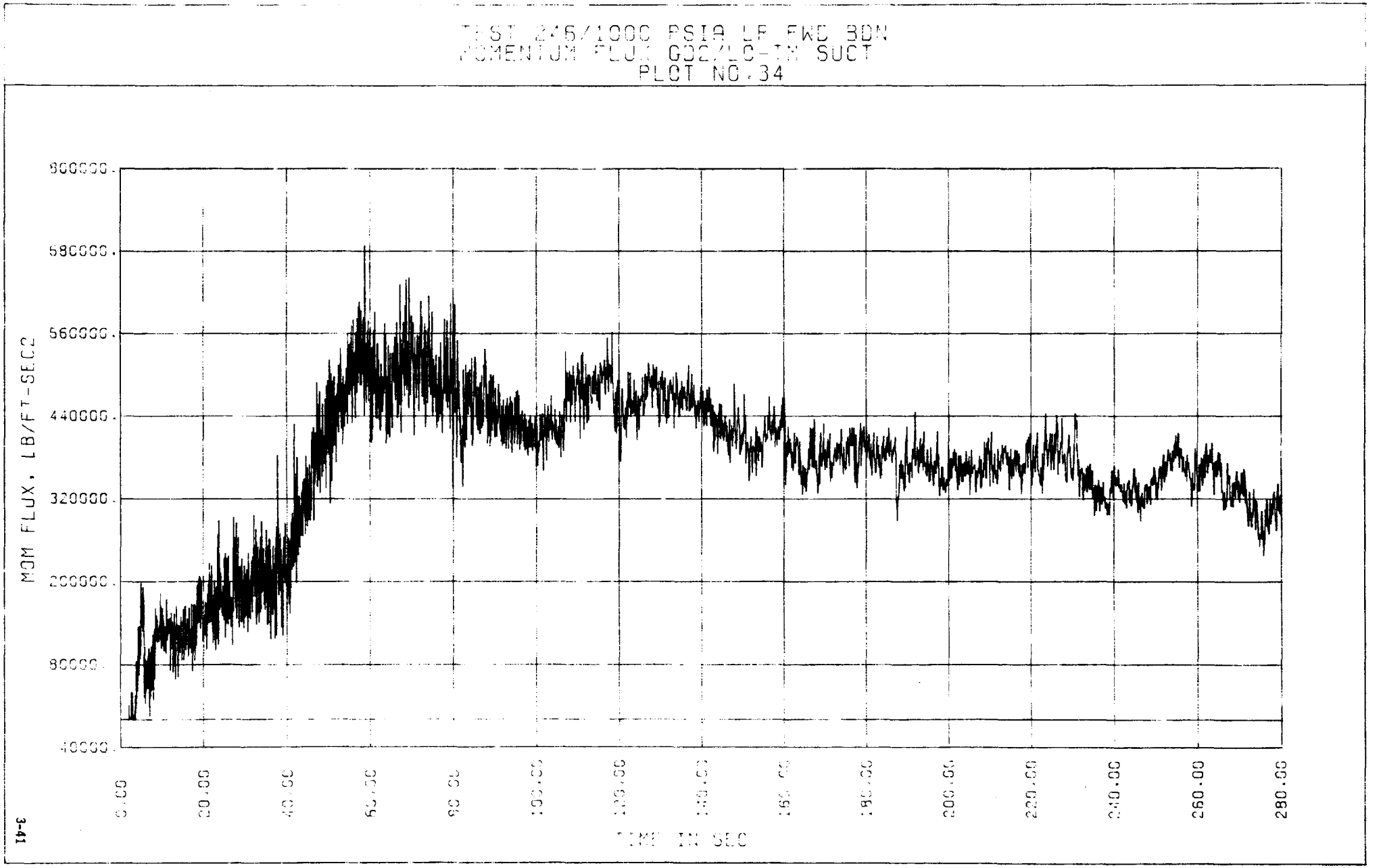


TEST 246/1000 PSIA LR FWD BDN
MASS FLWO RATE HI-DD/GD2 DISCH
PLOT NO.32

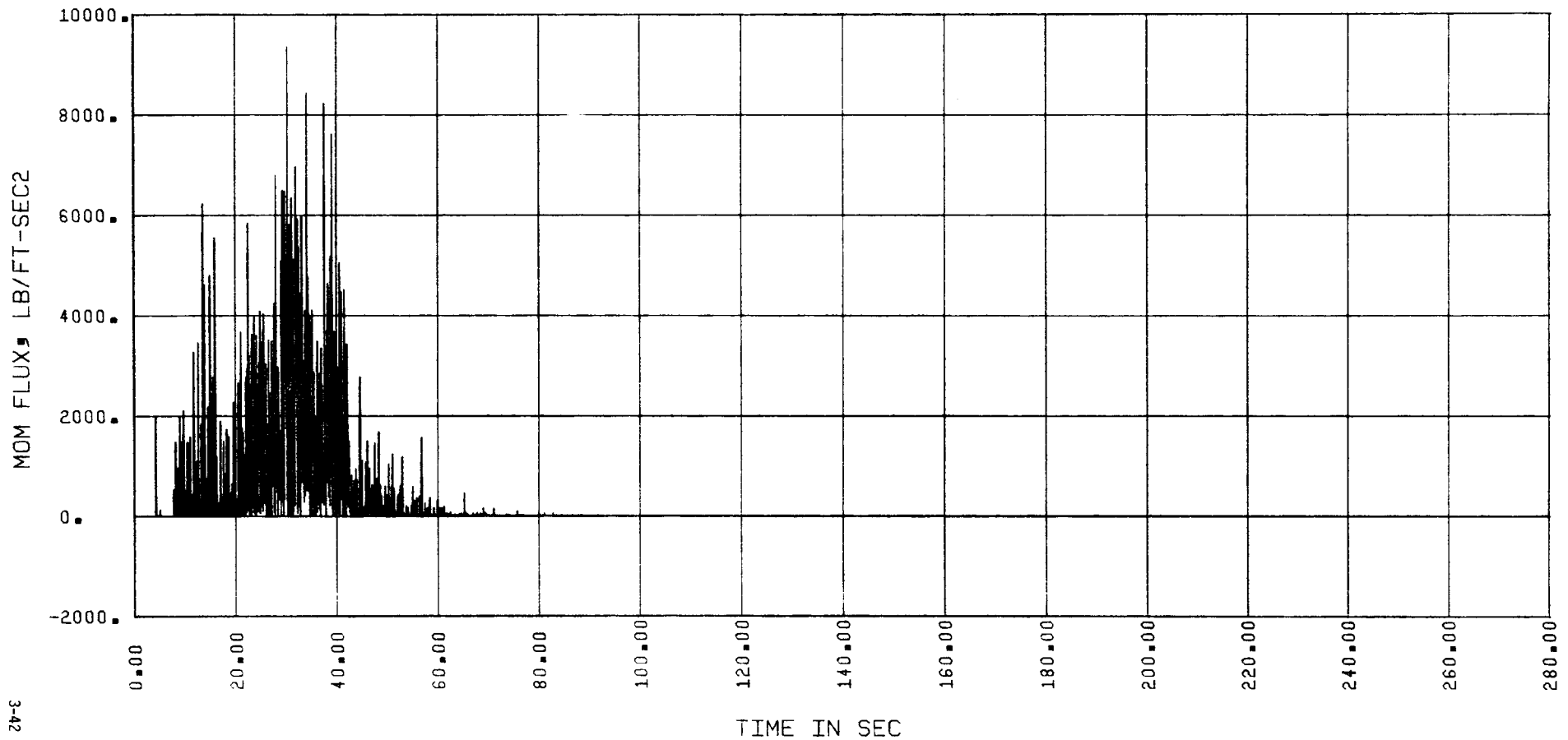


TEST 246/1000 PSIA LR FWD BDN
MASS FLOW RATE LO-DD/GD2 DSCH
PLOT NO.33

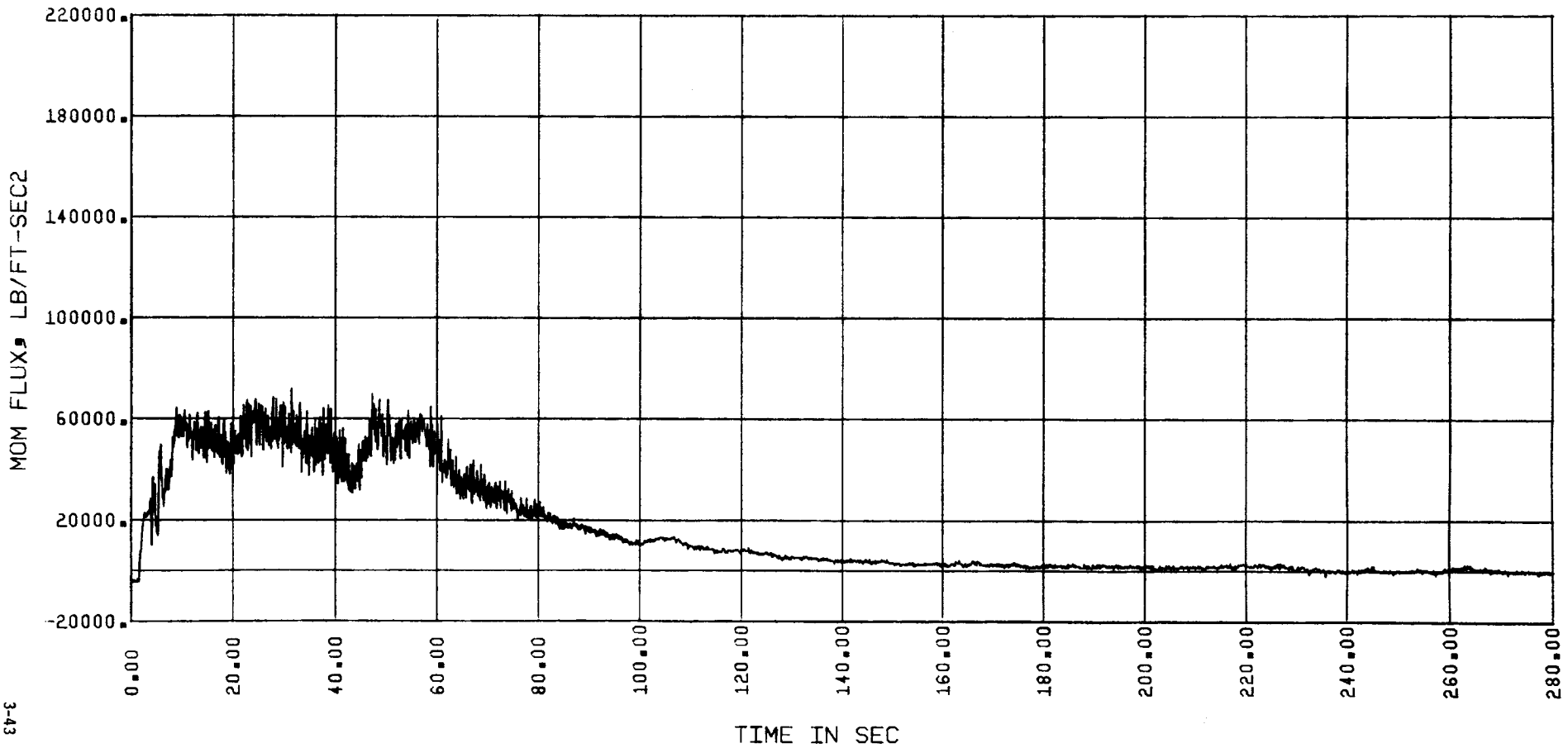



TEST 246/1000 PSIA LP FWD BDN
MOMENTUM FLUX G02/LC-TM SUCT
PLOT NO. 34
MOM FLUX, LB/FT-SEC2
800000.
680000.
560000.
440000.
320000.
200000.
80000.
40000.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

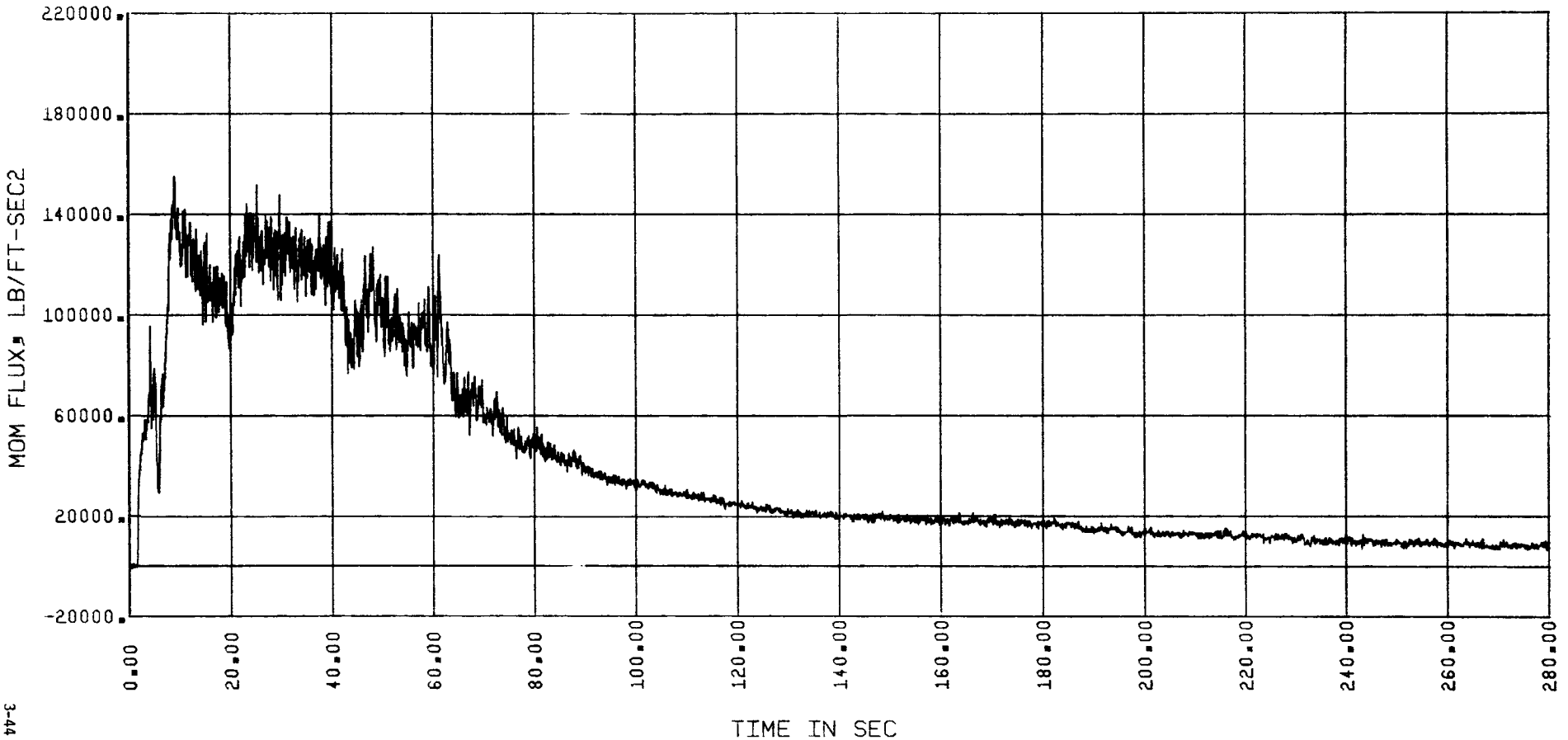
TEST 246/1000 PSIA LR FWD BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.35



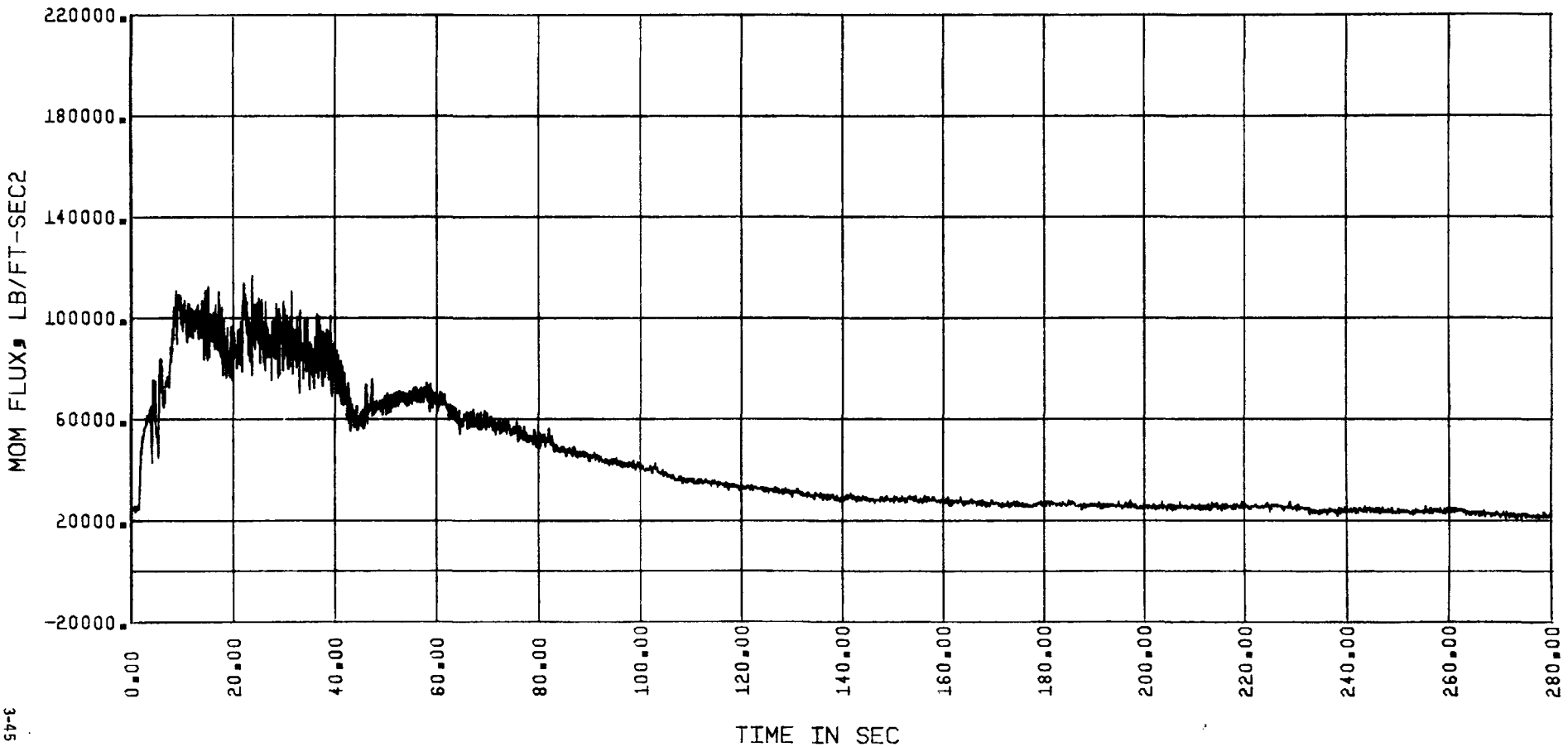
TEST 246/1000 PSIA LR FWD BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.36



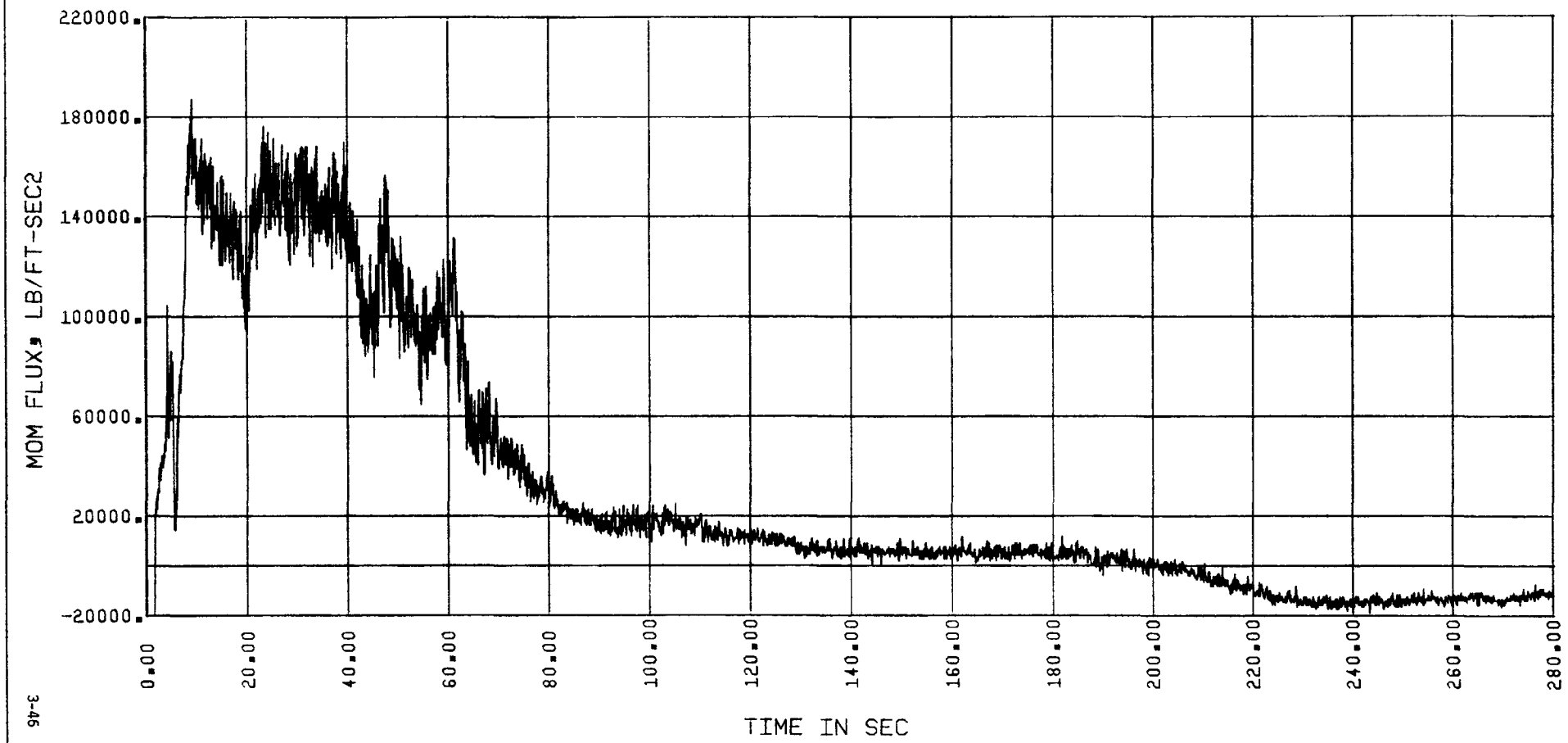
TEST 246/1000 PSIA LR FWD BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.37



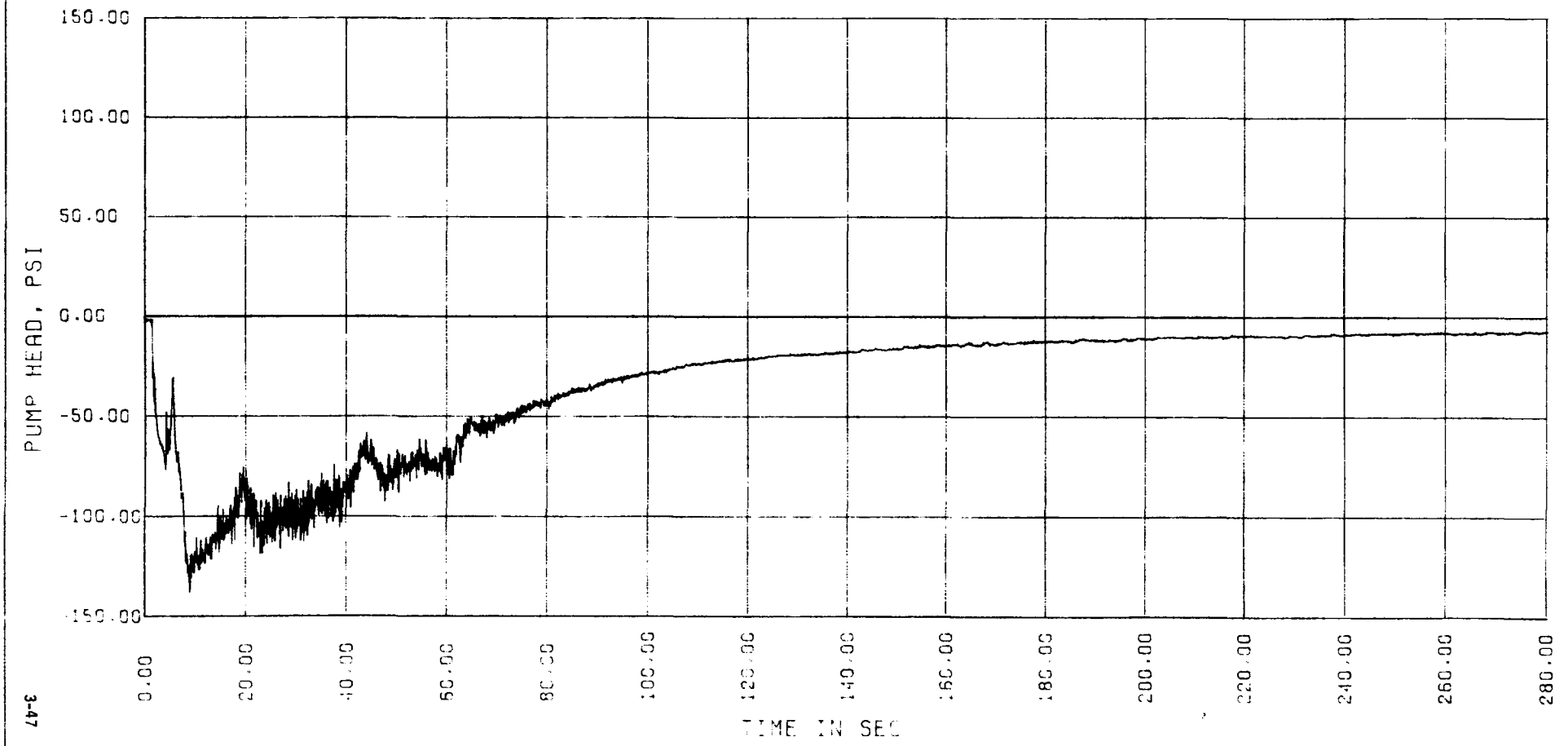
TEST 246/1000 PSIA LR FWD BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



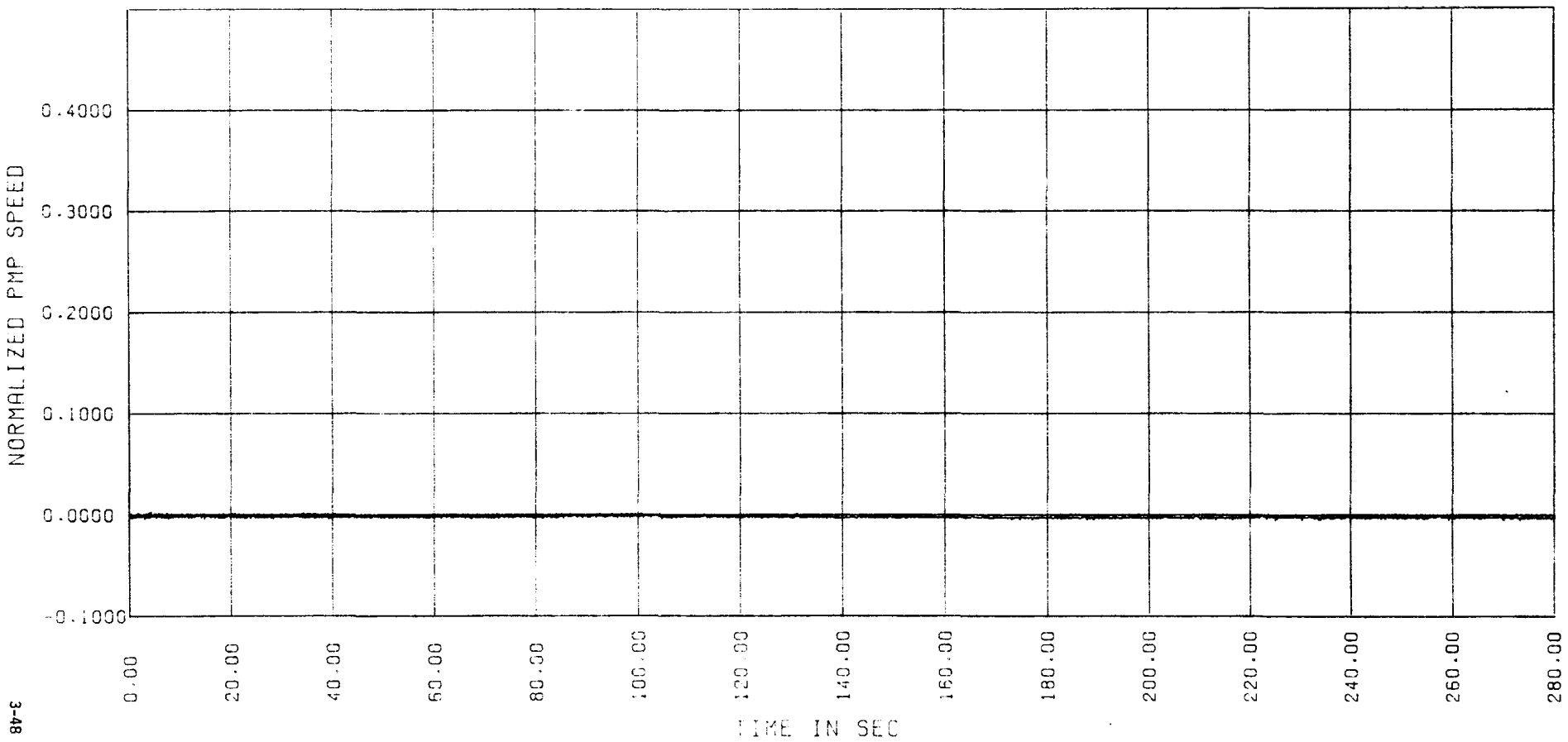
TEST 246/1000 PSIA LR FWD BDN
MOMENTUM FLUX LO-DD DISCHARGE
PLOT NO.39

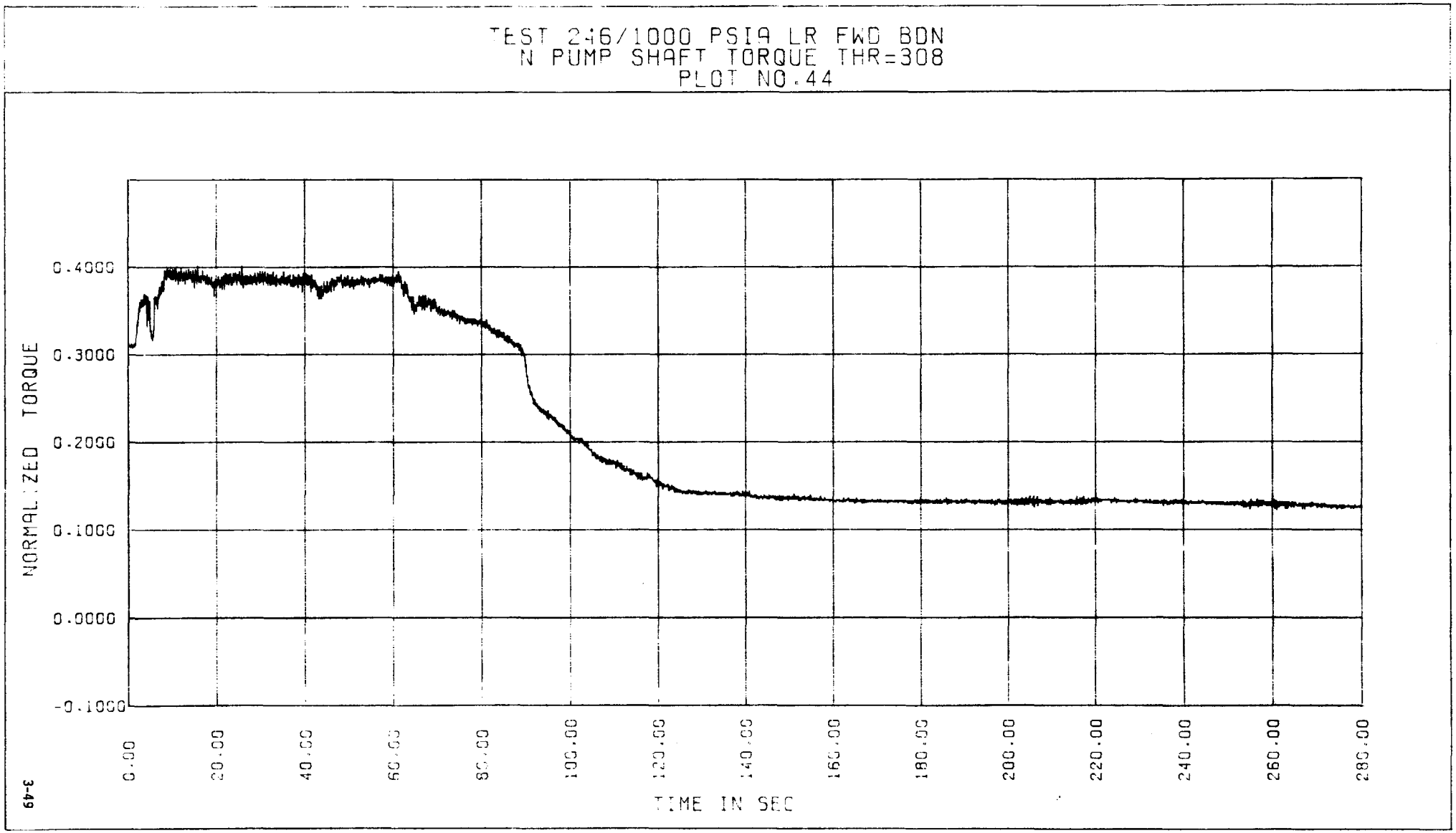


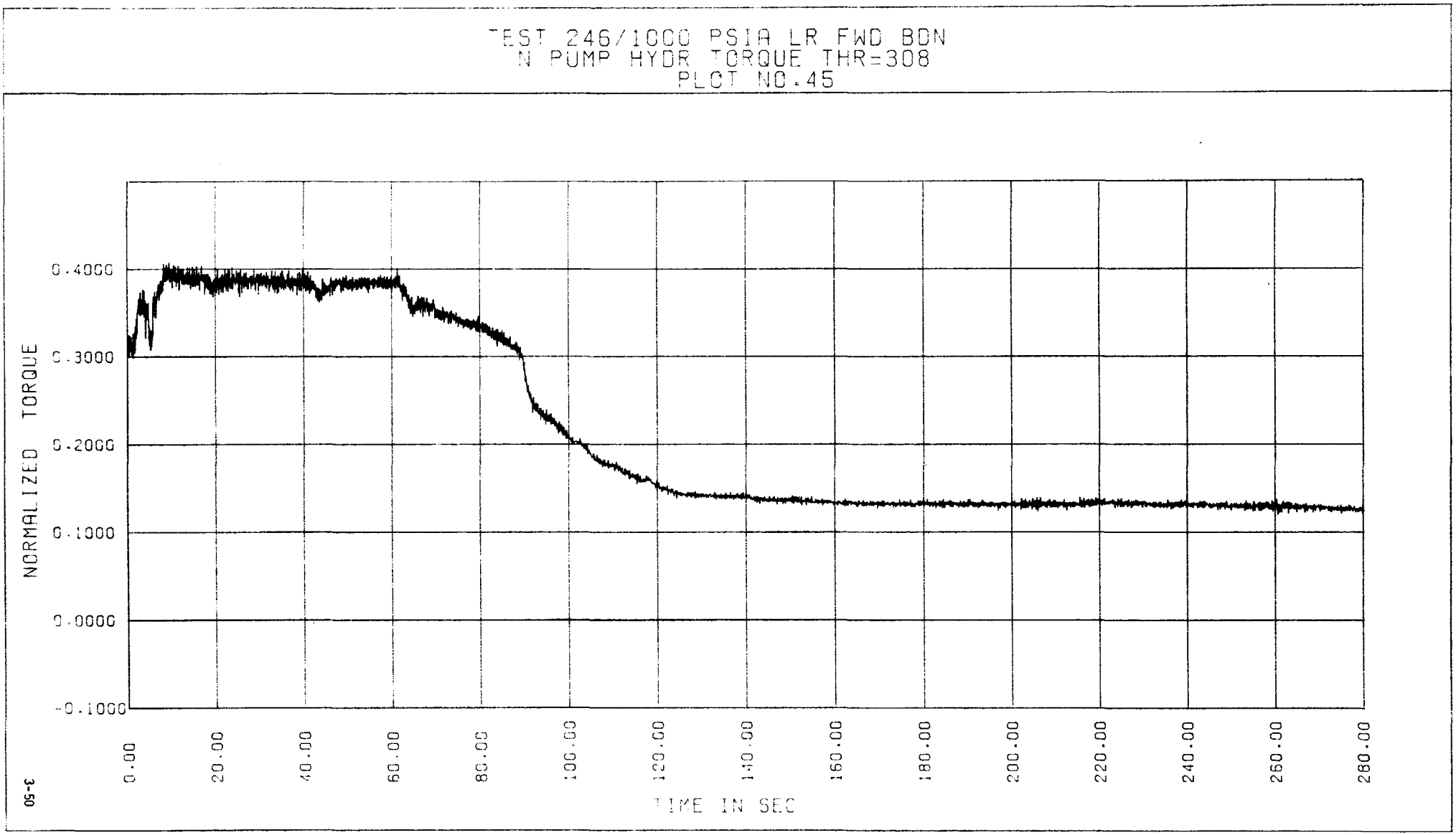
TEST 246/1000 PSIA LR FWD BDN
PUMP HEAD IN PSI
PLOT NO.40



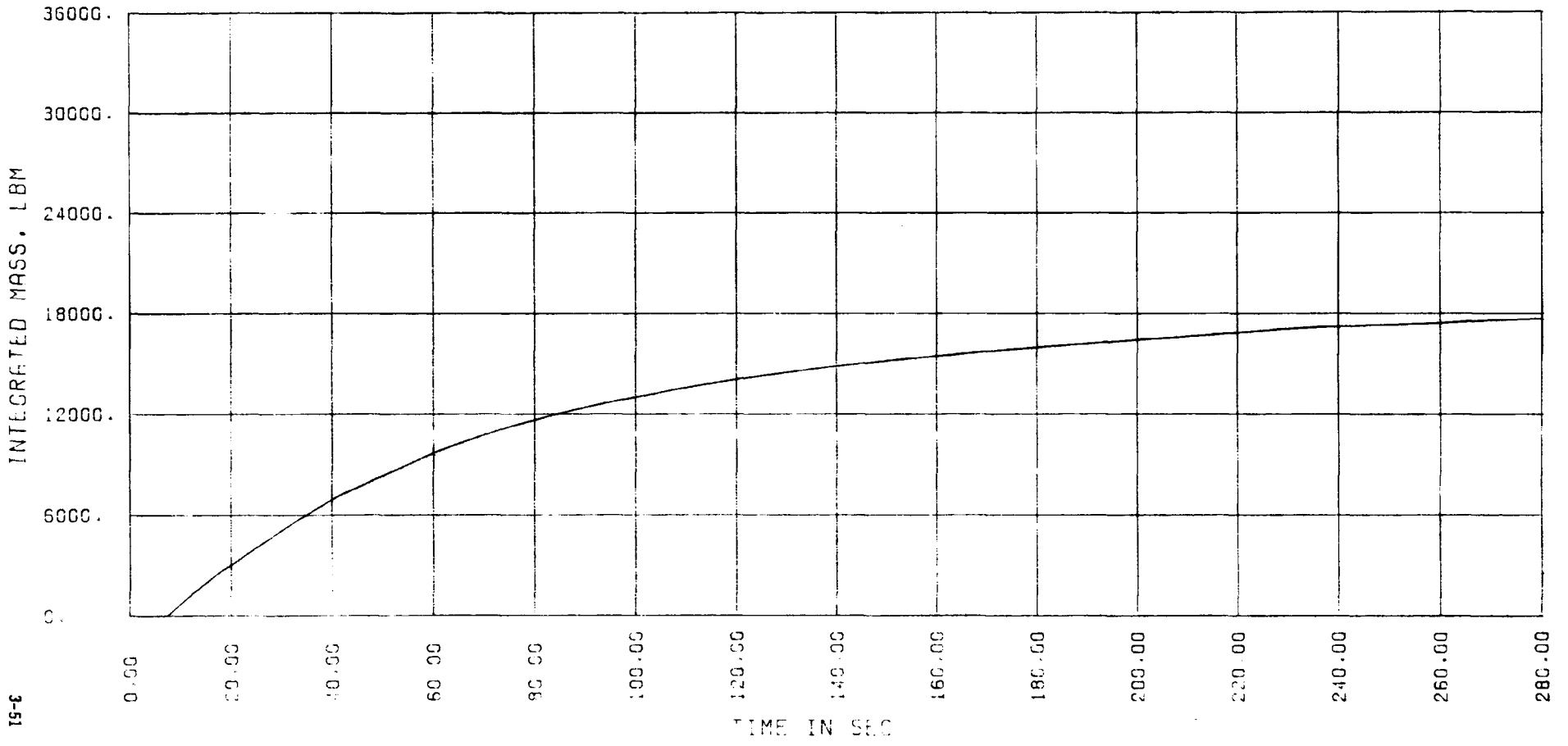
TEST 246/1000 PSIA LR FWD BDN
N PUMP SPEED NR=4500
PLOT NO.43



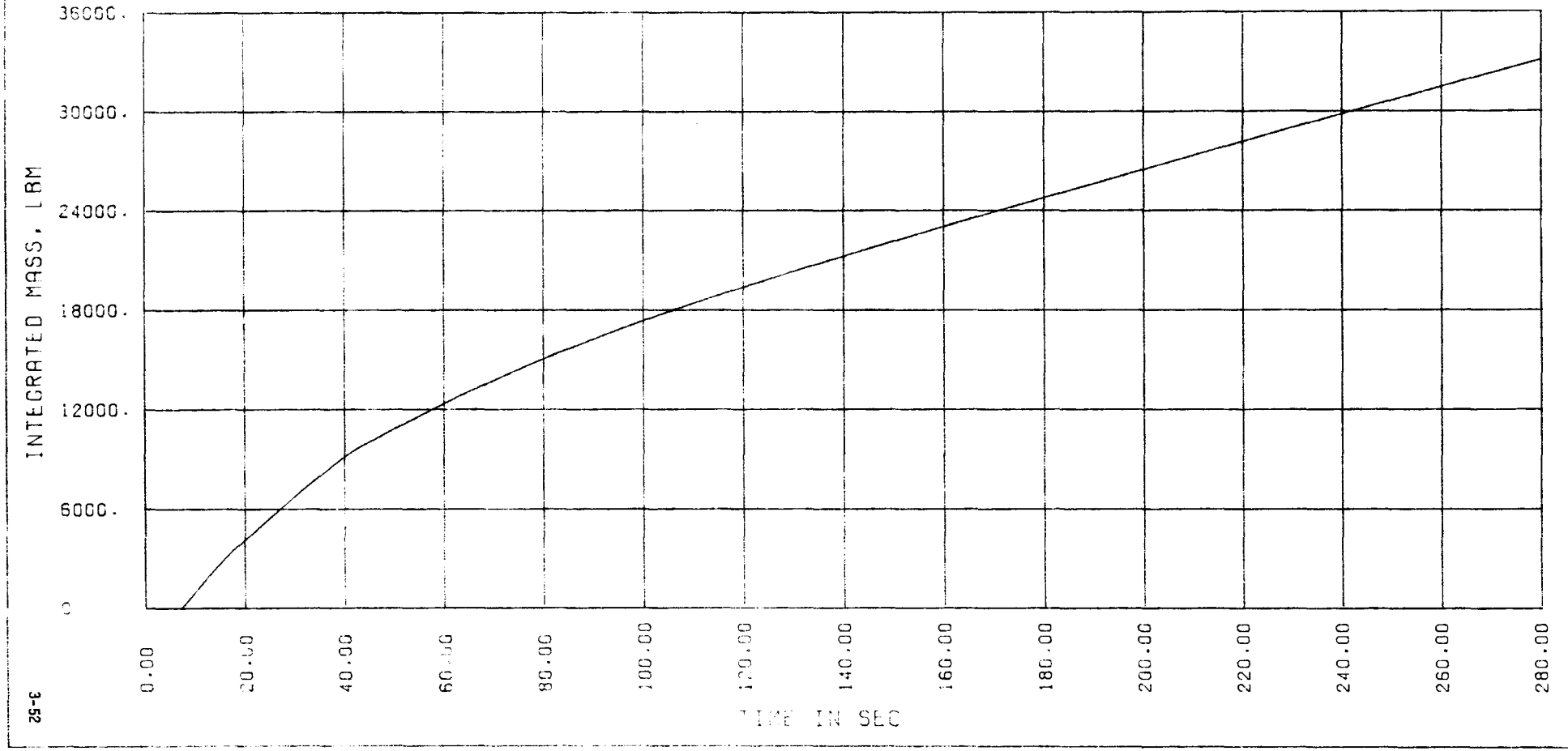

TEST 246/1000 PSIA LR FWD BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.44
NORMALIZED TORQUE
0.4000
0.3000
0.2000
0.1000
0.0000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC


TEST 246/1000 PSIA LR FWD BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.45
NORMALIZED TORQUE
0.4000
0.3000
0.2000
0.1000
0.0000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

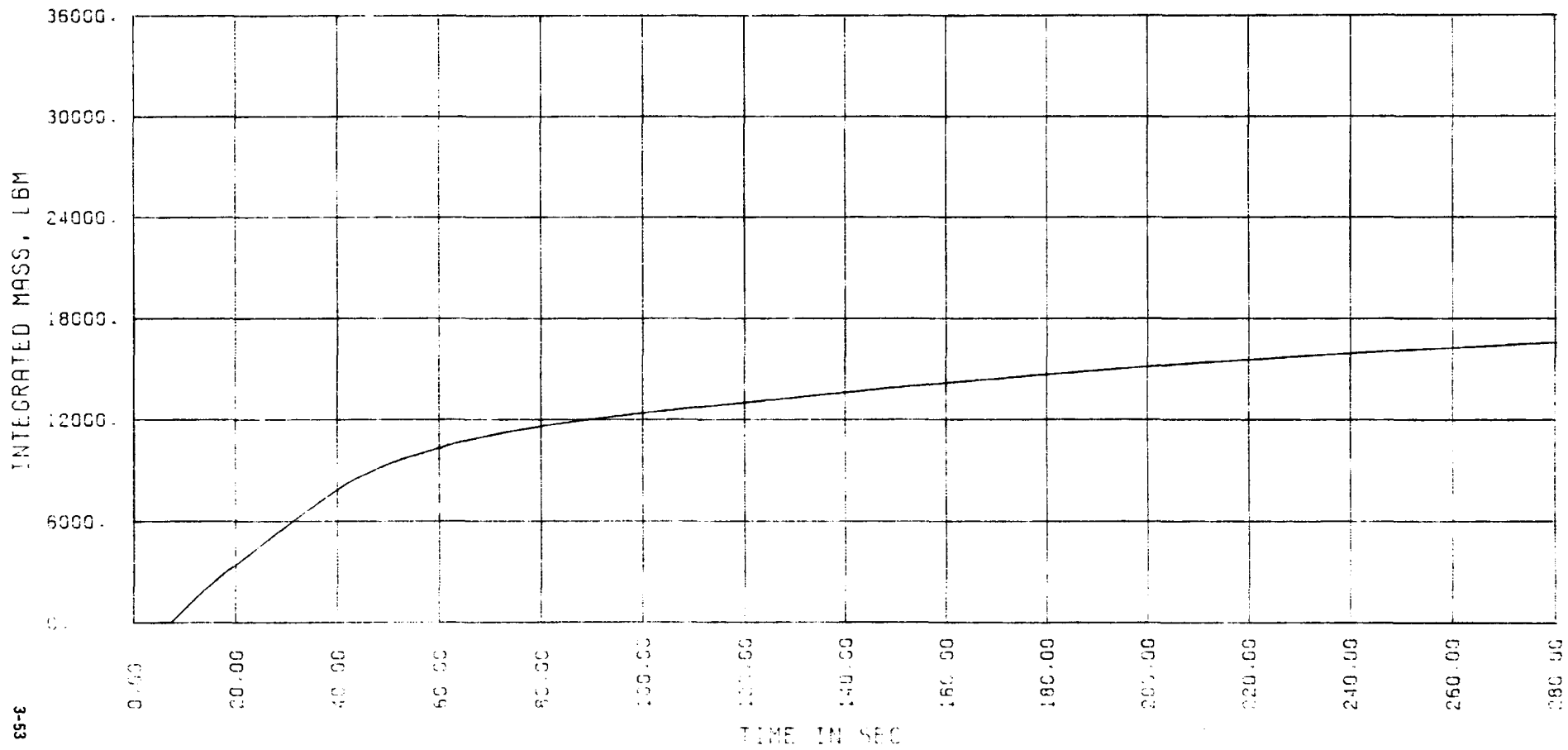
TEST 246/1000 PSIA LR FWD BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.46



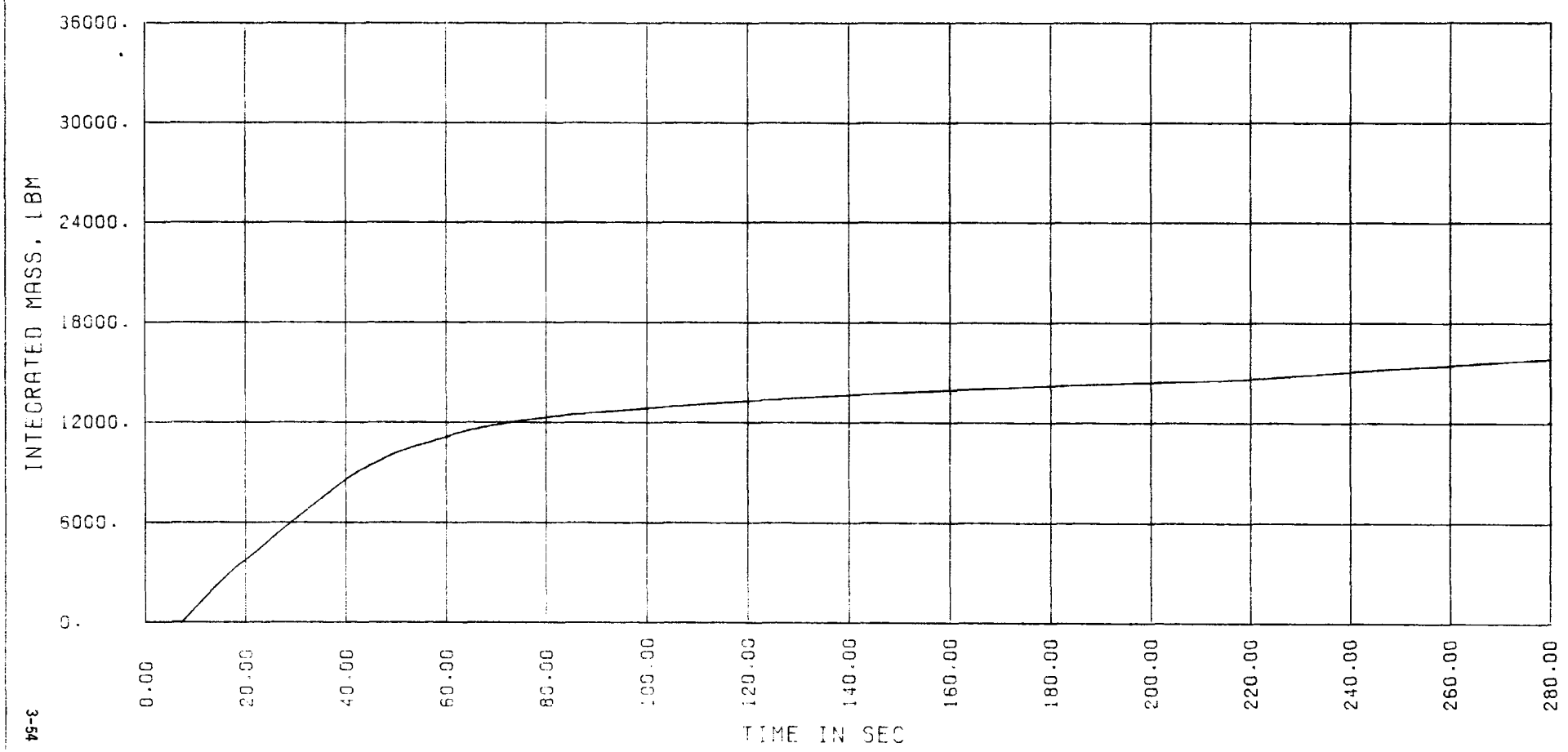
TEST 246/1000 PSIA LR FWD BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.47



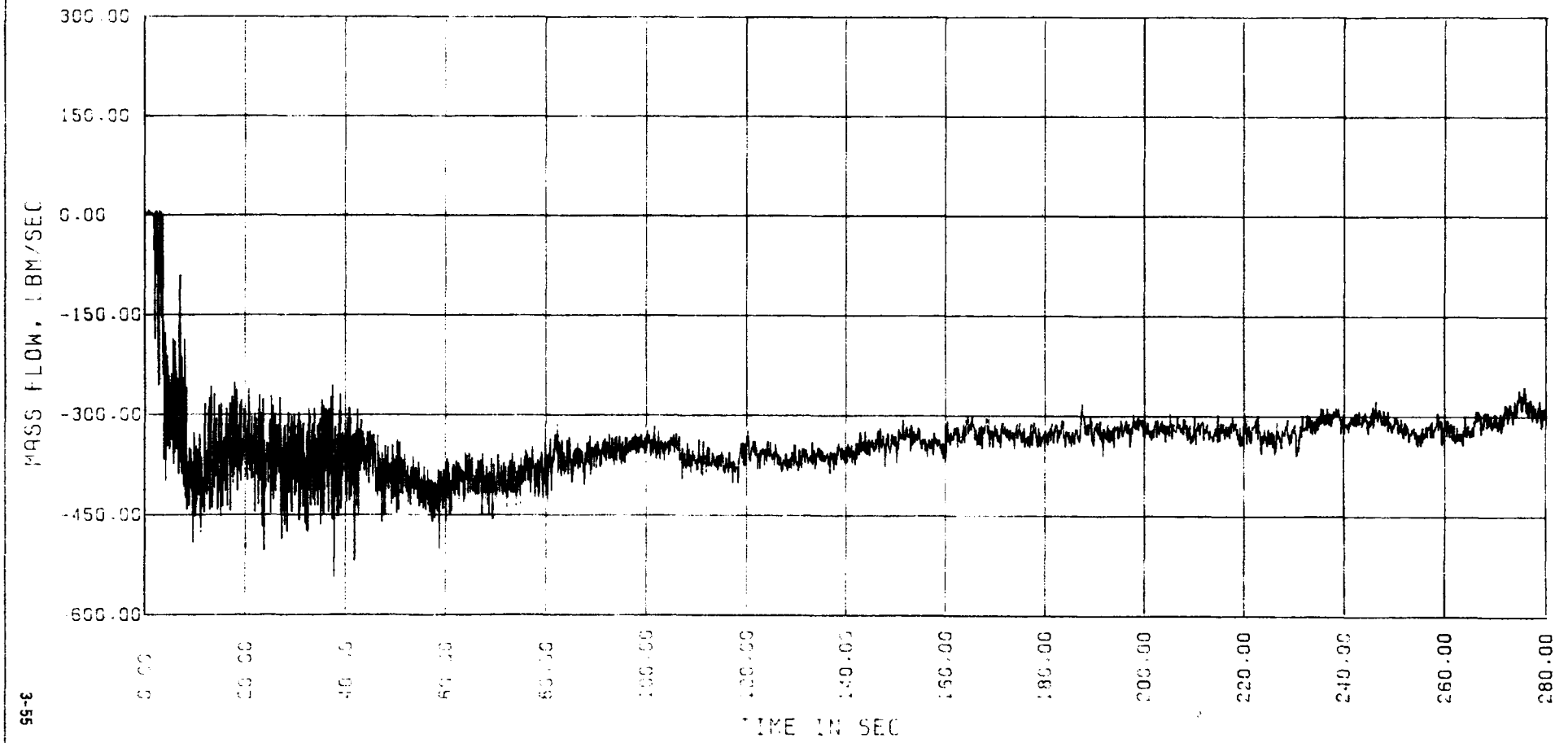
TEST 246/1000 PSIA LR FWD BDN
INTEGRATED MASS HI-OD/GD2 DIS
PLOT NO.48



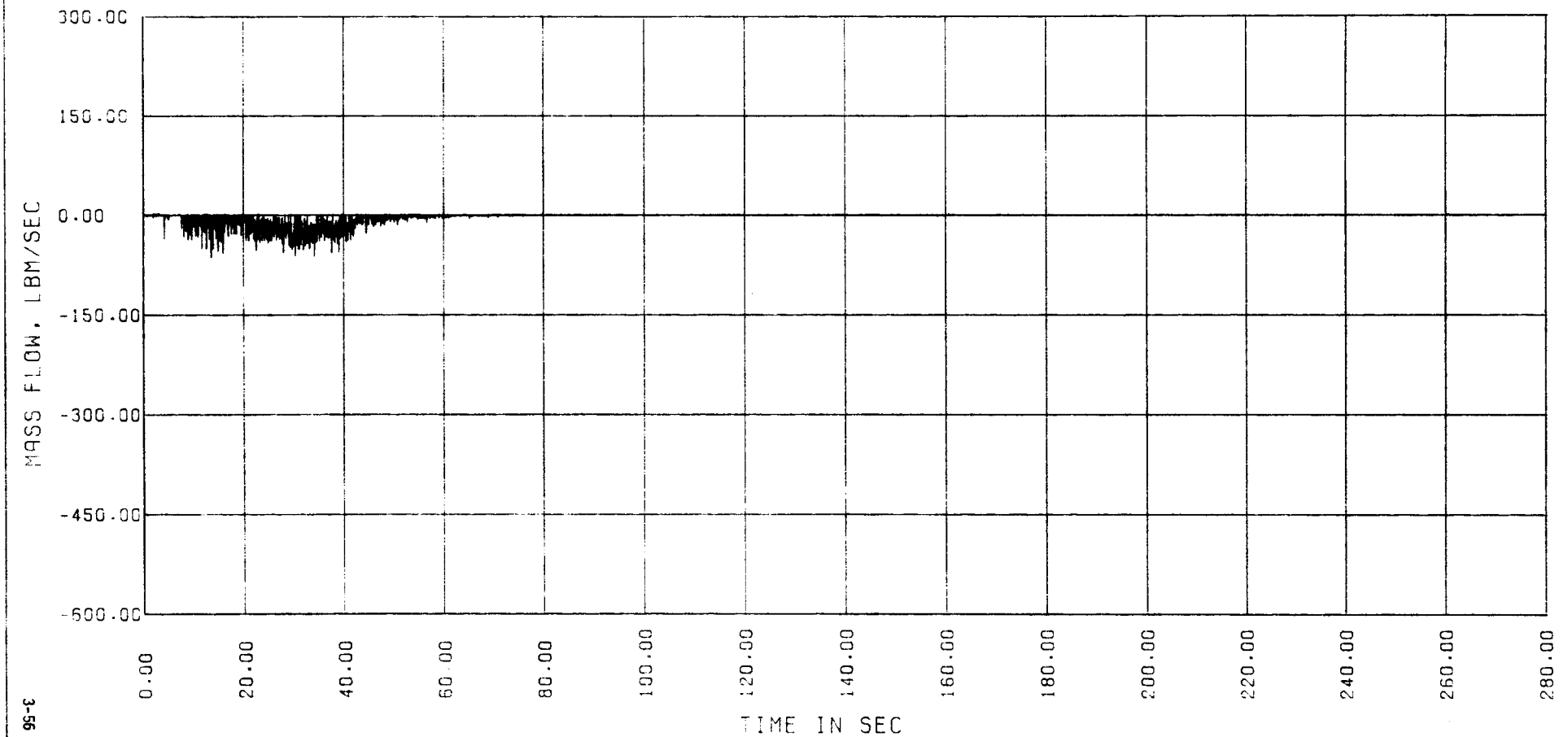
TEST 246/1000 PSIA LR FWD BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.49



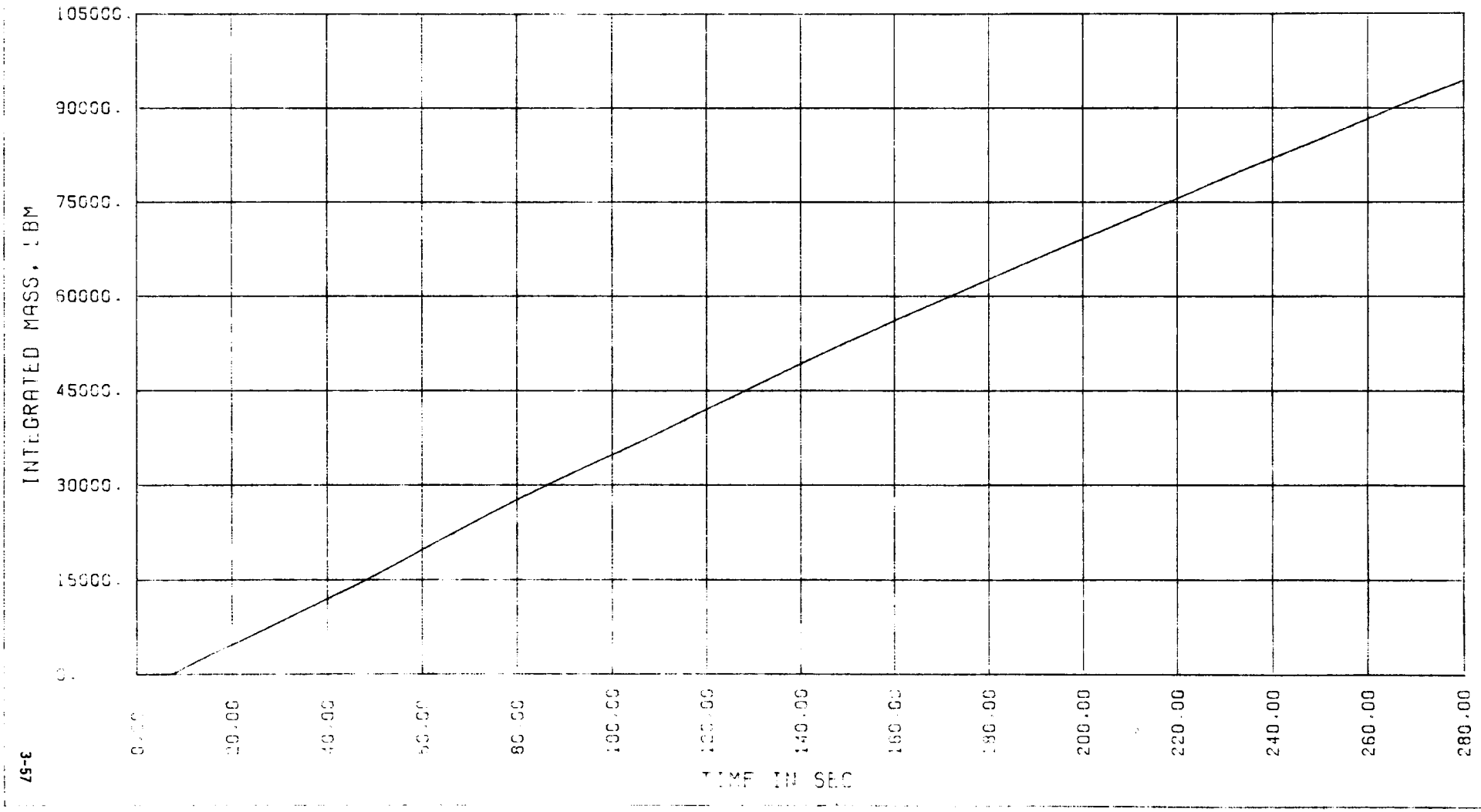
TEST 246/1000 PSIA LR FWD BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.51



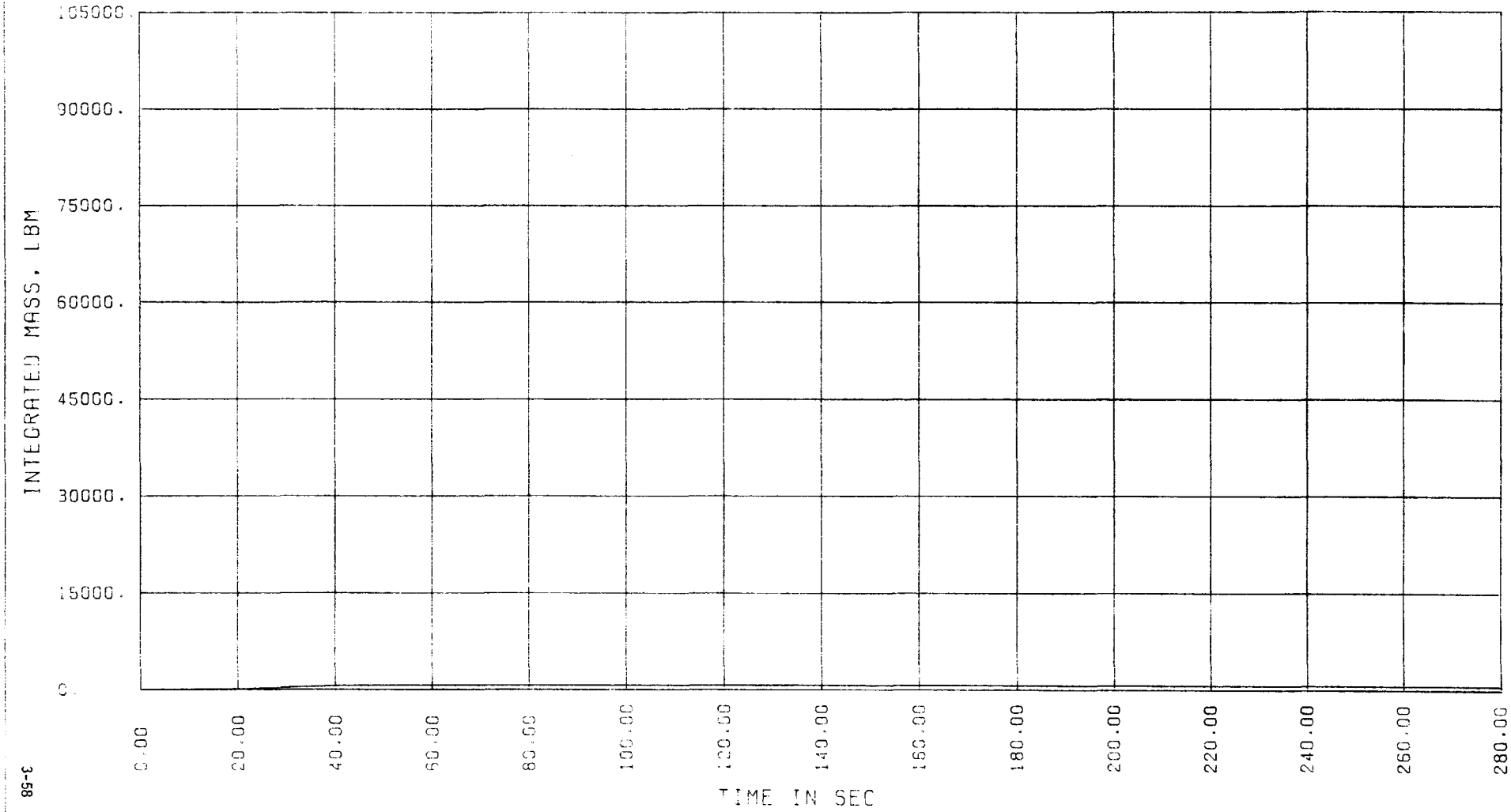
TEST 246/1000 PSIA LR FWD BDN
MASS FLOW RATE LO-TM/GO2 DISCH
PLOT NO.52



TEST 246/1000 PSIA LR FWD BDN
INTEGRATED MASS LO-TM/GO2 S
PLOT NO.55

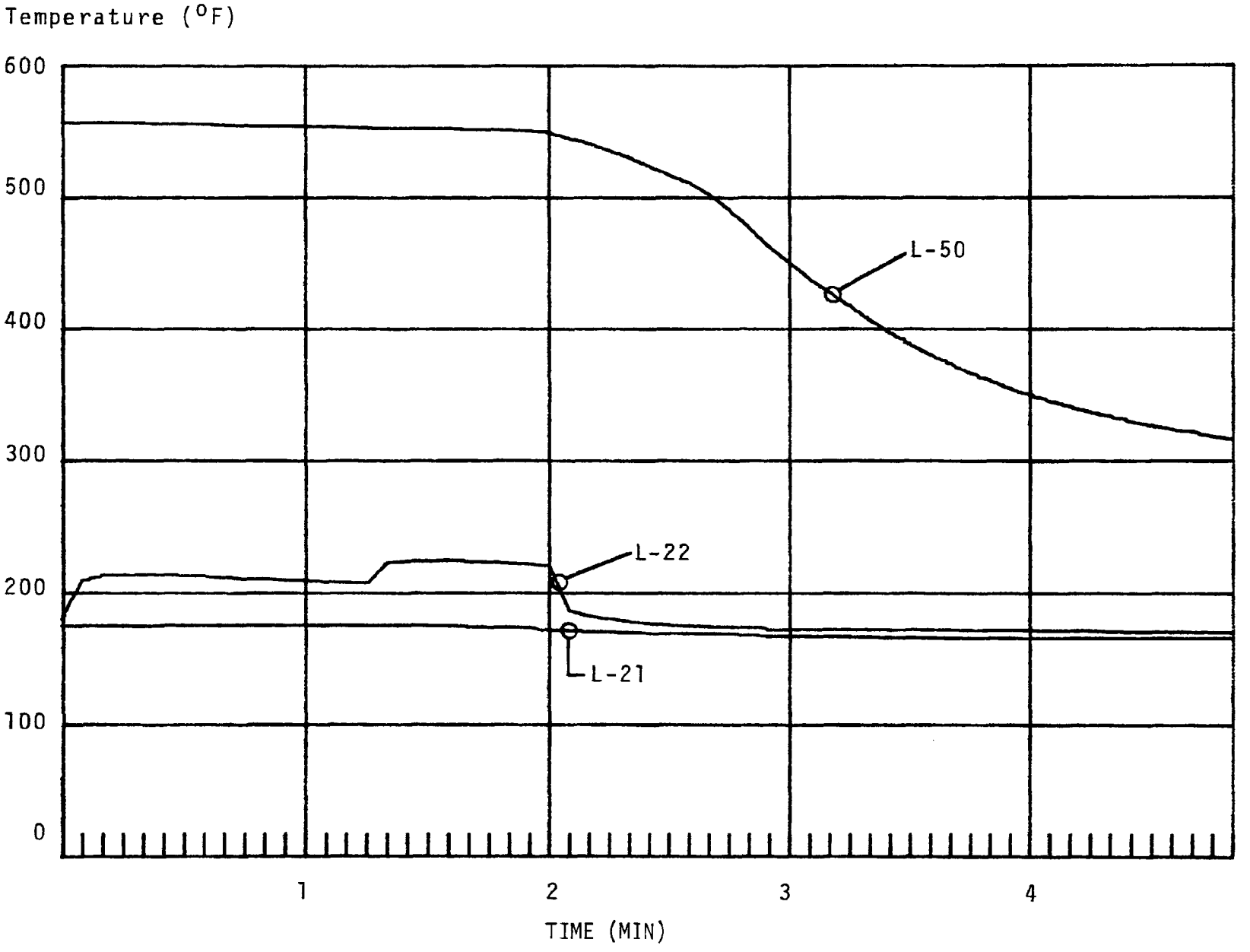


TEST 246/1000 PSIA LR FWD BDN
INTEGRATED MASS HI-TM/GO2 D
PLOT NO.56

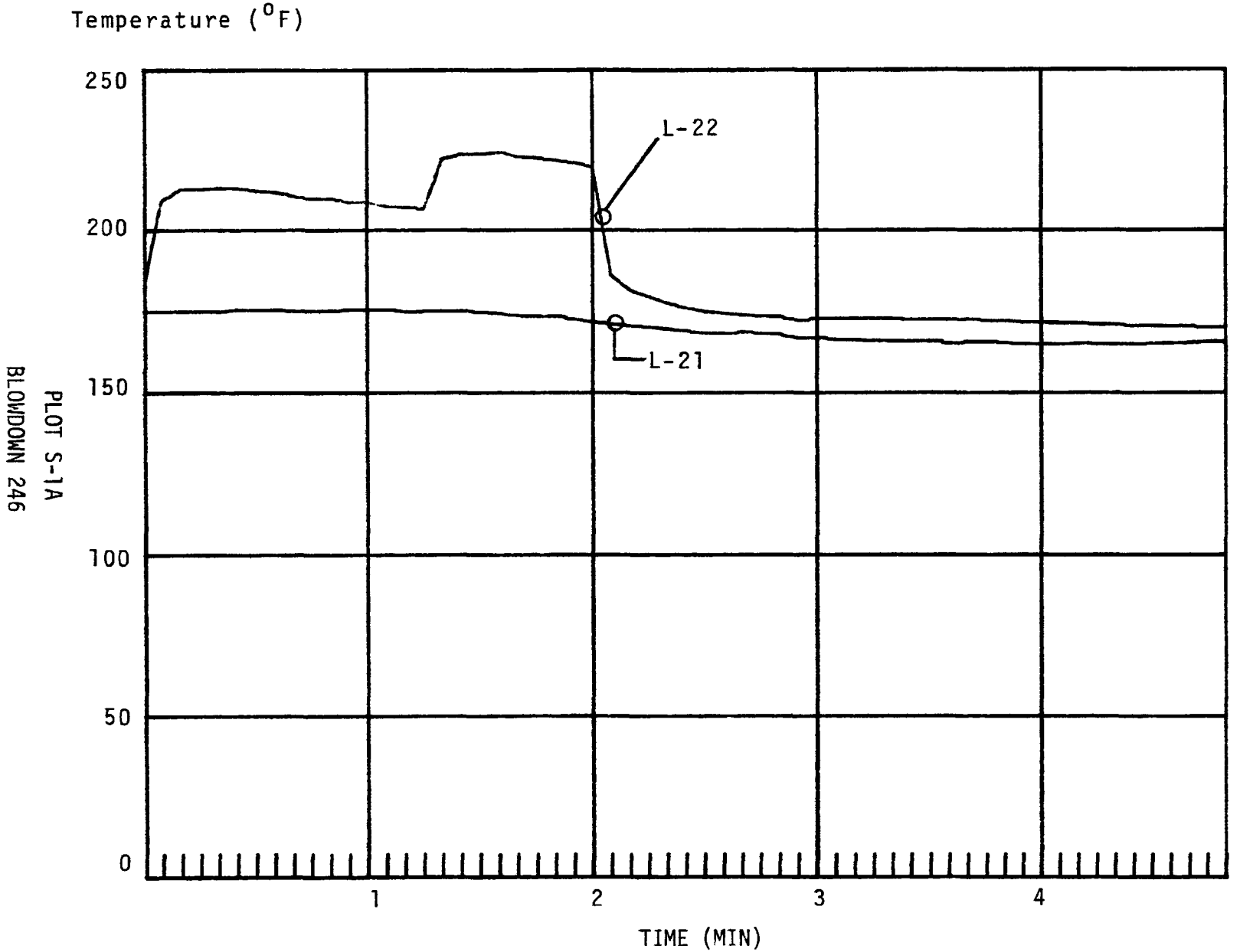


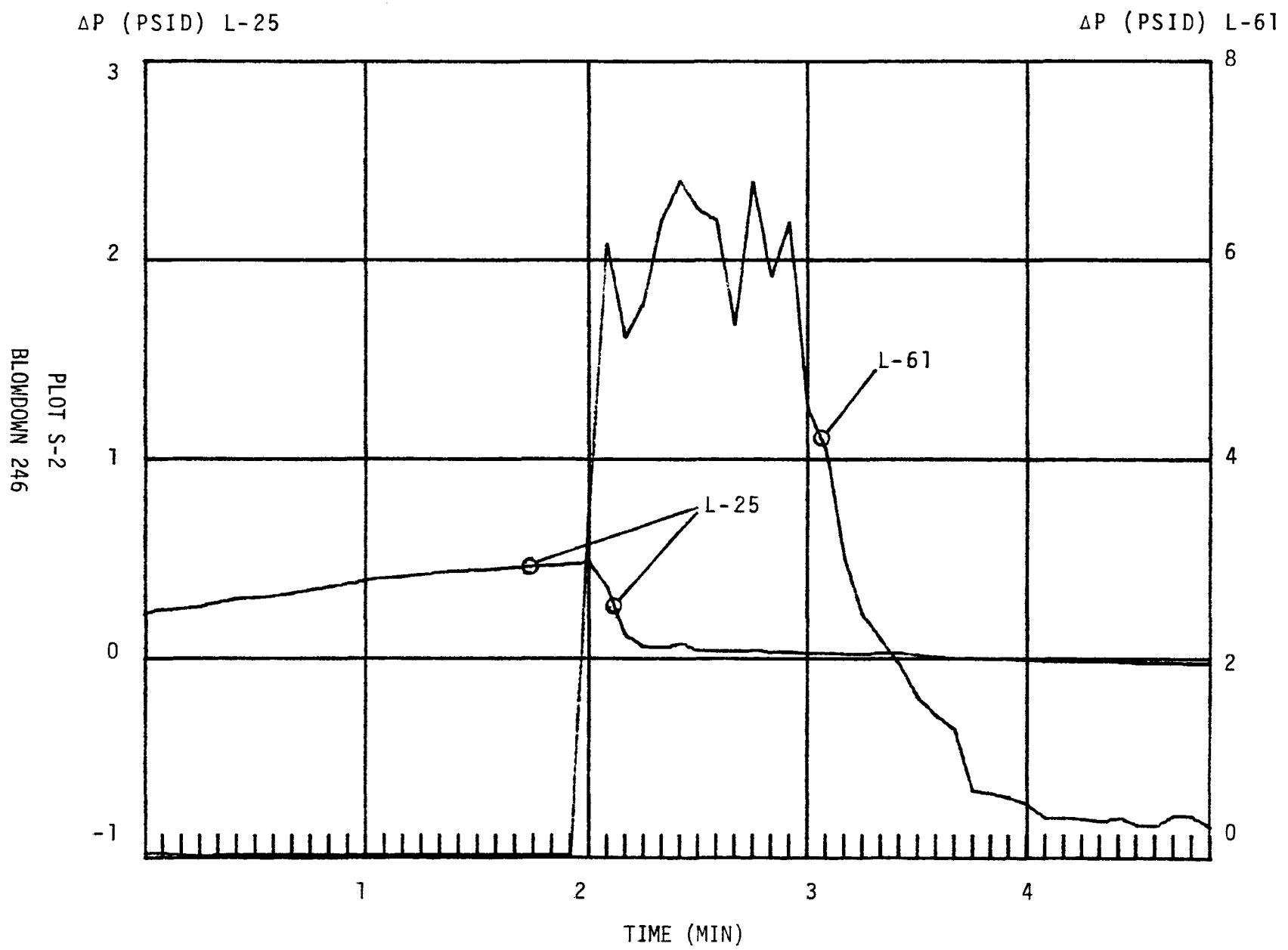
Index Listing
of
SCANNER DATA PLOTS
Test Number (246)

Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
	L-50	Main Water Orifice Thermocouple
S-1A	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

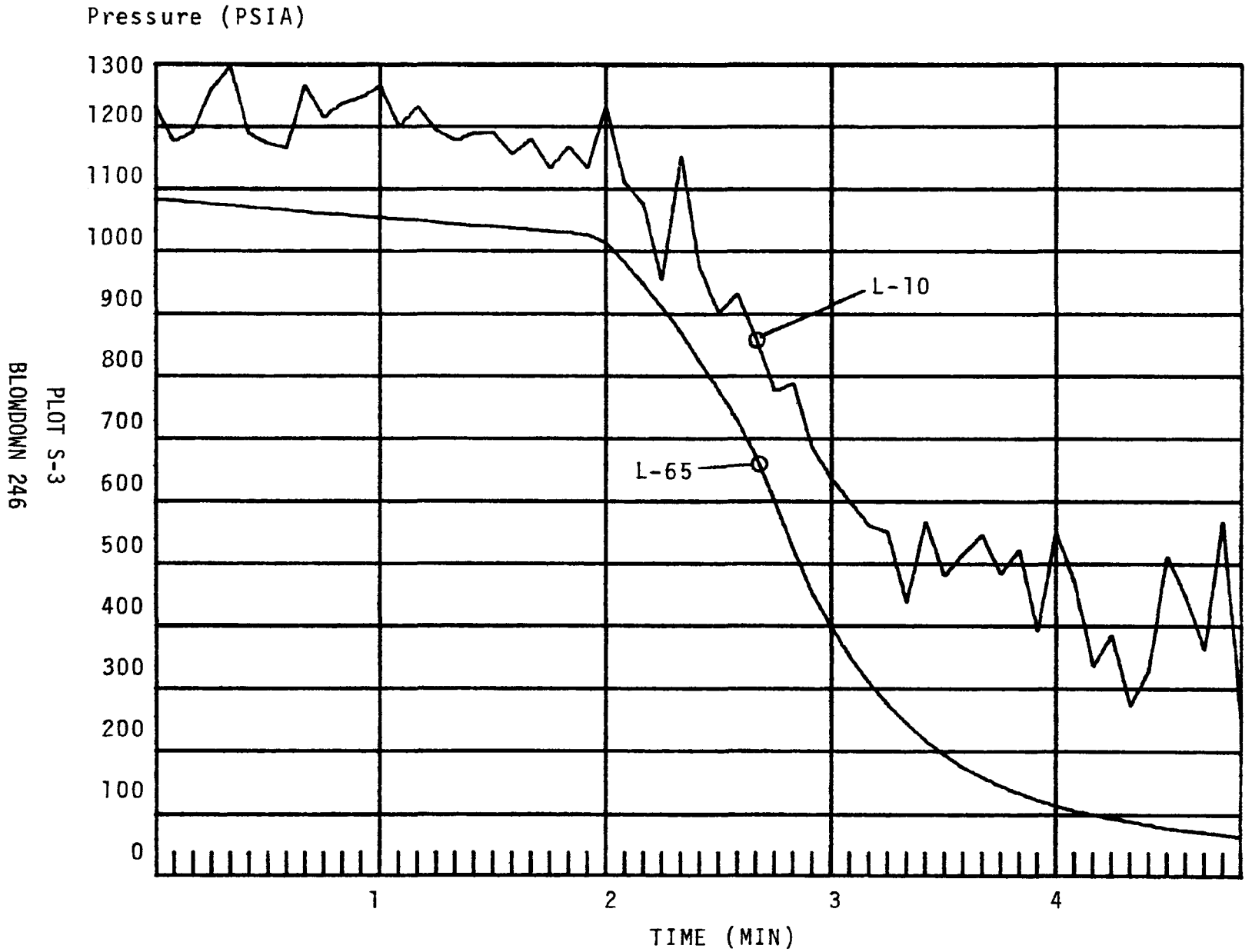


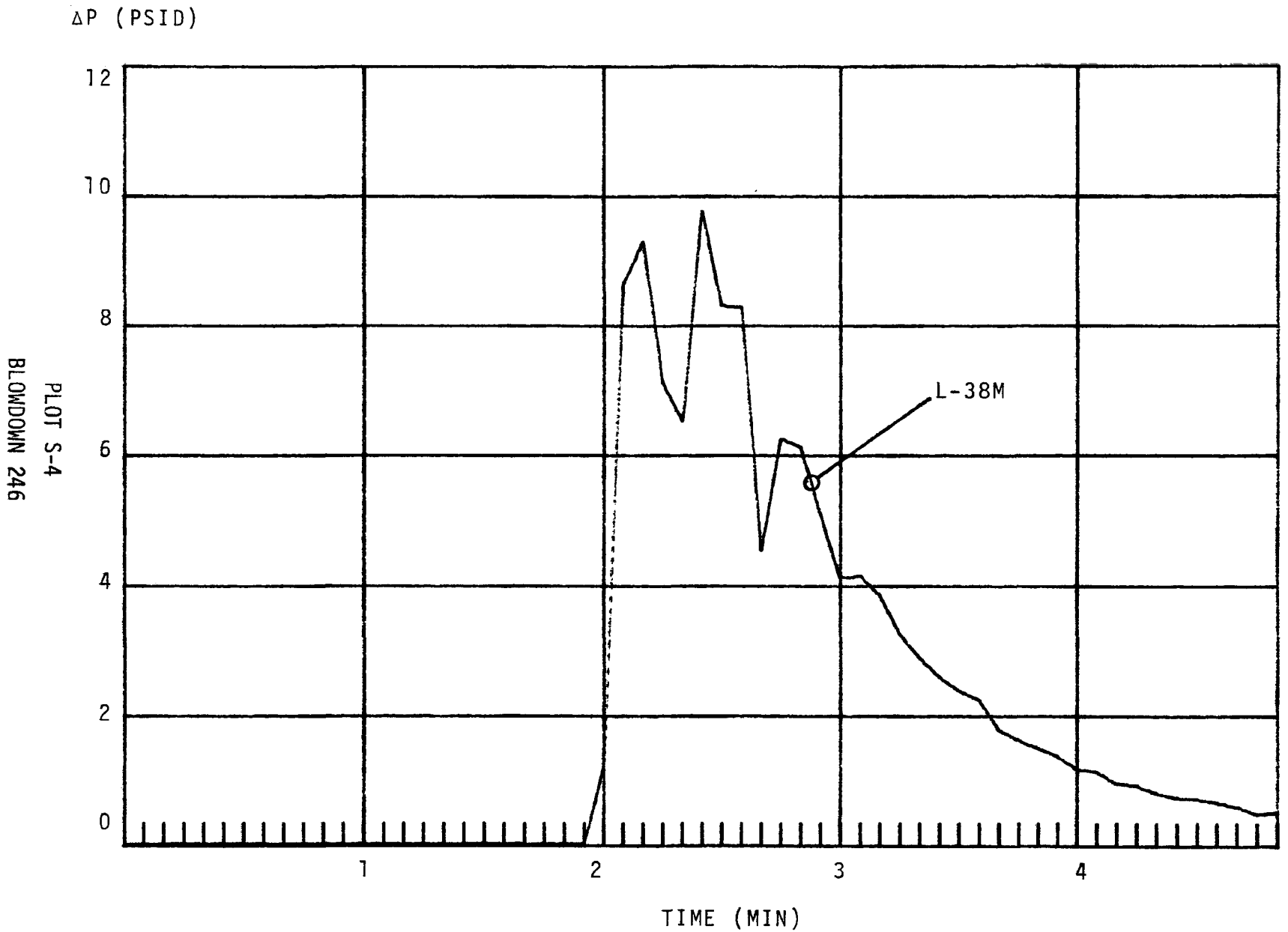
PLOT S-1
BLOWDOWN 246

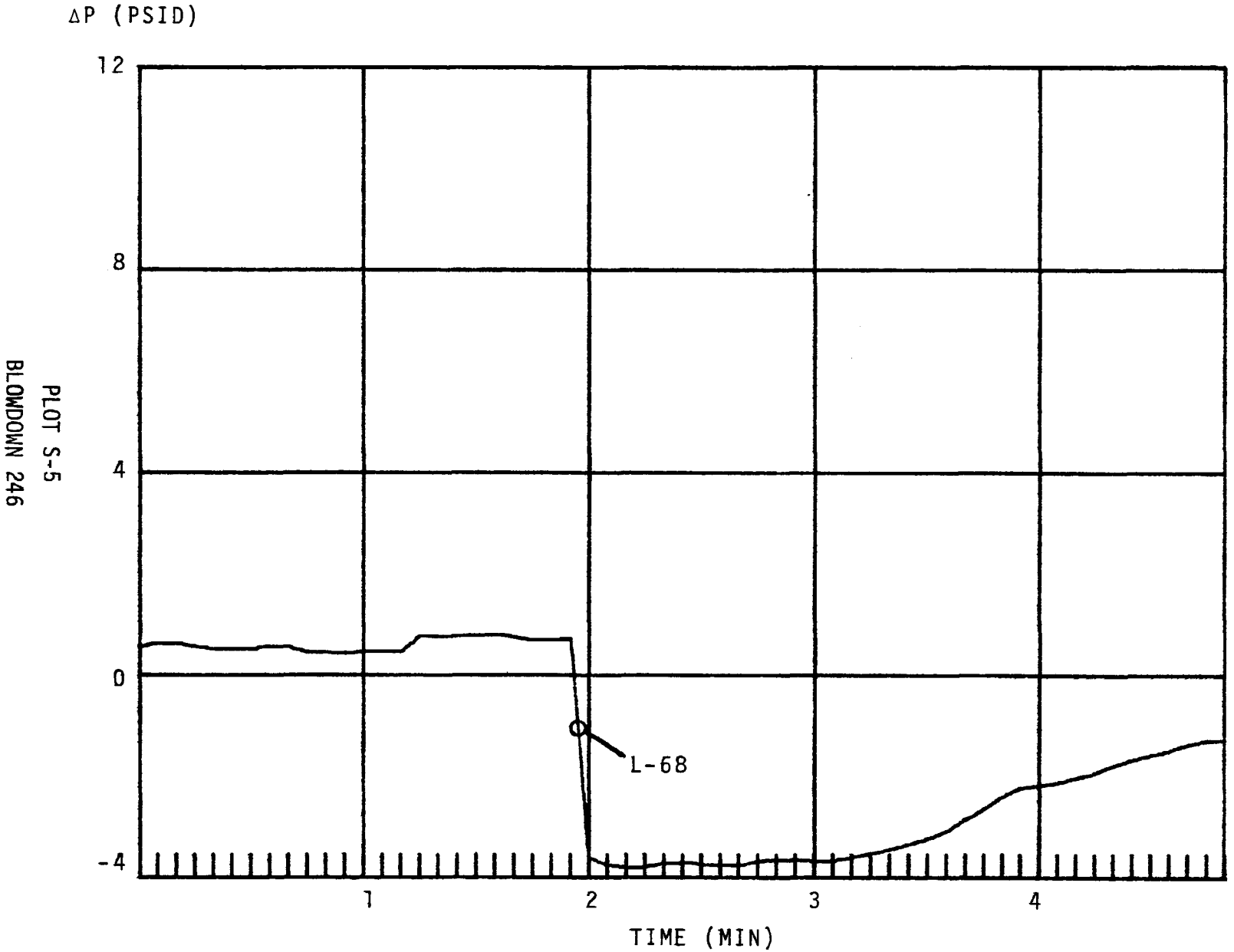

Temperature (°F)
250
200
150
100
50
0
L-22
L-21
1
2
3
4
TIME (MIN)
PLOT S-1A
BLOWDOWN 246



PLOT S-2
BLOWDOWN 246


Pressure (PSIA)
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
L-10
L-65
1
2
3
4
TIME (MIN)
BLOWDOWN 246
PLOT S-3


ΔP (PSID)
12
10
8
6
4
2
0
1
2
3
4
TIME (MIN)
L-38M
PLOT S-4
BLOWDOWN 246


ΔP (PSID)
12
8
4
0
-4
1
2
3
4
TIME (MIN)
L-68
PLOT S-5
BLOWDOWN 246

SYSTEM CONFIGURATION

Test Number 252

Break Location	Discharge	
Break Size	10.13	in^2
	36	% of 6 in. diameter inlet area of pump
Mixing Plate	In	
Pump Mode	Free-Wheeling	

COMMENTS

1. Malfunctioning or Inoperable Instruments: None
2. Other Comments : None
3. Affected FM Data Plots : None

INITIAL CONDITIONS

t = 70 Sec[a]

Test Number 252

System Pressures

High Pressure Drum	969.8	psia
Suction Instrument Spool	922.2	psia
Discharge Instrument Spool	981.3	psia

Fluid Temperatures

Suction Instrument Spool	537.0	°F
Discharge Instrument Spool	543.0	°F

Fluid Density

Suction Instrument Spool	46.79	lbm/ft^3
Discharge Instrument Spool	46.41	lbm/ft^3

System Flows

Mass Flow Rate	244	lb/sec
Suction Volumetric Flow Rate	2341	gpm
Discharge Volumetric Flow Rate	2355	gpm
Suction Normalized Volumetric Flow Rate	0.67	
Discharge Normalized Volumetric Flow Rate	0.67	
Suction Fluid Velocity	28.81	ft/sec
Discharge Fluid Velocity	28.98	ft/sec
Suction Momentum Flux	38850	$lbm/ft\ sec^2$
Discharge Momentum Flux	38997	$lbm/ft\ sec^2$

Pump Performance

Pump head	52.36	psi
	161.0	ft
Pump Speed	4511	rpm
Pump Shaft Torque	186.0	ft lb
Pump Hydraulic Torque	161.2	ft lb

System Mass (t = 80 Sec)[a]

High Pressure Drum Level	47.3	in[b]
Fluid Mass Upstream of Test Pump	13,613	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 252

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-6.5	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	c	c
HPSW-1 Closed	c	c
Pump Power Trip	11.9	80
Initiate Rupture Mechanism	10.0	c
Blowdown Starts	12.1	80
End of Digitized Data 20 s/sec	683.0	-
200 s/sec	304.0	-
FM Recording System Off	858.0	-
Scanner System Off	-	380

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

Index Listing

of

FM DATA PLOTS

Test Number (252)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 SUC.
25	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 DISCH.
26	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 SUC.
27	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 DISCH.
28	L-28	Norm. Vol. Flow Rate HI-TM Suction
29	L-29	Norm. Vol. Flow Rate HI-TM Discharge

Index Listing

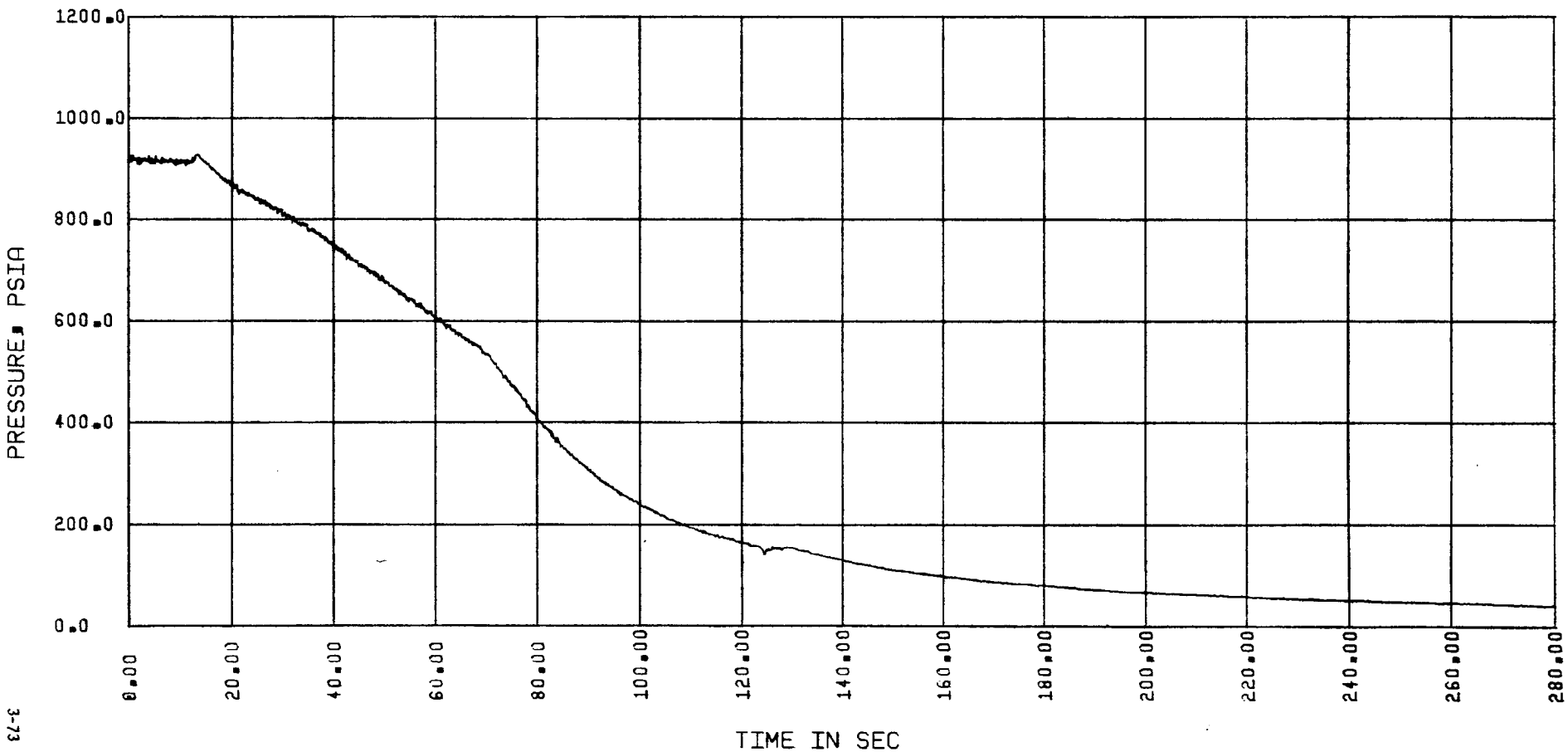
of

FM DATA PLOTS (Cont'd.)

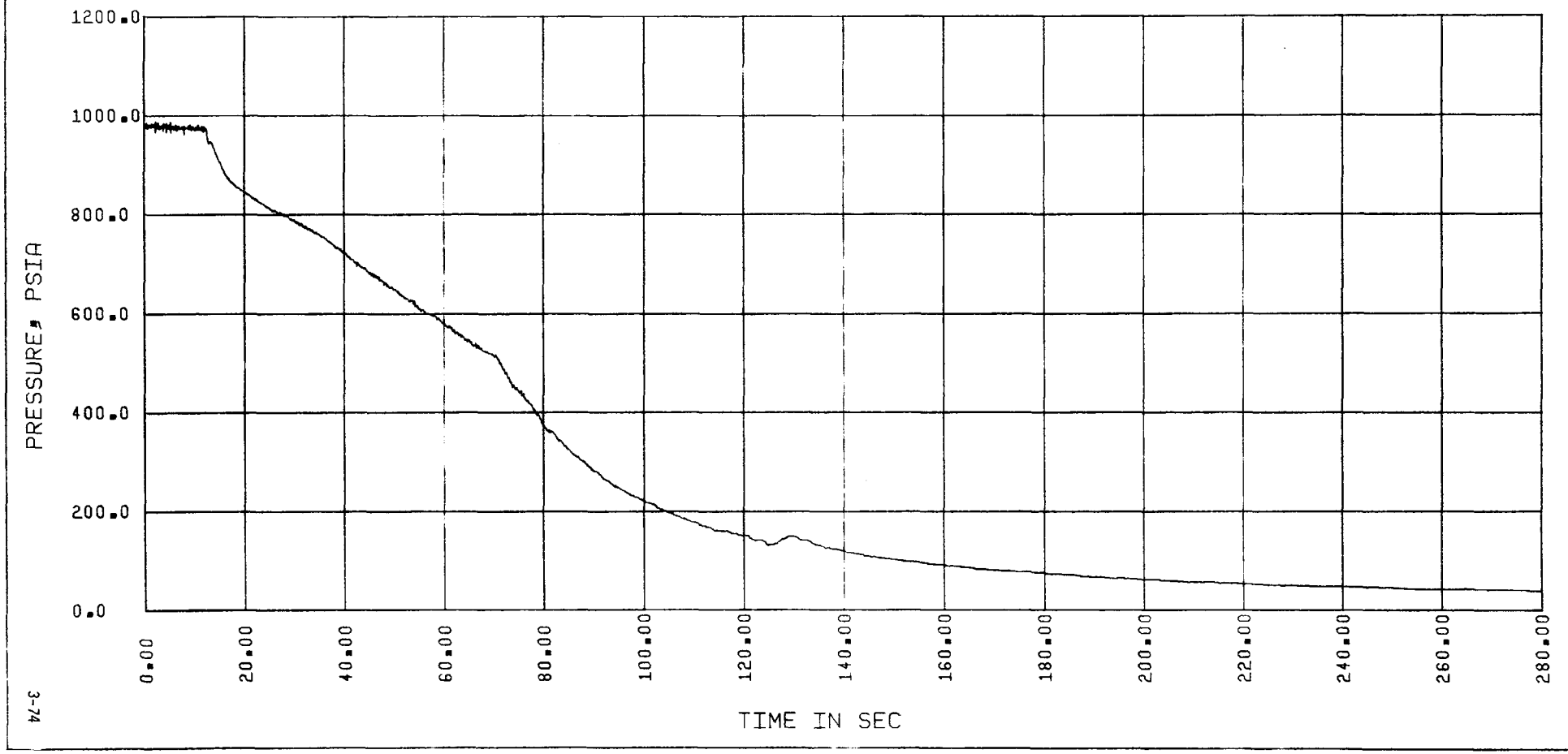
Test Number (252)

Plot Number	Location Number	Description of Parameter
30	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
31	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
32	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
33	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
34	L-16/L-28	Momentum Flux GD2/HI-TM Suction
35	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
36	L-1	Momentum Flux HI-DD Suction
37	L-2	Momentum Flux HI-DD Discharge
38	L-26	Momentum Flux LO-DD Suction
39	L-27	Momentum Flux LO-DD Discharge
40	L-7	Pump Head in Psi
43	L-12	Norm. Pump Speed
44	L-11	Norm. Pump Shaft Torque
45	L-11/L-12	Norm. Pump Hydraulic Torque
46	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
47	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
48	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
49	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
51	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
52	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
55	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
56	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge

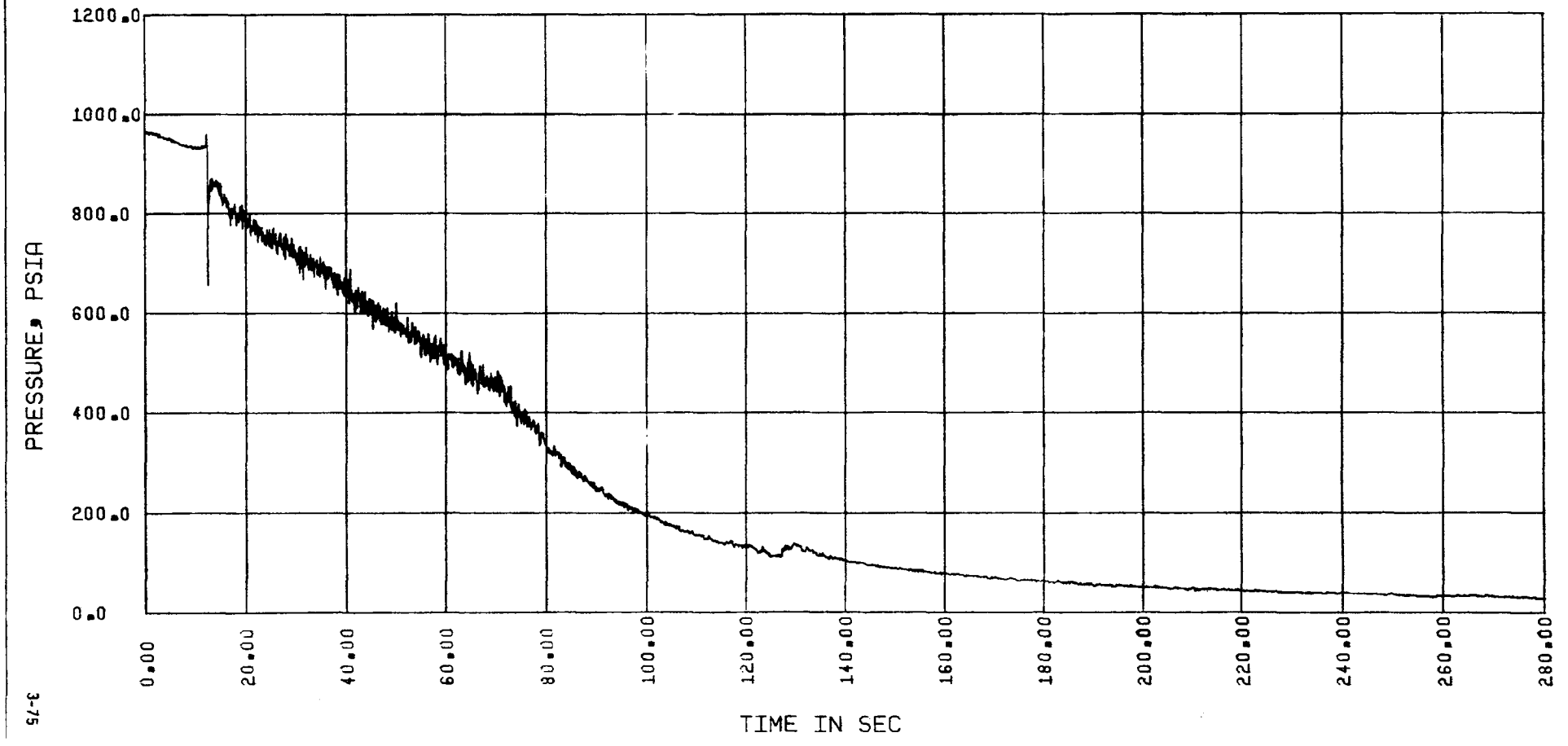
TEST 252/1000 PSIA FW FWD BDN
PUMP SUCTION PRESSURE
PLOT NO.1



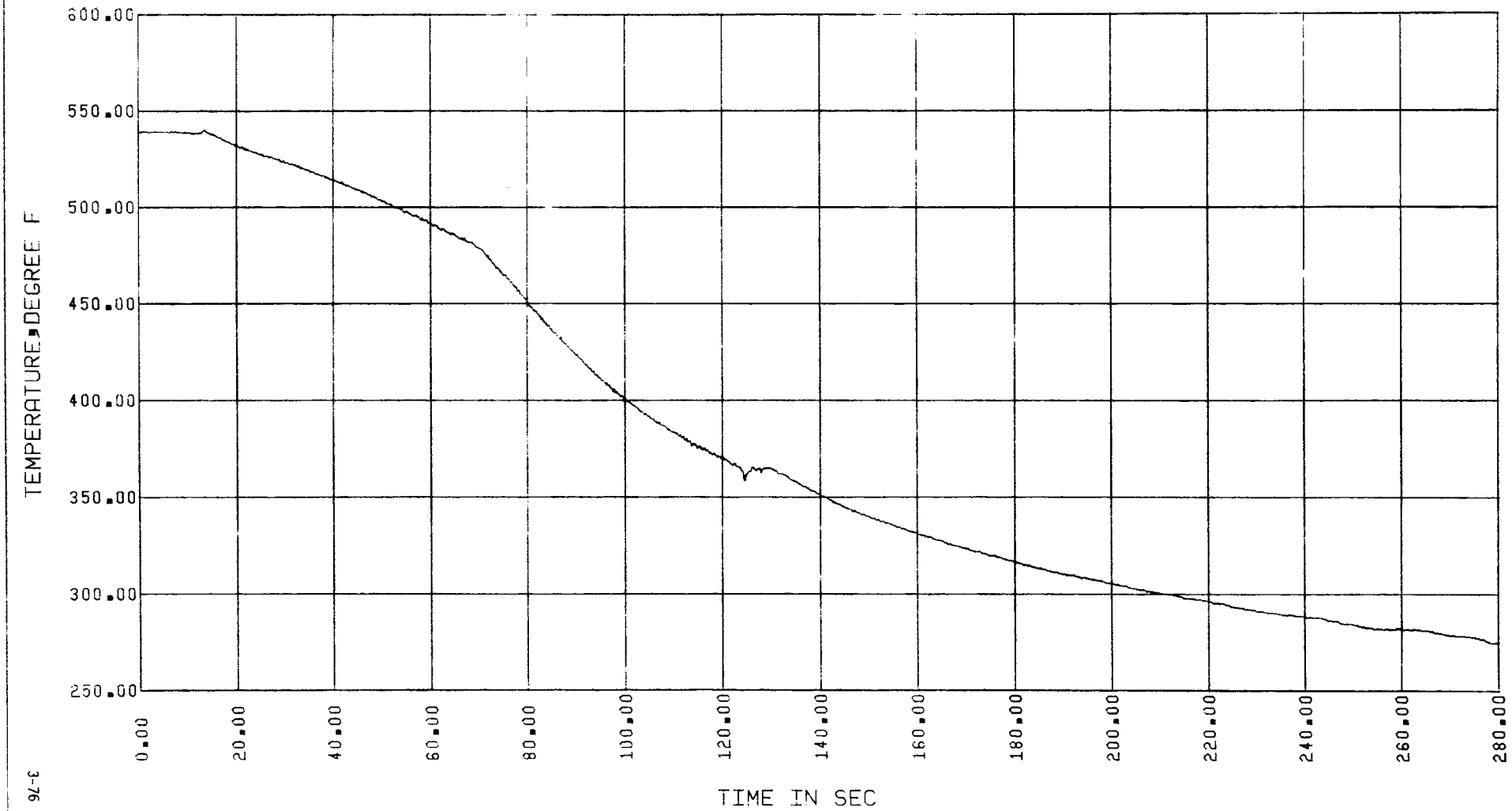
TEST 252/1000 PSIA FW FWD BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2



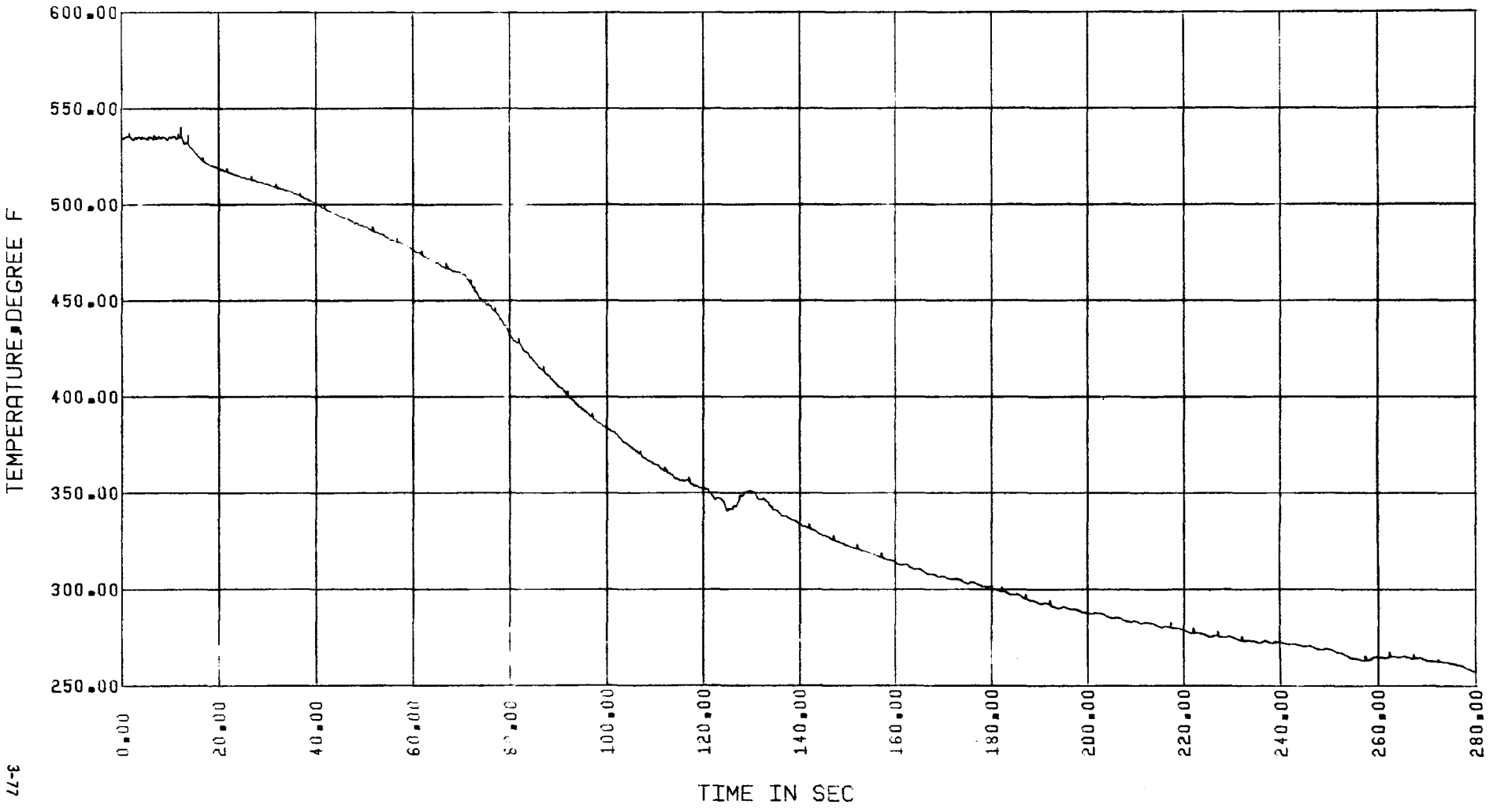
TEST 252/1000 PSIA FW FWD BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



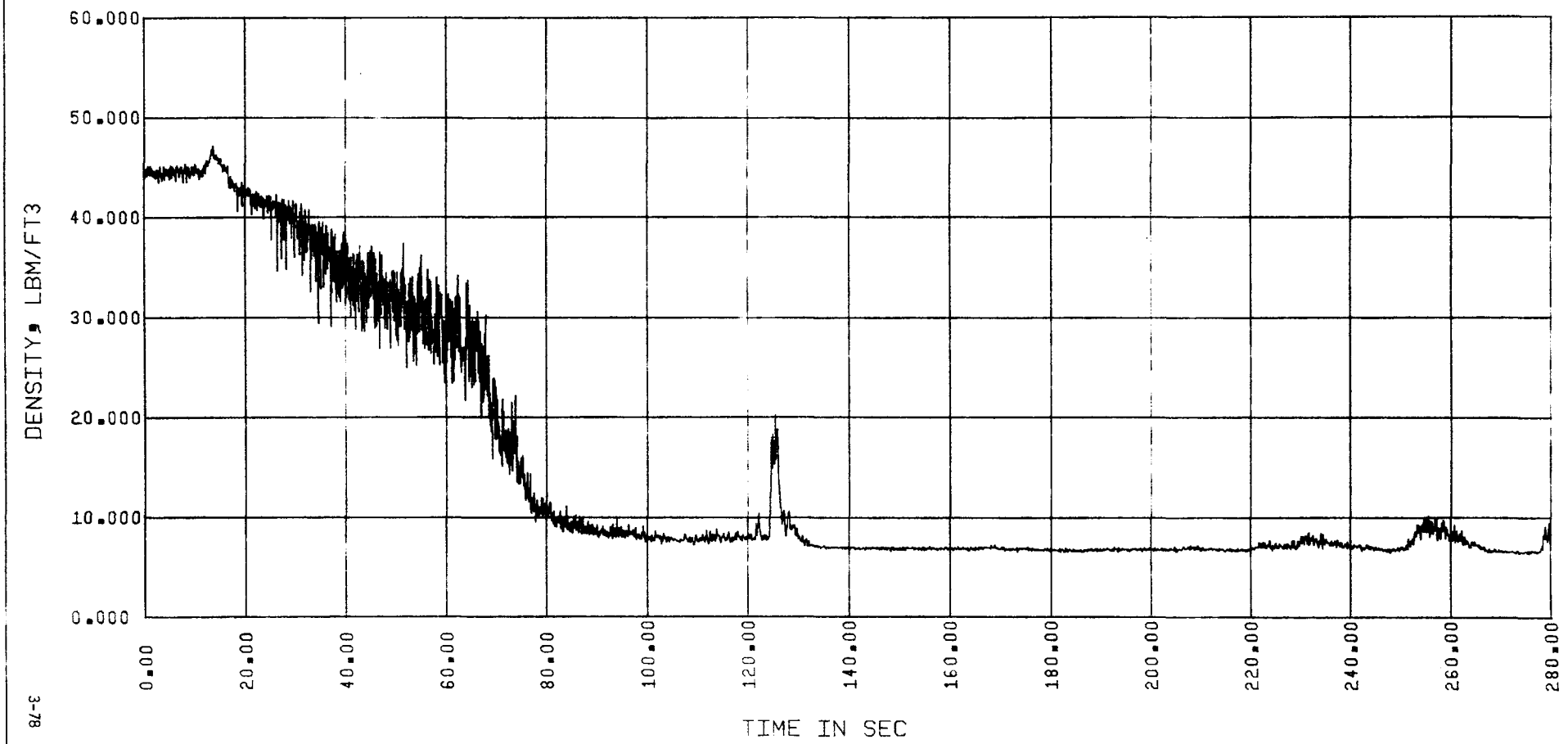
TEST 252/1000 PSIA FW FWD BDN
PUMP SUCTION TEMPERATURE
PLOT NO. 4



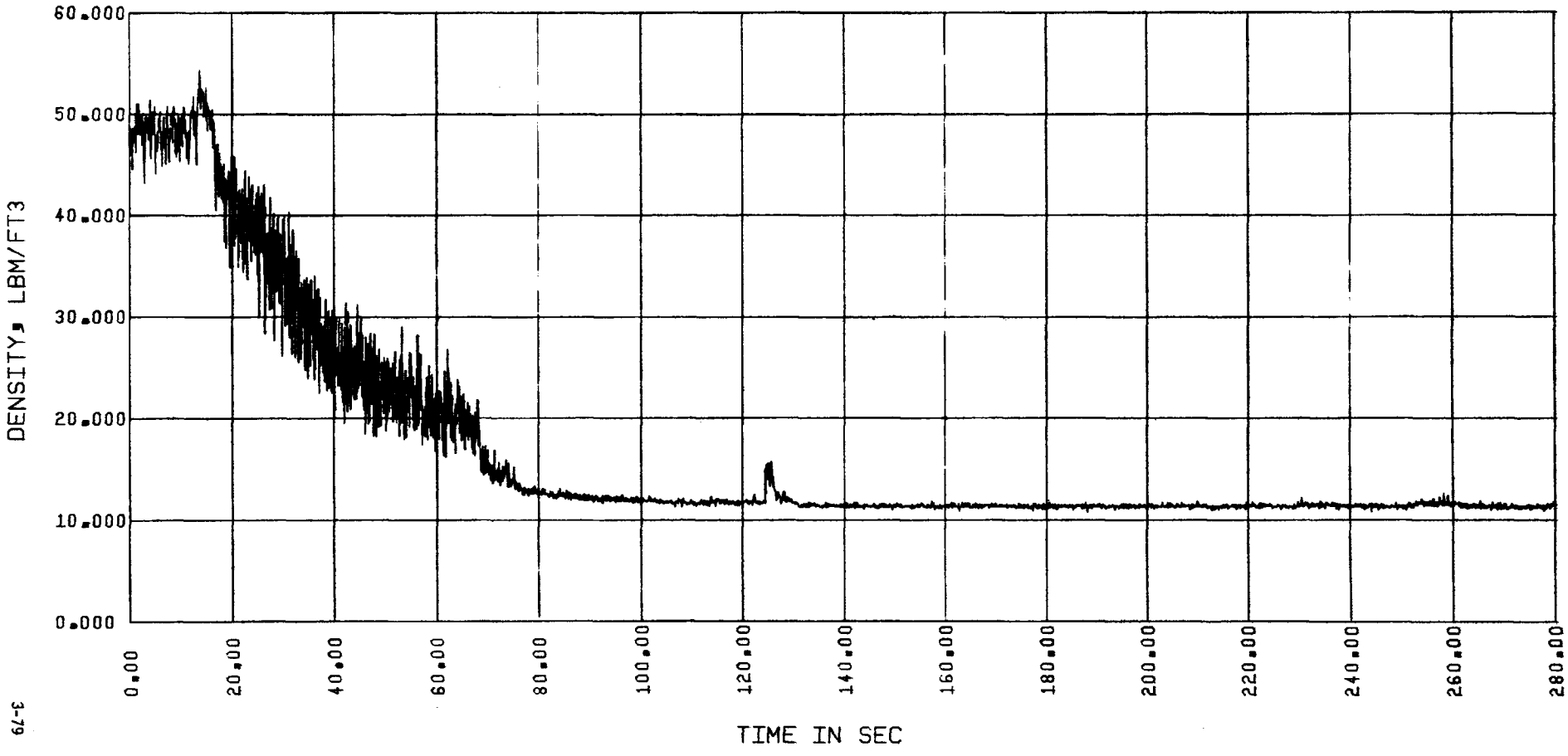
TEST 252/1000 PSIA FW FWD BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5



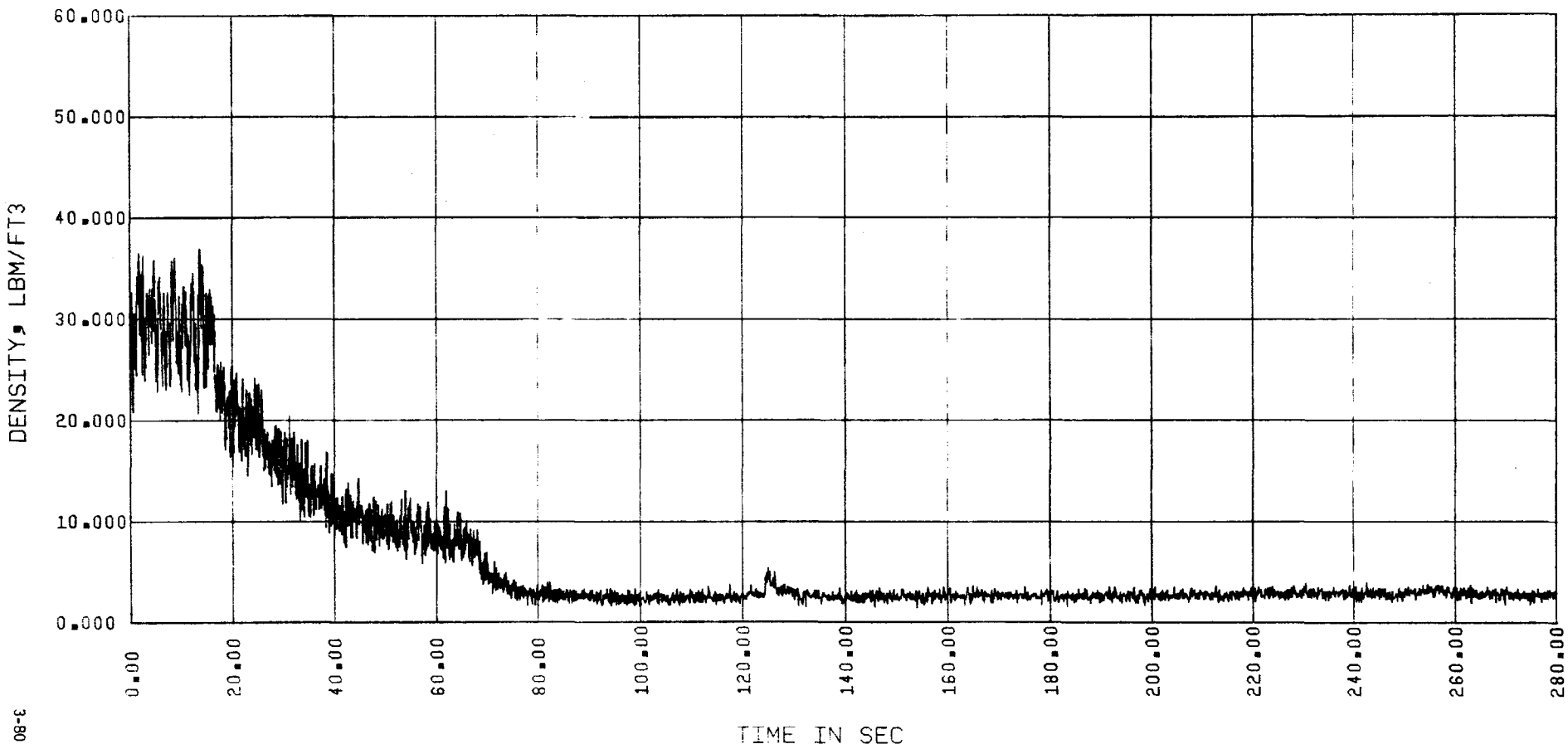
TEST 252/1000 PSIA FW FWD BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



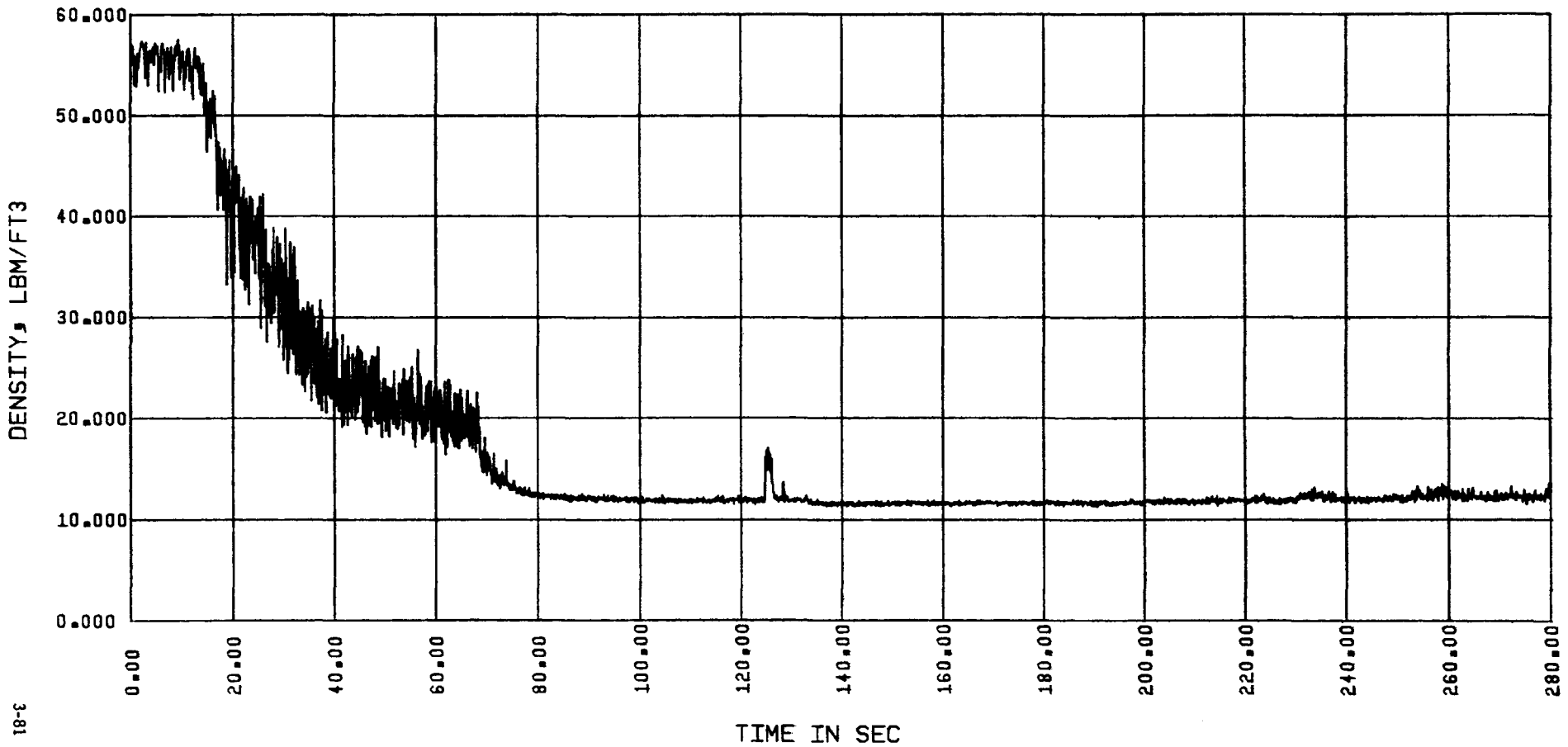
TEST 252/1000 PSIA FW FWD BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7



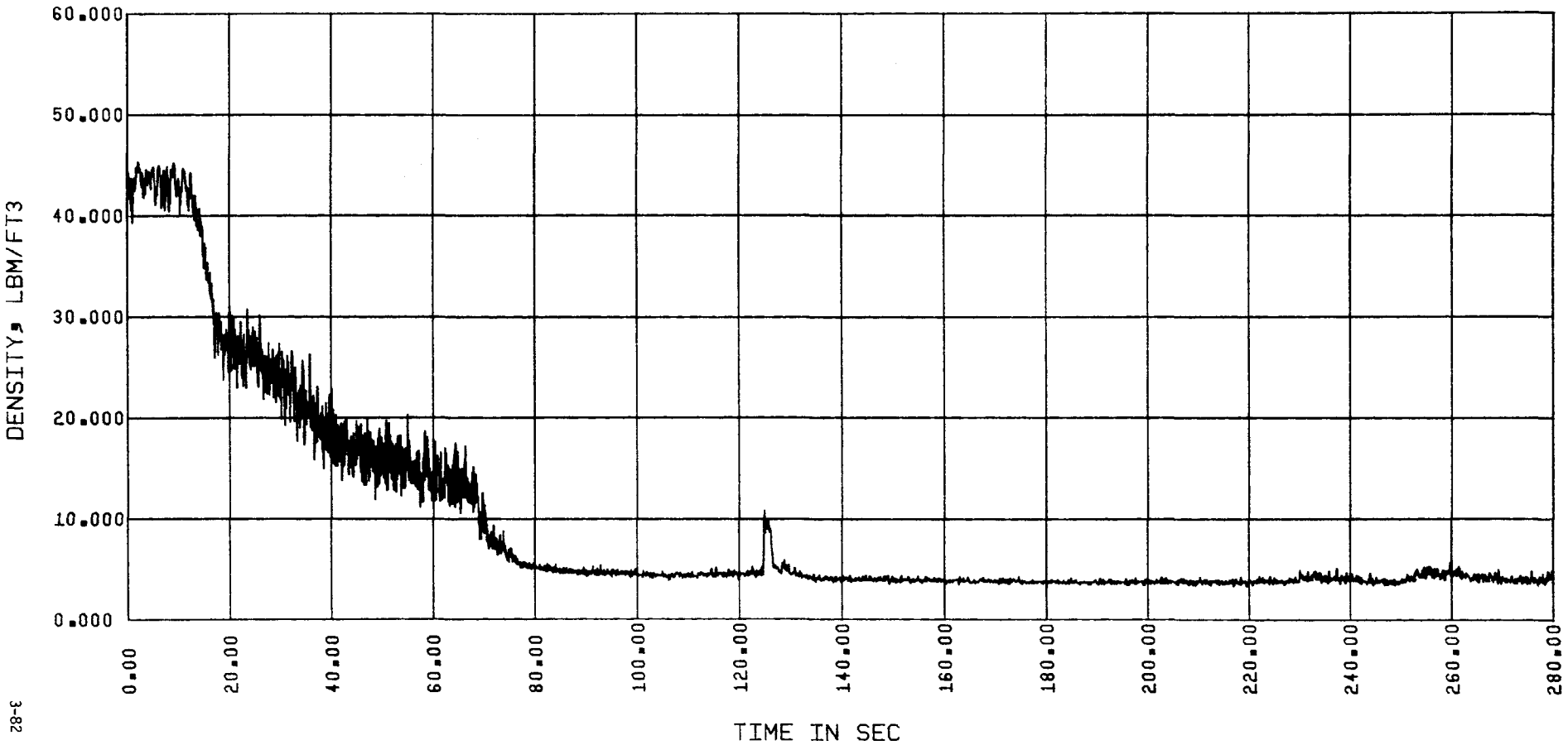
TEST 252/1000 PSIA FW FWD BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8



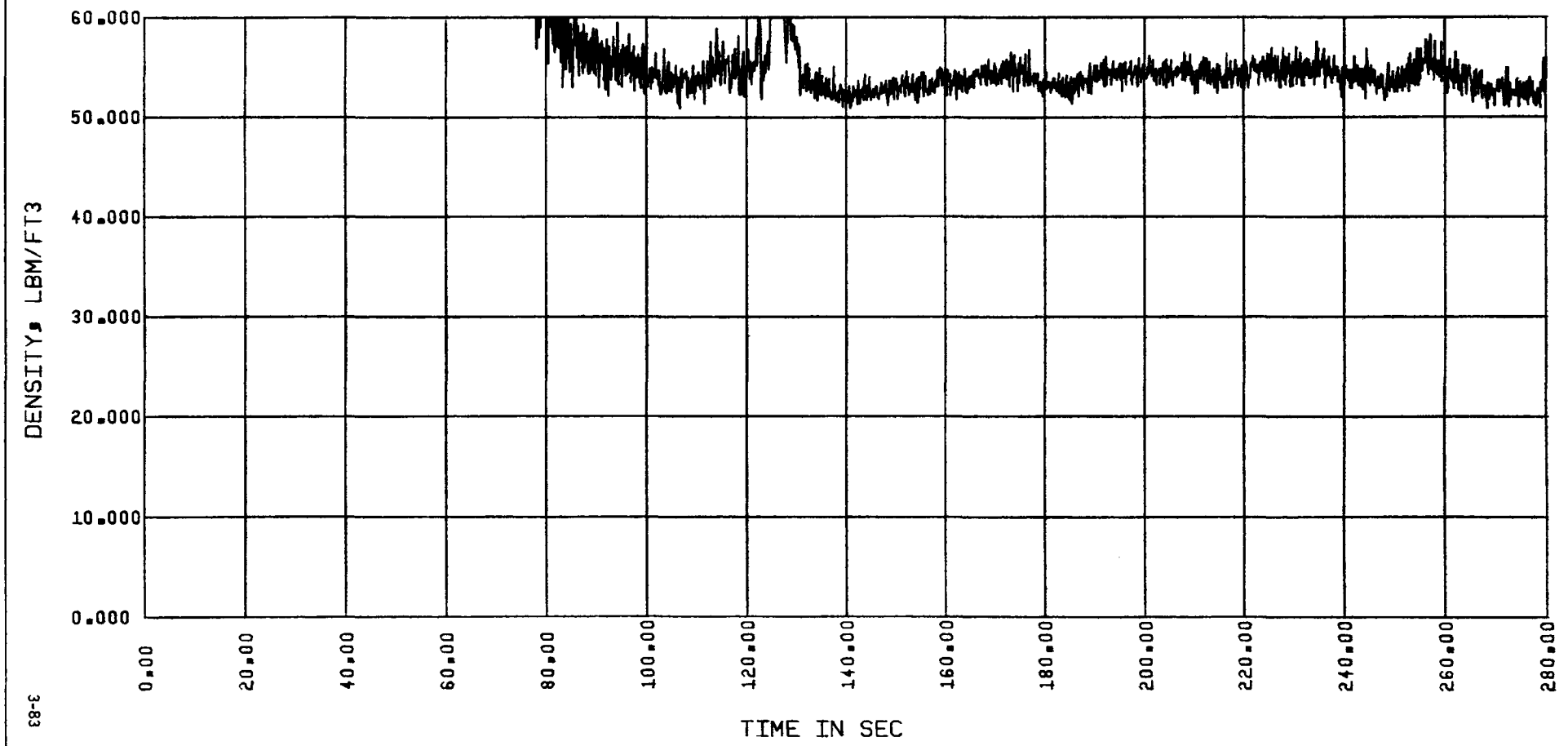
TEST 252/1000 PSIA FW FWD BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9



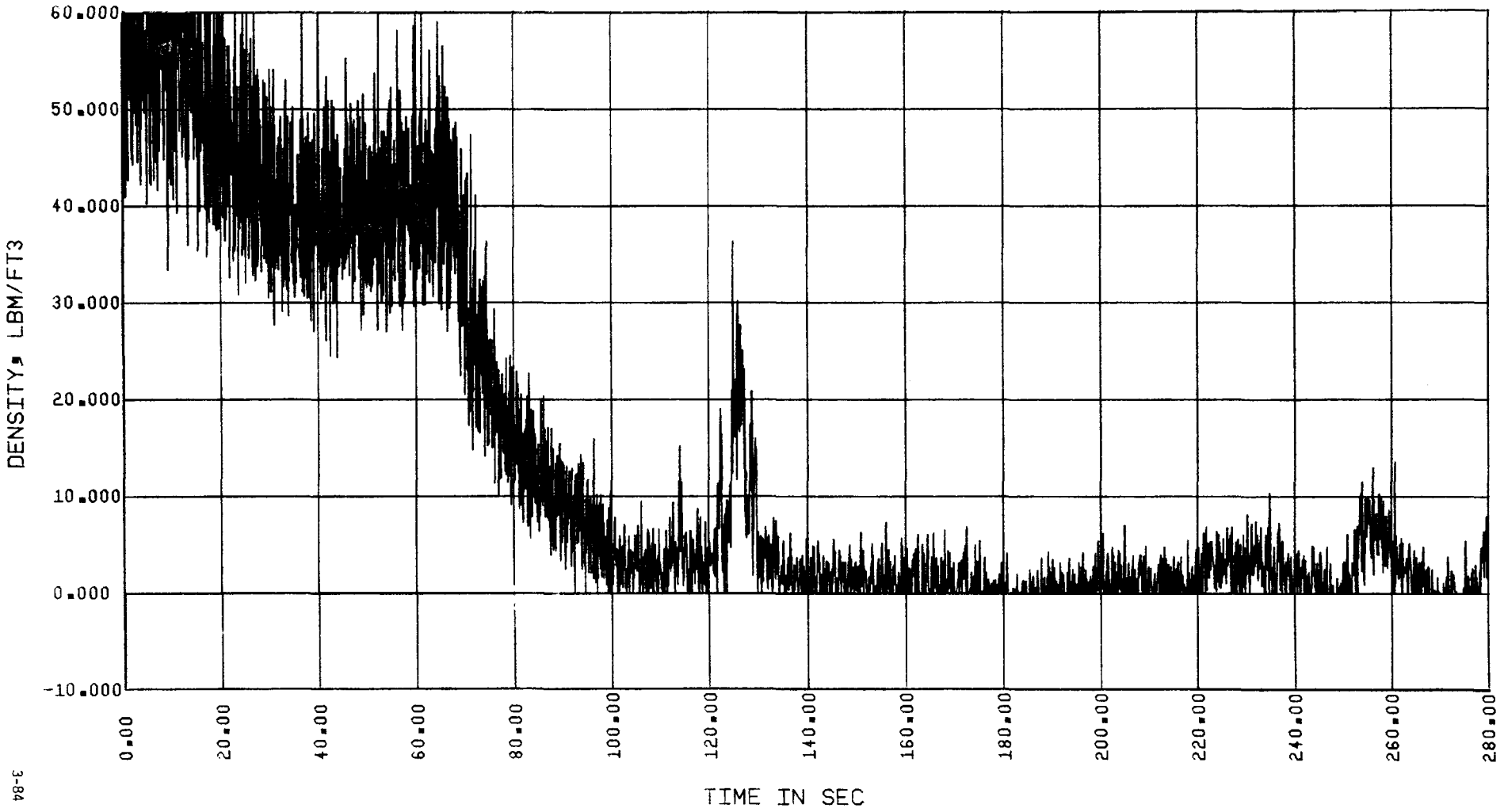
TEST 252/1000 PSIA FW FWD BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10



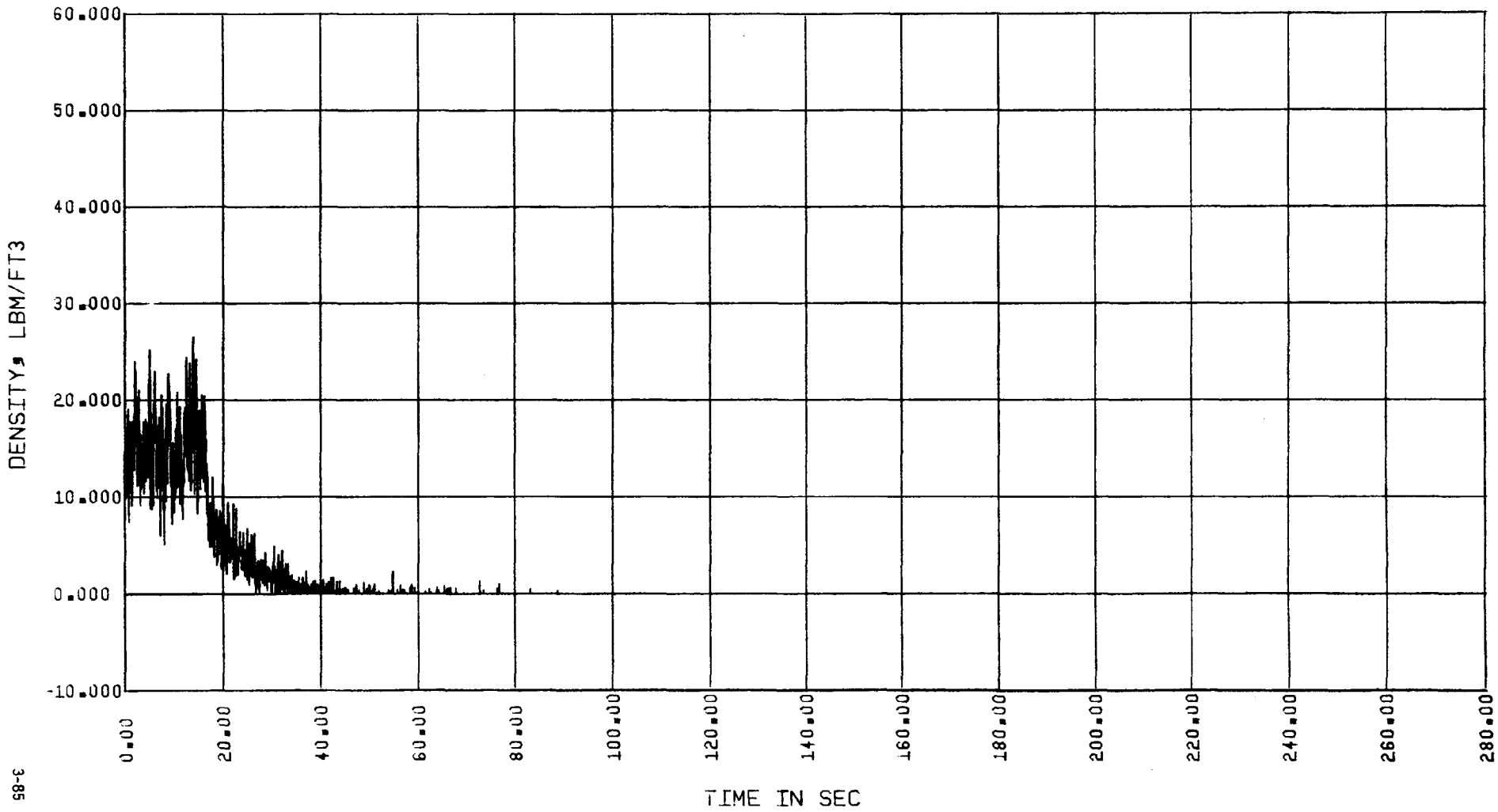
TEST 252/1000 PSIA FW FWD BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11



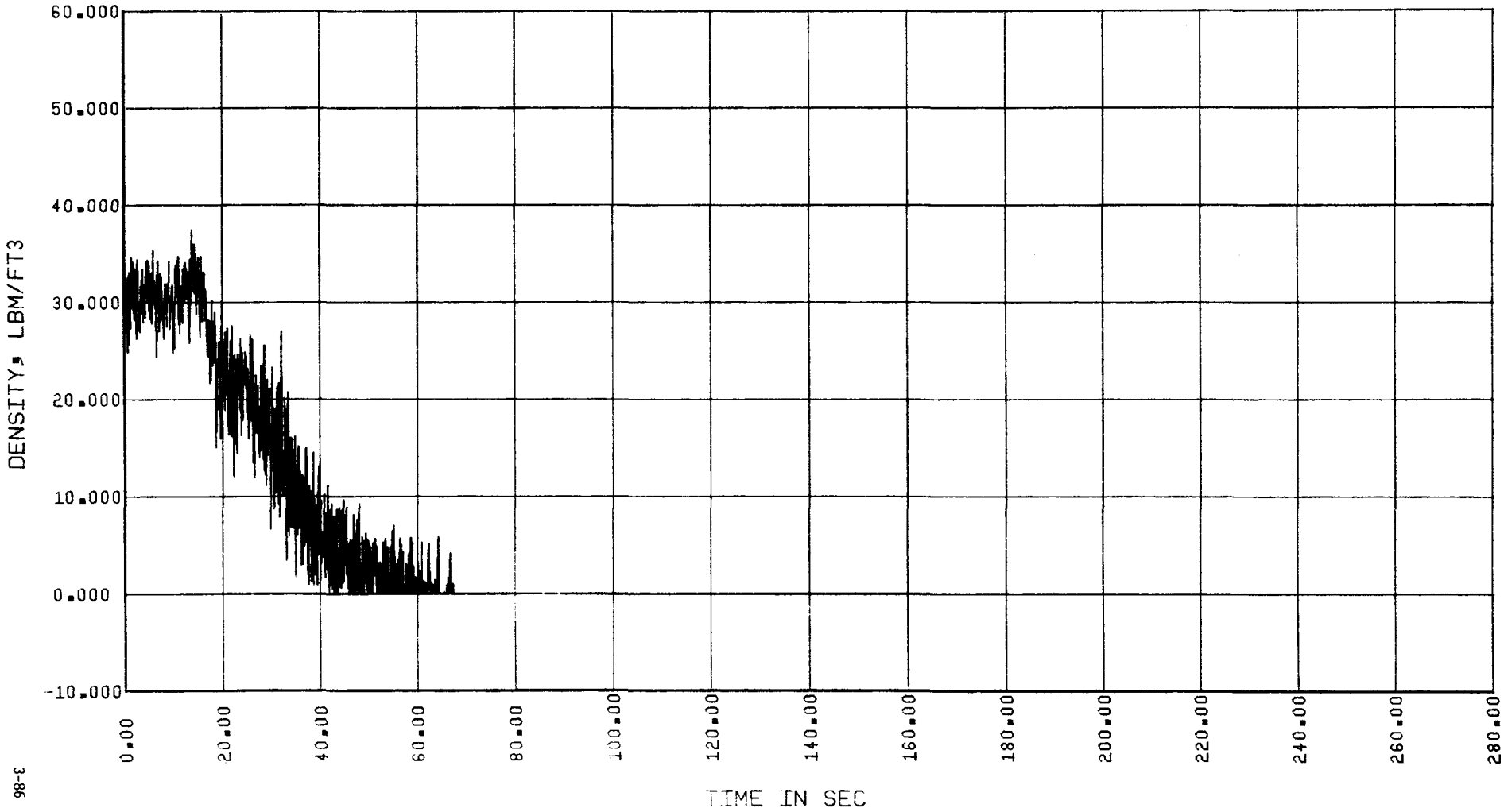
TEST 252/1000 PSIA FW FWD BDN
DENSITY BEAM1 AECL GD
PLOT NO.12



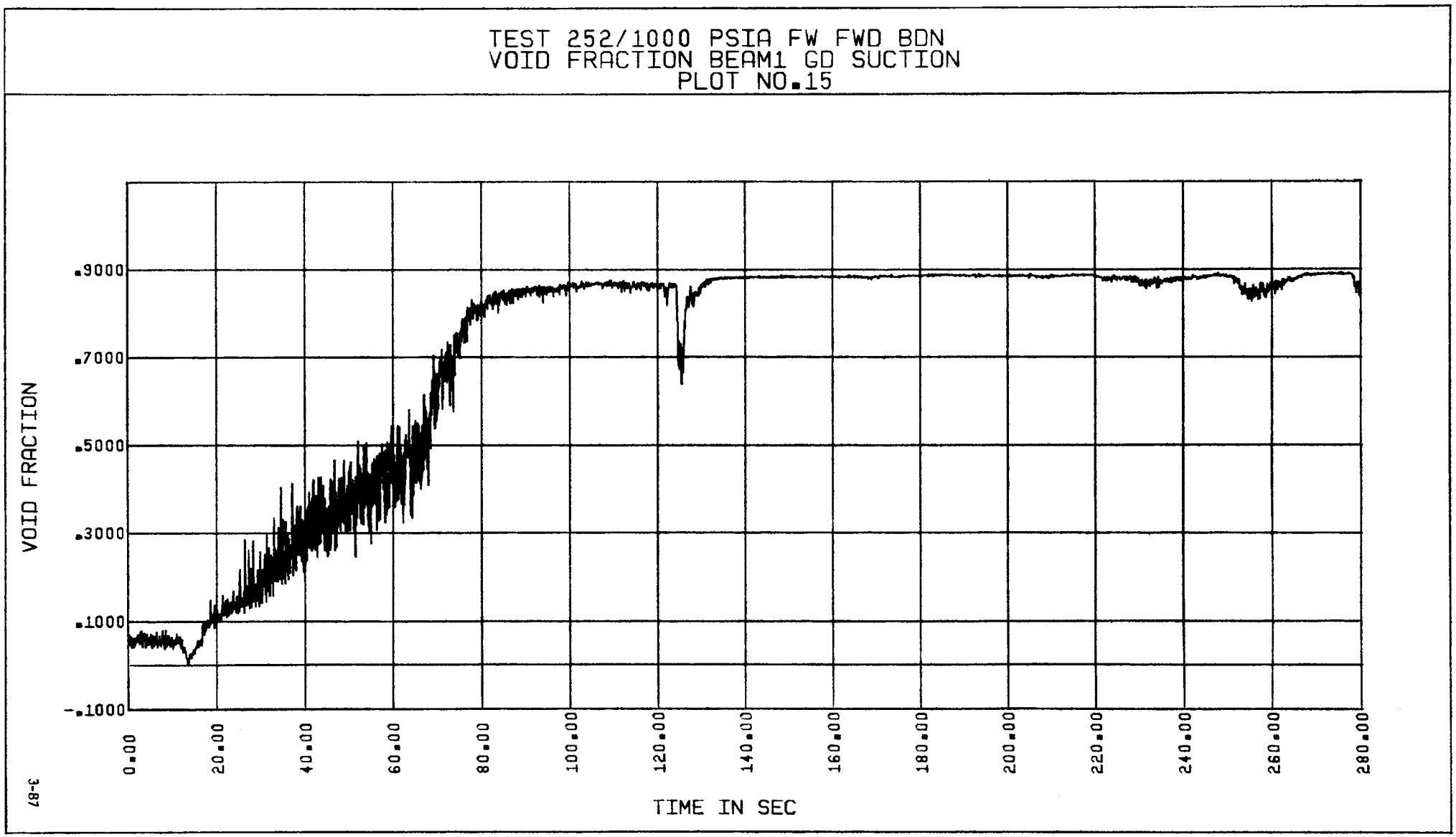
TEST 252/1000 PSIA FW FWD BDN
DENSITY BEAM2 AECL GD
PLOT NO. 13



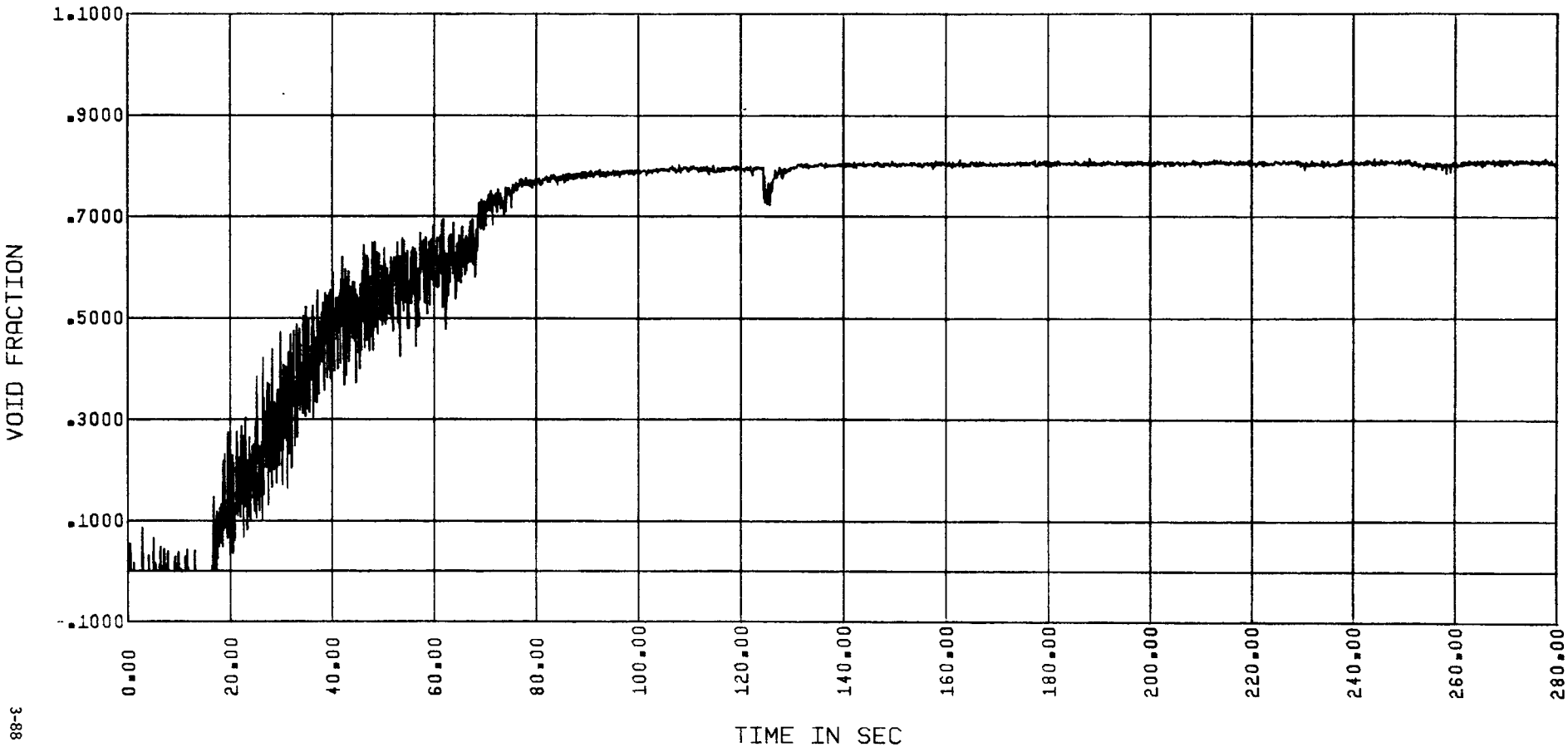
TEST 252/1000 PSIA FW FWD BDN
DENSITY BEAM3 AECL GD
PLOT NO. 14

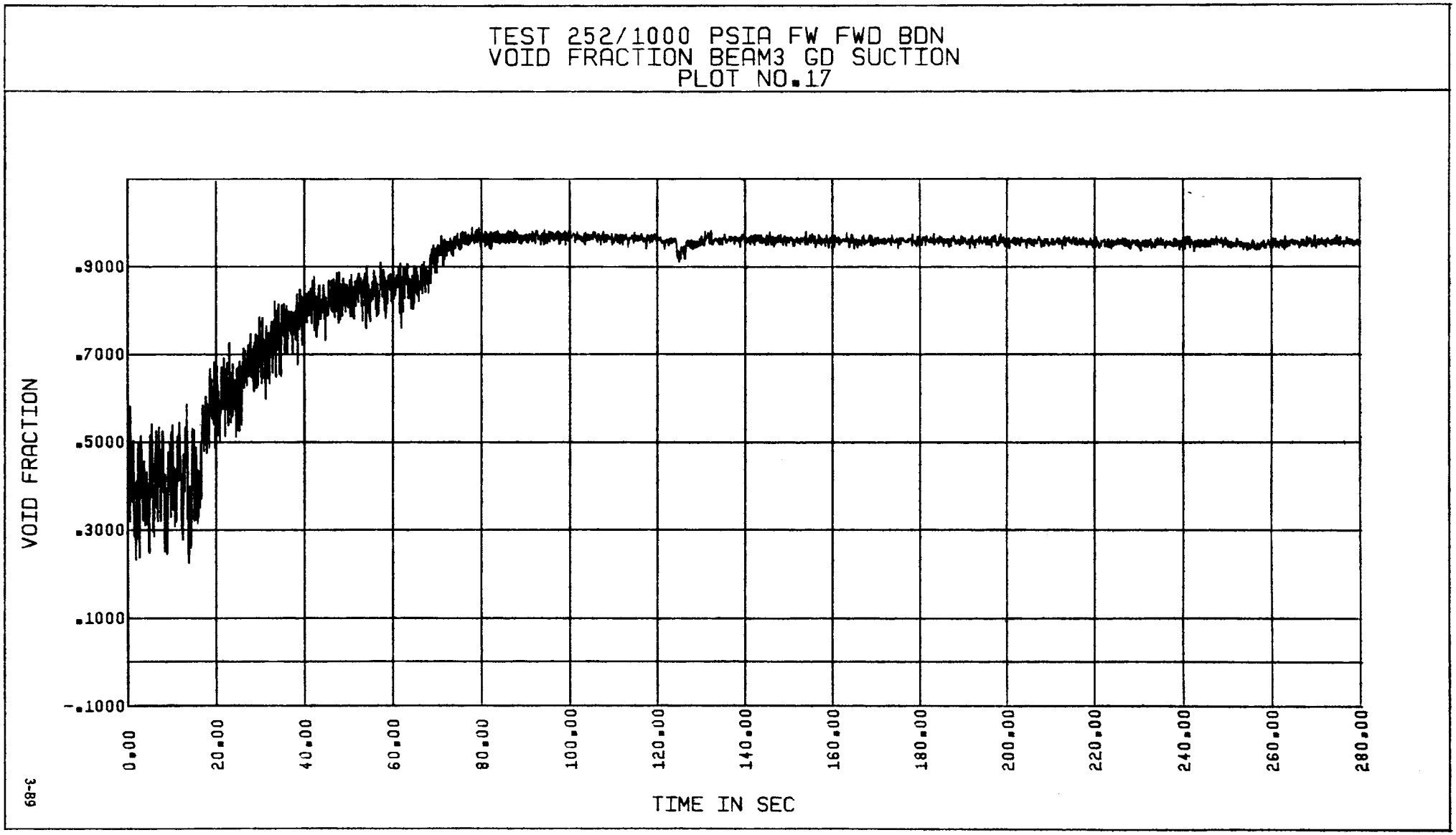


3-86

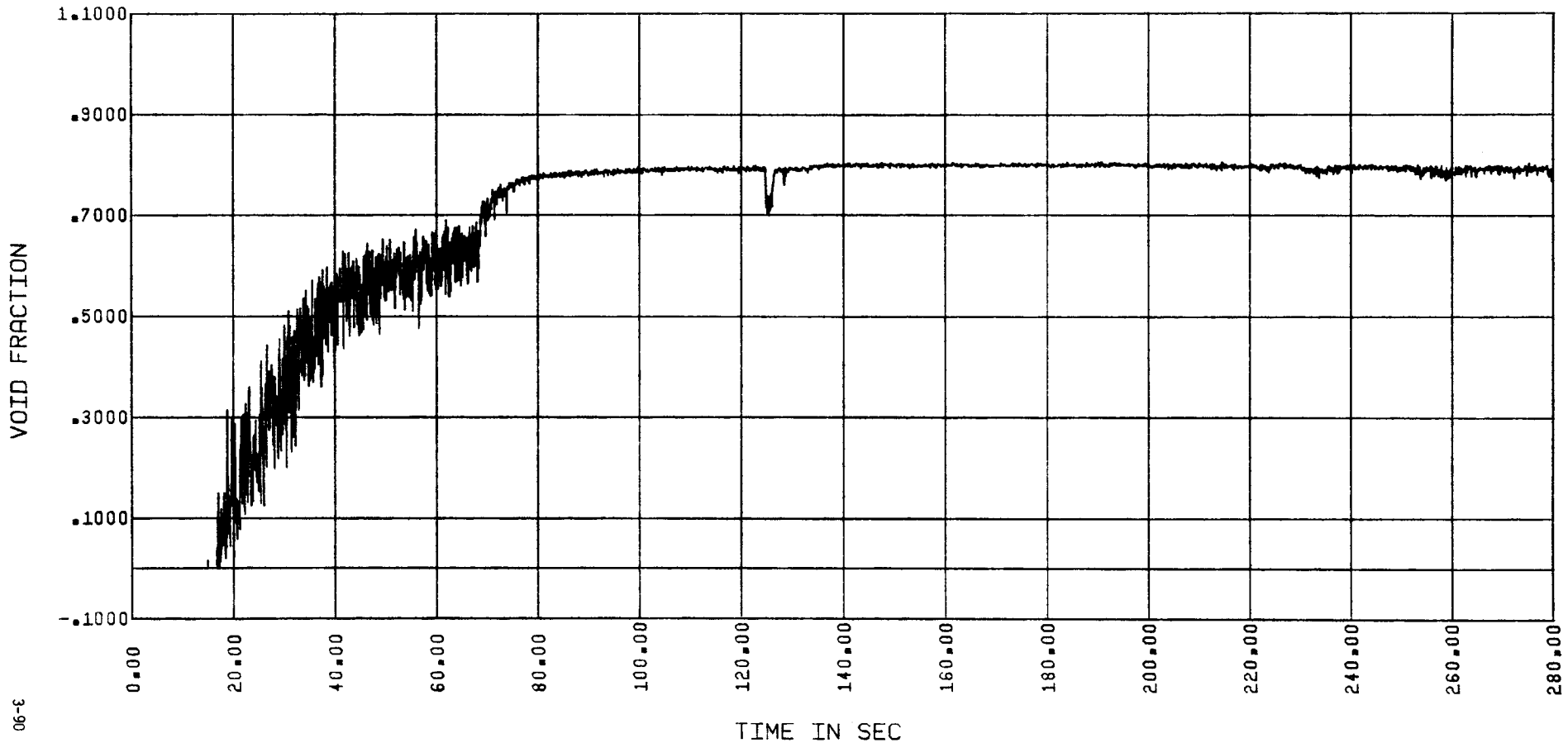

TEST 252/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

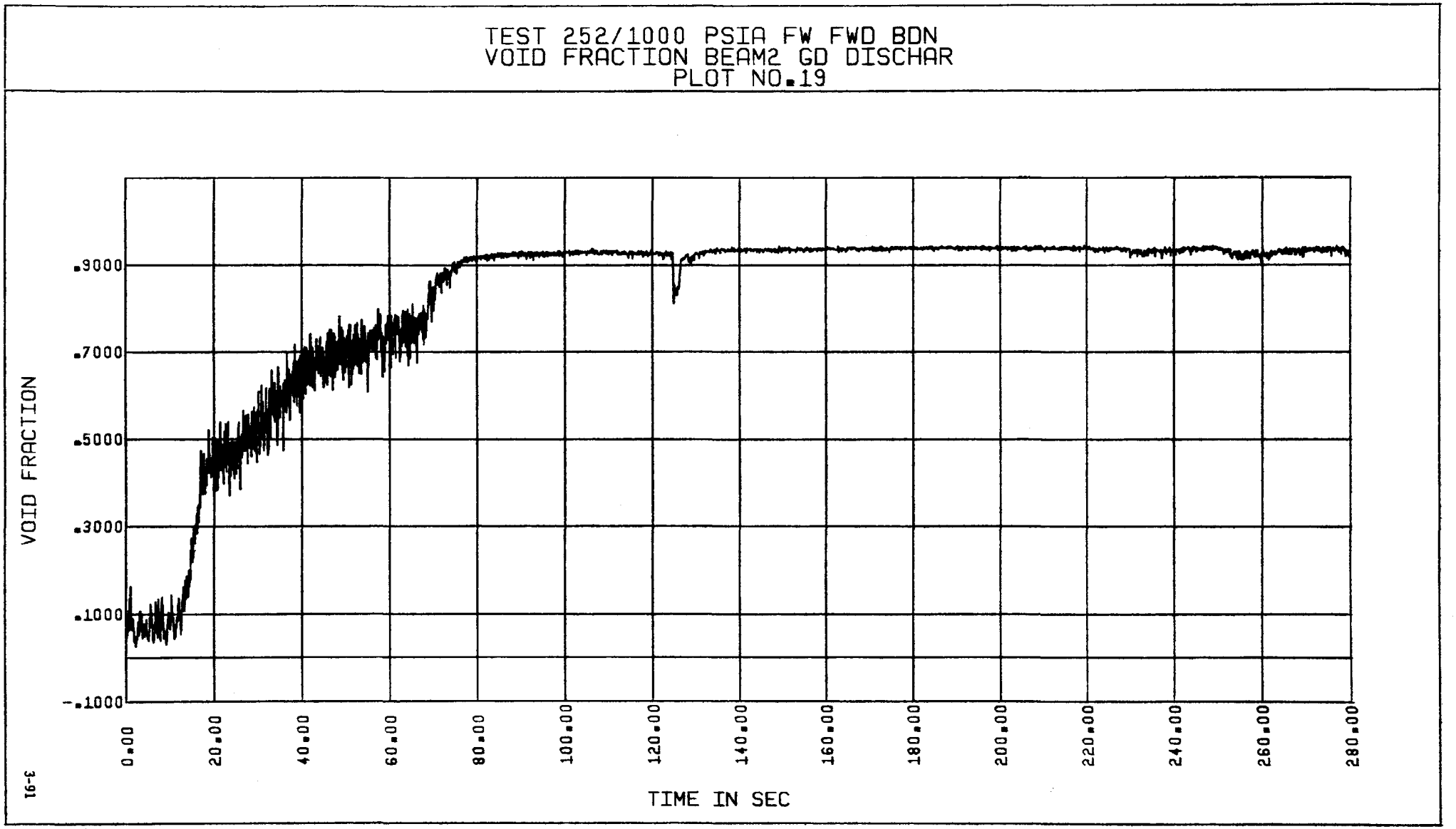
TEST 252/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16



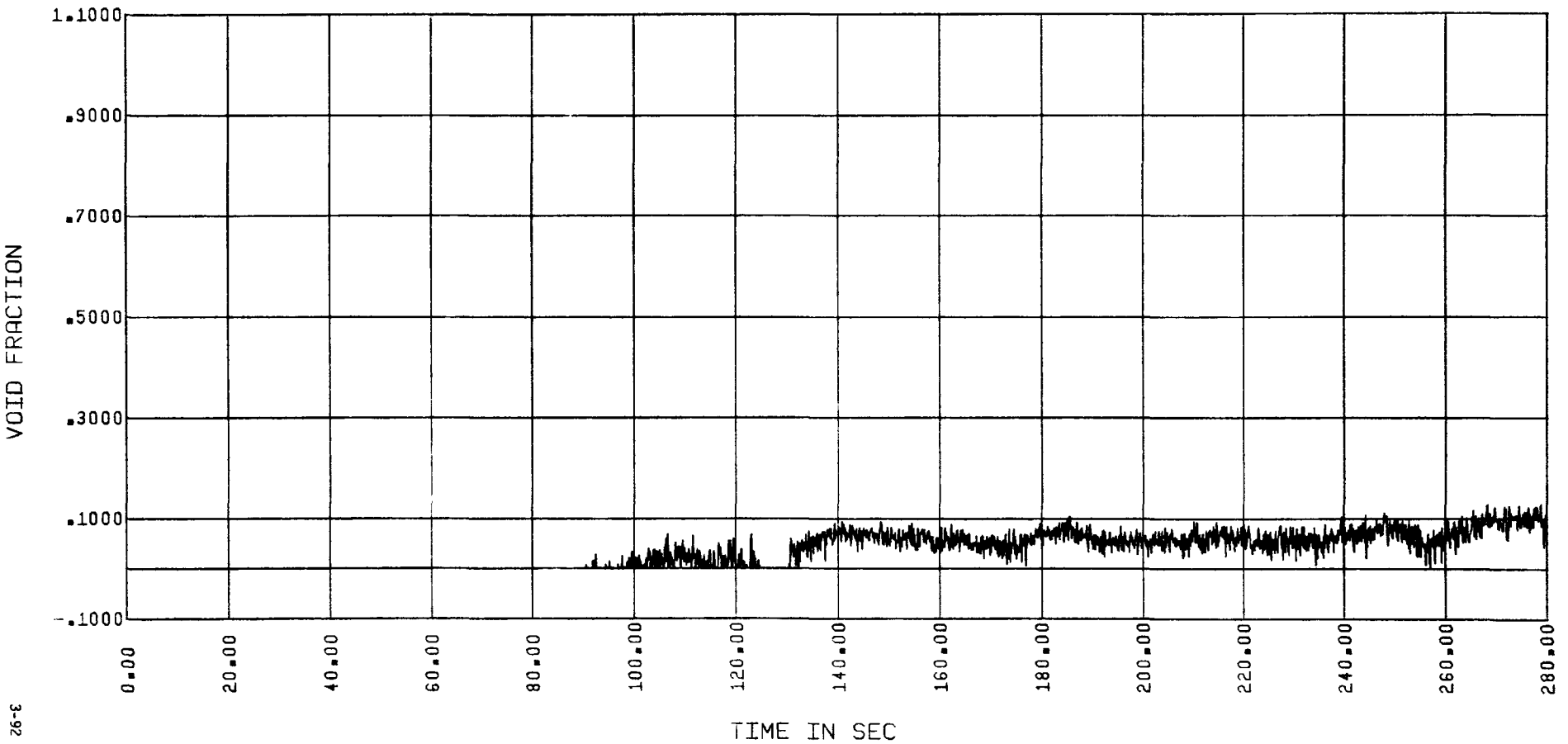

TEST 252/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-89

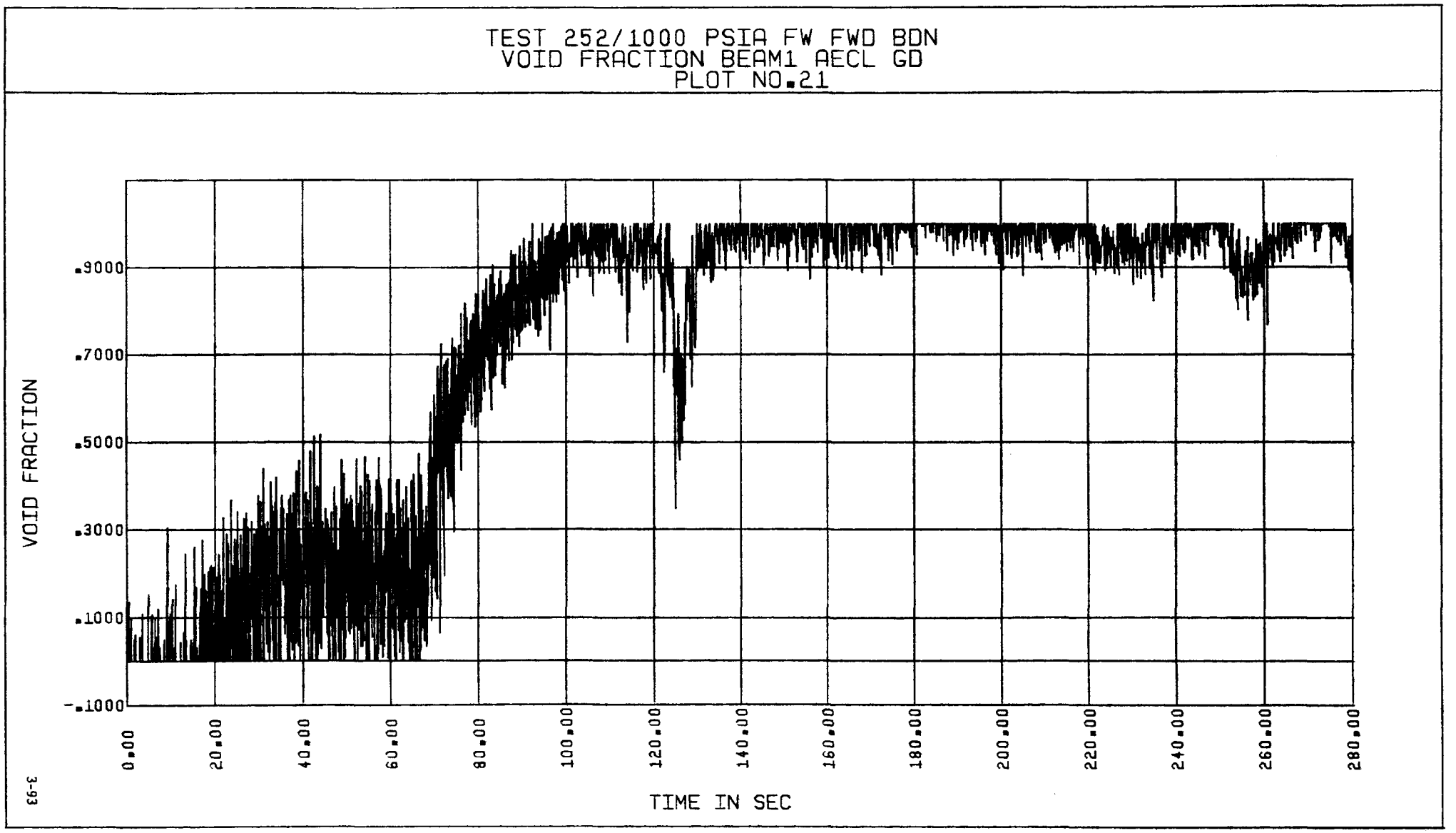
TEST 252/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18



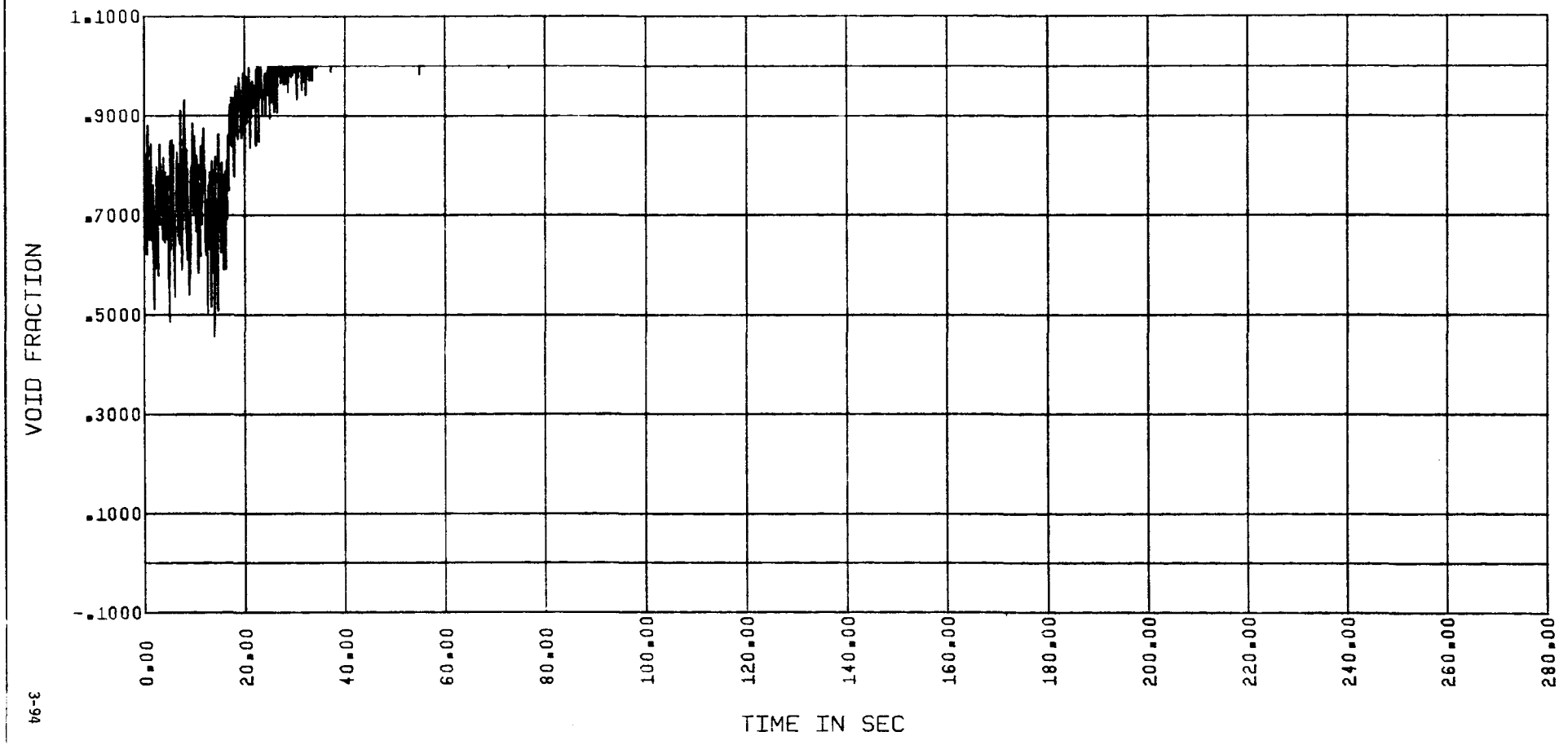

TEST 252/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-91

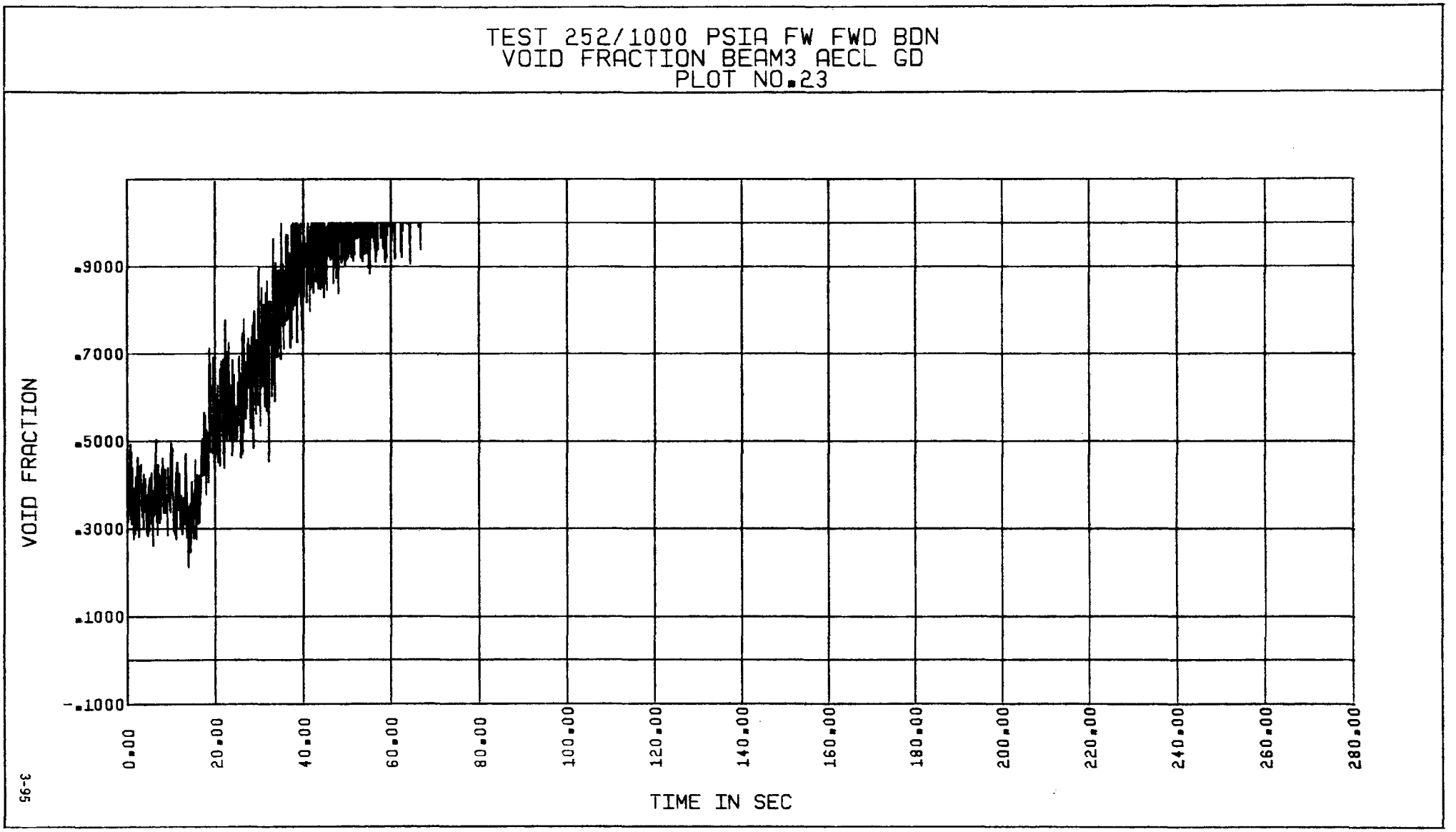
TEST 252/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20



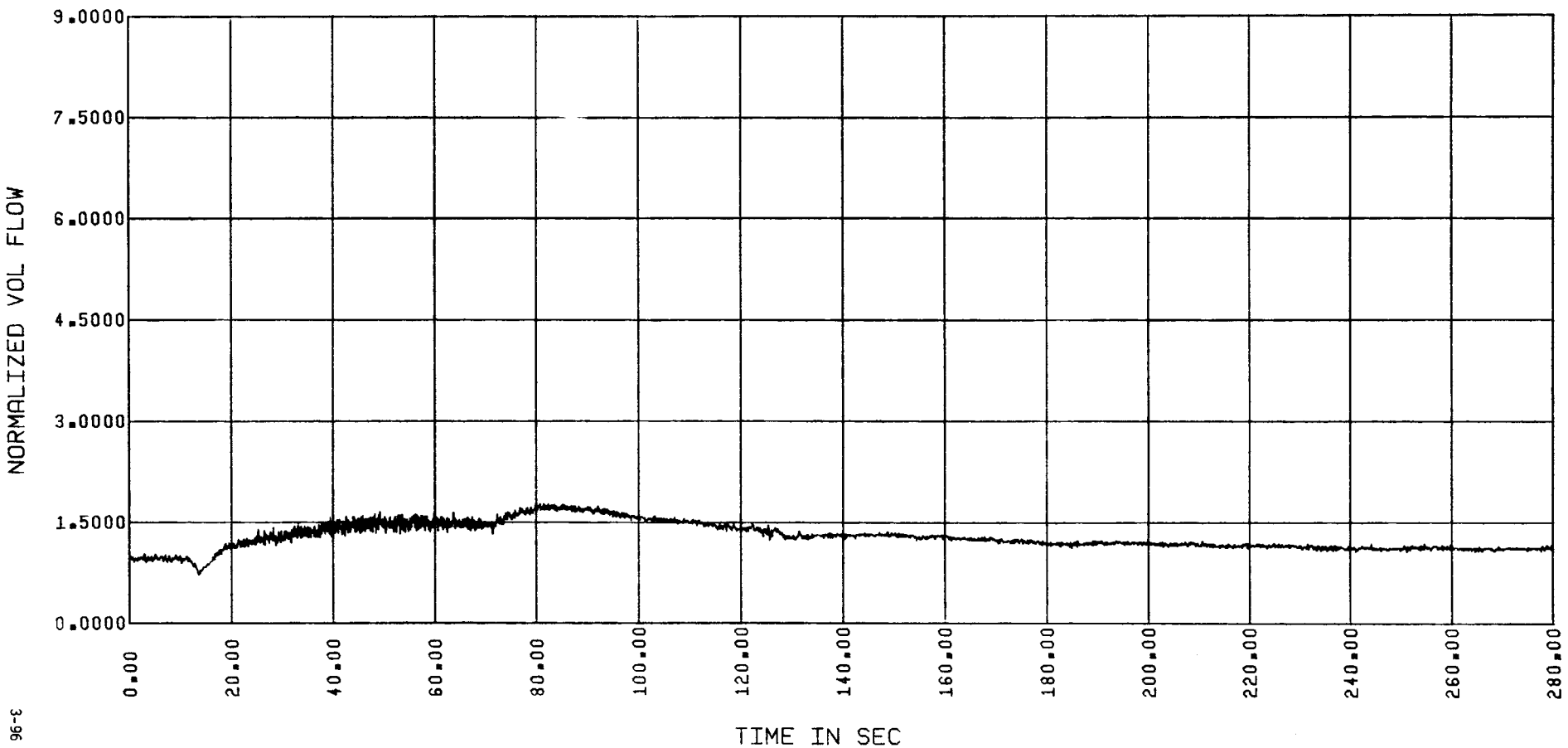

TEST 252/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

TEST 252/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22




TEST 252/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-95

TEST 252/1000 PSIA FW FWD BDN
NORM VOL FLW RTE LO-DD/GD SUCT
PLOT NO.24



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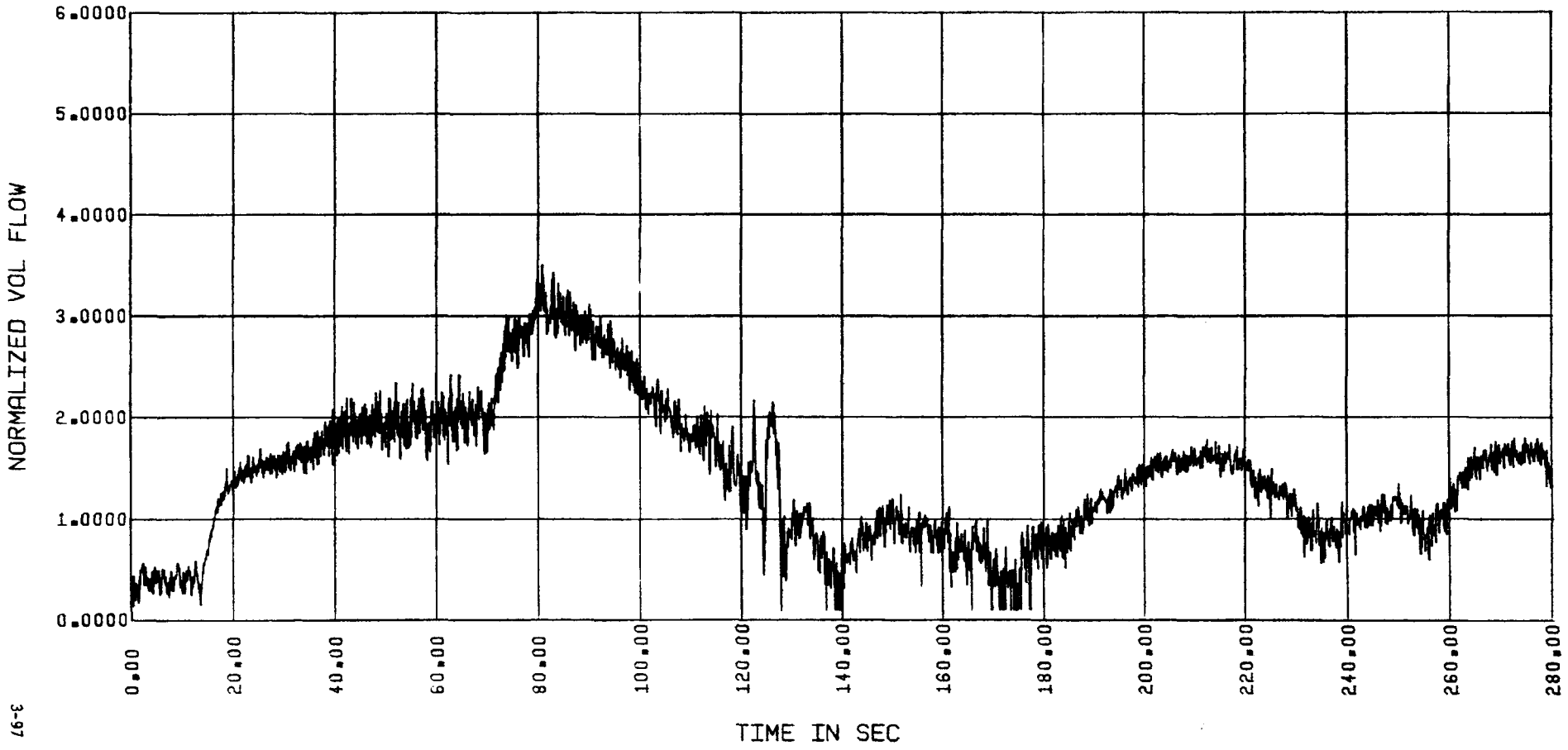
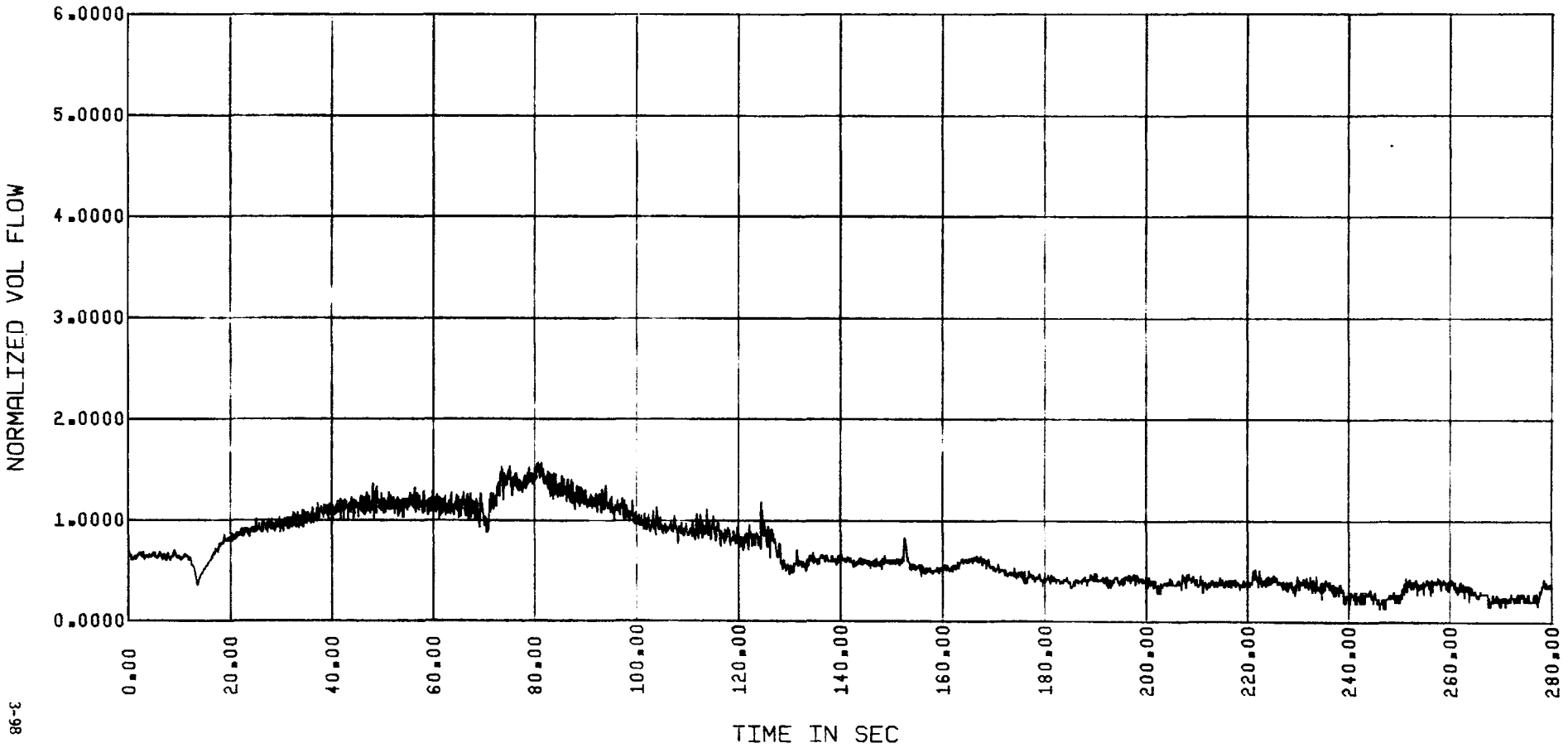
TEST 252/1000 PSIA FW FWD BDN
NORM VOL FLW RTE LO-DD/GD DSCH
PLOT NO.25

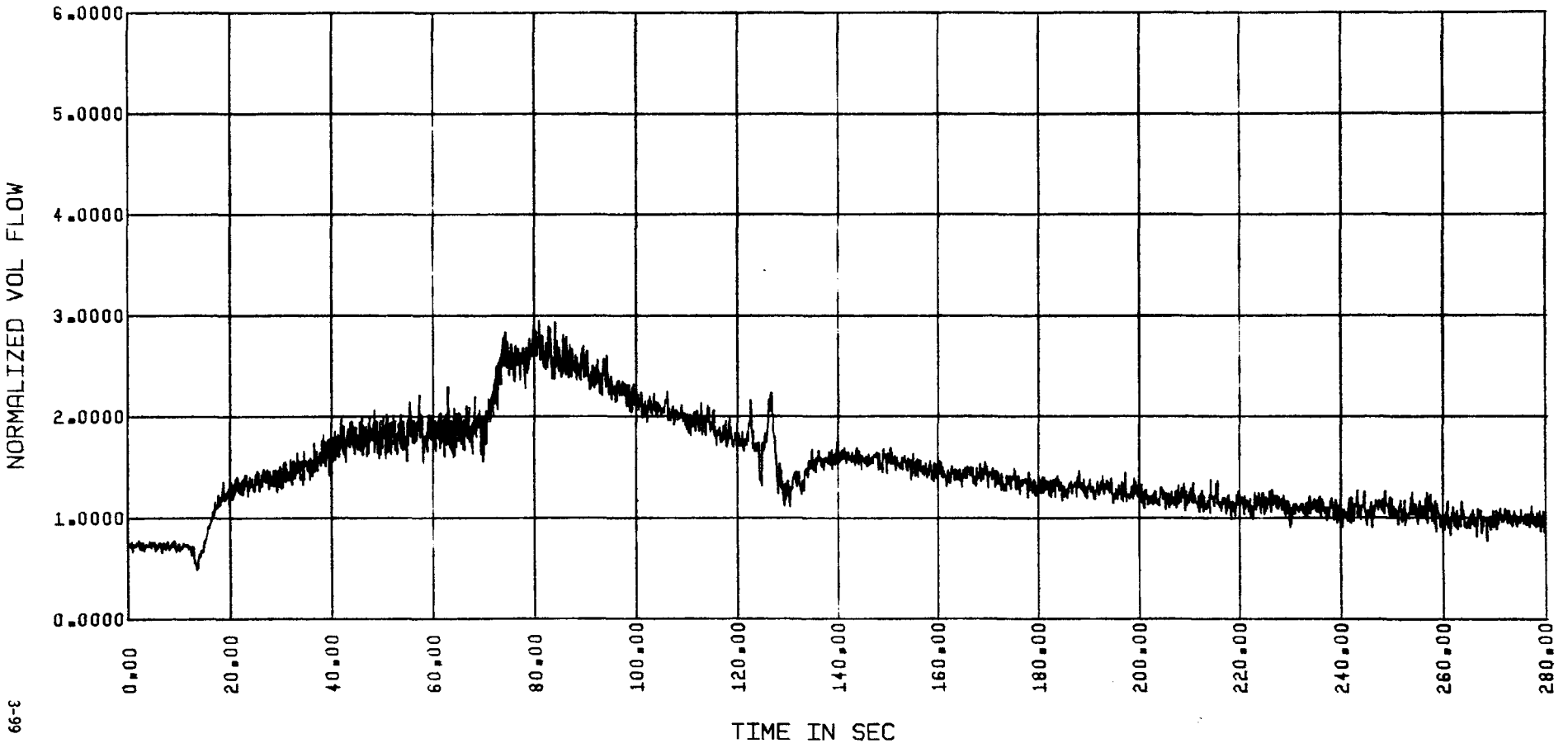


TEST 252/1000 PSIA FW FWD BDN
NORM VOL FLW RTE HI-DD/GD SUCT
PLOT NO.26

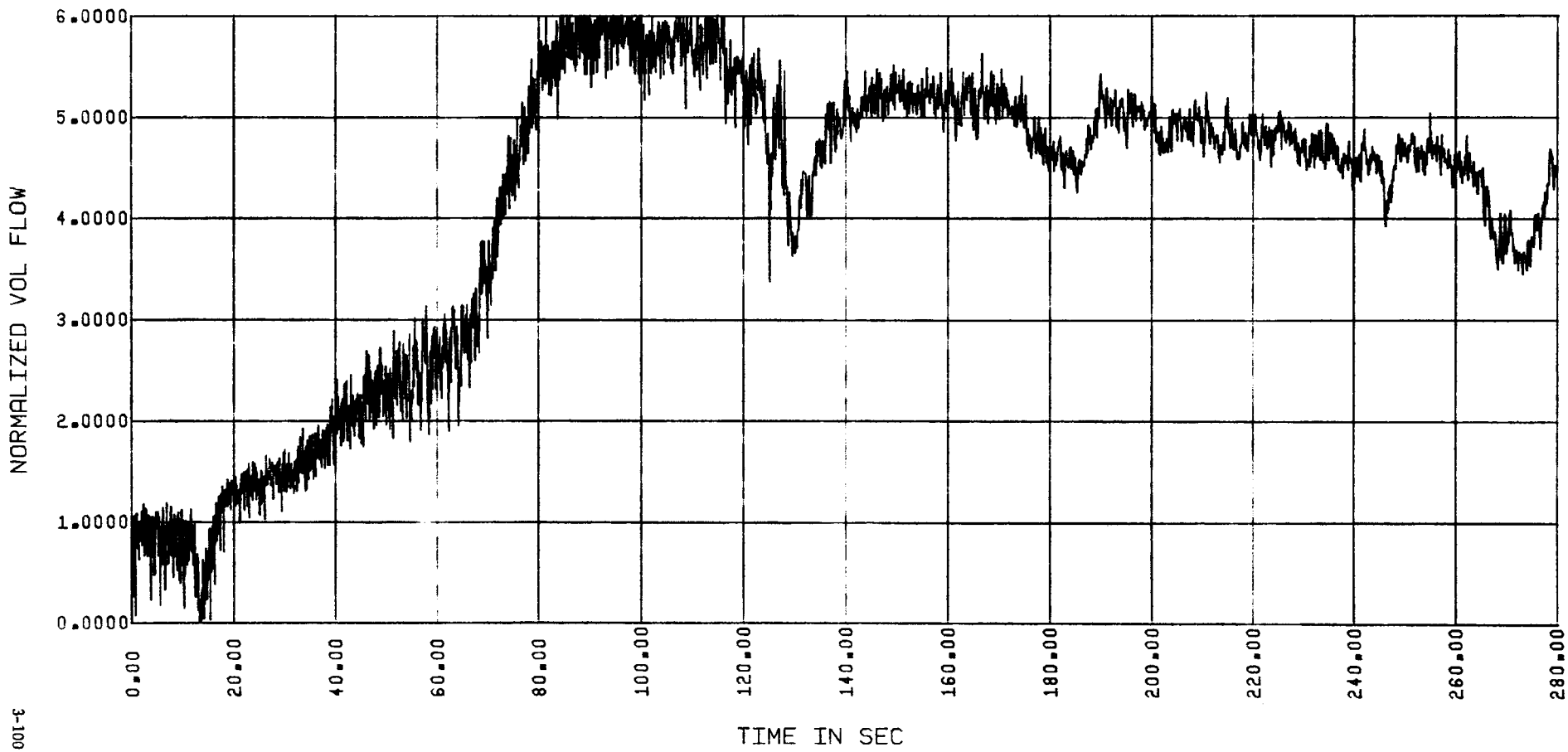


3-98

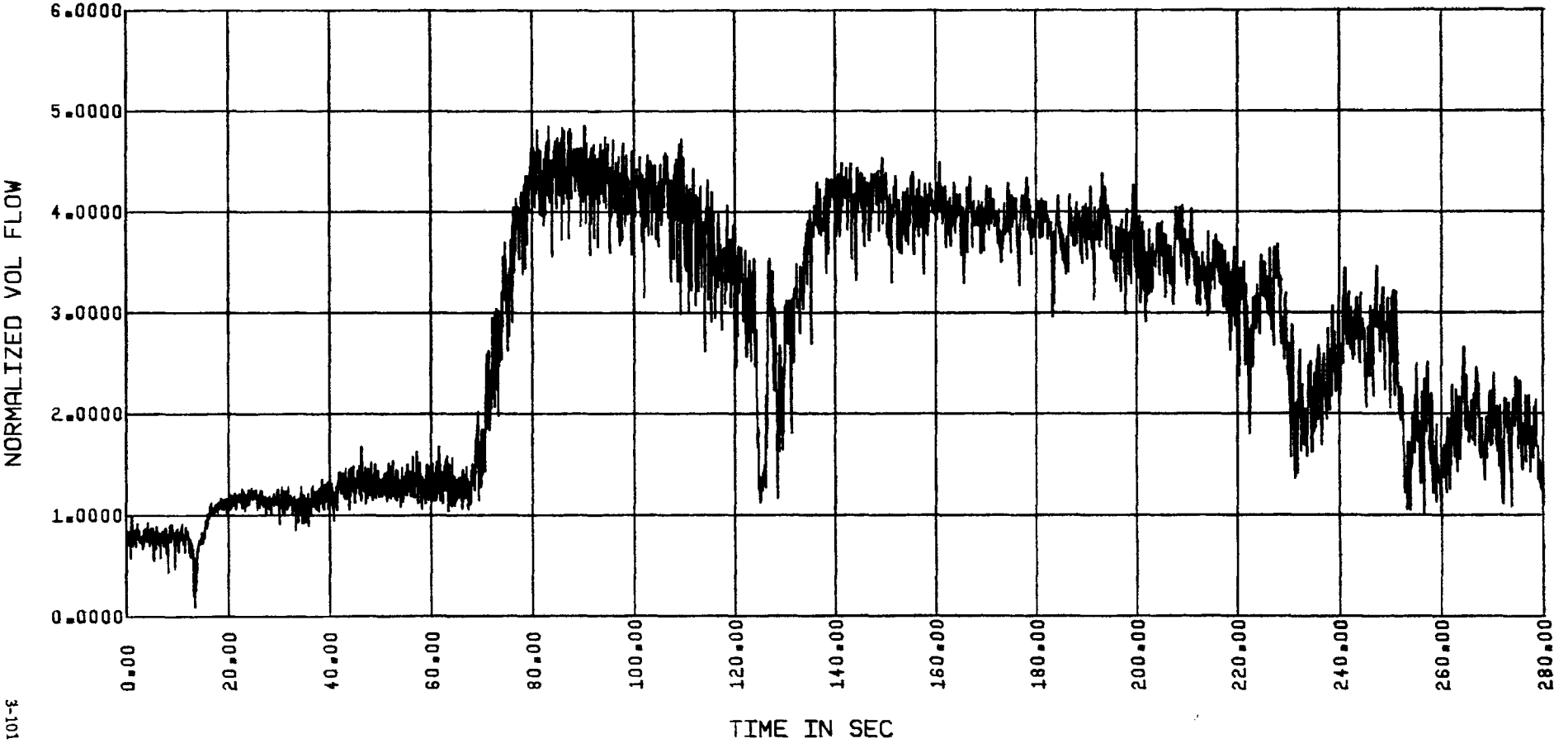
TEST 252/1000 PSIA FW FWD BDN
NORM VOL FLW RTE HI-DD/GD DSCH
PLOT NO.27



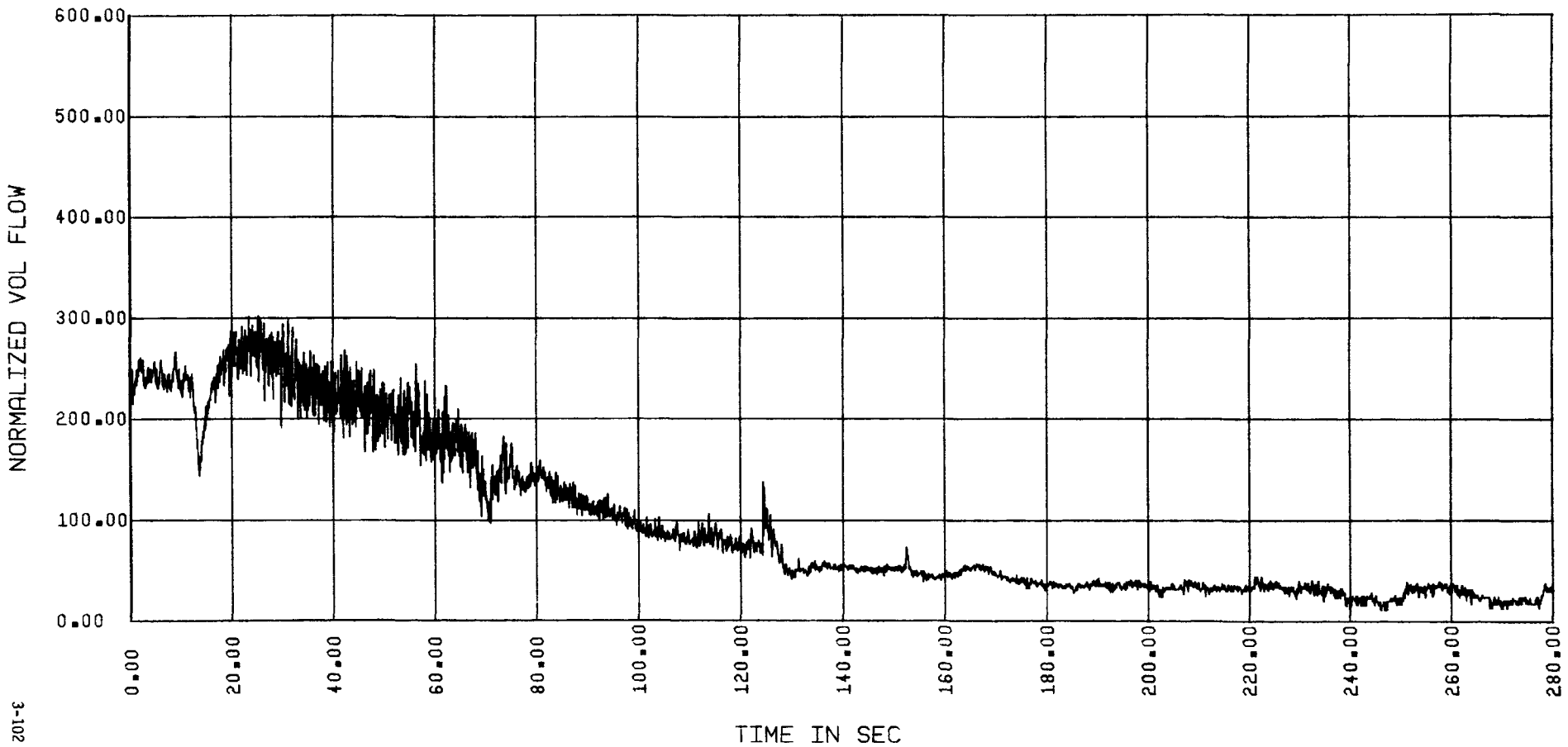
TEST 252/1000 PSIA FW FWD BDN
NORM VOL FLW RTE TM SUCTION
PLOT NO.28



TEST 252/1000 PSIA FW FWD BDN
NORM VOL FLW RTE TM DISCHARGE
PLOT NO.29



TEST 252/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.30



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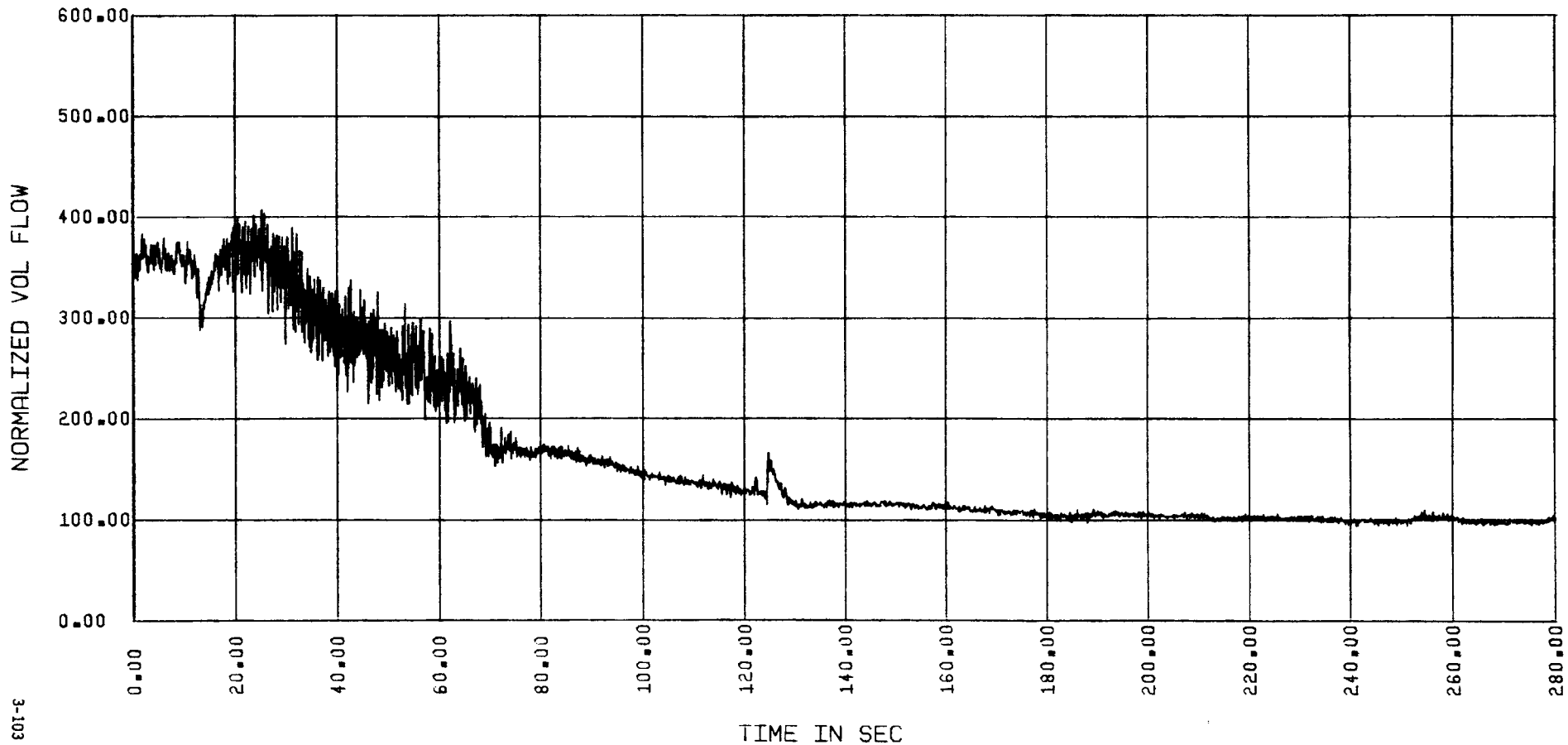
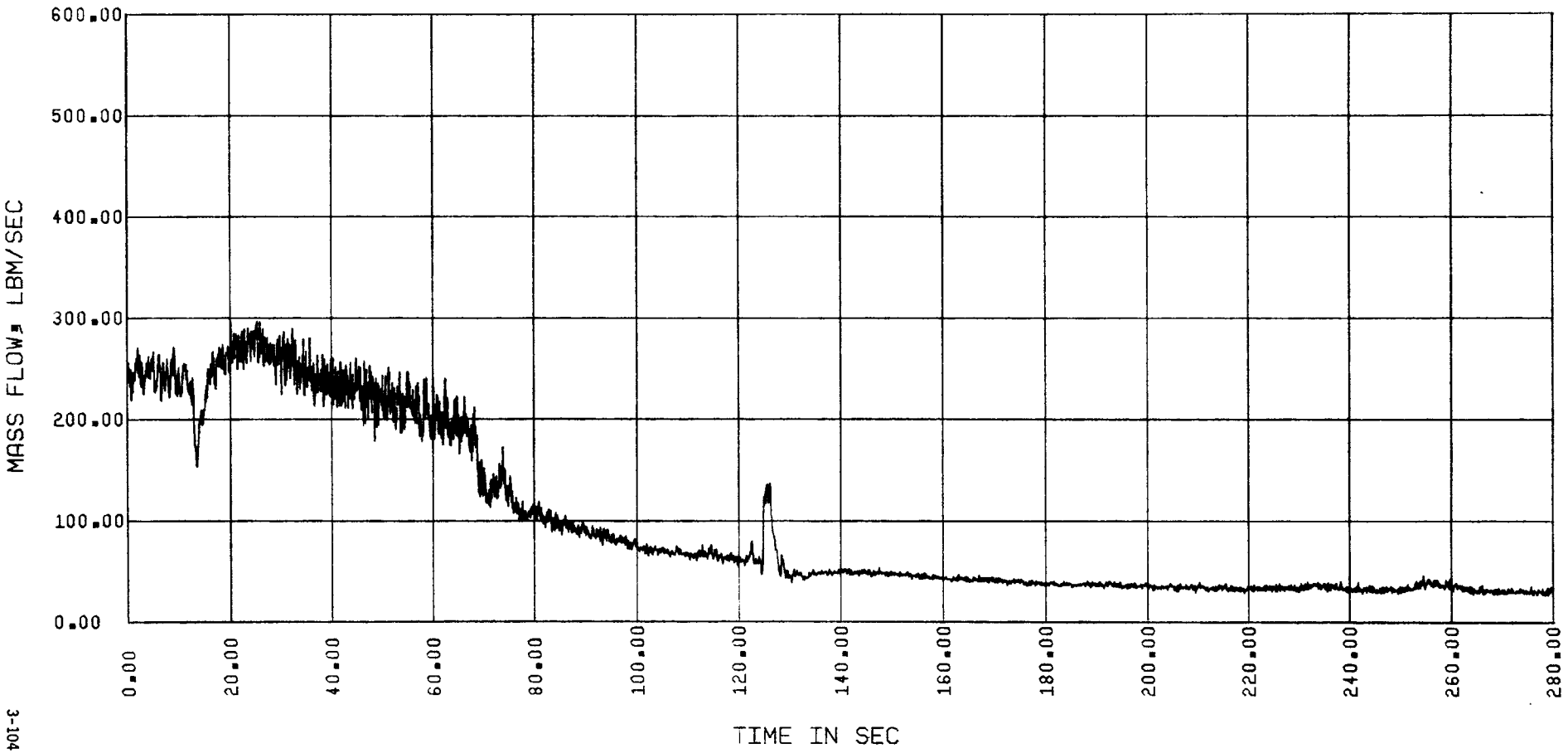
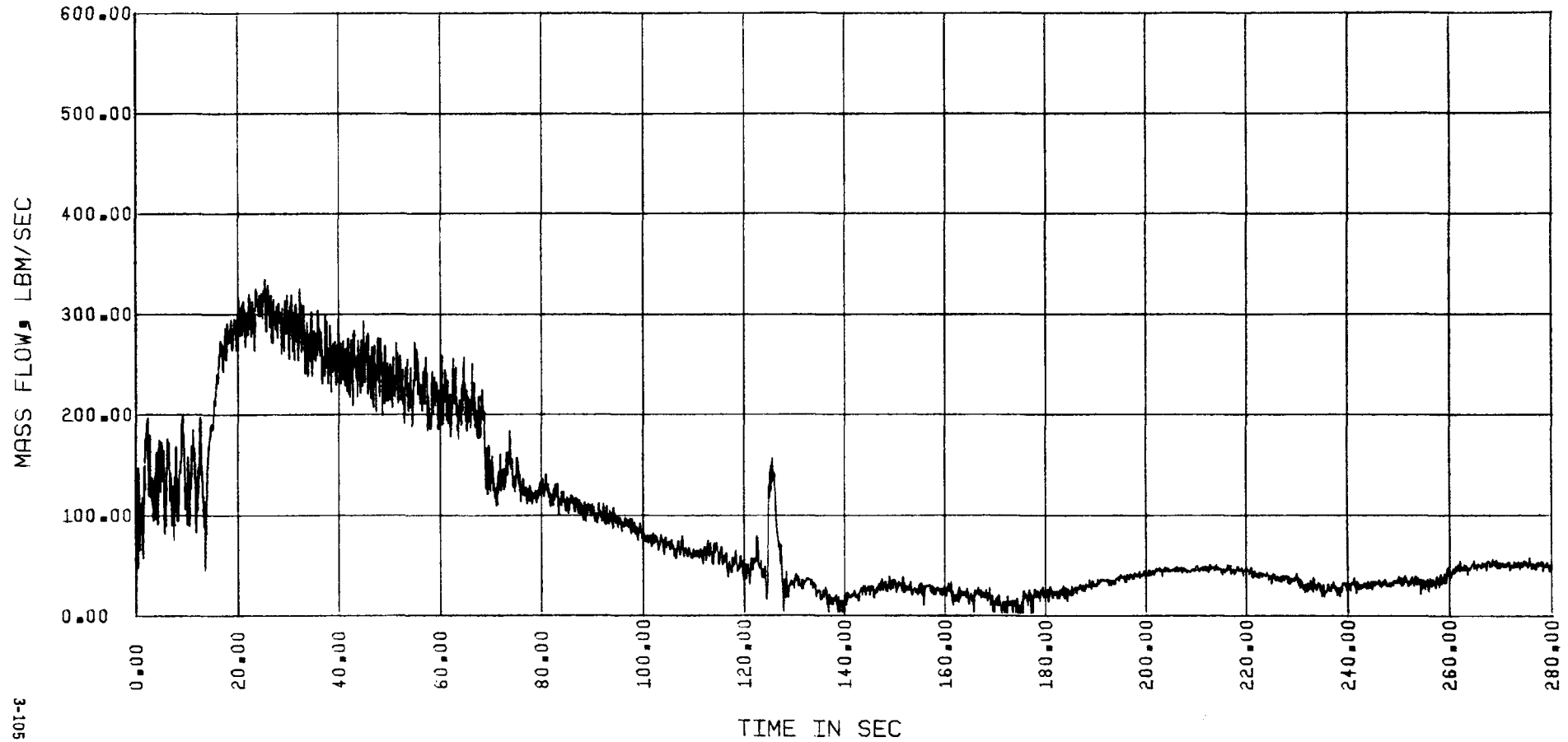
TEST 252/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.31



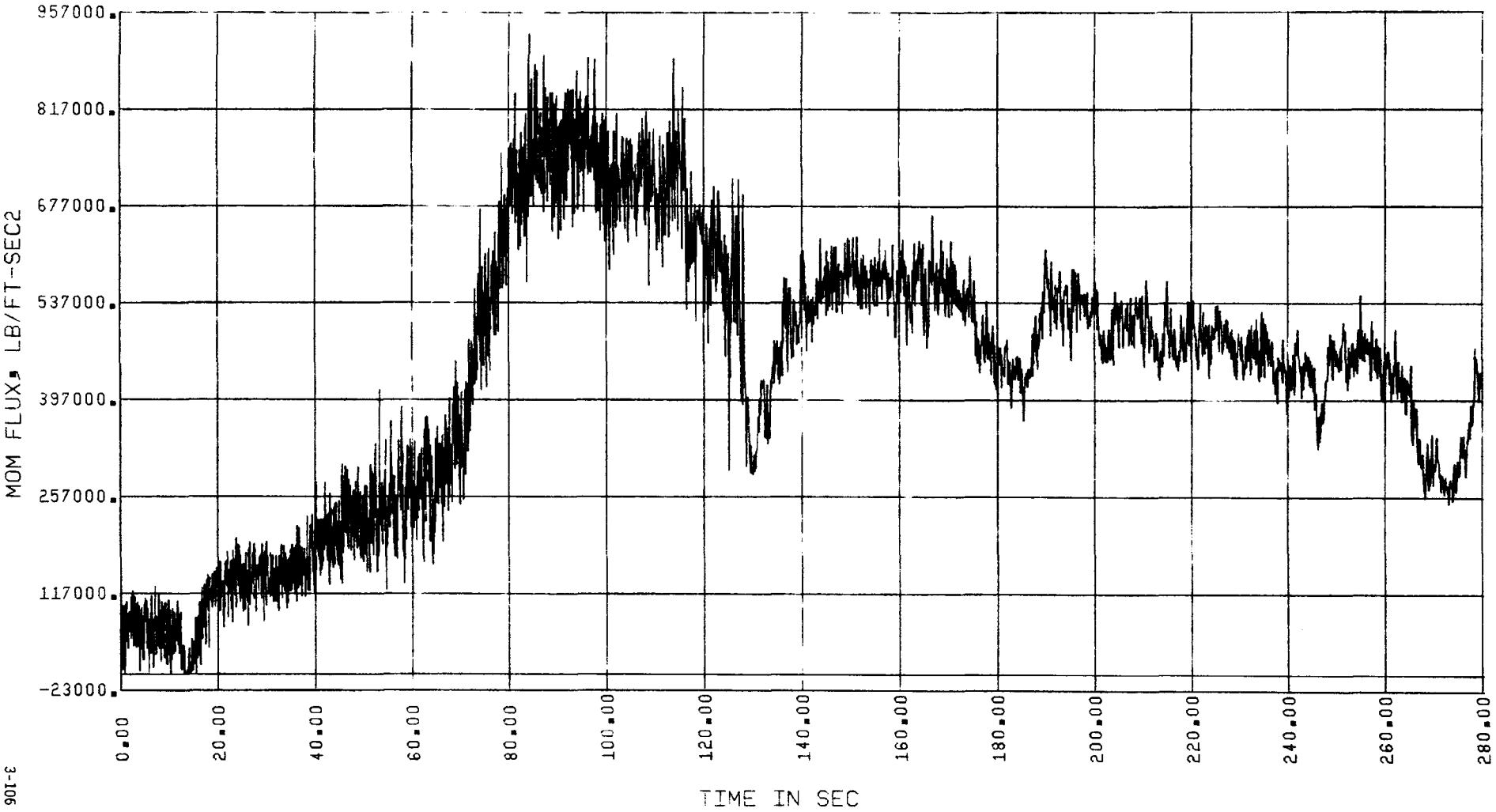
TEST 252/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-DD/GD2 DSCH
PLOT NO.32



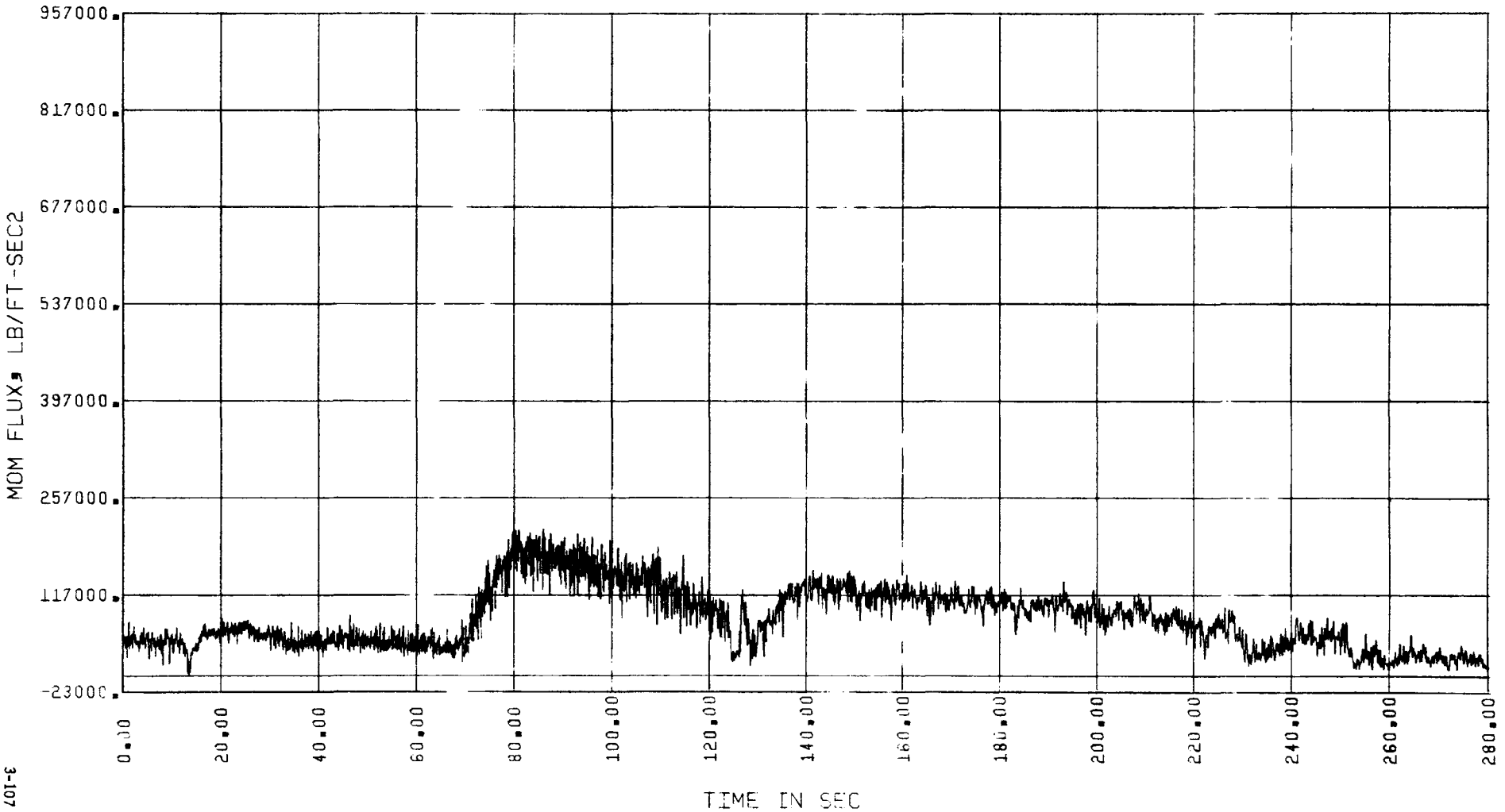
TEST 252/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-DD/GD2 DSCH
PLOT NO.33



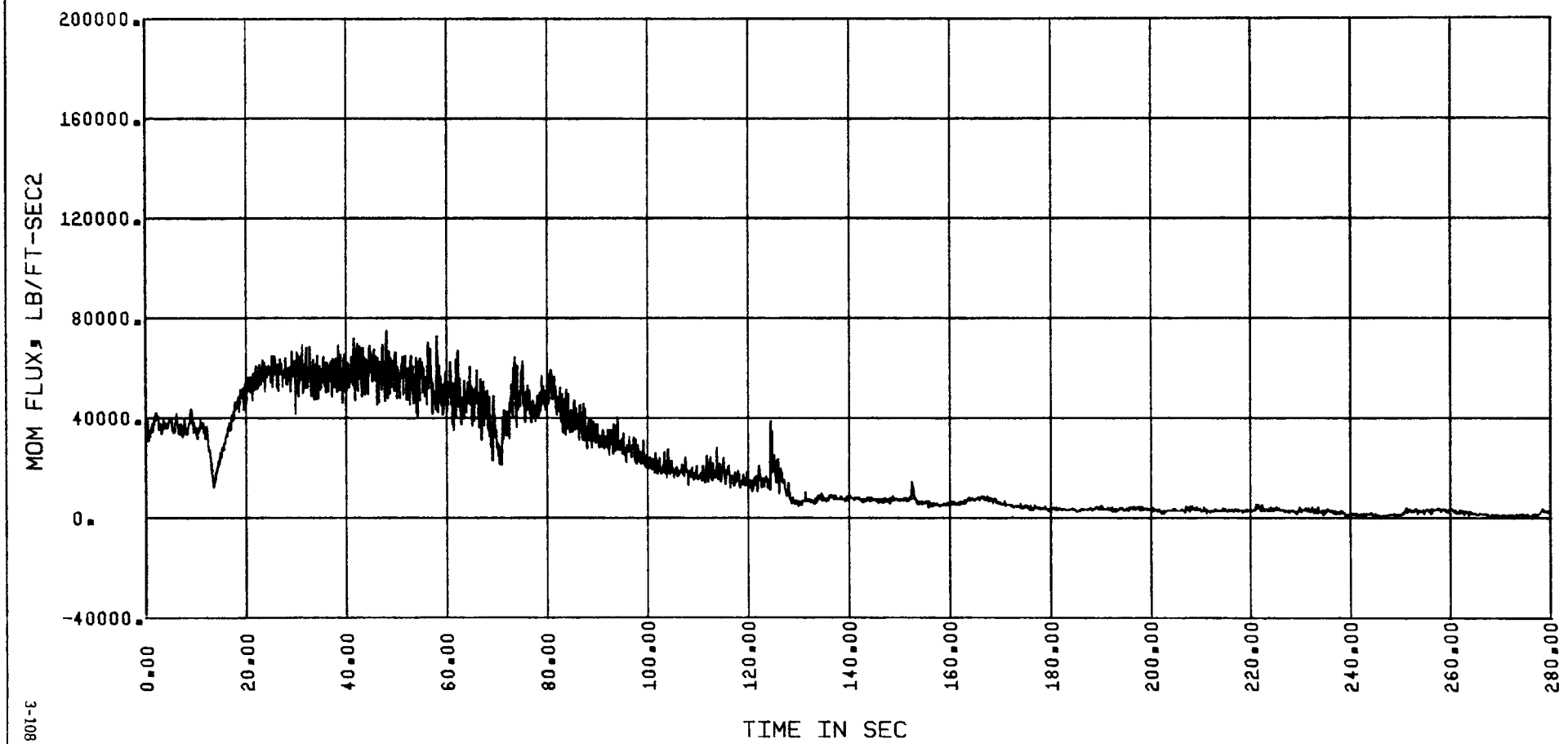
TEST 252/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/LO-TM SUCT
PLOT NO.34



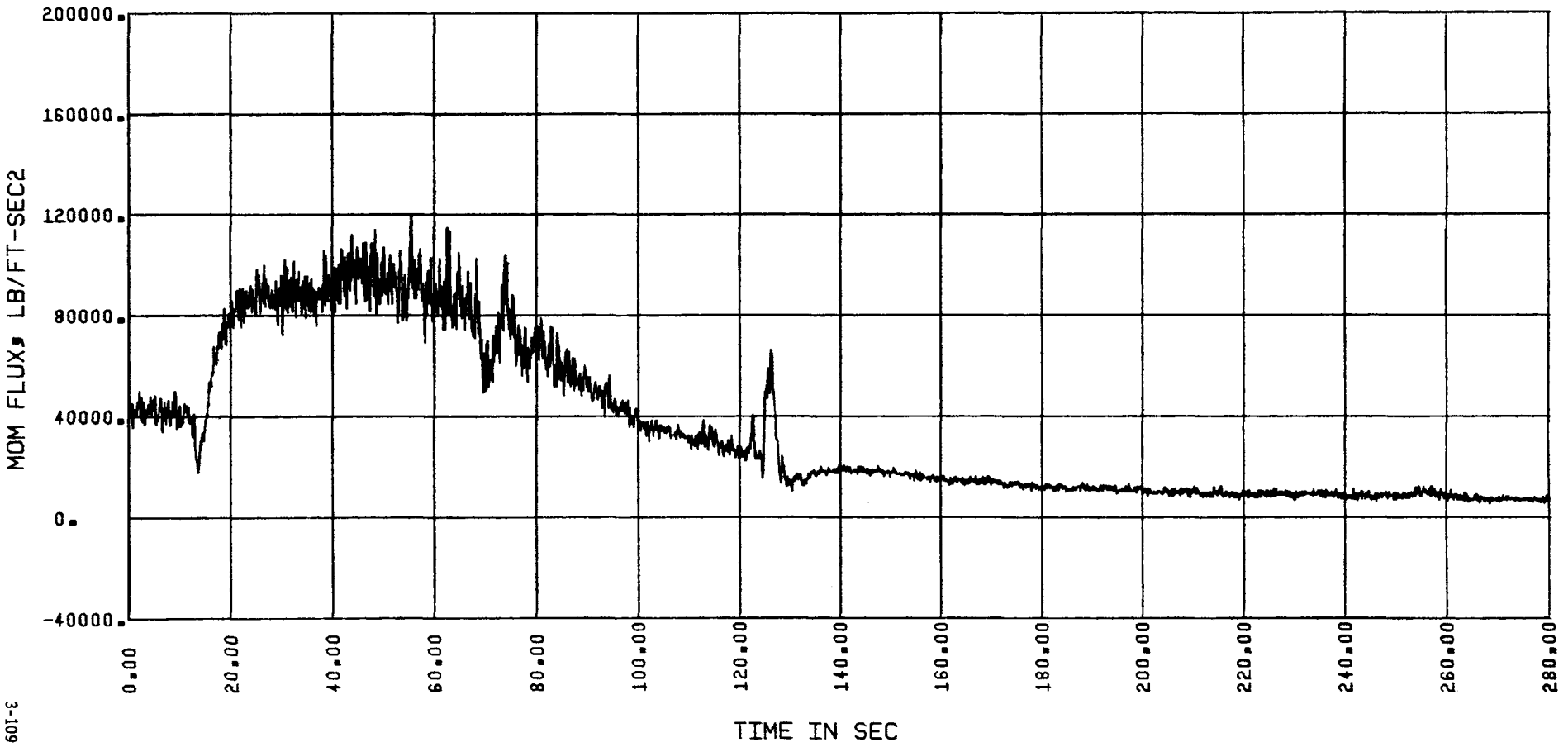
TEST 252/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.35



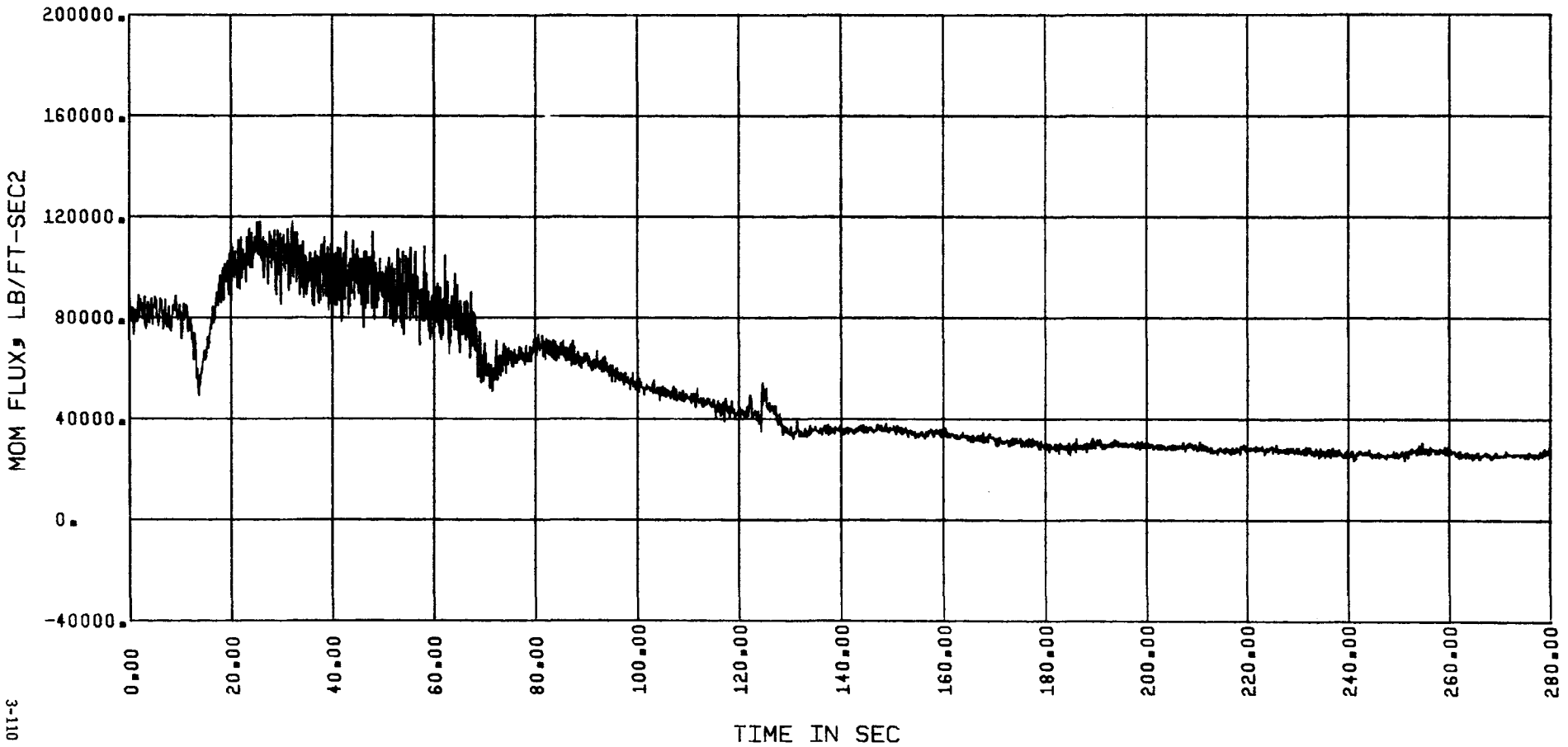
TEST 252/1000 PSIA FW FWD BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.36



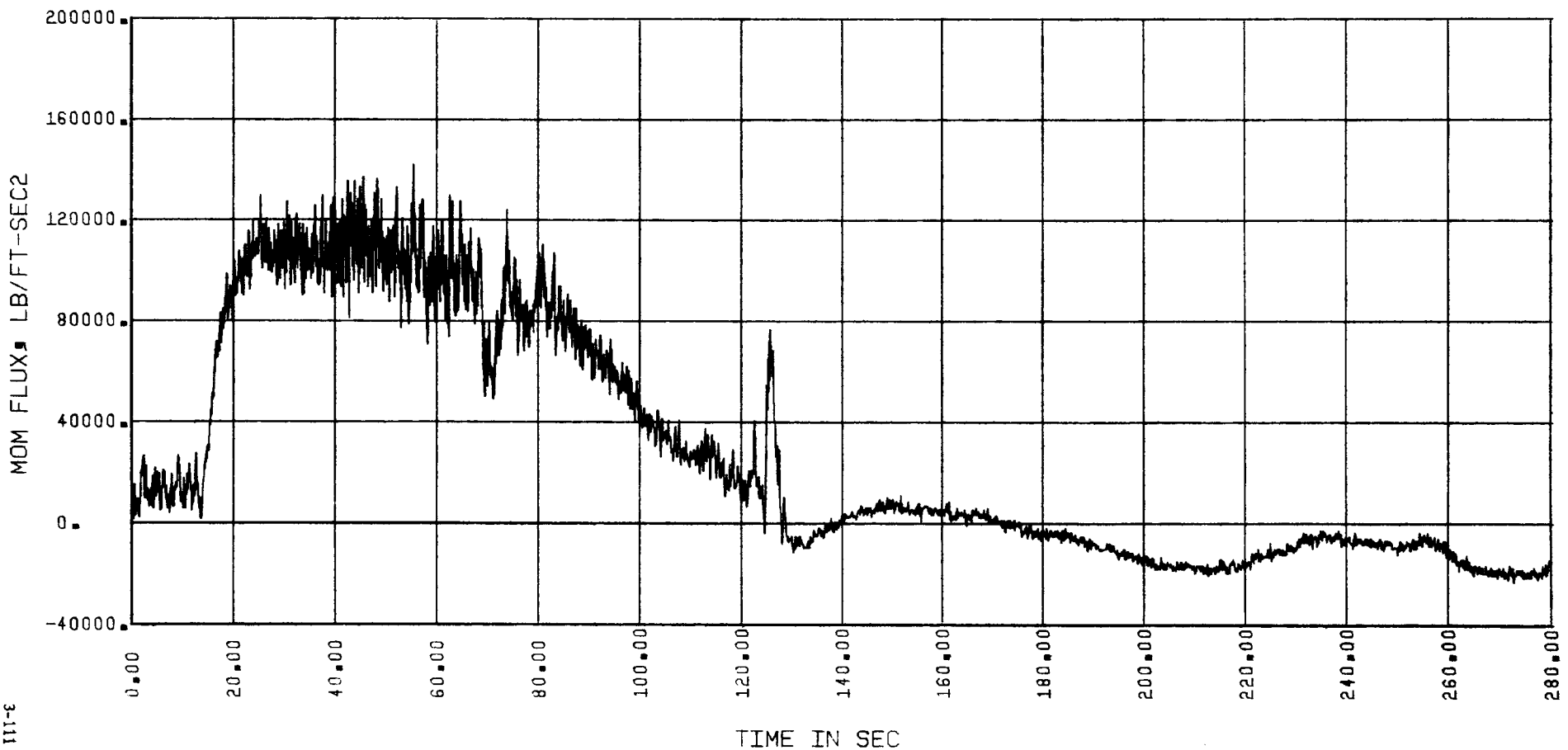
TEST 252/1000 PSIA FW FWD BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.37



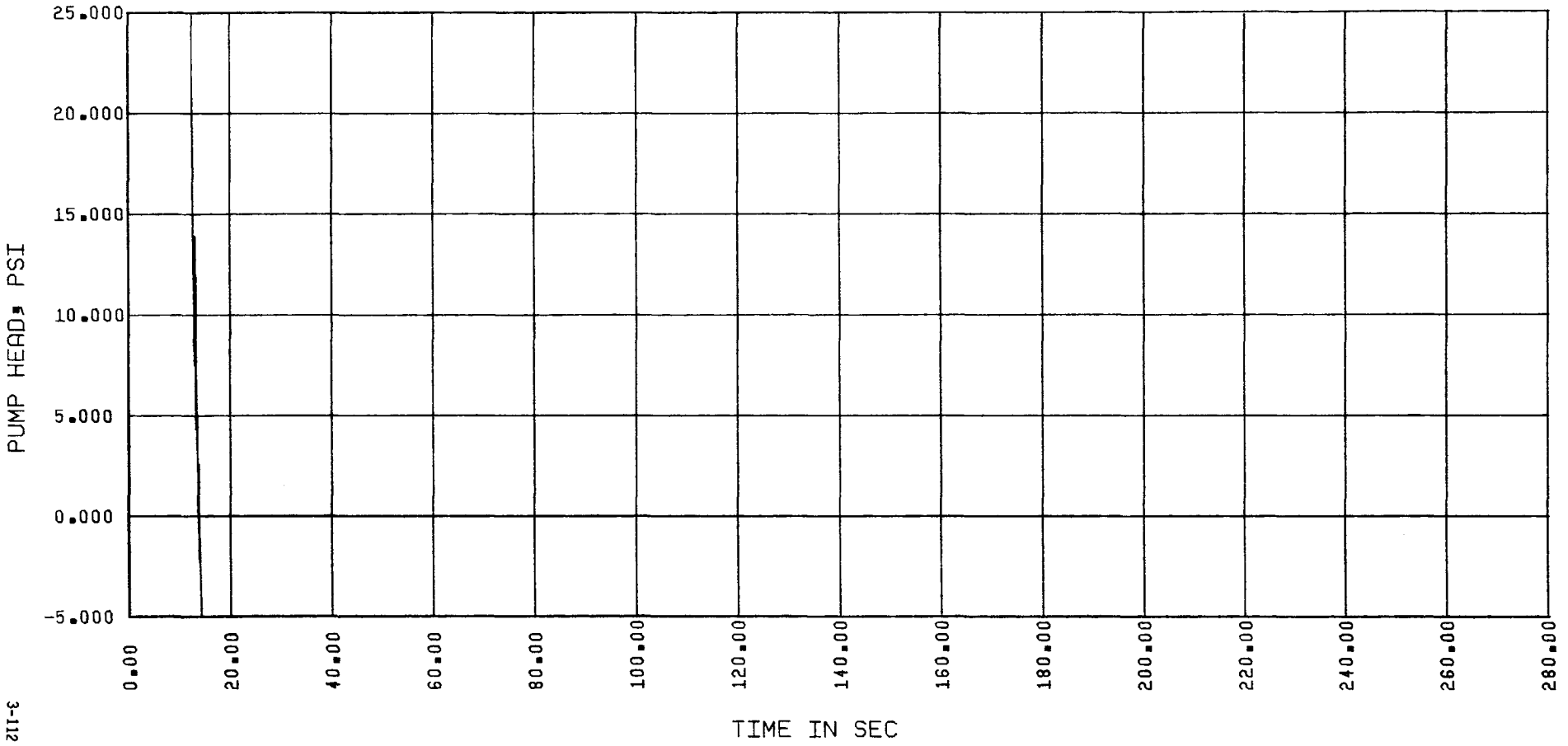
TEST 252/1000 PSIA FW FWD BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



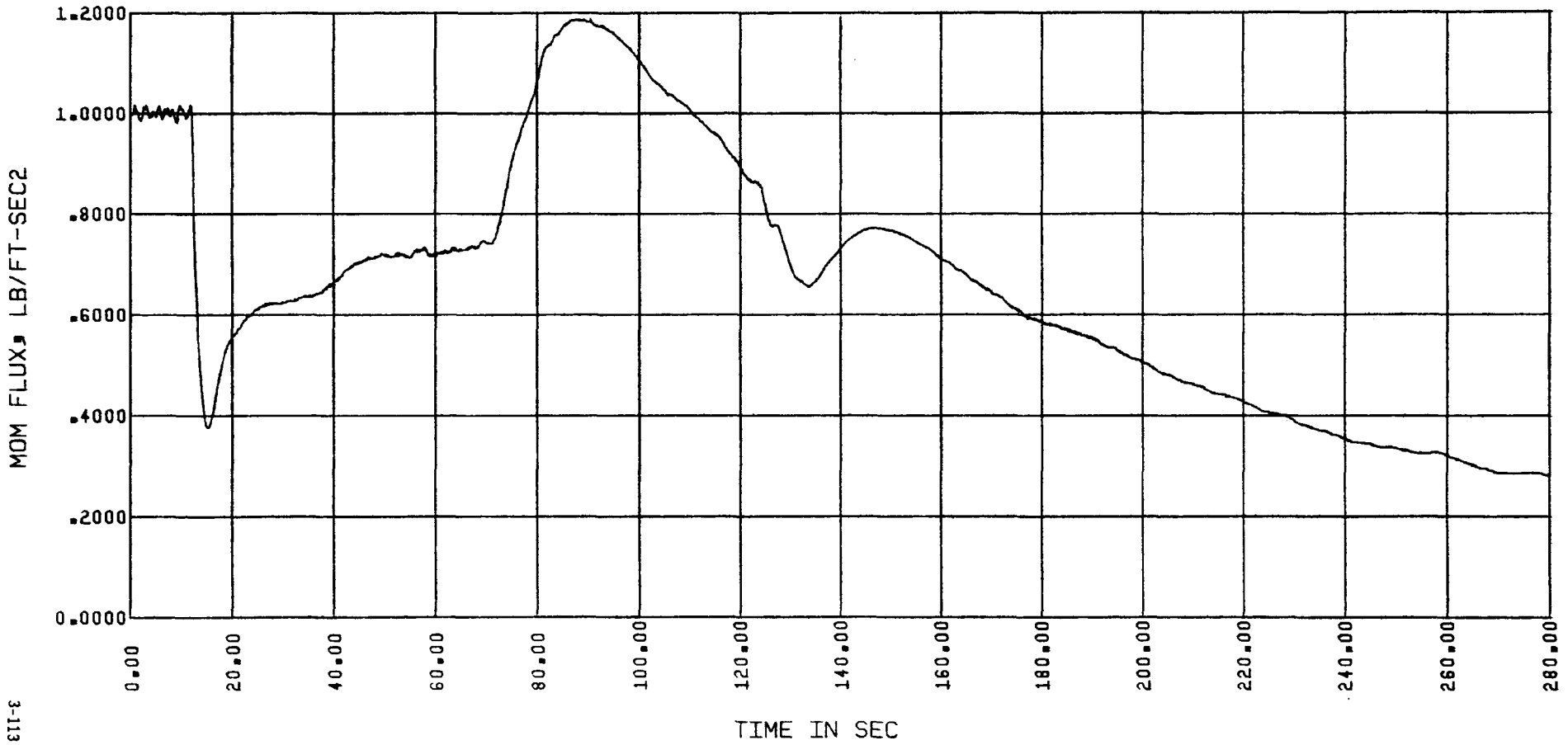
TEST 252/1000 PSIA FW FWD BDN
MOMENTUM FLUX LO-DD DISCHARGE
PLOT NO.39



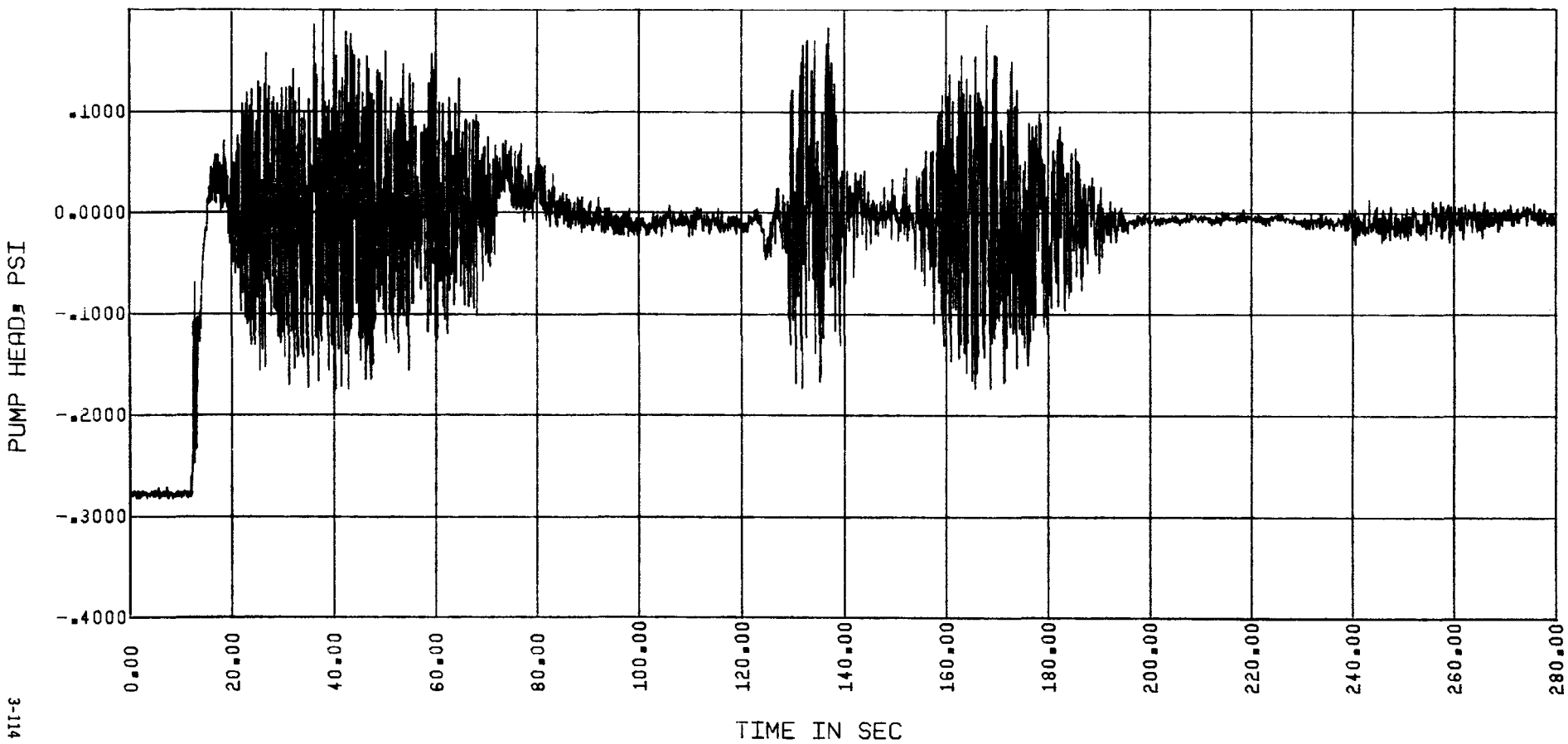
TEST 252/1000 PSIA FW FWD BDN
PUMP HEAD IN PSI
PLOT NO.40



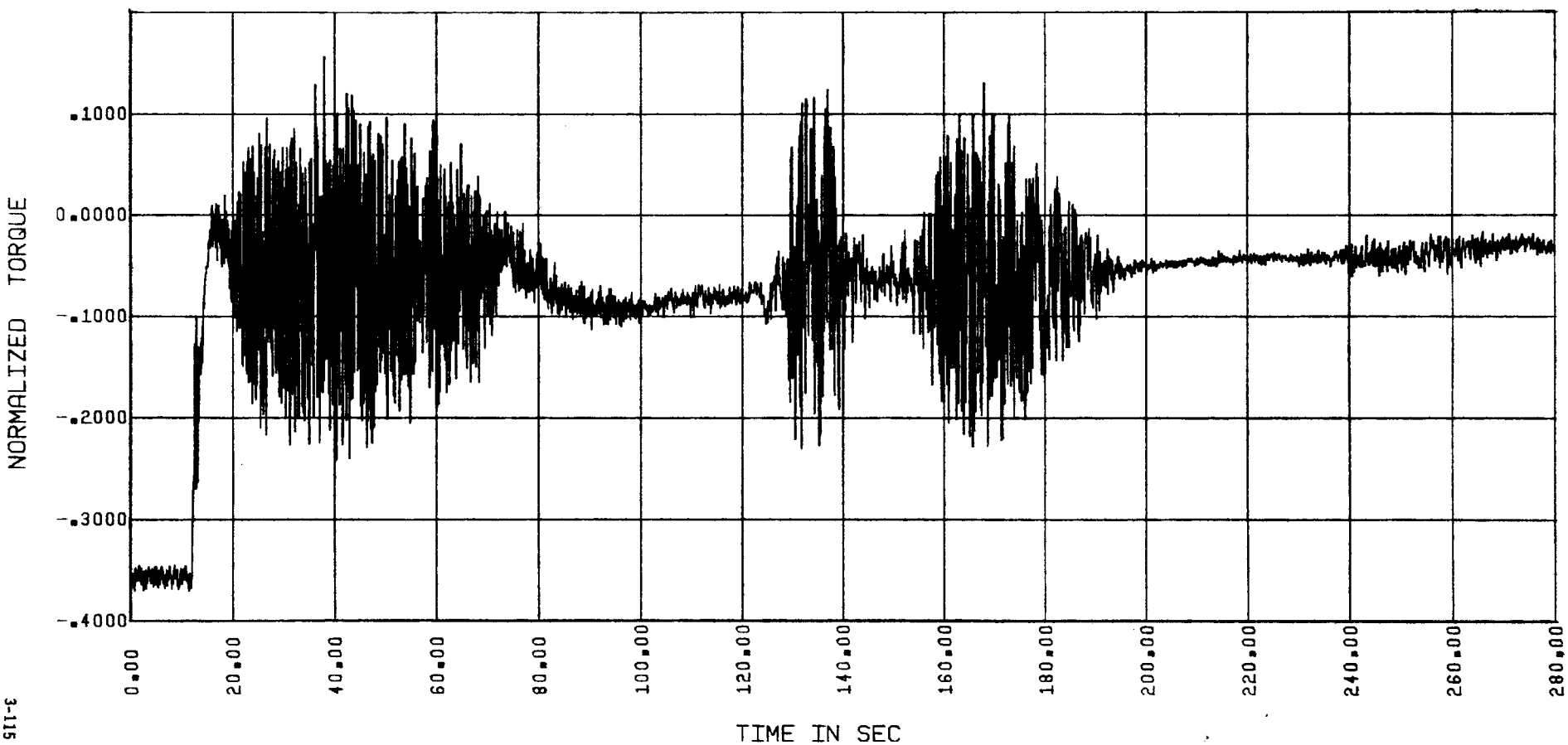
TEST 252/1000 PSIA FW FWD BDN
NORMALIZED PUMP SPEED
PLOT NO.43



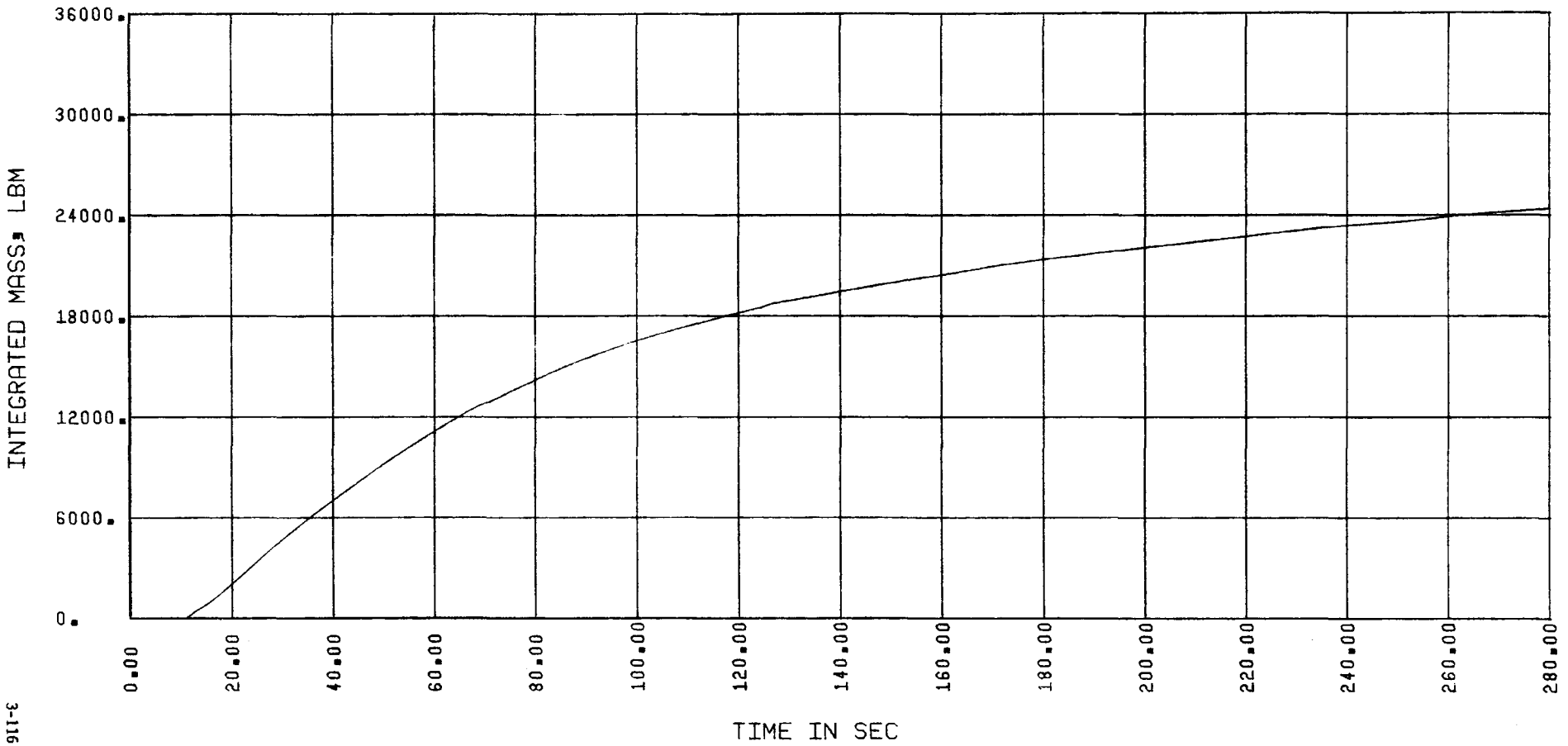
TEST 252/1000 PSIA FW FWD BDN
NORM. PUMP SHAFT TORQUE
PLOT NO.44



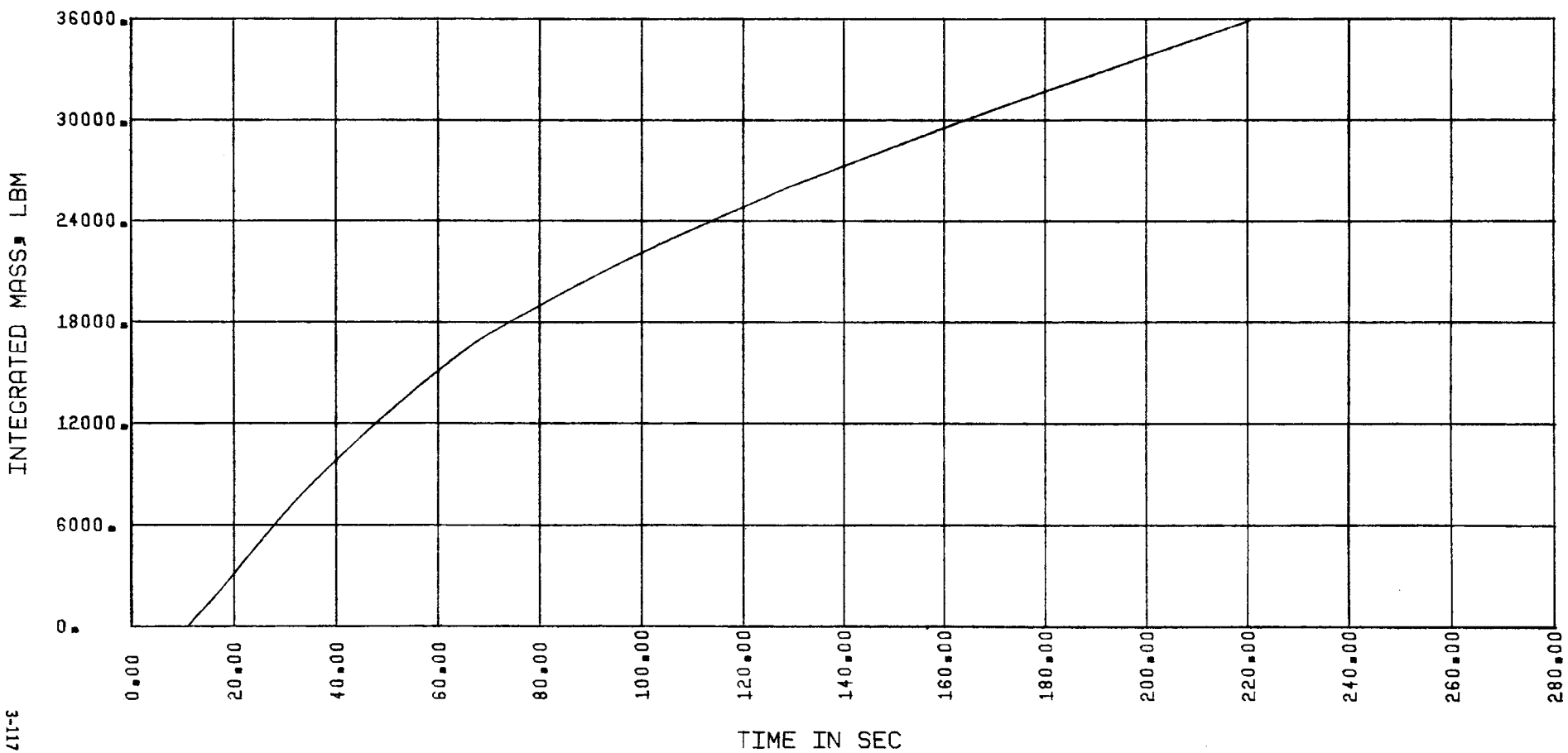
TEST 252/1000 PSIA FW FWD BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.45



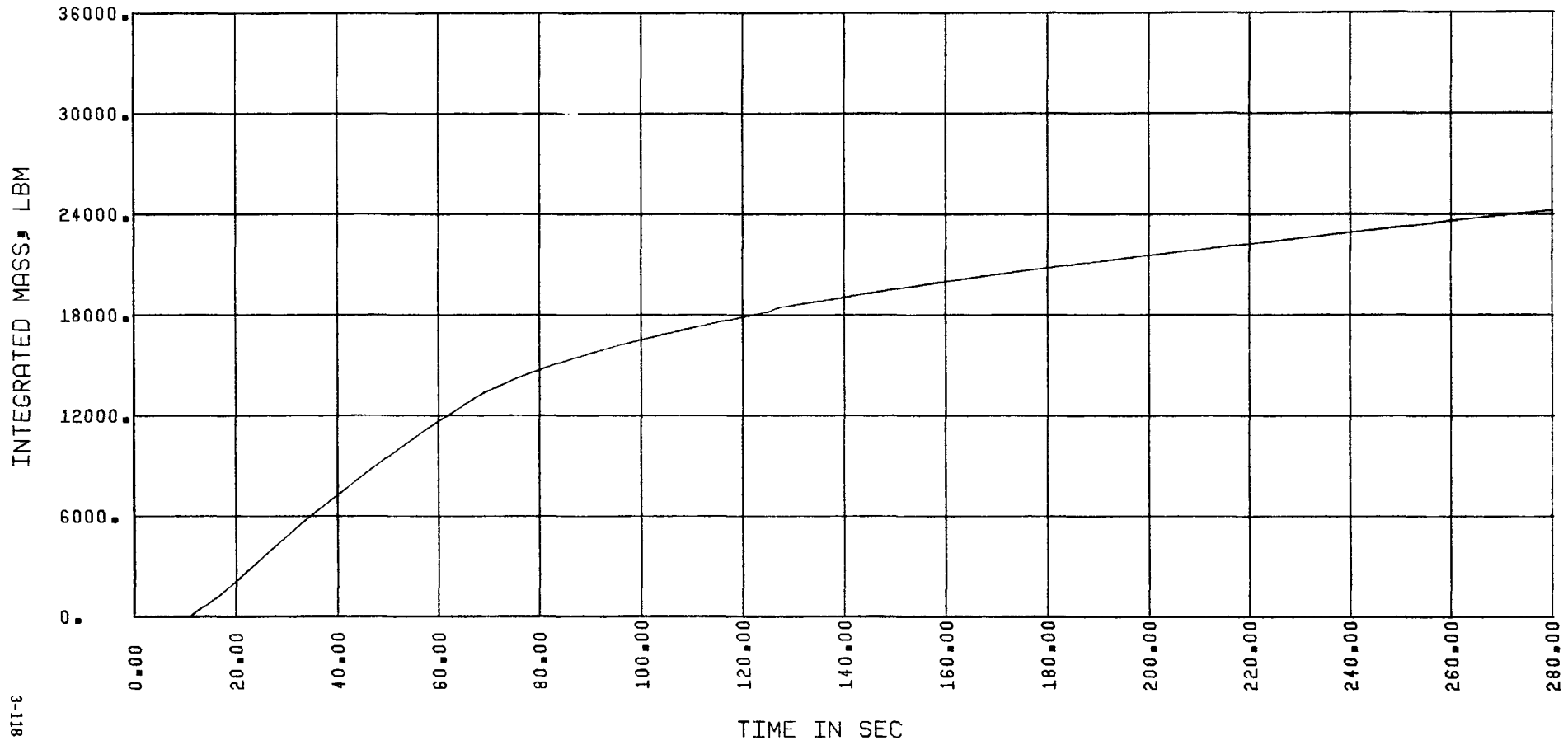
TEST 252/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.46



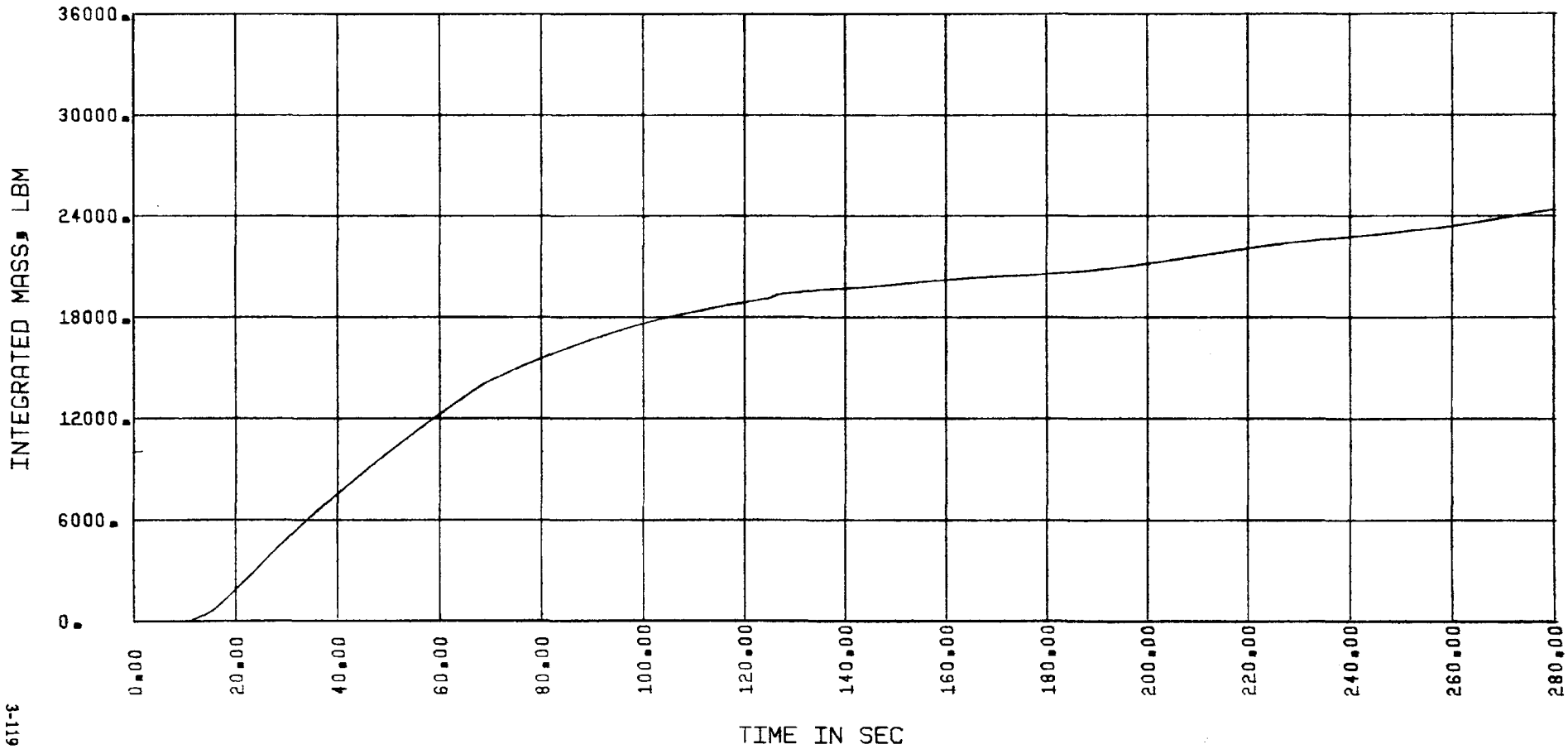
TEST 252/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.47



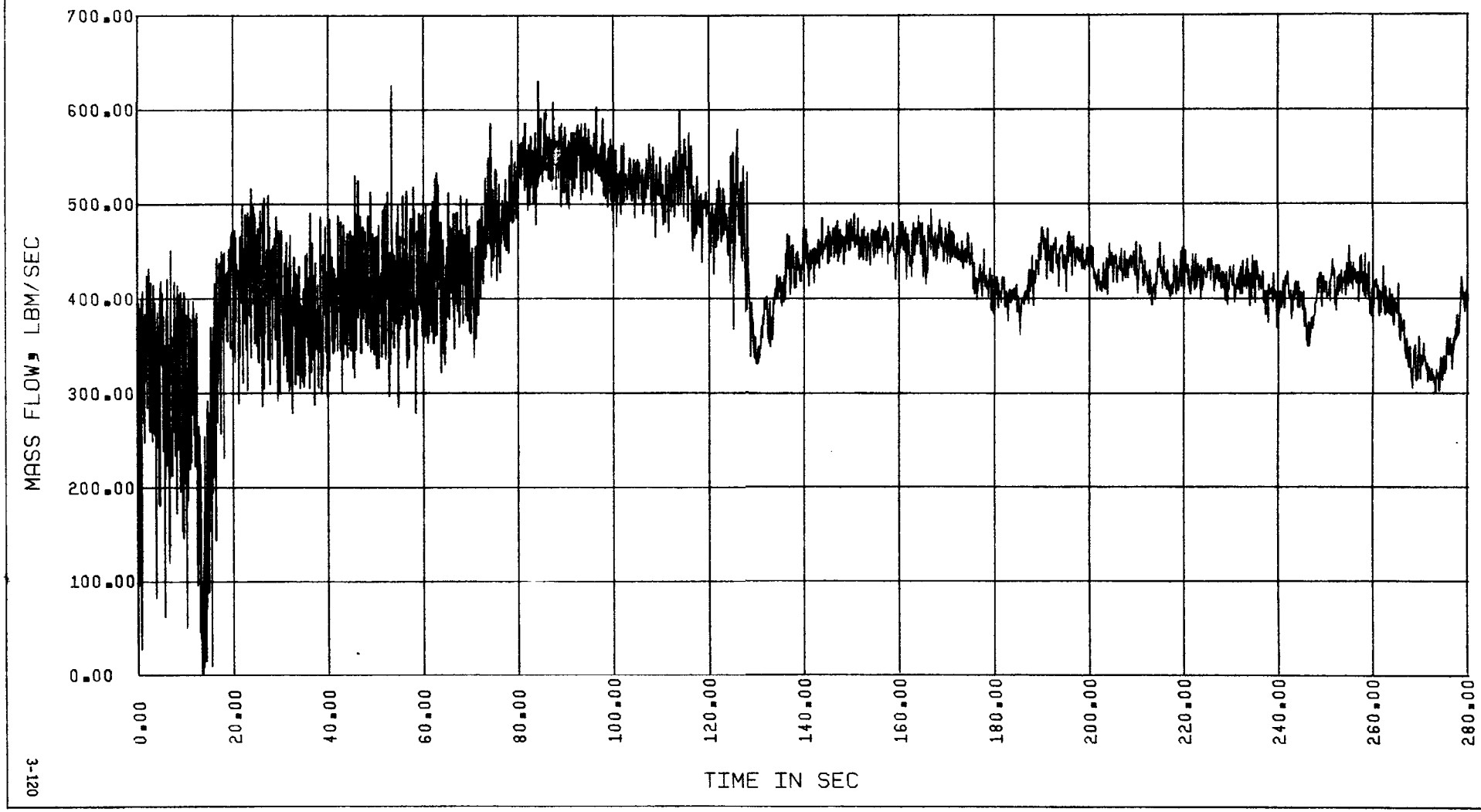
TEST 252/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.48



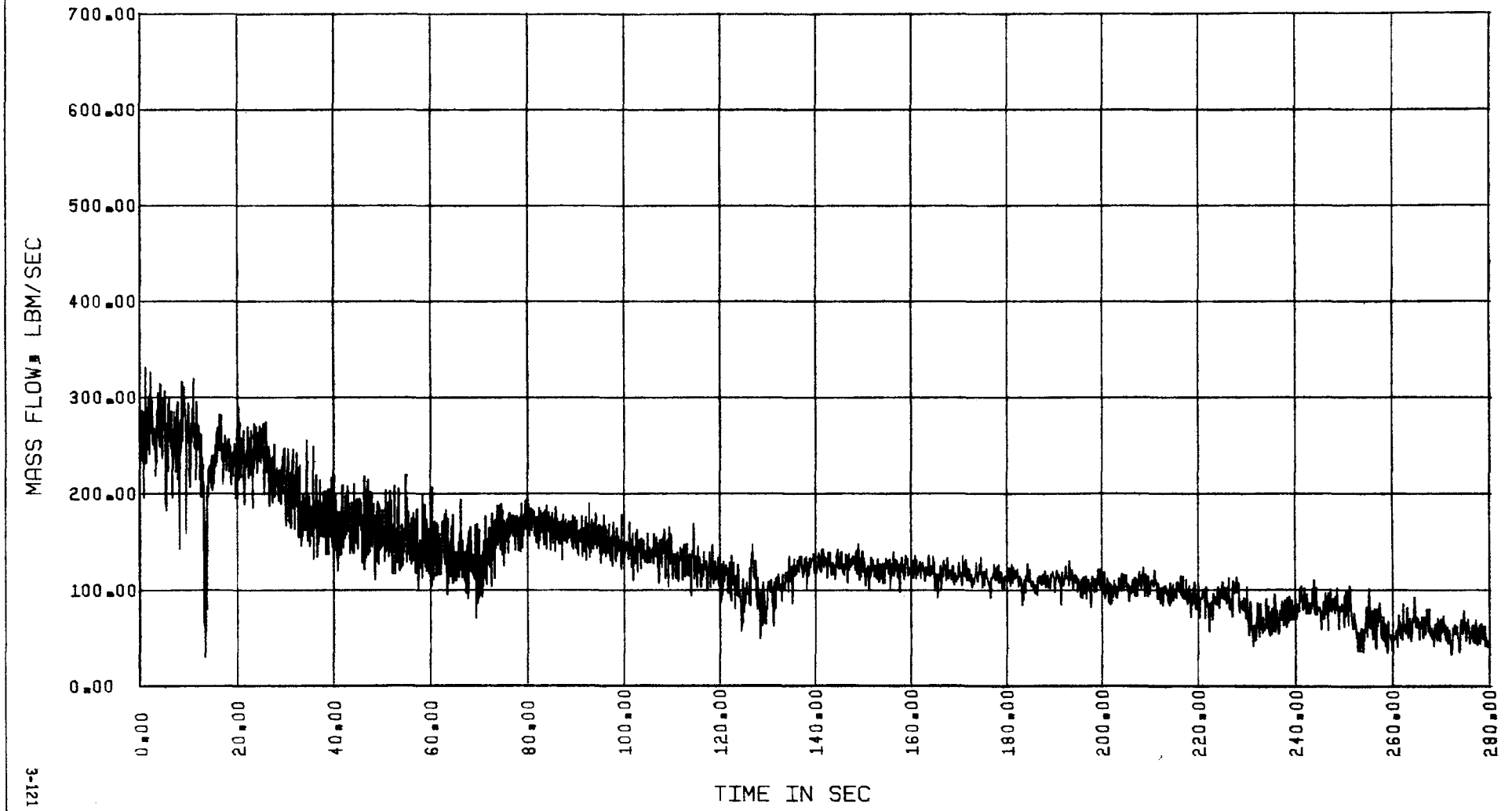
TEST 252/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.49



TEST 252/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.51

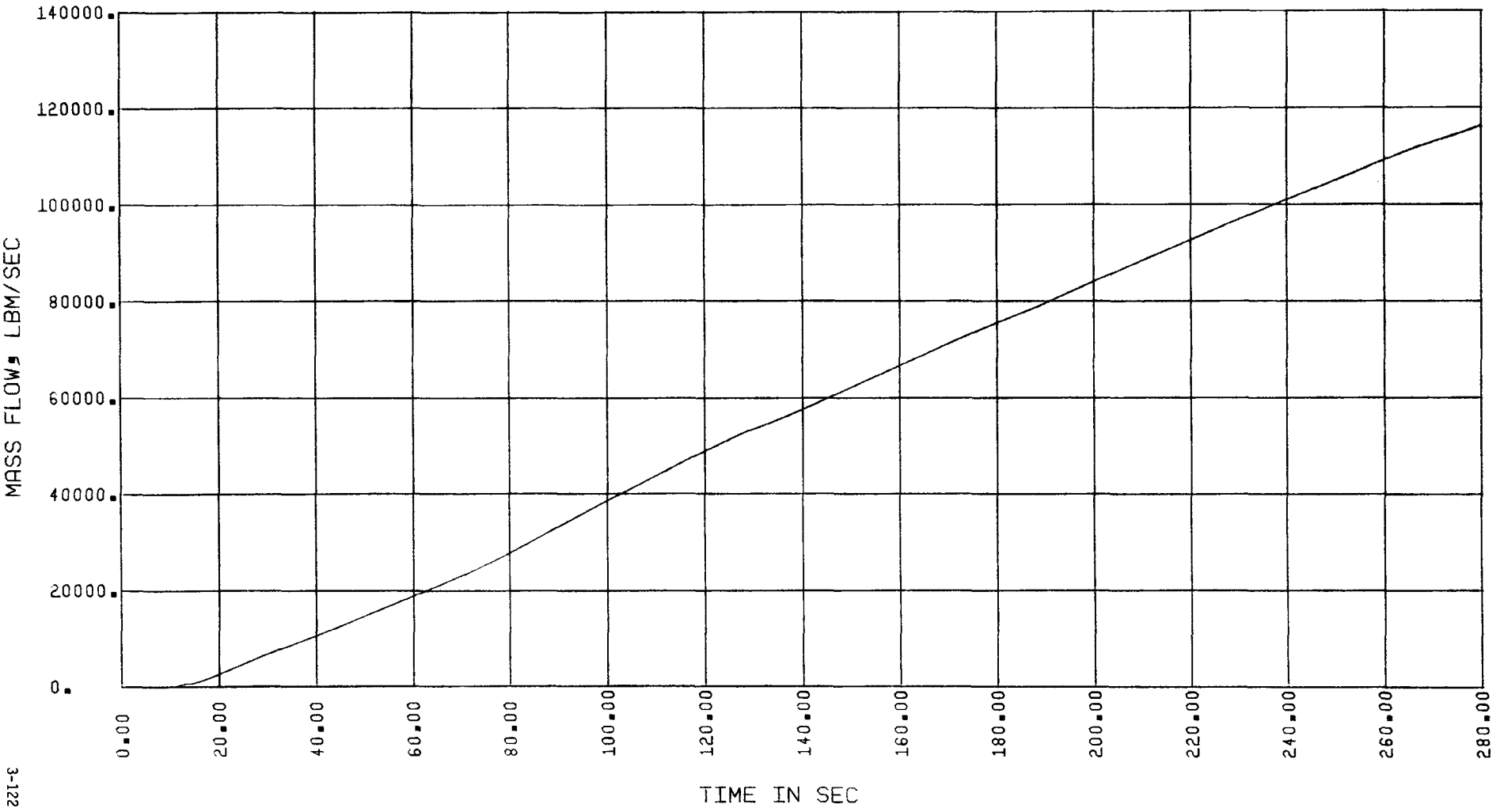


TEST 252/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-TM/GD2 DISCH
PLOT NO.52

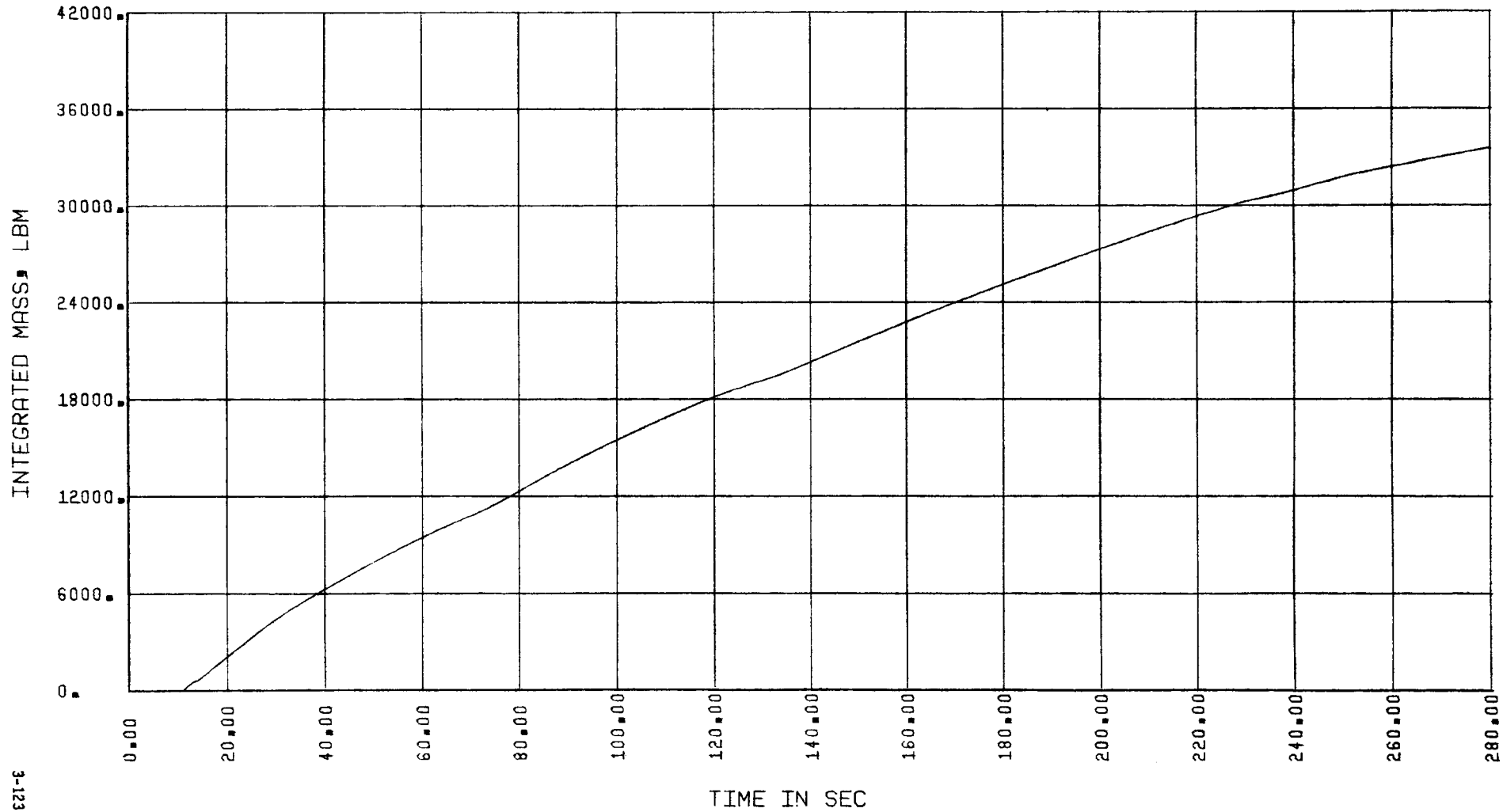


3-121

TEST 252/1000 PSIA FW FWD BDN
INTERGRATED MASS LO-TM/GD2 S
PLOT NO.55

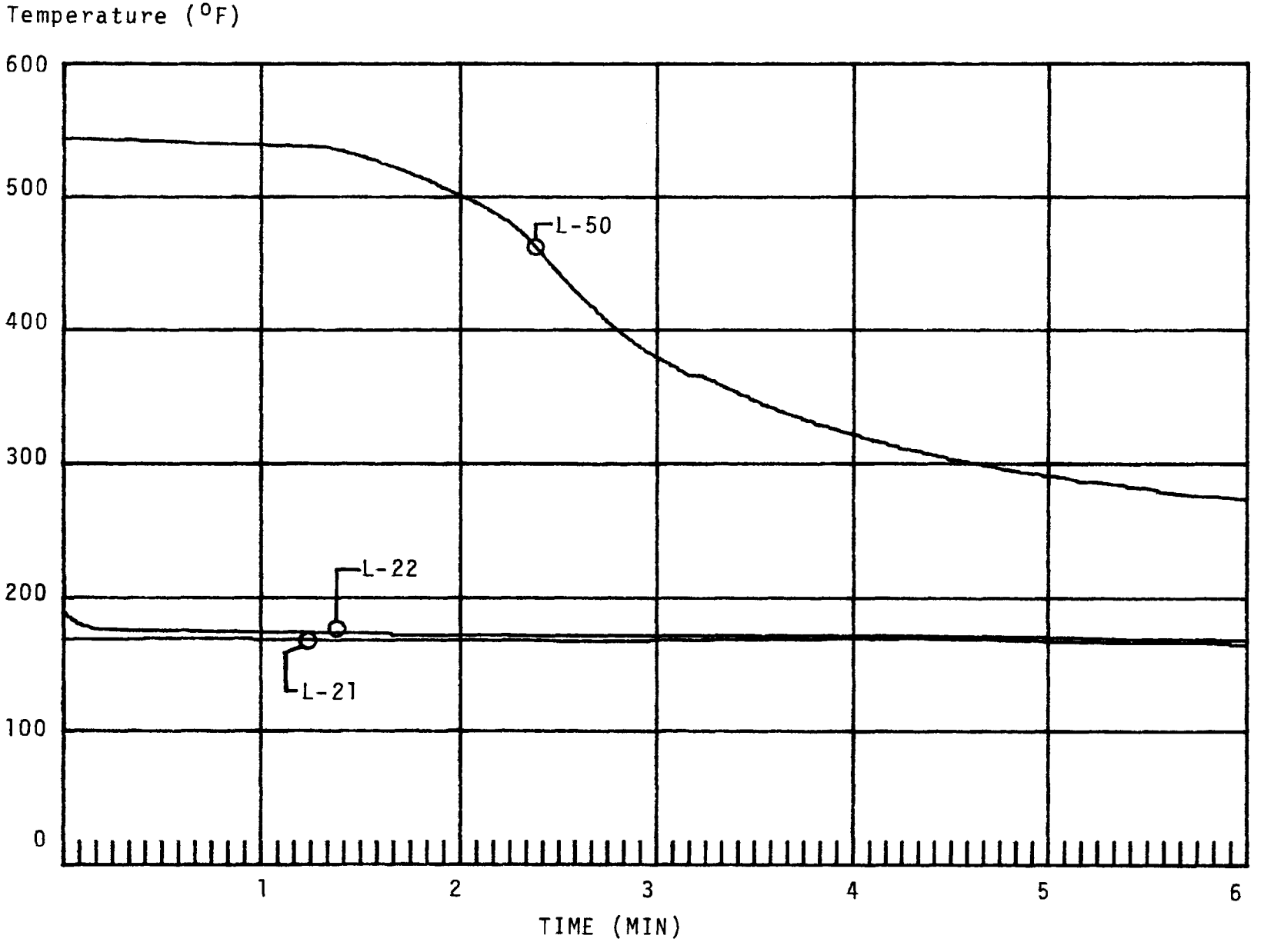


TEST 252/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-TM/GD2 D
PLOT NO.56

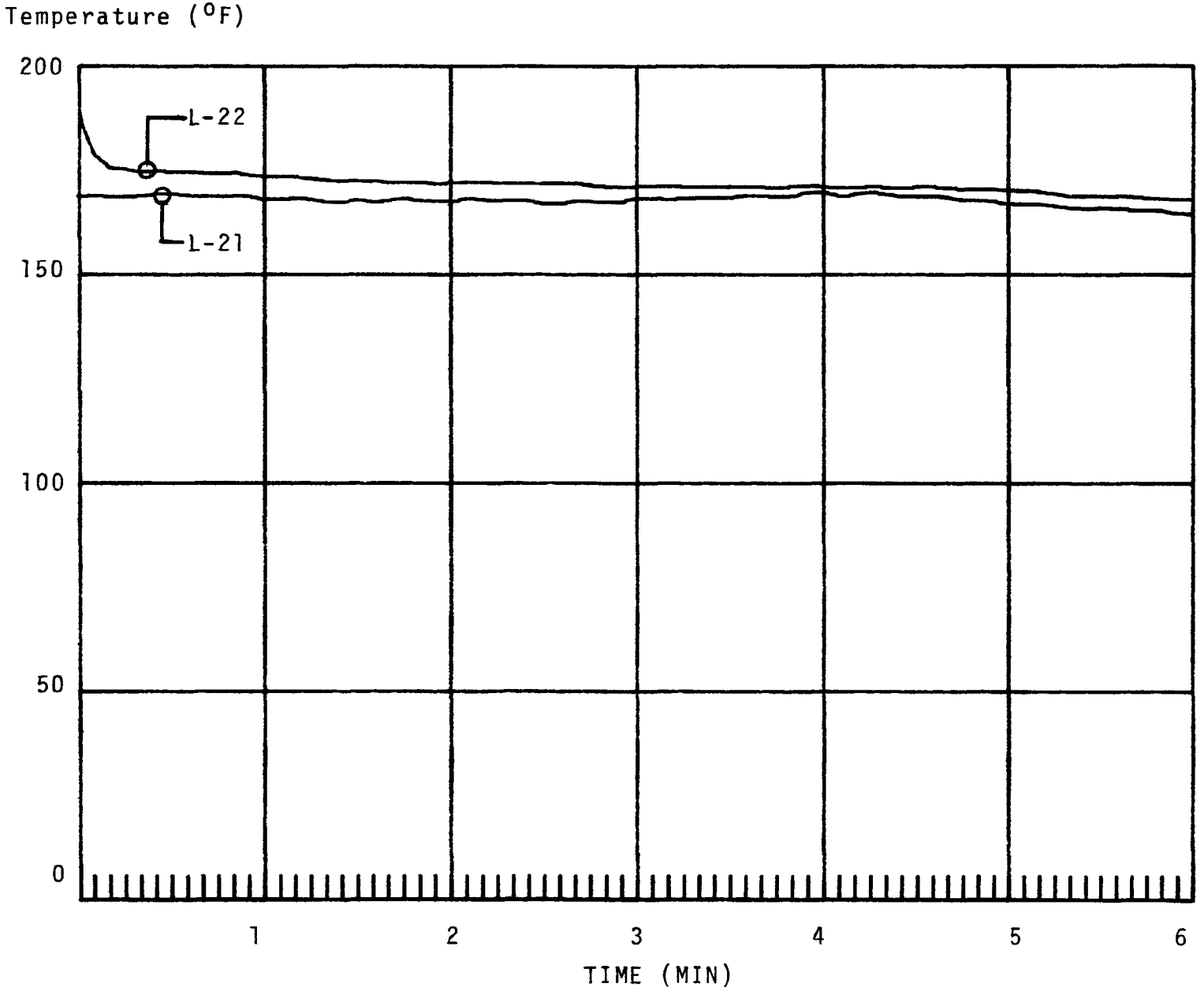


Index Listing
of
SCANNER DATA PLOTS
Test Number (252)

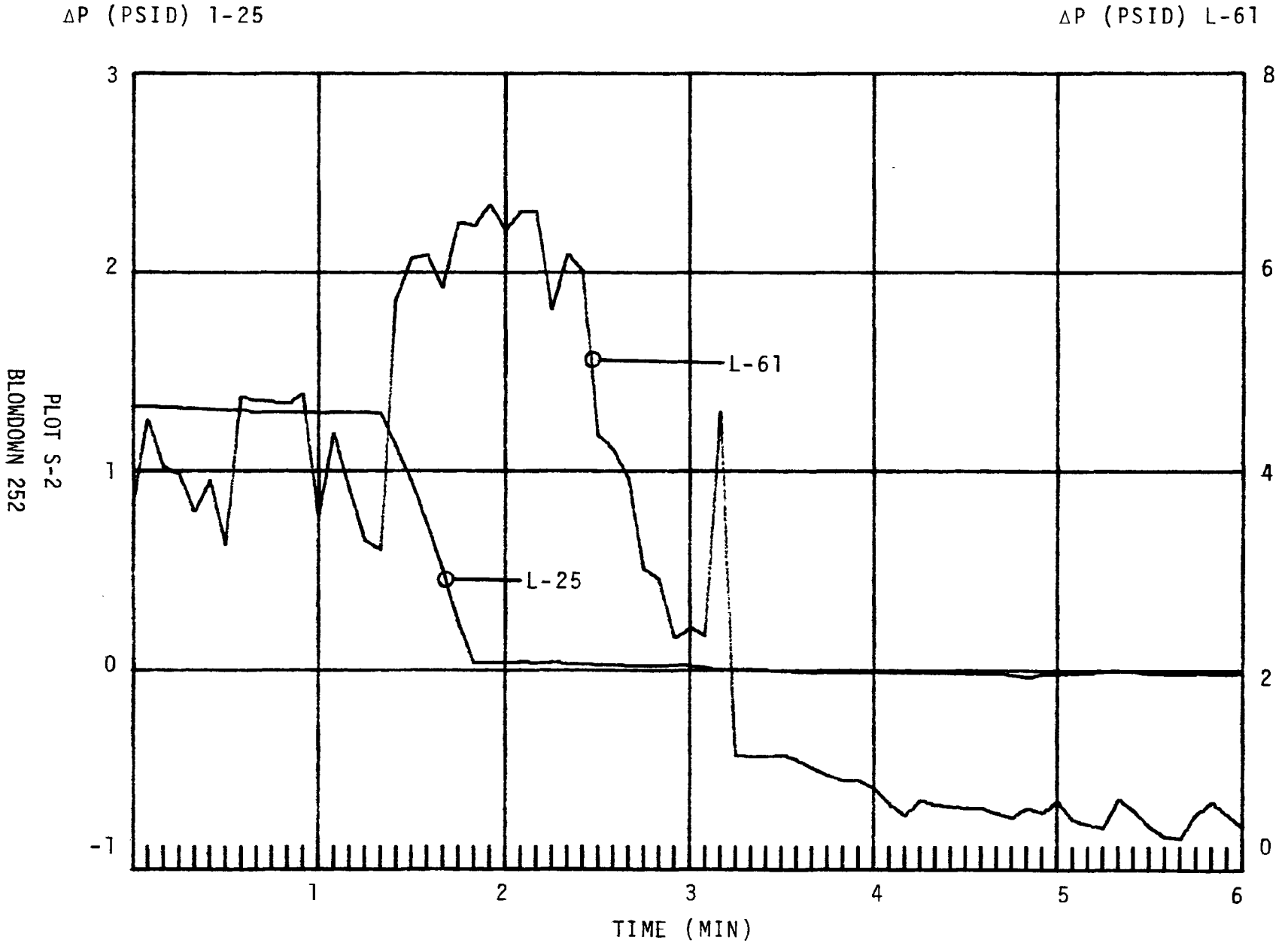
Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
	L-50	Main Water Orifice Thermocouple
S-1A	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

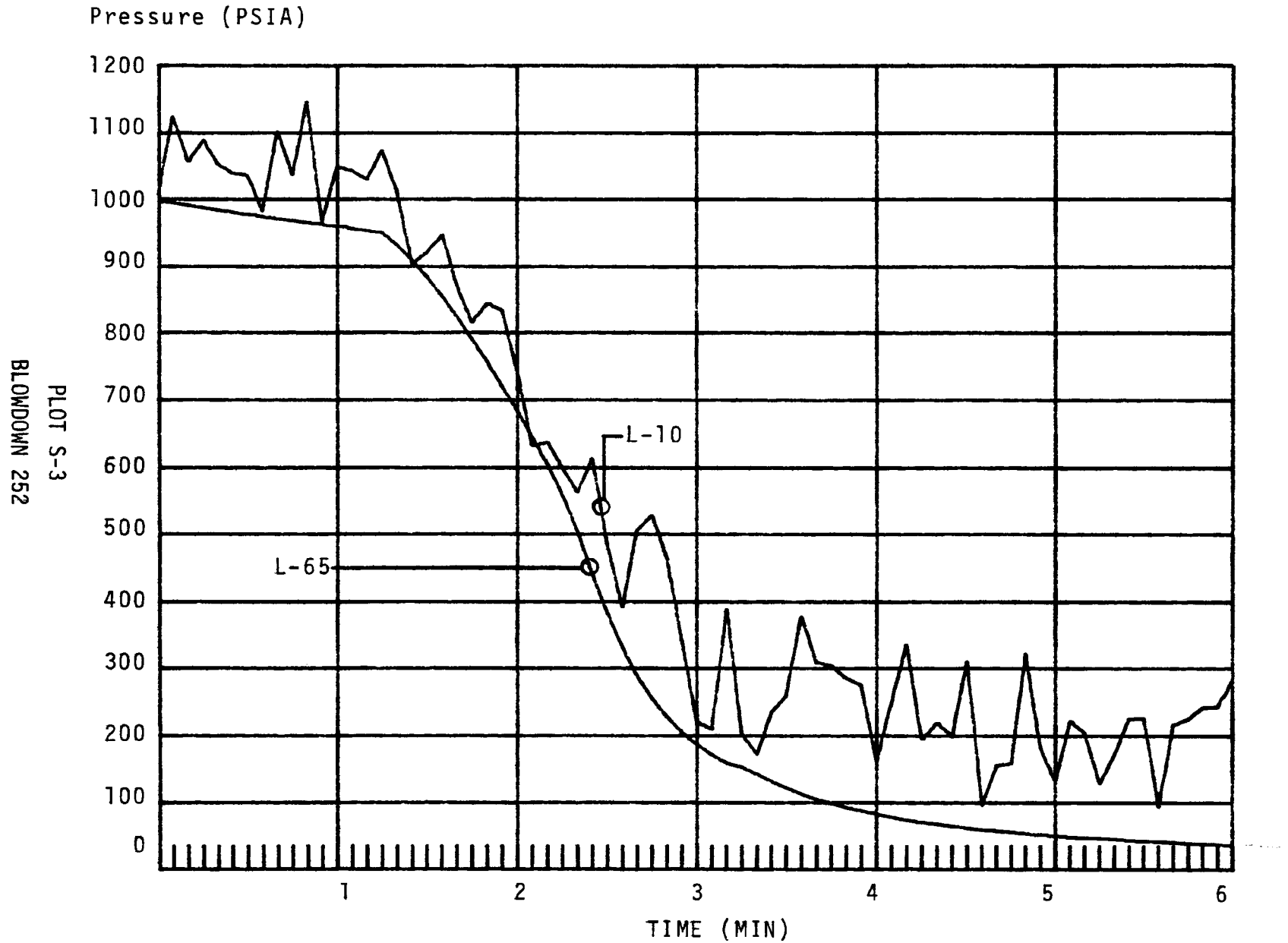


PLOT S-1
BLOWDOWN 252

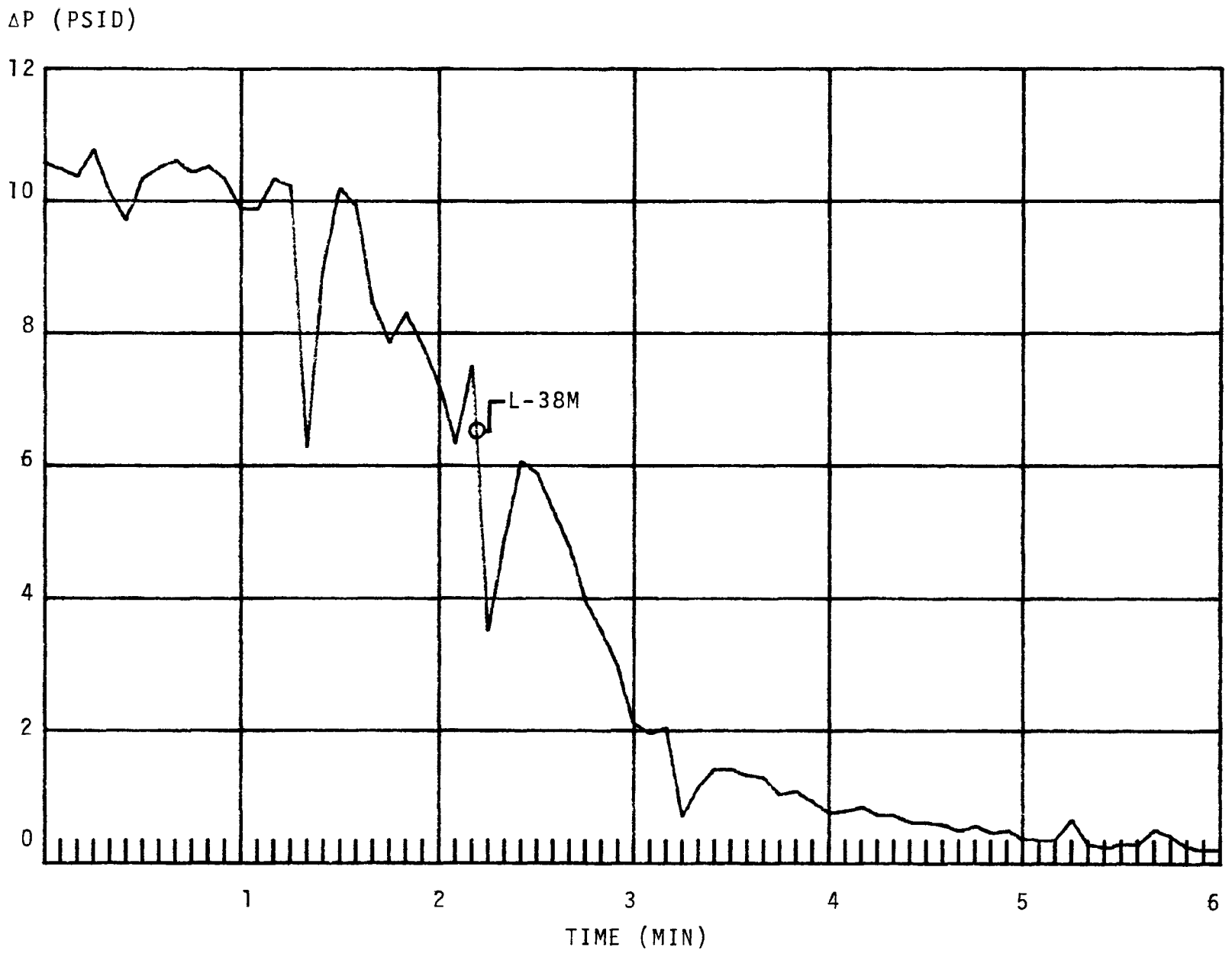


PLOT S-1A
BLOWDOWN 252

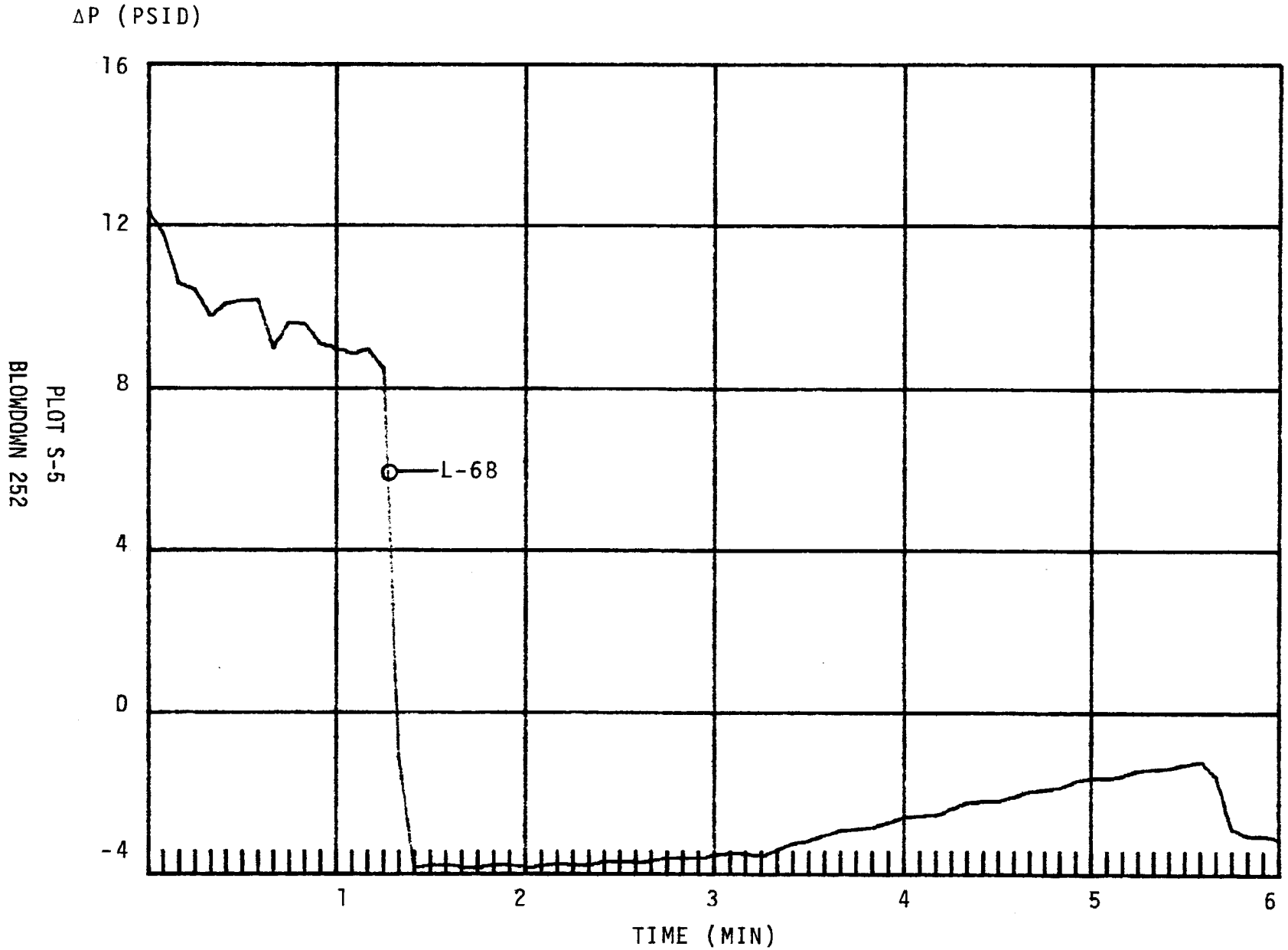

ΔP (PSID) 1-25
ΔP (PSID) L-61
3
2
1
0
-1
8
6
4
2
0
L-61
L-25
1
2
3
4
5
6
TIME (MIN)
PLOT S-2
BLOWDOWN 252



PLOT S-3
BLOWDOWN 252



PLOT S-4
BLOWDOWN 252



PLOT S-5
BLOWDOWN 252

SYSTEM CONFIGURATION

Test Number 475

Break Location	Suction
Break Size	16.26 in^2
	57 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Locked Rotor

COMMENTS

1. Malfunctioning or Inoperable Instruments:

   (a) Pump discharge drag disc (LO) was not installed.

   (b) Pump suction turbine meter (LO) high range data appear to have been clipped electronically. The specified range of this instrument was exceeded during portions of this test.

2. Other Comments: The calculated mass flow rates do not show negative flow as indicated by the plots of volumetric flow rate.

3. Affected FM Data Plots: 28 - Normalized Volumetric Flow Rate
   30 - Mass Flow Rate
   31 - Mass Flow Rate
   32 - Mass Flow Rate
   34 - Momentum Flux
   51 - Mass Flow Rate
   52 - Mass Flow Rate
   55 - Integrated Mass

   The following plots of the standard plot package were deleted:

   25 - Normalized Volumetric Flow Rate
   33 - Mass Flow Rate
   39 - Momentum Flux
   49 - Integrated Mass

INITIAL CONDITIONS

t = 10 Sec[a]

Test Number 475

System Pressures

High Pressure Drum	1165.1	psia
Suction Instrument Spool	1168.1	psia
Discharge Instrument Spool	1171.4	psia

Fluid Temperatures

Suction Instrument Spool	565.0	°F
Discharge Instrument Spool	566.2	°F

Fluid Density

Suction Instrument Spool	44.96	lbm/ft^3
Discharge Instrument Spool	44.87	lbm/ft^3

System Flows

Mass Flow Rate	14	lb/sec
Suction Volumetric Flow Rate	-139	gpm
Discharge Volumetric Flow Rate	-150	gpm
Suction Normalized Volumetric Flow Rate	-0.04	
Discharge Normalized Volumetric Flow Rate	-0.04	
Suction Fluid Velocity	1.71	ft/sec
Discharge Fluid Velocity	1.84	ft/sec
Suction Momentum Flux	270	$lbm/ft\ sec^2$
Discharge Momentum Flux	292	$lbm/ft\ sec^2$

Pump Performance

Pump head	0.65	psi
	2.1	ft
Pump Speed	Locked Rotor	
Pump Shaft Torque	50.9	ft lb
Pump Hydraulic Torque	51.2	ft lb

System Mass (t = 65 Sec)[a]

High Pressure Drum Level	45.6	in[b]
Fluid Mass Upstream of Test Pump	13,333	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 475

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-6.0	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	2.0	c
HPSW-1 Closed	3.7	c
Pump Power Trip	-	-
Initiate Rupture Mechanism	3.0	c
Blowdown Starts	4.9	70
End of Digitized Data 20 s/sec	924.0	-
200 s/sec	324.0	-
FM Recording System Off	2550.0	-
Scanner System Off	-	305

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

Index Listing

of

FM DATA PLOTS

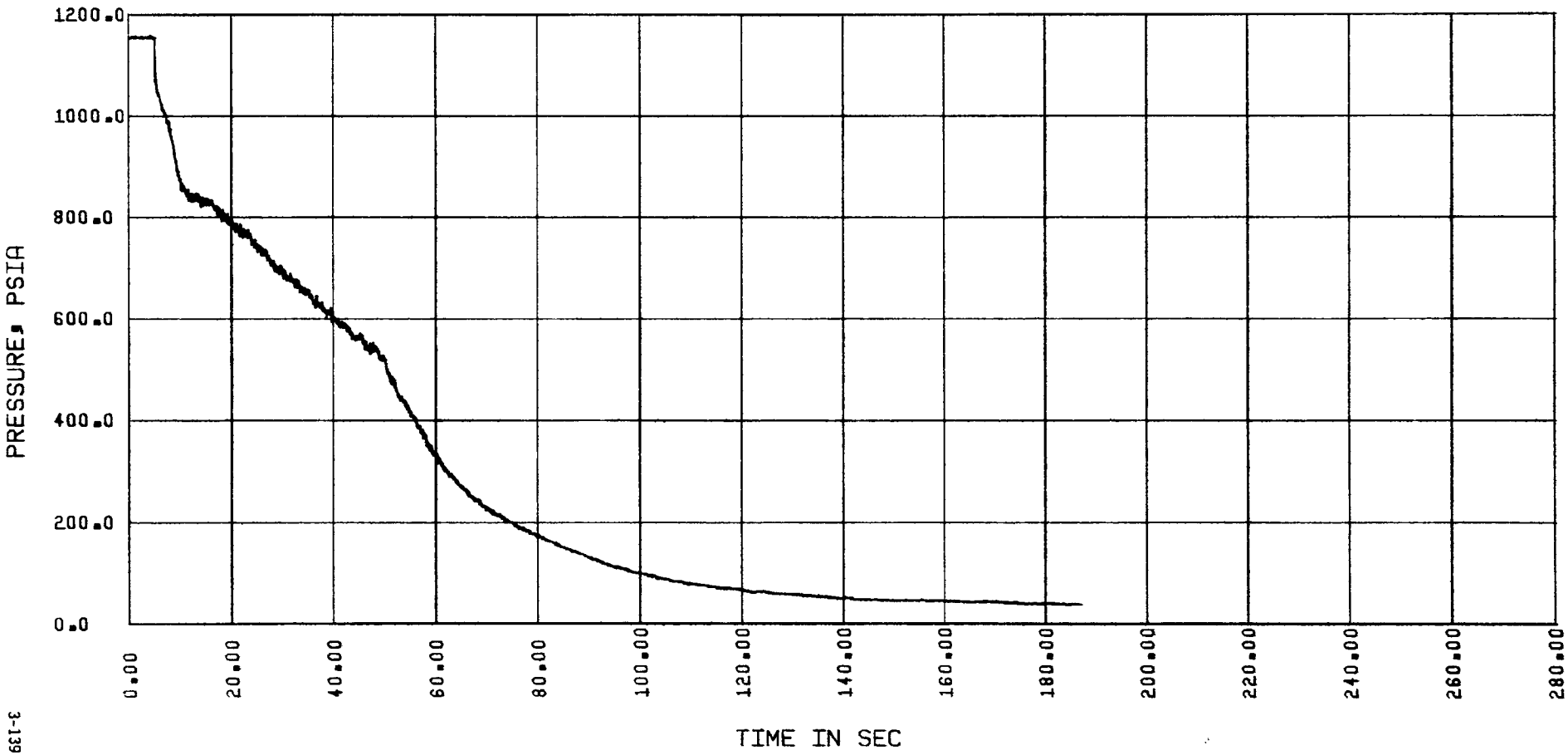
Test Number (475)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 SUC.
26	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 SUC.
27	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 DISCH.
28	L-3	Norm. Vol. Flow Rate LO-TM Suction
29	L-29	Norm. Vol. Flow Rate HI-TM Discharge
30	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction

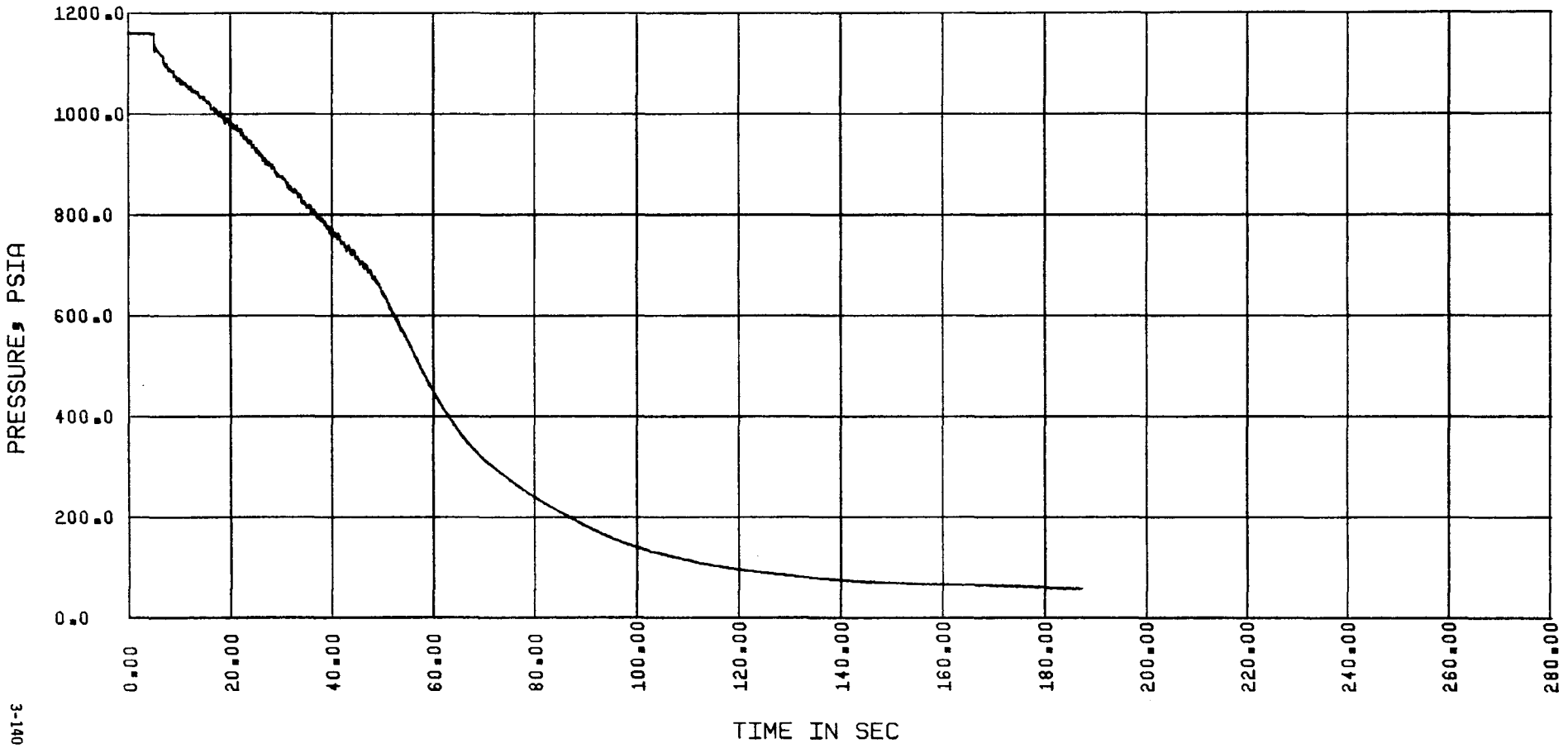
Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (475)

Plot Number	Location Number	Description of Parameter
31	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
32	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
34	L-16/L-3	Momentum Flux GD2/LO-TM Suction
35	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
36	L-1	Momentum Flux HI-DD Suction
37	L-2	Momentum Flux HI-DD Discharge
38	L-26	Momentum Flux LO-DD Suction
40	L-7	Pump Head in Psi
43	L-12	Norm. Pump Speed
44	L-11	Norm. Pump Shaft Torque
45	L-11/L-12	Norm. Pump Hydraulic Torque
46	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
47	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
48	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
51	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
52	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
55	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
56	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge

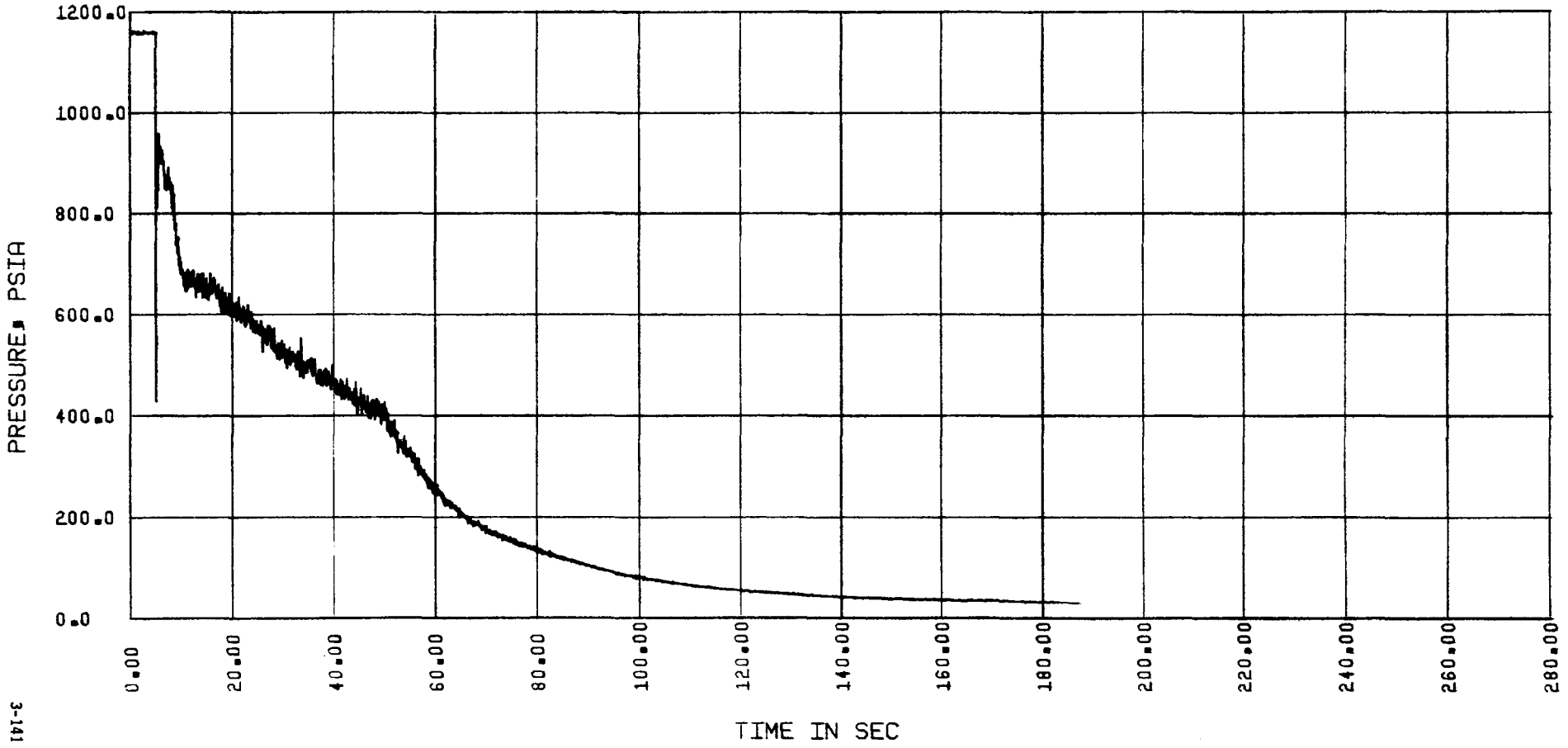
TEST 475/1000 PSIA LR REV BDN
PUMP SUCTION PRESSURE
PLOT NO.1



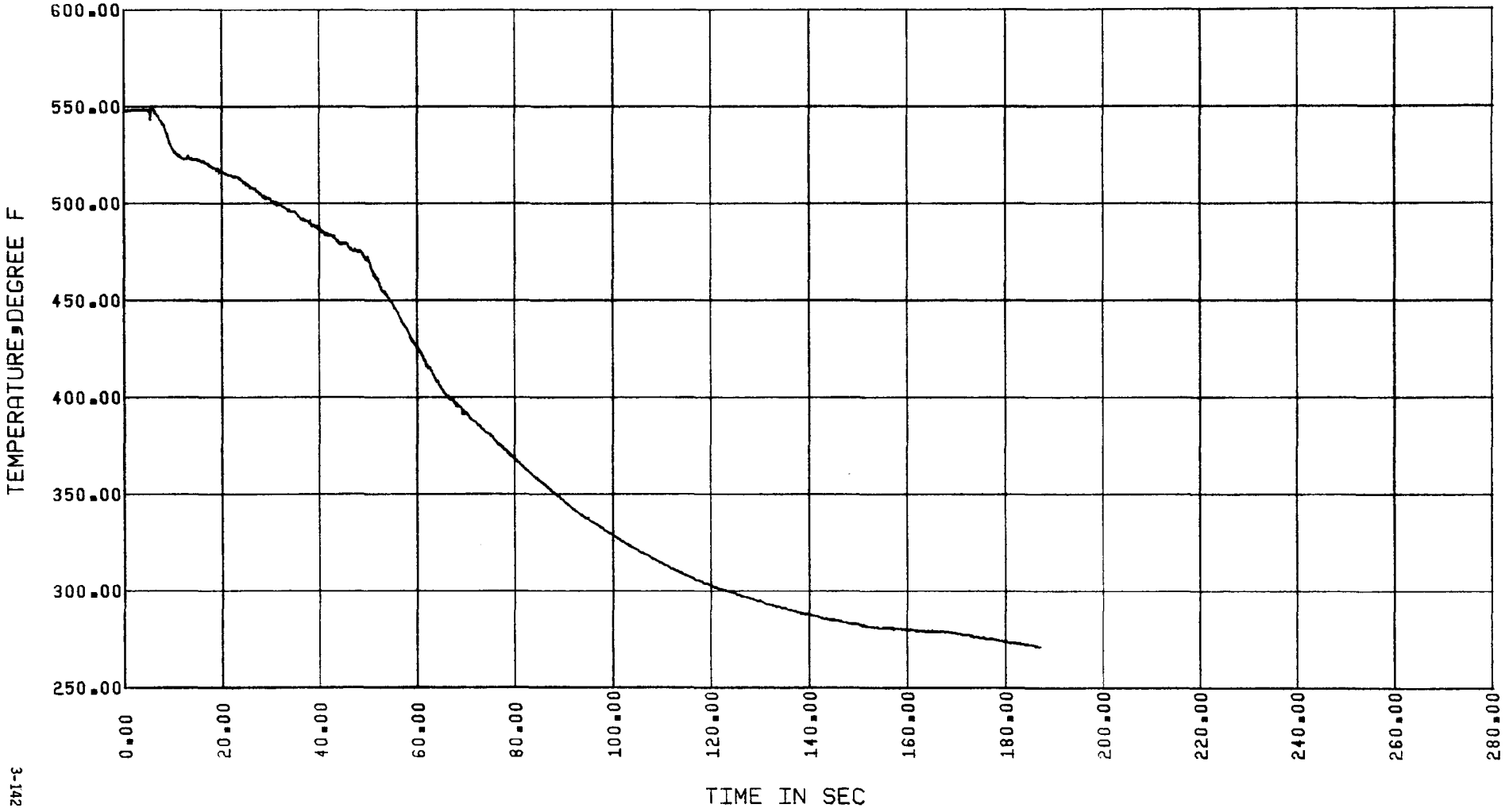
TEST 475/1000 PSIA LR REV BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2



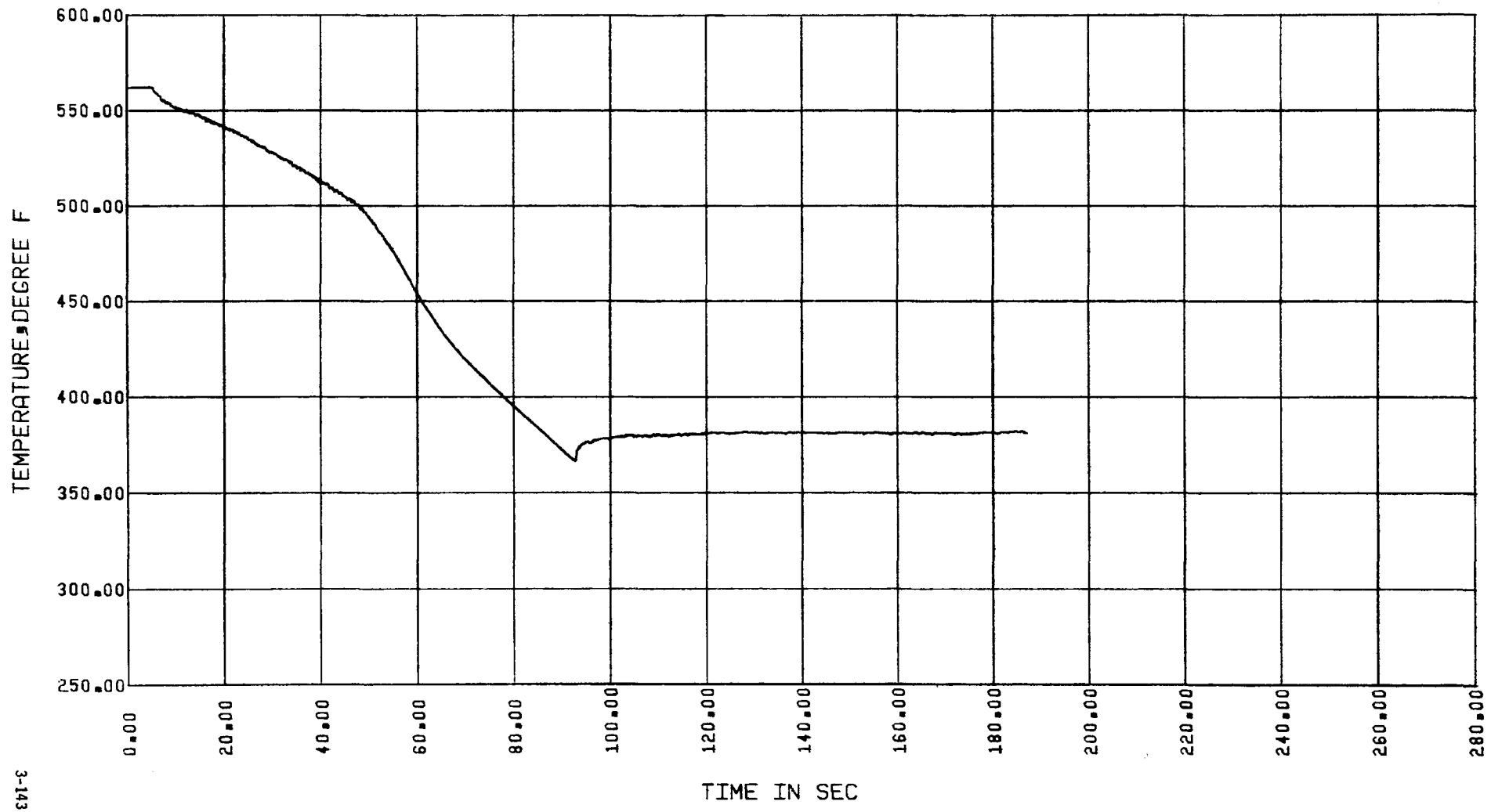
TEST 475/1000 PSIA LR REV BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



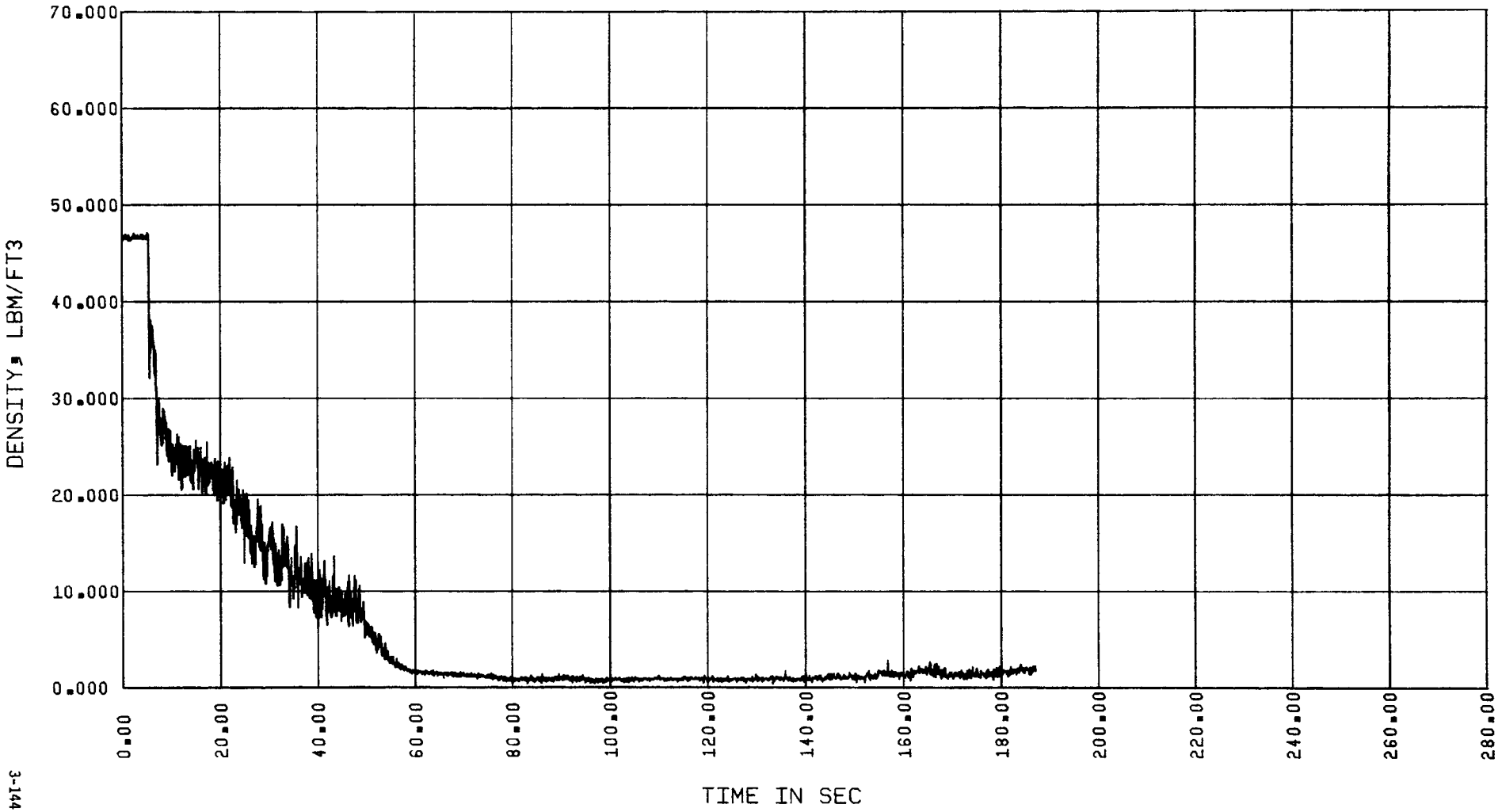
TEST 475/1000 PSIA LR REV BDN
PUMP SUCTION TEMPERATURE
PLOT NO.4



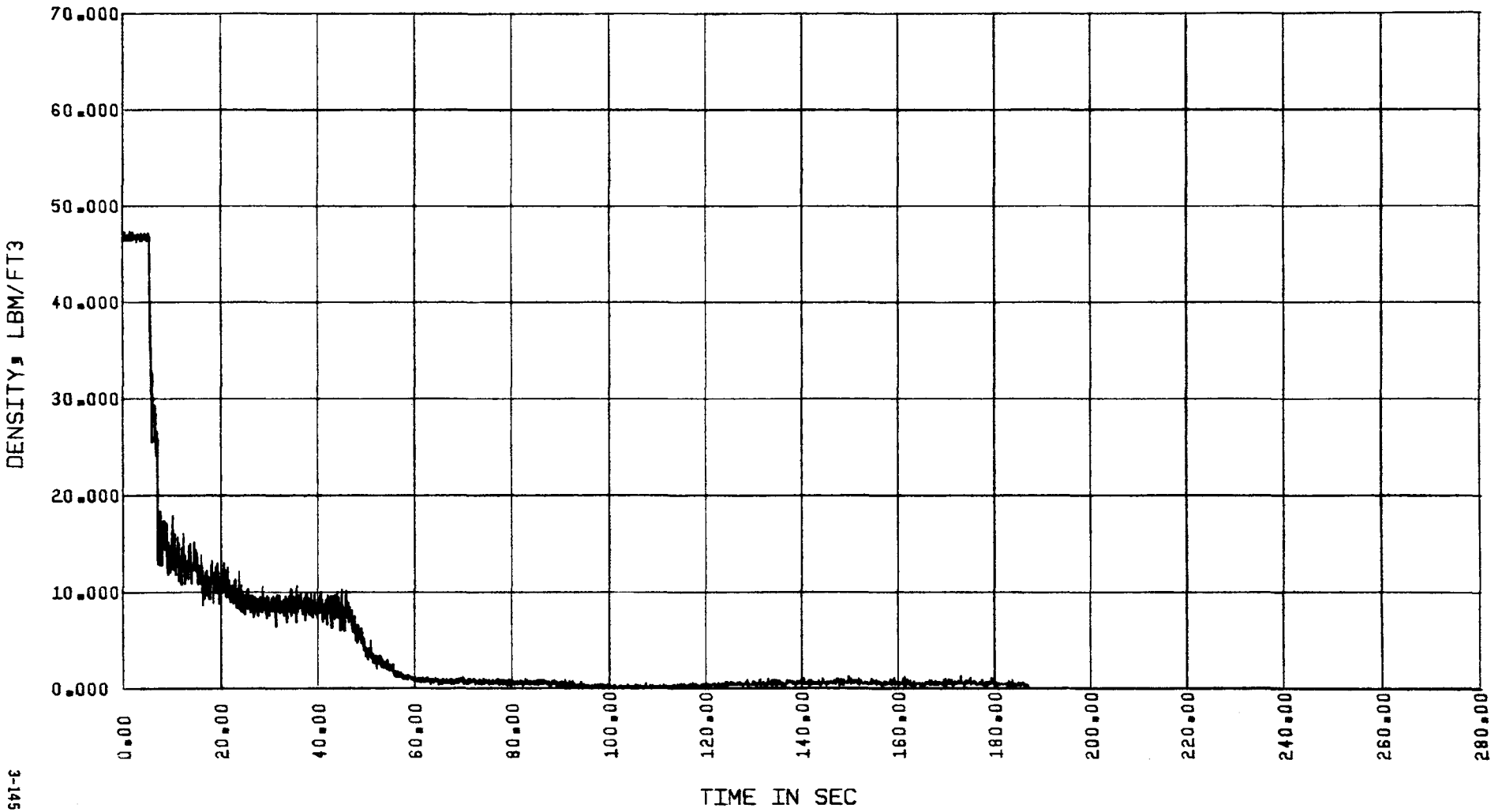
TEST 475/1000 PSIA LR REV BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5



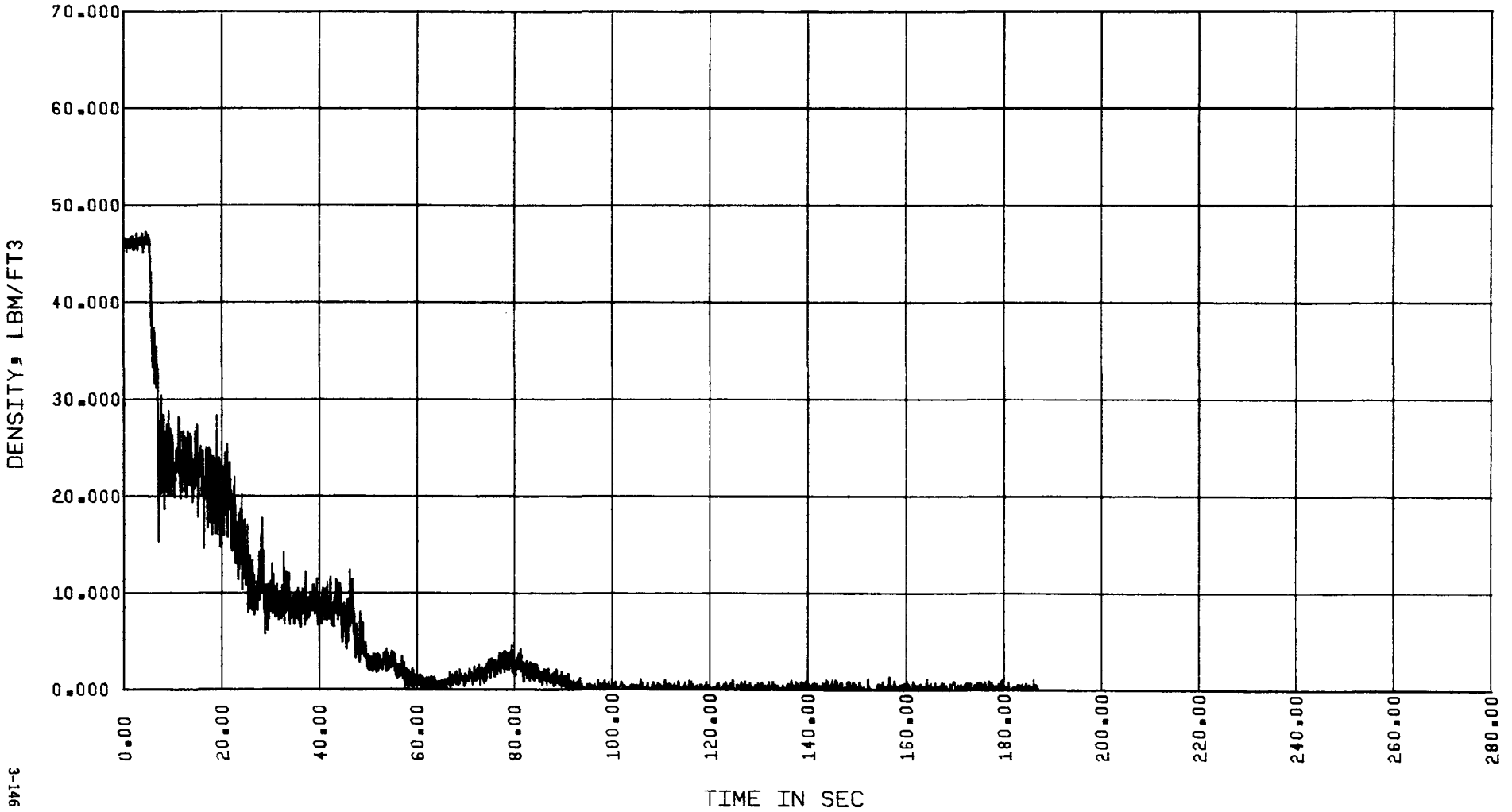
TEST 475/1000 PSIA LR REV BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



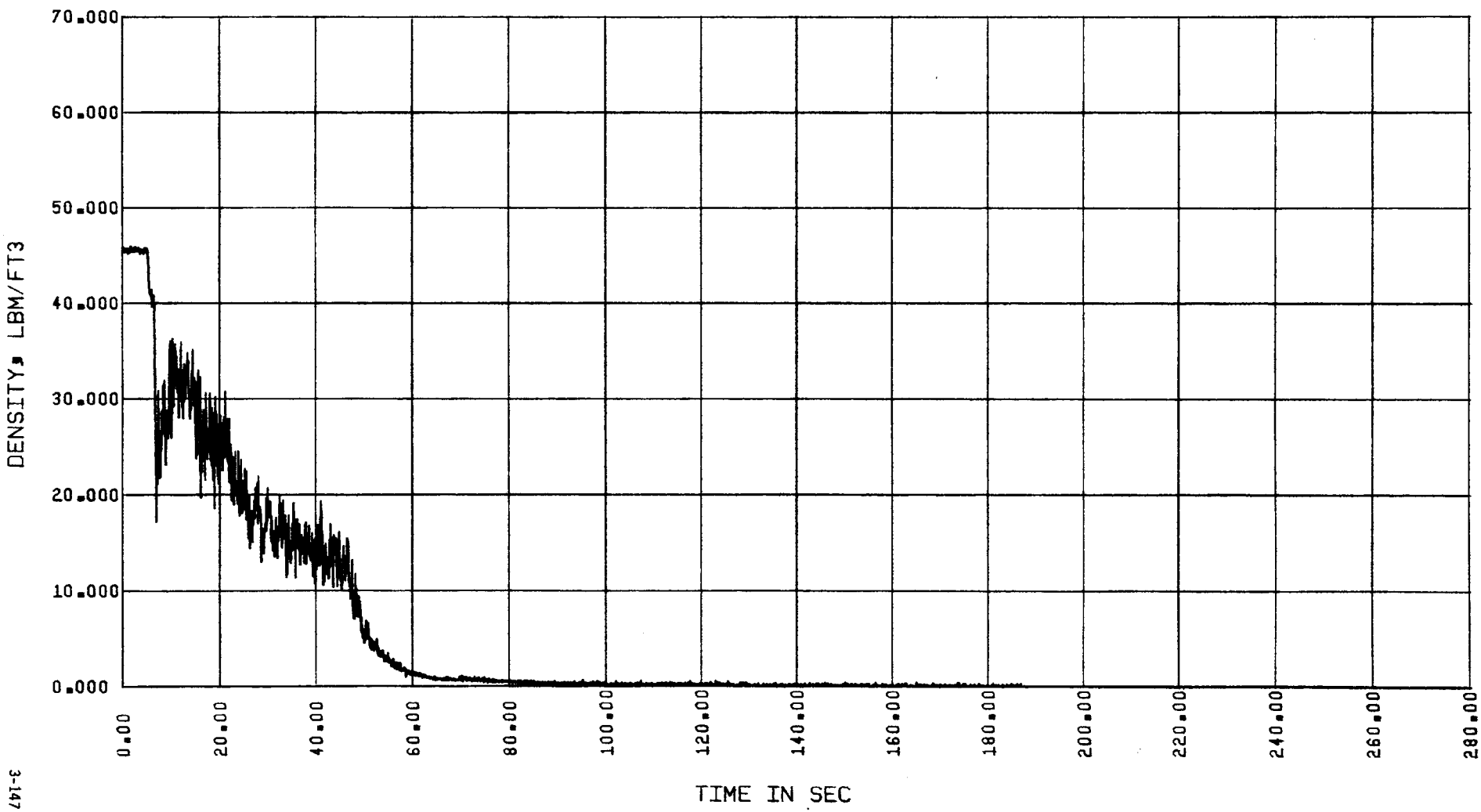
TEST 475/1000 PSIA LR REV BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7



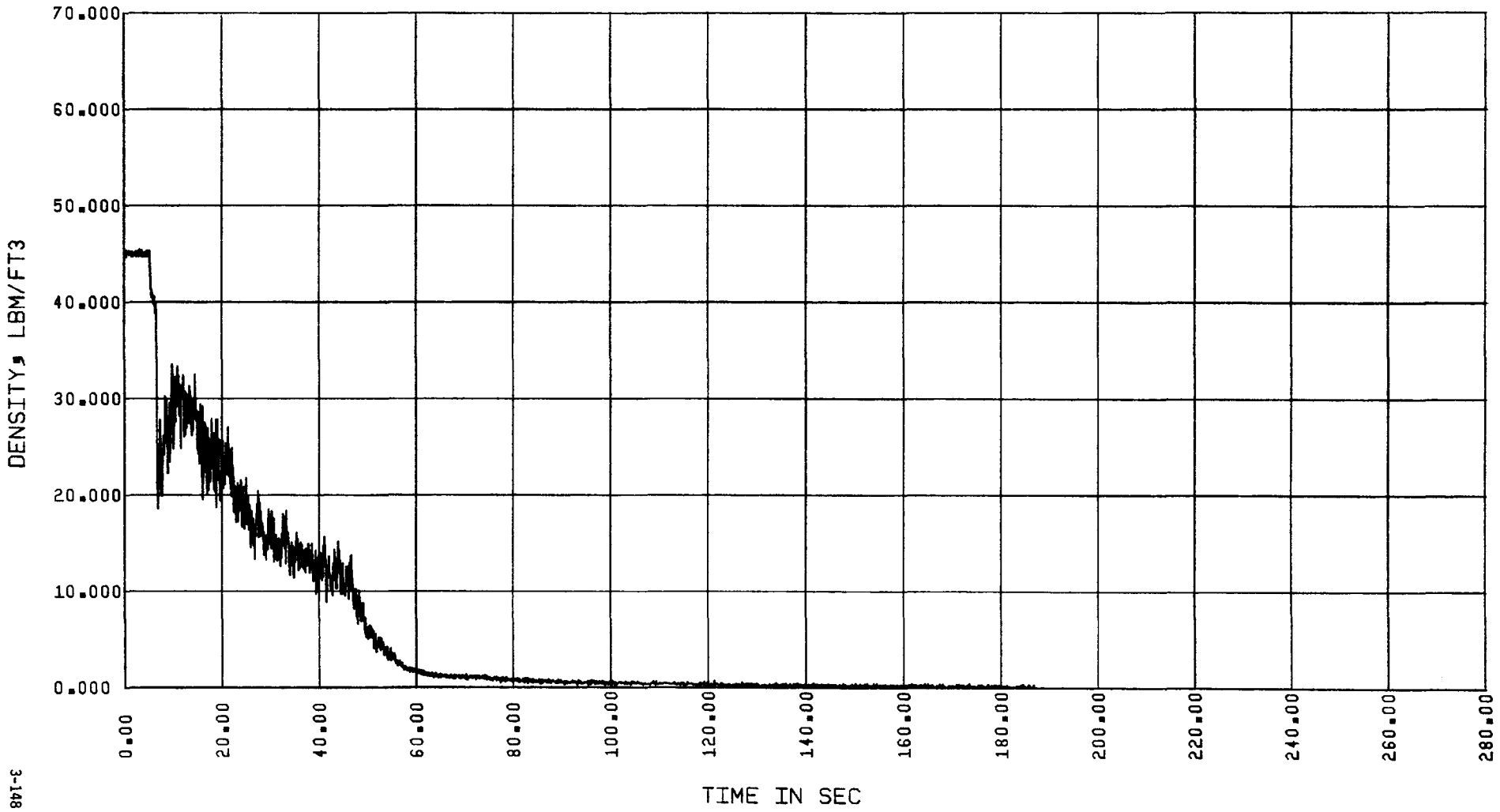
TEST 475/1000 PSIA LR REV BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8



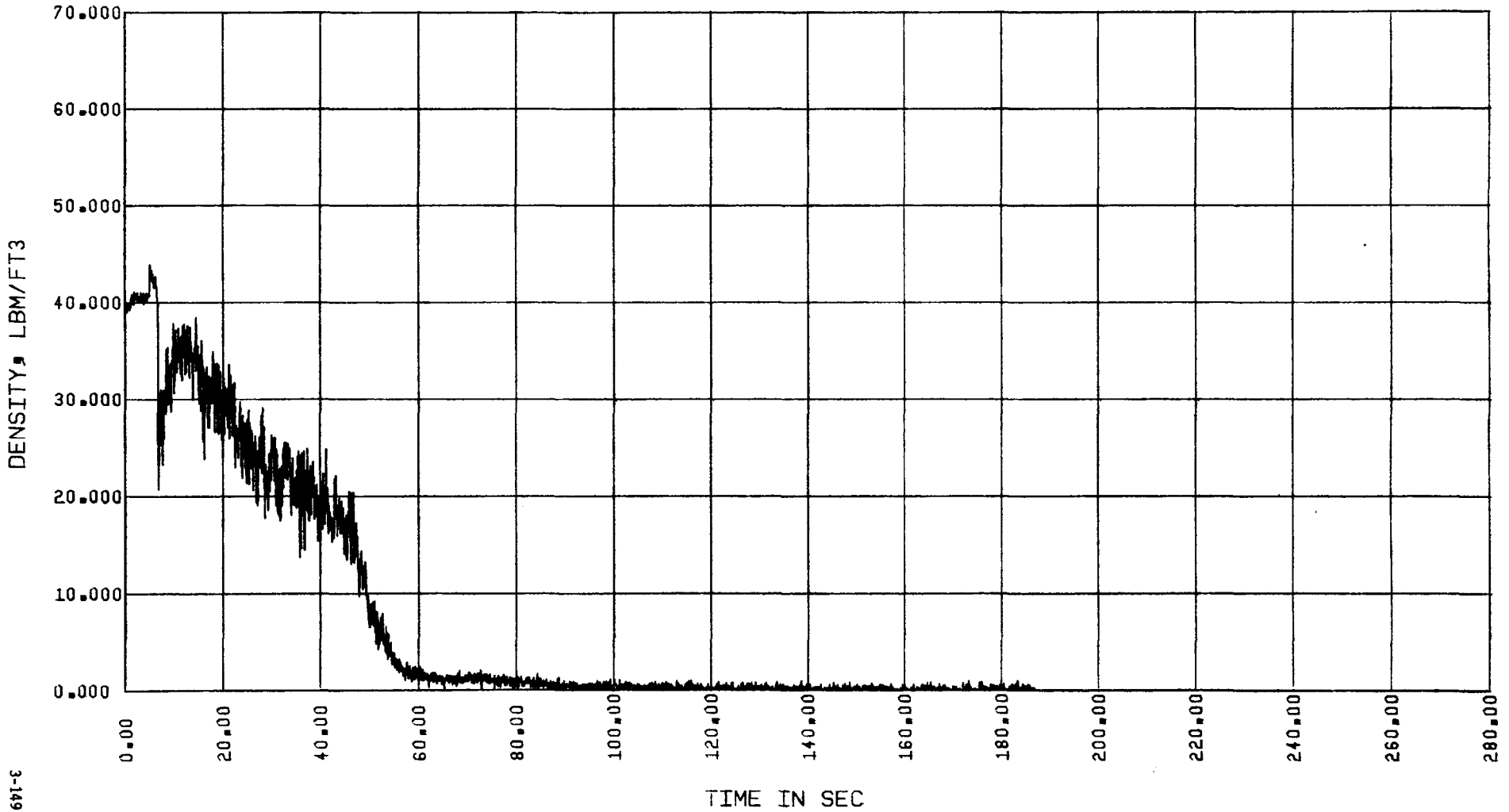
TEST 475/1000 PSIA LR REV BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9



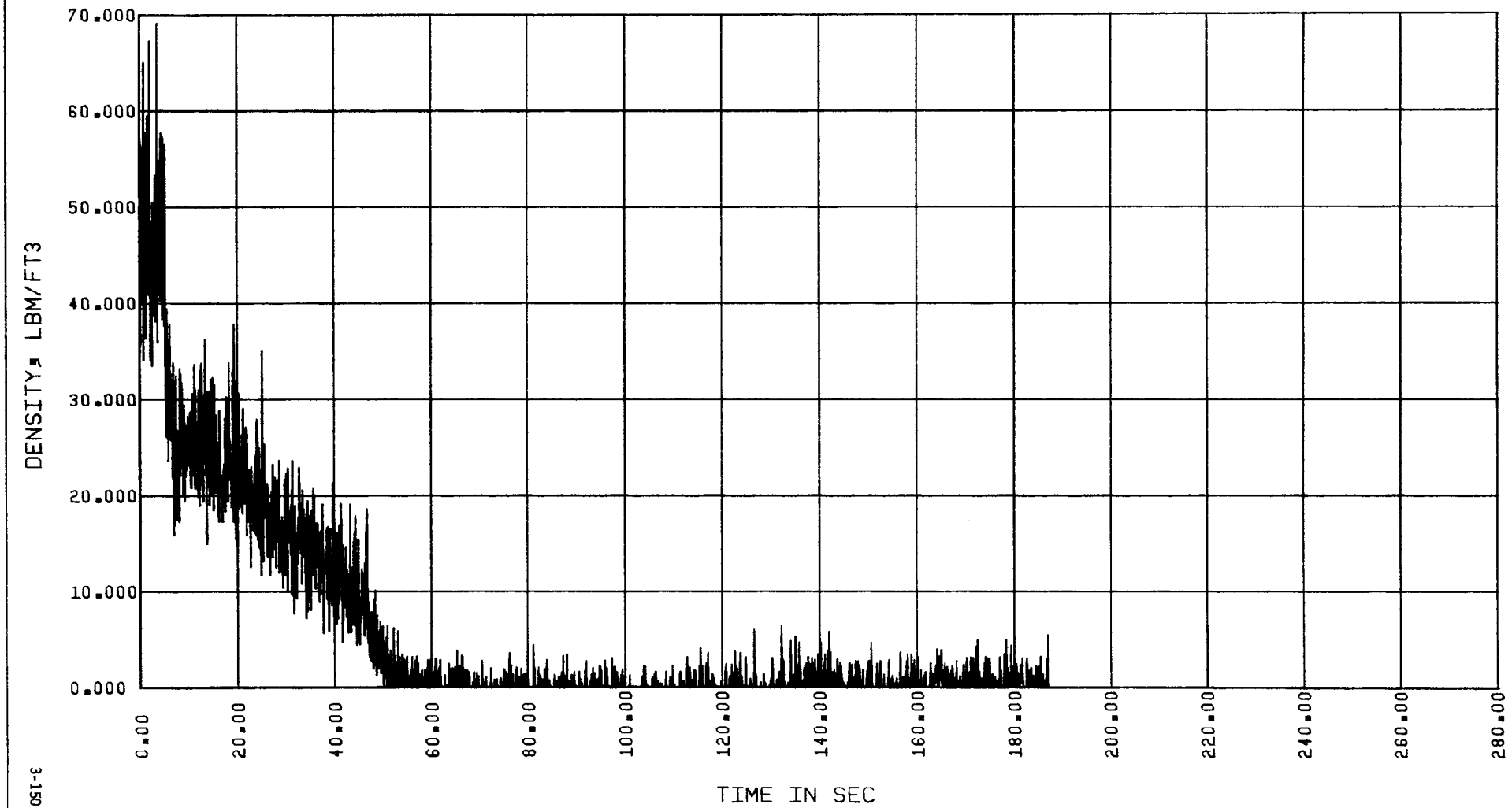
TEST 475/1000 PSIA LR REV BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10



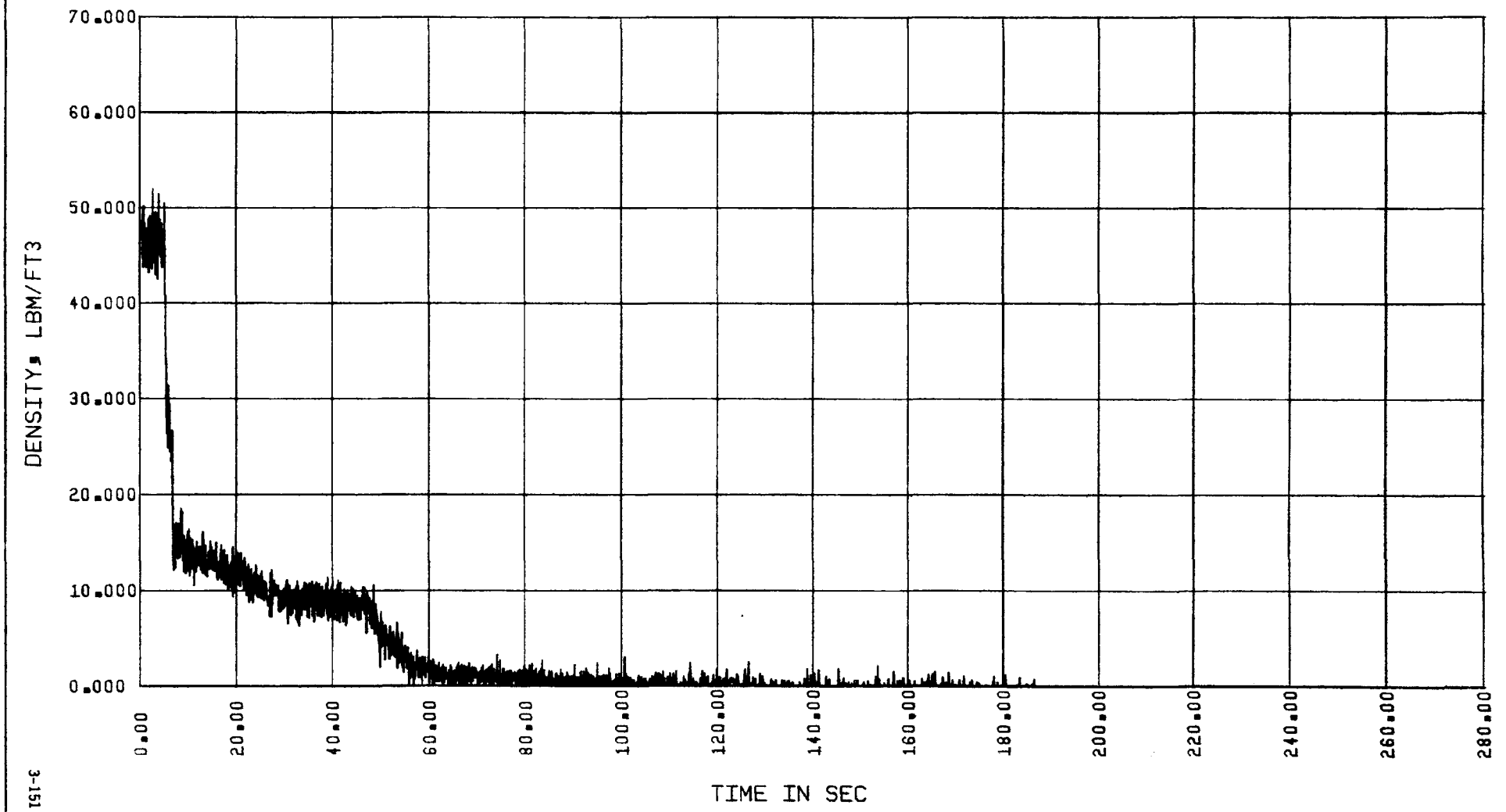
TEST 475/1000 PSIA LR REV BDN
DENSITY BEAM 3 GD DISCHARGE
PLOT NO.11



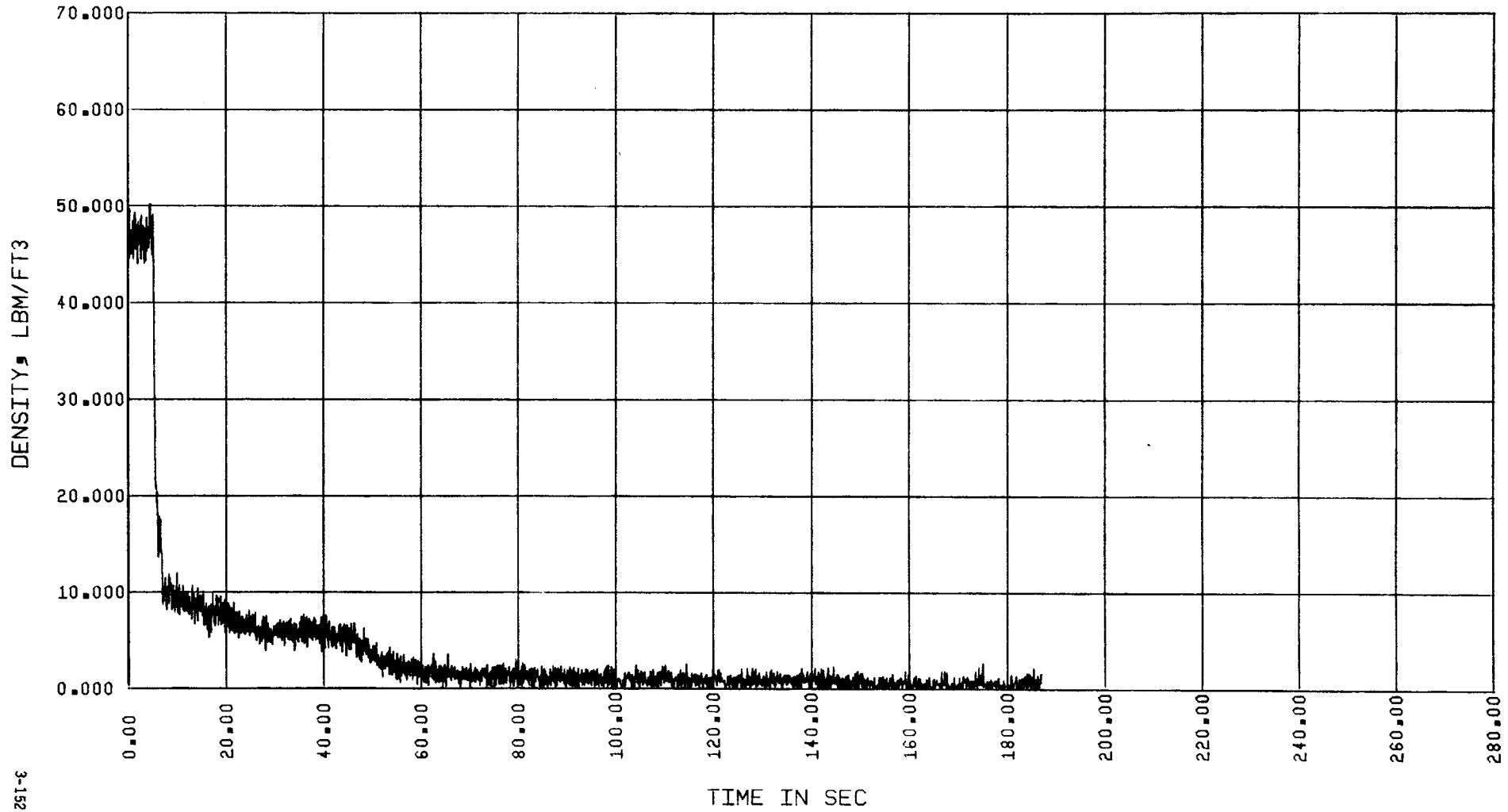
TEST 475/1000 PSIA LR REV BDN
DENSITY BEAM1 AECL GD
PLOT NO.12



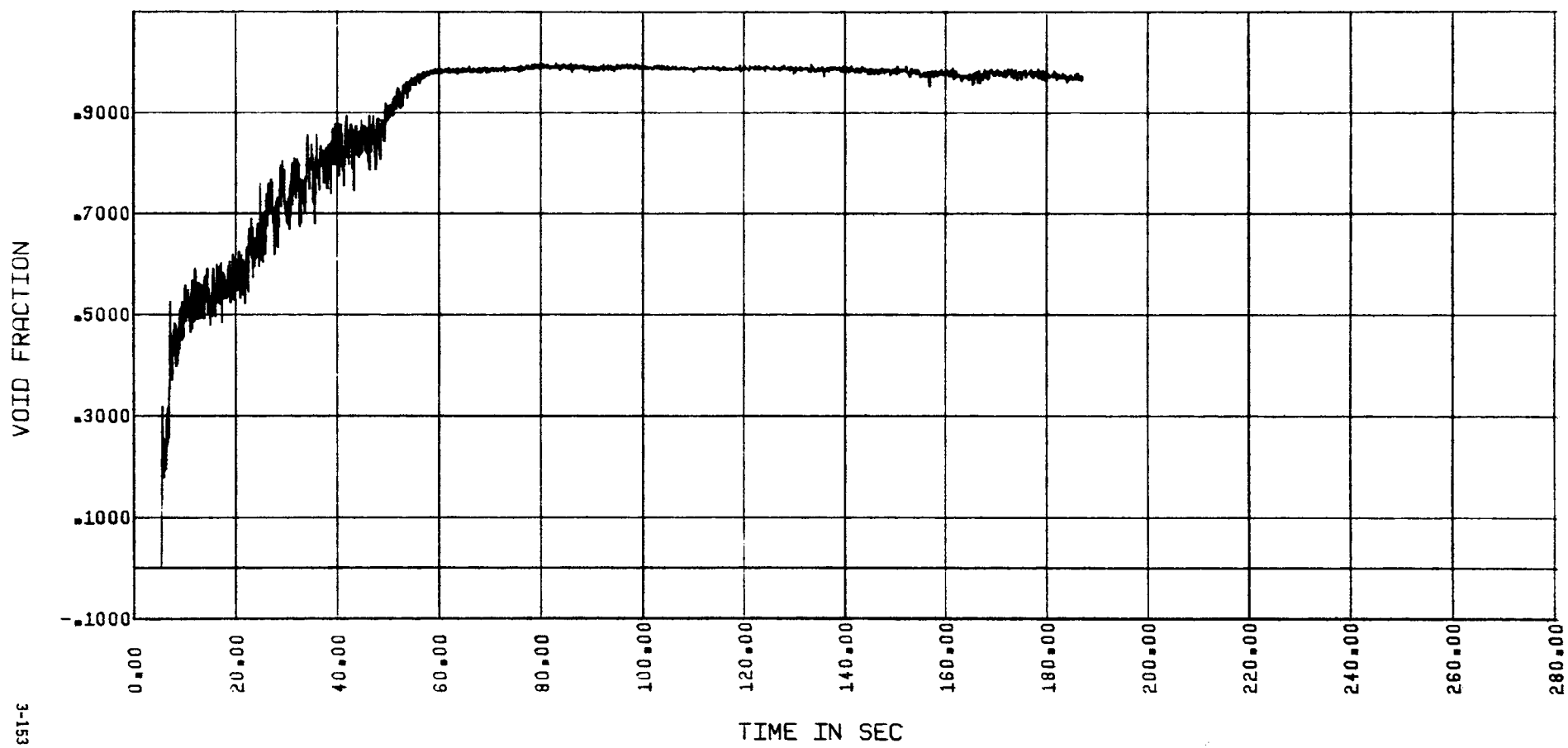
TEST 475/1000 PSIA LR REV BDN
DENSITY BEAM2 AECL GD
PLOT NO.13



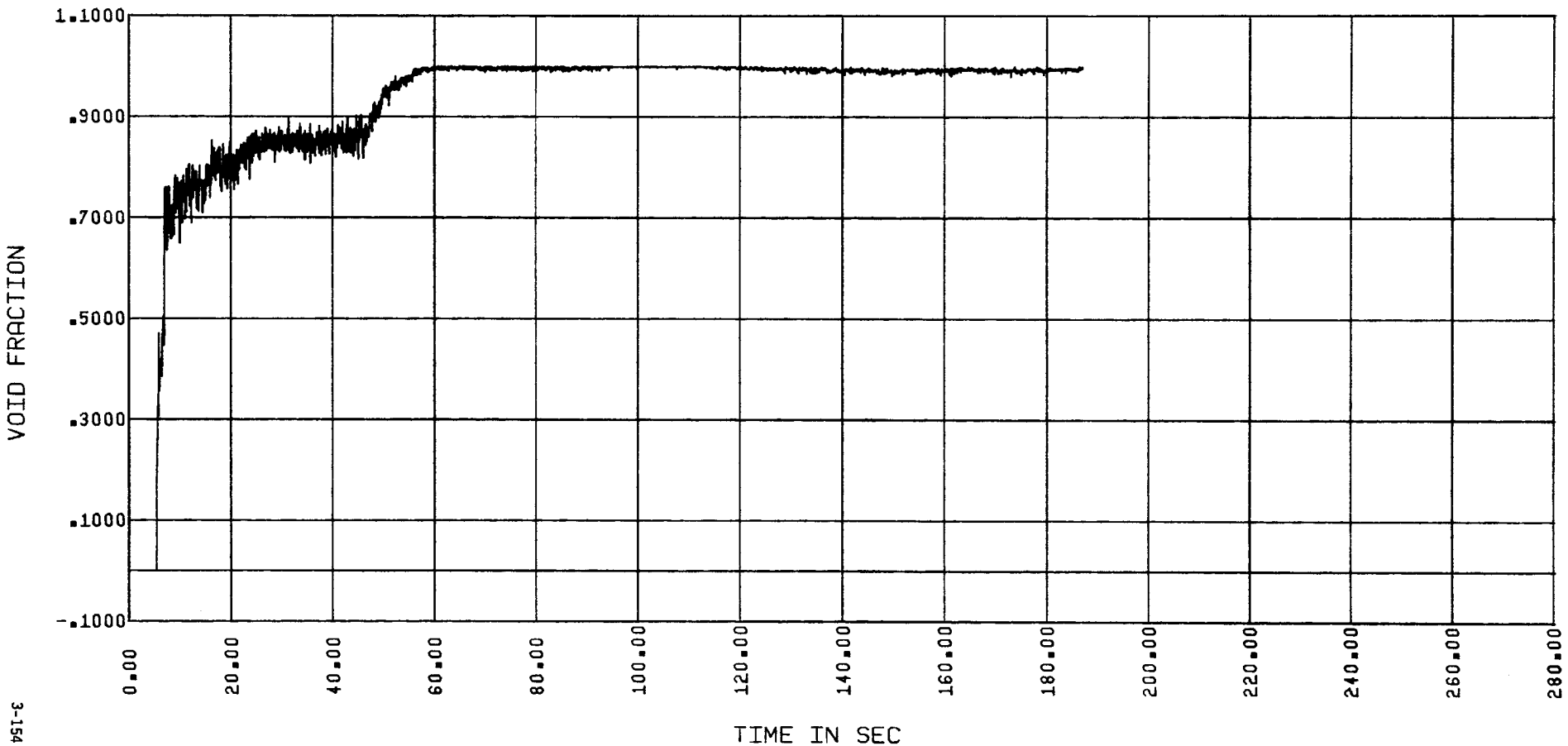
TEST 475/1000 PSIA LR REV BDN
DENSITY BEAM3 AECL GD
PLOT NO.14



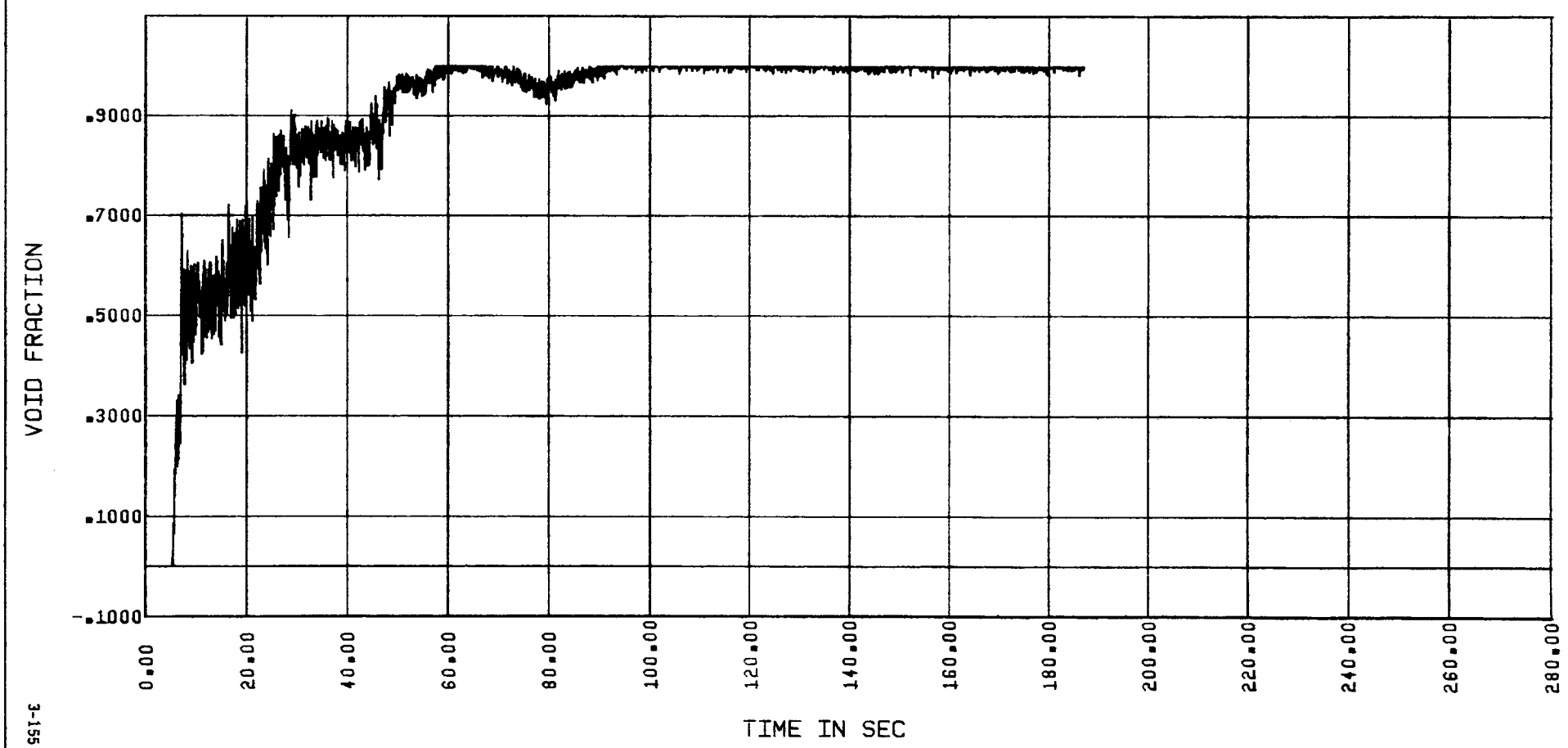
TEST 475/1000 PSIA LR REV BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15



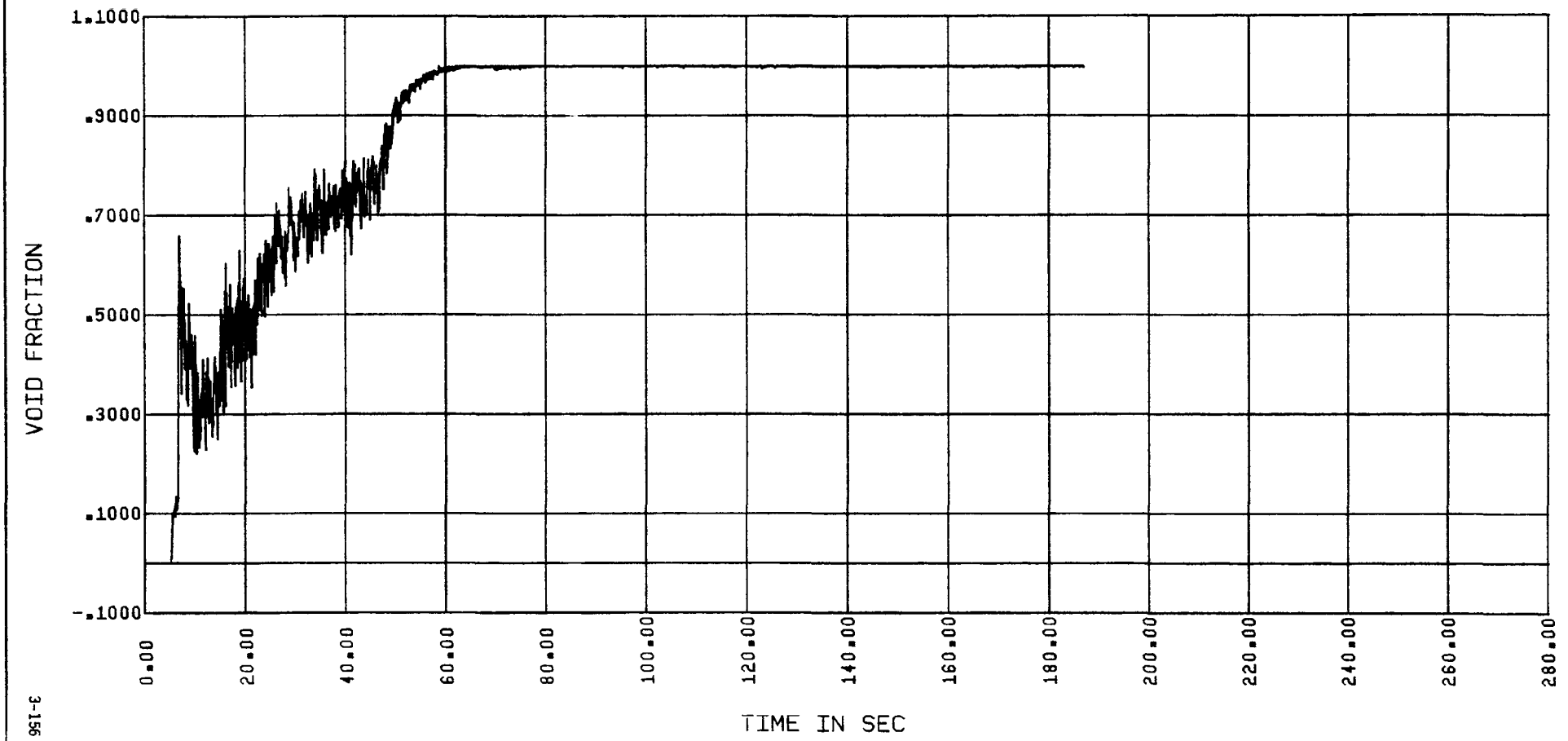
TEST 475/1000 PSIA LR REV BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16

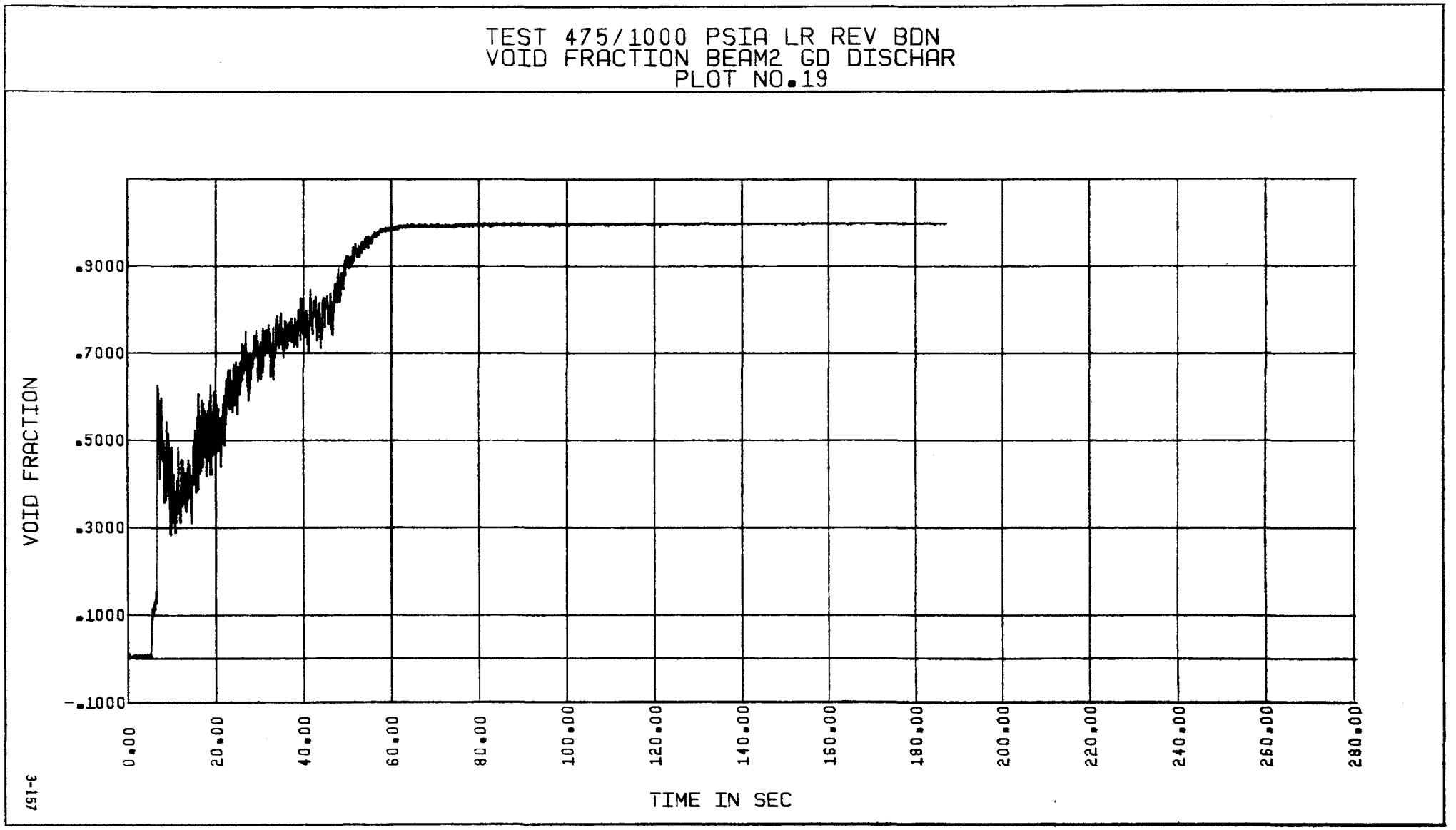


TEST 475/1000 PSIA LR REV BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17

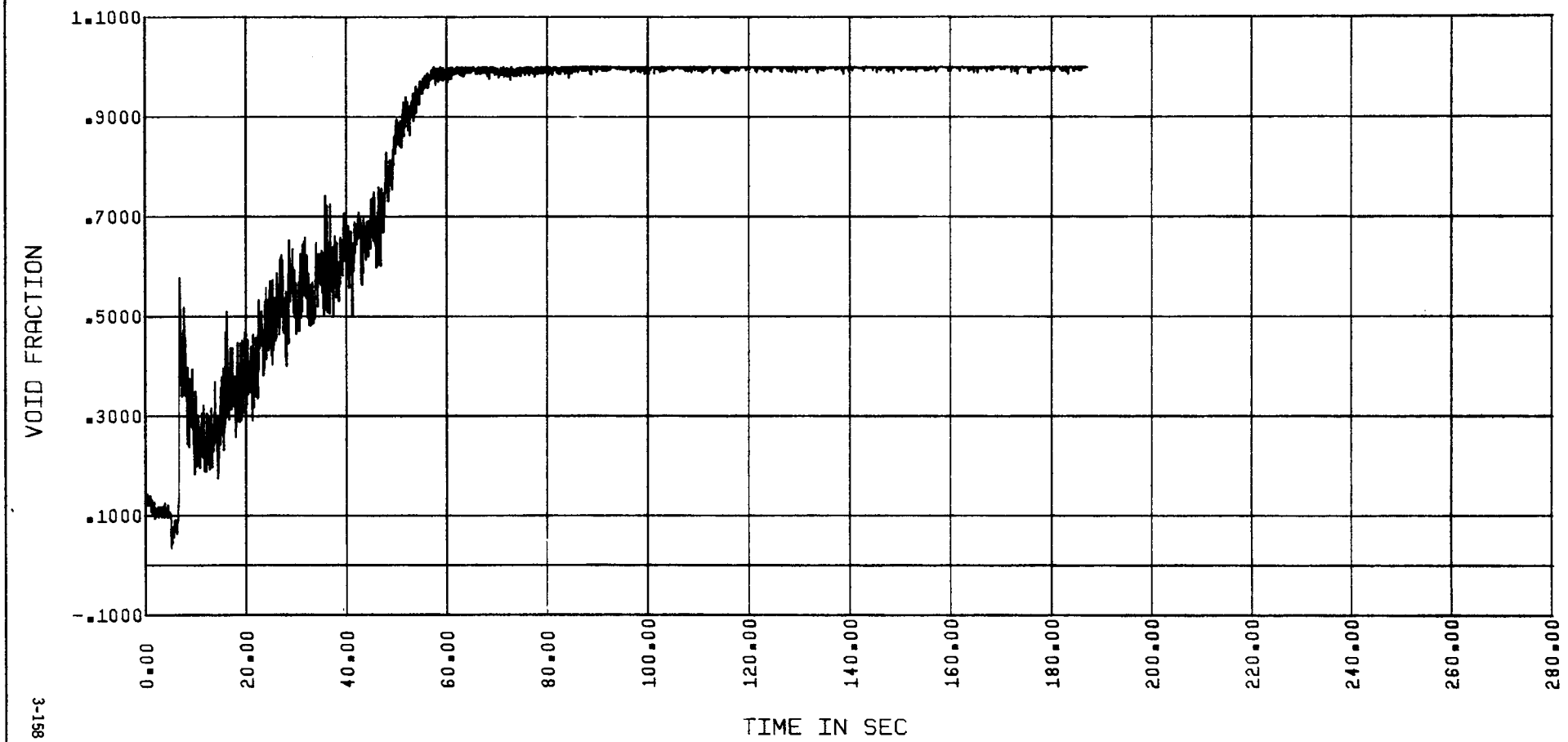


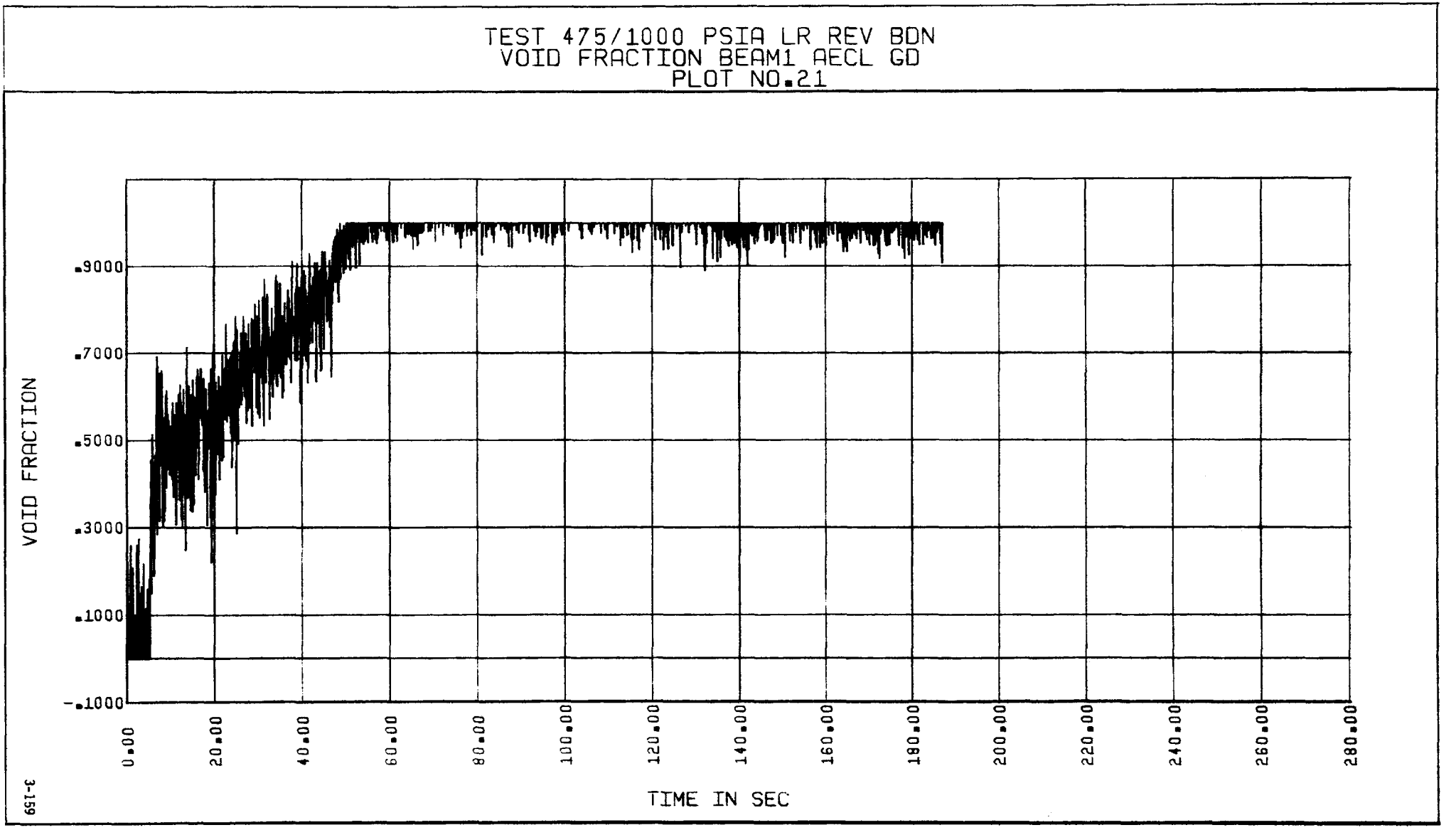
TEST 475/1000 PSIA LR REV BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18



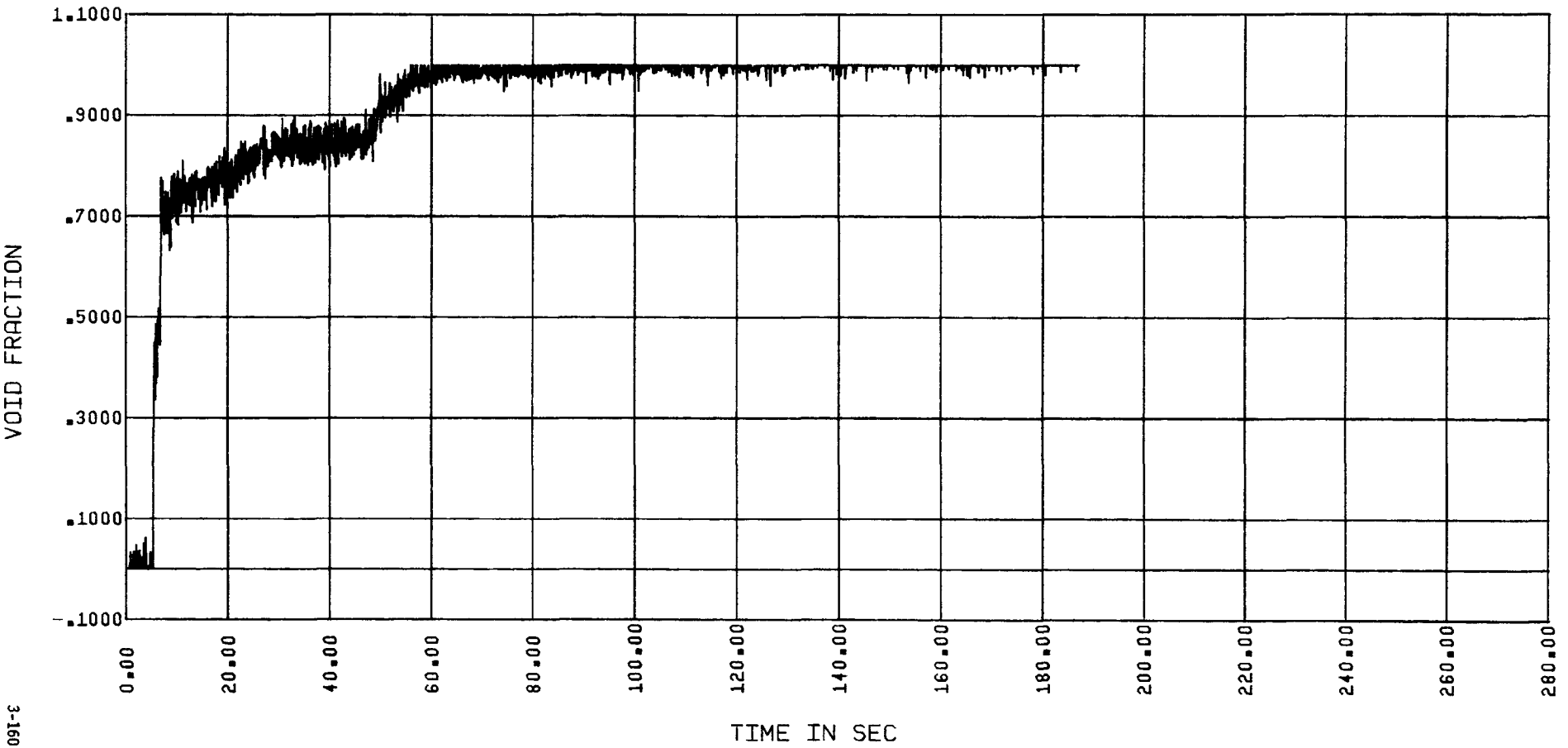

TEST 475/1000 PSIA LR REV BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-157

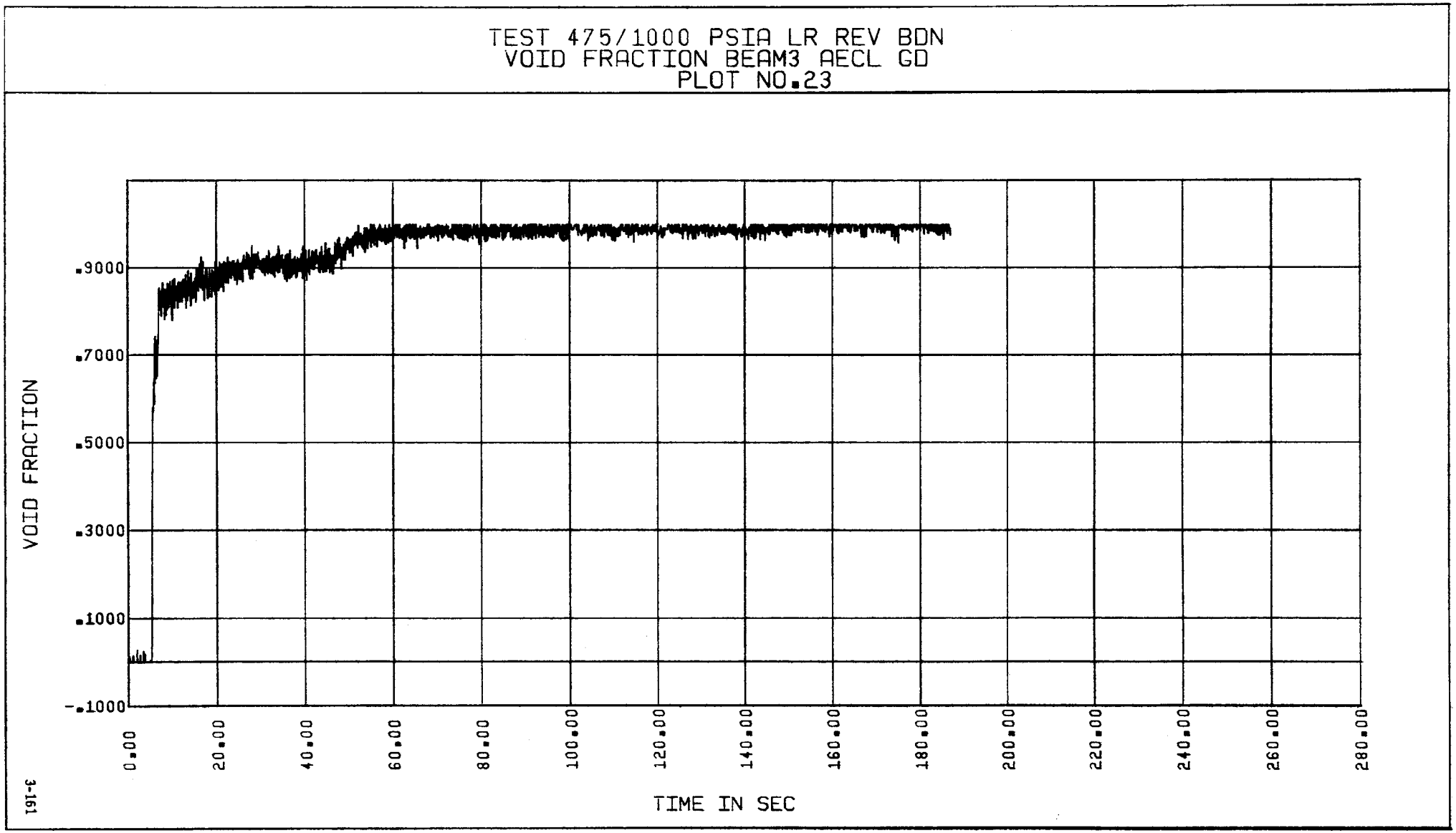
TEST 475/1000 PSIA LR REV BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20



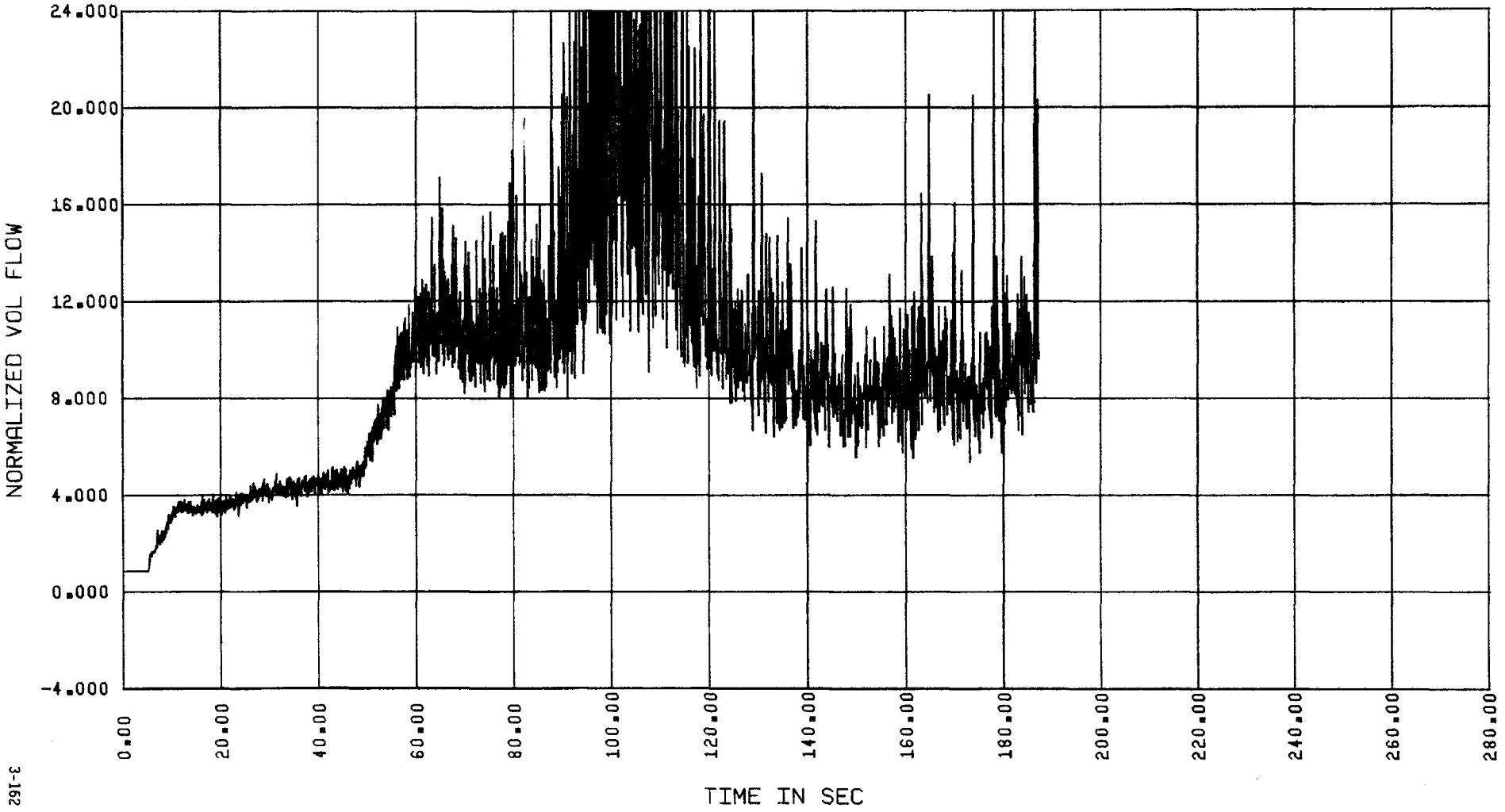

TEST 475/1000 PSIA LR REV BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

TEST 475/1000 PSIA LR REV BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22

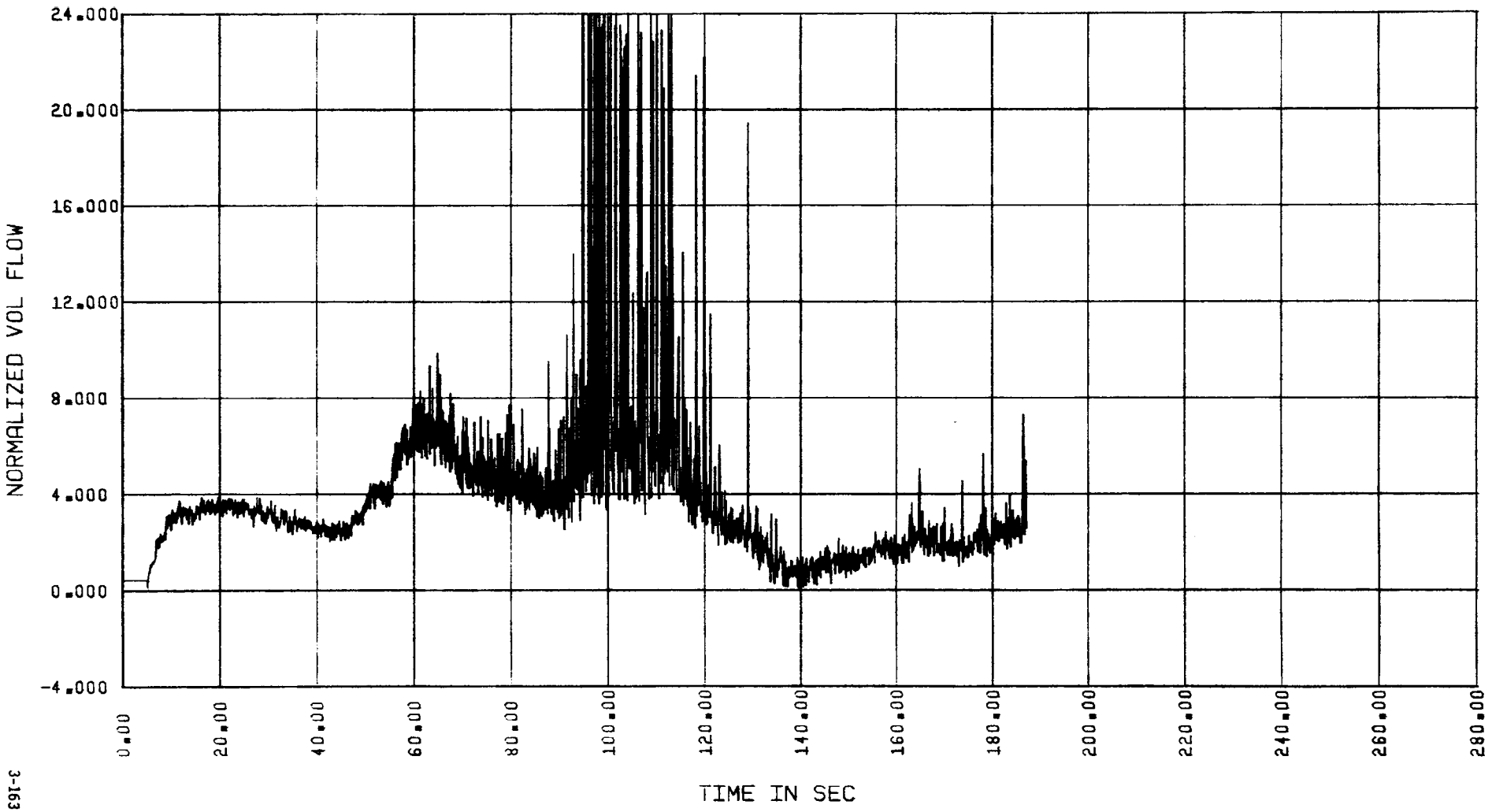



TEST 475/1000 PSIA LR REV BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-191

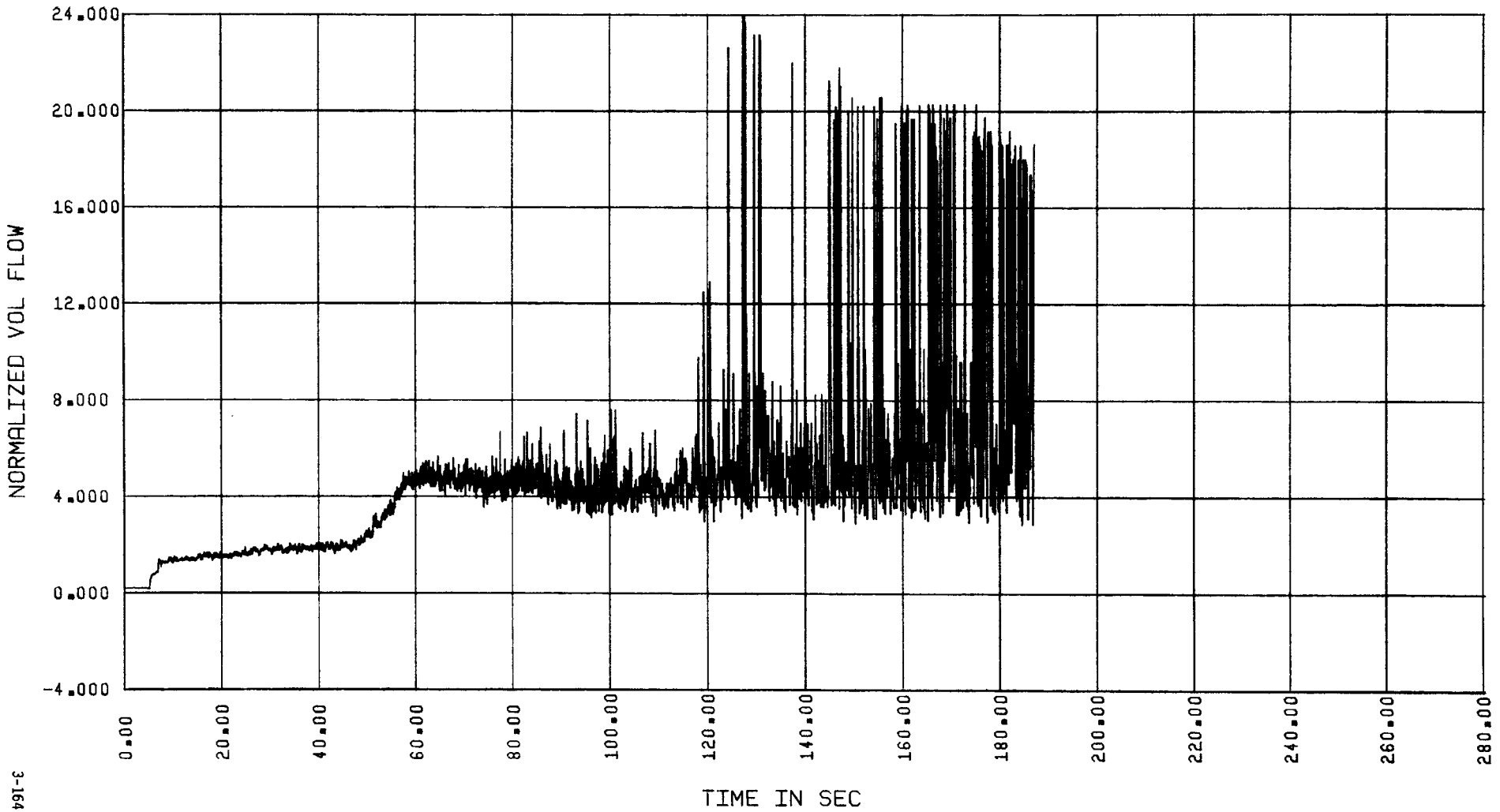
TEST 475/1000 PSIA LR REV BDN
N VOL FLOW LO-DD/GD2 S QR=3500
PLOT NO.24



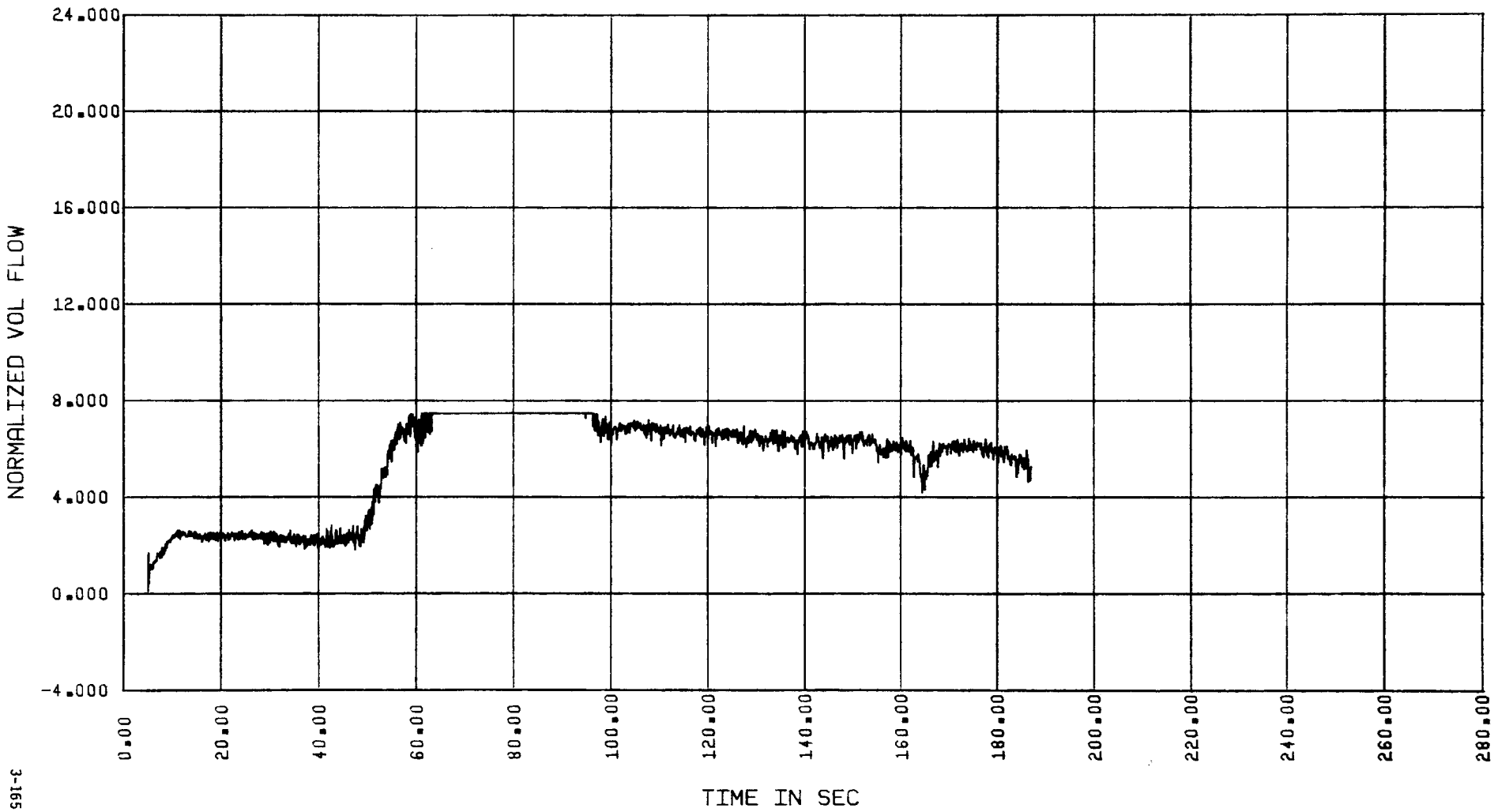
TEST 475/1000 PSIA LR REV BDN
N VOL FLOW HI-DD/GD2 S QR=3500
PLOT NO.26



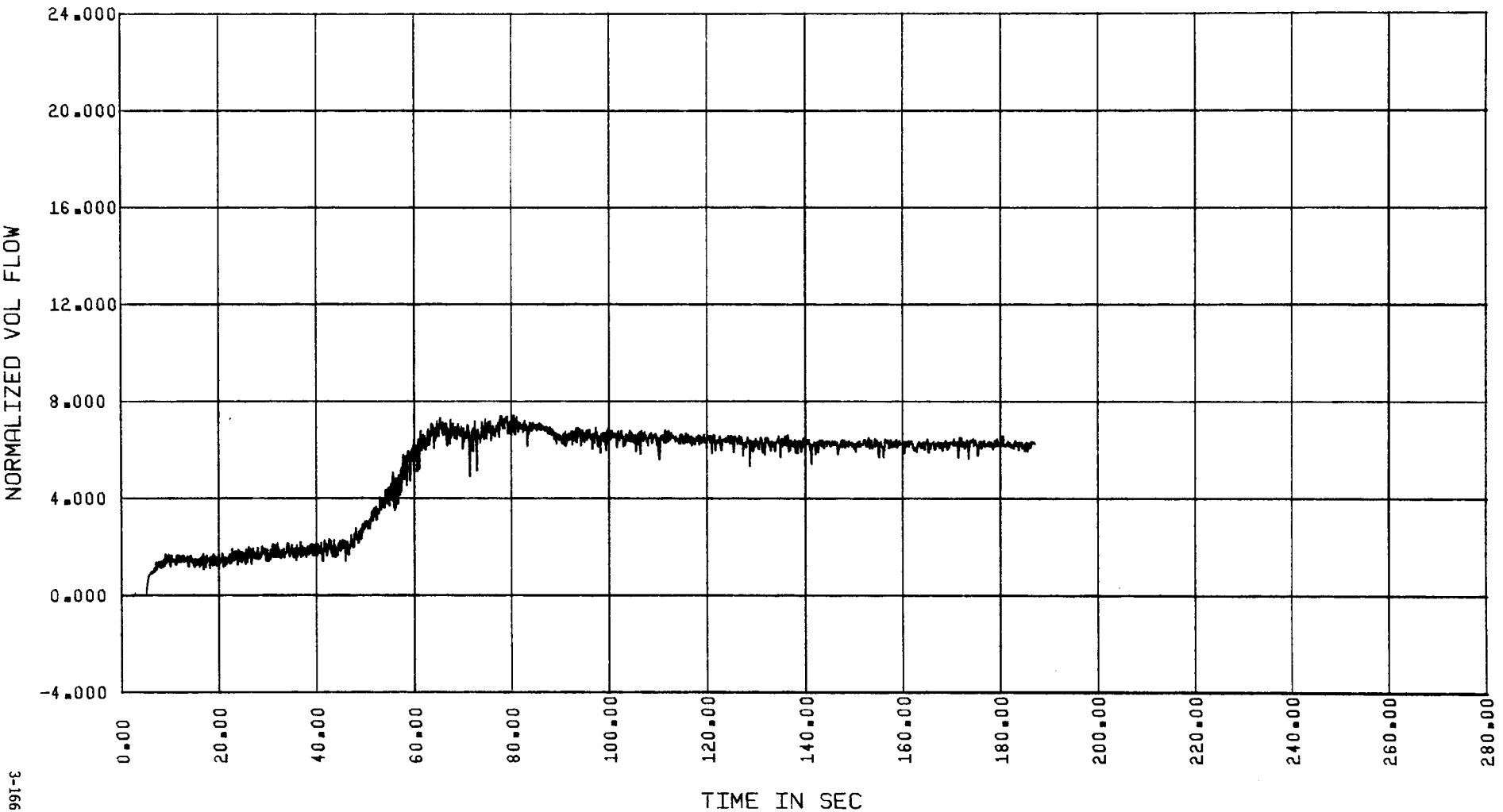
TEST 475/1000 PSIA LR REV BDN
N VOL FLOW HI-DD/GD2 D QR=3500
PLOT NO.27



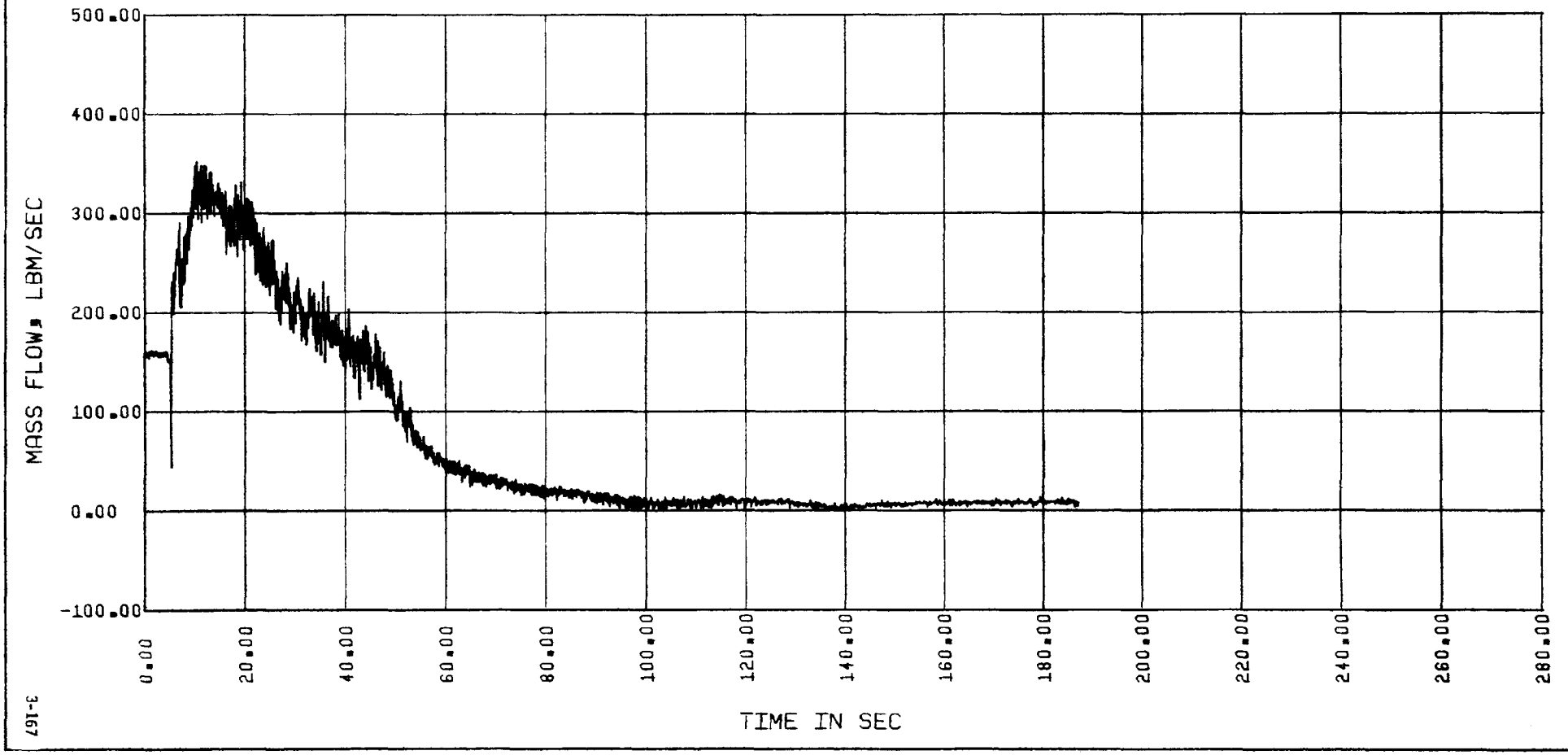
TEST 475/1000 PSIA LR REV BDN
N VOL FLOW LO-TM SUCT QR=3500
PLOT NO.28



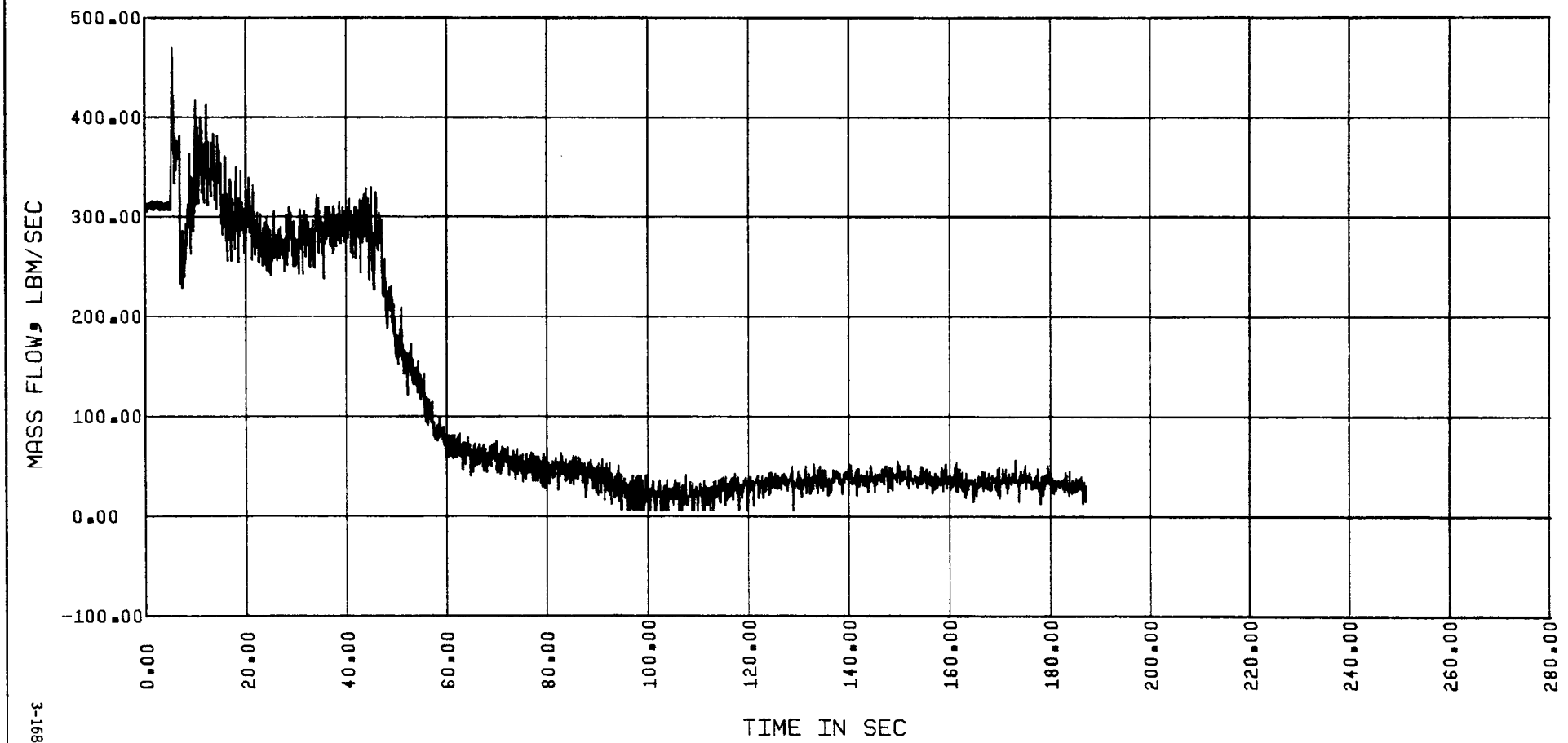
TEST 475/1000 PSIA LR REV BDN
N VOL FLOW HI-TM DISCH QR=3500
PLOT NO.29



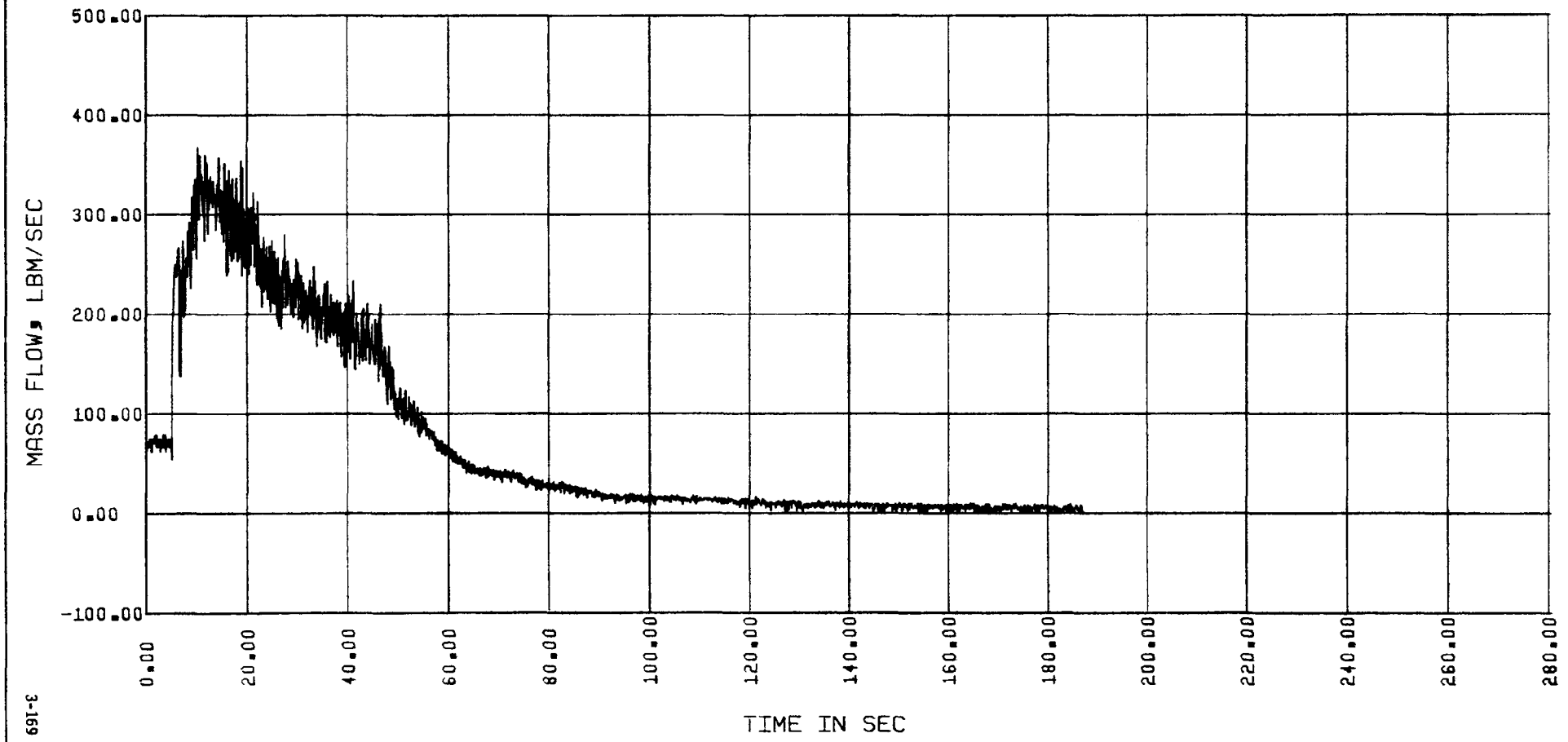
TEST 475/1000 PSIA LR REV BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.30



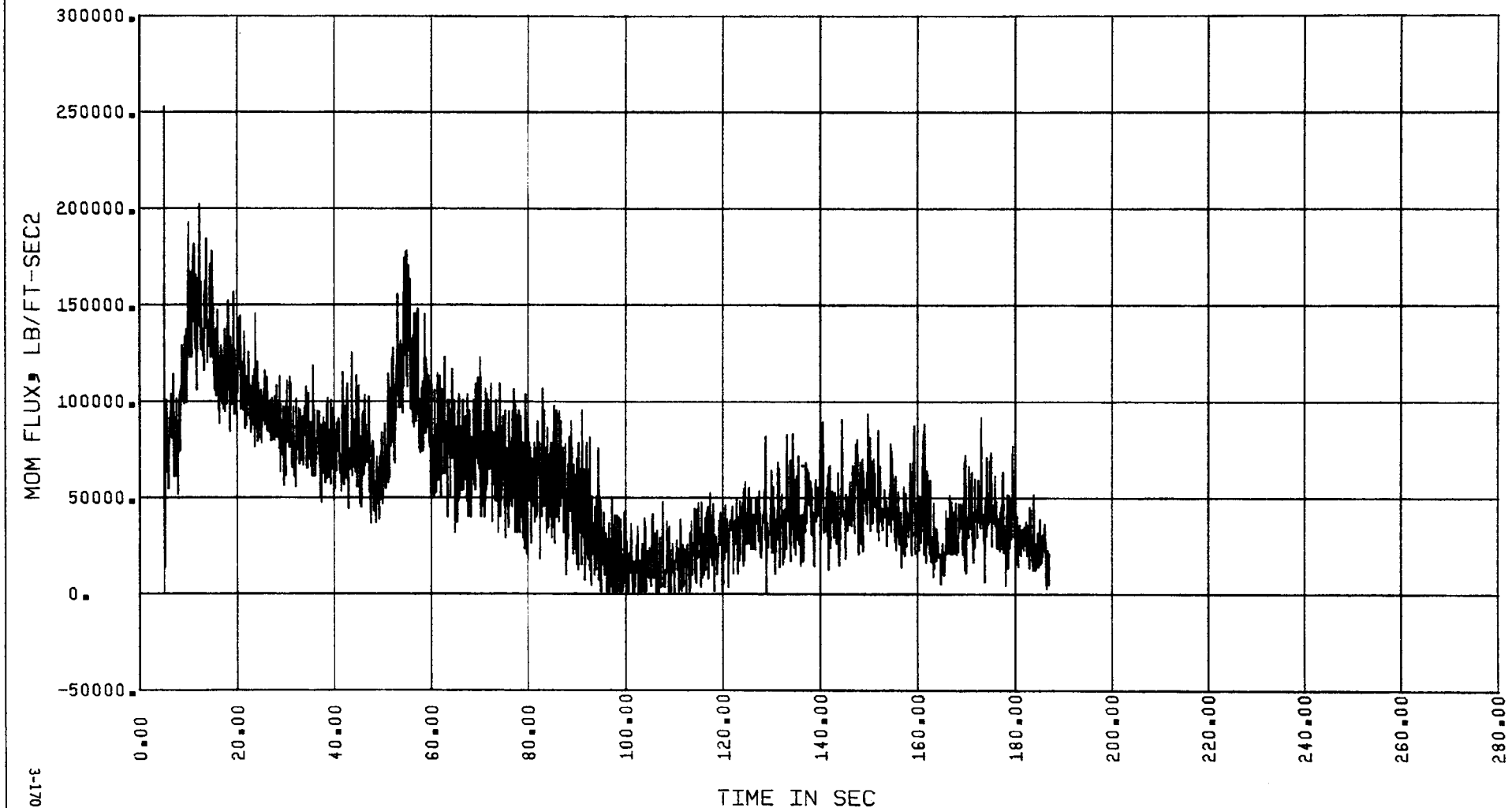
TEST 475/1000 PSIA LR REV BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.31



TEST 475/1000 PSIA LR REV BDN
MASS FLOW RATE HI-DD/GD2 DISCH
PLOT NO.32



TEST 475/1000 PSIA LR REV BDN
MOMENTUM FLUX GD2/LO-TM SUCT
PLOT NO.34



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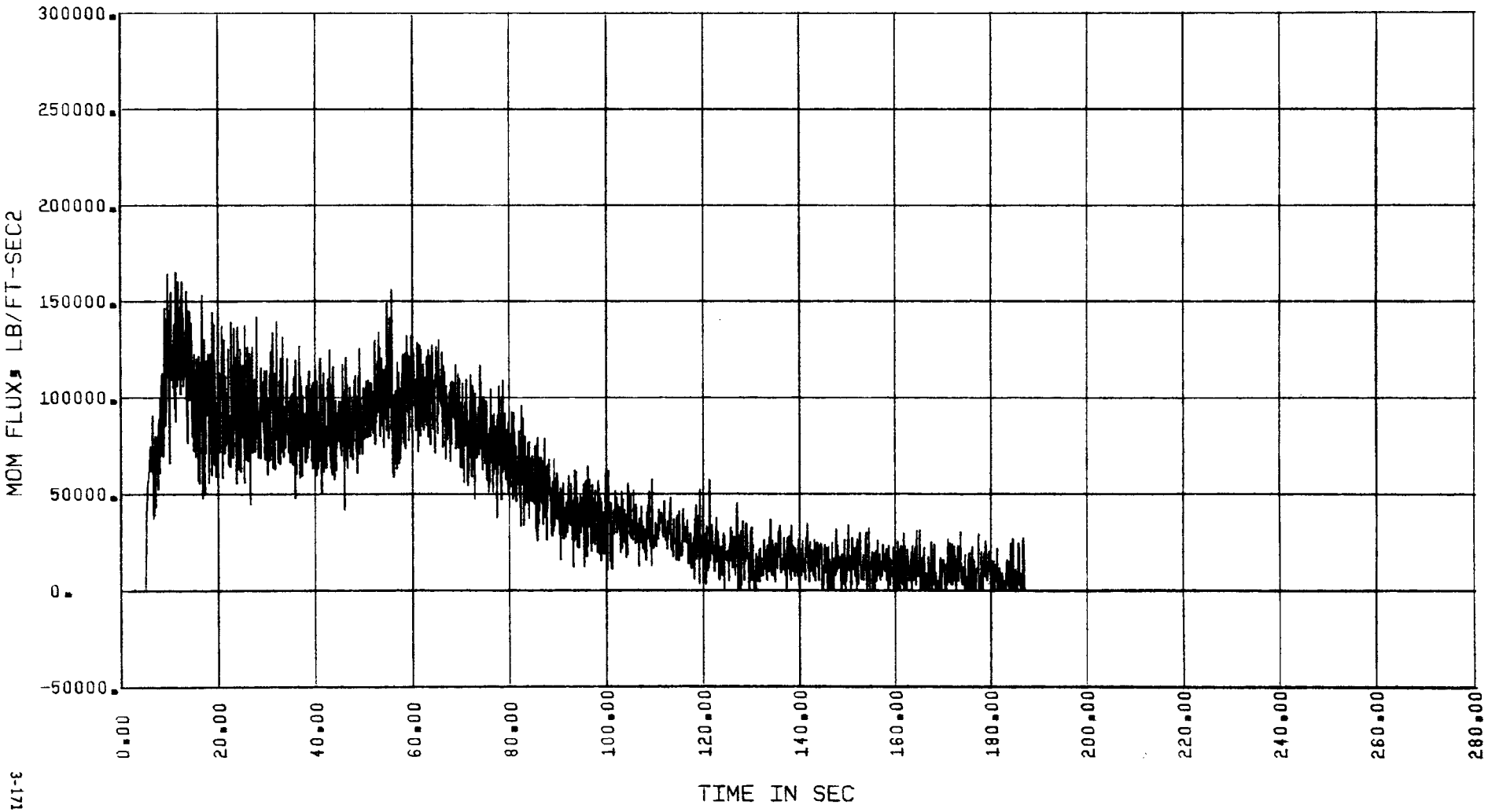
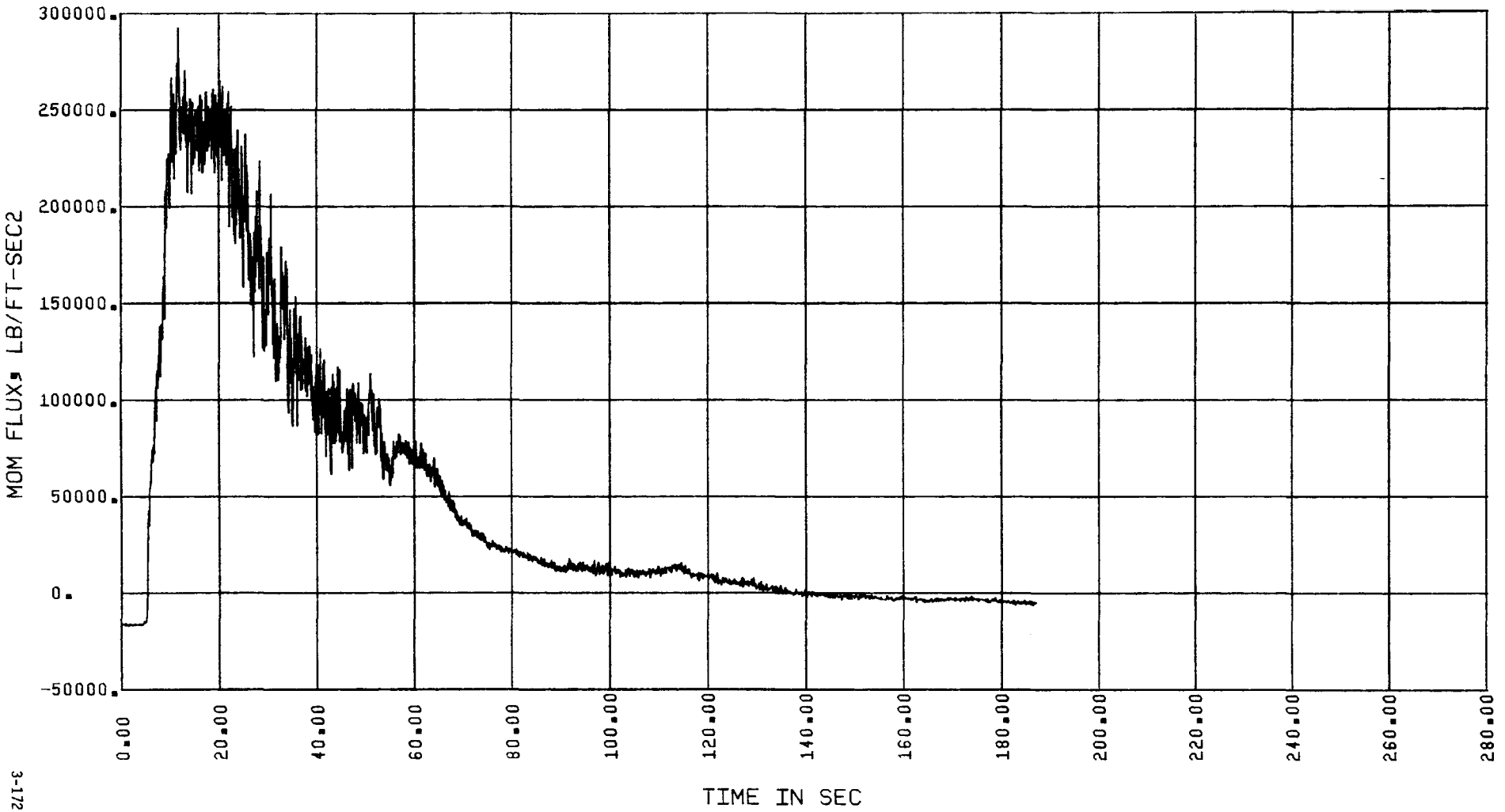
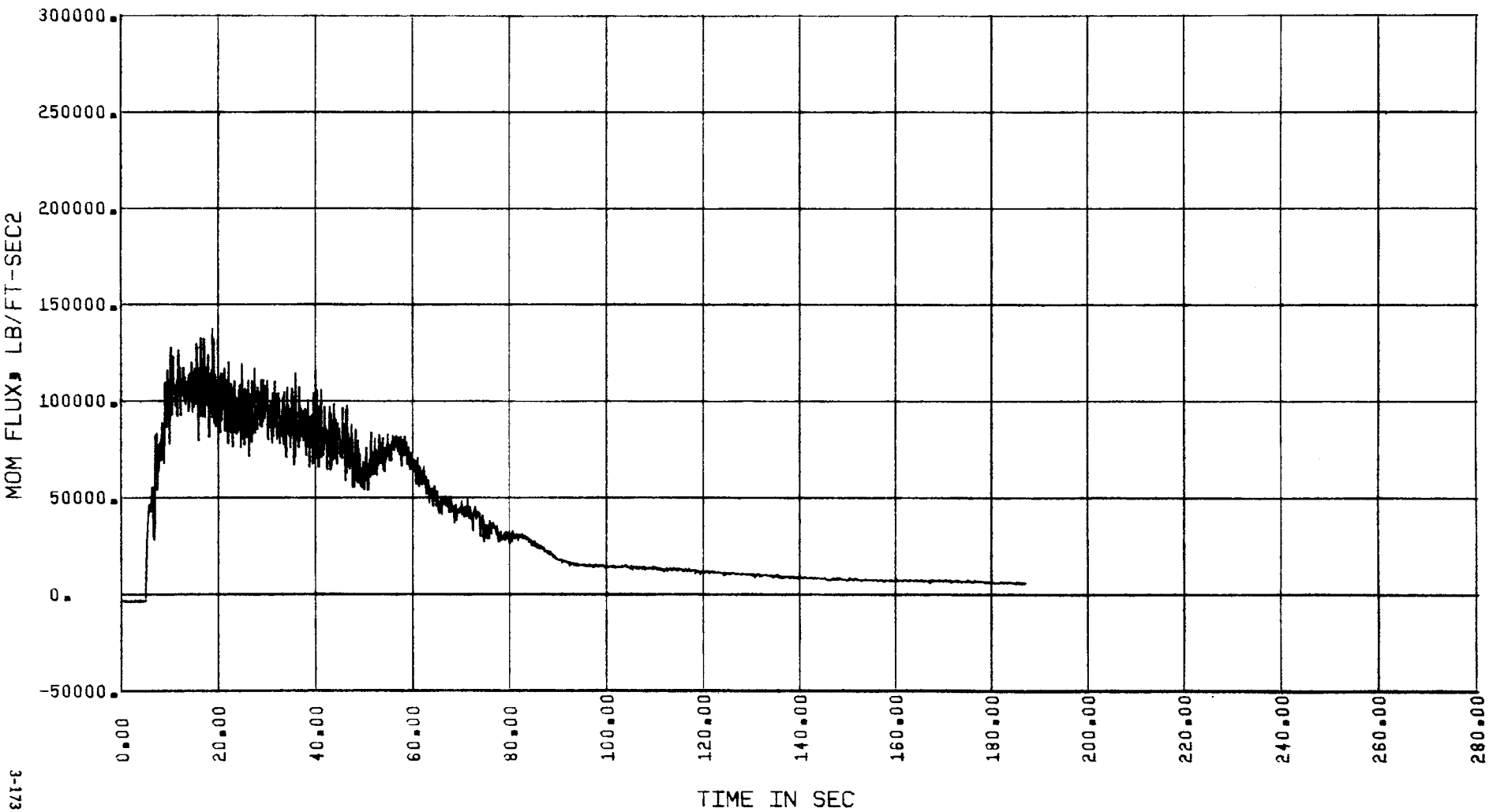
TEST 475/1000 PSIA LR REV BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.35



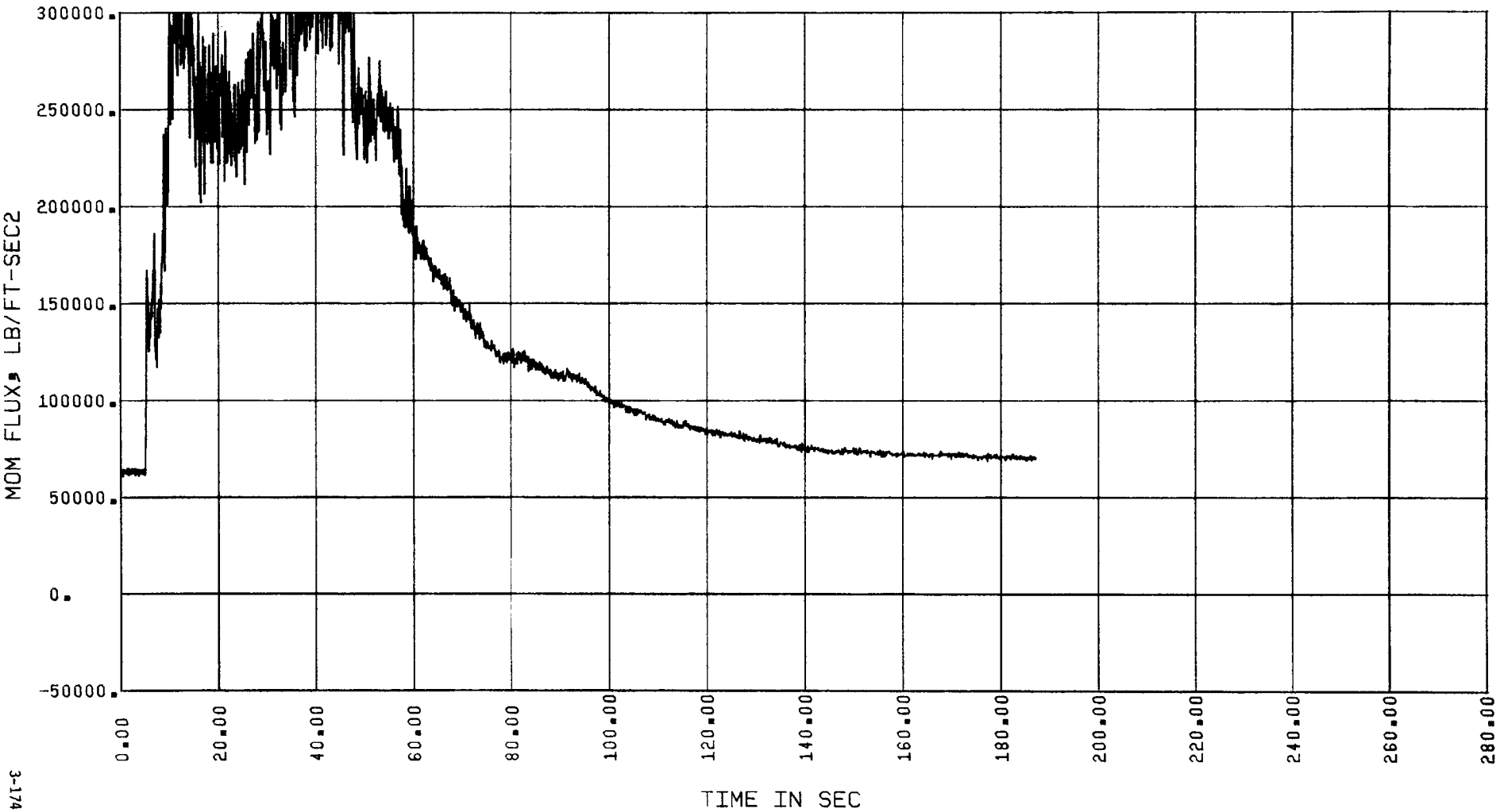
TEST 475/1000 PSIA LR REV BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.36



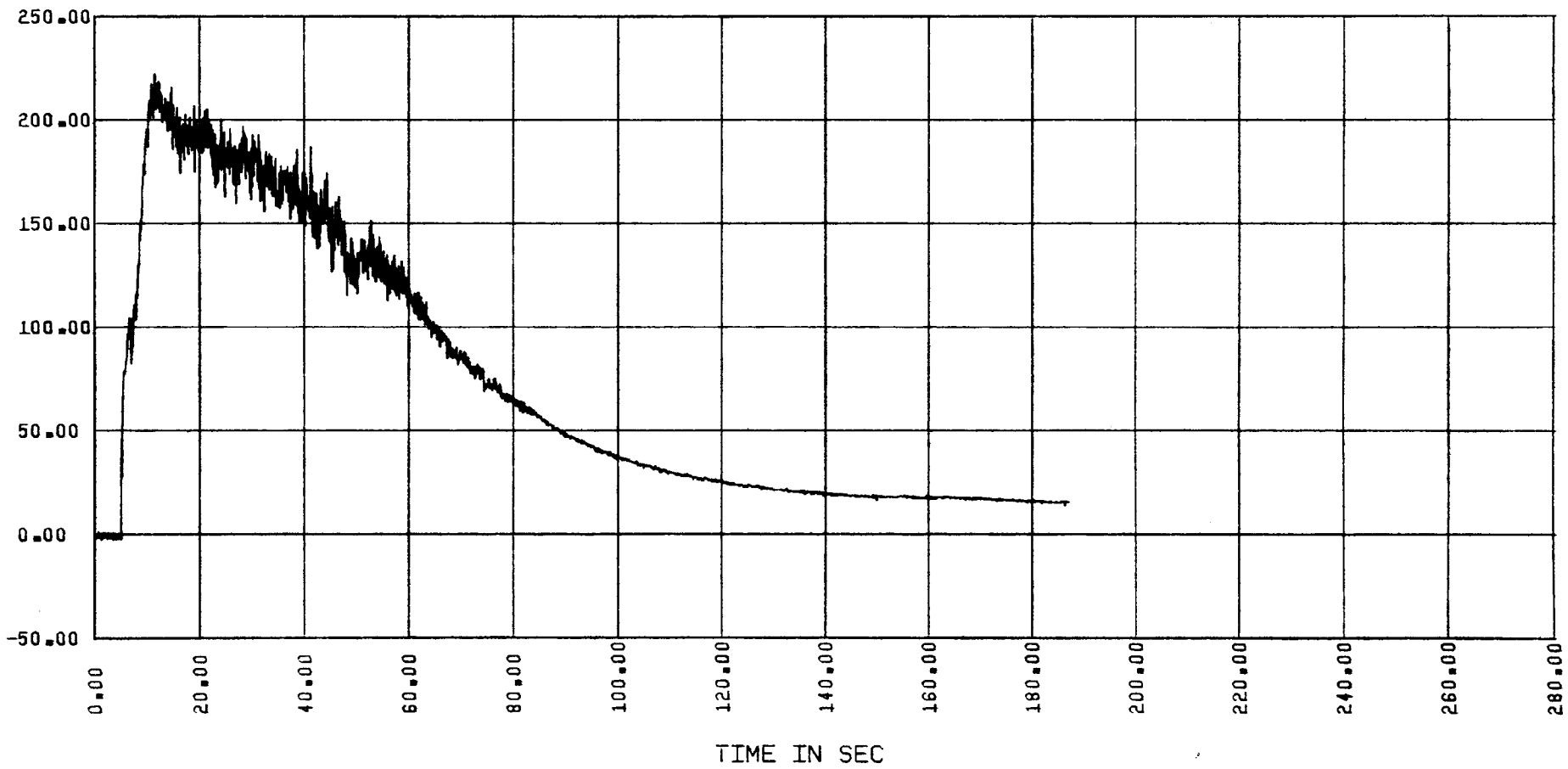
TEST 475/1000 PSIA LR REV BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.37



TEST 475/1000 PSIA LR REV BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



TEST 475/1000 PSIA LR REV BDN
PUMP HEAD IN PSI
PLOT NO.40



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Pump Speed Measurements. Pump speed data are not presented for reverse flow, locked rotor tests.

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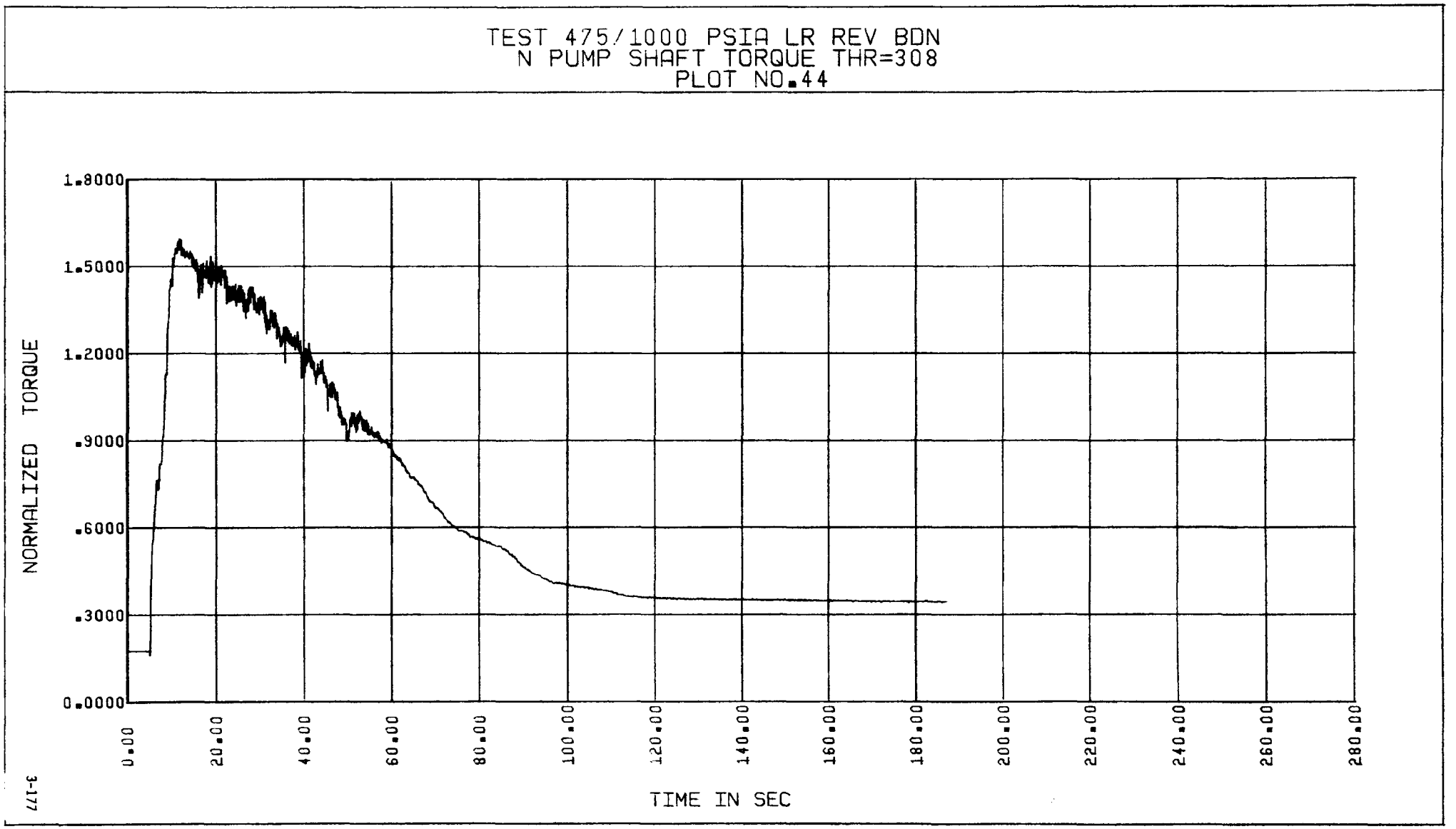
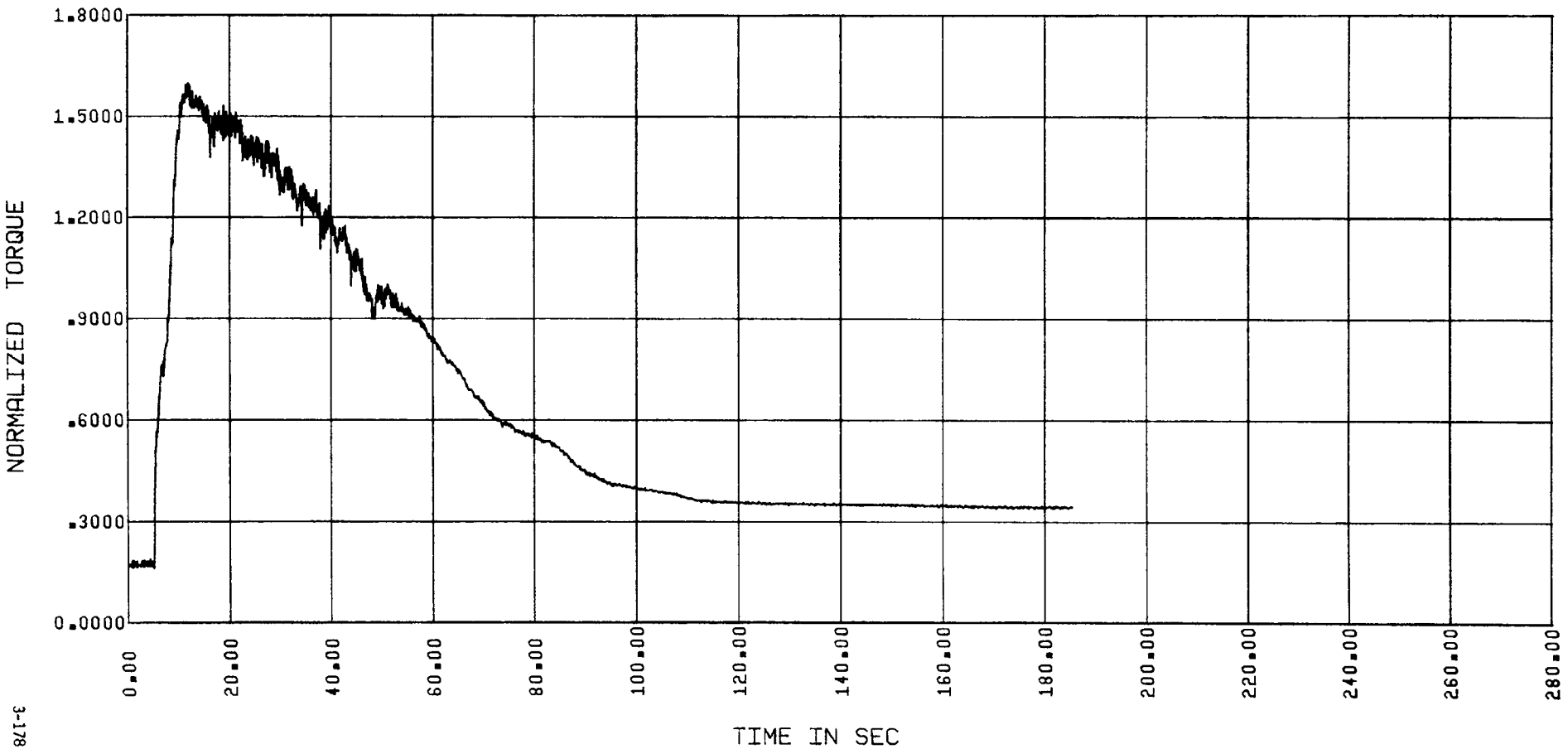
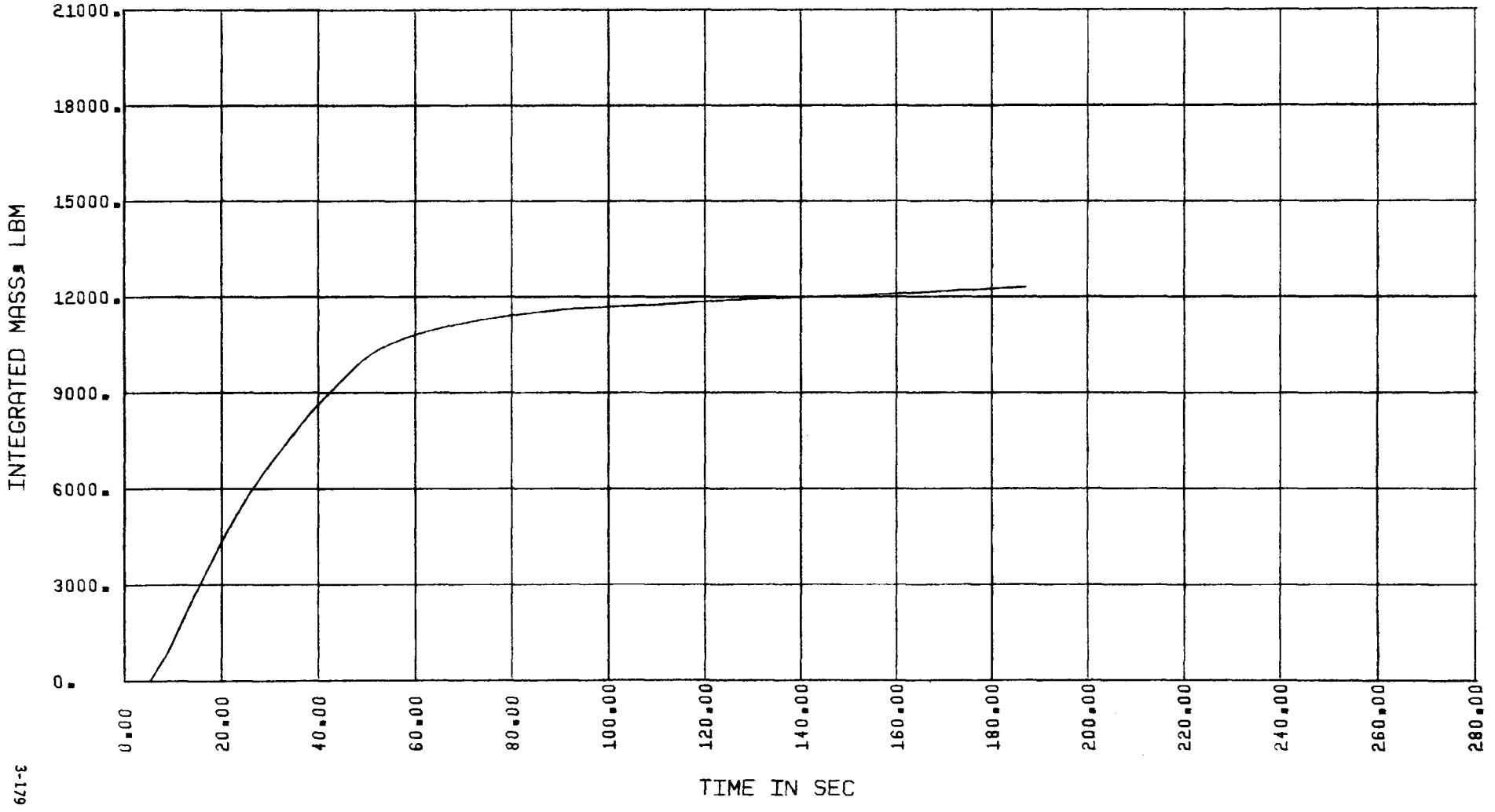

TEST 475/1000 PSIA LR REV BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.44
NORMALIZED TORQUE
1.8000
1.5000
1.2000
.9000
.6000
.3000
0.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

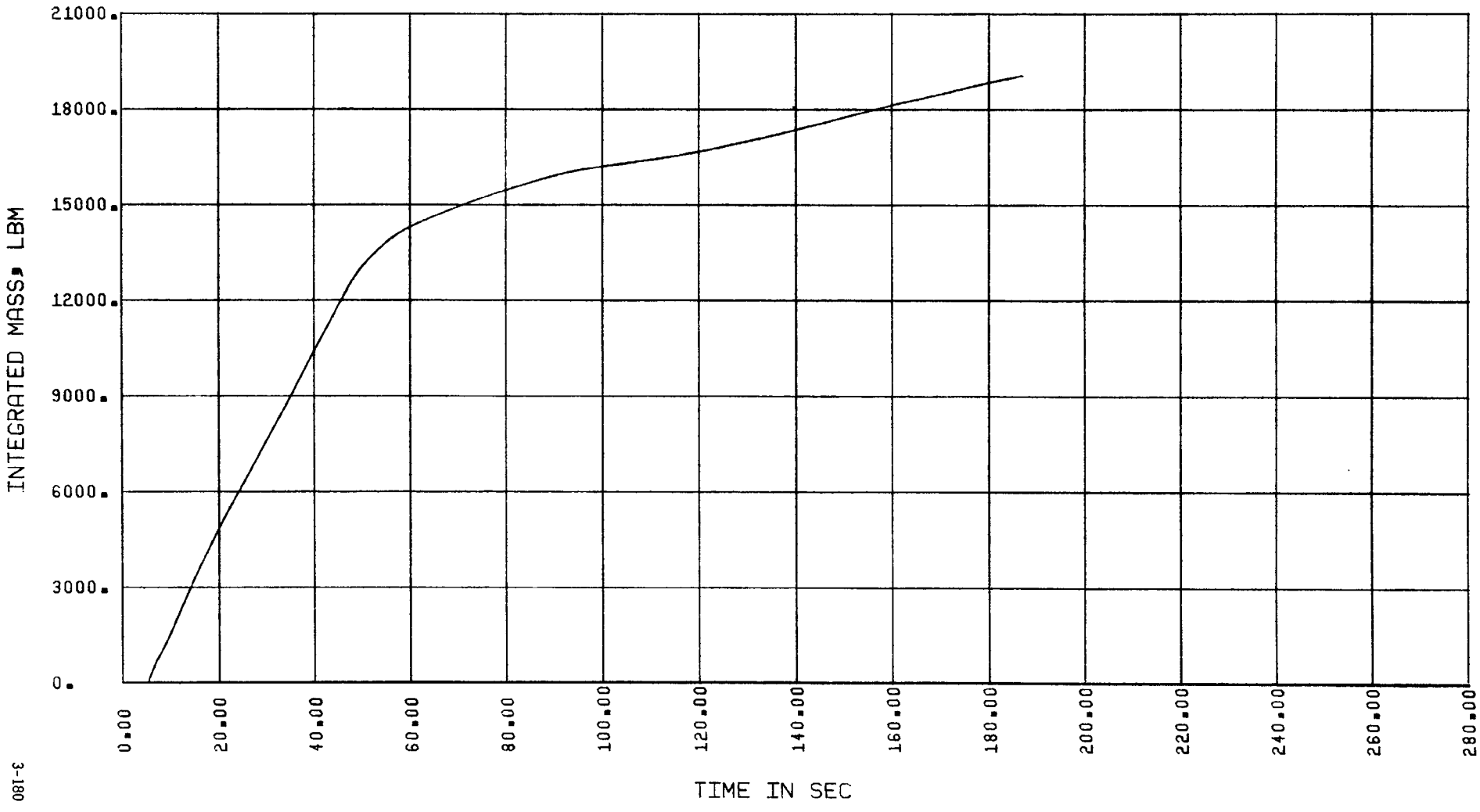
TEST 475/1000 PSIA LR REV BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.45



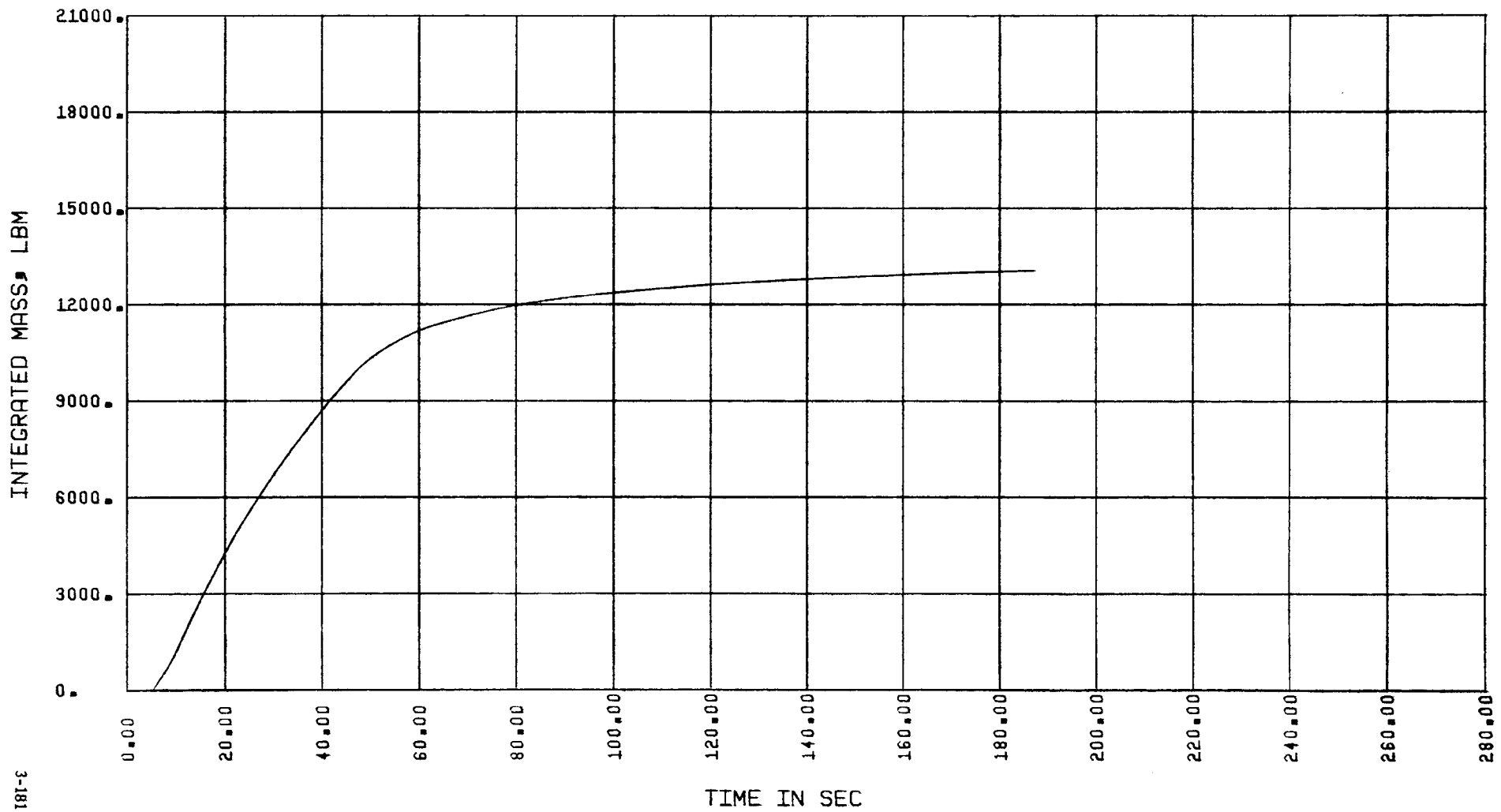
TEST 475/1000 PSIA LR REV BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.46



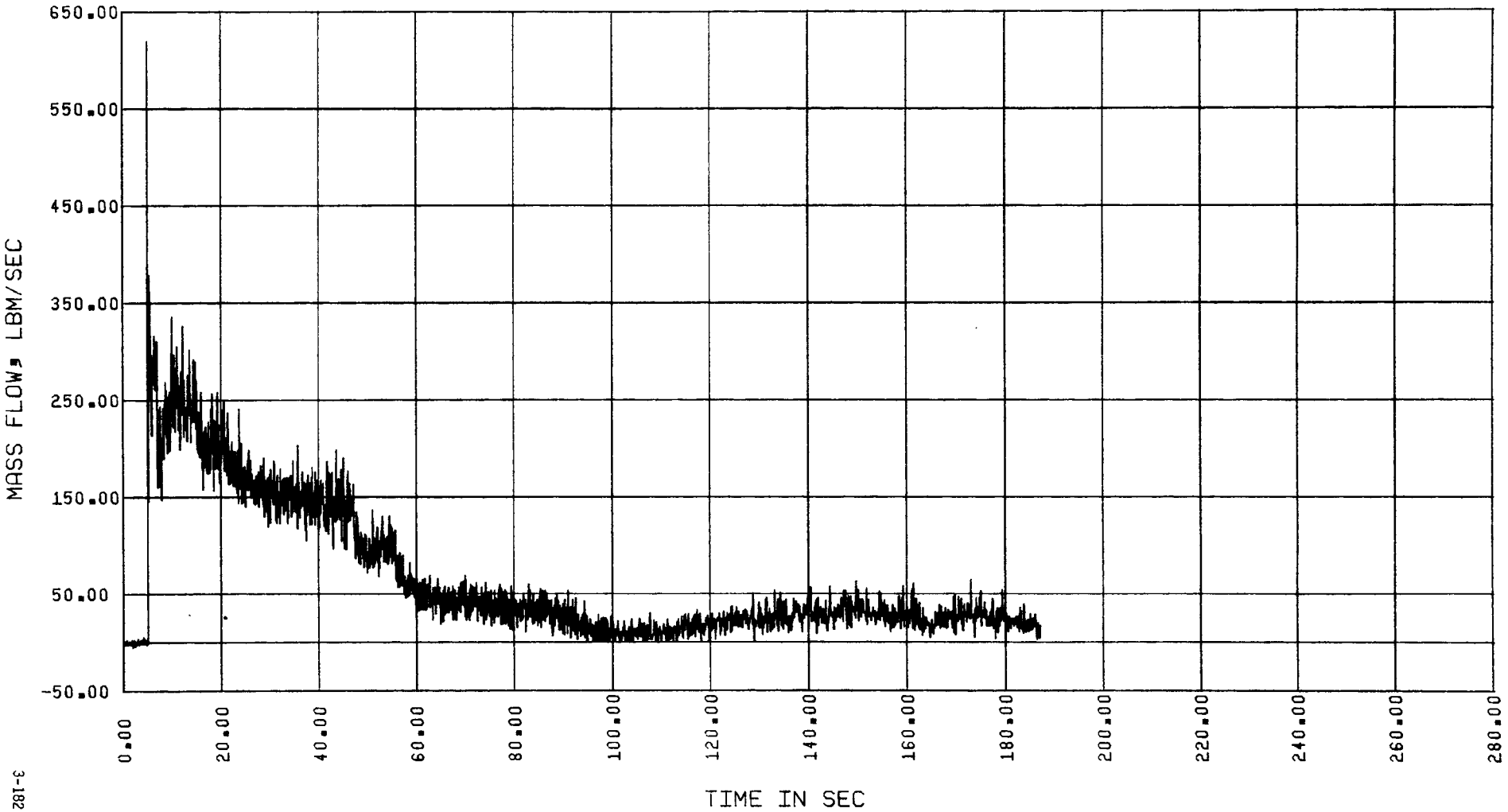
TEST 475/1000 PSIA LR REV BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.47



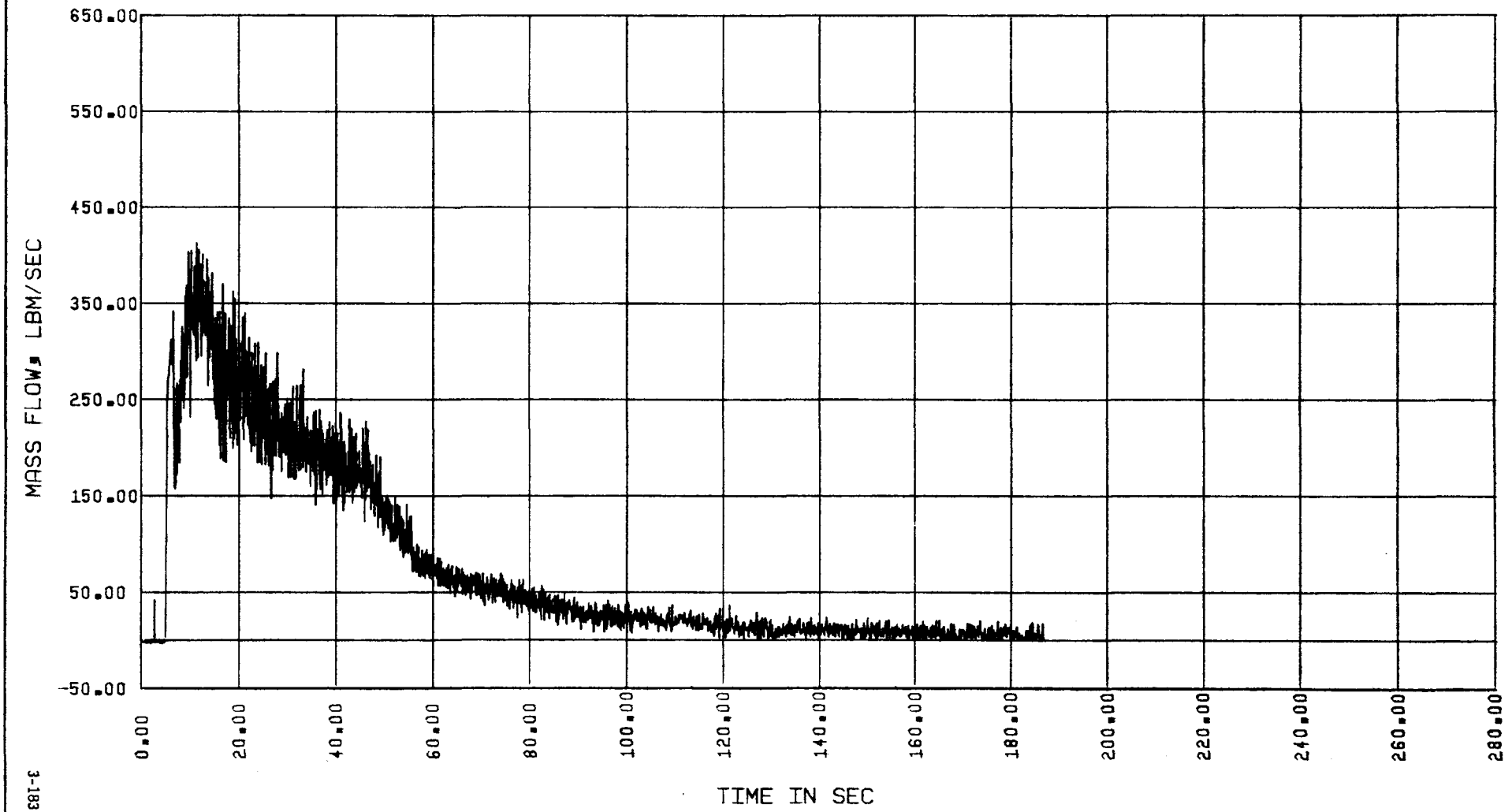
TEST 475/1000 PSIA LR REV BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.48



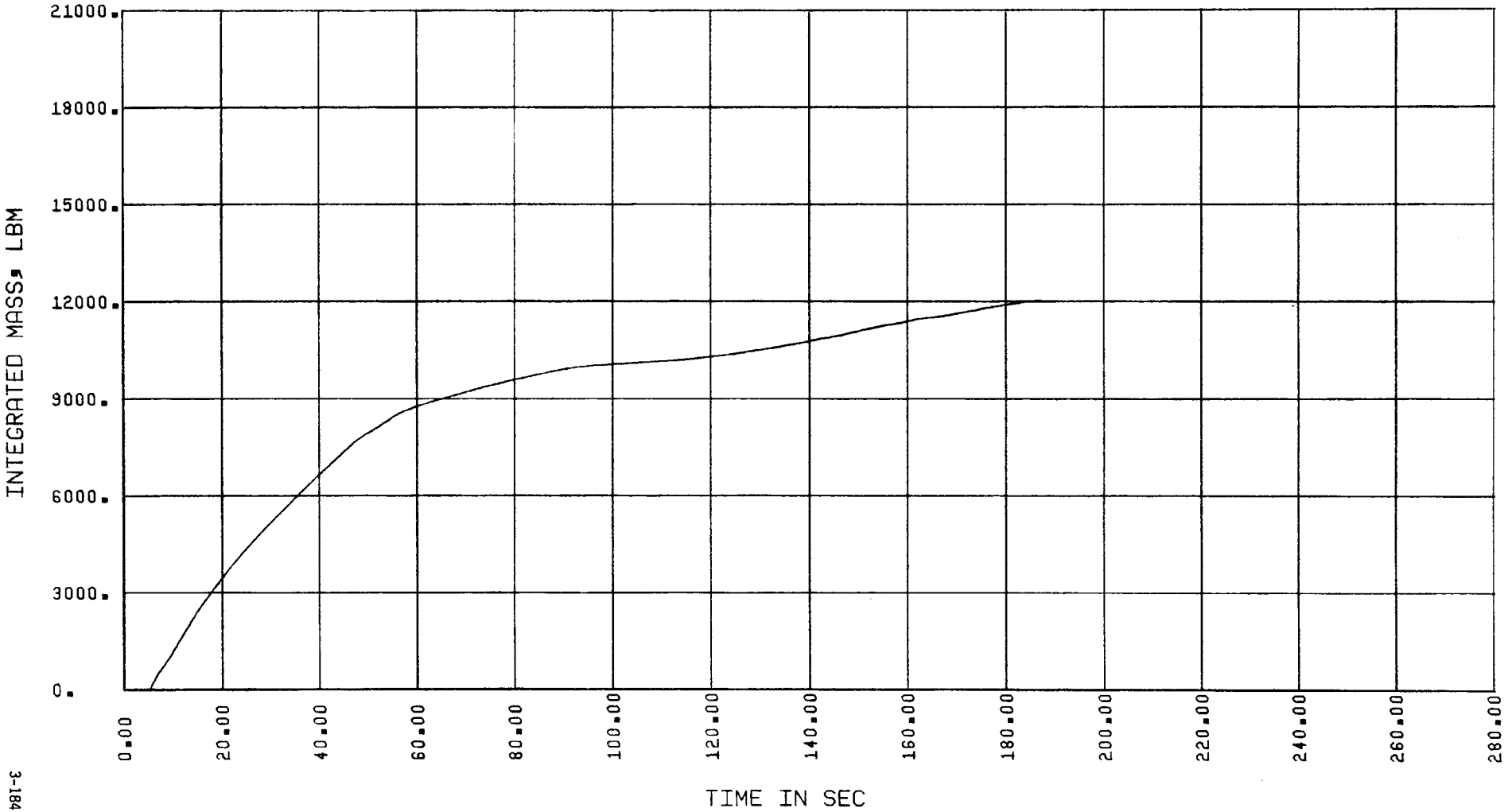
TEST 475/1000 PSIA LR REV BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.51



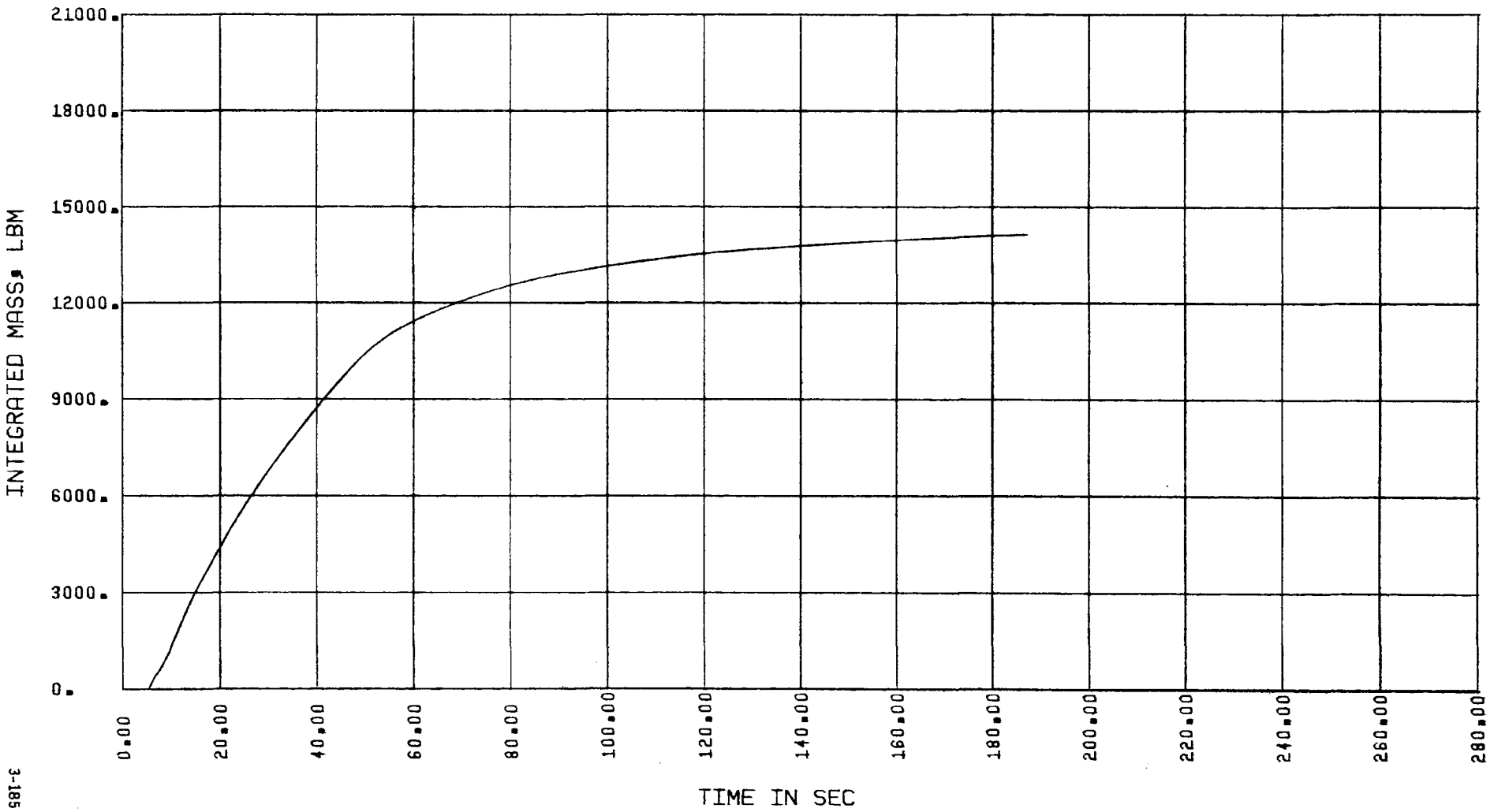
TEST 475/1000 PSIA LR REV BDN
MASS FLOW RATE HI-TM/GD2 DSCH
PLOT NO.52



TEST 475/1000 PSIA LR REV BDN
INTEGRATED MASS LO-TM/GD2 S
PLOT NO.55

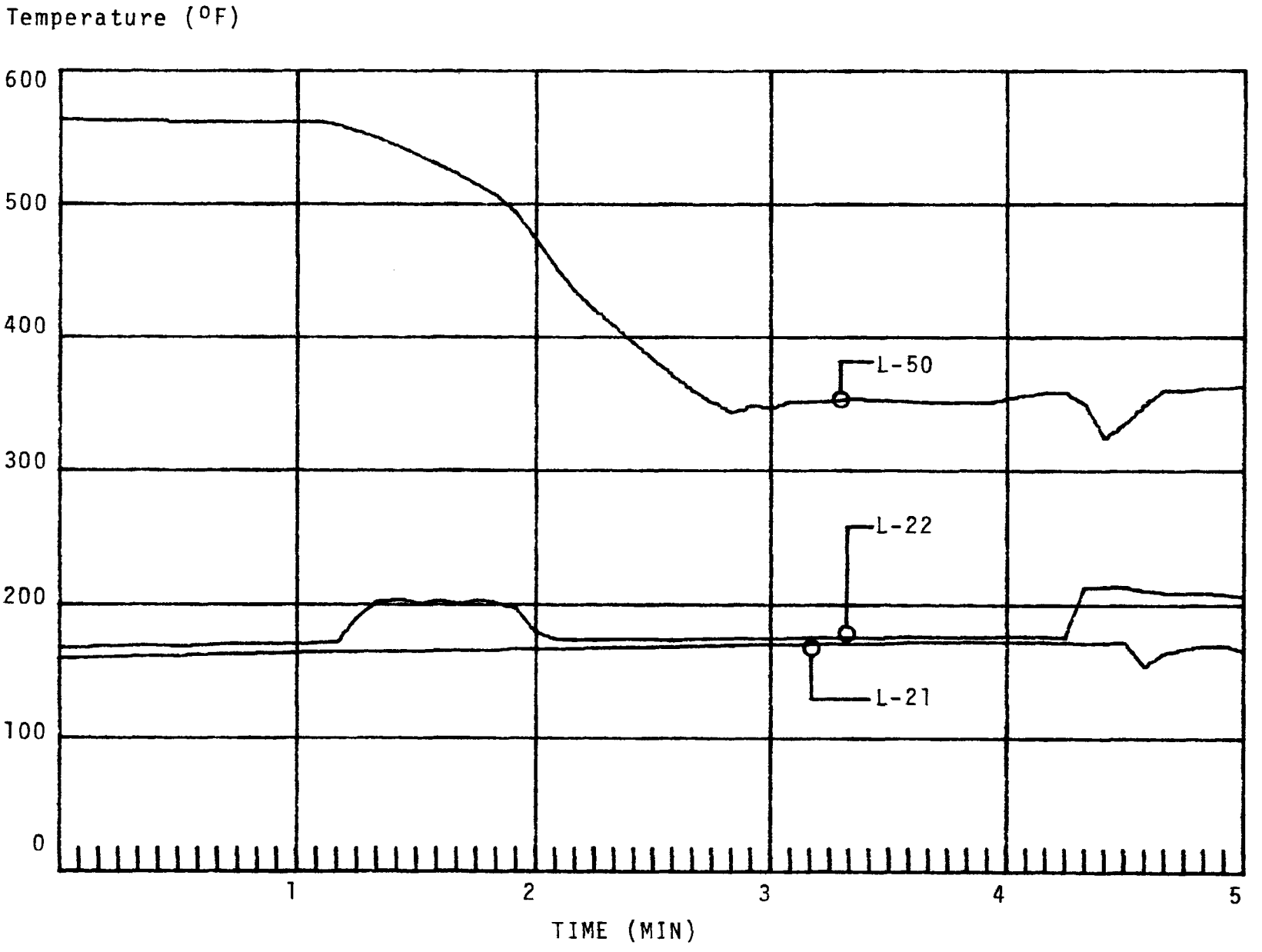


TEST 475/1000 PSIA LR REV BDN
INTEGRATED MASS HI-TM/GD2 D
PLOT NO.56

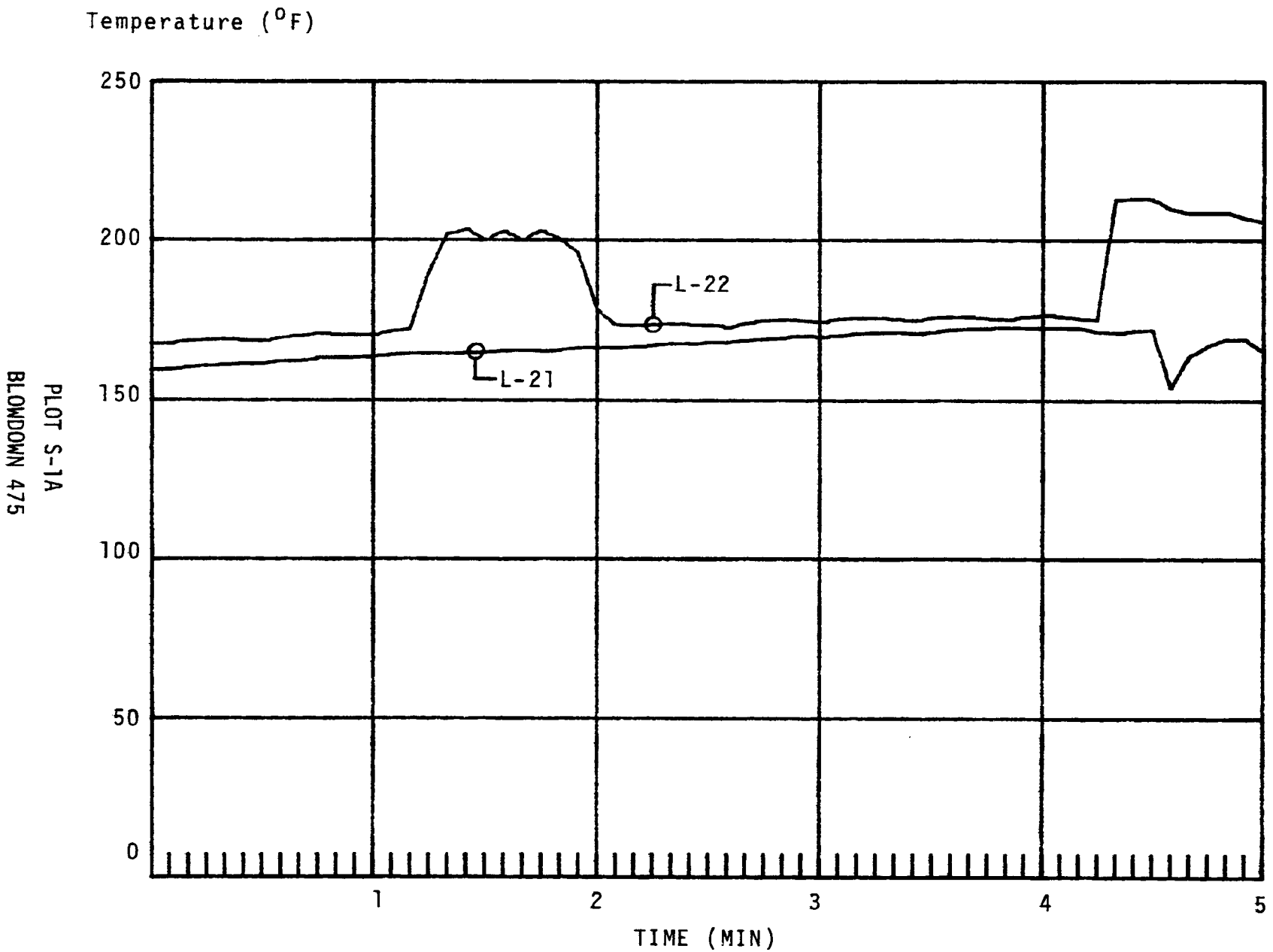


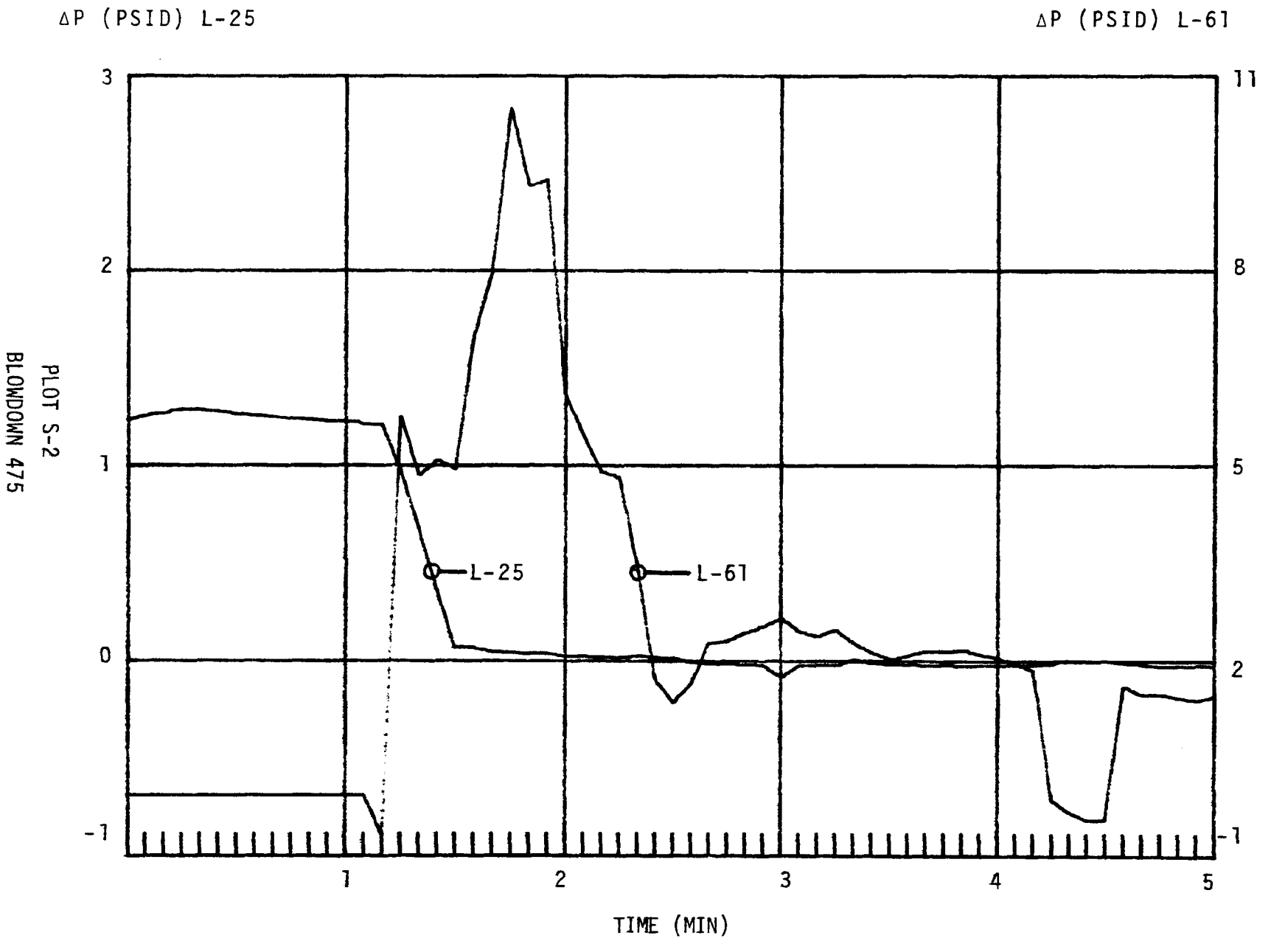
Index Listing
of
SCANNER DATA PLOTS
Test Number (475)

Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
	L-50	Main Water Orifice Thermocouple
S-1A	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

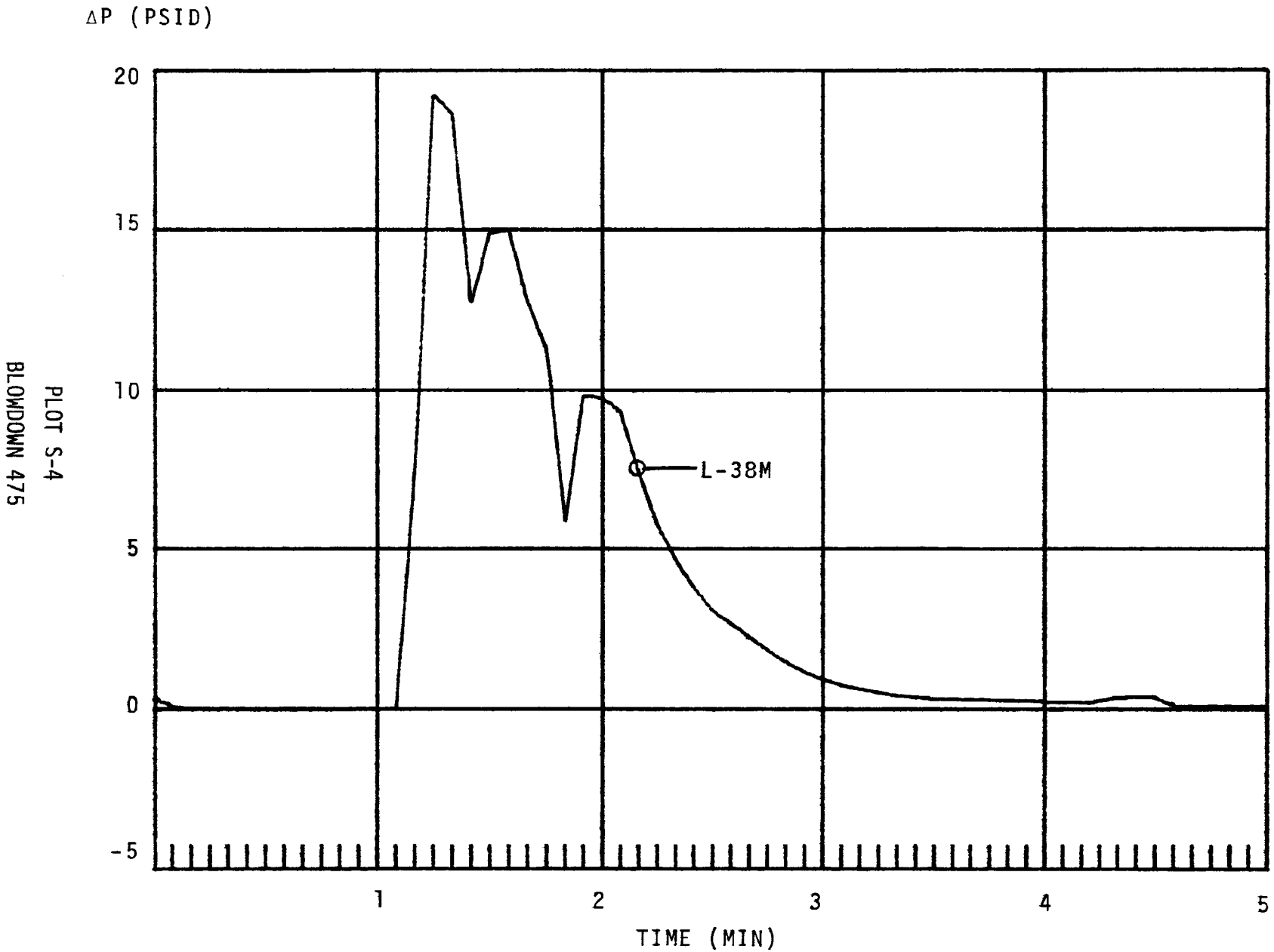


PLOT S-1
BLOWDOWN 475


Temperature (°F)
250
200
150
100
50
0
L-22
L-21
1
2
3
4
5
TIME (MIN)
PLOT S-1A
BLOWDOWN 475

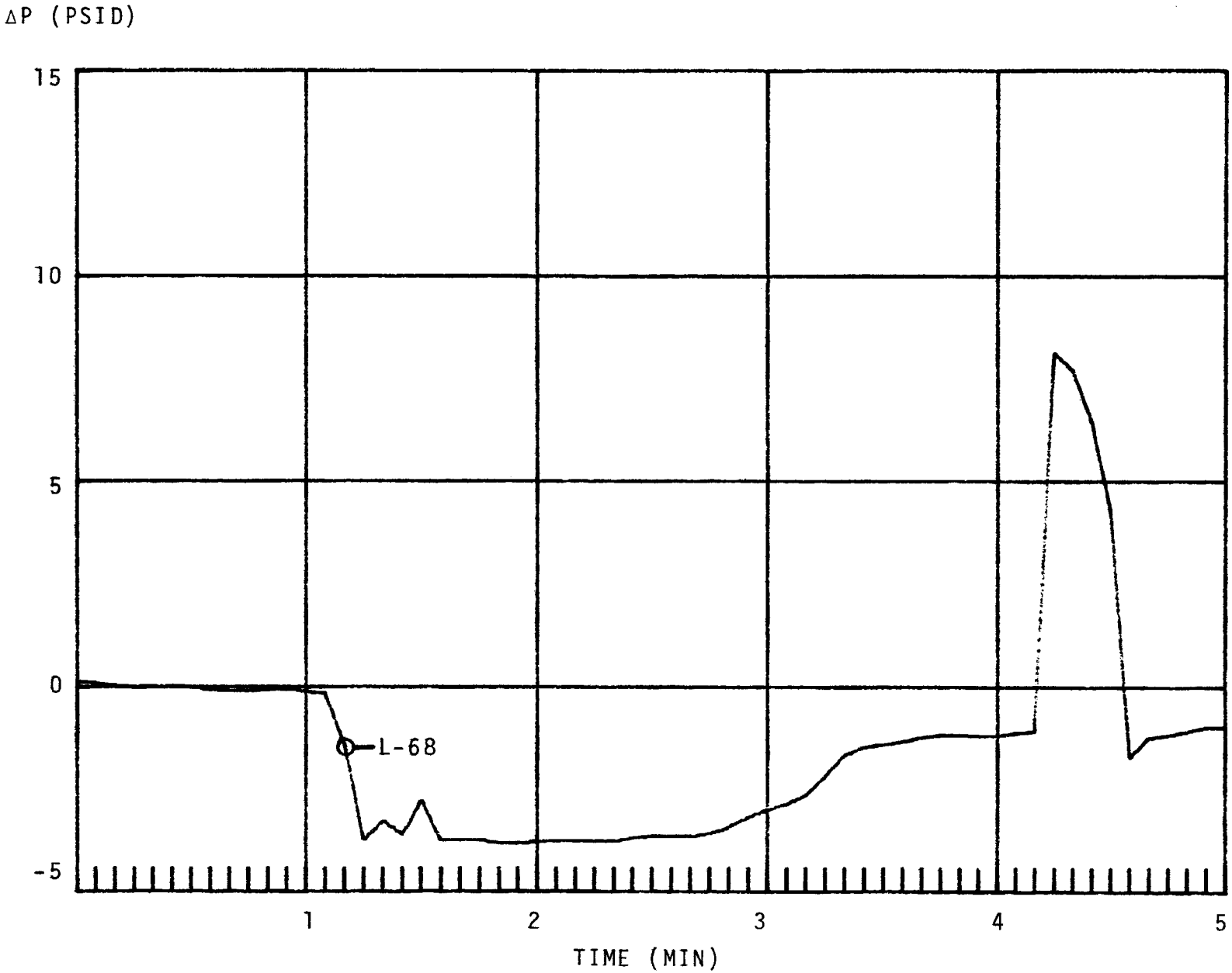

ΔP (PSID) L-25
ΔP (PSID) L-61
3
2
1
0
-1
11
8
5
2
-1
L-25
L-61
1
2
3
4
5
TIME (MIN)
PLOT S-2
BLOWDOWN 475

PLOT S-3
BLOWDOWN 475



BLOWDOWN 475

PLOT S-4



PLOT S-5
BLOWDOWN 475

SYSTEM CONFIGURATION

Test Number 497

Break Location	Suction
Break Size	7.67 in^2
	29 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Free-Wheeling

COMMENTS

1. Malfunctioning or Inoperable Instruments: Pump discharge drag disc (LO) was not installed.

2. Other Comments: The normalized hydraulic torque is in error because the friction and windage torque was added to the shaft torque instead of being subtracted.

3. Affected FM Data Plots: 45 - Normalized Hydraulic Torque

   The following plots of the standard plot package were deleted:

   25 - Normalized Volumetric Flow Rate

   33 - Mass Flow Rate

   39 - Momentum Flux

   49 - Integrated Mass

   All of the data in the following plots are reversed in sign from the usual presentation:

   38 - Momentum Flux

   44 - Normalized Shaft Torque

INITIAL CONDITIONS

t = 25 Sec[a]

Test Number 497

System Pressures

High Pressure Drum	1122.3	psia
Suction Instrument Spool	1119.5	psia
Discharge Instrument Spool	1132.8	psia

Fluid Temperatures

Suction Instrument Spool	547.0	°F
Discharge Instrument Spool	548.8	°F

Fluid Density

Suction Instrument Spool	46.22	lbm/ft^3
Discharge Instrument Spool	43.97	lbm/ft^3

System Flows

Mass Flow Rate	-2	lb/sec
Suction Volumetric Flow Rate	24	gpm
Discharge Volumetric Flow Rate	13	gpm
Suction Normalized Volumetric Flow Rate	.007	
Discharge Normalized Volumetric Flow Rate	.004	
Suction Fluid Velocity	-0.29	ft/sec
Discharge Fluid Velocity	-0.16	ft/sec
Suction Momentum Flux	4	$lbm/ft\ sec^2$
Discharge Momentum Flux	1	$lbm/ft\ sec^2$

Pump Performance

Pump head	12.4	psi
	38.6	ft
Pump Speed	4477	rpm
Pump Shaft Torque	73.6	ft lb
Pump Hydraulic Torque	48.7	ft lb

System Mass (t = 35 Sec)[a]

High Pressure Drum Level	69.6	in[b]
Fluid Mass Upstream of Test Pump	15,171	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 497

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-7.0	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	c	c
HPSW-1 Closed	c	c
Pump Power Trip	15.1	80
Initiate Rupture Mechanism	c	c
Blowdown Starts	15.1	80
End of Digitized Data 20 s/sec	158.0	-
200 s/sec	78.0	-
FM Recording System Off	178.0	-
Scanner System Off	-	185

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

Index Listing

of

FM DATA PLOTS

Test Number (497)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 SUC.
26	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 SUC.
27	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 DISCH.
28	L-3	Norm. Vol. Flow Rate LO-TM Suction
29	L-29	Norm. Vol. Flow Rate HI-TM Discharge
30	L-1/L-16	Mass Flow Rate HI-DD/ GD2 Suction

Index Listing

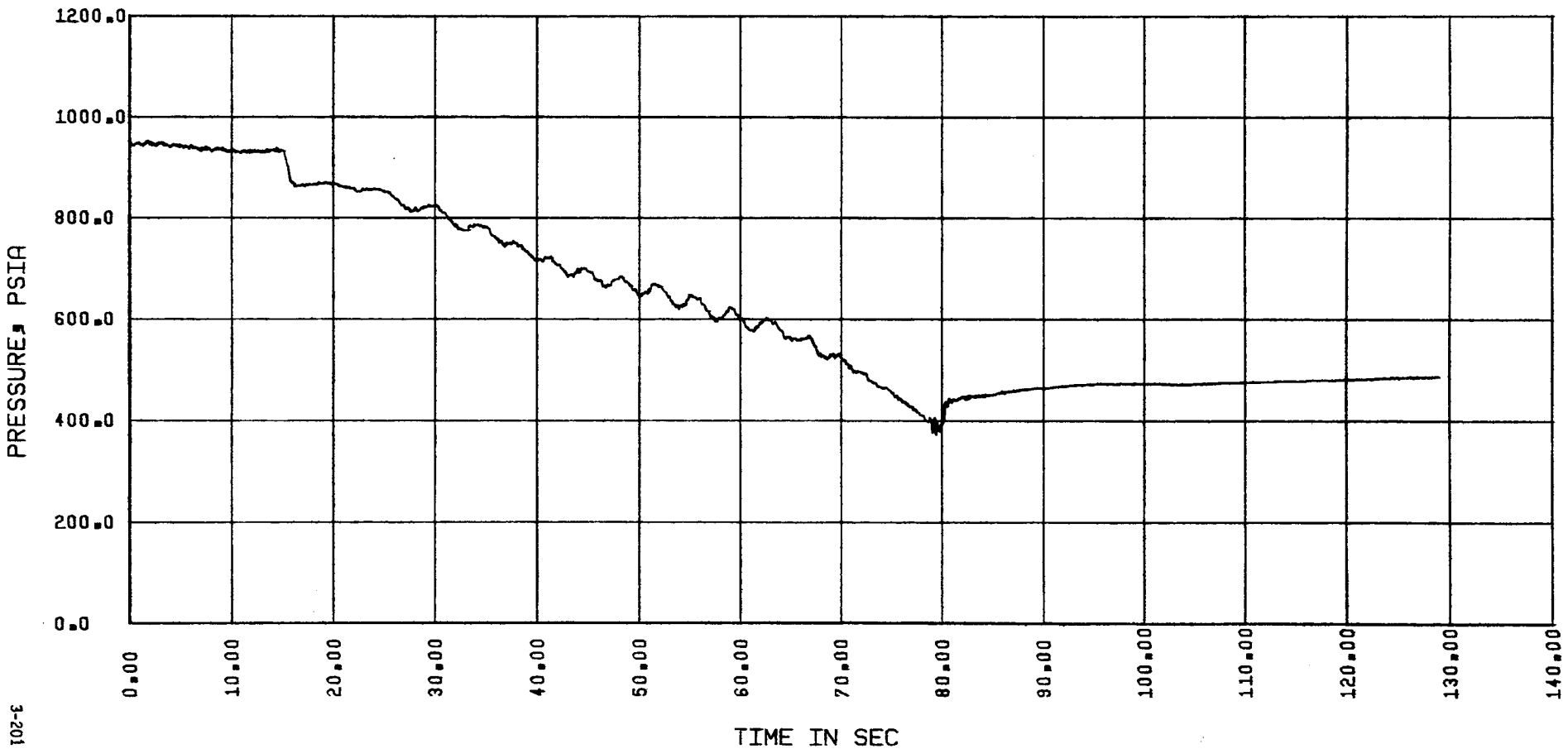
of

FM DATA PLOTS (Cont'd.)

Test Number (497)

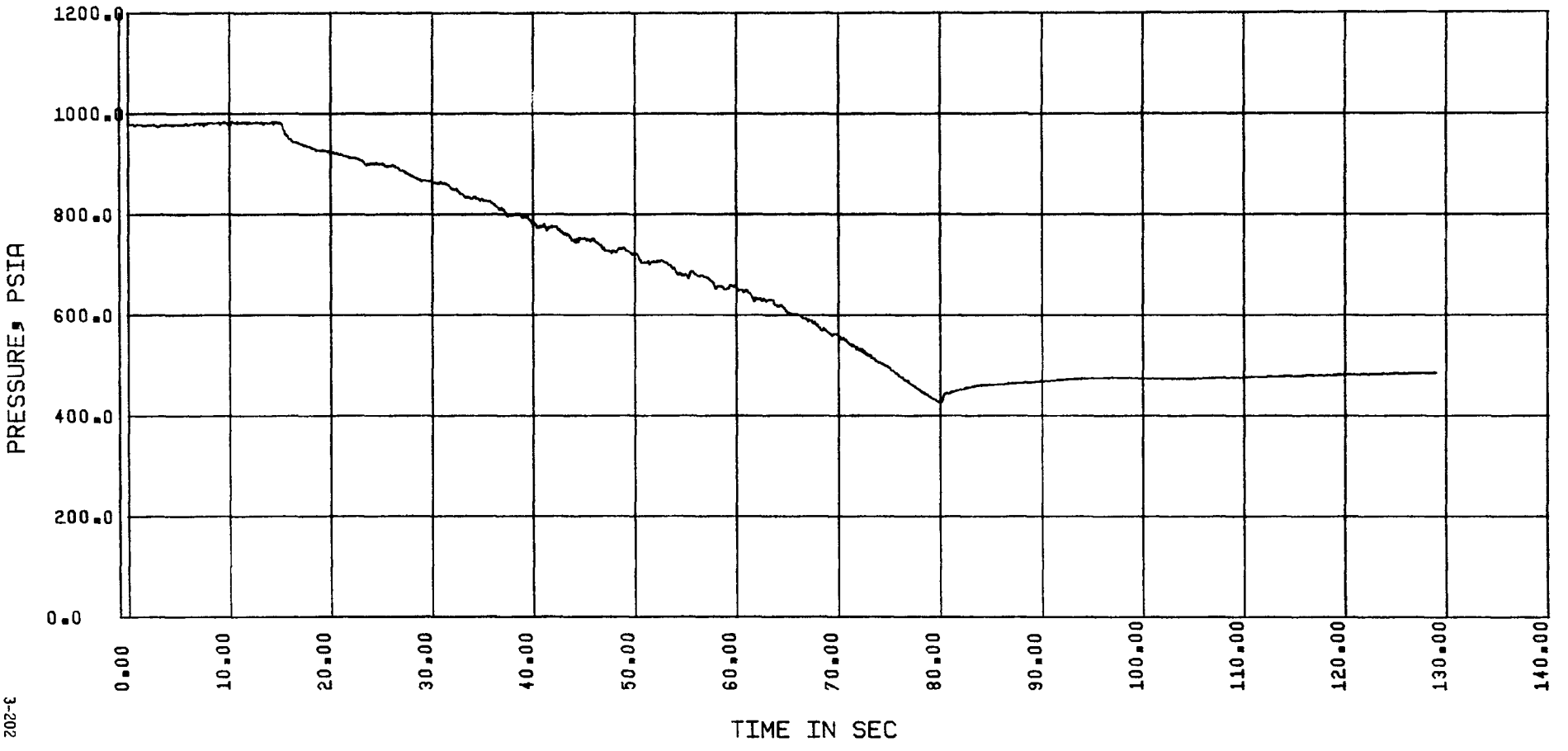
Plot Number	Location Number	Description of Parameter
31	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
32	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
34	L-16/L-3	Momentum Flux GD2/LO-TM Suction
35	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
36	L-1	Momentum Flux HI-DD Suction
37	L-2	Momentum Flux HI-DD Discharge
38	L-26	Momentum Flux LO-DD Suction
40	L-7	Pump Head in Psi
43	L-12	Norm. Pump Speed
44	L-11	Norm. Pump Shaft Torque
45	L-11/L-12	Norm. Pump Hydraulic Torque
46	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
47	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
48	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
51	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
52	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
55	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
56	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge

TEST 497/1000 PSIA FW REV BDN
PUMP SUCTION PRESSURE
PLOT NO.1

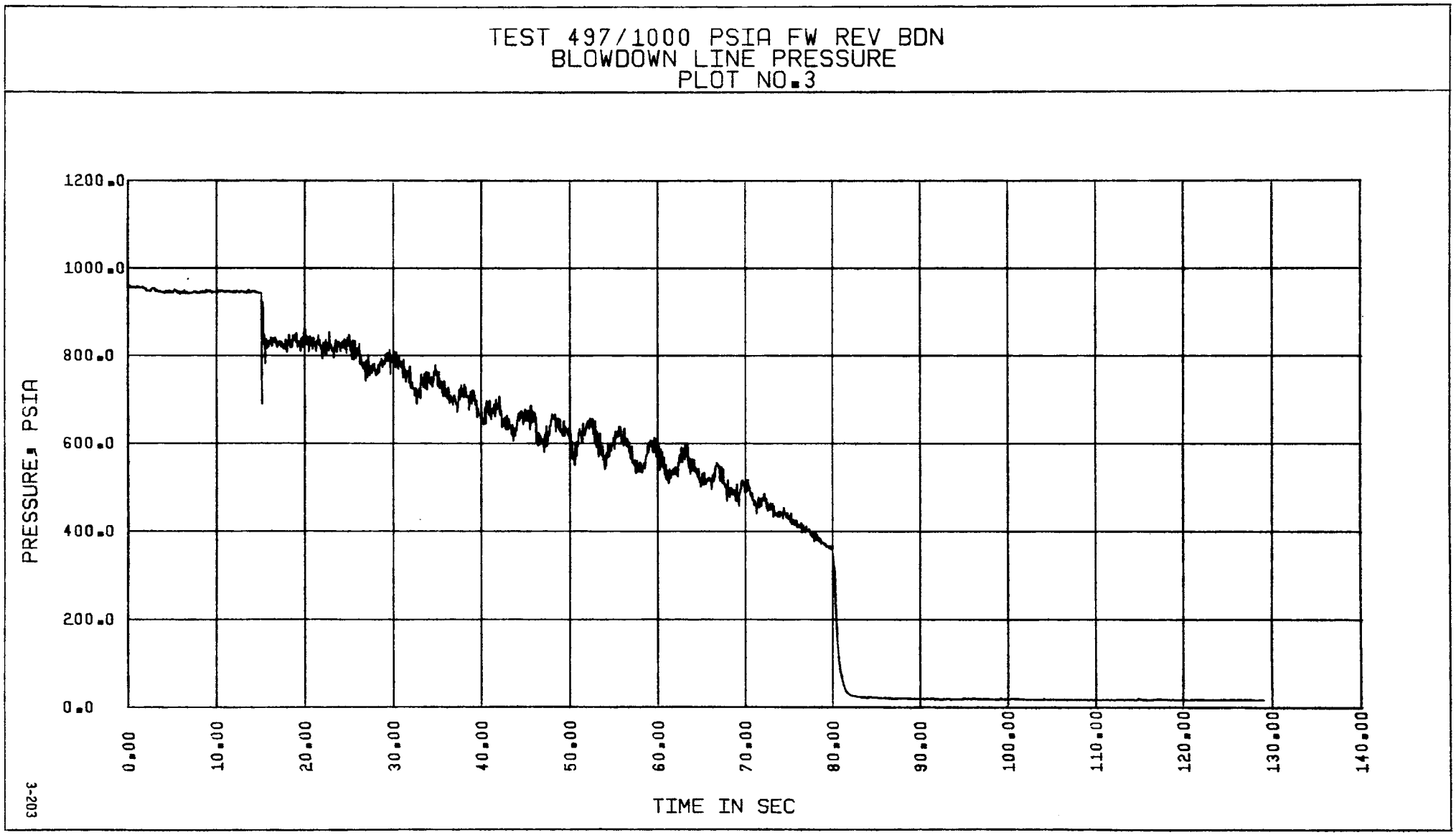


3-201

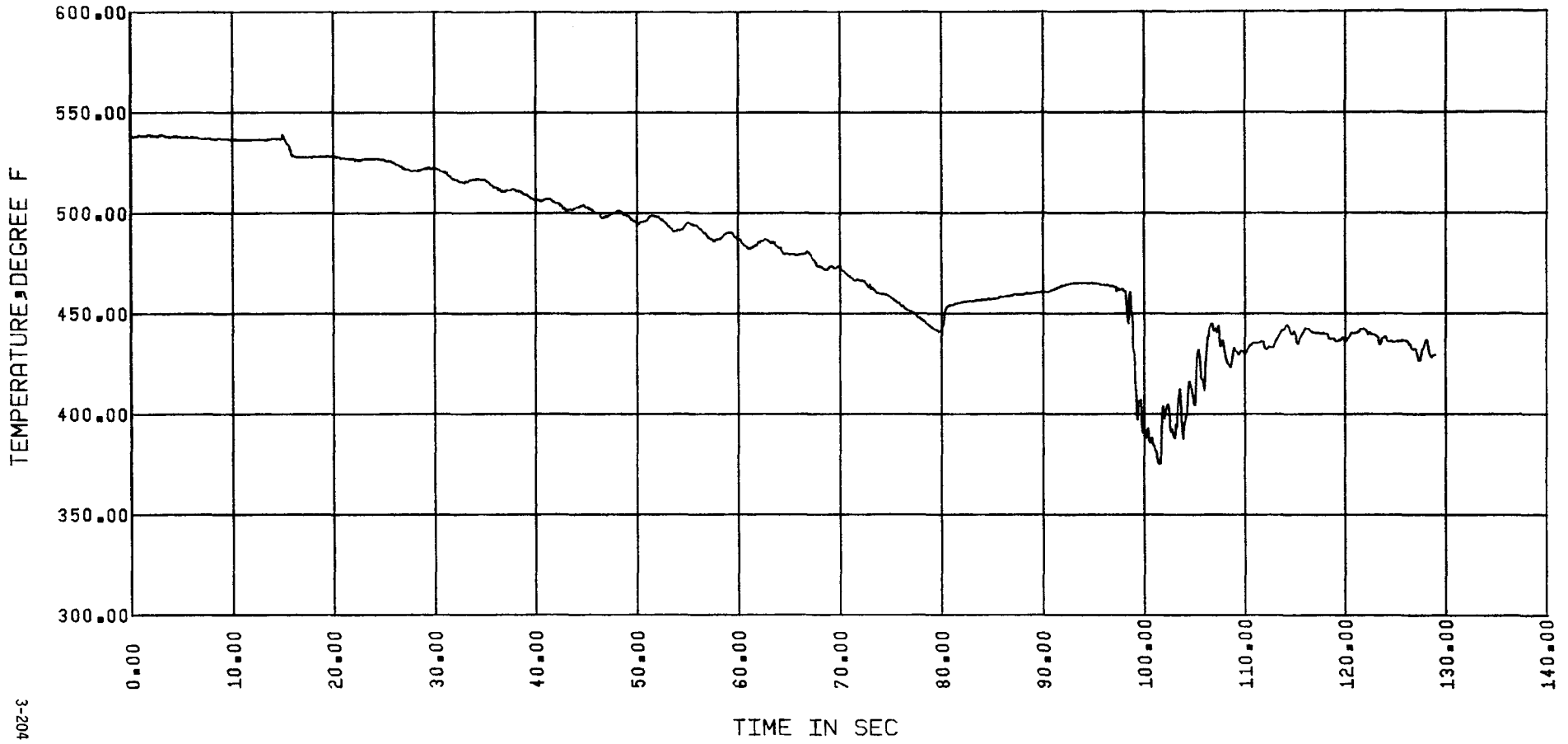
TEST 497/1000 PSIA FW REV BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2



3-202

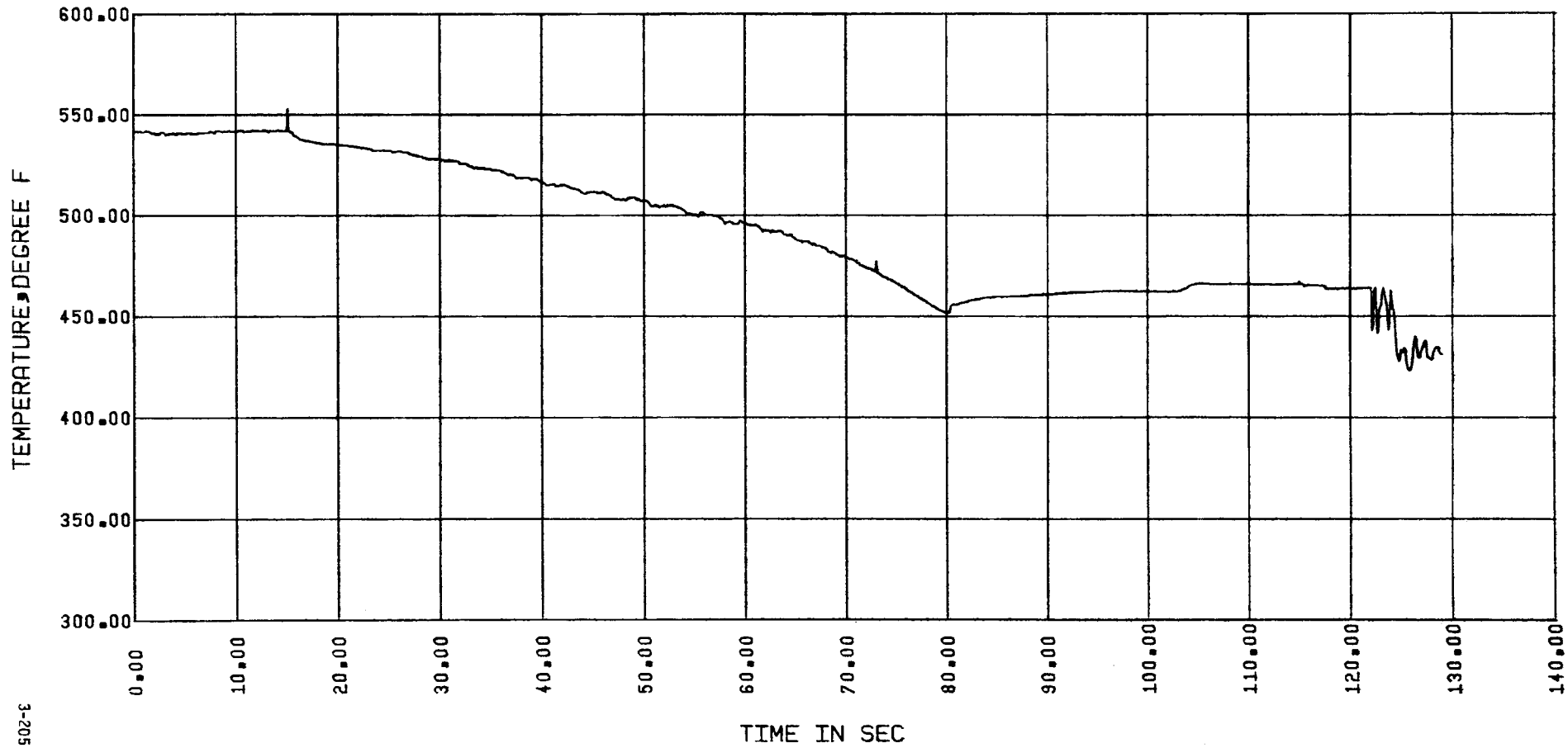

TEST 497/1000 PSIA FW REV BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
PRESSURE, PSIA
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
120.00
130.00
140.00
TIME IN SEC
3-203

TEST 497/1000 PSIA FW REV BDN
PUMP SUCTION TEMPERATURE
PLOT NO.4



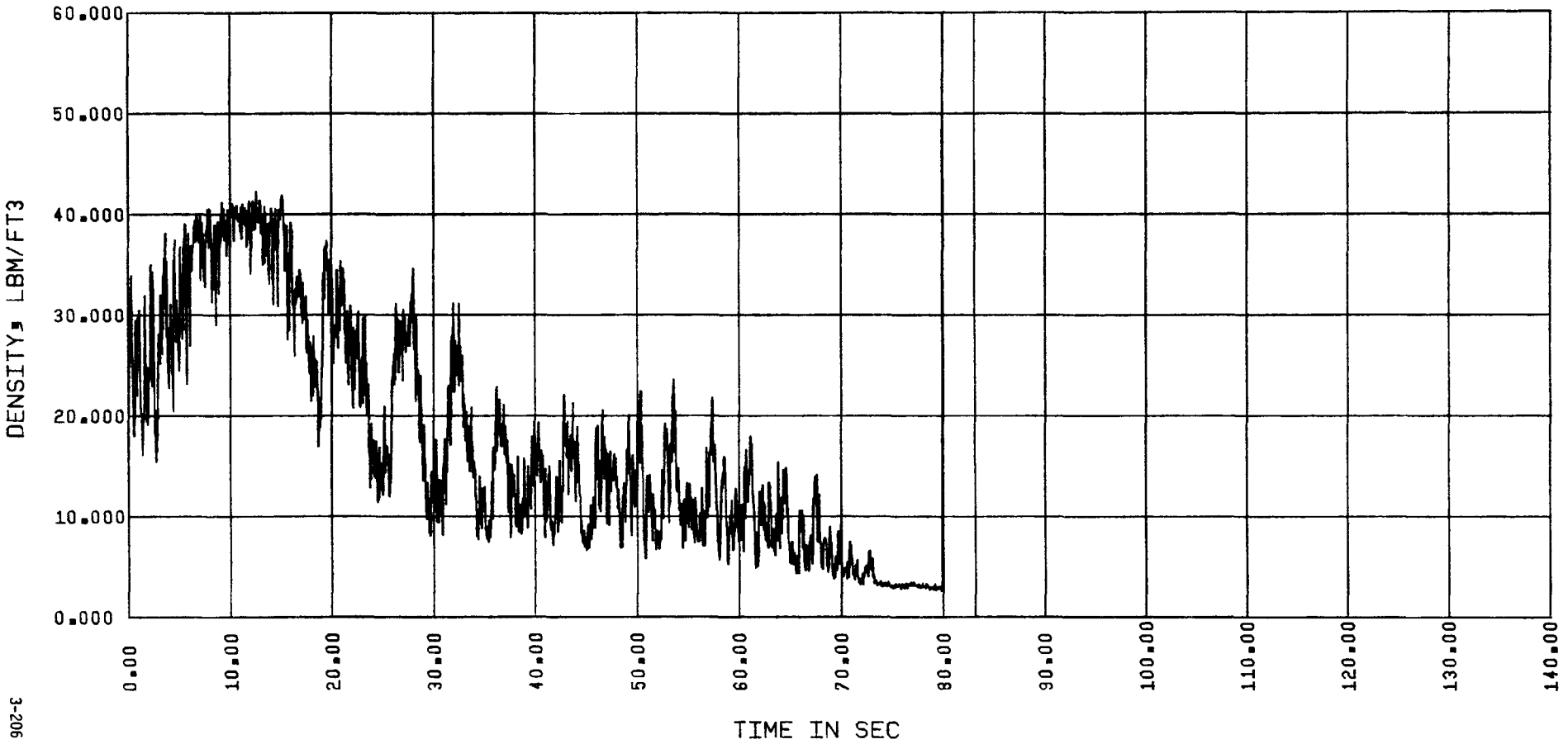
3-204

TEST 497/1000 PSIA FW REV BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5

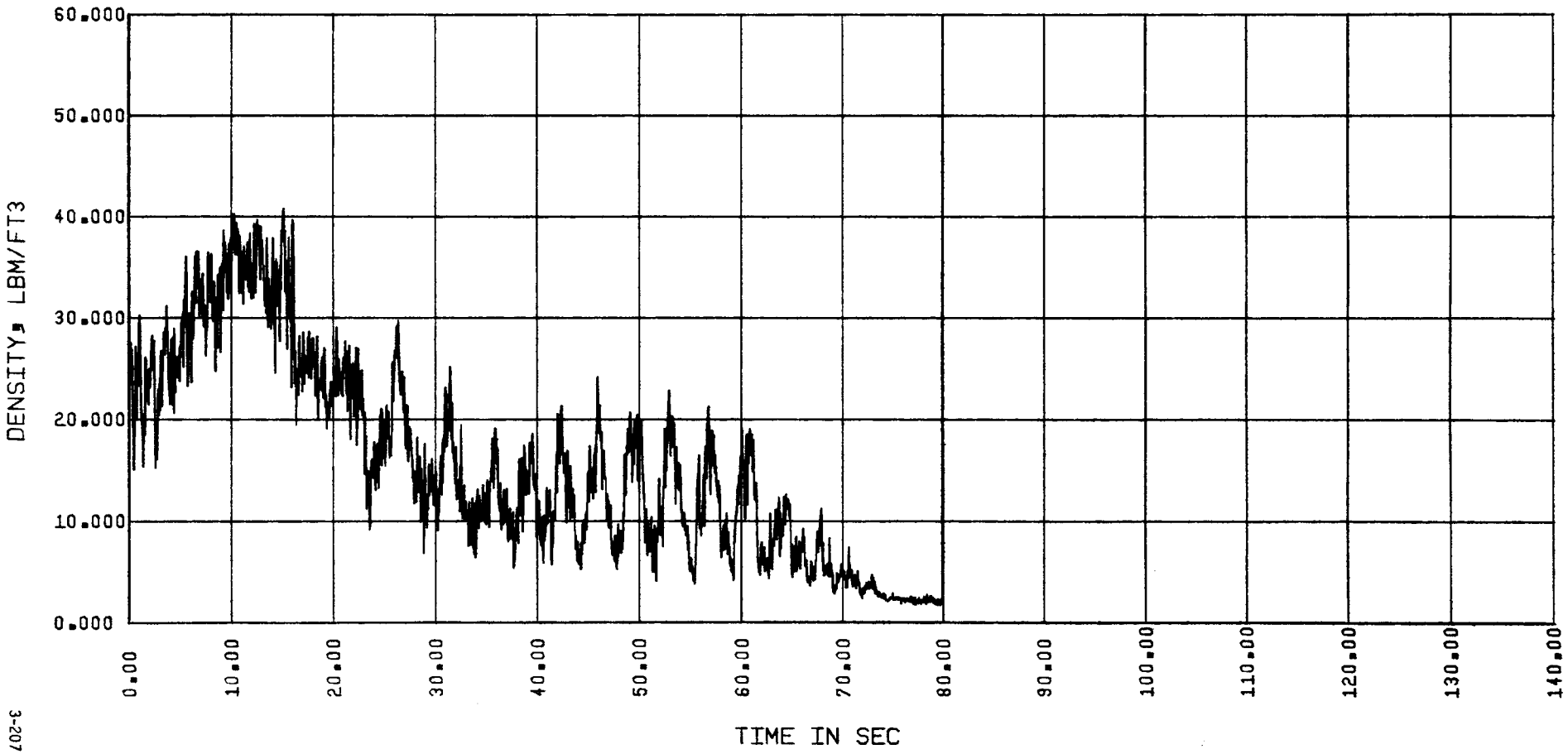


3-205

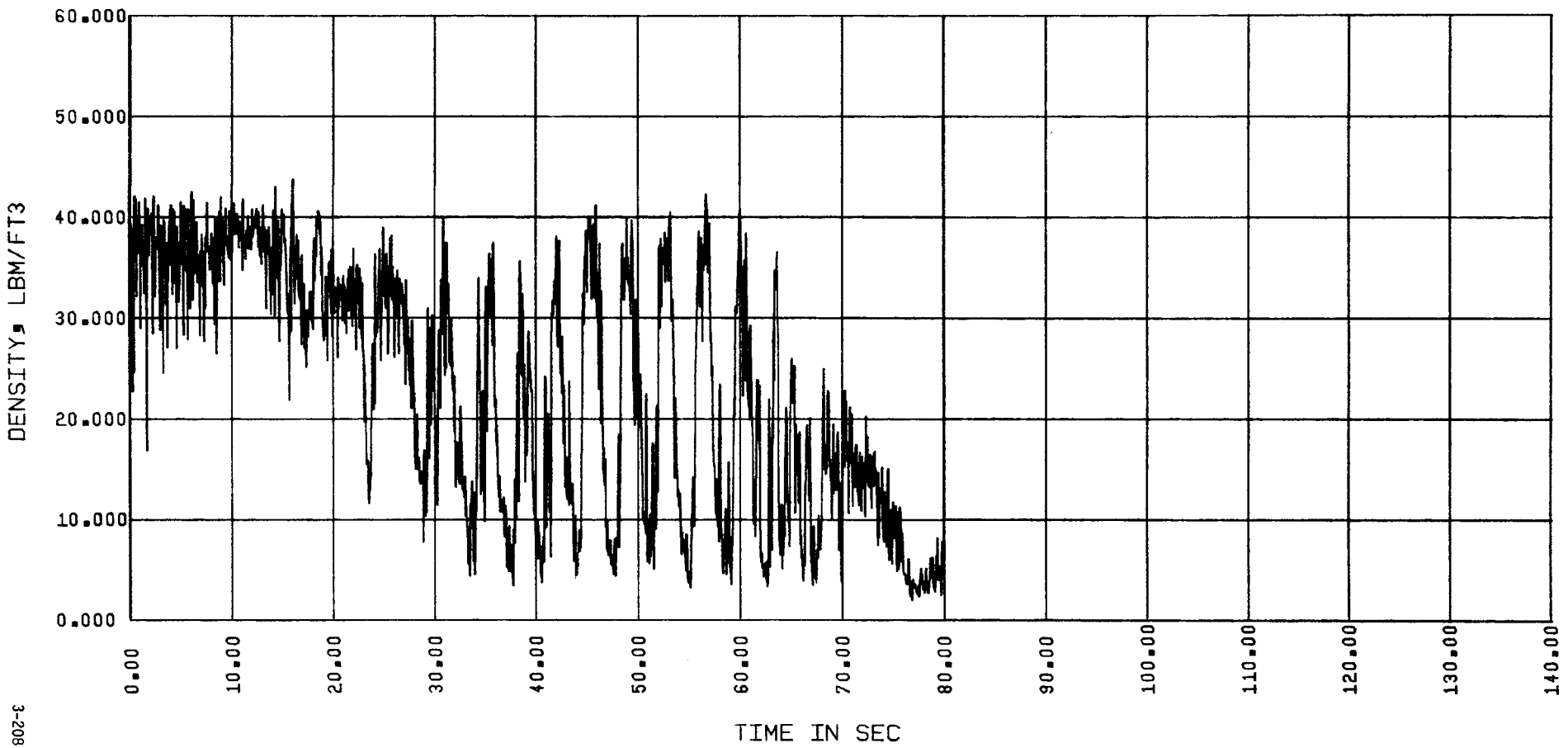
TEST 497/1000 PSIA FW REV BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



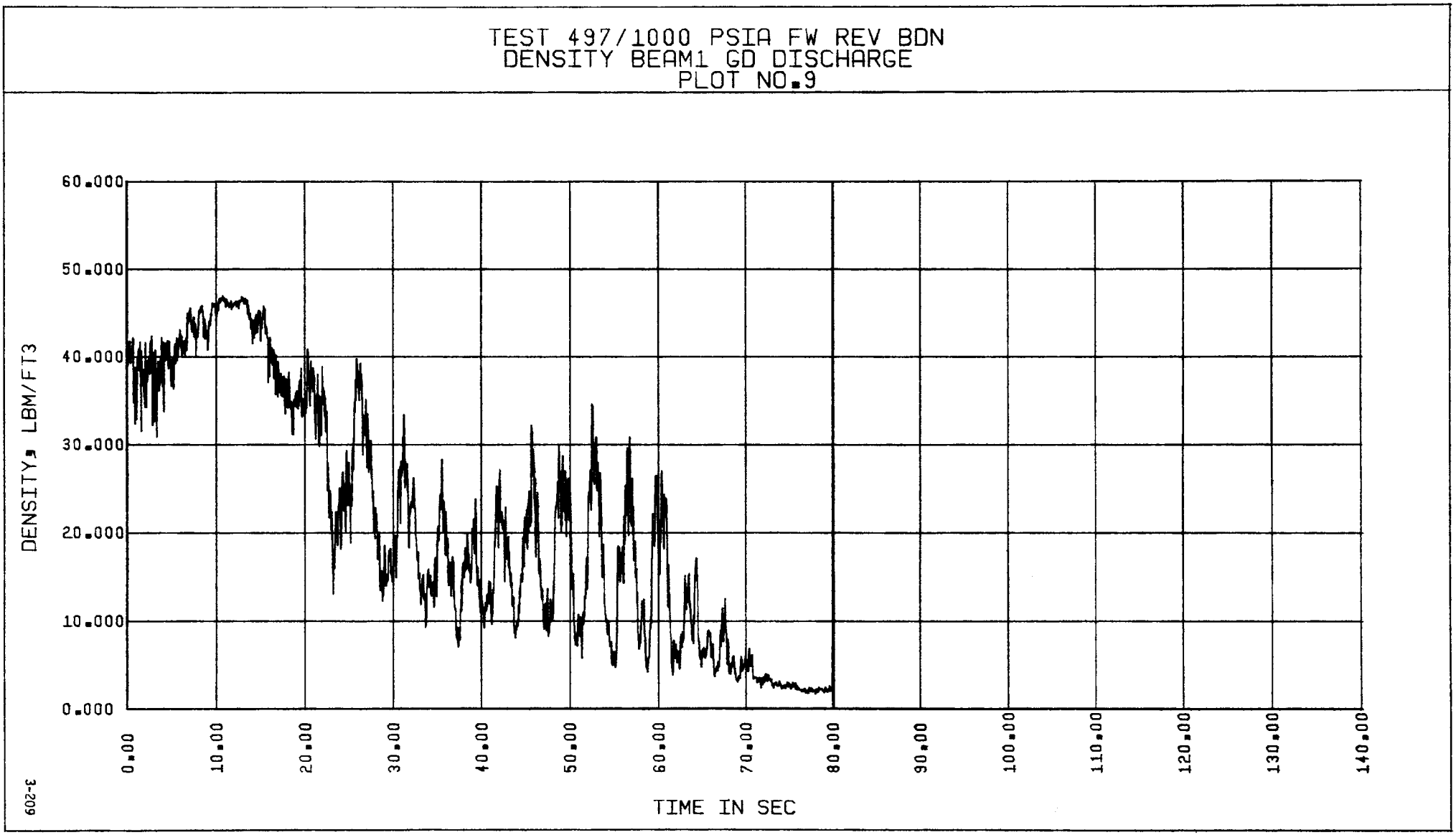
TEST 497/1000 PSIA FW REV BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7



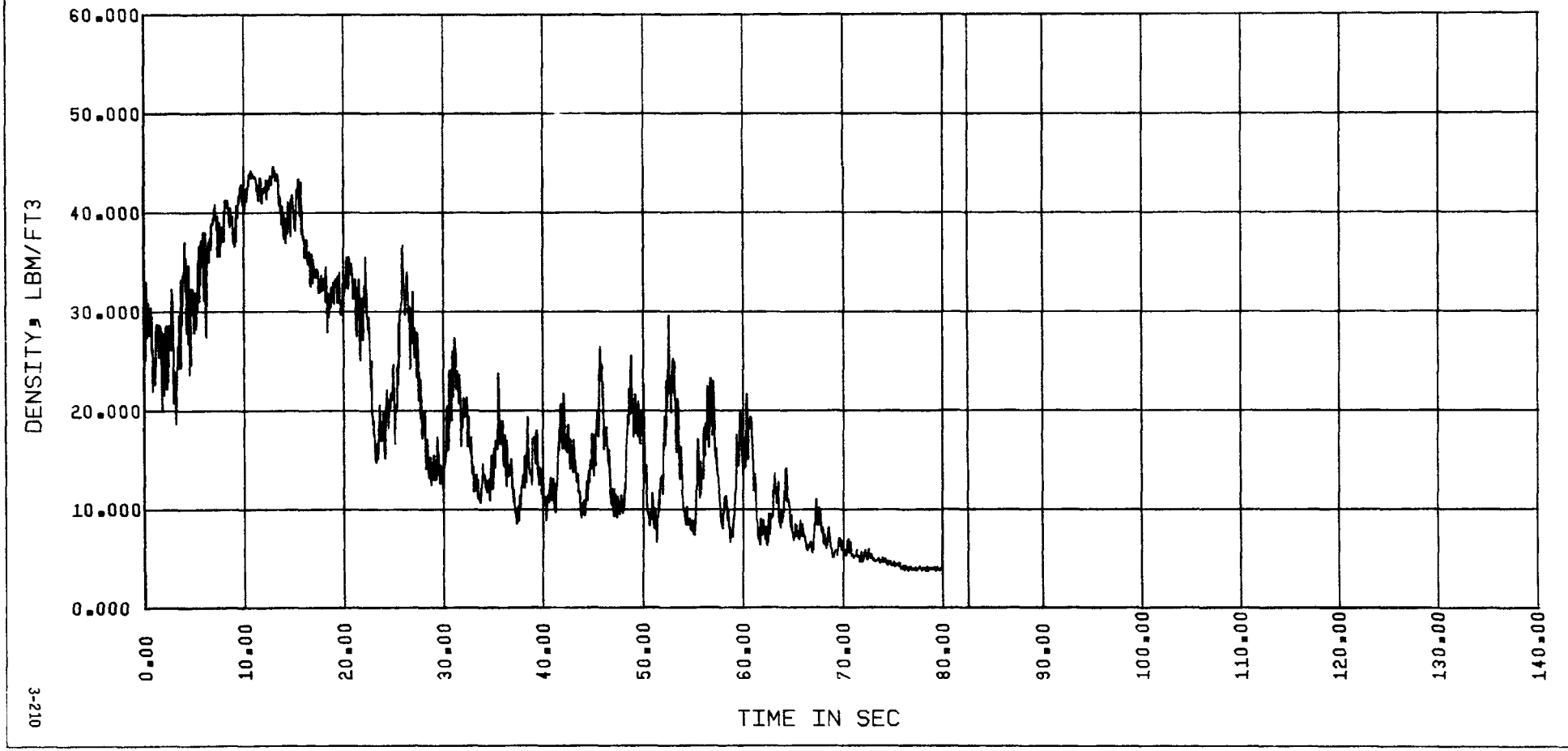
TEST 497/1000 PSIA FW REV BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8



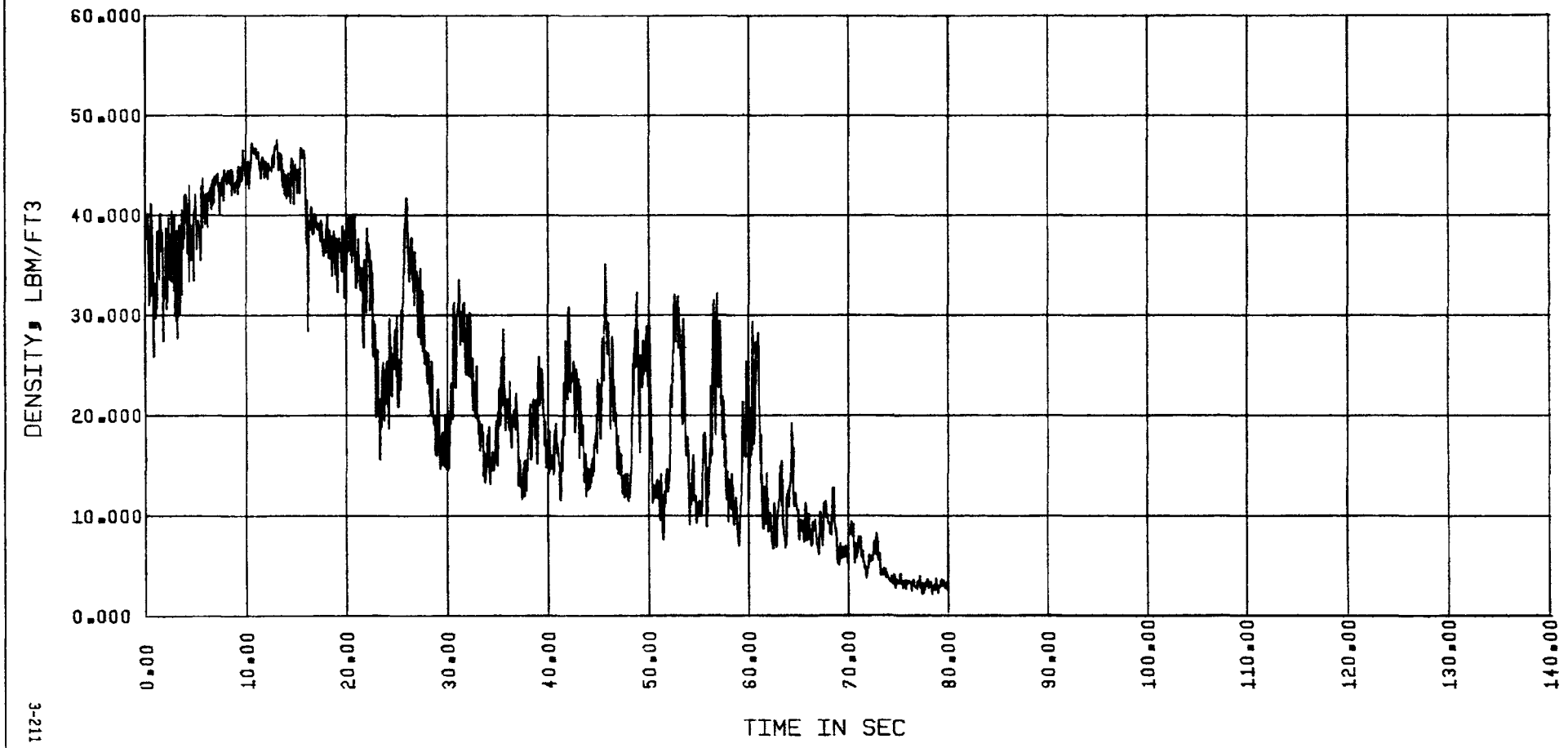
3-208


TEST 497/1000 PSIA FW REV BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9
DENSITY, LBM/FT3
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
120.00
130.00
140.00
TIME IN SEC
3-209

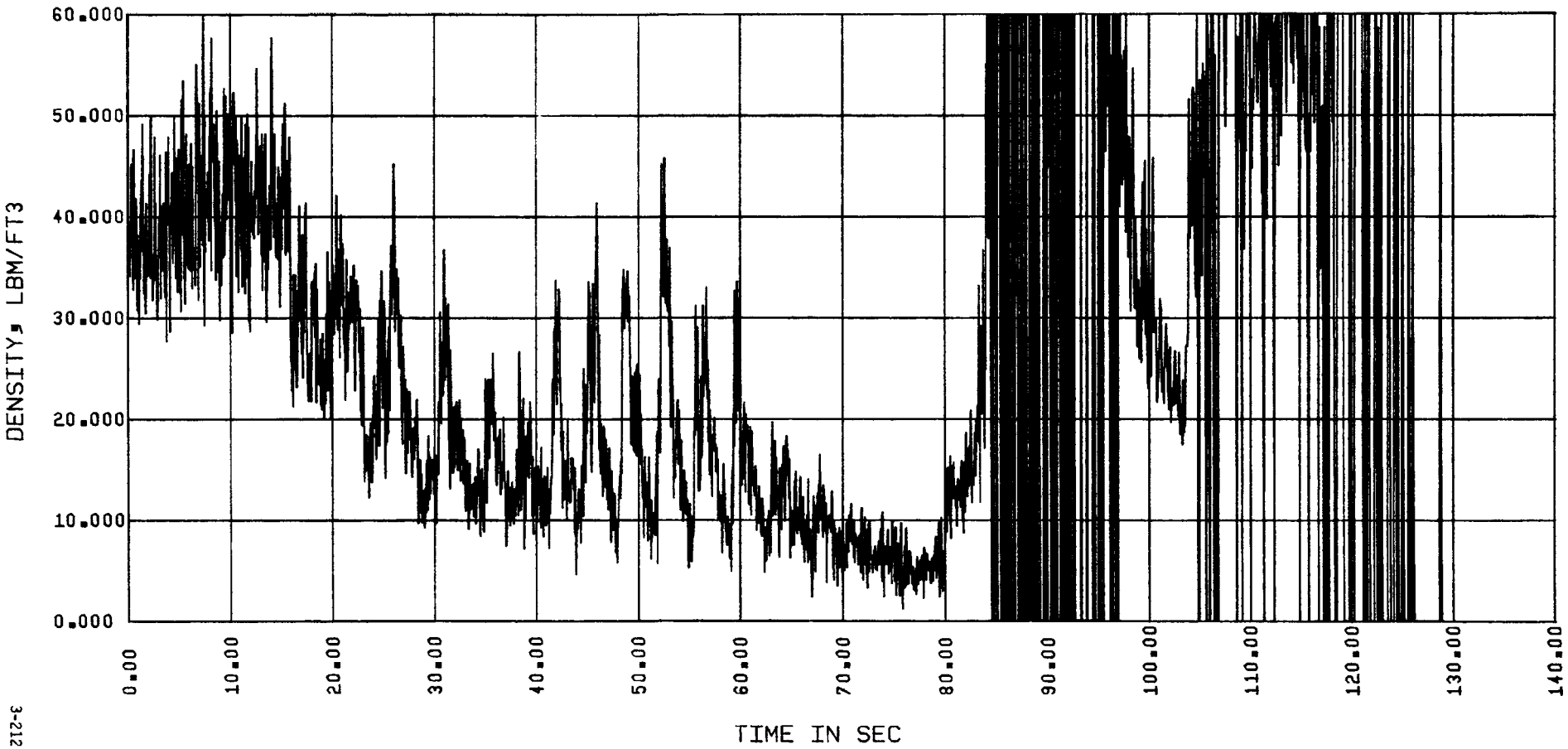
TEST 497/1000 PSIA FW REV BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10

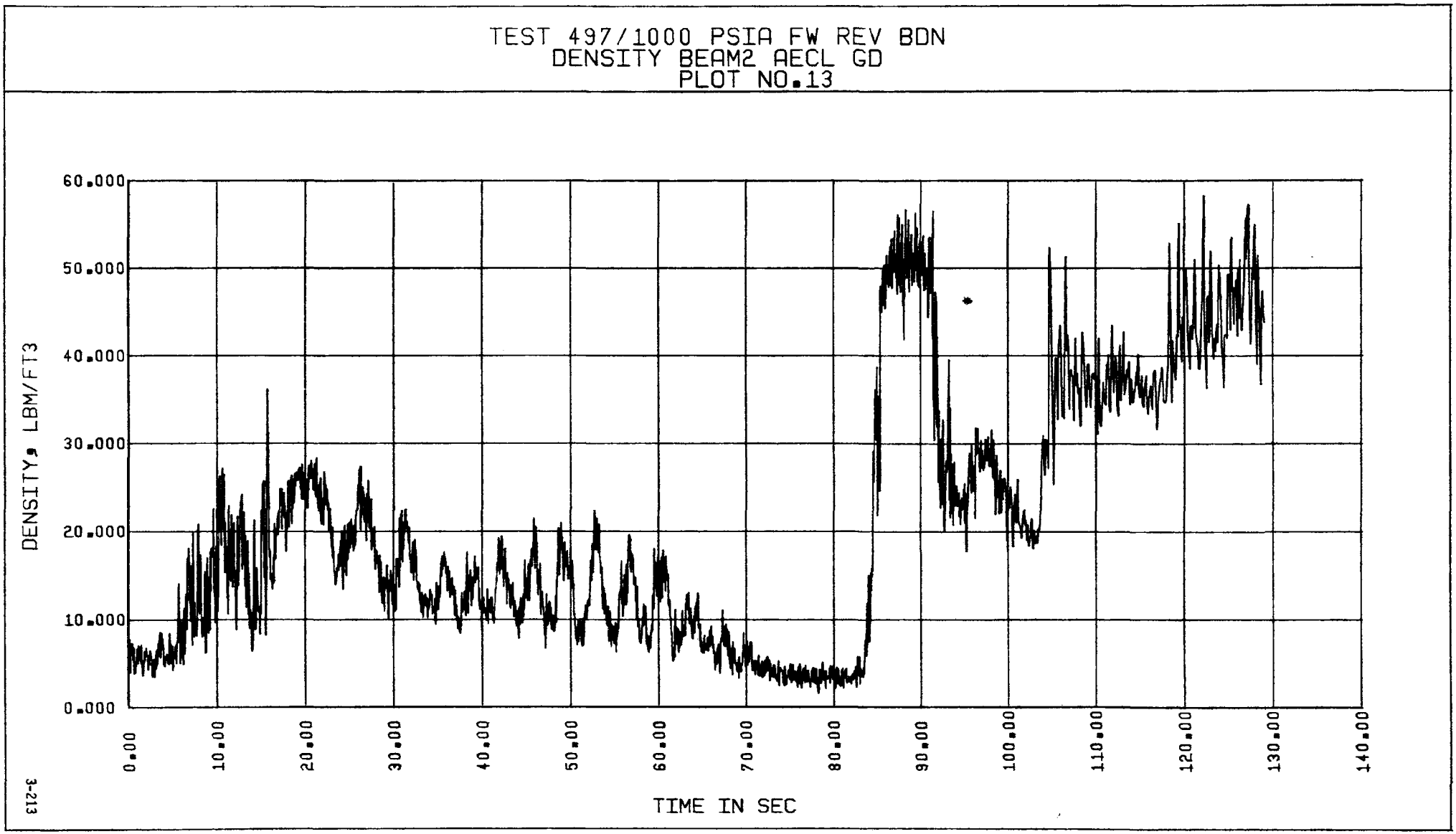


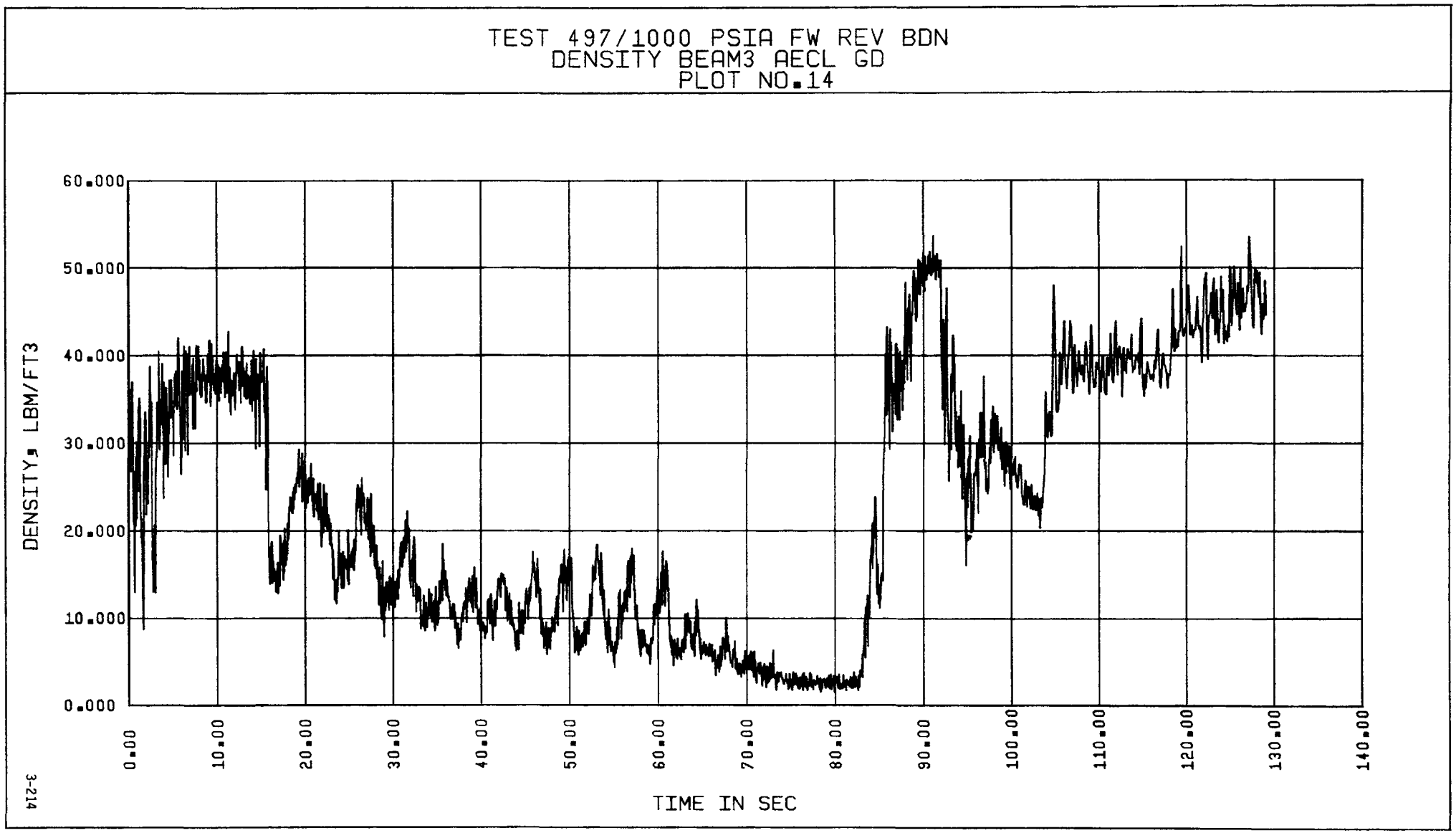
TEST 497/1000 PSIA FW REV BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11



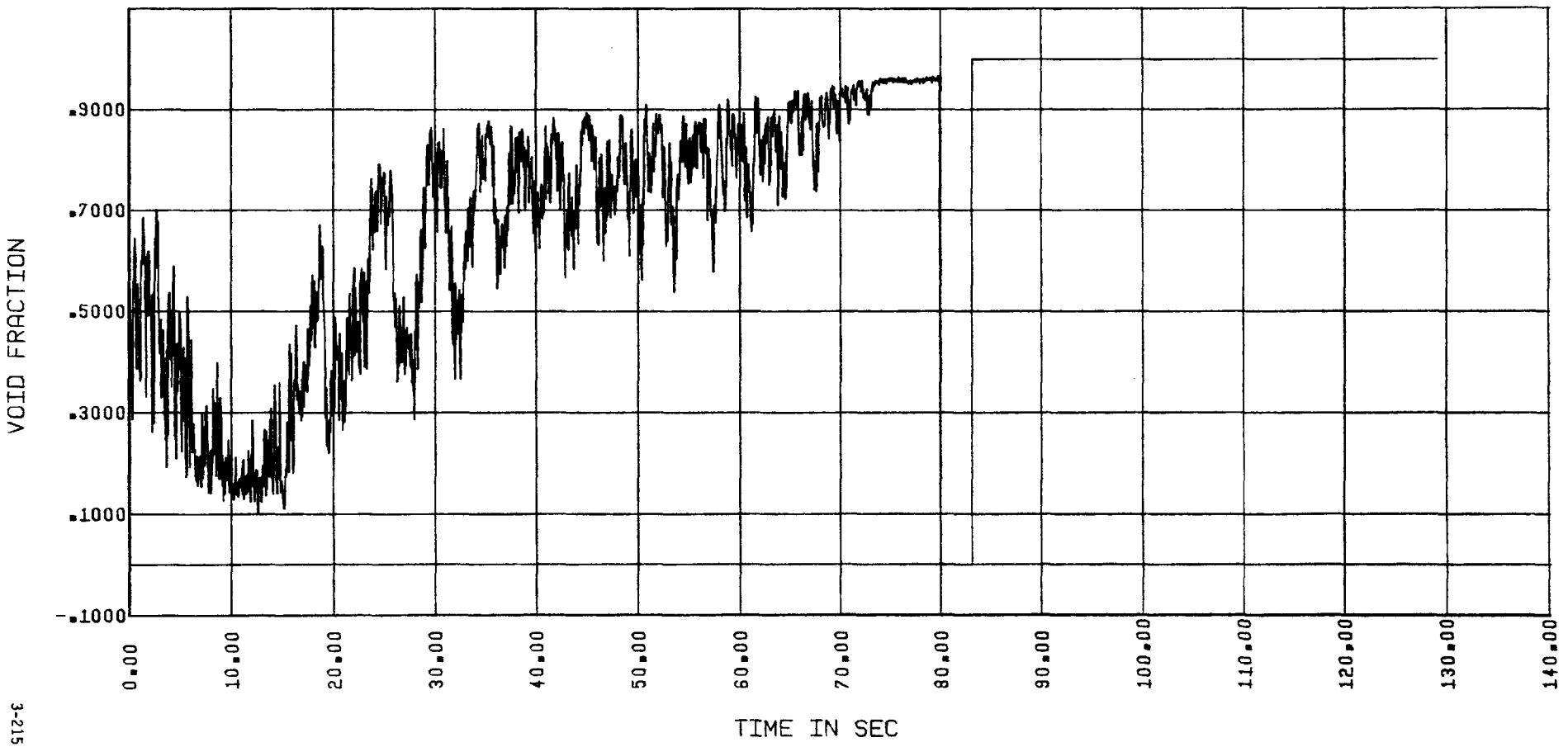
TEST 497/1000 PSIA FW REV BDN
DENSITY BEAM1 AECL GD
PLOT NO.12



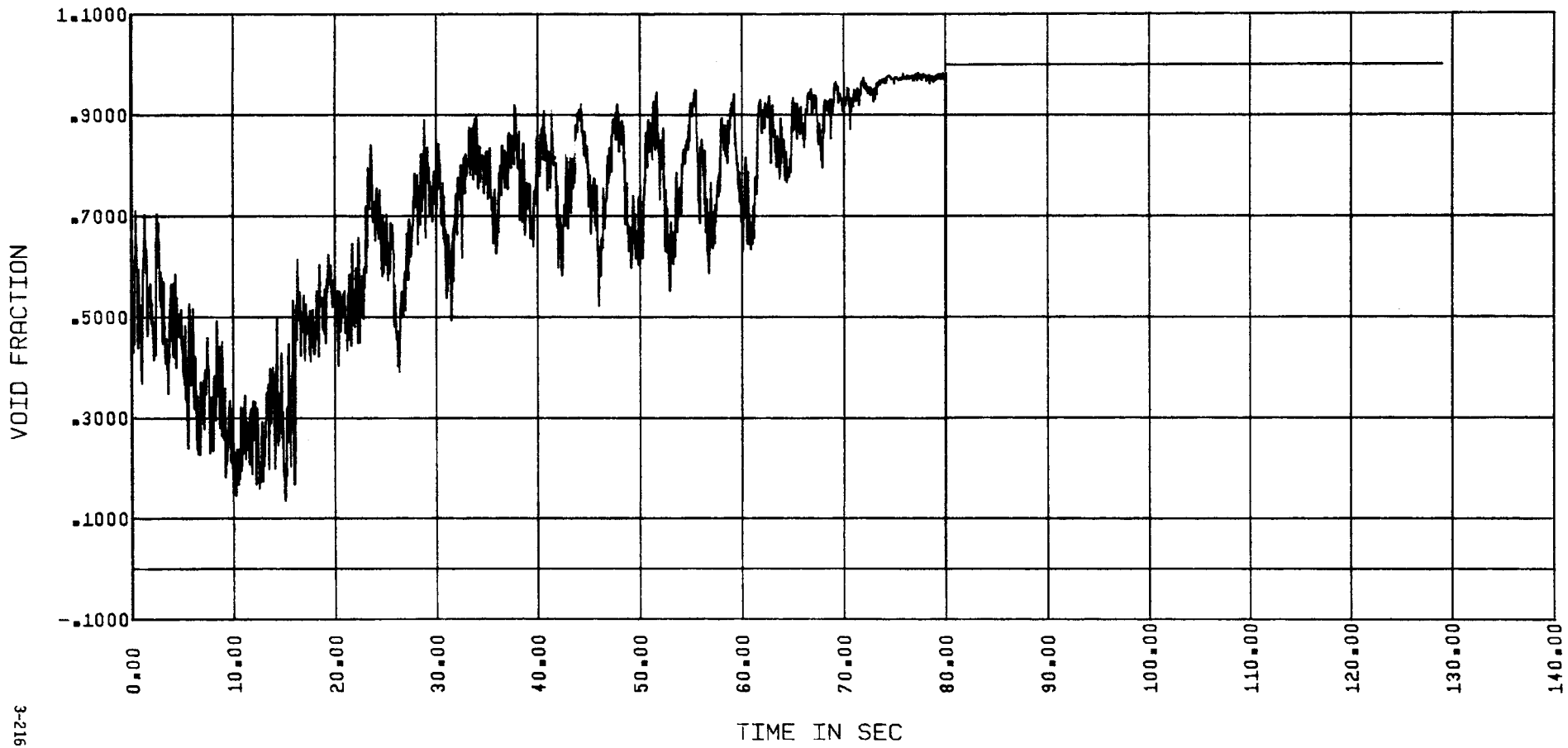

TEST 497/1000 PSIA FW REV BDN
DENSITY BEAM2 AECL GD
PLOT NO.13
DENSITY, LBM/FT3
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
120.00
130.00
140.00
TIME IN SEC


TEST 497/1000 PSIA FW REV BDN
DENSITY BEAM3 AECL GD
PLOT NO.14
DENSITY, LBM/FT3
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
120.00
130.00
140.00
TIME IN SEC

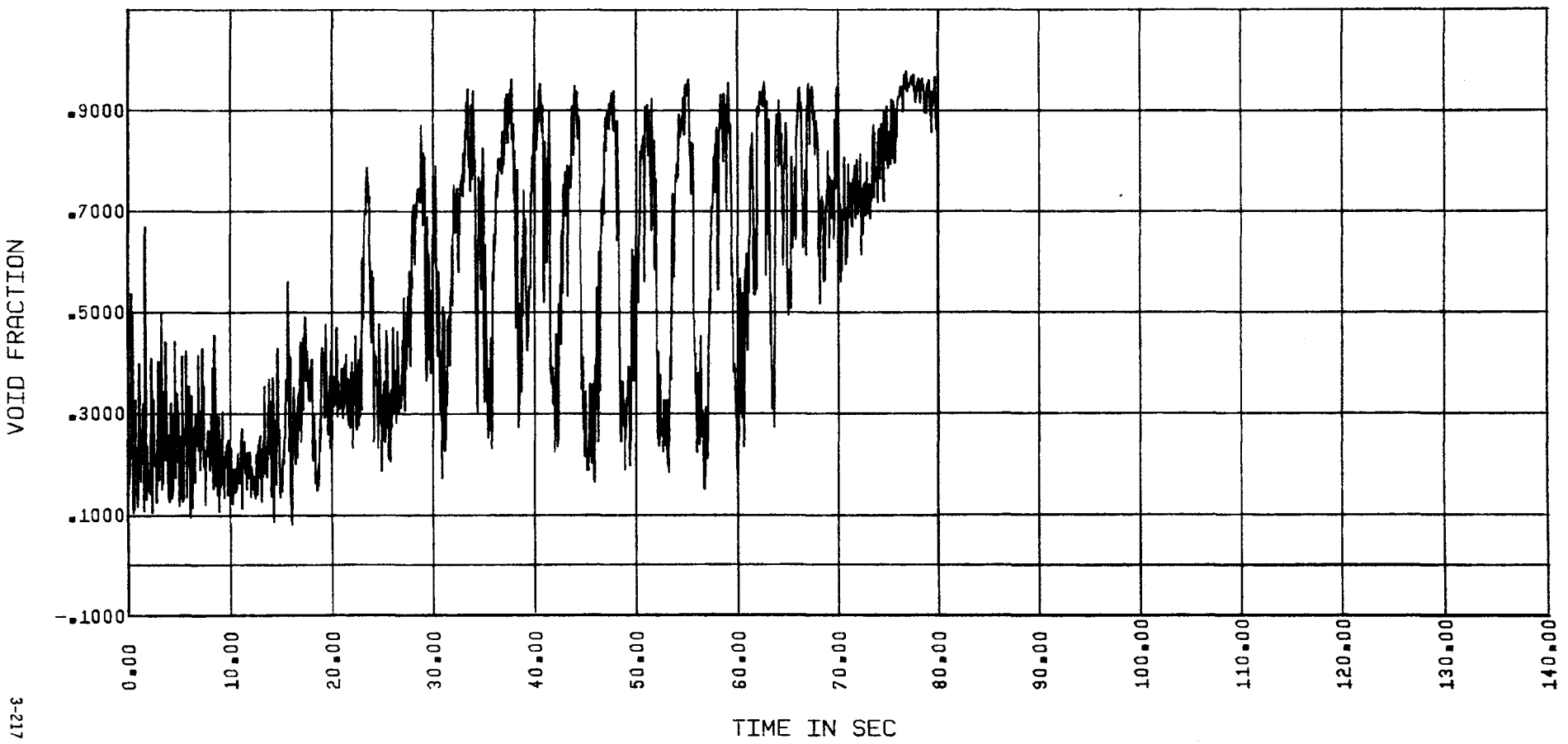
TEST 497/1000 PSIA FW REV BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15



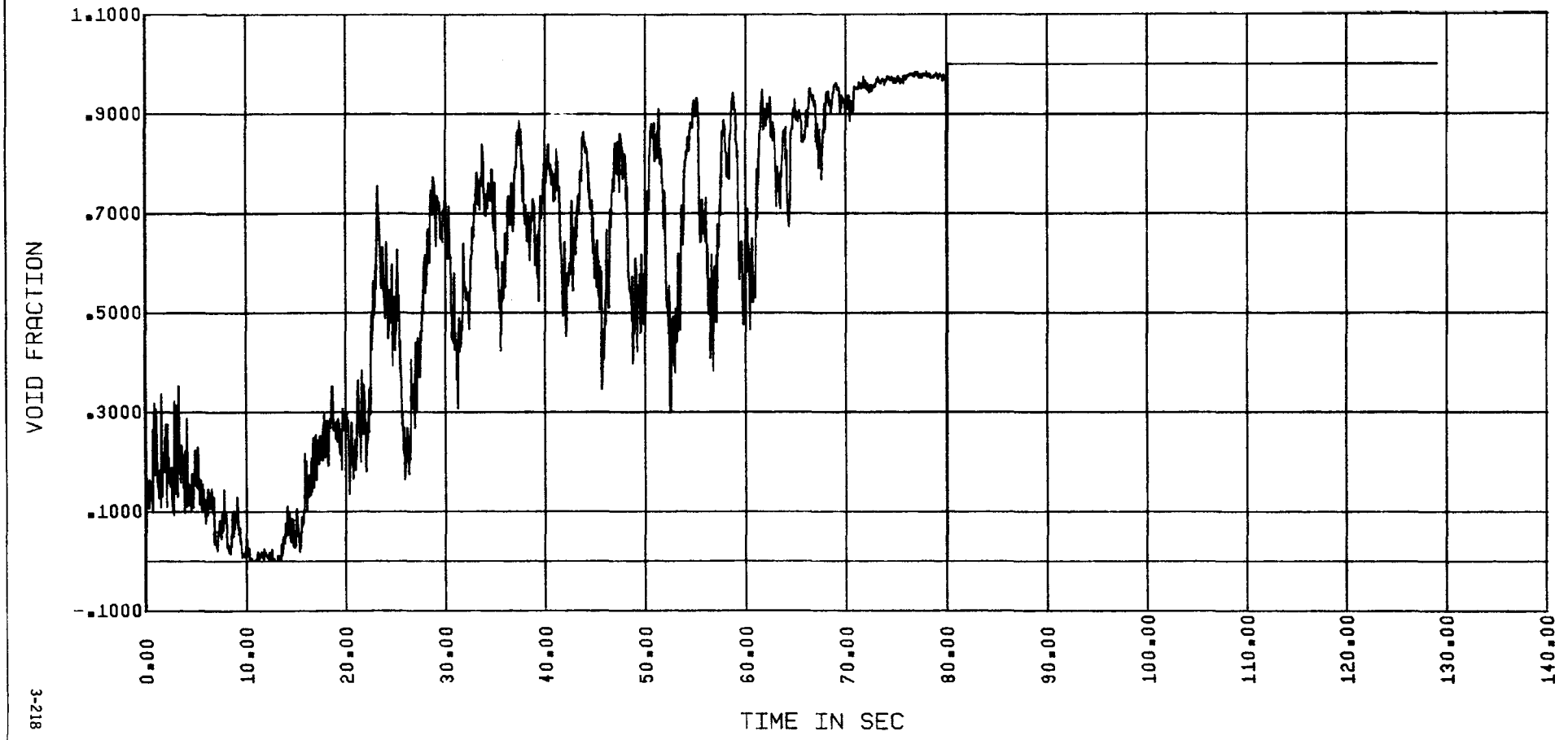
TEST 497/1000 PSIA FW REV BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16

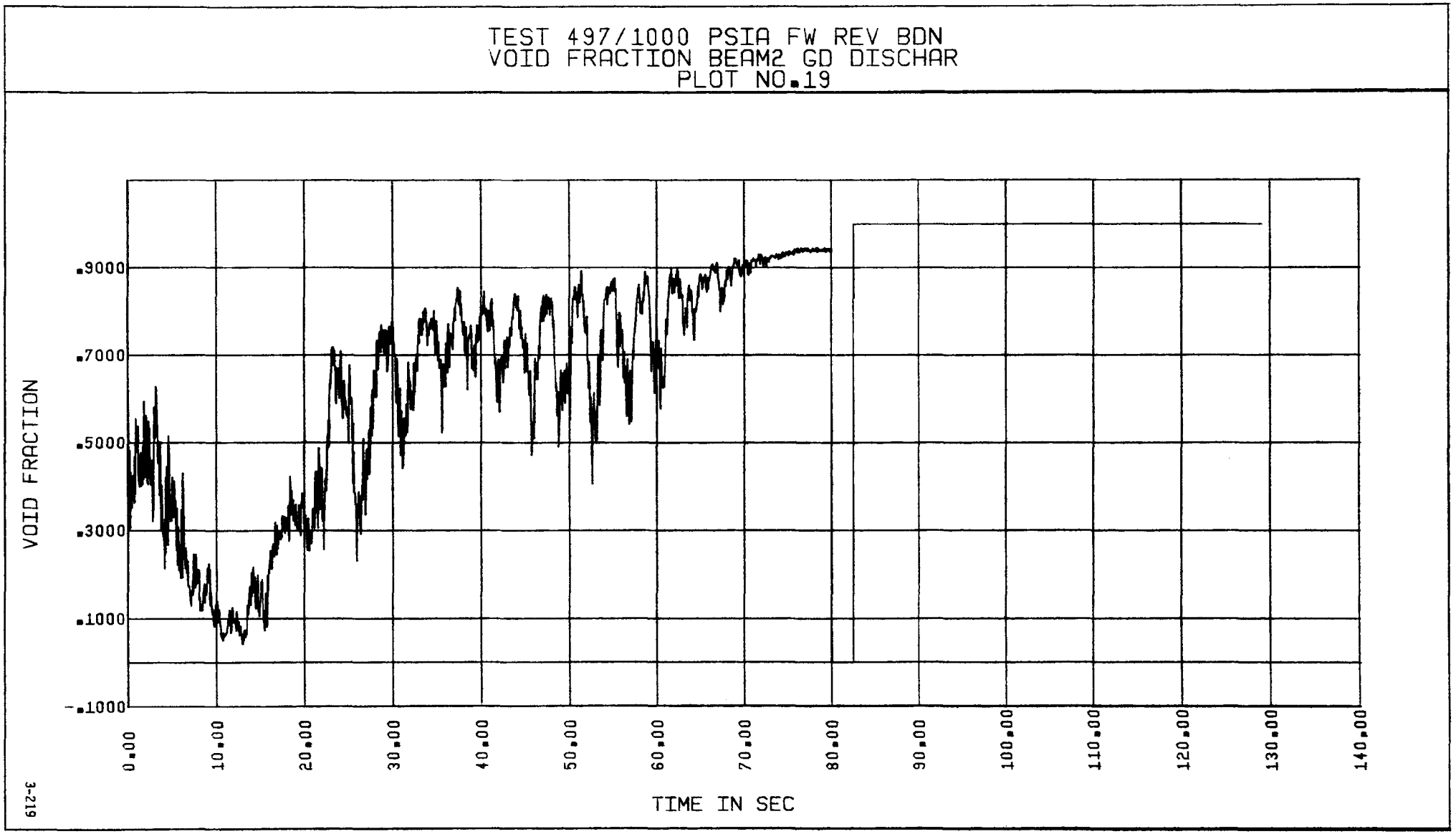


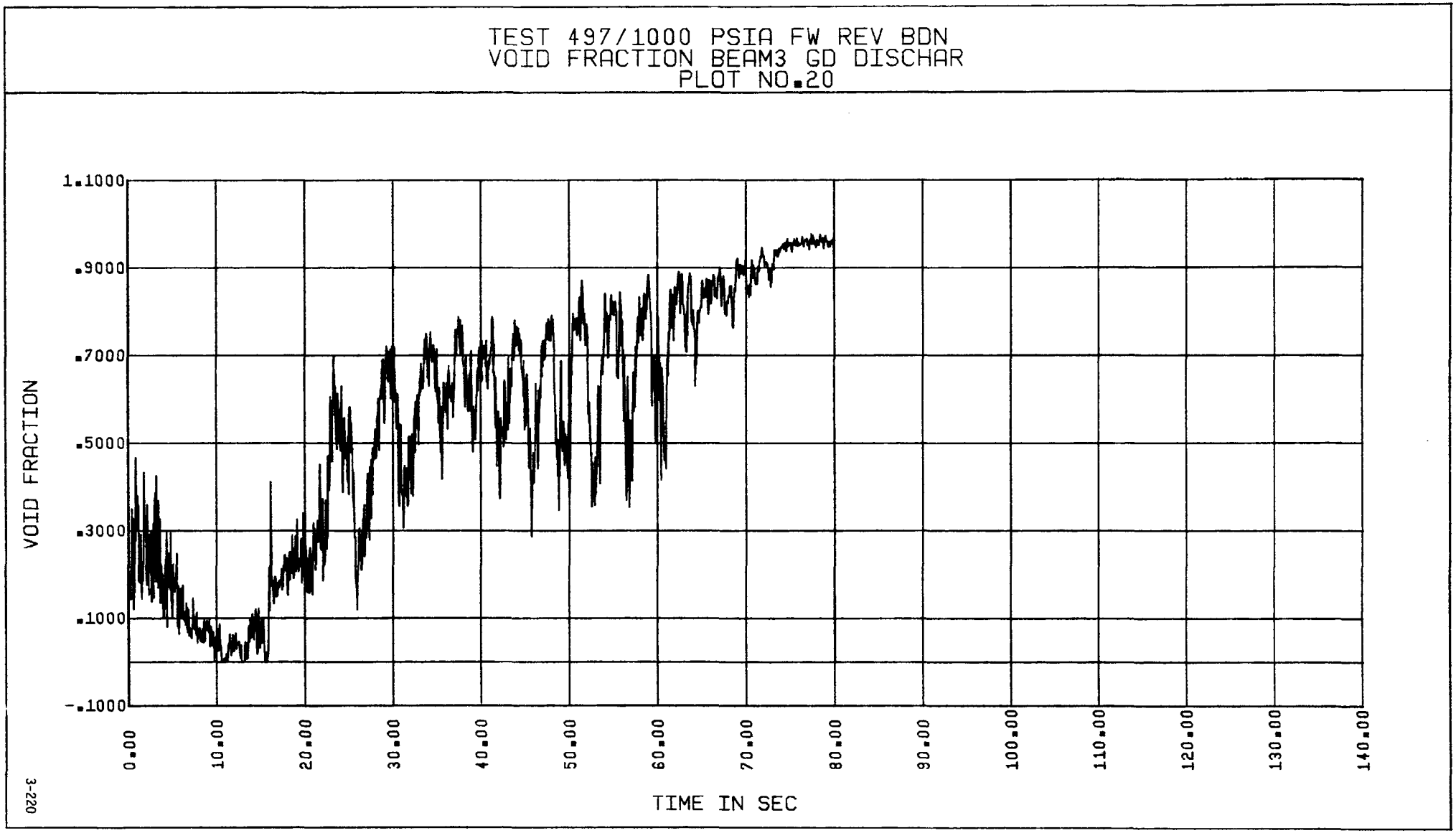
TEST 497/1000 PSIA FW REV BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17



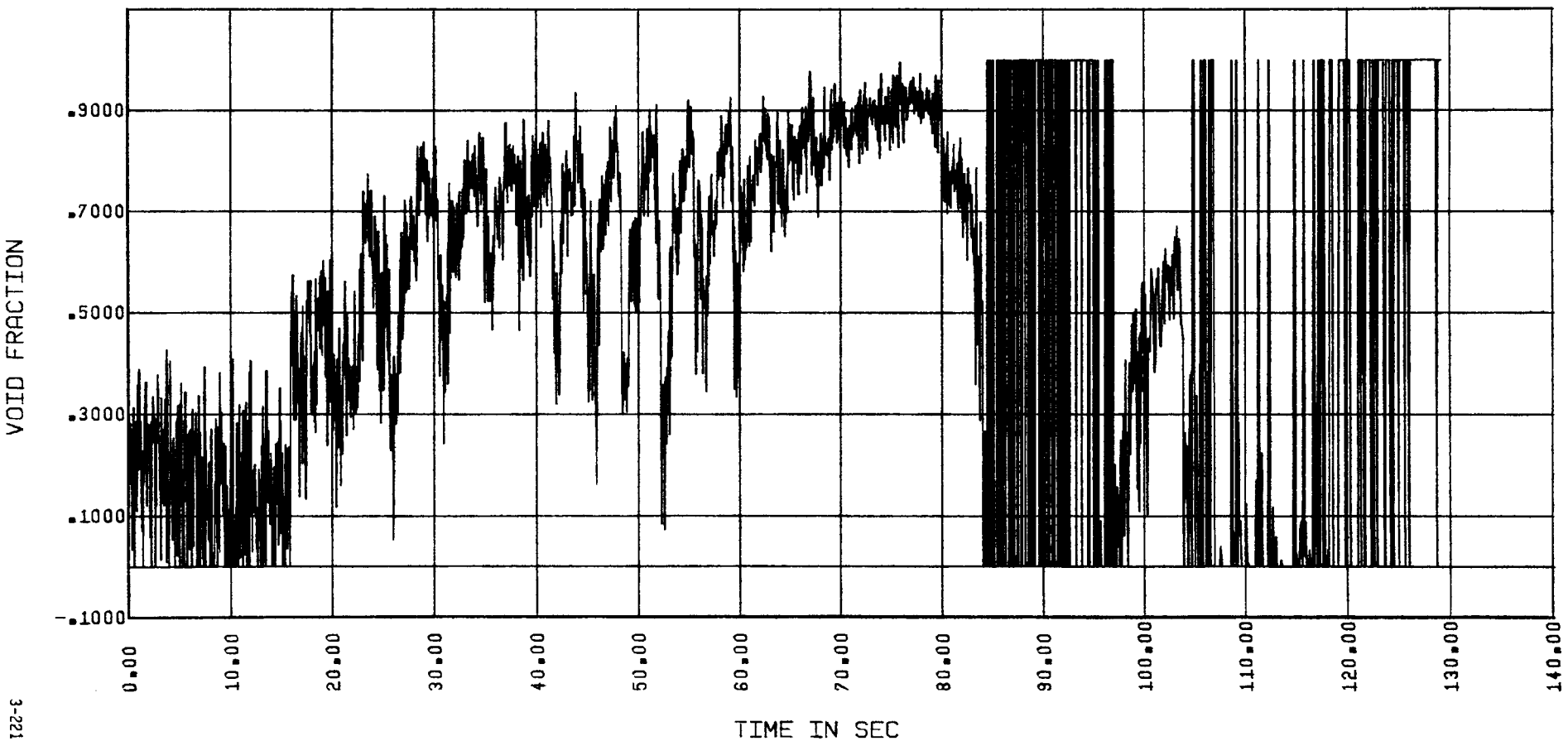
TEST 497/1000 PSIA FW REV BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18



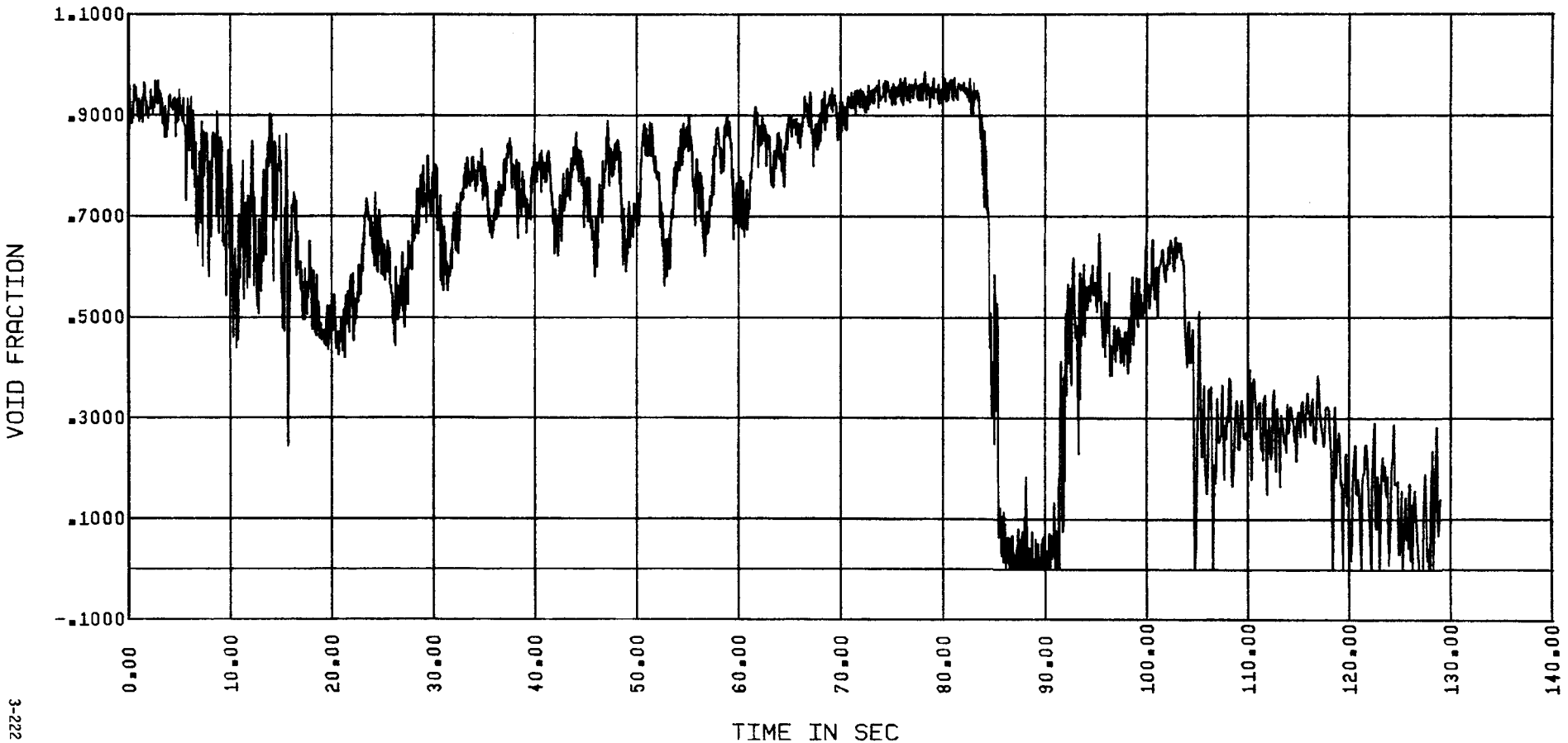

TEST 497/1000 PSIA FW REV BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
120.00
130.00
140.00
TIME IN SEC
3-219

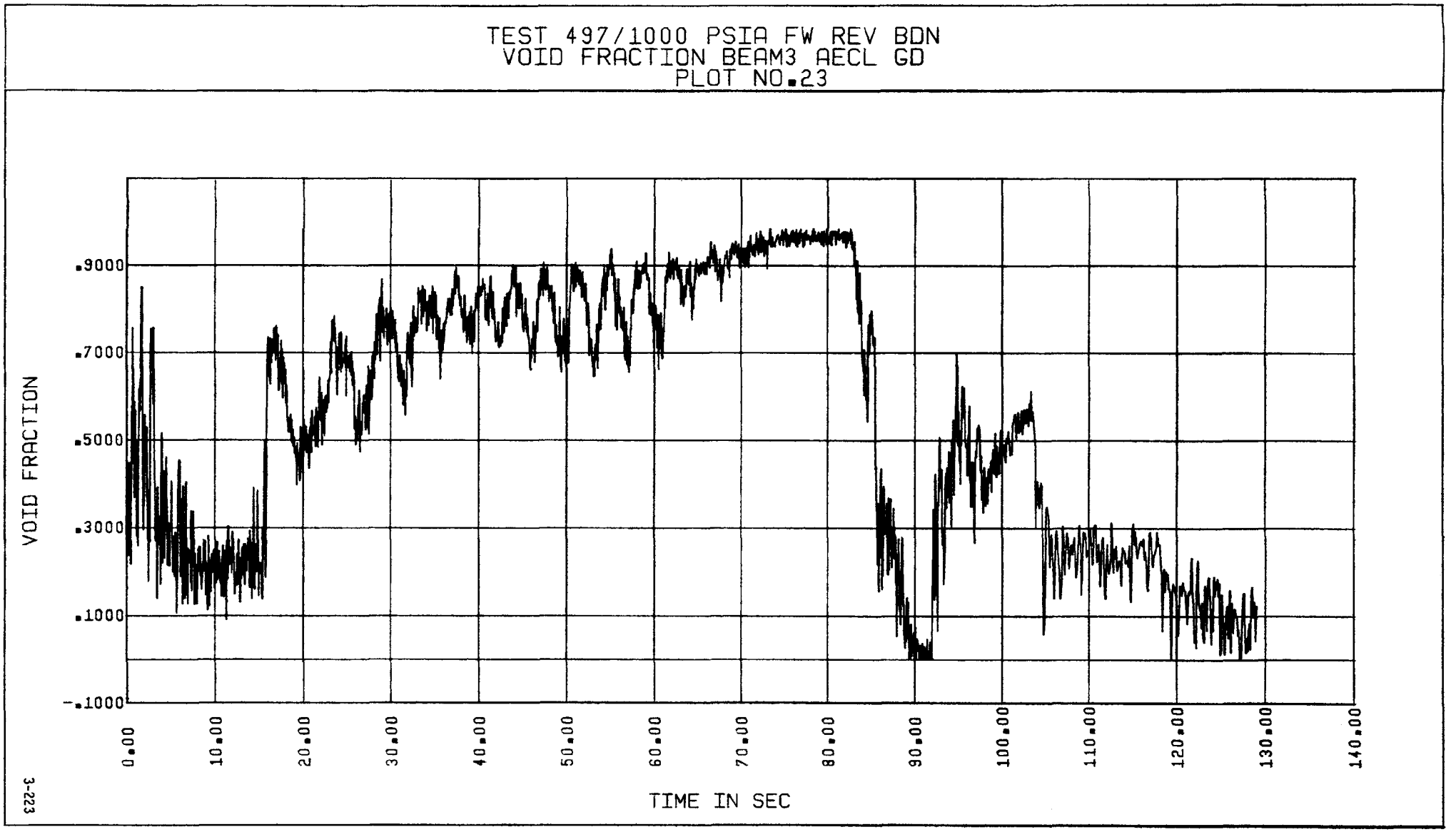

TEST 497/1000 PSIA FW REV BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20
VOID FRACTION
1.1000
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
120.00
130.00
140.00
TIME IN SEC
3-220

TEST 497/1000 PSIA FW REV BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21

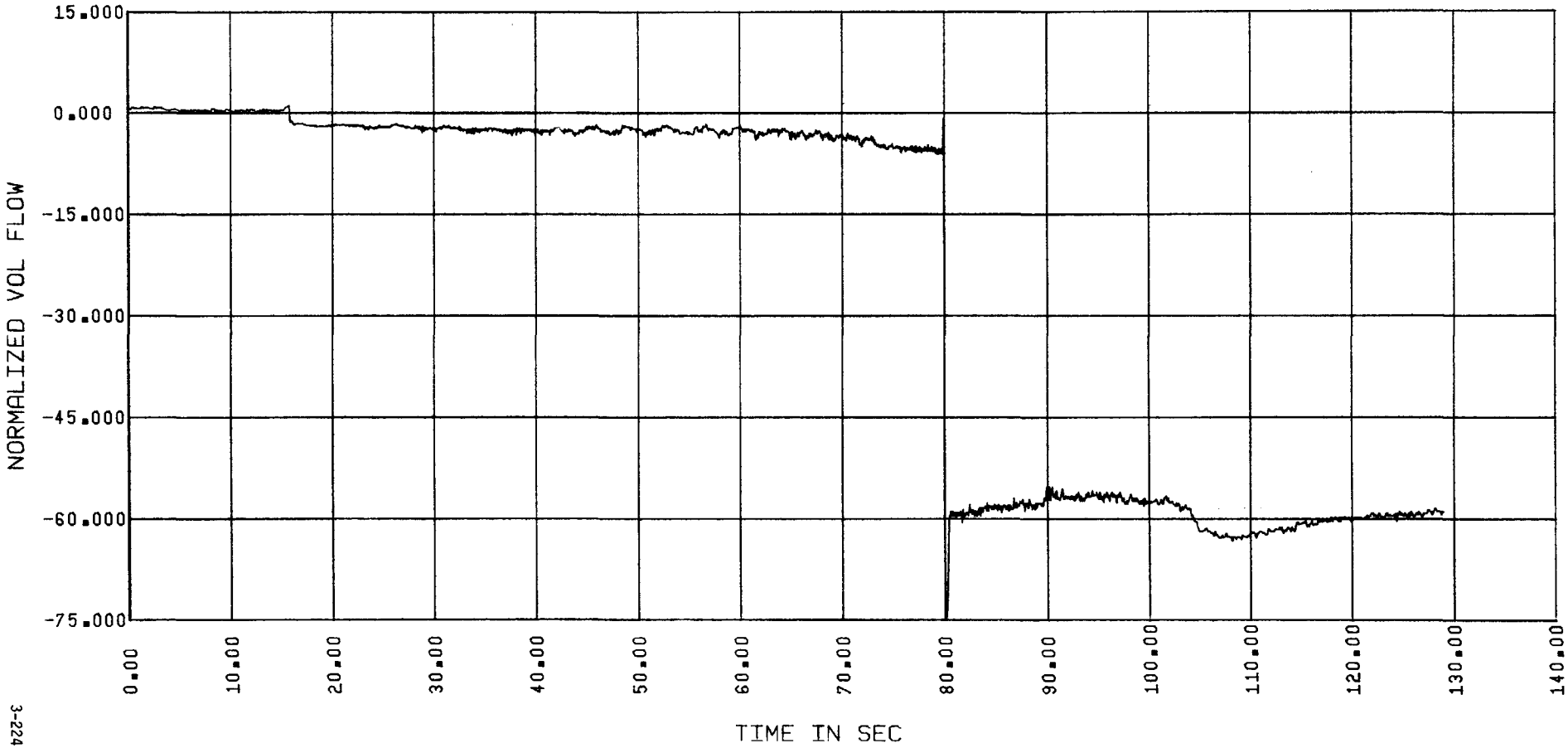


TEST 497/1000 PSIA FW REV BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22

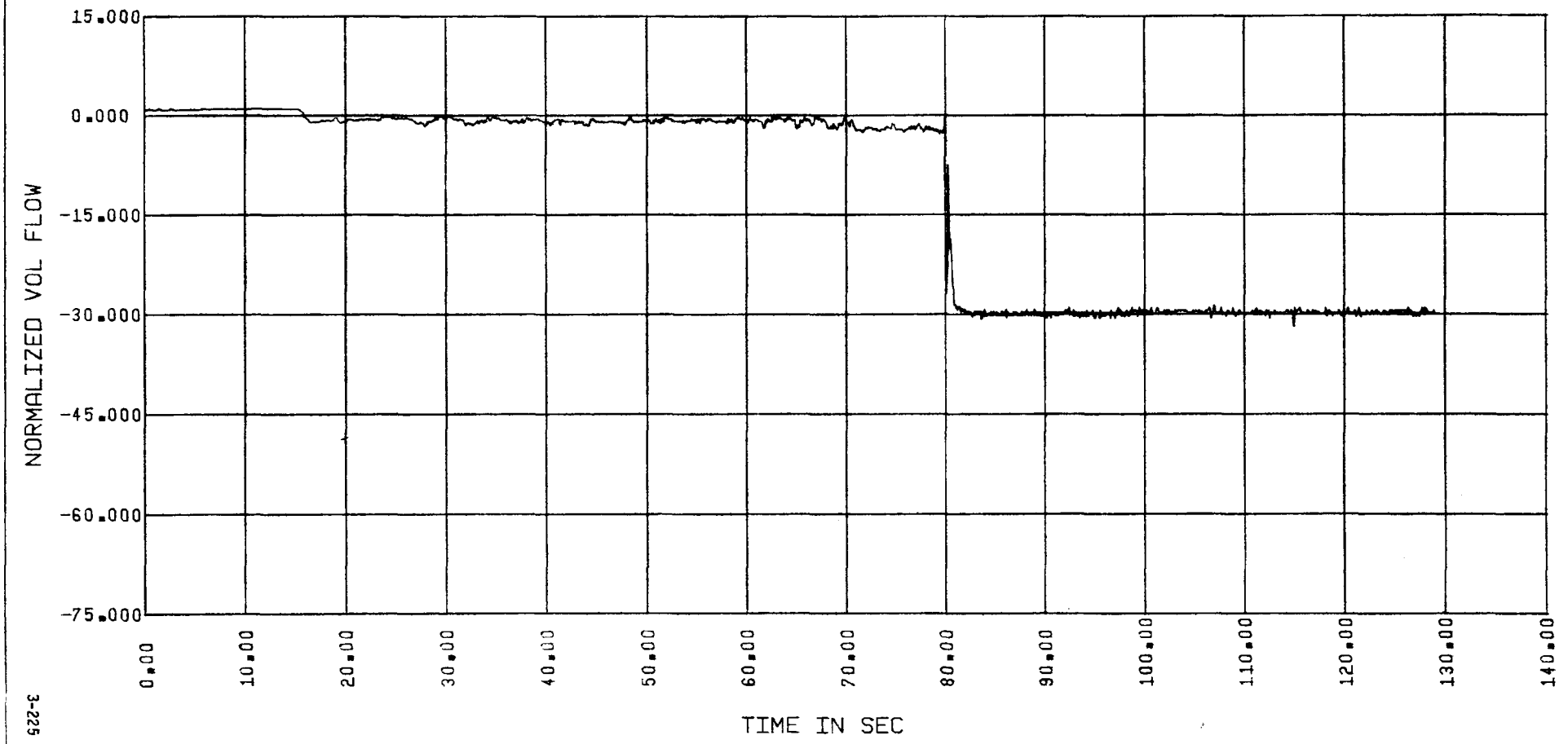



TEST 497/1000 PSIA FW REV BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
120.00
130.00
140.00
TIME IN SEC
3-223

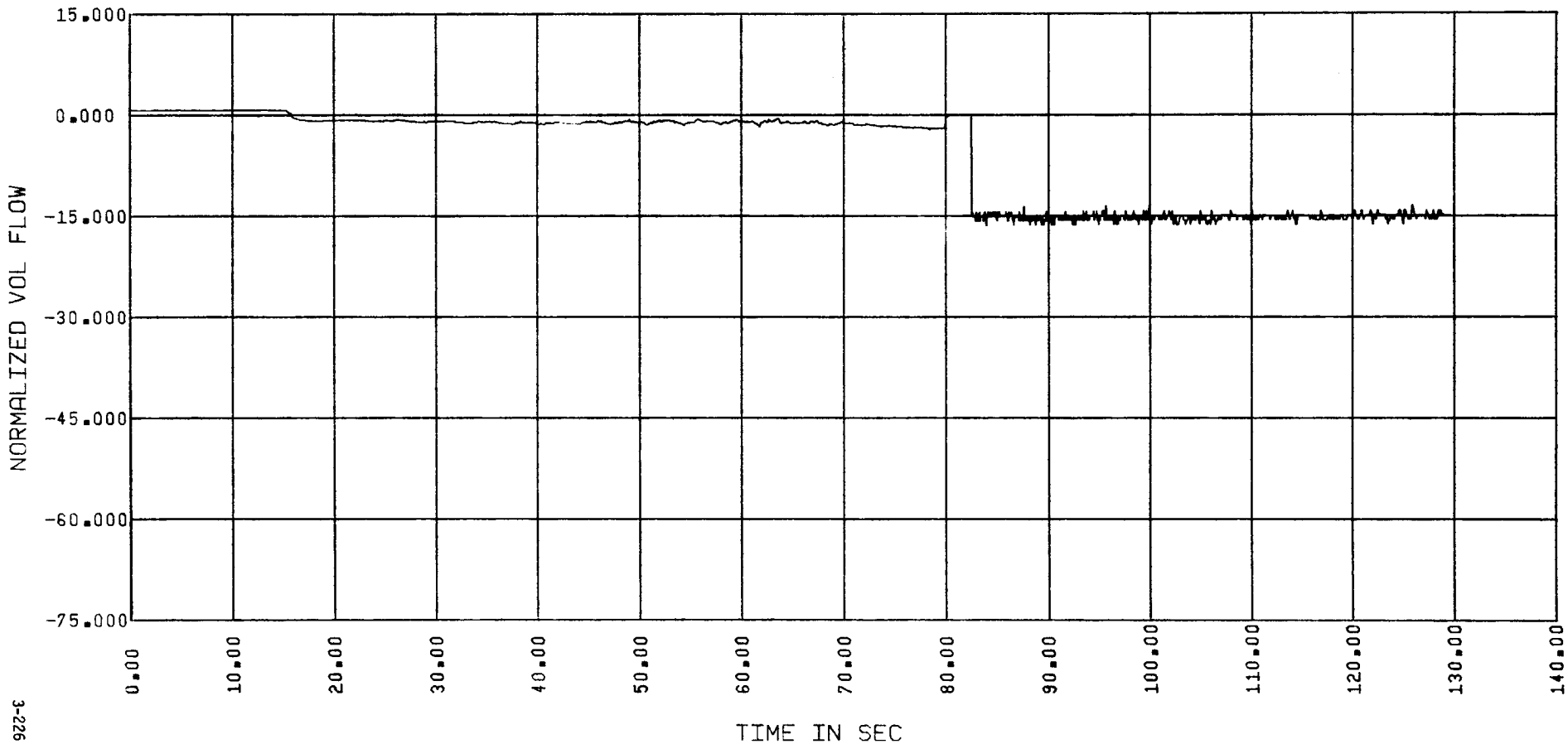
TEST 497/1000 PSIA FW REV BDN
N VOL FLOW LO-DD/GD2 S QR=3500
PLOT NO.24

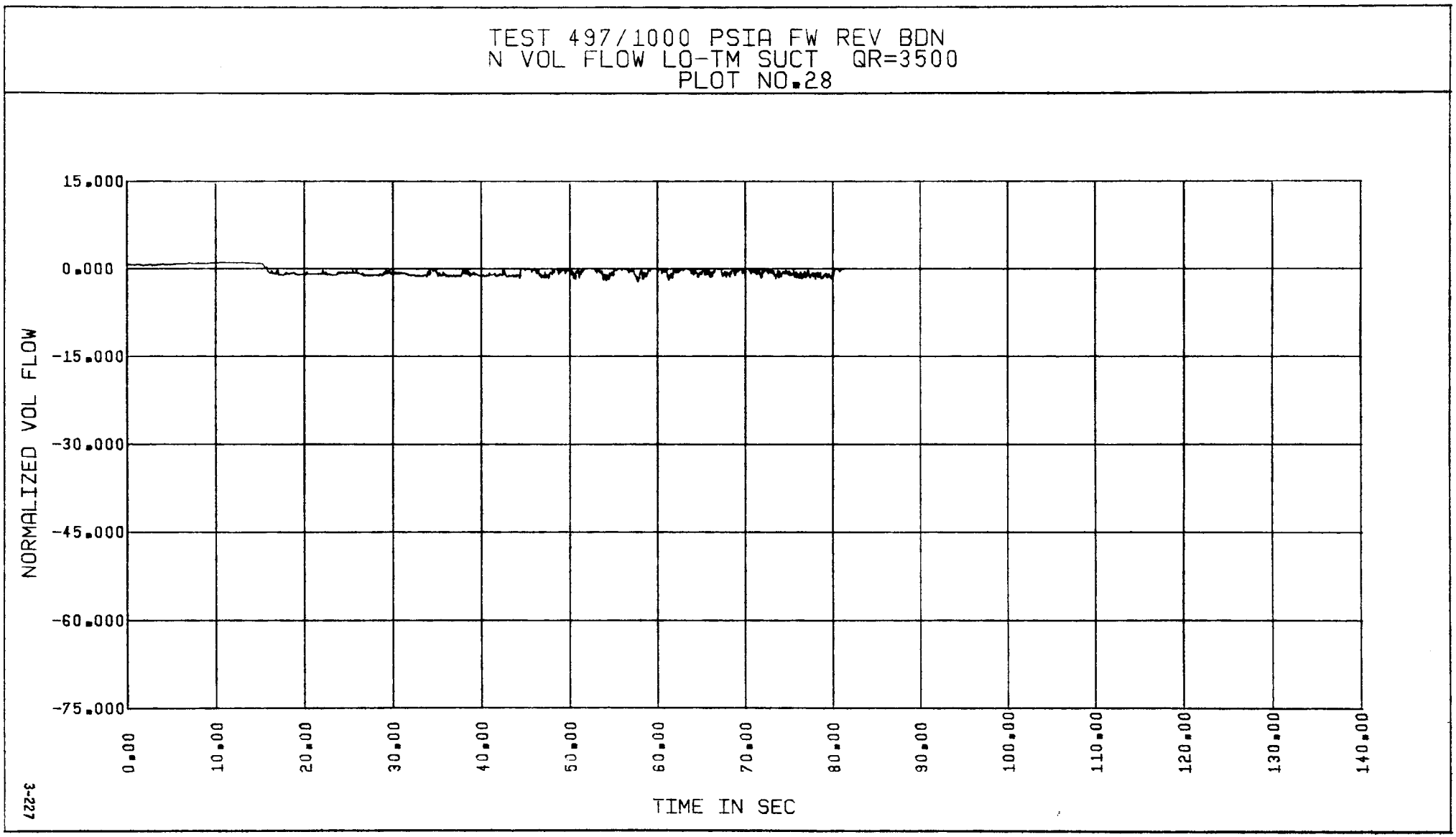


TEST 497/1000 PSIA FW REV BDN
N VOL FLOW HI-DD/GD2 S QR=3500
PLOT NO.26

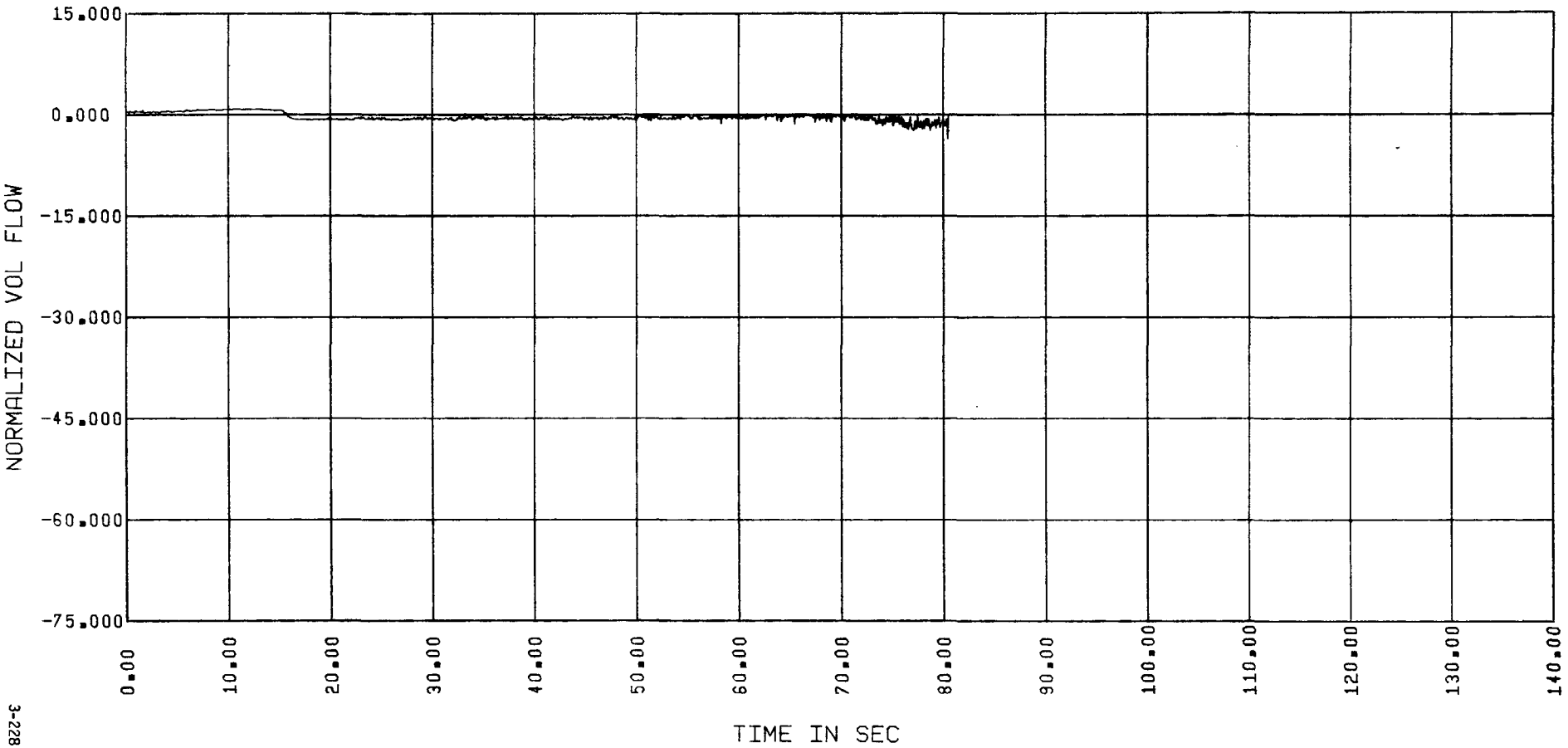


TEST 497/1000 PSIA FW REV BDN
N VOL FLOW HI-DD/GD2 D QR=3500
PLOT NO.27




TEST 497/1000 PSIA FW REV BDN
N VOL FLOW LO-TM SUCT QR=3500
PLOT NO.28
15.000
0.000
-15.000
-30.000
-45.000
-60.000
-75.000
NORMALIZED VOL FLOW
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
120.00
130.00
140.00
TIME IN SEC

TEST 497/1000 PSIA FW REV BDN
N VOL FLOW HI-TM DISCH QR=3500
PLOT NO.29



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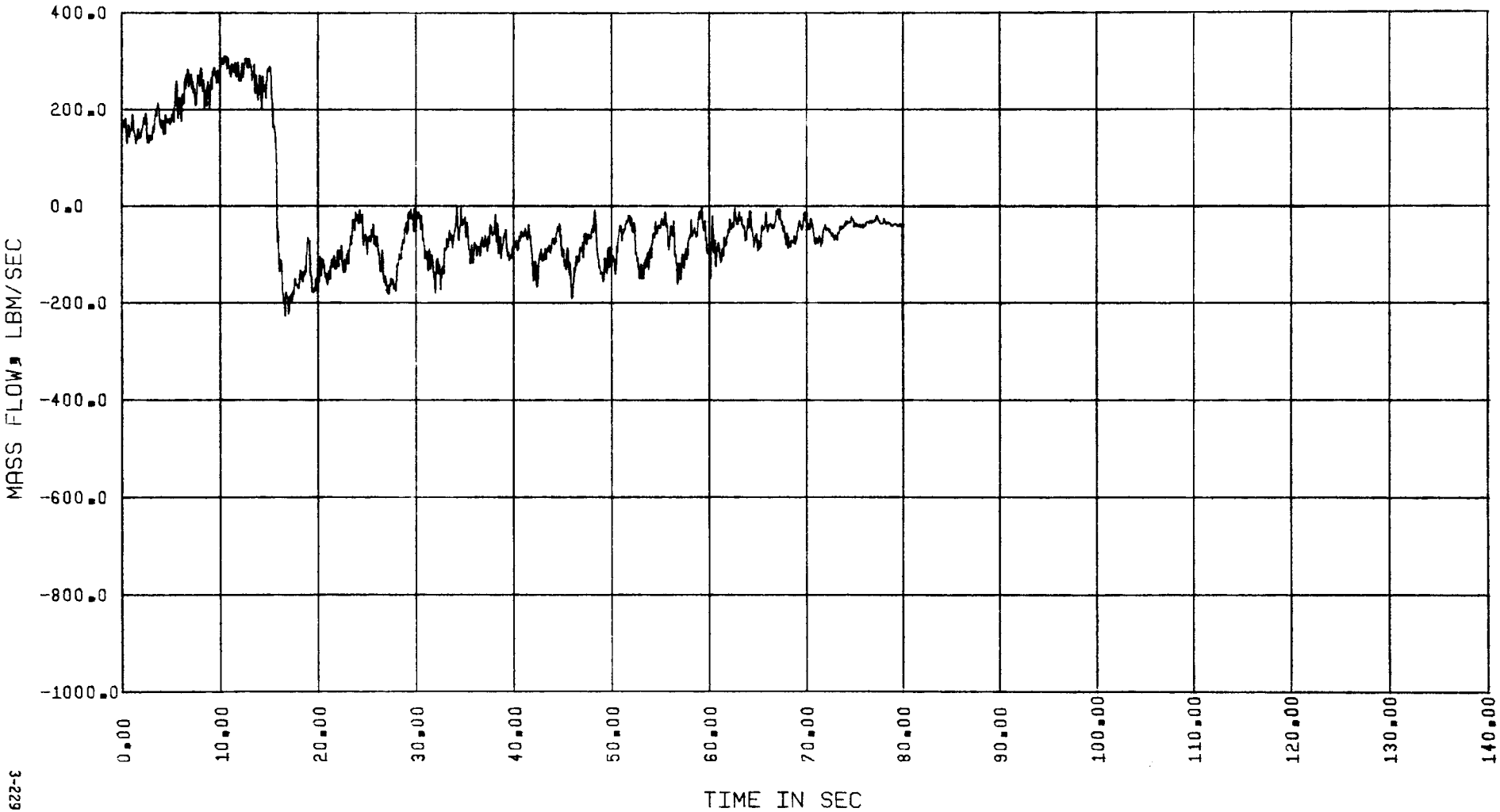
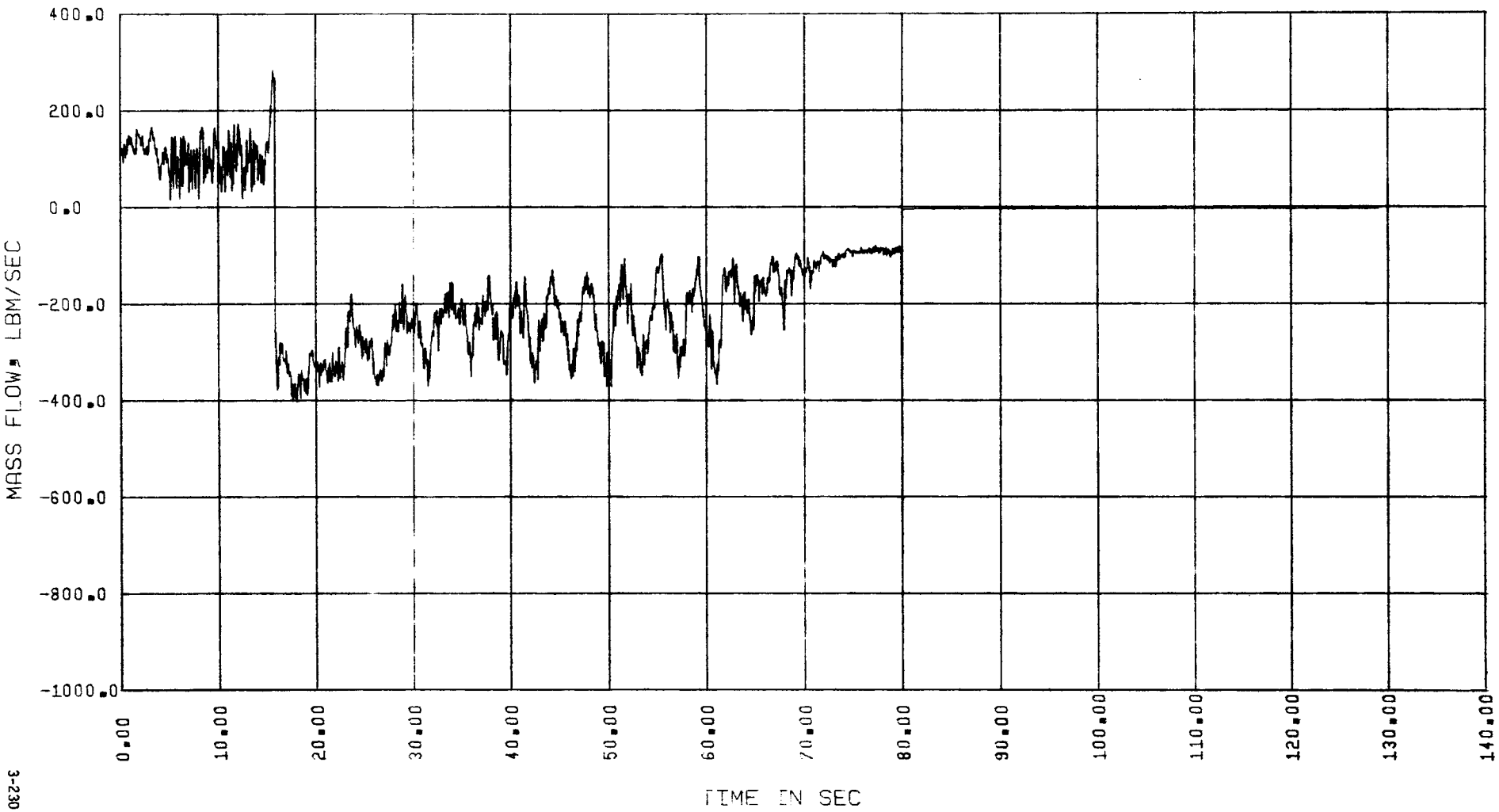
TEST 497/1000 PSIA FW REV BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.30

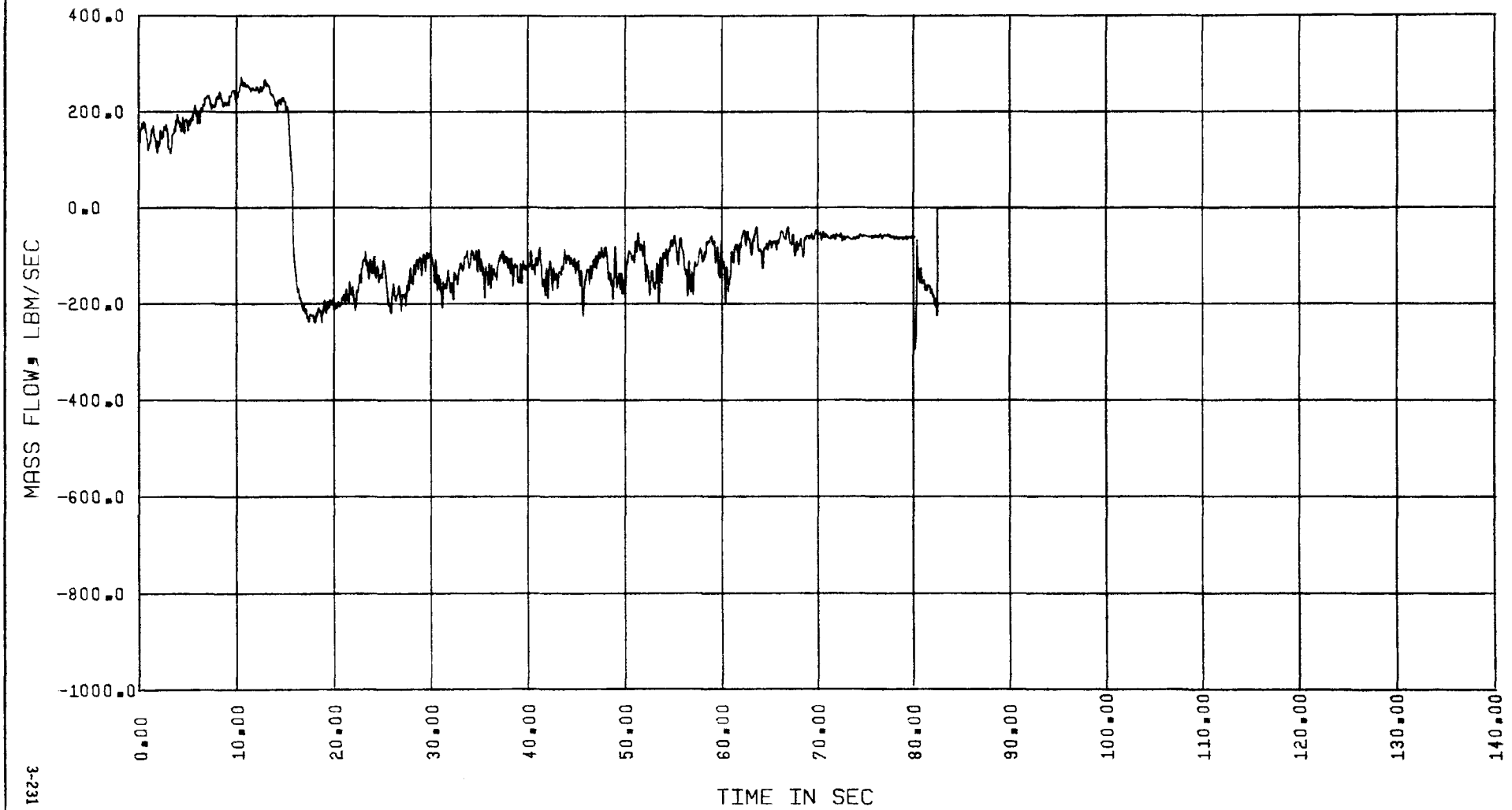


TEST 497/1000 PSIA FW REV BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.31

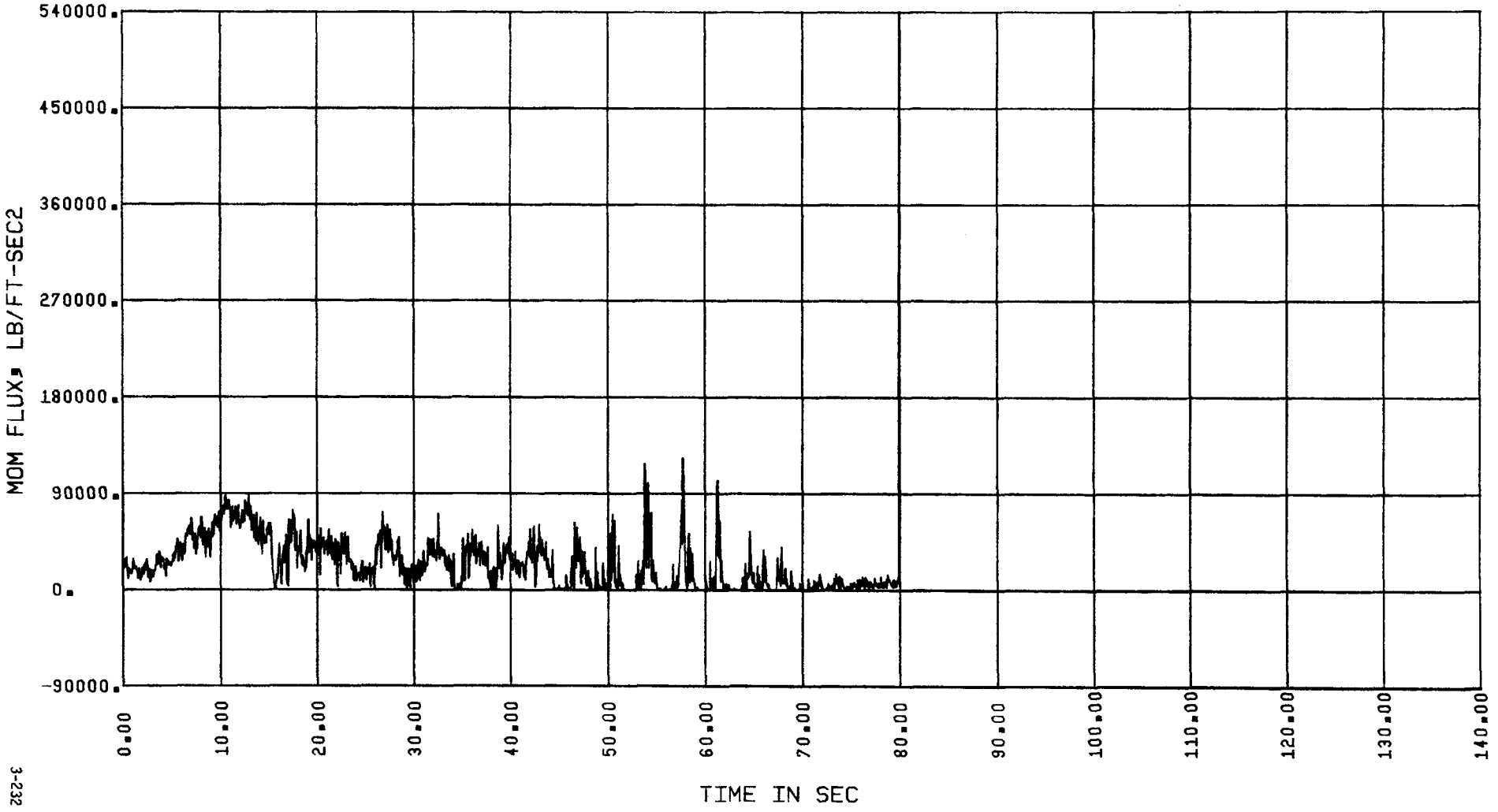


3-230

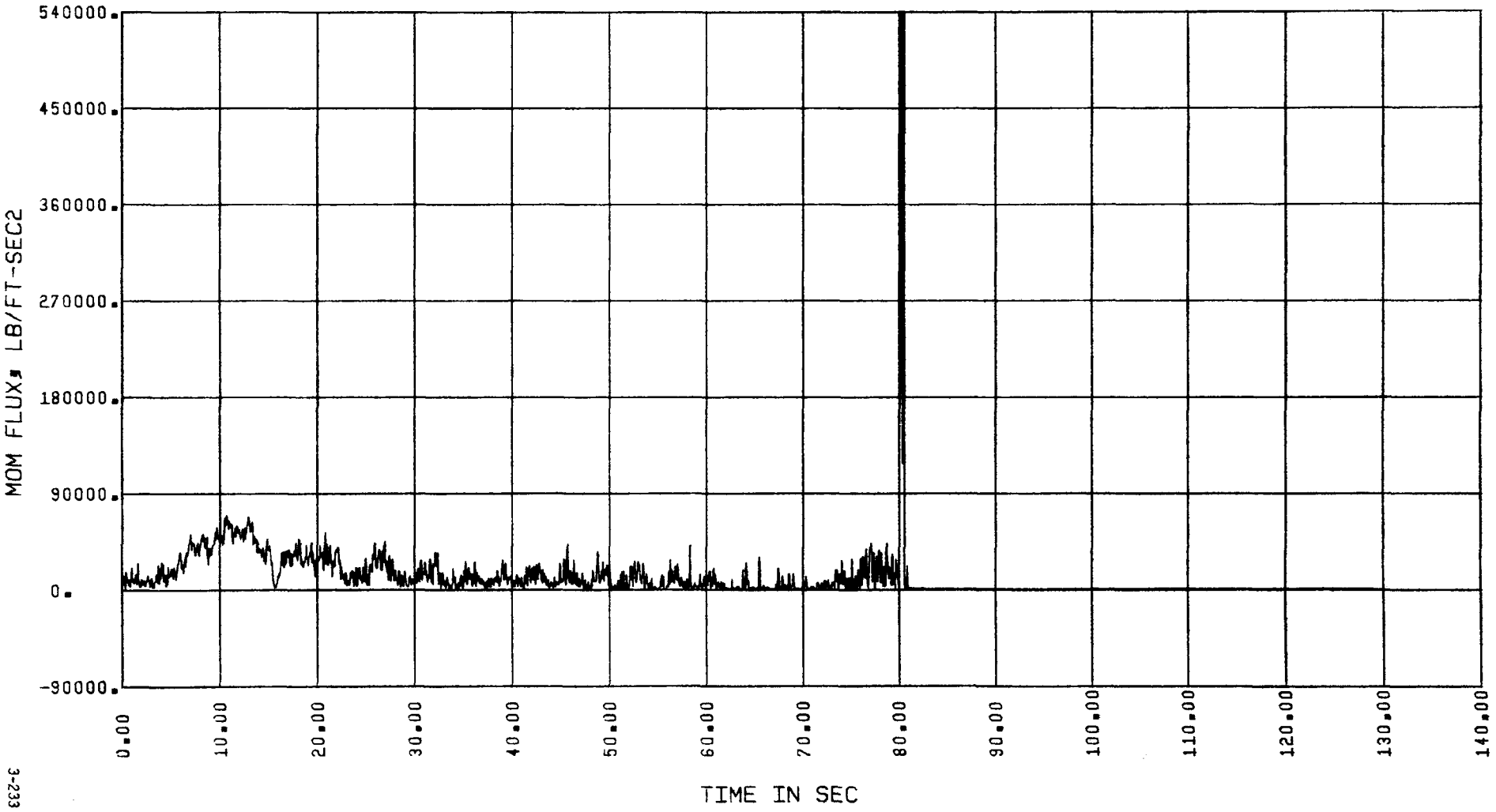
TEST 497/1000 PSIA FW REV BDN
MASS FLWO RATE HI-DD/GD2 DISCH
PLOT NO.32



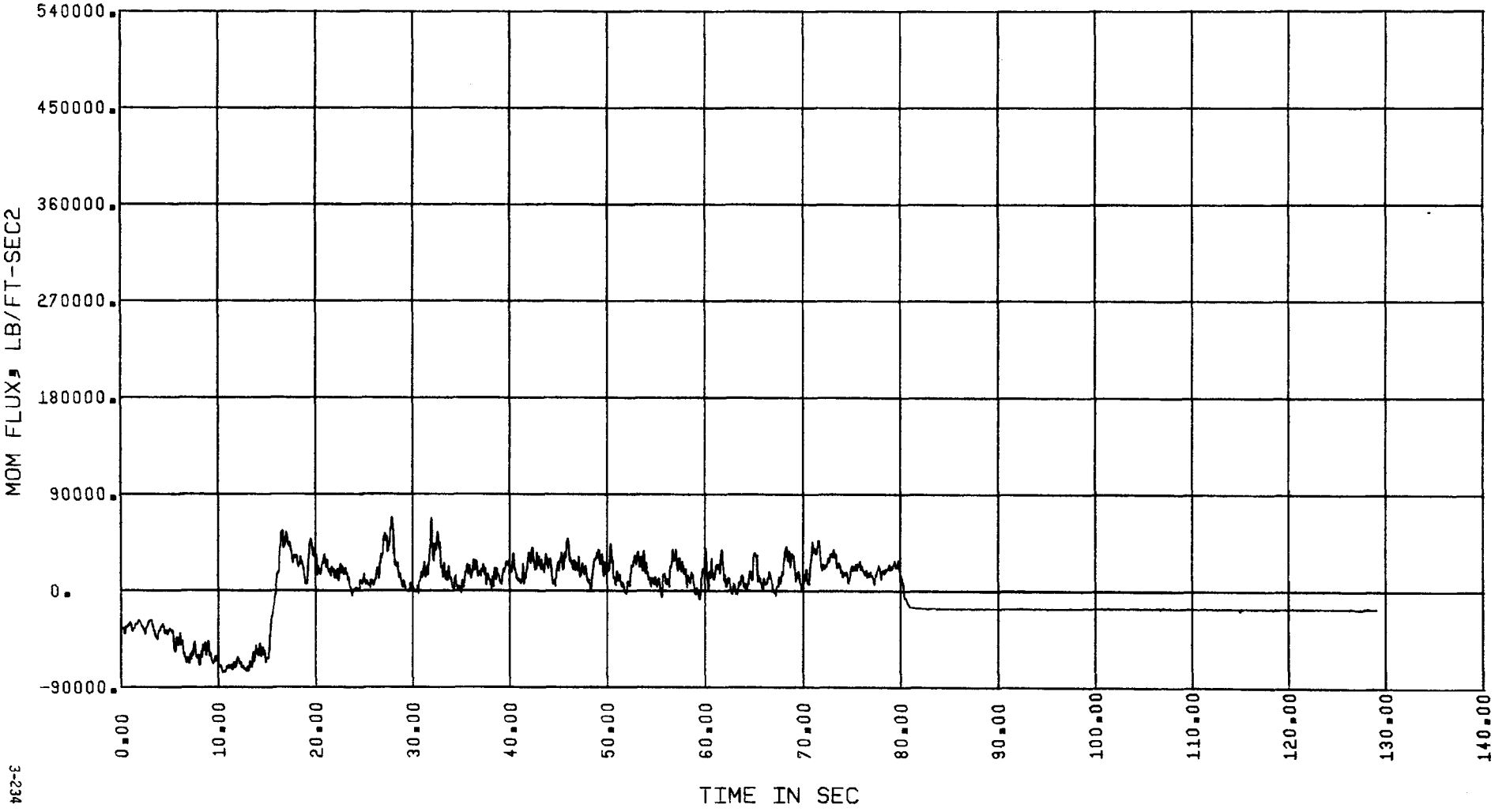
TEST 497/1000 PSIA FW REV BDN
MOMENTUM FLUX GD2/LO-TM SUCT
PLOT NO.34



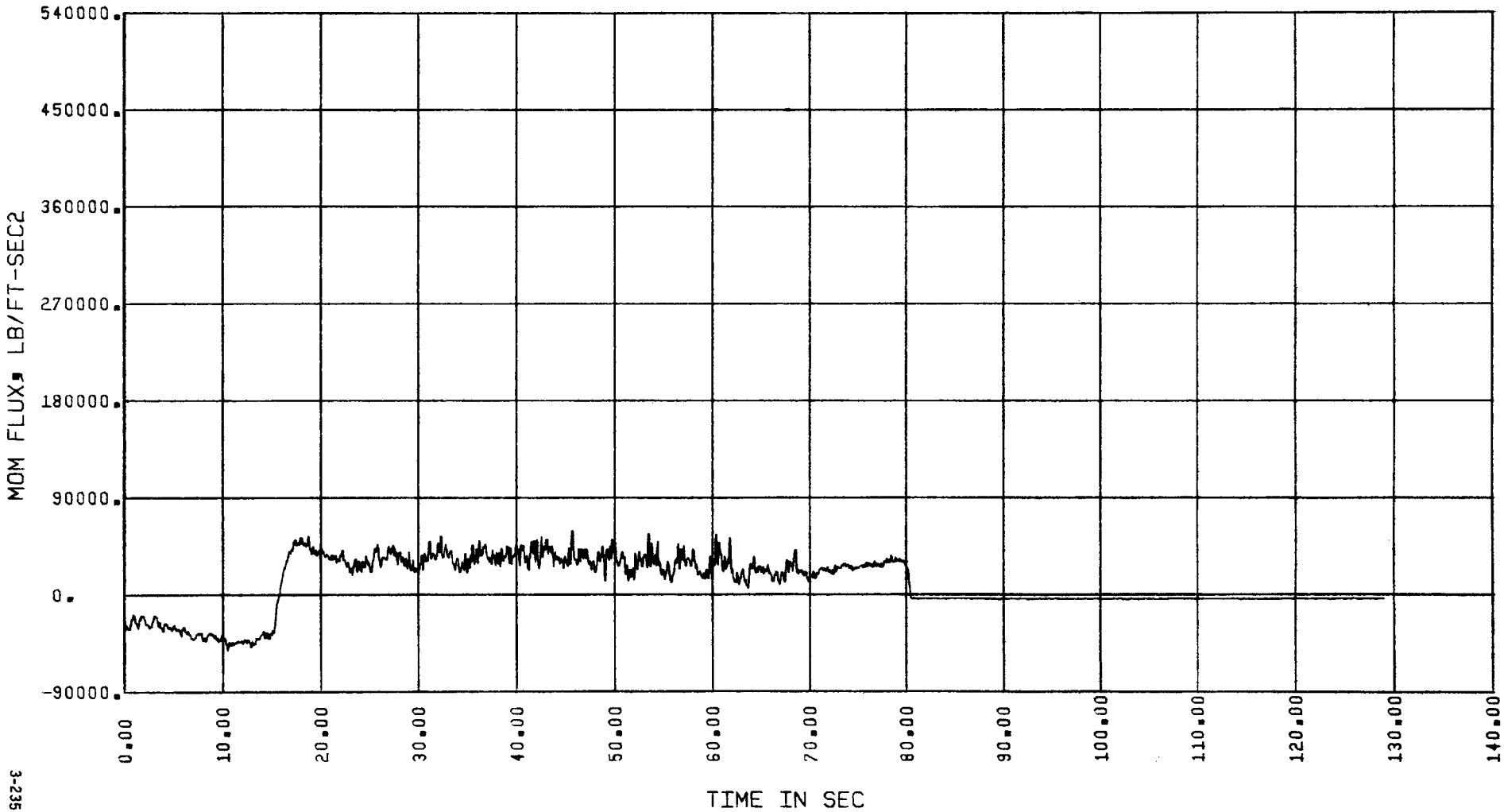
TEST 497/1000 PSIA FW REV BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.35



TEST 497/1000 PSIA FW REV BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.36

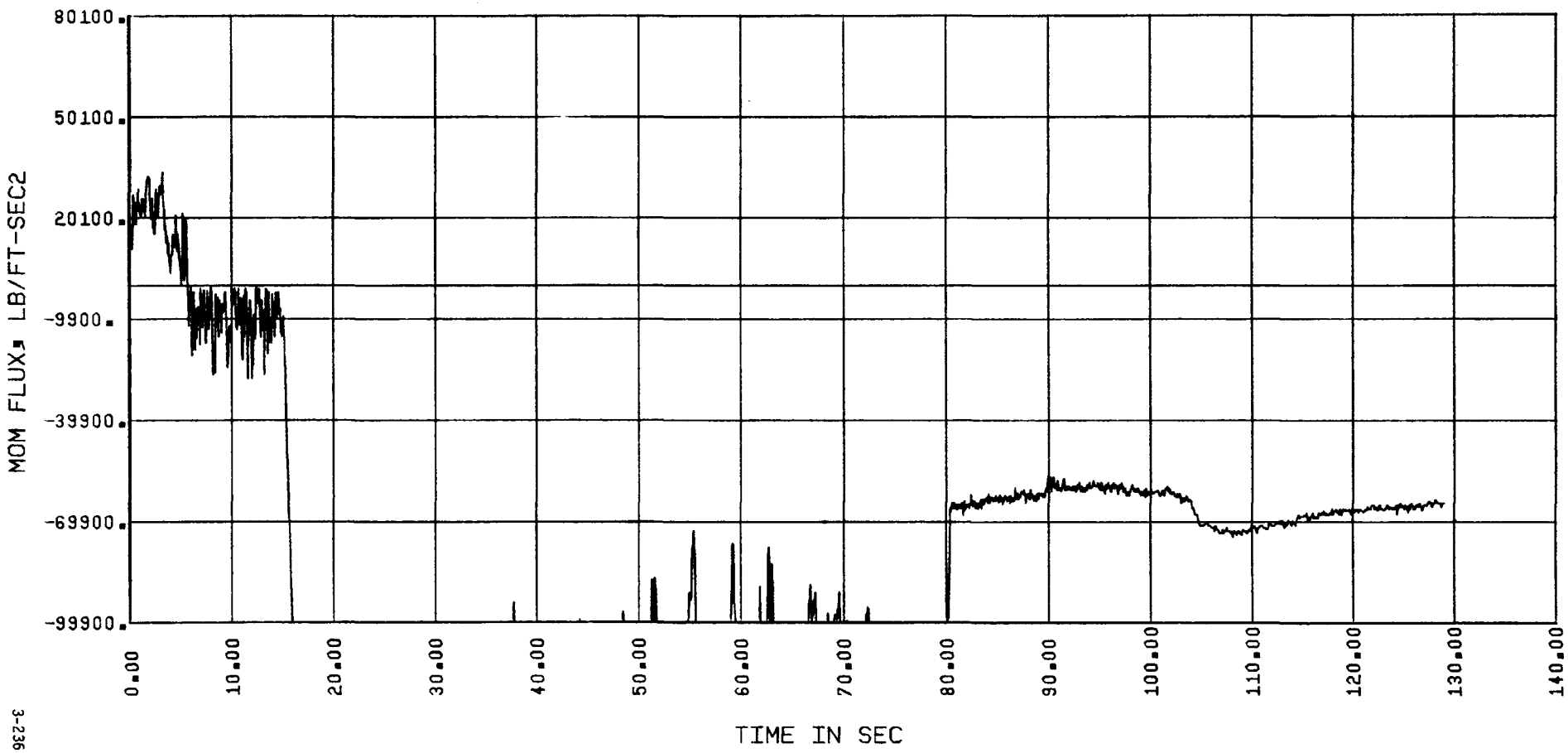


TEST 497/1000 PSIA FW REV BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.37

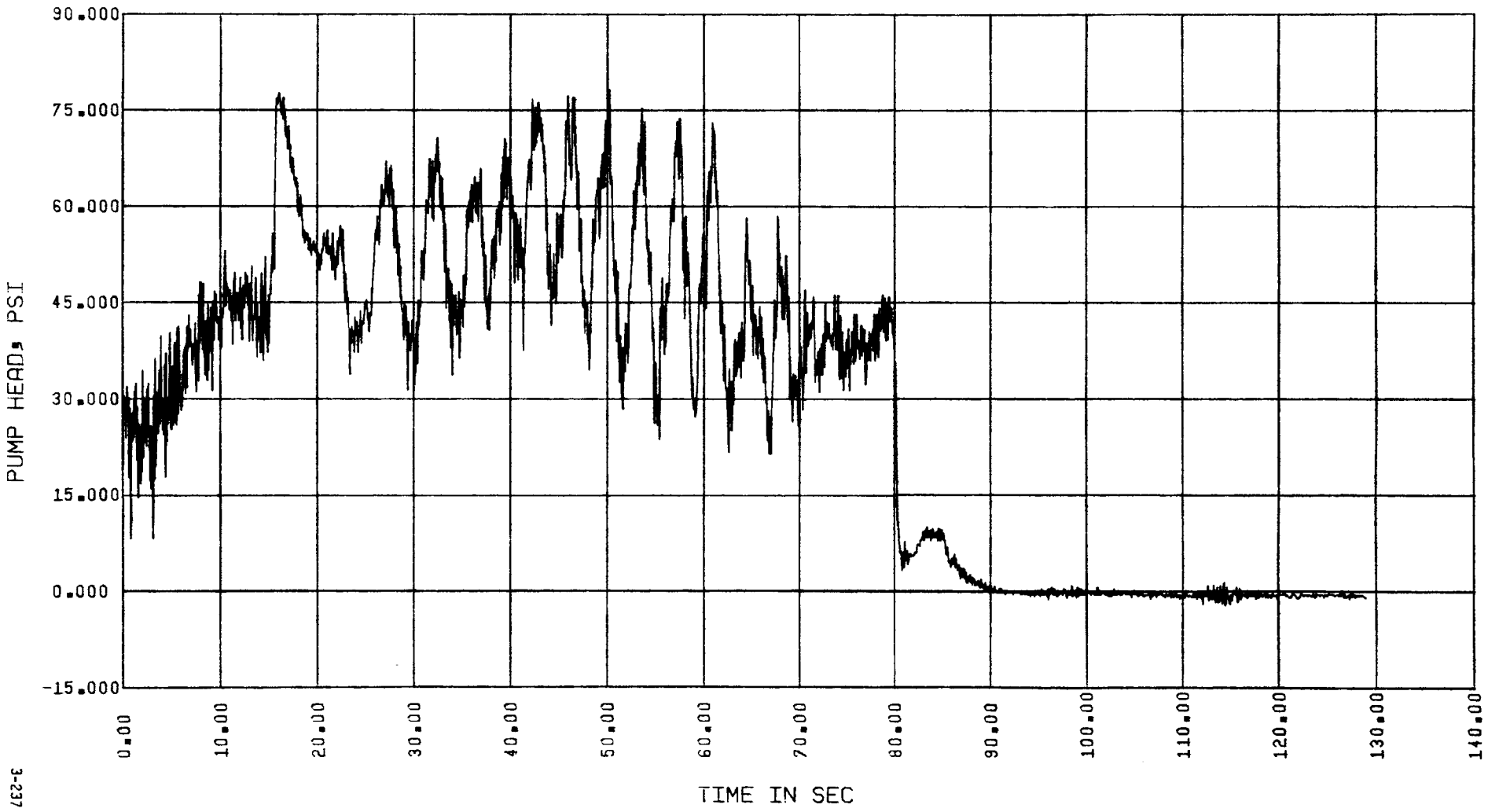


3-235

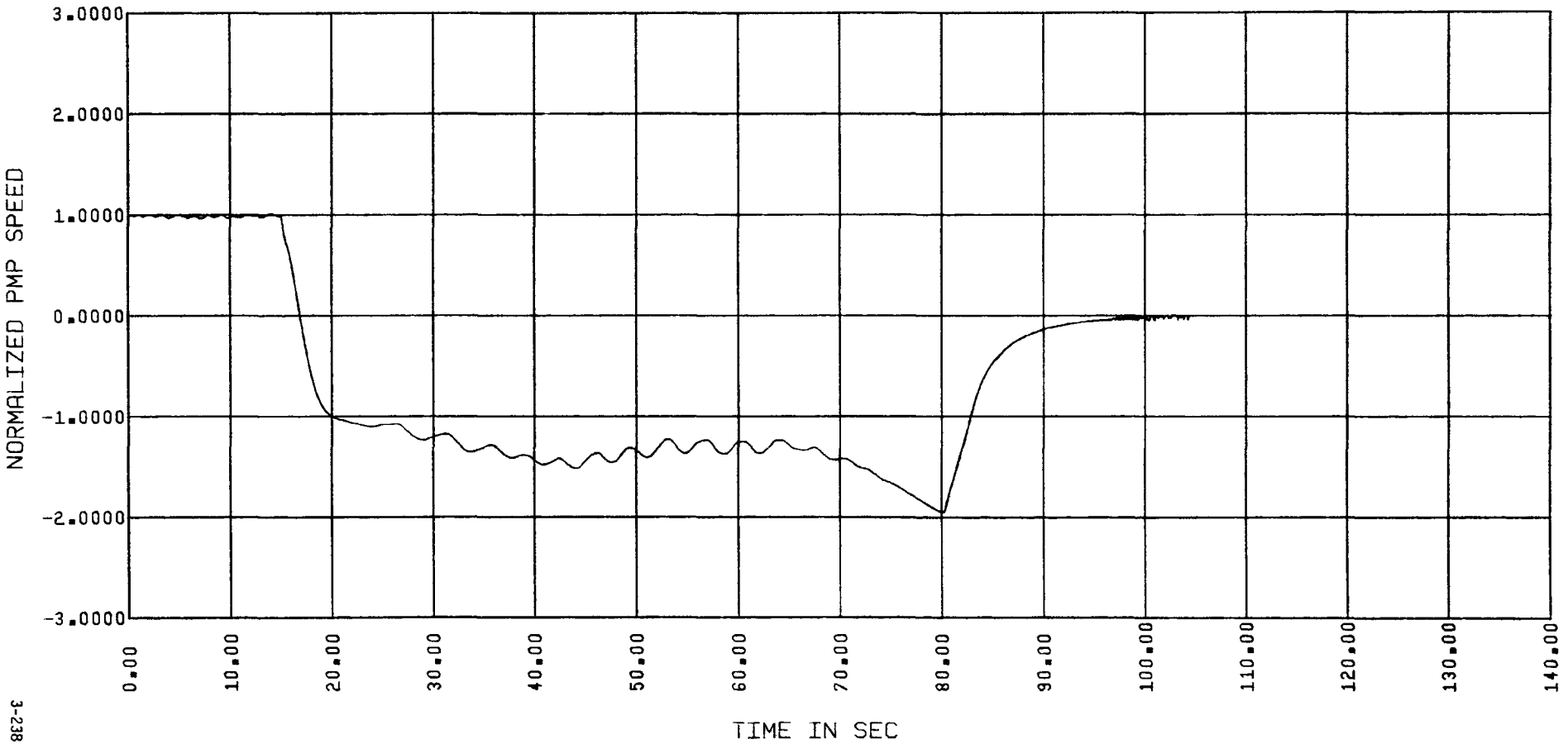
TEST 497/1000 PSIA FW REV BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



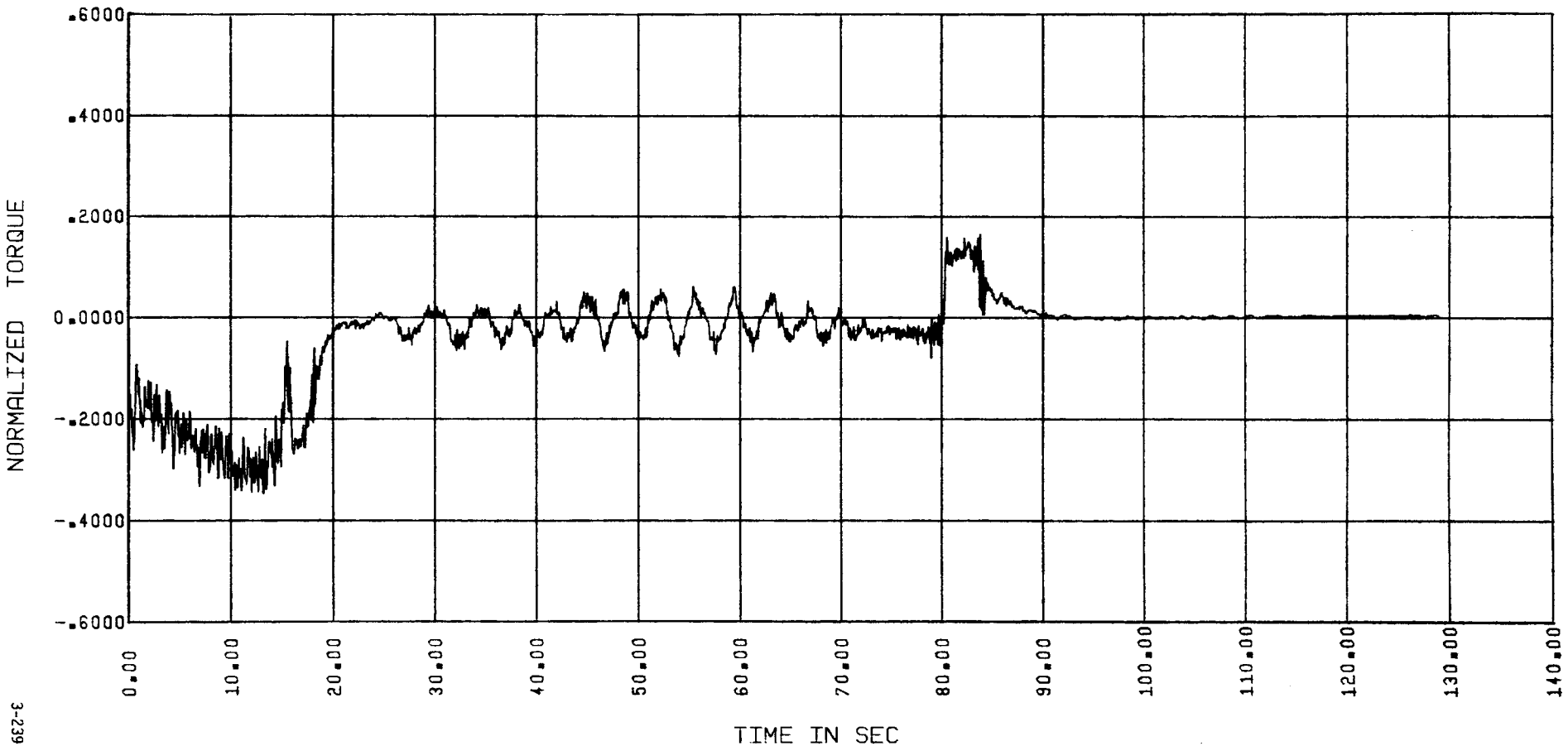
TEST 497/1000 PSIA FW REV BDN
PUMP HEAD IN PSI
PLOT NO.40



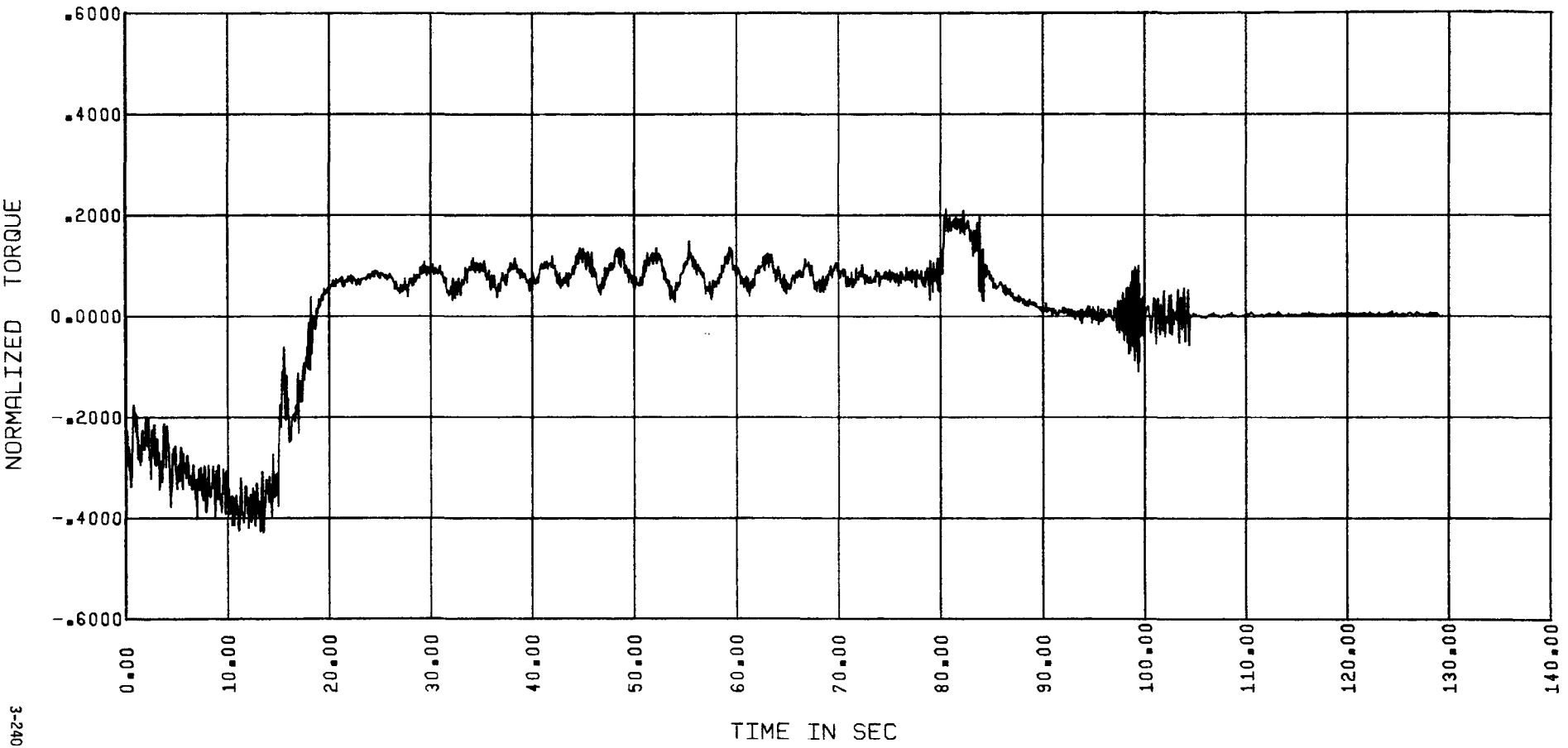
TEST 497/1000 PSIA FW REV BDN
N PUMP SPEED NR=4500
PLOT NO.43



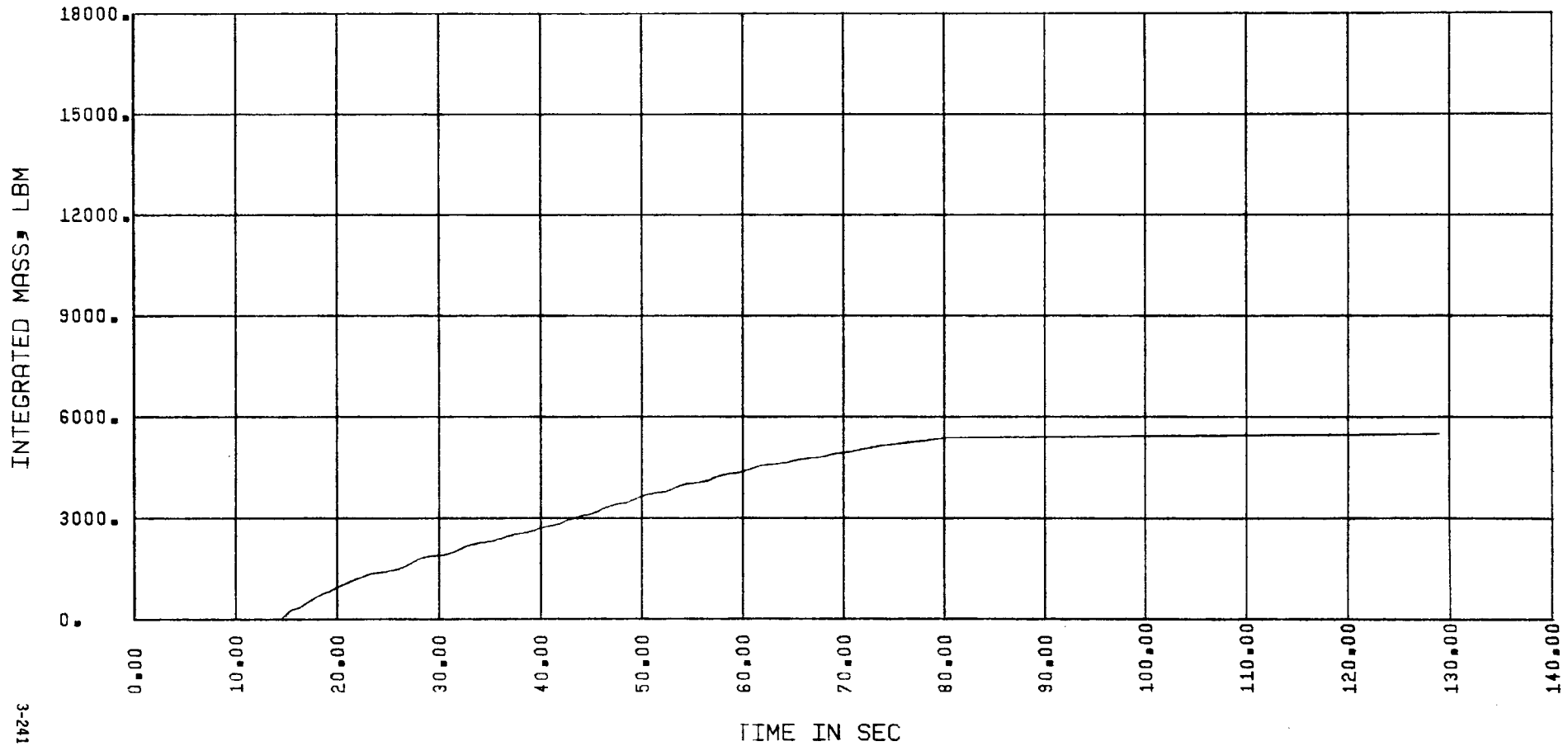
TEST 497/1000 PSIA FW REV BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.44



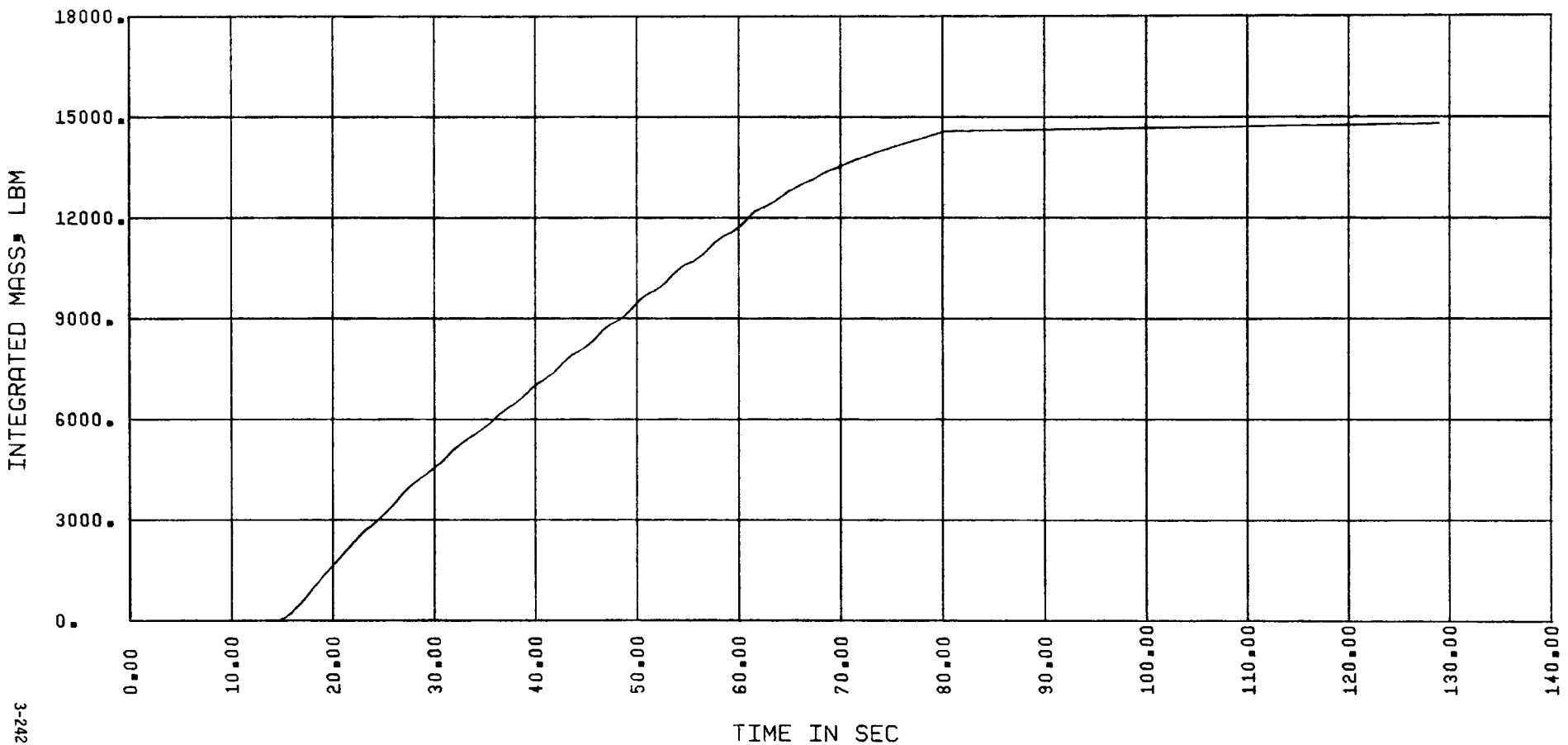
TEST 497/1000 PSIA FW REV BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.45



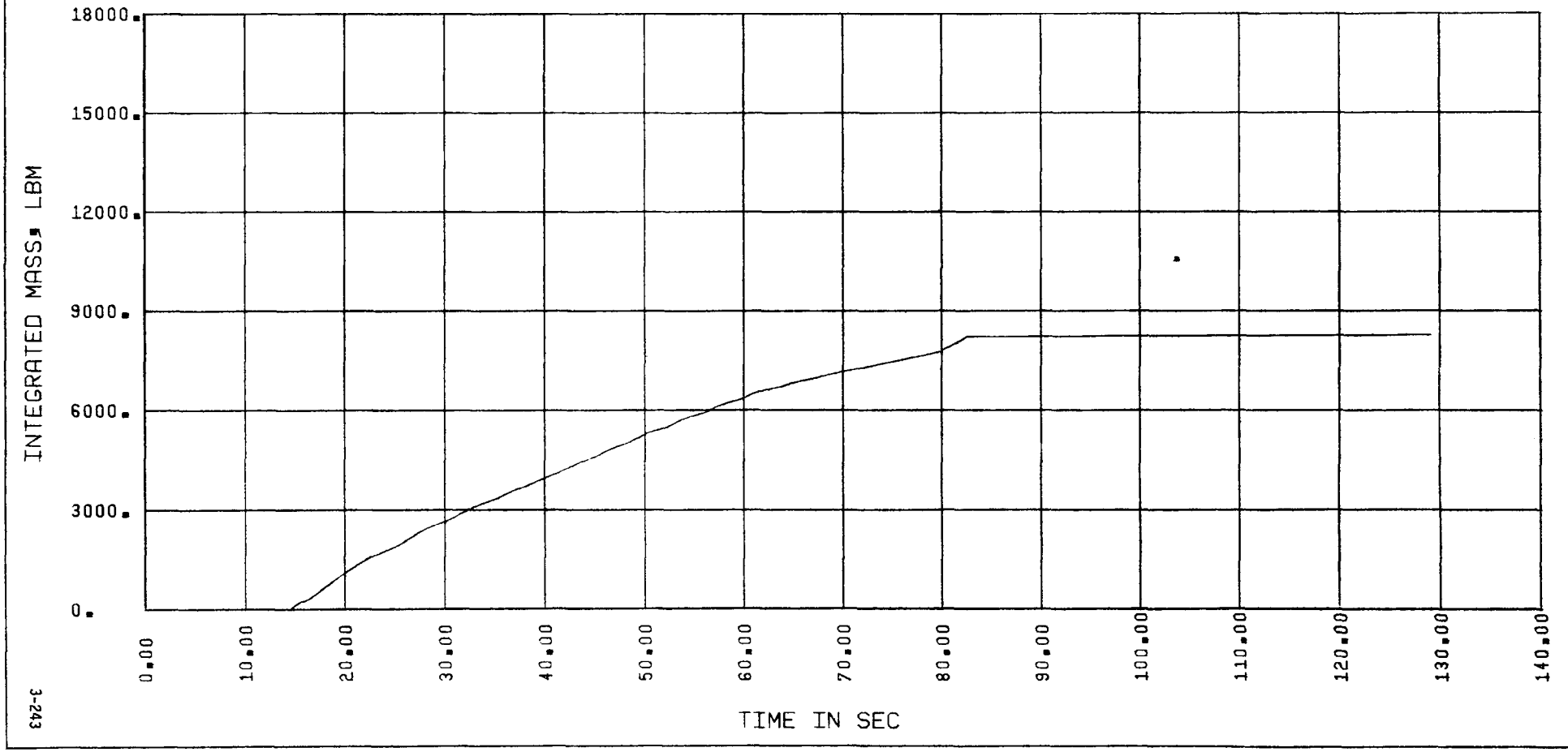
TEST 497/1000 PSIA FW REV BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.46



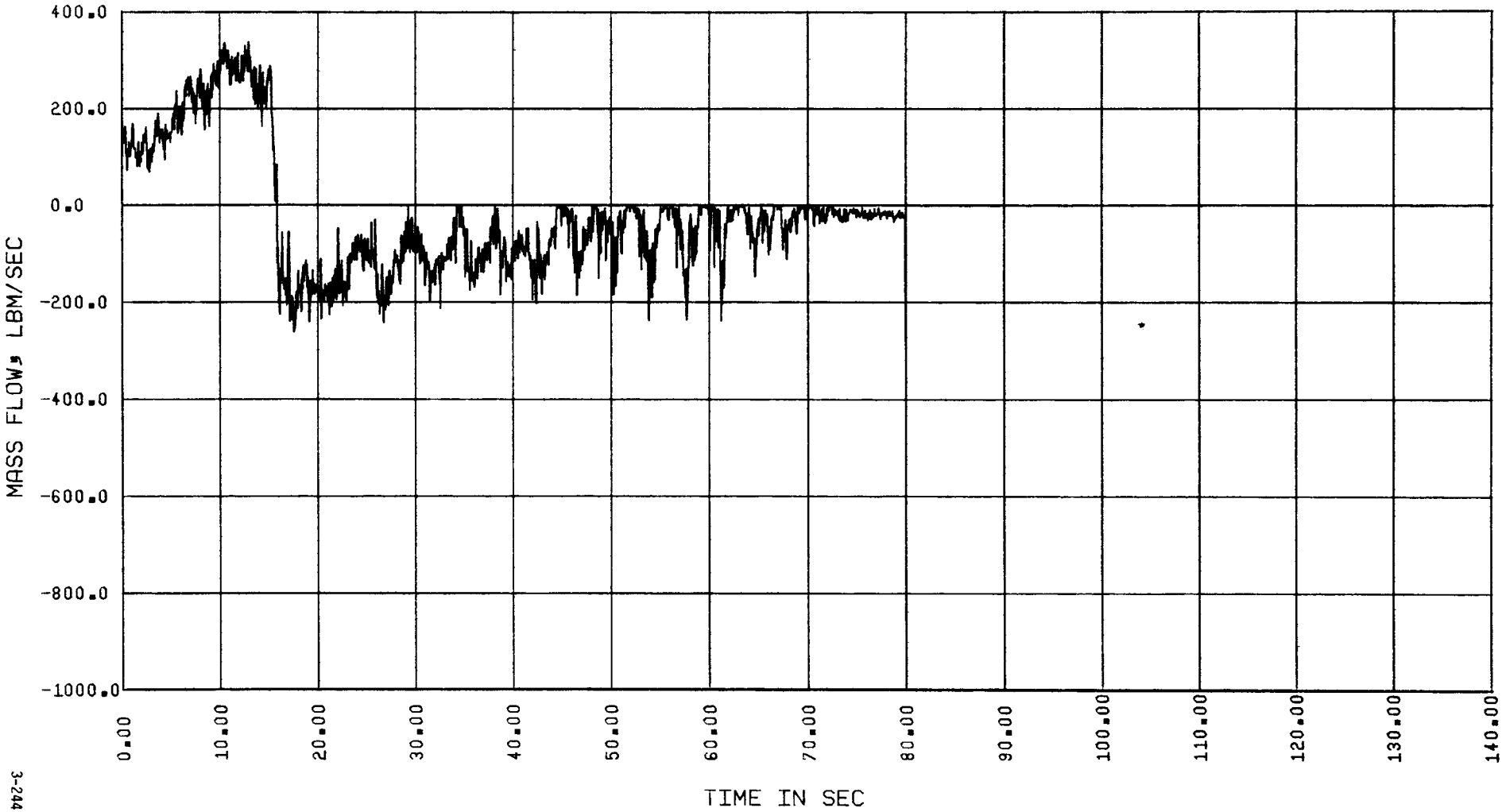
TEST 497/1000 PSIA FW REV BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.47



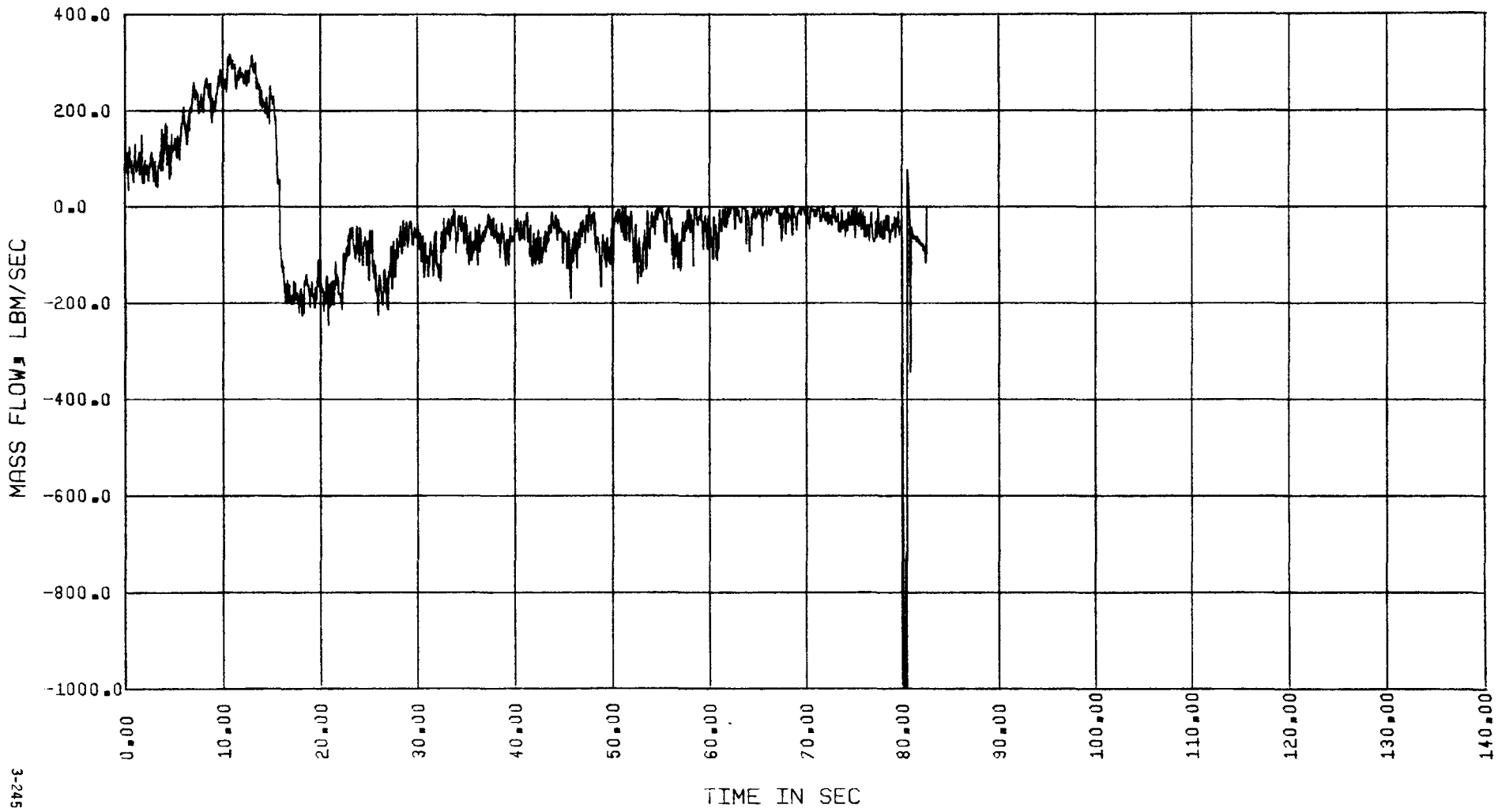
TEST 497/1000 PSIA FW REV BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.48



TEST 497/1000 PSIA FW REV BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.51



TEST 497/1000 PSIA FW REV BDN
MASS FLOW RATE HI-TM/GD2 DSCH
PLOT NO.52



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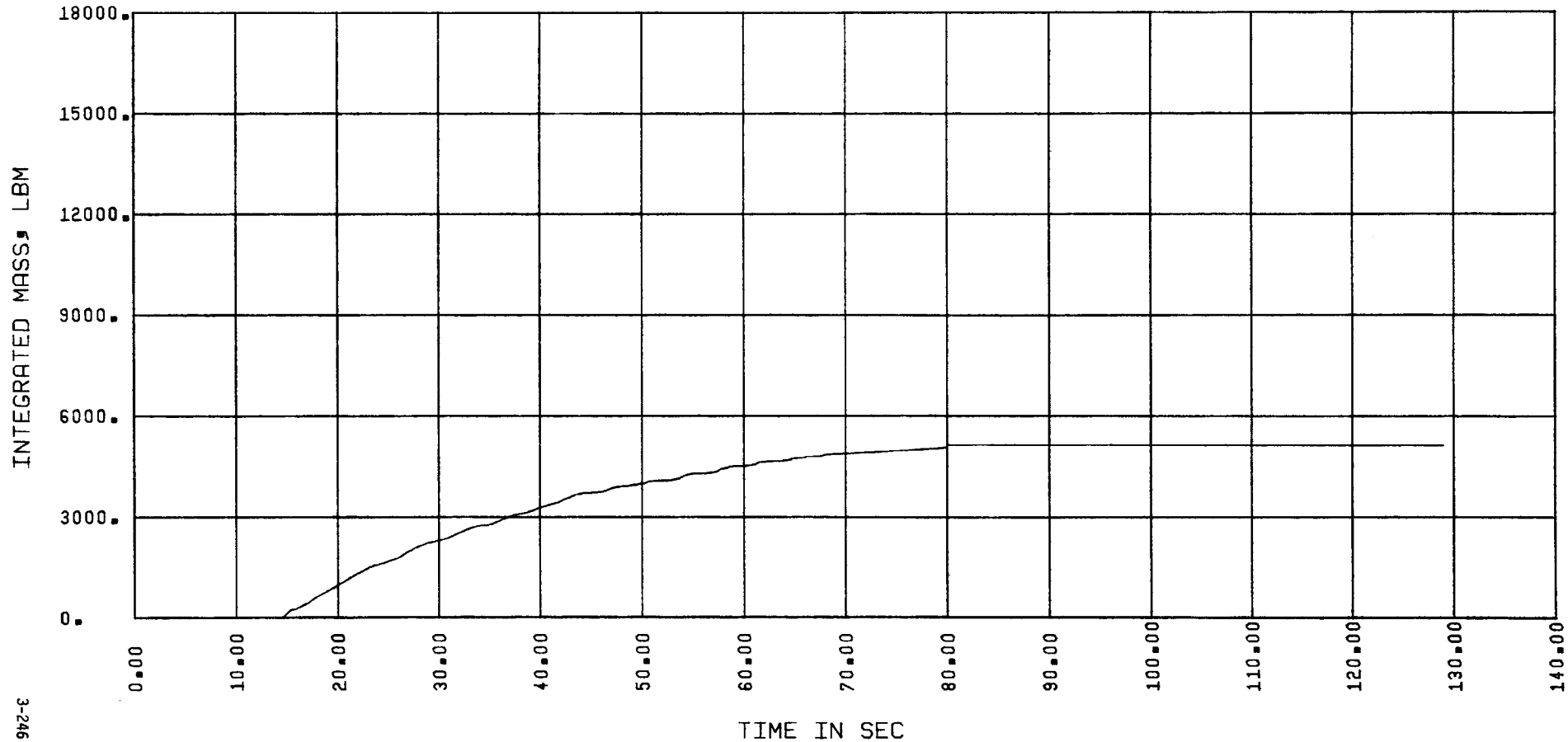
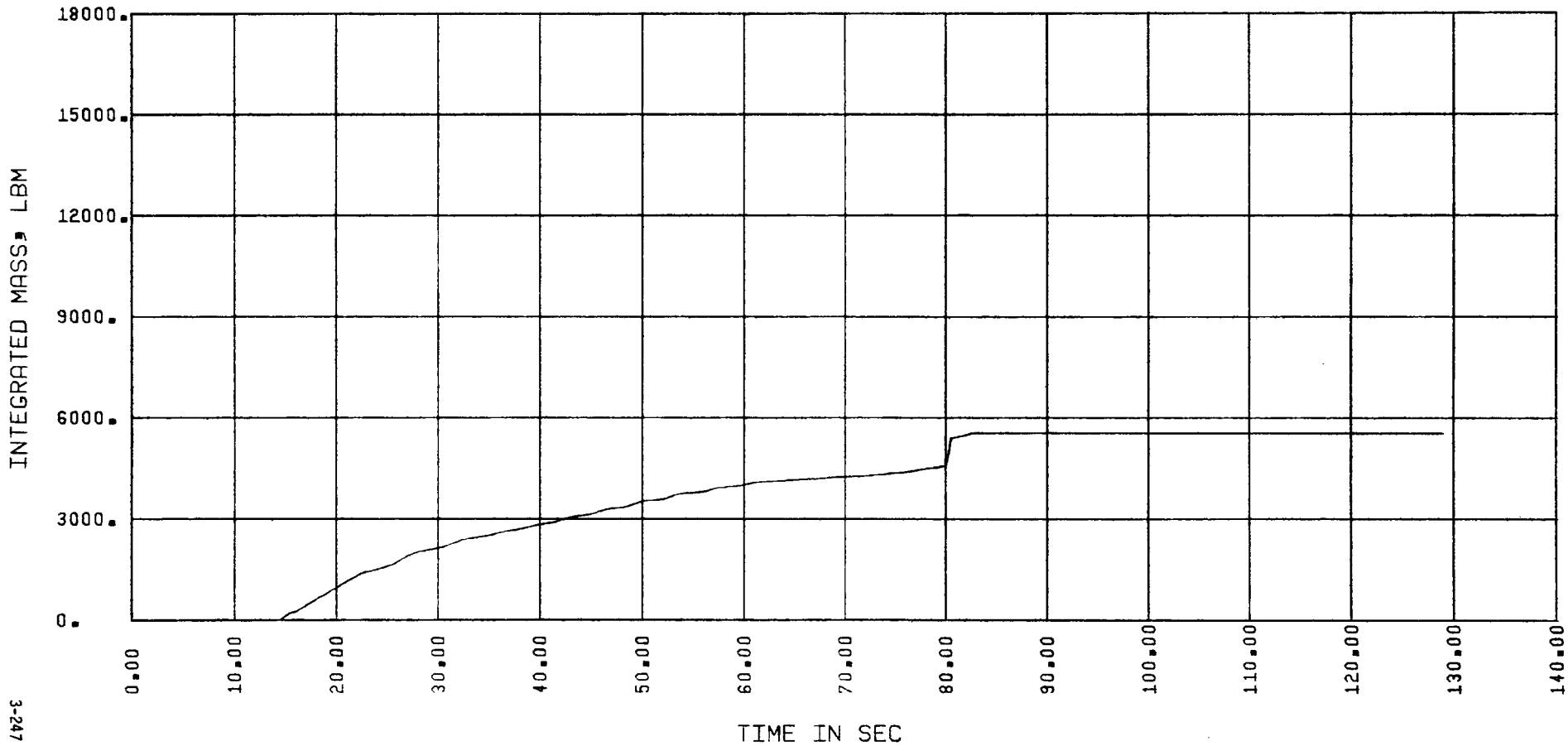
TEST 497/1000 PSIA FW REV BDN
INTEGRATED MASS LO-TM/GD2 S
PLOT NO.55

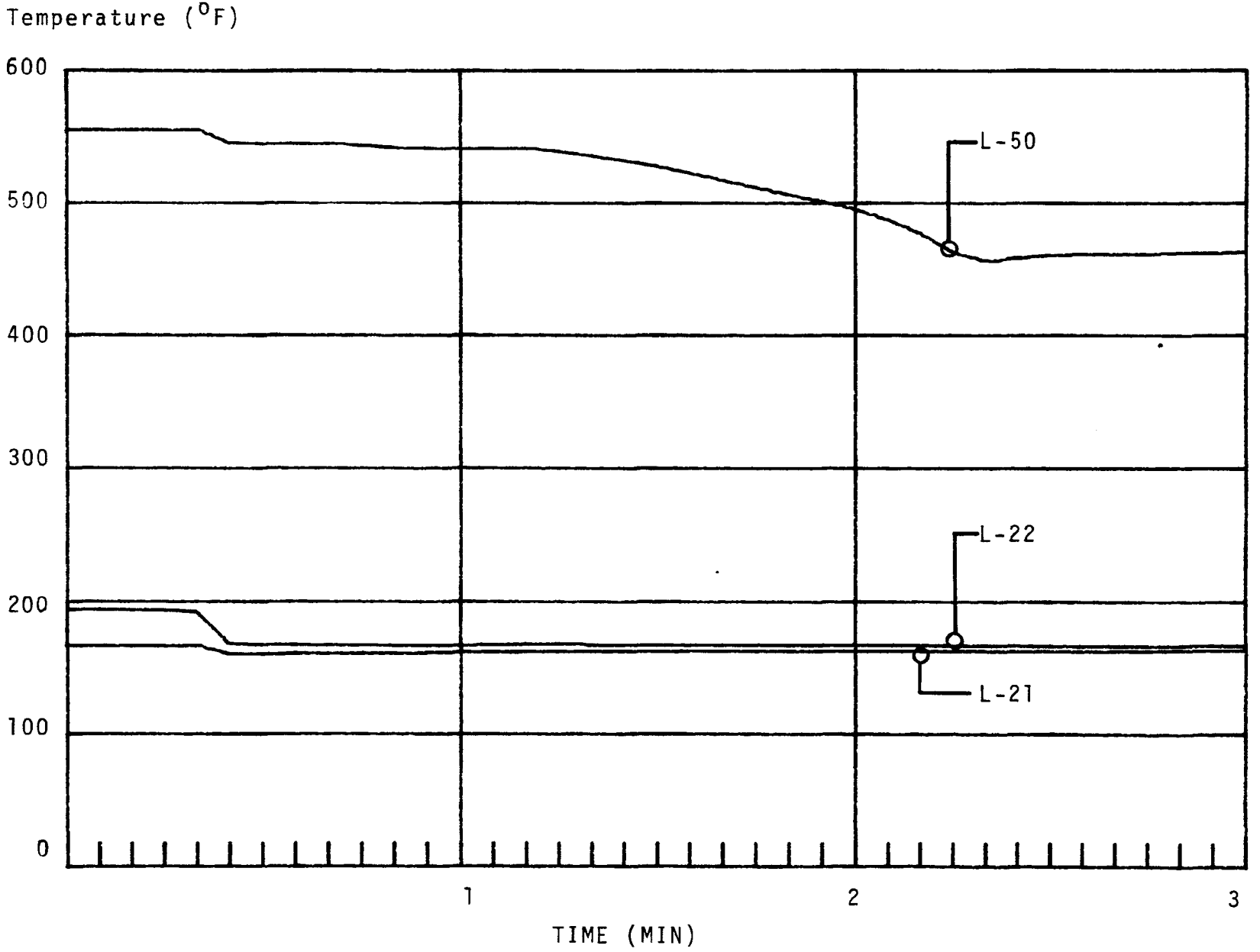


TEST 497/1000 PSIA FW REV BDN
INTEGRATED MASS HI-TM/GD2 D
PLOT NO.56

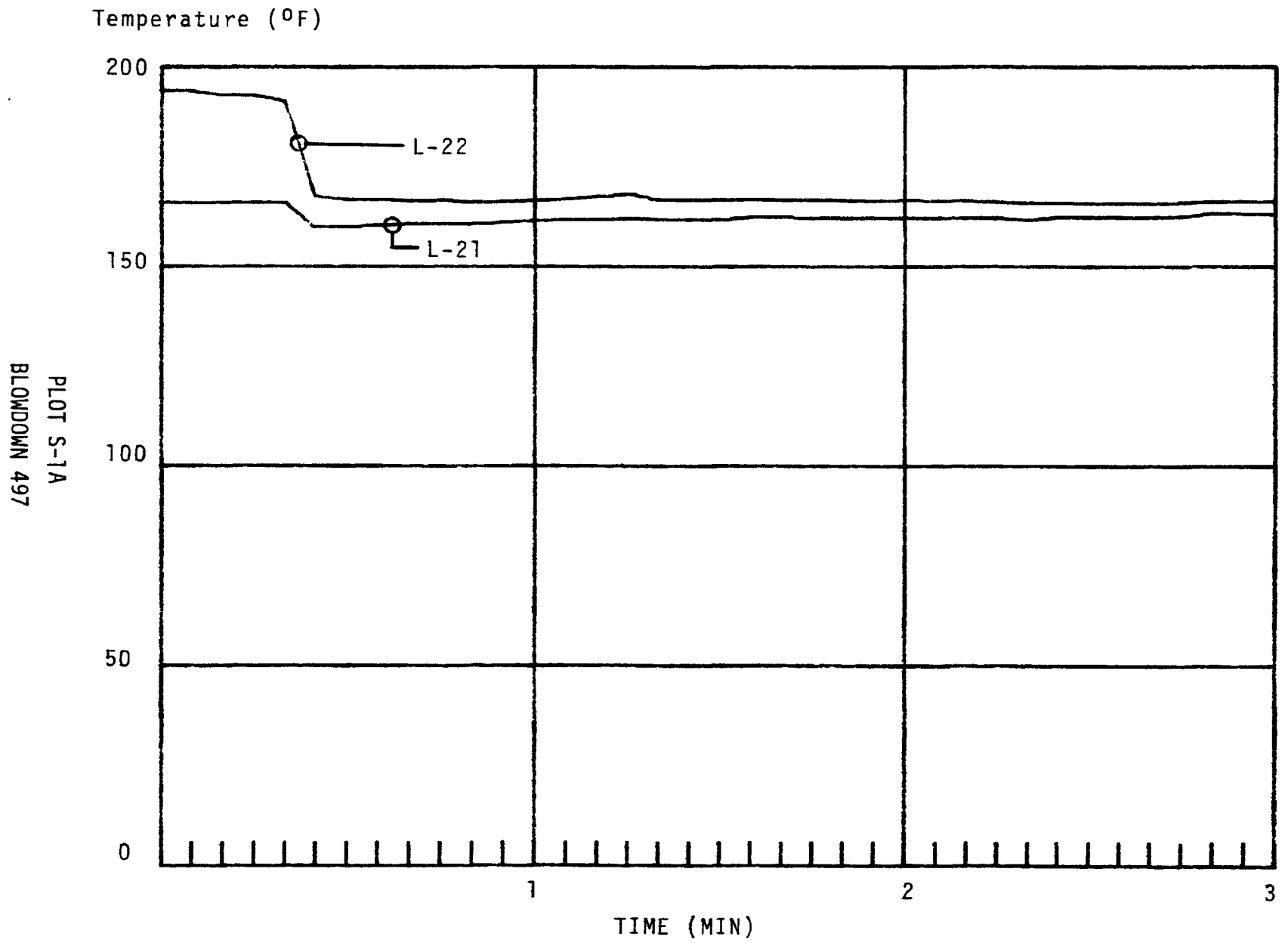


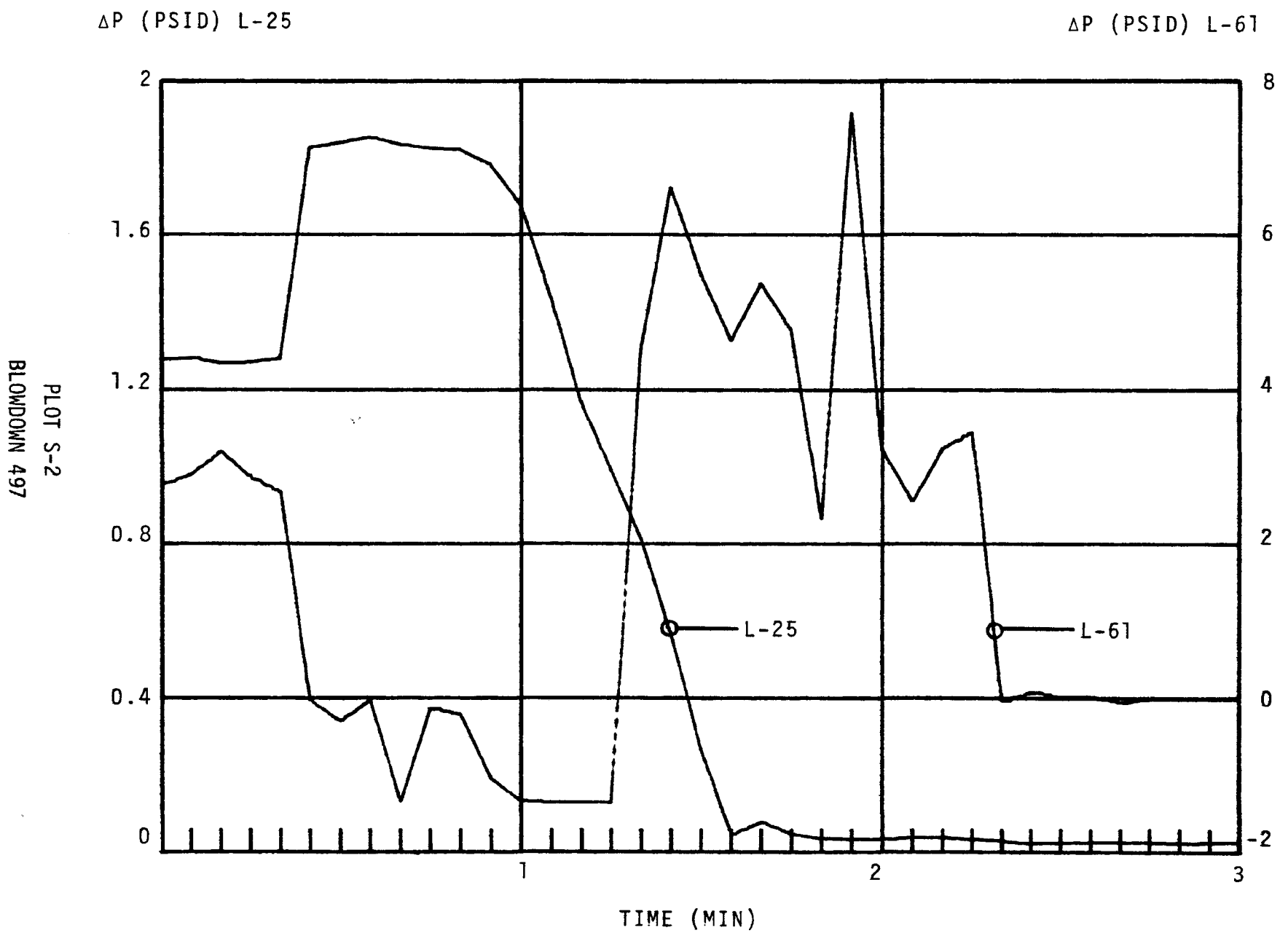
Index Listing
of
SCANNER DATA PLOTS
Test Number (497)

Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
	L-50	Main Water Orifice Thermocouple
S-1A	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

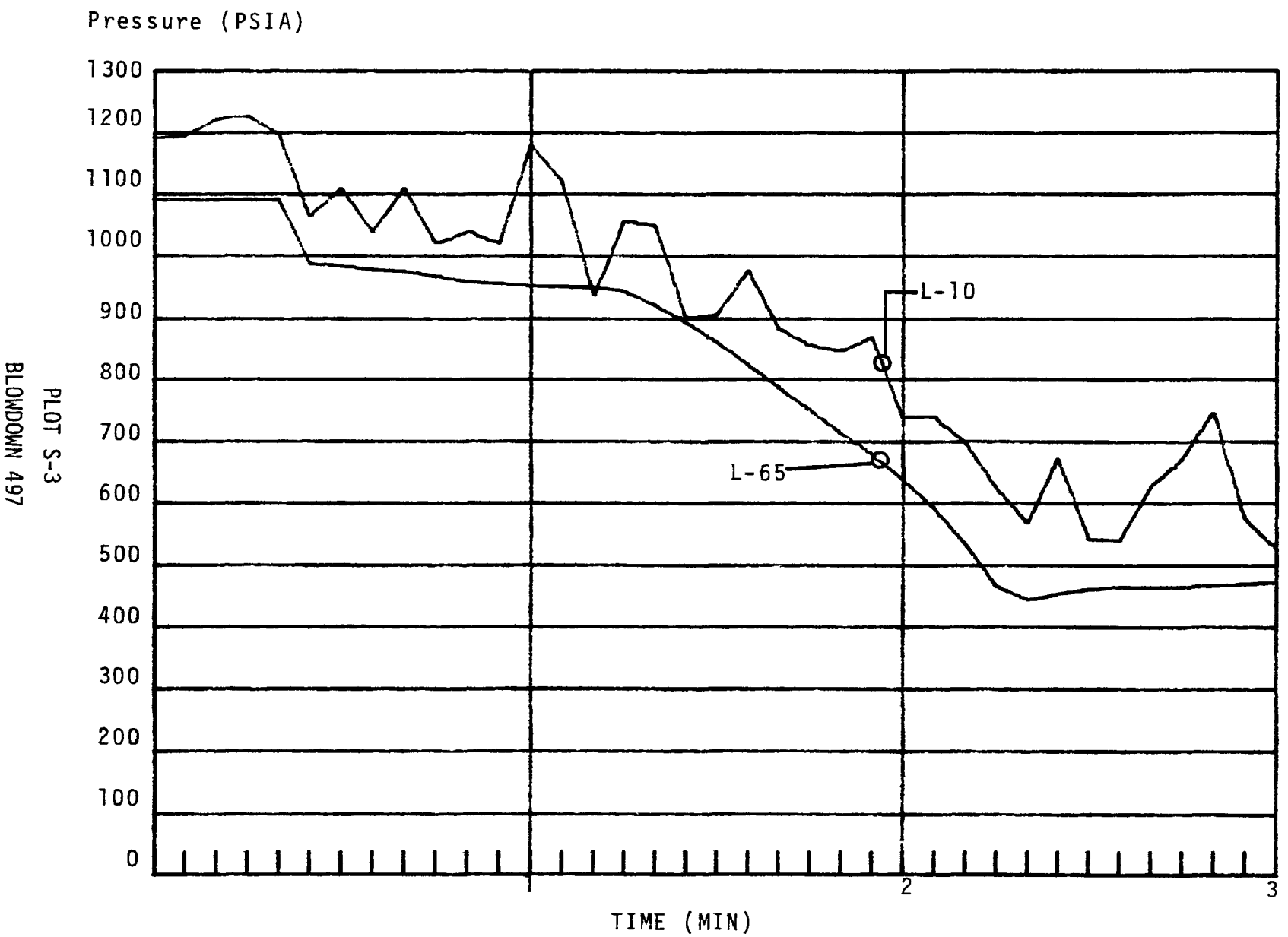


PLOT S-1
BLOWDOWN 497

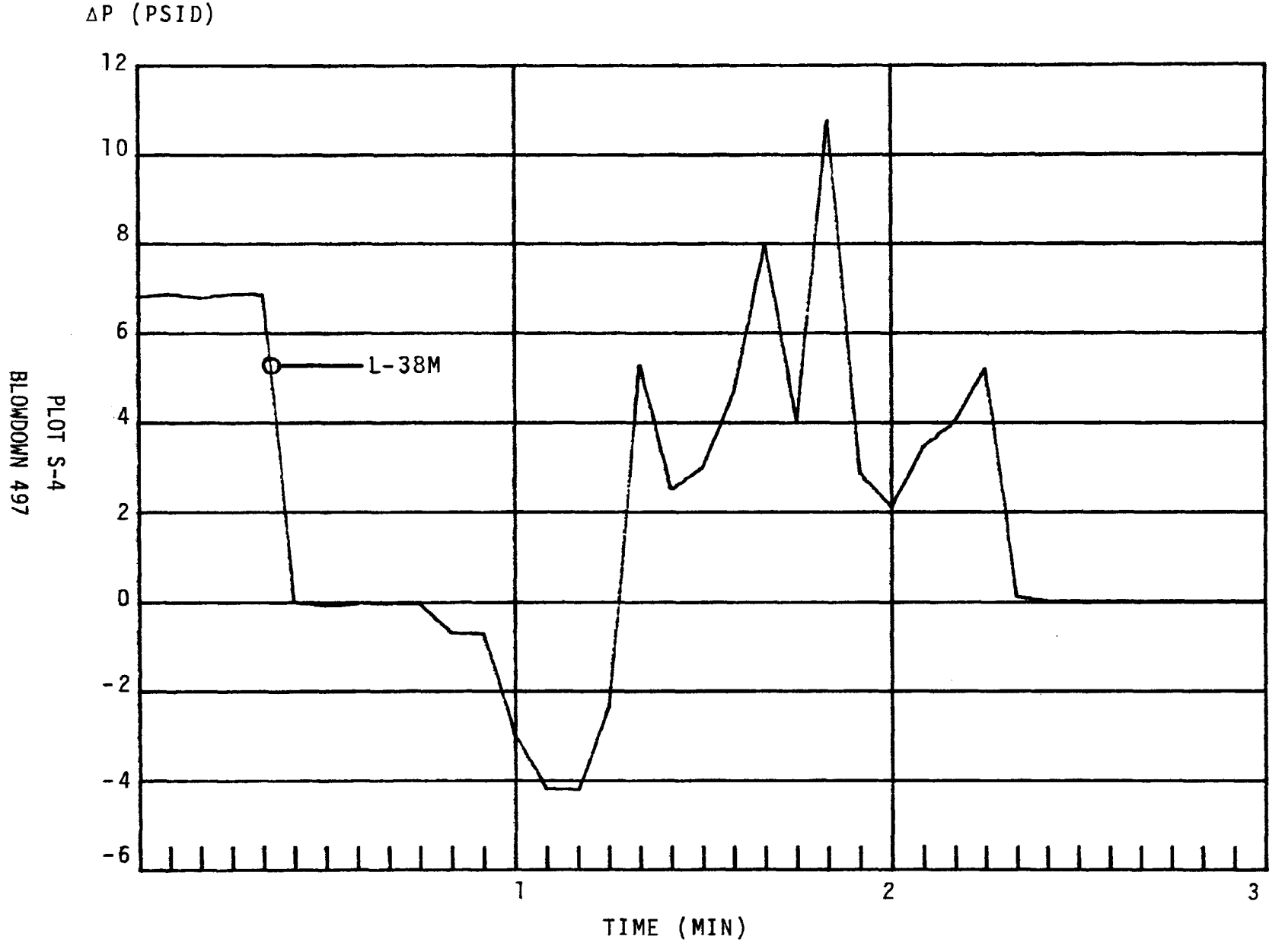

Temperature (°F)
200
150
100
50
0
L-22
L-21
1
2
3
TIME (MIN)
PLOT S-1A
BLOWDOWN 497

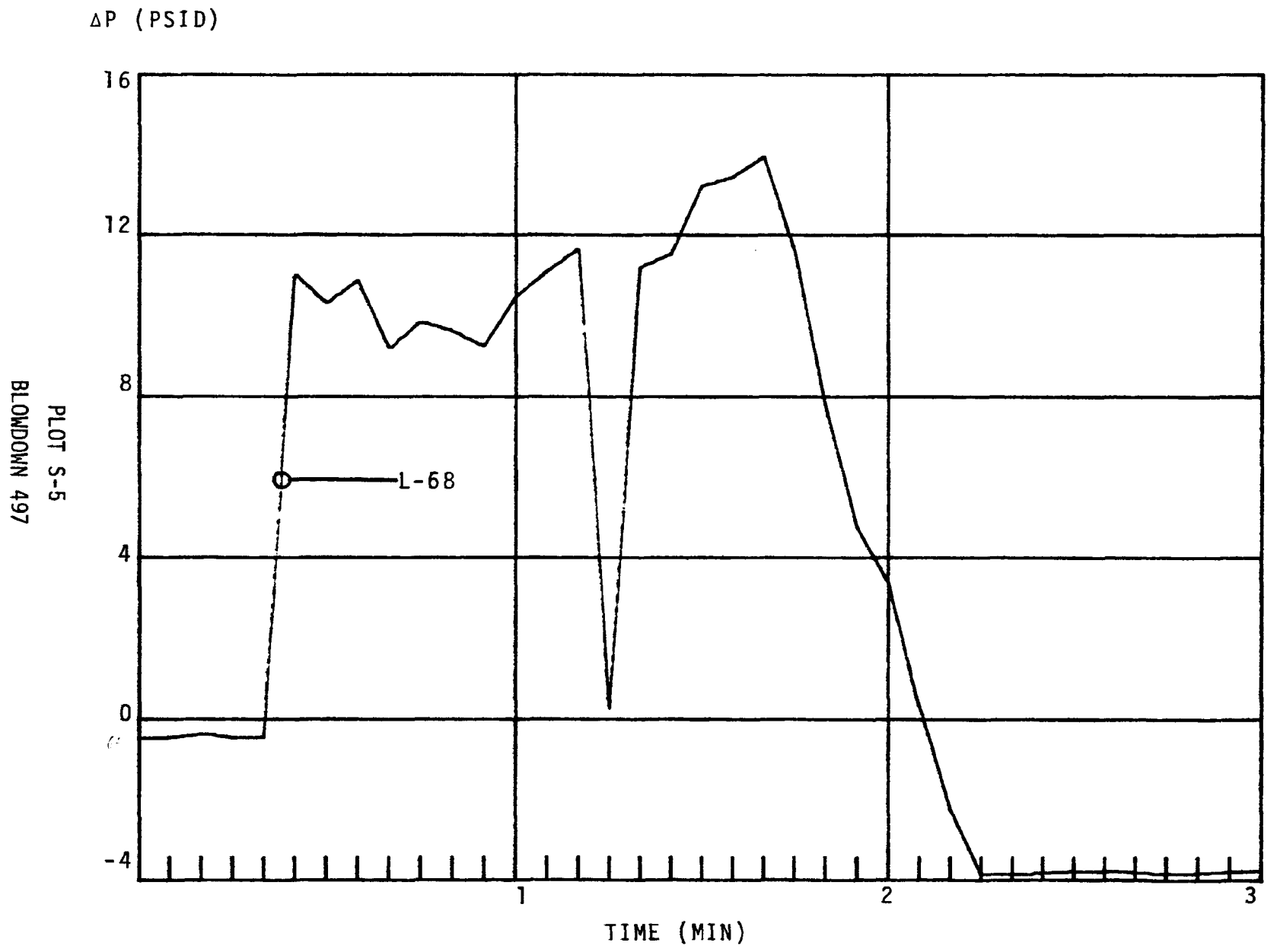


PLOT S-2
BLOWDOWN 497



PLOT S-3
BLOWDOWN 497


ΔP (PSID)
12
10
8
6
4
2
0
-2
-4
-6
L-38M
1
2
3
TIME (MIN)
PLOT S-4
BLOWDOWN 497


ΔP (PSID)
16
12
8
4
0
-4
L-68
1
2
3
TIME (MIN)
PLOT S-5
BLOWDOWN 497

SYSTEM CONFIGURATION

Test Number 676

Break Location	Discharge
Break Size	16.26 in^2
	57 % of 6 in. diameter inlet area of pump
Mixing Plate	In
Pump Mode	Free-Wheeling

COMMENTS

1. Malfunctioning or Inoperable Instruments:

   (a) Pump discharge drag disc (LO) not connected to FM system.

   (b) Pump suction turbine meter (LO) not functioning properly prior to blowdown.

   (c) Pump discharge turbine meter (HI) failed about 55 seconds after start of blowdown.

2. Other Comments: None

3. Affected FM Data Plots: 26 - Normalized Volumetric Flow Rate
   31 - Normalized Volumetric Flow Rate
   36 - Momentum Flux
   41 - Momentum Flux
   55 - Mass Flow Rate
   56 - Mass Flow Rate
   61 - Integrated Mass
   62 - Integrated Mass

   The following plots of the standard plot package were deleted:

   28 - Normalized Volumetric Flow Rate
   35 - Mass Flow Rate
   42 - Momentum Flux
   53 - Integrated Mass

INITIAL CONDITIONS

t = 45 Sec[a]

Test Number 676

System Pressures

High Pressure Drum	998.2	psia
Suction Instrument Spool	963.1	psia
Discharge Instrument Spool	1015.0	psia

Fluid Temperatures

Suction Instrument Spool	541.9	°F
Discharge Instrument Spool	547.3	°F

Fluid Density

Suction Instrument Spool	46.48	lbm/ft^3
Discharge Instrument Spool	46.14	lbm/ft^3

System Flows

Mass Flow Rate	242	lb/sec
Suction Volumetric Flow Rate	2335	gpm
Discharge Volumetric Flow Rate	2348	gpm
Suction Normalized Volumetric Flow Rate	0.67	
Discharge Normalized Volumetric Flow Rate	0.67	
Suction Fluid Velocity	28.73	ft/sec
Discharge Fluid Velocity	28.90	ft/sec
Suction Momentum Flux	38,381	$lbm/ft\ sec^2$
Discharge Momentum Flux	38,552	$lbm/ft\ sec^2$

Pump Performance

Pump head	56.1	psi
	173.8	ft
Pump Speed	4582	rpm
Pump Shaft Torque	192.3	ft lb
Pump Hydraulic Torque	167.0	ft lb

System Mass (t = 55 Sec)[a]

High Pressure Drum Level	39.7	in[b]
Fluid Mass Upstream of Test Pump	12,989	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 676

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-6.0	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	5.4	c
HPSW-1 Closed	7.3	c
Pump Power Trip	8.6	60
Initiate Rupture Mechanism	6.4	c
Blowdown Starts	8.6	60
End of Digitized Data 20 s/sec	619.0	-
200 s/sec	378.0	-
FM Recording System Off	619.0	-
Scanner System Off	-	560

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

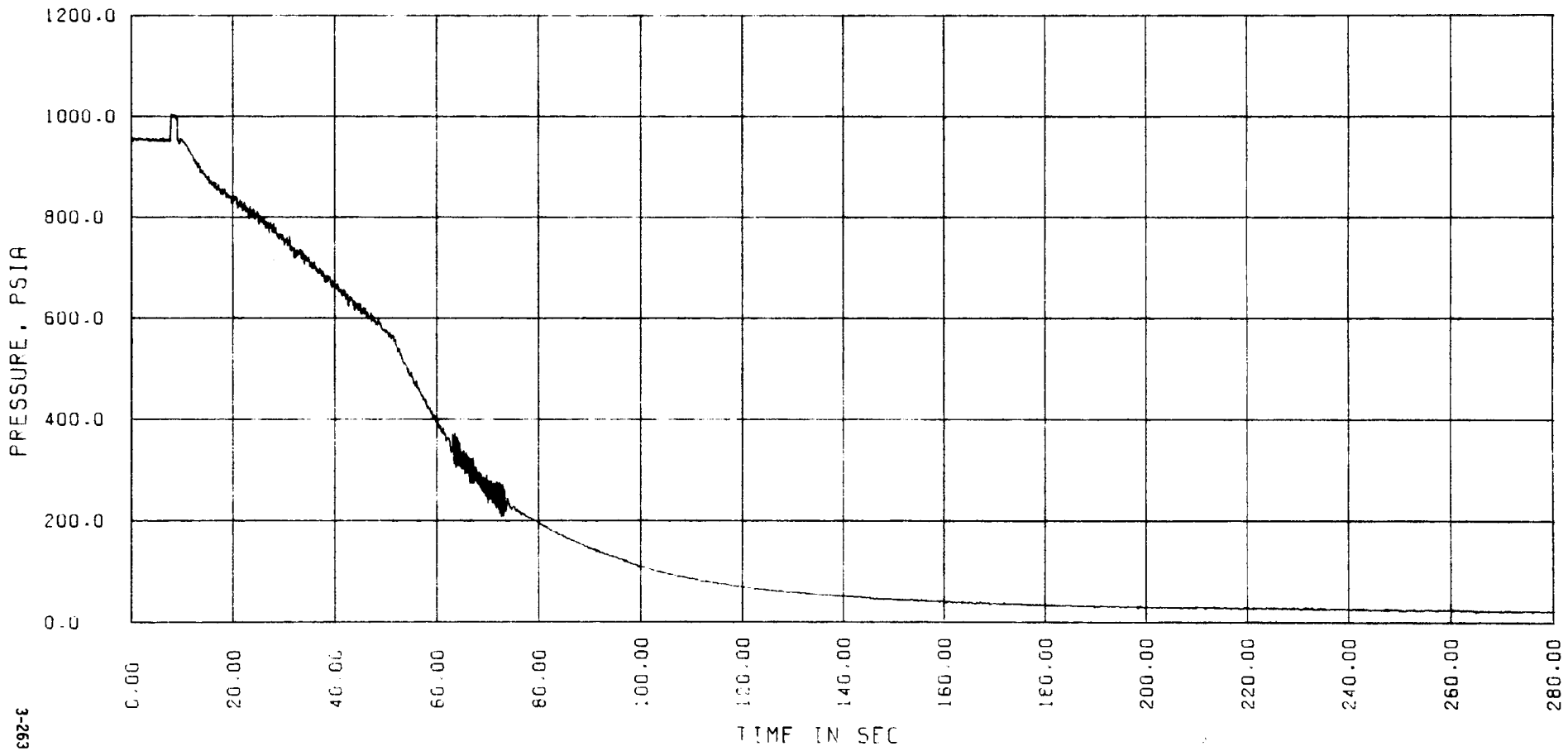
Index Listing
of
FM DATA PLOTS
Test Number (676)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge

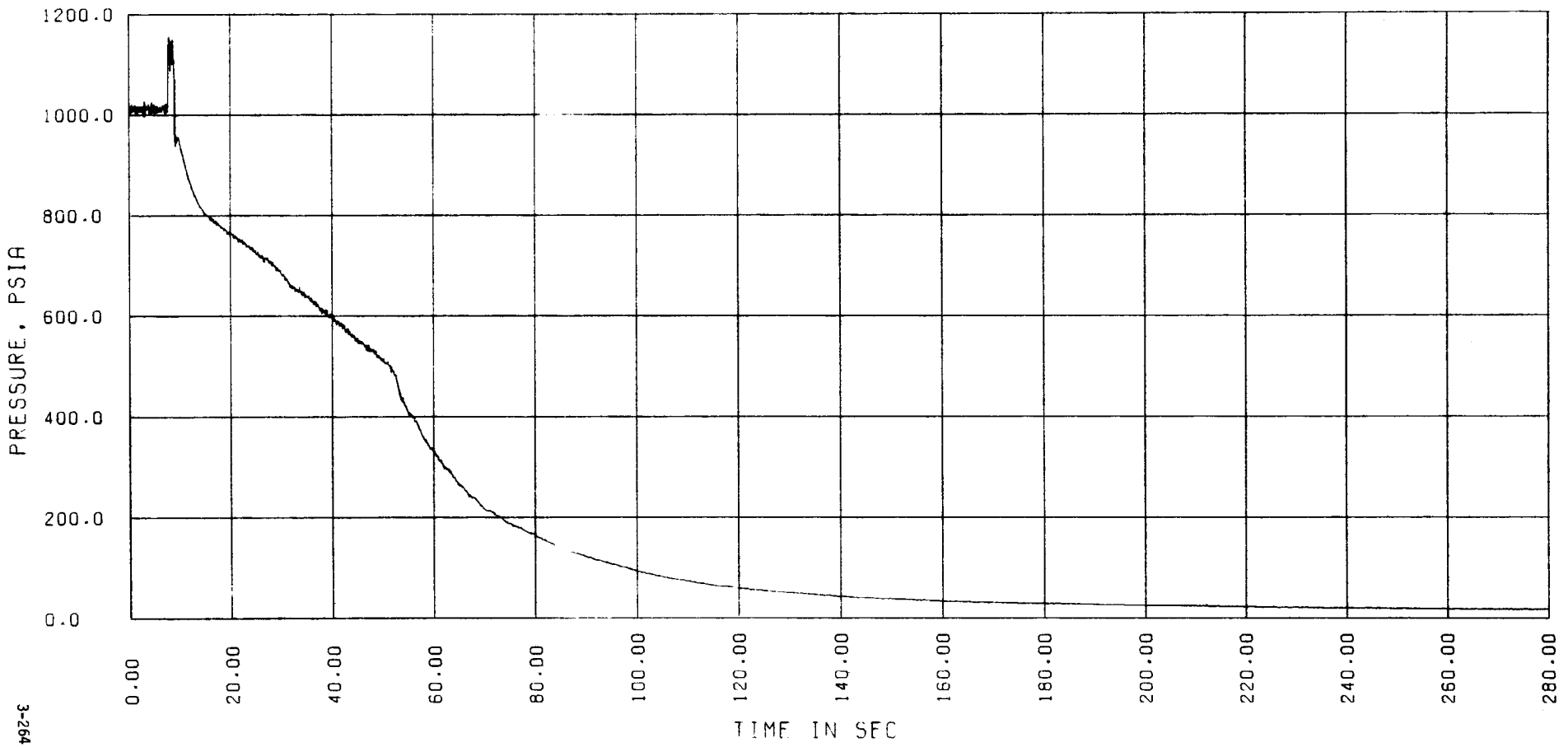
Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (676)

Plot Number	Location Number	Description of Parameter
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge

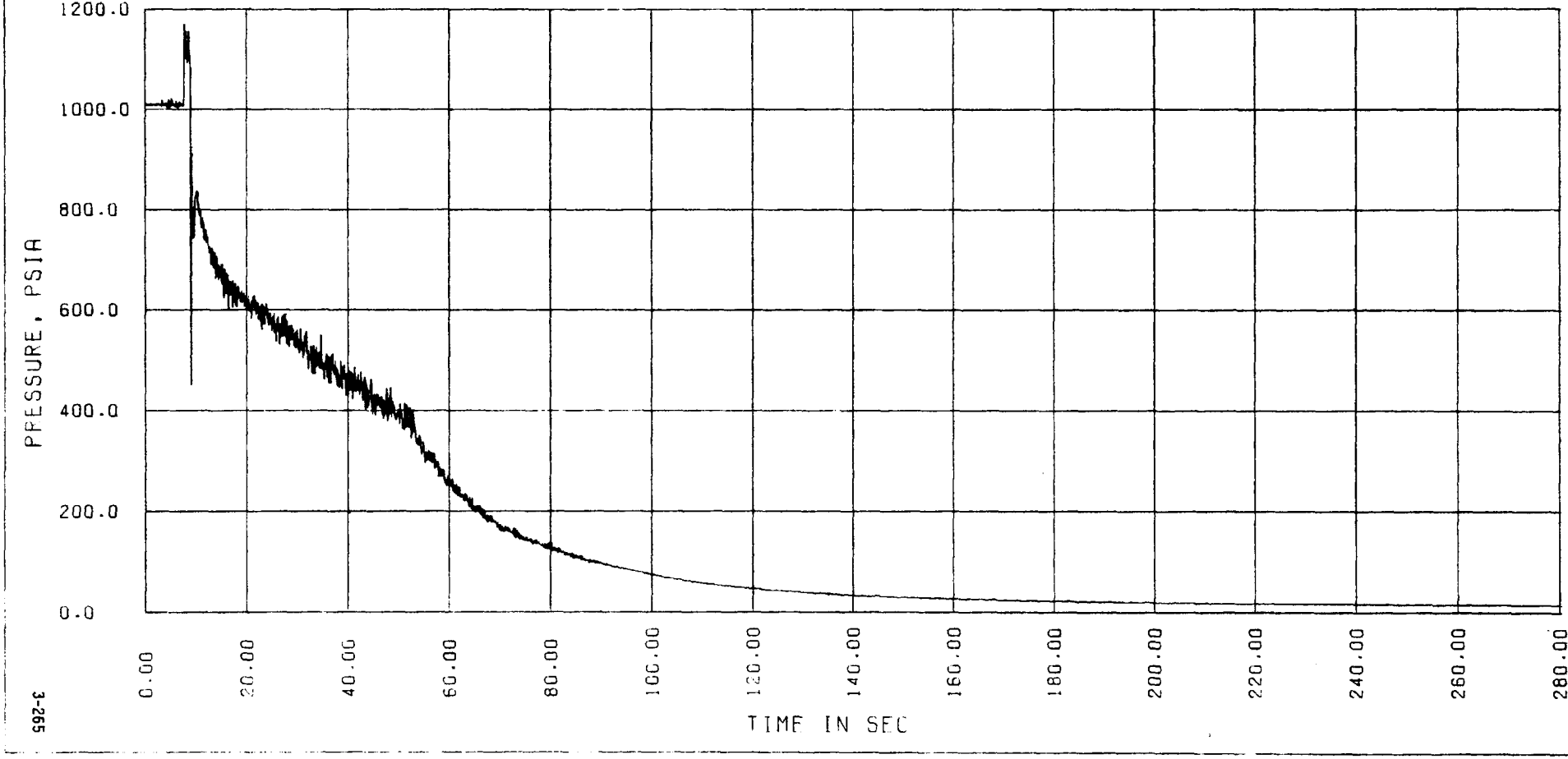
TEST 675/1000 PSIA FW FWD BDN
PUMP SUCTION PRESSURE
PLOT NO.1



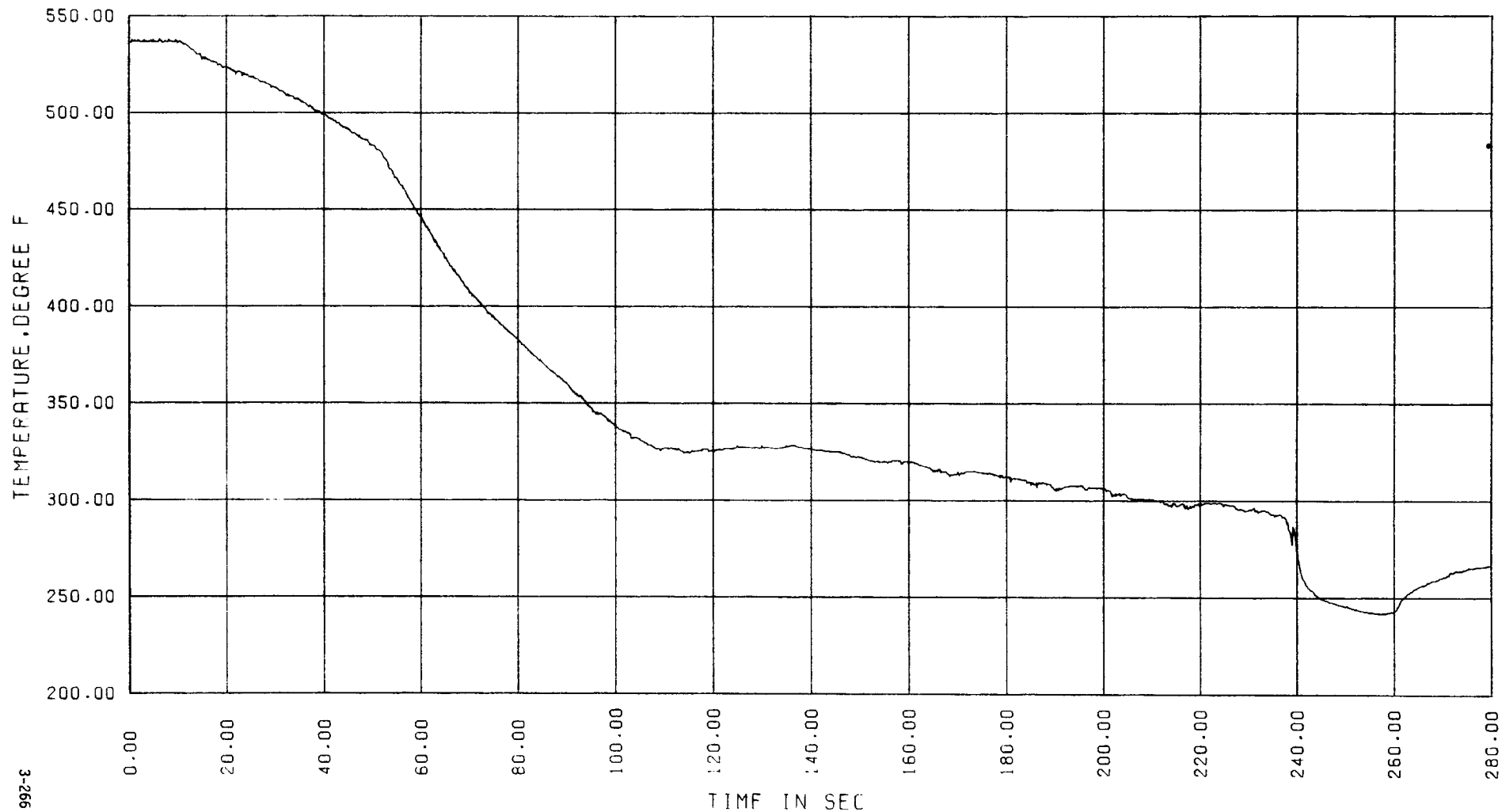
TEST 676/1000 PSIA FW FWD BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2



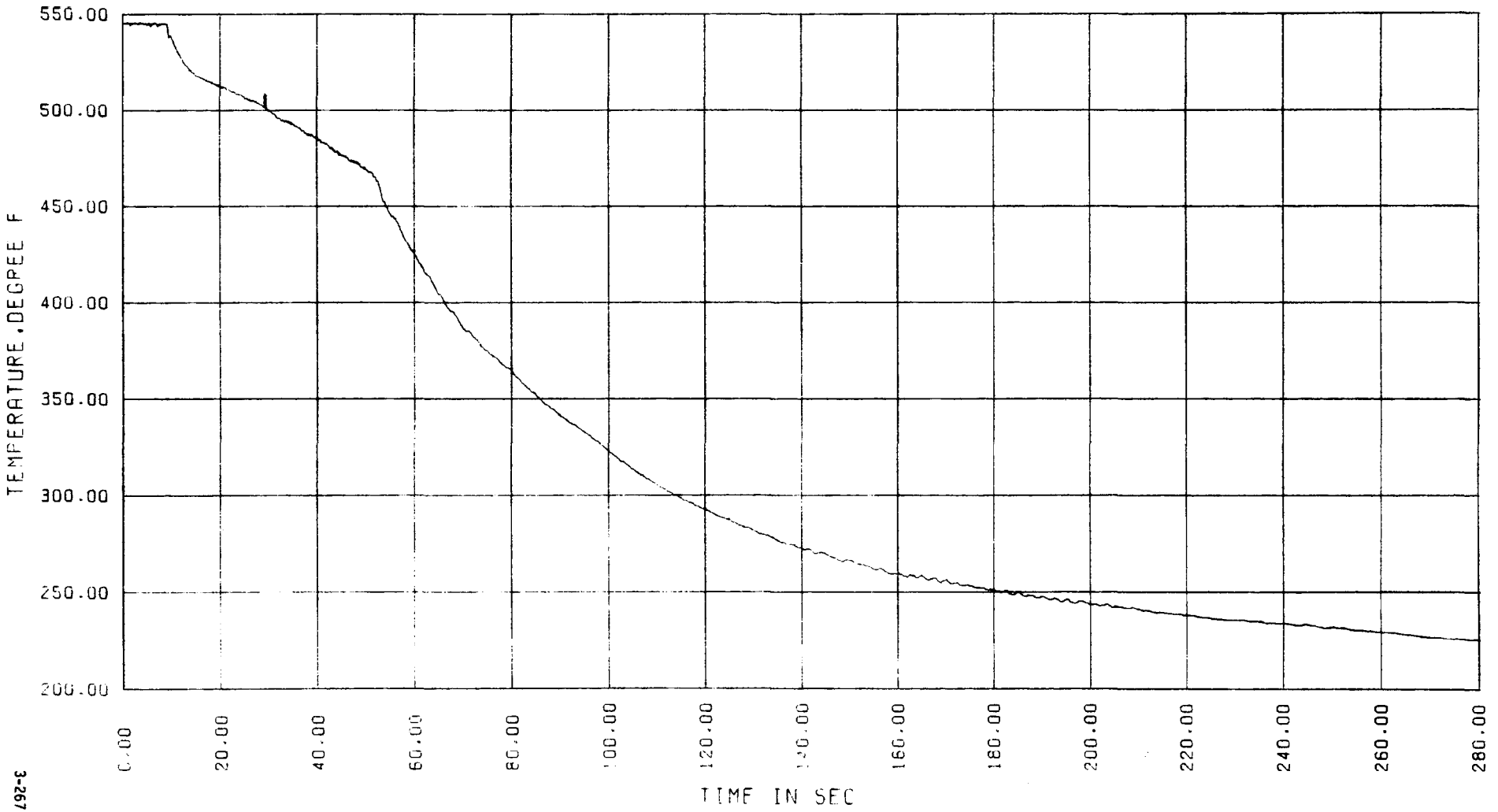
TEST 676/1000 PSIA FW FWD BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



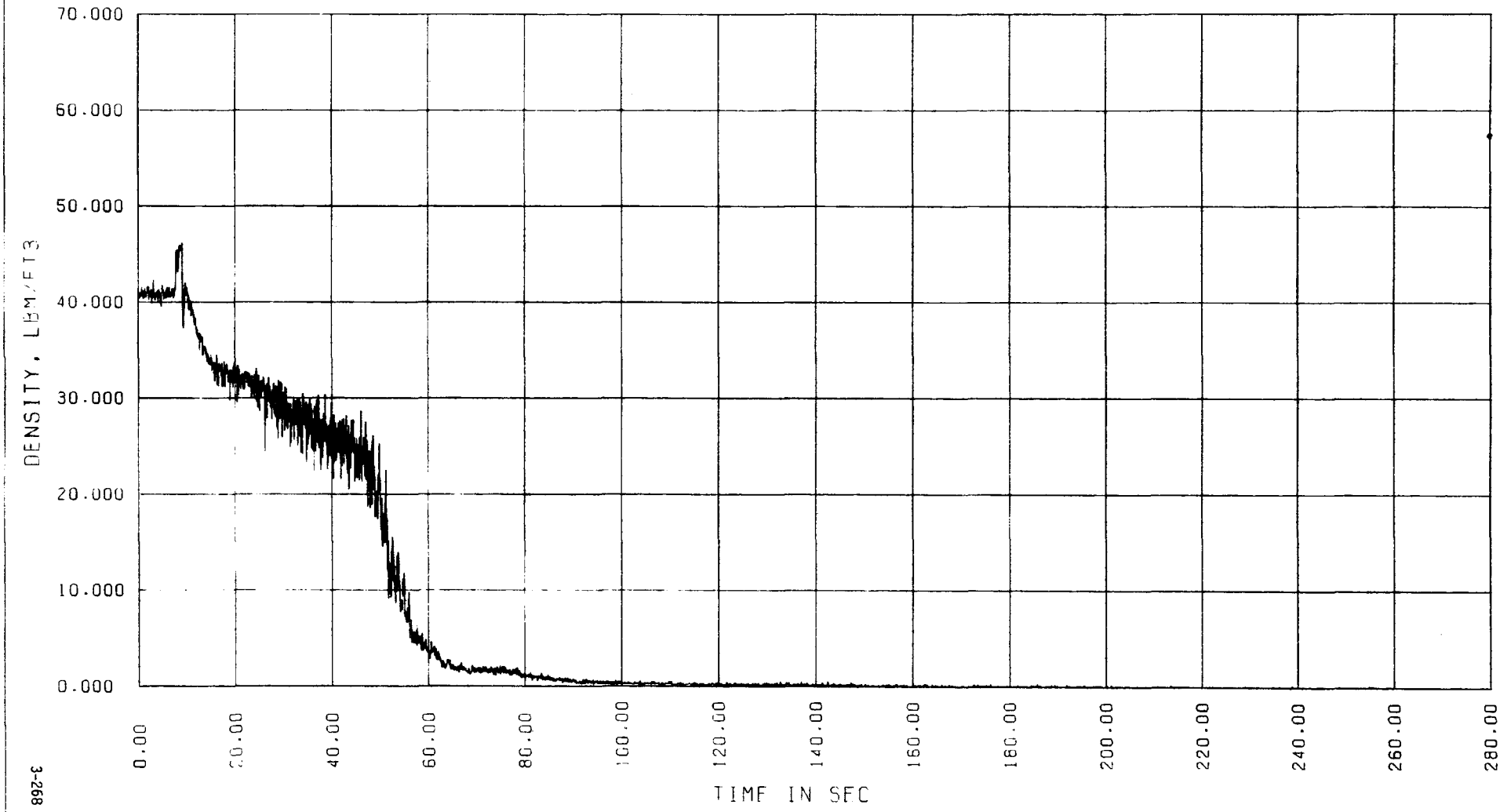
TEST 676/1000 PSIA FW FWD BDN
PUMP SUCTION TEMPERATURE
PLOT NO.4

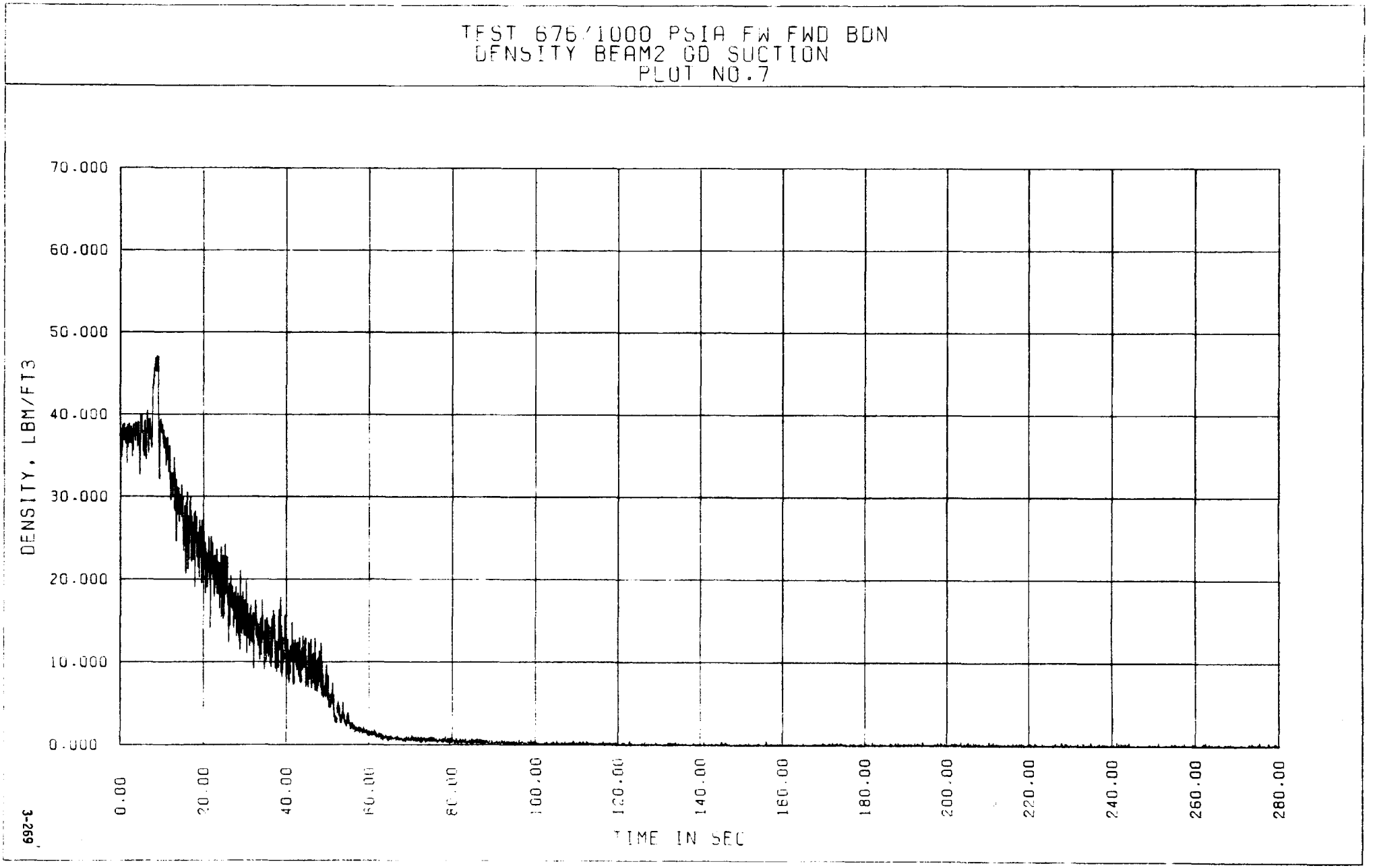


TEST 676.1000 PSIA FW FWD BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5

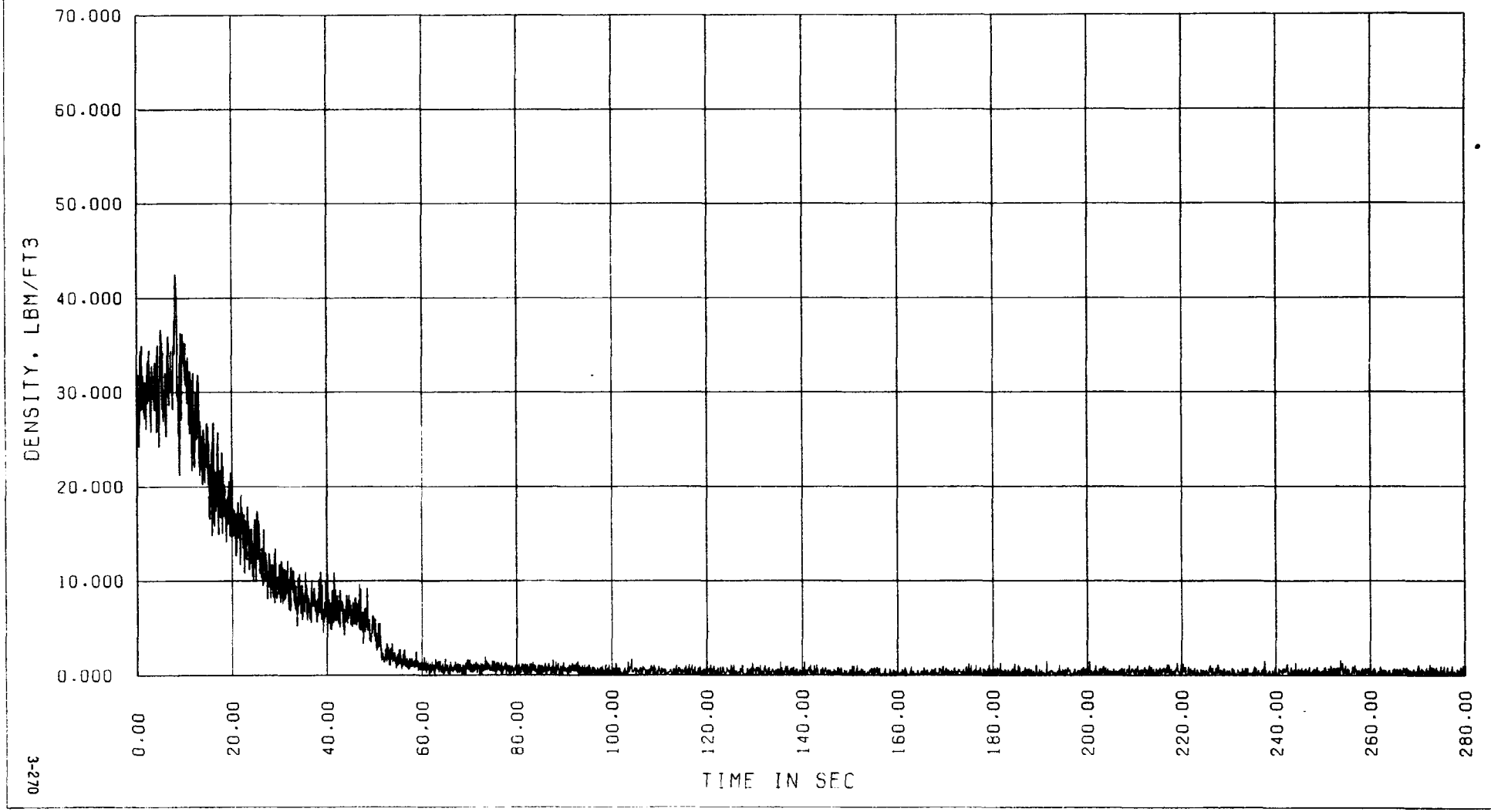


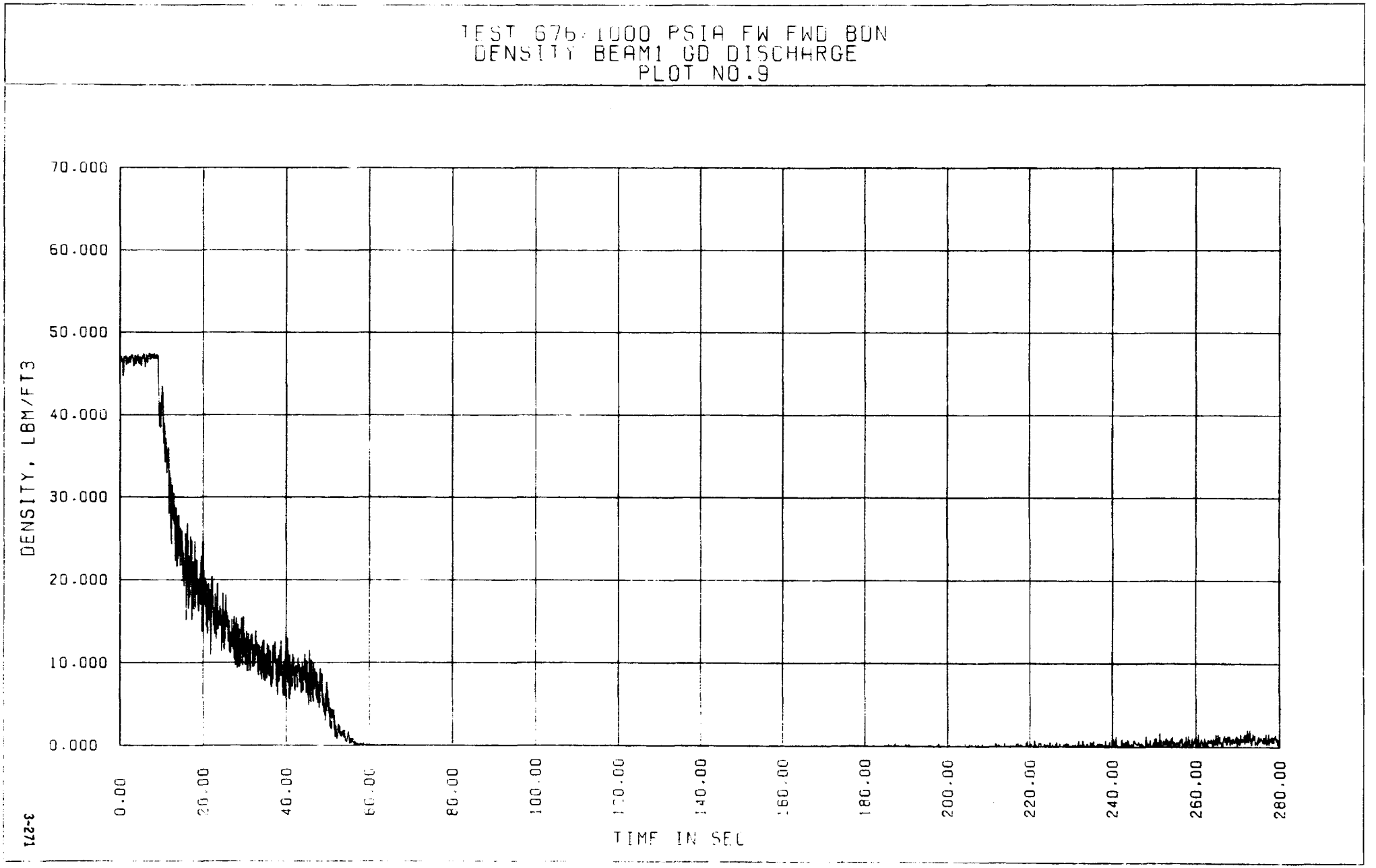
TEST 676/1000 PSIA FW FWD BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



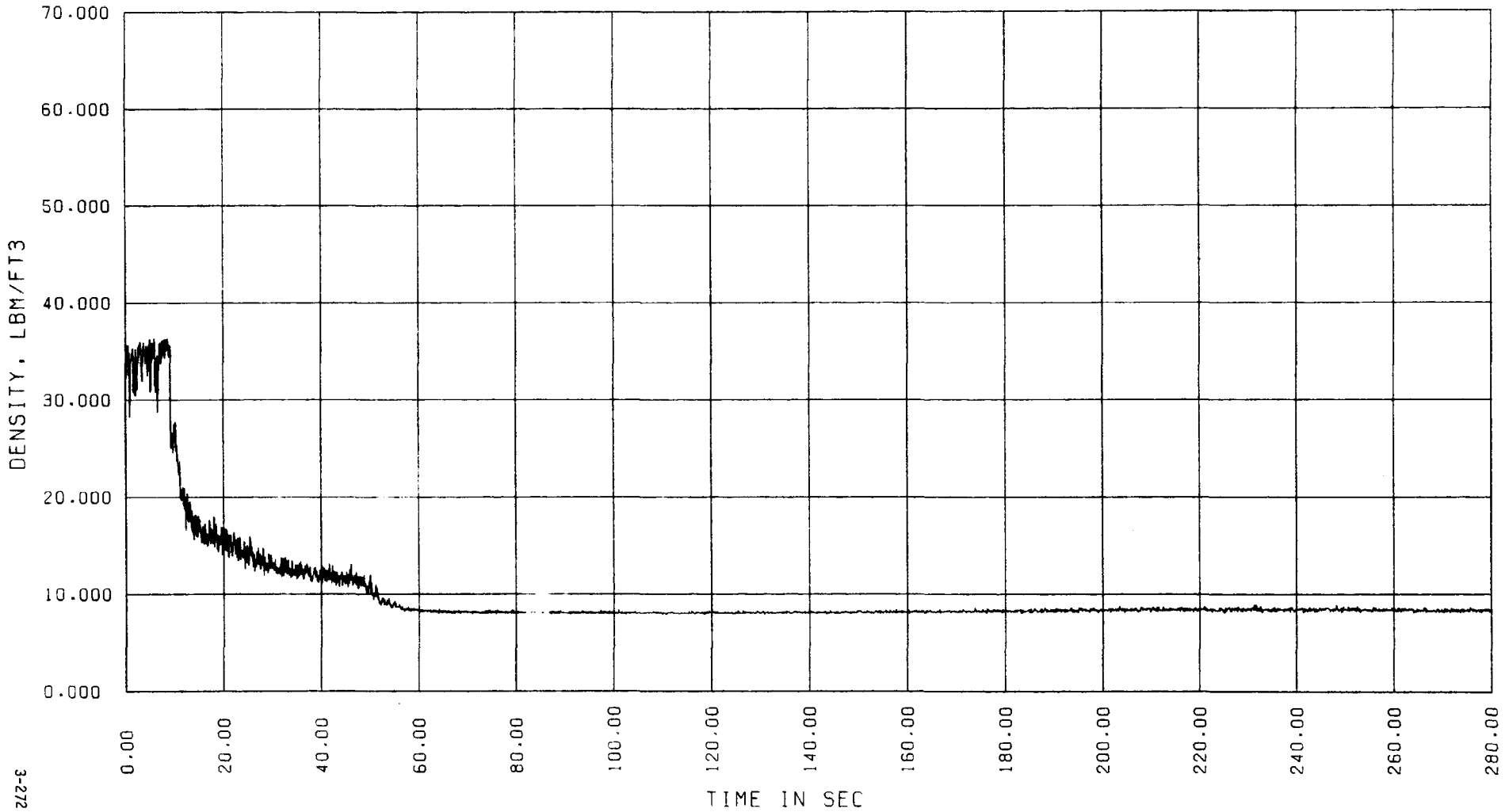

TEST 676/1000 PSIA FW FWD BDN
DENSITY BEAM2 CD SUCTION
PLOT NO.7
70.000
60.000
50.000
40.000
30.000
20.000
10.000
0.000
DENSITY, LBM/FT3
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

TEST 676/1000 PSIA FW FWD BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8

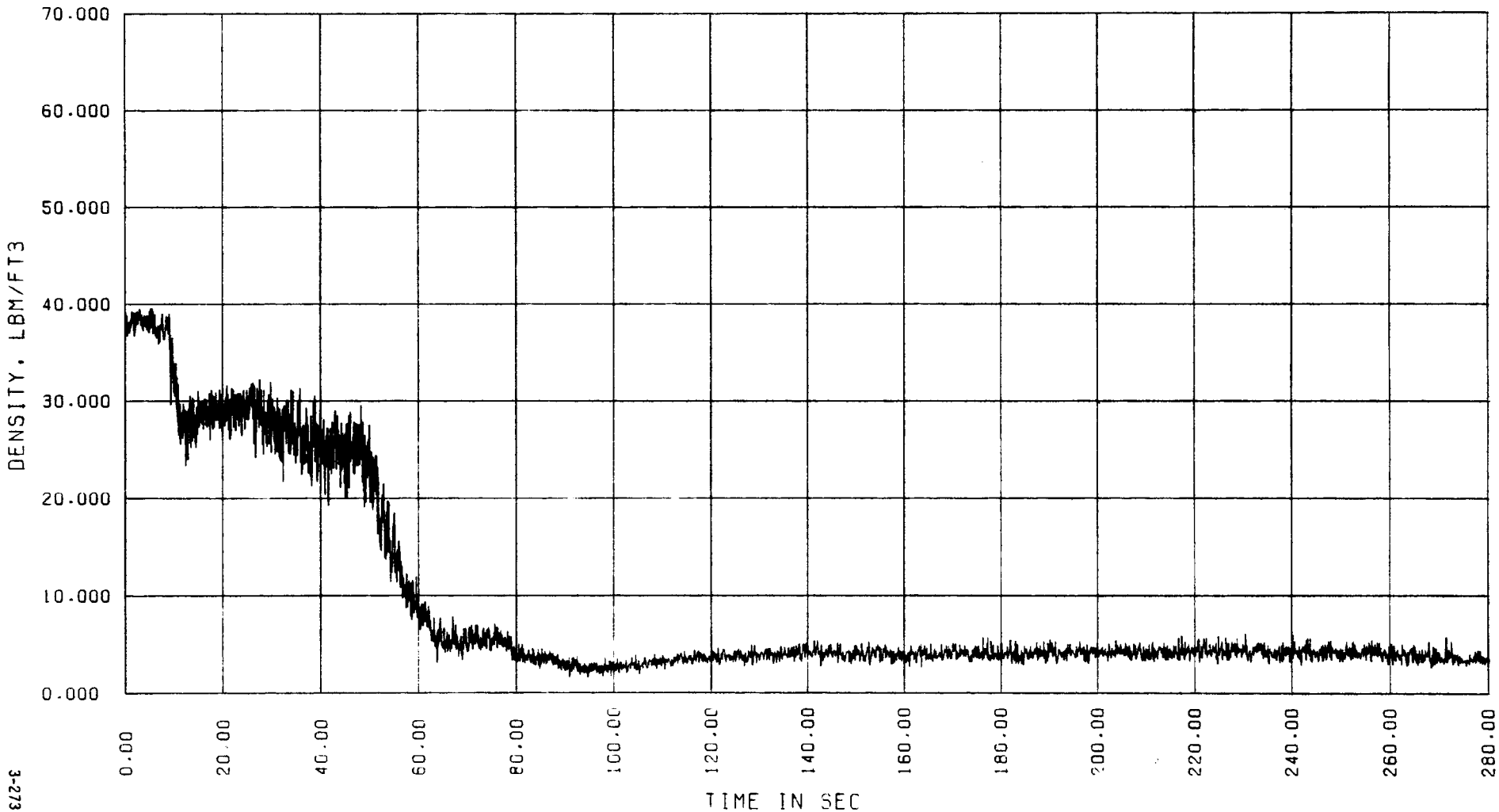



TEST 676-1000 PSIA FW FWD BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9
70.000
60.000
50.000
40.000
30.000
20.000
10.000
0.000
DENSITY, LBM/FT3
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-271

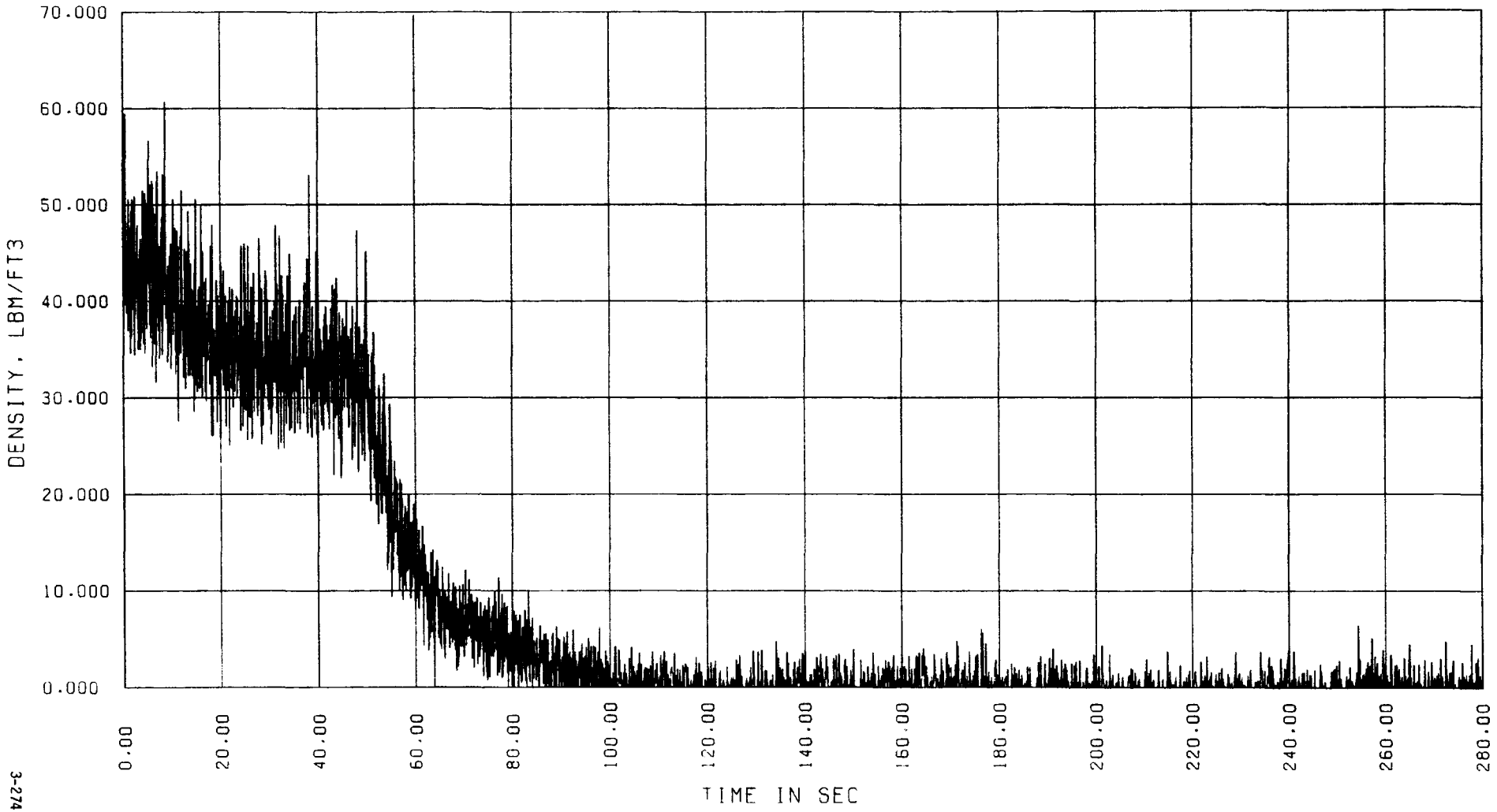
TEST 676/1000 PSIA FW FWD BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10

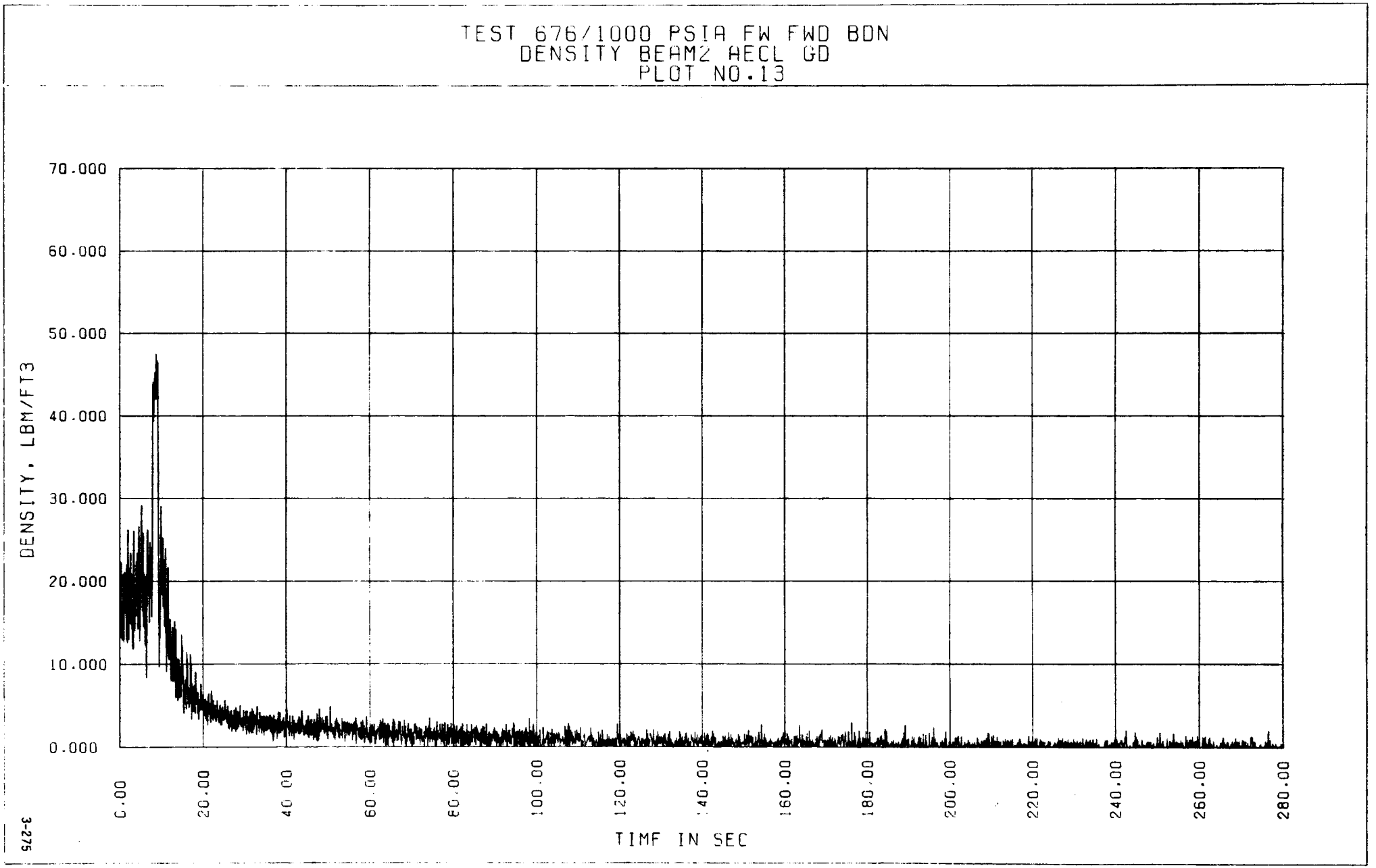


TEST 676/1000 PSIA FW FWD BDN
DENSITY BEHM3 GD DISCHARGE
PLOT NO.11

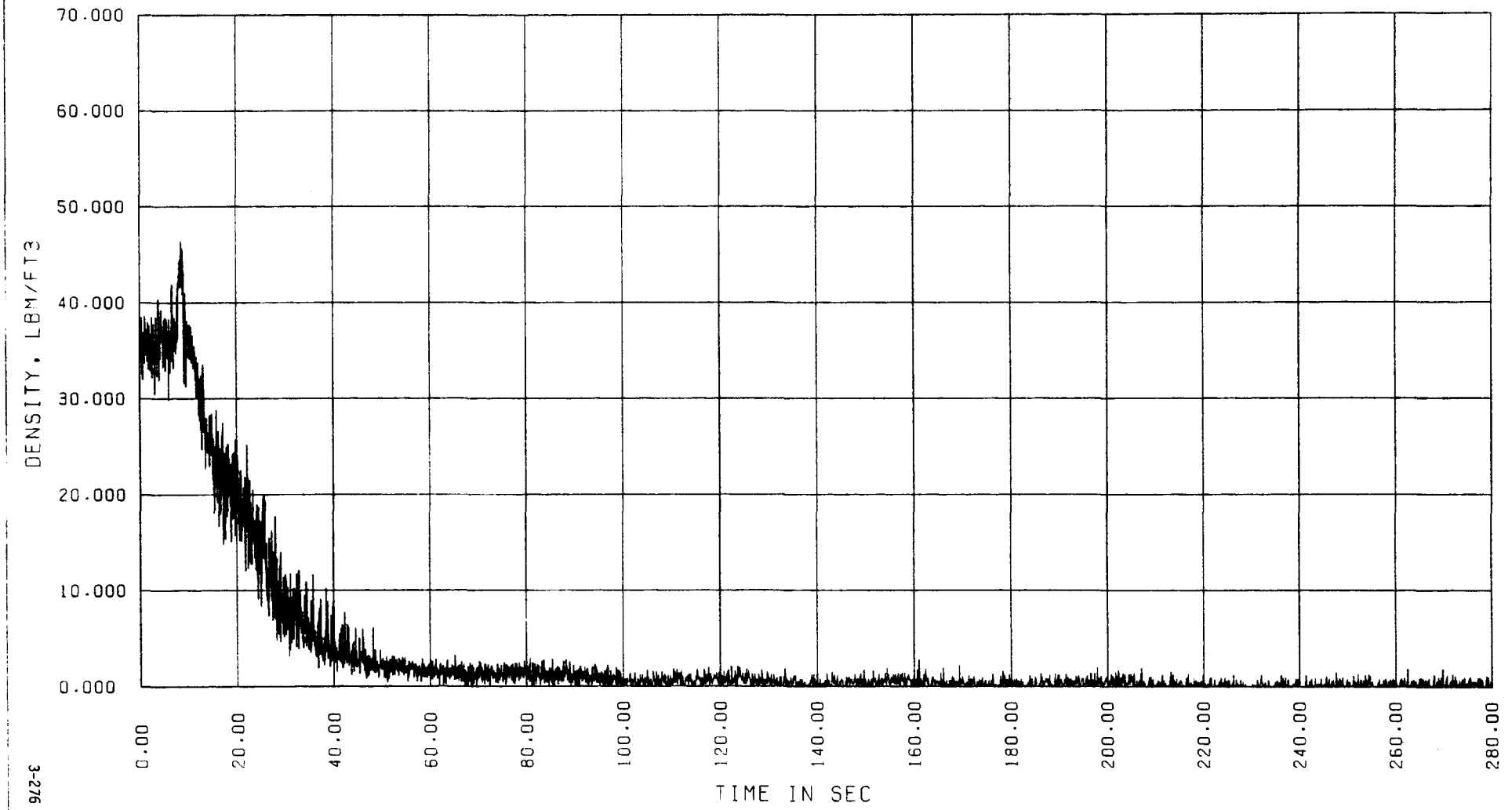


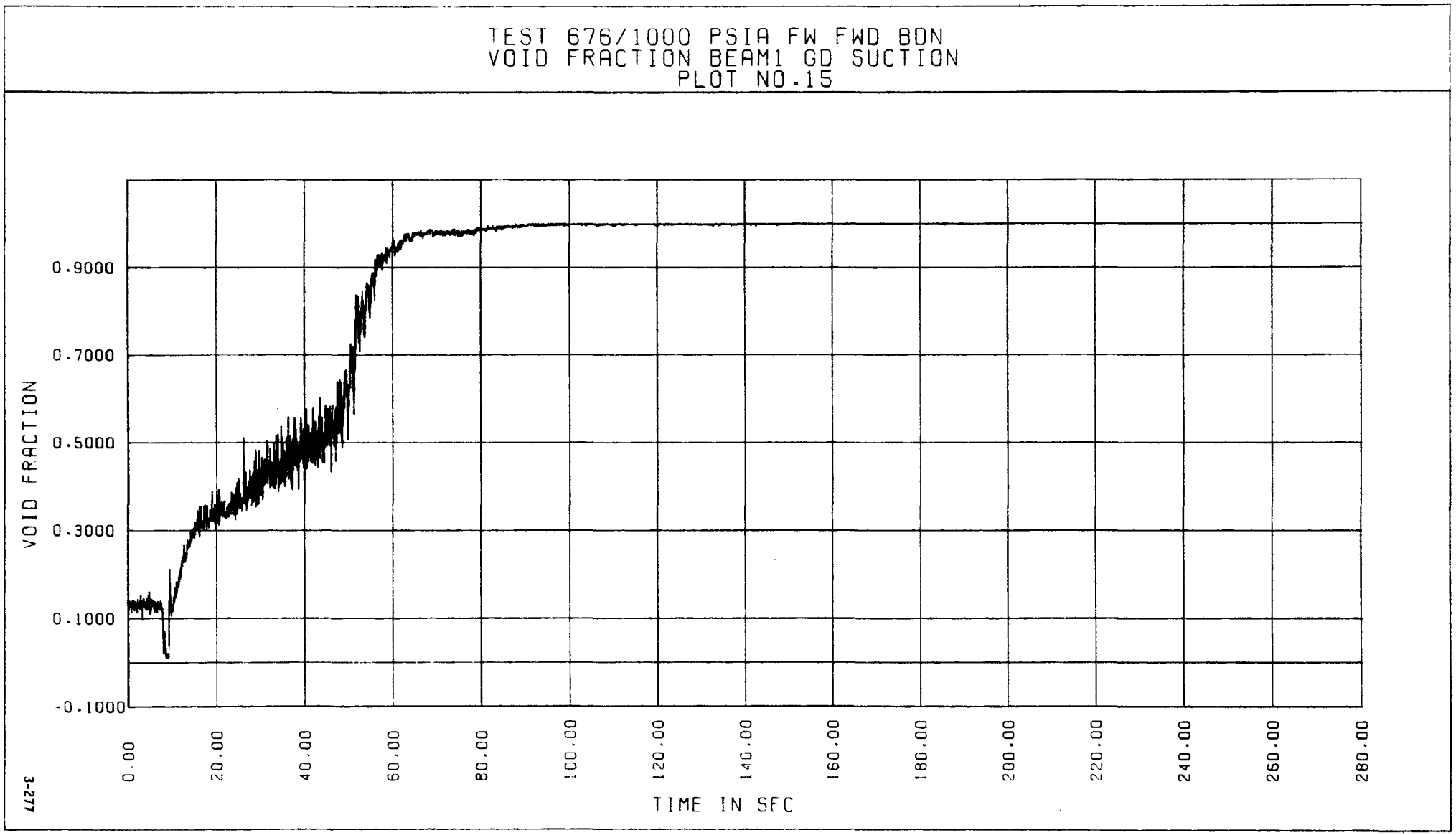
TEST 676/1000 PSIA FW FWD BDN
DENSITY BEAM1 AECL GD
PLOT NO.12

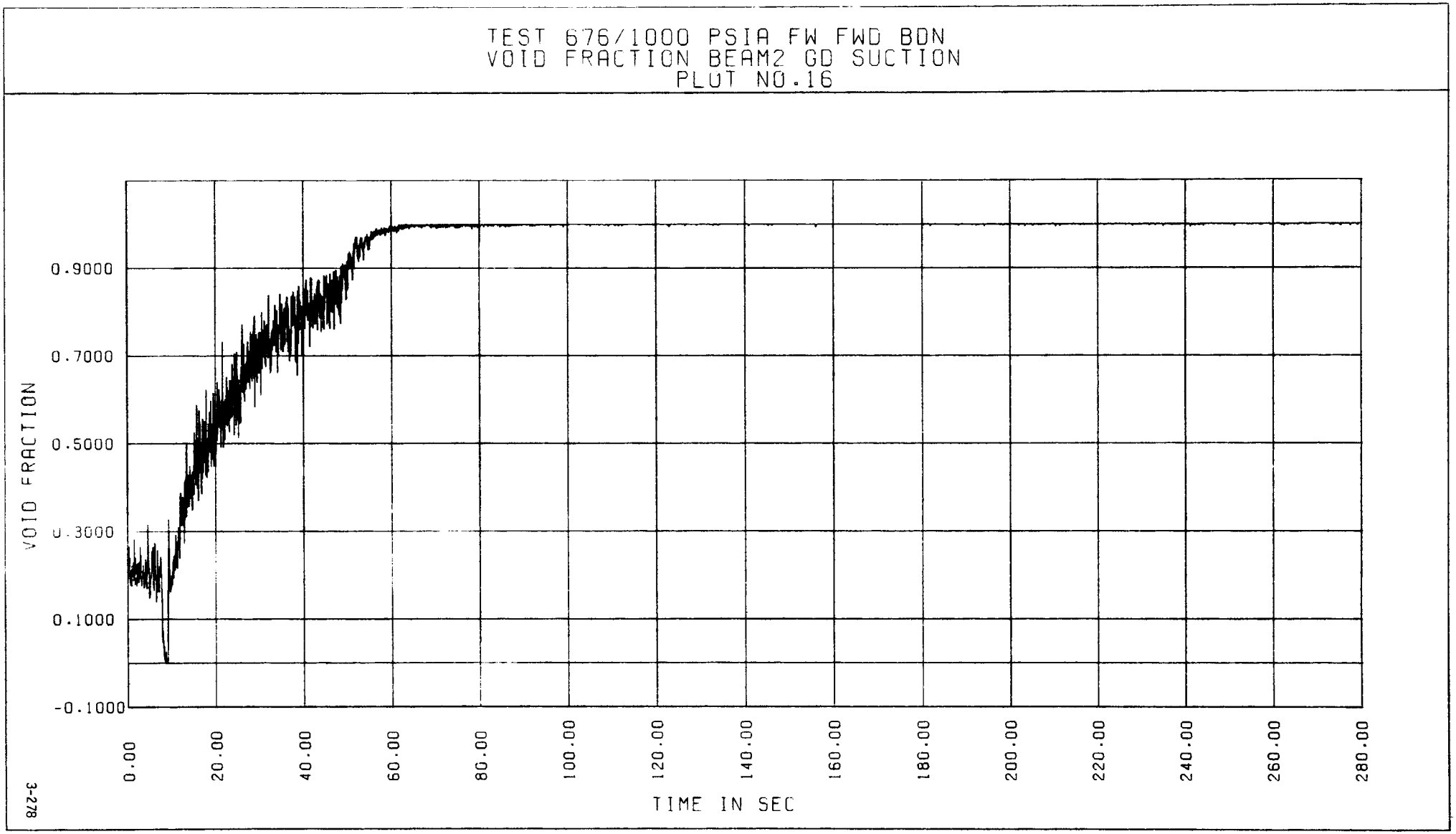


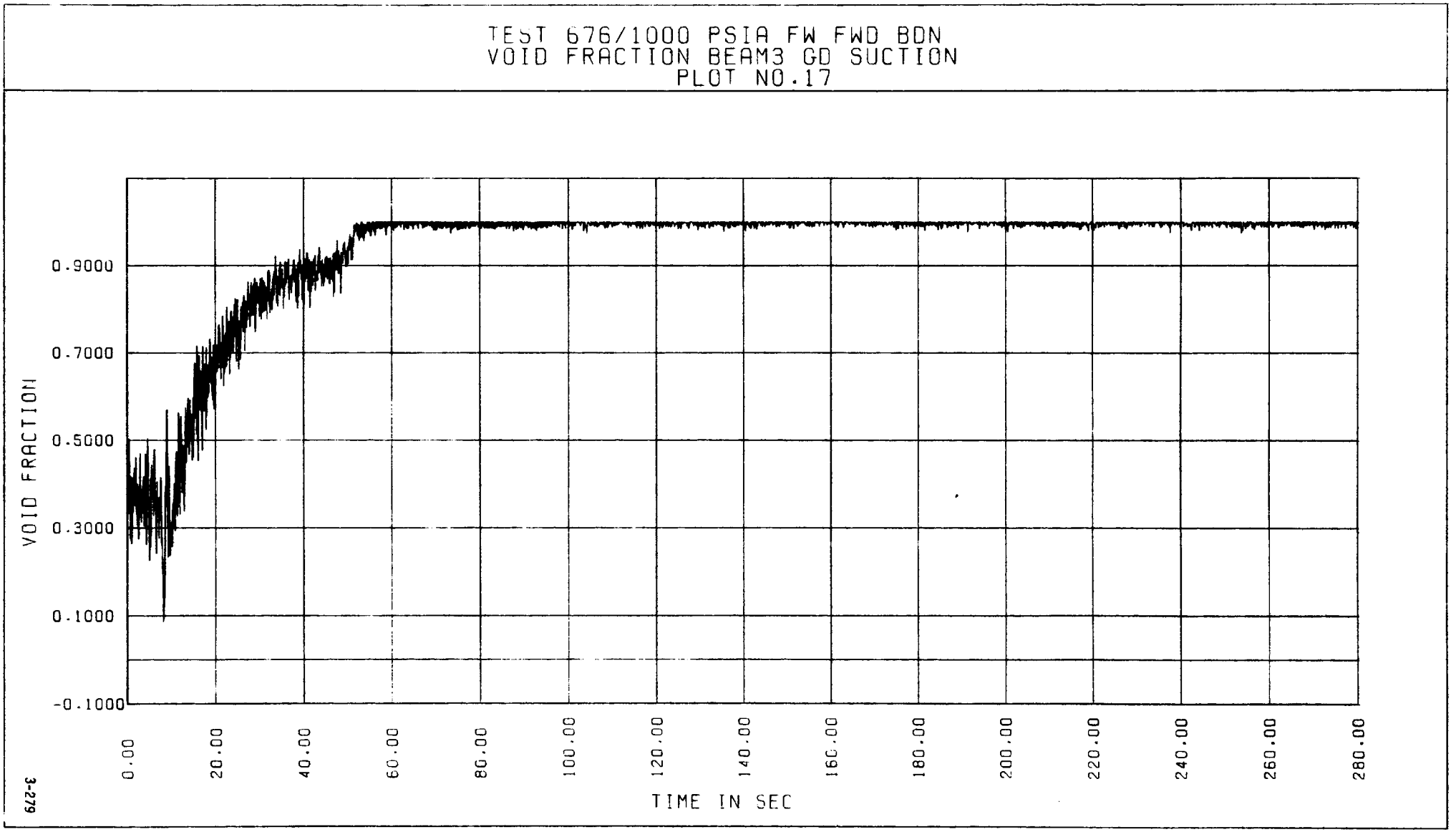

TEST 676/1000 PSIA FW FWD BDN
DENSITY BEAM2 AECL GD
PLOT NO.13
70.000
60.000
50.000
40.000
30.000
20.000
10.000
0.000
DENSITY, LBM/FT3
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-275

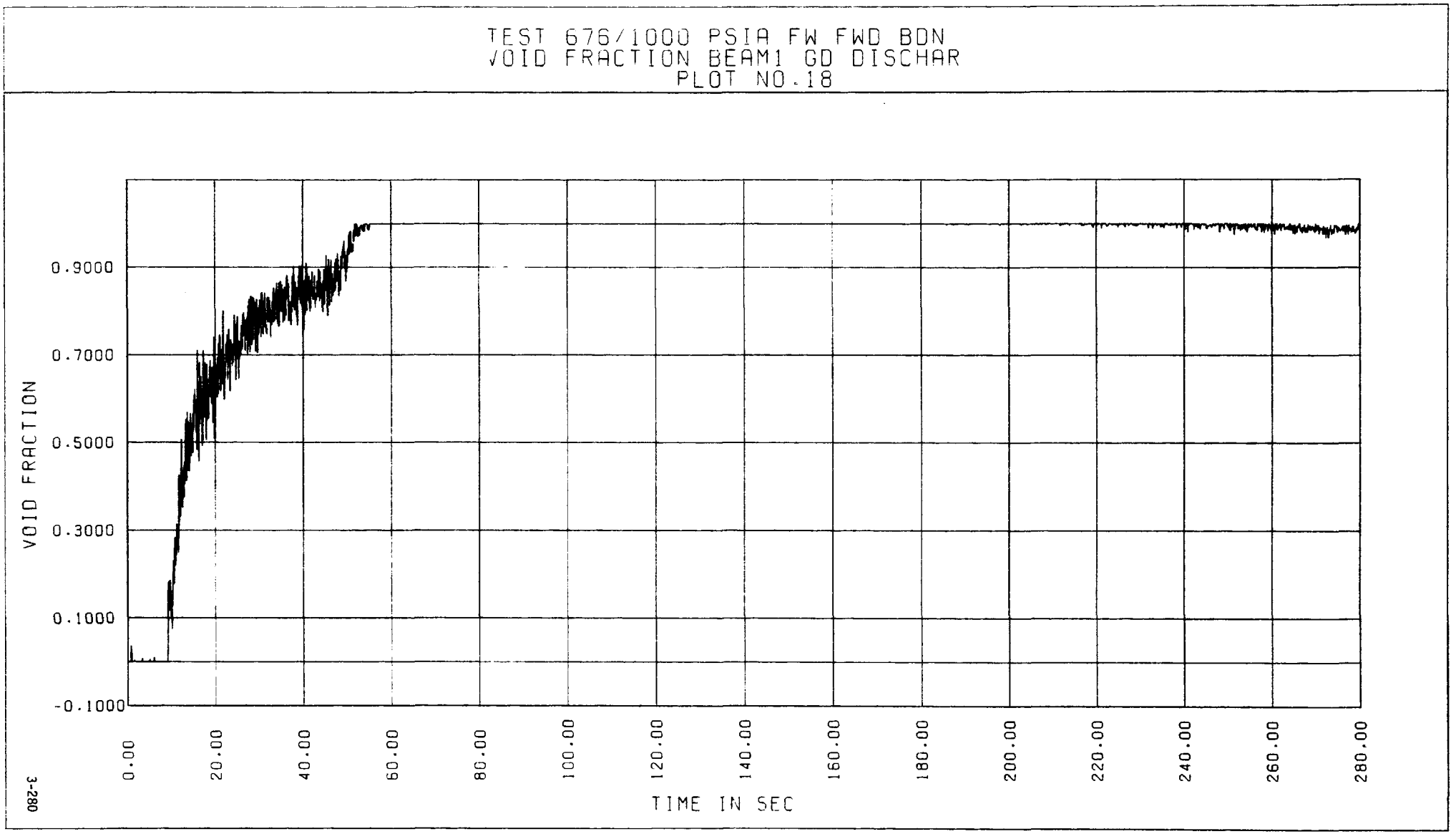
TEST 676/1000 PSIA FW FWD BDN
DENSITY BEAM3 AECL GD
PLOT NO.14

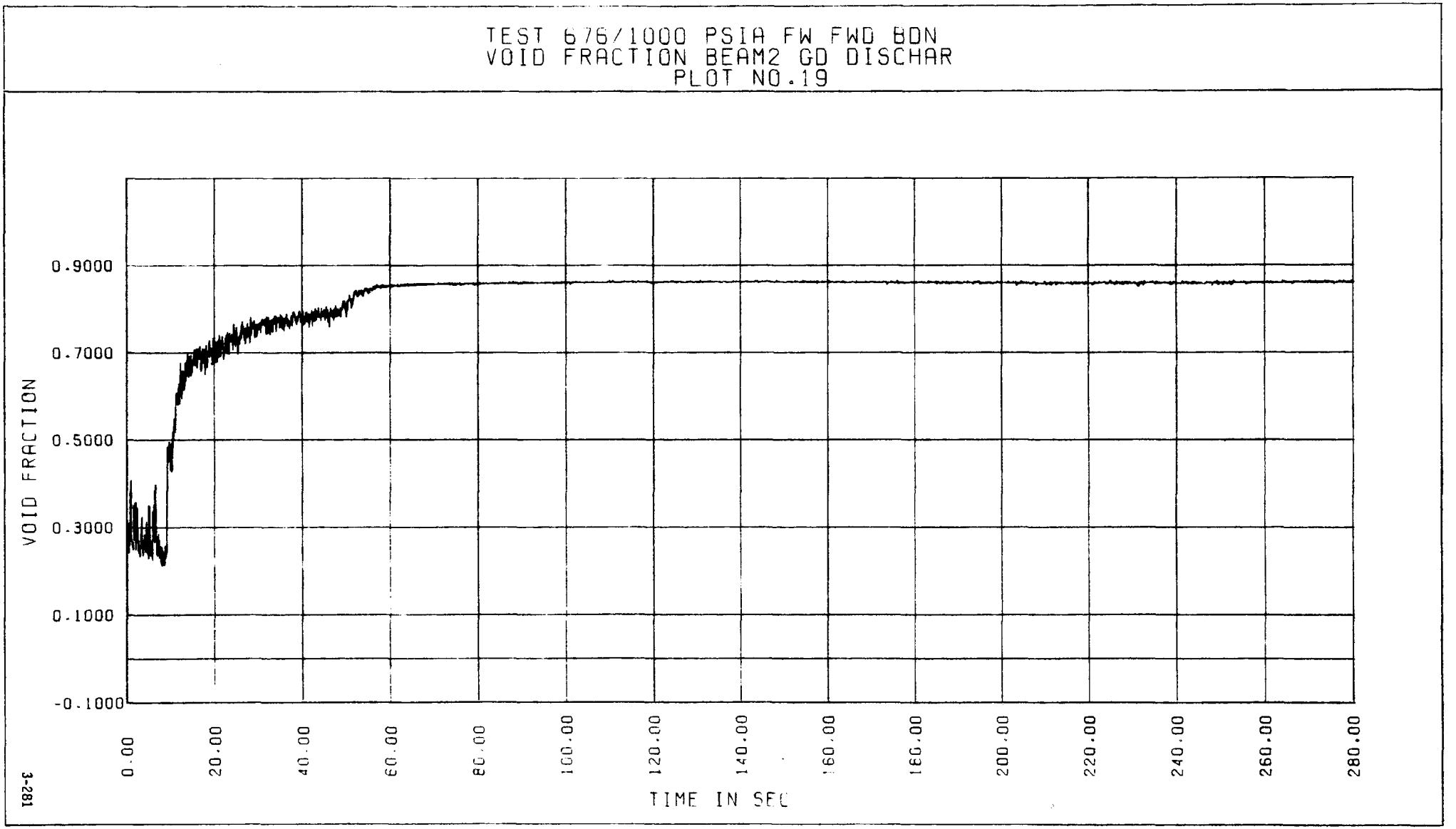


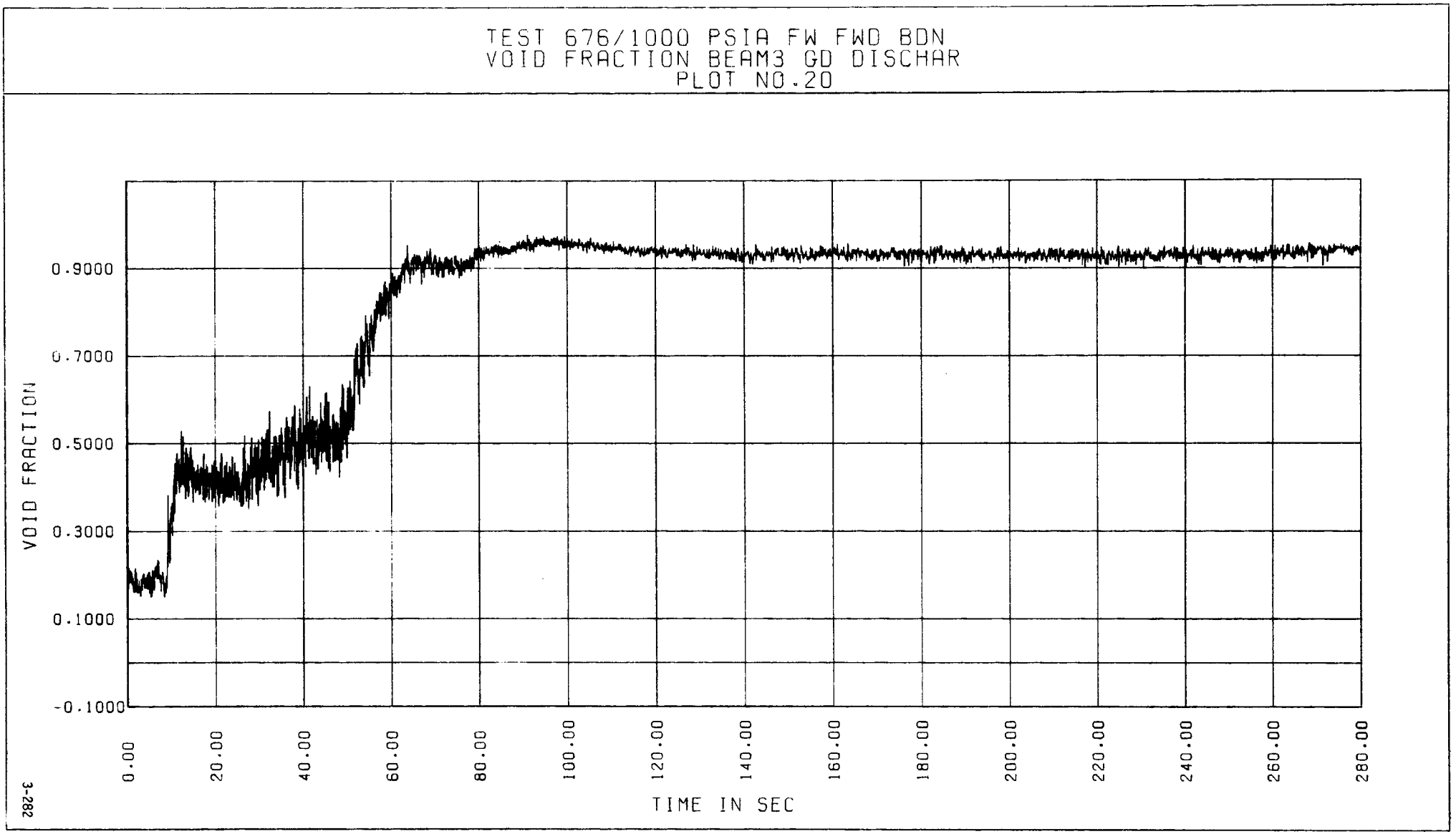

TEST 676/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-277

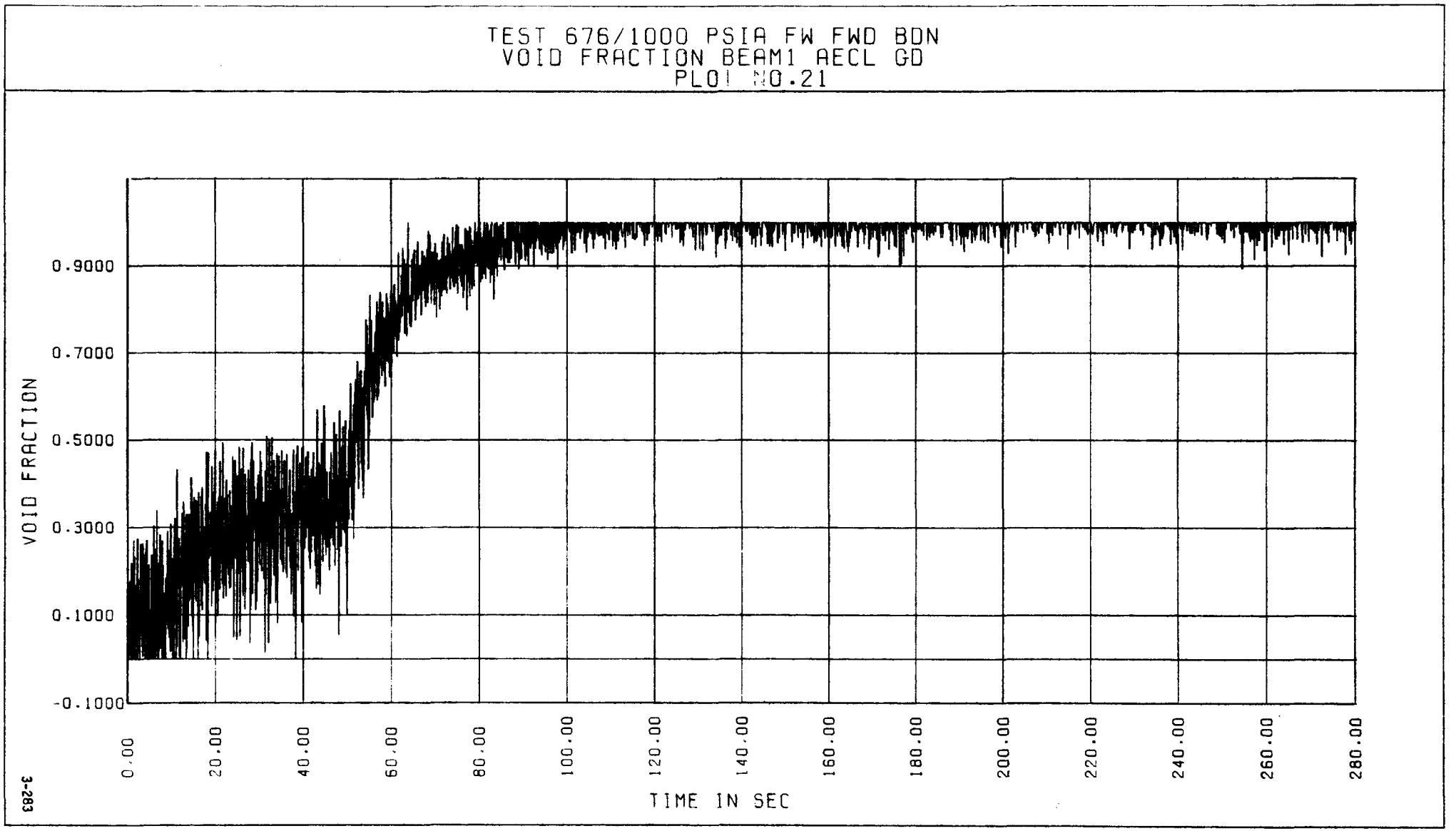

TEST 676/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 CD SUCTION
PLOT NO.16
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-278


TEST 676/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-279

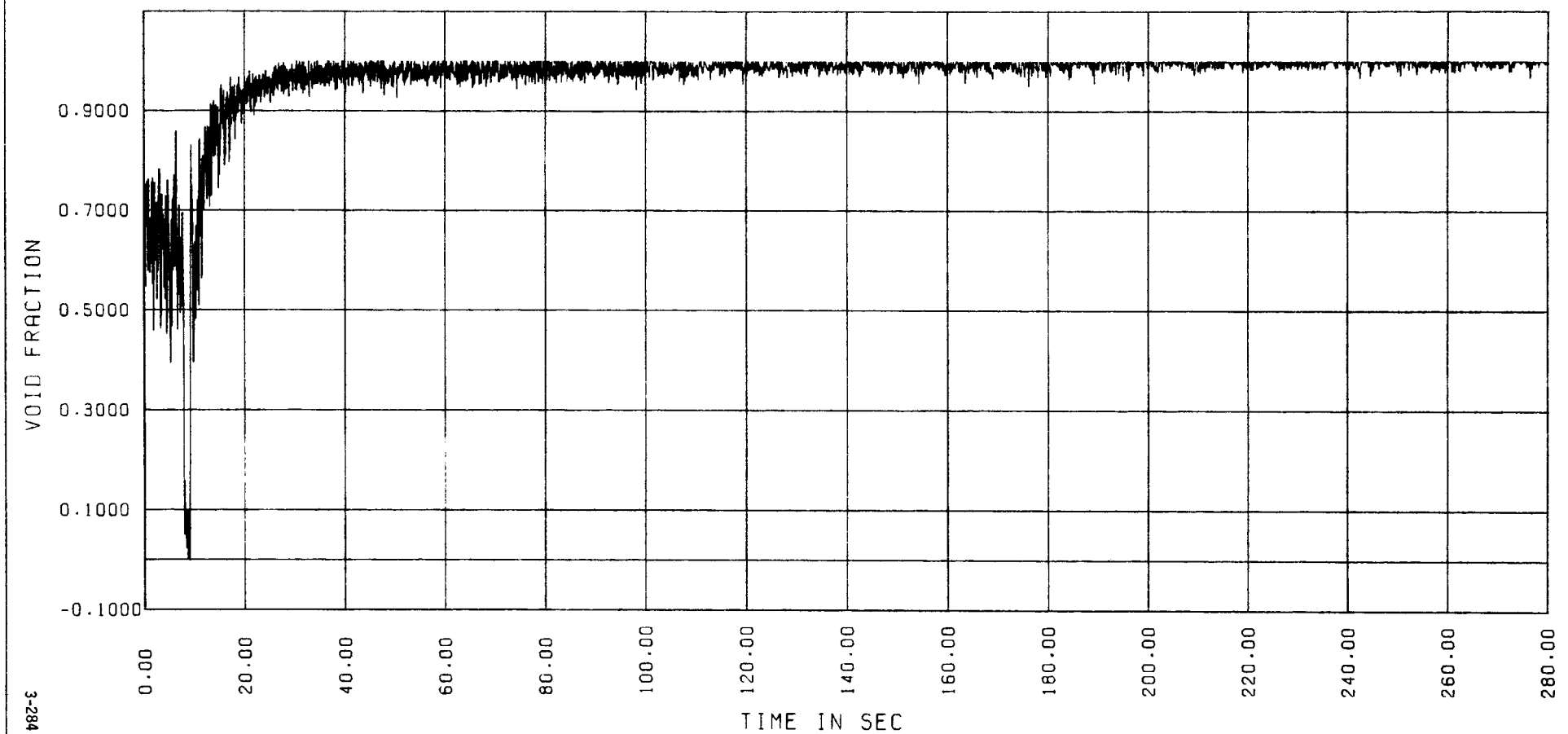

TEST 676/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-280


TEST 676/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-182

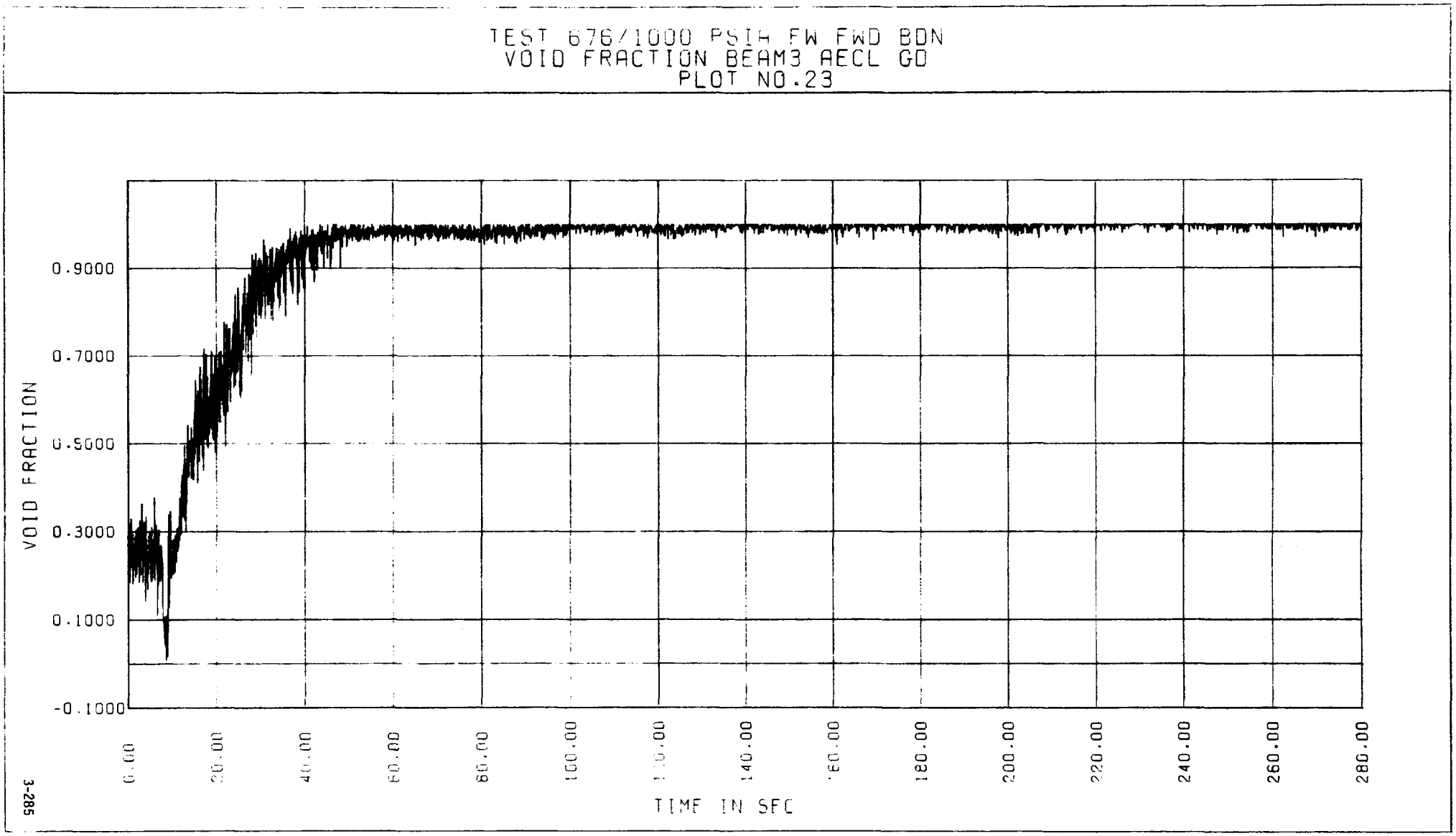

TEST 676/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
282-3


TEST 676/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

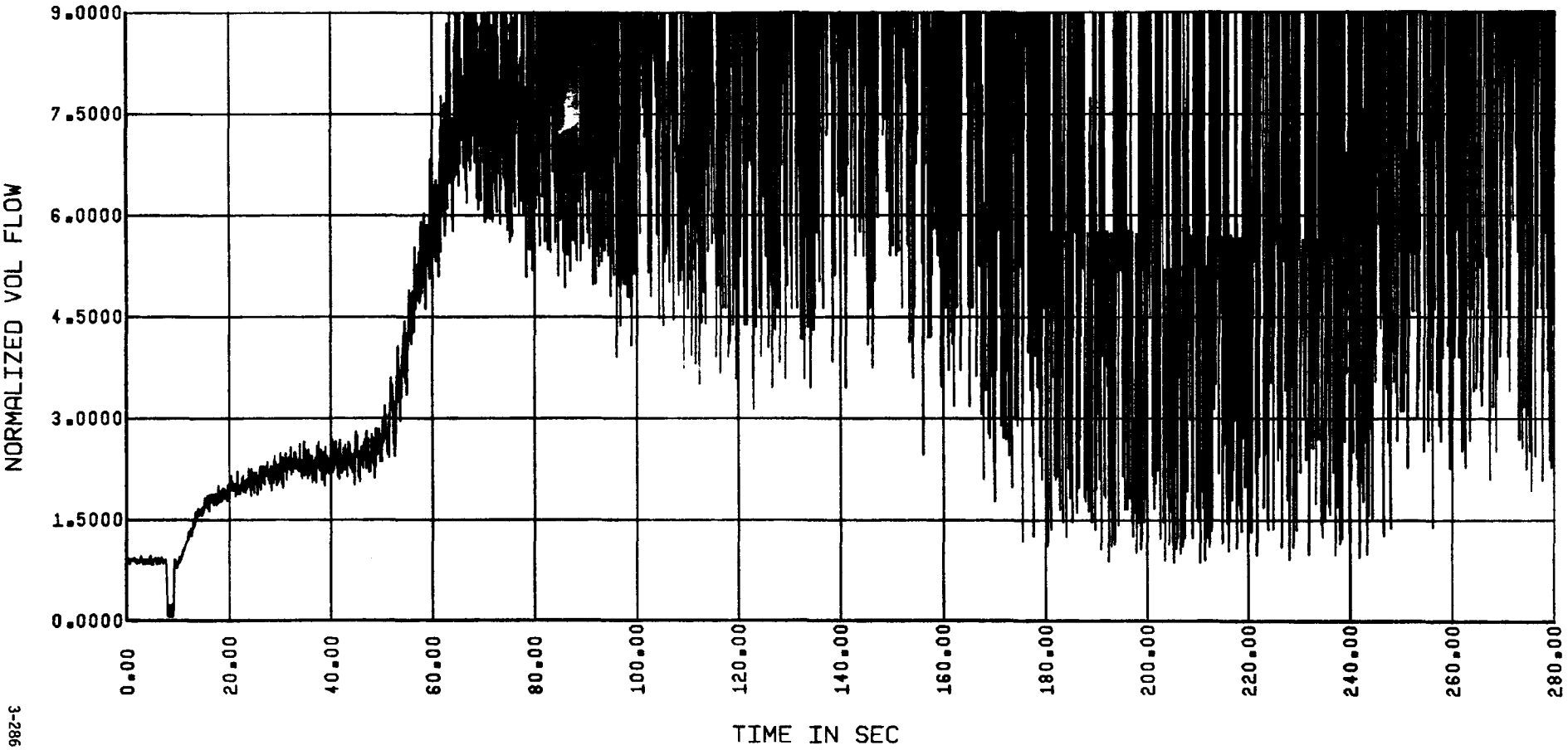
TEST 676/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22



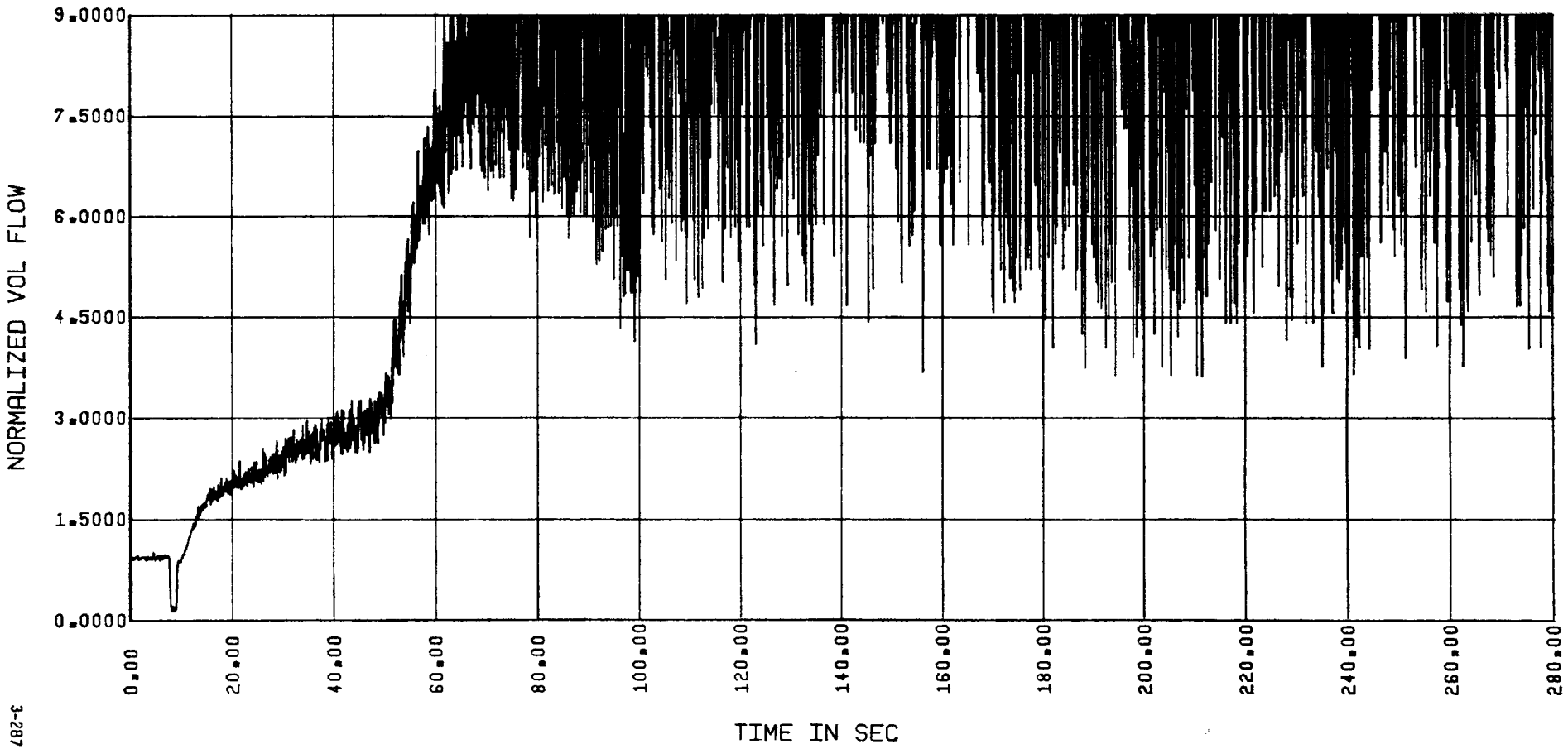
3-284


TEST 676/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

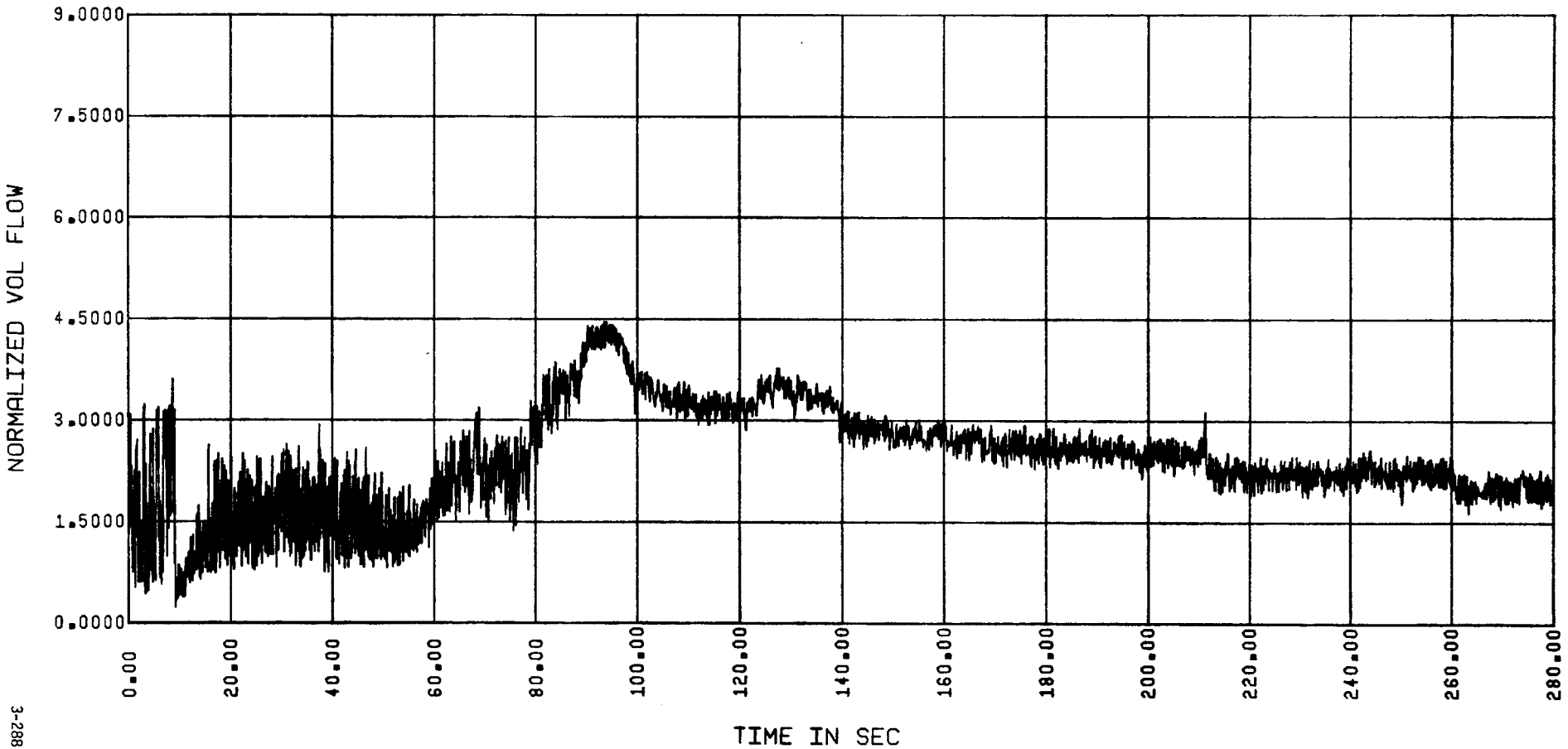
TEST 676/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-DD/GD2 S
PLOT NO.24



TEST 676/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-DD/GD2 S
PLOT NO.25

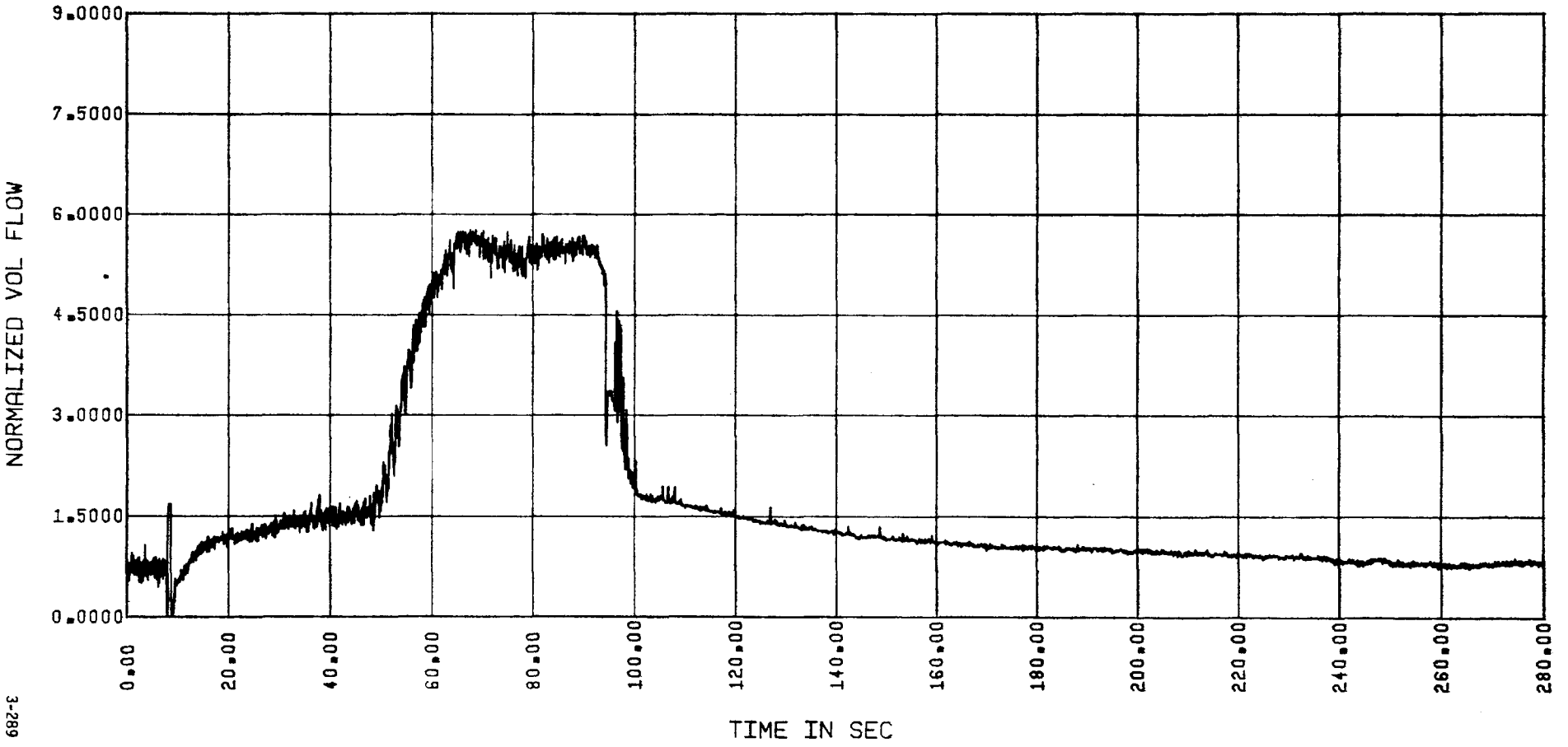


TEST 676/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-TM SUCT
PLOT NO.26



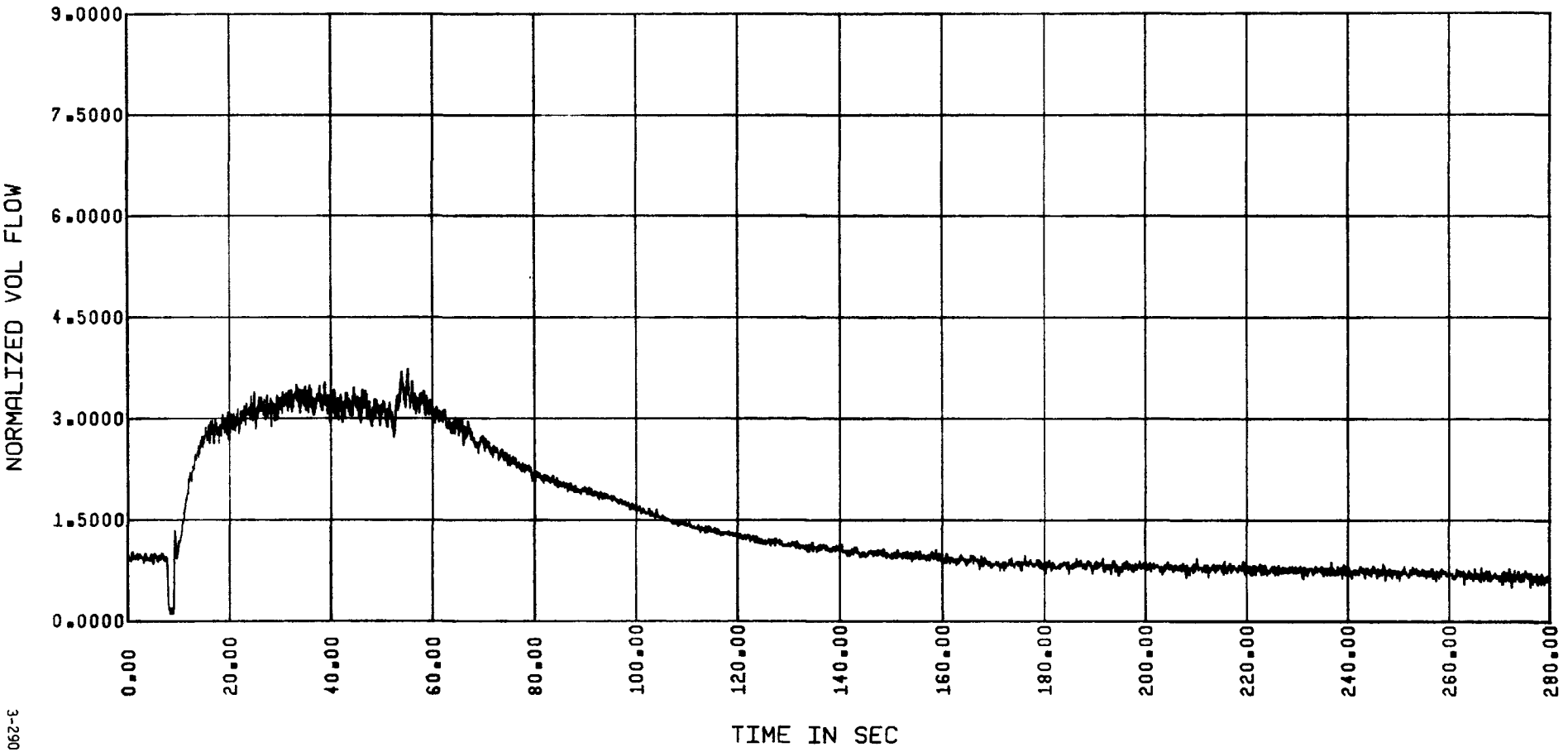
3-288

TEST 676/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-TM SUCT
PLOT NO.27

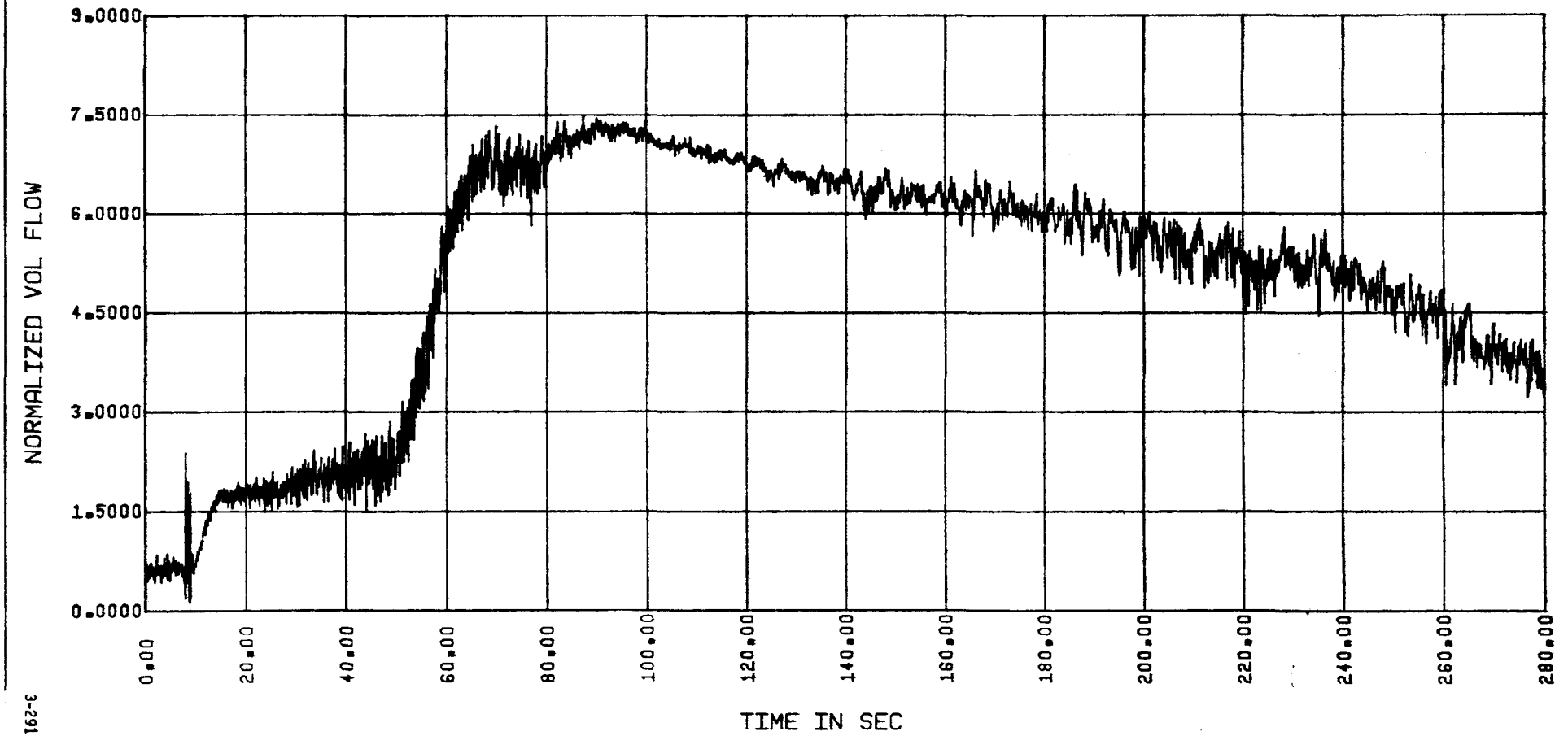


3-289

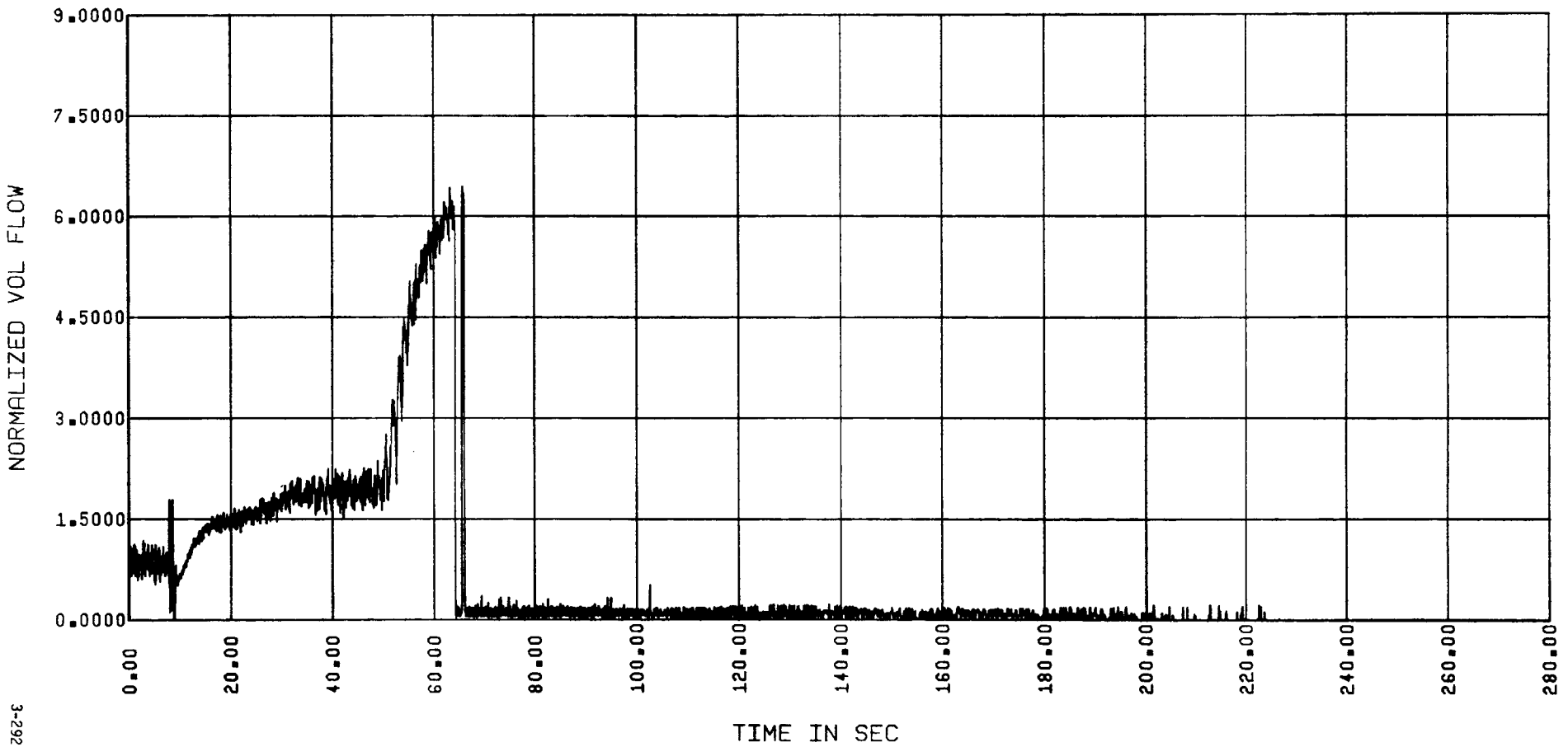
TEST 676/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-DD/GD2 D
PLOT NO.29



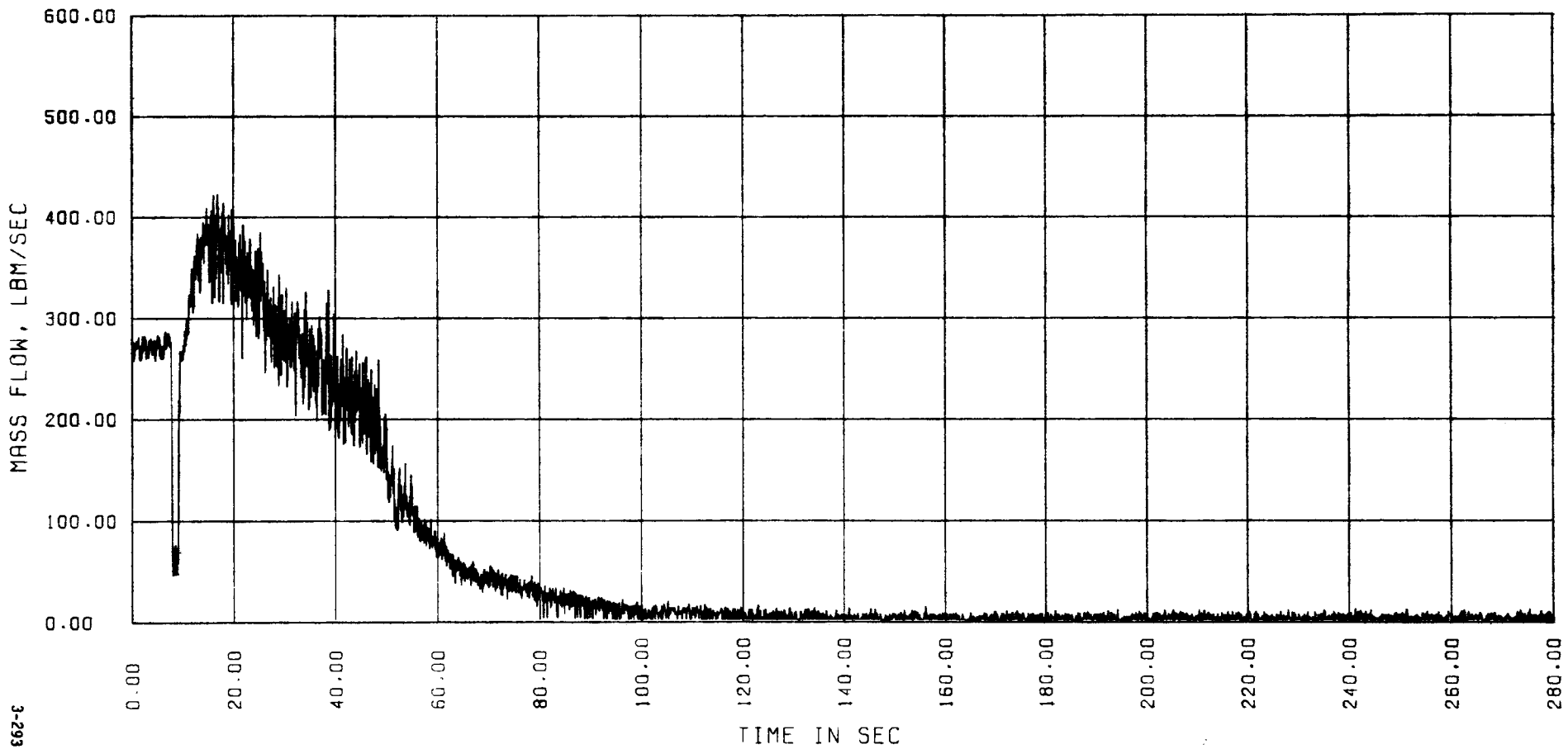
TEST 676/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-TM DSCH
PLOT NO.30



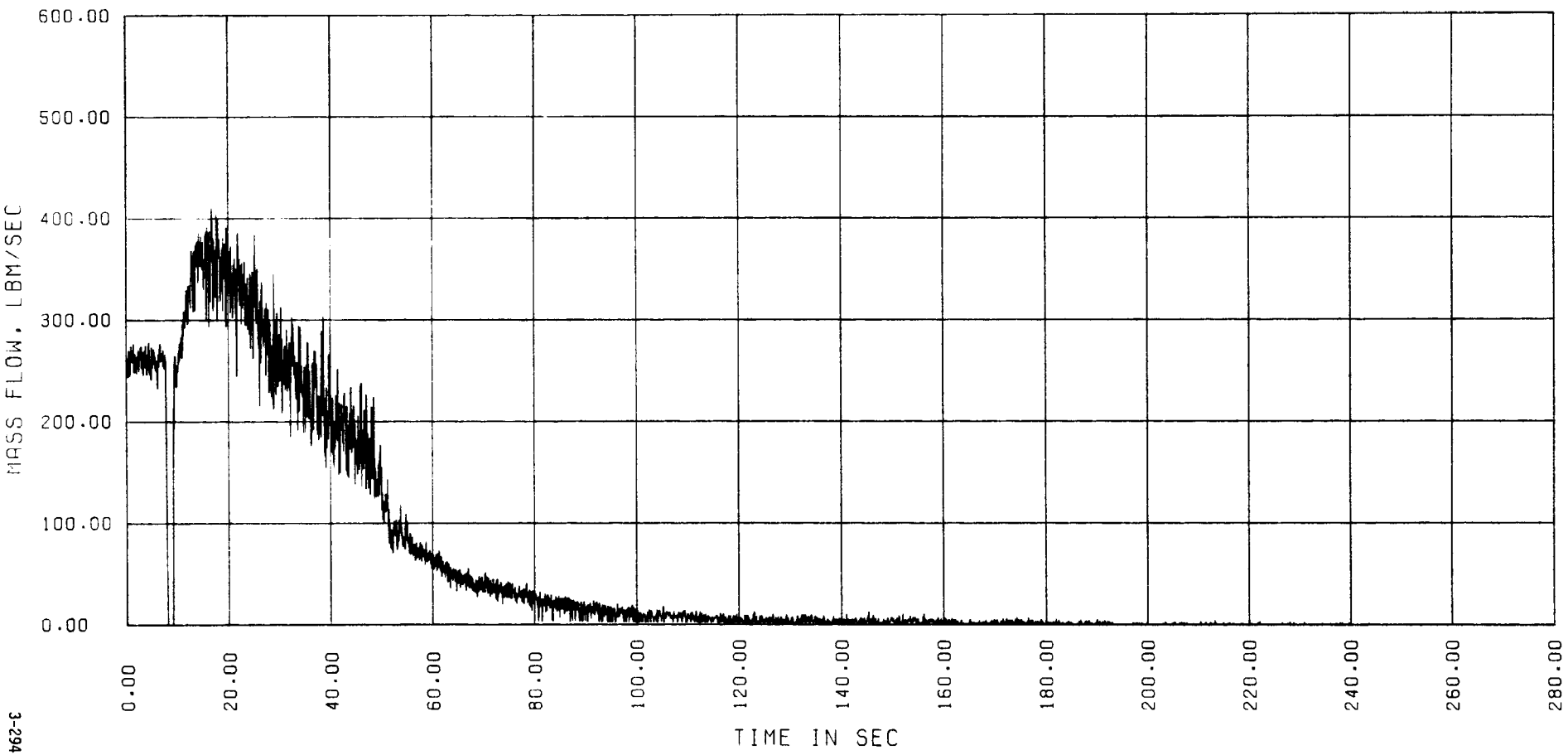
TEST 676/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-TM DSCH
PLOT NO.31



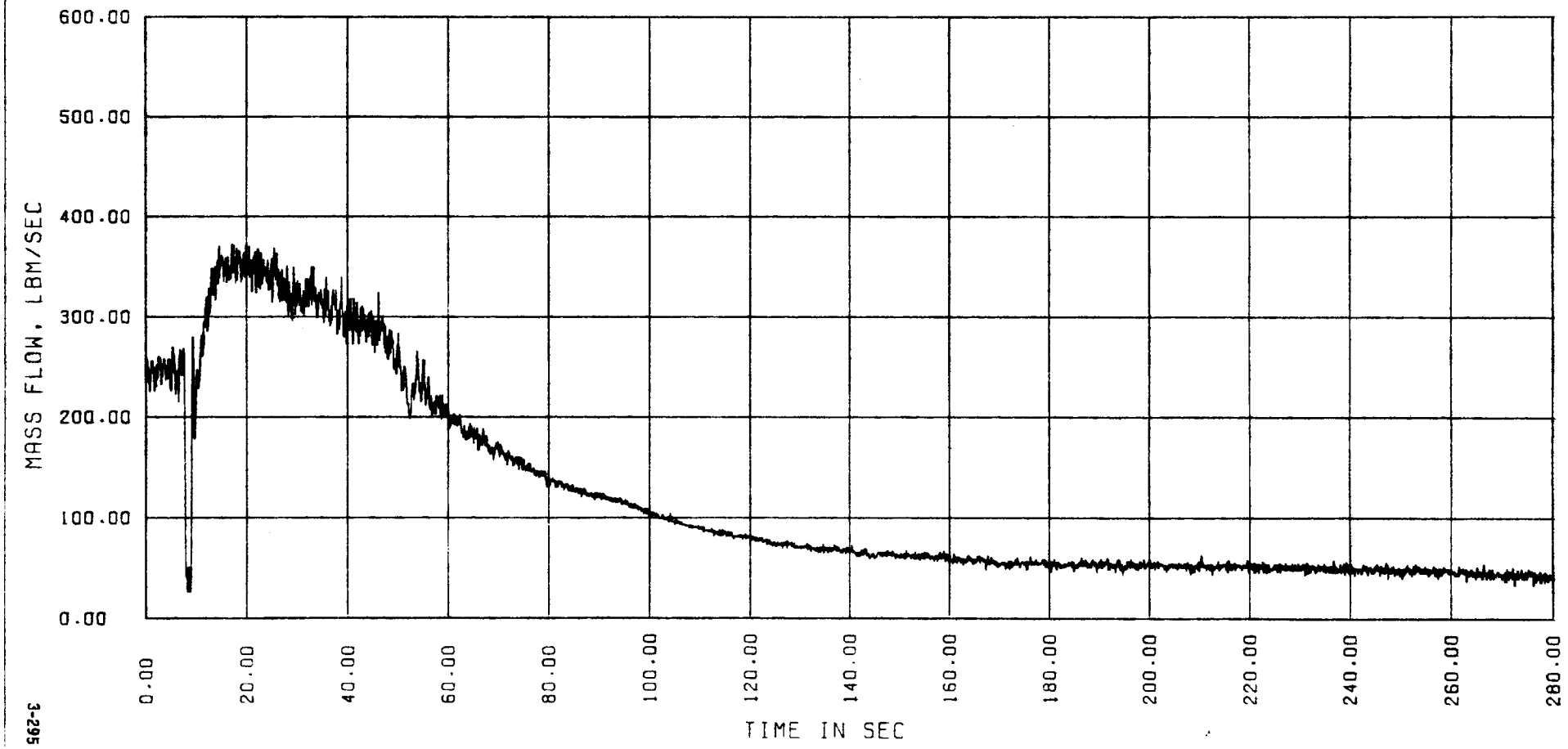
TEST 676/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-OD/GD2 SUCT
PLOT NO.32



TEST 676/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.33

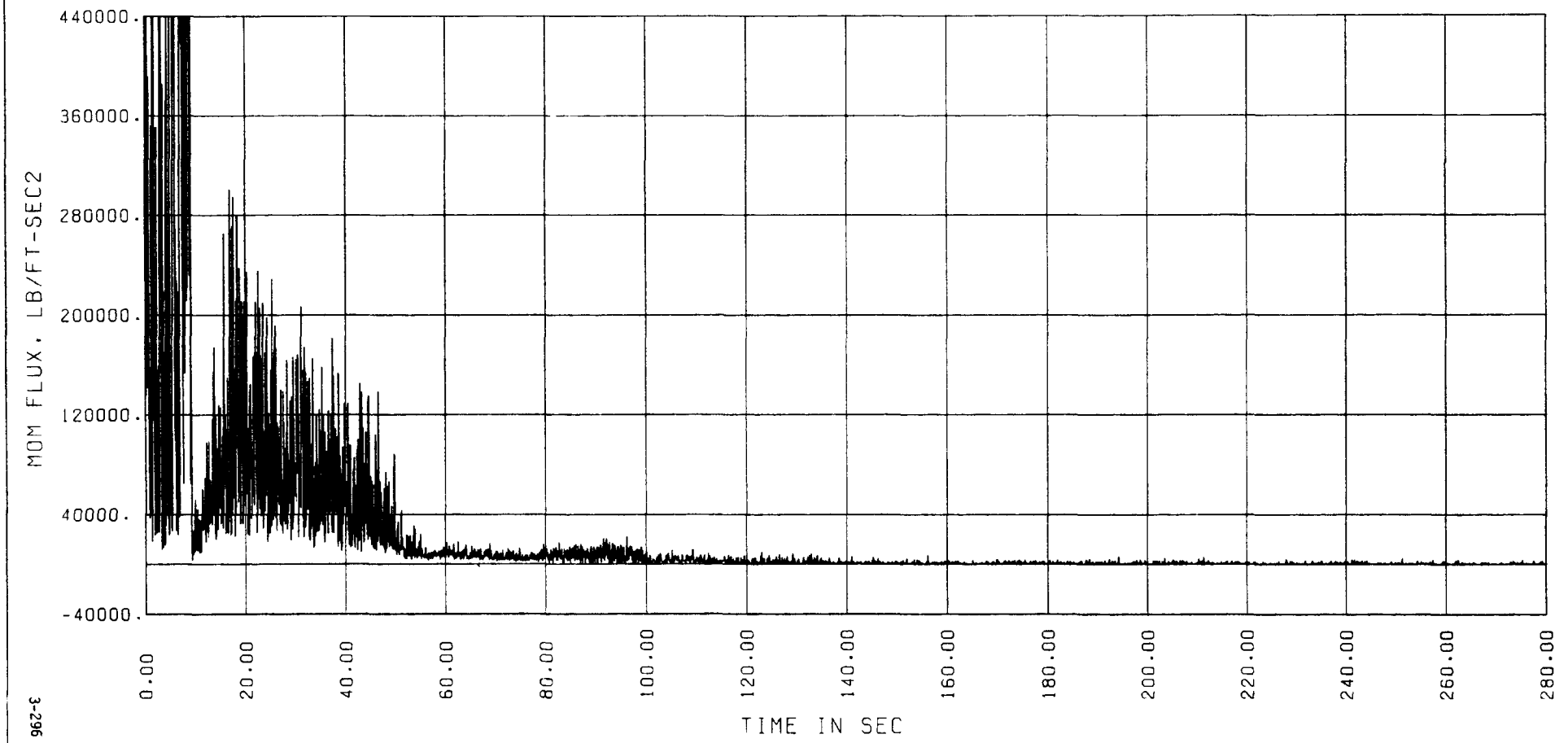


TEST 676/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-OD/GD2 DISCH
PLOT NO.34

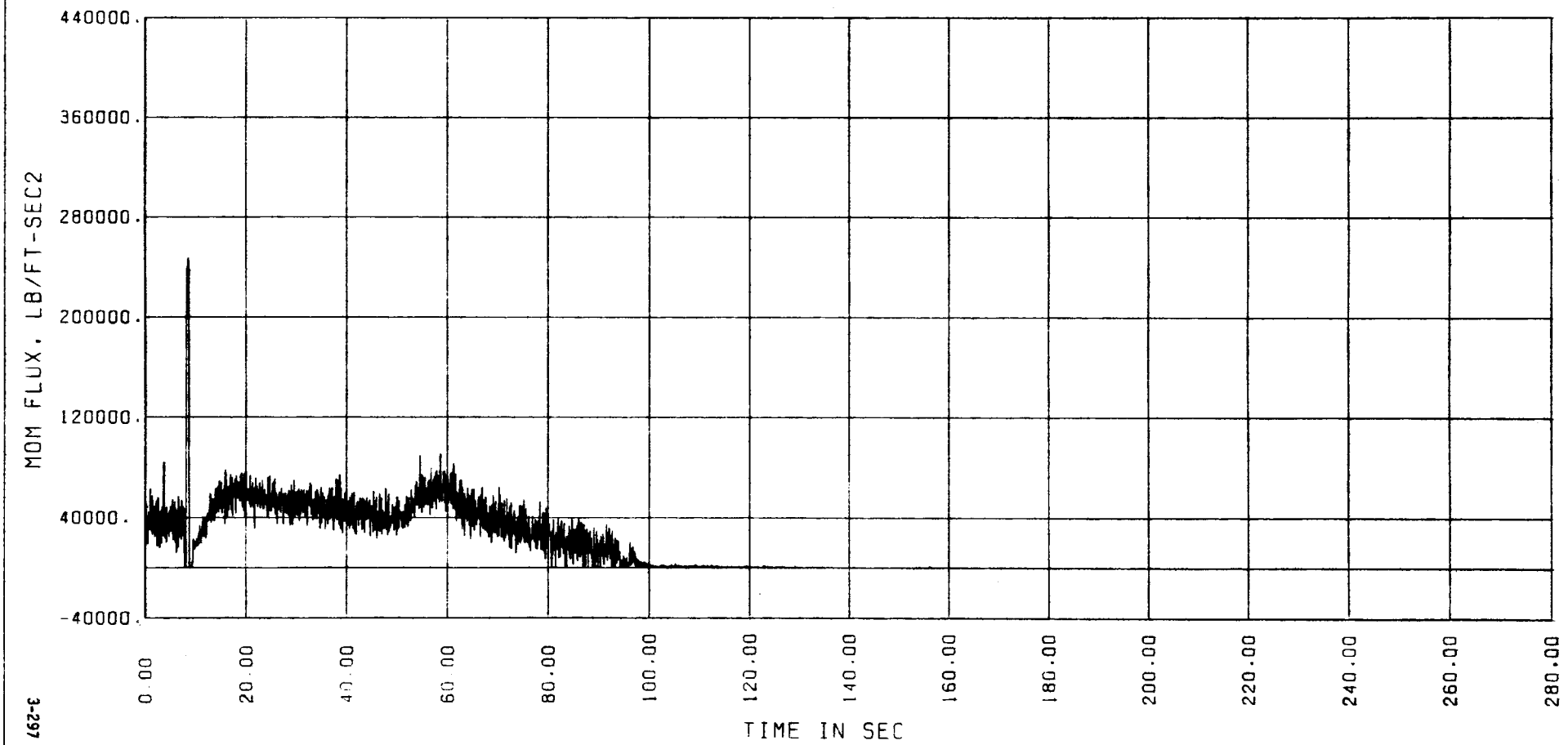


3-295

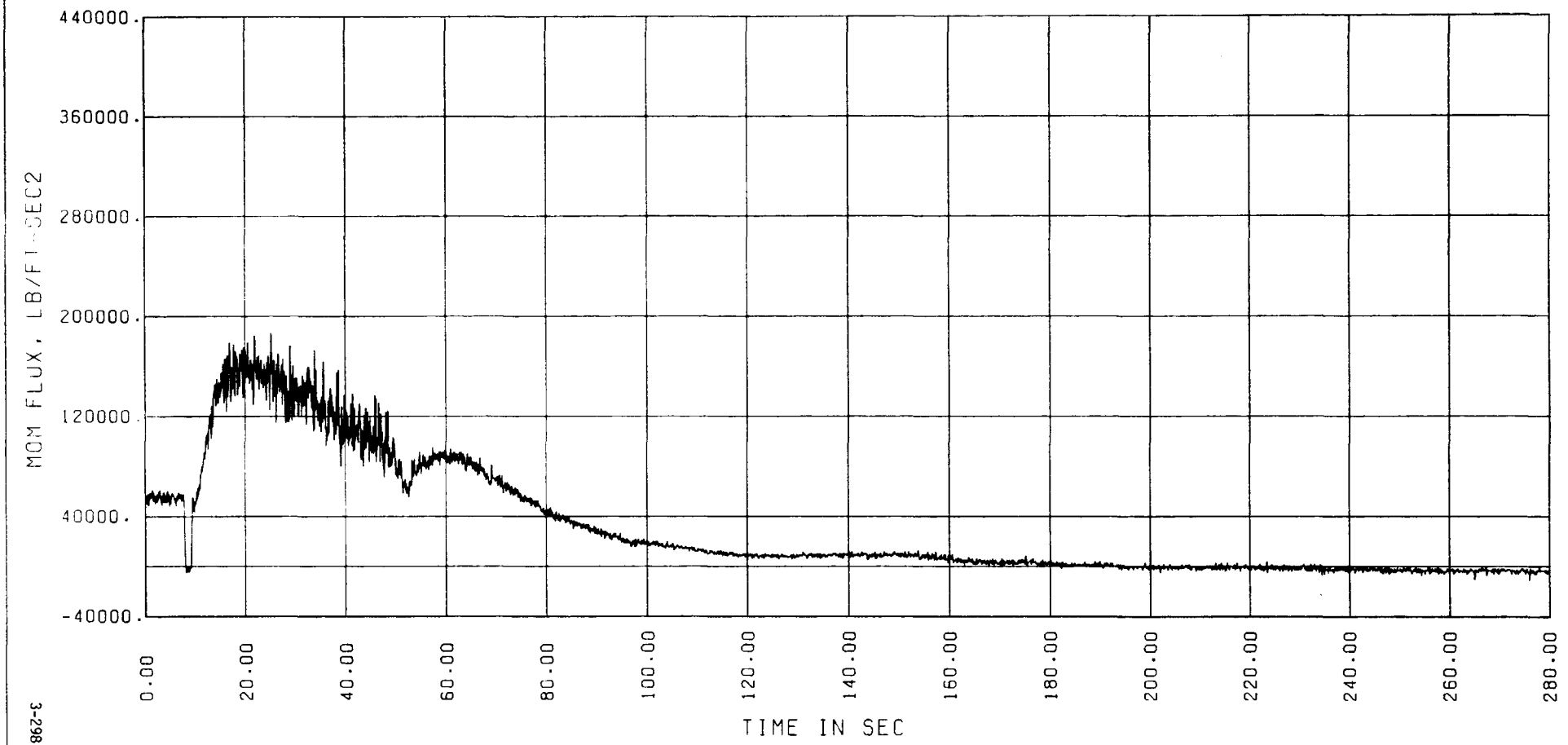
TEST 676/1000 PSIA FW FWD BDN
MOMENTUM FLUX GO2/LO-TM SUCT
PLOT NO.36



TEST 676/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.37



TEST 676/1000 PSIA FW FWD BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



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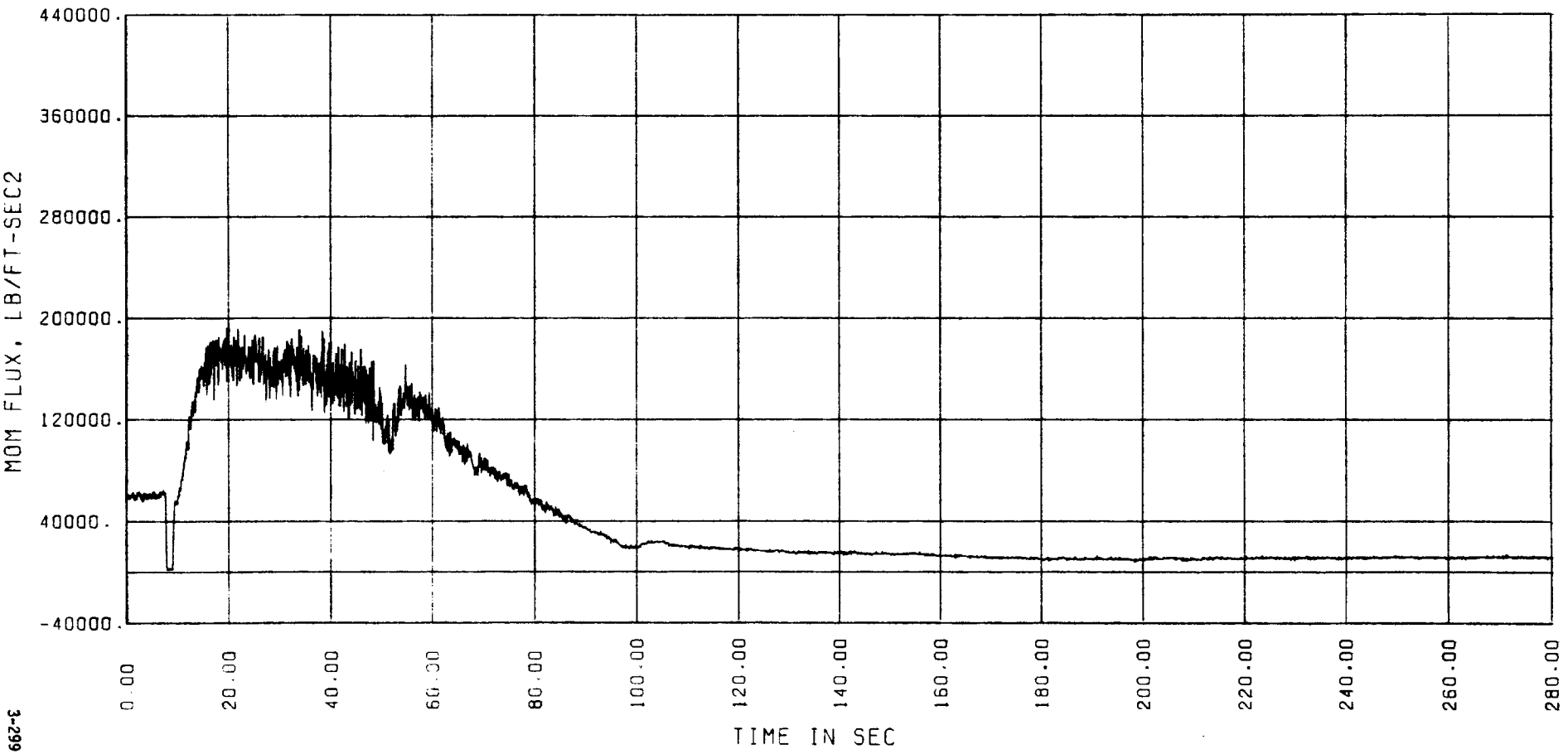
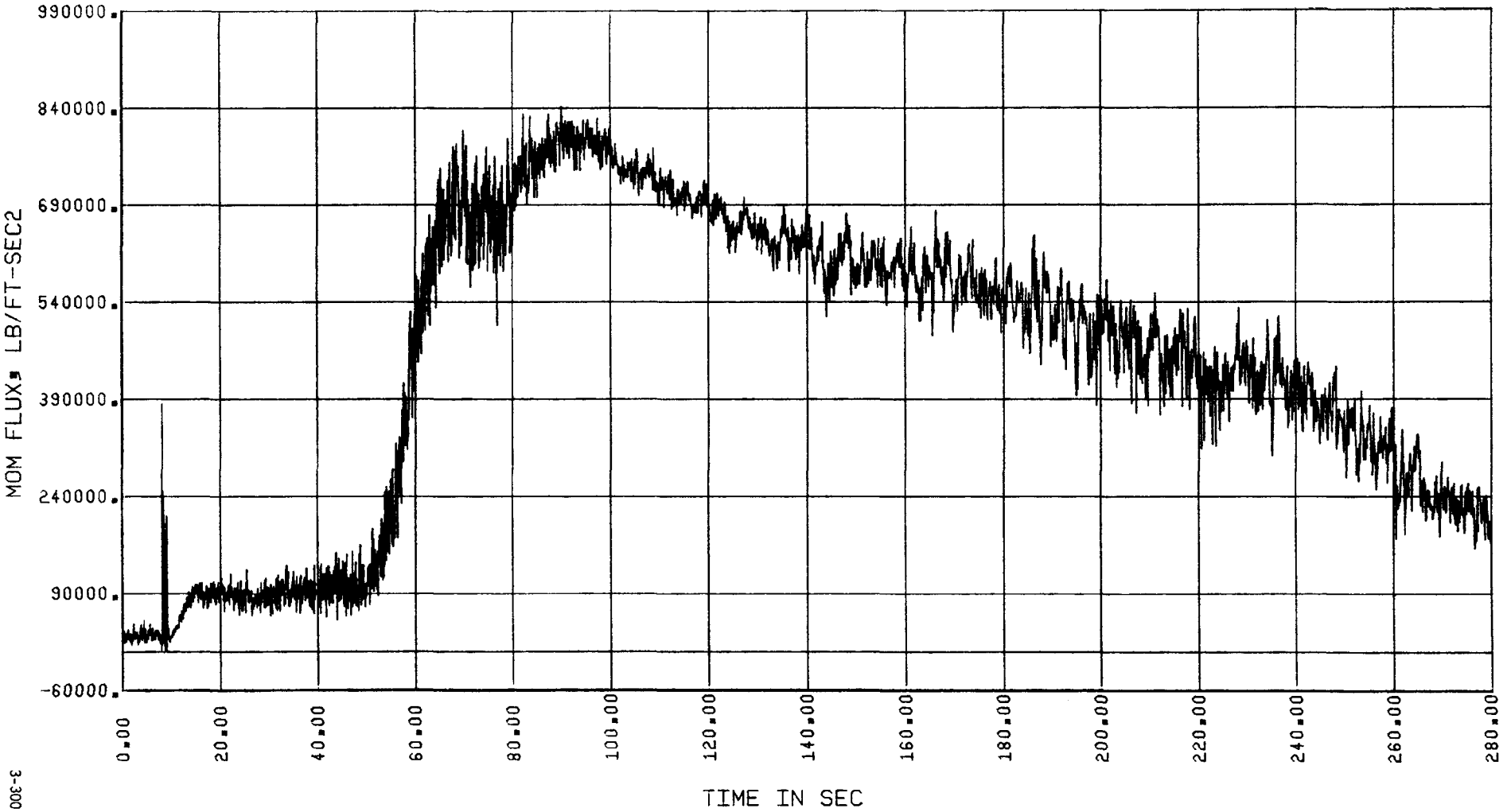
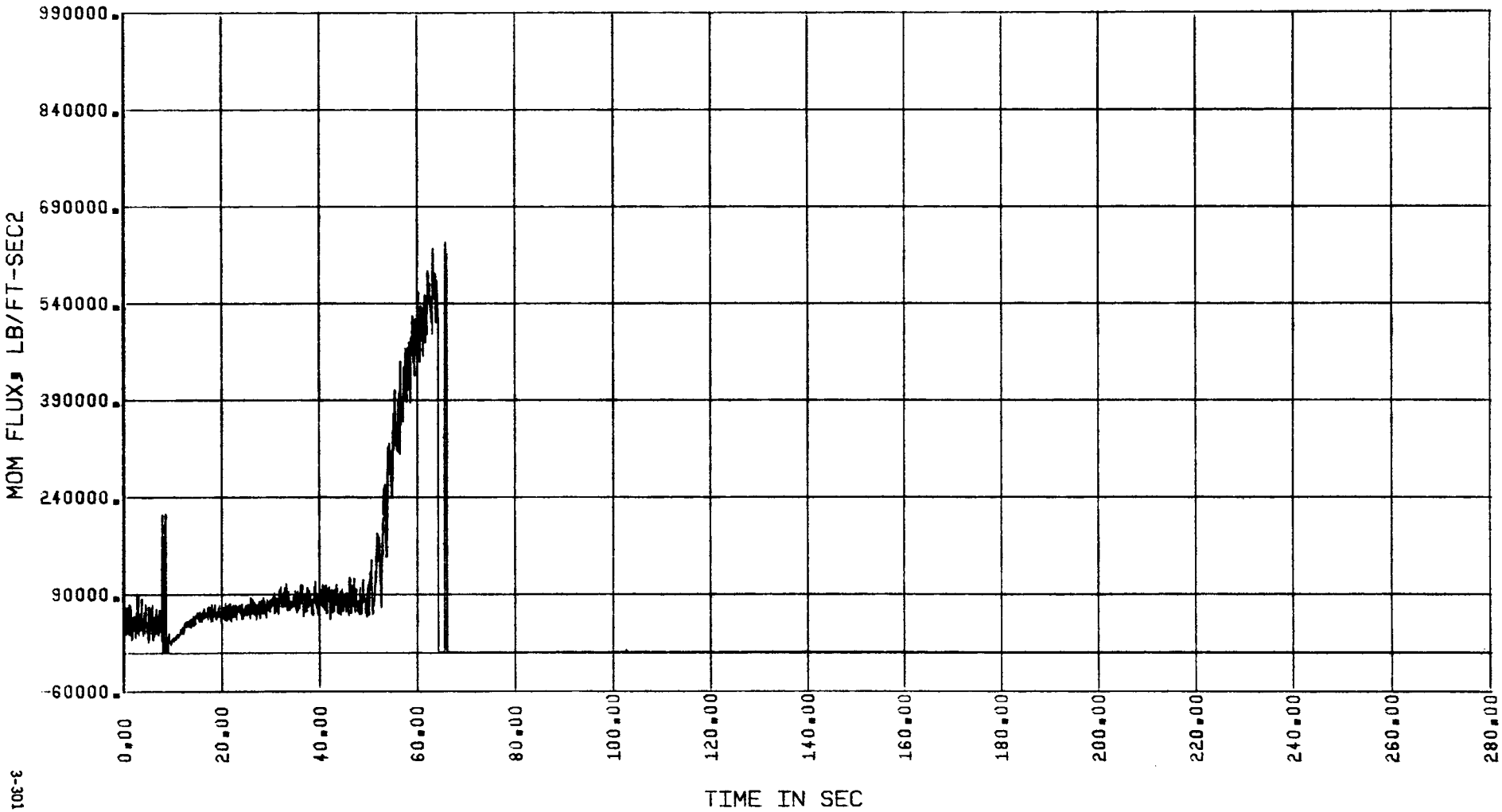
TEST 676/1000 PSIA FW FWD BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39



TEST 676/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/LO-TM DSCH
PLOT NO.40



TEST 676/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/HI-TM DSCH
PLOT NO.41



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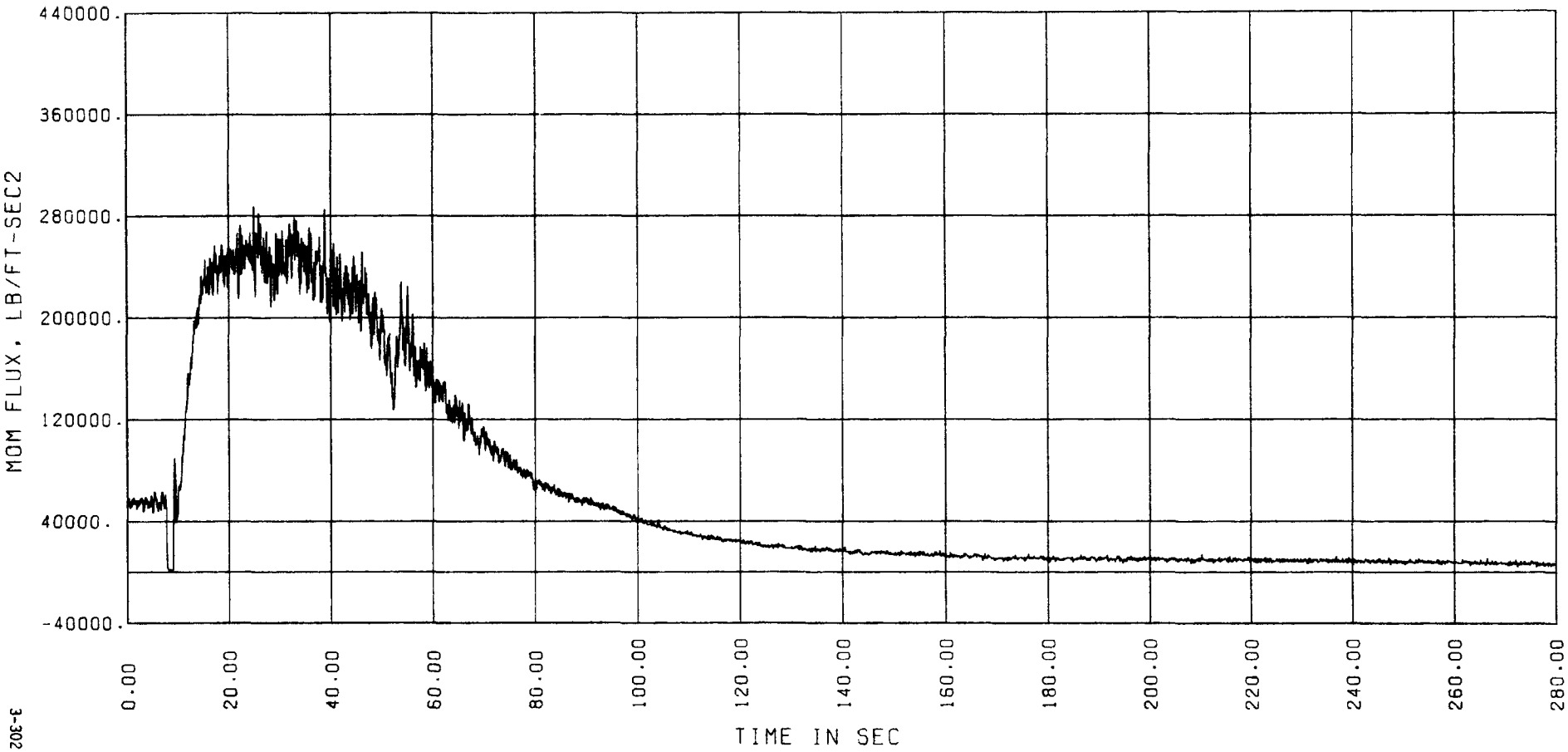
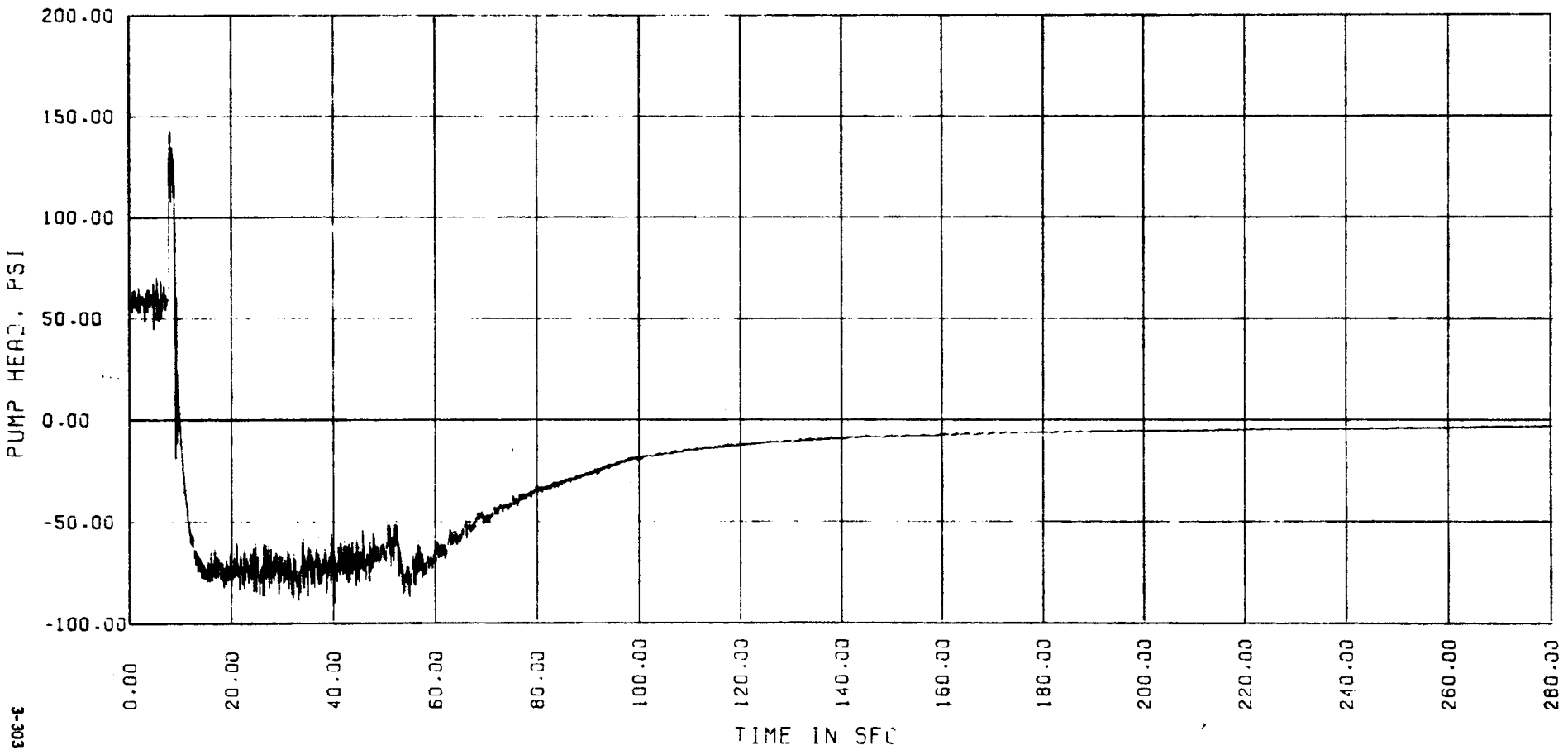
TEST 676/1000 PSIA FW FWD BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.43

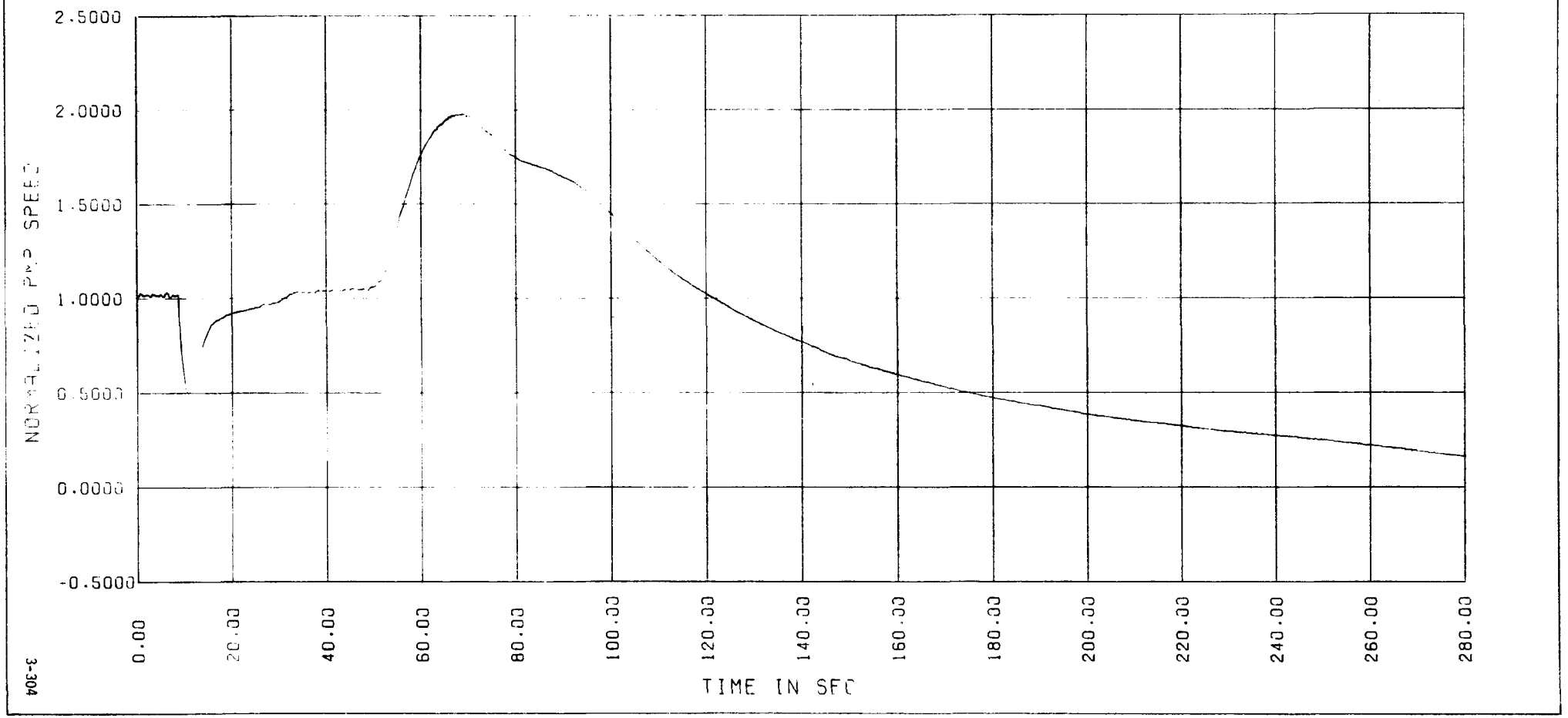


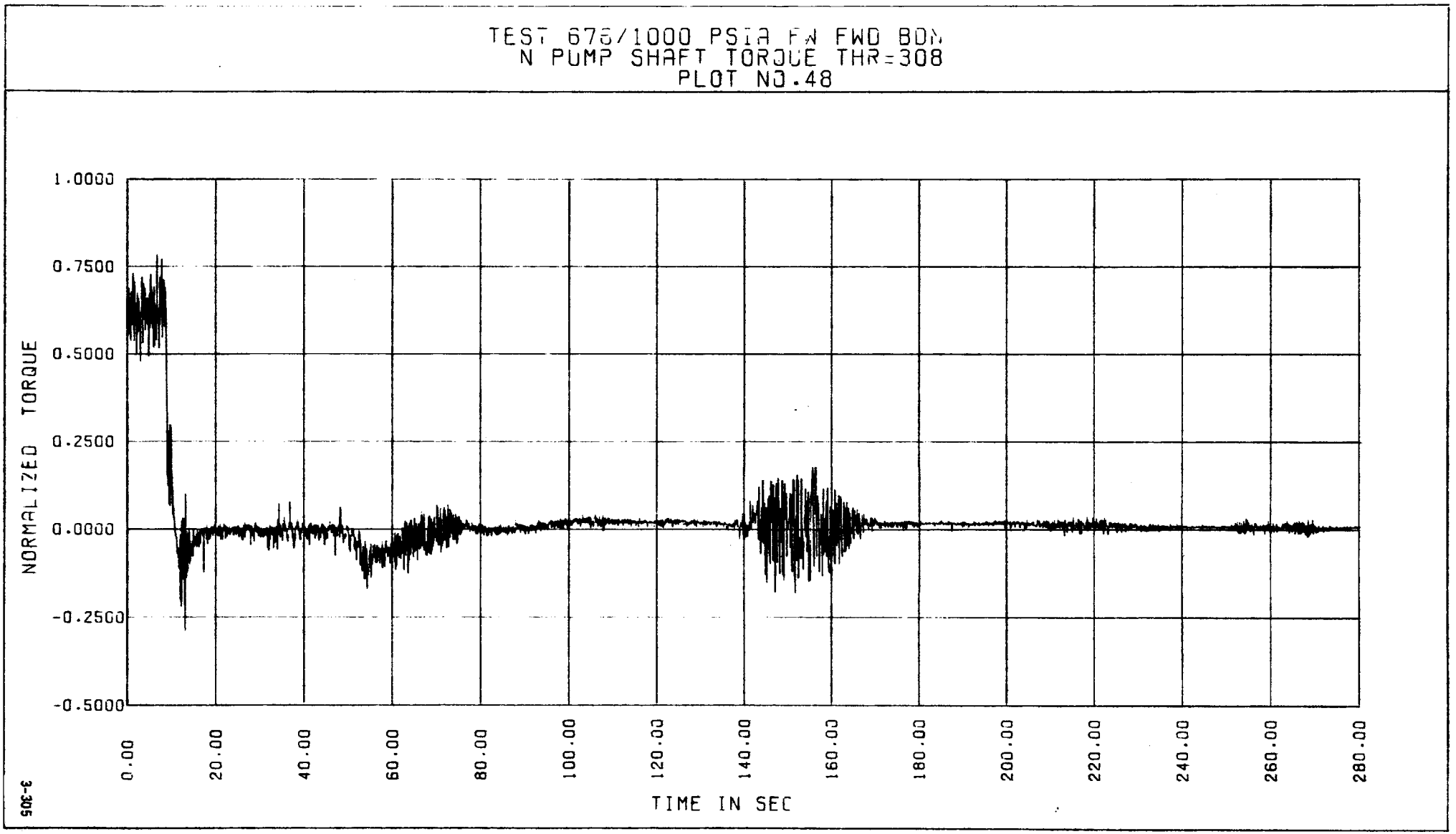
TEST 676/1000 PSIA FW FWD BDN
PUMP HEAD IN PSI
PLOT NO.44

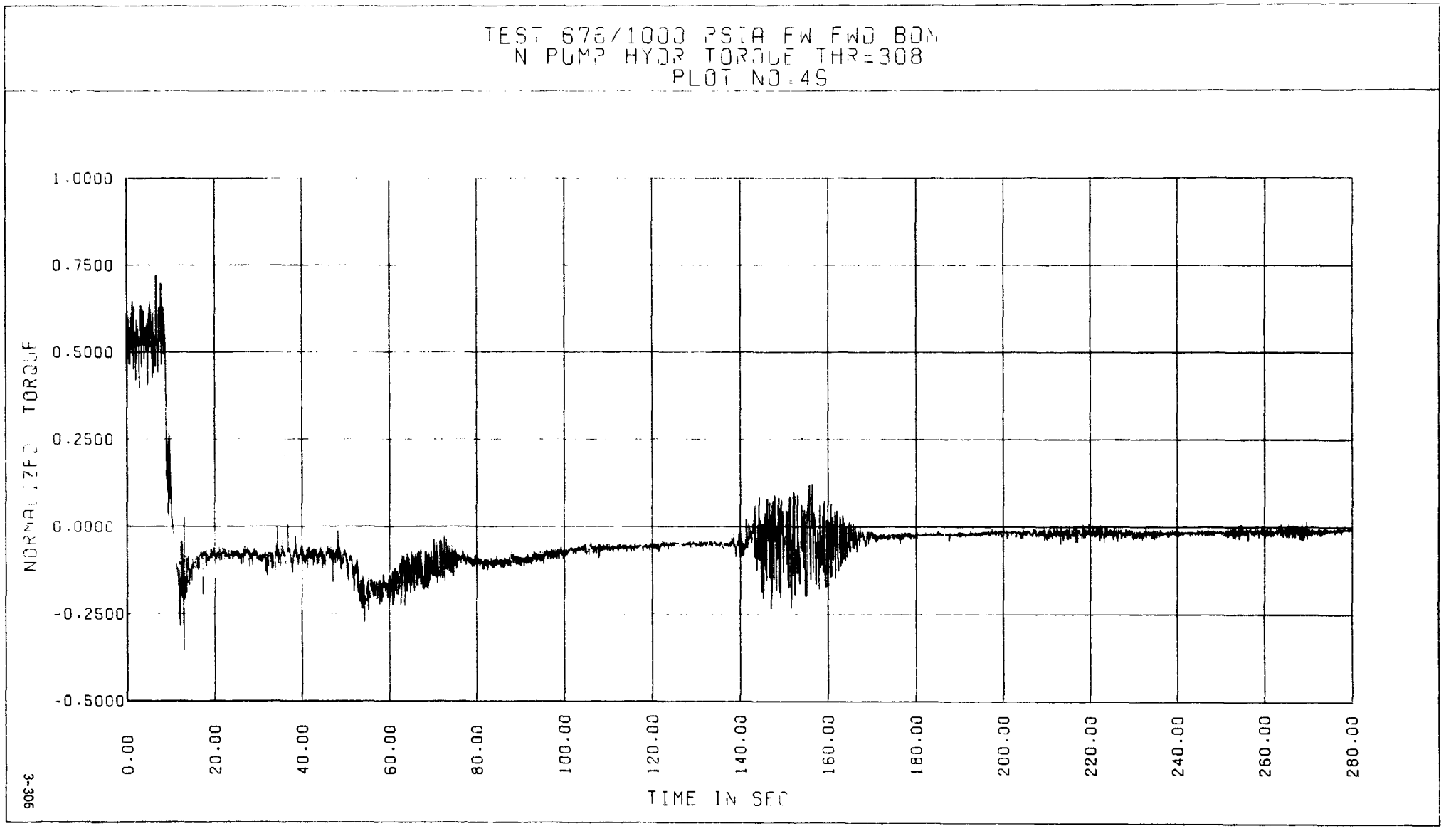


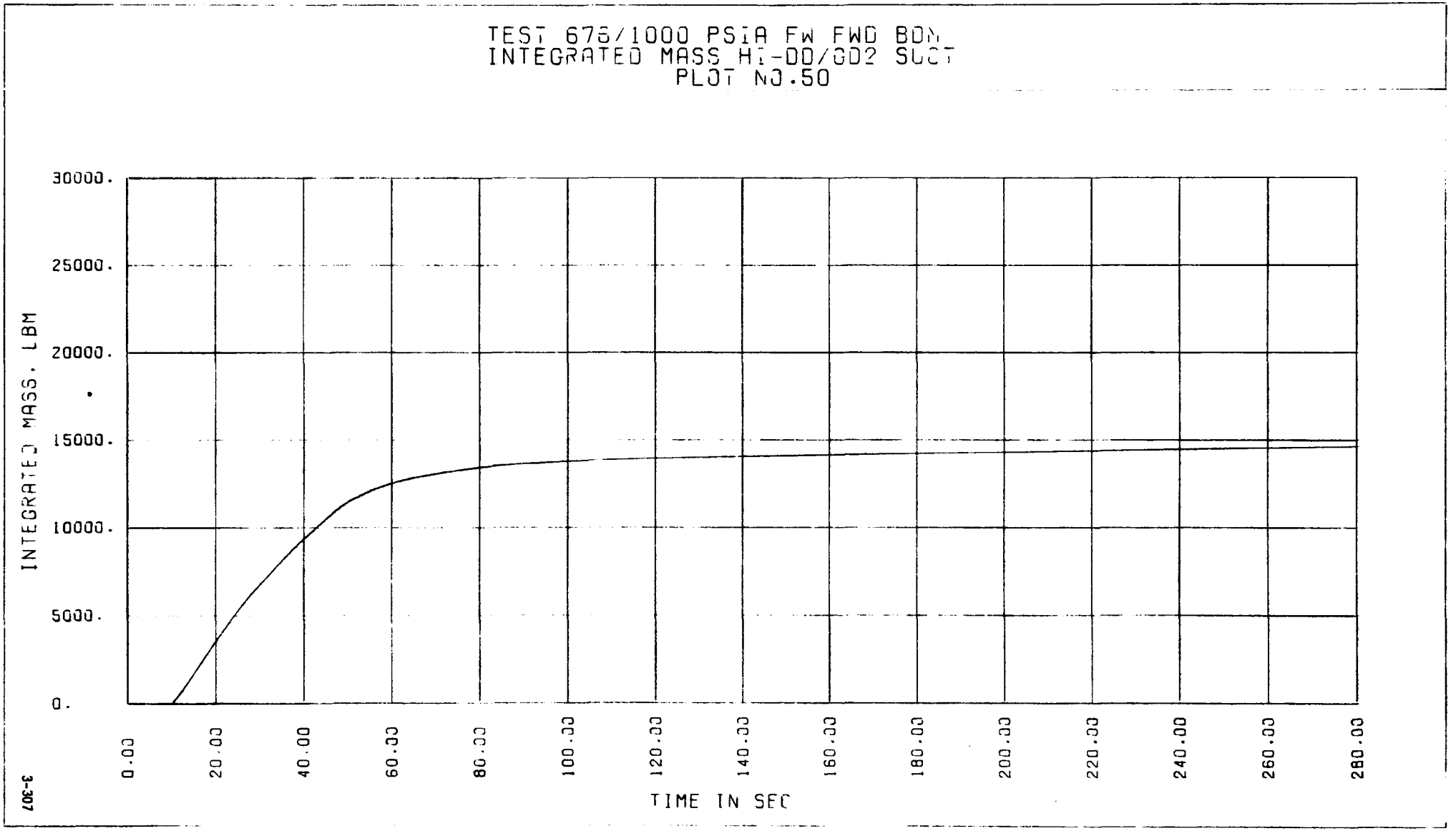
3-303

TEST 676/1000 PSIA FW FWD BDN
N PUMP SPEED NR-4500
PLOT NO.47

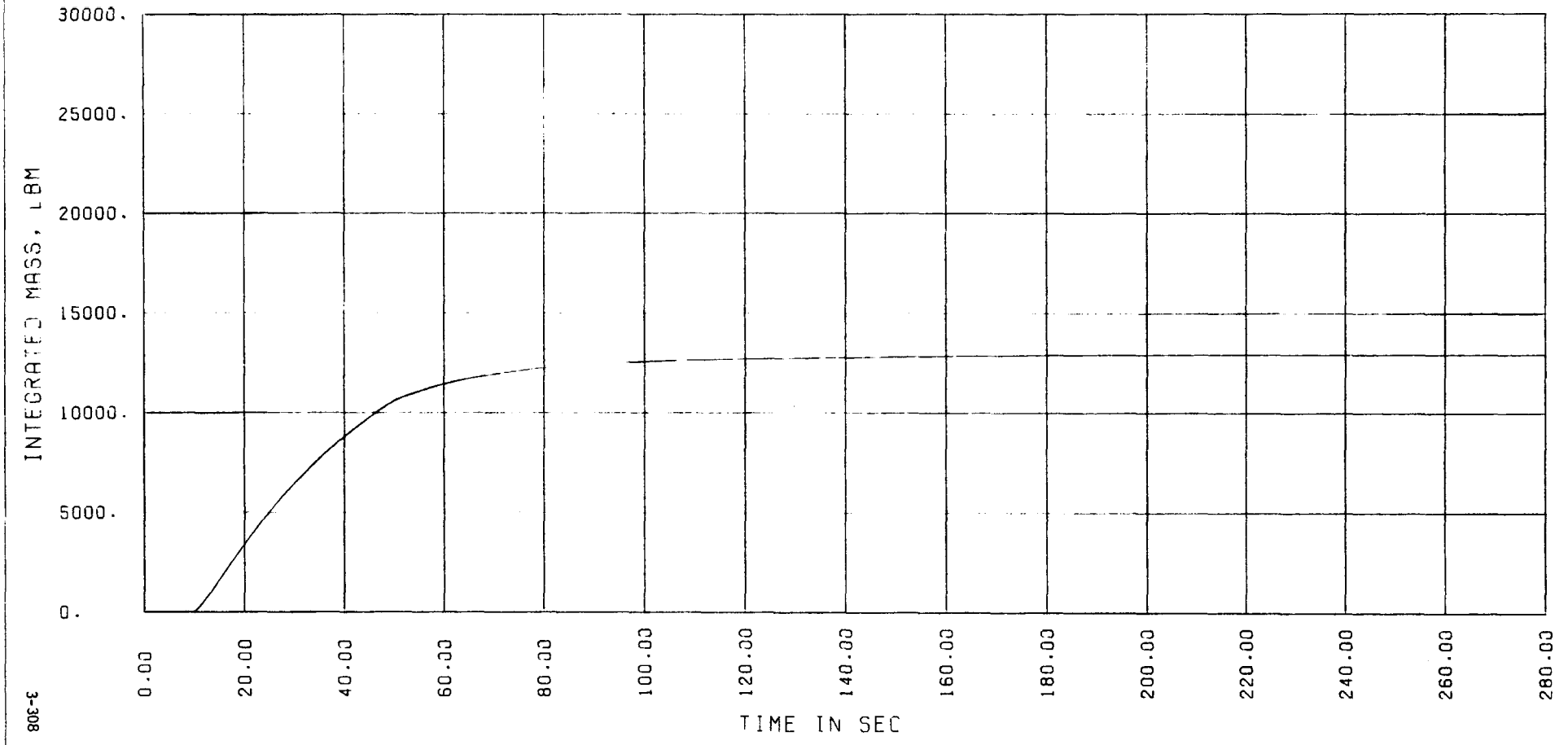



TEST 675/1000 PSIA FW FWD BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.48
NORMALIZED TORQUE
1.0000
0.7500
0.5000
0.2500
0.0000
-0.2500
-0.5000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-305


TEST 676/1000 PSIA FW FWD BDM
N PUMP HYDR TORQUE THR=308
PLOT NO.49
1.0000
0.7500
0.5000
0.2500
0.0000
-0.2500
-0.5000
NORMALIZED TORQUE
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-306

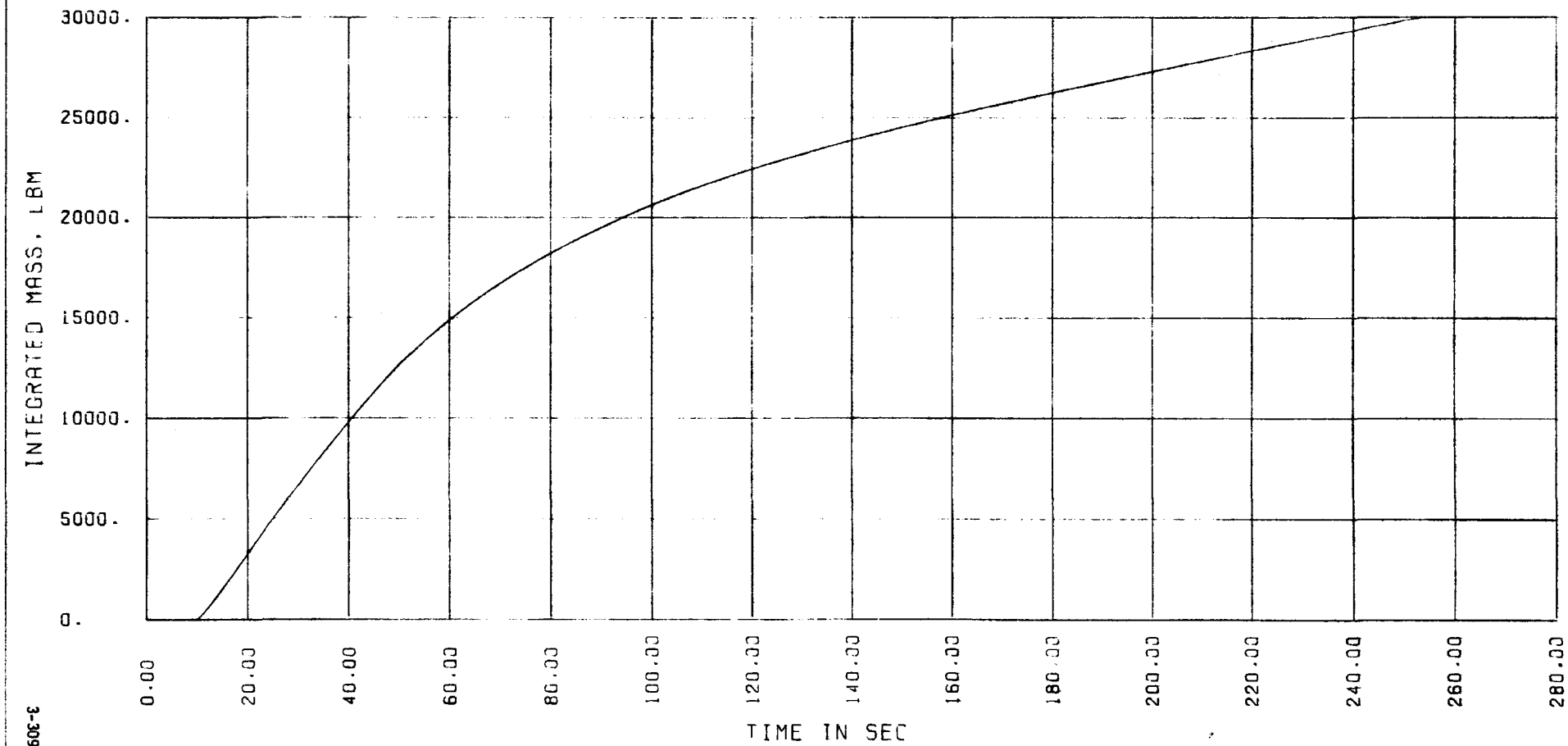

TEST 676/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-OD/OD2 SUCT
PLOT NO.50
INTEGRATED MASS, LBM
30000.
25000.
20000.
15000.
10000.
5000.
0.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

TEST 676/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-OO/GO2 SUCT
PLOT NO.51



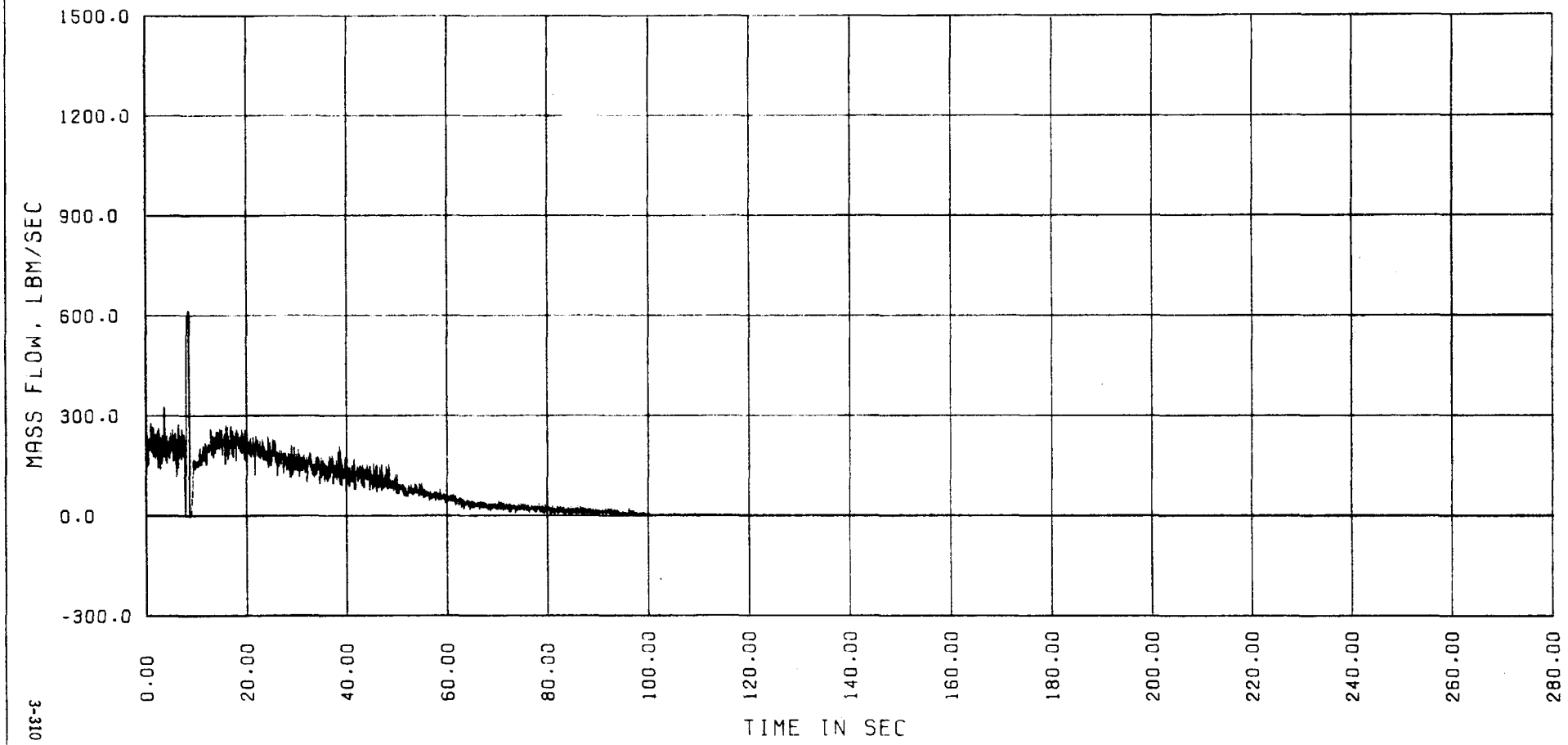
3-308

TEST 676/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-OD/GD2 DIS
PLOT NO.52

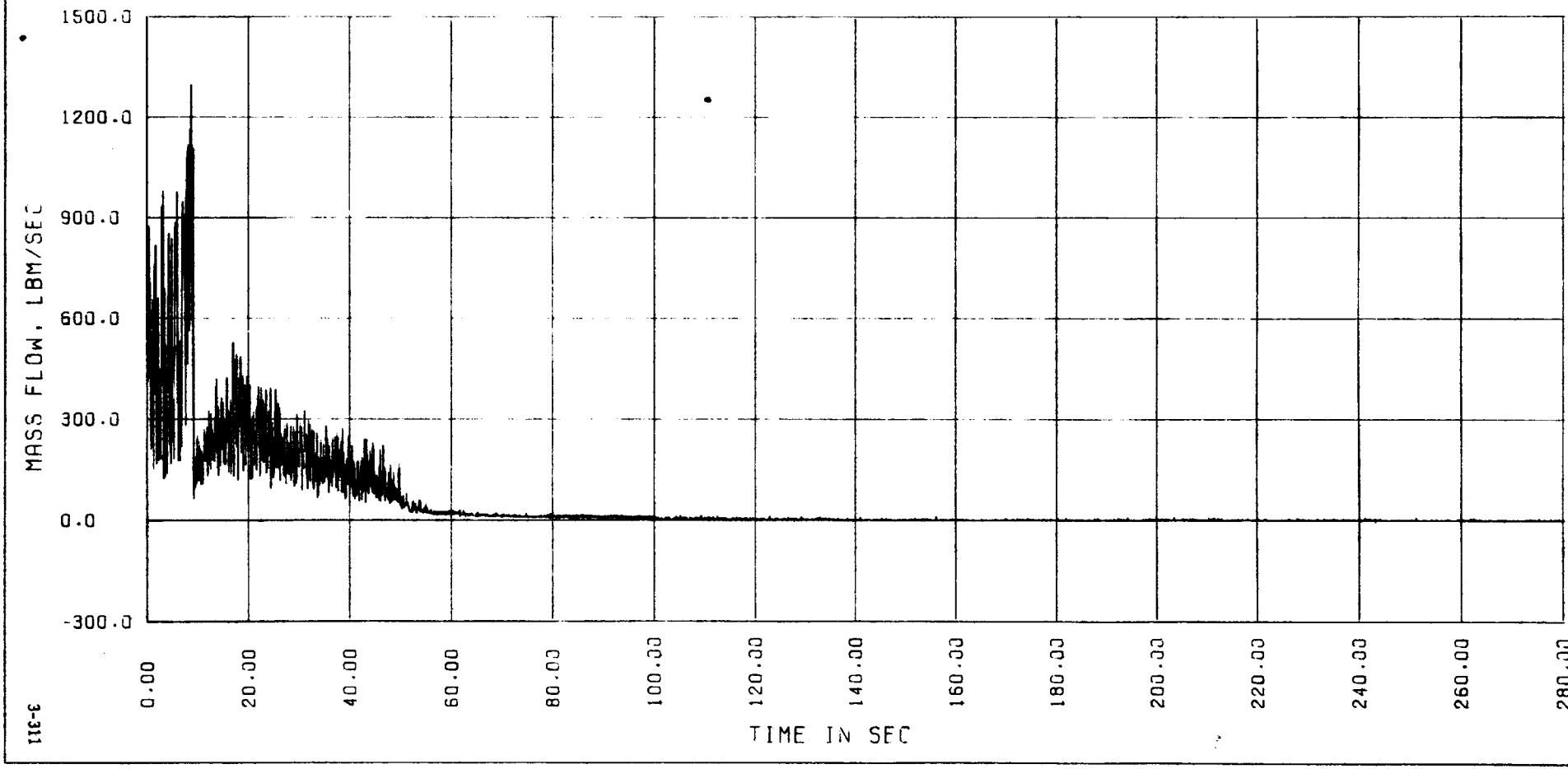


3-309

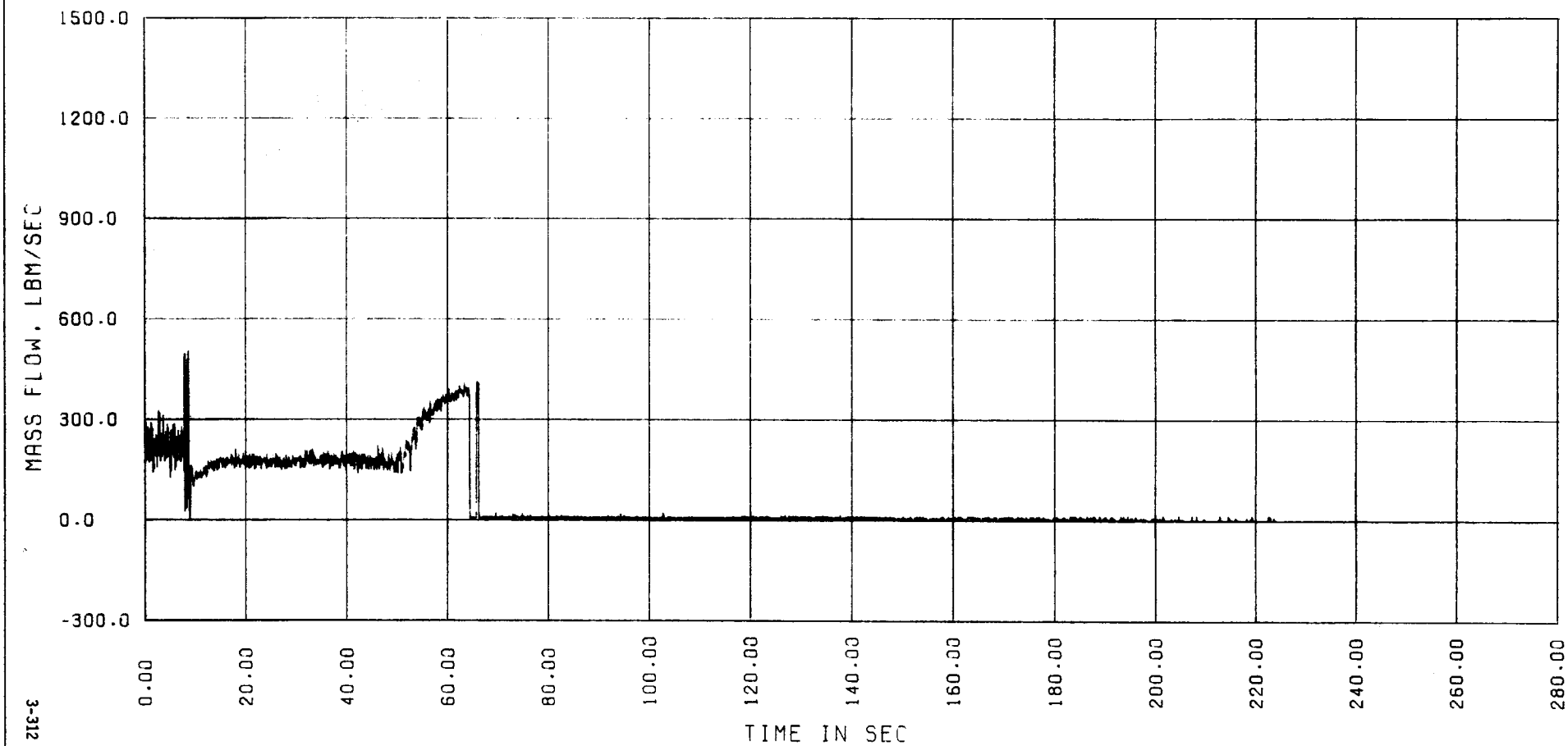
TEST 676/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54



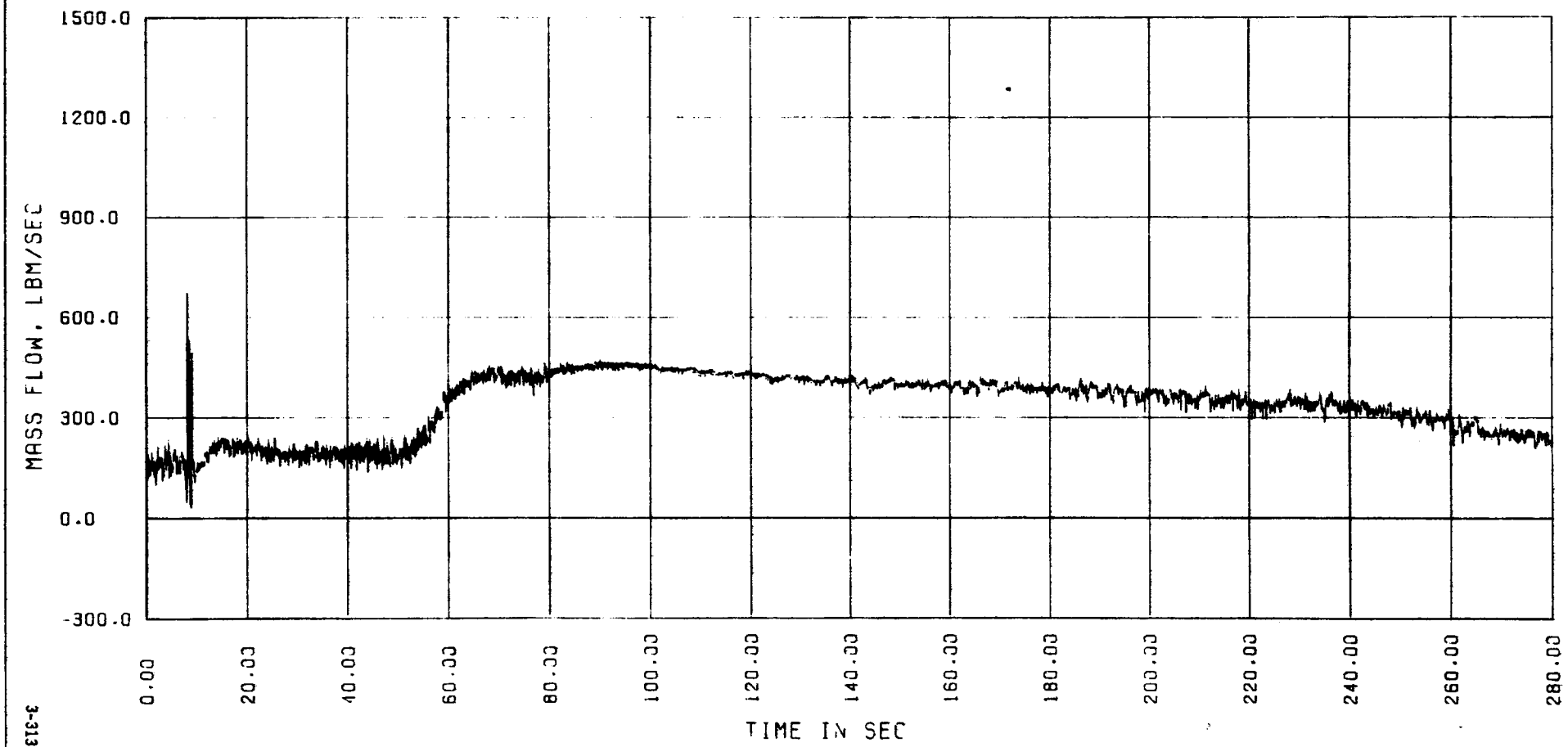
TEST 676, 1000 PSIA FW FWD BDY
MASS FLOW RATE LO-TM/GO2 SUCT
PLOT NO.55

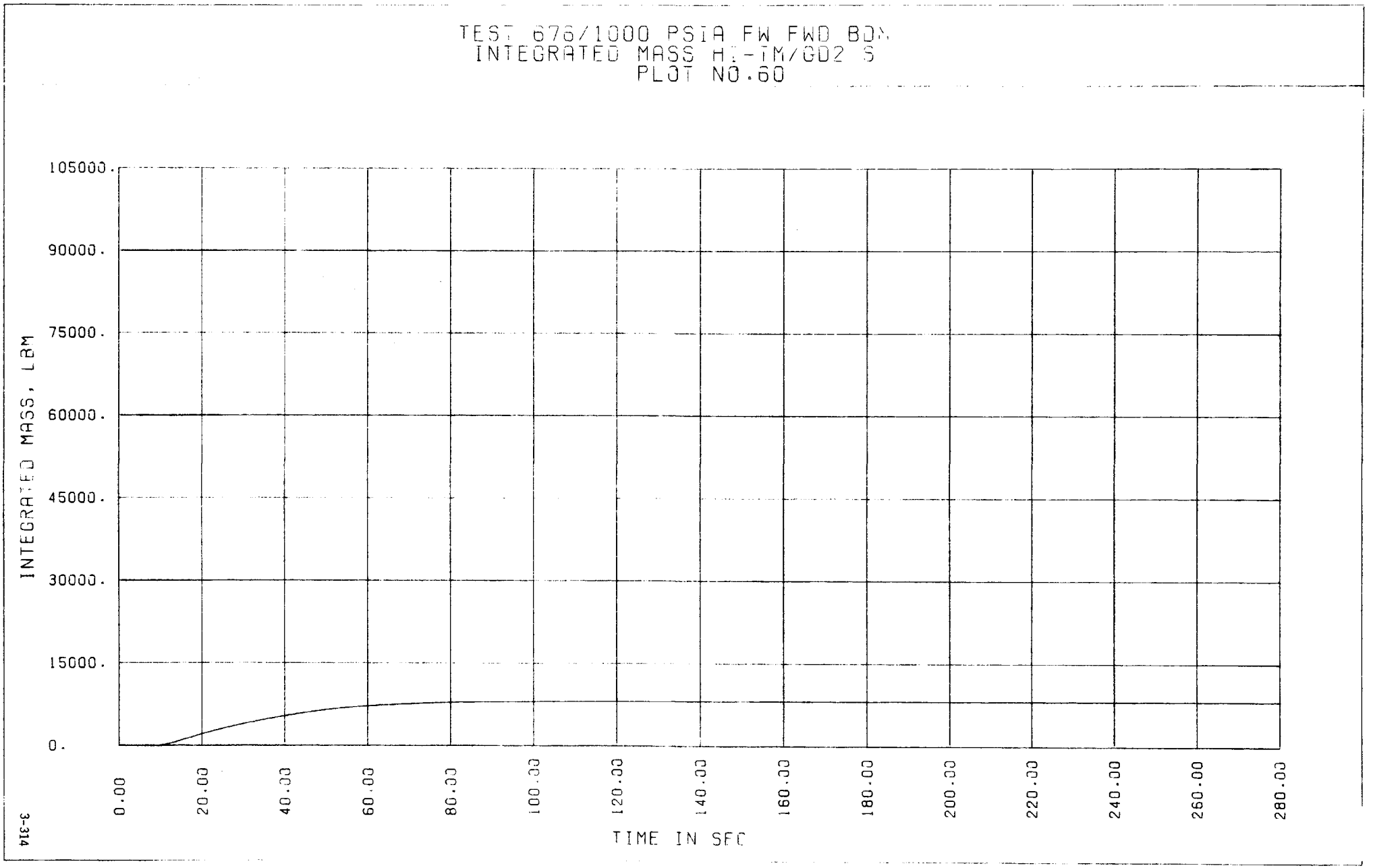


TEST 676/1000 PSIA FW FWD BDN
MASS FLOW RATE Hi-TM/GD2 DISCH
PLOT NO.56

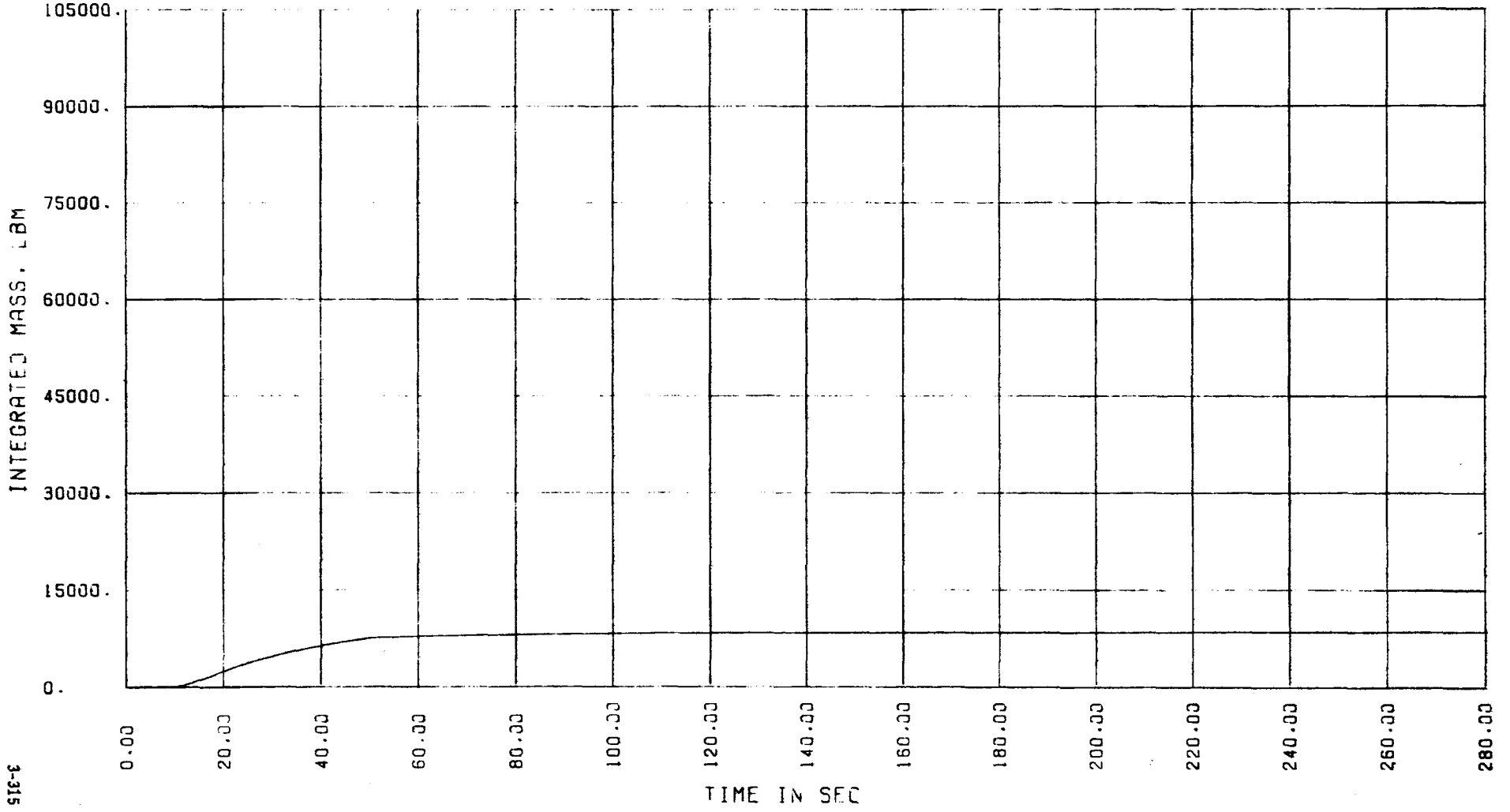


TEST 676/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-TM/GD2 DISCH
PLOT NO.57

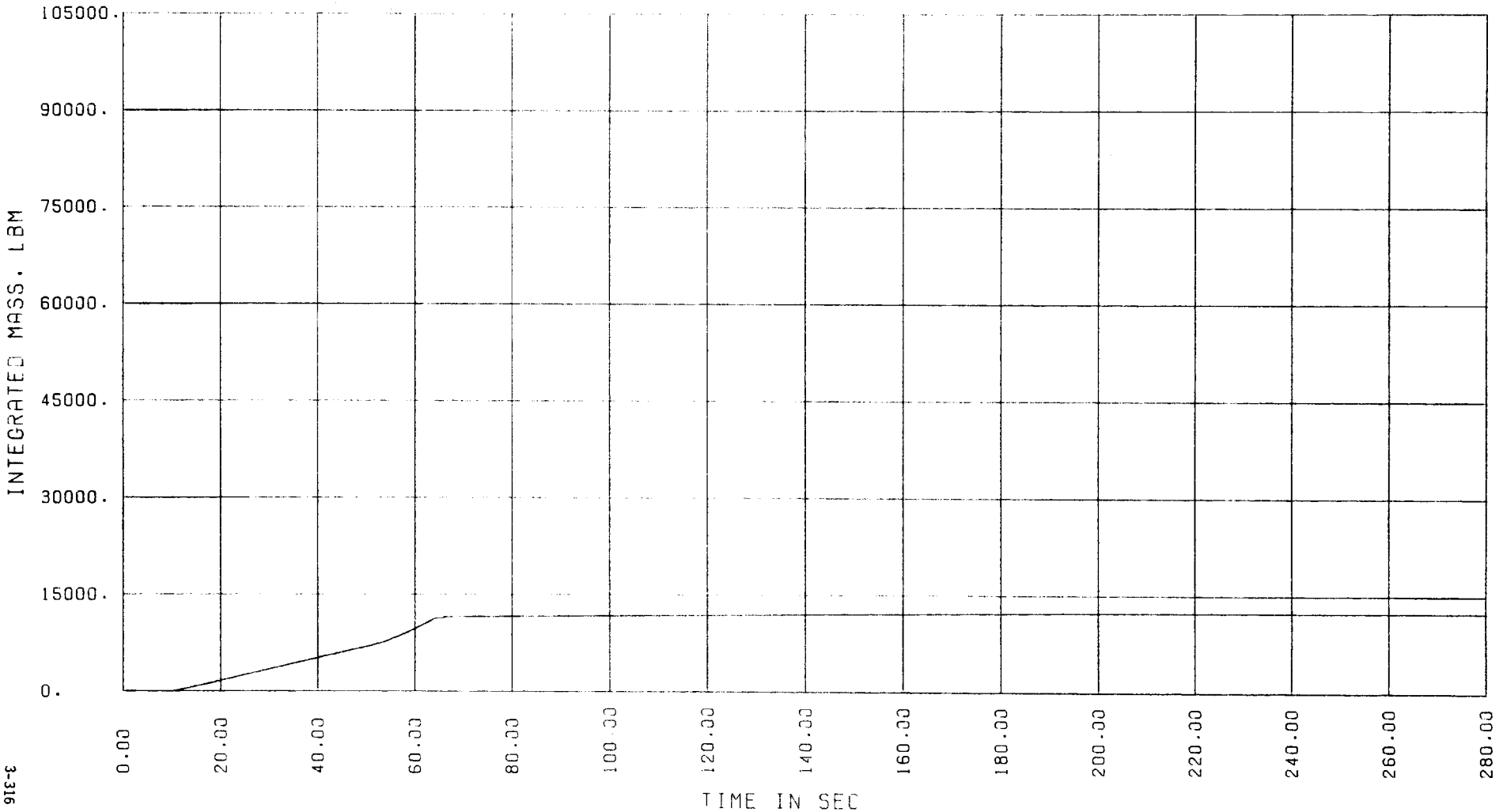



TEST 676/1000 PSIA FW FWD BDY
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60
INTEGRATED MASS, LBM
105000.
90000.
75000.
60000.
45000.
30000.
15000.
0.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

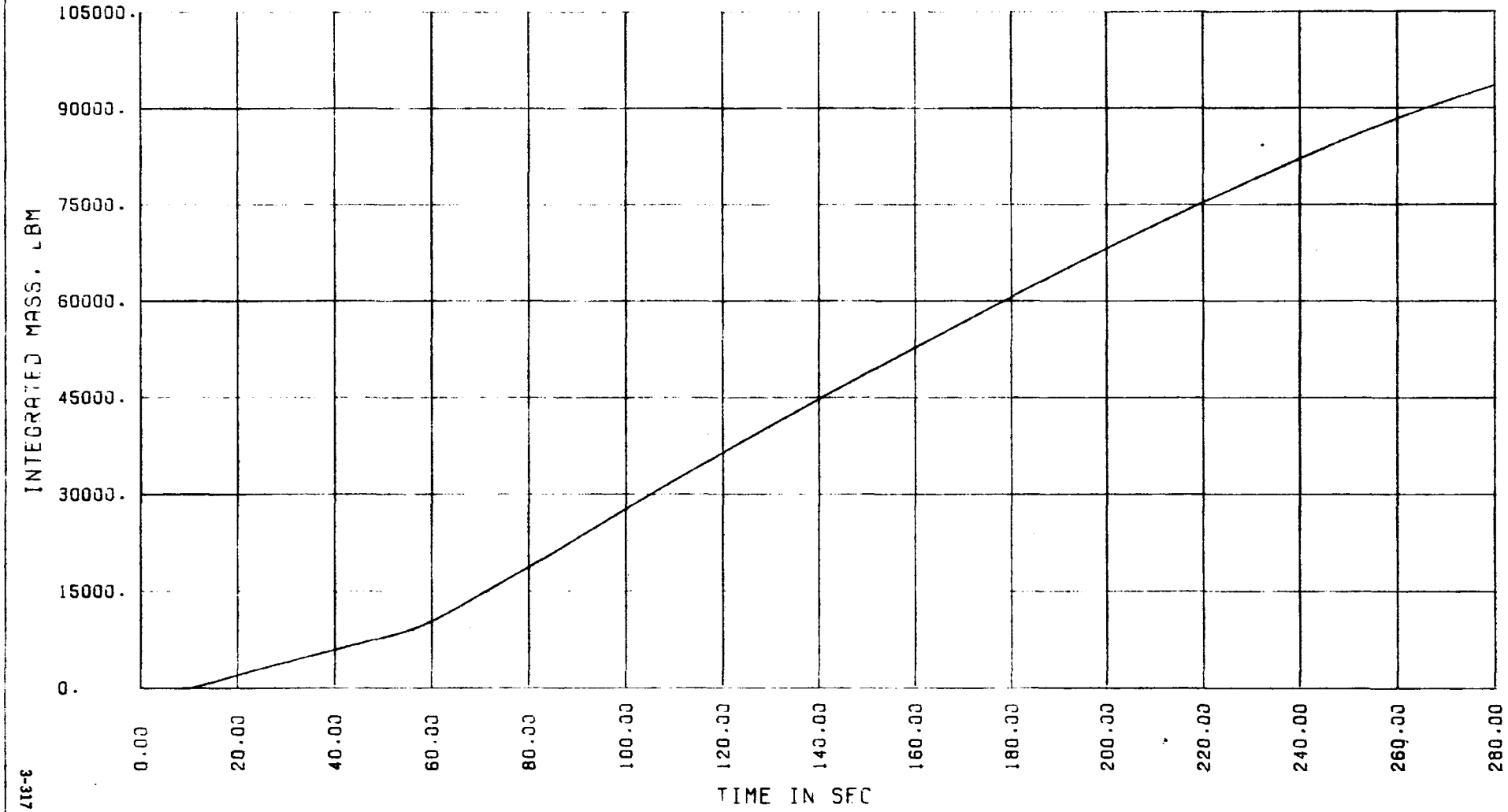
TEST 676/1000 PSIA FW FWD BDY
INTEGRATED MASS LO-TM/GO2 S
PLOT NO.61



TEST 676/1000 PSIA Fw FWD BDN
INTEGRATED MASS Hi-TM/GD2 D
PLOT NO.62



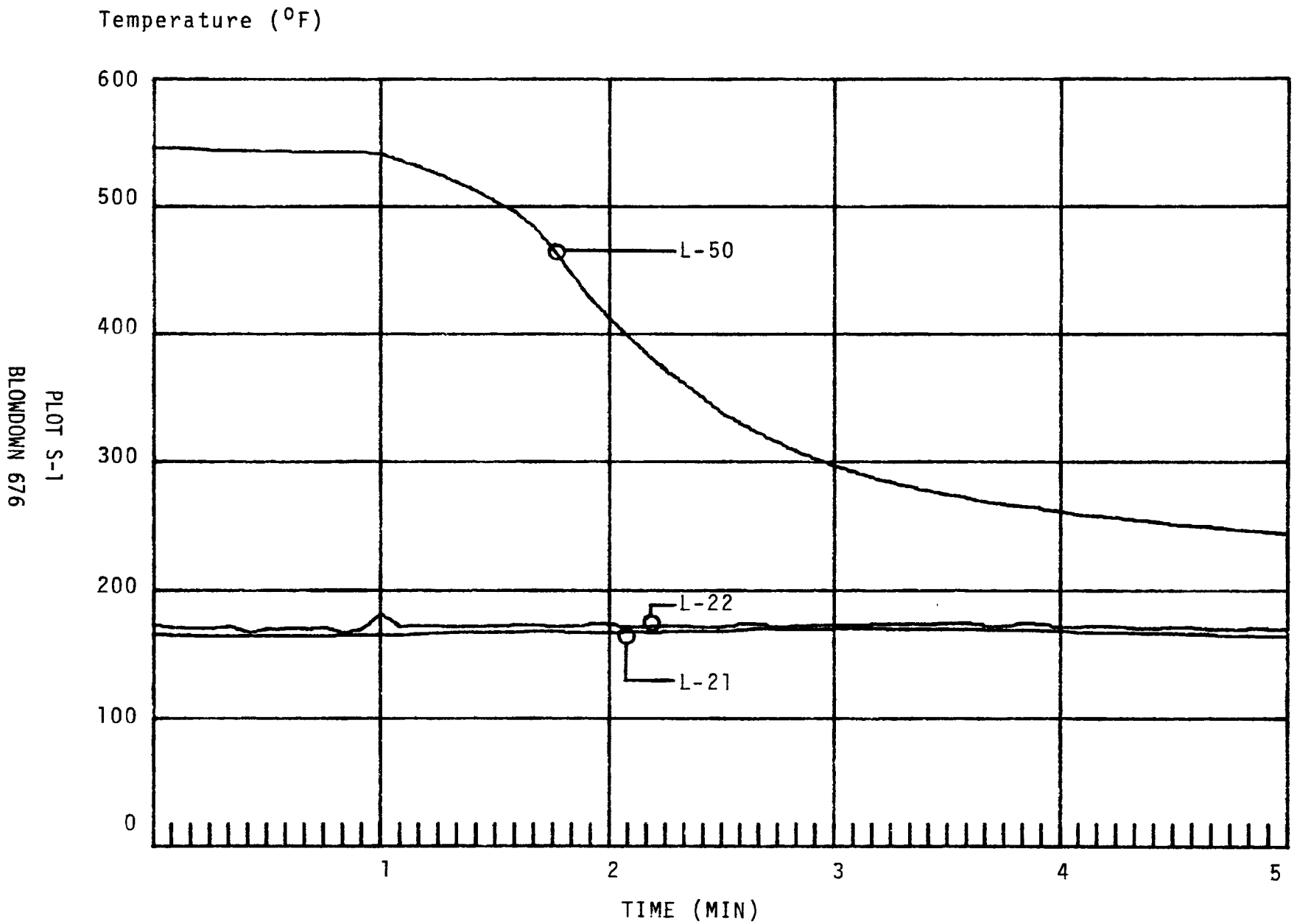
TEST 676/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-TM/GO2 D
PLOT NO.63

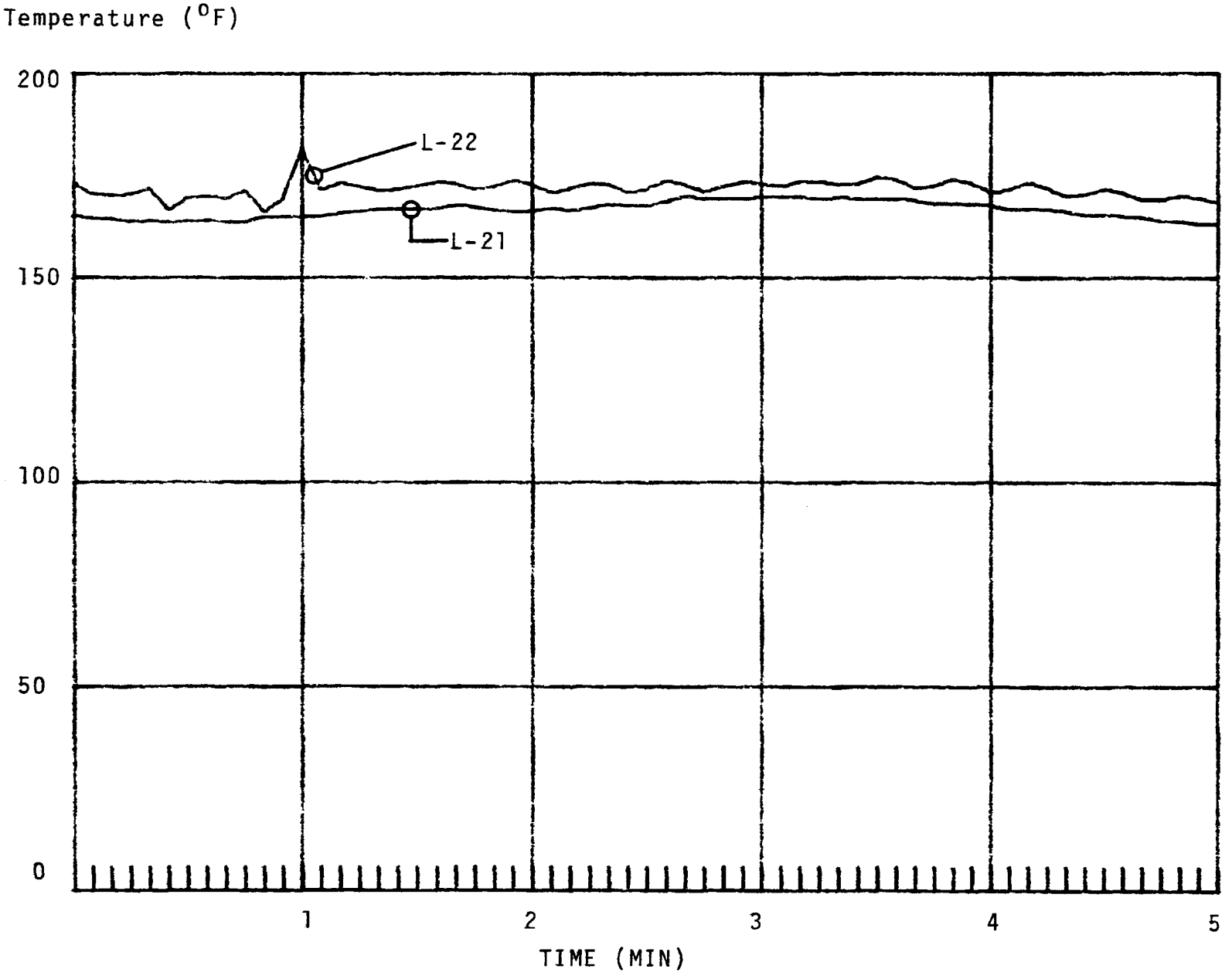


Index Listing
of
SCANNER DATA PLOTS

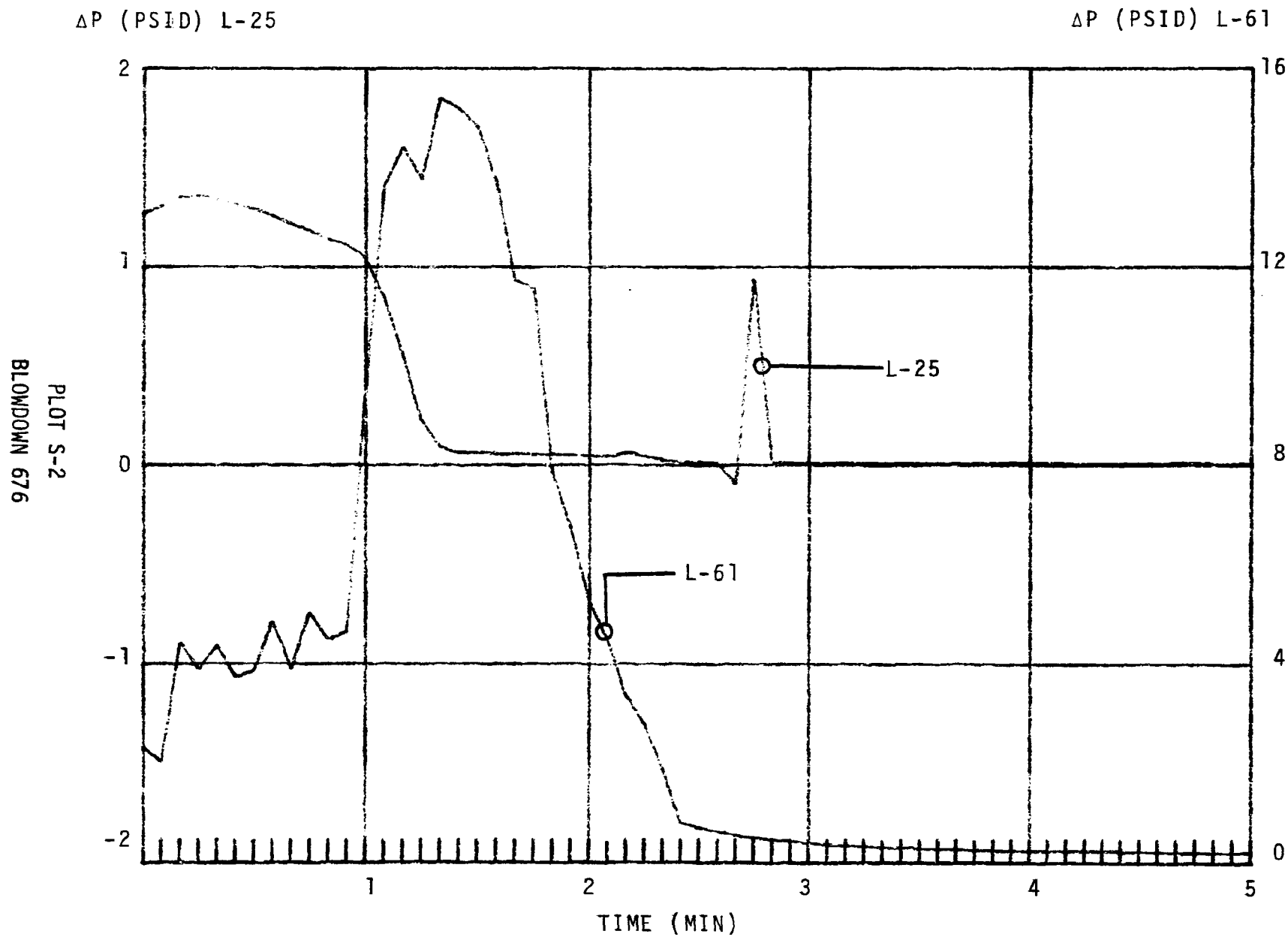
Test Number (676)

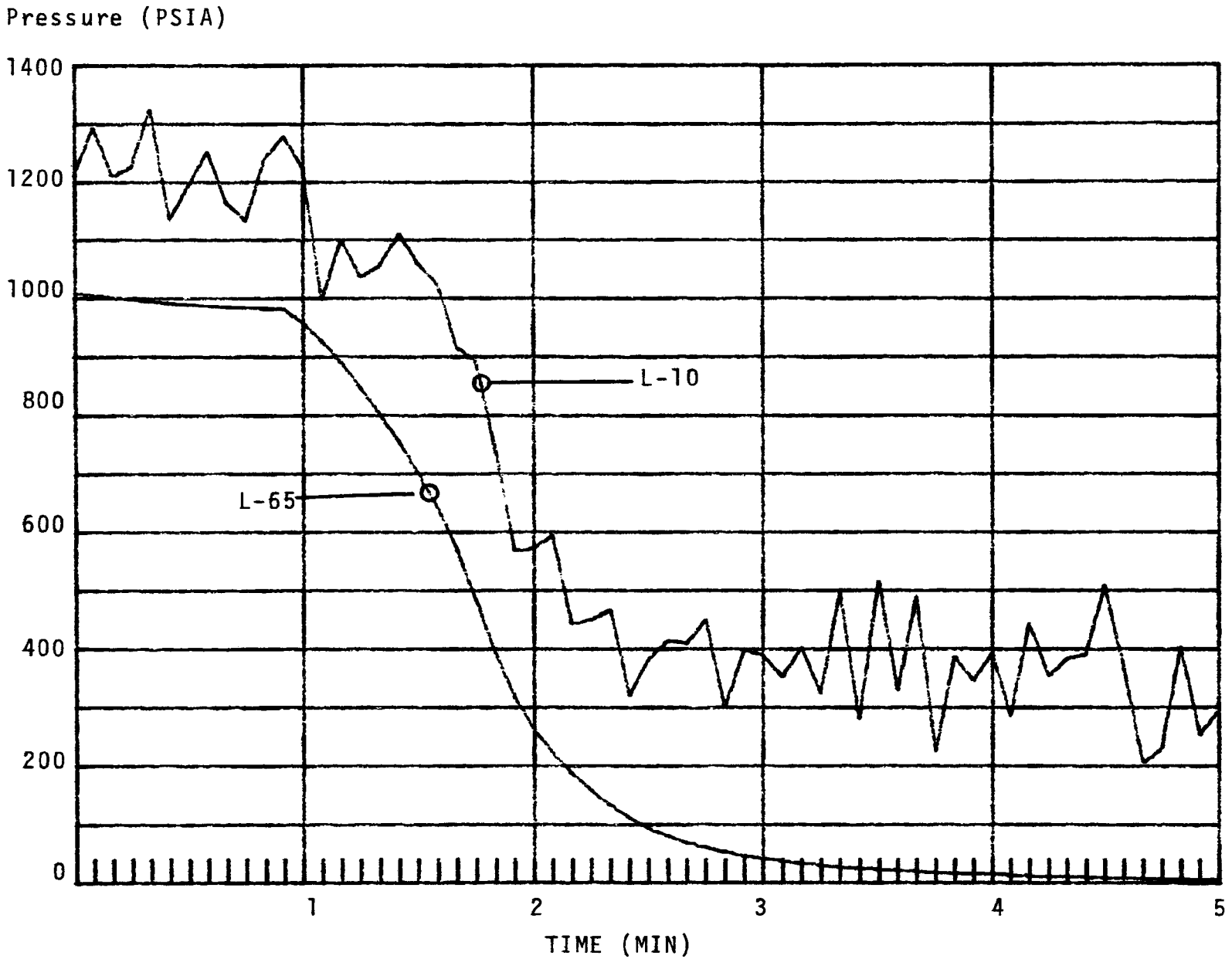
Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
	L-50	Main Water Orifice Thermocouple
S-1A	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell


Temperature (°F)
600
500
400
300
200
100
0
L-50
L-22
L-21
1
2
3
4
5
TIME (MIN)
BLOWDOWN 676
PLOT S-1

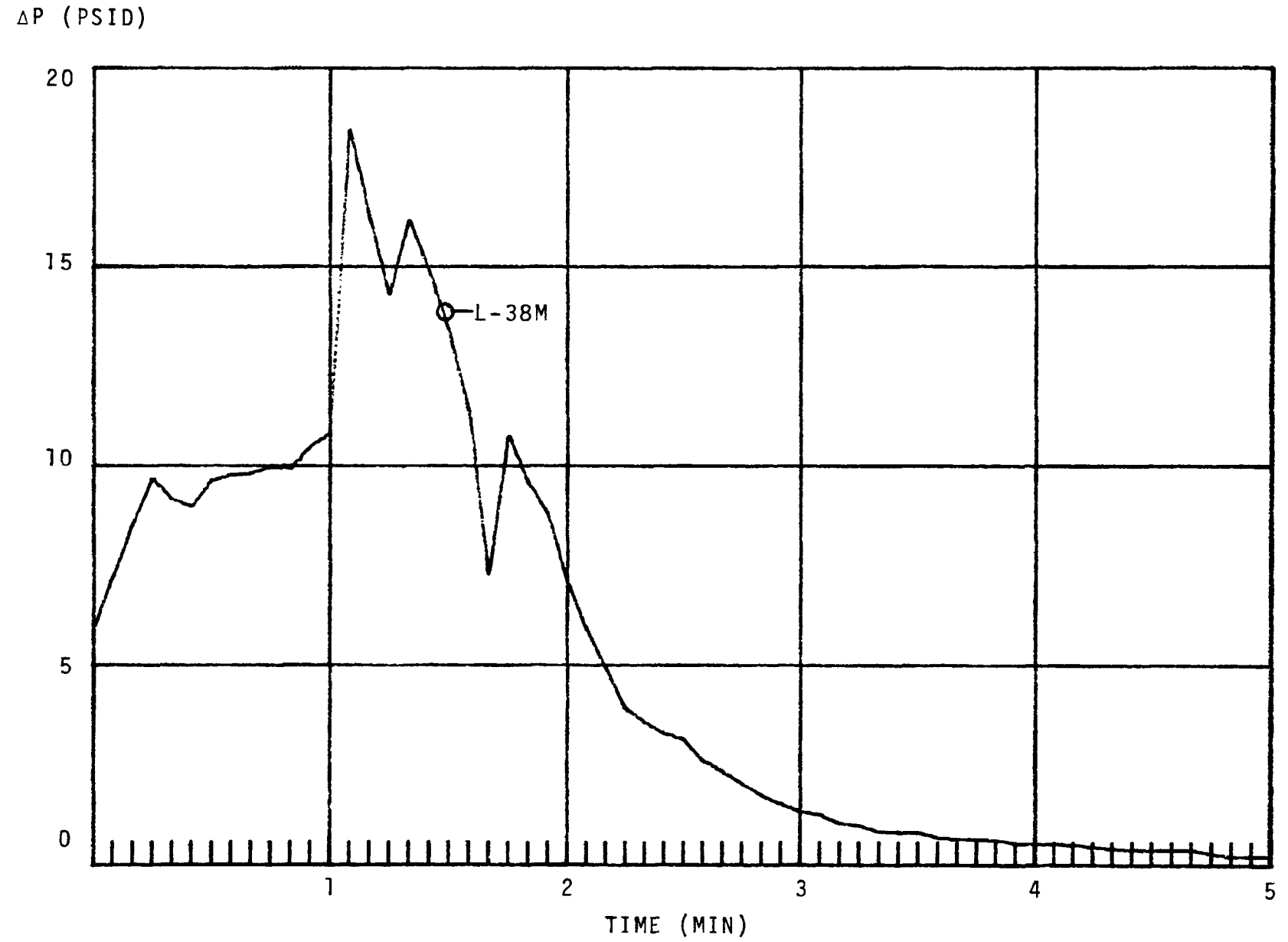


PLOT S-1A
BLOWDOWN 676

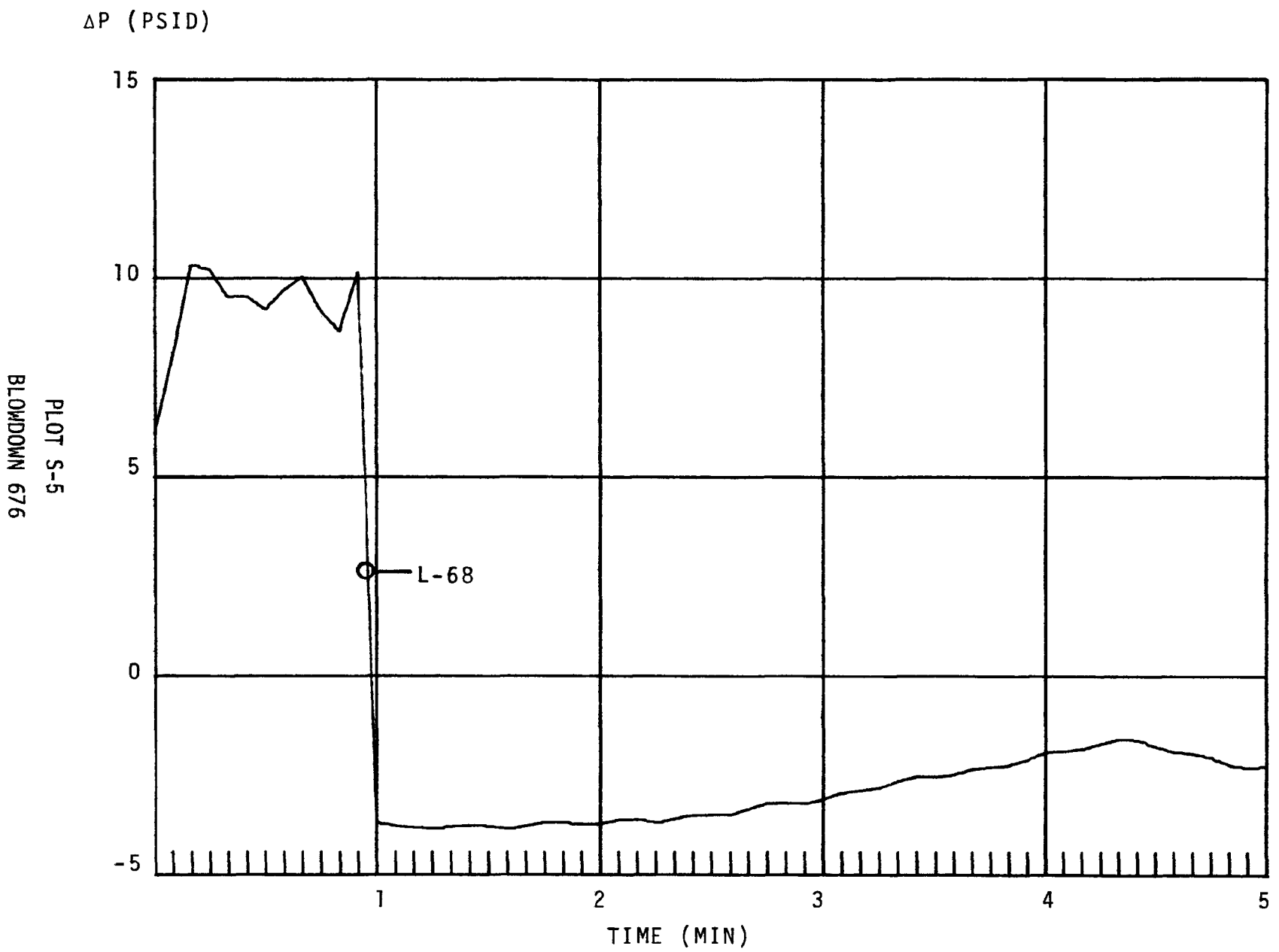

ΔP (PSID) L-25
ΔP (PSID) L-61
2
1
0
-1
-2
16
12
8
4
0
L-25
L-61
1
2
3
4
5
TIME (MIN)
PLOT S-2
BLOWDOWN 676



PLOT S-3
BLOWDOWN 676



PLOT S-4
BLOWDOWN 676


ΔP (PSID)
15
10
5
0
-5
L-68
1
2
3
4
5
TIME (MIN)
PLOT S-5
BLOWDOWN 676

SYSTEM CONFIGURATION

Test Number 701

Break Location	Discharge
Break Size	16.26 in^2
	57 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Free-Wheeling

COMMENTS

1. Malfunctioning or Inoperable Instruments:

   (a) Pump discharge turbine meter (HI) was not installed.

   (b) Pump discharge drag disc (LO) was not connected to the FM system.

2. Other Comments: None

3. Affected FM Data Plots: The following plots of the standard plot package were deleted.

   28 - Normalized Volumetric Flow Rate
   31 - Normalized Volumetric Flow Rate
   35 - Mass Flow Rate
   41 - Momentum Flux
   42 - Momentum Flux
   53 - Integrated Mass
   56 - Mass Flow Rate
   62 - Integrated Mass

INITIAL CONDITIONS

t = 45 Sec[a]

Test Number 701

System Pressures

High Pressure Drum	1014.5	psia
Suction Instrument Spool	981.6	psia
Discharge Instrument Spool	1047.6	psia

Fluid Temperatures

Suction Instrument Spool	543.7	°F
Discharge Instrument Spool	548.8	°F

Fluid Density

Suction Instrument Spool	46.37	lbm/ft^3
Discharge Instrument Spool	46.04	lbm/ft^3

System Flows

Mass Flow Rate	259	lb/sec
Suction Volumetric Flow Rate	2503	gpm
Discharge Volumetric Flow Rate	2517	gpm
Suction Normalized Volumetric Flow Rate	0.72	
Discharge Normalized Volumetric Flow Rate	0.72	
Suction Fluid Velocity	30.8	ft/sec
Discharge Fluid Velocity	30.98	ft/sec
Suction Momentum Flux	44,018	$lbm/ft\ sec^2$
Discharge Momentum Flux	44,197	$lbm/ft\ sec^2$

Pump Performance

Pump head	52.95	psi
	164.4	ft
Pump Speed	4483	rpm
Pump Shaft Torque	197.3	ft lb
Pump Hydraulic Torque	172.4	ft lb

System Mass (t = 55 Sec)[a]

High Pressure Drum Level	43.11	in[b]
Fluid Mass Upstream of Test Pump	13,206	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 701

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-6.0	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	3.6	c
HPSW-1 Closed	5.5	c
Pump Power Trip	6.7	65
Initiate Rupture Mechanism	4.6	c
Blowdown Starts	7.0	65
End of Digitized Data 20 s/sec	564.0	-
200 s/sec	378.0	-
FM Recording System Off	704.0	-
Scanner System Off	-	540

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

Index Listing

of

FM DATA PLOTS

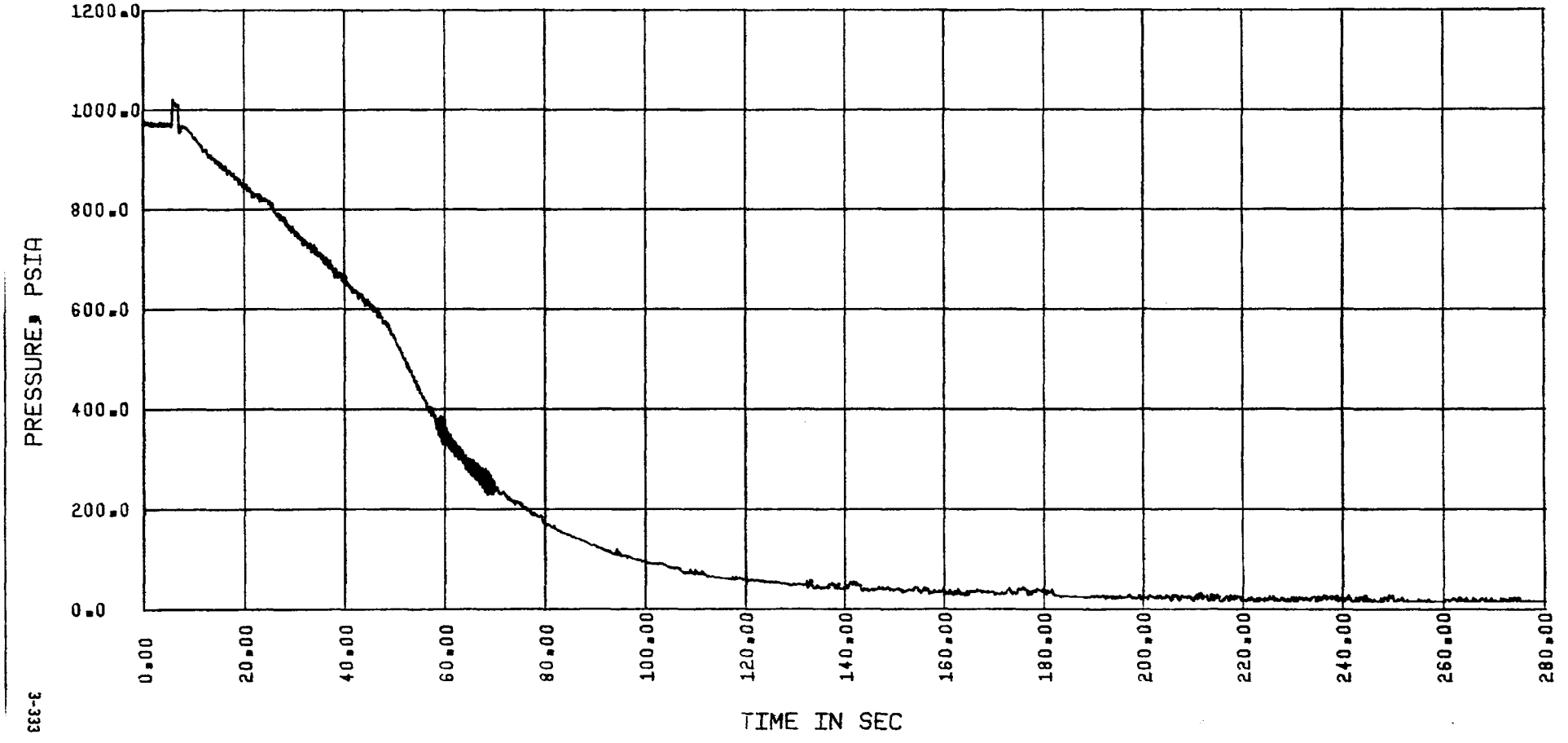
Test Number (701)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge

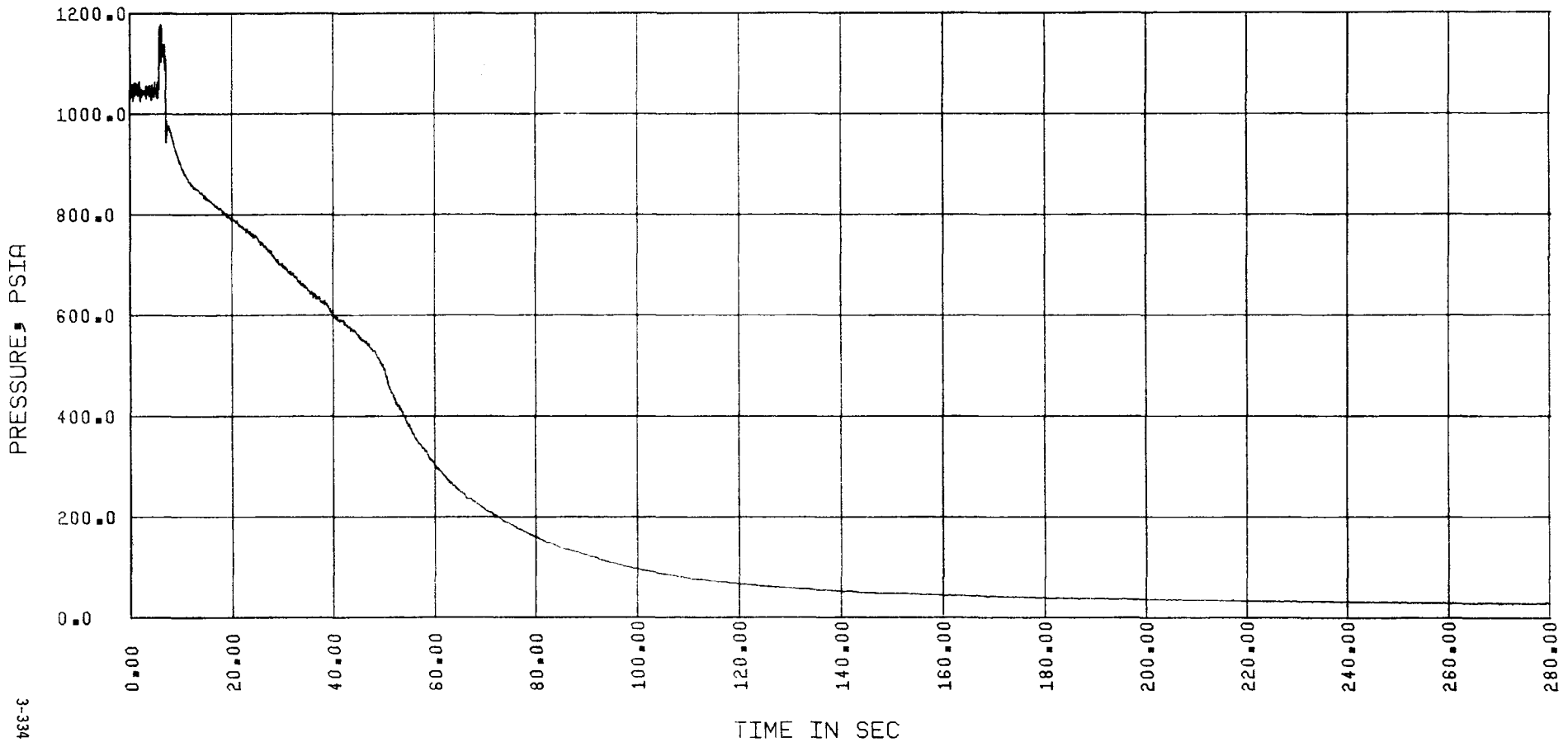
Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (701)

Plot Number	Location Number	Description of Parameter
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge

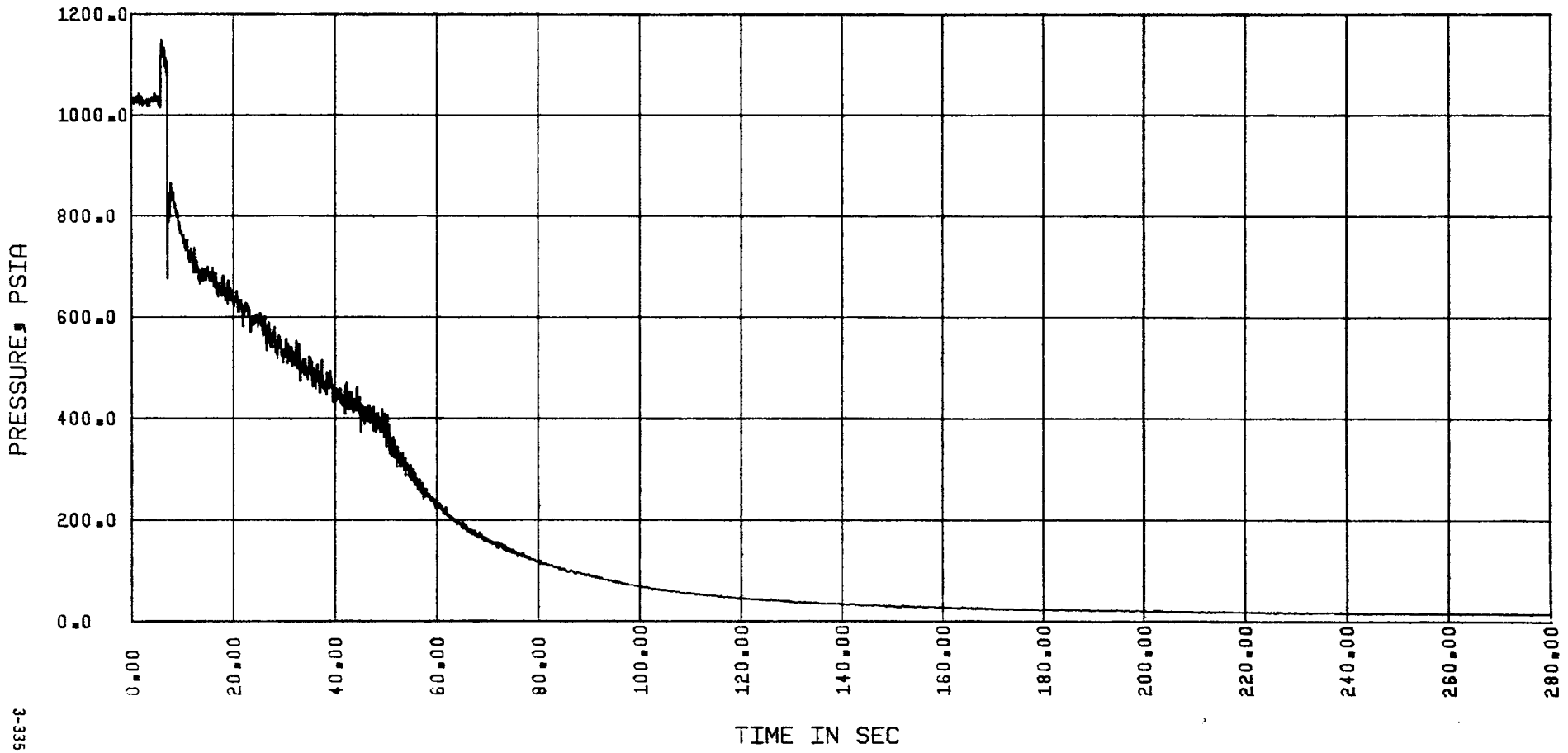
TEST 701/1000 PSIA FW FWD BDN
PUMP SUCTION PRESSURE
PLOT NO.1



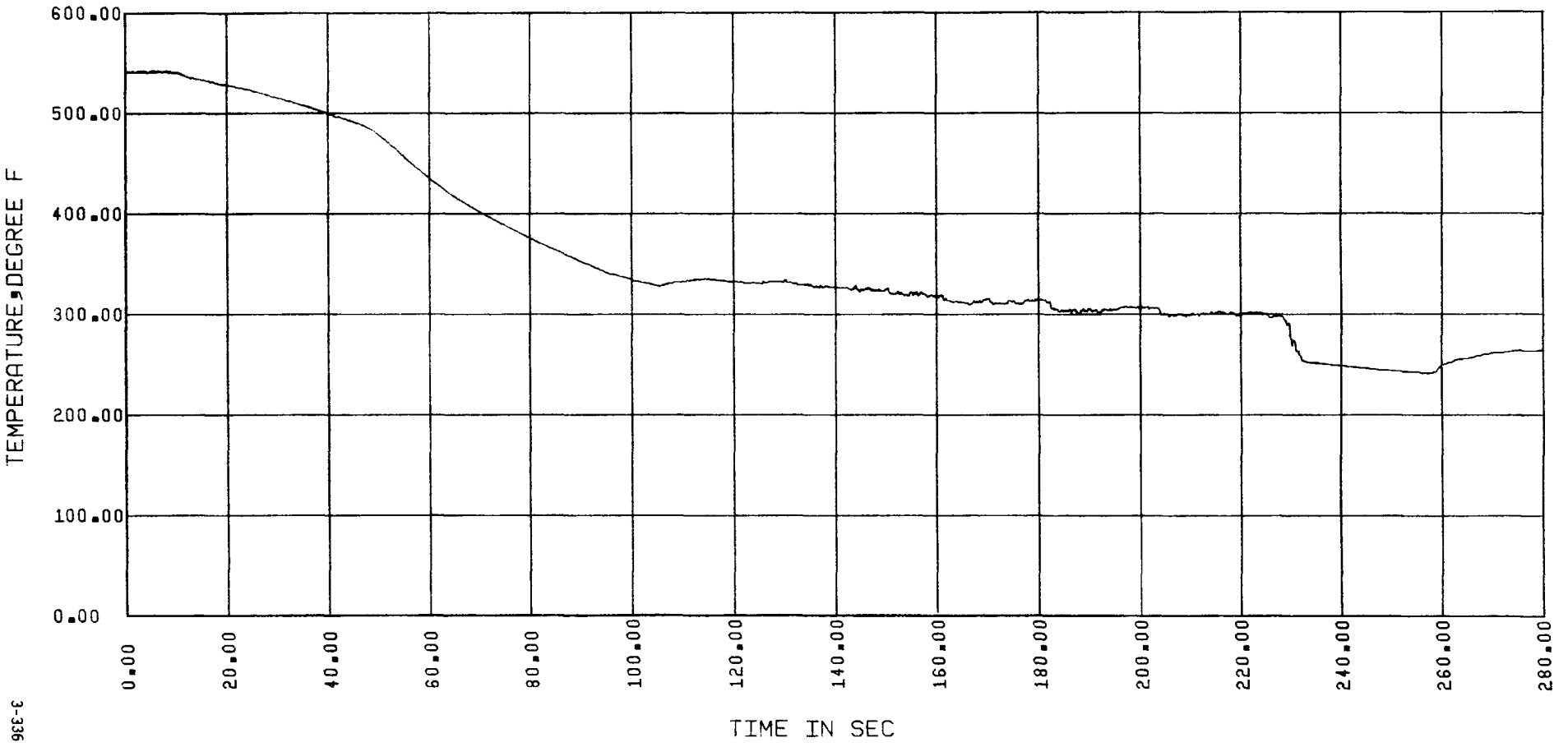
TEST 701/1000 PSIA FW FWD BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2



TEST 701/1000 PSIA FW FWD BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



TEST 701/1000 PSIA FW FWD BDN
PUMP SUCTION TEMPERATURE
PLOT NO.4



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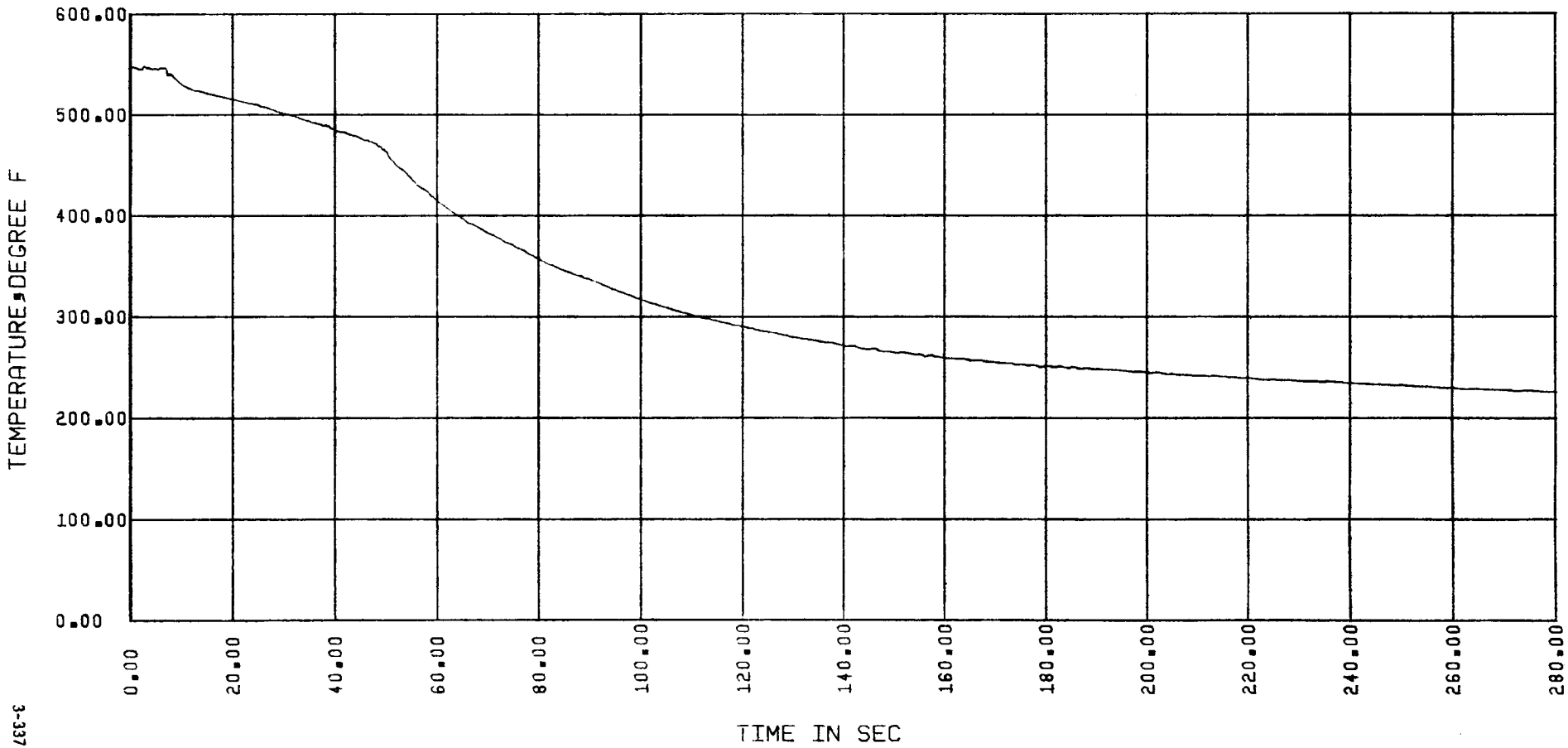
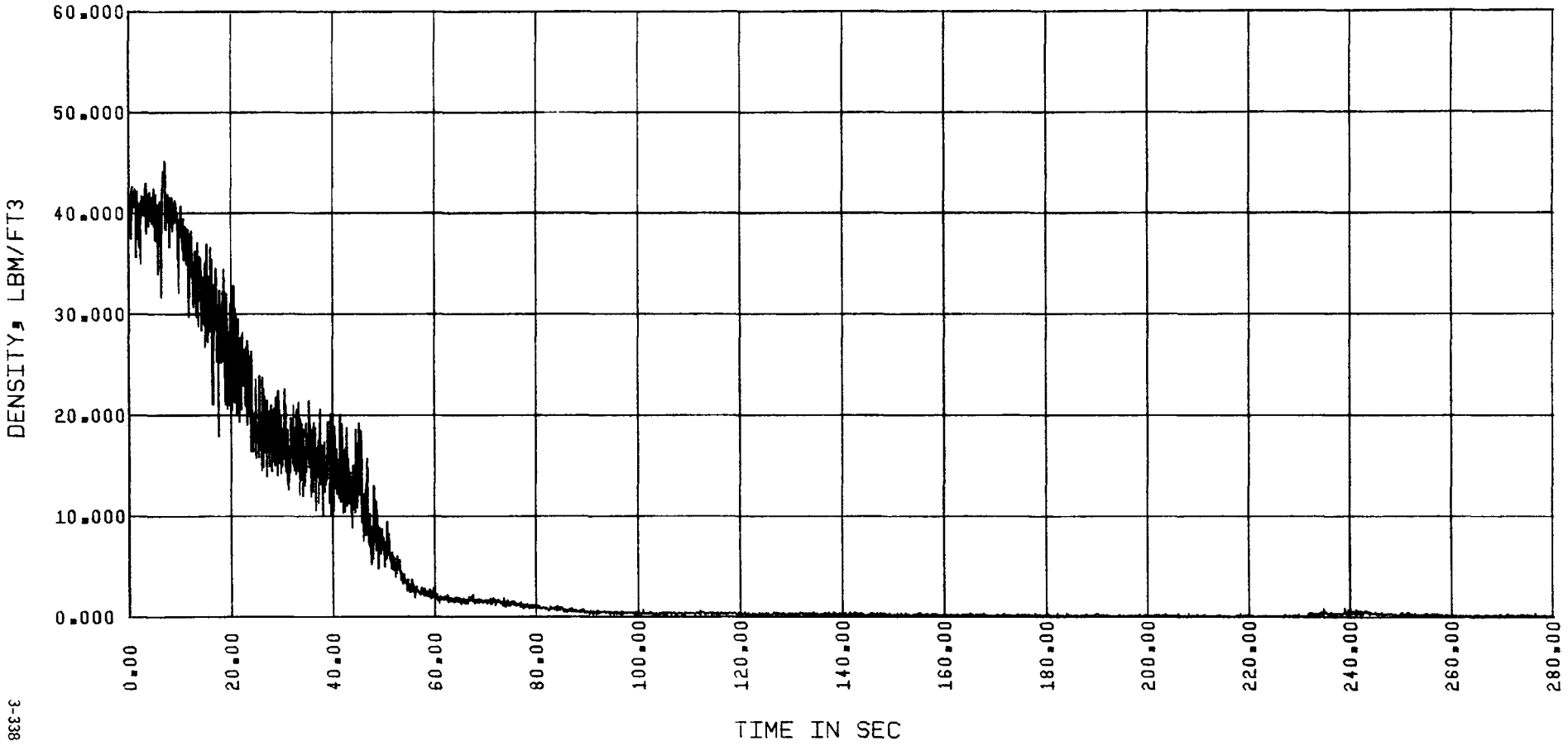
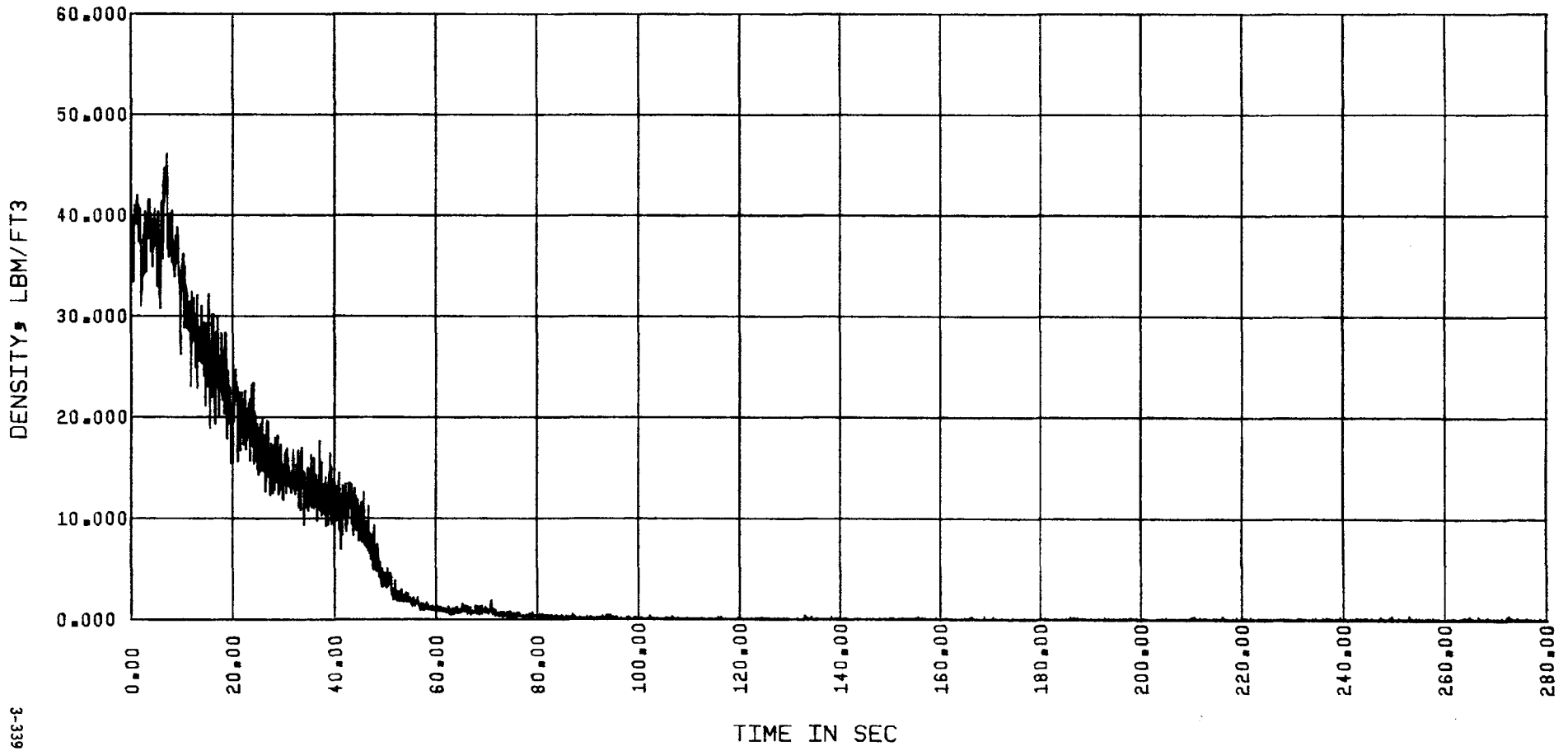
TEST 701/1000 PSIA FW FWD BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5



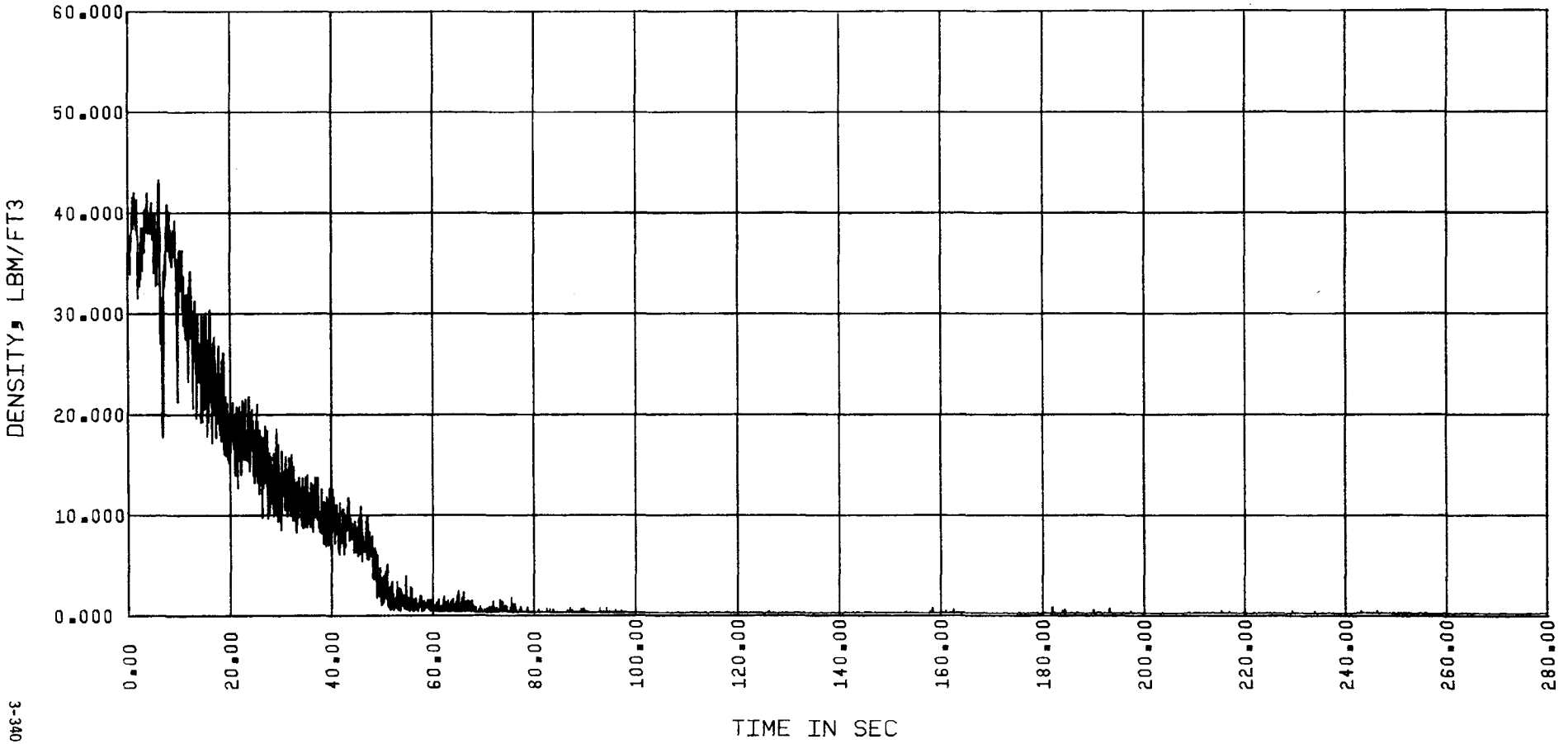
TEST 701/1000 PSIA FW FWD BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



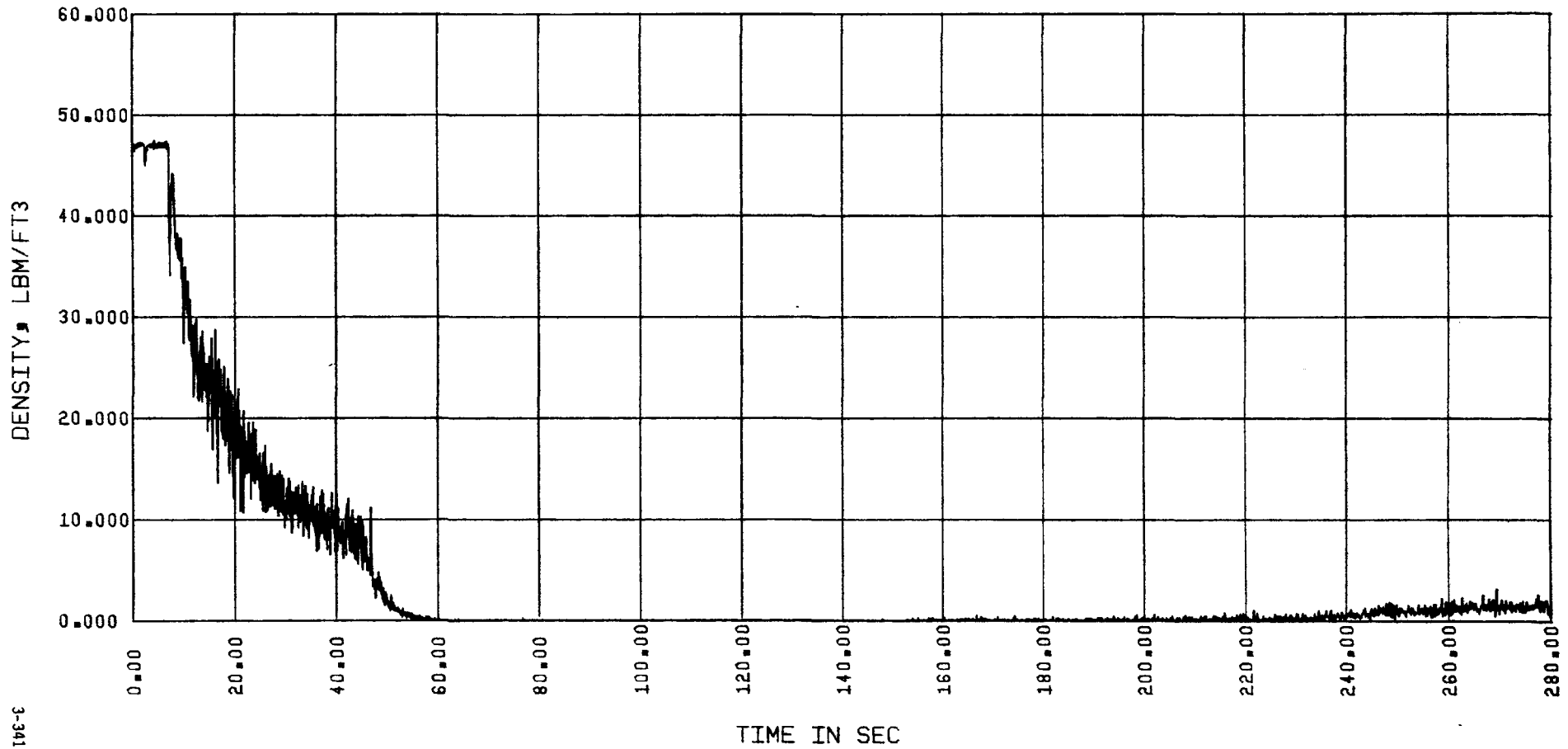
TEST 701/1000 PSIA FW FWD BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7



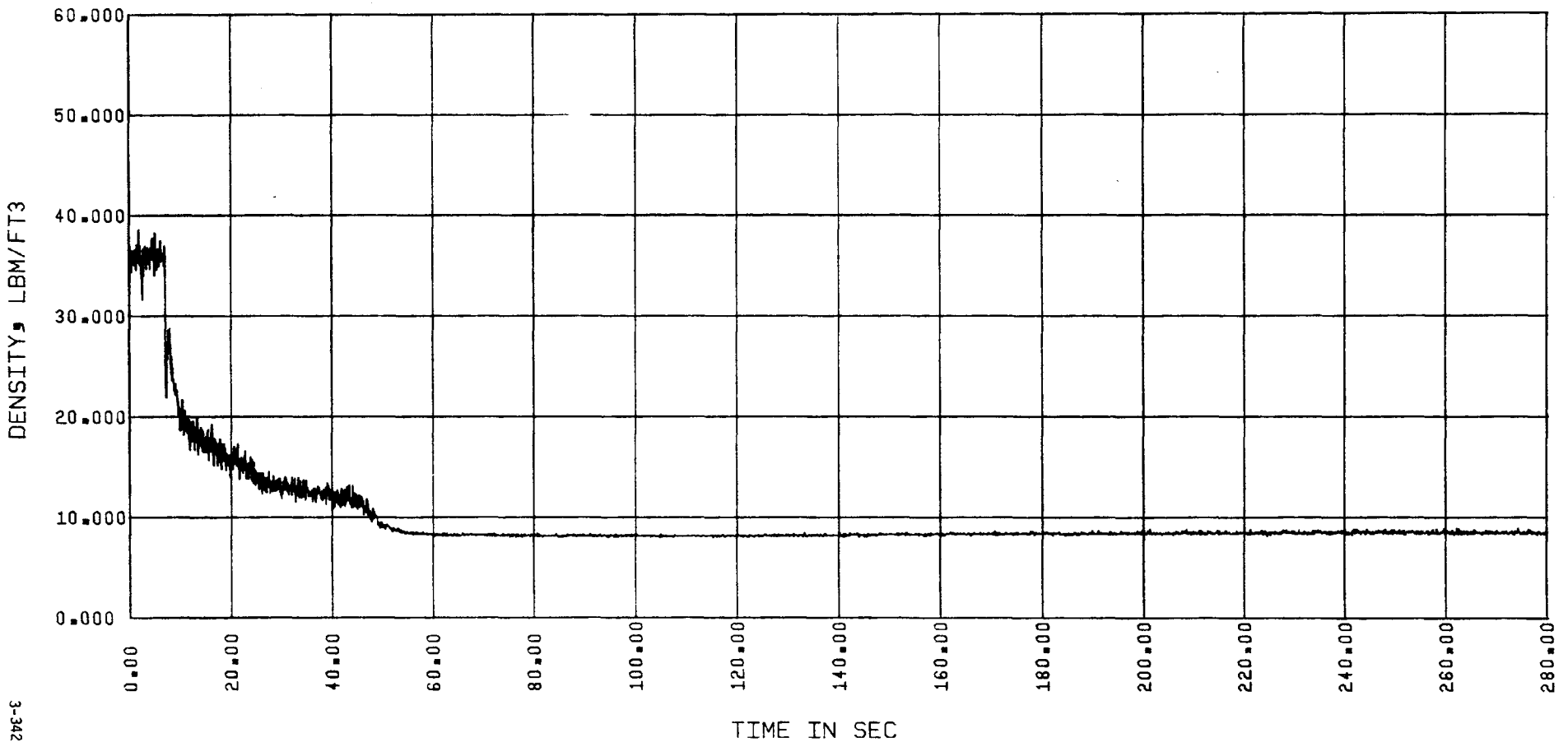
TEST 701/1000 PSIA FW FWD BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8



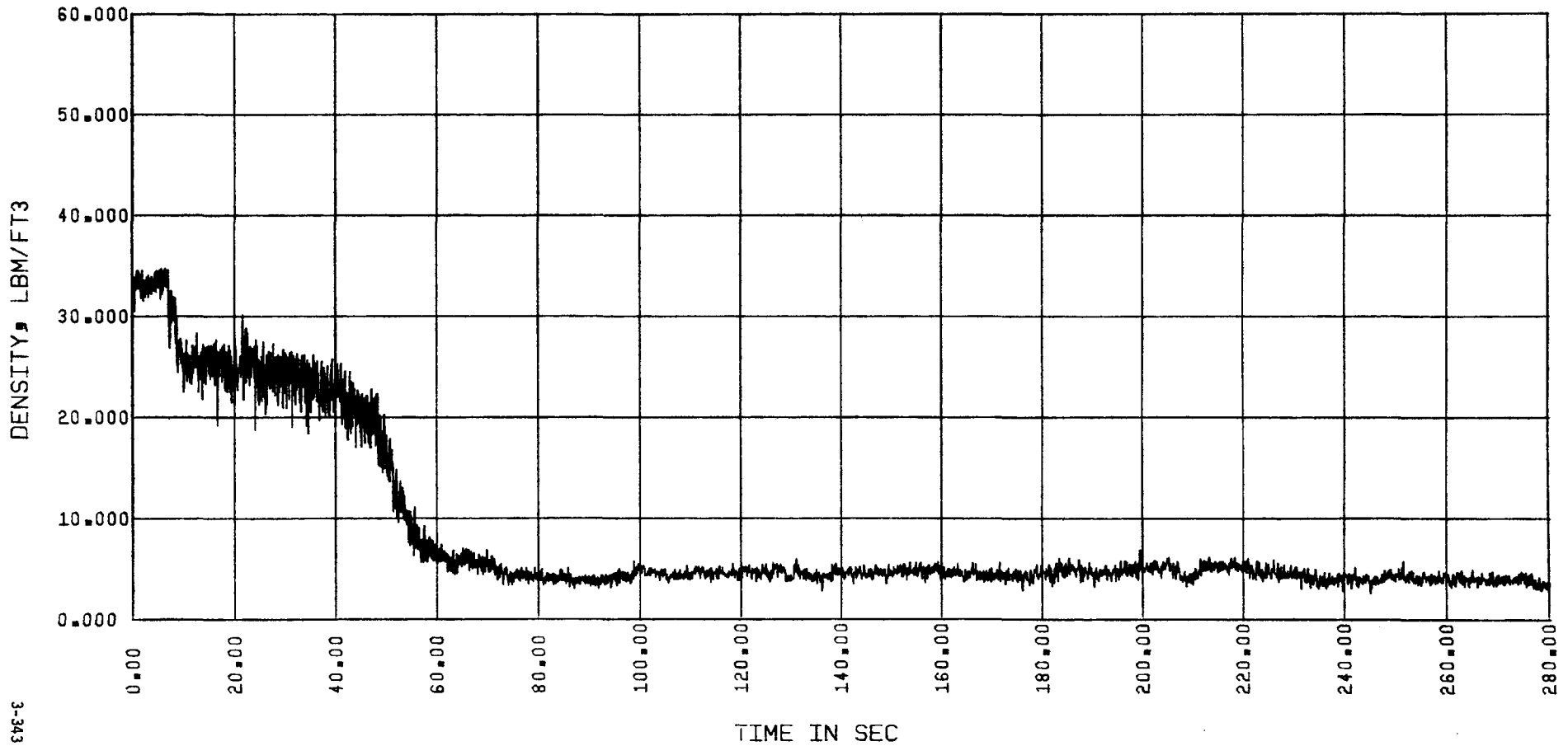
TEST 701/1000 PSIA FW FWD BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9



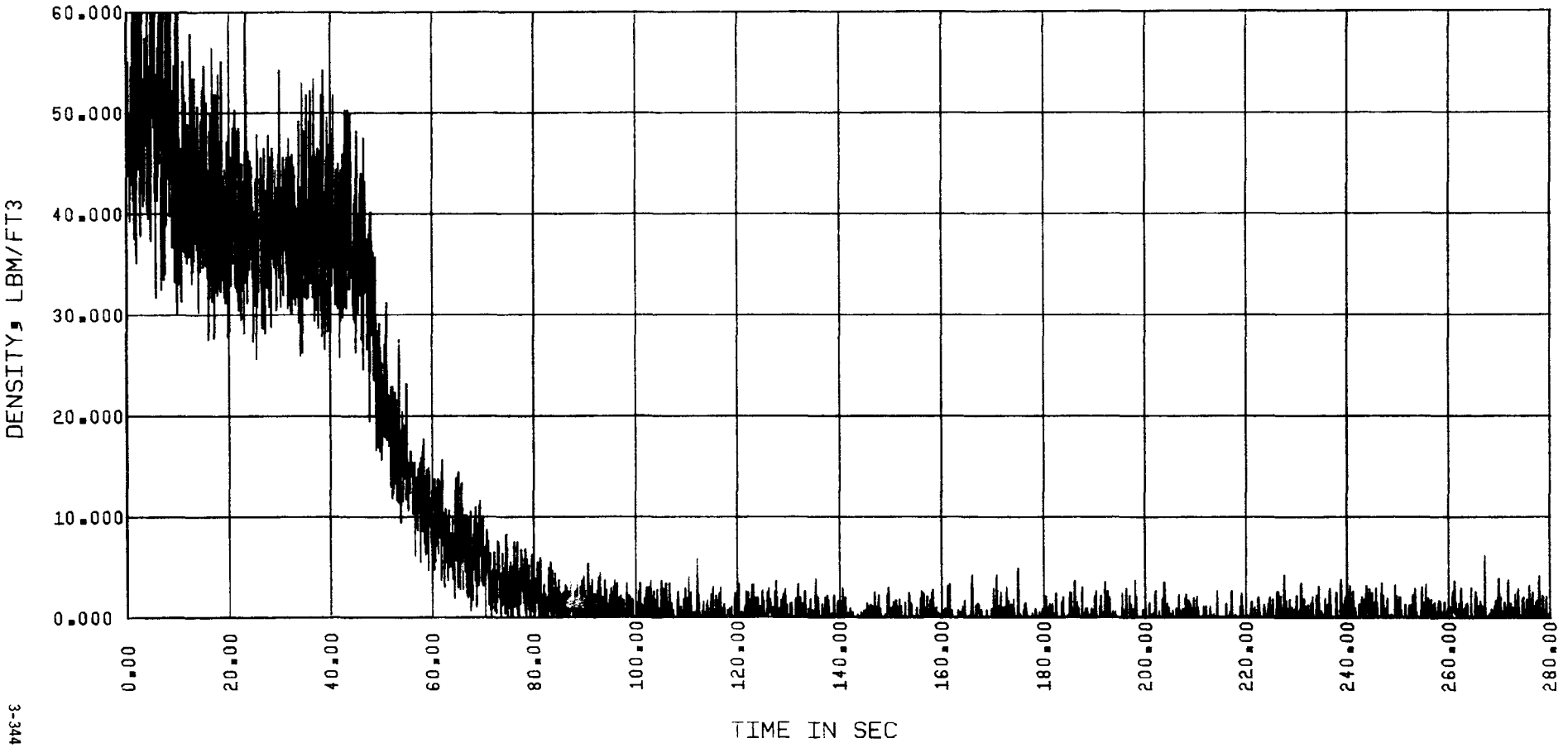
TEST 701/1000 PSIA FW FWD BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10

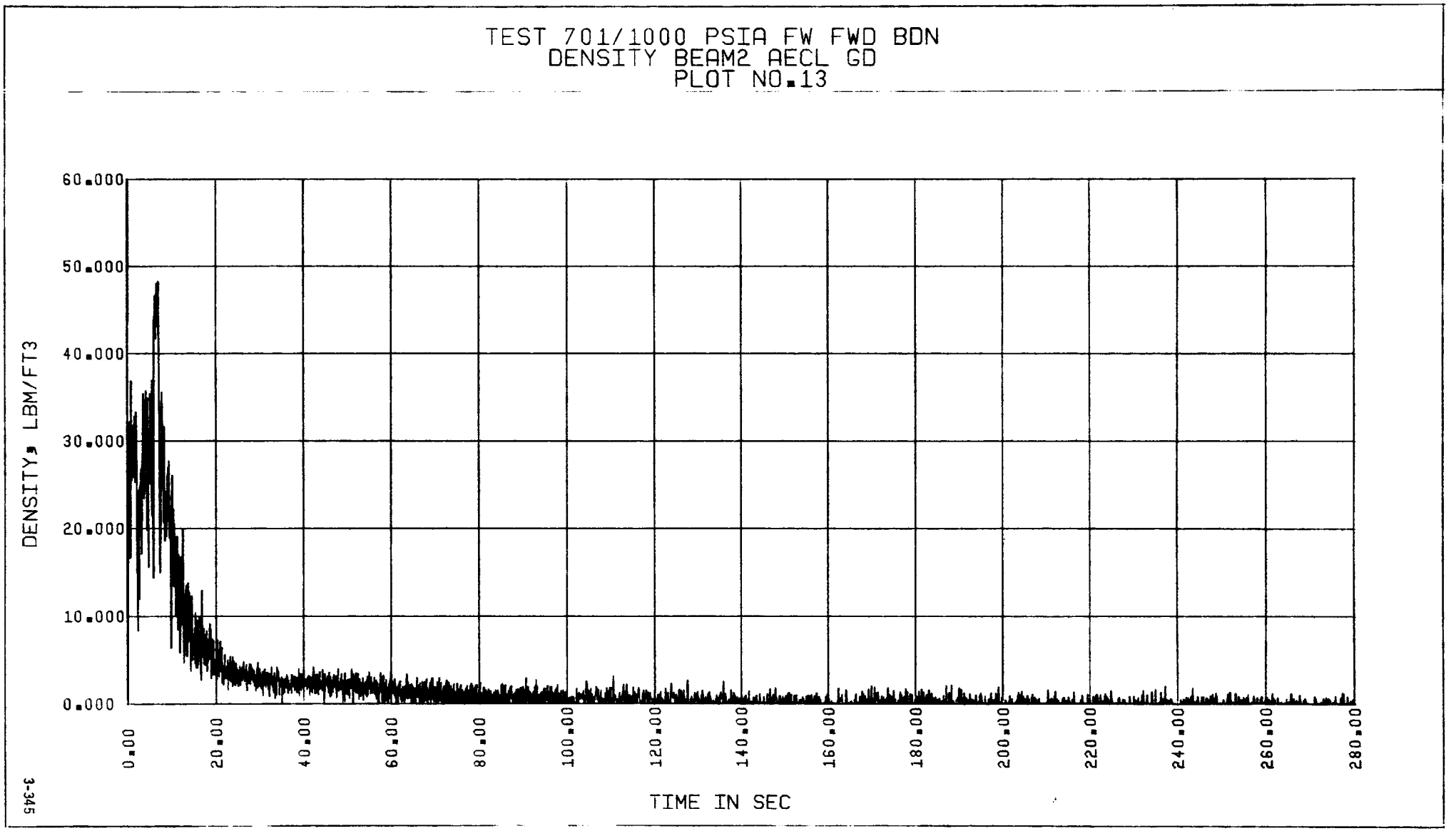


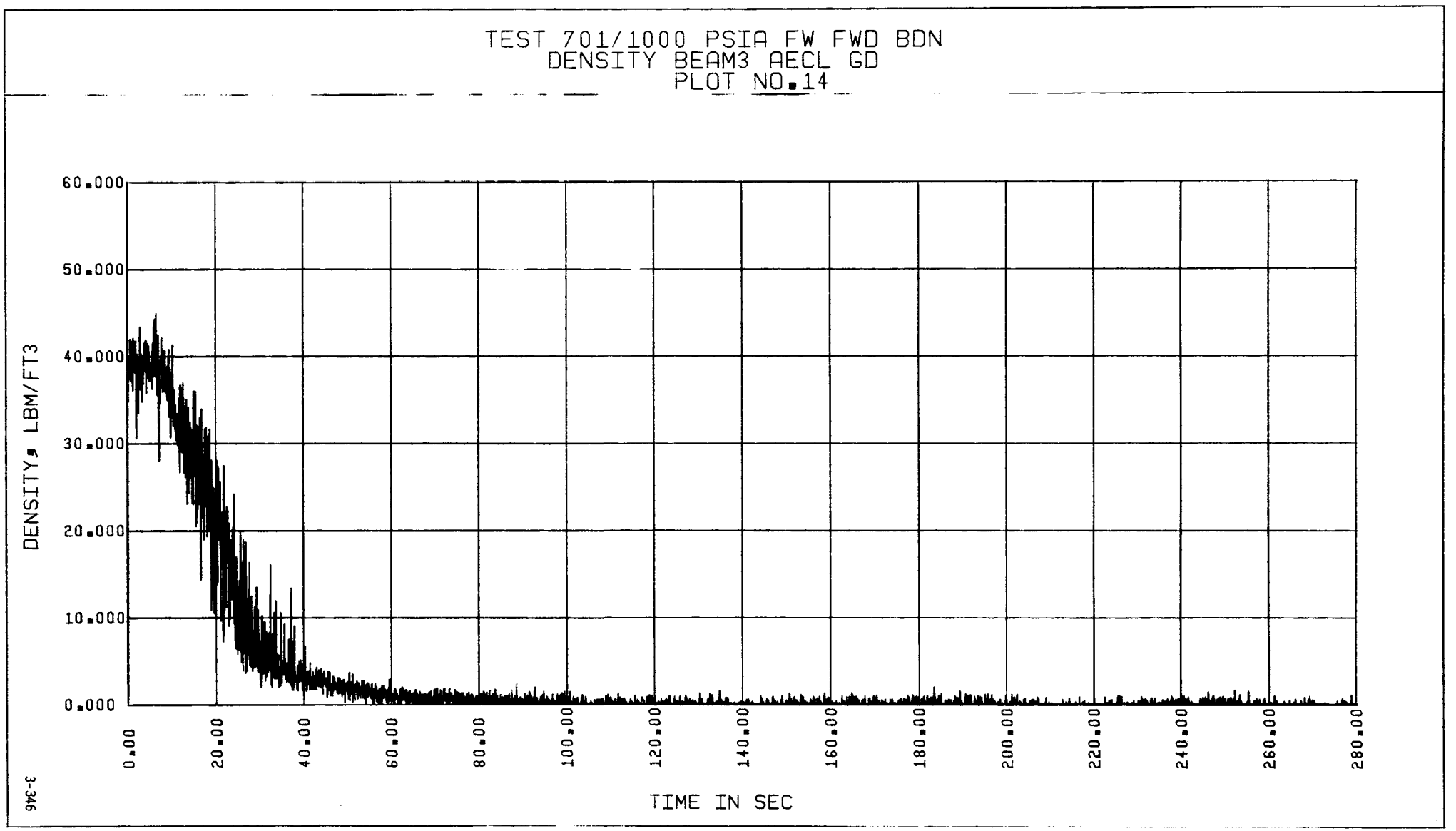
TEST 701/1000 PSIA FW FWD BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11



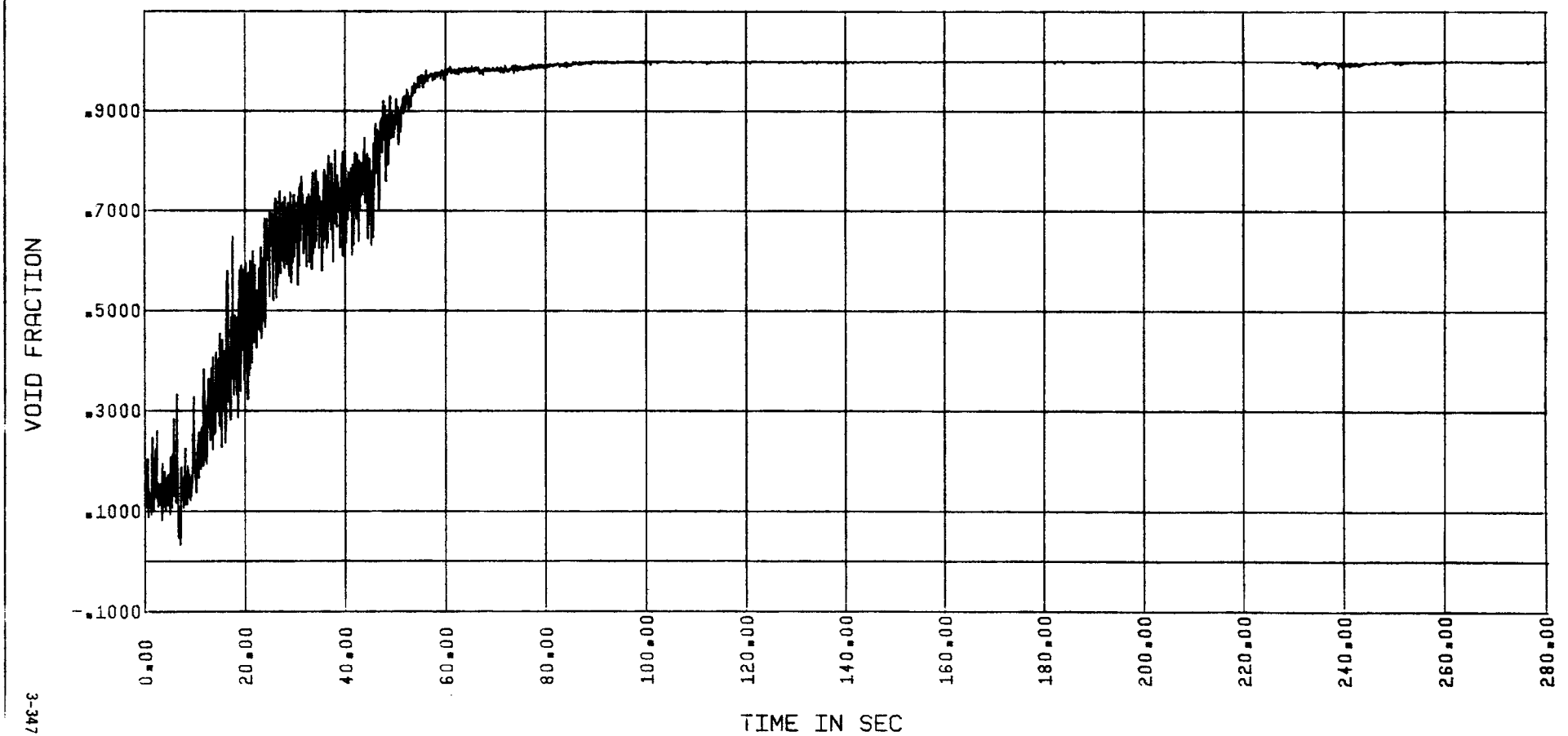
TEST 701/1000 PSIA FW FWD BDN
DENSITY BEAM1 AECL GD
PLOT NO.12



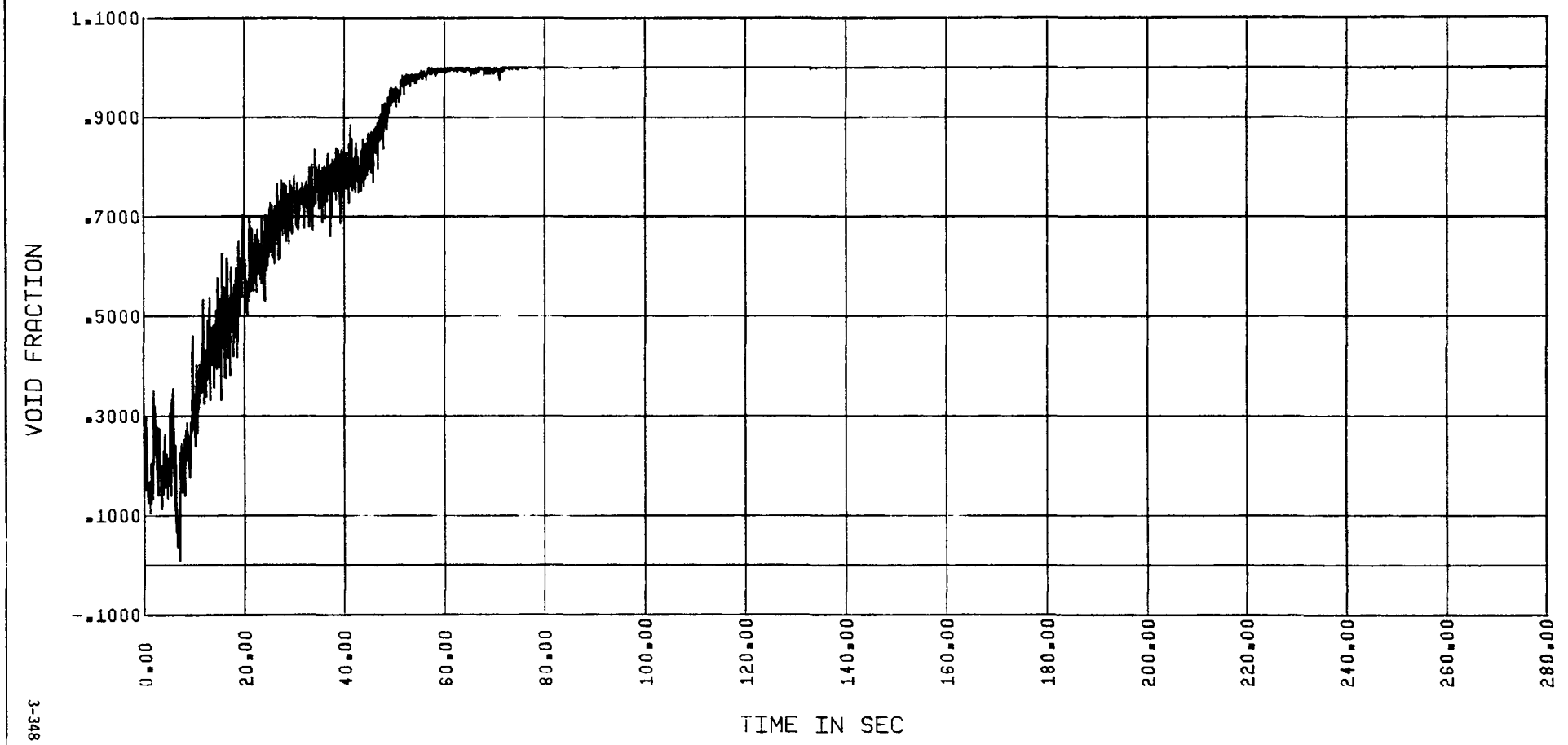

TEST 701/1000 PSIA FW FWD BDN
DENSITY BEAM2 AECL GD
PLOT NO.13
DENSITY, LBM/FT3
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC


TEST 701/1000 PSIA FW FWD BDN
DENSITY BEAM3 AECL GD
PLOT NO.14
DENSITY, LBM/FT3
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-346

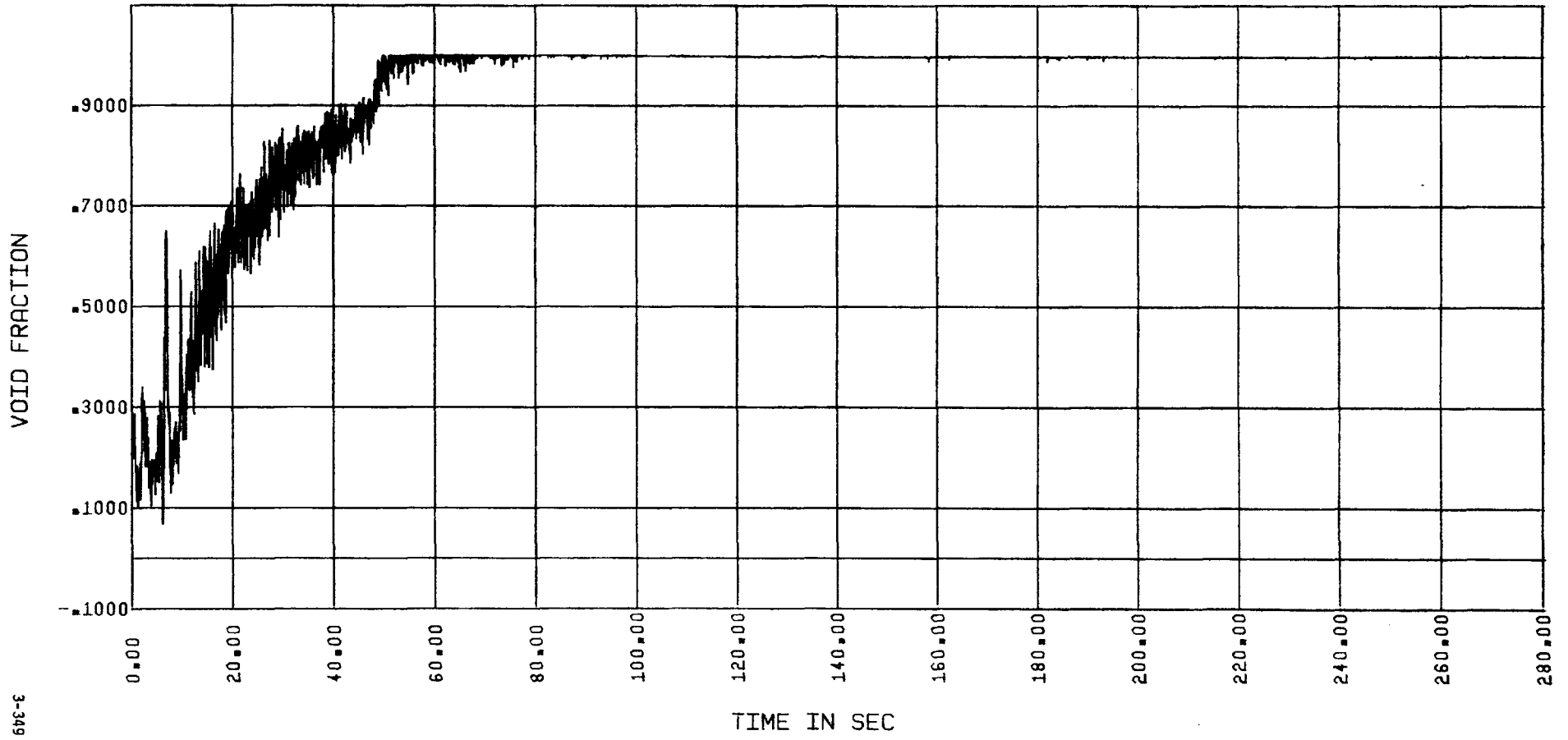
TEST 701/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15



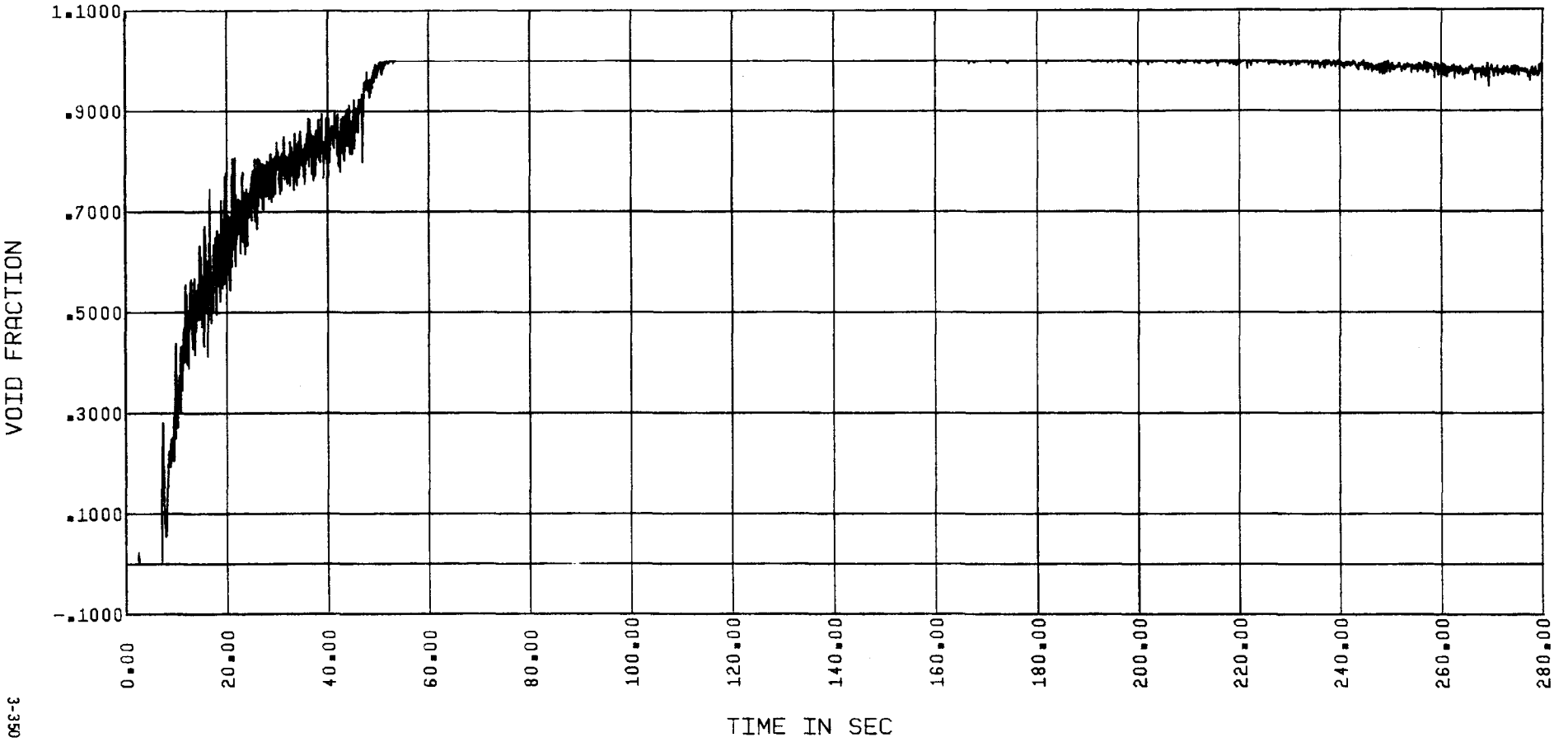
TEST 701/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16



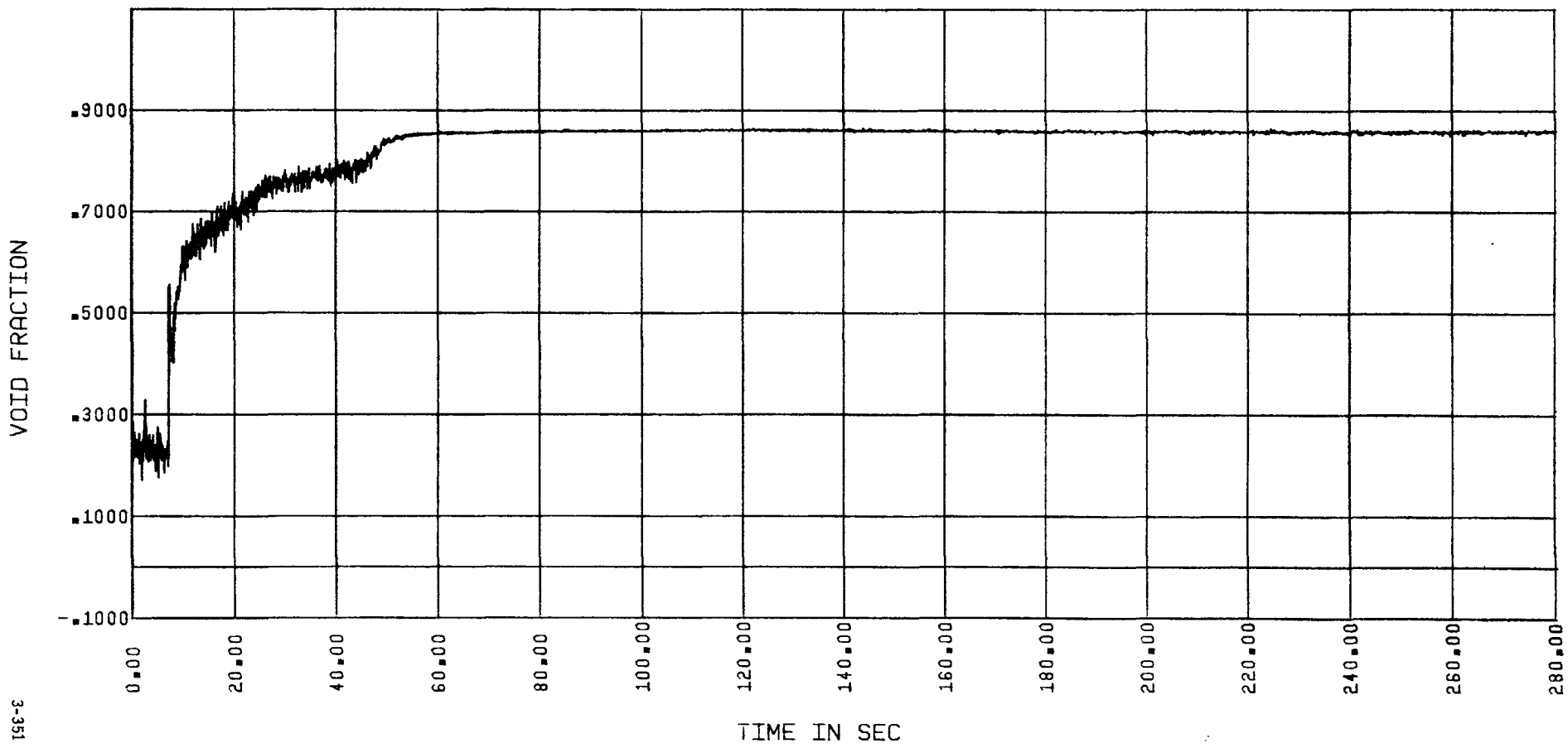
TEST 701/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17



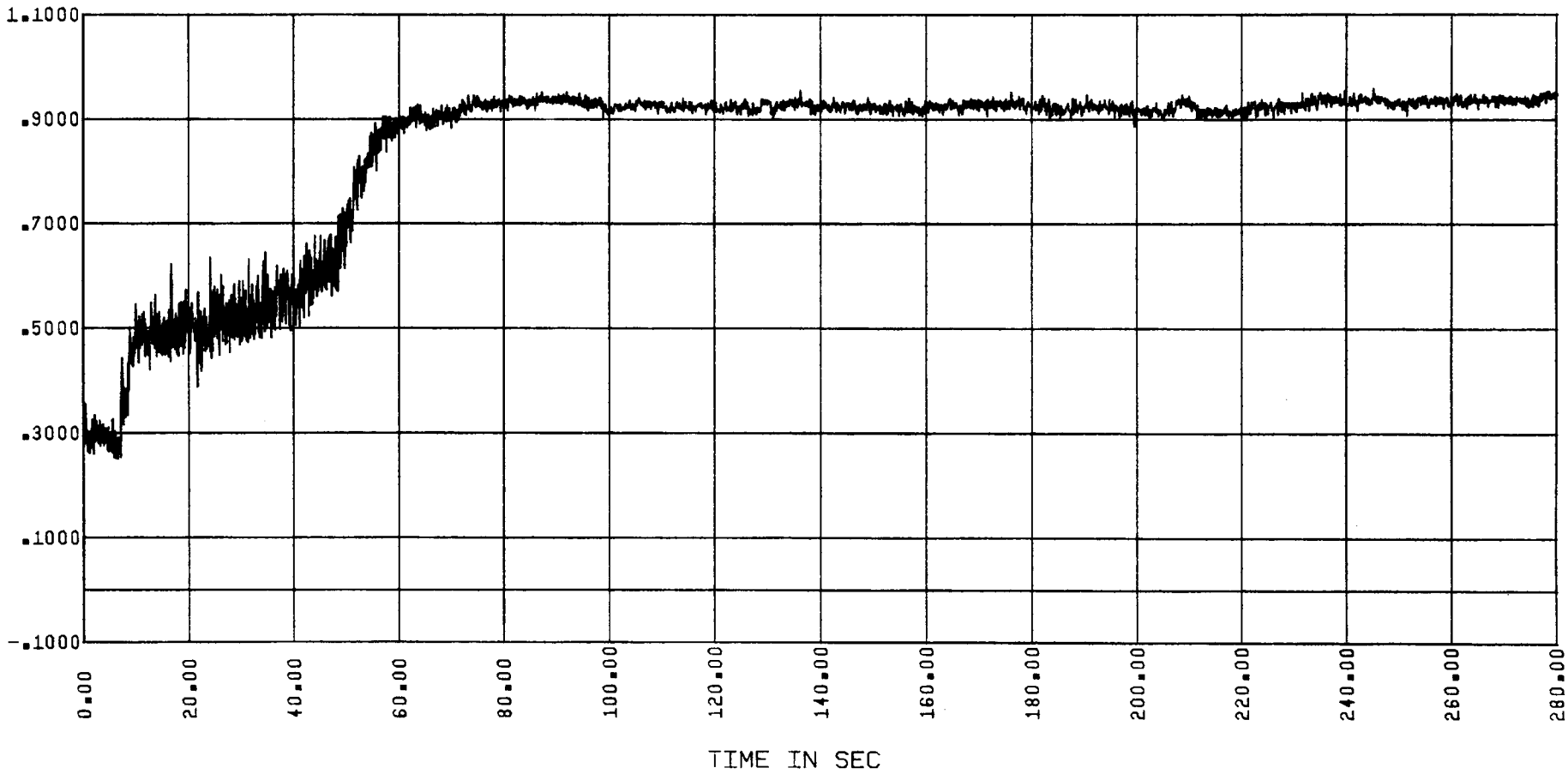
TEST 701/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18

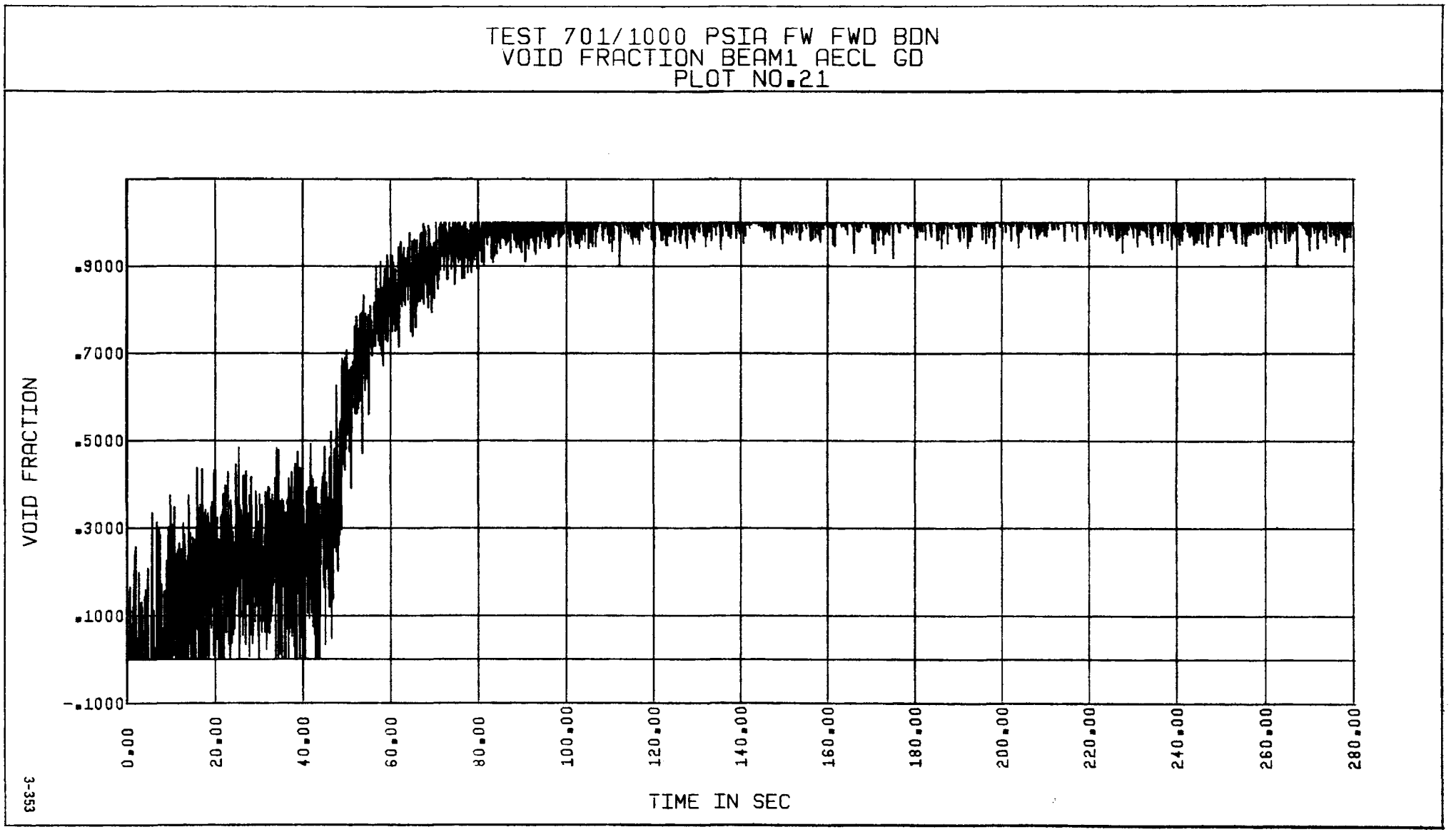


TEST 701/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19

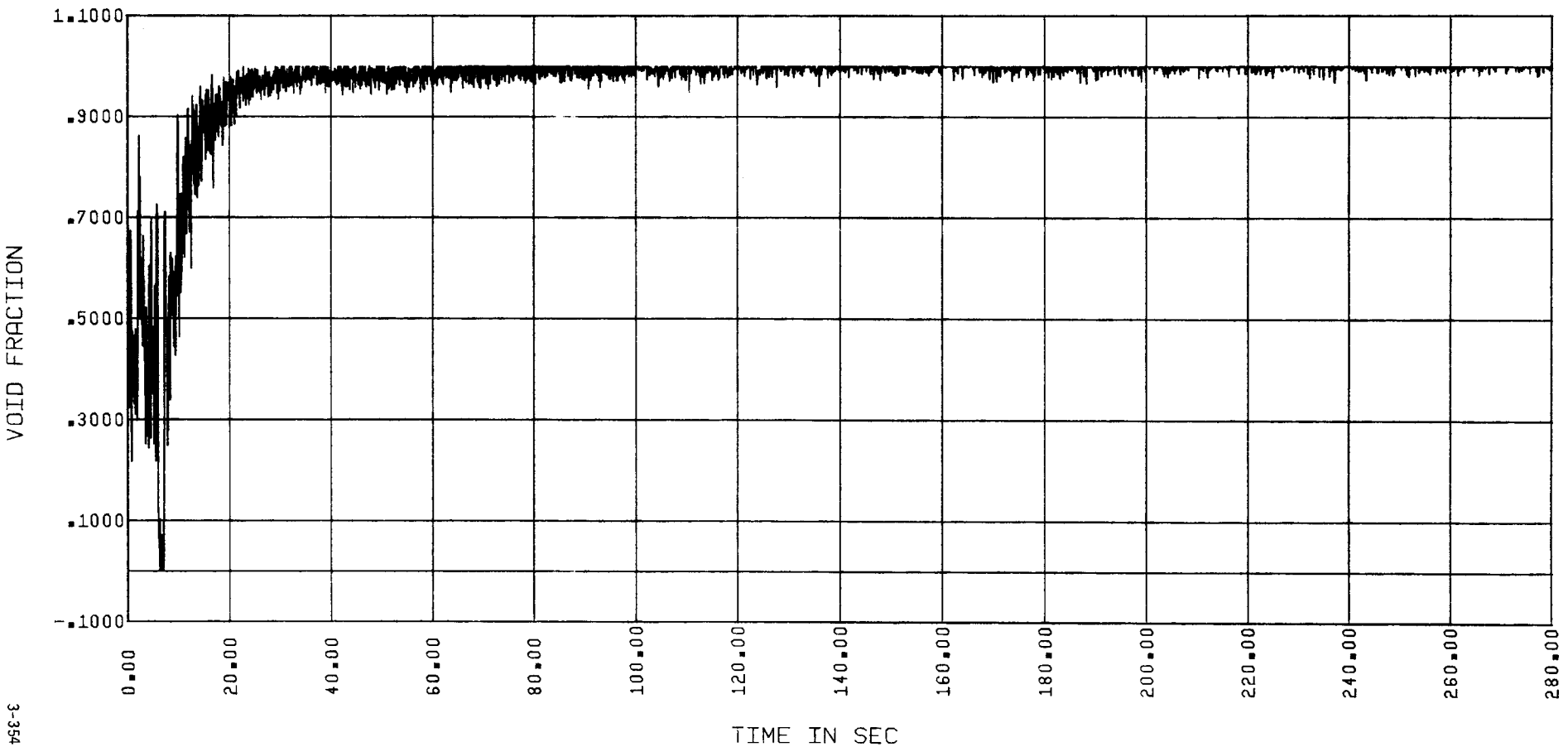


TEST 701/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20

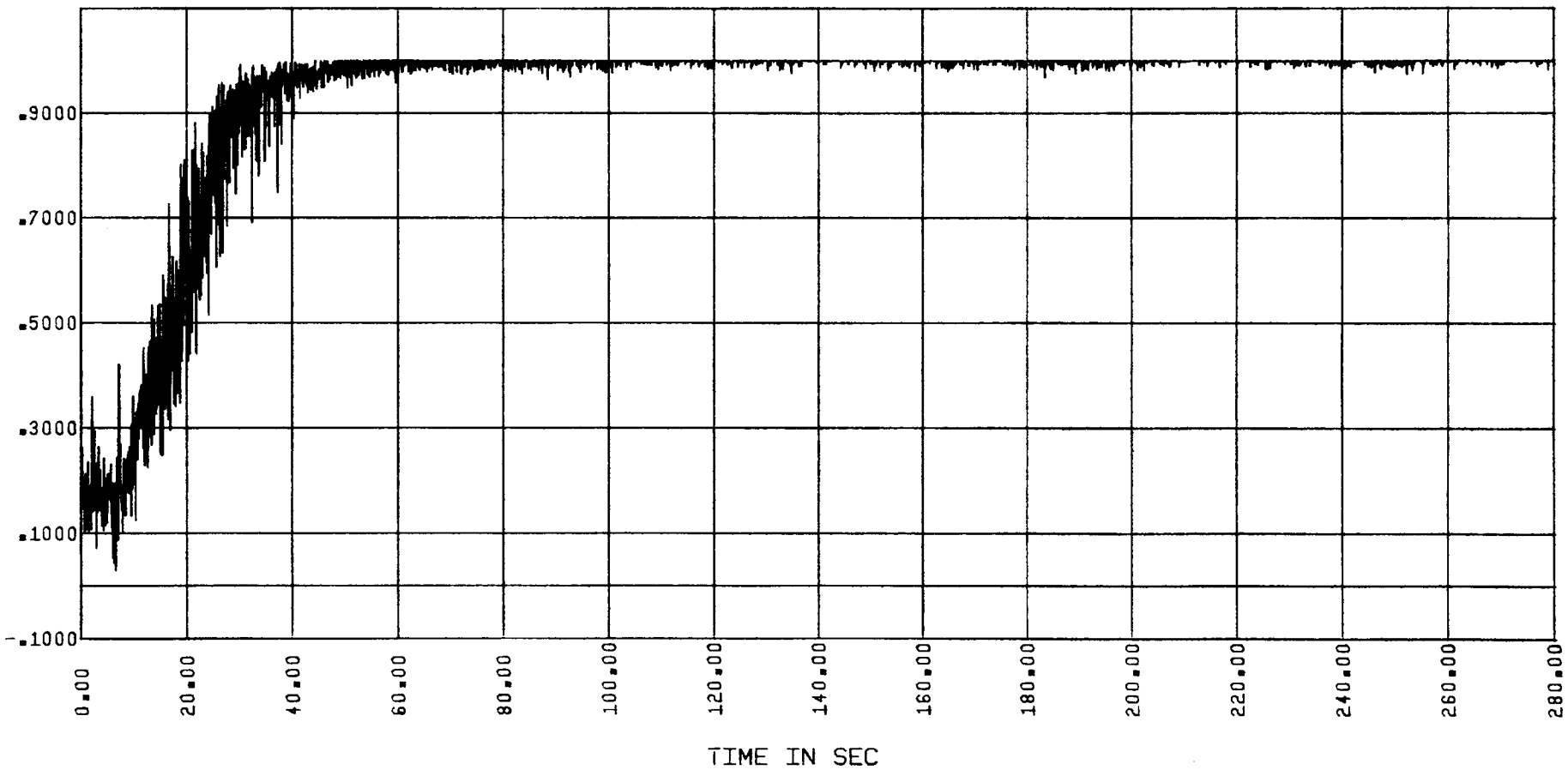



TEST 701/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

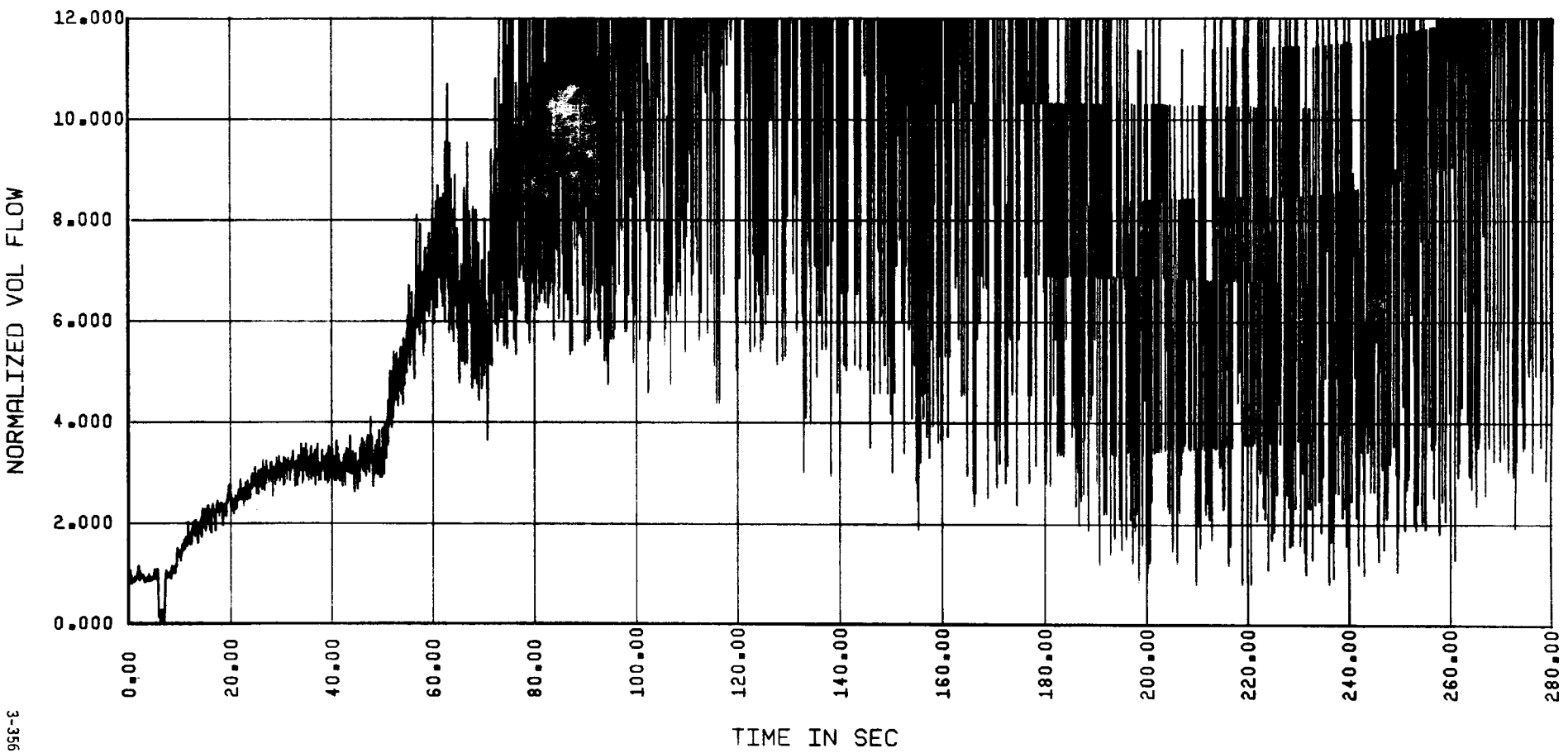
TEST 701/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22

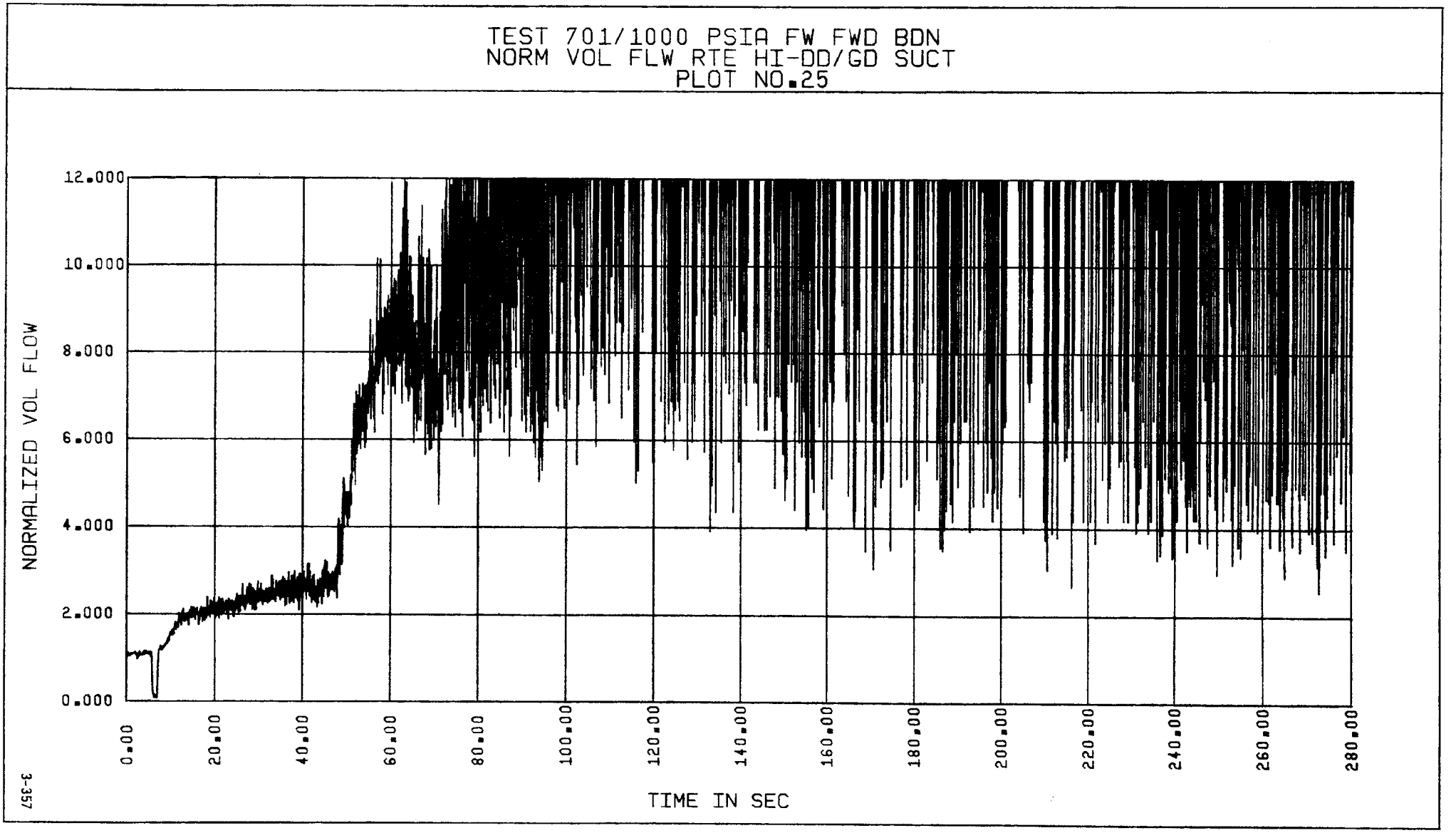


TEST 701/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23

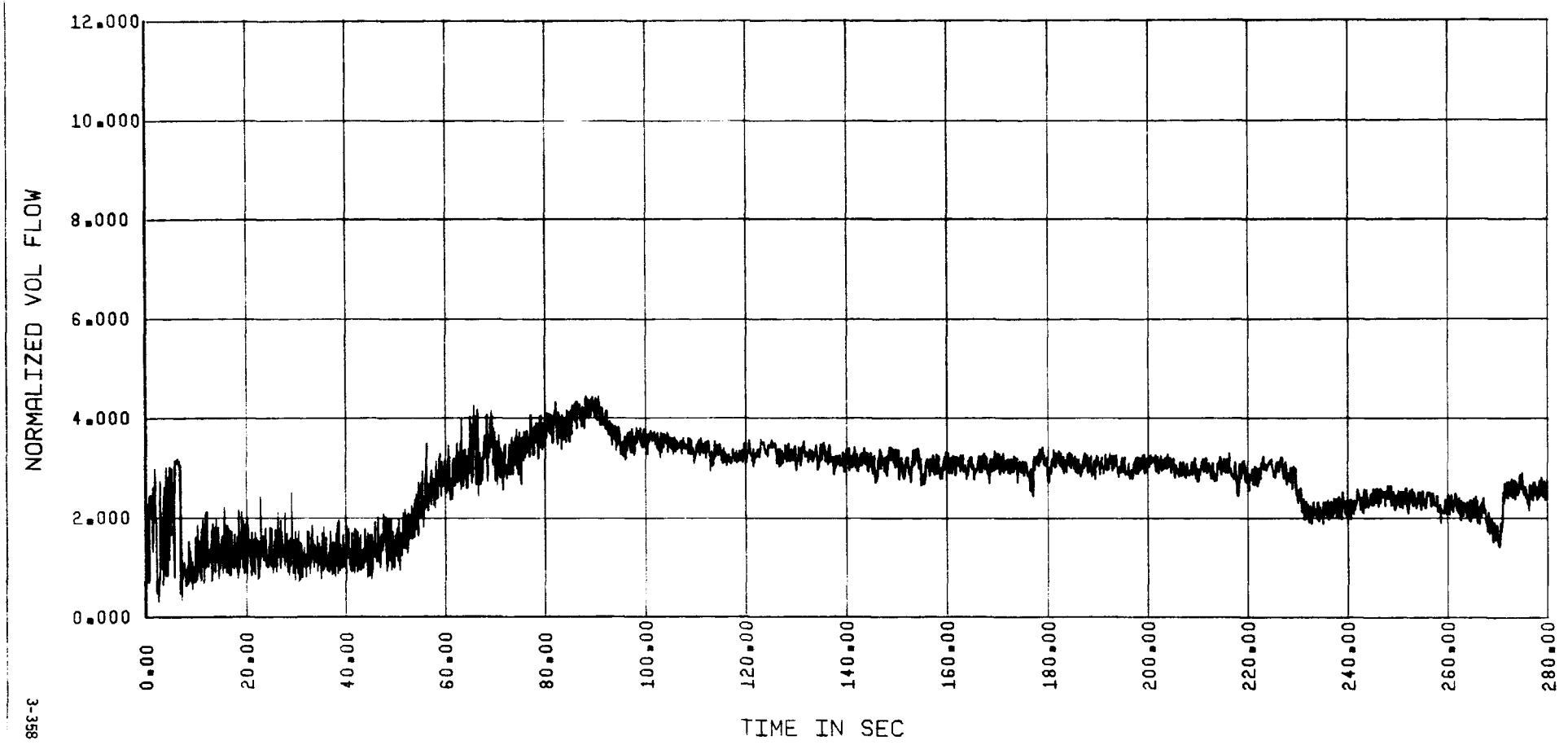


TEST 701/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-DD/GD2 S
PLOT NO.24

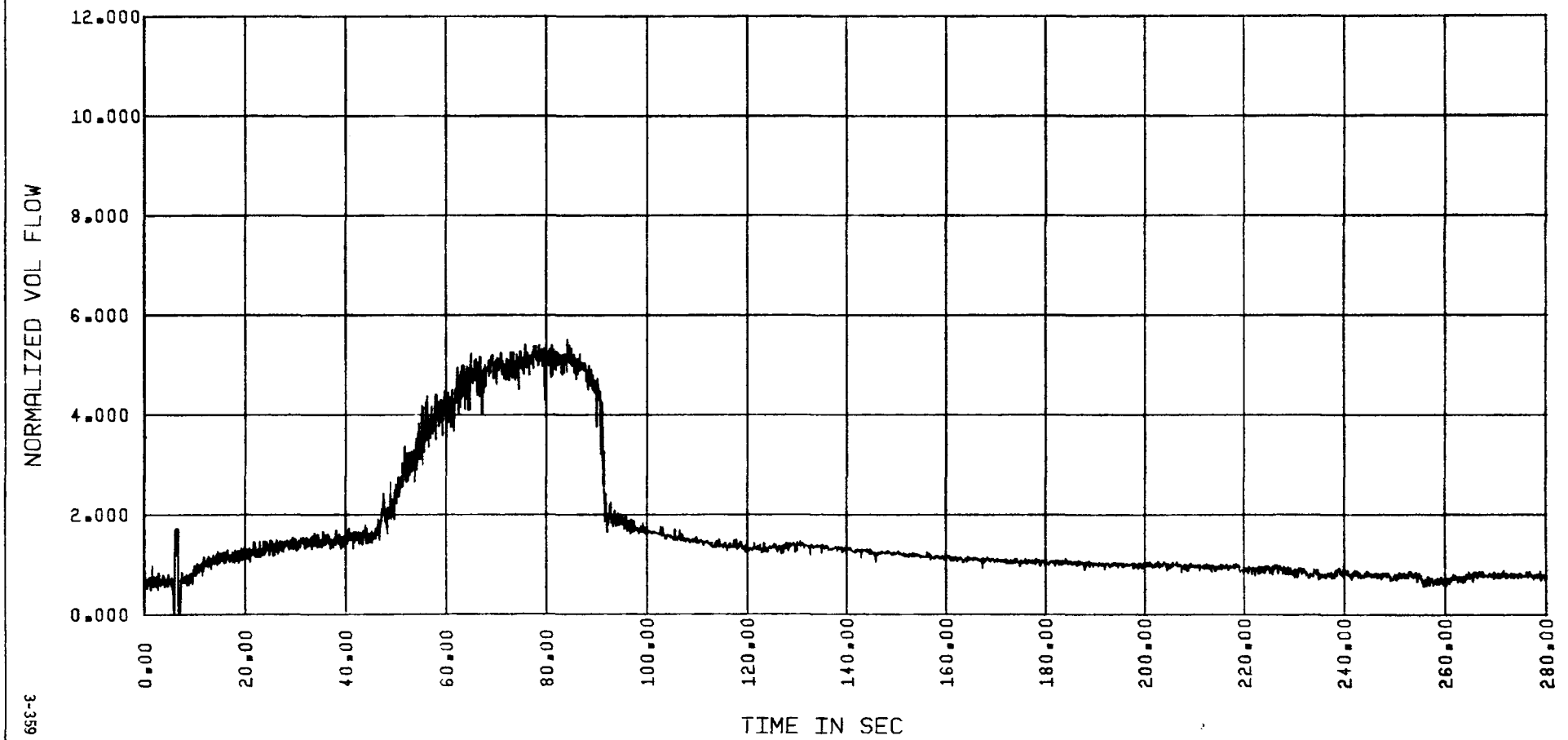



TEST 701/1000 PSIA FW FWD BDN
NORM VOL FLW RTE HI-DD/GD SUCT
PLOT NO.25
NORMALIZED VOL FLOW
12.000
10.000
8.000
6.000
4.000
2.000
0.000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-357

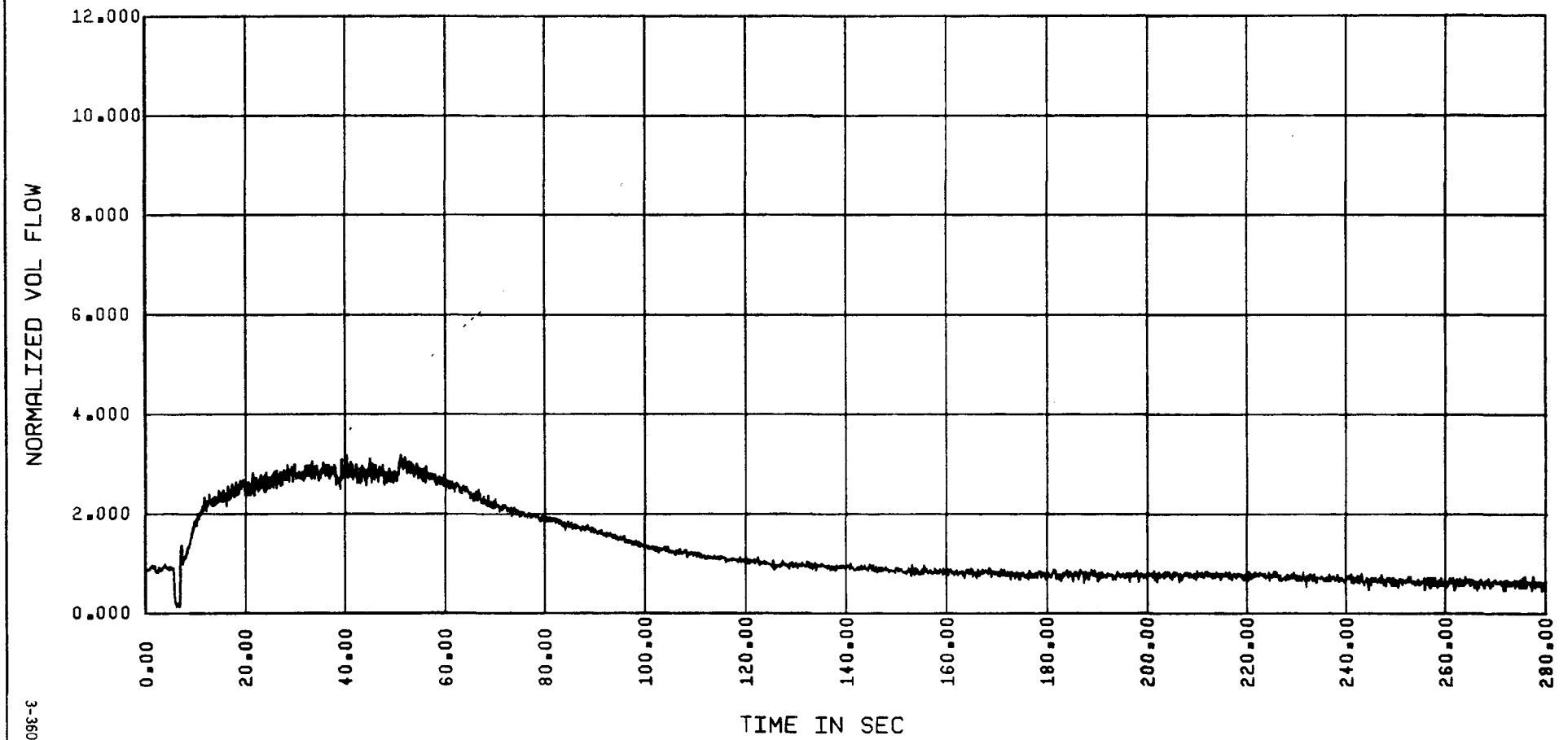
TEST 701/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-TM SUCT
PLOT NO.26



TEST 701/1000 PSIA FW FWD BDN
N VOL FLOW HI-TM SUCT QR=3500
PLOT NO.27

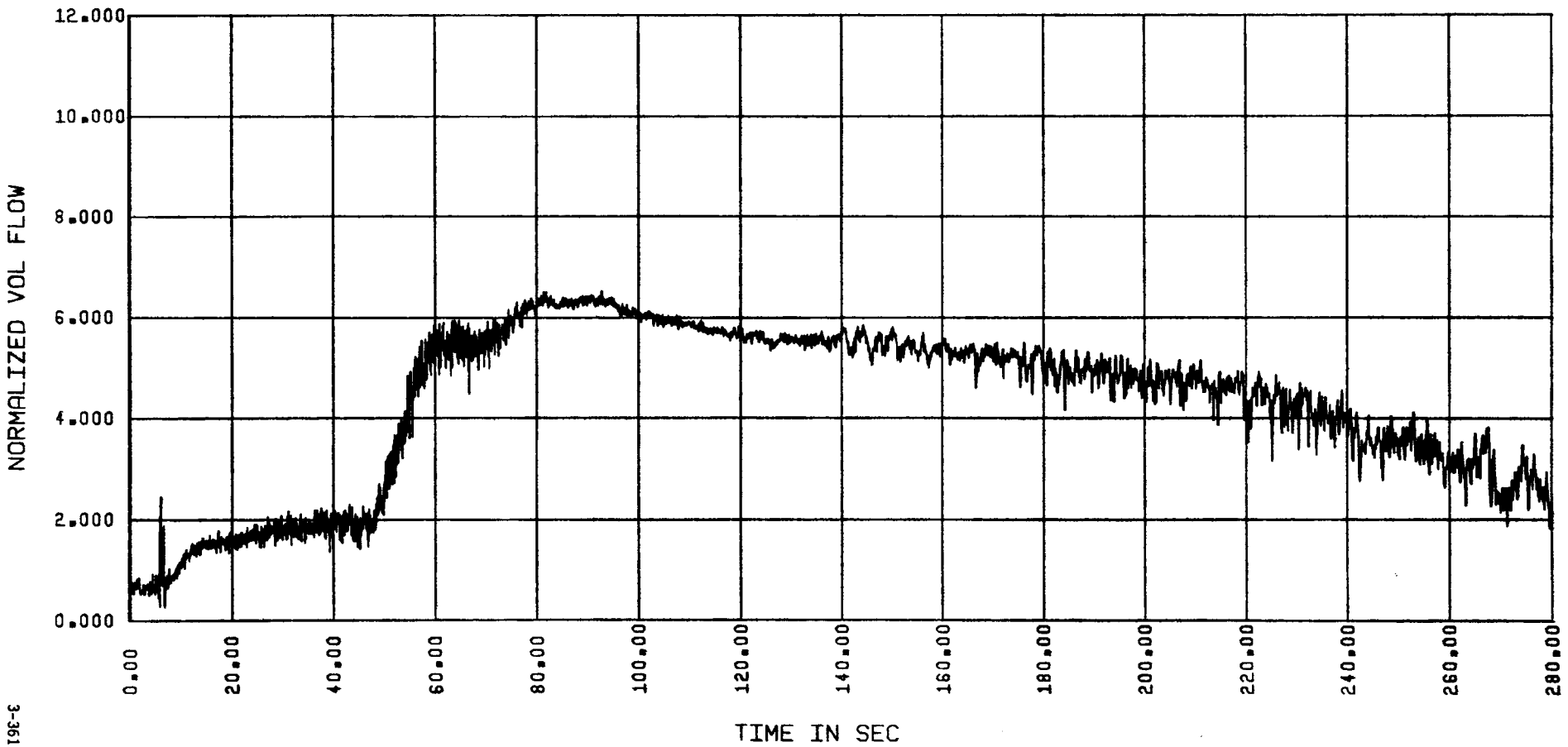


TEST 701/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-DD/GD2 D
PLOT NO.29

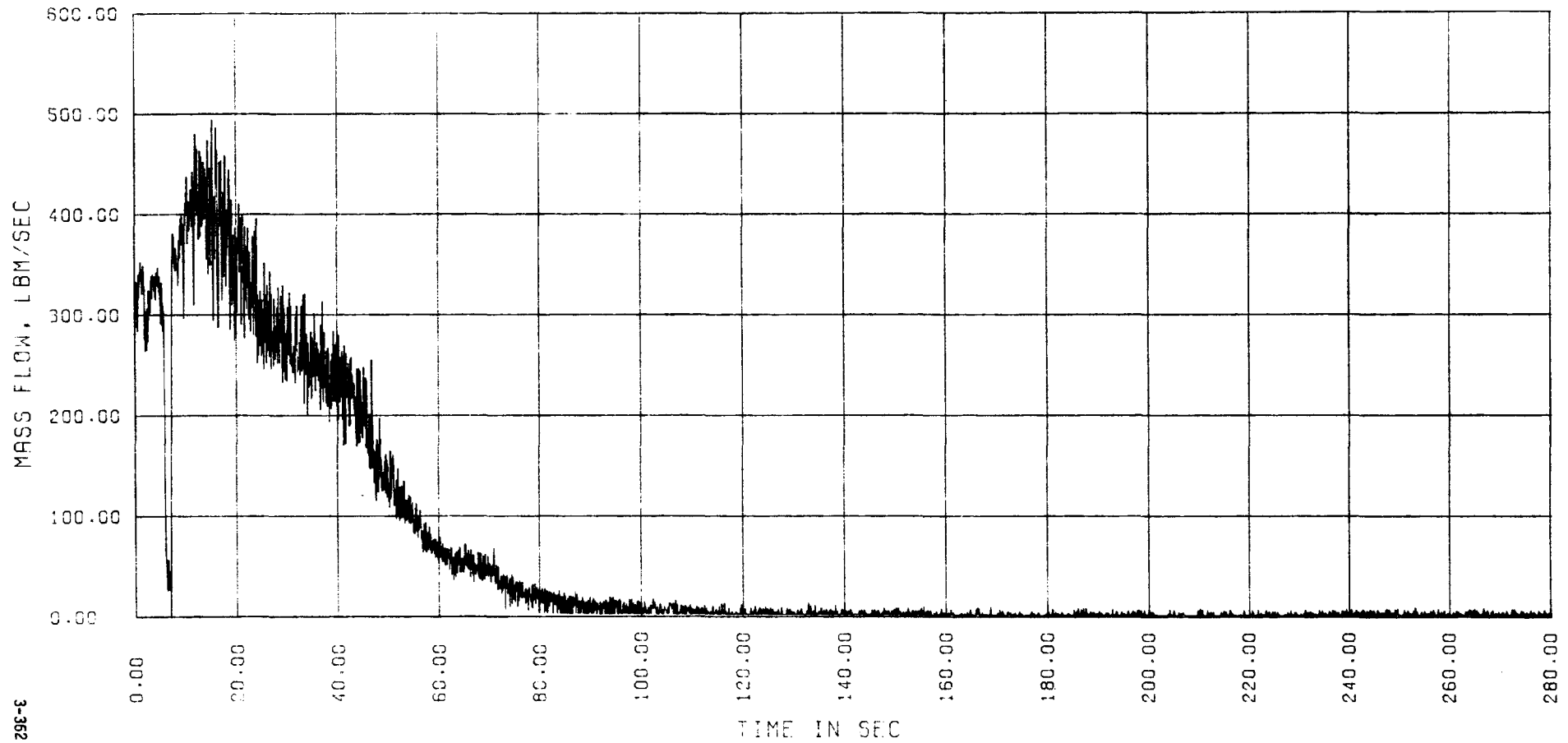


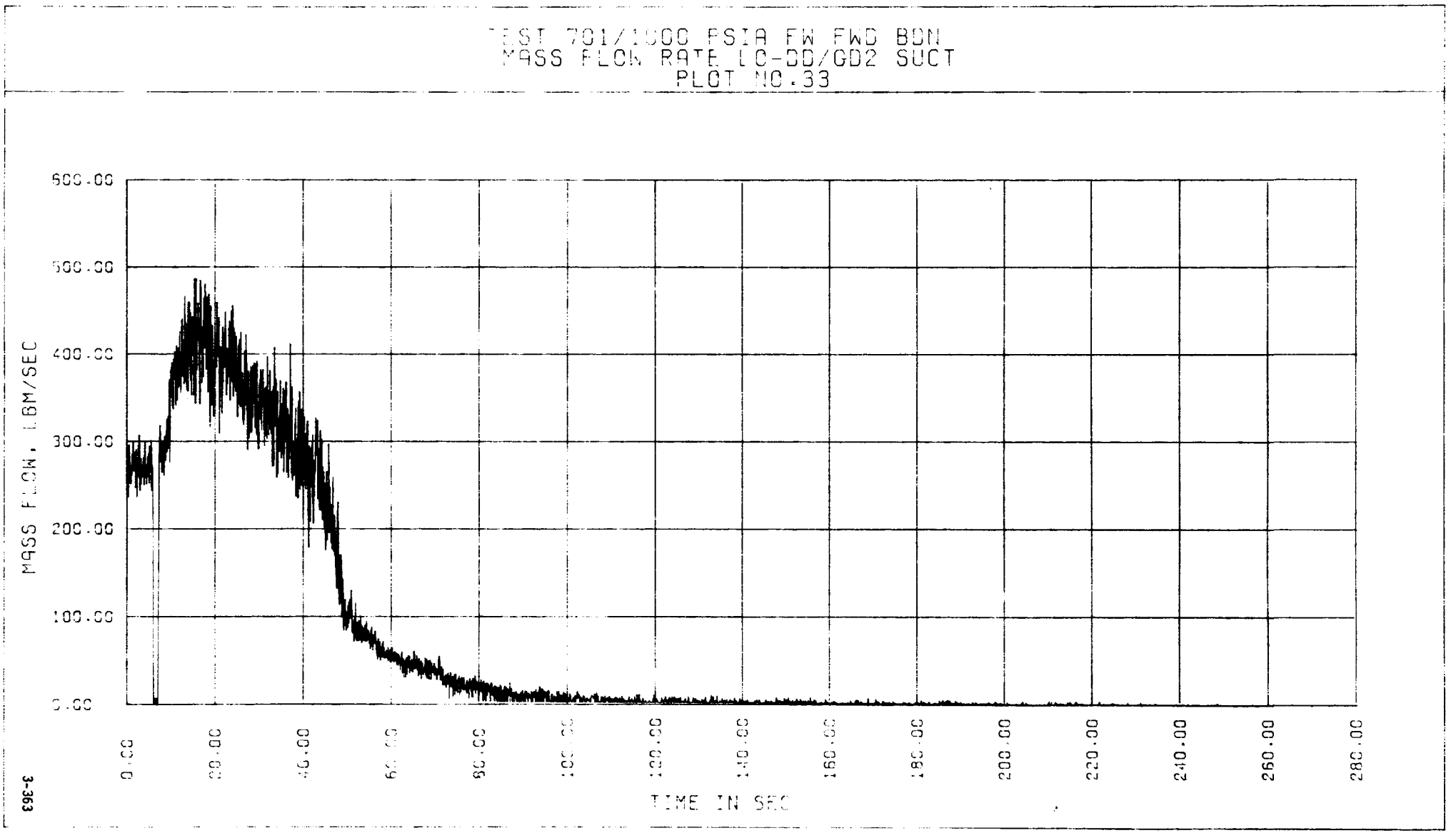
3-360

TEST 701/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-TM DSCH
PLOT NO.30

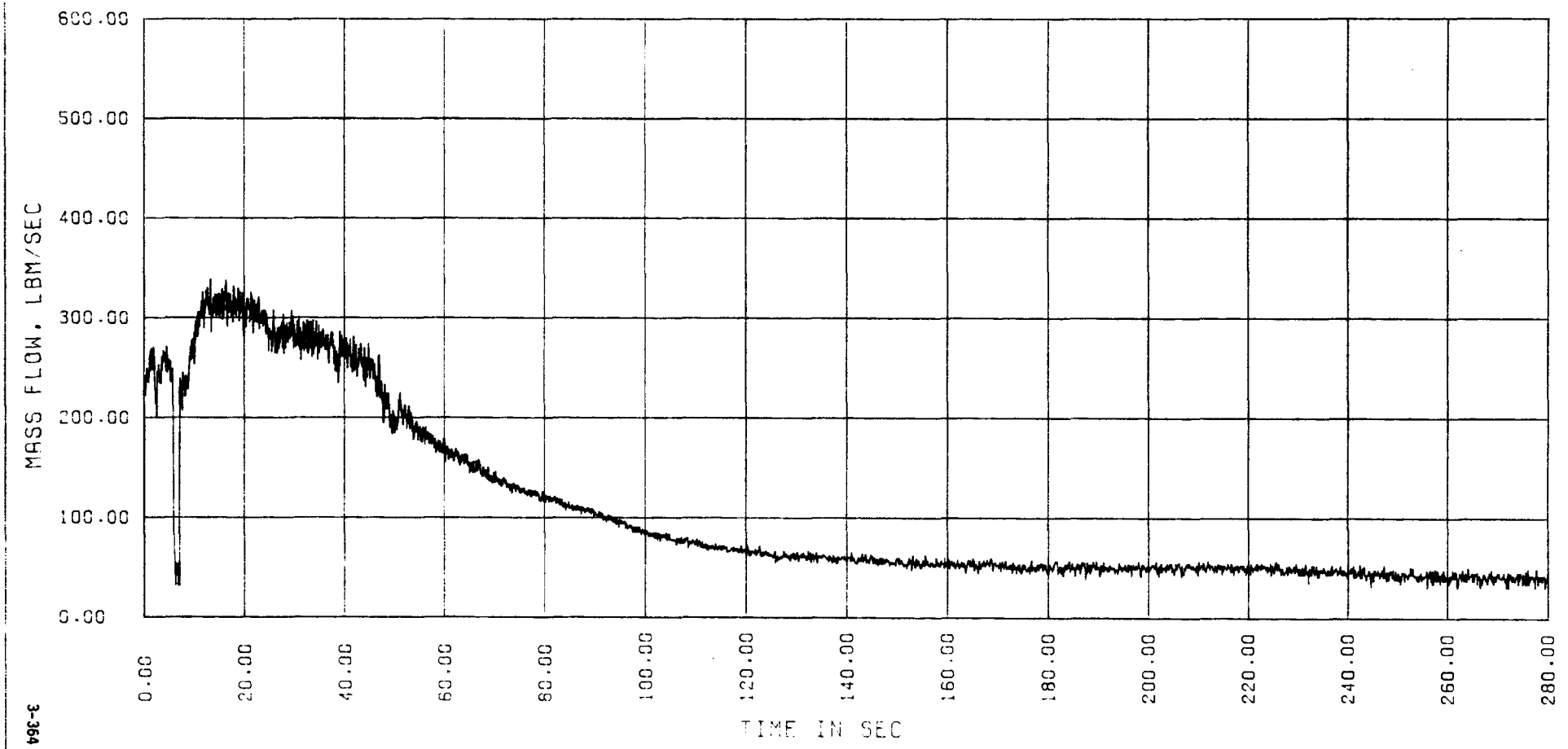


TEST 701/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.32

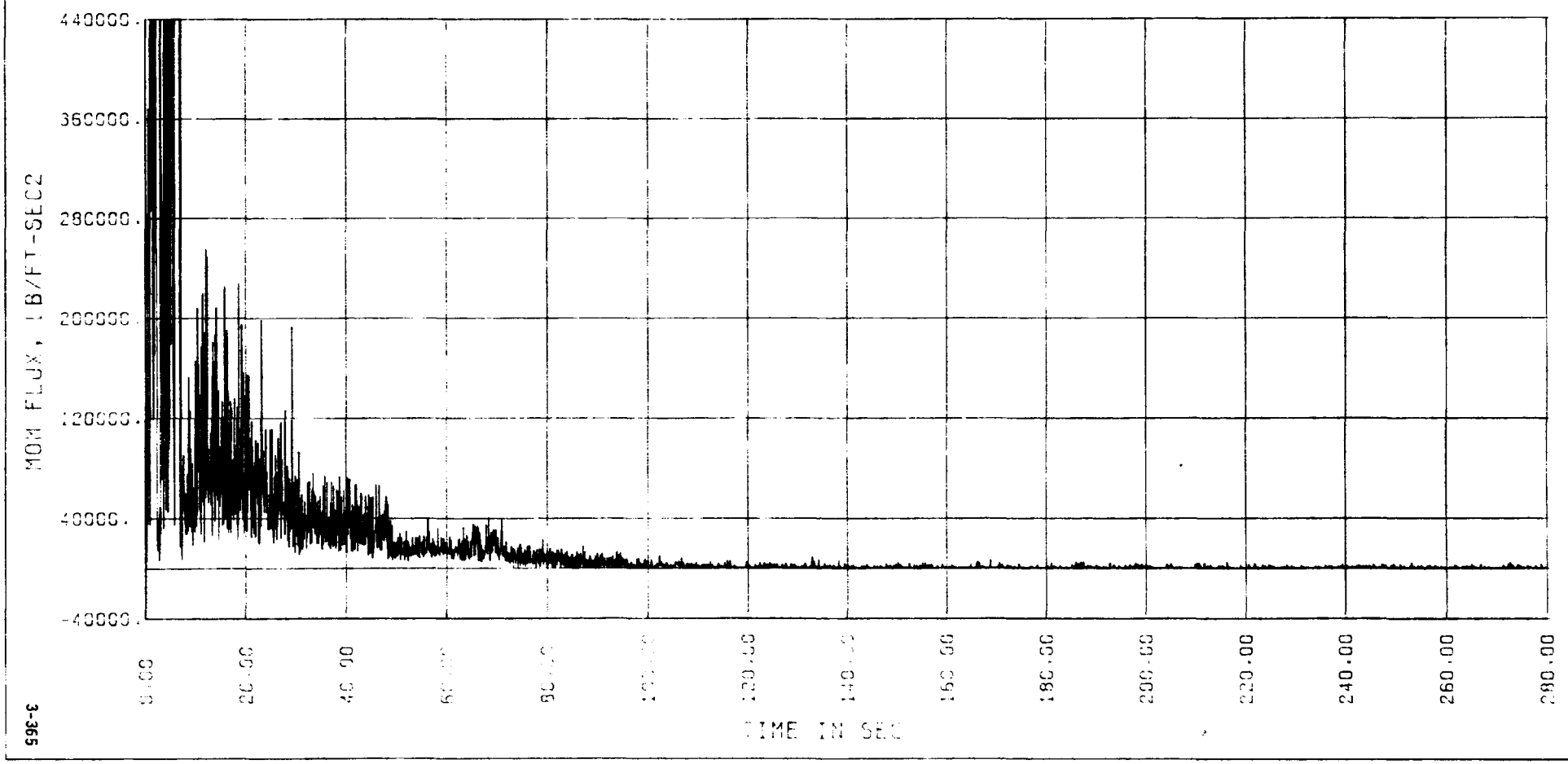



TEST 701/1500 PSIA FW FWD BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.33
MASS FLOW, LBM/SEC
600.00
500.00
400.00
300.00
200.00
100.00
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

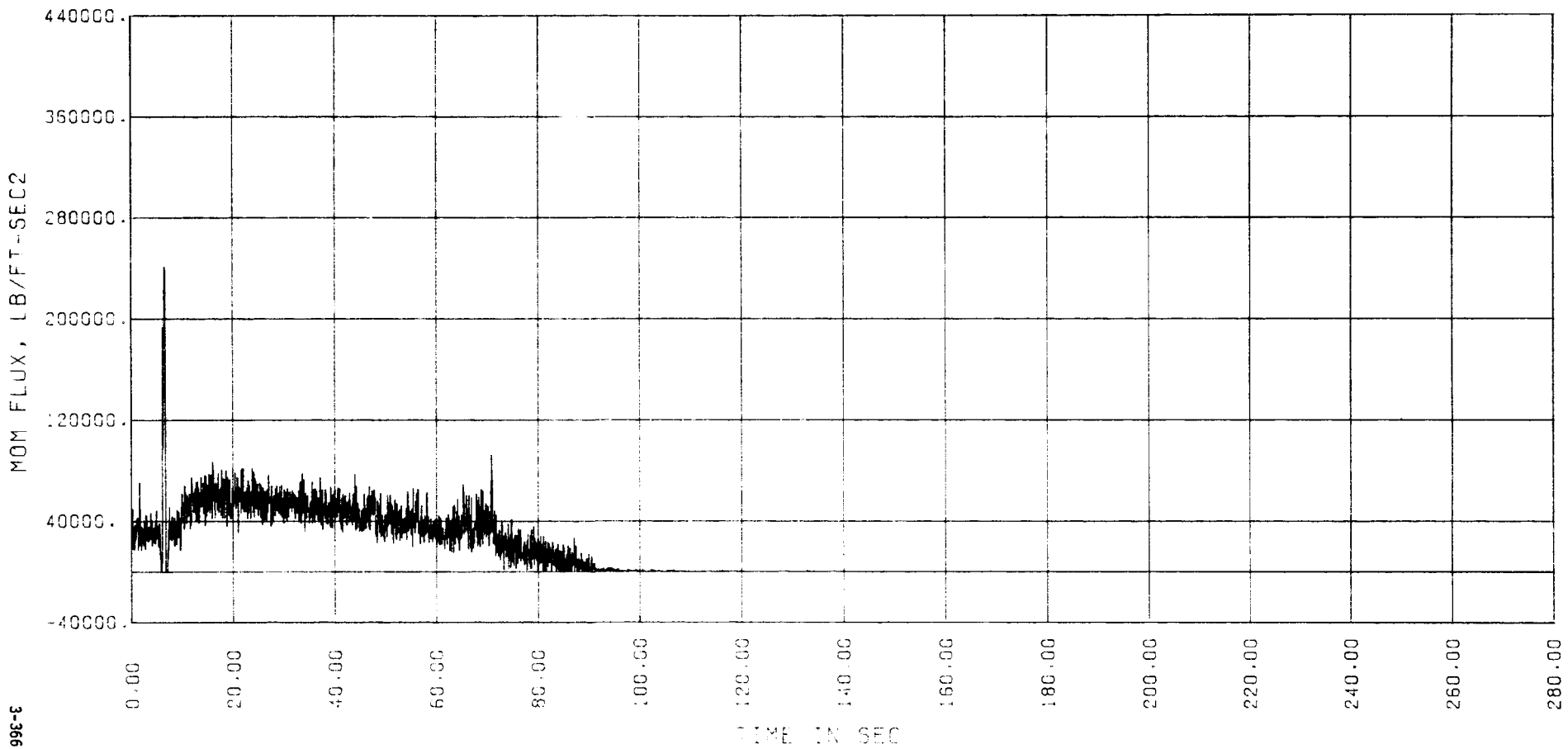
TEST 701/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-OD/GO2 DISCH
PLOT NO.34



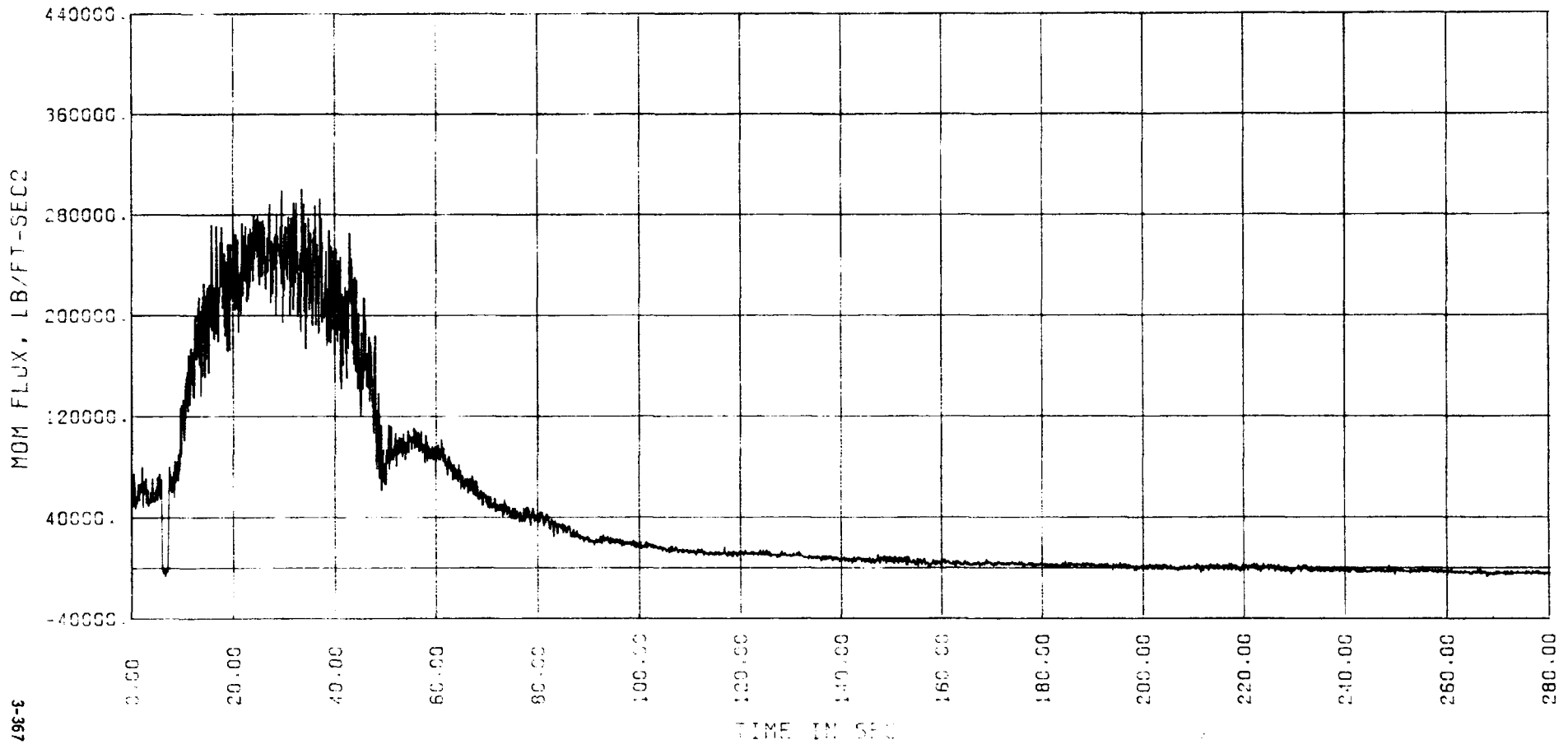
TEST 701/1000 PSIA FW FWD BDN
MOMENTUM FLUX GO2/LO-TM SUCT
PLOT NO.36



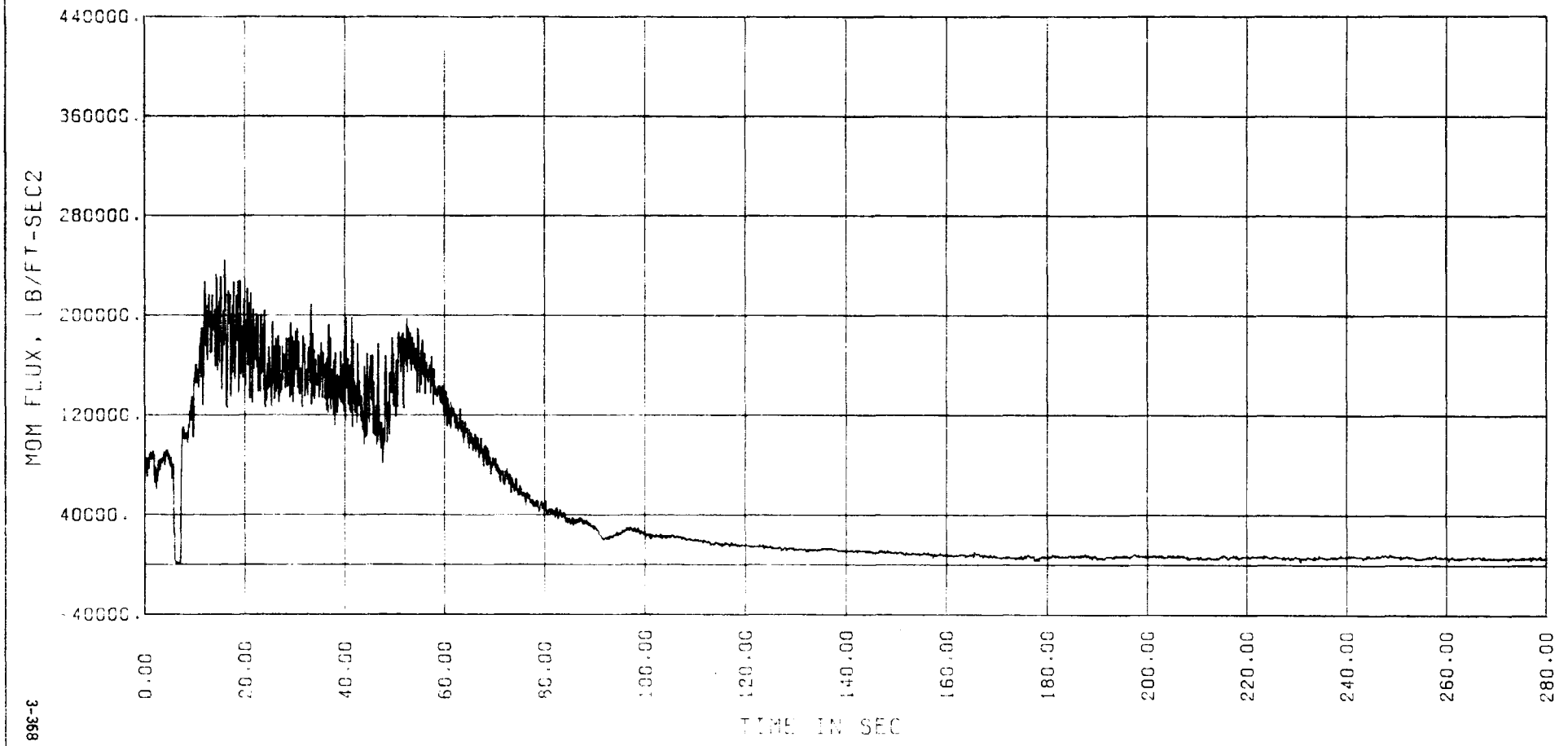
TEST 701/1000 PSIA FW FWD BDN
MOMENTUM FLUX GO2/HI-TM SUCT
PLOT NO.37



TEST 701/1000 PSIA FW FWD BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38

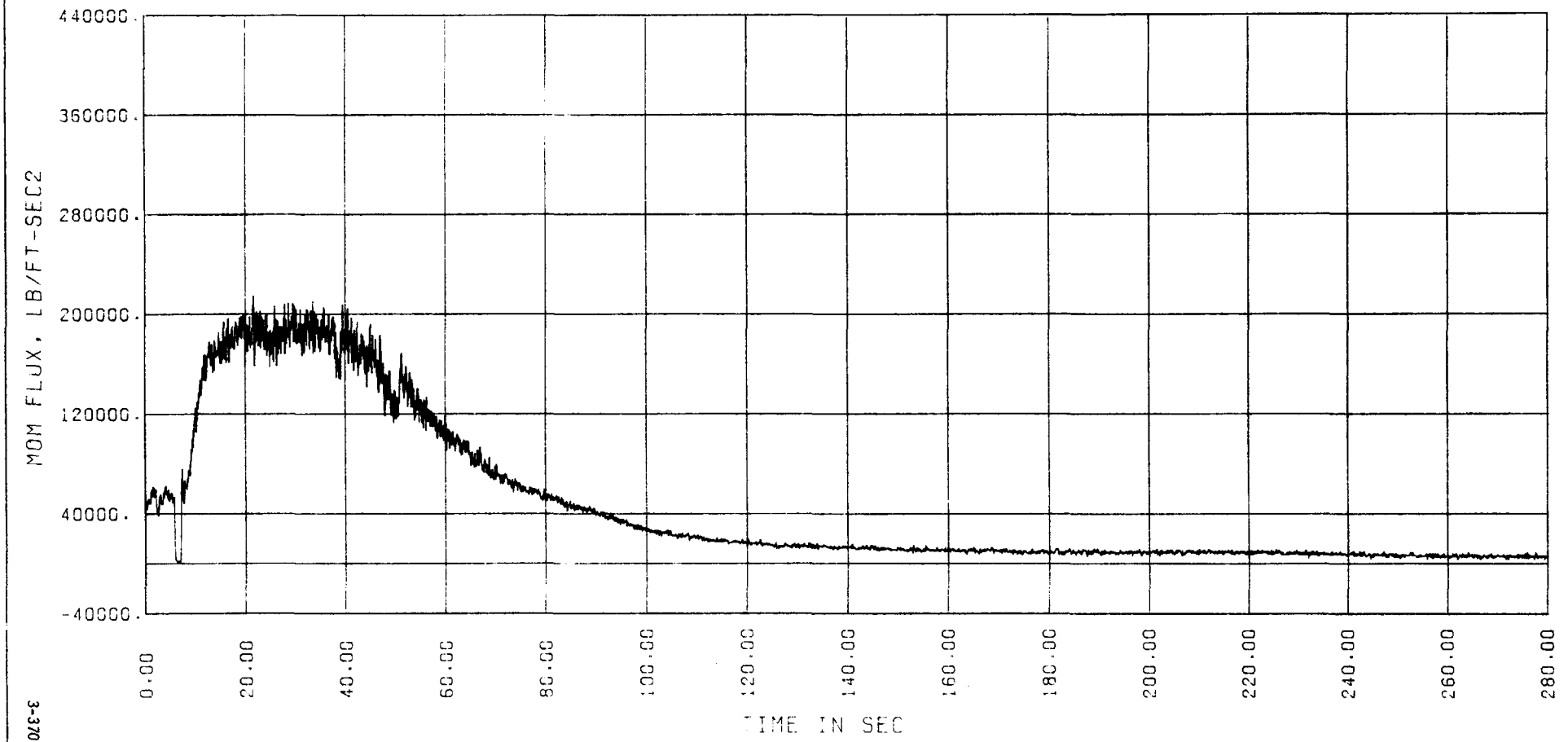


TEST 701/1000 PSIA FW FWD BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39



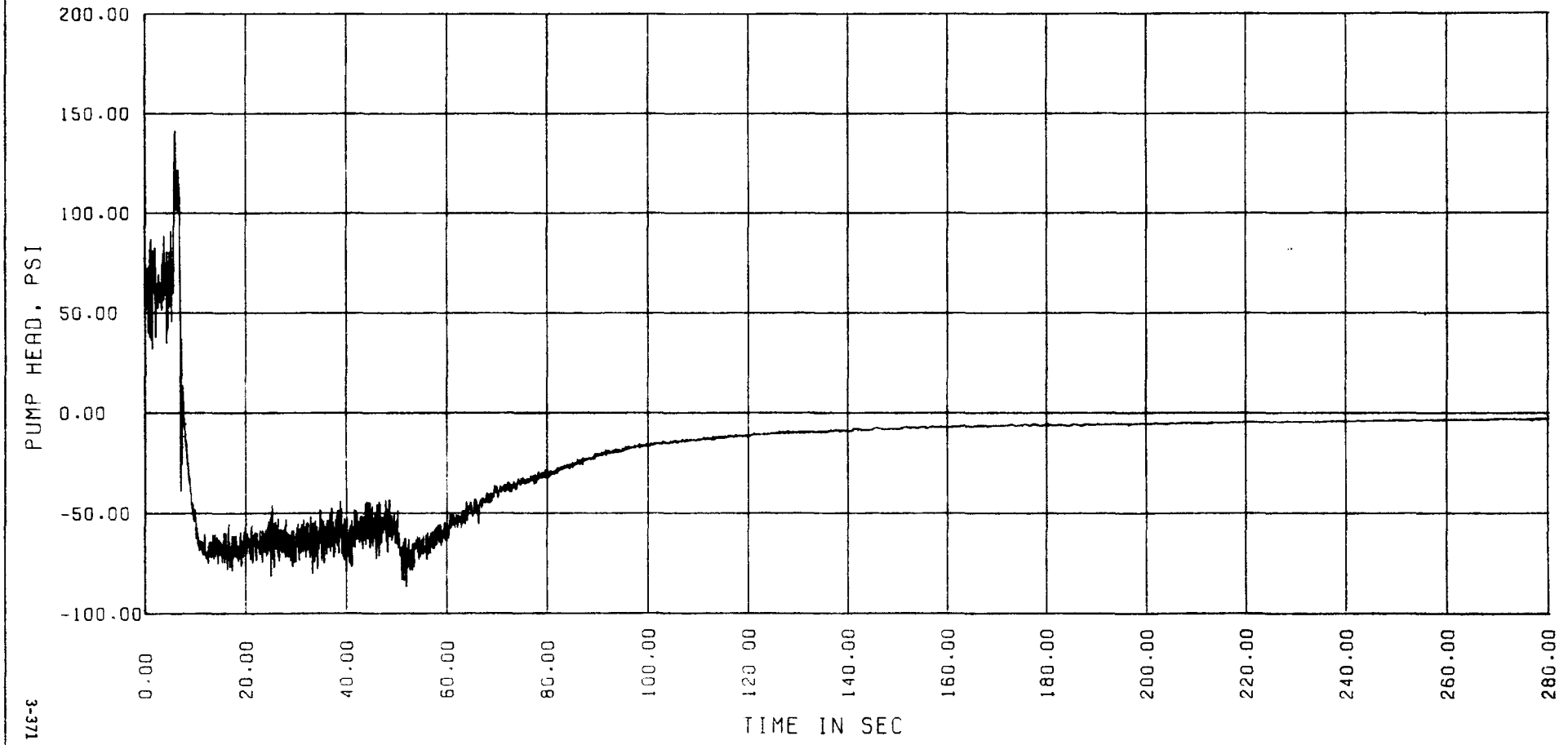
TEST 701/1000 PSIA FW FWD BDN
MOMENTUM FLUX G02/LO-TM DISCH
PLOT NO.40

TEST 701/1000 PSIA FW FWD BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.43

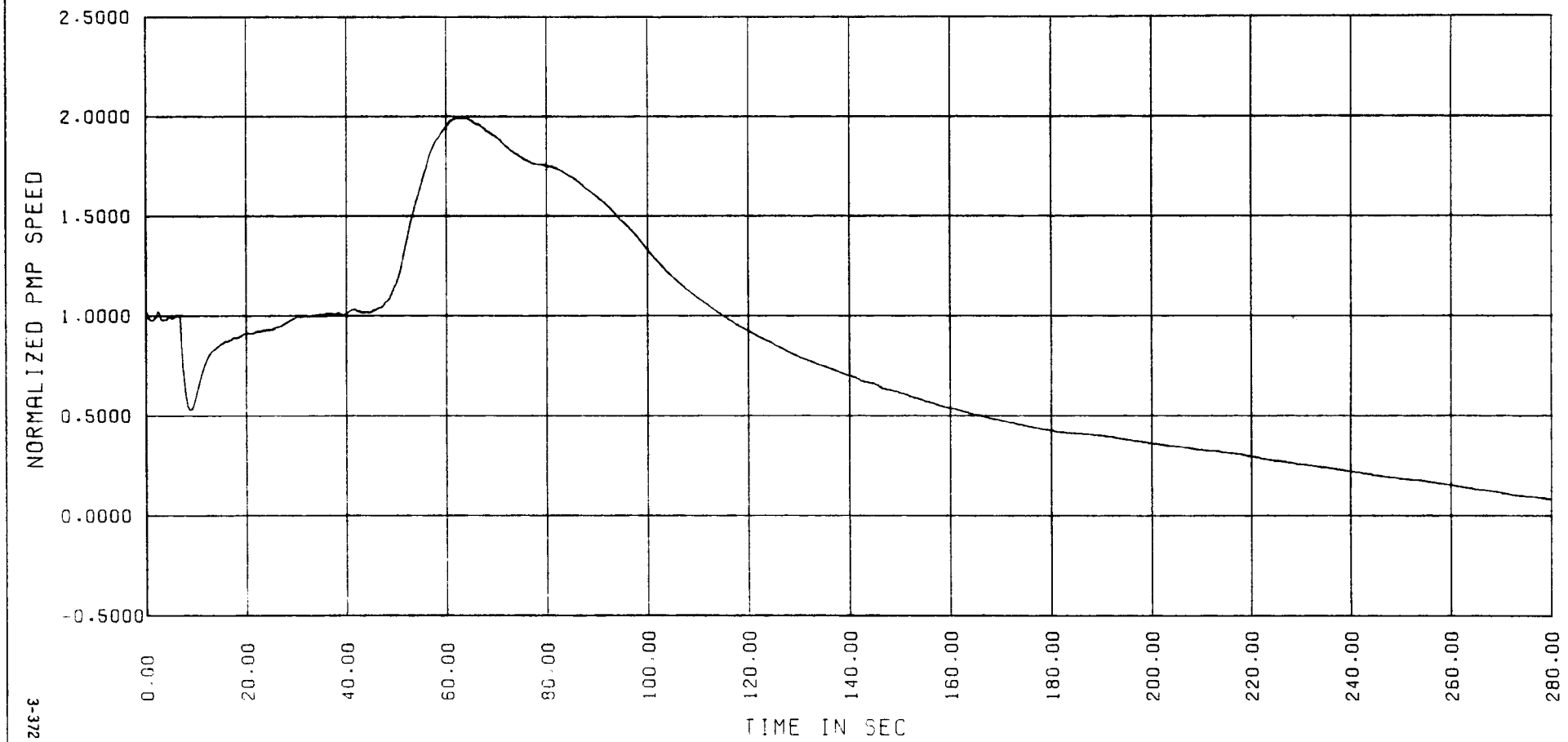


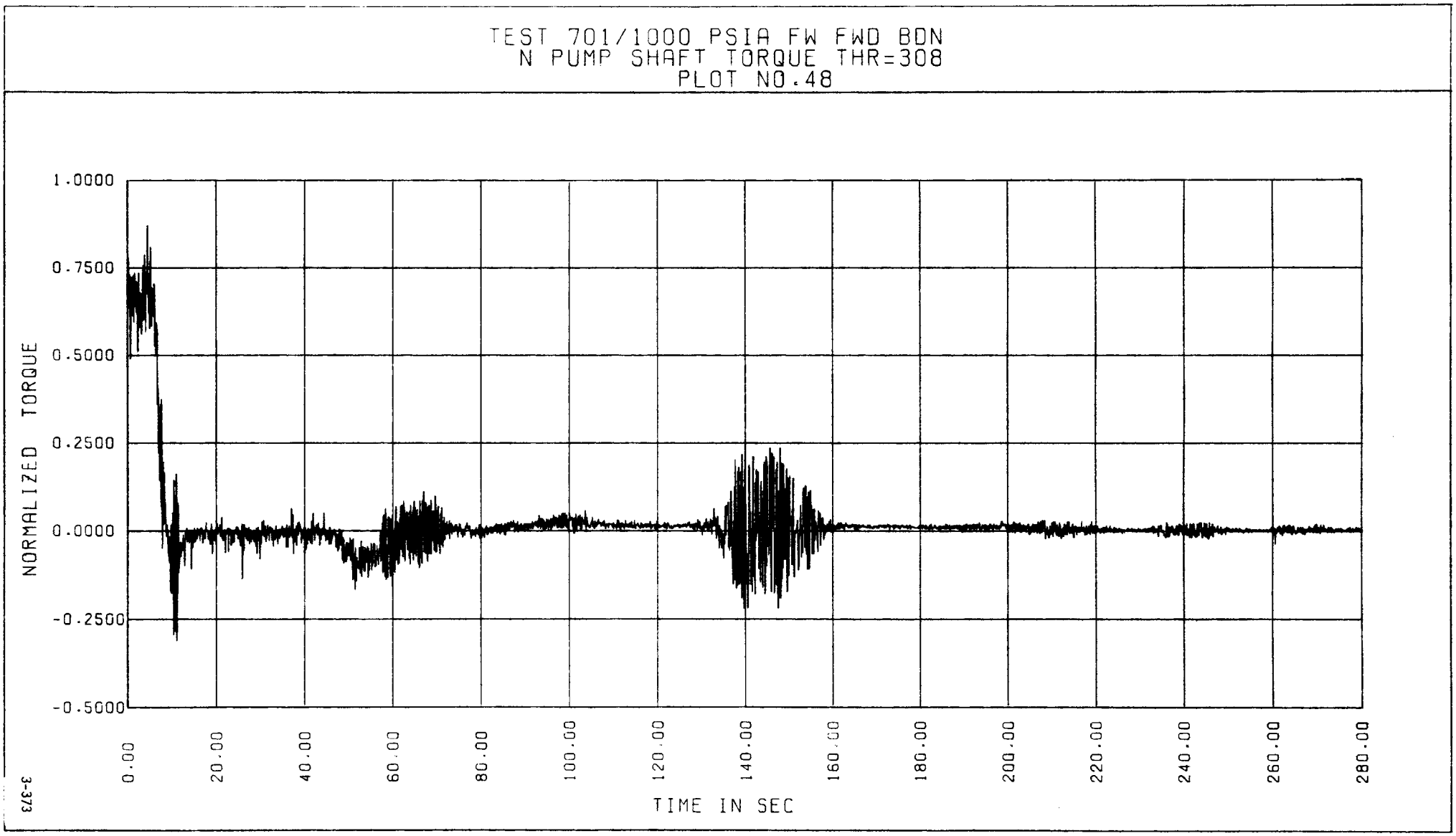
3-370

TEST 701/1000 PSIA FW FWD BDN
PUMP HEAD IN PSI
PLOT NO.44

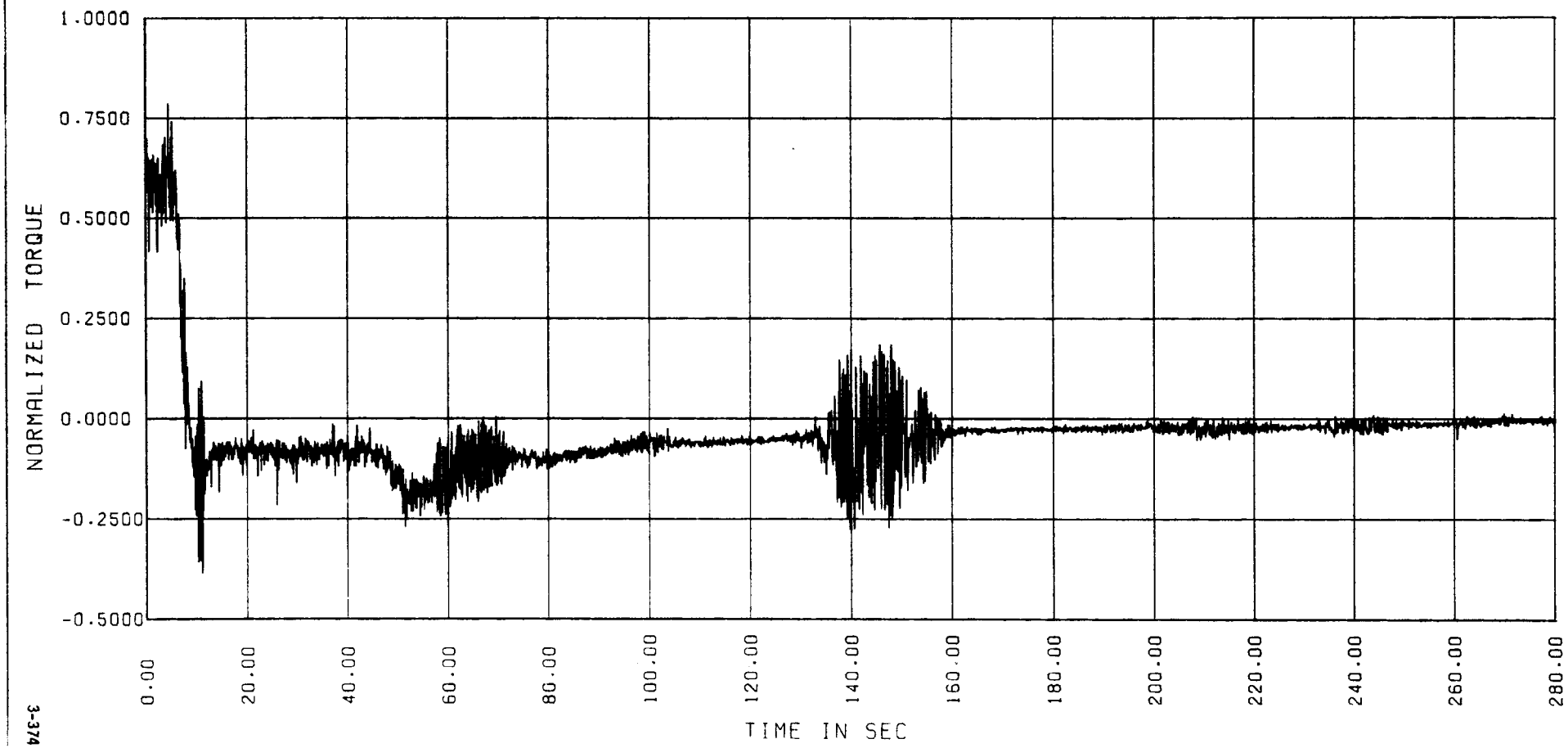


TEST 701/1000 PSIA FW FWD BDN
N PUMP SPEED NR=4500
PLOT NO.47

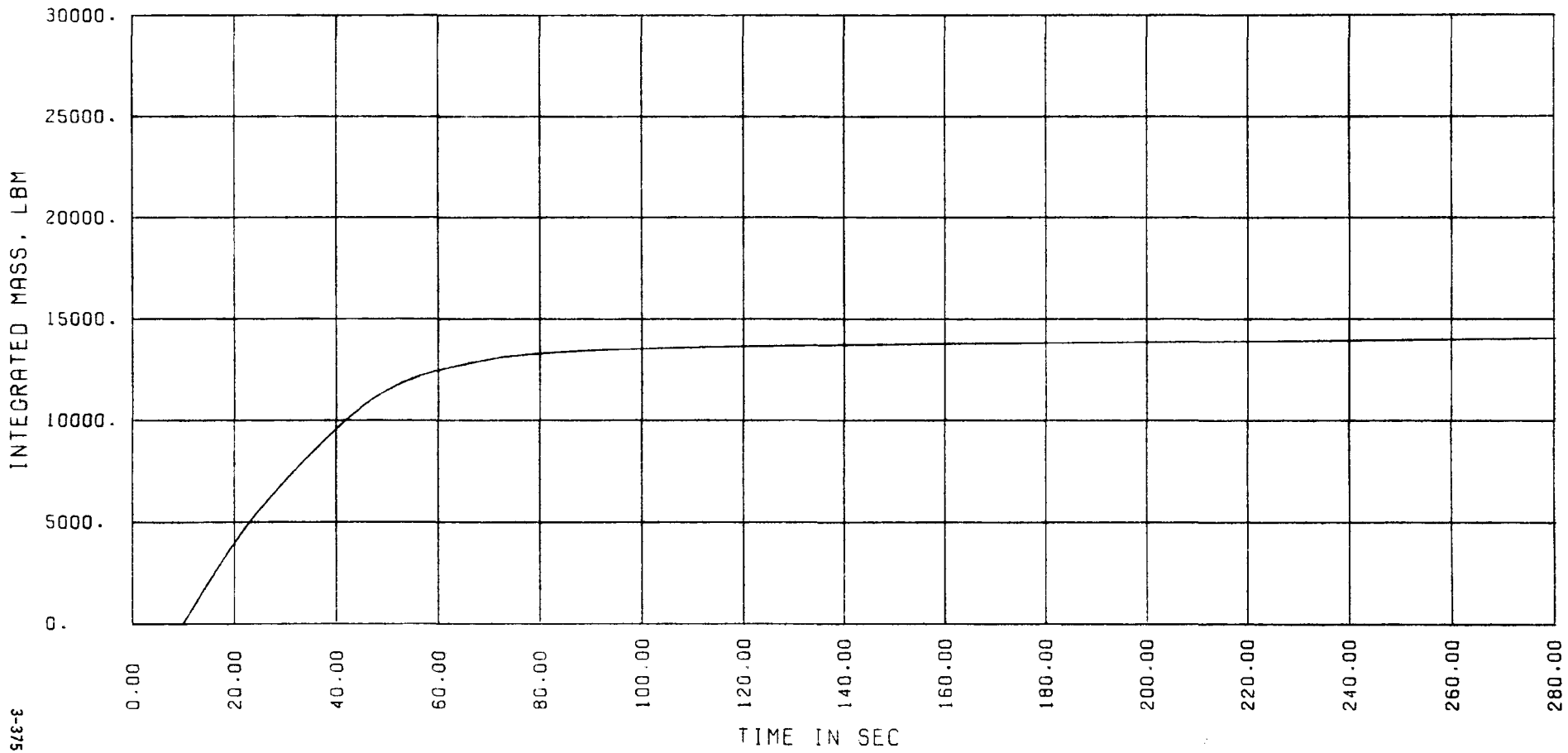



TEST 701/1000 PSIA FW FWD BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.48
NORMALIZED TORQUE
1.0000
0.7500
0.5000
0.2500
0.0000
-0.2500
-0.5000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

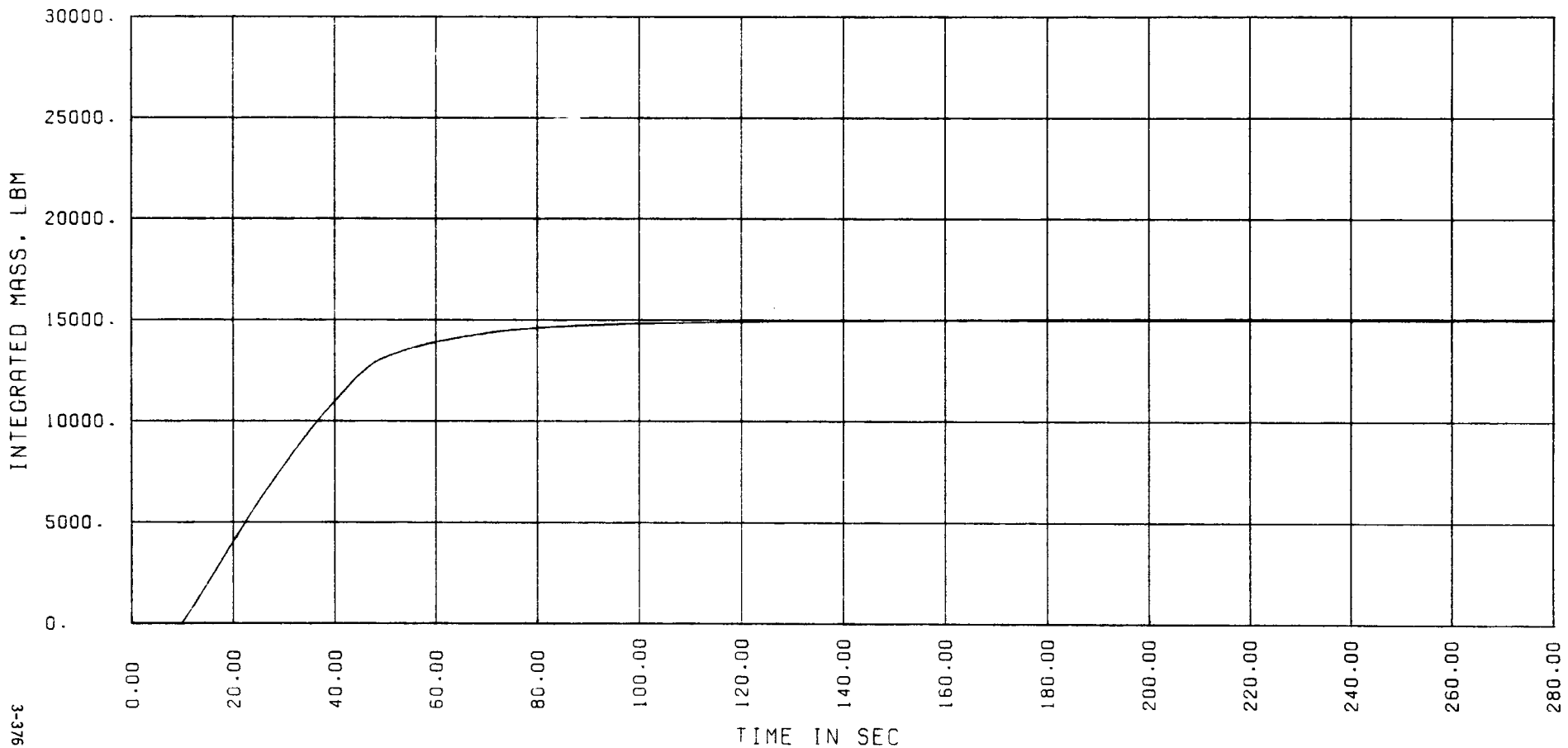
TEST 701/1000 PSIA FW FWD BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.49

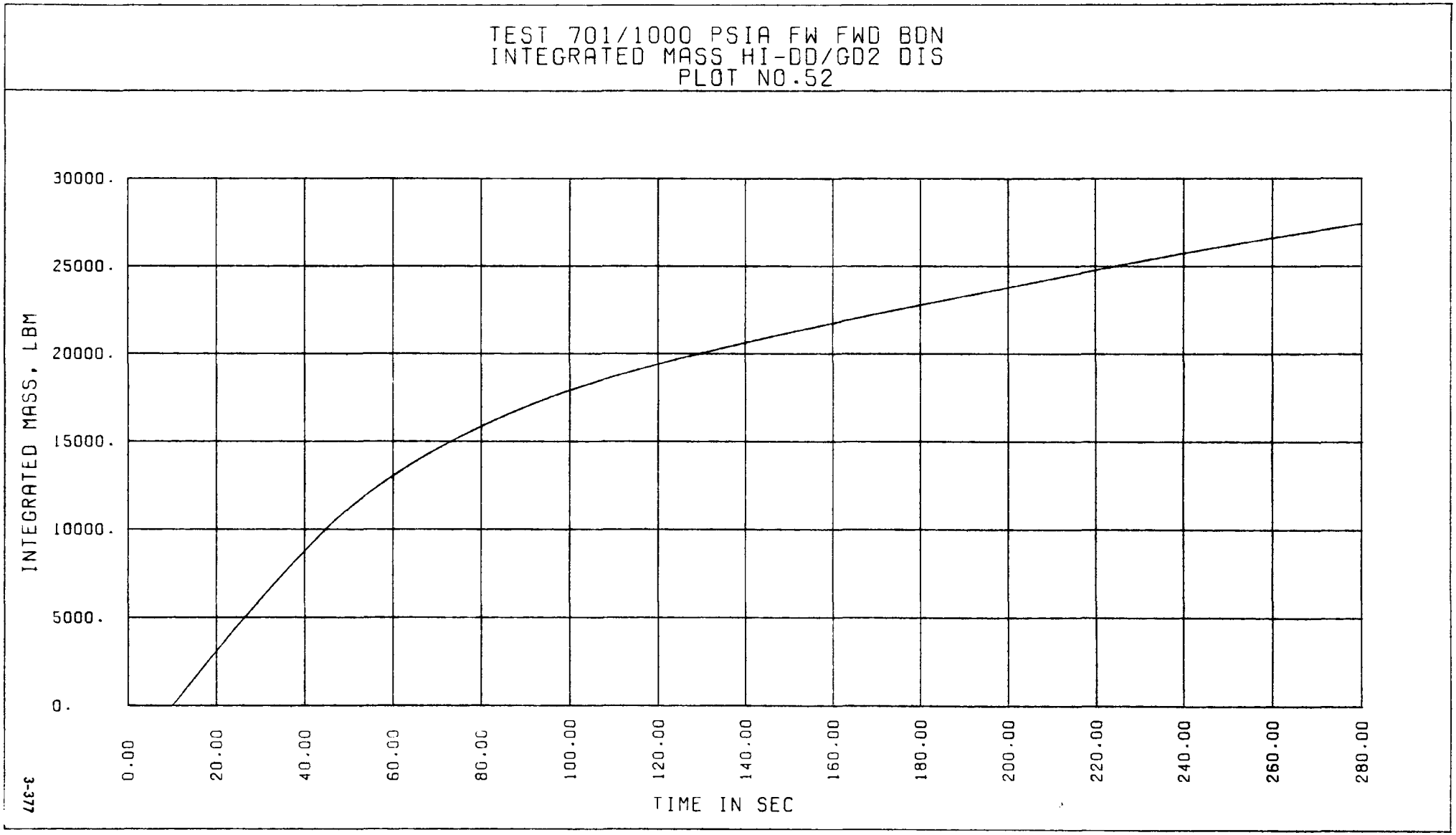


TEST 701/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50

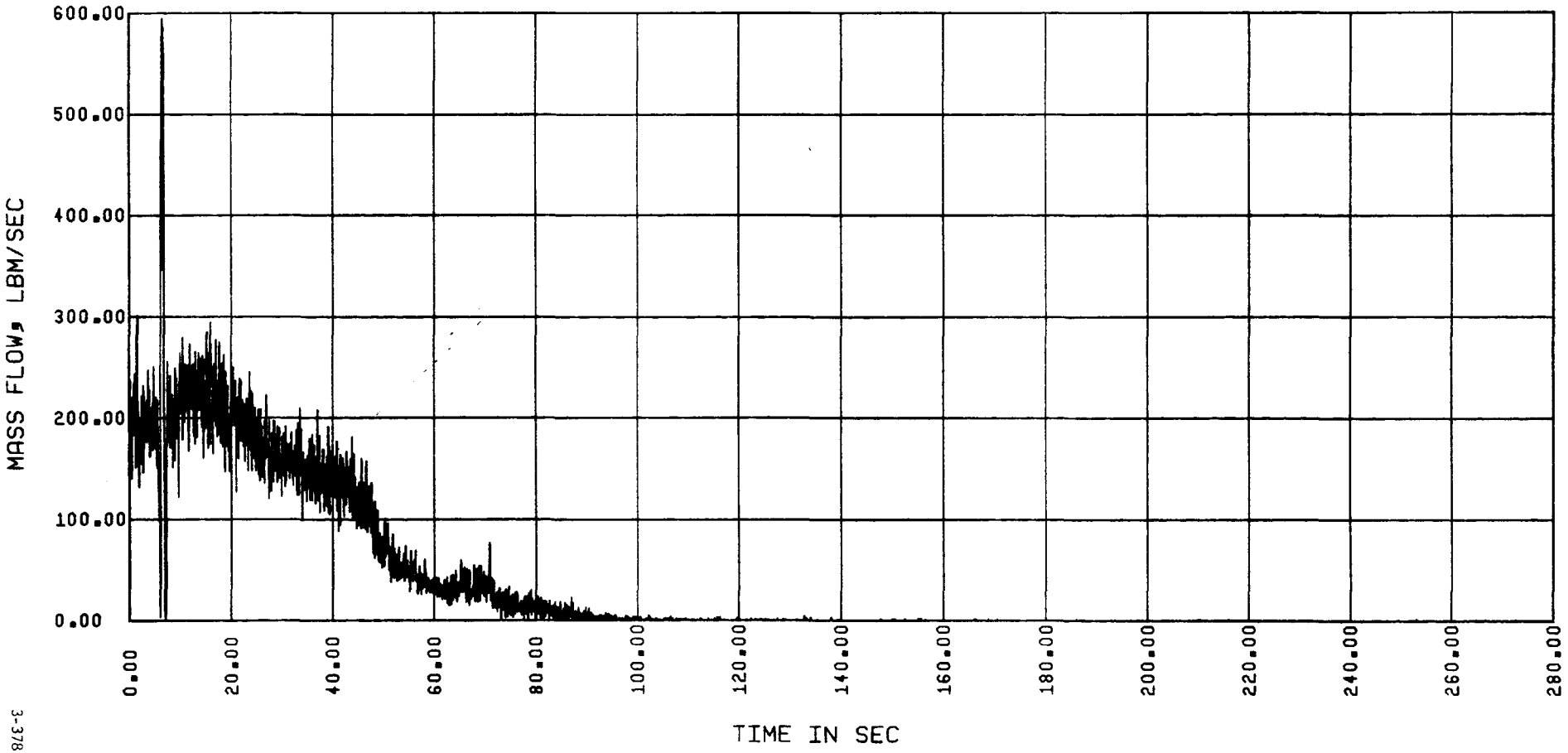


TEST 701/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-OD/GO2 SUCT
PLOT NO.51

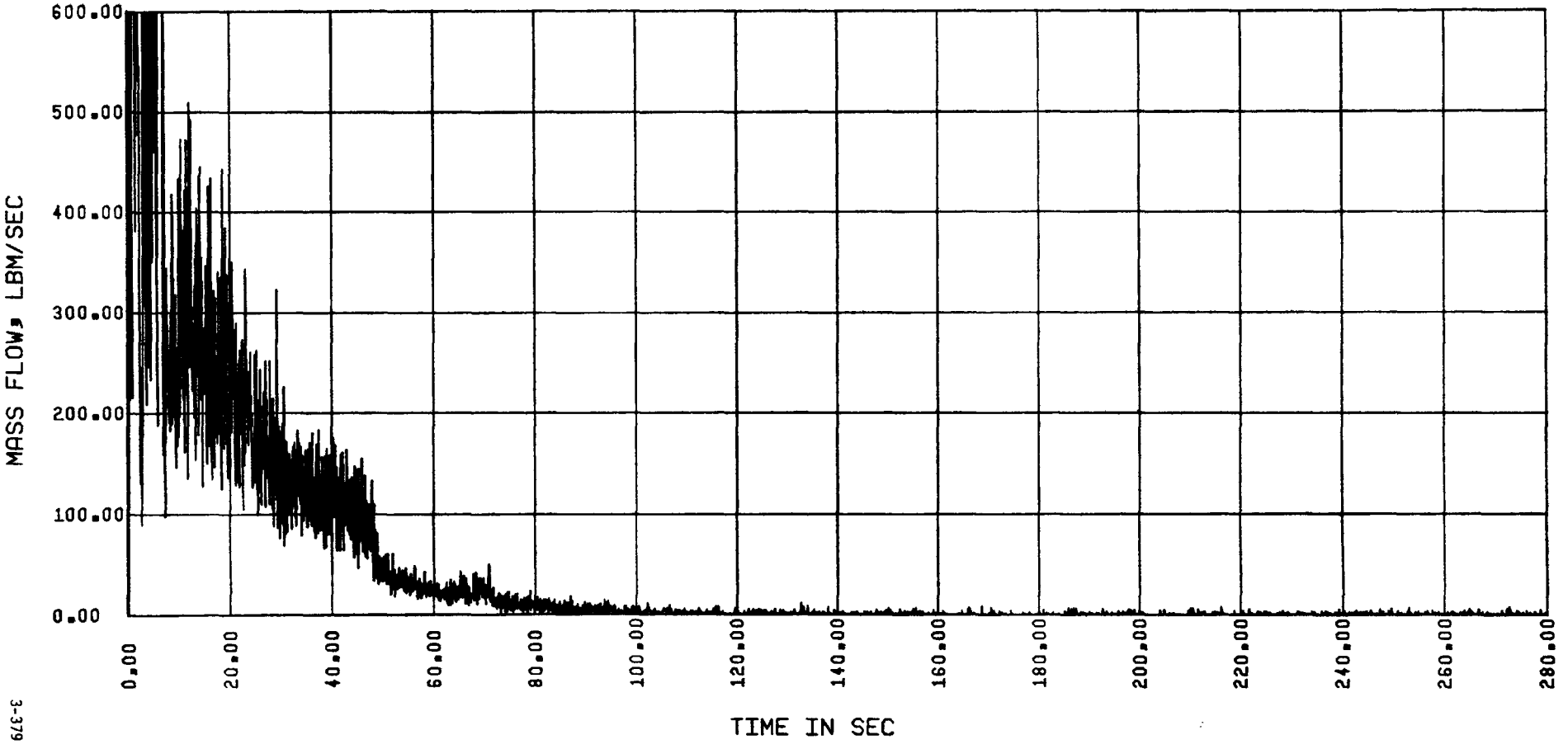



TEST 701/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.52
INTEGRATED MASS, LBM
30000.
25000.
20000.
15000.
10000.
5000.
0.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

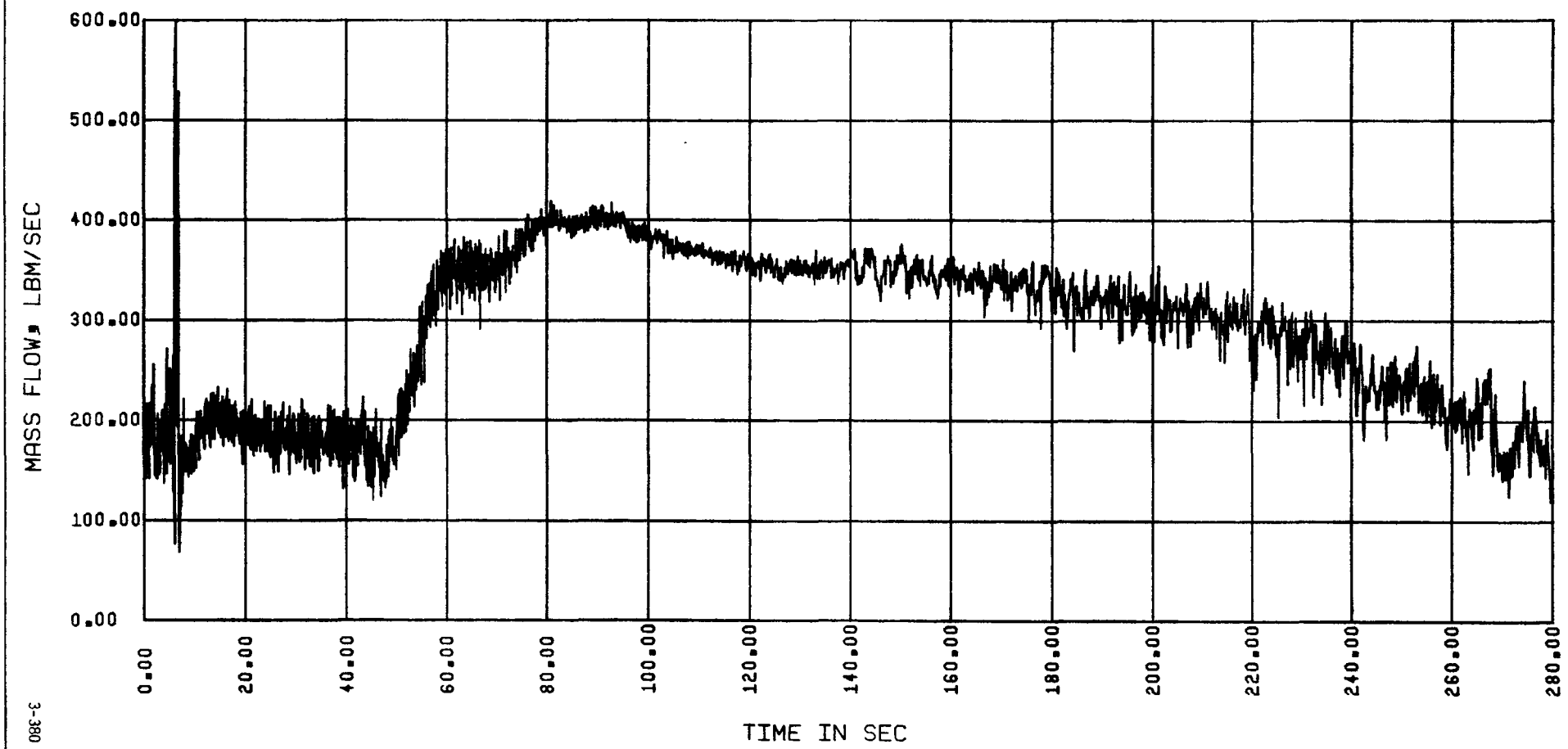
TEST 701/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54



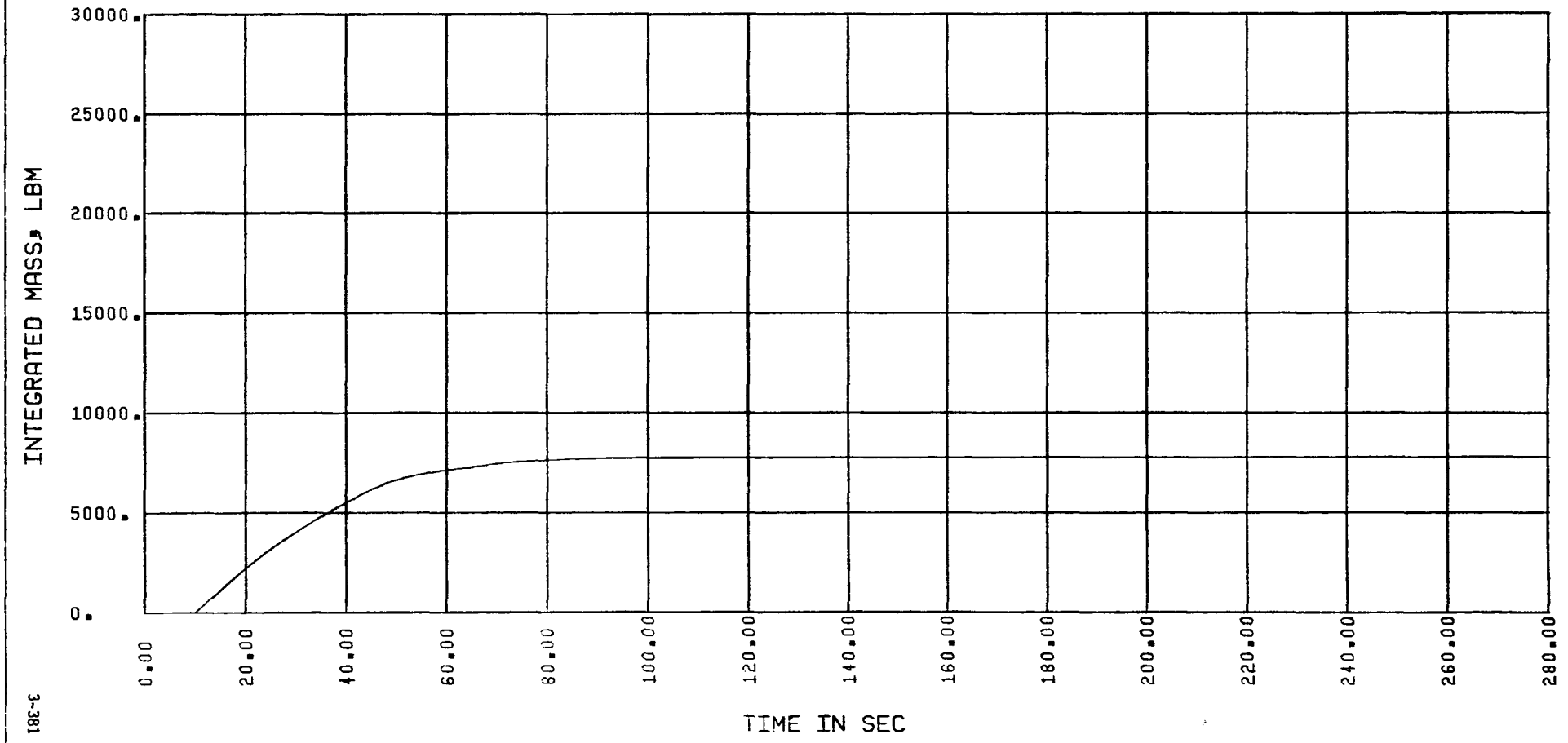
TEST 701/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.55



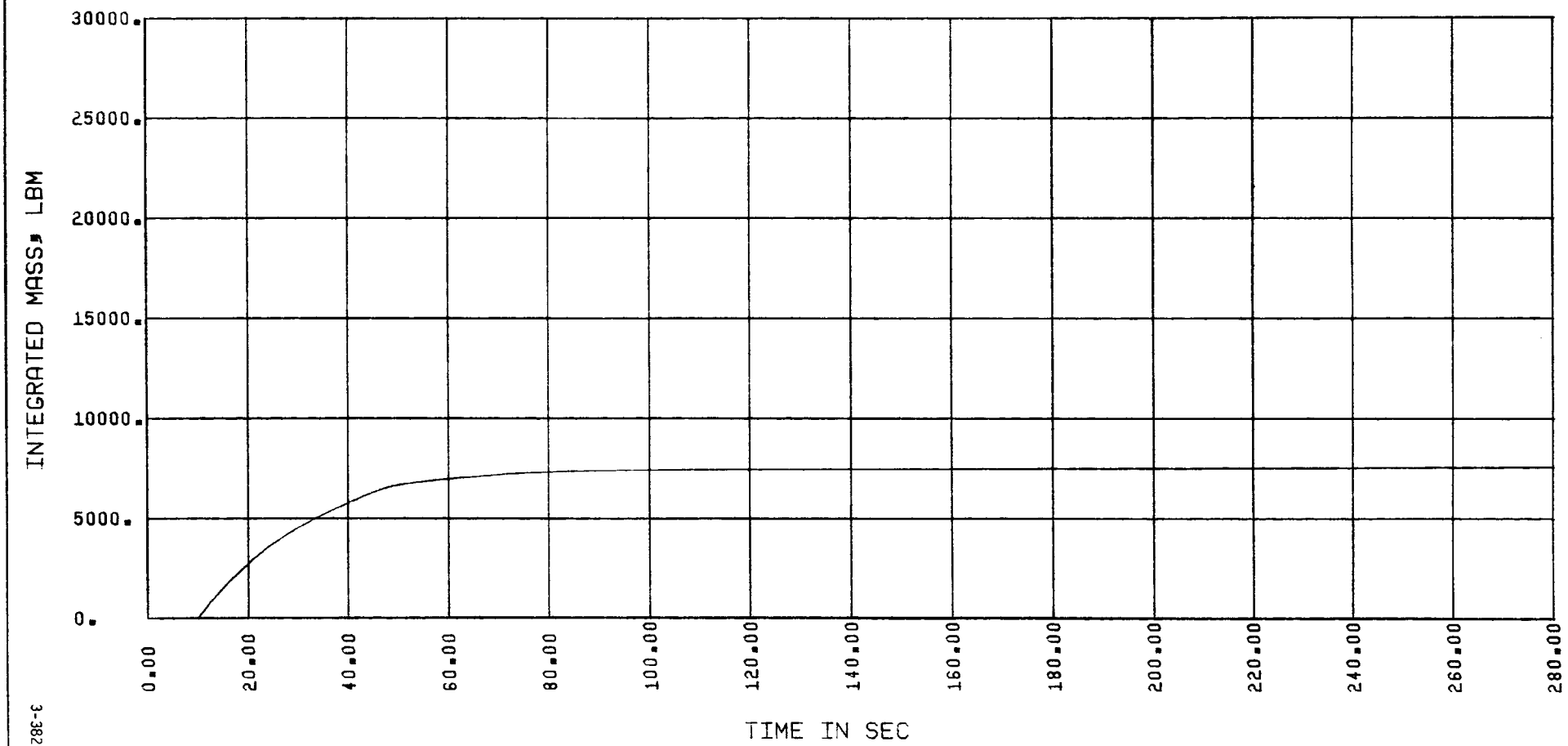
TEST 701/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-TM/GD2 DSCH
PLOT NO.57



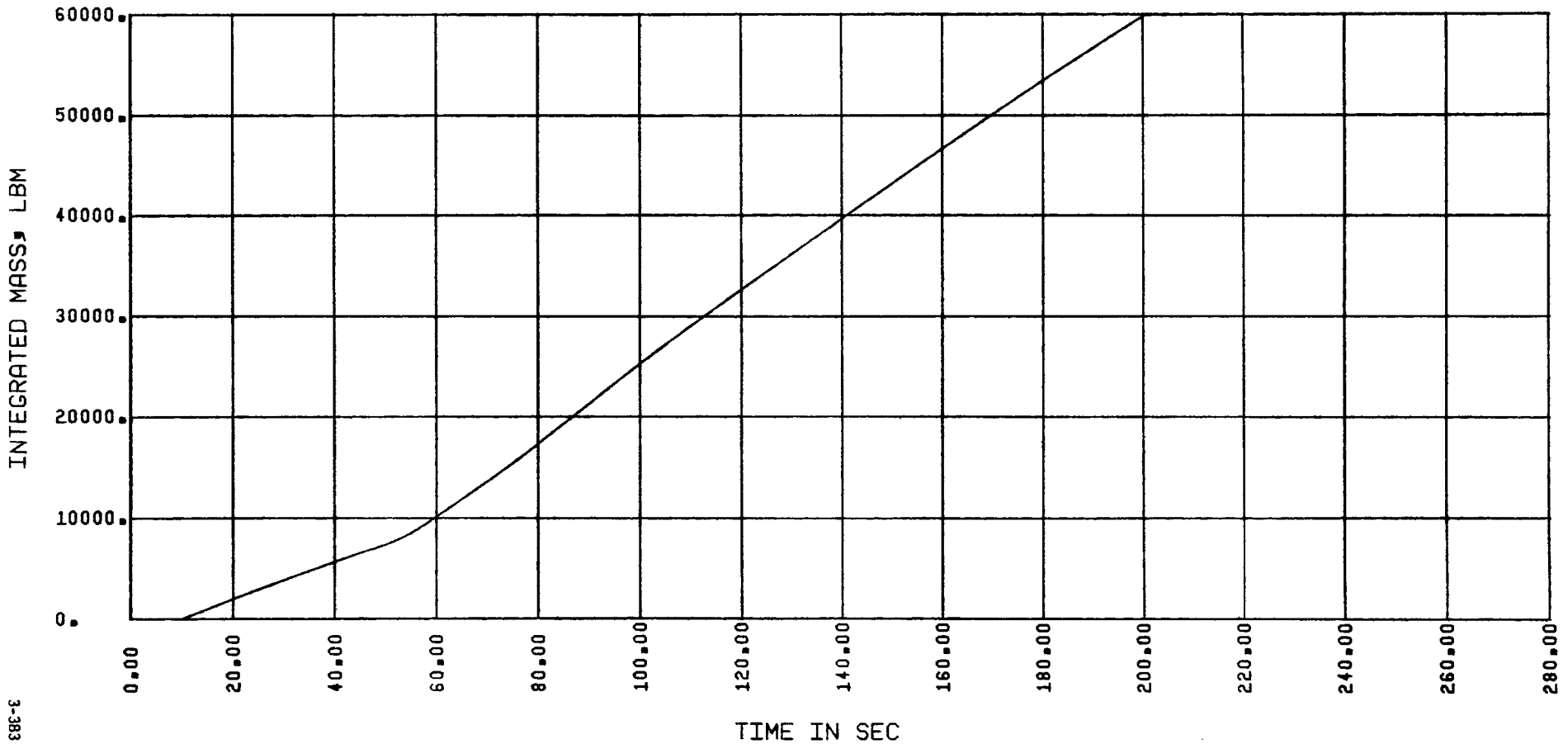
TEST 701/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60



TEST 701/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-TM/GD2 S
PLOT NO.61

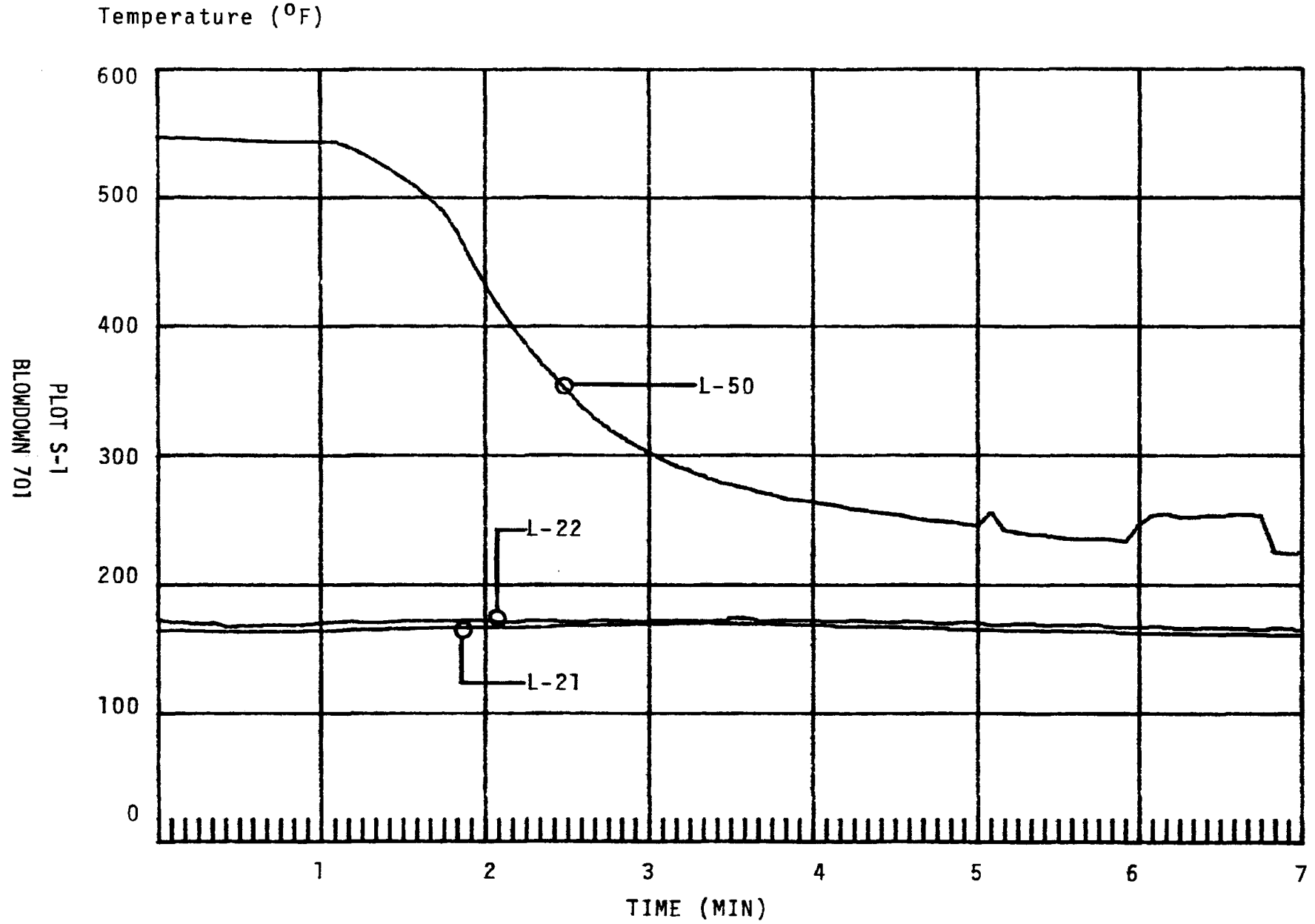


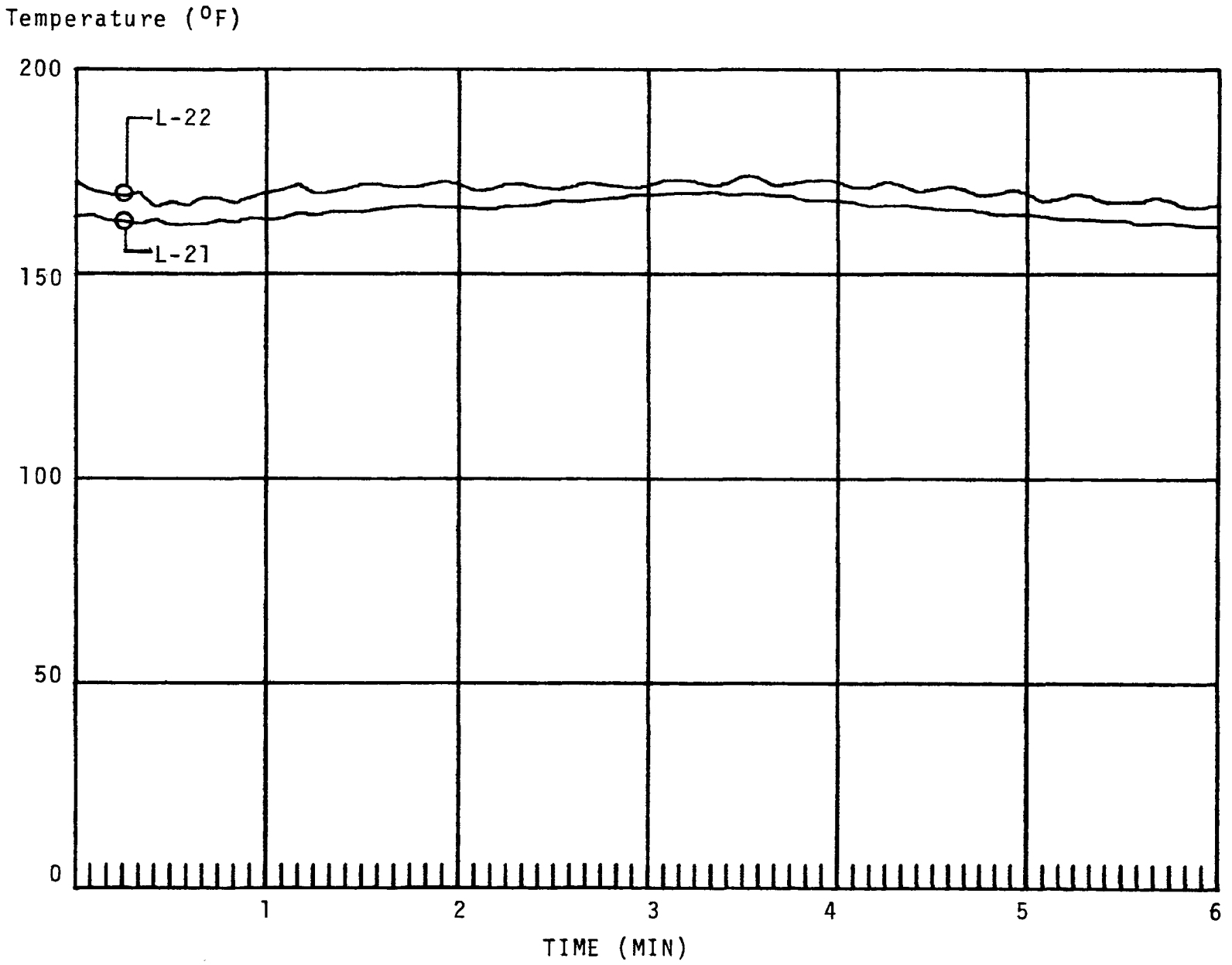
TEST 701/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-TM/GD2 DSCH
PLOT NO.63



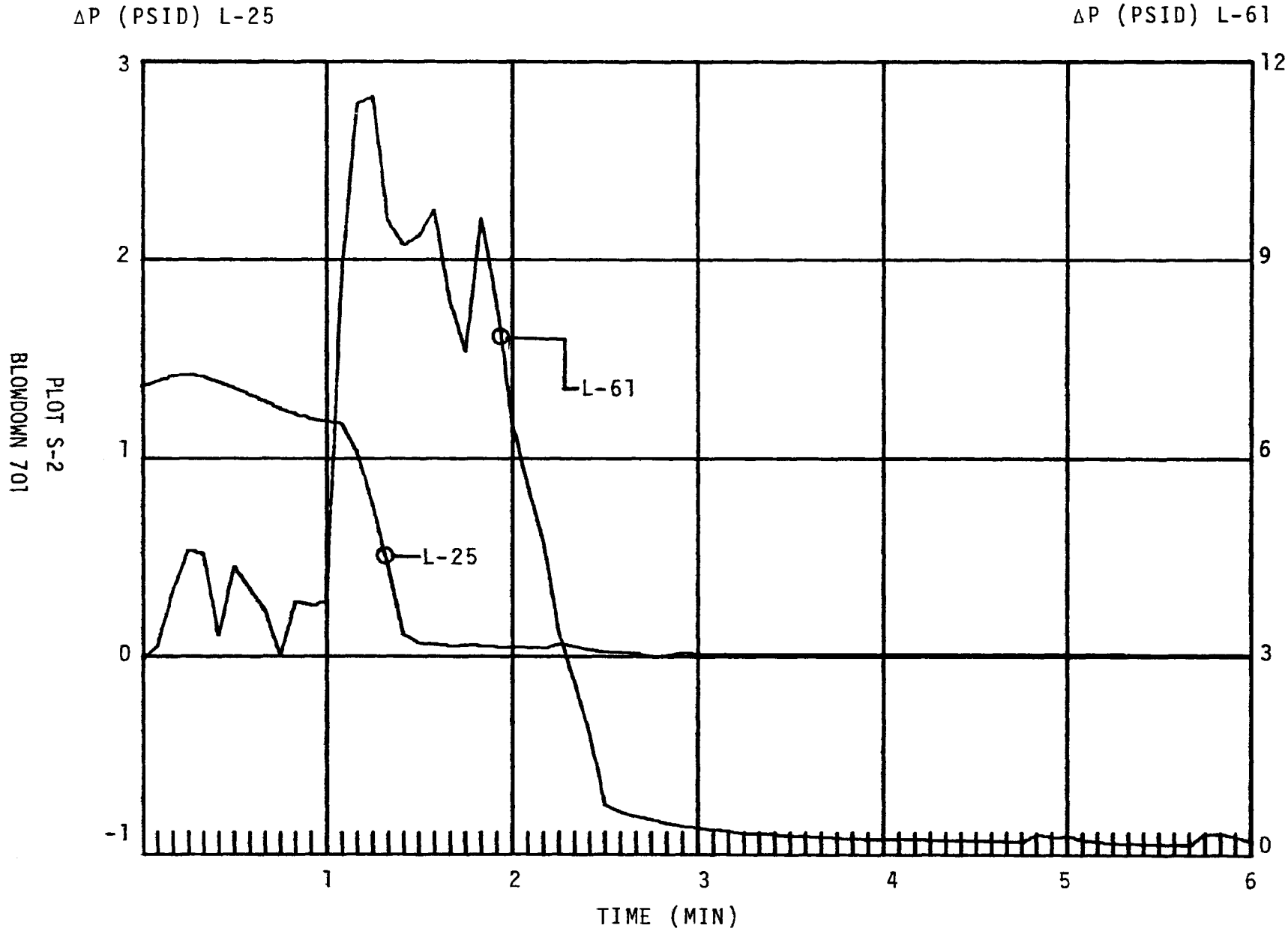
Index Listing
of
SCANNER DATA PLOTS
Test Number (701)

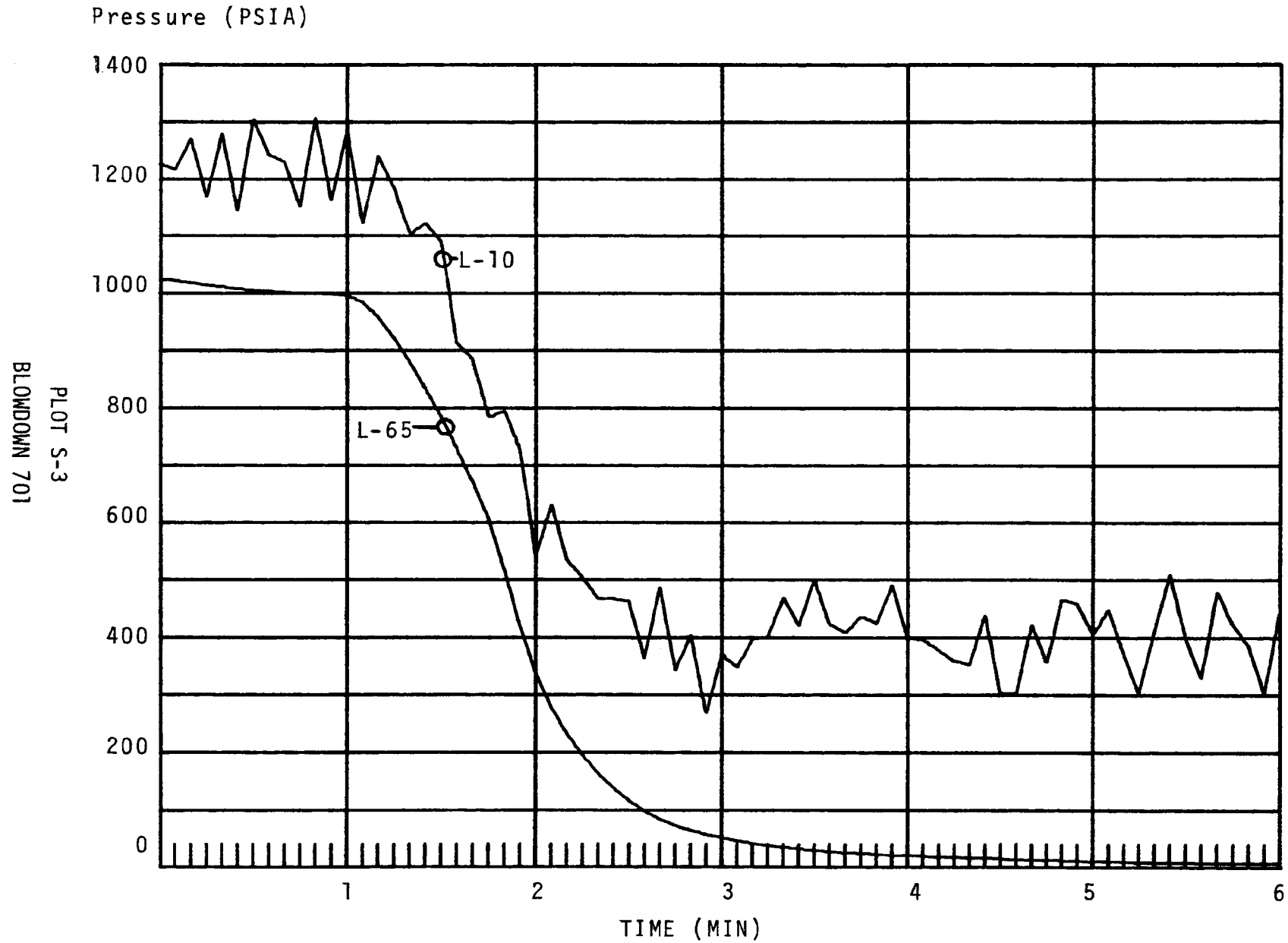
Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
	L-50	Main Water Orifice Thermocouple
S-1A	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

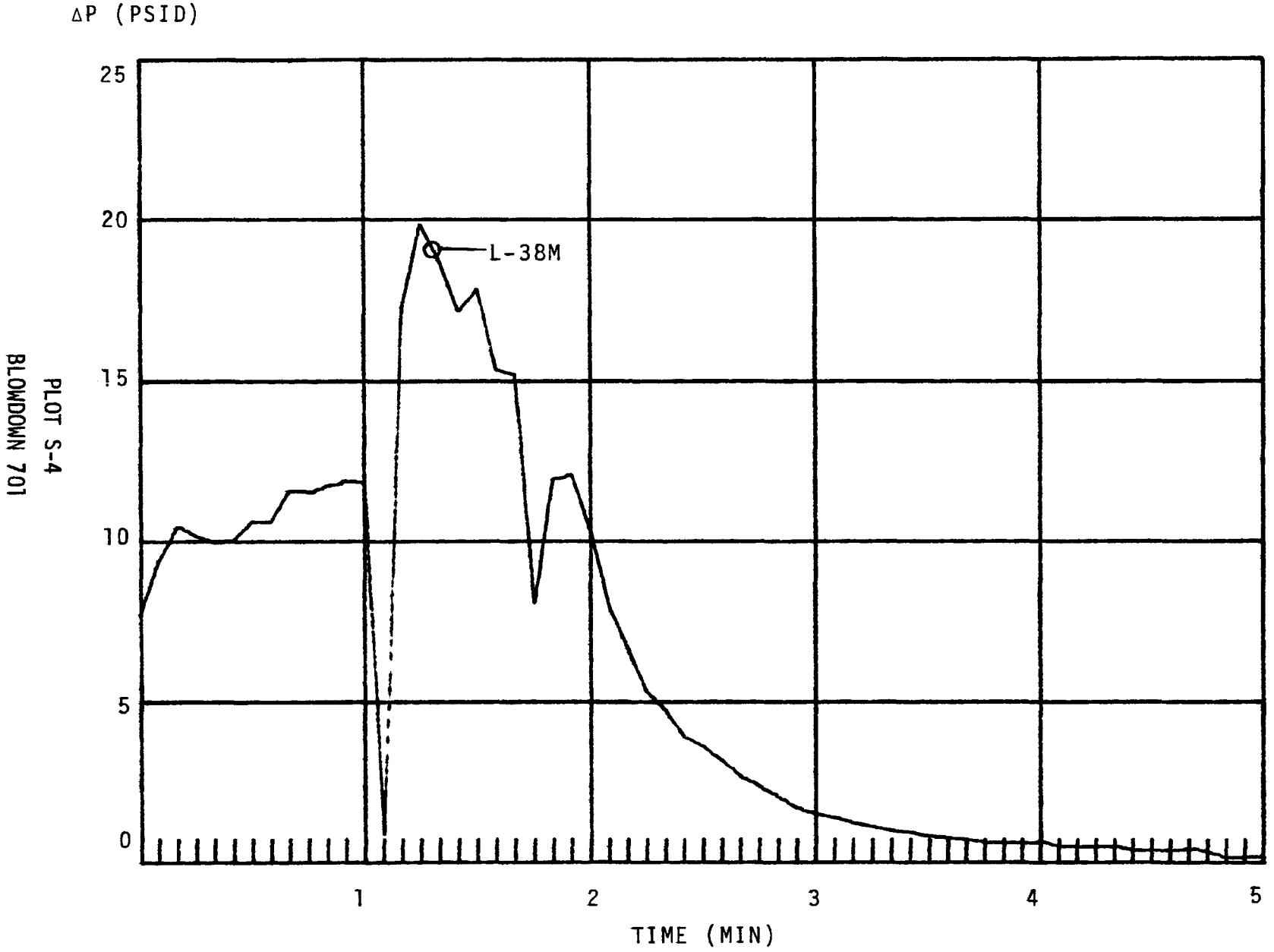

Temperature (°F)
600
500
400
300
200
100
0
L-50
L-22
L-21
1
2
3
4
5
6
7
TIME (MIN)
PLOT S-1
BLOWDOWN 701

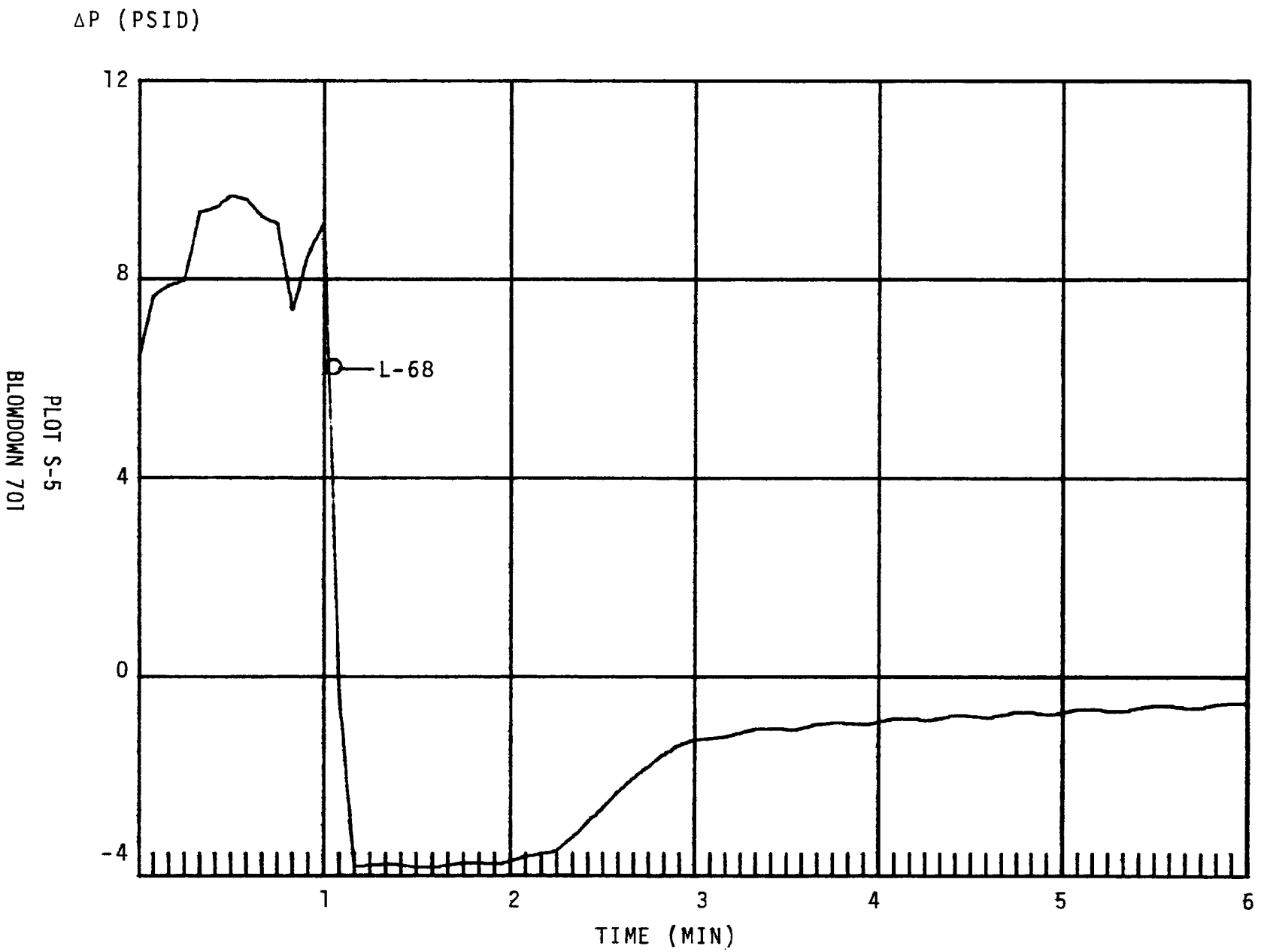


PLOT S-1A
BLOWDOWN 701


ΔP (PSID) L-25
ΔP (PSID) L-61
3
2
1
0
-1
12
9
6
3
0
L-61
L-25
1
2
3
4
5
6
TIME (MIN)
BLOWDOWN 701
PLOT S-2


Pressure (PSIA)
1400
1200
1000
800
600
400
200
0
L-10
L-65
1
2
3
4
5
6
TIME (MIN)
PLOT S-3
BLOWDOWN 701


ΔP (PSID)
25
20
15
10
5
0
L-38M
1
2
3
4
5
TIME (MIN)
BLOWDOWN 701
PLOT S-4


ΔP (PSID)
12
8
4
0
-4
L-68
1
2
3
4
5
6
TIME (MIN)
PLOT S-5
BLOWDOWN 701

SYSTEM CONFIGURATION

Test Number 846

Break Location	Discharge	
Break Size	16.26	in^2
	57	% of 6 in. diameter inlet area of pump
Mixing Plate	Out	
Pump Mode	Constant Speed	

COMMENTS

1. Malfunctioning or Inoperable Instruments: None
2. Other Comments: None
3. Affected FM Data Plots: None

INITIAL CONDITIONS

t = 40 Sec[a]

Test Number 846

System Pressures

High Pressure Drum	1004.6	psia
Suction Instrument Spool	969.3	psia
Discharge Instrument Spool	1026.3	psia

Fluid Temperatures

Suction Instrument Spool	543.5	°F
Discharge Instrument Spool	547.8	°F

Fluid Density

Suction Instrument Spool	46.39	lbm/ft^3
Discharge Instrument Spool	46.11	lbm/ft^3

System Flows

Mass Flow Rate	251	lb/sec
Suction Volumetric Flow Rate	2427	gpm
Discharge Volumetric Flow Rate	2436	gpm
Suction Normalized Volumetric Flow Rate	0.69	
Discharge Normalized Volumetric Flow Rate	0.70	
Suction Fluid Velocity	29.86	ft/sec
Discharge Fluid Velocity	29.97	ft/sec
Suction Momentum Flux	41,373	$lbm/ft\ sec^2$
Discharge Momentum Flux	41,431	$lbm/ft\ sec^2$

Pump Performance

Pump head	65.43	psi
	203.1	ft
Pump Speed	4510	rpm
Pump Shaft Torque	206.0	ft lb
Pump Hydraulic Torque	181.0	ft lb

System Mass (t = 50 Sec)[a]

High Pressure Drum Level	43.29	in[b]
Fluid Mass Upstream of Test Pump	13,239	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 846

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-6.2	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	9.8	c
HPSW-1 Closed	11.4	c
Pump Power Trip	-	-
Initiate Rupture Mechanism	10.8	c
Blowdown Starts	12.7	55
End of Digitized Data 20 s/sec	274.0	-
200 s/sec	260.0	-
FM Recording System Off	298.0	-
Scanner System Off	-	230

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

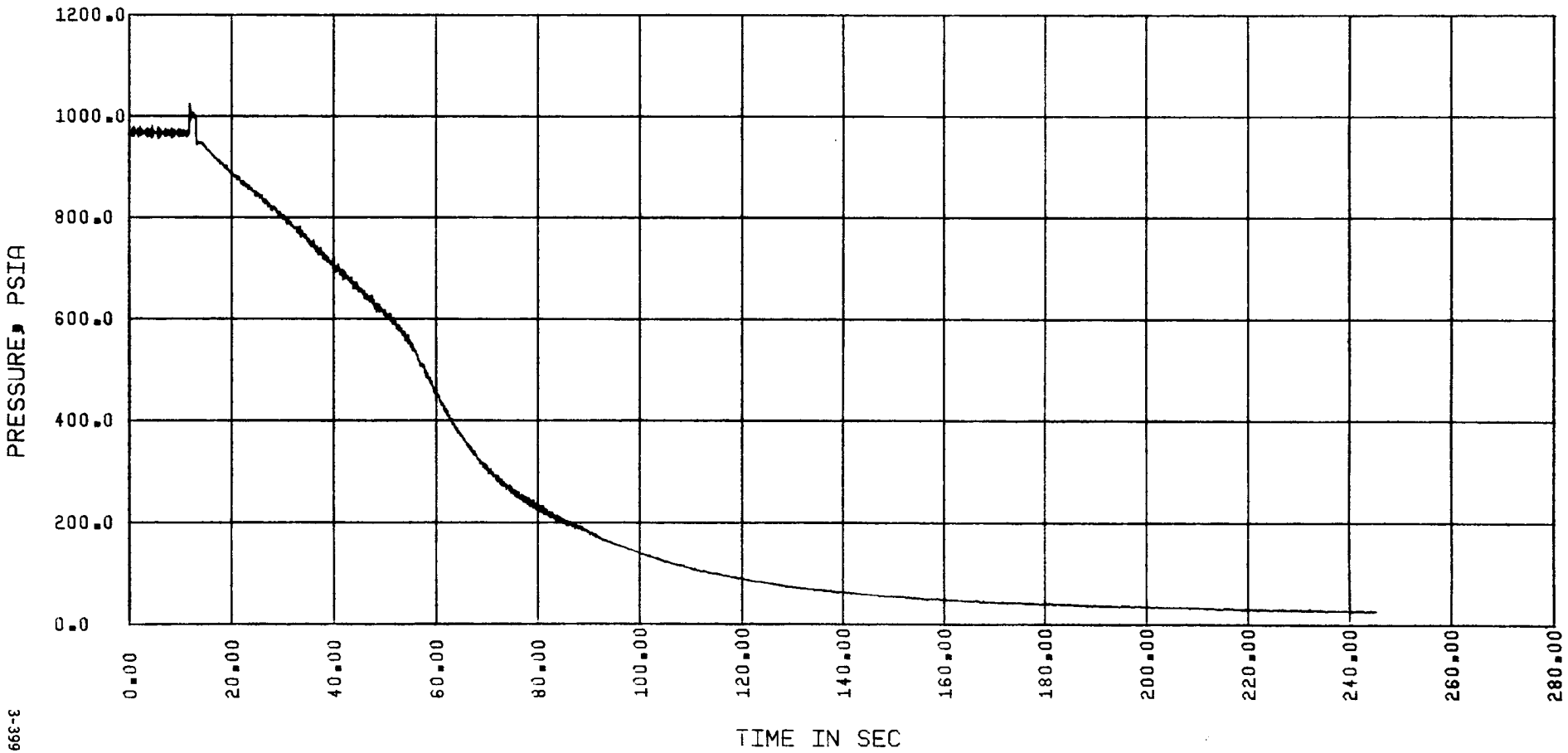
Index Listing
of
FM DATA PLOTS
Test Number (846)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
28	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 Discharge
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge

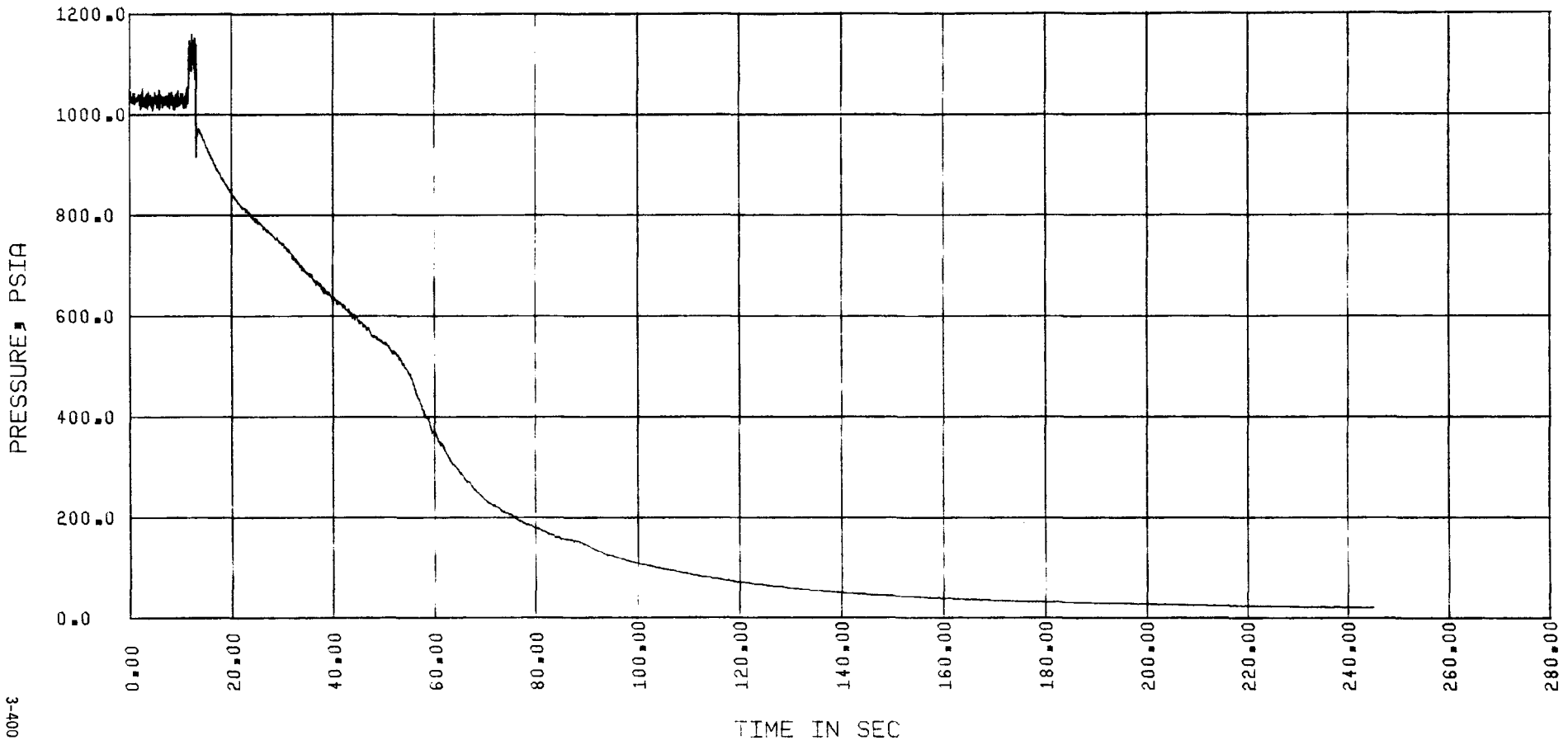
Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (846)

Plot Number	Location Number	Description of Parameter
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
35	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
42	L-27	Momentum Flux LO-DD Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
53	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge

TEST 846/1000 PSIA PON FWD BDN
PUMP SUCTION PRESSURE
PLOT NO.1

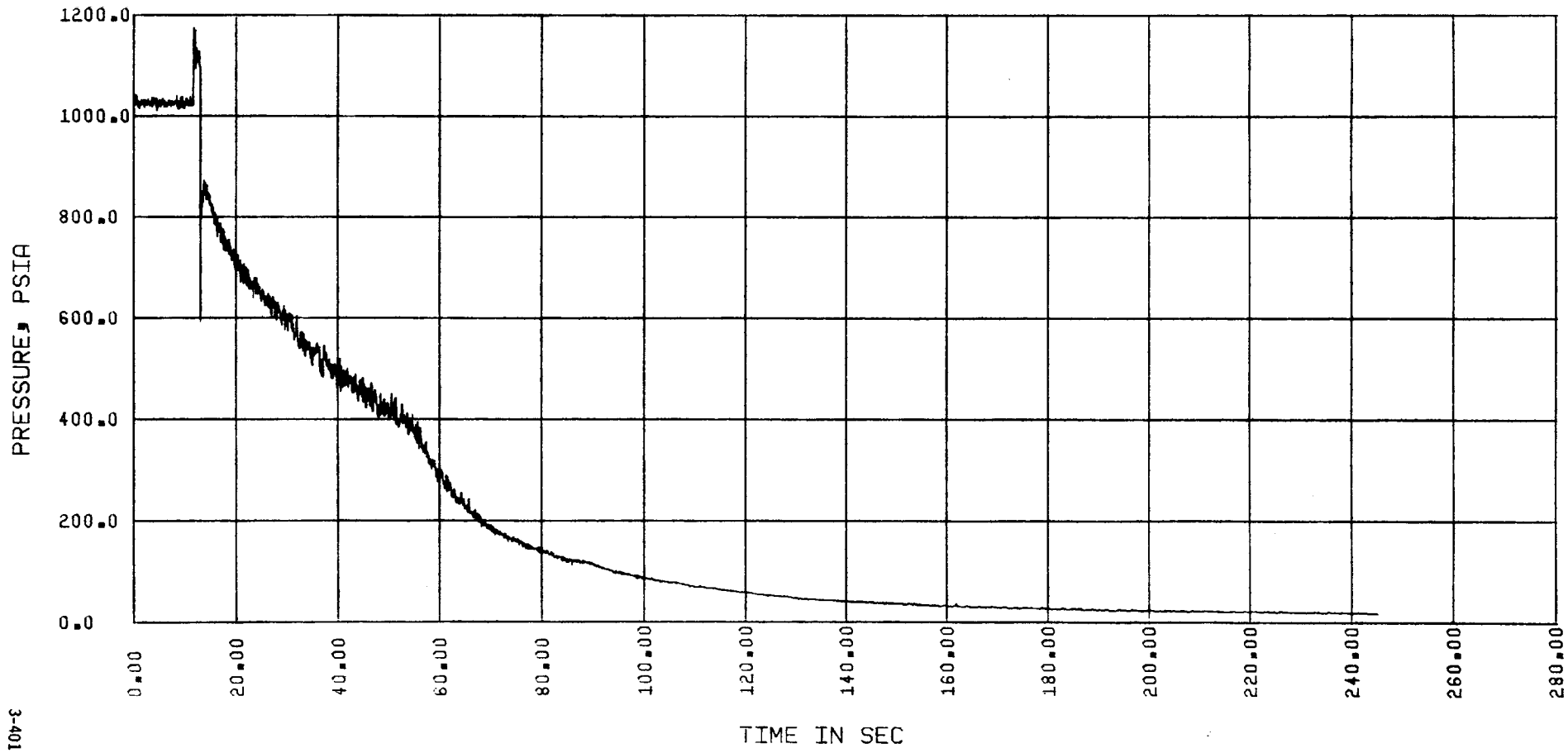


TEST 846/1000 PSIA PON FWD BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2

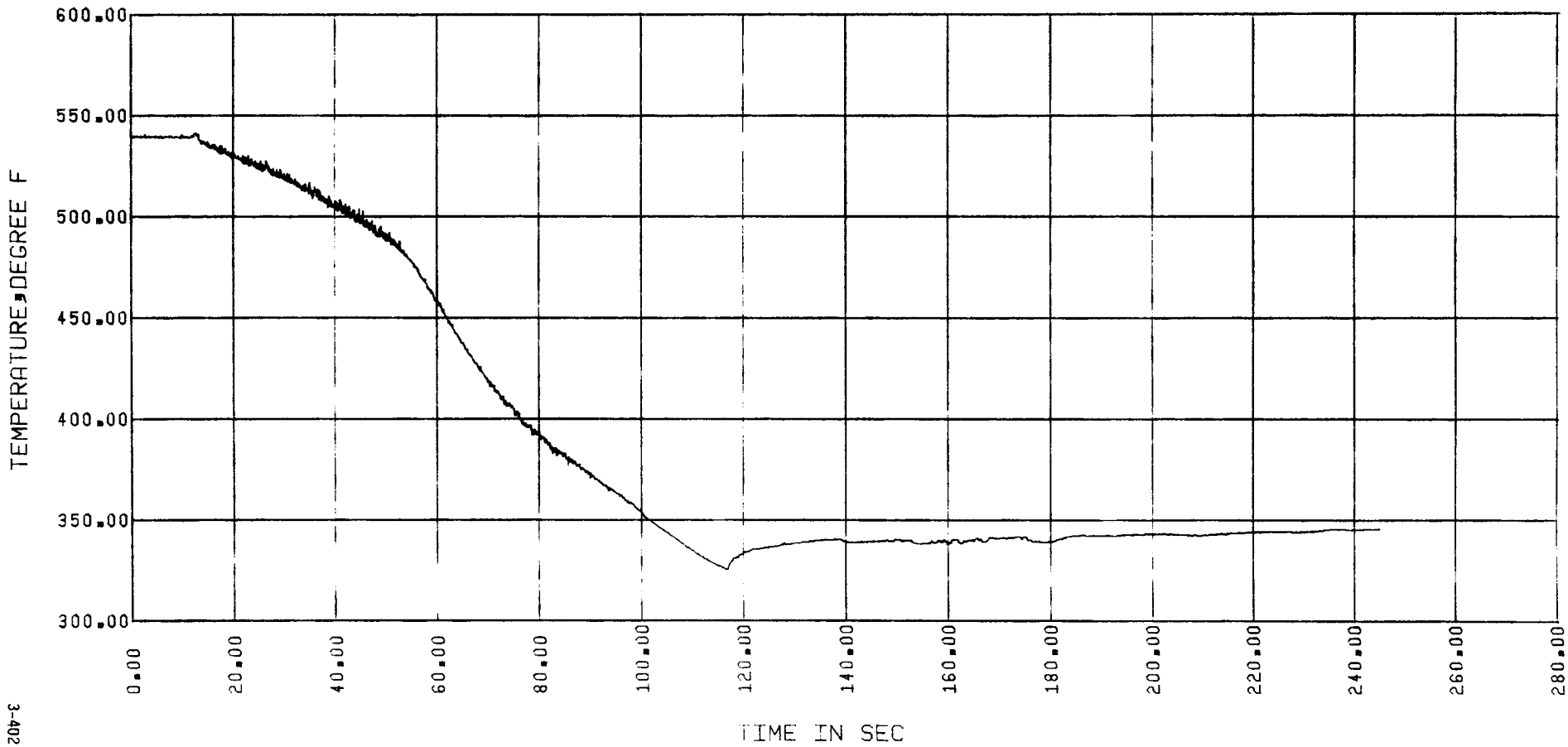


3-400

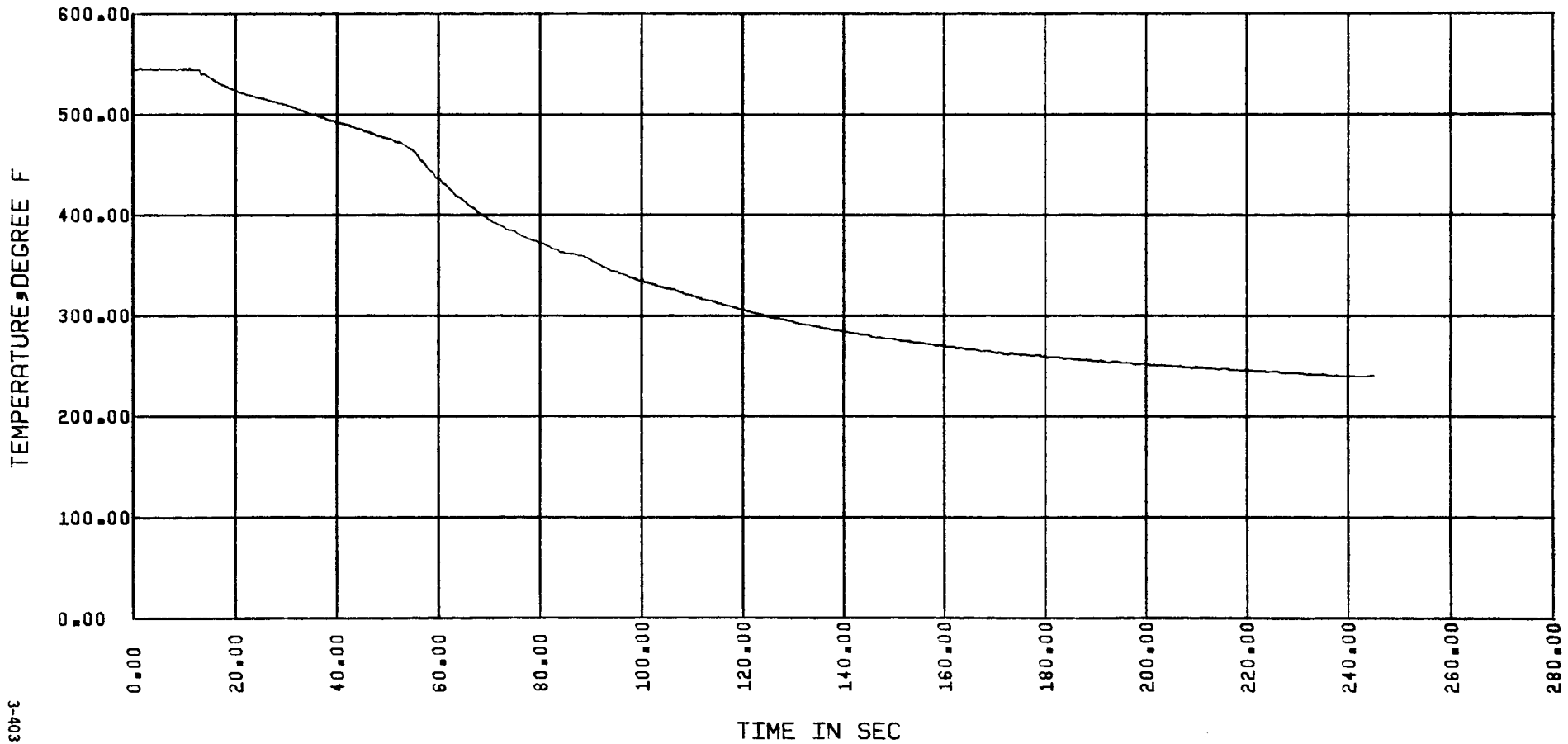
TEST 846/1000 PSIA PON FWD BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



TEST 846/1000 PSIA PON FWD BDN
PUMP SUCTION TEMPERATURE
PLOT NO. 4

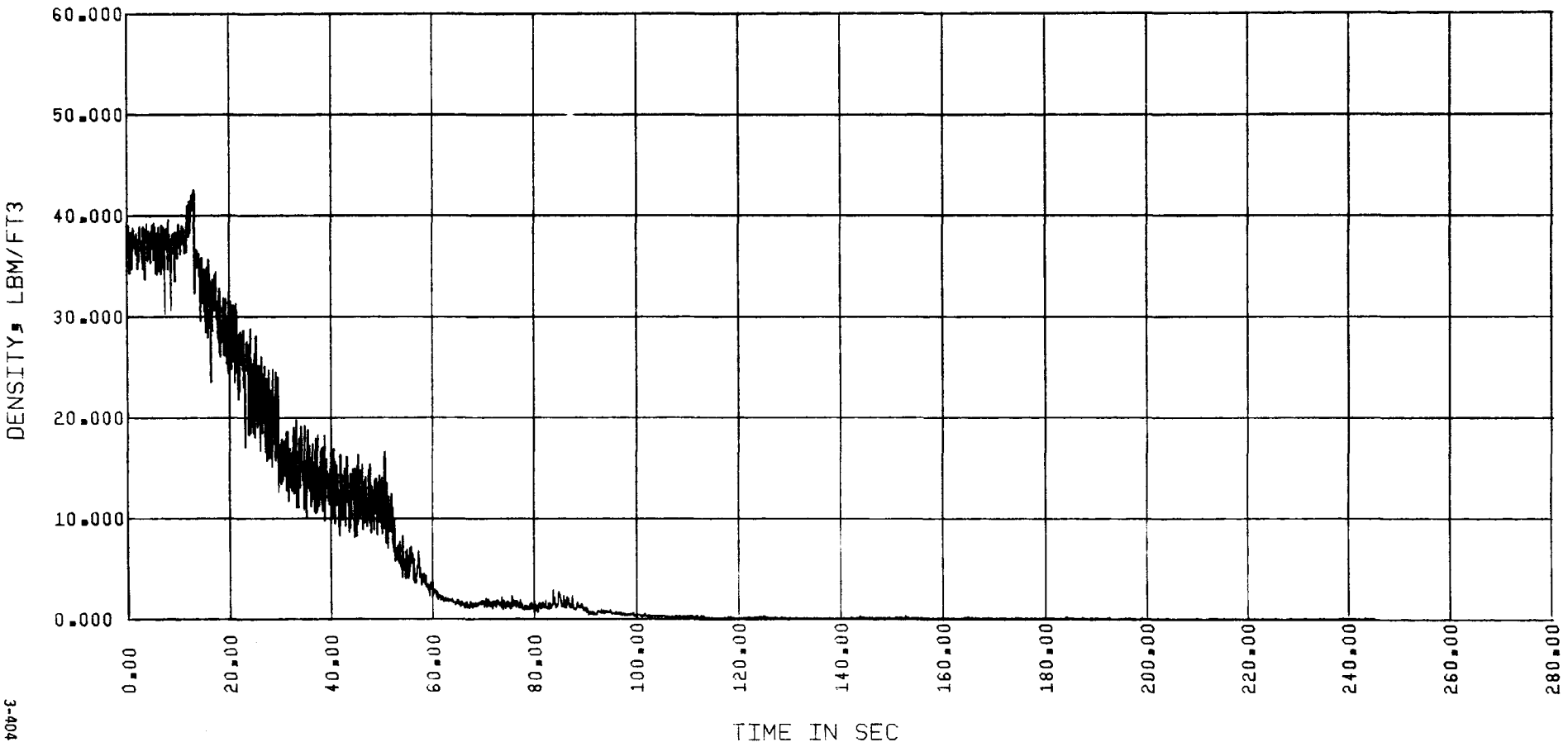


TEST 846/1000 PSIA PON FWD BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5

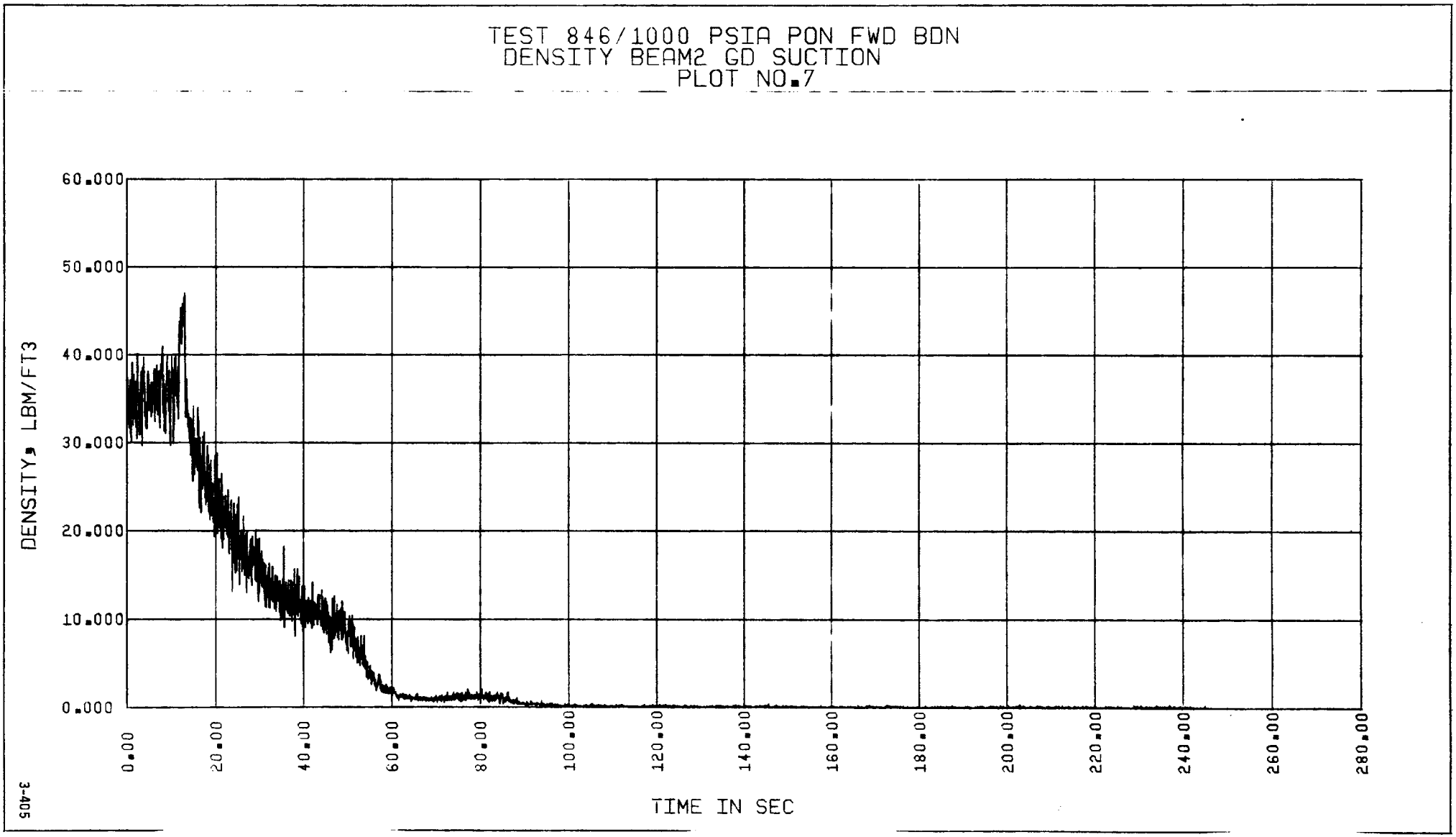


3-403

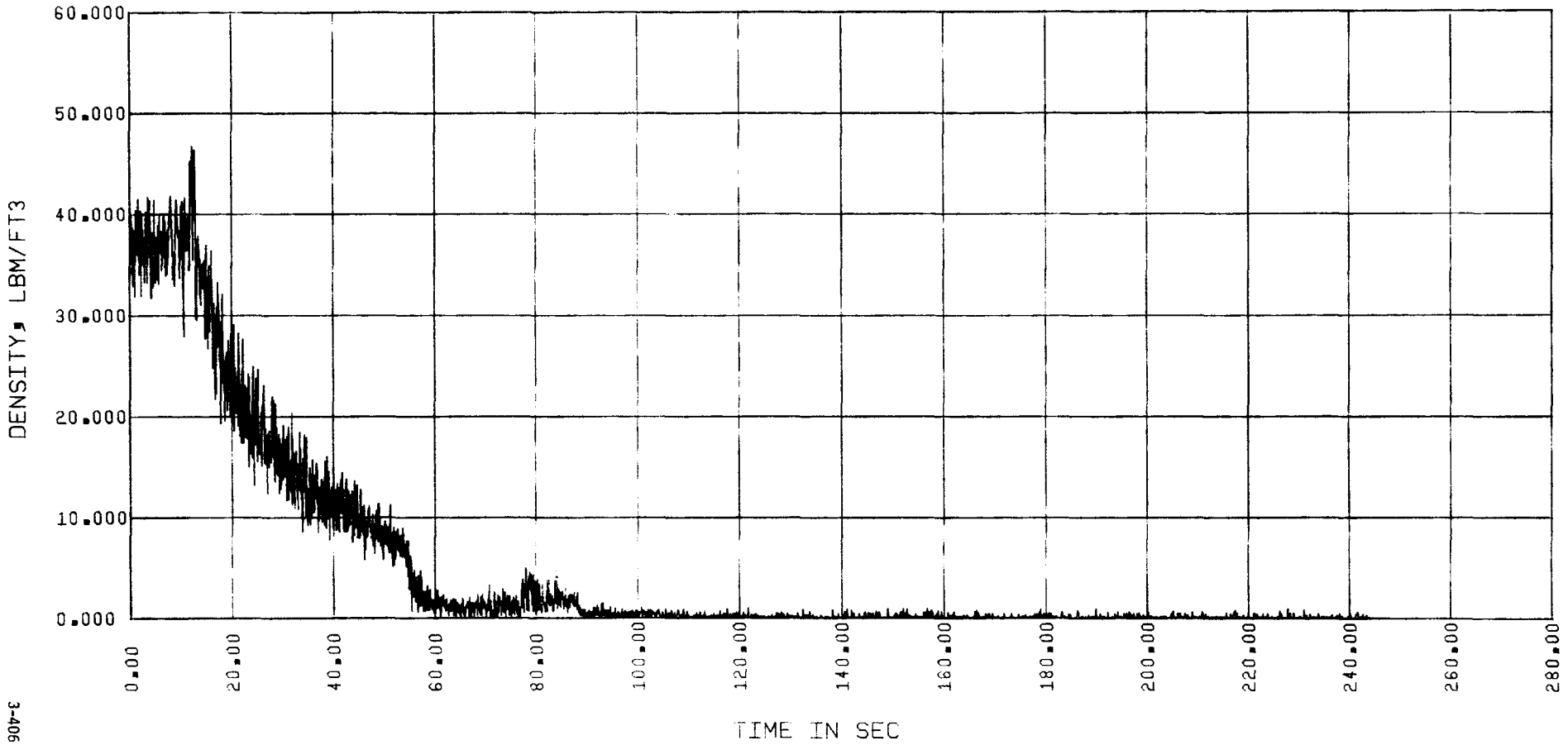
TEST 846/1000 PSIA PON FWD BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



3-04

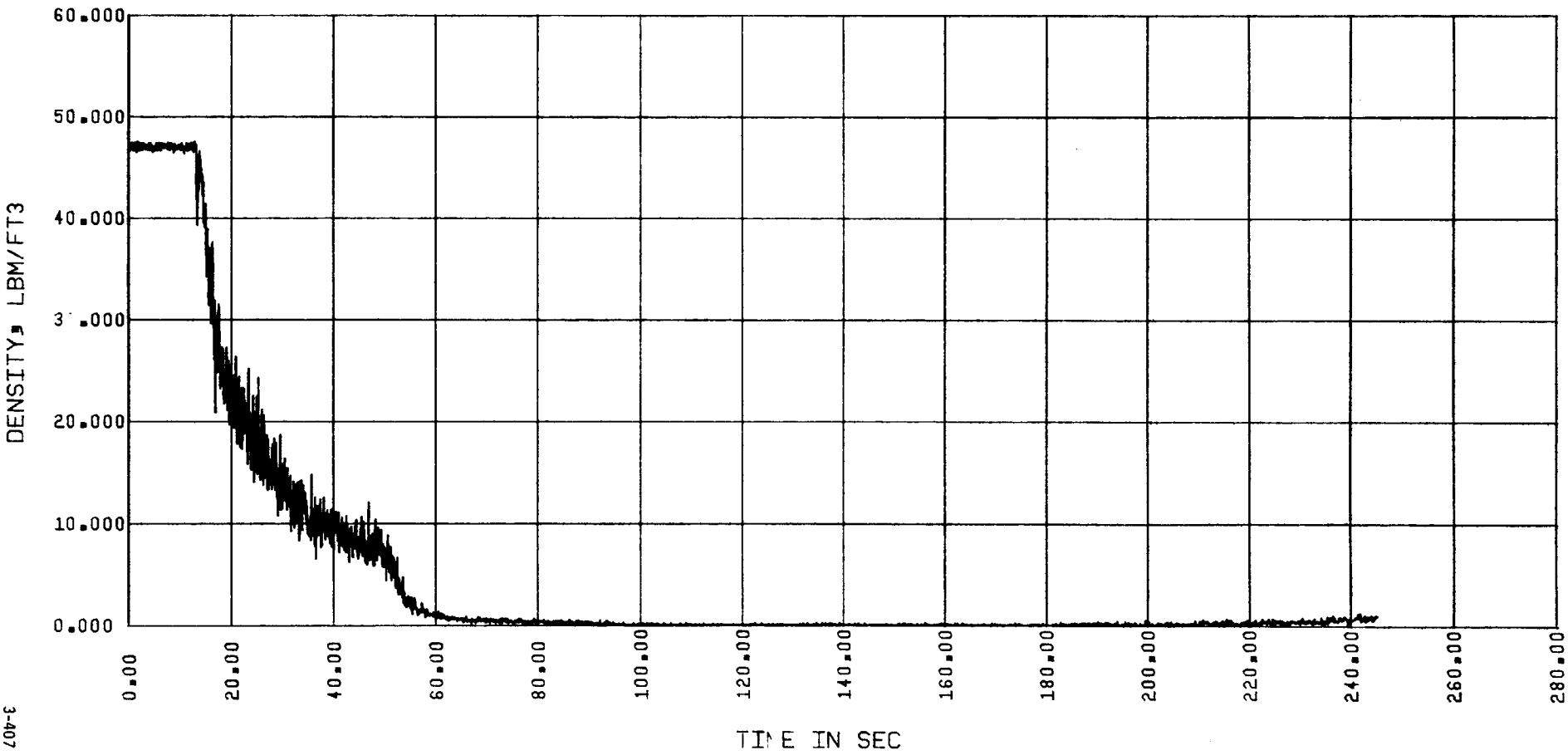

TEST 846/1000 PSIA PON FWD BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7
DENSITY, LBM/FT3
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-405

TEST 846/1000 PSIA PON FWD BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8

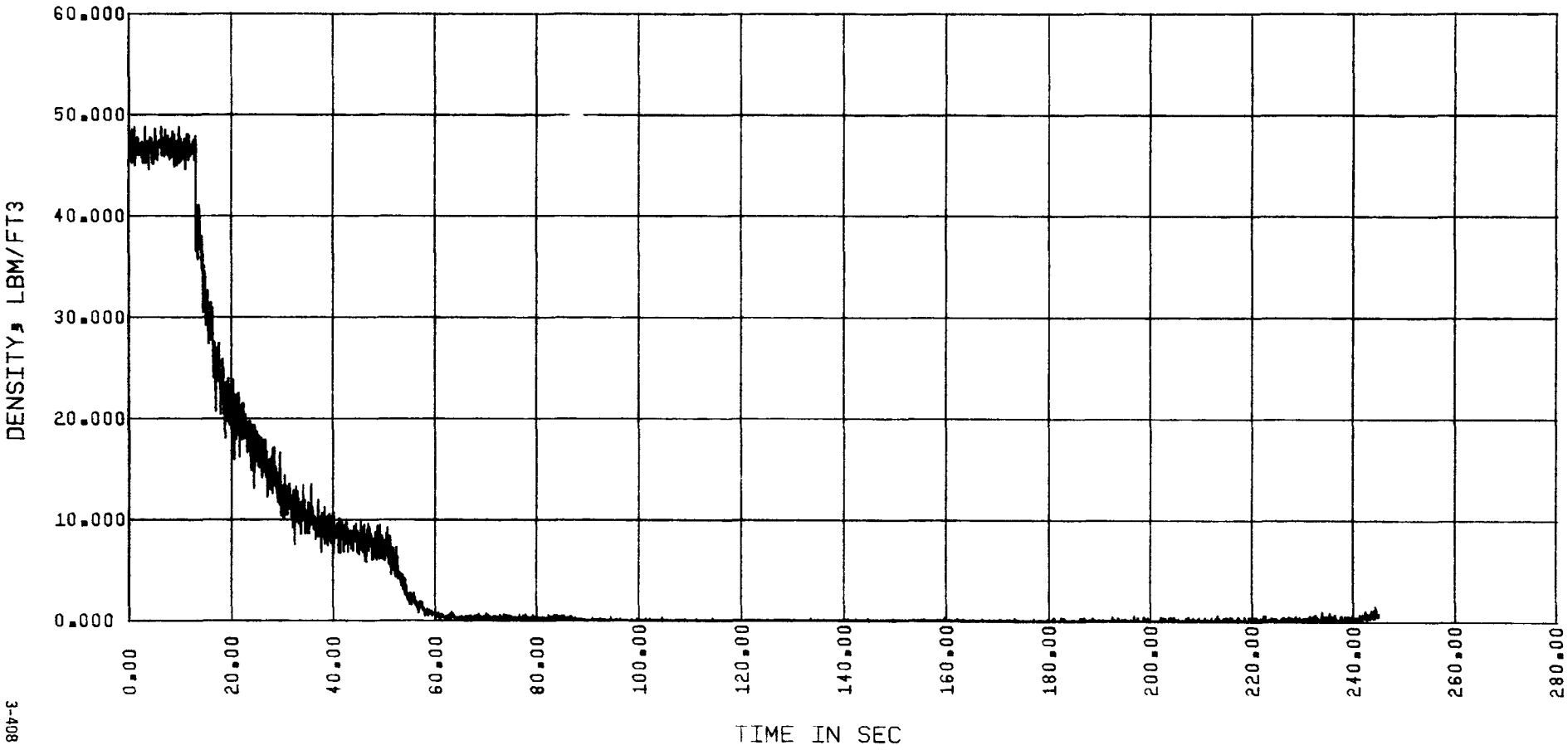


3-406

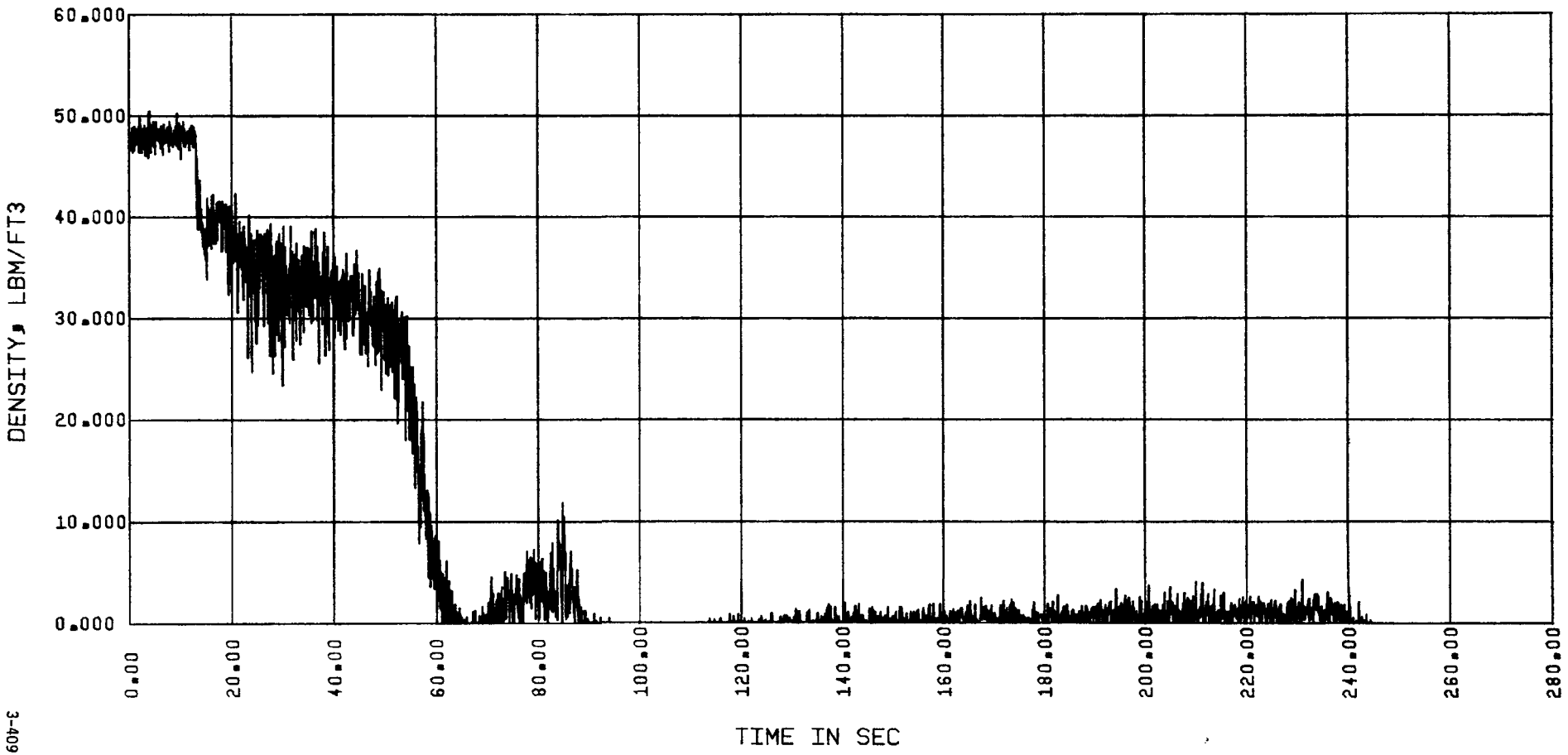
TEST 846/1000 PSIA PON FWD BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9



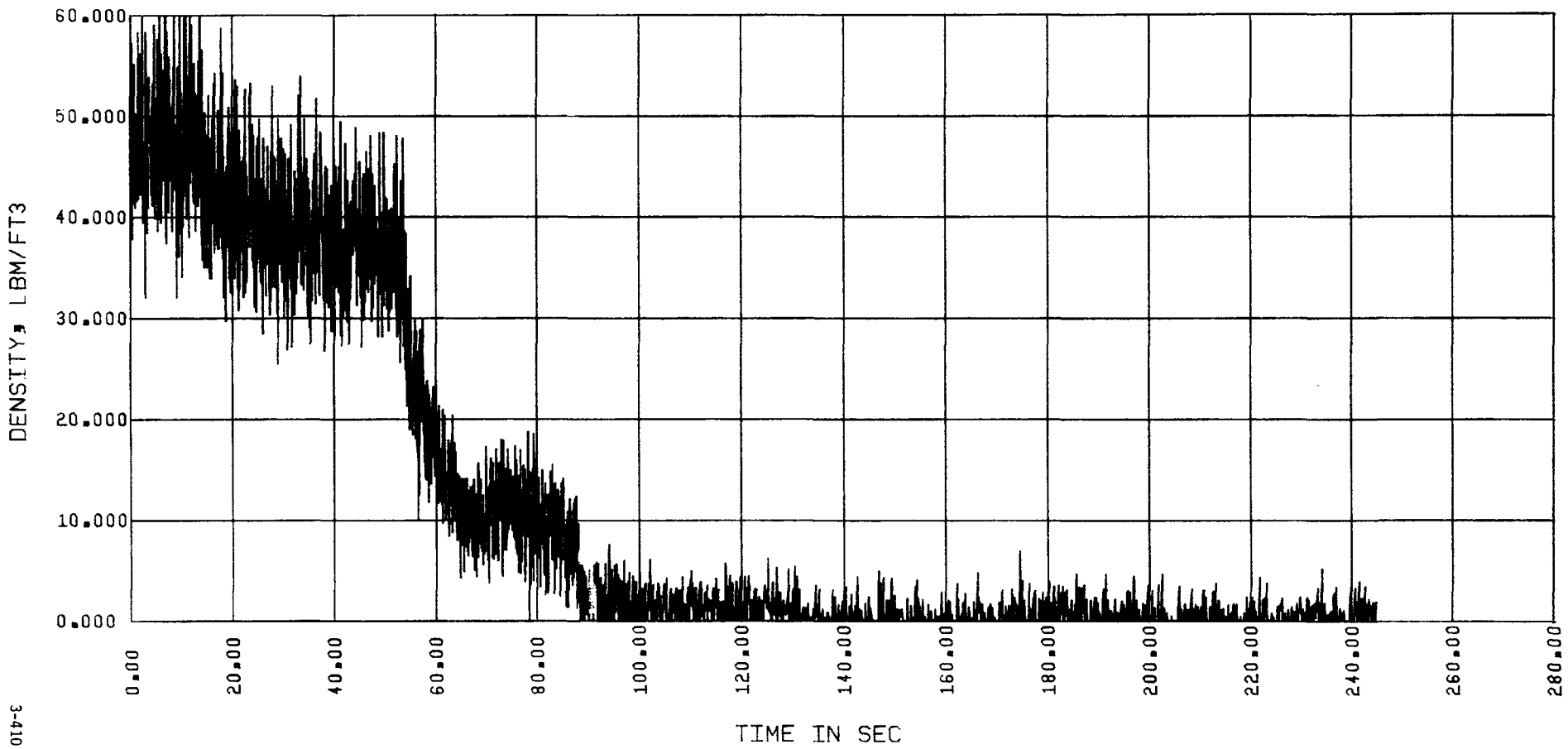
TEST 846/1000 PSIA PON FWD BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10

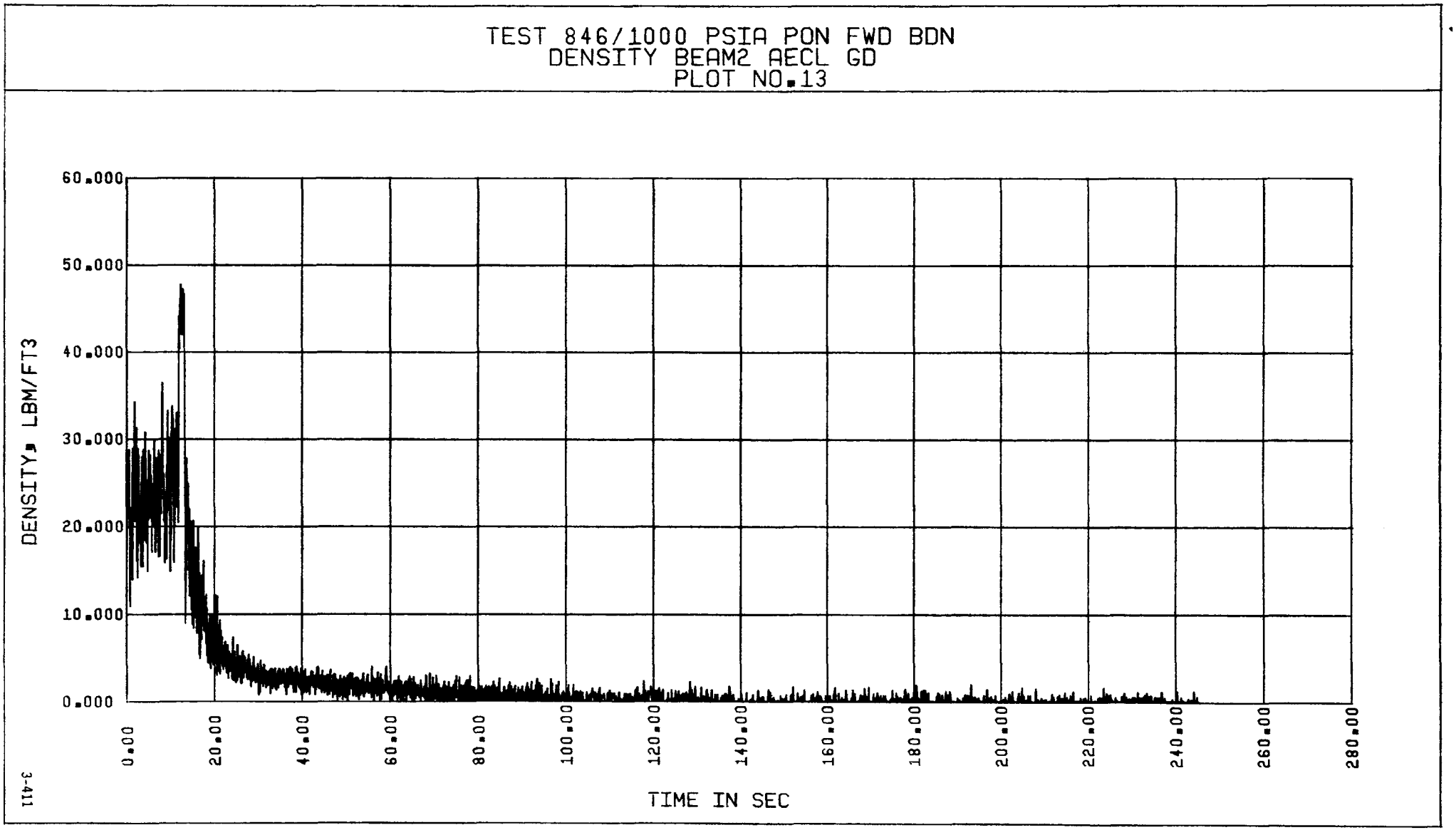


TEST 846/1000 PSIA PON FWD BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11

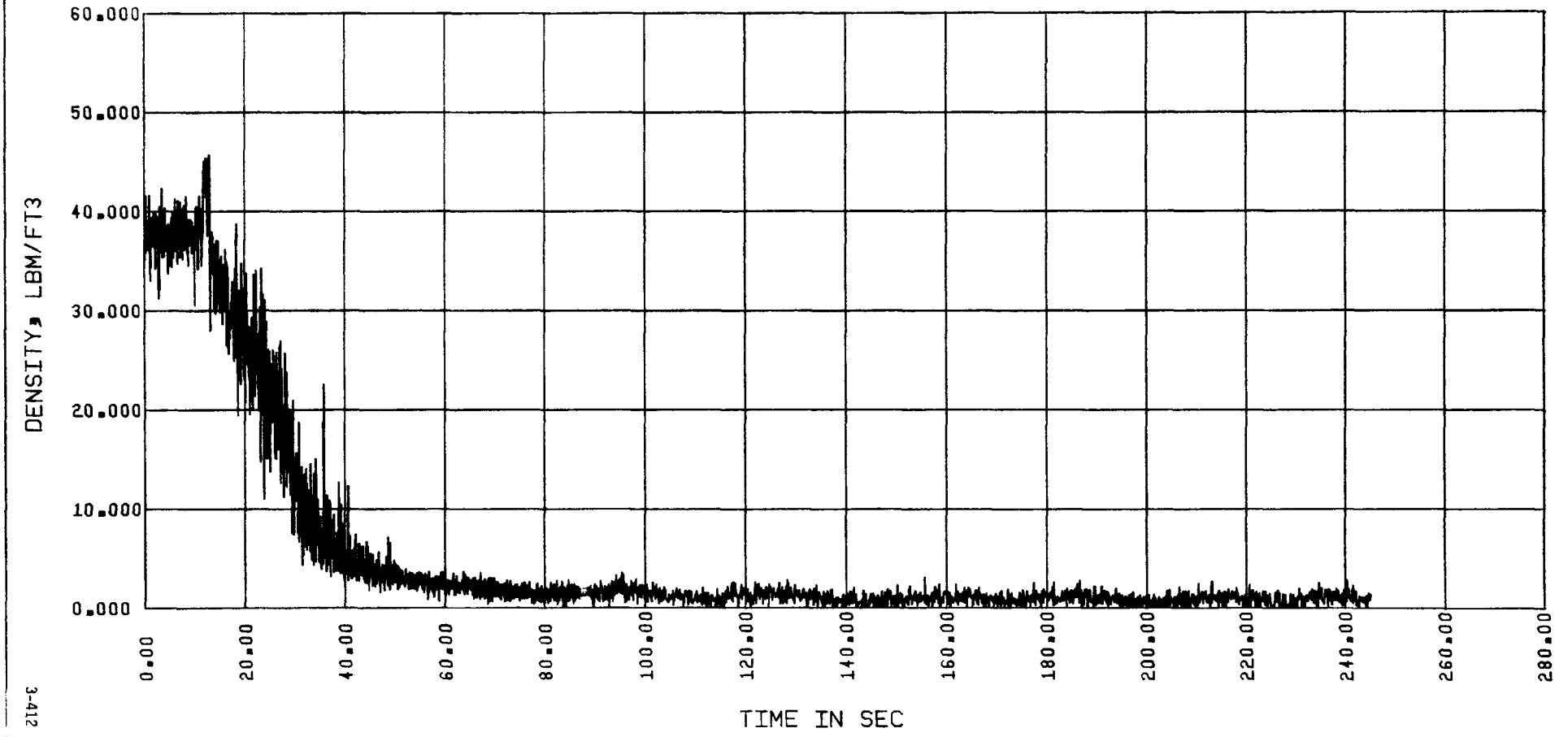


TEST 846/1000 PSIA PON FWD BDN
DENSITY BEAM1 AECL GD
PLOT NO.12

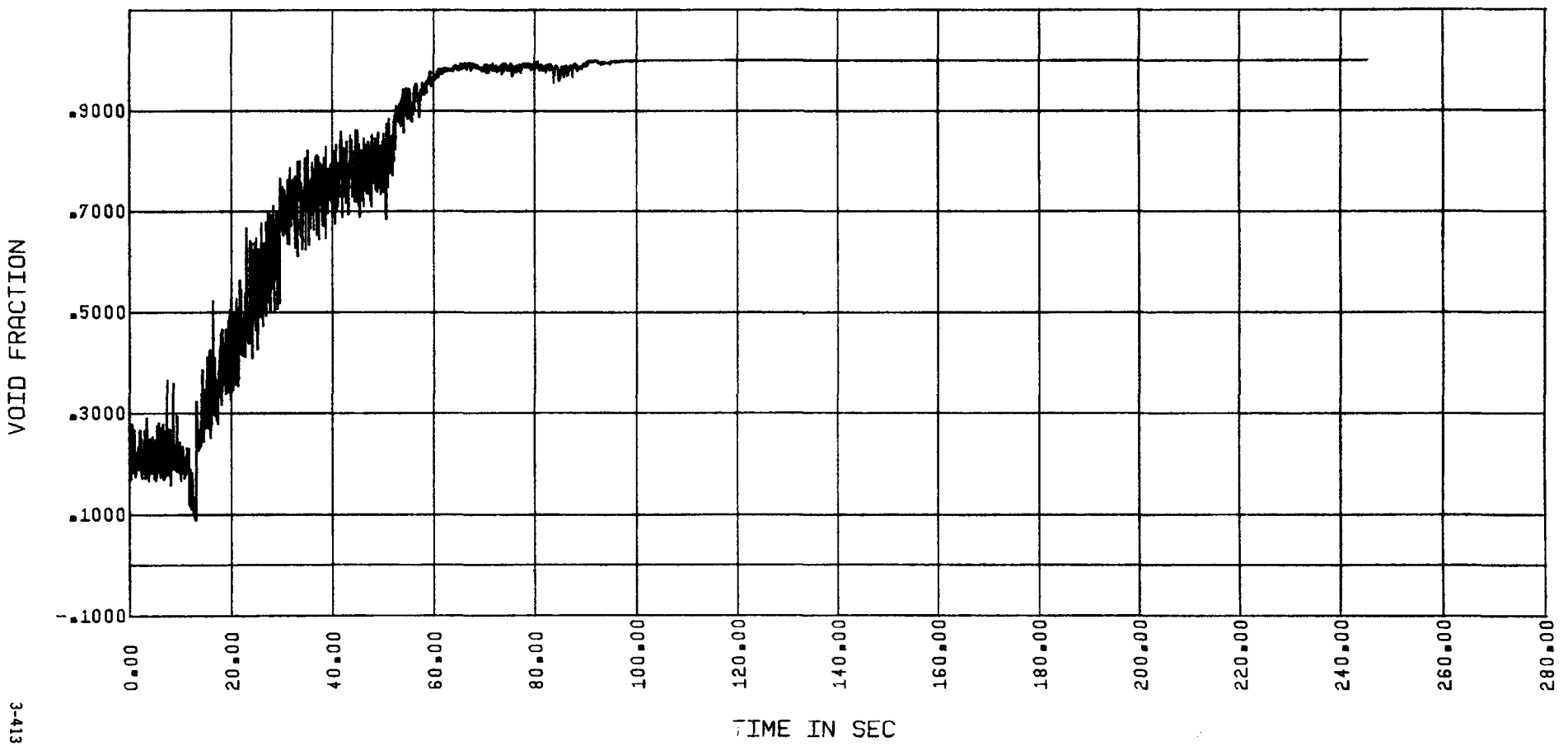



TEST 846/1000 PSIA PON FWD BDN
DENSITY BEAM2 AECL GD
PLOT NO.13
DENSITY, LBM/FT3
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

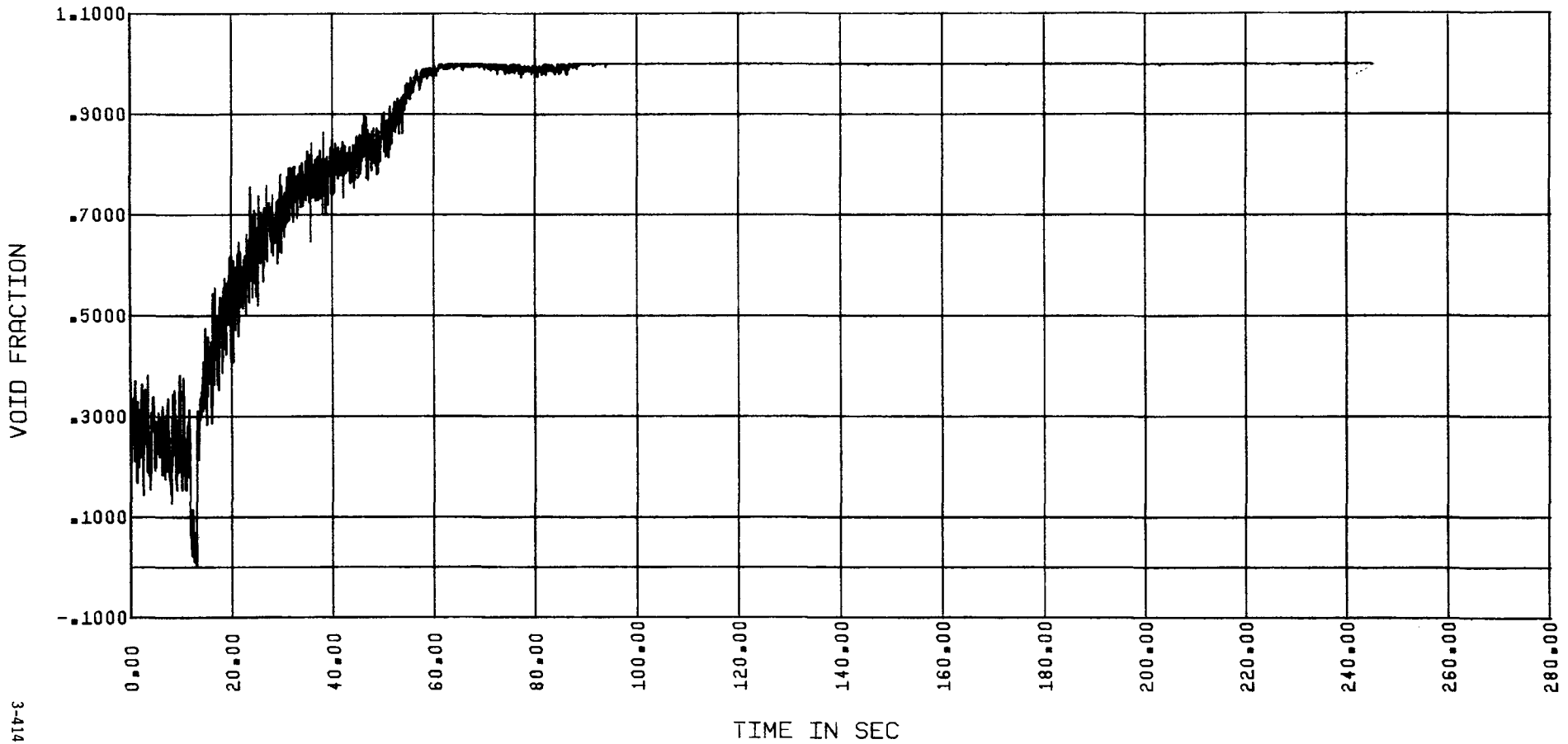
TEST 846/1000 PSIA PON FWD BDN
DENSITY BEAM3 AECL GD
PLOT NO. 14



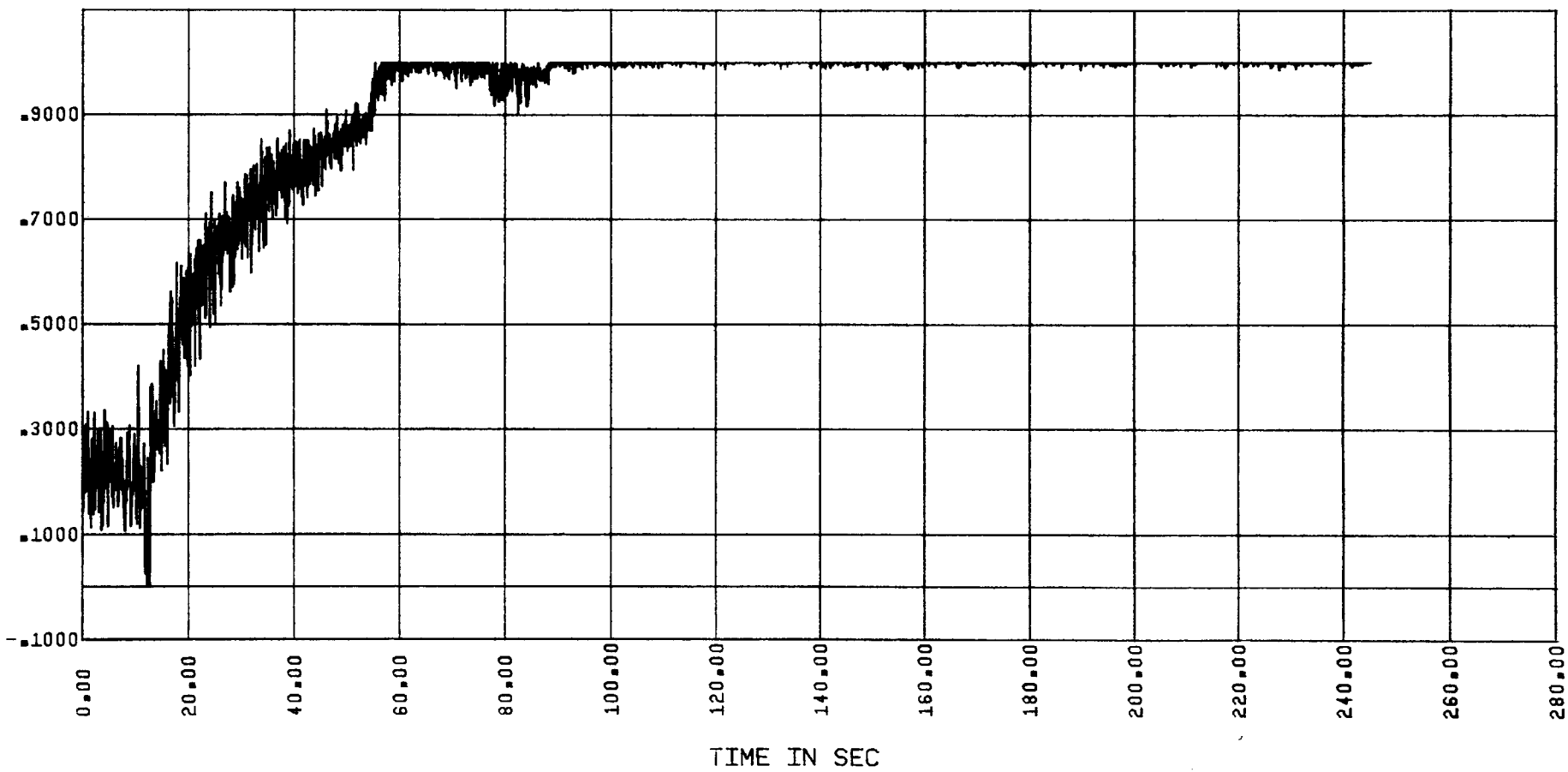
TEST 846/1000 PSIA PON FWD BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15



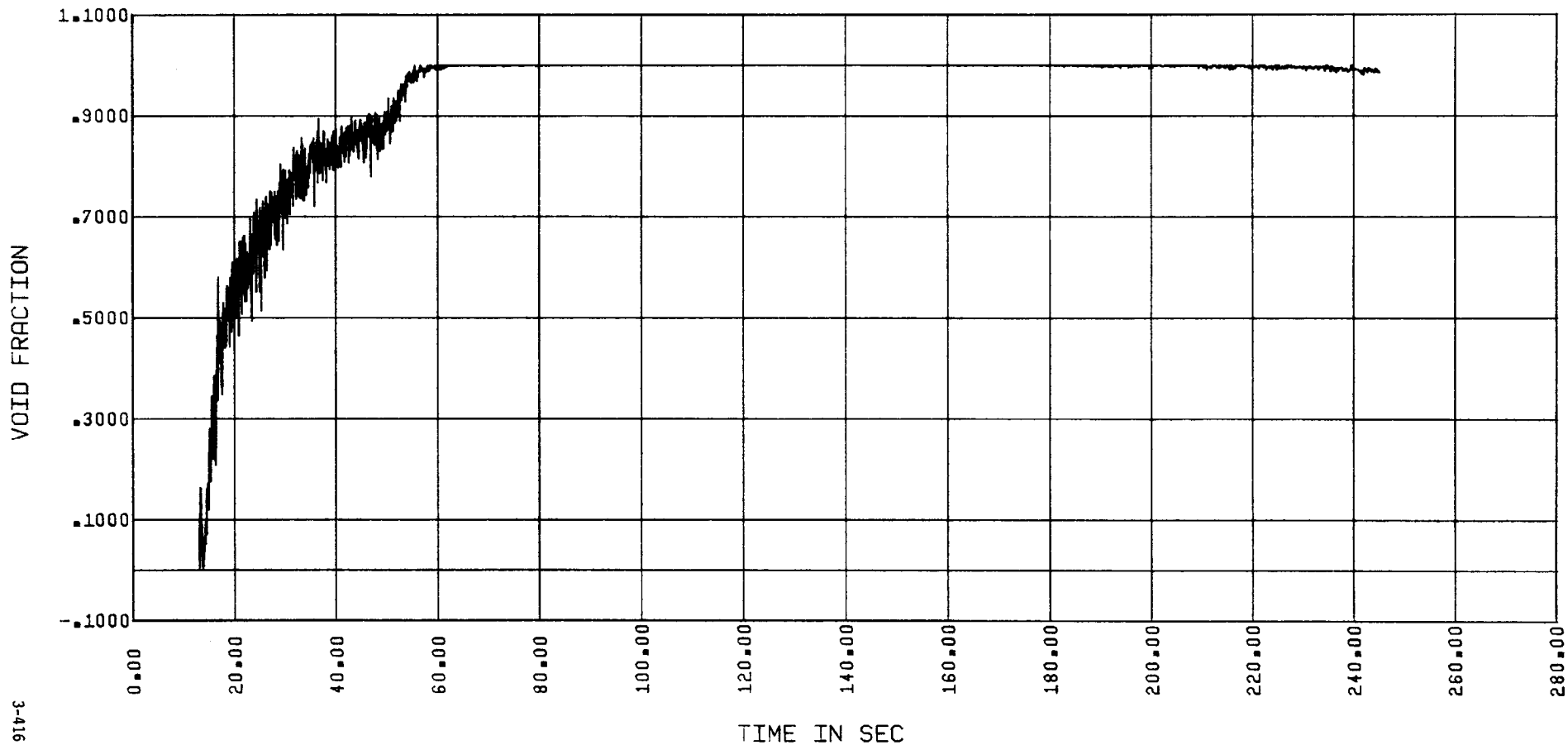
TEST 846/1000 PSIA PON FWD BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16



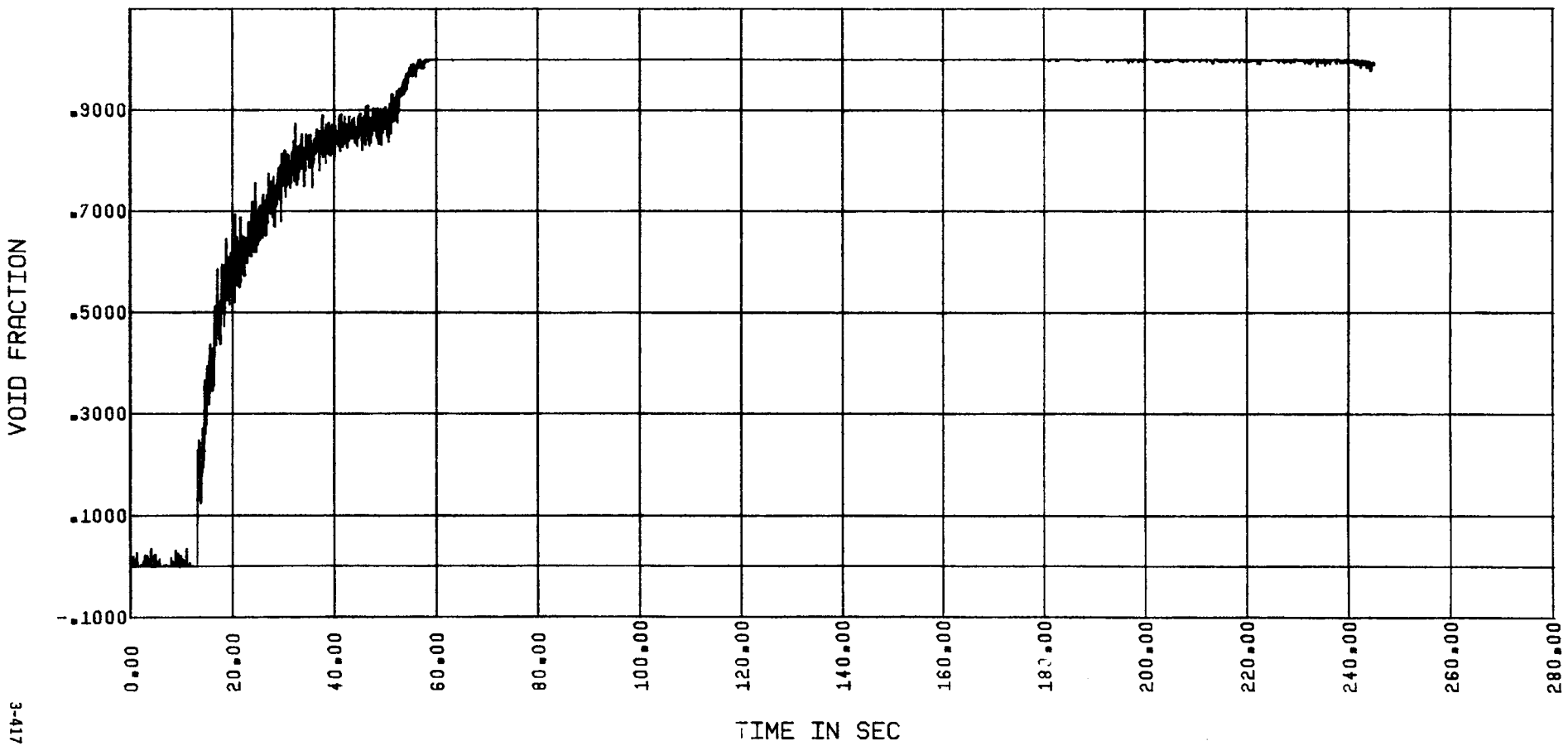
TEST 846/1000 PSIA PON FWD BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17



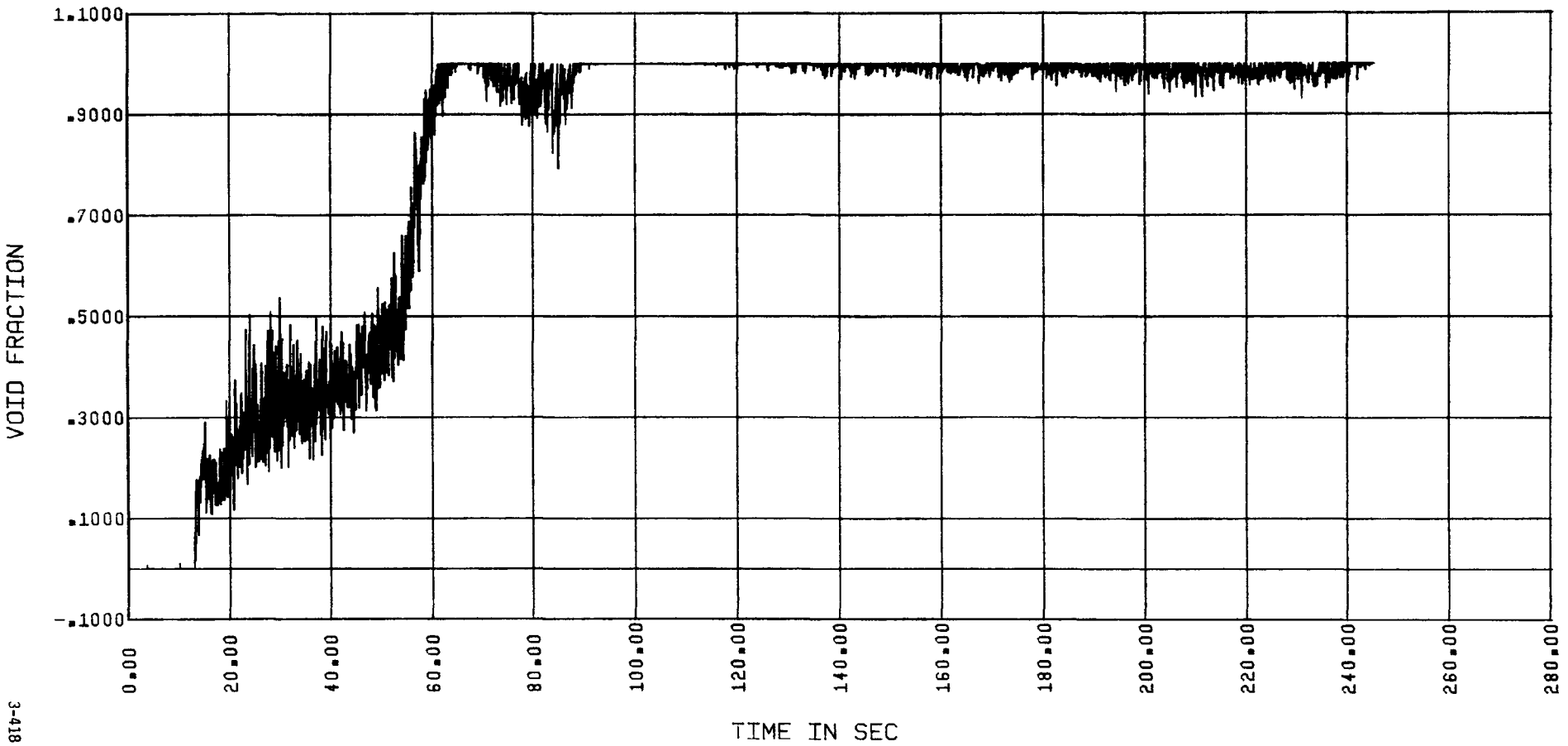
TEST 846/1000 PSIA PON FWD BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18

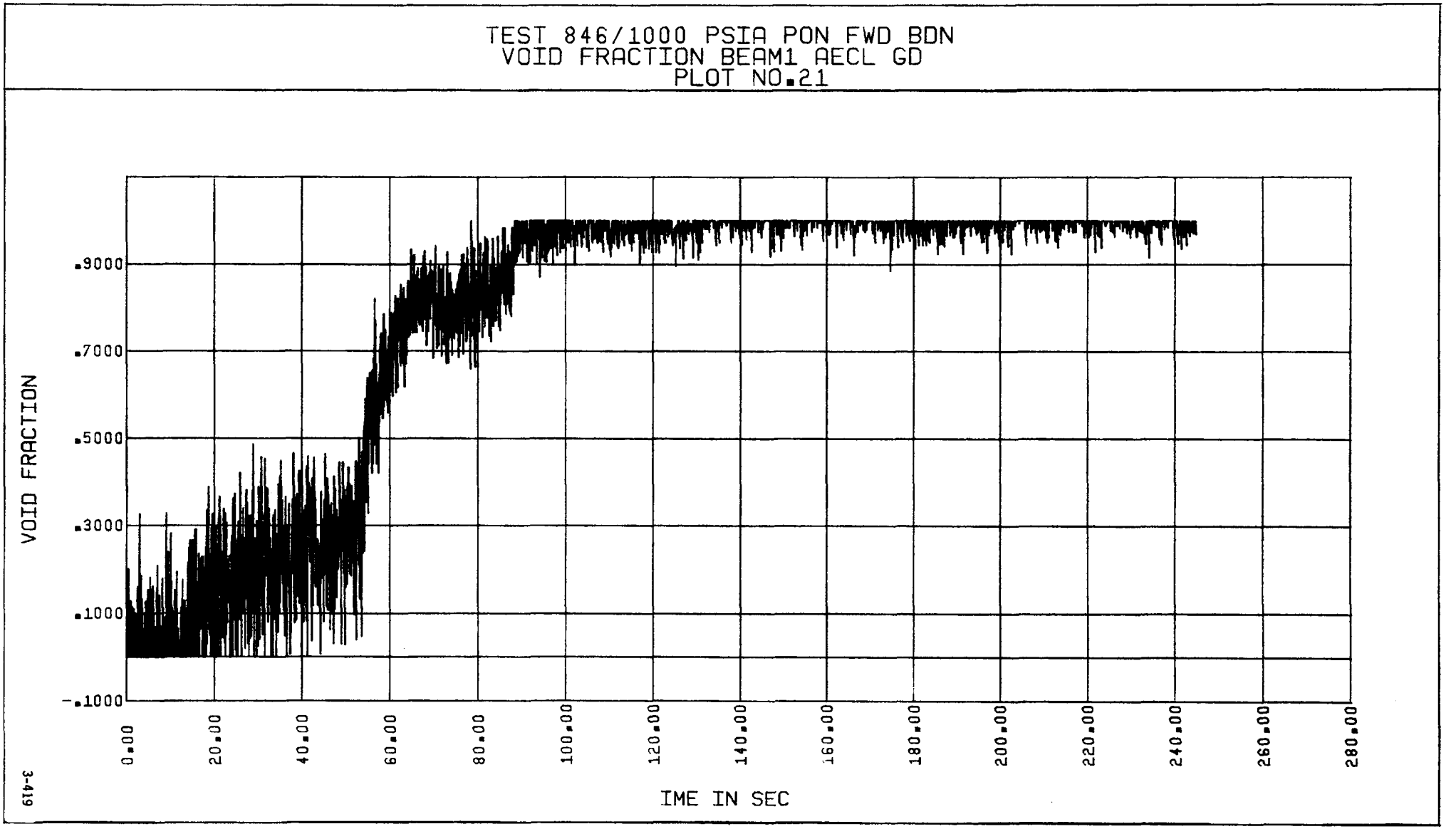


TEST 846/1000 PSIA PON FWD BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19

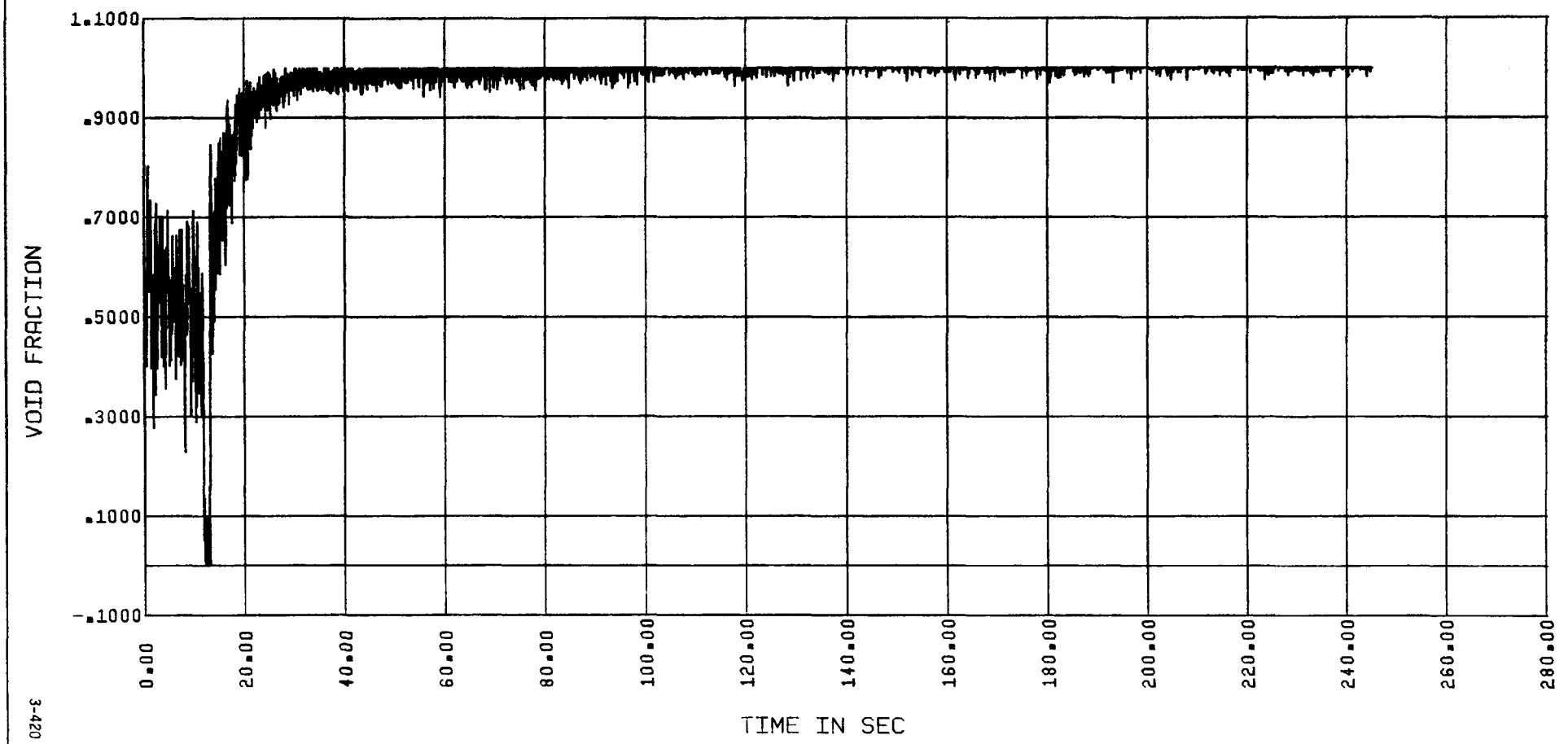


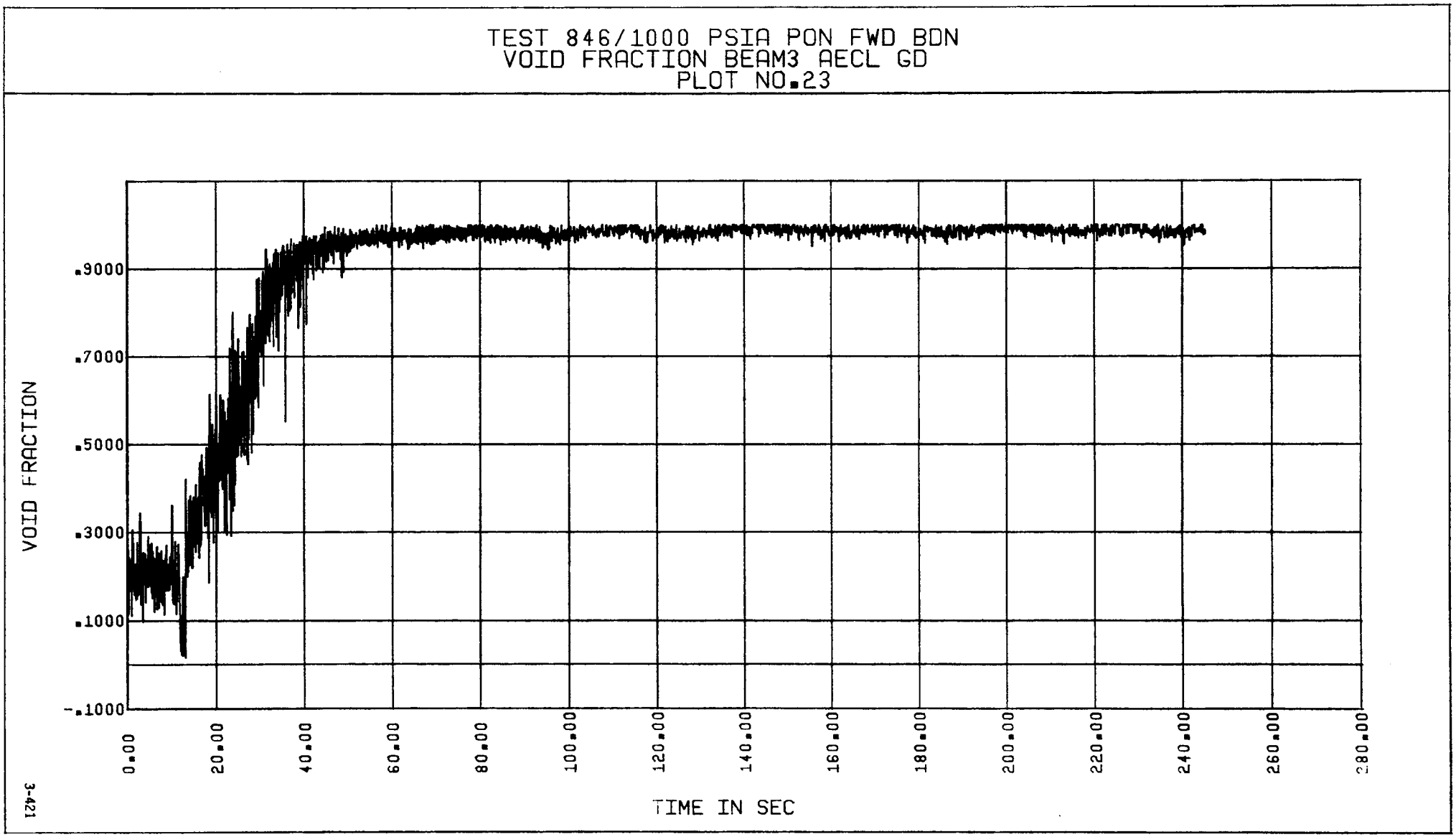
TEST 846/1000 PSIA PON FWD BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20



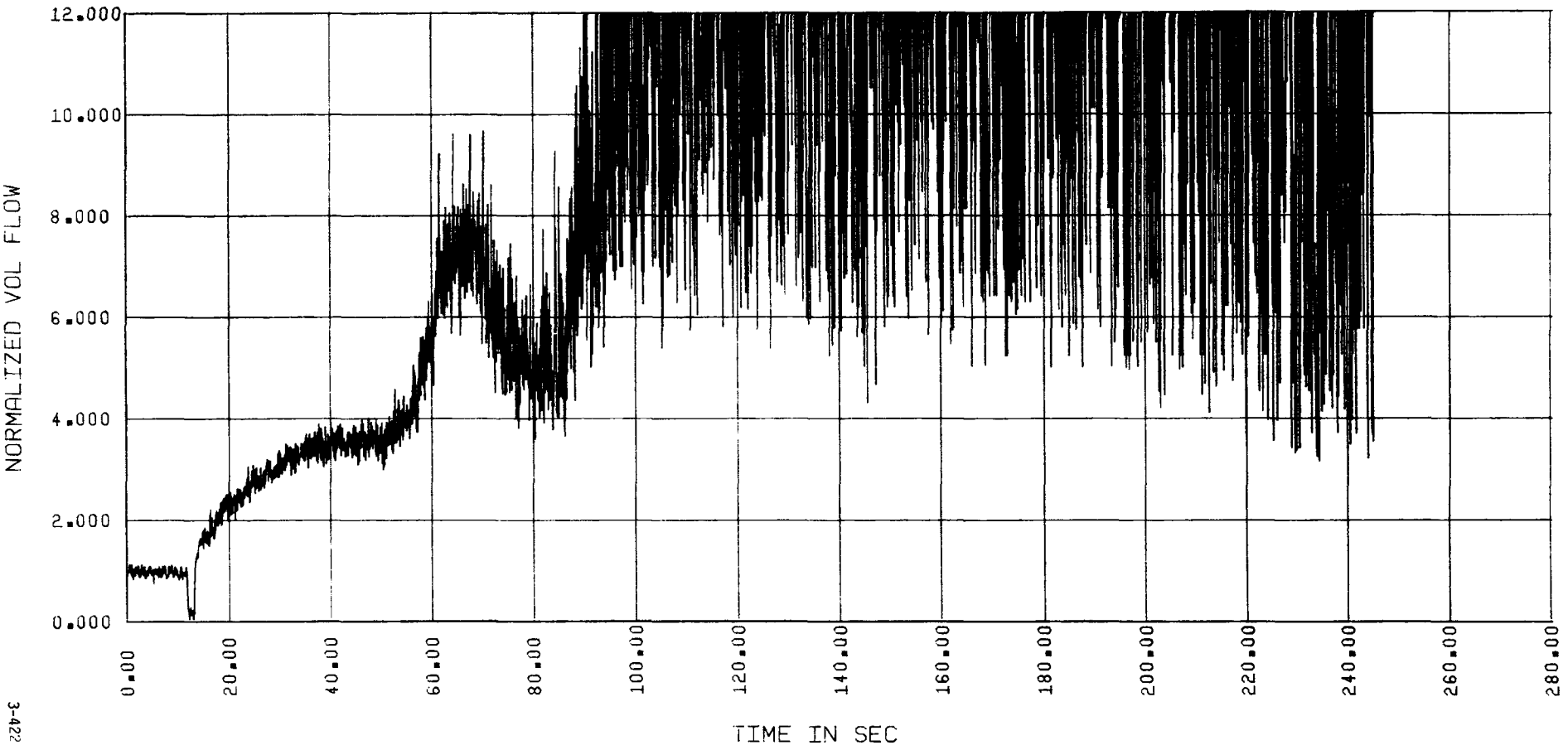

TEST 846/1000 PSIA PON FWD BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
IME IN SEC
3-419

TEST 846/1000 PSIA PON FWD BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22

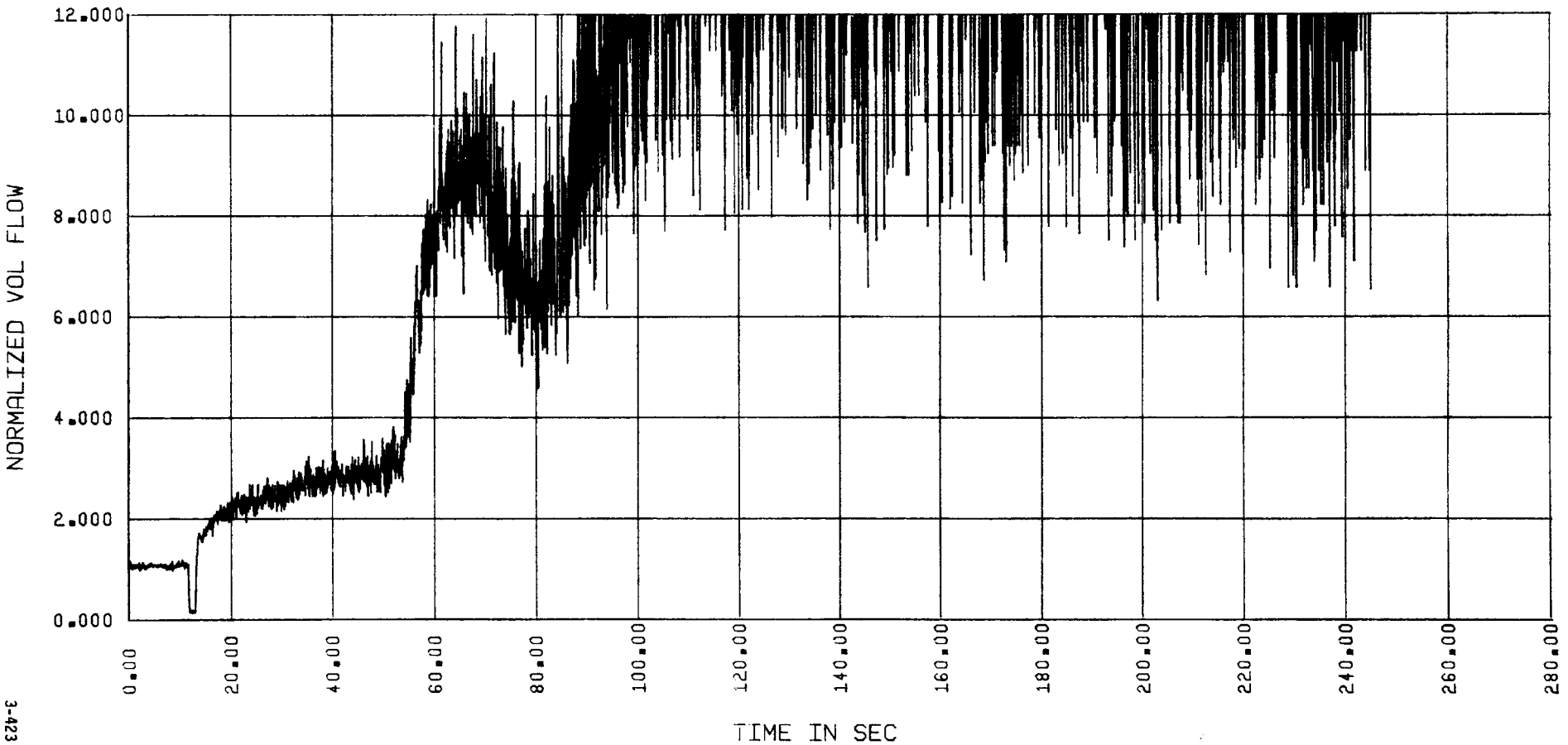



TEST 846/1000 PSIA PON FWD BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

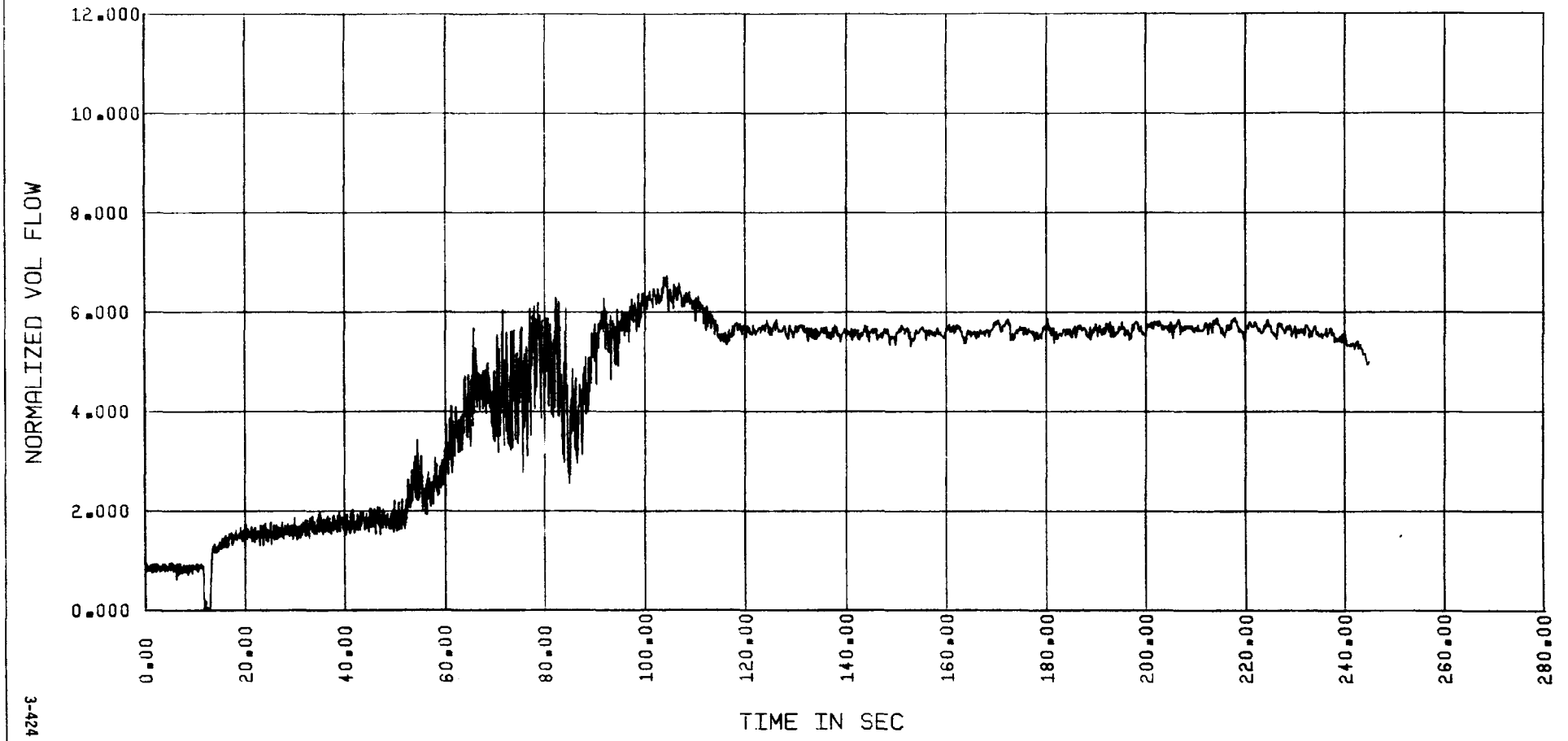
TEST 846/1000 PSIA PON FWD BDN
NORM VOL FLOW RATE LO-DD/GD2 S
PLOT NO.24



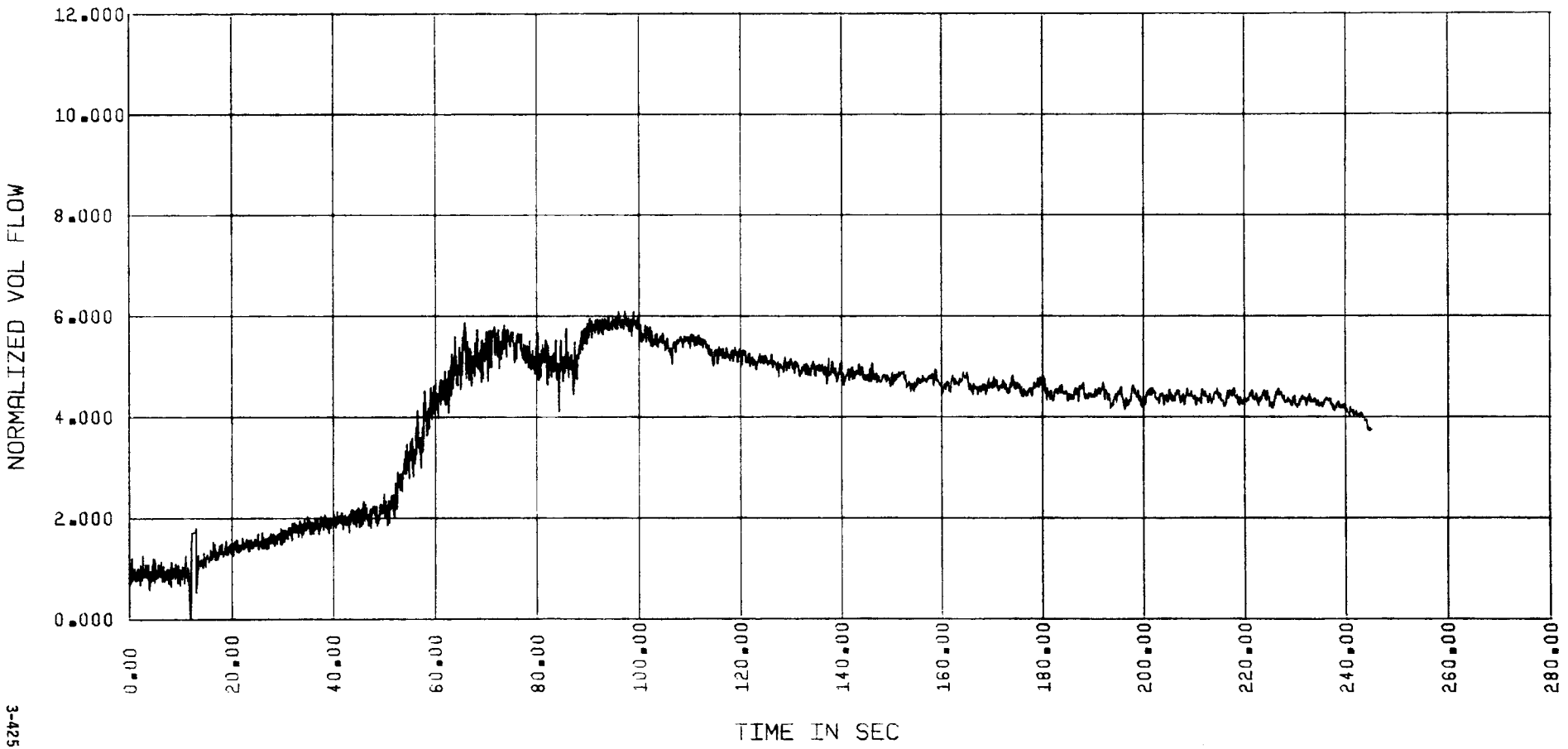
TEST 846/1000 PSIA PON FWD BDN
NORM VOL FLOW RATE HI-DD/GD2 S
PLOT NO.25



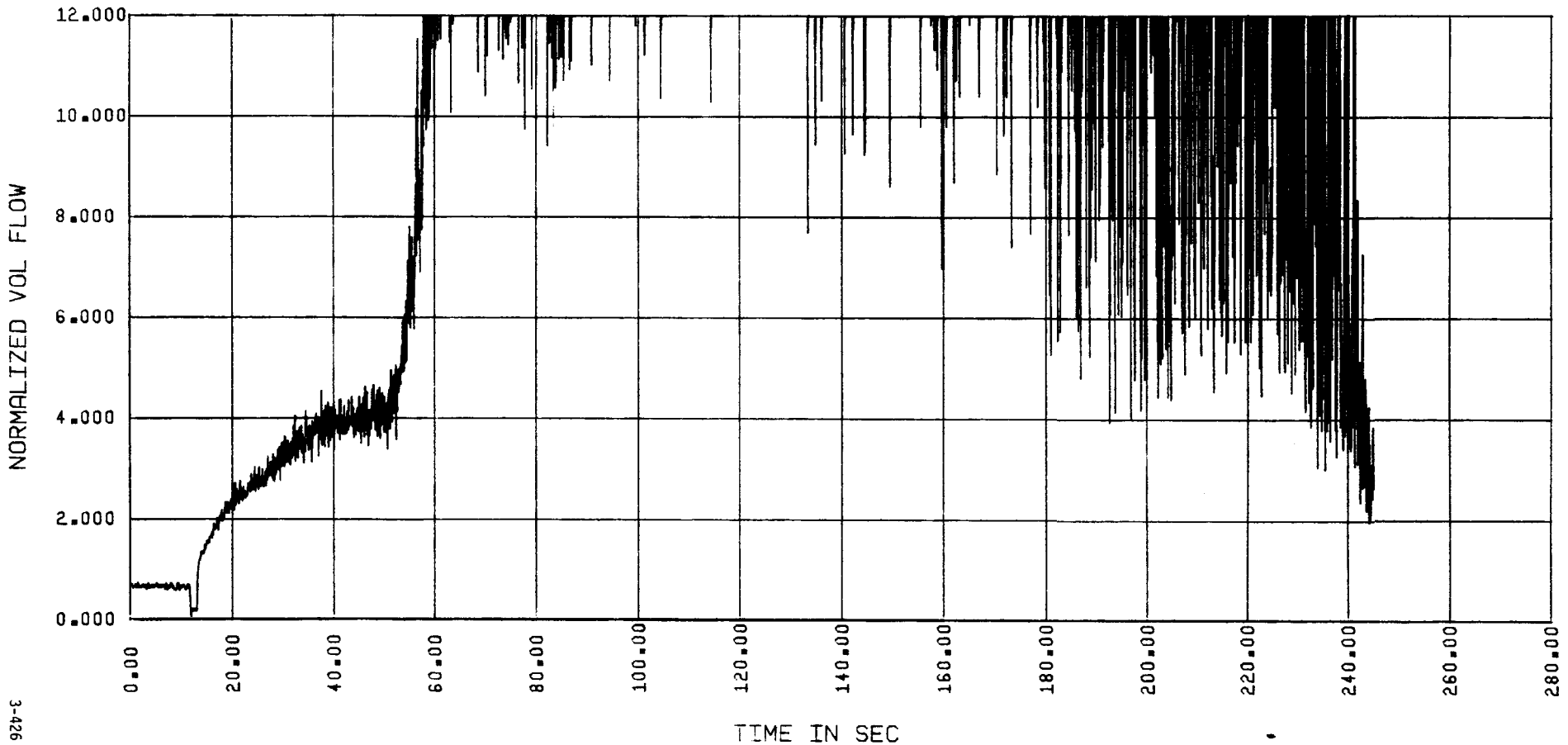
TEST 846/1000 PSIA PON FWD BDN
NORM VOL FLOW RATE LO-TM SUCT
PLOT NO.26



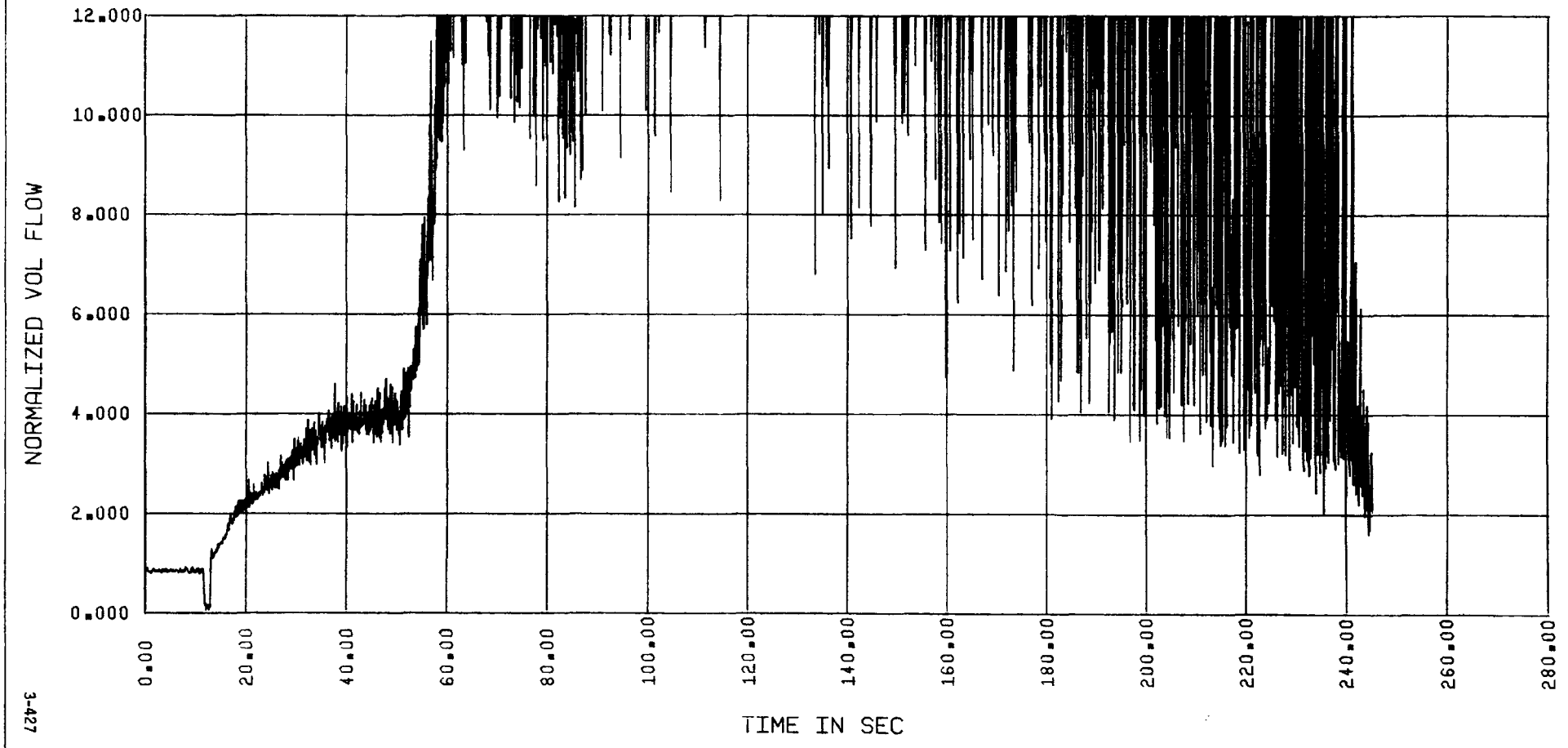
TEST 846/1000 PSIA PON FWD BDN
NORM VOL FLOW RATE HI-TM SUCT
PLOT NO.27



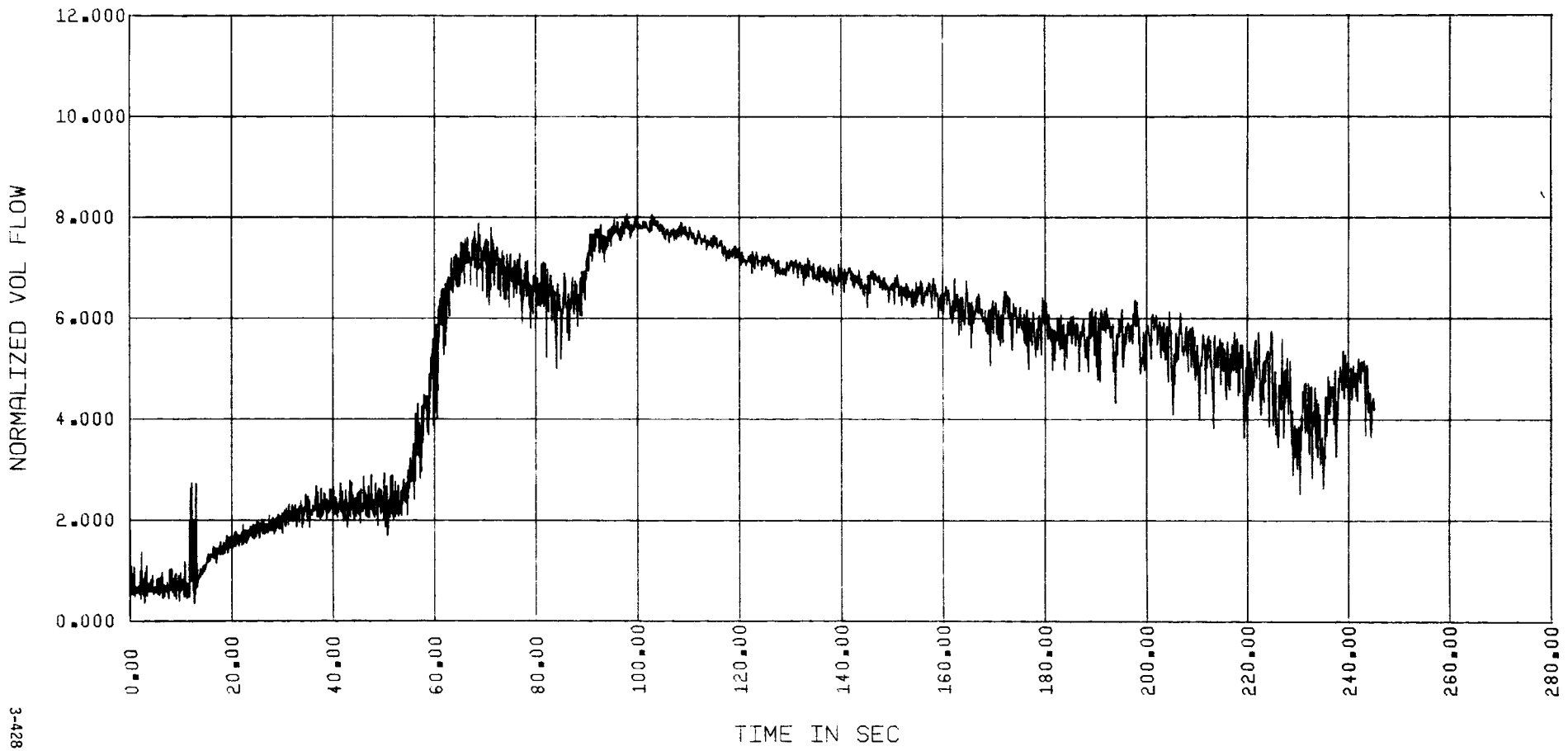
TEST 846/1000 PSIA PON FWD BD
NORM VOL FLOW RATE LO-DD/GD2 D
PLOT NO.28



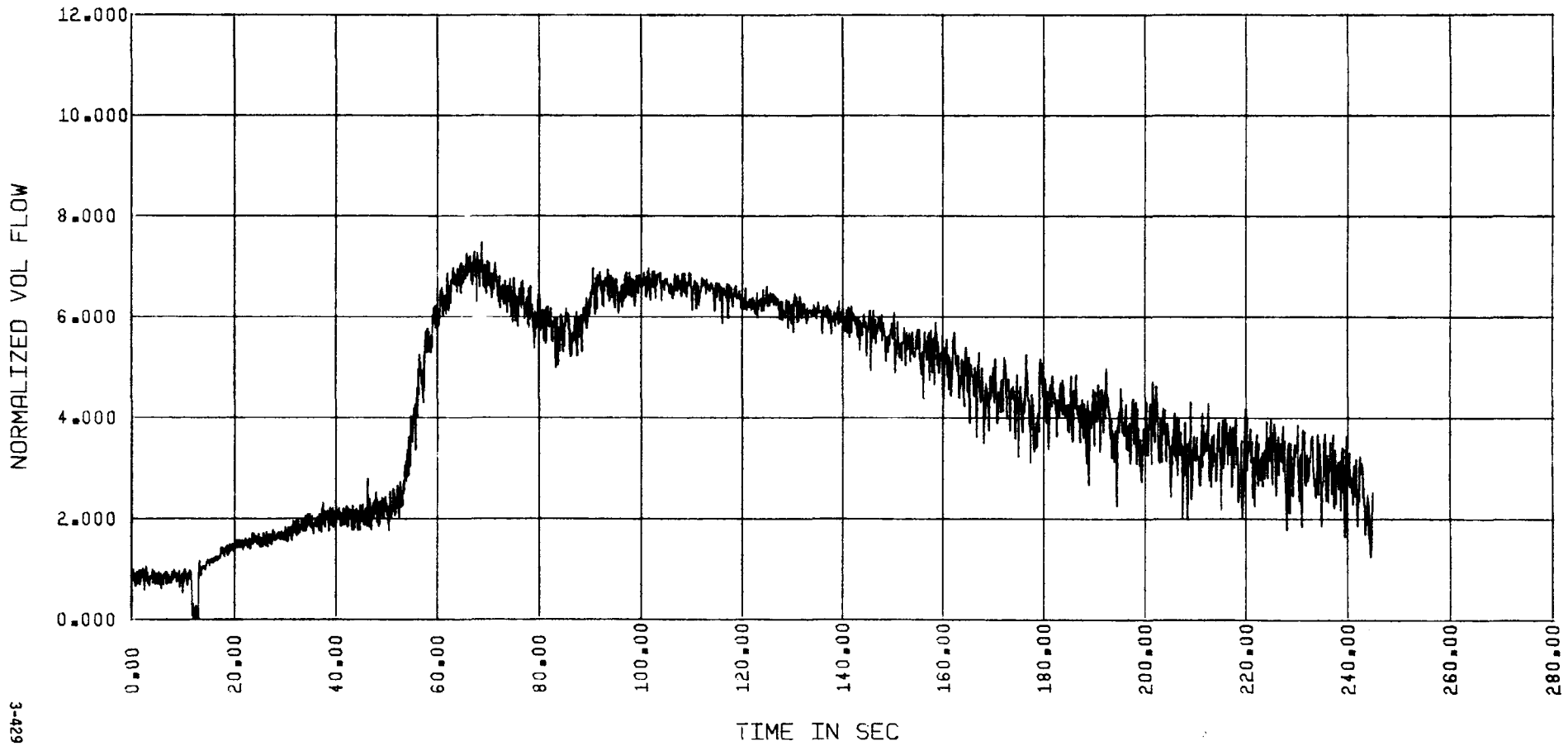
TEST 846/1000 PSIA PON FWD BDN
NORM VOL FLOW RATE HI-DD/GD2 D
PLOT NO.29



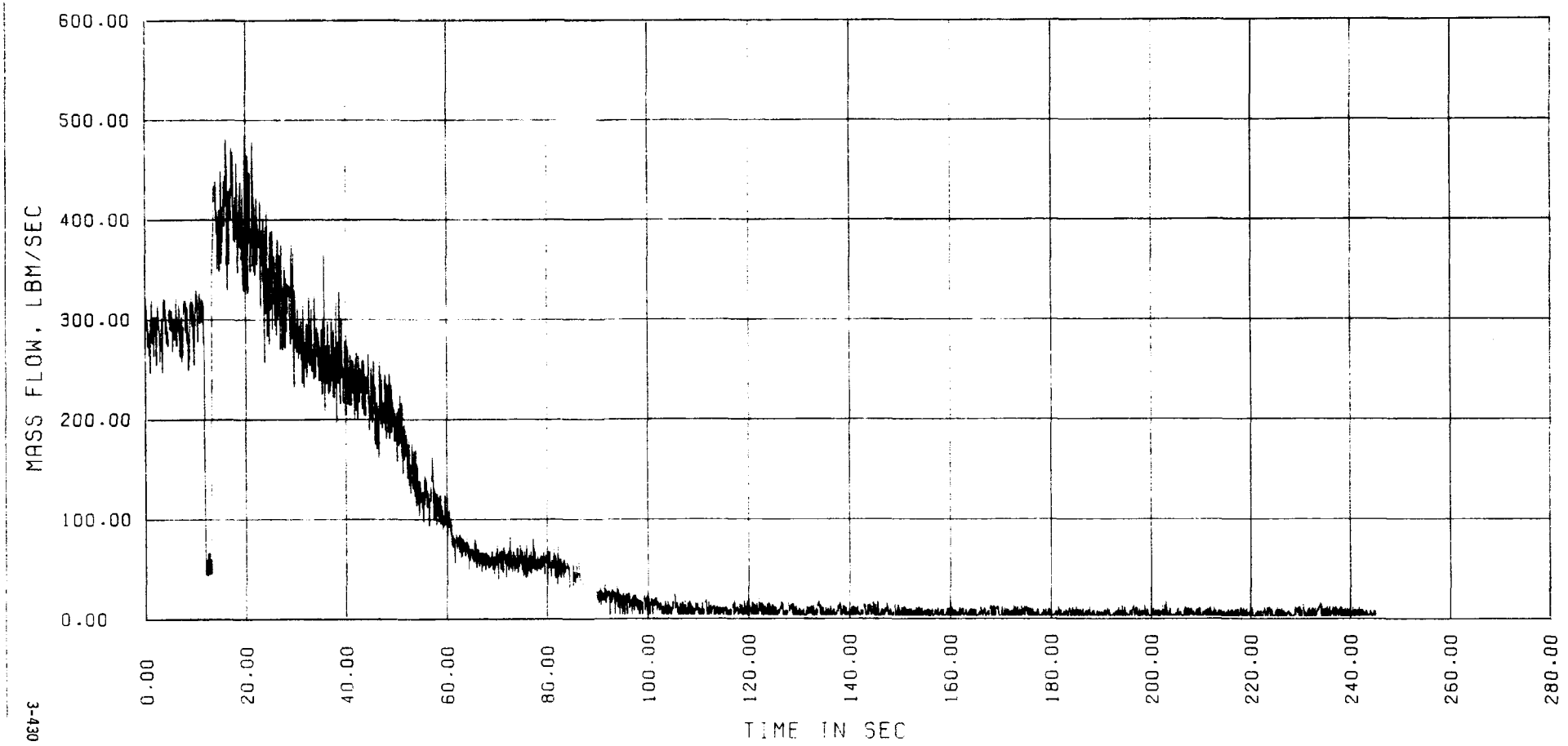
TEST 846/1000 PSIA PON FWD BDN
NORM VOL FLOW RATE LO-TM DSCH
PLOT NO.30



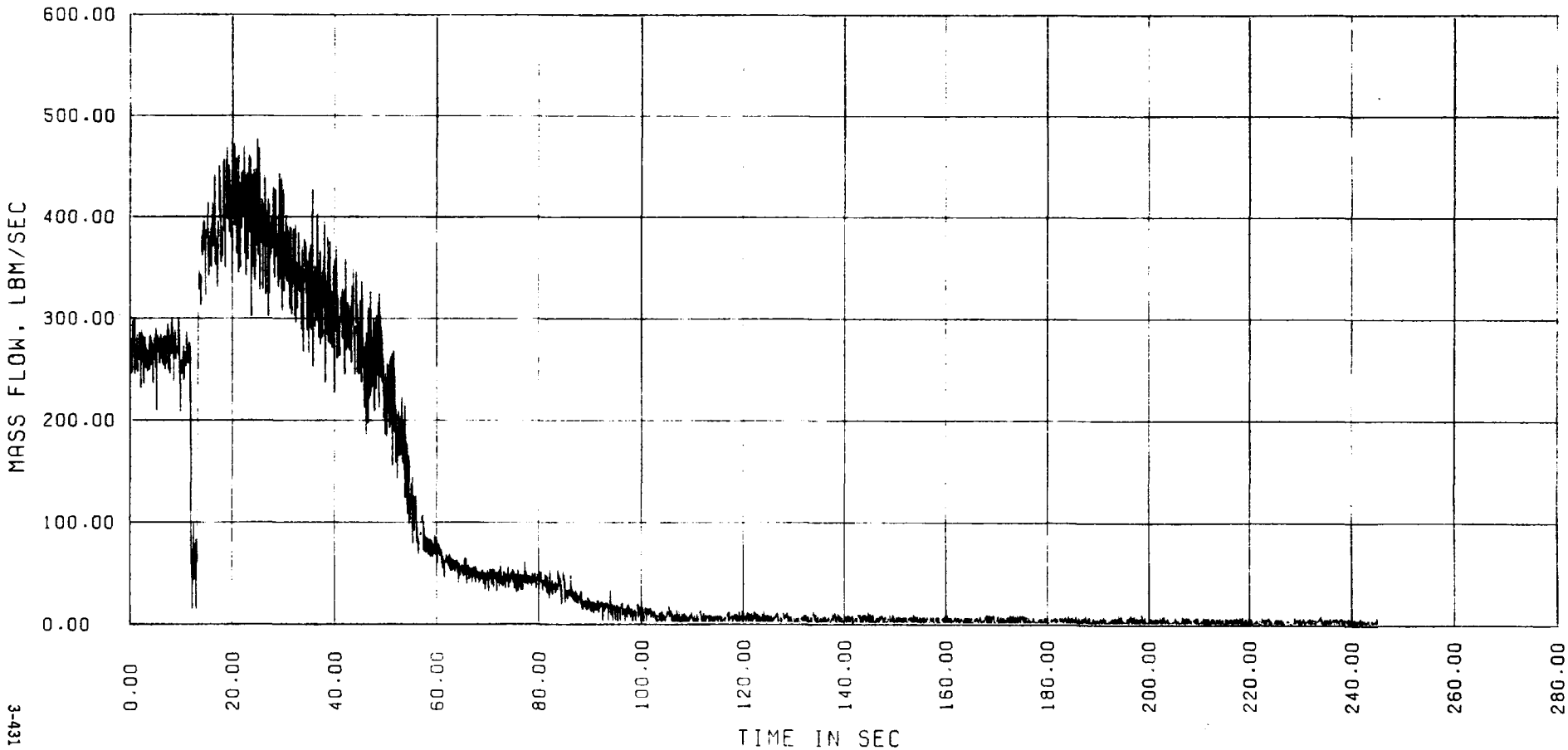
TEST 846/1000 PSIA PON FWD BDN
NORM VOL FLOW RATE HI-TM DSCH
PLOT NO.31



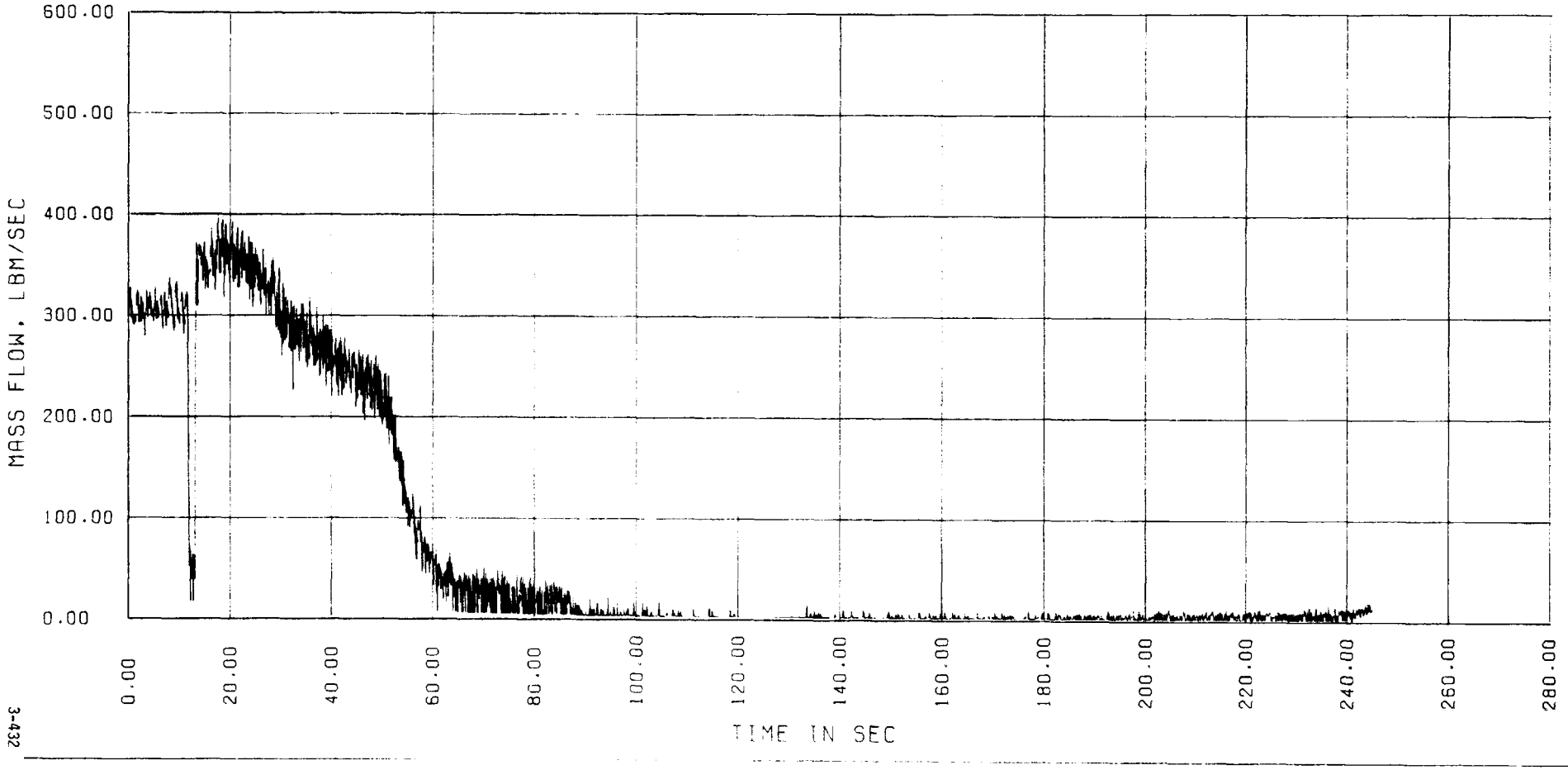
TEST 846/1000 PSIA PON FWD BDN
MASS FLOW RATE HI-OD/GO2 SUCT
PLOT NO.32



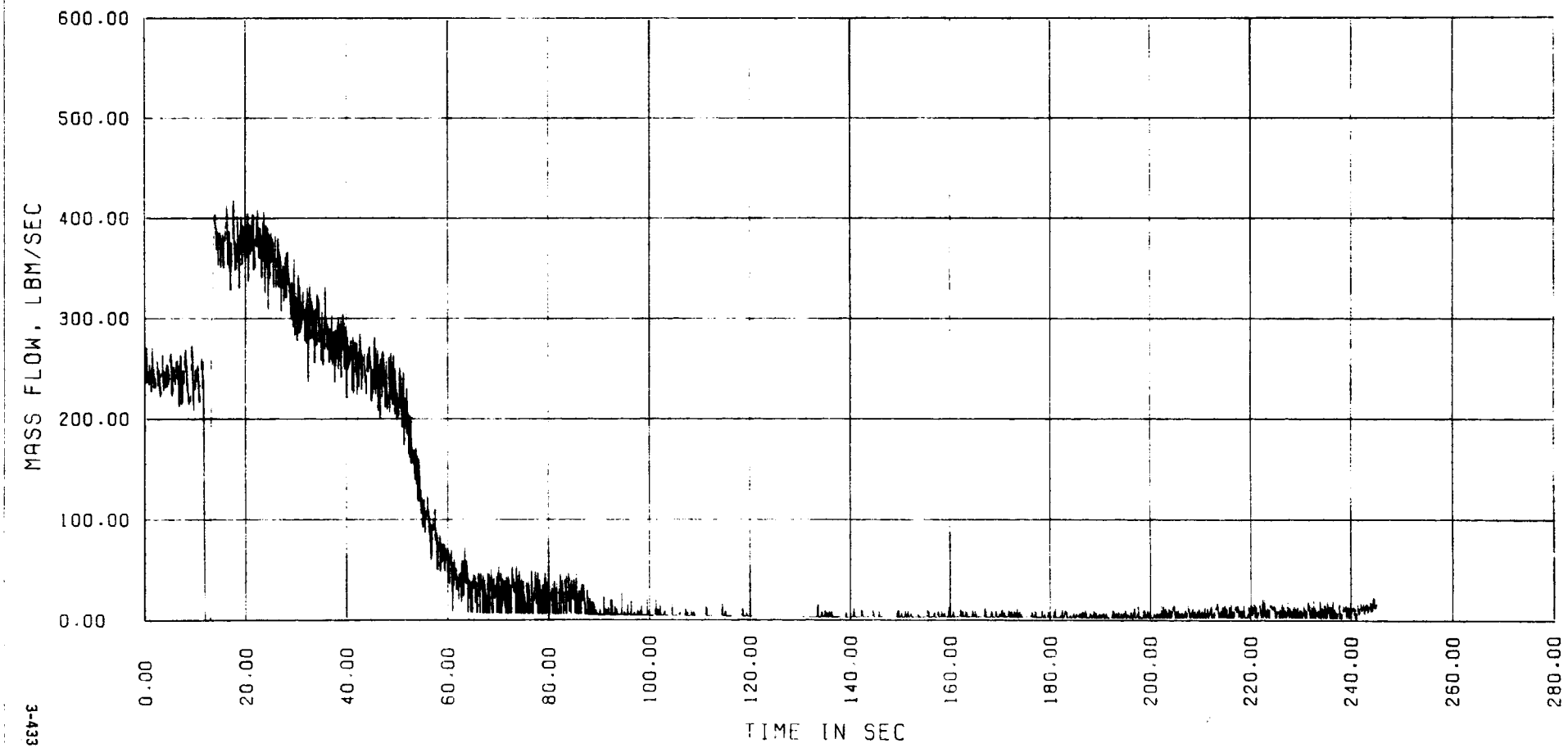
TEST 846/1000 PSIA PON FWD BDN
MASS FLOW RATE LO-DO/GO2 SUCT
PLOT NO.33



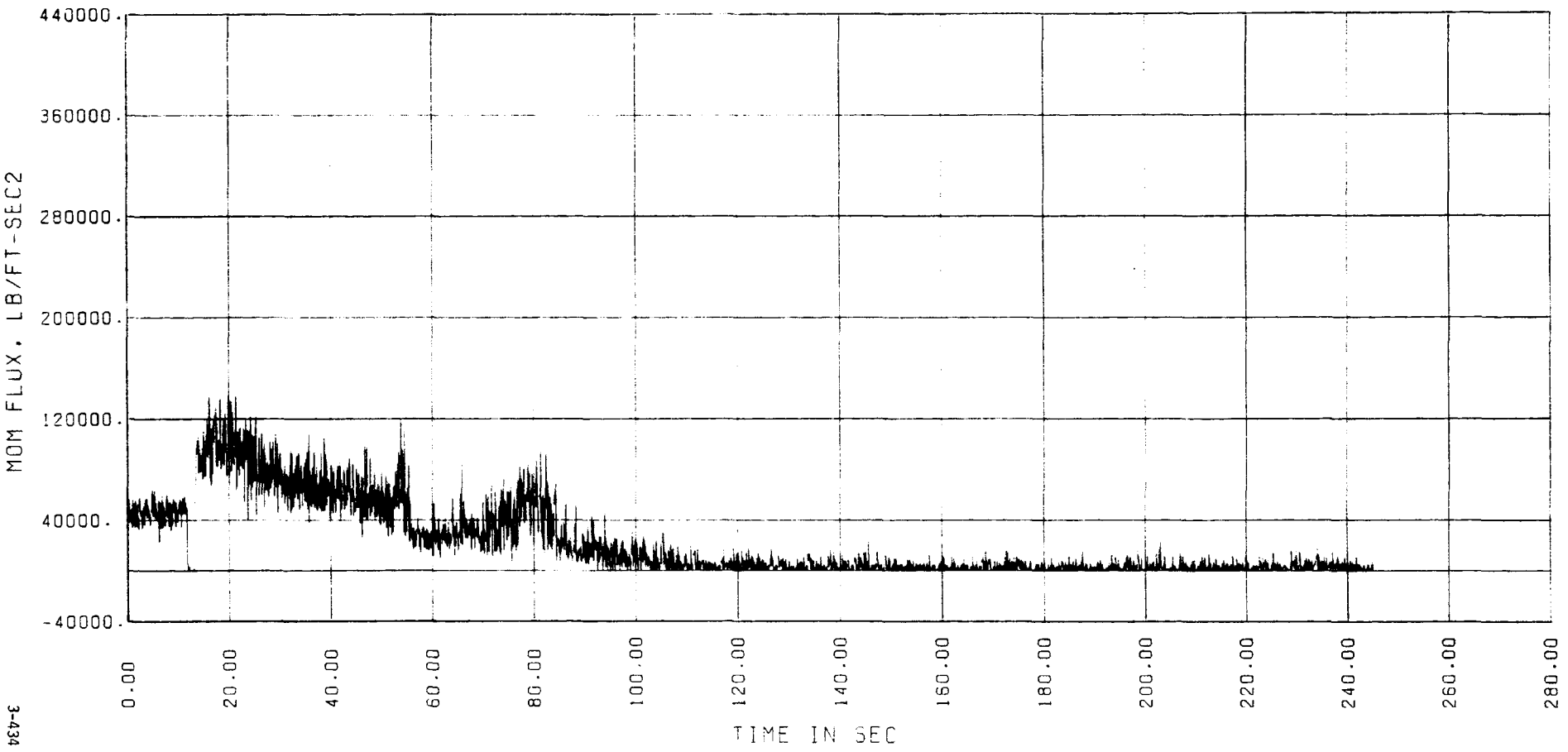
TEST 846/1000 PSIA PON FWD BDN
MASS FLOW RATE Hi-DD/GD2 DISCH
PLOT NO.34



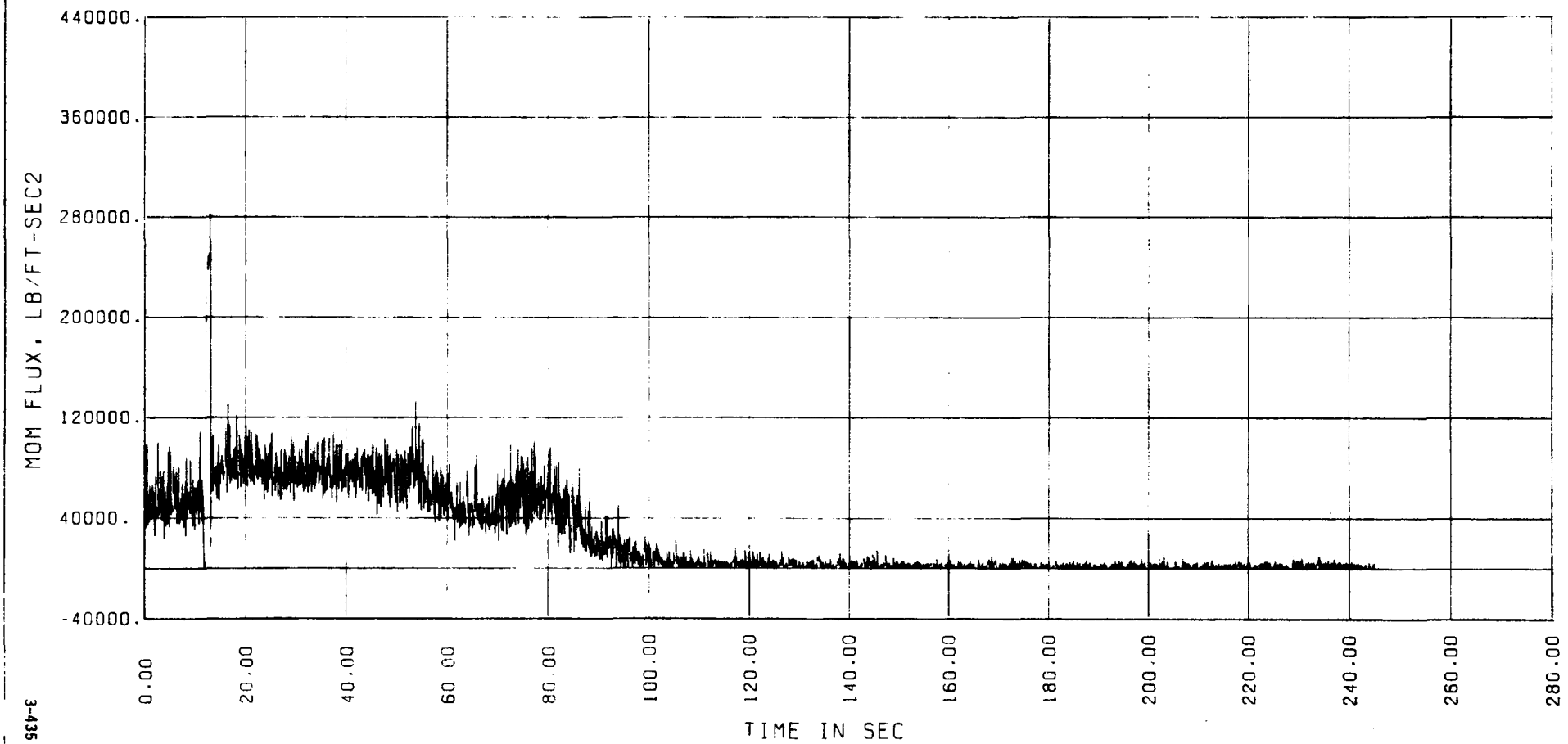
TEST 846/1000 PSIA PON FWD BDN
MASS FLOW RATE LO-DO/GO2 DISCH
PLOT NO.35



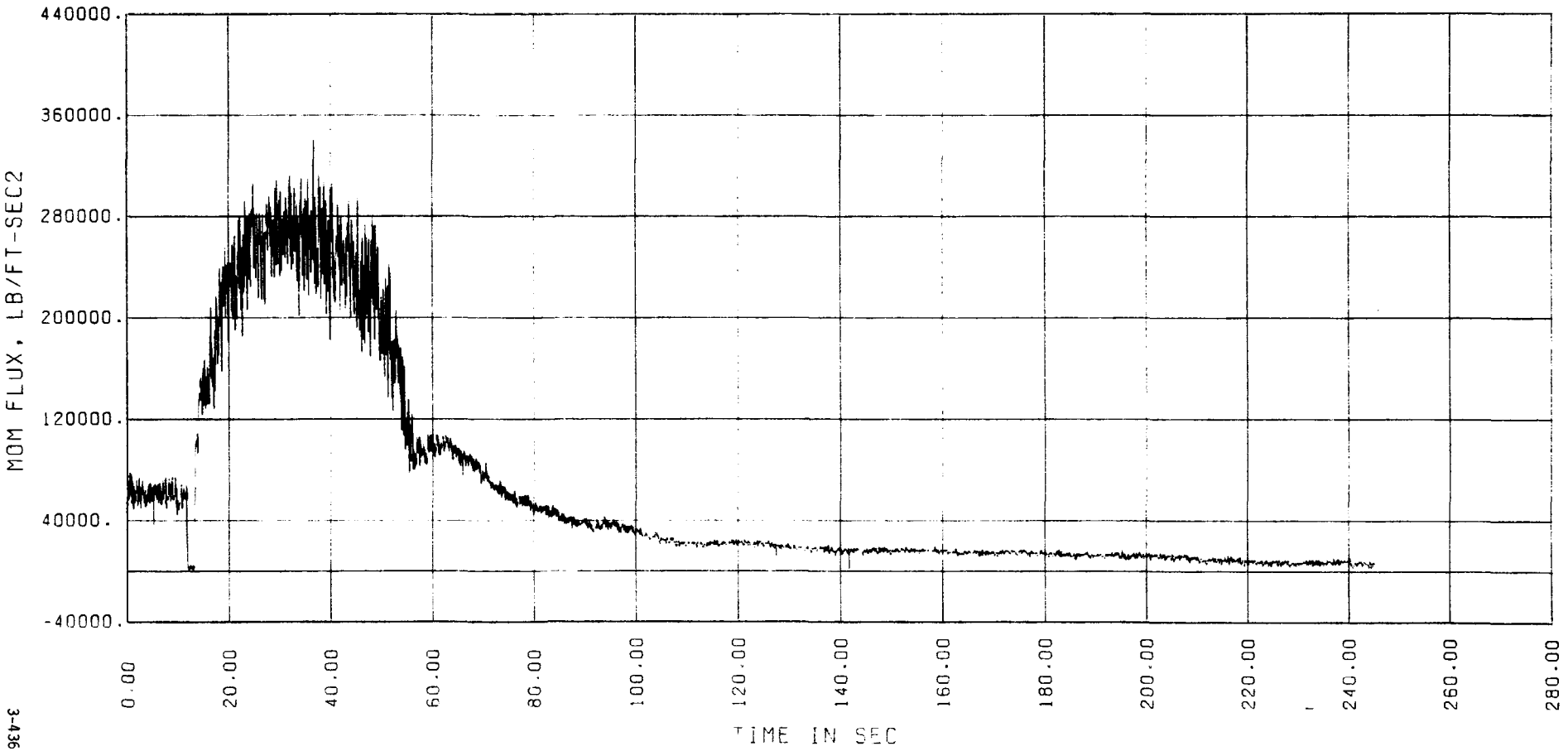
TEST 846/1000 PSIA PON FWD BDN
MOMENTUM FLUX GD2/LO-TM SUCT
PLOT NO.36



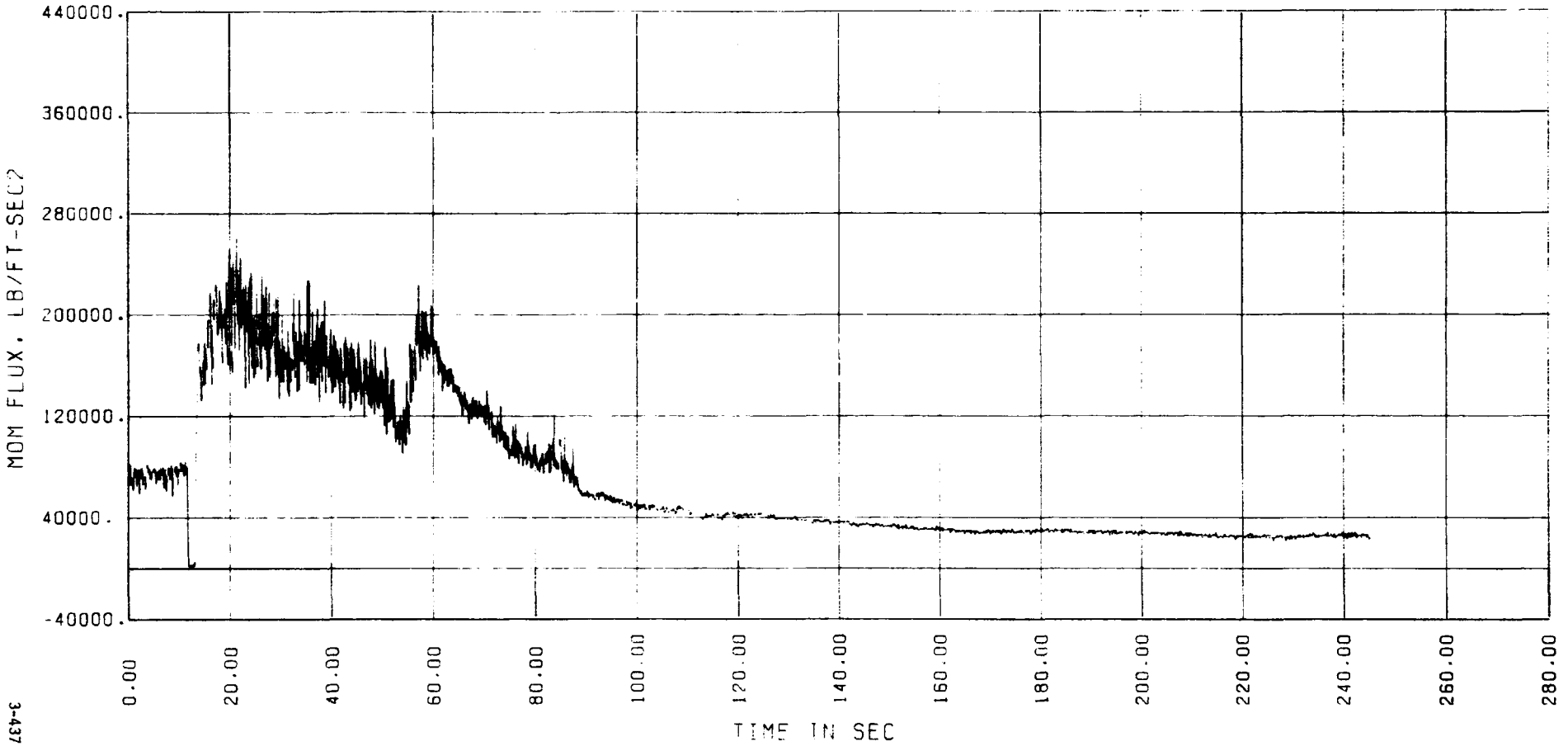
TEST 846/1000 PSIA PON FWD BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.37



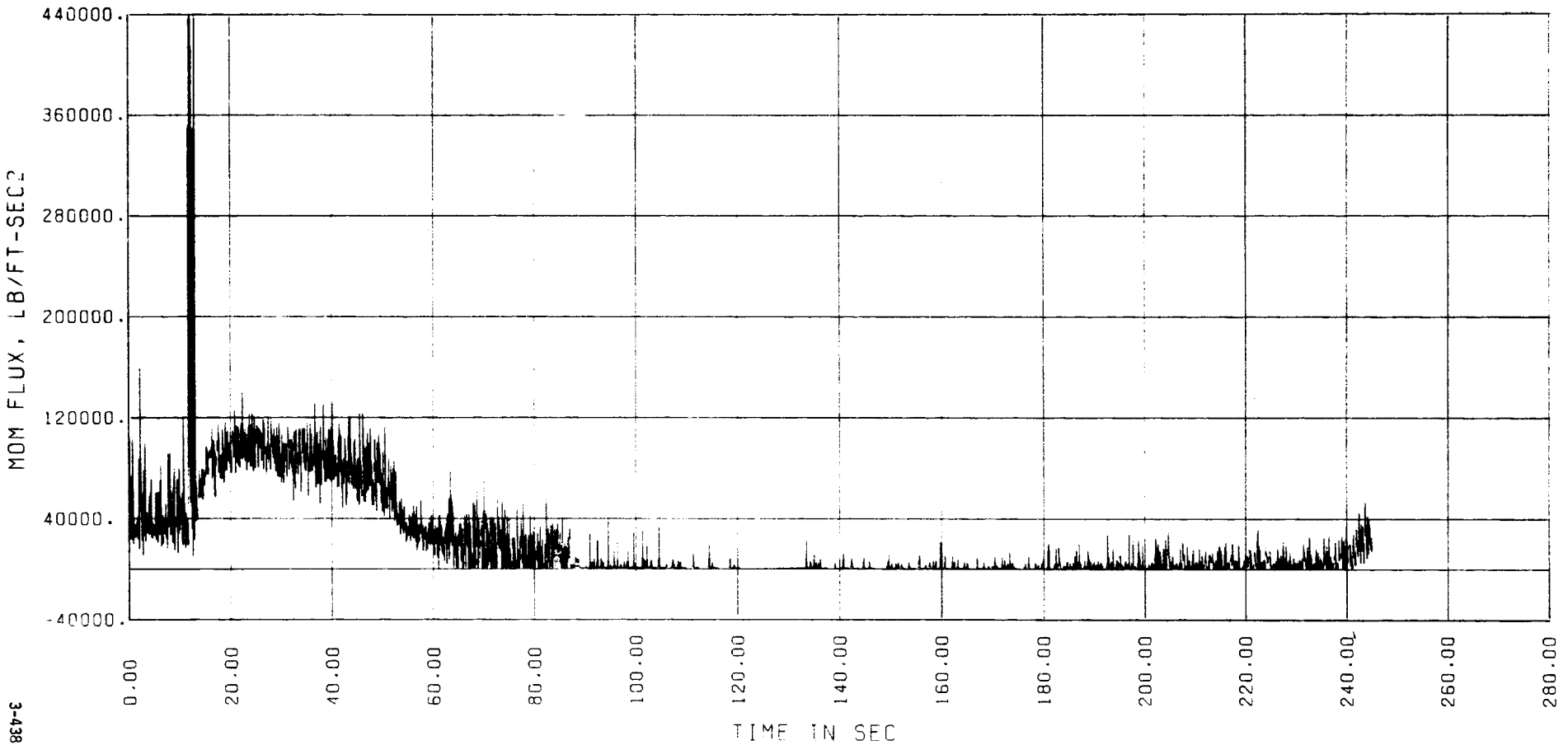
TEST 846/1000 PSIA PON FWD BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



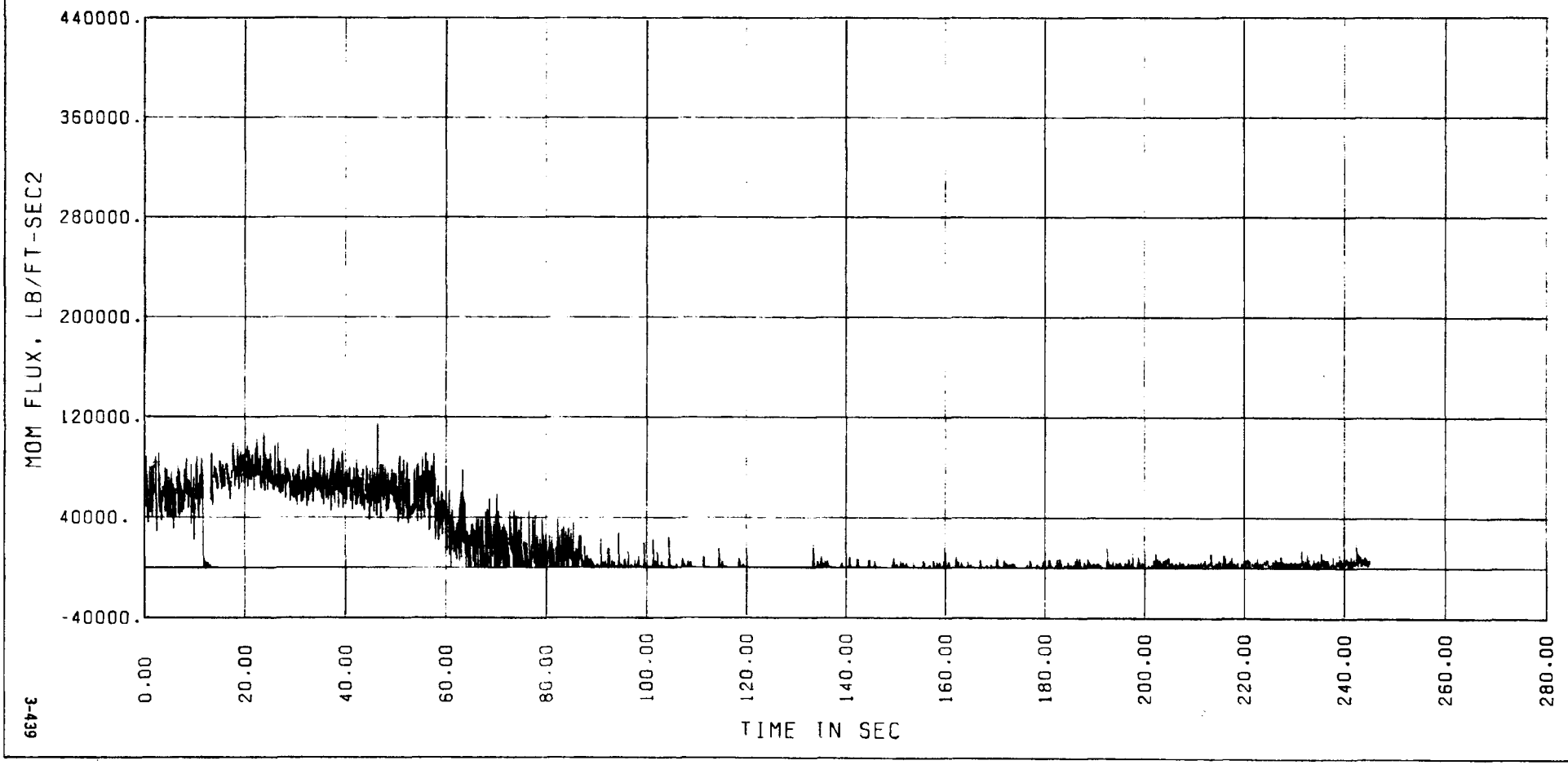
TEST 846/1000 PSIA PON FWD BDN
MOMENTUM FLUX Hi-DD SUCTION
PLOT NO.39



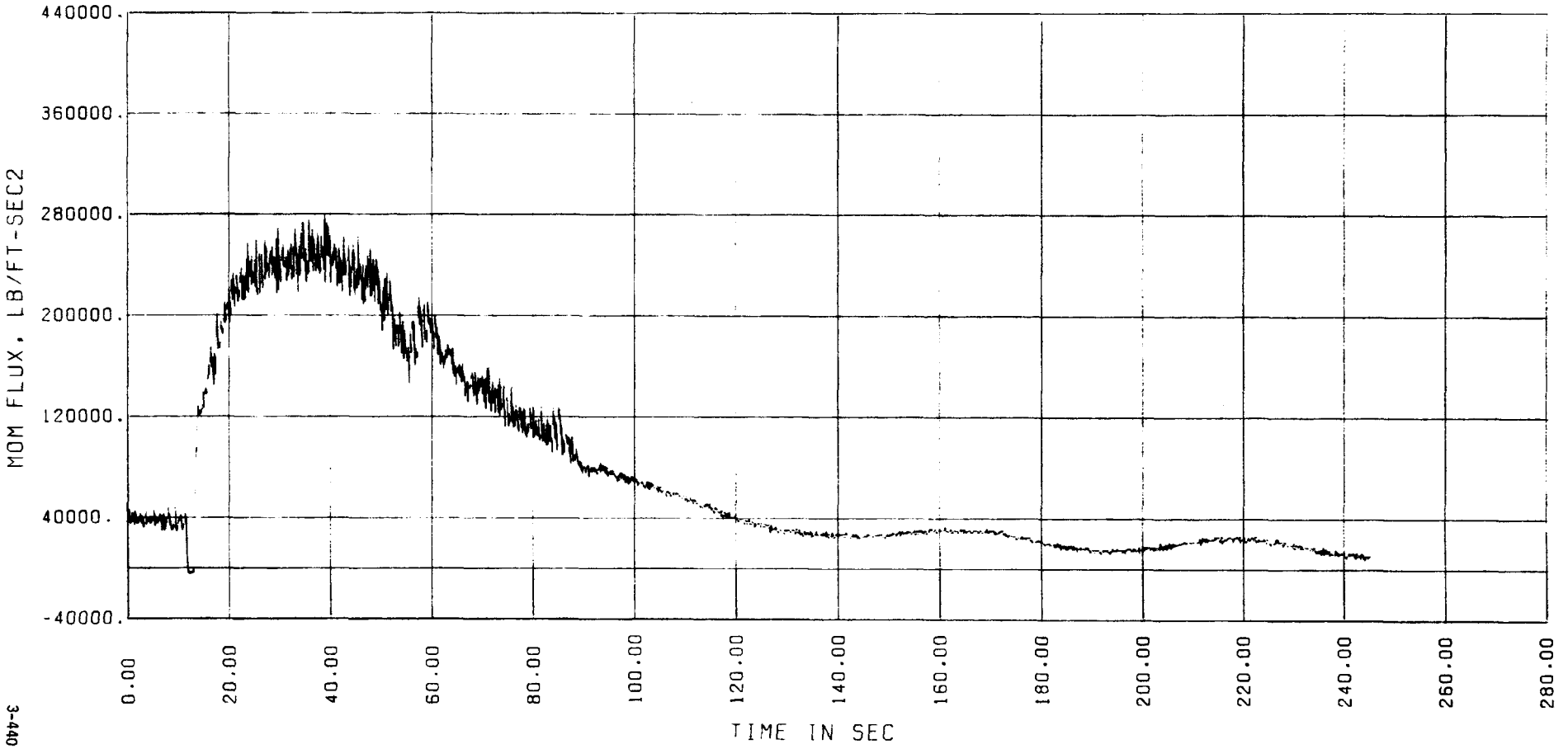
TEST 846/1000 PSIA PON FWD BDN
MOMENTUM FLUX GO2/LO-TM DISCH
PLOT NO.40



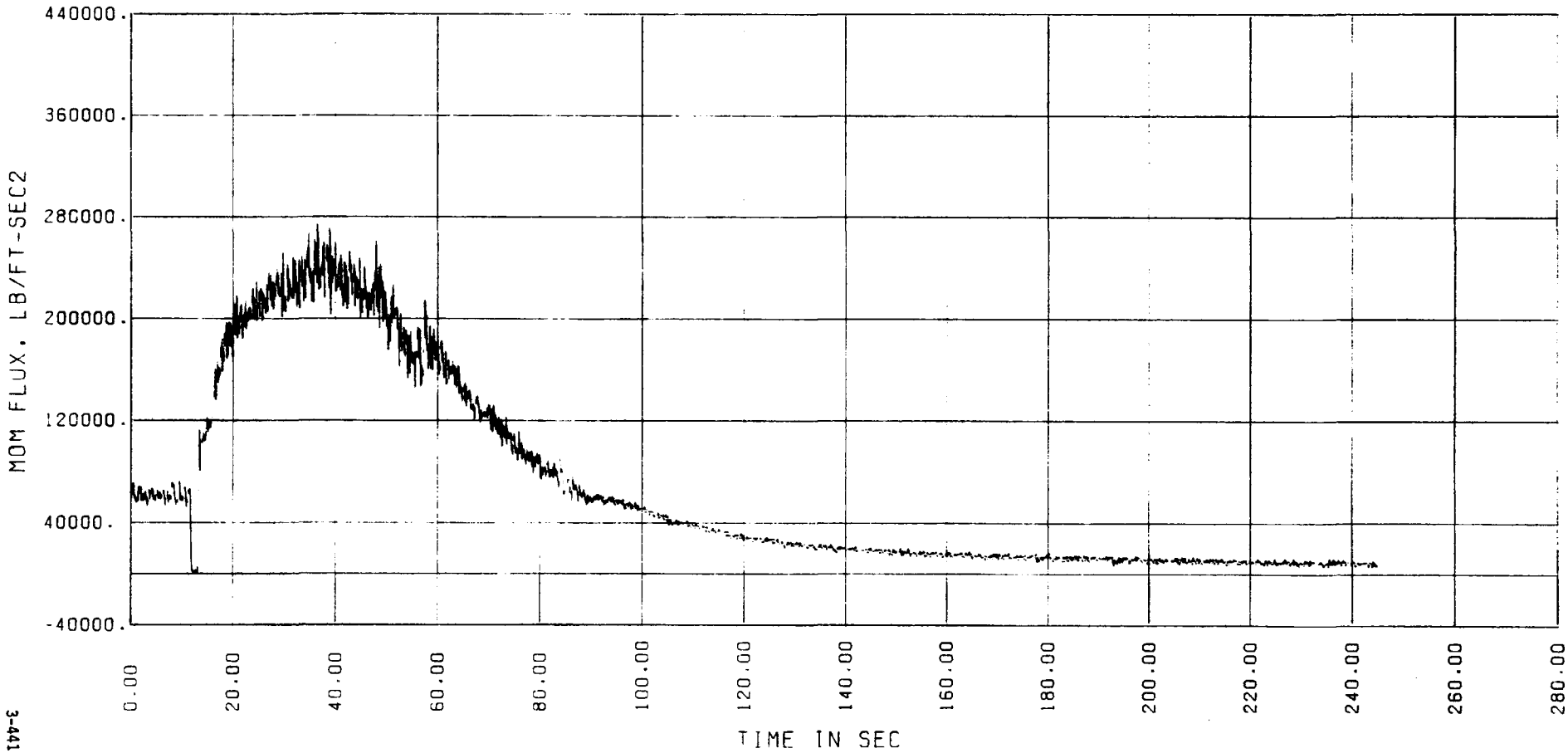
TEST 846/1000 PSIA PON FWD BDN
MOMENTUM FLUX GD2/HI-TM DISCH
PLOT NO.41



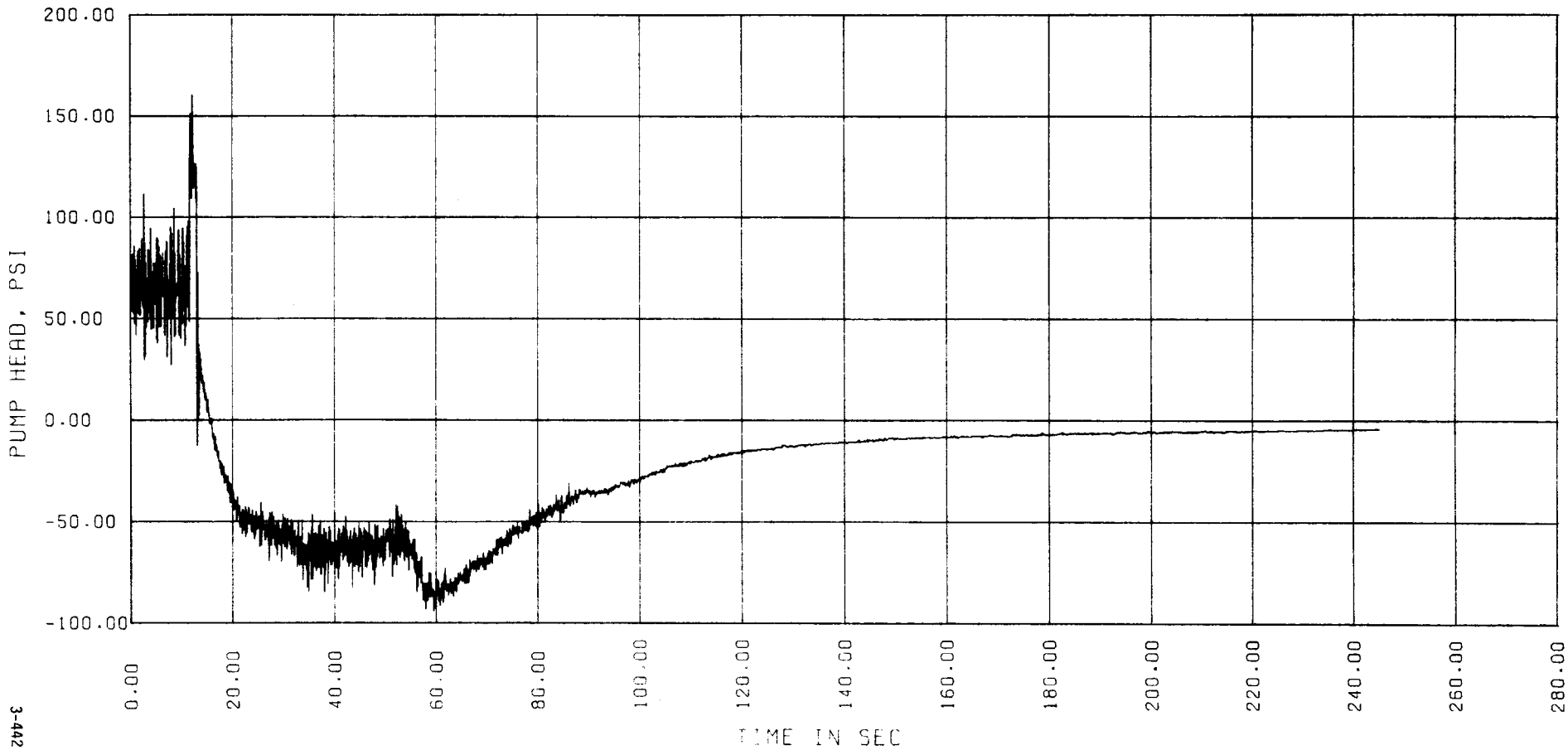
TEST 846/1000 PSIA PON FWD BDN
MOMENTUM FLUX LO-DD DISCHARGE
PLOT NO.42



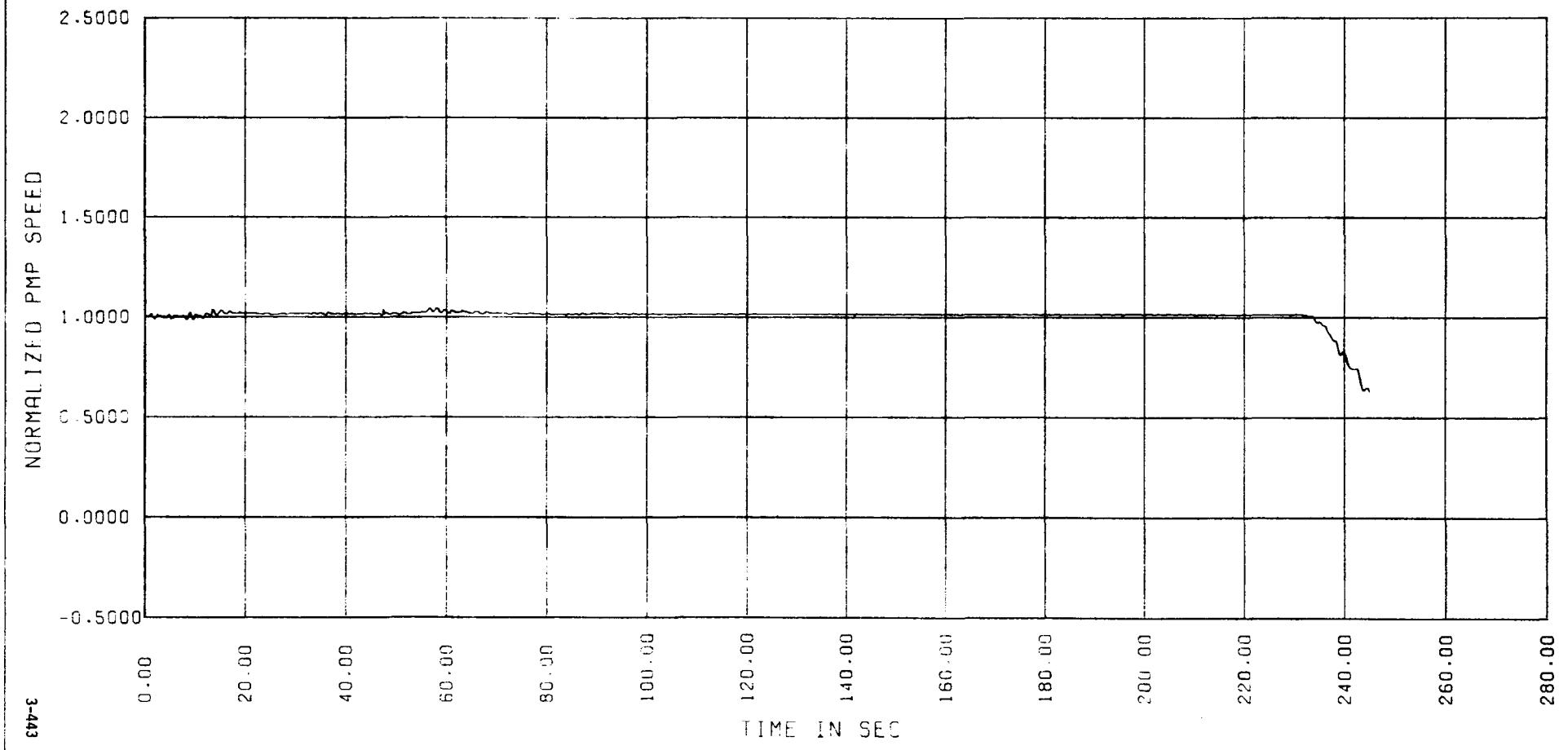
TEST 846/1000 PSIA PON FWD BDN
MOMENTUM FLUX HI-DO DISCHARGE
PLOT NO.43



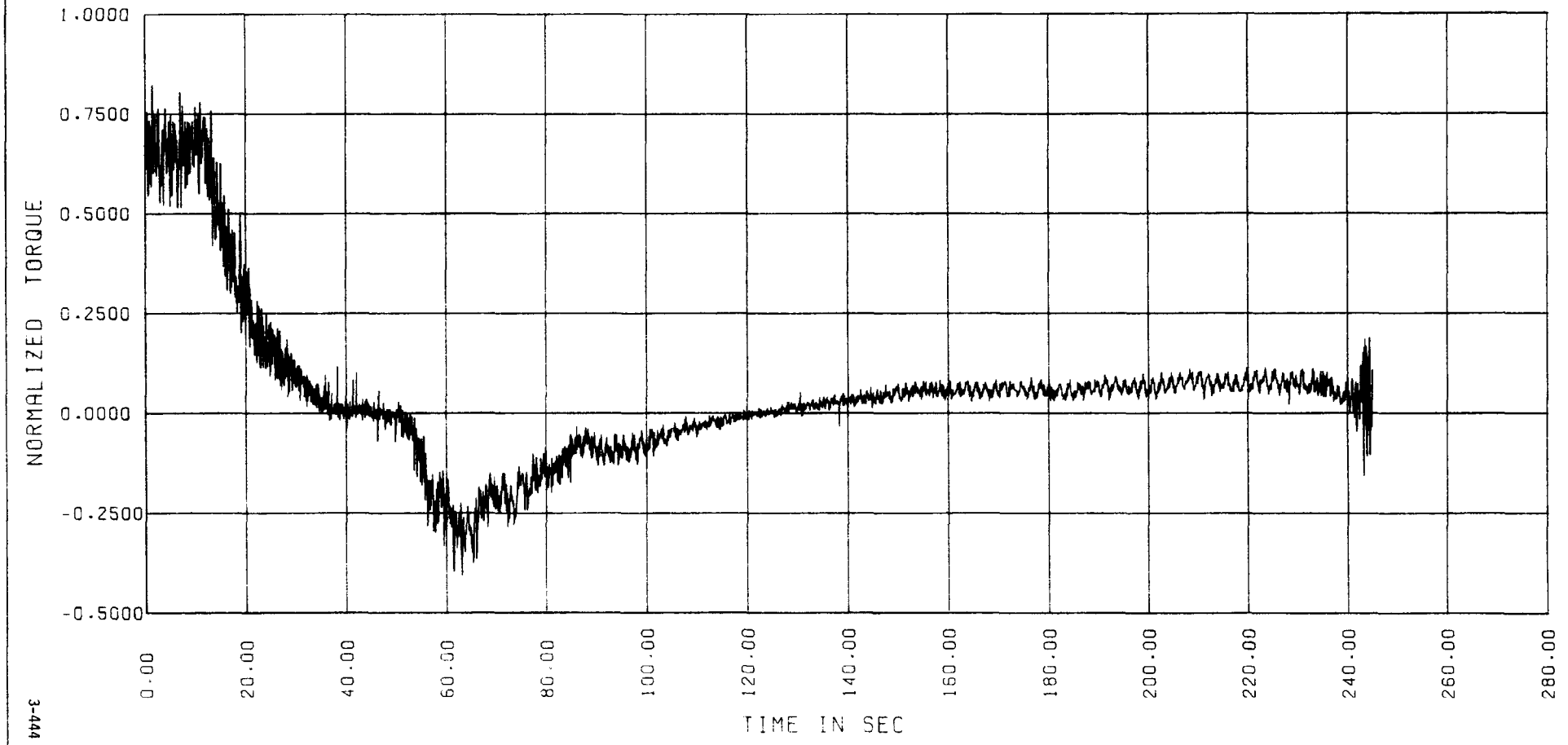
TEST 846/1000 PSIA PON FWD BDN
PUMP HEAD IN PSI
PLOT NO.44

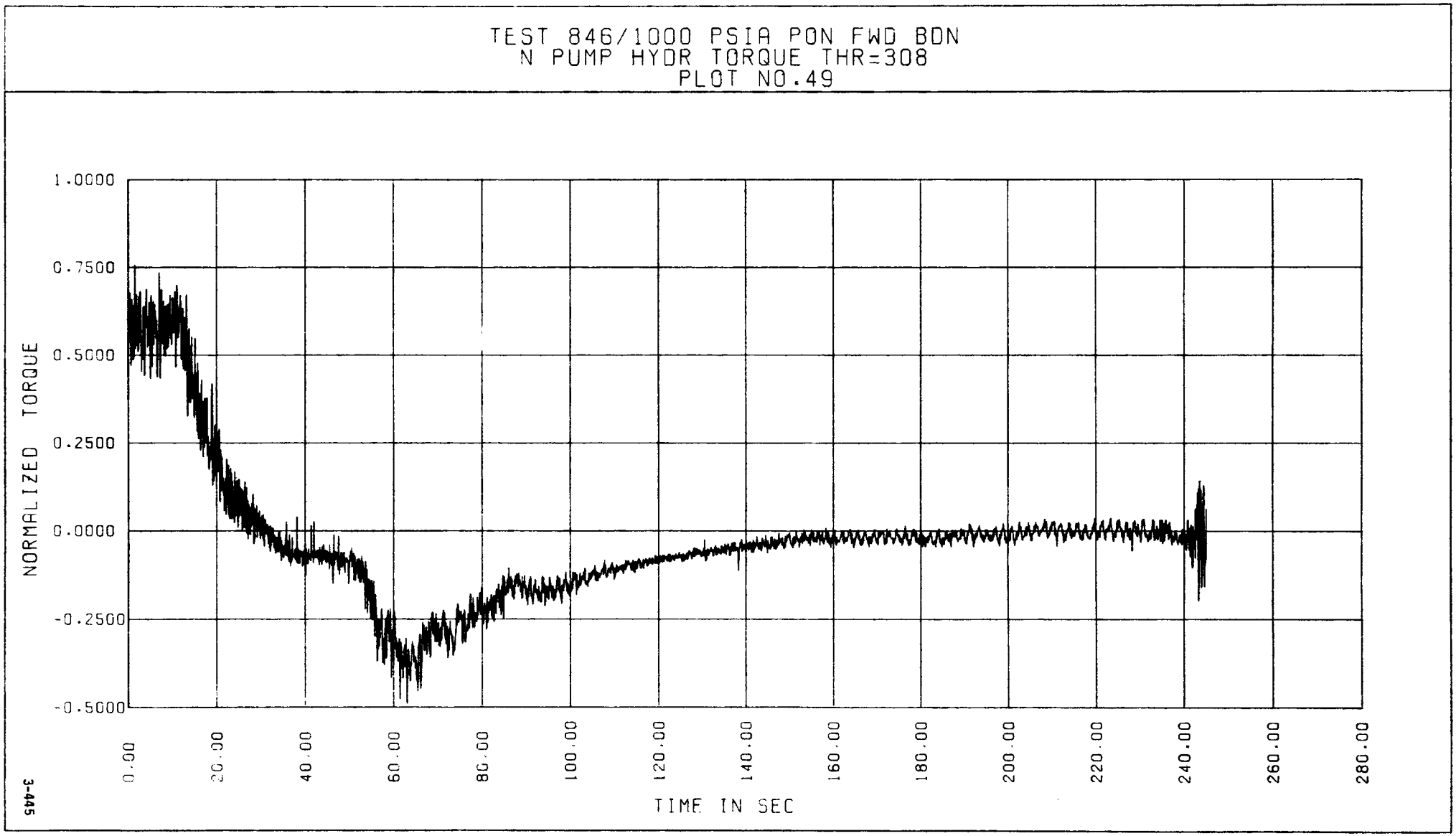


TEST 846/1000 PSIA PON FWD BDN
N PUMP SPEED NR=4500
PLOT NO.47

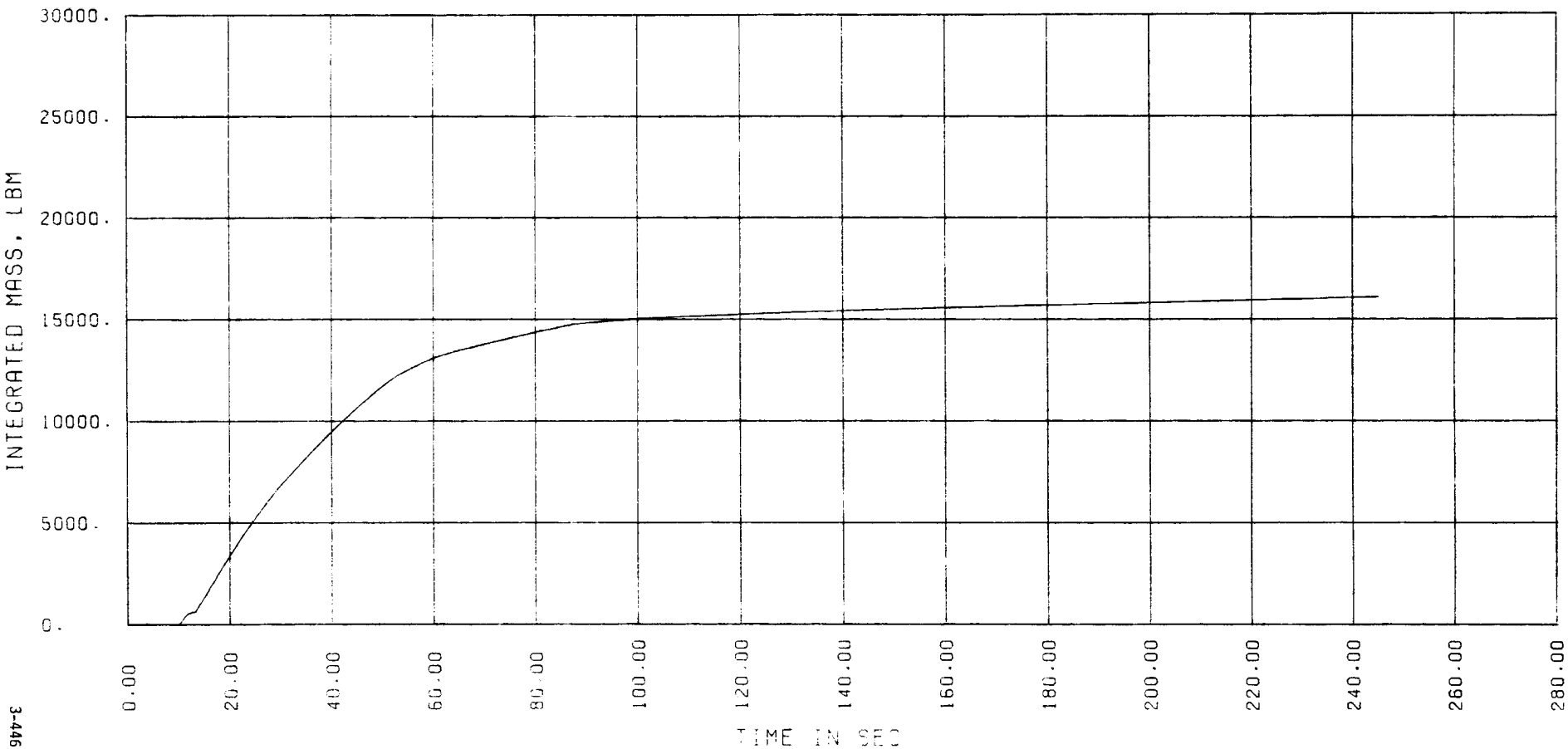


TEST 846/1000 PSIA PON FWD BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.48

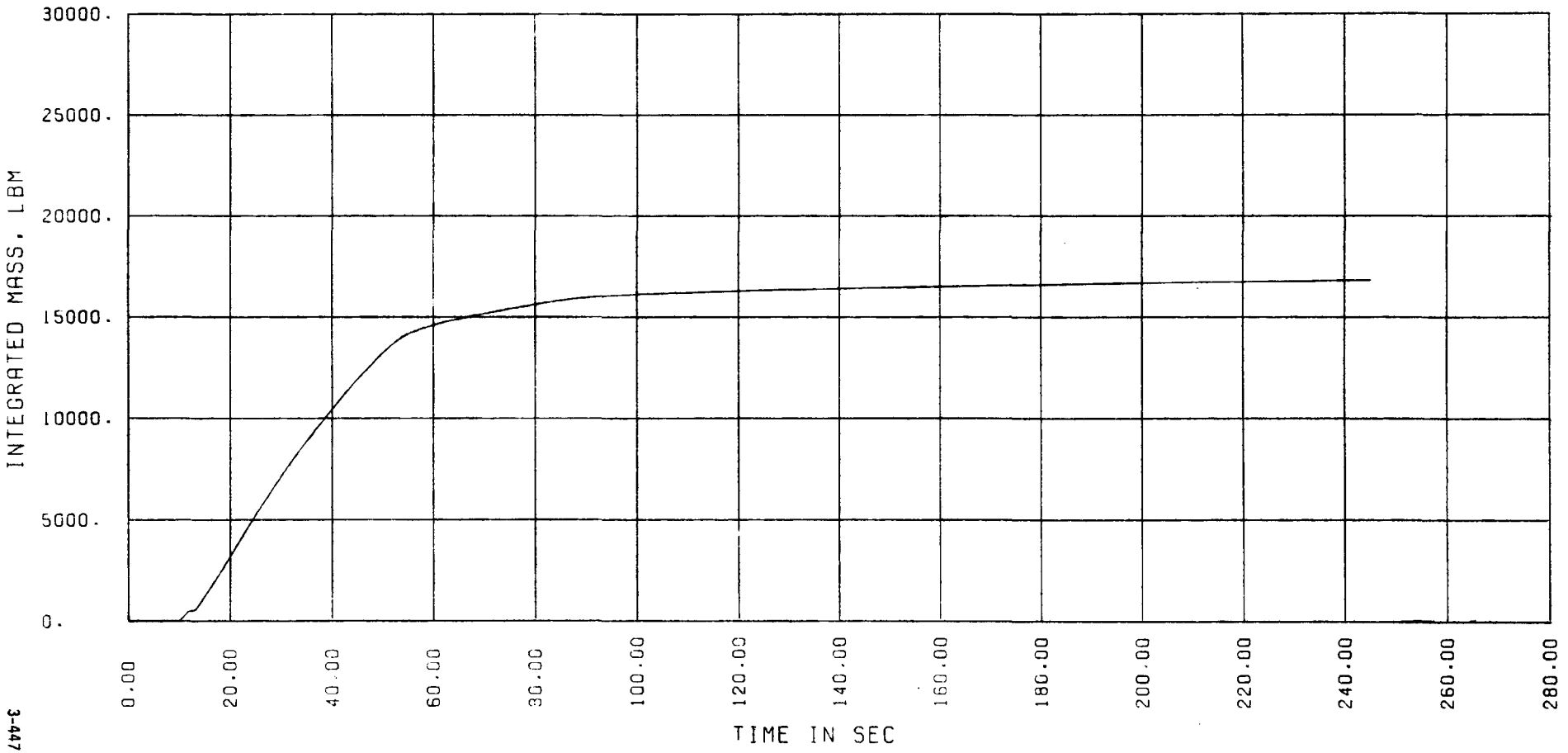



TEST 846/1000 PSIA PON FWD BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.49
NORMALIZED TORQUE
1.0000
0.7500
0.5000
0.2500
0.0000
-0.2500
-0.5000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-445

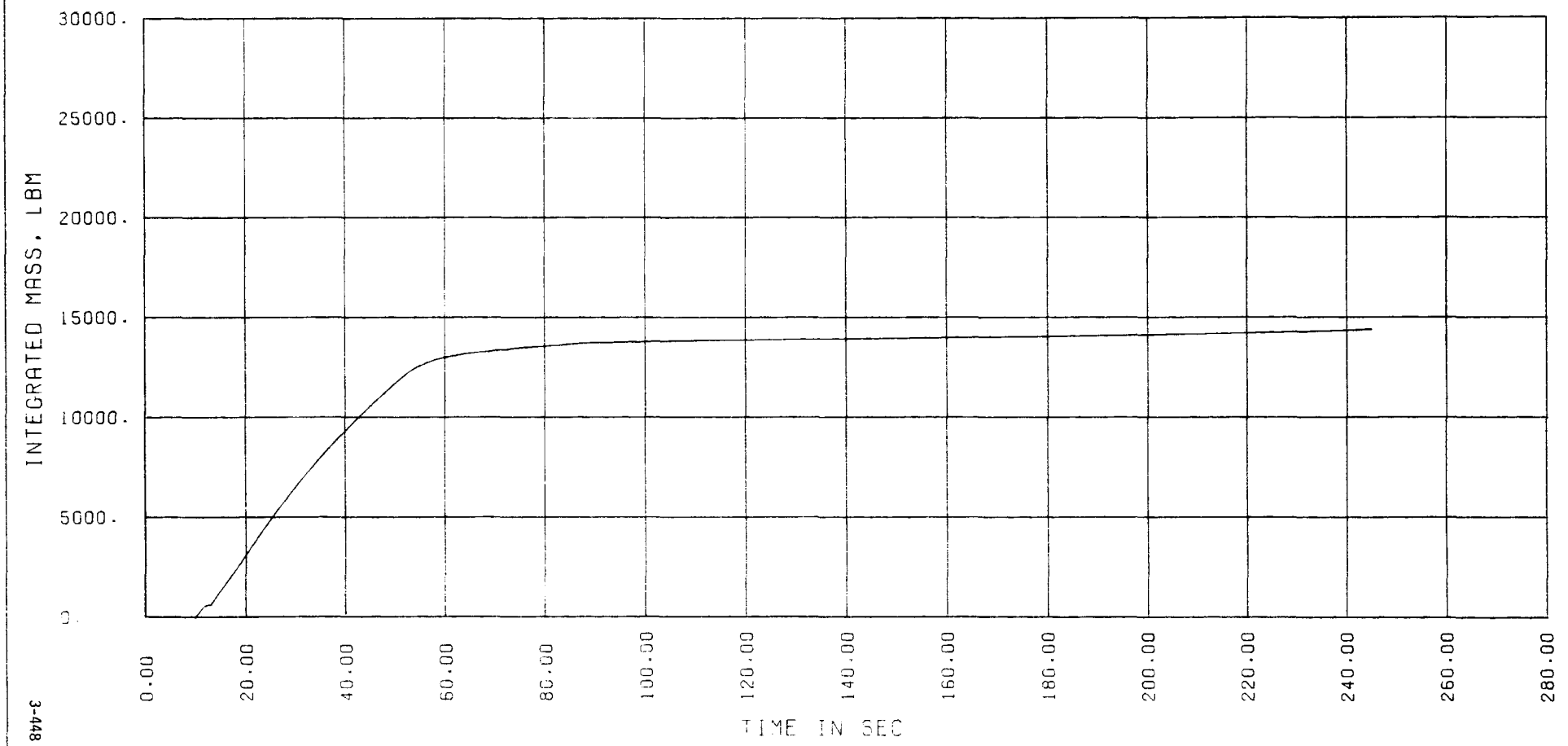
TEST 846/1000 PSIA PON FWD BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50



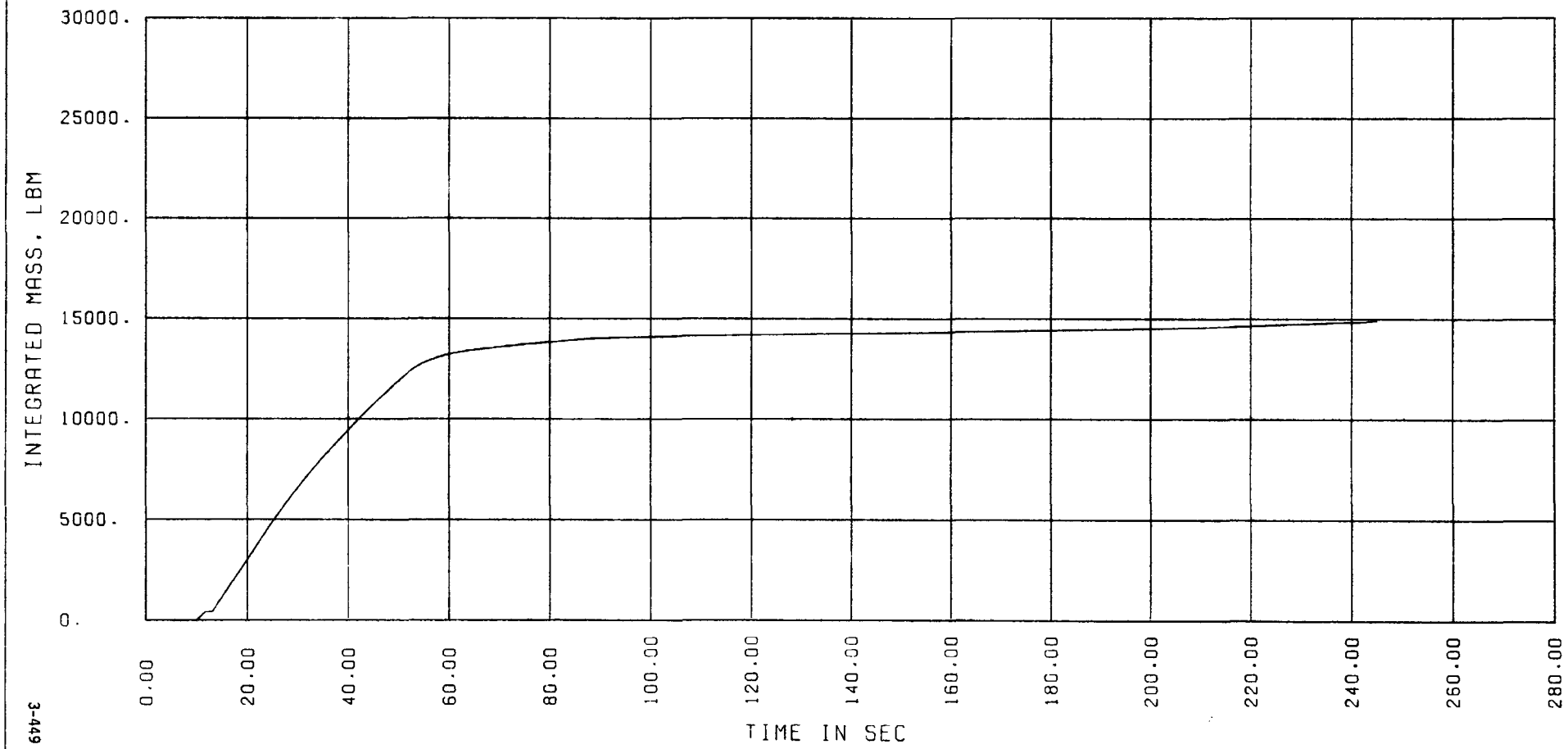
TEST 846/1000 PSIA PON FWD BDN
INTEGRATED MASS LO-OD/GD2 SUCT
PLOT NO.51



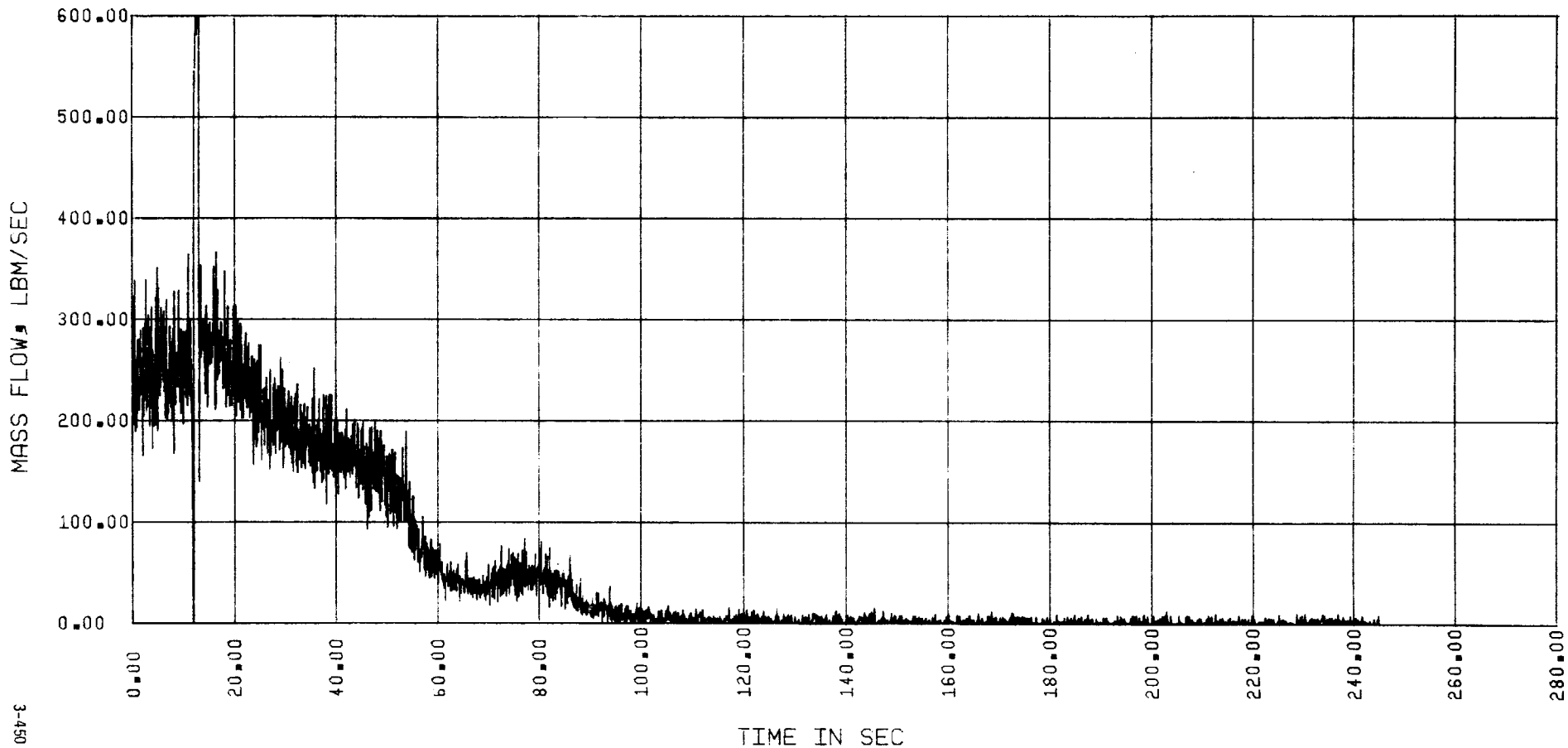
TEST 846/1000 PSIA PON FWD BDN
INTEGRATED MASS HI-OD/GD2 DIS
PLOT NO.52



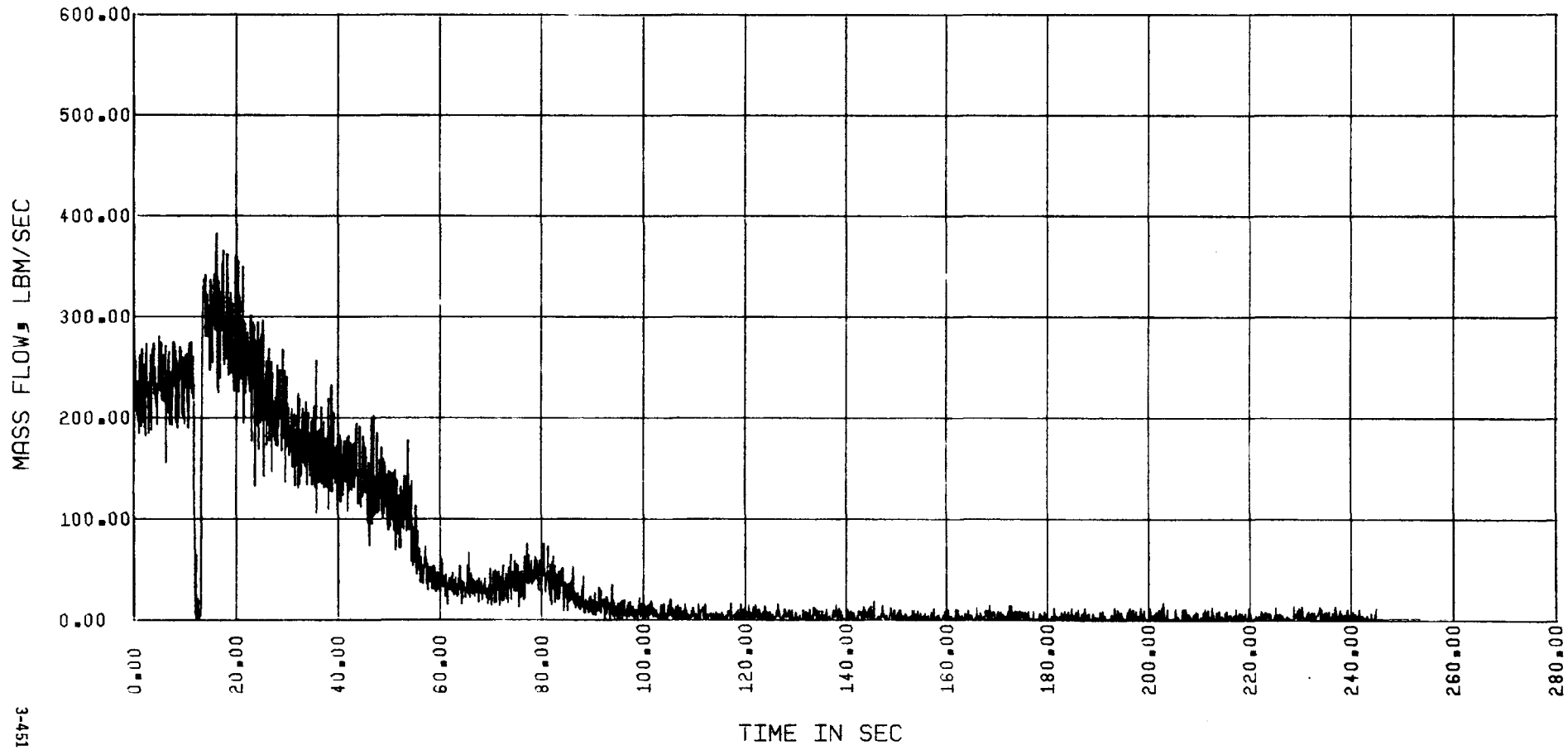
TEST 846/1000 PSIA PON FWD BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.53



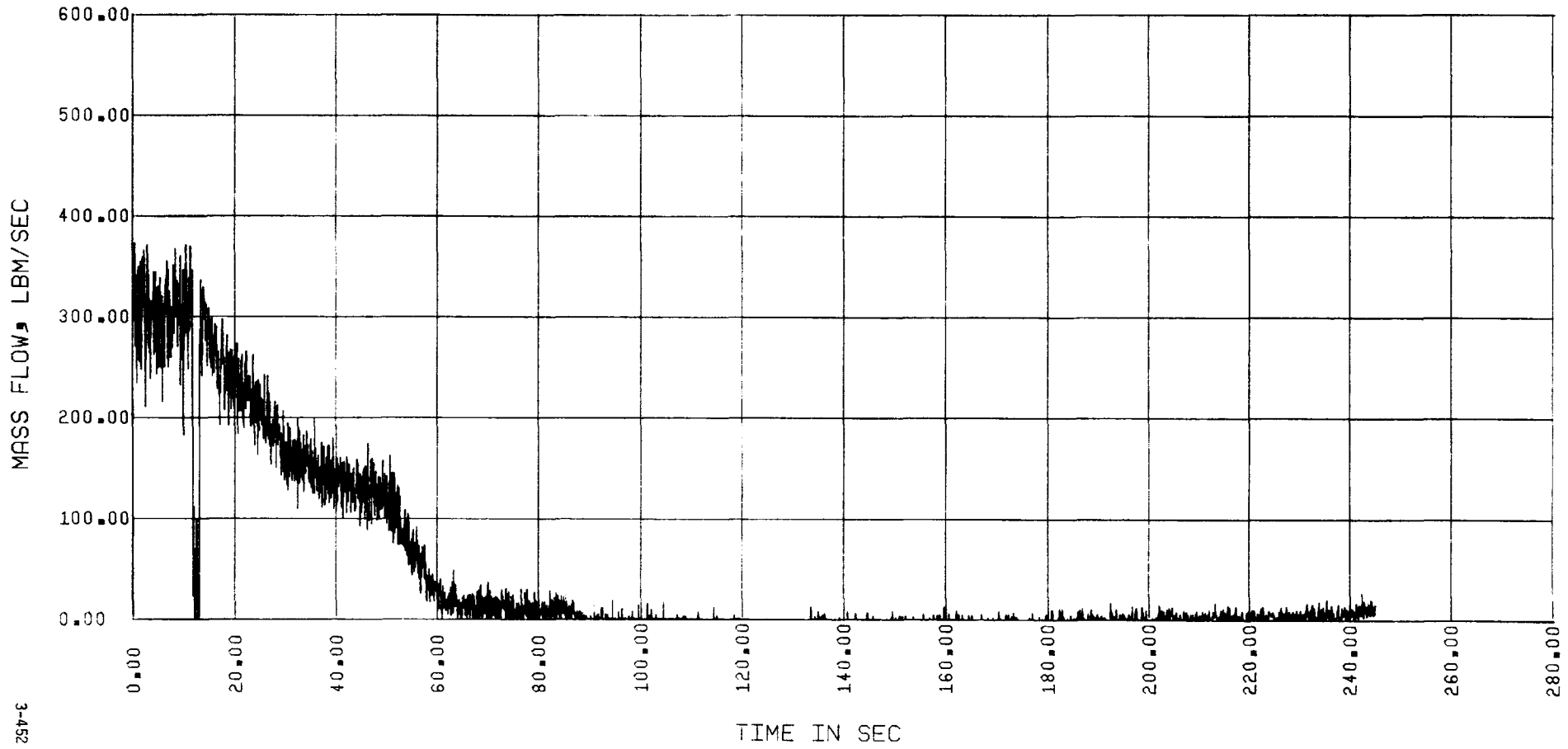
TEST 846/1000 PSIA PON FWD BDN
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54



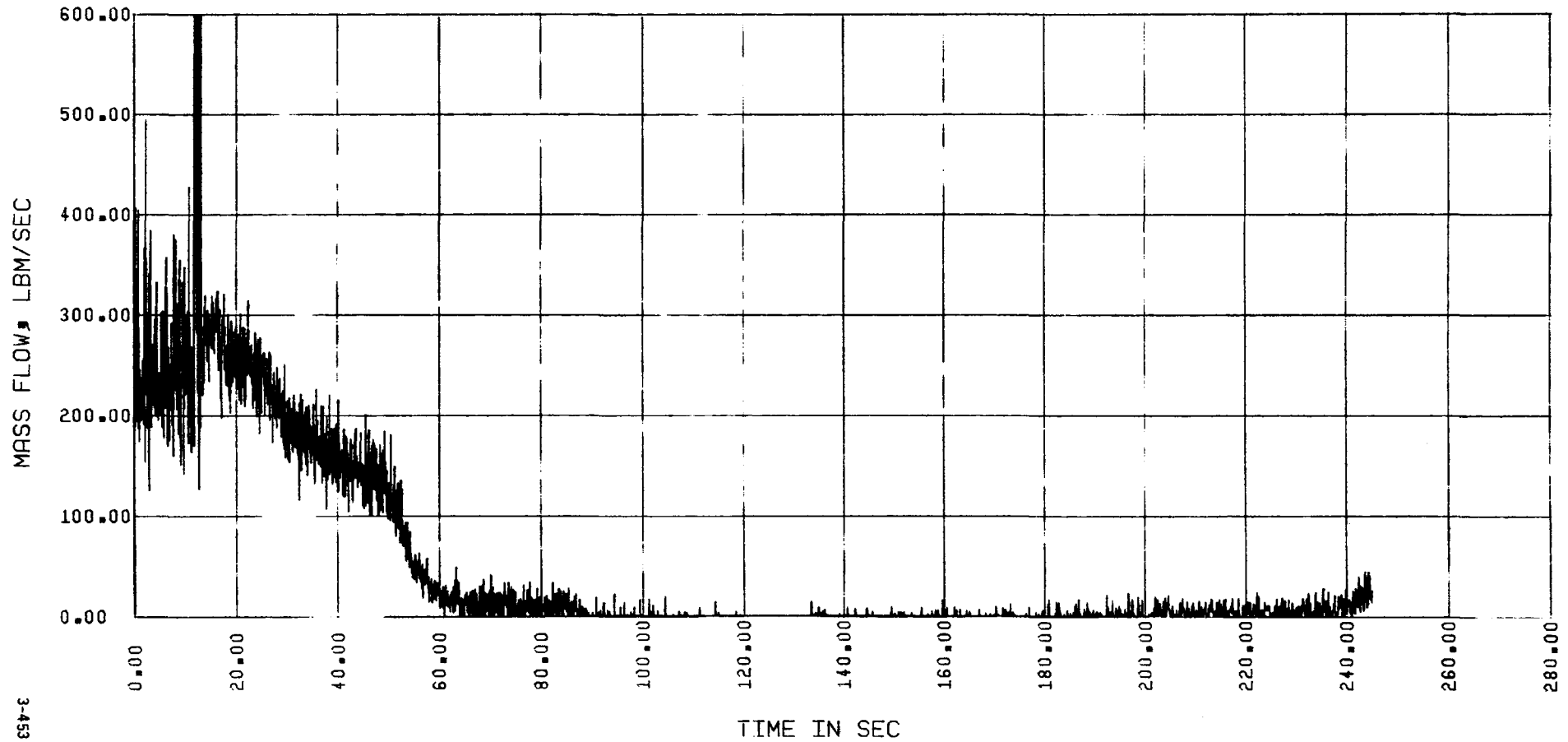
TEST 846/1000 PSIA PON FWD BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.55



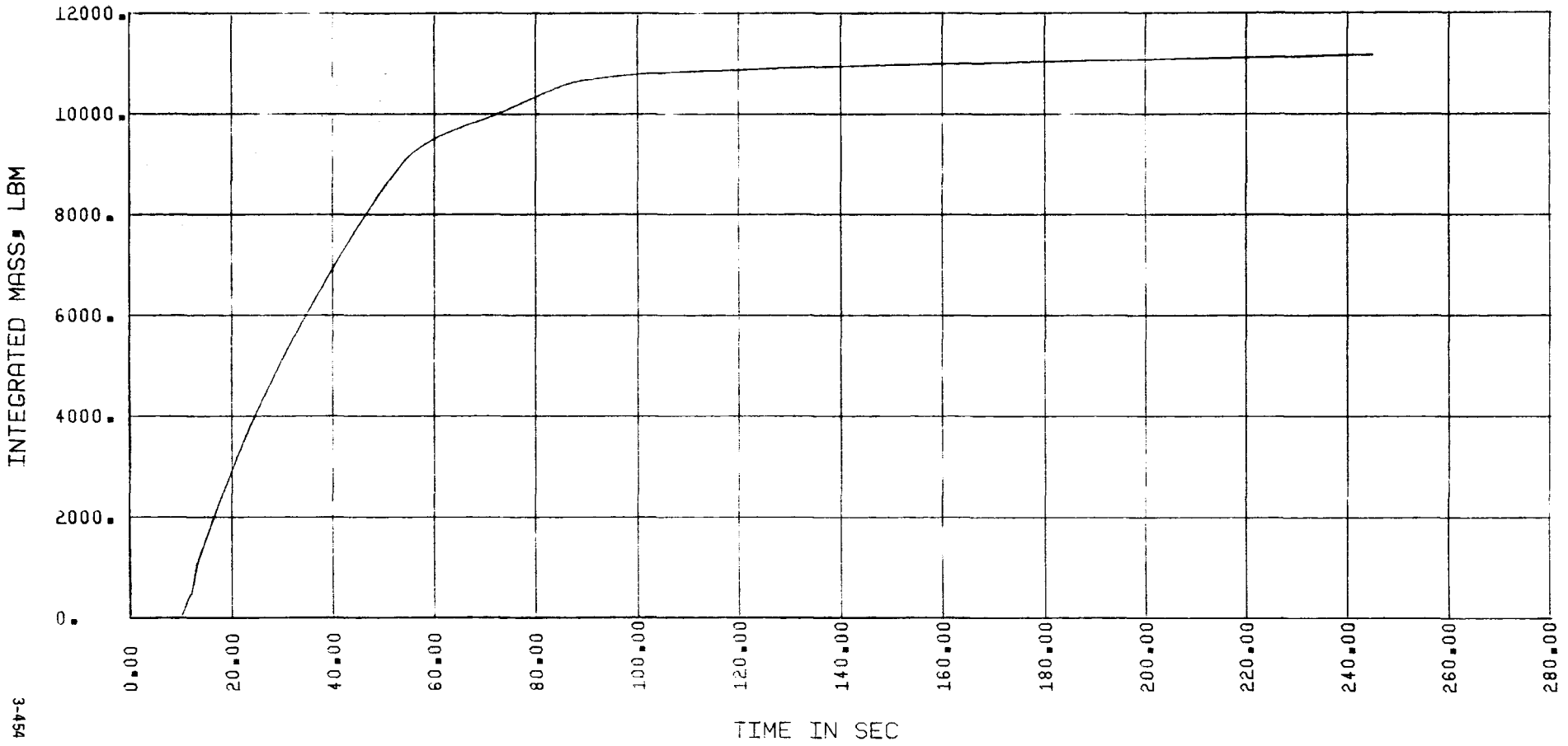
TEST 846/1000 PSIA PON FWD BDN
MASS FLOW RATE HI-TM/GD2 DSCH
PLOT NO.56



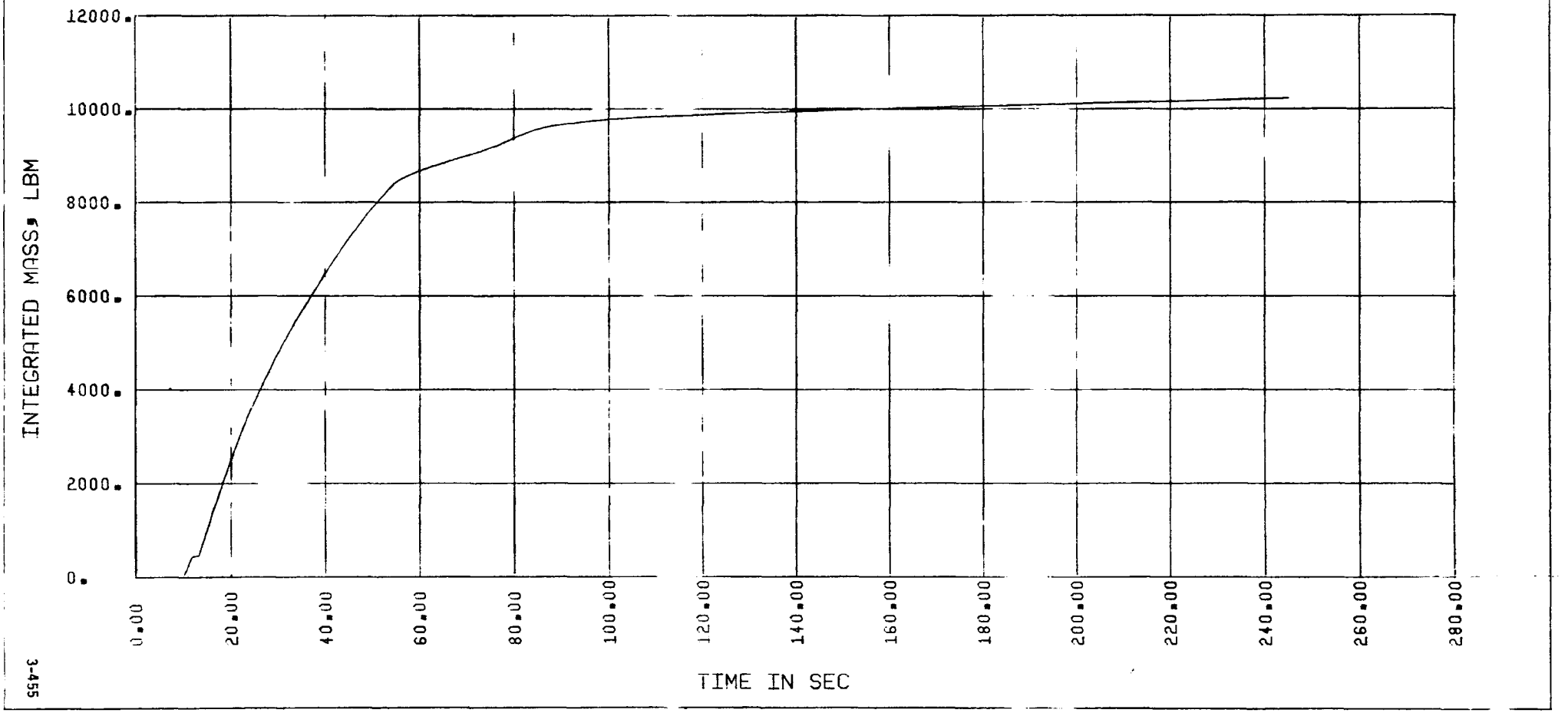
TEST 846/1000 PSIA PON FWD BDN
MASS FLOW RATE LO-TM/GD2 DSCH
PLOT NO.57



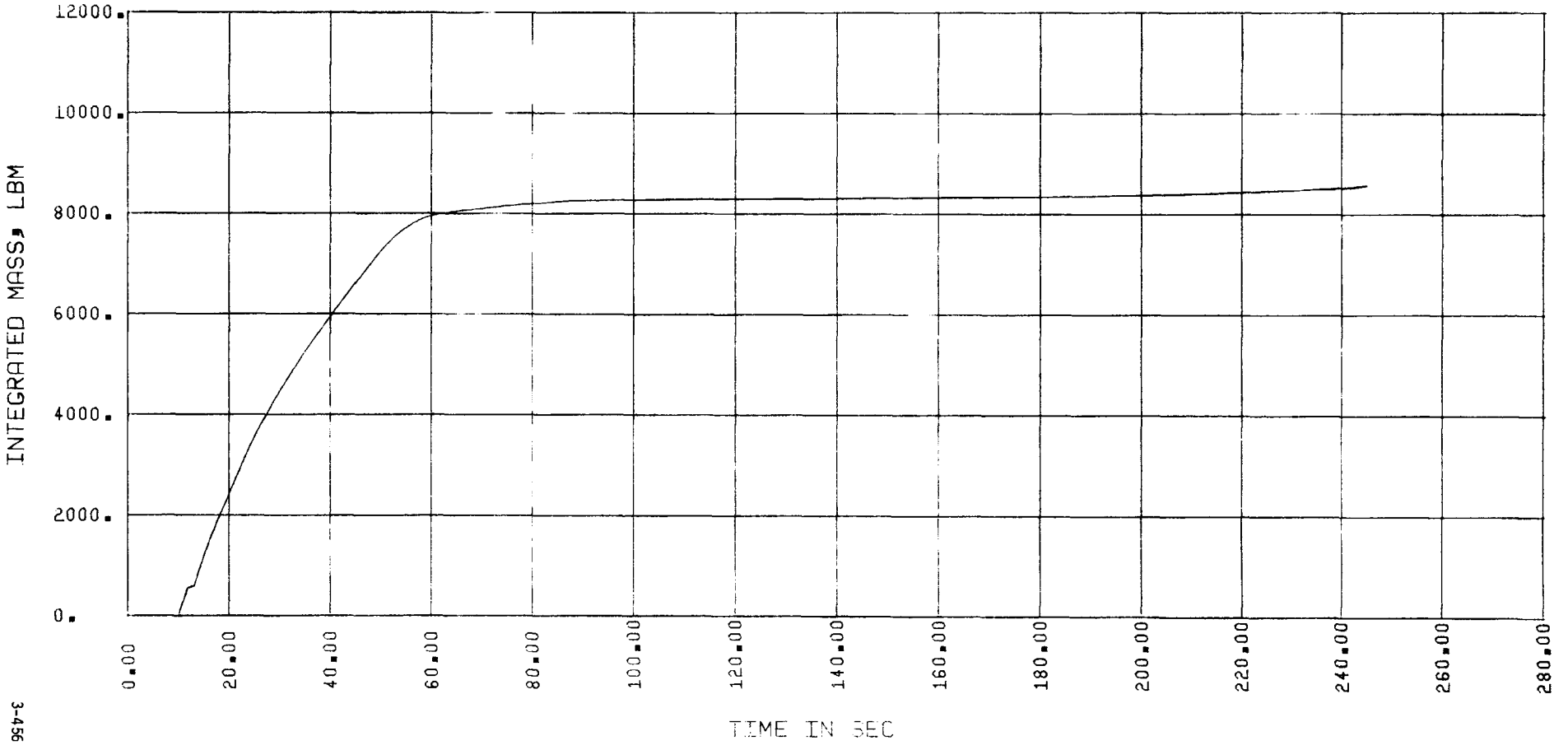
TEST 846/1000 PSIA PON FWD BDN
INTEGRATED MASS HI-TM/GD2 SUCT
PLOT NO.60



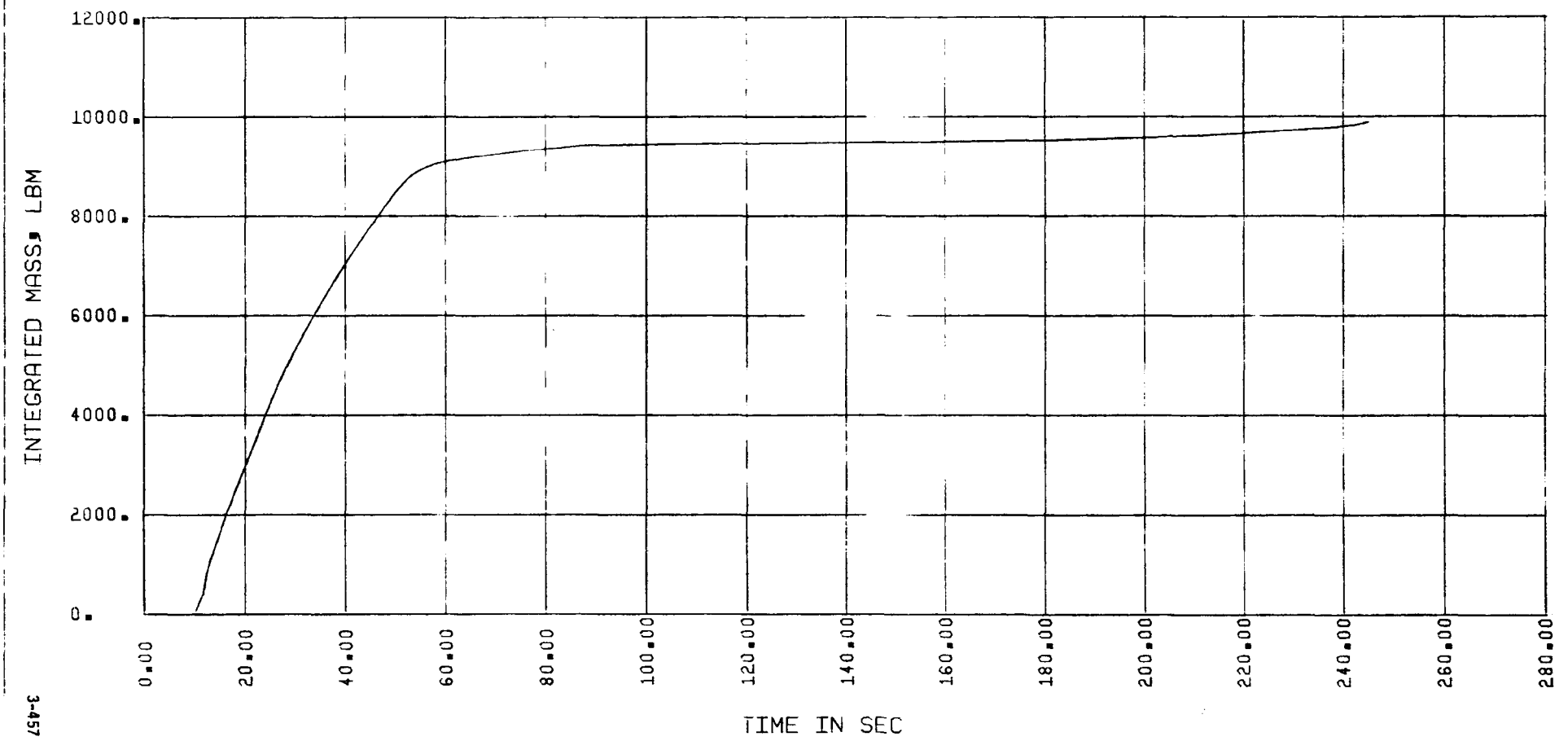
TEST 846/1000 PSIA PON FWD BDN
INTEGRATED MASS LO-TM/GD2 SUCT
PLOT NO.61



TEST 846/1000 PSIA PON FWD BDN
INTEGRATED MASS HI-TM/GD2 DSCH
PLOT NO.62



TEST 846/1000 PSIA PON FWD BDN
INTEGRATED MASS LO-TM/GD2 DSCH
PLOT NO.63



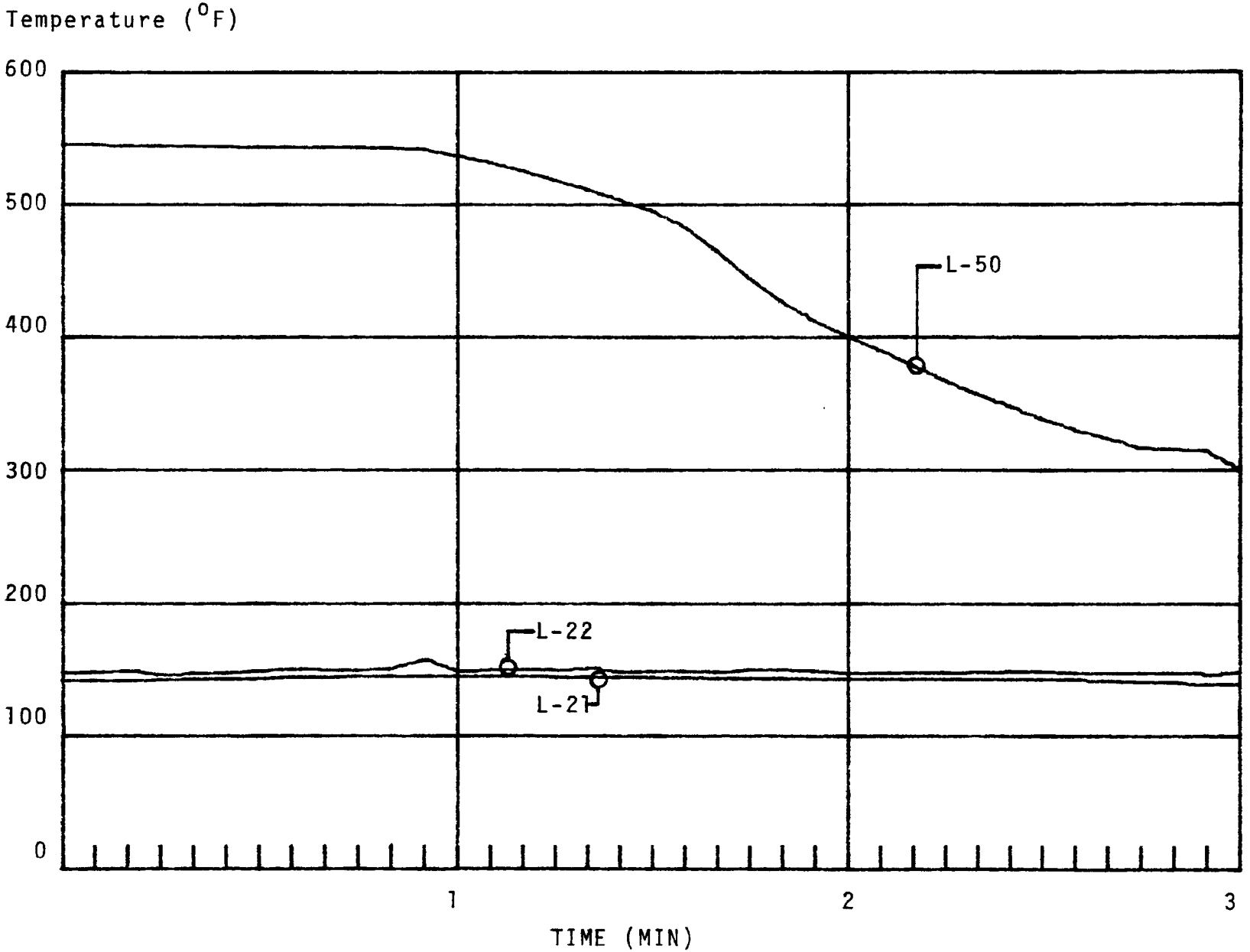
Index Listing

of

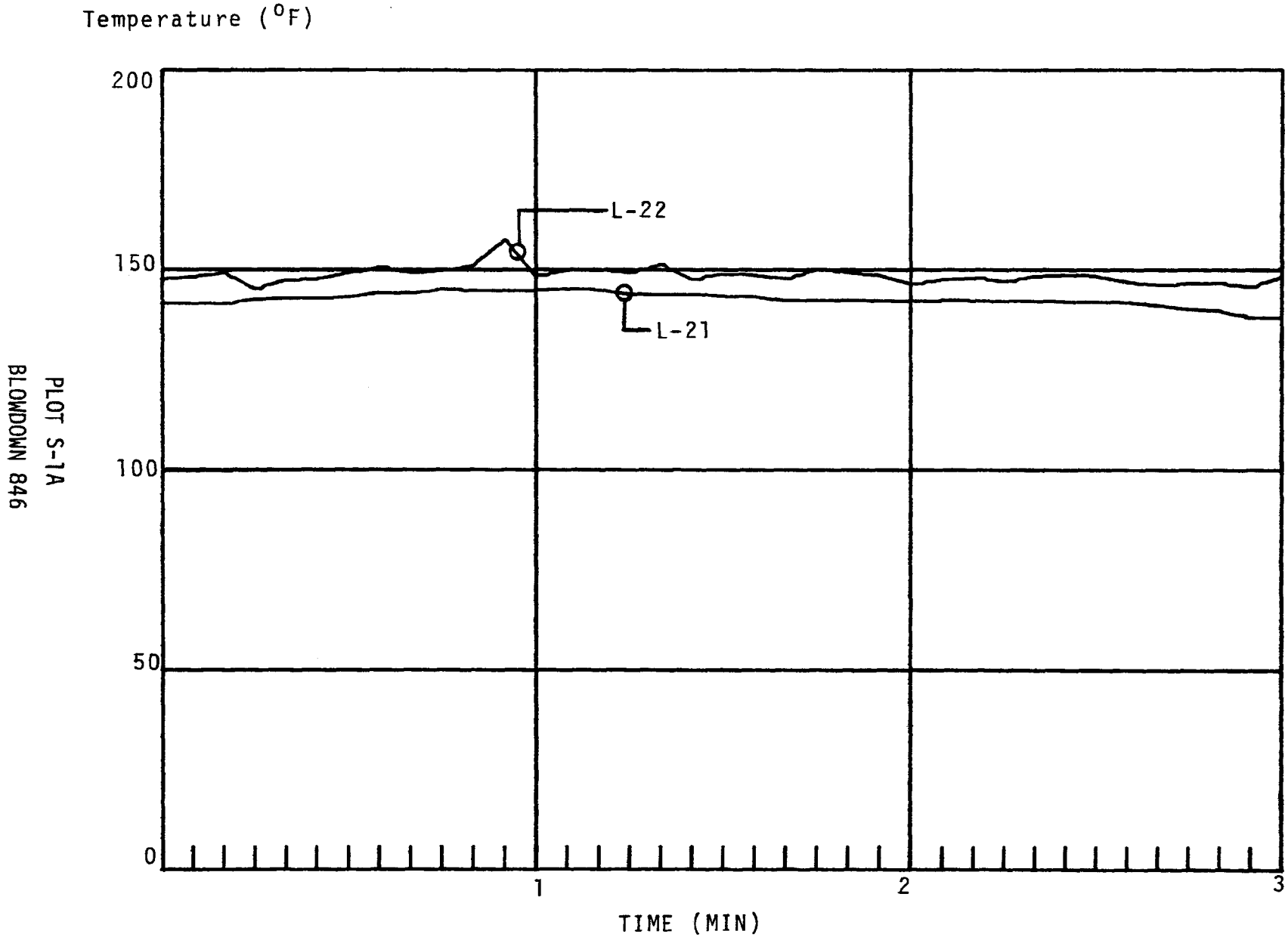
SCANNER DATA PLOTS

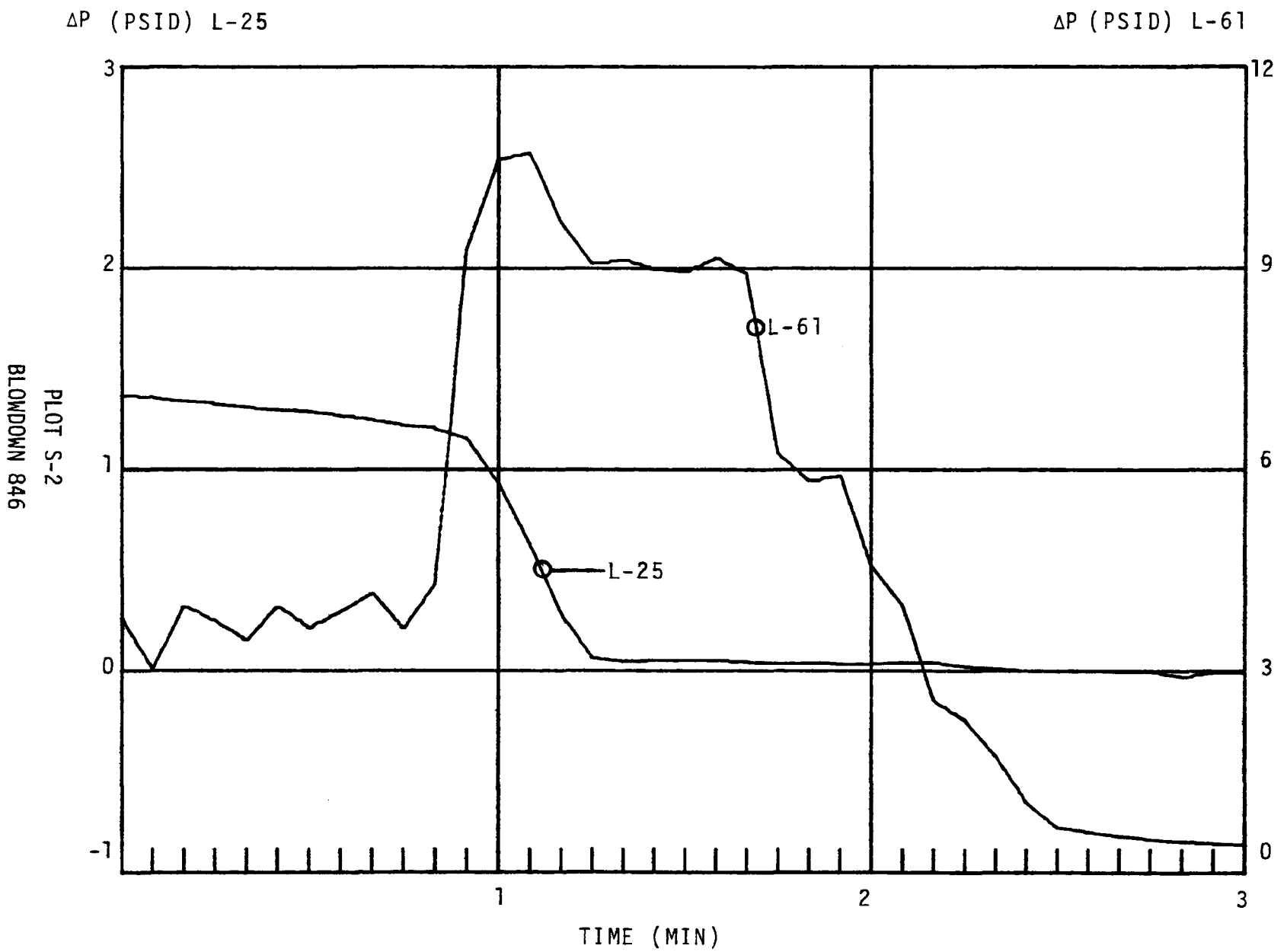
Test Number (846)

Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
	L-50	Main Water Orifice Thermocouple
S-1A	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

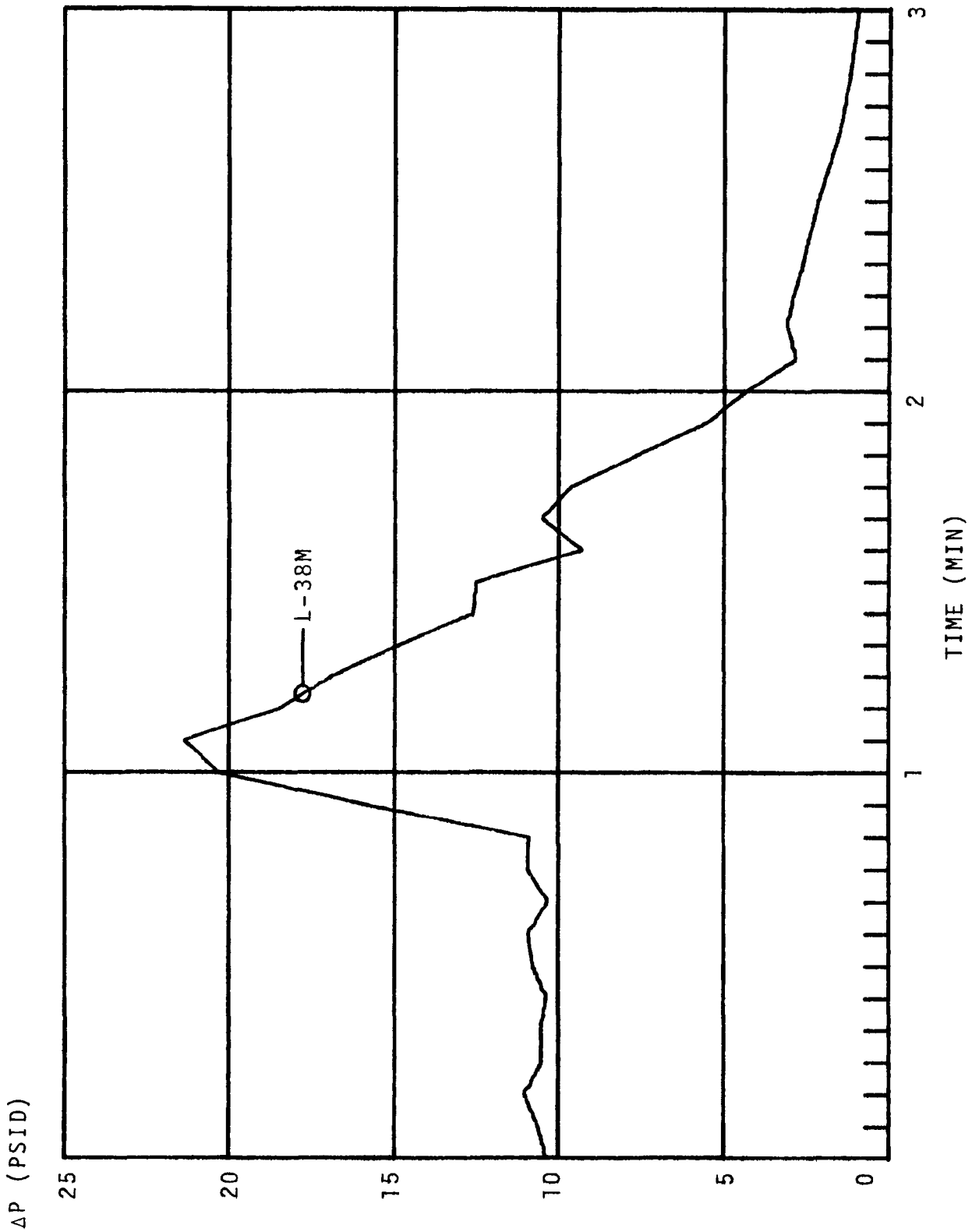


PLOT S-1
BLOWDOWN 846

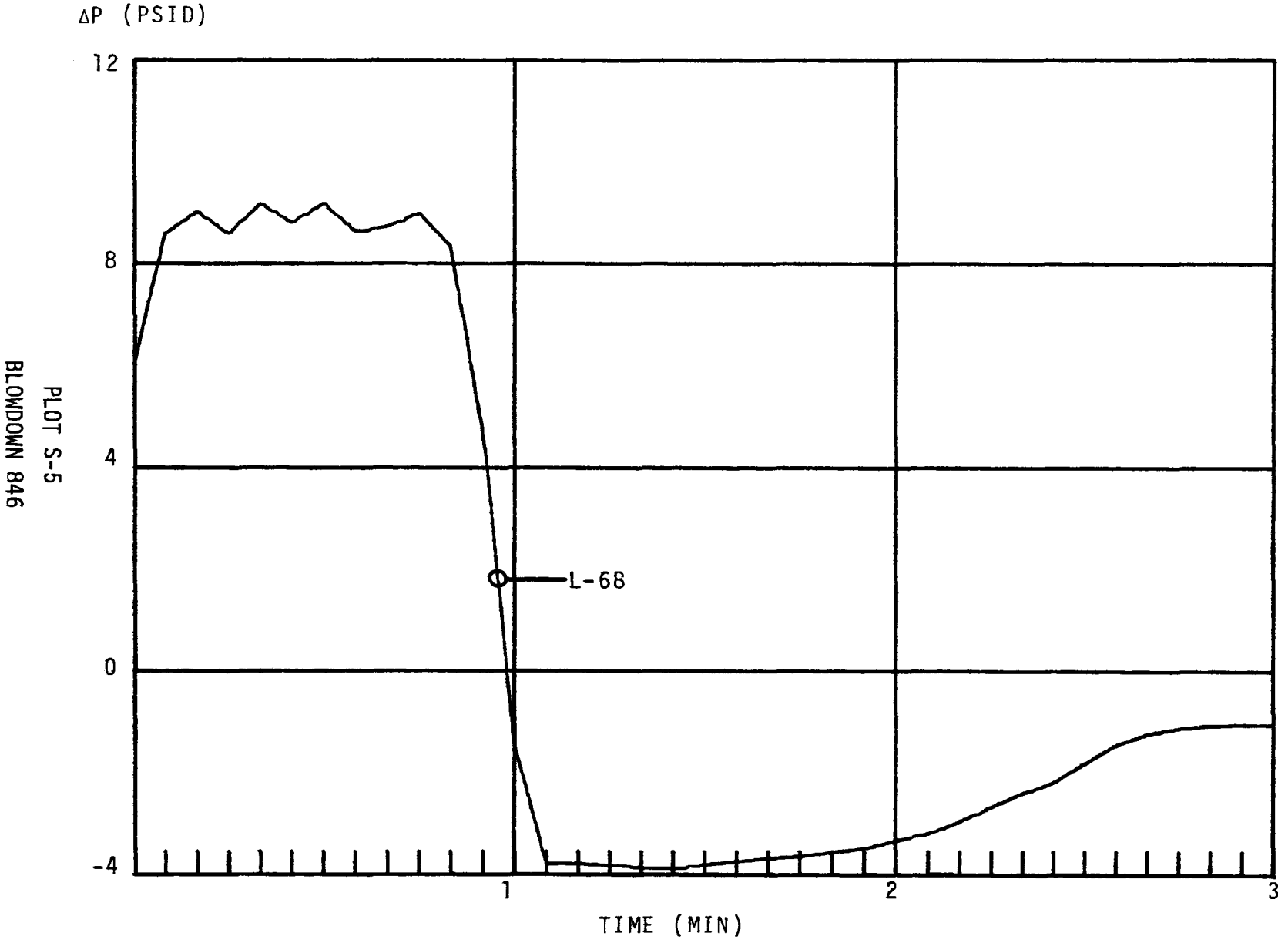

Temperature (°F)
200
150
100
50
0
L-22
L-21
1
2
3
TIME (MIN)
PLOT S-1A
BLOWDOWN 846


ΔP (PSID) L-25
ΔP (PSID) L-61
3
2
1
0
-1
12
9
6
3
0
L-61
L-25
1
2
3
TIME (MIN)
PLOT S-2
BLOWDOWN 846

PLOT S-3
BLOWDOWN 846



PLOT S-4
BLOWDOWN 846


ΔP (PSID)
12
8
4
0
-4
L-68
1
2
3
TIME (MIN)
PLOT S-5
BLOWDOWN 846

SYSTEM CONFIGURATION

Test Number 1156

Break Location	Discharge
Break Size	16.26 in^2
	57 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Free-Wheeling

COMMENTS

1. Malfunctioning or Inoperable Instruments: AECL gamma densitometer beam 3 not connected to FM system.

2. Other Comments: The FM calibration voltages for Test 1156 were recorded after the blowdown. Subsequent analysis showed that the calibration voltages were stable through the testing program, and therefore it was felt that the post-test calibration voltage was accurate.

3. Affected FM Data Plots: The following plots of the standard plot package were deleted:

   14 - AECL Gamma Densitometer Beam 3 Density

   23 - AECL Gamma Densitometer Beam 3 Void Fraction

INITIAL CONDITIONS

t = 60 Sec[a]

Test Number 1156

System Pressures

High Pressure Drum	972.0	psia
Suction Instrument Spool	447.8	psia
Discharge Instrument Spool	999.6	psia

Fluid Temperatures

Suction Instrument Spool	539.8	°F
Discharge Instrument Spool	545.7	°F

Fluid Density

Suction Instrument Spool	46.62	lbm/ft^3
Discharge Instrument Spool	46.25	lbm/ft^3

System Flows

Mass Flow Rate	227	lb/sec
Suction Volumetric Flow Rate	2185	gpm
Discharge Volumetric Flow Rate	2226	gpm
Suction Normalized Volumetric Flow Rate	0.62	
Discharge Normalized Volumetric Flow Rate	0.64	
Suction Fluid Velocity	26.89	ft/sec
Discharge Fluid Velocity	27.39	ft/sec
Suction Momentum Flux	33,724	$lbm/ft\ sec^2$
Discharge Momentum Flux	34,713	$lbm/ft\ sec^2$

Pump Performance

Pump head	56.65	psi
	175.0	ft
Pump Speed	4541	rpm
Pump Shaft Torque	199.9	ft lb
Pump Hydraulic Torque	174.9	ft lb

System Mass (t = 70 Sec)[a]

High Pressure Drum Level	53.54	in[b]
Fluid Mass Upstream of Test Pump	14,074	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 1156

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-12.5	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	9.9	c
HPSW-1 Closed	11.5	c
Pump Power Trip	12.6	75
Initiate Rupture Mechanism	10.6	c
Blowdown Starts	12.5	75
End of Digitized Data 20 s/sec	487.5	-
200 s/sec	347.5	-
FM Recording System Off	734.0	-
Scanner System Off	-	570

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

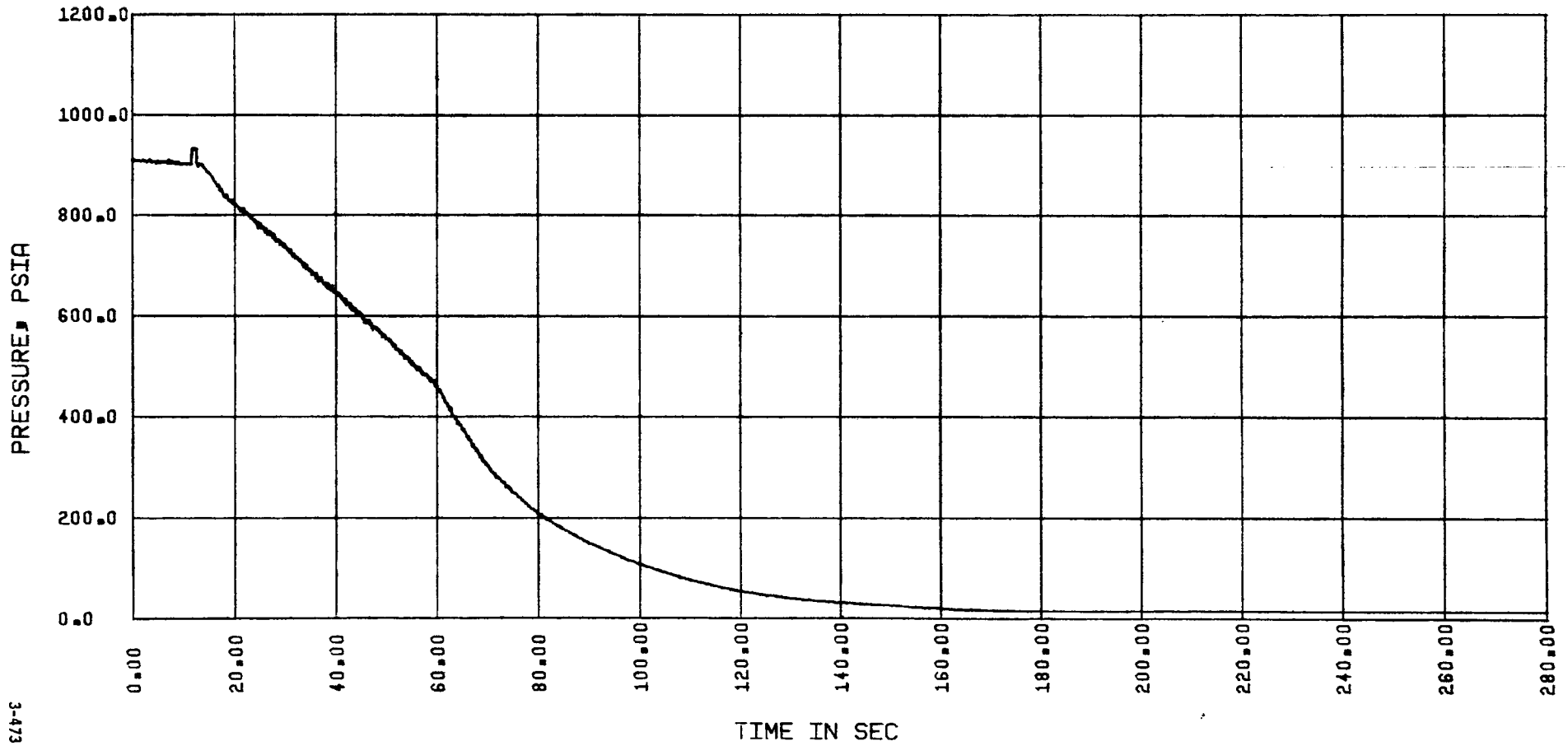
Index Listing
of
FM DATA PLOTS
Test Number (1156)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
28	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 Discharge
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge

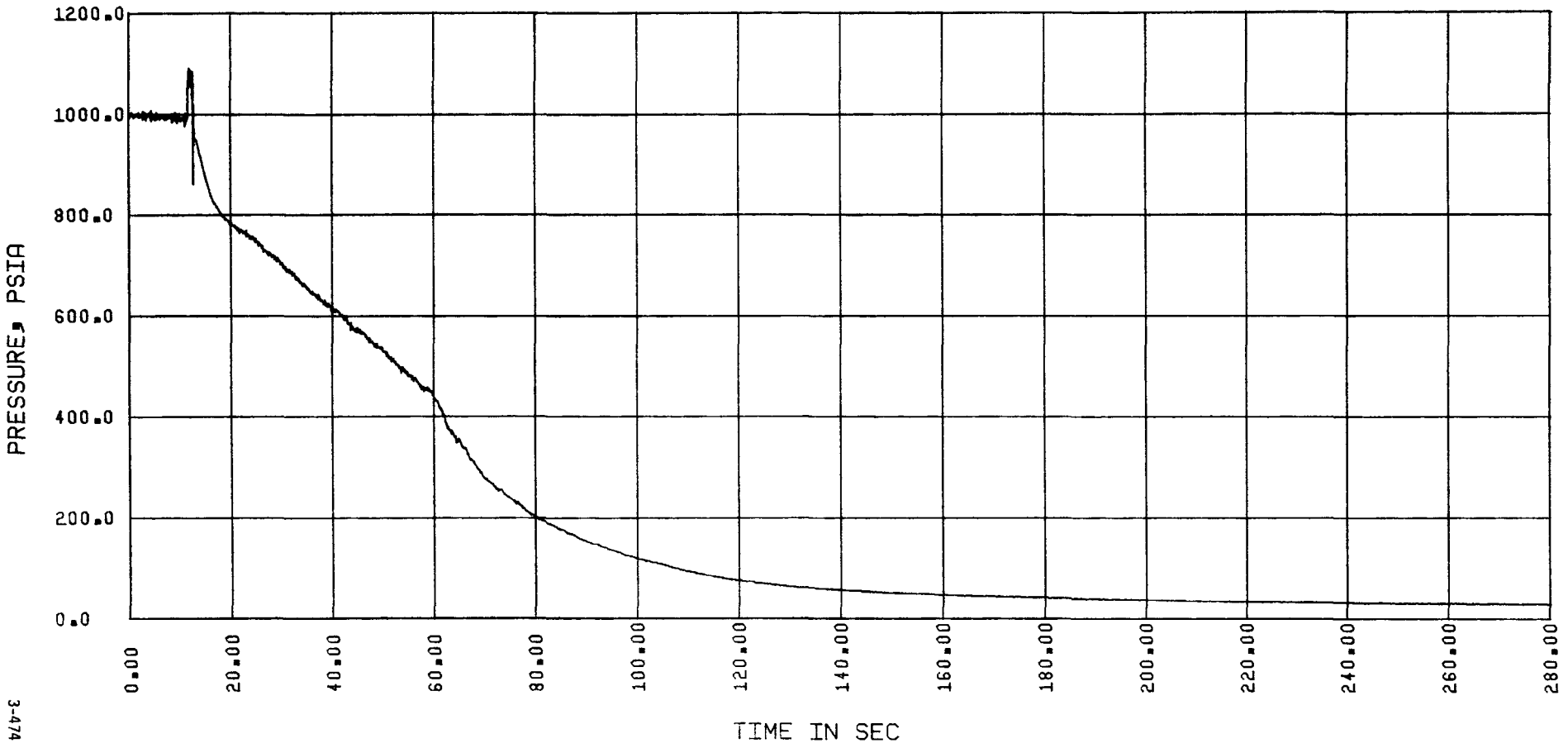
Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (1156)

Plot Number	Location Number	Description of Parameter
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
35	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
42	L-27	Momentum Flux LO-DD Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
53	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge
64	L-9	Pump Injection Mass Flow Rate In
65	L-32	Pump Injection Mass Flow Rate Out
66	L-9/L-32	Seal Injection Leakage Mass Flow Rate

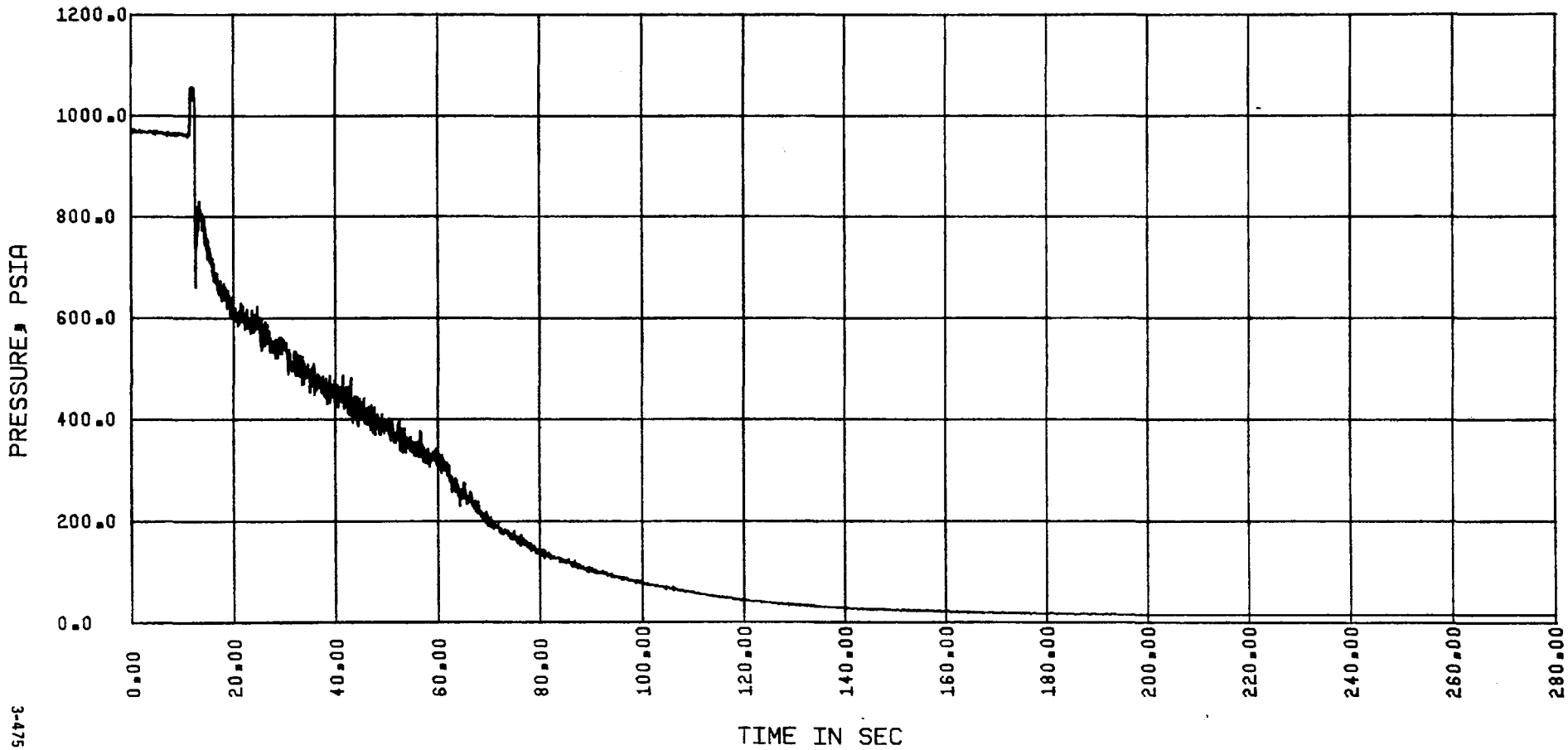
TEST 1156/1000 PSIA FW FWD BDN
PUMP SUCTION PRESSURE
PLOT NO.1



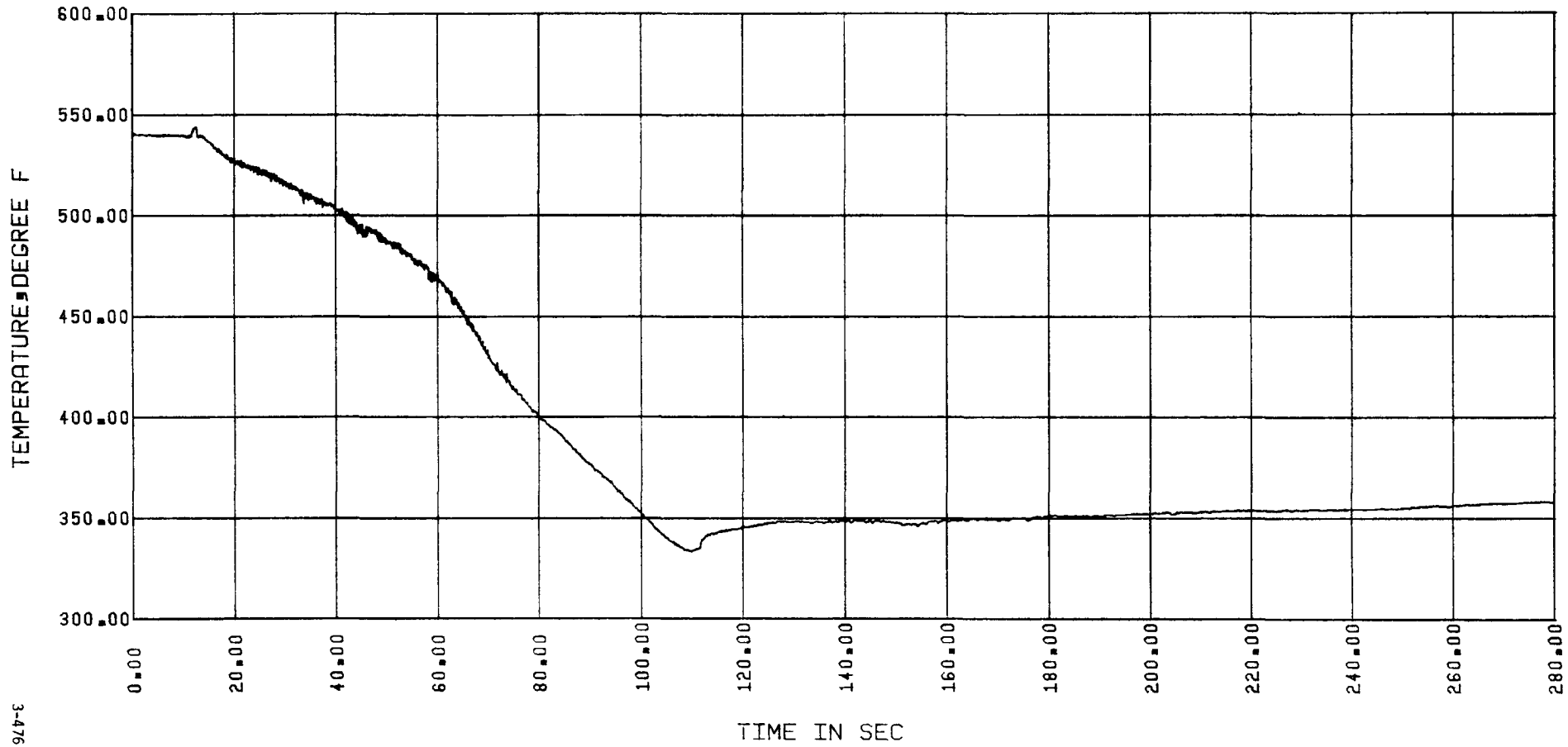
TEST 1156/1000 PSIA FW FWD BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2



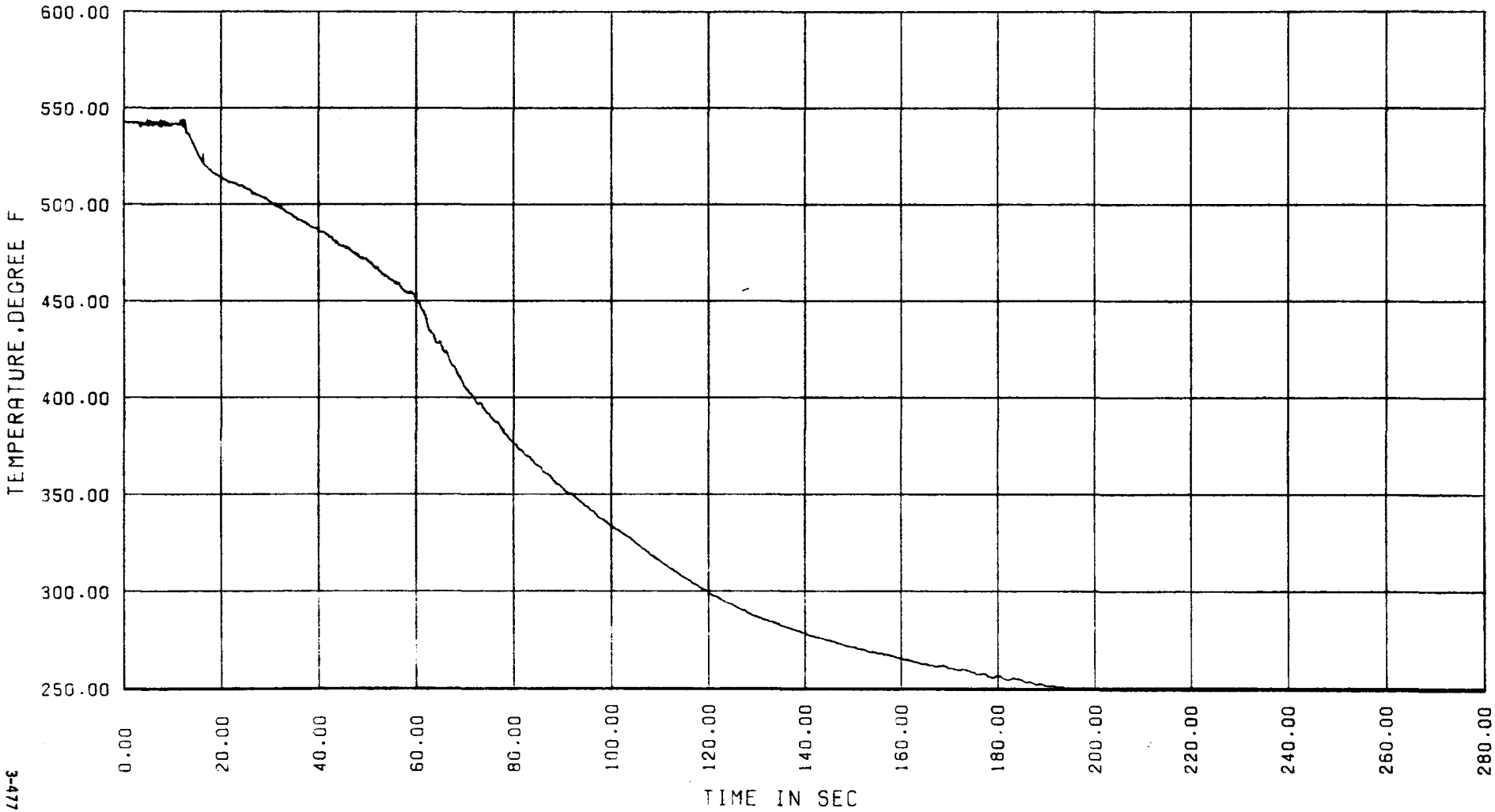
TEST 1156/1000 PSIA FW FWD BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



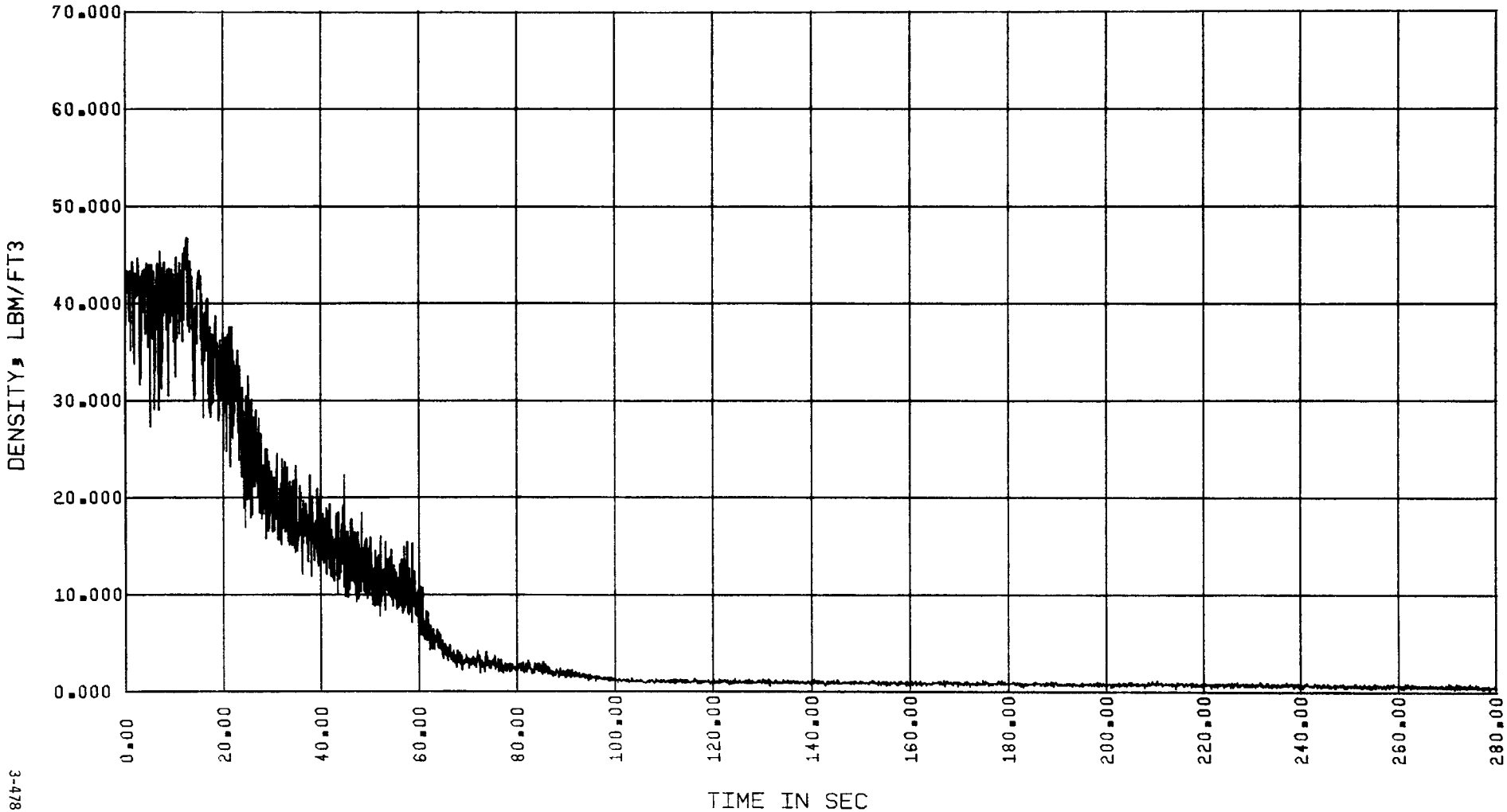
TEST 1156/1000 PSIA FW FWD BDN
PUMP SUCTION TEMPERATURE
PLOT NO.4



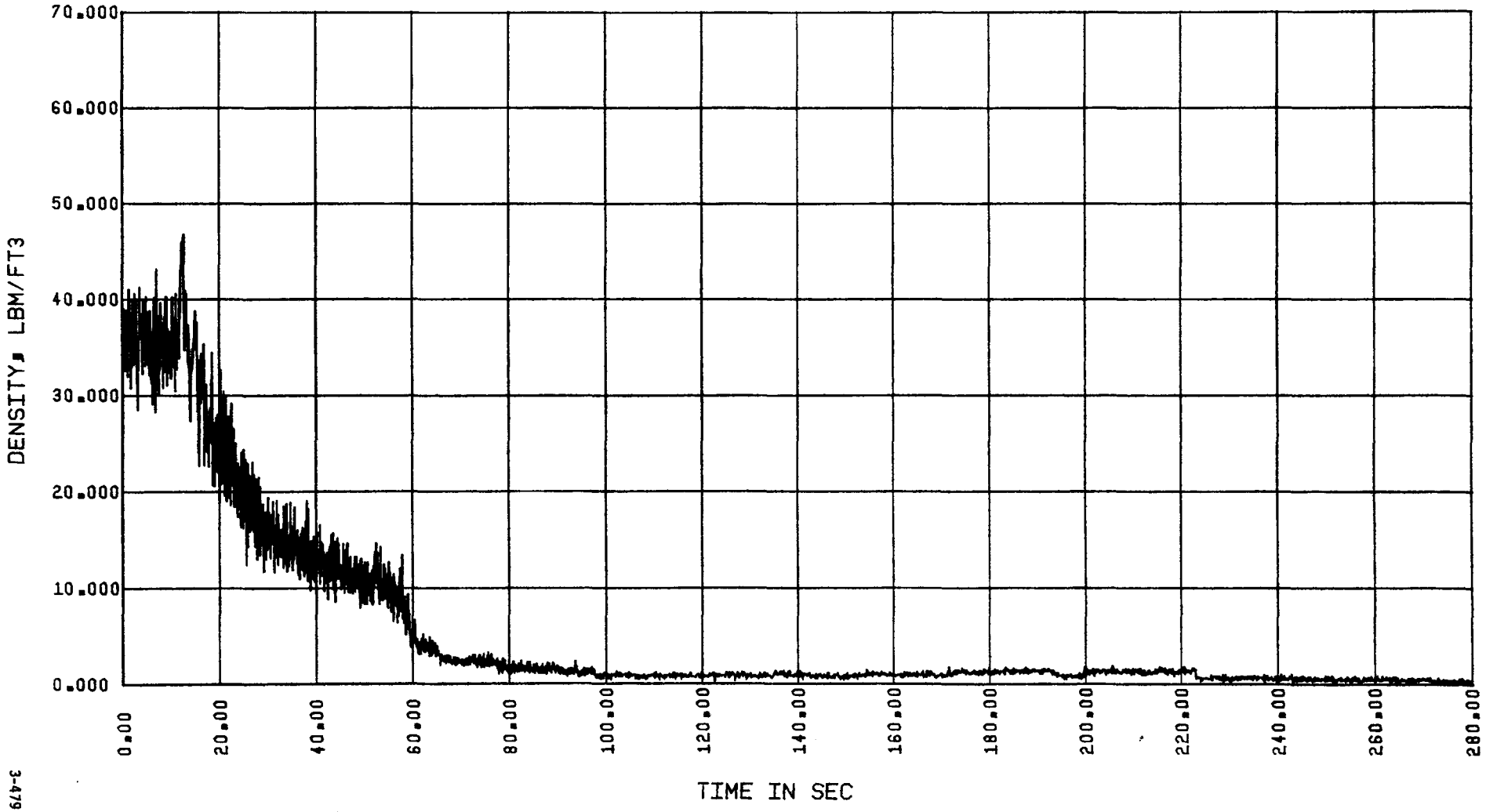
TEST 1156/1000 PSIA FW FWD BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5



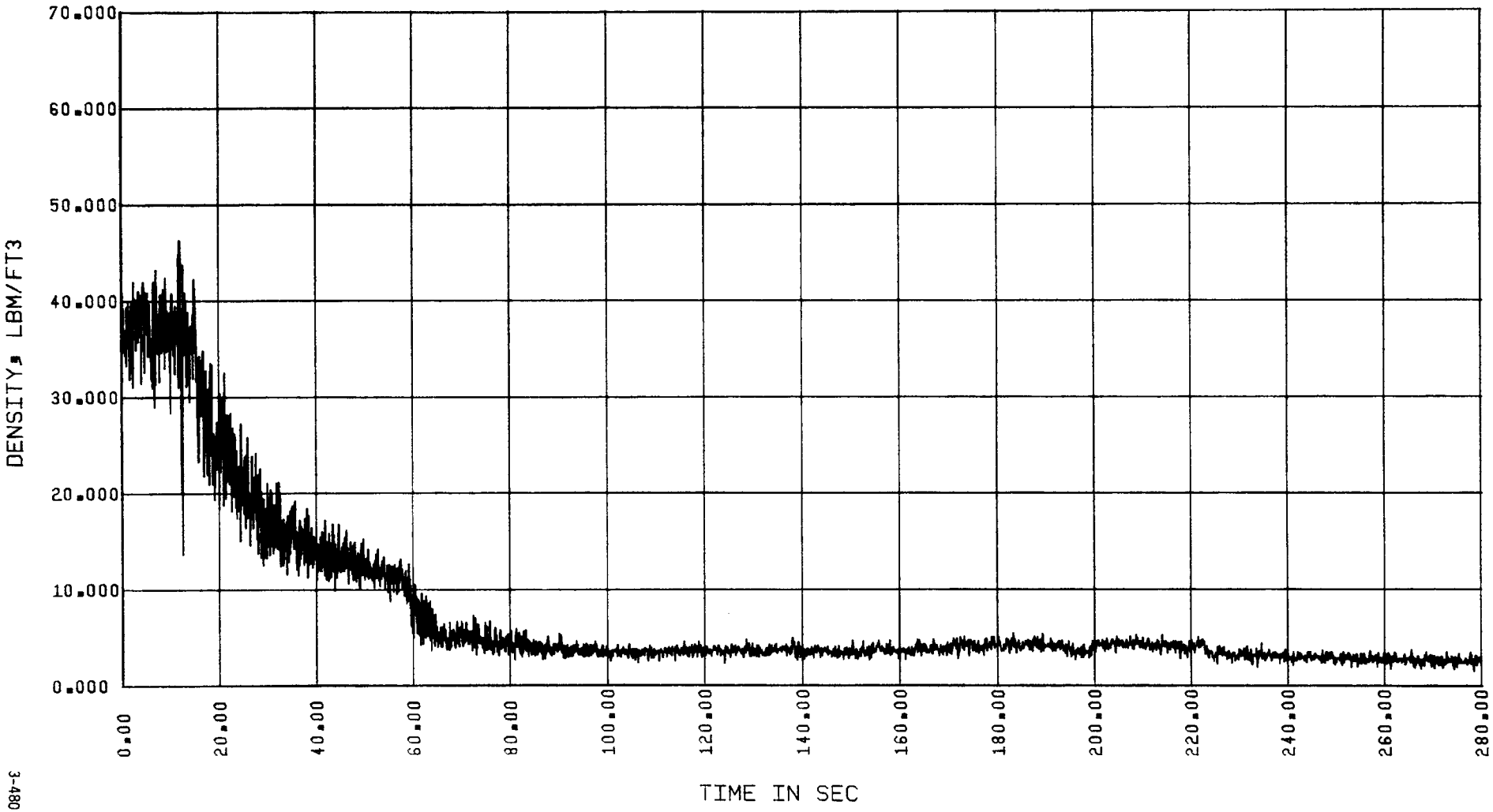
TEST 1156/1000 PSIA FW FWD BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



TEST 1156/1000 PSIA FW FWD BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7

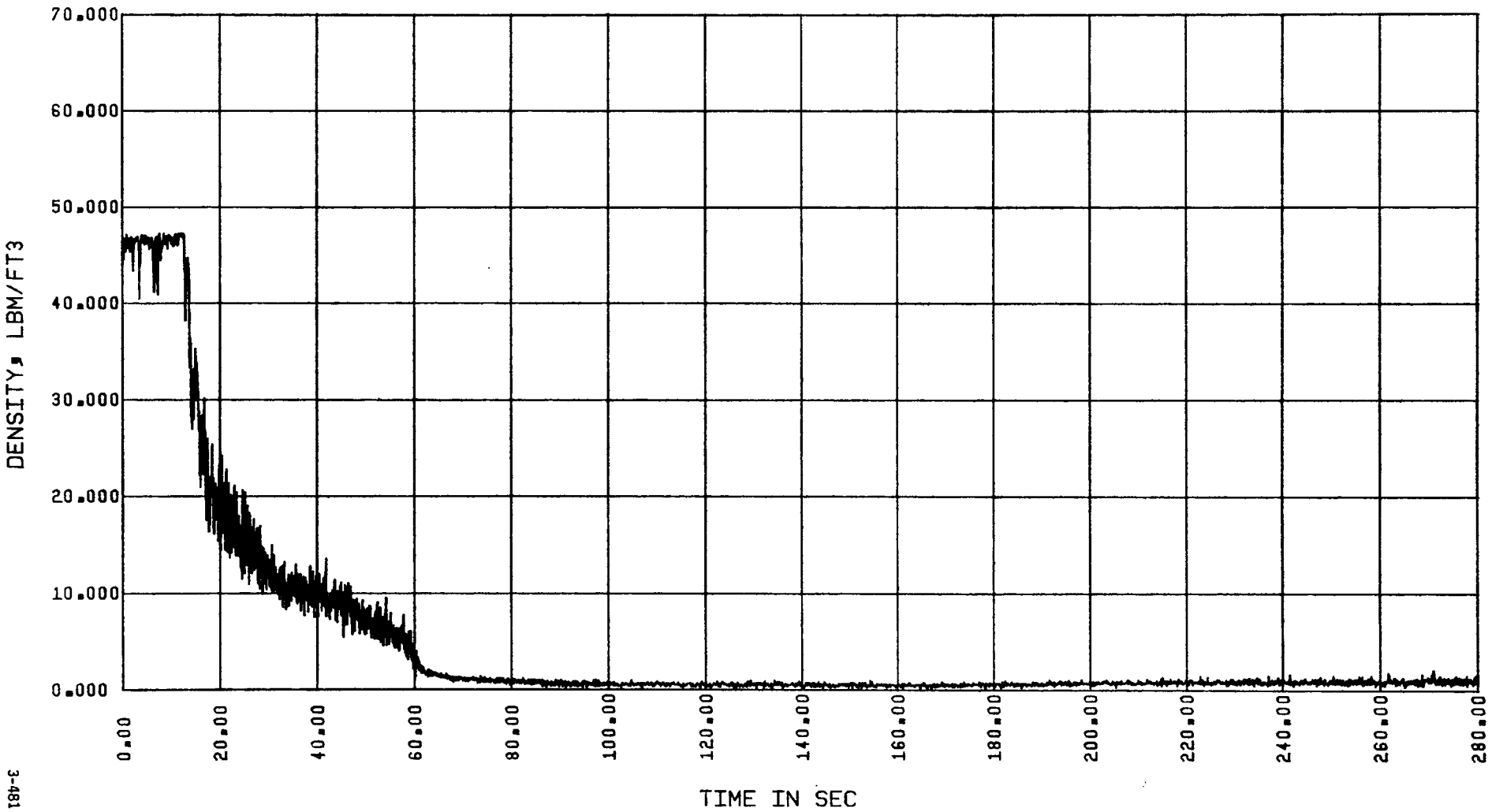


TEST 1156/1000 PSIA FW FWD BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8

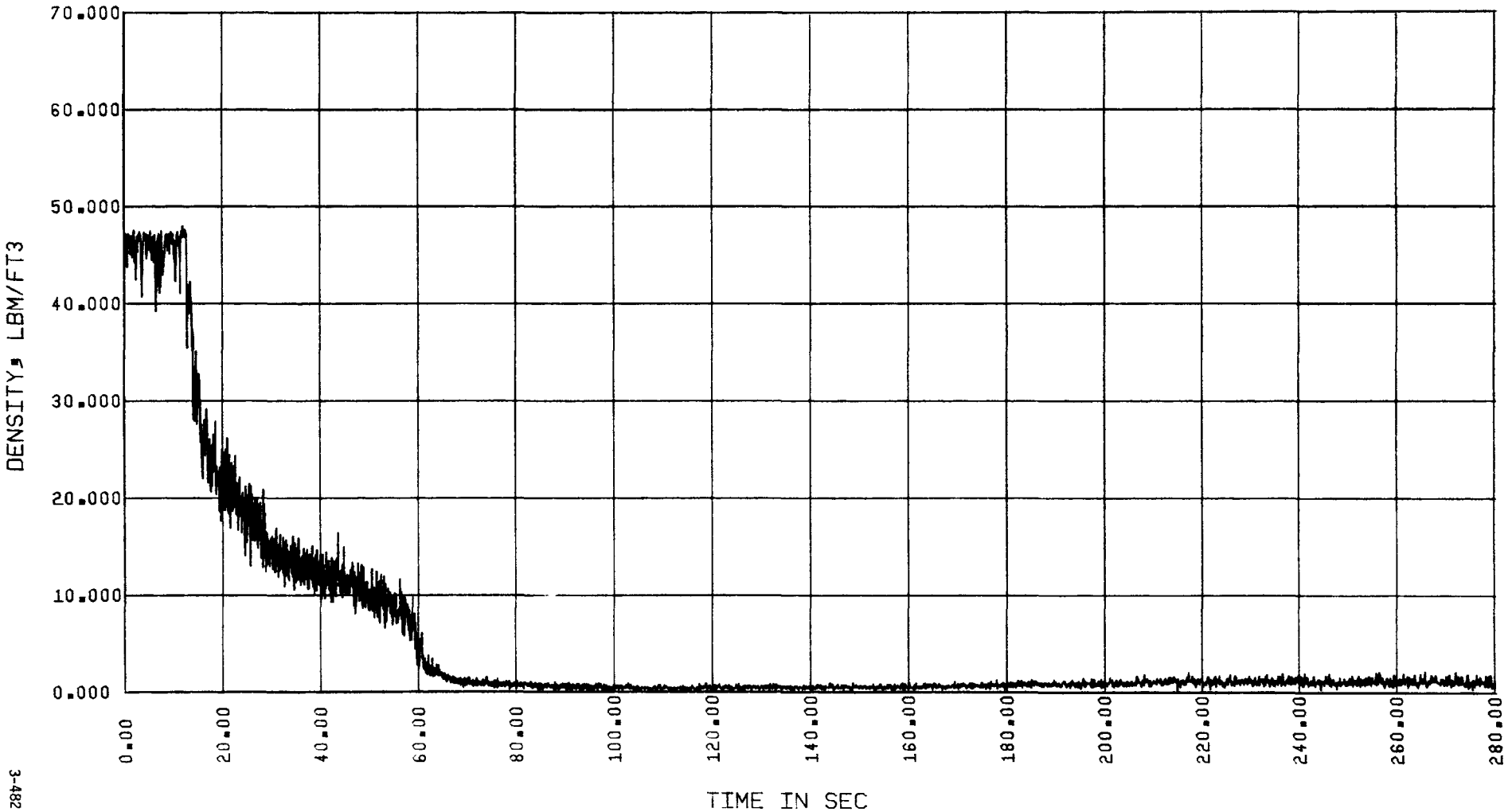


3-480

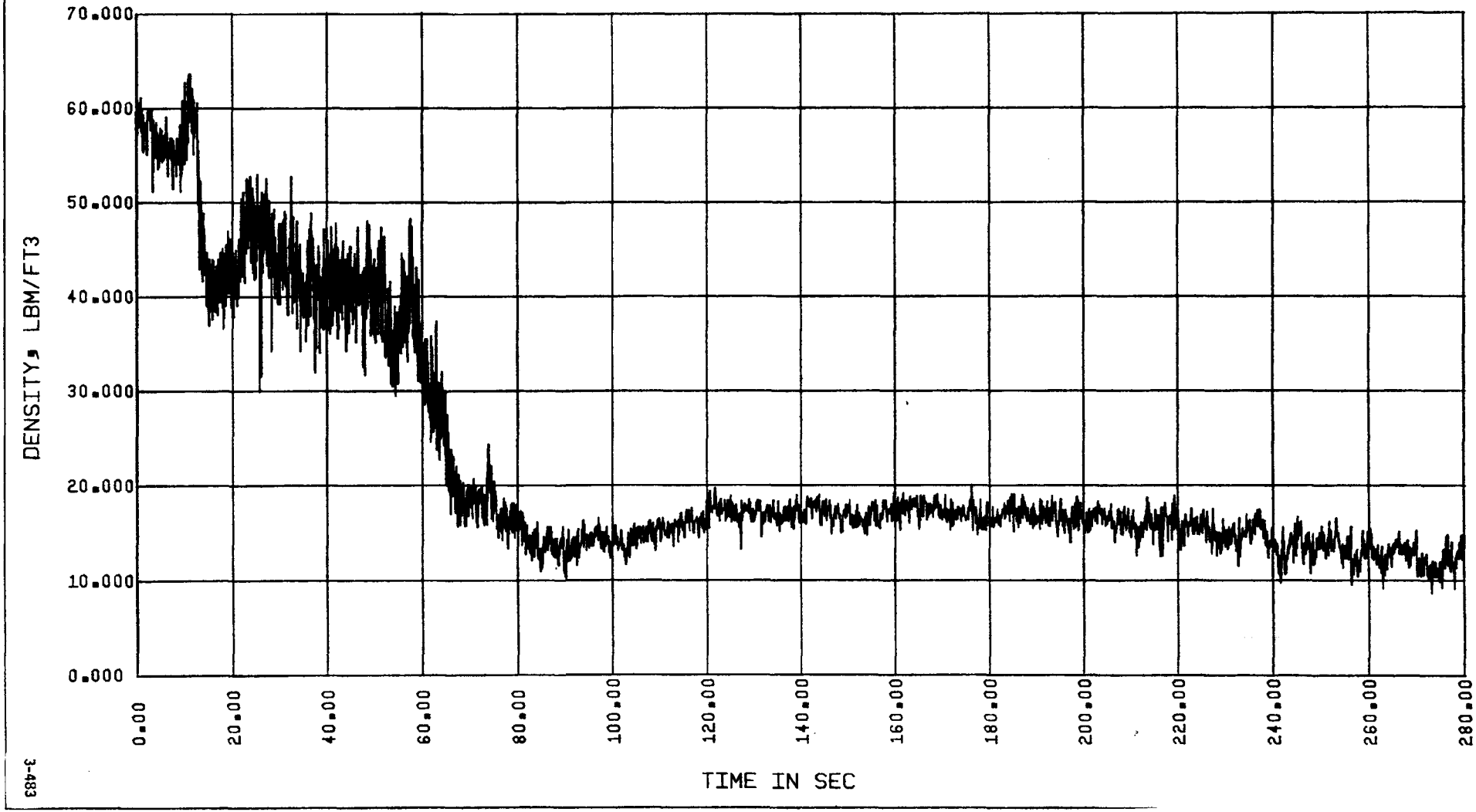
TEST 1156/1000 PSIA FW FWD BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9



TEST 1156/1000 PSIA FW FWD BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10

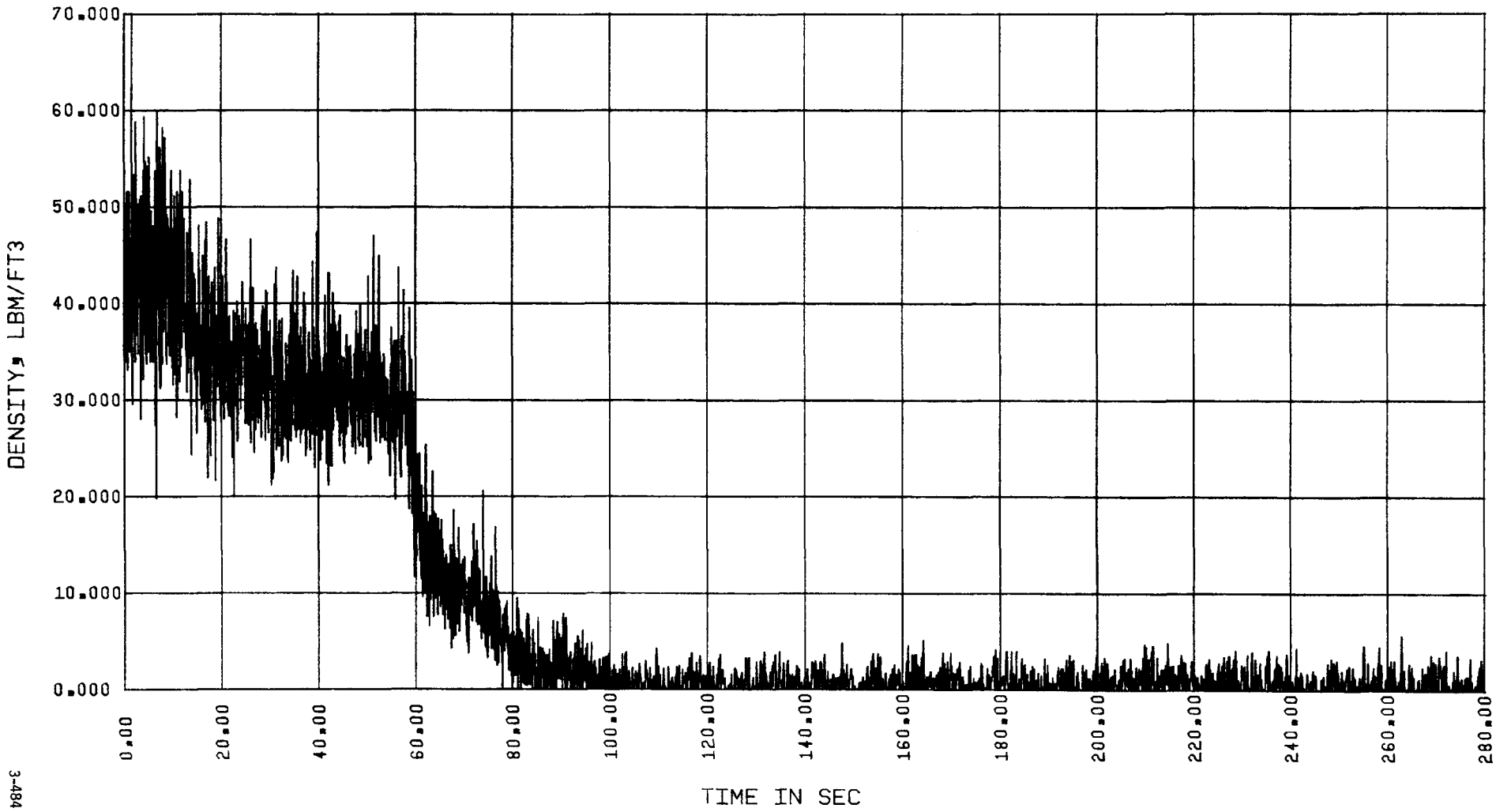


TEST 1156/1000 PSIA FW FWD BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11

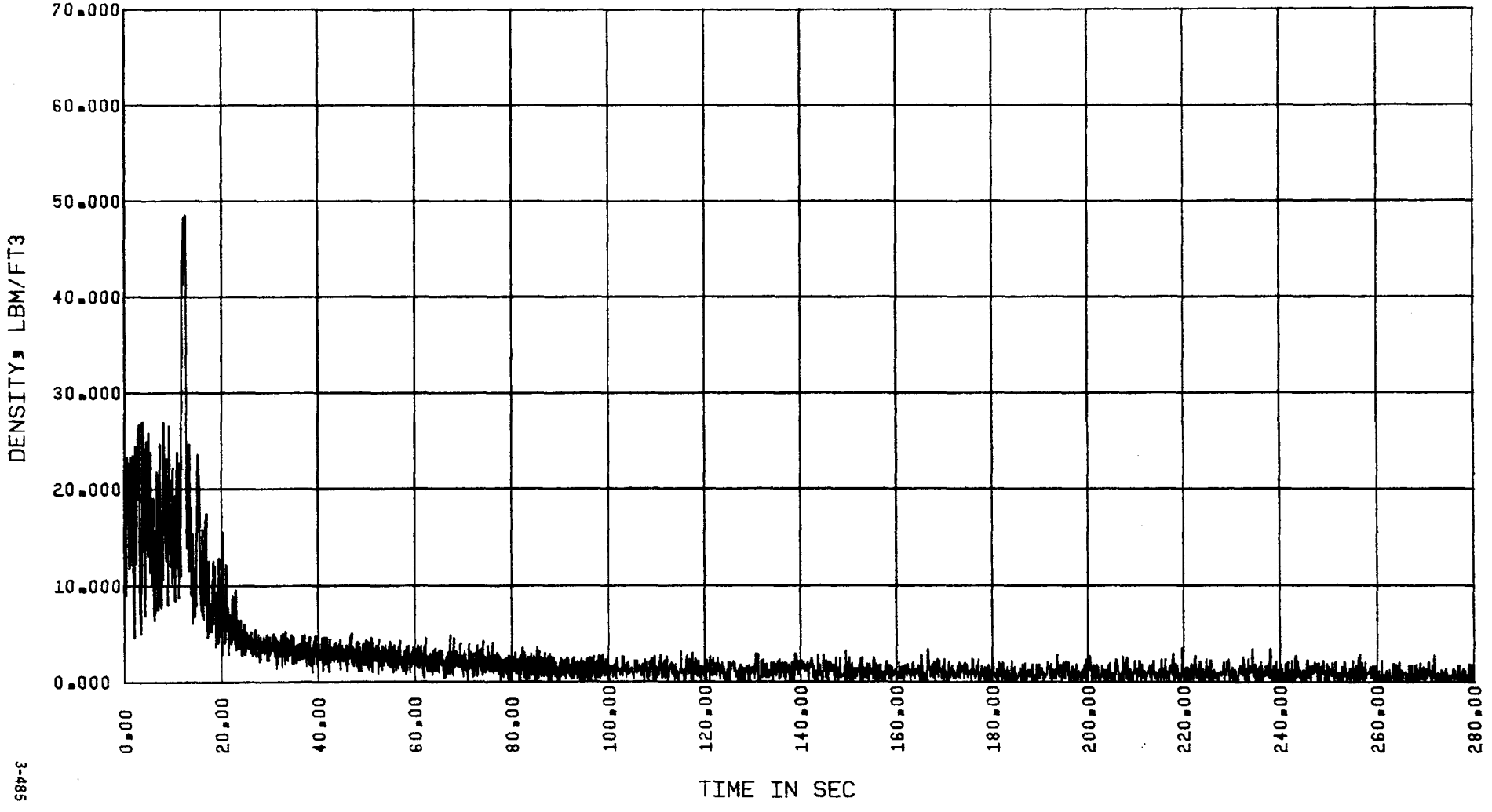


3-483

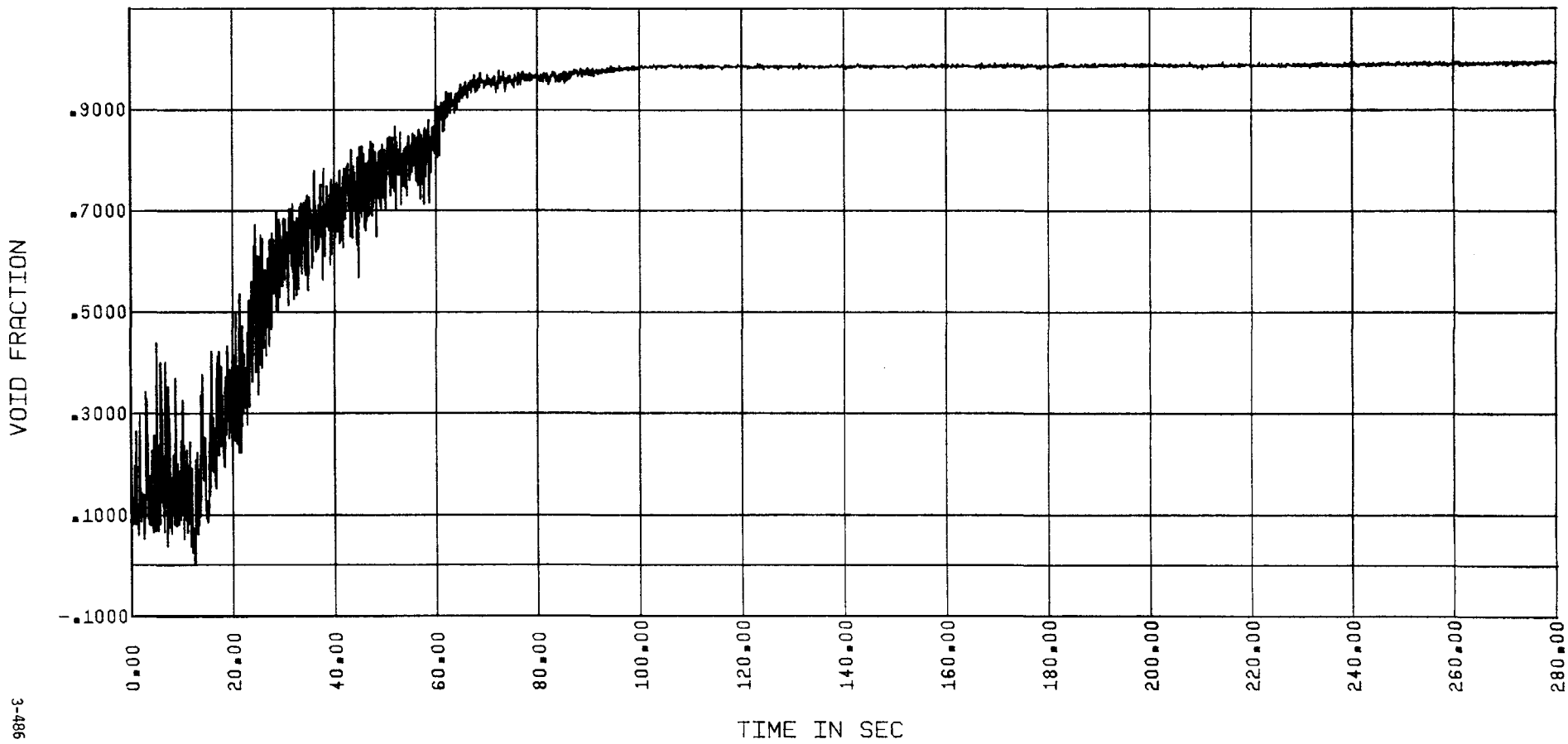
TEST 1156/1000 PSIA FW FWD BDN
DENSITY BEAM1 AECL GD
PLOT NO.12



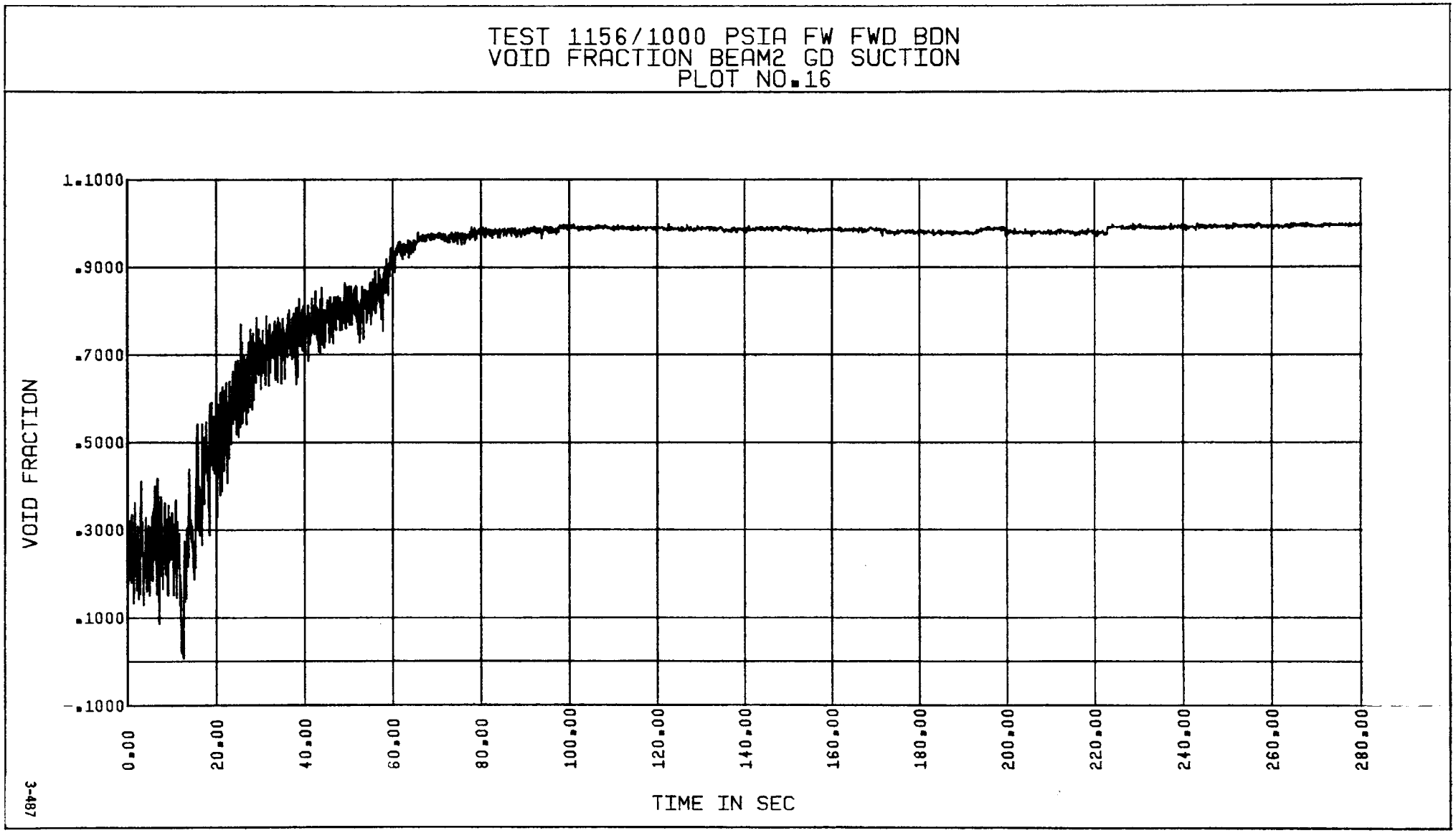
TEST 1156/1000 PSIA FW FWD BDN
DENSITY BEAM2 AECL GD
PLOT NO. 13



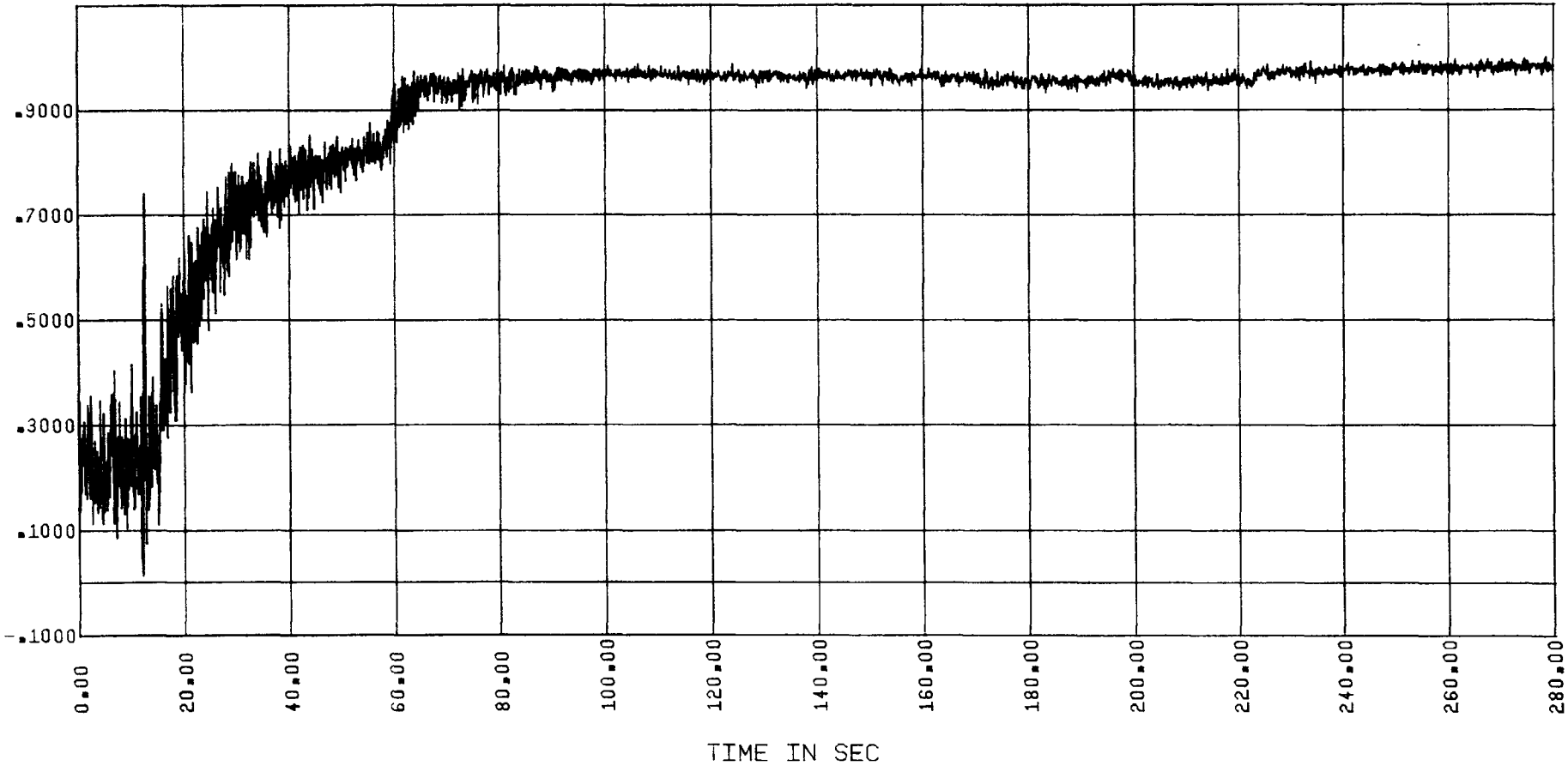
TEST 1156/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15



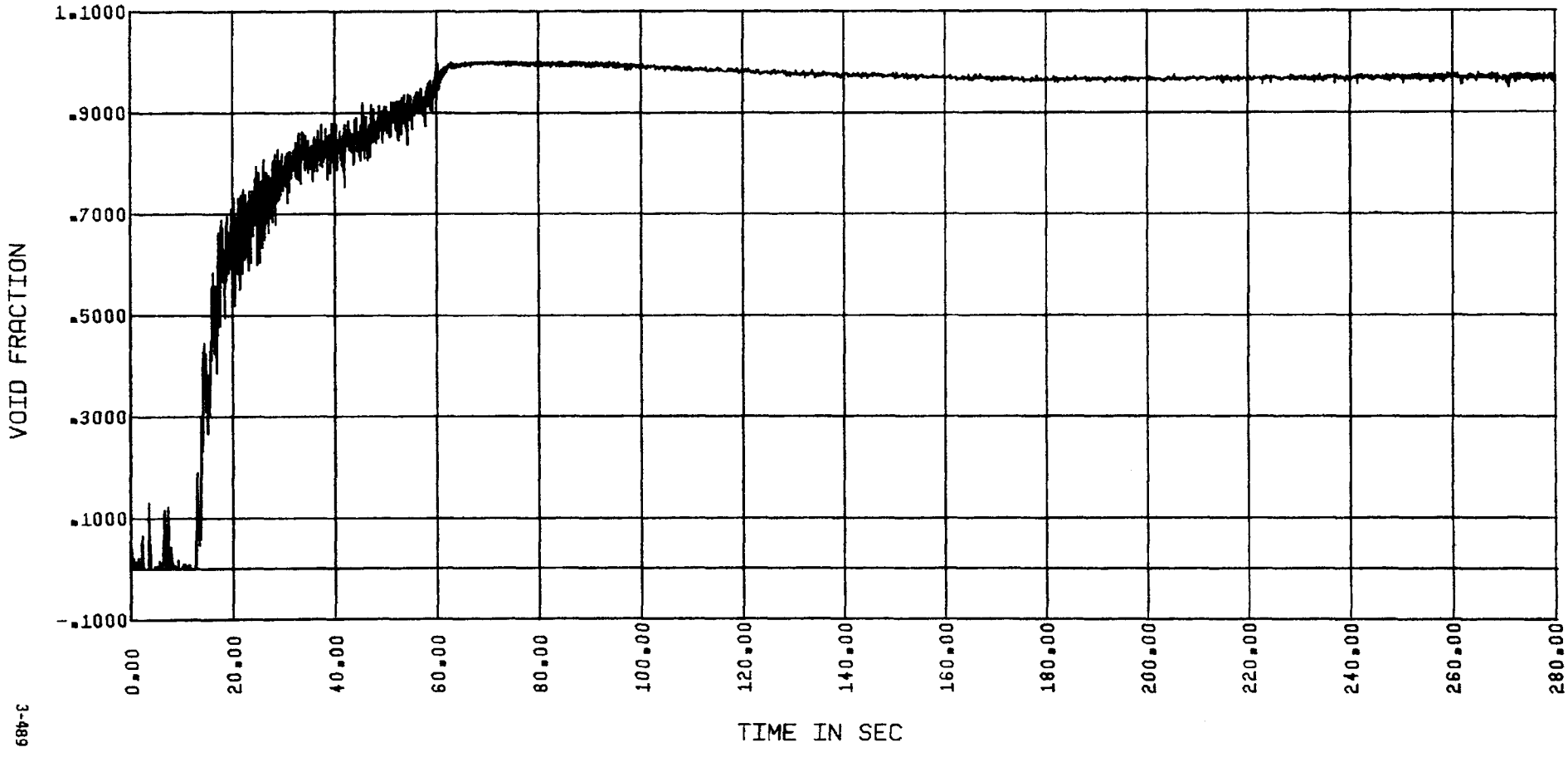
3-486


TEST 1156/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16
1.1000
.9000
.7000
.5000
.3000
.1000
-.1000
VOID FRACTION
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-87

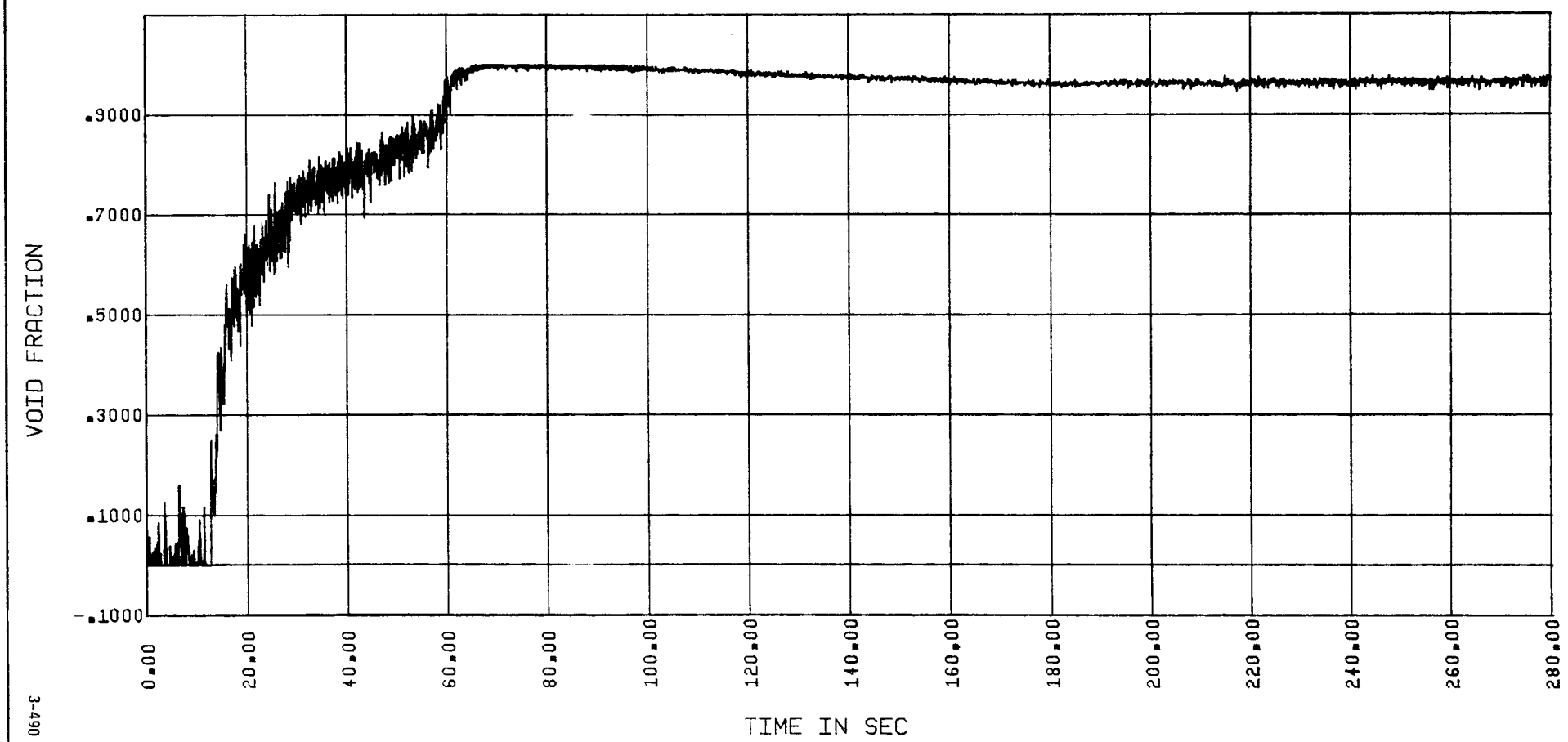
TEST 1156/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17



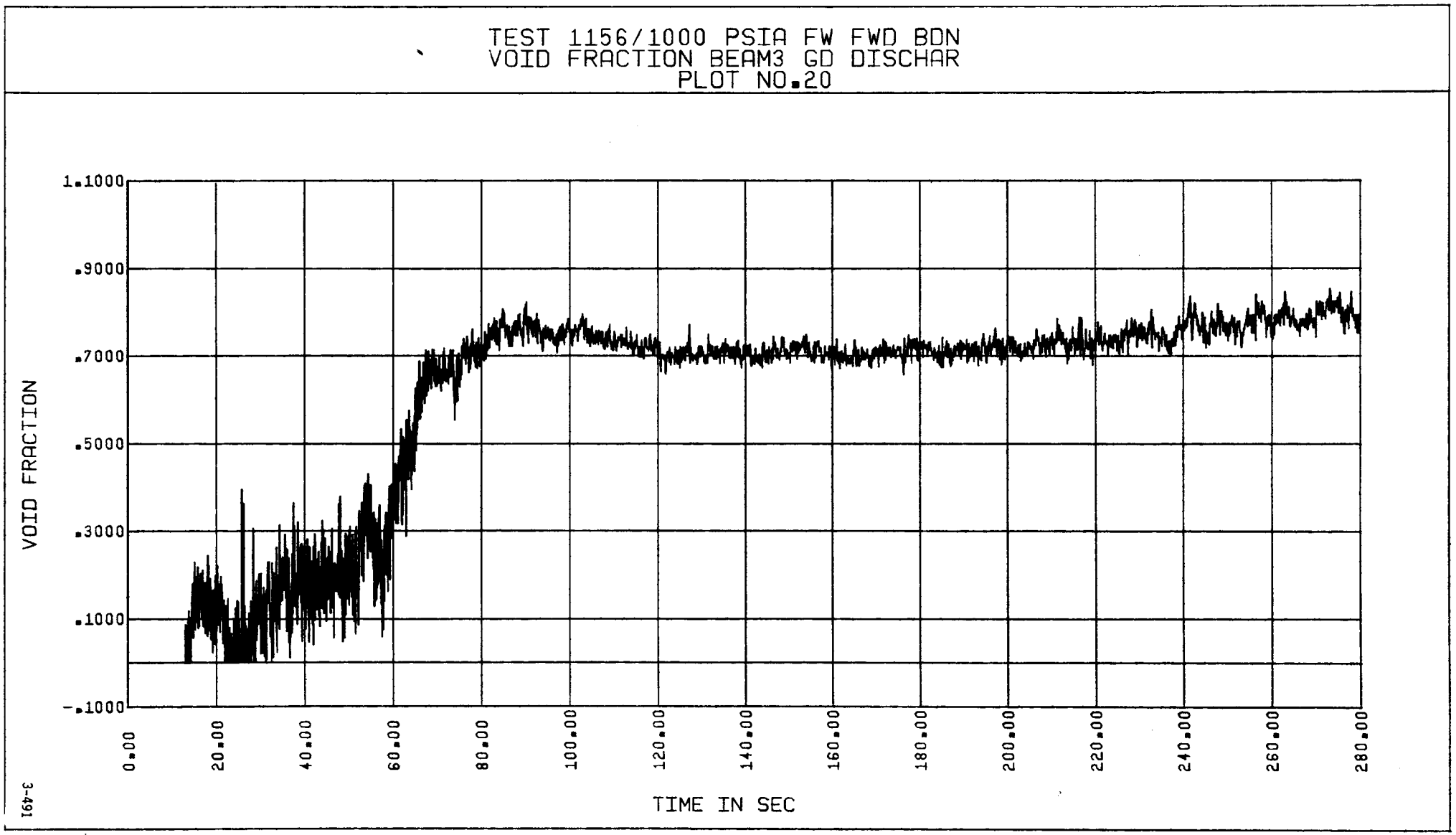
TEST 1156/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18



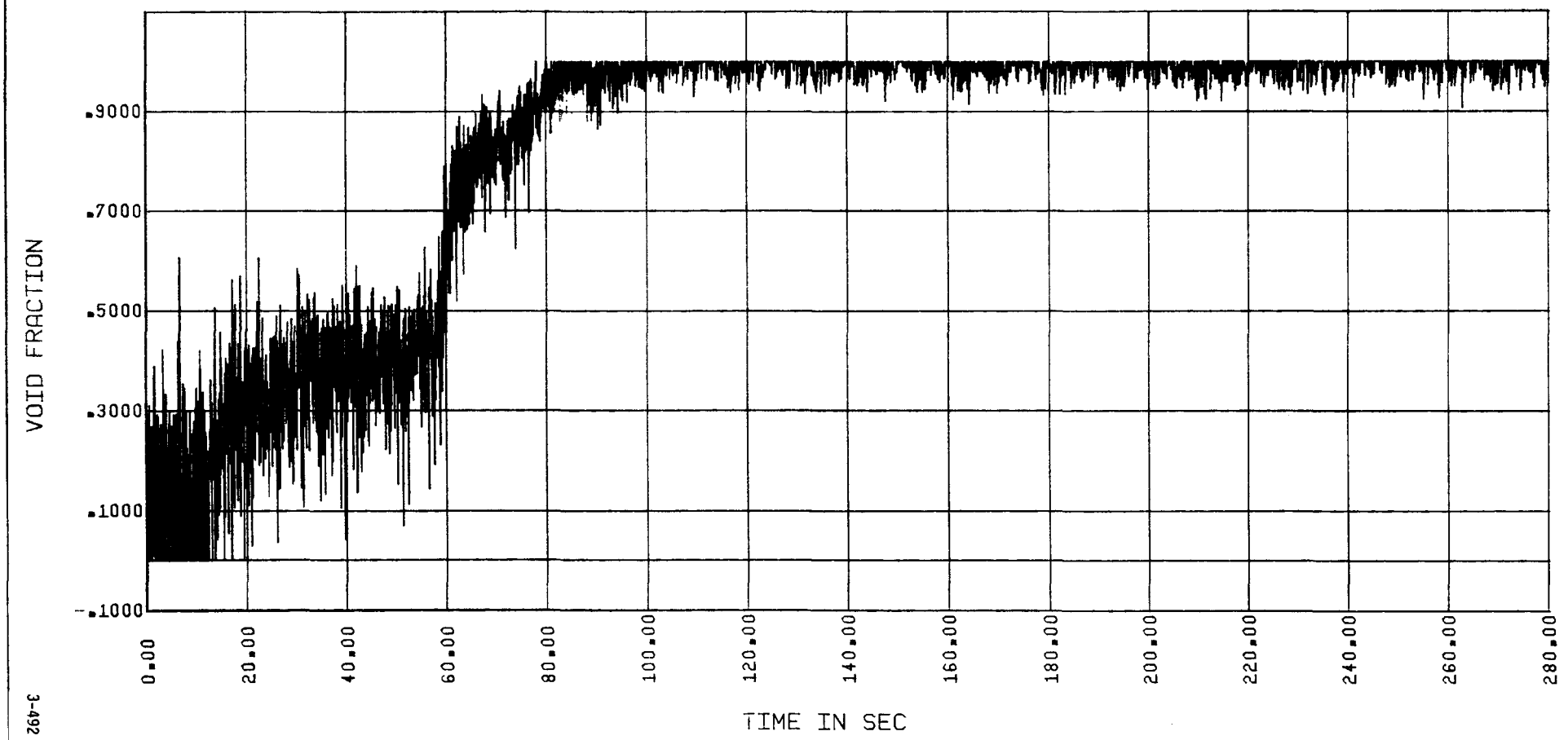
TEST 1156/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19



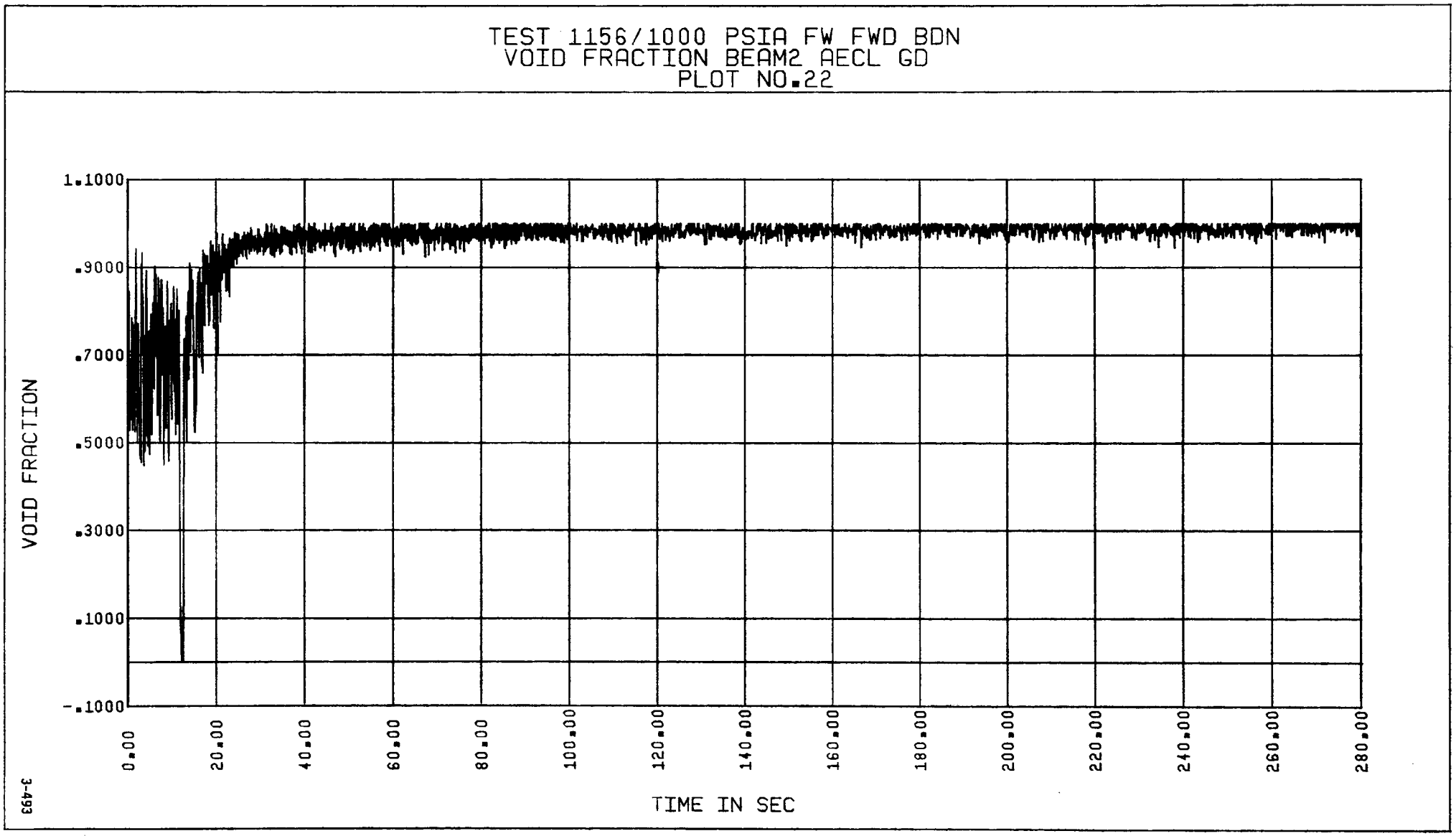
3-490


TEST 1156/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20
1.1000
.9000
.7000
.5000
.3000
.1000
-.1000
VOID FRACTION
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-491

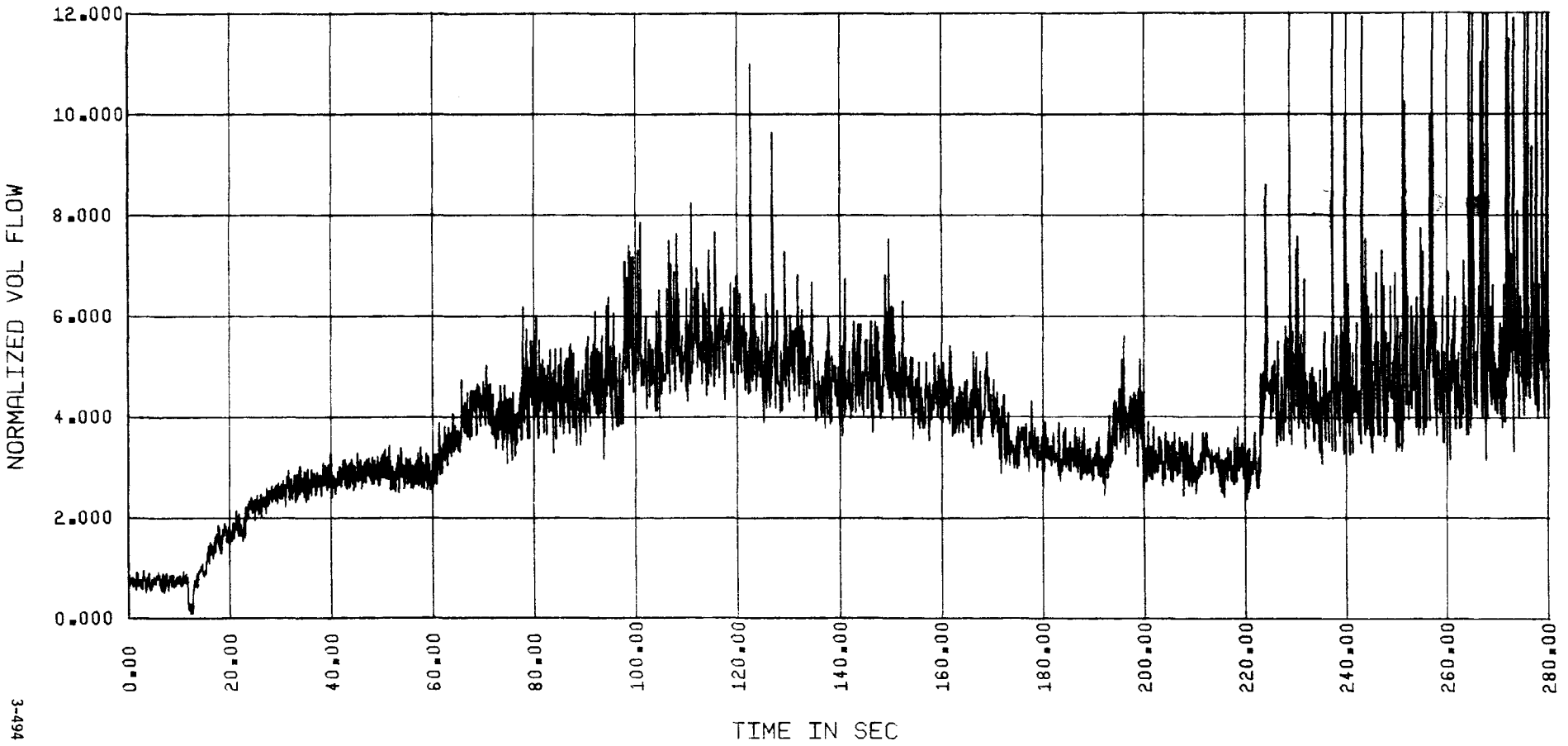
TEST 1156/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21



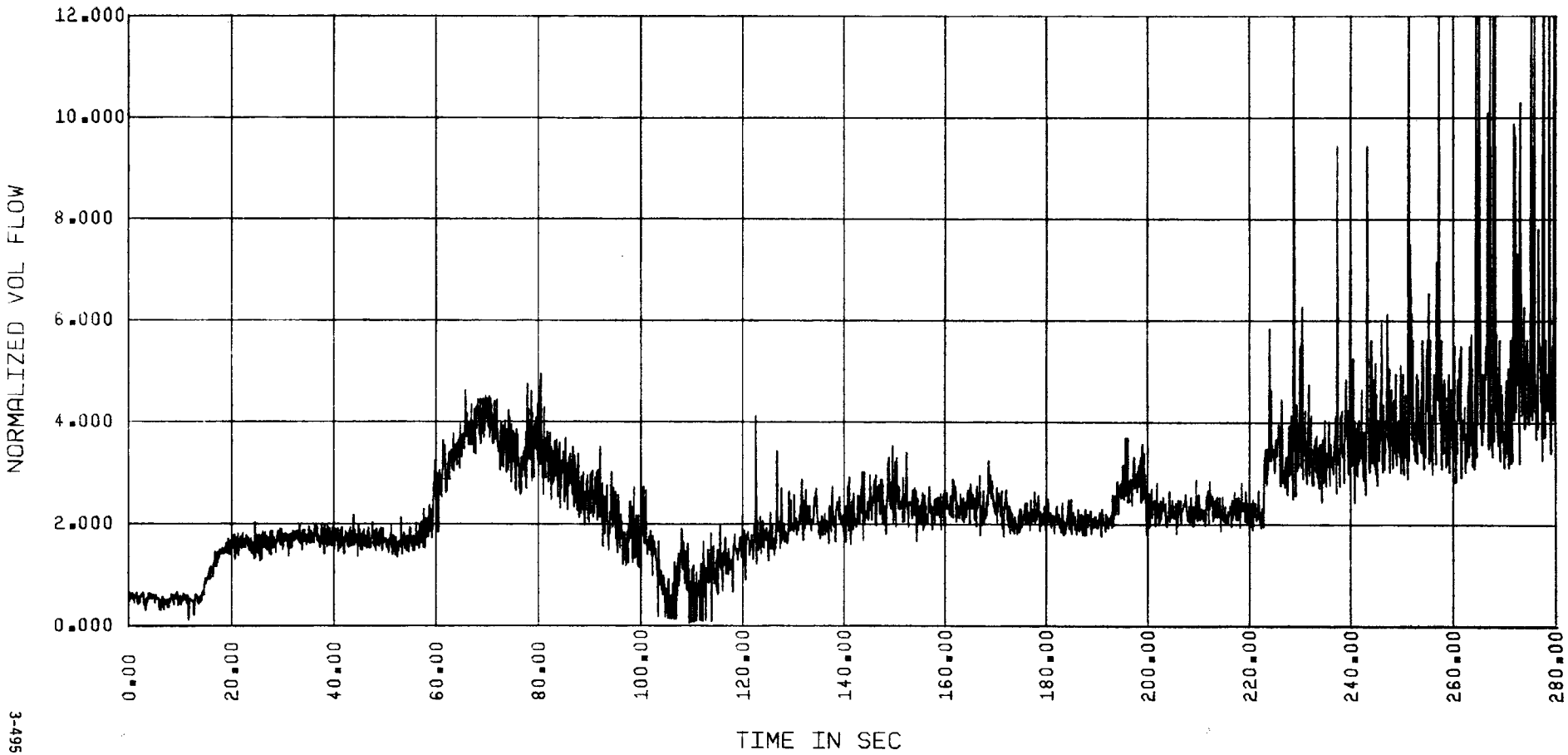
3-492


TEST 1156/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22
1.1000
.9000
.7000
.5000
.3000
.1000
-.1000
VOID FRACTION
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-493

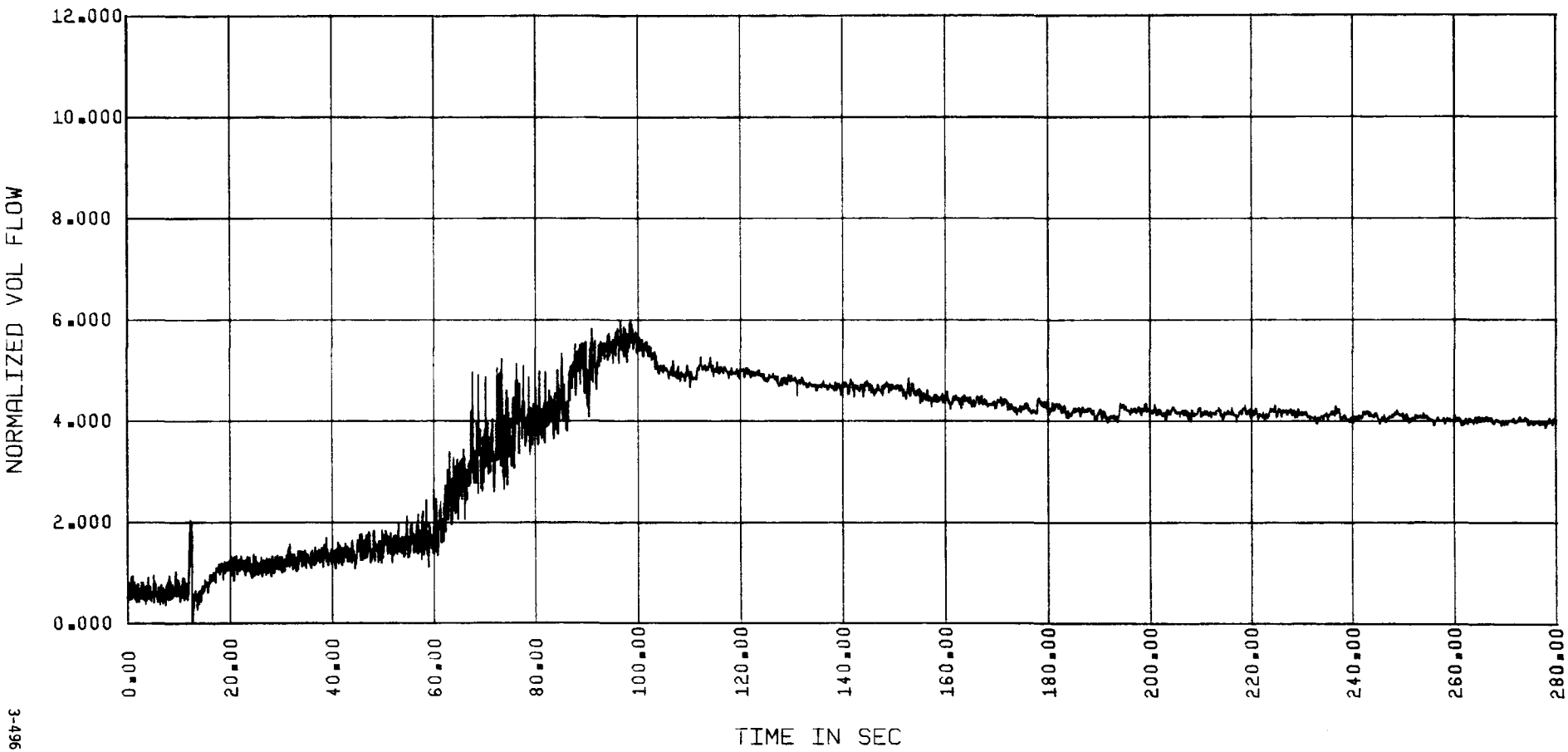
TEST 1156/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-DD/GD2 S
PLOT NO.24



TEST 1156/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-DD/GD2 S
PLOT NO.25

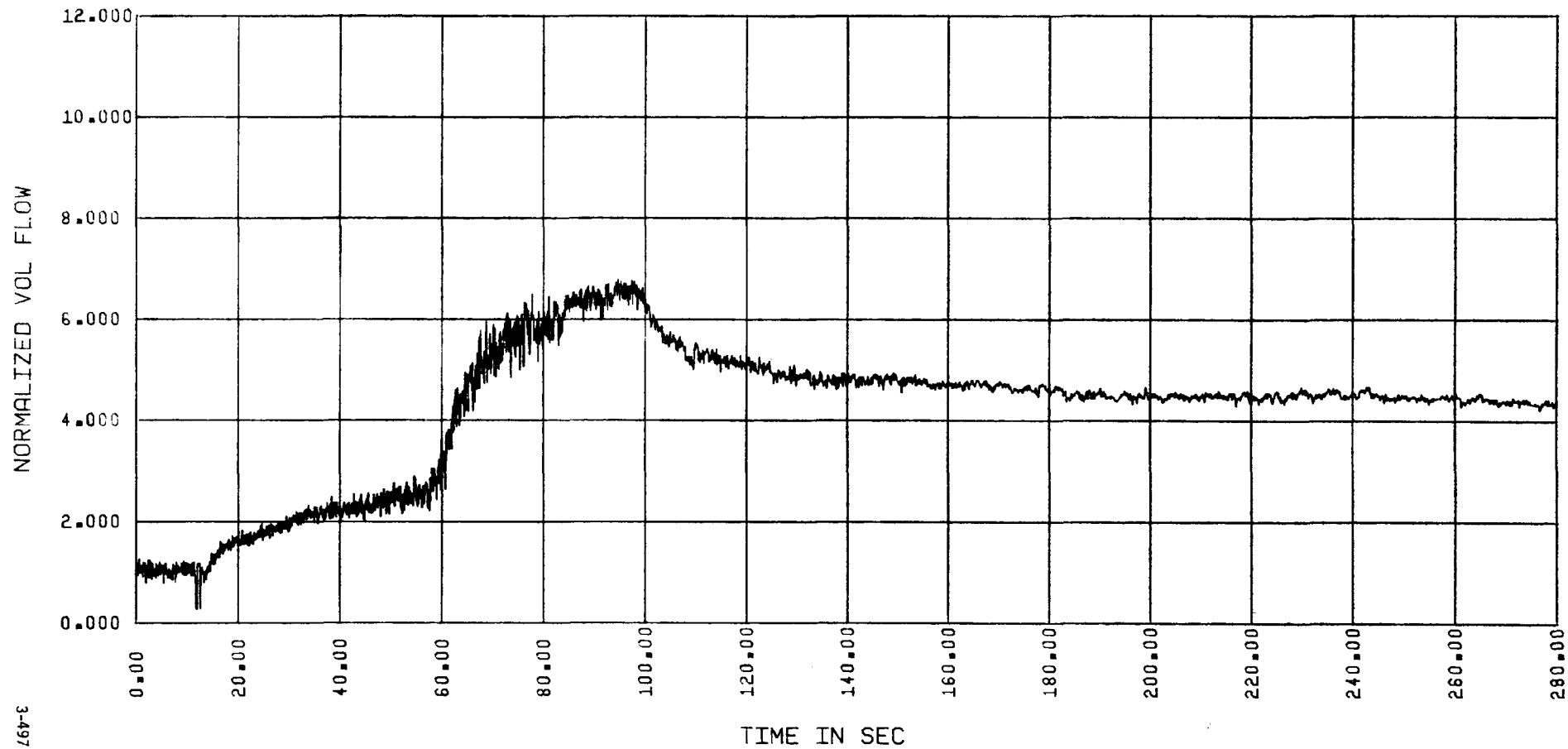


TEST 1156/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-TM SUCT
PLOT NO.26

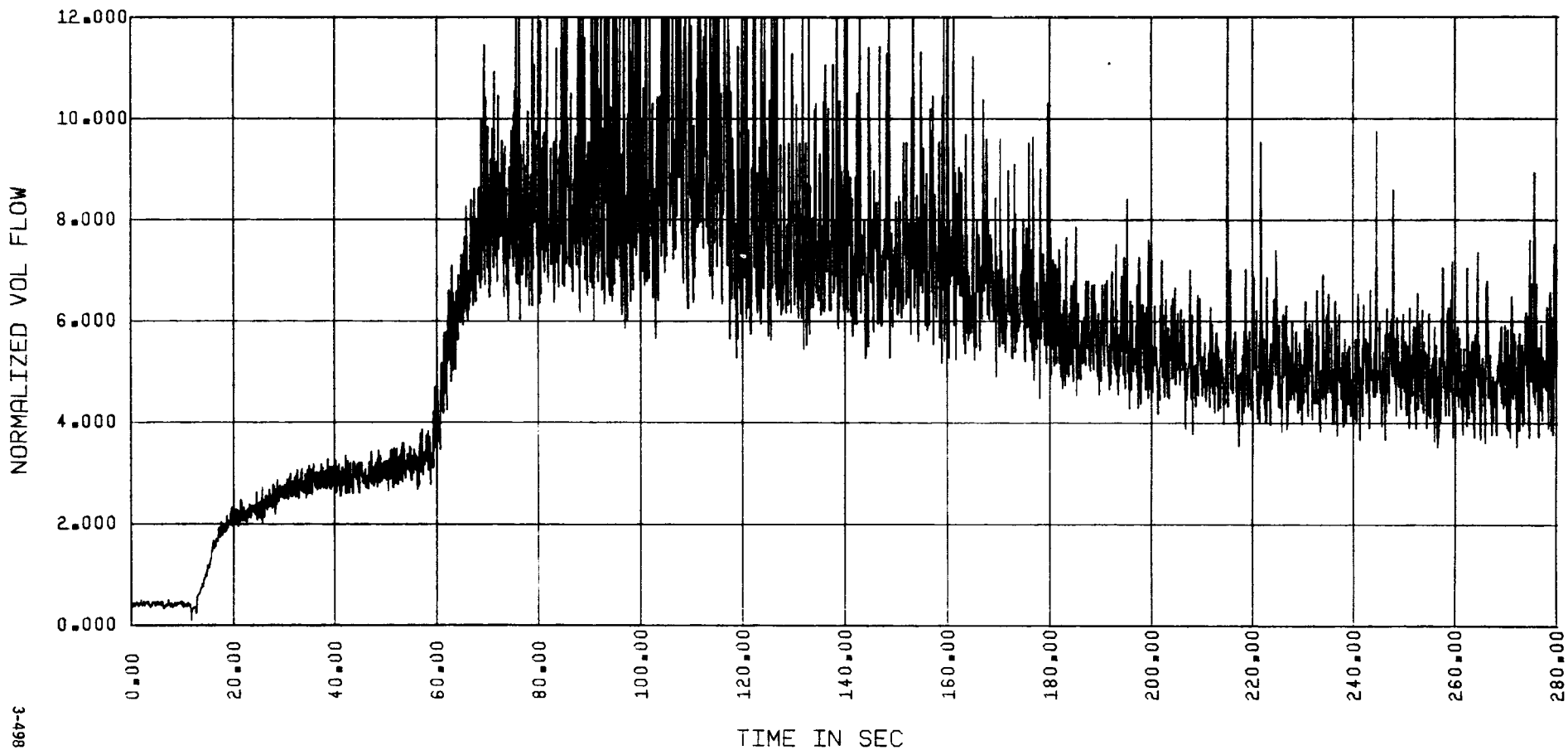


3-496

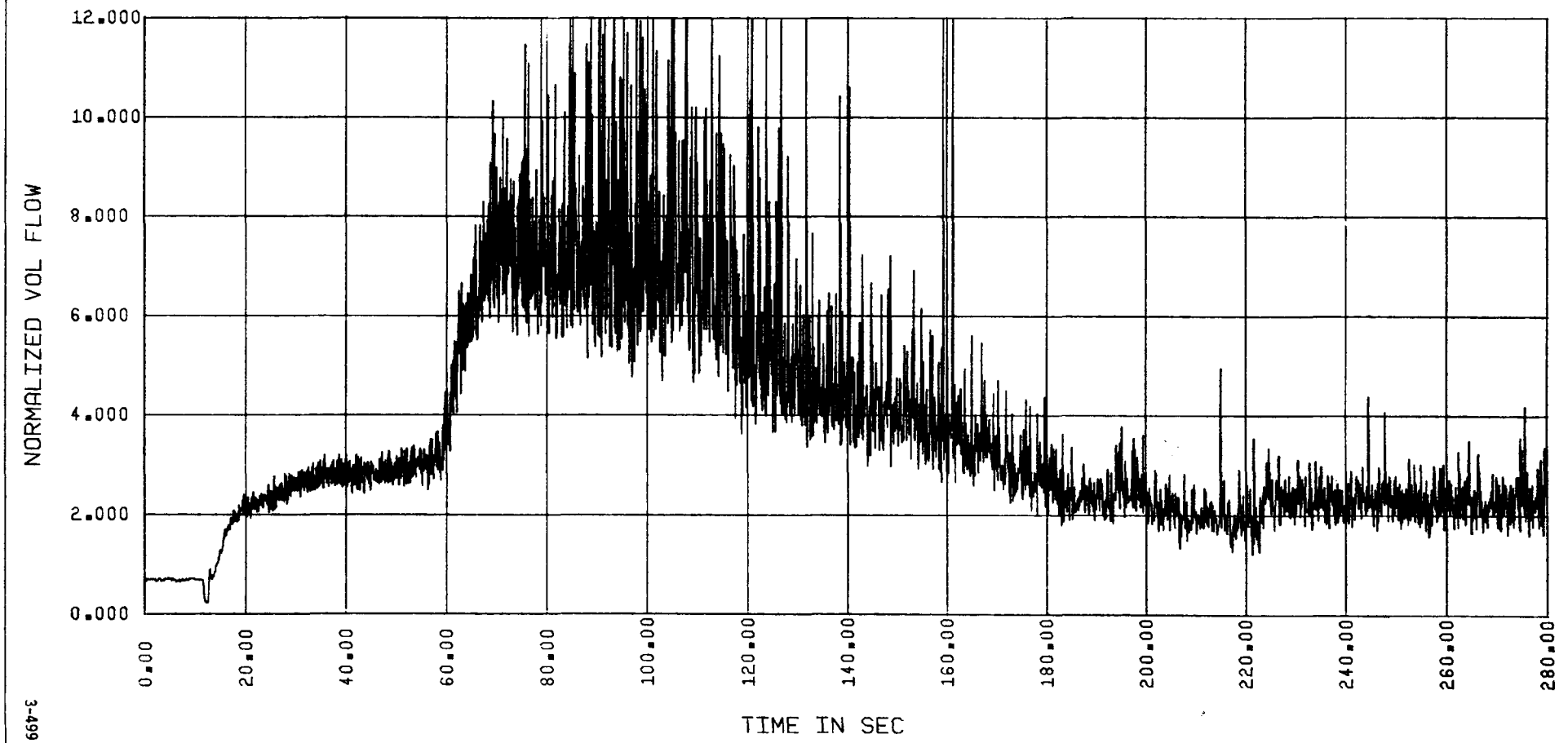
TEST 1156/1000 PSIA FW FWD BDN
N VOL FLOW HI-TM SUCT QR=3500
PLOT NO.27



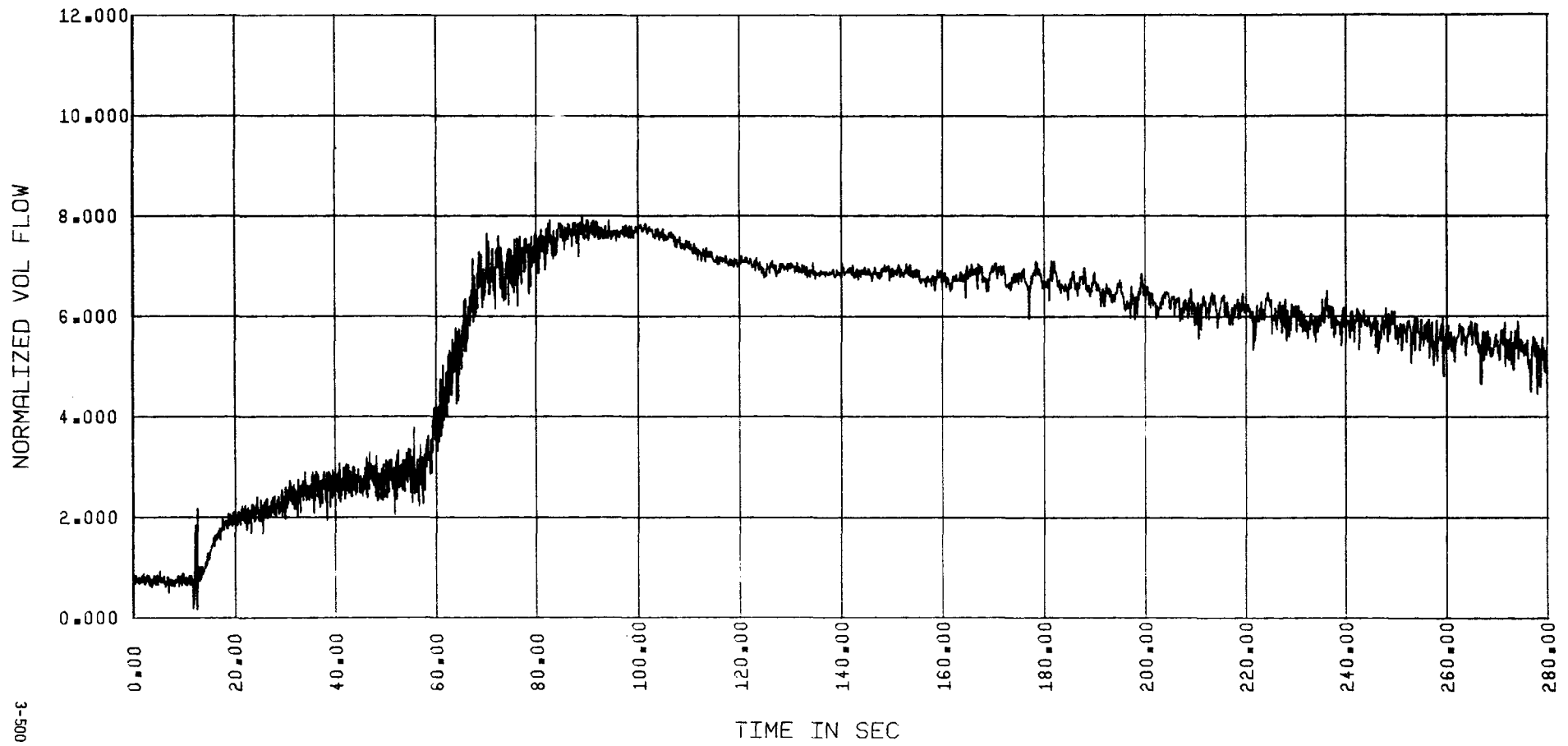
TEST 1156/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-DD/GD2 D
PLOT NO.28



TEST 1156/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-DD/GD2 D
PLOT NO.29

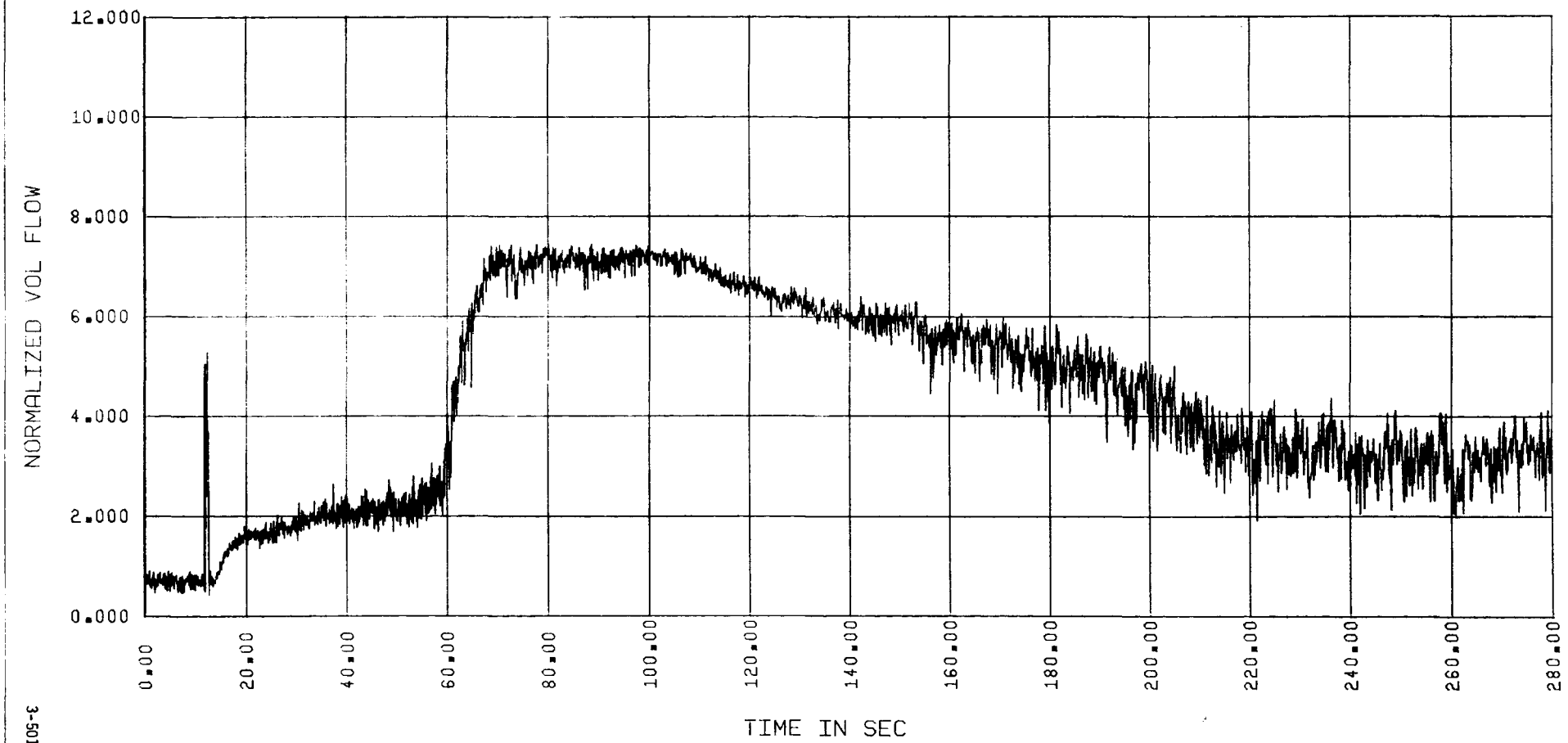


TEST 1156/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-TM DSCH
PLOT NO.30

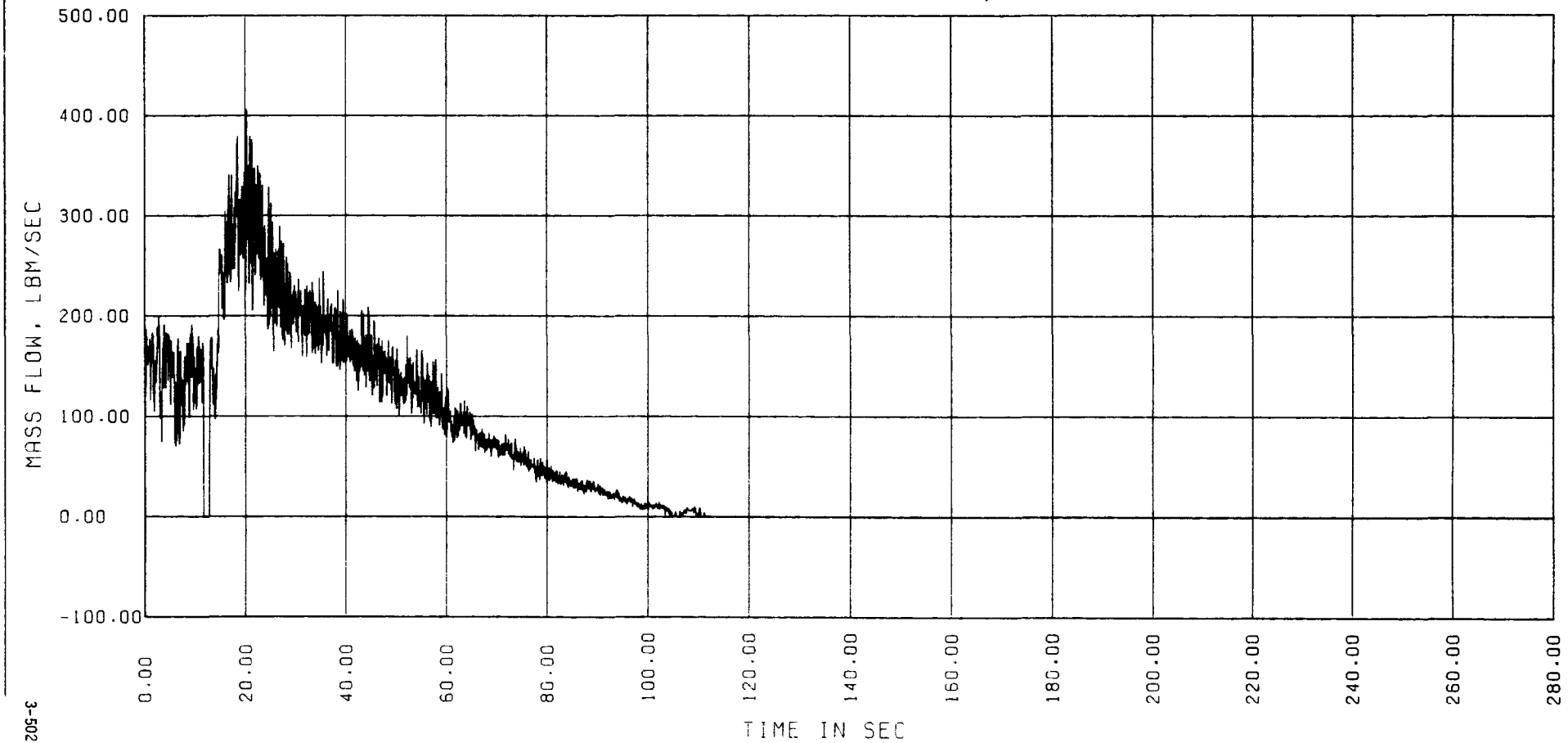


3-500

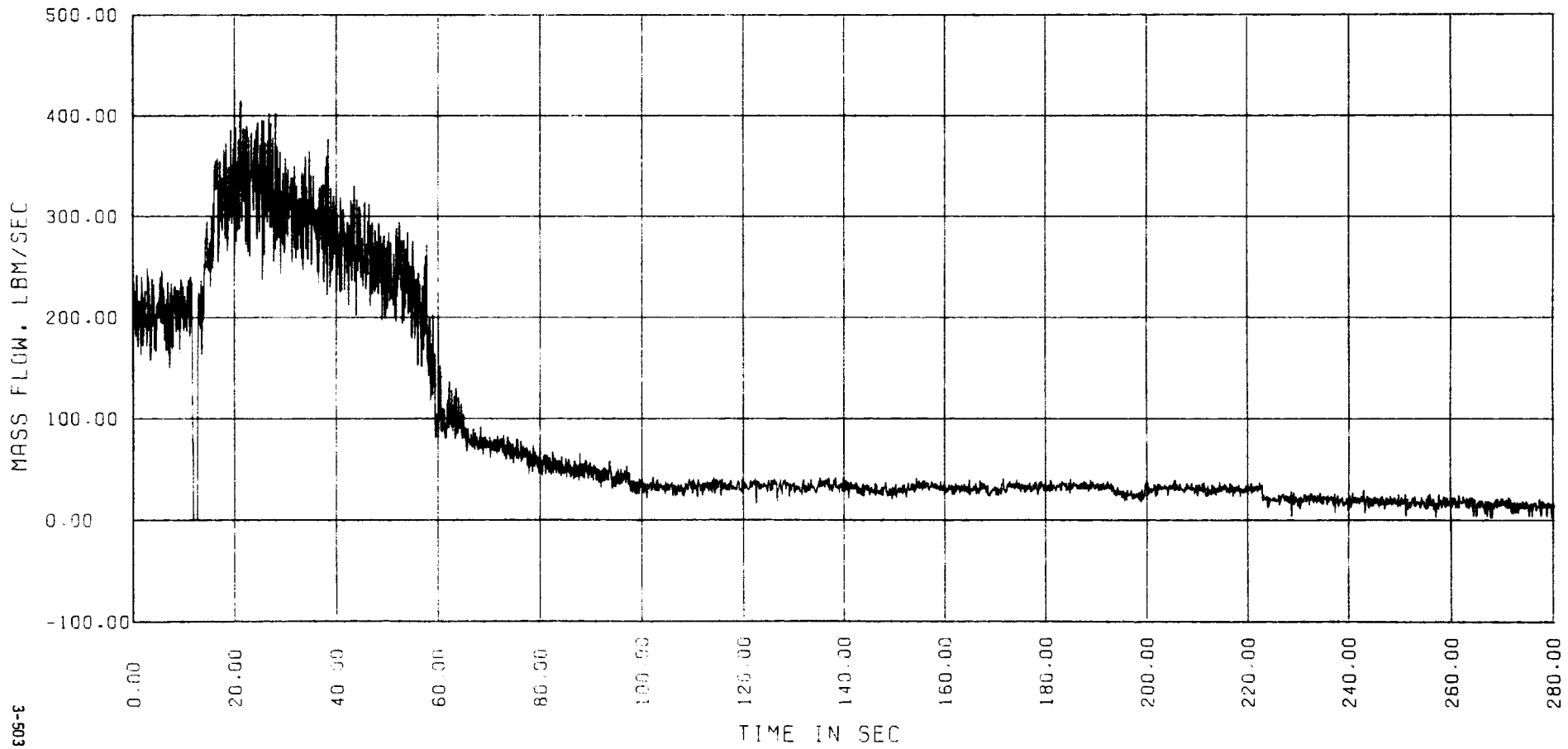
TEST 1156/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-TM DSCH
PLOT NO.31



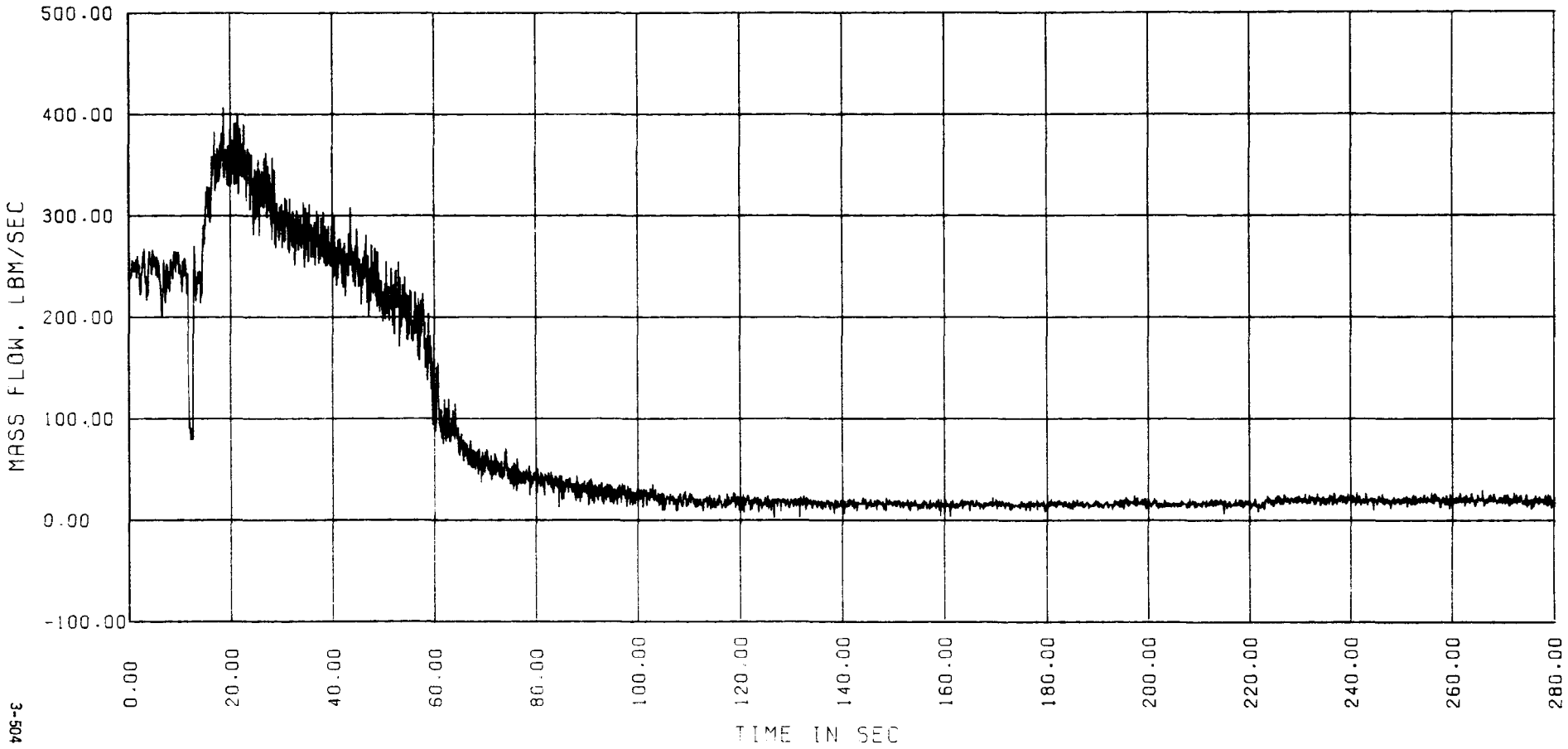
TEST 1156/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-OD/GO2 SUCT
PLOT NO.32



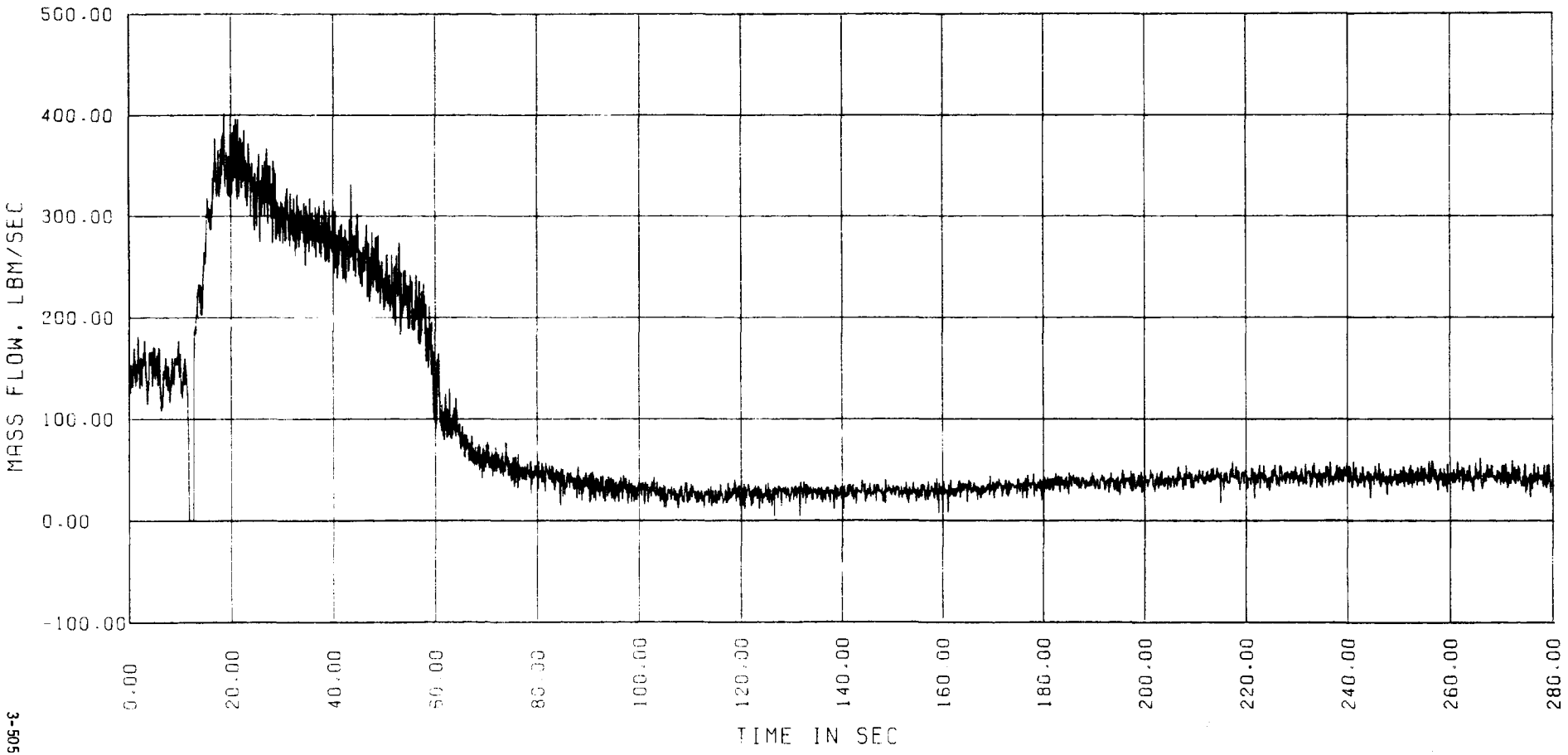
TEST 1156/1000 PSIA FW FWD BON
MASS FLOW RATE LO-DD/GO2 SUCT
PLOT NO.33



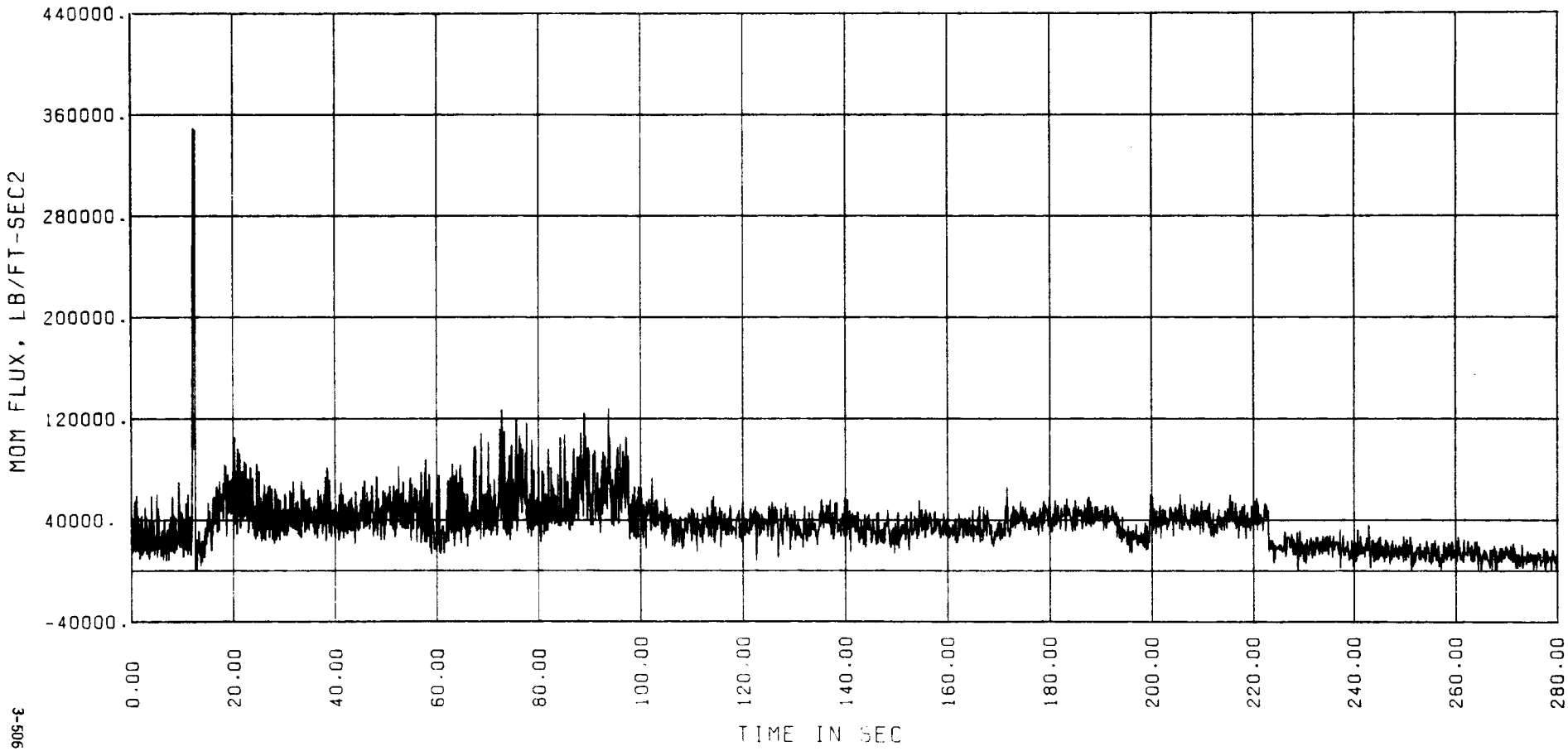
TEST 1156/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-DD/GD2 DISCH
PLOT NO.34



TEST 1156/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-DO/GO2 DISCH
PLOT NO.35

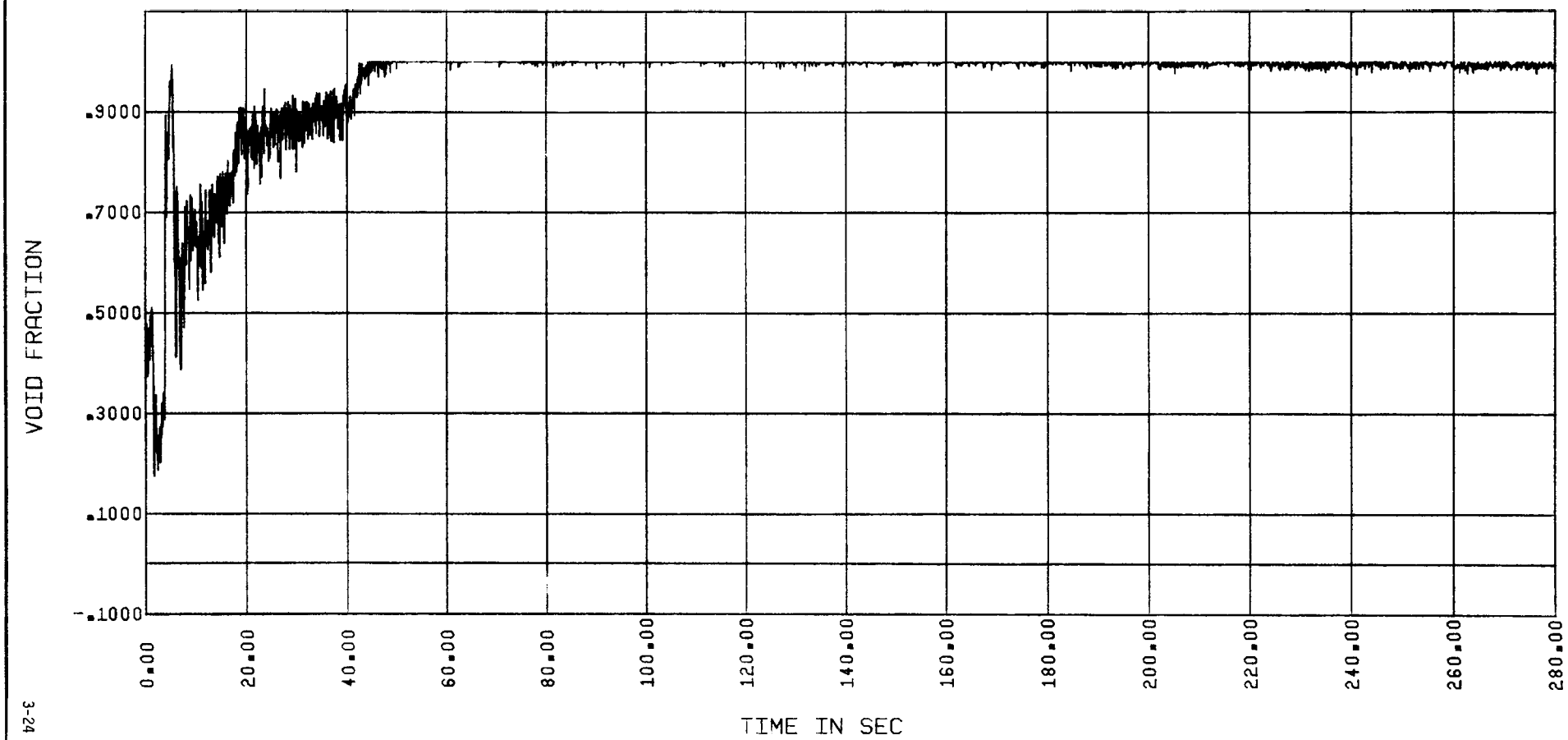


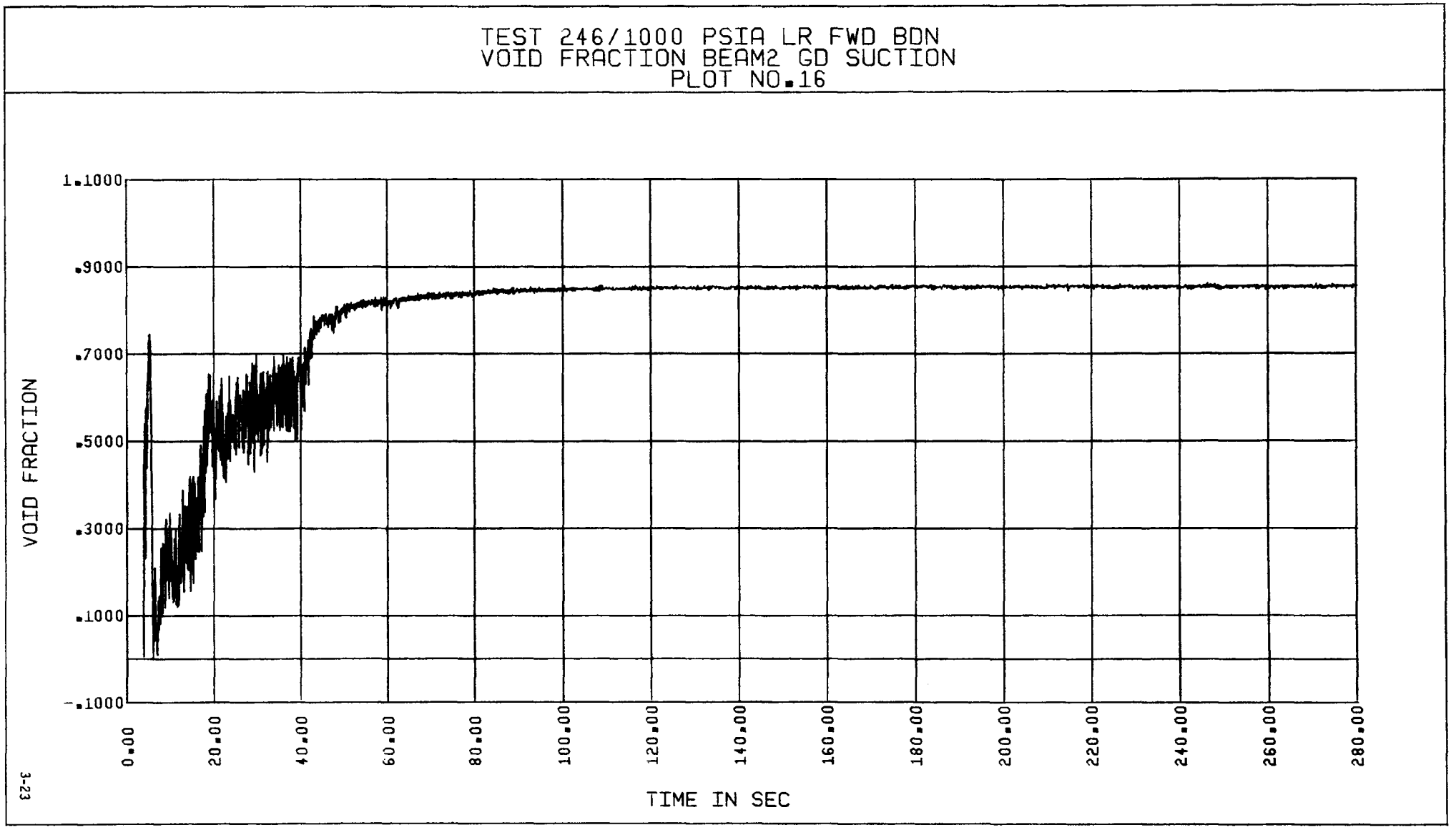
TEST 1156/1000 PSIA FW FWD BDN
MOMENTUM FLUX GO2/LO-TM SUCT
PLOT NO.36



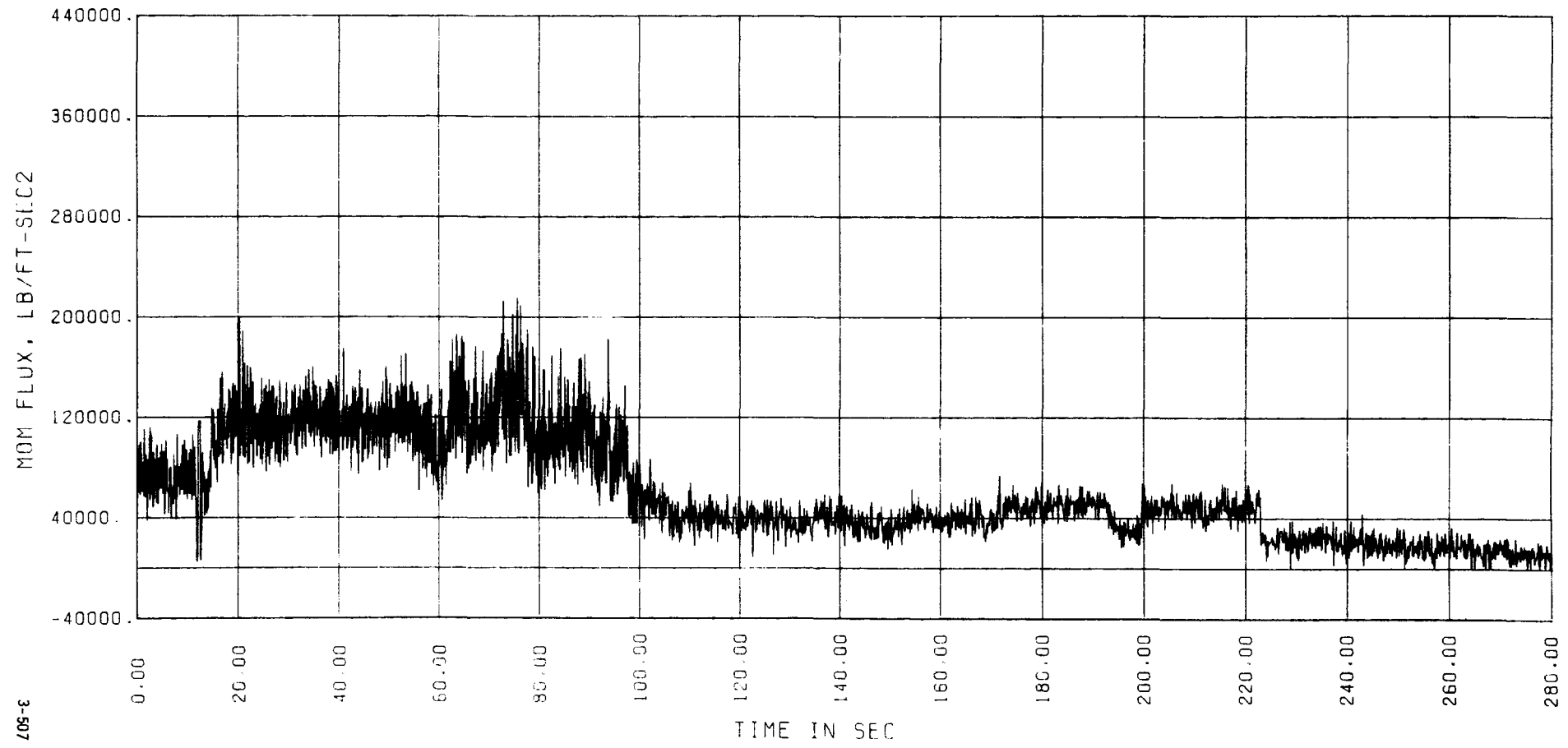
3-506

TEST 246/1000 PSIA LR FWD BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17

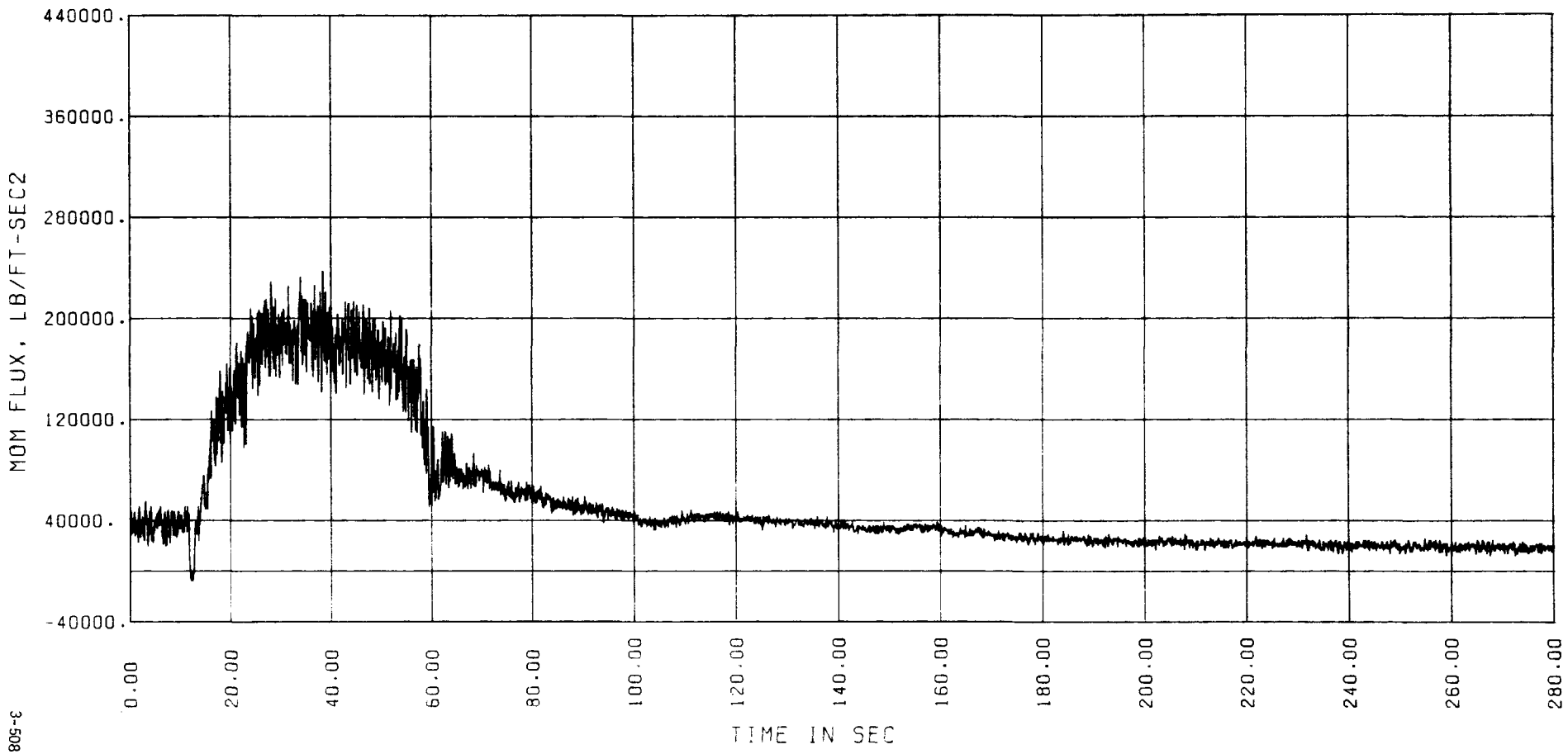



TEST 246/1000 PSIA LR FWD BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16
1.1000
.9000
.7000
.5000
.3000
.1000
-.1000
VOID FRACTION
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

TEST 1156/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.37

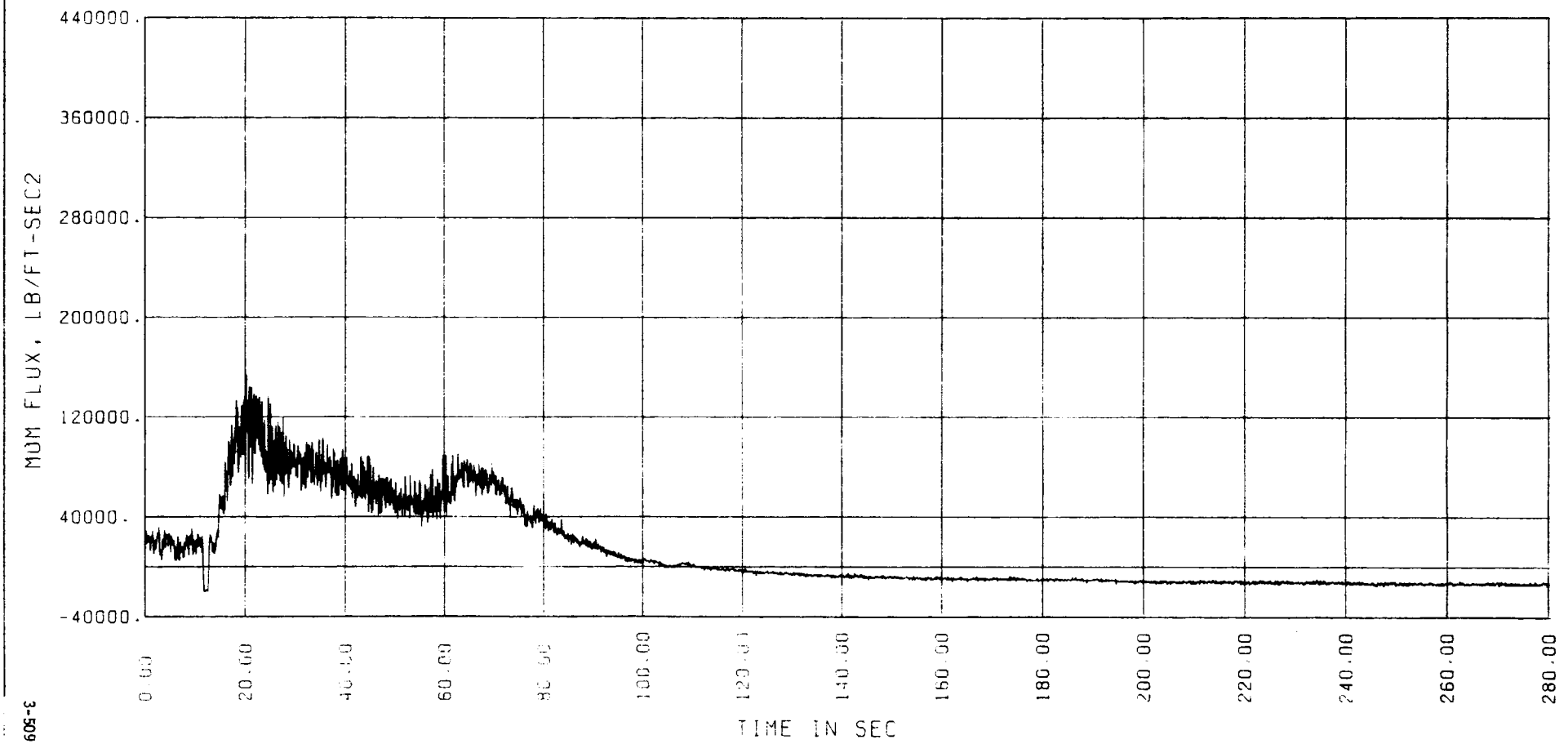


TEST 1156/1000 PSIA FW FWD BDN
MOMENTUM FLUX LO-OD SUCTION
PLOT NO.38



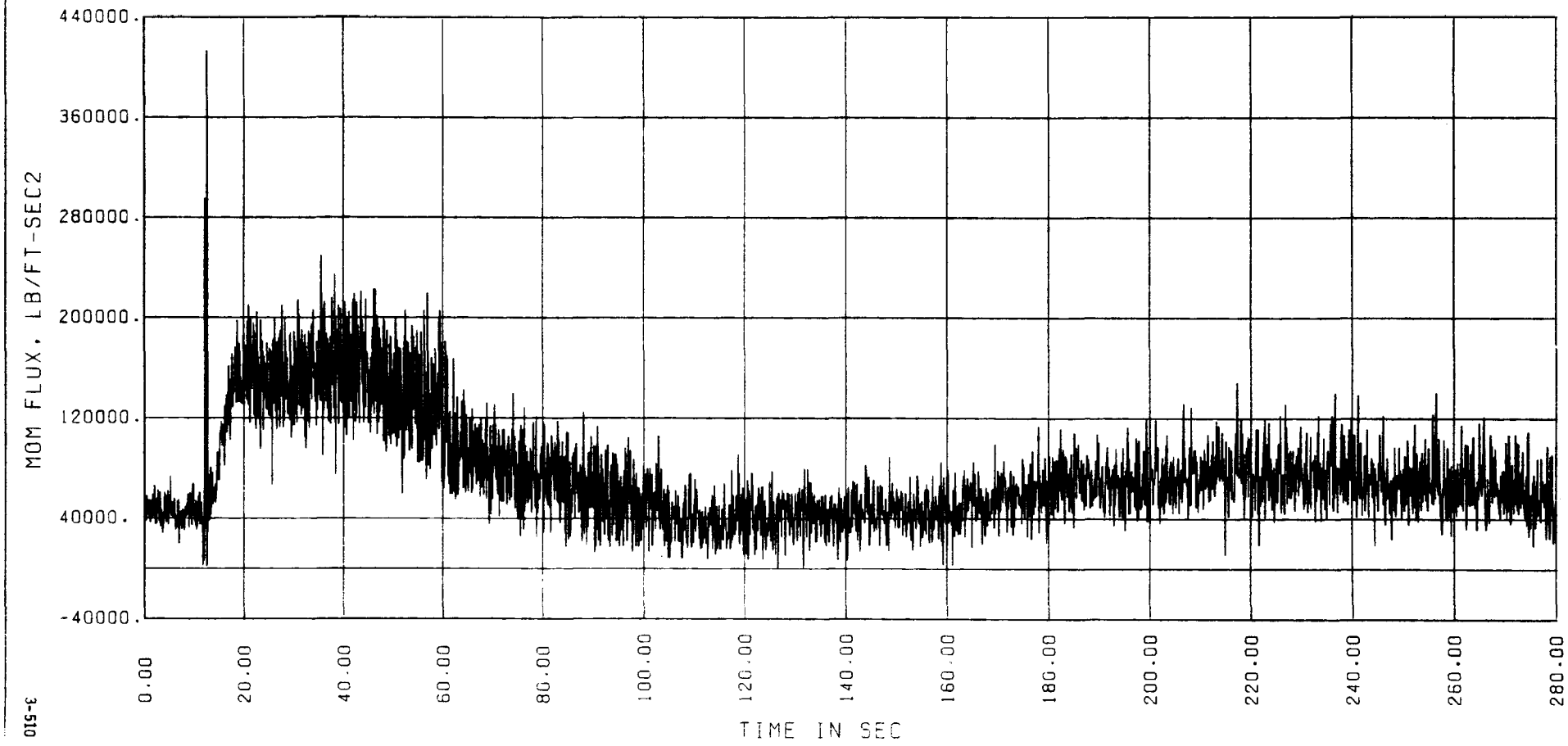
3-508

TEST 1156/1000 PSIA FW FWD BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39



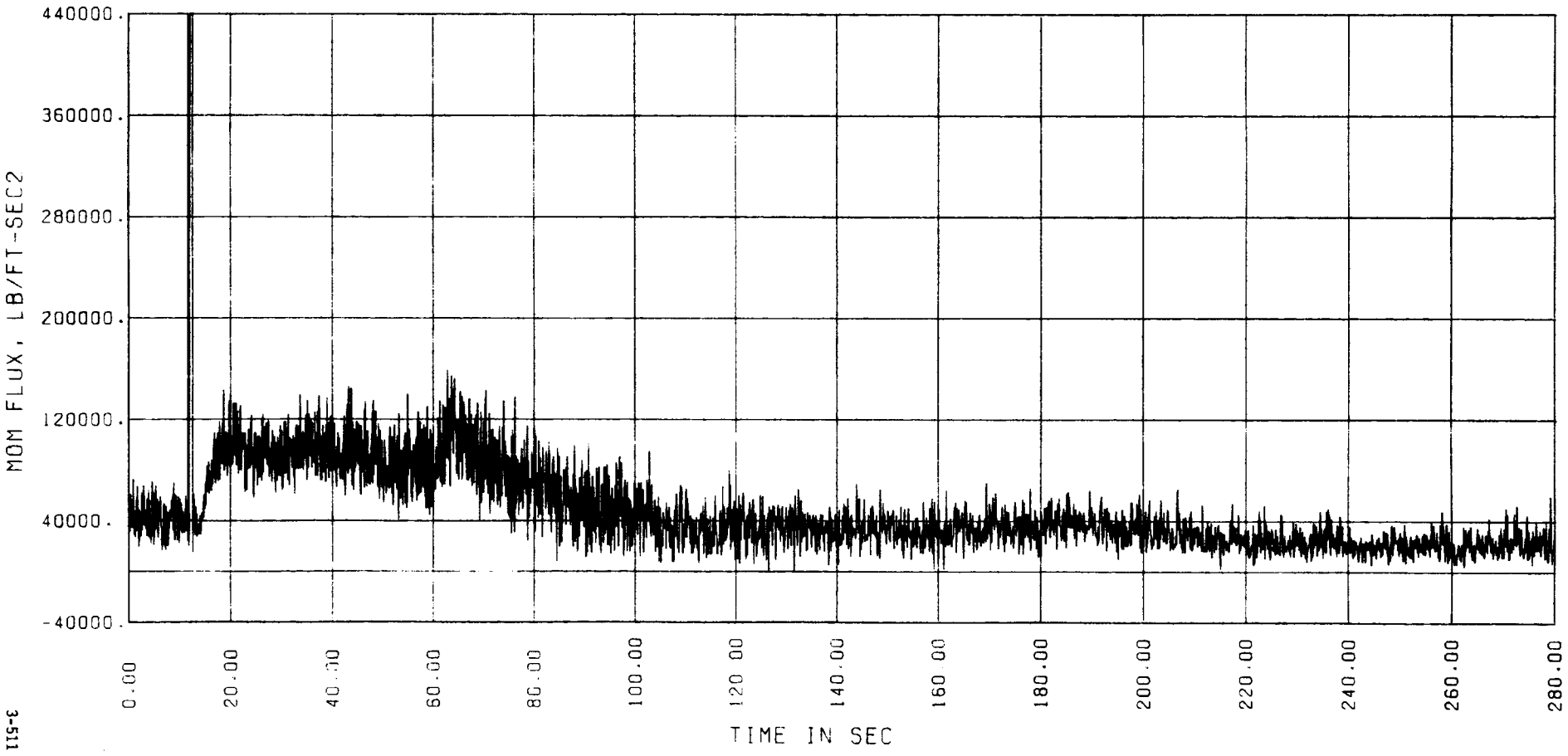
3-509

TEST 1156/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/LO-TM DISCH
PLOT NO.40

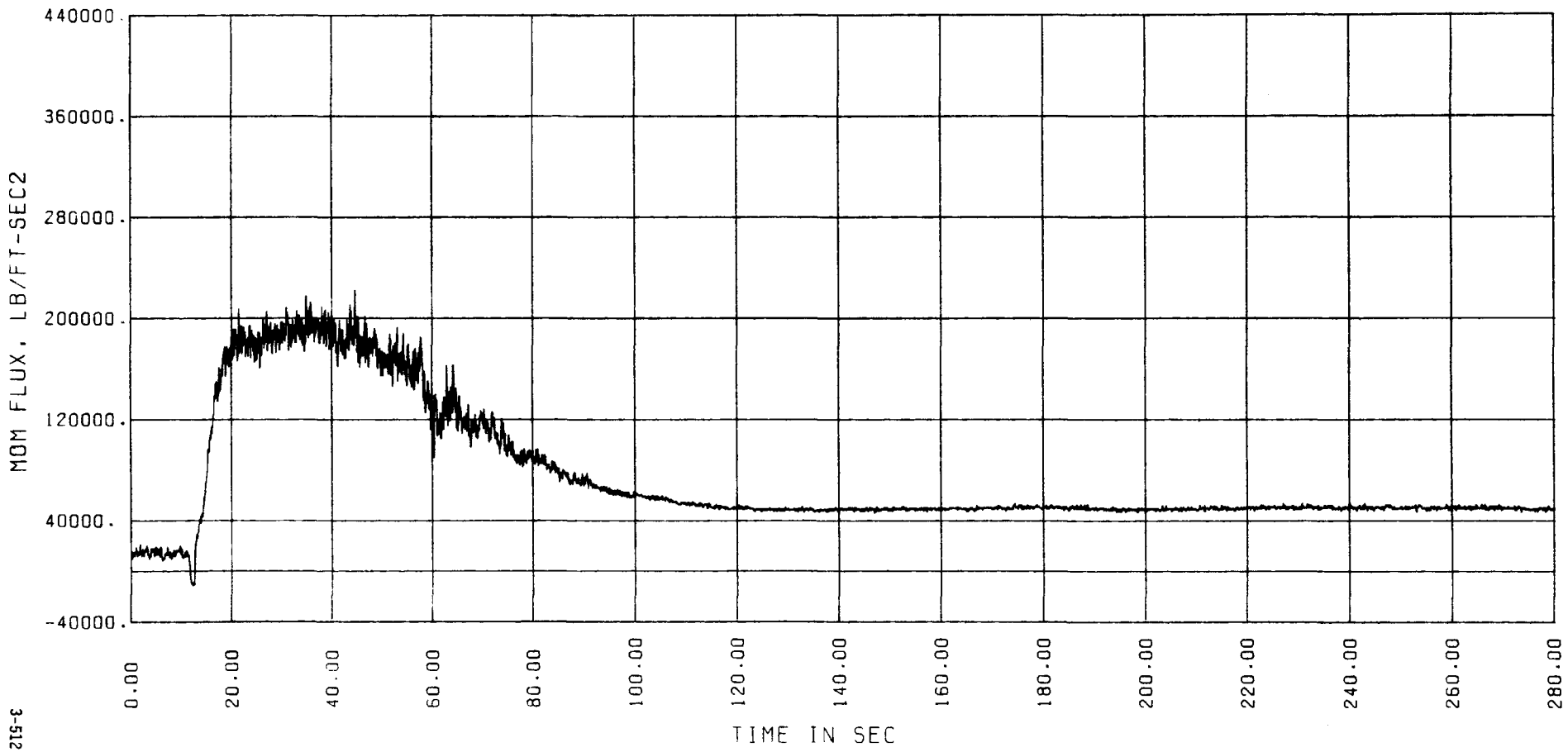


3-510

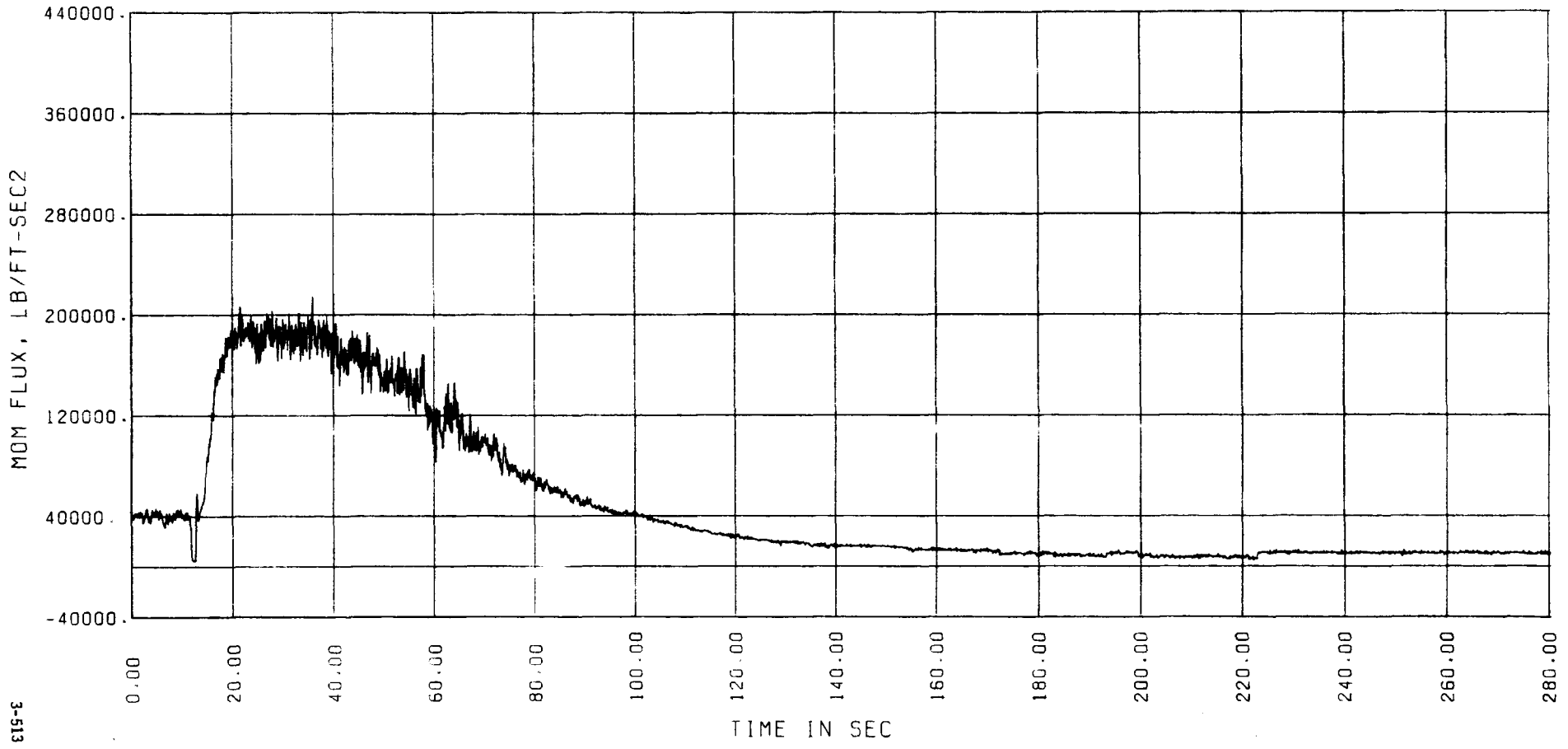
TEST 1156/1000 PSIA FW FWD BDN
MOMENTUM FLUX GO2/HI-TM DISCH
PLOT NO.41



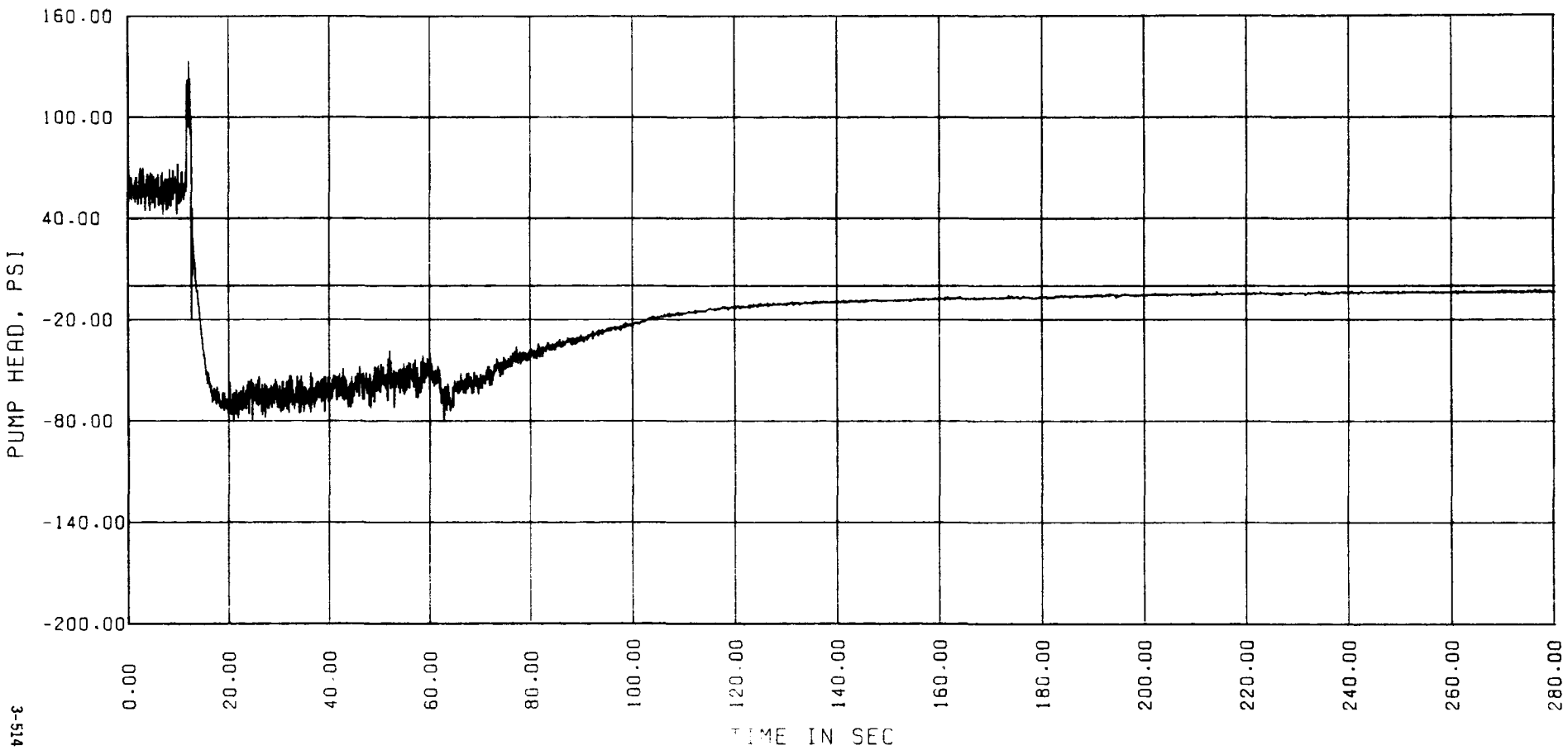
TEST 1156/1000 PSIA FW FWD BDN
MOMENTUM FLUX LO-OO DISCHARGE
PLOT NO.42

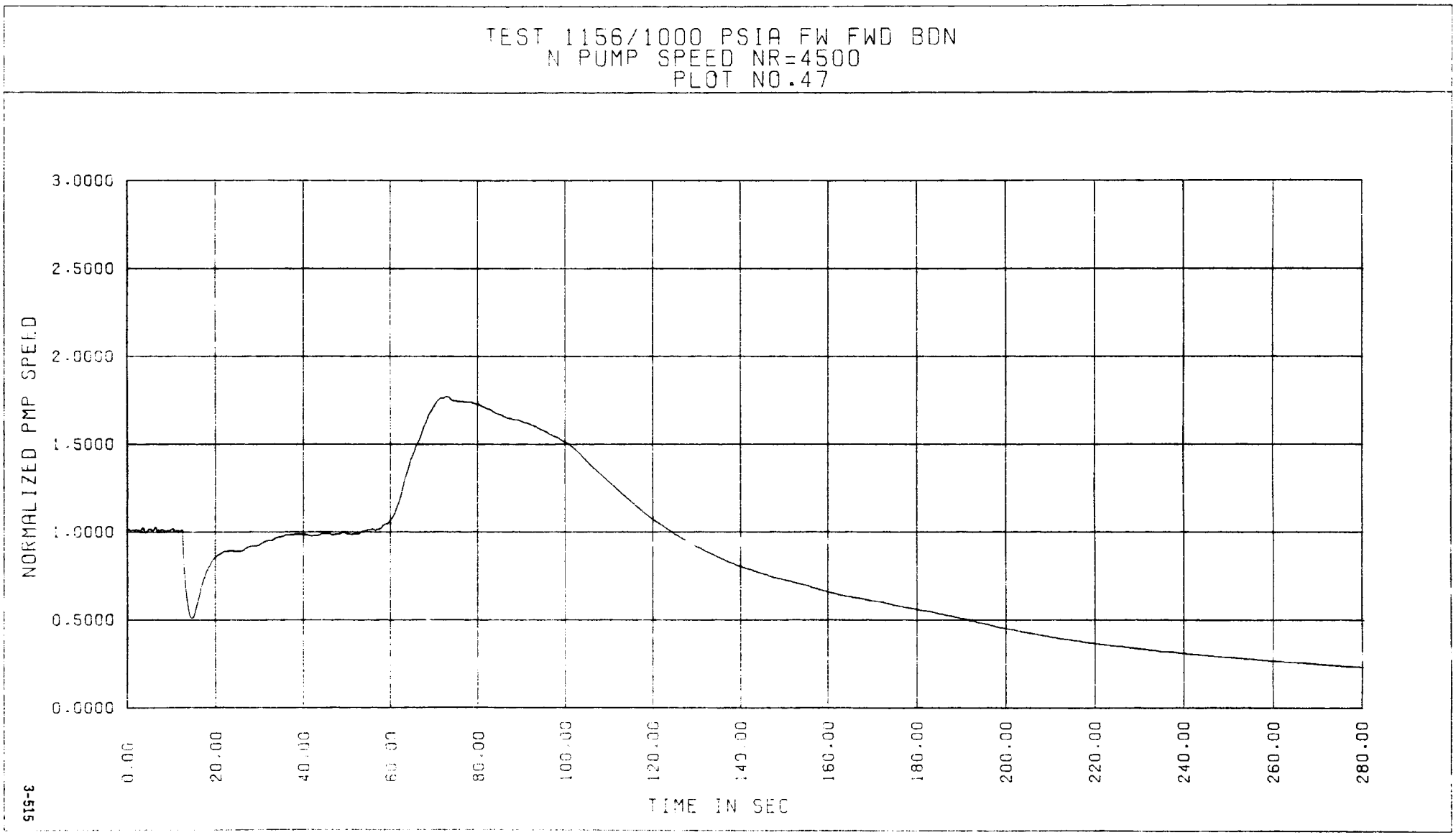


TEST 1156/1000 PSIA FW FWD BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.43

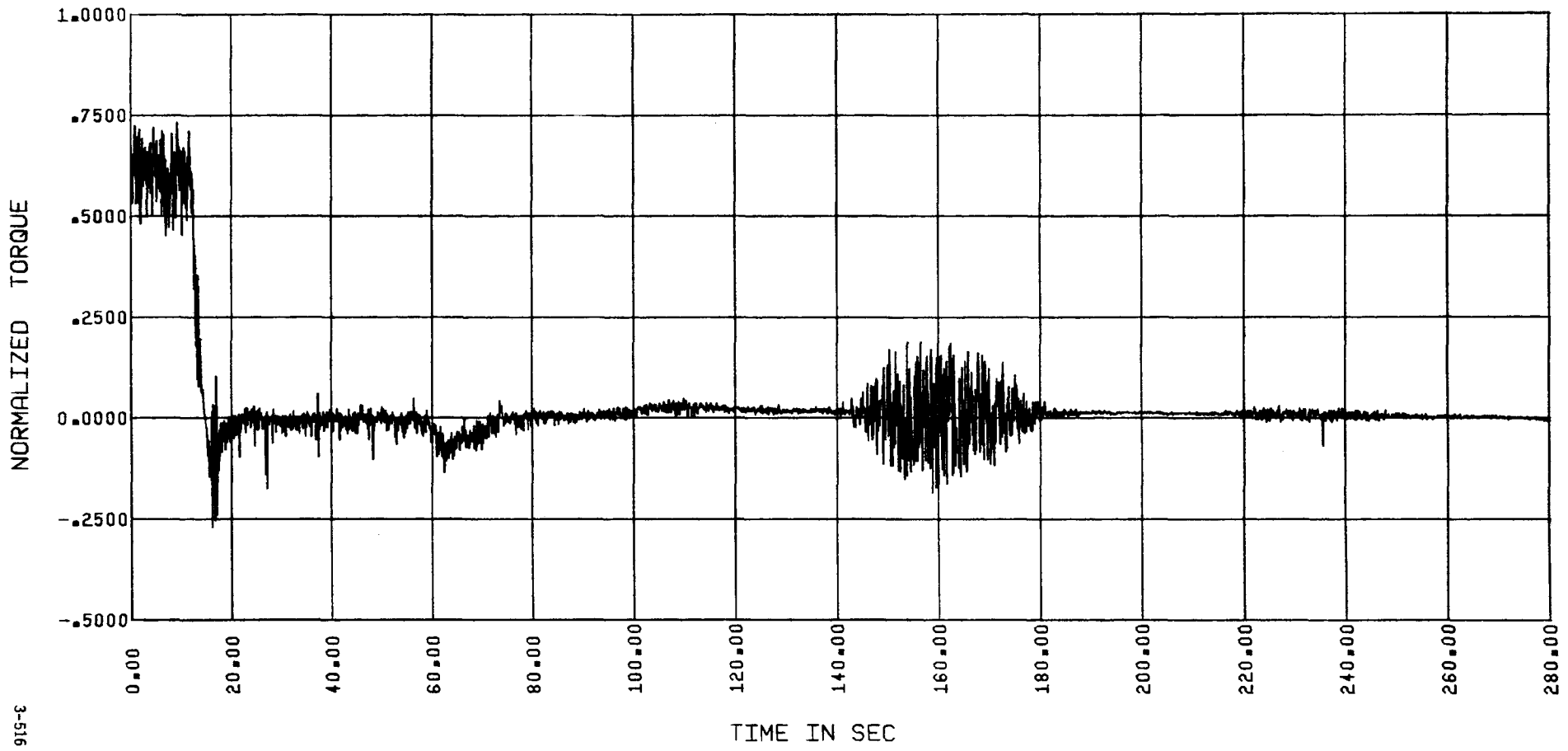


TEST 1156/1000 PSIA FW FWD BDN
PUMP HEAD IN PSI
PLOT NO.44

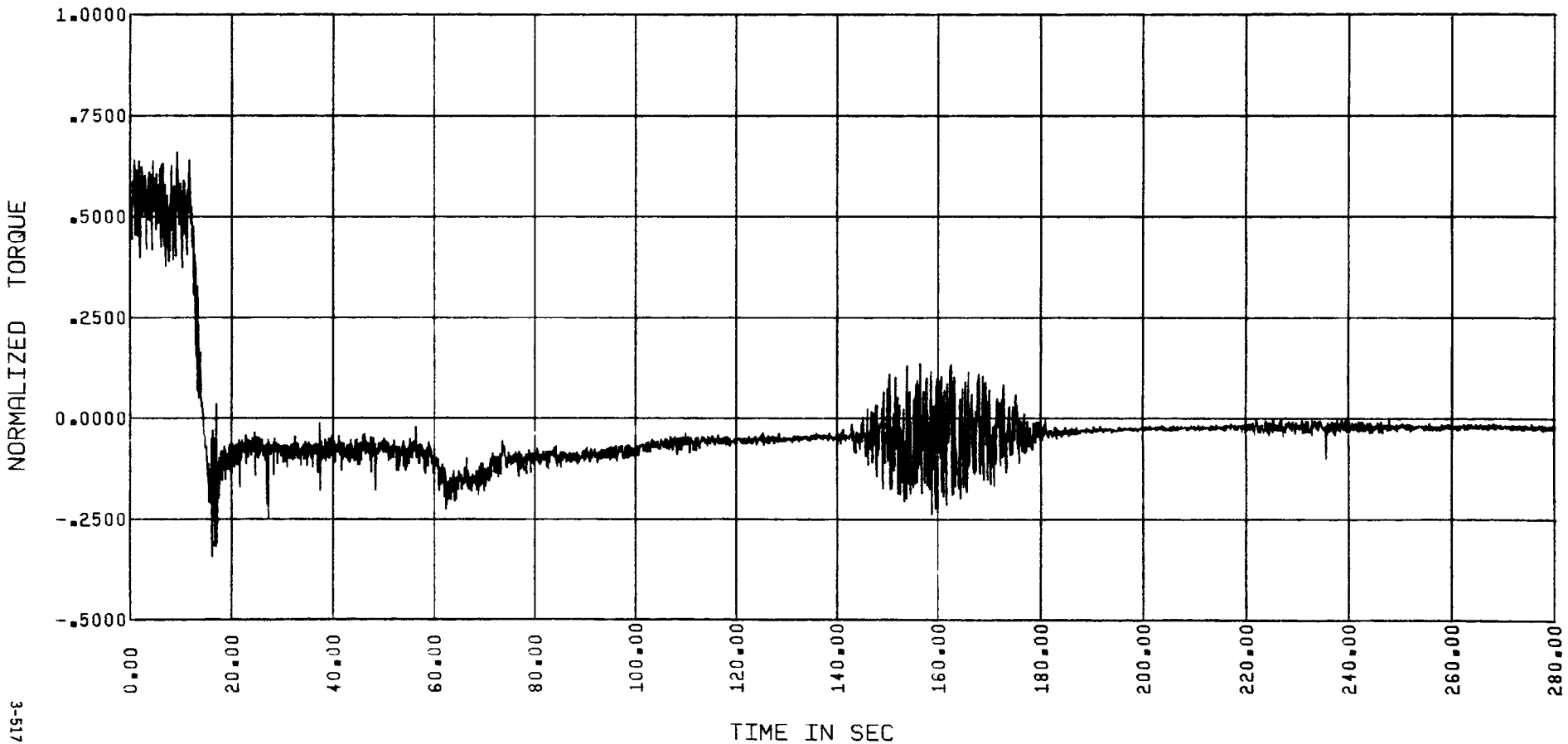



TEST 1156/1000 PSIA FW FWD BDN
N PUMP SPEED NR=4500
PLOT NO.47
NORMALIZED PMP SPEED
3.0000
2.5000
2.0000
1.5000
1.0000
0.5000
0.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

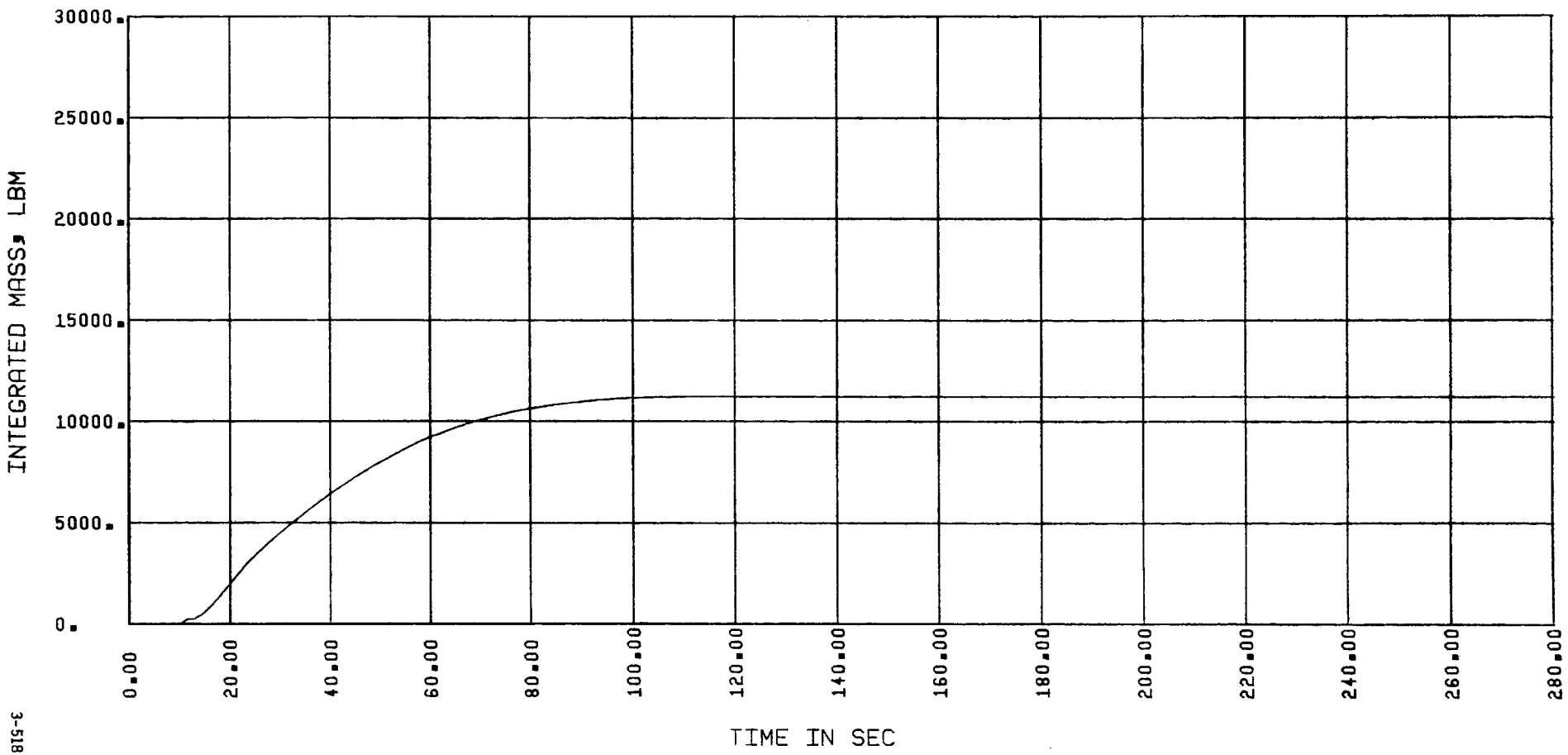
TEST 1156/1000 PSIA FW FWD BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.48



TEST 1156/1000 PSIA FW FWD BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.49



TEST 1156/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50



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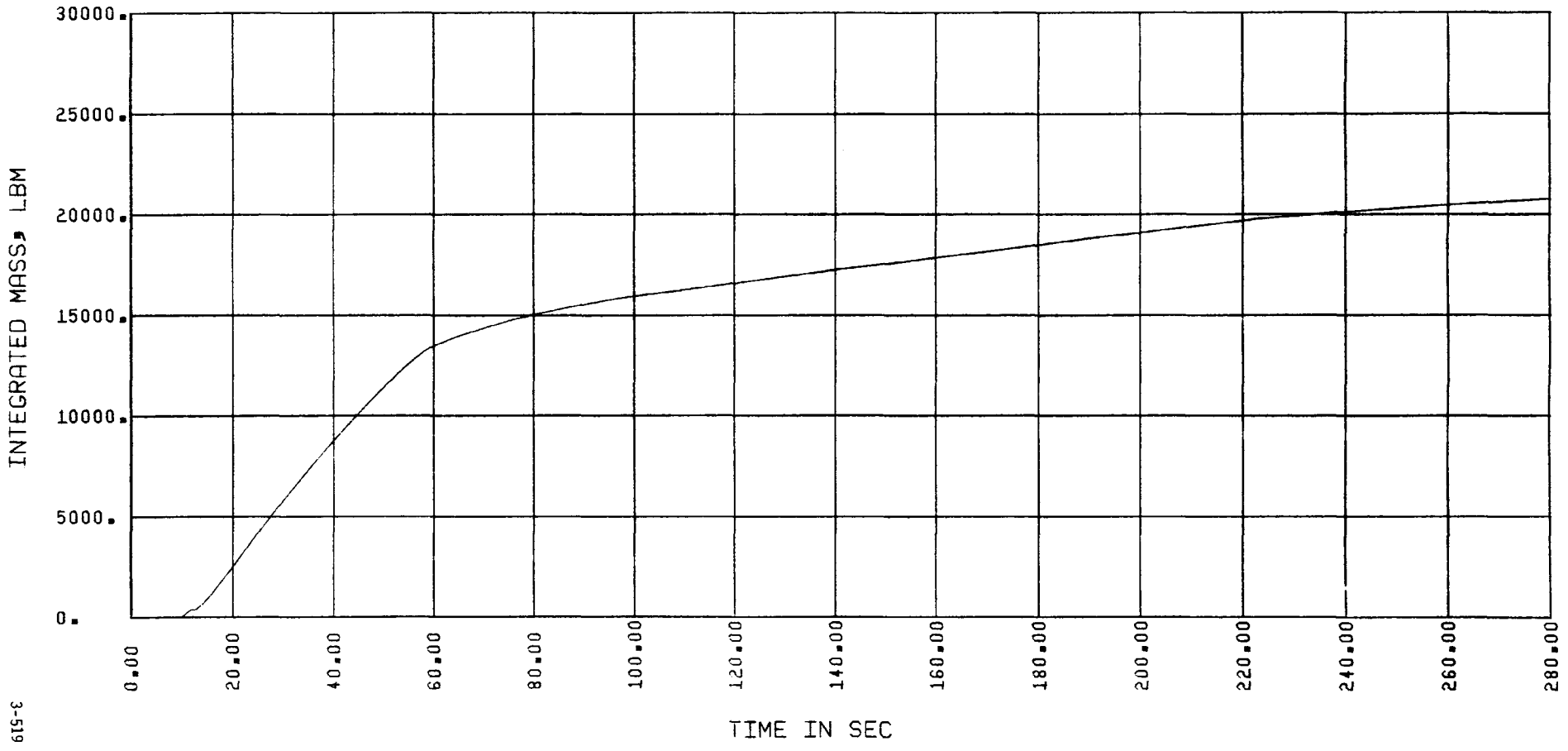
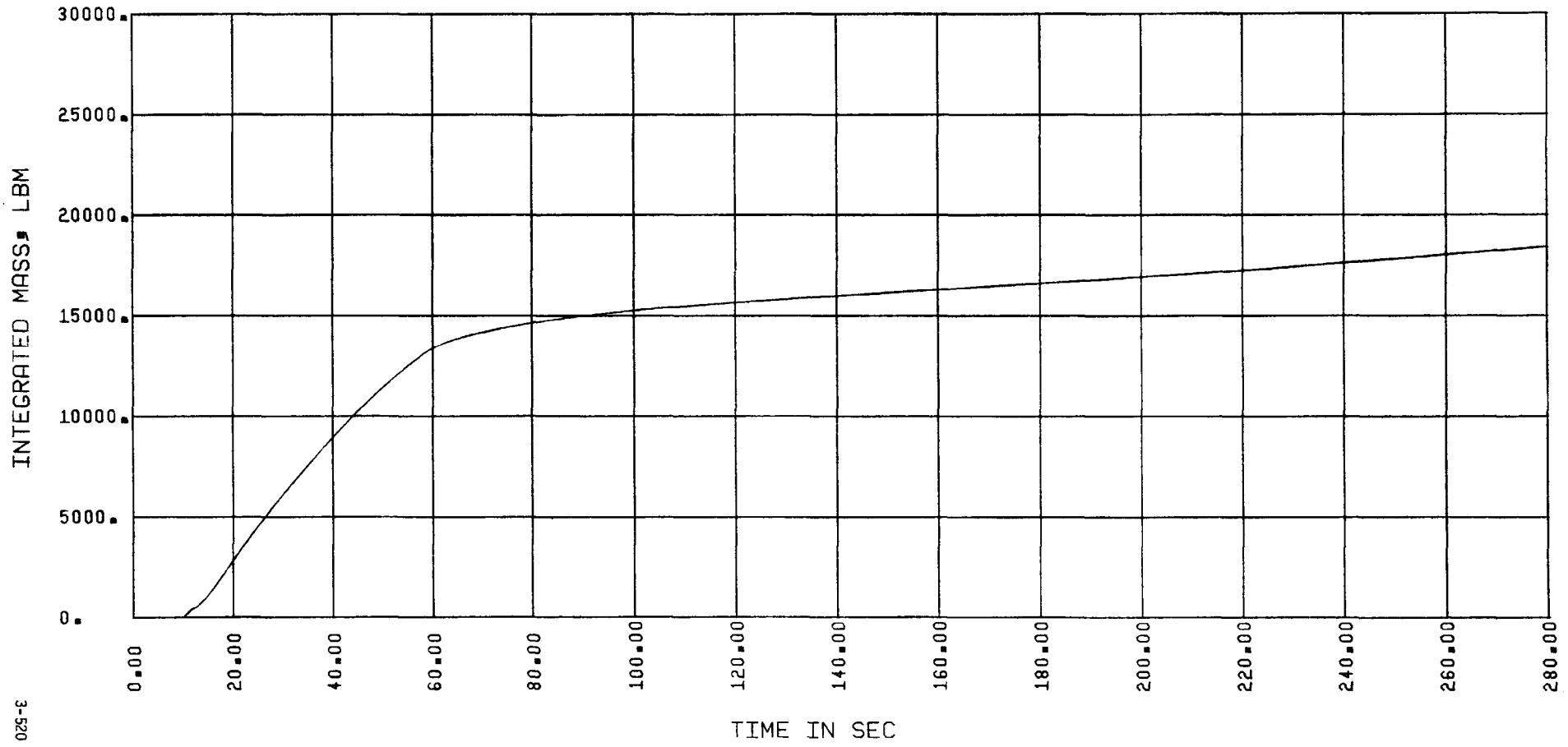
TEST 1156/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.51

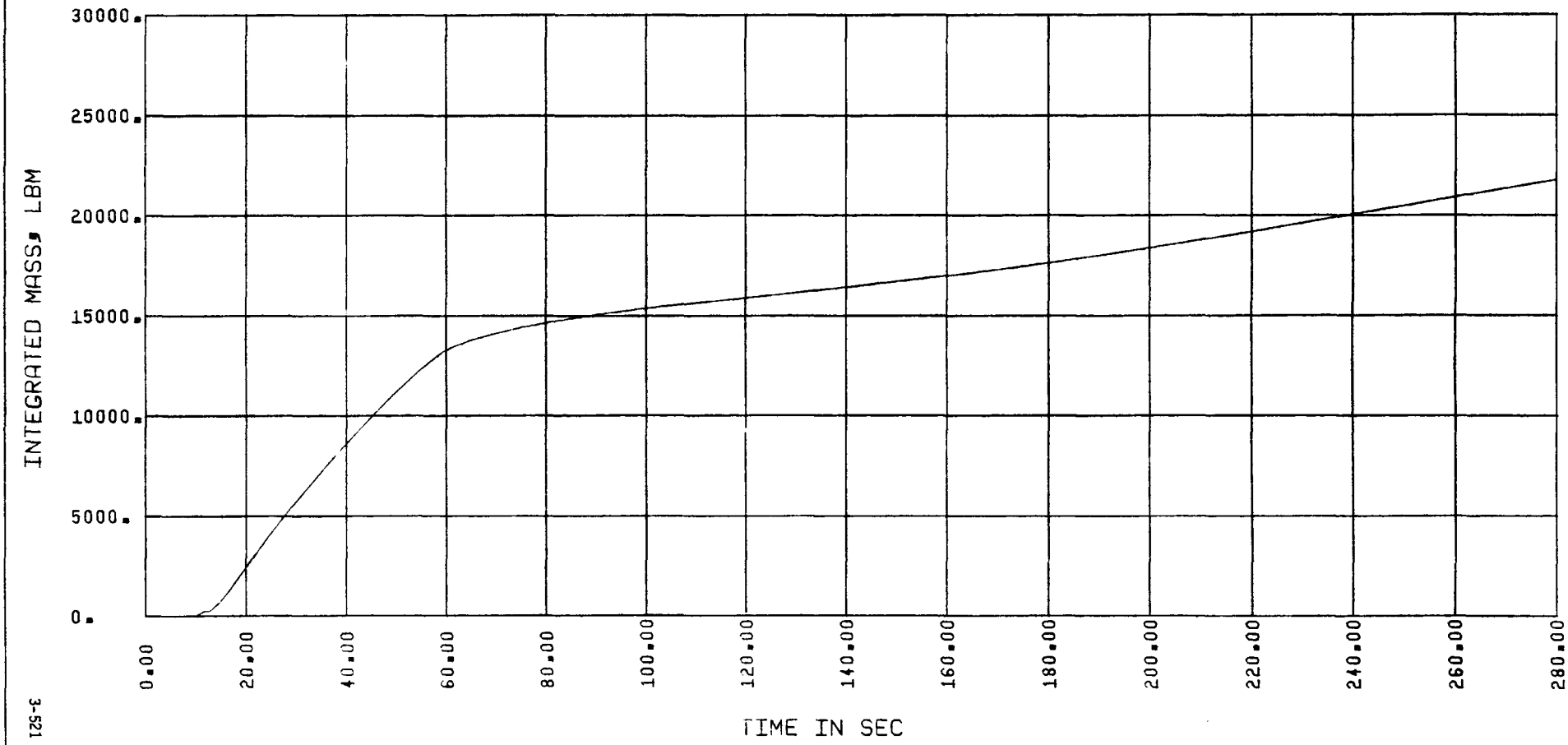


3-519

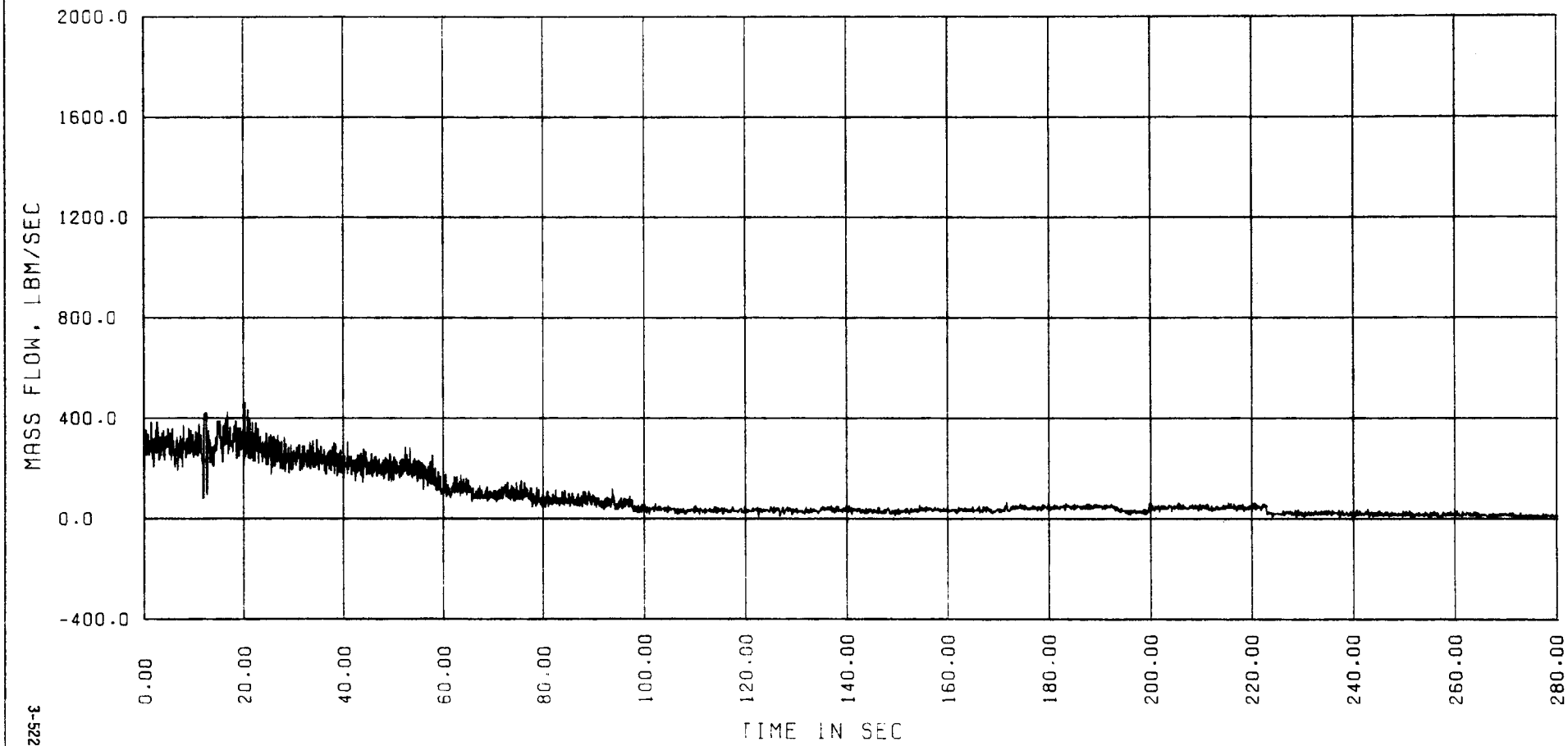
TEST 1156/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.52



TEST 1156/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.53

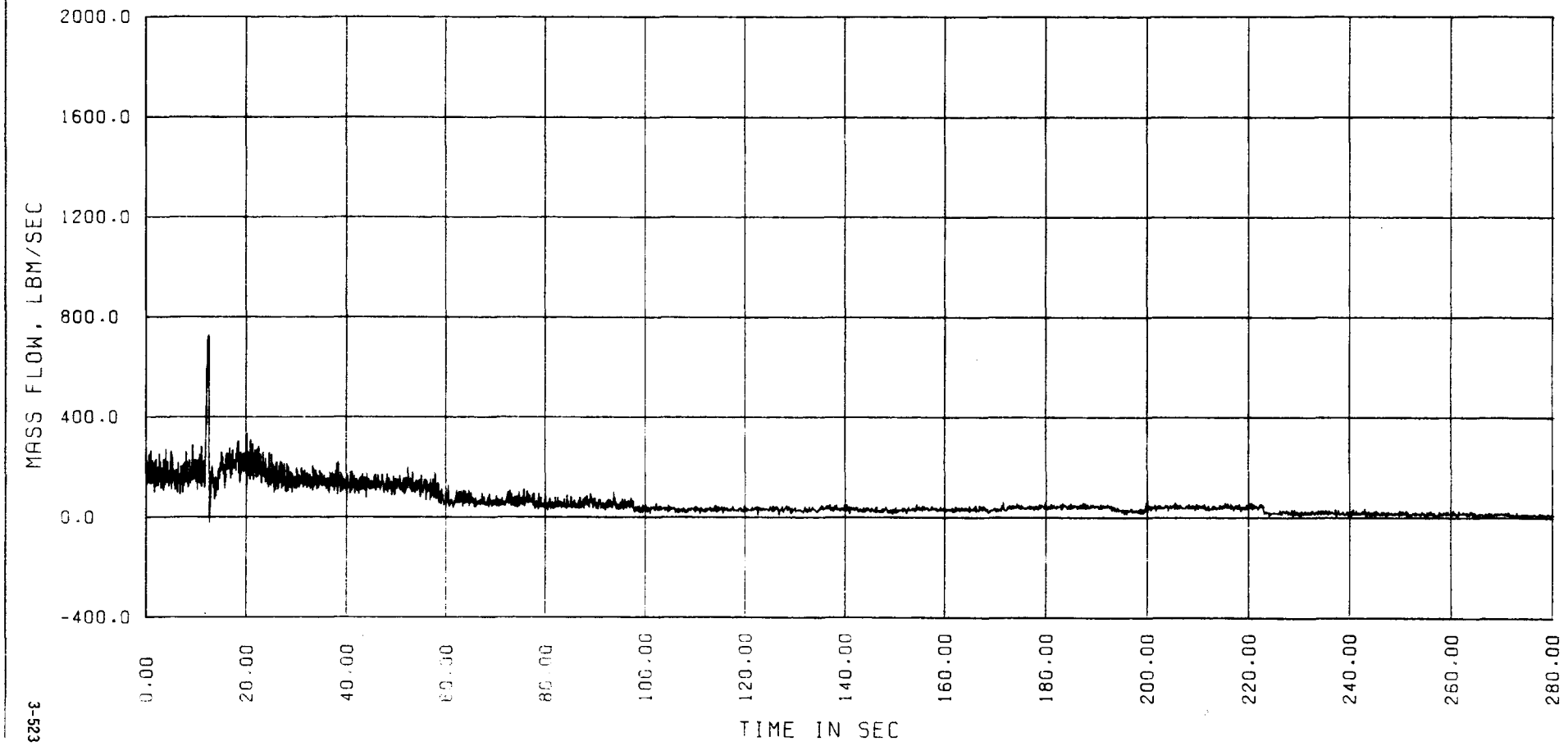


TEST 1156/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54

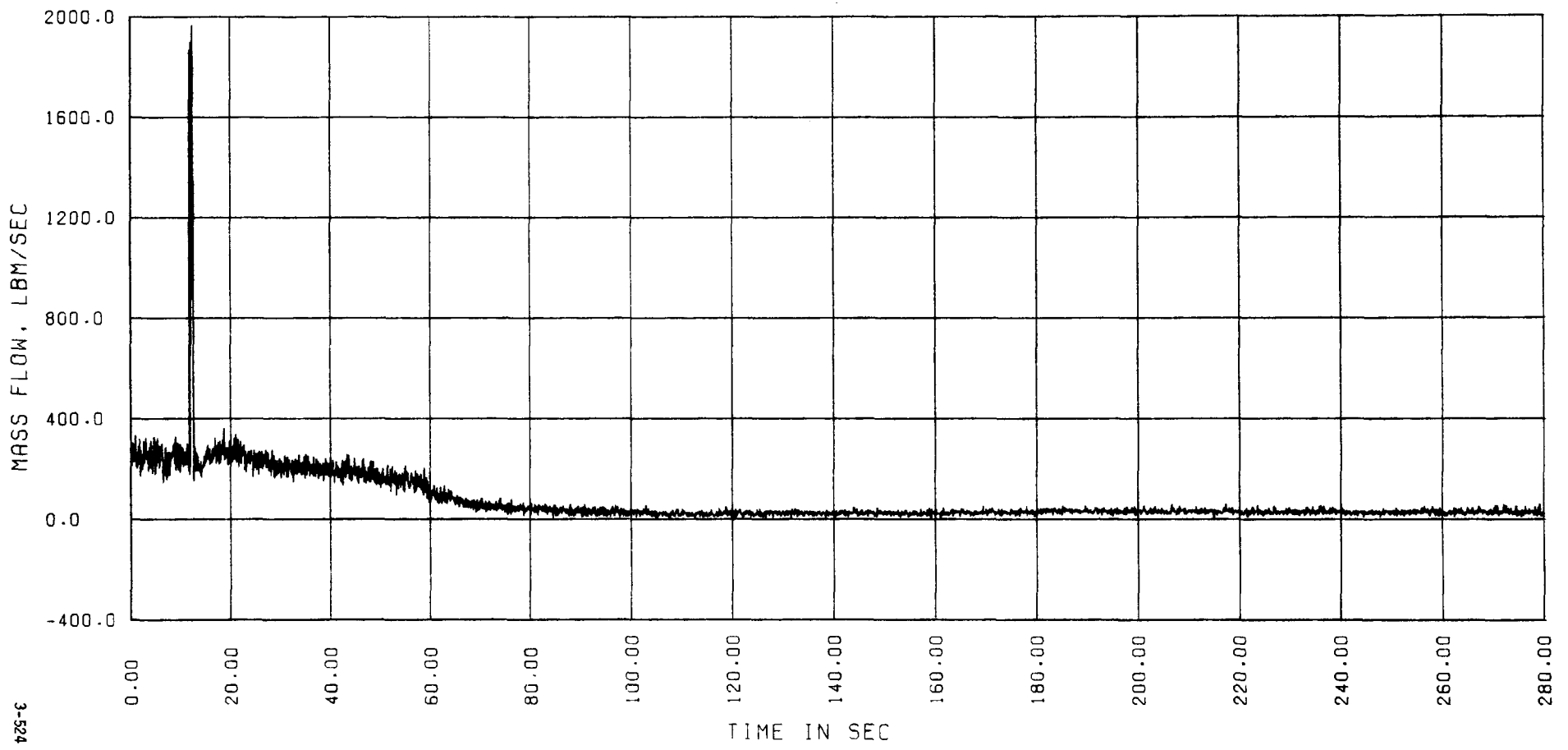


3-522

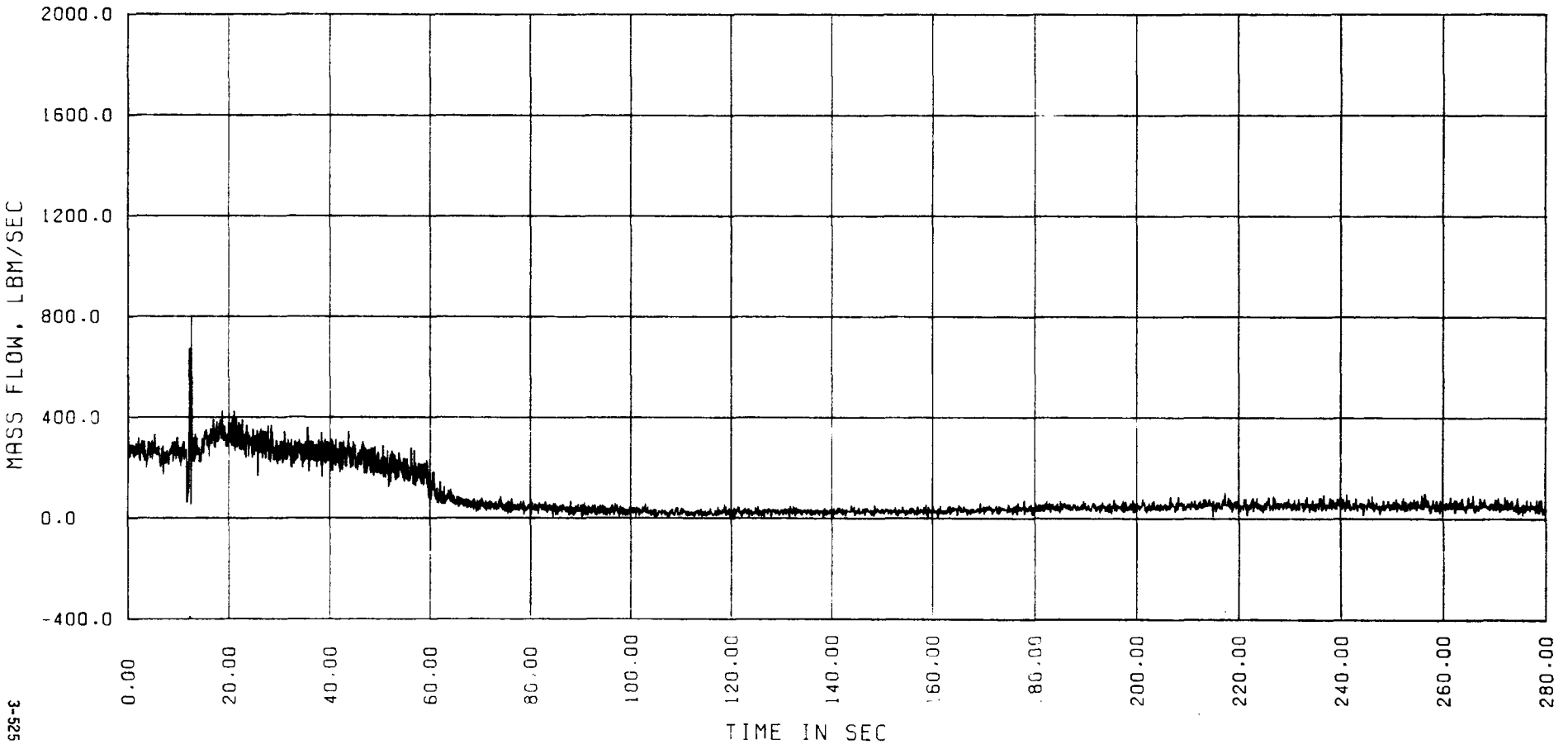
TEST 1156/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-TM/GO2 SUCT
PLOT NO.55



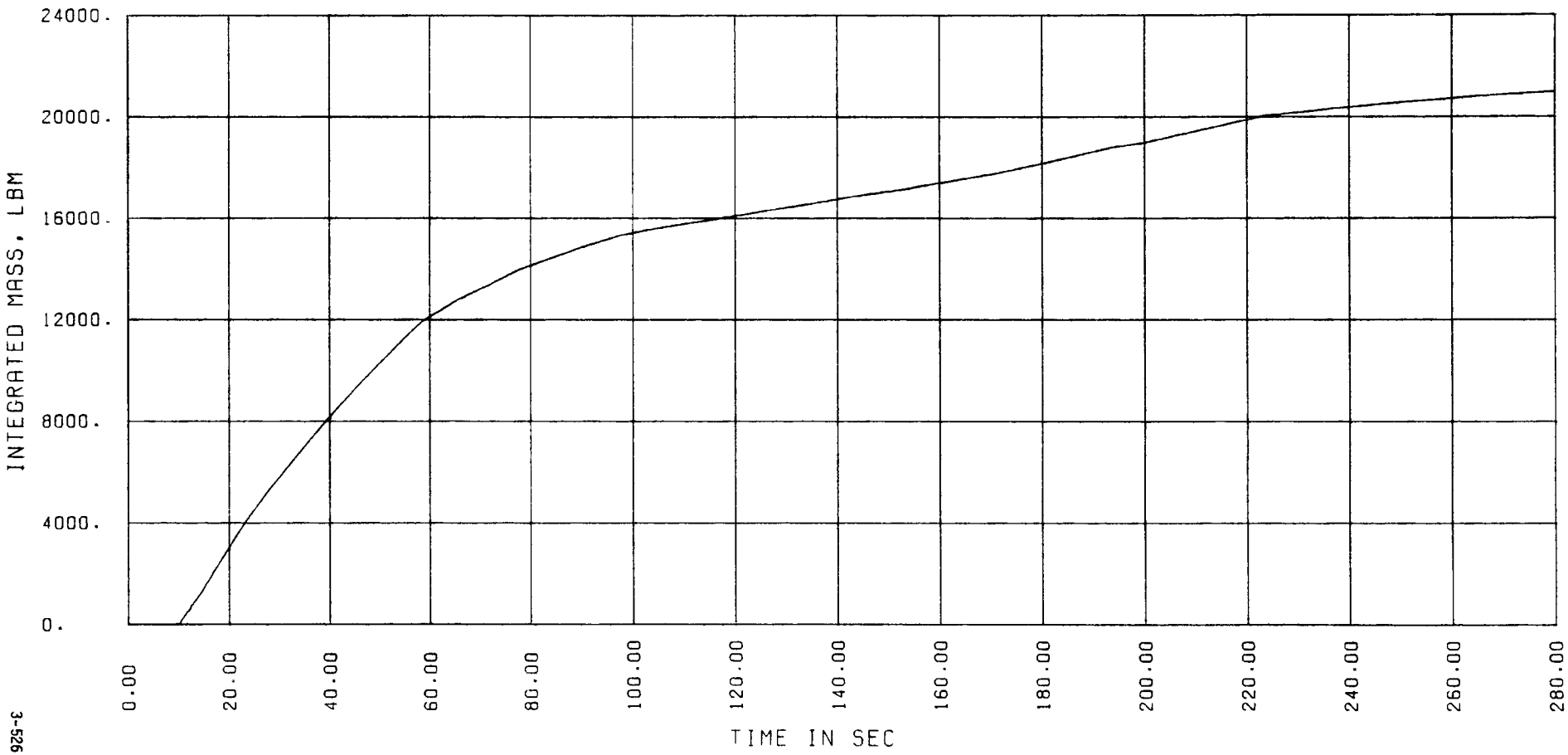
TEST 1156/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-TM/GD2 DISCH
PLOT NO.56



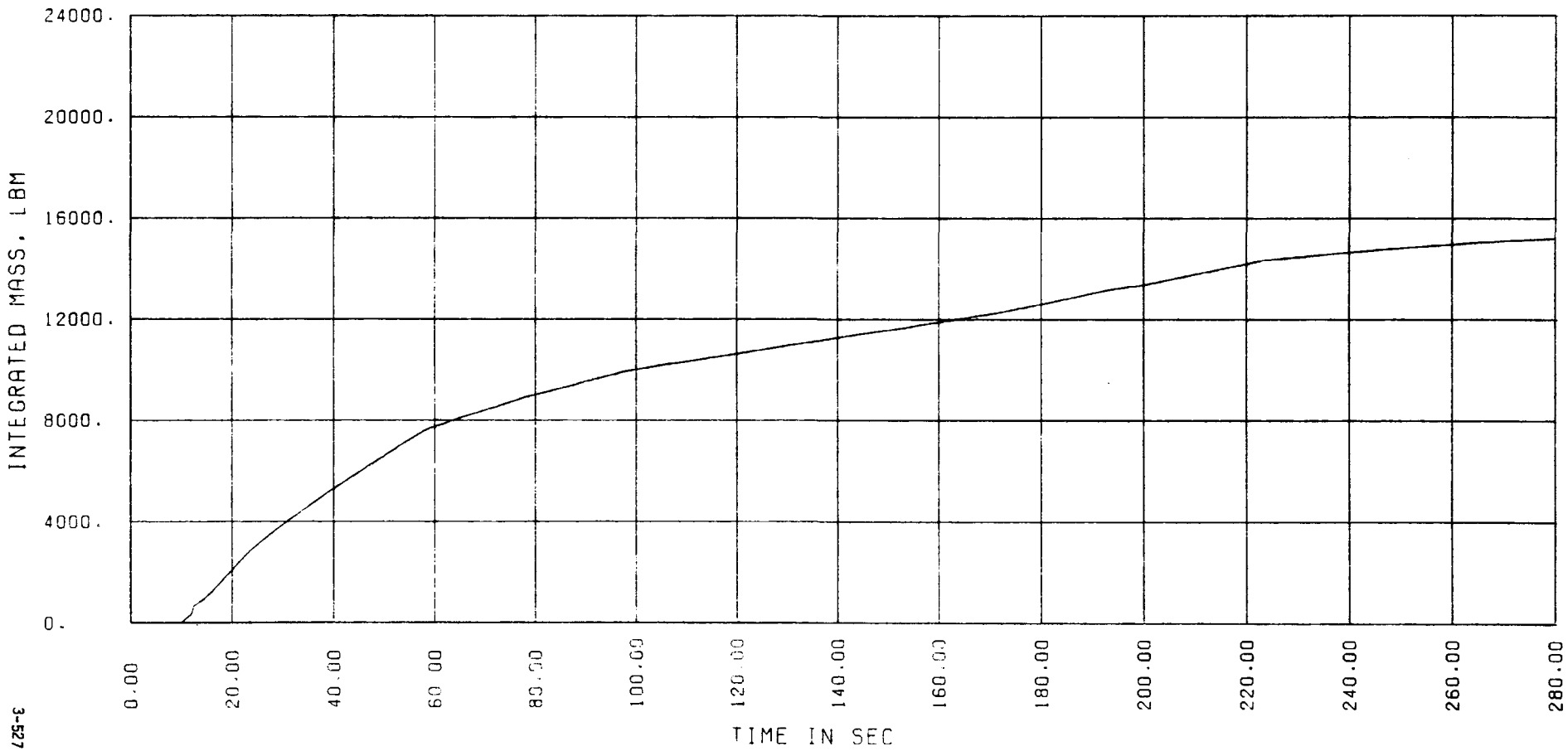
TEST 1156/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-TM/GO2 DISCH
PLOT NO.57



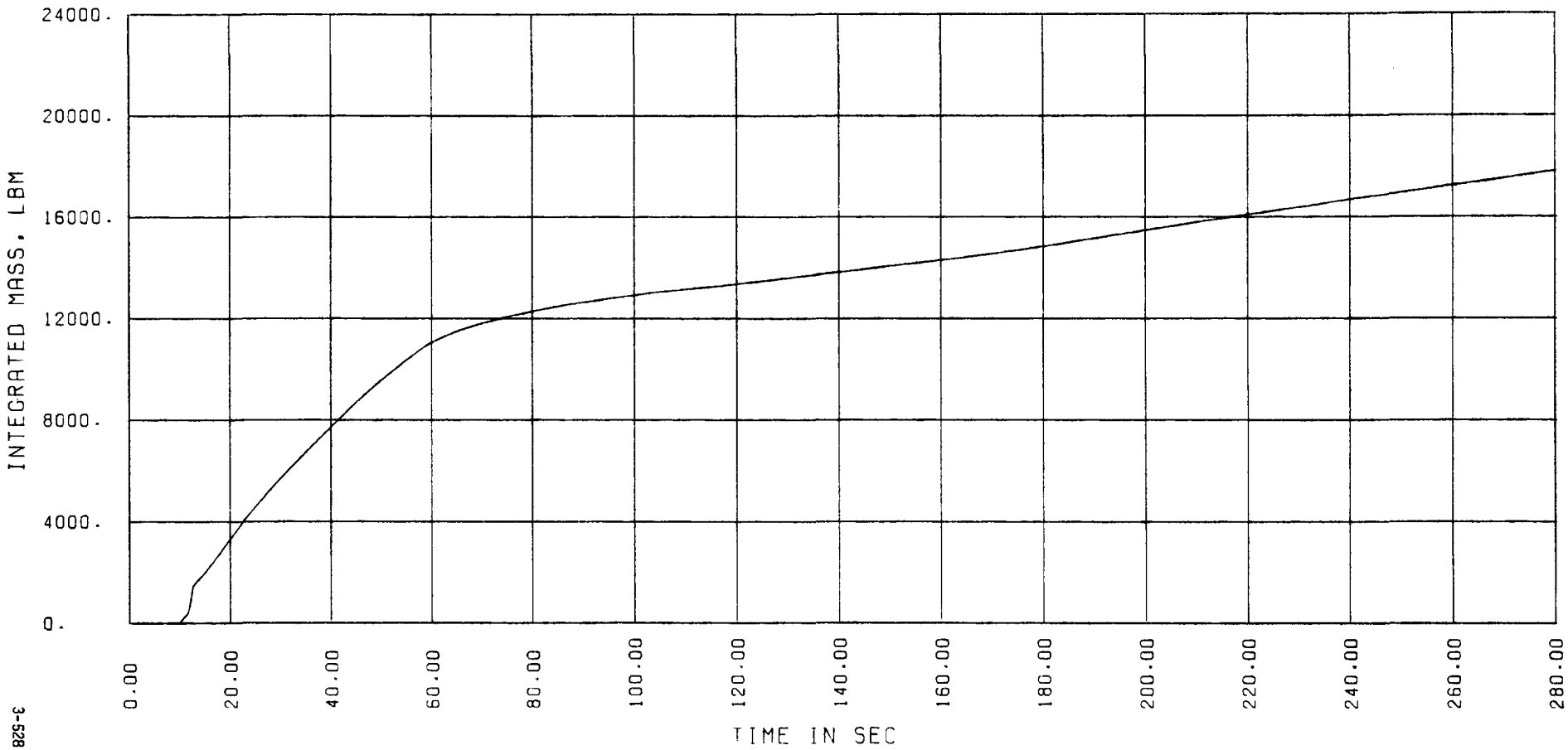
TEST 1156/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60



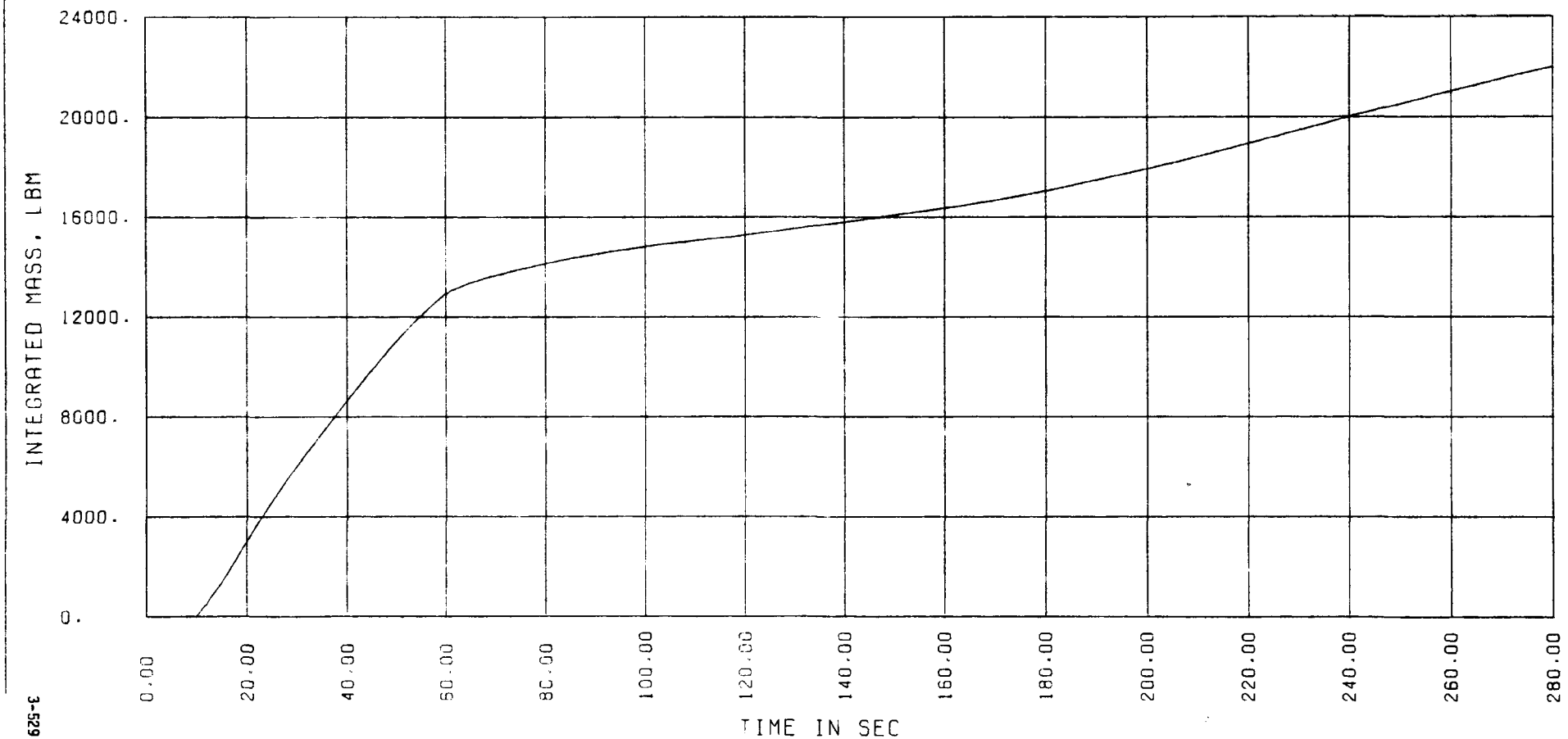
TEST 1156/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-TM/GD2 S
PLOT NO.61



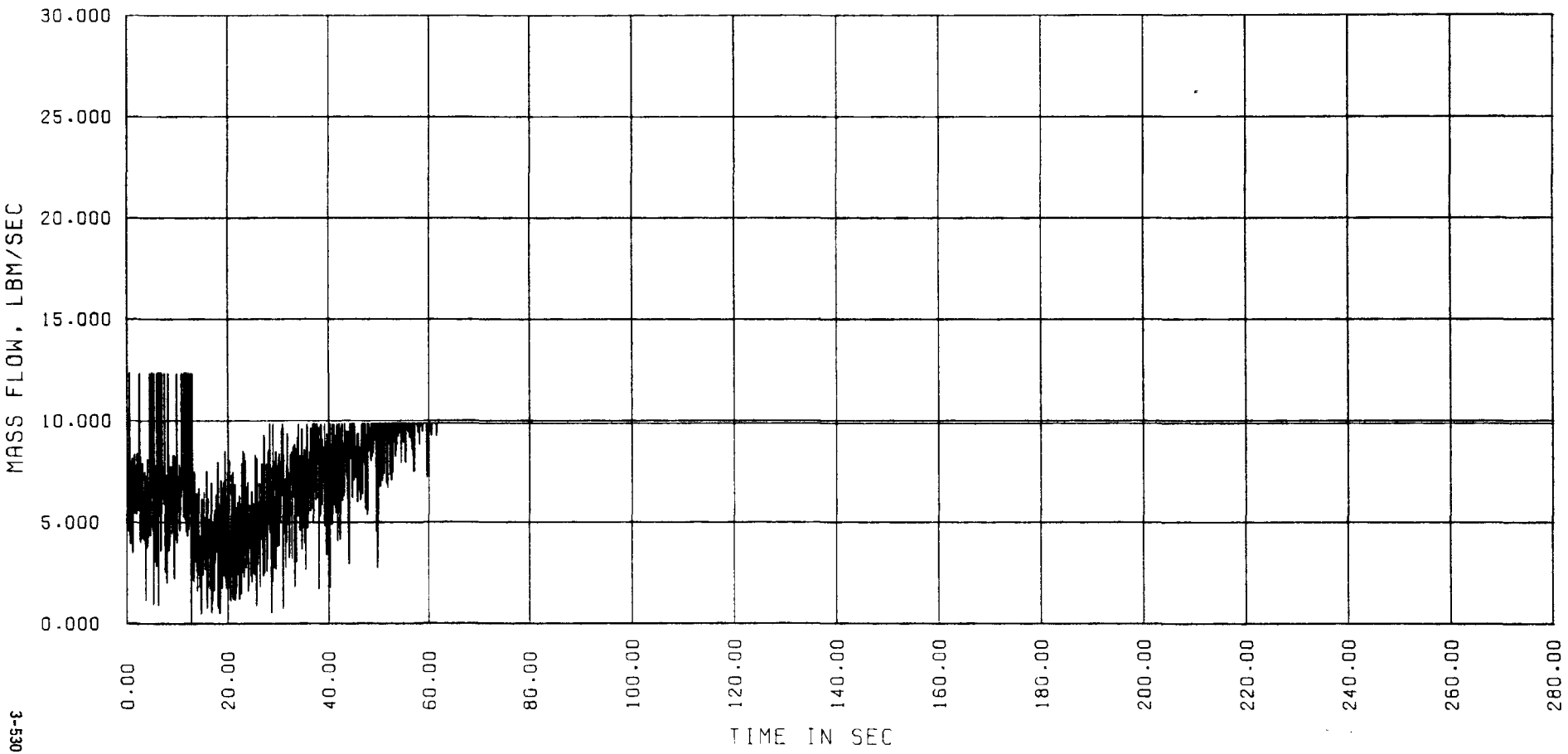
TEST 1156/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-TM/GO2 D
PLOT NO.62



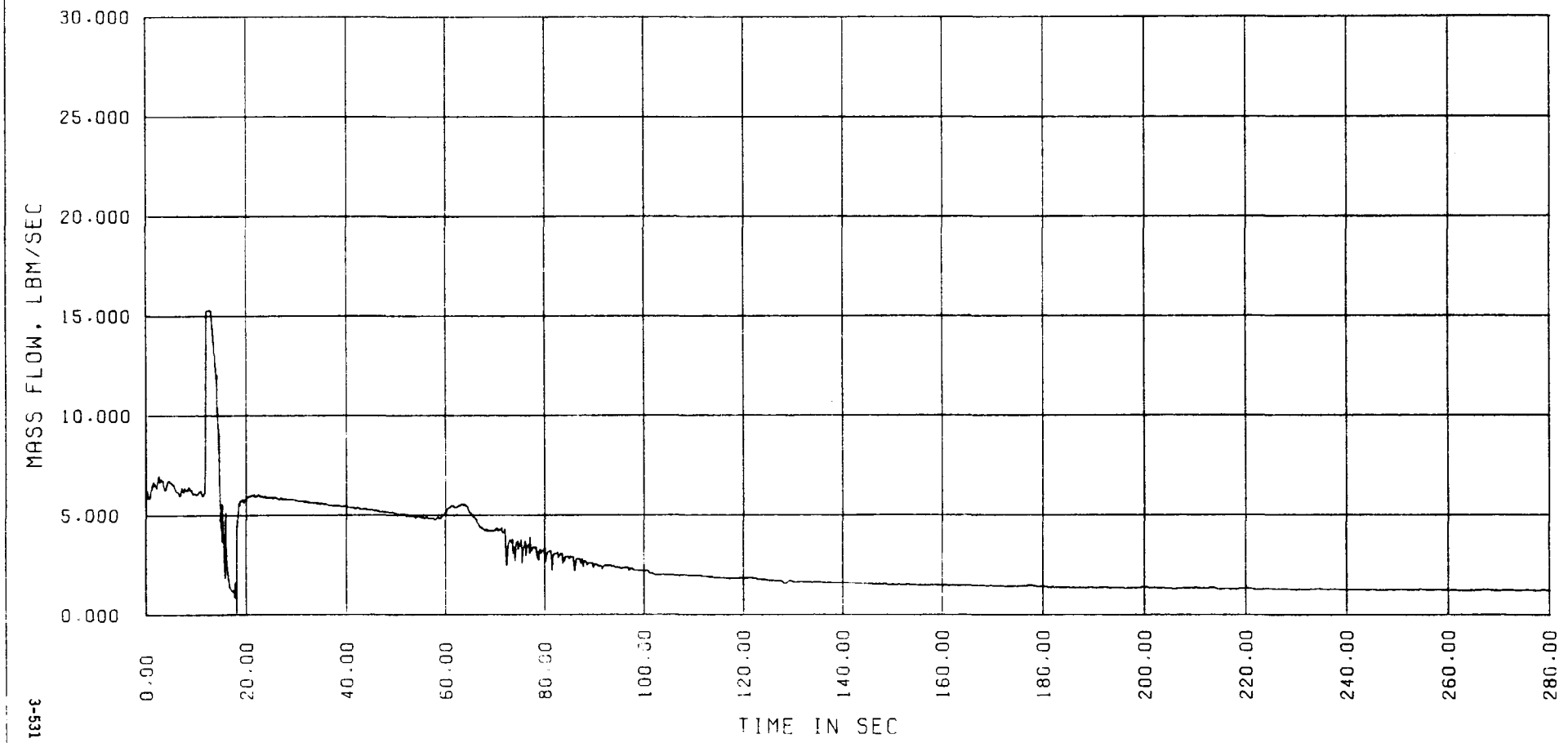
TEST 1156/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-TM/GO2 O
PLOT NO.63



TEST 1156/1000 PSIA FW FWD BDN
PUMP INLET INJECTION FLOW
PLOT NO.64



TEST 1156/1000 PSIA FW FWD BDN
PUMP OUTLET INJECTION FLOW
PLOT NO.65



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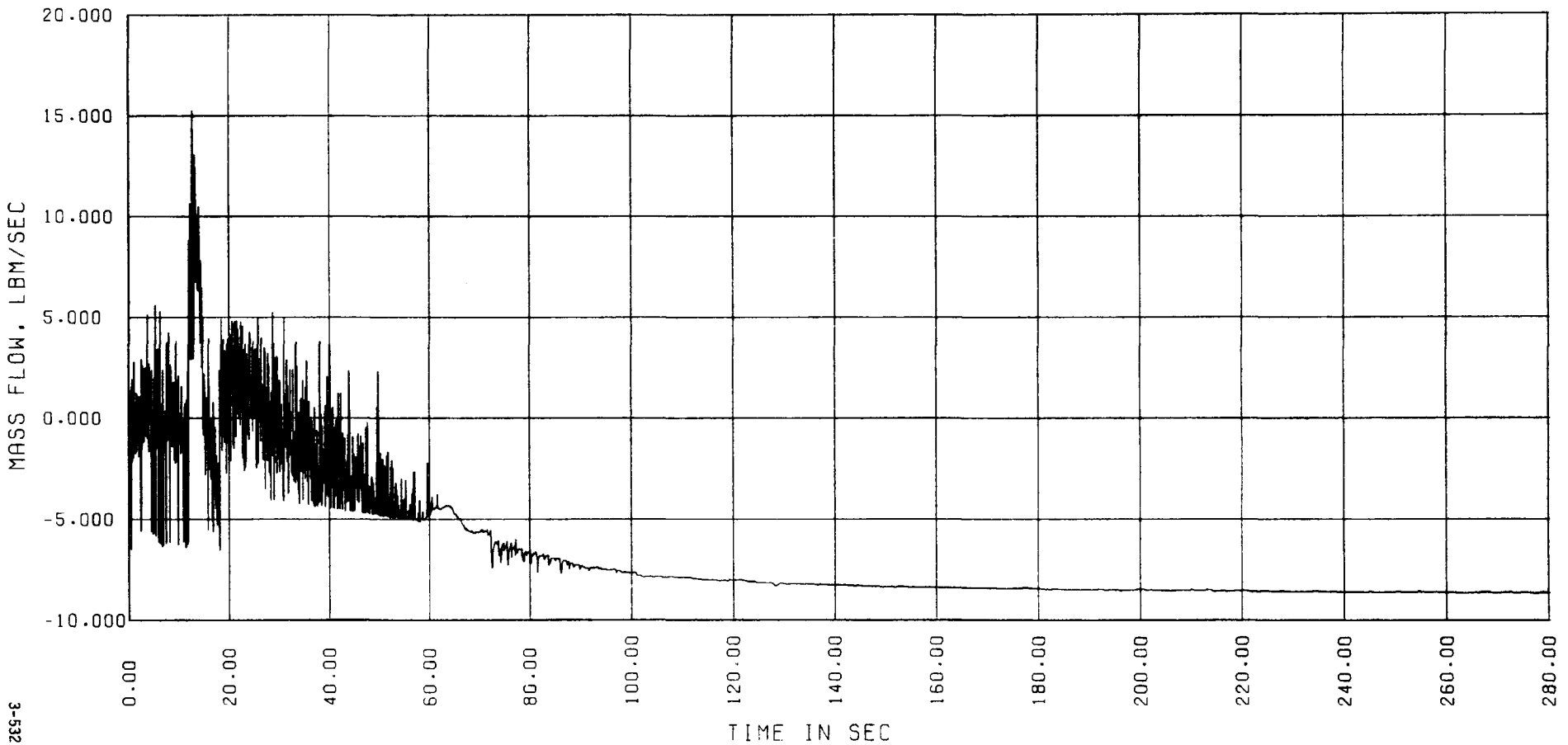
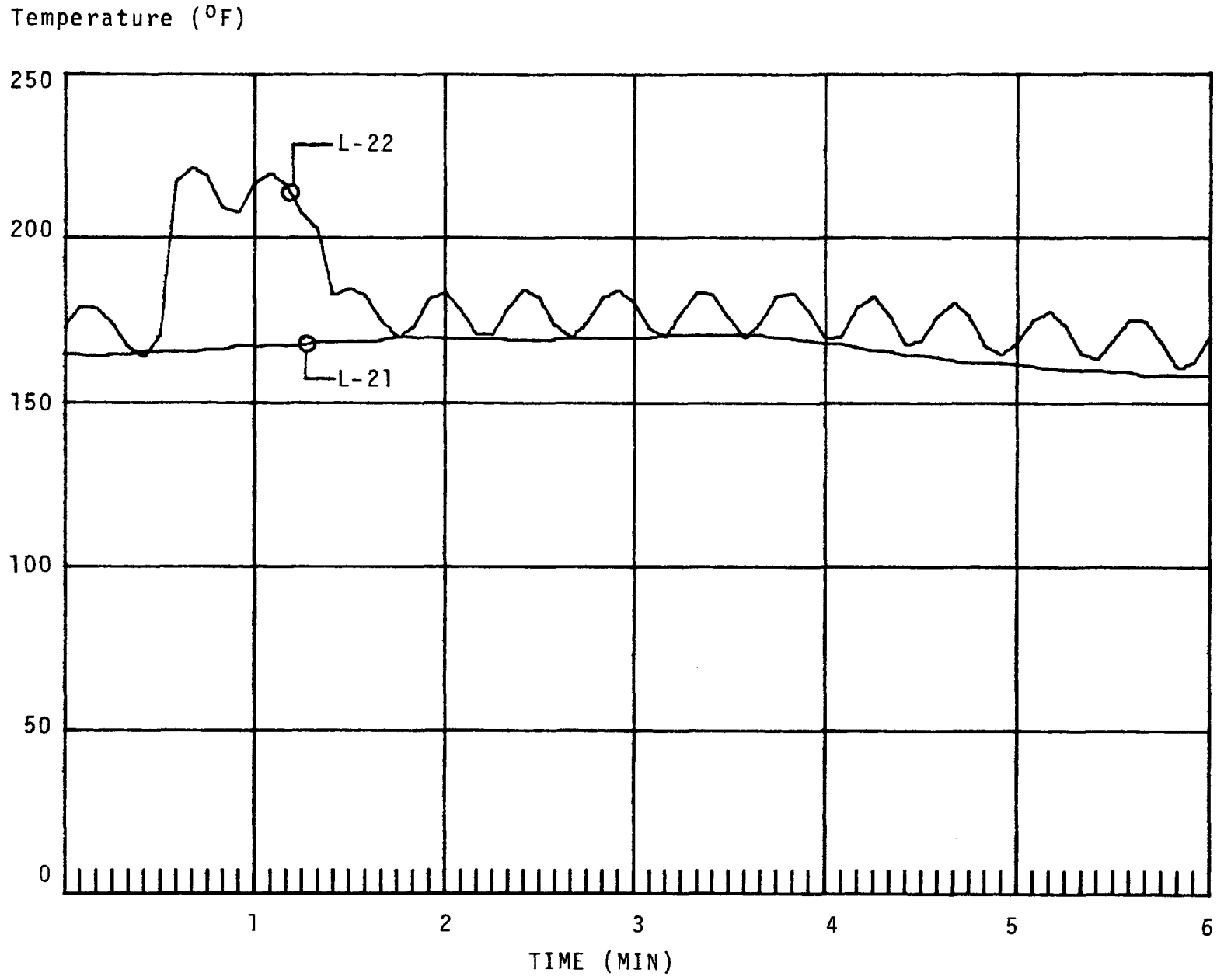
TEST 1156/1000 PSIA FW FWD BDN
PUMP SEAL INJ LEAKAGE FLOW
PLOT NO.66



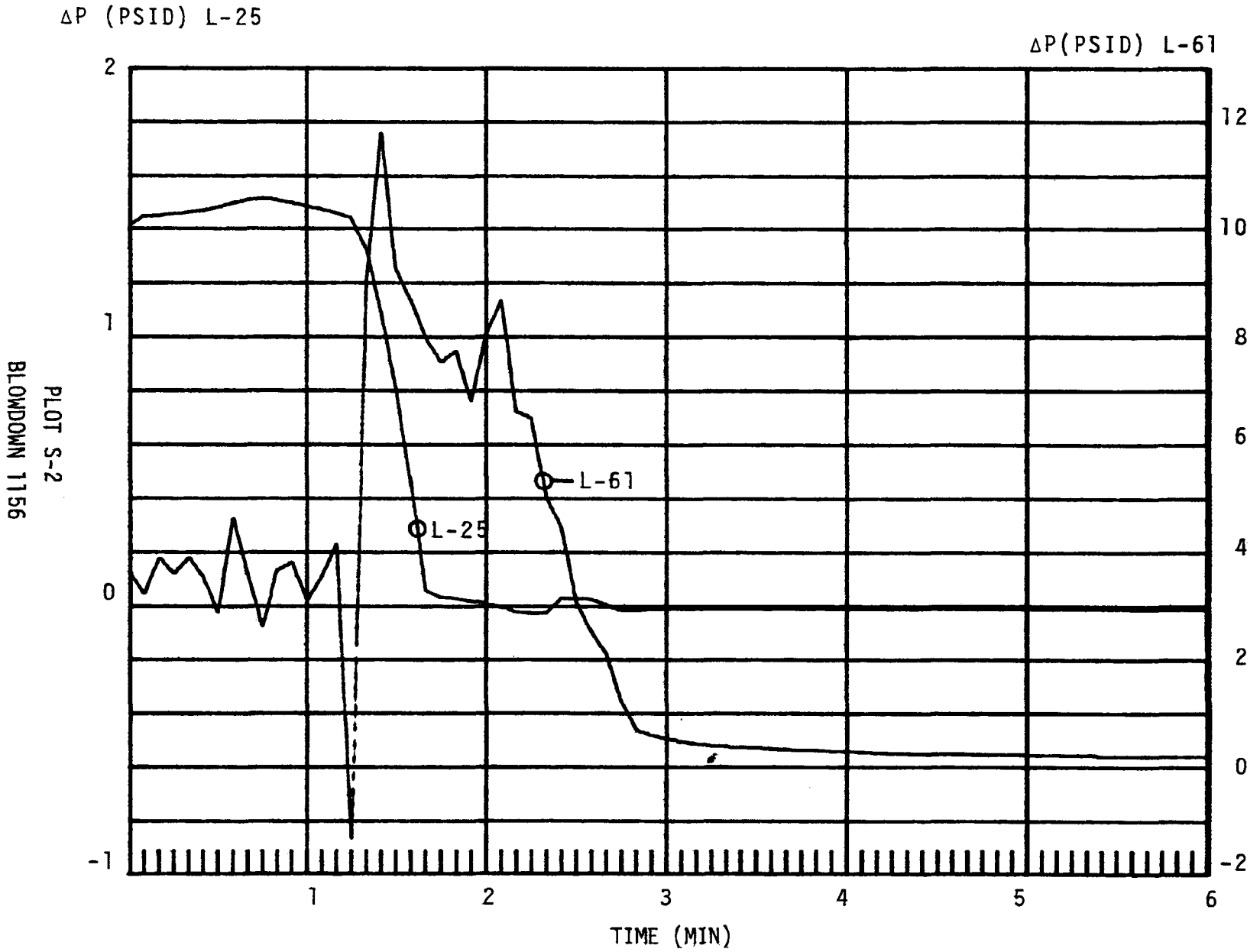
Index Listing
of
SCANNER DATA PLOTS
Test Number (1156)

Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

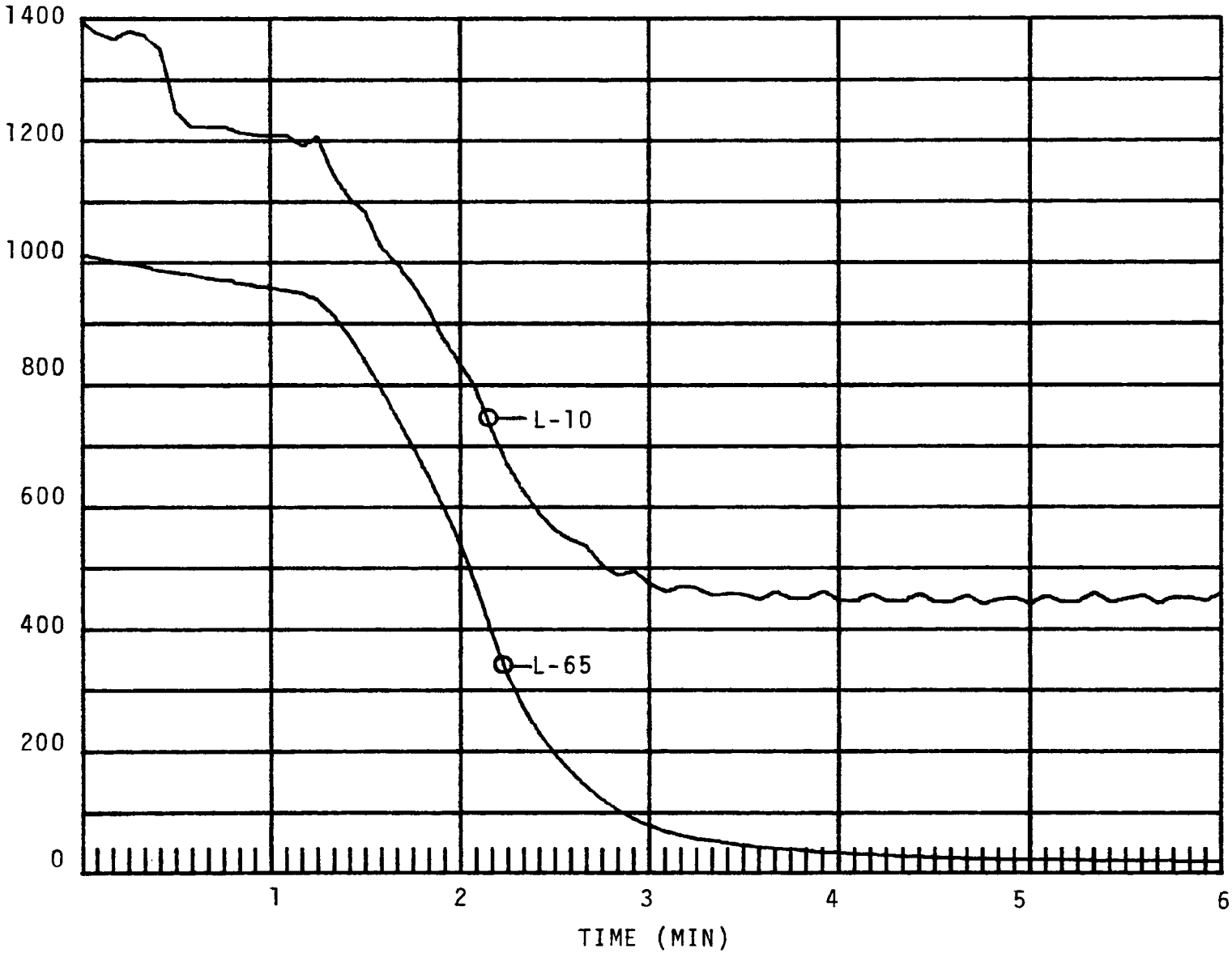


PLOT S-1

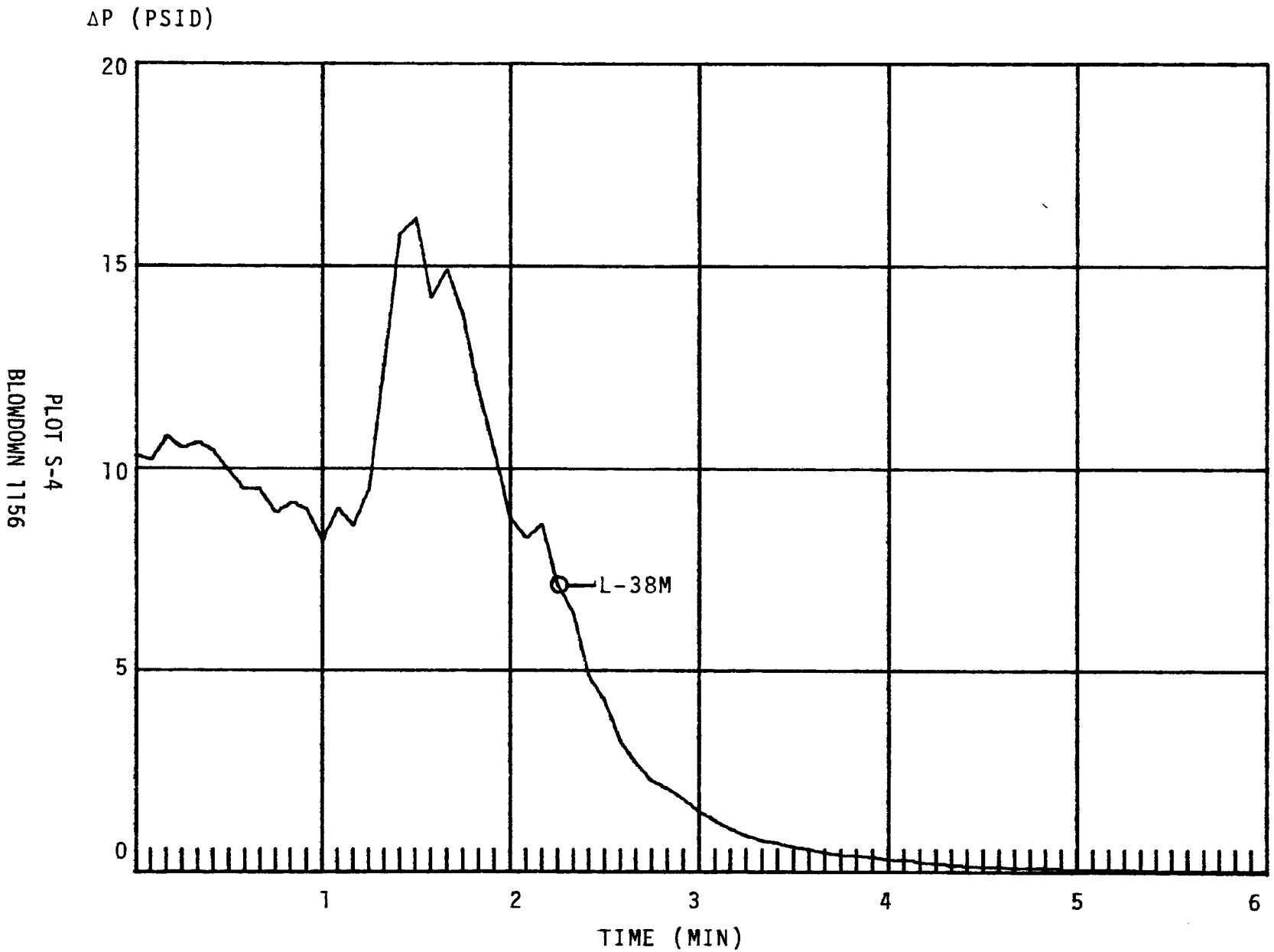
BLOWDOWN 1156



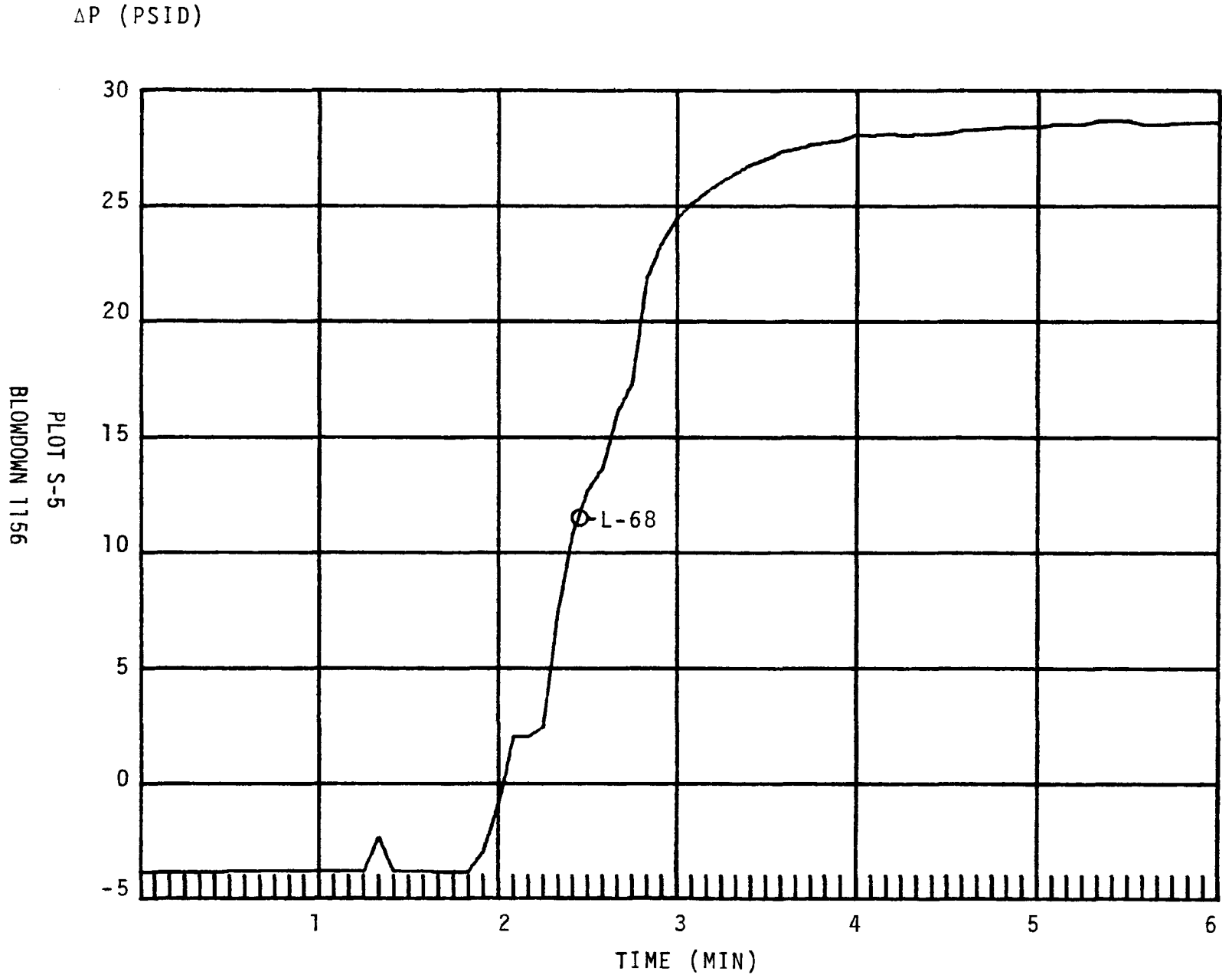
PLOT S-2
BLOWDOWN 1156



PLOT S-3
BLOWDOWN 1156



PLOT S-4
BLOWDOWN 1156


ΔP (PSID)
30
25
20
15
10
5
0
-5
1
2
3
4
5
6
TIME (MIN)
L-68
PLOT S-5
BLOWDOWN 1156

SYSTEM CONFIGURATION

Test Number 1179

Break Location	Discharge
Break Size	9.59 in^2
	34 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Free-Wheeling

COMMENTS

1. Malfunctioning or Inoperable Instruments: None
2. Other Comments: None
3. Affected FM Data Plots: None

INITIAL CONDITIONS

t = 30 Sec[a]

Test Number 1179

System Pressures

High Pressure Drum	1016.1	psia
Suction Instrument Spool	984.1	psia
Discharge Instrument Spool	1056.9	psia

Fluid Temperatures

Suction Instrument Spool	544.5	°F
Discharge Instrument Spool	549.2	°F

Fluid Density

Suction Instrument Spool	46.32	lbm/ft^3
Discharge Instrument Spool	46.02	lbm/ft^3

System Flows

Mass Flow Rate	244	lb/sec
Suction Volumetric Flow Rate	2368	gpm
Discharge Volumetric Flow Rate	2416	gpm
Suction Normalized Volumetric Flow Rate	0.68	
Discharge Normalized Volumetric Flow Rate	0.69	
Suction Fluid Velocity	29.14	ft/sec
Discharge Fluid Velocity	29.73	ft/sec
Suction Momentum Flux	39,342	$lbm/ft\ sec^2$
Discharge Momentum Flux	40,679	$lbm/ft\ sec^2$

Pump Performance

Pump head	65.33	psi
	203.1	ft
Pump Speed	4540	rpm
Pump Shaft Torque	158.5	ft lb
Pump Hydraulic Torque	133.4	ft lb

System Mass (t = 40 Sec)[a]

High Pressure Drum Level	47.77	in[b]
Fluid Mass Upstream of Test Pump	13,544	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 1179

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-12.0	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	9.8	c
HPSW-1 Closed	11.4	c
Pump Power Trip	12.6	45
Initiate Rupture Mechanism	10.5	c
Blowdown Starts	12.7	45
End of Digitized Data 20 s/sec	518.0	-
200 s/sec	288.0	-
FM Recording System Off	750.0	-
Scanner System Off	-	765

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

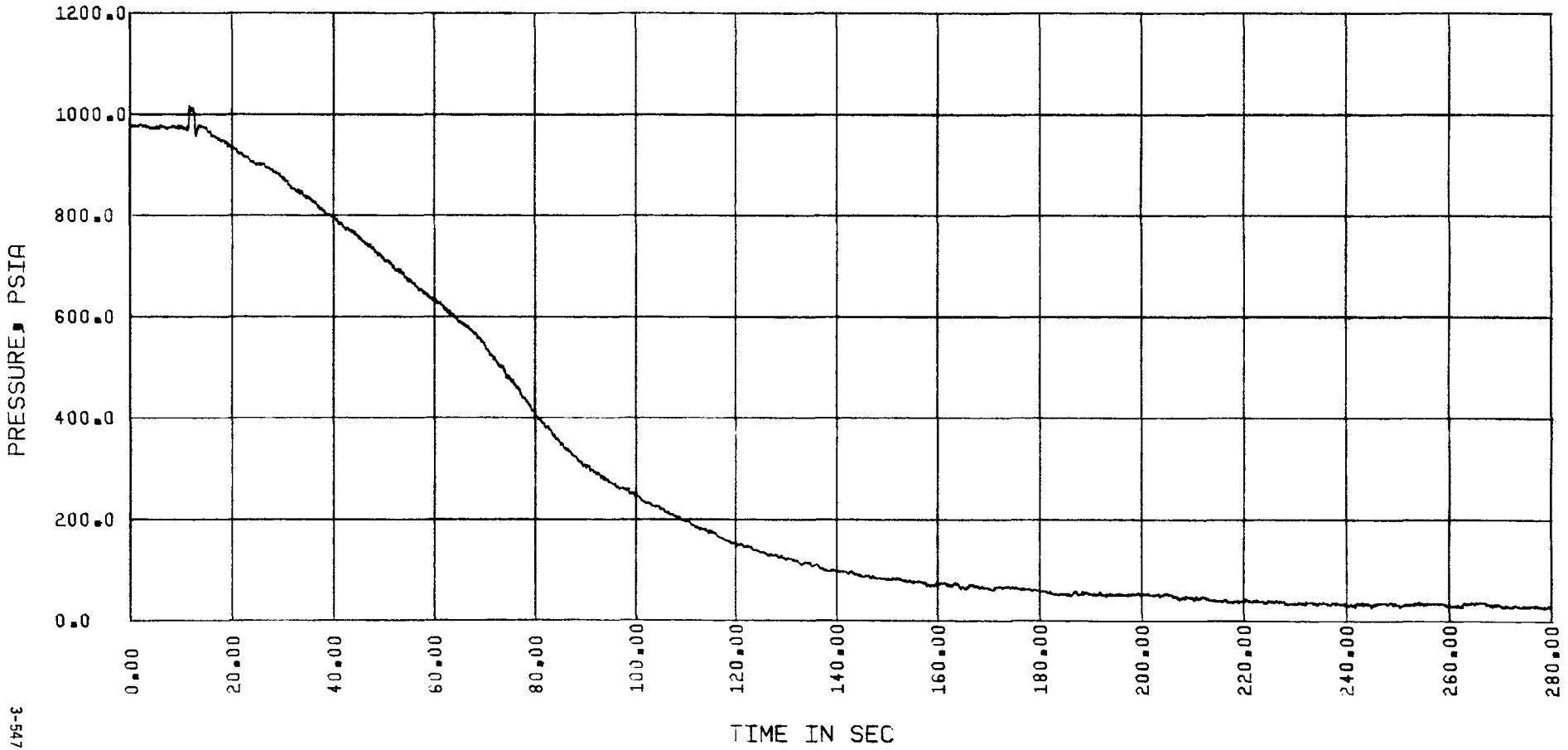
Index Listing
of
FM DATA PLOTS
Test Number (1179)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
28	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 Discharge
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge

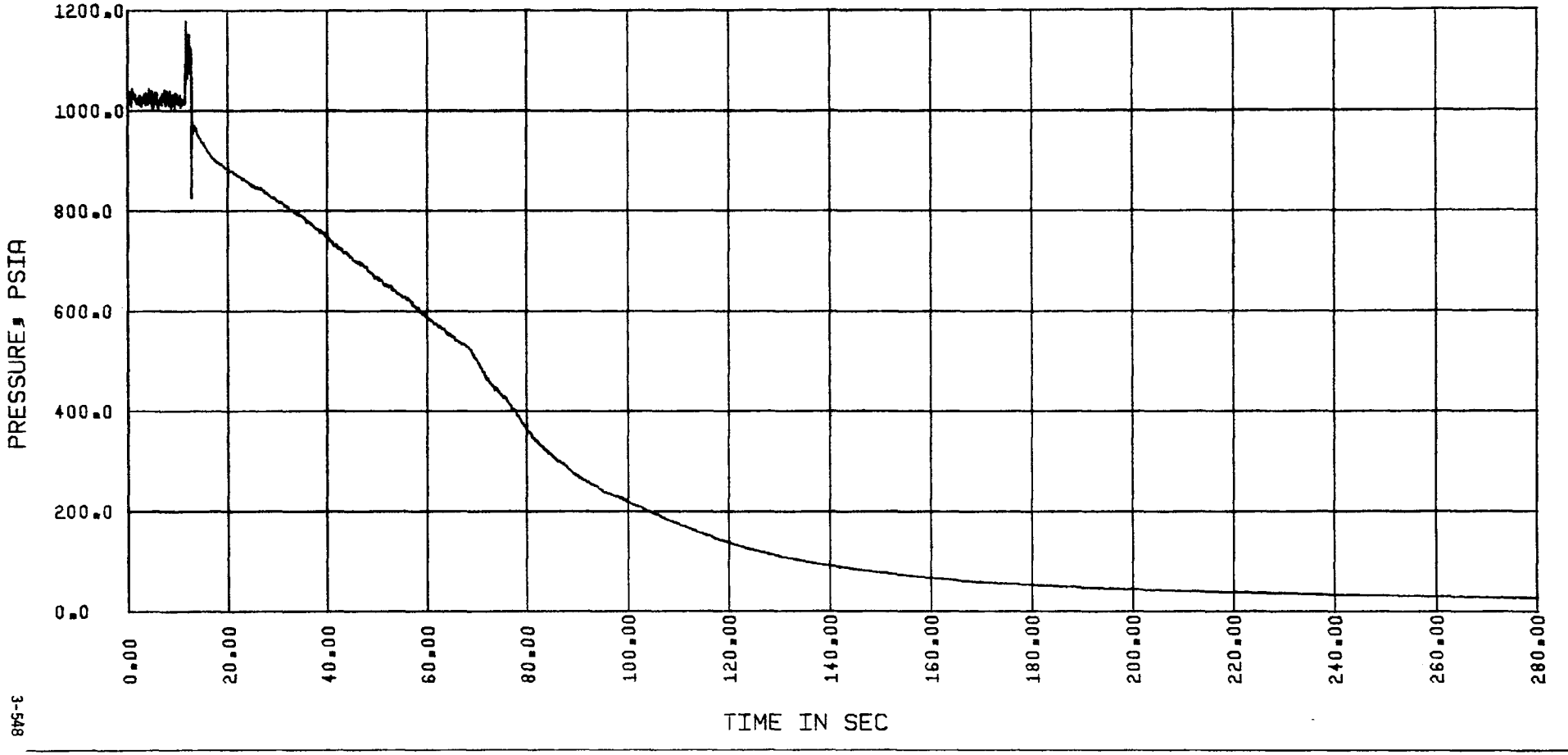
Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (1179)

Plot Number	Location Number	Description of Parameter
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
35	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
42	L-27	Momentum Flux LO-DD Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
53	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge
64	L-9	Pump Injection Mass Flow Rate In
65	L-32	Pump Injection Mass Flow Rate Out
66	L-9/L-32	Seal Injection Leakage Mass Flow Rate

TEST 1179/MECHANIST FW FWD BDN
PUMP SUCTION PRESSURE
PLOT NO.1



TEST 1179/MECHANIST FW FWD BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2



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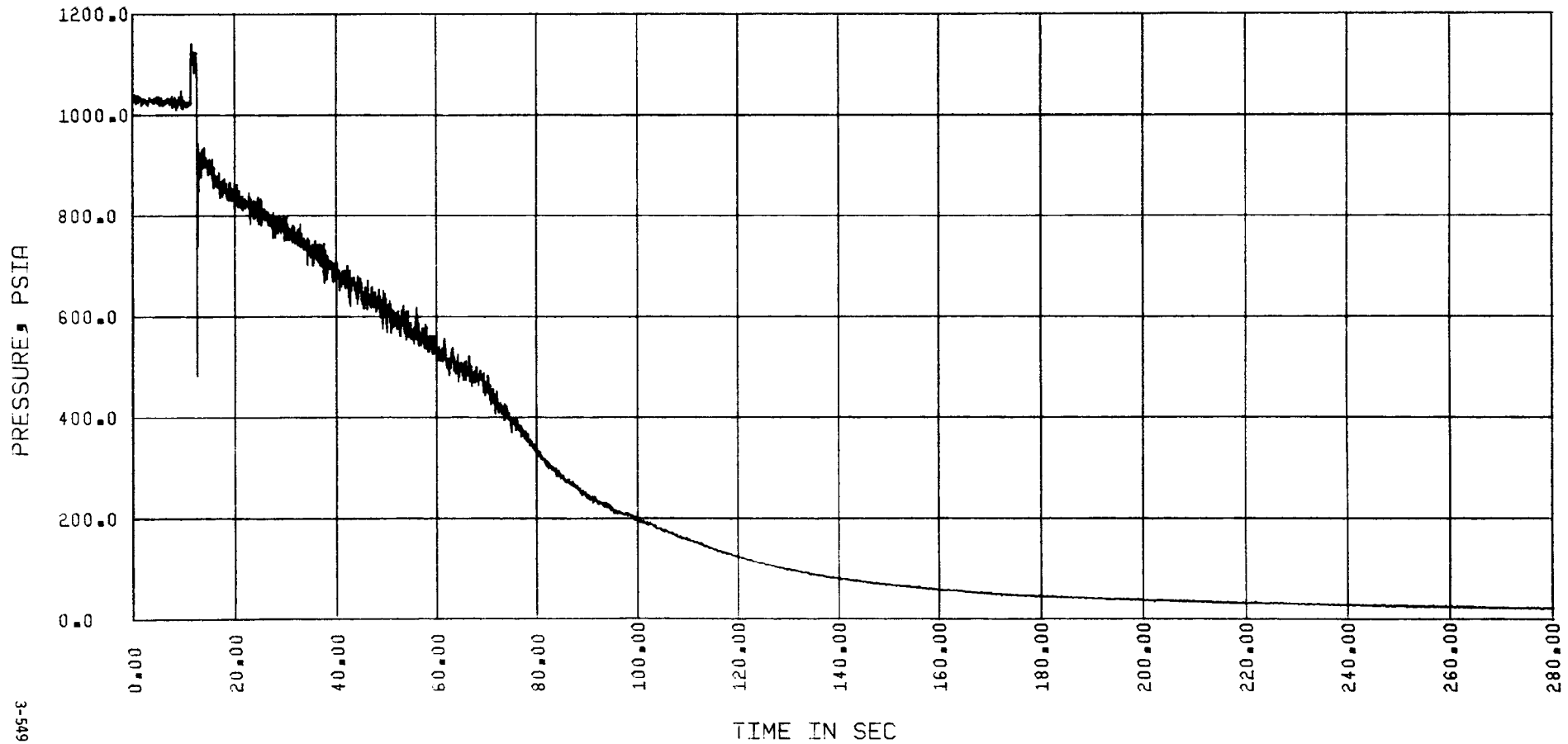
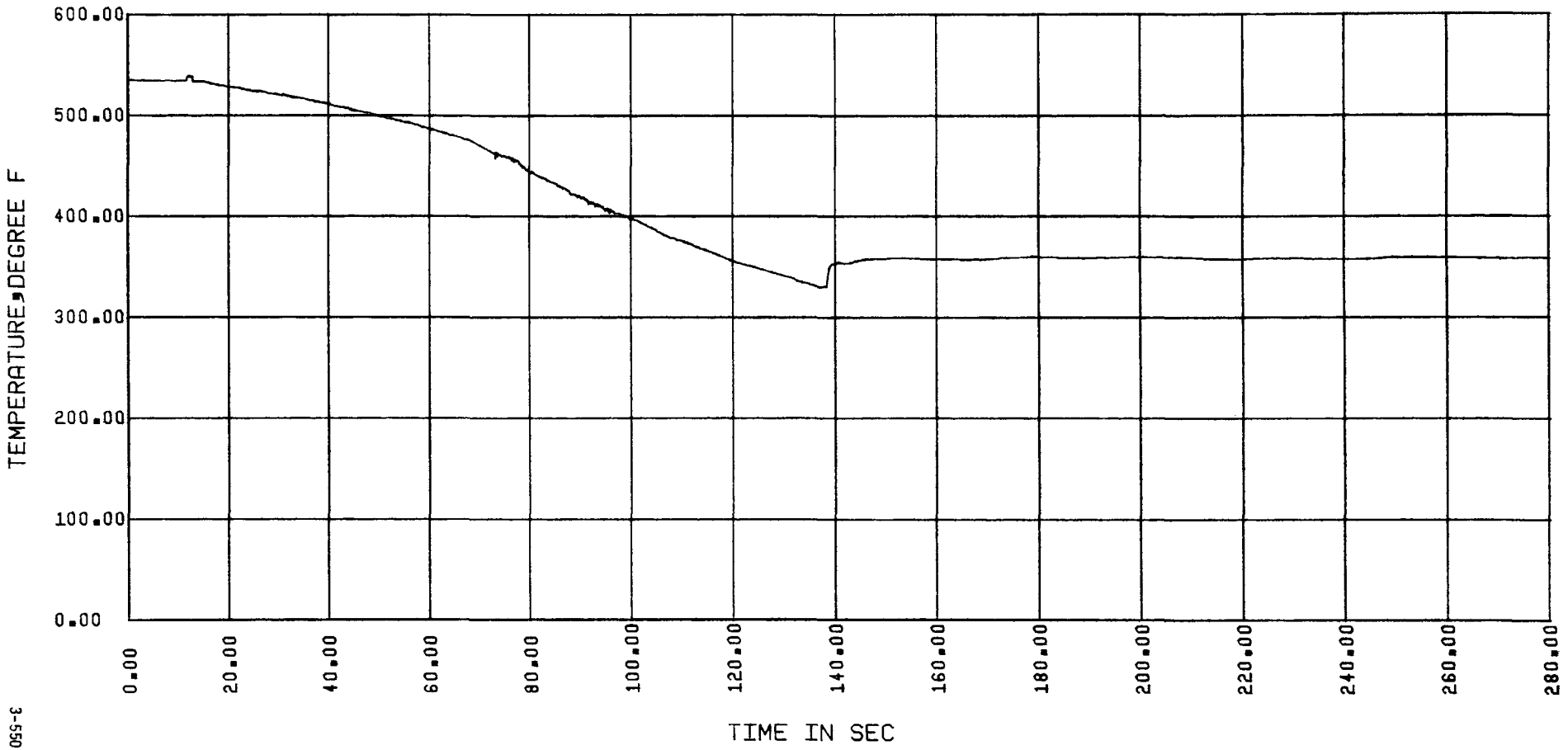
TEST 1179/MECHANIST FW FWD BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3

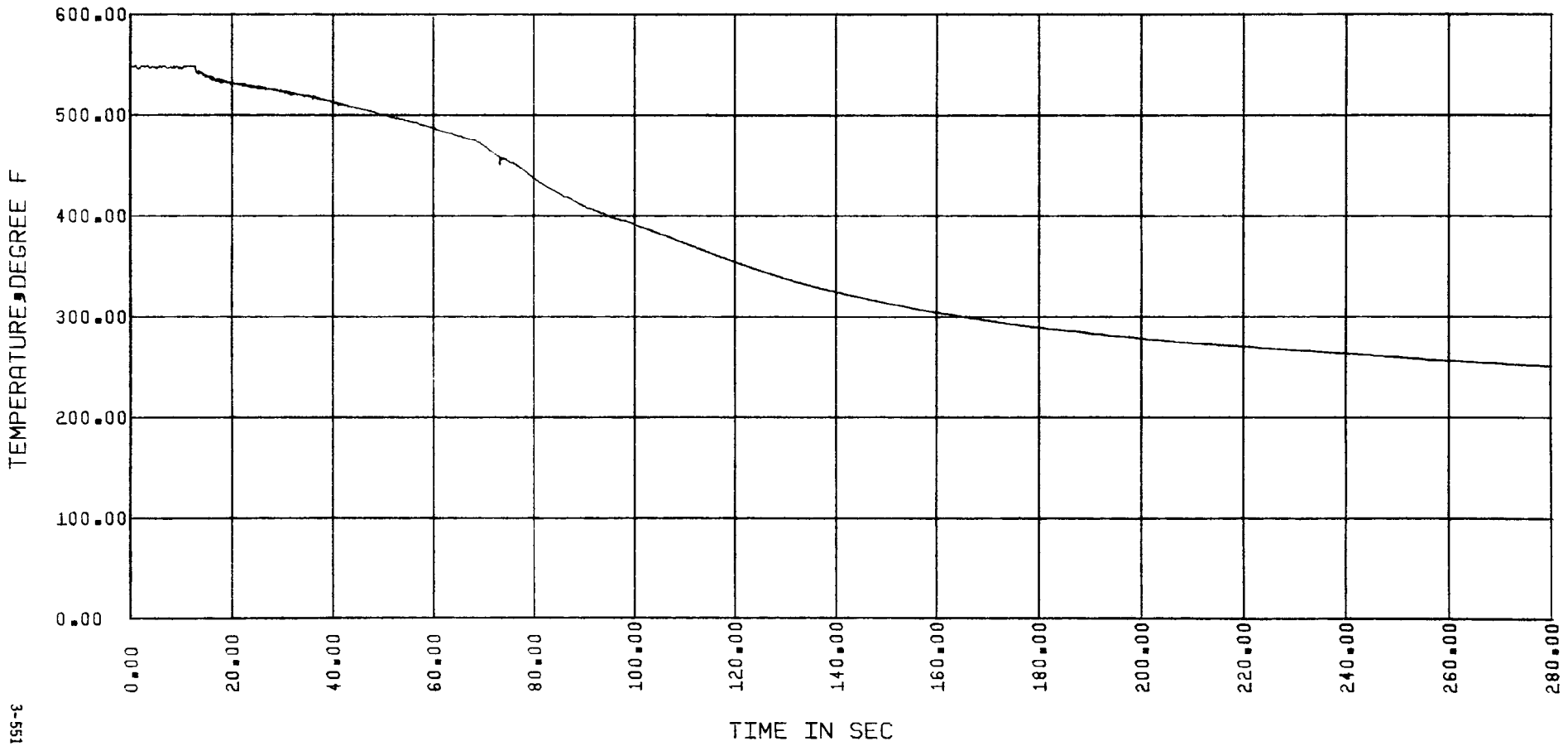


TEST 1179/MECHANIST FW FWD BDN
PUMP SUCTION TEMPERATURE
PLOT NO. 4

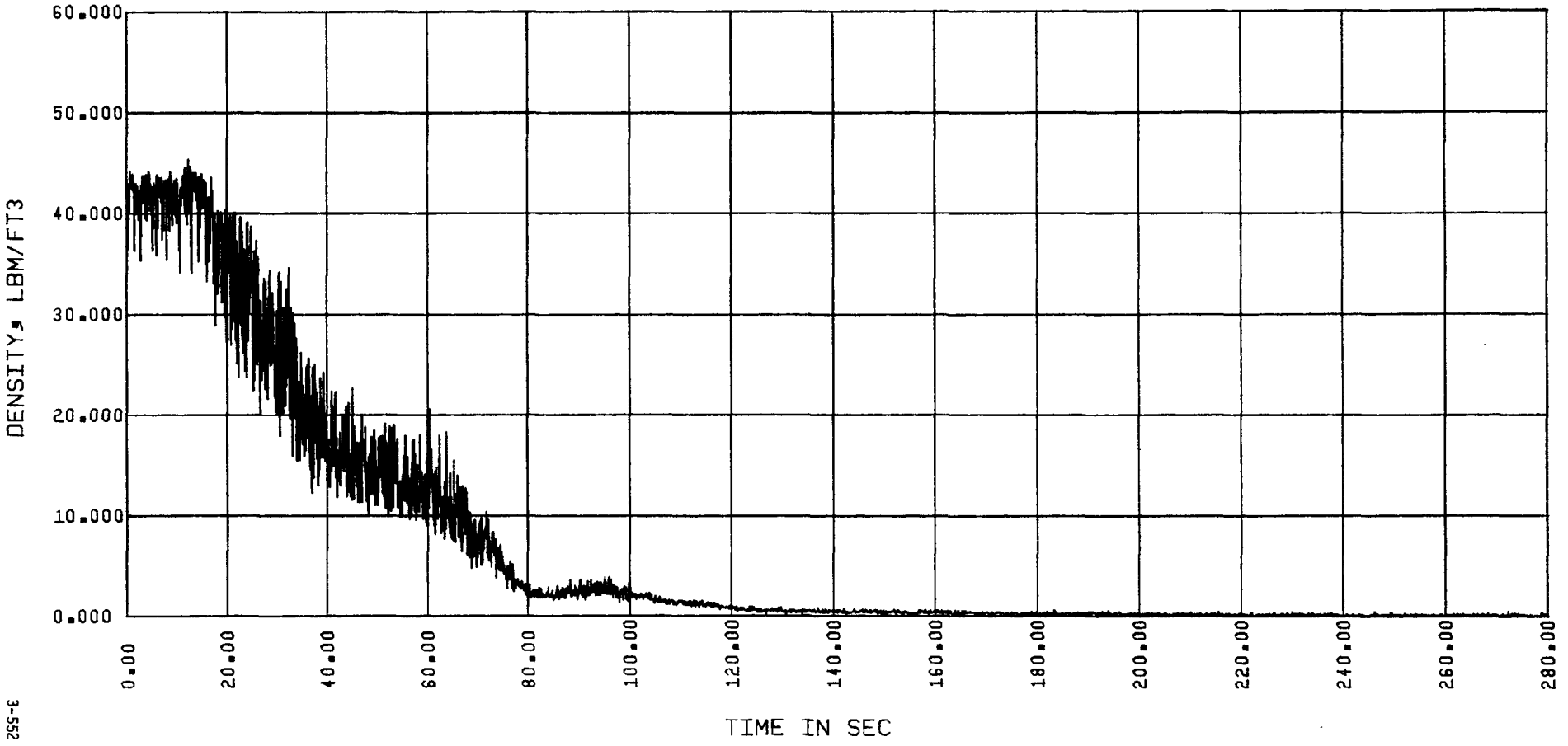


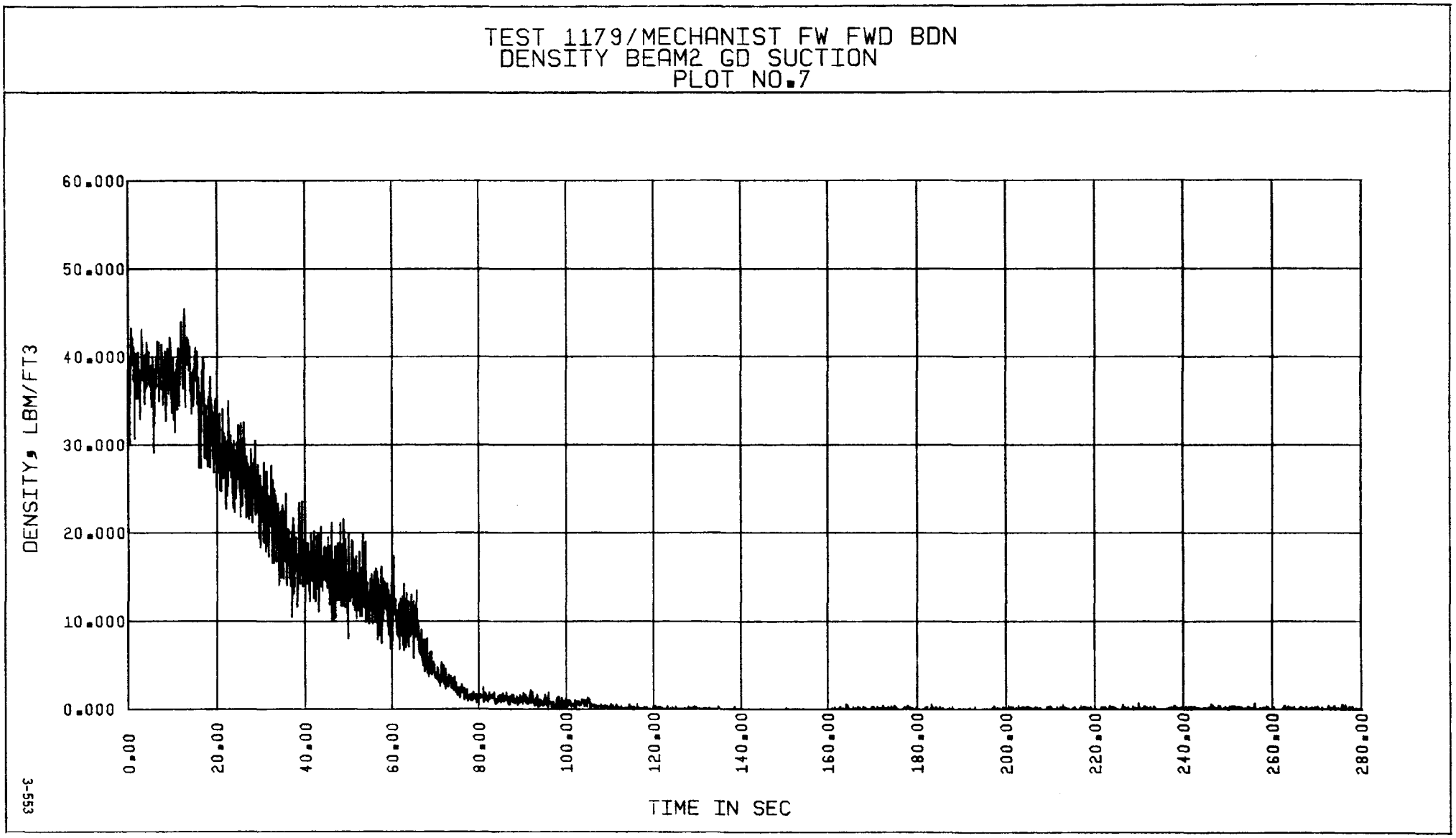
3-550

TEST 1179/MECHANIST FW FWD BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5

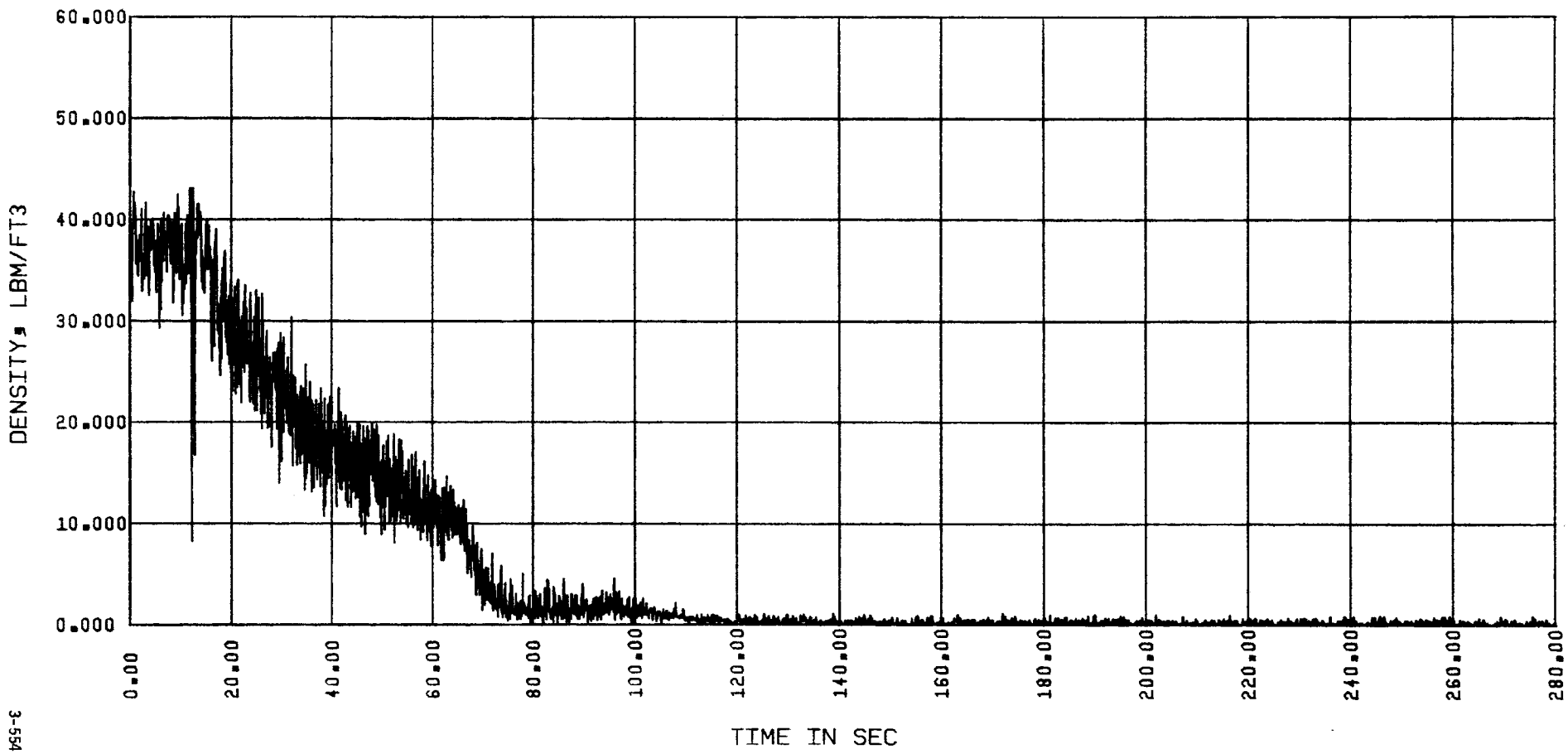


TEST 1179/MECHANIST FW FWD BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



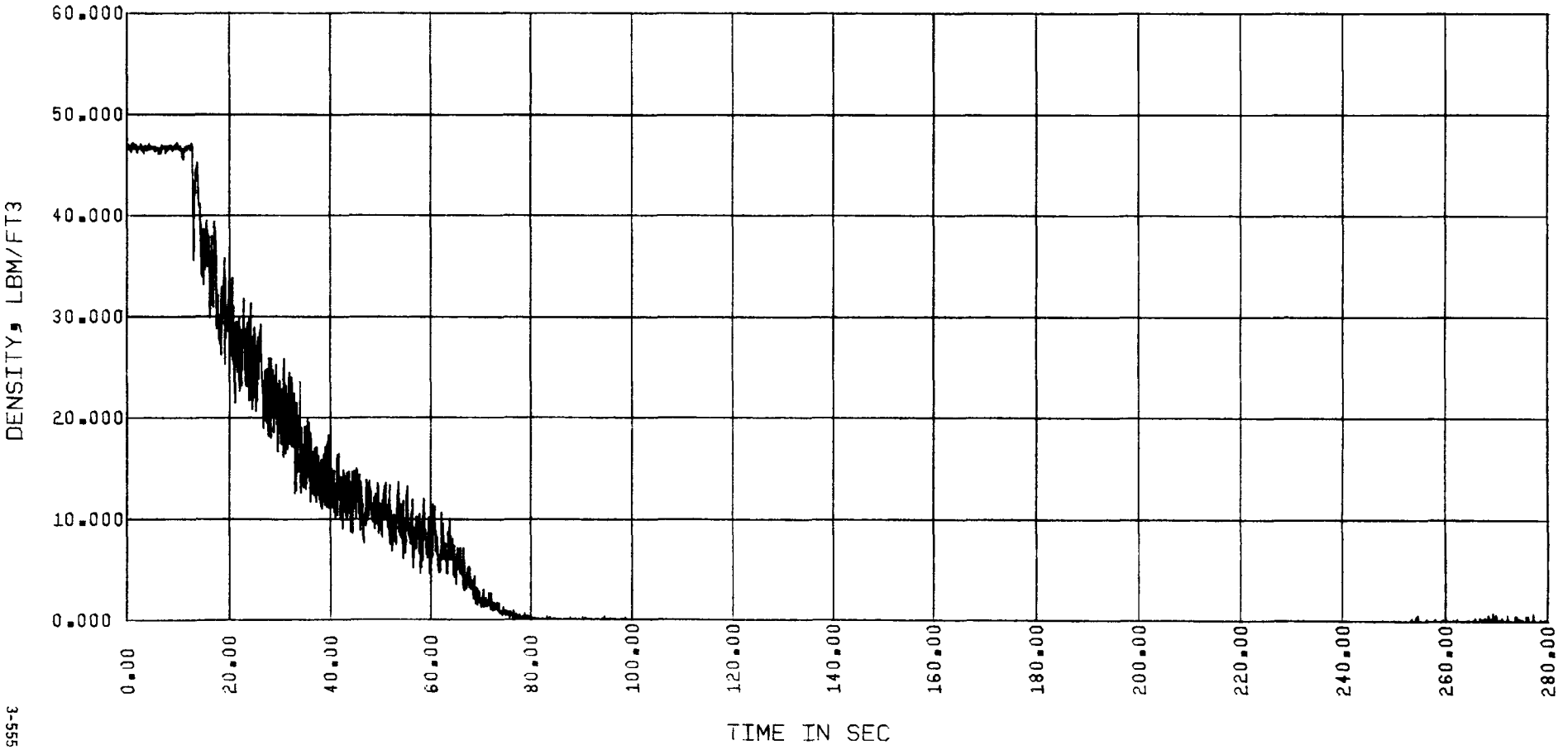

TEST 1179/MECHANIST FW FWD BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7
DENSITY, LBM/FT3
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-553

TEST 1179/MECHANIST FW FWD BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8

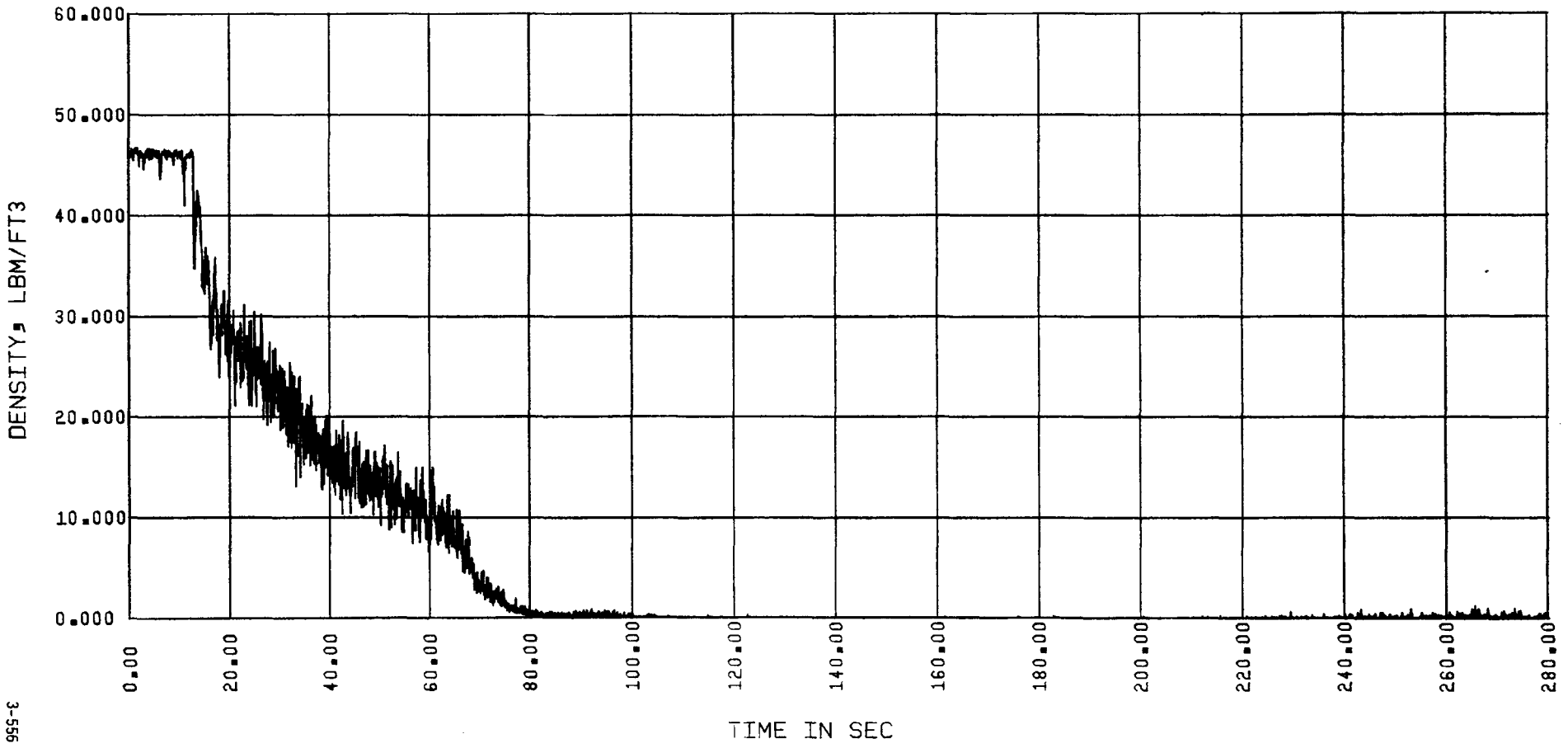


3-55A

TEST 1179/MECHANIST FW FWD BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9

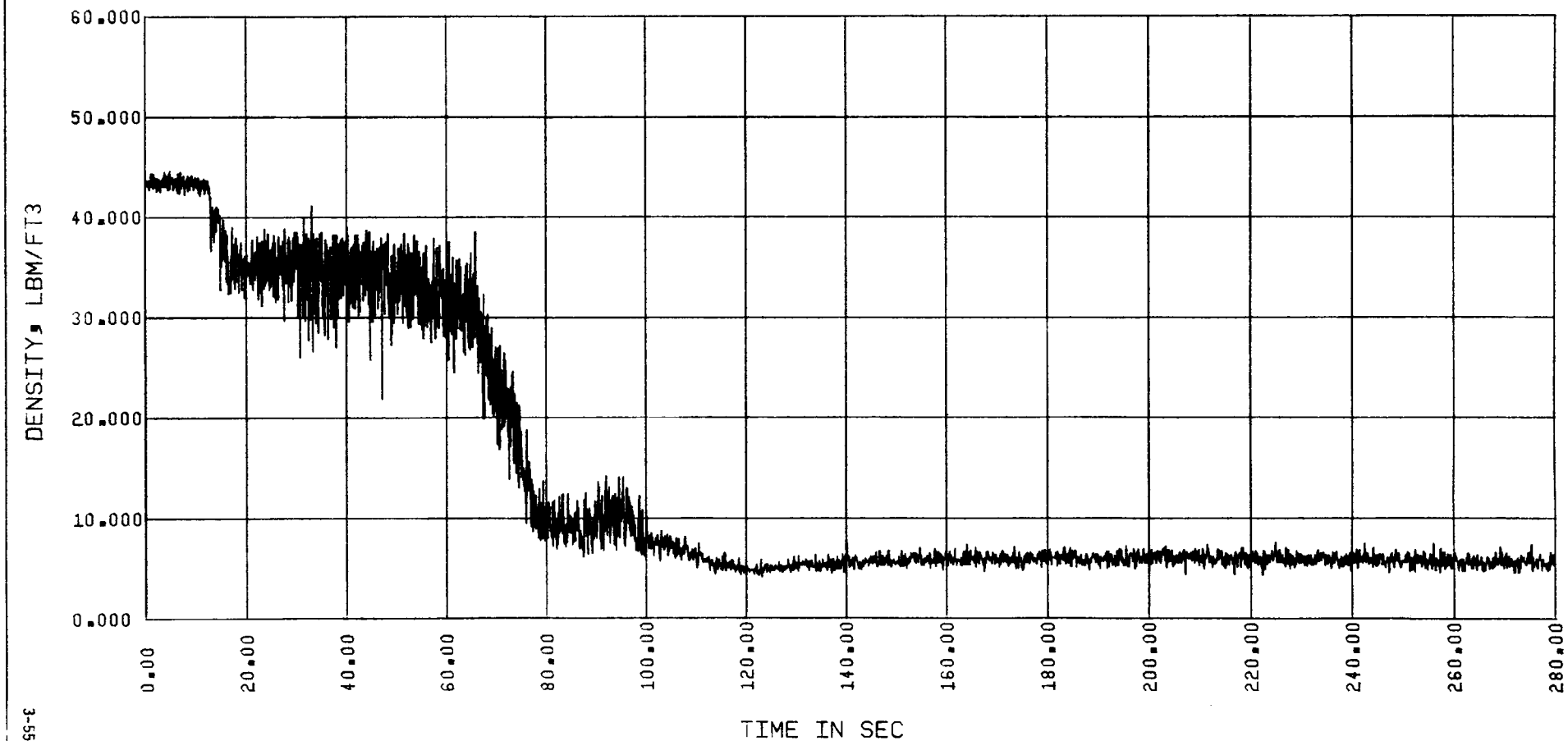


TEST 1179/MECHANIST FW FWD BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10

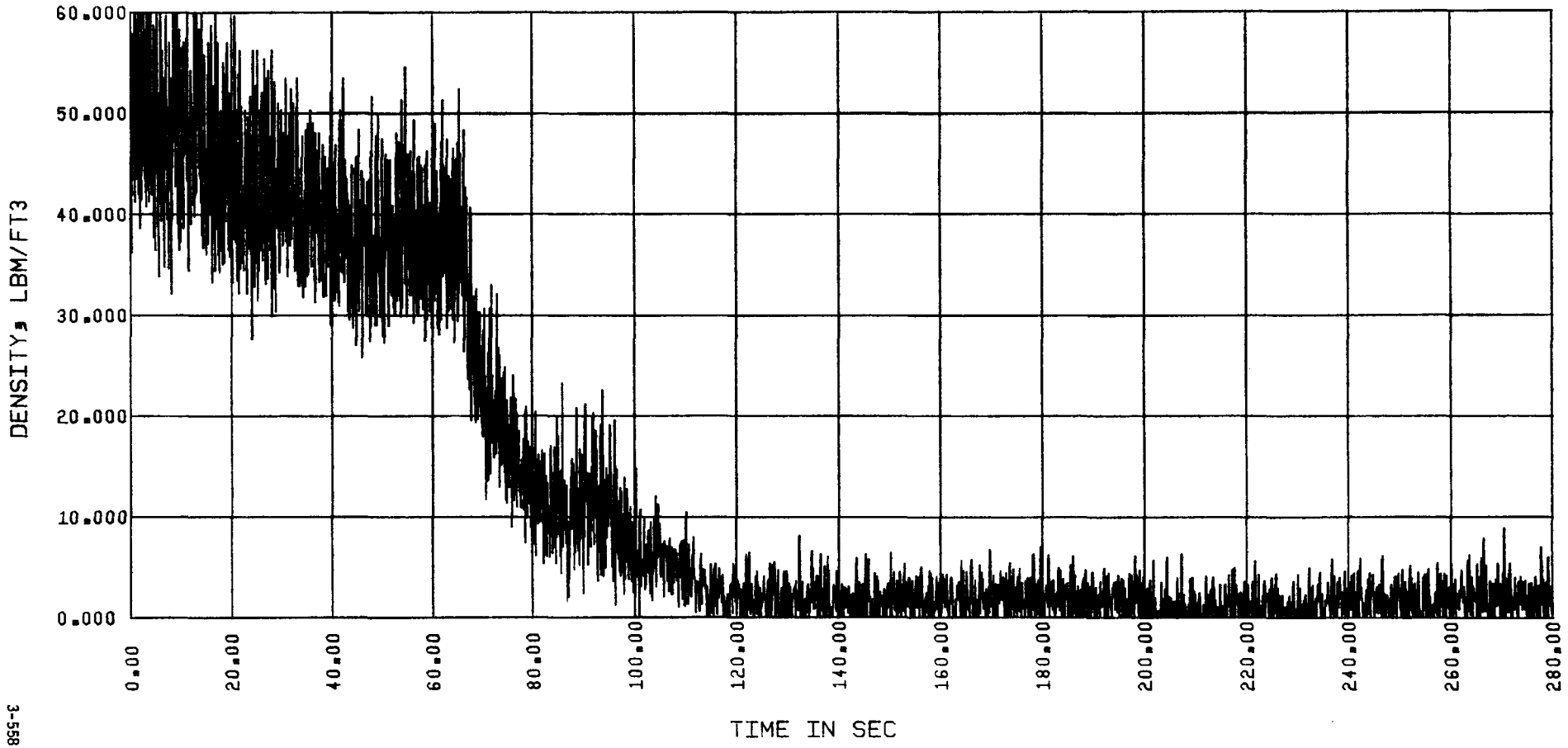


3-556

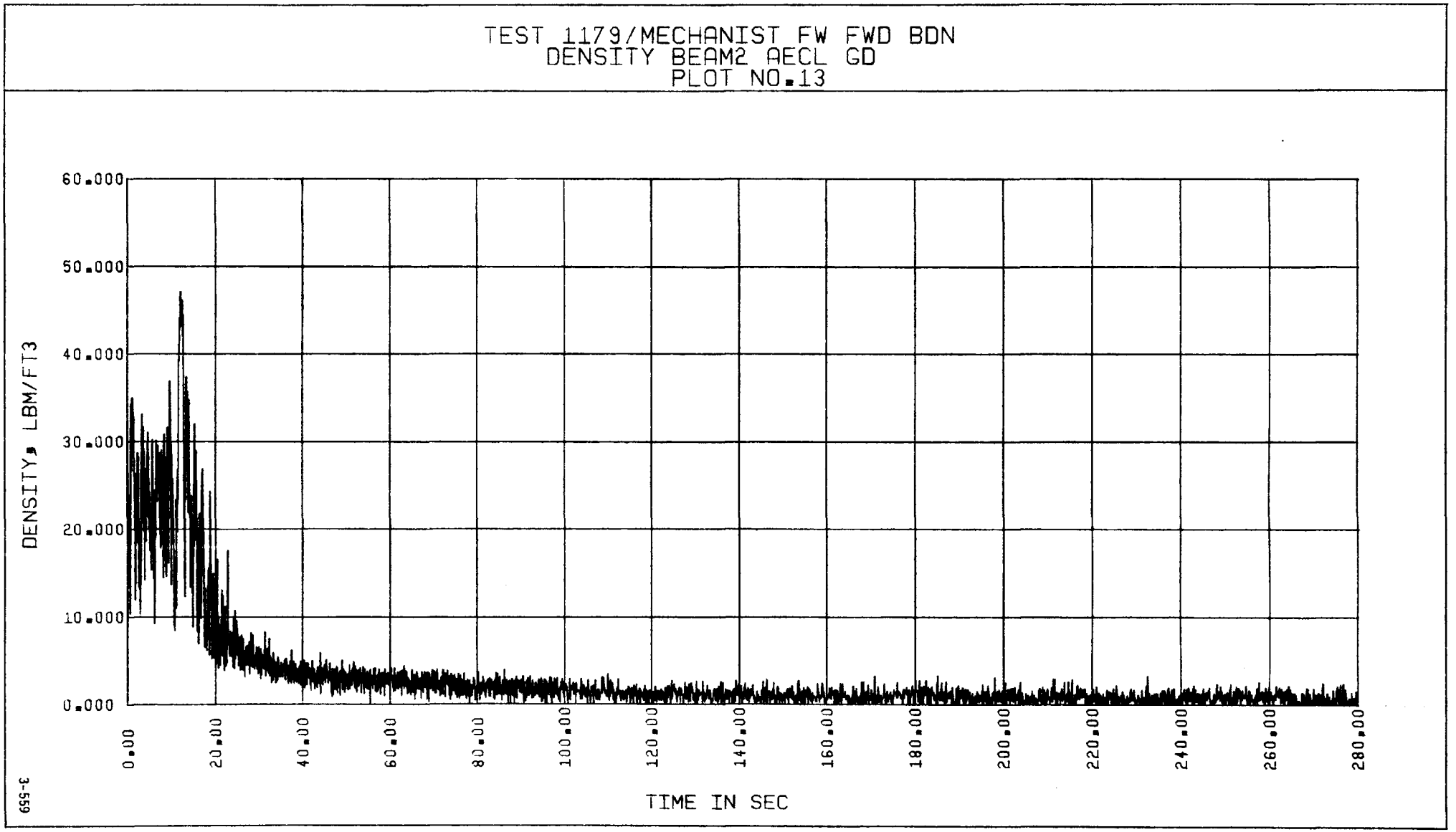
TEST 1179/MECHANIST FW FWD BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11



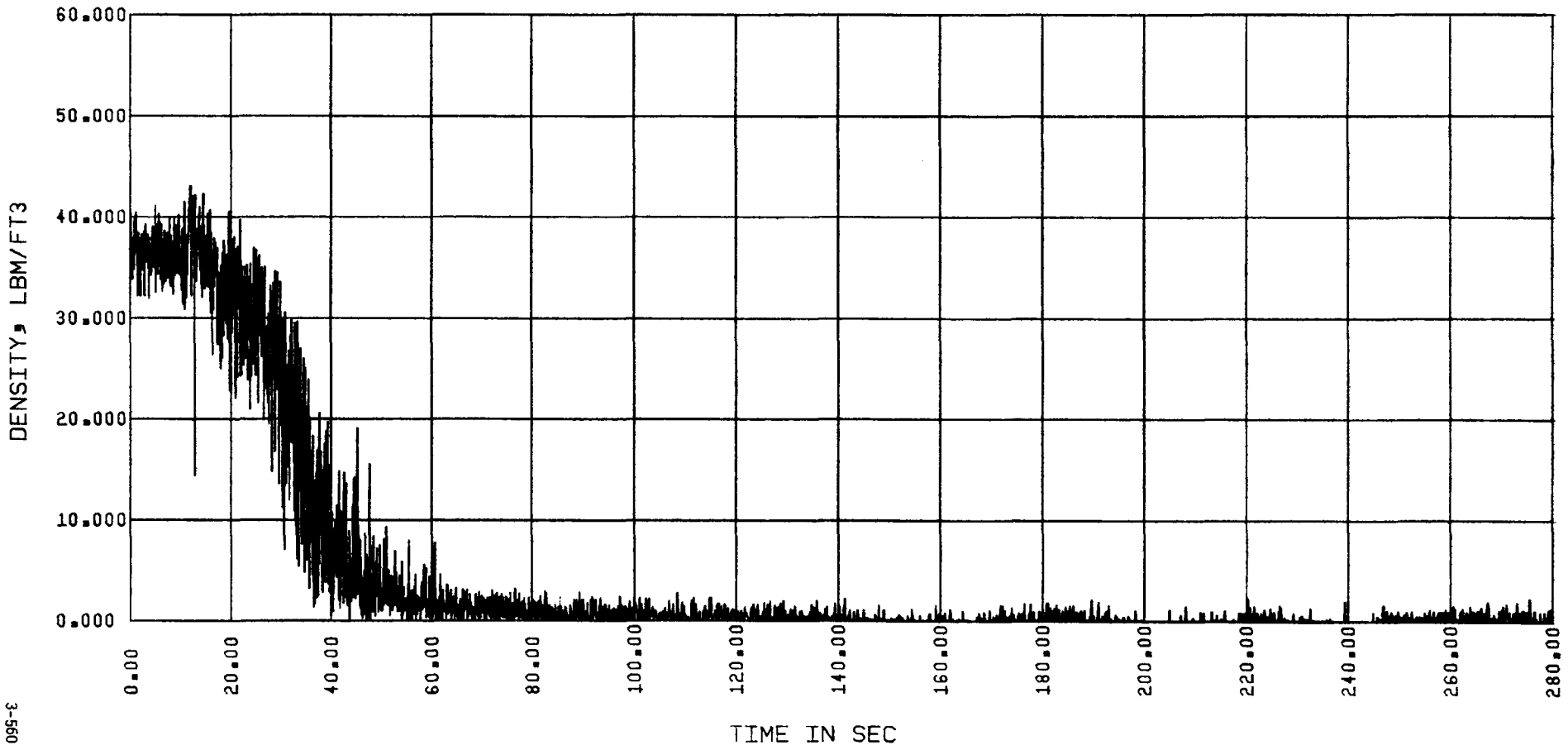
TEST 1179/MECHANIST FW FWD BDN
DENSITY BEAM1 AECL GD
PLOT NO.12



3-558

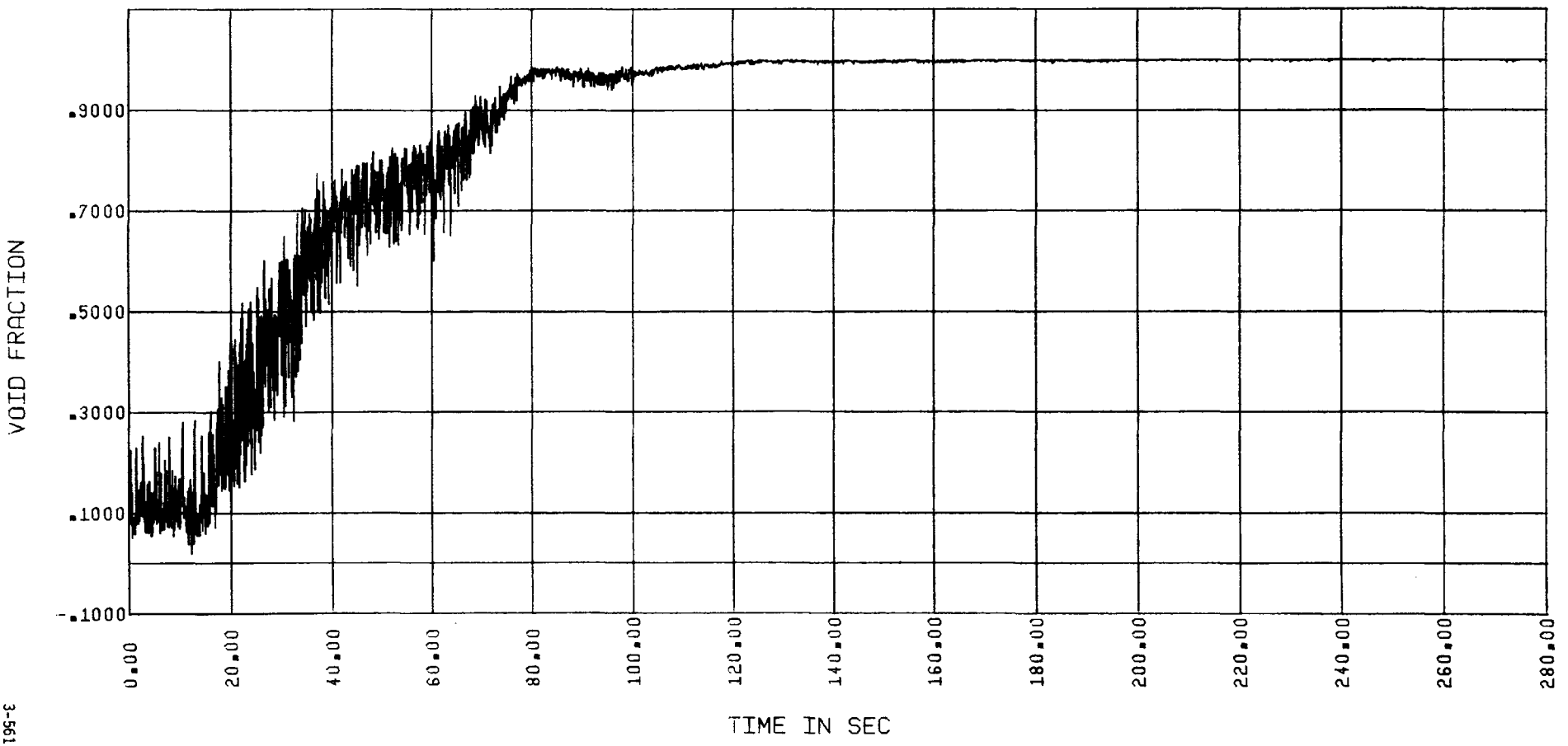

TEST 1179/MECHANIST FW FWD BDN
DENSITY BEAM2 AECL GD
PLOT NO.13
60.000
50.000
40.000
30.000
20.000
10.000
0.000
DENSITY, LBM/FT3
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-559

TEST 1179/MECHANIST FW FWD BDN
DENSITY BEAM3 AECL GD
PLOT NO.14

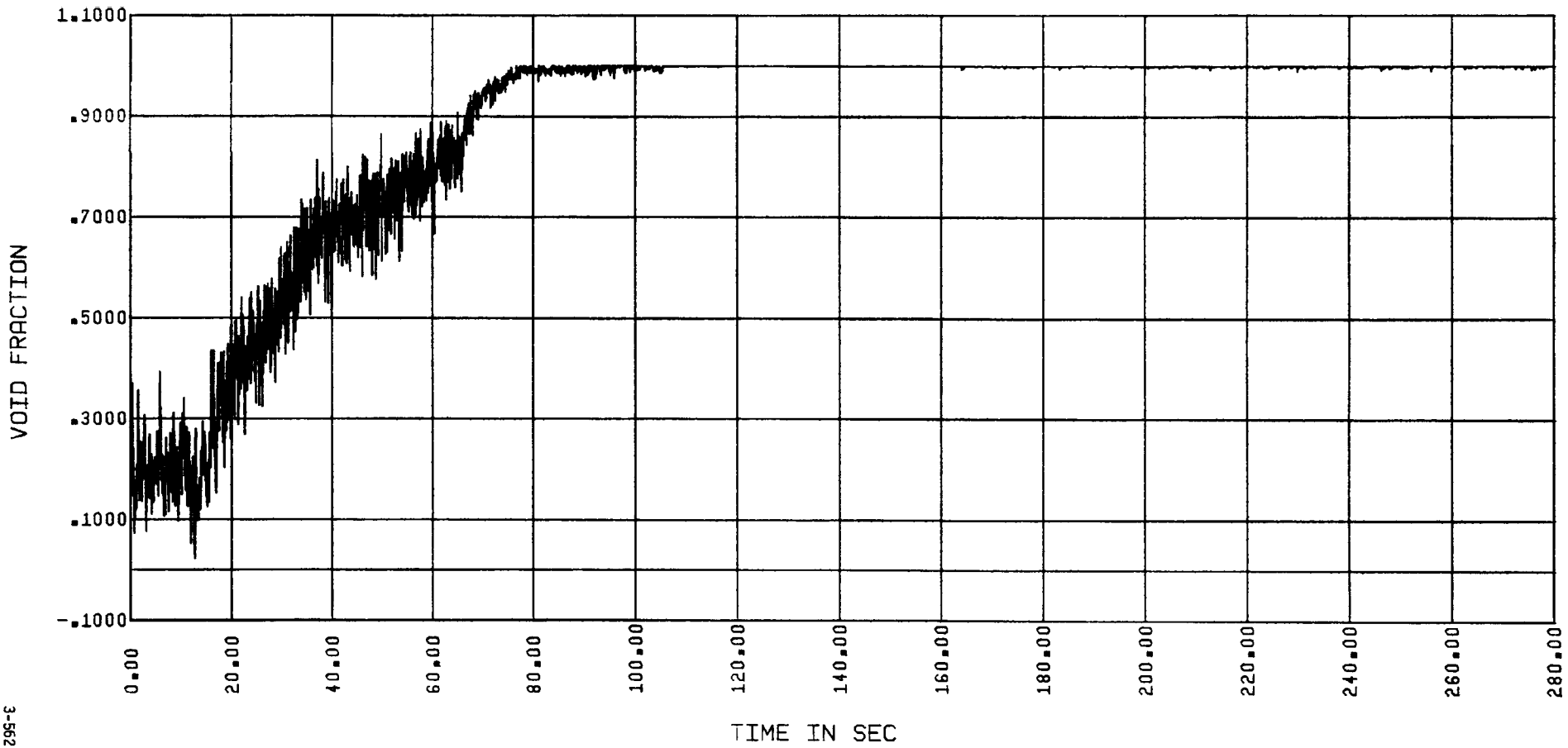


3-560

TEST 1179/MECHANIST FW FWD BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15

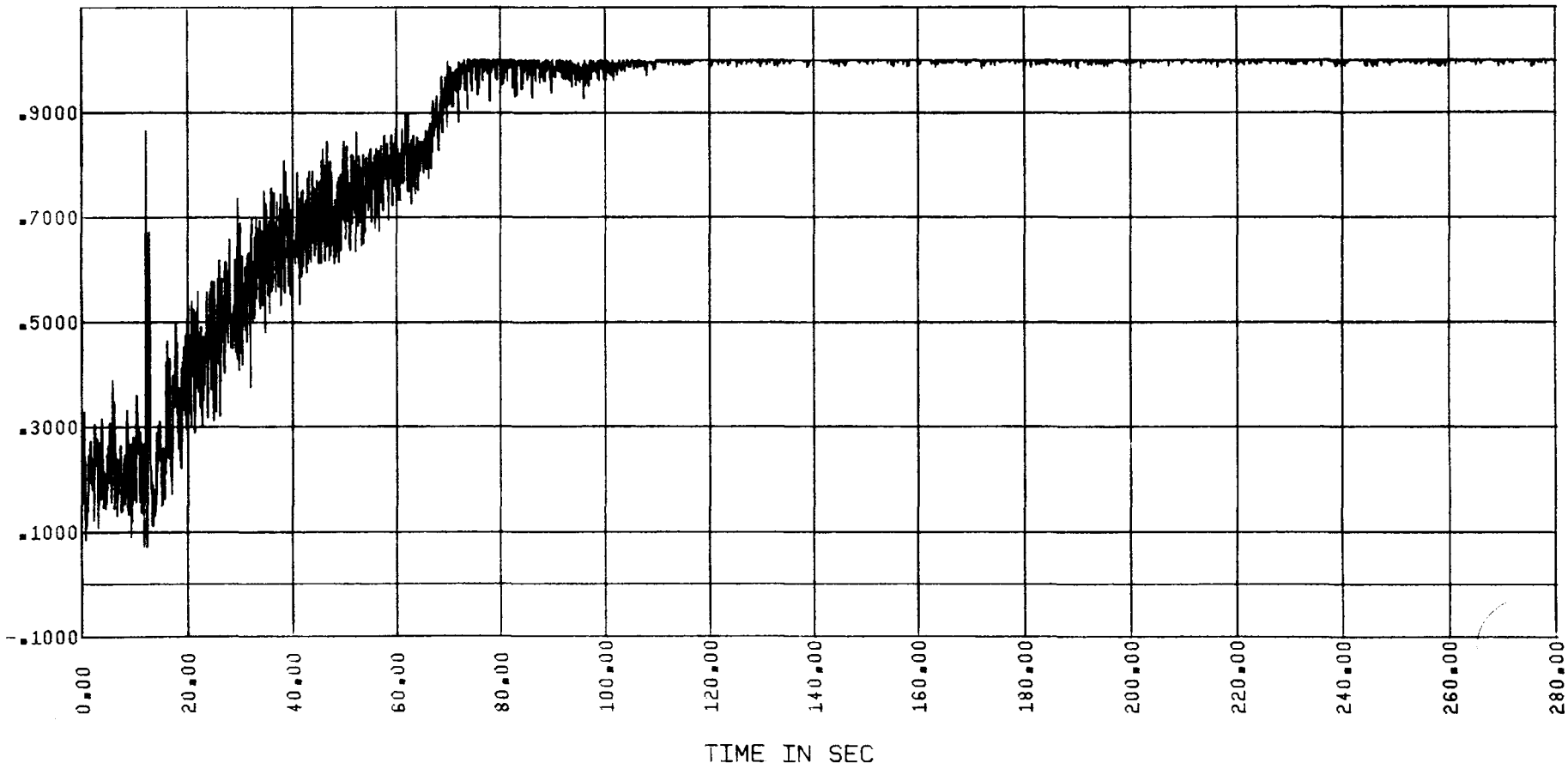


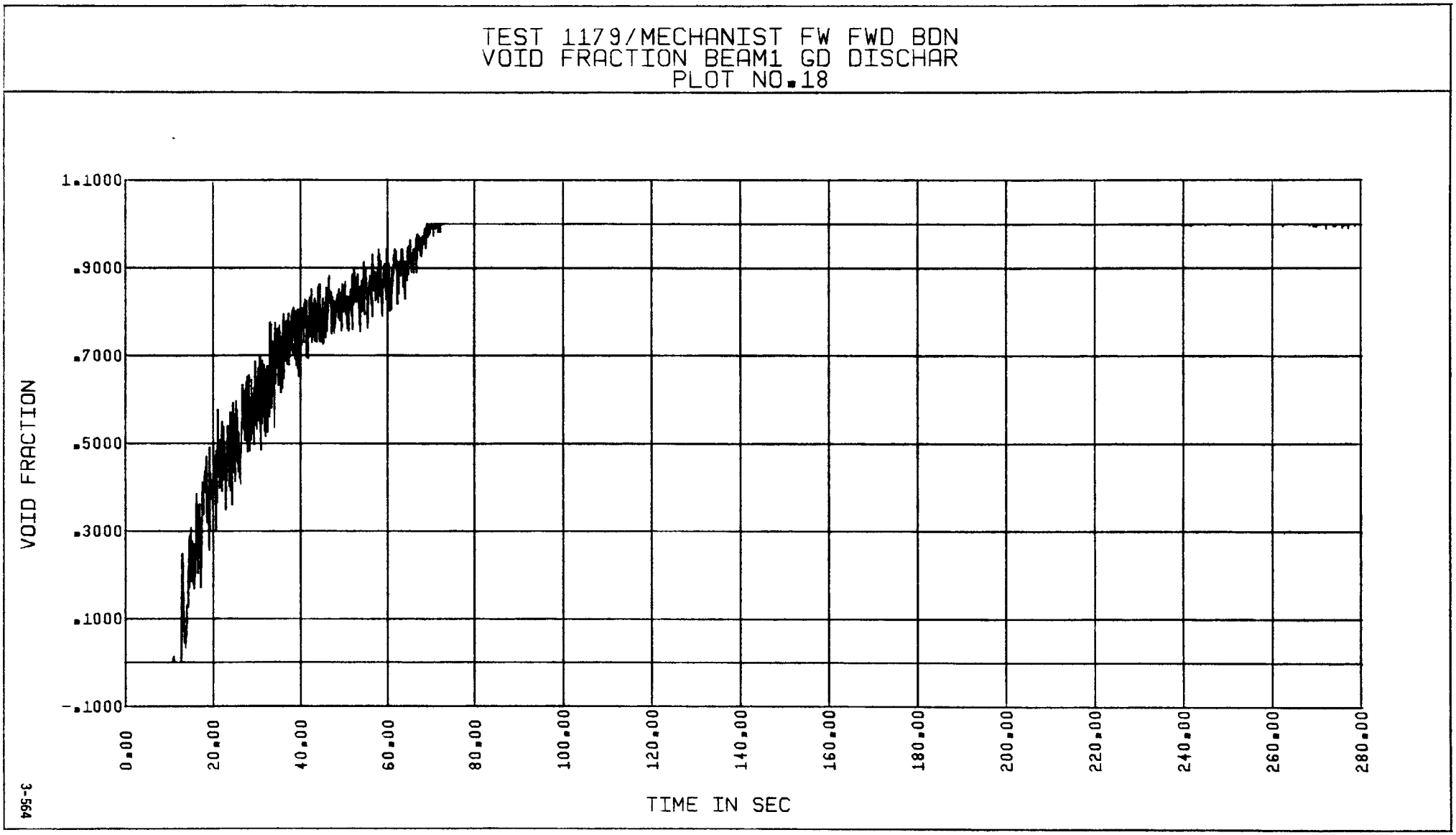
TEST 1179/MECHANIST FW FWD BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16



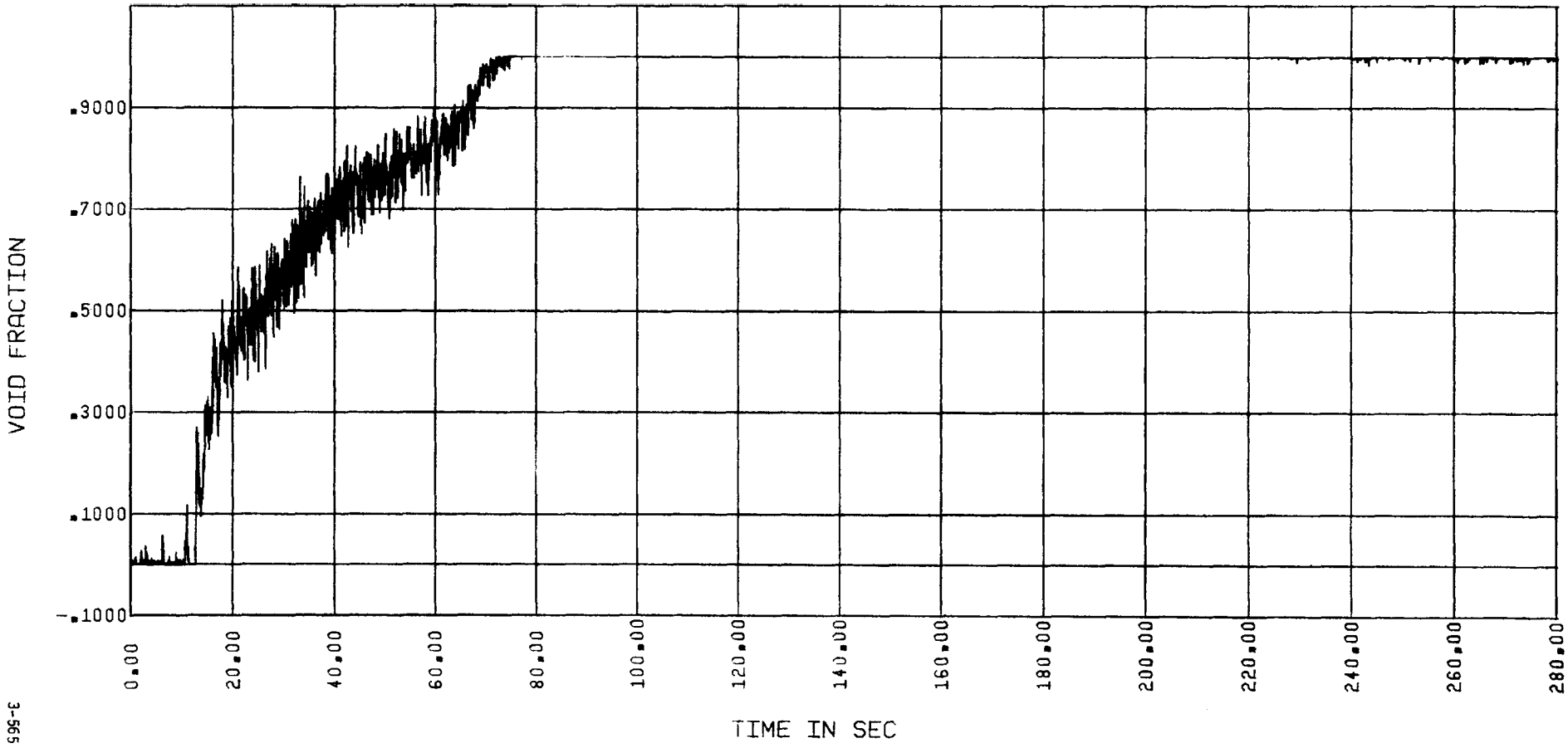
3-562

TEST 1179/MECHANIST FW FWD BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17

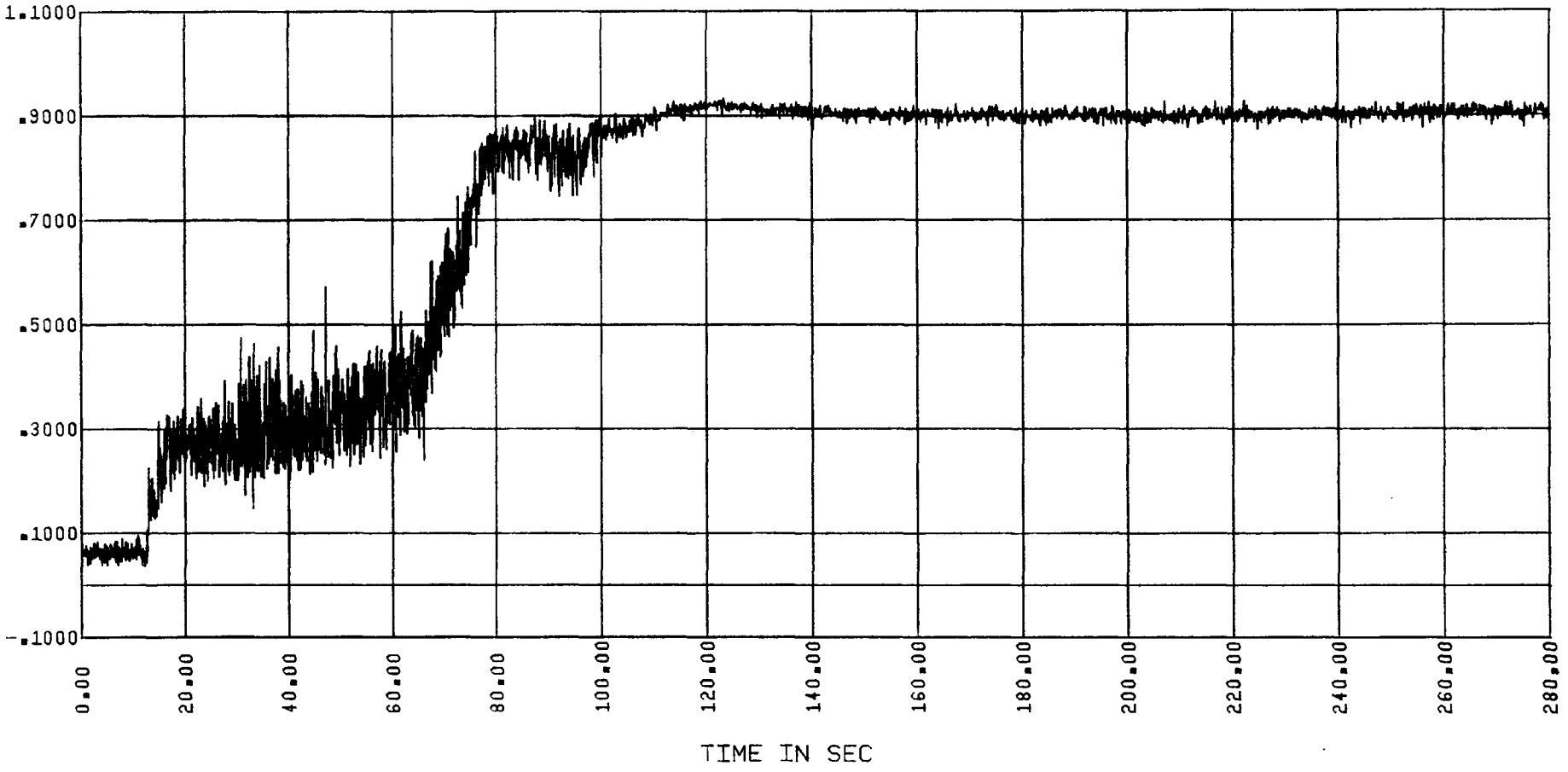



TEST 1179/MECHANIST FW FWD BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18
VOID FRACTION
1.1000
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-564

TEST 1179/MECHANIST FW FWD BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19

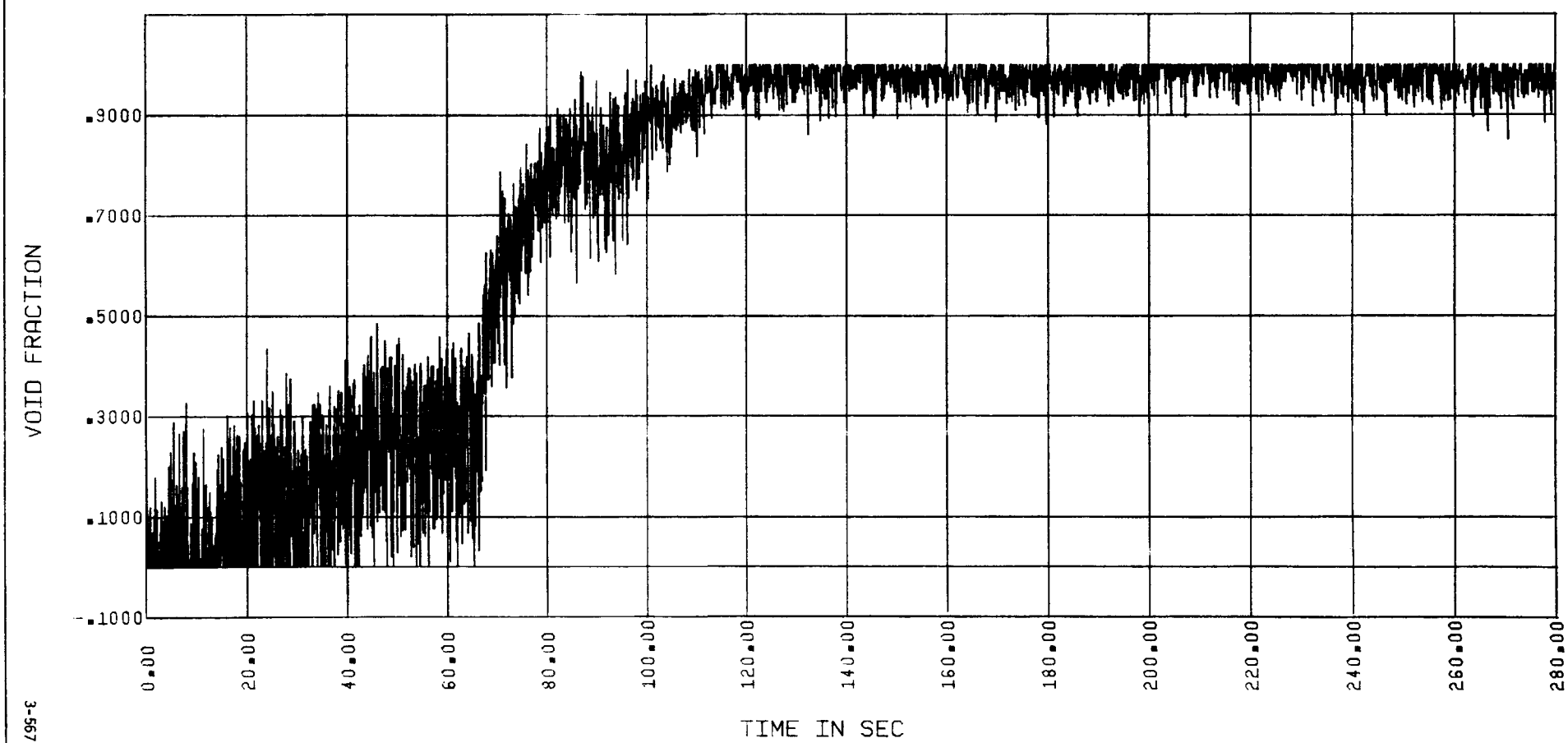


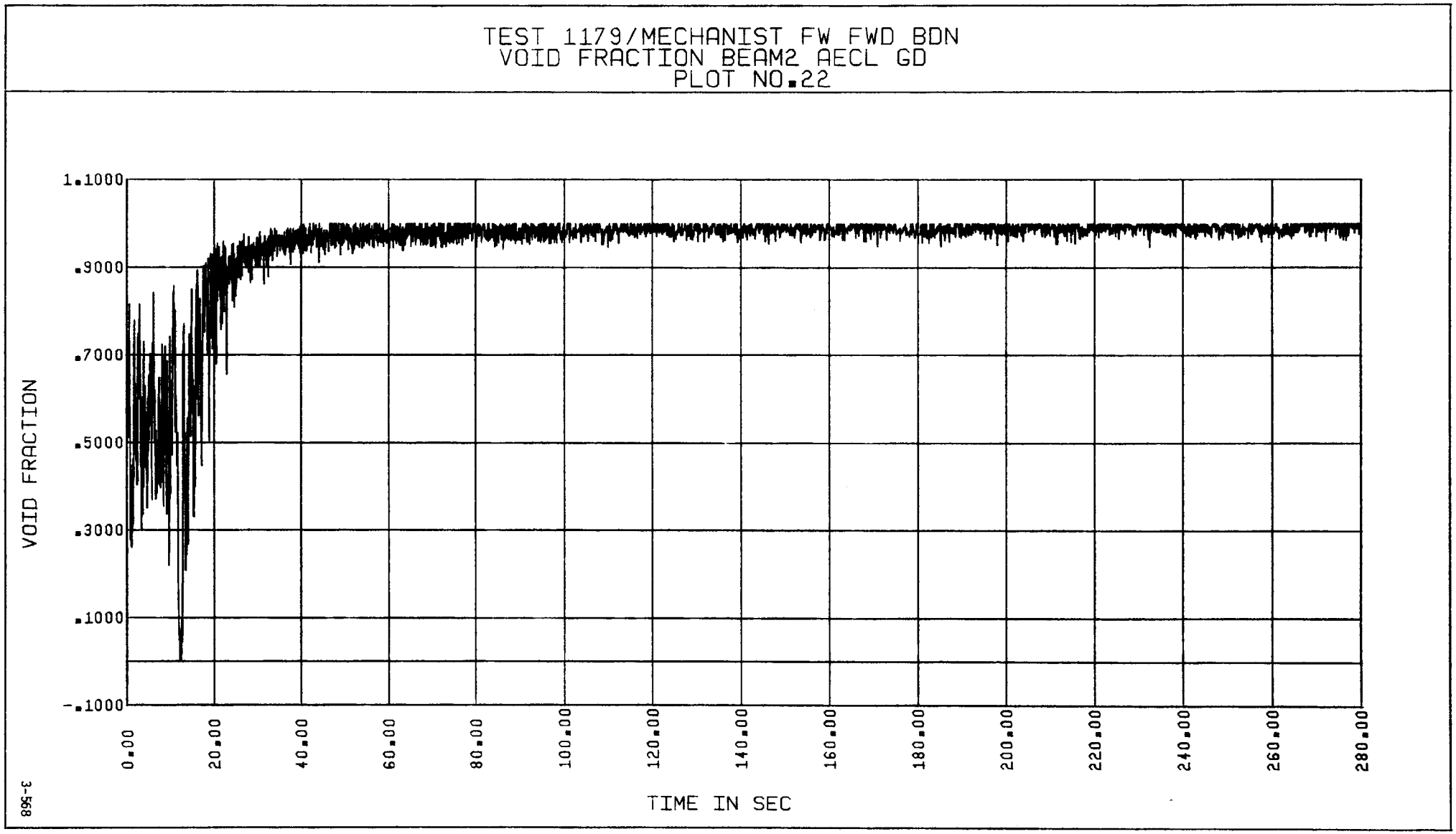
TEST 1179/MECHANIST FW FWD BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20

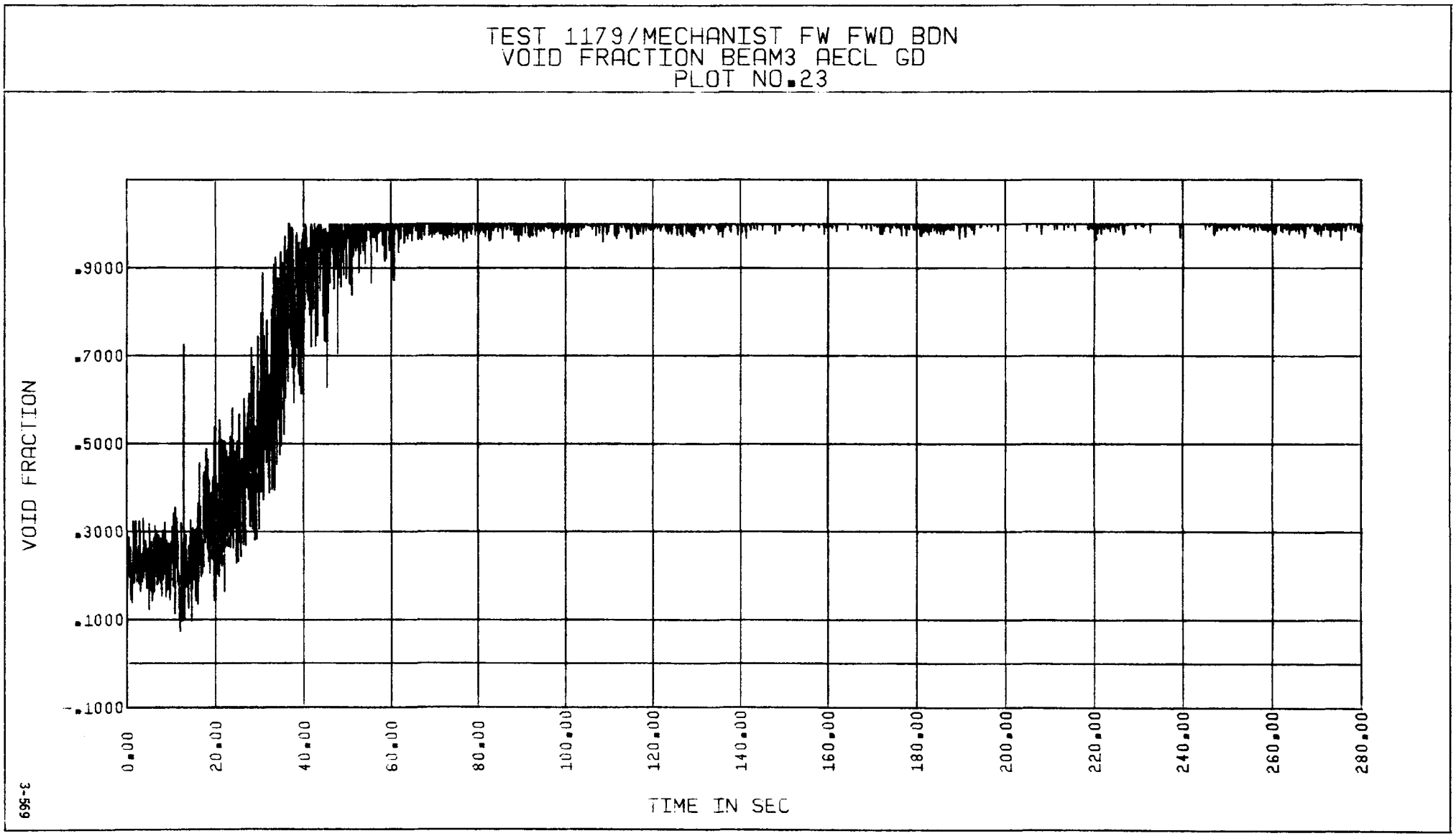


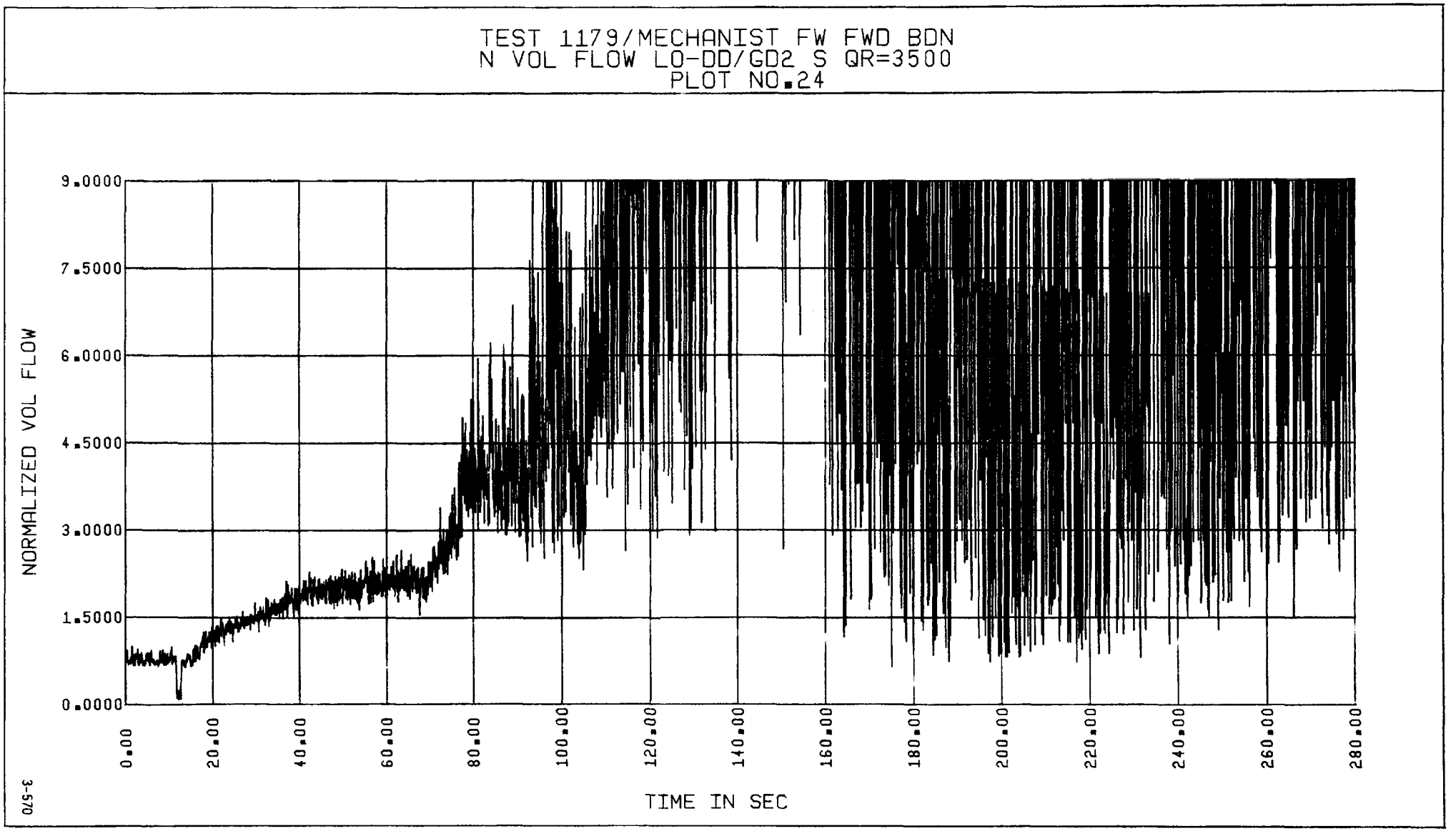
3-566

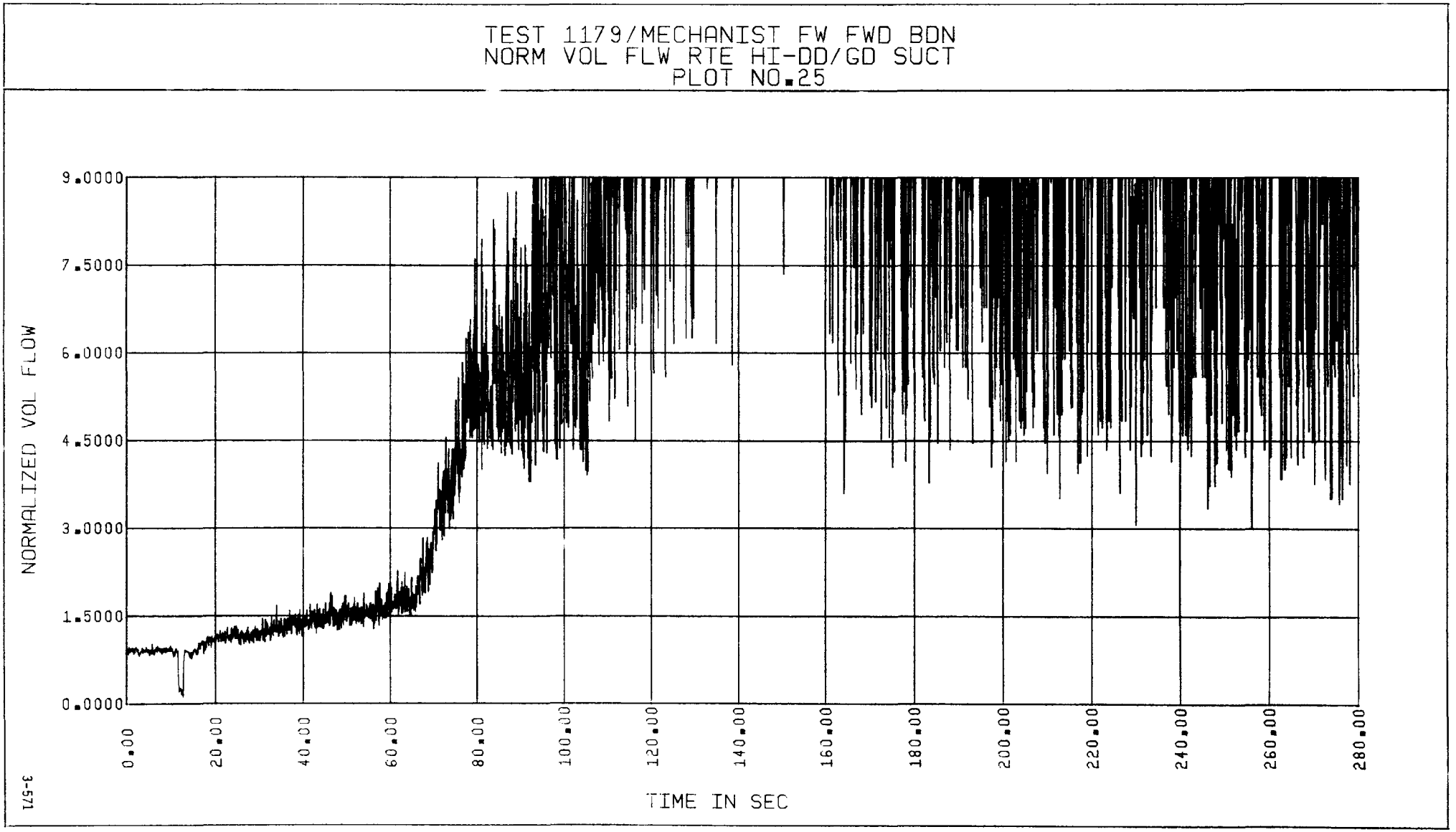
TEST 1179/MECHANIST FW FWD BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21

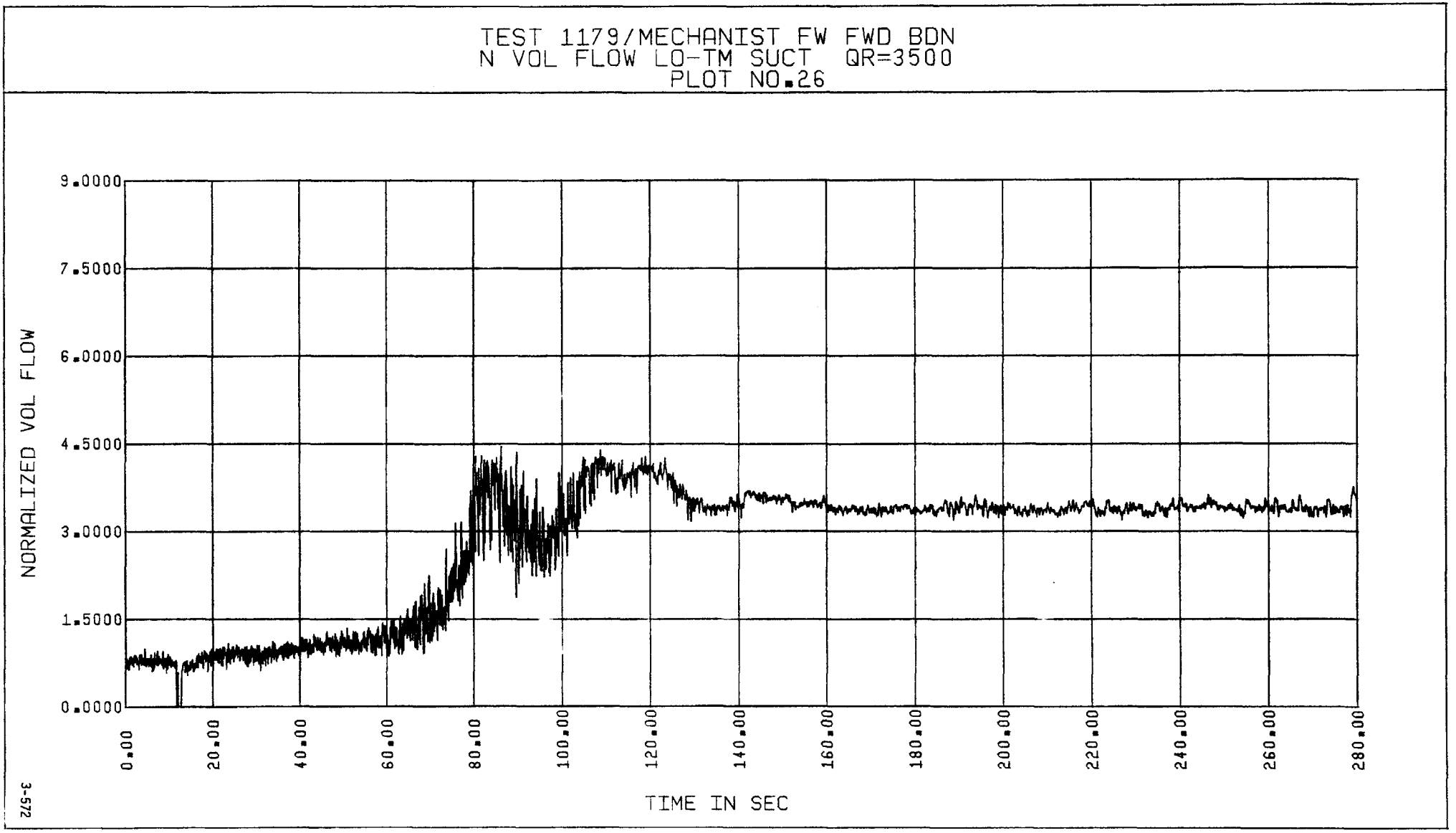


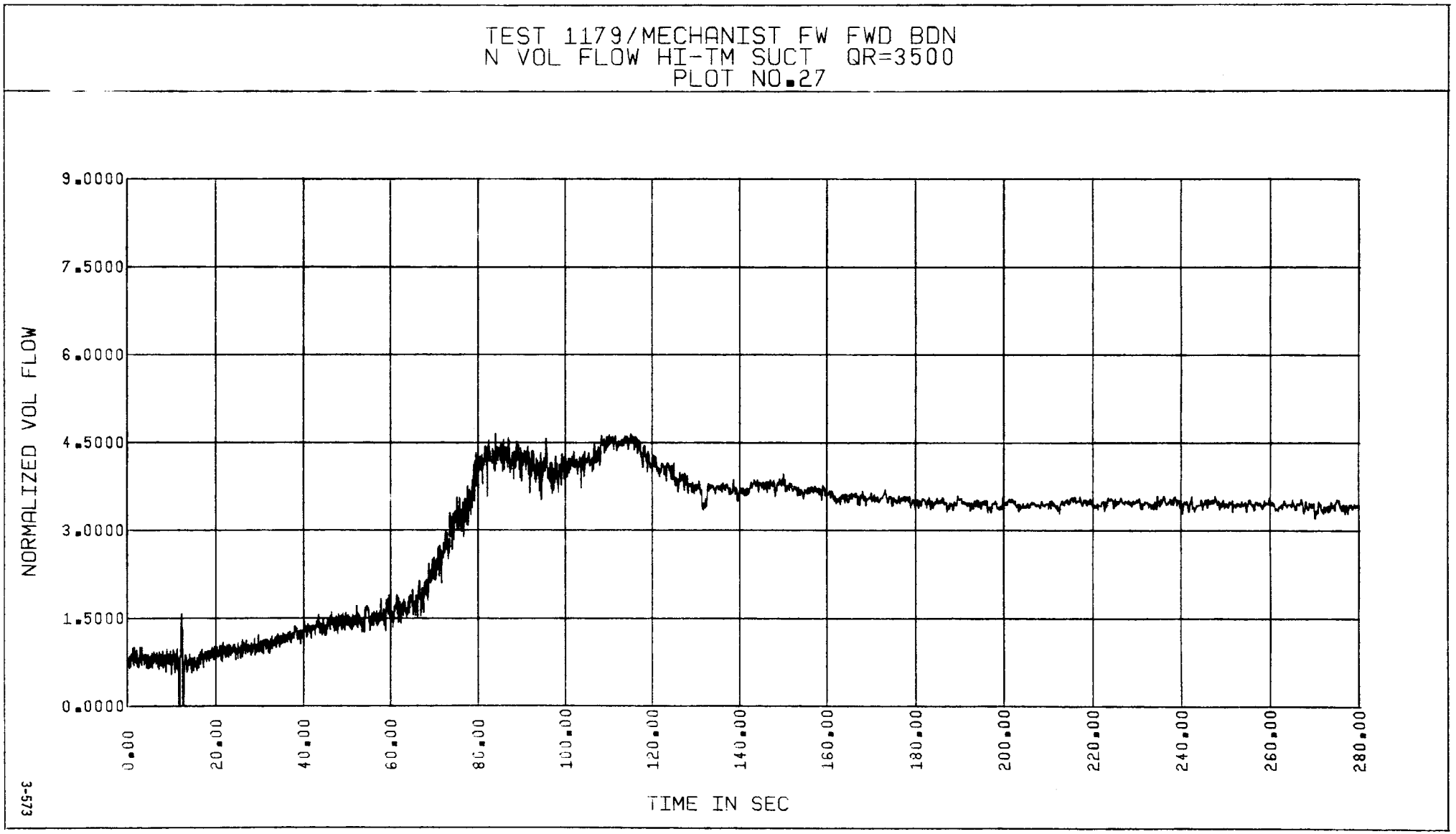

TEST 1179/MECHANIST FW FWD BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22
1.1000
.9000
.7000
.5000
.3000
.1000
-.1000
VOID FRACTION
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-568


TEST 1179/MECHANIST FW FWD BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-569

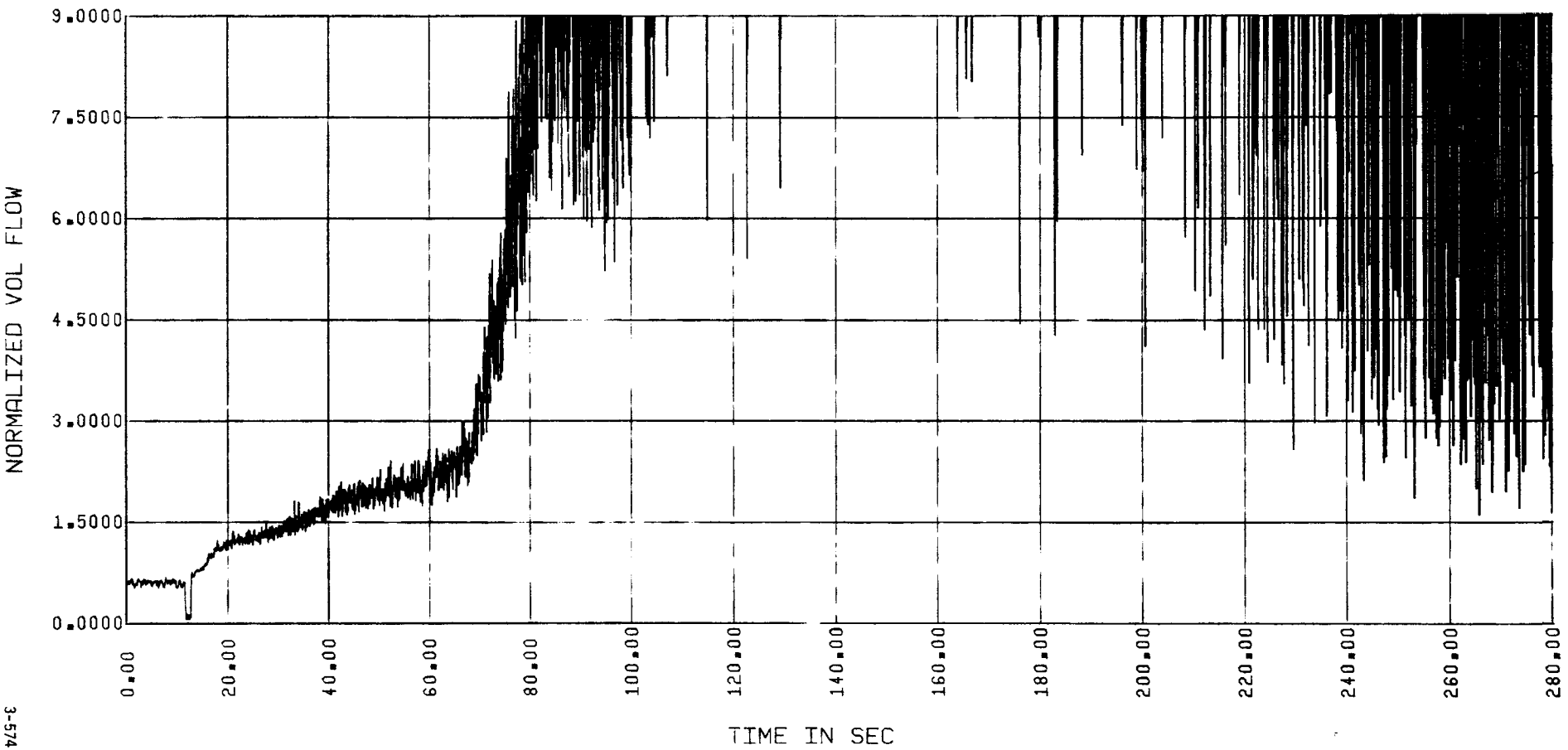

TEST 1179/MECHANIST FW FWD BDN
N VOL FLOW LO-DD/GD2 S QR=3500
PLOT NO.24
NORMALIZED VOL FLOW
9.0000
7.5000
6.0000
4.5000
3.0000
1.5000
0.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-570

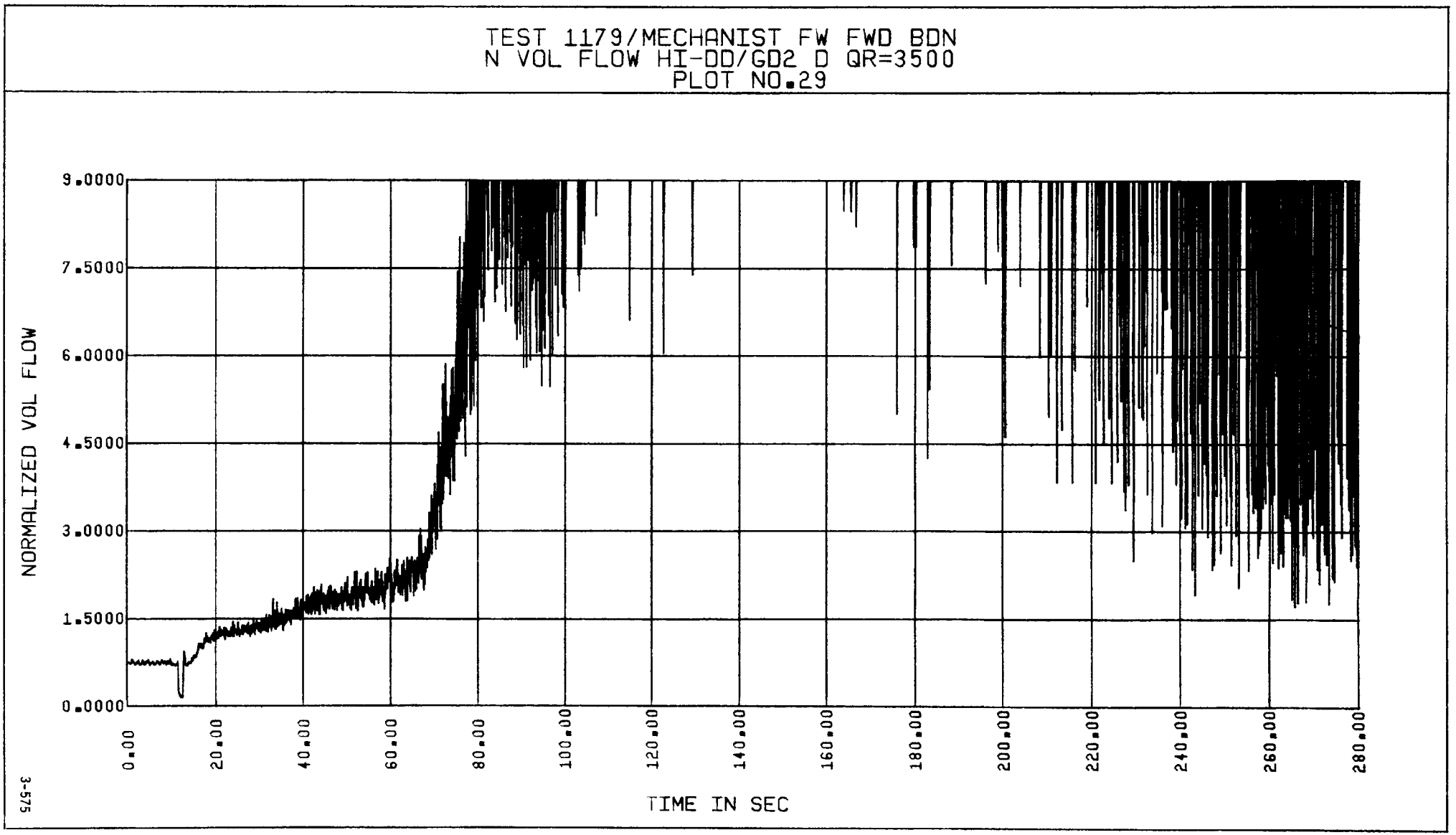

TEST 1179/MECHANIST FW FWD BDN
NORM VOL FLW RTE HI-DD/GD SUCT
PLOT NO.25
NORMALIZED VOL FLOW
9.0000
7.5000
6.0000
4.5000
3.0000
1.5000
0.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-571


TEST 1179/MECHANIST FW FWD BDN
N VOL FLOW LO-TM SUCT QR=3500
PLOT NO.26
NORMALIZED VOL FLOW
9.0000
7.5000
6.0000
4.5000
3.0000
1.5000
0.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-572

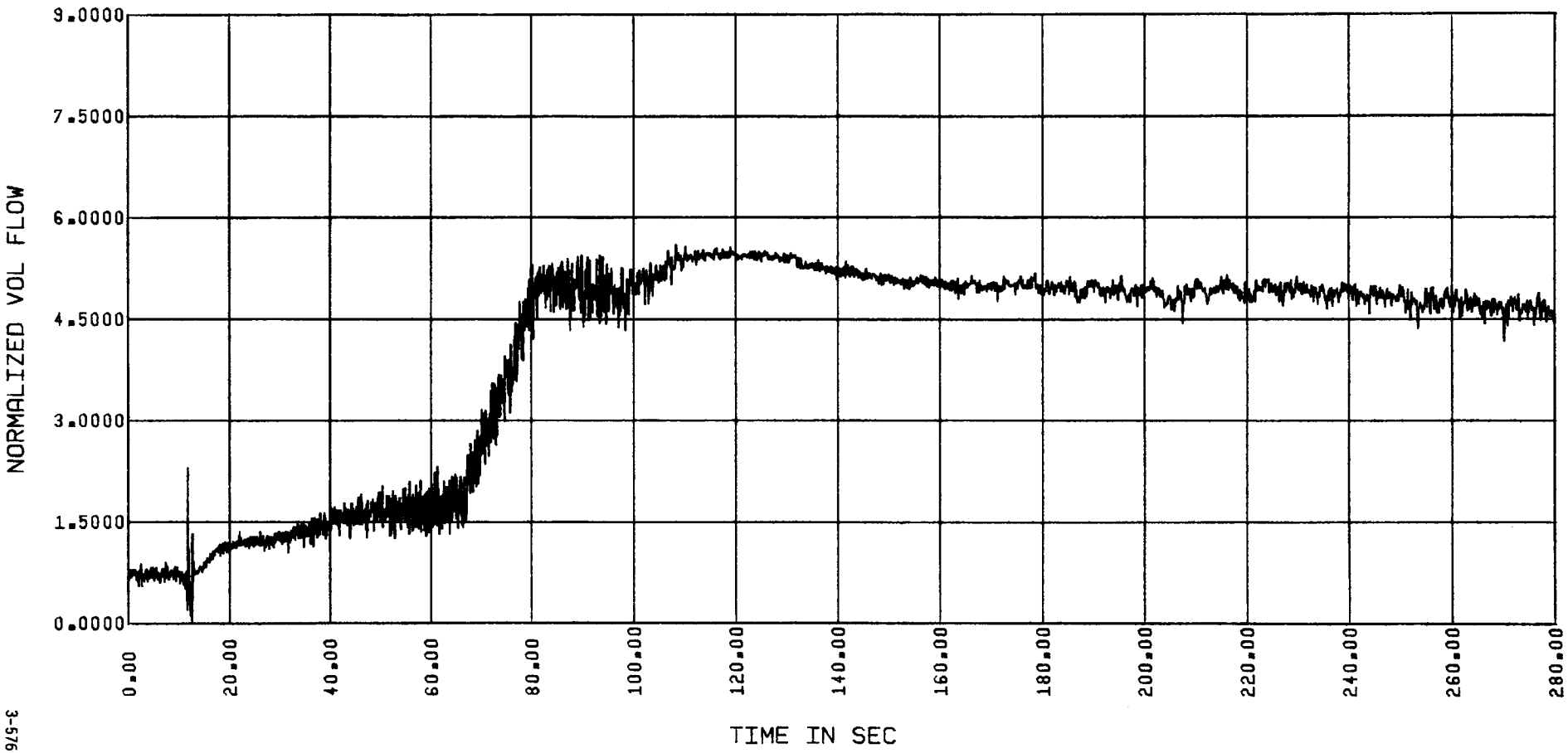

TEST 1179/MECHANIST FW FWD BDN
N VOL FLOW HI-TM SUCT QR=3500
PLOT NO.27
NORMALIZED VOL FLOW
9.0000
7.5000
6.0000
4.5000
3.0000
1.5000
0.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

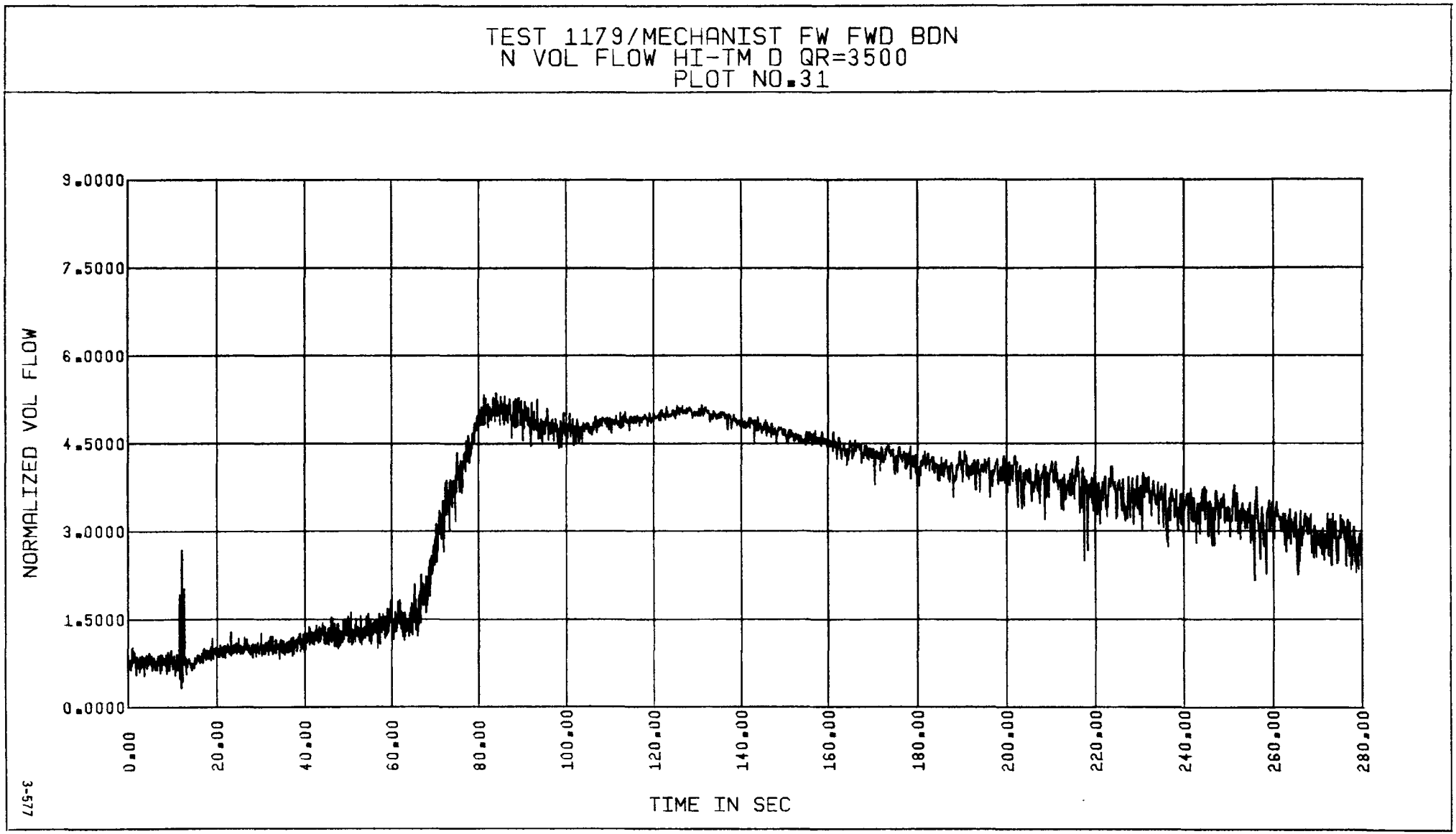
TEST 1179/MECHANIST FW FWD BDN
N VOL FLOW LO-DD/GD2 D QR=3500
PLOT NO.28



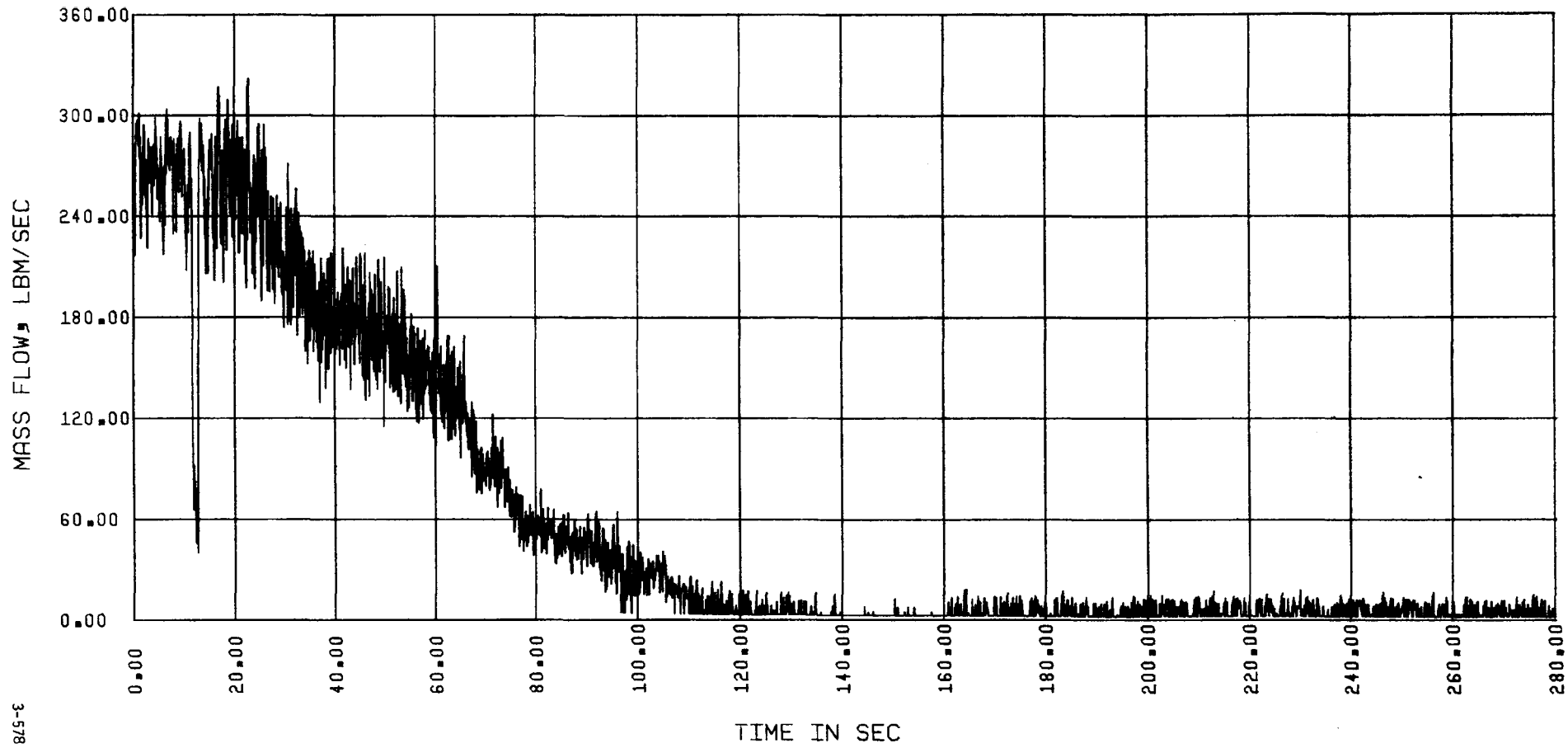

TEST 1179/MECHANIST FW FWD BDN
N VOL FLOW HI-DD/GD2 D QR=3500
PLOT NO.29
NORMALIZED VOL FLOW
9.0000
7.5000
6.0000
4.5000
3.0000
1.5000
0.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-575

TEST 1179/MECHANIST FW FWD BDN
N VOL FLOW LO-TM DISCH QR=3500
PLOT NO.30

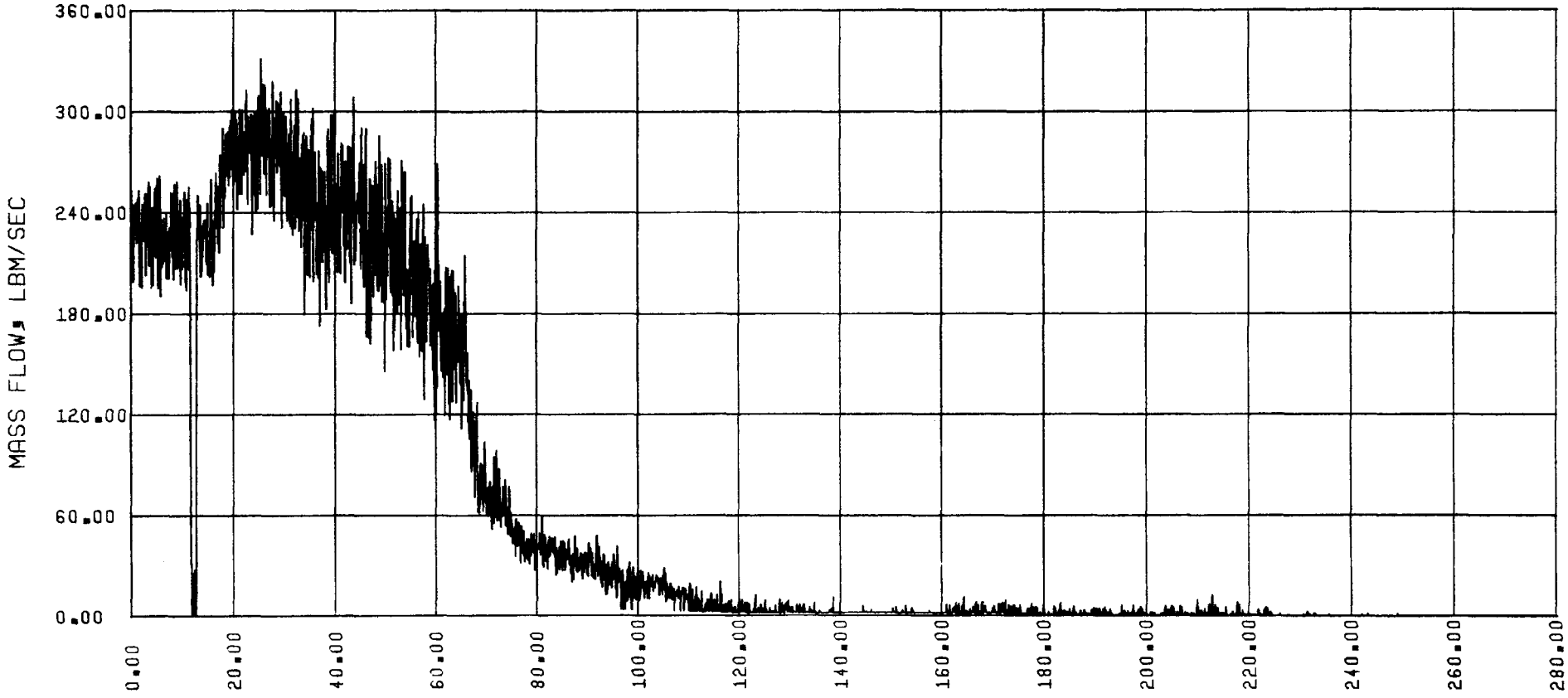



TEST 1179/MECHANIST FW FWD BDN
N VOL FLOW HI-TM D QR=3500
PLOT NO.31
NORMALIZED VOL FLOW
9.0000
7.5000
6.0000
4.5000
3.0000
1.5000
0.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-577

TEST 1179/MECHANIST FW FWD BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.32

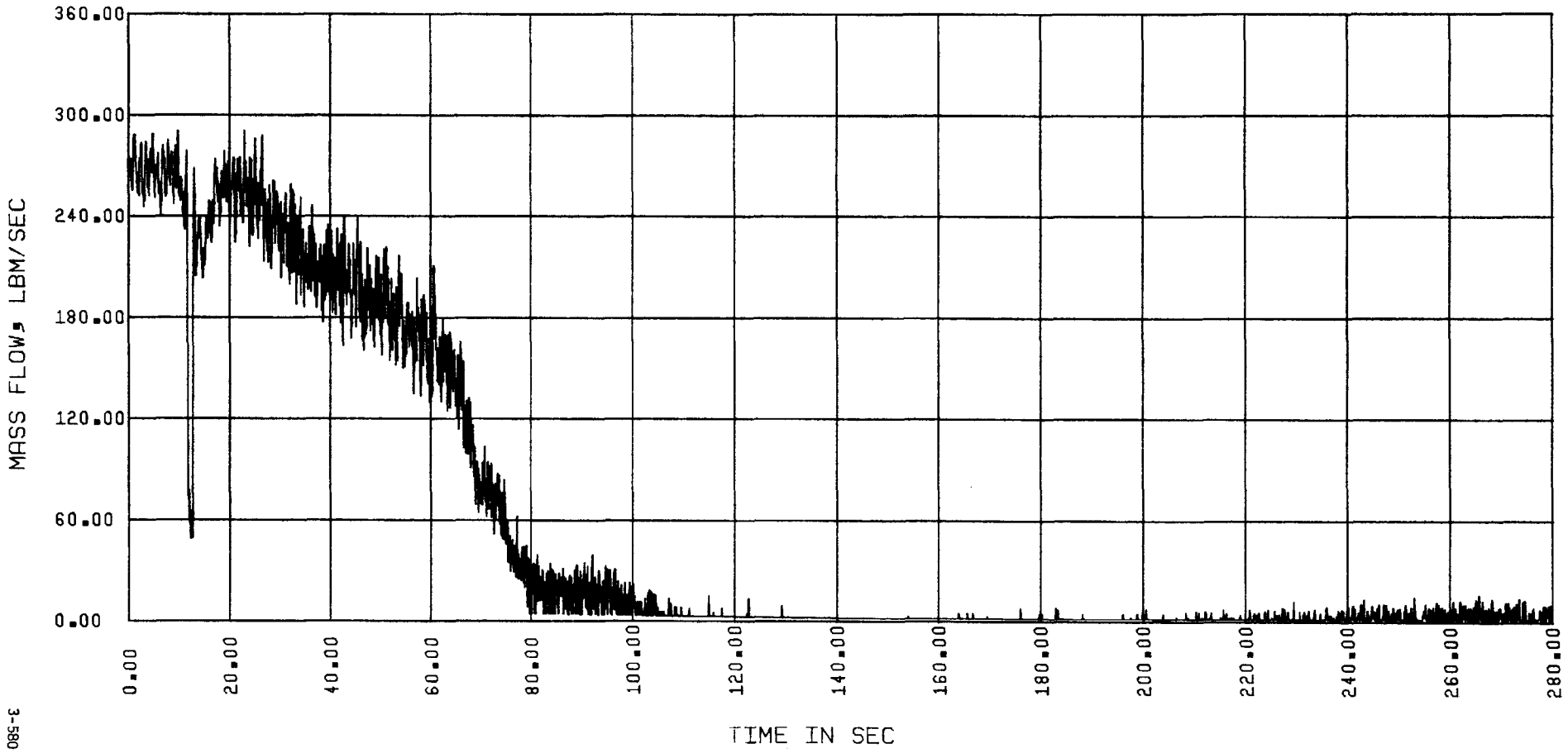


TEST 1179/MECHANIST FW FWD BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.33

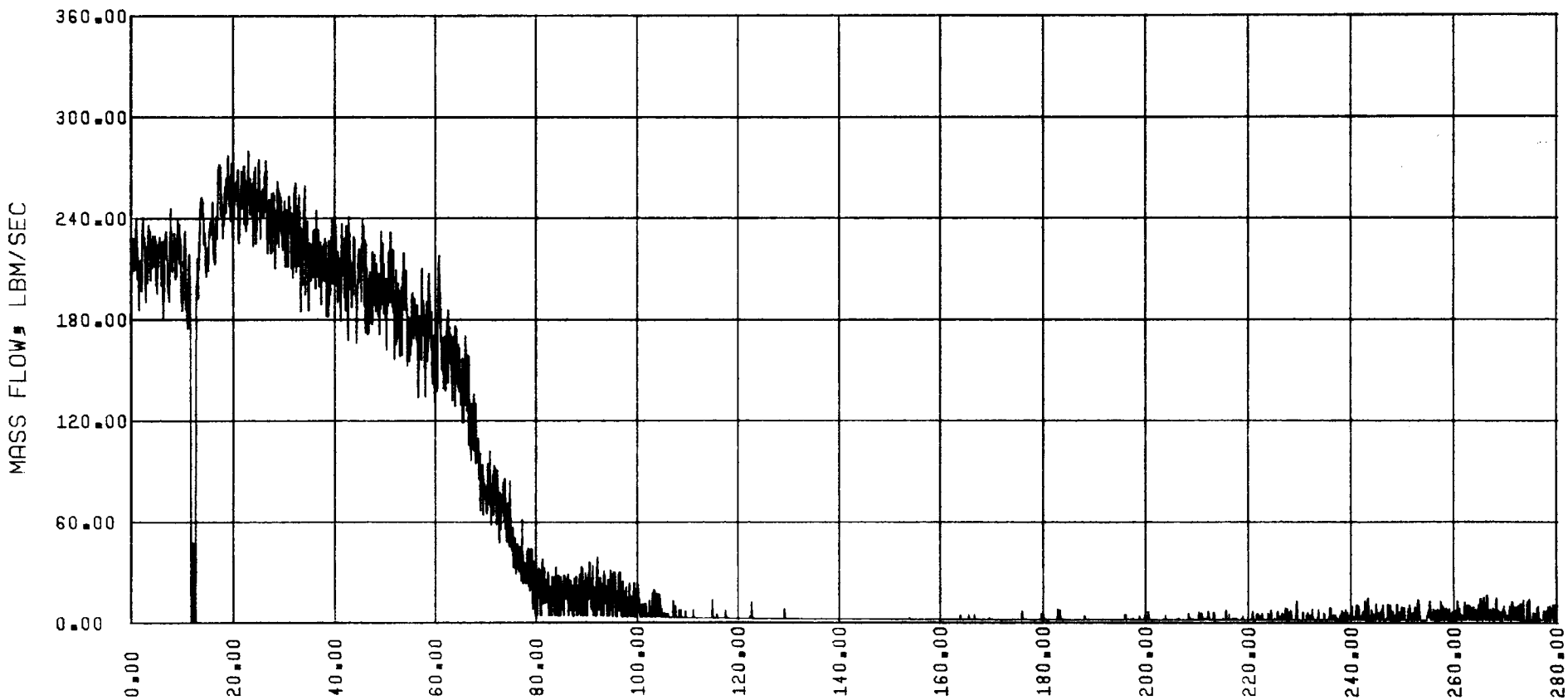


3-579

TEST 1179/MECHANIST FW FWD BDN
MASS FLOW RATE HI-DD/GD2 DISCH
PLOT NO.34

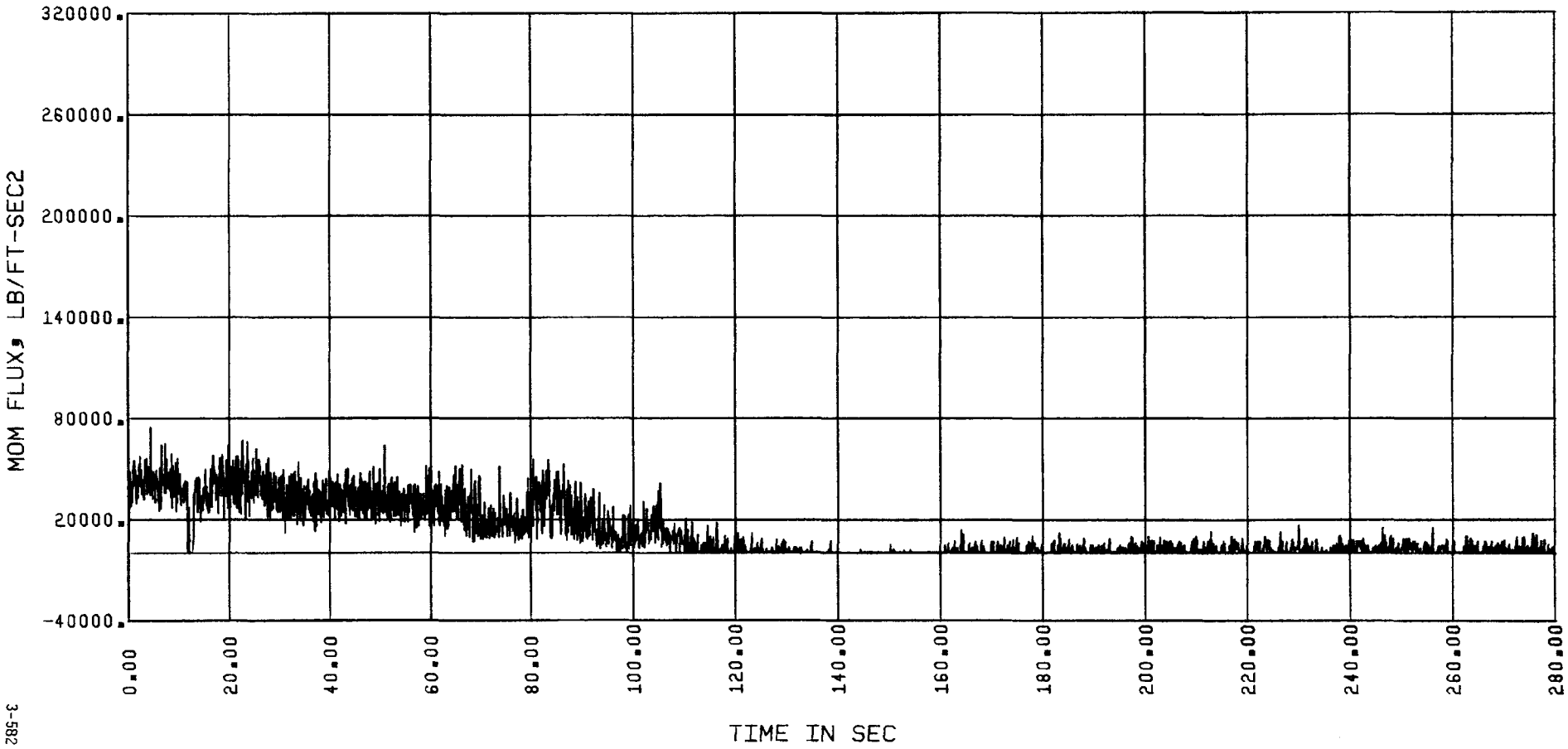


TEST 1179/MECHANIST FW FWD BDN
MASS FLOW RATE LO-DD/GD2 DISCH
PLOT NO.35



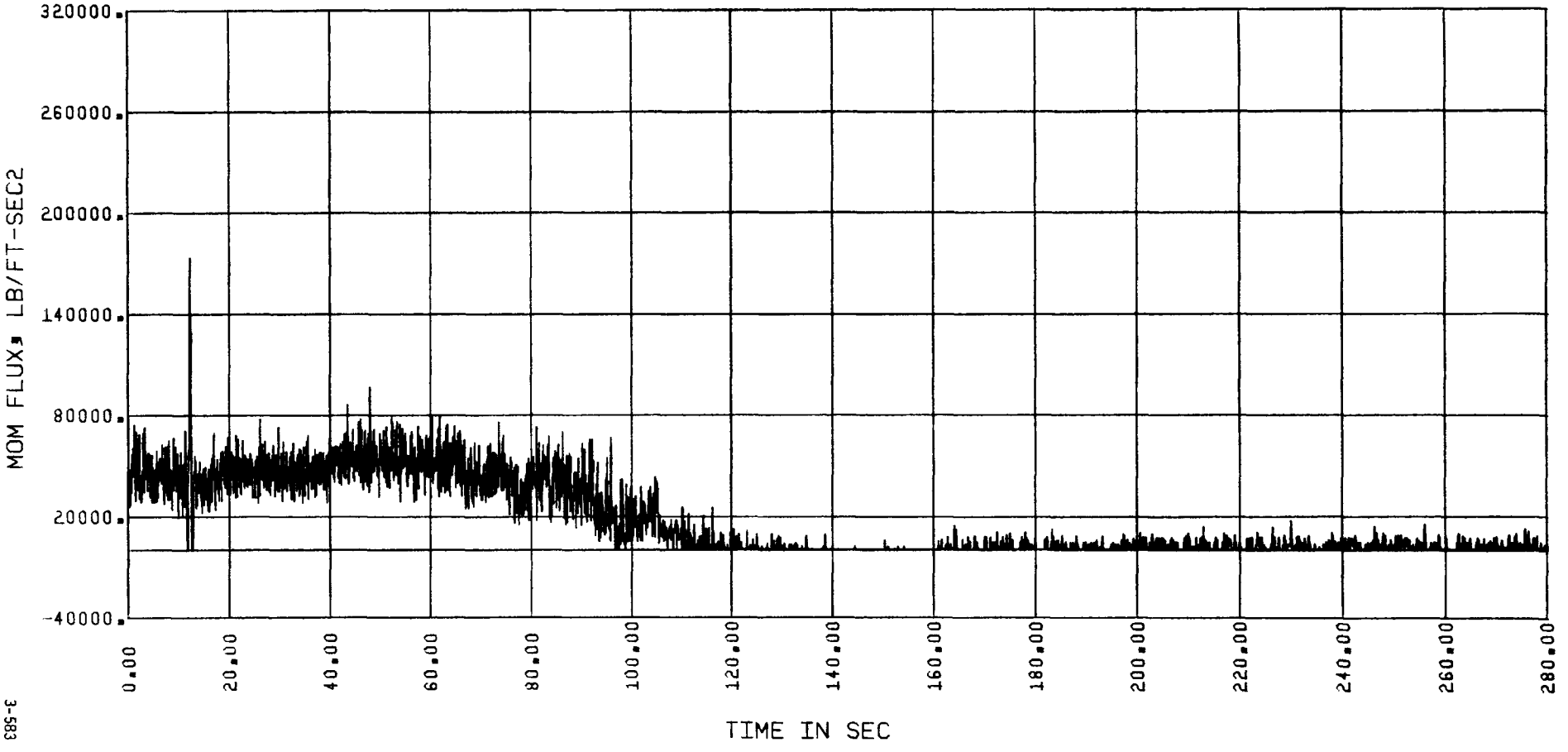
3-581

TEST 1179/MECHANIST FW FWD BDN
MOMENTUM FLUX GD2/LO-TM SUCT
PLOT NO.36

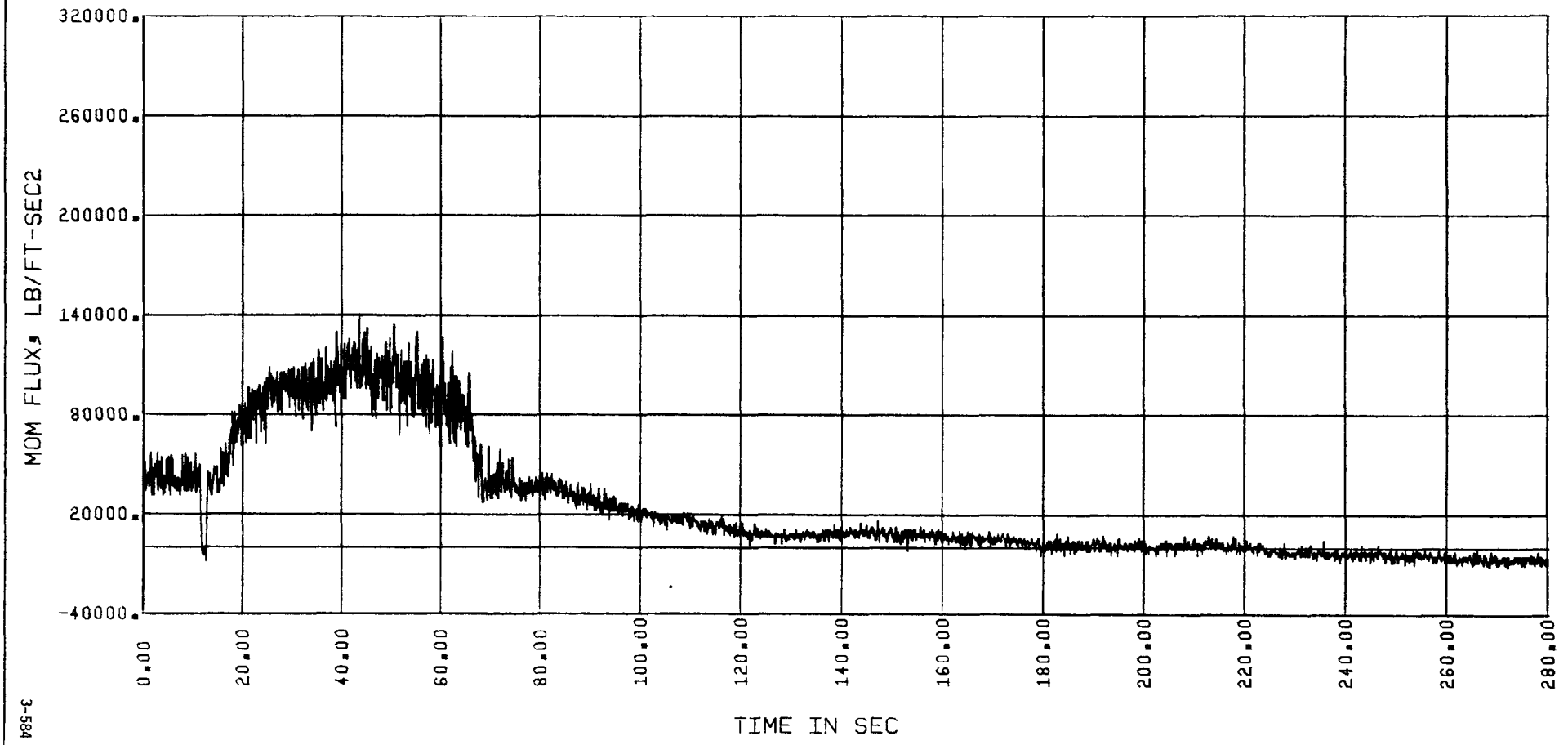


3-582

TEST 1179/MECHANIST FW FWD BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.37

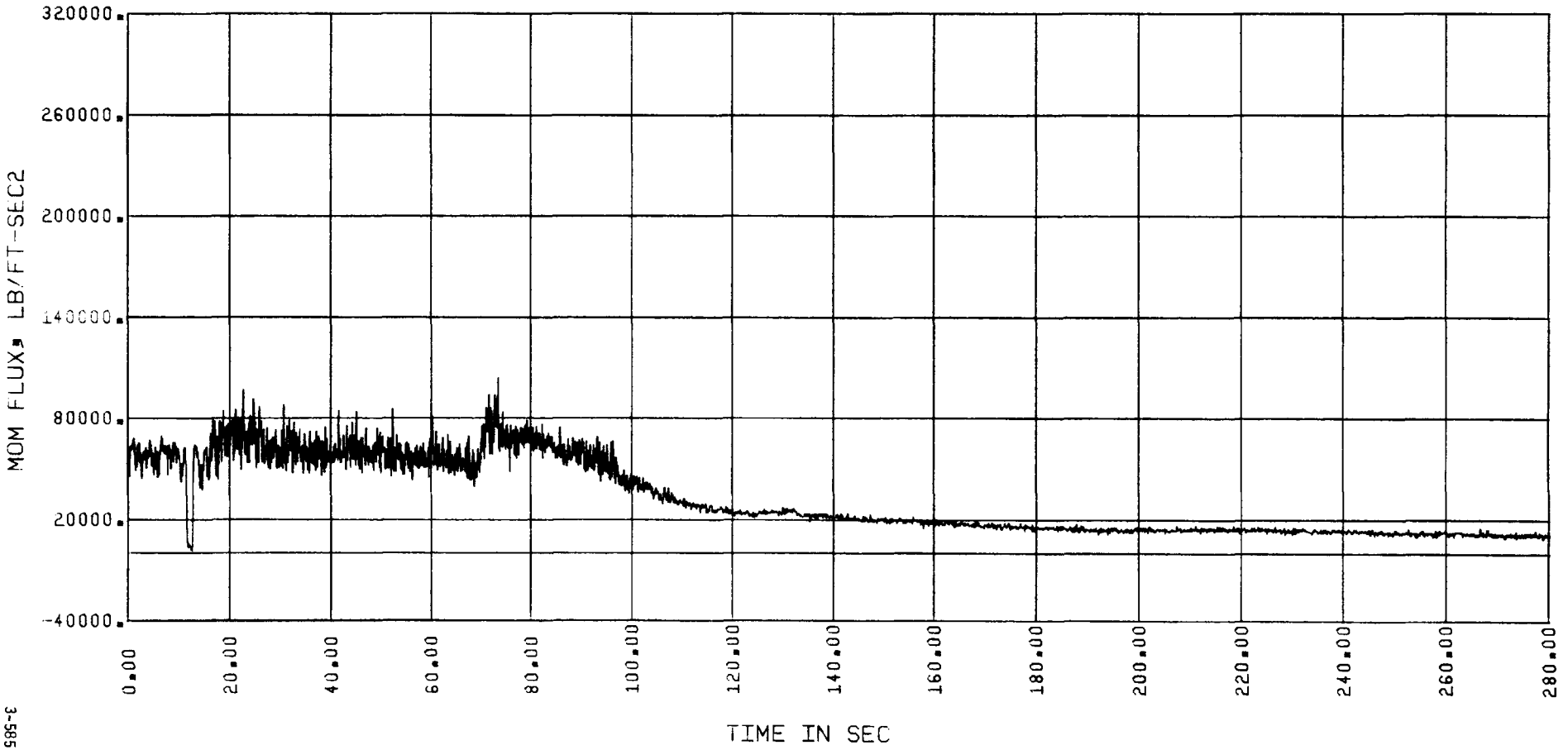


TEST 1179/MECHANIST FW FWD BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



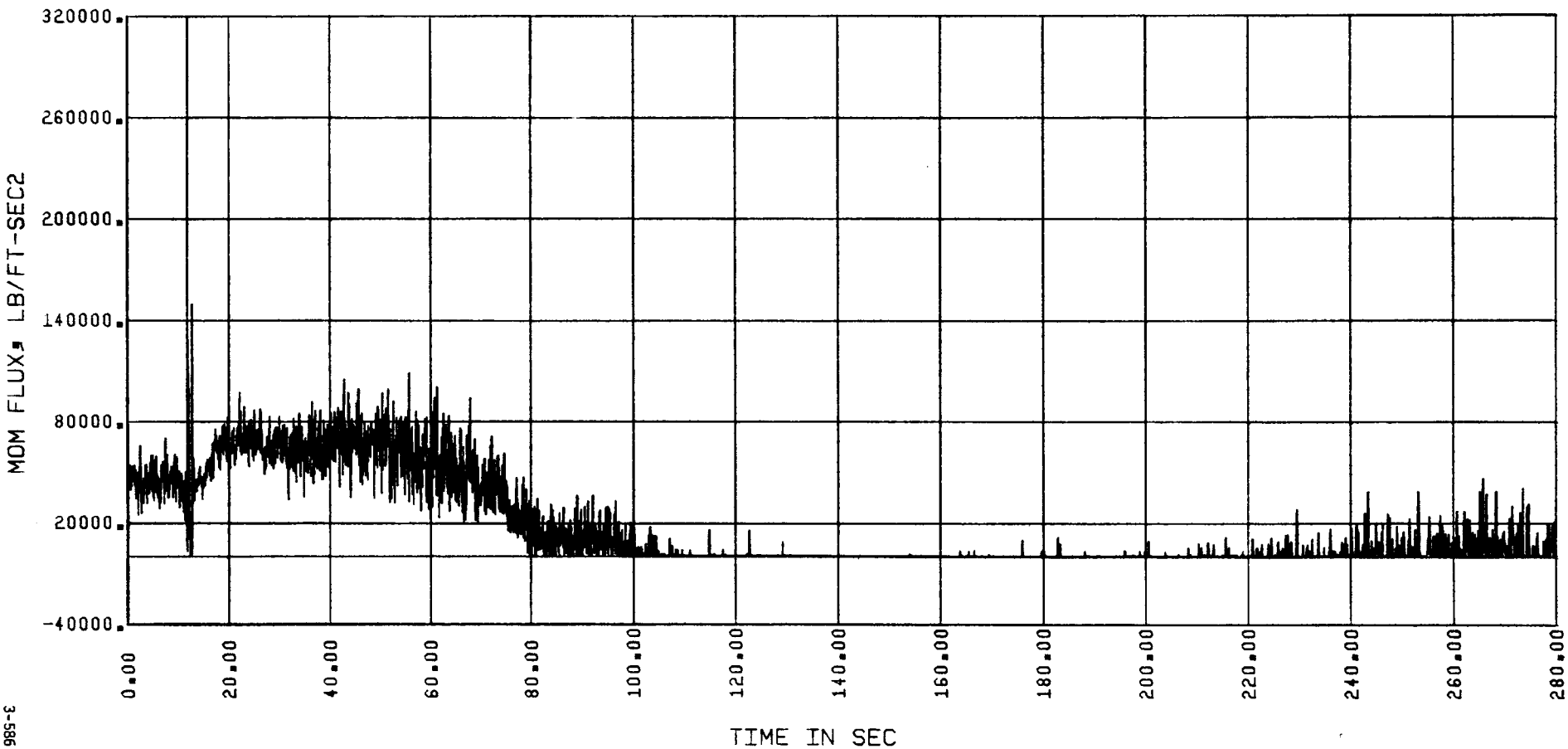
3-564

TEST 1179/MECHANIST FW FWD BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39



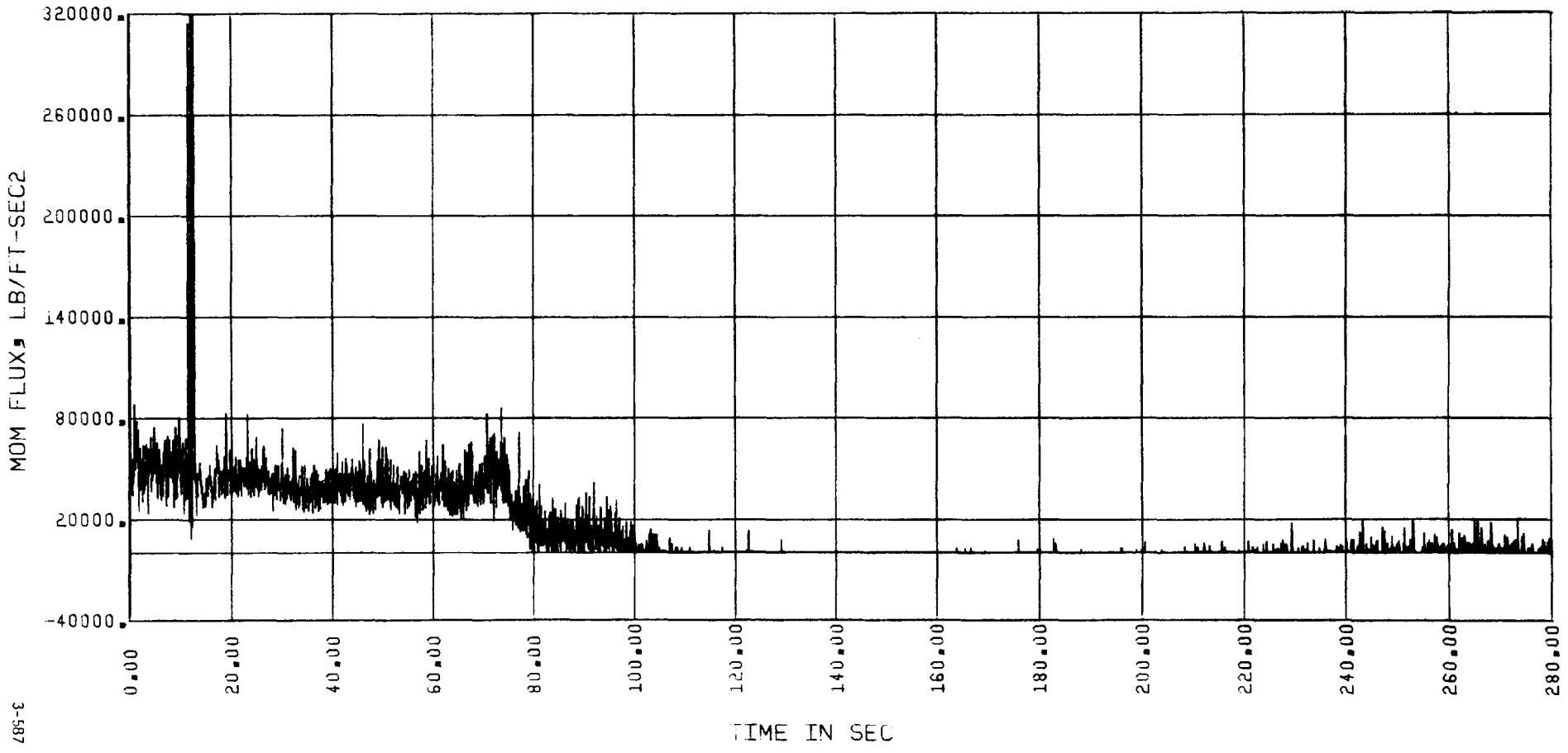
3-585

TEST 1179/MECHANIST FW FWD BDN
MOMENTUM FLUX GD2/LO-TM DISCH
PLOT NO.40



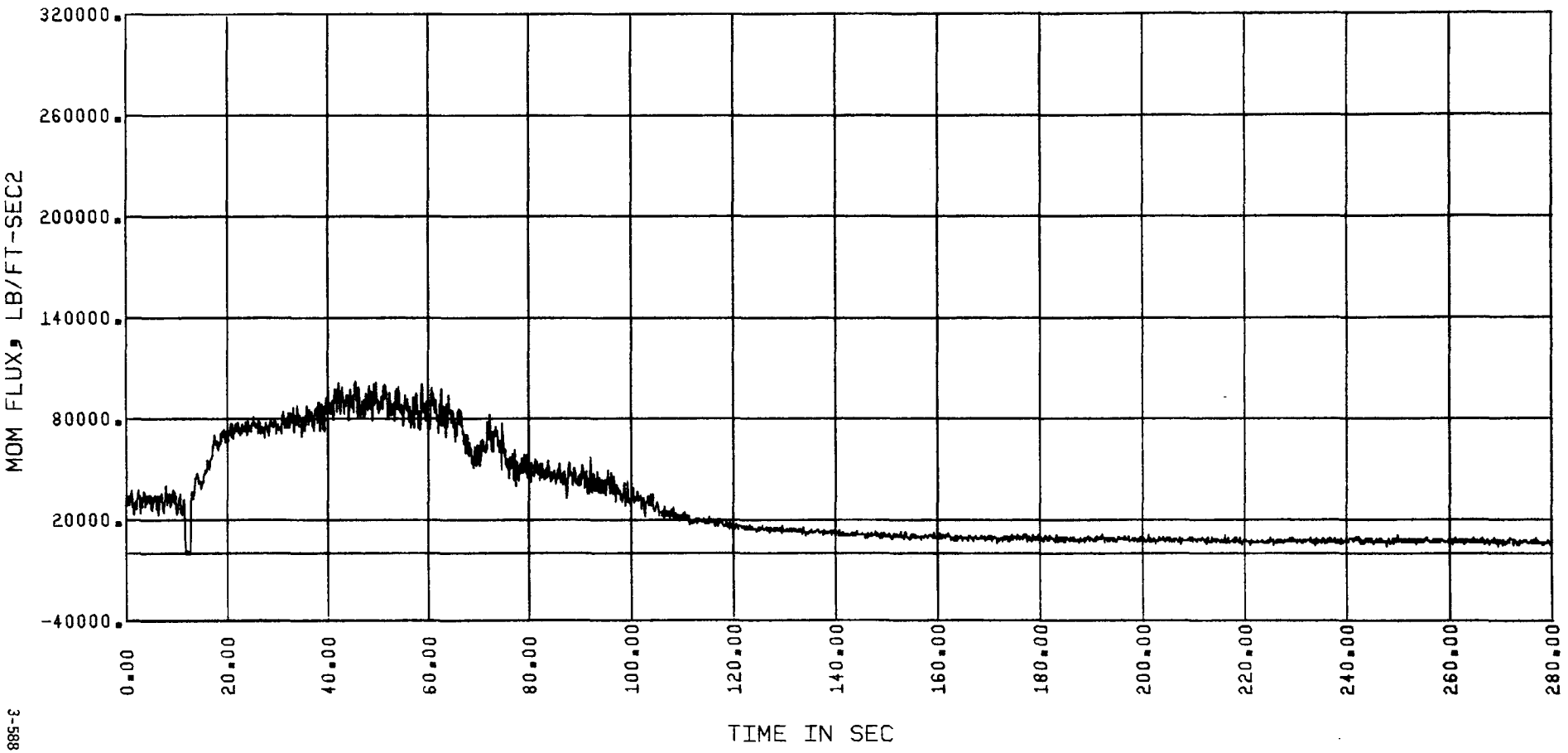
3-586

TEST 1179/MECHANIST FW FWD BDN
MOMENTUM FLUX GD2/HI-TM DISCH
PLOT NO.41

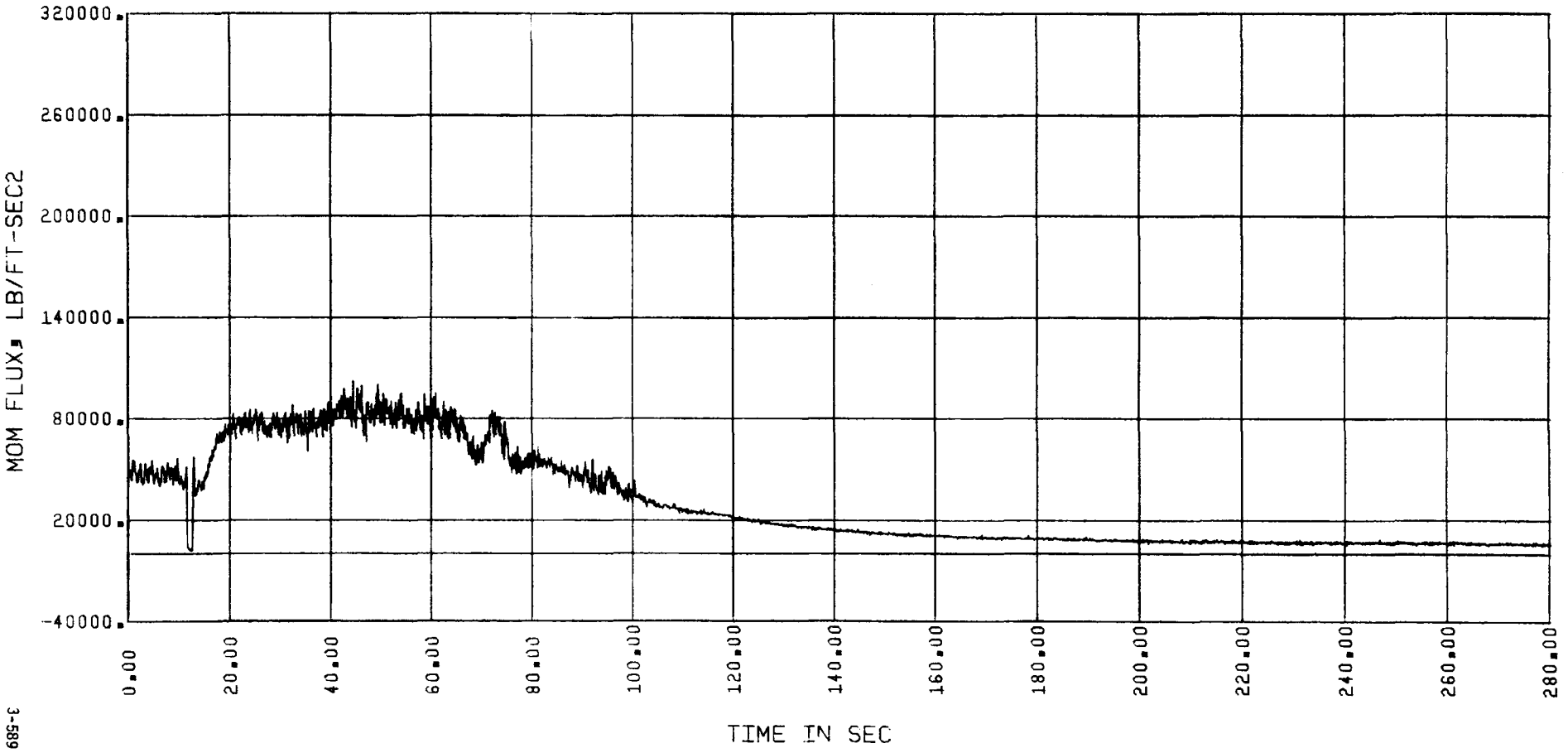


3-587

TEST 1179/MECHANIST FW FWD BDN
MOMENTUM FLUX LO-DD DISCHARGE
PLOT NO.42

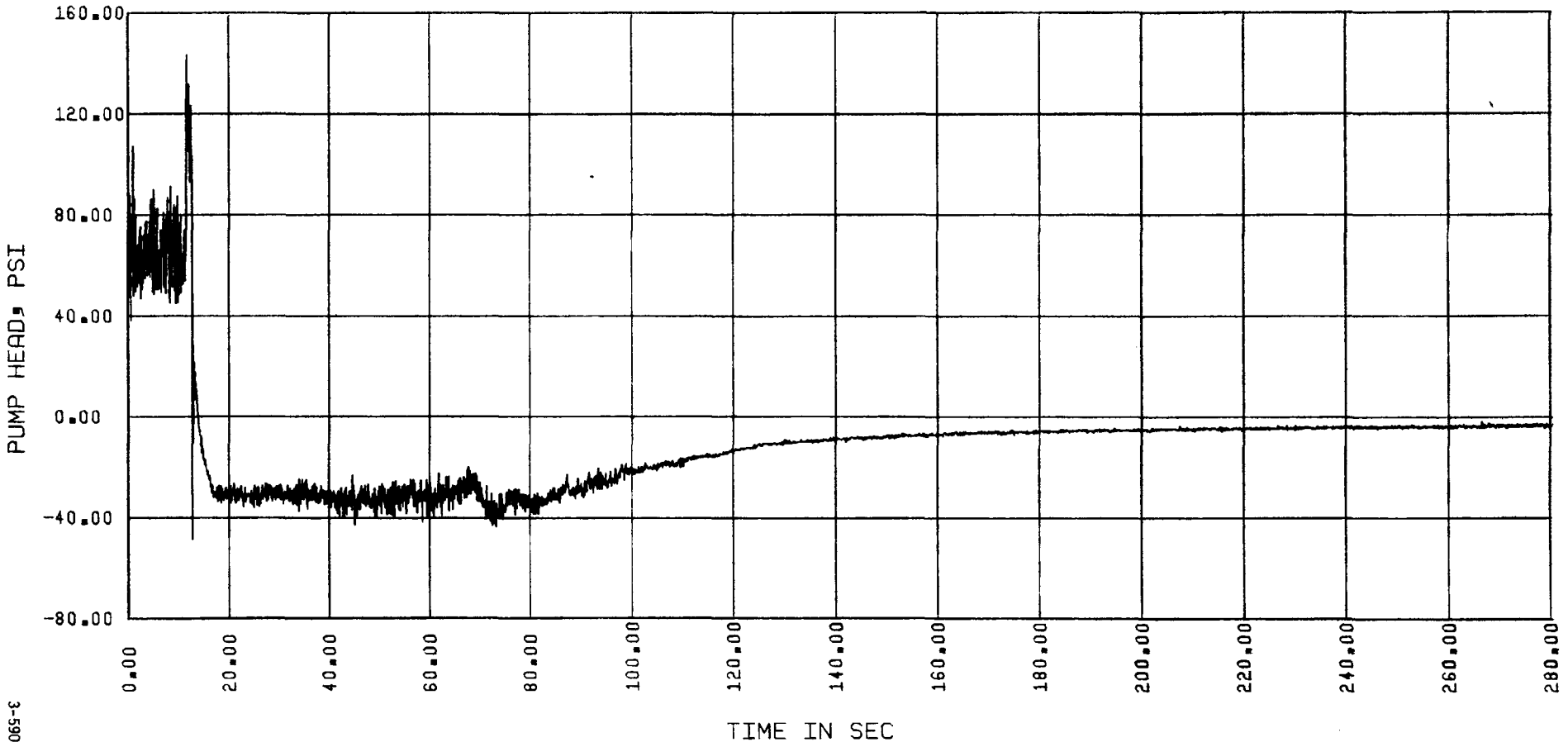


TEST 1179/MECHANIST FW FWD BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO. 43

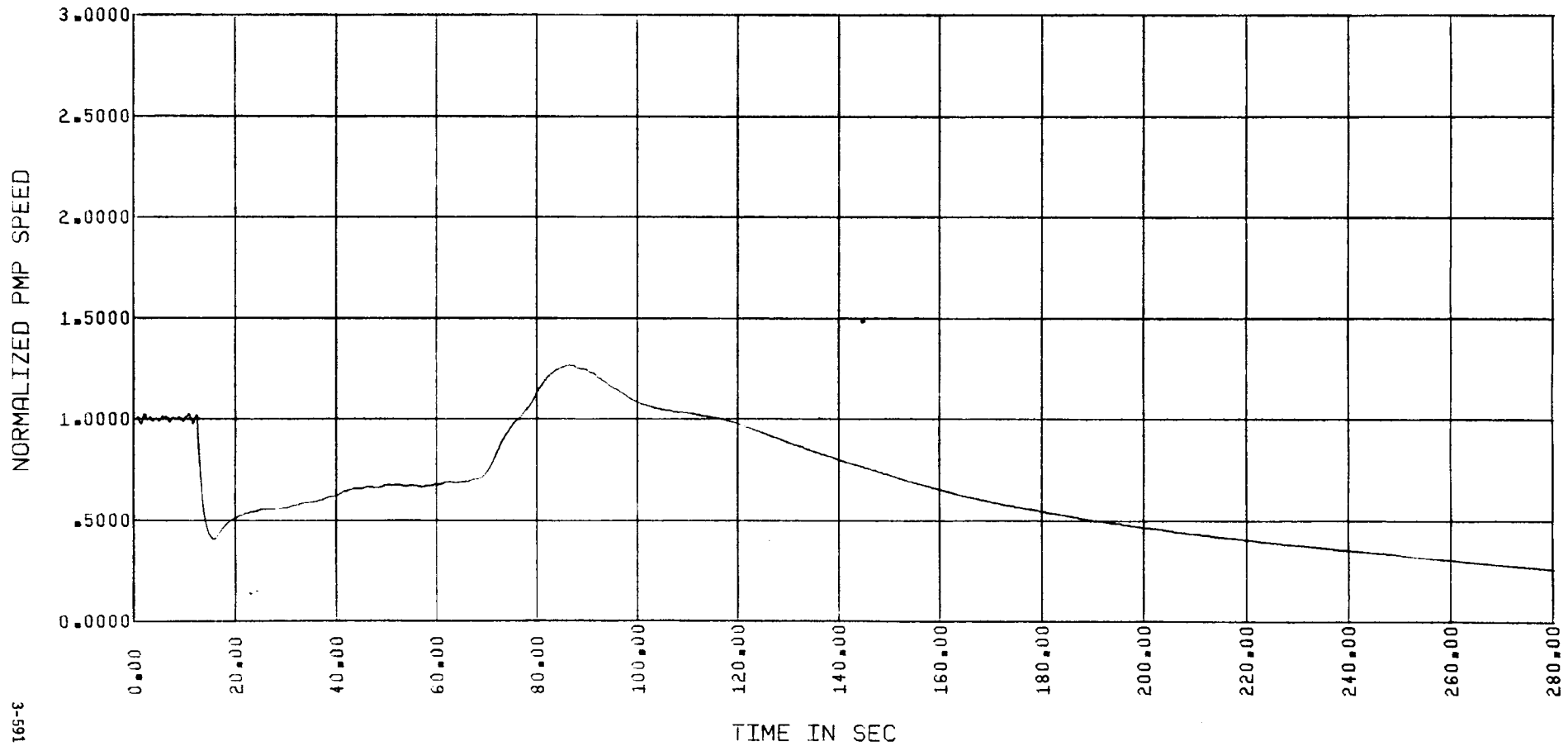


3-589

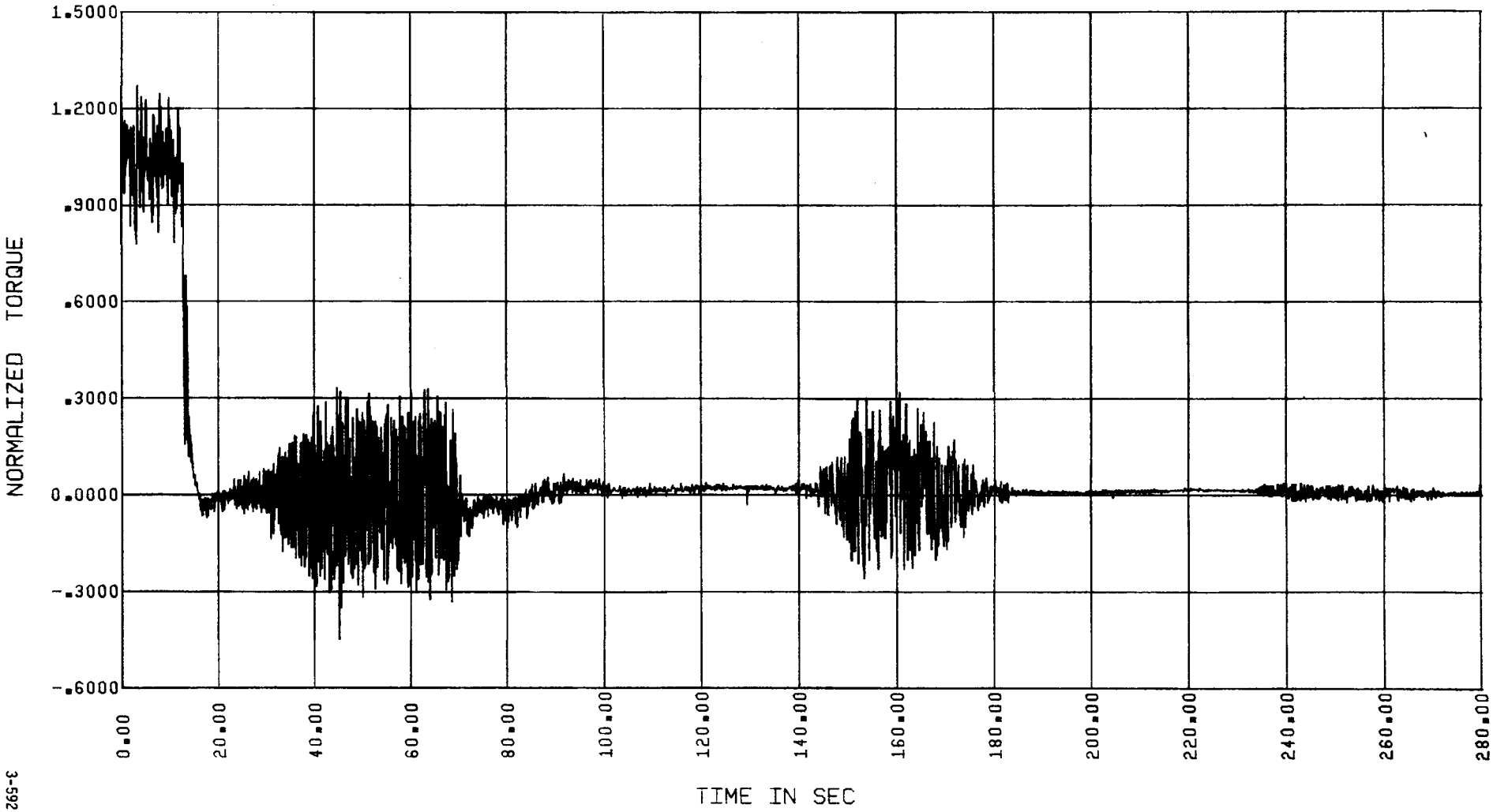
TEST 1179/MECHANIST FW FWD BDN
PUMP HEAD IN PSI
PLOT NO.44



TEST 1179/MECHANIST FW FWD BDN
N PUMP SPEED NR=4500
PLOT NO.47

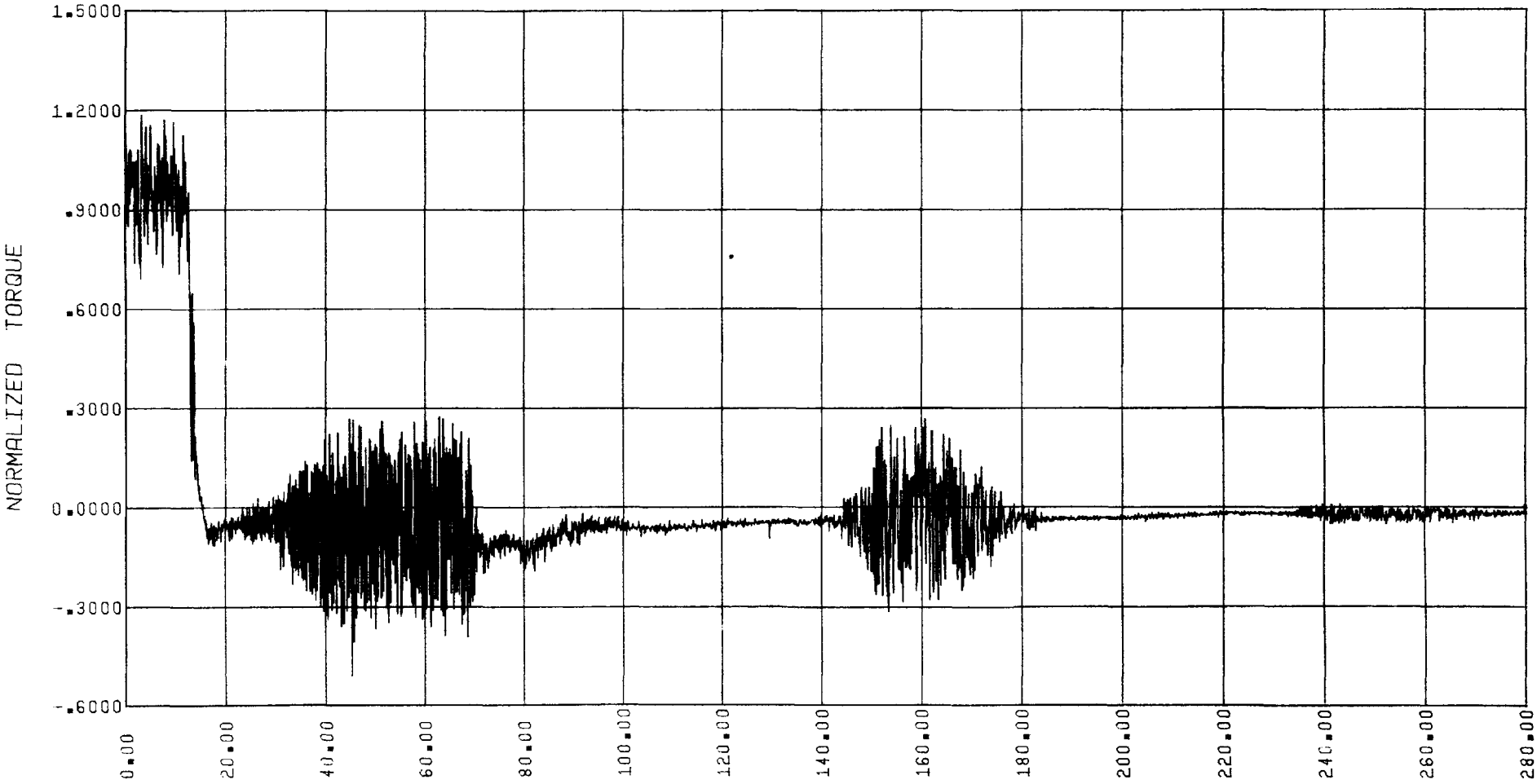


TEST 1179/MECHANIST FW FWD BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.48

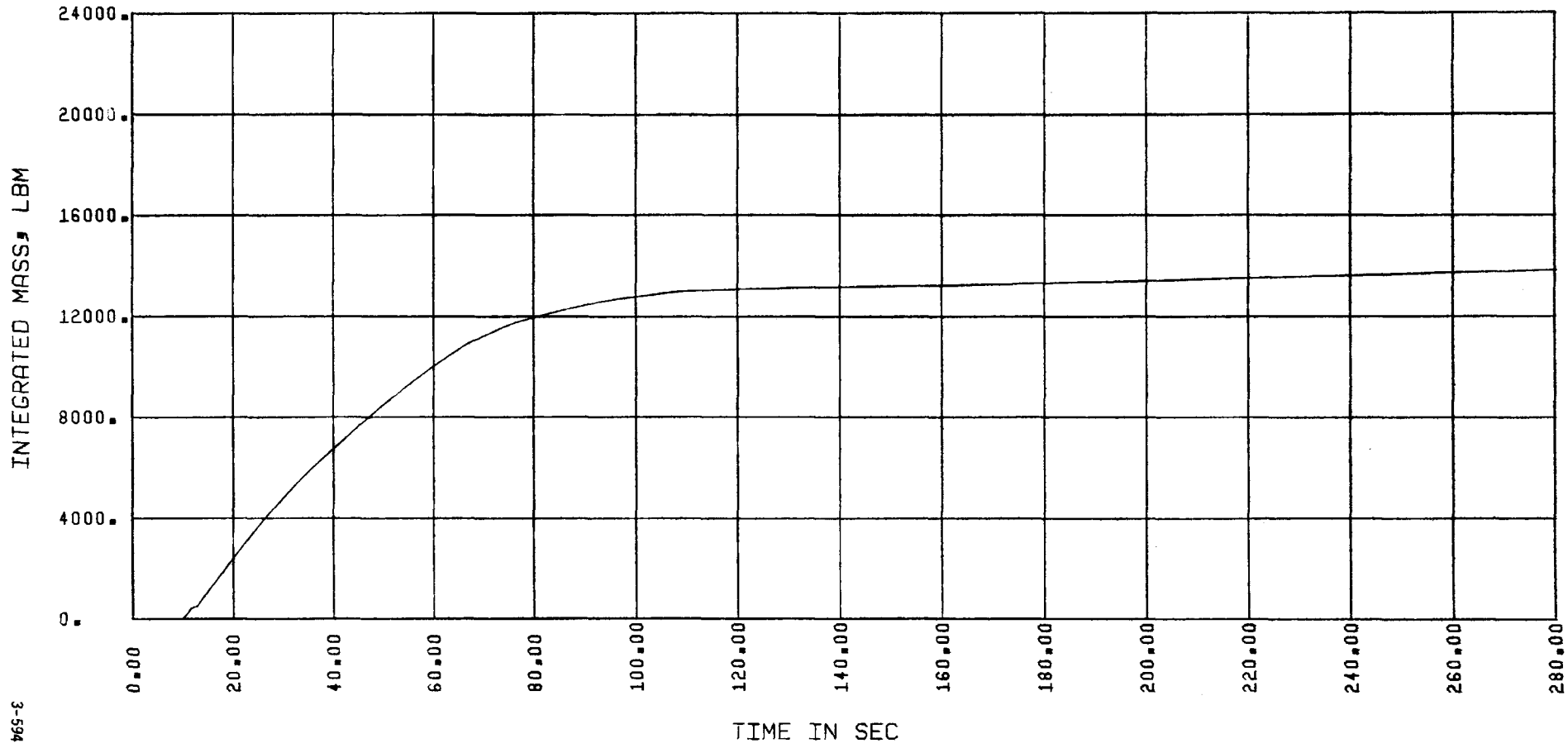


3-592

TEST 1179/MECHANIST FW FWD BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.49

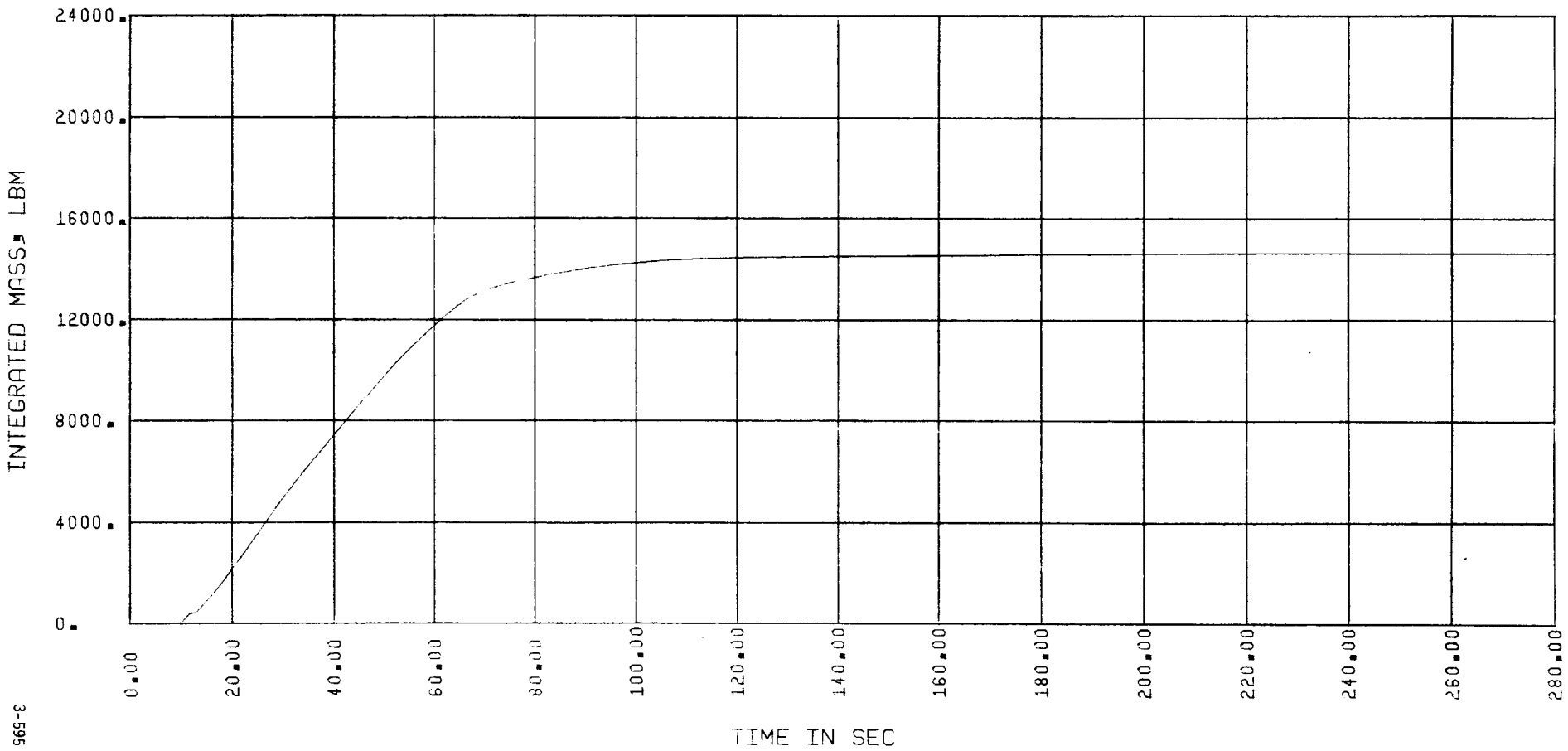


TEST 1179/MECHANIST FW FWD BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50



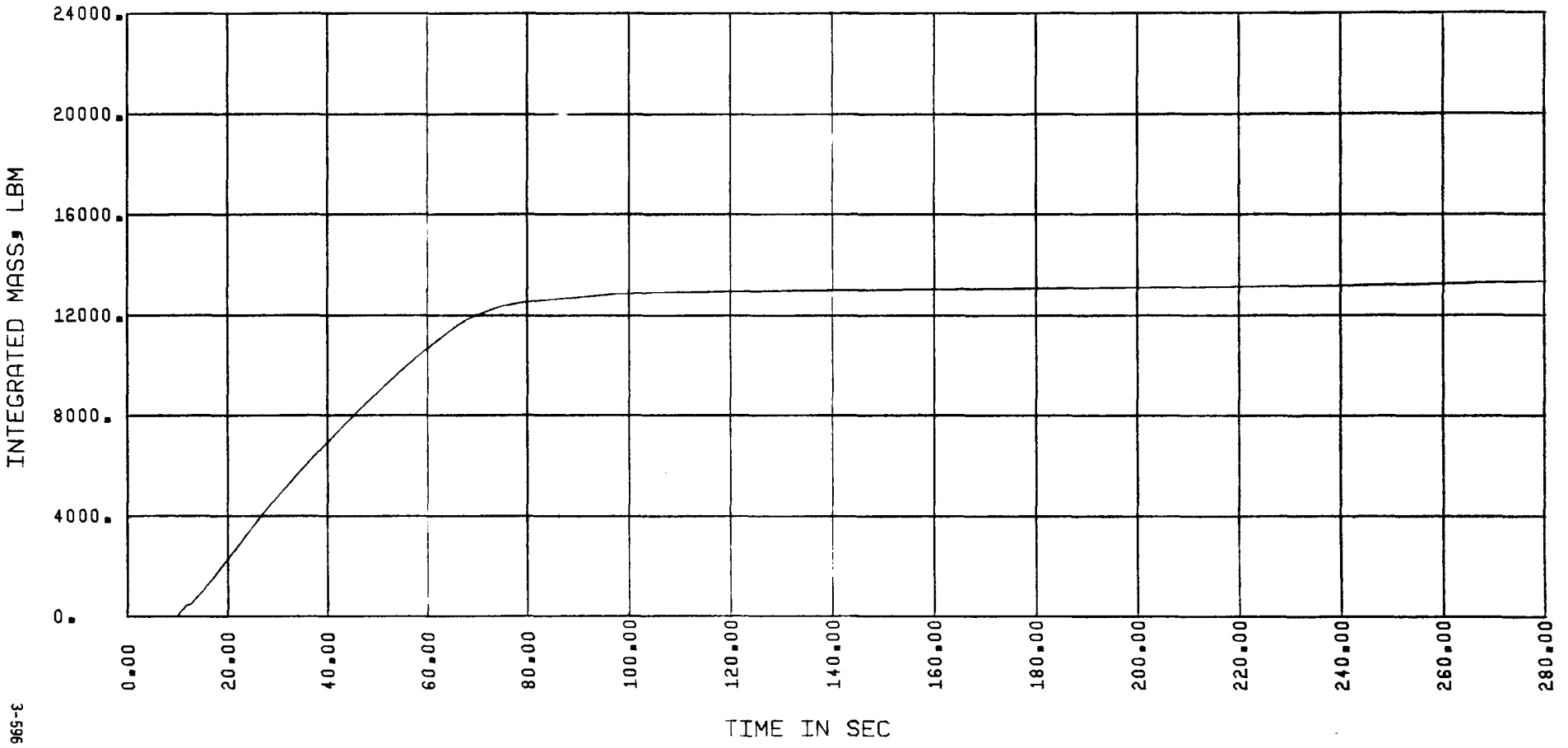
3-594

TEST 1179/MECHANIST FW FWD BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.51



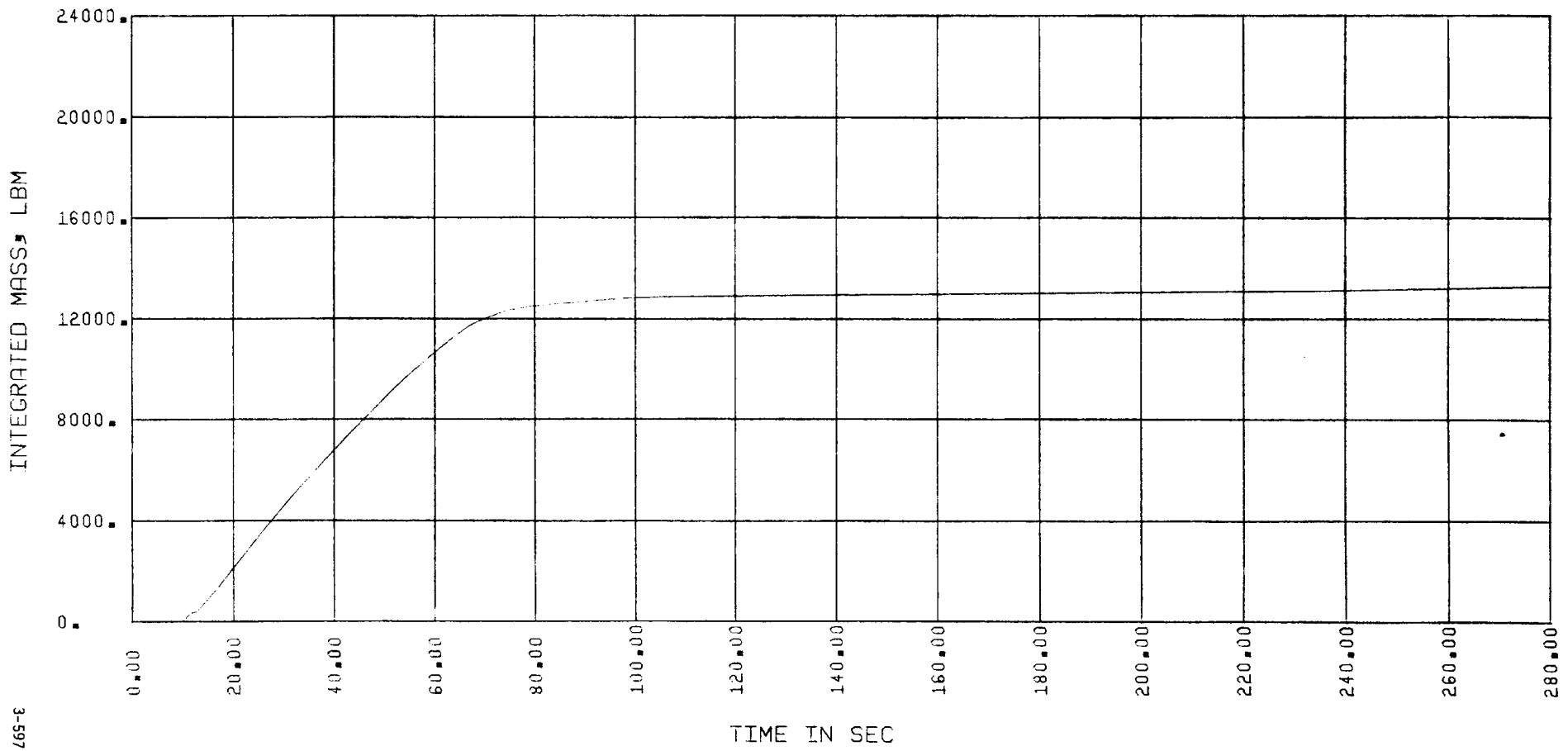
3-595

TEST 1179/MECHANIST FW FWD BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.52

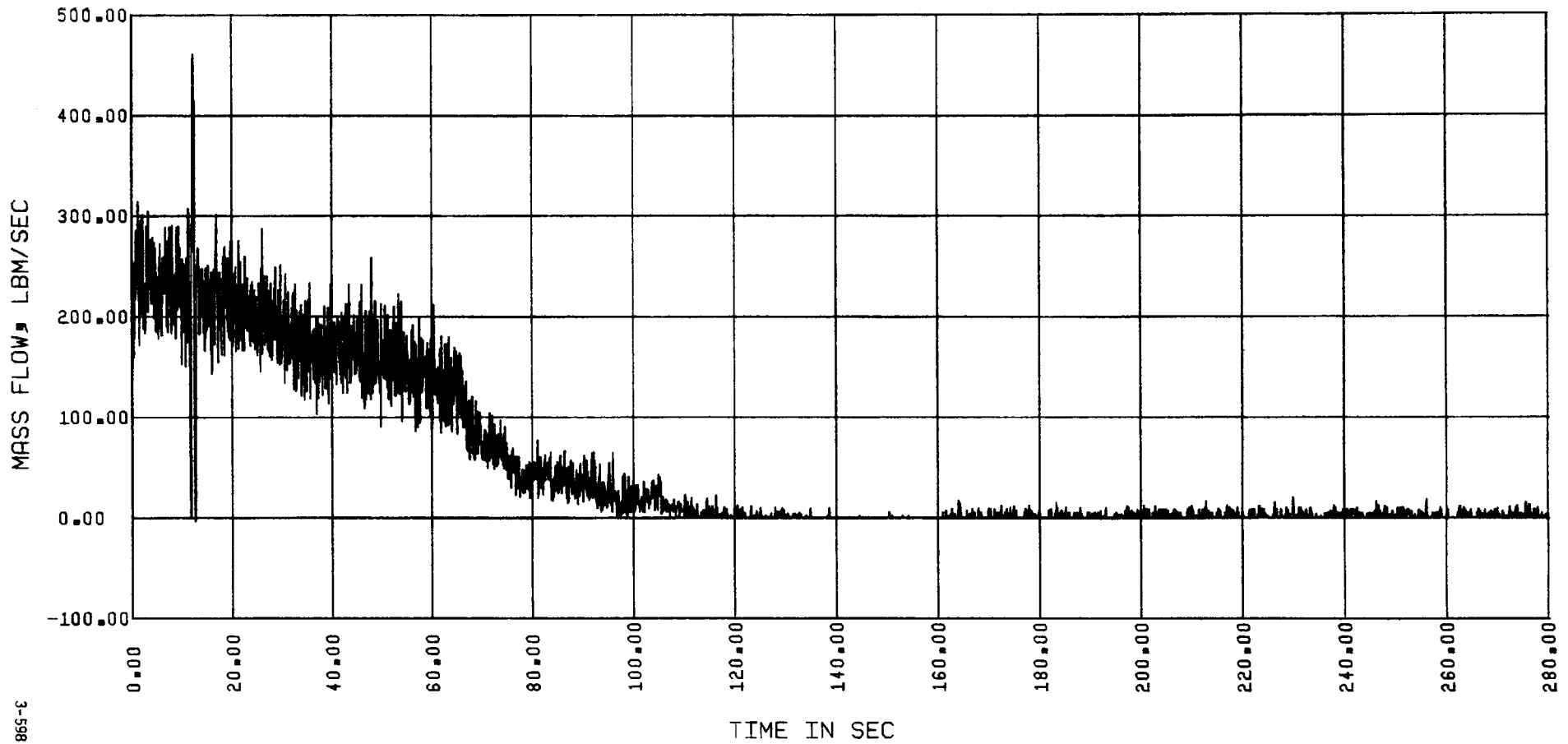


3-596

TEST 1179/MECHANIST FW FWD BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.53

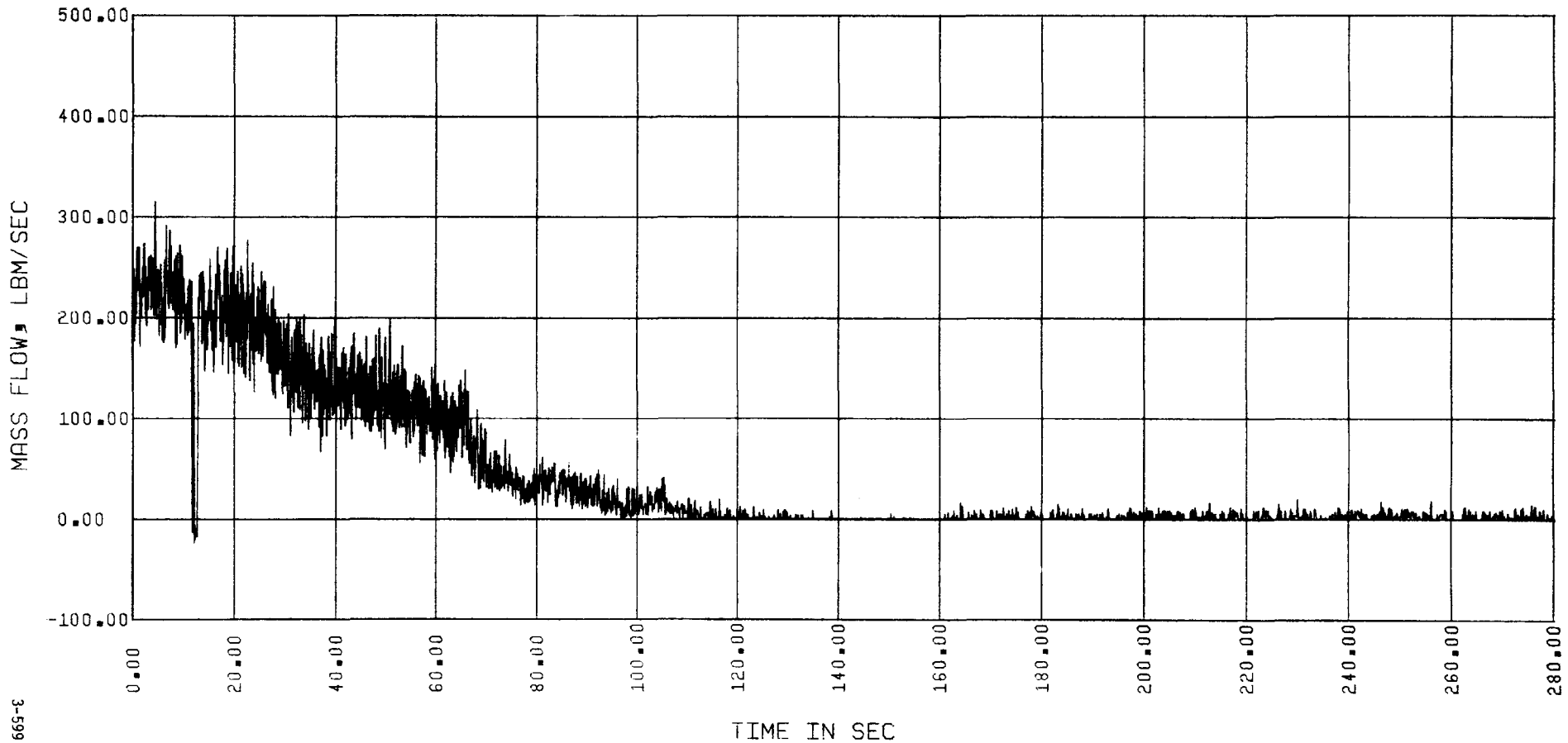


TEST 1179/MECHANIST FW FWD BDN
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54



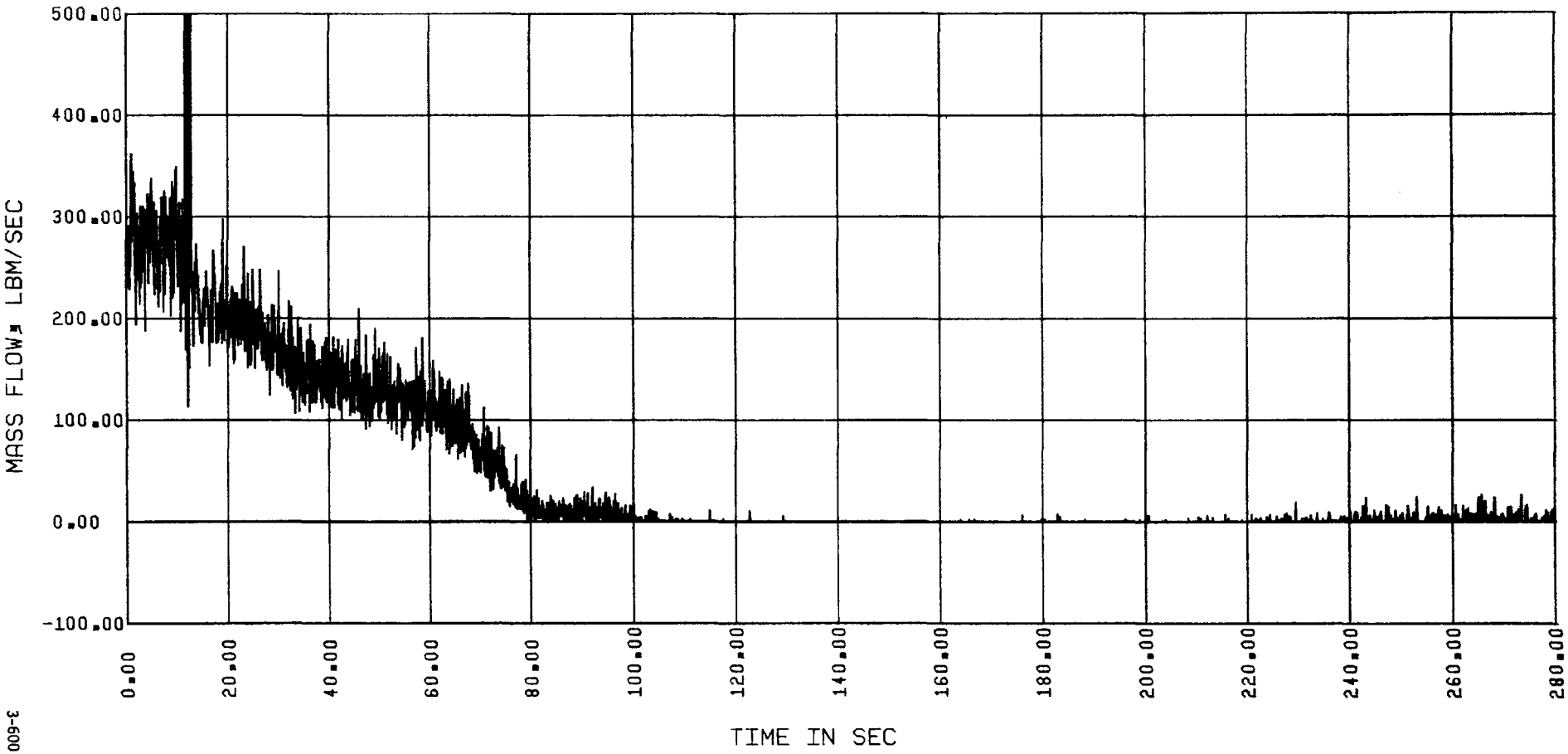
3-598

TEST 1179/MECHANIST FW FWD BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.55



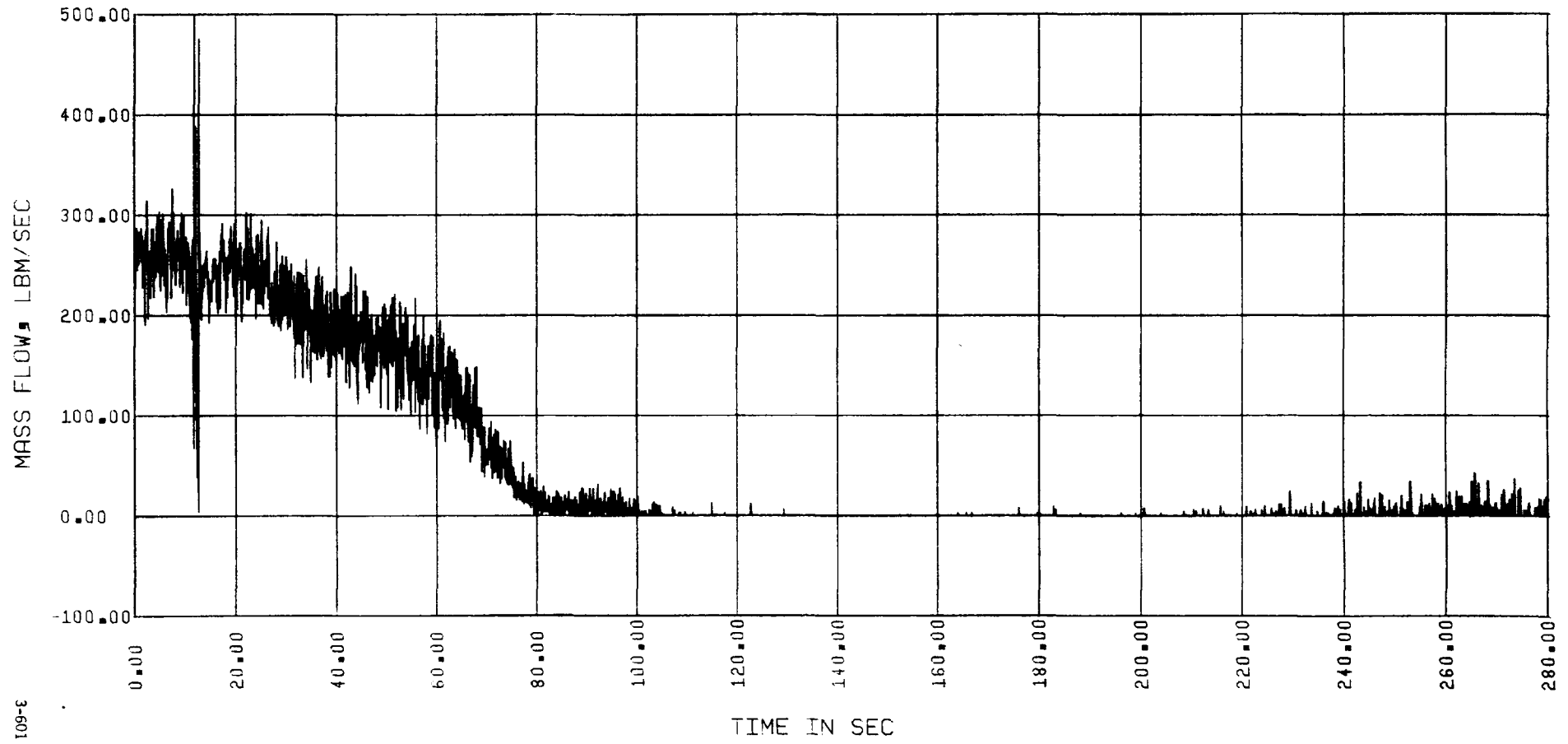
3-599

TEST 1179/MECHANIST FW FWD BDN
MASS FLOW RATE HI-TM/GD2 DISCH
PLOT NO.56



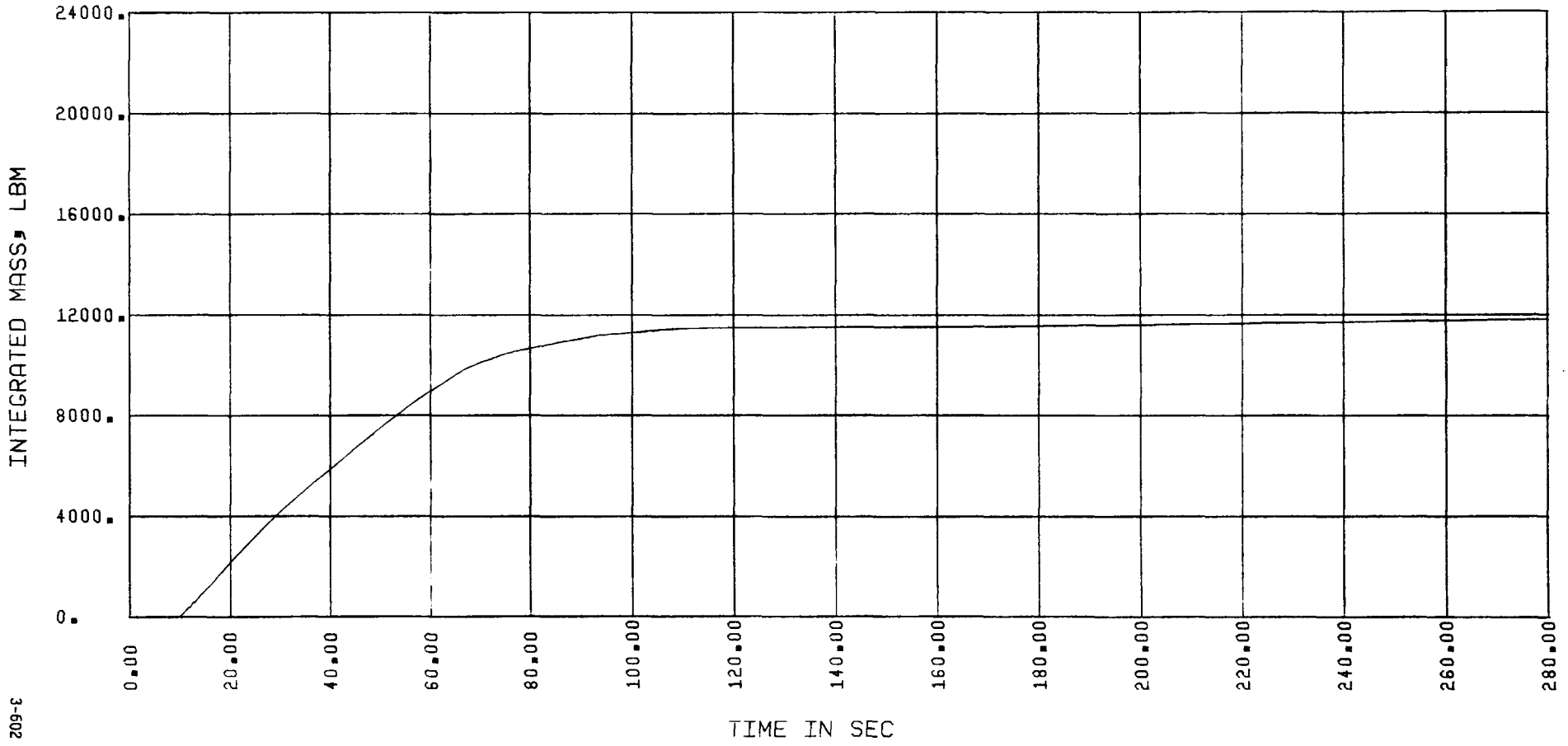
3-600

TEST 1179/MECHANIST FW FWD BDN
MASS FLOW RATE LO-TM/GD2 DISCH
PLOT NO.57



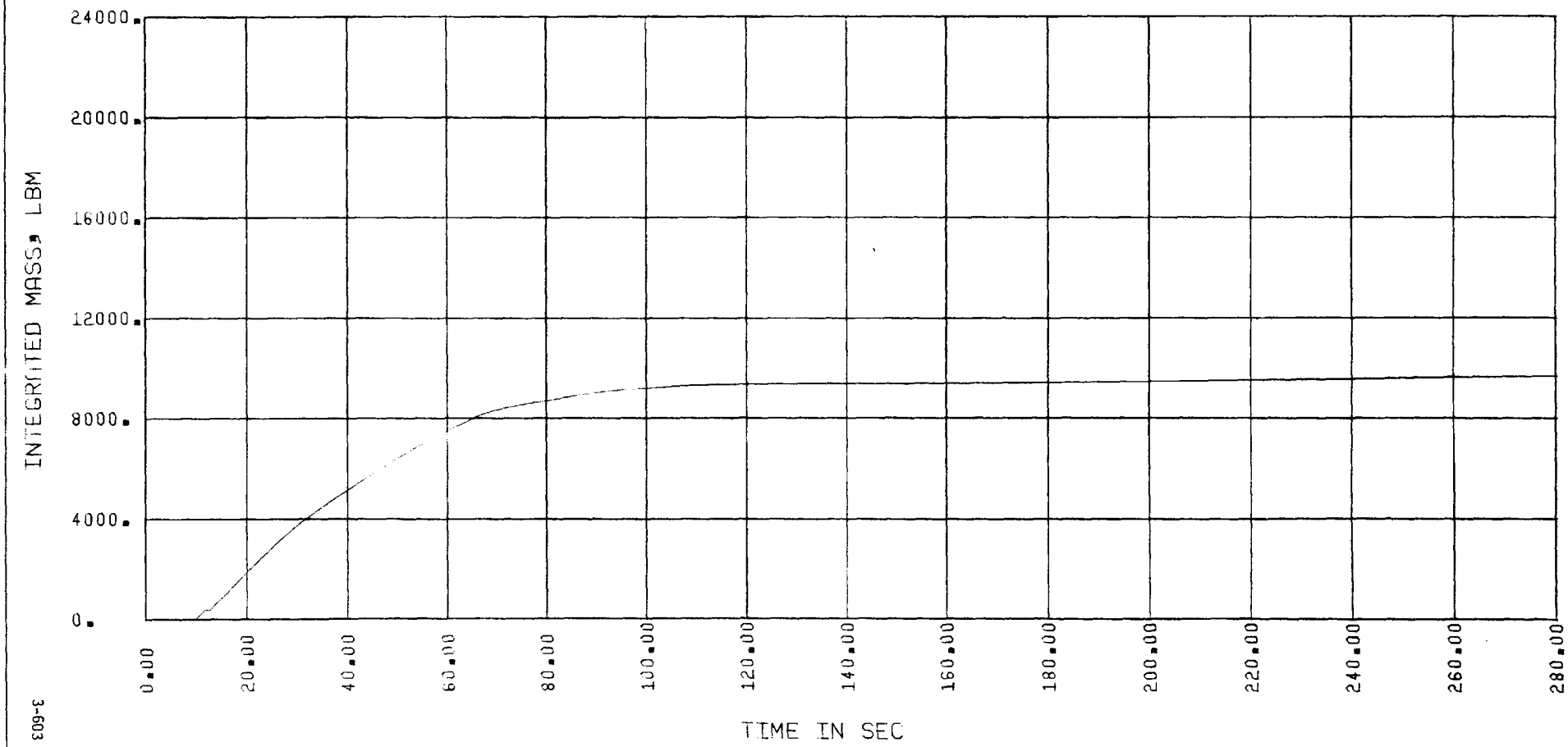
3-601

TEST 1179/MECHANIST FW FWD BDN
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60

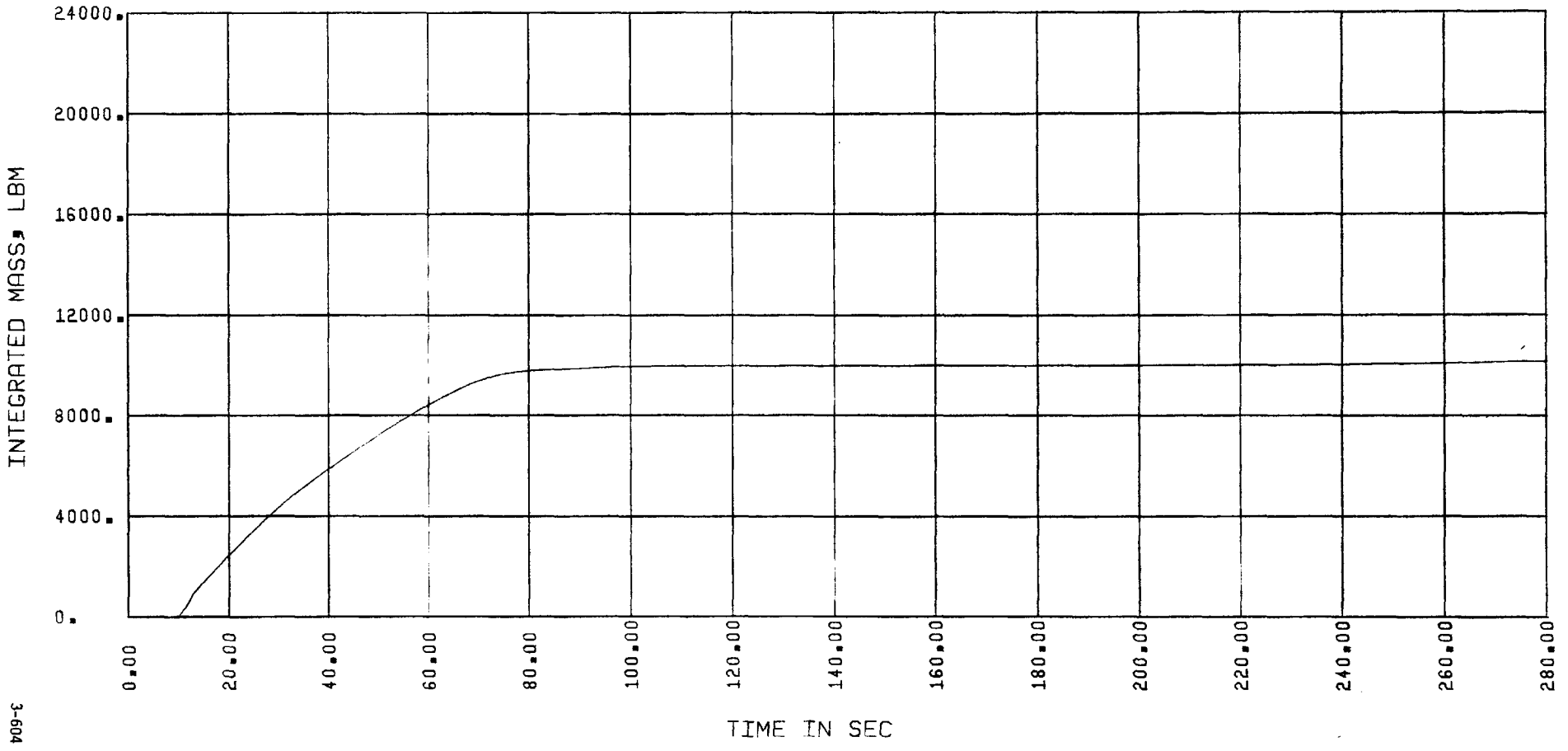


3-602

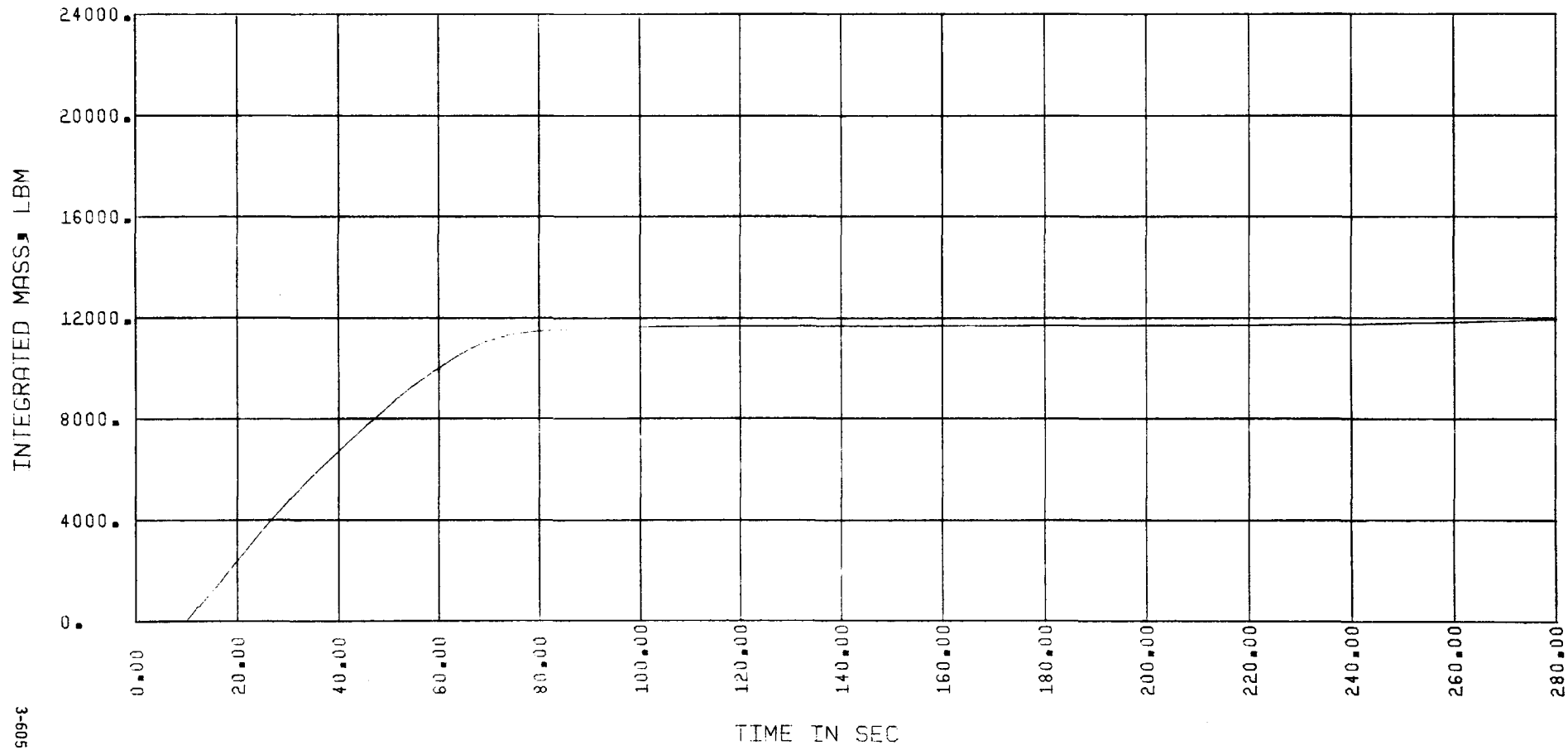
TEST 1179/MECHANIST FW FWD BDN
INTEGRATED MASS LO-TM/GD2 S
PLOT NO.61



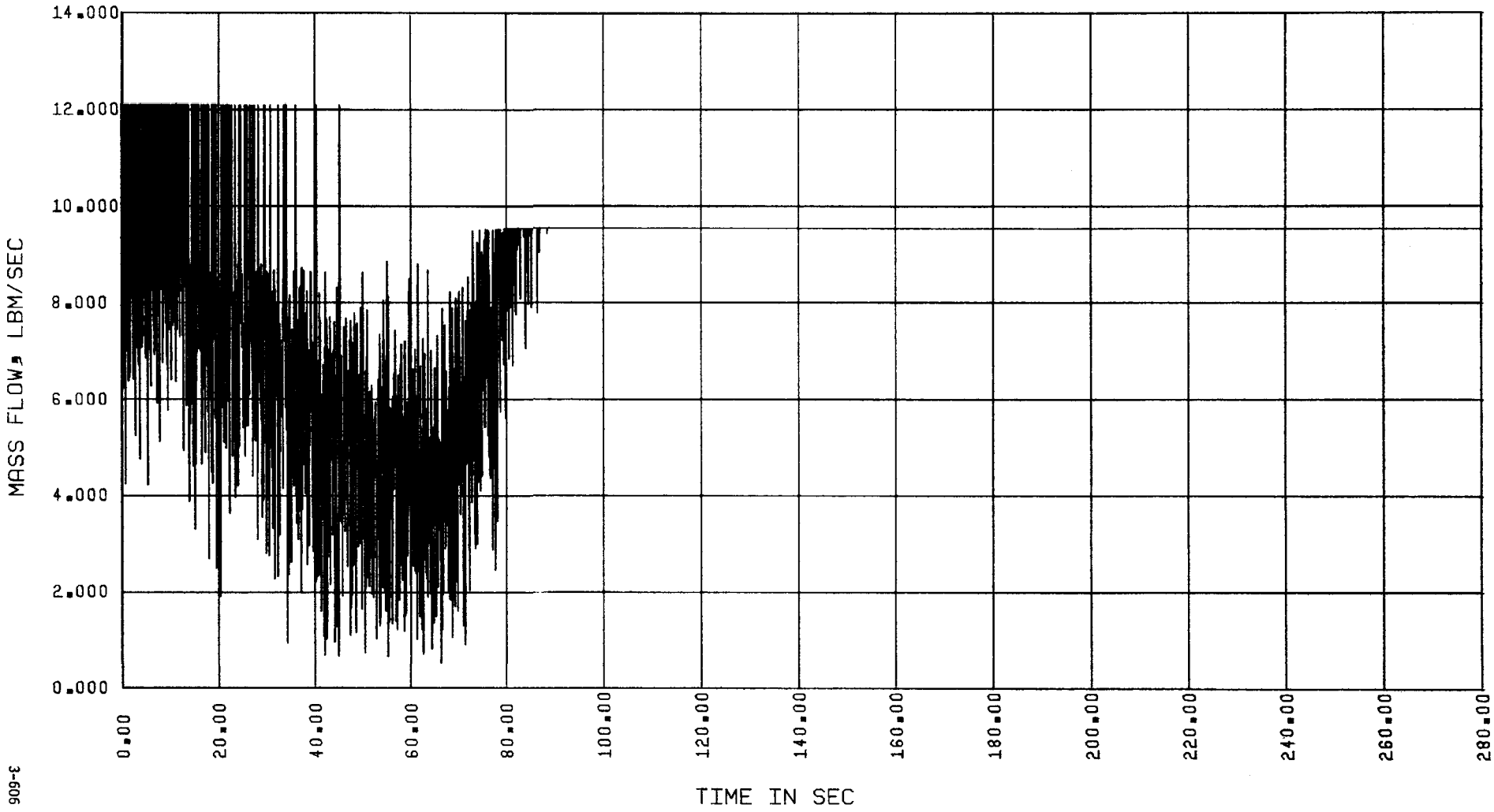
TEST 1179/MECHANIST FW FWD BDN
INTEGRATED MASS HI-TM/GD2 D
PLOT NO.62



TEST 1179/MECHANIST FW FWD BDN
INTEGRATED MASS LO-TM/GD2 D
PLOT NO.63



TEST 1179/MECHANIST FW FWD BDN
PUMP INLET INJECTION FLOW
PLOT NO.64



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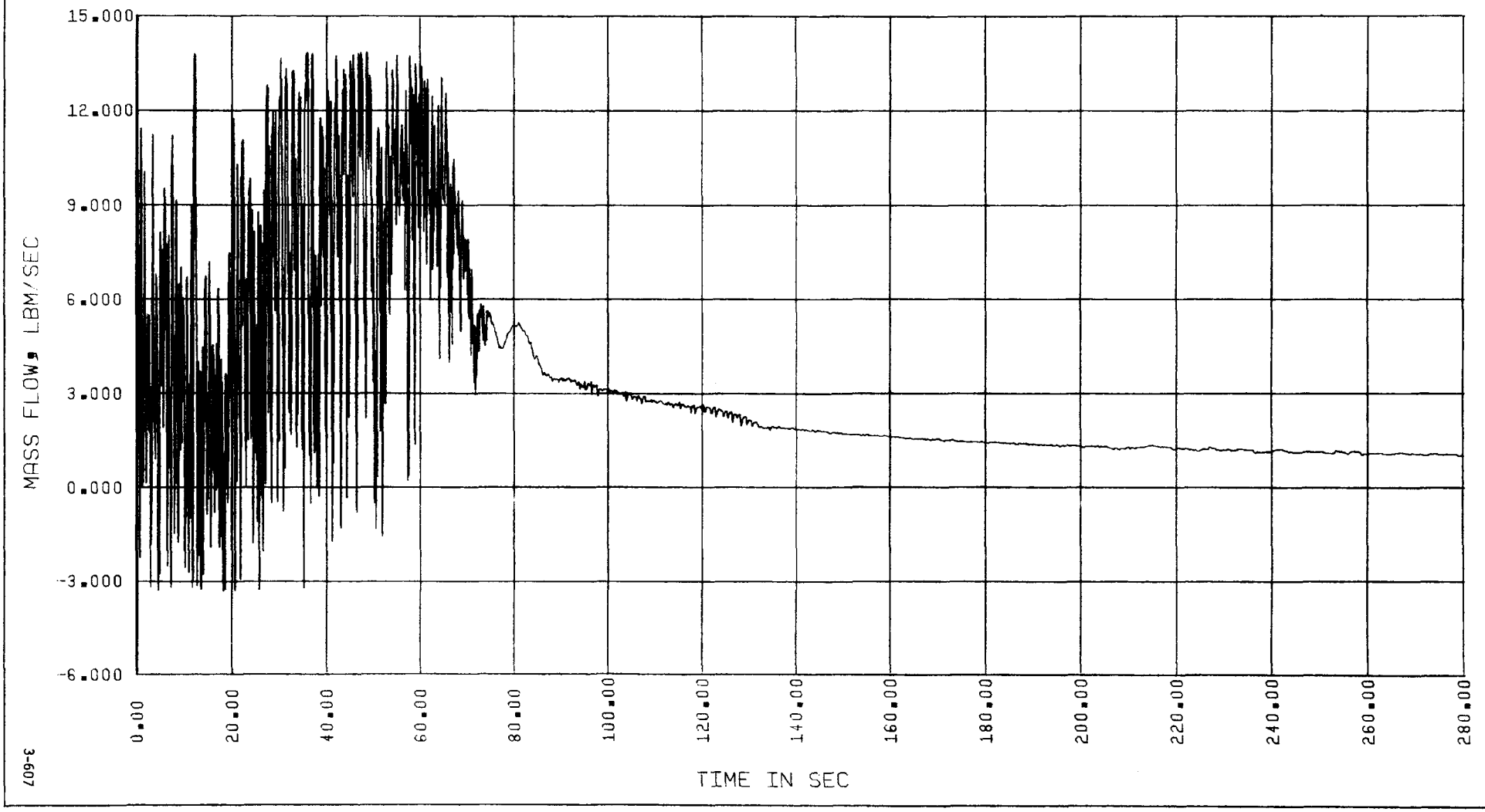
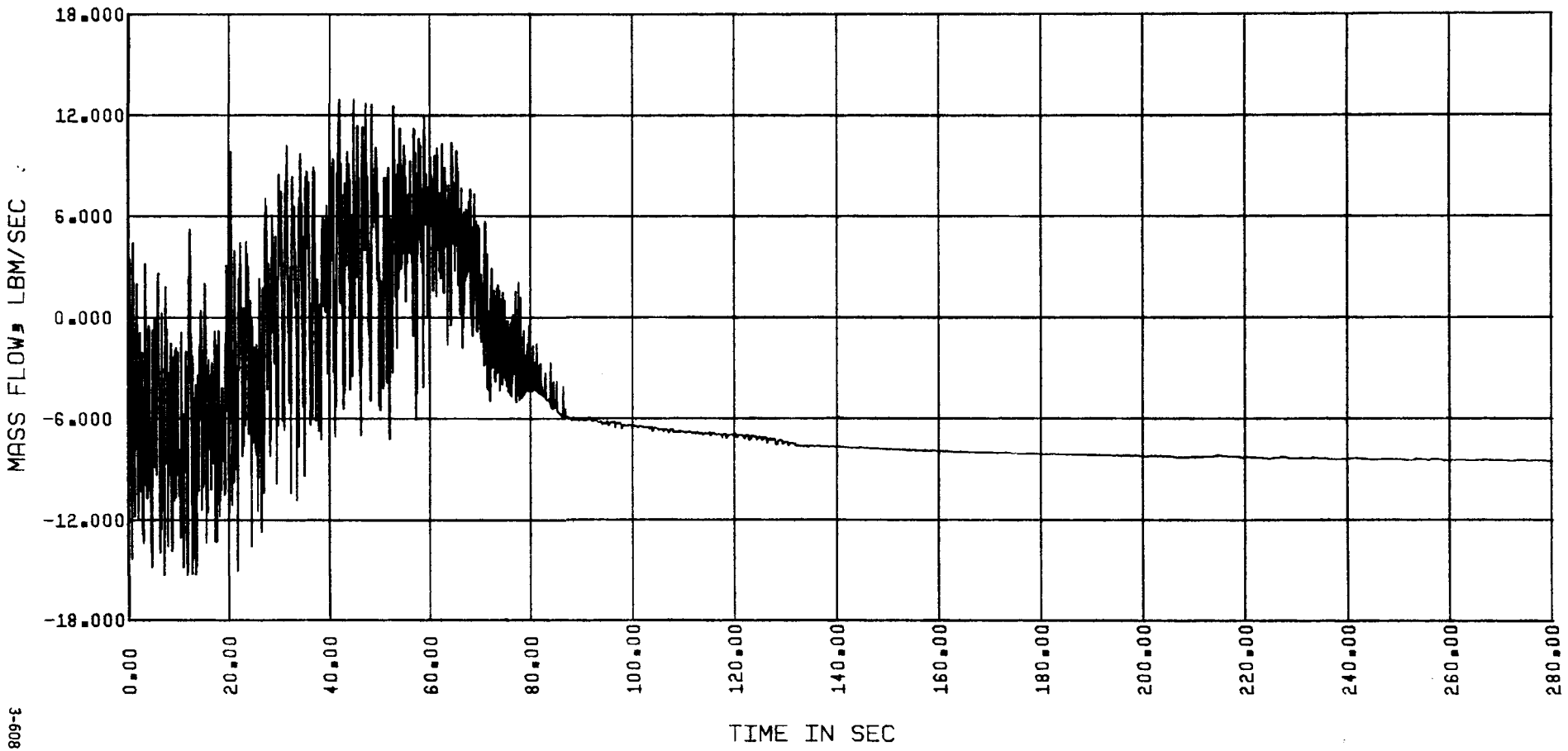
TEST 1179/MECHANIST FW FWD BDN
PUMP OUTLET INJECTION FLOW
PLOT NO.65



TEST 1179/MECHANIST FW FWD BDN
PUMP SEAL INJ LEAKAGE FLOW
PLOT NO.66



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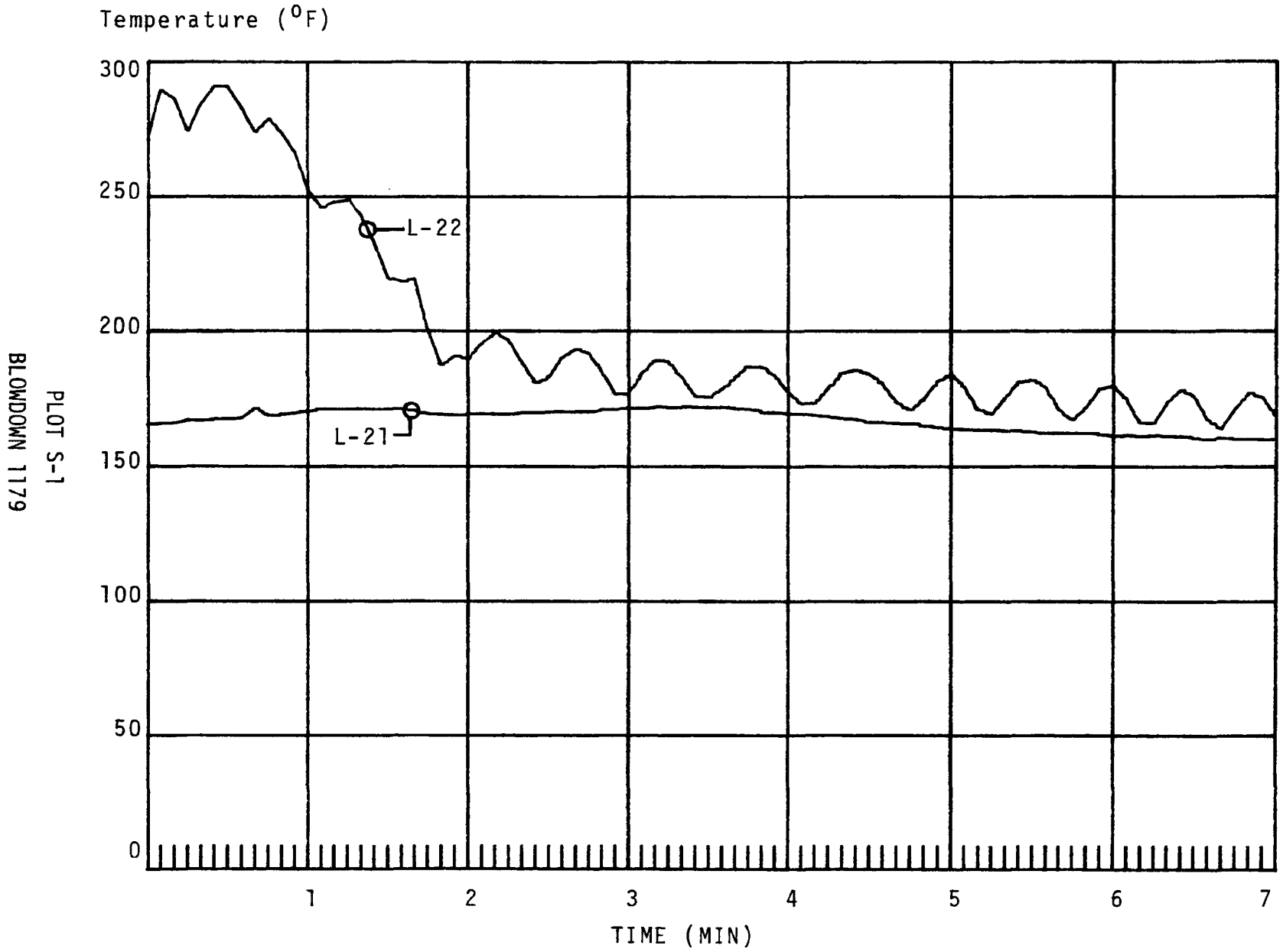
Index Listing

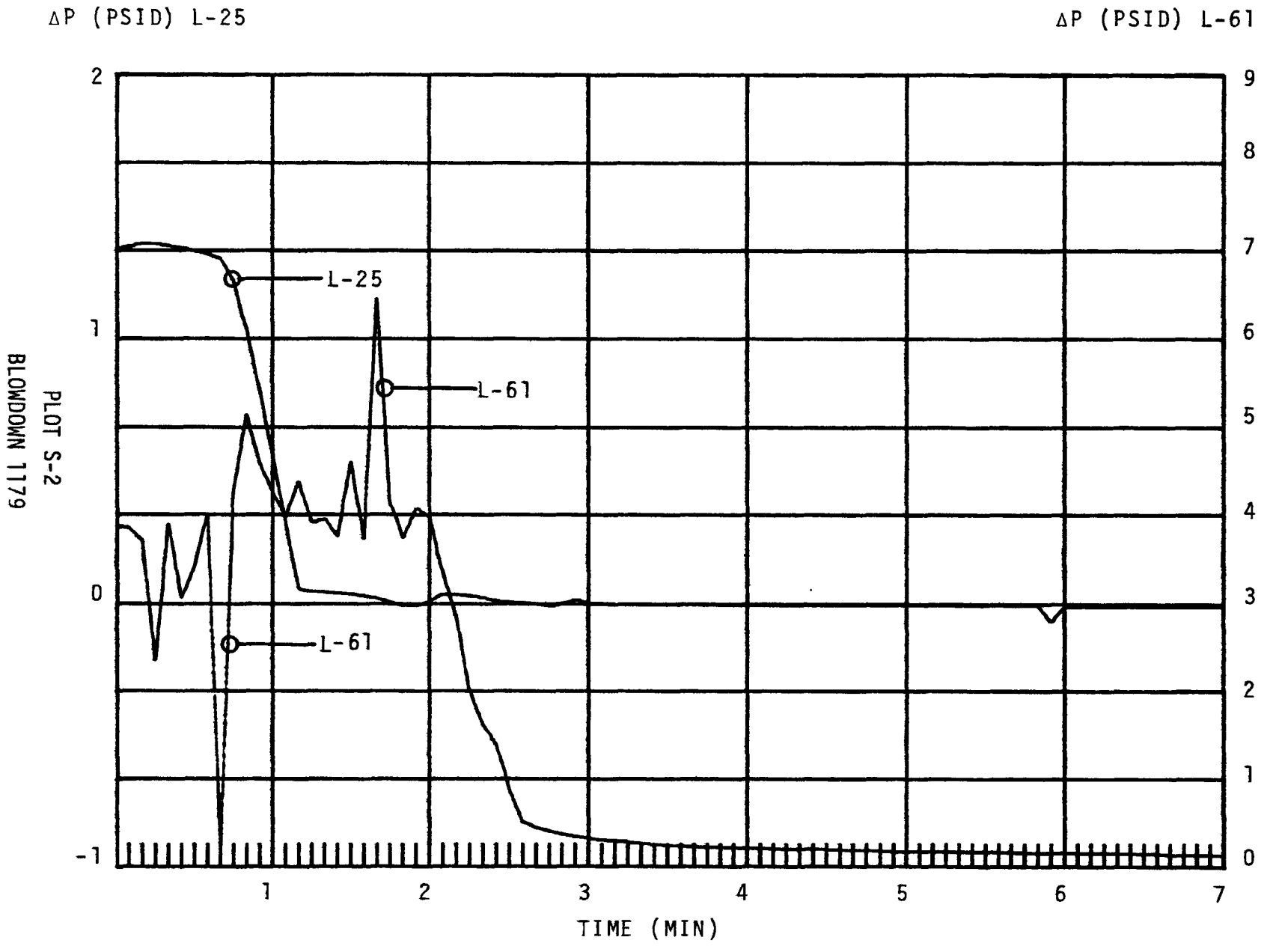
of

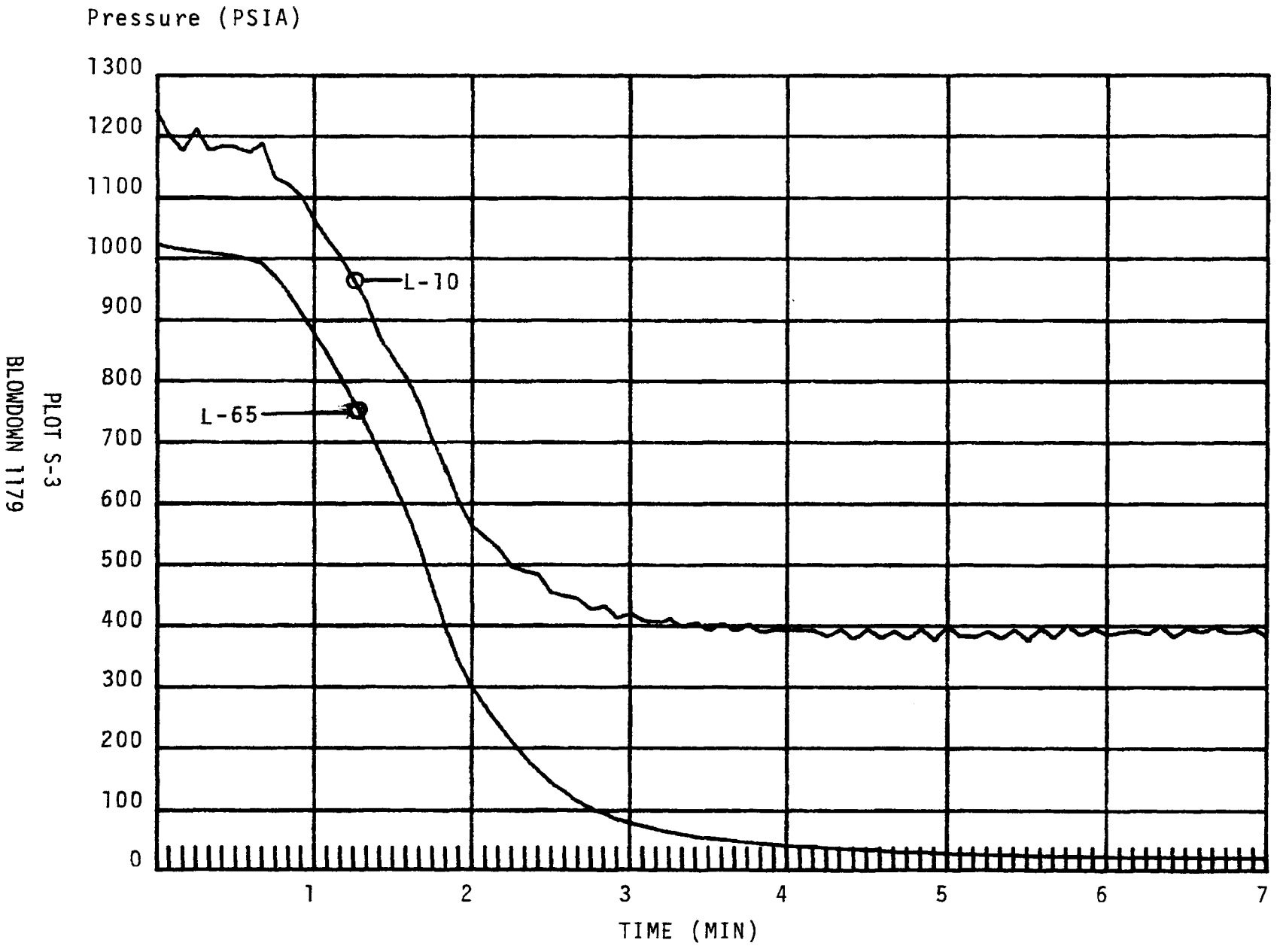
SCANNER DATA PLOTS

Test Number (1179)

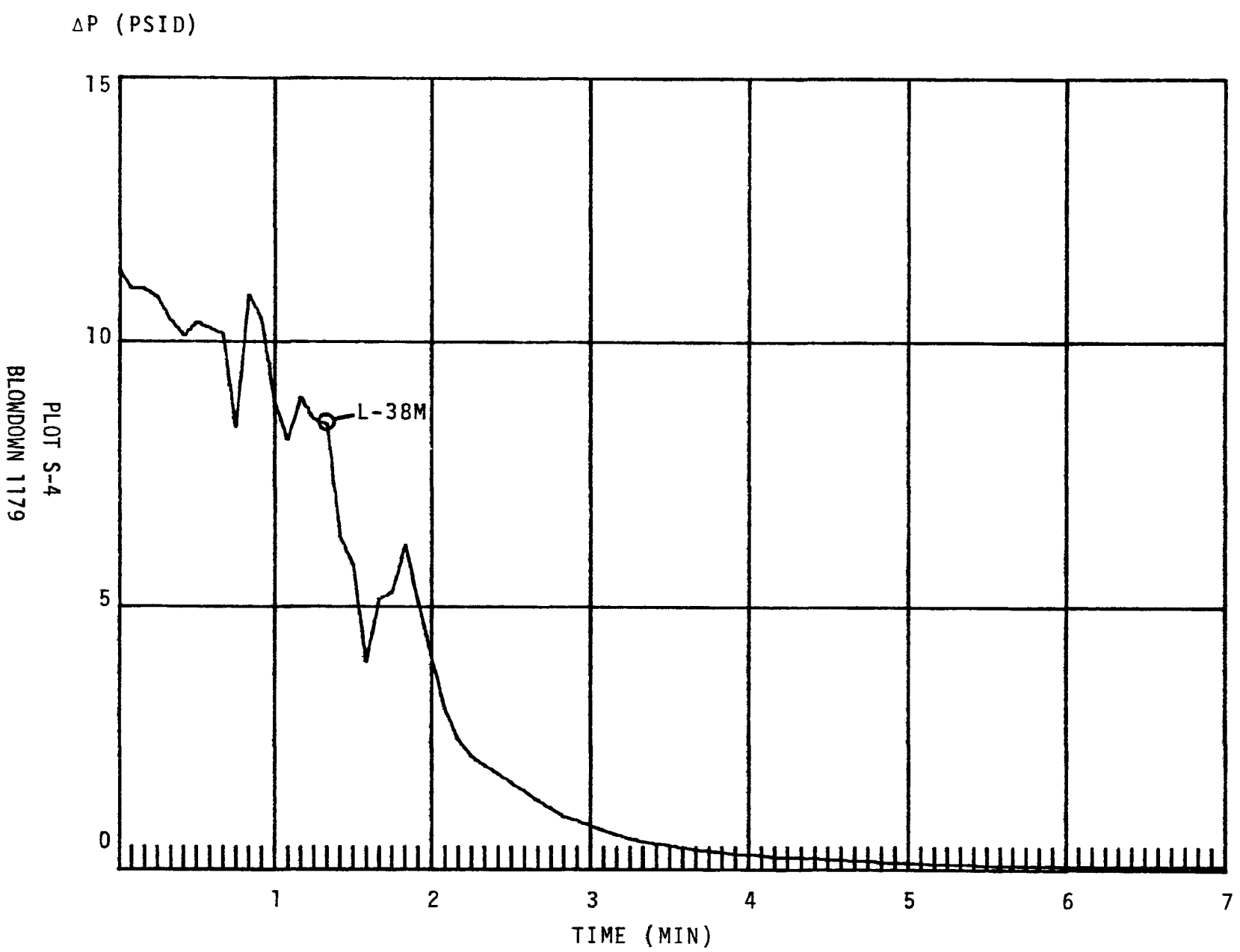
Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

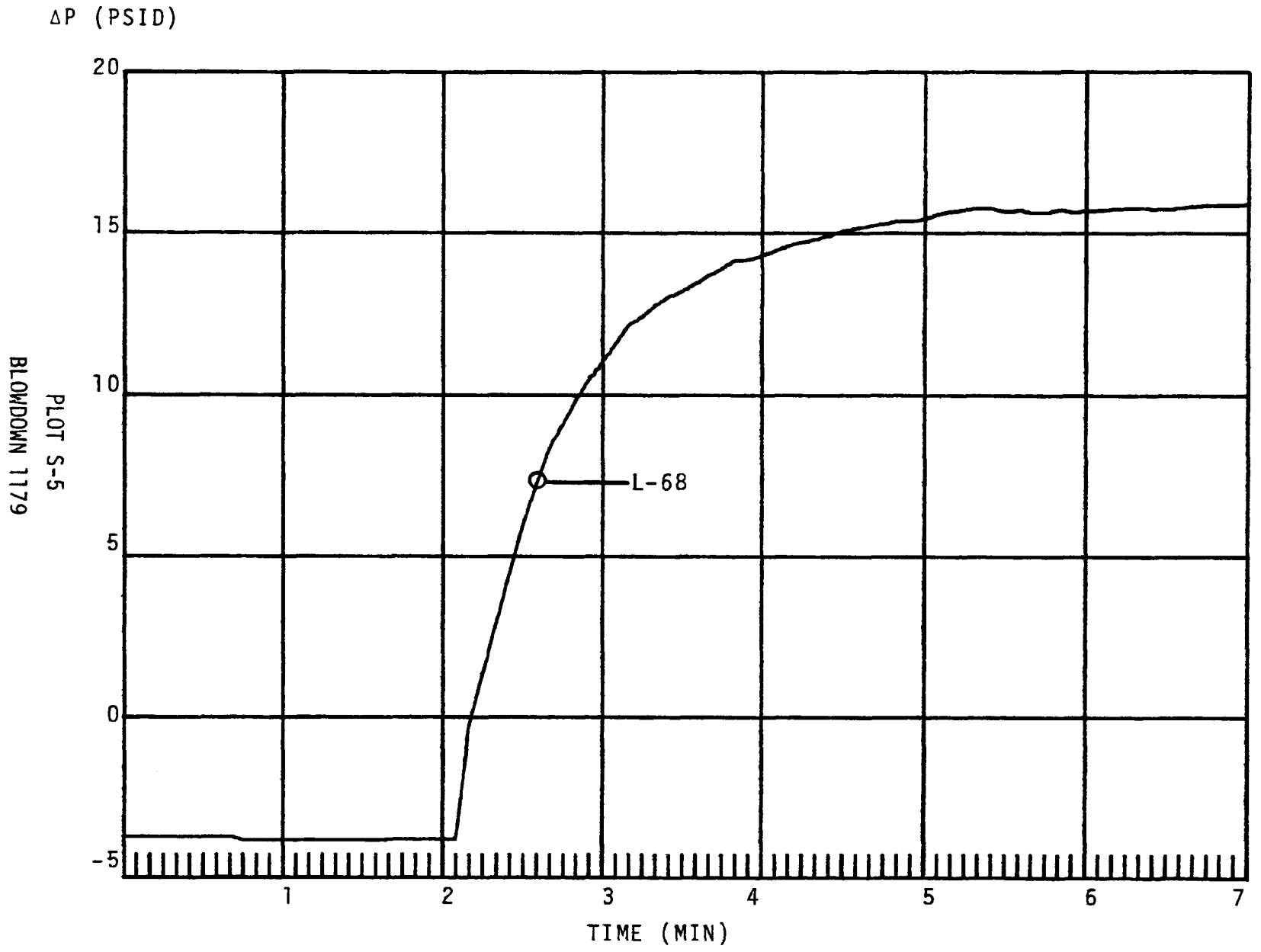

Temperature (°F)
300
250
200
150
100
50
0
L-22
L-21
1
2
3
4
5
6
7
TIME (MIN)
BLOWDOWN 1179
PLOT S-1


ΔP (PSID) L-25
ΔP (PSID) L-61
2
1
0
-1
9
8
7
6
5
4
3
2
1
0
L-25
L-61
L-61
1
2
3
4
5
6
7
TIME (MIN)
PLOT S-2
BLOWDOWN 1179



PLOT S-3
BLOWDOWN 1179


ΔP (PSID)
15
10
5
0
L-38M
1
2
3
4
5
6
7
TIME (MIN)
PLOT S-4
BLOWDOWN 1179


ΔP (PSID)
20
15
10
5
0
-5
1
2
3
4
5
6
7
TIME (MIN)
L-68
PLOT S-5
BLOWDOWN 1179

SYSTEM CONFIGURATION

Test Number 1211

Break Location	Discharge
Break Size	1.46 in^2
	5 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Constant Speed

COMMENTS

1. Malfunctioning or Inoperable Instruments: None

2. Other Comments: The calibration constants used for processing the discharge gamma densitometer data for this test were approximated by interpolation since normal calibration procedures were precluded by test conditions. More reasonable curves can be obtained from the data using the steady state equation and constants from the steady state zero file 1209 as discussed in Volume II of this report.

3. Affected FM Data Plots:
   - 9 - Density
   - 10 - Density
   - 11 - Density
   - 18 - Void Fraction
   - 19 - Void Fraction
   - 20 - Void Fraction
   - 28 - Normalized Volumetric Flow Rate
   - 29 - Normalized Volumetric Flow Rate
   - 34 - Mass Flow Rate
   - 35 - Mass Flow Rate
   - 40 - Momentum Flux
   - 41 - Momentum Flux
   - 52 - Integrated Mass
   - 53 - Integrated Mass
   - 56 - Mass Flow Rate
   - 57 - Mass Flow Rate
   - 62 - Integrated Mass
   - 63 - Integrated Mass

INITIAL CONDITIONS

t = 15 Sec[a]

Test Number 1211

System Pressures

High Pressure Drum	1049.3	psia
Suction Instrument Spool	1022.1	psia
Discharge Instrument Spool	1097.7	psia

Fluid Temperatures

Suction Instrument Spool	548.3	°F
Discharge Instrument Spool	552.8	°F

Fluid Density

Suction Instrument Spool	46.08	lbm/ft^3
Discharge Instrument Spool	45.80	lbm/ft^3

System Flows

Mass Flow Rate	246	lb/sec
Suction Volumetric Flow Rate	2394	gpm
Discharge Volumetric Flow Rate	2449	gpm
Suction Normalized Volumetric Flow Rate	0.68	
Discharge Normalized Volumetric Flow Rate	0.70	
Suction Fluid Velocity	29.46	ft/sec
Discharge Fluid Velocity	30.14	ft/sec
Suction Momentum Flux	40,013	$lbm/ft\ sec^2$
Discharge Momentum Flux	41,598	$lbm/ft\ sec^2$

Pump Performance

Pump head	66.69	psi
	208.4	ft
Pump Speed	4472	rpm
Pump Shaft Torque	222.6	ft lb
Pump Hydraulic Torque	197.6	ft lb

System Mass (t = 25 Sec)[a]

High Pressure Drum Level	54.55	in[b]
Fluid Mass Upstream of Test Pump	13,969	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 1211

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-11.6	-
Start of Digitized Data	0.0	0
Start of Plotted Data	0.0	-
Command to Close Loop Control Valve HPSW-1	9.3	c
HPSW-1 Closed	10.9	c
Pump Power Trip	-	-
Initiate Rupture Mechanism	10.0	c
Blowdown Starts	12.1	35
End of Digitized Data 20 s/sec	1518.4	-
200 s/sec	384.4	-
FM Recording System Off	1536.0	-
Scanner System Off	-	1590

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

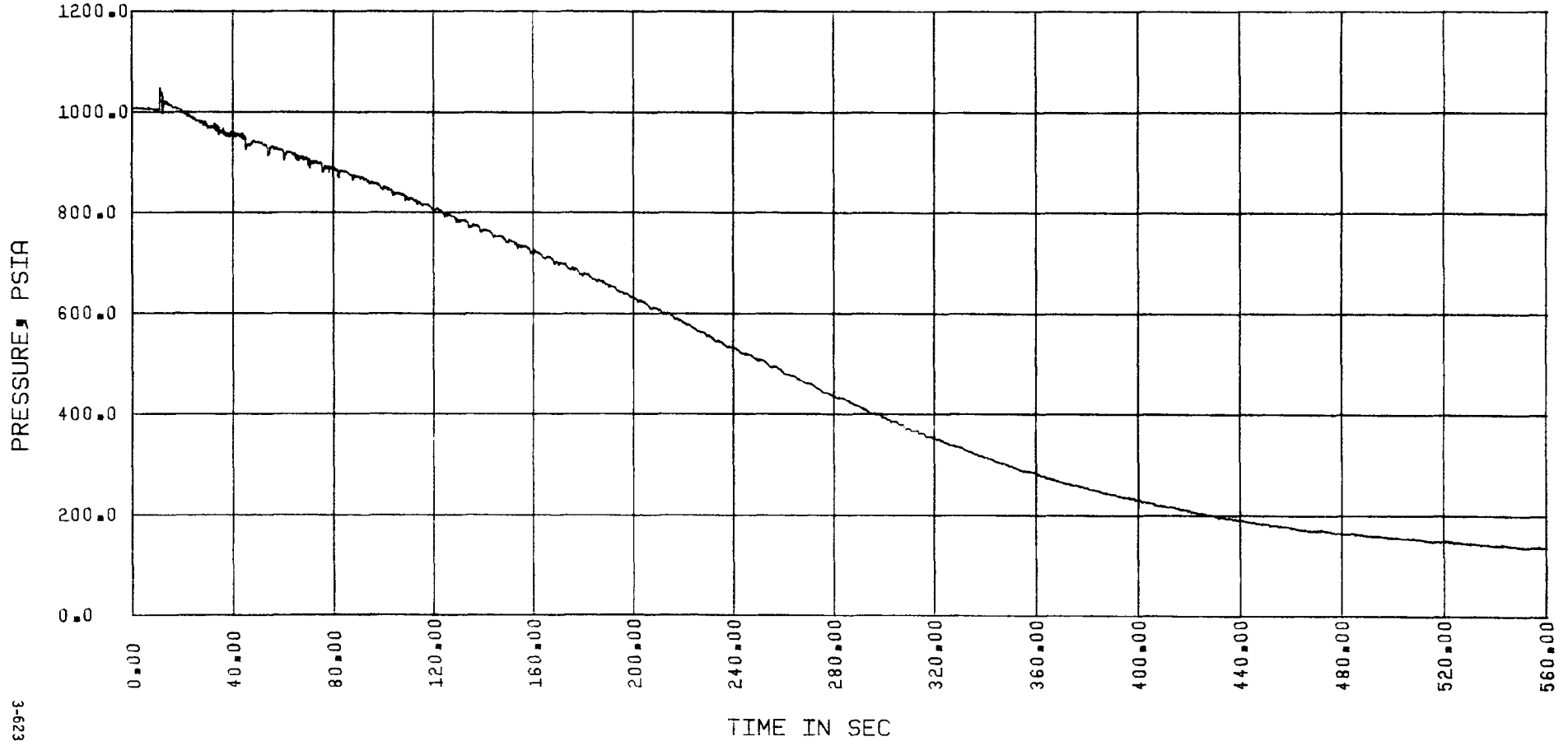
Index Listing
of
FM DATA PLOTS
Test Number (1211)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
28	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 Discharge
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge

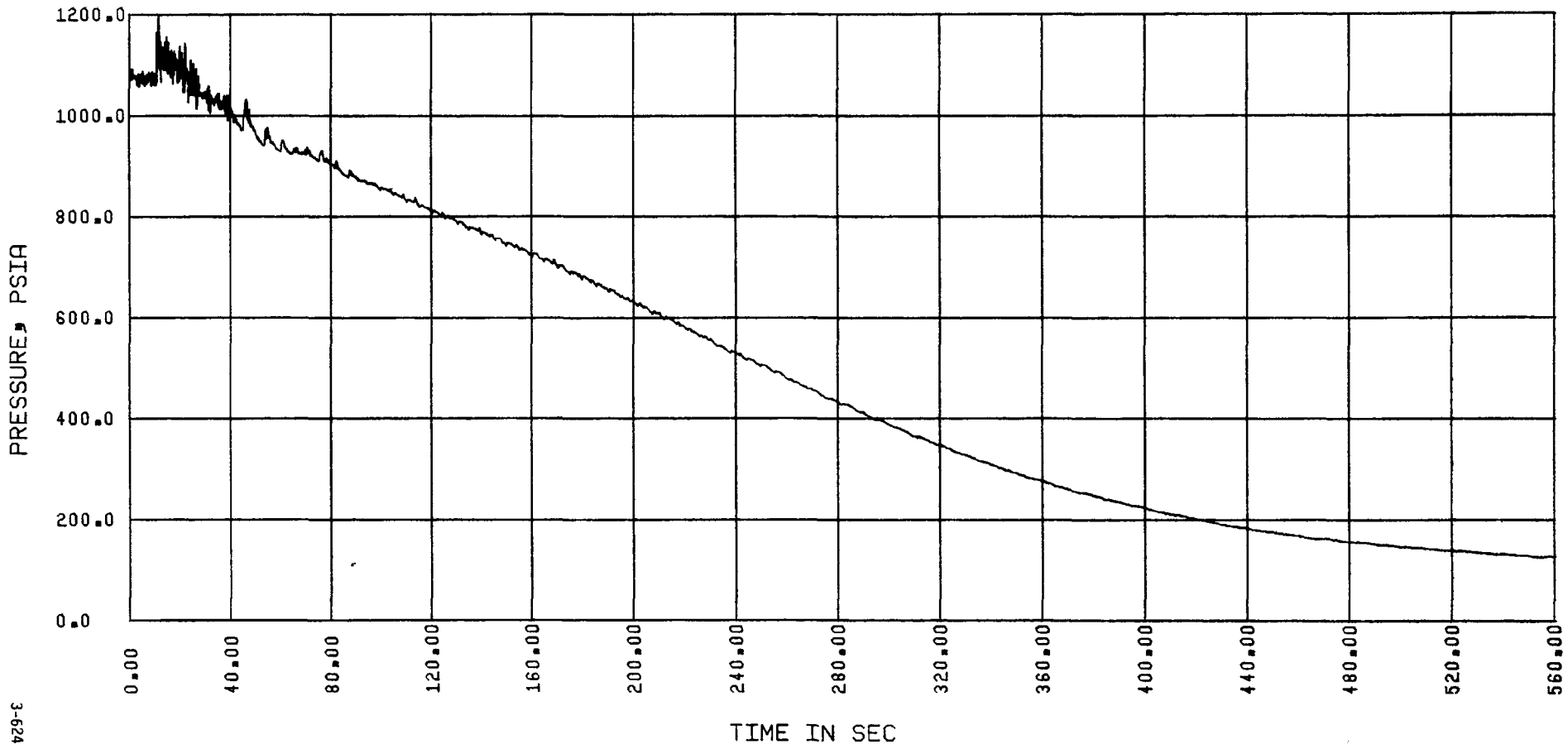
Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (1211)

Plot Number	Location Number	Description of Parameter
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
35	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
42	L-27	Momentum Flux LO-DD Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
53	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge
64	L-9	Pump Injection Mass Flow Rate In
65	L-32	Pump Injection Mass Flow Rate Out
66	L-9/L-32	Seal Injection Leakage Mass Flow Rate

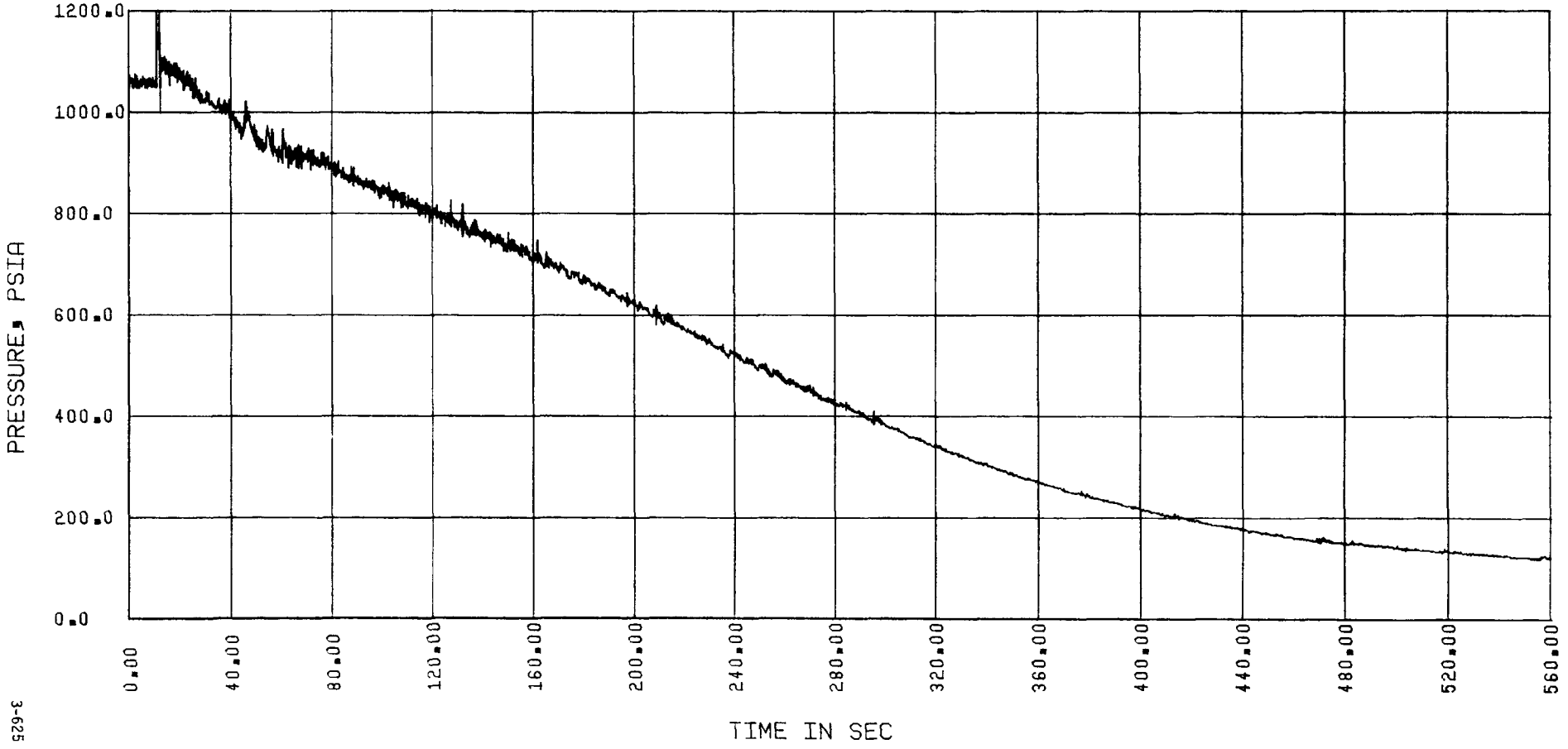
TEST 1211/1000 PSIA PON FWD BD
PUMP SUCTION PRESSURE
PLOT NO.1



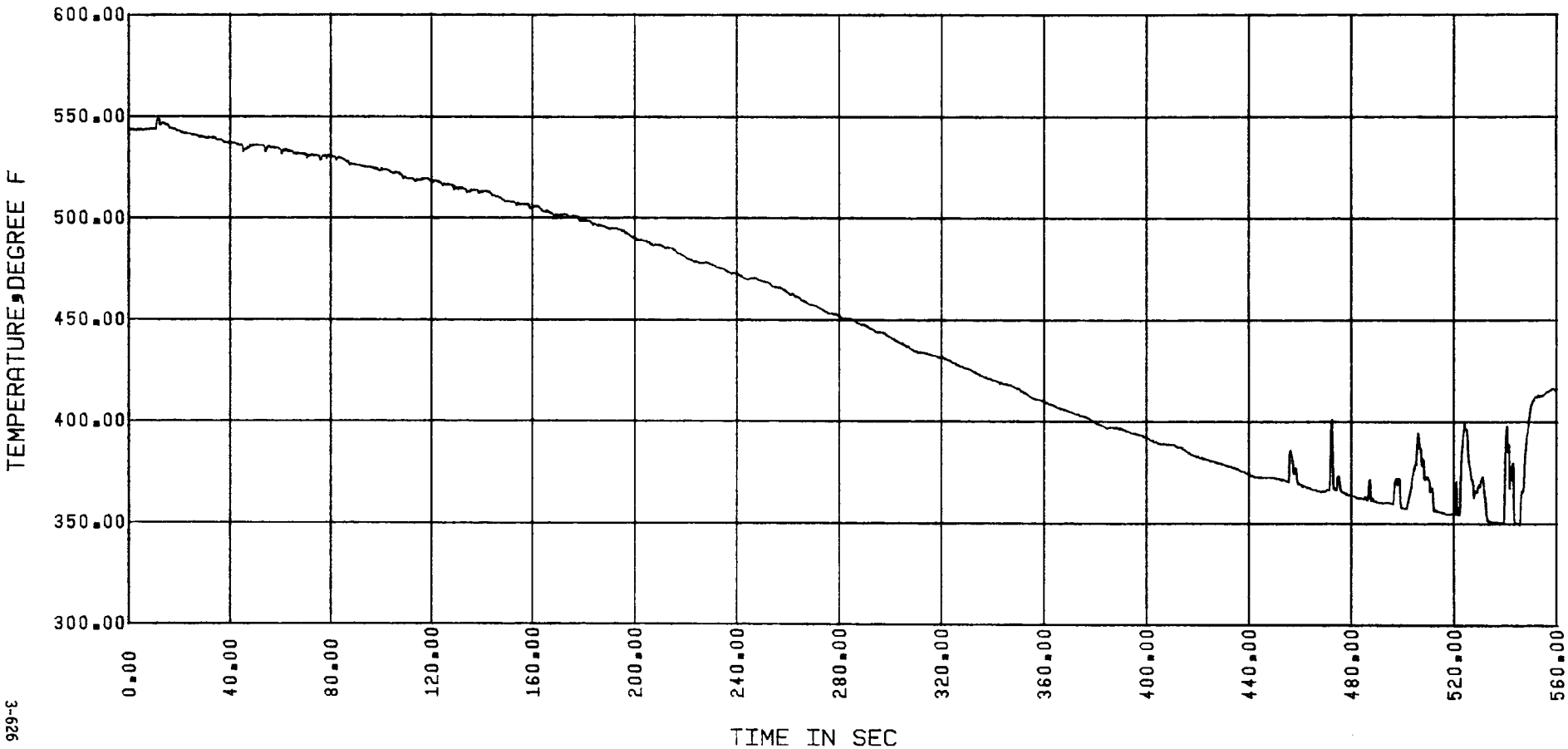
TEST 1211/1000 PSIA PON FWD BD
PUMP DISCHARGE PRESSURE
PLOT NO.2



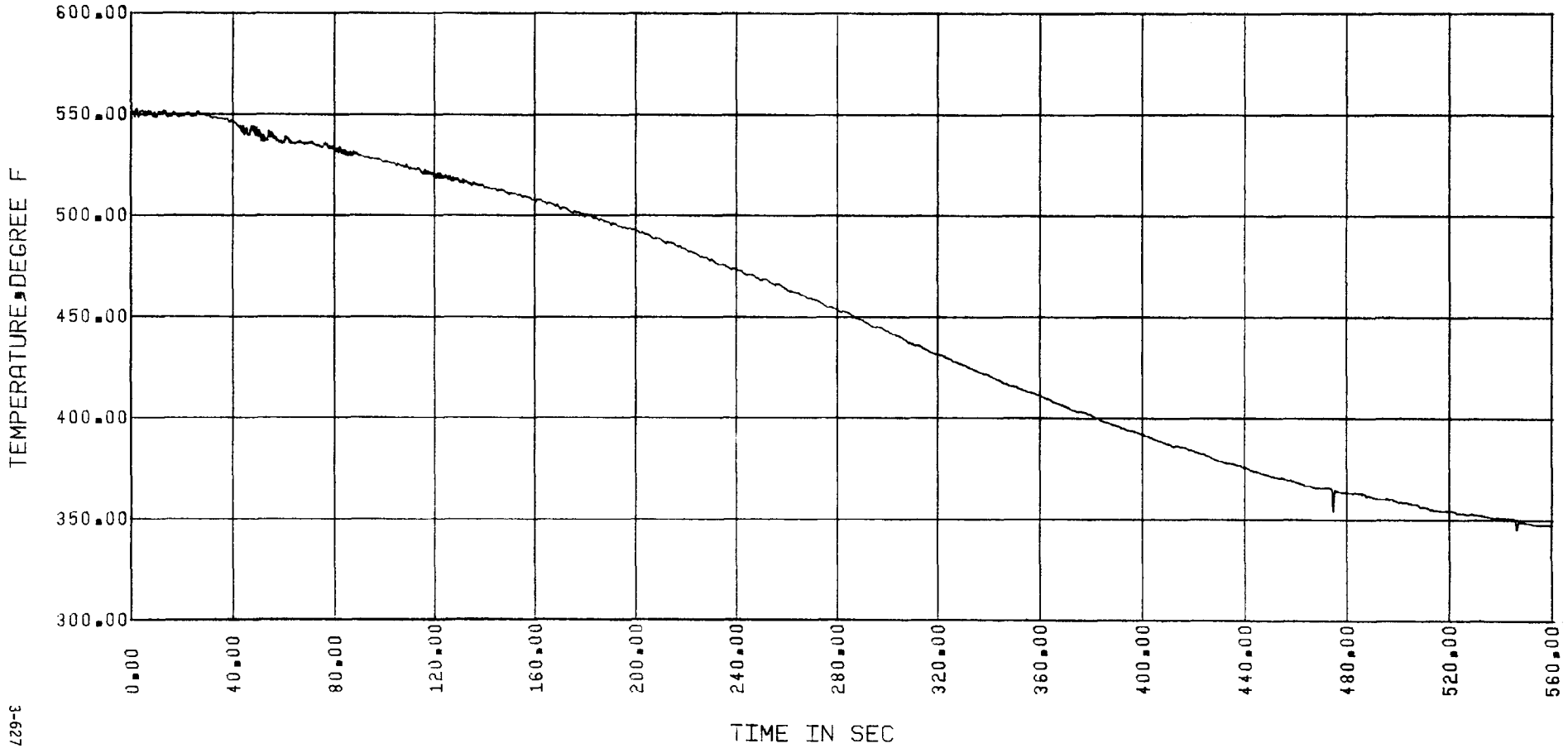
TEST 1211/1000 PSIA PON FWD BD
BLOWDOWN LINE PRESSURE
PLOT NO.3



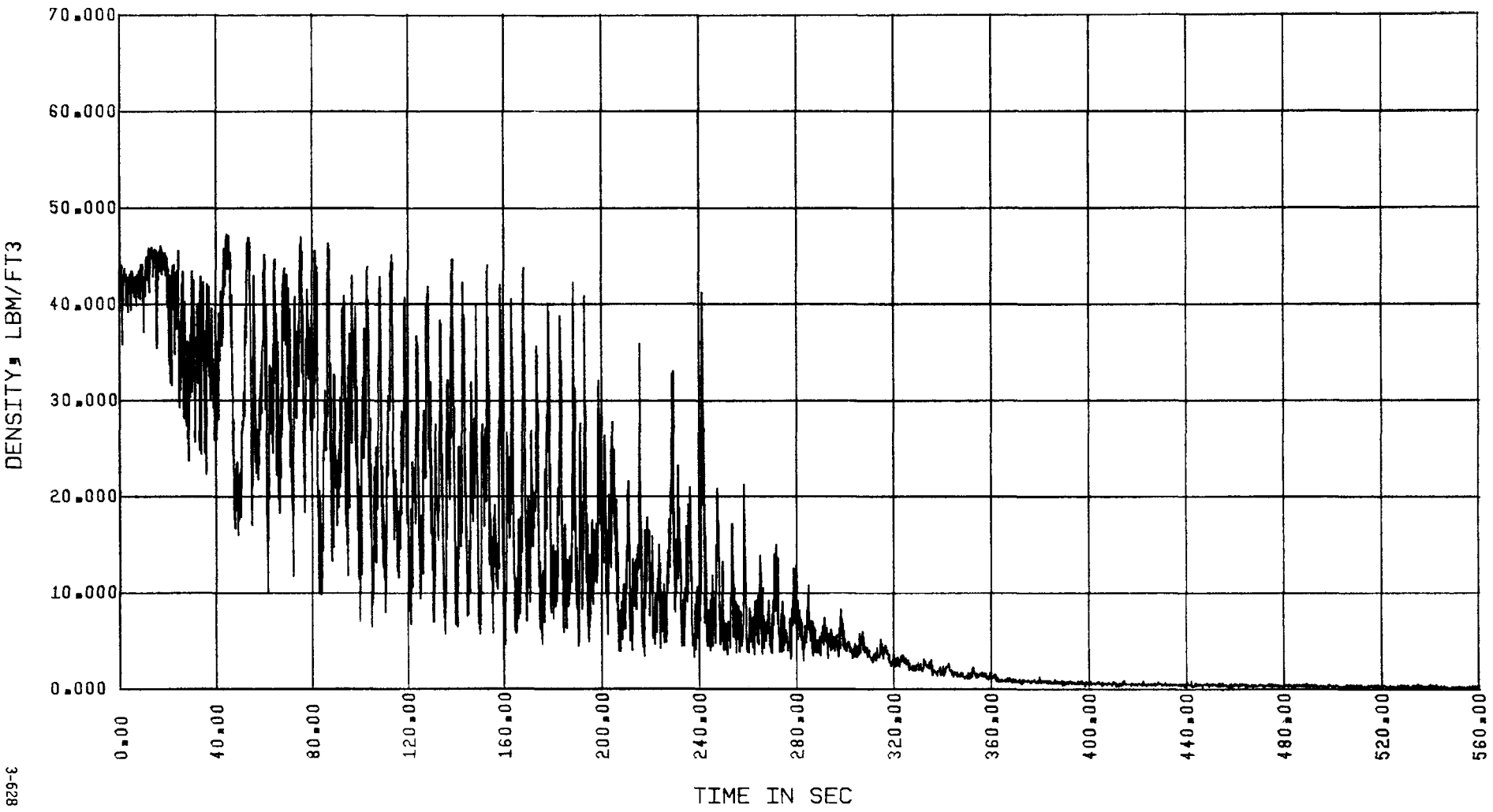
TEST 1211/1000 PSIA PON FWD BD
PUMP SUCTION TEMPERATURE
PLOT NO.4



TEST 1211/1000 PSIA PON FWD BD
PUMP DISCHARGE TEMPERATURE
PLOT NO.5



TEST 1211/1000 PSIA PON FWD BD
DENSITY BEAM1 GD SUCTION
PLOT NO.6



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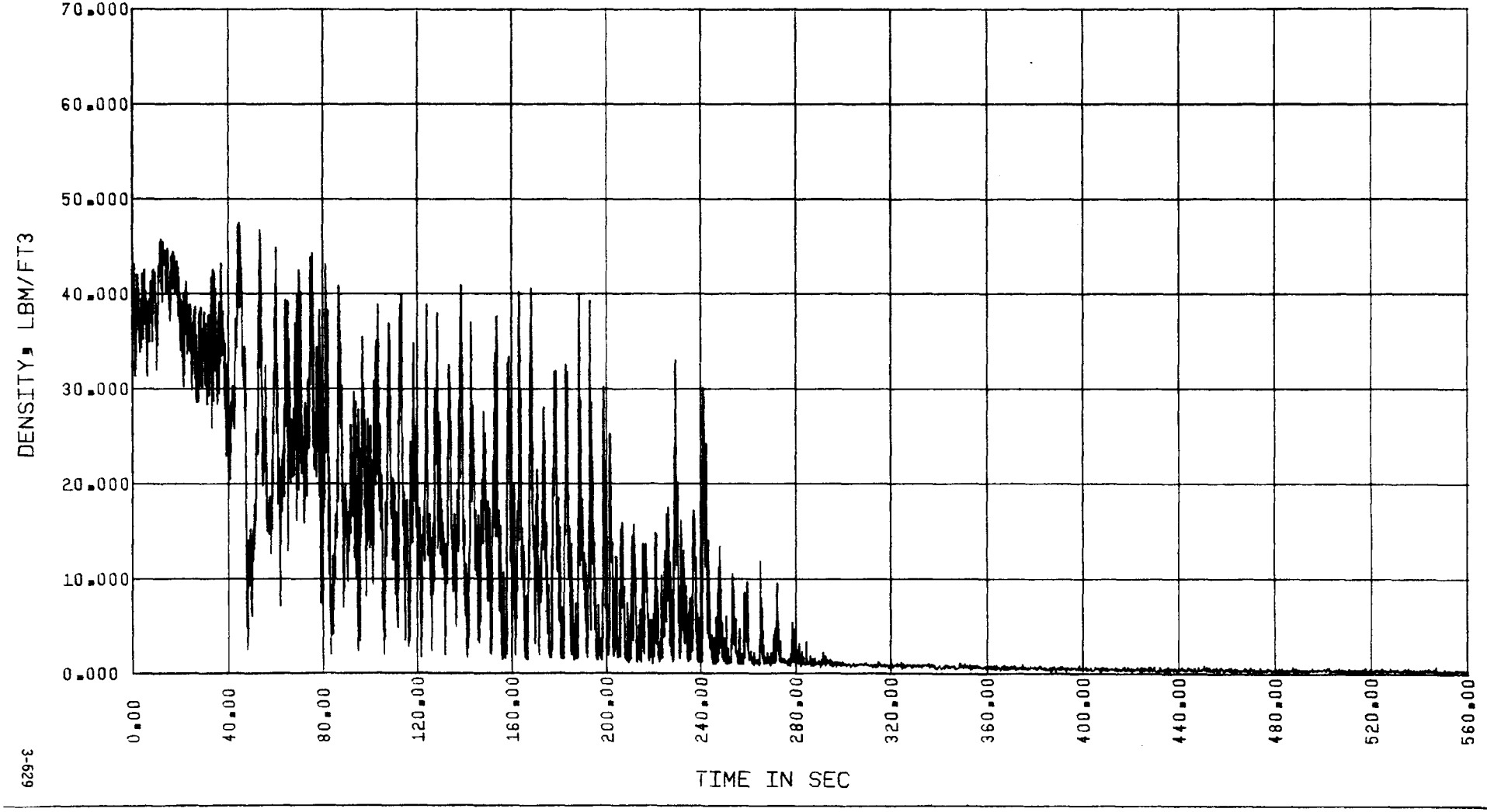
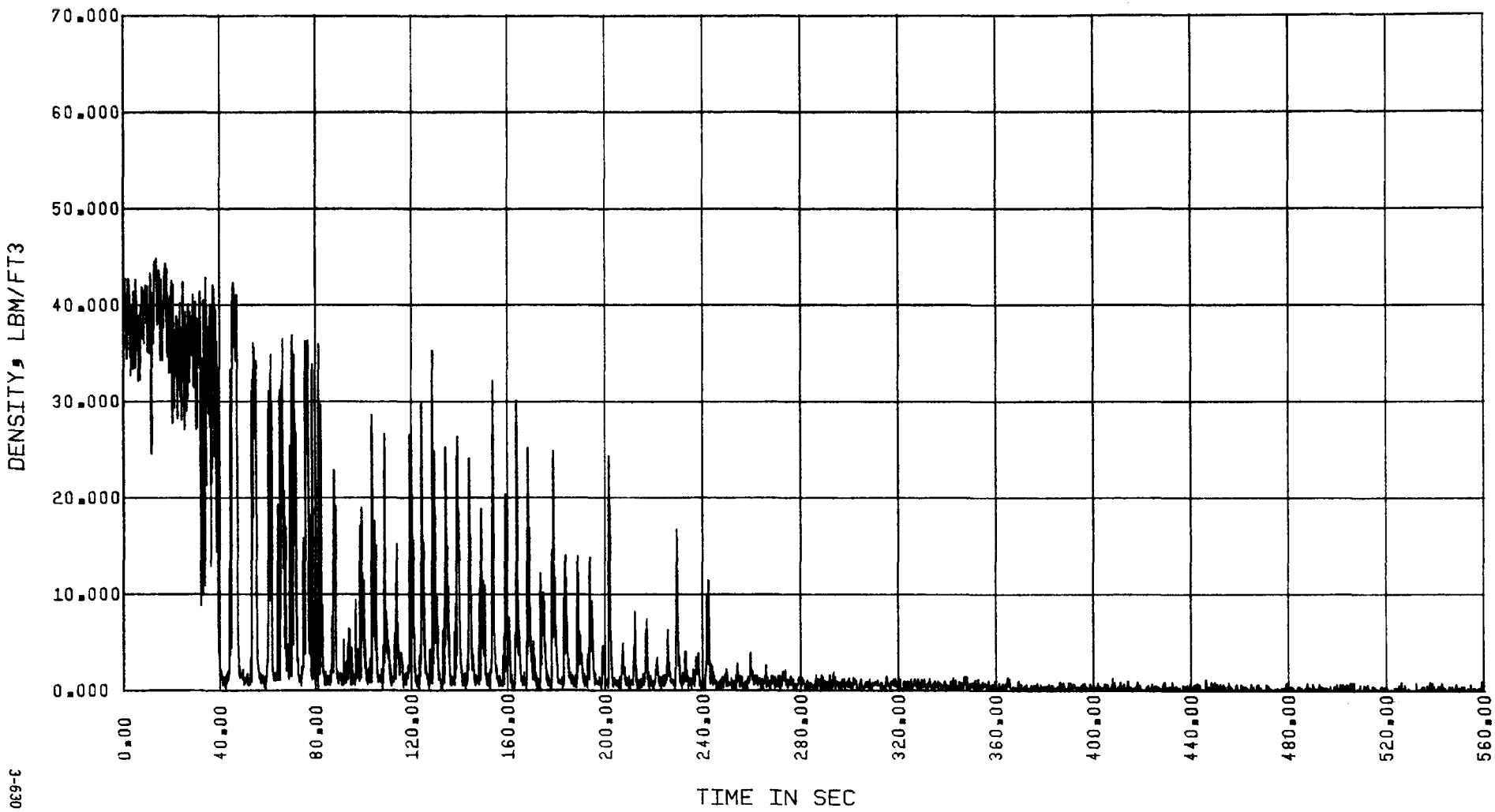
TEST 1211/1000 PSIA PON FWD BD
DENSITY BEAM2 GD SUCTION
PLOT NO.7

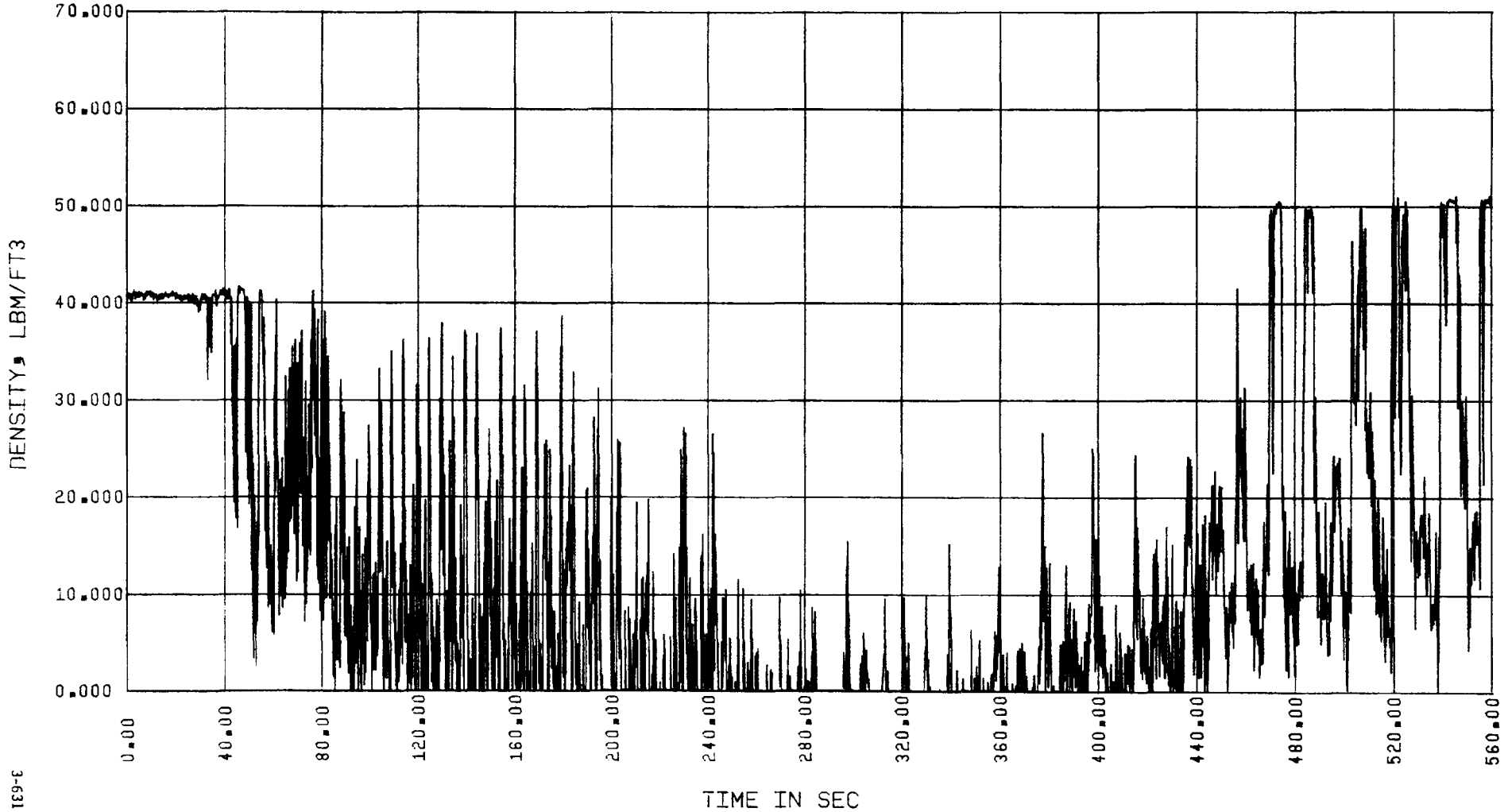


629-E

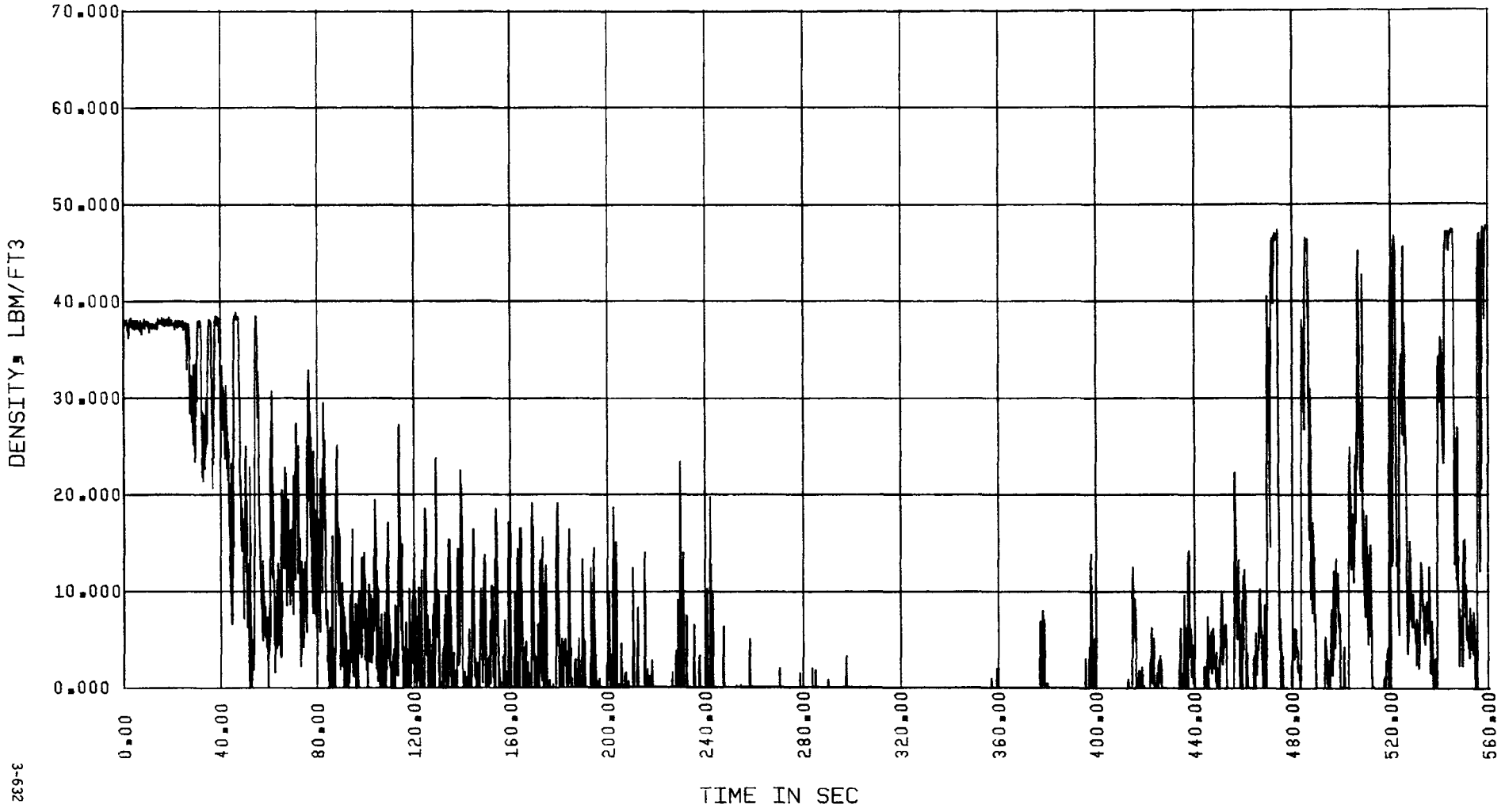
TEST 1211/1000 PSIA PON FWD BD
DENSITY BEAM3 GD SUCTION
PLOT NO.8



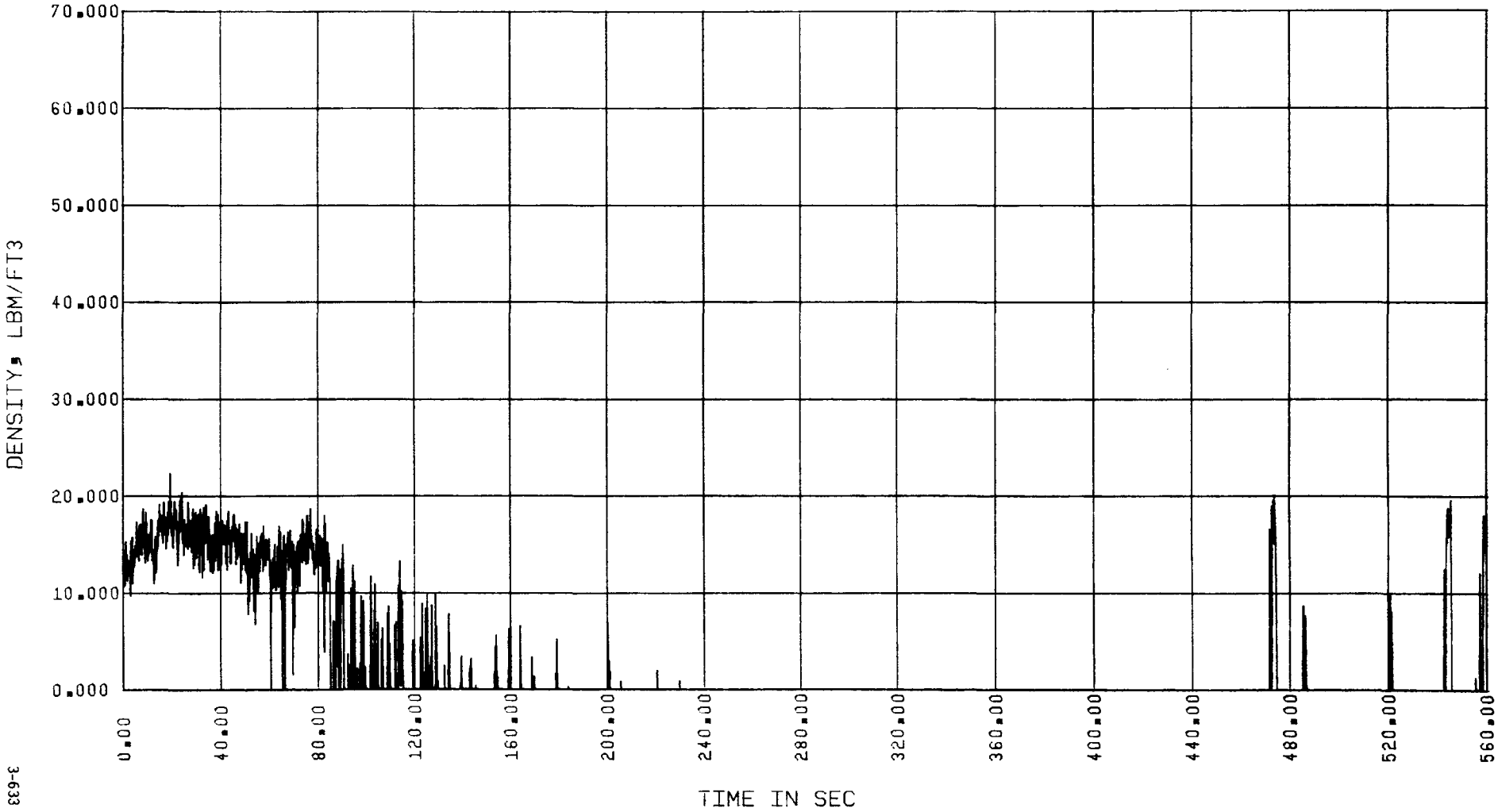
TEST 1211/1000 PSIA PON FWD BD
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9



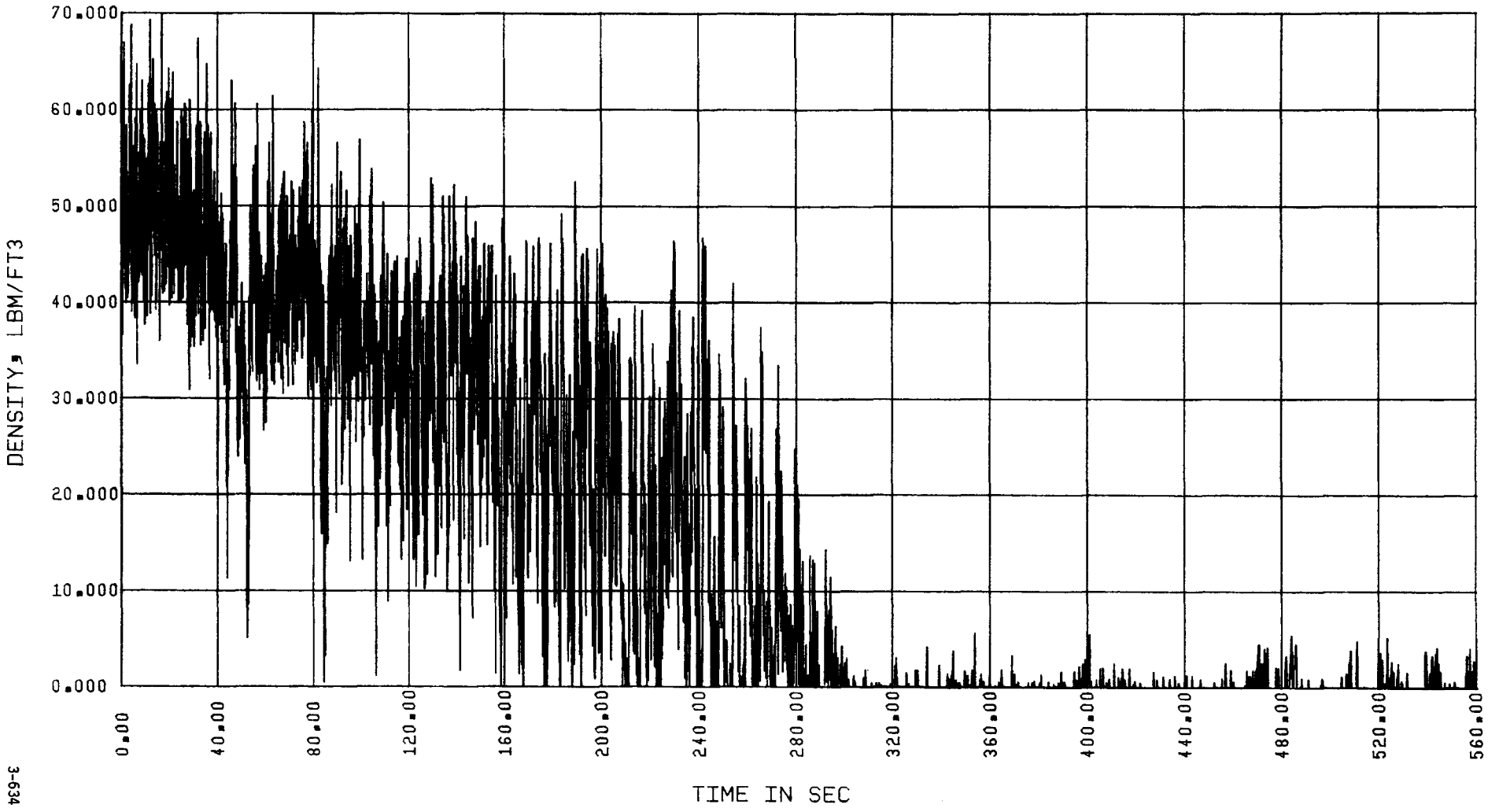
TEST 1211/1000 PSIA PON FWD BD
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10



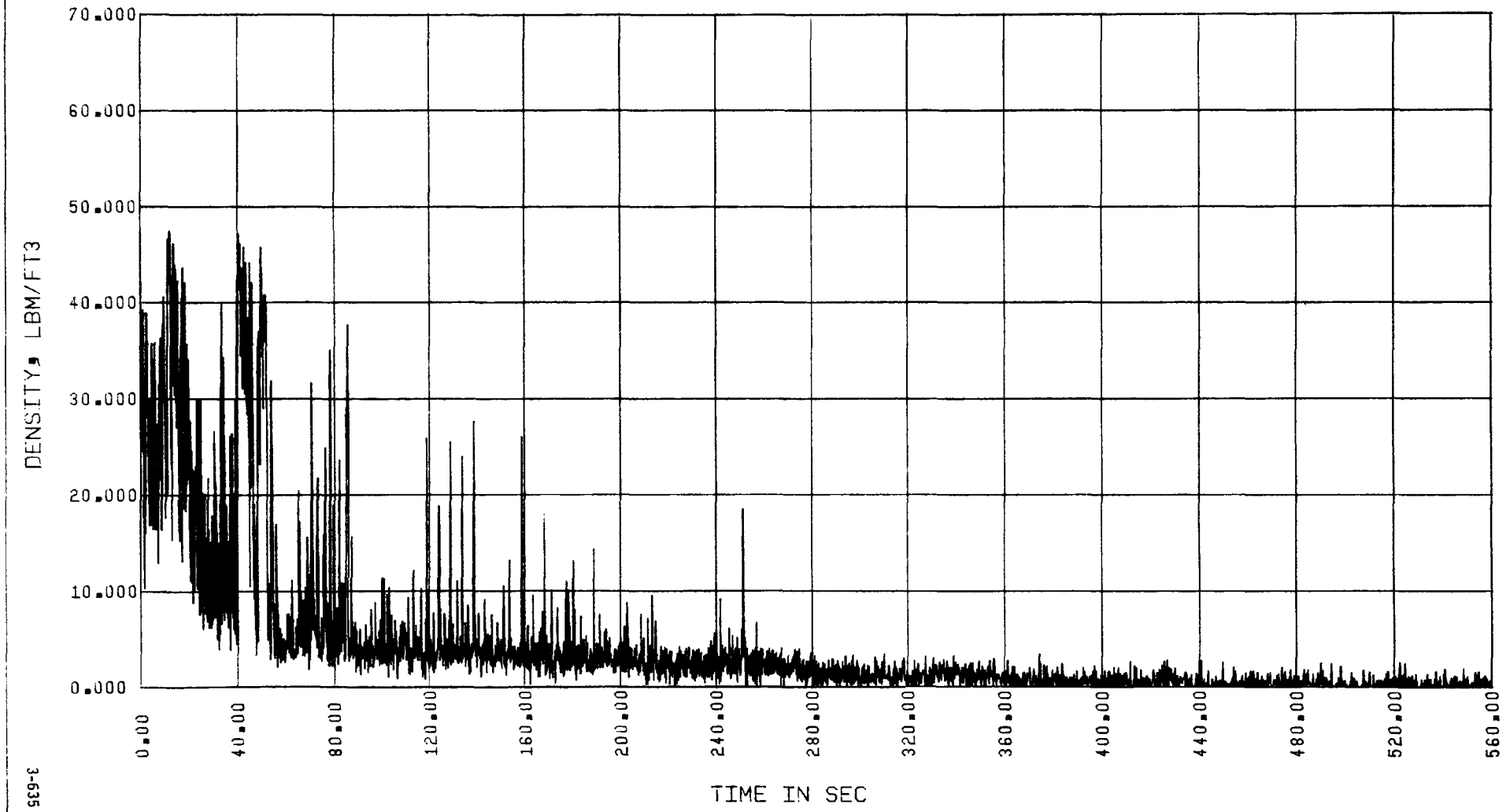
TEST 1211/1000 PSIA PON FWD BD
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11



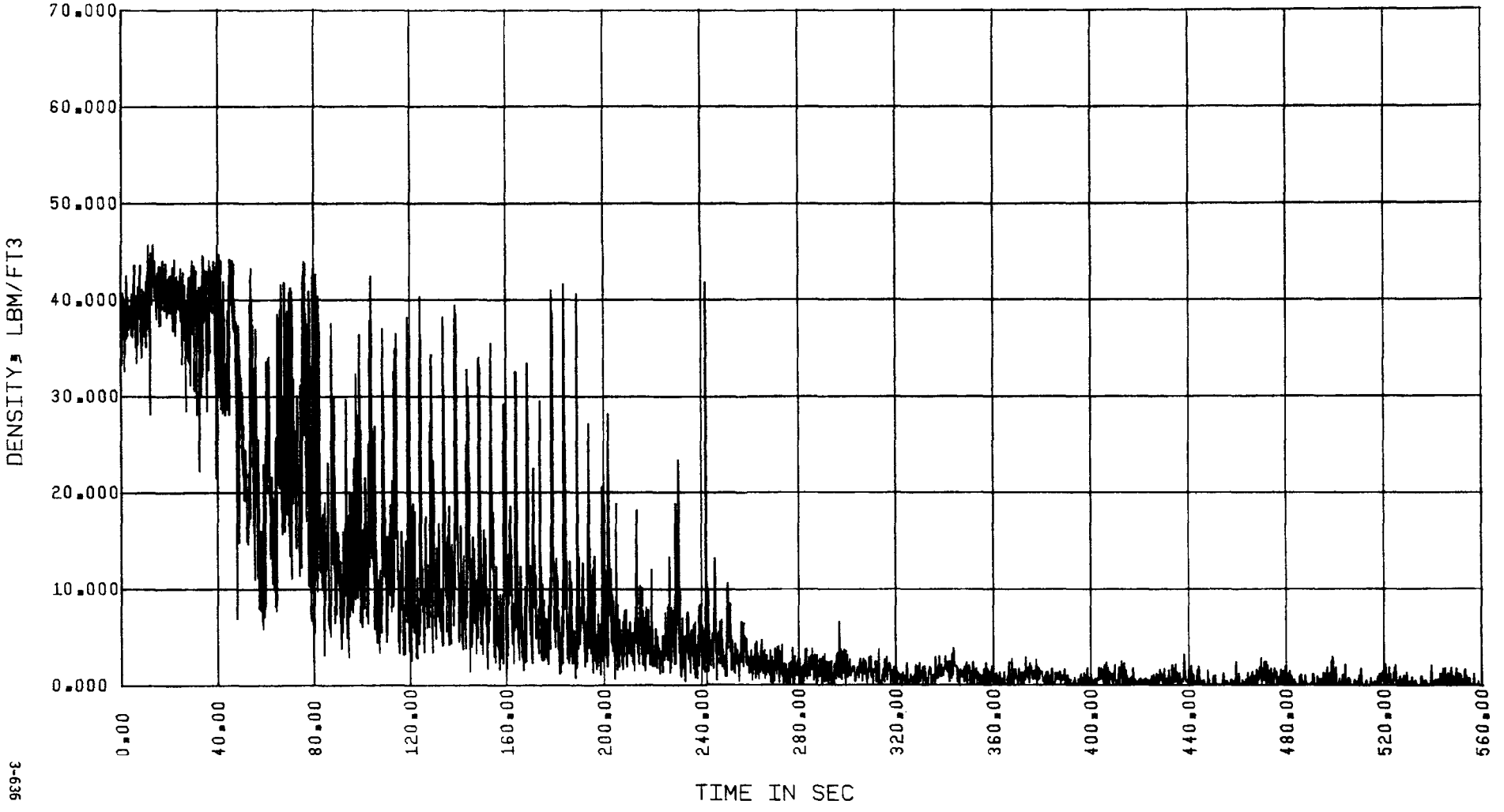
TEST 1211/1000 PSIA PON FWD BD
DENSITY BEAM1 AECL GD
PLOT NO.12



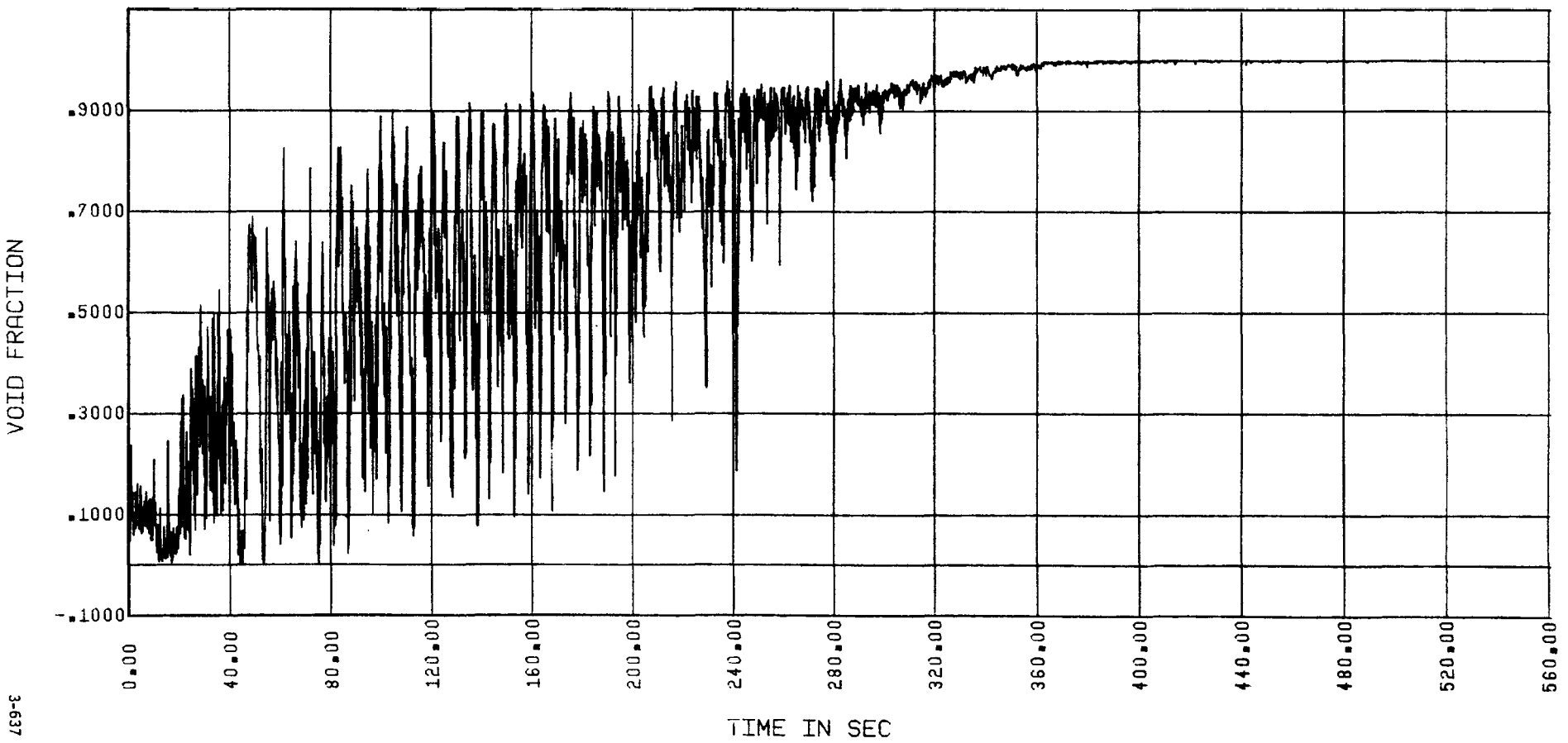
TEST 1211/1000 PSIA PON FWD BD
DENSITY BEAM2 AECL GD
PLOT NO.13



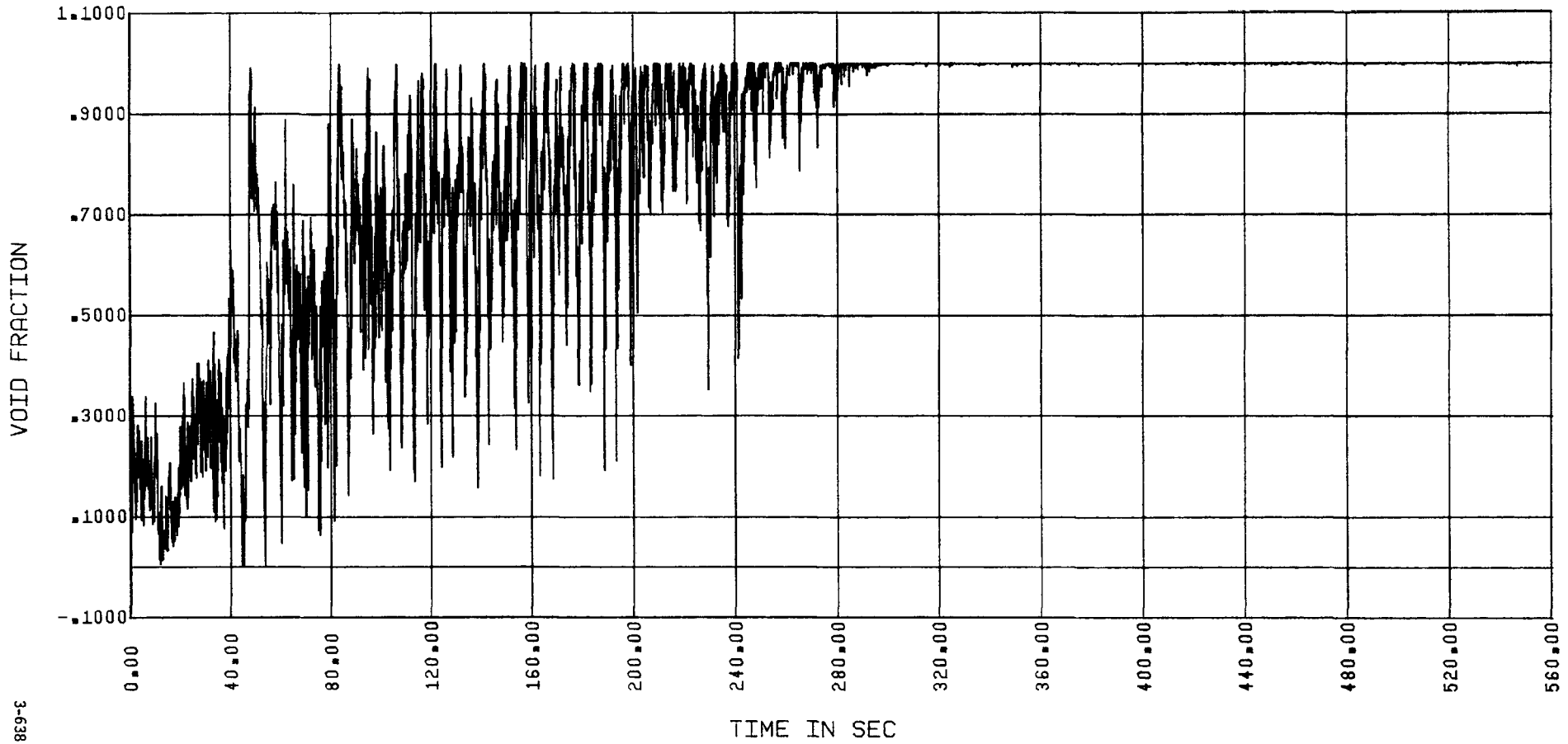
TEST 1211/1000 PSIA PON FWD BD
DENSITY BEAM3 AECL GD
PLOT NO.14



TEST 1211/1000 PSIA PON FWD BD
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15



TEST 1211/1000 PSIA PON FWD BD
VOID FRACTION BEAM2 GD SUCTION
PLOT NO. 16



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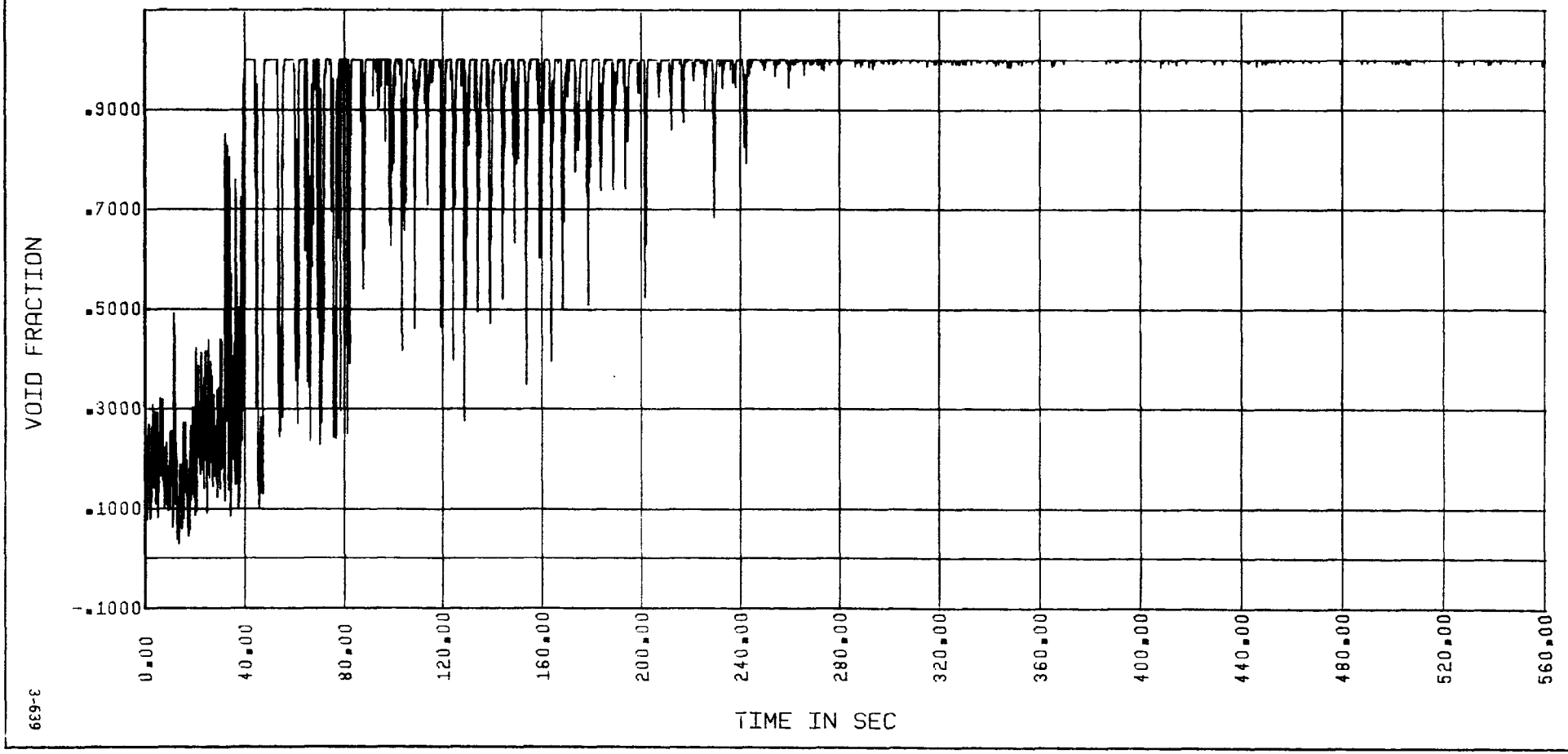
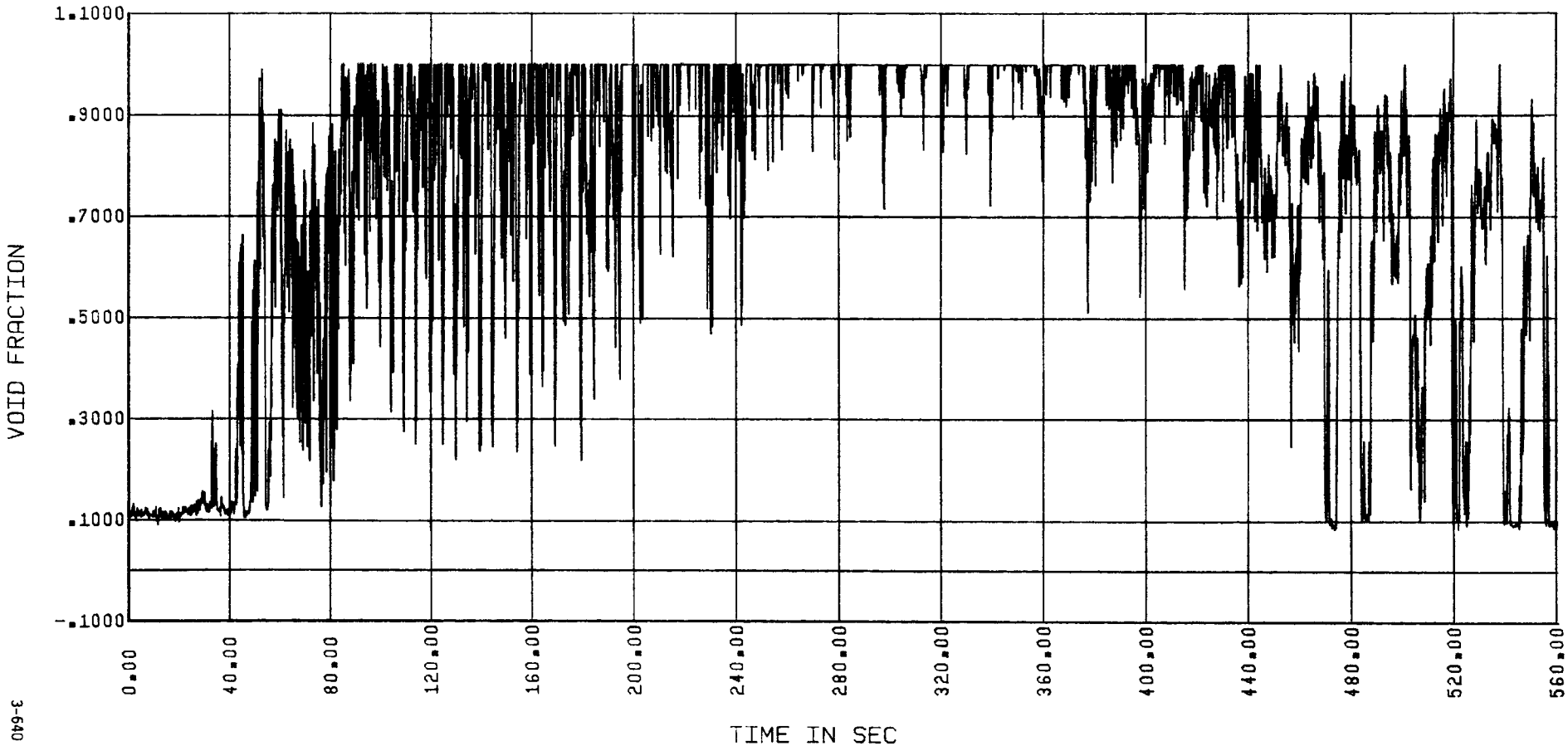
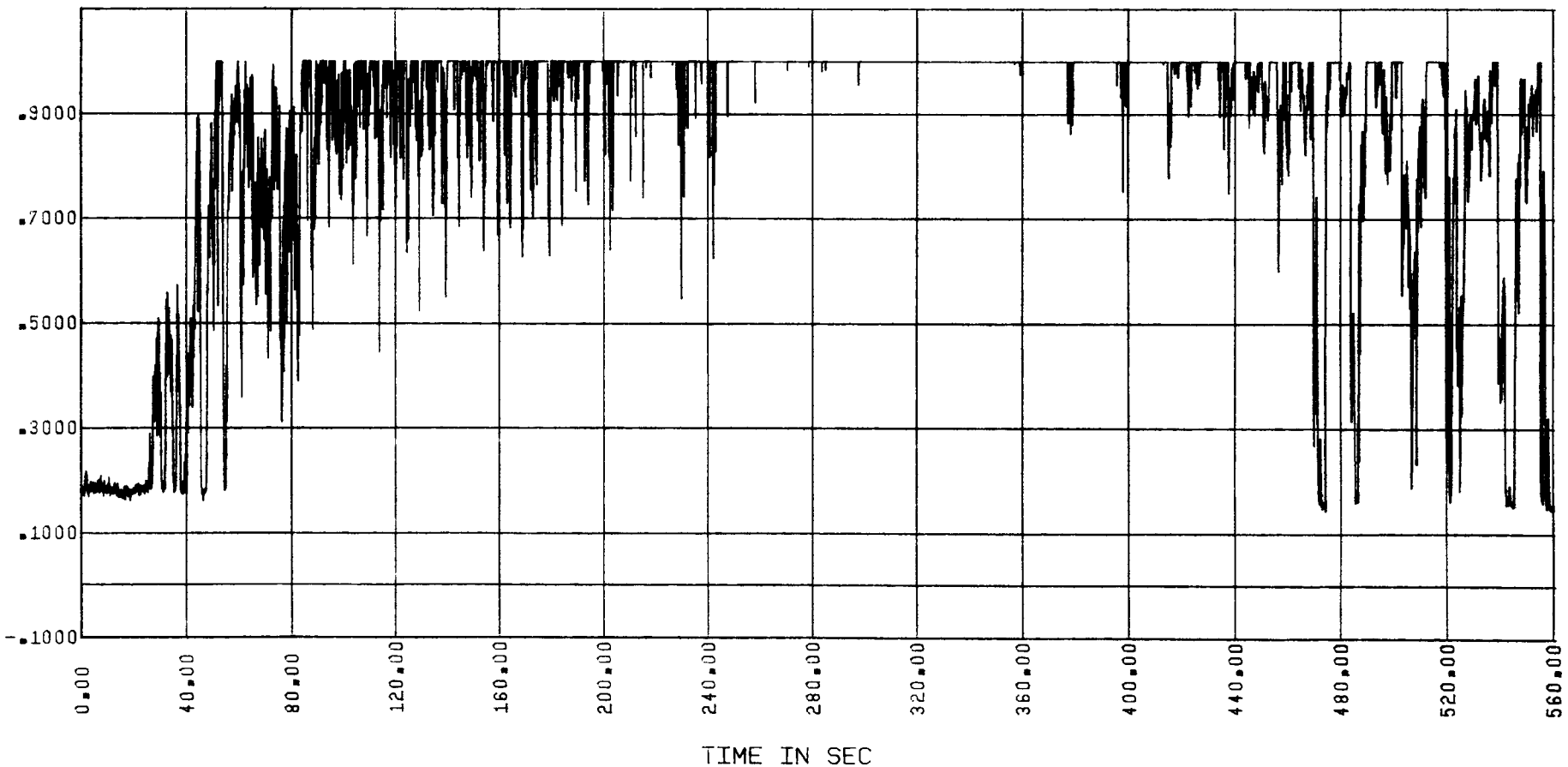
TEST 1211/1000 PSIA PON FWD BD
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17



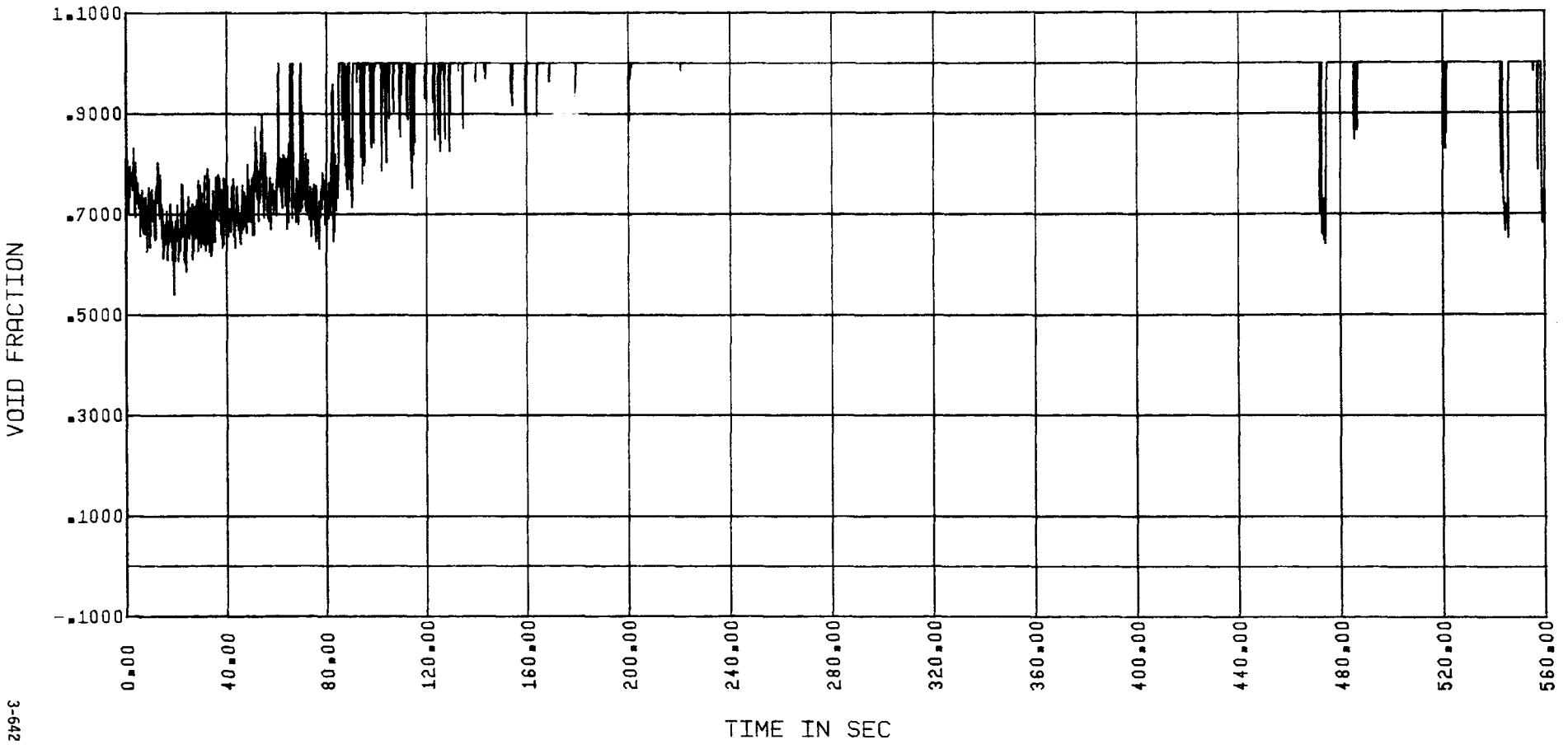
TEST 1211/1000 PSIA PON FWD BD
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18



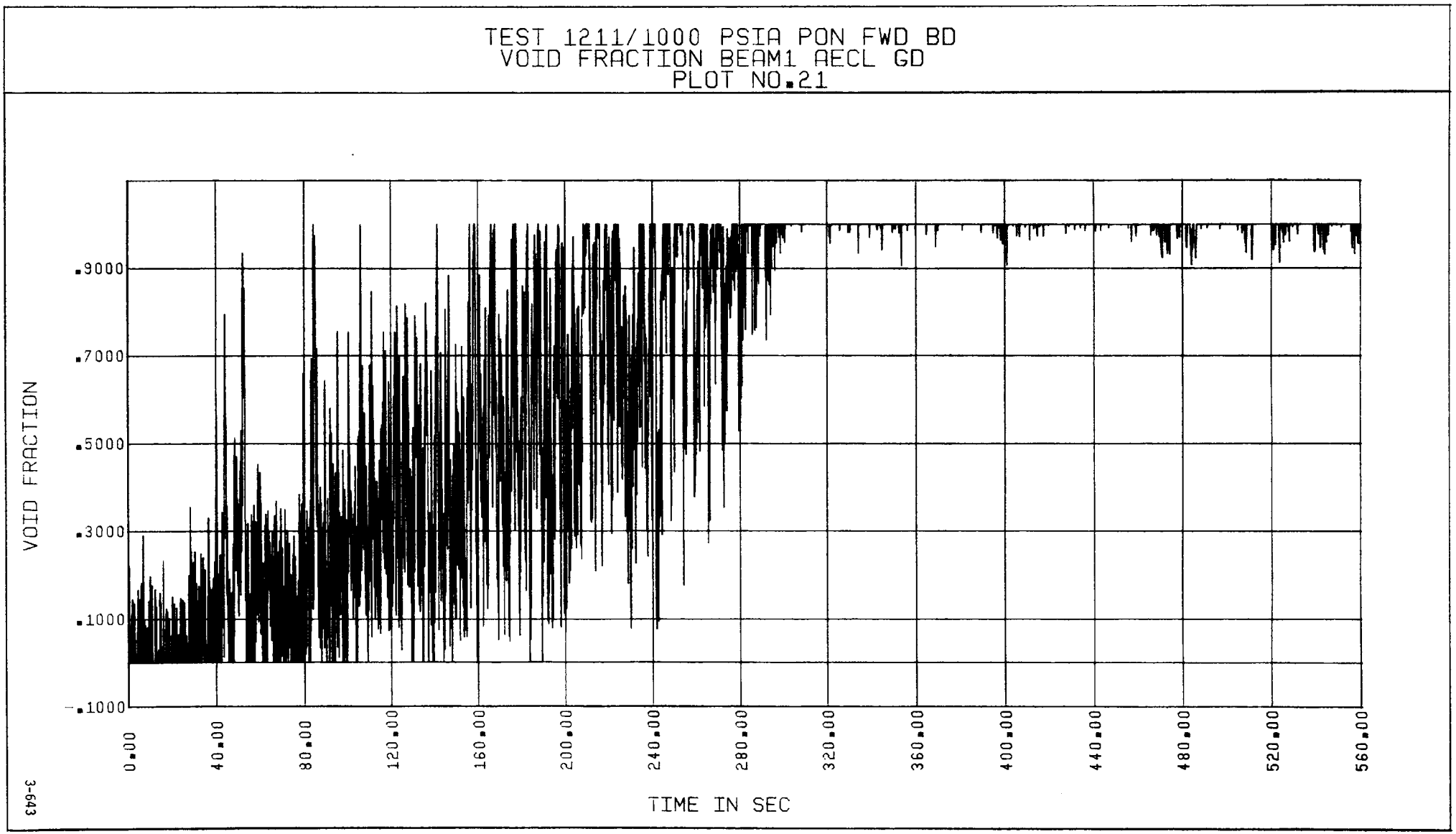
TEST 1211/1000 PSIA PON FWD BD
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19



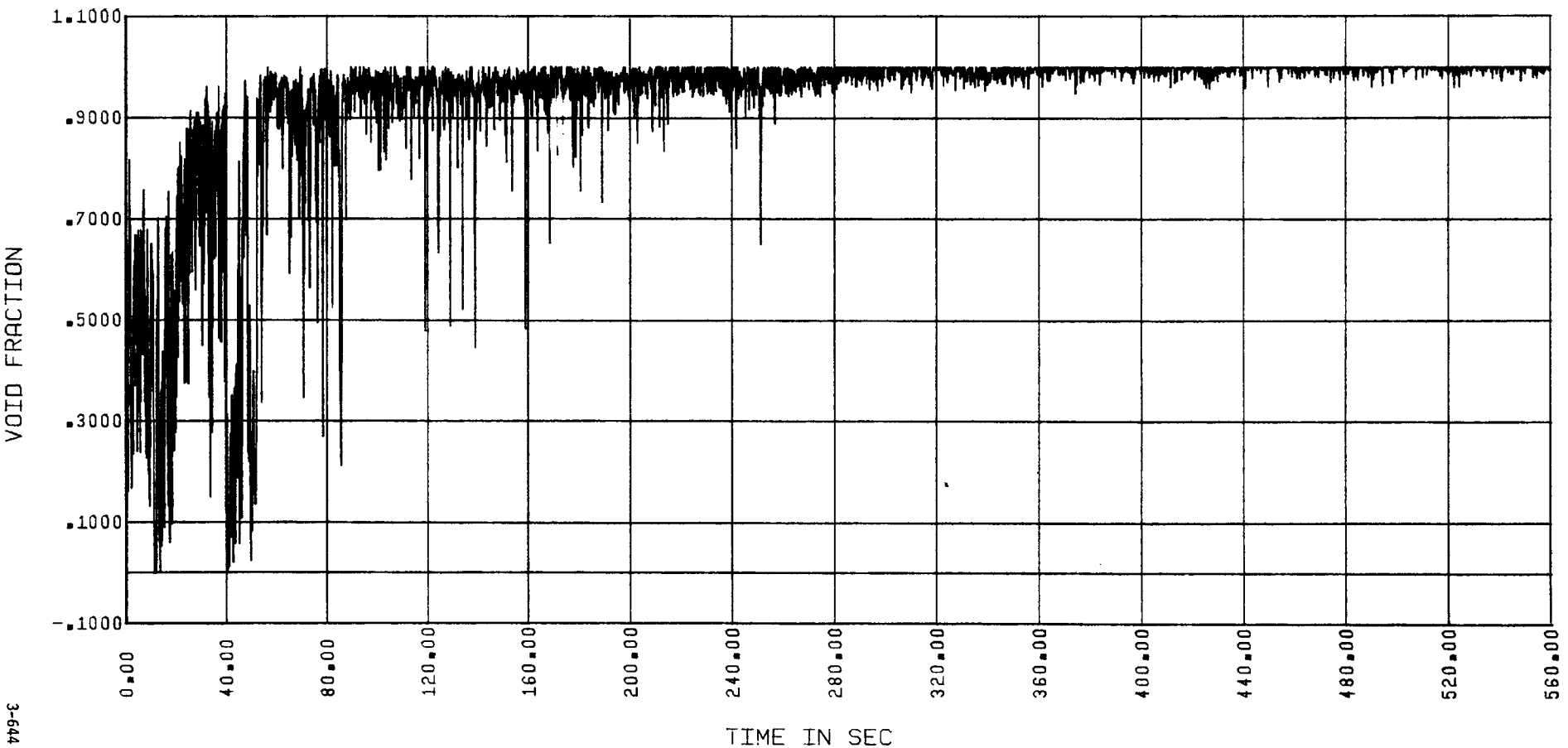
TEST 1211/1000 PSIA PON FWD BD
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20



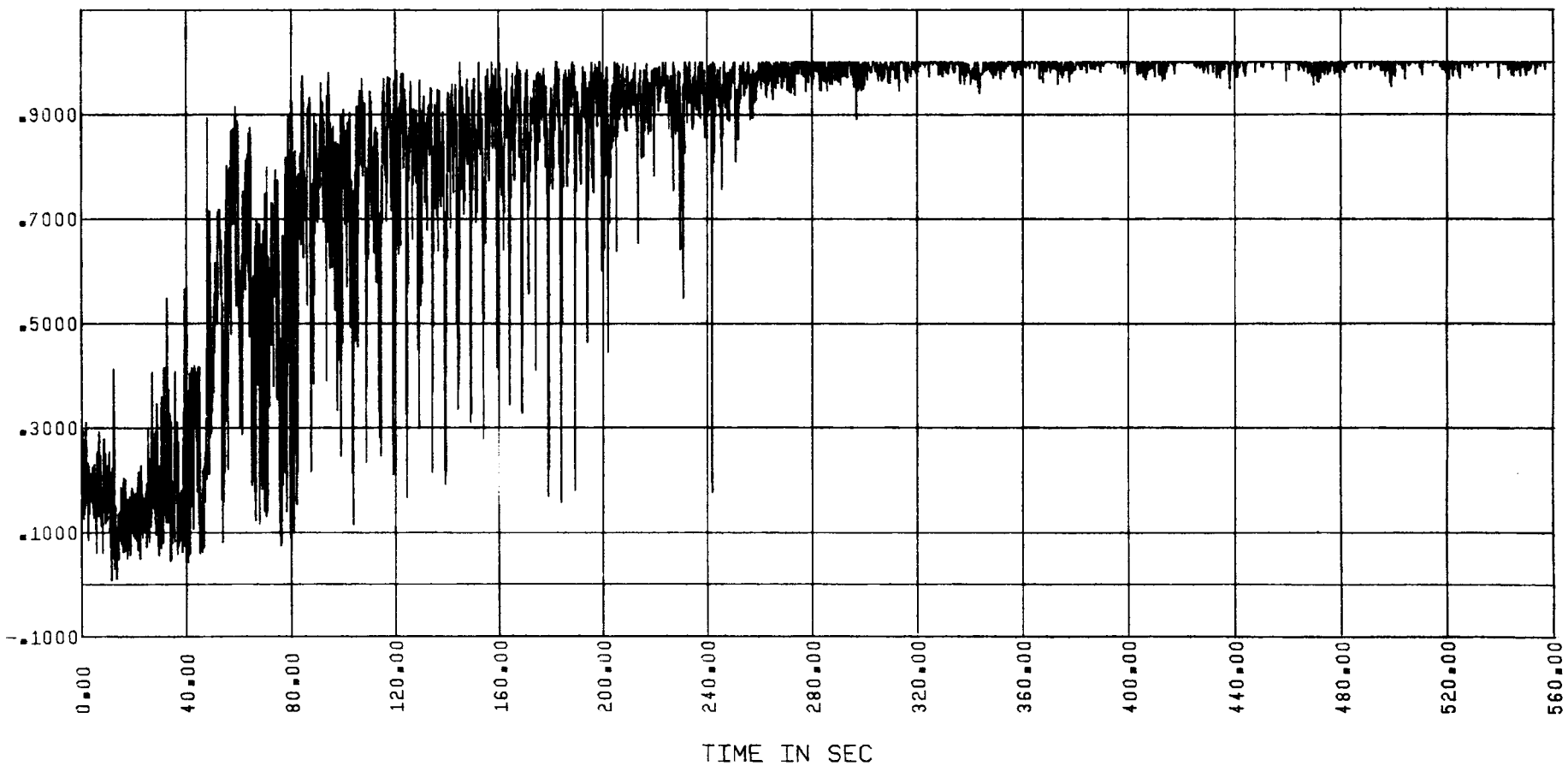
3-642


TEST 1211/1000 PSIA PON FWD BD
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
440.00
480.00
520.00
560.00
TIME IN SEC

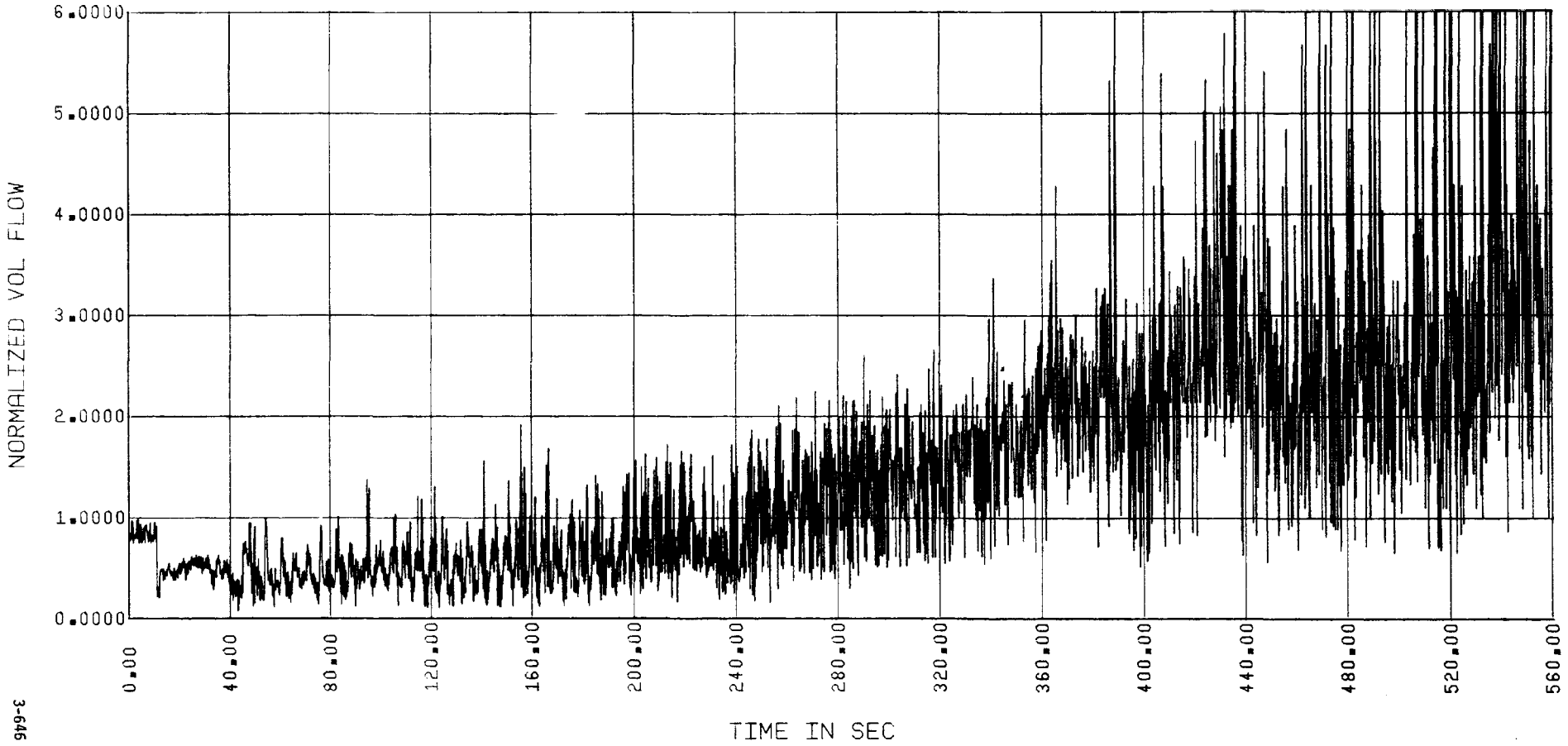
TEST 1211/1000 PSIA PON FWD BD
VOID FRACTION BEAM2 AECL GD
PLOT NO.22



TEST 1211/1000 PSIA PON FWD BD
VOID FRACTION BEAM3 AECL GD
PLOT NO.23

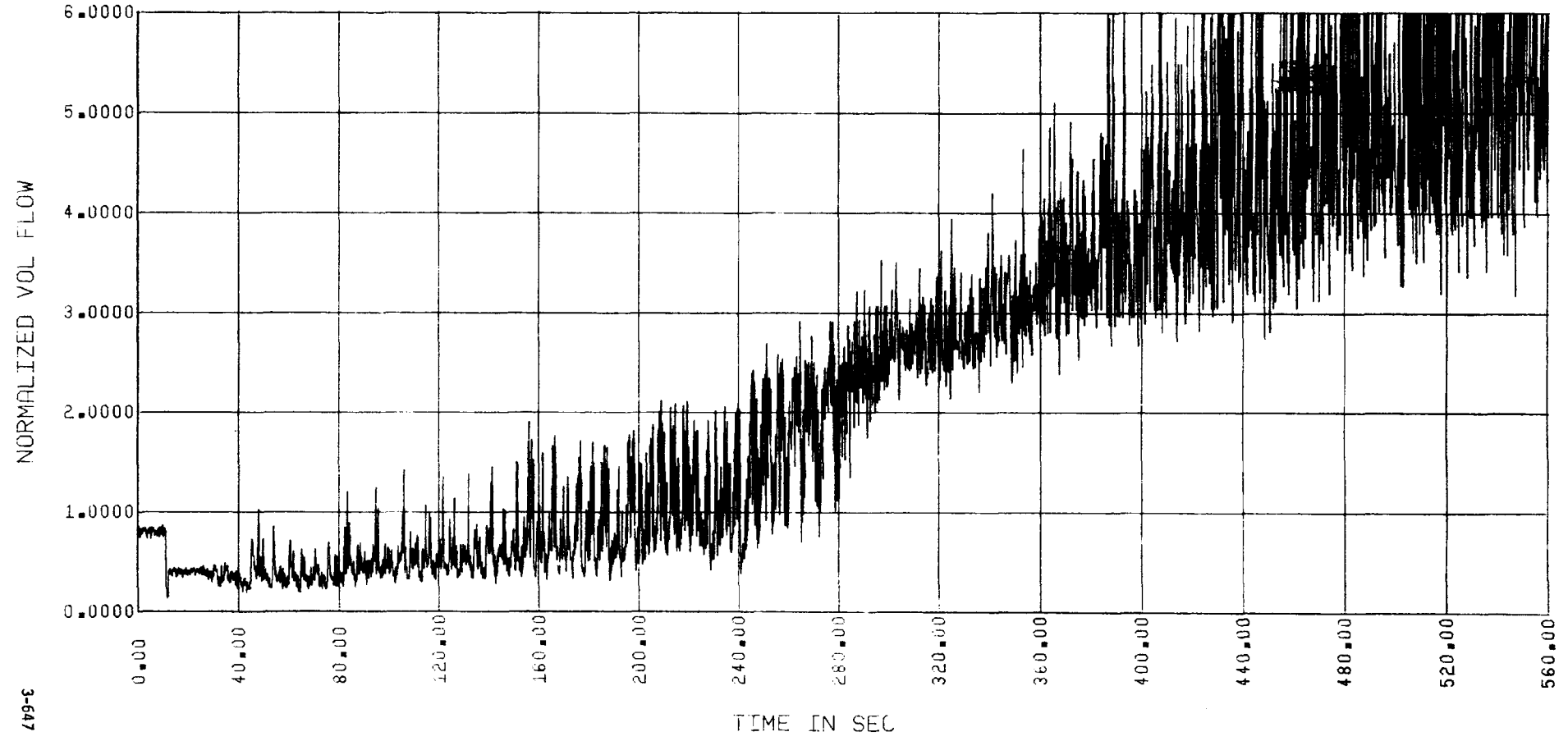


TEST 1211/1000 PSIA PON FWD BD
NORM VOL FLOW RATE LO-DD/GD2 S
PLOT NO.24

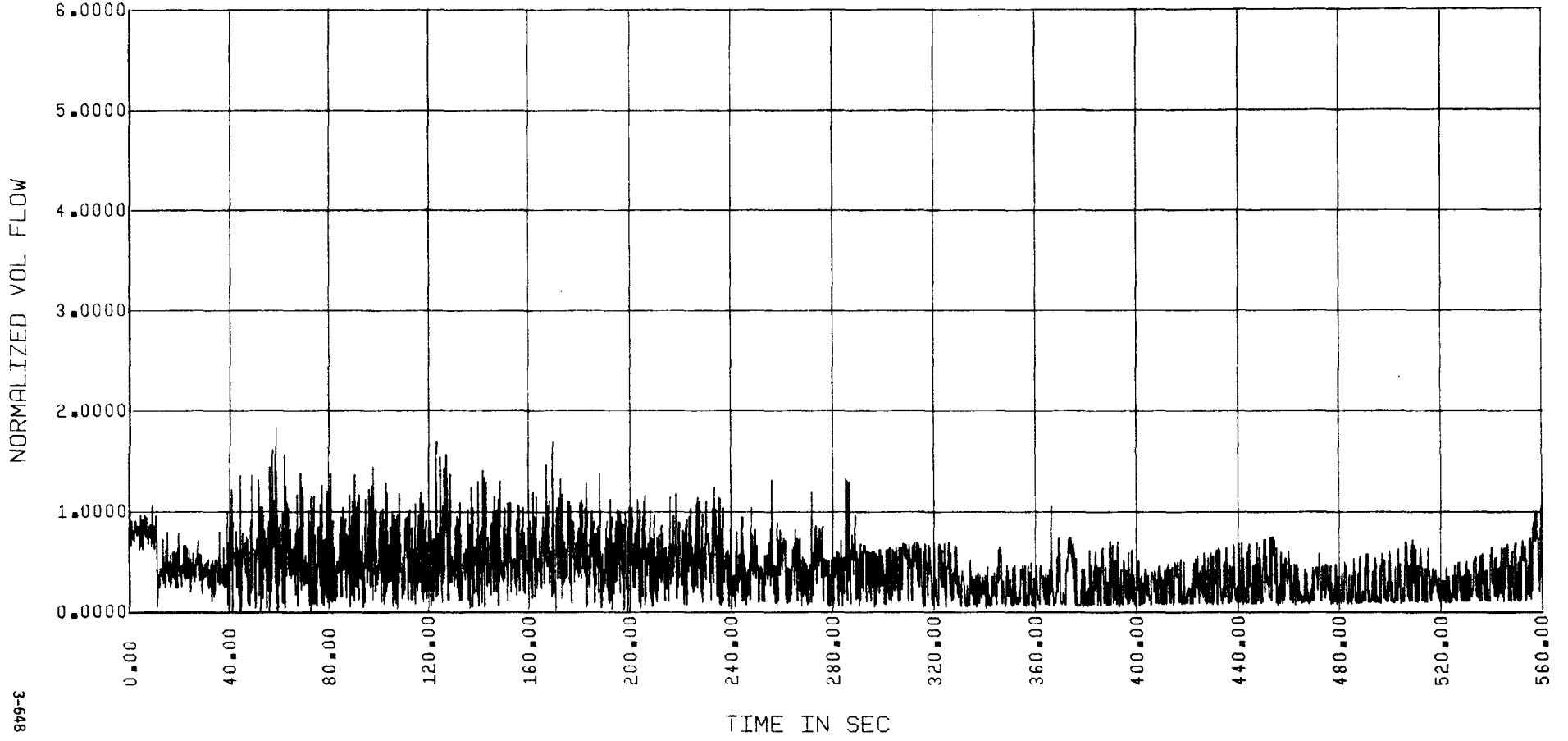


3-946

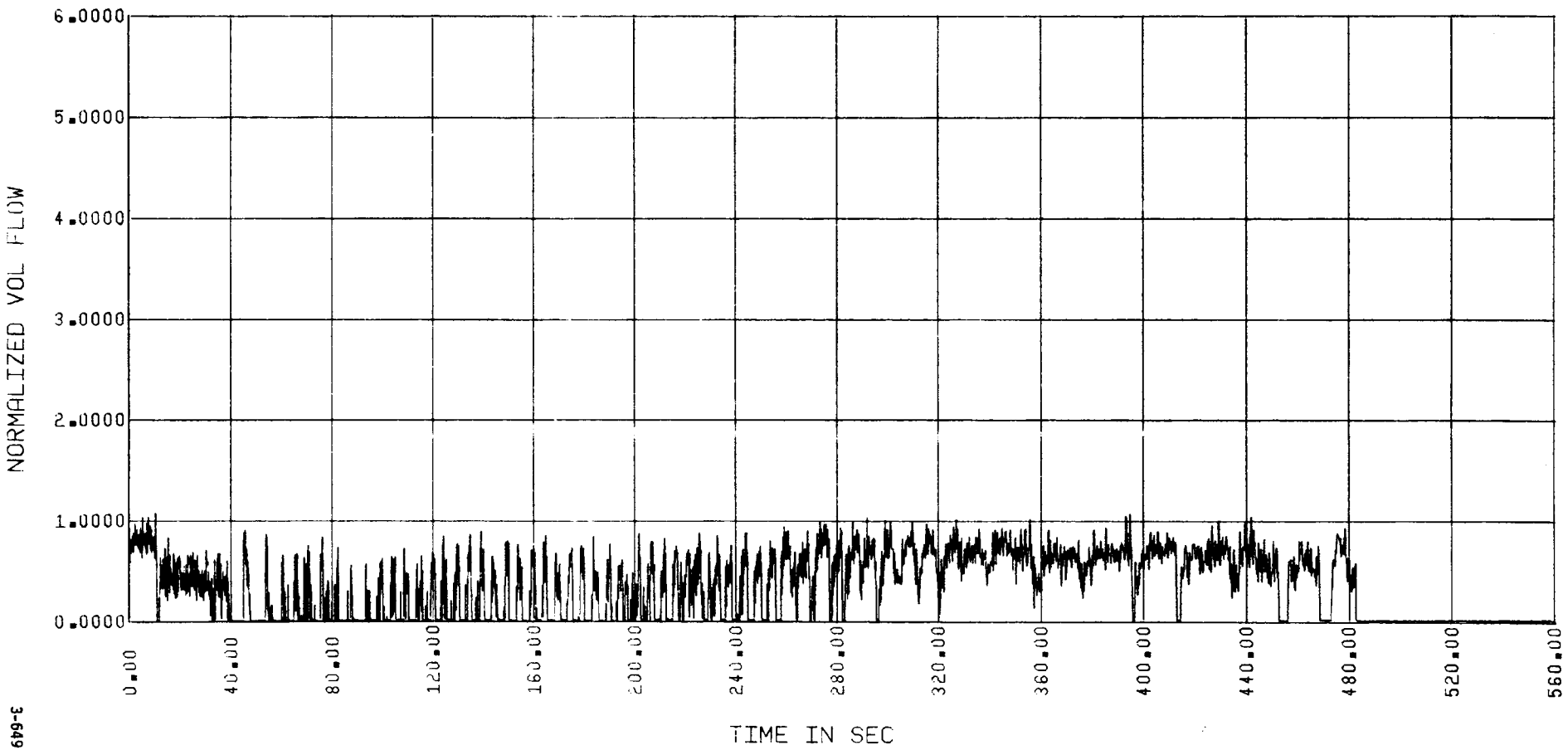
TEST 1211/1000 PSIA PON FWD BD
NORM VOL FLOW RATE HI-DD/GD2 S
PLOT NO.25



TEST 1211/1000 PSIA PON FWD BD
NORM VOL FLOW RATE LO-TM SUCT
PLOT NO.26

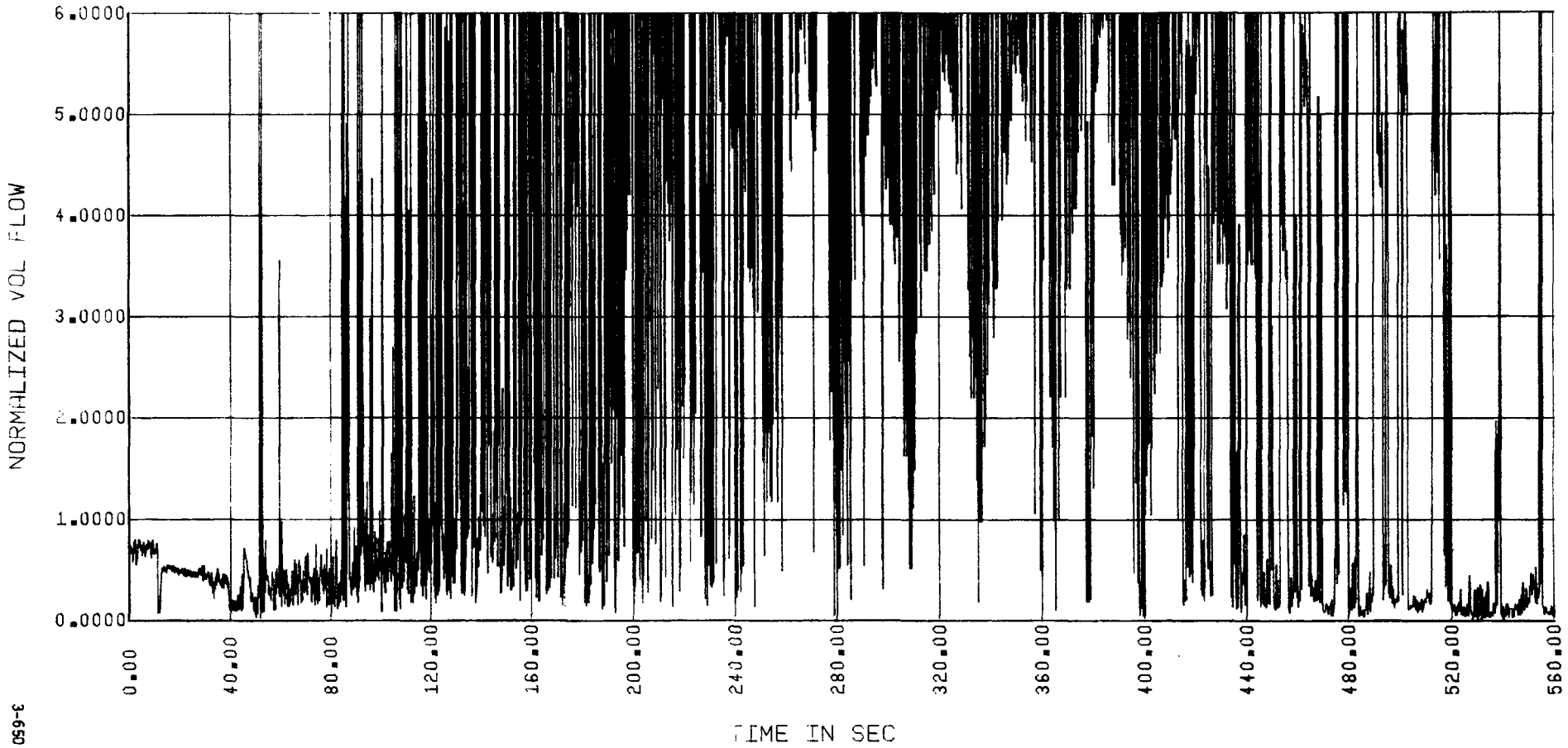


TEST 1211/1000 PSIA PON FWD BD
NORM VOL FLOW RATE HI-TM SUCT
PLOT NO.27



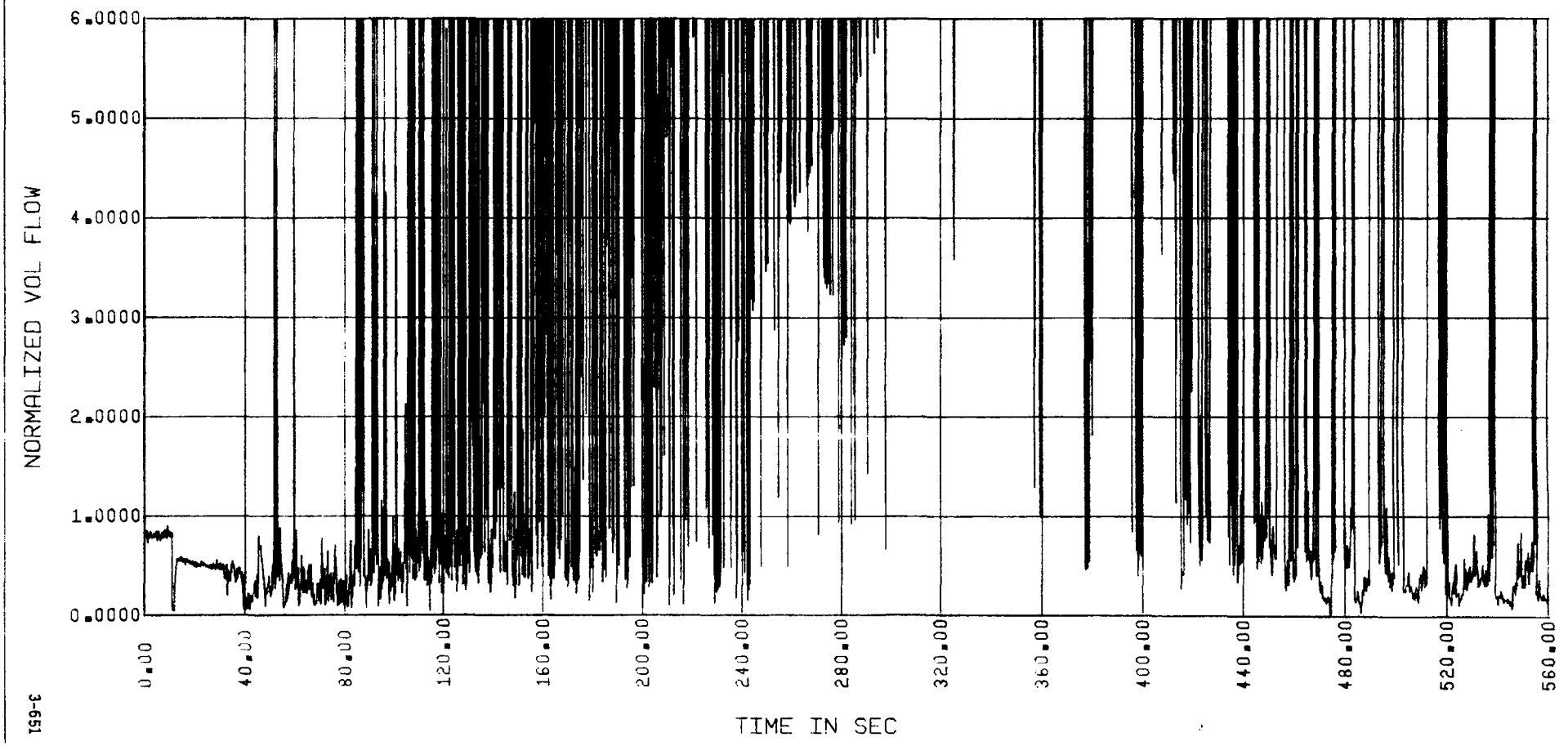
3-669

TEST 1211/1000 PSIA PON FWD BD
NORM VOL FLOW RATE LO-DD/GD2 D
PLOT NO.28



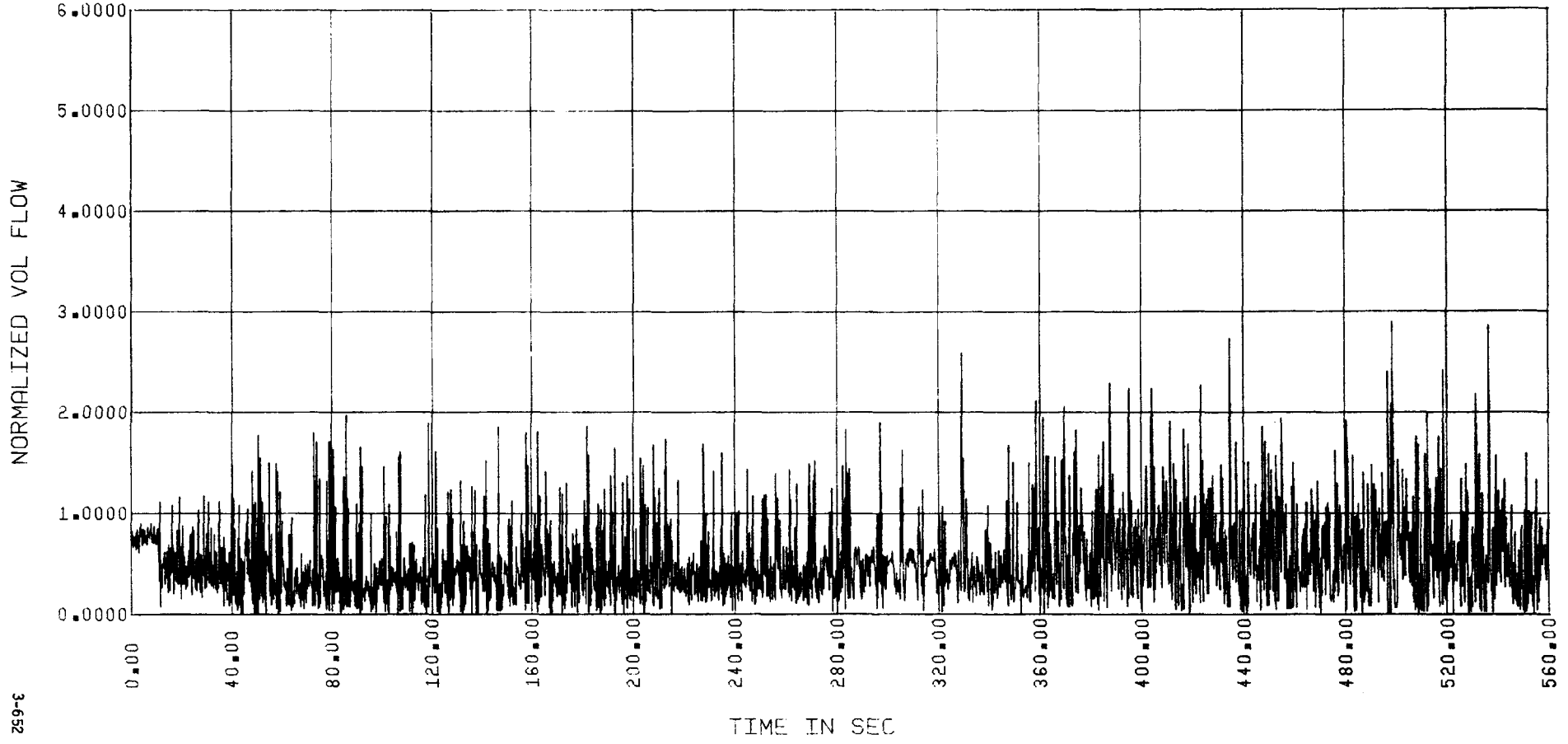
3-650

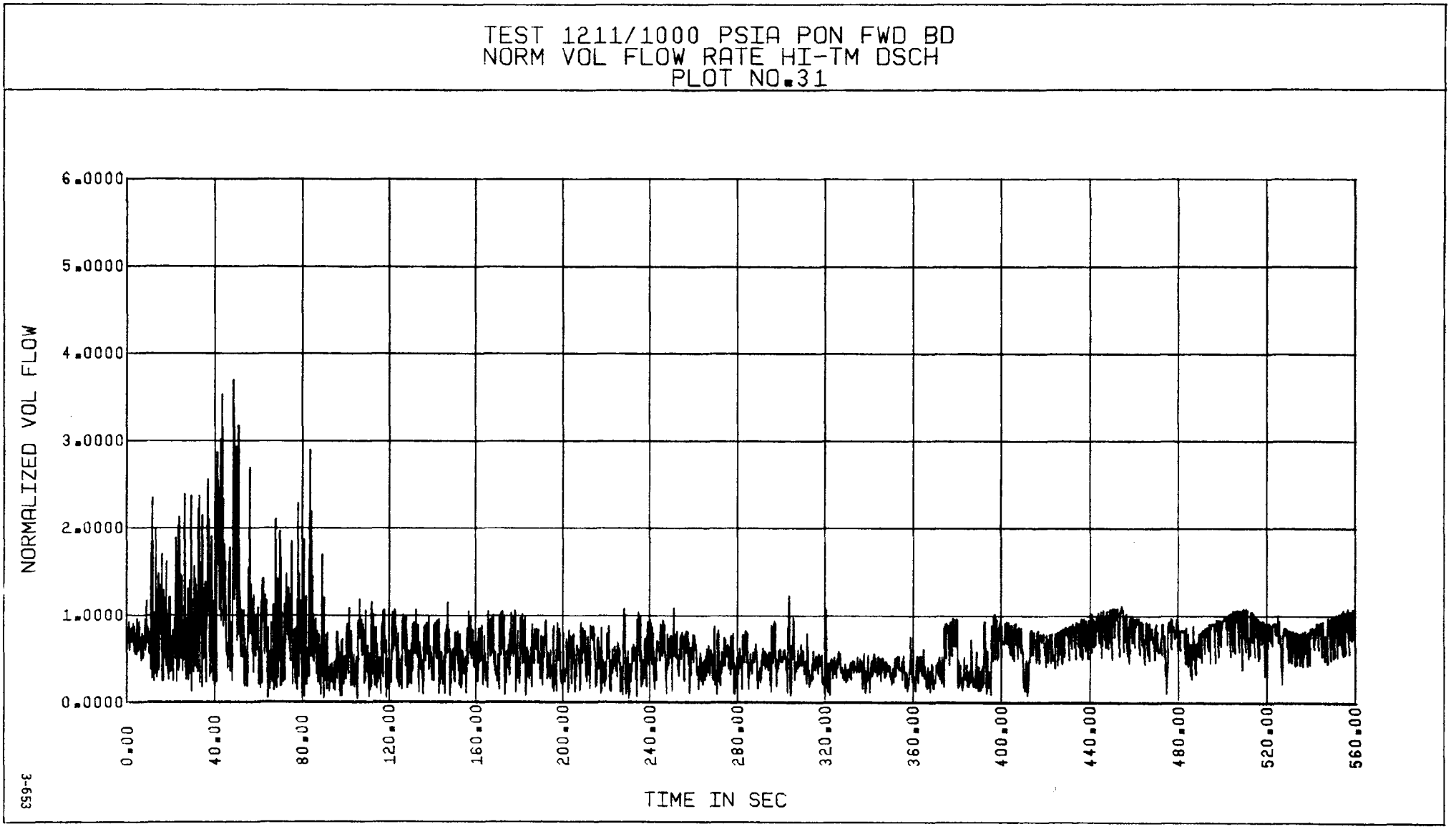
TEST 1211/1000 PSIA PON FWD BD
NORM VOL FLOW RATE HI-DD/GD2 D
PLOT NO.29



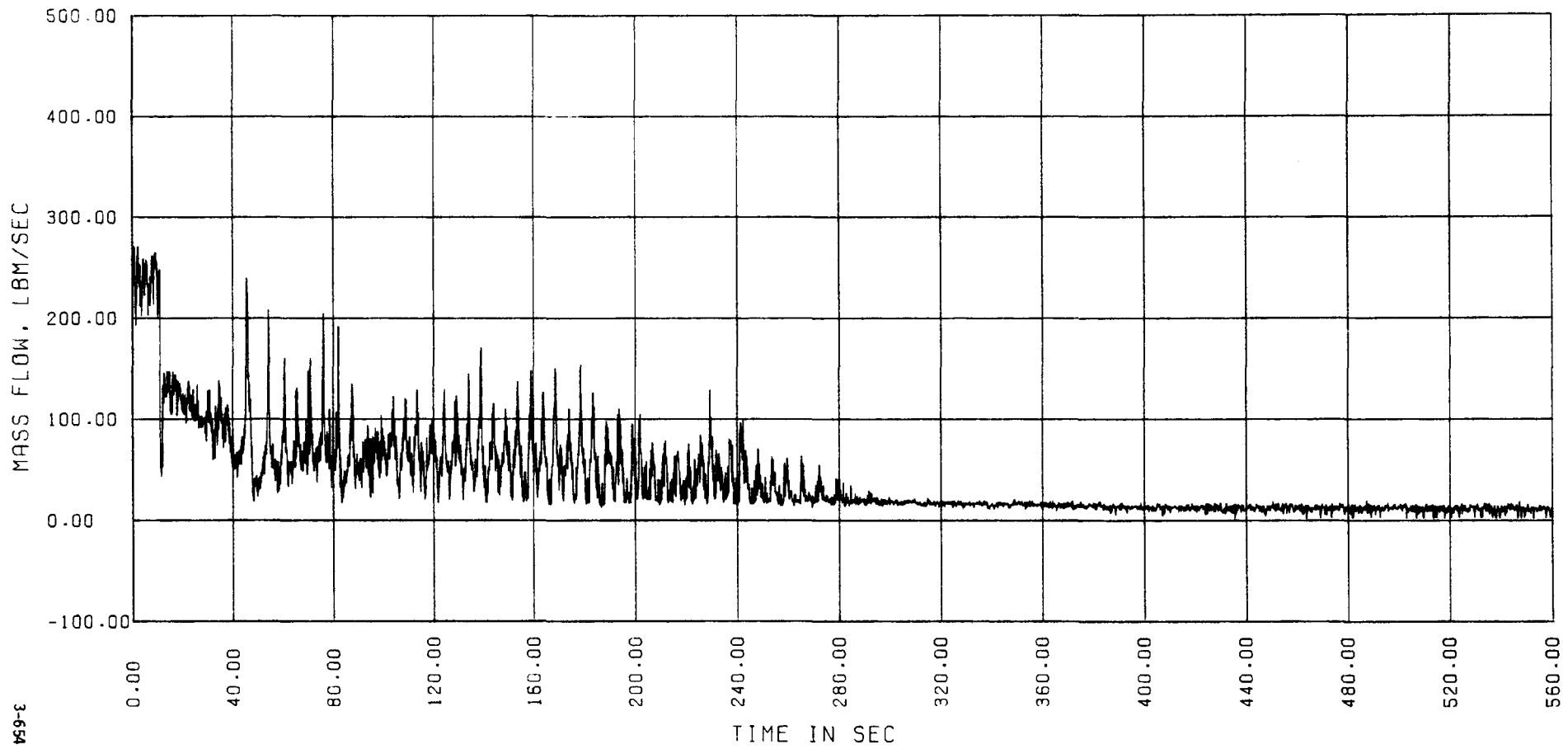
3-651

TEST 1211/1000 PSIA PON FWD BD
NORM VOL FLOW RATE LO-TM DSCH
PLOT NO.30



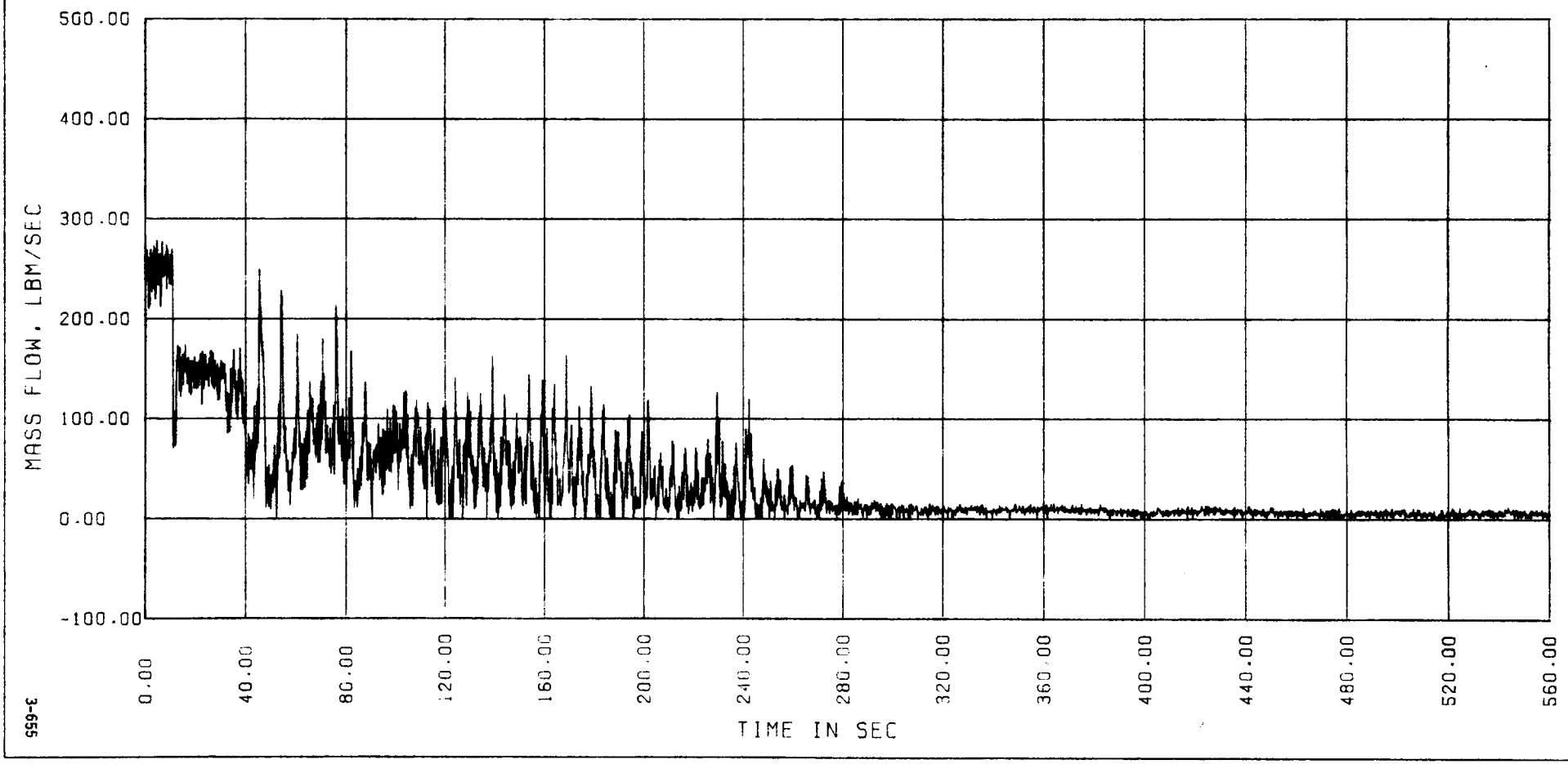

TEST 1211/1000 PSIA PON FWD BD
NORM VOL FLOW RATE HI-TM DSCH
PLOT NO.31
NORMALIZED VOL FLOW
6.0000
5.0000
4.0000
3.0000
2.0000
1.0000
0.0000
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
440.00
480.00
520.00
560.00
TIME IN SEC
3-653

TEST 1211/1000 PSIA PON FWD BD
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.32



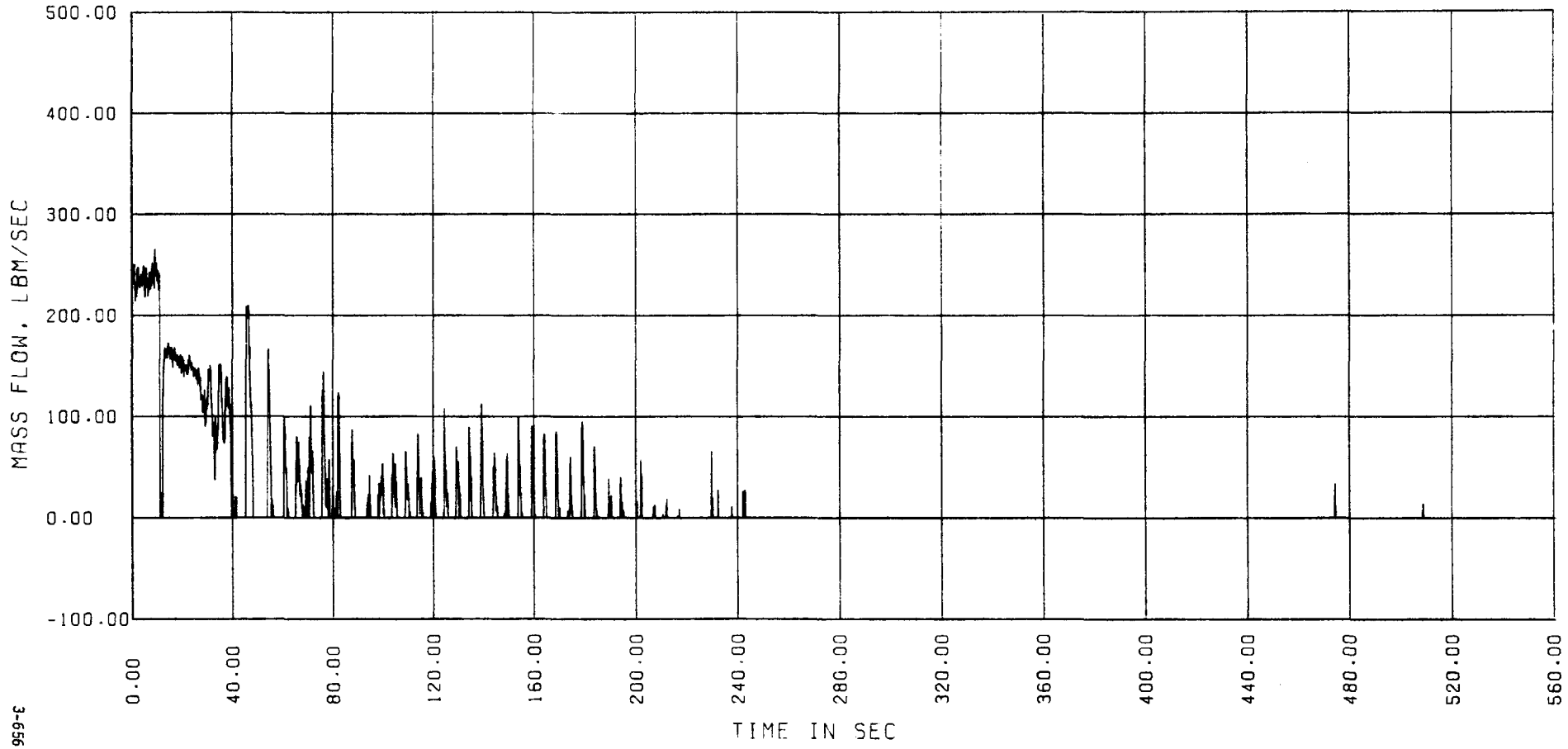
3-654

TEST 1211/1000 PSIA PON FWD BD
MASS FLOW RATE LO-OD/GD2 SUCT
PLOT NO.33



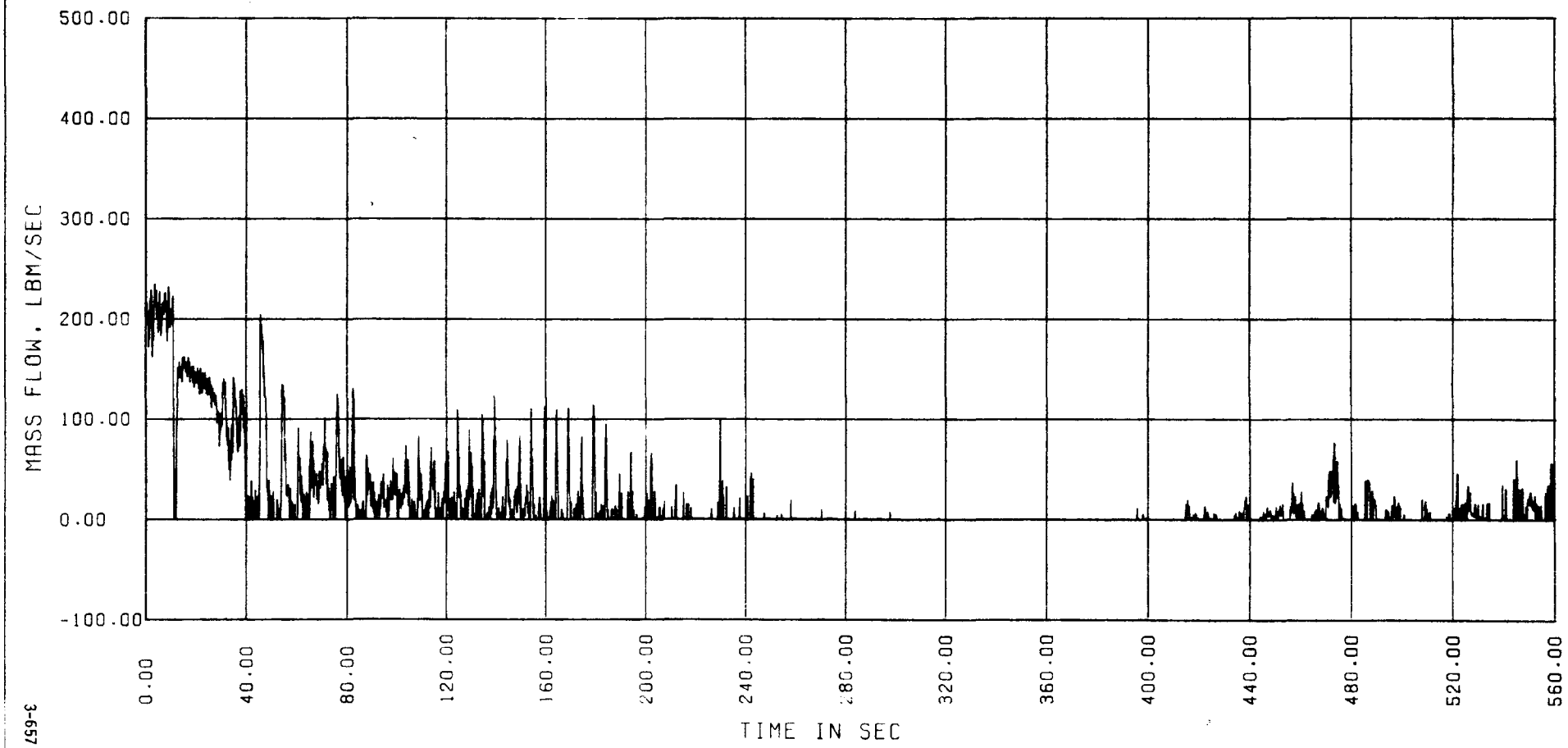
3-655

TEST 1211/1000 PSIA PON FWD BD
MASS FLOW RATE HI-DD/GD2 DISCH
PLOT NO.34

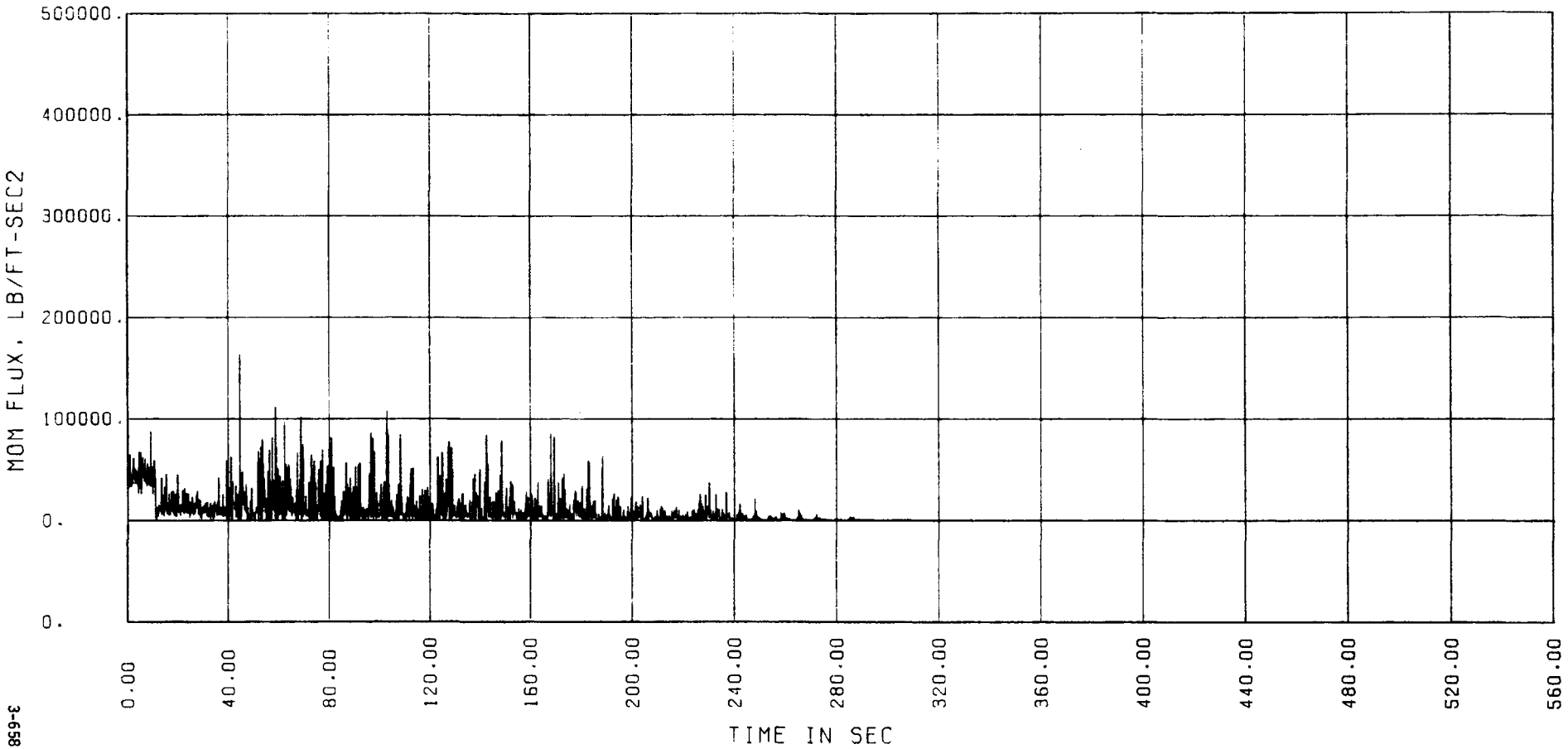


3-656

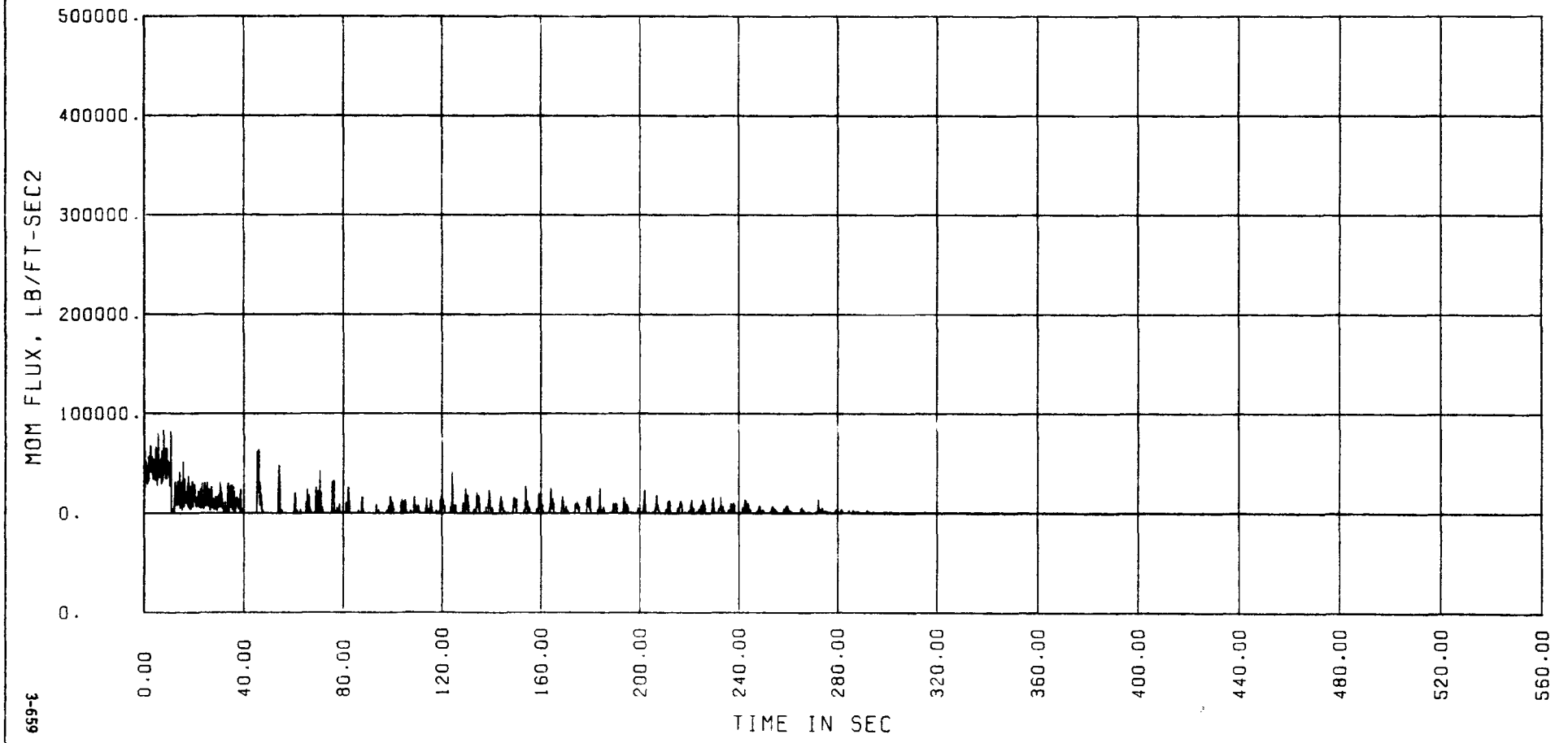
TEST 1211/1000 PSIA PON FWD BD
MASS FLOW RATE LO-DO/GO2 DISCH
PLOT NO.35



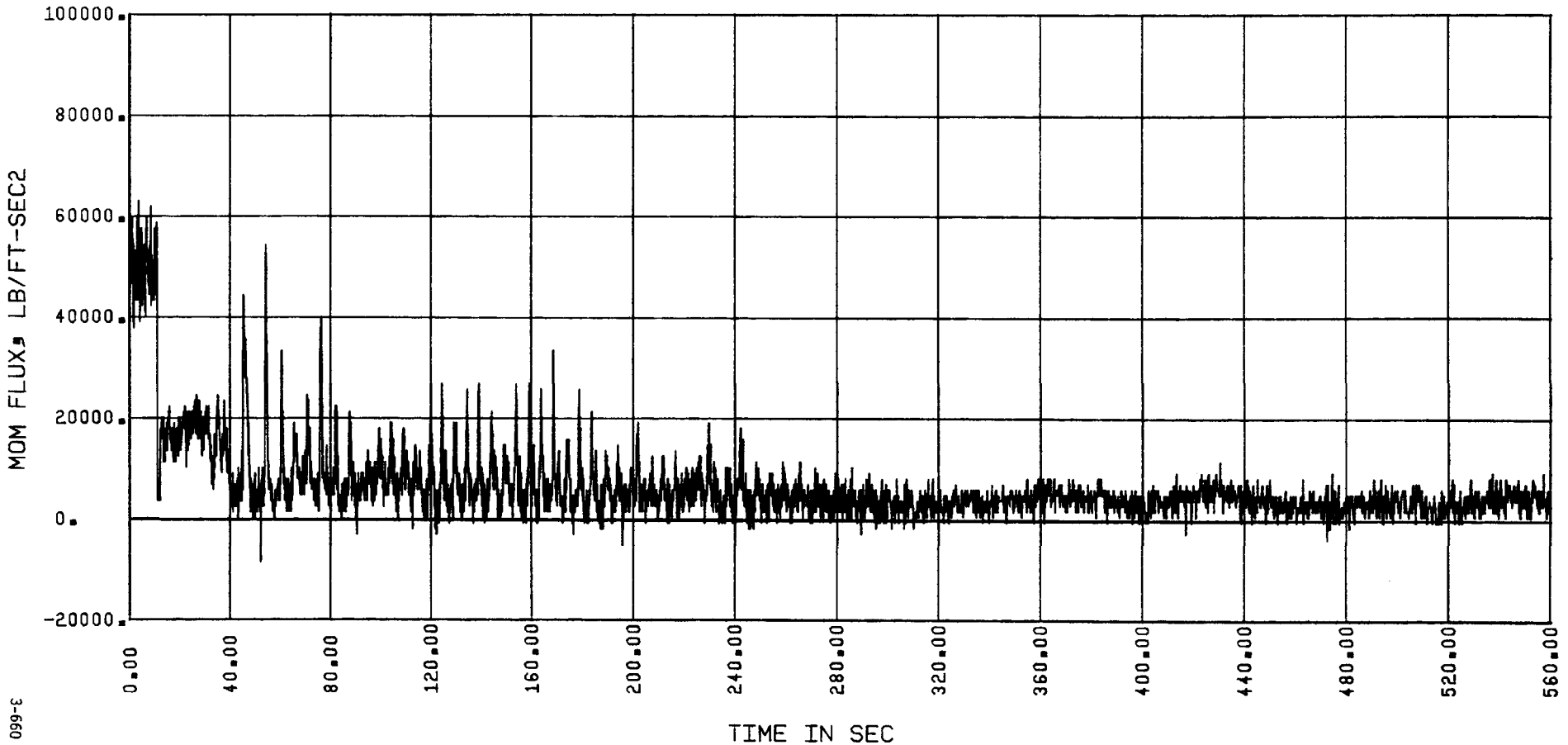
TEST 1211/1000 PSIA PON FWD BD
MOMENTUM FLUX GO2/LO-TM SUCT
PLOT NO.36



TEST 1211/1000 PSIA PON FWD BD
MOMENTUM FLUX GO2/HI-TM SUCT
PLOT NO.37

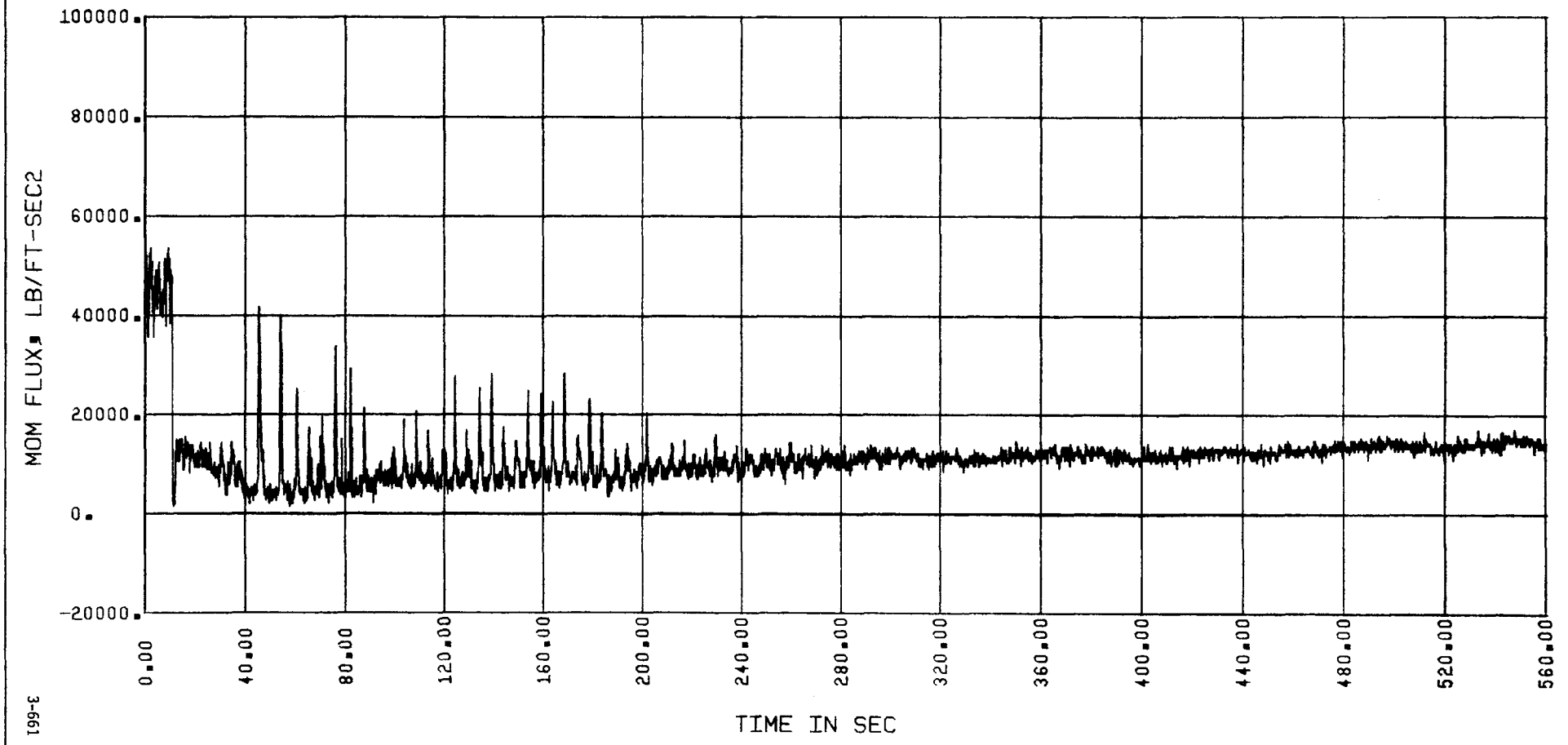


TEST 1211/1000 PSIA PON FWD BD
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38

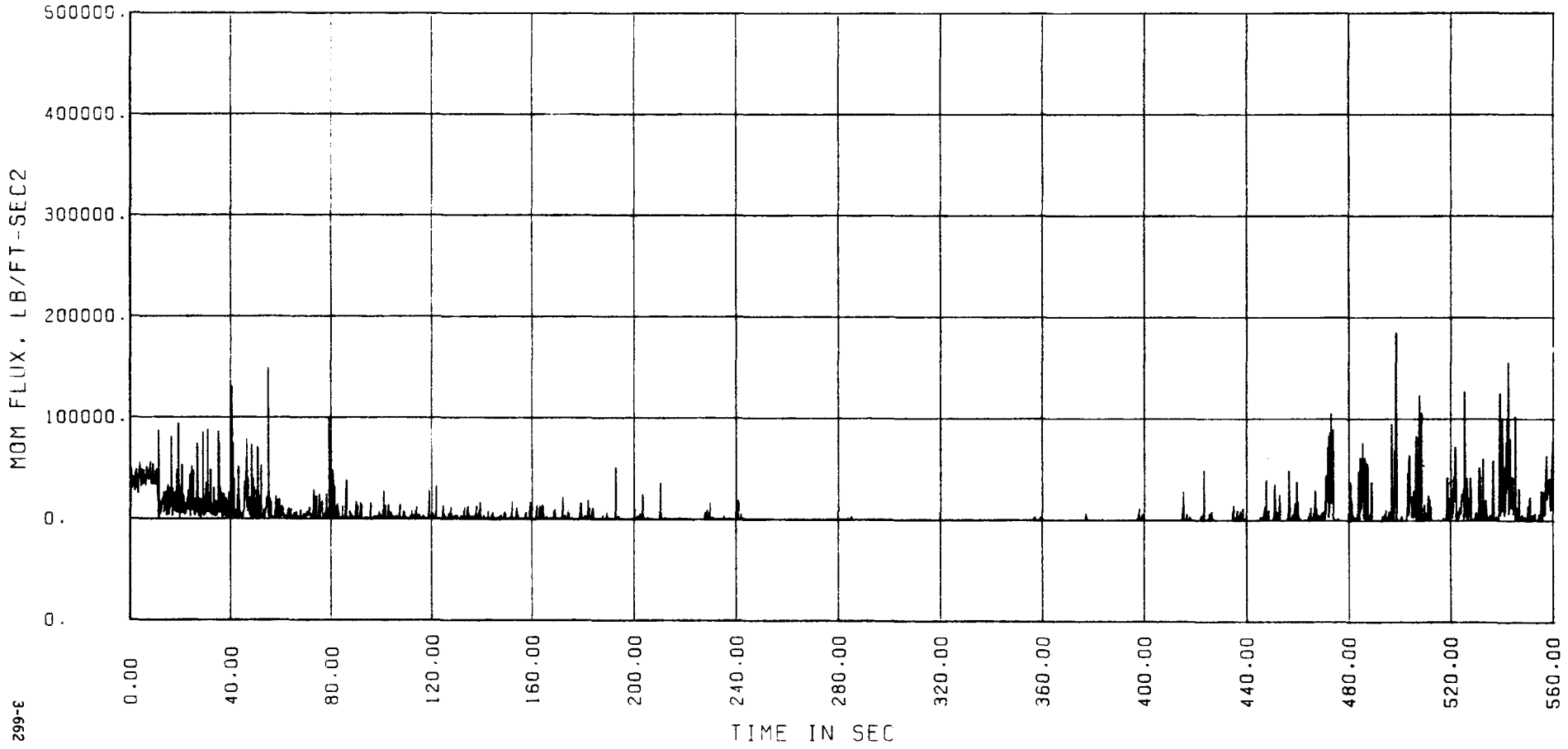


3-660

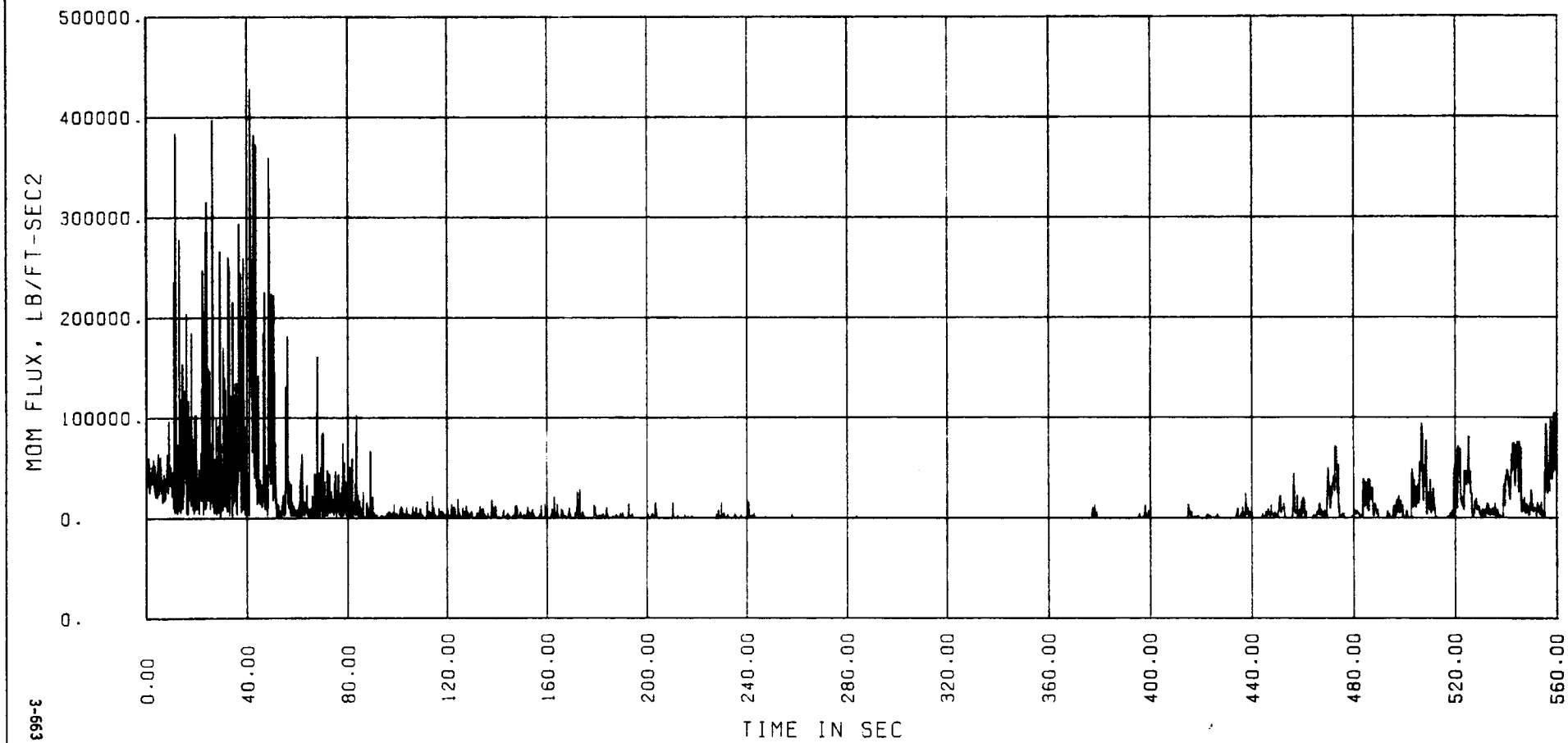
TEST 1211/1000 PSIA PON FWD BD
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39



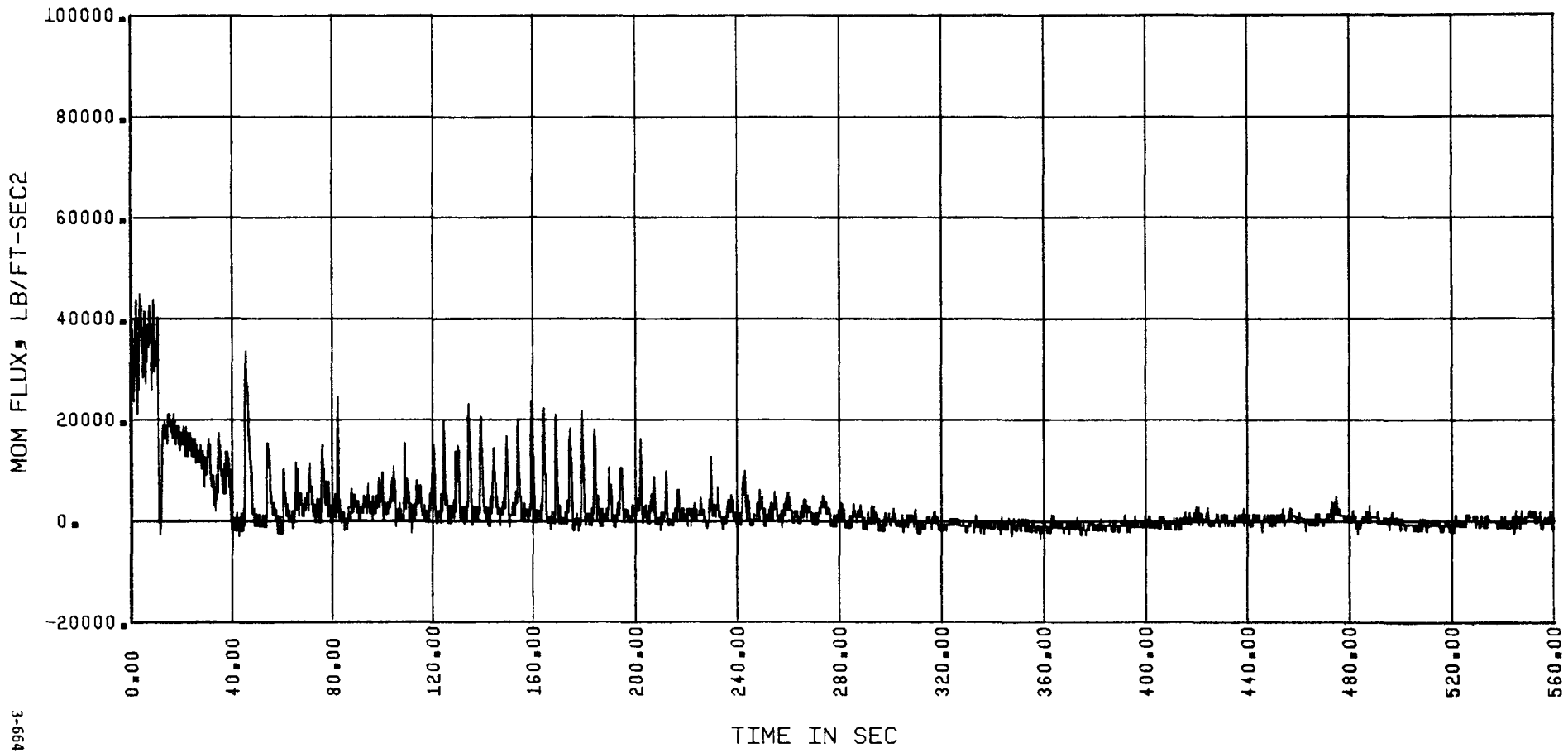
TEST 1211/1000 PSIA PON FWD BD
MOMENTUM FLUX GO2/LO-TM DISCH
PLOT NO.40



TEST 1211/1000 PSIA PON FWD BD
MOMENTUM FLUX GD2/HI-TM DISCH
PLOT NO.41

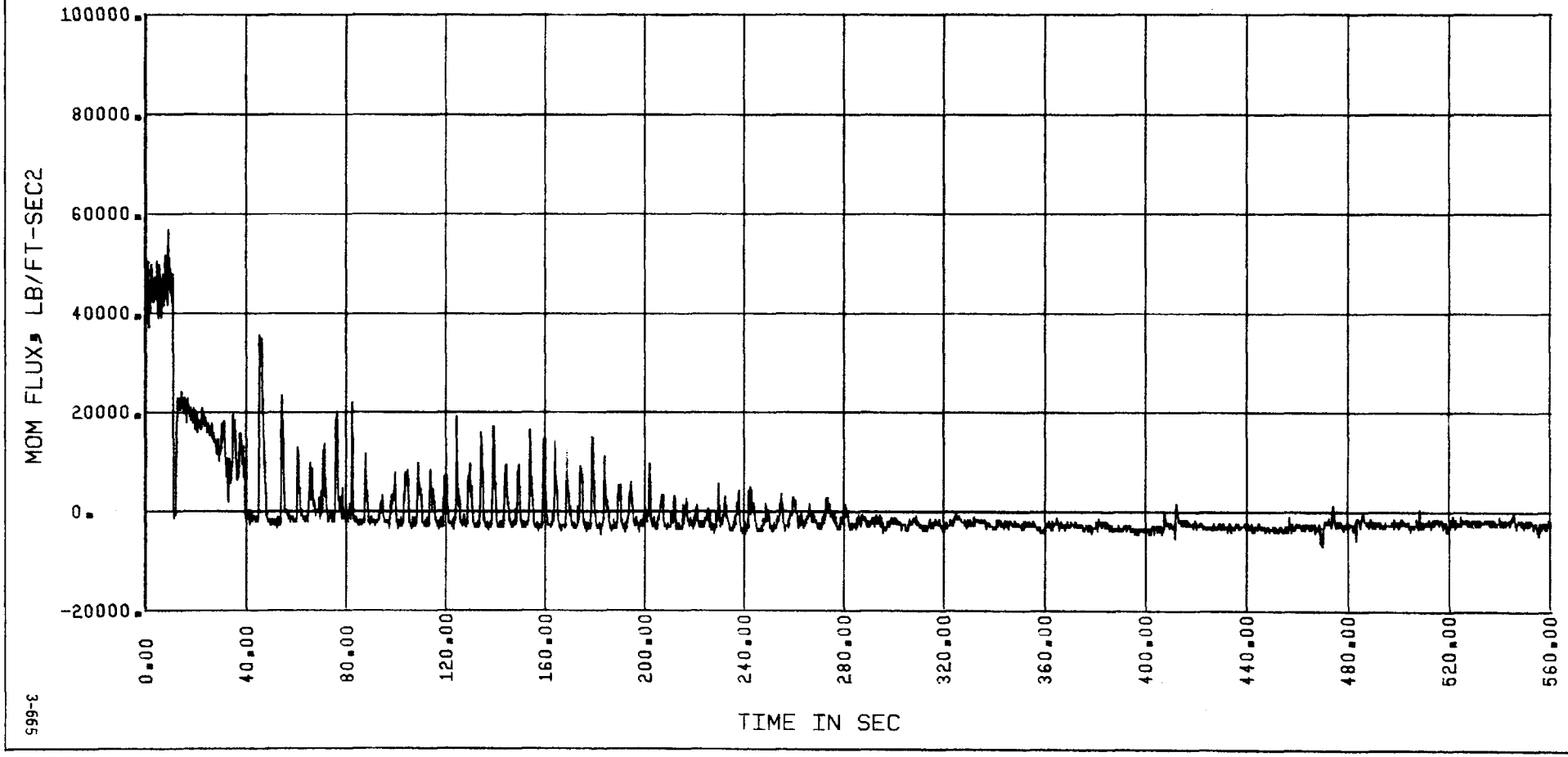


TEST 1211/1000 PSIA PON FWD BD
MOMENTUM FLUX LO-DD DSCH
PLOT NO.42



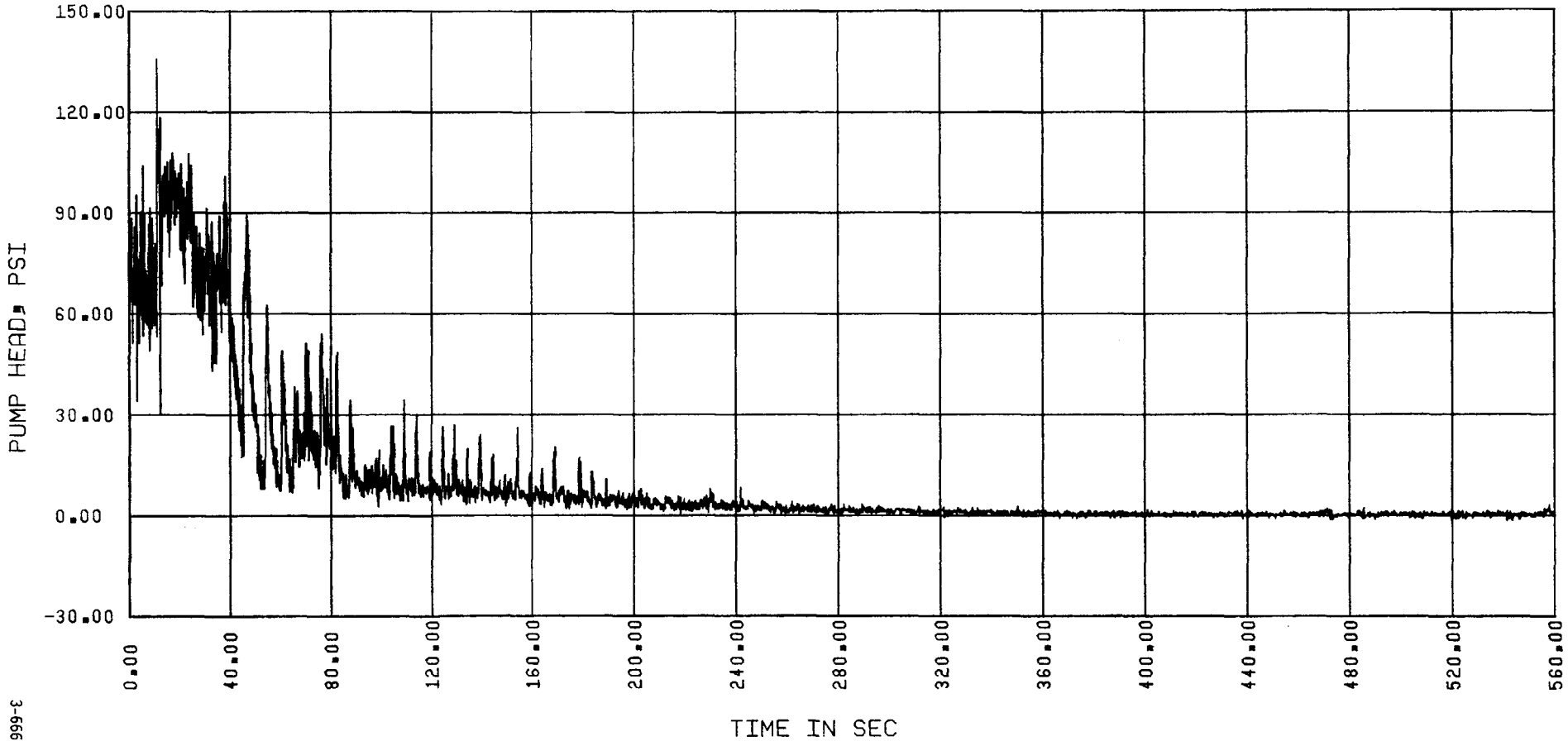
3-664

TEST 1211/1000 PSIA PON FWD BD
MOMENTUM FLUX HI-DD DSCH
PLOT NO.43

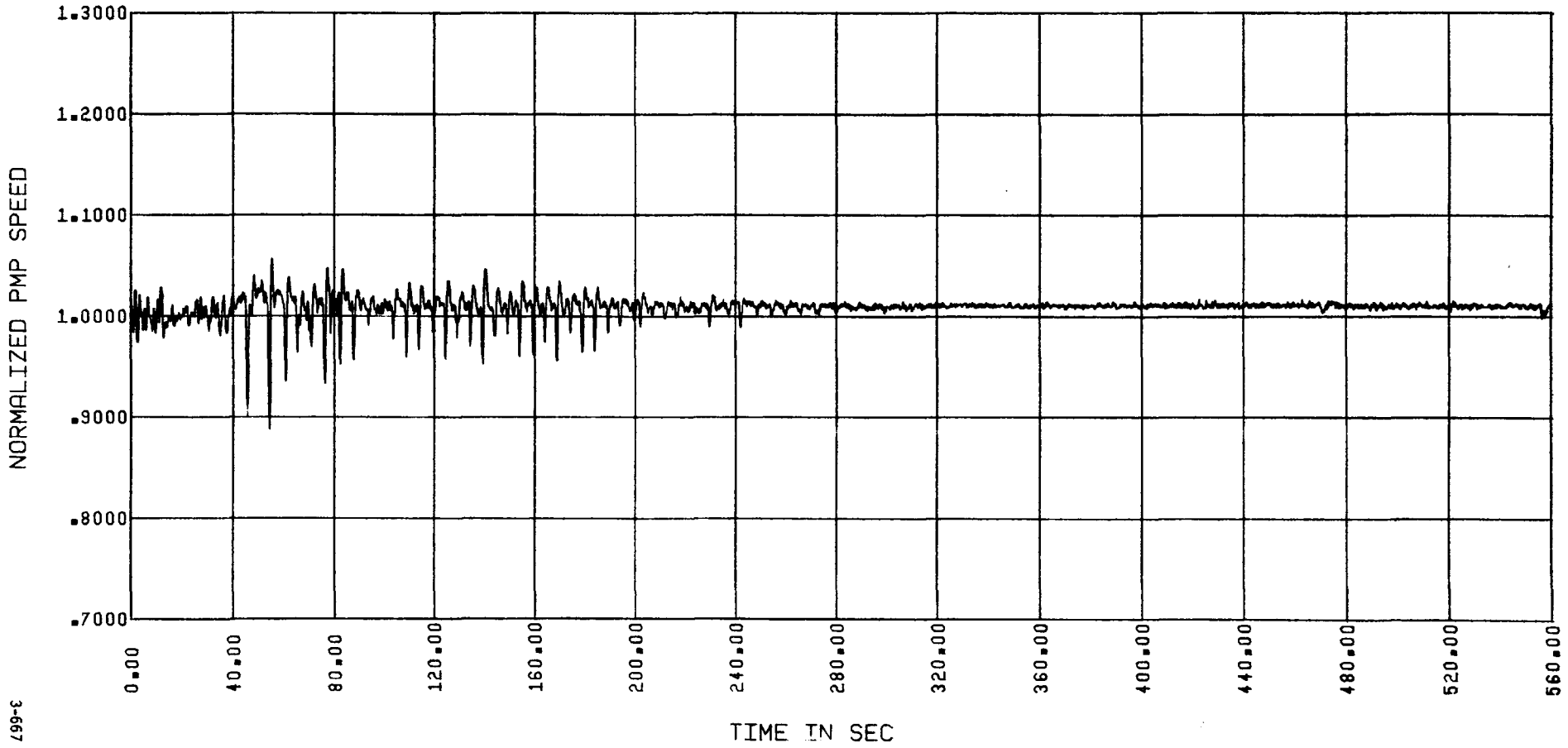


3-665

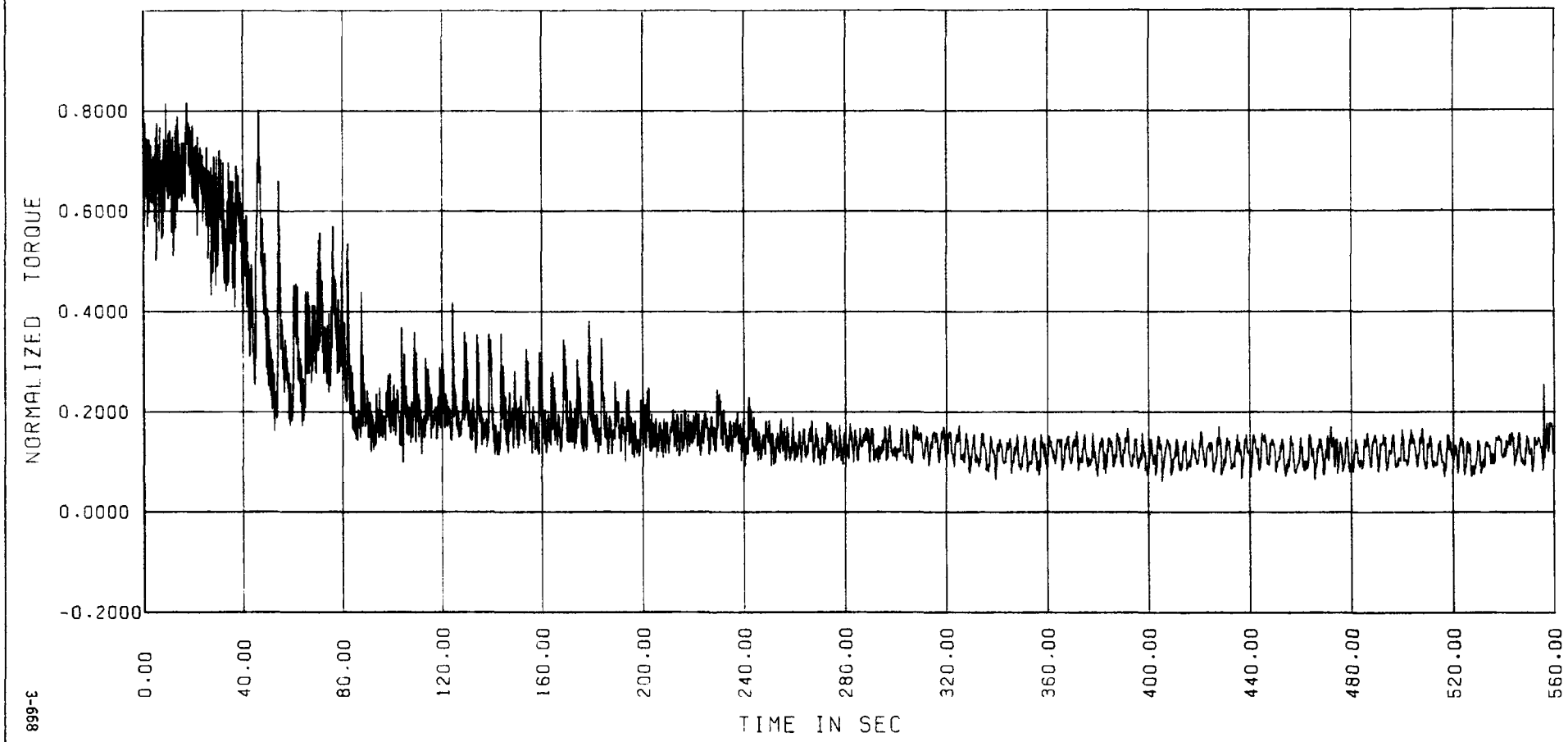
TEST 1211/1000 PSIA PON FWD BD
PUMP HEAD IN PSI
PLOT NO.44



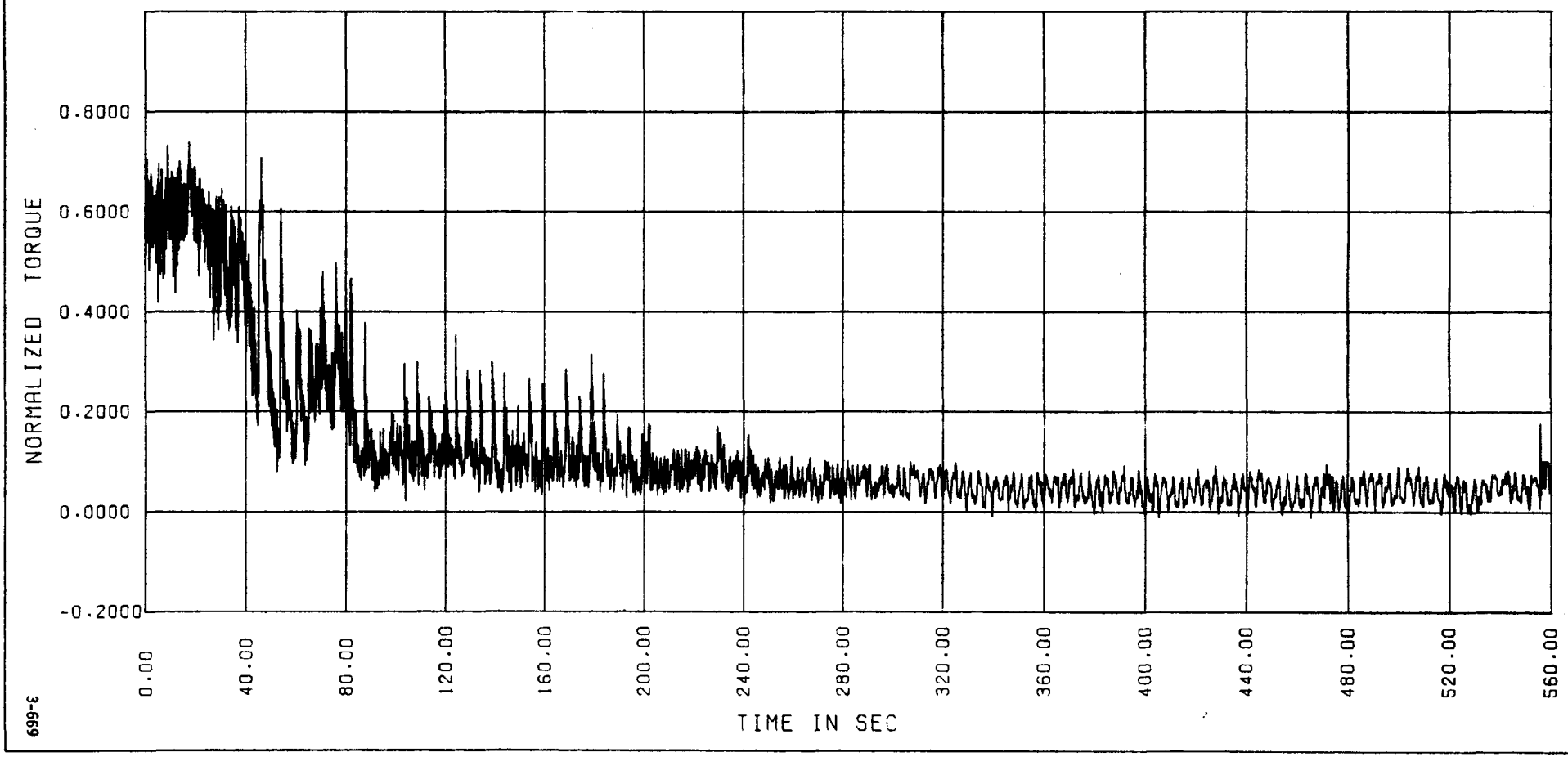
TEST 1211/1000 PSIA PON FWD BD
N PUMP SPEED NR=4500
PLOT NO.47



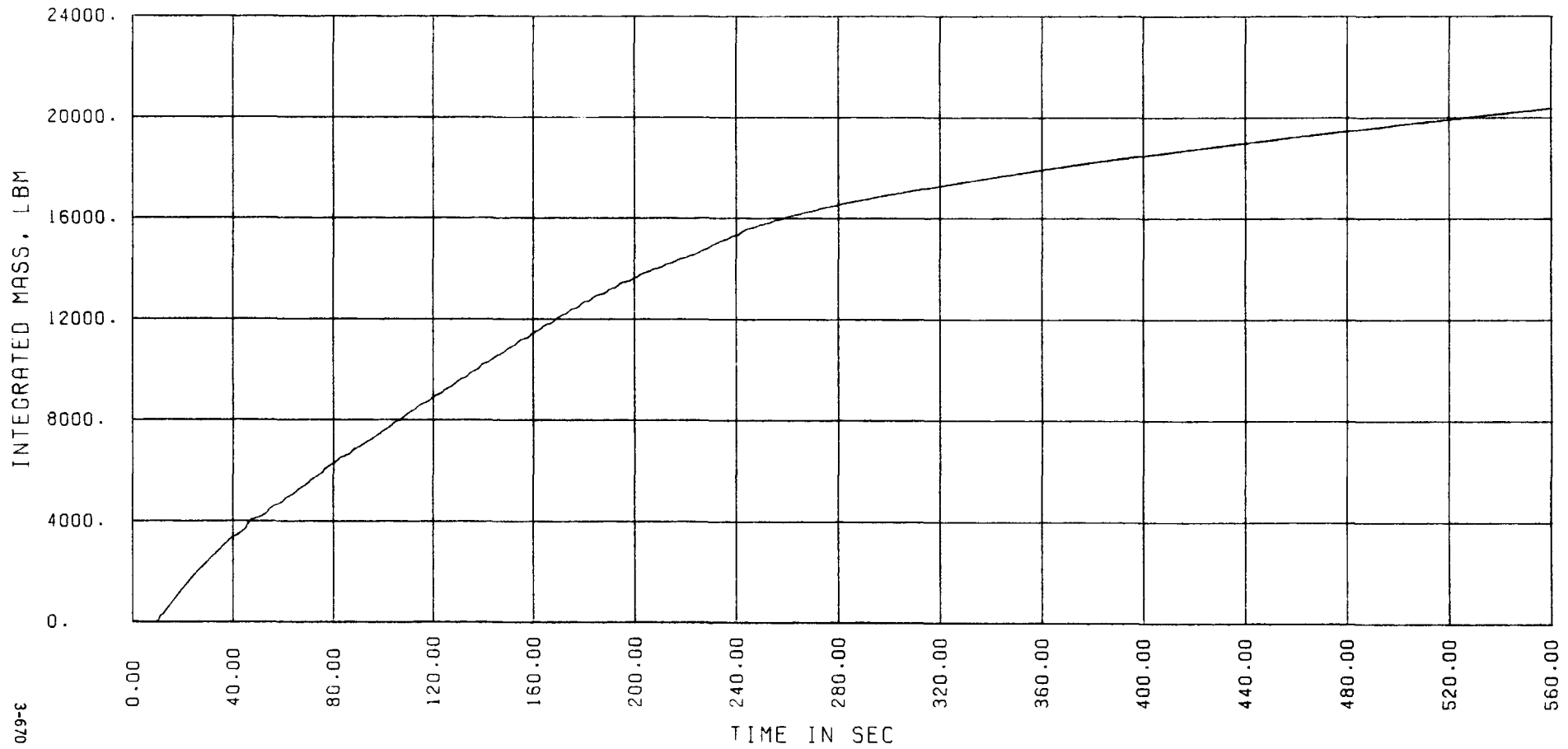
TEST 1211/1000 PSIA PON FWD BD
N PUMP SHAFT TORQUE THR=308
PLOT NO.48



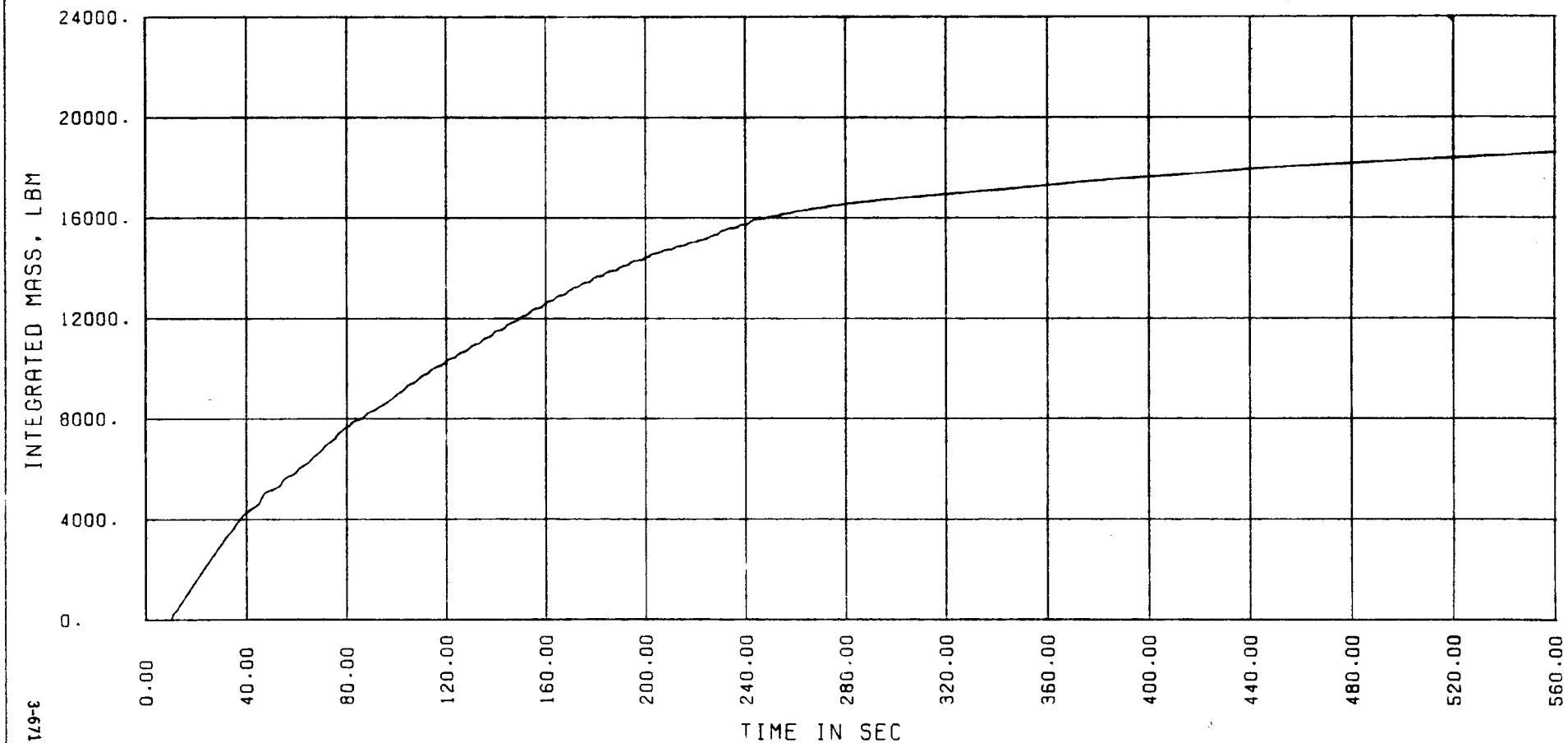
TEST 1211/1000 PSIA PON FWD BD
N PUMP HYDR TORQUE THR=308
PLOT NO.49



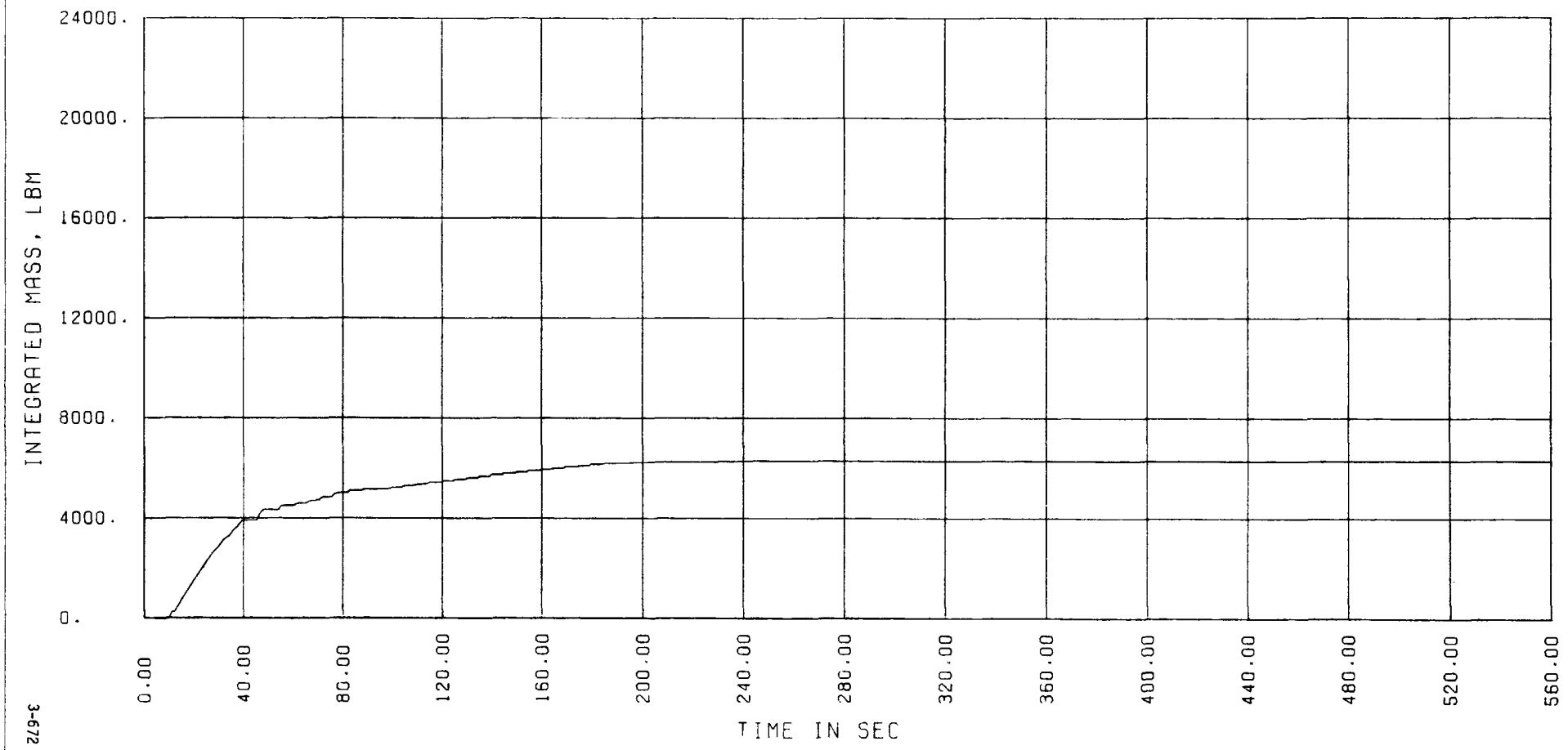
TEST 1211/1000 PSIA PON FWD BD
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50



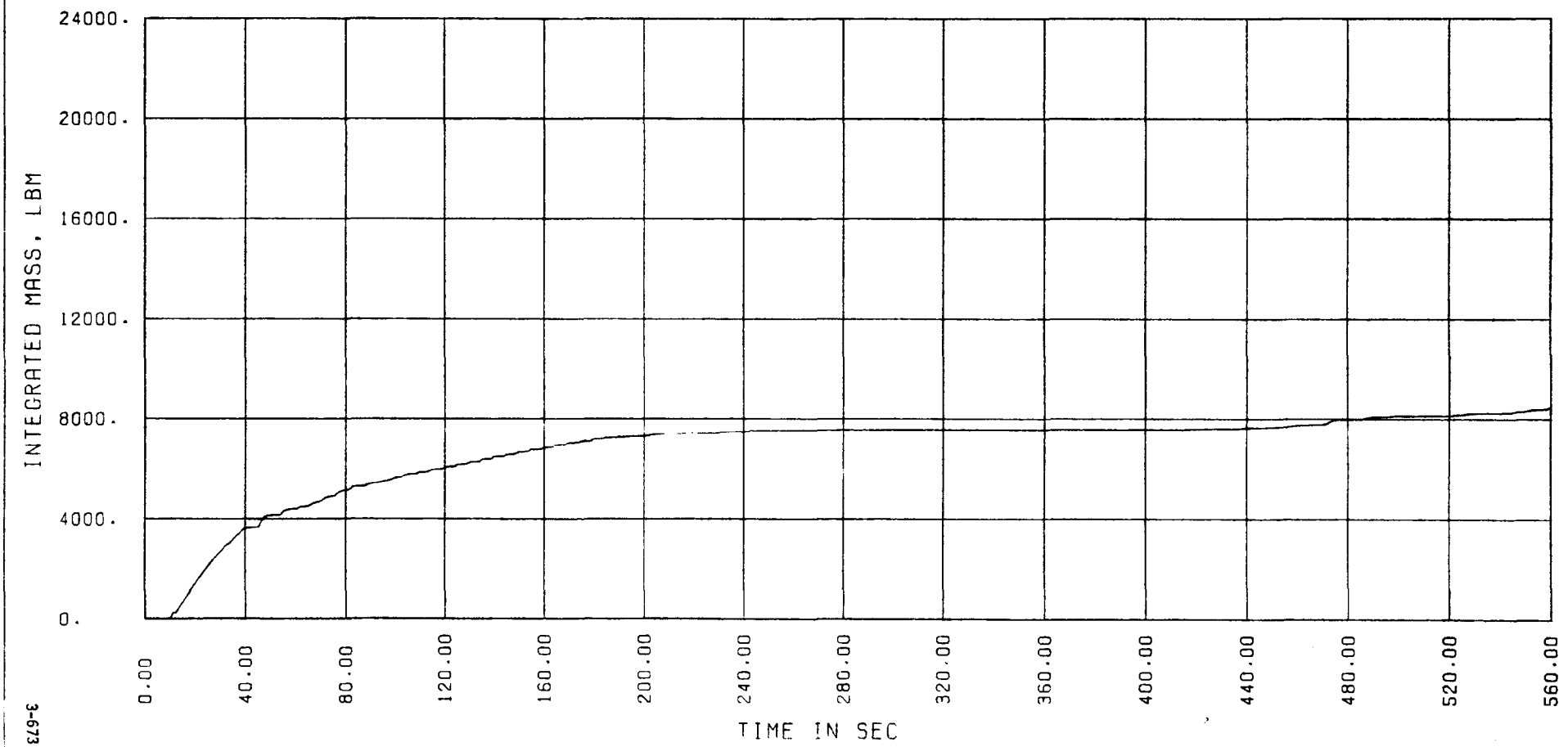
TEST 1211/1000 PSIA PON FWD BD
INTEGRATED MASS LO-DD/GO2 SUCT
PLOT NO.51



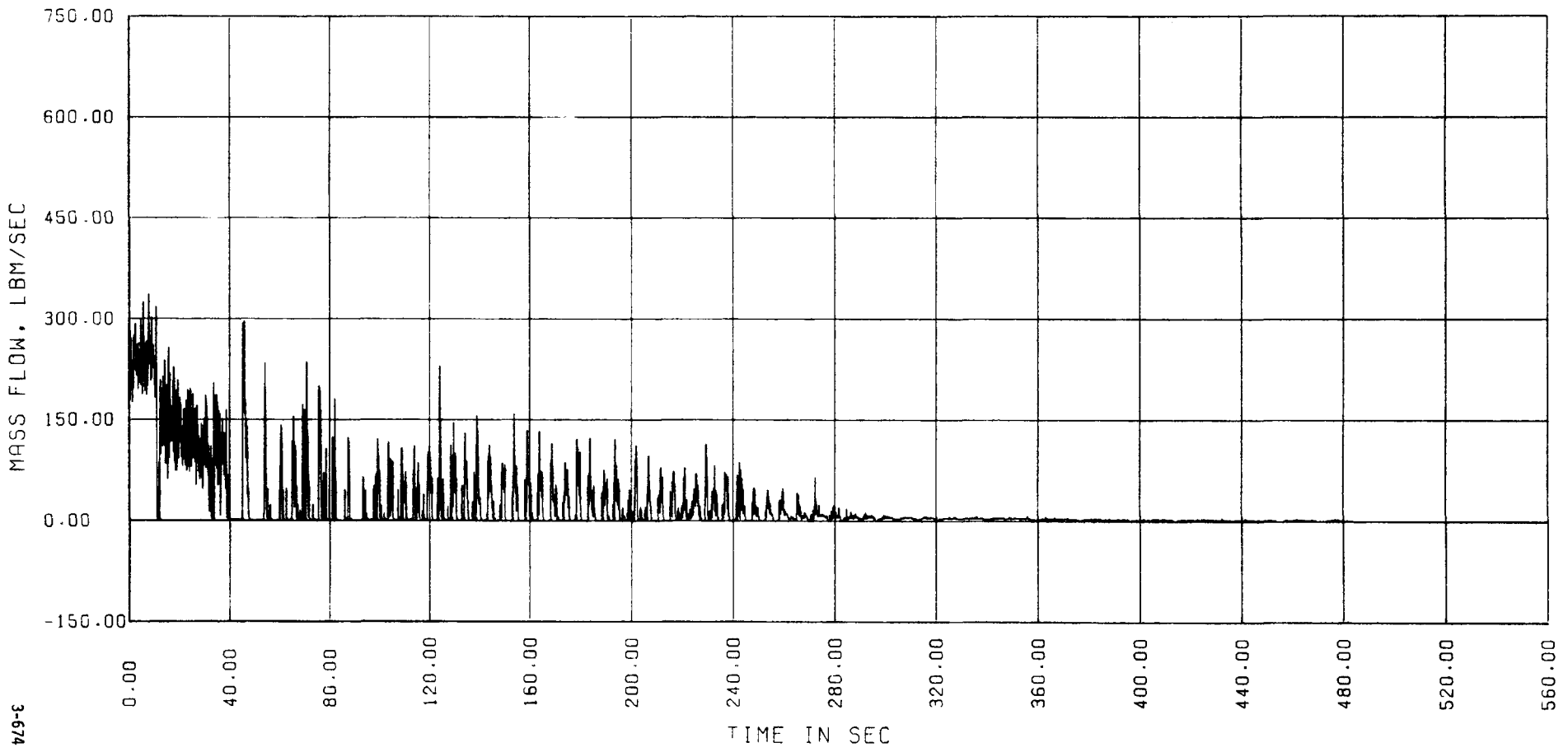
TEST 1211/1000 PSIA PON FWD BD
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.52



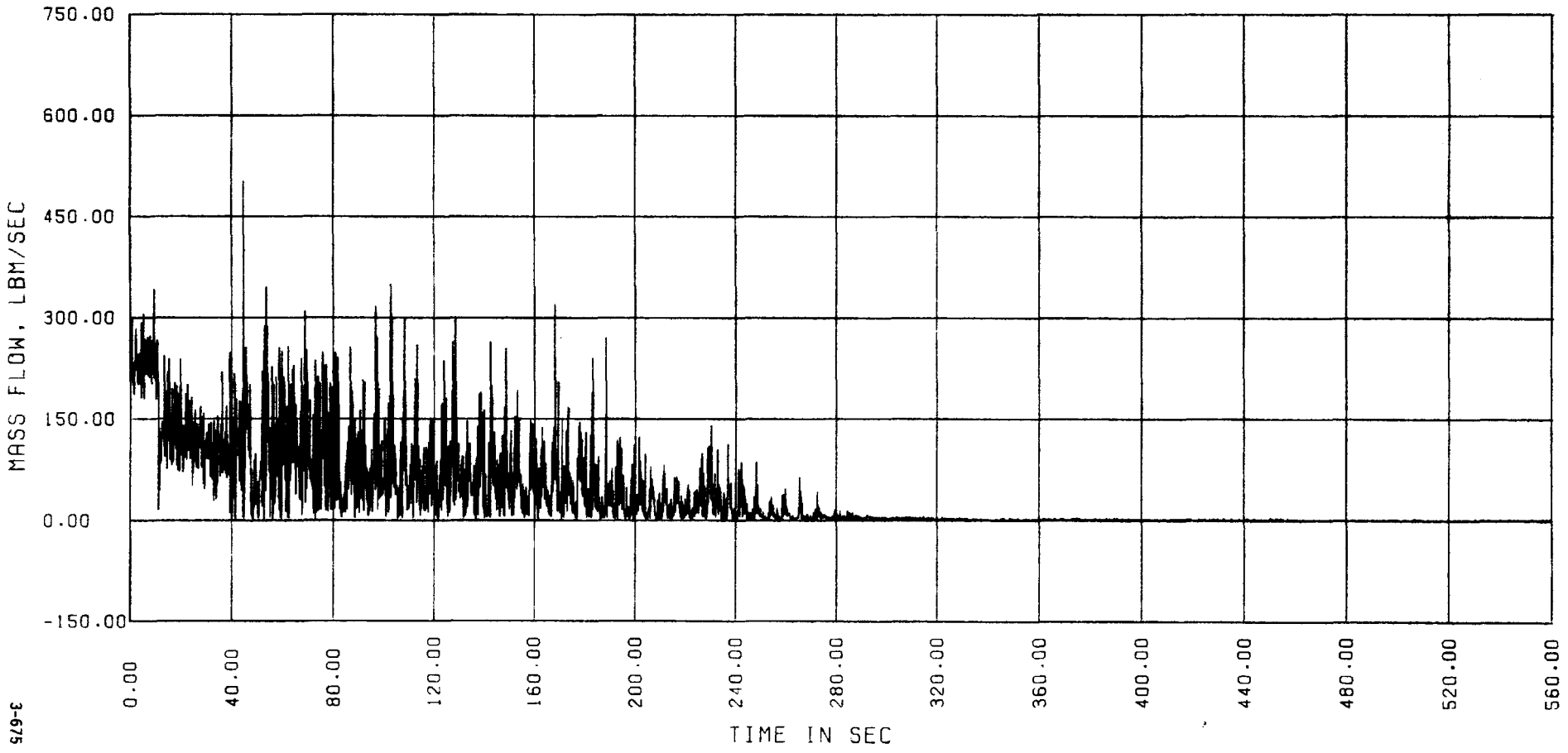
TEST 1211/1000 PSIA PON FWD BD
INTEGRATED MASS LO-OD/GO2 DIS
PLOT NO.53



TEST 1211/1000 PSIA PON FWD BD
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54

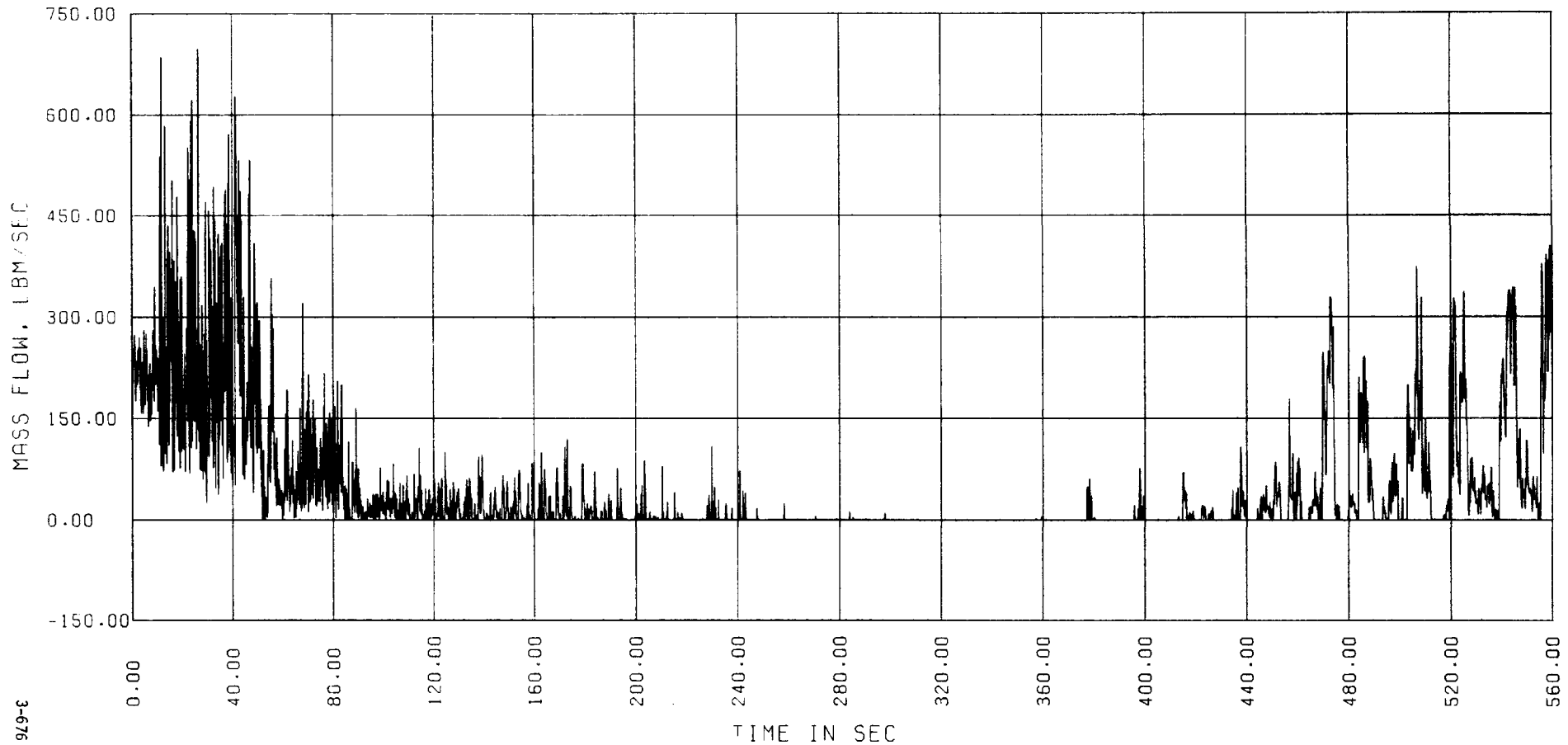


TEST 1211/1000 PSIA PON FWD BD
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.55

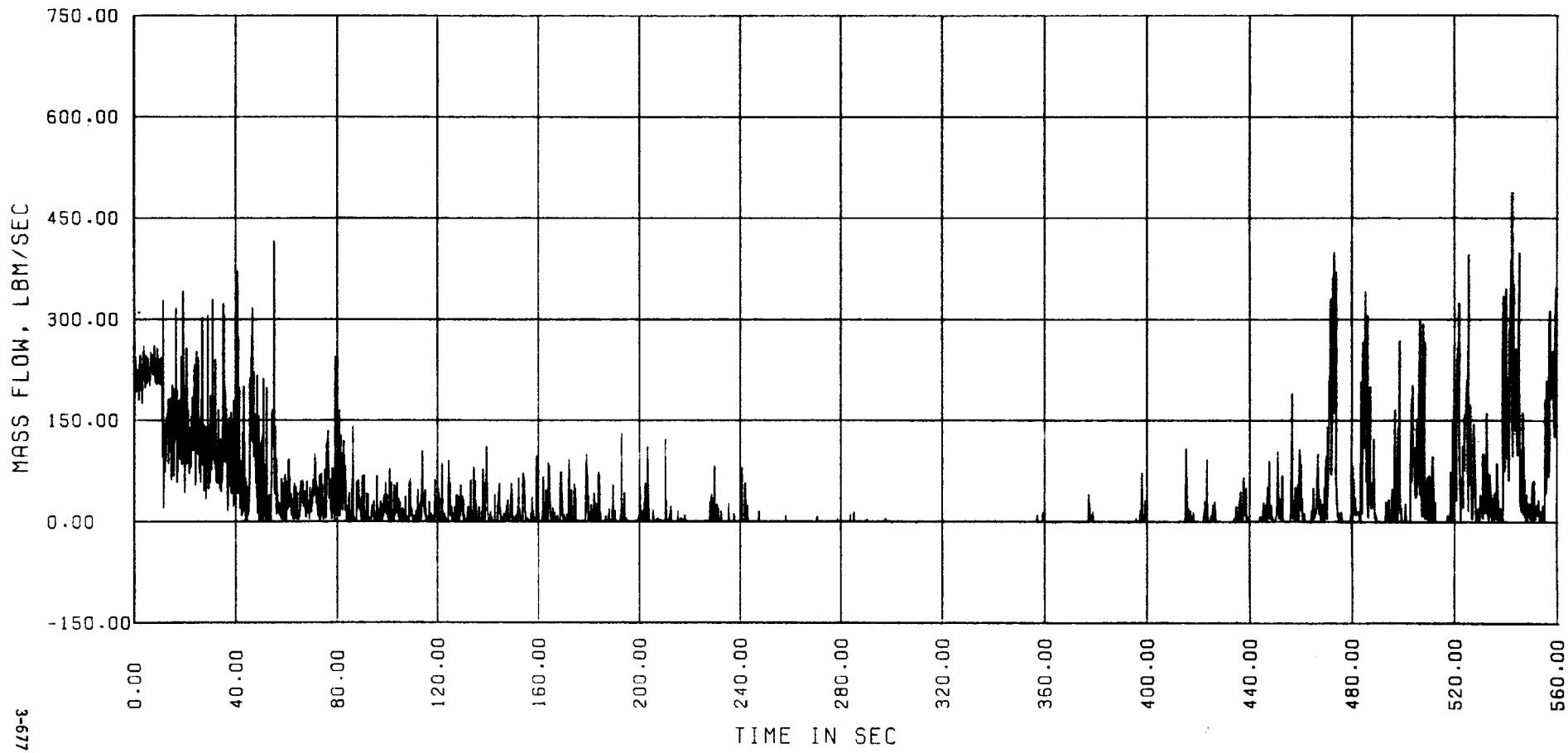


3-675

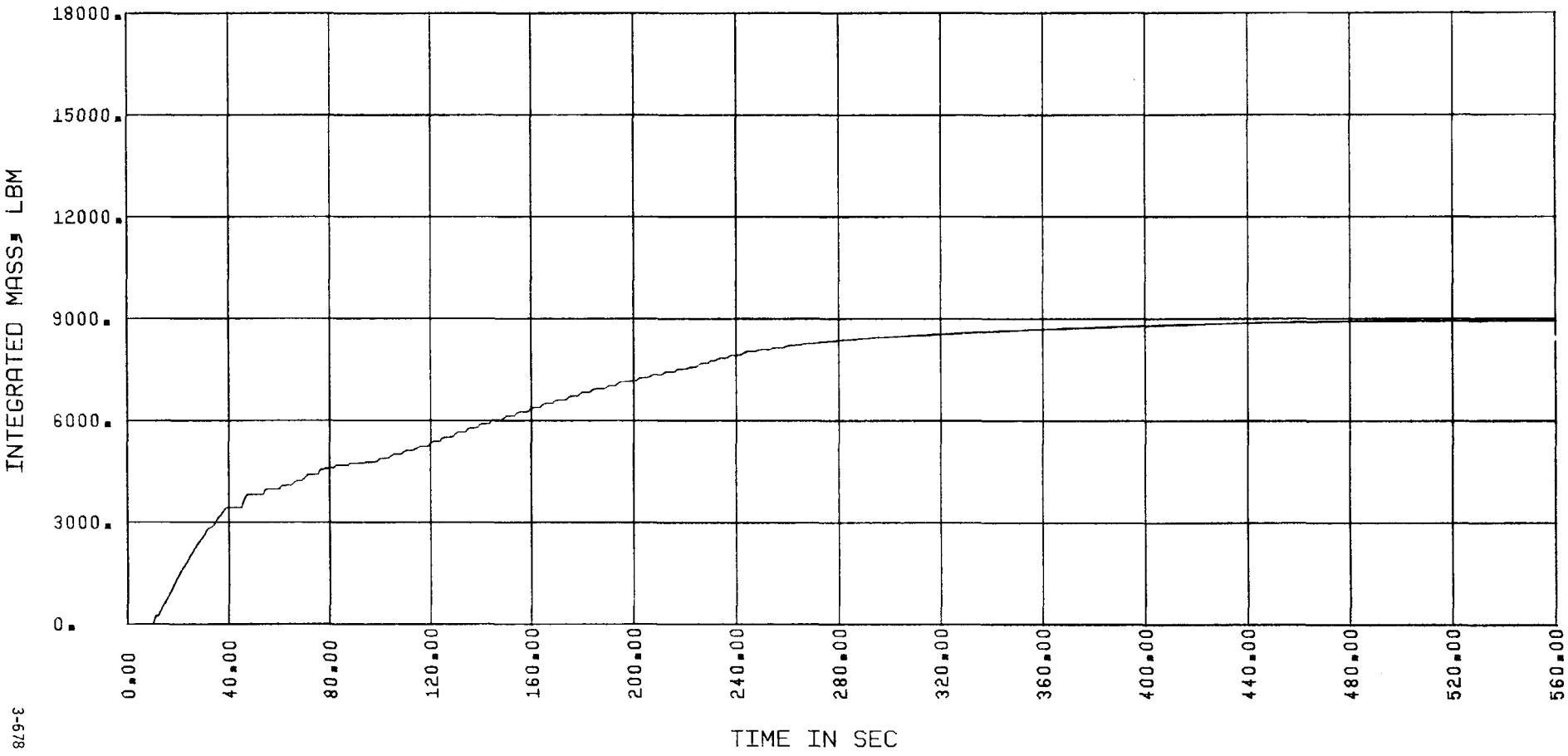
TEST 1211/1000 PSIA PON FWD BD
MASS FLOW RATE HI-TM/GD2 DISCH
PLOT NO.56



TEST 1211/1000 PSIA PON FWD BD
MASS FLOW RATE LO-TM/GO2 DISCH
PLOT NO.57

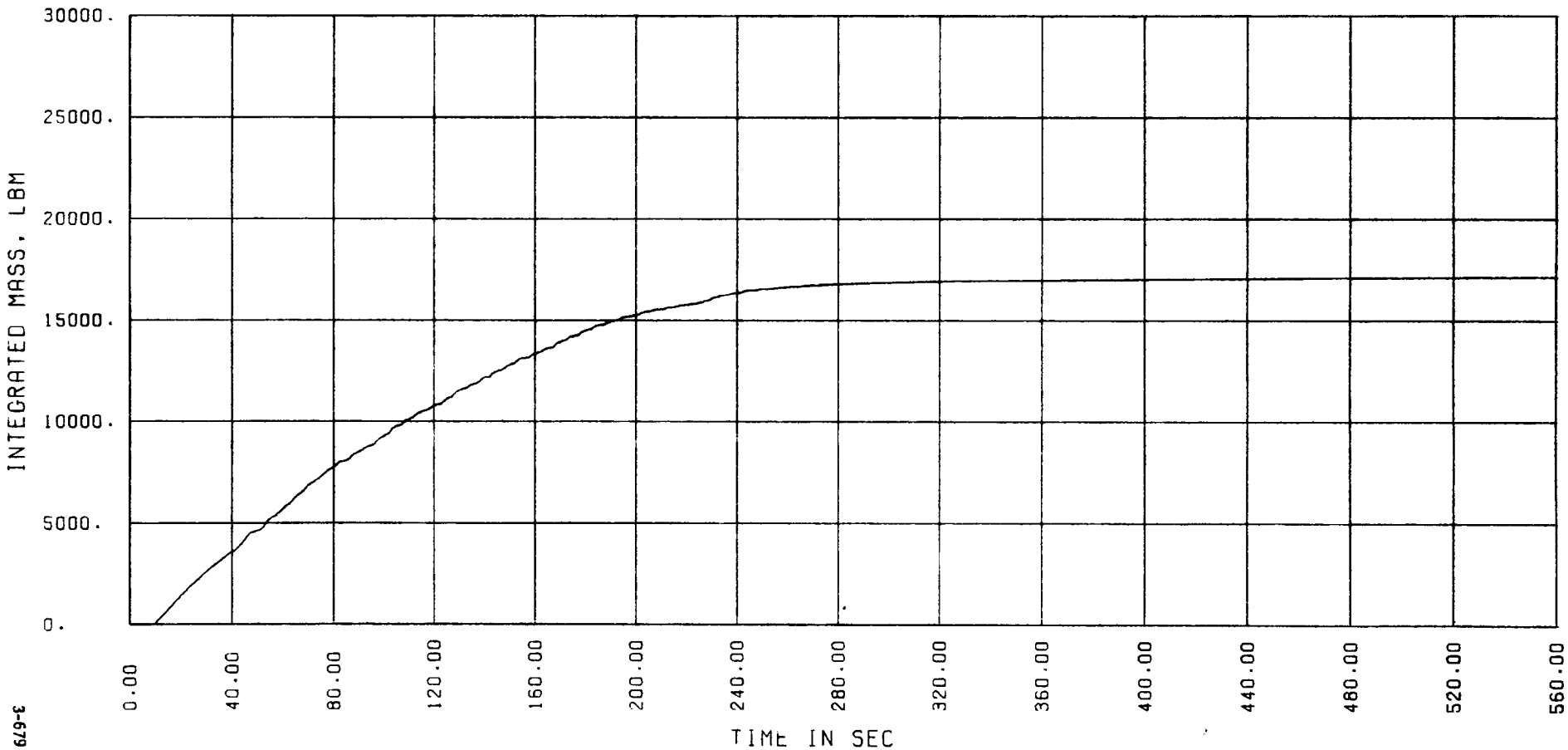


TEST 1211/1000 PSIA PON FWD BD
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60



3-678

TEST 1211/1000 PSIA PON FWD BD
INTEGRATED MASS LO-TM/GO2 S
PLOT NO.61



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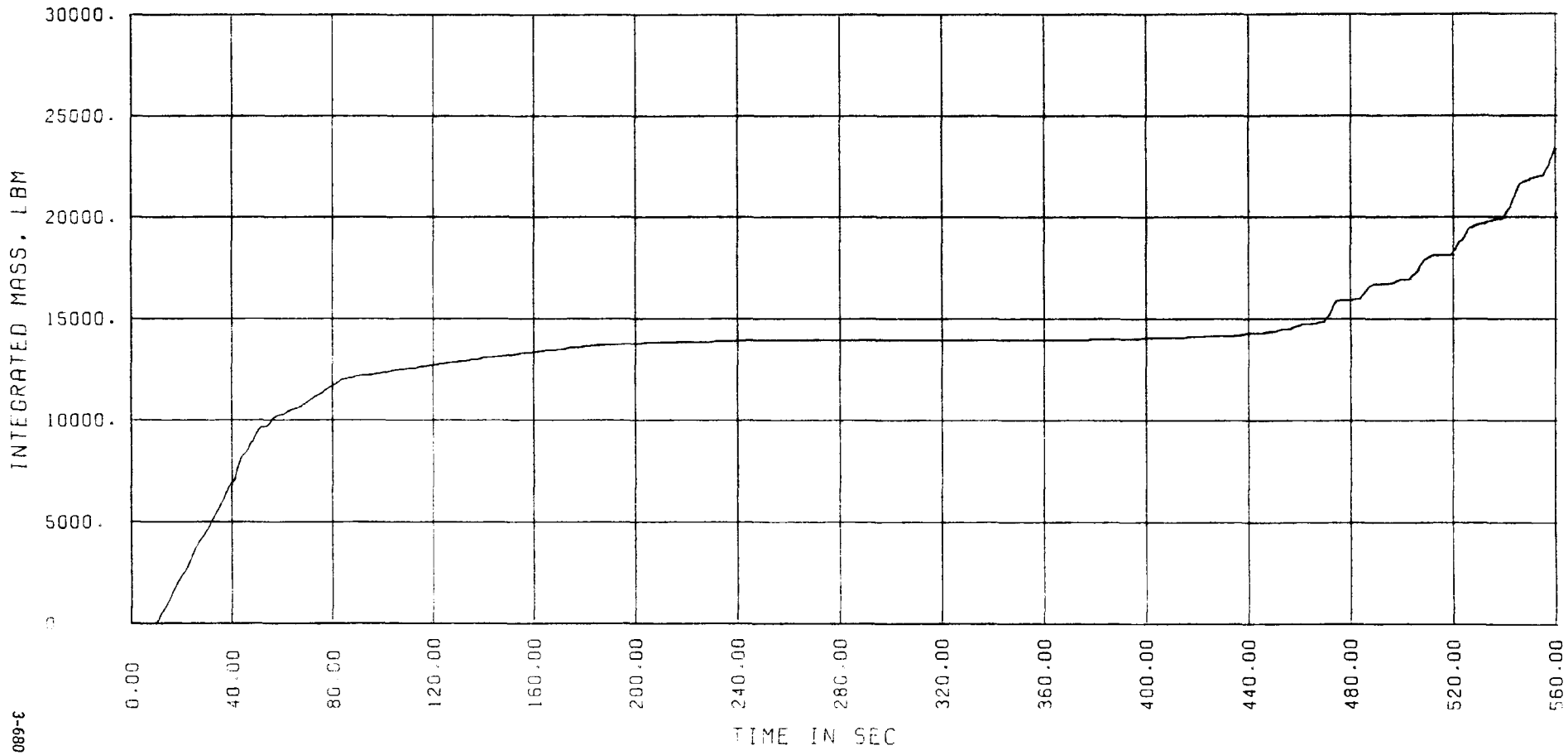
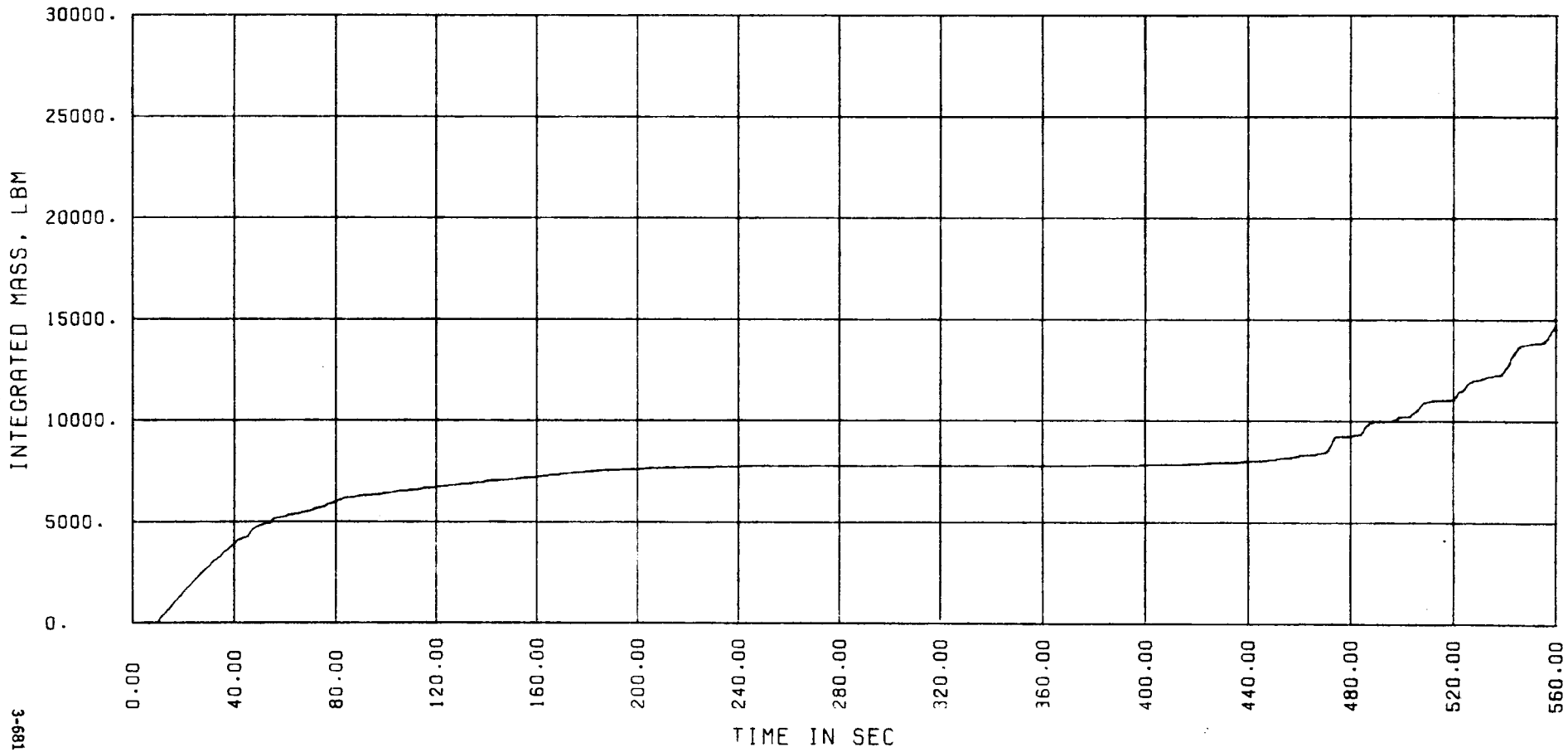
TEST 1211/1000 PSIA PON FWD BD
INTEGRATED MASS HI-TM/GD2 D
PLOT NO.62

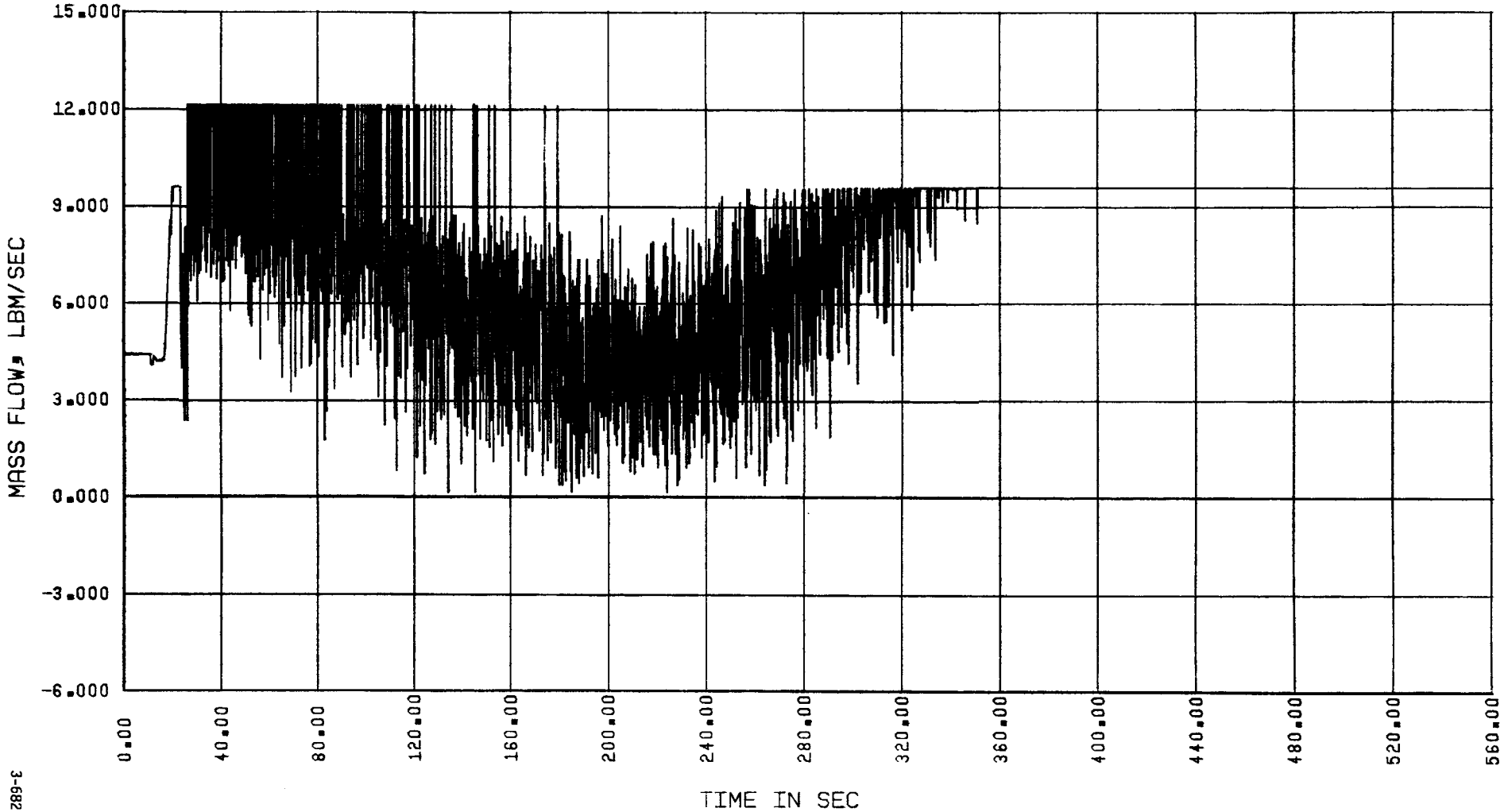


TEST 1211/1000 PSIA PON FWD BD
INTEGRATED MASS LO-TM/GD2 D
PLOT NO.63

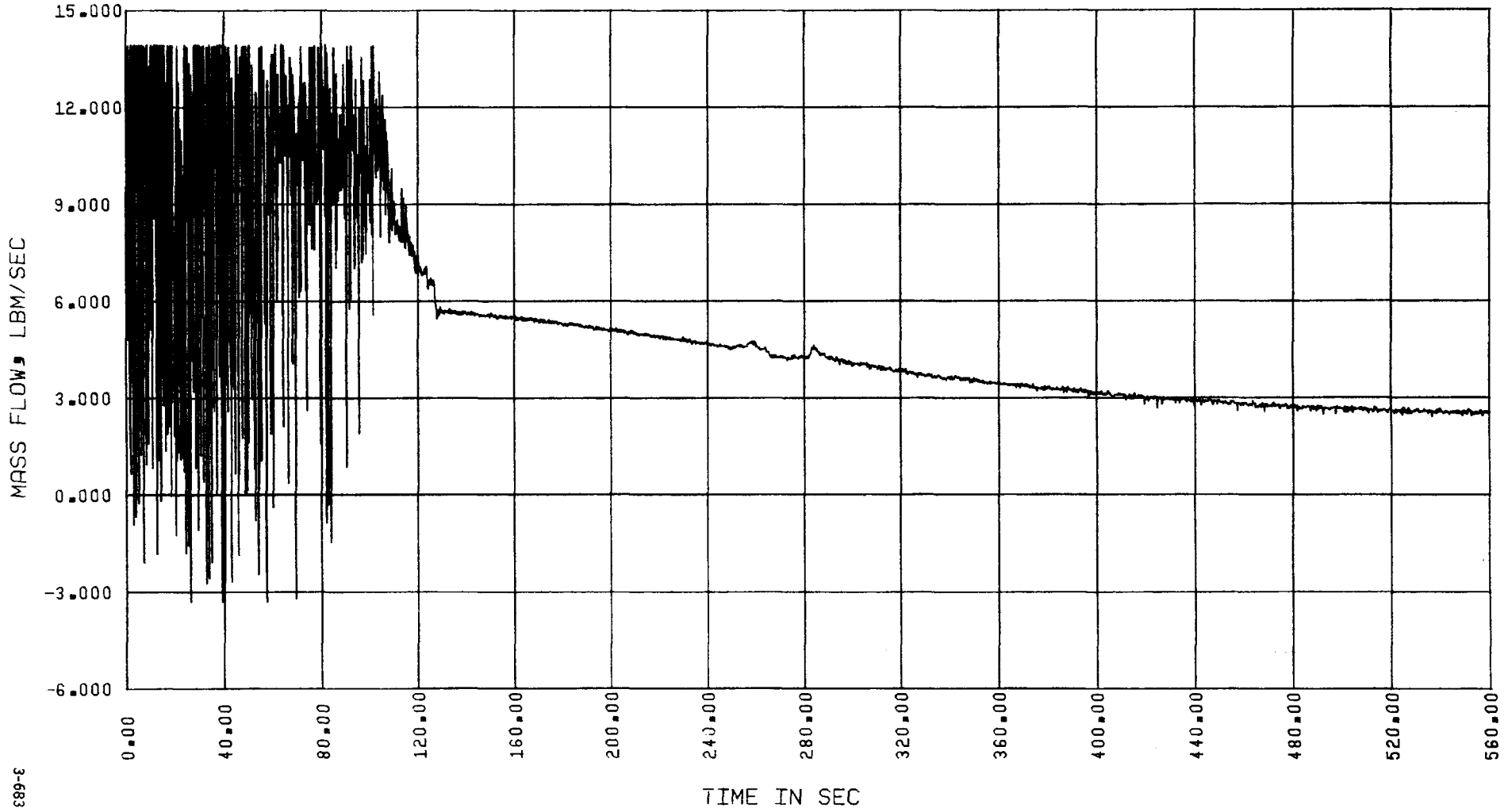


189-3

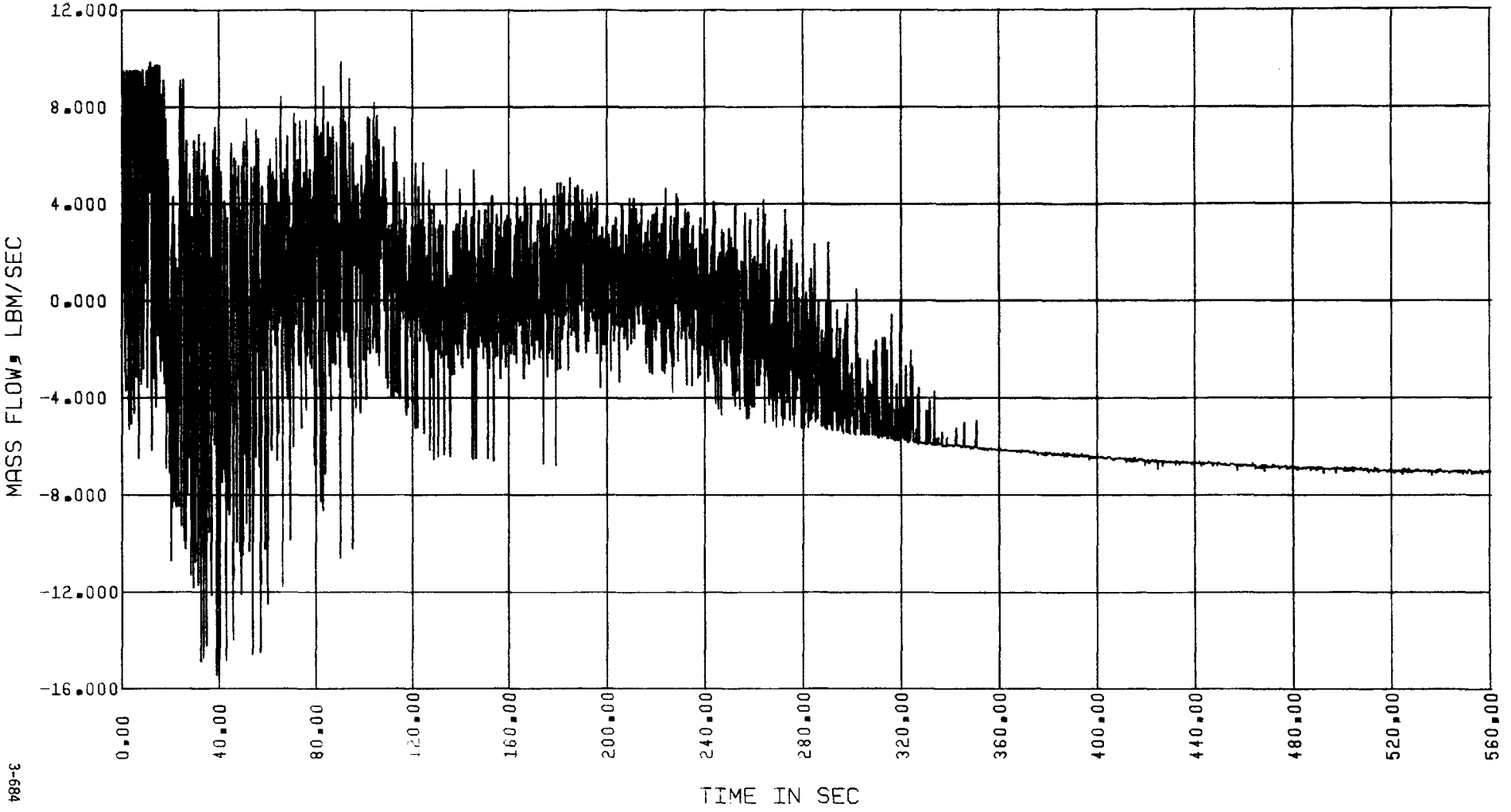
TEST 1211/1000 PSIA PON FWD BD
PUMP INJECT MASS FLOW RATE IN
PLOT NO.64



TEST 1211/1000 PSIA PON FWD BD
PUMP OUTLET INJECTION FLOW
PLOT NO.65



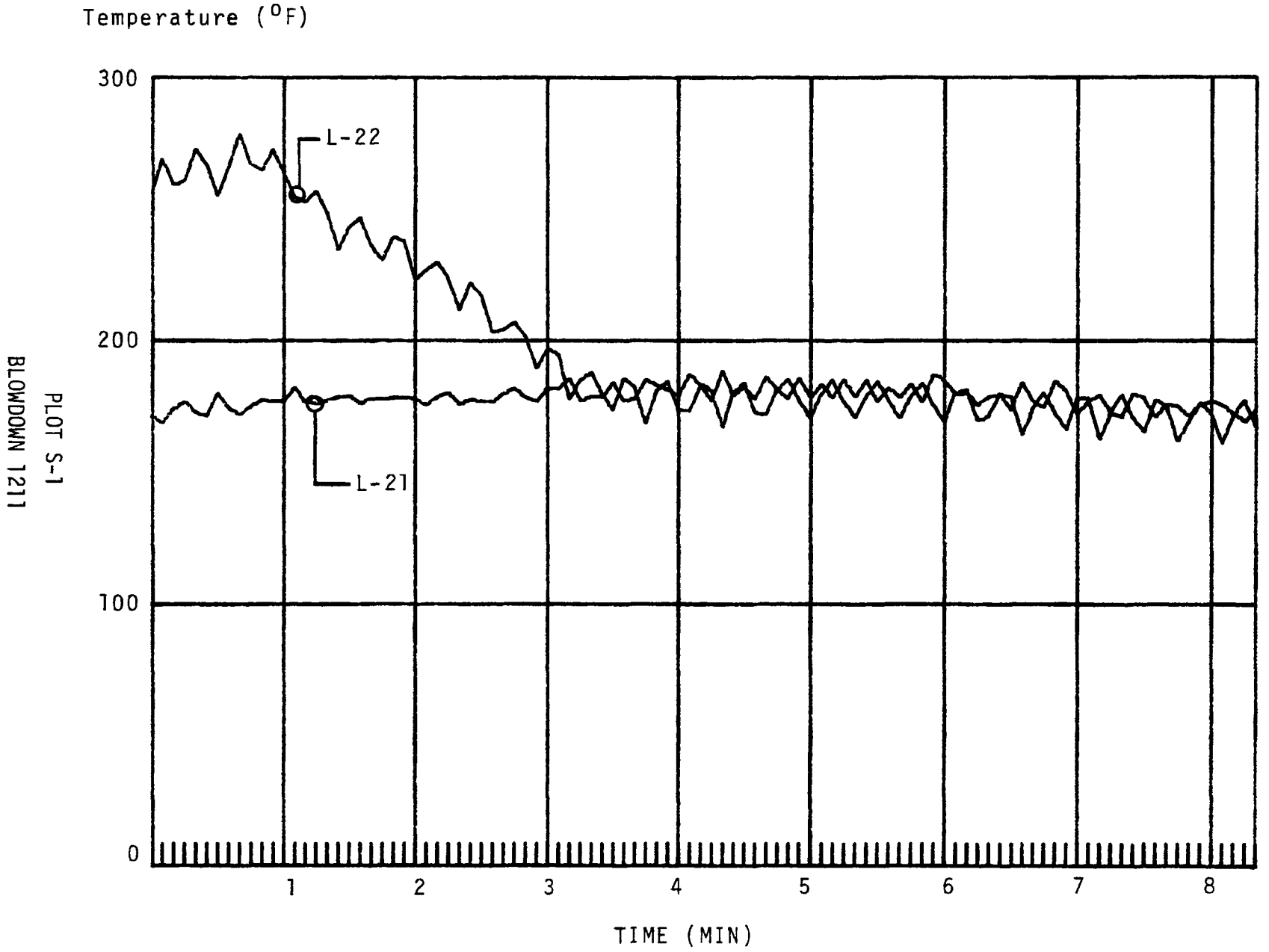
TEST 1211/1000 PSIA PON FWD BD
PUMP SEAL INJ LEAKAGE FLOW
PLOT NO.66

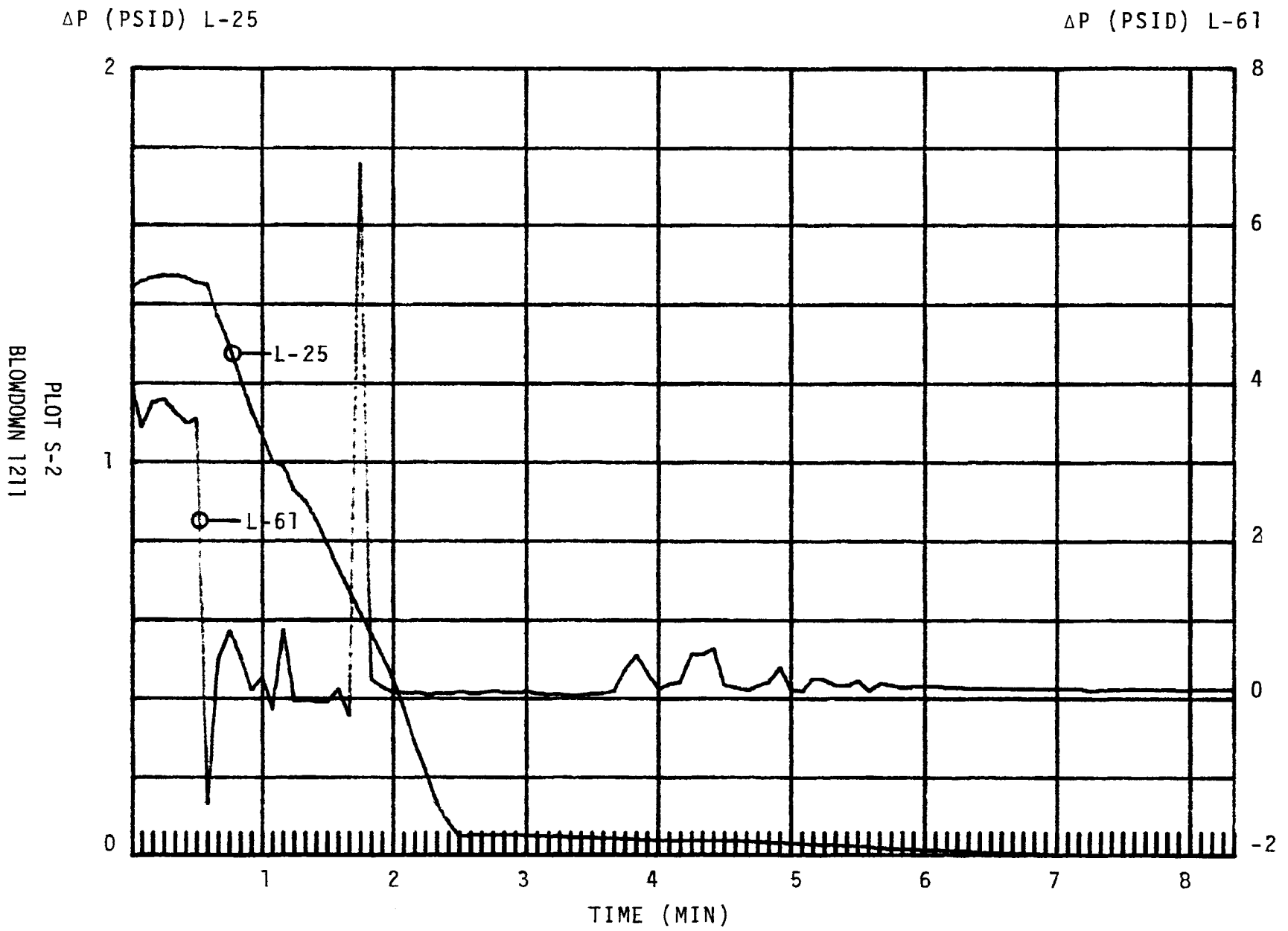


3-684

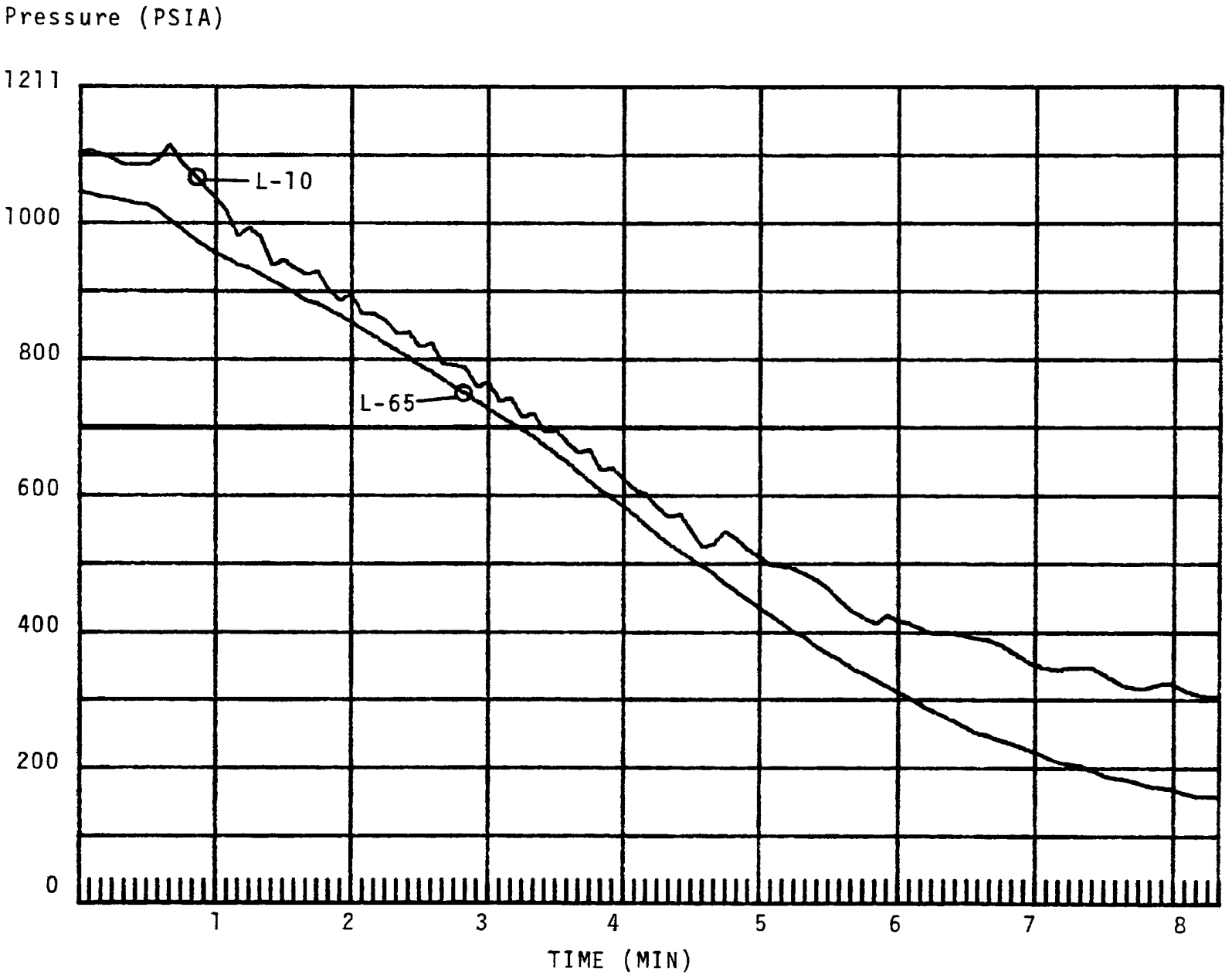
Index Listing
of
SCANNER DATA PLOTS
Test Number (1211)

Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

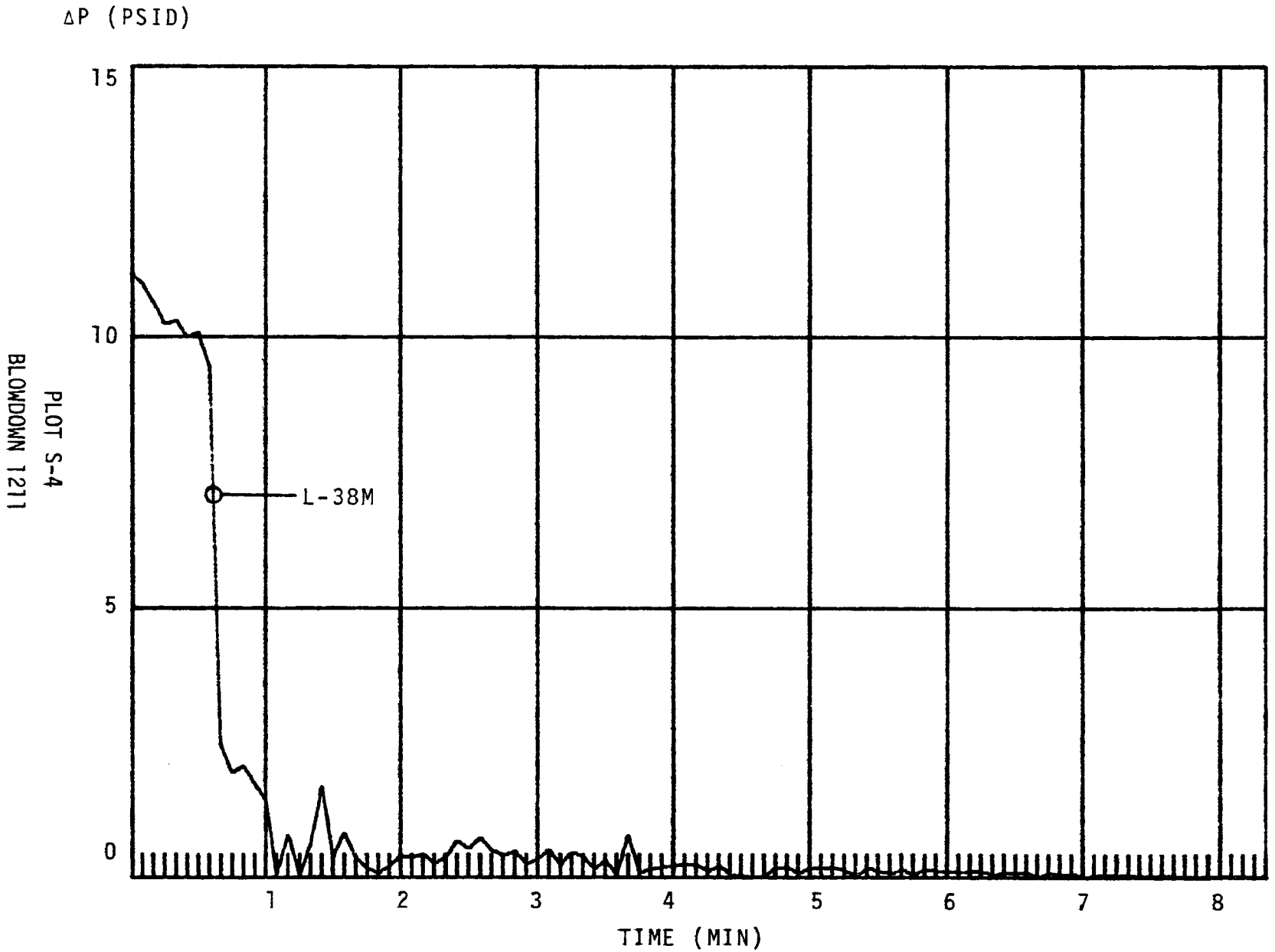

Temperature (°F)
300
200
100
0
L-22
L-21
1
2
3
4
5
6
7
8
TIME (MIN)
PLOT S-1
BLOWDOWN 1211



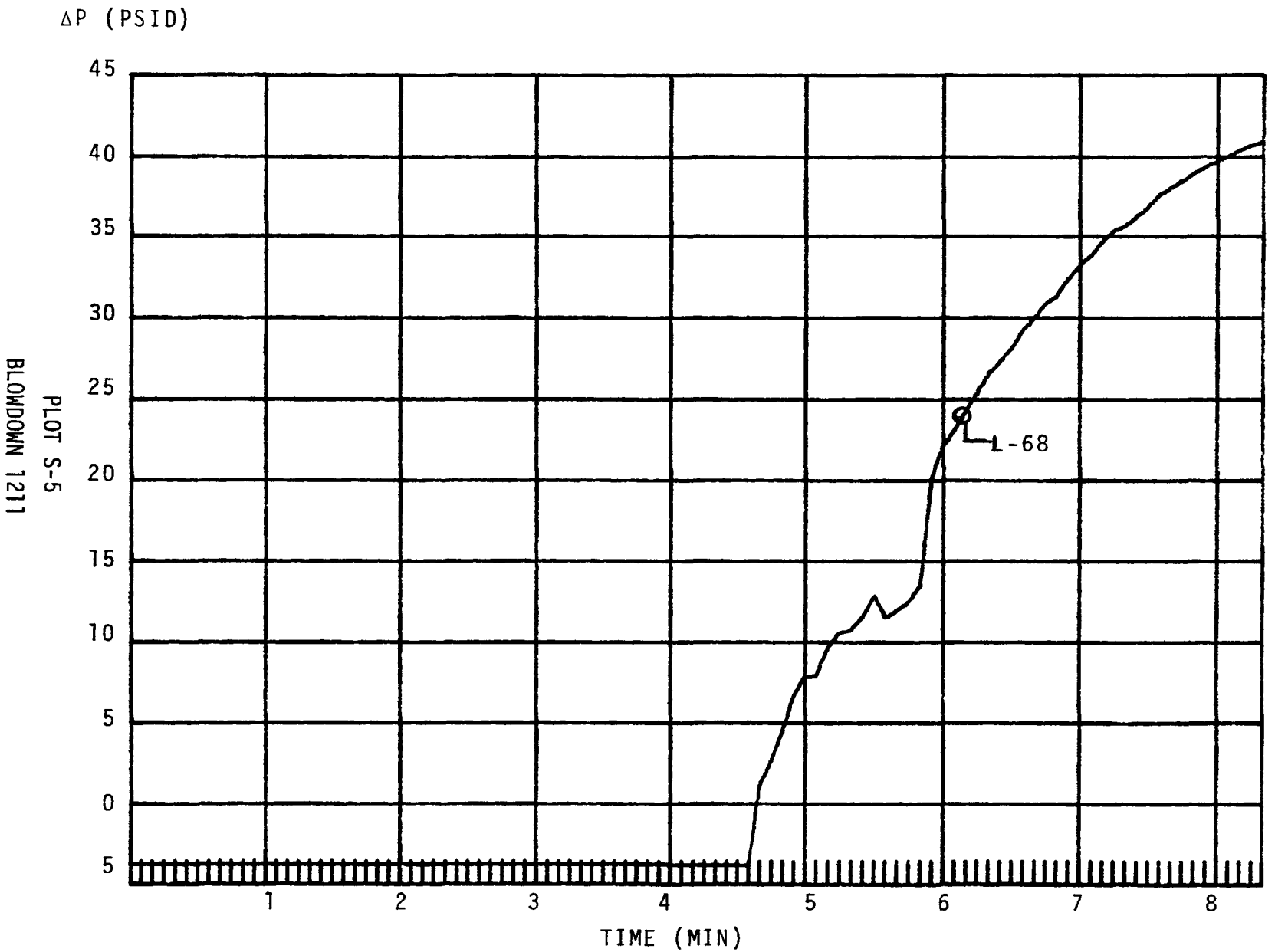
PLOT S-2
BLOWDOWN 1211



PLOT S-3
BLOWDOWN 1211



PLOT S-4
BLOWDOWN 1211


ΔP (PSID)
45
40
35
30
25
20
15
10
5
0
5
1
2
3
4
5
6
7
8
TIME (MIN)
L-68
BLOWDOWN 1211
PLOT S-5

SYSTEM CONFIGURATION

Test Number 1267

Break Location	Discharge	
Break Size	27.75	in^2
	100	% of 6 in. diameter inlet area of pump
Mixing Plate	Out	
Pump Mode	Locked Rotor	

COMMENTS

1. Malfunctioning or Inoperable Instruments: None
2. Other Comments: None
3. Affected FM Data Plots: None

INITIAL CONDITIONS

t = 15 Sec[a]

Test Number 1267

System Pressures

High Pressure Drum	1010.2	psia
Suction Instrument Spool	1022.2	psia
Discharge Instrument Spool	1011.8	psia

Fluid Temperatures

Suction Instrument Spool	546.2	°F
Discharge Instrument Spool	526.3	°F

Fluid Density

Suction Instrument Spool	45.66	lbm/ft^3
Discharge Instrument Spool	47.53	lbm/ft^3

System Flows

Mass Flow Rate	-1	lb/sec
Suction Volumetric Flow Rate	-11	gpm
Discharge Volumetric Flow Rate	-7	gpm
Suction Normalized Volumetric Flow Rate	-0.003	
Discharge Normalized Volumetric Flow Rate	-0.002	
Suction Fluid Velocity	-0.14	ft/sec
Discharge Fluid Velocity	-0.09	ft/sec
Suction Momentum Flux	10	$lbm/ft\ sec^2$
Discharge Momentum Flux	10	$lbm/ft\ sec^2$

Pump Performance

Pump head	-0.58	psi
	-1.8	ft
Pump Speed	Locked Rotor	
Pump Shaft Torque	-3.5	ft lb
Pump Hydraulic Torque	-2.4	ft lb

System Mass (t = 25 Sec)[a]

High Pressure Drum Level	59.79	in[b]
Fluid Mass Upstream of Test Pump	14,448	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 1267

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-7.2	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	2.3	c
HPSW-1 Closed	3.9	c
Pump Power Trip	-	-
Initiate Rupture Mechanism	4.5	c
Blowdown Starts	5.8	30
End of Digitized Data 20 s/sec	402.8	-
200 s/sec	352.8	-
FM Recording System Off	432.0	-
Scanner System Off	-	380

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

Index Listing

of

FM DATA PLOTS

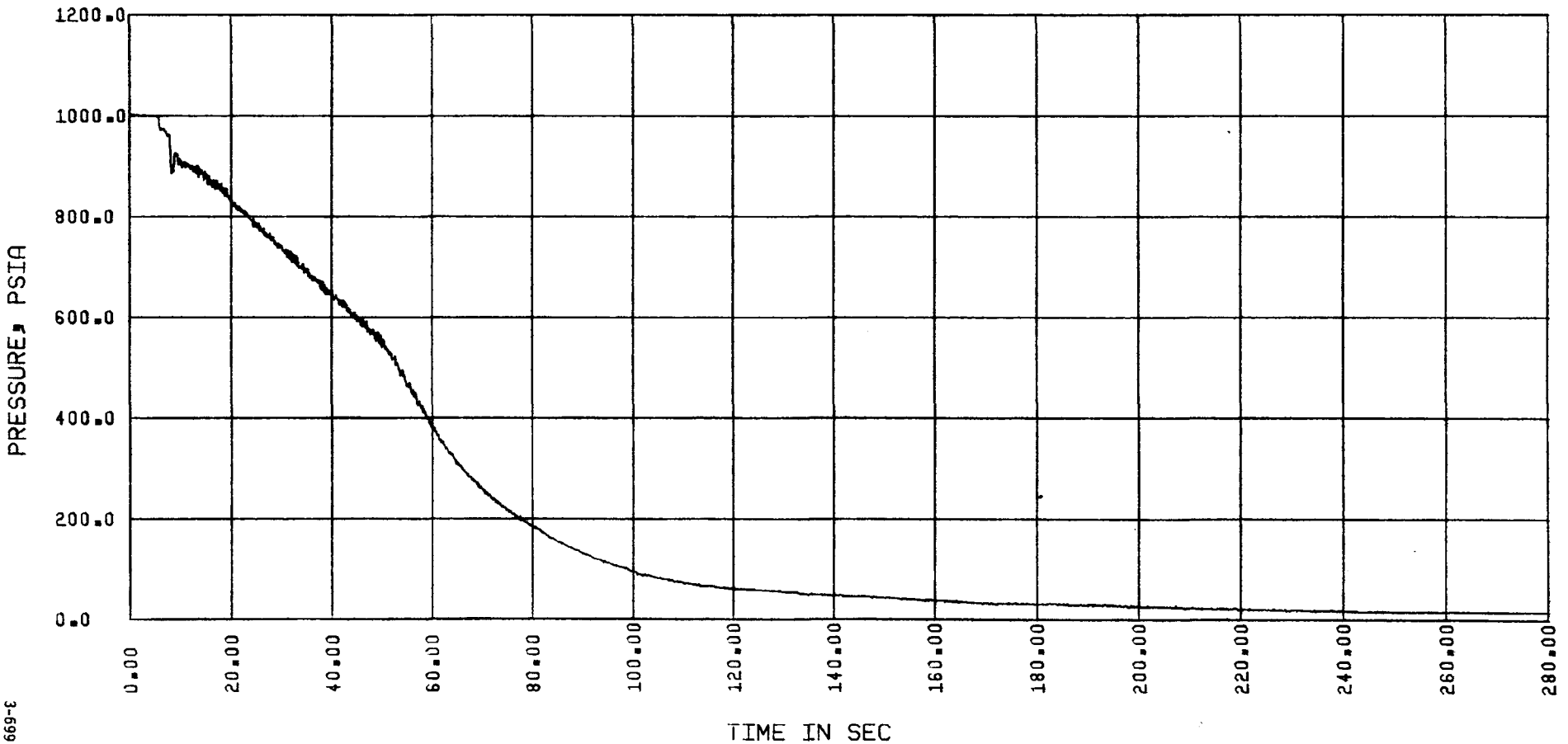
Test Number (1267)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
28	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 Discharge
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge

Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (1267)

Plot Number	Location Number	Description of Parameter
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
35	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
42	L-27	Momentum Flux LO-DD Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
53	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge
64	L-9	Pump Injection Mass Flow Rate In
65	L-32	Pump Injection Mass Flow Rate Out
66	L-9/L-32	Seal Injection Leakage Mass Flow Rate

TEST 1267/1000 PSIA LR FWD BDN
PUMP SUCTION PRESSURE
PLOT NO.1



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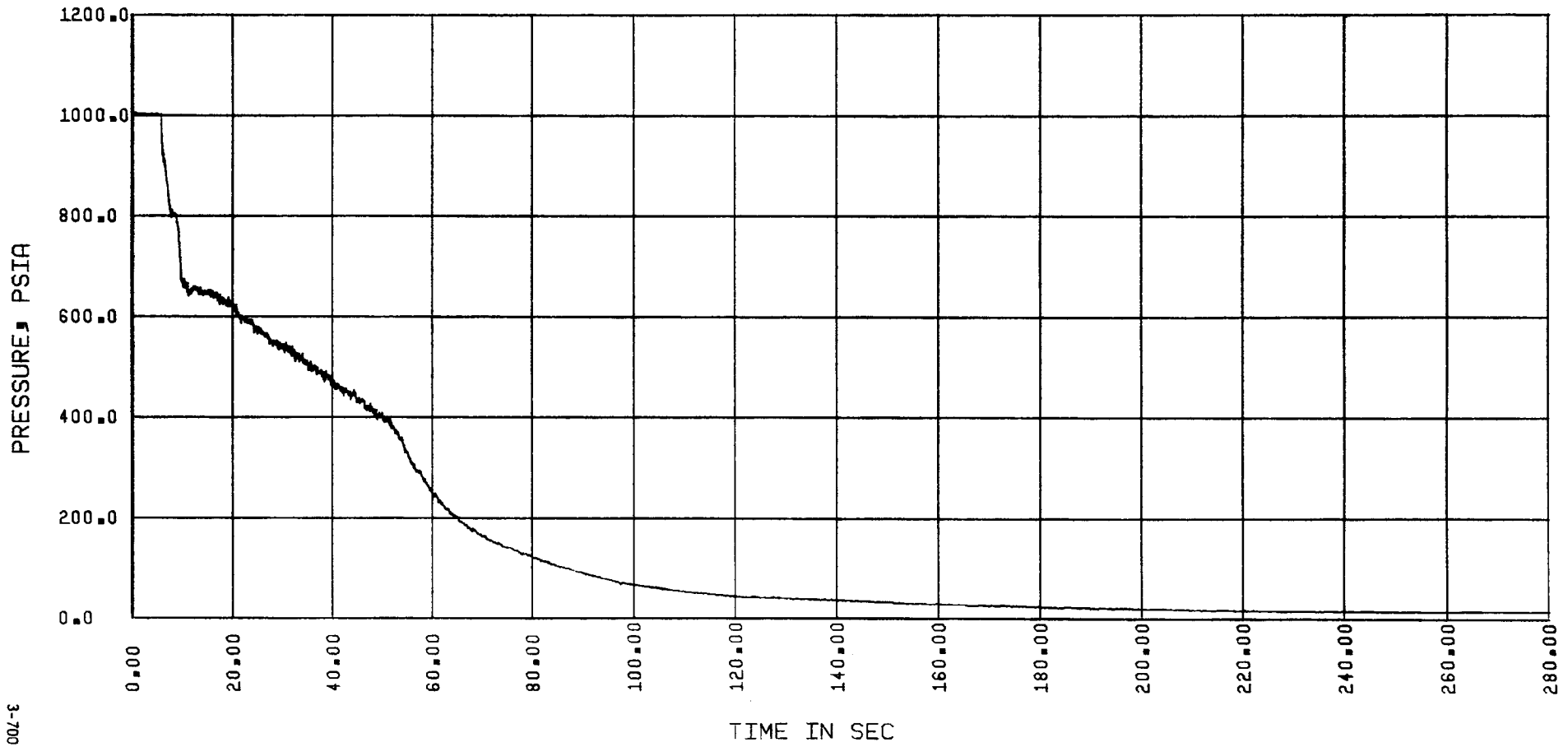
TEST 1267/1000 PSIA LR FWD BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2



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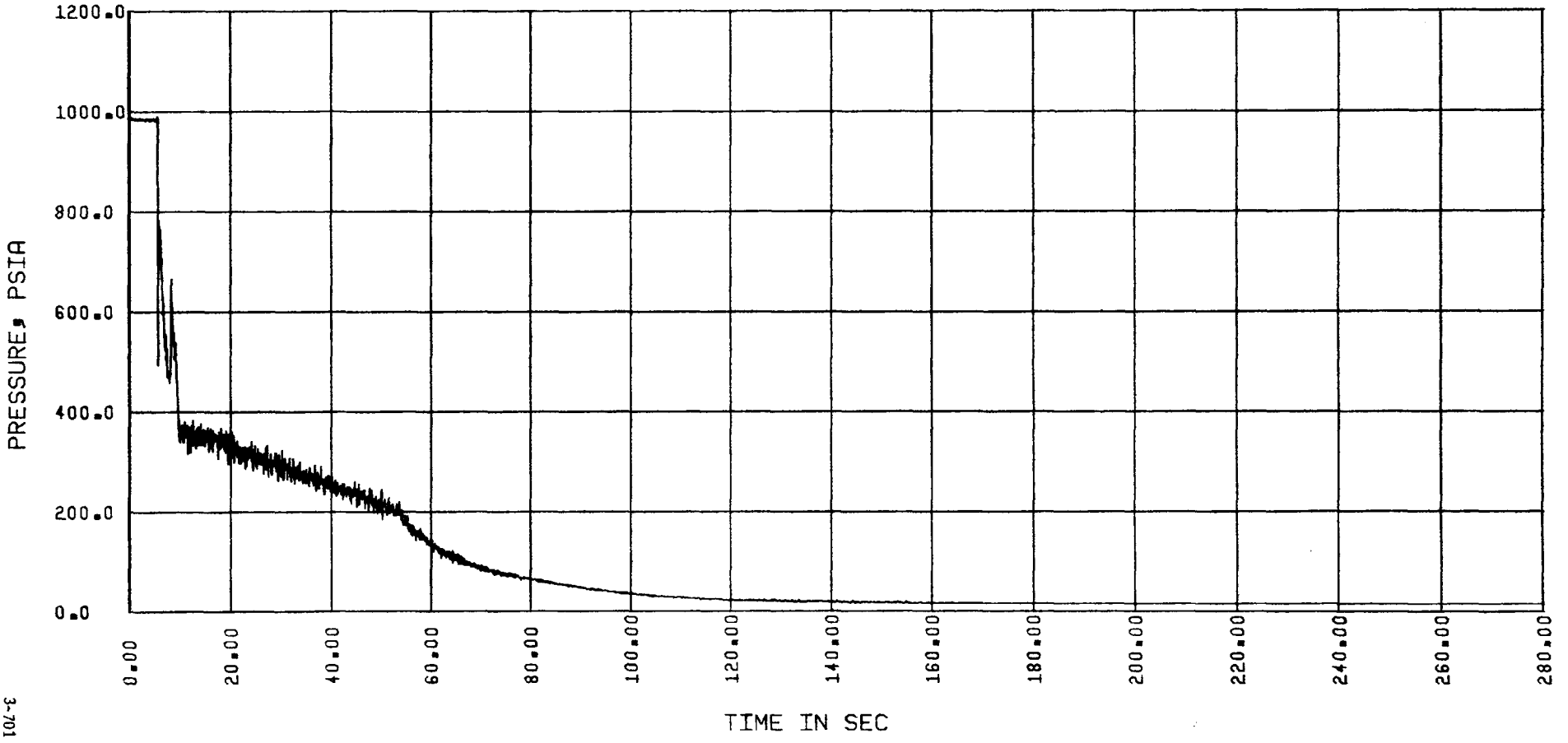
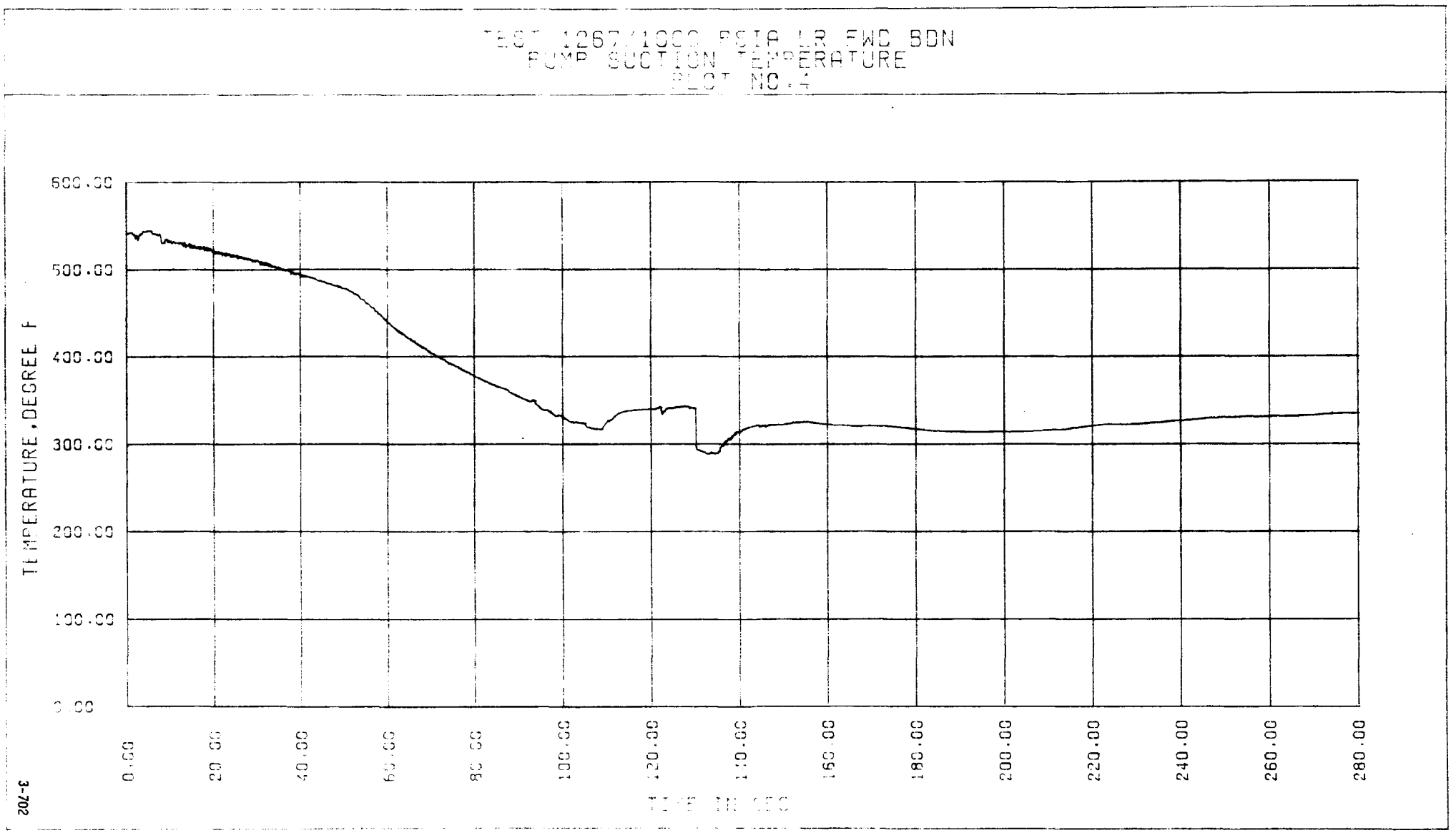
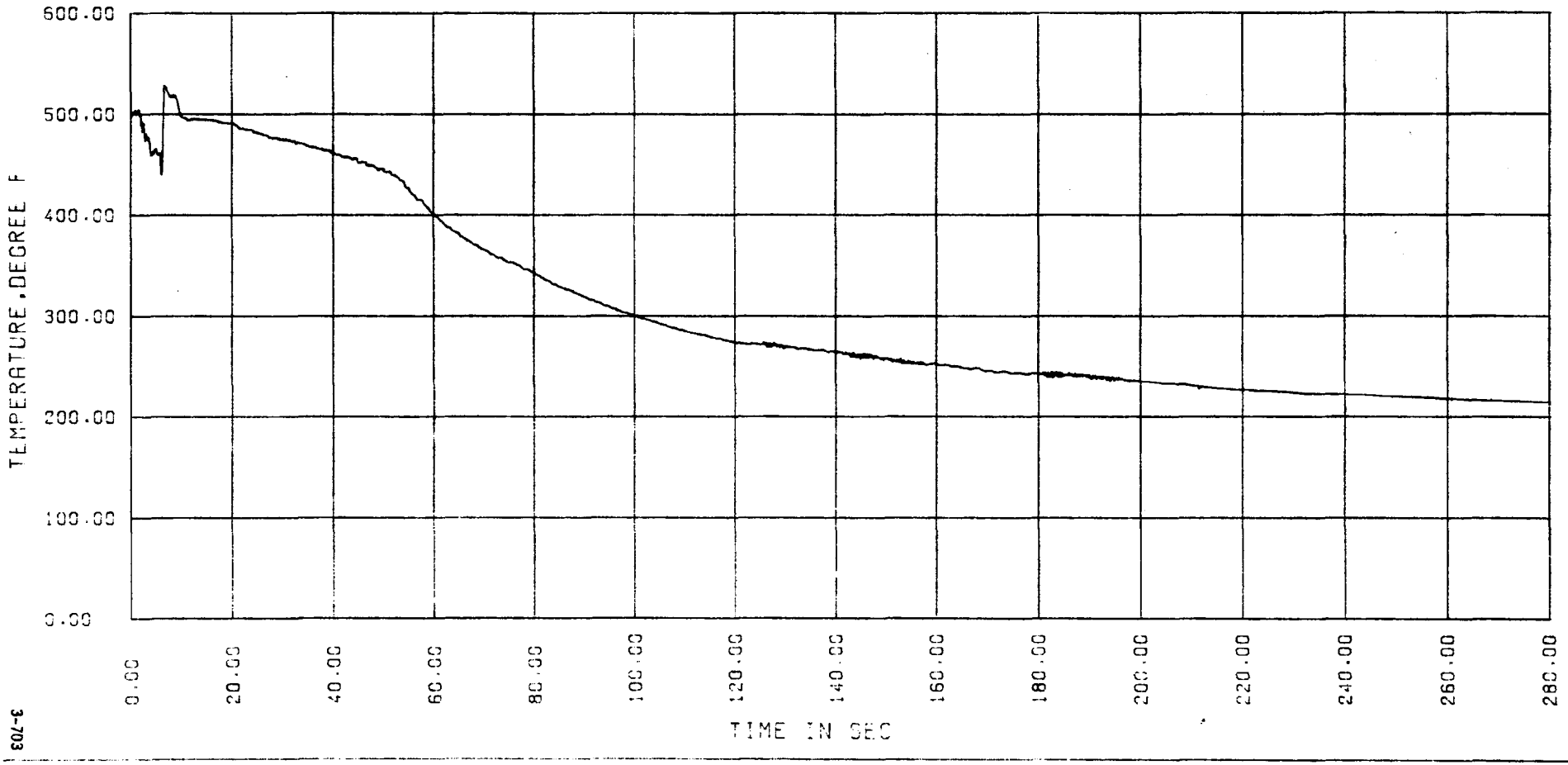
TEST 1267/1000 PSIA LR FWD BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3

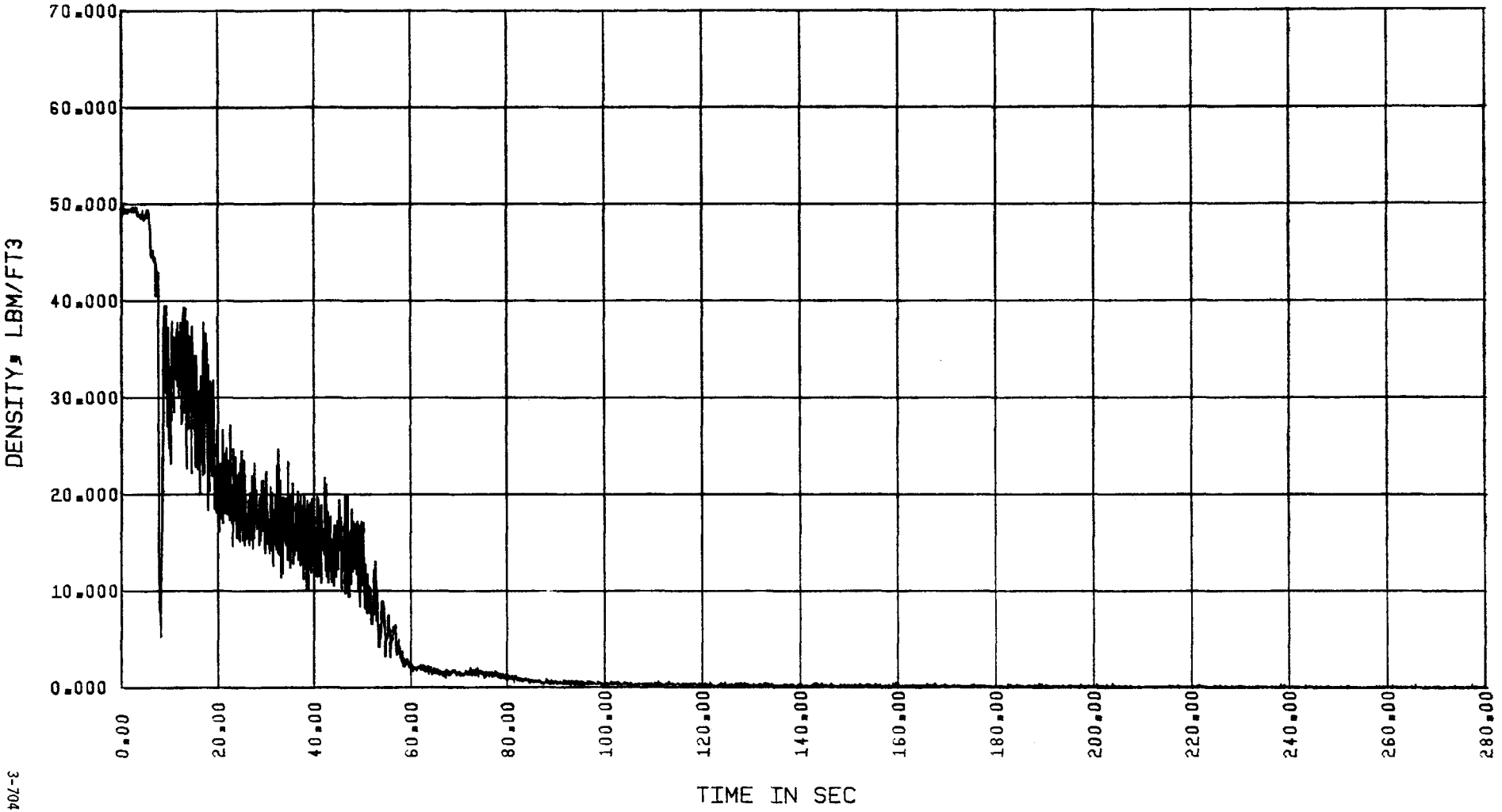



PUMP SUCTION TEMPERATURE
PLOT NO. 1
TEMPERATURE, DEGREE F
500.00
400.00
300.00
200.00
100.00
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00

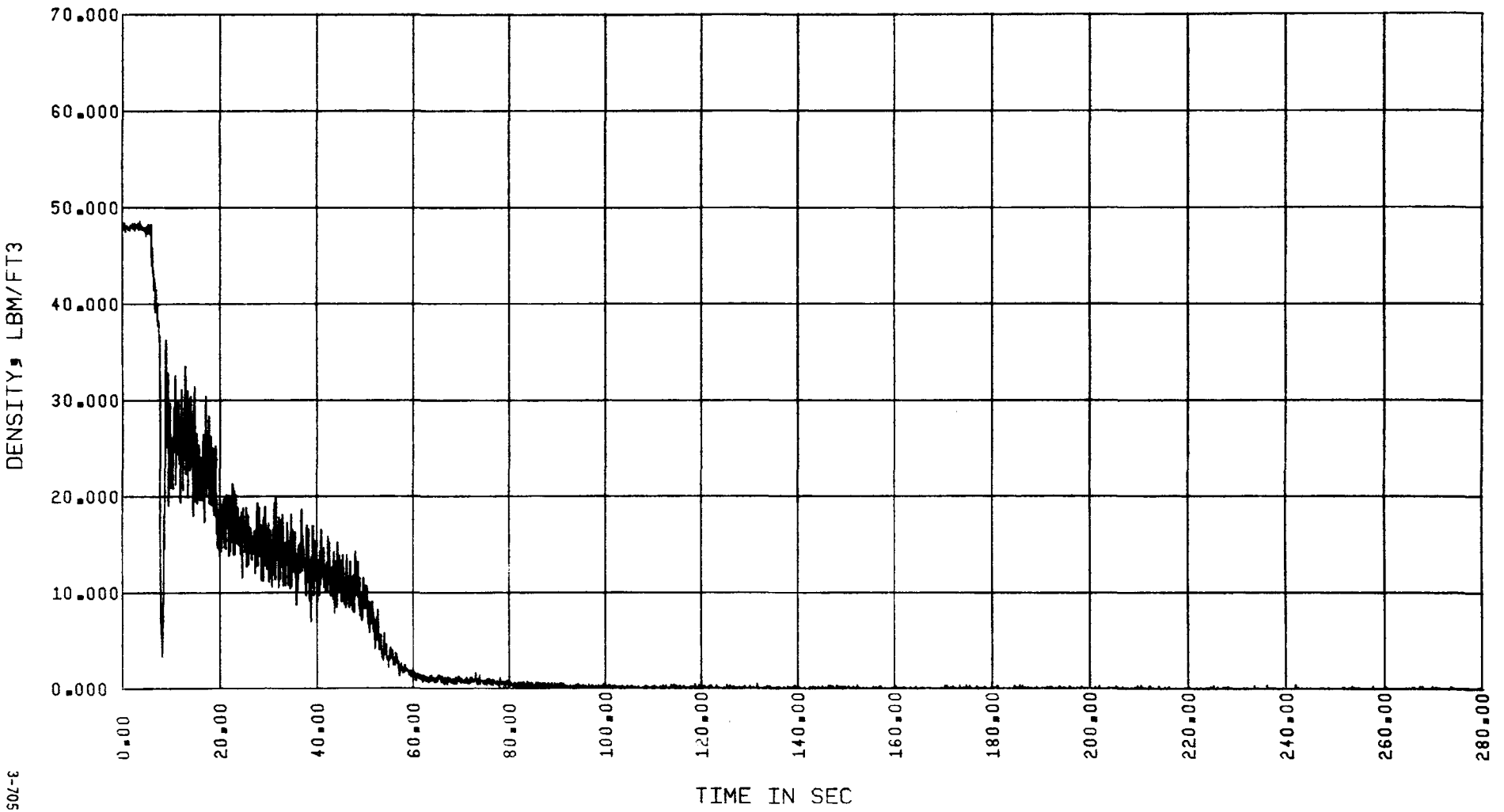
TEST 1267/1000 PSIA LR FWD BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5



TEST 1267/1000 PSIA LR FWD BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6

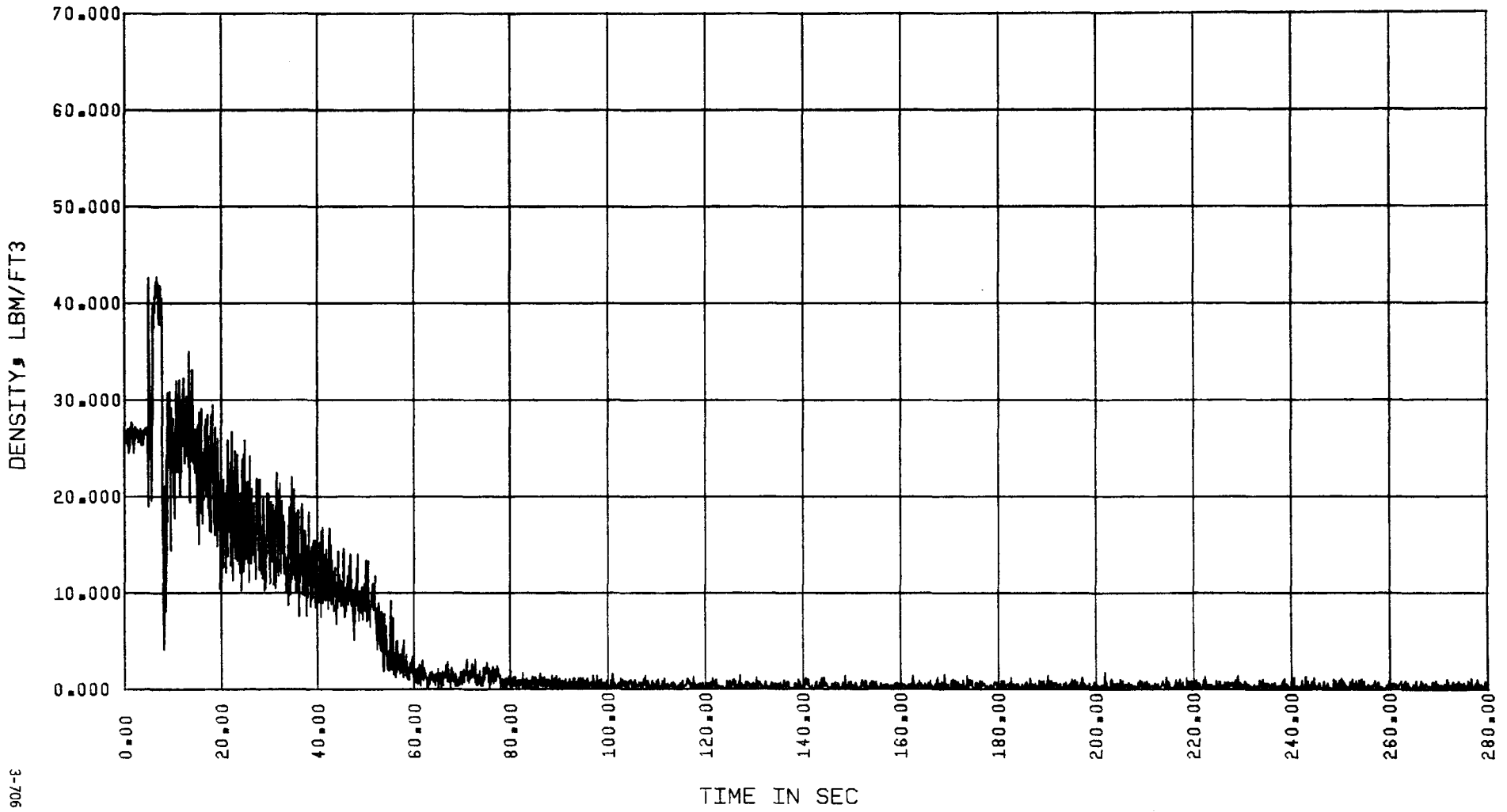


TEST 1267/1000 PSIA LR FWD BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7



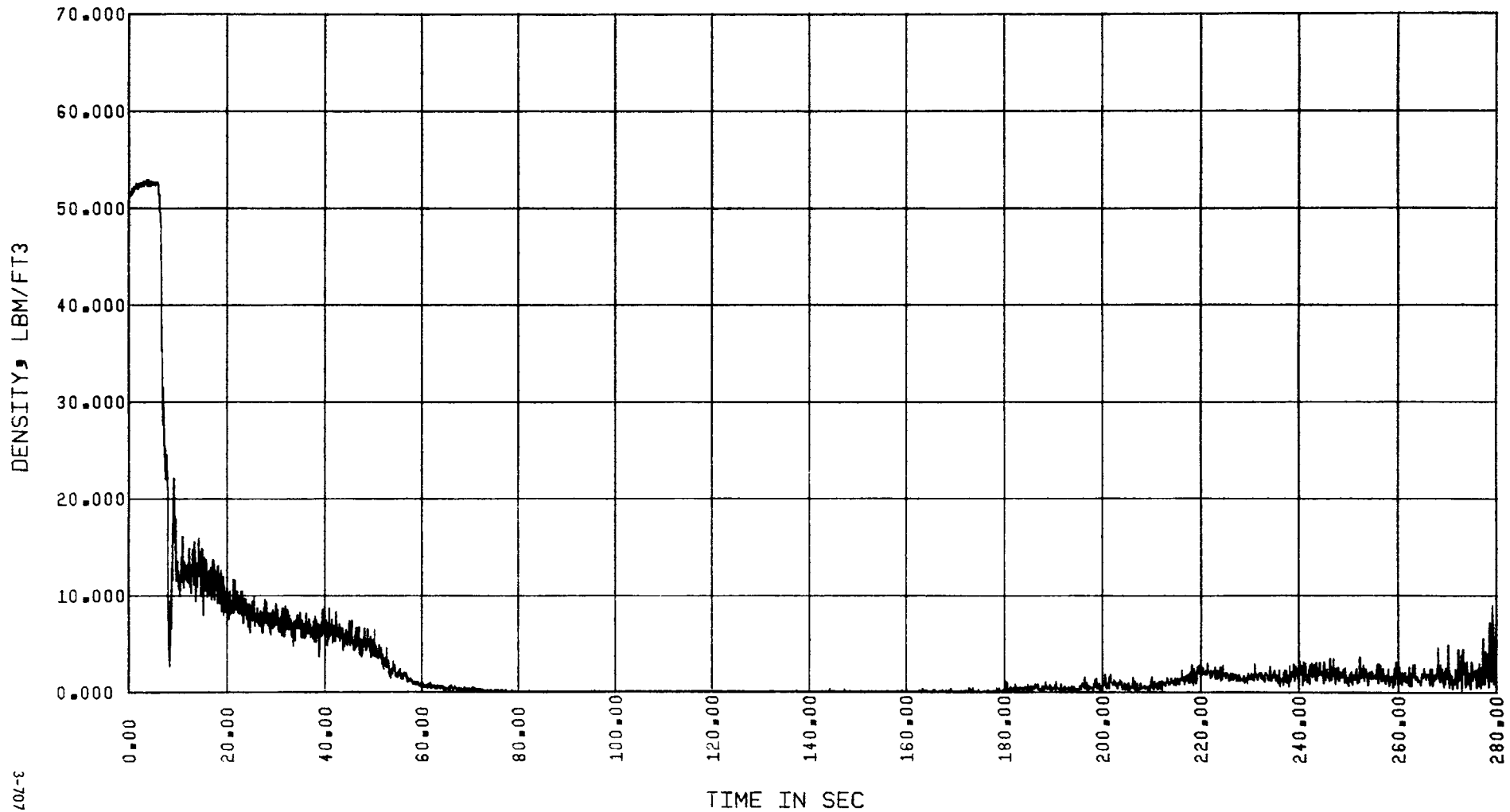
3-705

TEST 1267/1000 PSIA LR FWD BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8

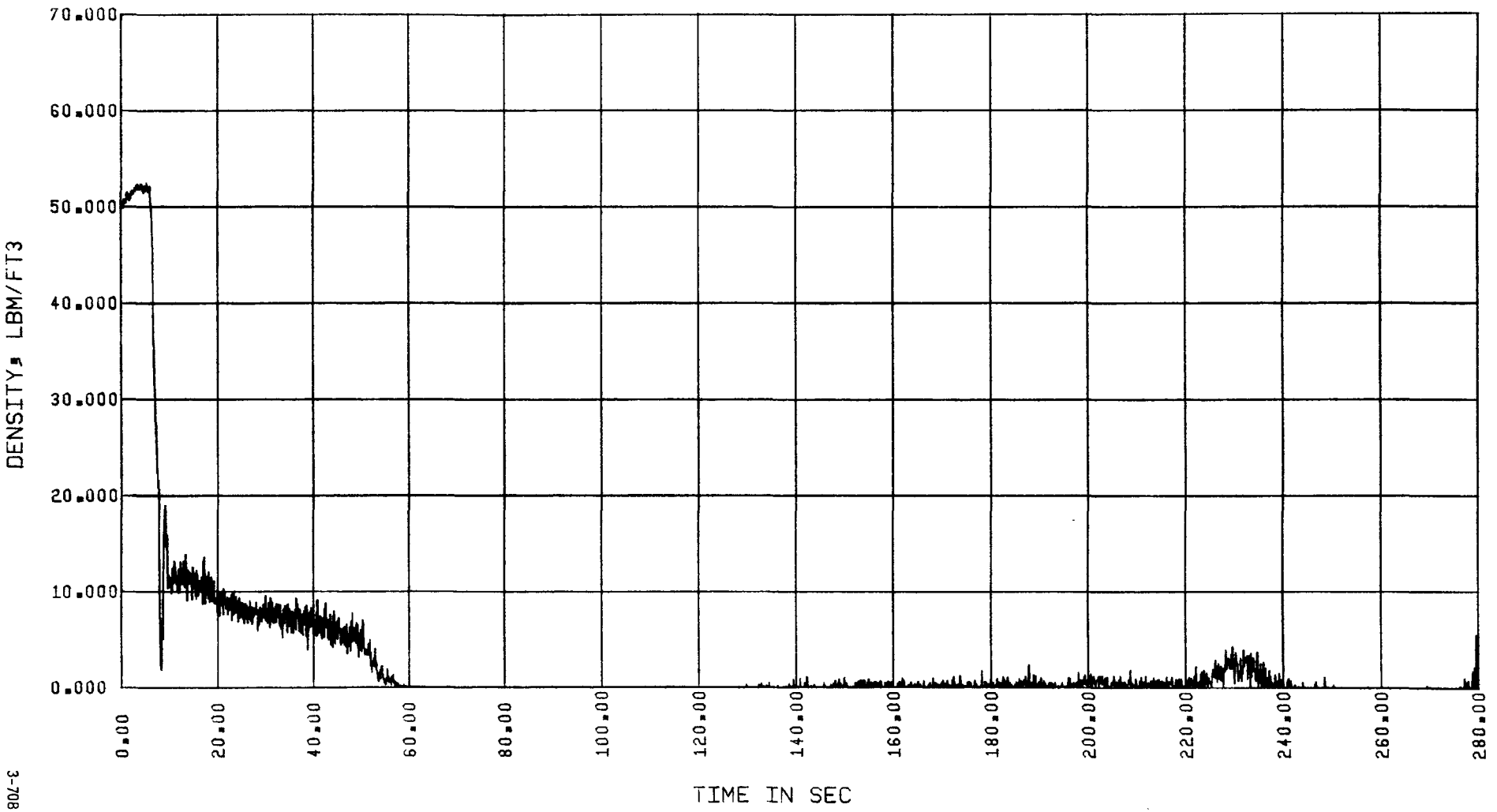


3-706

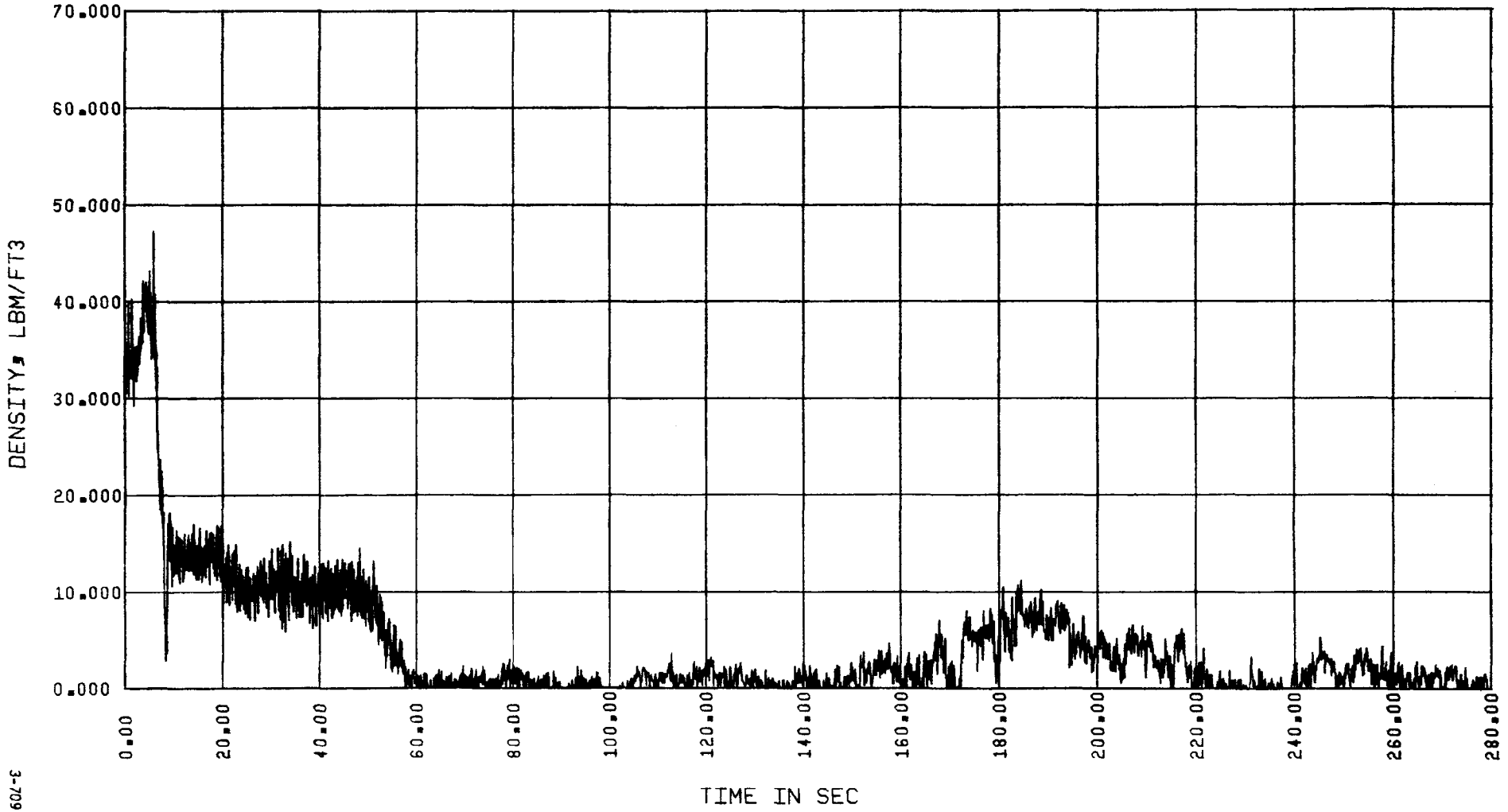
TEST 1267/1000 PSIA LR FWD BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9



TEST 1267/1000 PSIA LR FWD BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10

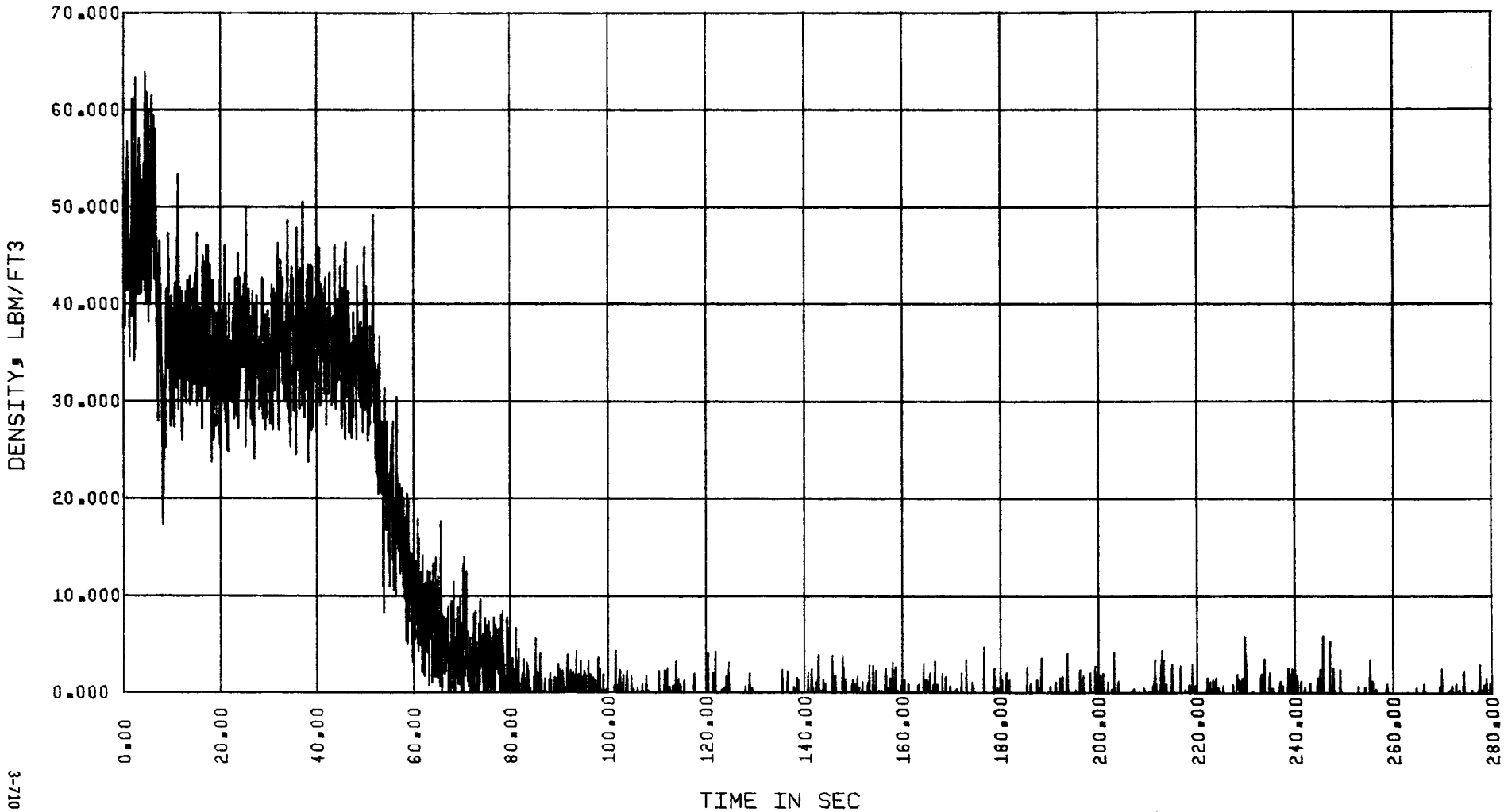


TEST 1267/1000 PSIA LR FWD BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11

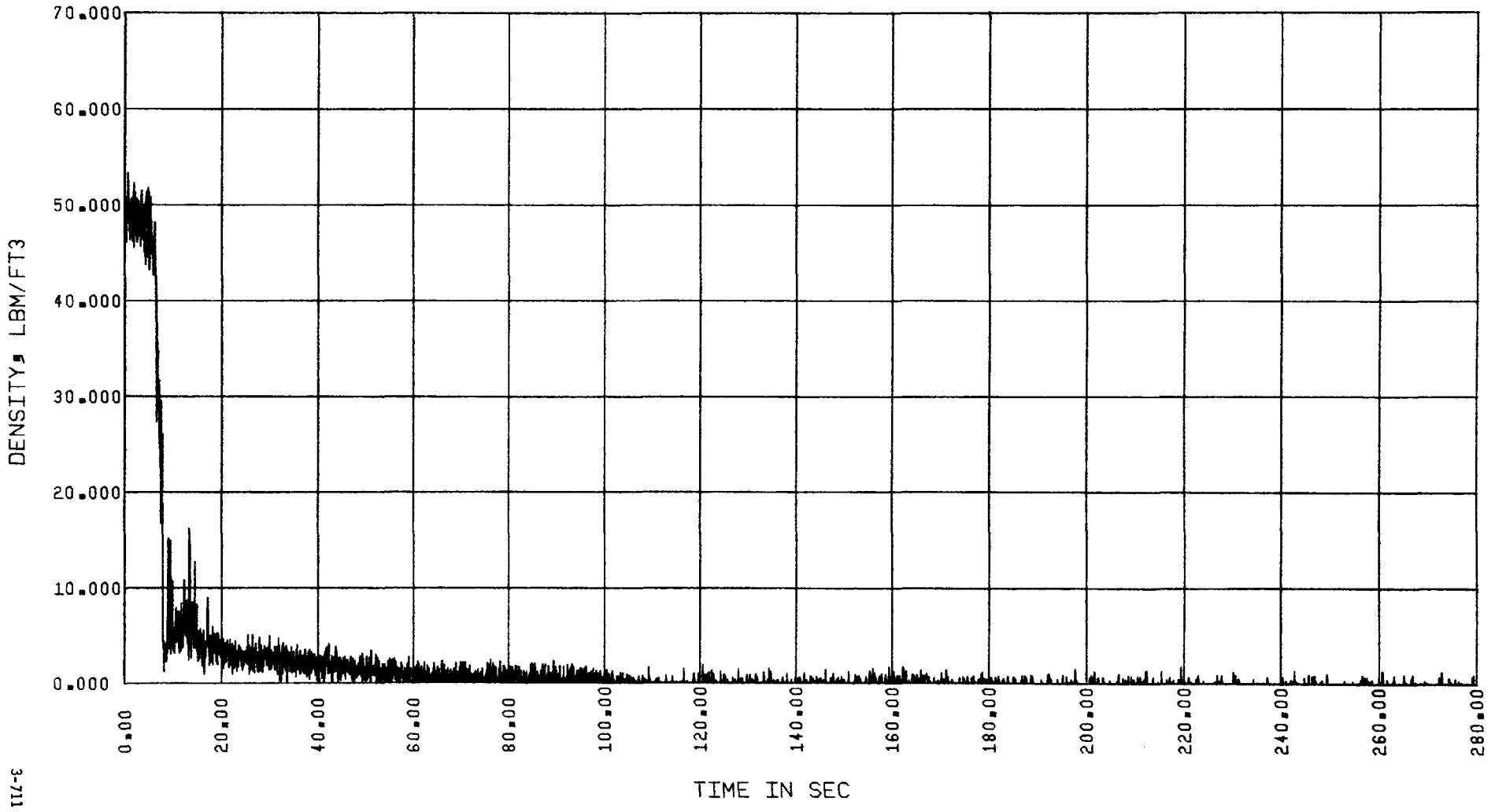


3-709

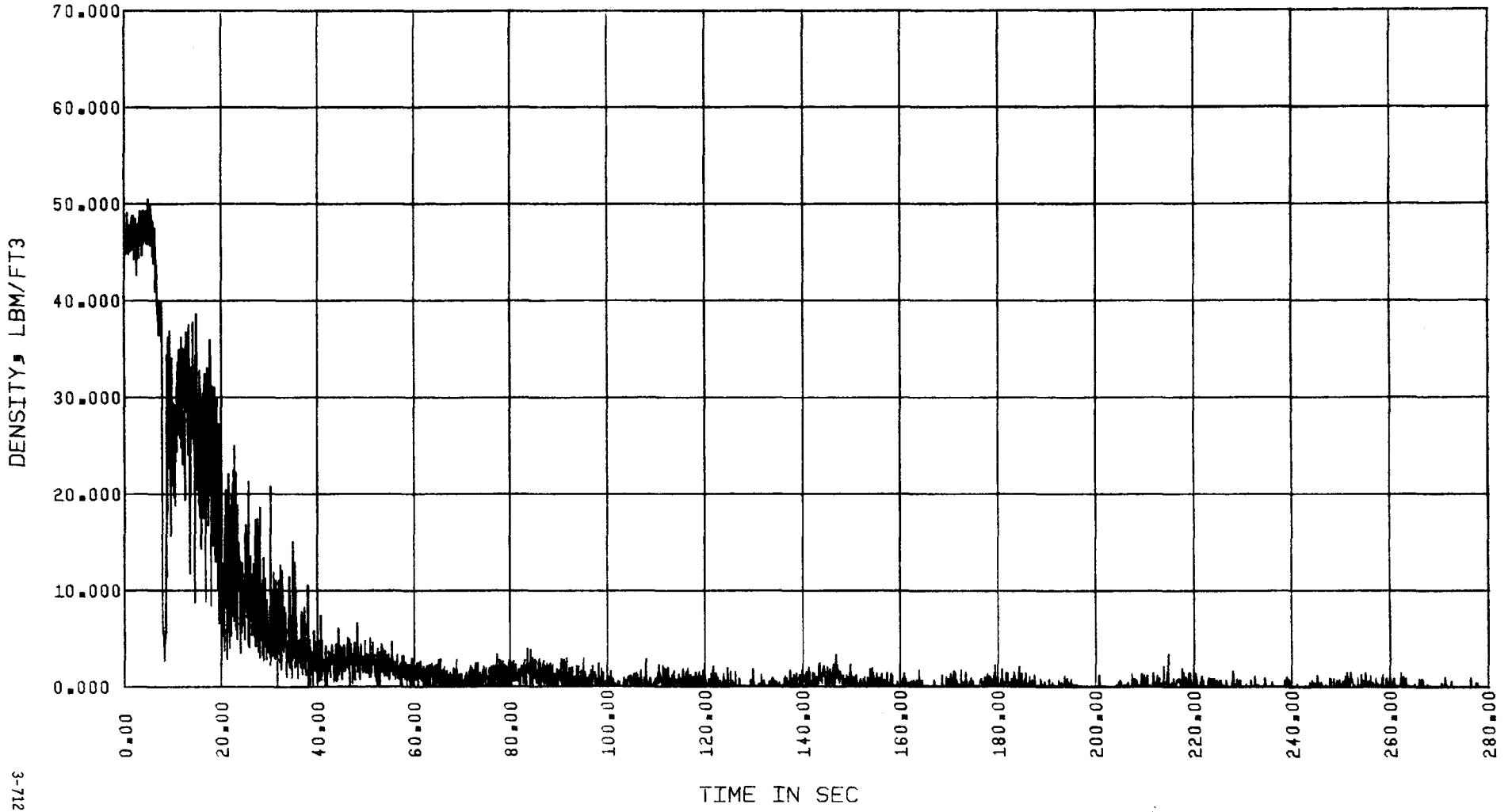
TEST 1267/1000 PSIA LR FWD BDN
DENSITY BEAM1 AECL GD
PLOT NO.12



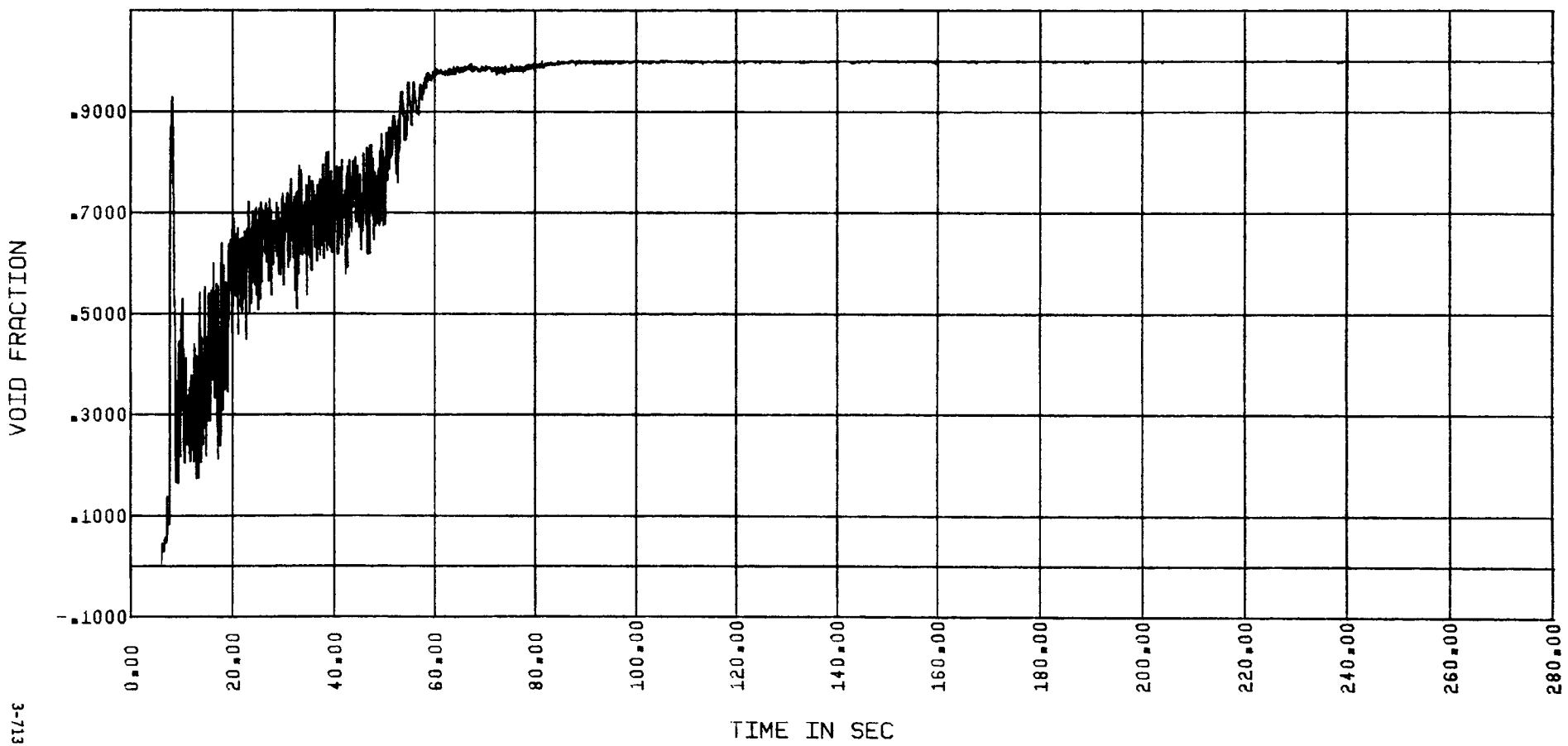
TEST 1267/1000 PSIA LR FWD BDN
DENSITY BEAM2 AECL GD
PLOT NO.13



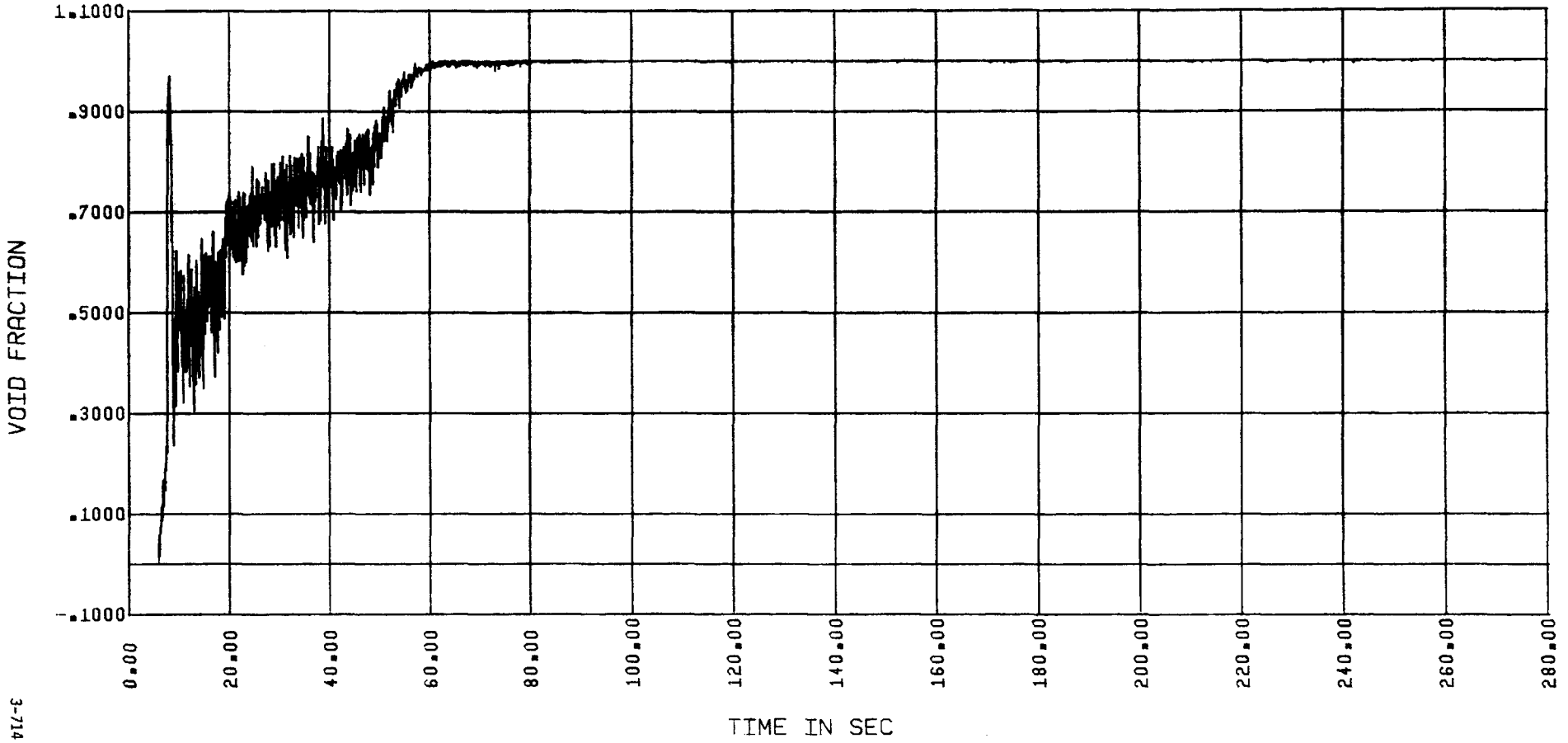
TEST 1267/1000 PSIA LR FWD BDN
DENSITY BEAM3 AECL GD
PLOT NO.14



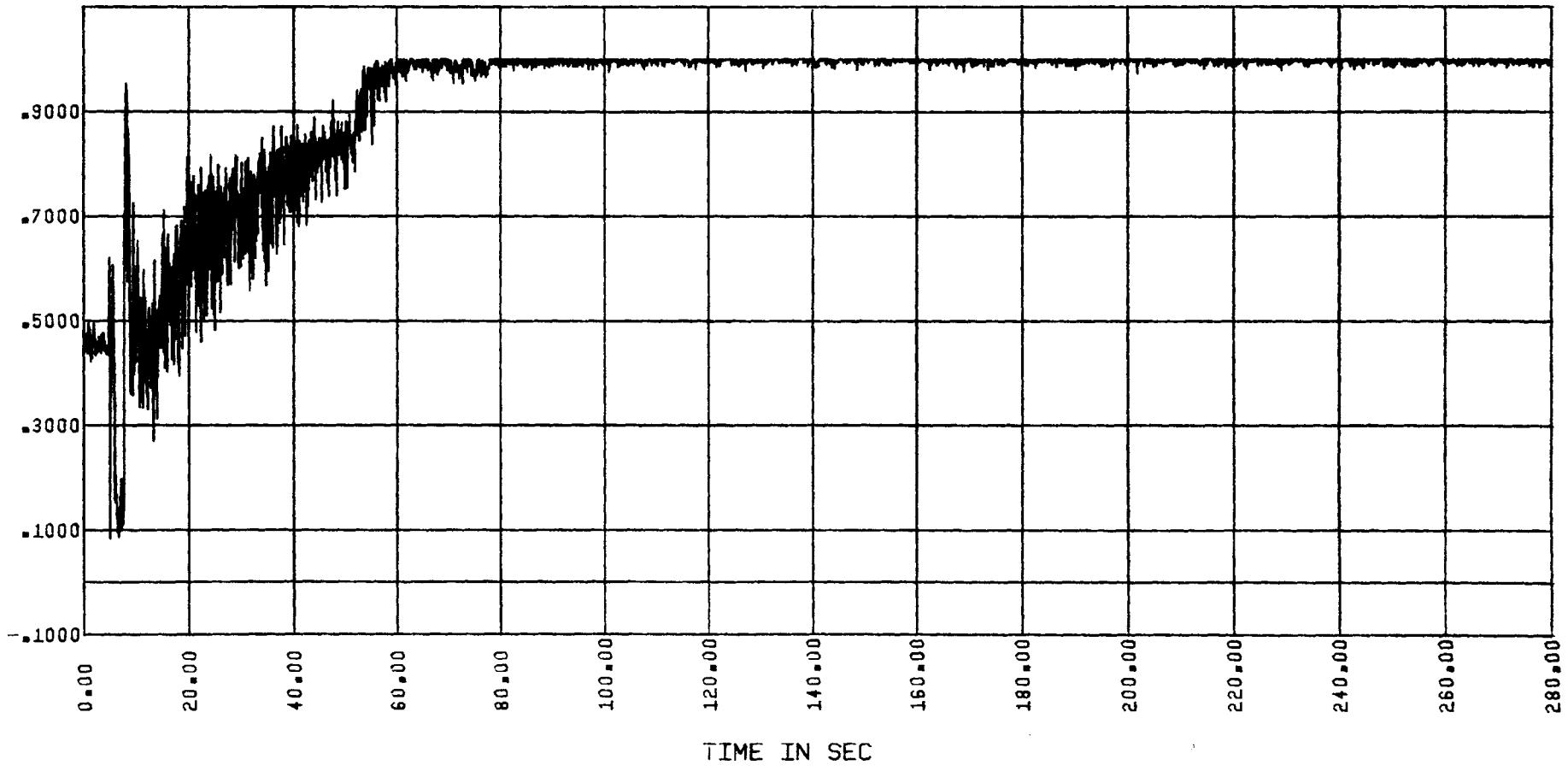
TEST 1267/1000 PSIA LR FWD BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15



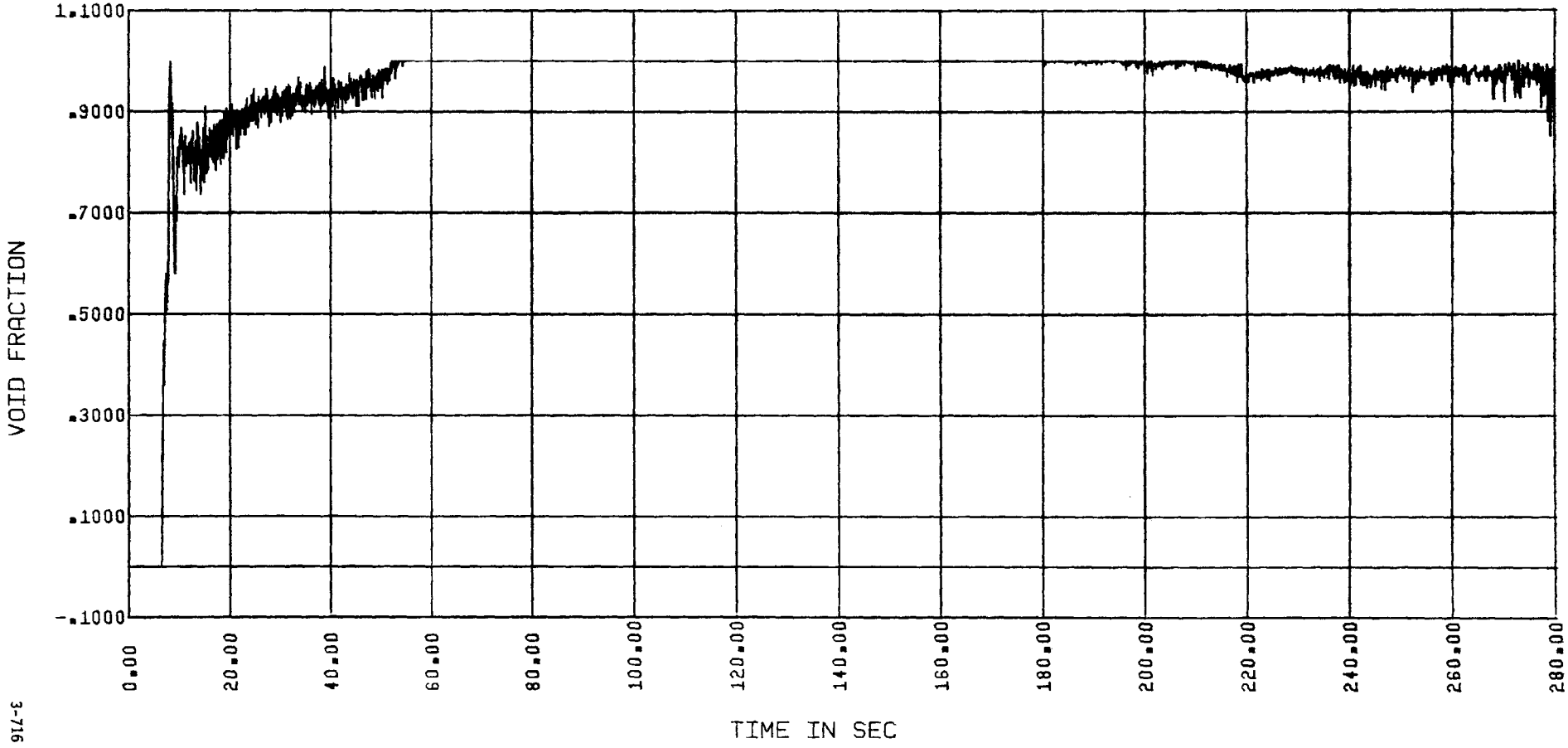
TEST 1267/1000 PSIA LR FWD BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16



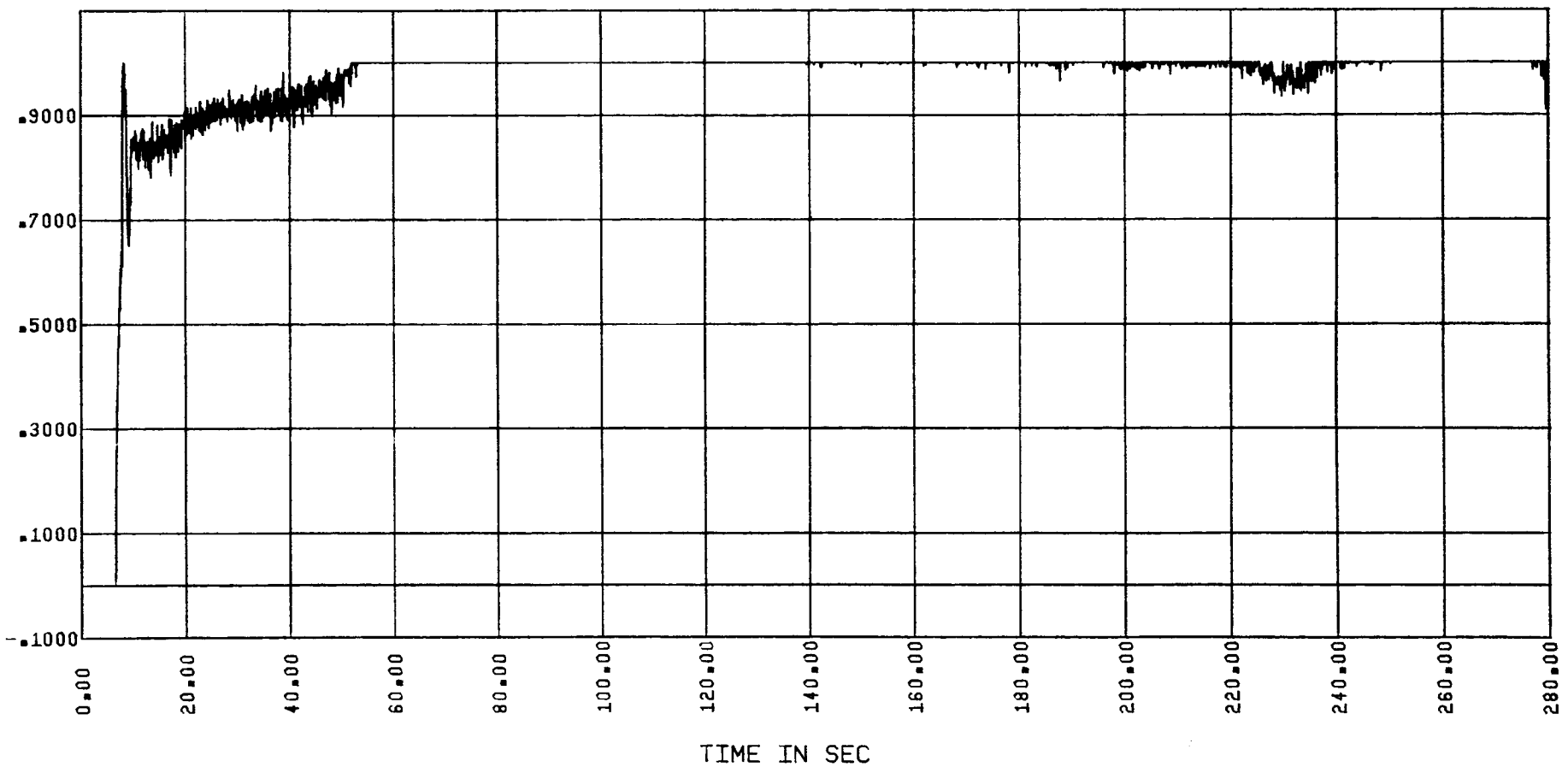
TEST 1267/1000 PSIA LR FWD BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17



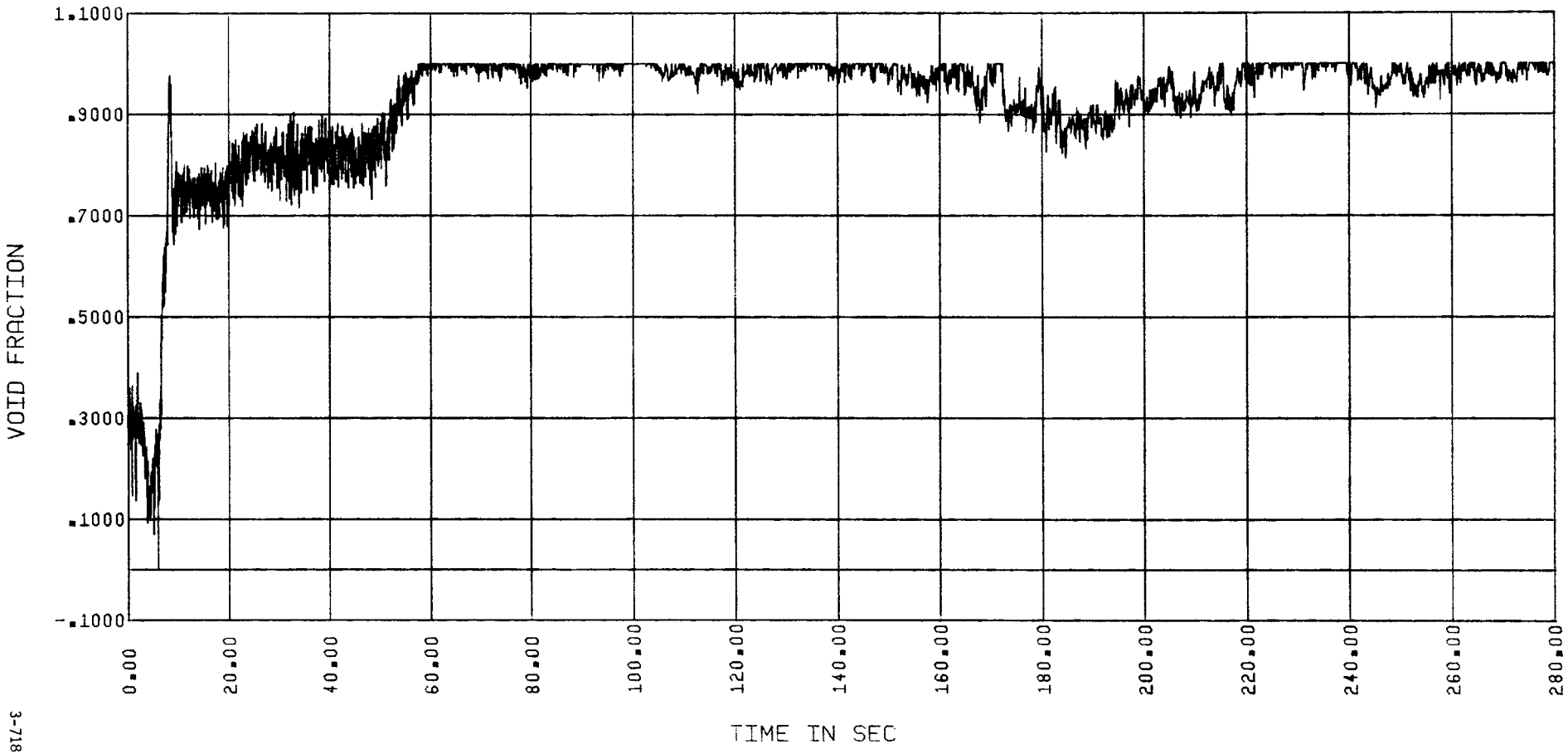
TEST 1267/1000 PSIA LR FWD BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18

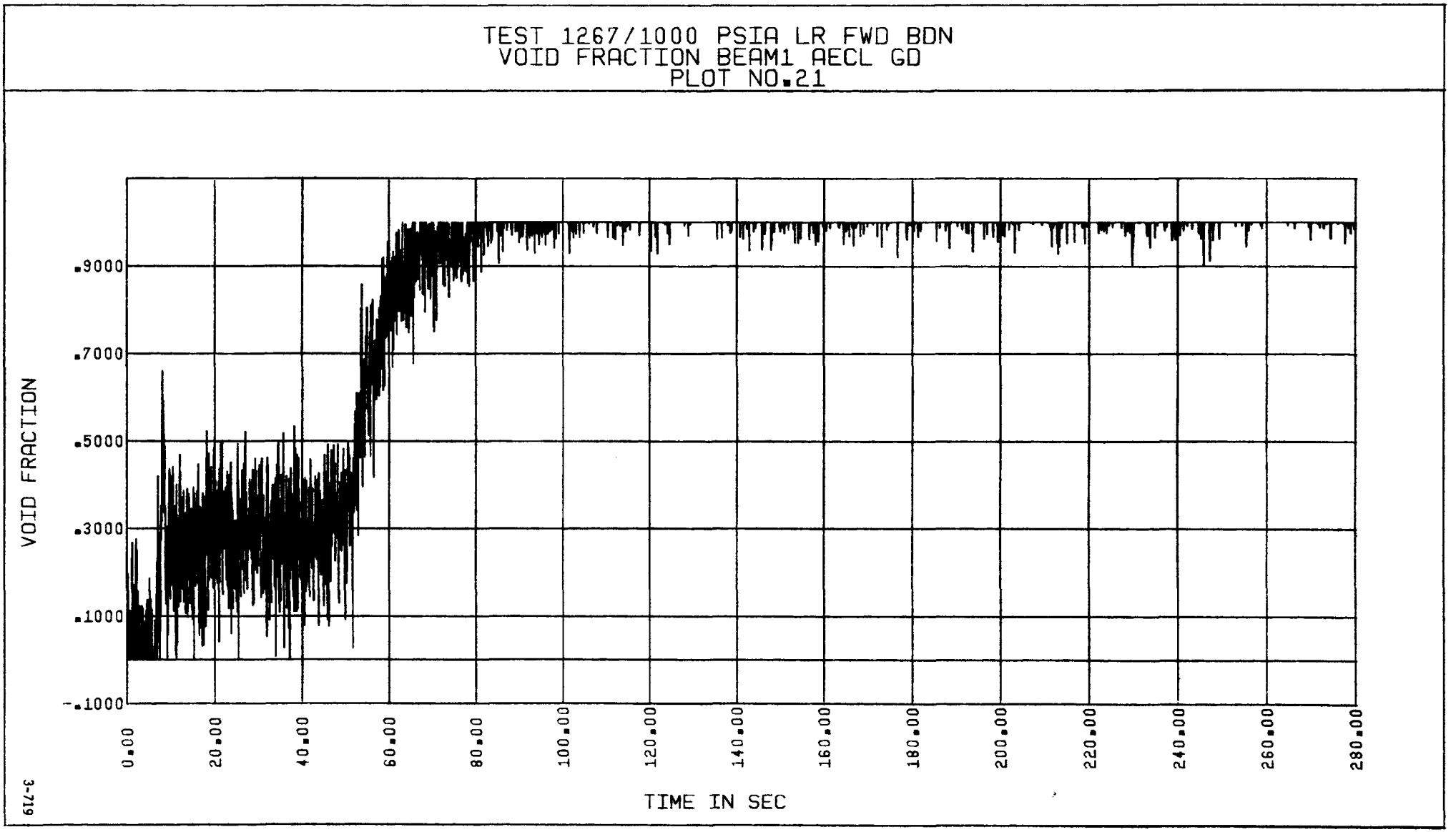


TEST 1267/1000 PSIA LR FWD BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19

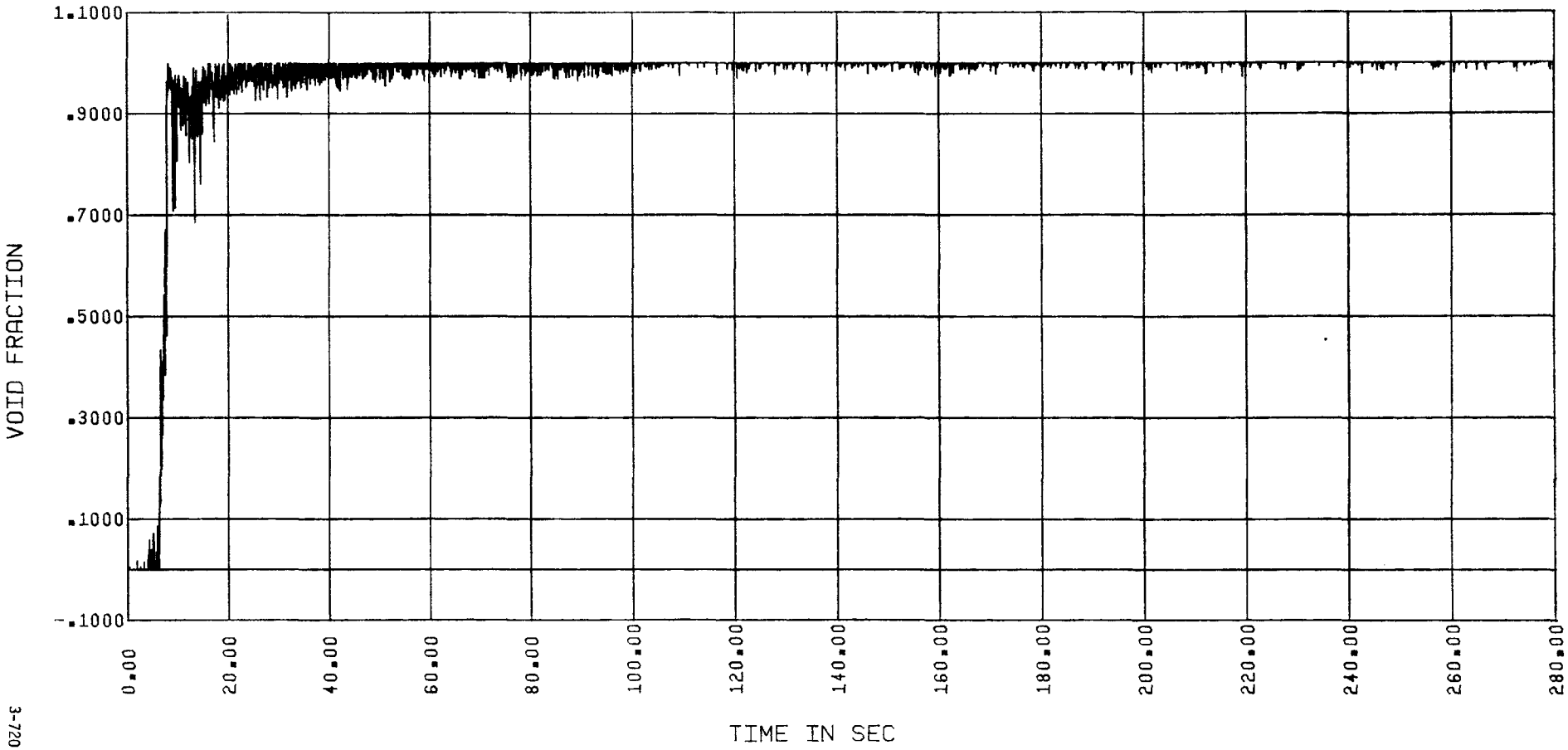


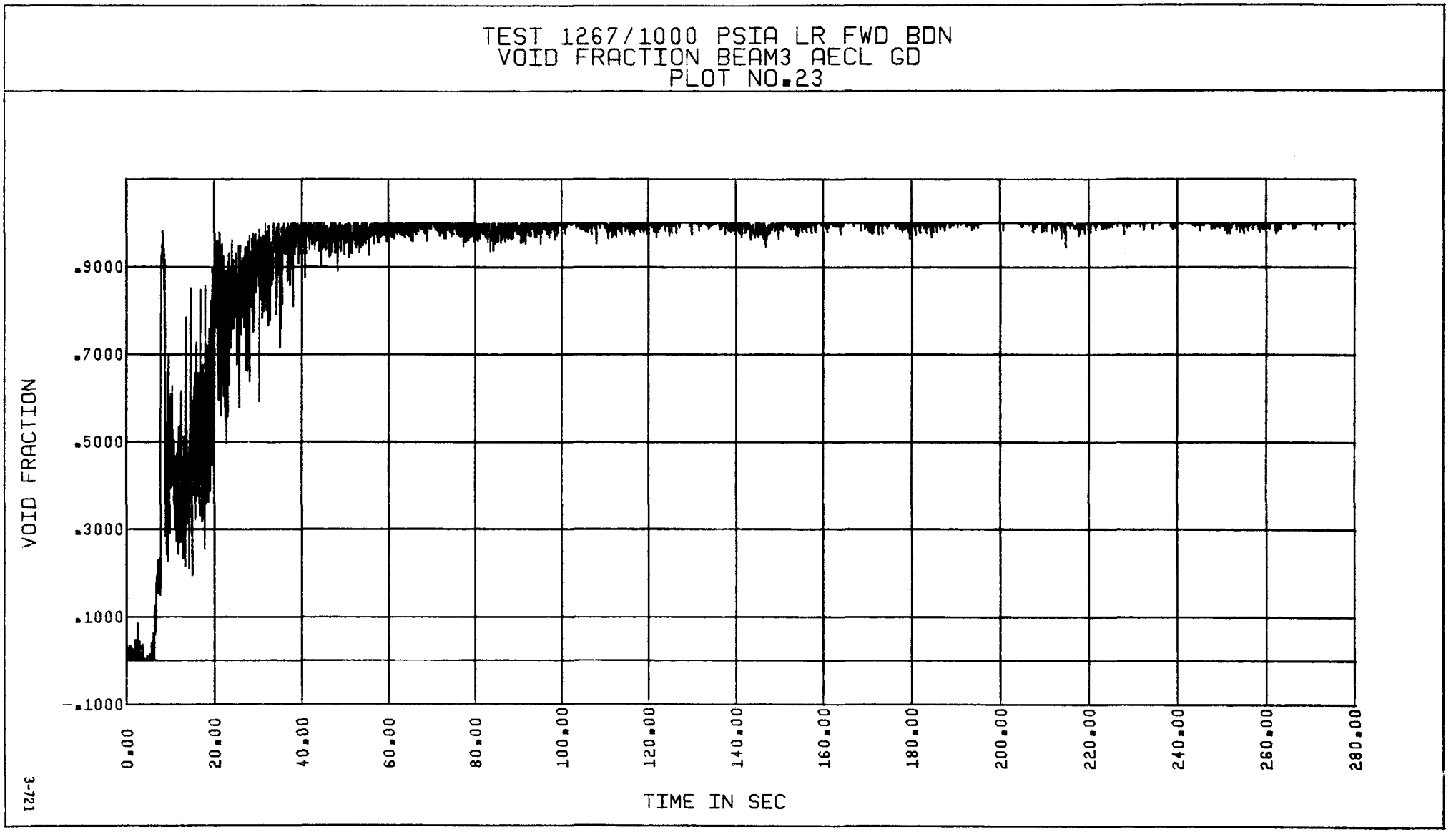
TEST 1267/1000 PSIA LR FWD BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20



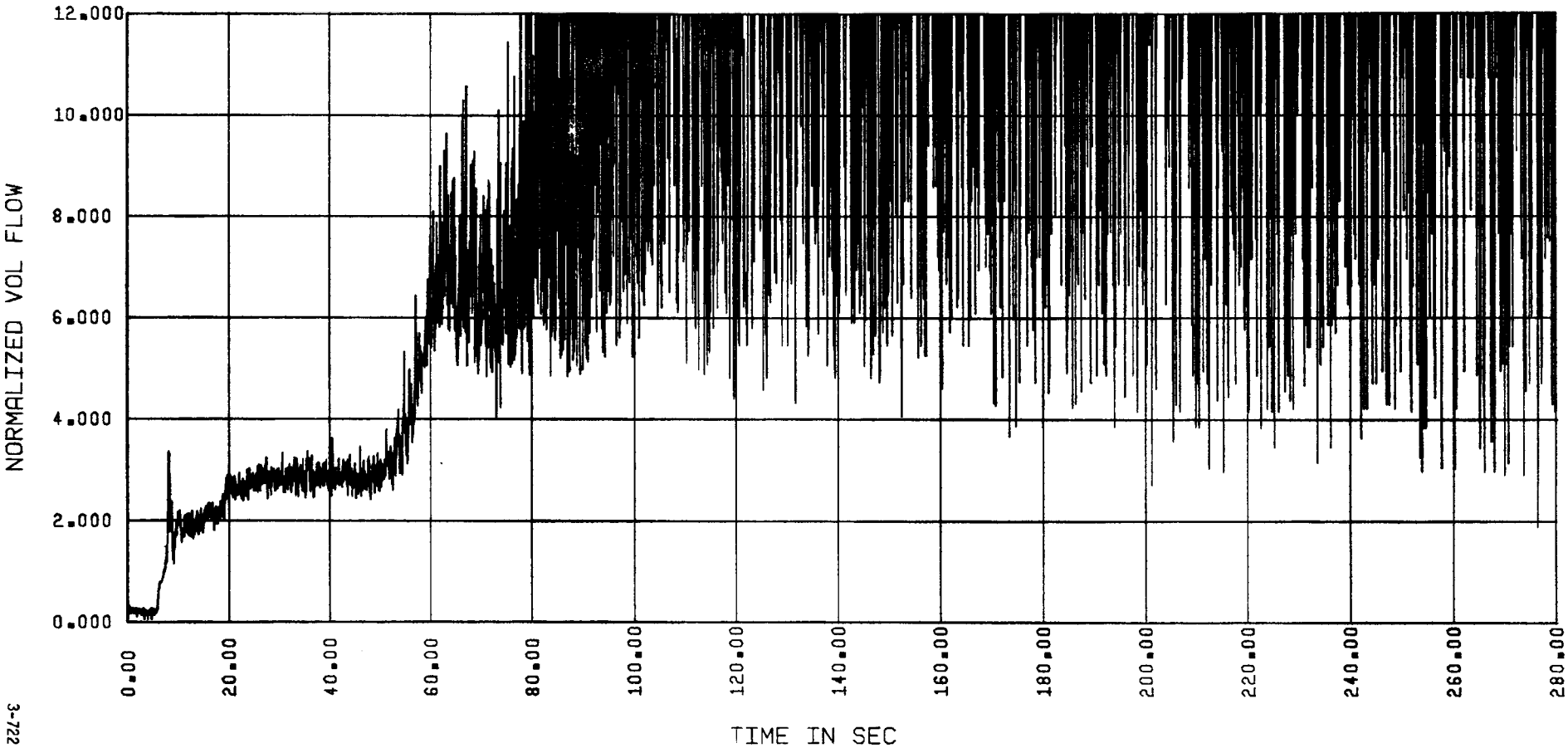

TEST 1267/1000 PSIA LR FWD BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-719

TEST 1267/1000 PSIA LR FWD BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22

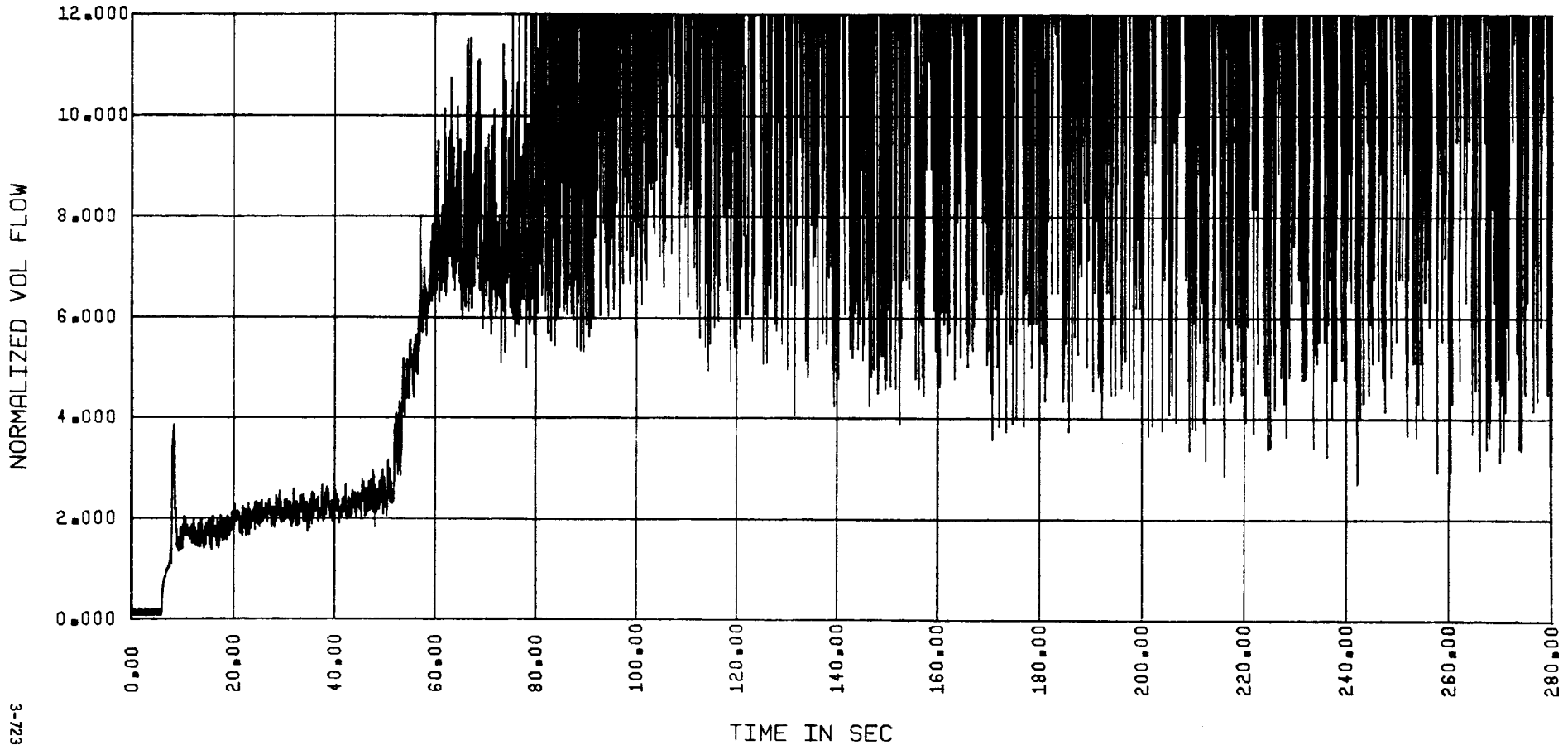



TEST 1267/1000 PSIA LR FWD BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

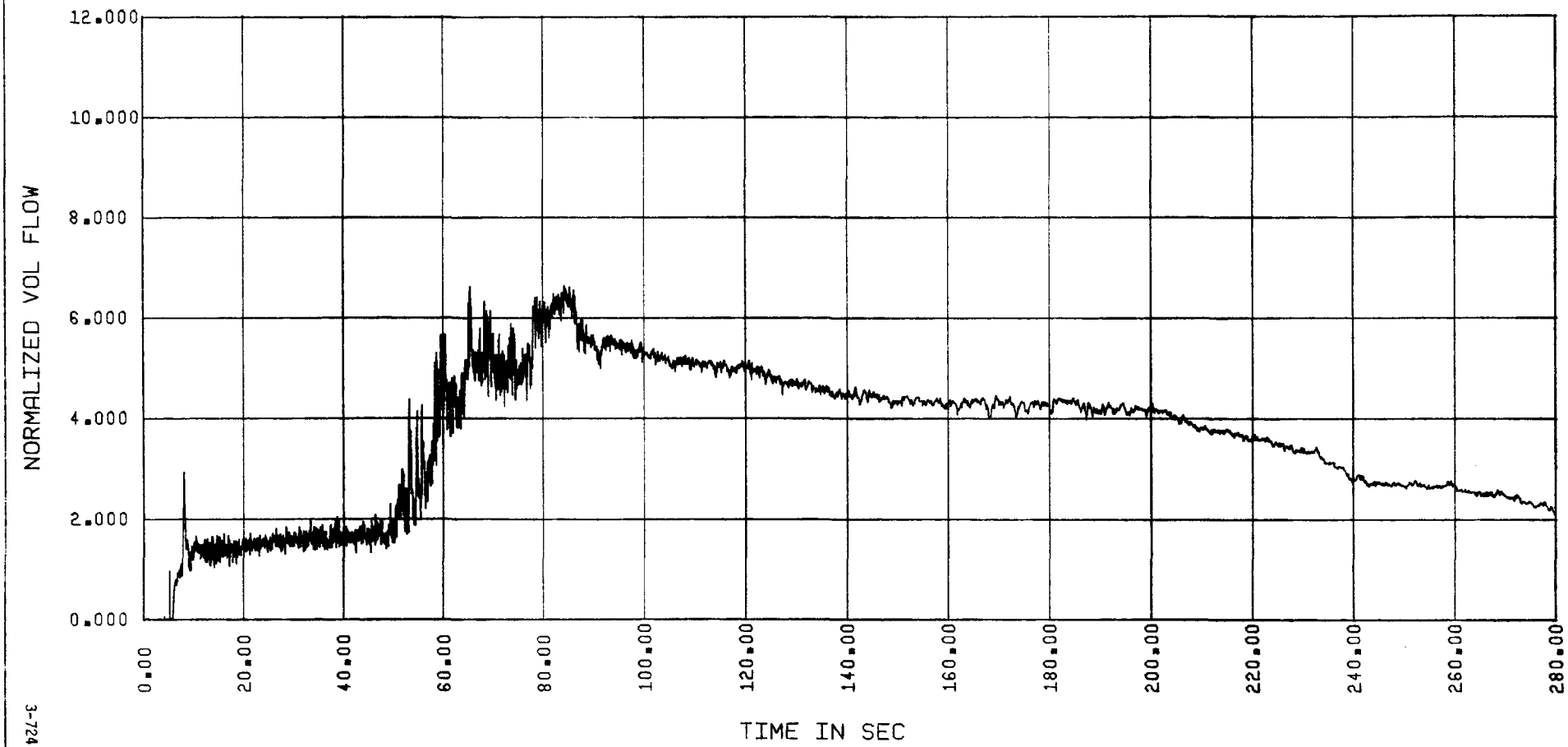
TEST 1267/1000 PSIA LR FWD BDN
NORM VOL FLOW RATE LO-DD/GD2 S
PLOT NO.24



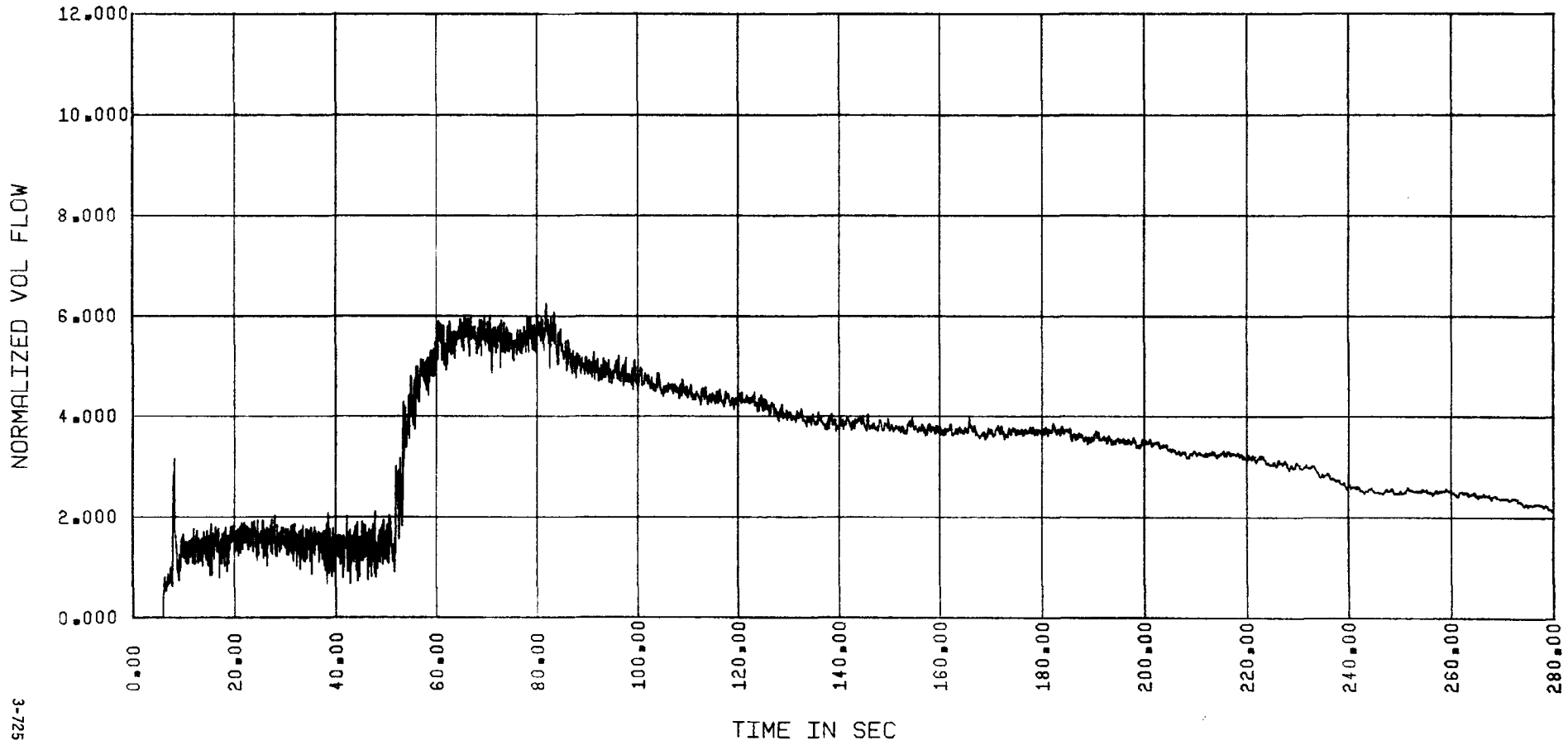
TEST 1267/1000 PSIA LR FWD BDN
NORM VOL FLOW RATE HI-DD/GD2 S
PLOT NO.25



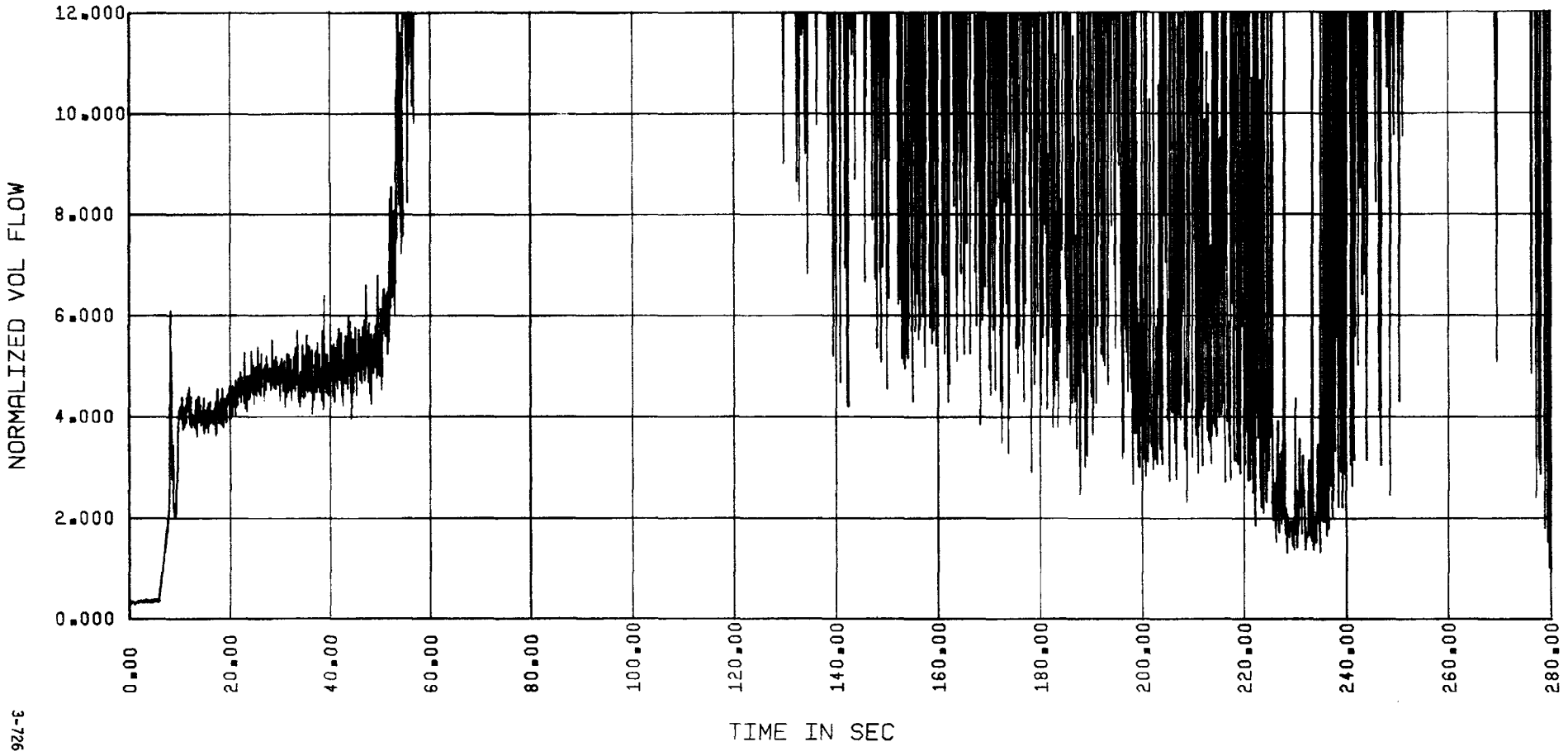
TEST 1267/1000 PSIA LR FWD BDN
NORM VOL FLOW RATE LO-TM SUCT
PLOT NO.26



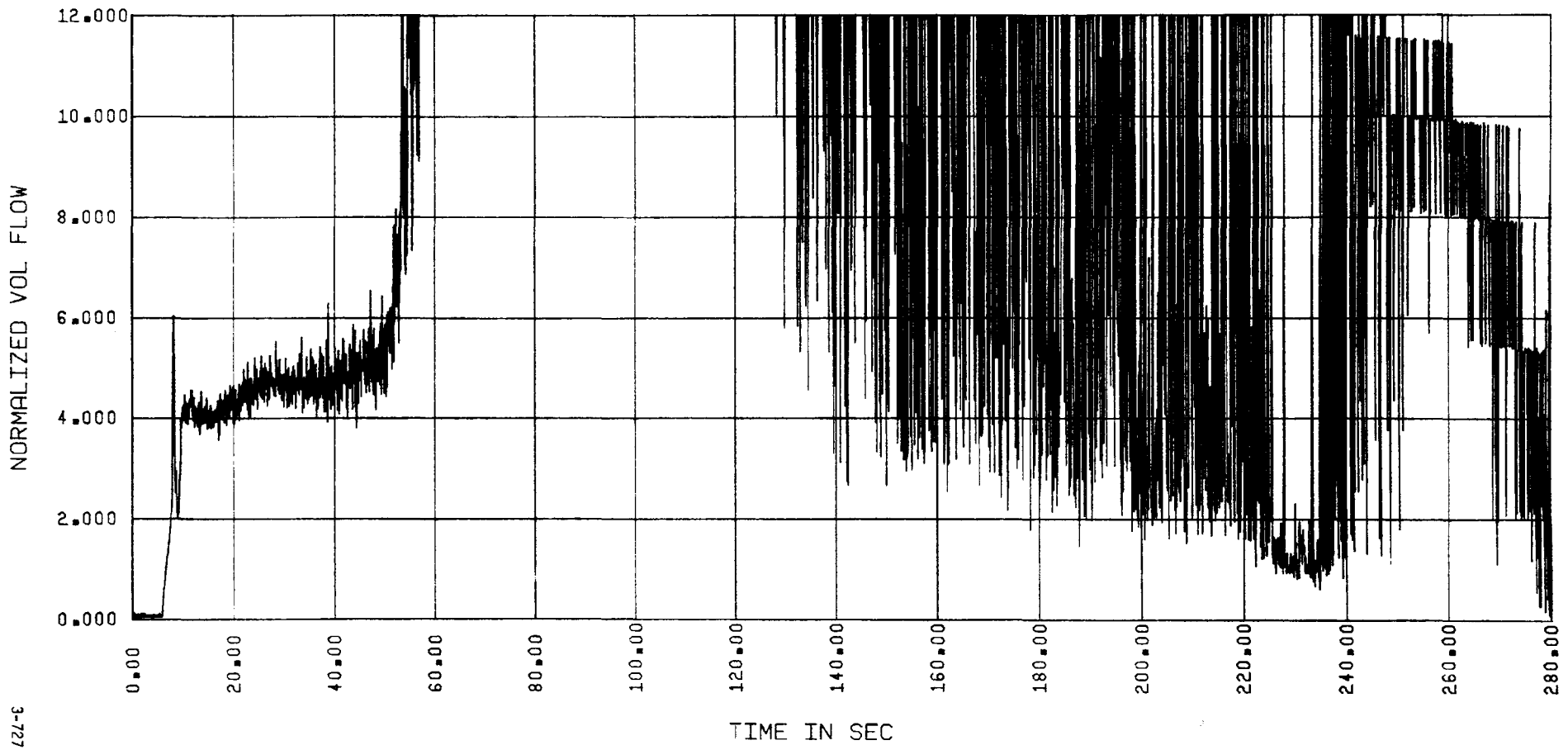
TEST 1267/1000 PSIA LR FWD BDN
NORM VOL FLOW RATE HI-TM SUCT
PLOT NO.27



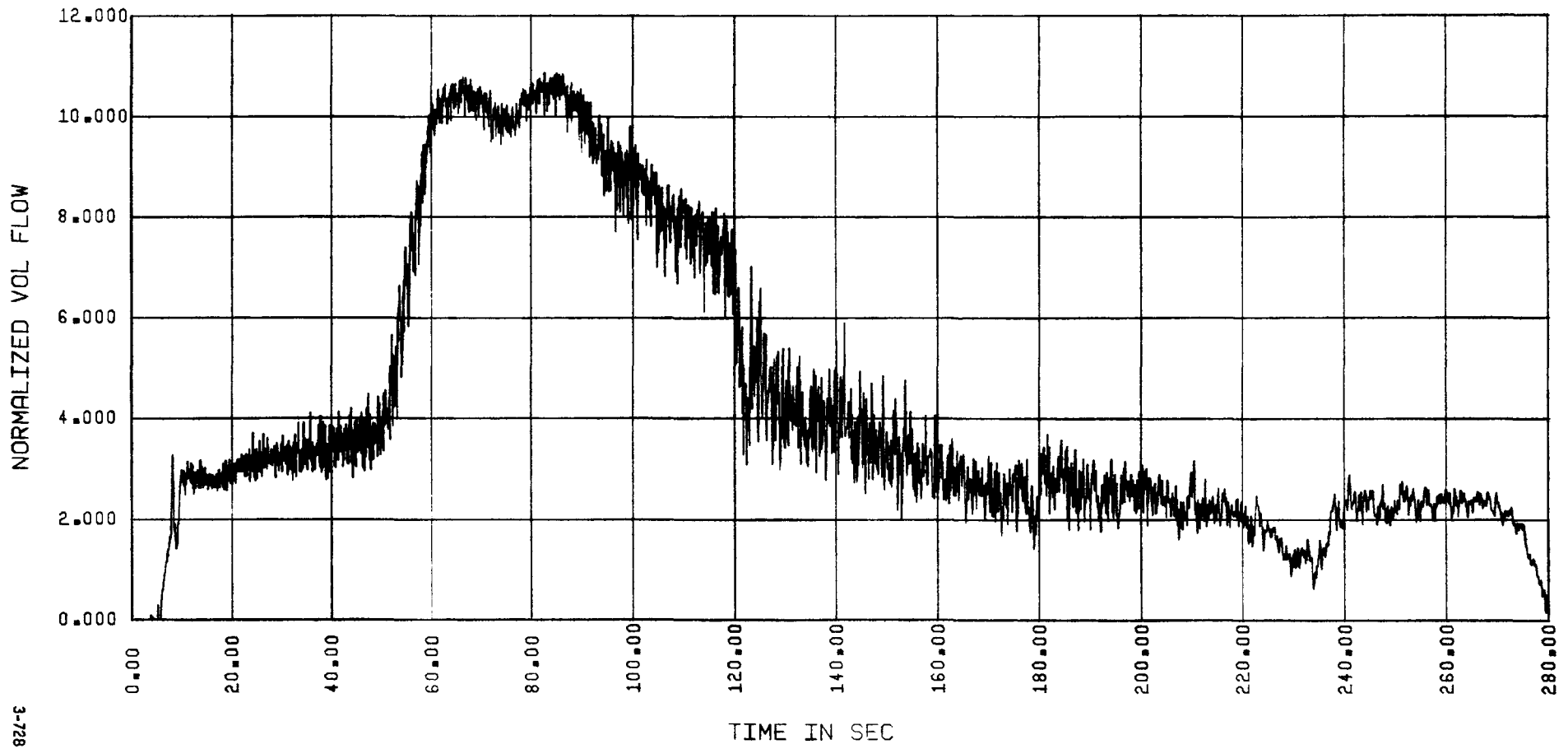
TEST 1267/1000 PSIA LR FWD BDN
NORM VOL FLOW RATE LO-DD/GD2 D
PLOT NO.28



TEST 1267/1000 PSIA LR FWD BDN
NORM VOL FLOW RATE HI-DD/GD2 D
PLOT NO.29



TEST 1267/1000 PSIA LR FWD BDN
NORM VOL FLOW RATE LO-TM DSCH
PLOT NO.30



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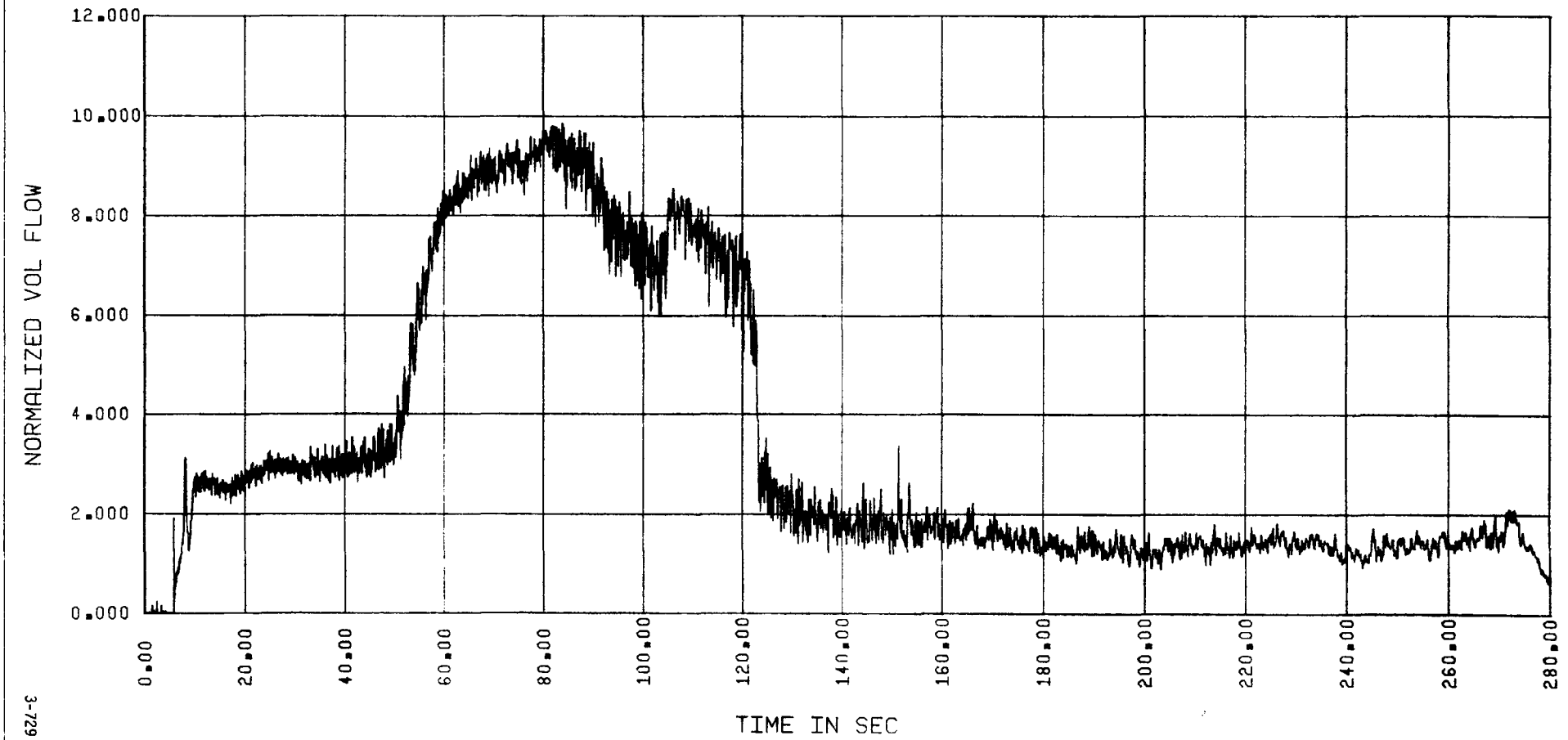
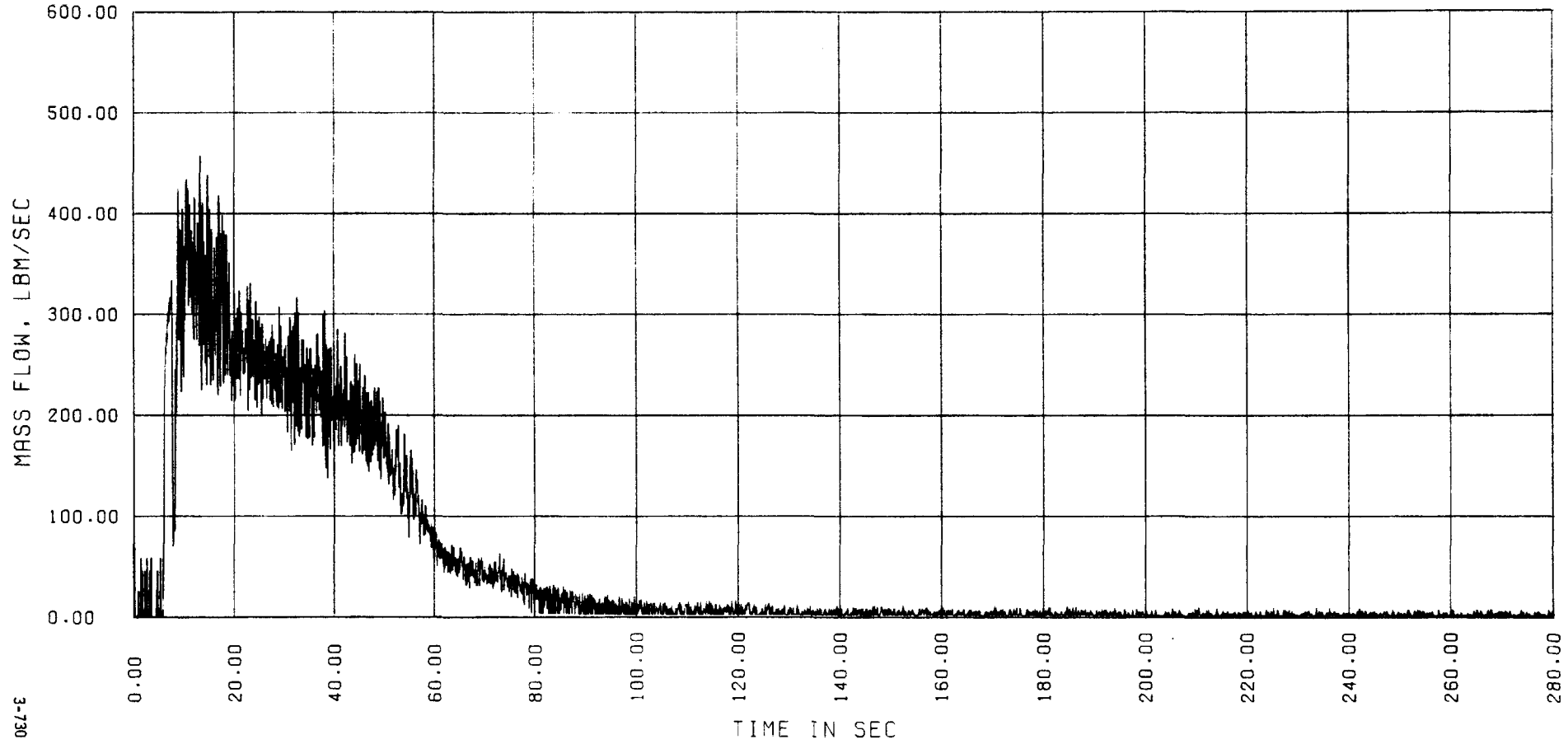
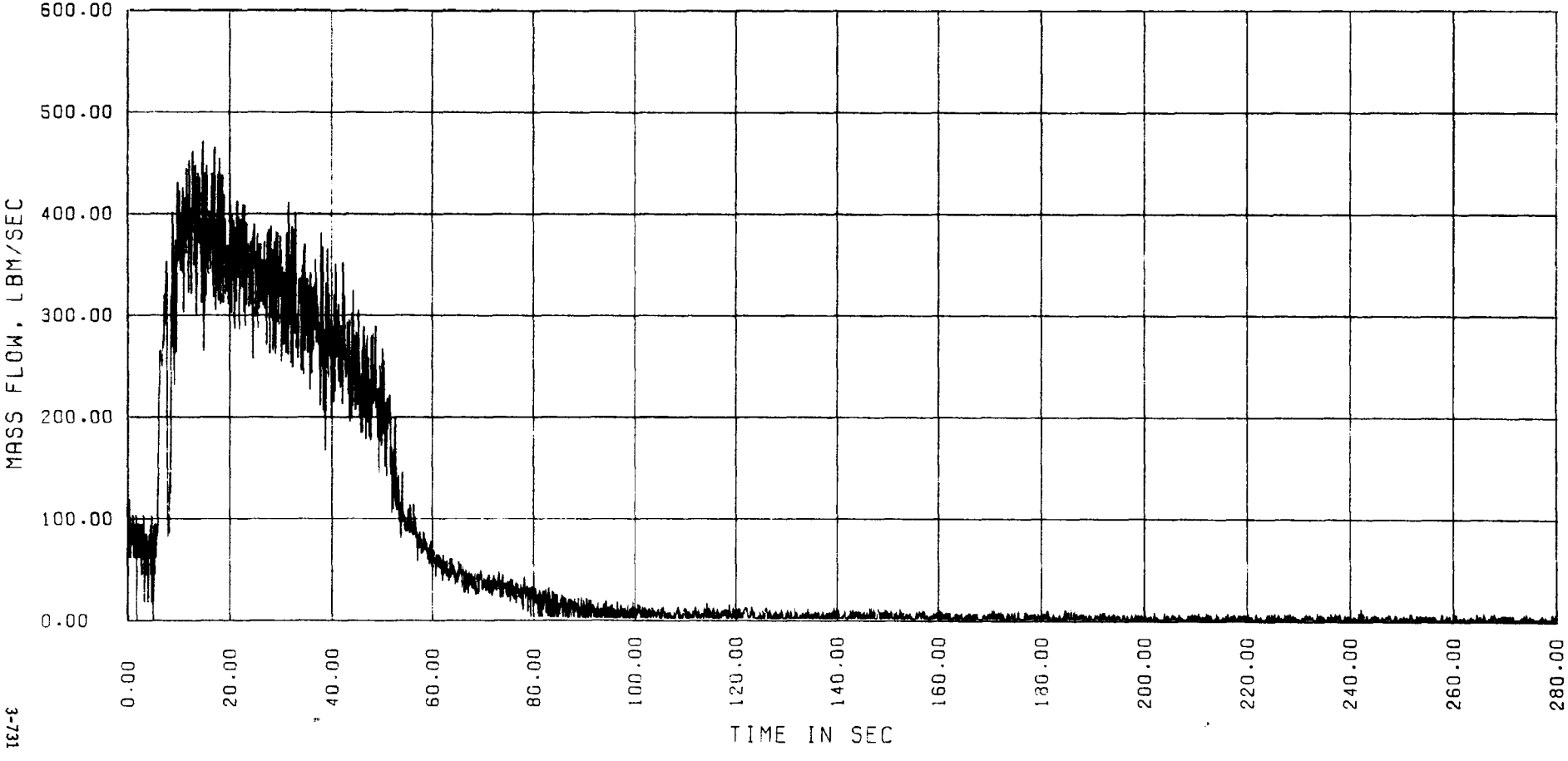
TEST 1267/1000 PSIA LR FWD BDN
NORM VOL FLOW RATE HI-TM DSCH
PLOT NO.31



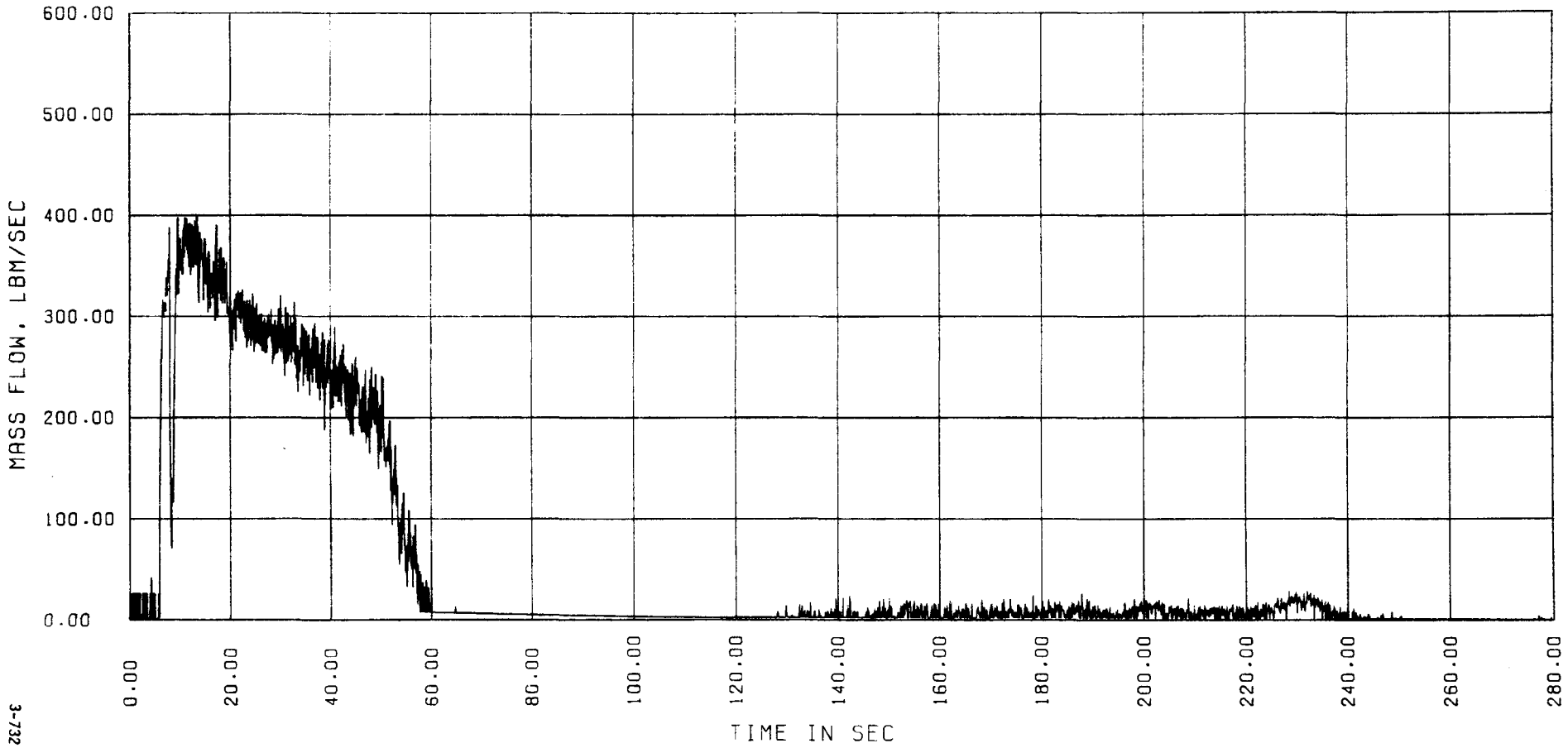
TEST 1267/1000 PSIA LR FWD BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.32



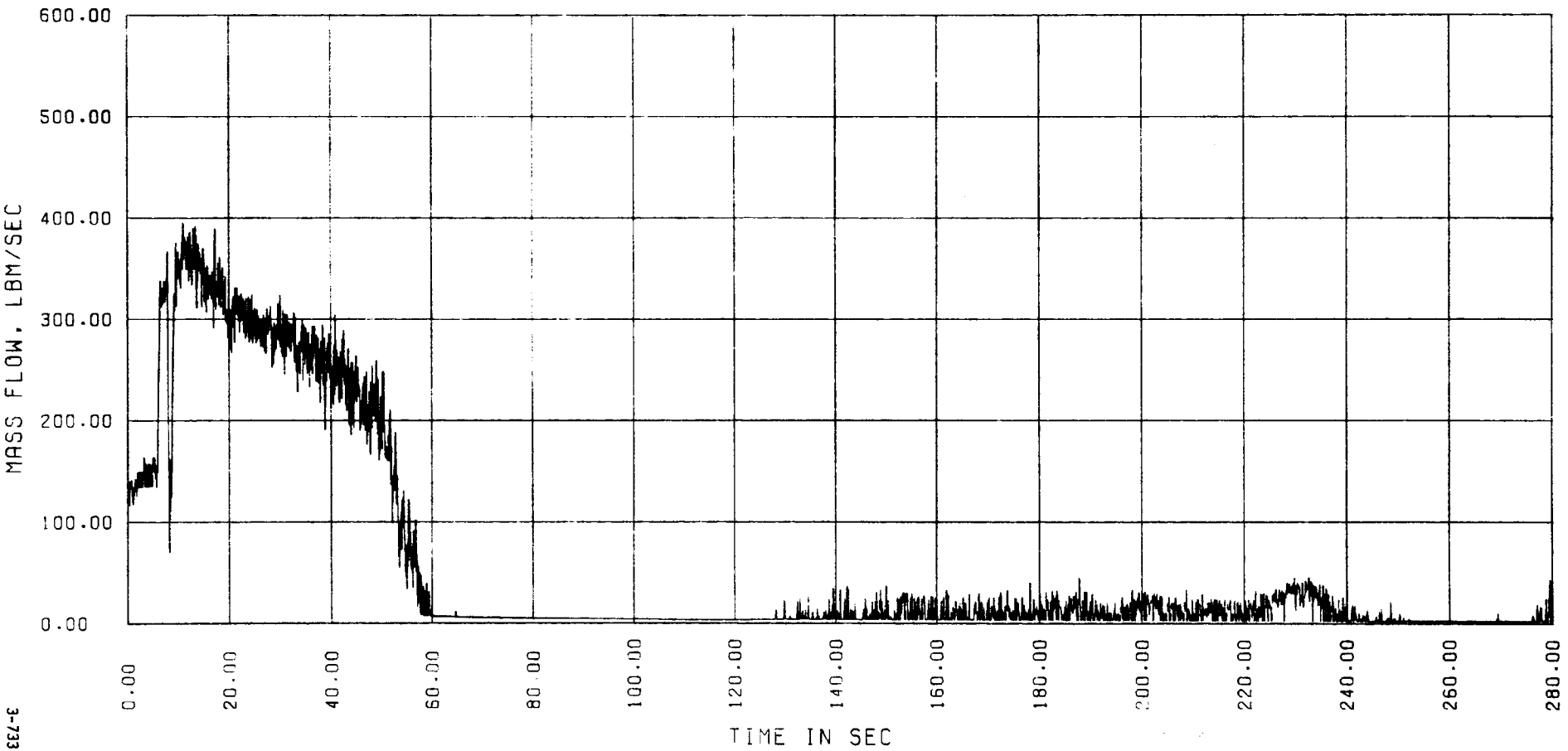
TEST 1267/1000 PSIA LR FWD BDN
MASS FLOW RATE LO-DO/GO2 SUCT
PLOT NO.33

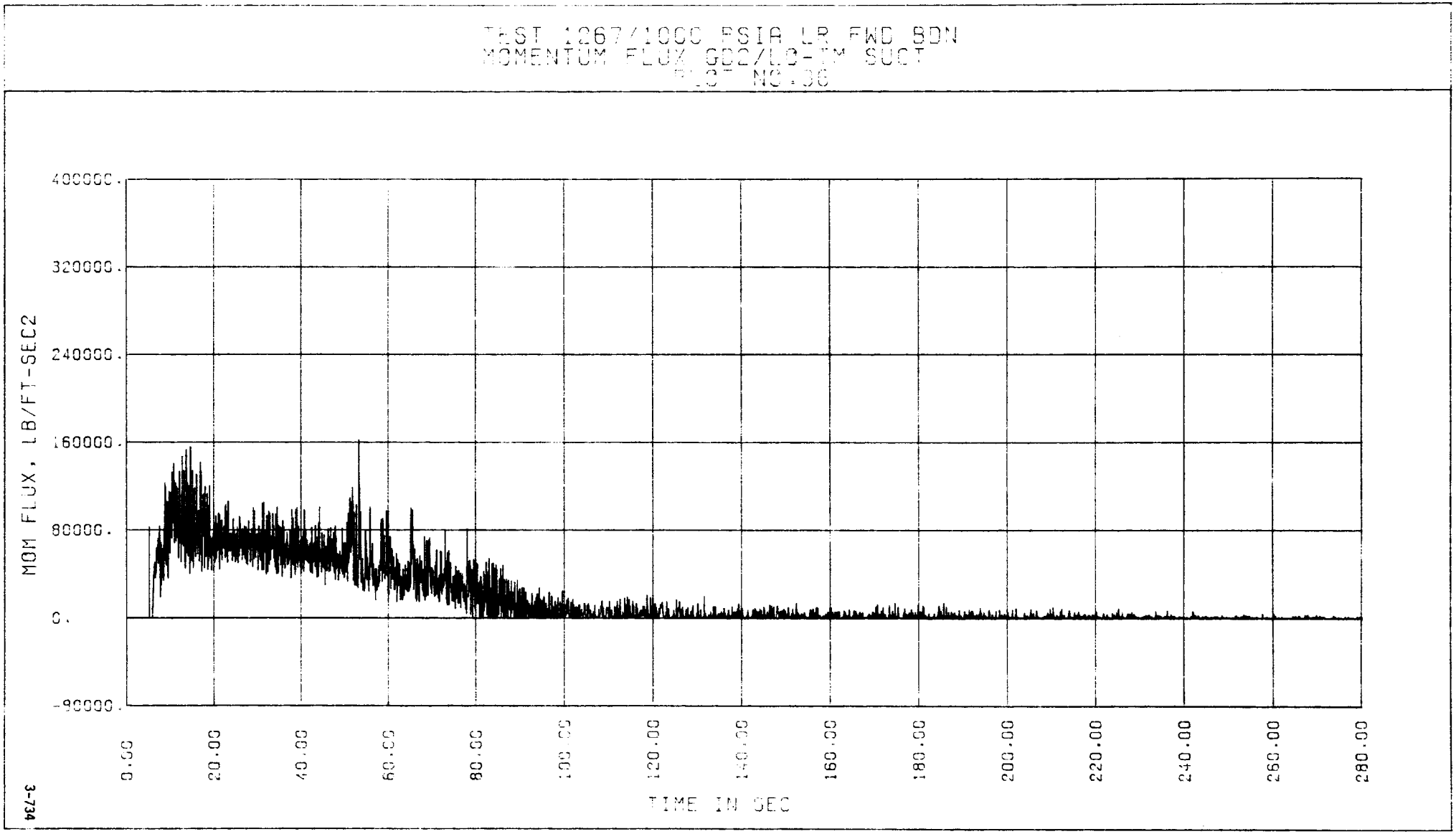


TEST 1267/1000 PSIA LR FWD BDN
MASS FLOW RATE HI-DD/GD2 DISCH
PLOT NO.34

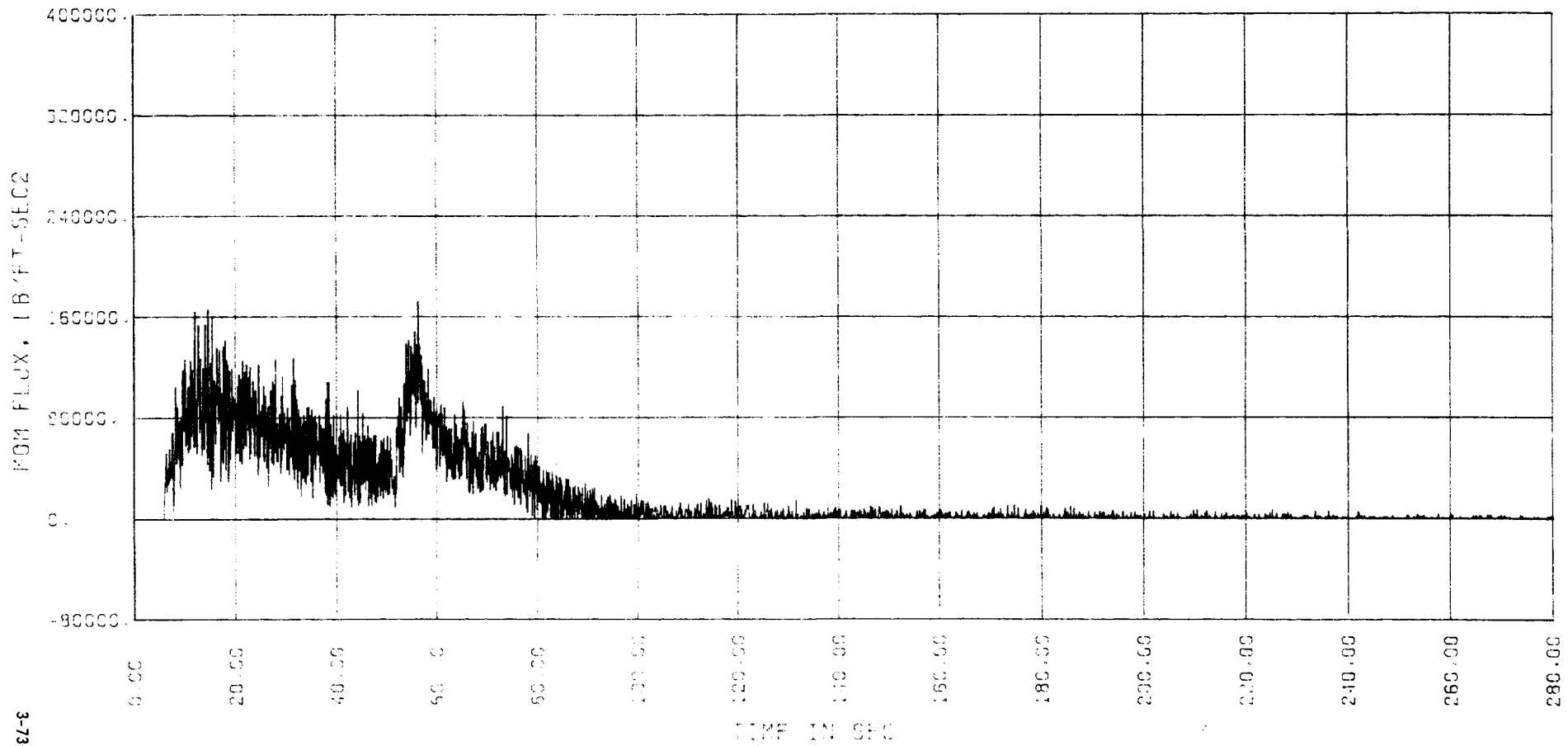


TEST 1267/1000 PSIA LR FWD BDN
MASS FLOW RATE LO-OD/GO2 DISCH
PLOT NO.35

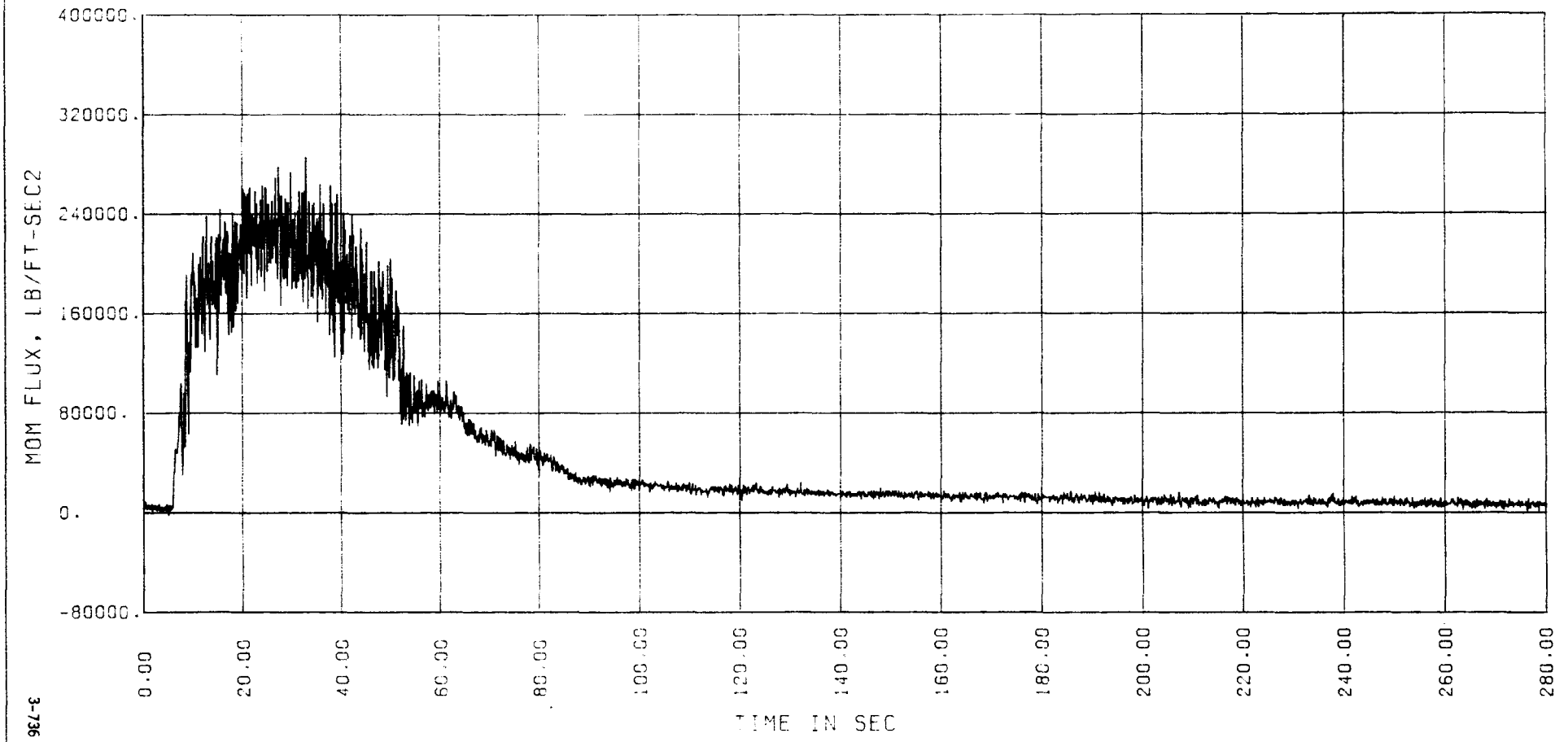



TEST 1267/1000 PSIA LR FWD BDN
MOMENTUM FLUX GB2/LB-FM SUCT
PLOT NO 38
400000.
320000.
240000.
160000.
80000.
0.
-80000.
MOM FLUX, LB/FT-SEC2
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

TEST 1267/1000 PSIA LR FWD BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.37



TEST 1267/1000 PSIA LR FWD BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



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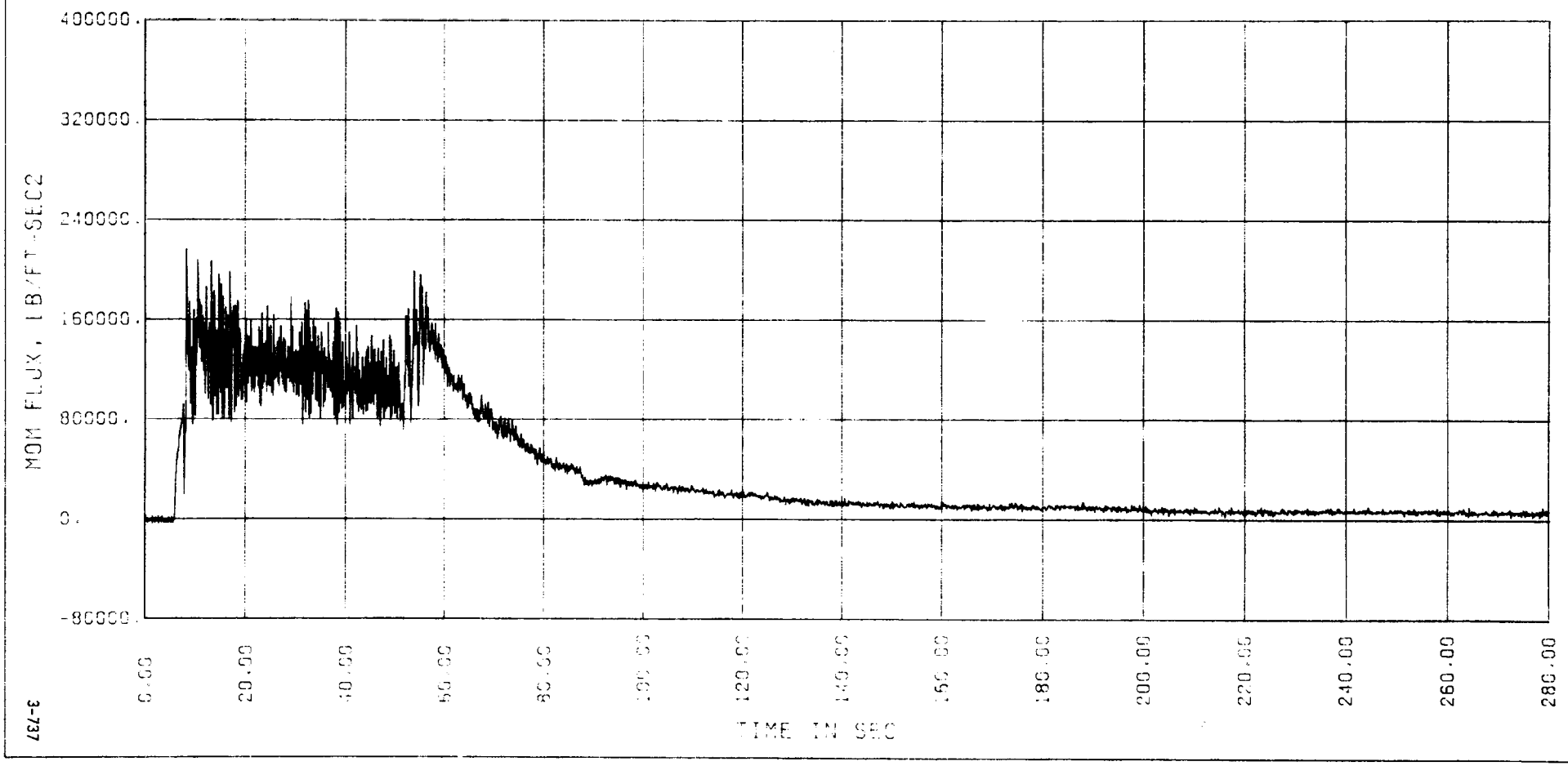
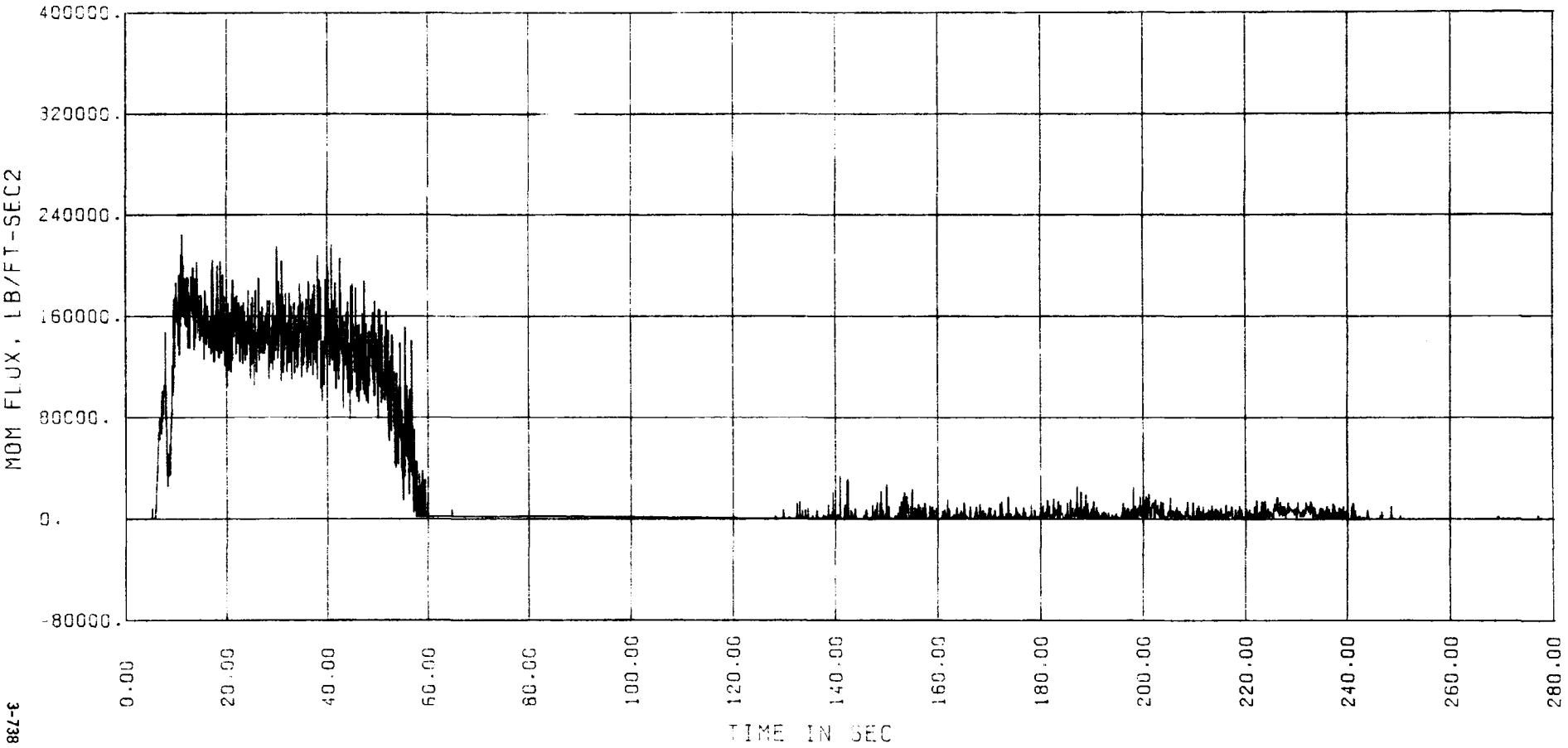
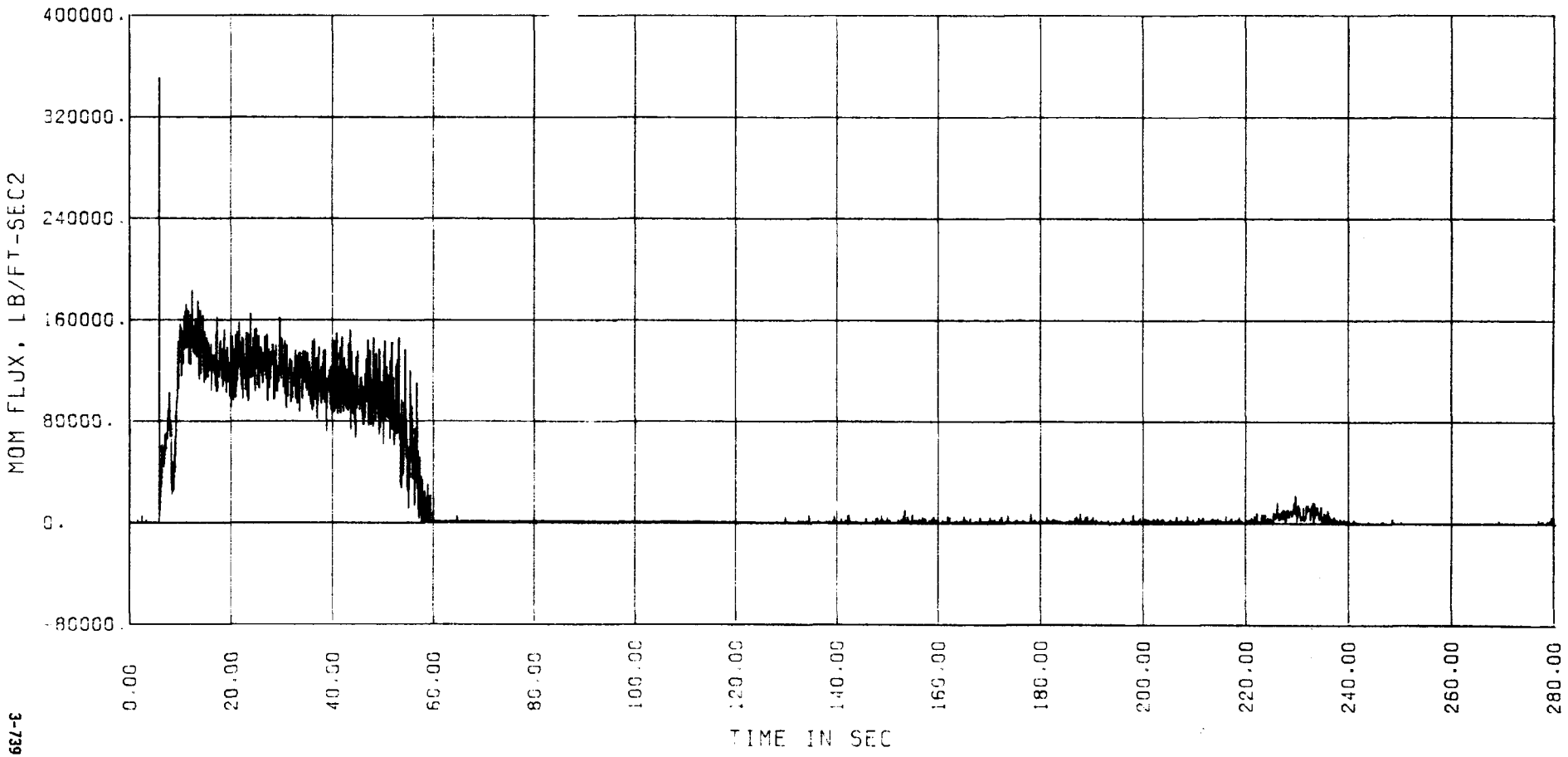
TEST 1267/1000 PSIA LR FWD BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39



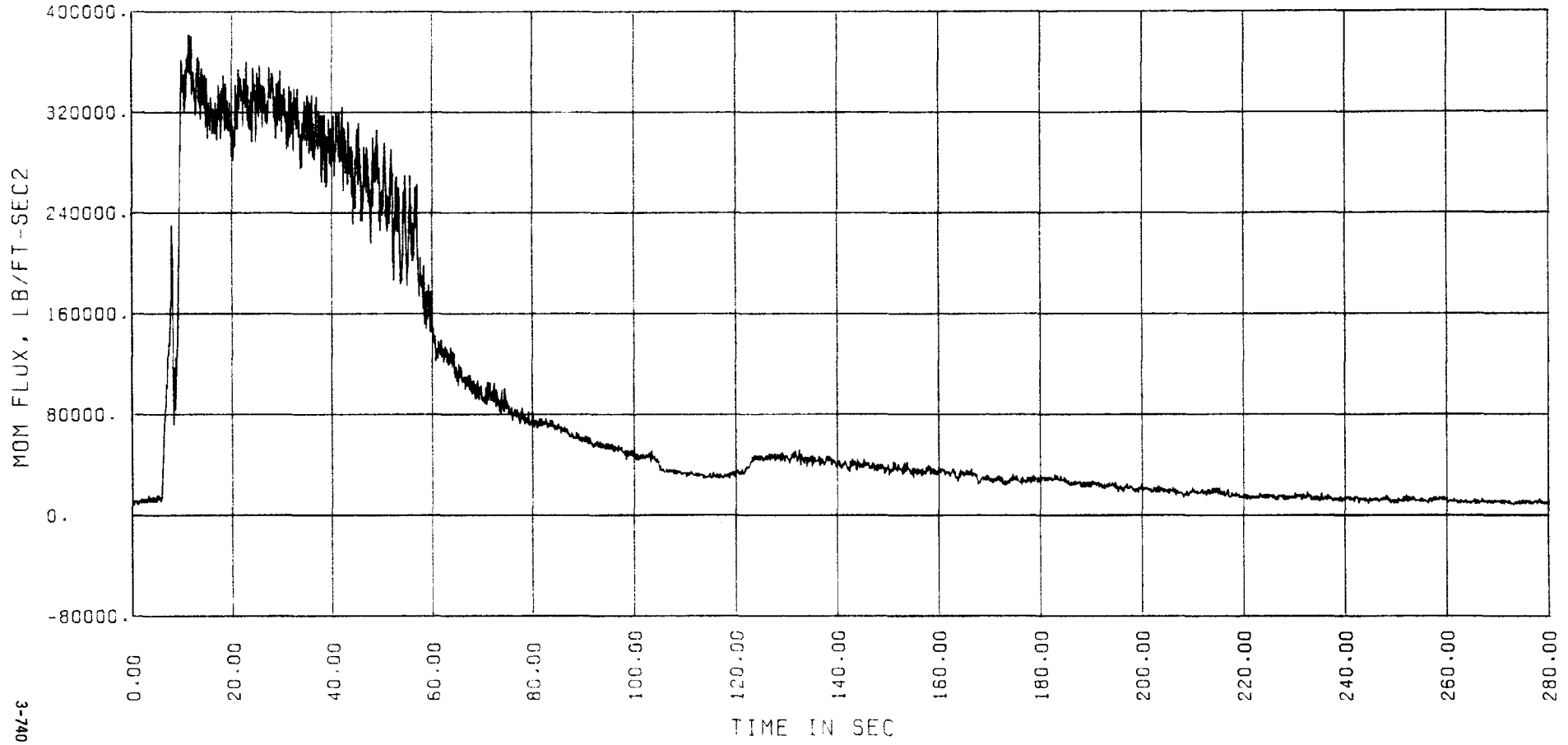
TEST 1267/1000 PSIA LR FWD BDN
MOMENTUM FLUX GO2/LO-TM DISCH
PLOT NO.40



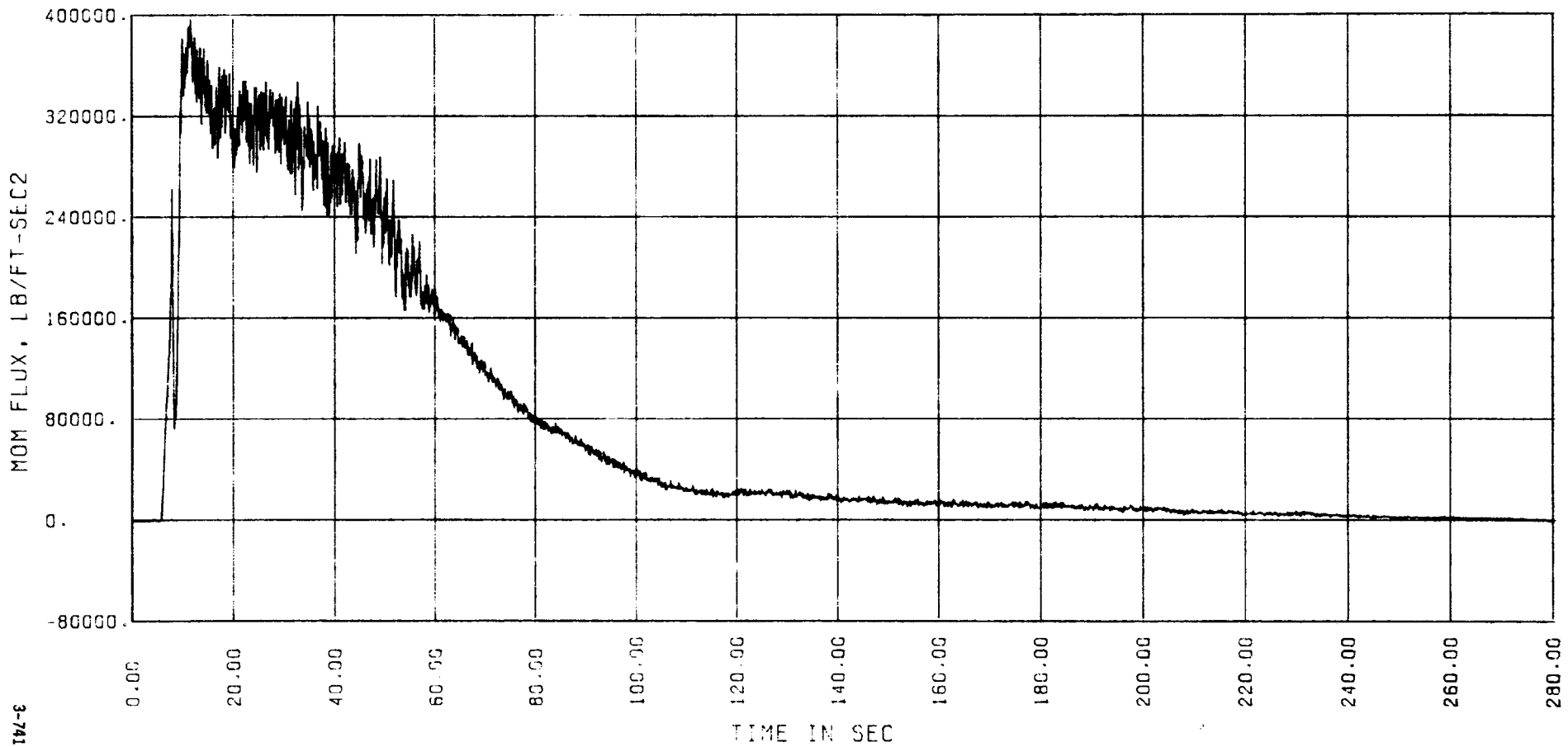
TEST 1267/1000 PSIA LR FWD BDN
MOMENTUM FLUX GD2/HI-TM DISCH
PLOT NO.41



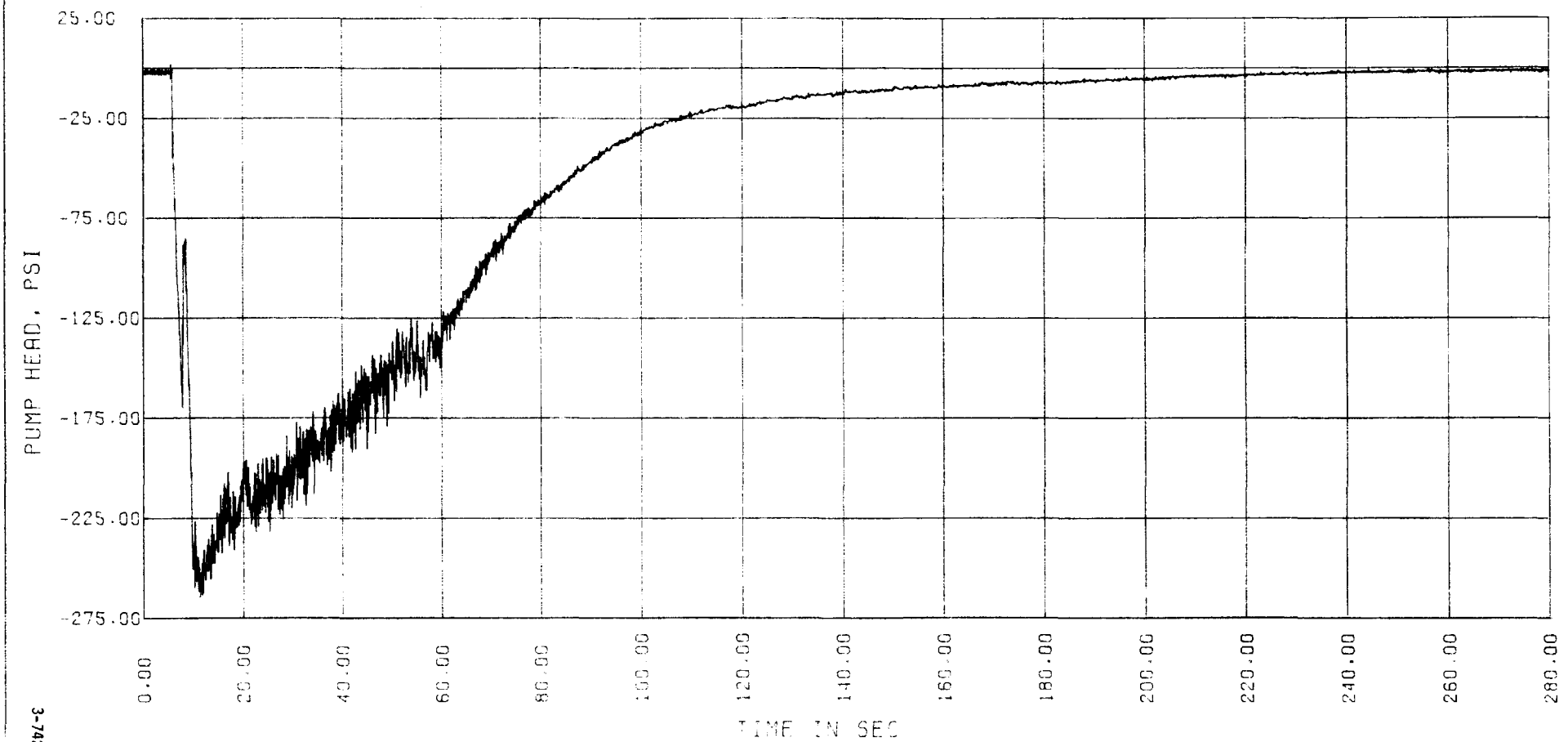
TEST 1267/1000 PSIA LR FWD BDN
MOMENTUM FLUX LO-OD DISCHARGE
PLOT NO.42

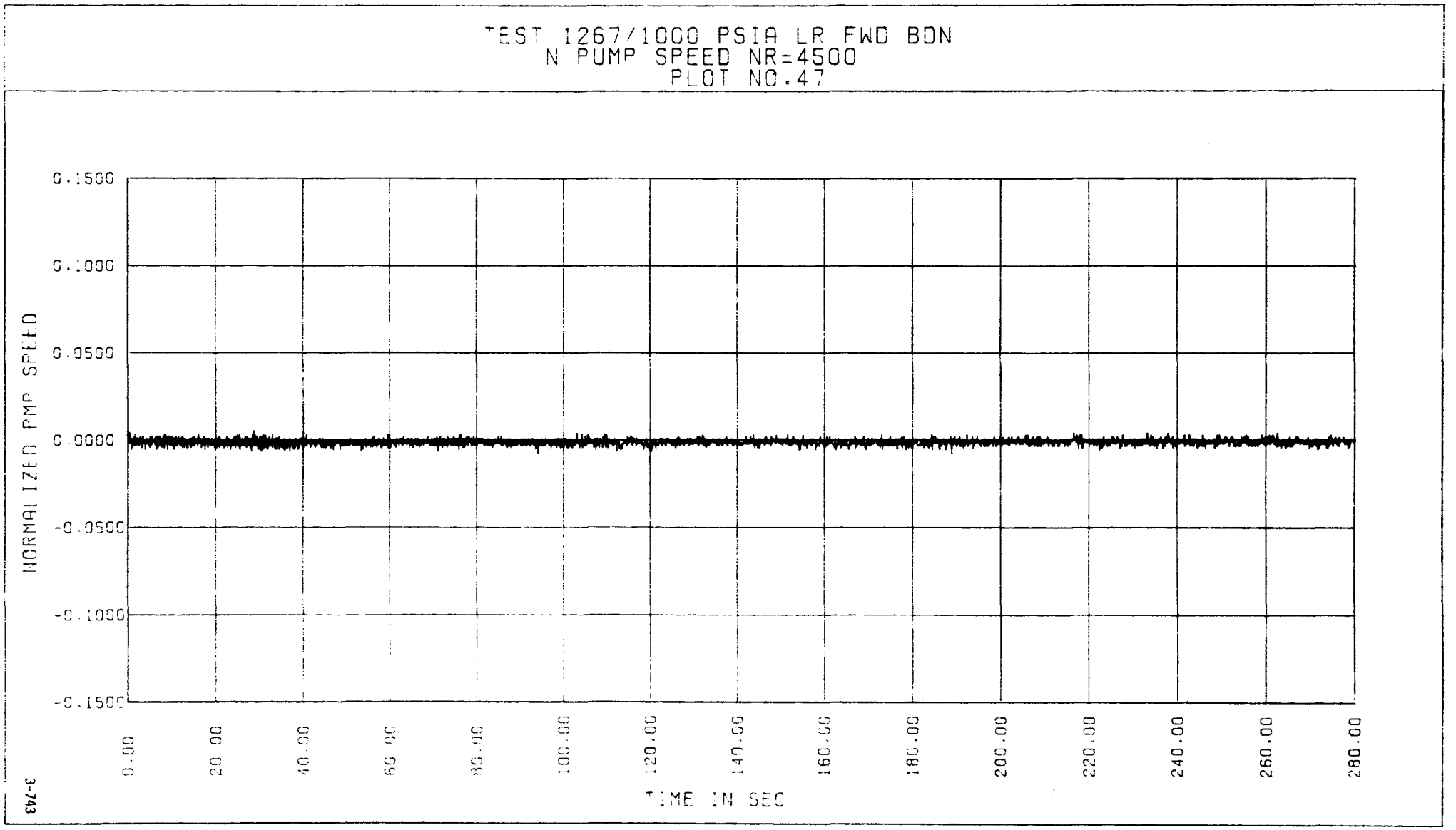


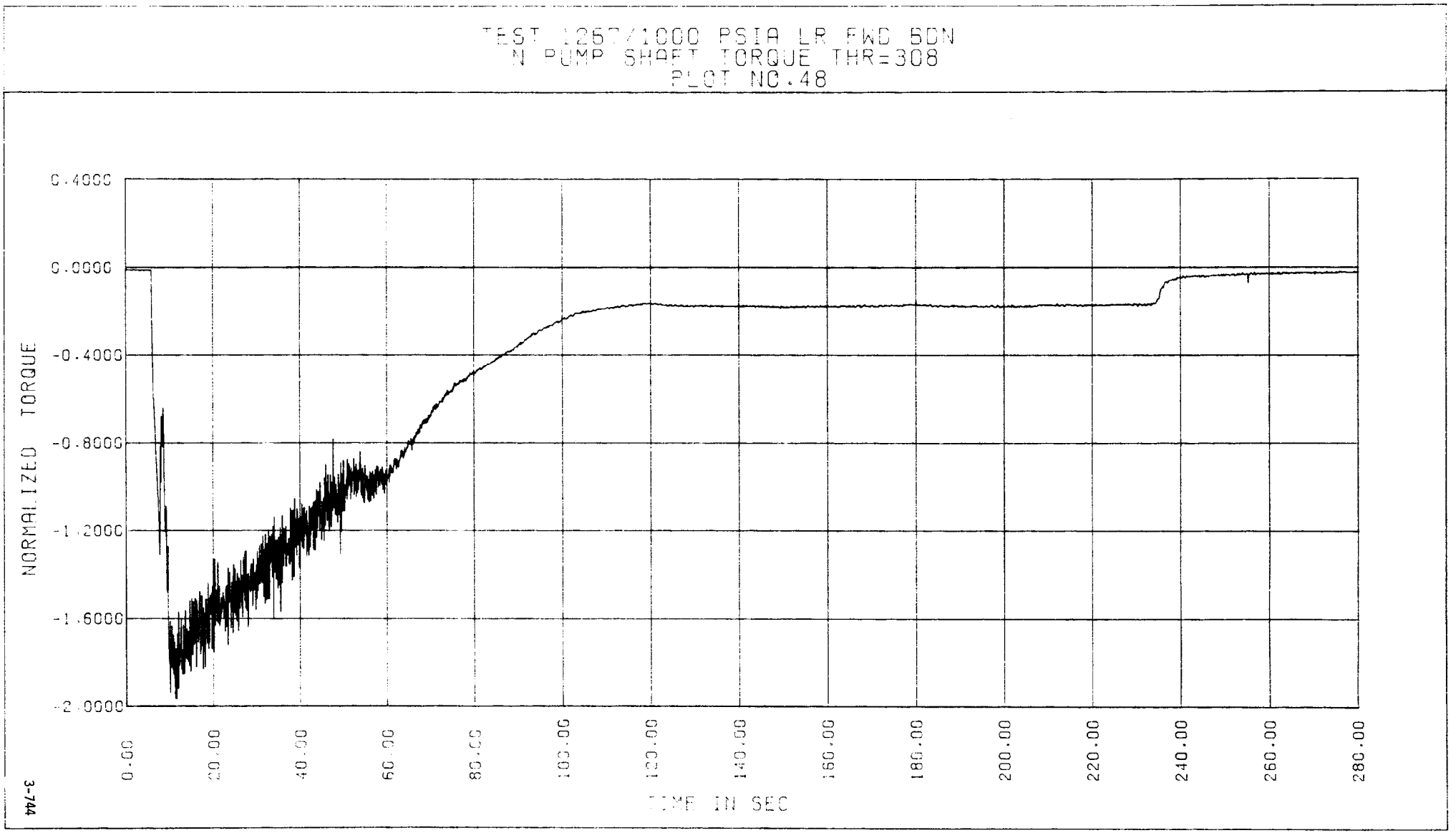
TEST 1267/1000 PSIA LR FWD BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.43

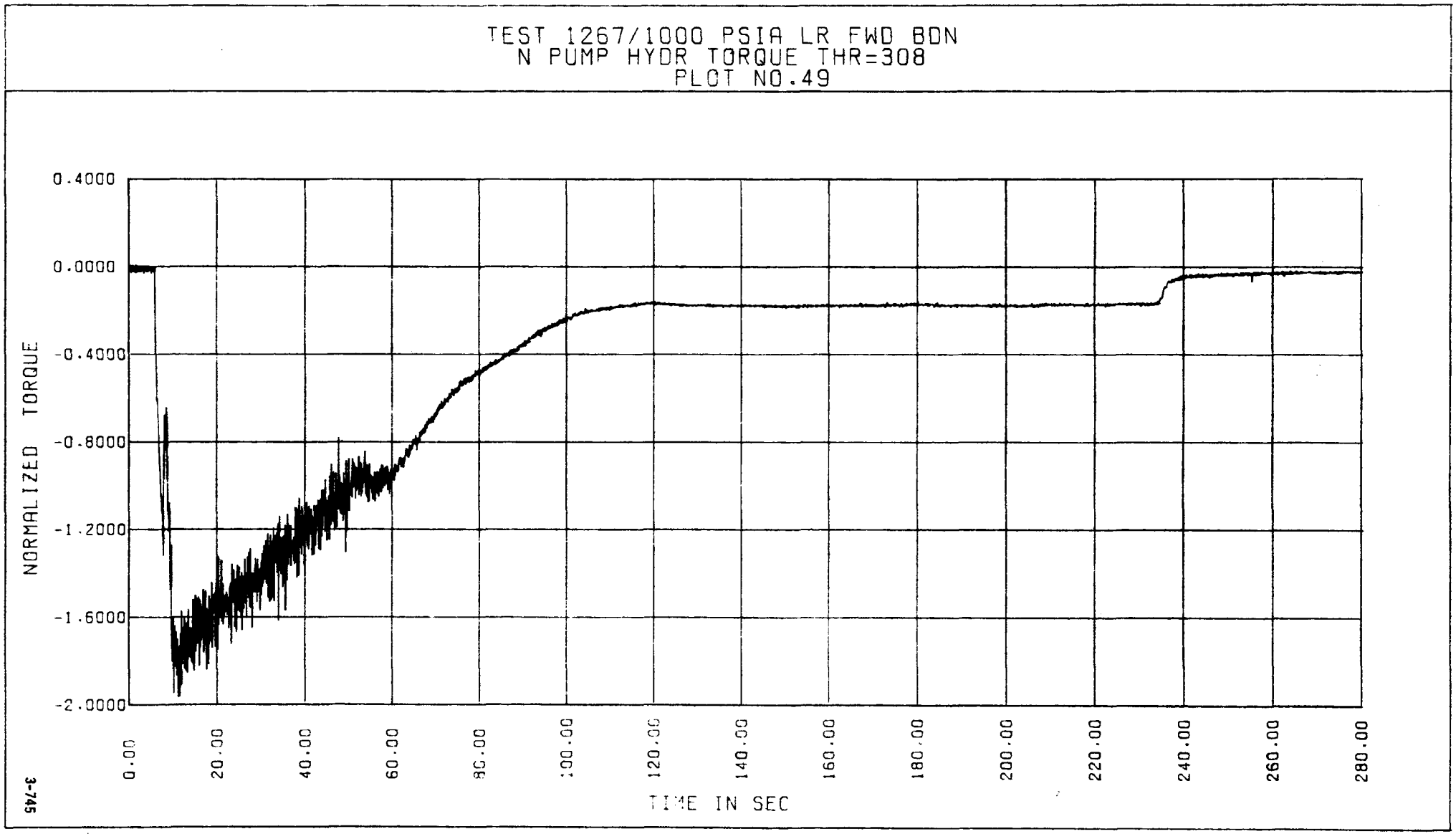


TEST 1267 1000 PSIA LR FWD BDN
PUMP HEAD IN PSI
PLOT NO. 44

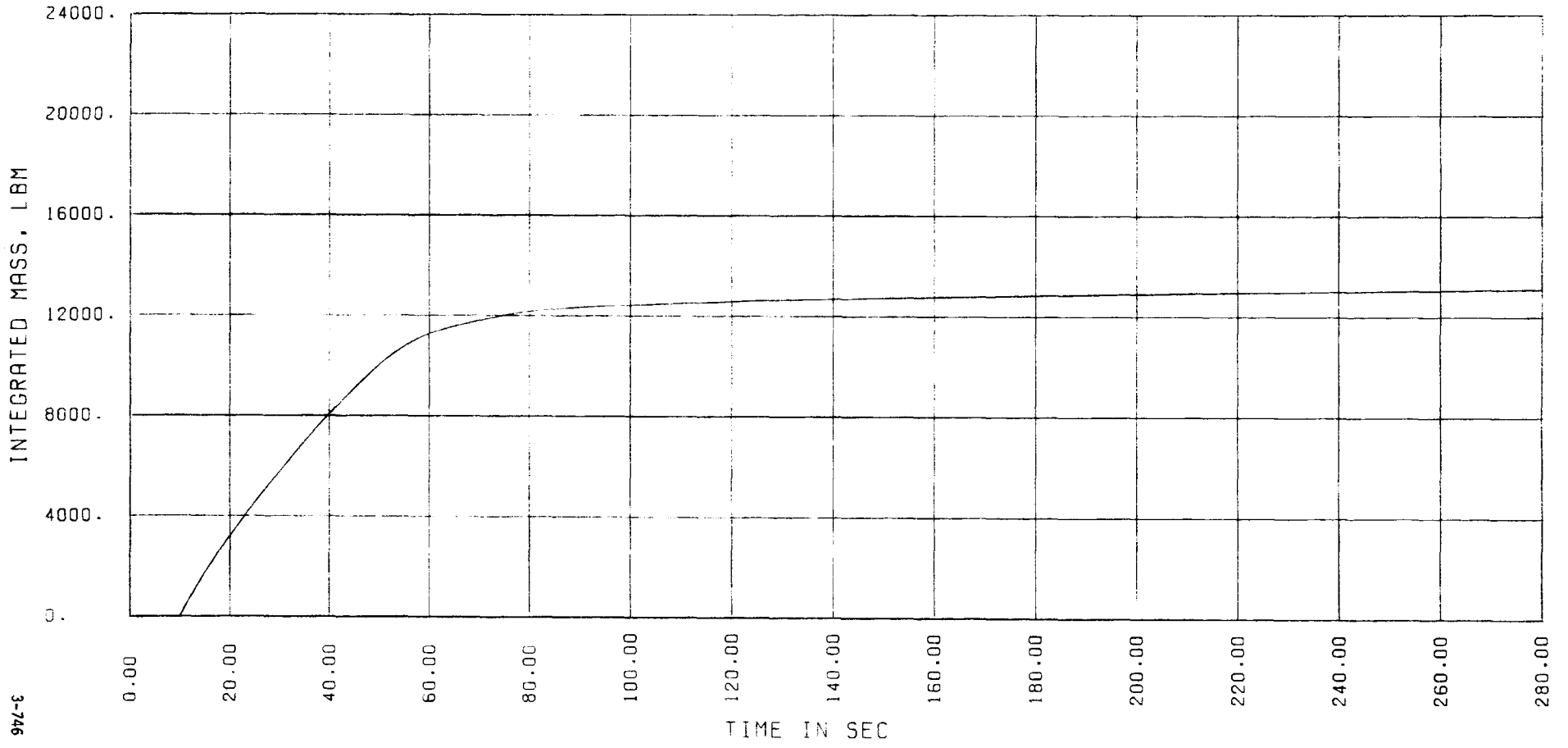



TEST 1267/1000 PSIA LR FWD BDN
N PUMP SPEED NR=4500
PLOT NO.47
NORMALIZED PMP SPEED
0.1500
0.1000
0.0500
0.0000
-0.0500
-0.1000
-0.1500
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC


TEST 1267/1000 PSIA LR FWD BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.48
0.4000
0.0000
-0.4000
-0.8000
-1.2000
-1.6000
-2.0000
NORMALIZED TORQUE
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC


TEST 1267/1000 PSIA LR FWD BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.49
NORMALIZED TORQUE
0.4000
0.0000
-0.4000
-0.8000
-1.2000
-1.6000
-2.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

TEST 1267/1000 PSIA LR FWD BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50



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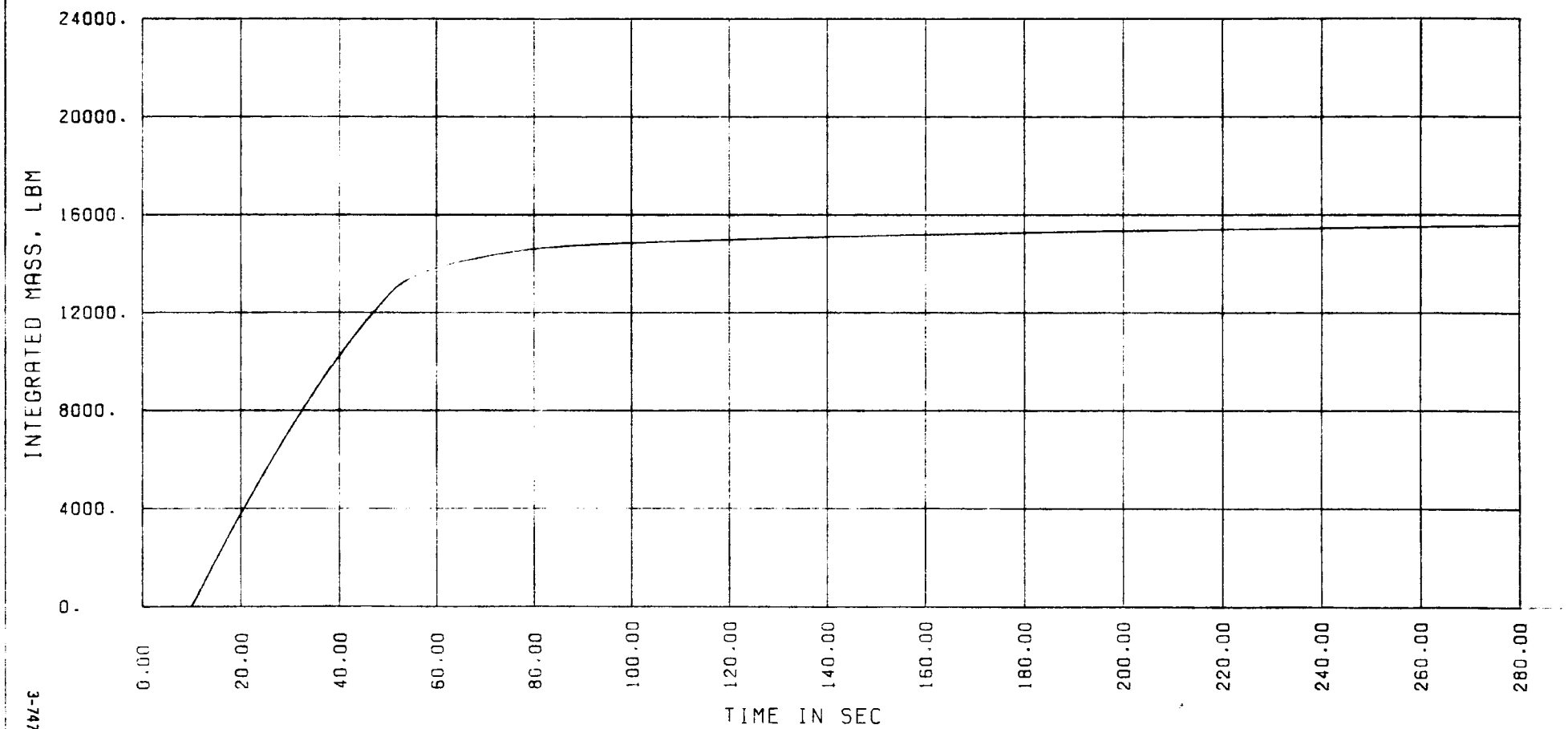
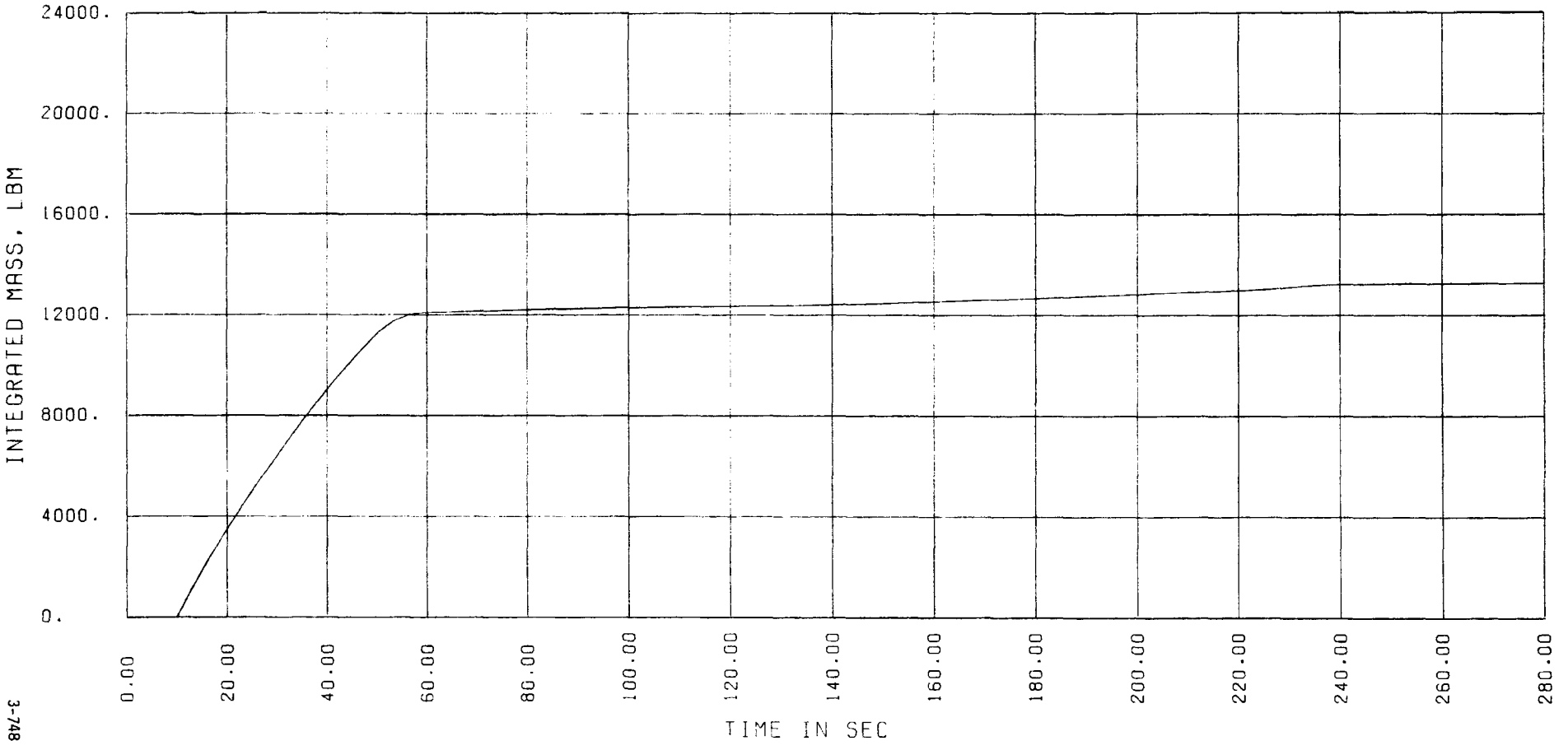
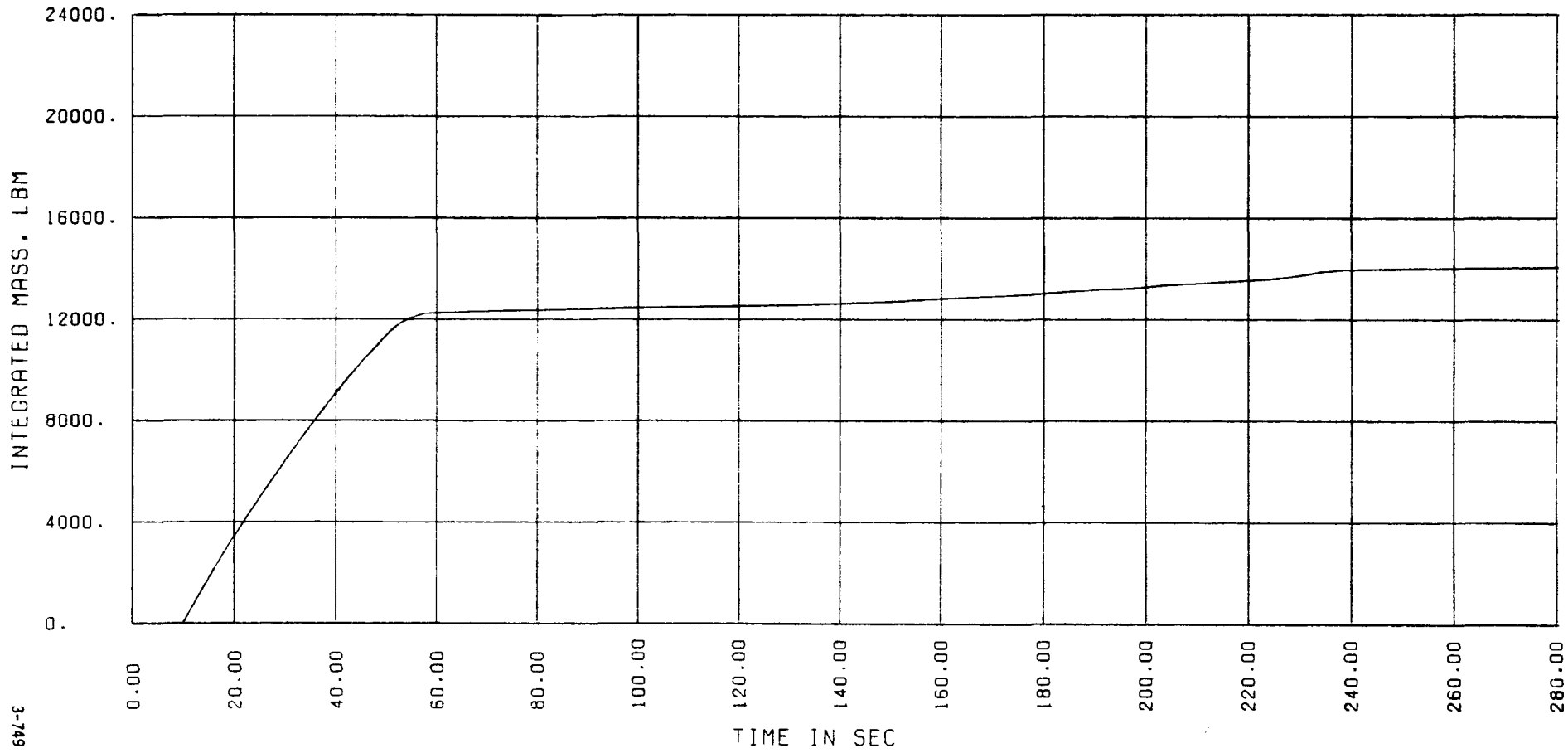
TEST 1267/1000 PSIA LR FWD BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.51



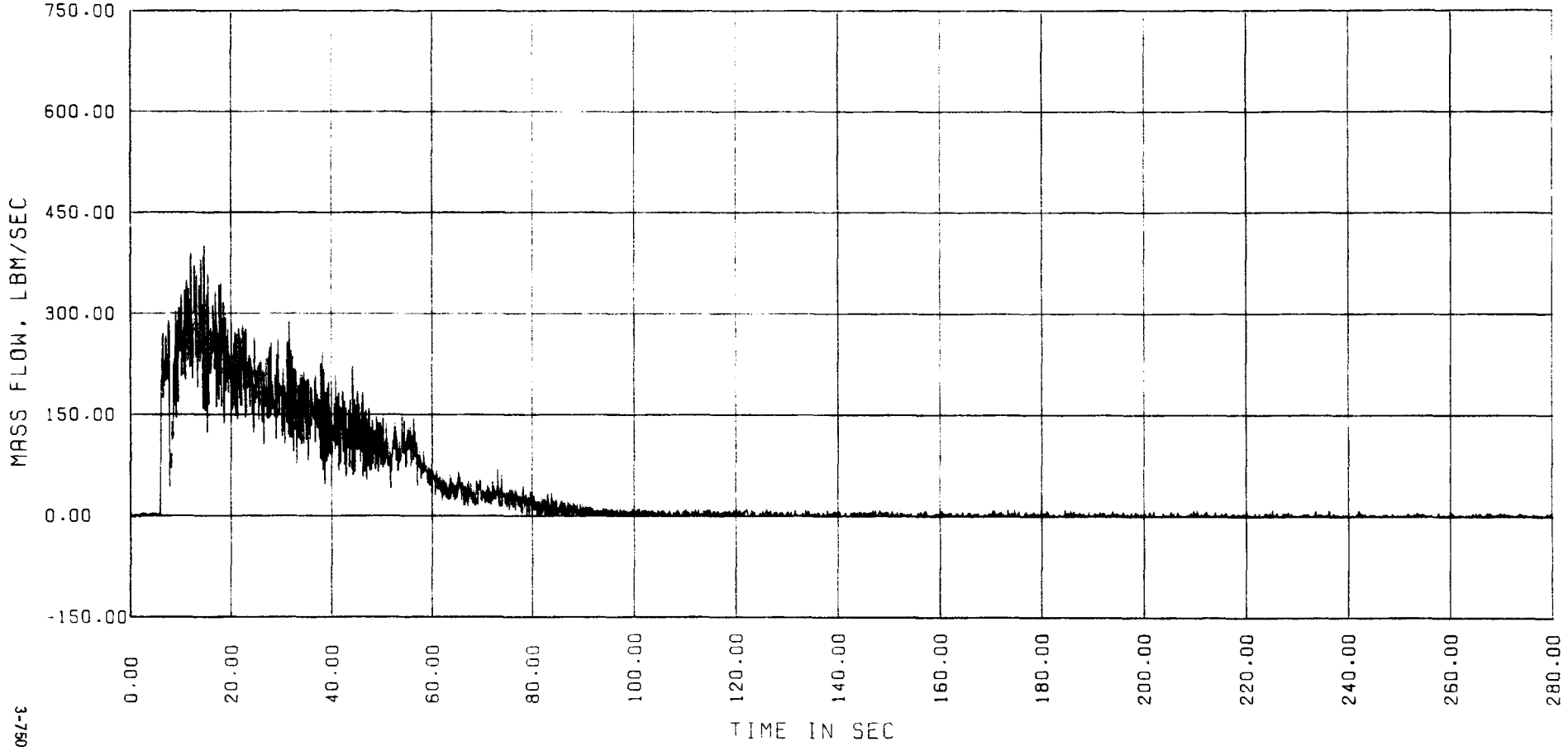
TEST 1267/1000 PSIA LR FWD BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.52



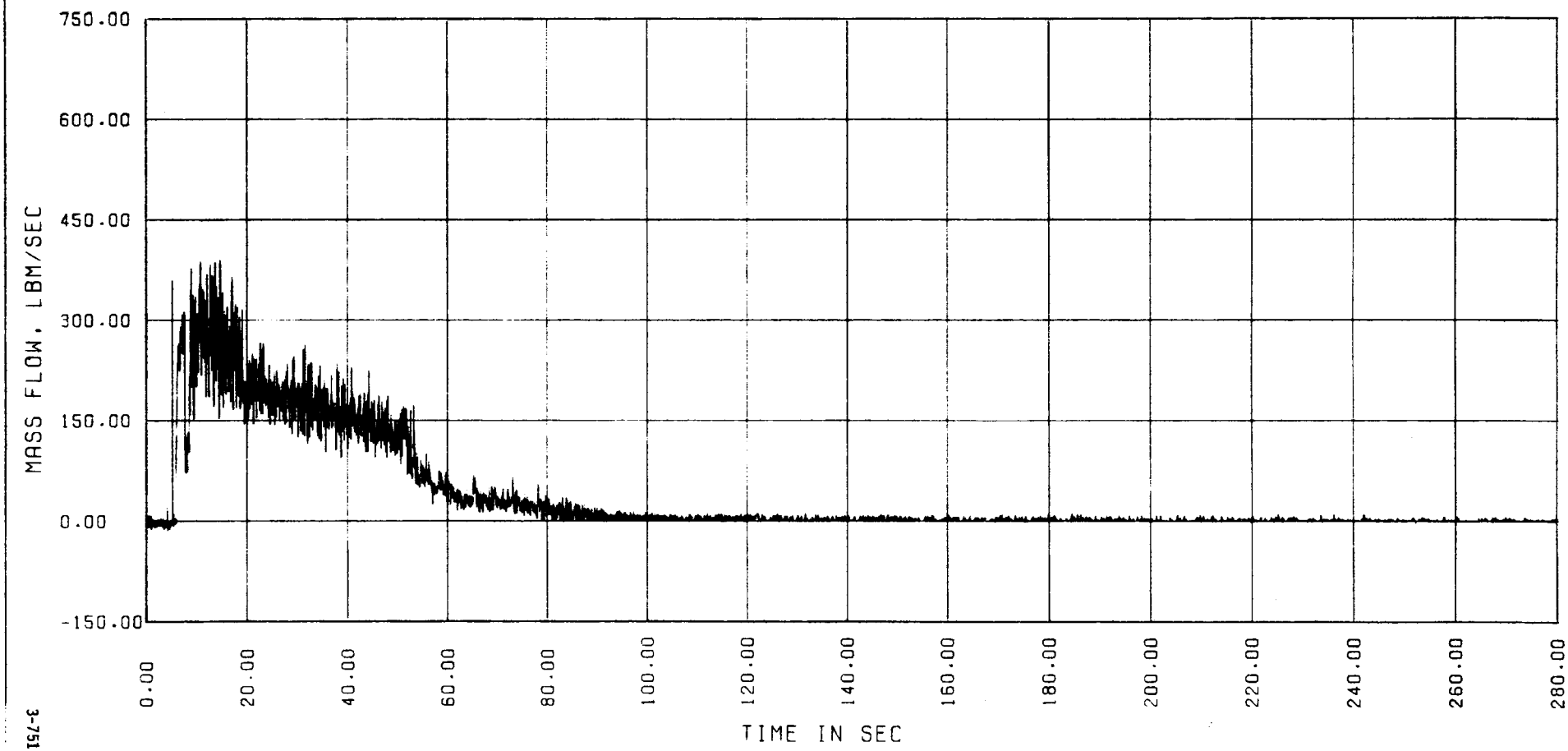
TEST 1267/1000 PSIA LR FWD BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.53



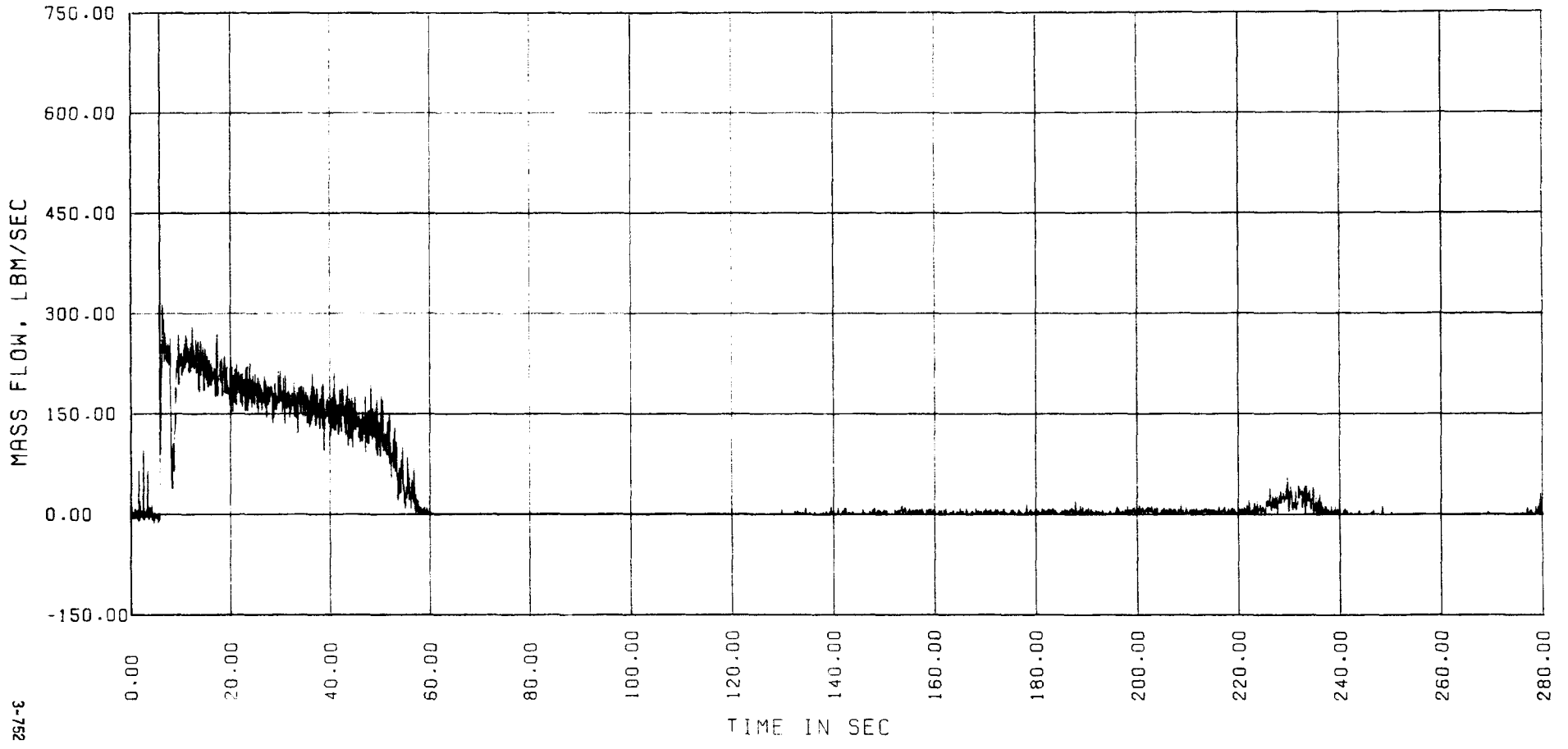
TEST 1267/1000 PSIA LR FWD BDN
MASS FLOW RATE HI-TM/GO2 SUCT
PLOT NO.54



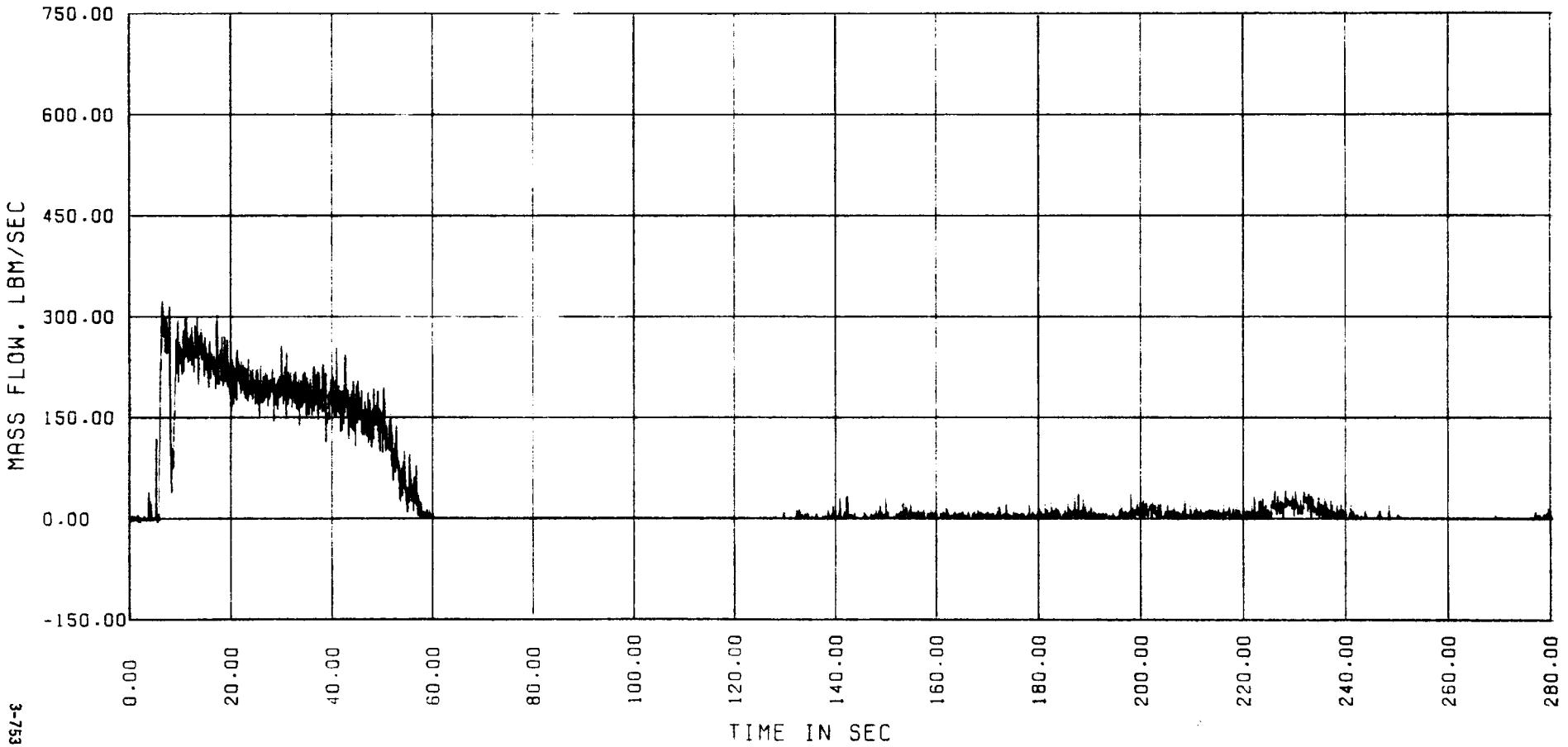
TEST 1267/1000 PSIA LR FWD BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.55



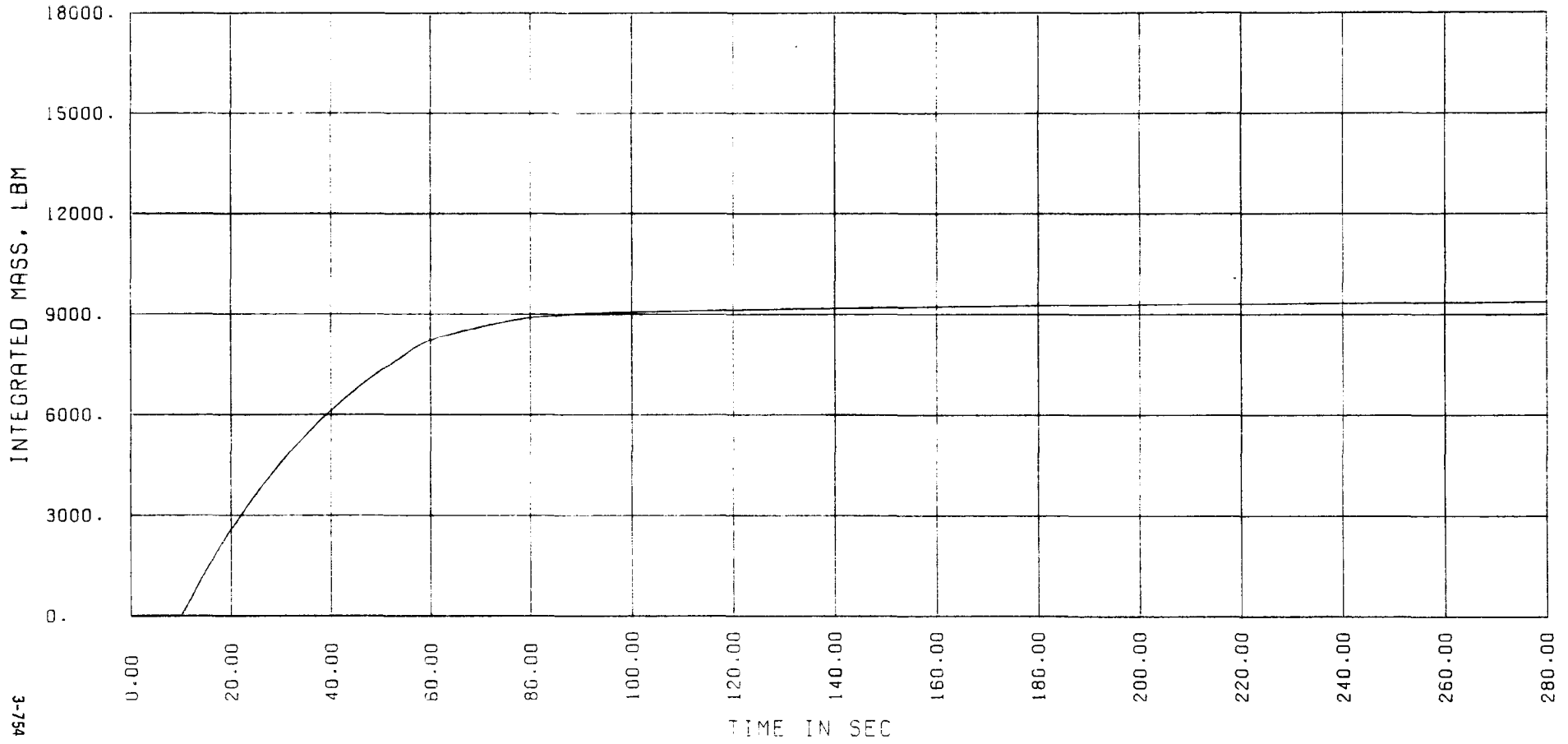
TEST 1267/1000 PSIA LR FWD BDN
MASS FLOW RATE HI-TM/GO2 DISCH
PLOT NO.56



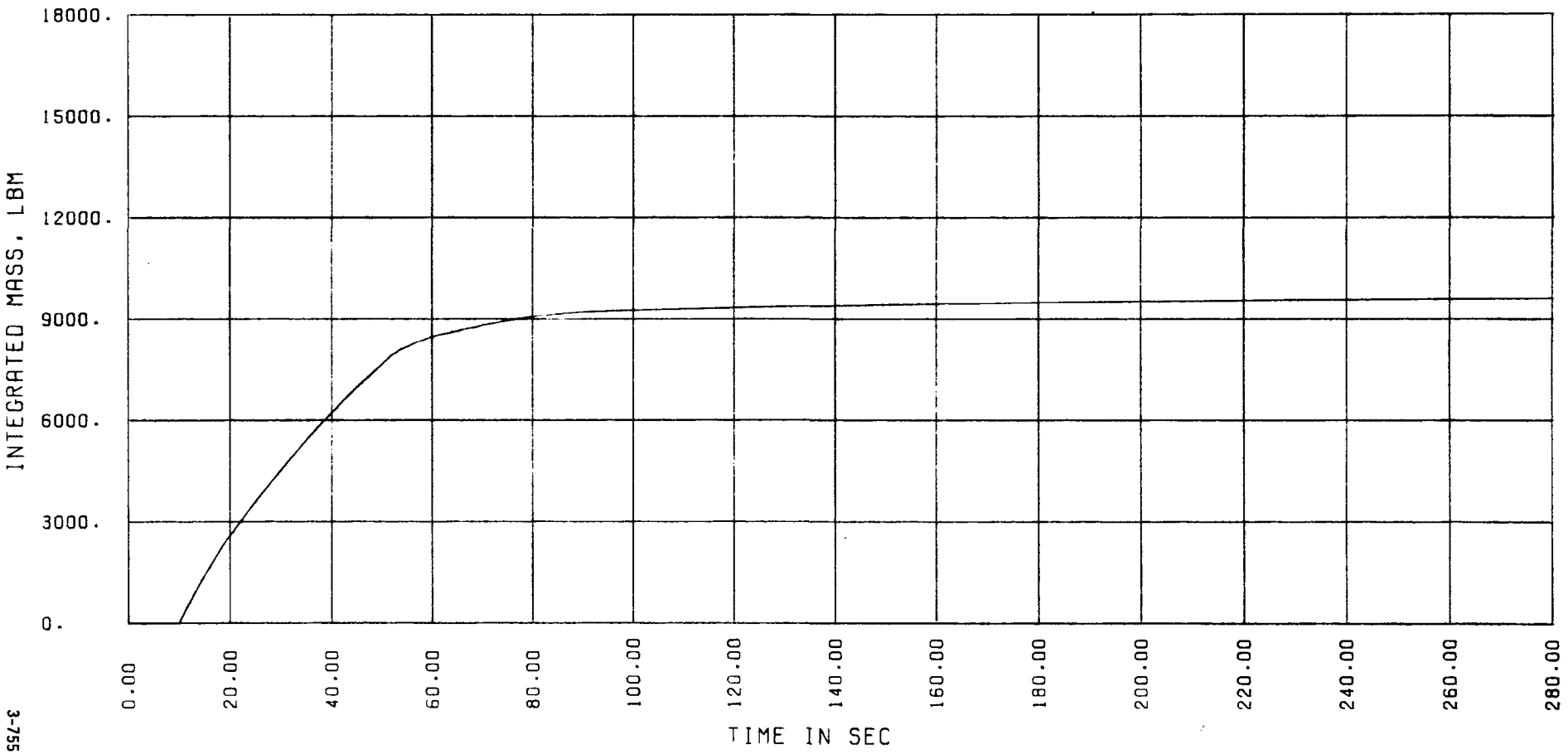
TEST 1267/1000 PSIA LR FWD BDN
MASS FLOW RATE LO-TM/GO2 DISCH
PLOT NO.57



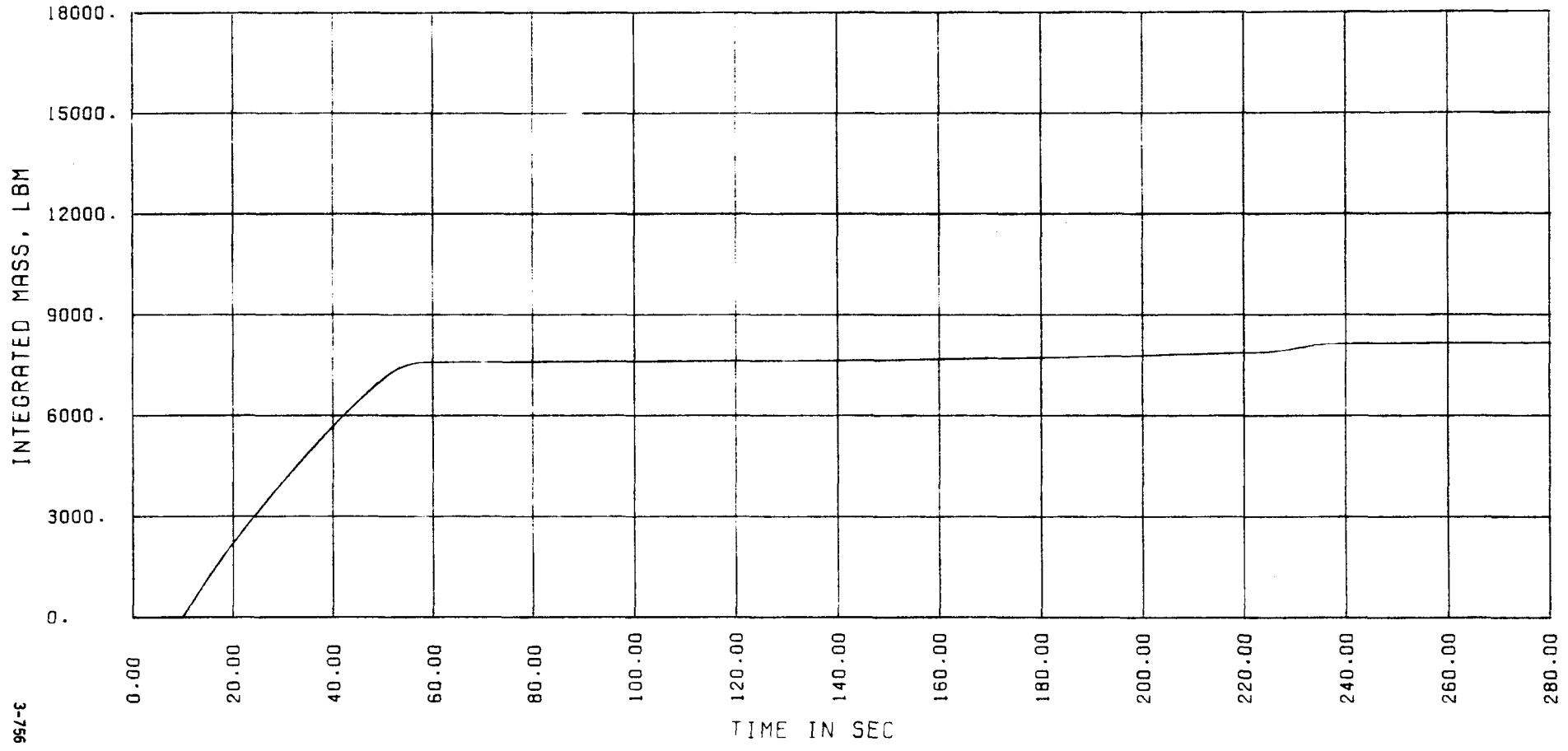
TEST 1267/1000 PSIA LR FWD BDN
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60



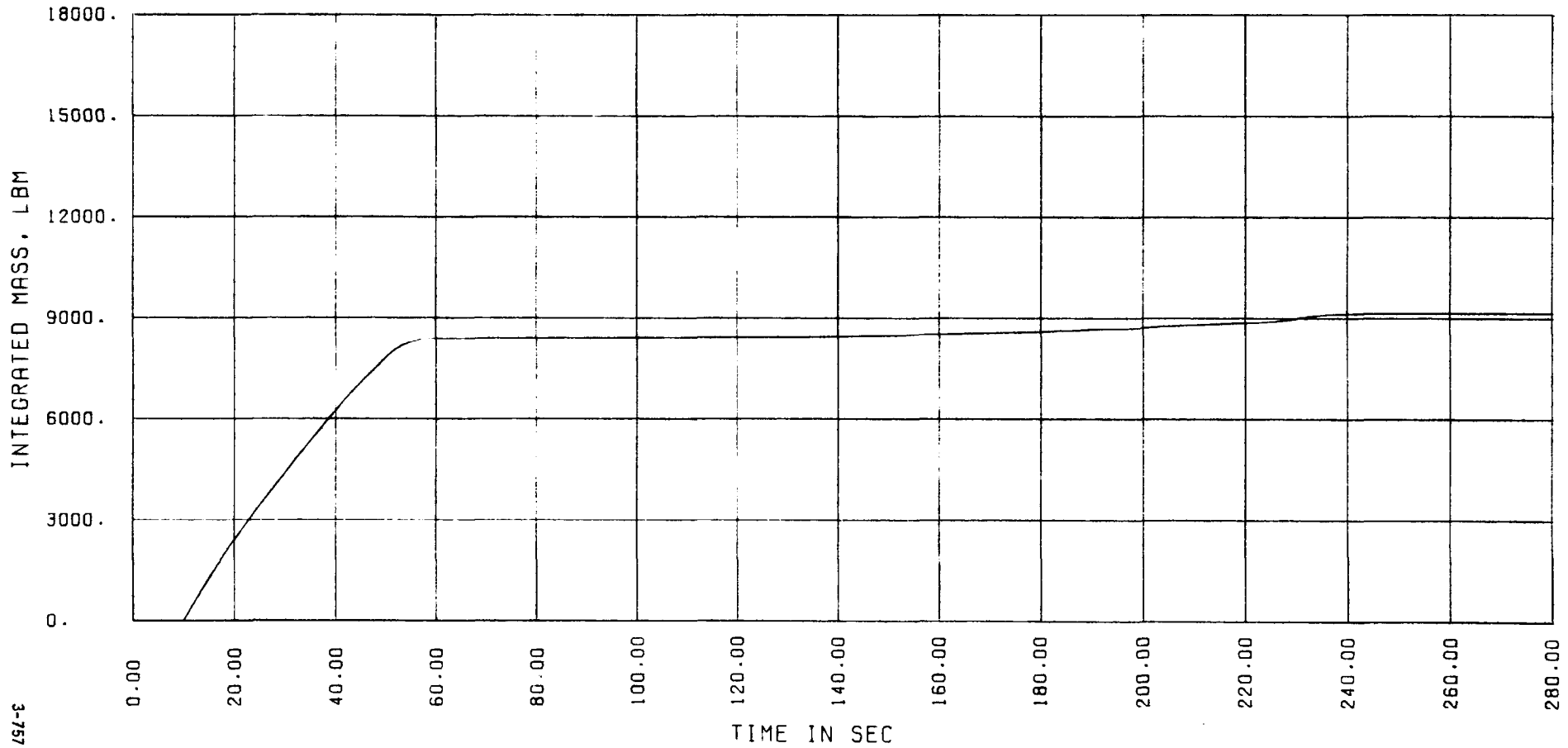
TEST 1267/1000 PSIA LR FWD BDN
INTEGRATED MASS LO-TM/GO2 S
PLOT NO.61



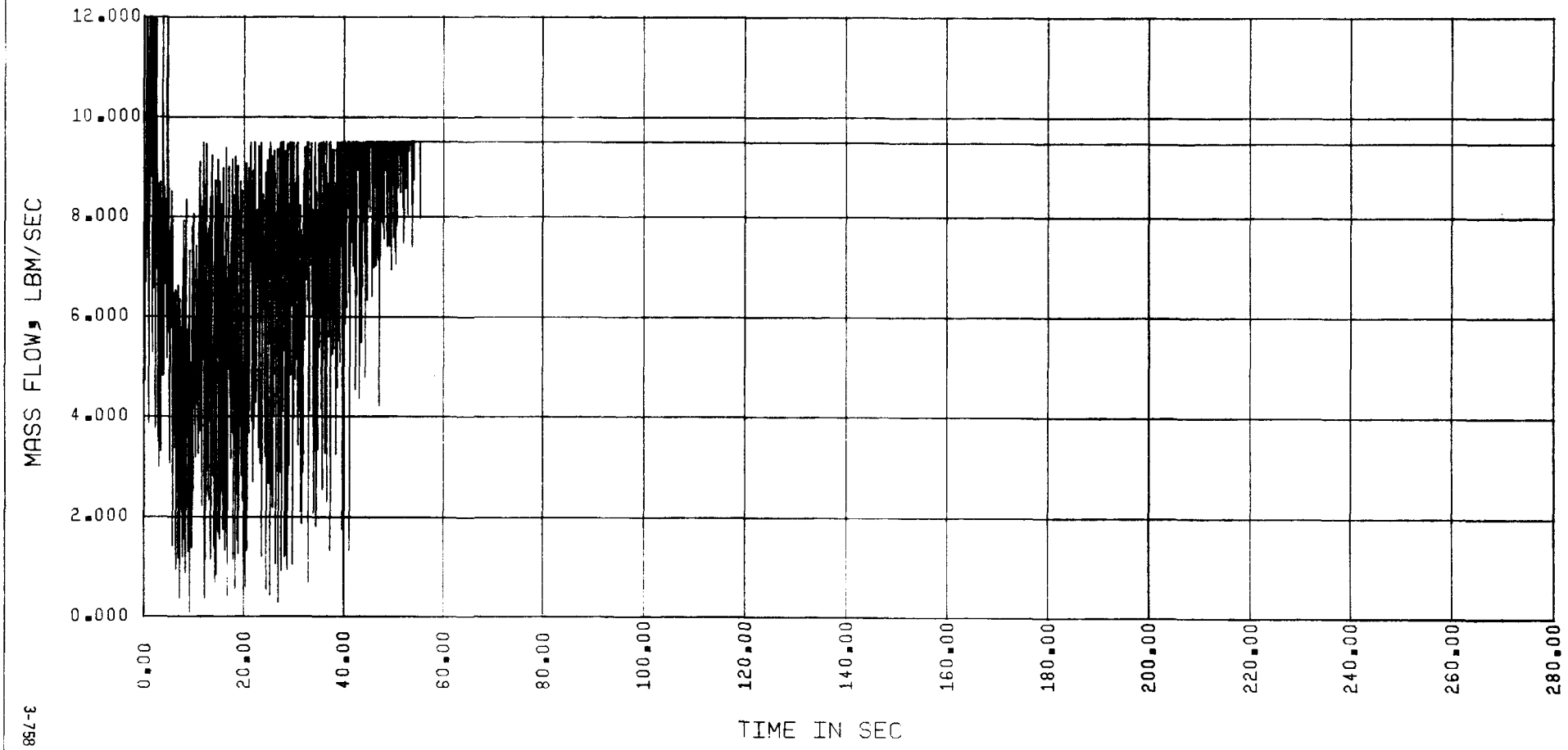
TEST 1267/1000 PSIA LR FWD BDN
INTEGRATED MASS HI-TM/GO2 D
PLOT NO.62



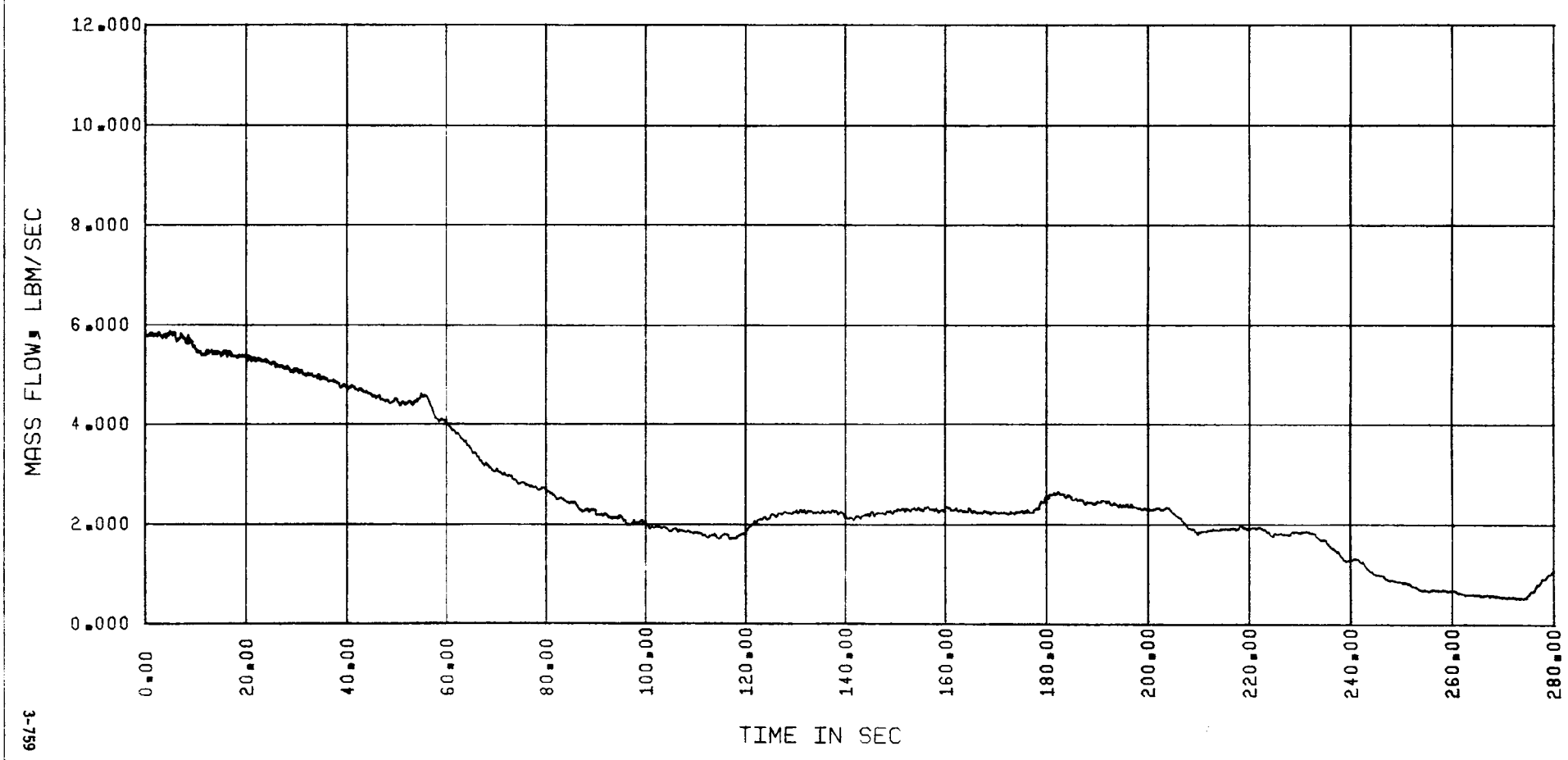
TEST 1267/1000 PSIA LR FWD BDN
INTEGRATED MASS LO-TM/GD2 D
PLOT NO.63



TEST 1267/1000 PSIA LR FWD BDN
PUMP INJECT MASS FLOW RATE IN
PLOT NO.64



TEST 1267/1000 PSIA LR FWD BDN
PUMP INJECT MASS FLOW RATE OUT
PLOT NO.65



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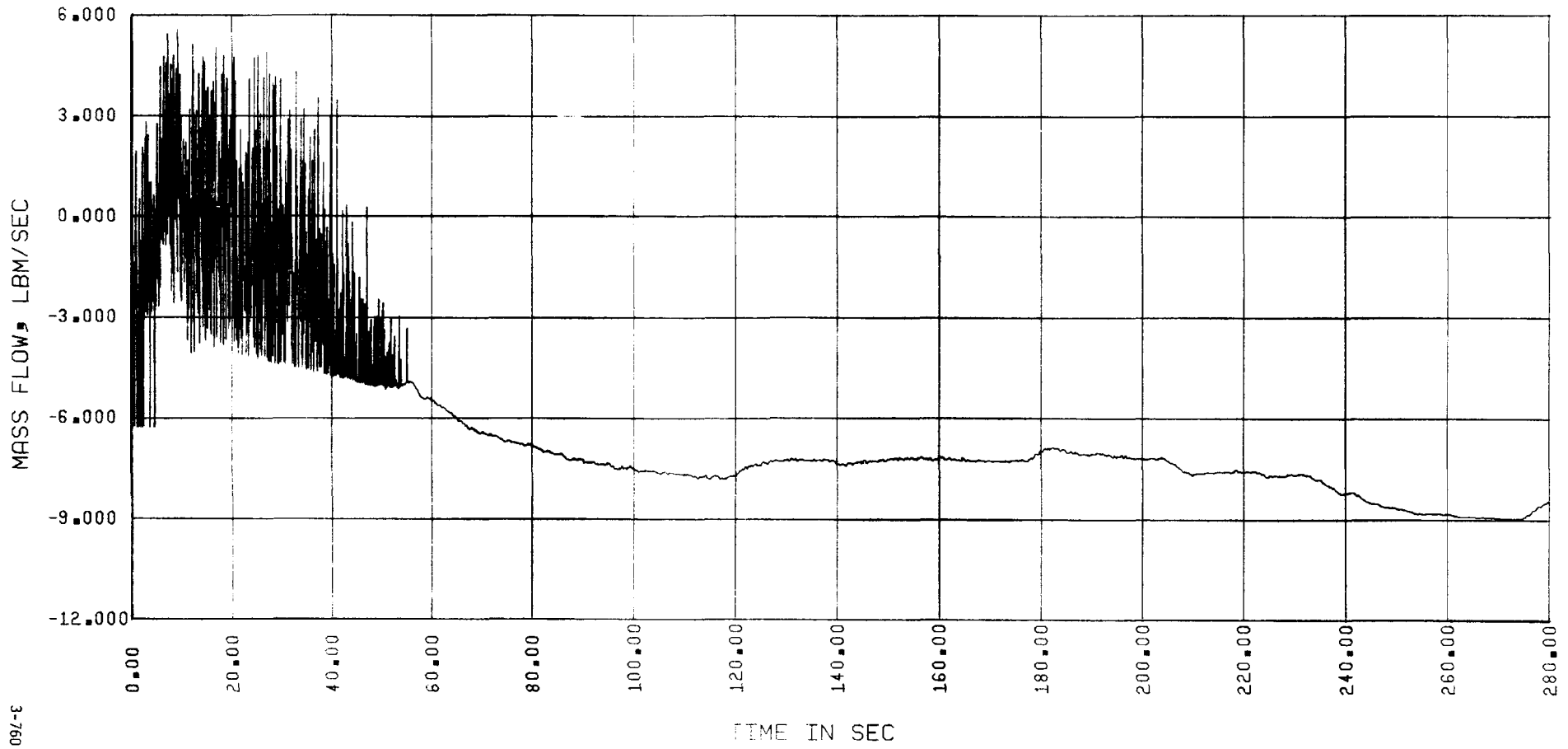
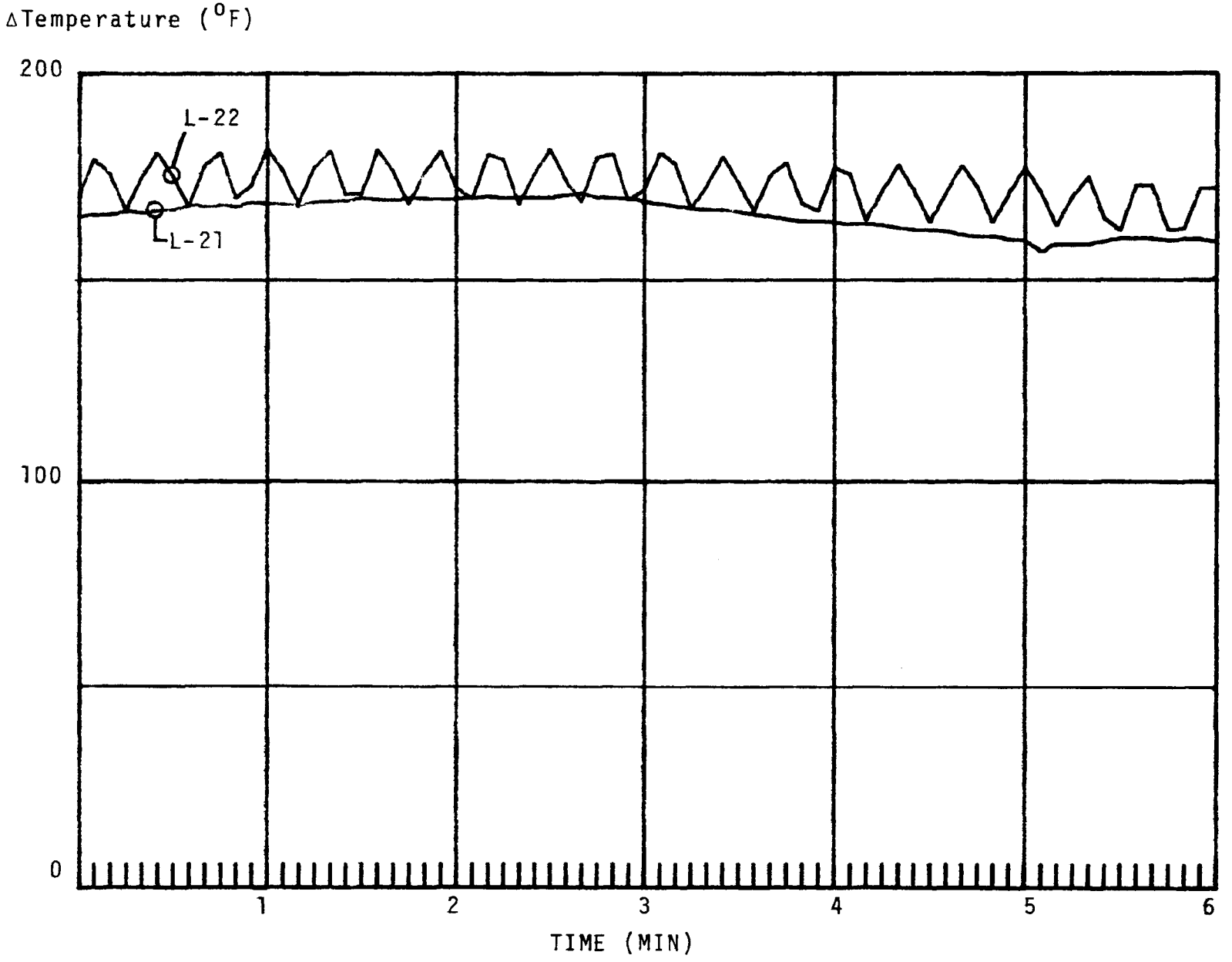
TEST 1267/1000 PSIA LR FWD BDN
SEAL INJEC LEAK MASS FLOW RATE
PLOT NO.66



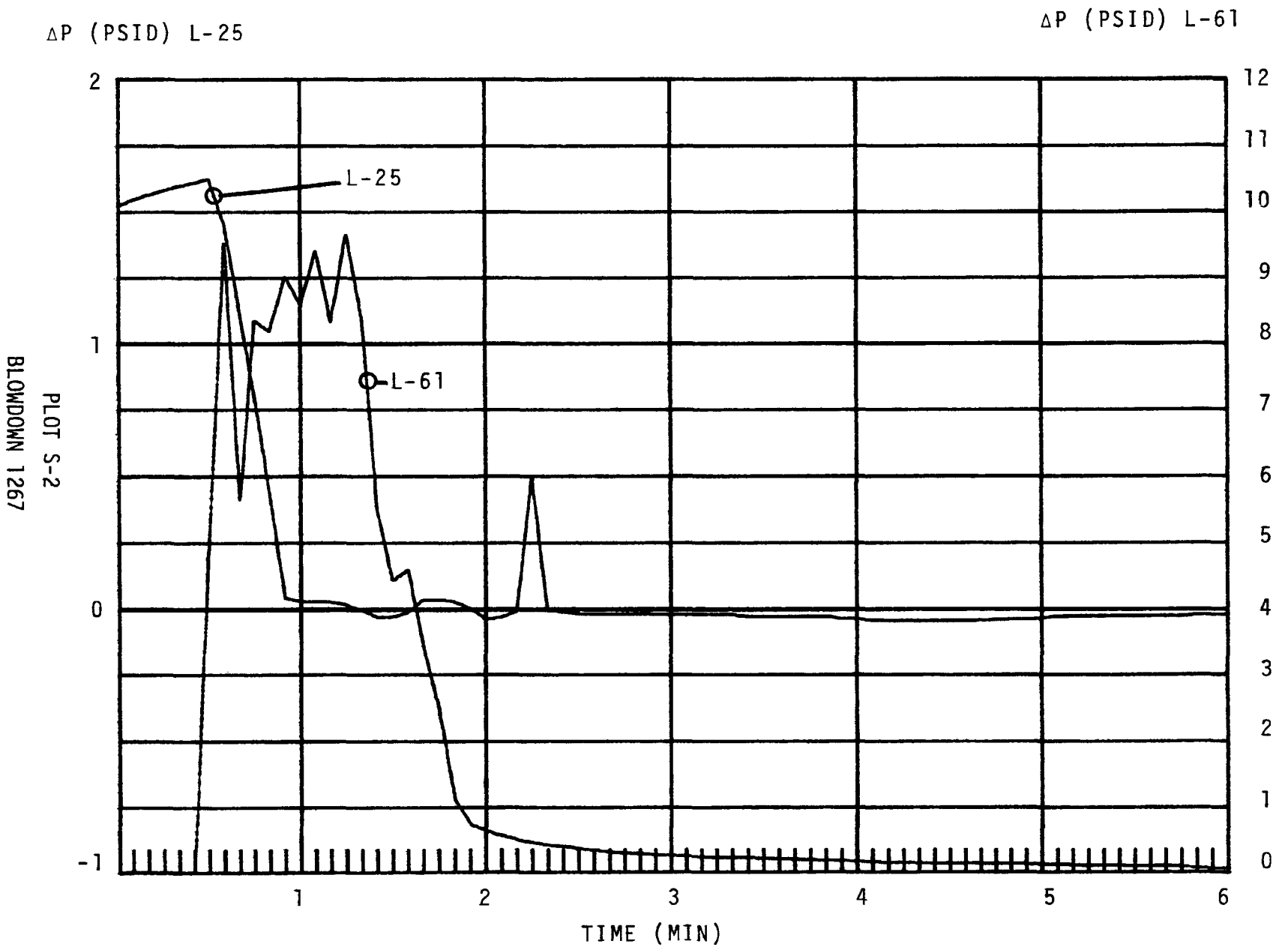
Index Listing
of
SCANNER DATA PLOTS
Test Number (1267)

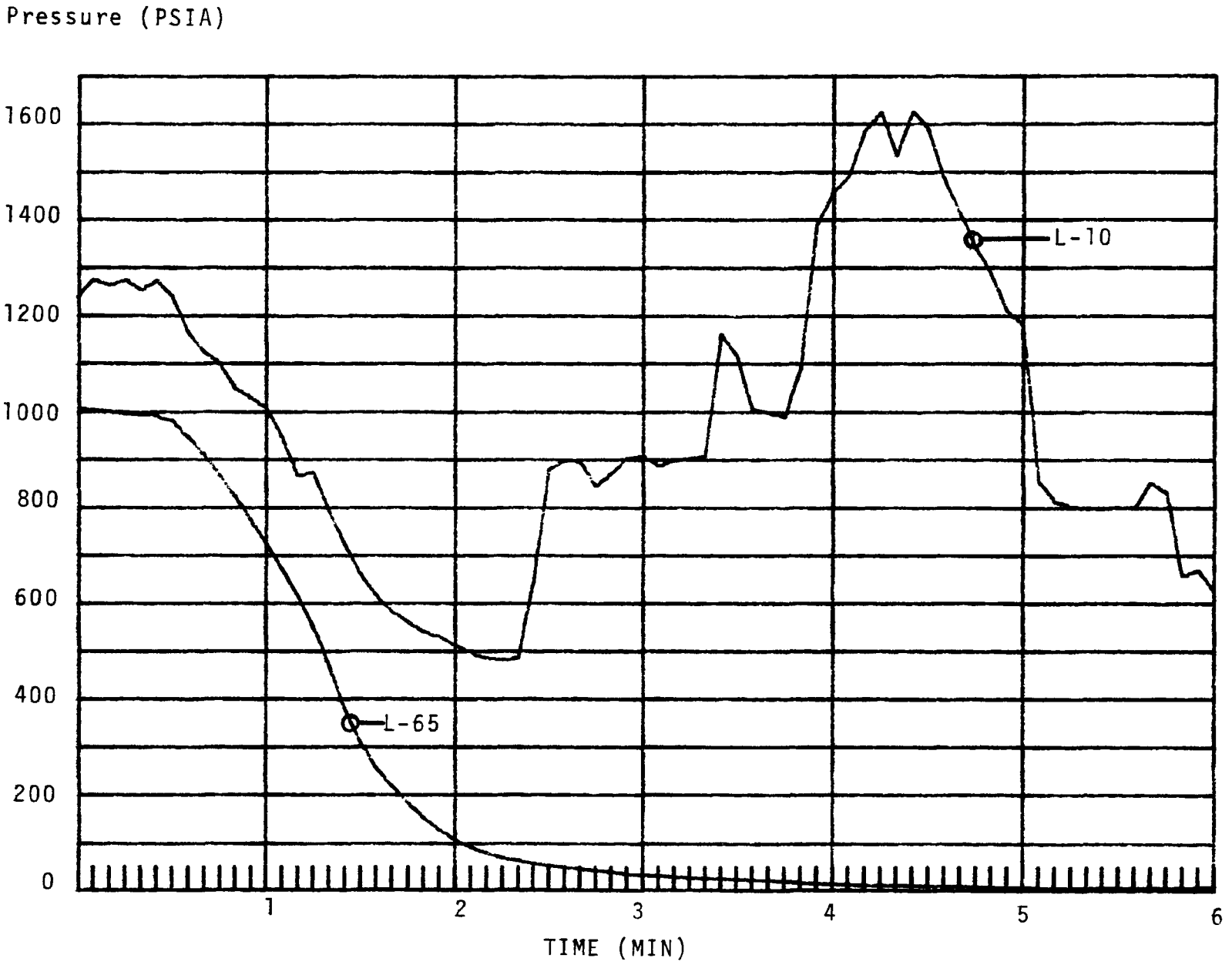
Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell



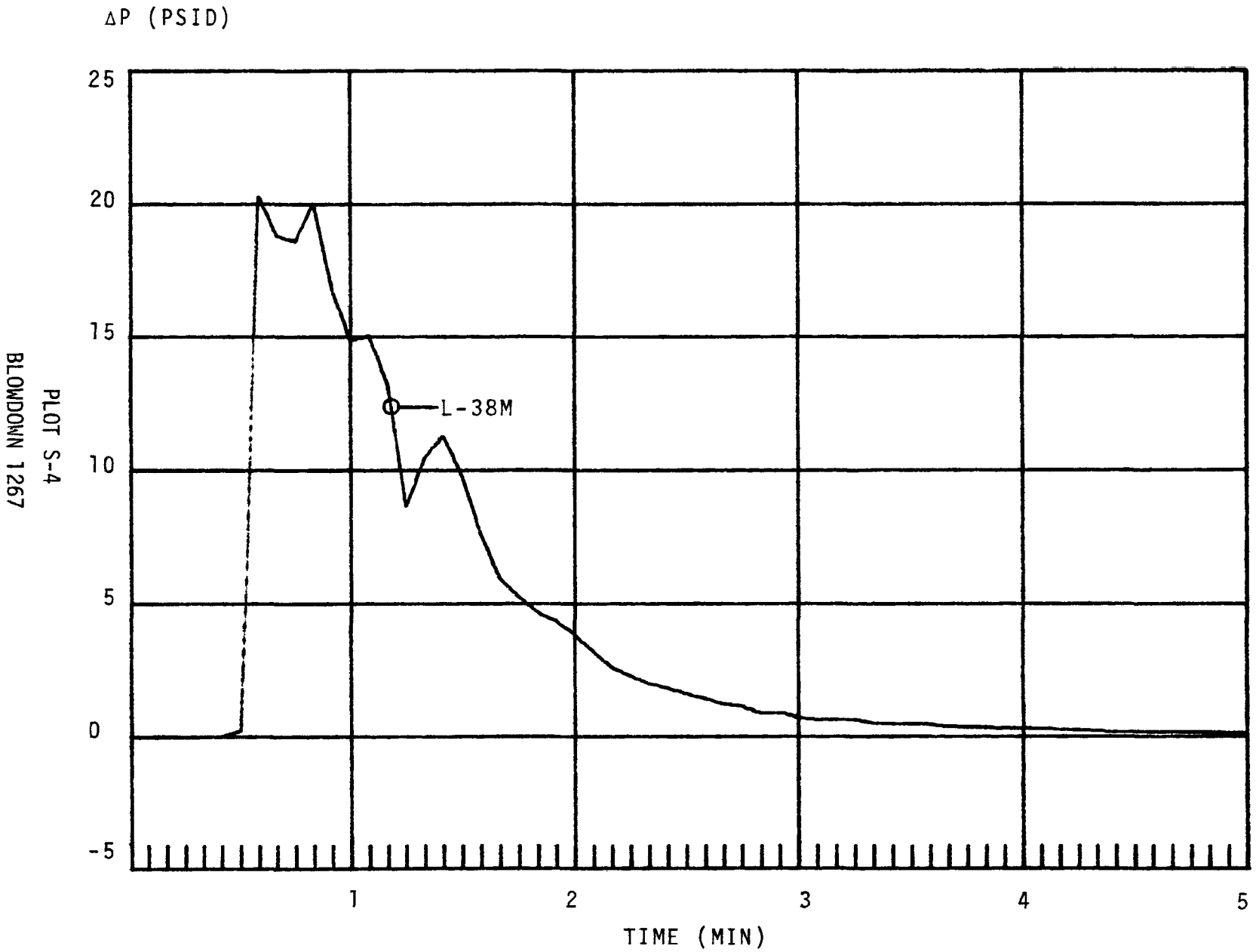
PLOT S-1

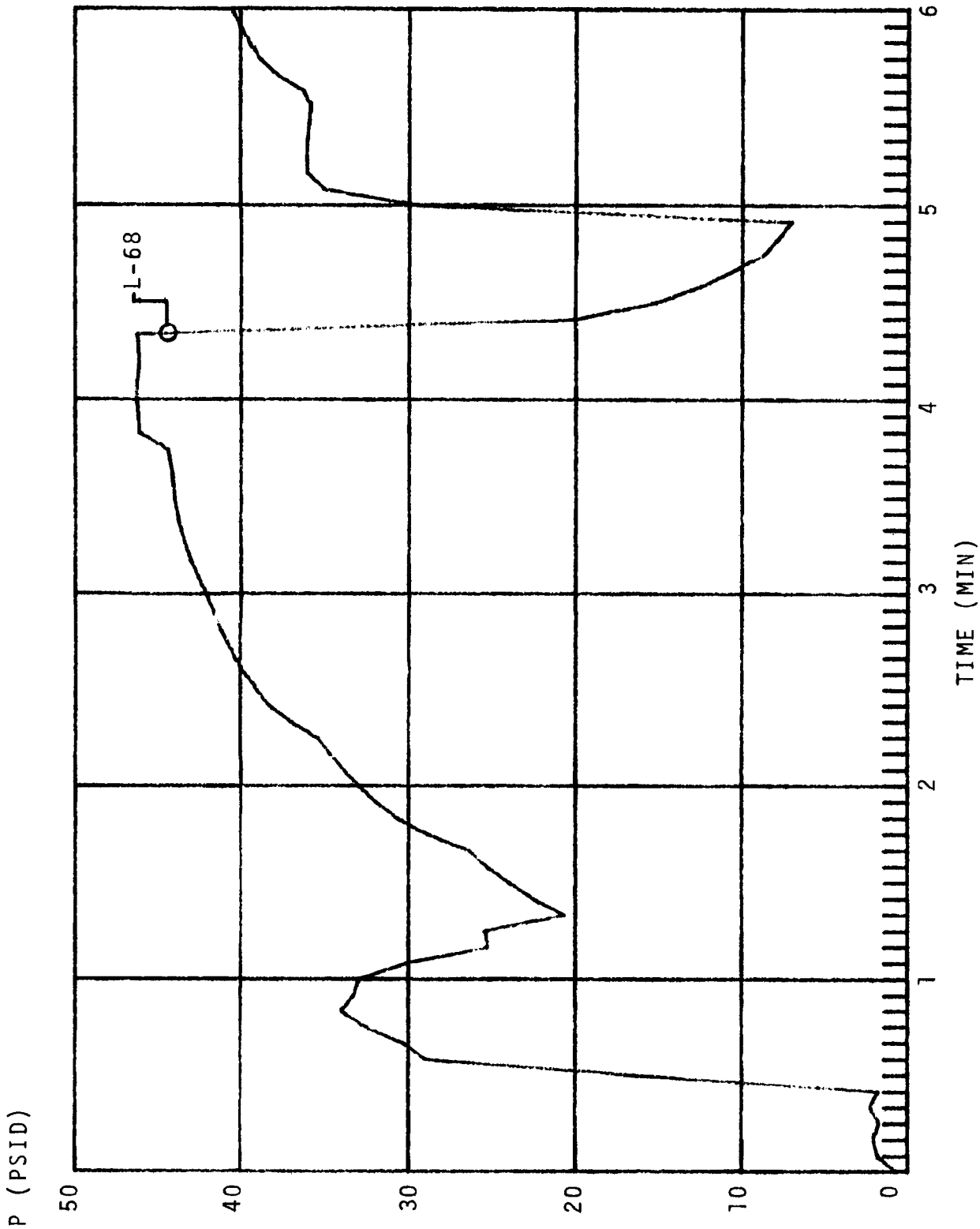
BLOWDOWN 1267


ΔP (PSID) L-25
ΔP (PSID) L-61
2
1
0
-1
12
11
10
9
8
7
6
5
4
3
2
1
0
L-25
L-61
1
2
3
4
5
6
TIME (MIN)
BLOWDOWN 1267
PLOT S-2



PLOT S-3
BLOWDOWN 1267


ΔP (PSID)
25
20
15
10
5
0
-5
L-38M
1
2
3
4
5
TIME (MIN)
PLOT S-4
BLOWDOWN 1267



PLOT S-5

BLOWDOWN 1267

SYSTEM CONFIGURATION

Test Number 1319

Break Location	Discharge
Break Size	27.75 in^2
	100 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Free-Wheeling

COMMENTS

1. Malfunctioning or Inoperable Instruments: None

2. Other Comments: There was difficulty obtaining accurate calibration constants for the pump discharge gamma densitometer, Beam 3. A more reasonable curve can be obtained from the data using the steady state equation and the steady state zero file 1308 as discussed in Volume II of this report.

3. Affected FM Data Plots: 11 - Density
   20 - Void Fraction

INITIAL CONDITIONS

t = 25 Sec[a]

Test Number 1319

System Pressures

High Pressure Drum	1014.1	psia
Suction Instrument Spool	985.2	psia
Discharge Instrument Spool	1027.6	psia

Fluid Temperatures

Suction Instrument Spool	541.2	°F
Discharge Instrument Spool	549.7	°F

Fluid Density

Suction Instrument Spool	46.53	lbm/ft^3
Discharge Instrument Spool	49.98	lbm/ft^3

System Flows

Mass Flow Rate	262	lb/sec
Suction Volumetric Flow Rate	2529	gpm
Discharge Volumetric Flow Rate	2604	gpm
Suction Normalized Volumetric Flow Rate	0.72	
Discharge Normalized Volumetric Flow Rate	0.74	
Suction Fluid Velocity	31.13	ft/sec
Discharge Fluid Velocity	32.05	ft/sec
Suction Momentum Flux	45,123	$lbm/ft\ sec^2$
Discharge Momentum Flux	47,258	$lbm/ft\ sec^2$

Pump Performance

Pump head	44.14	psi
	136.6	ft
Pump Speed	4477	rpm
Pump Shaft Torque	188.9	ft lb
Pump Hydraulic Torque	164.0	ft lb

System Mass (t = 35 Sec)[a]

High Pressure Drum Level	54.60	in[b]
Fluid Mass Upstream of Test Pump	14,055	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 1319

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-7.3	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	3.3	c
HPSW-1 Closed	4.9	c
Pump Power Trip	5.7	50
Initiate Rupture Mechanism	5.5	c
Blowdown Starts	5.7	50
HPSW-2 Closed	58.5	100
PAC-12 and PAC-16 Injection Off	c	330
PAC-12 and PAC-16 Injection On	c	c
Test Pump Injection Off	c	415
Test Pump Injection On	c	c
End of Digitized Data 20 s/sec	742.7	-
200 s/sec	292.7	-
FM Recording System Off	840.0	-
Scanner System Off	-	605

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

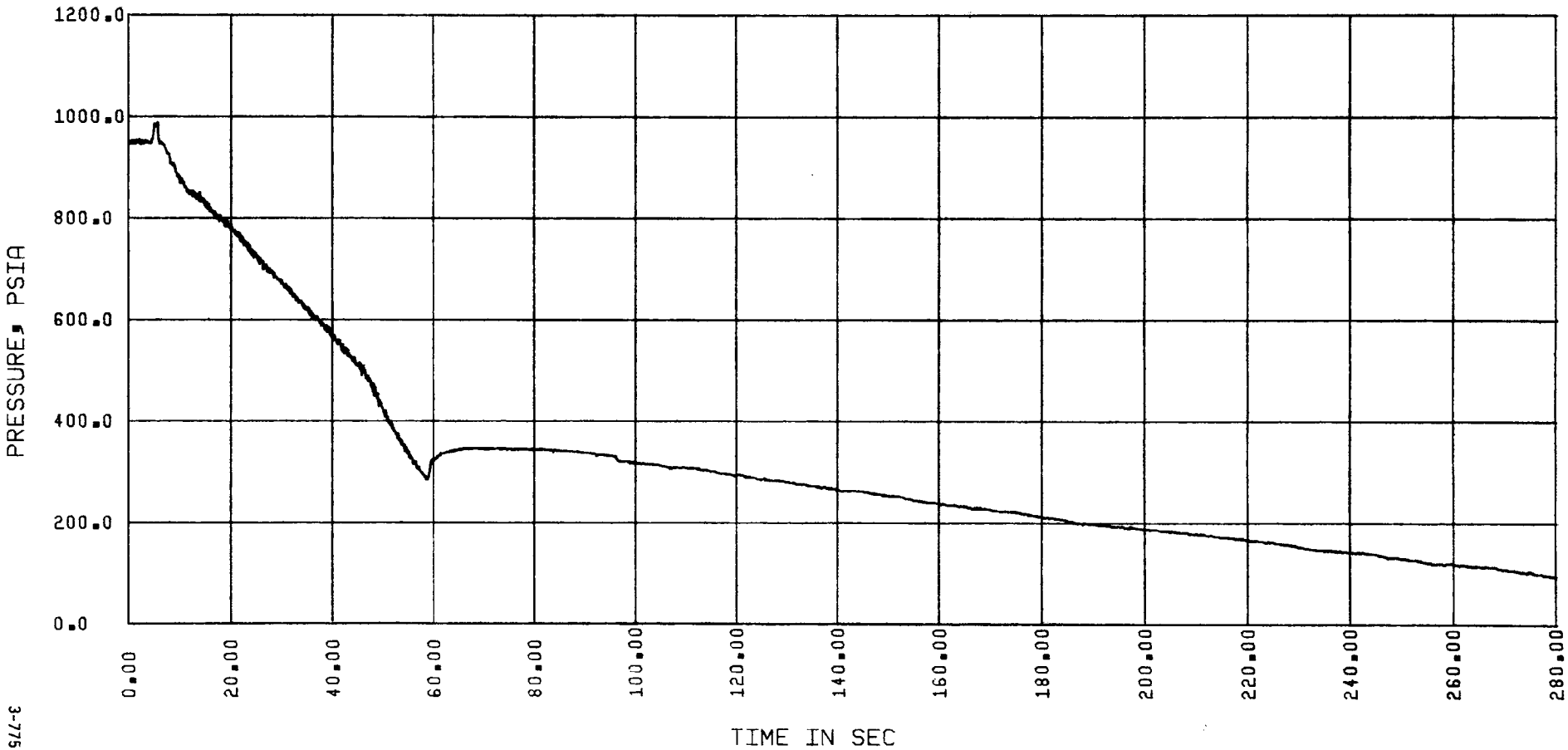
Index Listing
of
FM DATA PLOTS
Test Number (1319)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
28	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 Discharge
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge

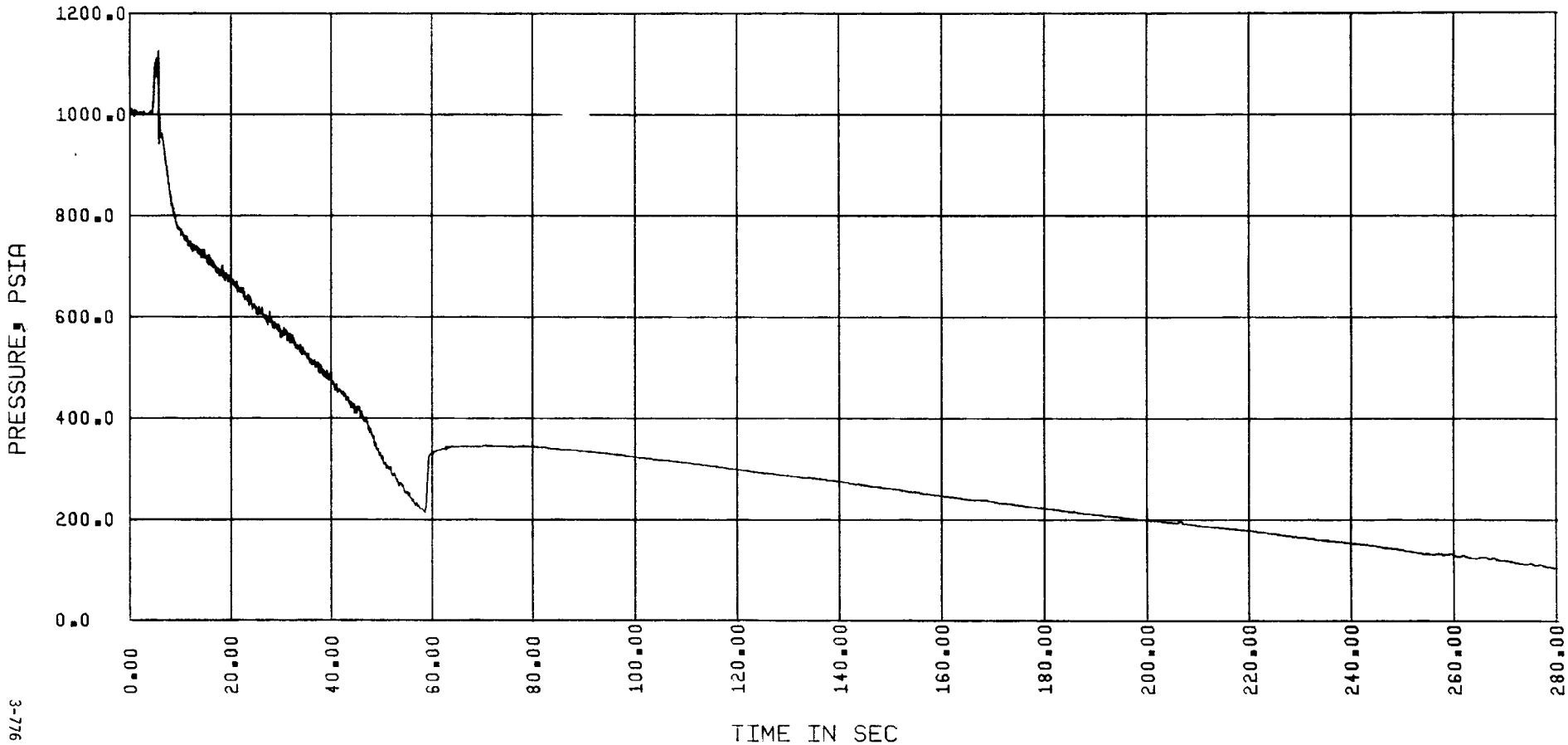
Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (1319)

Plot Number	Location Number	Description of Parameter
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
35	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
42	L-27	Momentum Flux LO-DD Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
53	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge
64	L-9	Pump Injection Mass Flow Rate In
65	L-32	Pump Injection Mass Flow Rate Out
66	L-9/L-32	Seal Injection Leakage Mass Flow Rate

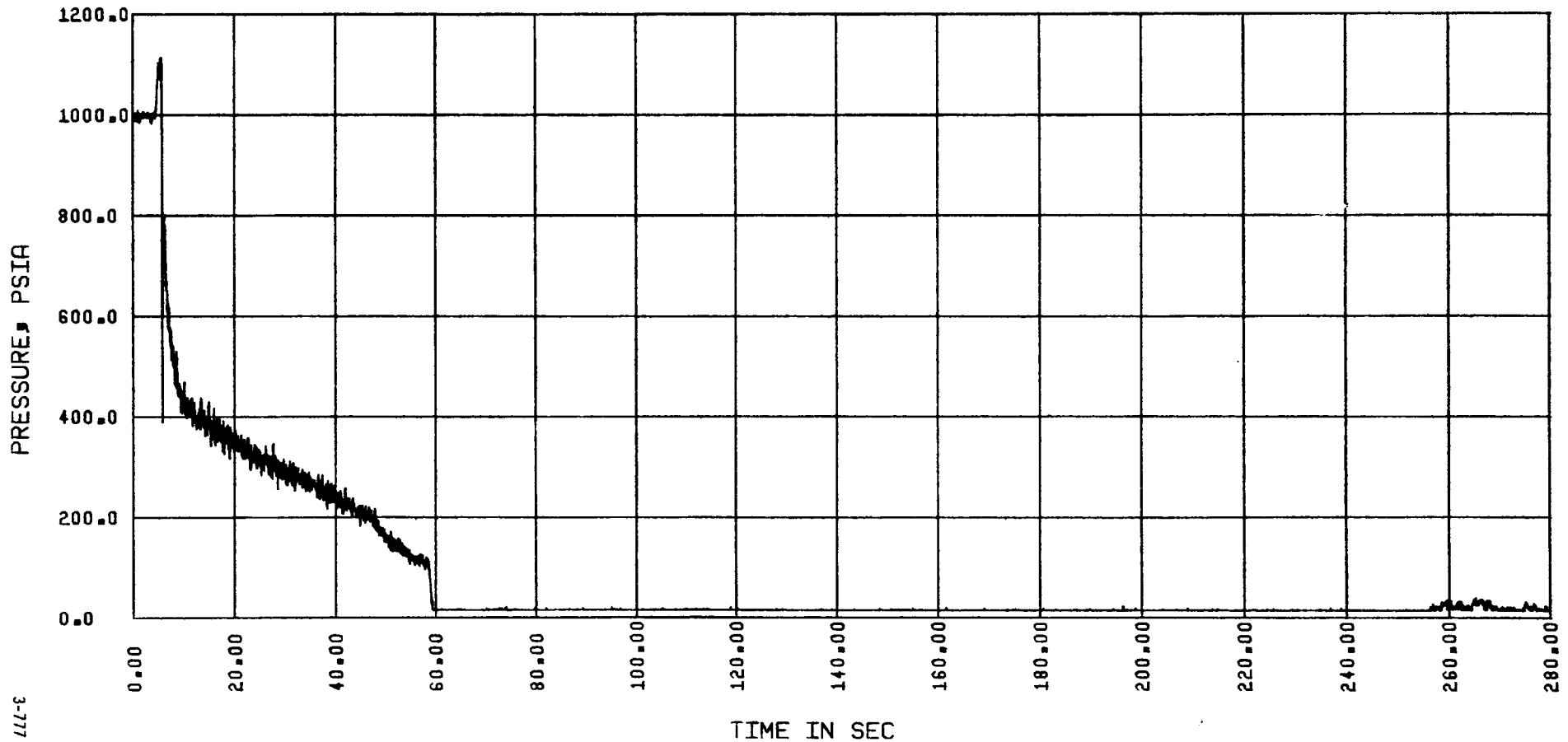
TEST 1319/1000 PSI FW FWD BDN
PUMP SUCTION PRESSURE
PLOT NO.1



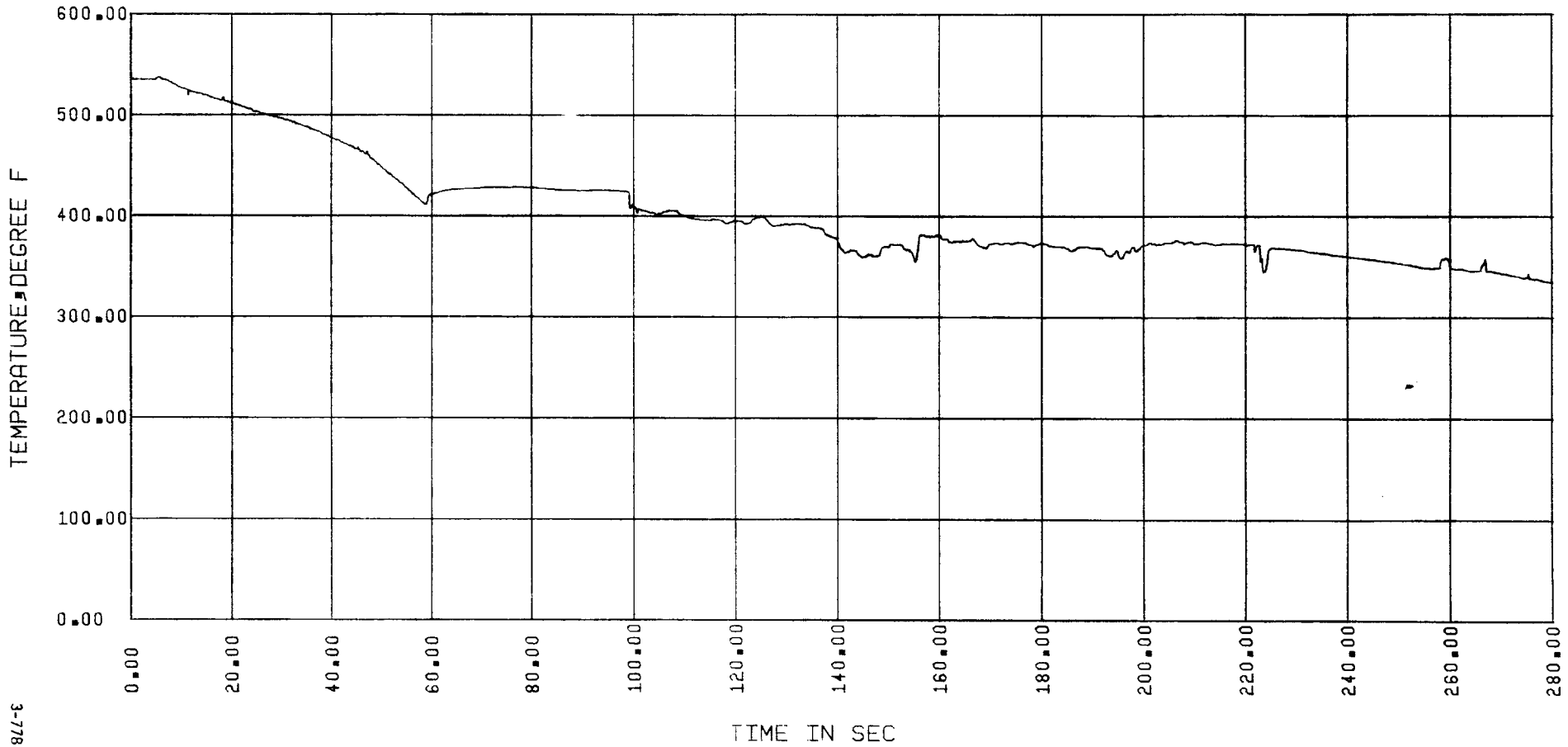
TEST 1319/1000 PSI FW FWD BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2



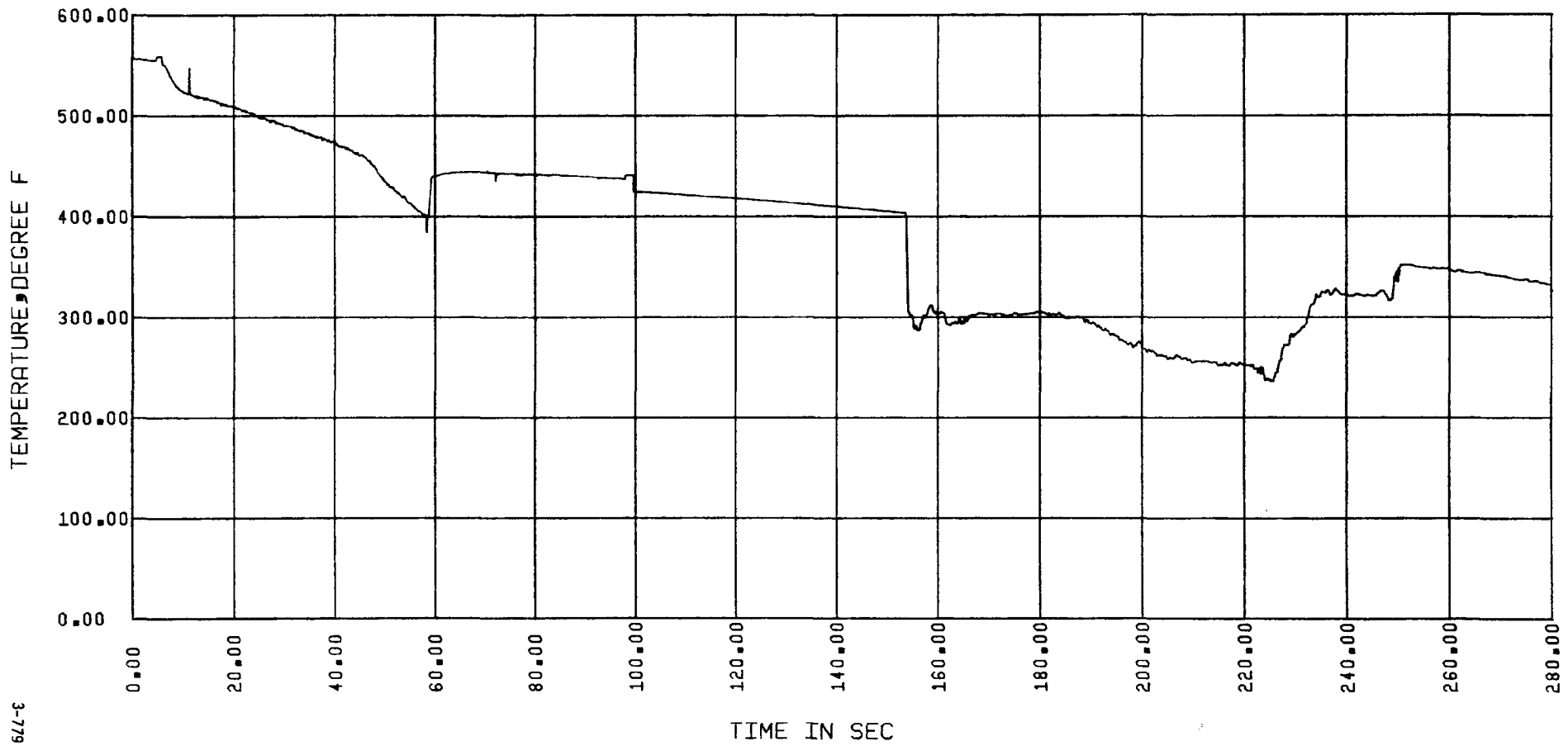
TEST 1319/1000 PSI FW FWD BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



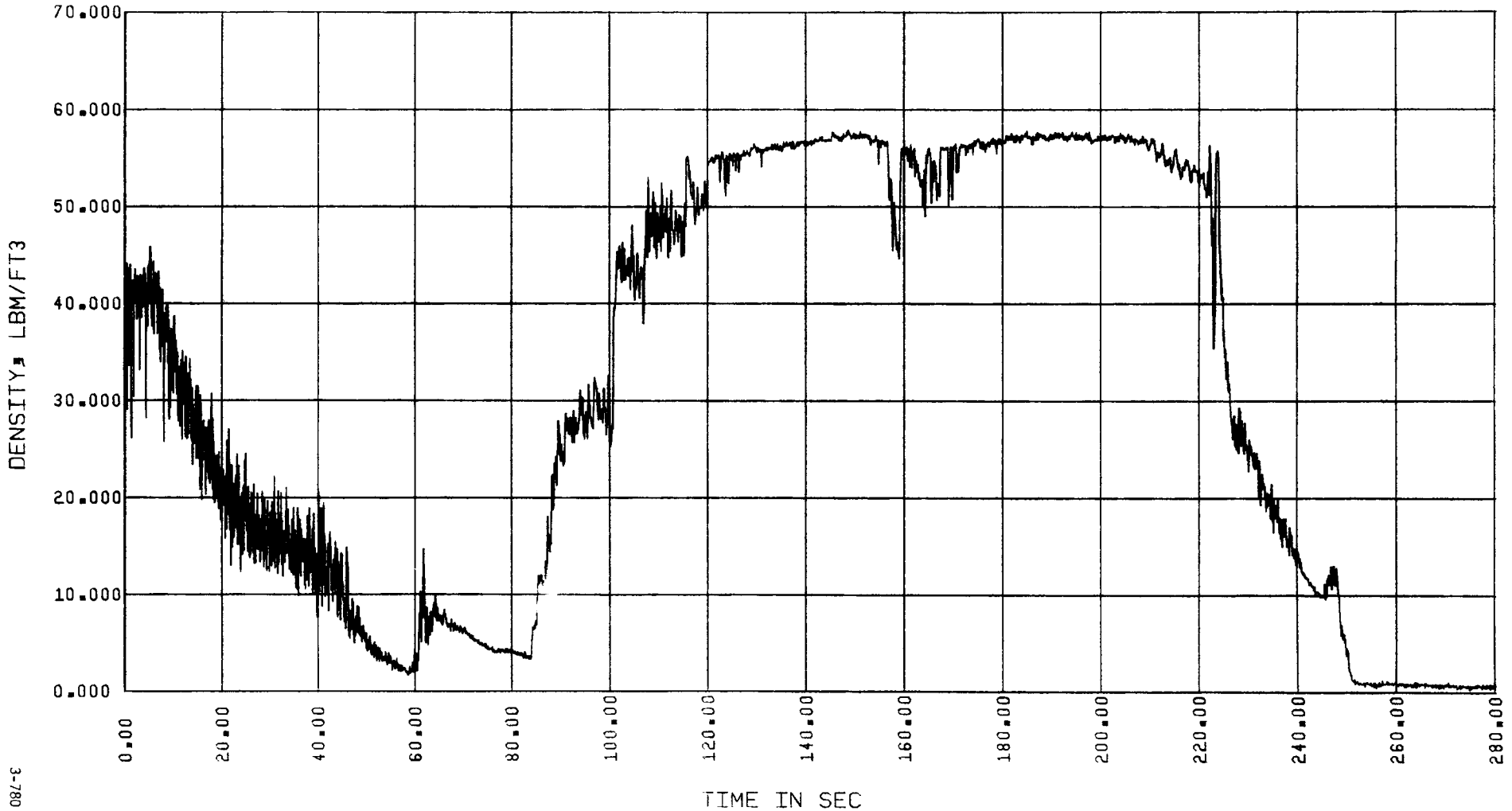
TEST 1319/1000 PSI FW FWD BDN
PUMP SUCTION TEMPERATURE
PLOT NO.4



TEST 1319/1000 PSI FW FWD BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5

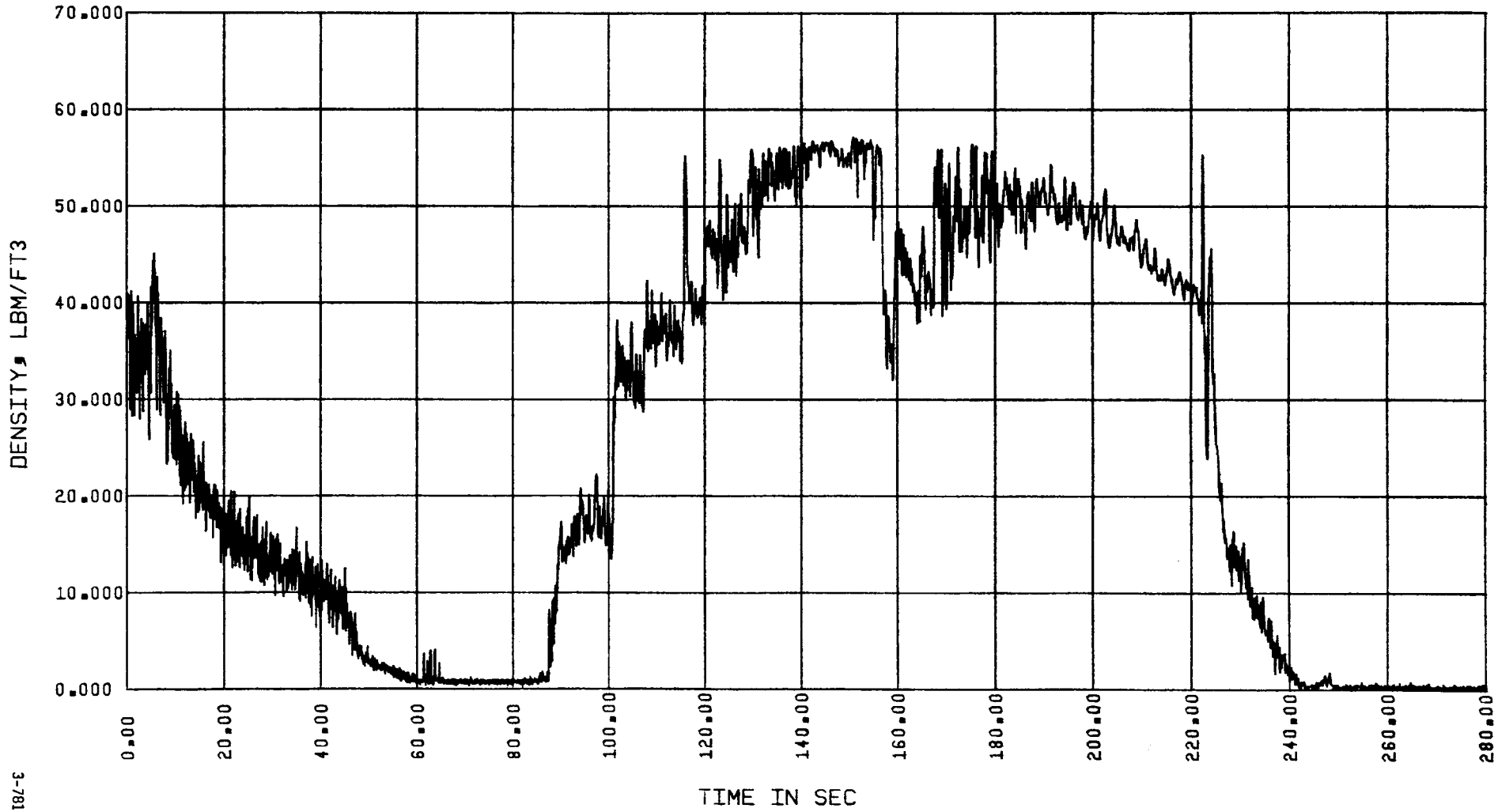


TEST 1319/1000 PSI FW FWD BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



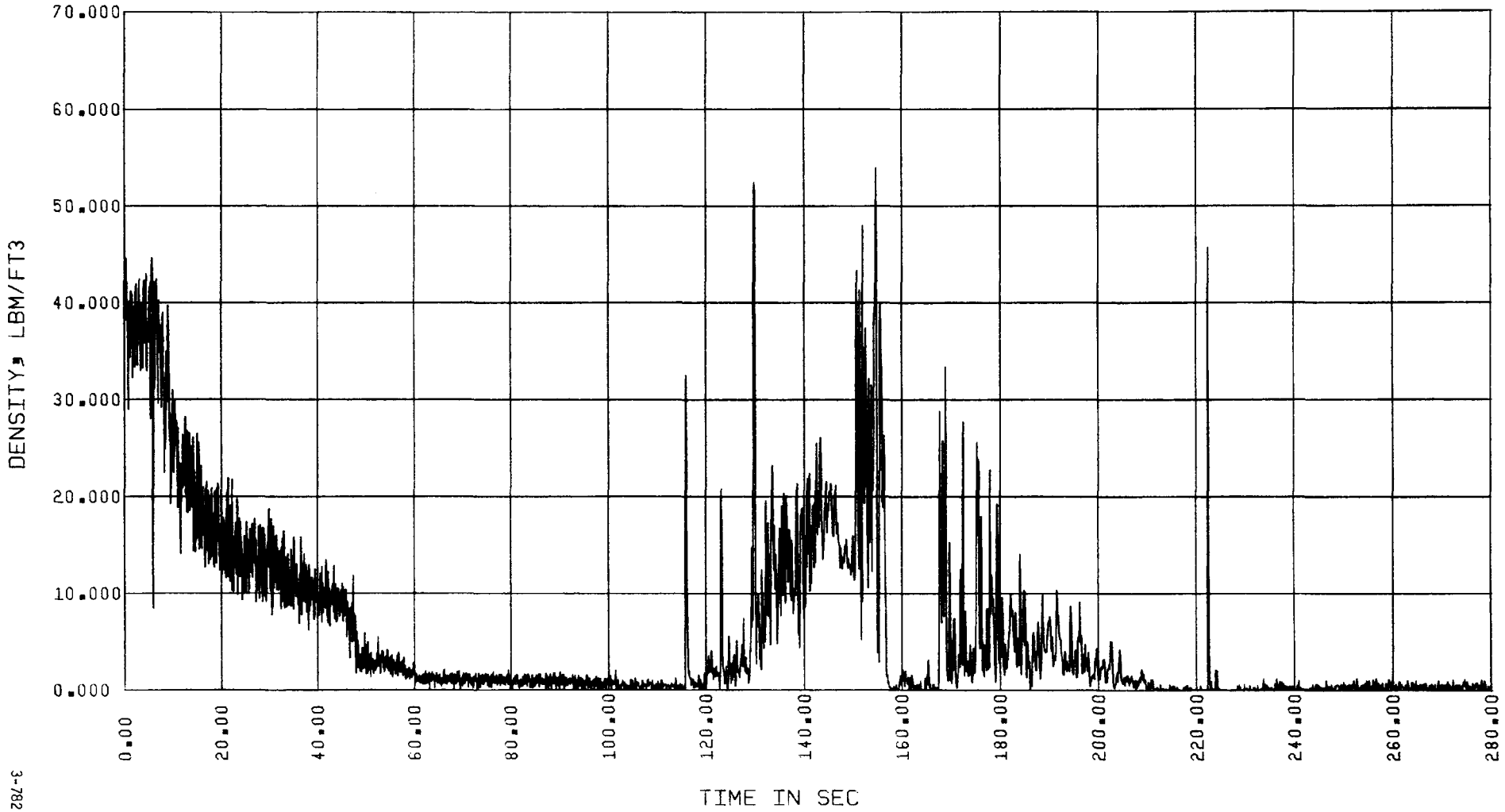
3-780

TEST 1319/1000 PSI FW FWD BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7

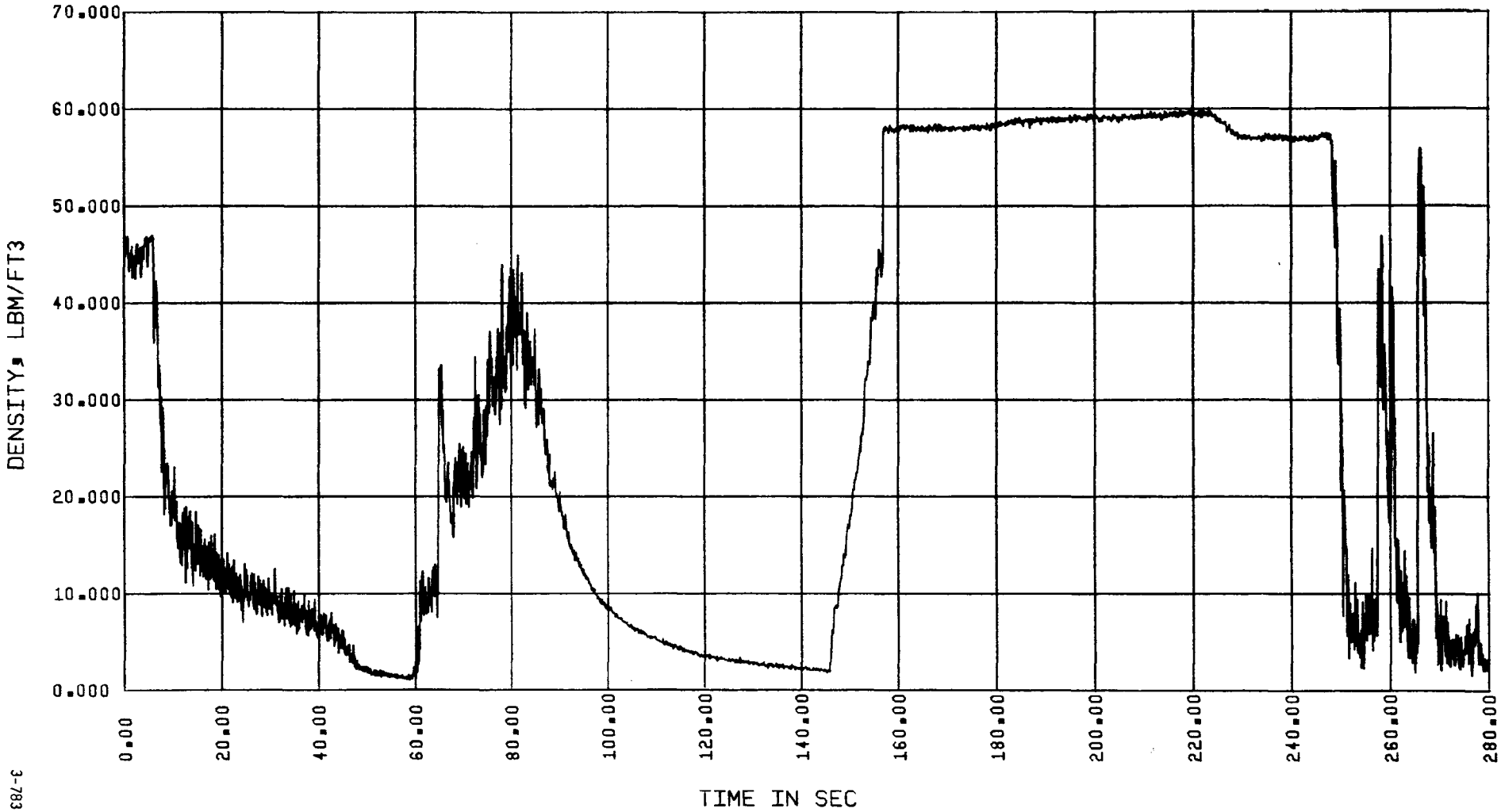


3-781

TEST 1319/1000 PSI FW FWD BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8

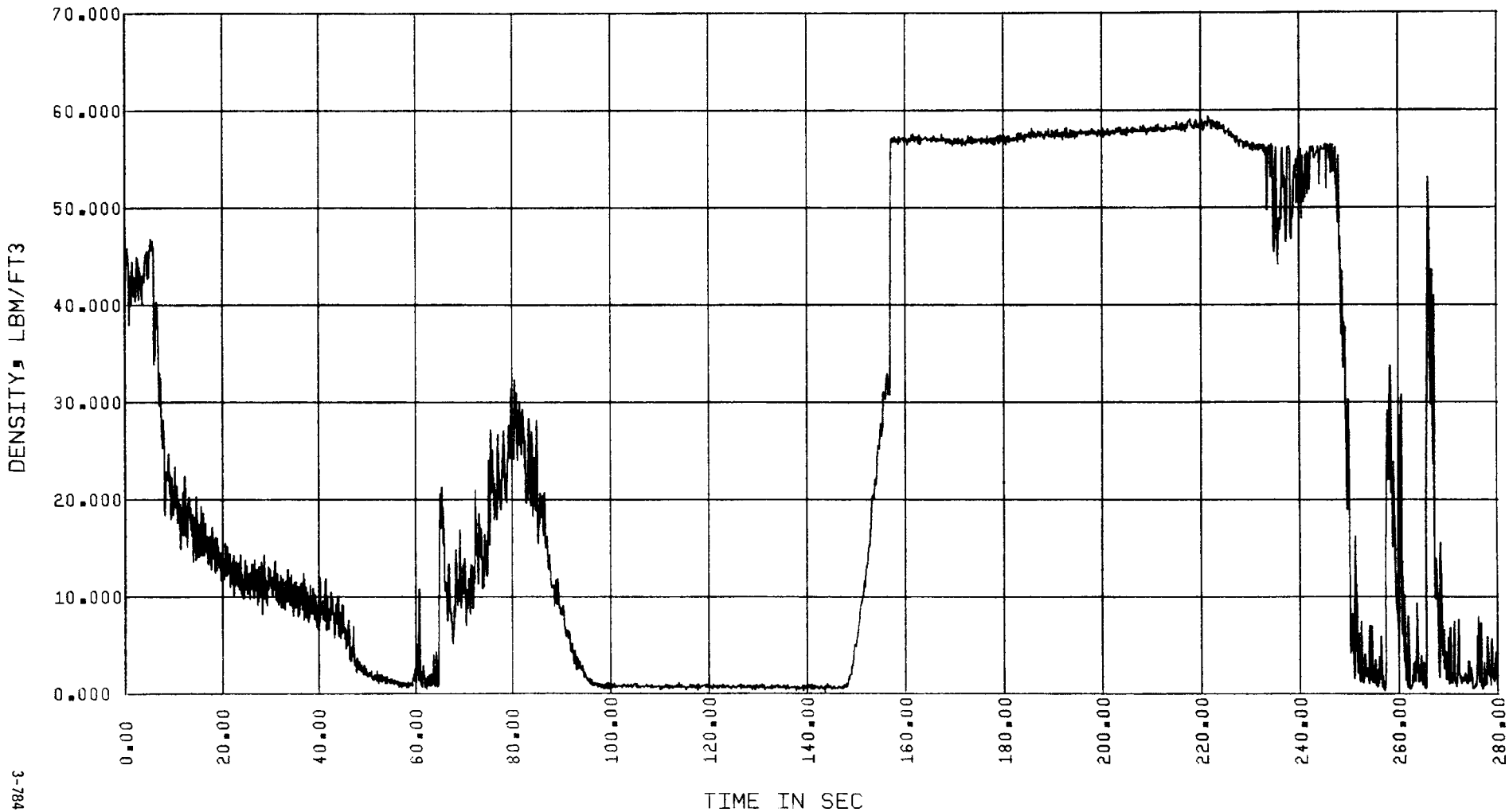


TEST 1319/1000 PSI FW FWD BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9

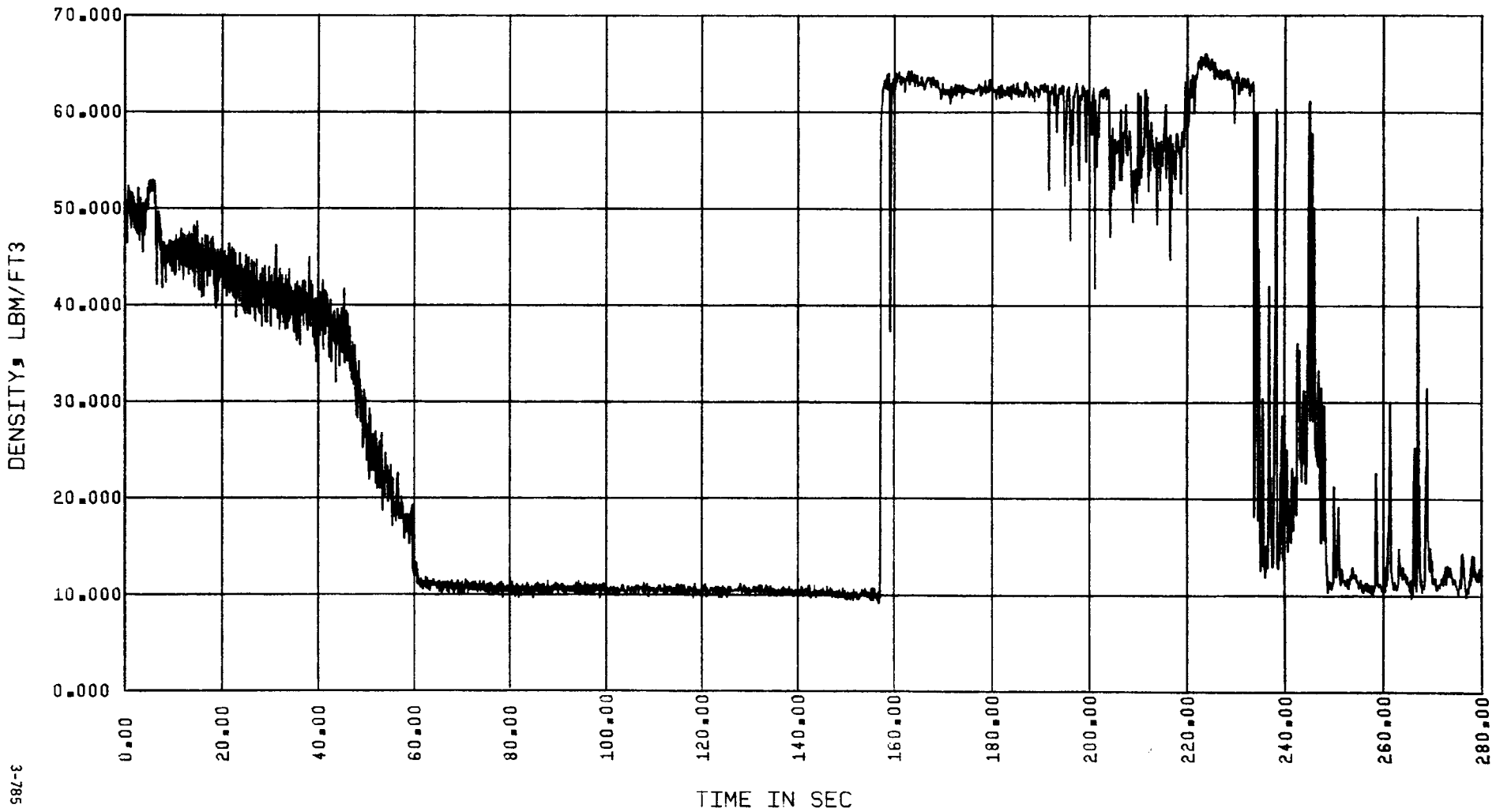


3-783

TEST 1319/1000 PSI FW FWD BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10

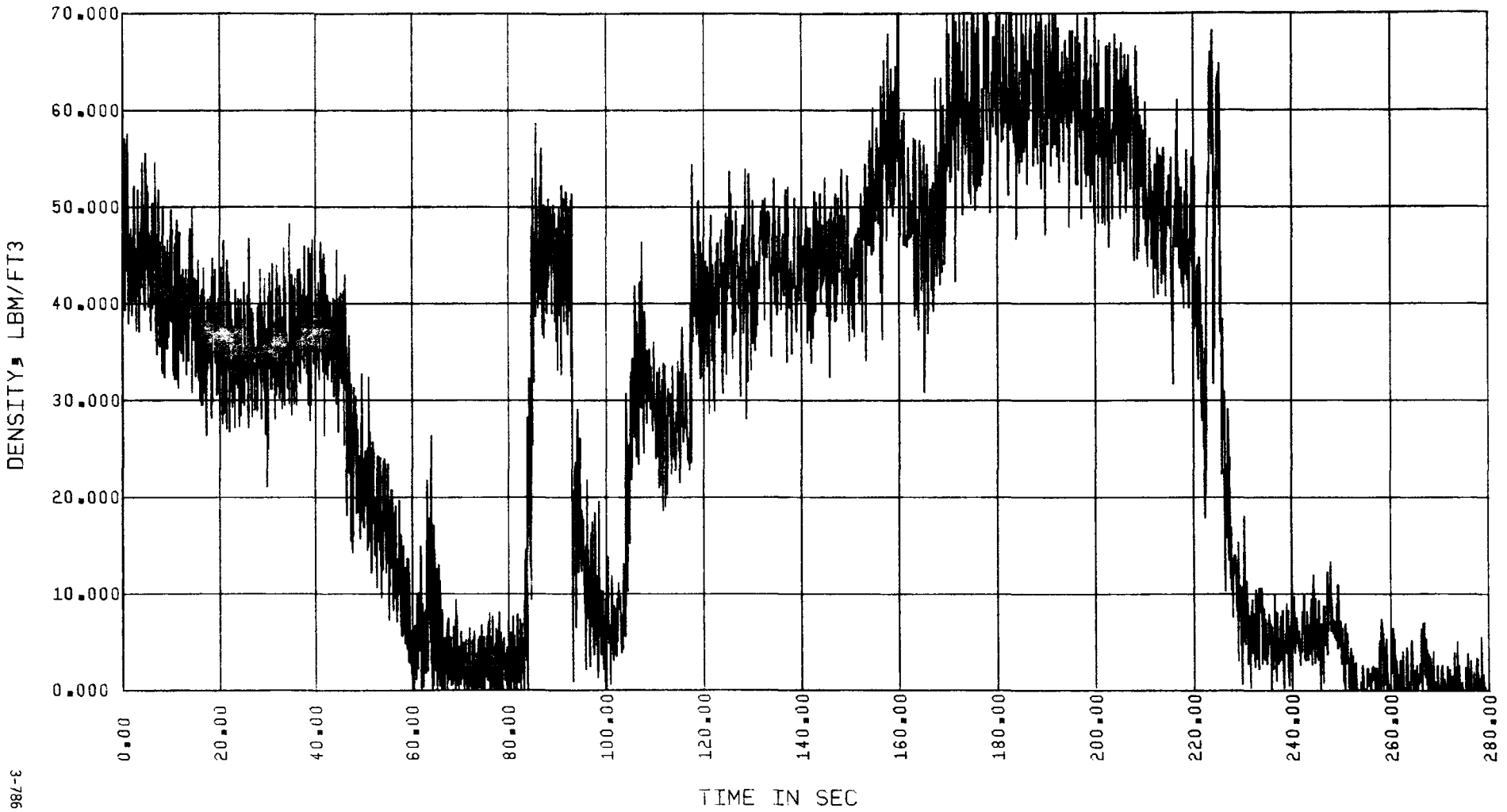


TEST 1319/1000 PSI FW FWD BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11



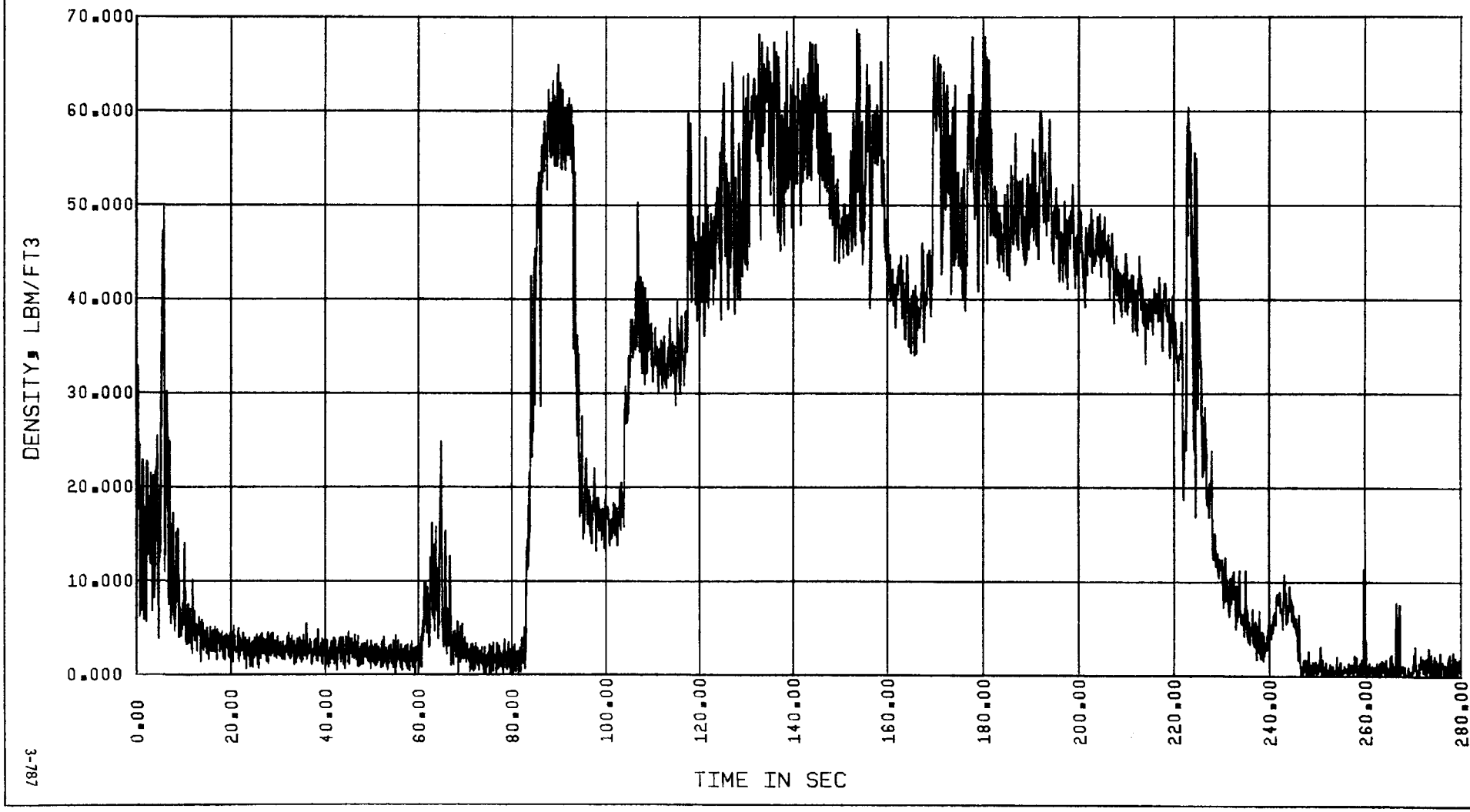
3-785

TEST 1319/1000 PSI FW FWD BDN
DENSITY BEAM1 AECL GD
PLOT NO.12

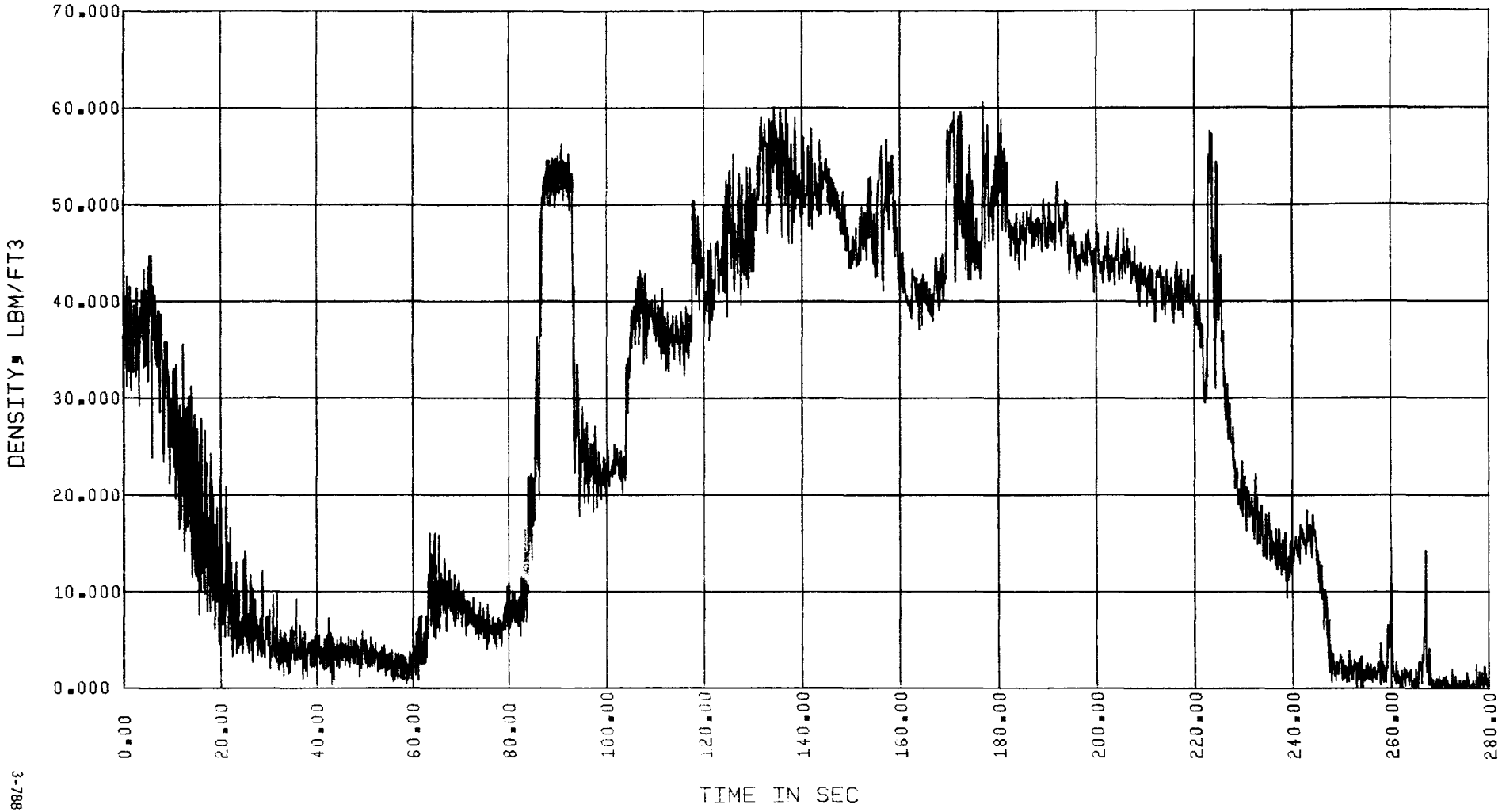


3-786

TEST 1319/1000 PSI FW FWD BDN
DENSITY BEAM2 AECL GD
PLOT NO.13

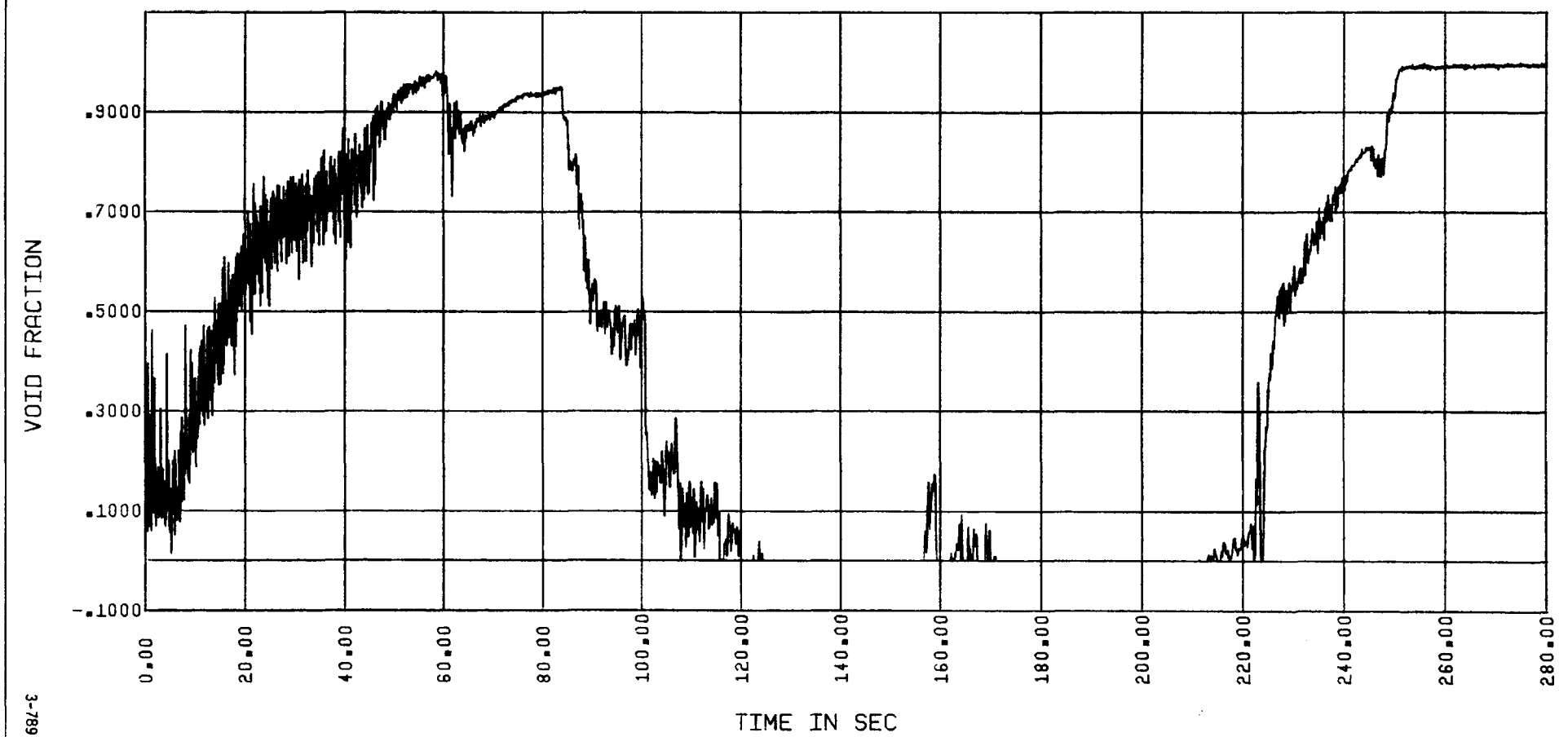


TEST 1319/1000 PSI FW FWD BDN
DENSITY BEAM3 AECL GD
PLOT NO.14



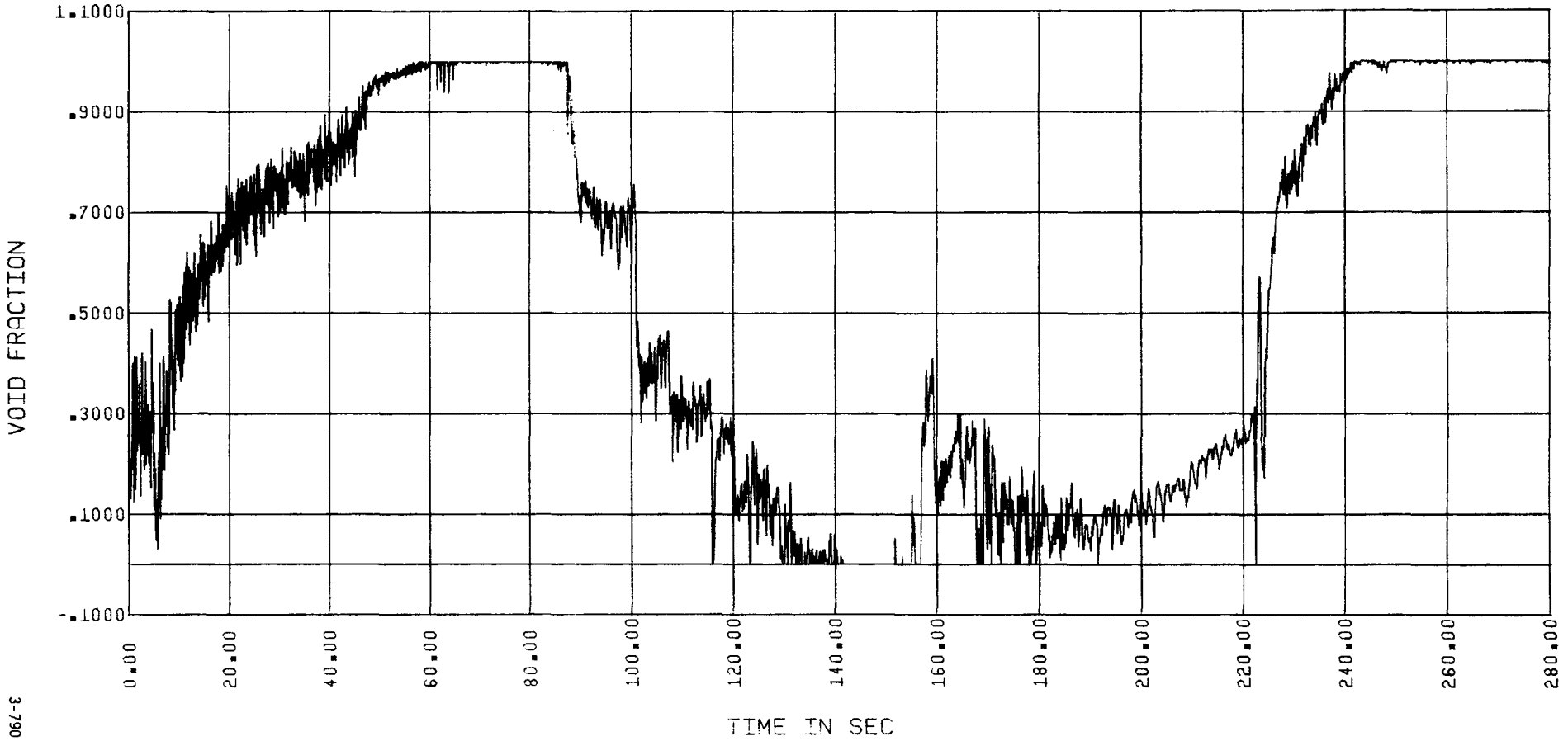
3-788

TEST 1319/1000 PSI FW FWD BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15



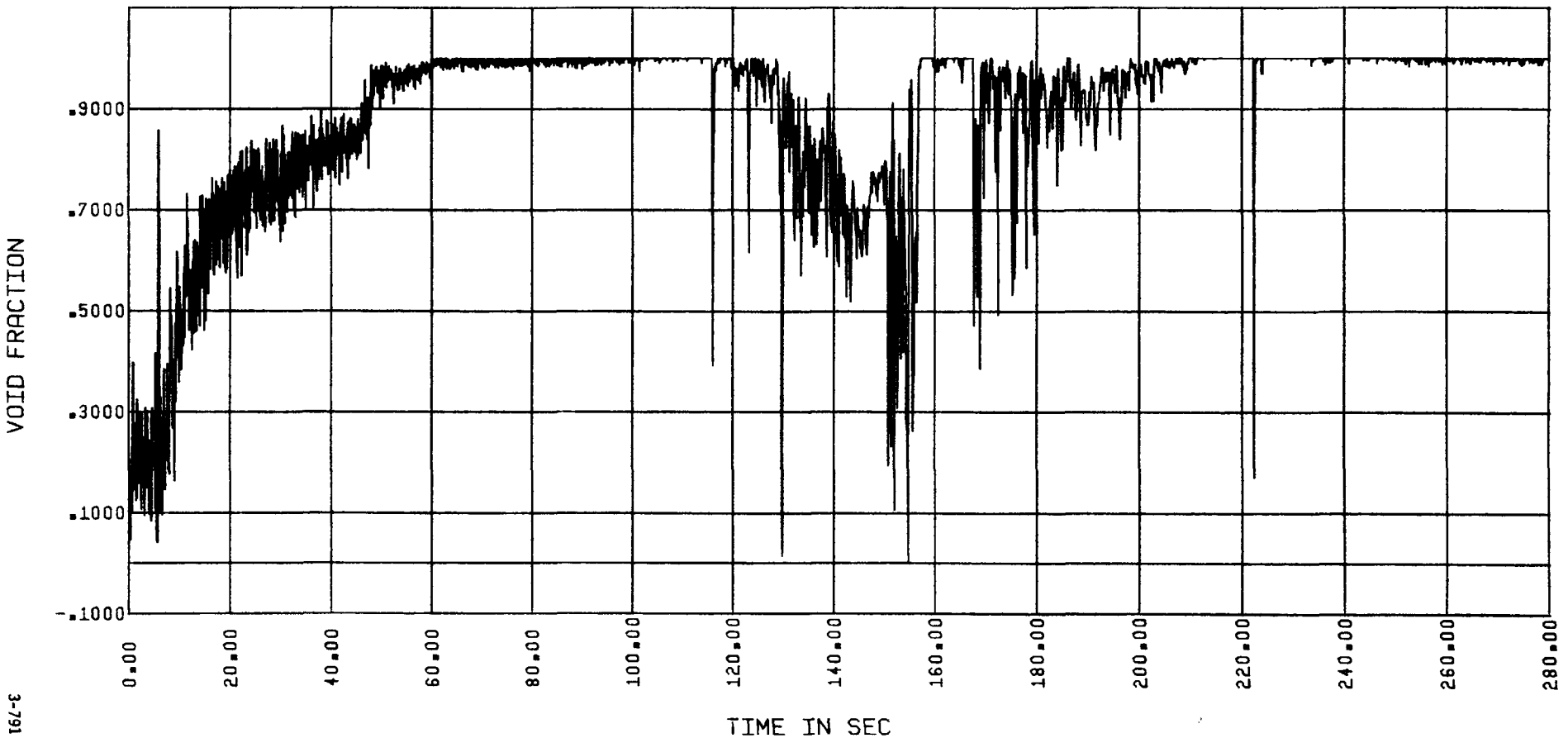
3-789

TEST 1319/1000 PSI FW FWD BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16

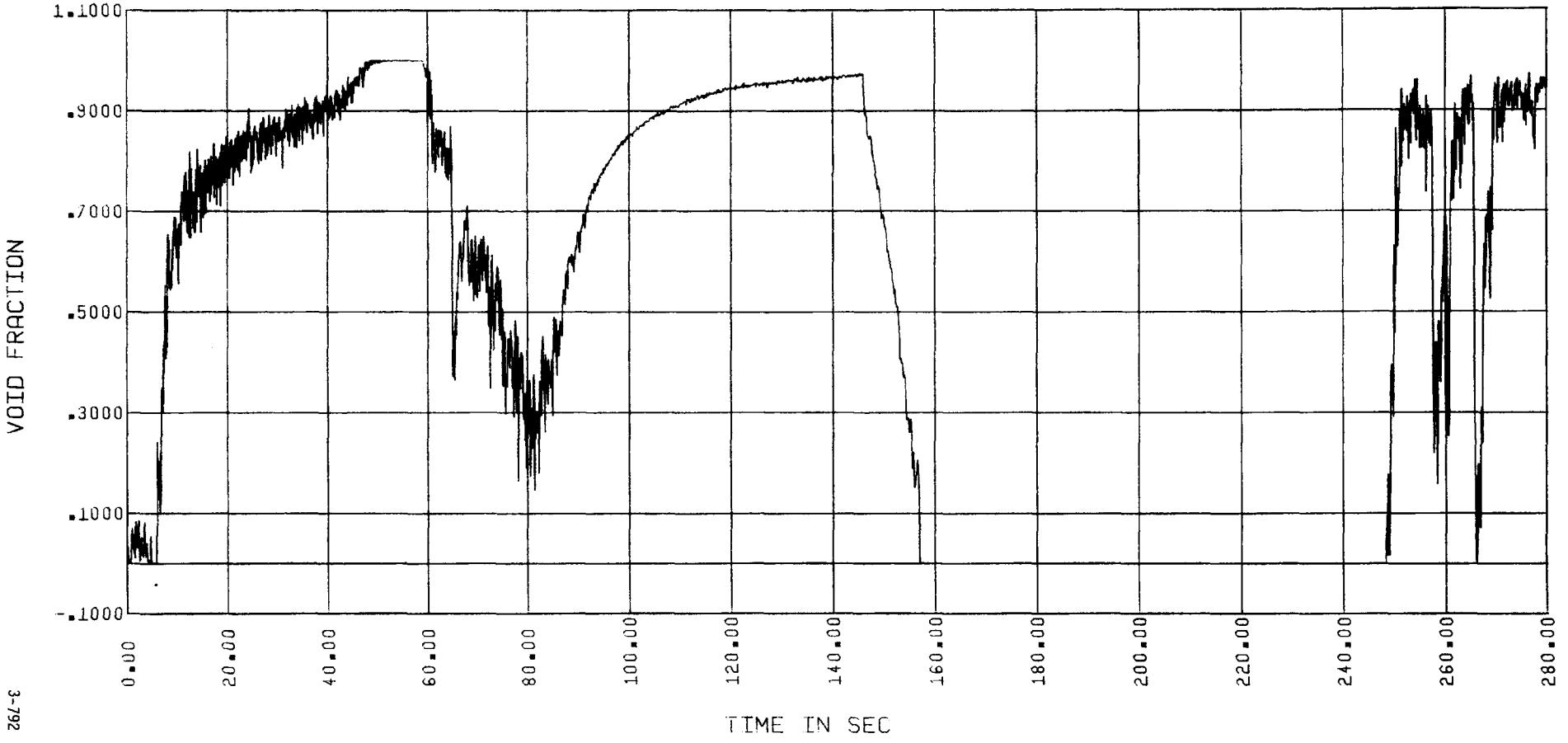


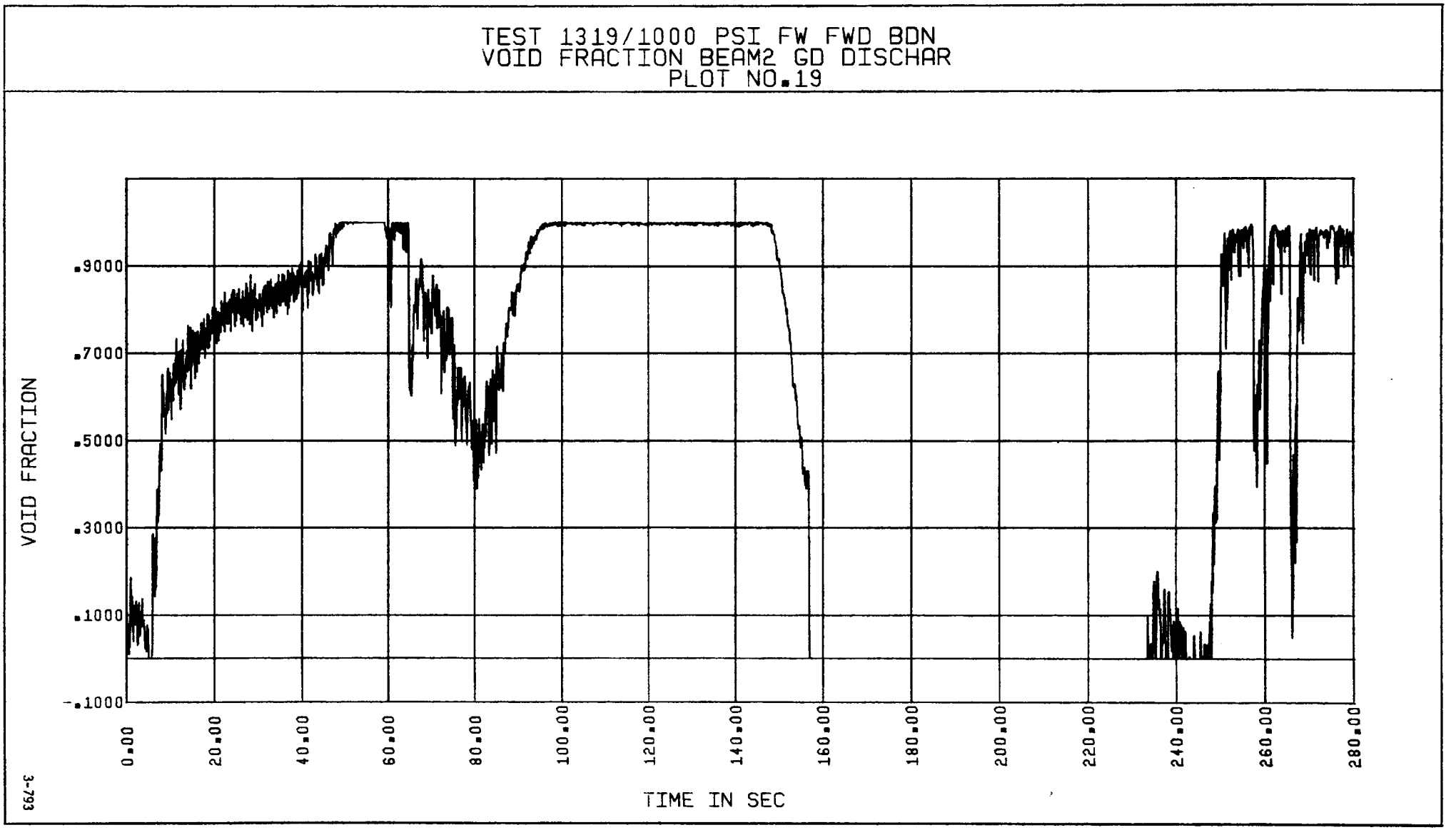
3-790

TEST 1319/1000 PSI FW FWD BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17

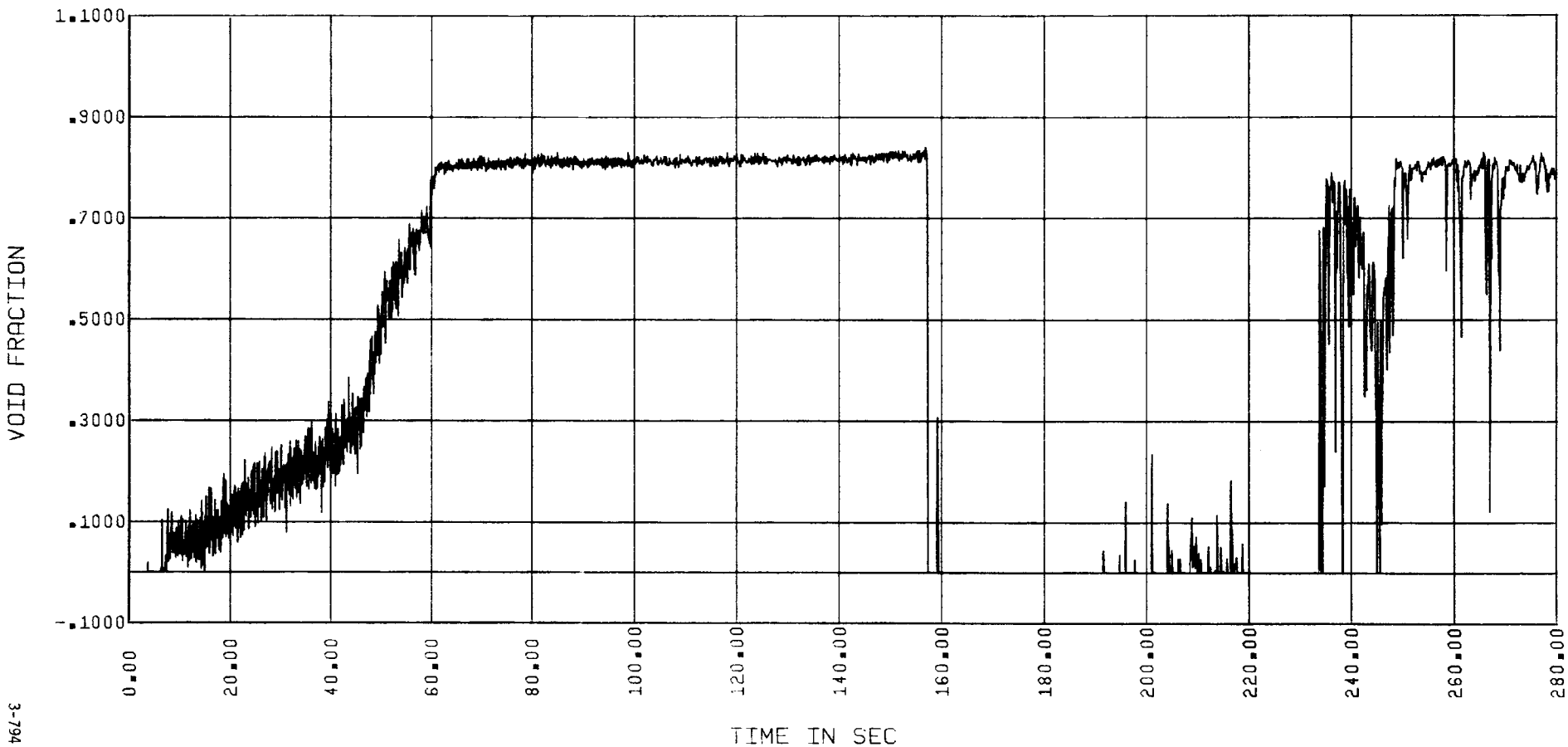


TEST 1319/1000 PSI FW FWD BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18

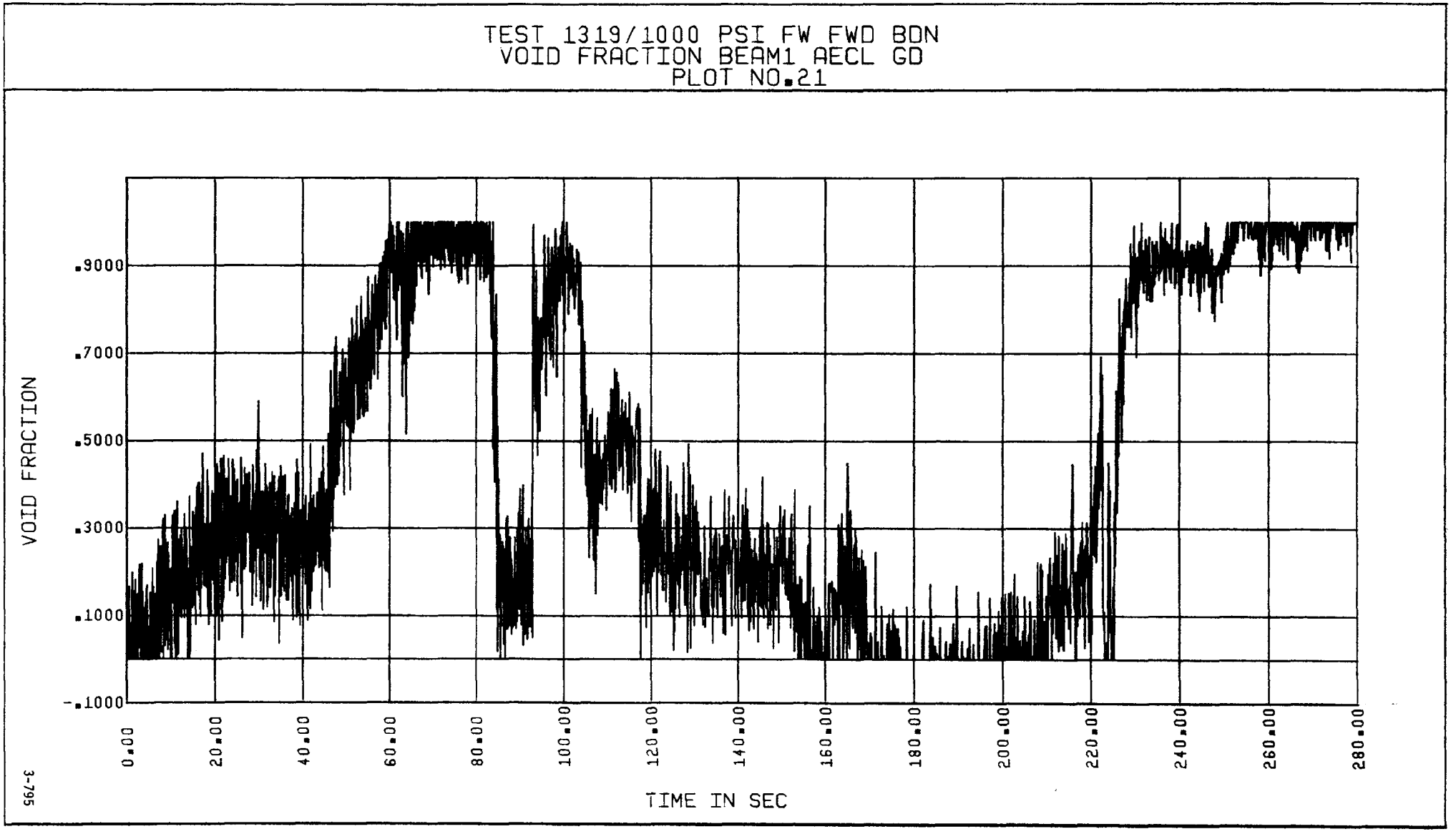



TEST 1319/1000 PSI FW FWD BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-293

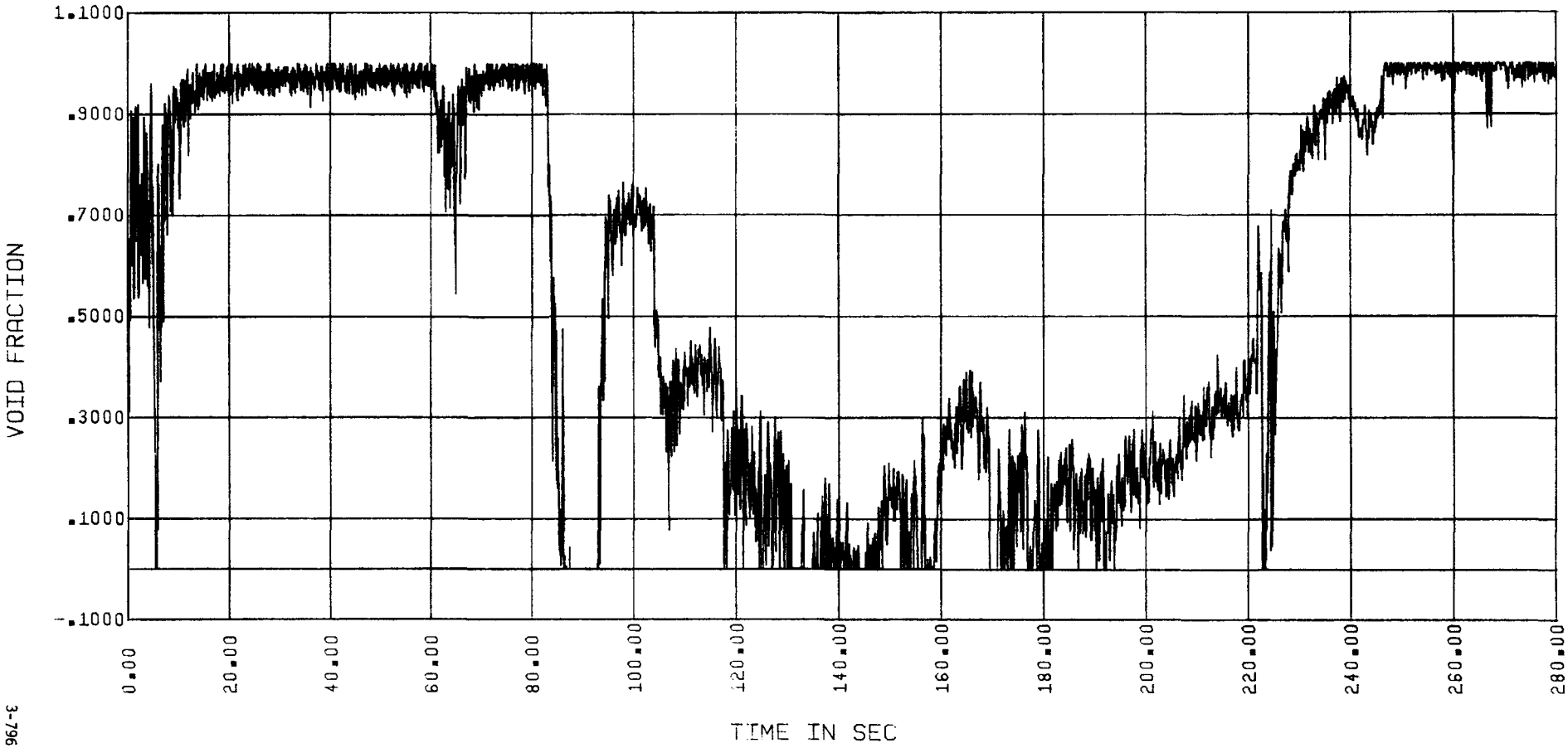
TEST 1319/1000 PSI FW FWD BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20



3-794

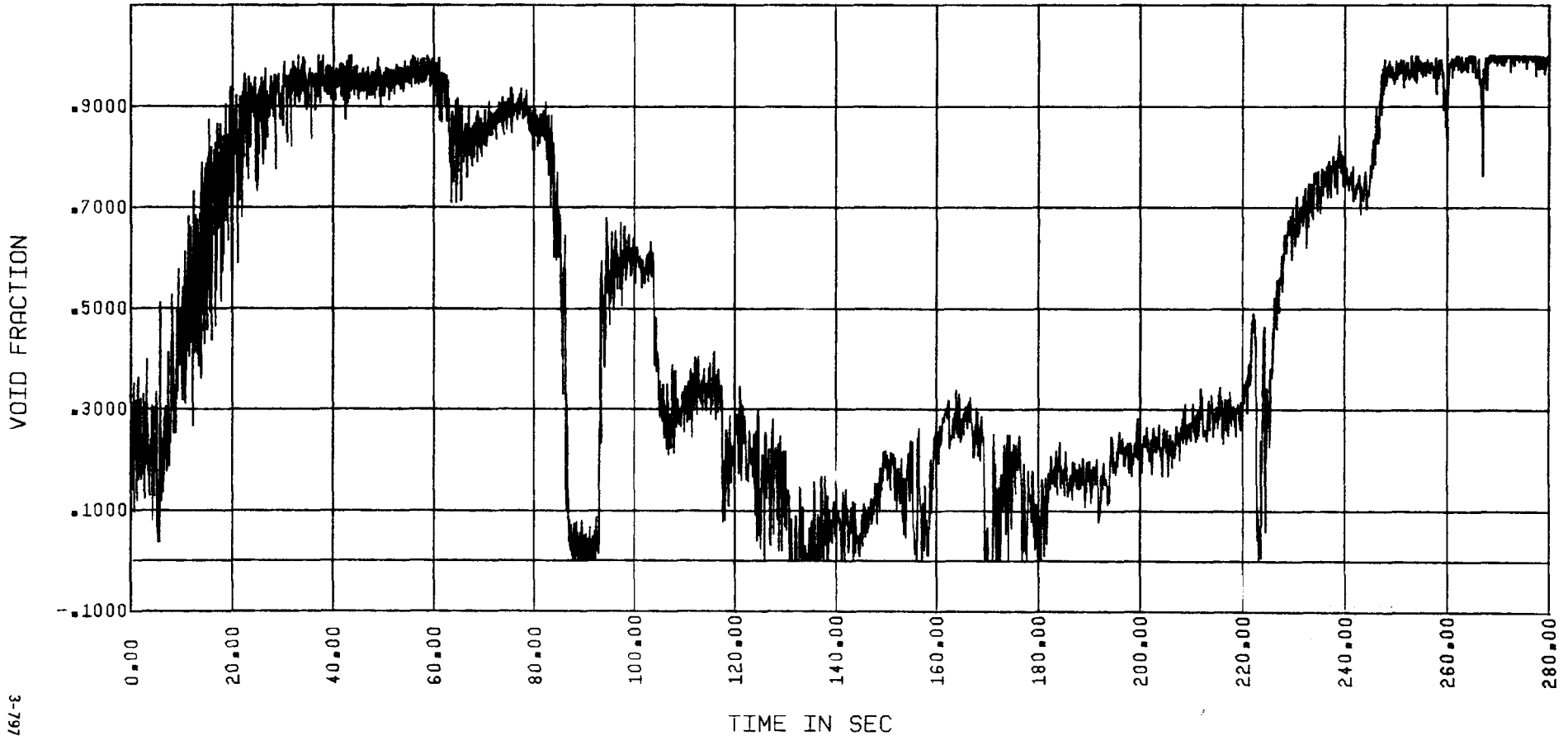

TEST 1319/1000 PSI FW FWD BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-795

TEST 1319/1000 PSI FW FWD BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22

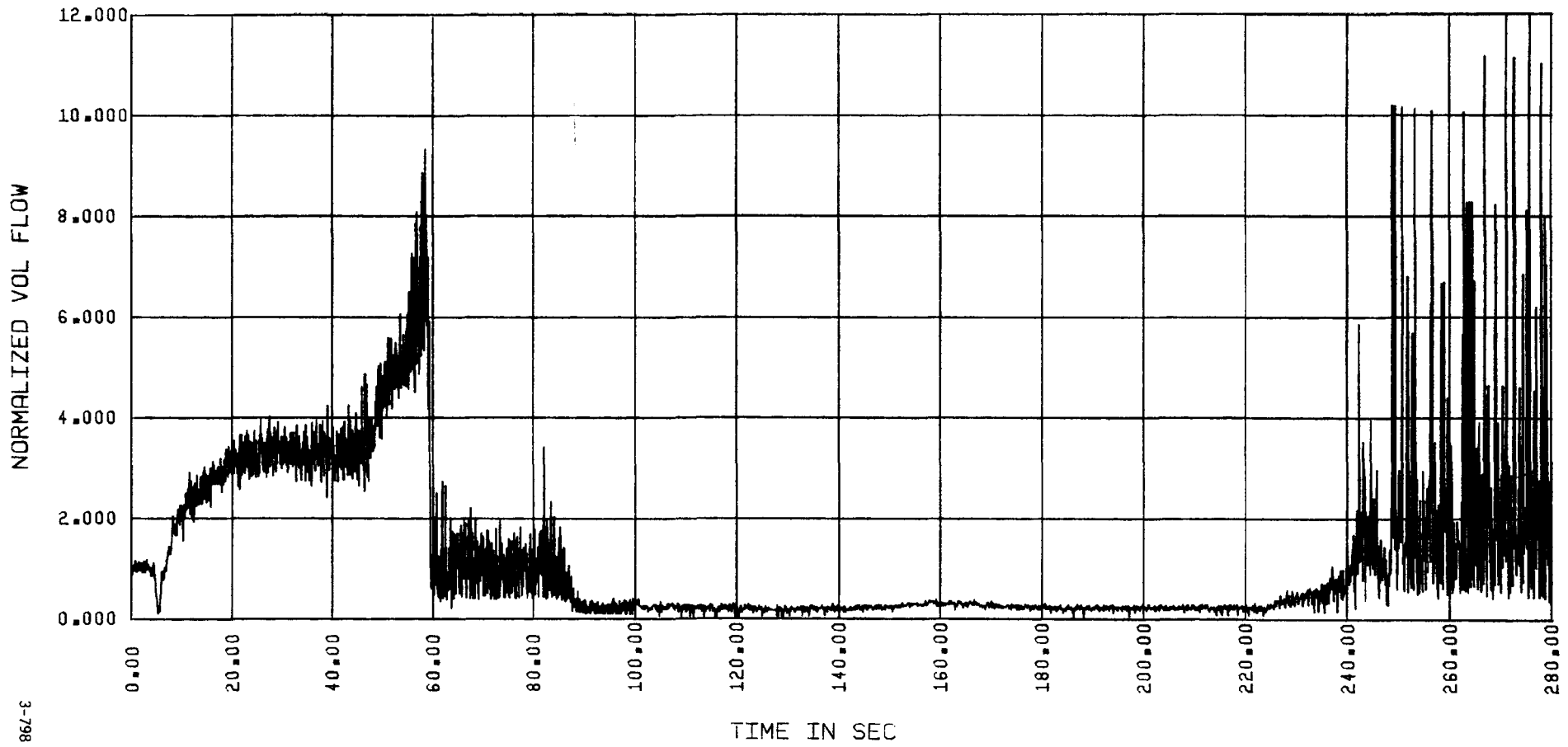


3-796

TEST 1319/1000 PSI FW FWD BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23

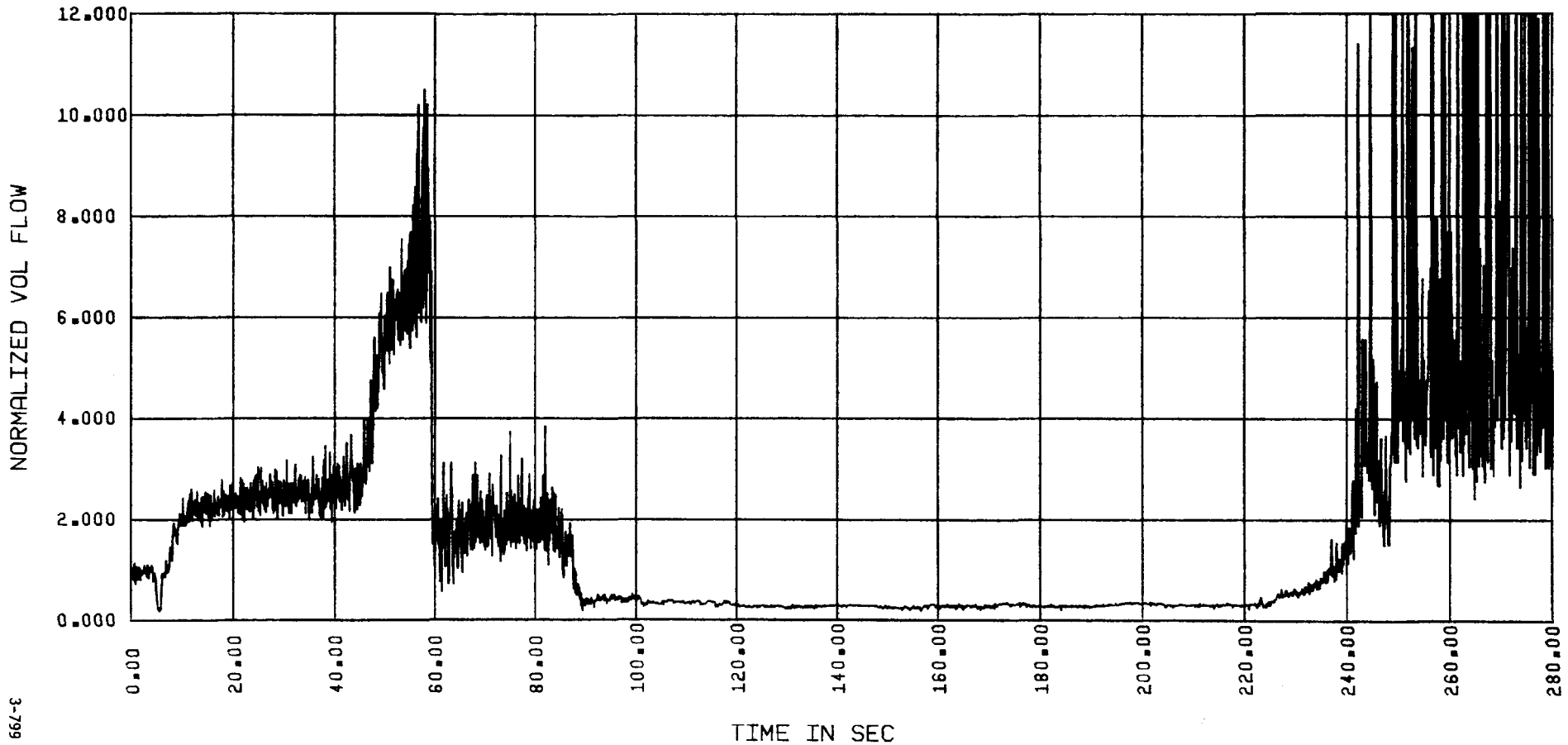


TEST 1319/1000 PSI FW FWD BDN
N VOL FLOW LO-DD/GD2 S QR=3500
PLOT NO.24



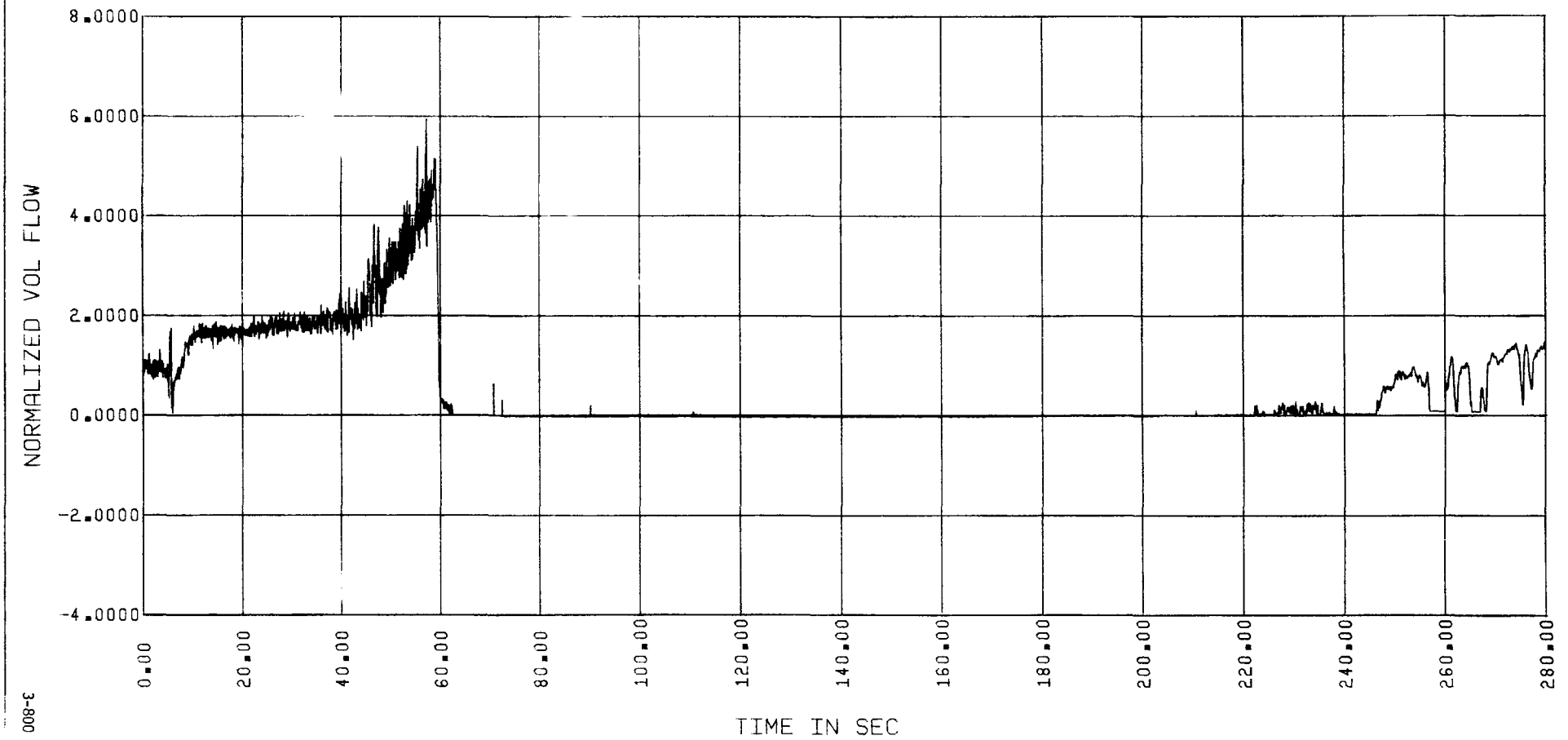
3-798

TEST 1319/1000 PSI FW FWD BDN
NORM VOL FLW RTE HI-DD/GD SUCT
PLOT NO.25

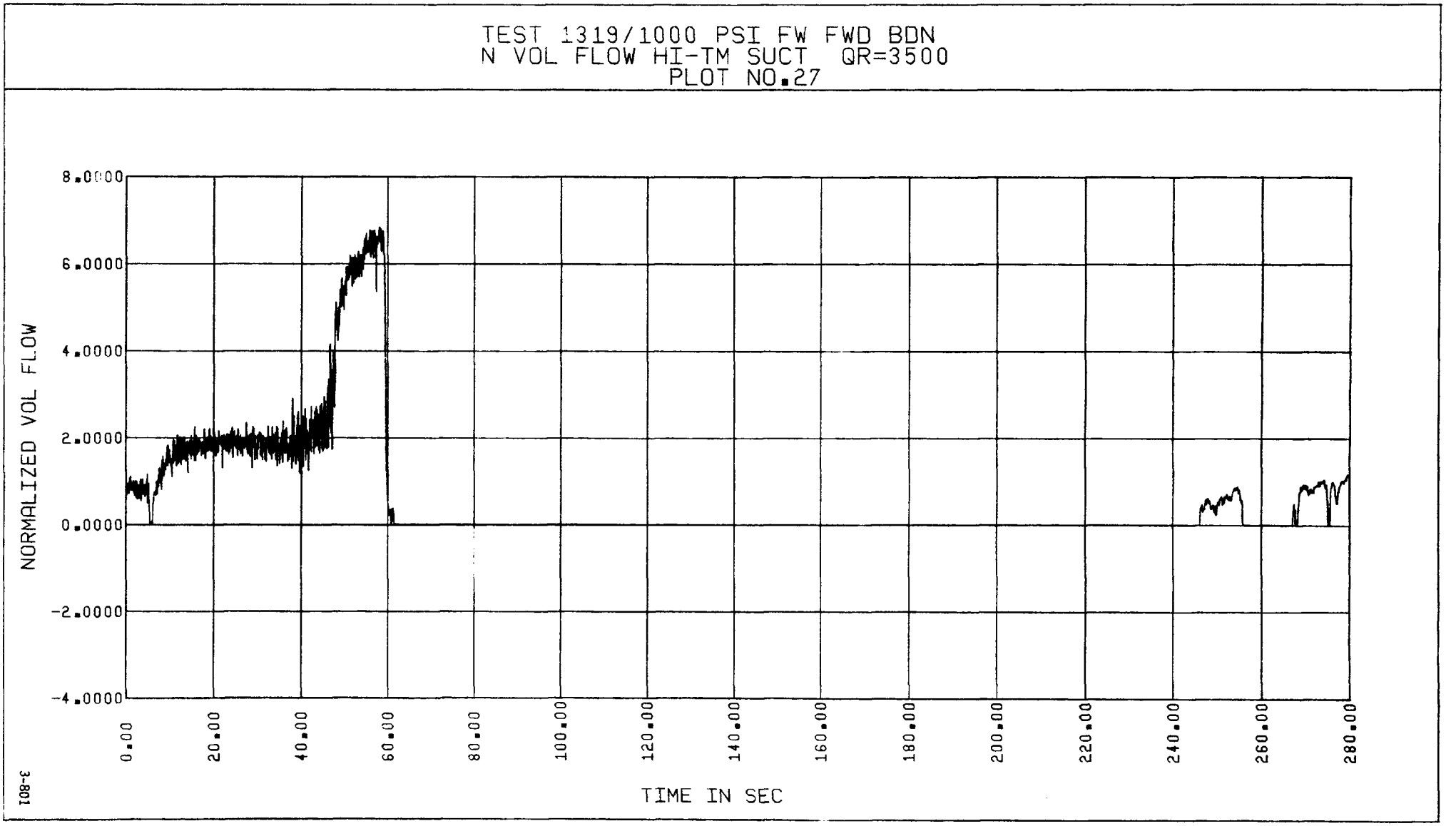


3-799

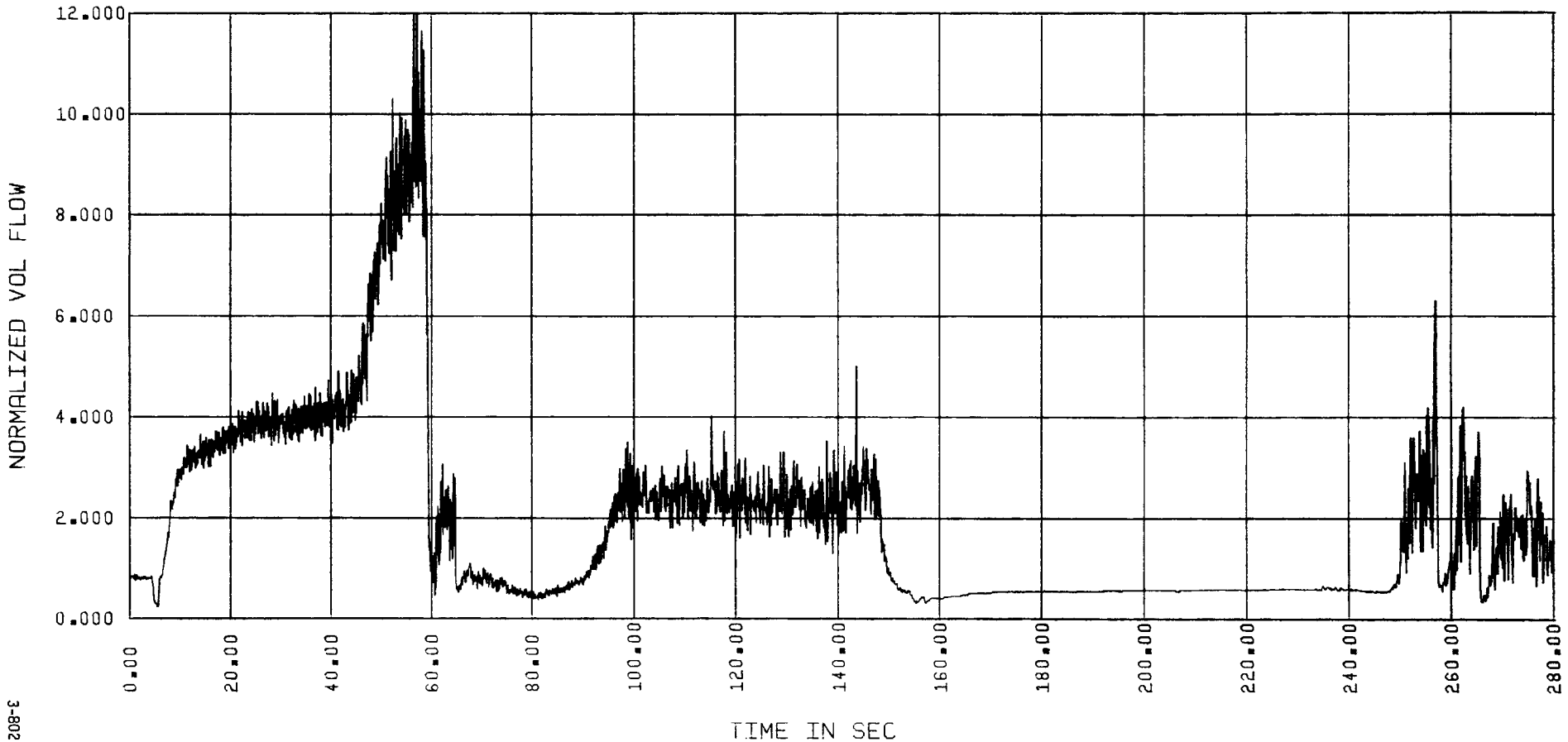
TEST 1319/1000 PSI FW FWD BDN
N VOL FLOW LO-TM SUCT QR=3500
PLOT NO.26

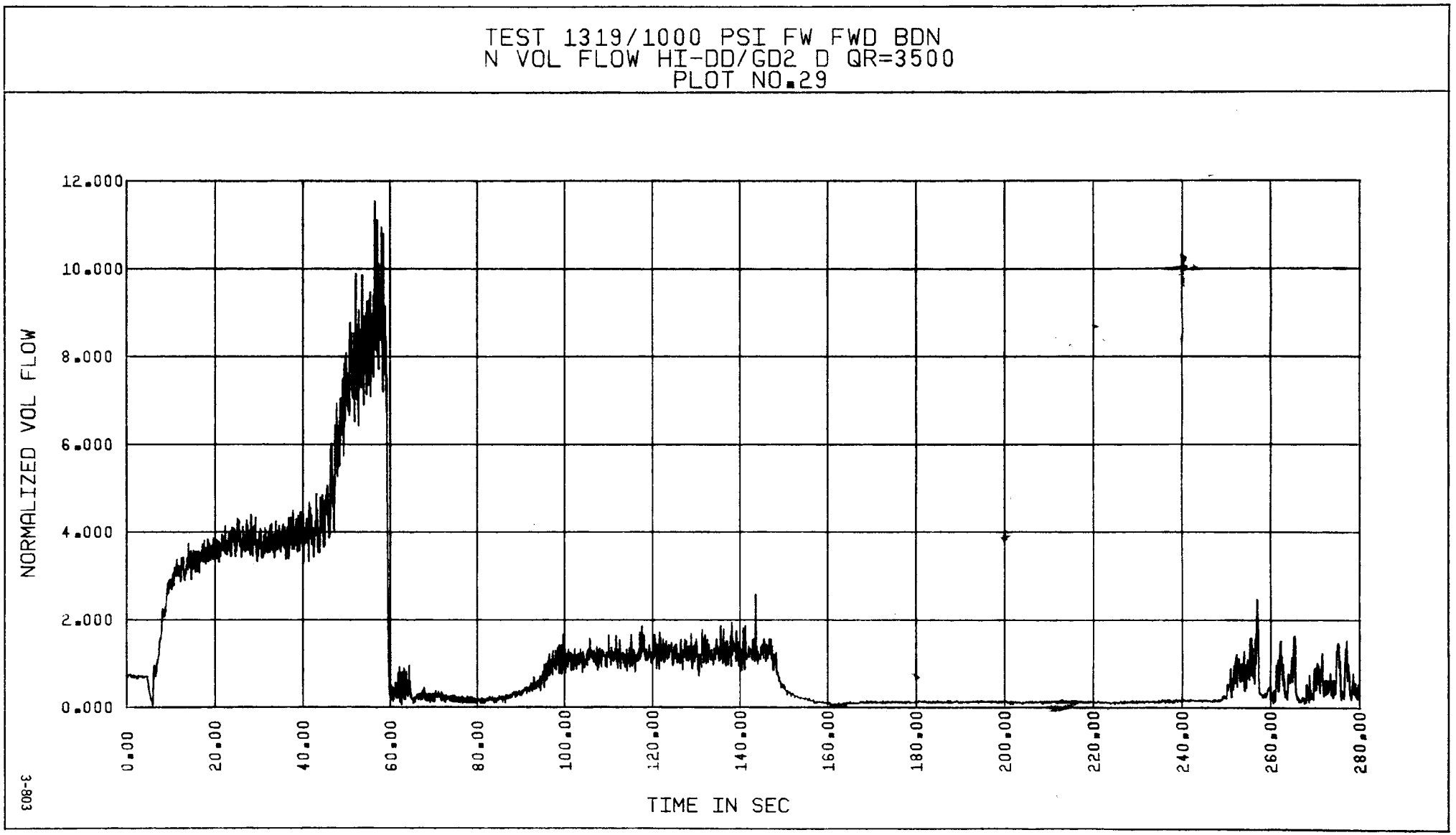


3-800

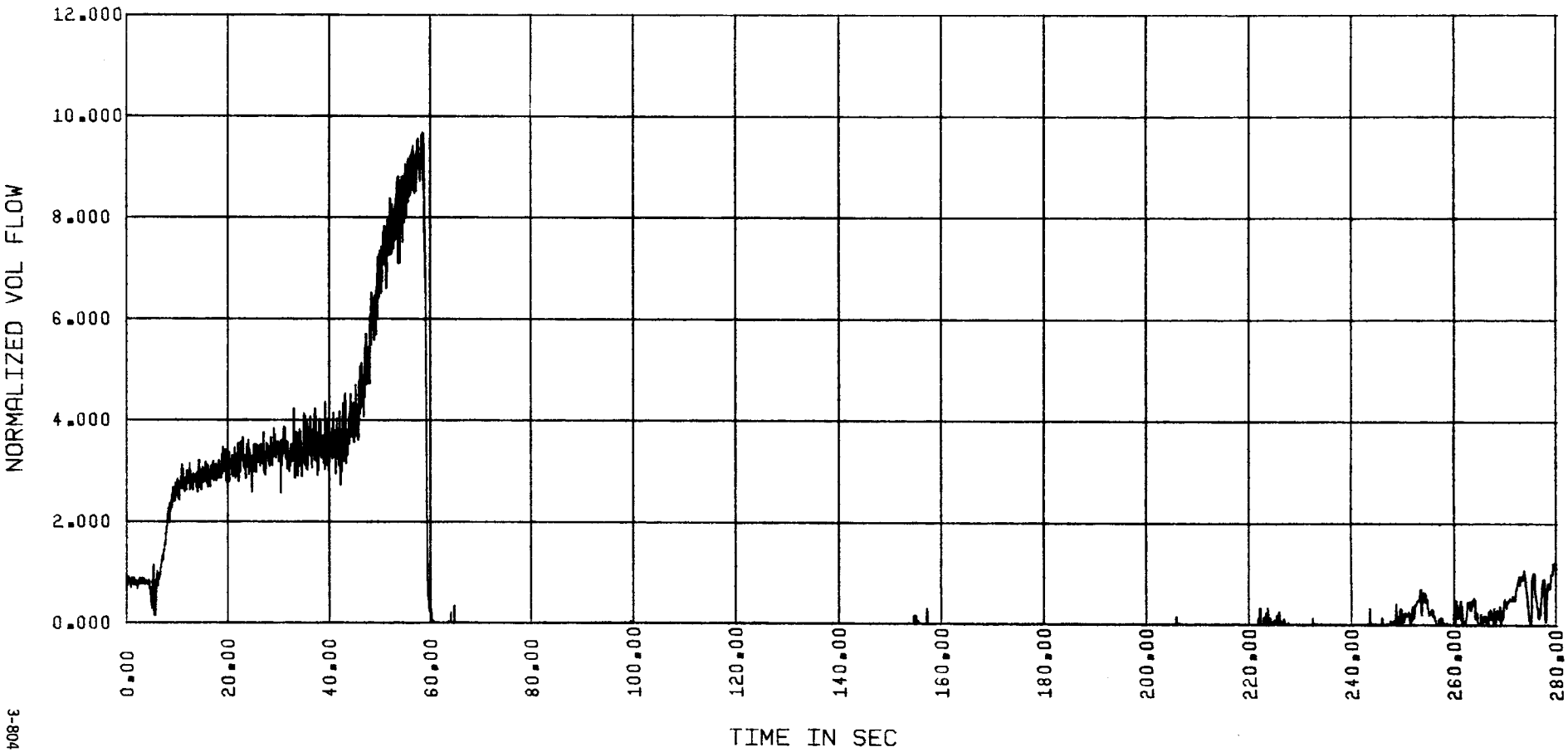

TEST 1319/1000 PSI FW FWD BDN
N VOL FLOW HI-TM SUCT QR=3500
PLOT NO.27
NORMALIZED VOL FLOW
8.0000
6.0000
4.0000
2.0000
0.0000
-2.0000
-4.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-801

TEST 1319/1000 PSI FW FWD BDN
N VOL FLOW LO-DD/GD2 D QR=3500
PLOT NO.28



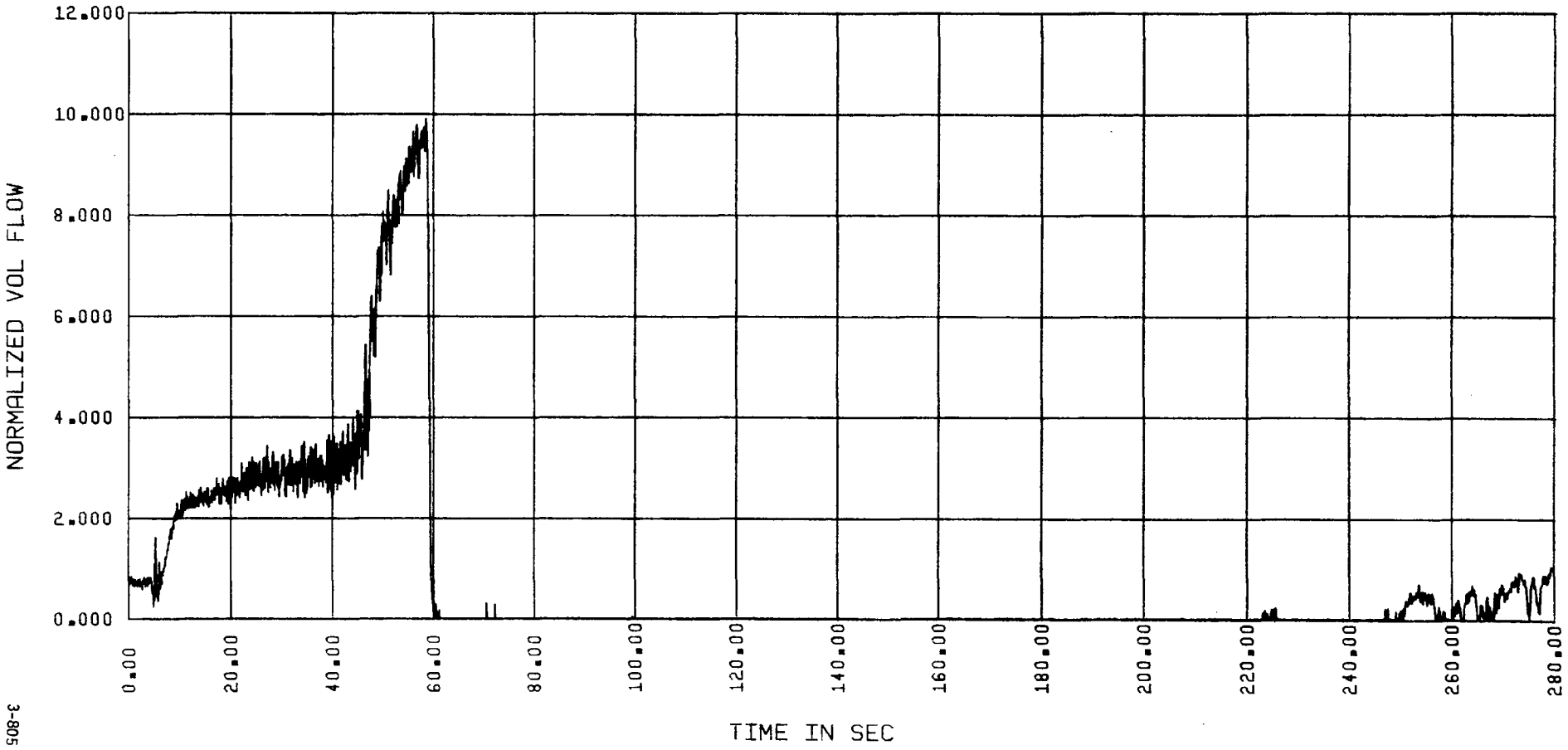

TEST 1319/1000 PSI FW FWD BDN
N VOL FLOW HI-DD/GD2 D QR=3500
PLOT NO.29
NORMALIZED VOL FLOW
12.000
10.000
8.000
6.000
4.000
2.000
0.000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-803

TEST 1319/1000 PSI FW FWD BDN
N VOL FLOW LO-TM DISCH QR=3500
PLOT NO.30



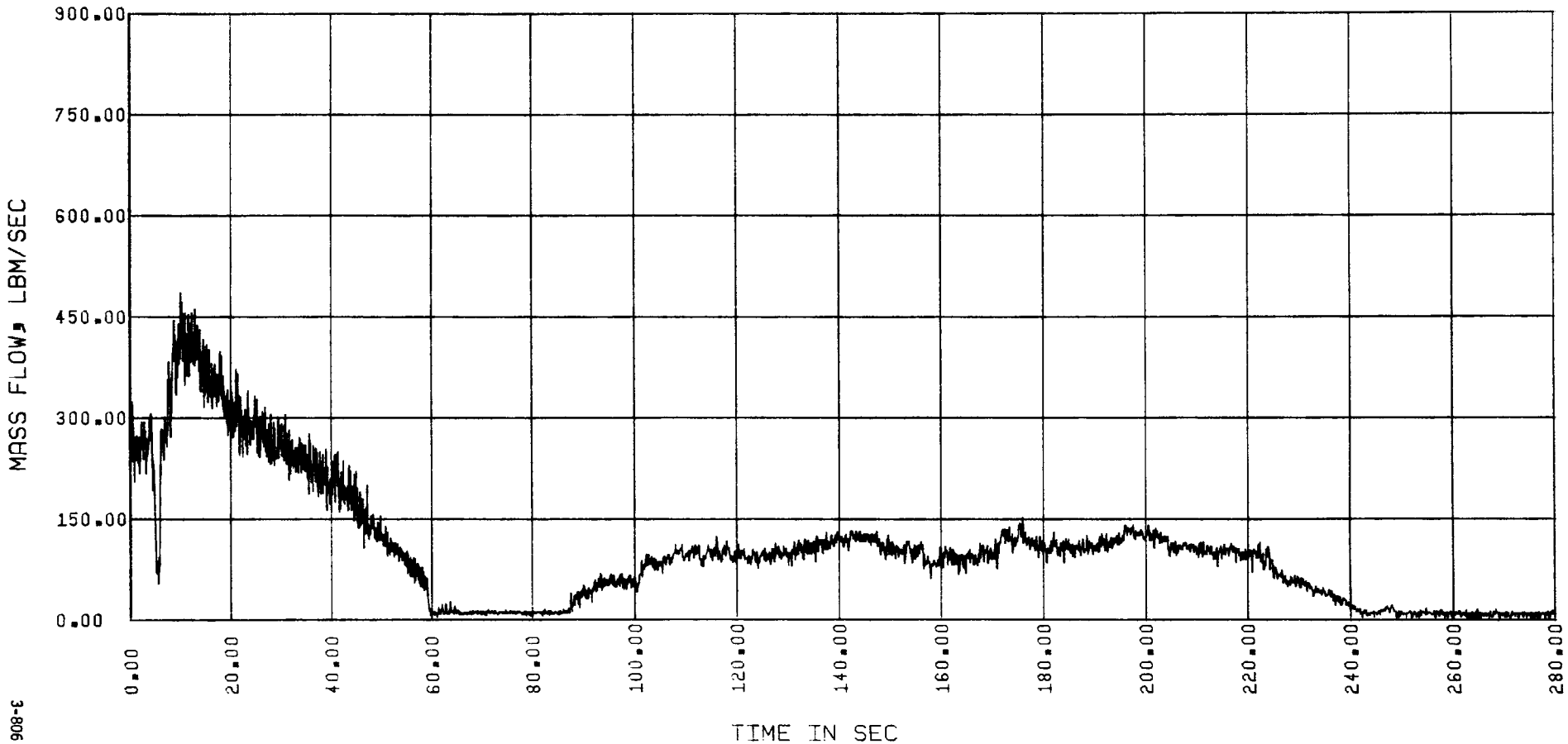
3-804

TEST 1319/1000 PSI FW FWD BDN
N VOL FLOW HI-TM D QR=3500
PLOT NO.31

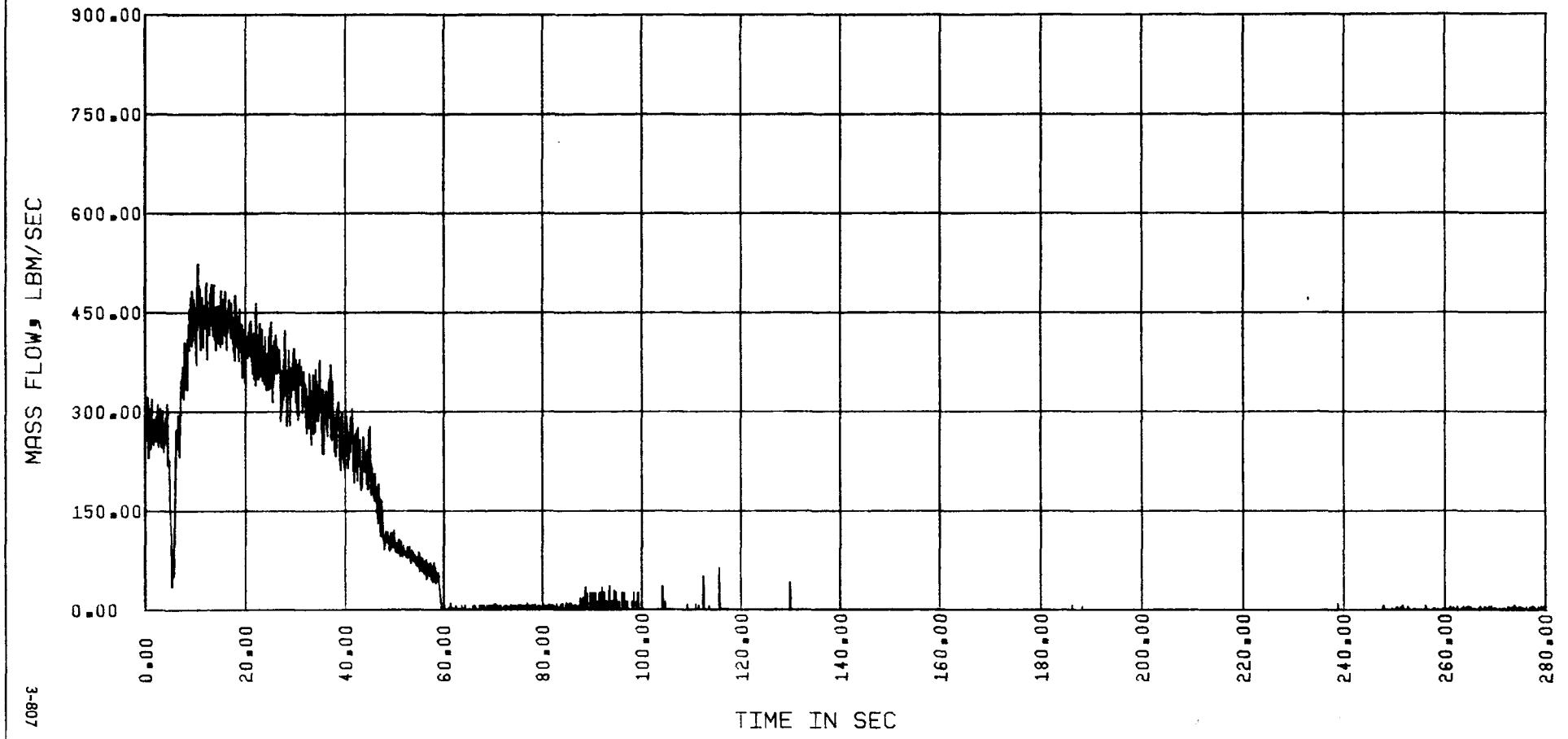


3-805

TEST 1319/1000 PSI FW FWD BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.32

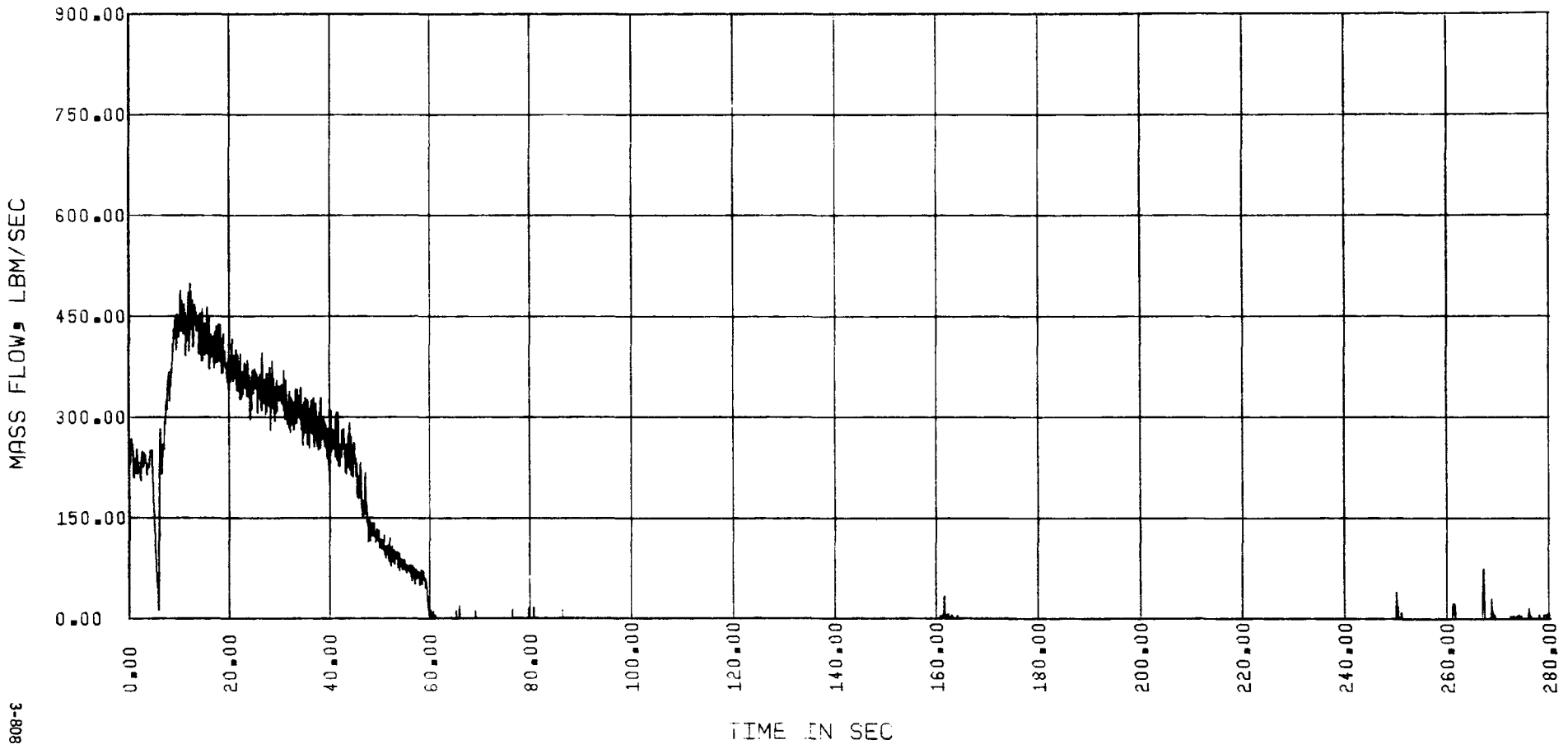


TEST 1319/1000 PSI FW FWD BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.33

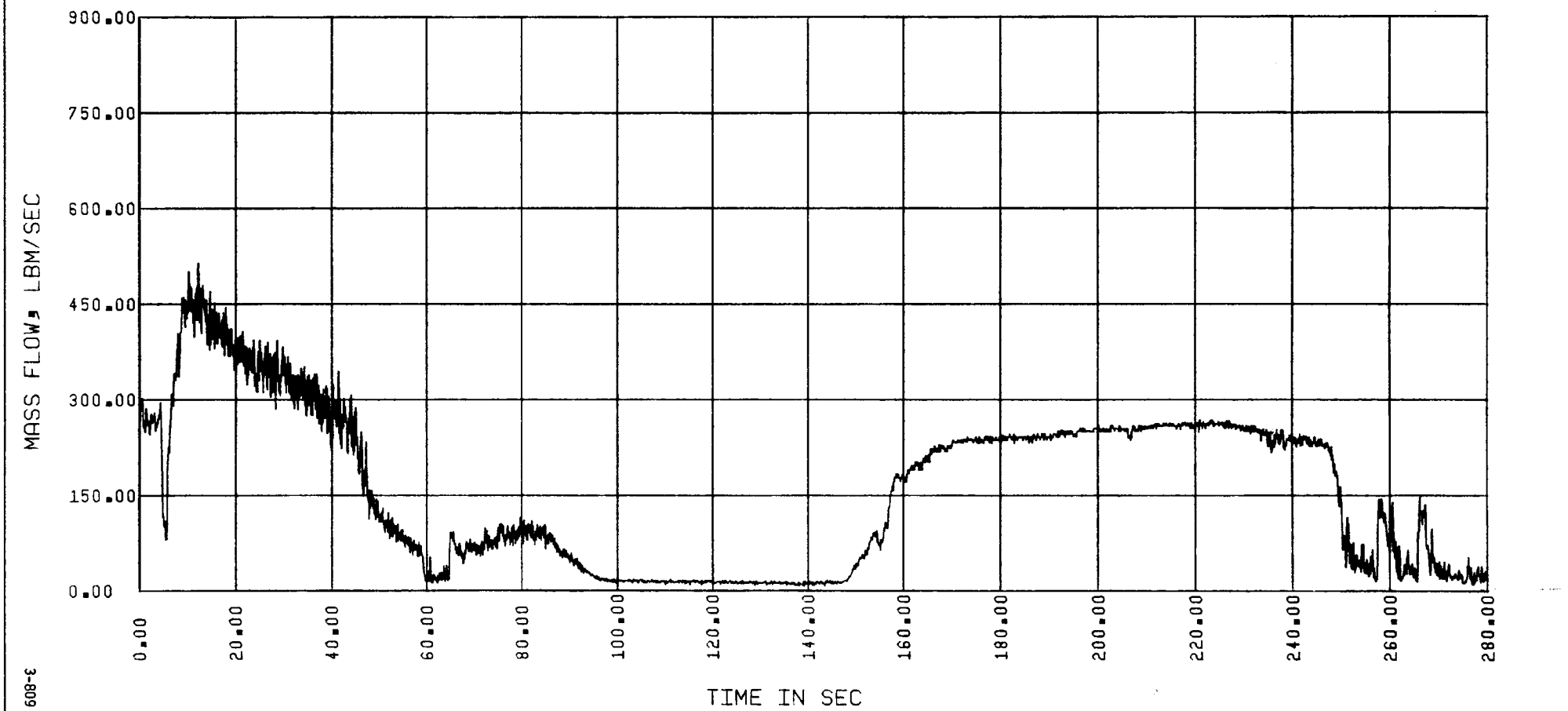


3-807

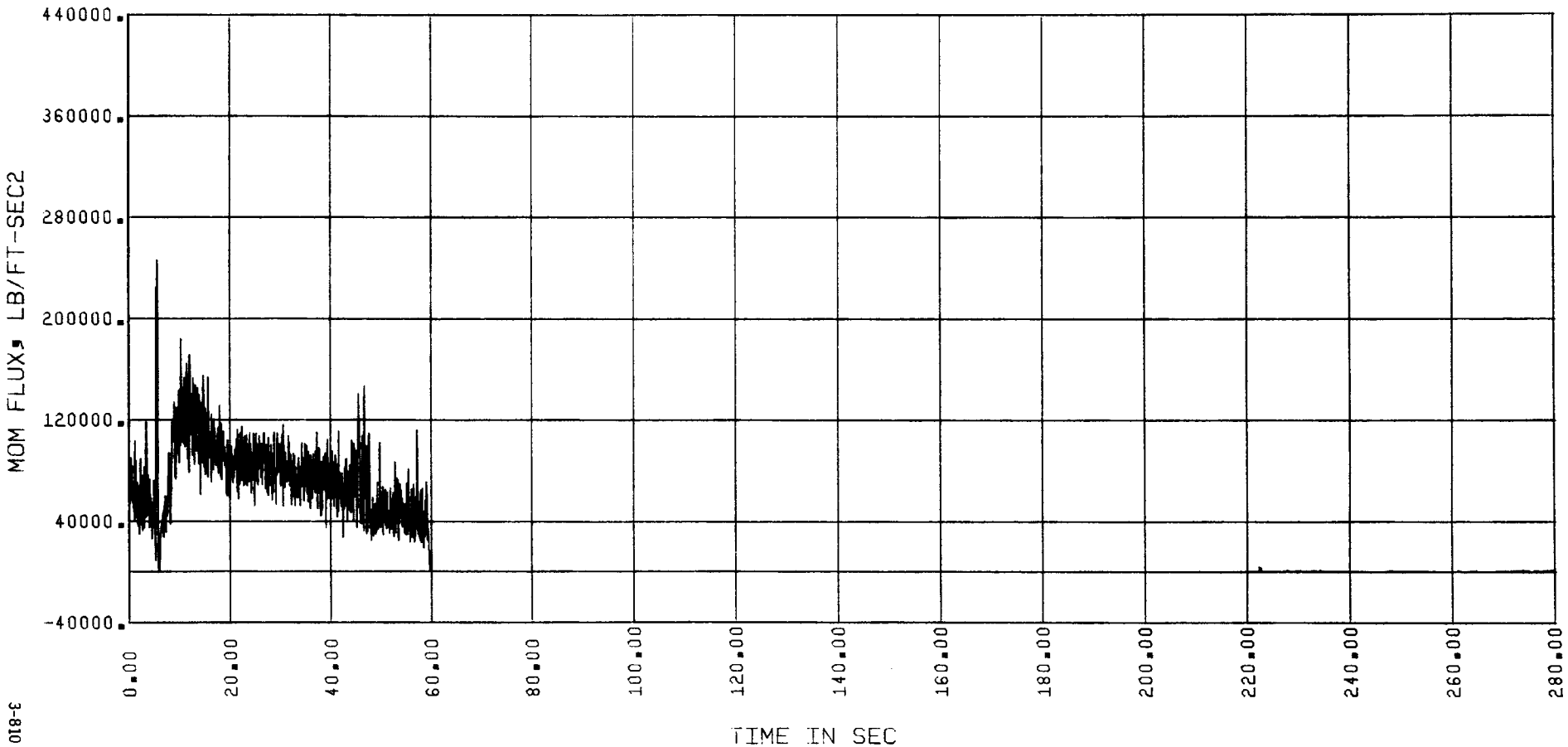
TEST 1319/1000 PSI FW FWD BDN
MASS FLOW RATE HI-DD/GD2 DISCH
PLOT NO.34



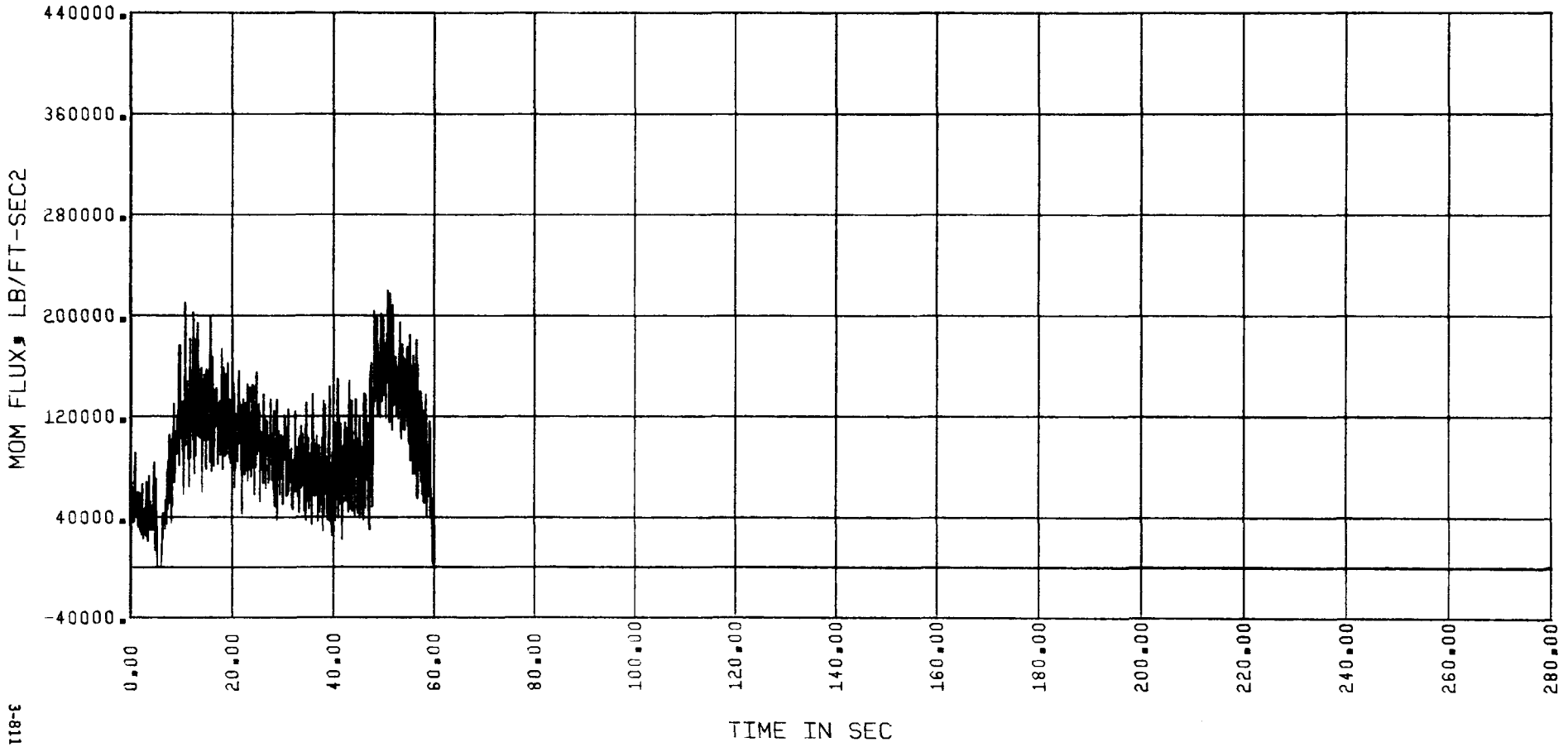
TEST 1319/1000 PSI FW FWD BDN
MASS FLOW RATE LO-DD/GD2 DISCH
PLOT NO.35



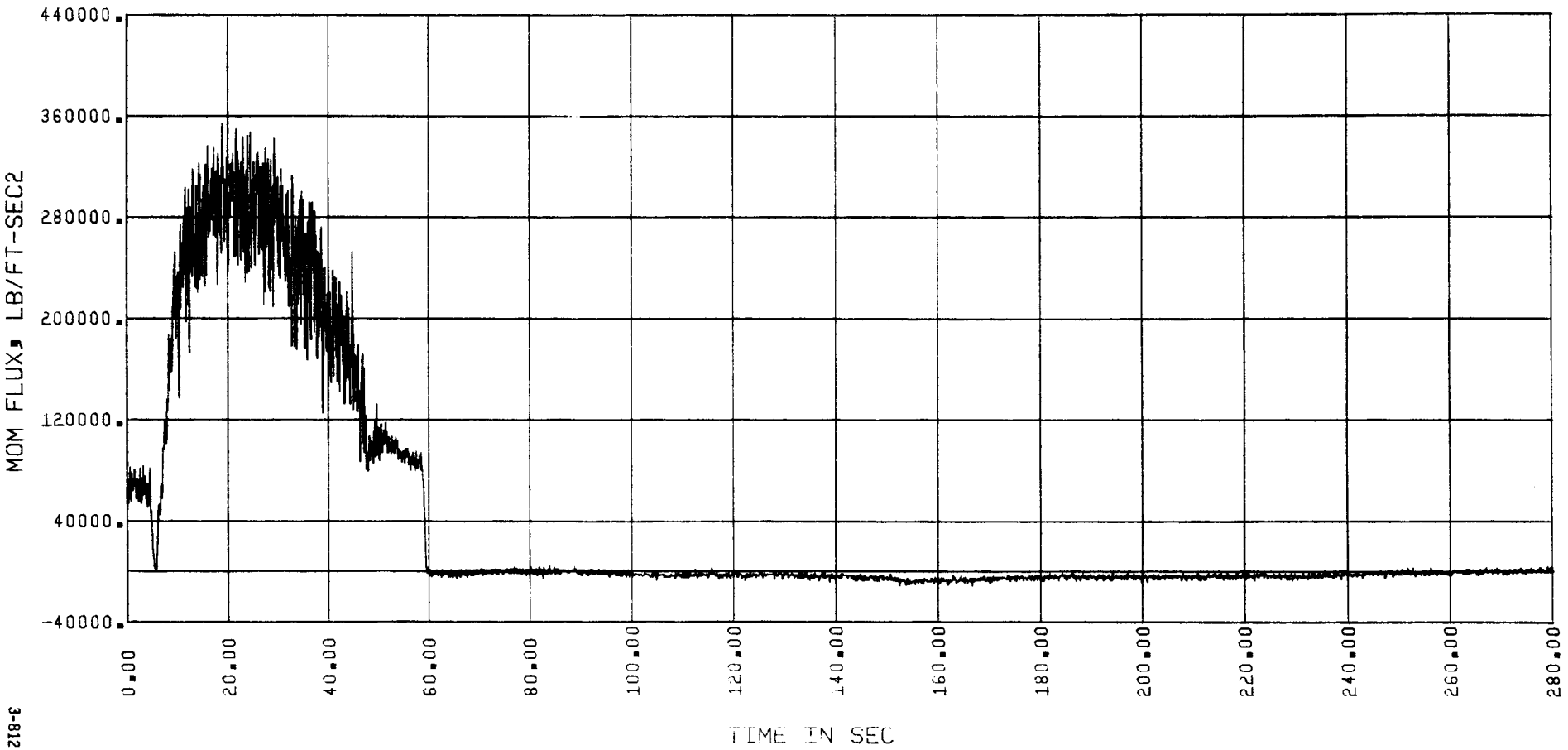
TEST 1319/1000 PSI FW FWD BDN
MOMENTUM FLUX GD2/LO-TM SUCT
PLOT NO.36



TEST 1319/1000 PSI FW FWD BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.37

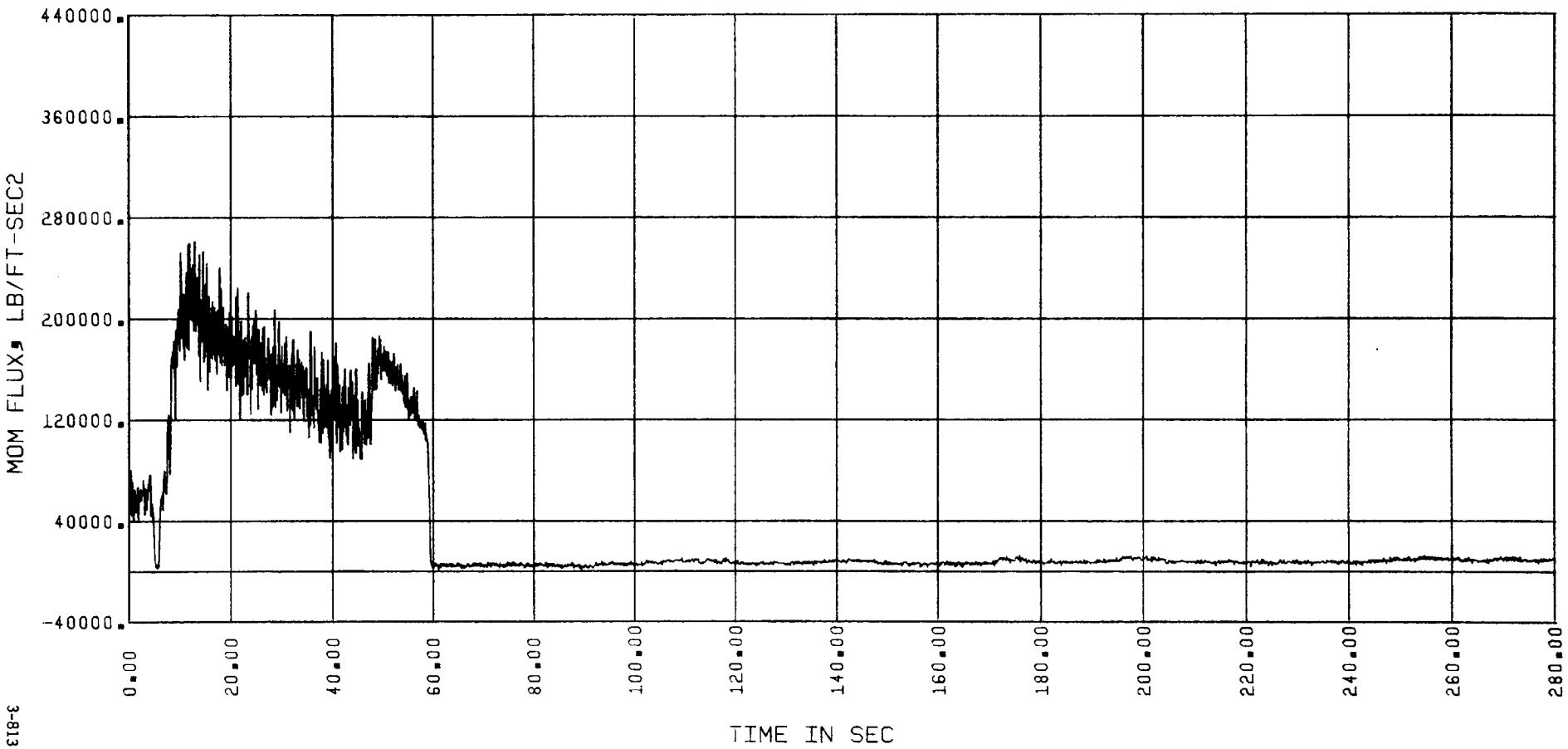


TEST 1319/1000 PSI FW FWD BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



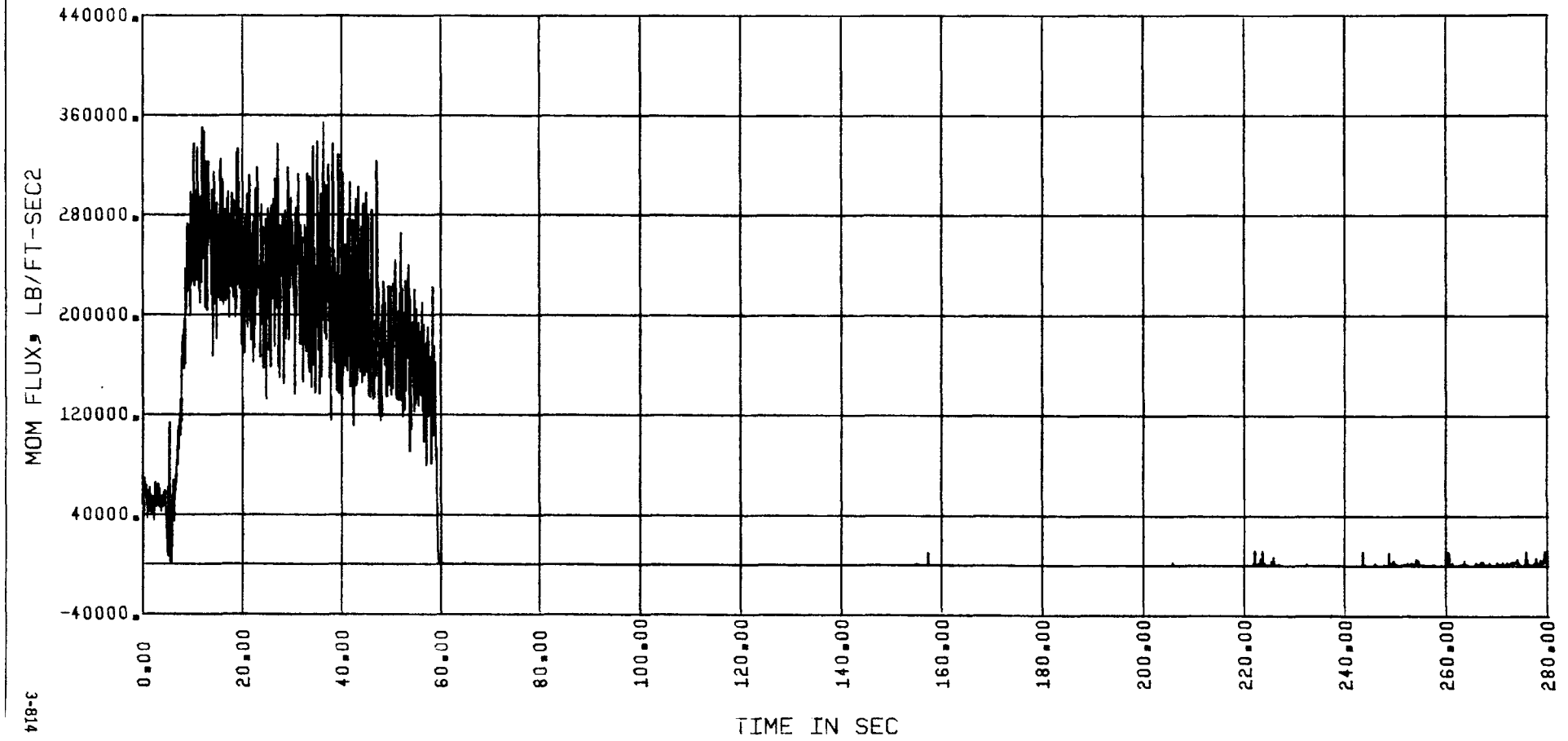
3-812

TEST 1319/1000 PSI FW FWD BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39



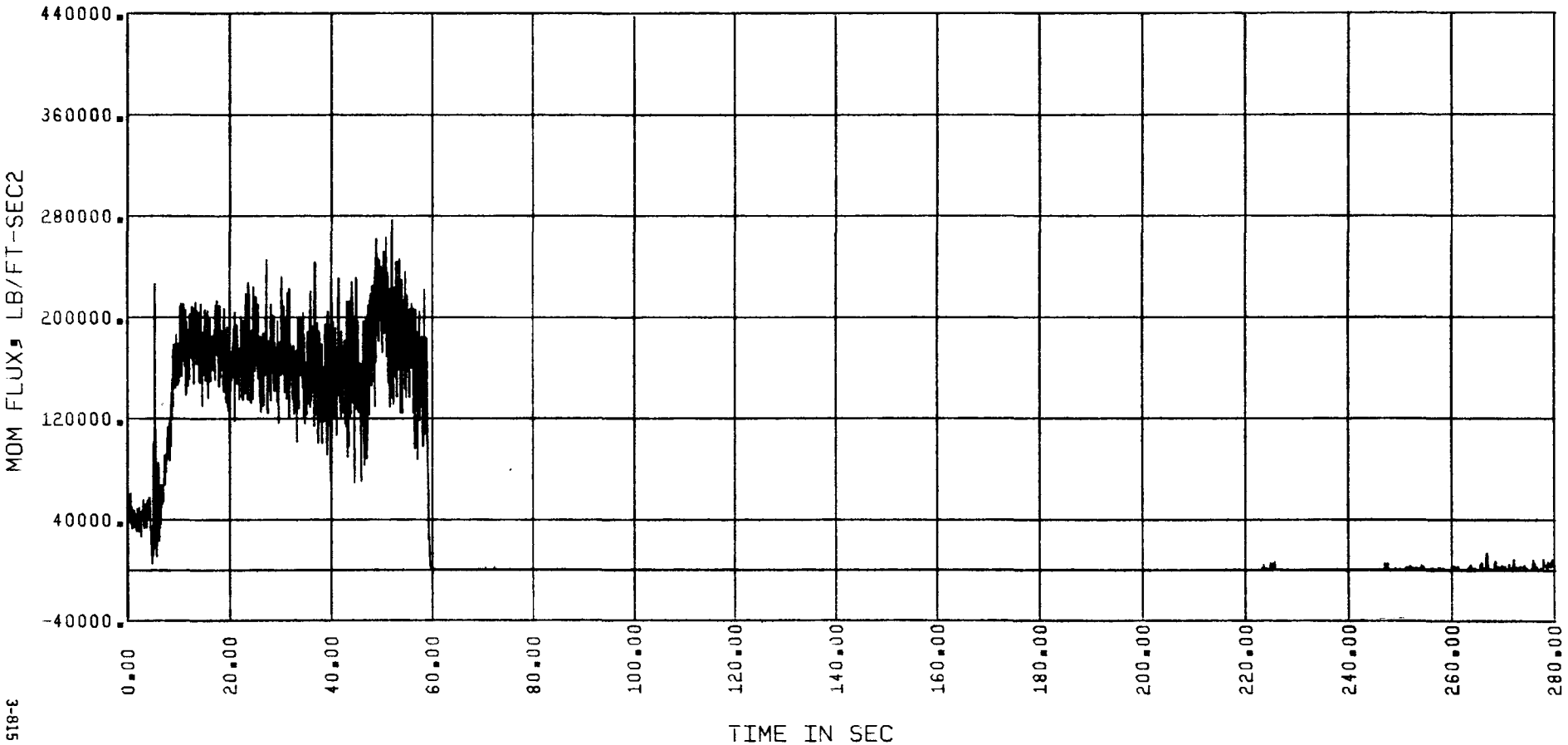
3-813

TEST 1319/1000 PSI FW FWD BDN
MOMENTUM FLUX GD2/LO-TM DISCH
PLOT NO.40

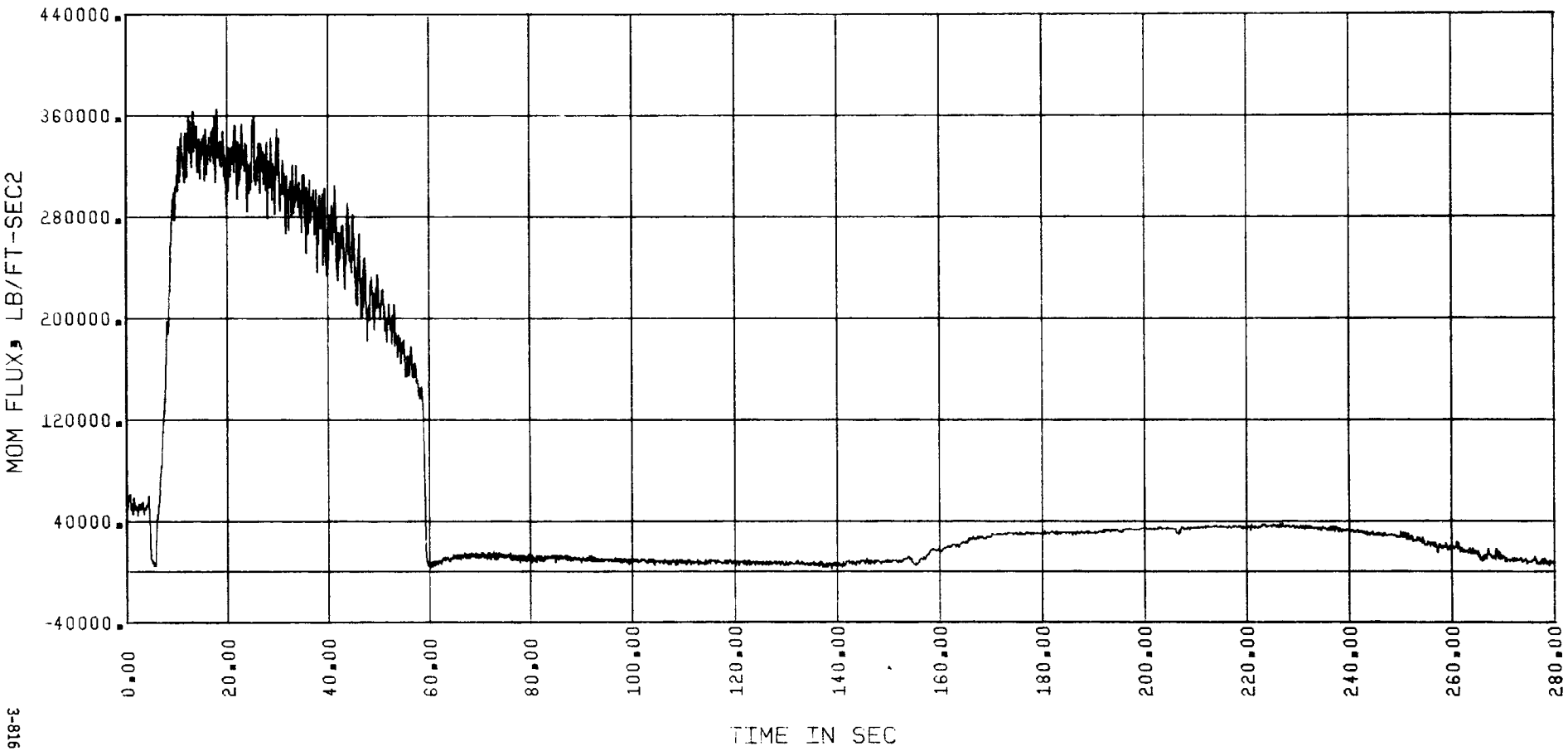


3-814

TEST 1319/1000 PSI FW FWD BDN
MOMENTUM FLUX GD2/HI-TM DISCH
PLOT NO.41

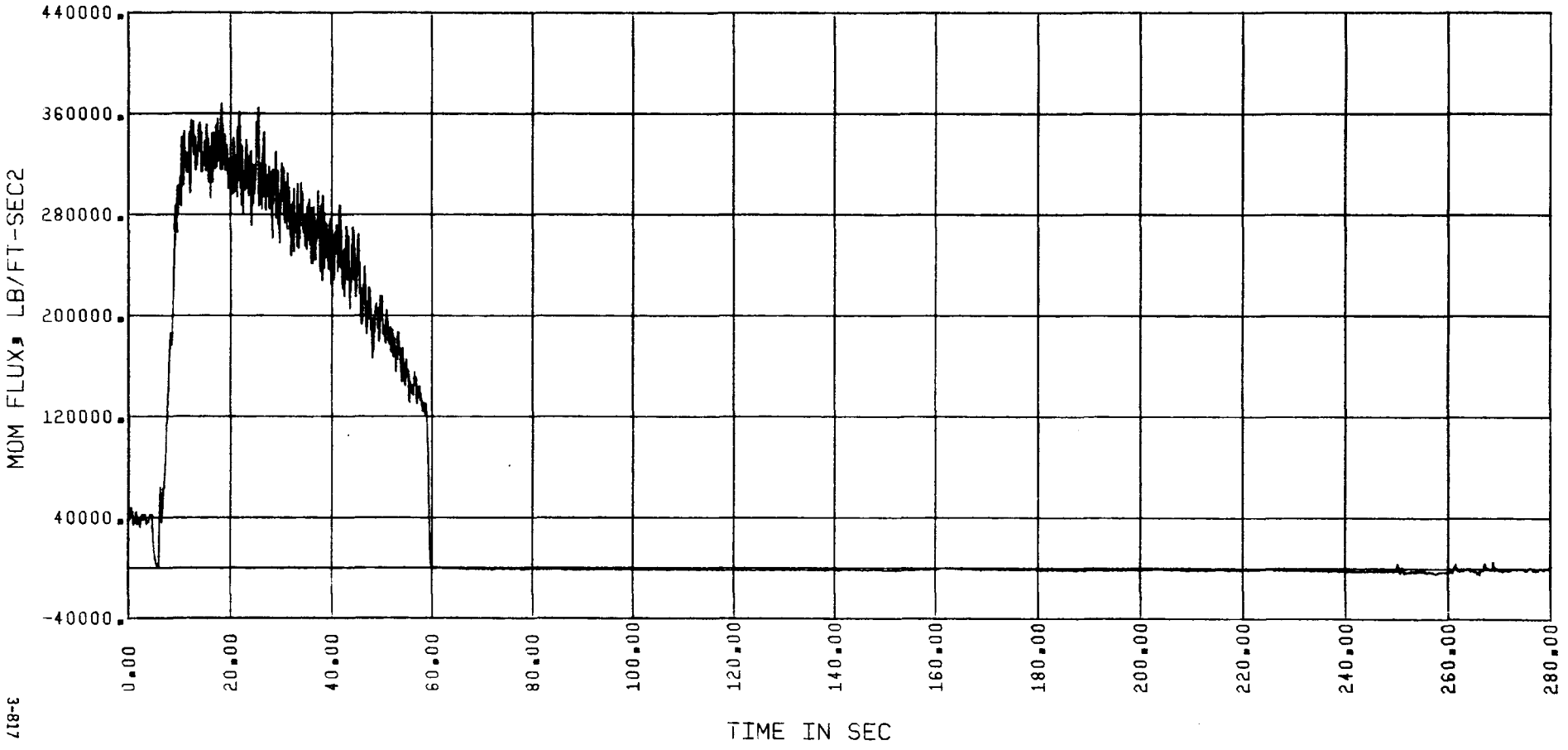


TEST 1319/1000 PSI FW FWD BDN
MOMENTUM FLUX LO-DD DISCHARGE
PLOT NO. 42

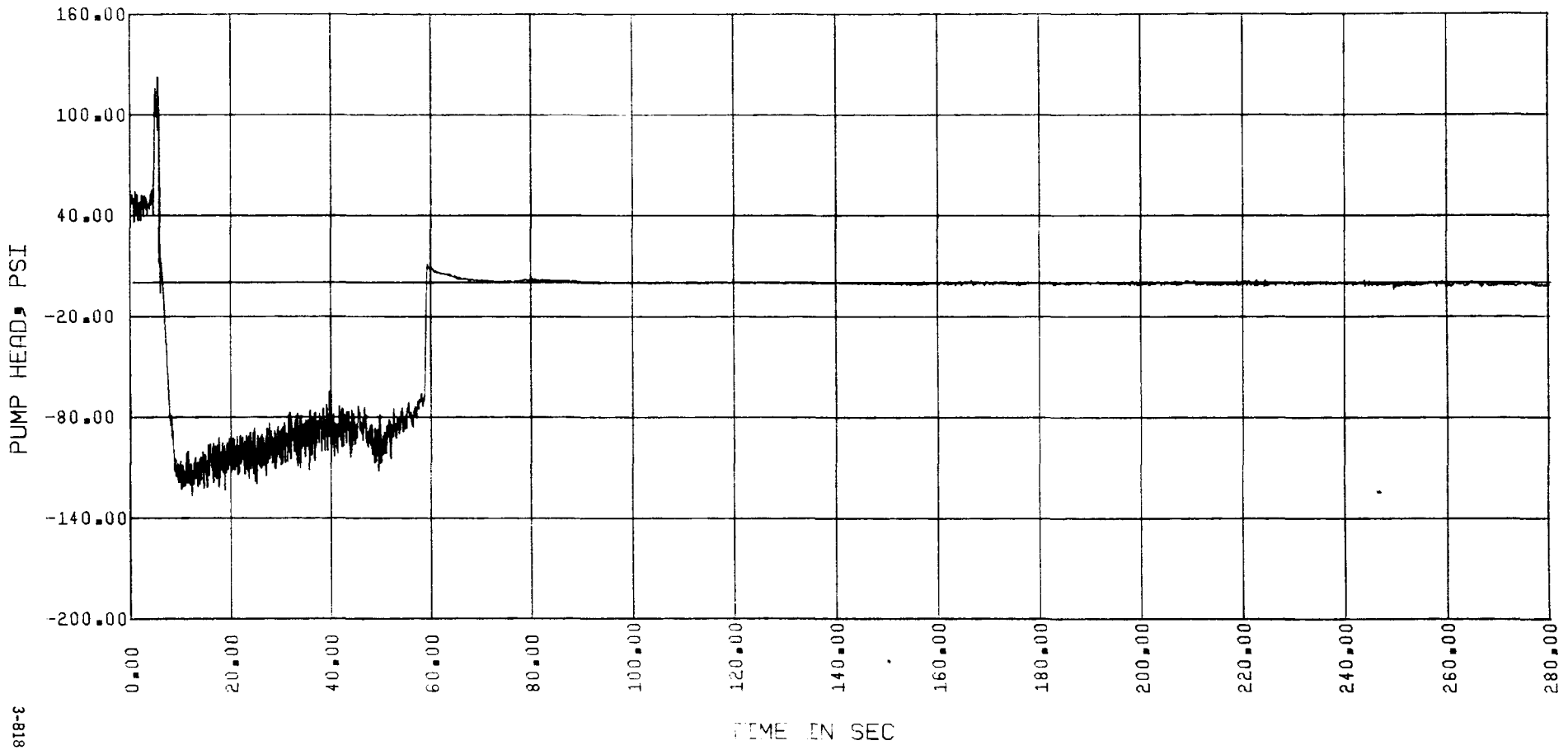


3-816

TEST 1319/1000 PSI FW FWD BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.43

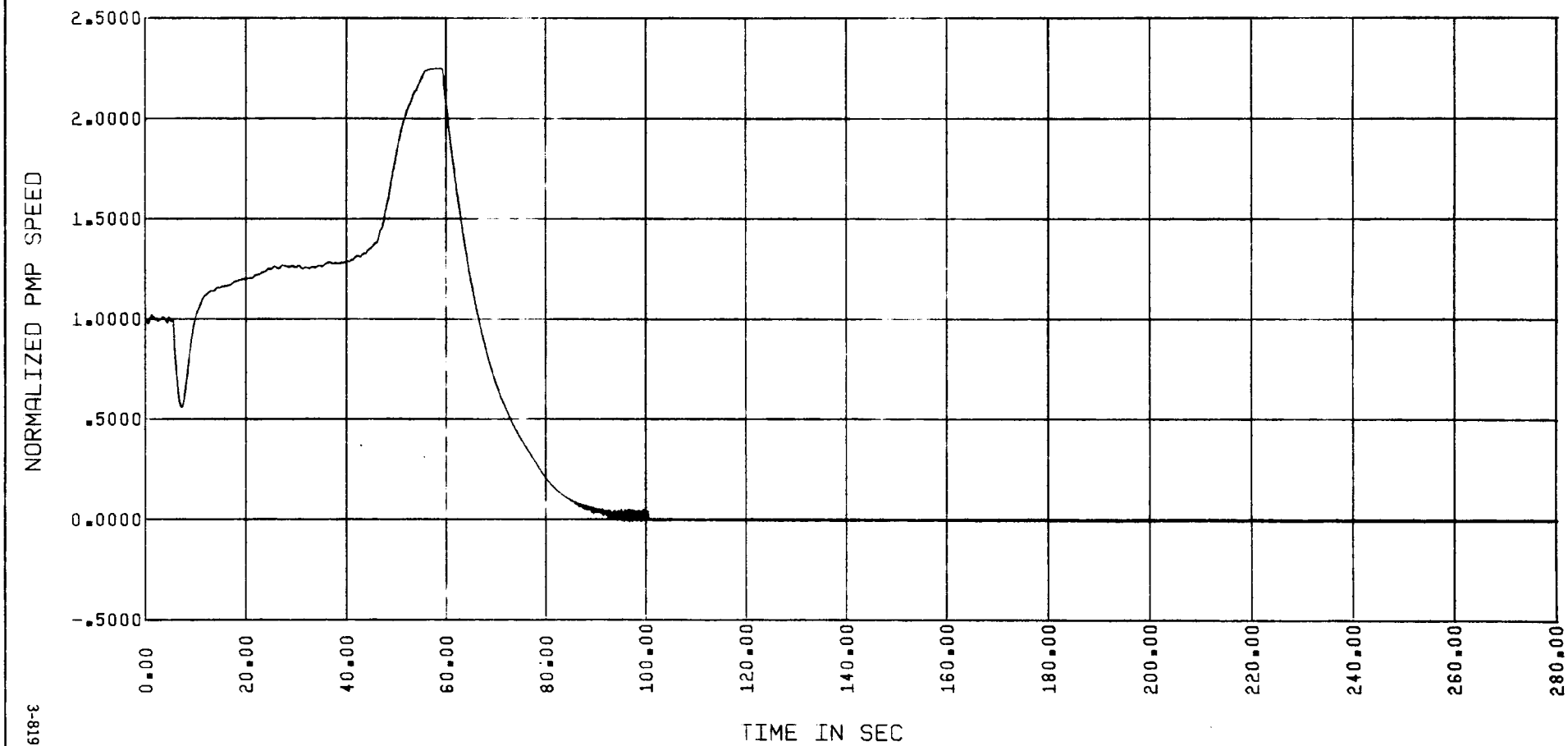


TEST 1319/1000 PSI FW FWD BDN
PUMP HEAD IN PSI
PLOT NO.44



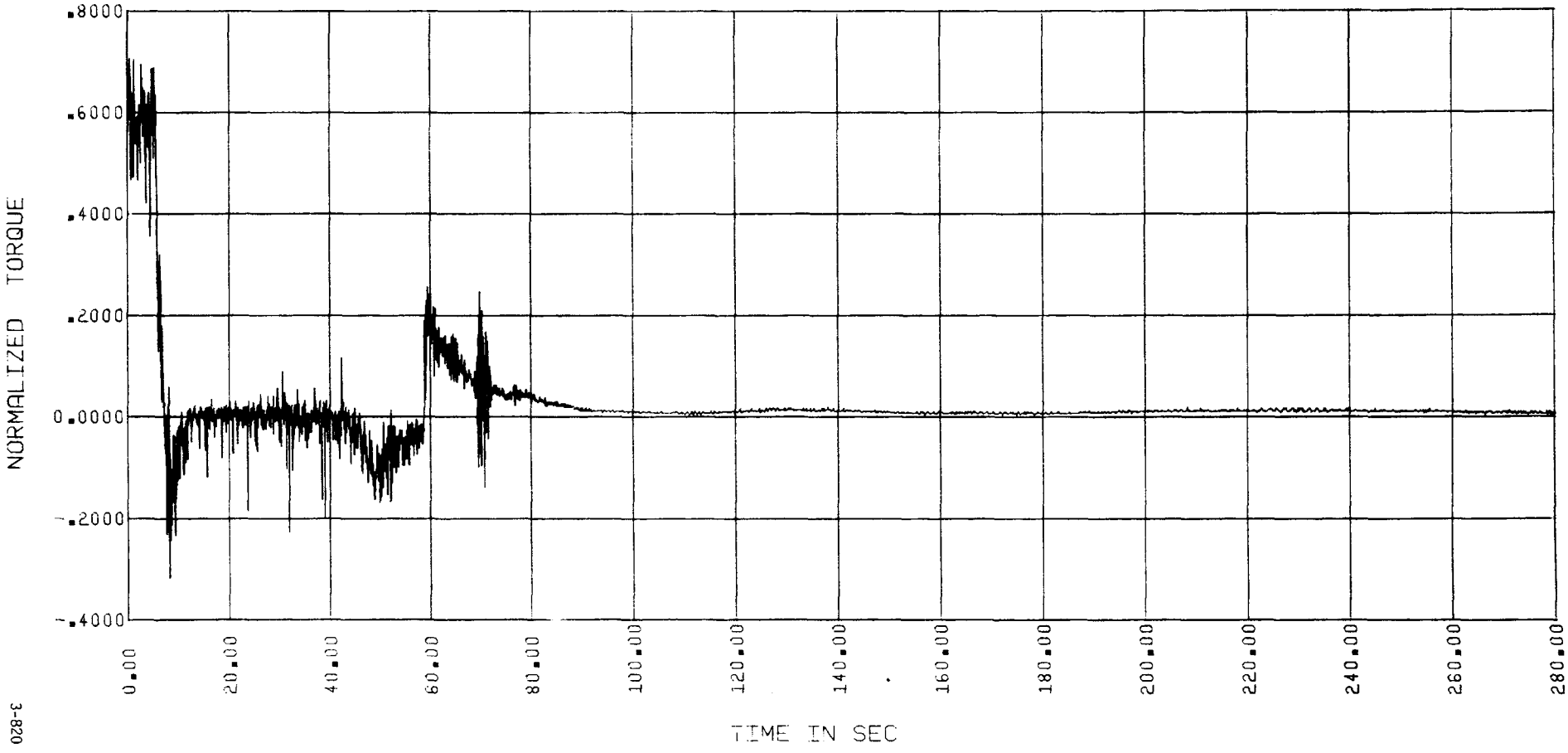
3-818

TEST 1319/1000 PSI FW FWD BDN
N PUMP SPEED NR=4500
PLOT NO.47

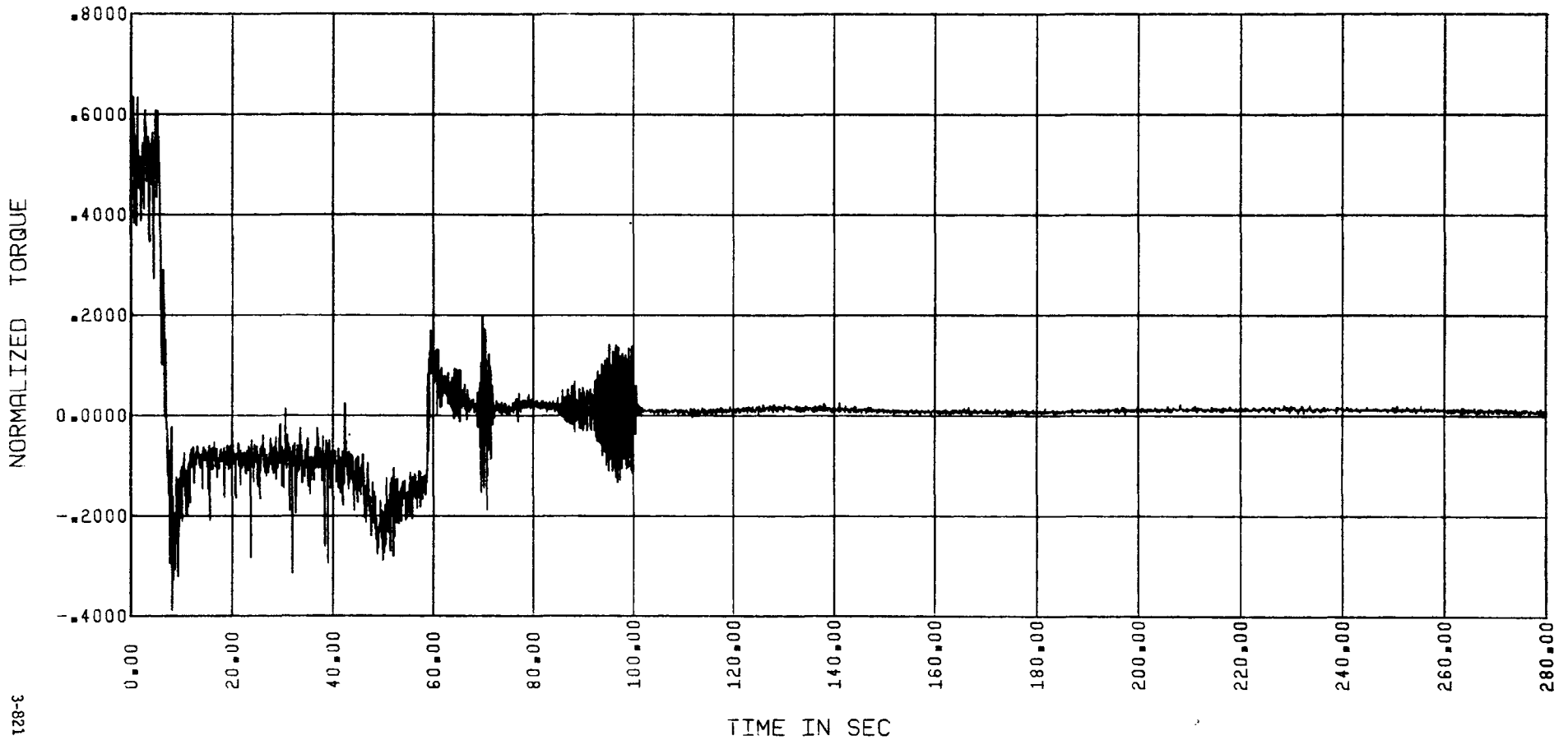


618-3

TEST 1319/1000 PSI FW FWD BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.48

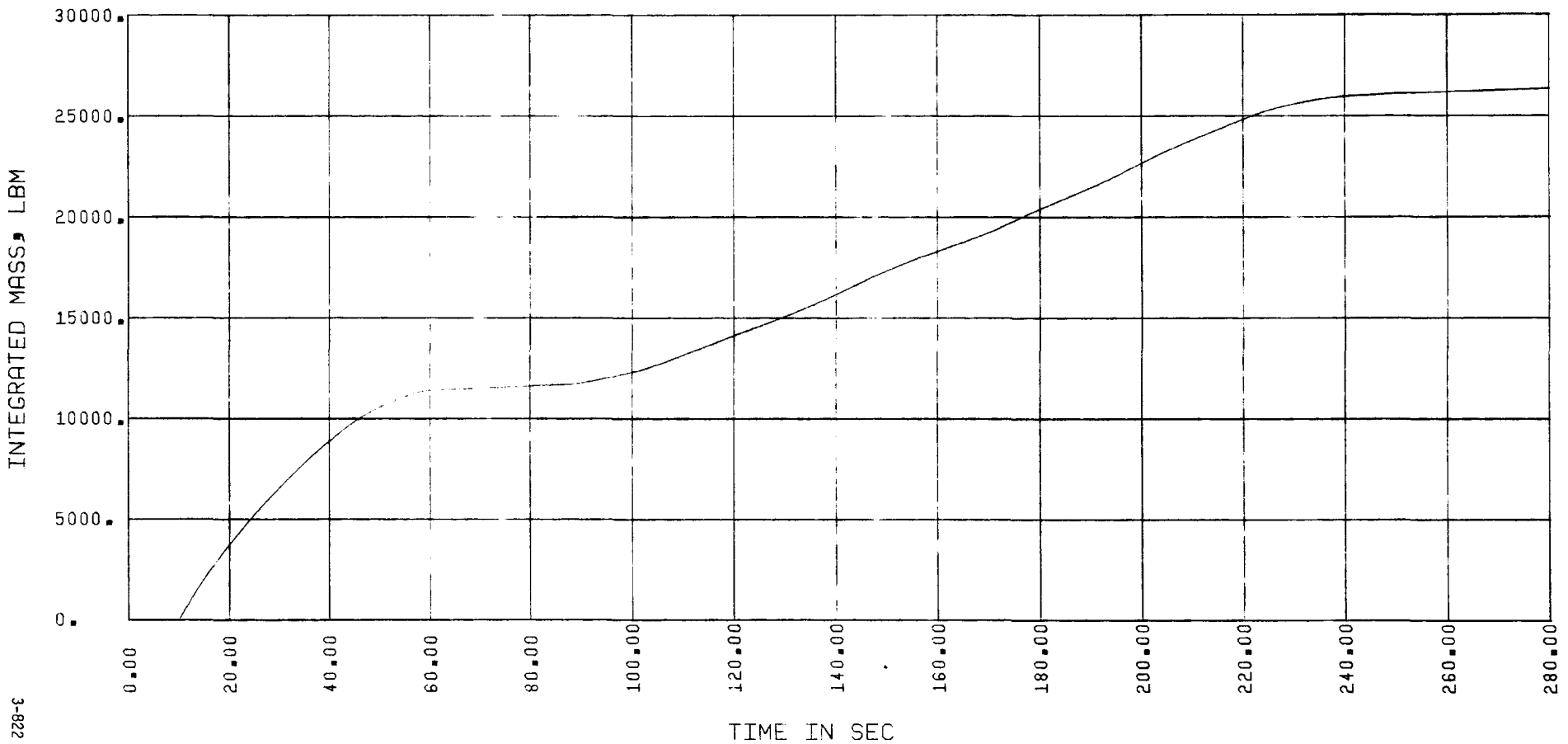


TEST 1319/1000 PSI FW FWD BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.49



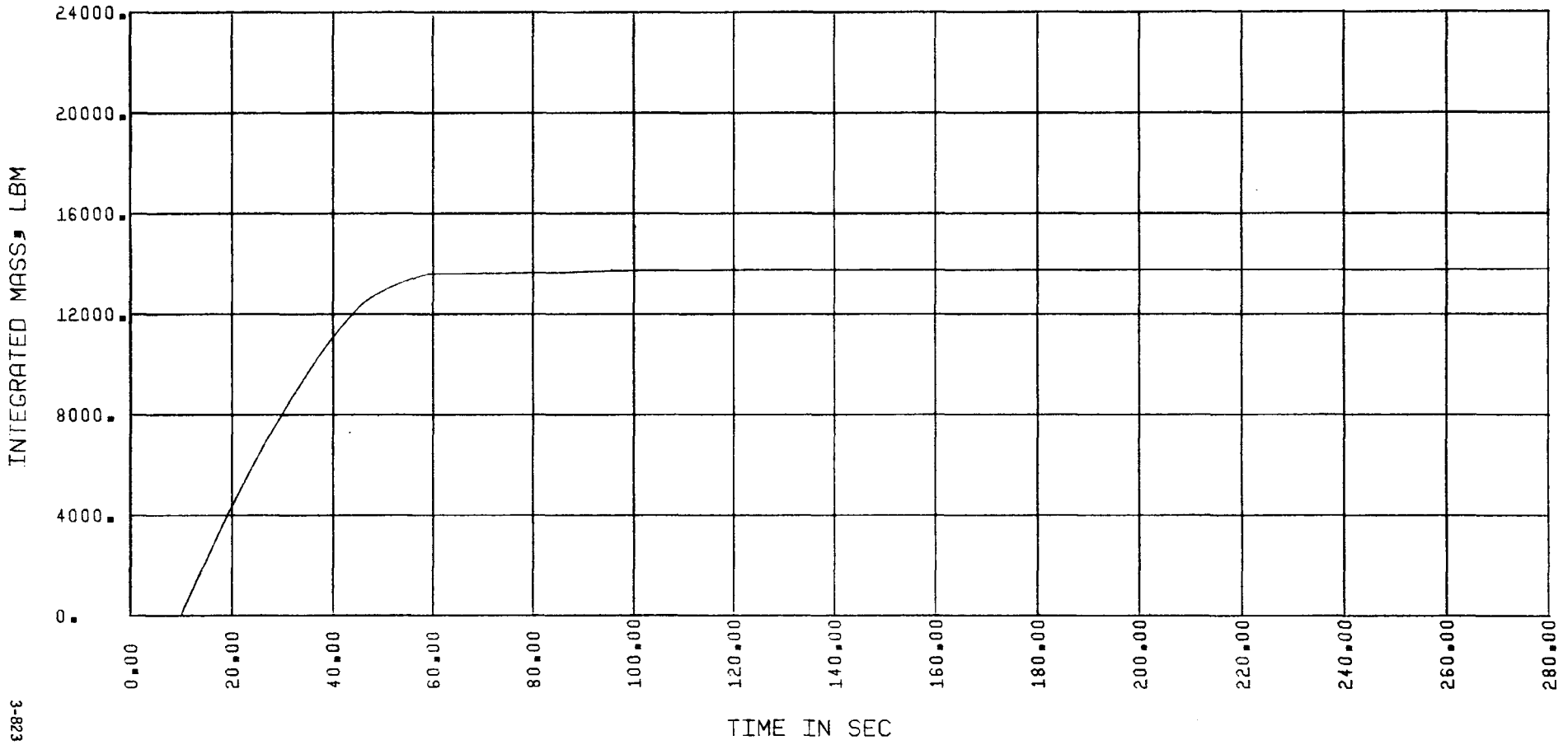
3-821

TEST 1319/1000 PSI FW FWD BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50

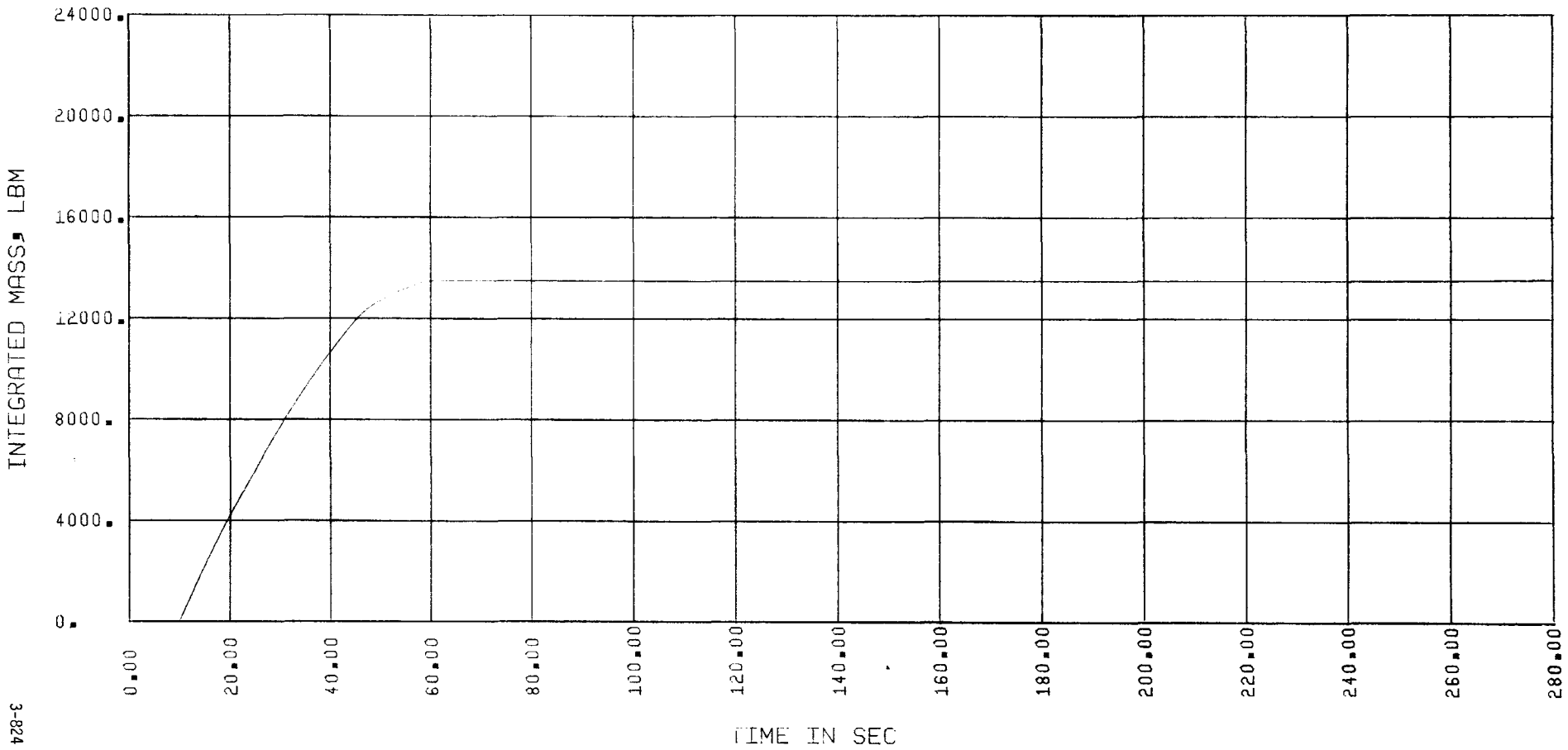


3-822

TEST 1319/1000 PSI FW FWD BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.51

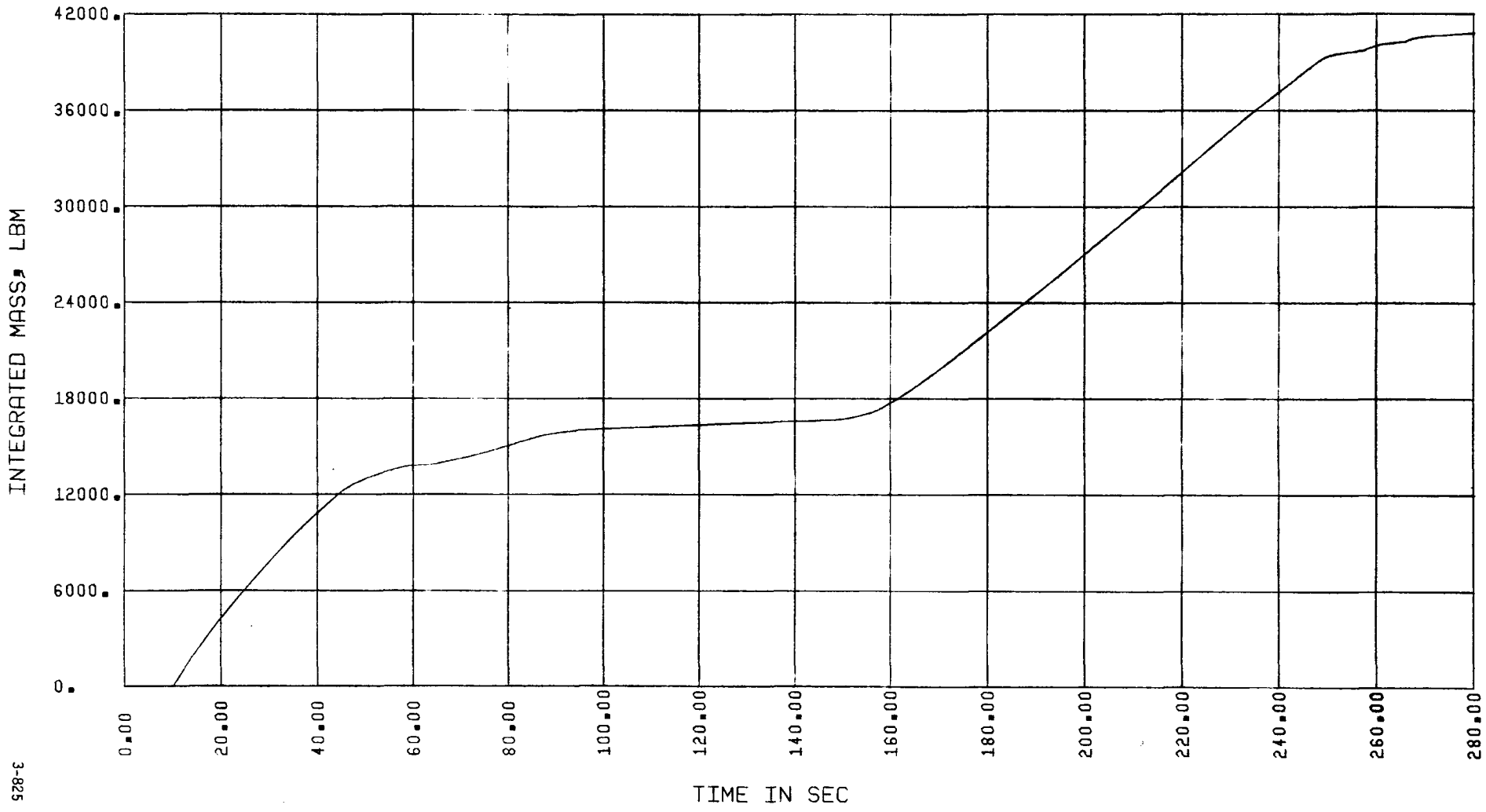


TEST 1319/1000 PSI FW FWD BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.52



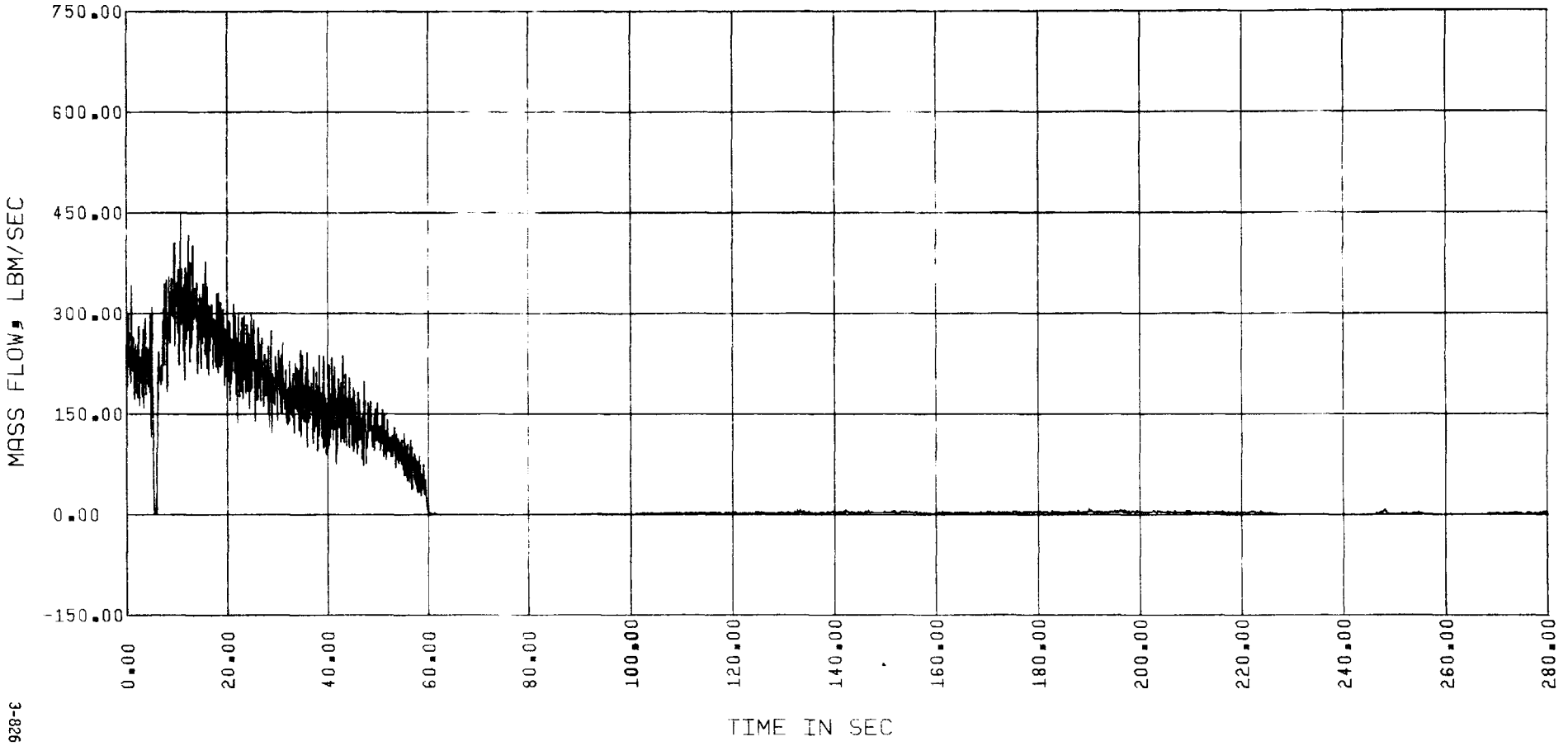
3-824

TEST 1319/1000 PSI FW FWD BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.53



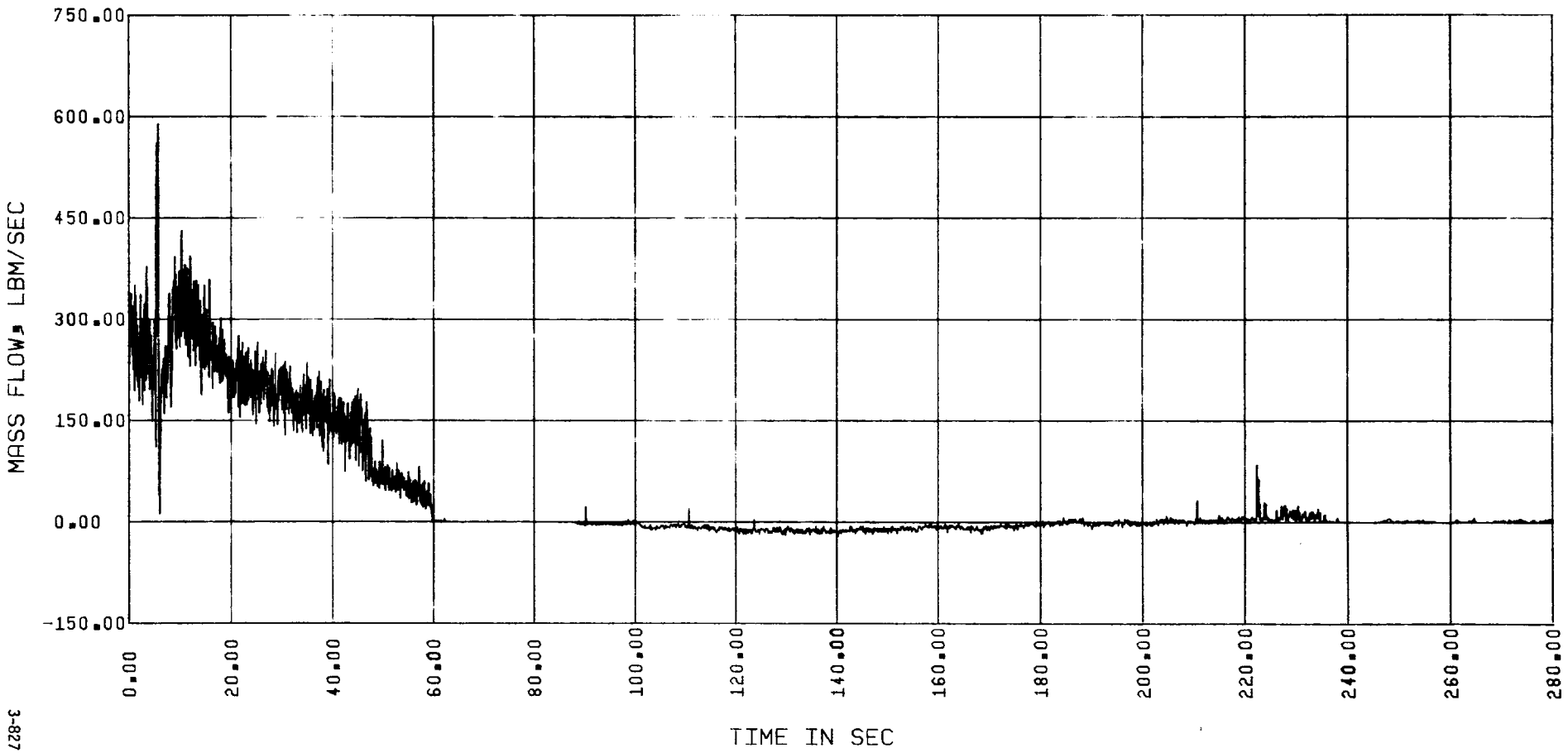
3-825

TEST 1319/1000 PSI FW FWD BDN
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54

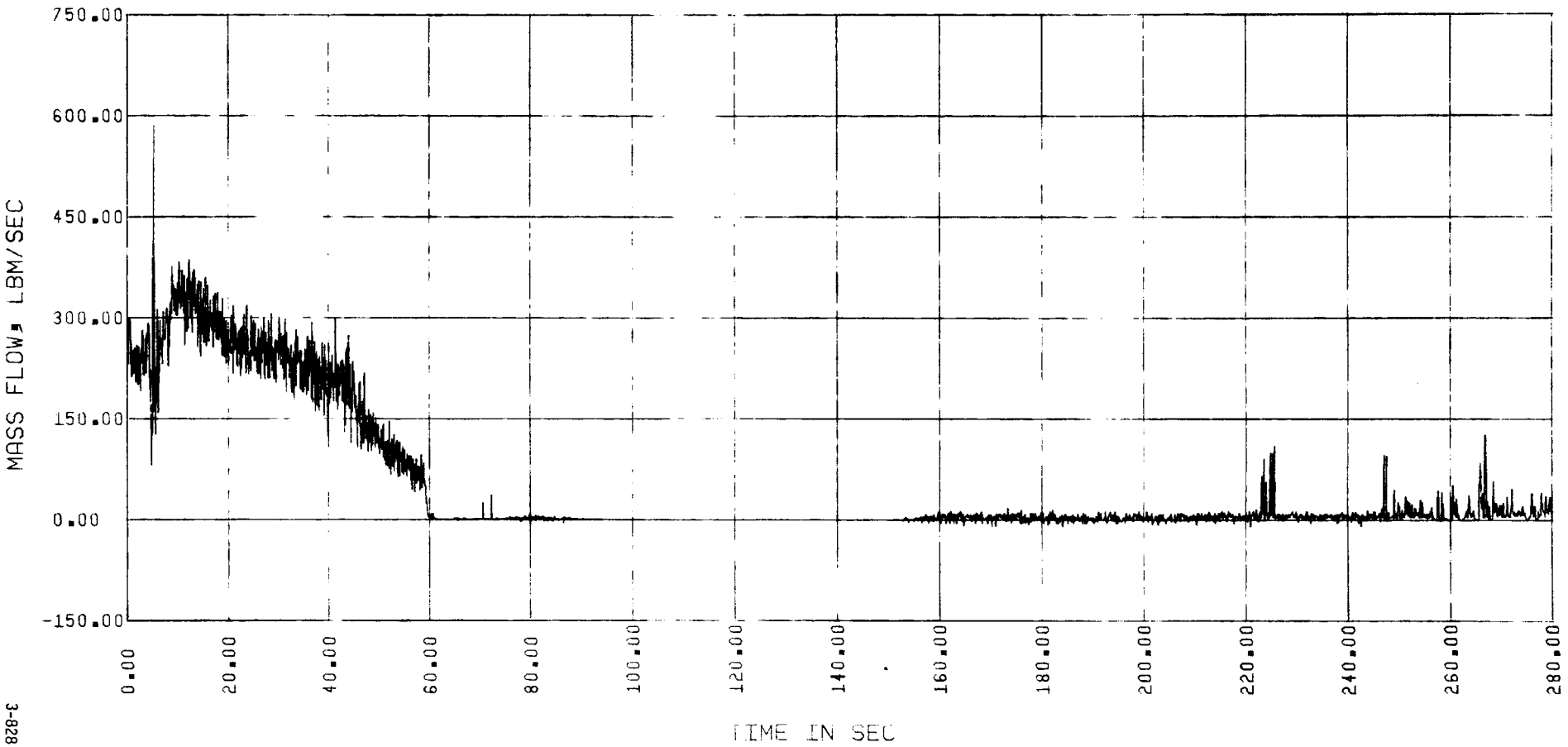


3-826

TEST 1319/1000 PSI FW FWD BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.55

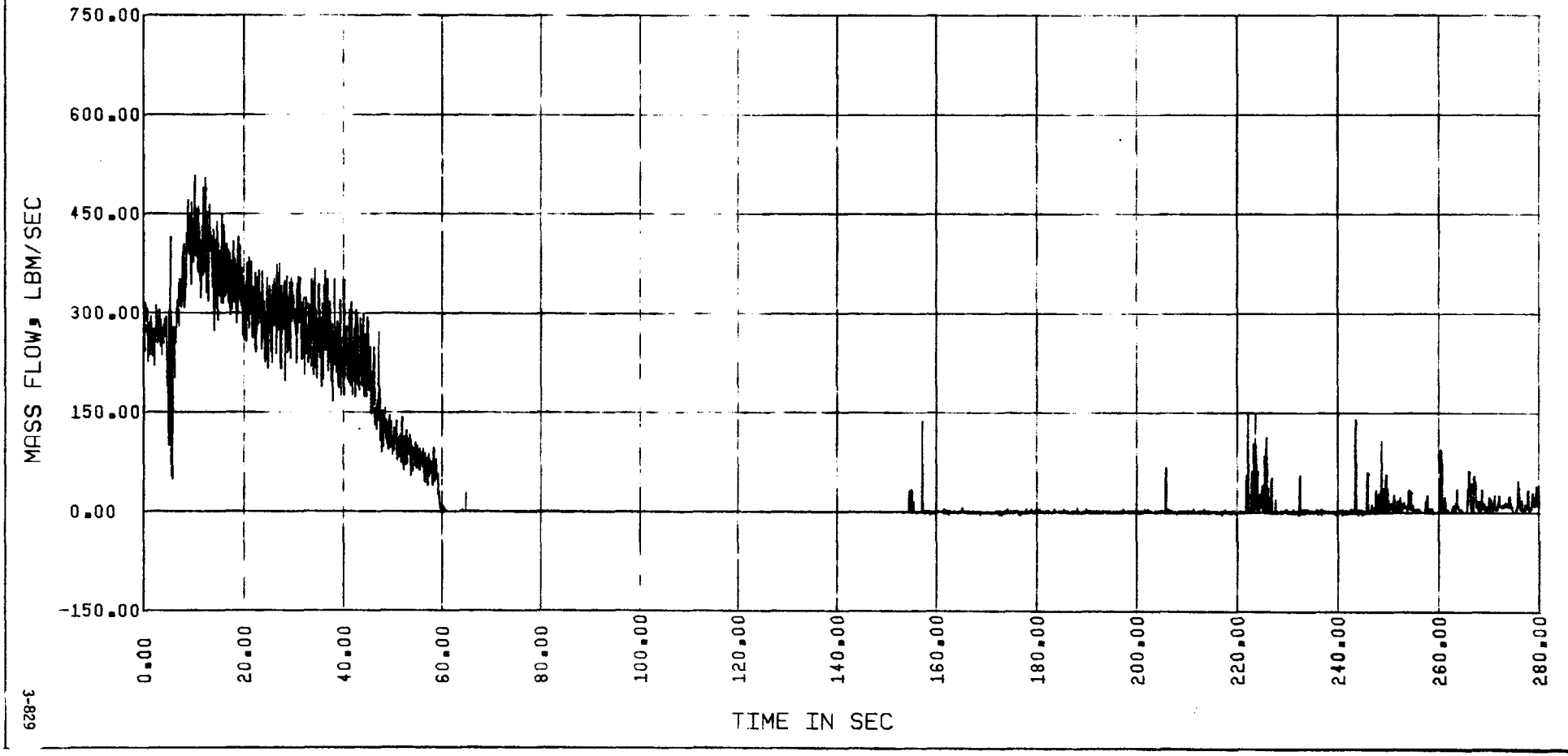


TEST 1319/1000 PSI FW FWD BDN
MASS FLOW RATE HI-TM/GD2 DISCH
PLOT NO.56



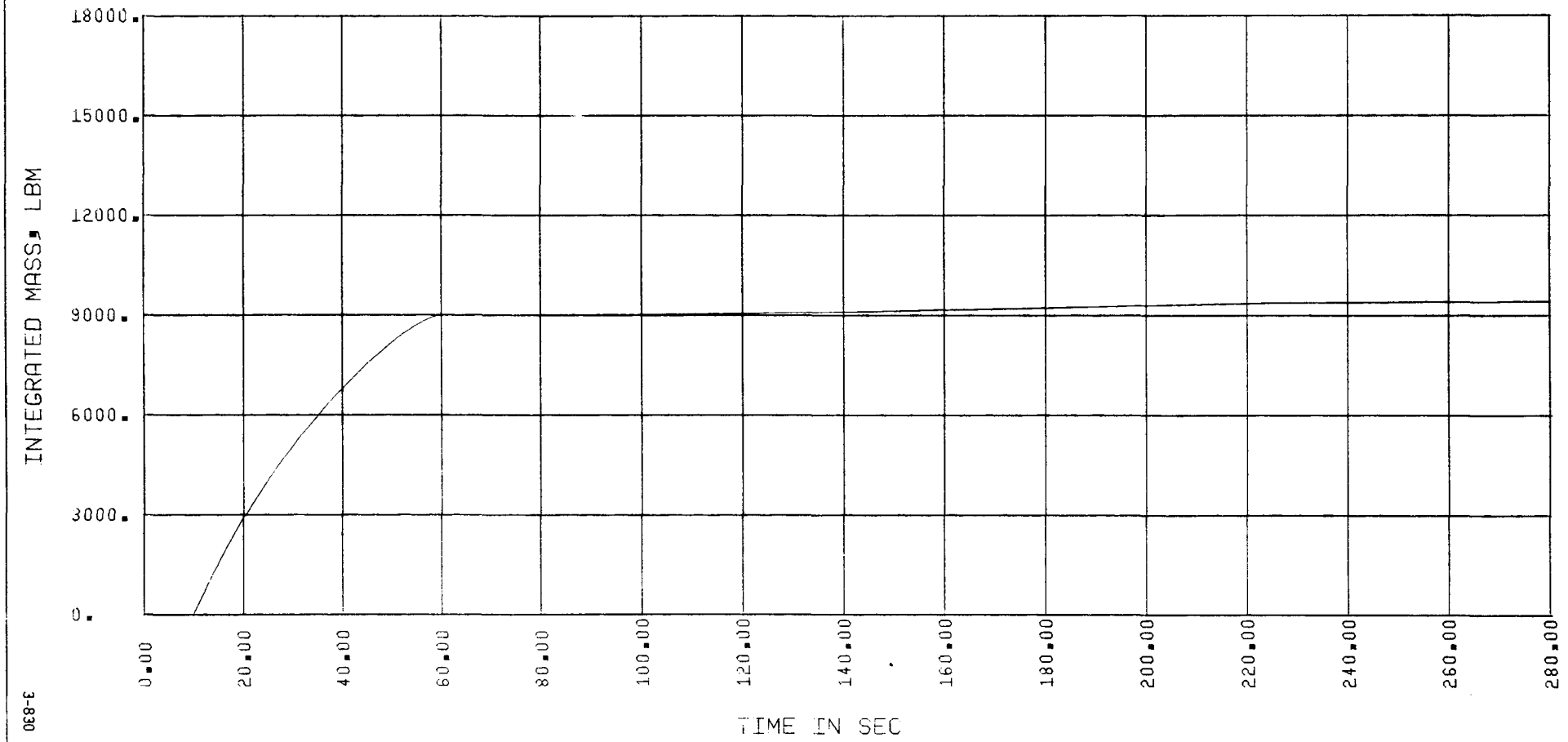
3-828

TEST 1319/1000 PSI FW FWD BDN
MASS FLOW RATE LO-TM/GD2 DISCH
PLOT NO.57



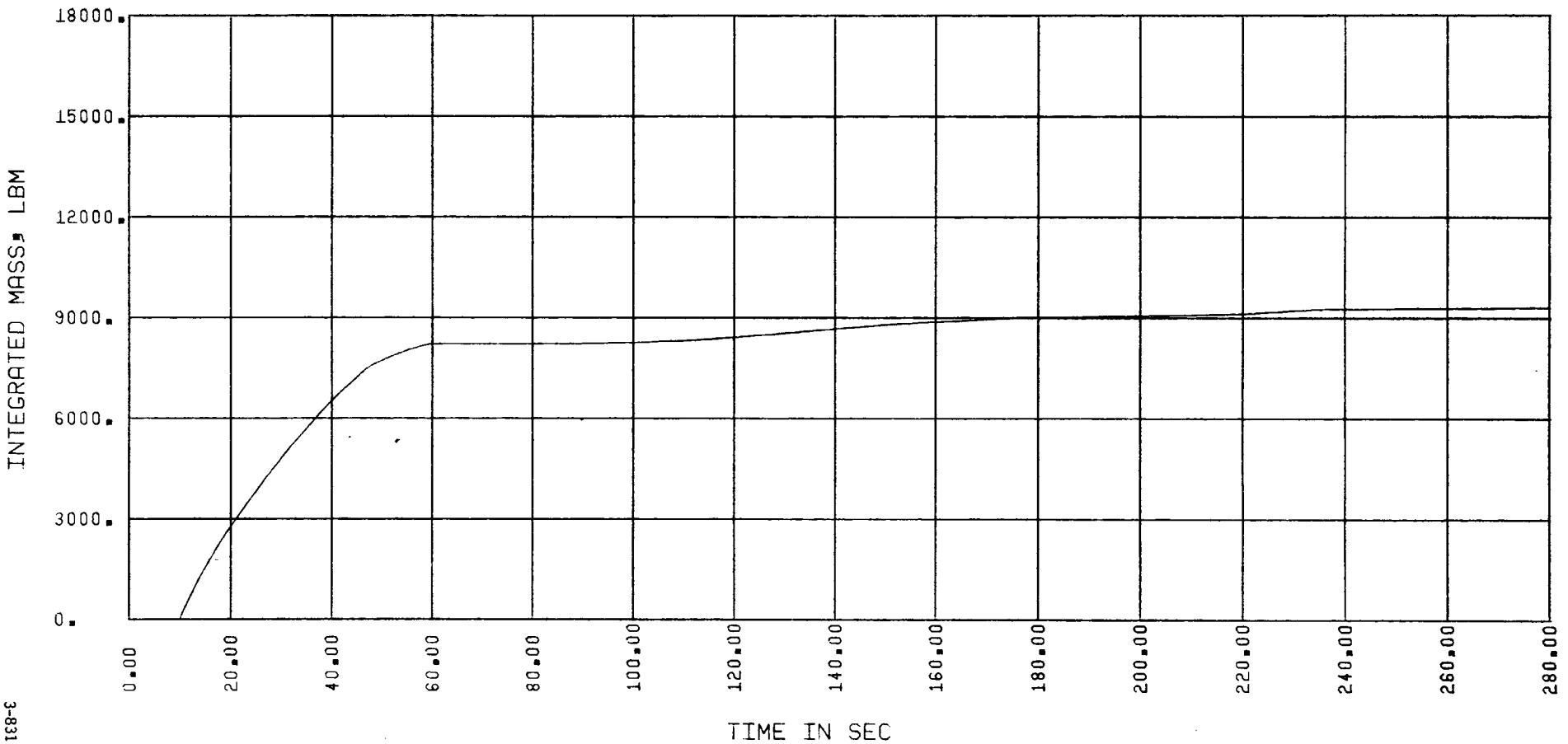
3-829

TEST 1319/1000 PSI FW FWD BDN
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60

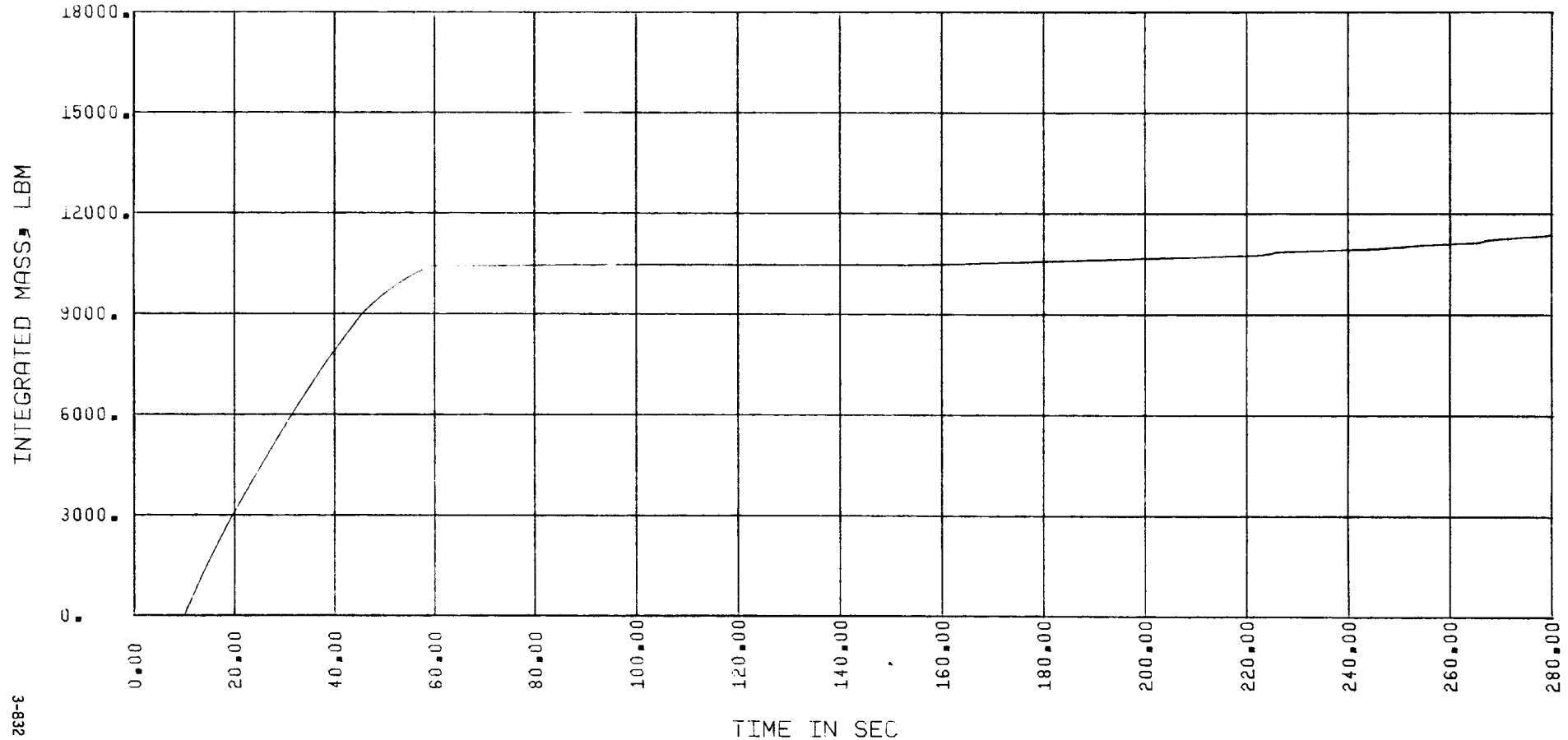


3-830

TEST 1319/1000 PSI FW FWD BDN
INTEGRATED MASS LO-TM/GD2 S
PLOT NO.61

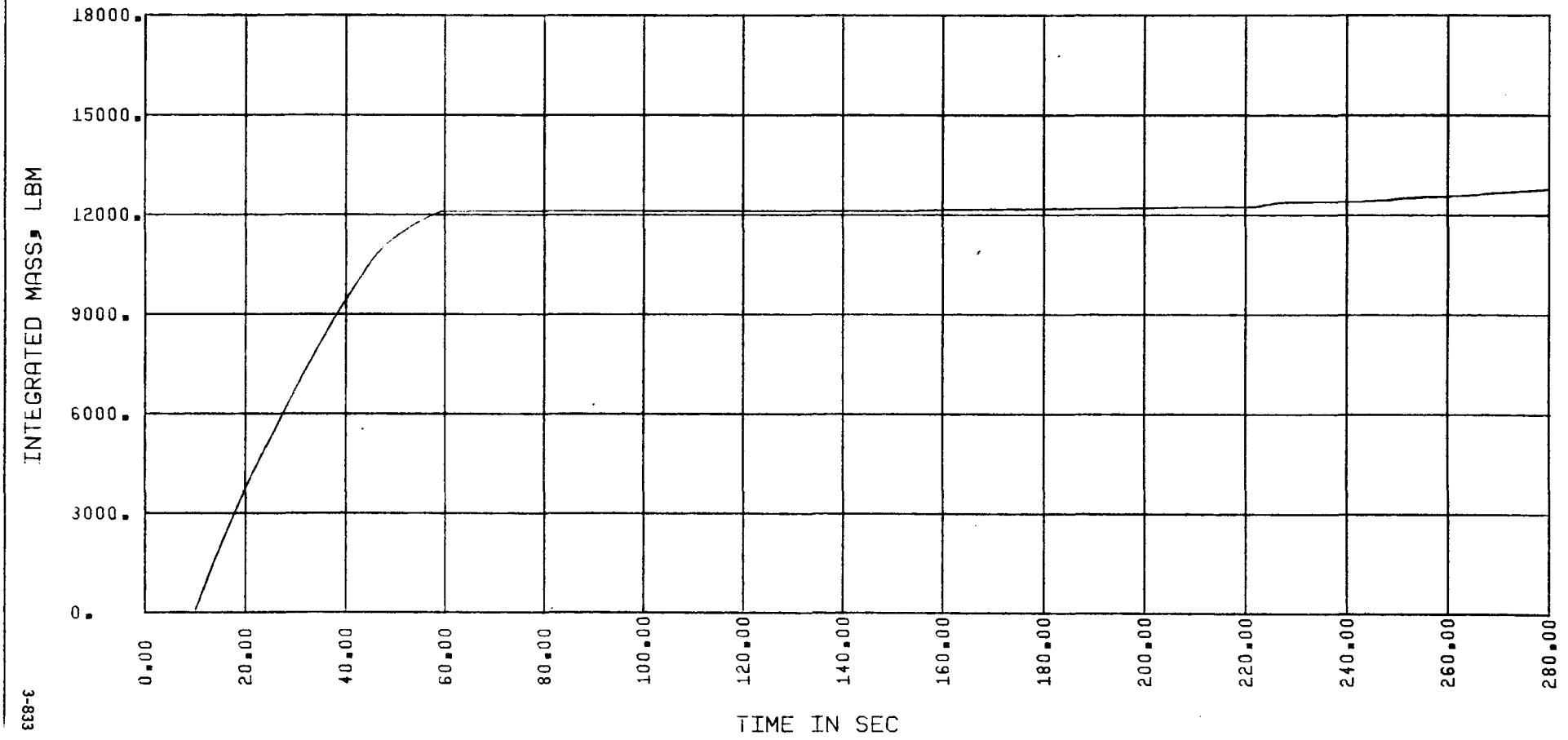


TEST 1319/1000 PSI FW FWD BDN
INTEGRATED MASS HI-TM/GD2 D
PLOT NO.62

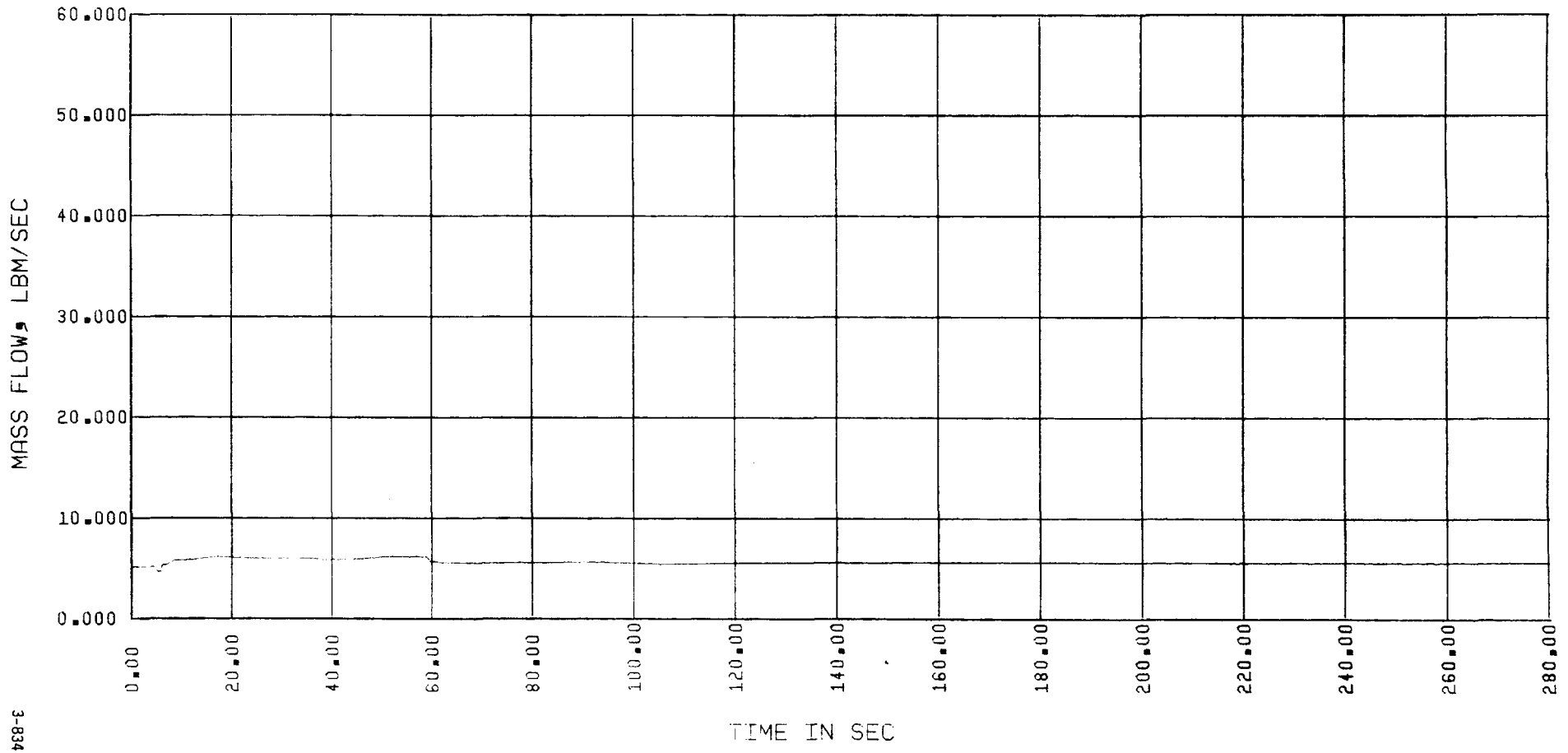


3-832

TEST 1319/1000 PSI FW FWD BDN
INTEGRATED MASS LO-TM/GD2 D
PLOT NO.63

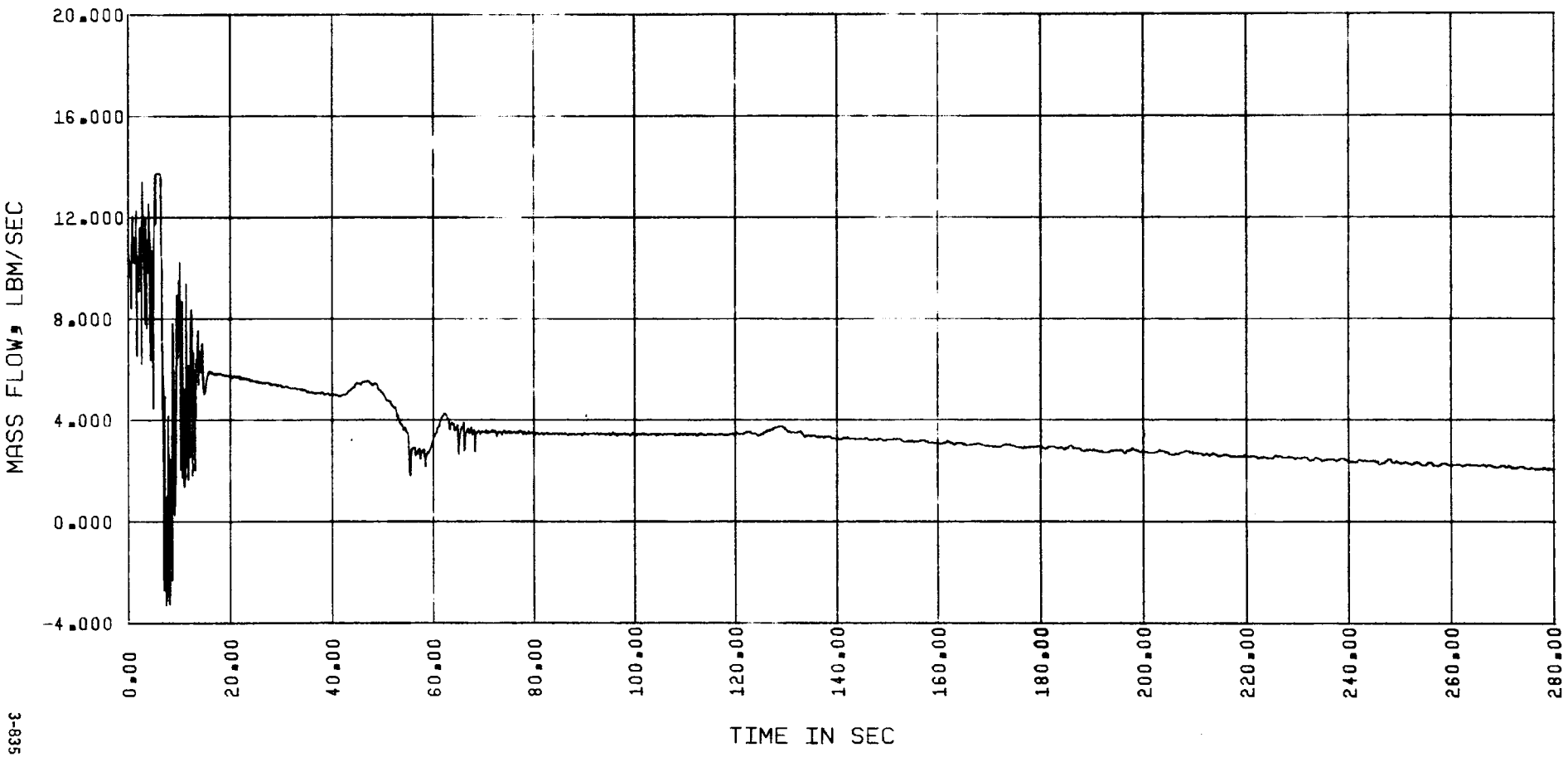


TEST 1319/1000 PSI FW FWD BDN
PUMP INLET INJECTION FLOW
PLOT NO.64



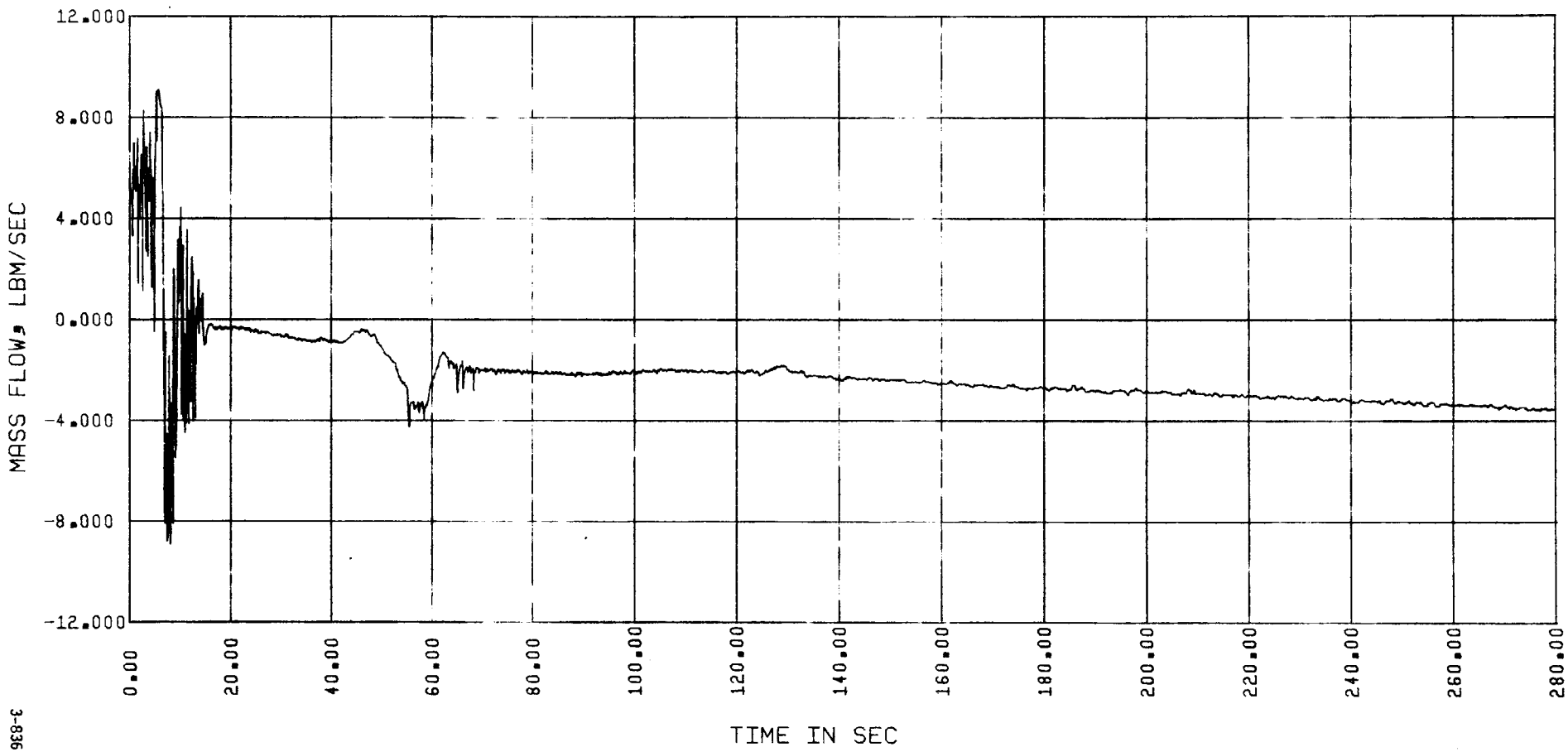
3-834

TEST 1319/1000 PSI FW FWD BDN
PUMP OUTLET INJECTION FLOW
PLOT NO.65



3-835

TEST 1319/1000 PSI FW FWD BDN
PUMP SEAL INJ LEAKAGE FLOW
PLOT NO.66



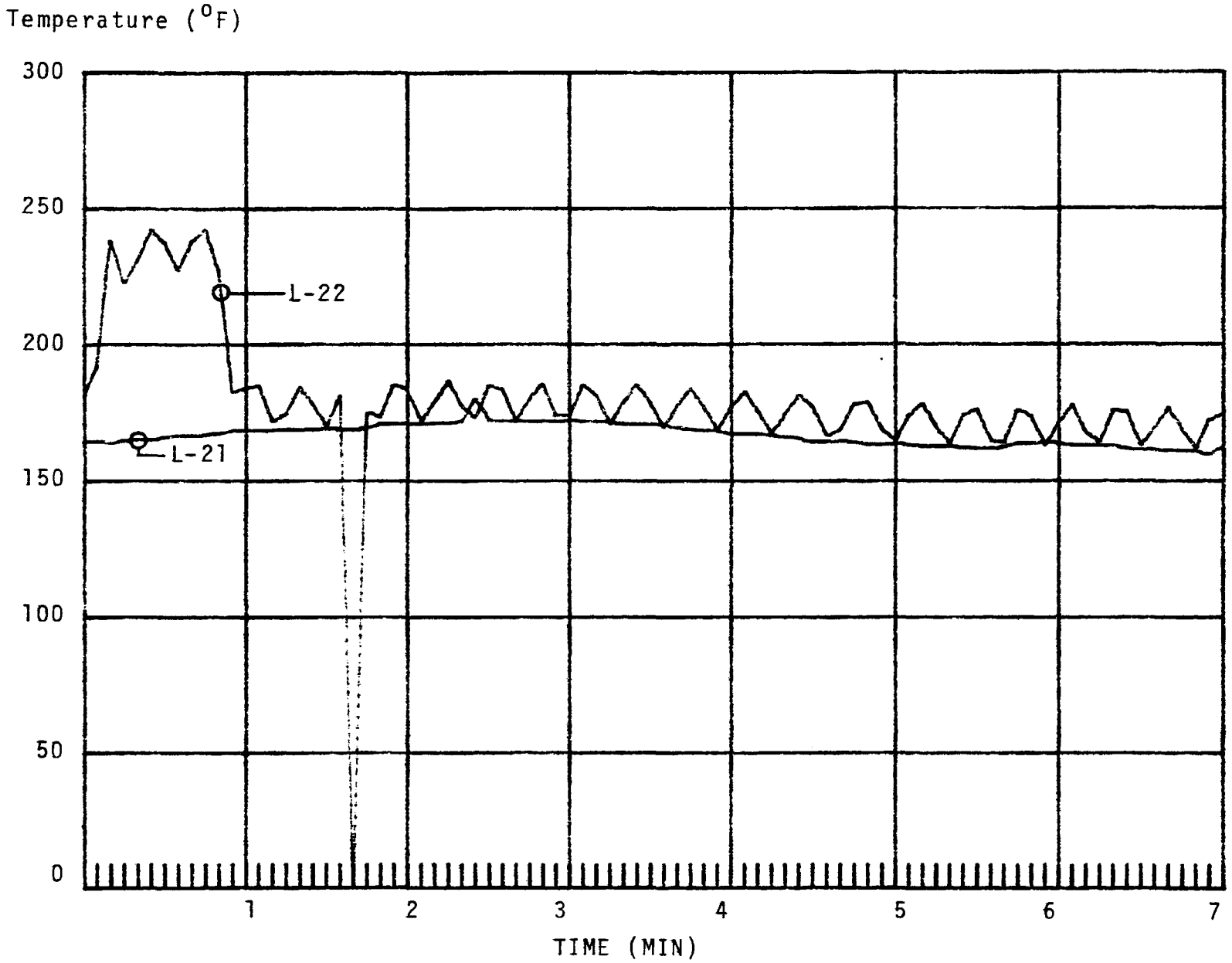
Index Listing

of

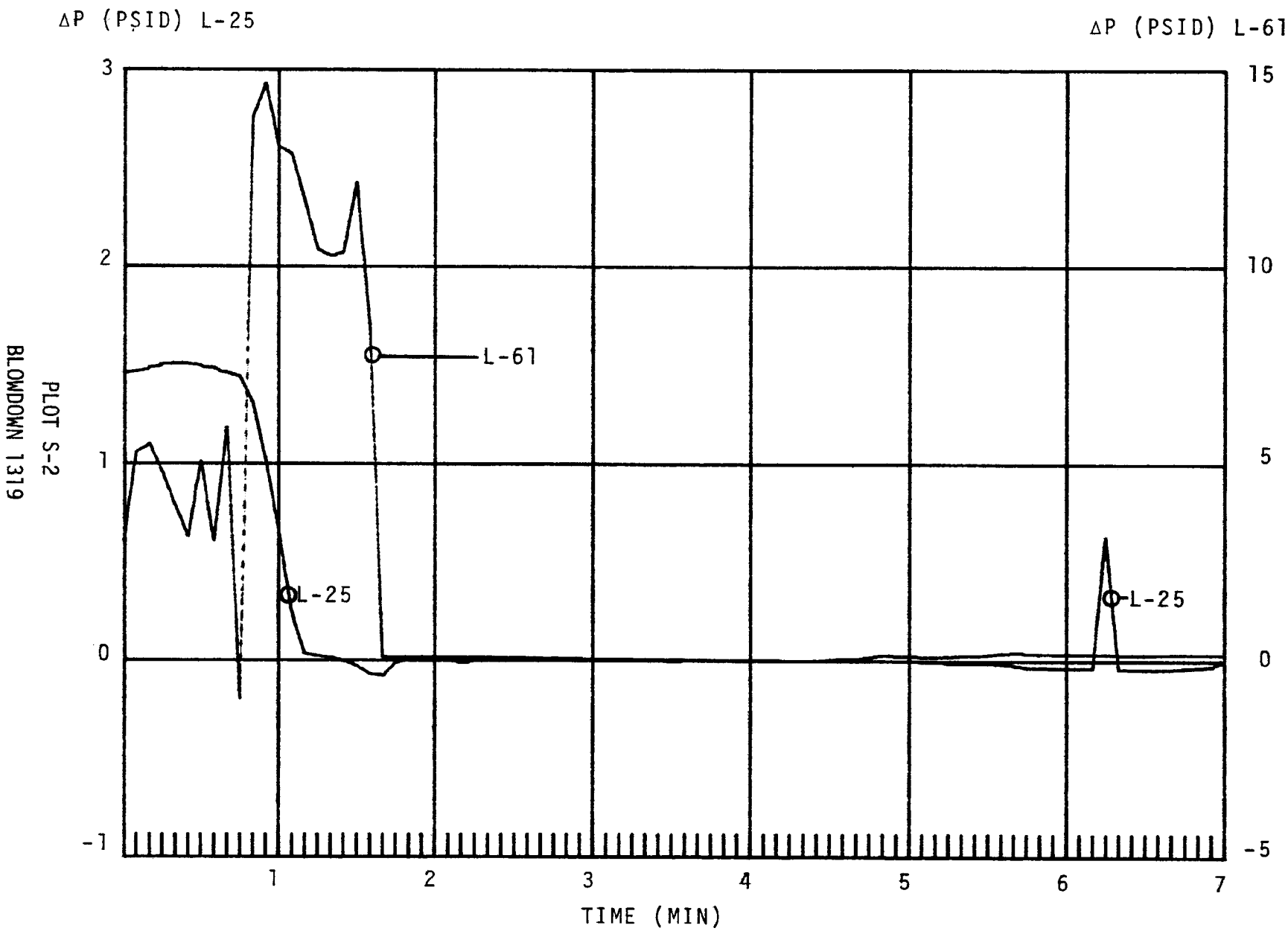
SCANNER DATA PLOTS

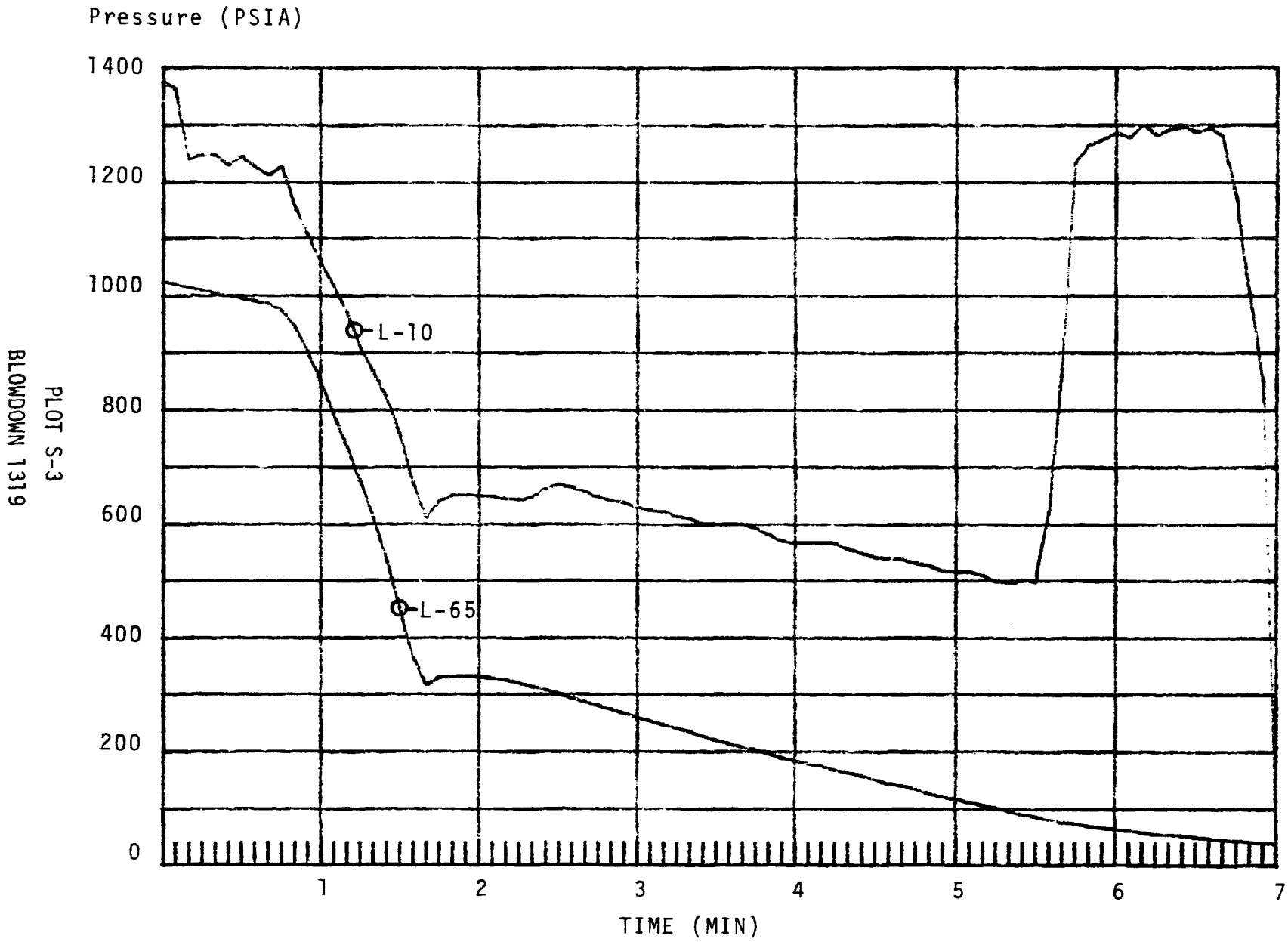
Test Number (1319)

Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

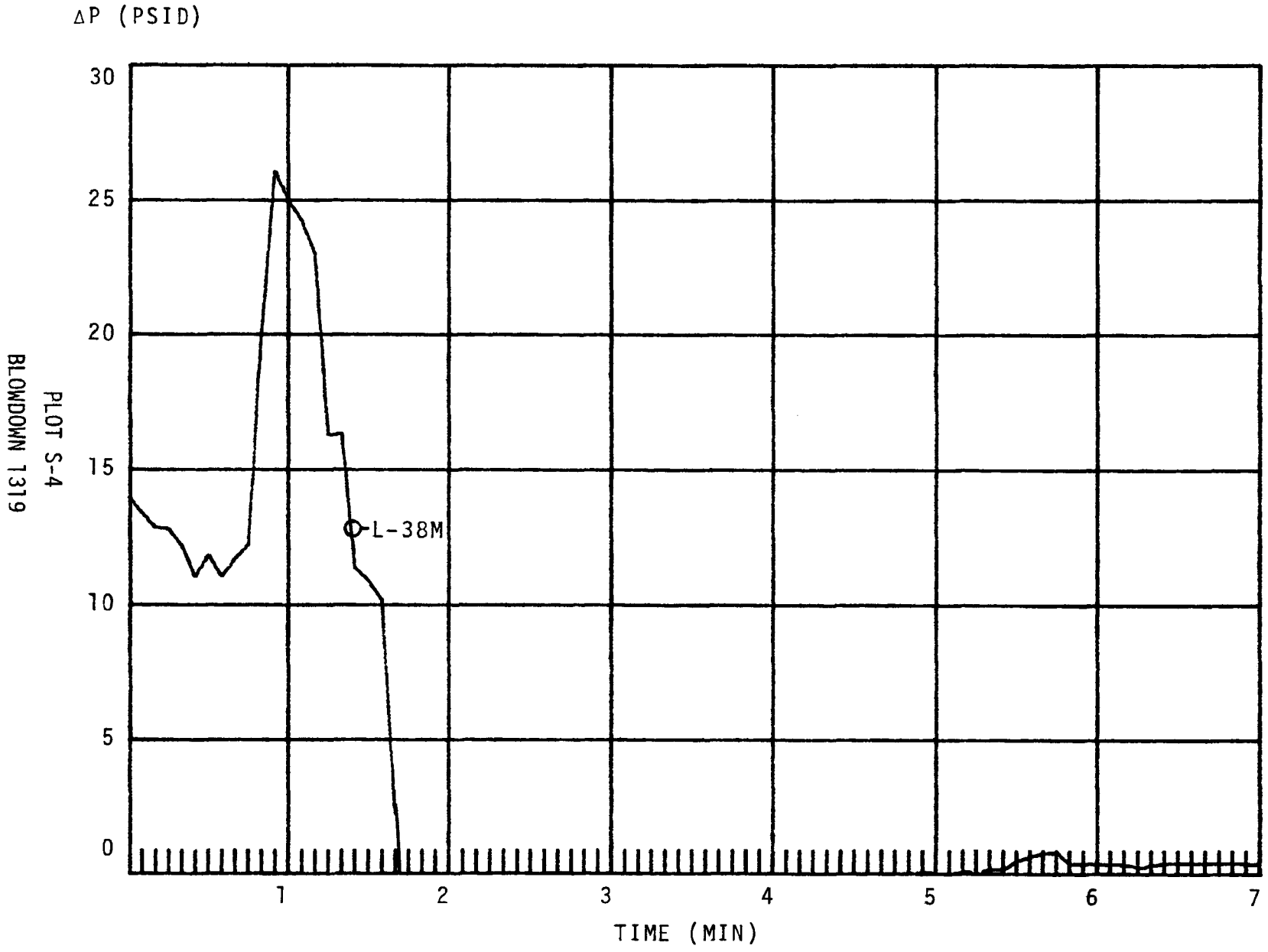


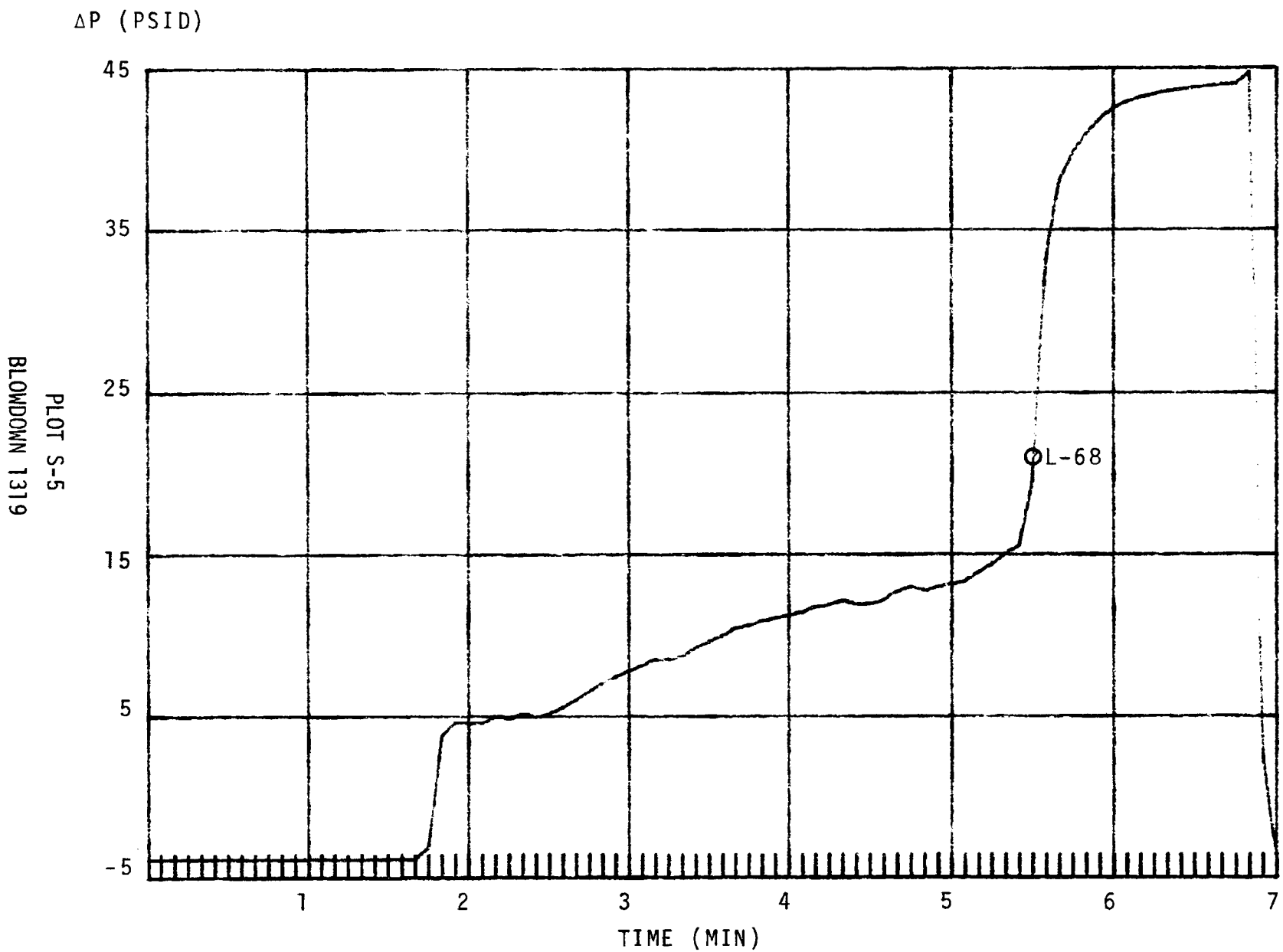
PLOT S-1
BLOWDOWN 1319


ΔP (PSID) L-25
ΔP (PSID) L-61
3
2
1
0
-1
15
10
5
0
-5
L-61
L-25
L-25
1
2
3
4
5
6
7
TIME (MIN)
PLOT S-2
BLOWDOWN 1319



PLOT S-3
BLOWDOWN 1319


ΔP (PSID)
30
25
20
15
10
5
0
1
2
3
4
5
6
7
TIME (MIN)
L-38M
PLOT S-4
BLOWDOWN 1319


ΔP (PSID)
45
35
25
15
5
-5
1
2
3
4
5
6
7
TIME (MIN)
L-68
PLOT S-5
BLOWDOWN 1319

SYSTEM CONFIGURATION

Test Number 1351

Break Location	Discharge
Break Size	27.75 in^2
	100 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Constant Speed

COMMENTS

1. Malfunctioning or Inoperable Instruments: Pump discharge turbine meter (LO and HI) high range data appear to have been clipped electronically. The specified ranges of these instruments were exceeded during portions of this test.

2. Other Comments: There was difficulty obtaining accurate calibration constants for the pump discharge gamma densitometer, Beam 3. A more reasonable curve can be obtained from the data using the steady state equation and the steady state zero file 1337 as discussed in Volume II of this report.

3. Affected FM Data Plots:
   - 11 - Density
   - 20 - Void Fraction
   - 30 - Normalized Volumetric Flow Rate
   - 31 - Normalized Volumetric Flow Rate
   - 40 - Momentum Flux
   - 41 - Momentum Flux
   - 56 - Mass Flow Rate
   - 57 - Mass Flow Rate
   - 62 - Integrated Mass
   - 63 - Integrated Mass

INITIAL CONDITIONS

t = 30 Sec[a]

Test Number 1351

System Pressures

High Pressure Drum	1022.2	psia
Suction Instrument Spool	1014.3	psia
Discharge Instrument Spool	1052.2	psia

Fluid Temperatures

Suction Instrument Spool	546.1	°F
Discharge Instrument Spool	550.5	°F

Fluid Density

Suction Instrument Spool	46.22	lbm/ft^3
Discharge Instrument Spool	45.93	lbm/ft^3

System Flows

Mass Flow Rate	179	lb/sec
Suction Volumetric Flow Rate	1736	gpm
Discharge Volumetric Flow Rate	1792	gpm
Suction Normalized Volumetric Flow Rate	0.50	
Discharge Normalized Volumetric Flow Rate	0.51	
Suction Fluid Velocity	21.36	ft/sec
Discharge Fluid Velocity	22.05	ft/sec
Suction Momentum Flux	21,092	$lbm/ft\ sec^2$
Discharge Momentum Flux	22,329	$lbm/ft\ sec^2$

Pump Performance

Pump head	38.63	psi
	120.4	ft
Pump Speed	3402	rpm
Pump Shaft Torque	127.0	ft lb
Pump Hydraulic Torque	106.0	ft lb

System Mass (t = 40 Sec)[a]

High Pressure Drum Level	52.79	in[b]
Fluid Mass Upstream of Test Pump	13,900	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 1351

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0.0
Start FM Recording System	-7.2	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0.0
Command to Close Loop Control Valve HPSW-1	1.4	c
HPSW-1 Closed	3.0	c
Pump Power Trip	-	-
Initiate Rupture Mechanism	3.6	c
Blowdown Starts	5.7	50
HPSW-2 Closed	173.6	220
PAC-12 and PAC-16 Injection Off	100.6	145
PAC-12 and PAC-16 Injection On	c	c
Test Pump Injection Off	146.4	190
Test Pump Injection On	c	c
End of Digitized Data 20 s/sec	413.0	-
200 s/sec	293.0	-
FM Recording System Off	424.0	-
Scanner System Off	-	475

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

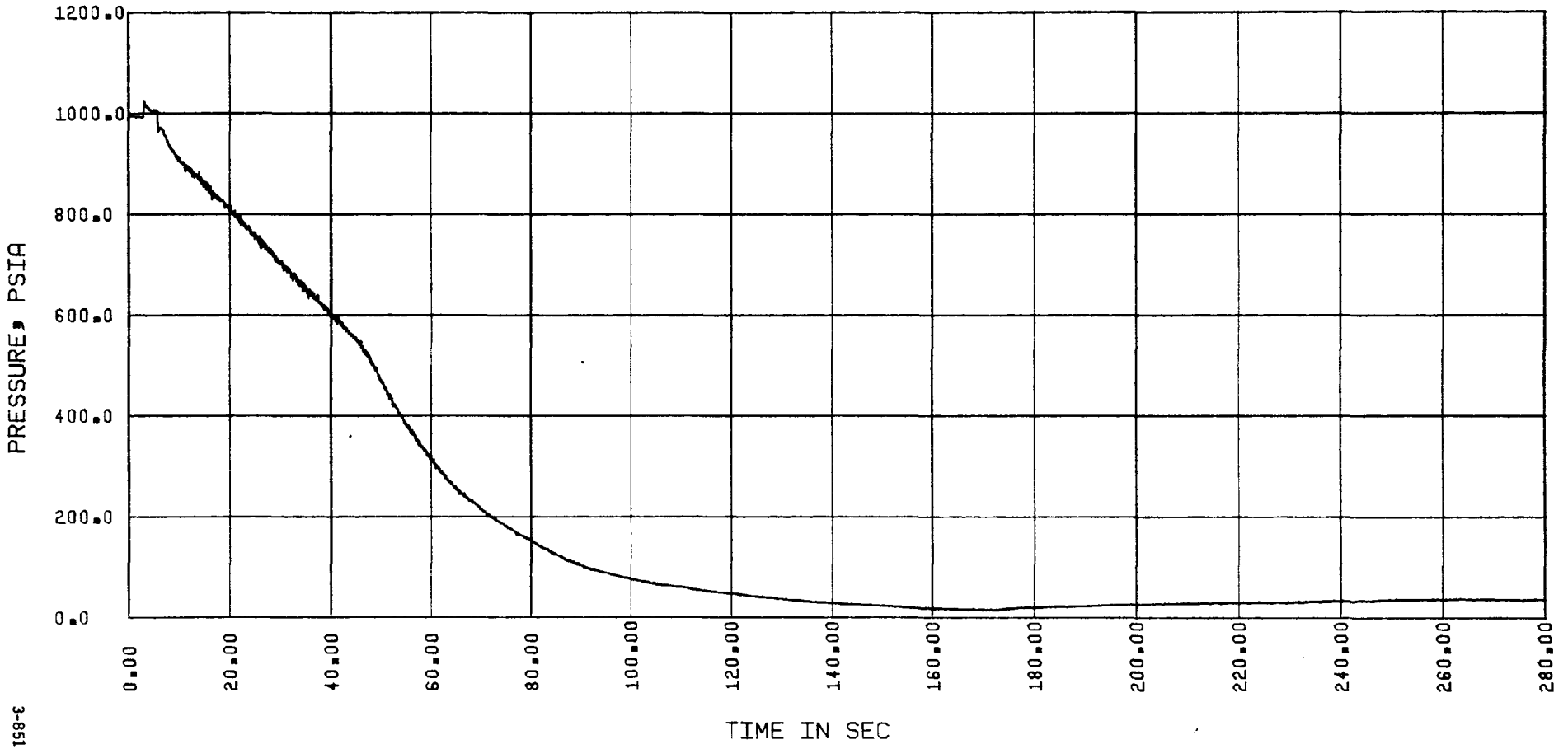
Index Listing
of
FM DATA PLOTS
Test Number (1351)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
28	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 Discharge
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge

Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (1351)

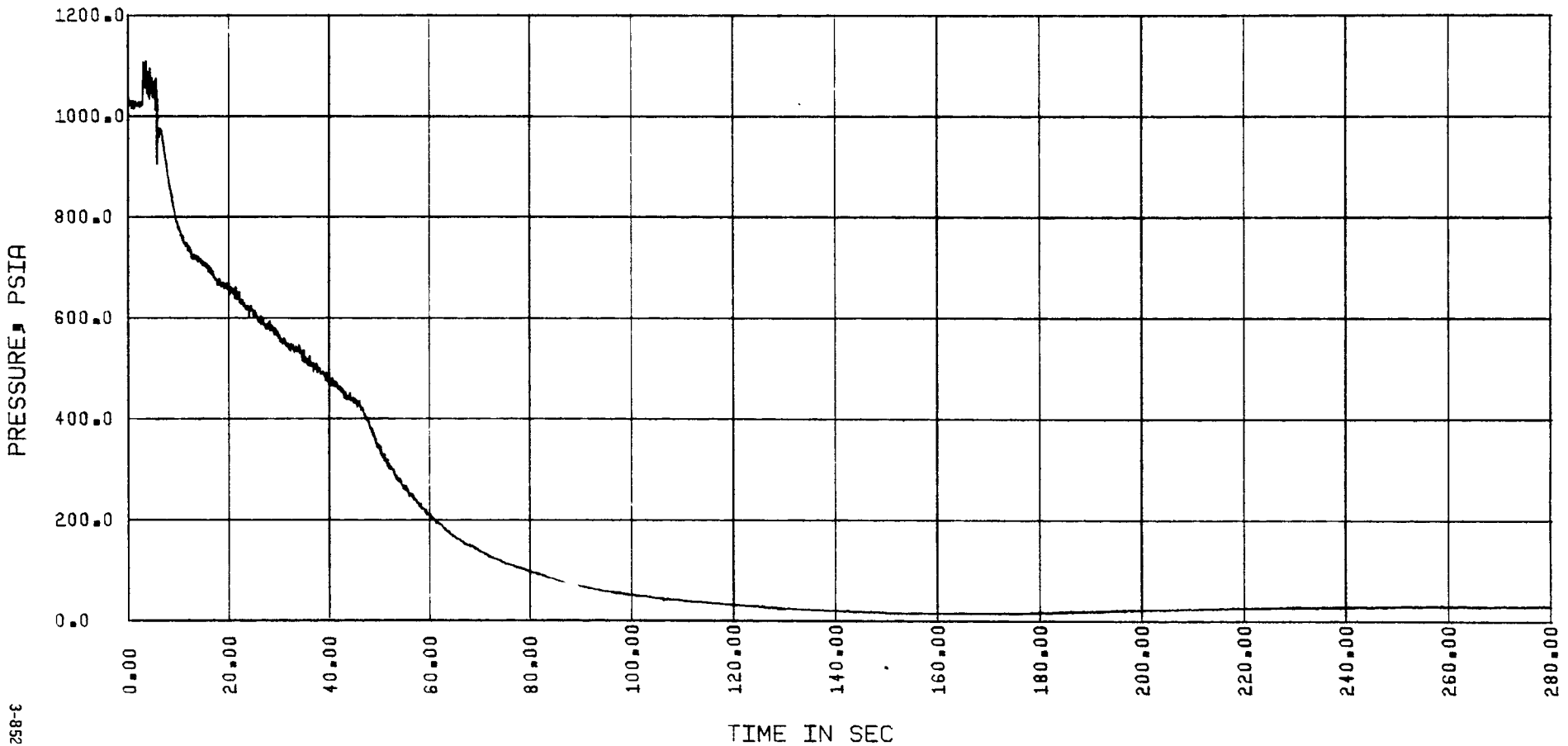
Plot Number	Location Number	Description of Parameter
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
35	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
42	L-27	Momentum Flux LO-DD Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
53	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge
64	L-9	Pump Injection Mass Flow Rate In
65	L-32	Pump Injection Mass Flow Rate Out
66	L-9/L-32	Seal Injection Leakage Mass Flow Rate

TEST 1351/1000 PSIA PON FWD BD
PUMP SUCTION PRESSURE
PLOT NO.1



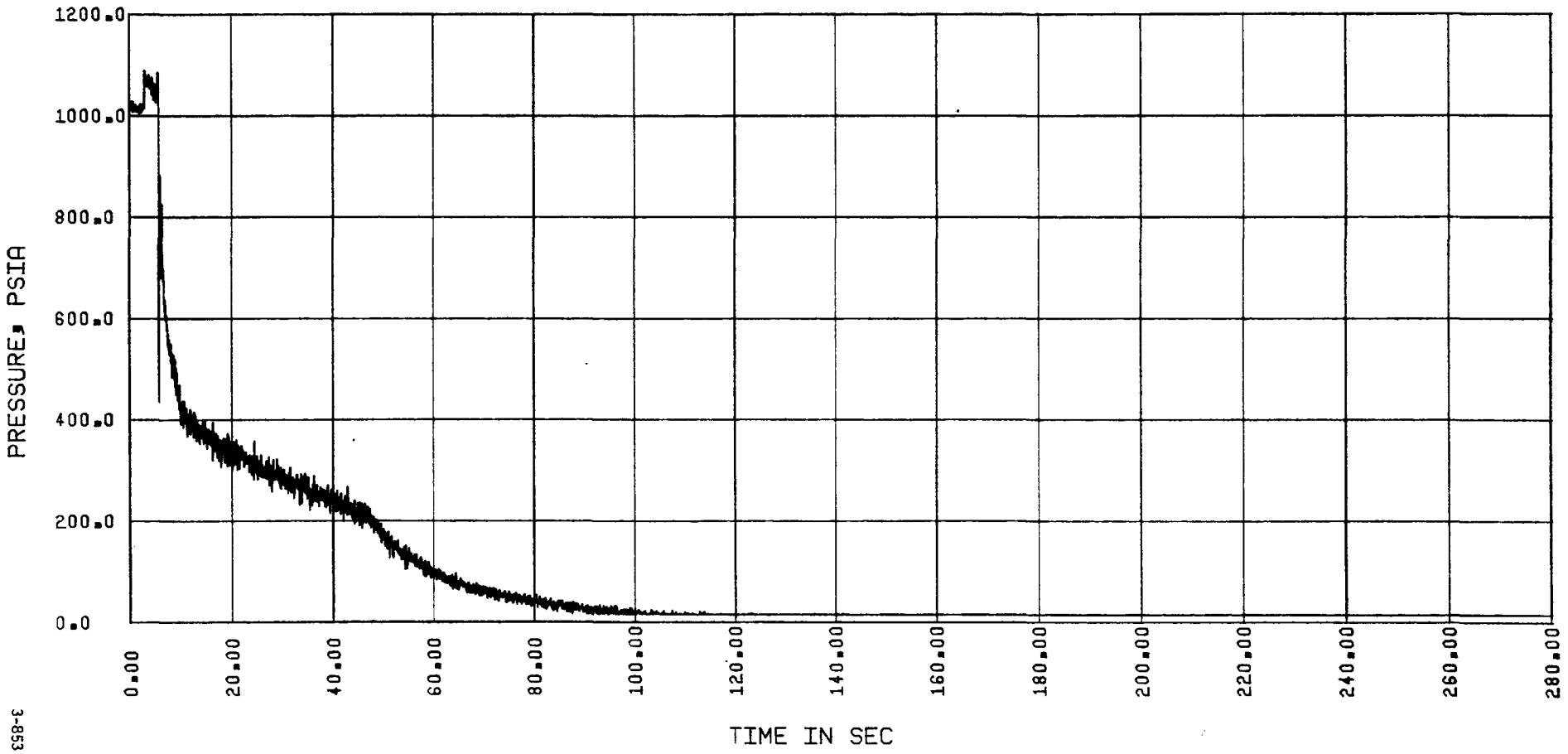
3-851

TEST 1351/1000 PSIA PON FWD BD
PUMP DISCHARGE PRESSURE
PLOT NO.2



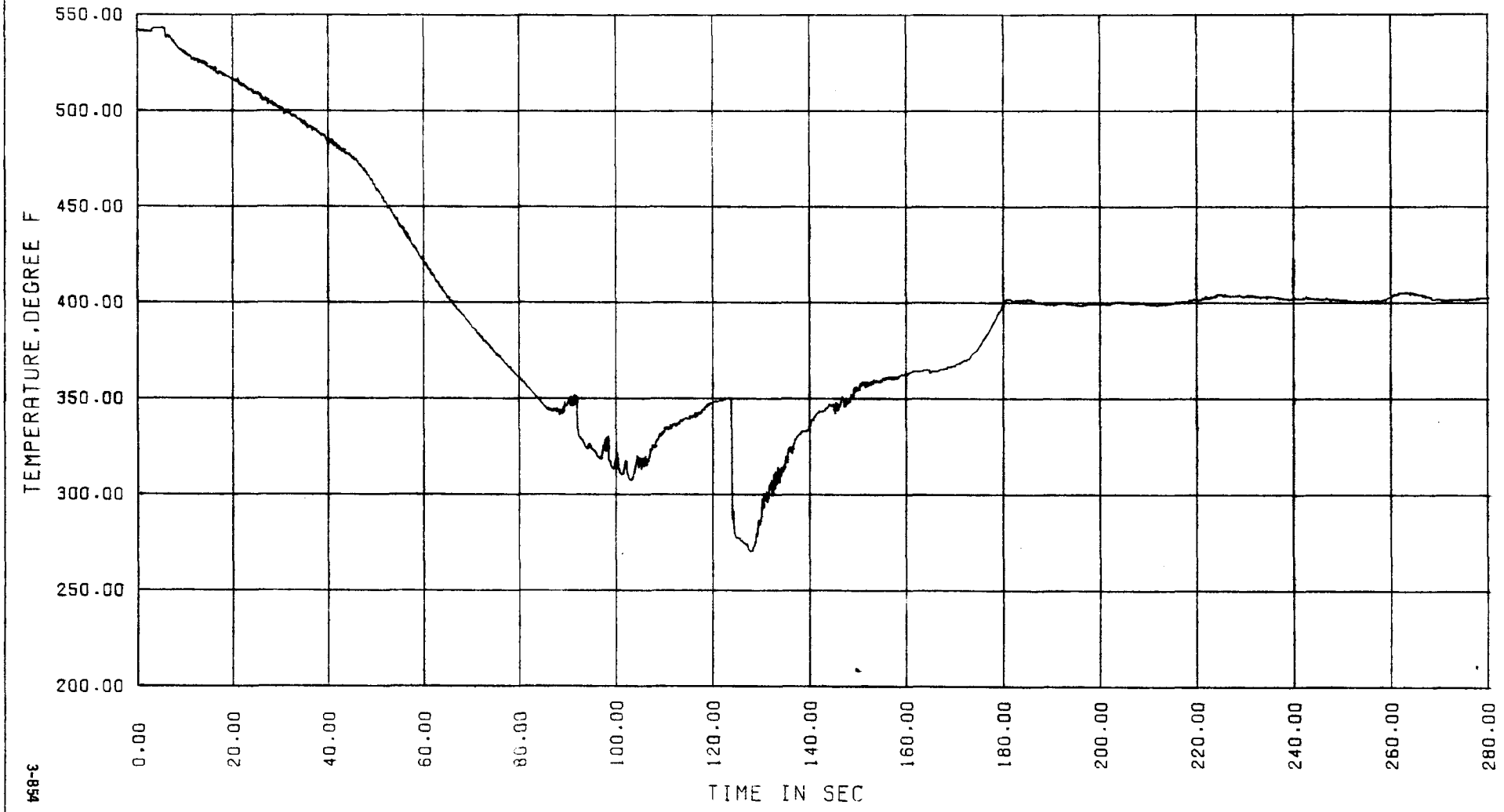
3-852

TEST 1351/1000 PSIA PON FWD BD
BLOWDOWN LINE PRESSURE
PLOT NO.3



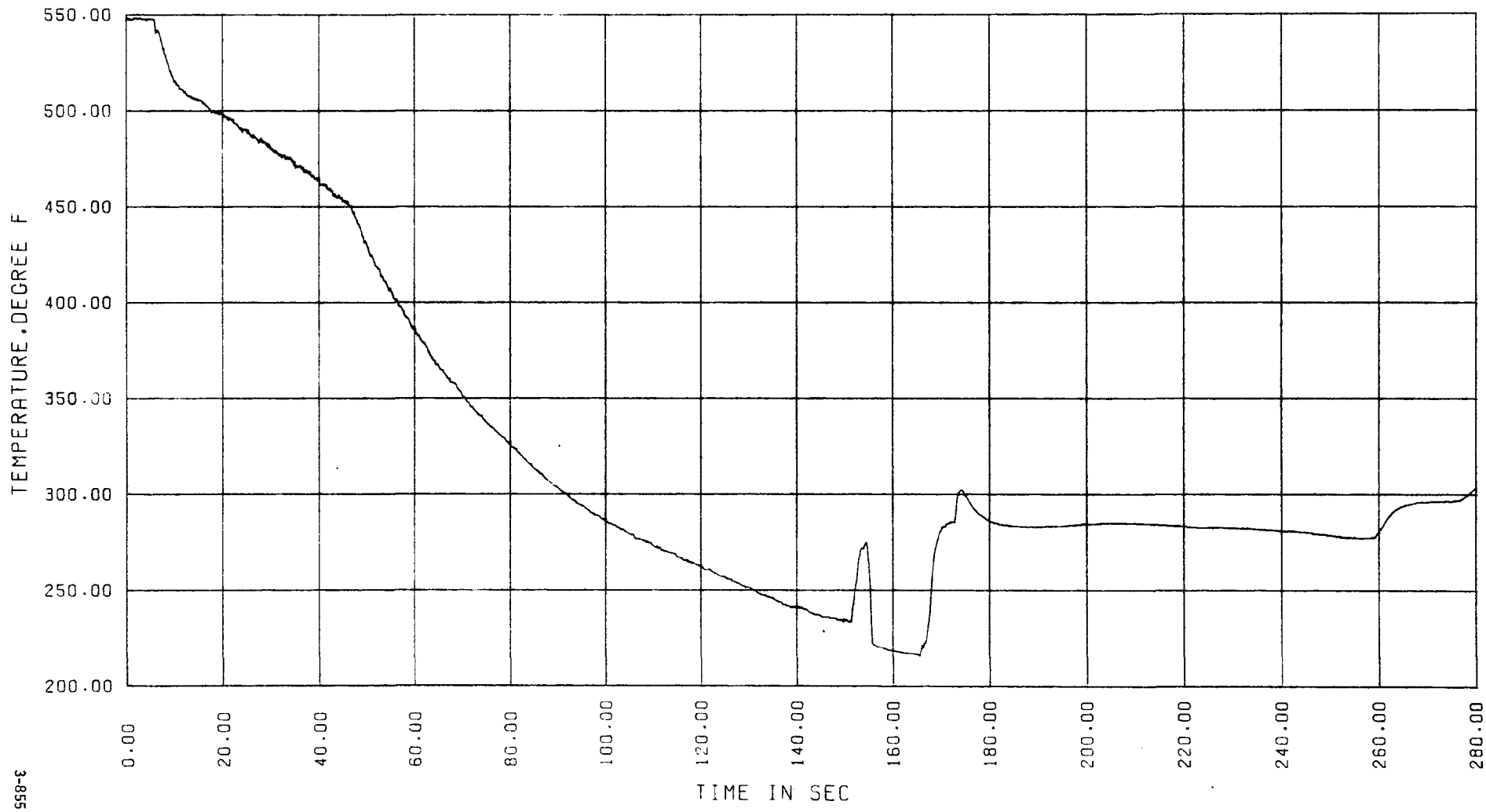
3-853

TEST 1351/1000 PSIA PON FWD BD
PUMP SUCTION TEMPERATURE
PLOT NO.4



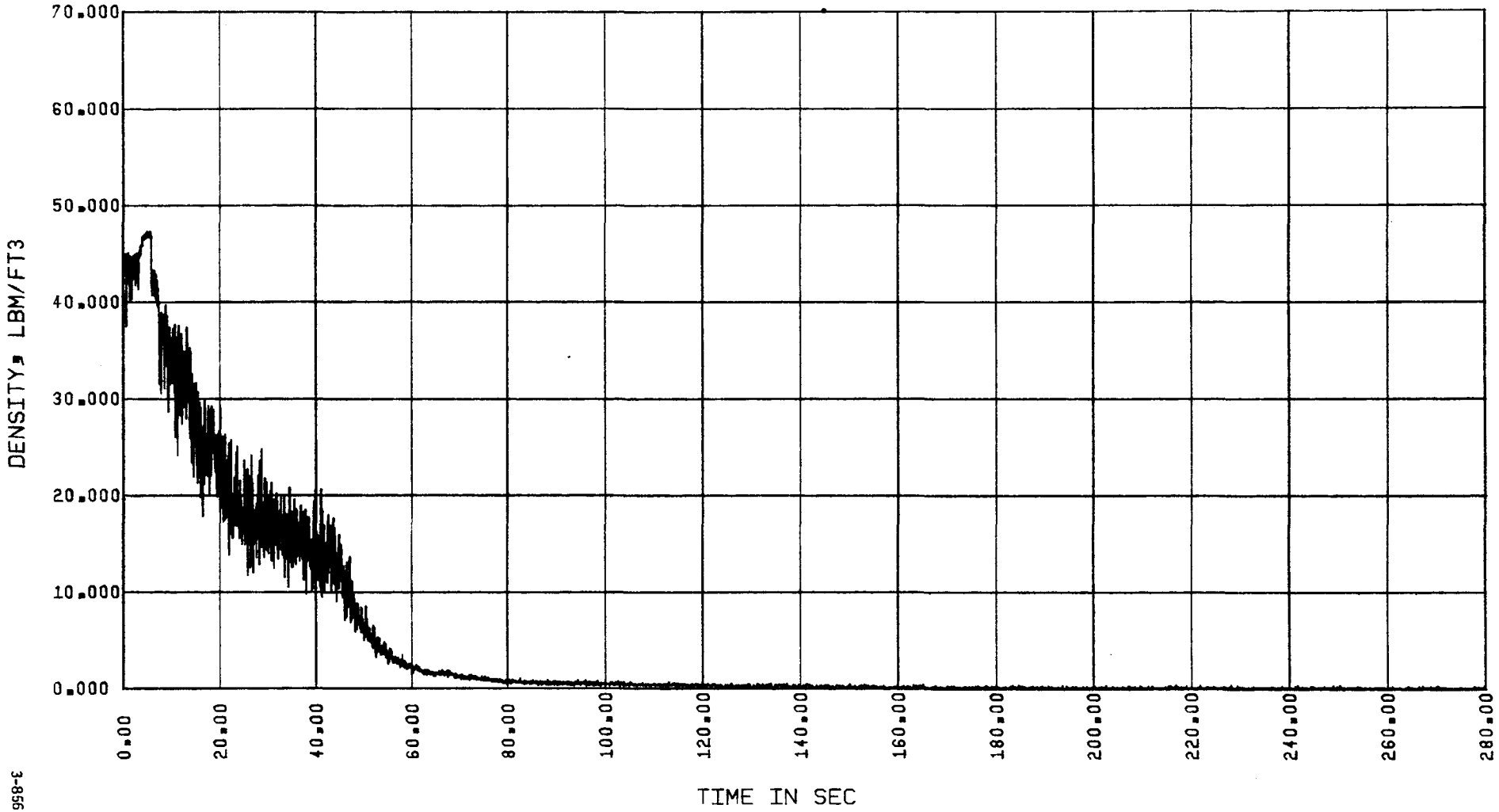
3-854

TEST 1351/1000 PSIA PON FWD BD
PUMP DISCHARGE TEMPERATURE
PLOT NO.5

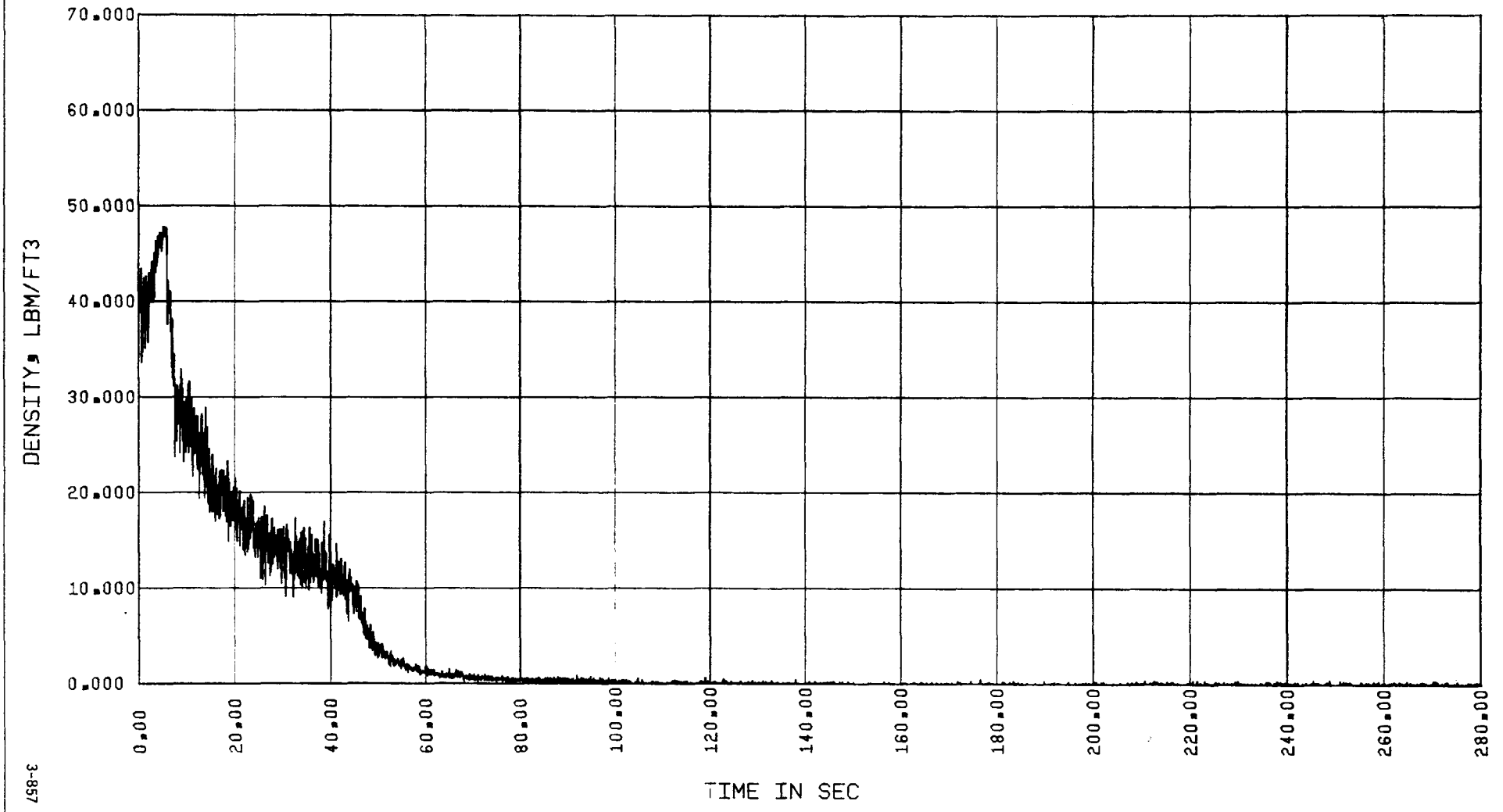


3-855

TEST 1351/1000 PSIA PON FWD BD
DENSITY BEAM1 GD SUCTION
PLOT NO.6

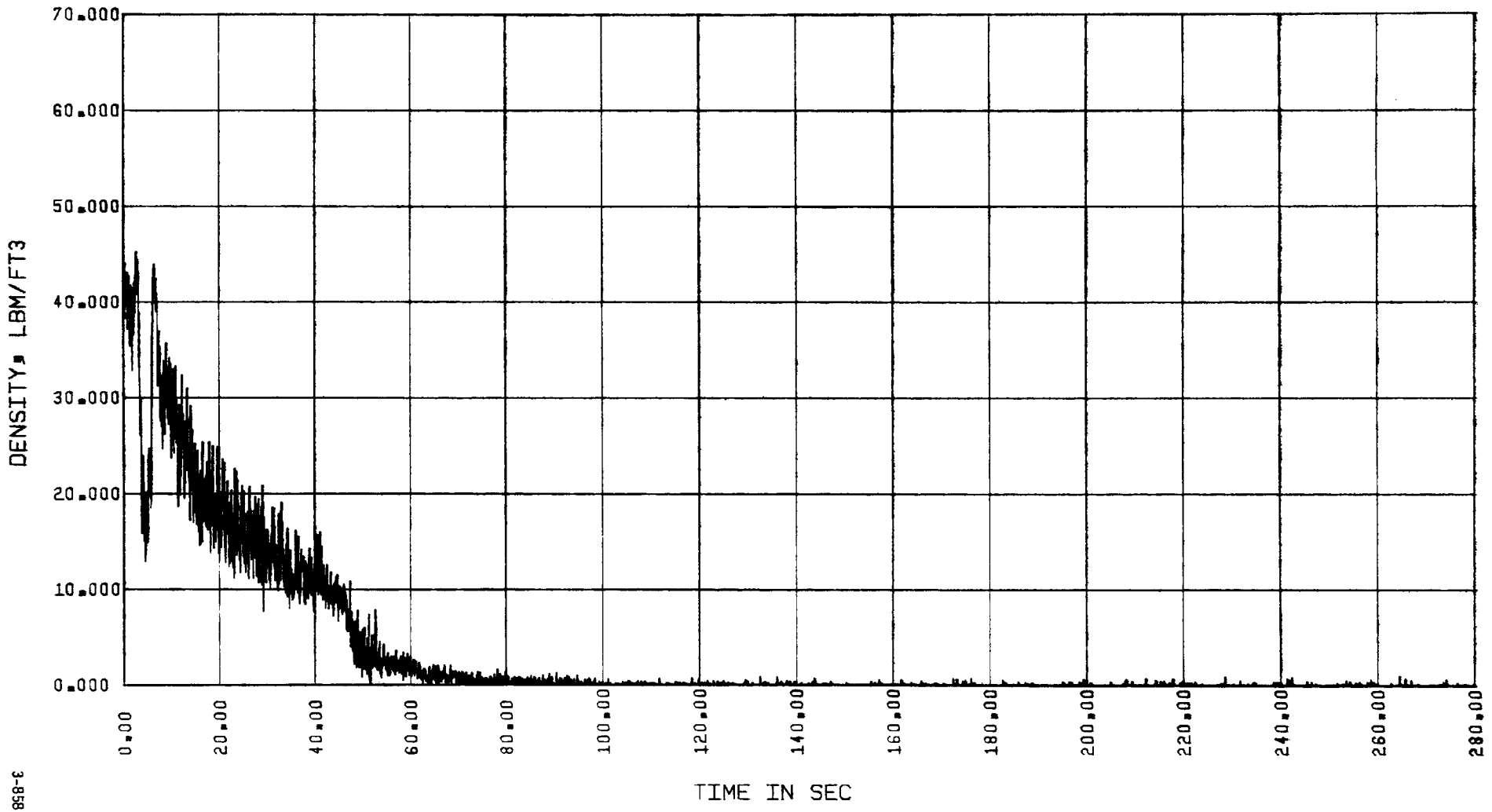


TEST 1351/1000 PSIA PON FWD BD
DENSITY BEAM2 GD SUCTION
PLOT NO.7

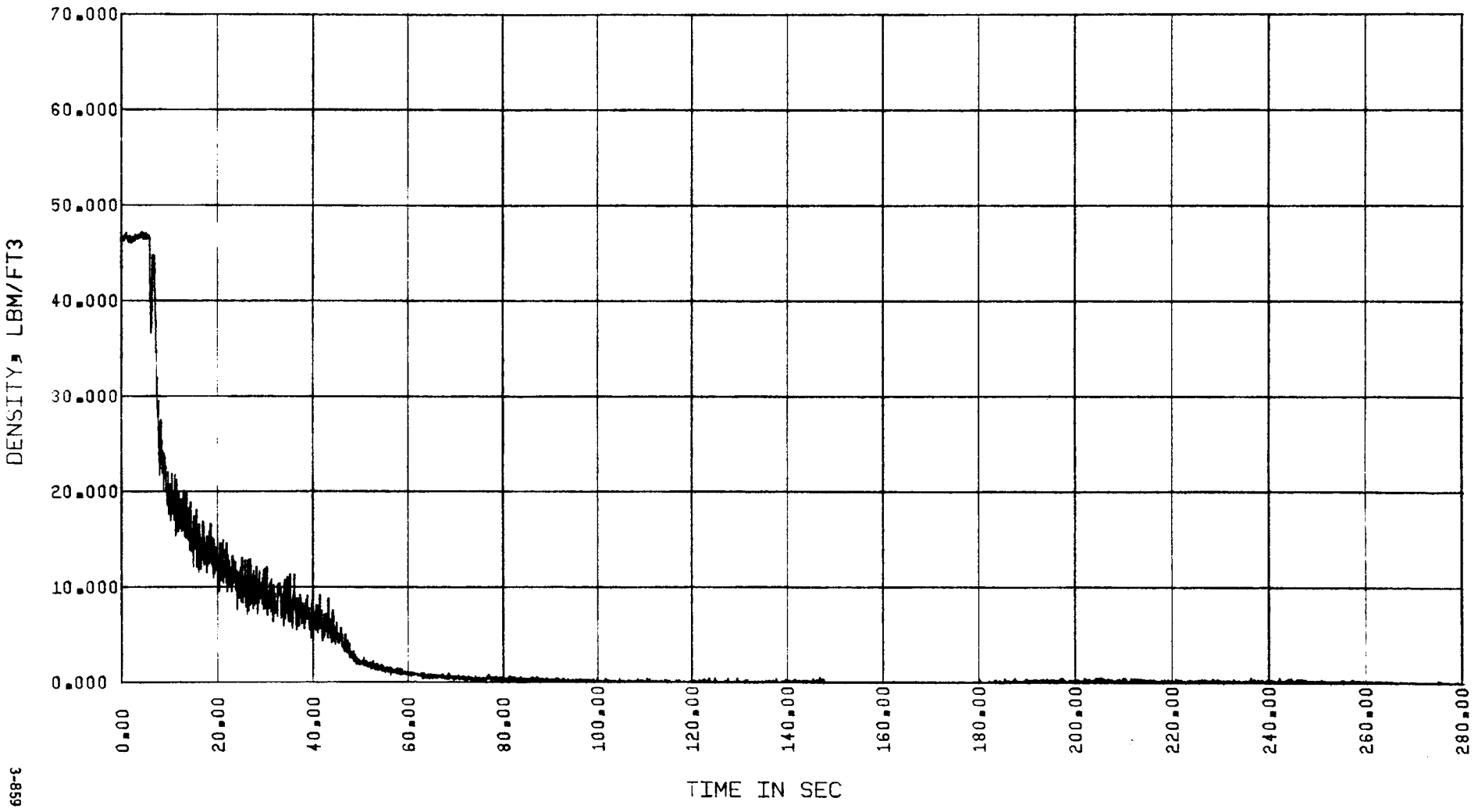


3-867

TEST 1351/1000 PSIA PON FWD BD
DENSITY BEAM3 GD SUCTION
PLOT NO.8

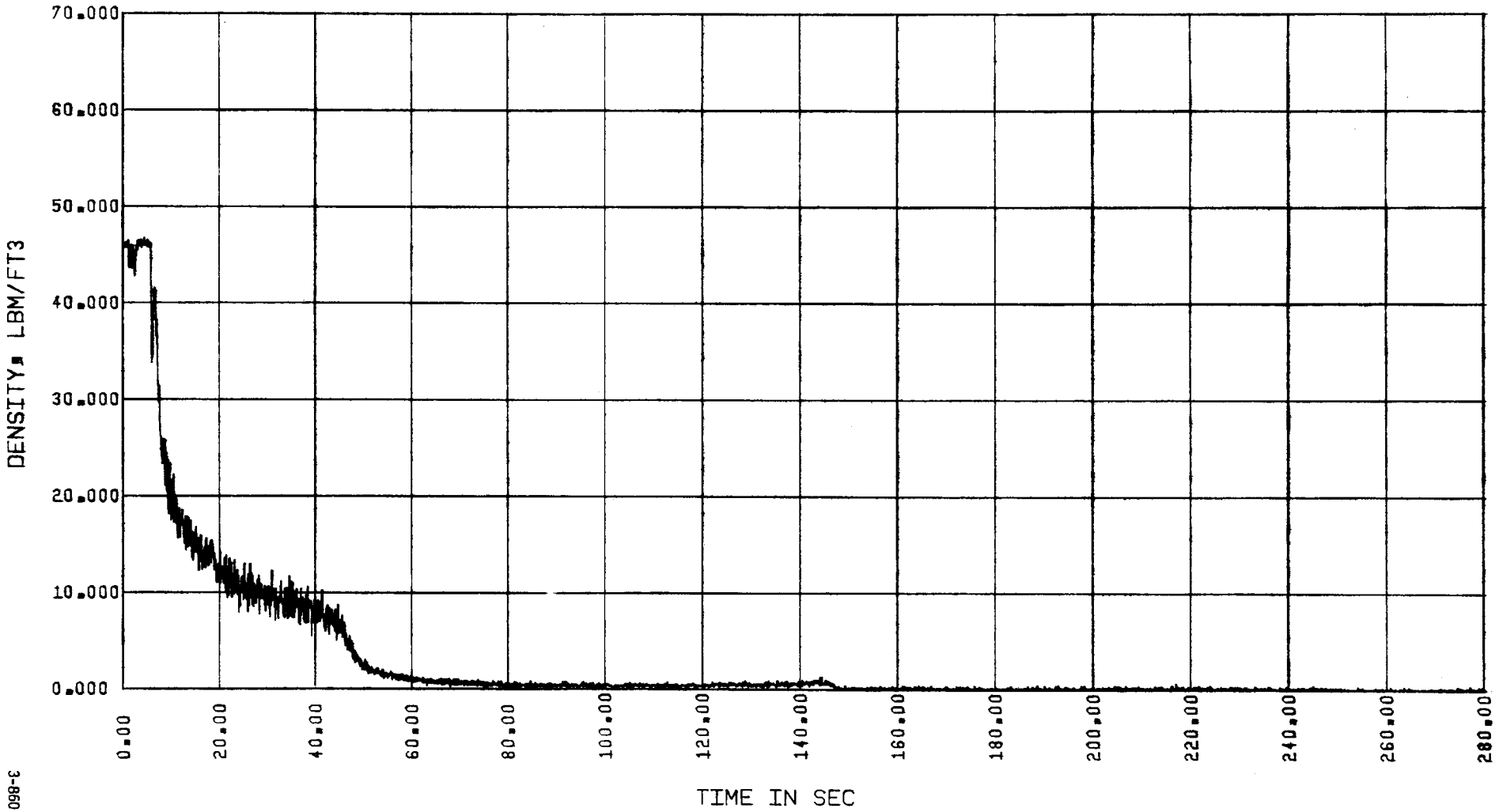


TEST 1351/1000 PSIA PON FWD BD
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9



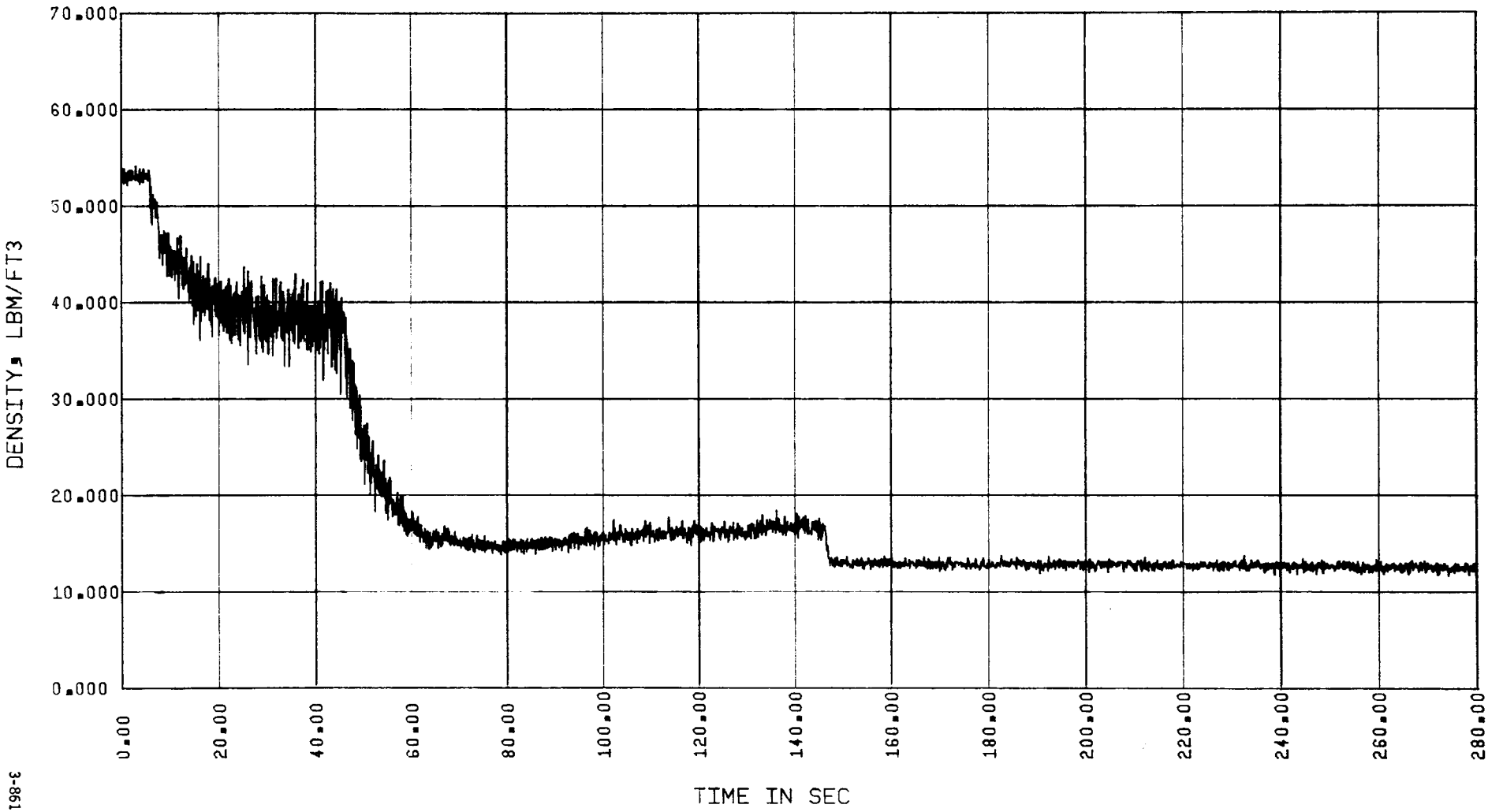
3-859

TEST 1351/1000 PSIA PON FWD BD
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10



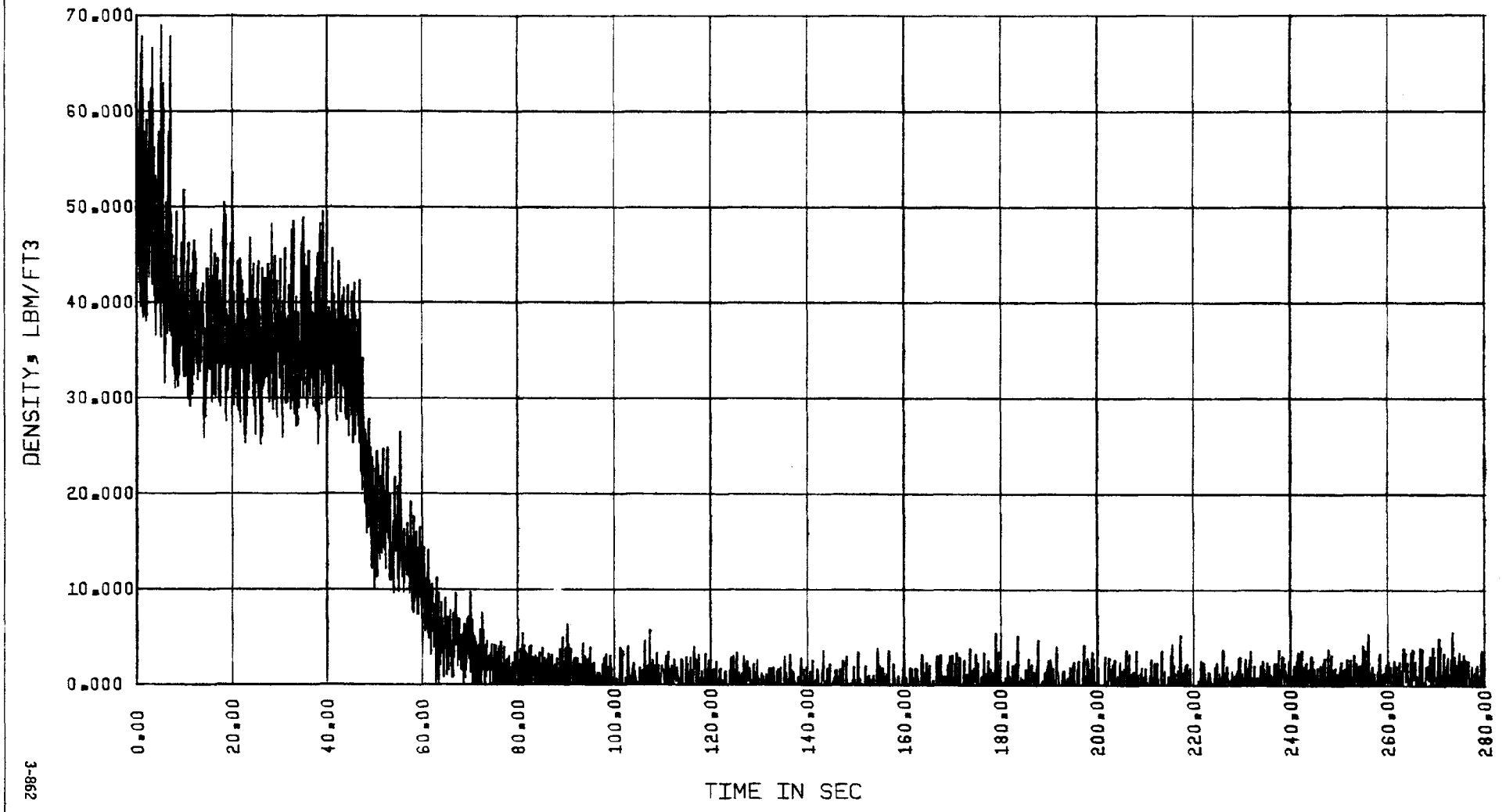
3-860

TEST 1351/1000 PSIA PON FWD BD
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11



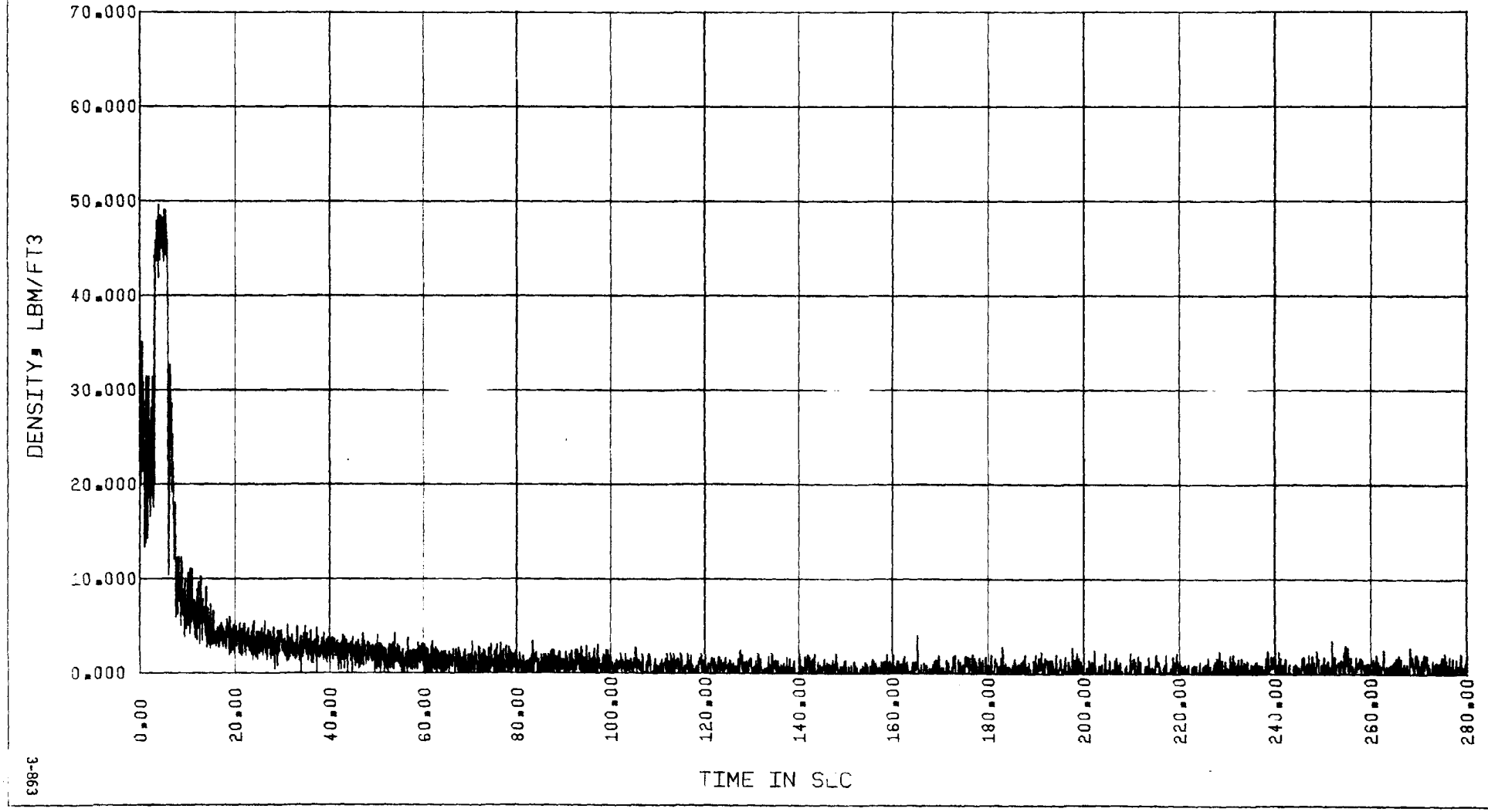
3-861

TEST 1351/1000 PSIA PON FWD BD
DENSITY BEAM1 AECL GD
PLOT NO.12

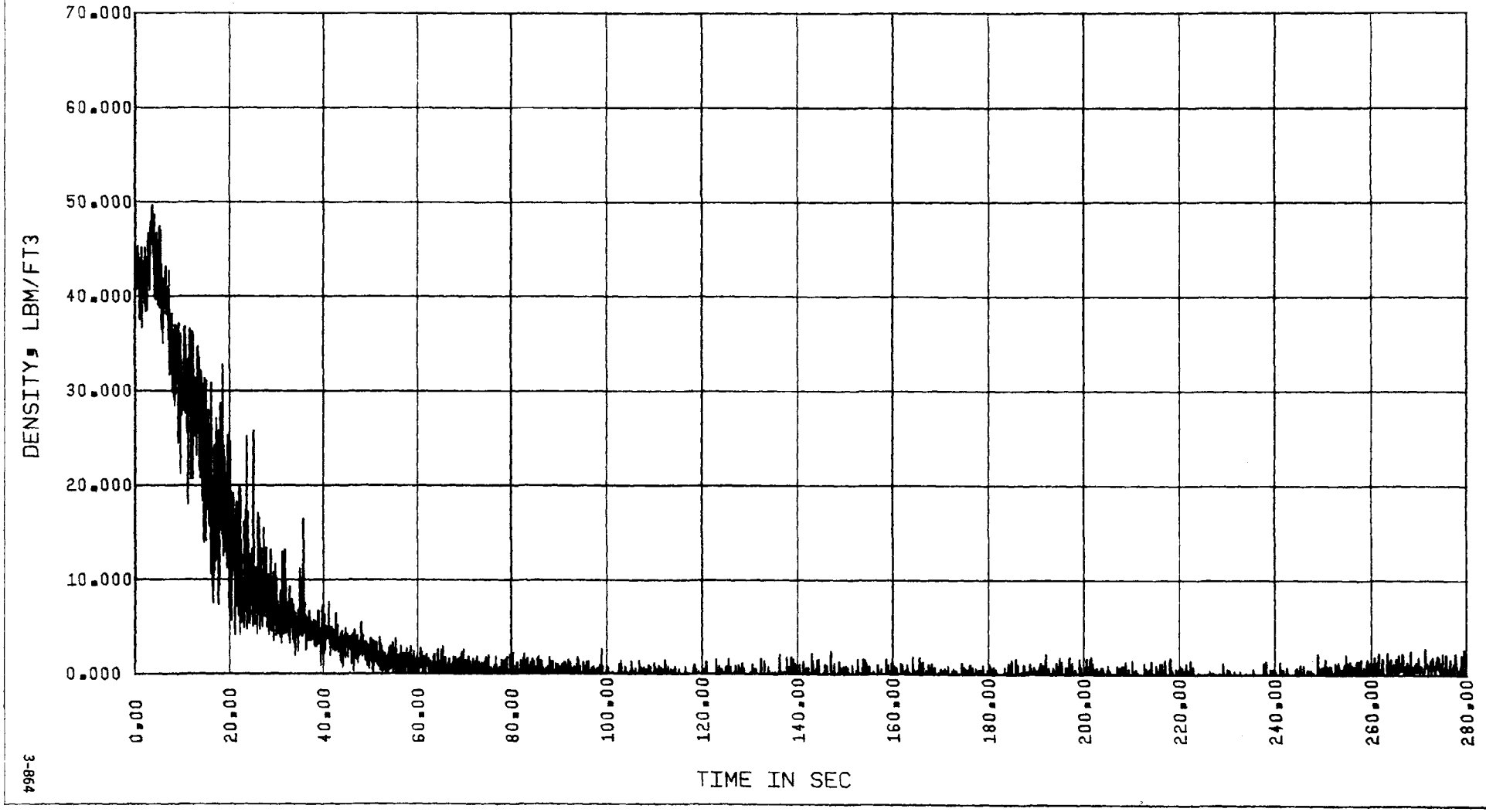


3-862

TEST 1351/1000 PSIA PON FWD BD
DENSITY BEAM2 AECL GD
PLOT NO.13

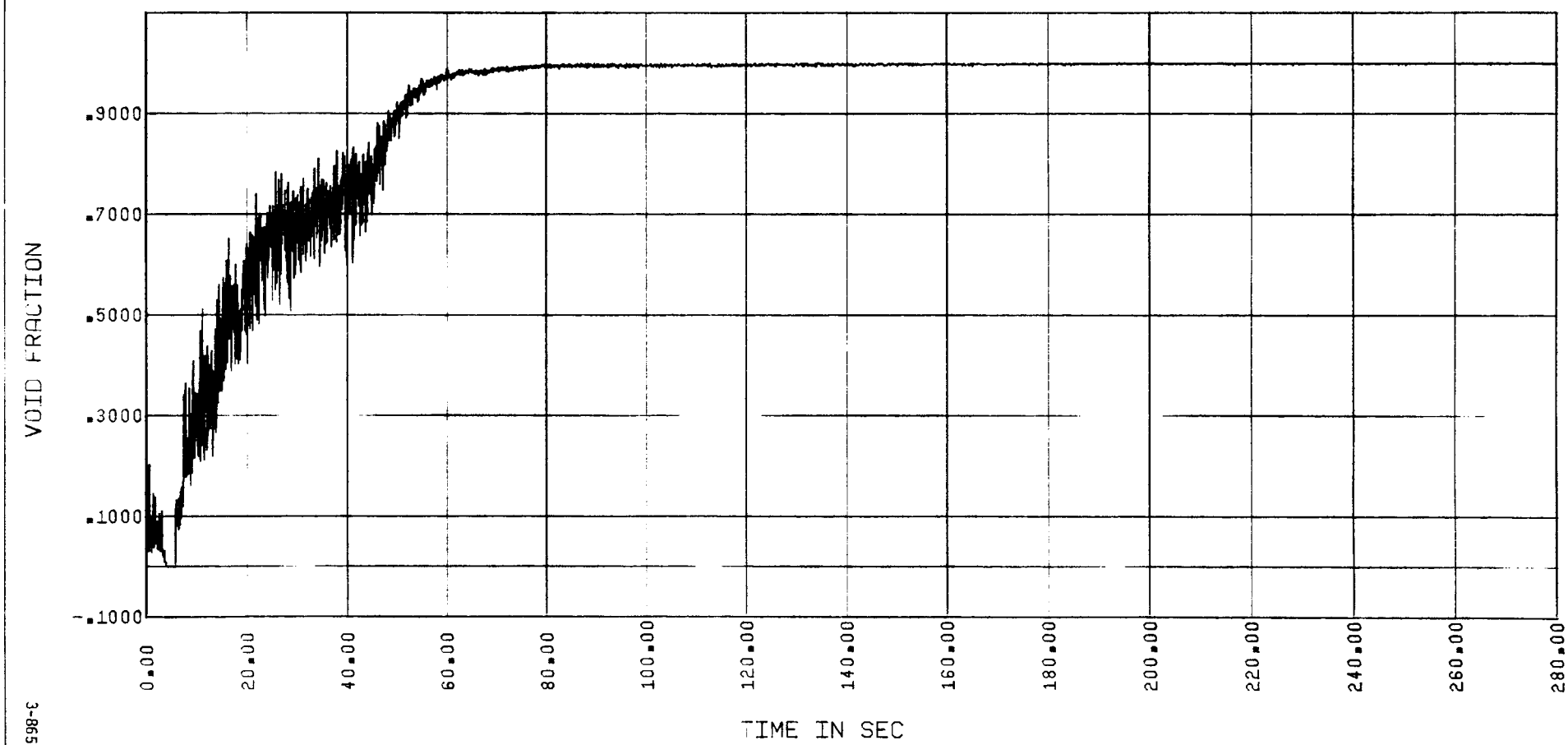


TEST 1351/1000 PSIA PON FWD BD
DENSITY BEAM3 AECL GD
PLOT NO. 14



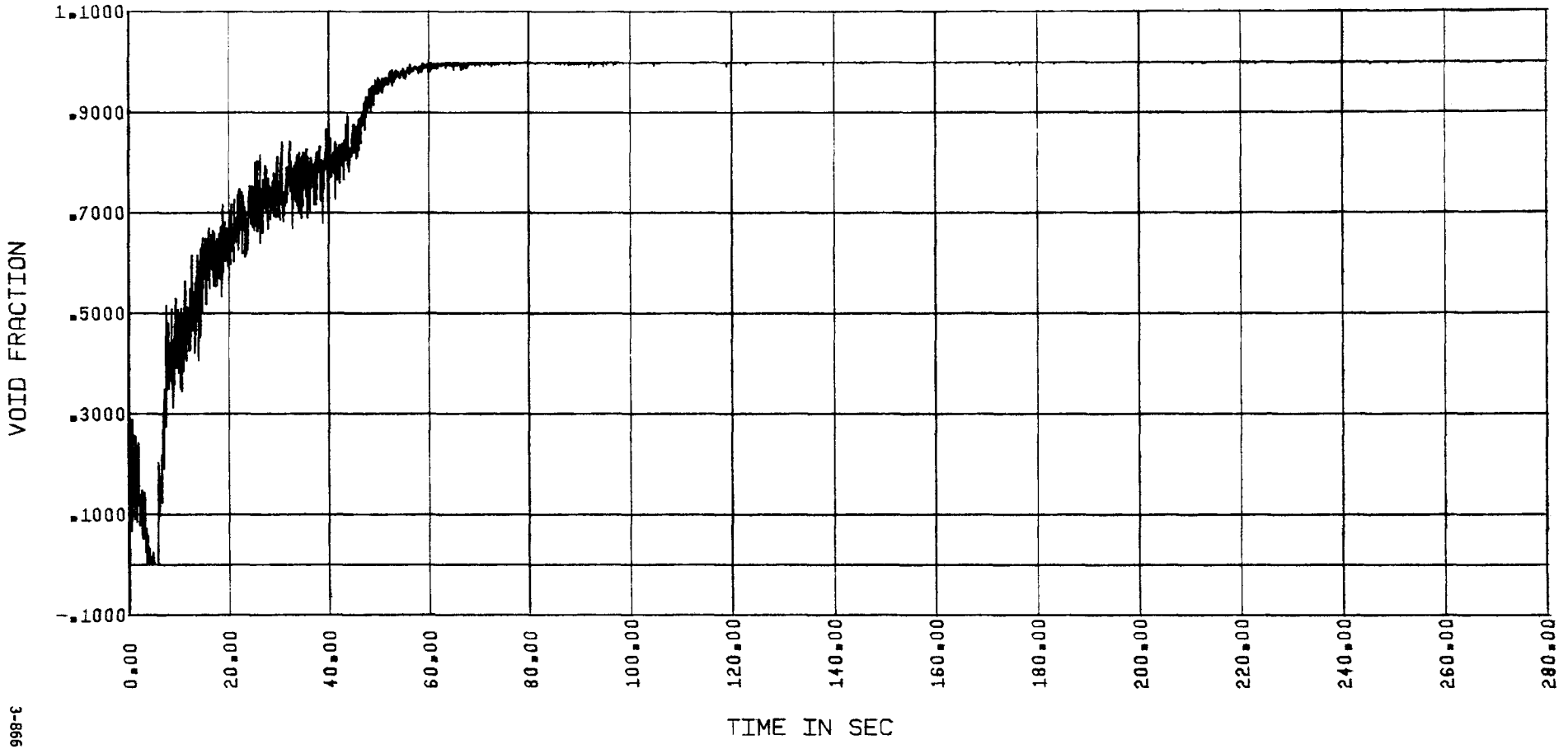
3-864

TEST 1351/1000 PSIA PON FWD BD
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15

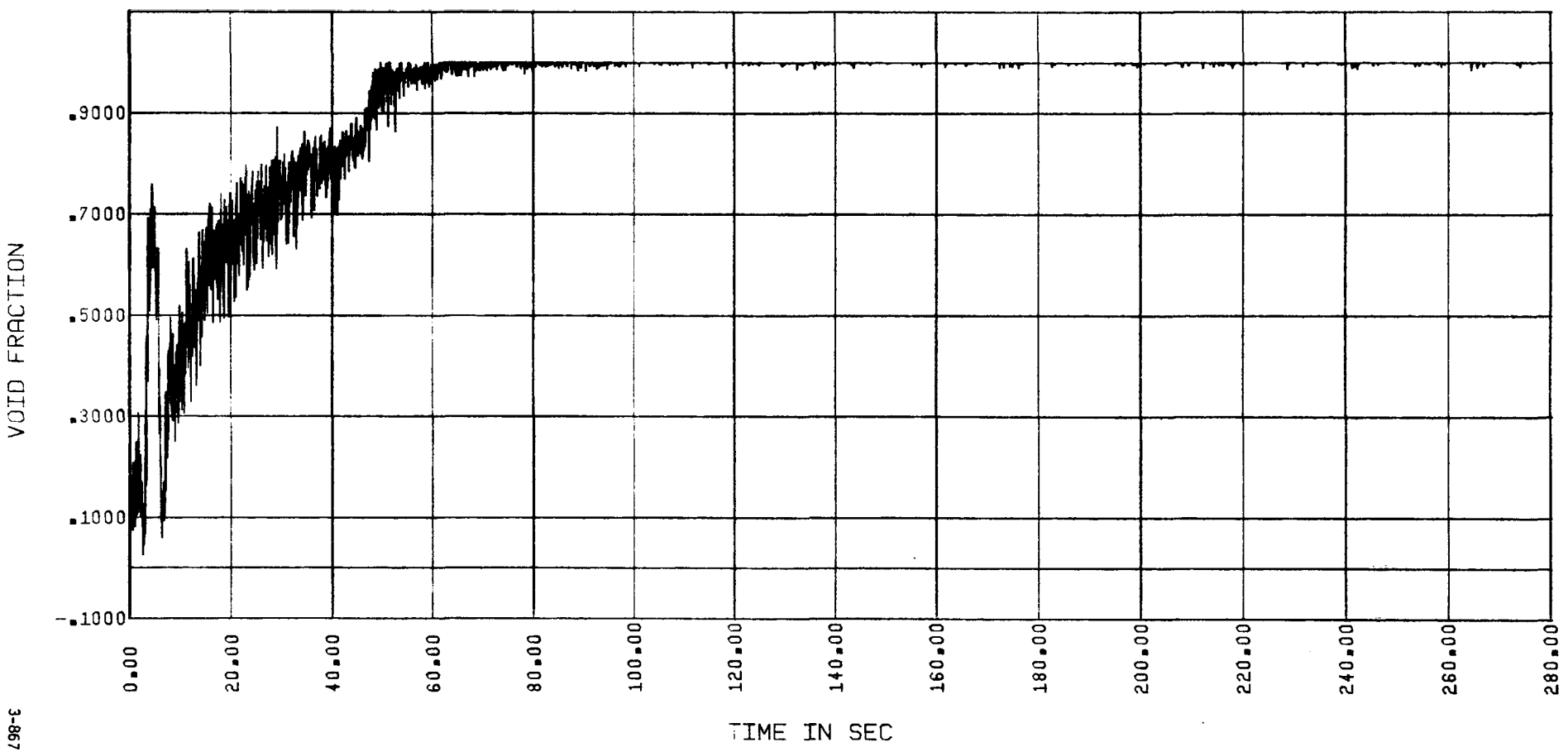


3-865

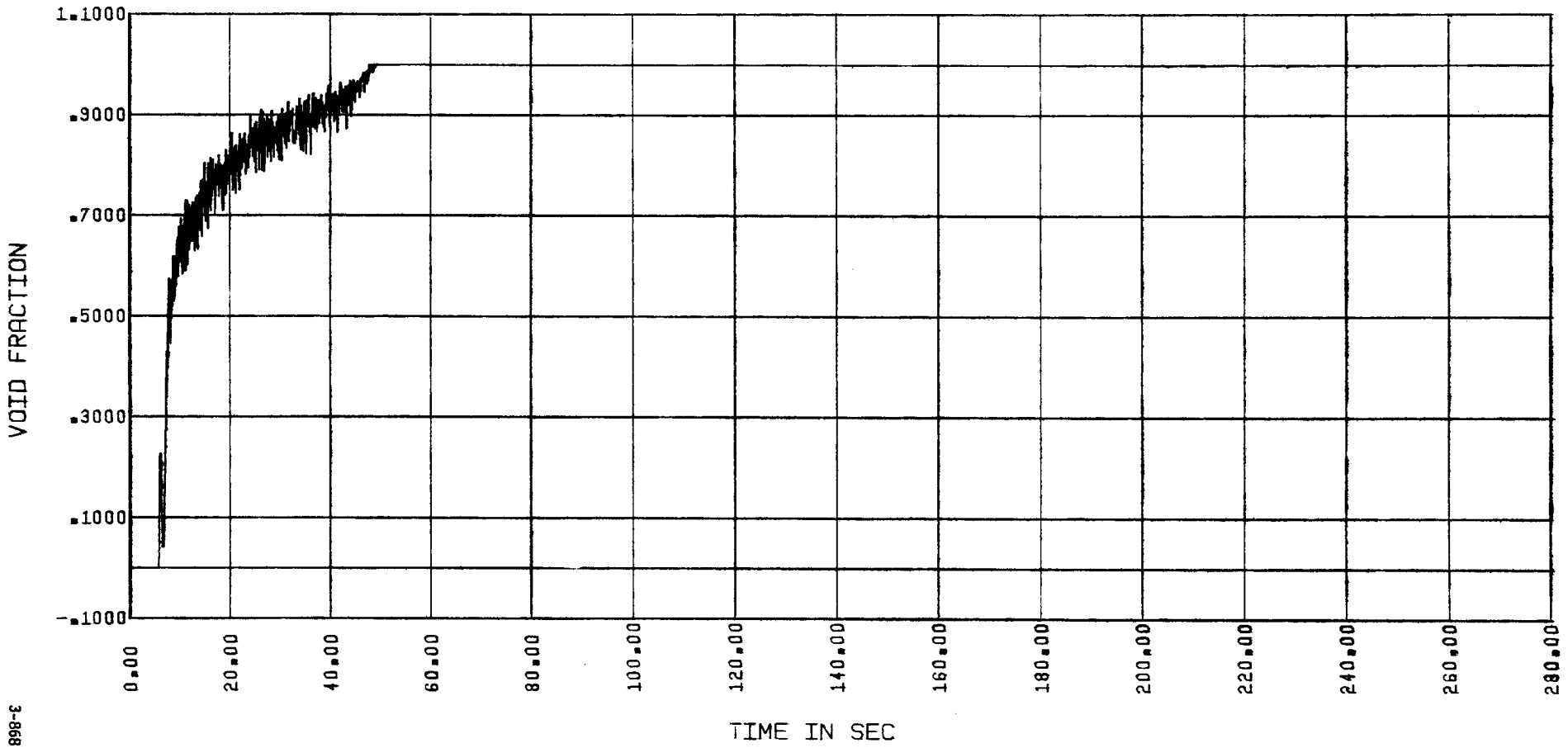
TEST 1351/1000 PSIA PON FWD BD
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16



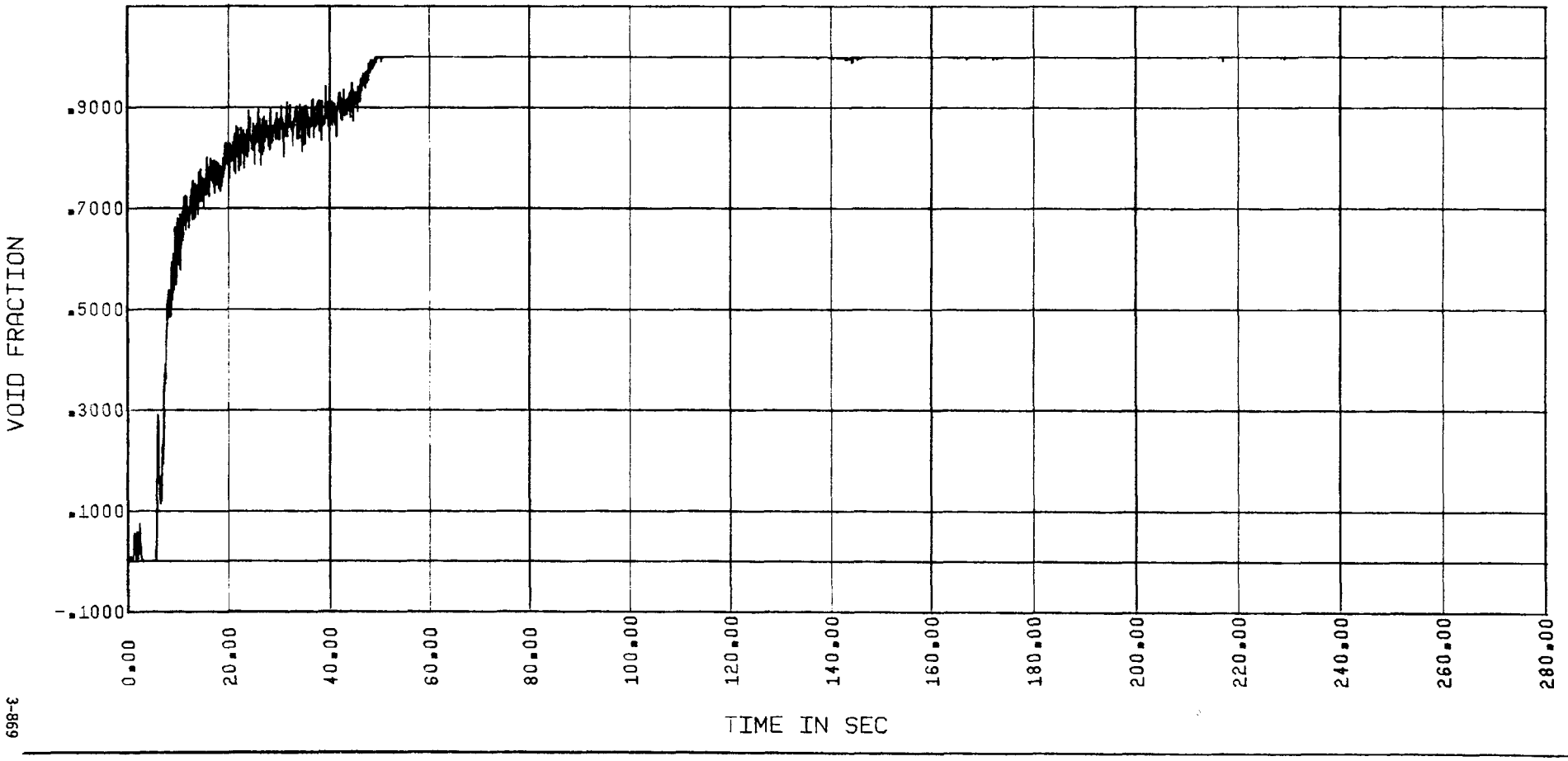
TEST 1351/1000 PSIA PON FWD BD
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17



TEST 1351/1000 PSIA PON FWD BD
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18

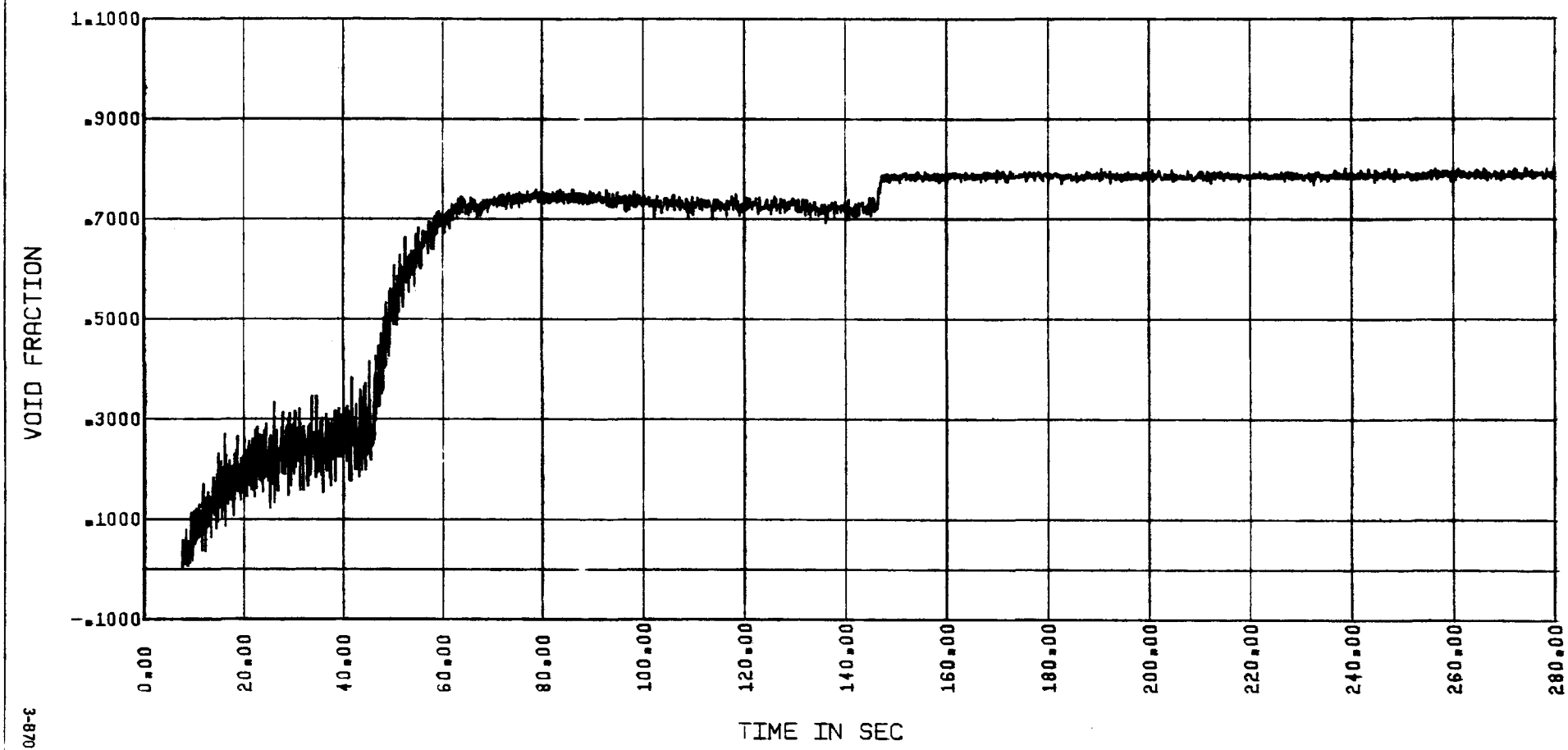


TEST 1351/1000 PSIA PON FWD BD
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19

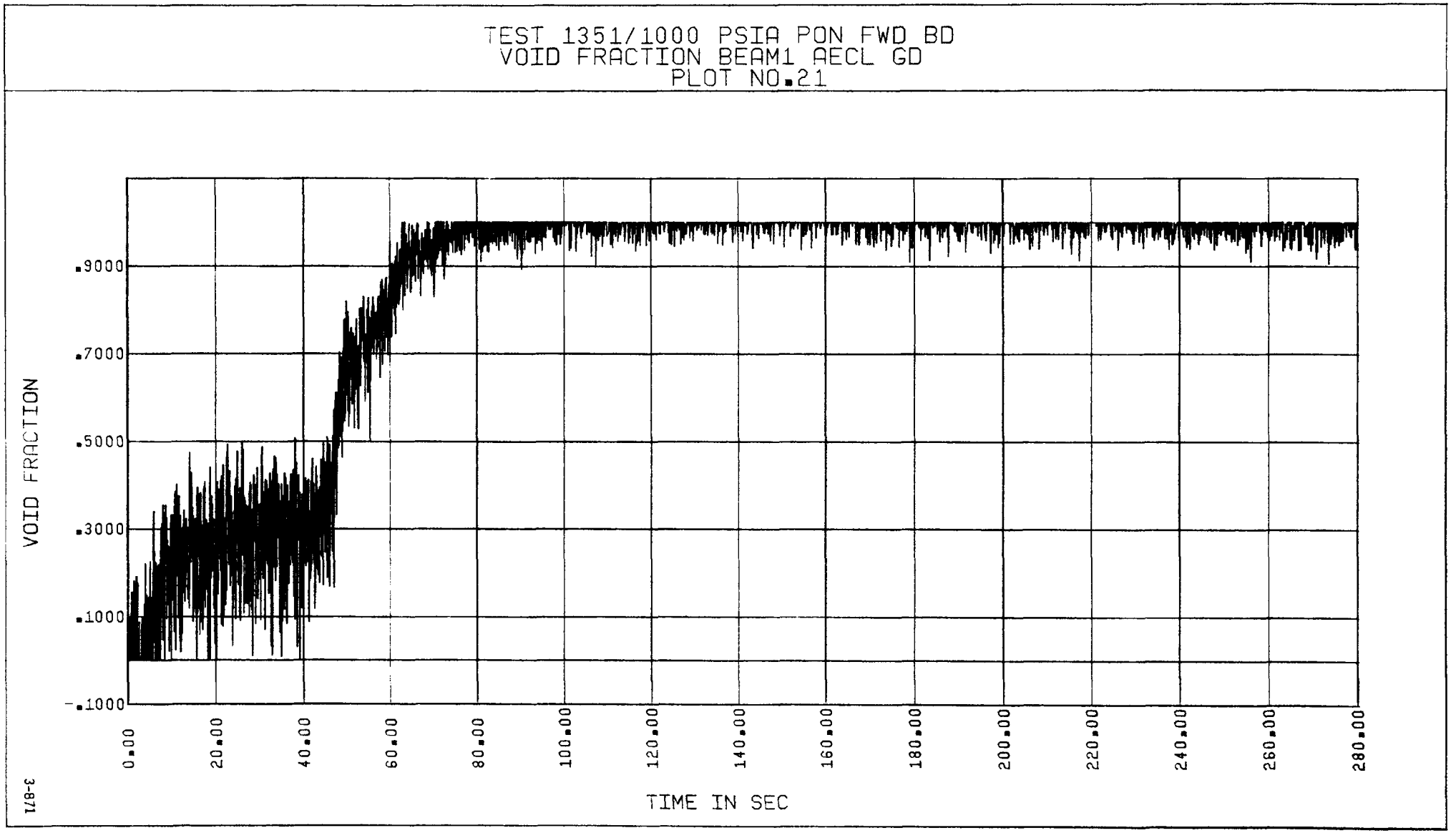


3-869

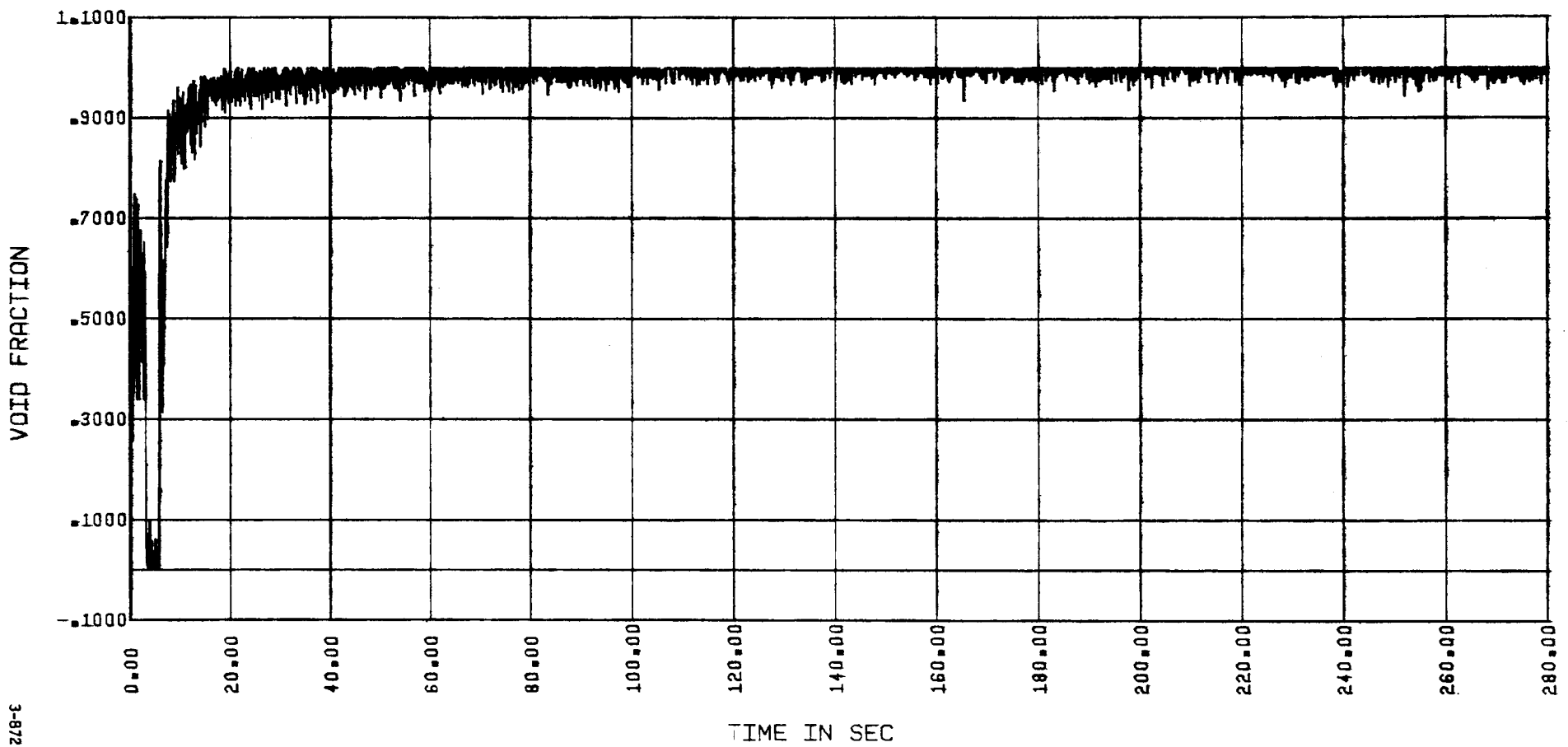
TEST 1351/1000 PSIA PON FWD BD
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20



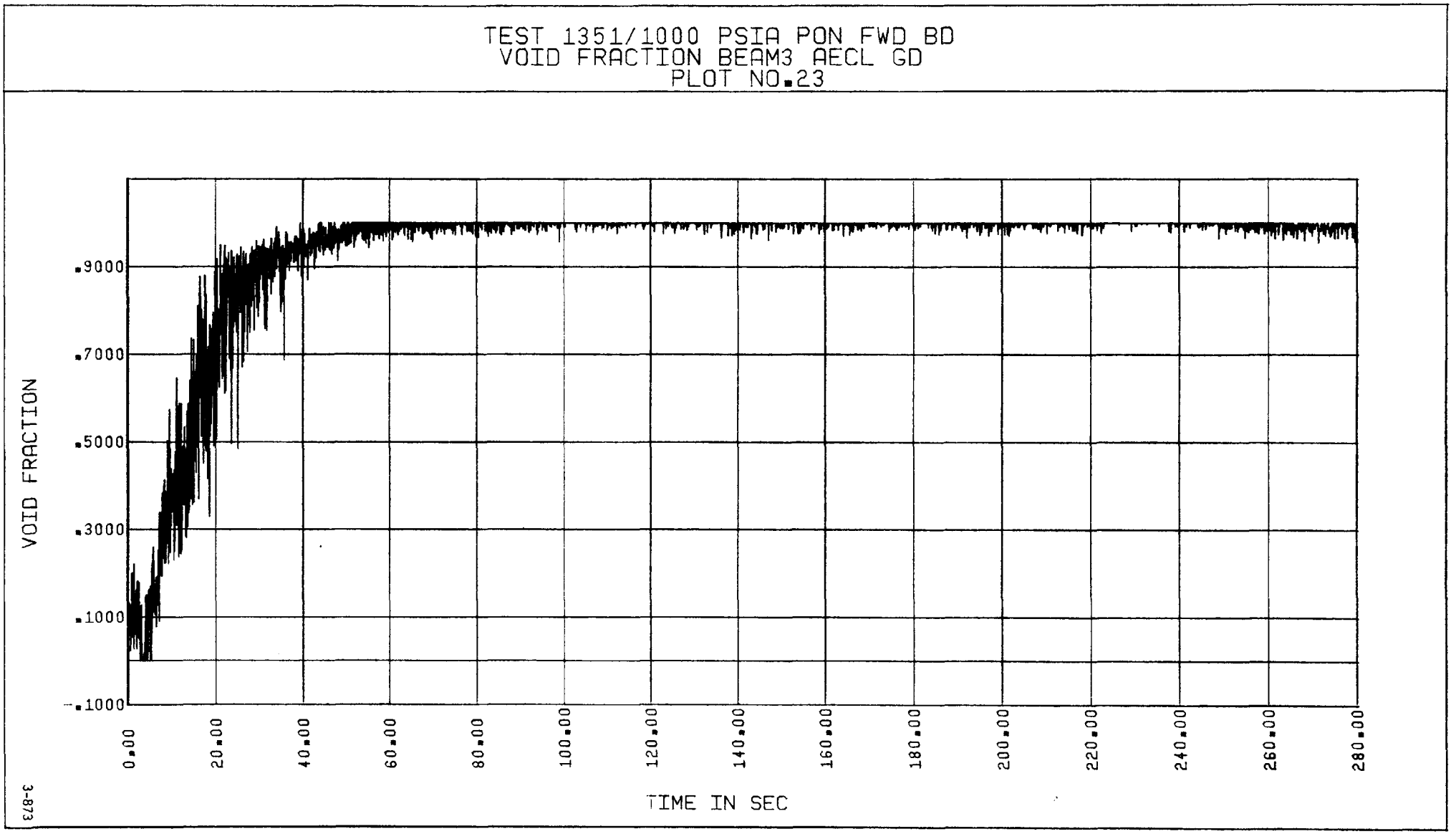
3-870


TEST 1351/1000 PSIA PON FWD BD
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-871

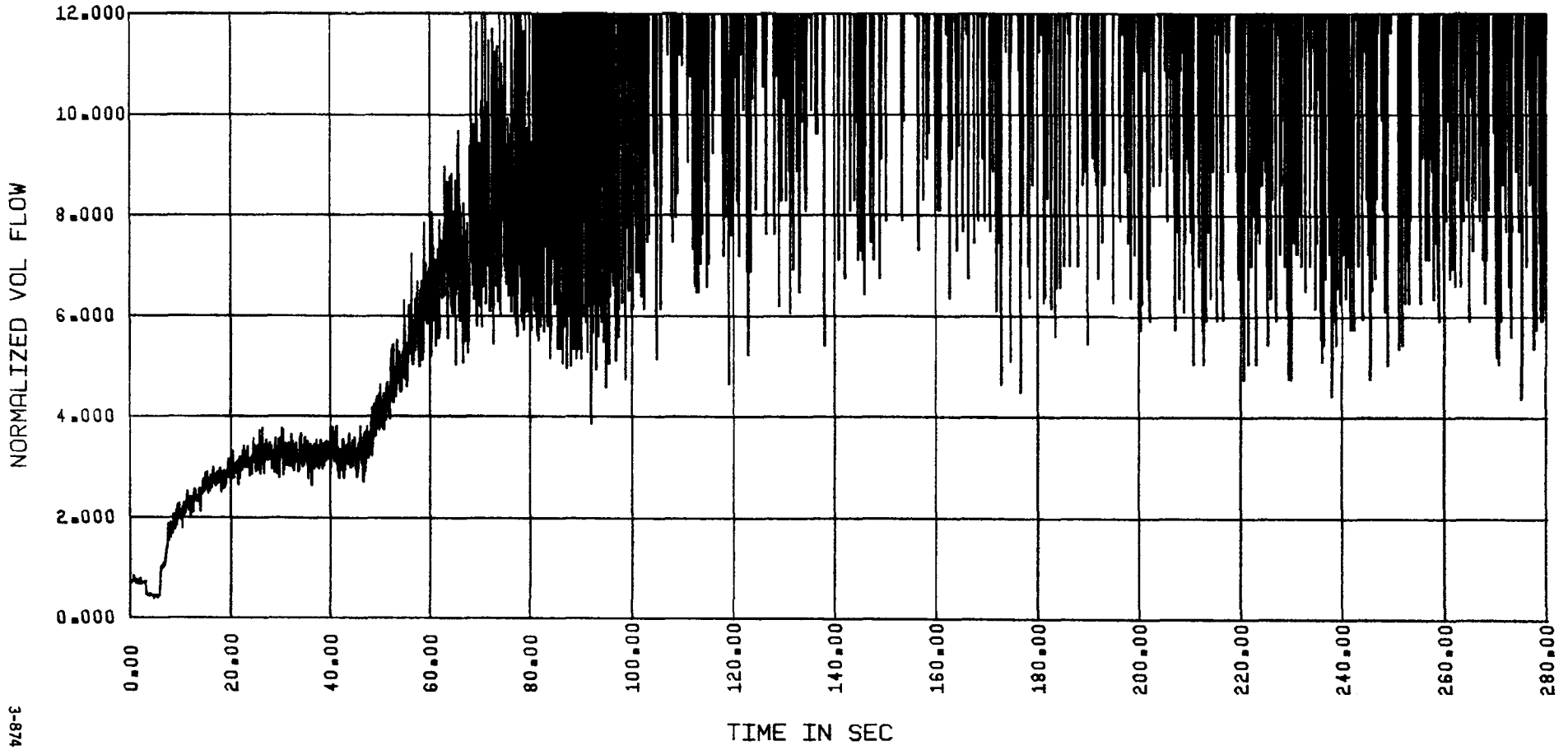
TEST 1351/1000 PSIA PON FWD BD
VOID FRACTION BEAM2 AECL GD
PLOT NO.22



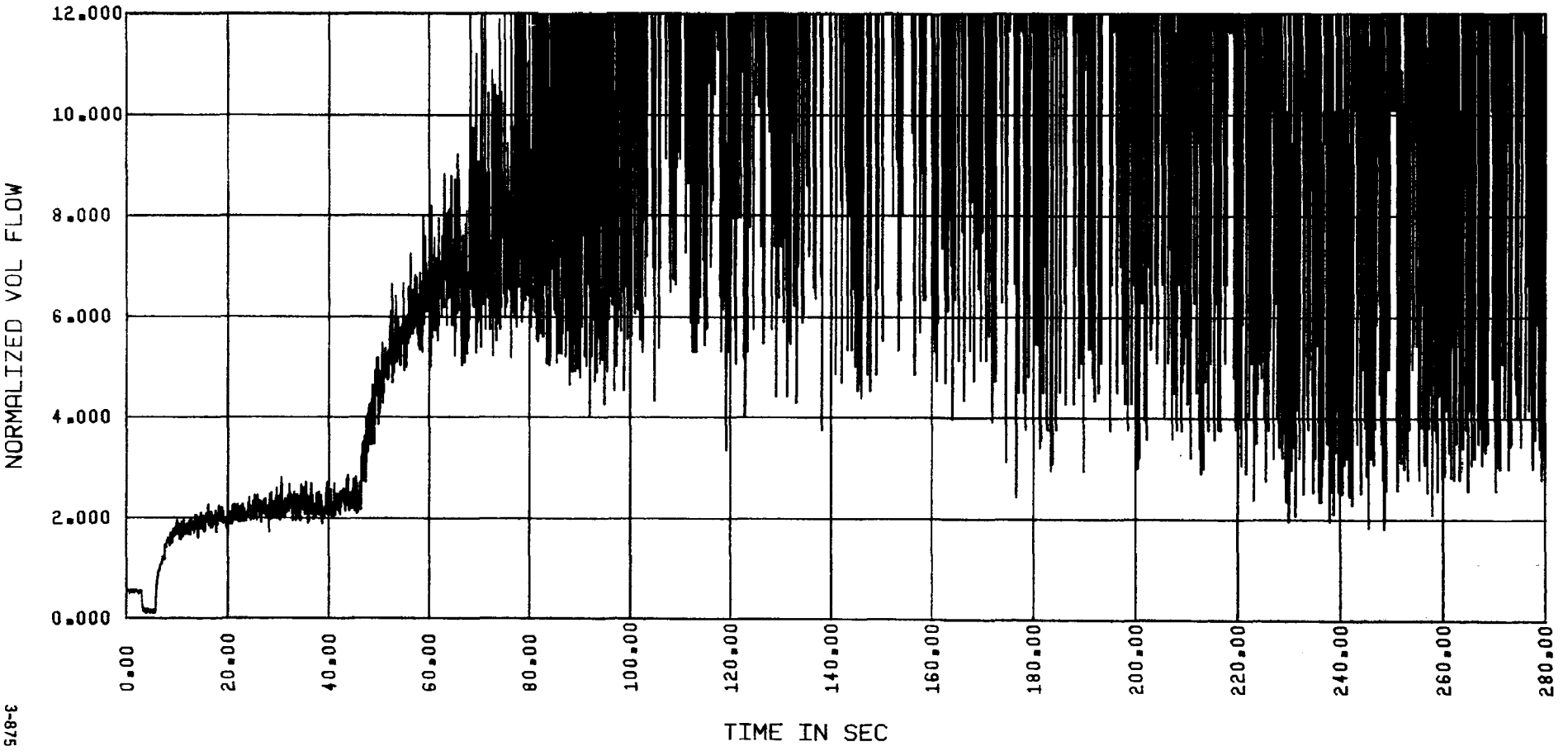
3-872


TEST 1351/1000 PSIA PON FWD BD
VOID FRACTION BEAM3 AECL GD
PLOT NO.23
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-813

TEST 1351/1000 PSIA PON FWD BD
N VOL FLOW LO-DD/GD2 S QR=3500
PLOT NO.24

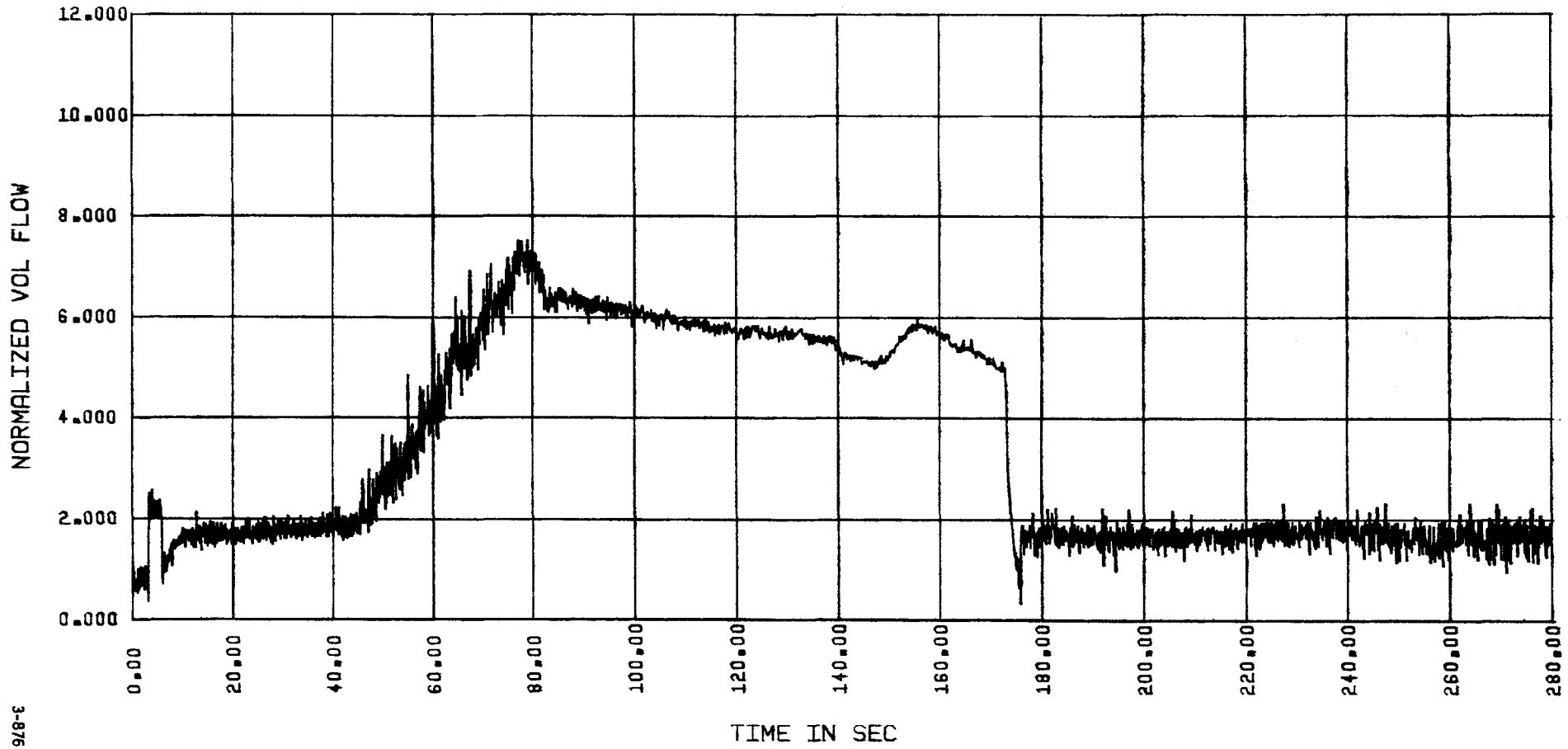


TEST 1351/1000 PSIA PON FWD BD
NORM VOL FLW RTE HI-DD/GD SUCT
PLOT NO.25

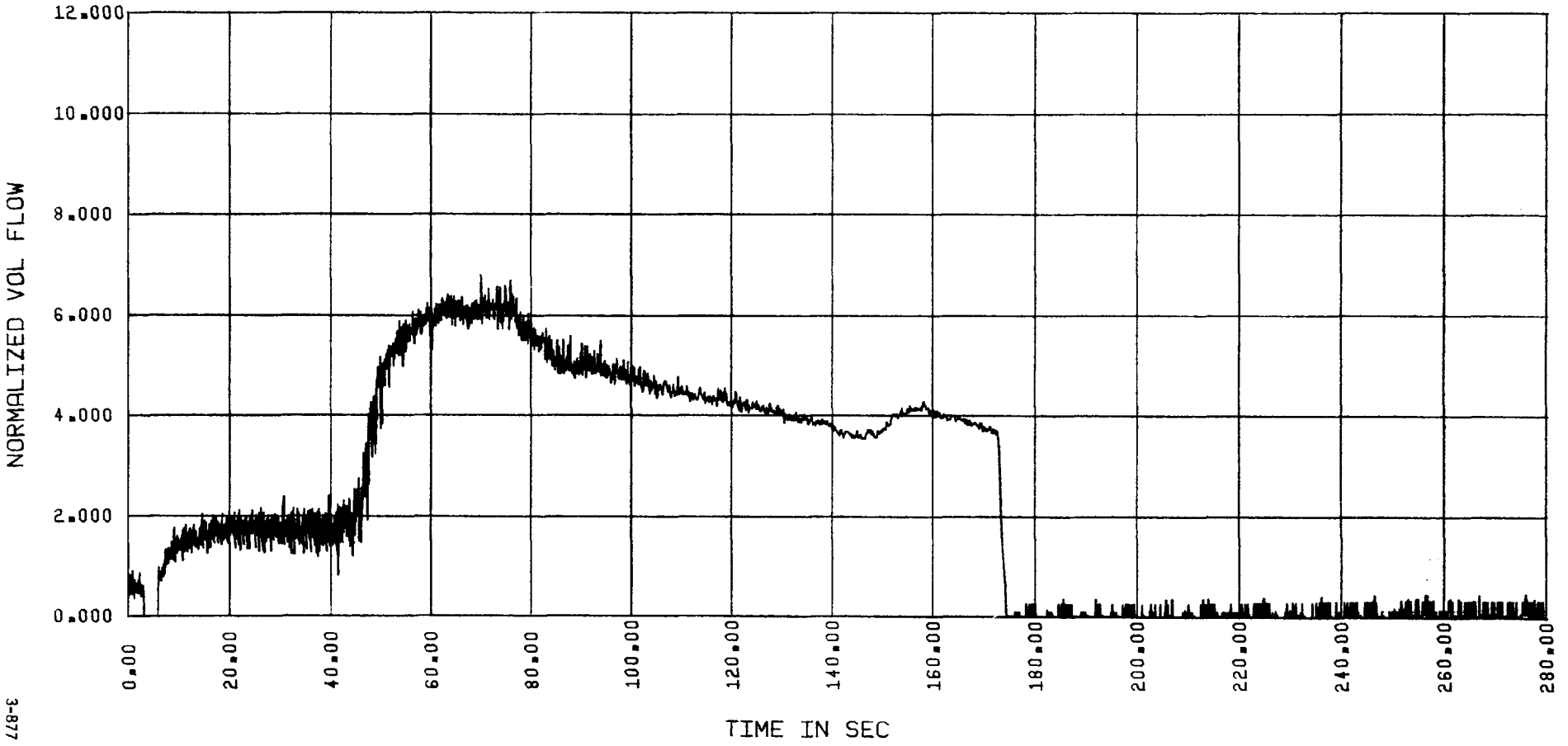


3-875

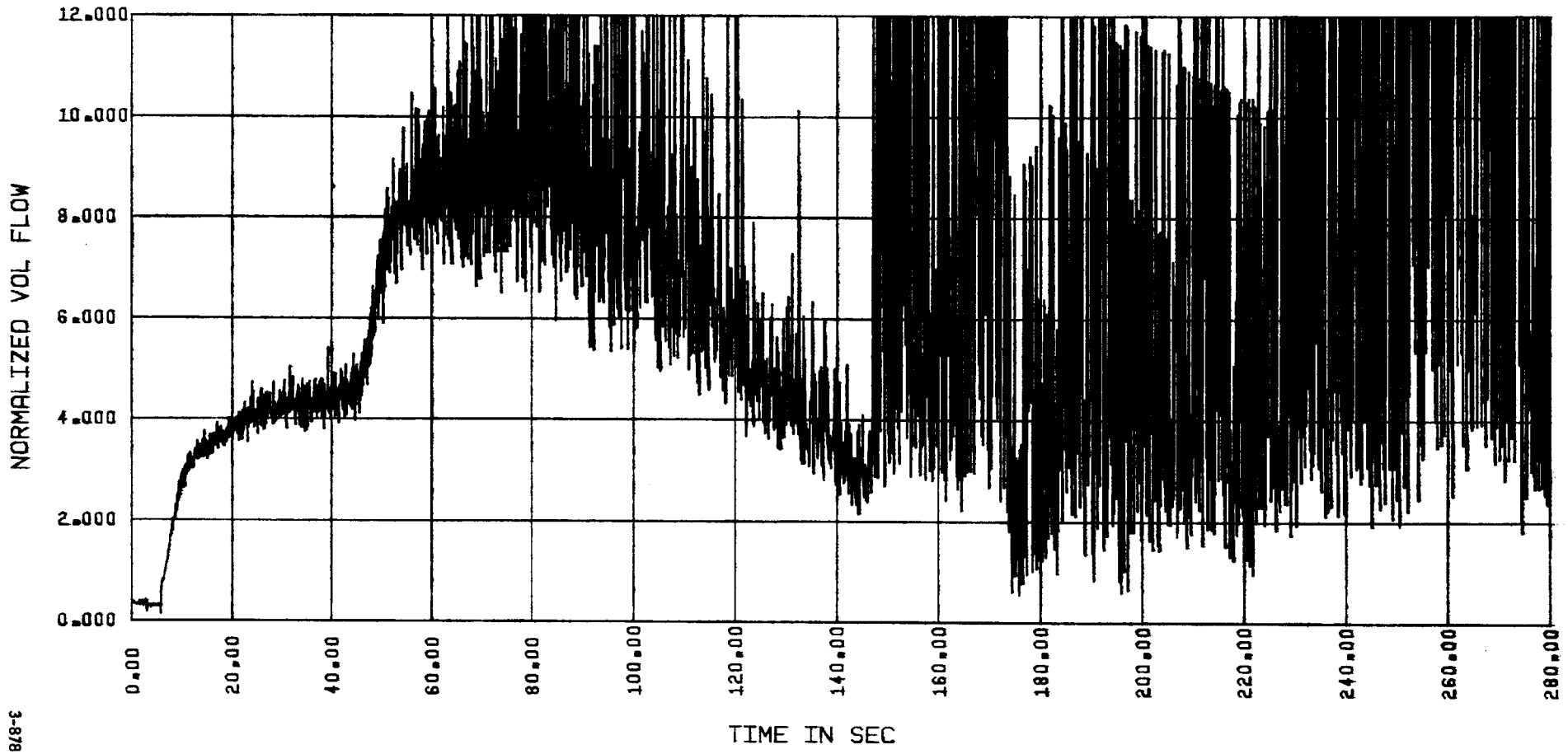
TEST 1351/1000 PSIA PON FWD BD
N VOL FLOW LO-TM SUCT QR=3500
PLOT NO.26



TEST 1351/1000 PSIA PON FWD BD
N VOL FLOW HI-TM SUCT QR=3500
PLOT NO.27

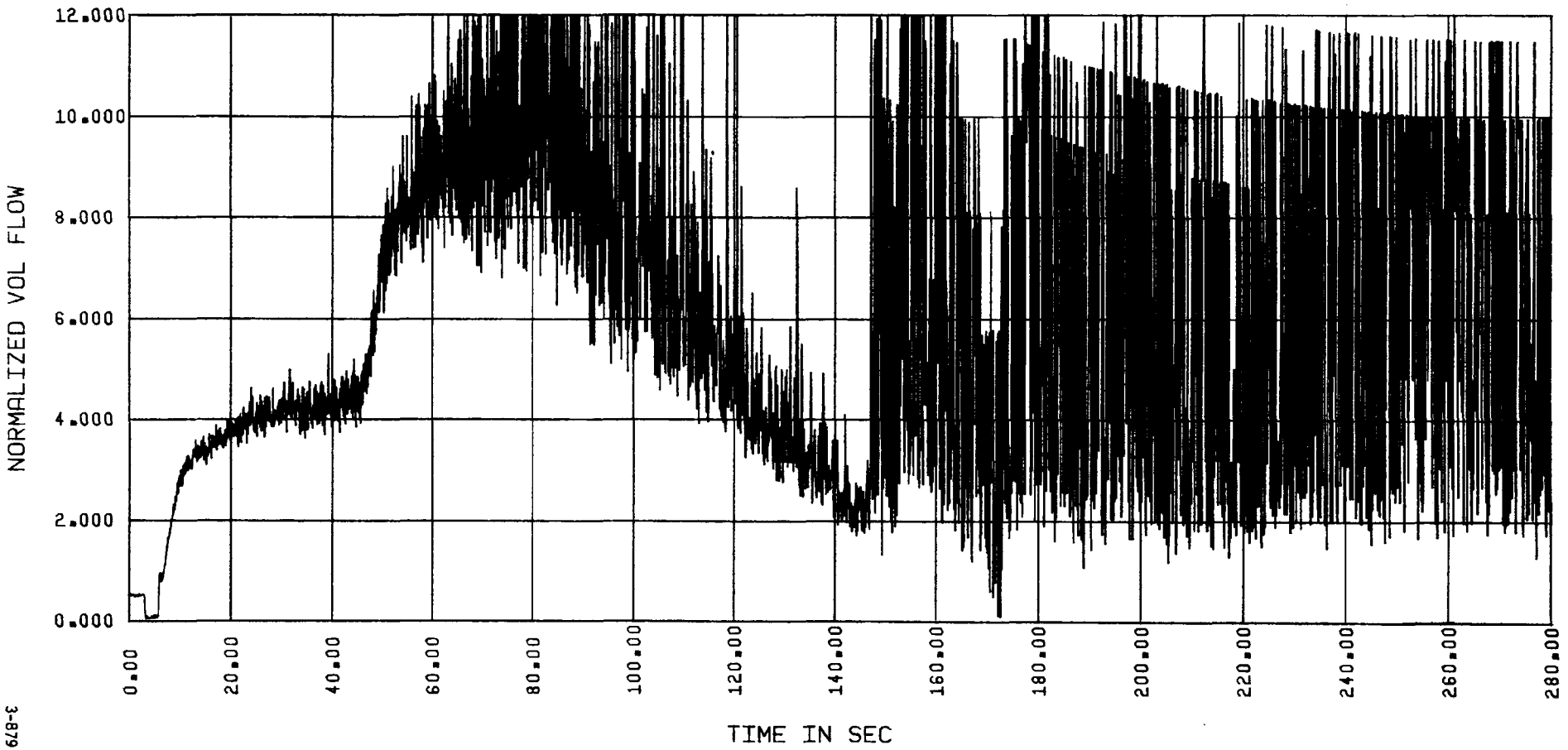


TEST 1351/1000 PSIA PON FWD BD
N VOL FLOW LO-DD/GD2 D QR=3500
PLOT NO.28

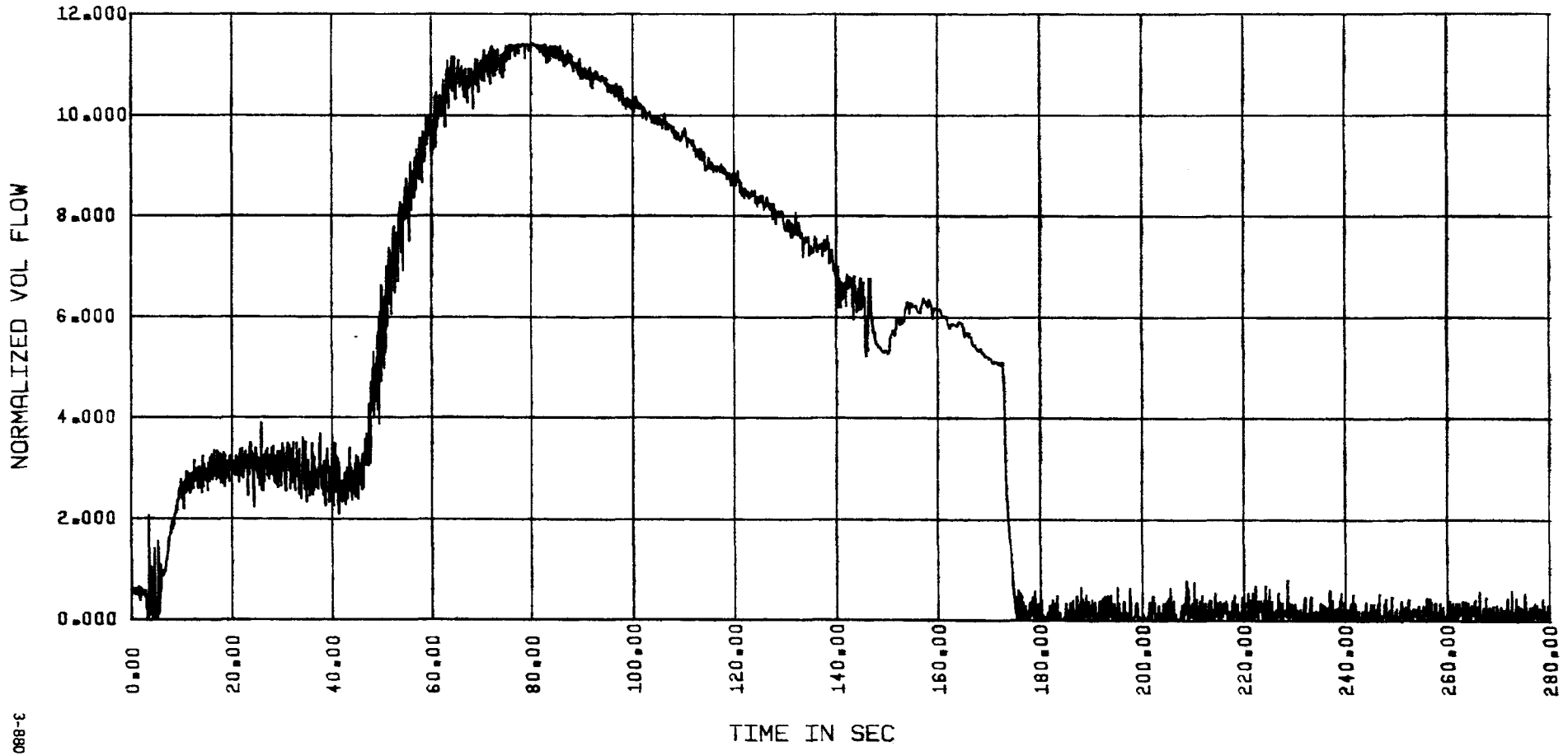


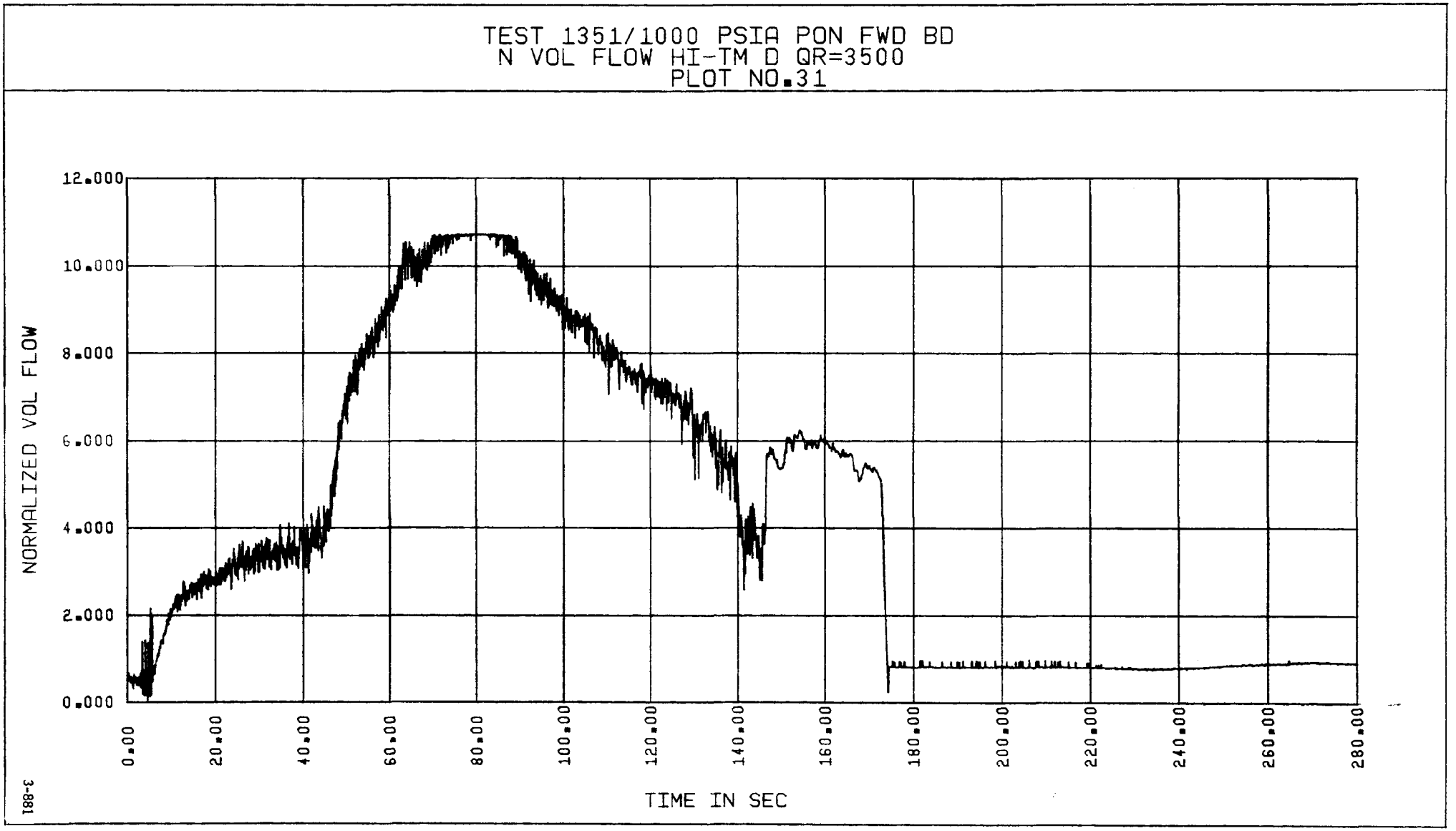
3-878

TEST 1351/1000 PSIA PON FWD BD
N VOL FLOW HI-DD/GD2 D QR=3500
PLOT NO.29

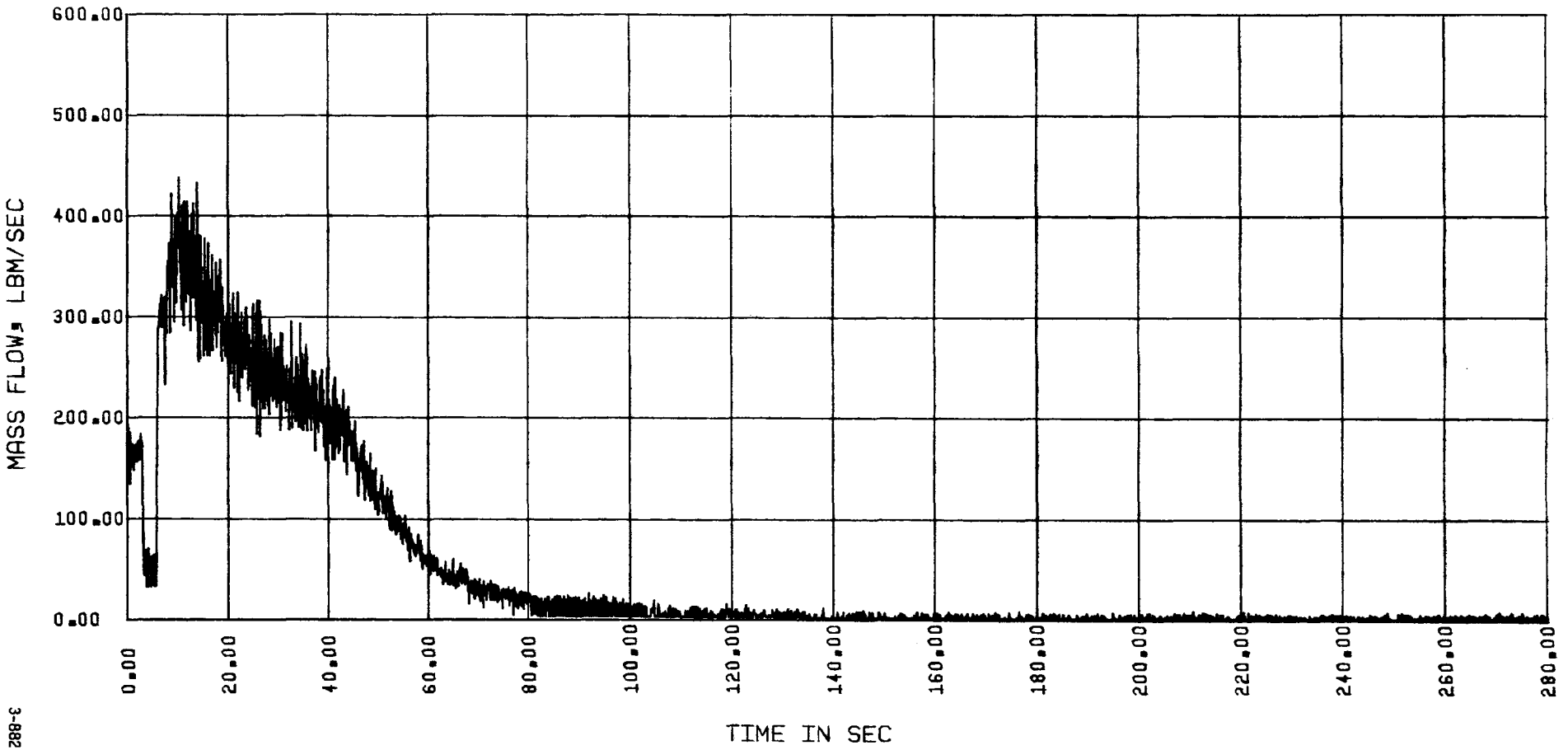


TEST 1351/1000 PSIA PON FWD BD
N VOL FLOW LO-TM DISCH QR=3500
PLOT NO.30

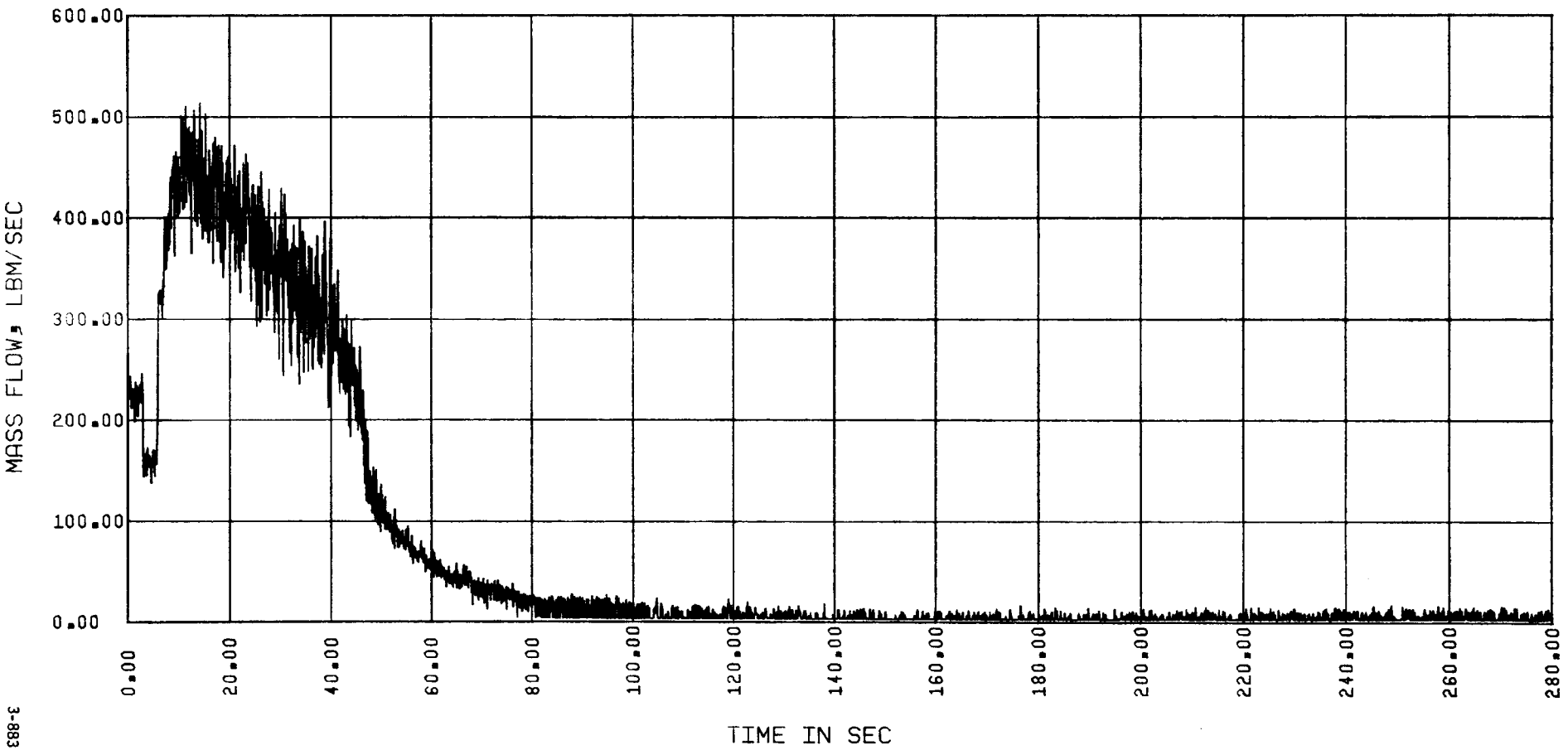



TEST 1351/1000 PSIA PON FWD BD
N VOL FLOW HI-TM D QR=3500
PLOT NO.31
NORMALIZED VOL FLOW
12.000
10.000
8.000
6.000
4.000
2.000
0.000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-881

TEST 1351/1000 PSIA PON FWD BD
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.32

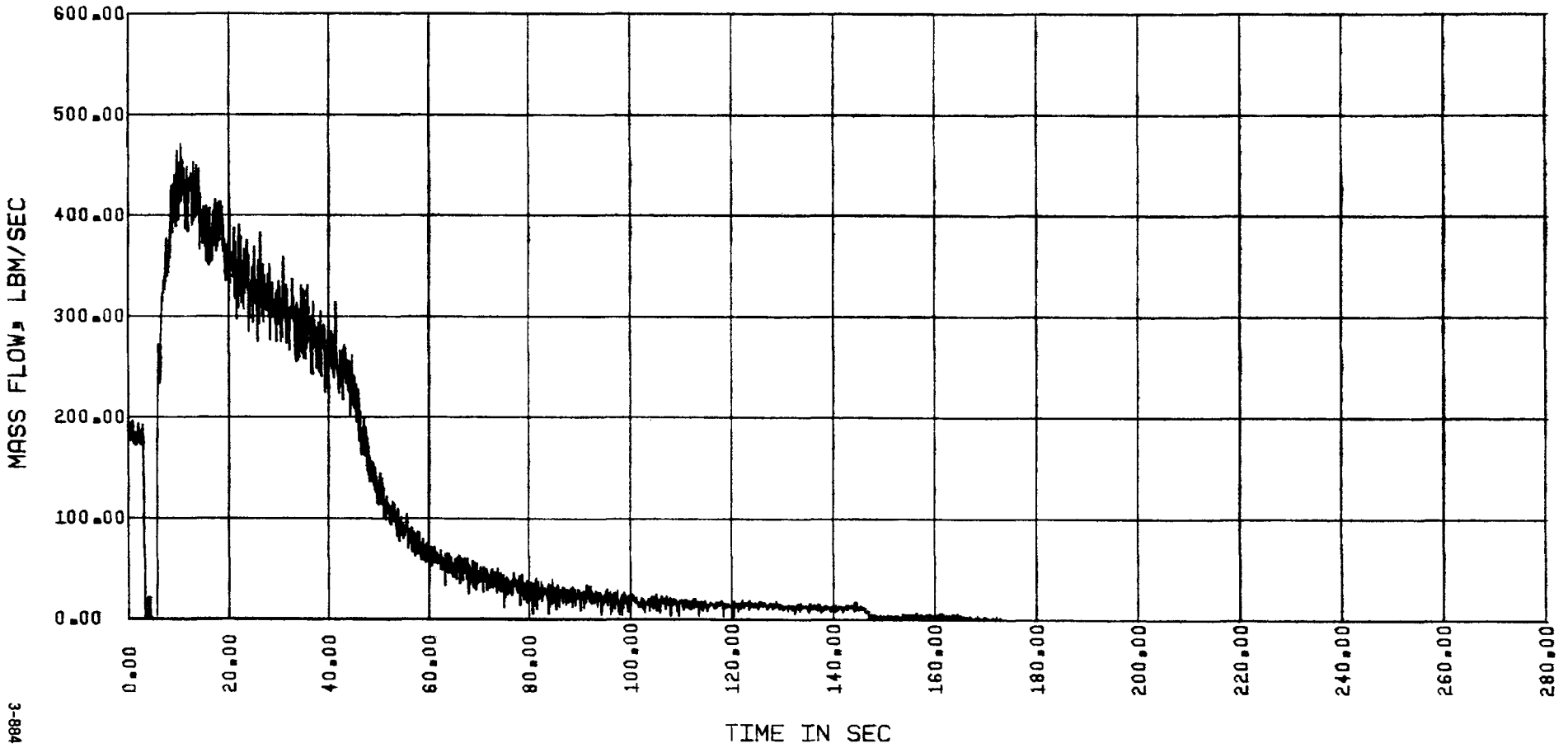


TEST 1351/1000 PSIA PON FWD BD
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.33

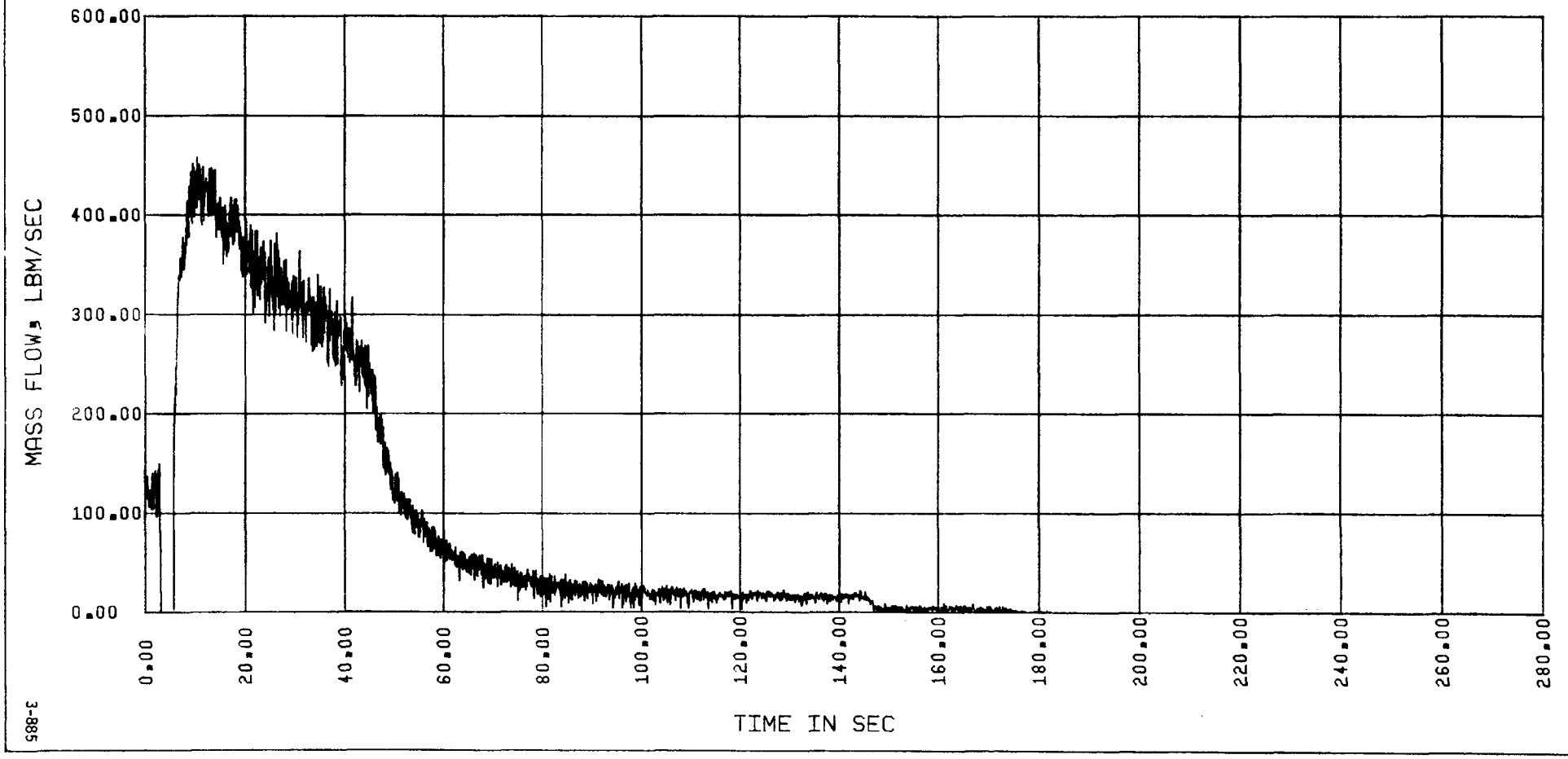


3-883

TEST 1351/1000 PSIA PON FWD BD
MASS FLOW RATE HI-OD/GO2 DISCH
PLOT NO.34

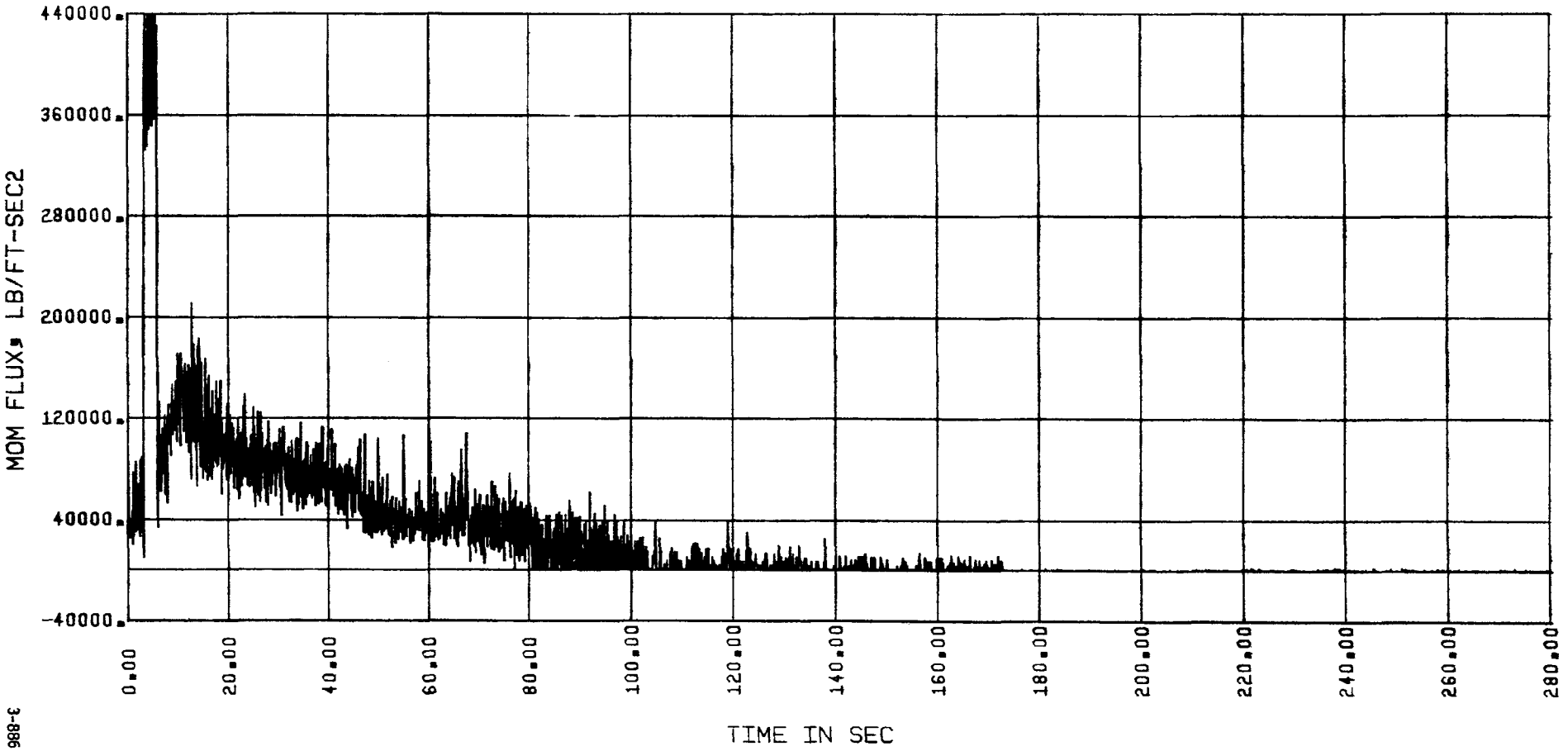


TEST 1351/1000 PSIA PON FWD BD
MASS FLOW RATE LO-DD/GD2 DISCH
PLOT NO.35

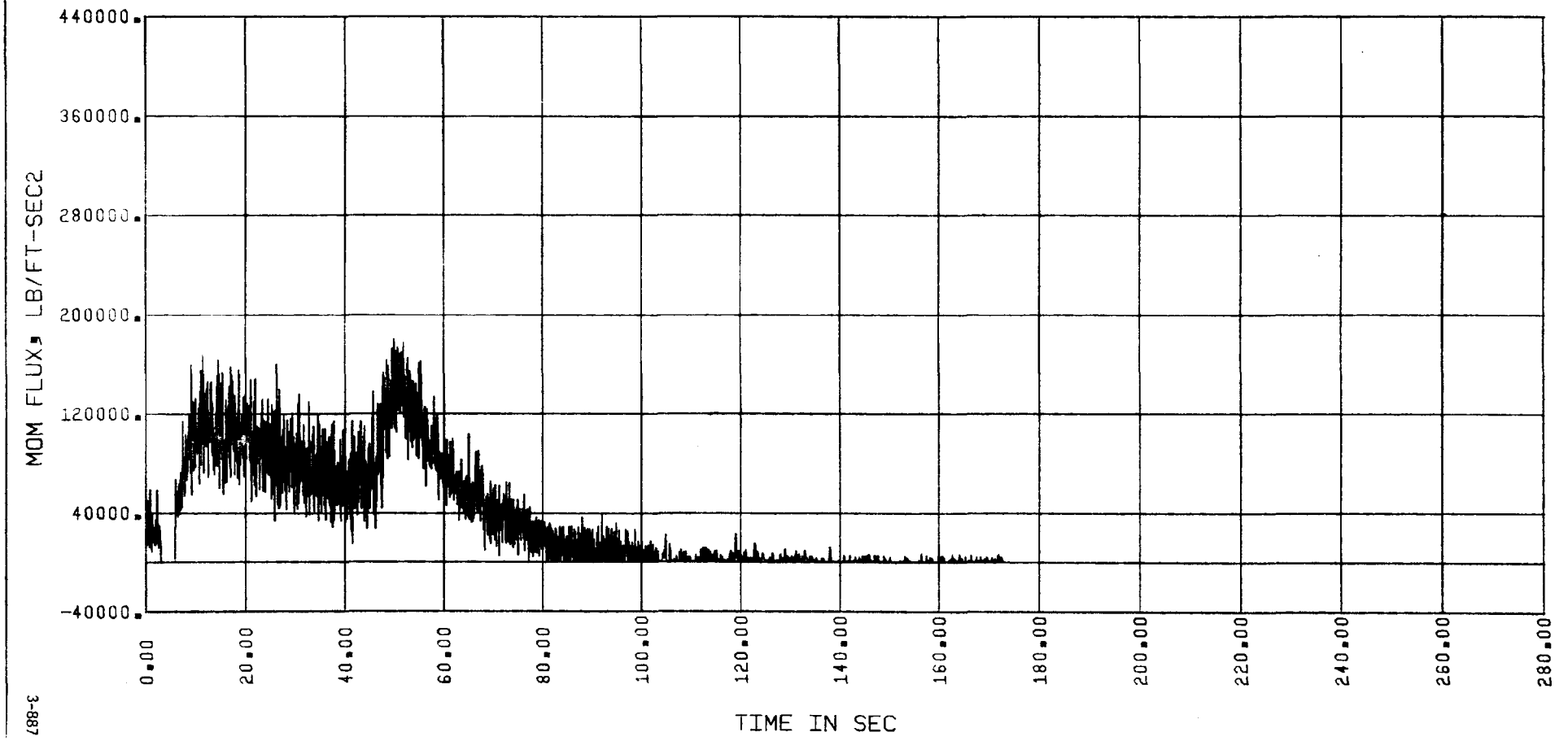


3-885

TEST 1351/1000 PSIA PON FWD BD
MOMENTUM FLUX GD2/LO-TM SUCT
PLOT NO.36

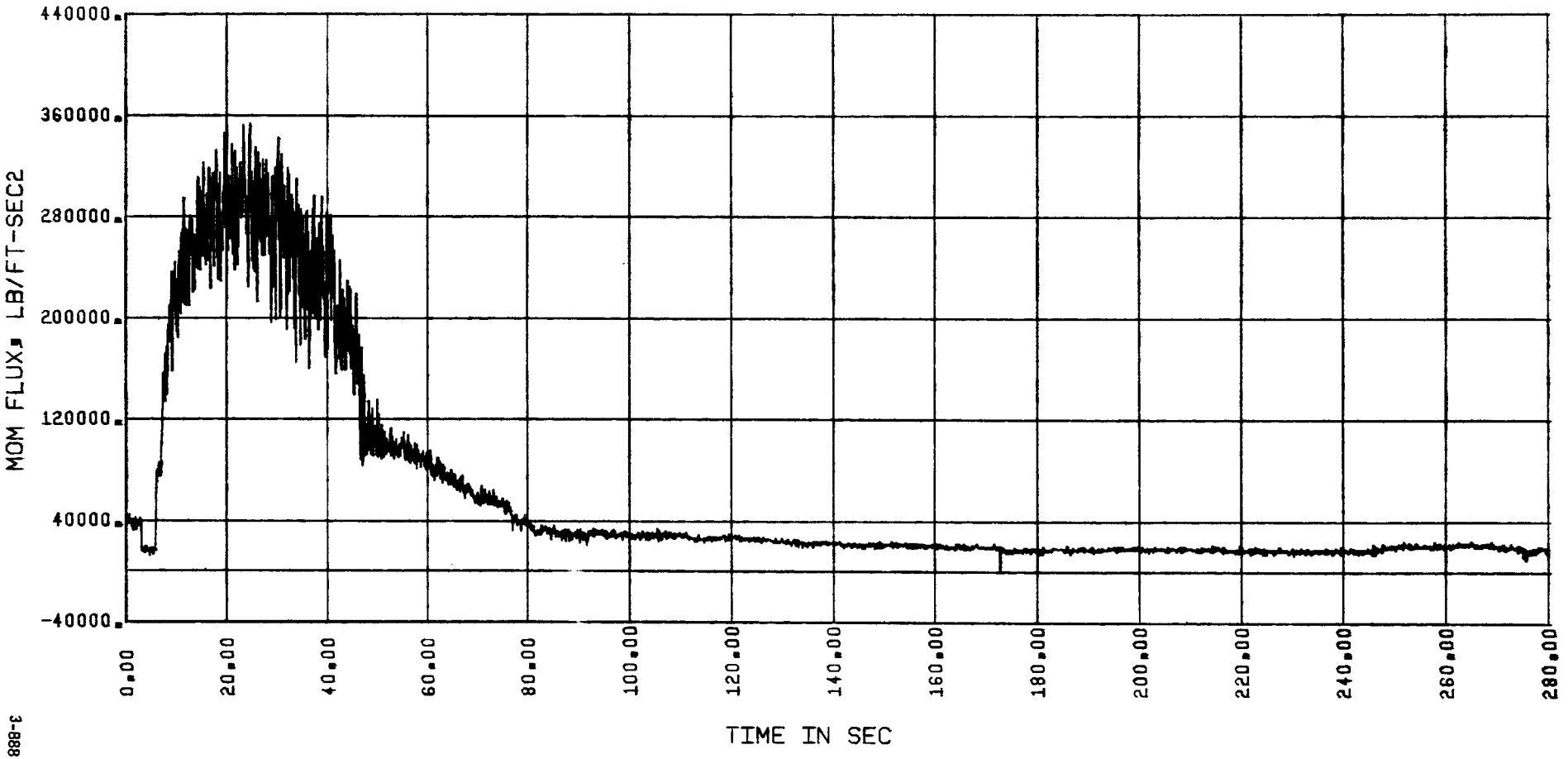


TEST 1351/1000 PSIA PON FWD BD
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO. 37

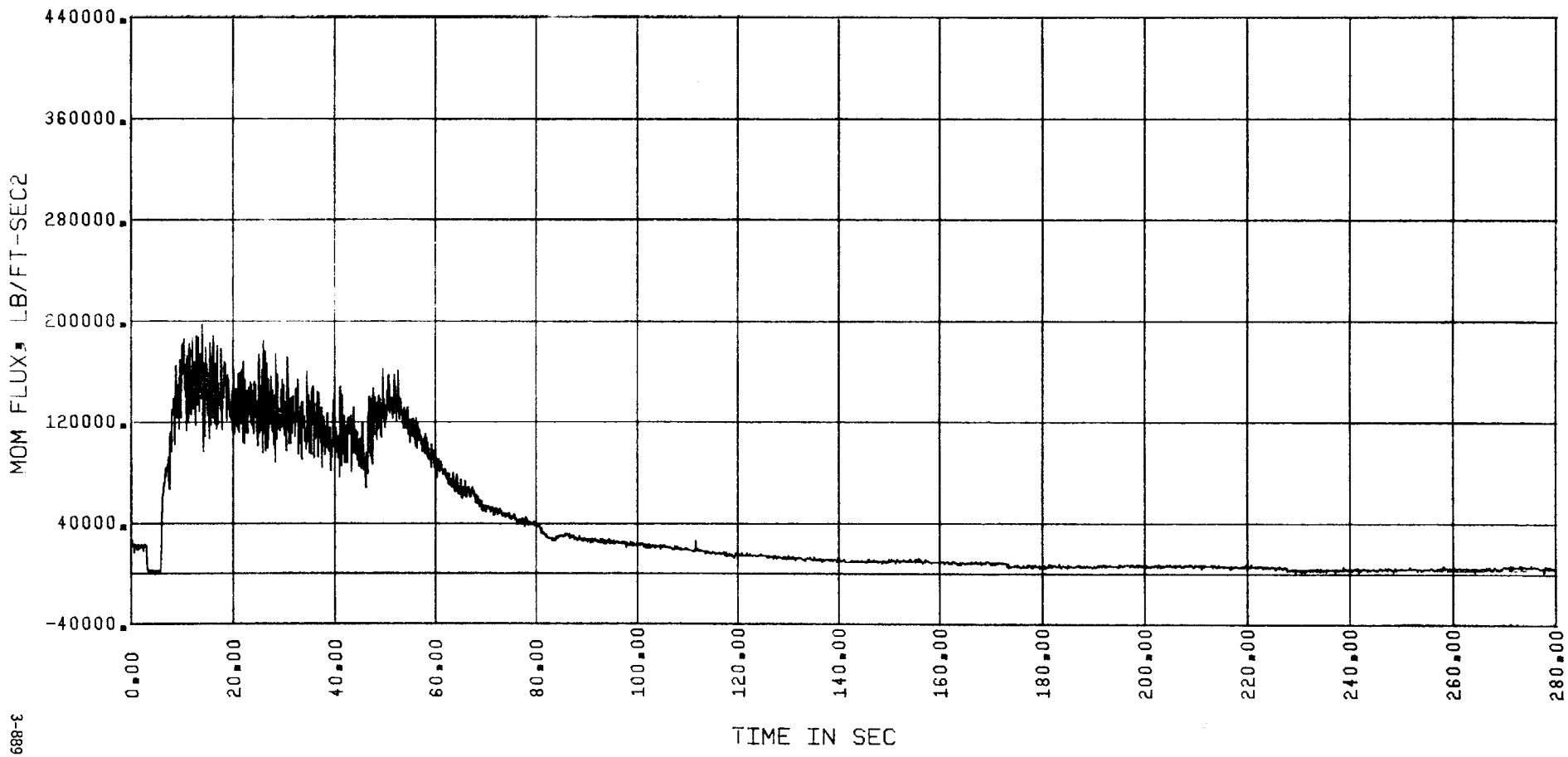


3-887

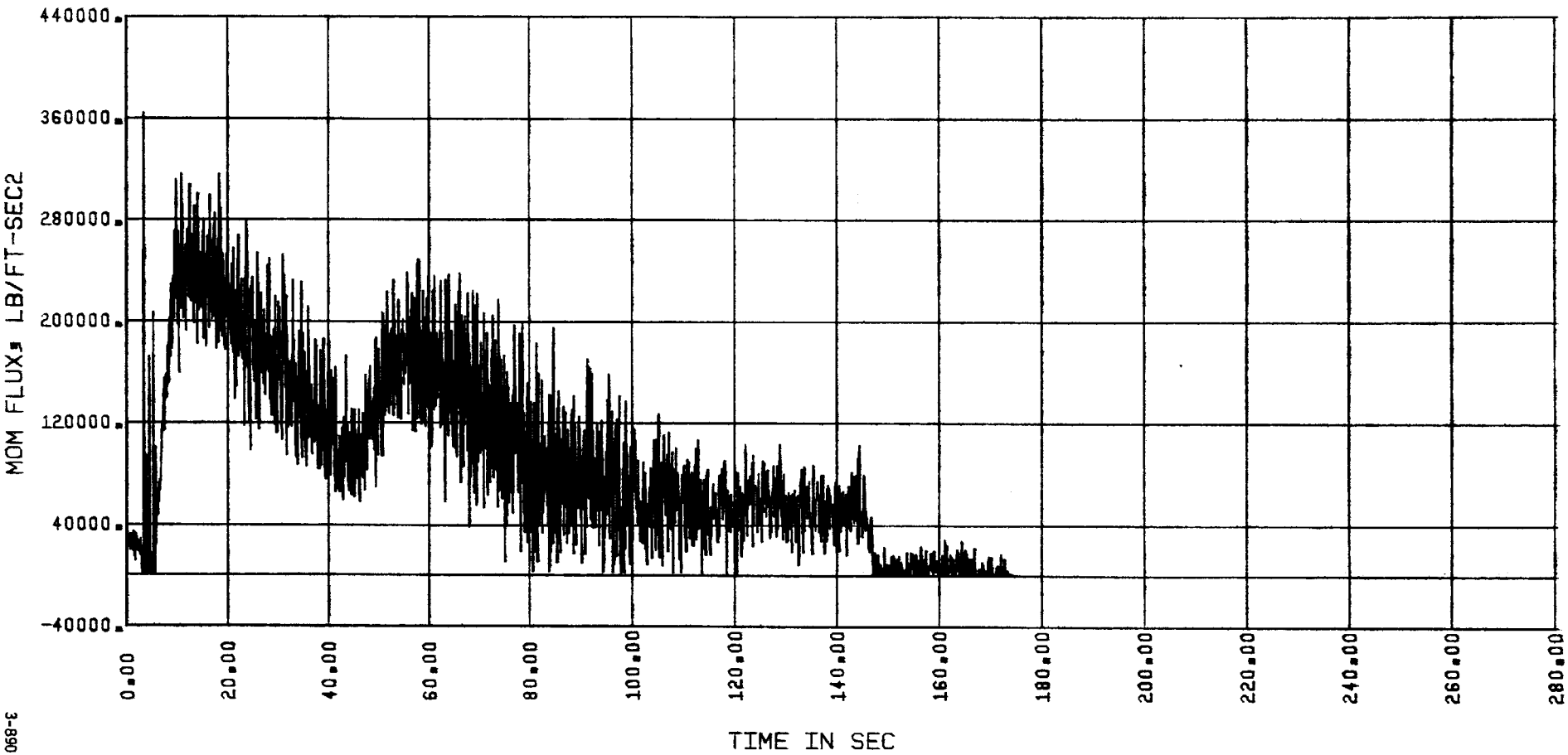
TEST 1351/1000 PSIA PON FWD BD
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



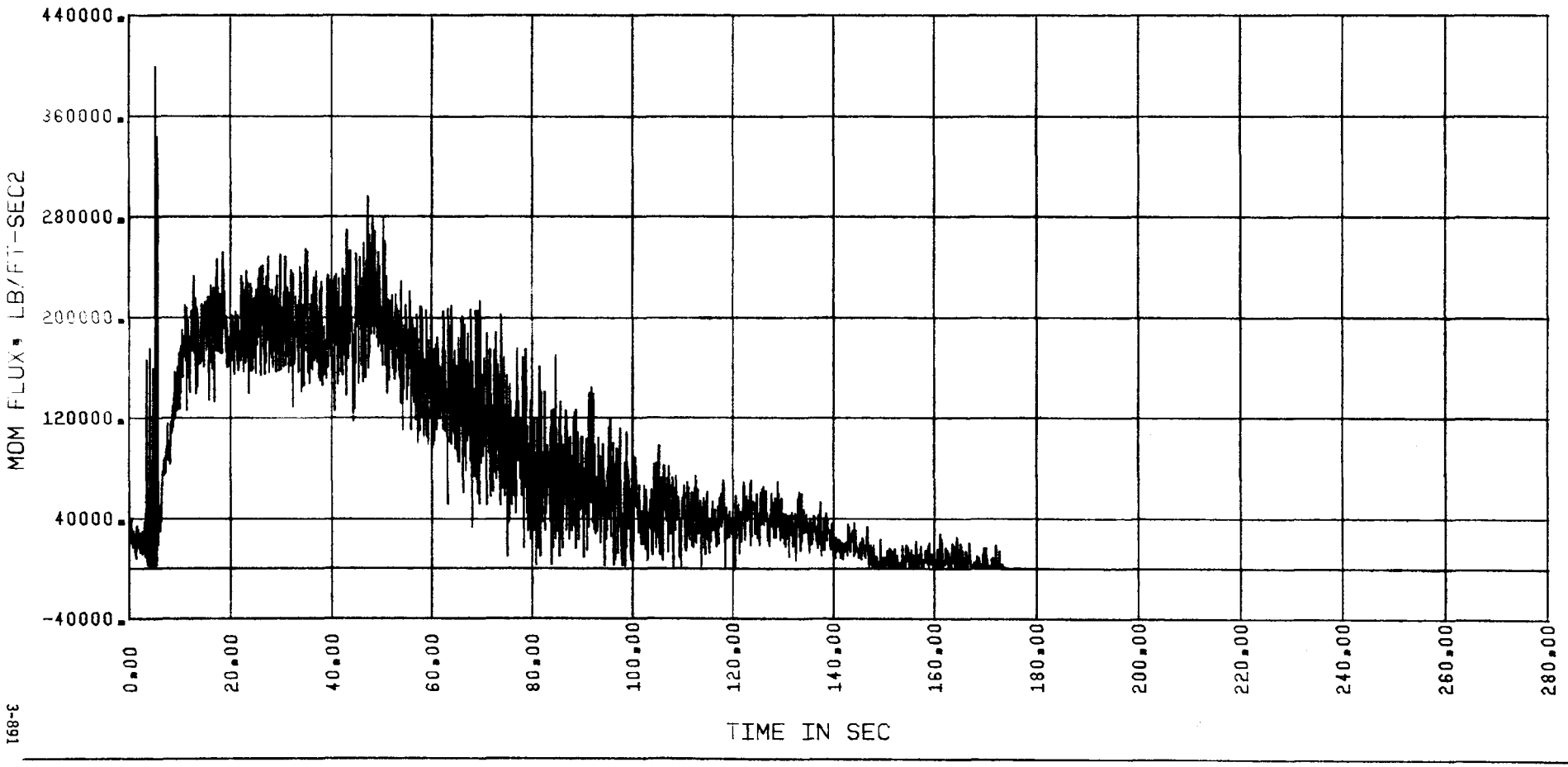
TEST 1351/1000 PSIA PON FWD BD
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39



TEST 1351/1000 PSIA PON FWD BD
MOMENTUM FLUX GD2/LO-TM DISCH
PLOT NO.40

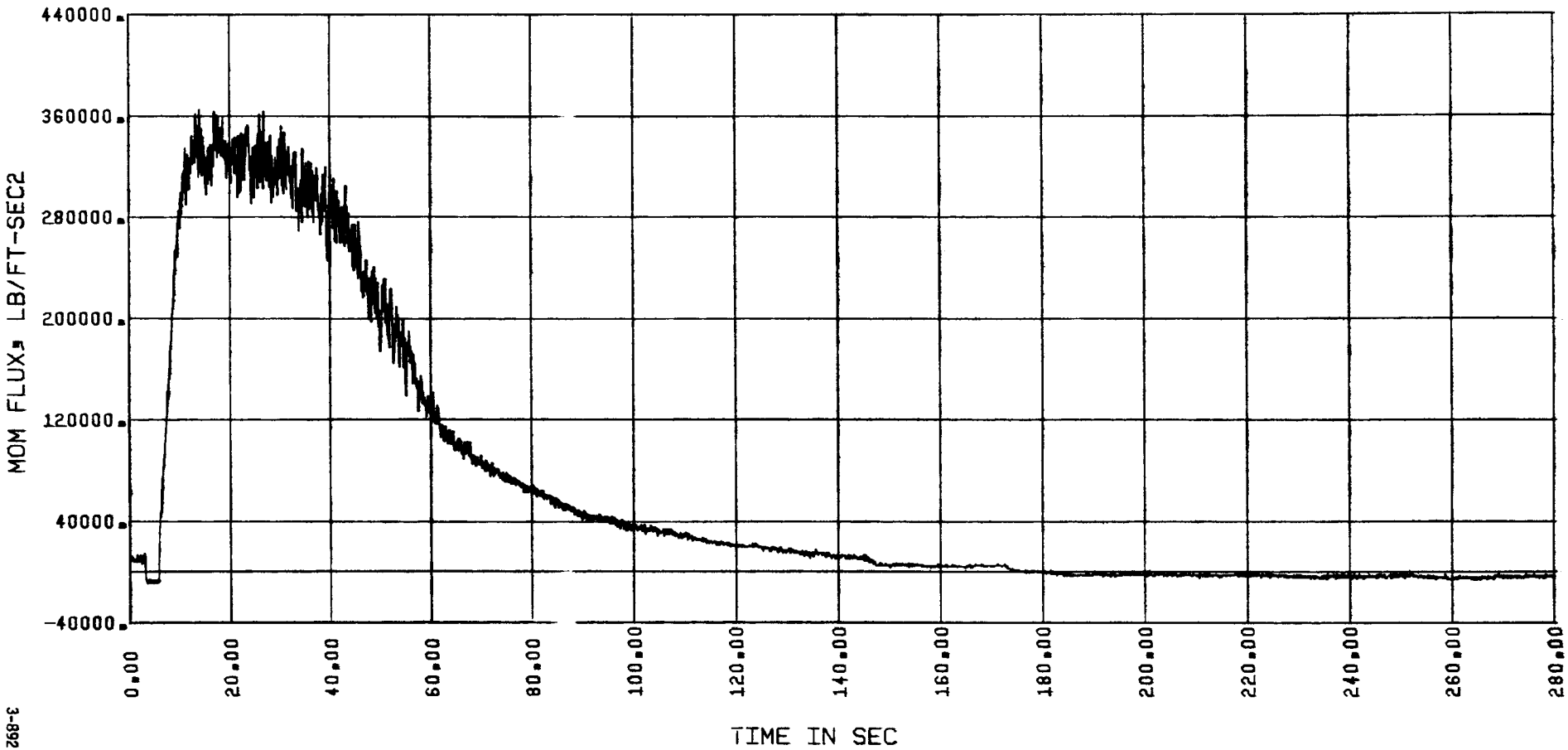


TEST 1351/1000 PSIA PON FWD BD
MOMENTUM FLUX GD2/HI-TM DISCH
PLOT NO.41

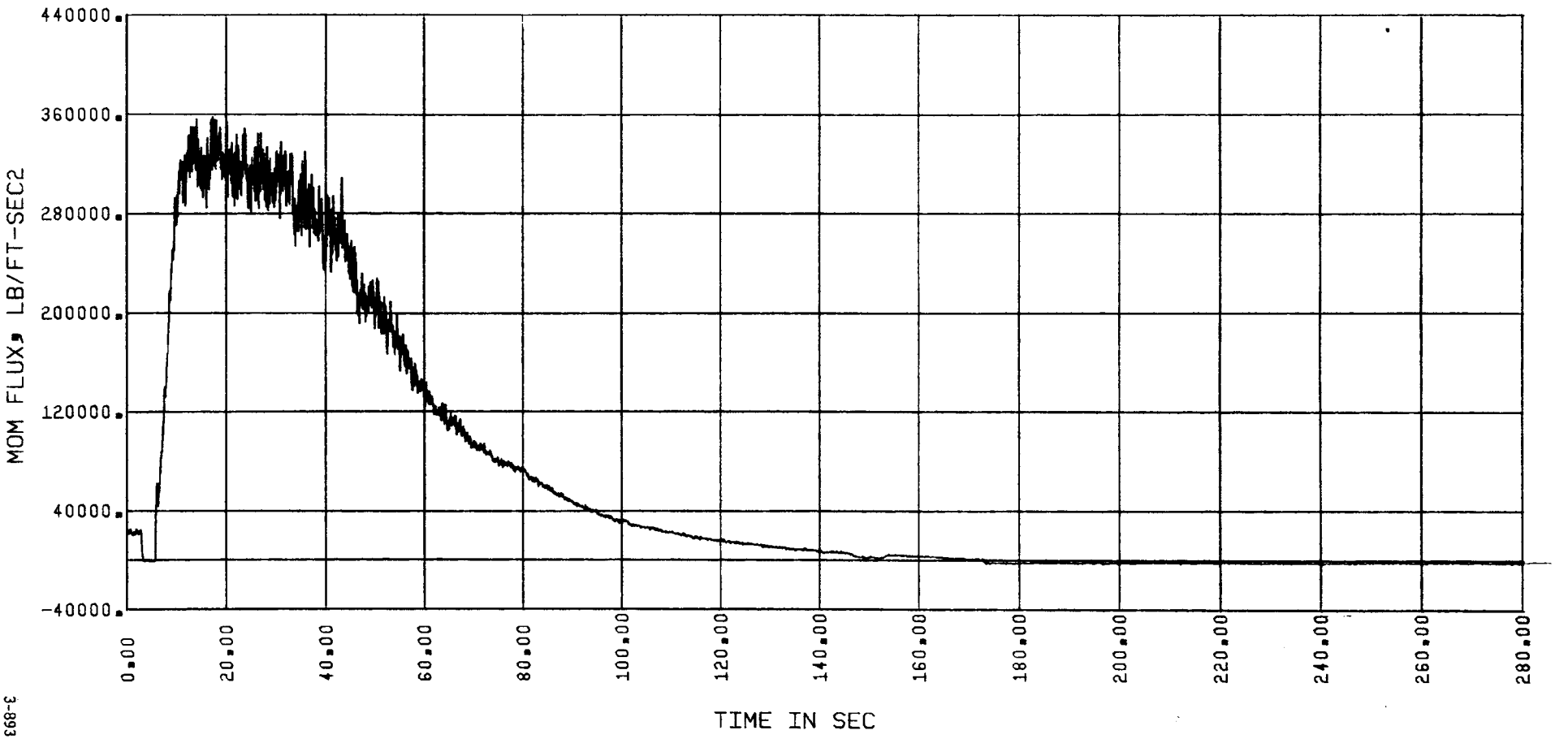


3-891

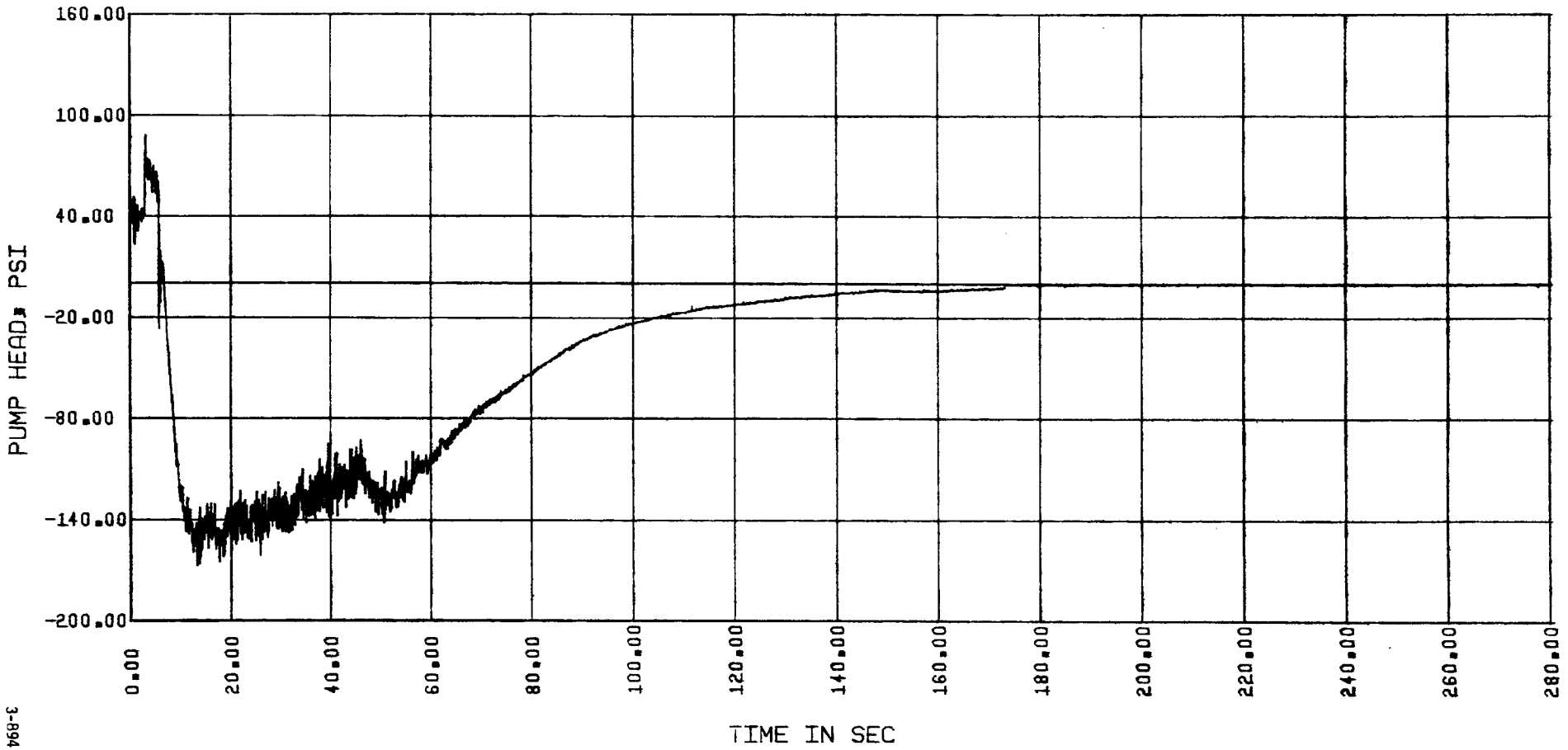
TEST 1351/1000 PSIA PON FWD BD
MOMENTUM FLUX LO-DD DISCHARGE
PLOT NO.42



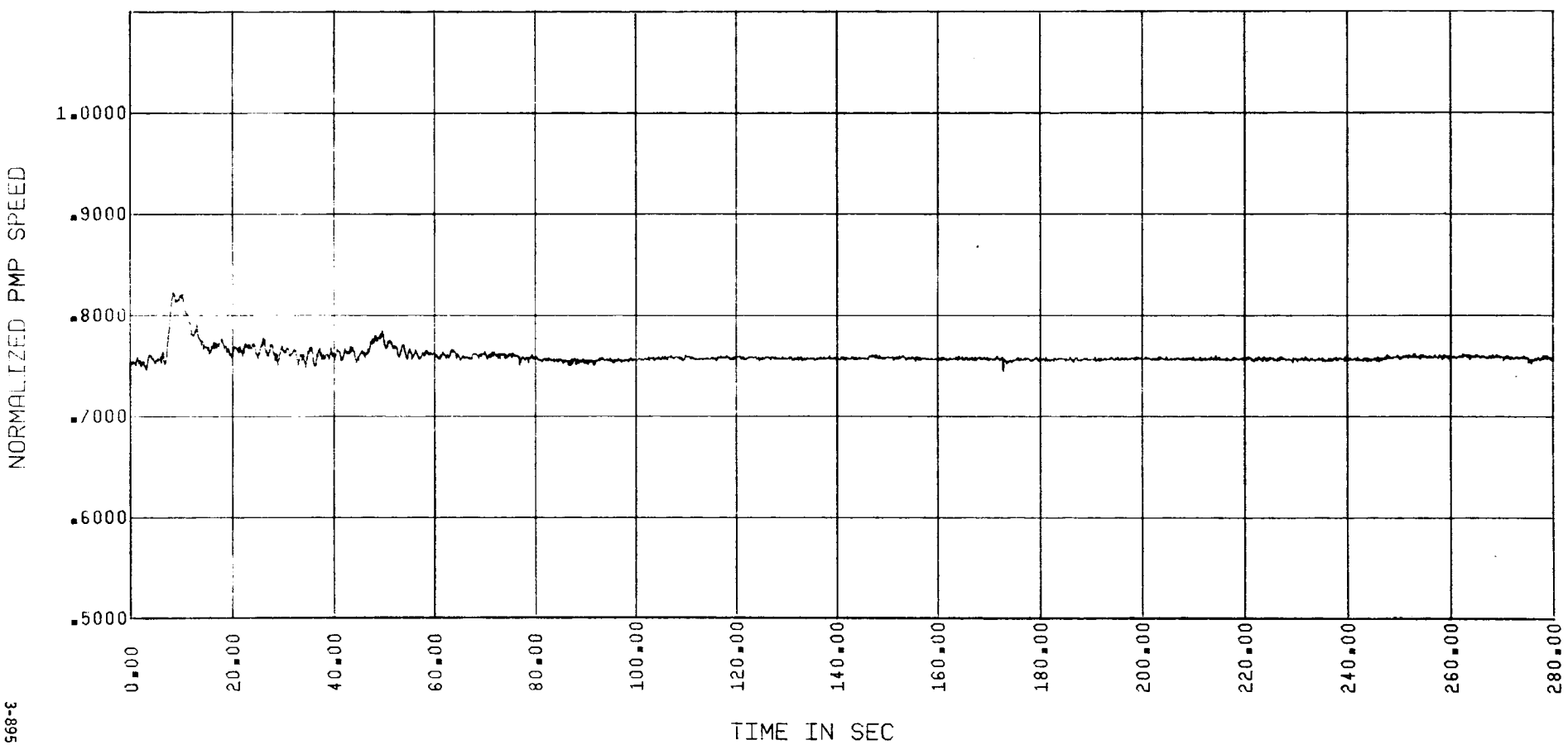
TEST 1351/1000 PSIA PON FWD BD
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.43



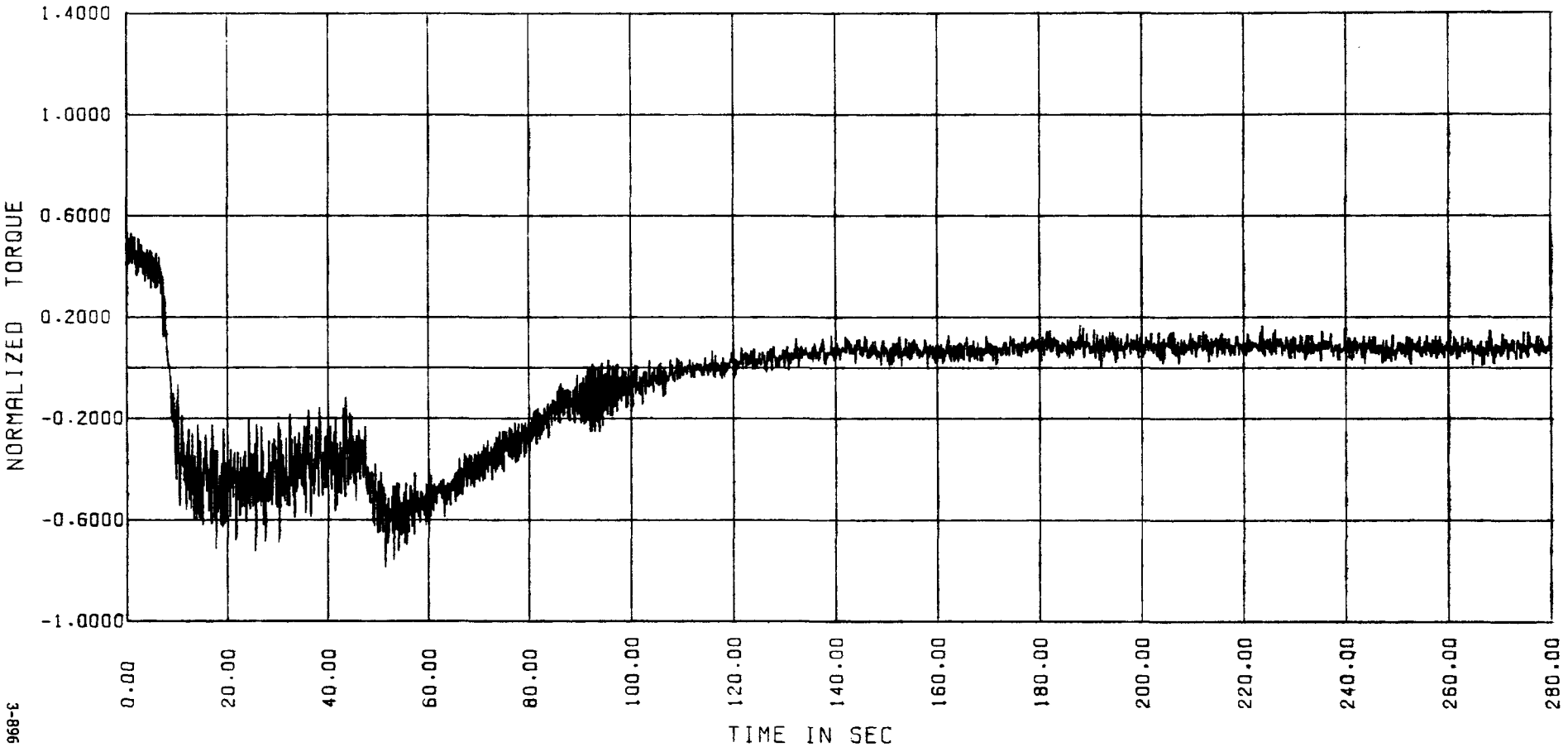
TEST 1351/1000 PSIA PON FWD BD
PUMP HEAD IN PSI
PLOT NO.44



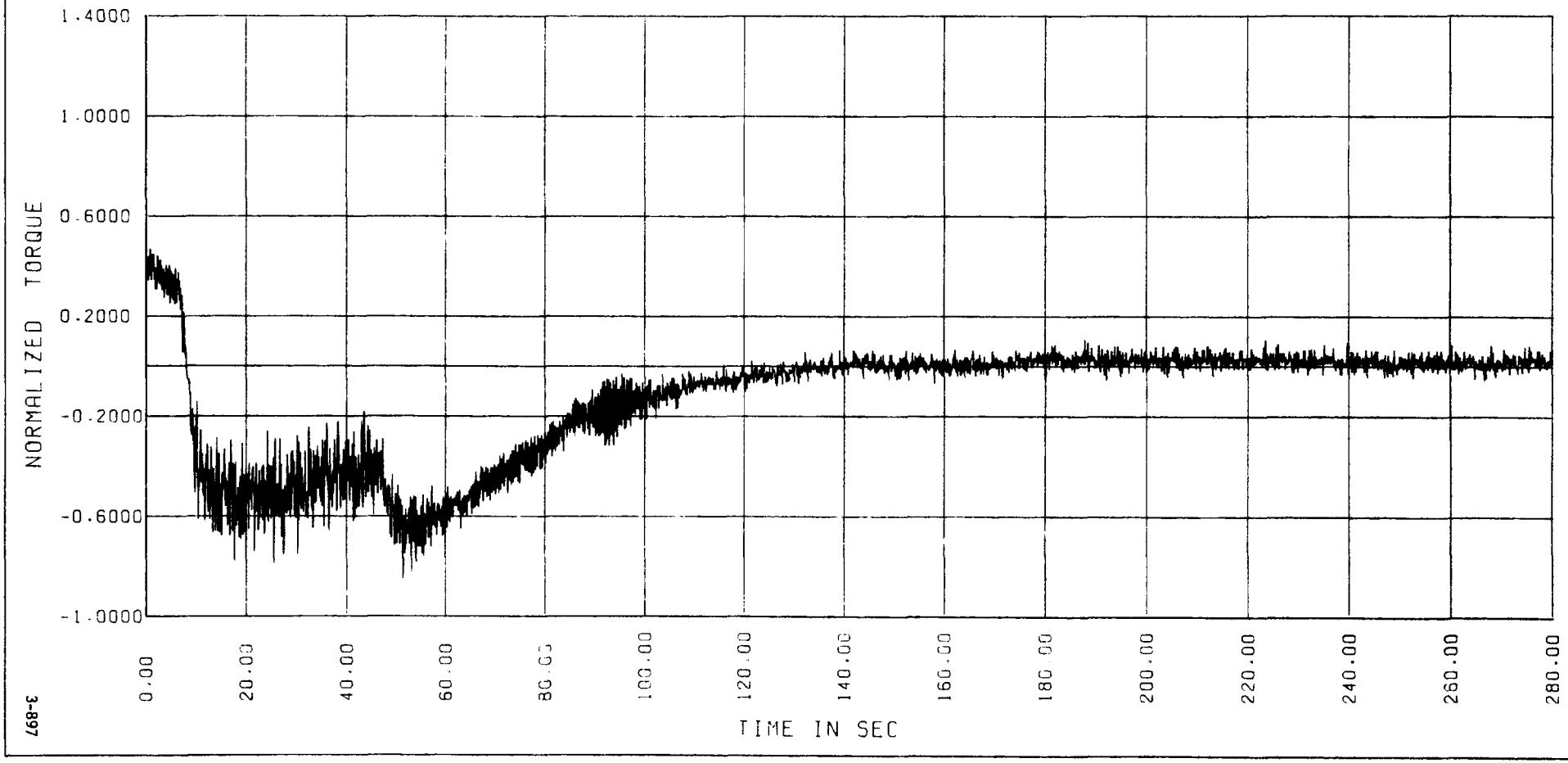
TEST 1351/1000 PSIA PON FWD BD
NORM PUMP SPEED
PLOT NO.47



TEST 1351/1000 PSIA PON FWD BD
N PUMP SHAFT TORQUE THR=308
PLOT NO.48



TEST 1351/1000 PSIA PON FWD BD
N PUMP HYDR TORQUE THR=308
PLOT NO.49



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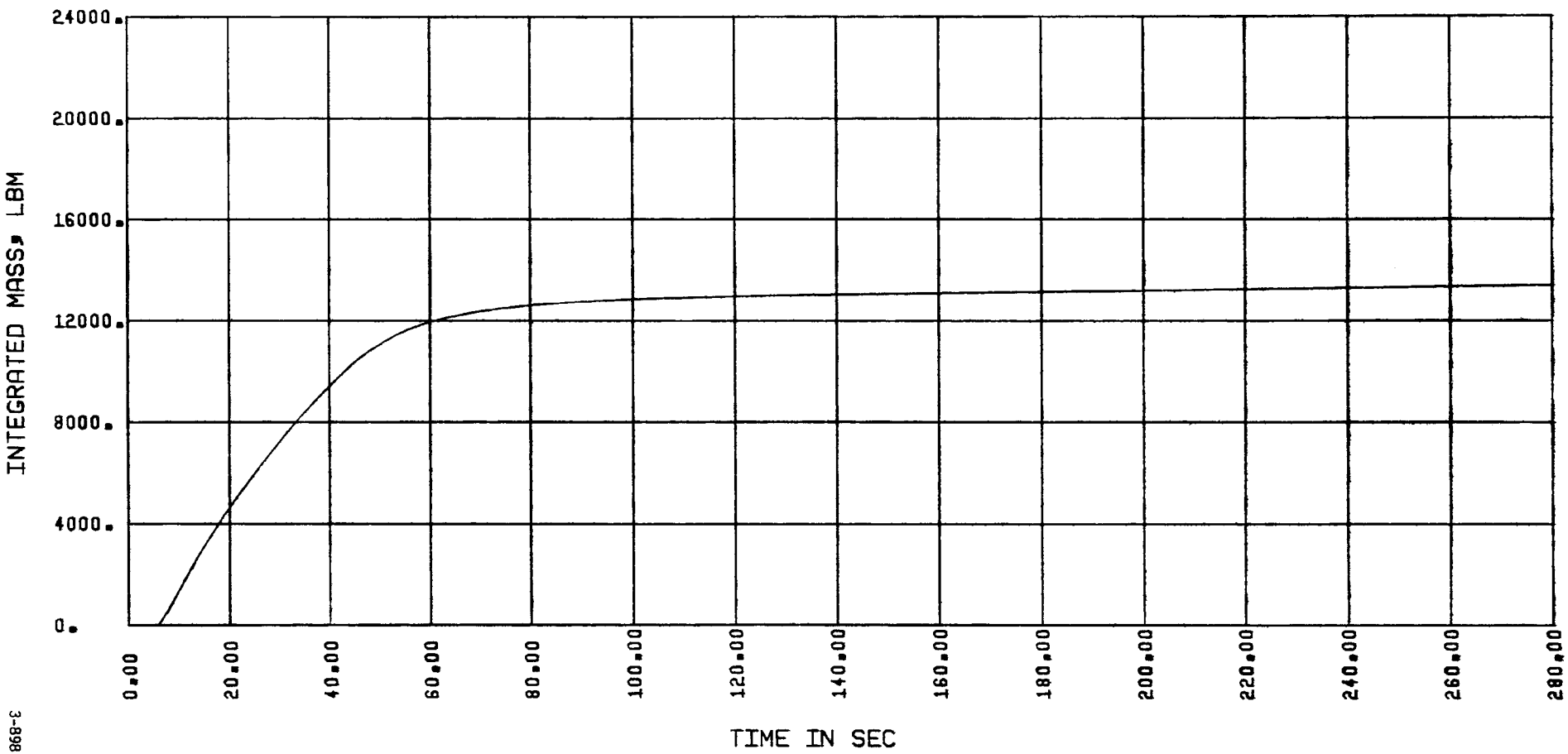
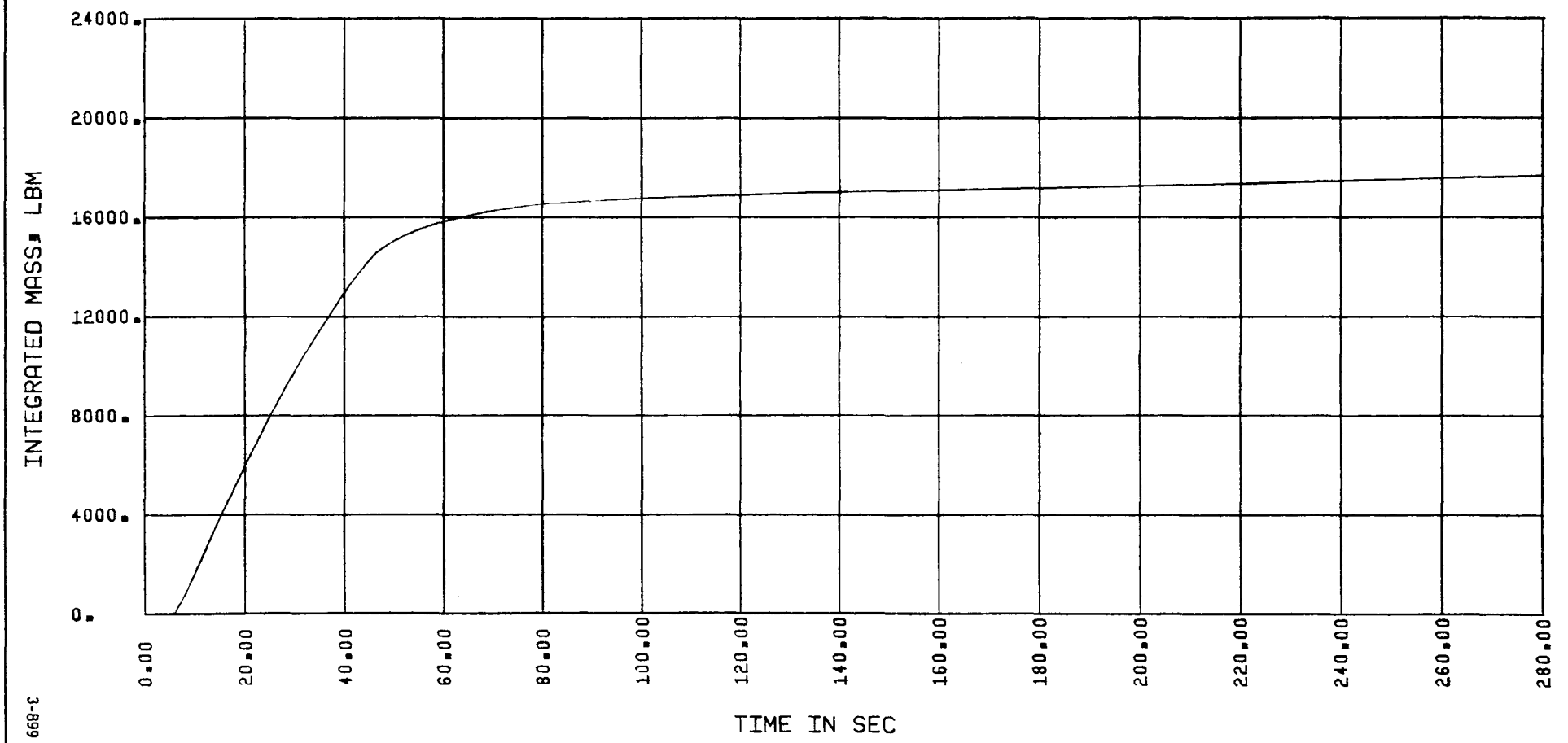
TEST 1351/1000 PSI PON FWD BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50

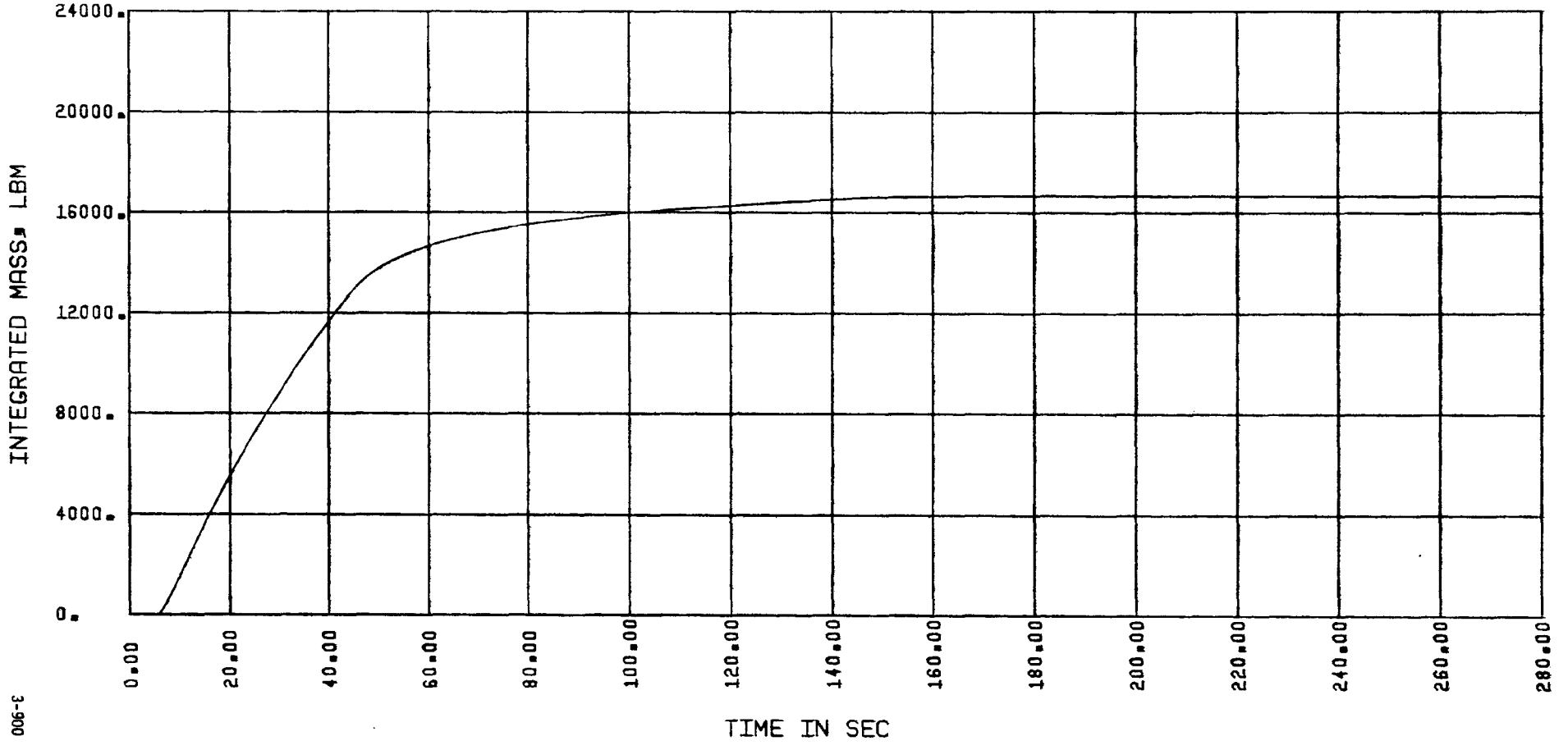


TEST 1351/1000 PSI PON FWD BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.51

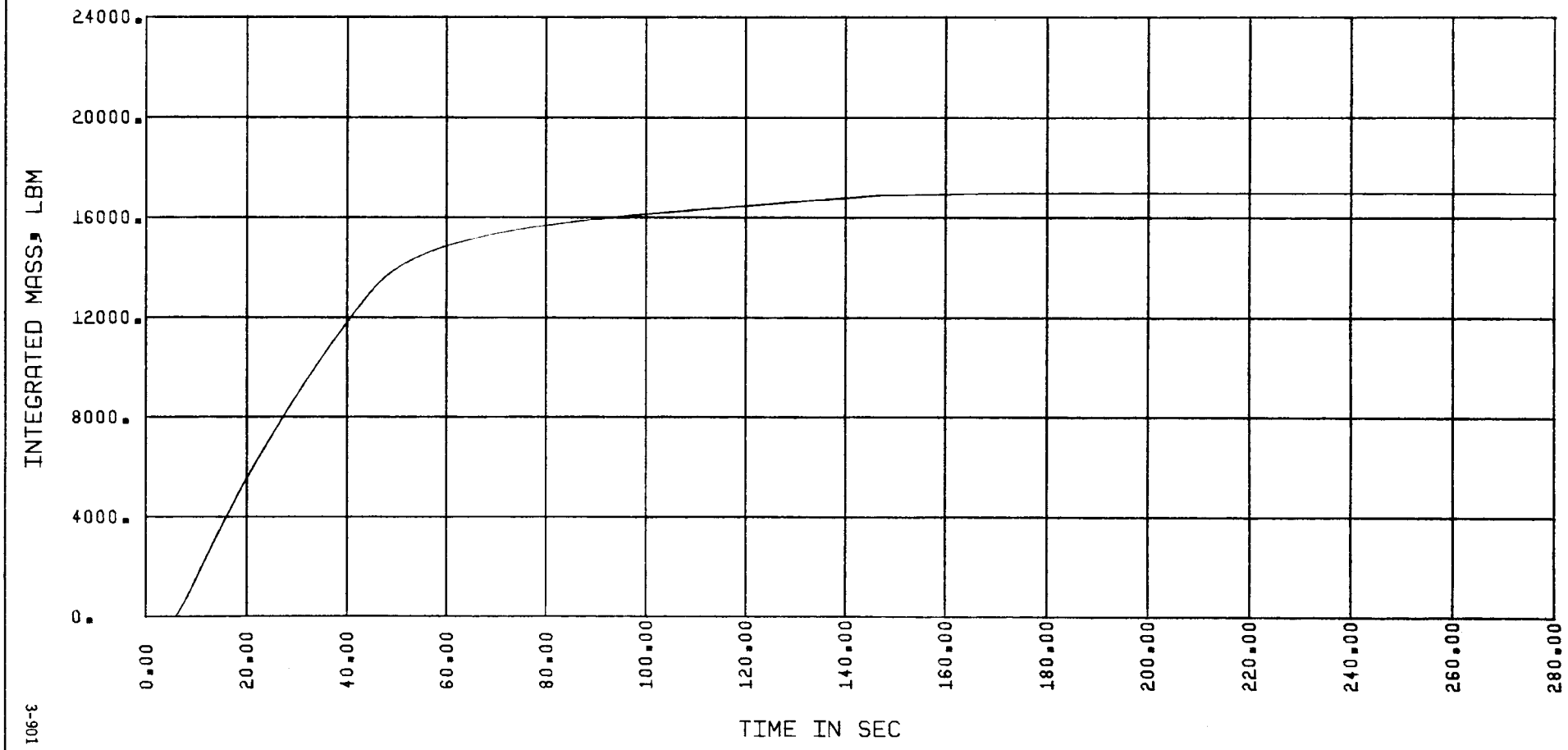


668-3

TEST 1351/1000 PSI PON FWD BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.52

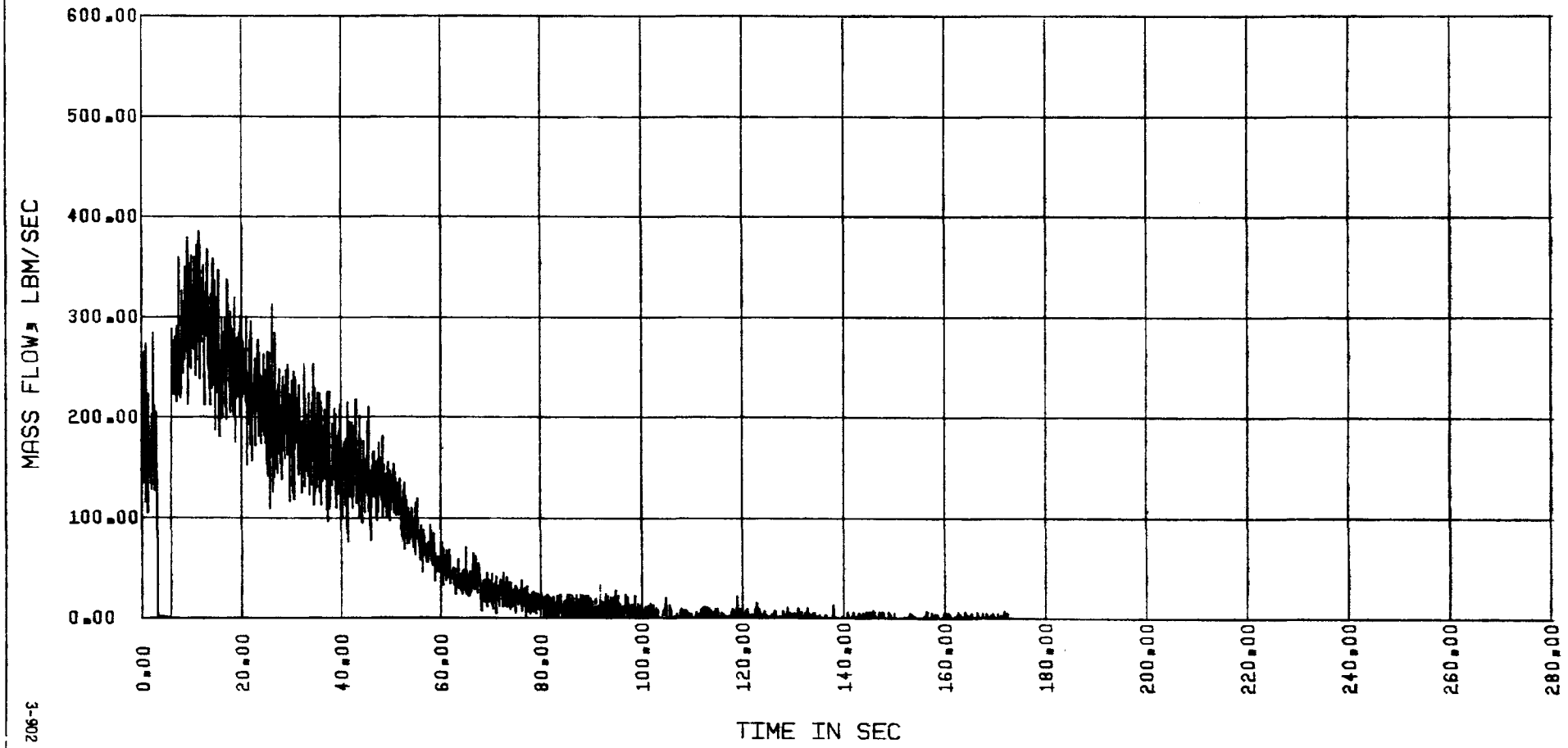


TEST 1351/1000 PSI PON FWD BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.53

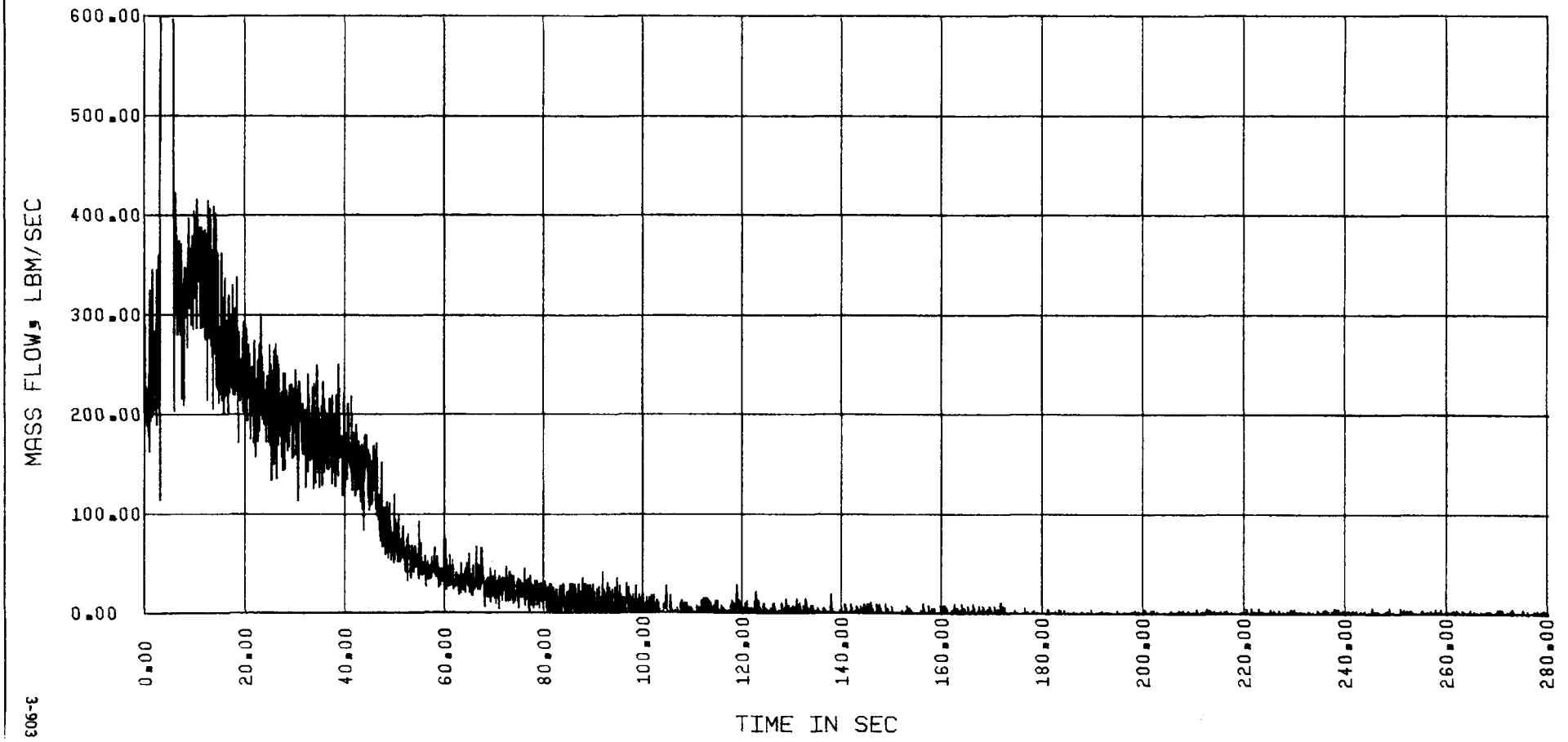


3-901

TEST 1351/1000 PSIA PON FWD BD
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54

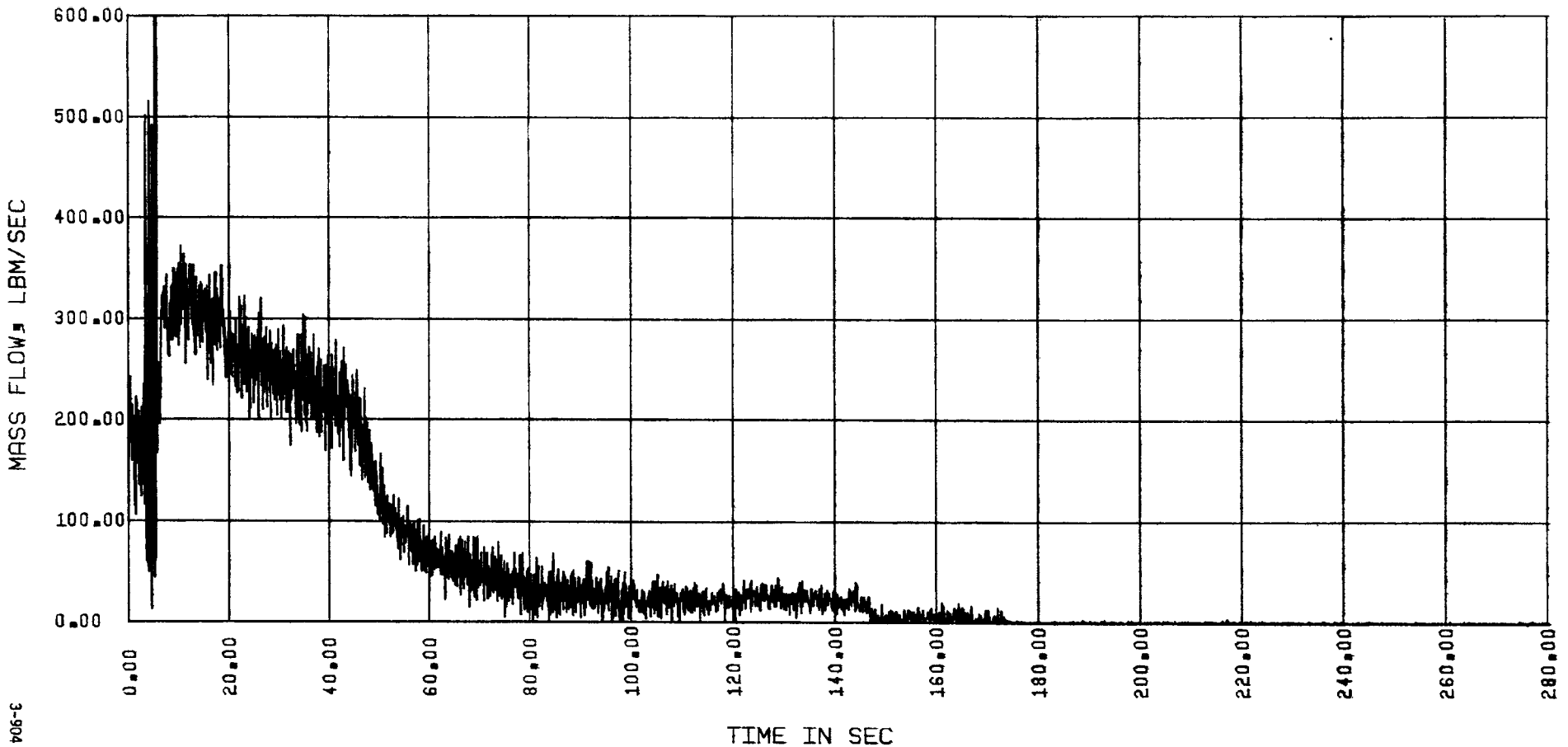


TEST 1351/1000 PSIA PON FWD BD
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.55



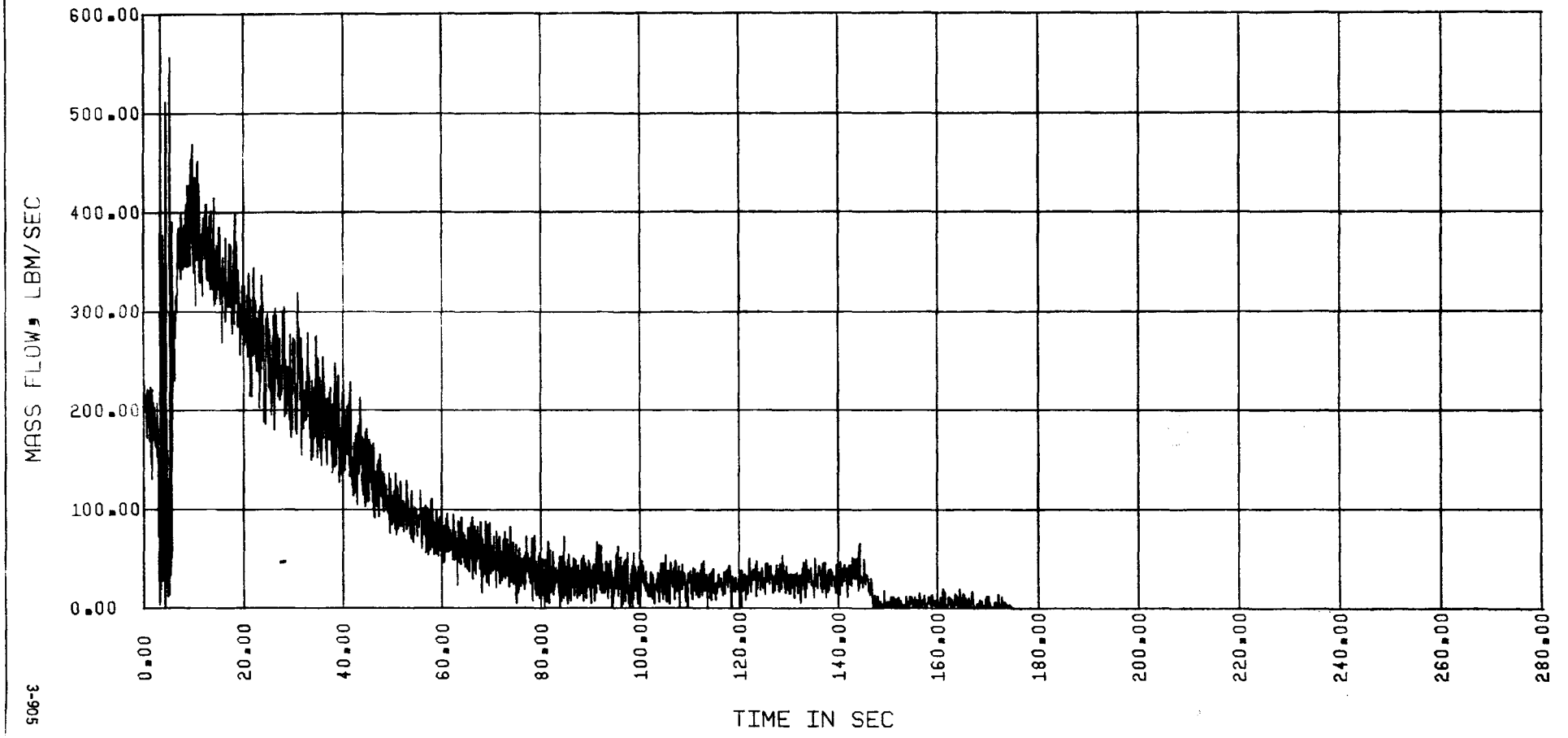
3-903

TEST 1351/1000 PSIA PON FWD BD
MASS FLOW RATE HI-TM/GD2 DISCH
PLOT NO.56

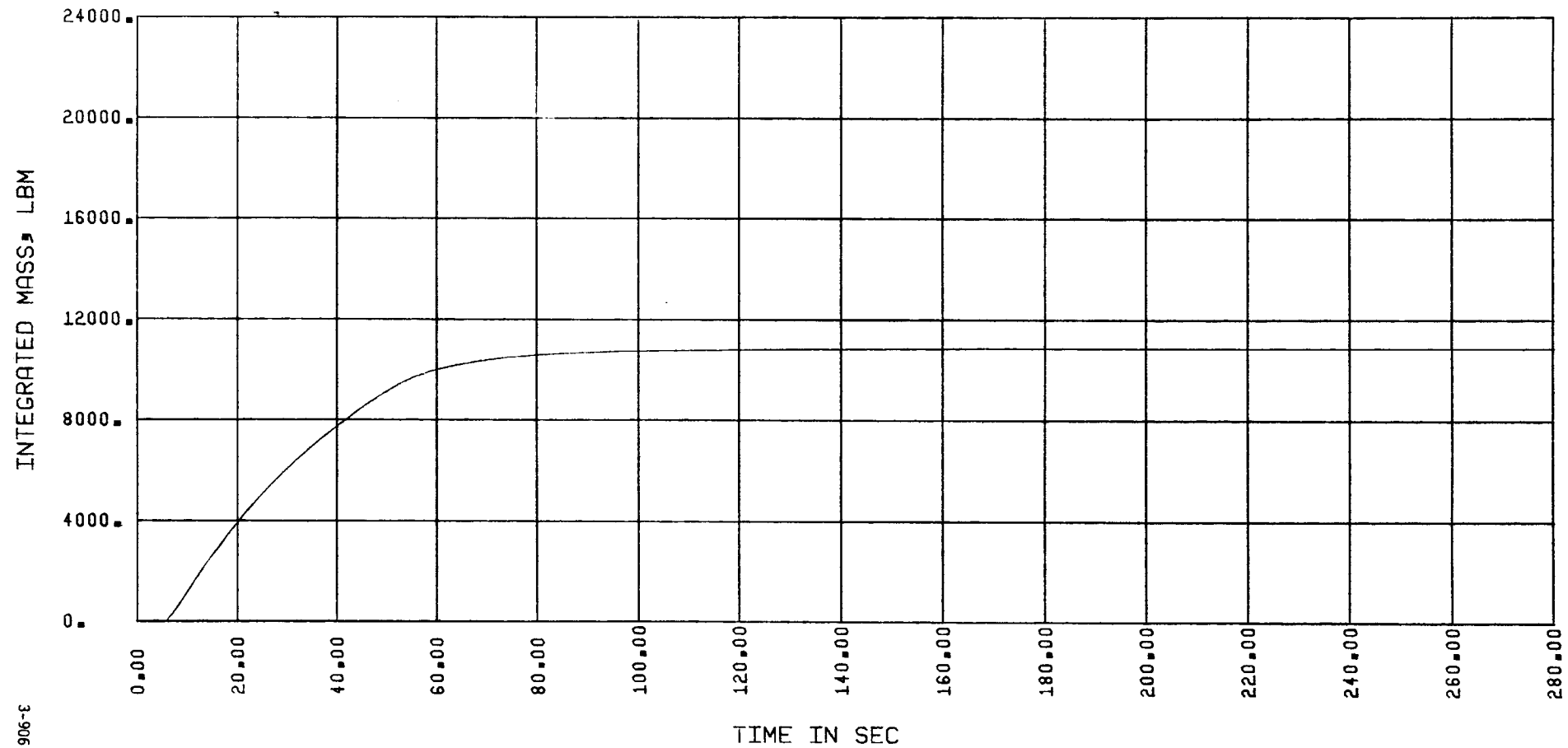


3-904

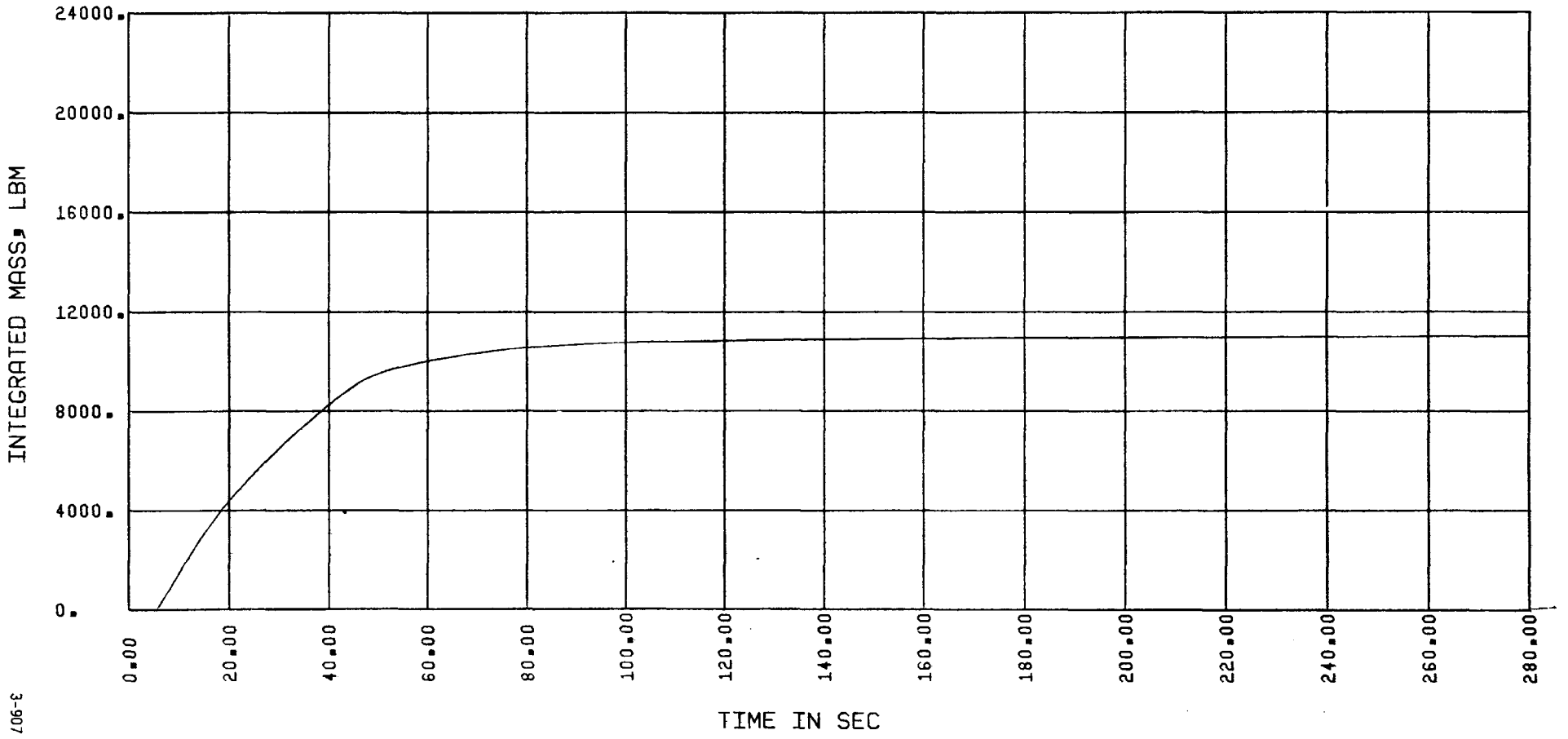
TEST 1351/1000 PSIA PON FWD BD
MASS FLOW RATE LO-TM/GD2 DISCH
PLOT NO.57



TEST 1351/1000 PSI PON FWD BDN
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60

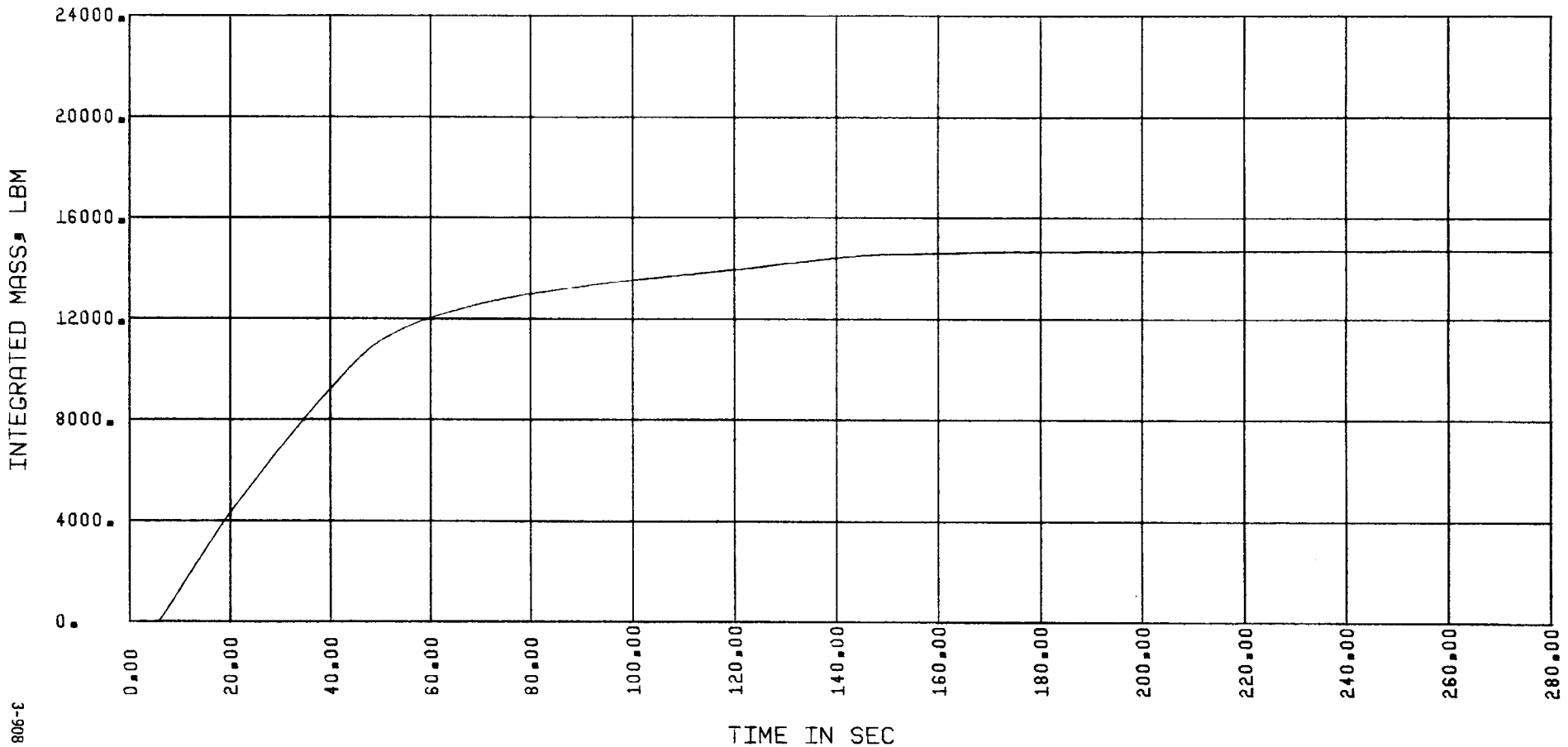


TEST 1351/1000 PSI PON FWD BDN
INTEGRATED MASS LO-TM/GD2 S
PLOT NO.61



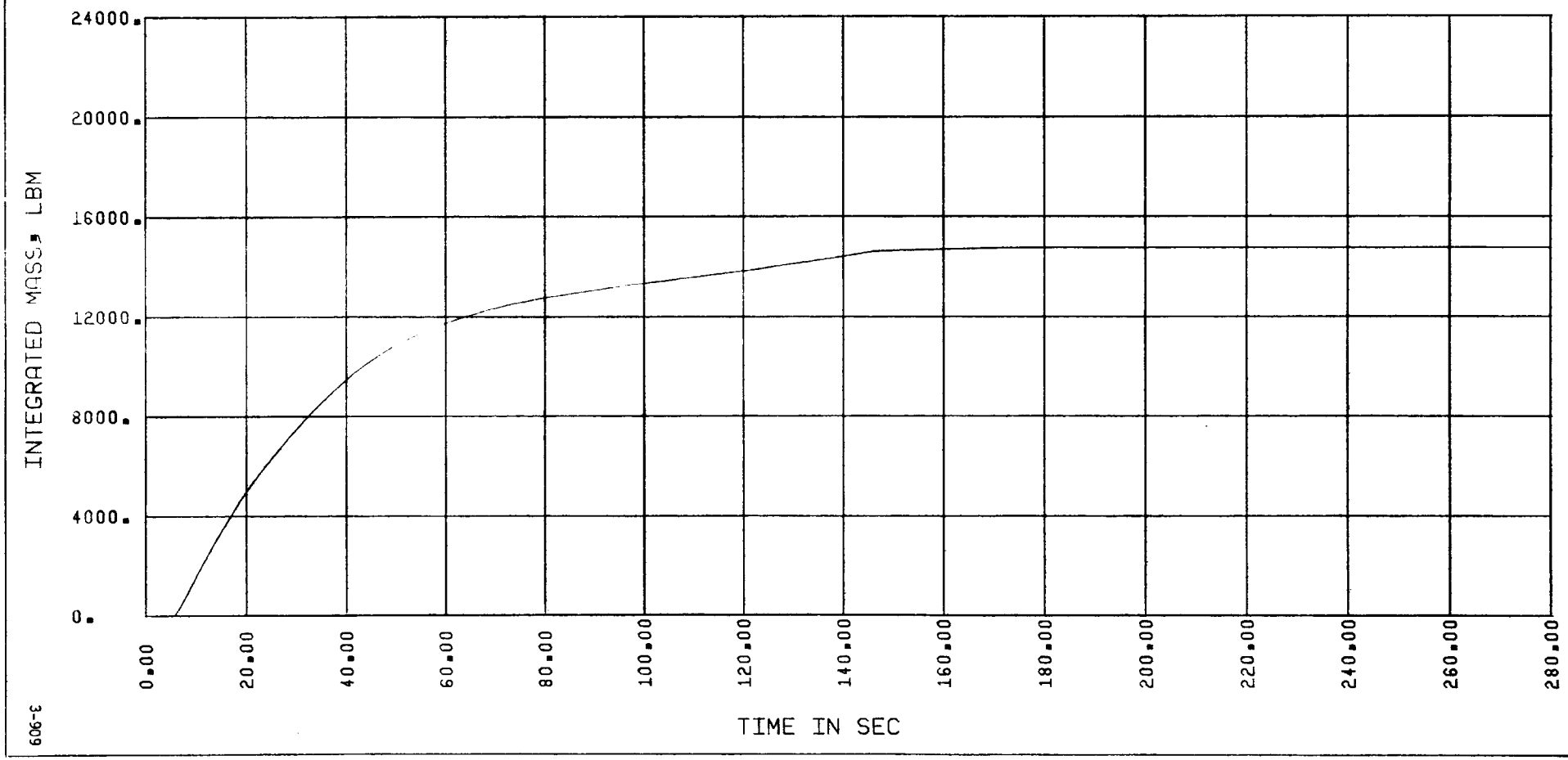
3-907

TEST 1351/1000 PSI PON FWD BDN
INTEGRATED MASS HI-TM/GD2 D
PLOT NO.62



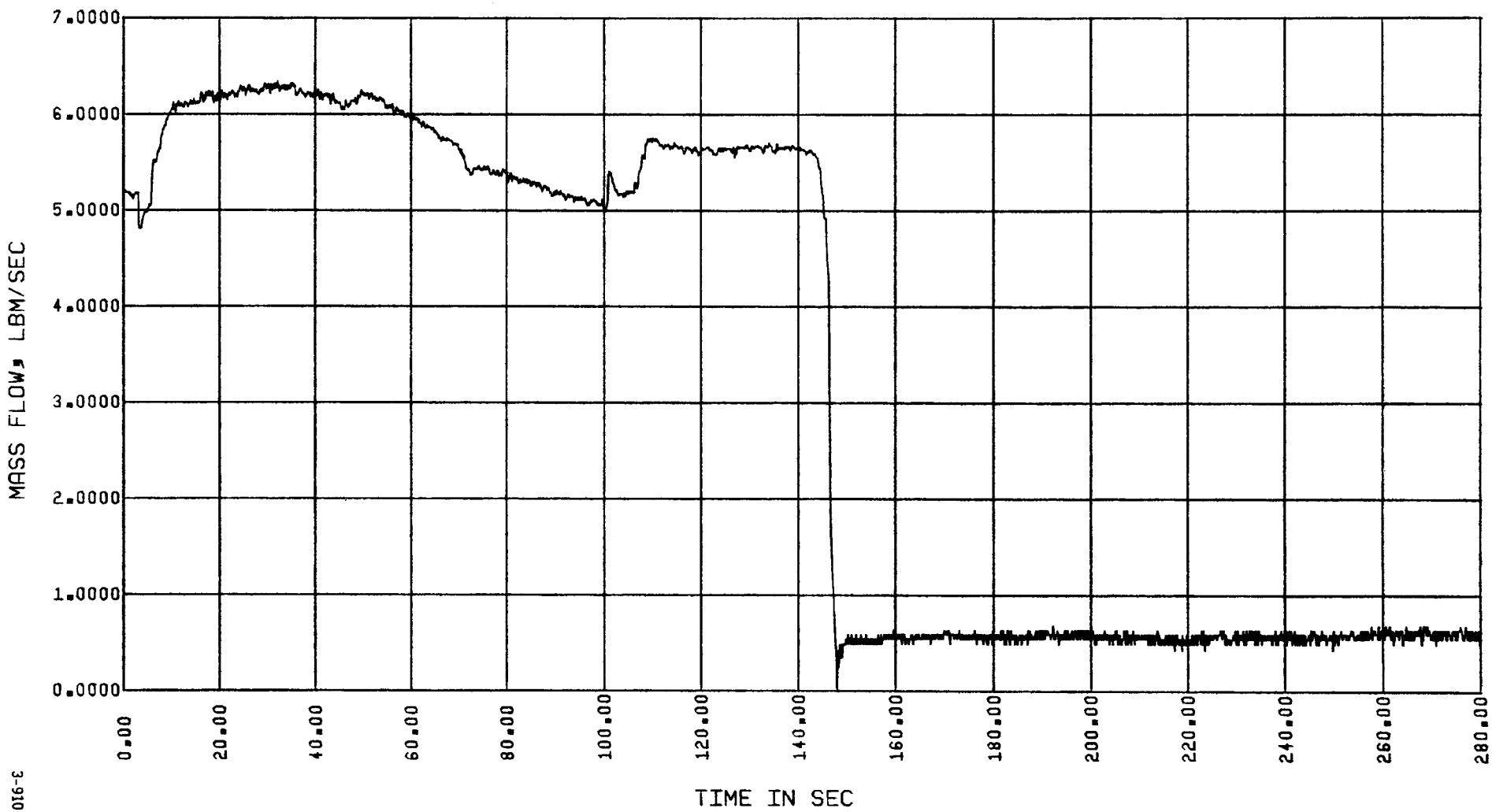
3-908

TEST 1351/1000 PSI PON FWD BDN
INTEGRATED MASS LO-TM/GD2 D
PLOT NO.63



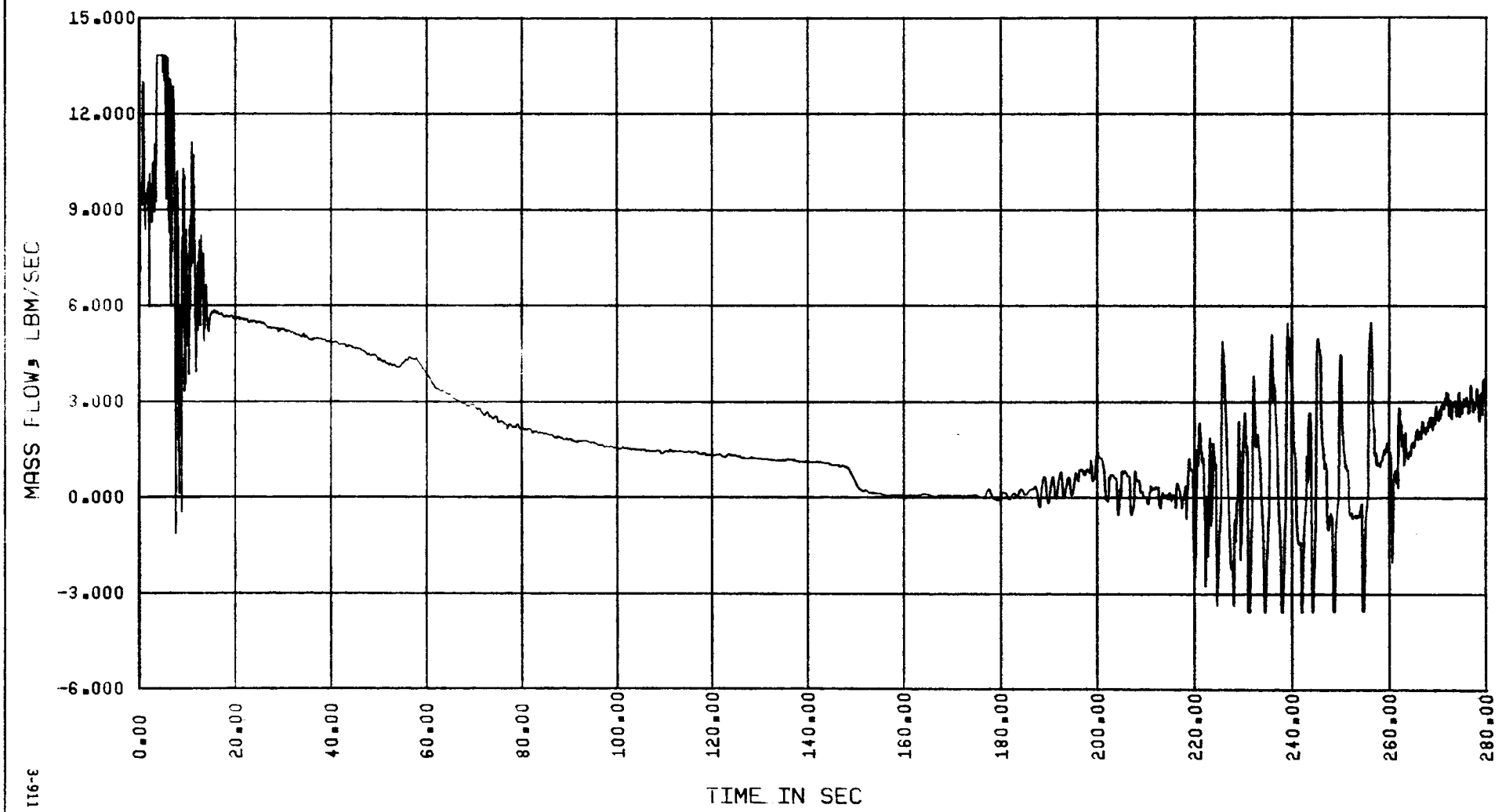
3-909

TEST 1351/1000 PSIA PON FWD BD
PUMP INLET INJECTION FLOW
PLOT NO.64



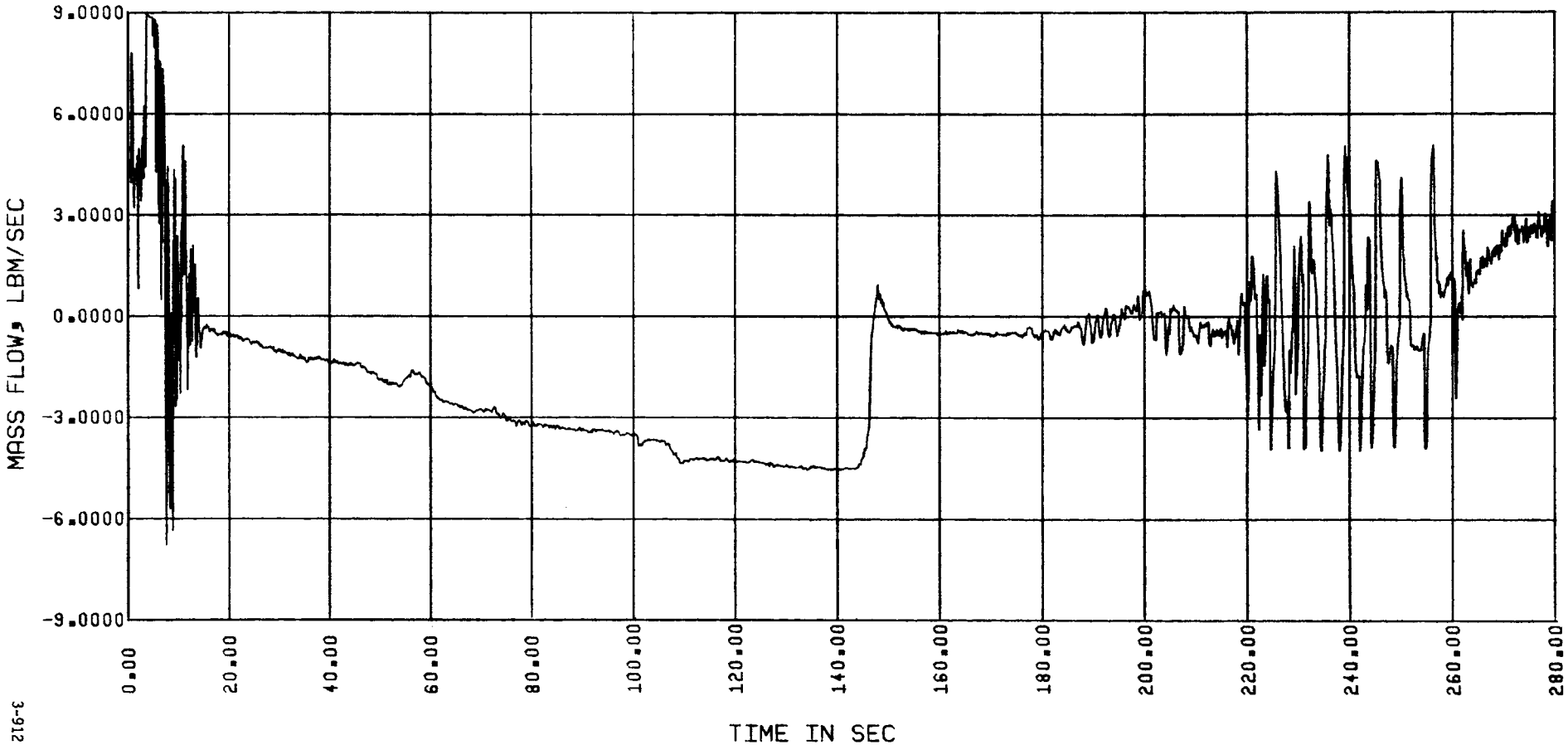
3-910

TEST 1351/1000 PSIA PON FWD BD
PUMP OUTLET INJECTION FLOW
PLOT NO.65



3-911

TEST 1351/1000 PSIA PON FWD BD
PUMP SEAL INJ LEAKAGE FLOW
PLOT NO.66



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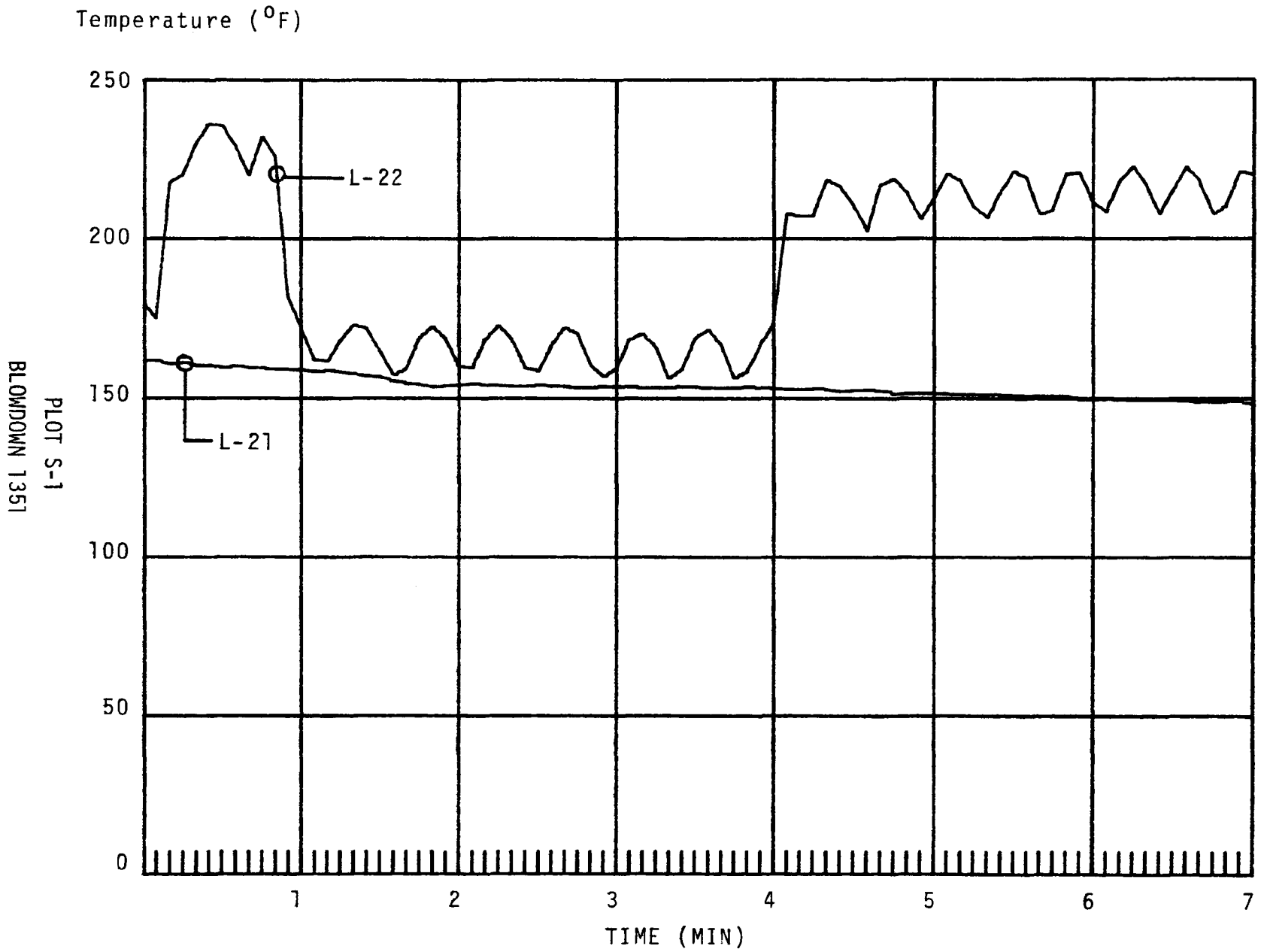
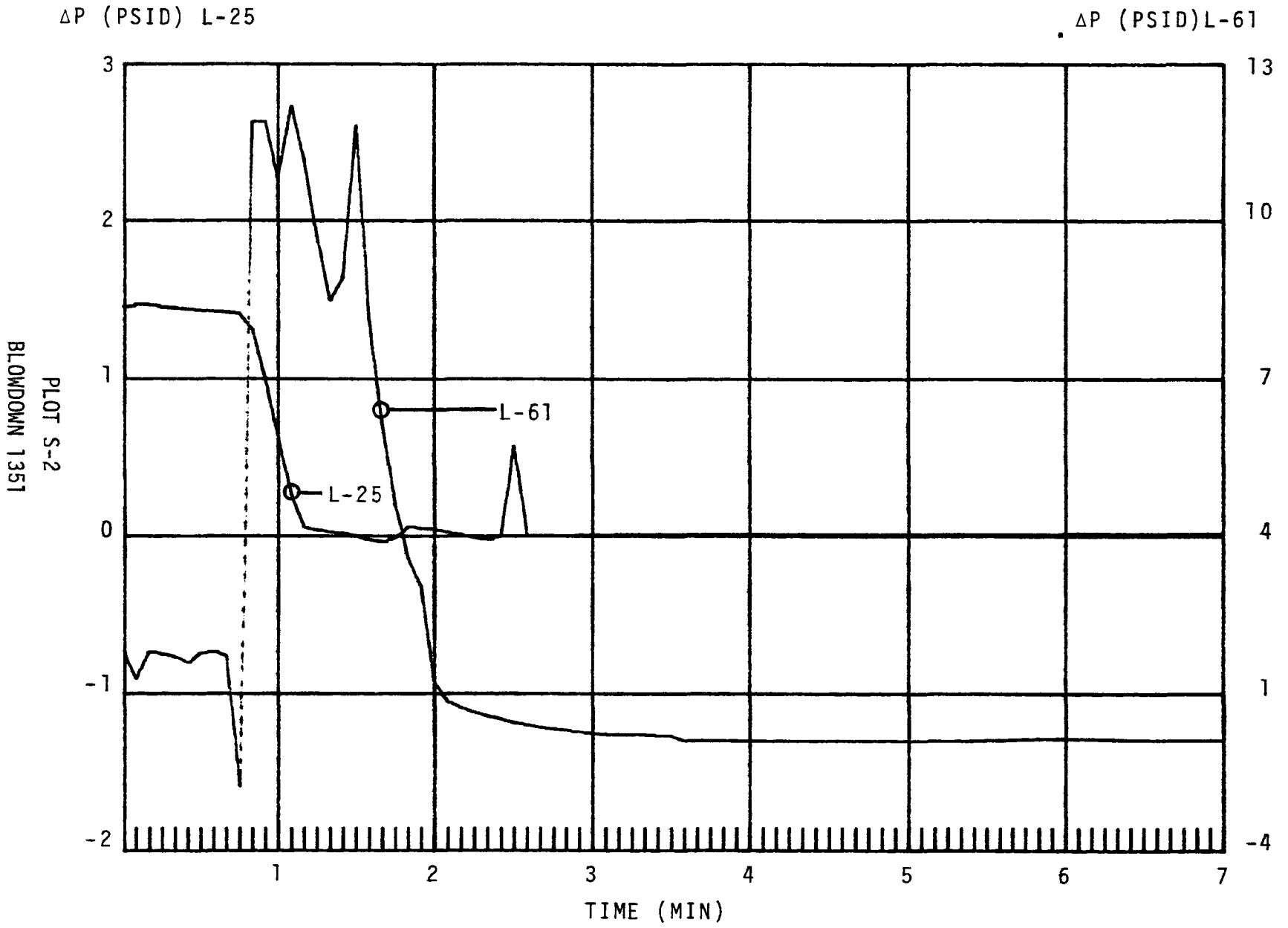
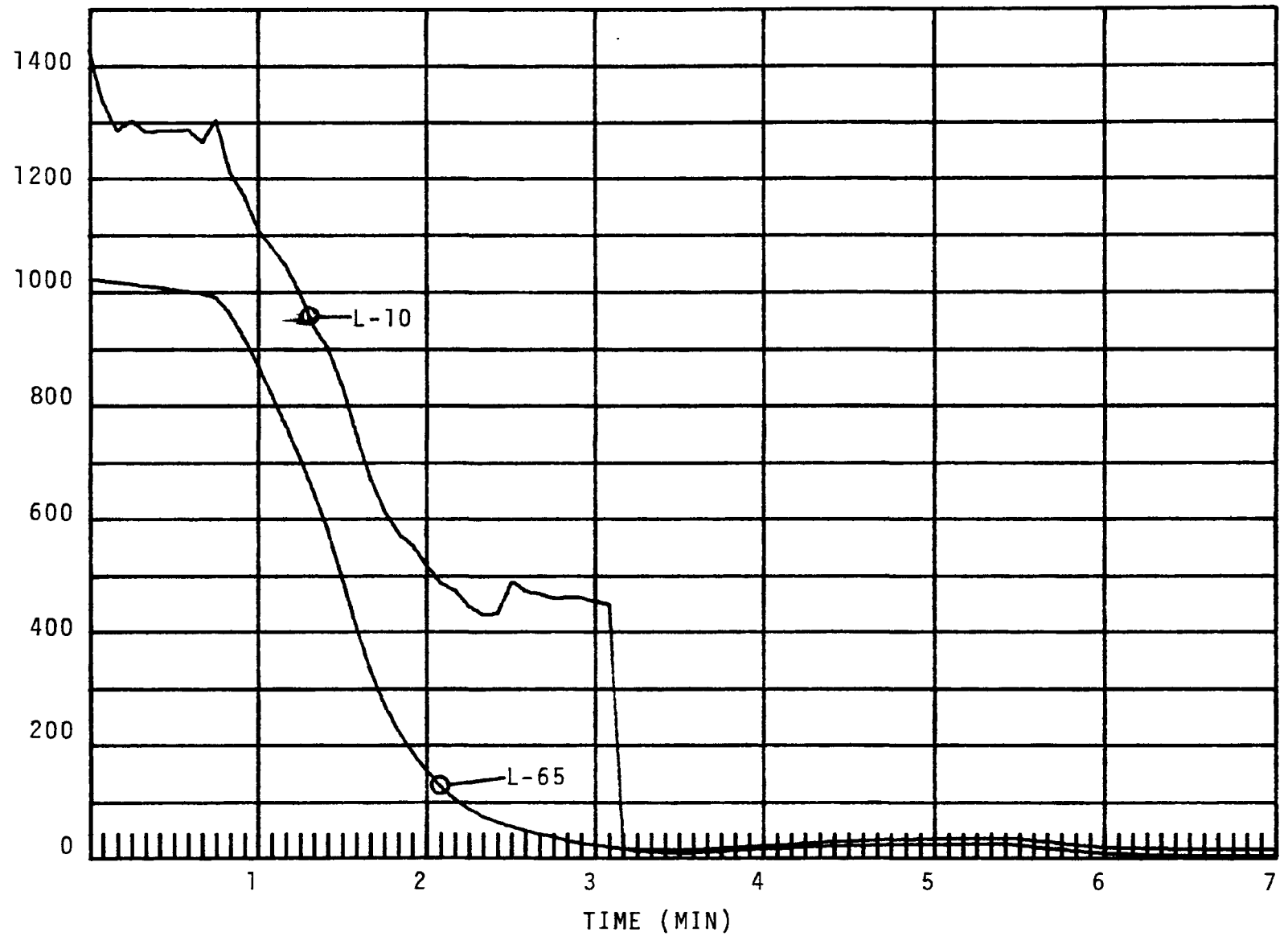
Index Listing
of
SCANNER DATA PLOTS
Test Number (1351)

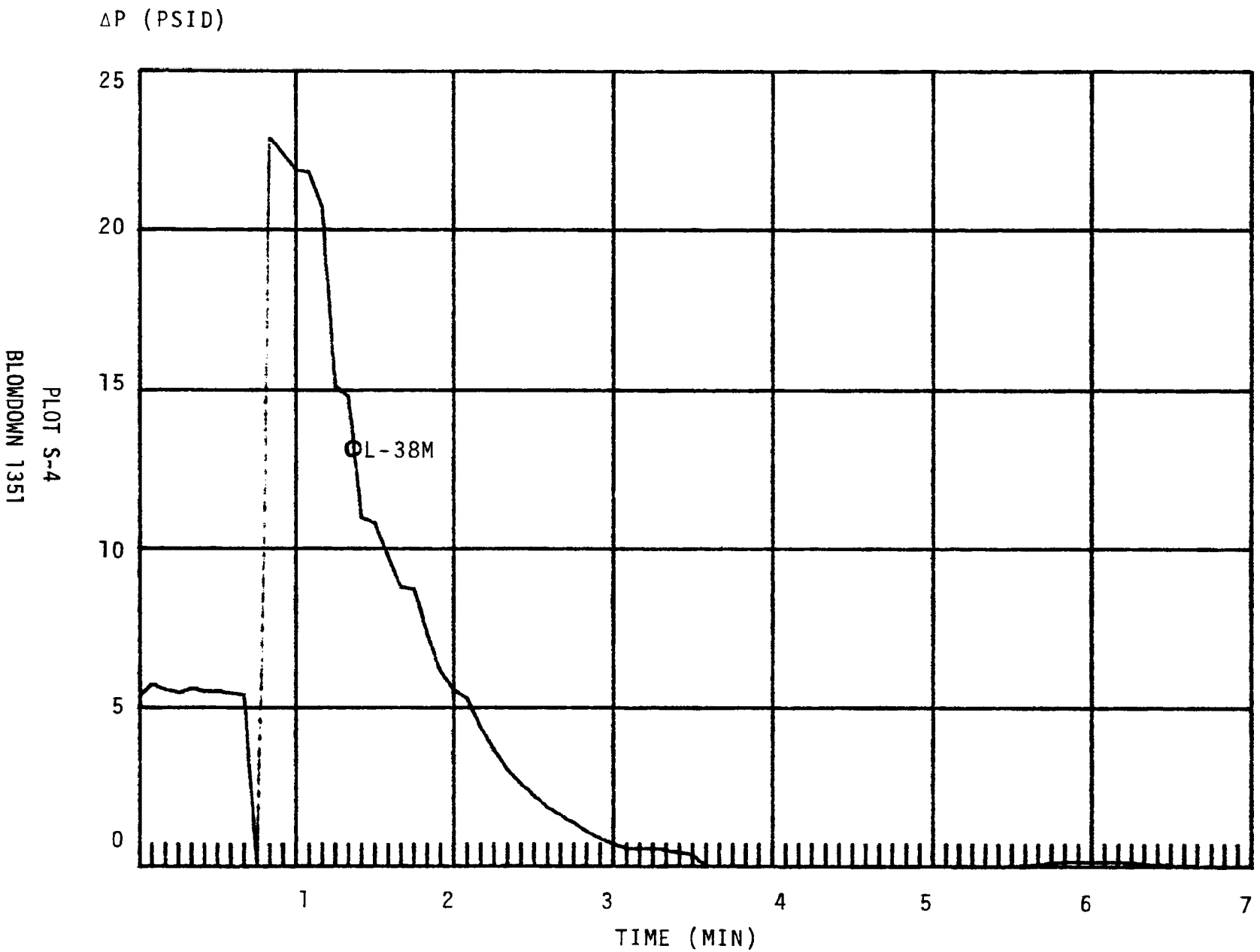
Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell


Temperature (°F)
250
200
150
100
50
0
L-22
L-21
1
2
3
4
5
6
7
TIME (MIN)
PLOT S-1
BLOWDOWN 1351

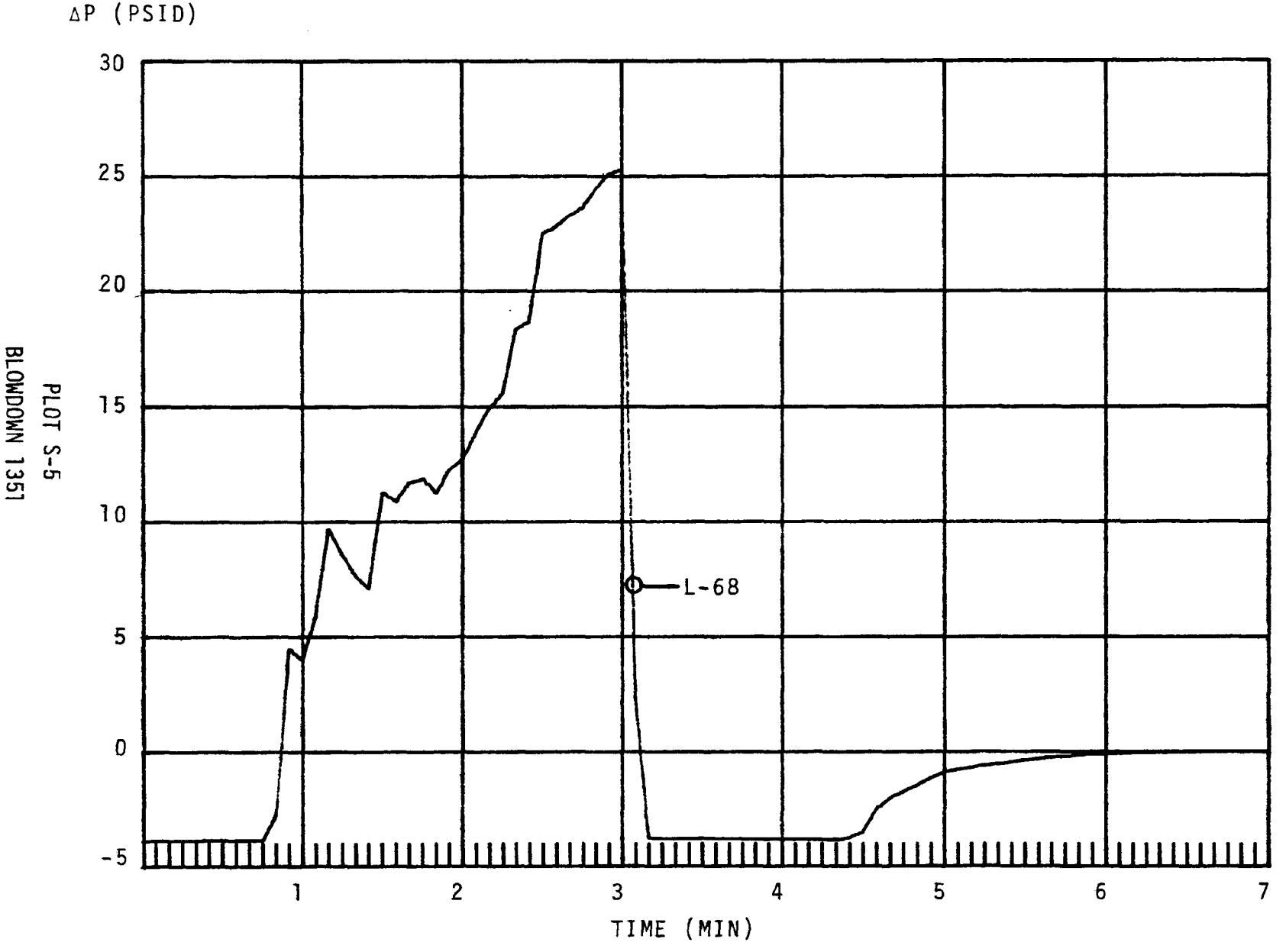

ΔP (PSID) L-25
ΔP (PSID)L-61
3
2
1
0
-1
-2
13
10
7
4
1
-4
1
2
3
4
5
6
7
TIME (MIN)
L-61
L-25
PLOT S-2
BLOWDOWN 1351



PLOT S-3
BLOWDOWN 1351



PLOT S-4
BLOWDOWN 1351


ΔP (PSID)
30
25
20
15
10
5
0
-5
1
2
3
4
5
6
7
TIME (MIN)
L-68
PLOT S-5
BLOWDOWN 1351

SYSTEM CONFIGURATION

Test Number 1380

Break Location	Discharge
Break Size	1.46 in^2
	5 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Free-Wheeling

COMMENTS

1. Malfunctioning or Inoperable Instruments: None
2. Other Comments: None
3. Affected FM Data Plots: None

INITIAL CONDITIONS

t = 10 Sec[a]

Test Number 1380

System Pressures

High Pressure Drum	969.5	psia
Suction Instrument Spool	986.3	psia
Discharge Instrument Spool	1063.2	psia

Fluid Temperatures

Suction Instrument Spool	543.0	°F
Discharge Instrument Spool	549.9	°F

Fluid Density

Suction Instrument Spool	46.41	lbm/ft^3
Discharge Instrument Spool	45.98	lbm/ft^3

System Flows

Mass Flow Rate	104	lb/sec
Suction Volumetric Flow Rate	1005	gpm
Discharge Volumetric Flow Rate	1061	gpm
Suction Normalized Volumetric Flow Rate	0.29	
Discharge Normalized Volumetric Flow Rate	0.30	
Suction Fluid Velocity	12.36	ft/sec
Discharge Fluid Velocity	13.06	ft/sec
Suction Momentum Flux	7106	$lbm/ft\ sec^2$
Discharge Momentum Flux	7851	$lbm/ft\ sec^2$

Pump Performance

Pump head	85.4	psi
	264.9	ft
Pump Speed	4511	rpm
Pump Shaft Torque	178.2	ft lb
Pump Hydraulic Torque	153.2	ft lb

System Mass (t = 20 Sec)[a]

High Pressure Drum Level	62.20	in[b]
Fluid Mass Upstream of Test Pump	14,725	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 1380

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-7.2	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	1.4	c
HPSW-1 Closed	3.0	c
Pump Power Trip	5.8	35
Initiate Rupture Mechanism	3.7	c
Blowdown Starts	5.9	35
End of Digitized Data 20 s/sec	593.0	-
200 s/sec	293.0	-
FM Recording System Off	1674.0	-
Scanner System Off	-	1510

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

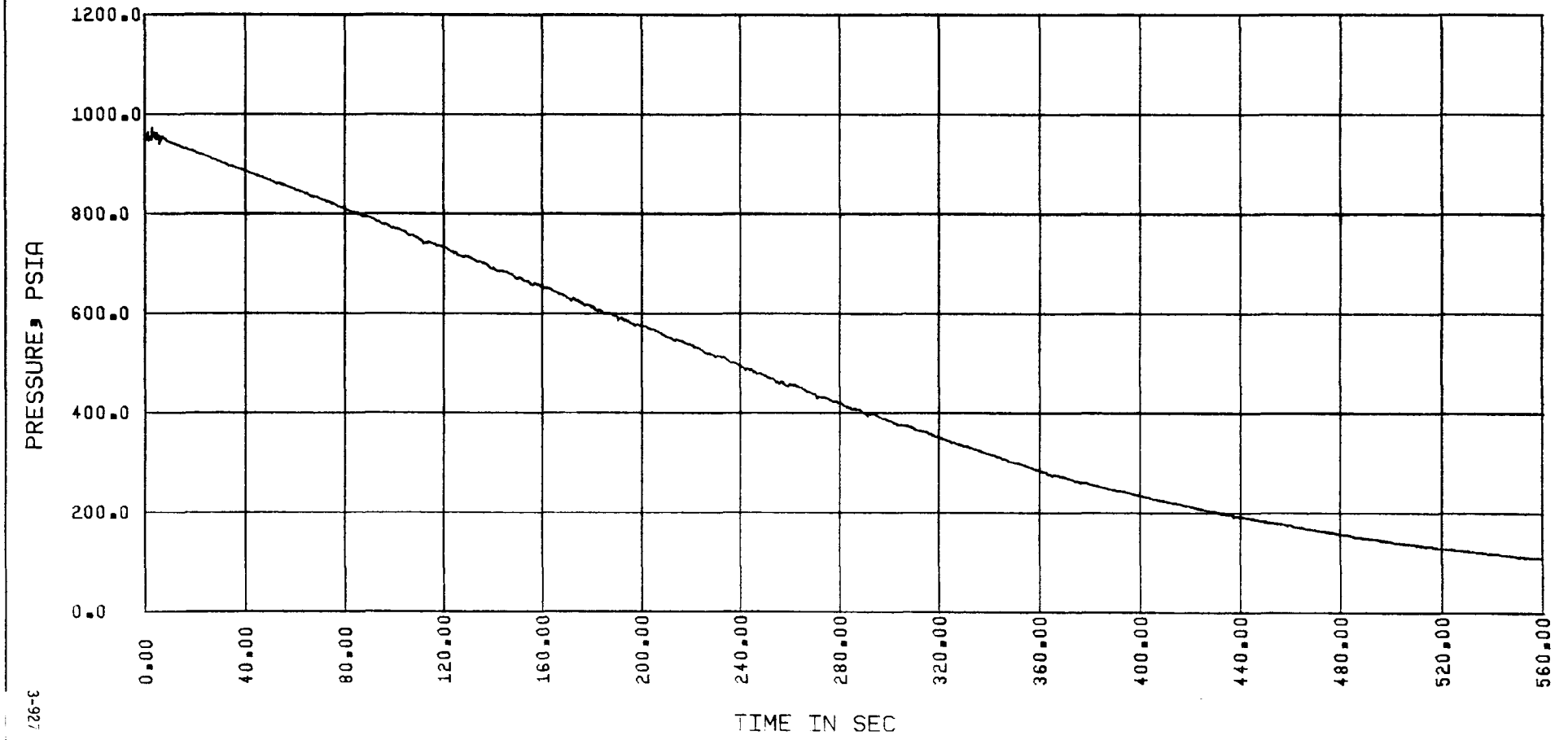
Index Listing
of
FM DATA PLOTS
Test Number (1380)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
28	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 Discharge
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge

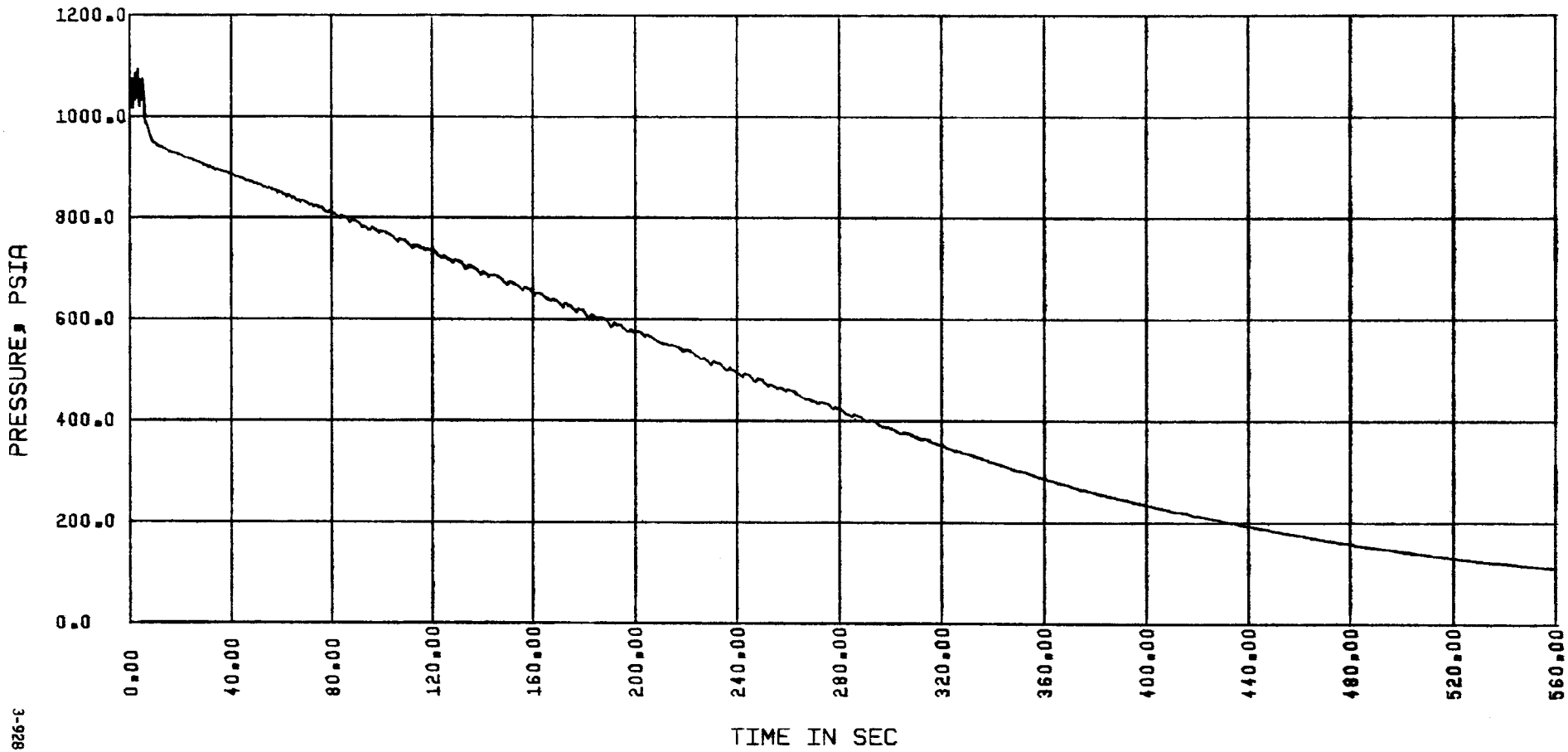
Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (1380)

Plot Number	Location Number	Description of Parameter
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
35	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
42	L-27	Momentum Flux LO-DD Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
53	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge
64	L-9	Pump Injection Mass Flow Rate In
65	L-32	Pump Injection Mass Flow Rate Out
66	L-9/L-32	Seal Injection Leakage Mass Flow Rate

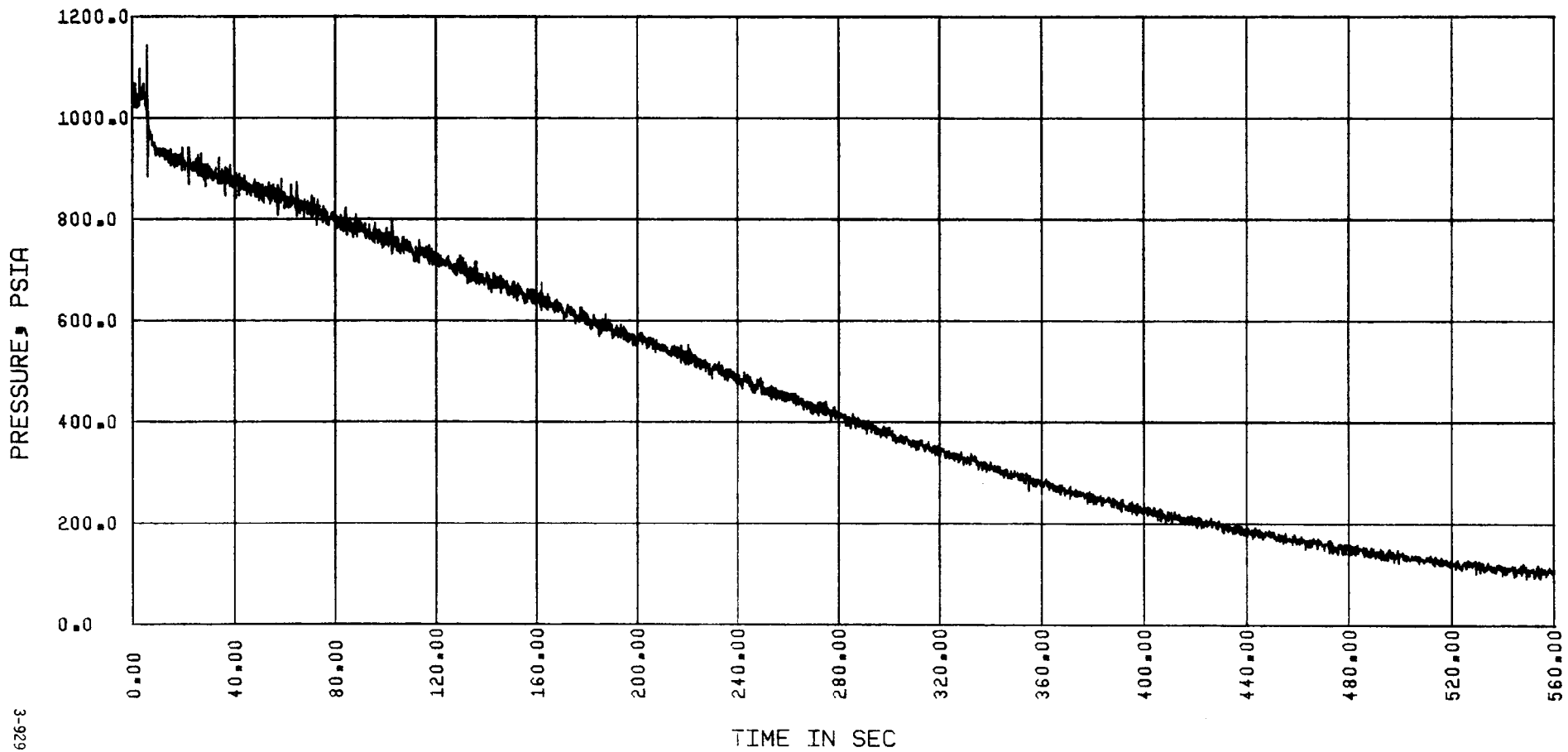
TEST 1380/1000 PSIA FW FWD BDN
PUMP SUCTION PRESSURE
PLOT NO.1



TEST 1380/1000 PSIA FW FWD BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2

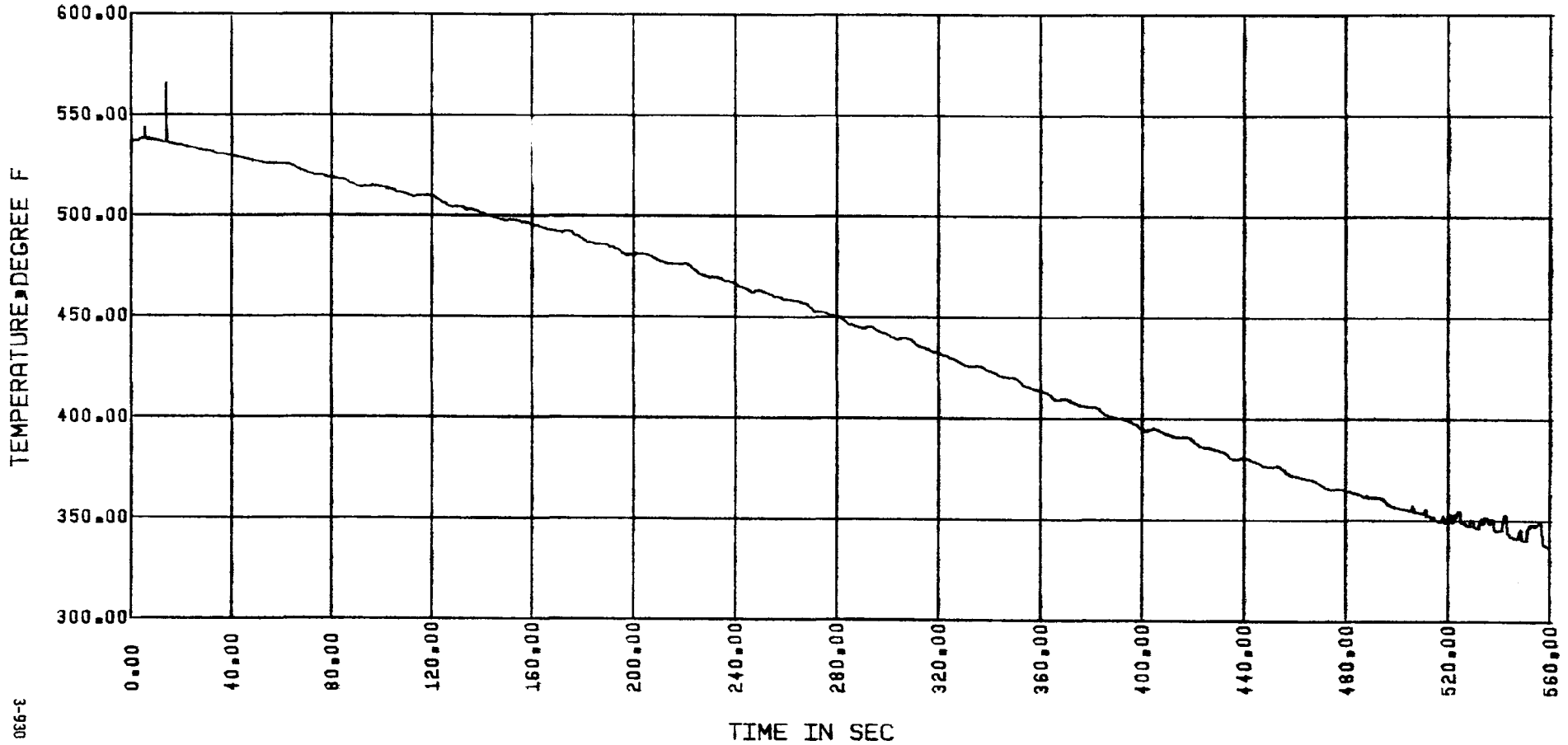


TEST 1380/1000 PSIA FW FWD BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



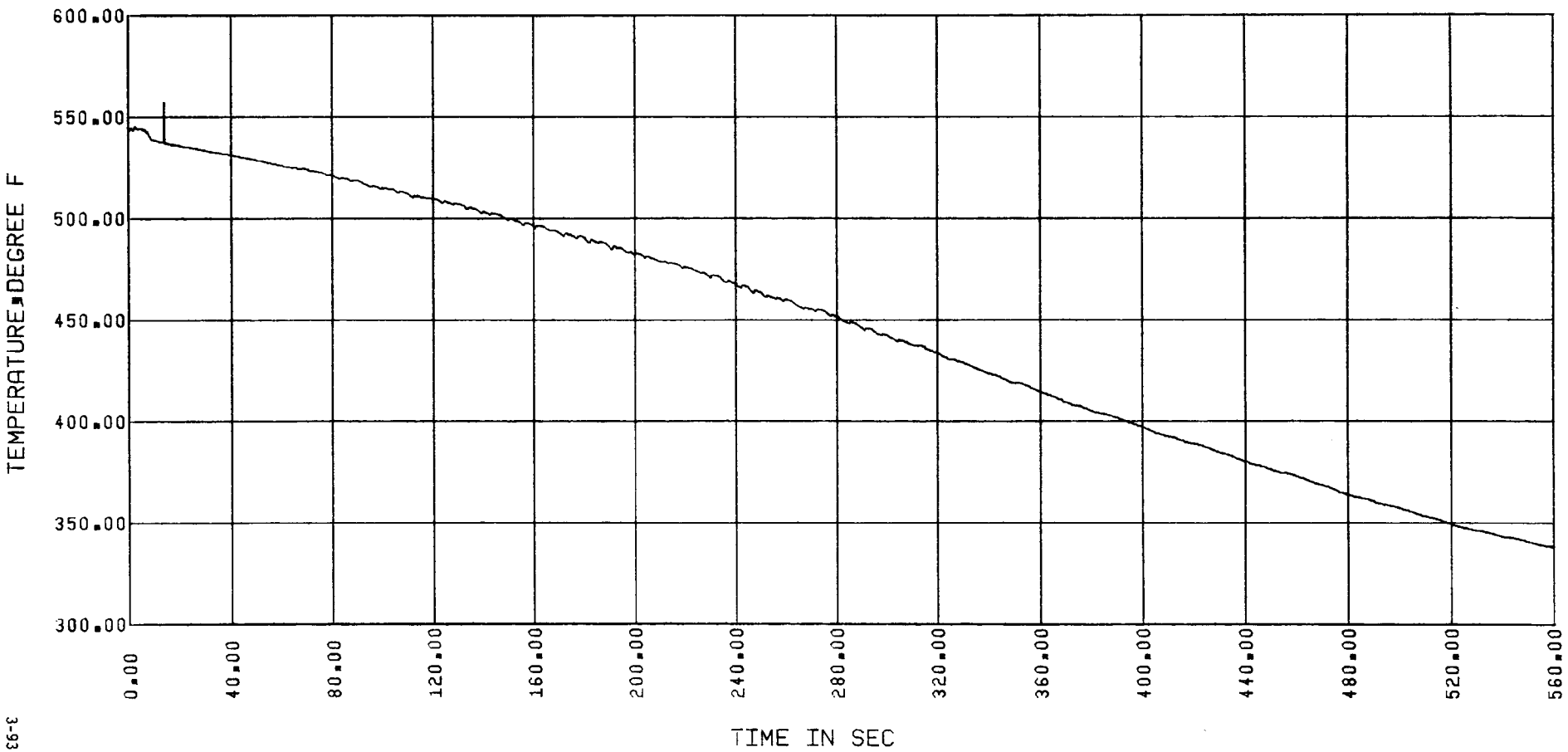
3-929

TEST 1380/1000 PSIA FW FWD BDN
PUMP SUCTION TEMPERATURE
PLOT NO.4

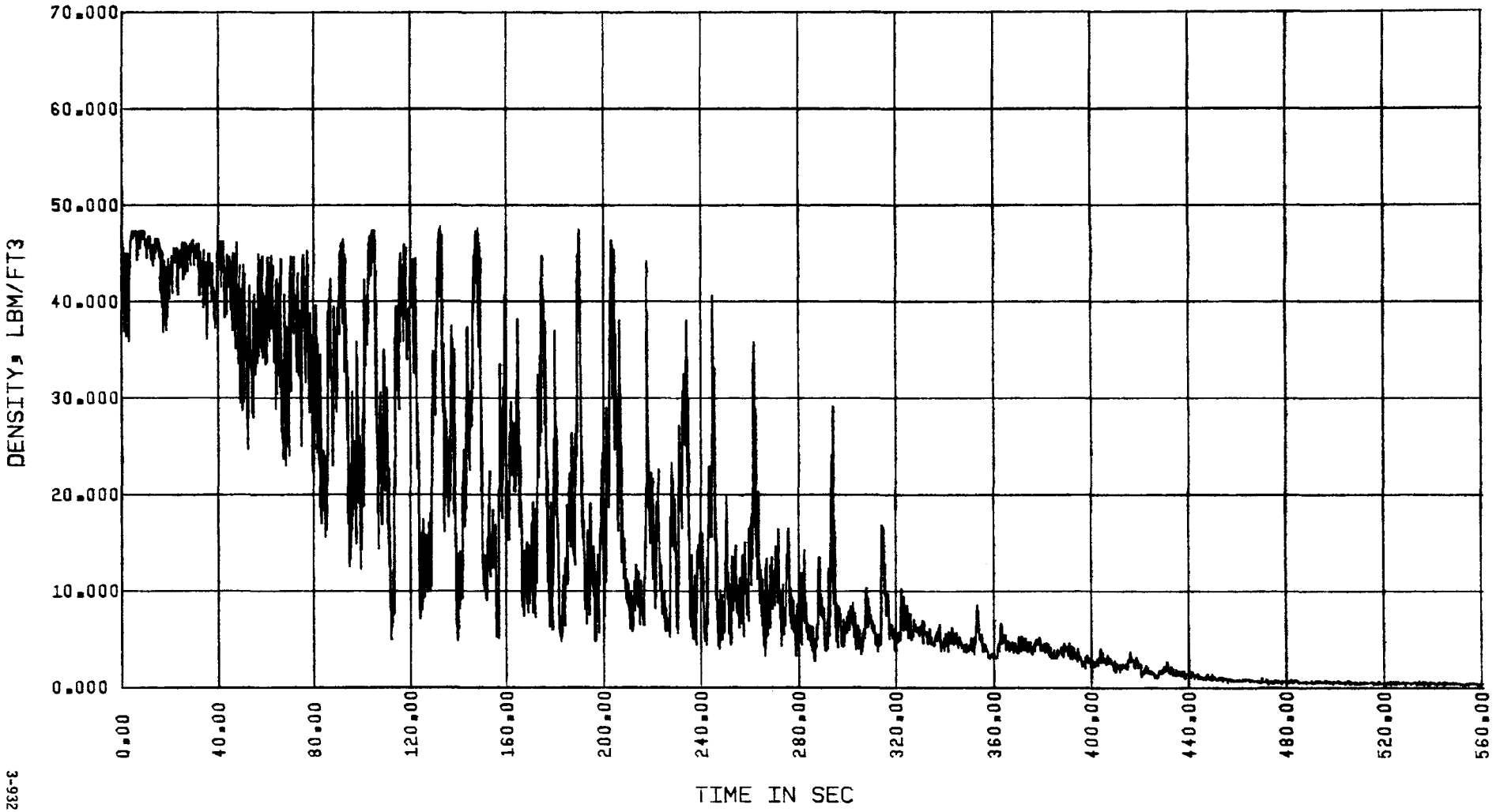


3-930

TEST 1380/1000 PSIA FW FWD BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5

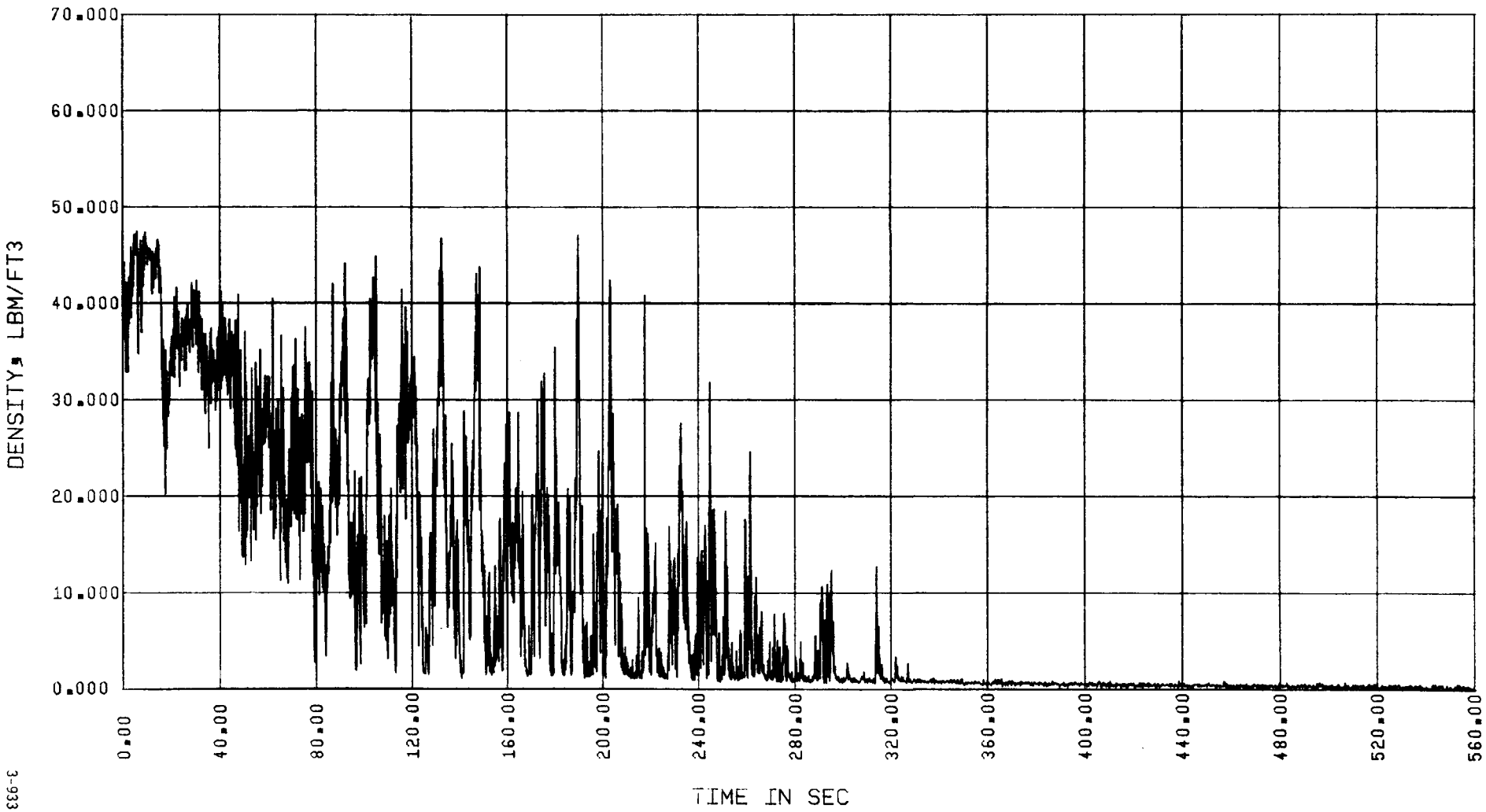


TEST 1380/1000 PSIA FW FWD BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



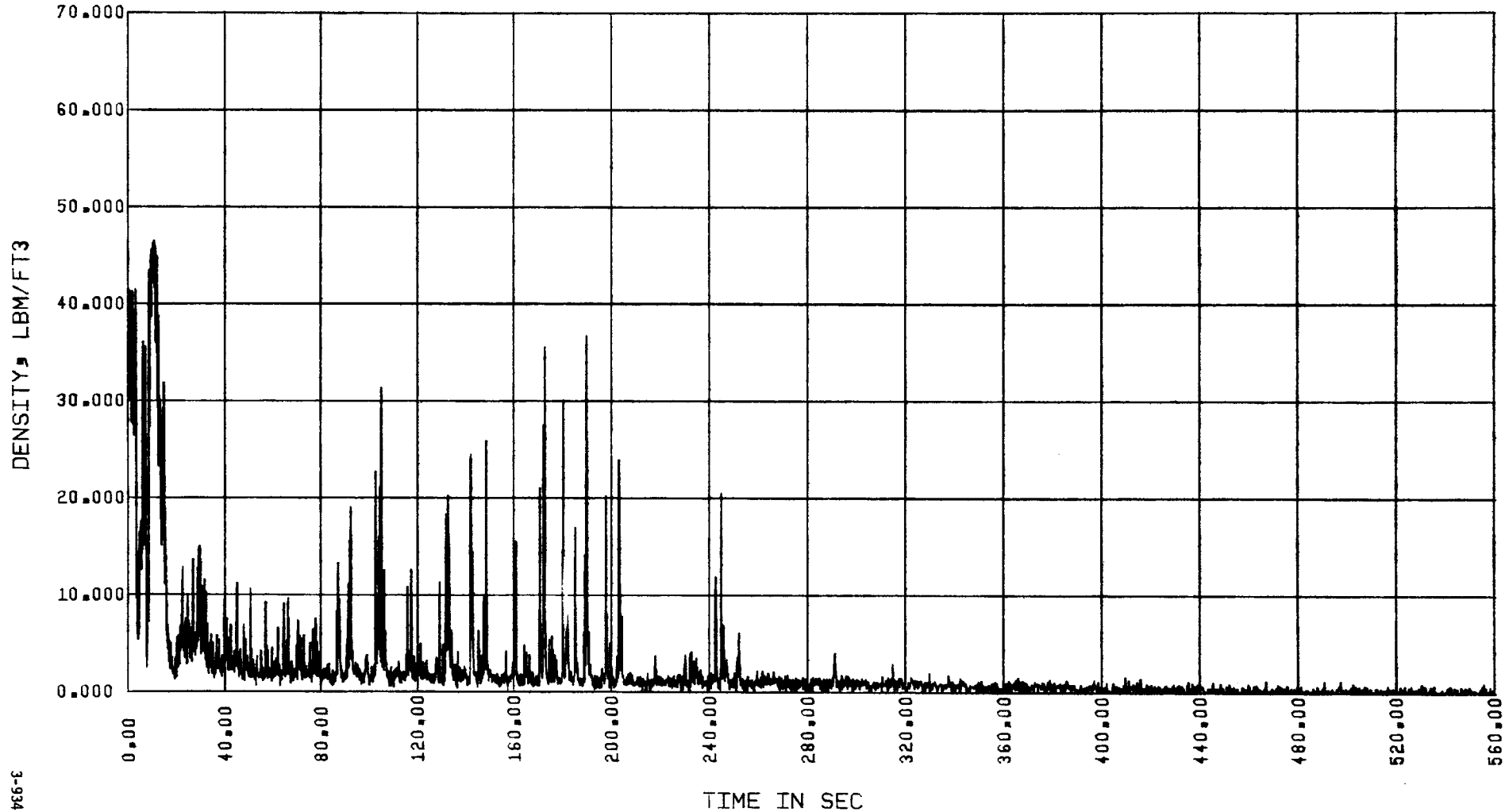
3-932

TEST 1380/1000 PSIA FW FWD BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7



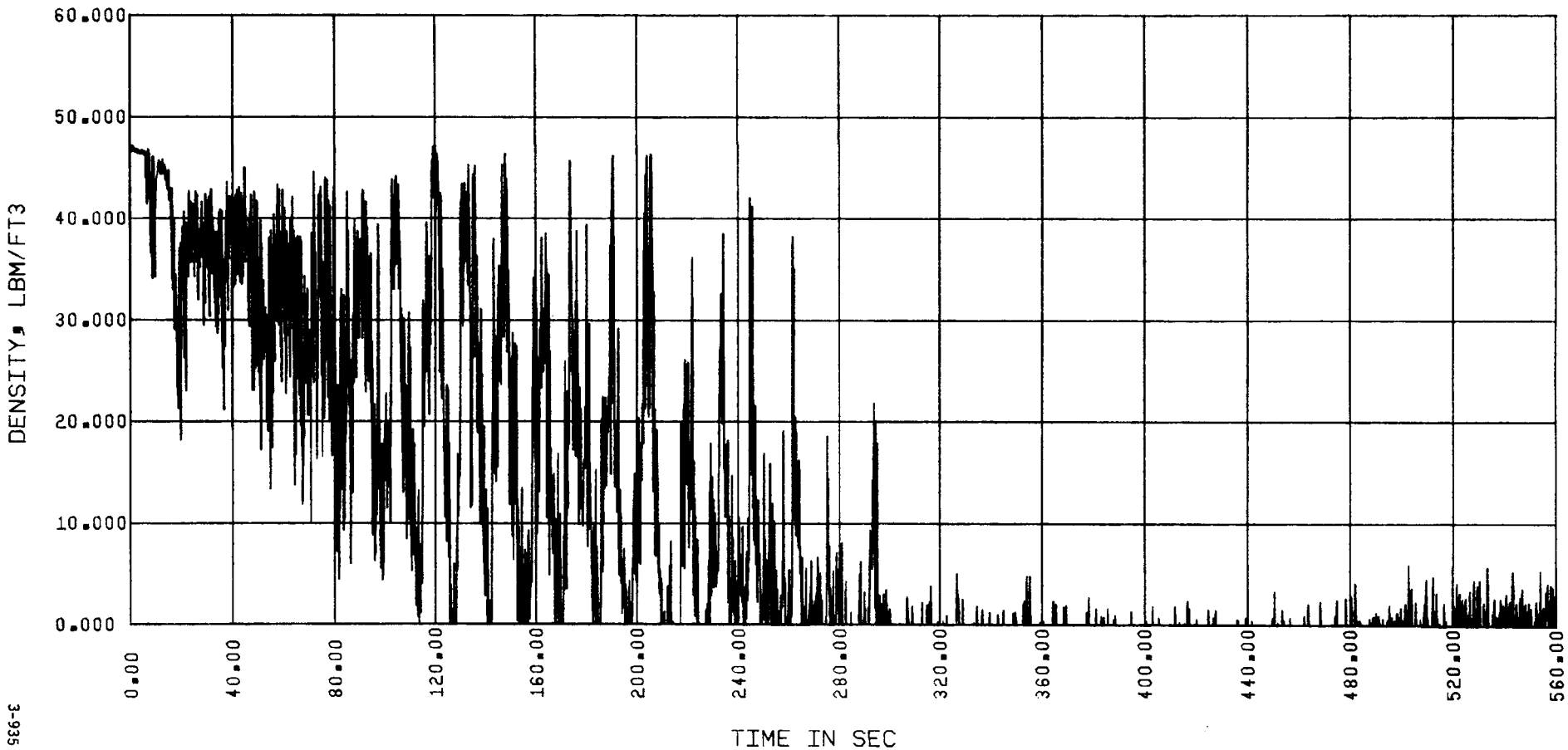
3-933

TEST 1380/1000 PSIA FW FWD BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8



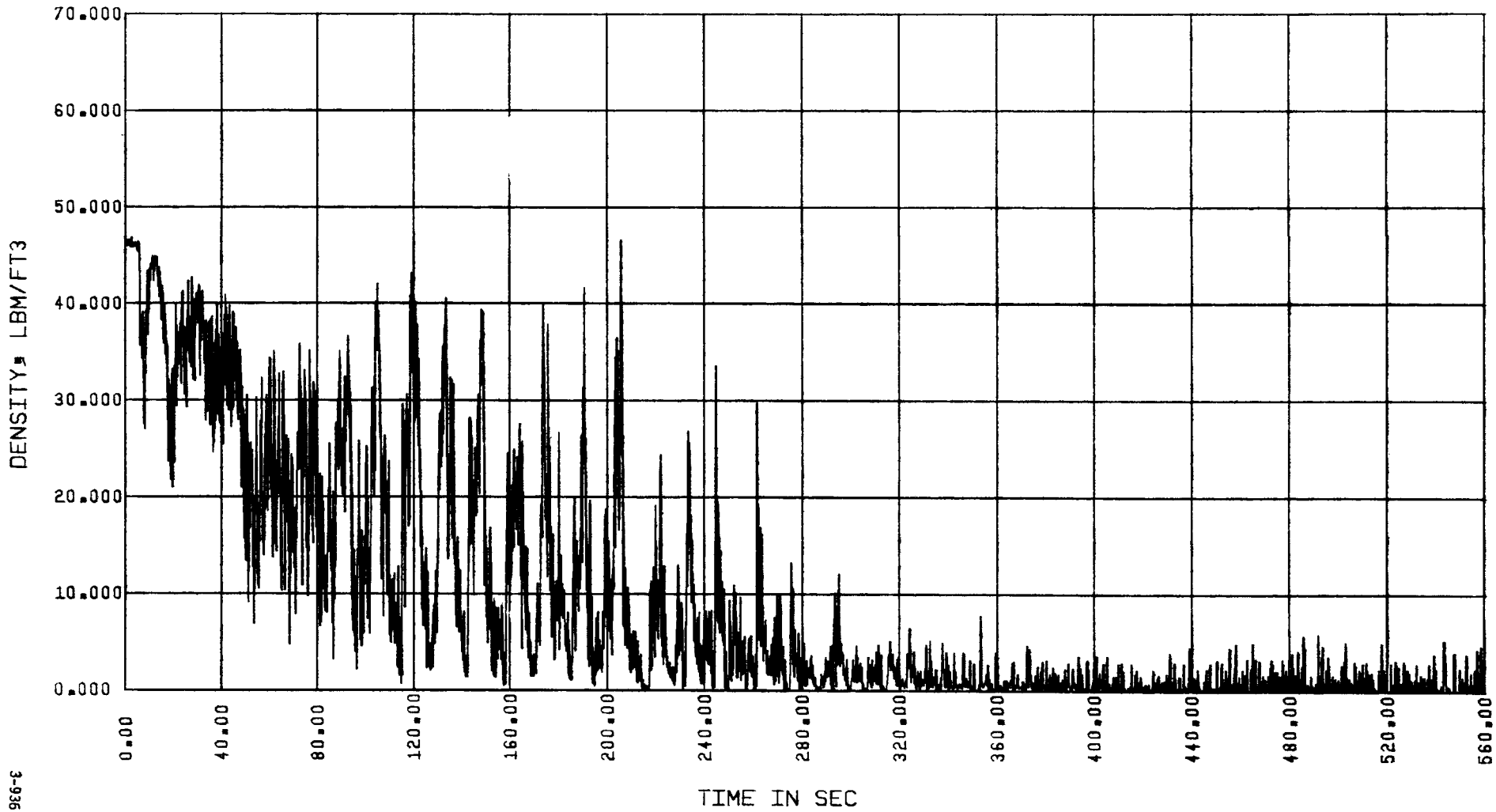
3-934

TEST 1380/1000 PSIA FW FWD BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9

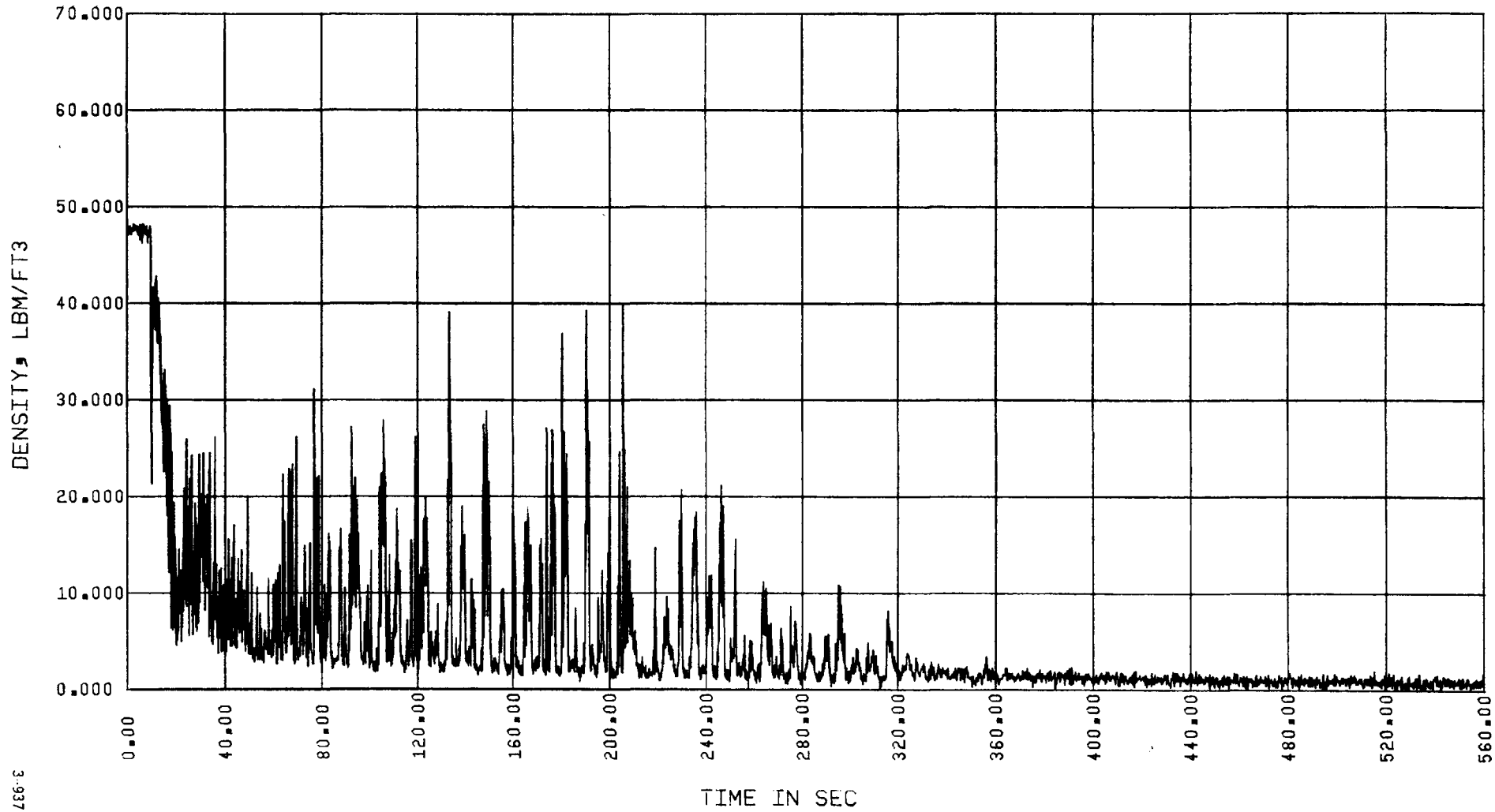


3-935

TEST 1380/1000 PSIA FW FWD BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10

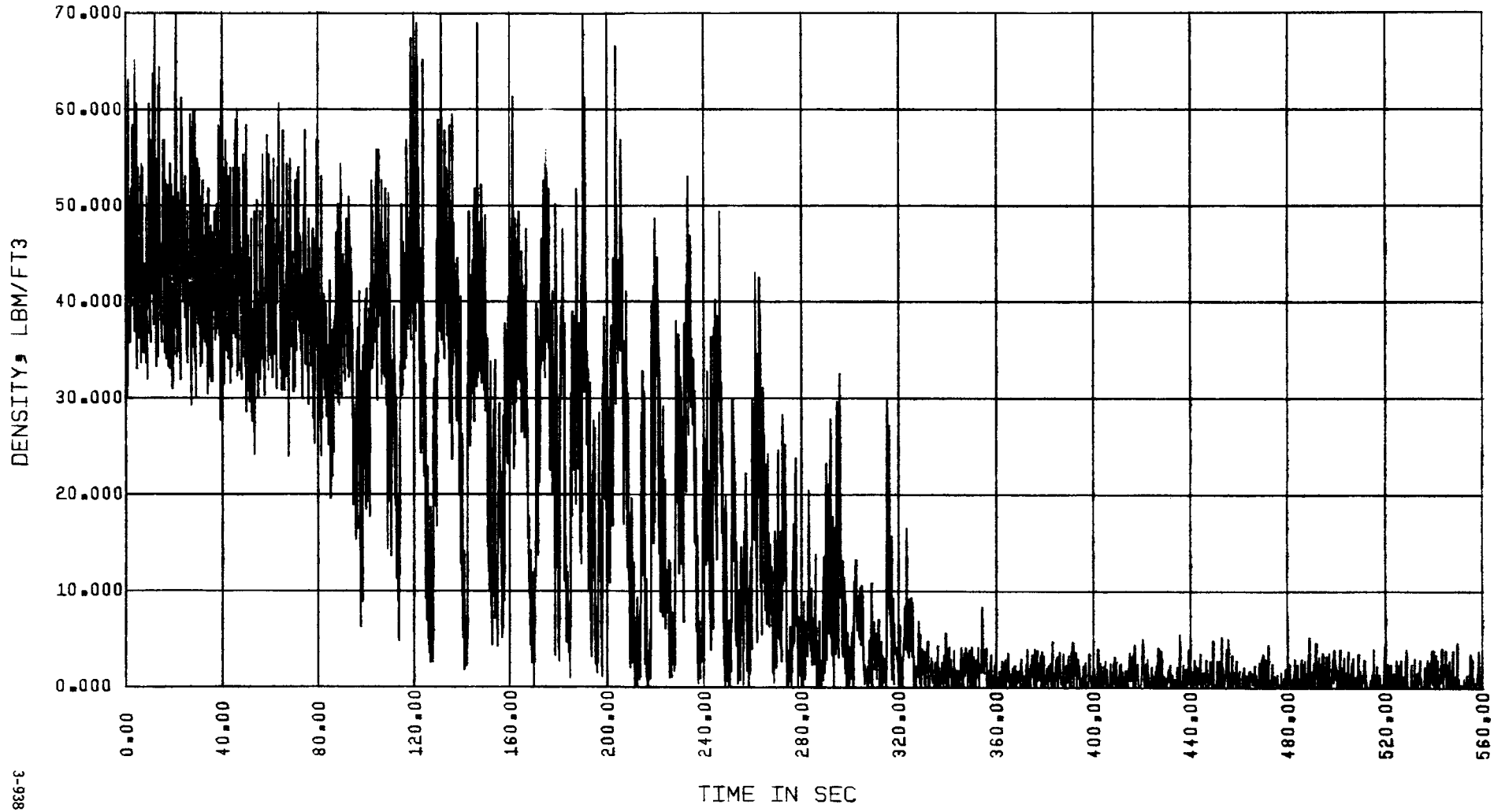


TEST 1380/1000 PSIA FW FWD BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11



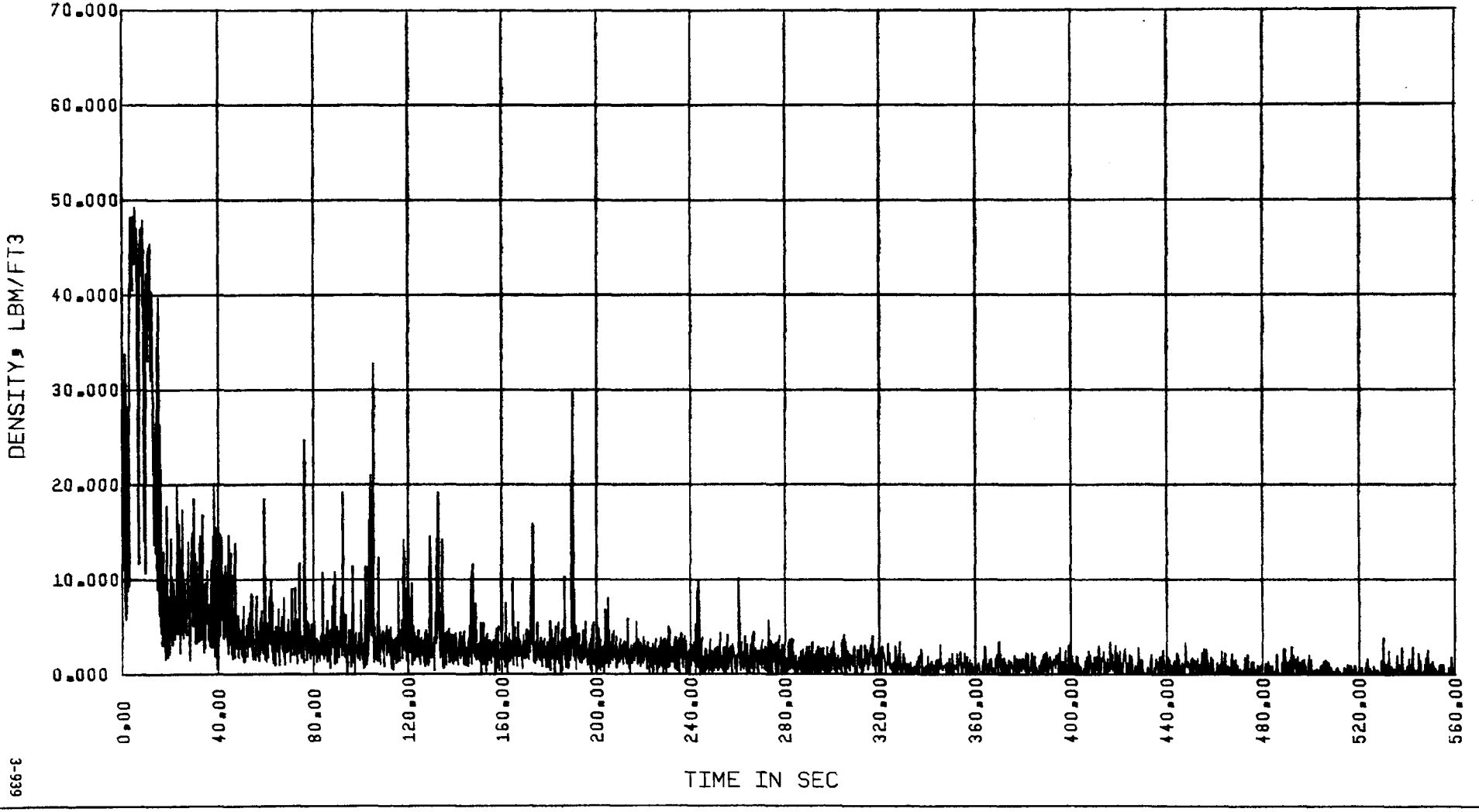
3.937

TEST 1380/1000 PSIA FW FWD BDN
DENSITY BEAM1 AECL GD
PLOT NO.12



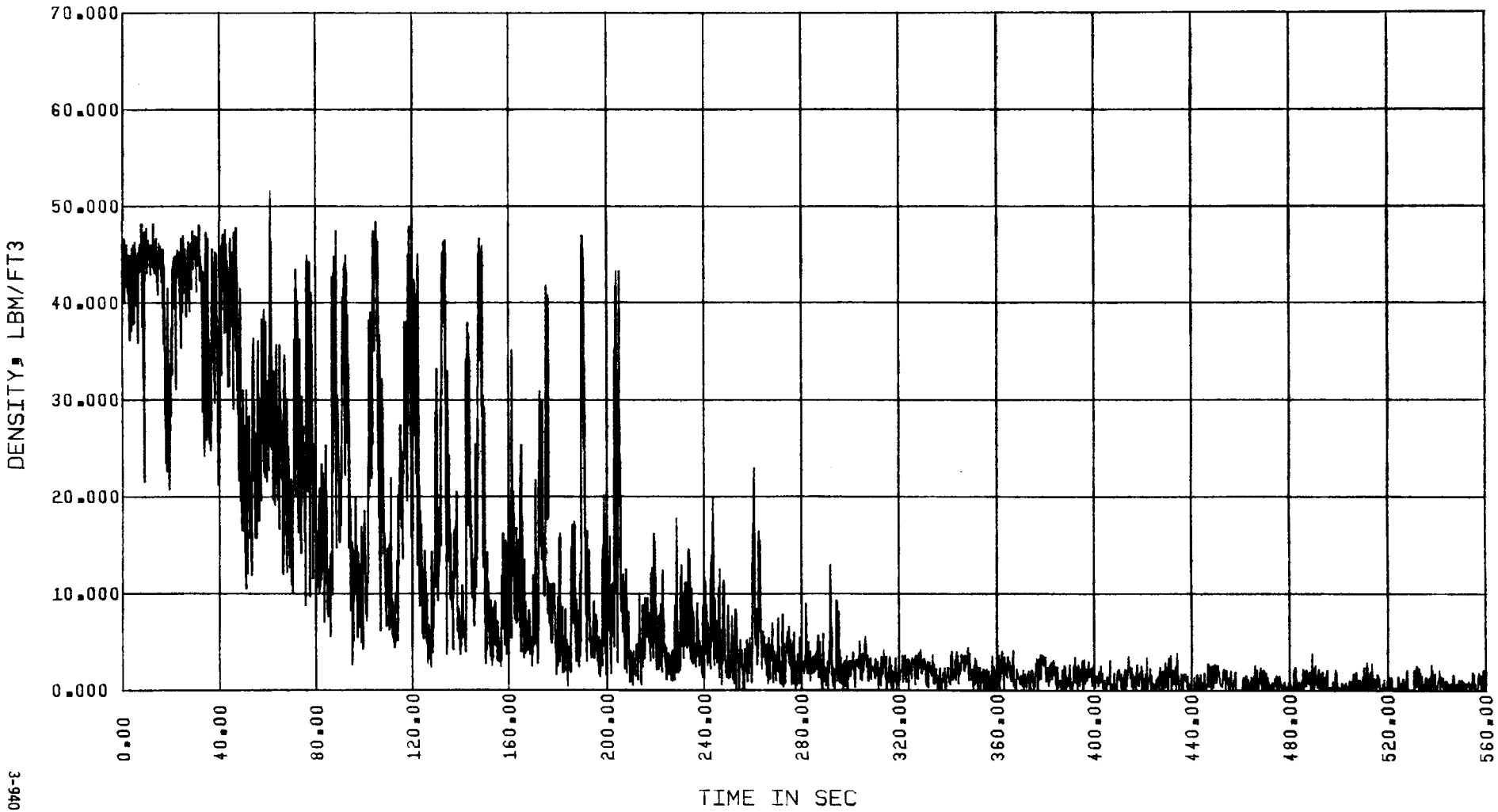
3-938

TEST 1380/1000 PSIA FW FWD BDN
DENSITY BEAM2 AECL GD
PLOT NO.13

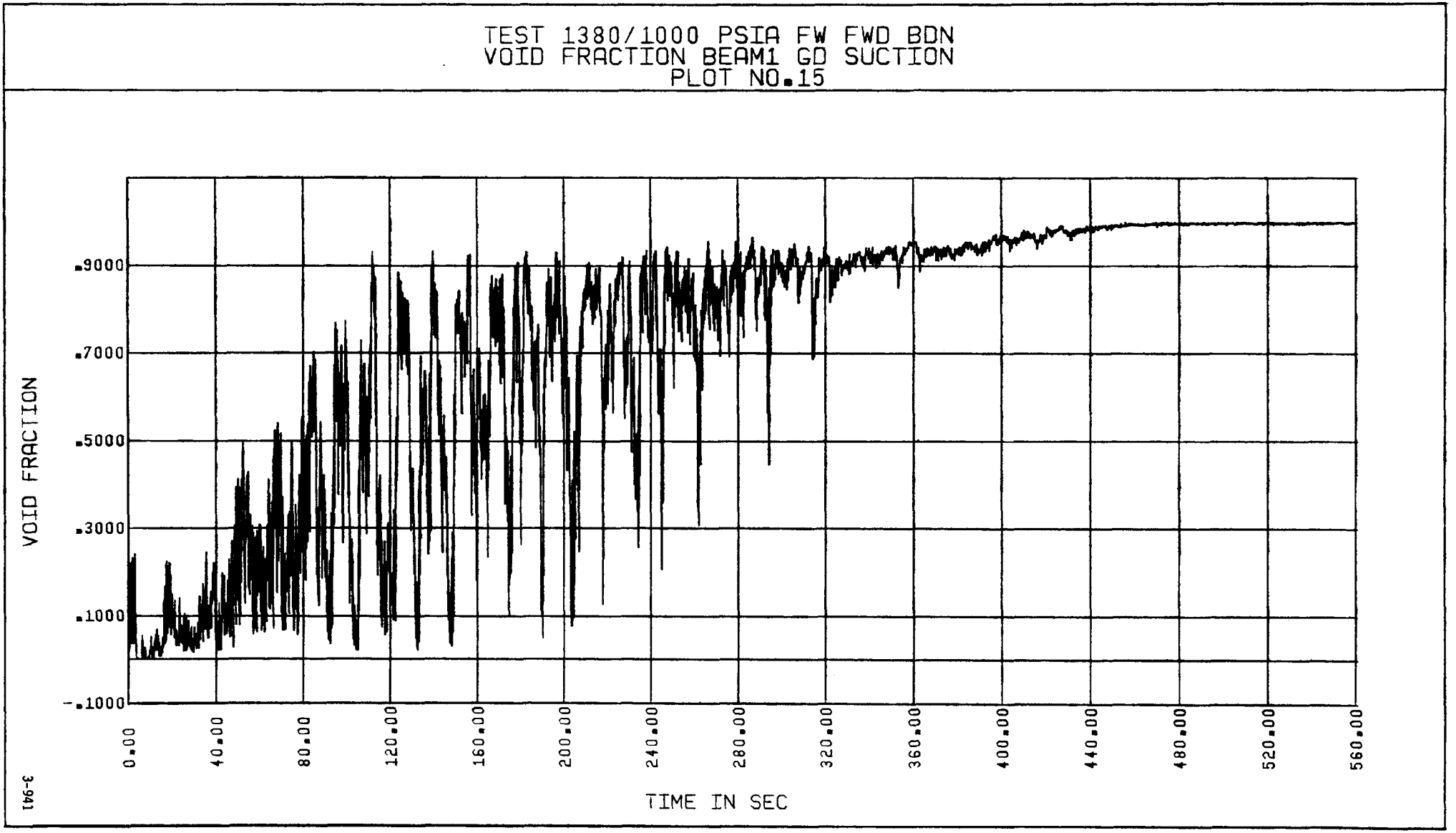


3-939

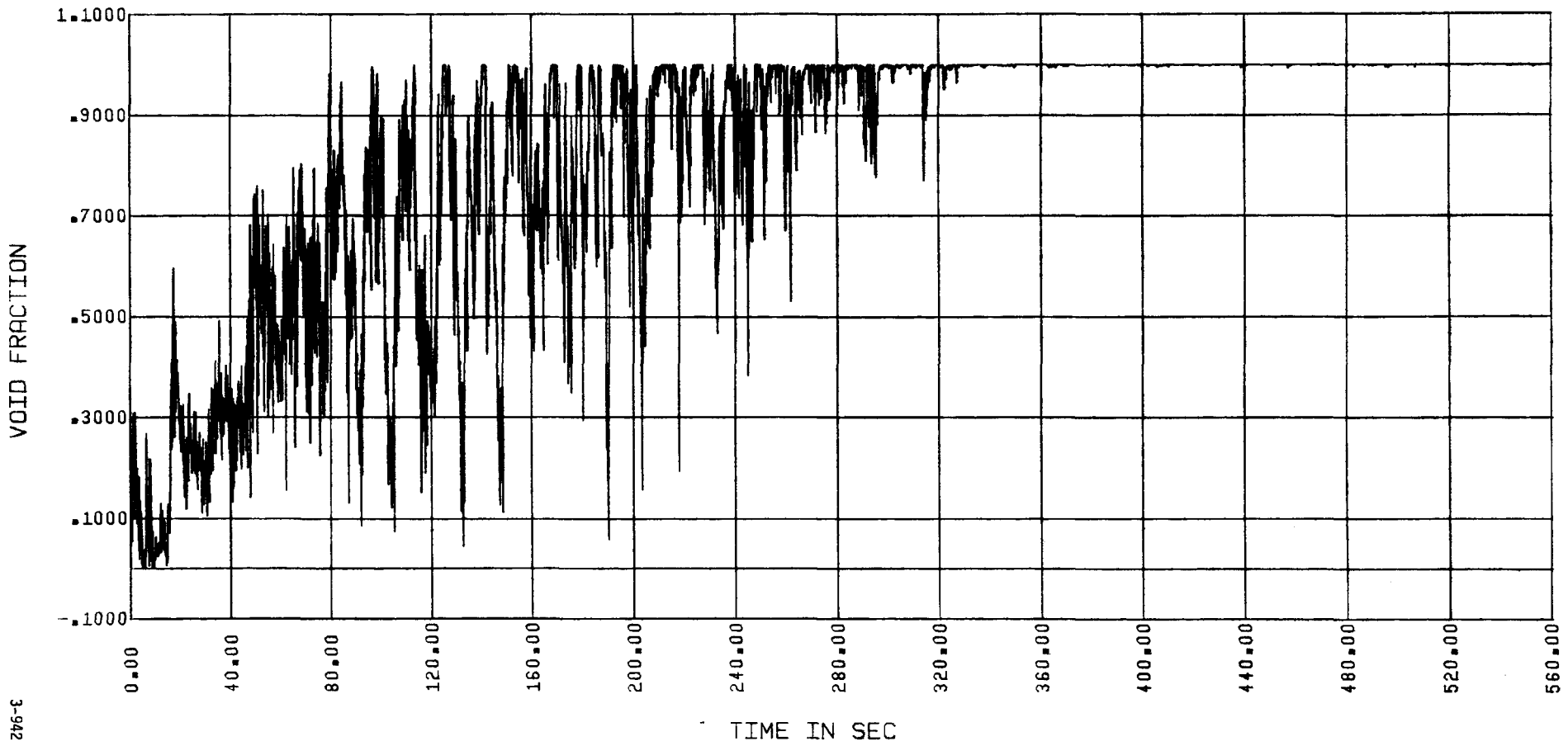
TEST 1380/1000 PSIA FW FWD BDN
DENSITY BEAM3 AECL GD
PLOT NO.14



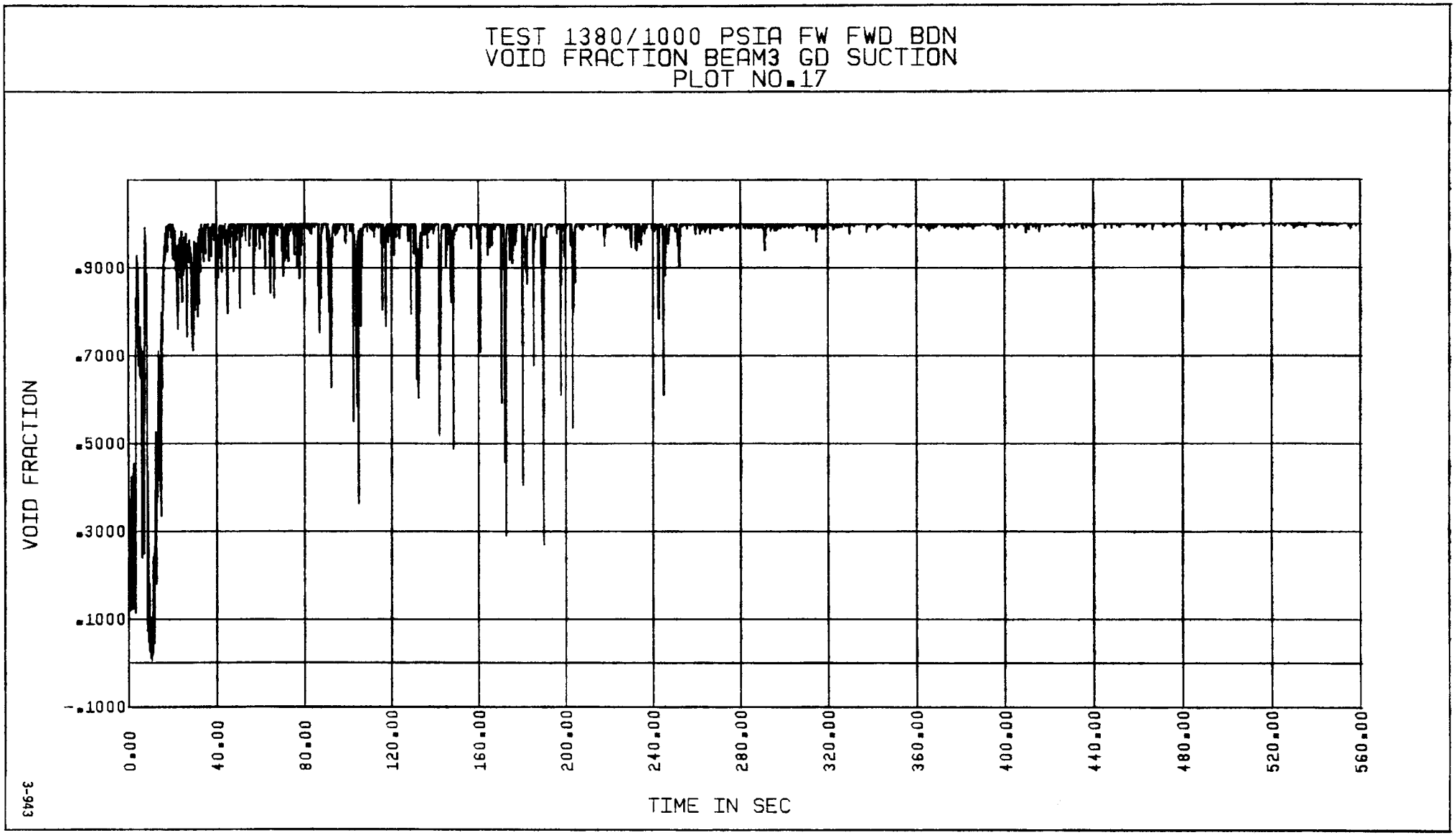
3-940


TEST 1380/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
440.00
480.00
520.00
560.00
TIME IN SEC
3-941

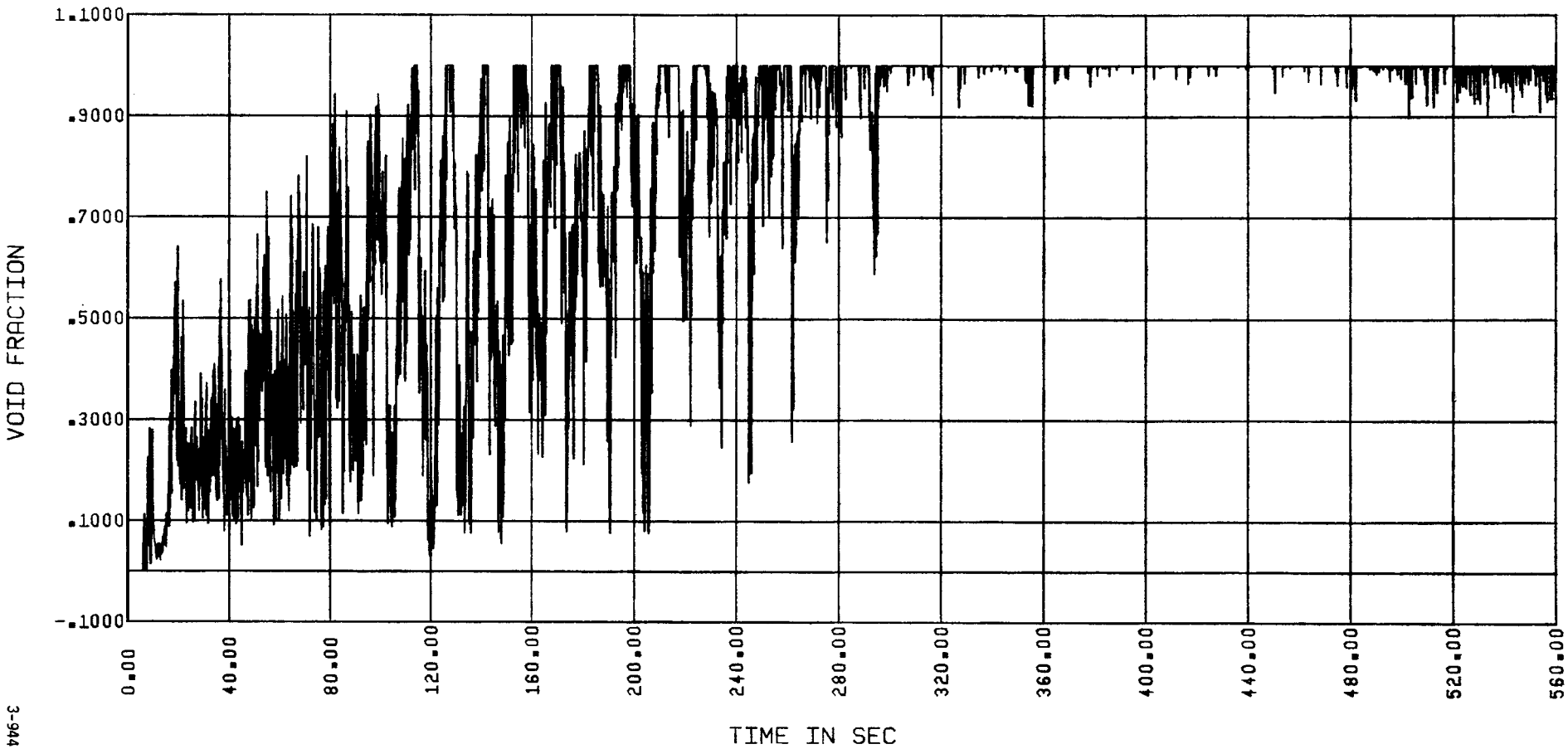
TEST 1380/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16



3-942

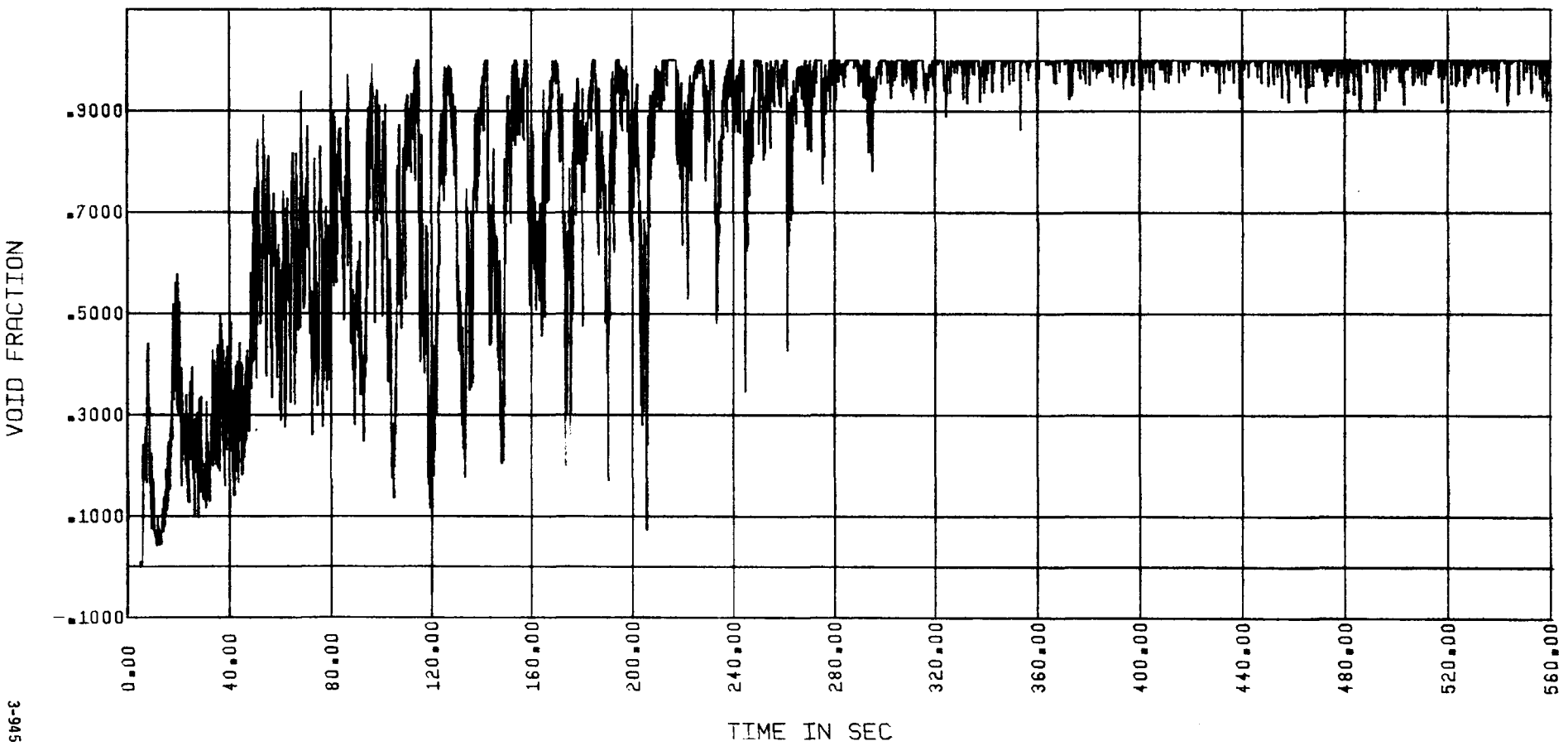

TEST 1380/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
440.00
480.00
520.00
560.00
TIME IN SEC
3-943

TEST 1380/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO.18



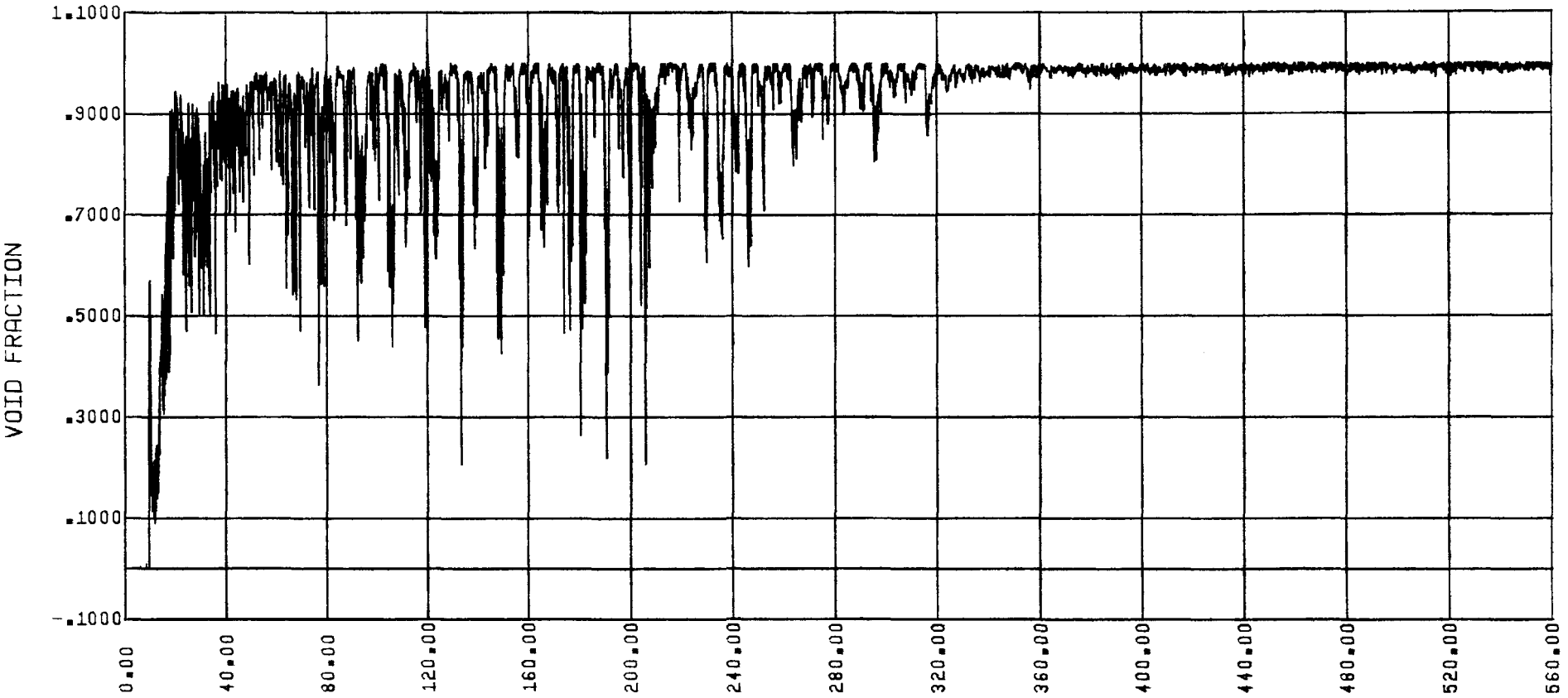
3-944

TEST 1380/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19

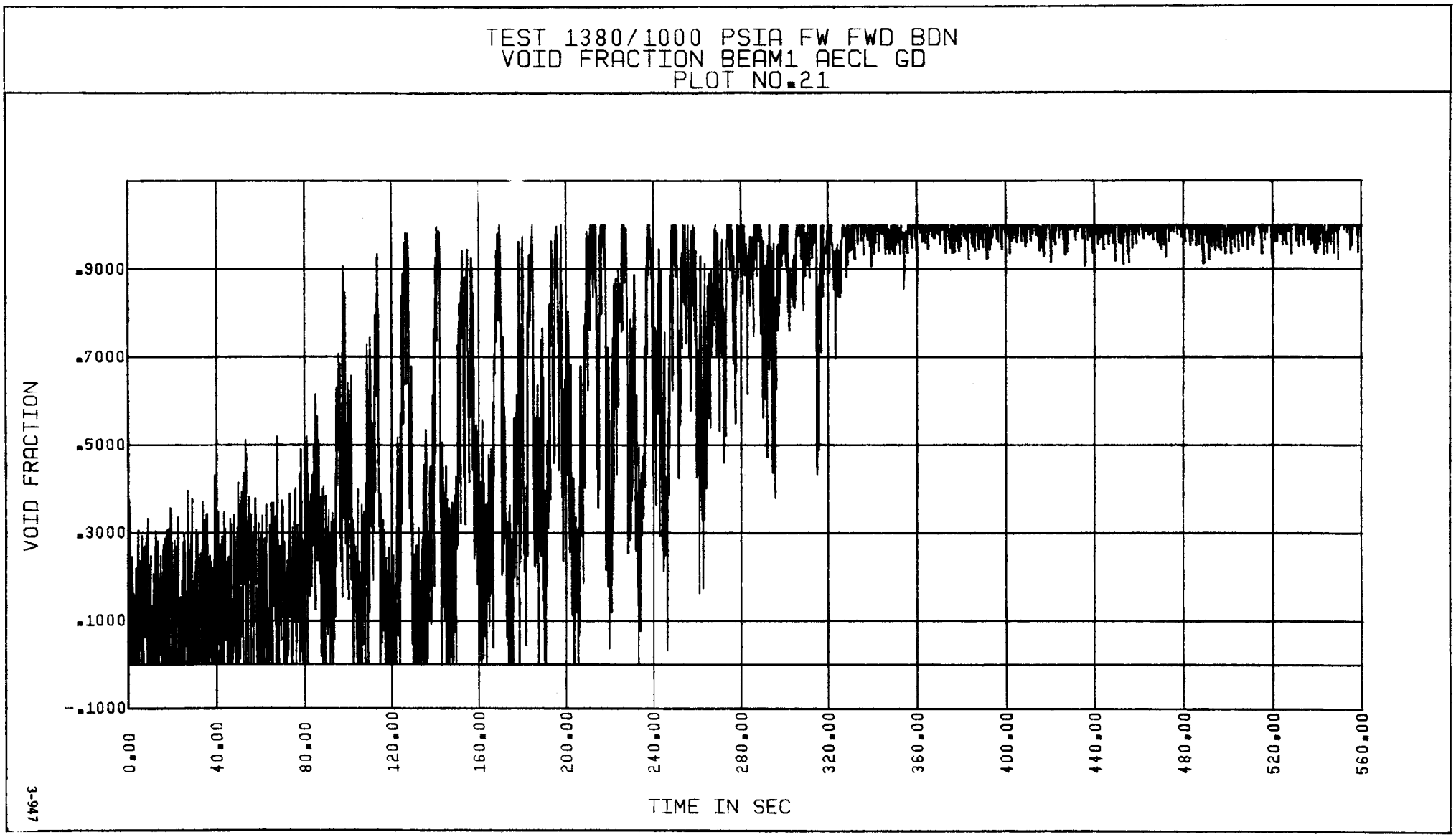


3-945

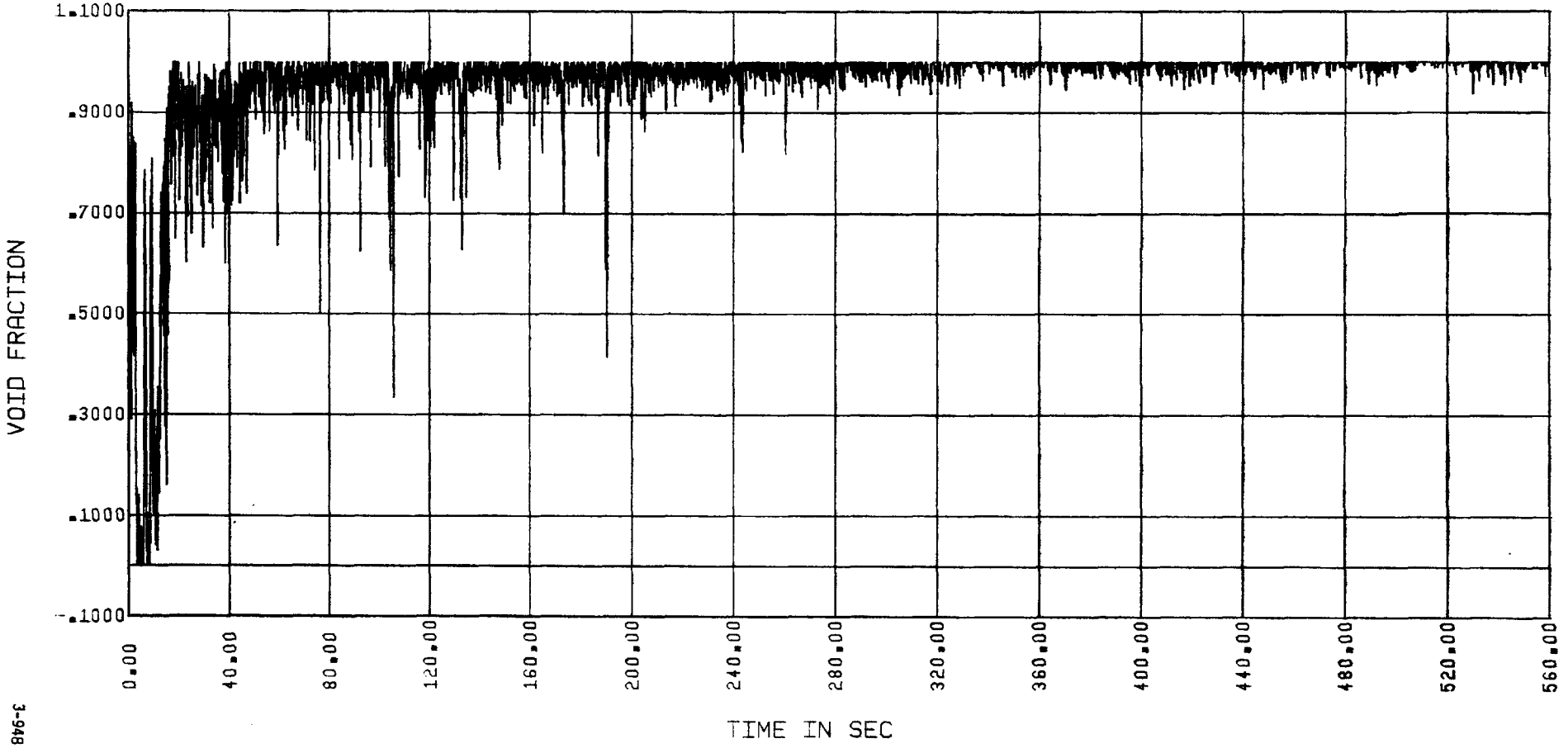
TEST 1380/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20



3-946

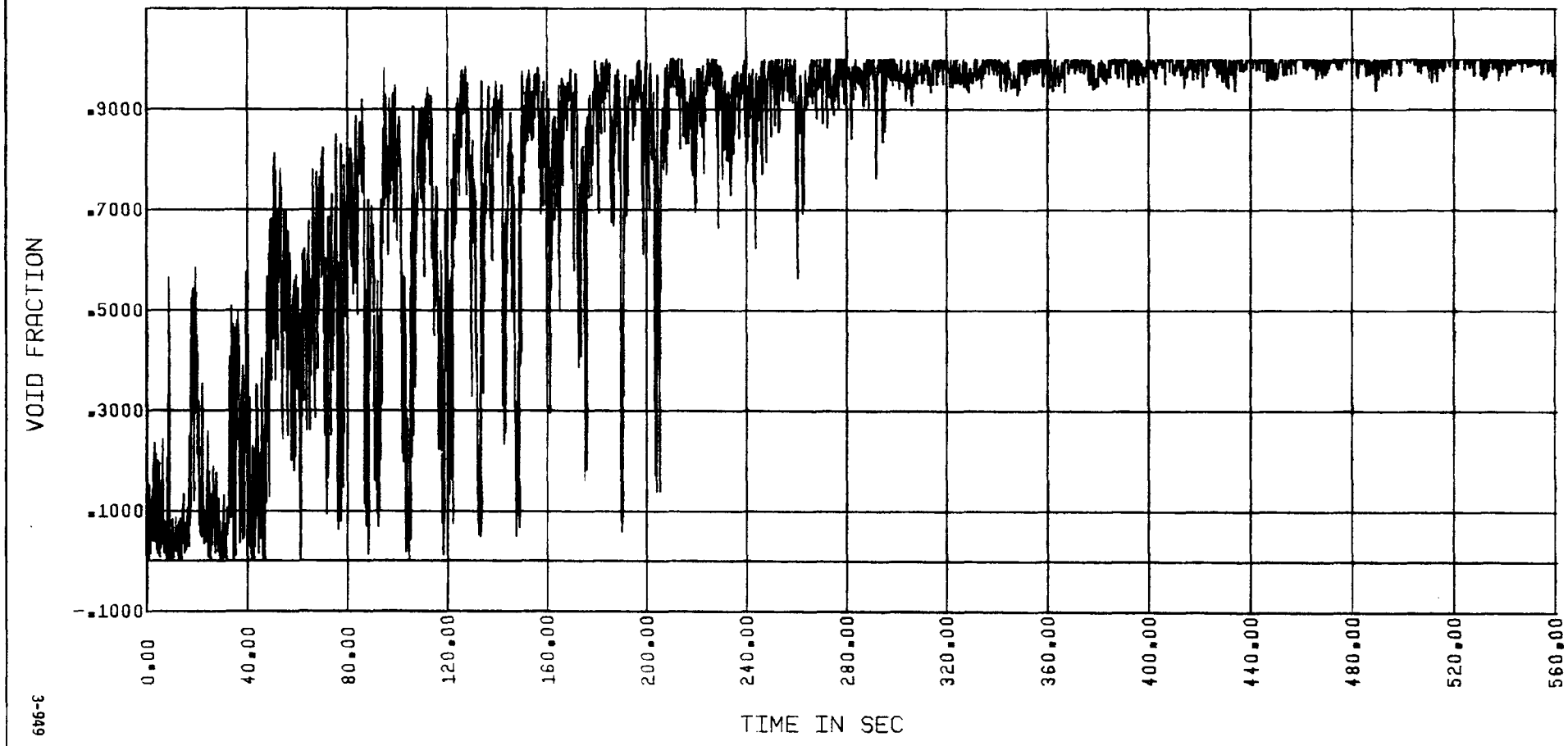

TEST 1380/1000 PSIA FW FWD BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
440.00
480.00
520.00
560.00
TIME IN SEC
3-947

TEST 1380/1000 PSIA FW FWD BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22



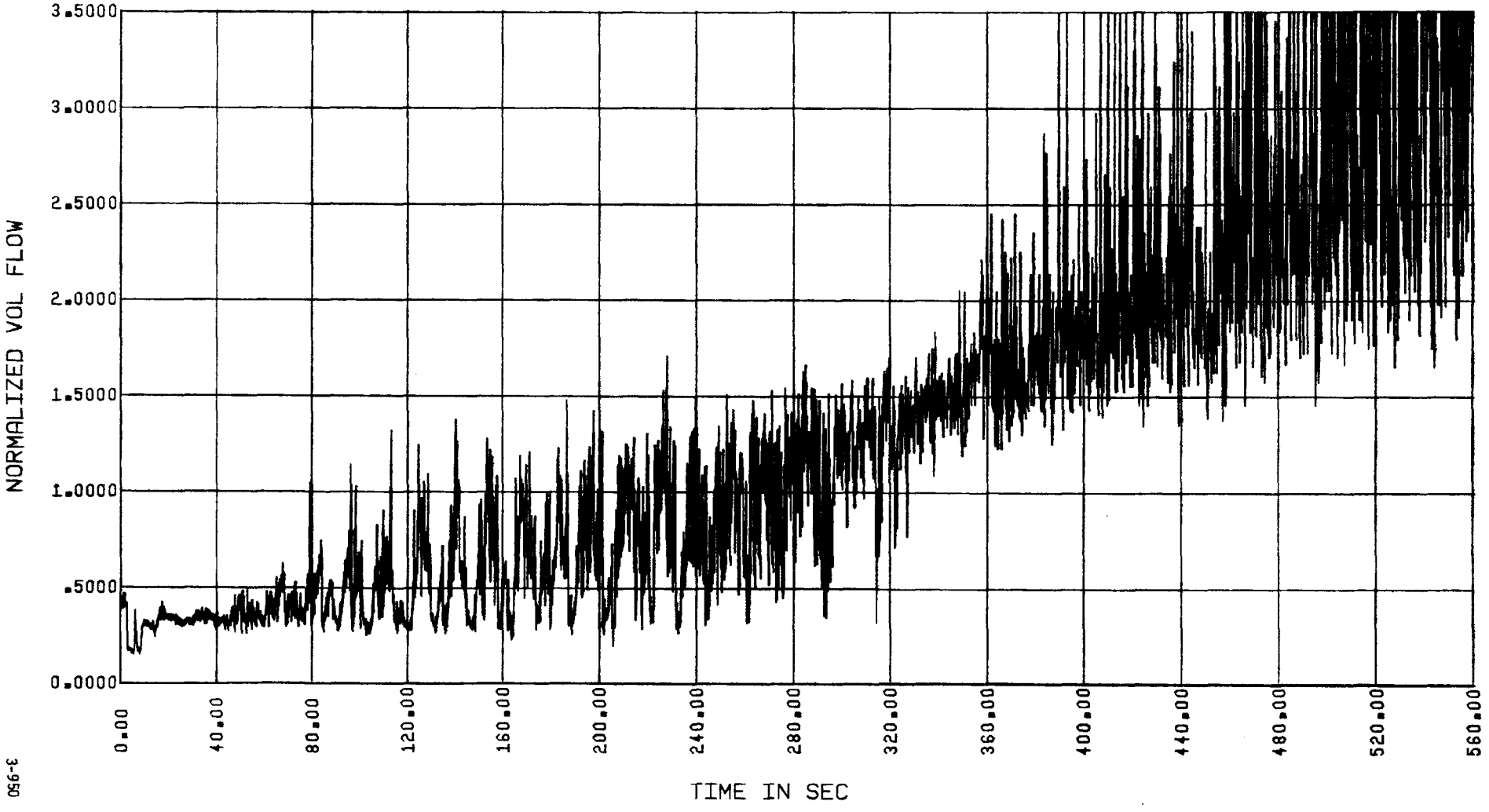
3-948

TEST 1380/1000 PSIA FW FWD BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23



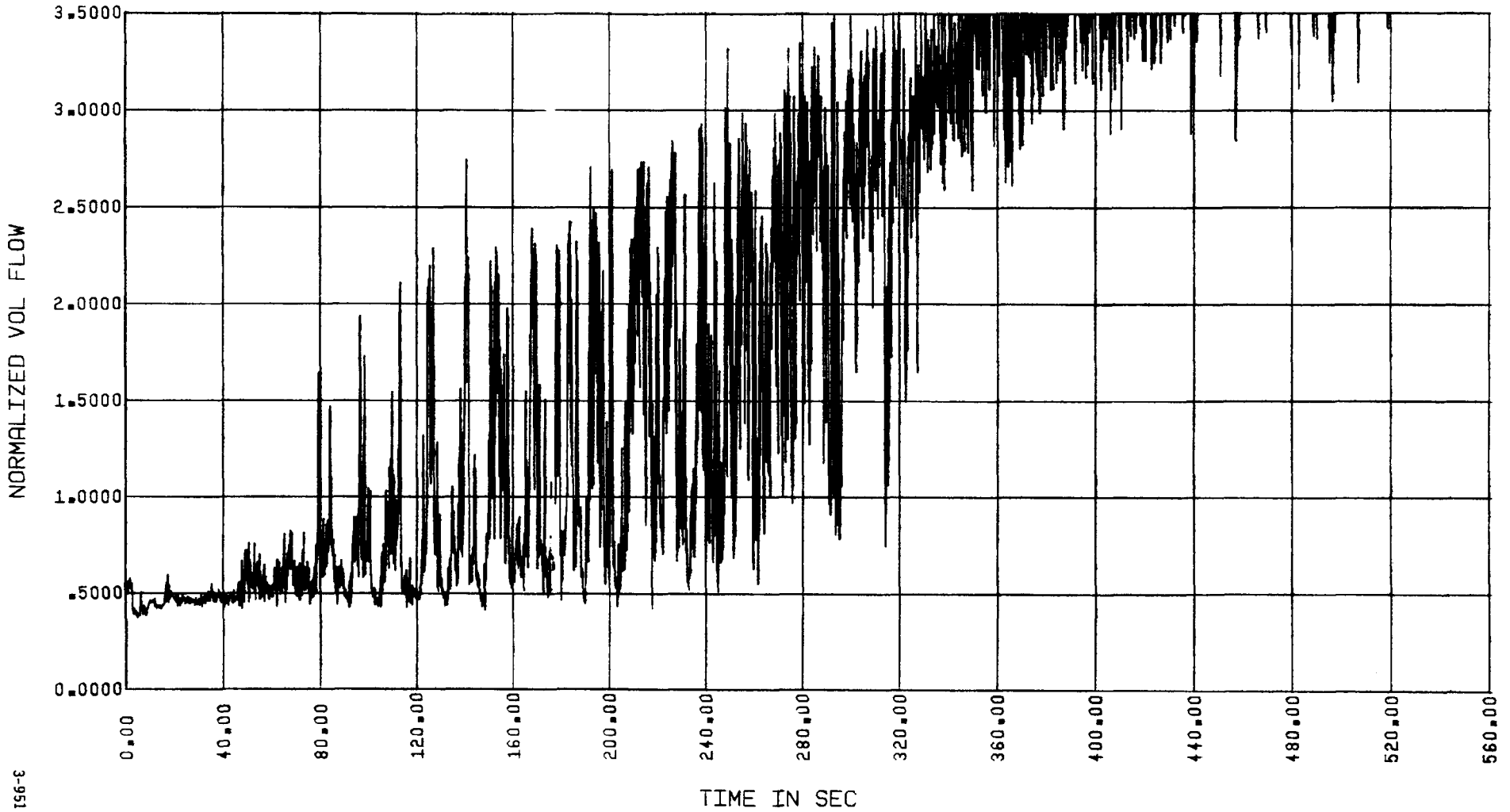
3-949

TEST 1380/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-DD/GD2 S
PLOT NO.24



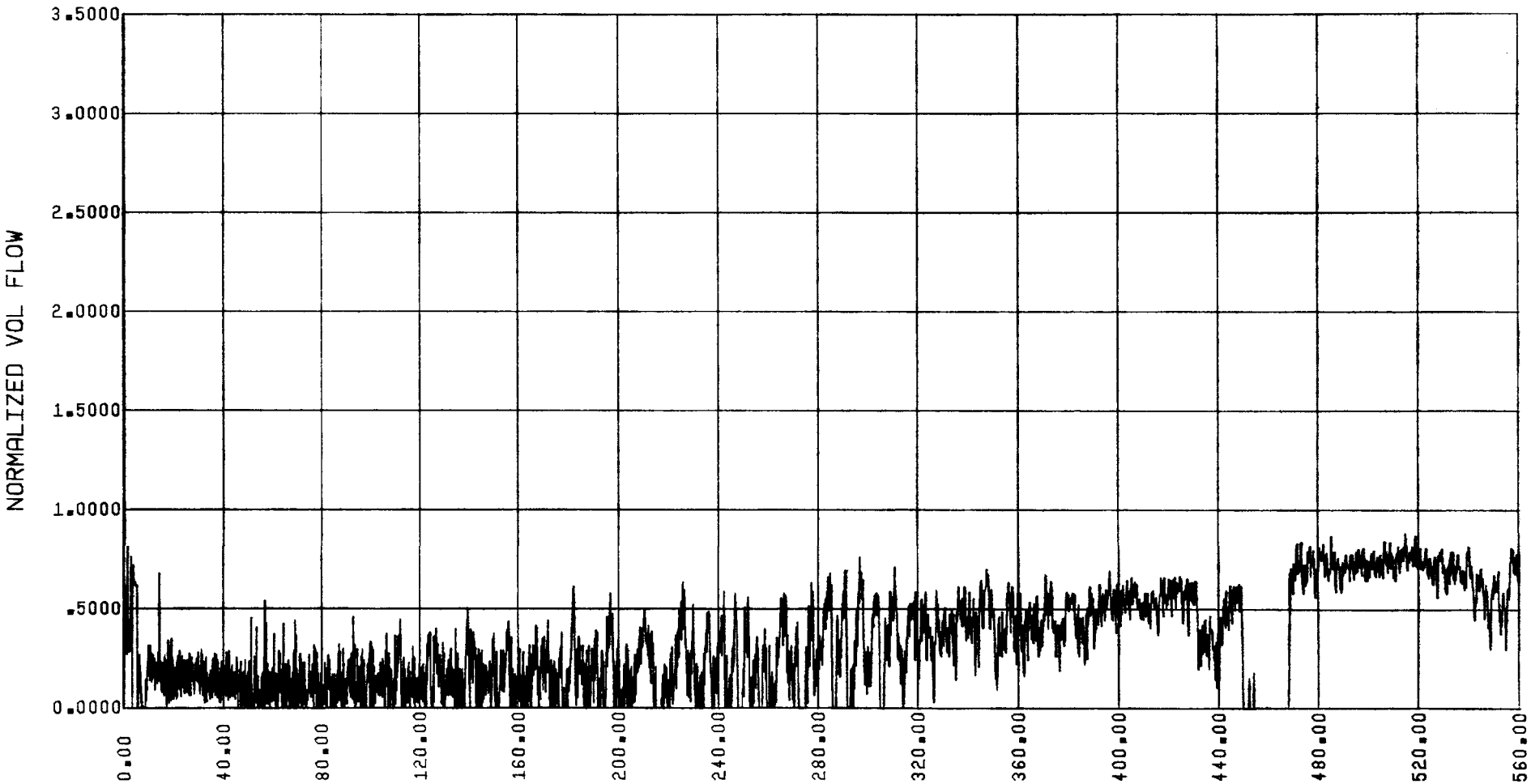
3-950

TEST 1380/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-DD/GD2 S
PLOT NO.25



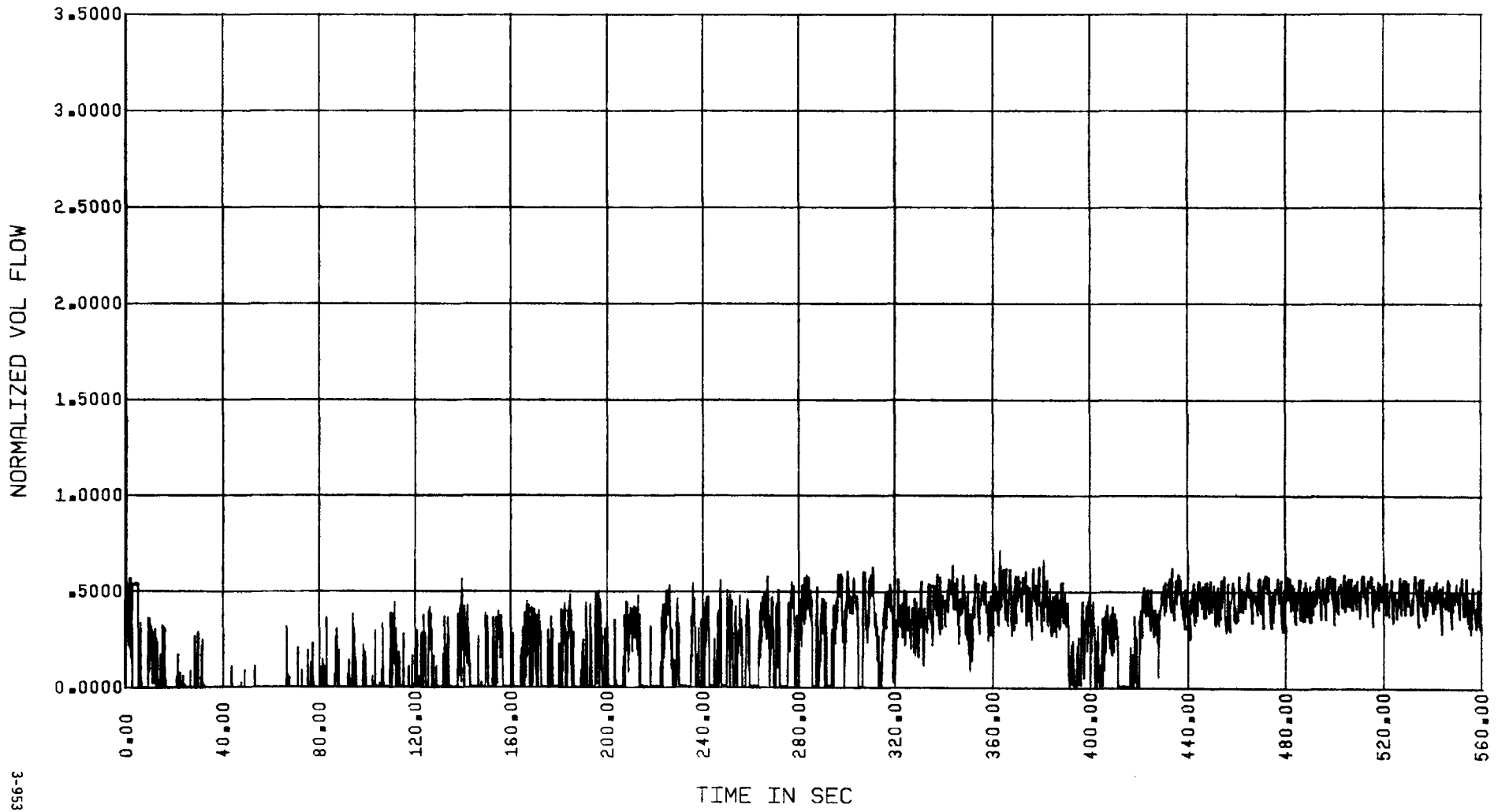
3-951

TEST 1380/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-TM SUCT
PLOT NO.26



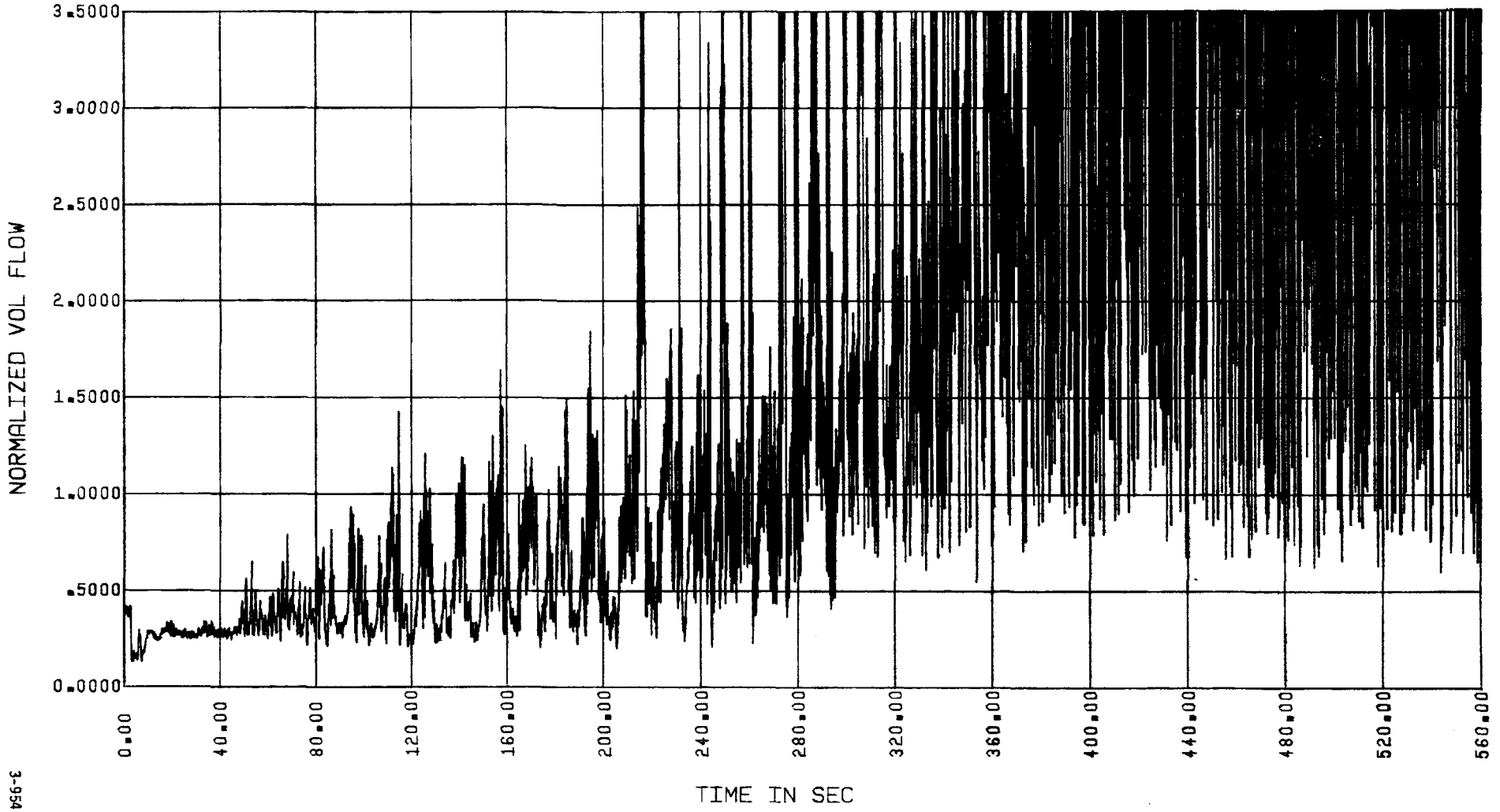
3-952

TEST 1380/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-TM SUCT
PLOT NO.27

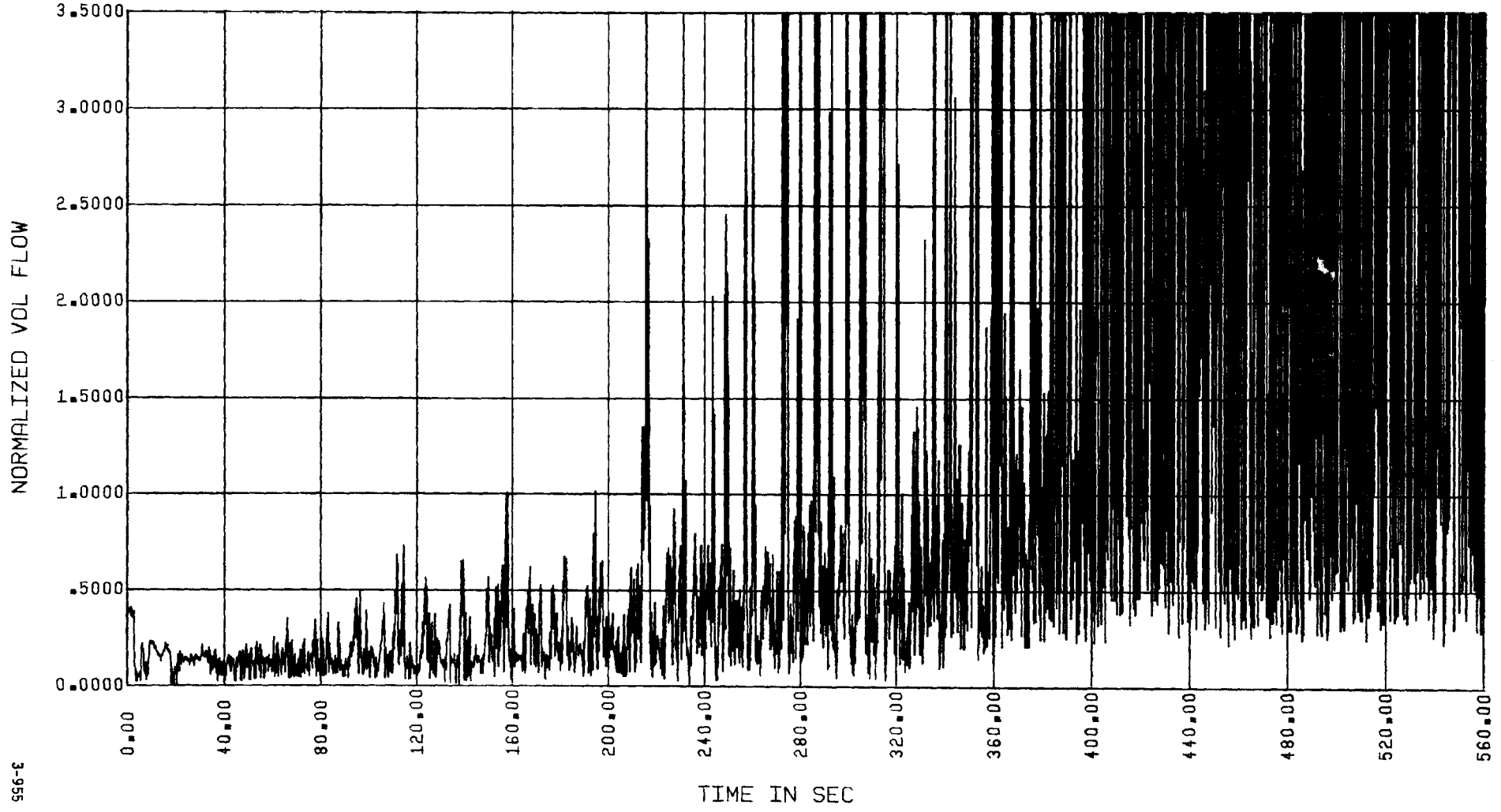


3-953

TEST 1380/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-DD/GD2 D
PLOT NO.28

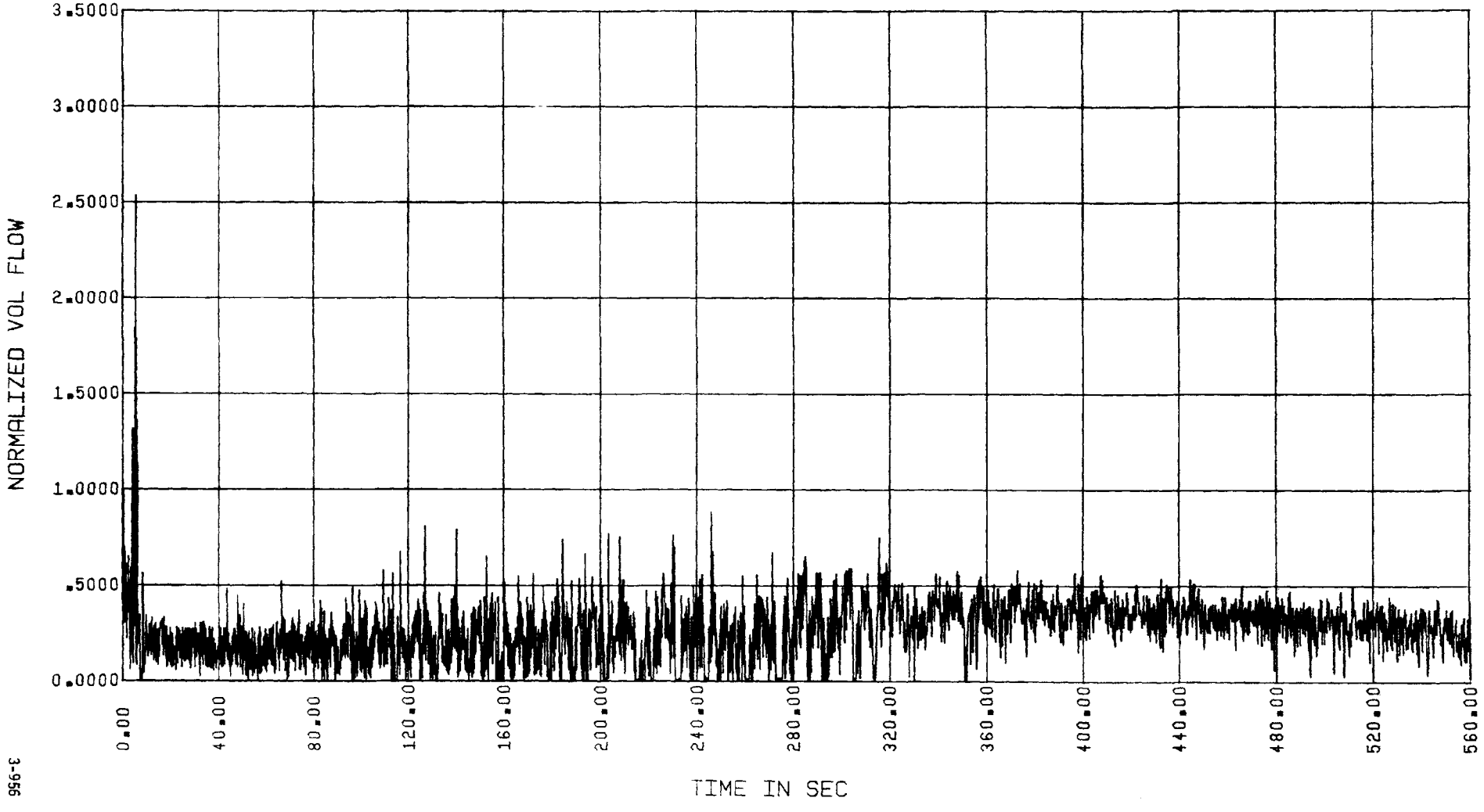


TEST 1380/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-DD/GD2 D
PLOT NO.29



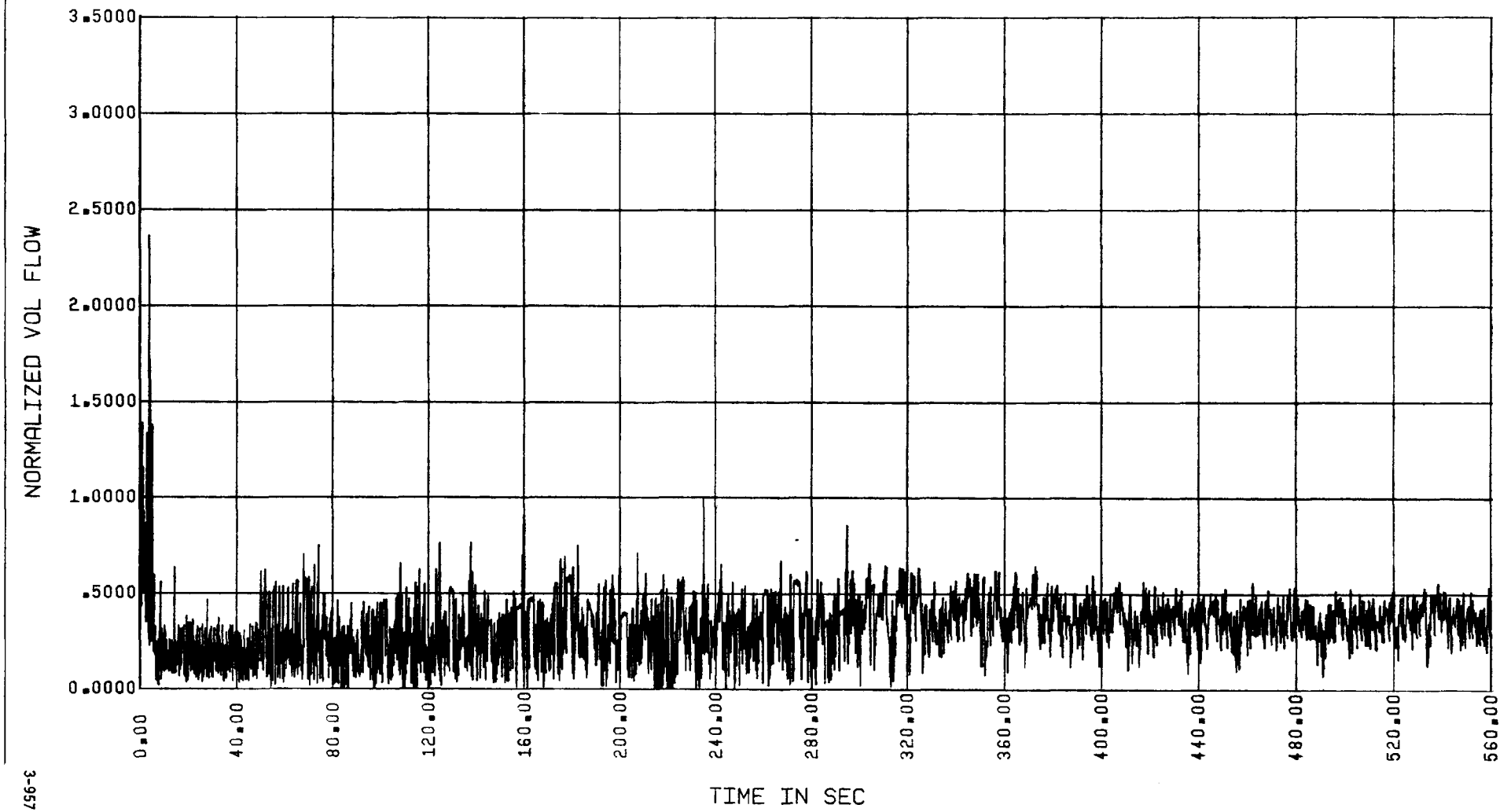
3-955

TEST 1380/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE LO-TM DSCH
PLOT NO.30

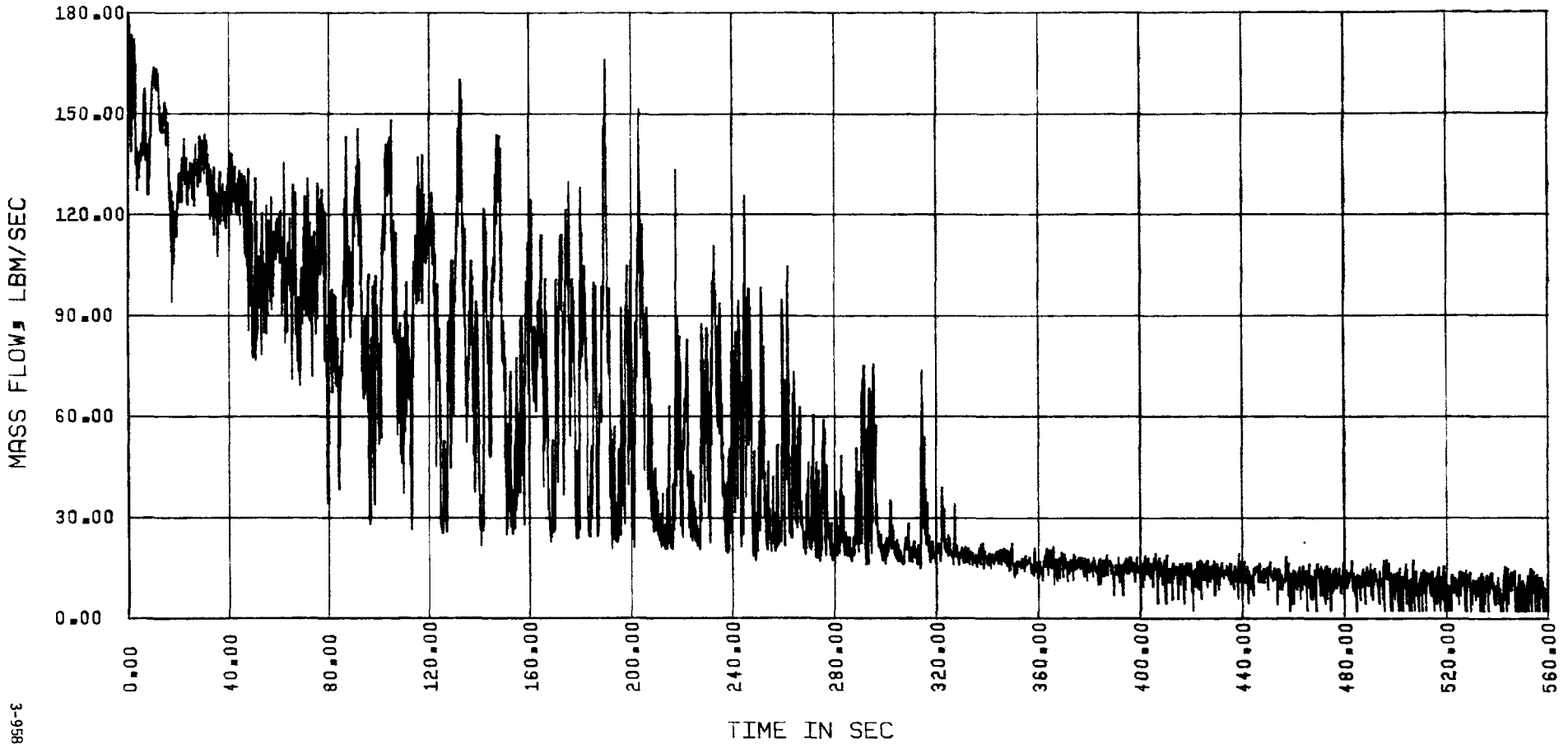


3-956

TEST 1380/1000 PSIA FW FWD BDN
NORM VOL FLOW RATE HI-TM DSCH
PLOT NO.31

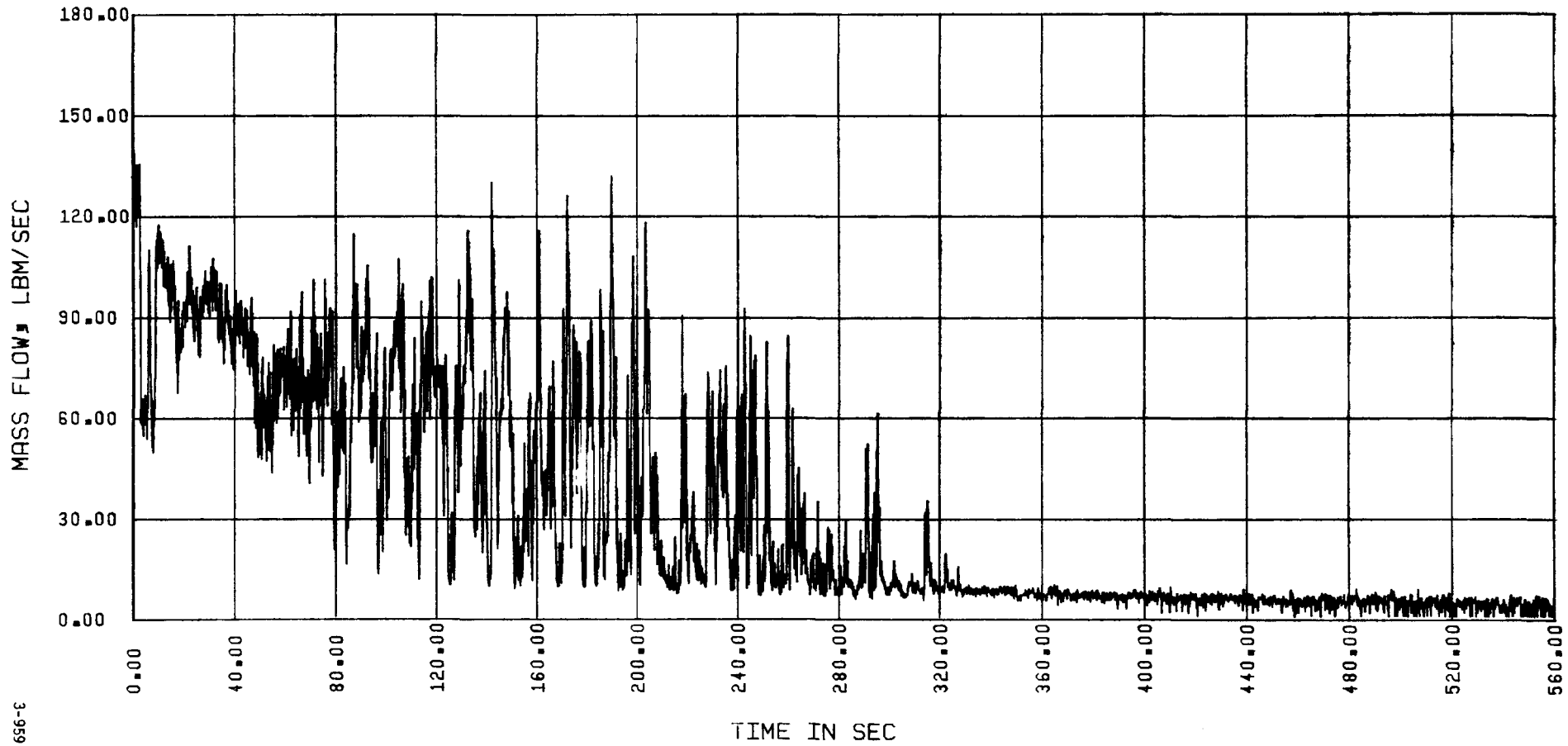


TEST 1380/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.32



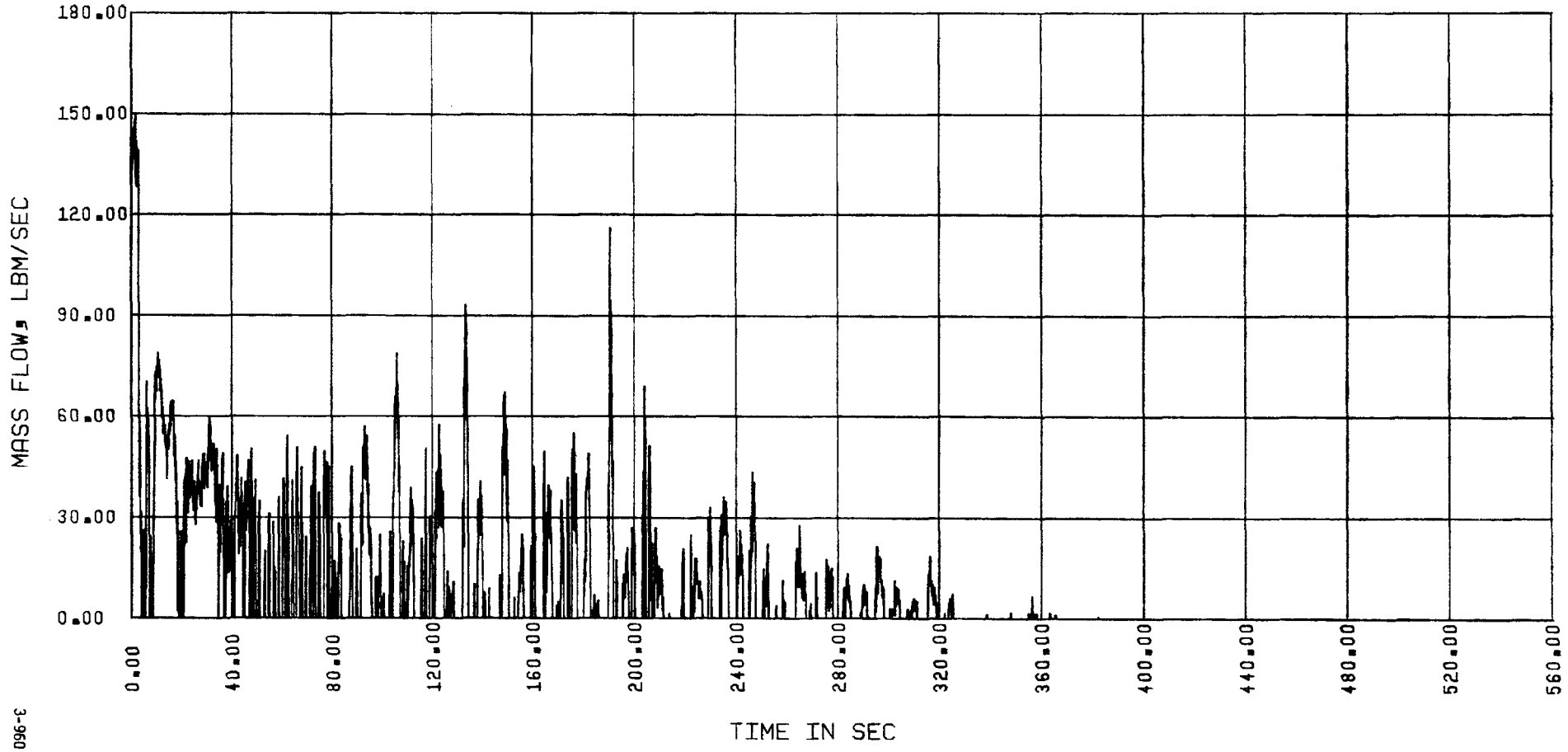
3-958

TEST 1380/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.33



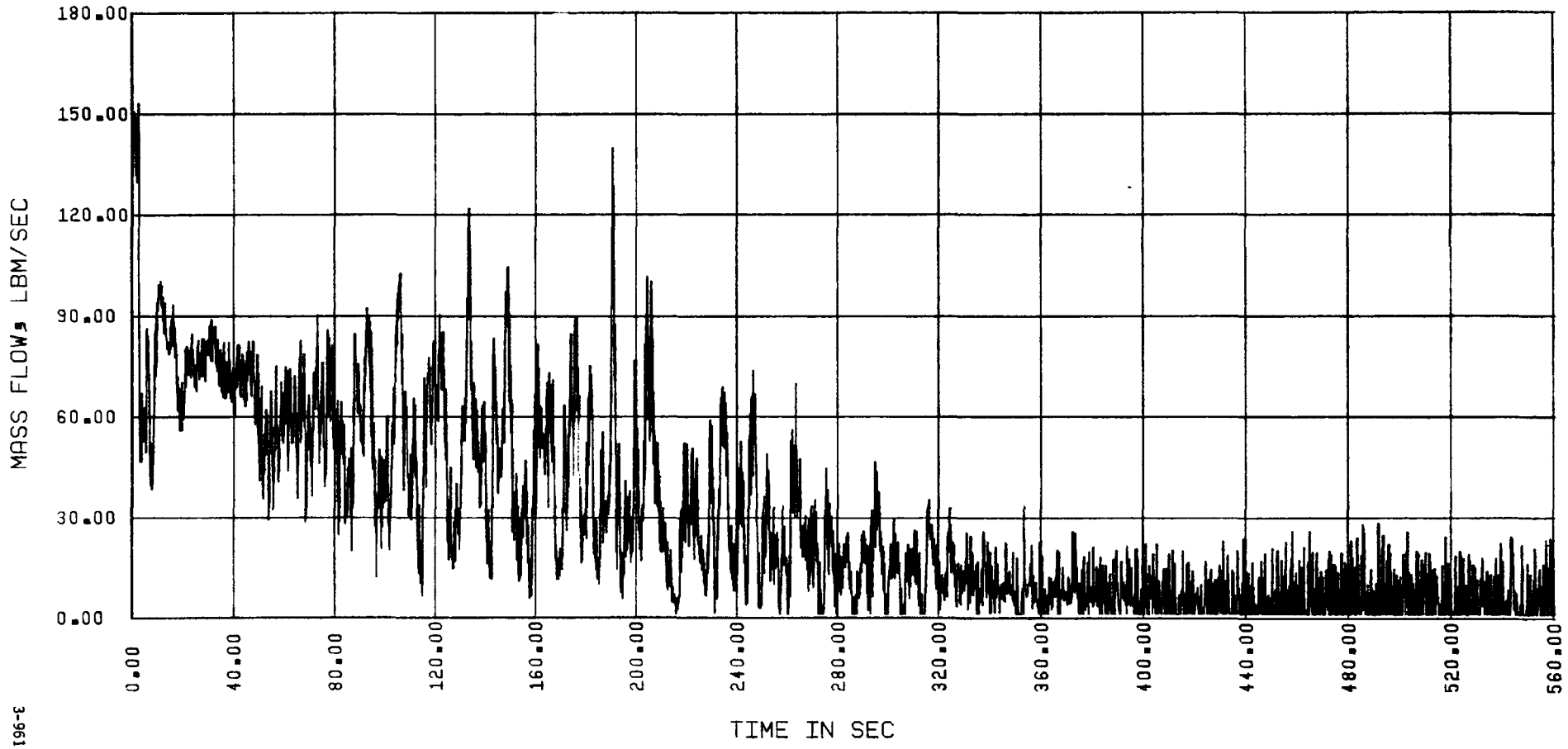
3-959

TEST 1380/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-DD/GD2 DISCH
PLOT NO.34



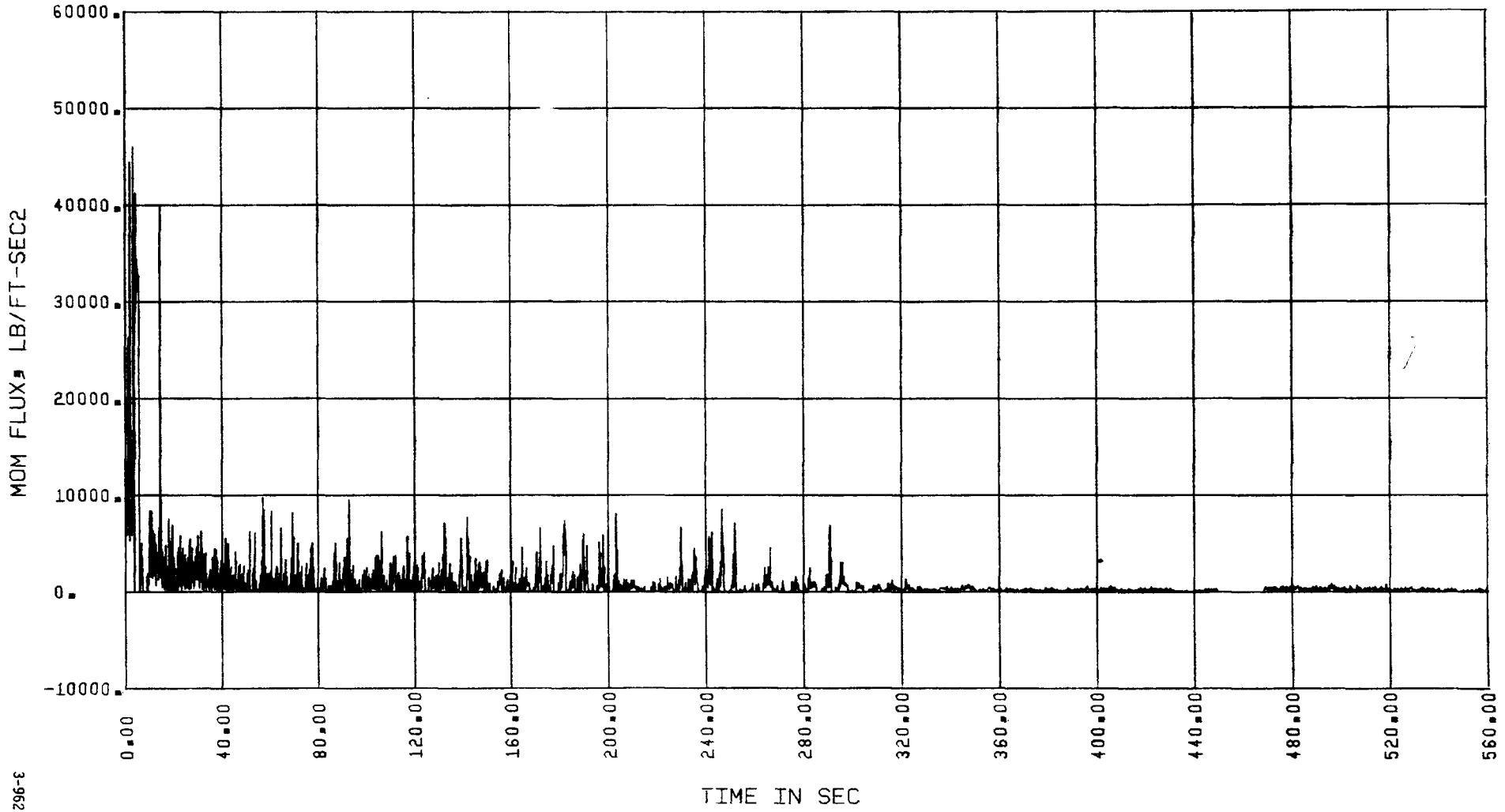
3-960

TEST 1380/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-DD/GD2 DISCH
PLOT NO.35



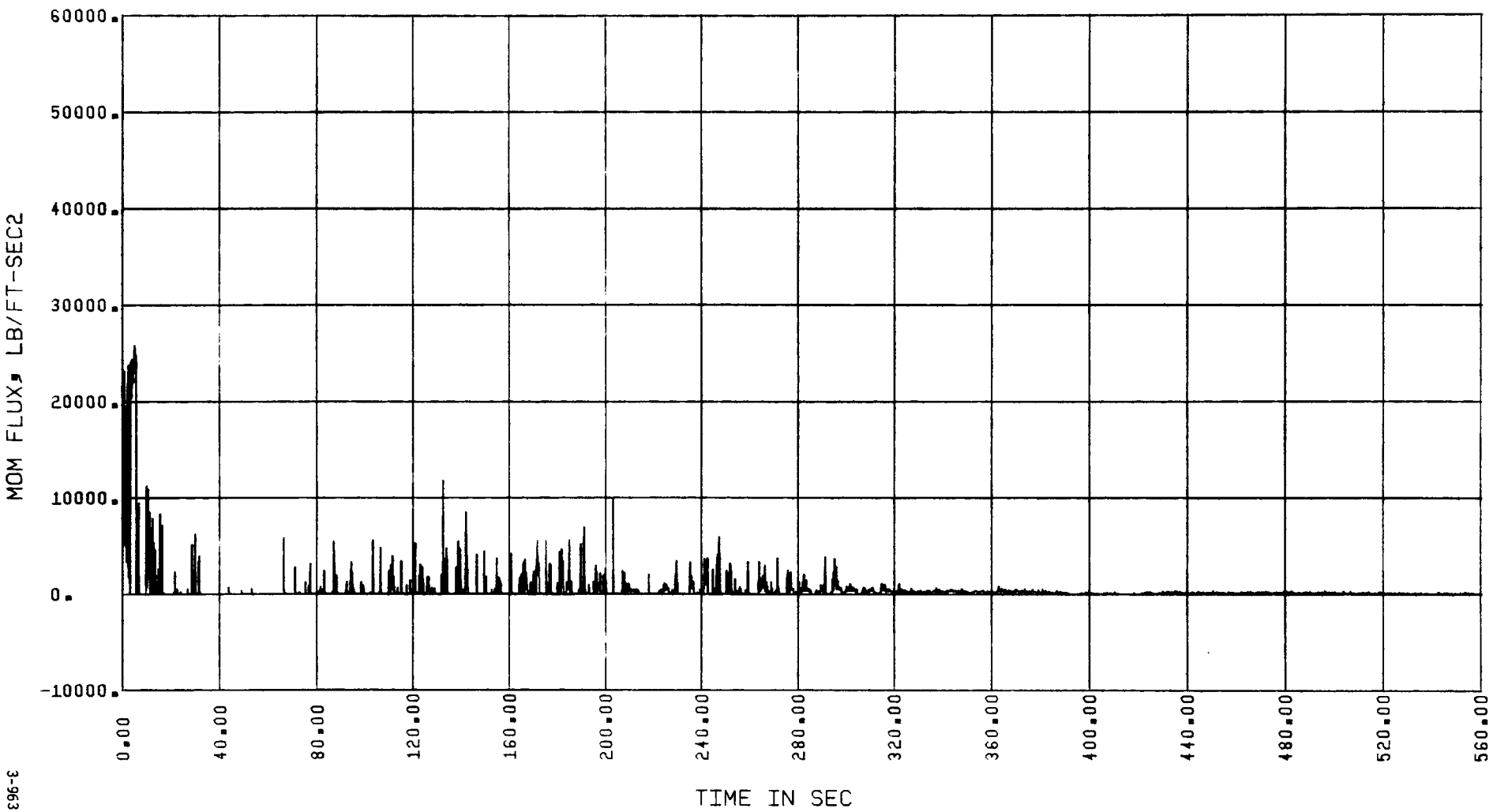
3-961

TEST 1380/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/LO-TM SUCT
PLOT NO.36



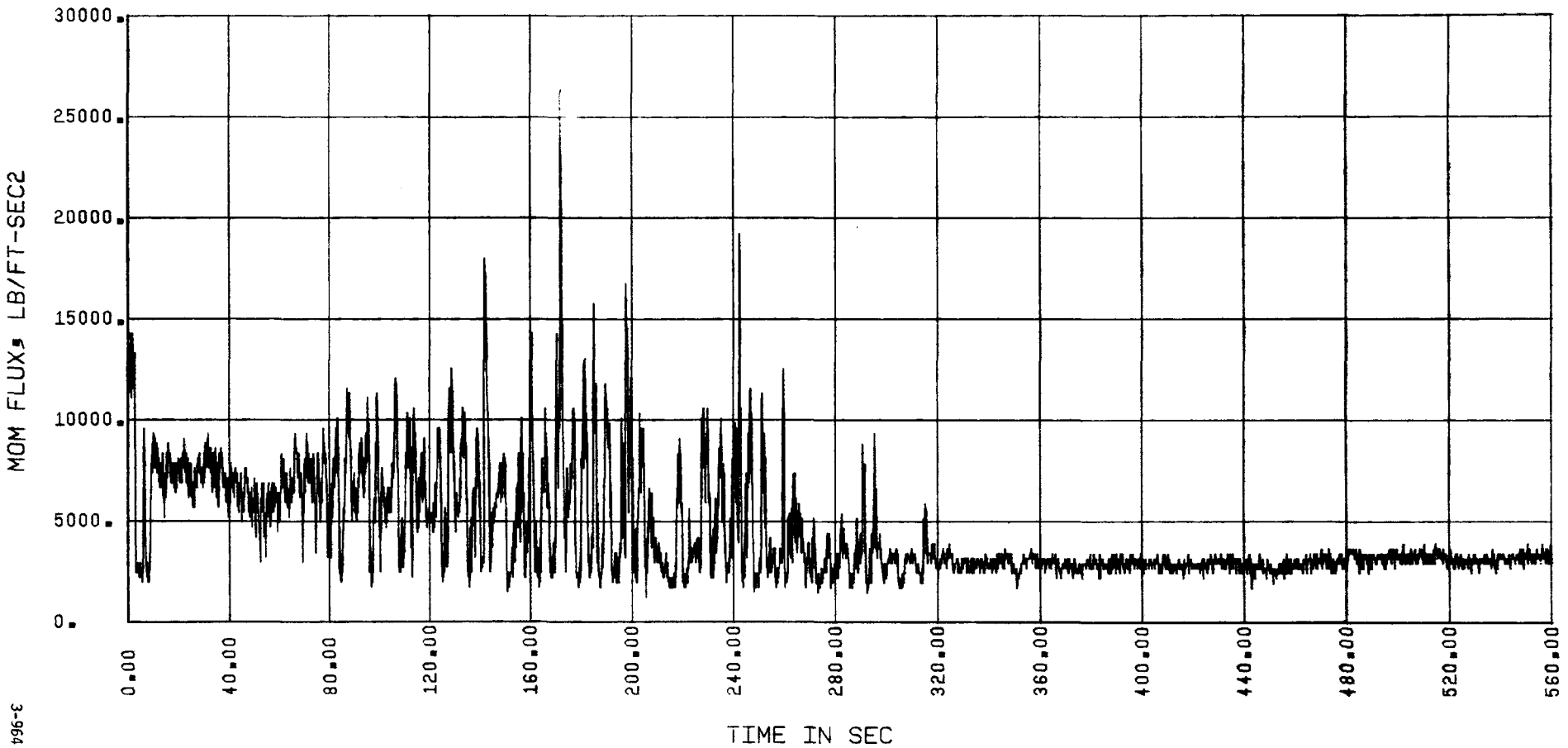
296-3

TEST 1380/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.37



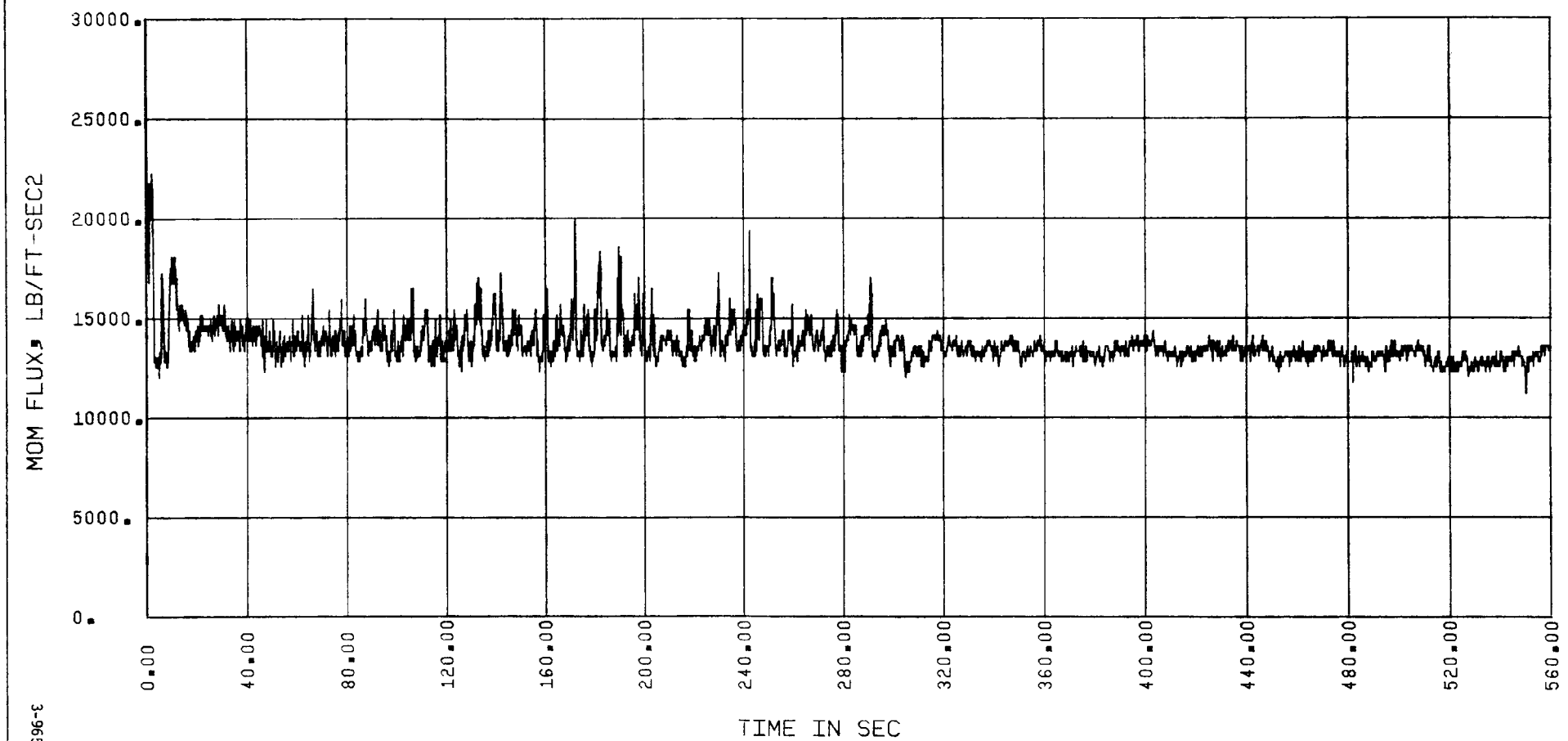
3-963

TEST 1380/1000 PSIA FW FWD BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38

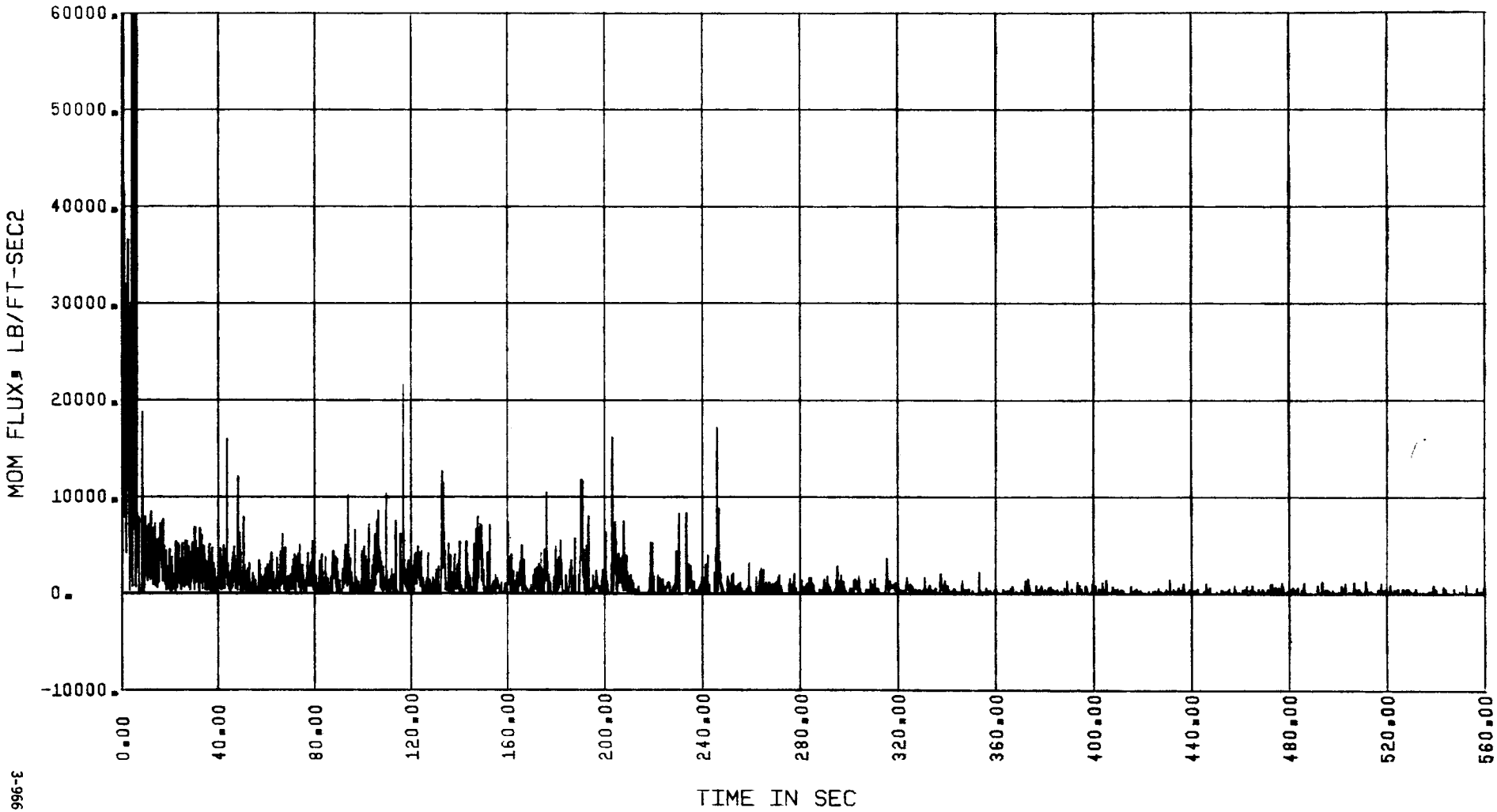


3-964

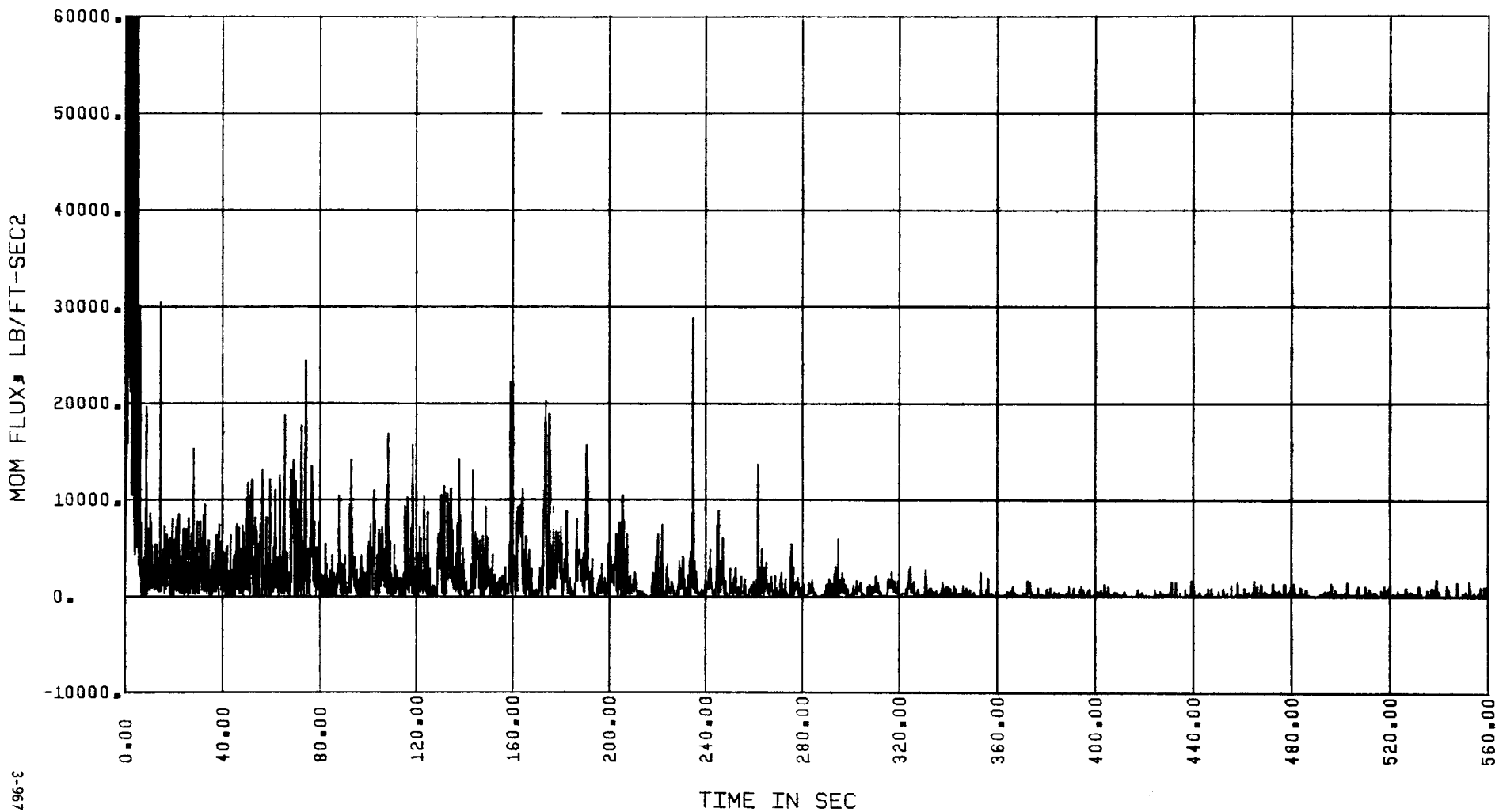
TEST 1380/1000 PSIA FW FWD BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39



TEST 1380/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/LO-TM DISCH
PLOT NO.40

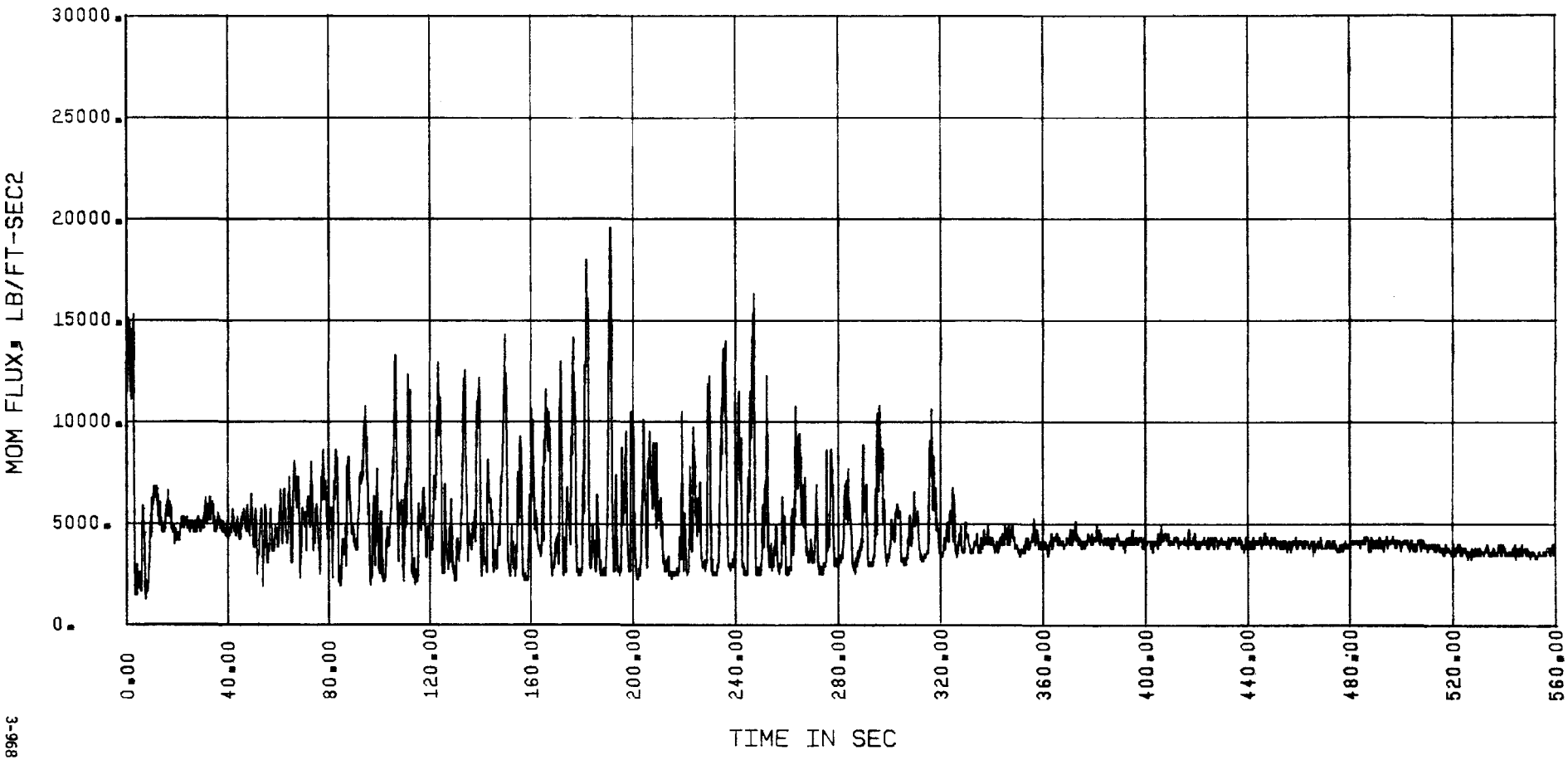


TEST 1380/1000 PSIA FW FWD BDN
MOMENTUM FLUX GD2/HI-TM DISCH
PLOT NO.41



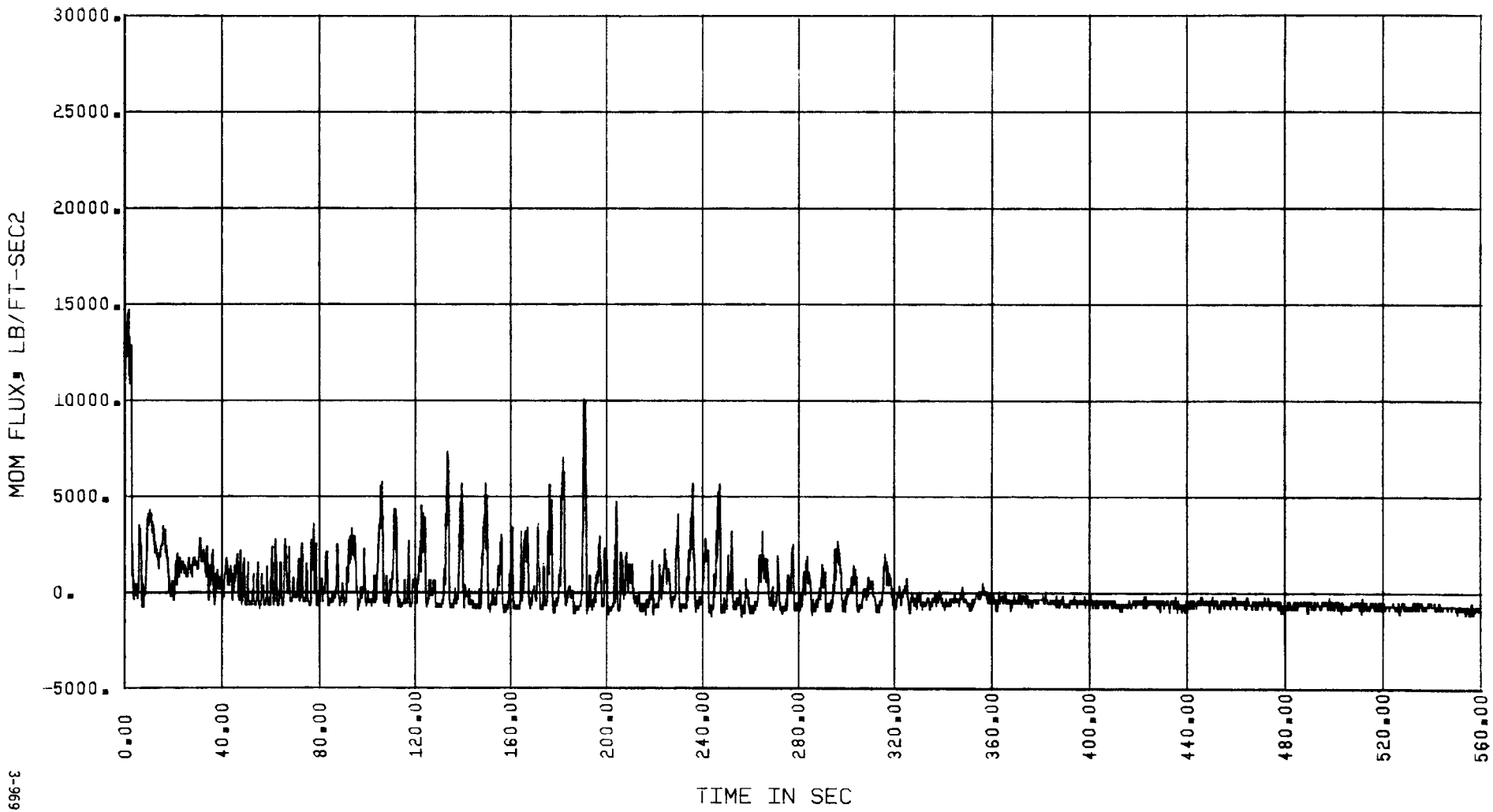
3-967

TEST 1380/1000 PSIA FW FWD BDN
MOMENTUM FLUX LO-DD DISCHARGE
PLOT NO.42



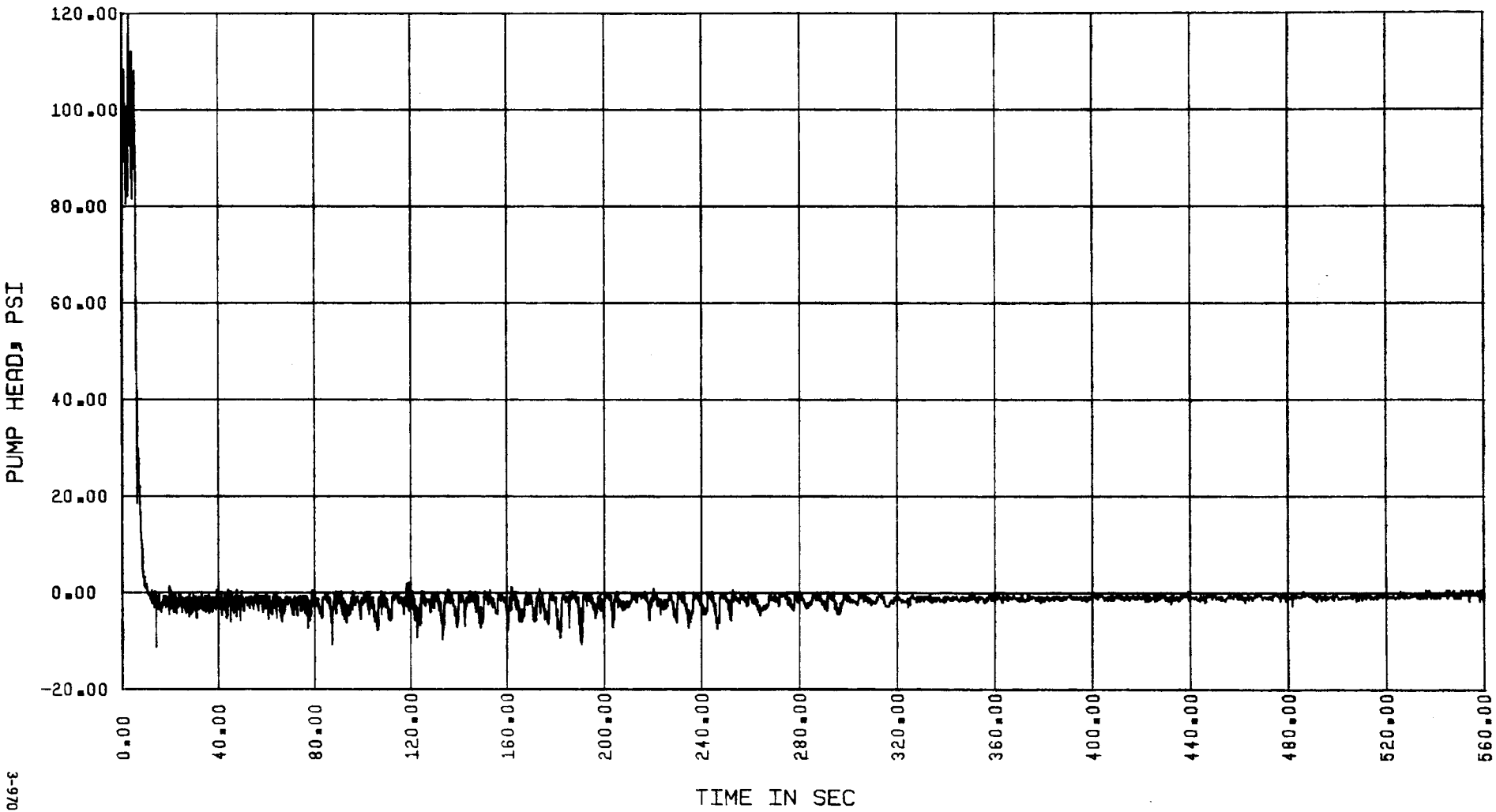
3-868

TEST 1380/1000 PSIA FW FWD BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.43



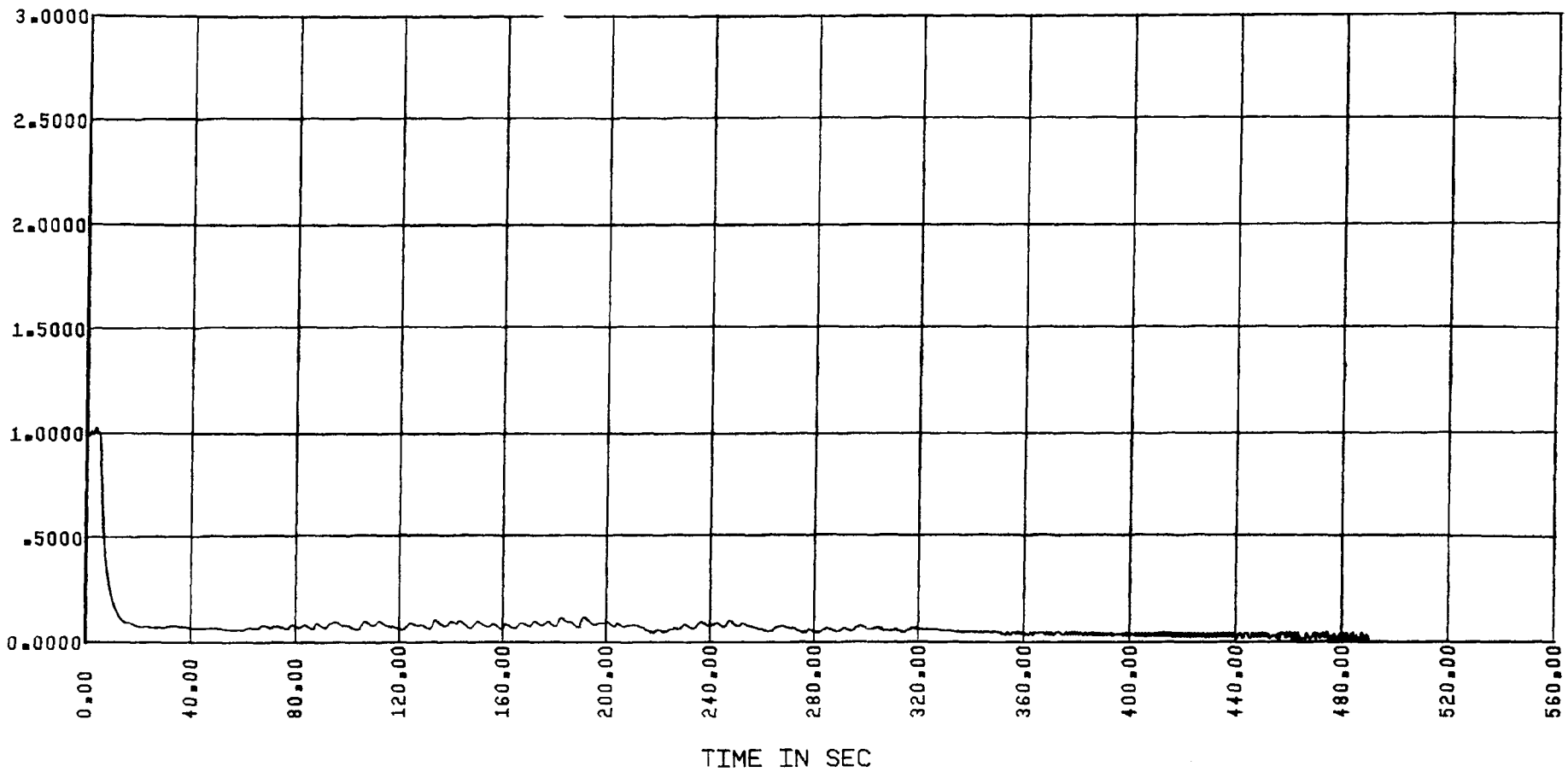
3-696

TEST 1380/1000 PSIA FW FWD BDN
PUMP HEAD IN PSI
PLOT NO. 44

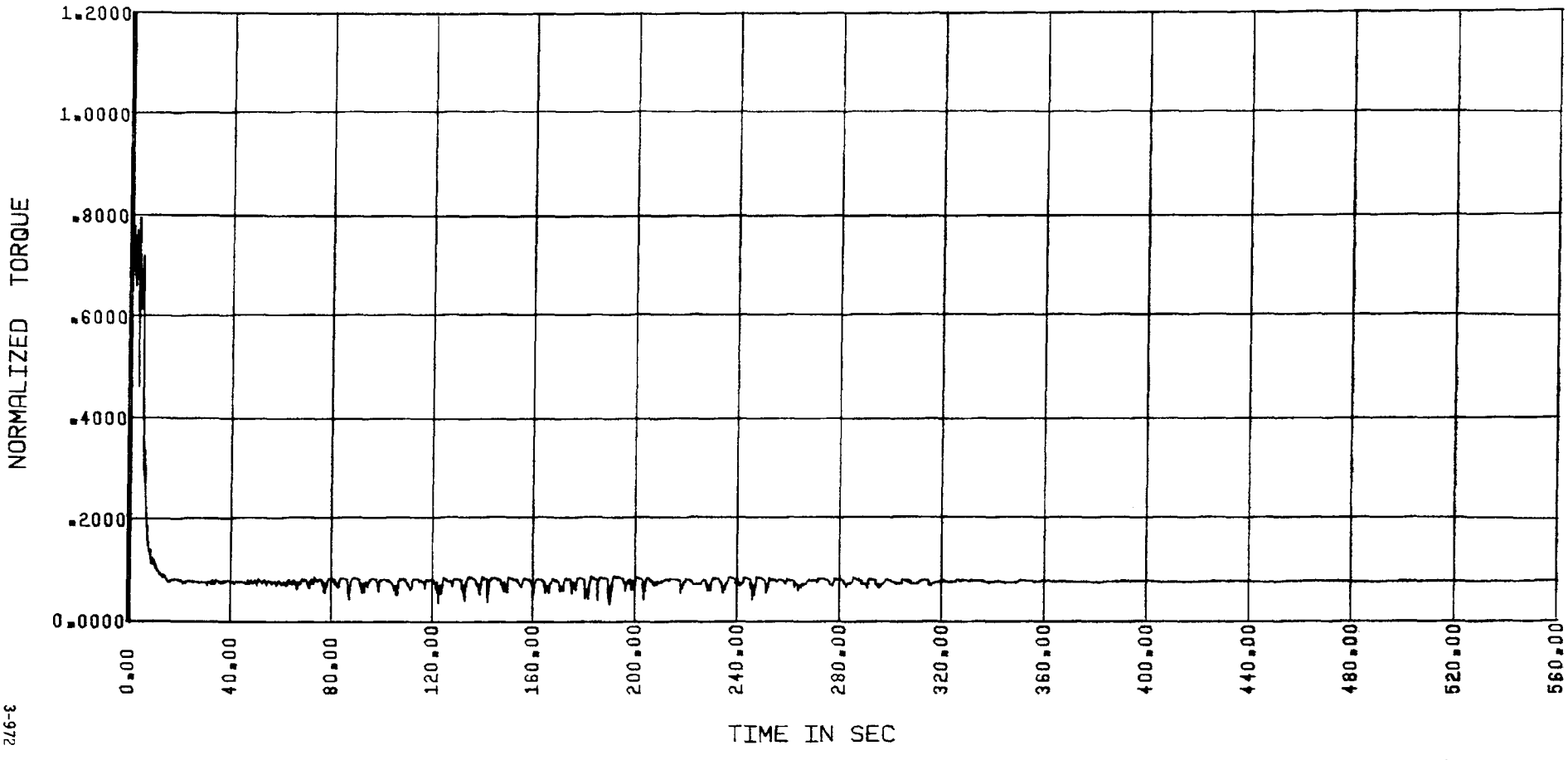


3-970

TEST 1380/1000 PSIA FW FWD BDN
N PUMP SPEED NR=4500
PLOT NO.47

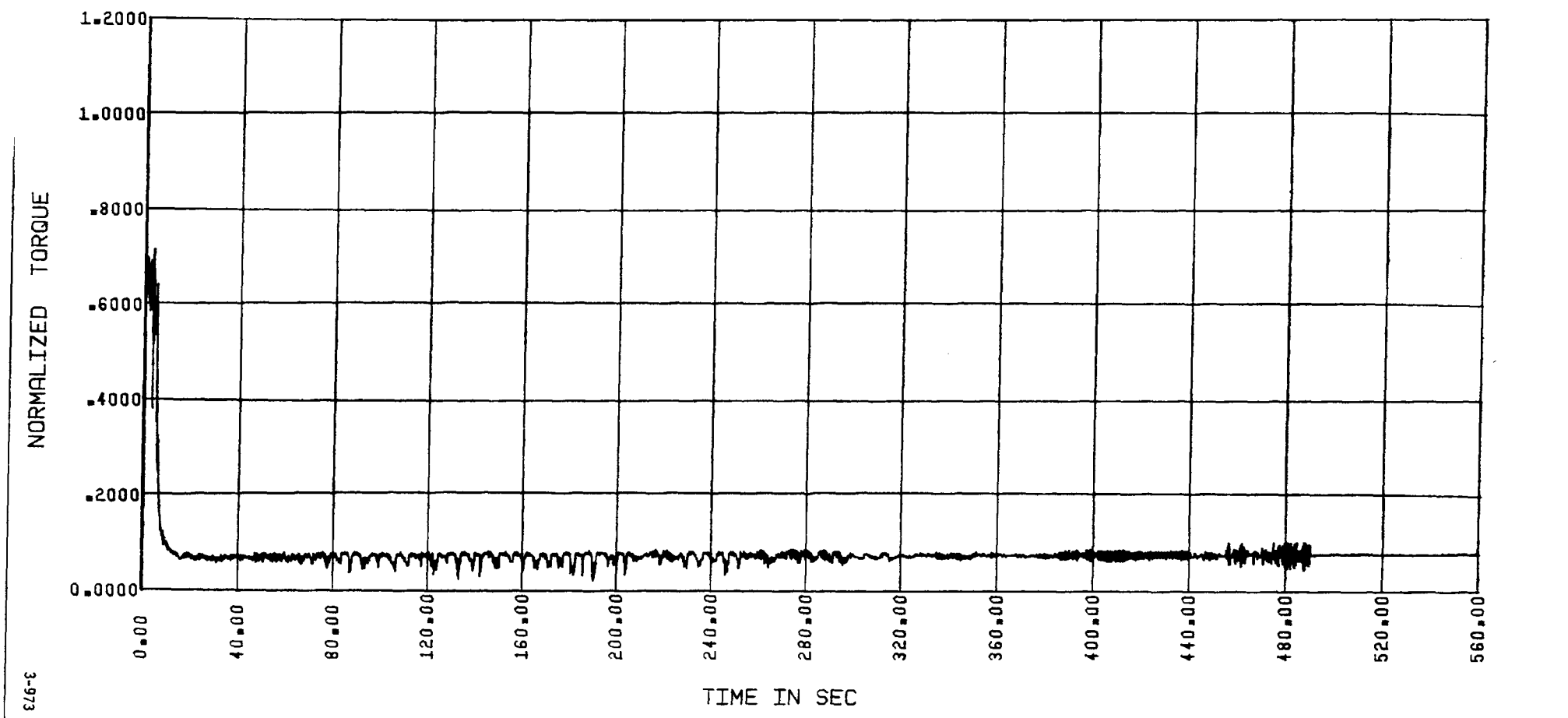


TEST 1380/1000 PSIA FW FWD BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.48



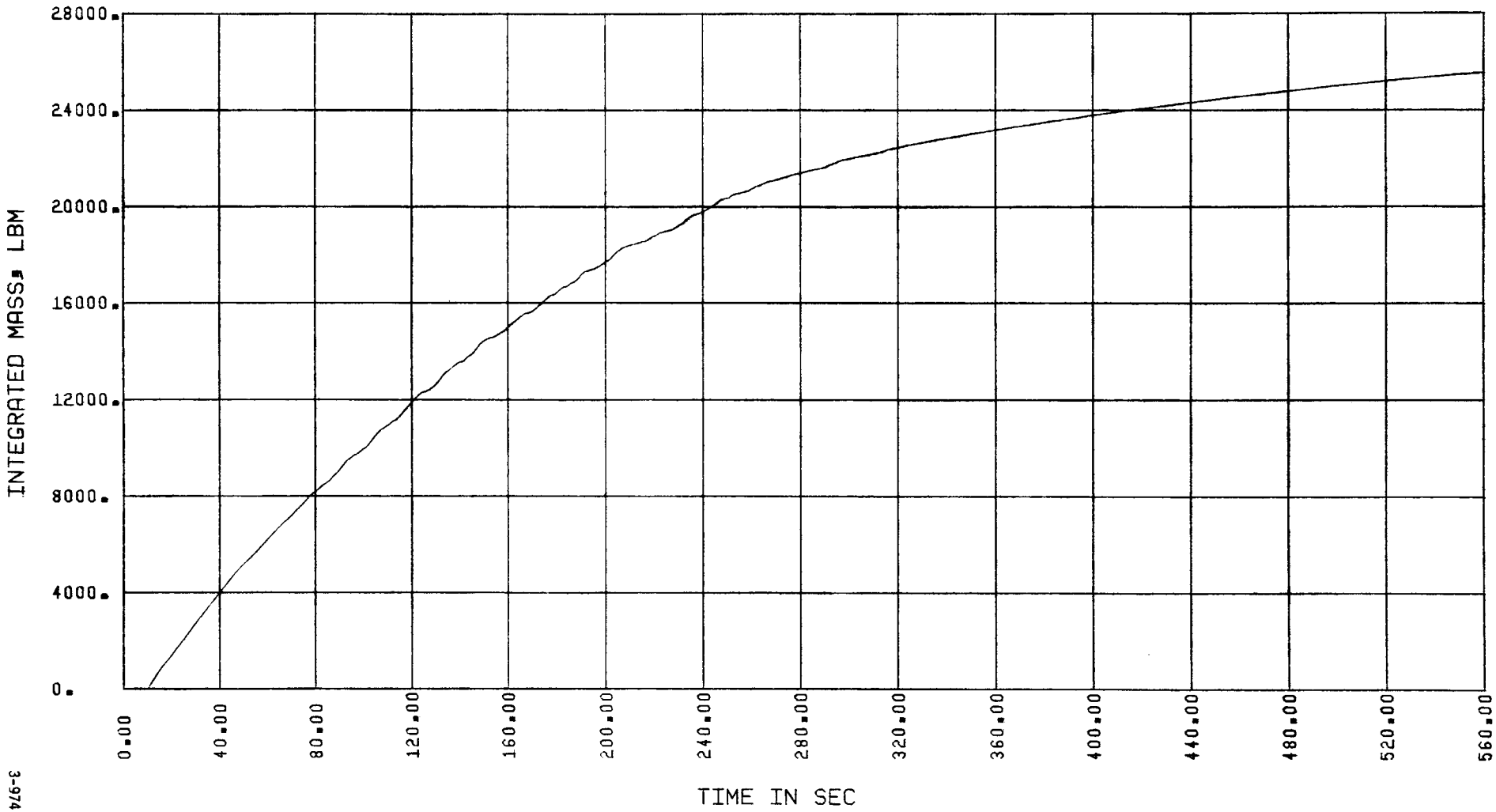
3-972

TEST 1380/1000 PSIA FW FWD BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.49



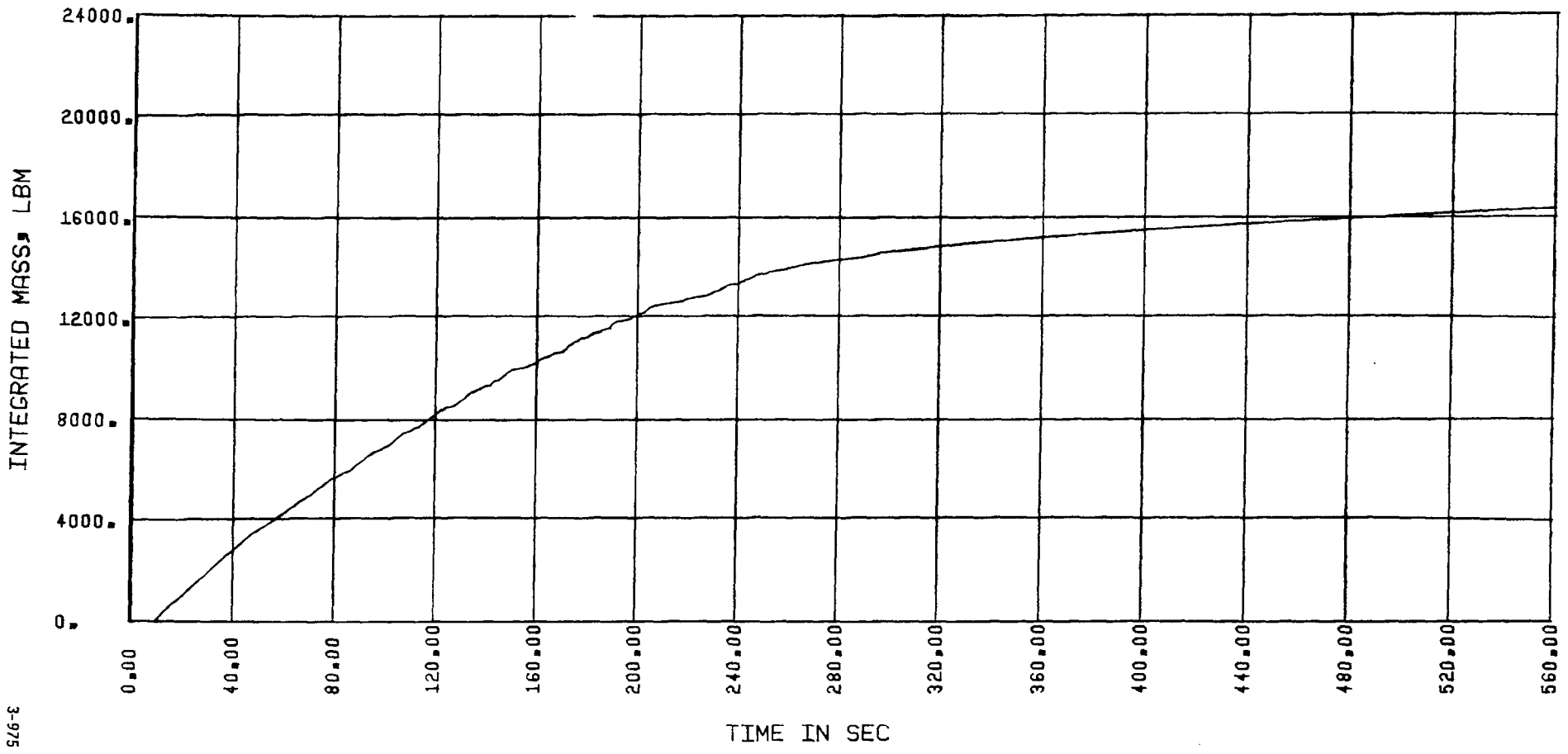
3-973

TEST 1380/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50

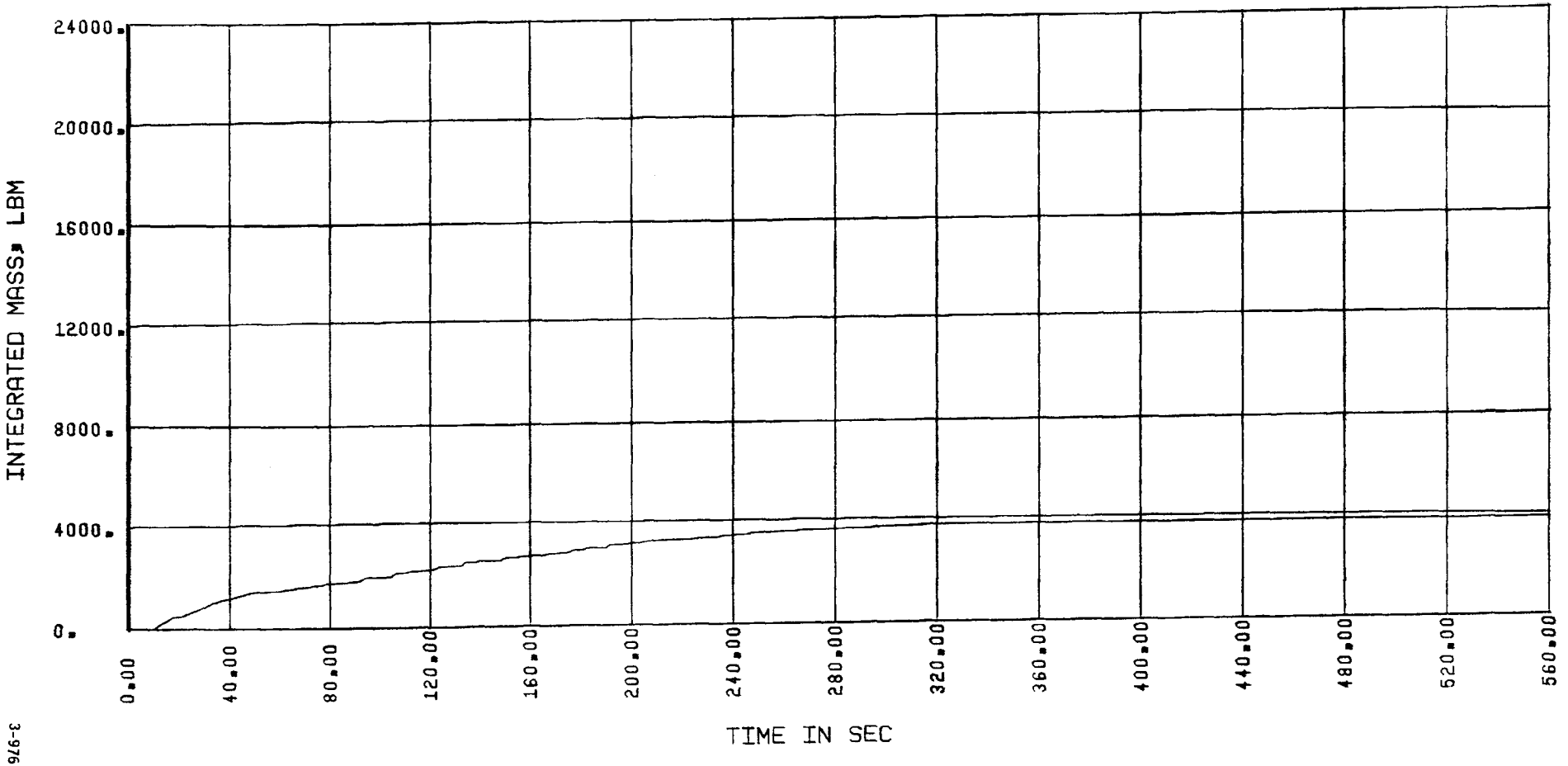


3-974

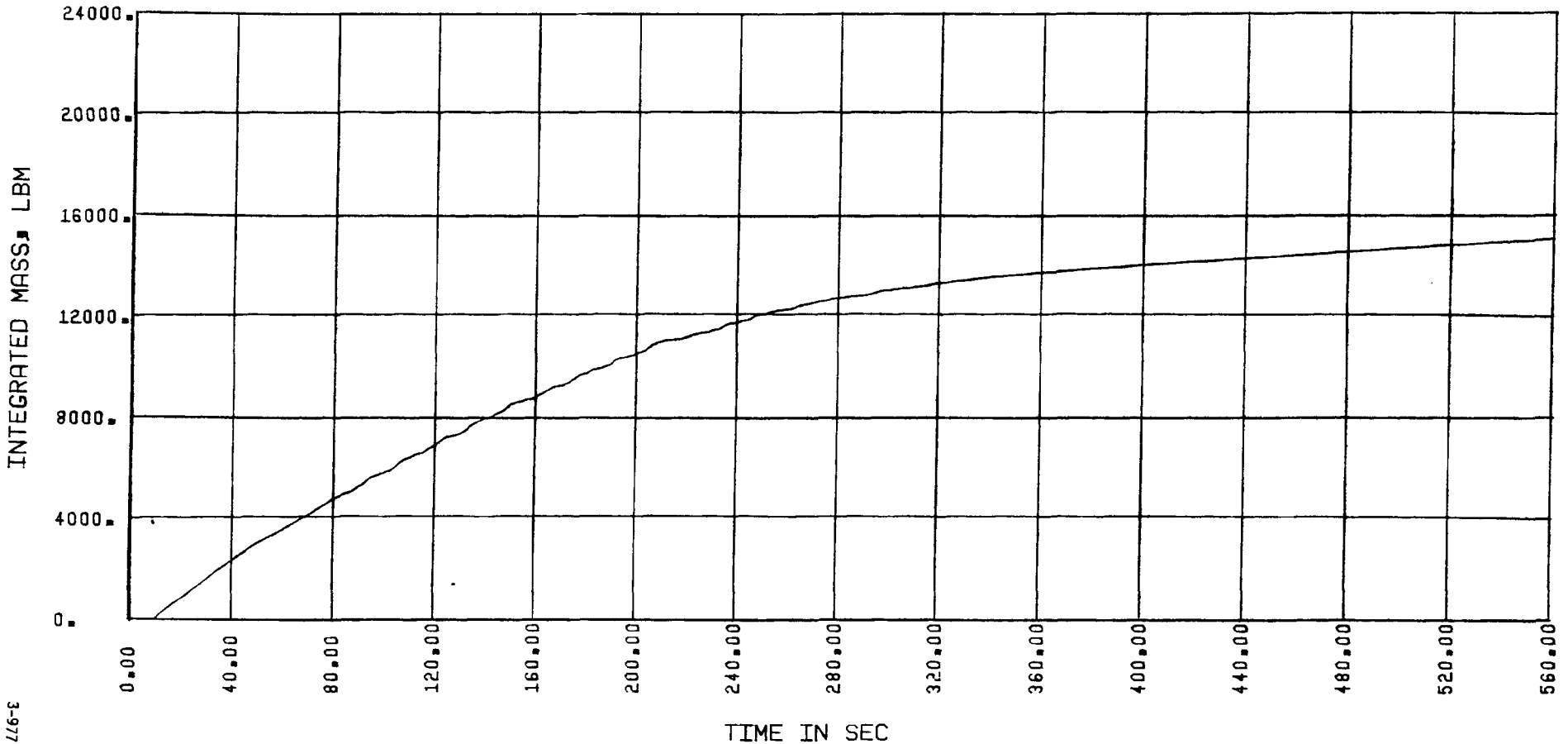
TEST 1380/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.51



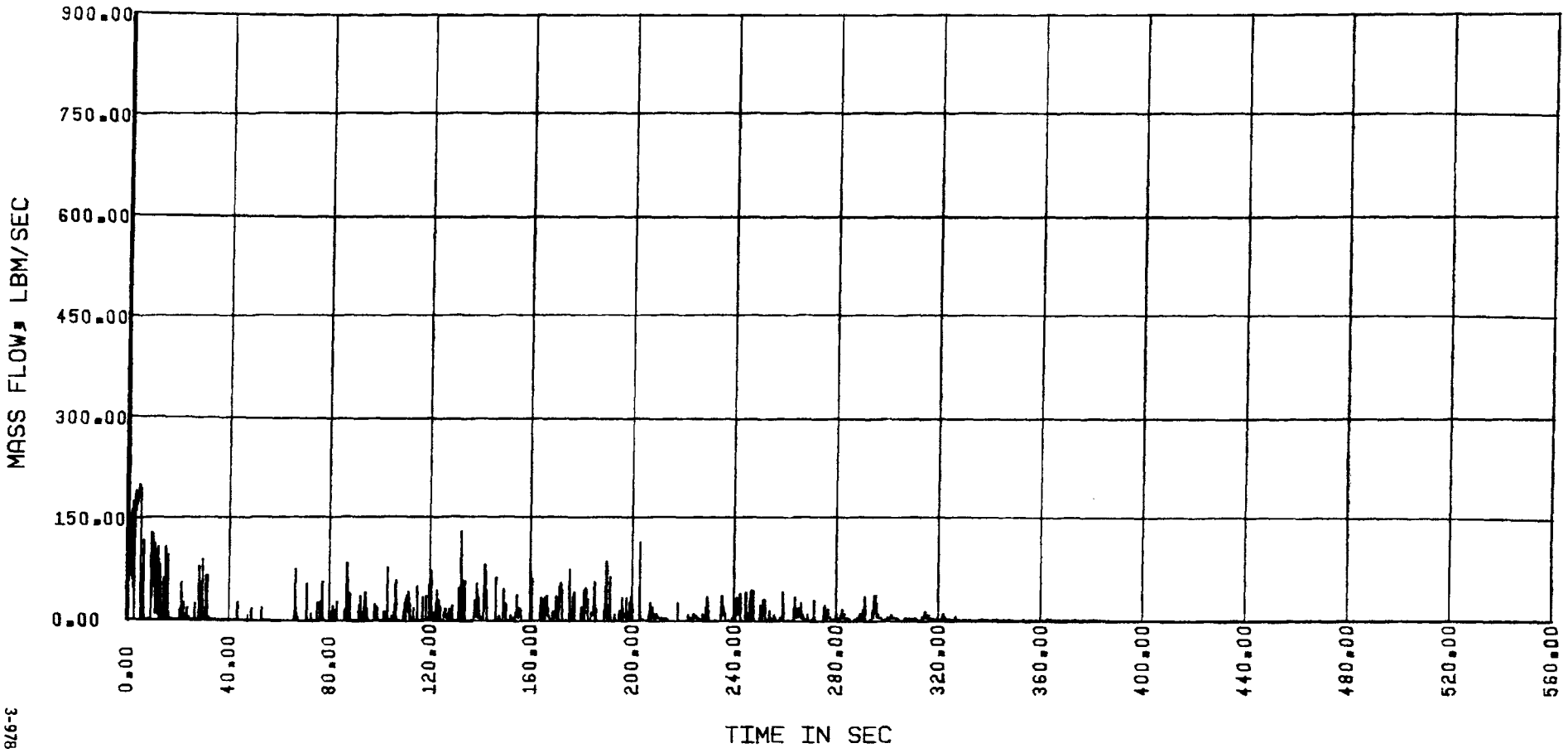
TEST 1380/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.52



TEST 1380/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.53

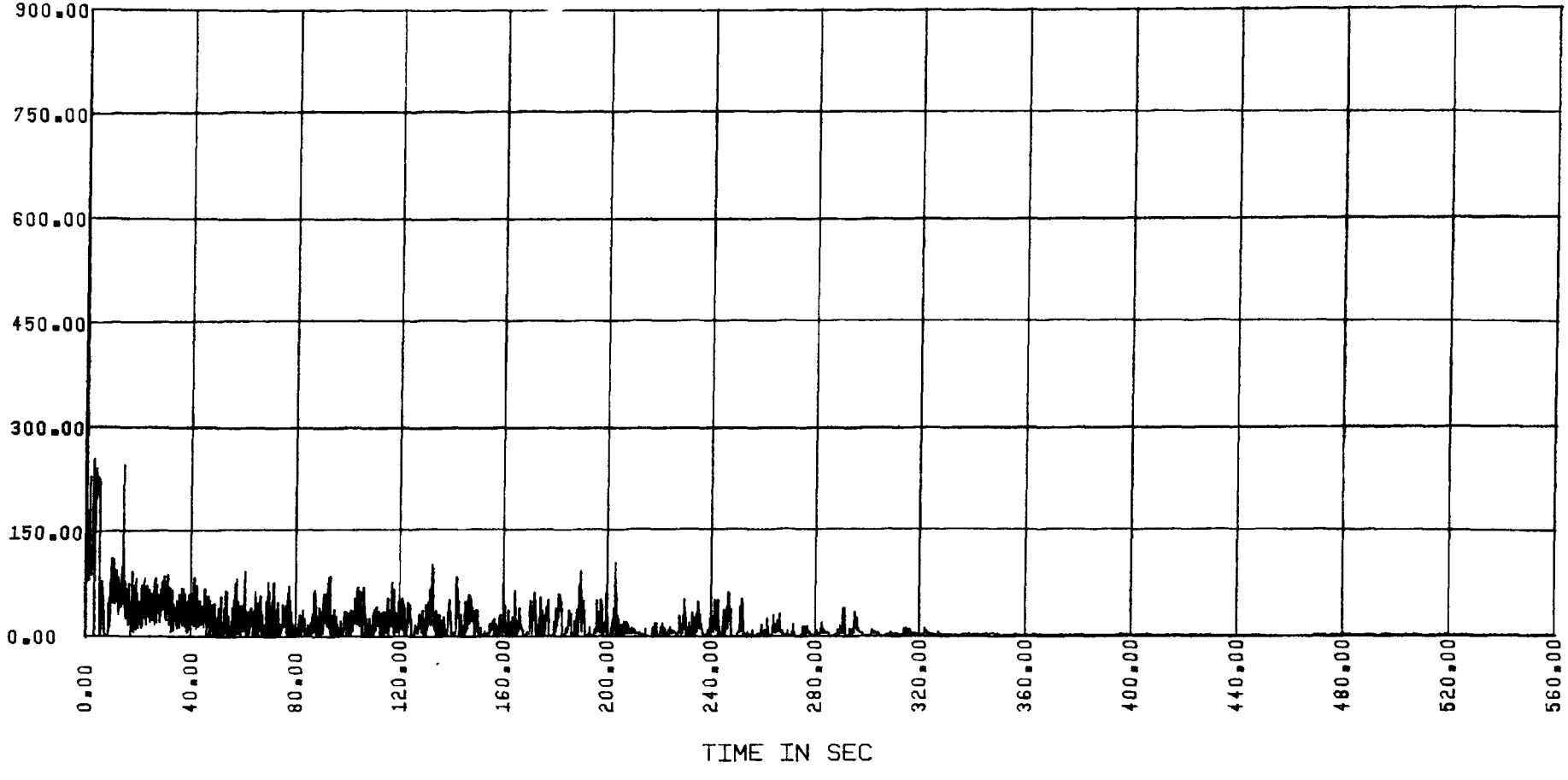


TEST 1380/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54

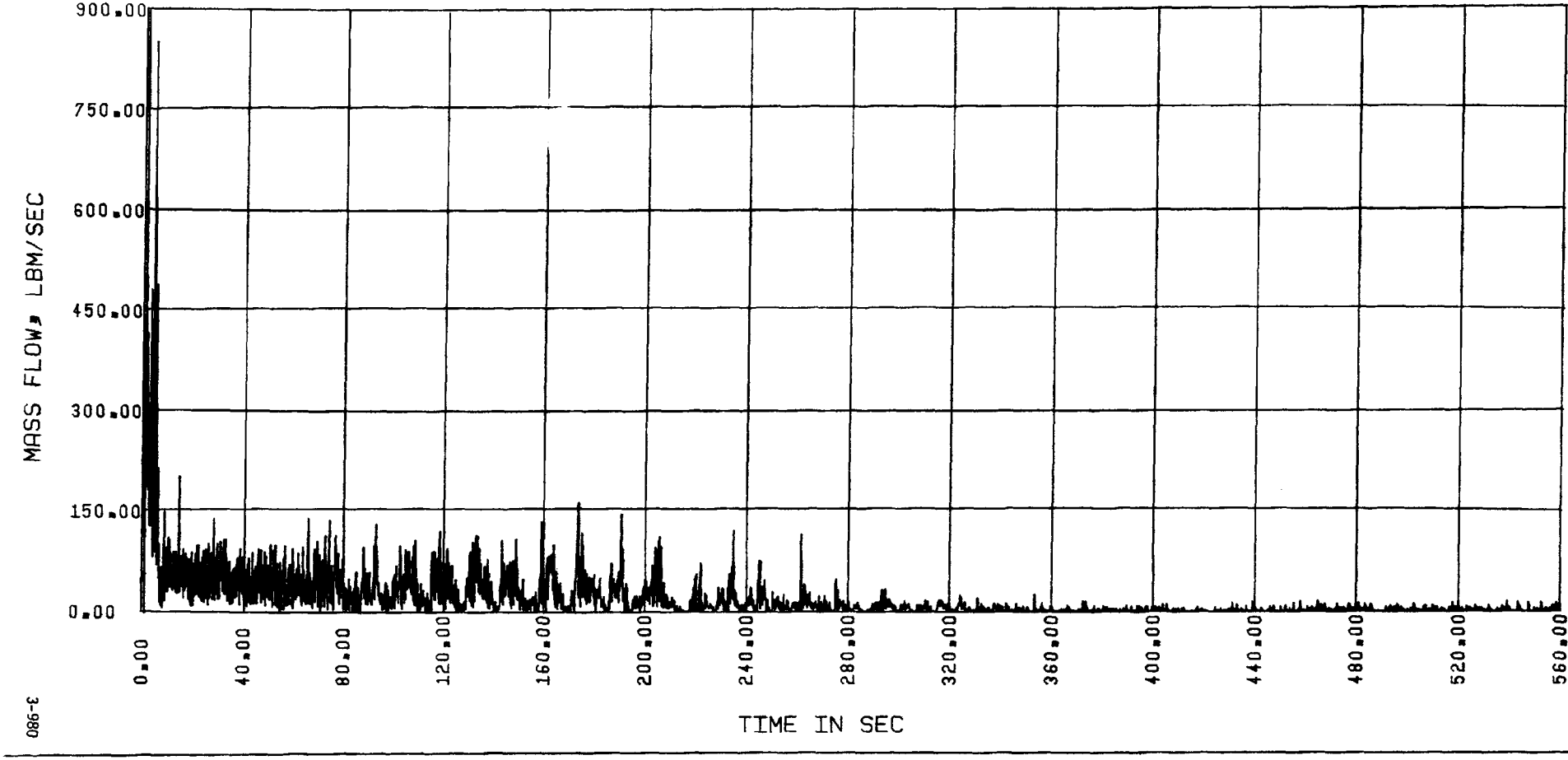


3-978

TEST 1380/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.55

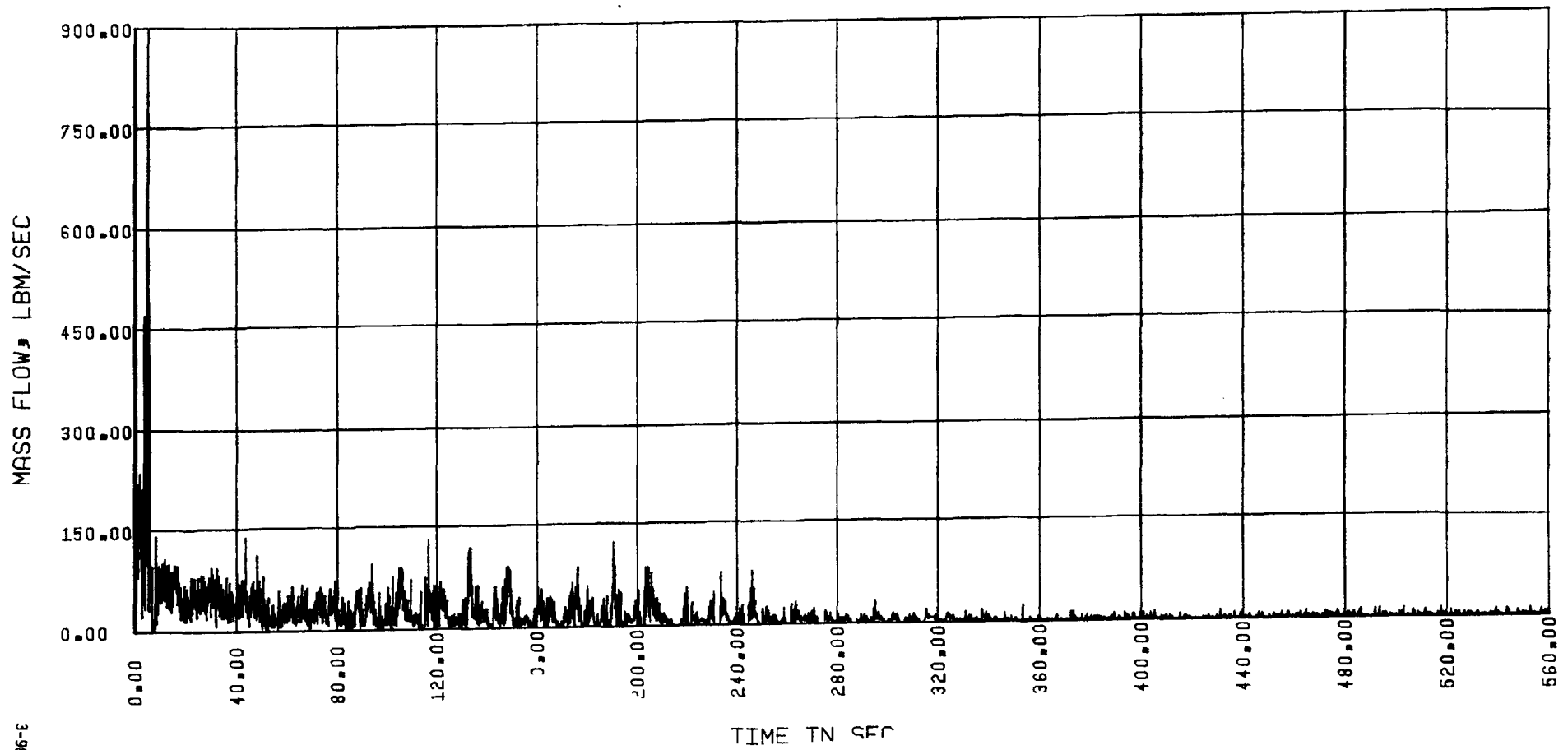


TEST 1380/1000 PSIA FW FWD BDN
MASS FLOW RATE HI-TM/GD2 DISCH
PLOT NO.56



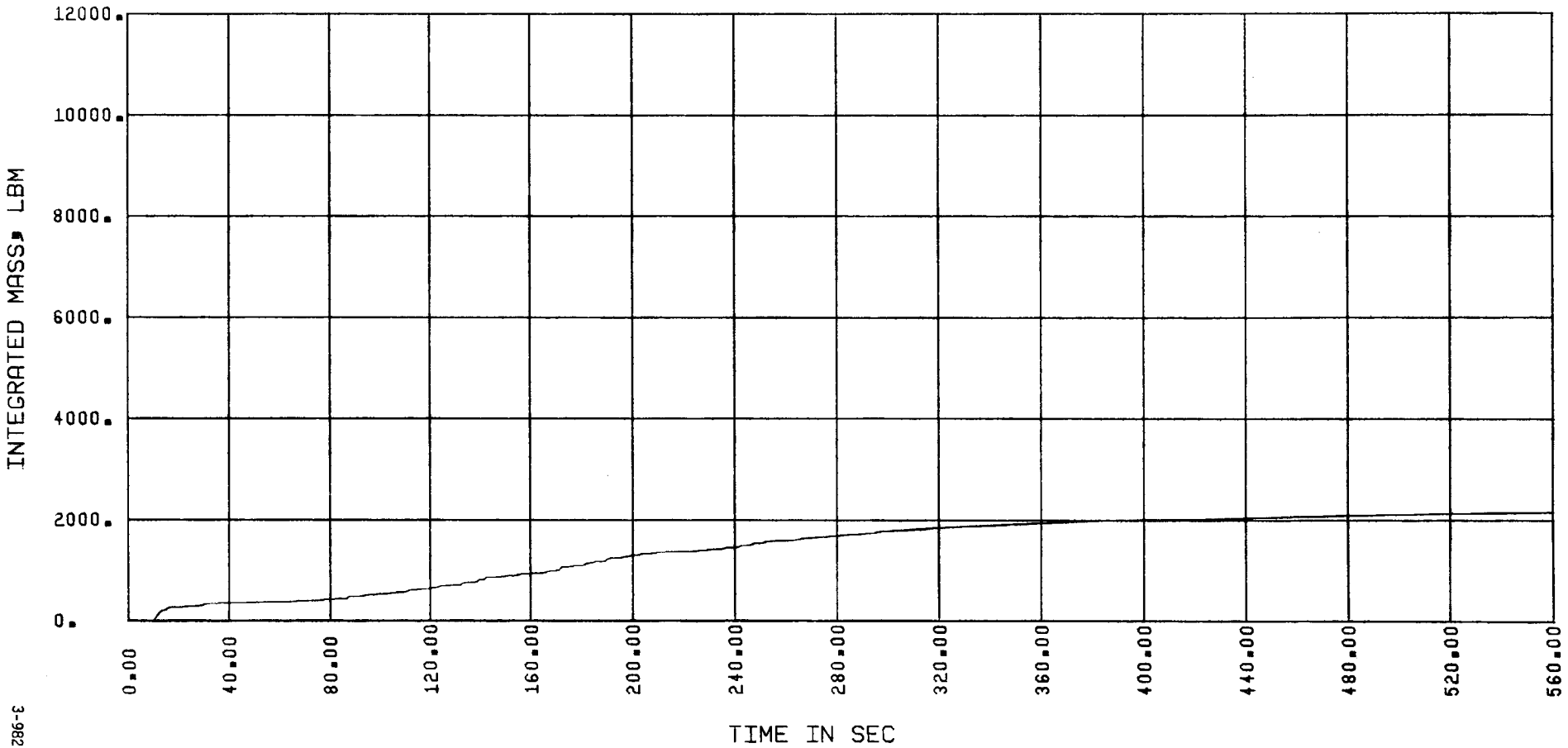
3-980

TEST 1380/1000 PSIA FW FWD BDN
MASS FLOW RATE LO-TM/GD2 DISCH
PLOT NO.57



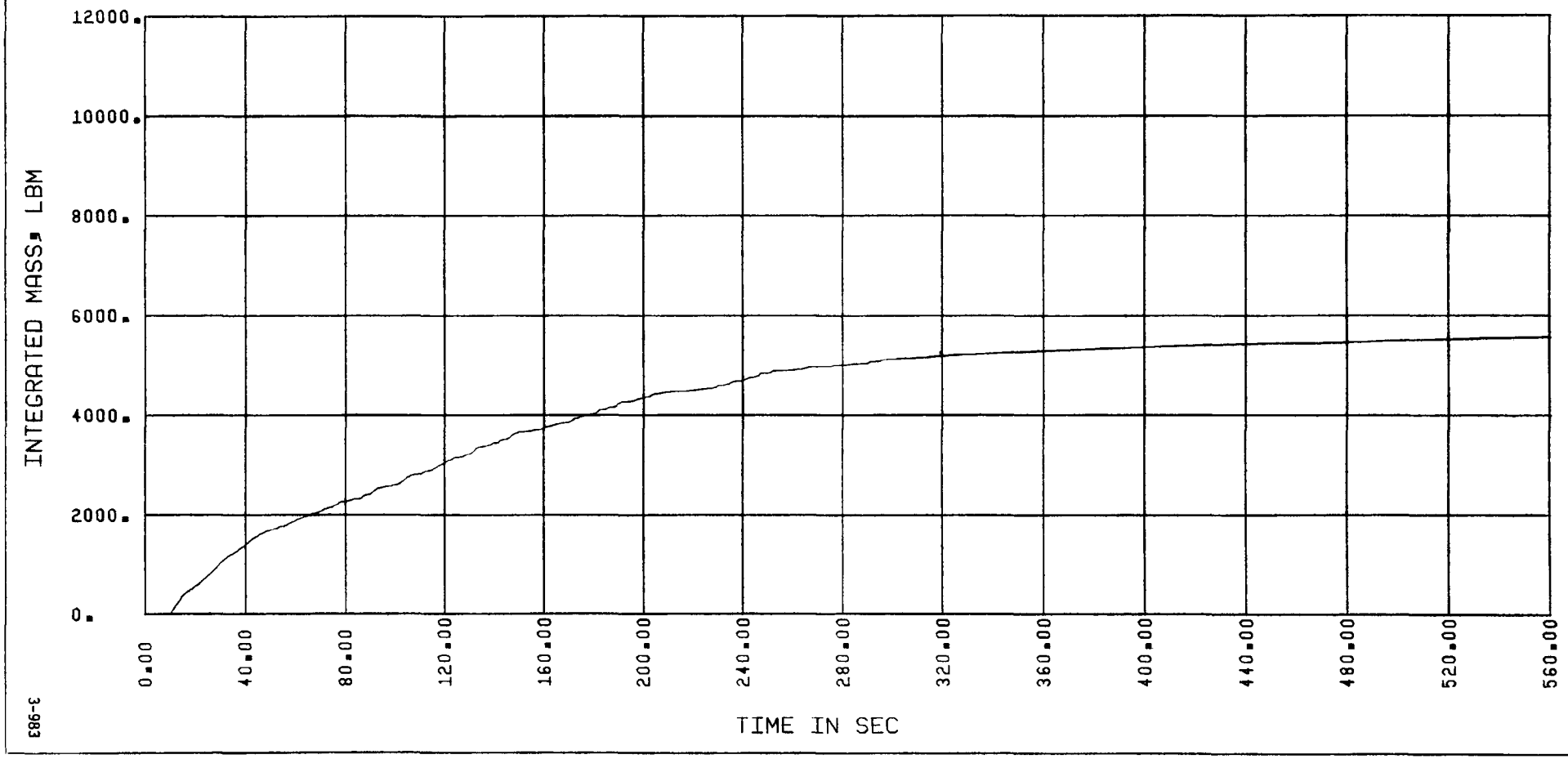
3-981

TEST 1380/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60



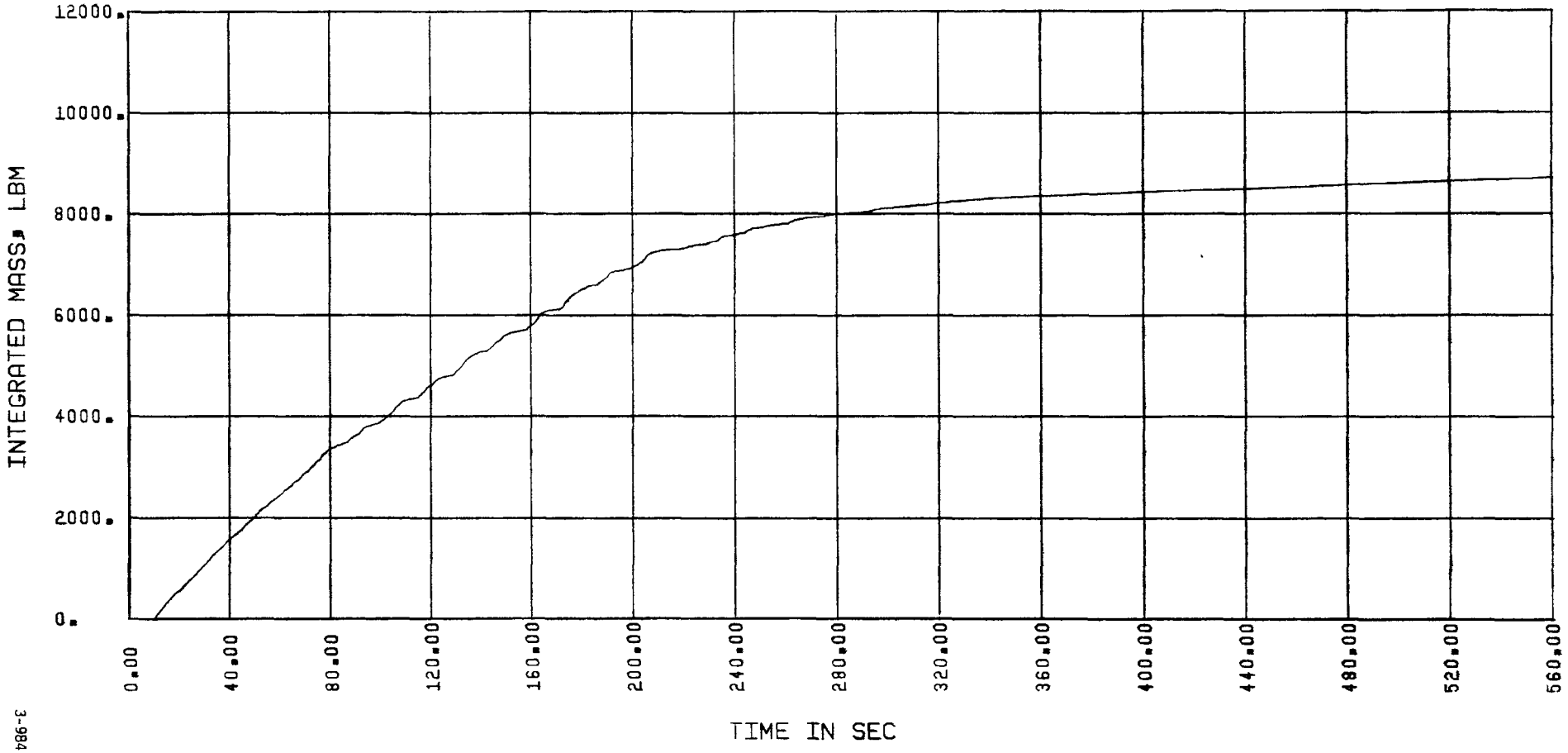
3-982

TEST 1380/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-TM/GD2 S
PLOT NO.61



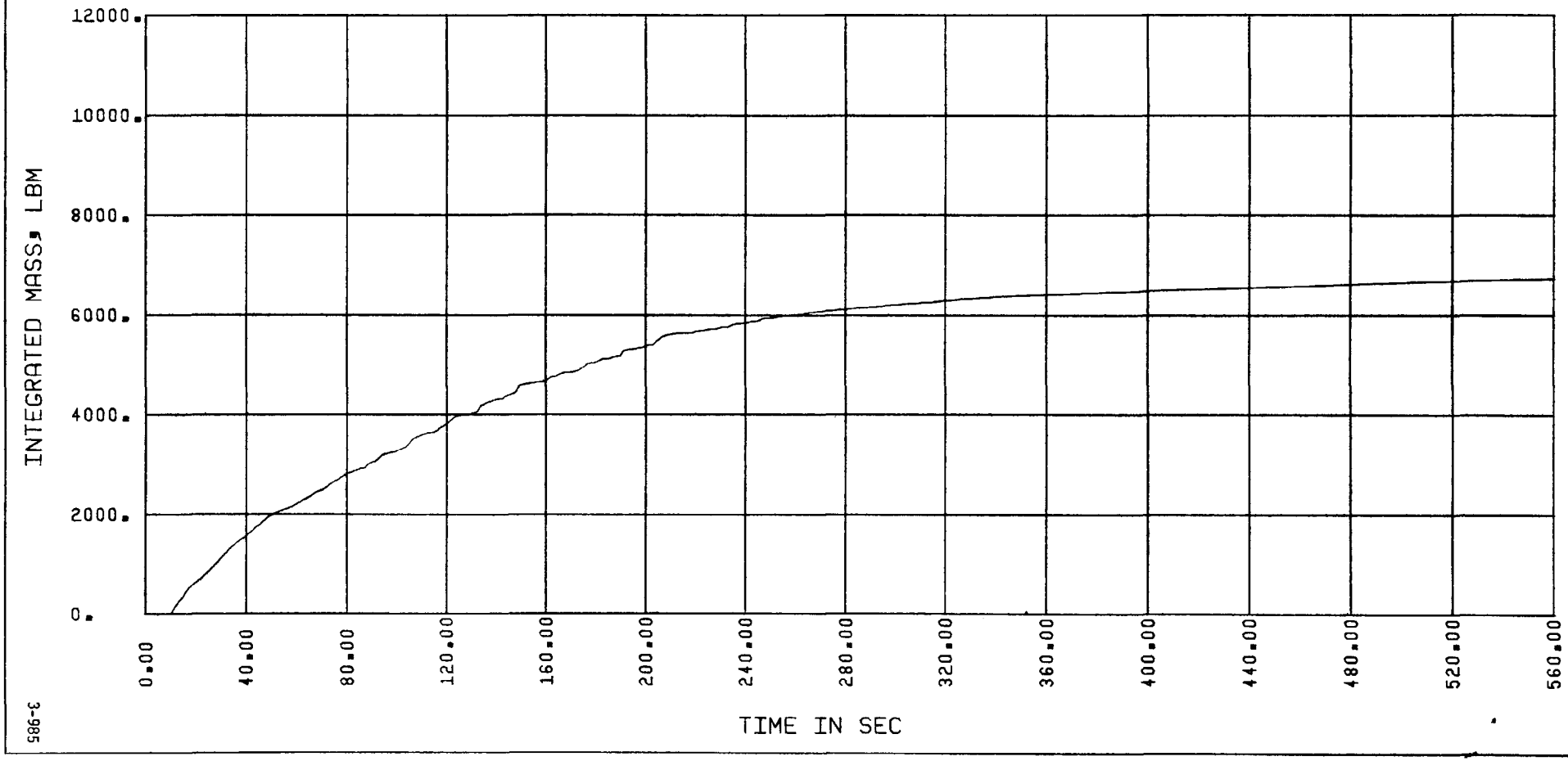
3-983

TEST 1380/1000 PSIA FW FWD BDN
INTEGRATED MASS HI-TM/GD2 D
PLOT NO.62



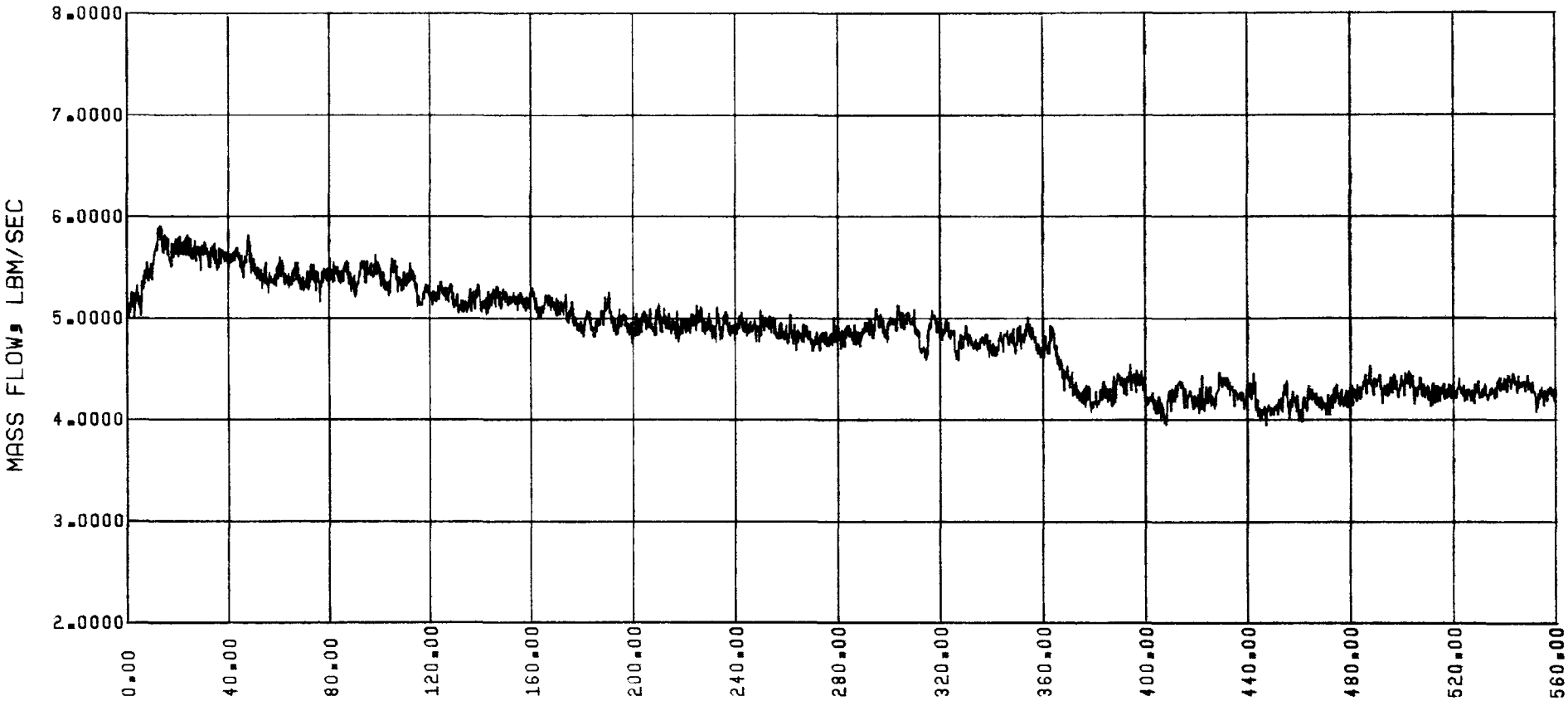
3-984

TEST 1380/1000 PSIA FW FWD BDN
INTEGRATED MASS LO-TM/GD2 D
PLOT NO.63



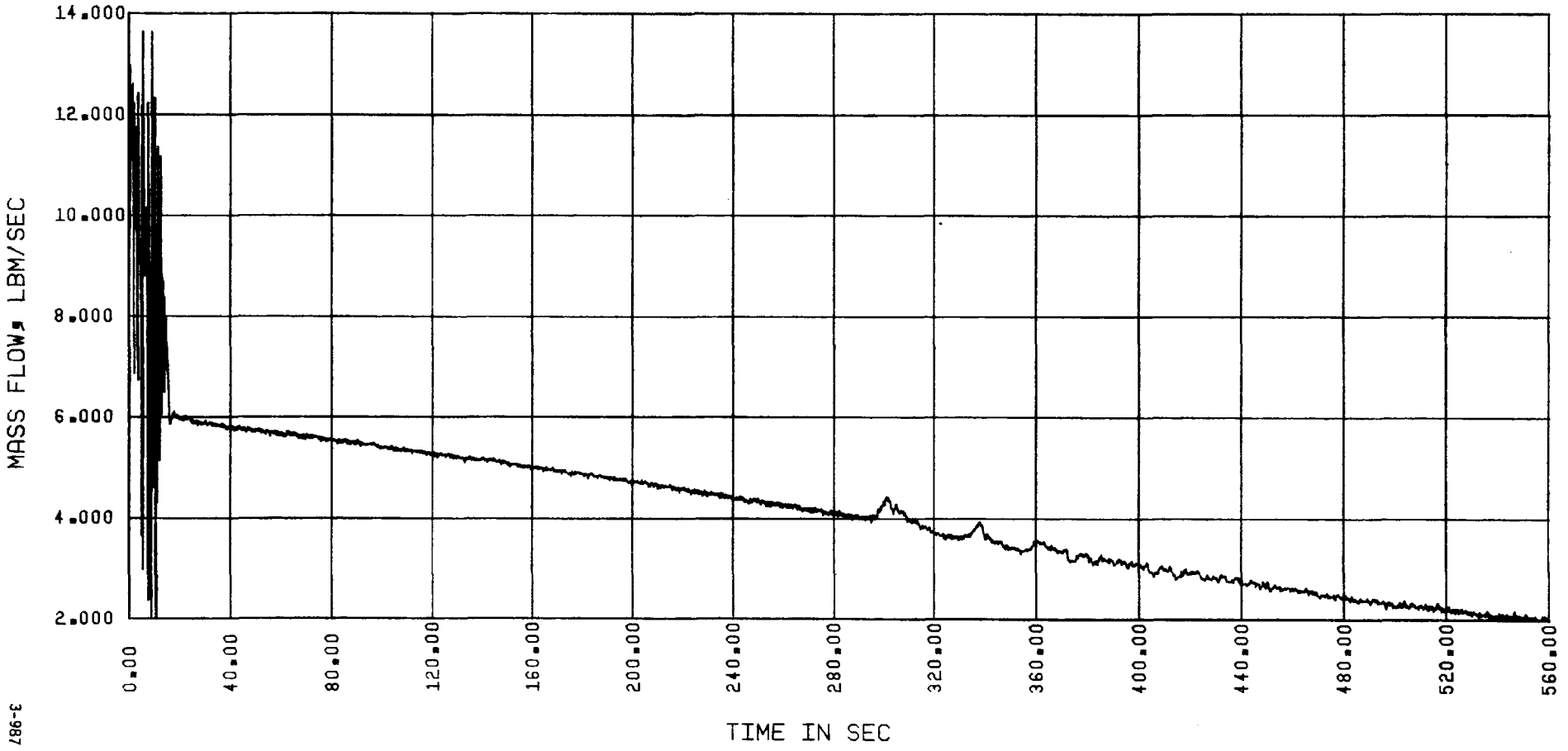
3-985

TEST 1380/1000 PSIA FW FWD BDN
PUMP INLET INJECTION FLOW
PLOT NO.64



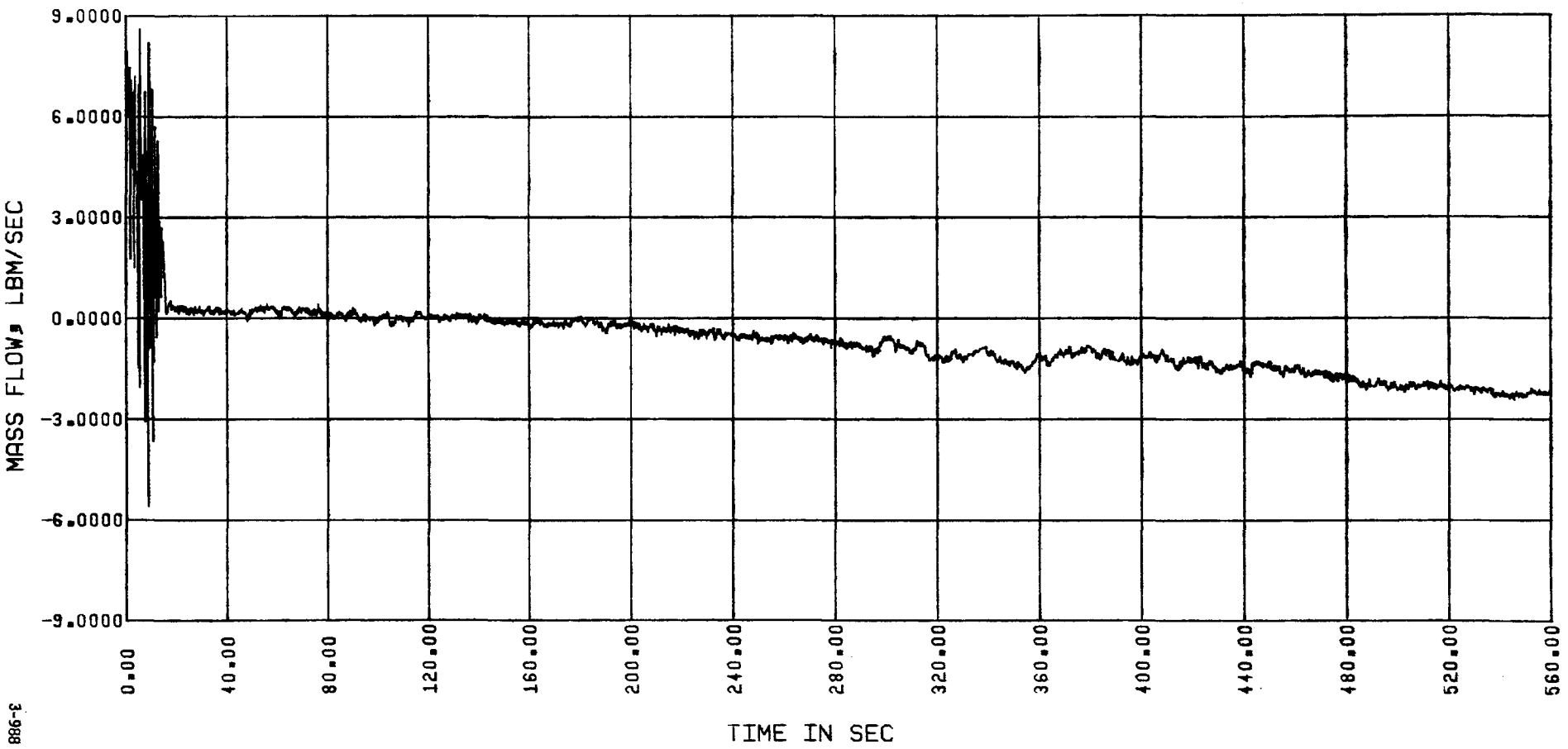
3-986

TEST 1380/1000 PSIA FW FWD BDN
PUMP INJECT MASS FLOW RATE OUT
PLOT NO.65



3-987

TEST 1380/1000 PSIA FW FWD BDN
PUMP SEAL INJ LEAKAGE FLOW
PLOT NO.66



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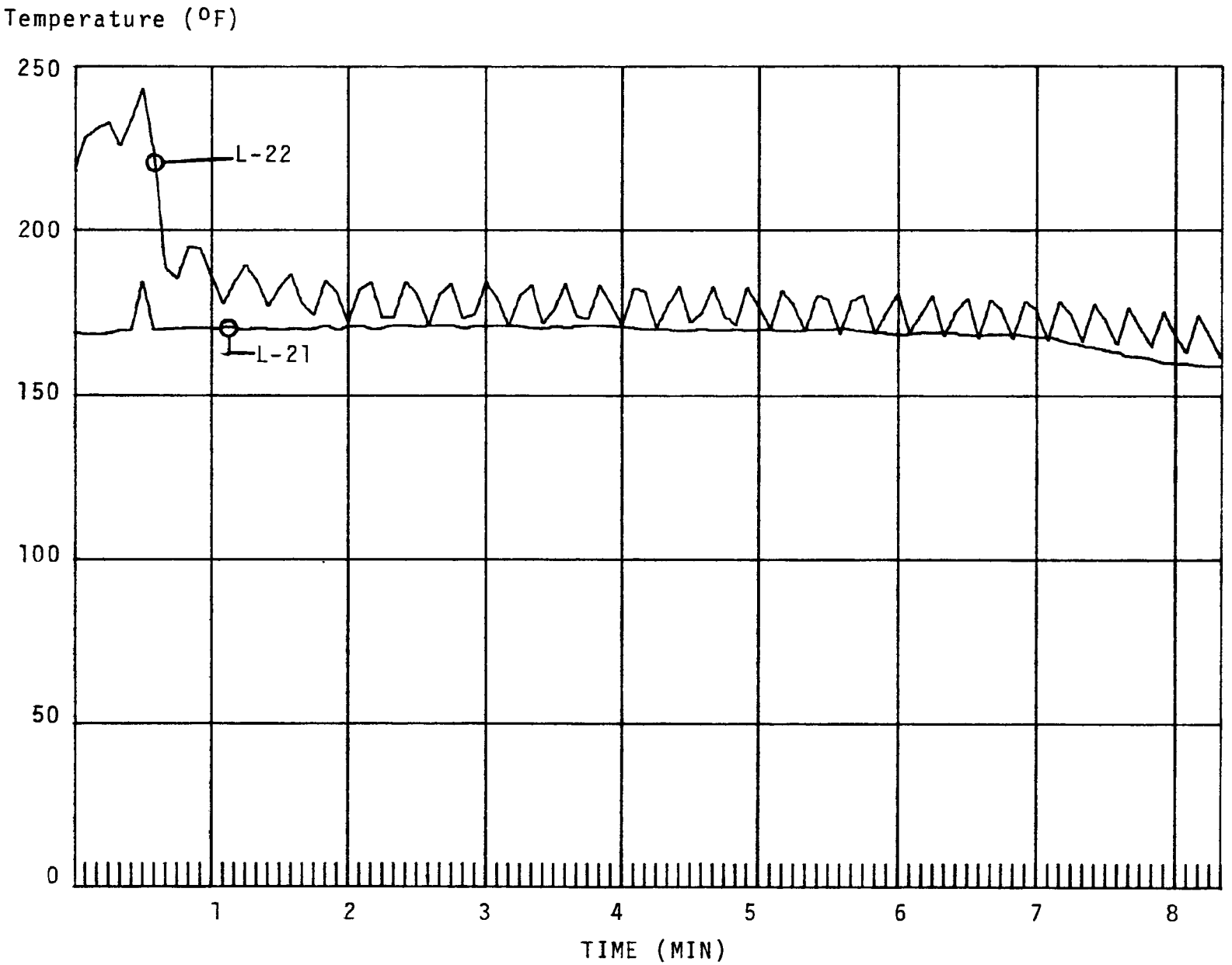
of

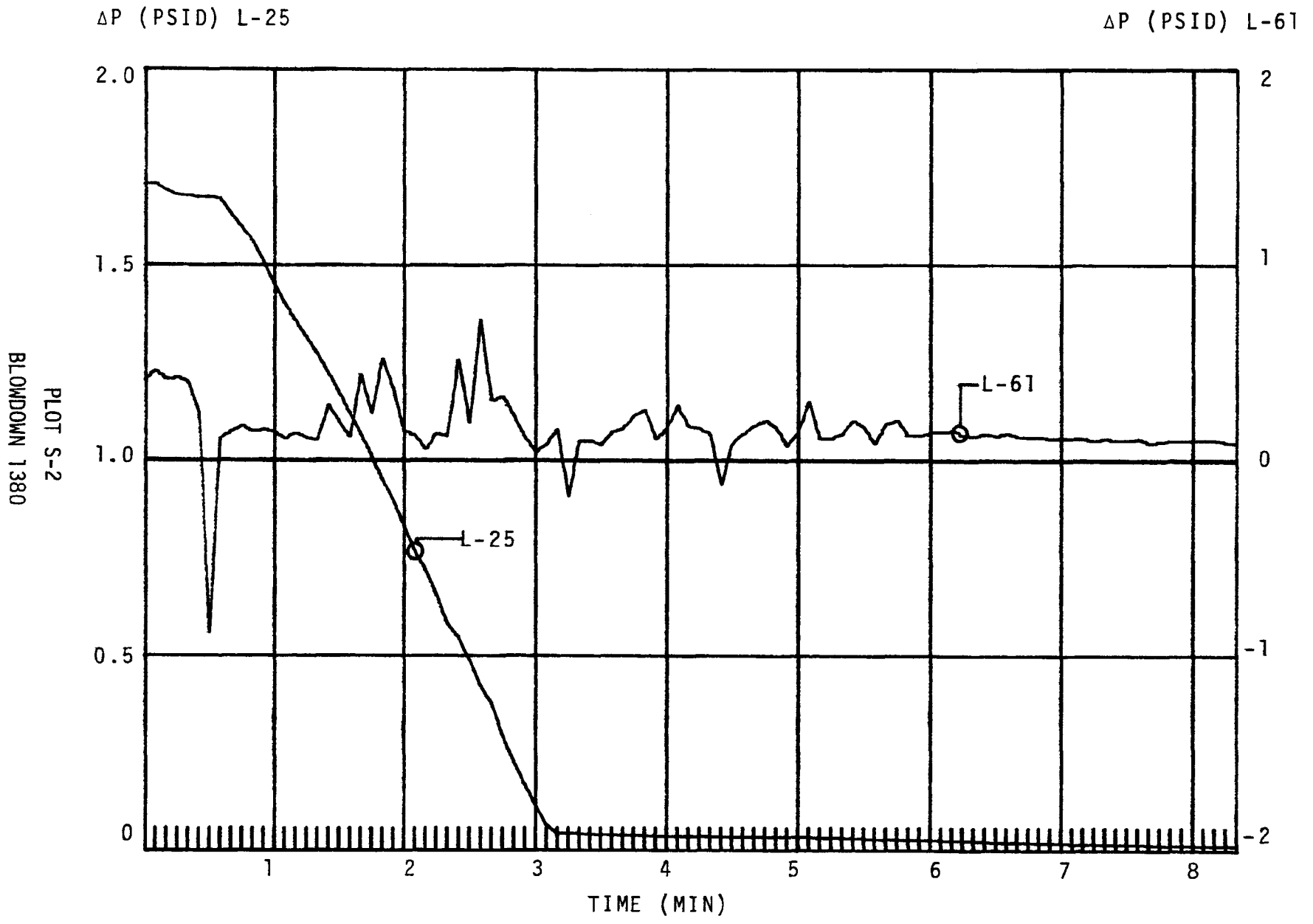
SCANNER DATA PLOTS

Test Number (1380)

Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

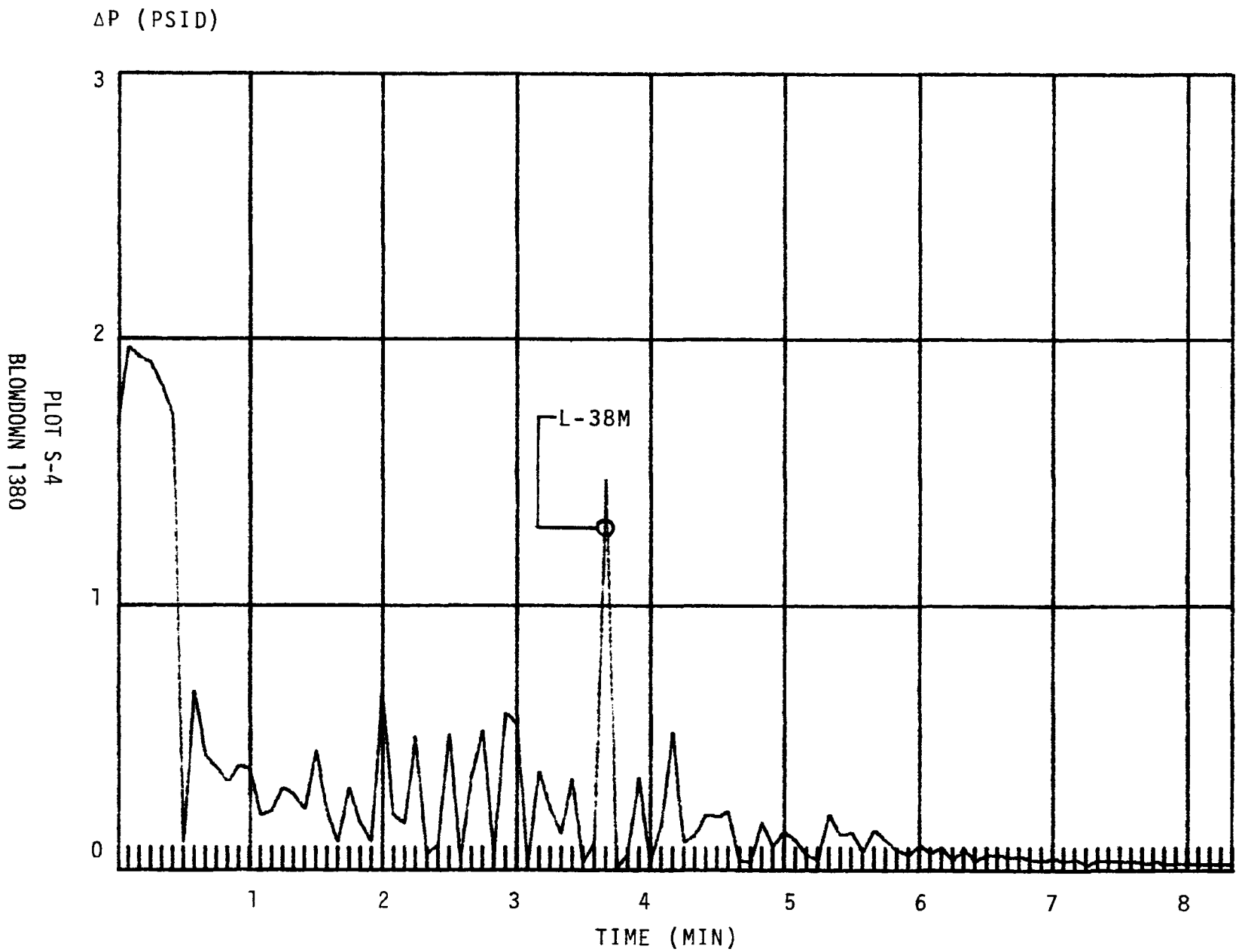


PLOT S-1
BLOWDOWN 1380

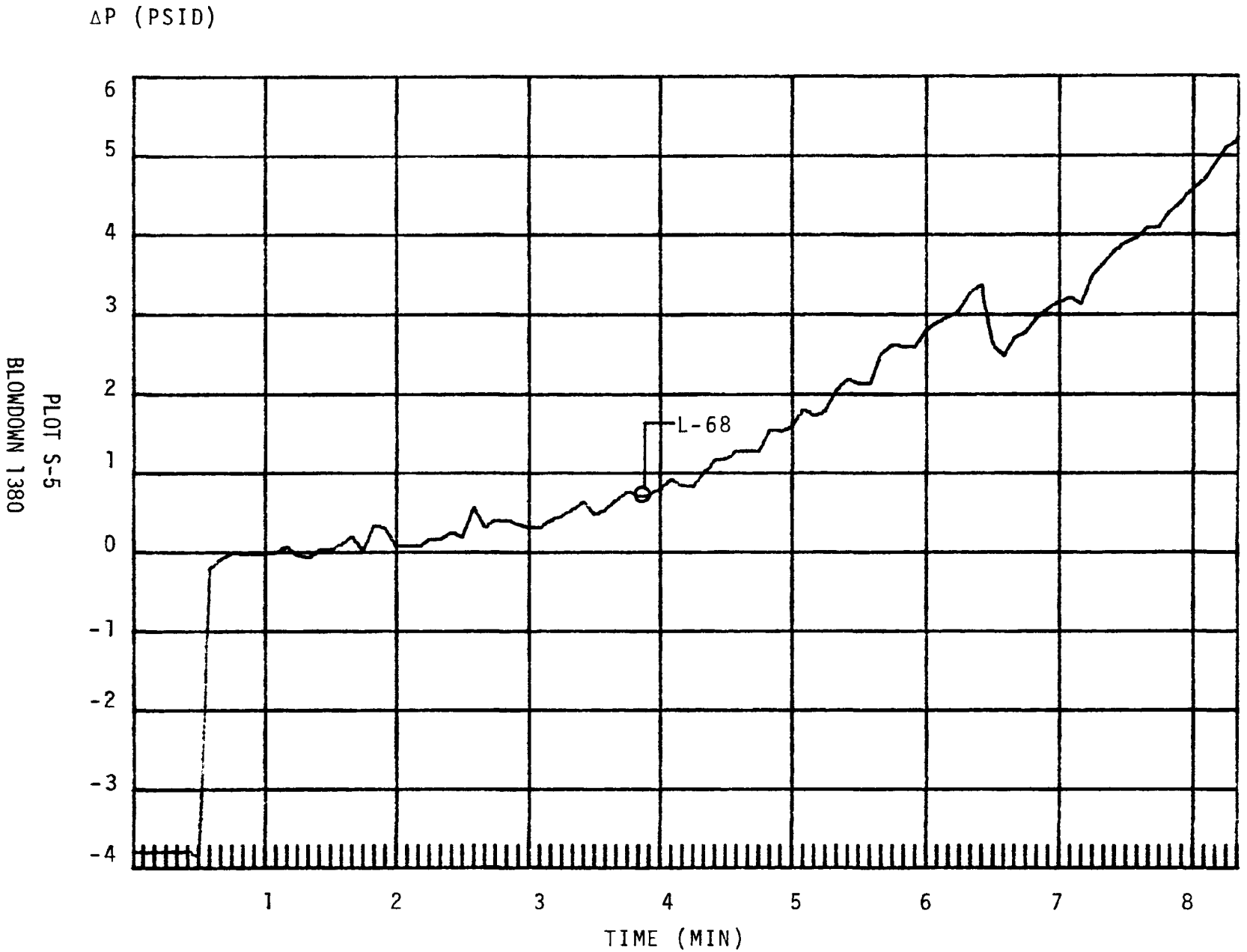


PLOT S-2
BLOWDOWN 1380

PLOT S-3
BLOWDOWN 1380



PLOT S-4
BLOWDOWN 1380


ΔP (PSID)
6
5
4
3
2
1
0
-1
-2
-3
-4
L-68
1
2
3
4
5
6
7
8
TIME (MIN)
PLOT S-5
BLOWDOWN 1380

SYSTEM CONFIGURATION

Test Number 1465

Break Location	Suction
Break Size	27.75 in^2
	100 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Locked Rotor

COMMENTS

1. Malfunctioning or Inoperable Instruments: Pump suction turbine meter (LO) initial data were lost; remaining data were unaffected.

2. Other Comments: The calculated mass flow rates do not show the negative flow which actually occurred during the test.

3. Affected FM Data Plots:
   - 26 - Normalized Volumetric Flow Rate
   - 32 - Mass Flow Rate
   - 33 - Mass Flow Rate
   - 34 - Mass Flow Rate
   - 35 - Mass Flow Rate
   - 36 - Momentum Flux
   - 54 - Mass Flow Rate
   - 55 - Mass Flow Rate
   - 56 - Mass Flow Rate
   - 57 - Mass Flow Rate
   - 61 - Integrated Mass

INITIAL CONDITIONS

t = 20 Sec[a]

Test Number 1465

System Pressures

High Pressure Drum	996.3	psia
Suction Instrument Spool	1017.9	psia
Discharge Instrument Spool	1006.0	psia

Fluid Temperatures

Suction Instrument Spool	544.8	°F
Discharge Instrument Spool	547.0	°F

Fluid Density

Suction Instrument Spool	46.30	lbm/ft^3
Discharge Instrument Spool	45.30	lbm/ft^3

System Flows

Mass Flow Rate	-5	lb/sec
Suction Volumetric Flow Rate	-47	gpm
Discharge Volumetric Flow Rate	-37	gpm
Suction Normalized Volumetric Flow Rate	-0.01	
Discharge Normalized Volumetric Flow Rate	-0.01	
Suction Fluid Velocity	-0.58	ft/sec
Discharge Fluid Velocity	-0.46	ft/sec
Suction Momentum Flux	17	$lbm/ft\ sec^2$
Discharge Momentum Flux	11	$lbm/ft\ sec^2$

Pump Performance

Pump head	-0.29	psi
	-0.9	ft
Pump Speed	Locked Rotor	
Pump Shaft Torque	6.7	ft lb
Pump Hydraulic Torque	7.8	ft lb

System Mass (t = 30 Sec)[a]

High Pressure Drum Level	66.52	in[b]
Fluid Mass Upstream of Test Pump	15,266	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 1465

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-6.9	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	1.4	c
HPSW-1 Closed	2.9	c
Pump Power Trip	-	-
Initiate Rupture Mechanism	3.9	c
Blowdown Starts	5.9	40
HPSW-2 Closed	273.9	310
PAC-12 and PAC-16 Injection Off	93.6	125
PAC-12 and PAC-16 Injection On	194.8	235
Test Pump Injection Off	125.8	165
Test Pump Injection On	168.8	200
End of Digitized Data 20 s/sec	433.0	-
200 s/sec	293.0	-
FM Recording System Off	771.0	-
Scanner System Off	-	480

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

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FM DATA PLOTS

Test Number (1465)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
28	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 Discharge
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge

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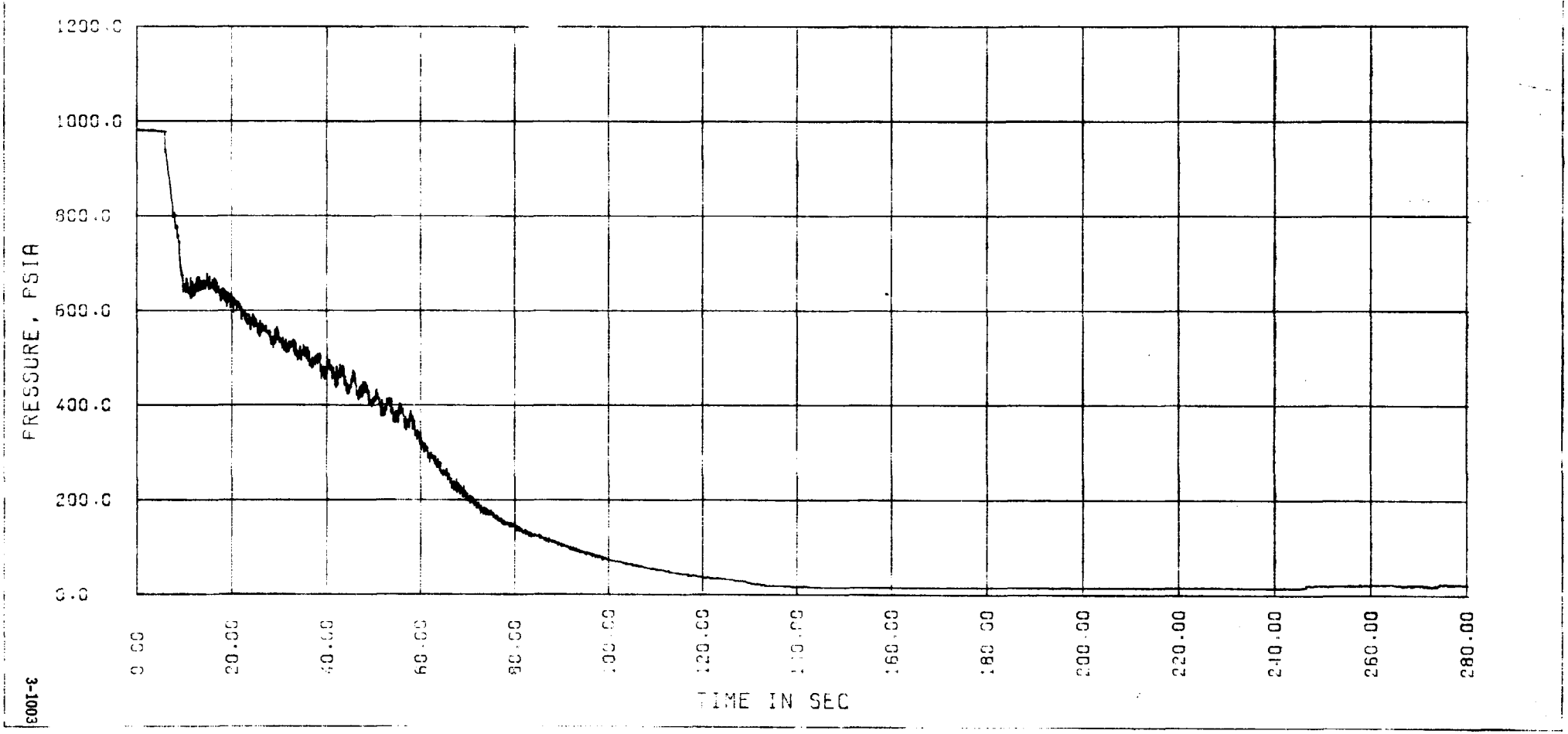
of

FM DATA PLOTS (Cont'd.)

Test Number (1465)

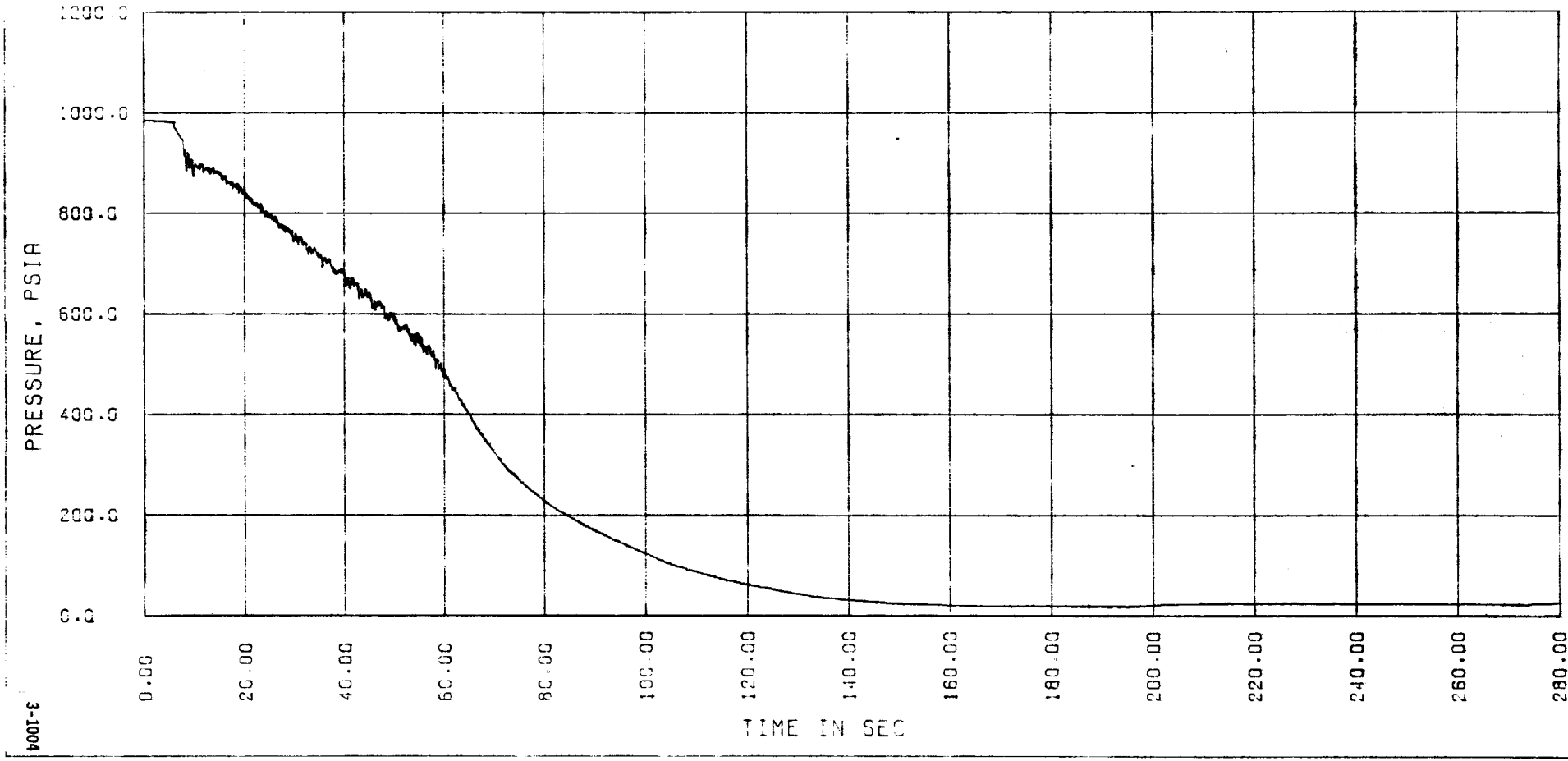
Plot Number	Location Number	Description of Parameter
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
35	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
42	L-27	Momentum Flux LO-DD Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
53	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge
64	L-9	Pump Injection Mass Flow Rate In
65	L-32	Pump Injection Mass Flow Rate Out
66	L-9/L-32	Seal Injection Leakage Mass Flow Rate

TEST 1465/1000 PSIA LR REV BDN
PUMP SUCTION PRESSURE
PLOT NO.1



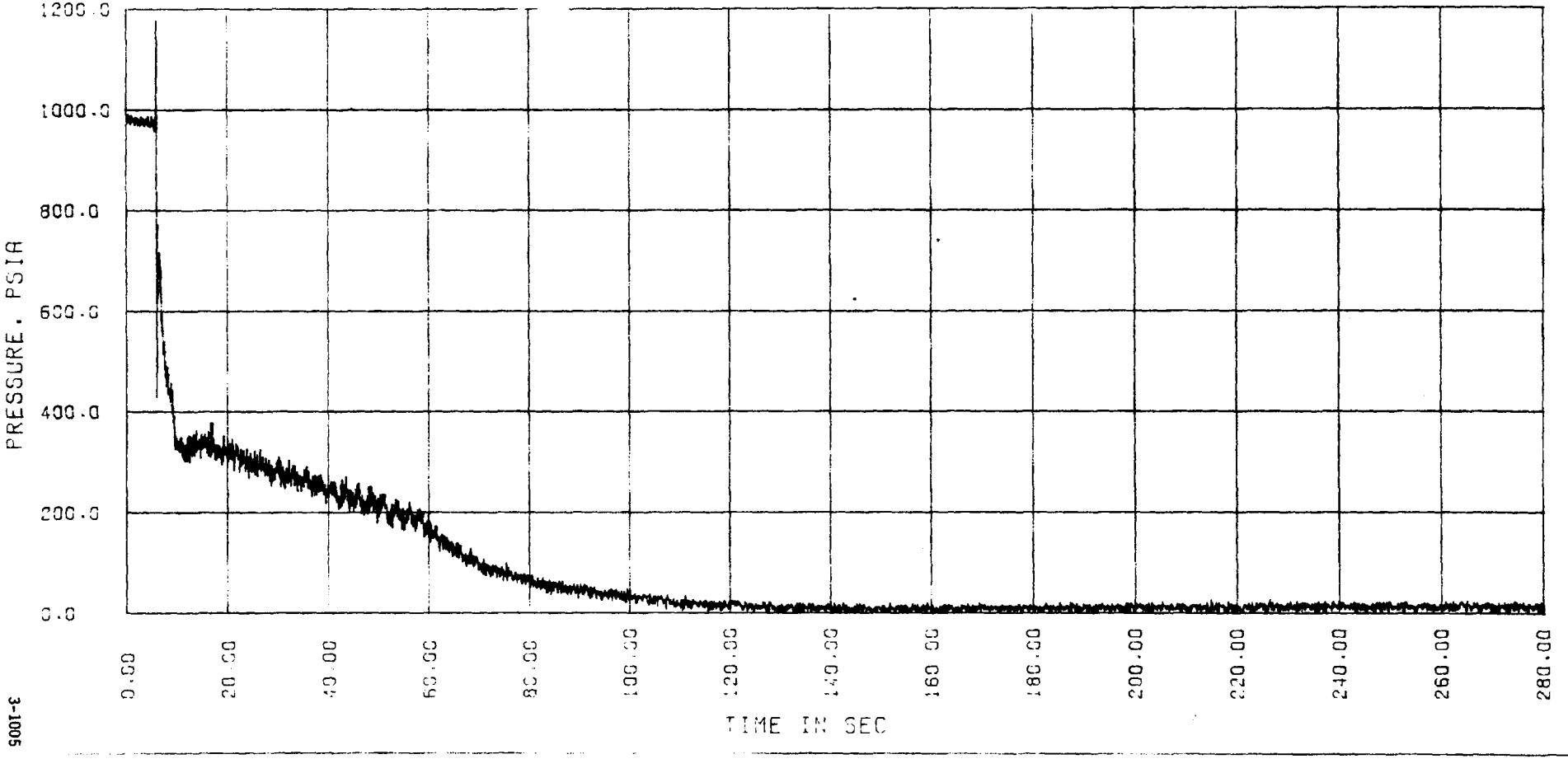
E-1003

TEST 1465/1000 PSIA LR REV BDN
PUMP DISCHARGE PRESSURE
PLOT NO-2



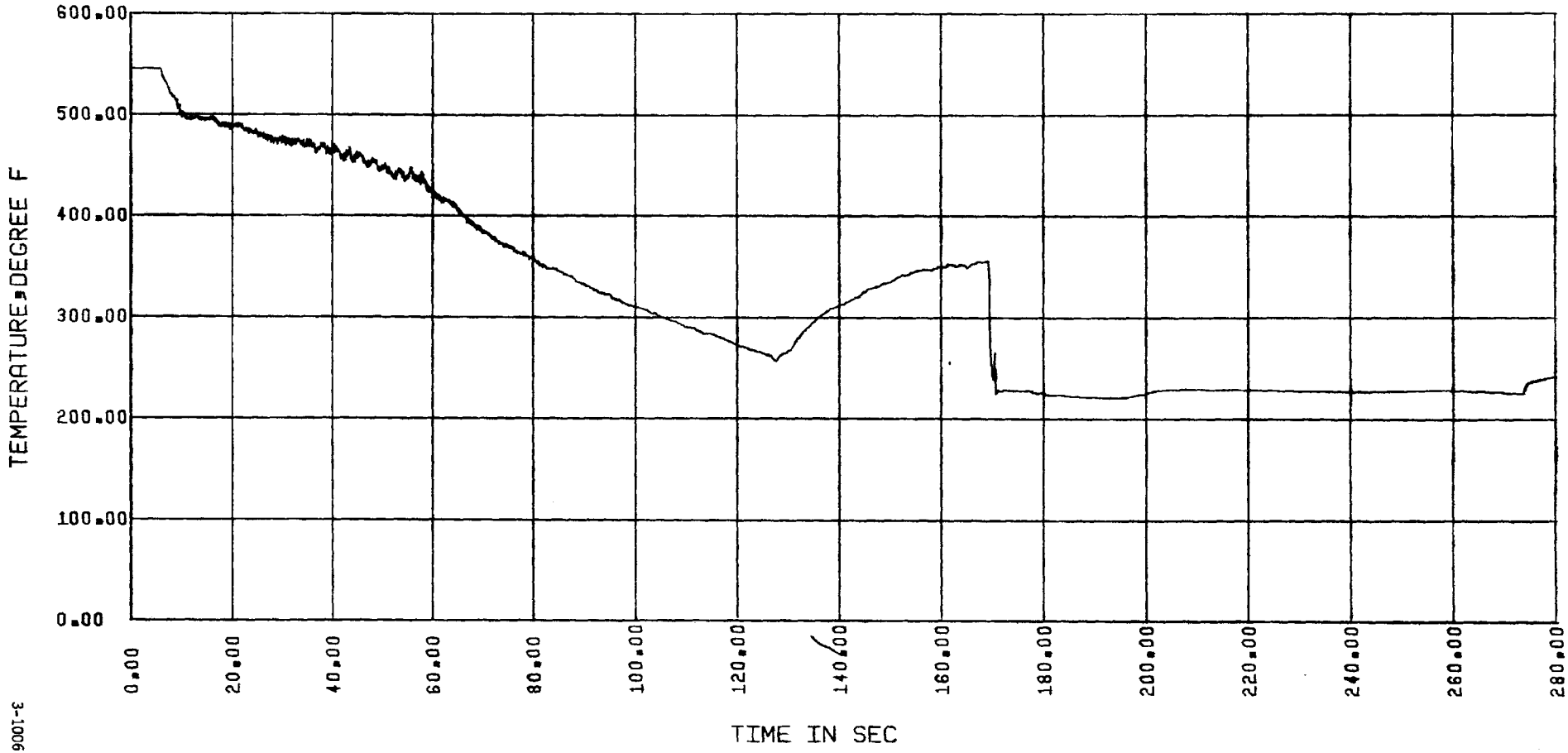
3-1004

TEST 1465/1000 PSIA LR REV BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



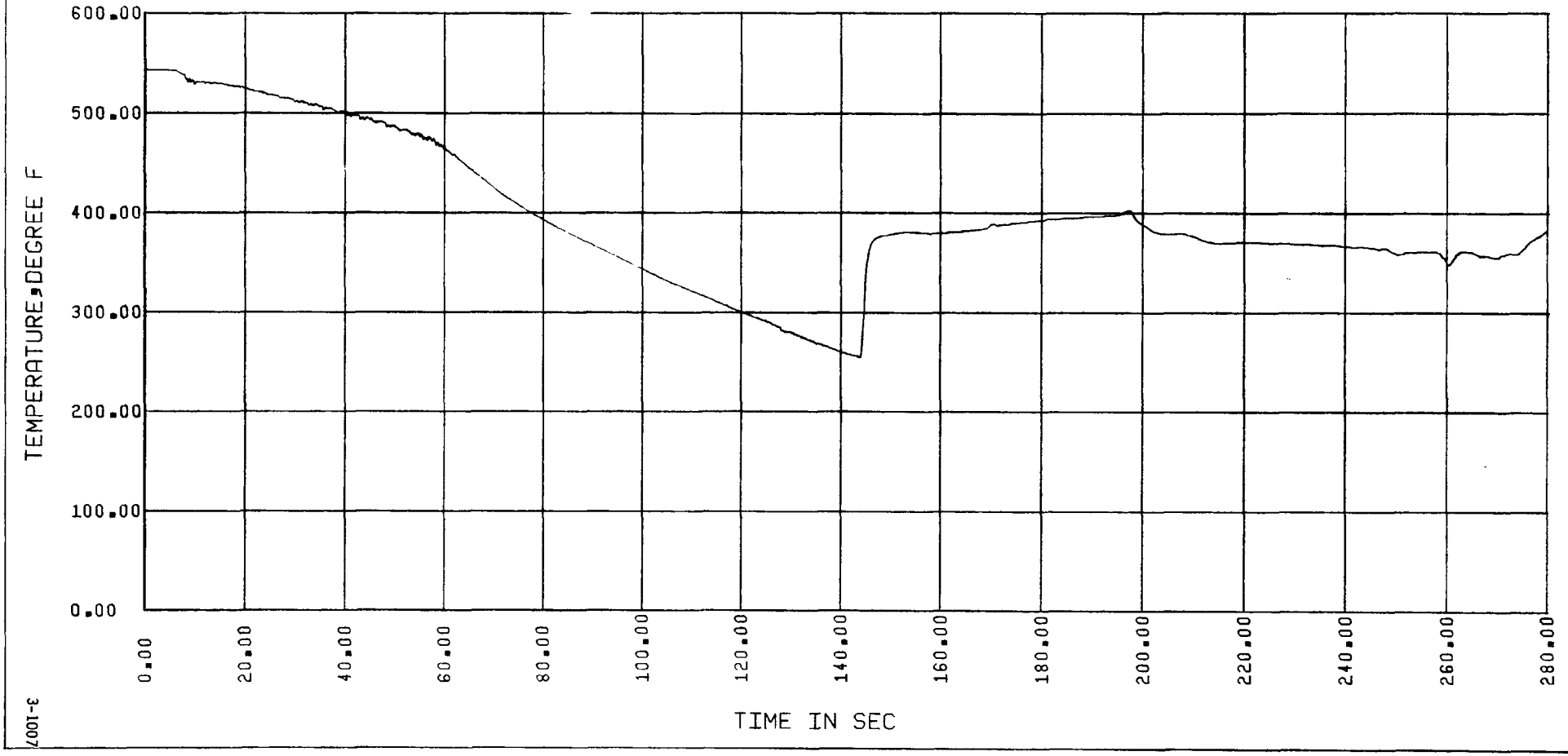
3-1005

TEST 1465/1000 PSIA LR REV BDN
PUMP SUCTION TEMPERATURE
PLOT NO. 4



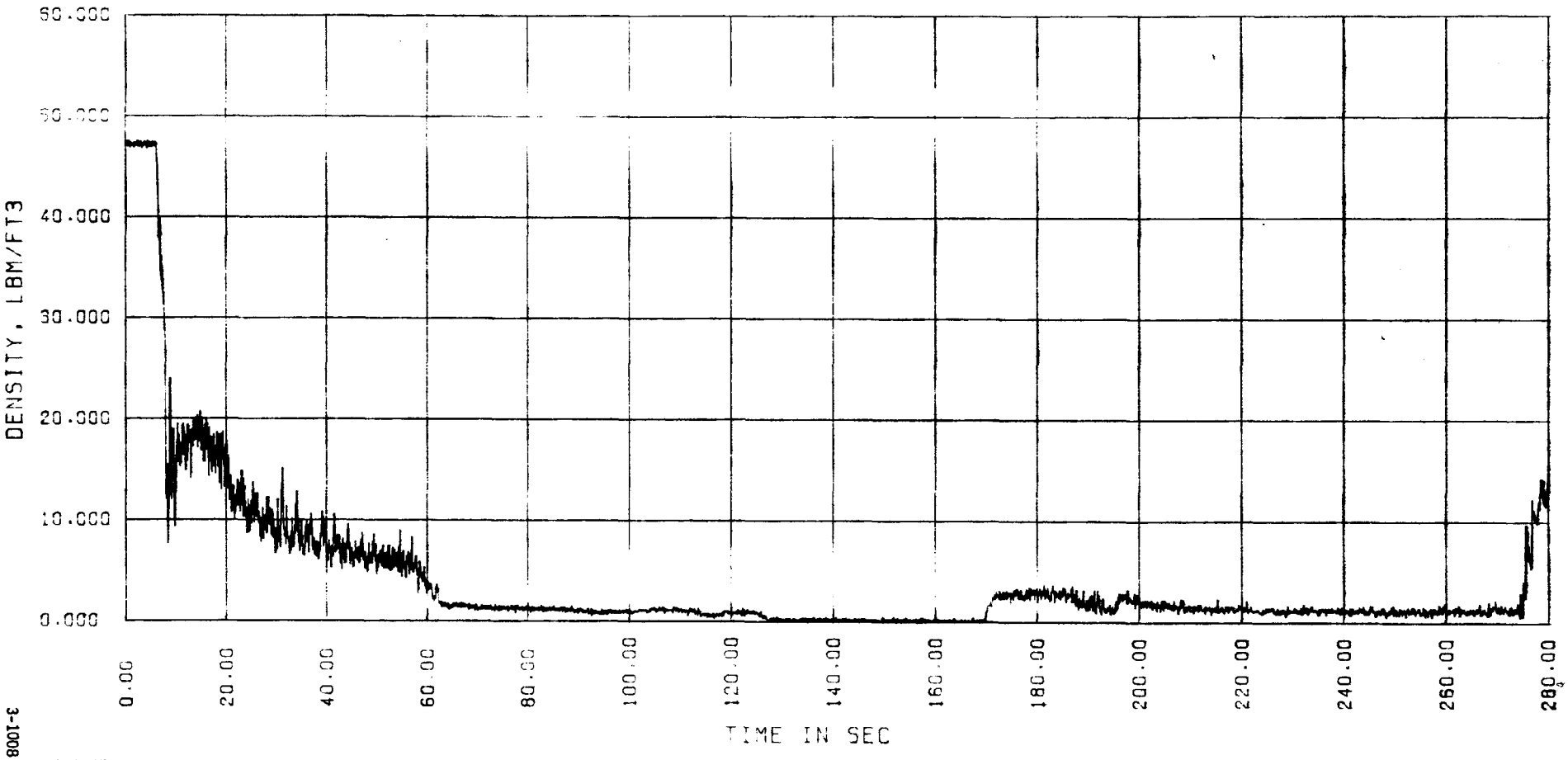
3-1006

TEST 1465/1000 PSIA LR REV BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5

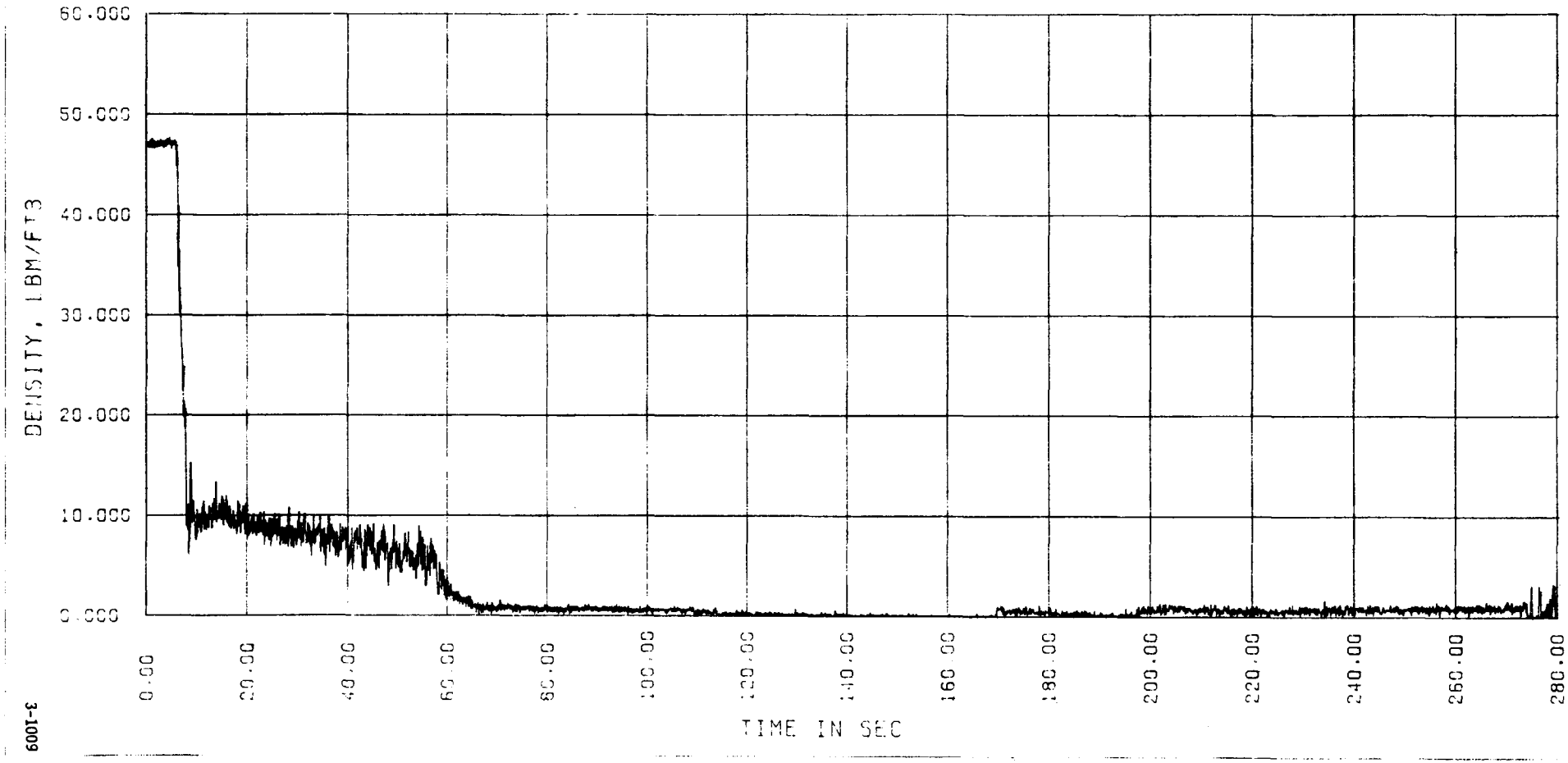


3-1007

TEST 1465/1000 PSIA LR REV BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6

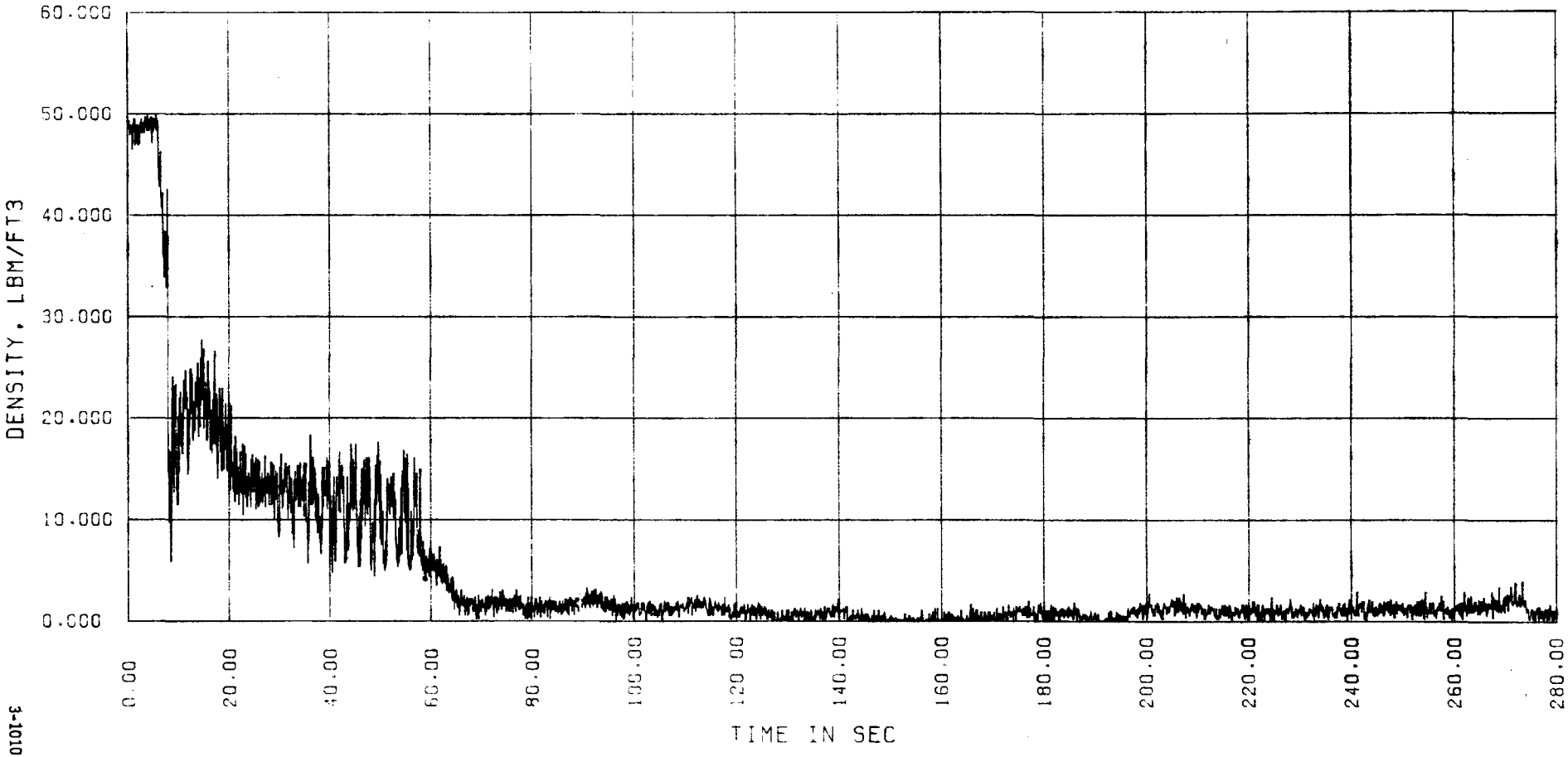


TEST 1465/1000 PSIA LR REV BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7



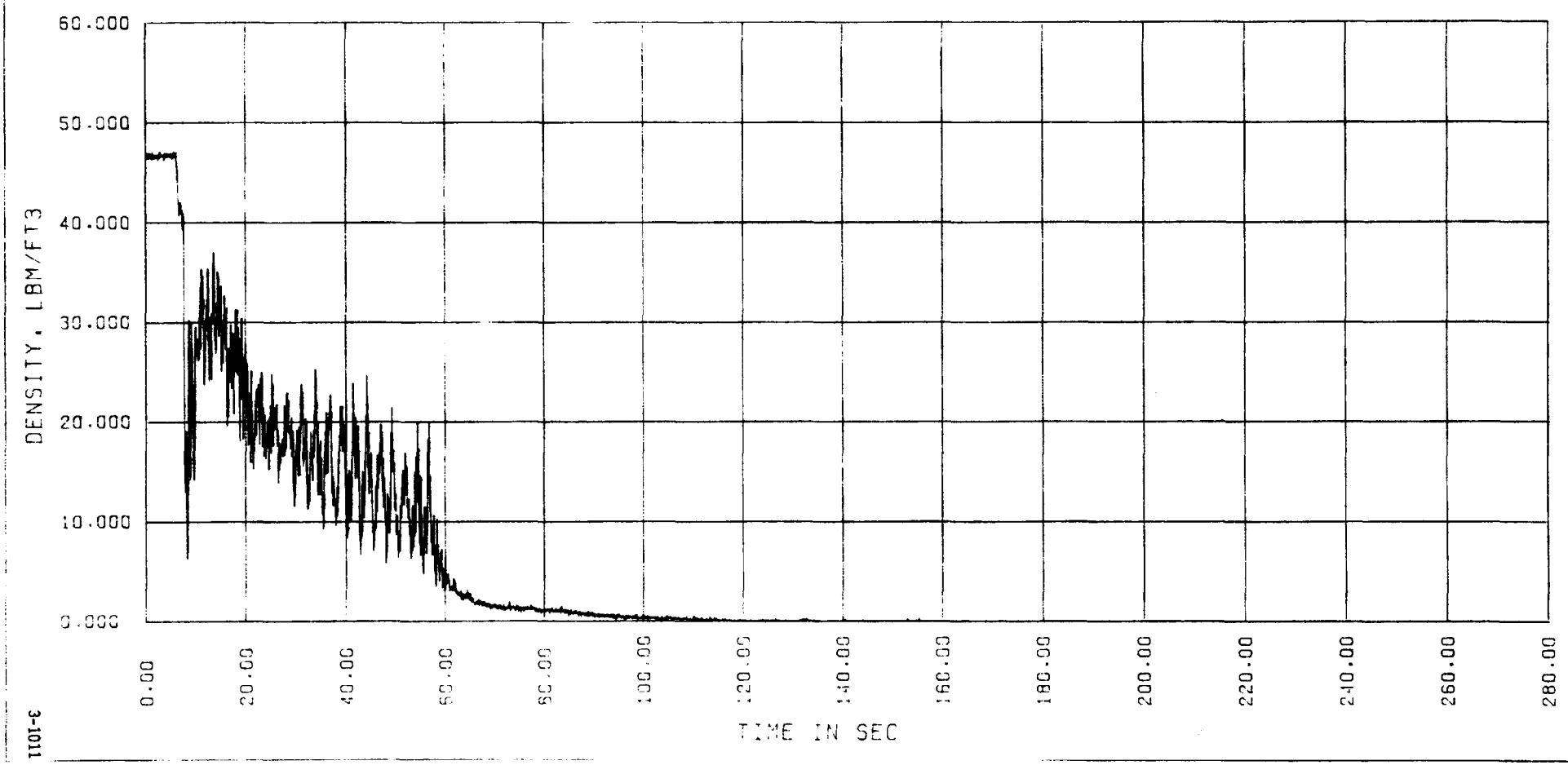
3-1009

TEST 1465/1000 PSIA LR REV BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8



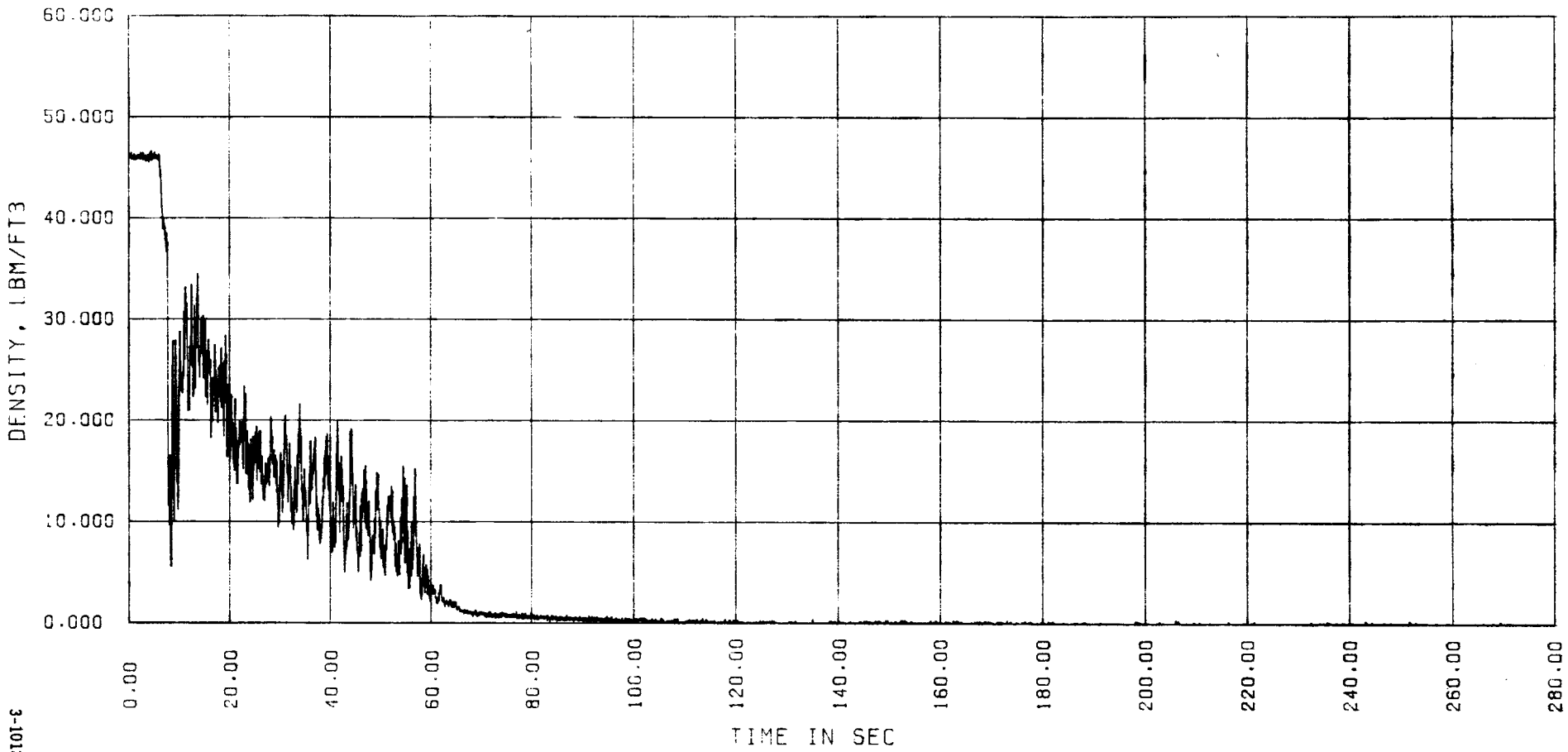
3-1010

TEST 1465/1000 PSIA LR REV BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9

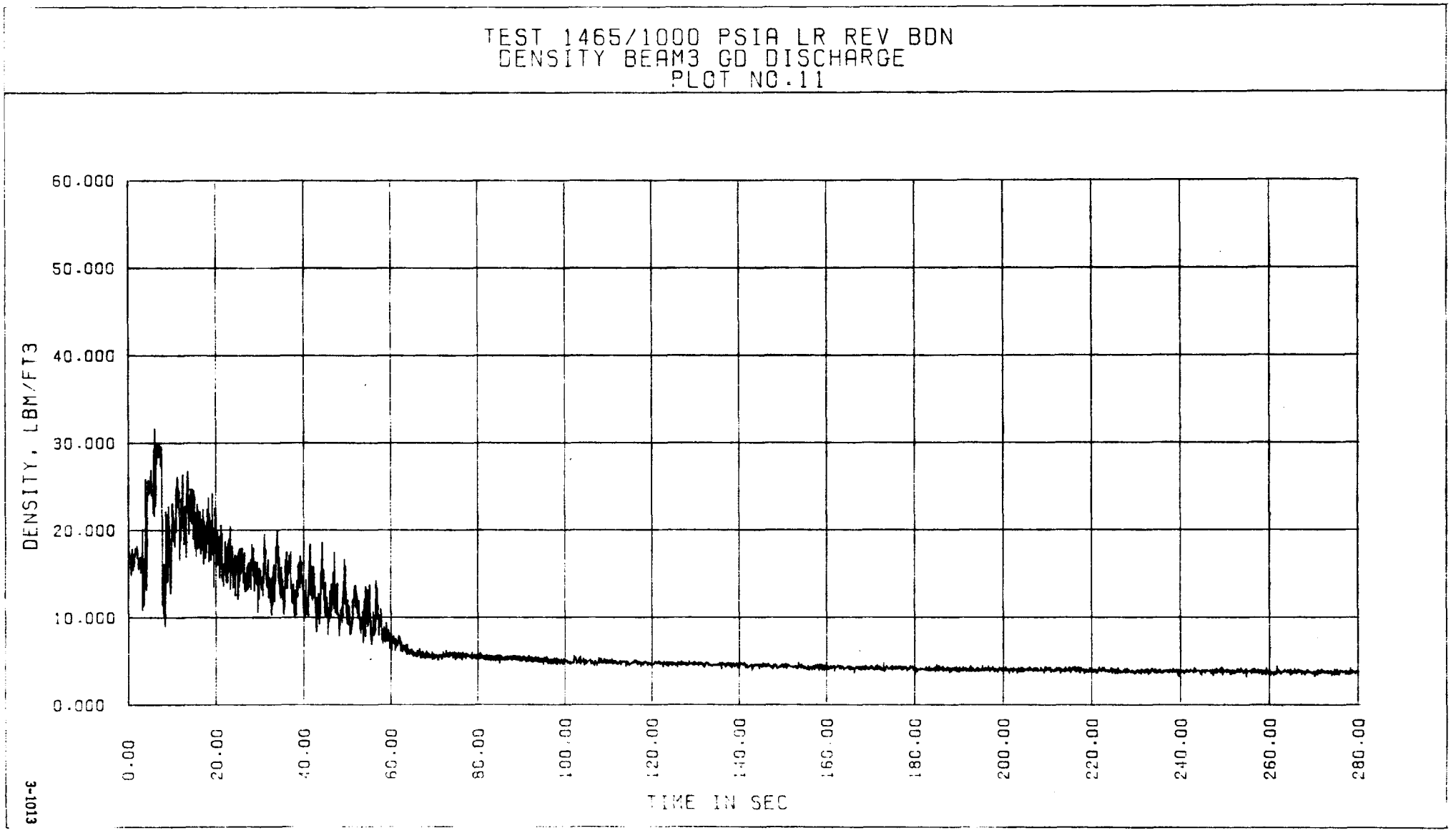


3-1011

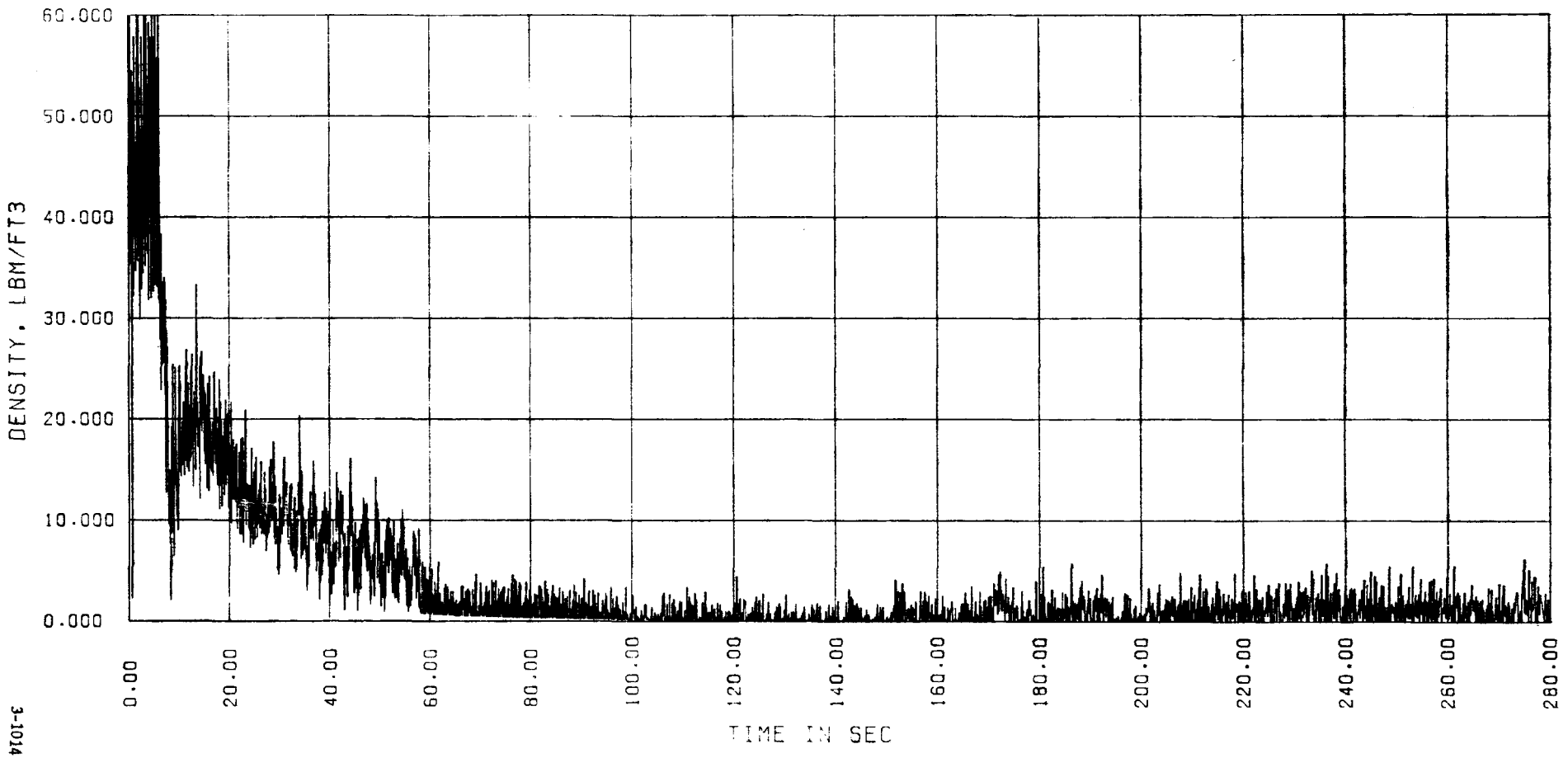
TEST 1465/1000 PSIA LR REV BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10

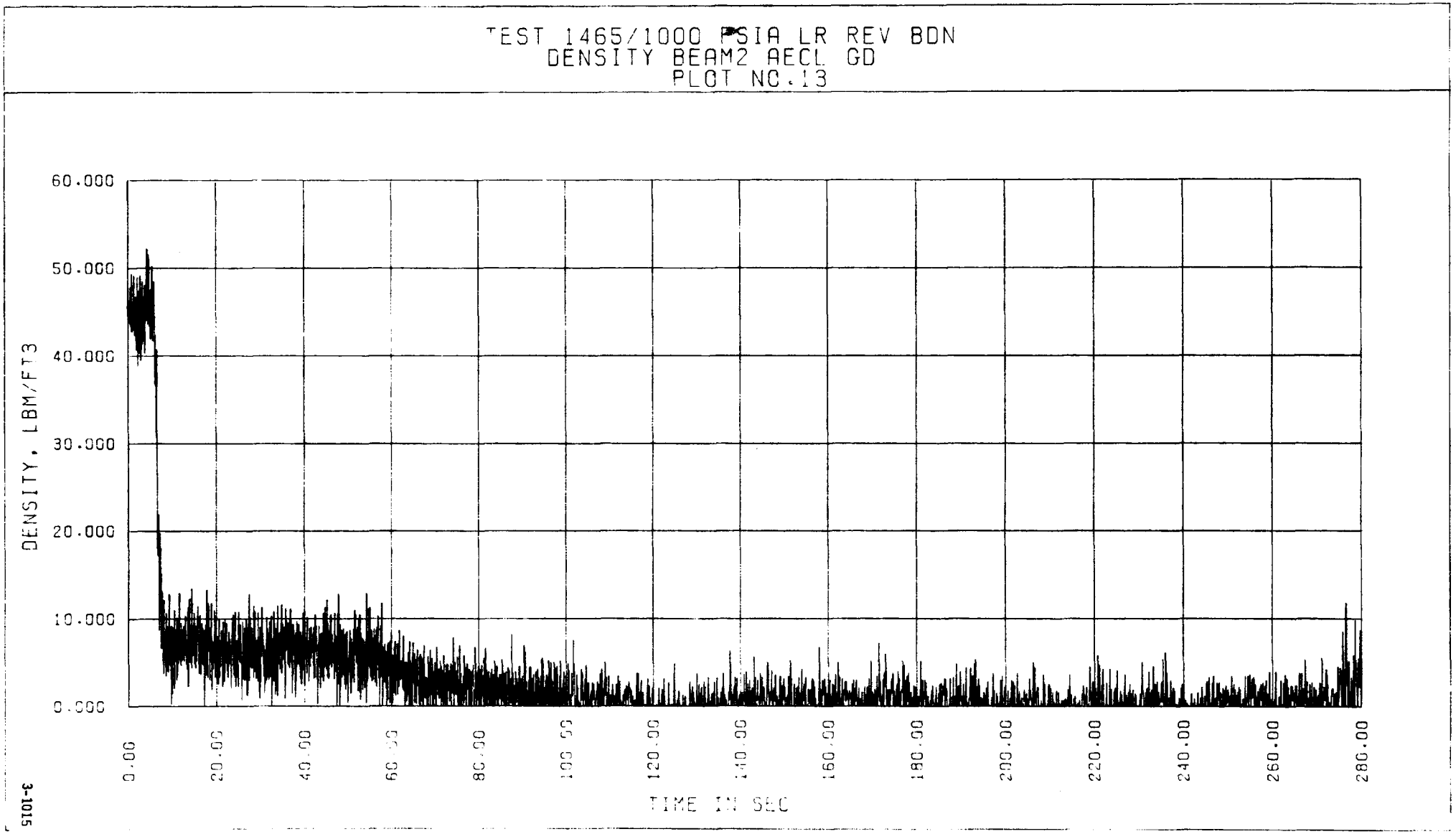


3-1012

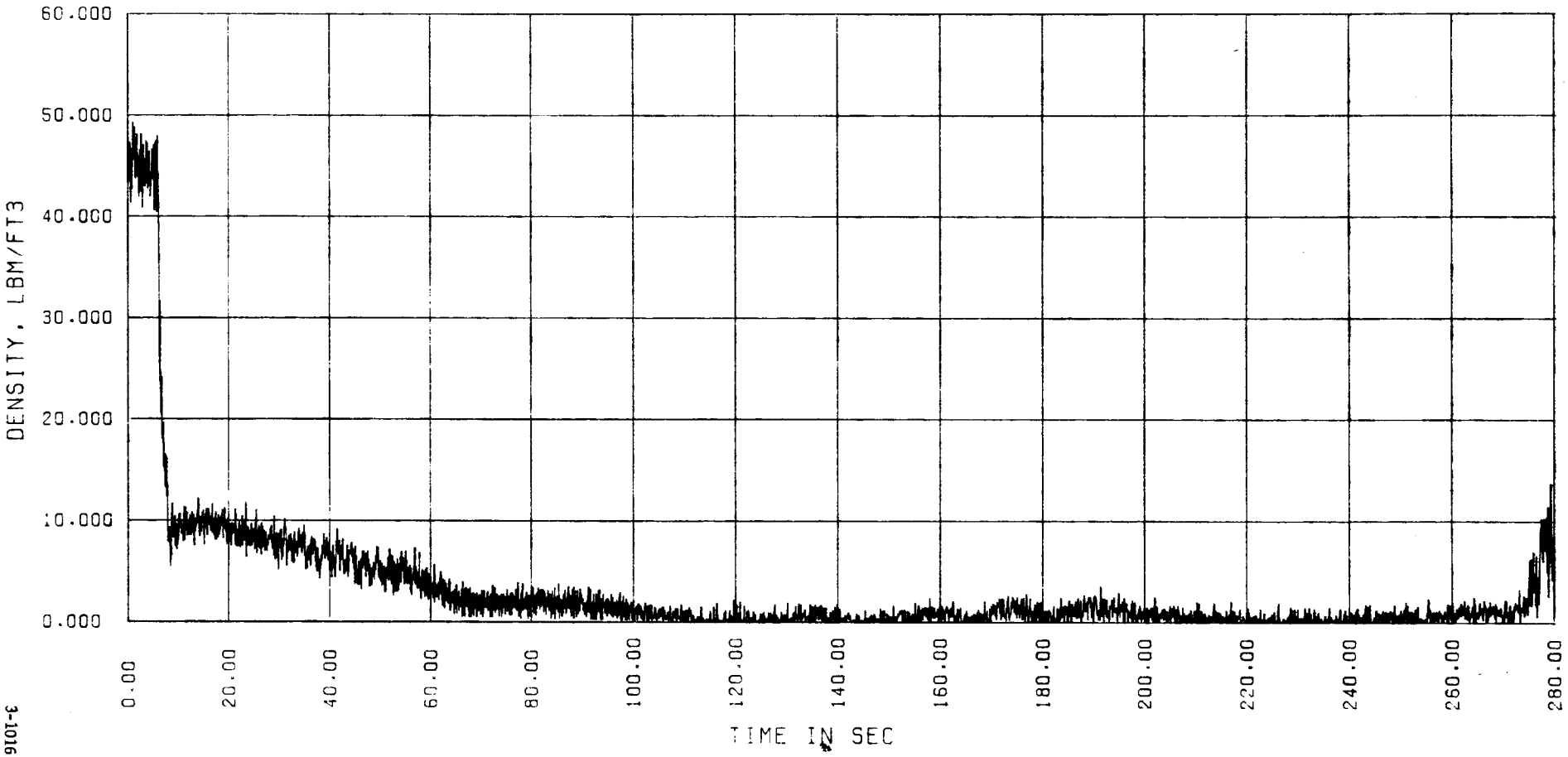

TEST 1465/1000 PSIA LR REV BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11
DENSITY, LBM/FT3
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
E101-3

TEST 1465/1000 PSIA LR REV BDN
DENSITY BEAM1 AECL GD
PLOT NO.12



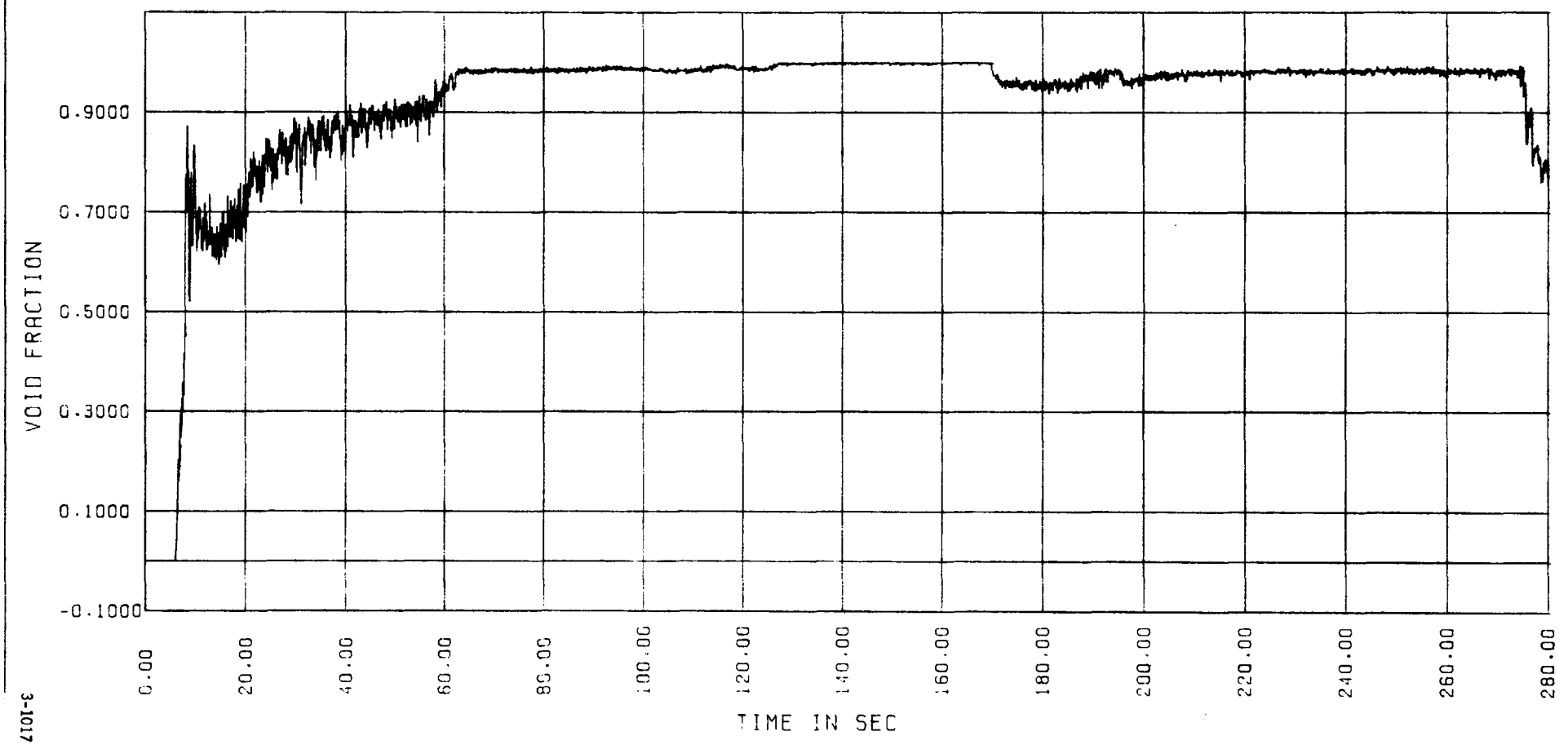

TEST 1465/1000 PSIA LR REV BDN
DENSITY BEAM2 AECL GD
PLOT NO. 13
DENSITY, LBM/FT3
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
20.00
40.00
80.00
120.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC

TEST 1465/1000 PSIA LR REV BDN
DENSITY BEAM3 AECL GD
PLOT NO.14

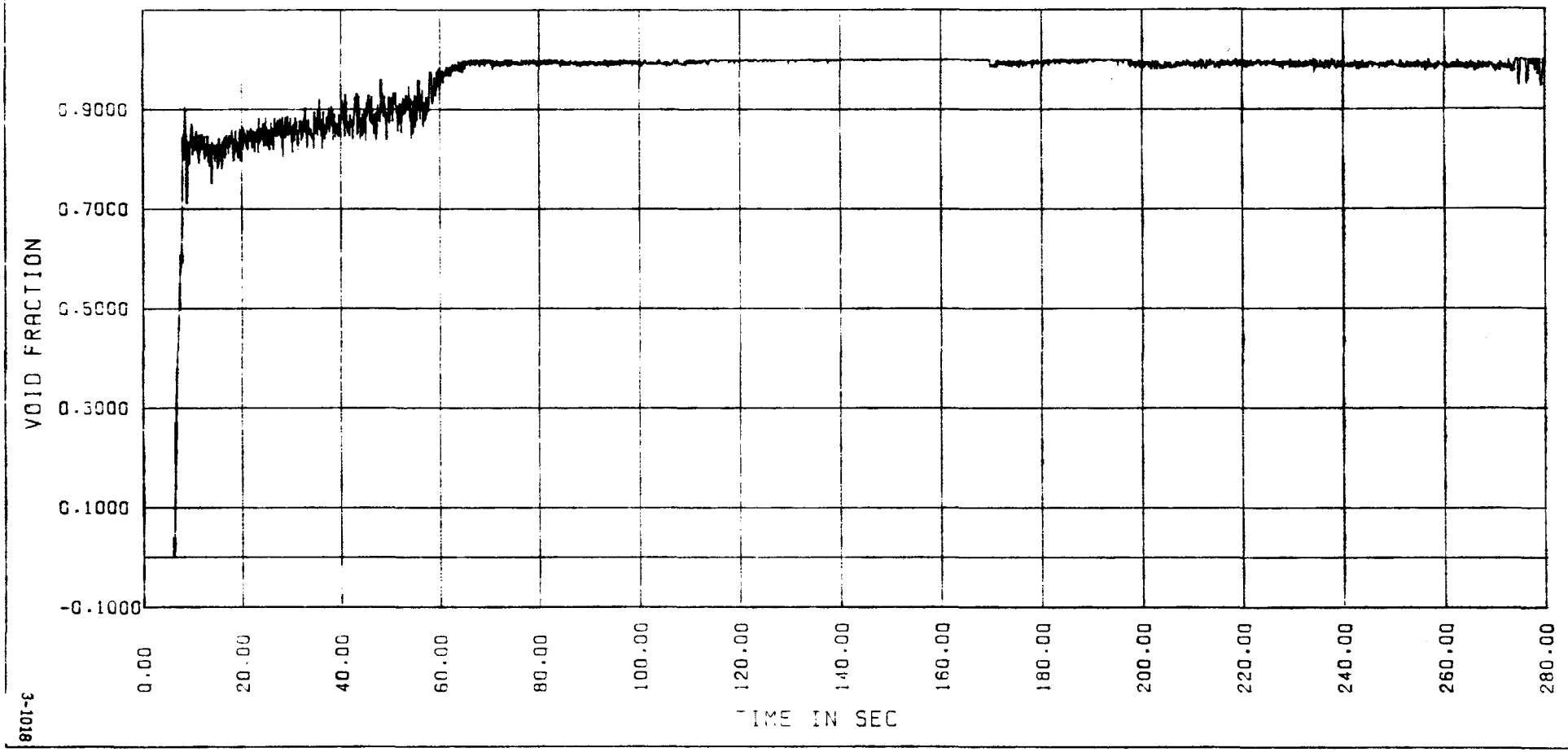


3-1016

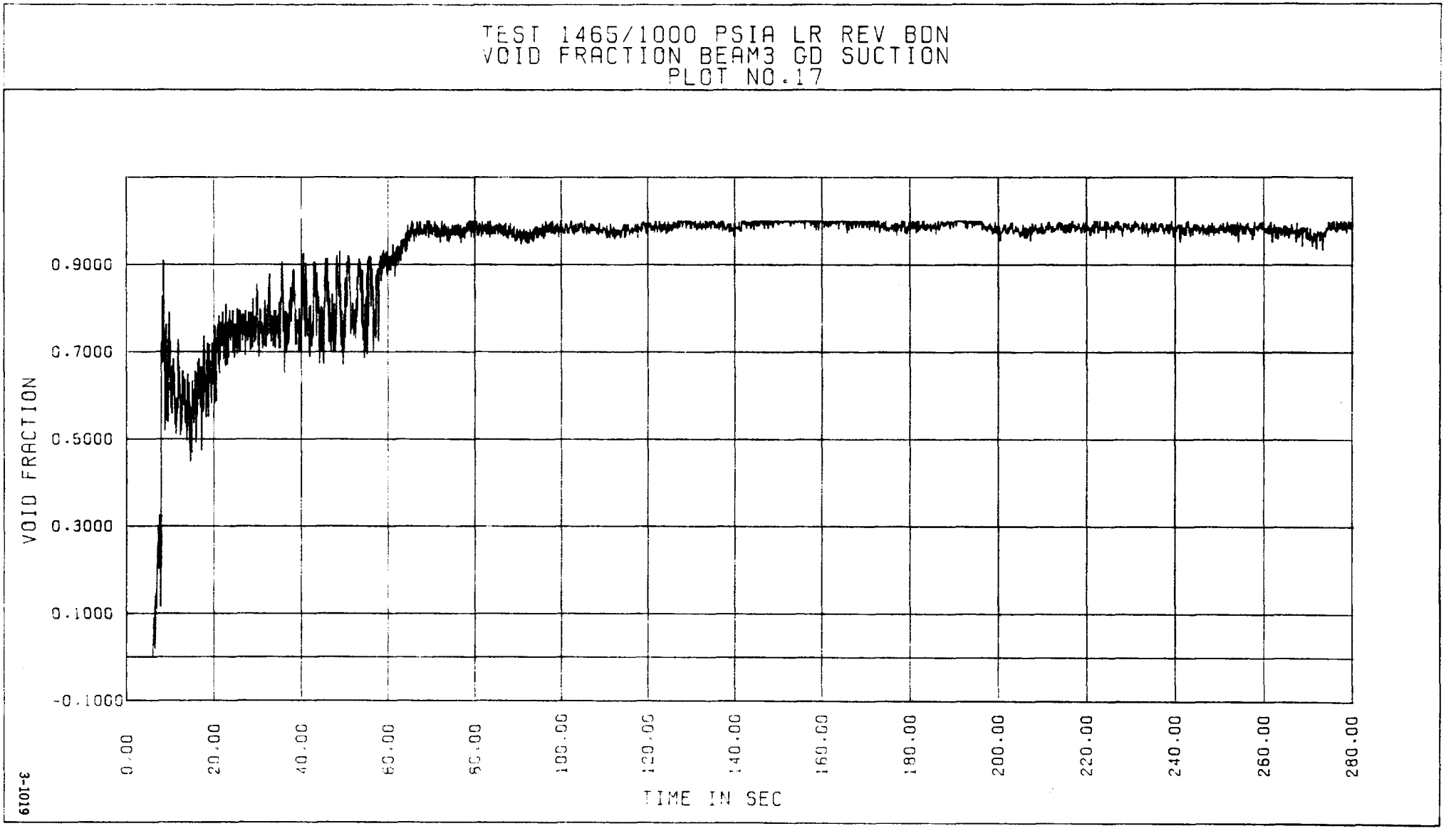
TEST 1465/1000 PSIA LR REV BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15



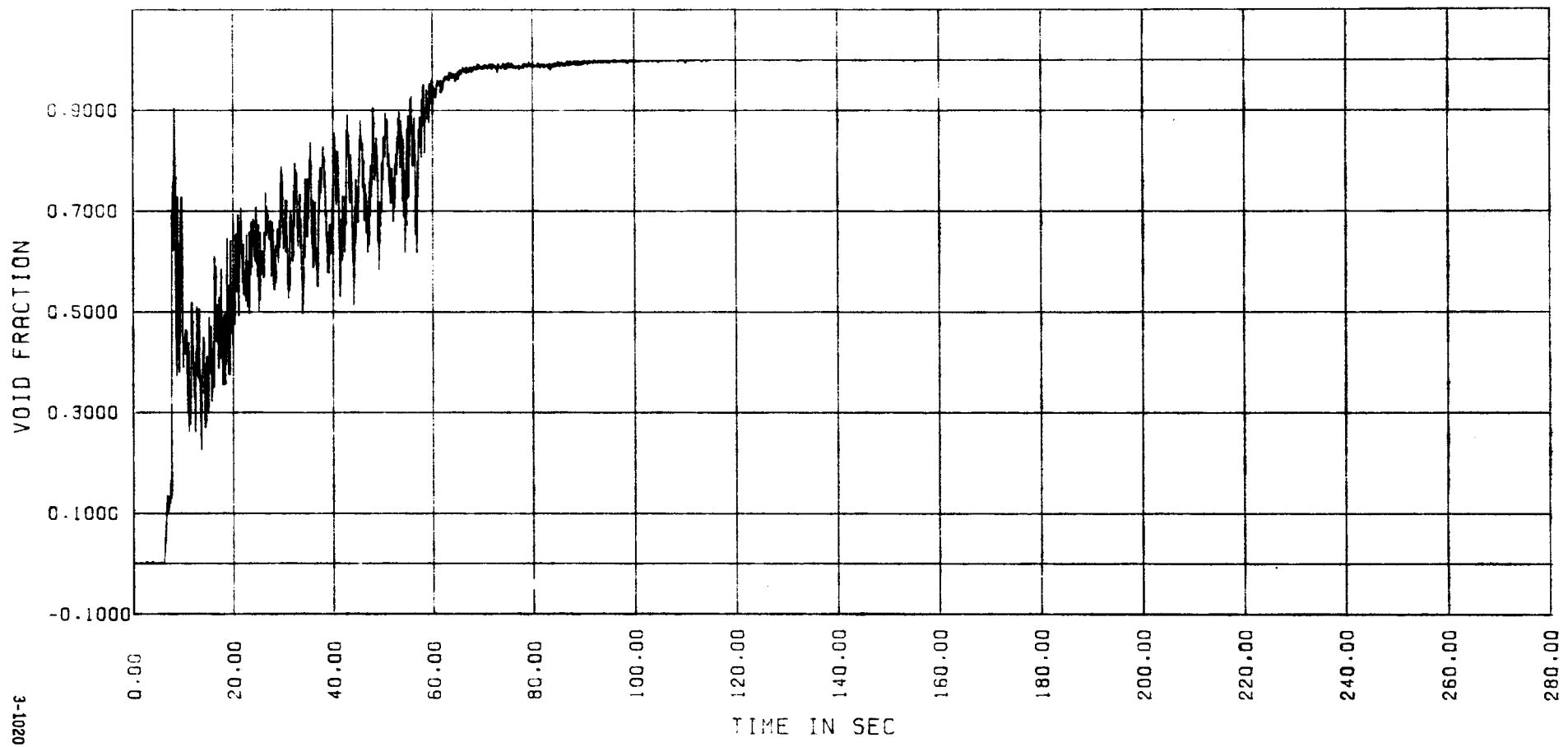
TEST 1465/1CCC PSIA LR REV BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16



E-1018

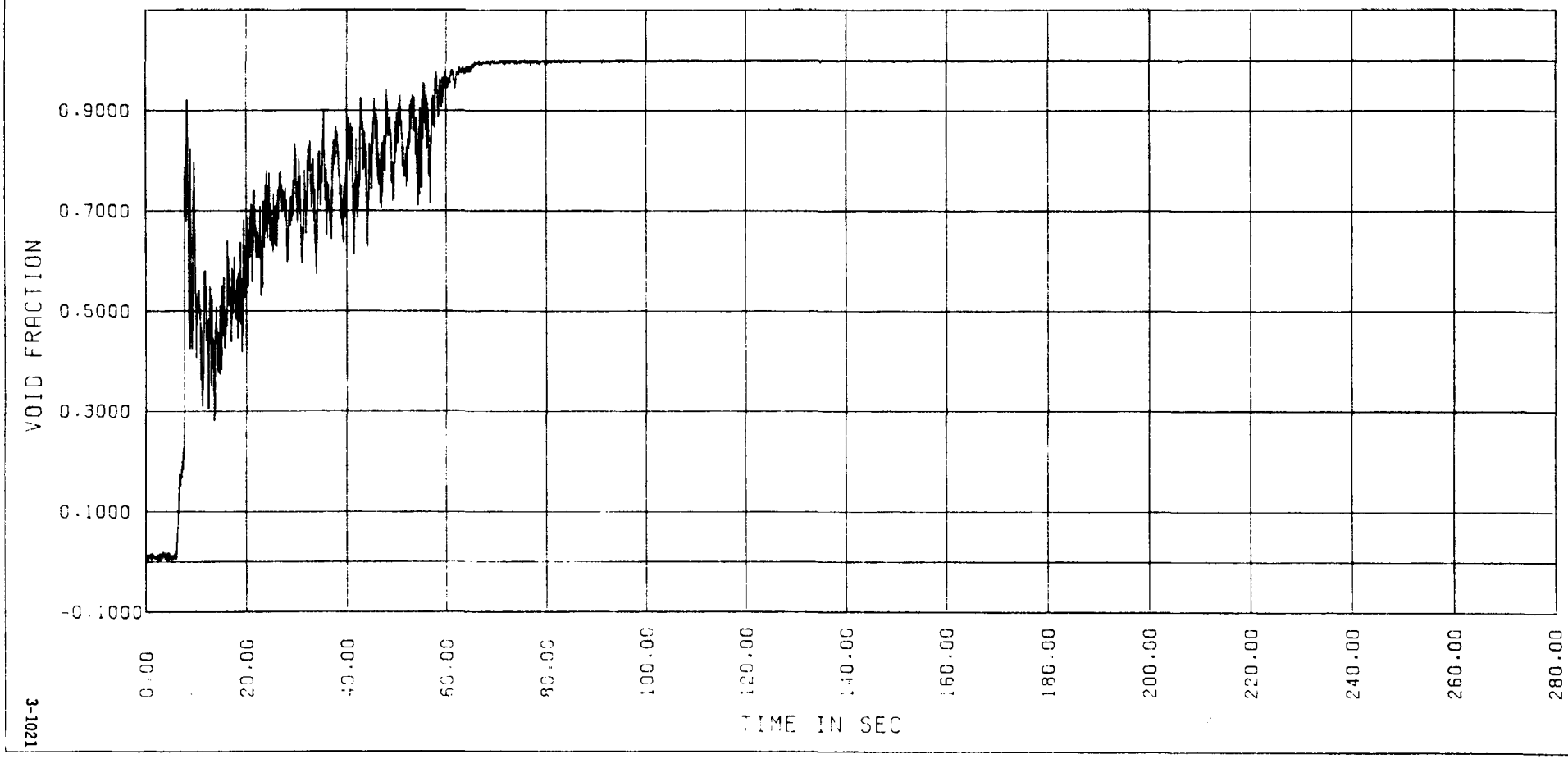

TEST 1465/1000 PSIA LR REV BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-1019

TEST 1465/1000 PSIA LR REV BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO. 18

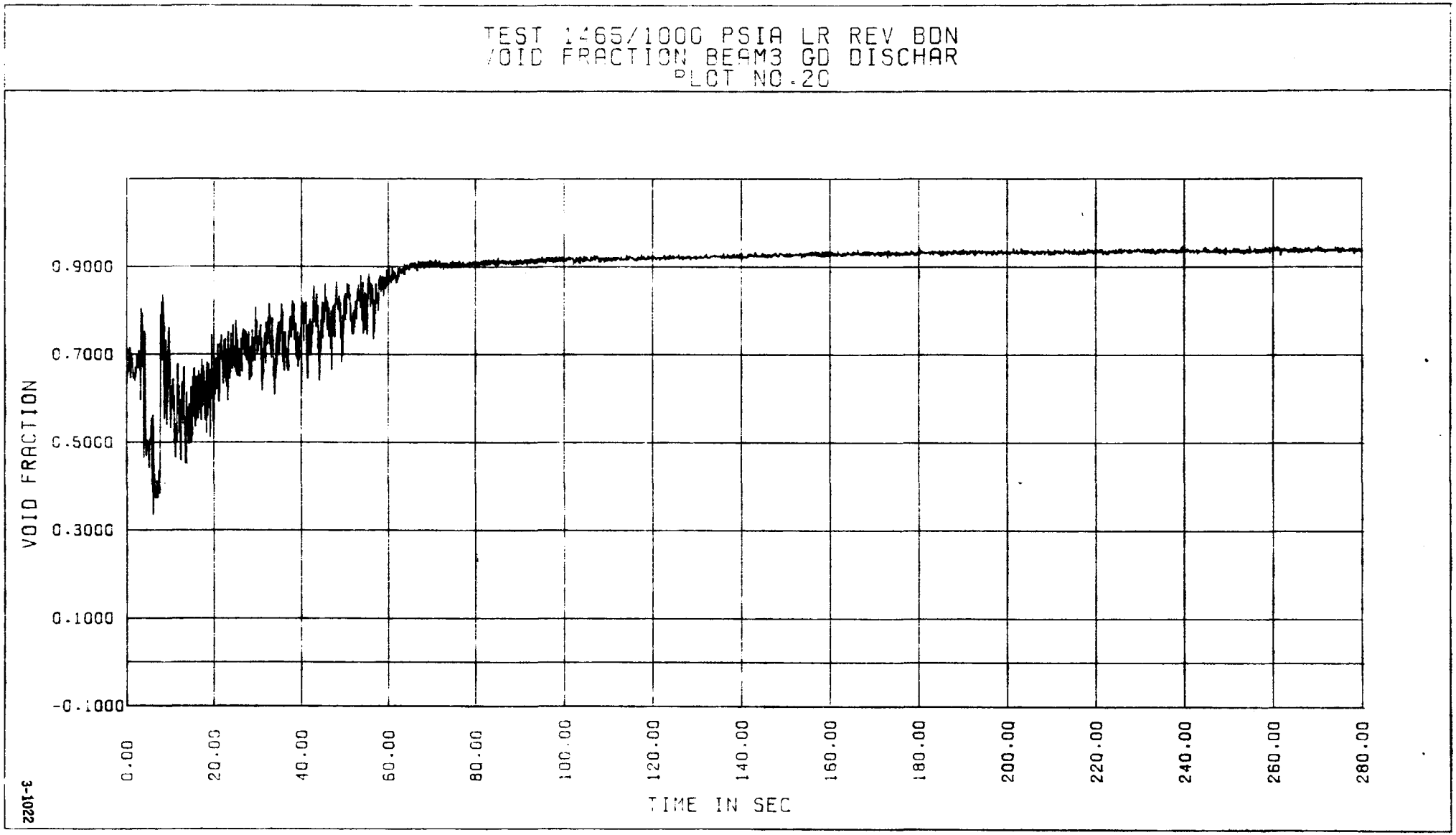


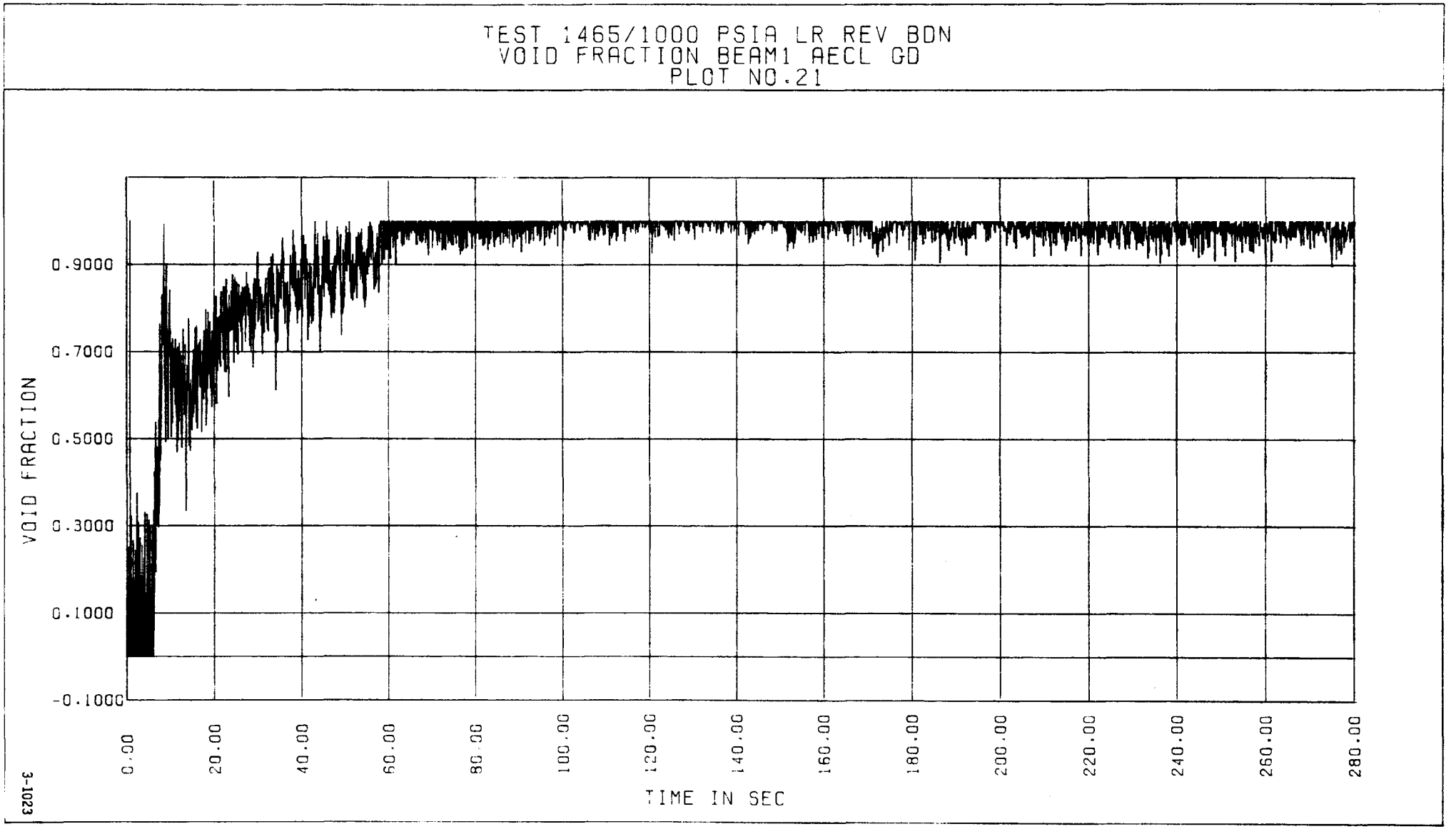
3-1020

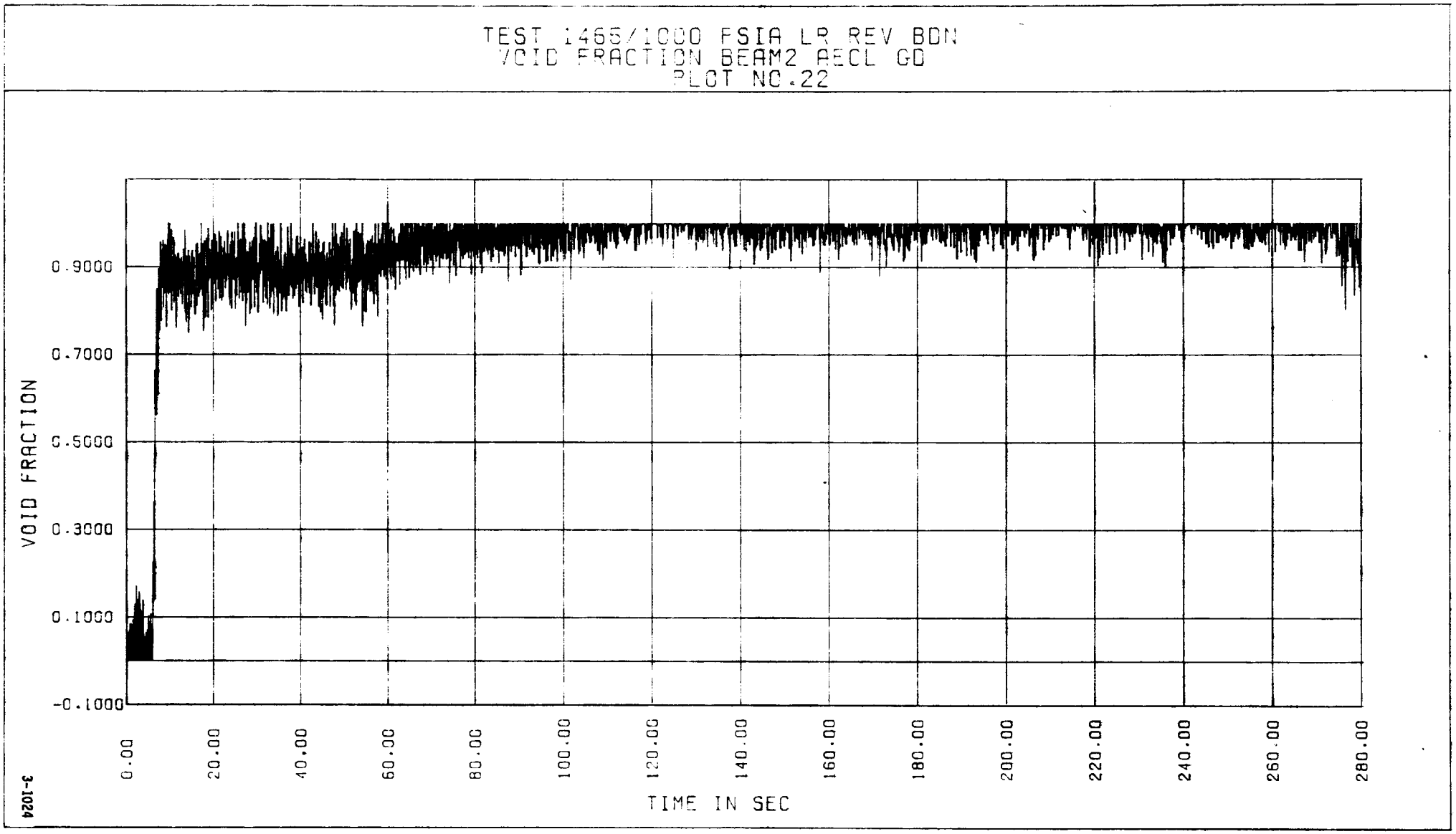
TEST 1465/1000 PSIA LR REV BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19

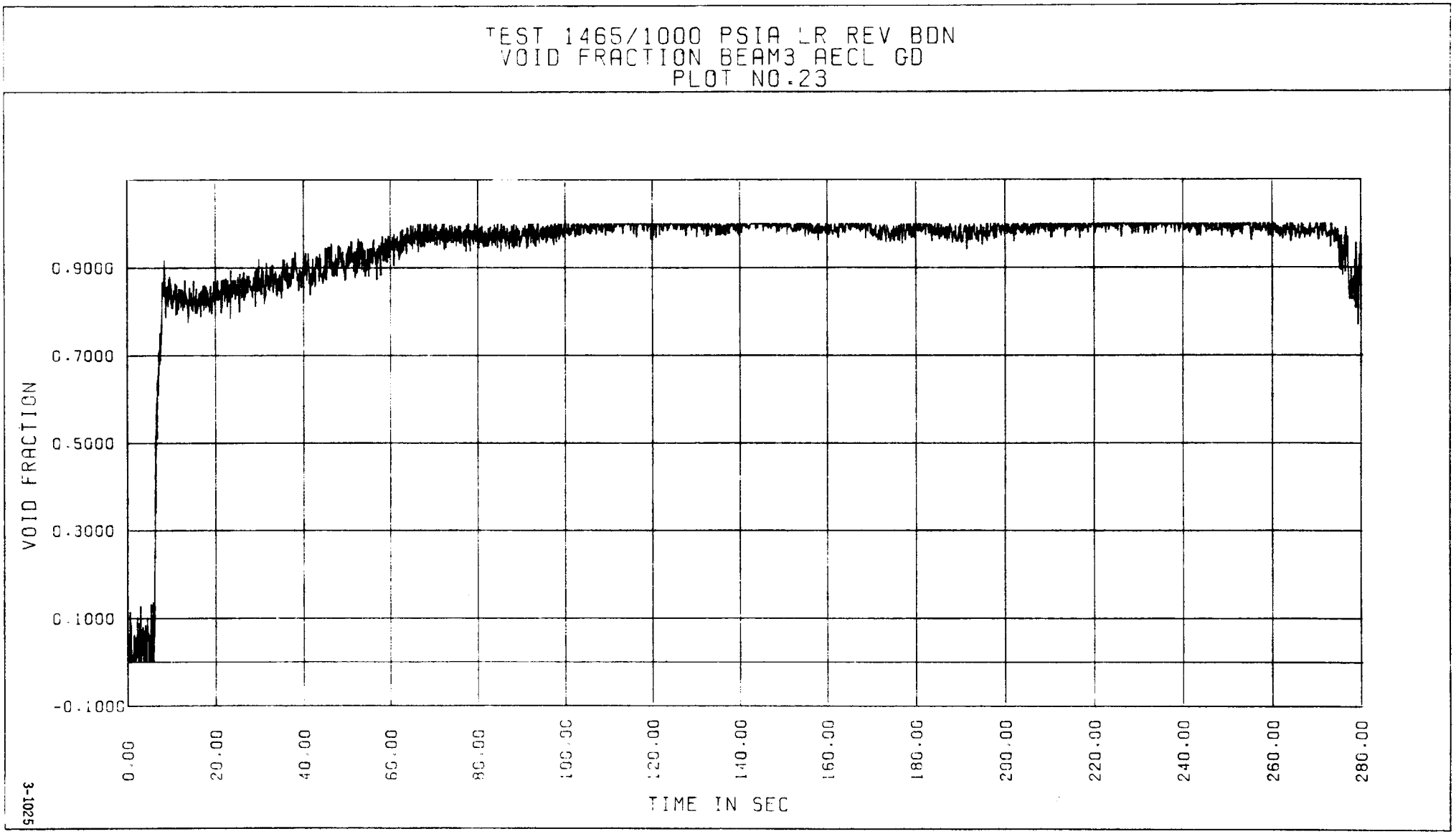


3-1021

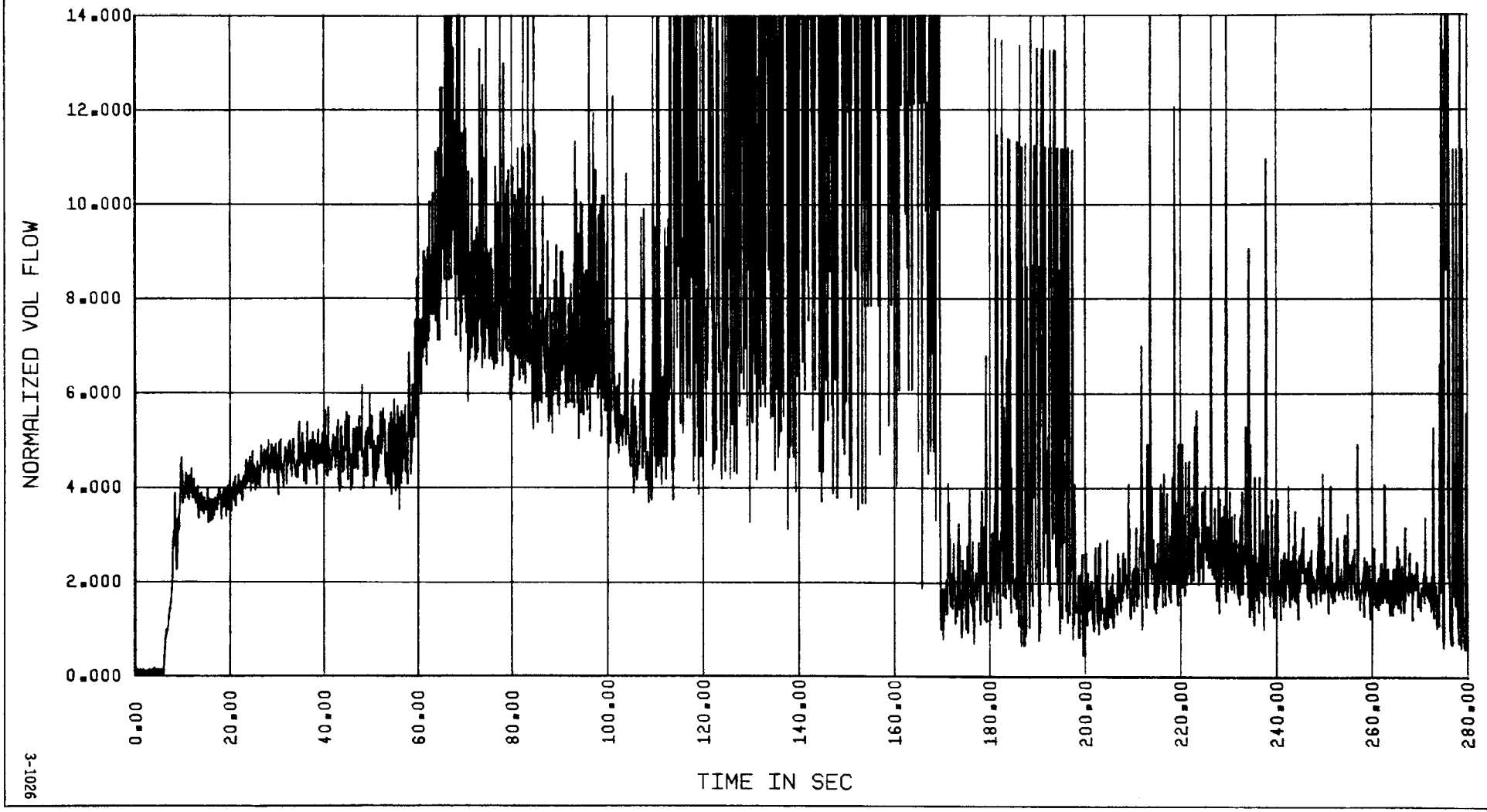

TEST 1465/1000 PSIA LR REV BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-1025


TEST 1465/1000 PSIA LR REV BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-1023


TEST 1465/1000 PSIA LR REV BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-1024

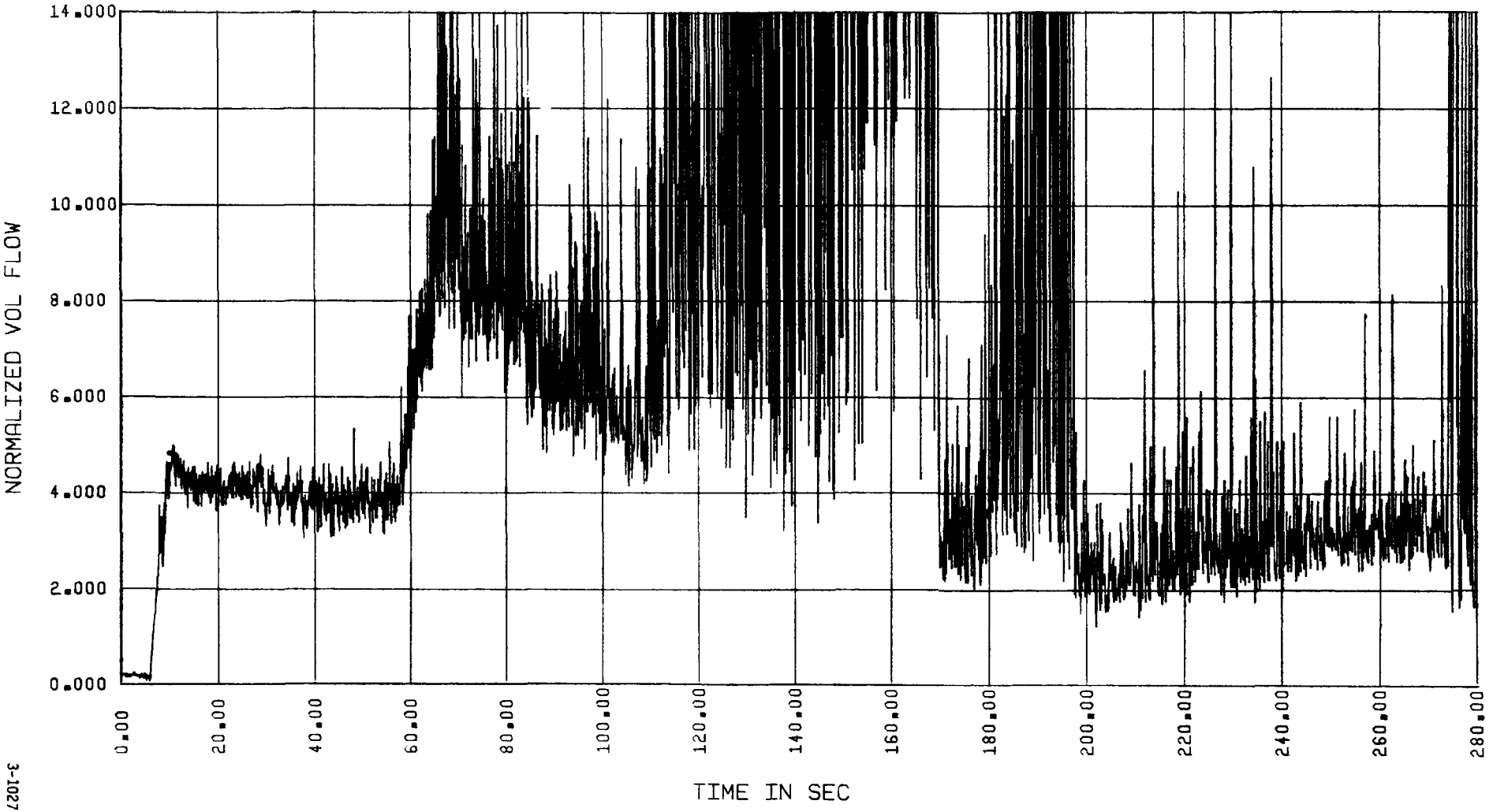

TEST 1465/1000 PSIA LR REV BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23
VOID FRACTION
0.9000
0.7000
0.5000
0.3000
0.1000
-0.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-1025

TEST 1465/1000 PSIA LR REV BDN
NORM VOL FLOW RATE LO-DD/GD2 S
PLOT NO.24



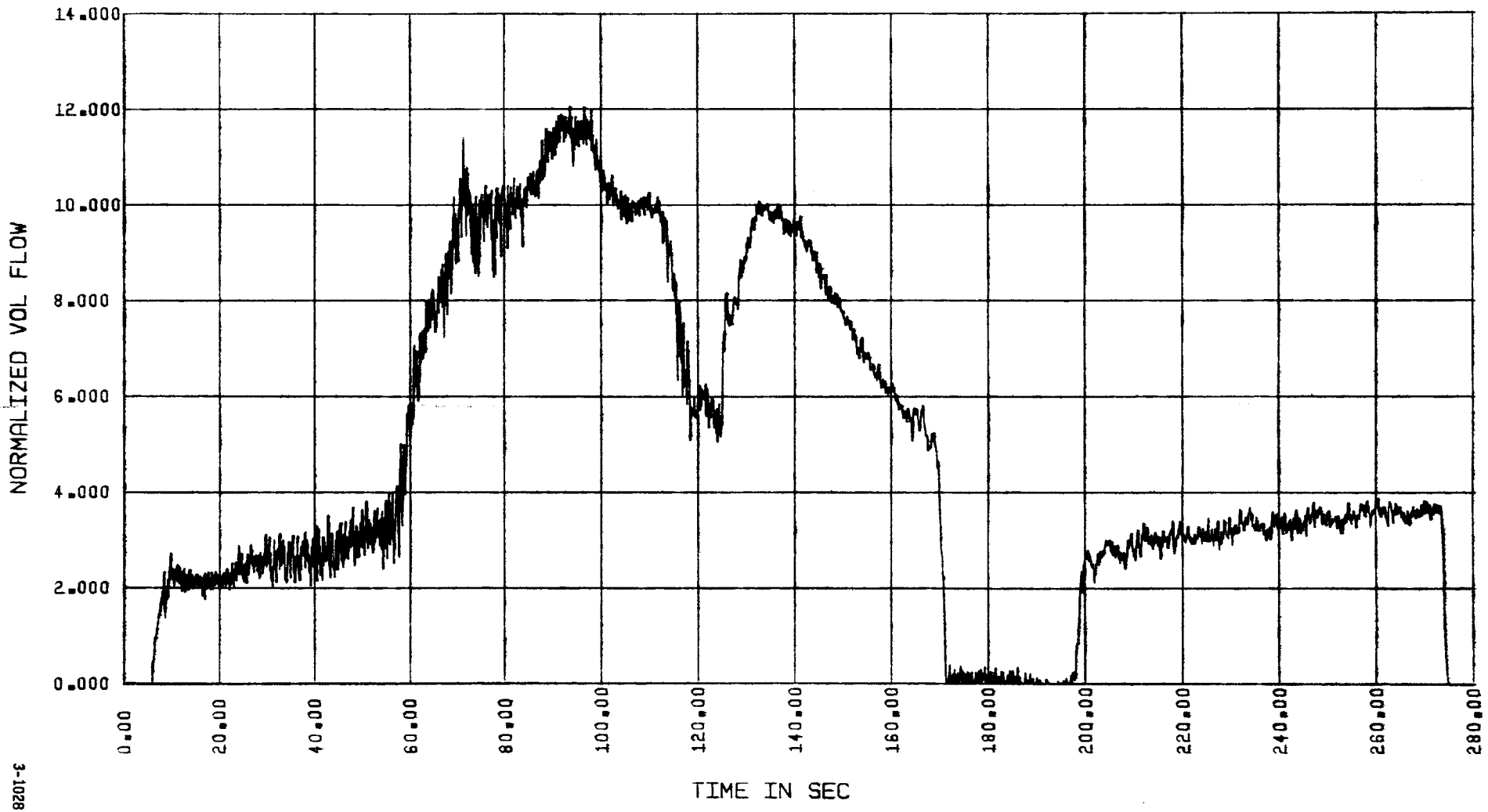
3-1026

TEST 1465/1000 PSIA LR REV BDN
NORM VOL FLOW RATE HI-DD/GD2 S
PLOT NO.25



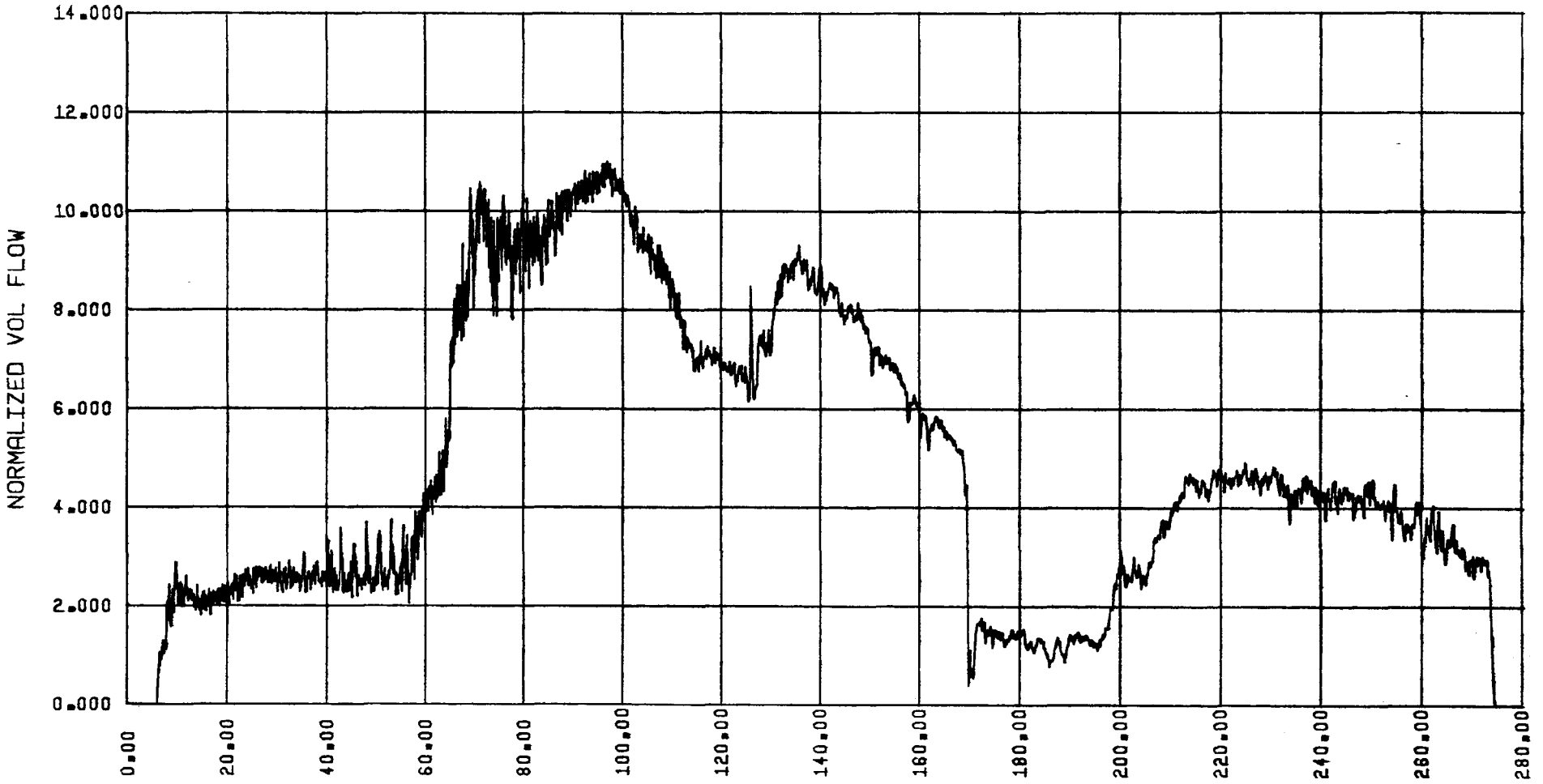
3-1027

TEST 1465/1000 PSIA LR REV BDN
NORM VOL FLOW RATE LO-TM SUCT
PLOT NO.26



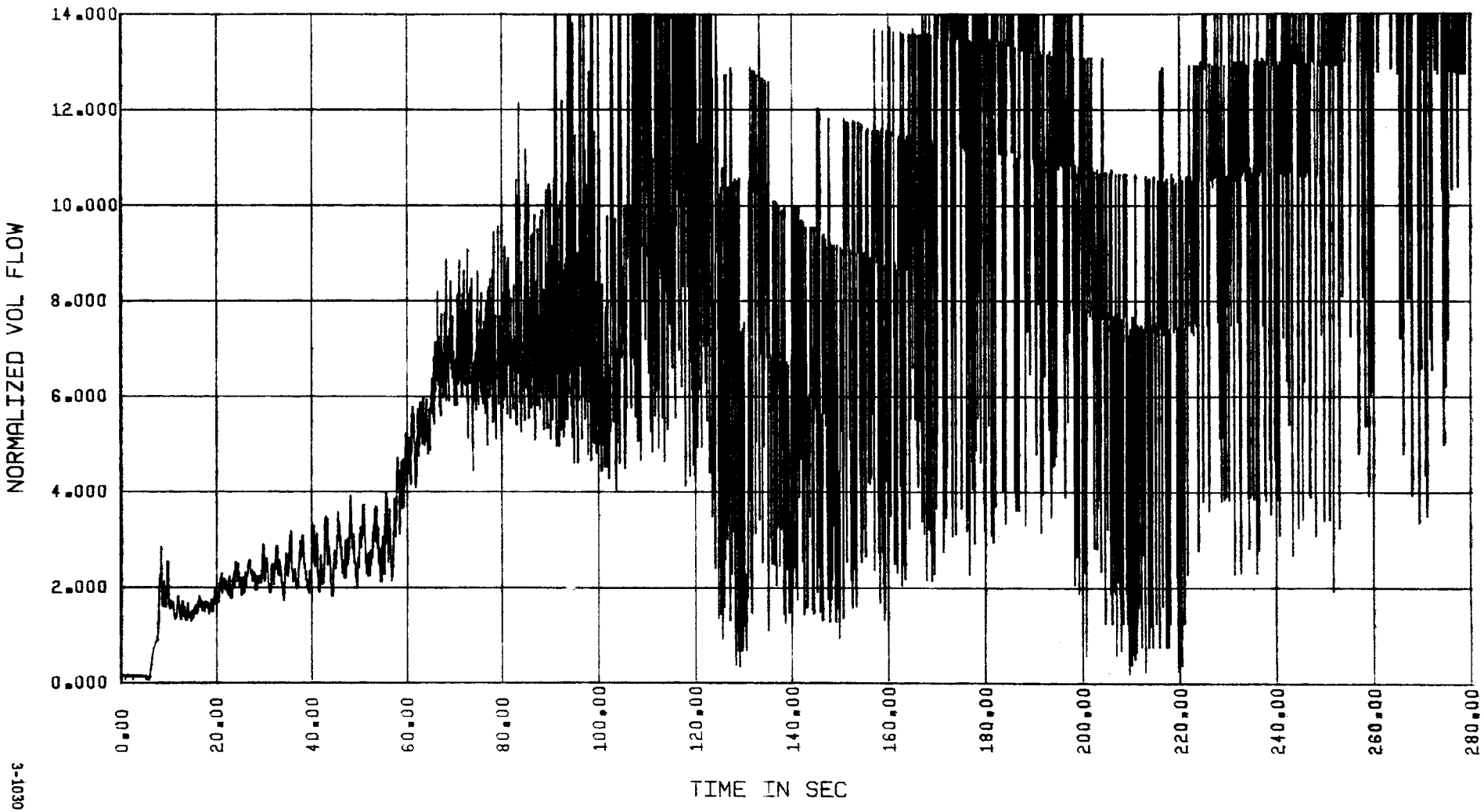
3-1028

TEST 1465/1000 PSIA LR REV BDN
NORM VOL FLOW RATE HI-TM SUCT
PLOT NO.27



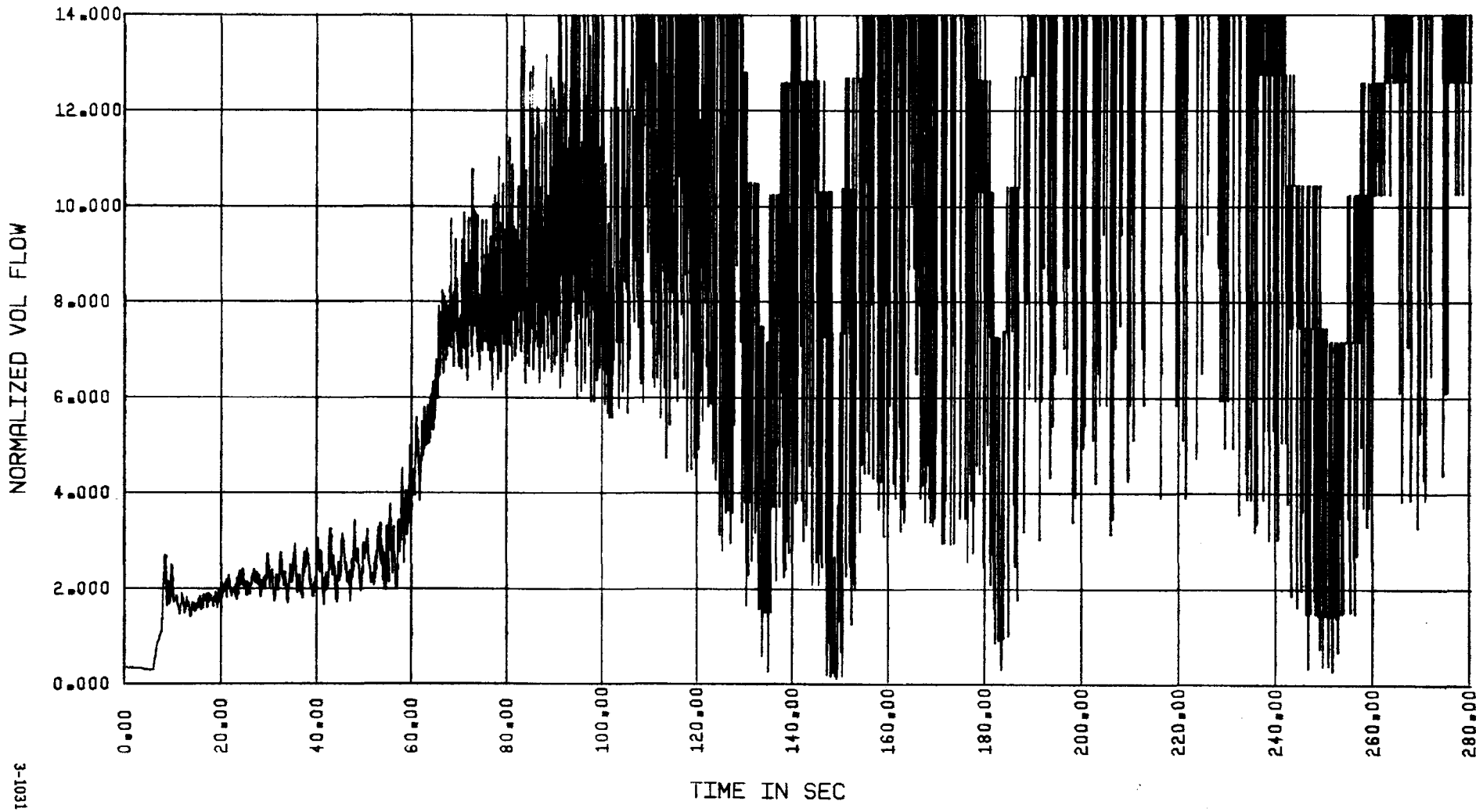
3-1029

TEST 1465/1000 PSIA LR REV BDN
NORM VOL FLOW RATE LO-DD/GD2 D
PLOT NO.28



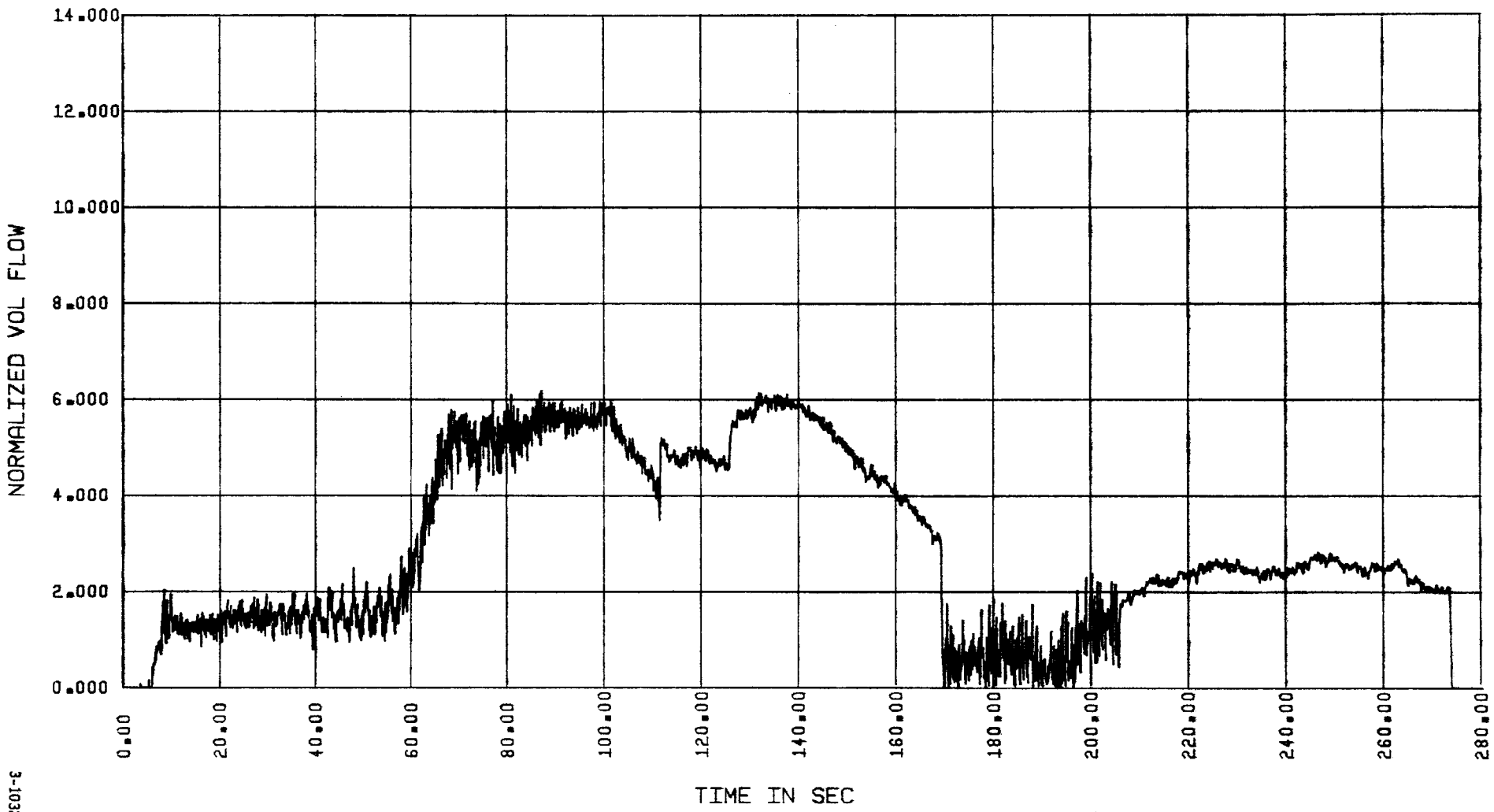
3-1030

TEST 1465/1000 PSIA LR REV BDN
NORM VOL FLOW RATE HI-DD/GD2 D
PLOT NO.29



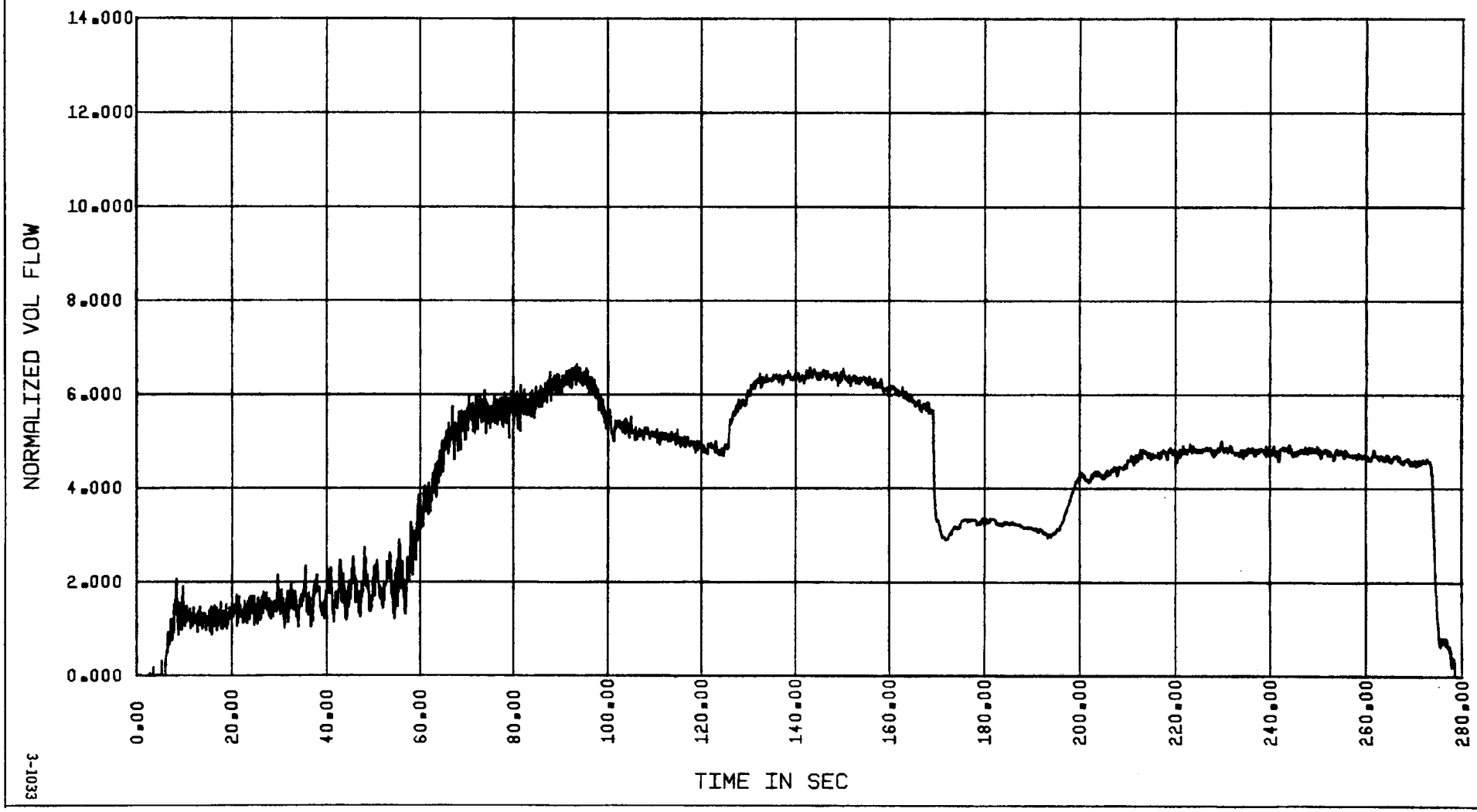
3-1031

TEST 1465/1000 PSIA LR REV BDN
NORM VOL FLOW RATE LO-TM DSCH
PLOT NO.30



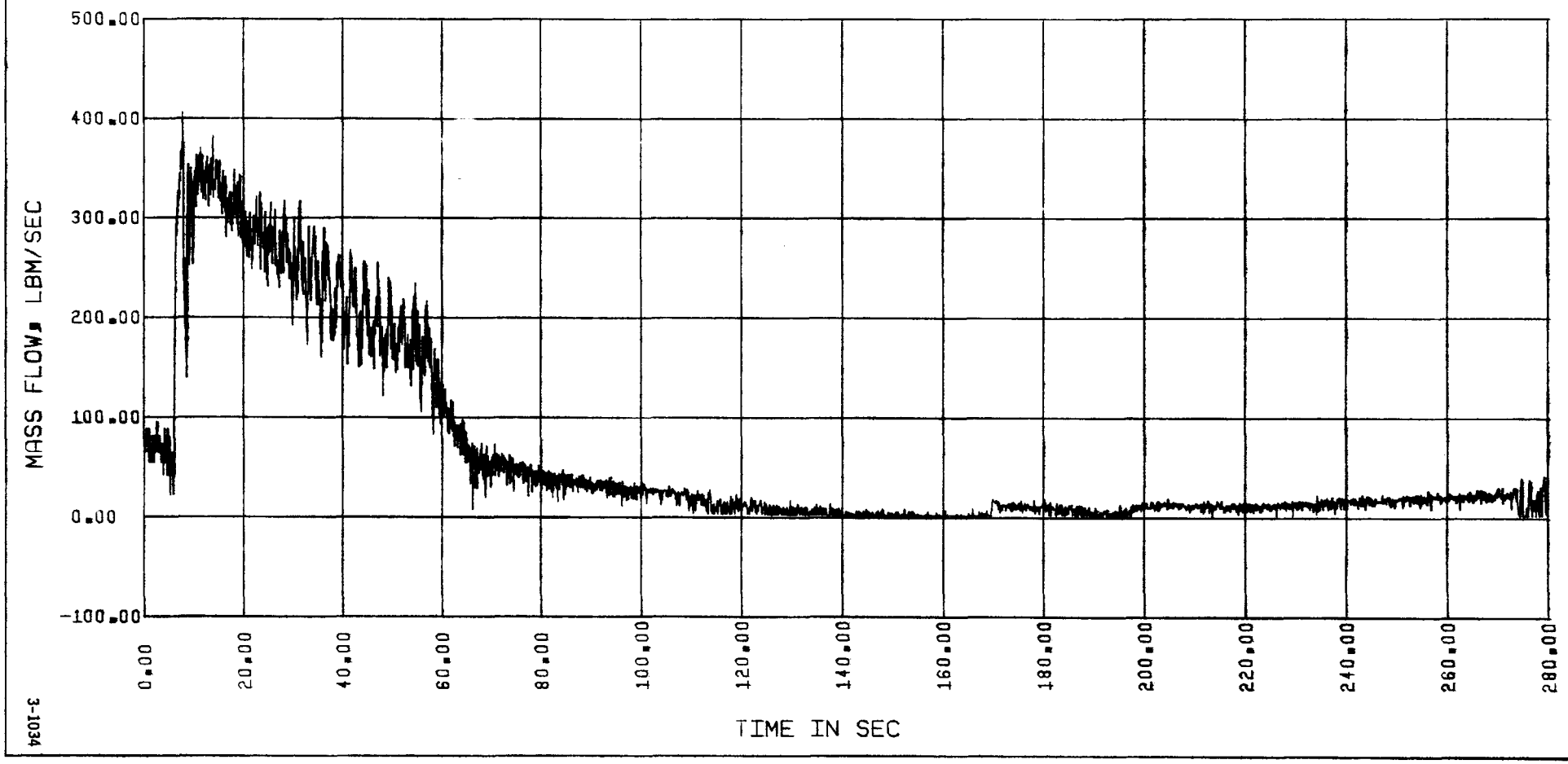
3-1032

TEST 1465/1000 PSIA LR REV BDN
NORM VOL FLOW RATE HI-TM DSCH
PLOT NO.31

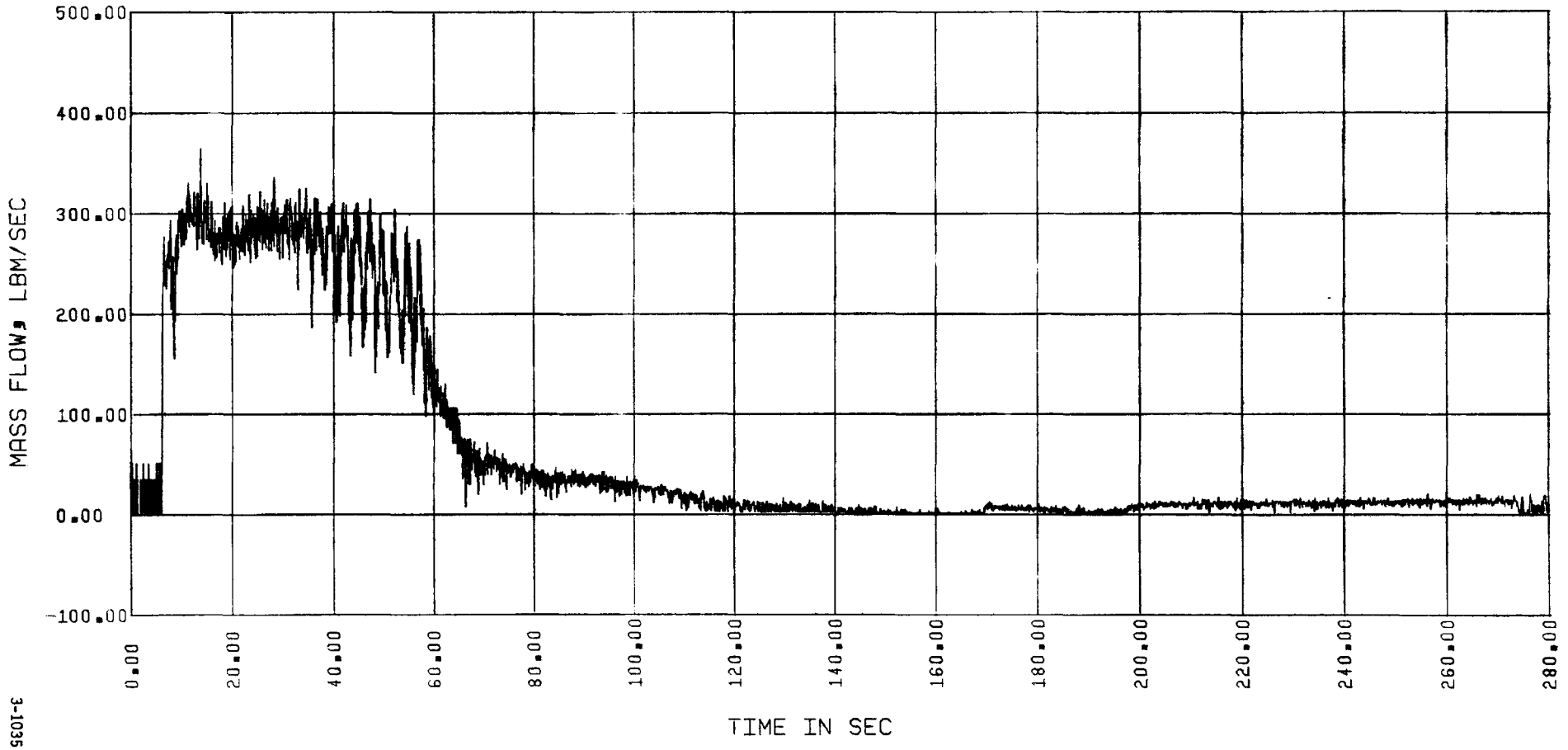


3-1033

TEST 1465/1000 PSIA LR REV BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.32

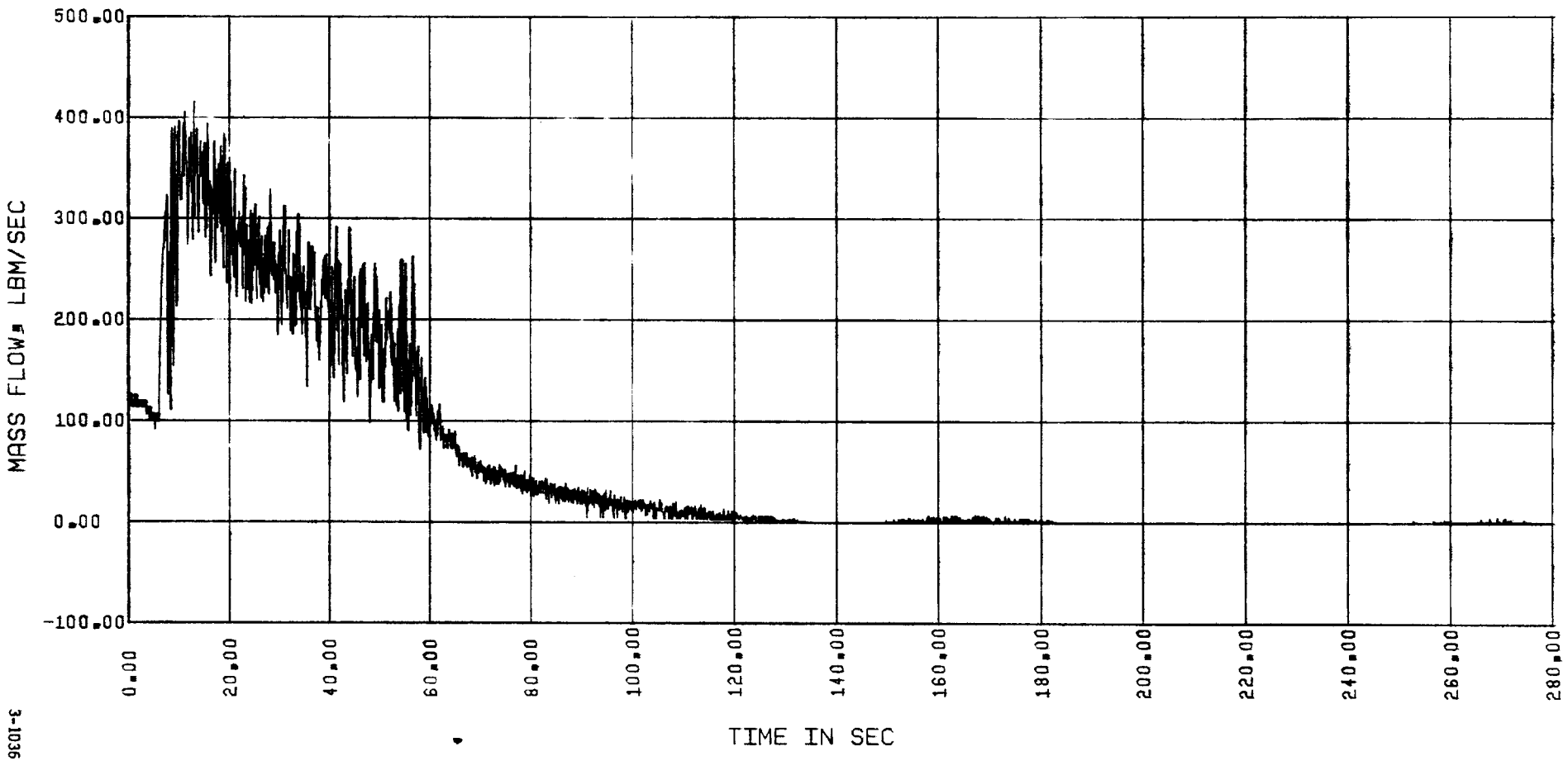


TEST 1465/1000 PSIA LR REV BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.33



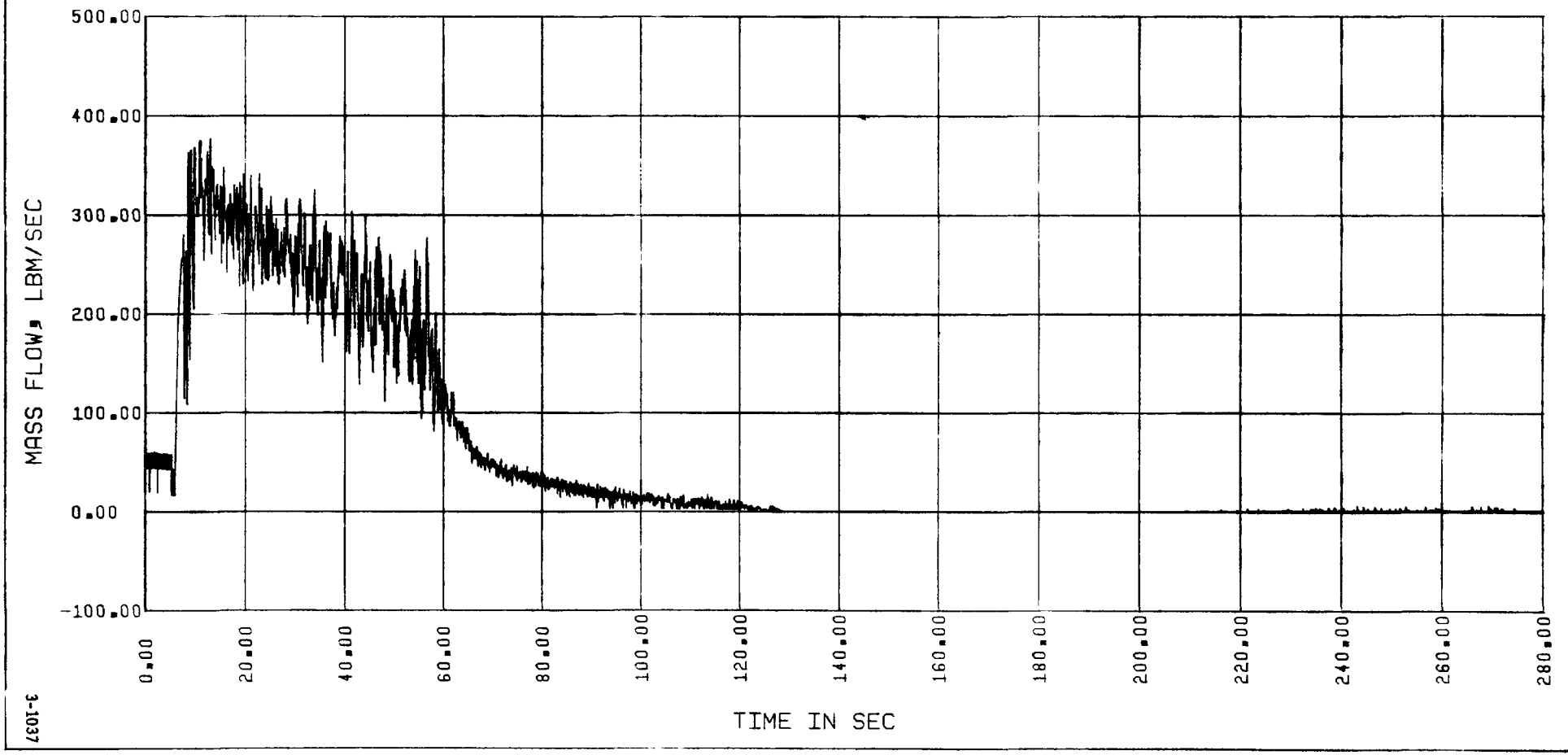
3-1035

TEST 1465/1000 PSIA LR REV BDN
MASS FLOW RATE HI-DD/GD2 DISCH
PLOT NO.34



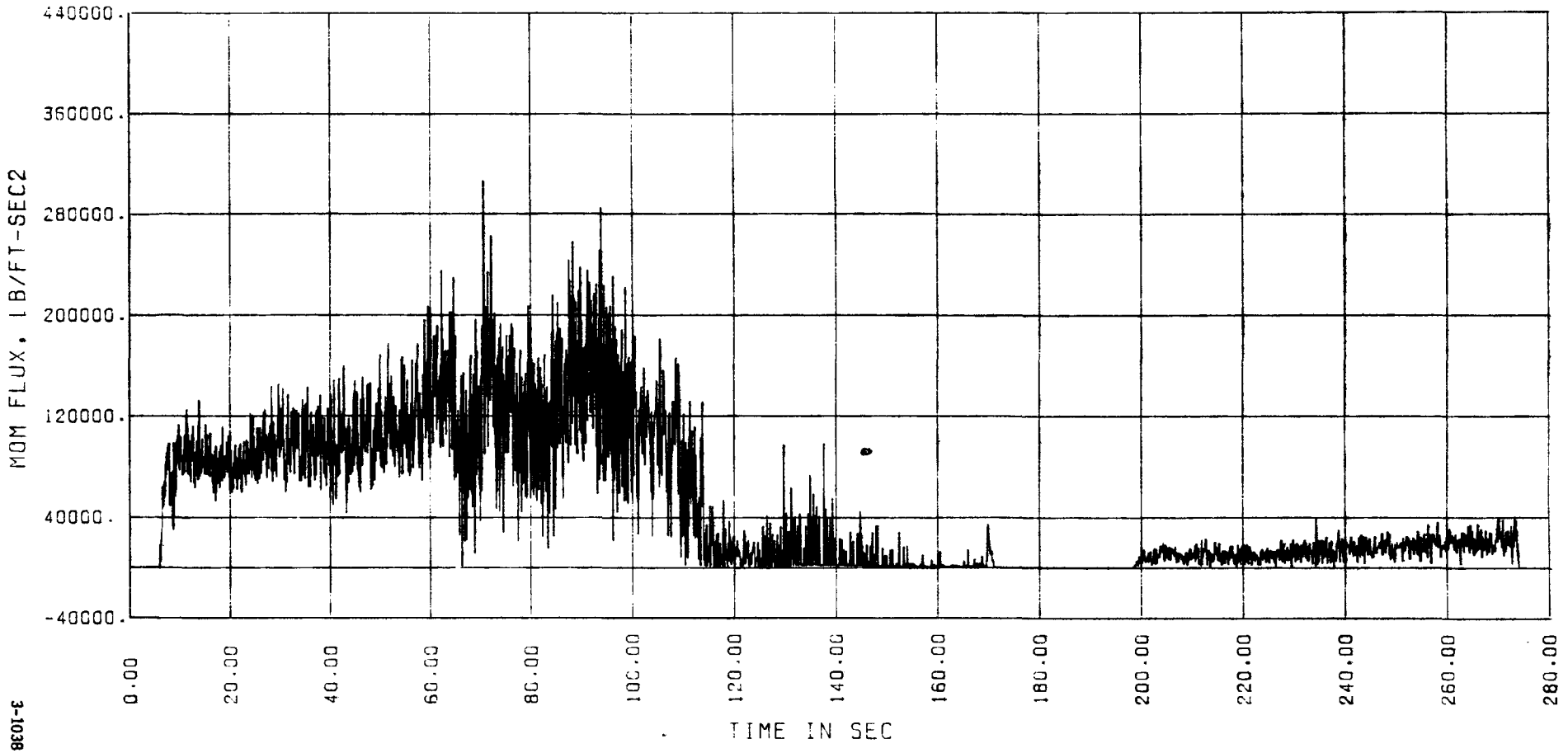
3-1036

TEST 1465/1000 PSIA LR REV BDN
MASS FLOW RATE LO-DD/GD2 DISCH
PLOT NO.35



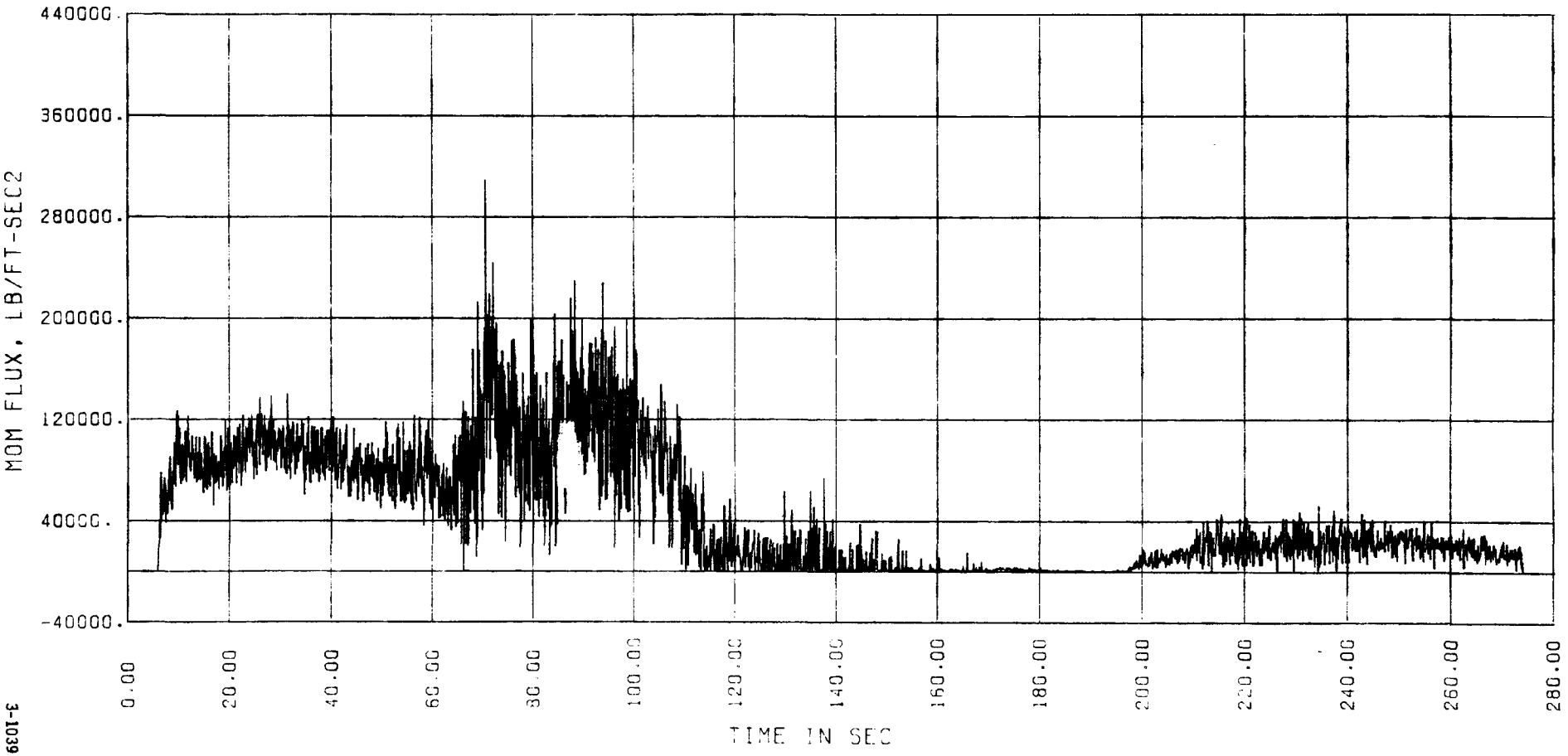
3-1037

TEST 1465/1000 PSIA LR REV BDN
MOMENTUM FLUX GO2/LO-TM SUCT
PLOT NO.36



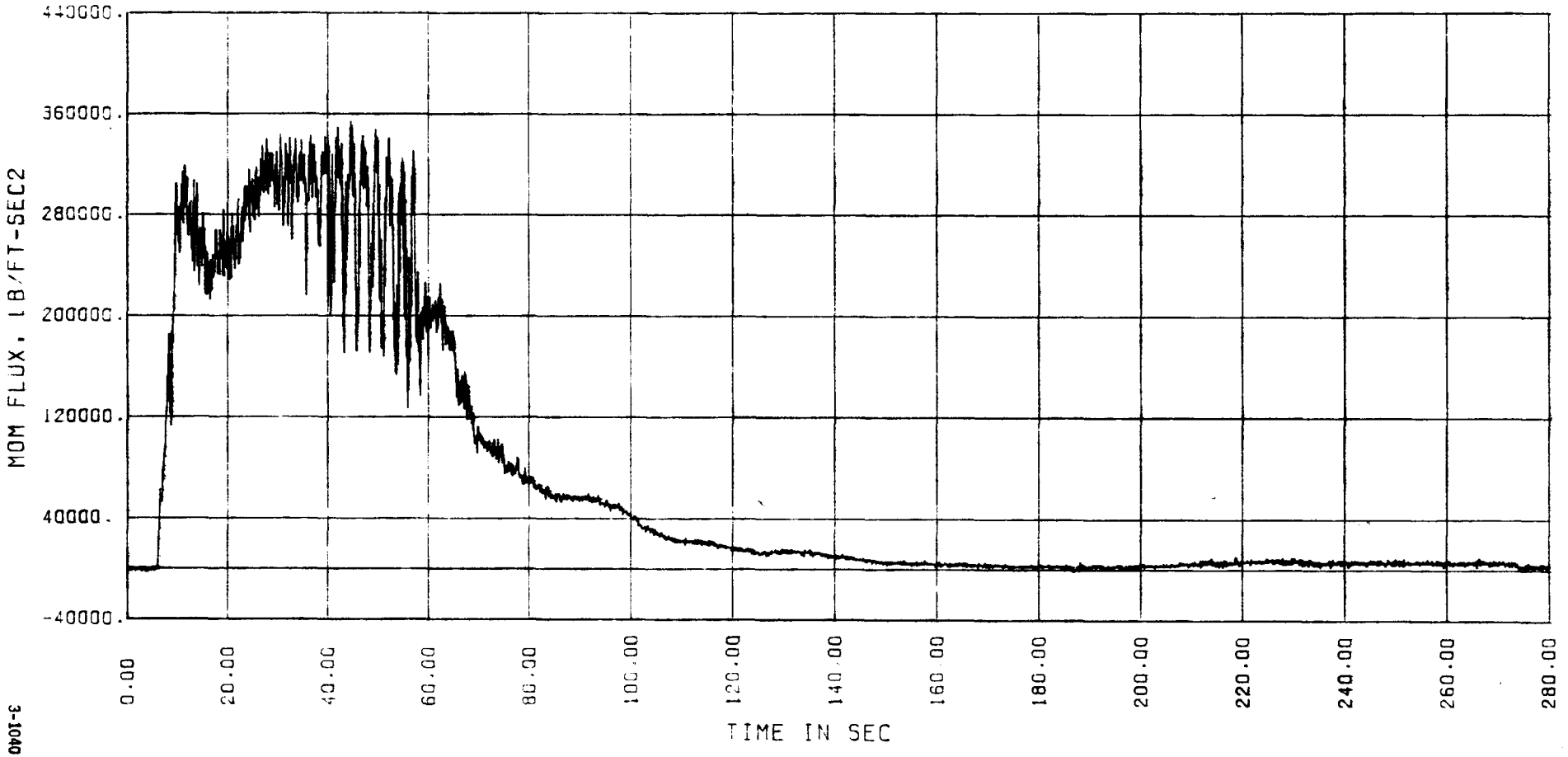
3-1038

TEST 1465/1000 PSIA LR REV BDN
MOMENTUM FLUX GO2/HI-TM SUCT
PLOT NO.37



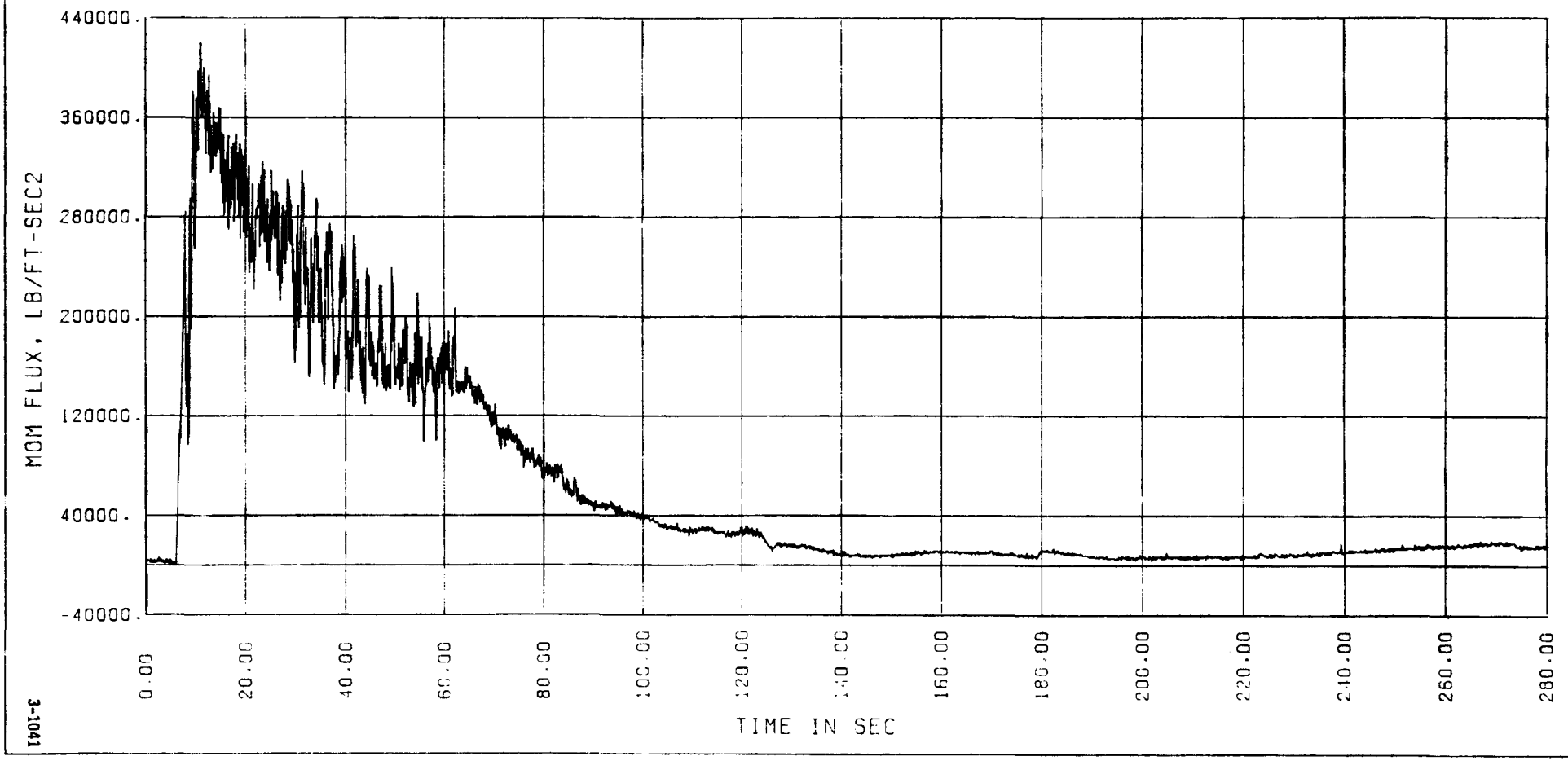
3-1039

TEST 1465/1000 PSIA LR REV BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38



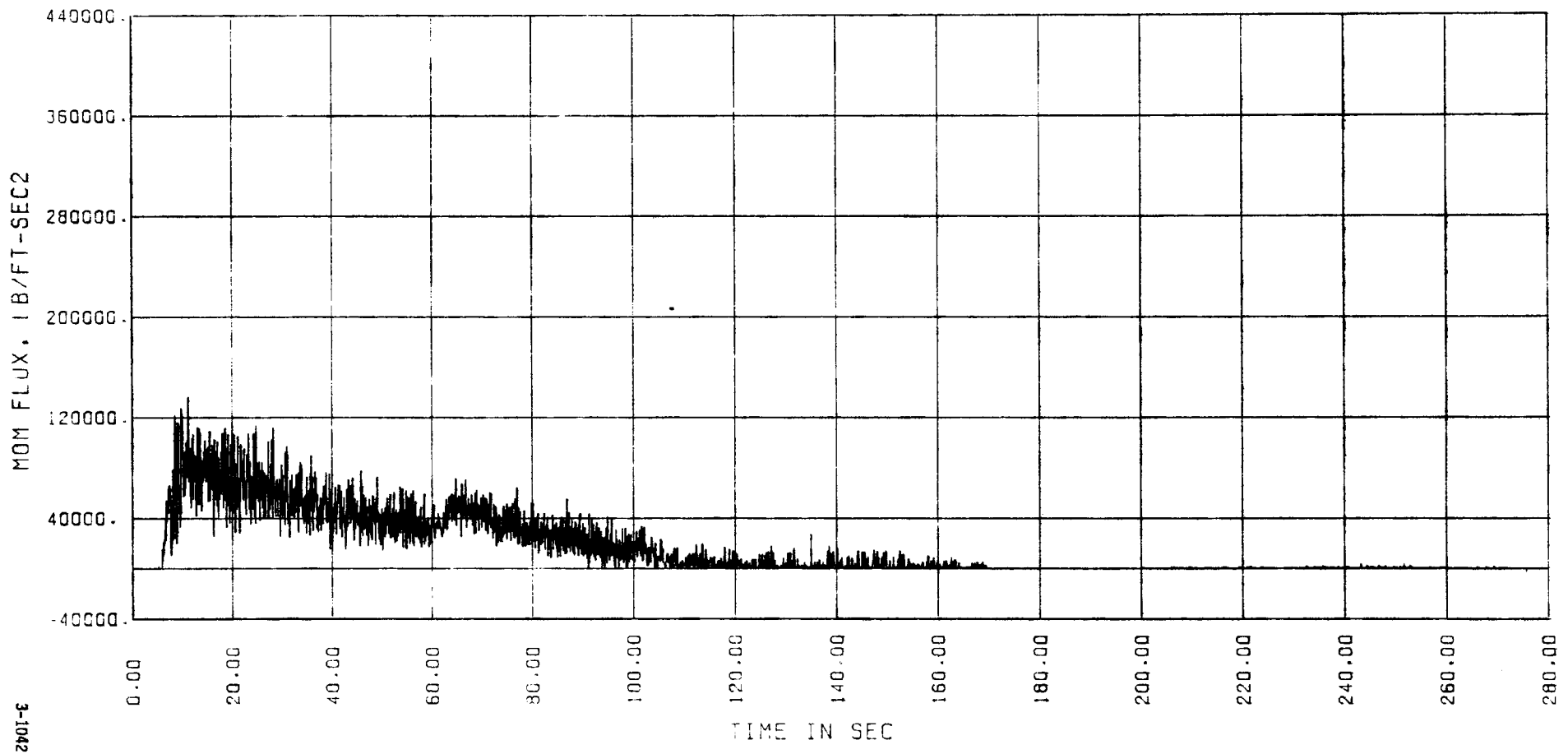
3-1040

TEST 1465/1000 PSIA LR REV BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39



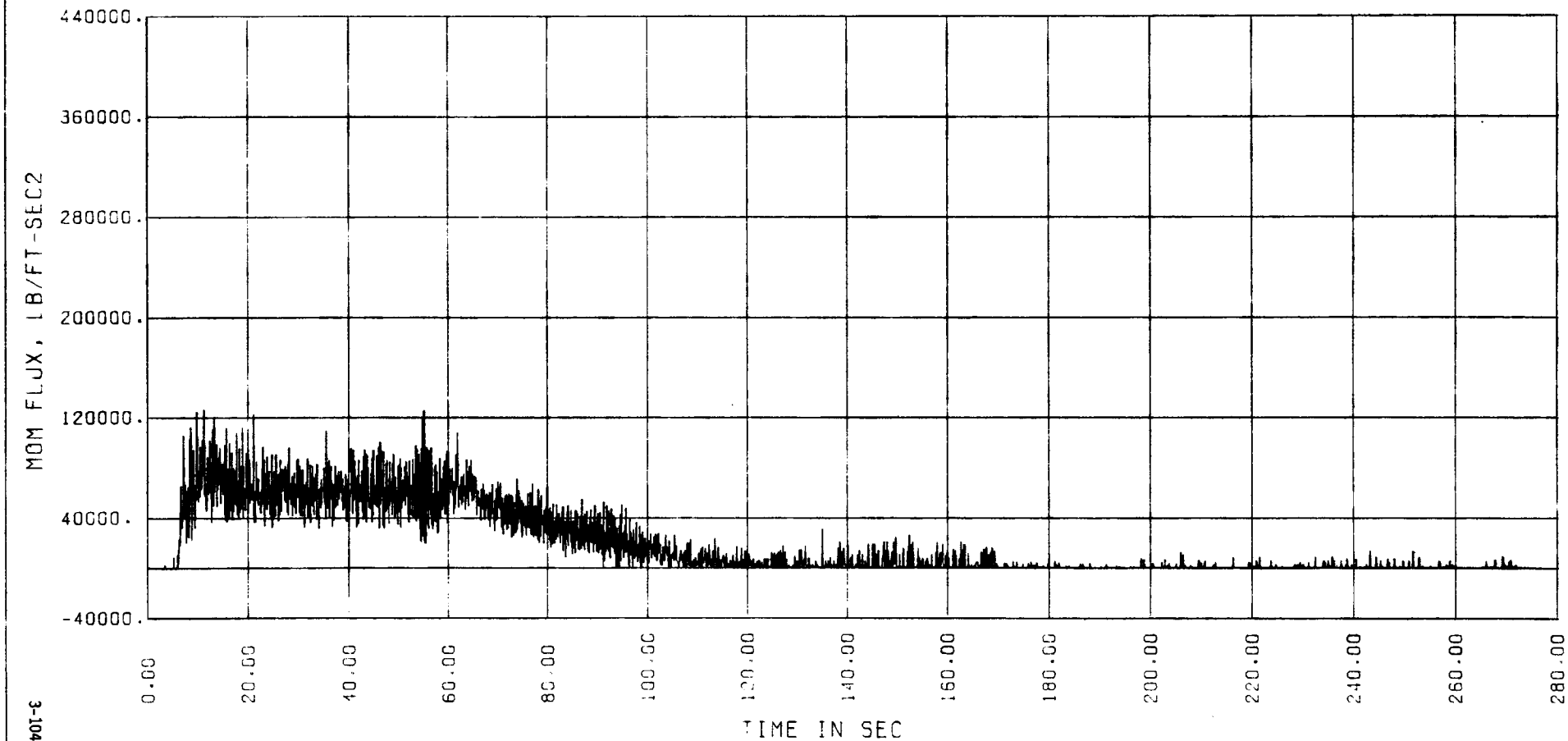
3-1041

TEST 1465/1000 PSIA LR REV 3DN
MOMENTUM FLUX GO2/LO-TM DISCH
PLOT NO.4C



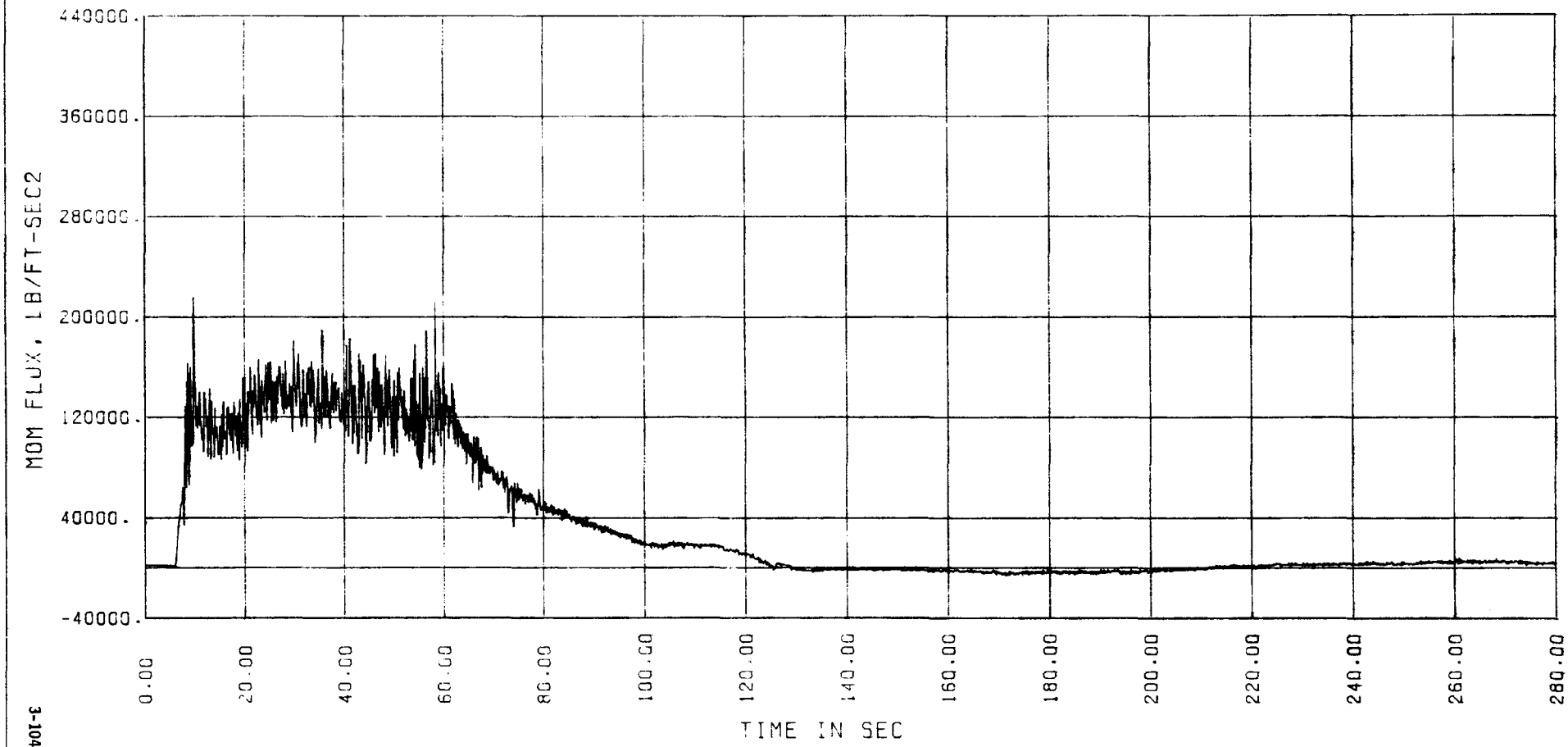
3-1042

TEST 1465/1000 PSIA LR REV BDN
MOMENTUM FLUX GO2/HI-TM DISCH
PLOT NO.41



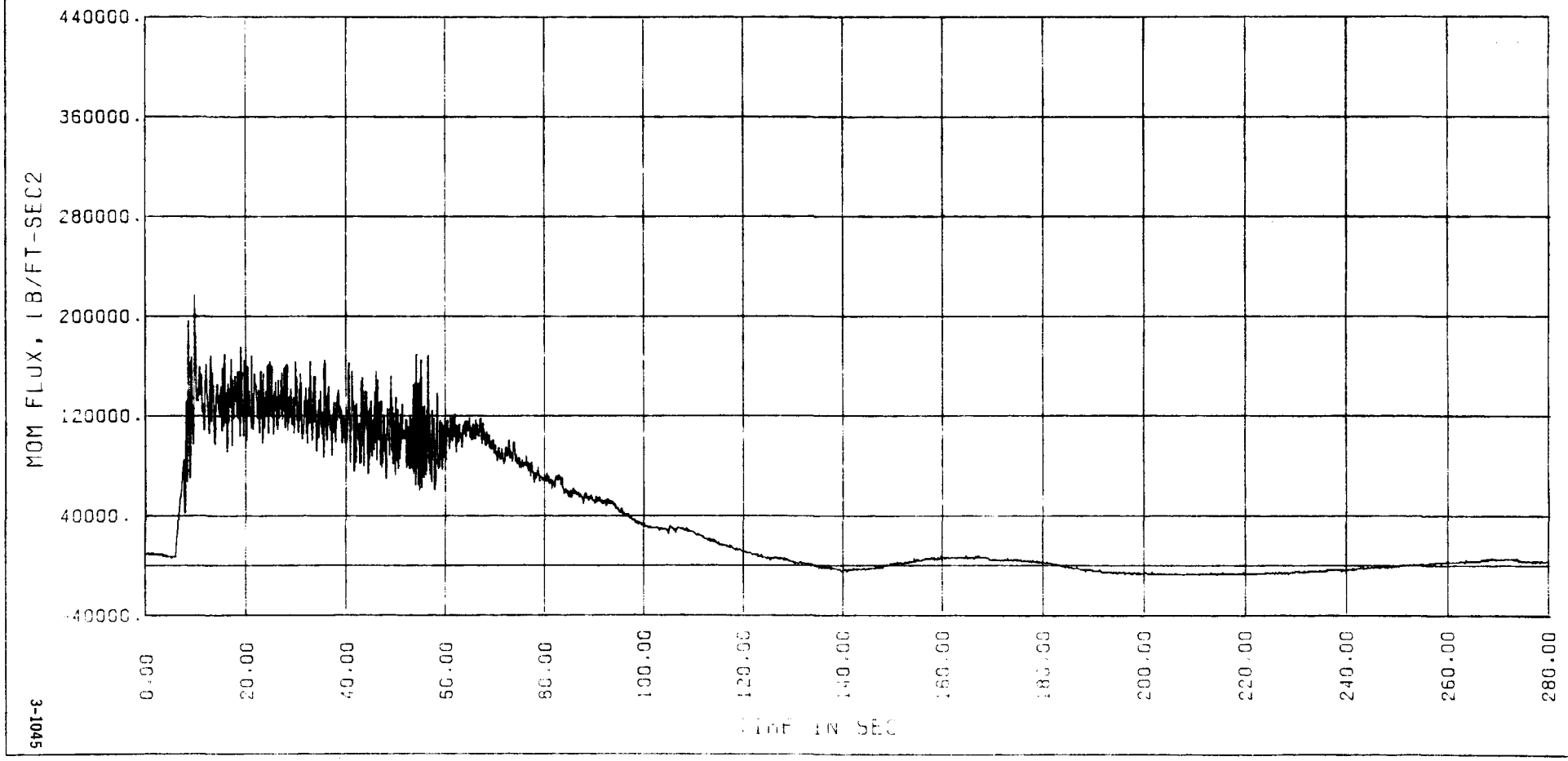
3-1043

TEST 1465/1000 PSIA LR REV BDN
MOMENTUM FLUX LO-DD DISCHARGE
PLOT NO.42



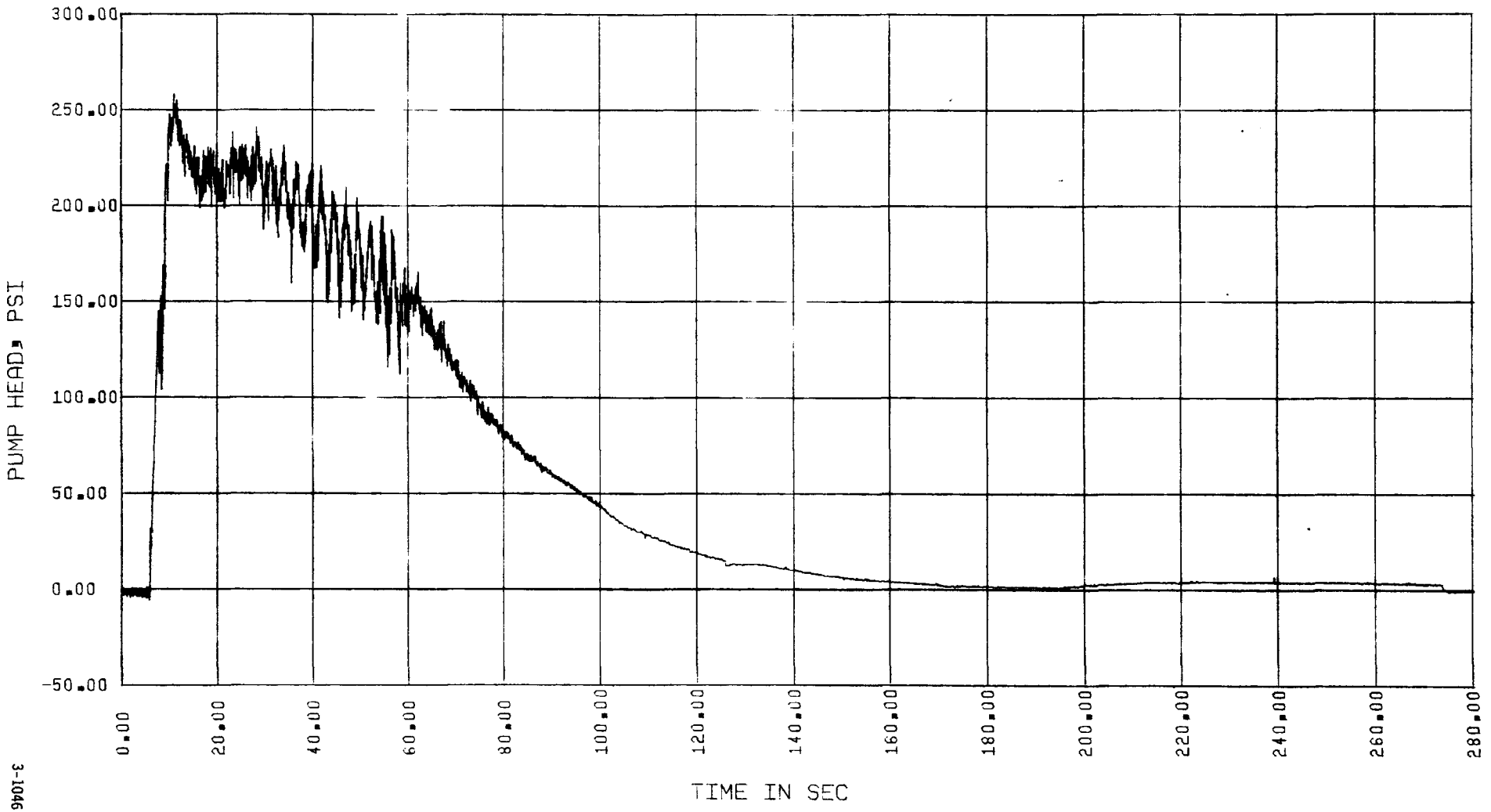
3-1044

TEST 1465/1000 PSIA LR REV BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.43



3-1045

TEST 1465/1000 PSIA LR REV BDN
PUMP HEAD IN PSI
PLOT NO. 44



3-1066

Pump Speed Measurements. Pump speed data are not presented for reverse flow, locked rotor tests.

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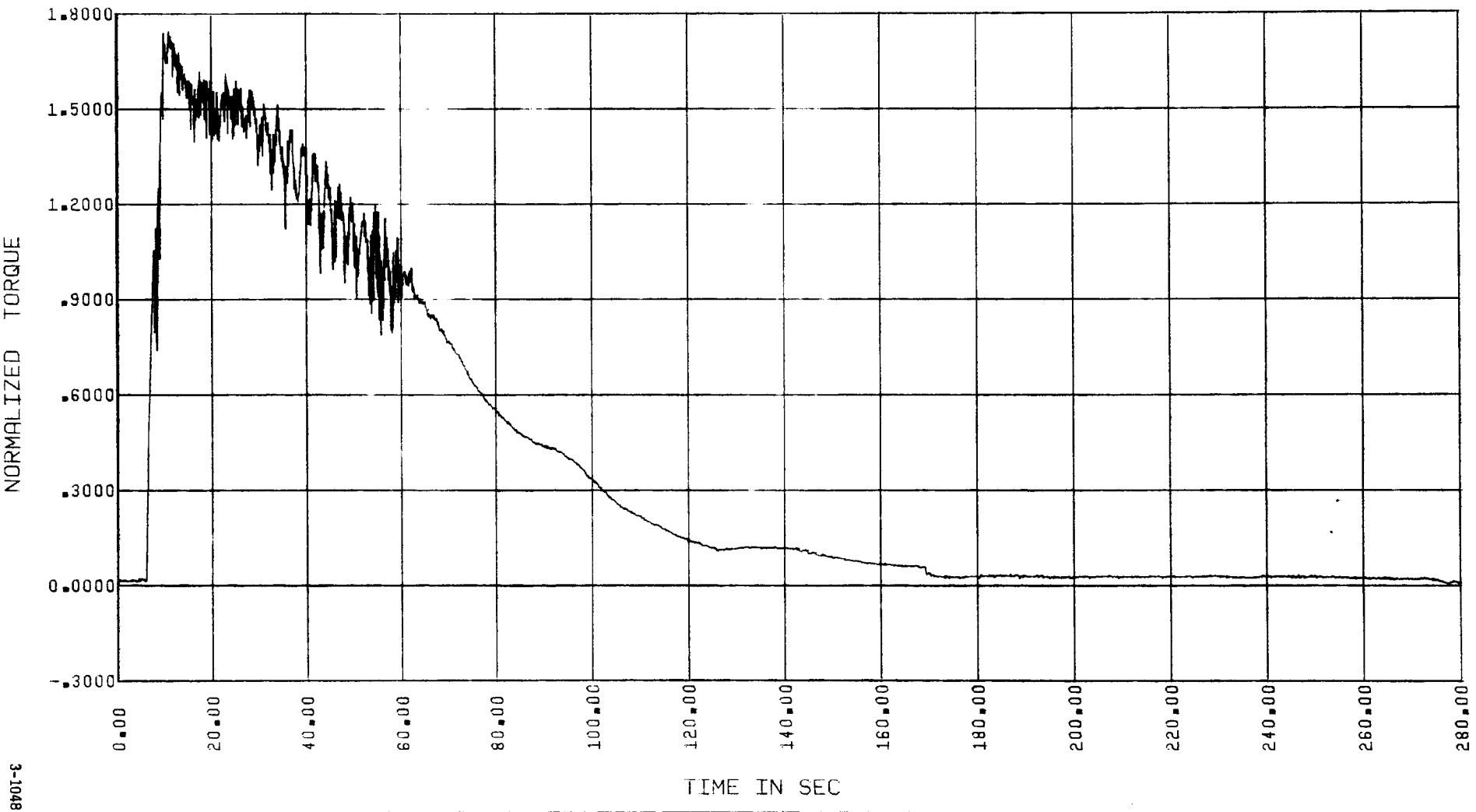
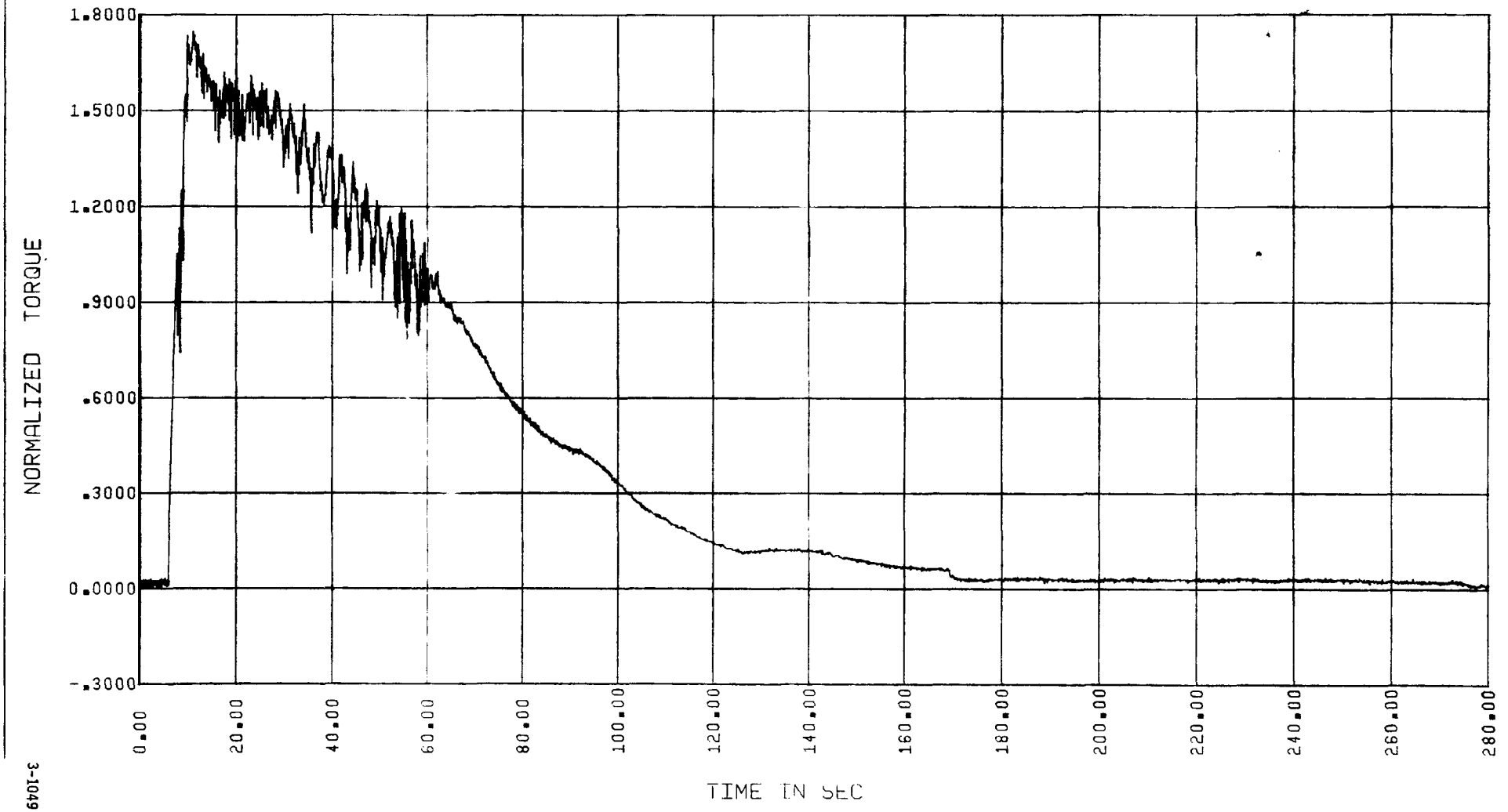
TEST 1465/1000 PSIA LR REV BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.48



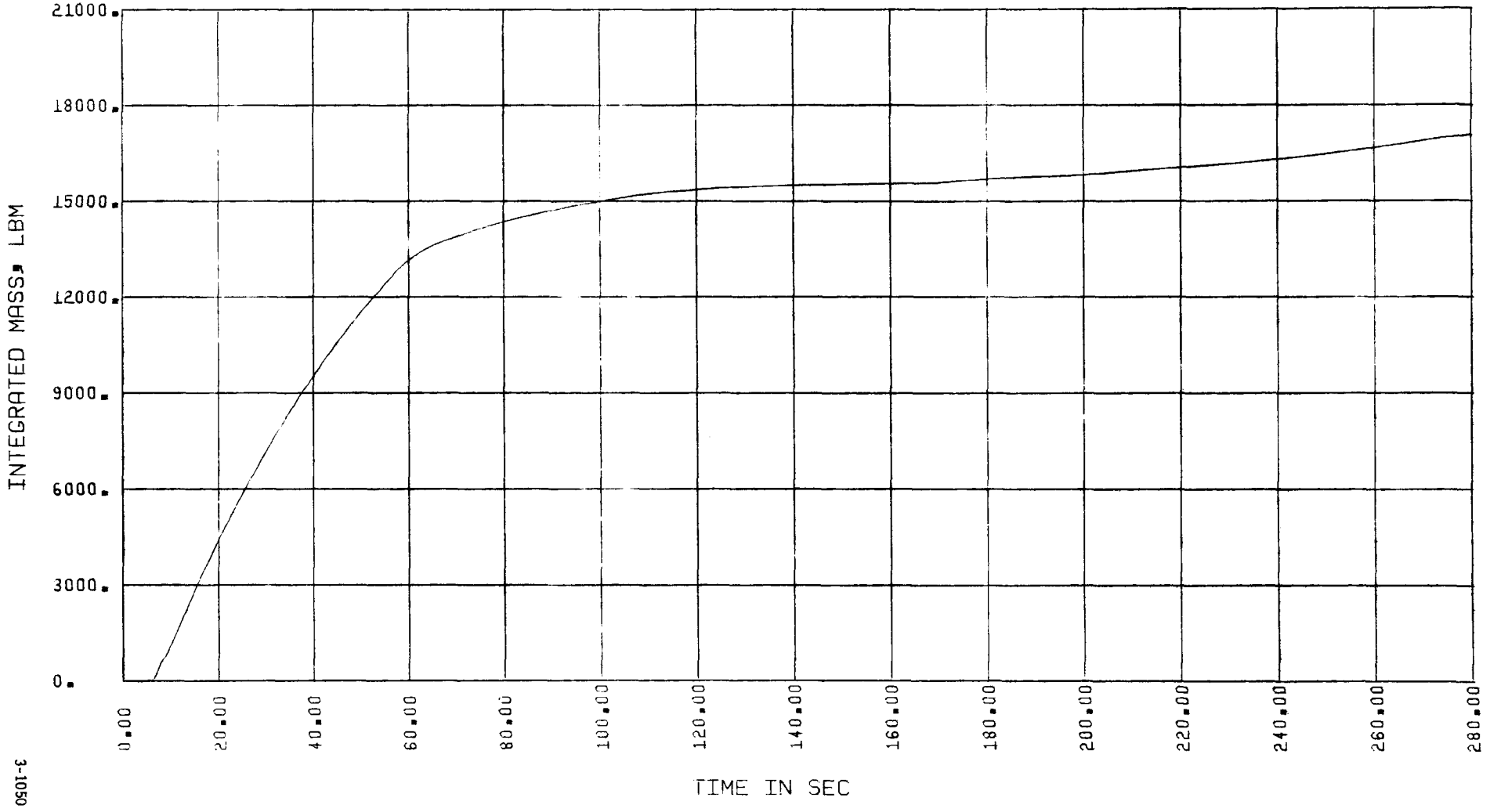
3-1048

TEST 1465/1000 PSIA LR REV BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.49



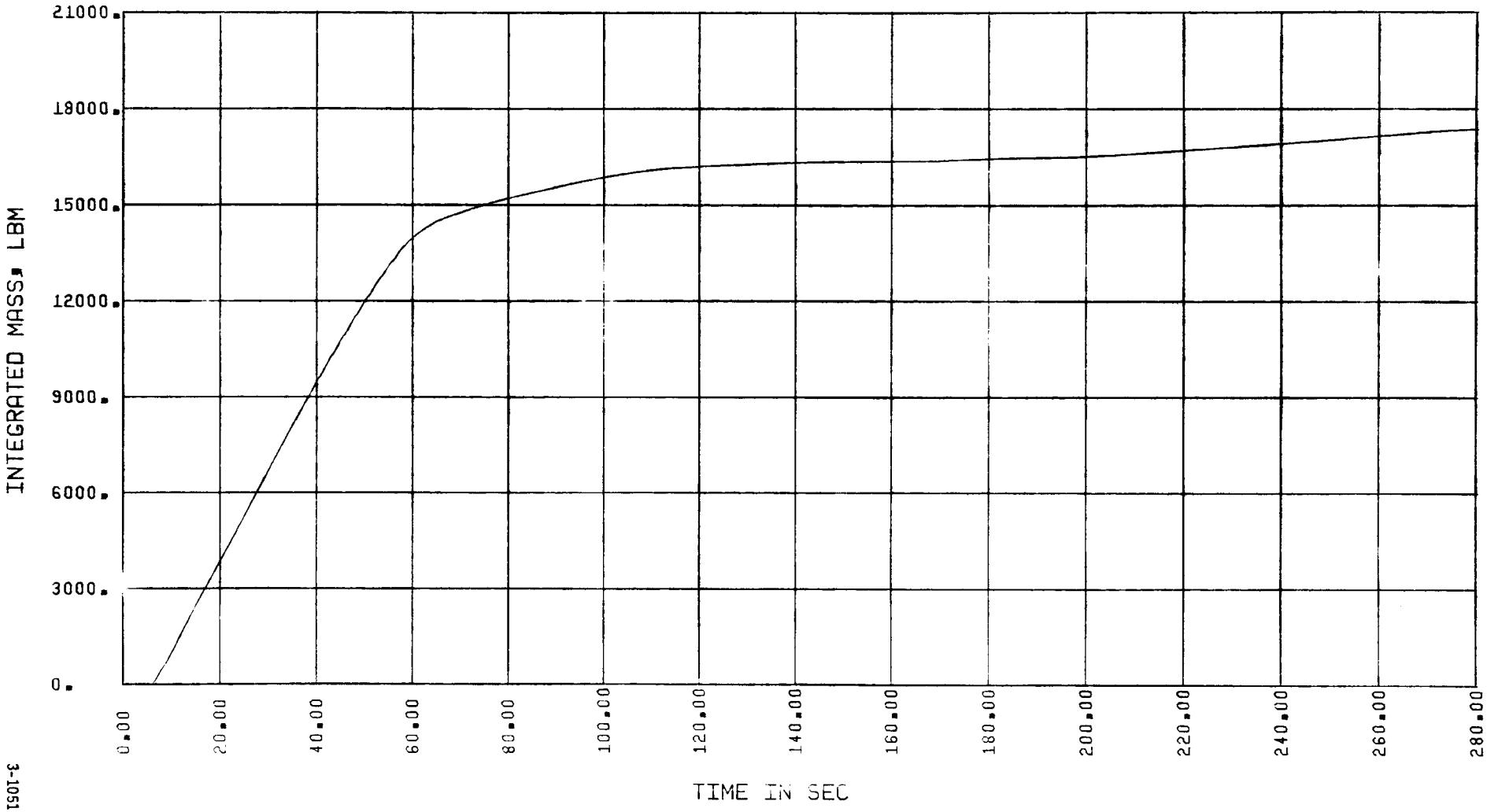
3-1049

TEST 1465/1000 PSIA LR REV BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50



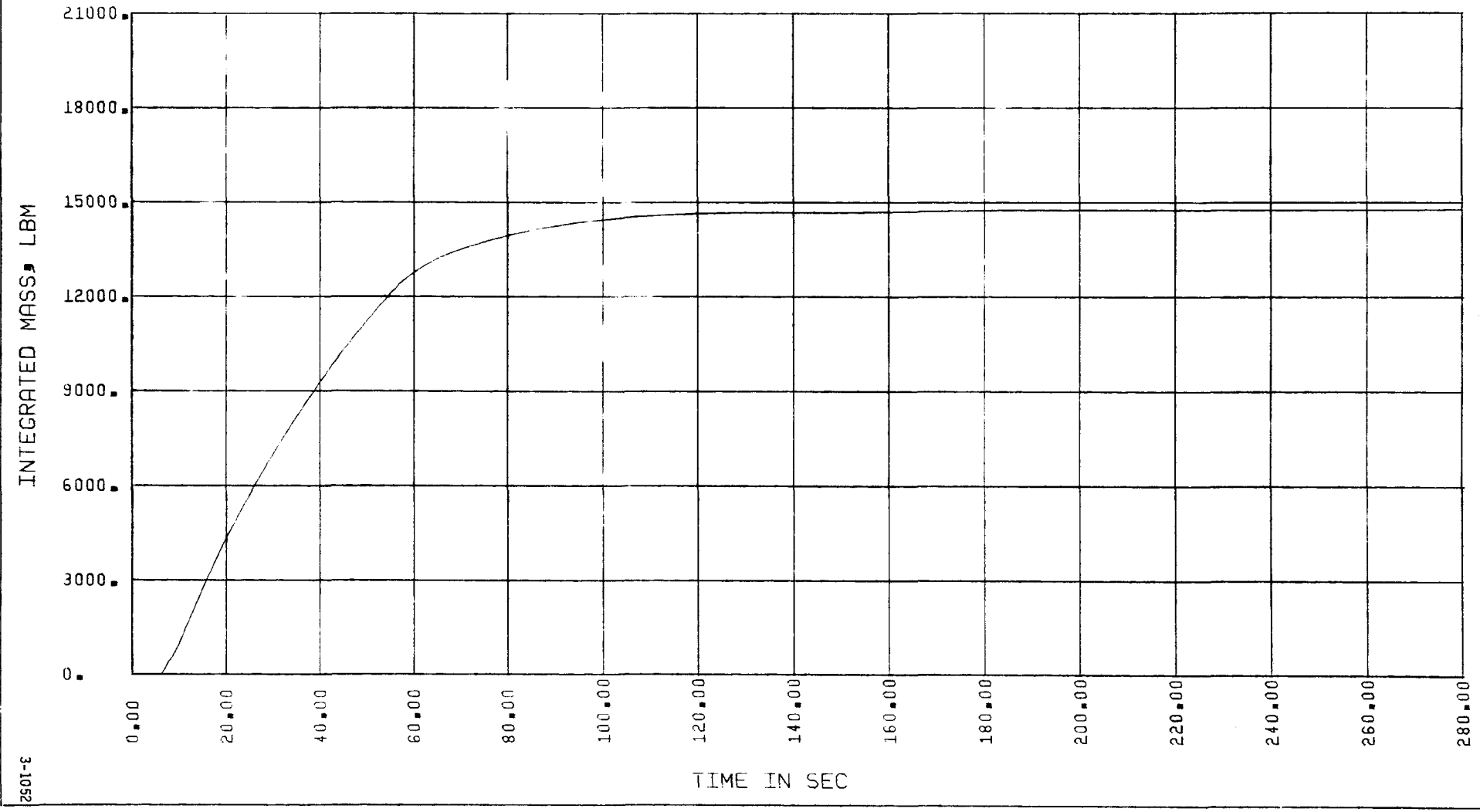
3-1050

TEST 1465/1000 PSIA LR REV BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.51



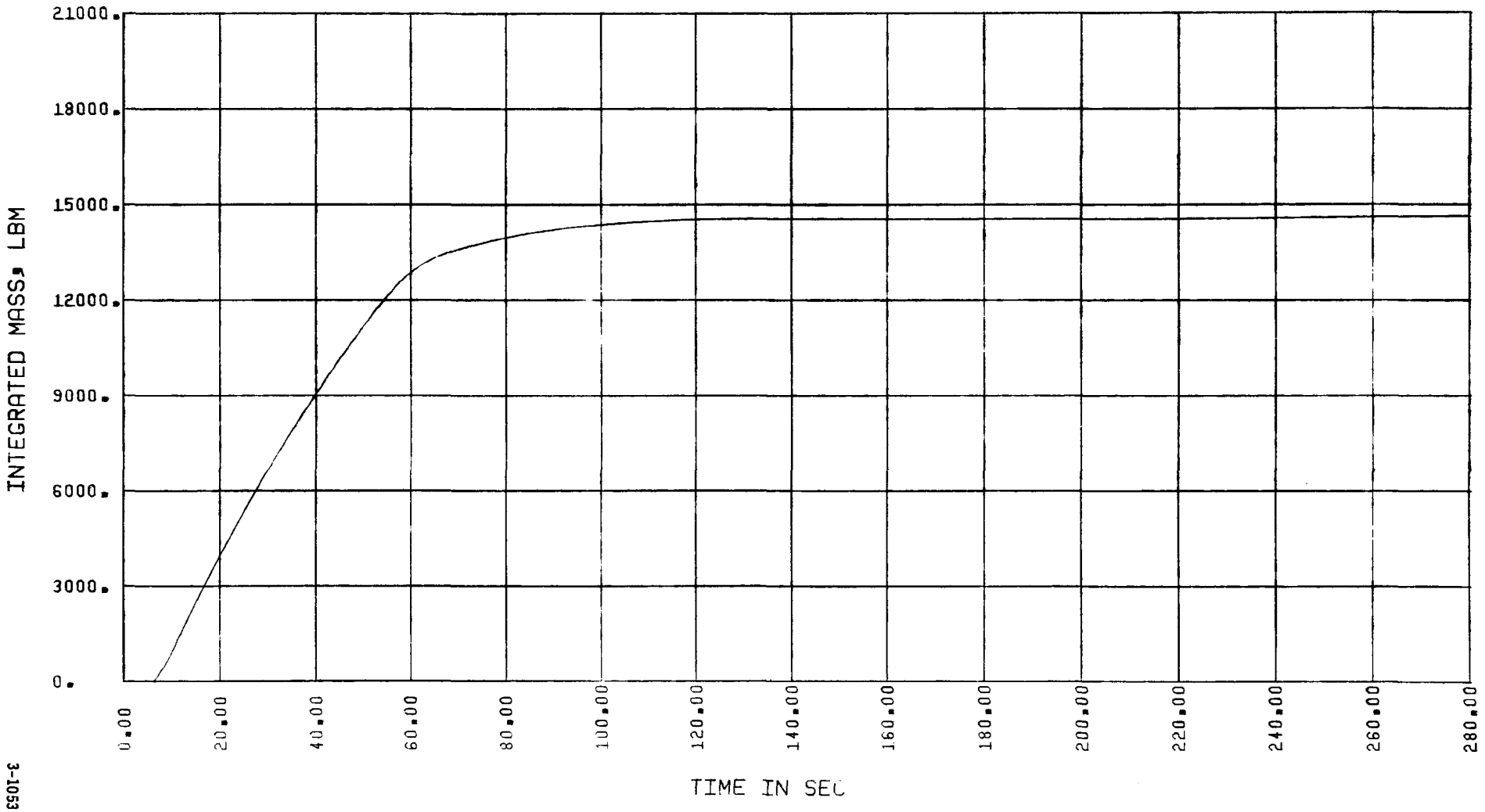
3-1051

TEST 1465'1000 PSIA LR REV BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.52



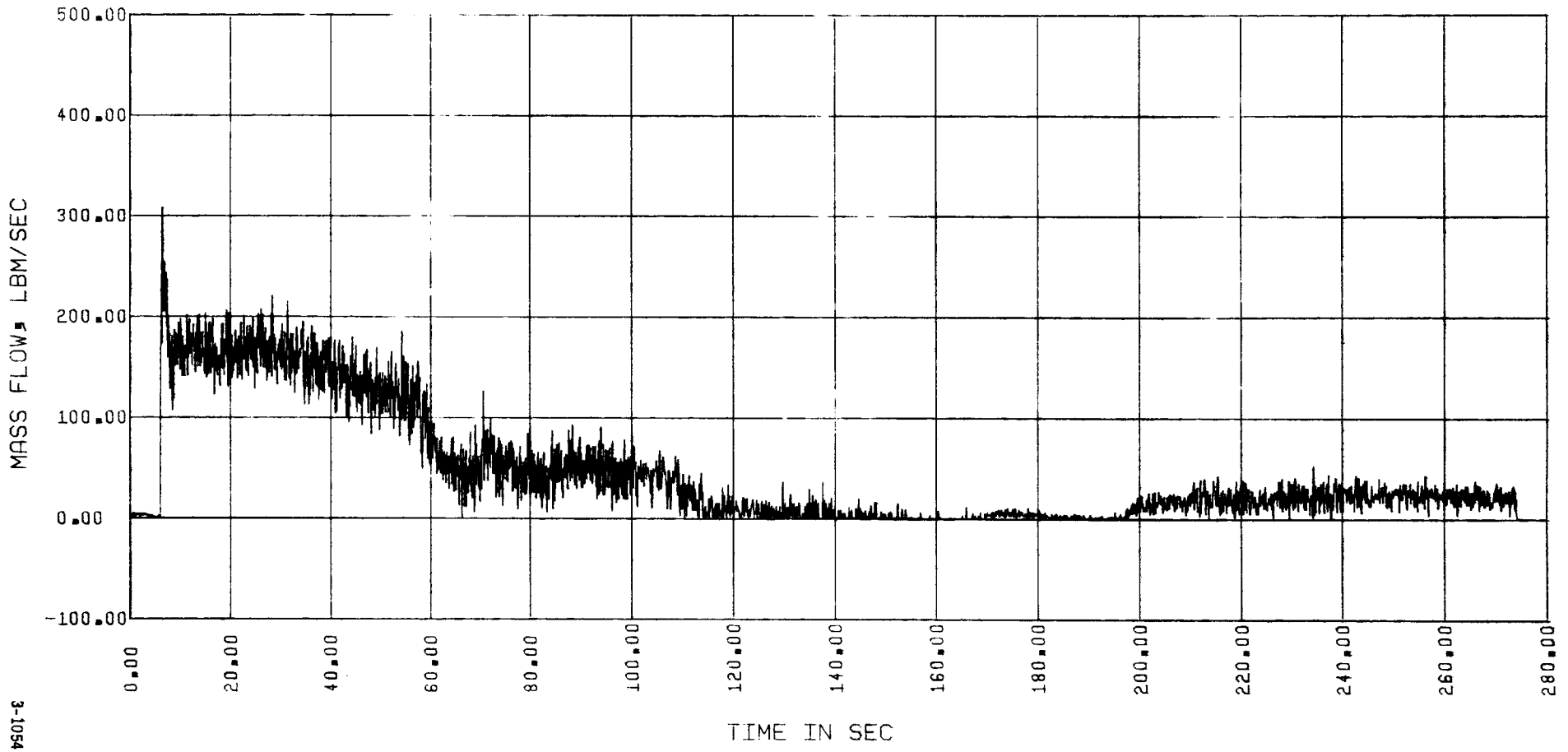
3-1052

TEST 1465/1000 PSIA LR REV BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.53



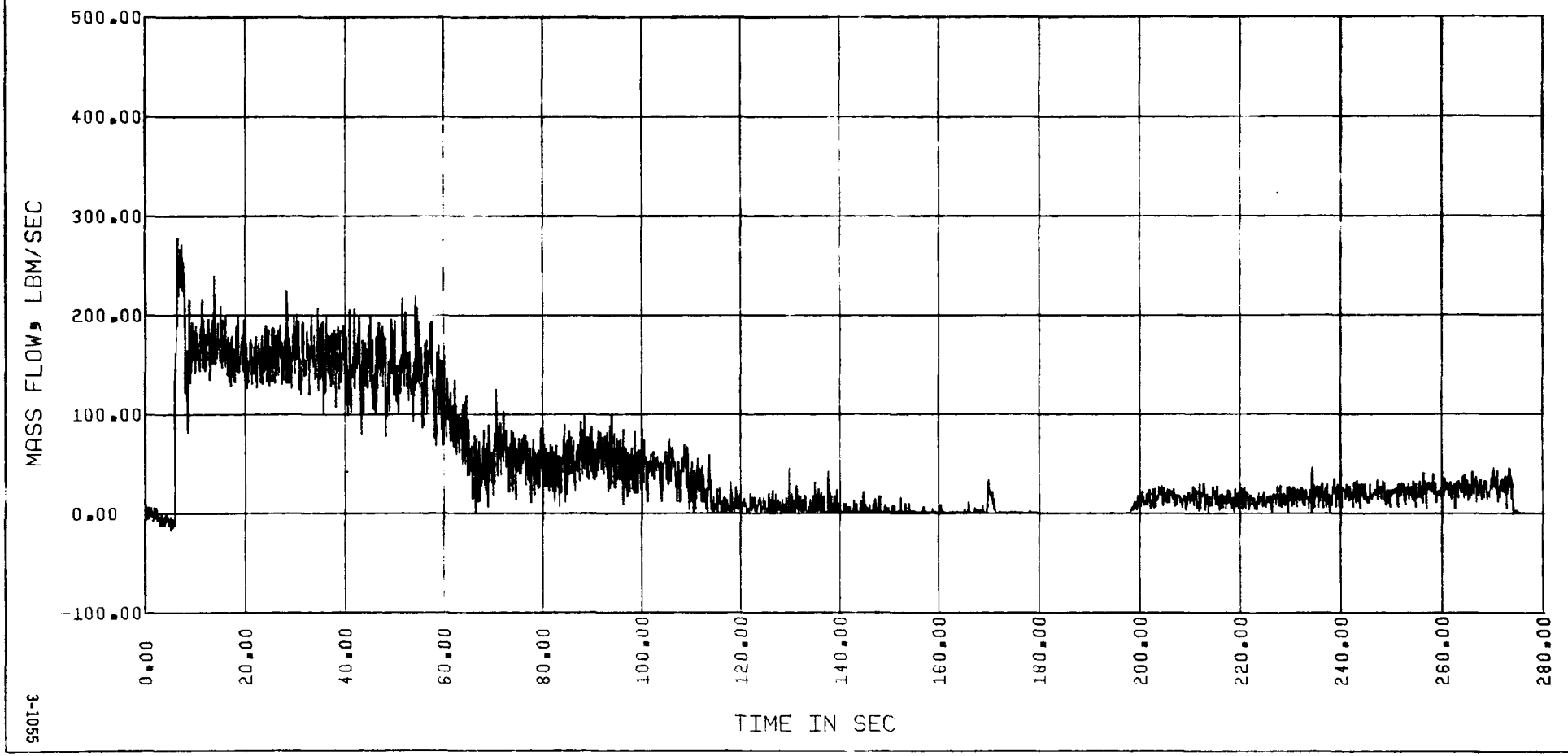
3-1053

TEST 1465/1000 PSIA LR REV BDN
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54



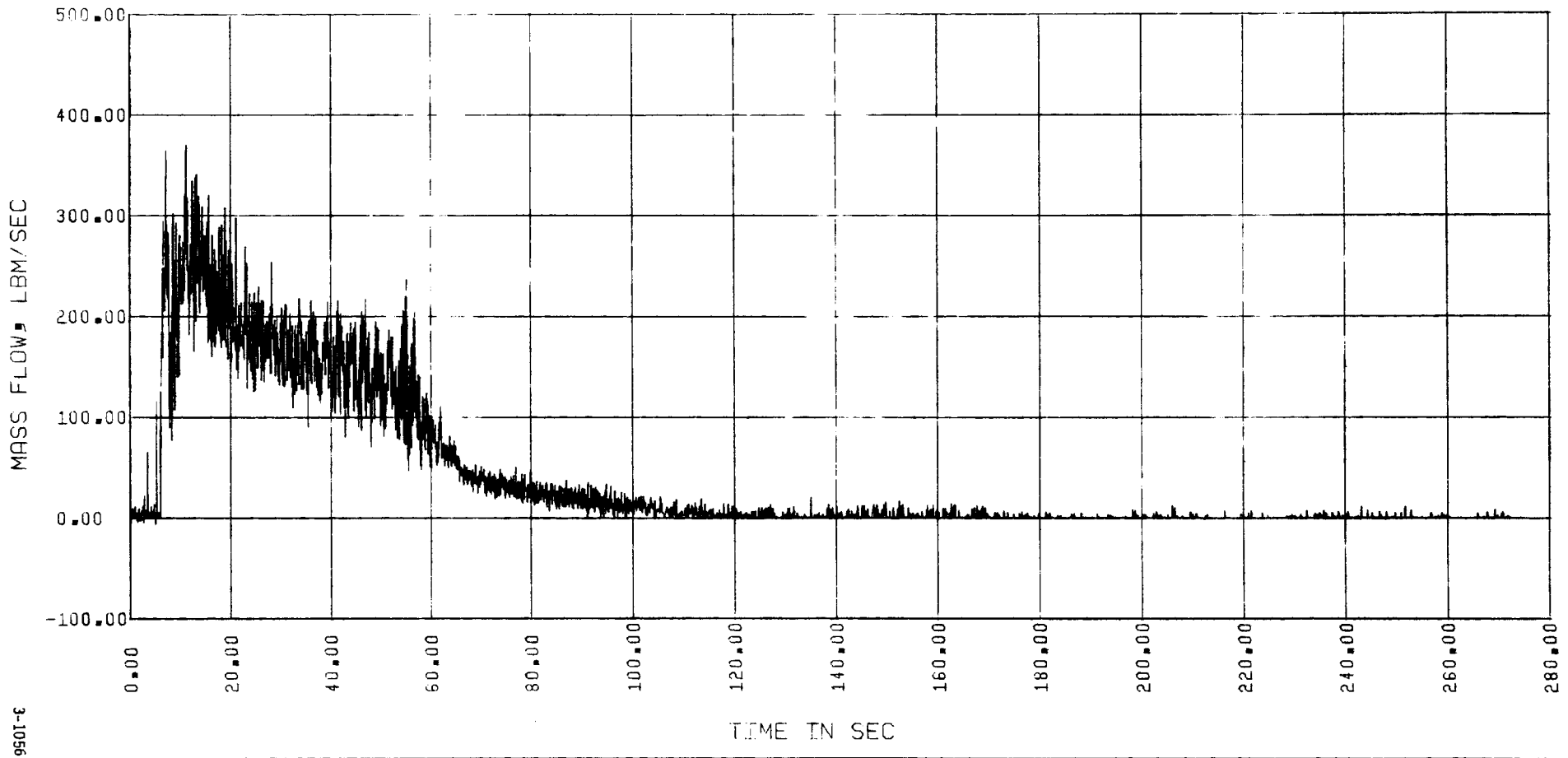
3-1054

TEST 1465/1000 PSIA LR REV BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.55



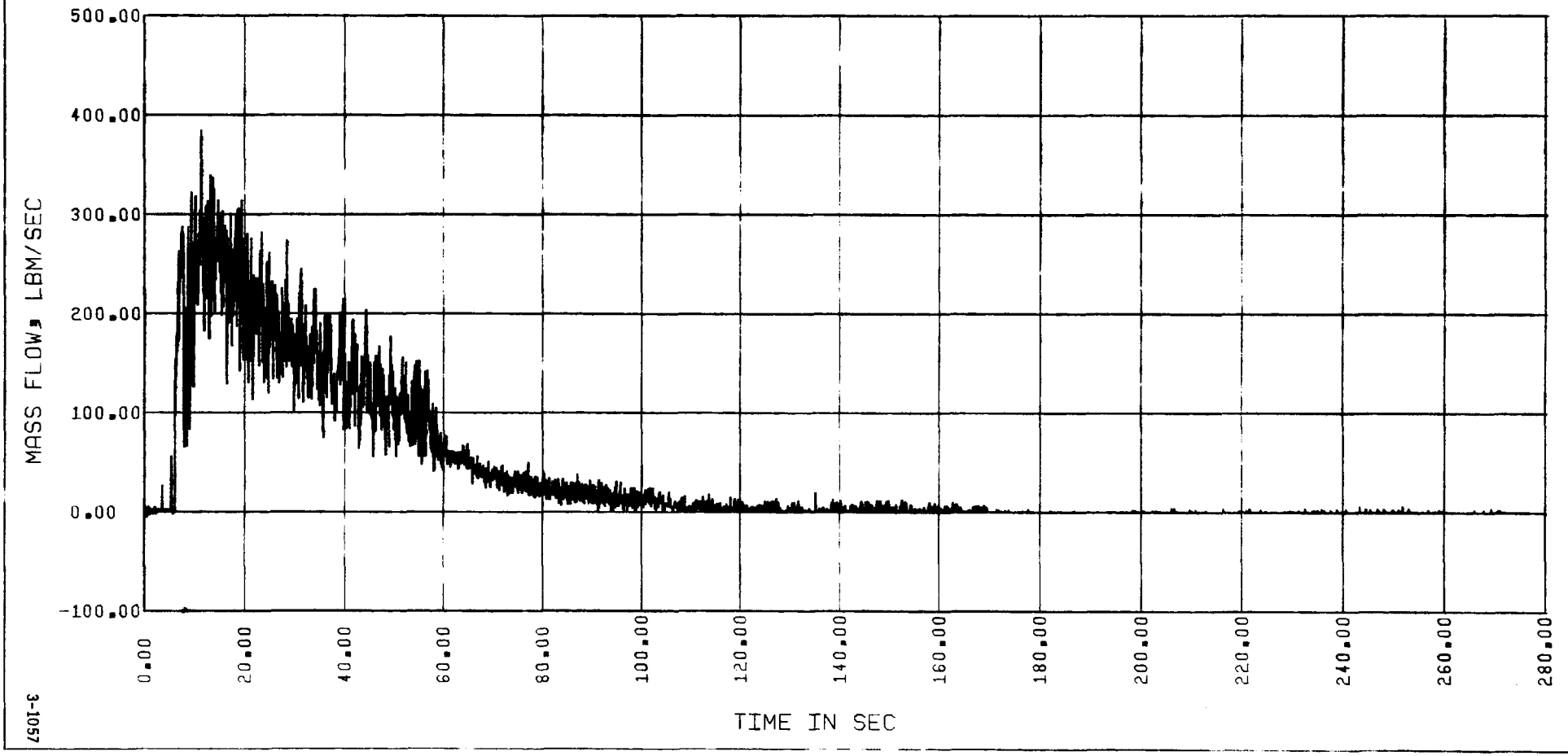
3-1055

TEST 1465/1000 PSIA LR REV BDN
MASS FLOW RATE HI-TM/GD2 DISCH
PLOT NO.56



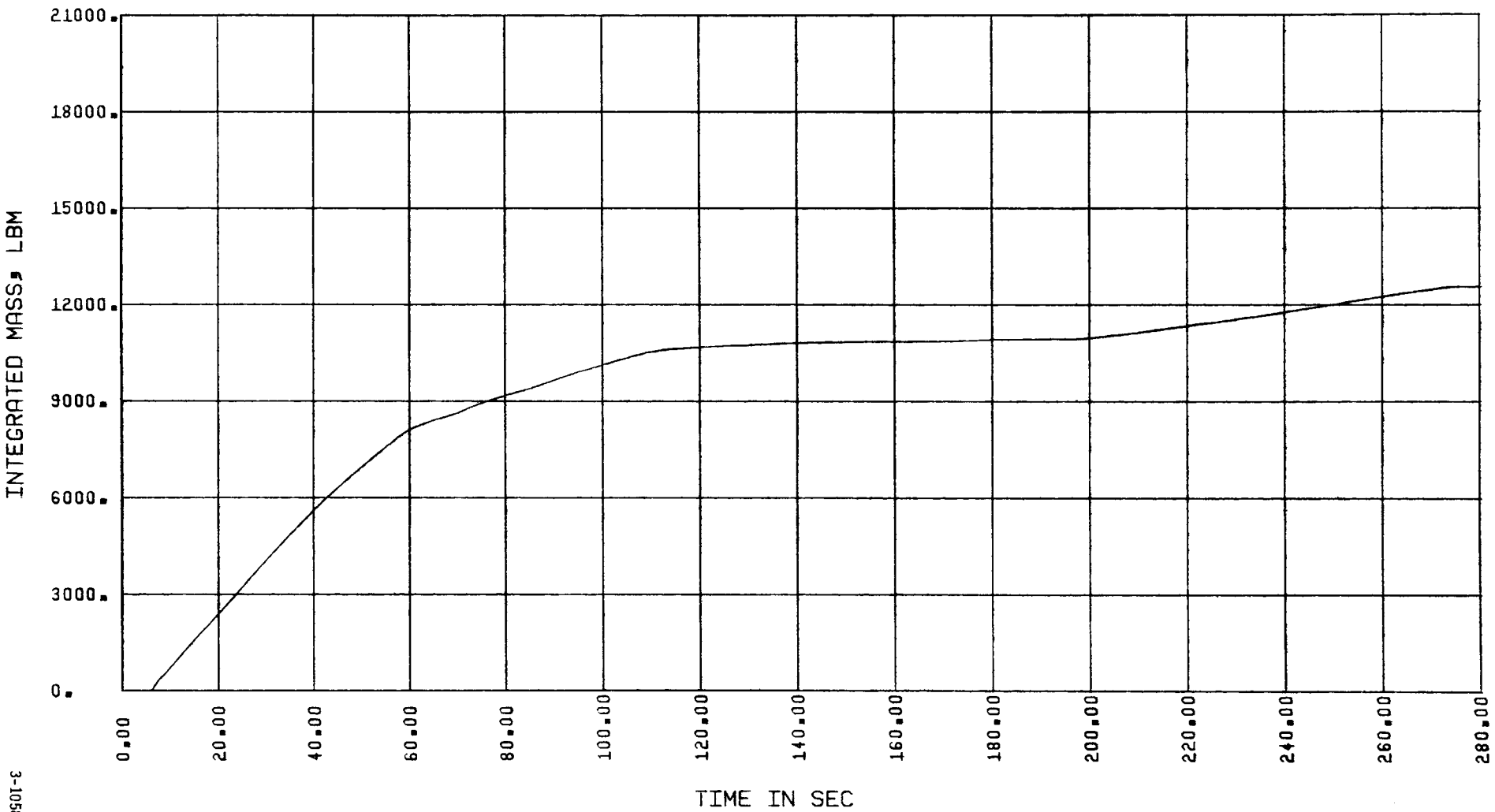
3-1056

TEST 1465/1000 PSIA LR REV BDN
MASS FLOW RATE LO-TM/GO2 DISCH
PLOT NO.57



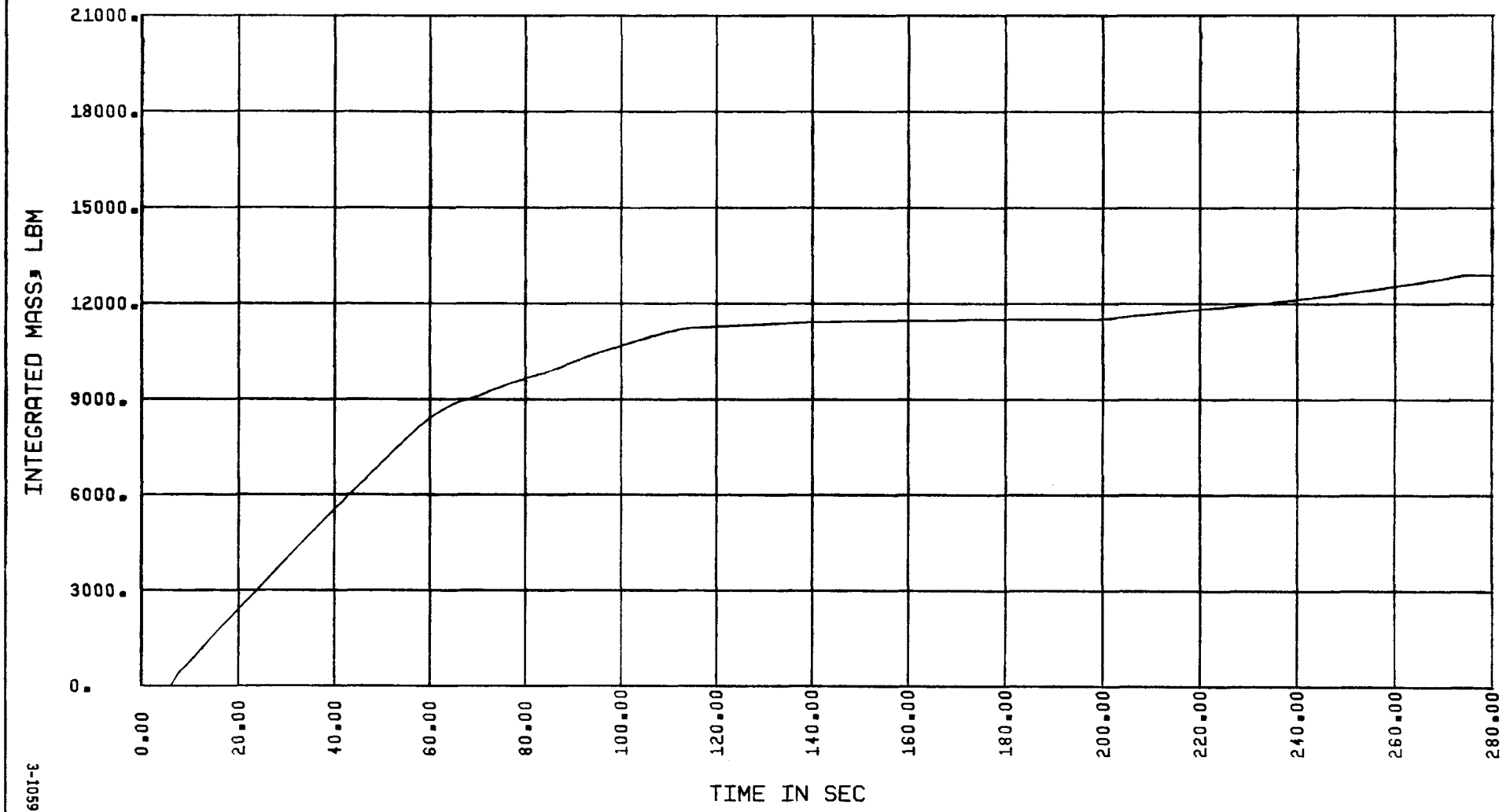
E-1057

TEST 1465/1000 PSIA LR REV BDN
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60



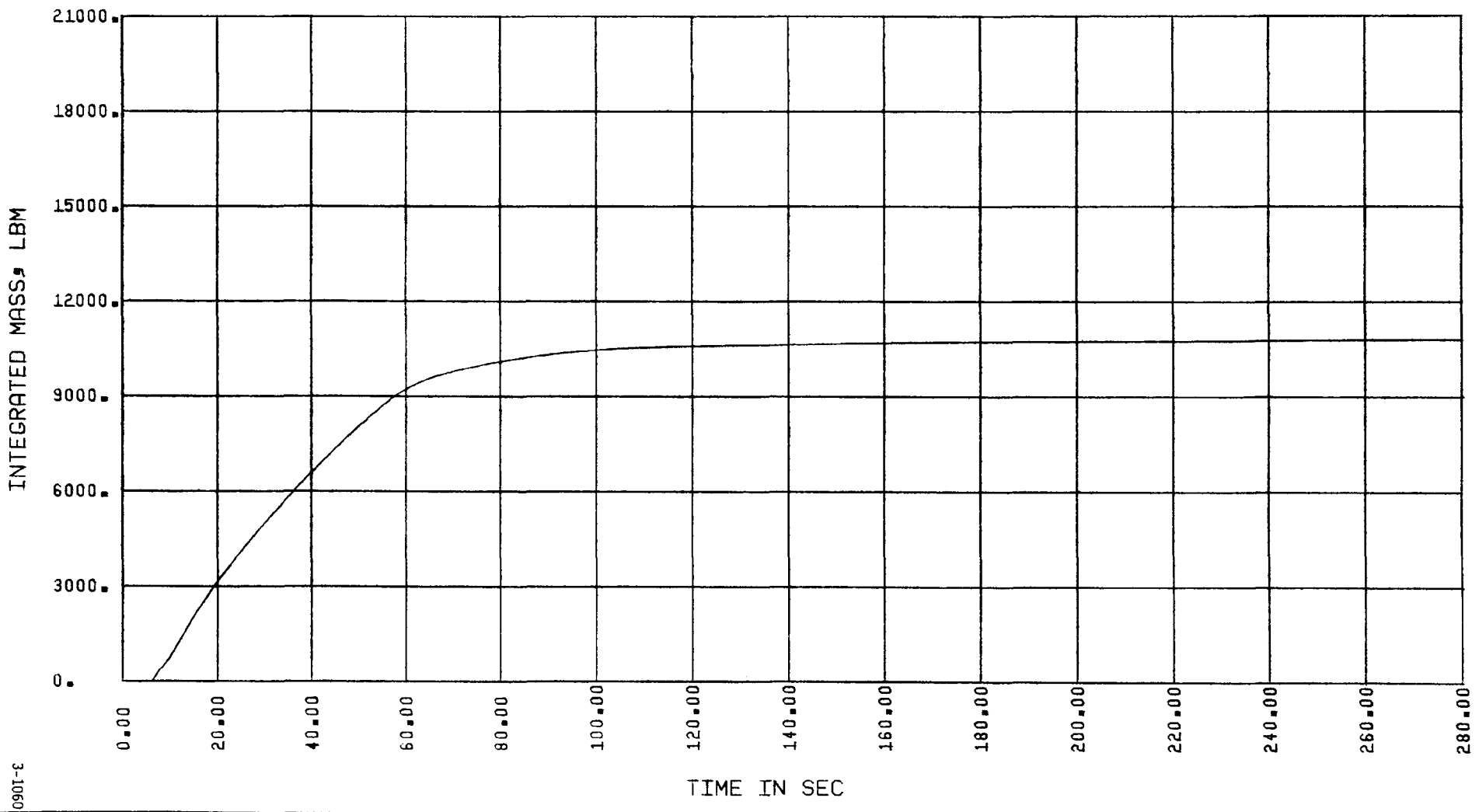
3-1058

TEST 1465/1000 PSIA LR REV BDN
INTEGRATED MASS LO-TM/GD2 S
PLOT NO.61



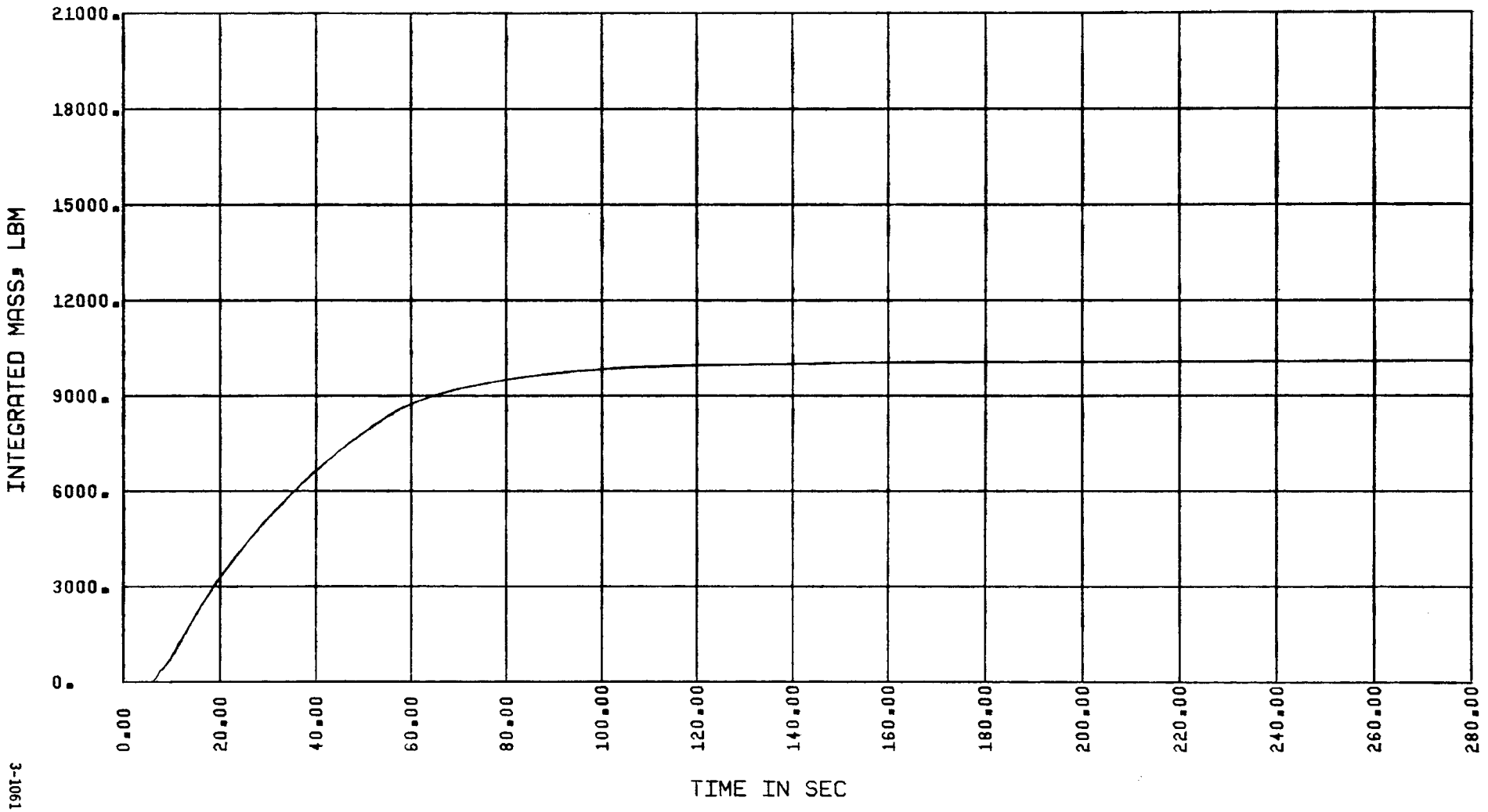
3-1059

TEST 1465/1000 PSIA LR REV BDN
INTEGRATED MASS HI-TM/GD2 D
PLOT NO.62



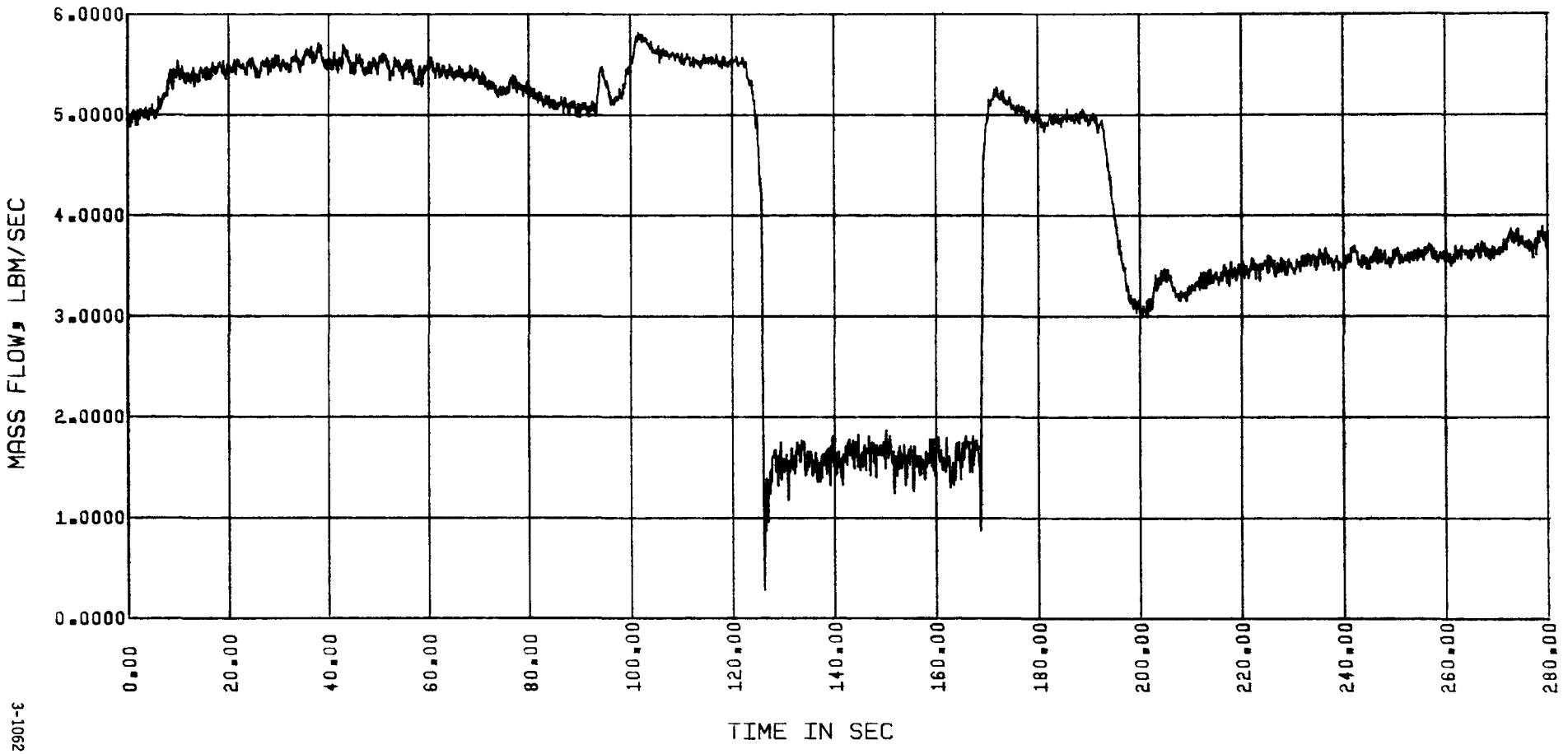
3-1060

TEST 1465/1000 PSIA LR REV BDN
INTEGRATED MASS LO-TM/GD2 D
PLOT NO.63



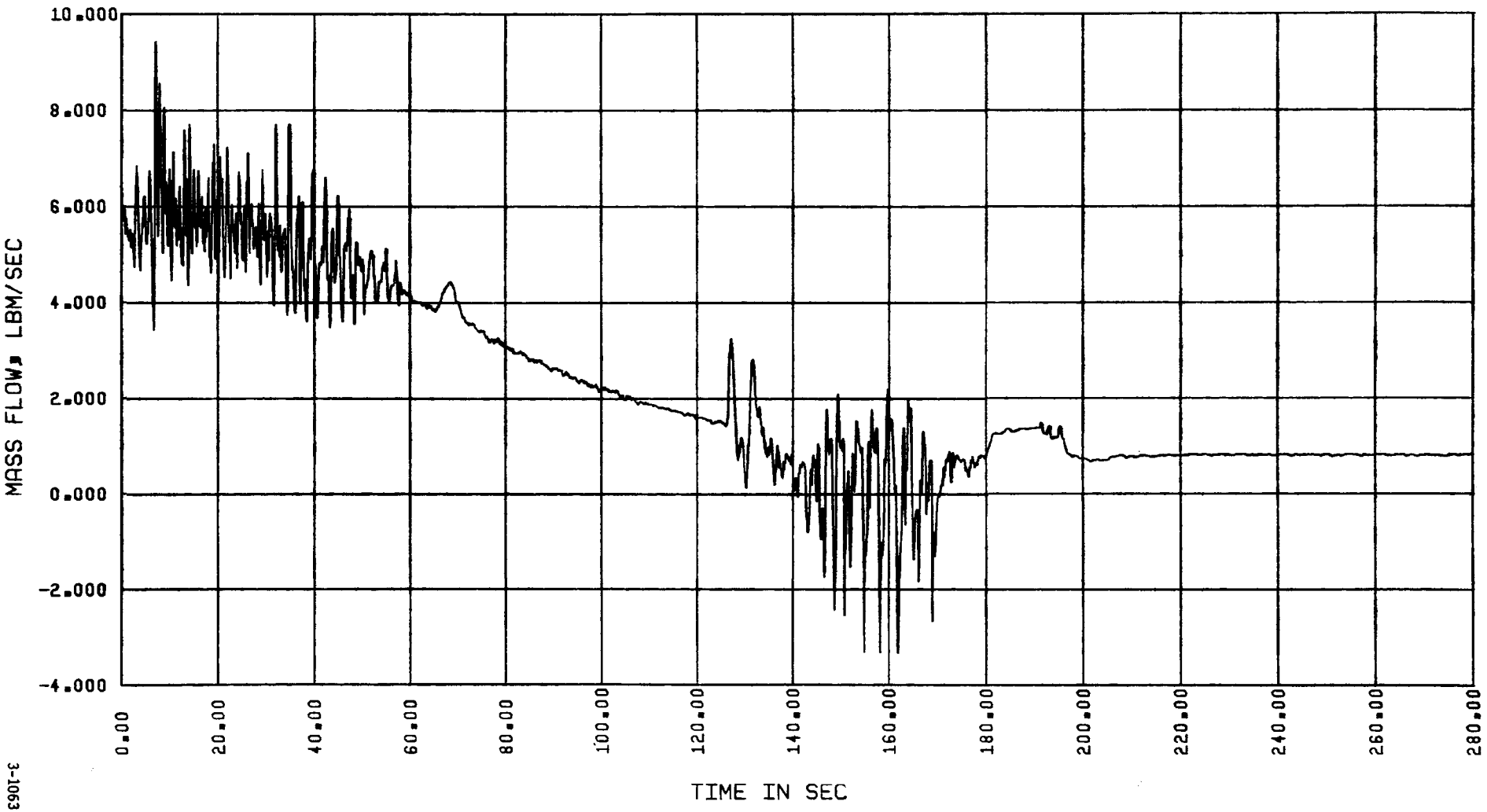
3-1061

TEST 1465/1000 PSIA LR REV BDN
PUMP INLET INJECTION FLOW
PLOT NO.64



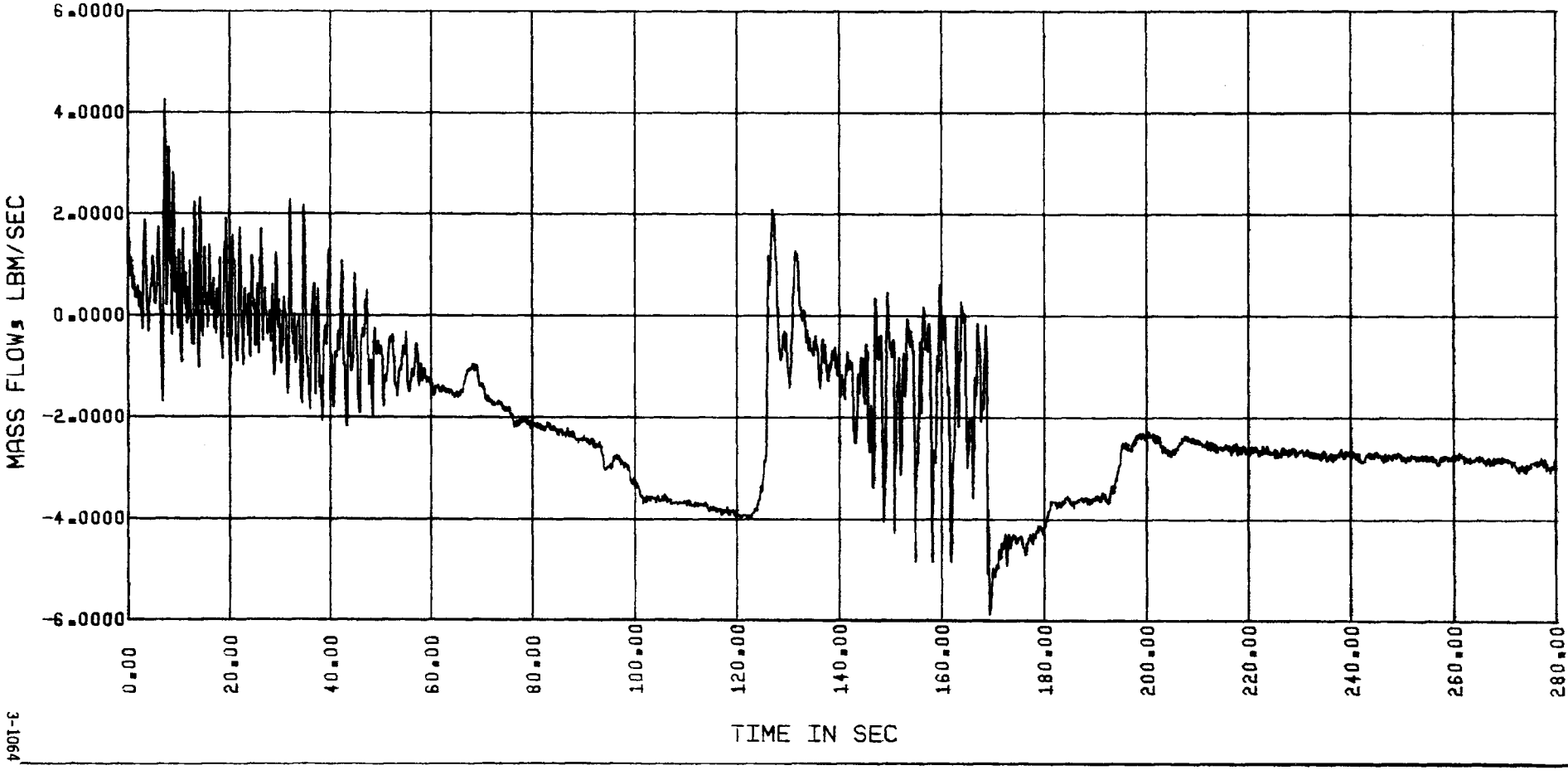
3-1062

TEST 1465/1000 PSIA LR REV BDN
PUMP OUTLET INJECTION FLOW
PLOT NO.65



3-1063

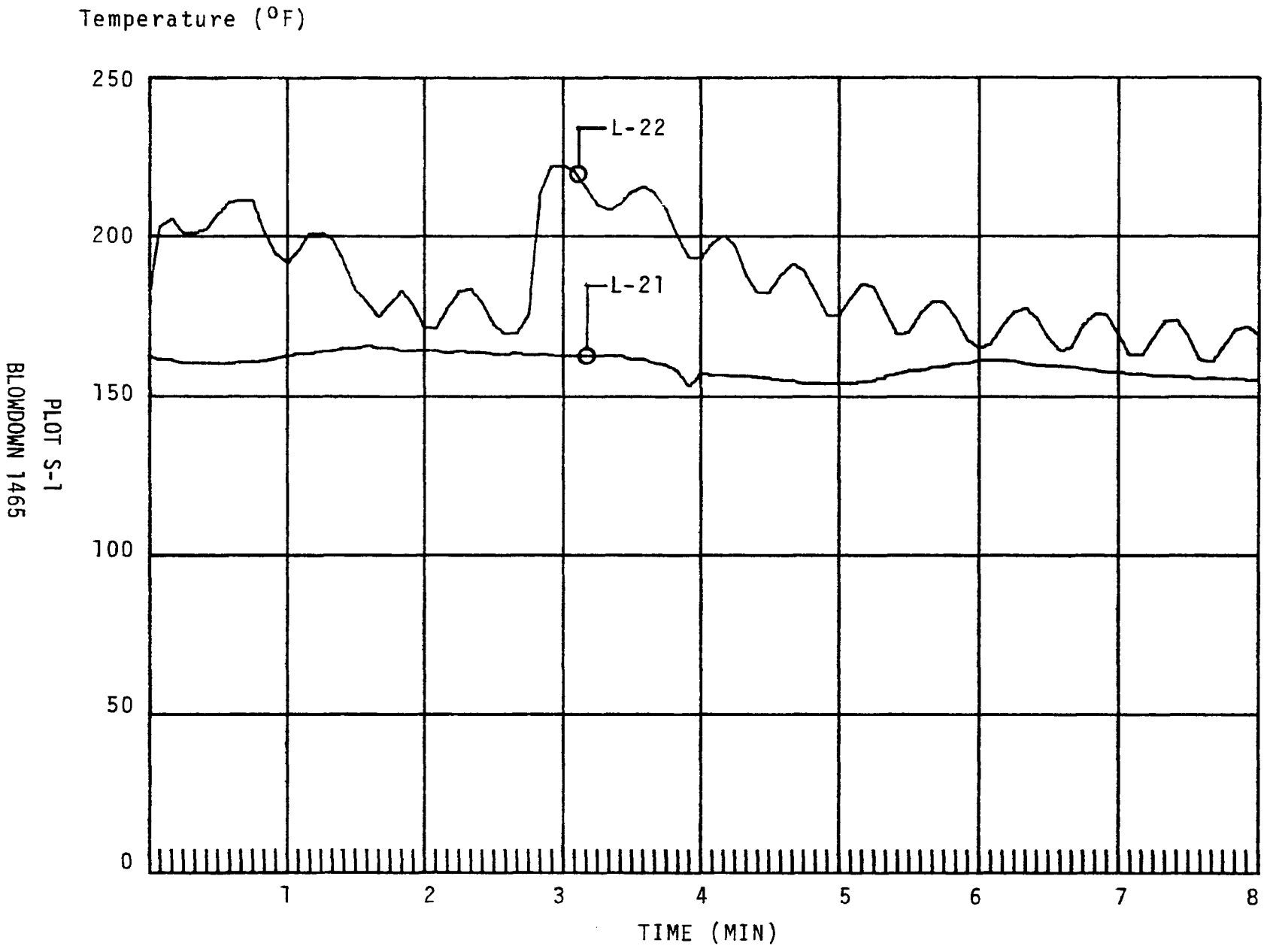
TEST 1465/1000 PSIA LR REV BDN
PUMP SEAL INJ LEAKAGE FLOW
PLOT NO.66

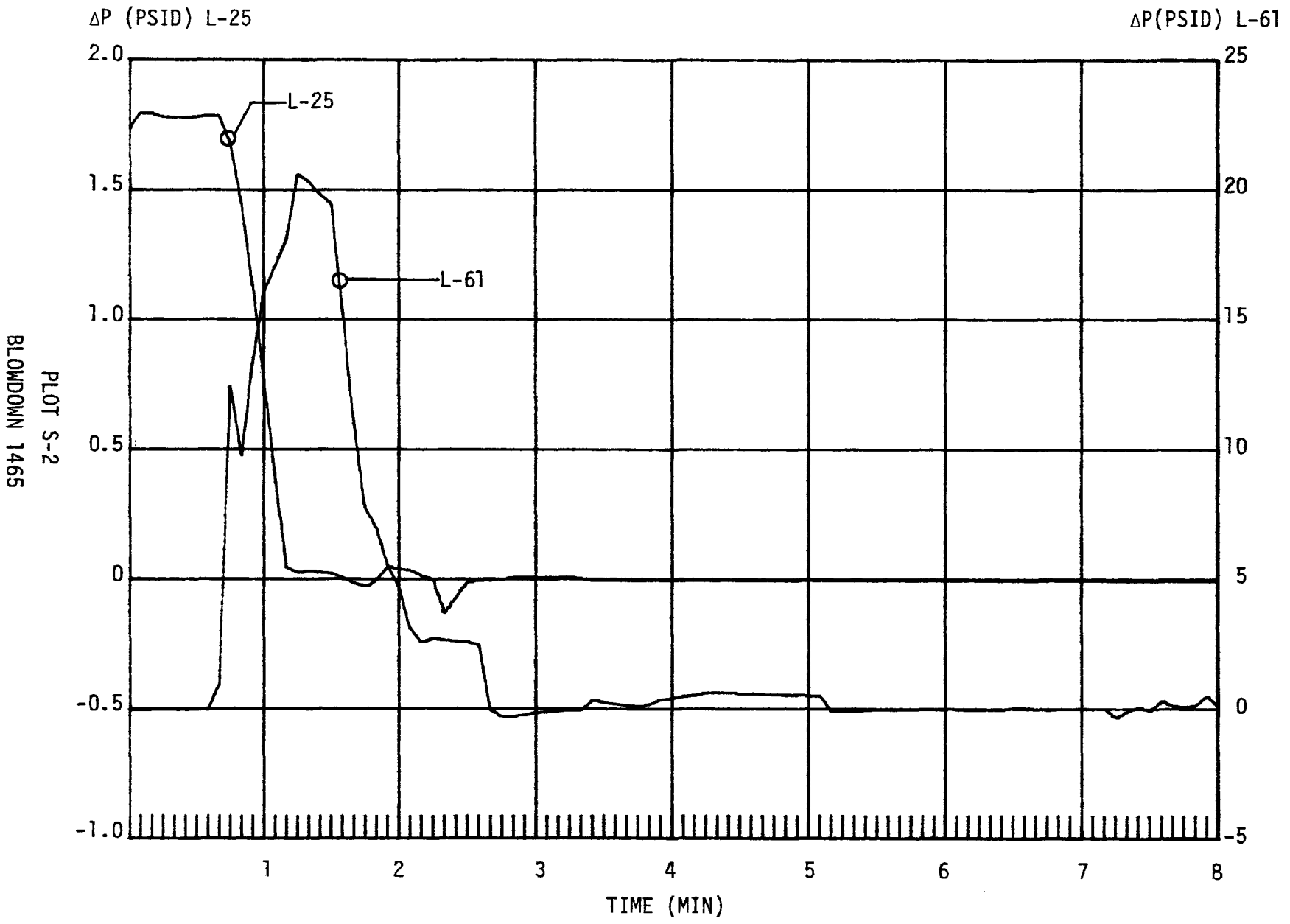


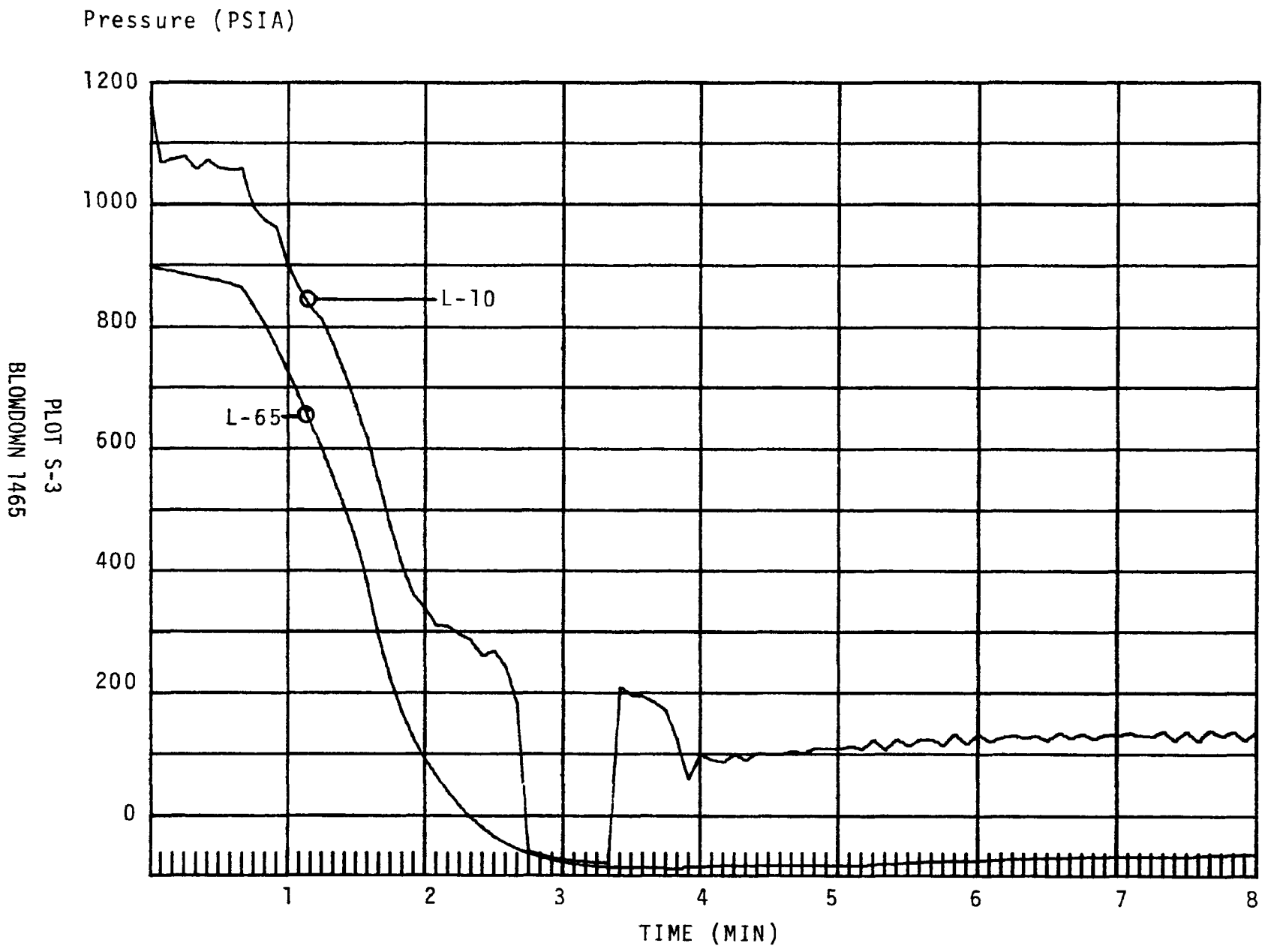
3-1064

Index Listing
of
SCANNER DATA PLOTS
Test Number (1465)

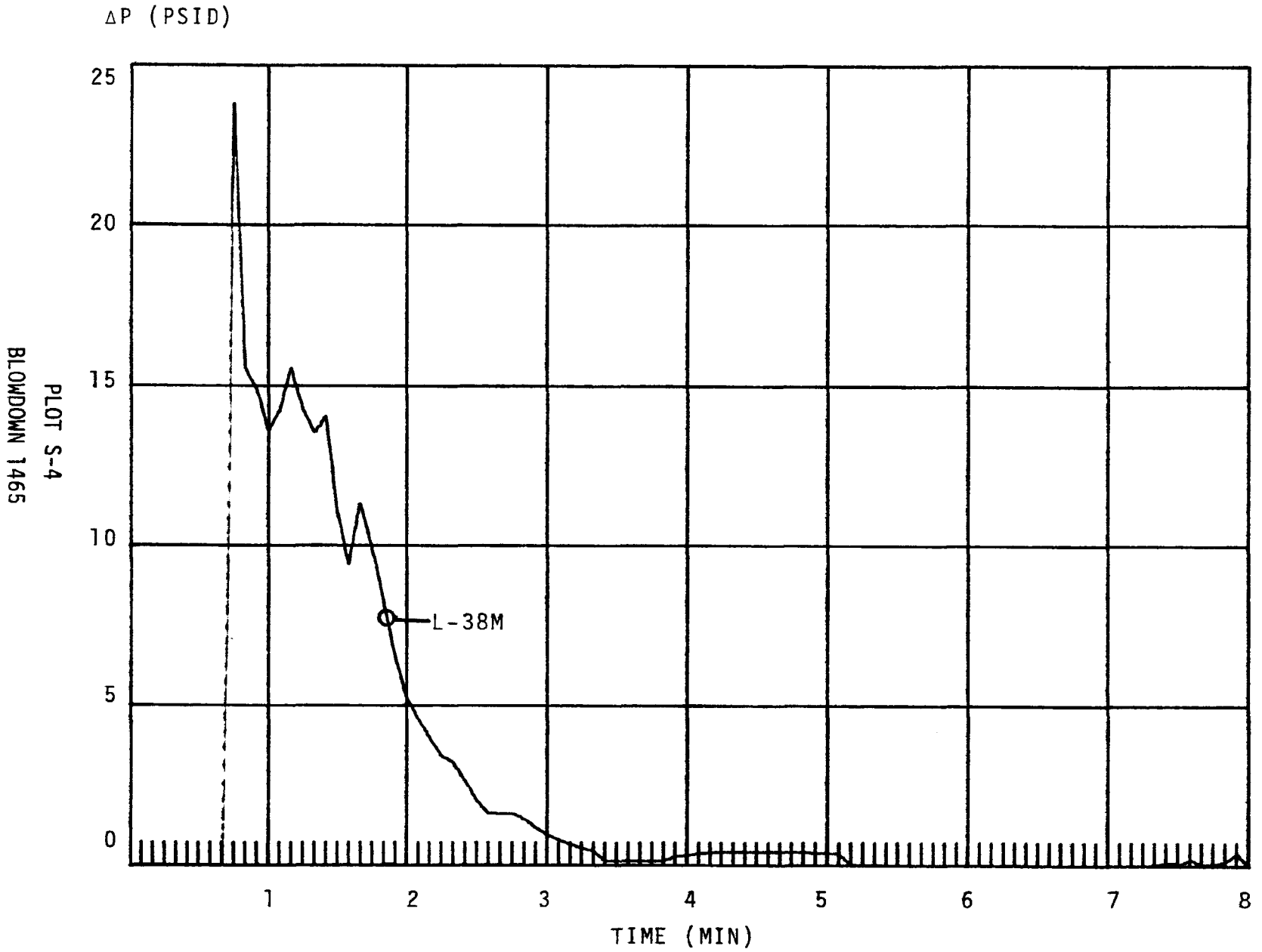
Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

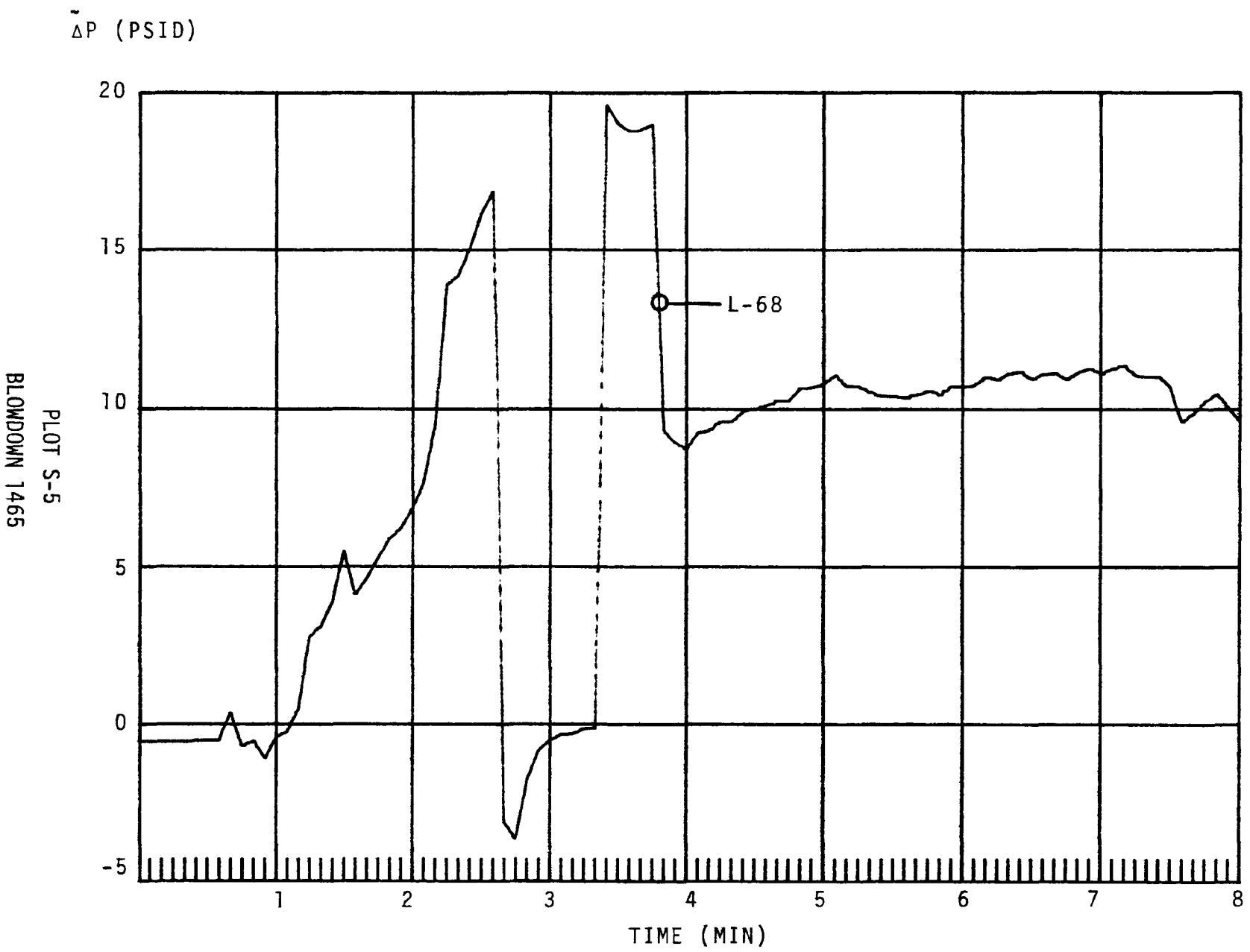

Temperature (°F)
250
200
150
100
50
0
L-22
L-21
1
2
3
4
5
6
7
8
TIME (MIN)
PLOT S-1
BLOWDOWN 1465


ΔP (PSID) L-25
ΔP(PSID) L-61
2.0
1.5
1.0
0.5
0
-0.5
-1.0
25
20
15
10
5
0
-5
L-25
L-61
1
2
3
4
5
6
7
8
TIME (MIN)
BLOWDOWN 1465
PLOT S-2



PLOT S-3
BLOWDOWN 1465


ΔP (PSID)
25
20
15
10
5
0
L-38M
1
2
3
4
5
6
7
8
TIME (MIN)
PLOT S-4
BLOWDOWN 1465



PLOT S-5
BLOWDOWN 1465

SYSTEM CONFIGURATION

Test Number 1511

Break Location	Suction
Break Size	4.23 in^2
	15 % of 6 in. diameter inlet area of pump
Mixing Plate	Out
Pump Mode	Free-Wheeling

COMMENTS

1. Malfunctioning or Inoperable Instruments: Pump suction turbine meter (HI) initial data were lost; remaining data were unaffected.

2. Other Comments:
   (a) The calculated mass flow rates do not show the reversal from positive to negative flow as indicated by the plots of volumetric flow rate.
   (b) All the shaft and hydraulic torque data are reversed in sign. In addition, the normalized hydraulic torque is in further error because the friction and windage torque was added to the shaft torque instead of being subtracted until the speed reverses from positive to negative.

3. Affected FM Data Plots:
   27 - Normalized Volumetric Flow Rate
   32 - Mass Flow Rate
   33 - Mass Flow Rate
   34 - Mass Flow Rate
   35 - Mass Flow Rate
   37 - Momentum Flux
   48 - Normalized Shaft Torque
   49 - Normalized Hydraulic Torque
   54 - Mass Flow Rate
   55 - Mass Flow Rate
   56 - Mass Flow Rate
   57 - Mass Flow Rate
   60 - Integrated Mass

INITIAL CONDITIONS

t = 20 Sec[a]

Test Number 1511

System Pressures

High Pressure Drum	1056.3	psia
Suction Instrument Spool	1059.6	psia
Discharge Instrument Spool	1073.5	psia

Fluid Temperatures

Suction Instrument Spool	554.4	°F
Discharge Instrument Spool	556.4	°F

Fluid Density

Suction Instrument Spool	45.70	lbm/ft^3
Discharge Instrument Spool	45.15	lbm/ft^3

System Flows

Mass Flow Rate	1	lb/sec
Suction Volumetric Flow Rate	-25	gpm
Discharge Volumetric Flow Rate	-15	gpm
Suction Normalized Volumetric Flow Rate	-0.007	
Discharge Normalized Volumetric Flow Rate	-0.004	
Suction Fluid Velocity	-0.31	ft/sec
Discharge Fluid Velocity	-0.19	ft/sec
Suction Momentum Flux	52	$lbm/ft\ sec^2$
Discharge Momentum Flux	37	$lbm/ft\ sec^2$

Pump Performance

Pump head	6.49	psi
	20.7	ft
Pump Speed	1899	rpm
Pump Shaft Torque	38.0	ft lb
Pump Hydraulic Torque	25.6	ft lb

System Mass (t = 30 Sec)[a]

High Pressure Drum Level	58.28	in[b]
Fluid Mass Upstream of Test Pump	14,509	lbm

[a] References to time zero on the scanner data plots (± 5 Sec)

[b] Inches above the bottom water level tap; Tap H in Figure 2-8 of Volume VII. Tap H is 22.25 inches above the drum bottom.

CHRONOLOGY OF EVENTS

Test Number 1511

Event	FM Plot Time Seconds[a]	Scanner Time Seconds[b]
Start Scanner System	-	0
Start FM Recording System	-7.0	-
Start of Digitized Data	0.0	-
Start of Plotted Data	0.0	0
Command to Close Loop Control Valve HPSW-1	1.1	c
HPSW-1 Closed	2.9	c
Pump Power Trip	5.9	40
Initiate Rupture Mechanism	4.9	c
Blowdown Starts	6.1	40
HPSW-2 Closed	227.3	265
PAC-12 and PAC-16 Injection Off	156.1	195
PAC-12 and PAC-16 Injection On	c	c
Test Pump Injection Off	206.1	240
Test Pump Injection On	c	c
End of Digitized Data 20 s/sec	413.0	-
200 s/sec	293.0	-
FM Recording System Off	466.0	-
Scanner System Off	-	

[a]Referenced to time zero on the FM data plots

[b]Referenced to time zero on scanner data plots

[c]Information not available

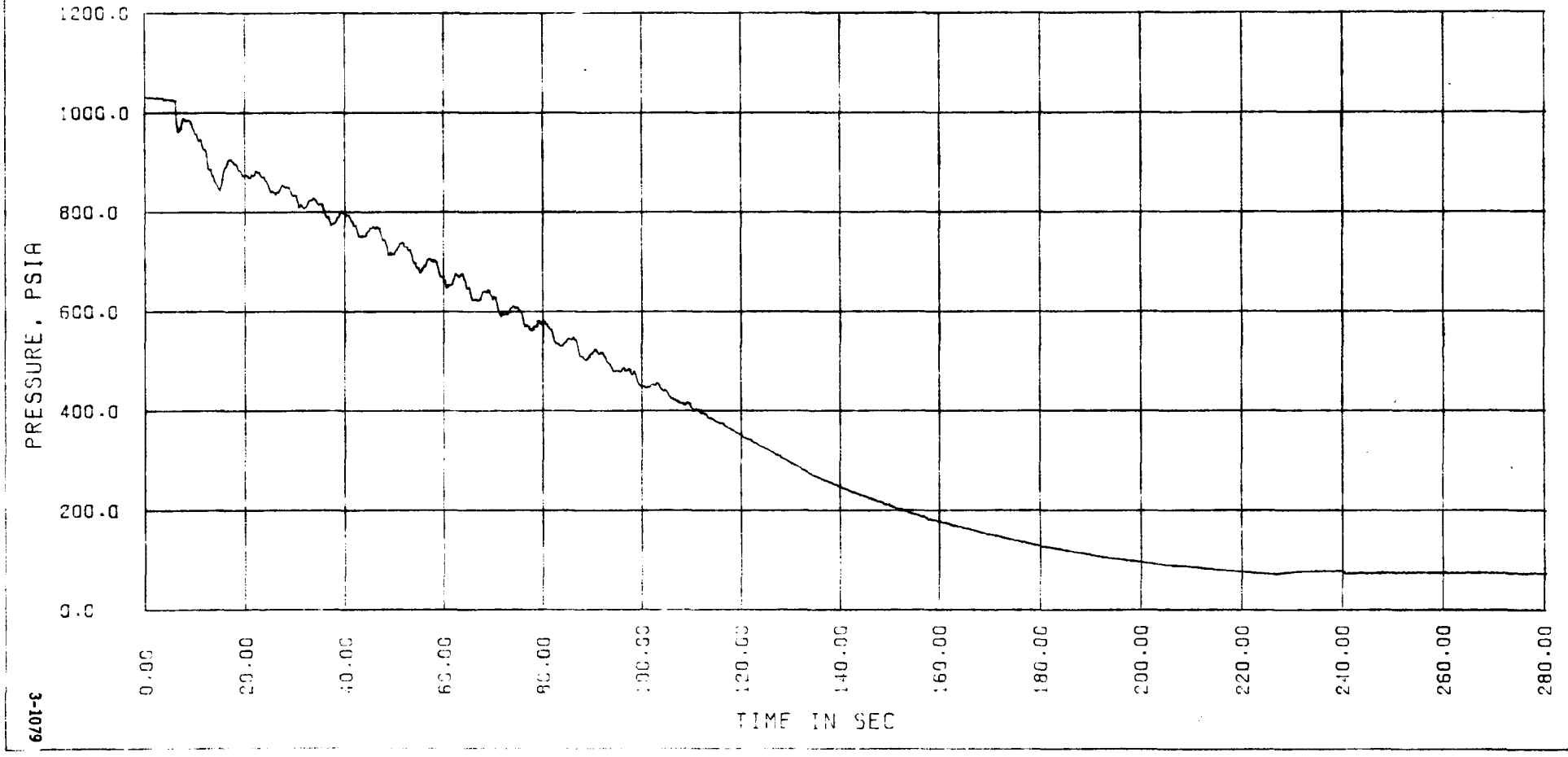
Index Listing
of
FM DATA PLOTS
Test Number (1511)

Plot Number	Location Number	Description of Parameter
1	L-5	Pump Suction Pressure
2	L-6	Pump Discharge Pressure
3	L-64	Blowdown Line Pressure
4	L-13	Pump Suction Temperature
5	L-14	Pump Discharge Temperature
6	L-15	Density Beam 1 GD Suction
7	L-16	Density Beam 2 GD Suction
8	L-17	Density Beam 3 GD Suction
9	L-18	Density Beam 1 GD Discharge
10	L-19	Density Beam 2 GD Discharge
11	L-20	Density Beam 3 GD Discharge
12	L-34	Density Beam 1 AECL GD
13	L-35	Density Beam 2 AECL GD
14	L-36	Density Beam 3 AECL GD
15	L-15	Void Fraction Beam 1 GD Suction
16	L-16	Void Fraction Beam 2 GD Suction
17	L-17	Void Fraction Beam 3 GD Suction
18	L-18	Void Fraction Beam 1 GD Discharge
19	L-19	Void Fraction Beam 2 GD Discharge
20	L-20	Void Fraction Beam 3 GD Discharge
21	L-34	Void Fraction Beam 1 AECL GD
22	L-35	Void Fraction Beam 2 AECL GD
23	L-36	Void Fraction Beam 3 AECL GD
24	L-26/L-16	Norm. Vol. Flow Rate LO-DD/GD2 Suction
25	L-1/L-16	Norm. Vol. Flow Rate HI-DD/GD2 Suction
26	L-3	Norm. Vol. Flow Rate LO-TM Suction
27	L-28	Norm. Vol. Flow Rate HI-TM Suction
28	L-27/L-19	Norm. Vol. Flow Rate LO-DD/GD2 Discharge
29	L-2/L-19	Norm. Vol. Flow Rate HI-DD/GD2 Discharge
30	L-4	Norm. Vol. Flow Rate LO-TM Discharge
31	L-29	Norm. Vol. Flow Rate HI-TM Discharge

Index Listing
of
FM DATA PLOTS (Cont'd.)
Test Number (1511)

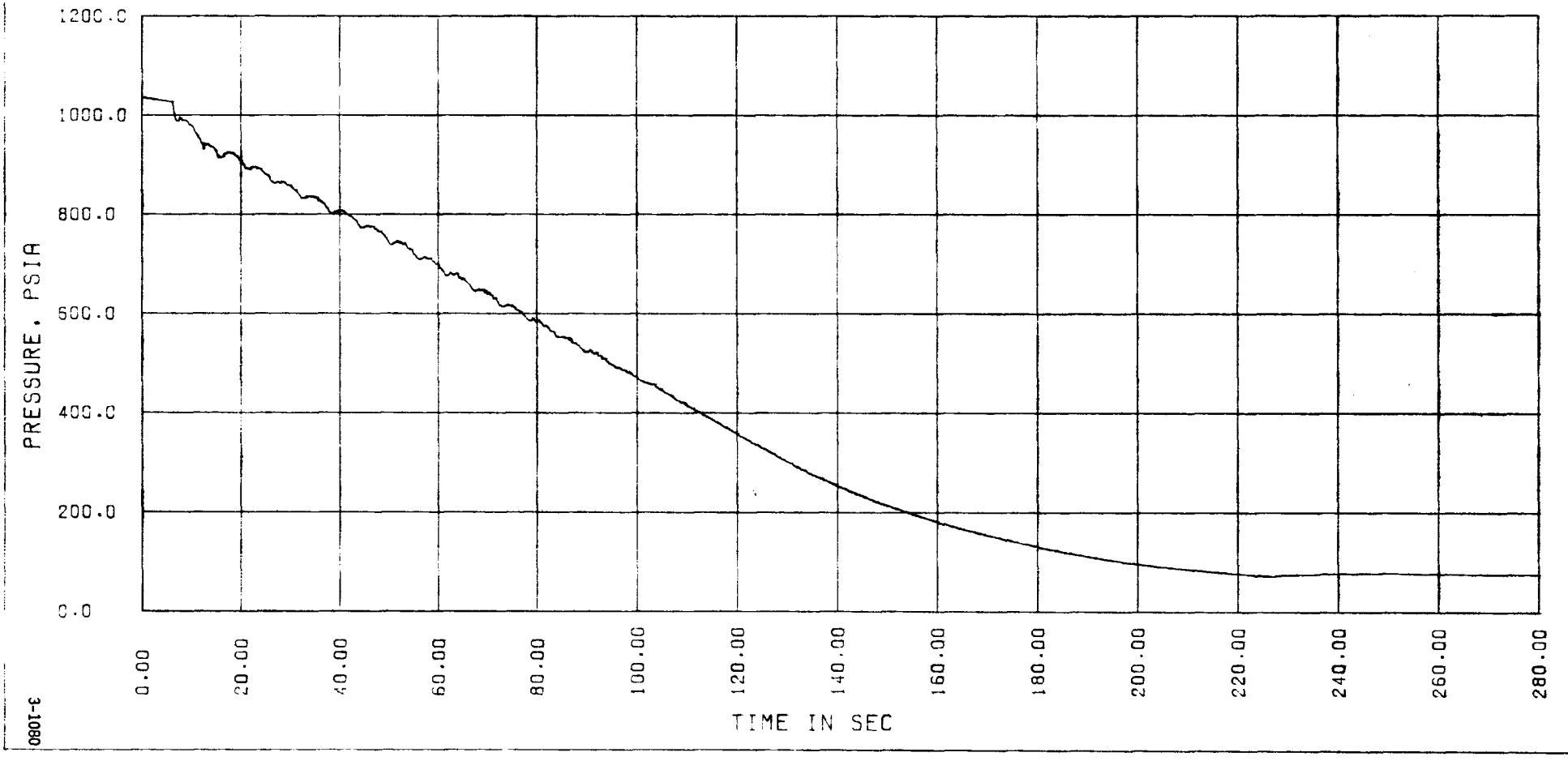
Plot Number	Location Number	Description of Parameter
32	L-1/L-16	Mass Flow Rate HI-DD/GD2 Suction
33	L-26/L-16	Mass Flow Rate LO-DD/GD2 Suction
34	L-2/L-19	Mass Flow Rate HI-DD/GD2 Discharge
35	L-27/L-19	Mass Flow Rate LO-DD/GD2 Discharge
36	L-16/L-3	Momentum Flux GD2/LO-TM Suction
37	L-16/L-28	Momentum Flux GD2/HI-TM Suction
38	L-26	Momentum Flux LO-DD Suction
39	L-1	Momentum Flux HI-DD Suction
40	L-19/L-4	Momentum Flux GD2/LO-TM Discharge
41	L-19/L-29	Momentum Flux GD2/HI-TM Discharge
42	L-27	Momentum Flux LO-DD Discharge
43	L-2	Momentum Flux HI-DD Discharge
44	L-7	Pump Head in psi
47	L-12	Norm. Pump Speed
48	L-11	Norm. Pump Shaft Torque
49	L-11/L-12	Norm. Pump Hydraulic Torque
50	L-1/L-16	Integrated Mass HI-DD/GD2 Suction
51	L-26/L-16	Integrated Mass LO-DD/GD2 Suction
52	L-2/L-19	Integrated Mass HI-DD/GD2 Discharge
53	L-27/L-19	Integrated Mass LO-DD/GD2 Discharge
54	L-28/L-16	Mass Flow Rate HI-TM/GD2 Suction
55	L-3/L-16	Mass Flow Rate LO-TM/GD2 Suction
56	L-29/L-19	Mass Flow Rate HI-TM/GD2 Discharge
57	L-4/L-19	Mass Flow Rate LO-TM/GD2 Discharge
60	L-28/L-16	Integrated Mass HI-TM/GD2 Suction
61	L-3/L-16	Integrated Mass LO-TM/GD2 Suction
62	L-29/L-19	Integrated Mass HI-TM/GD2 Discharge
63	L-4/L-19	Integrated Mass LO-TM/GD2 Discharge
64	L-9	Pump Injection Mass Flow Rate In
65	L-32	Pump Injection Mass Flow Rate Out
66	L-9/L-32	Seal Injection Leakage Mass Flow Rate

TEST 1511/1000 PSIA FW REV BDN
PUMP SUCTION PRESSURE
PLOT NO.1

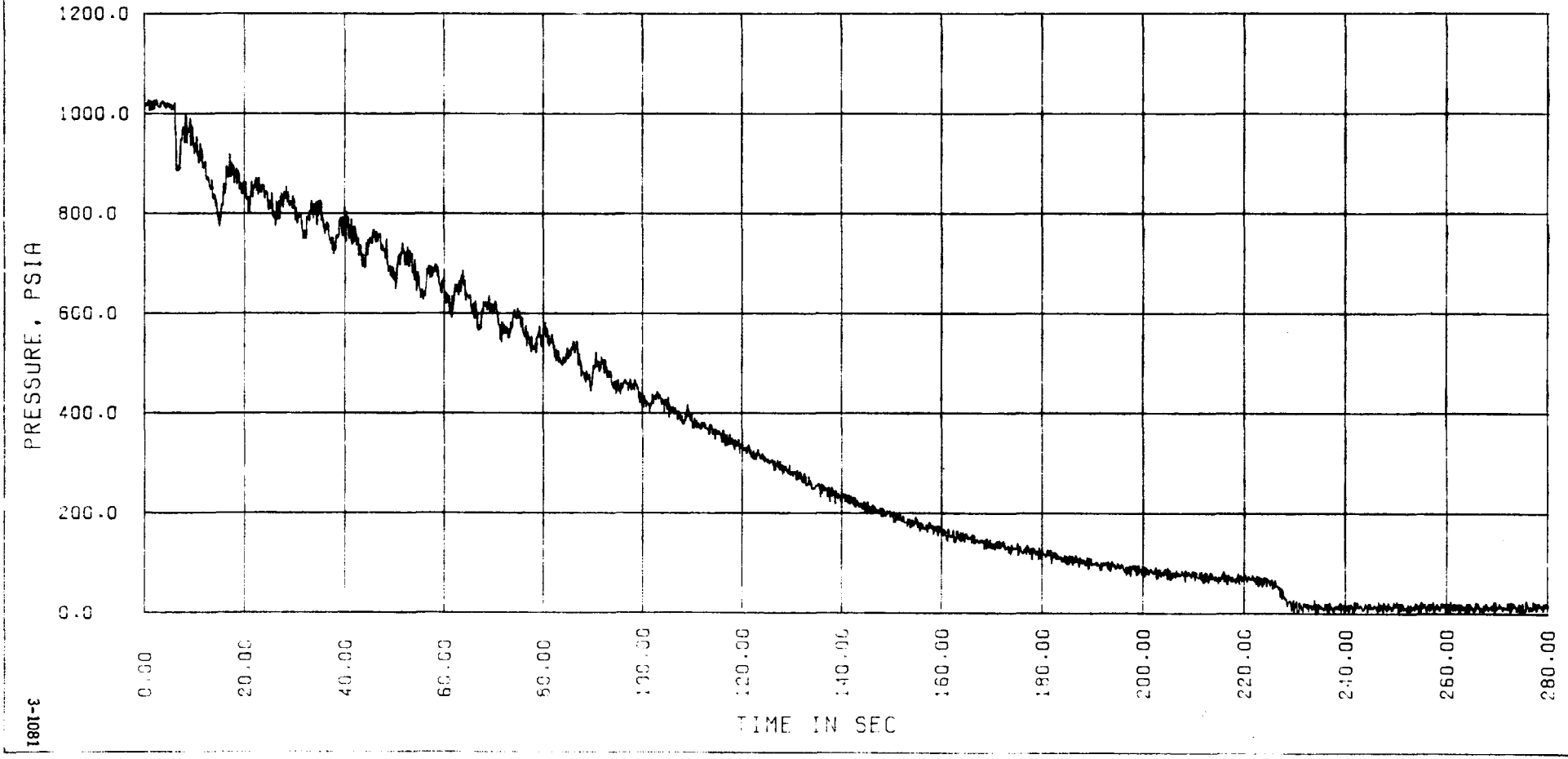


3-1079

TEST 1511/1000 PSIA FW REV BDN
PUMP DISCHARGE PRESSURE
PLOT NO.2

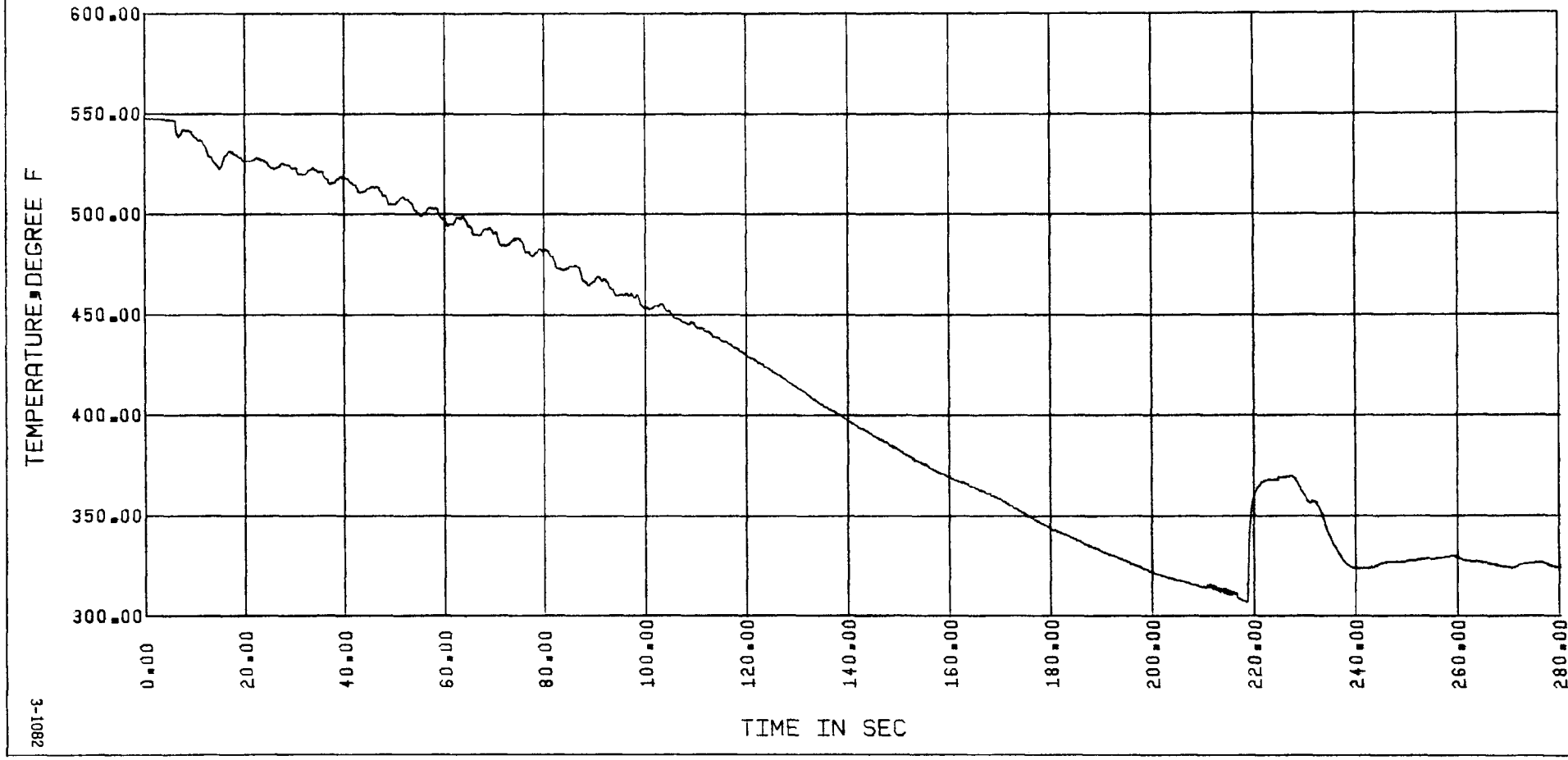


TEST 1511/1000 PSIA FW REV BDN
BLOWDOWN LINE PRESSURE
PLOT NO.3



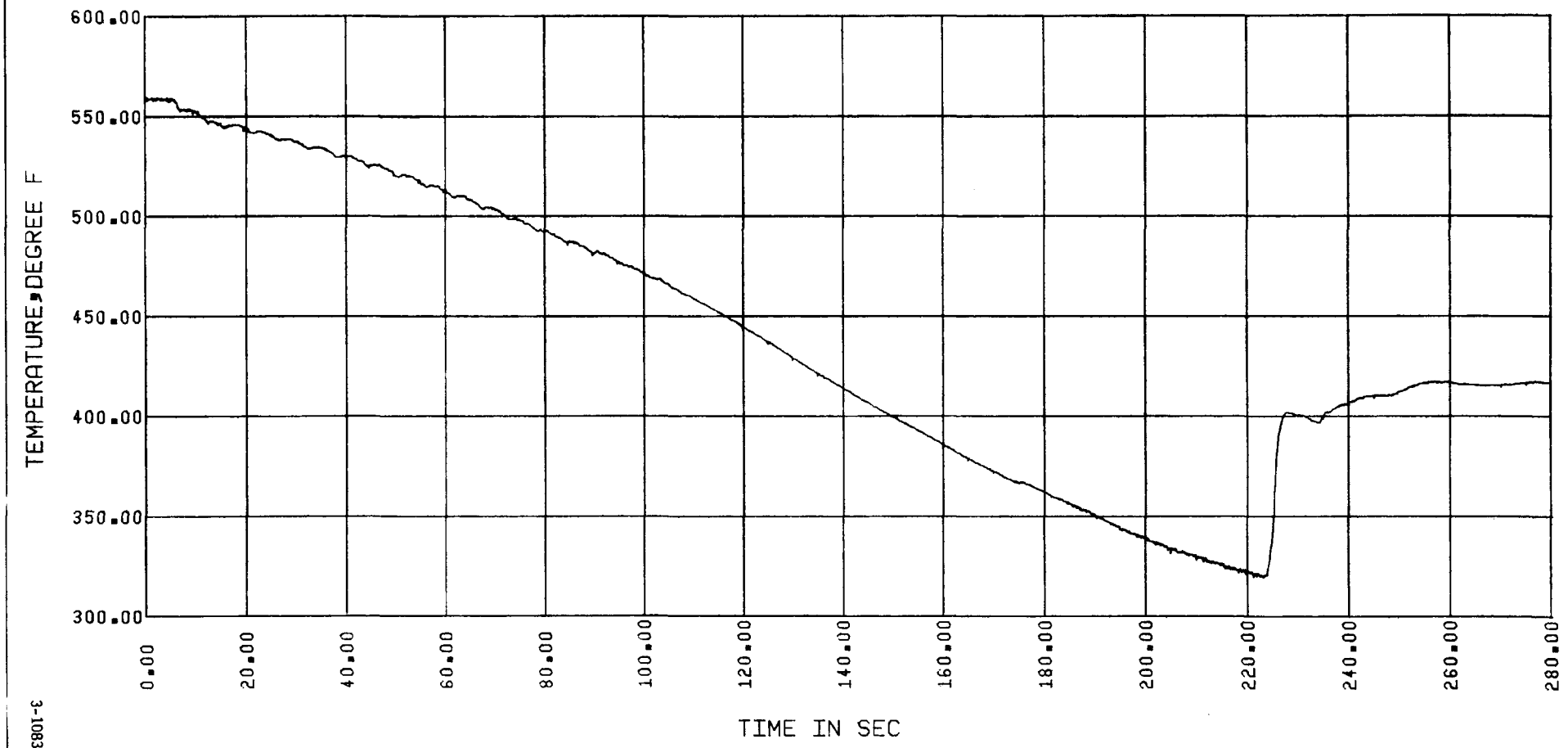
1801-3

TEST 1511/1000 PSIA FW REV BDN
PUMP SUCTION TEMPERATURE
PLOT NO. 4



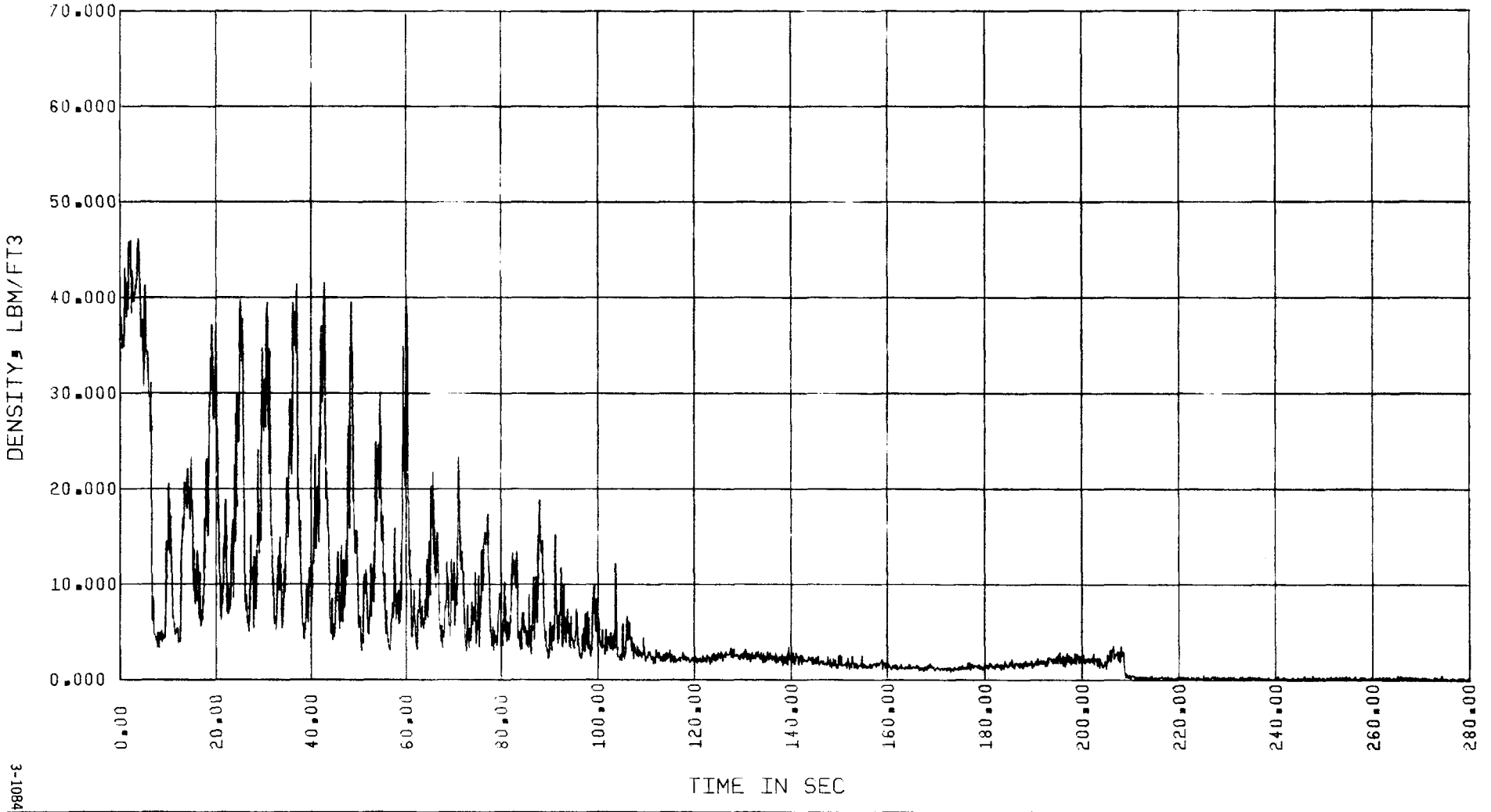
3-1082

TEST 1511/1000 PSIA FW REV BDN
PUMP DISCHARGE TEMPERATURE
PLOT NO.5



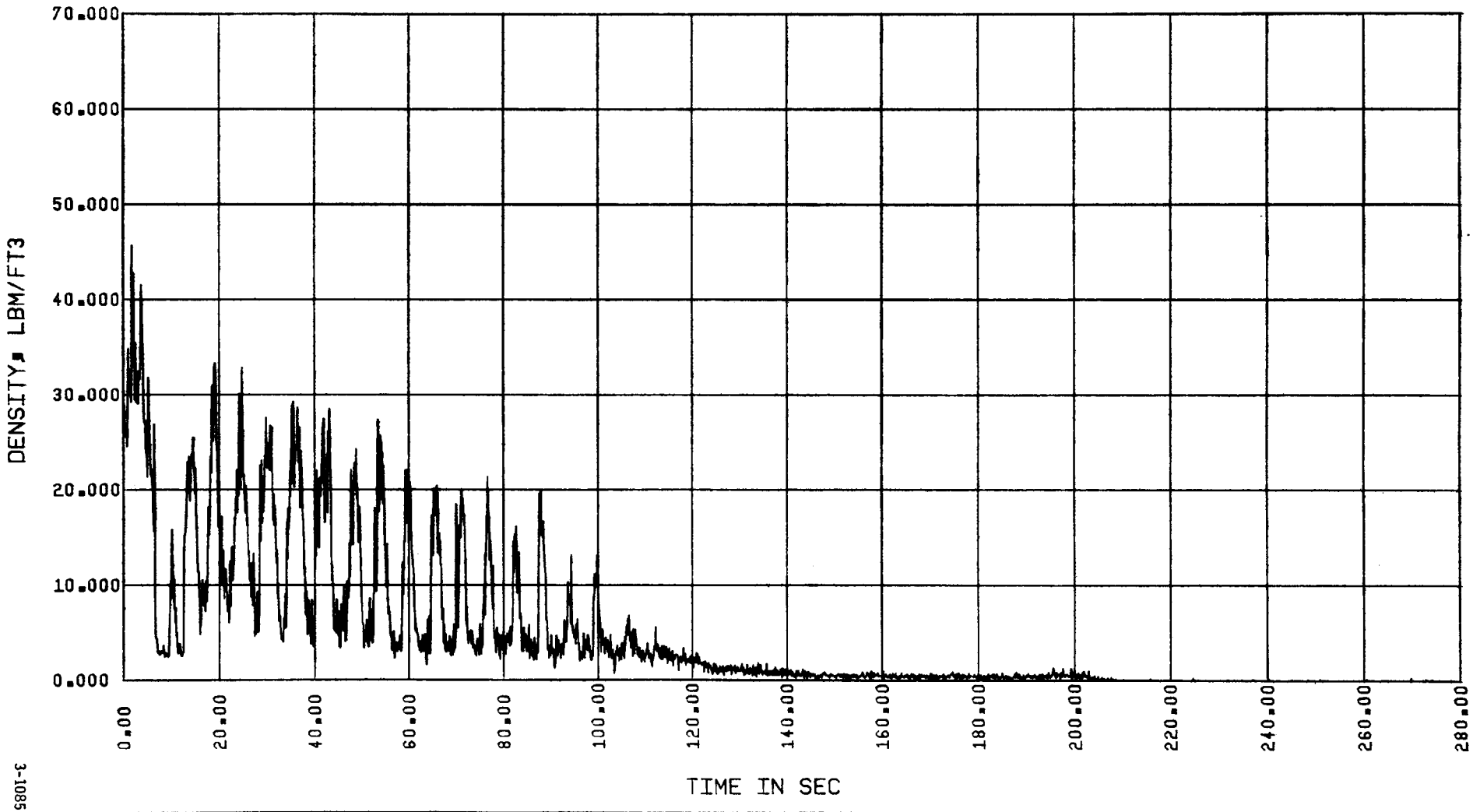
3-1083

TEST 1511/1000 PSIA FW REV BDN
DENSITY BEAM1 GD SUCTION
PLOT NO.6



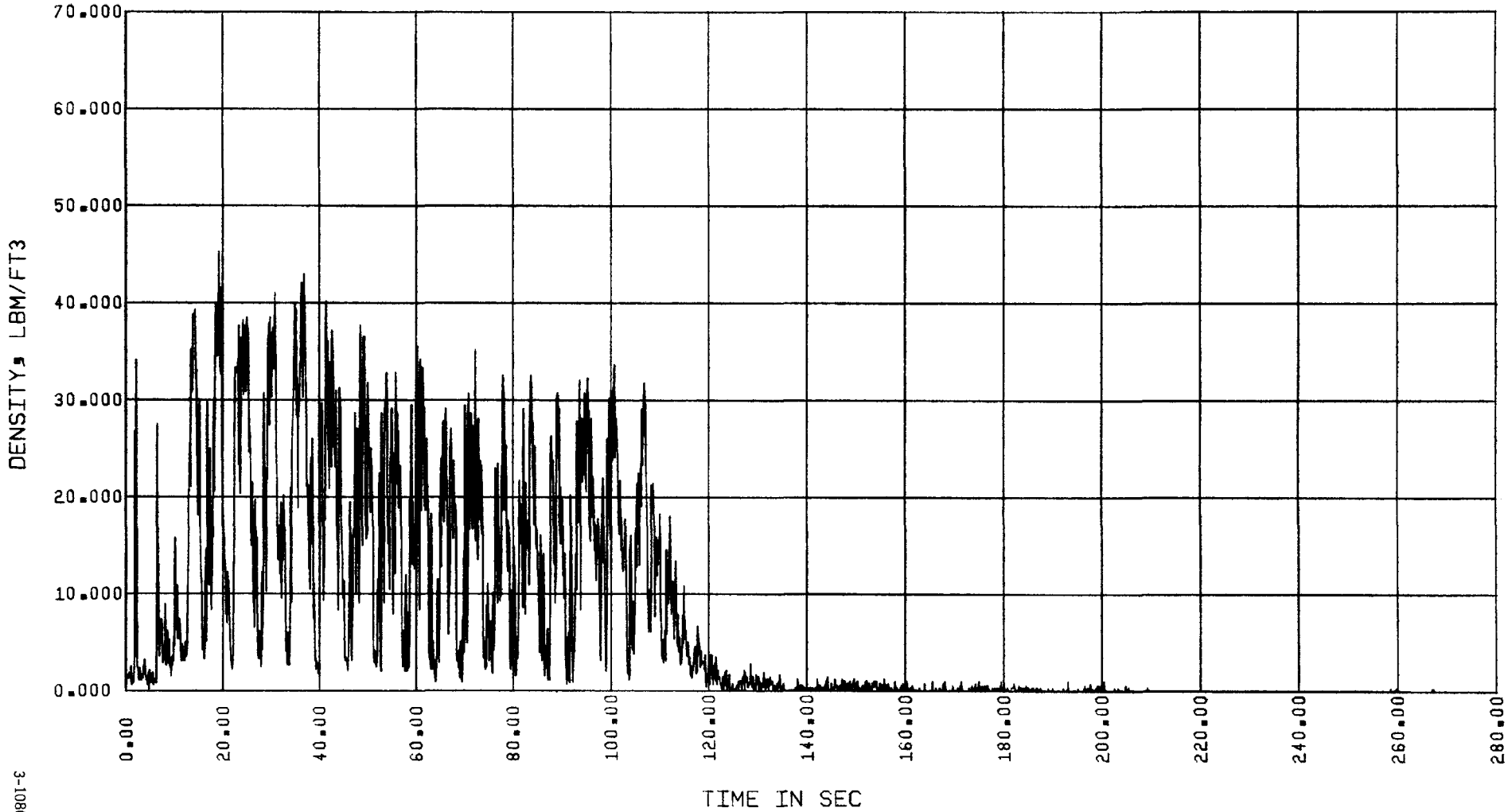
3-1084

TEST 1511/1000 PSIA FW REV BDN
DENSITY BEAM2 GD SUCTION
PLOT NO.7



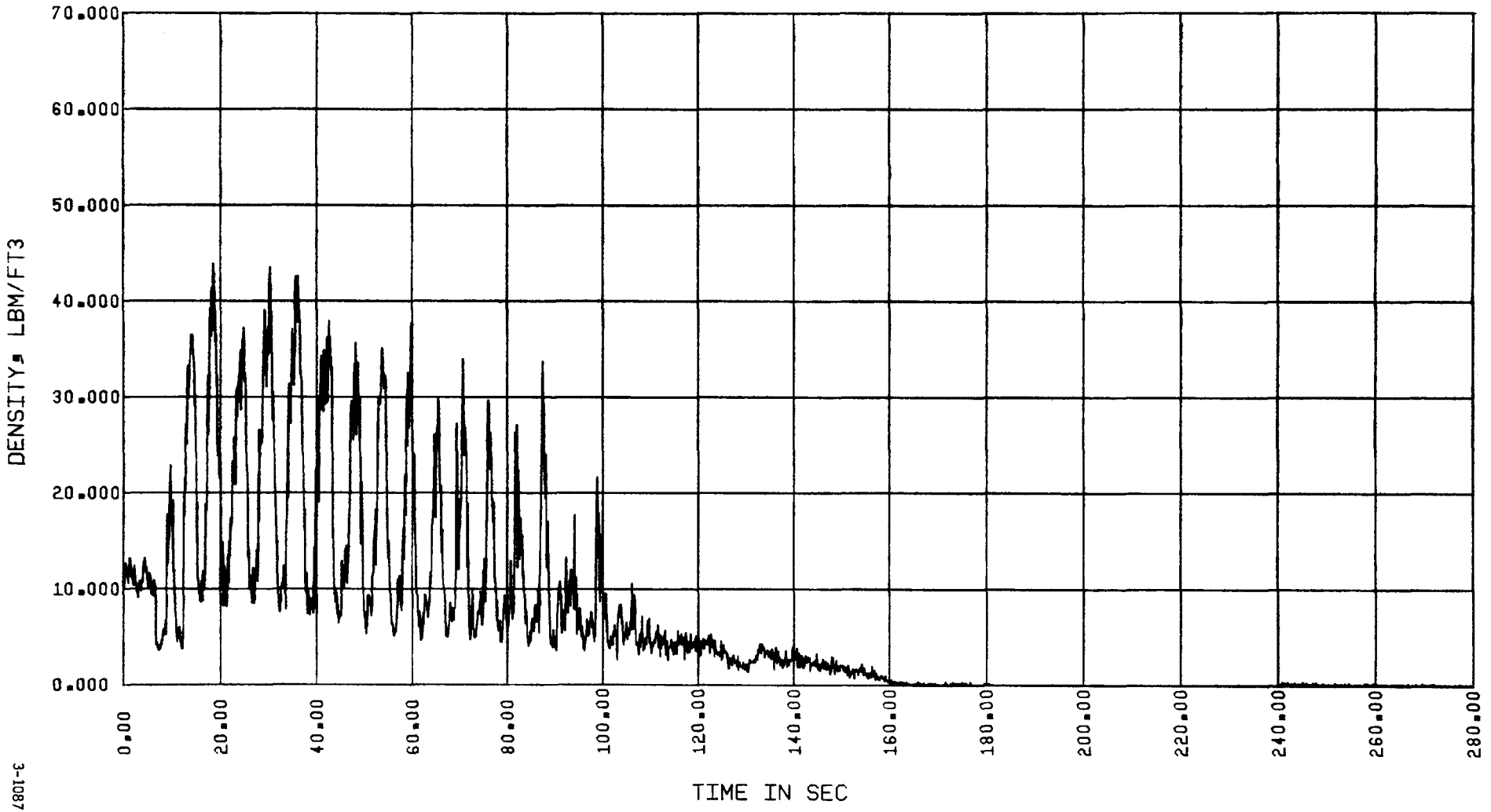
3-1085

TEST 1511/1000 PSIA FW REV BDN
DENSITY BEAM3 GD SUCTION
PLOT NO.8

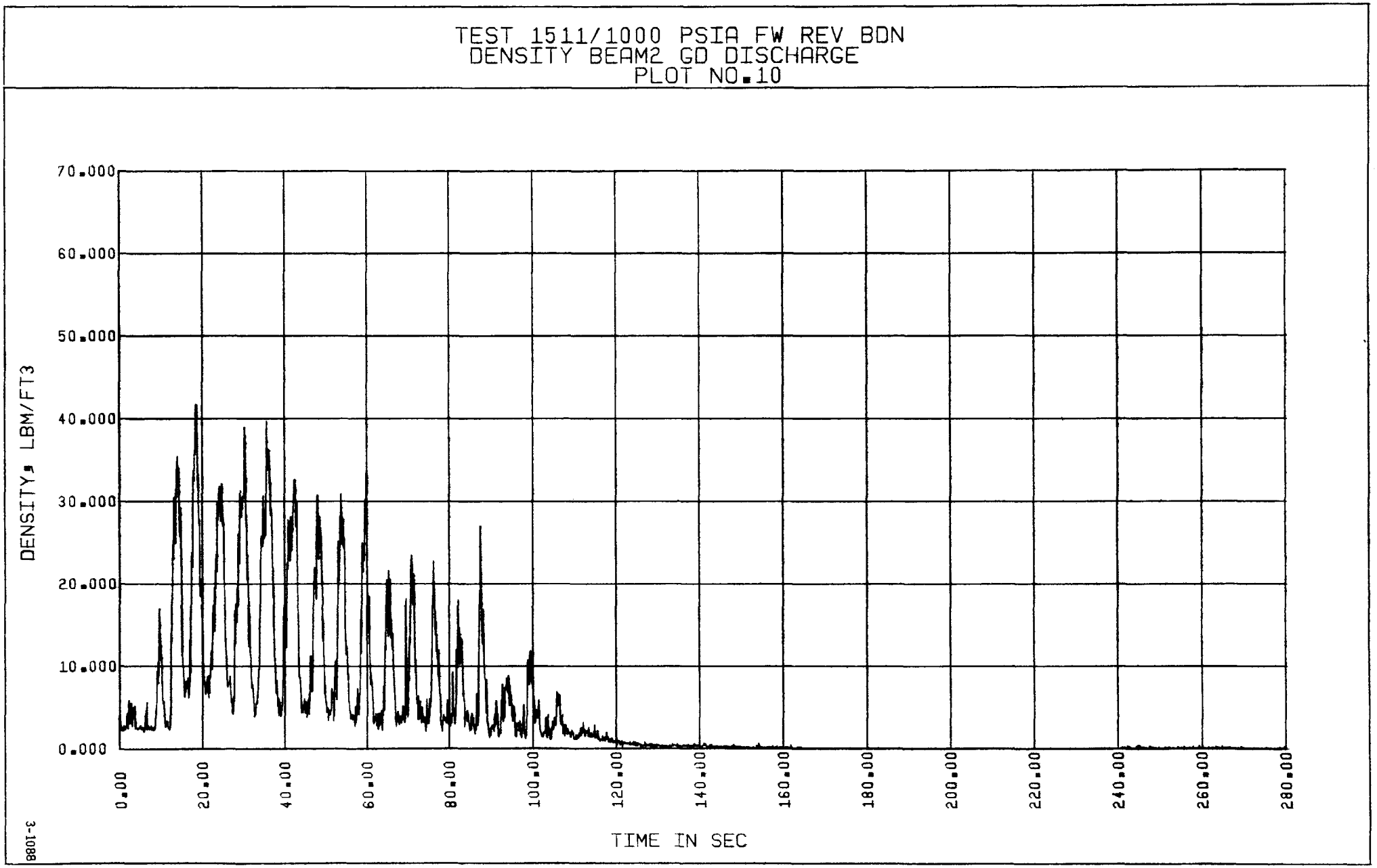


3-1086

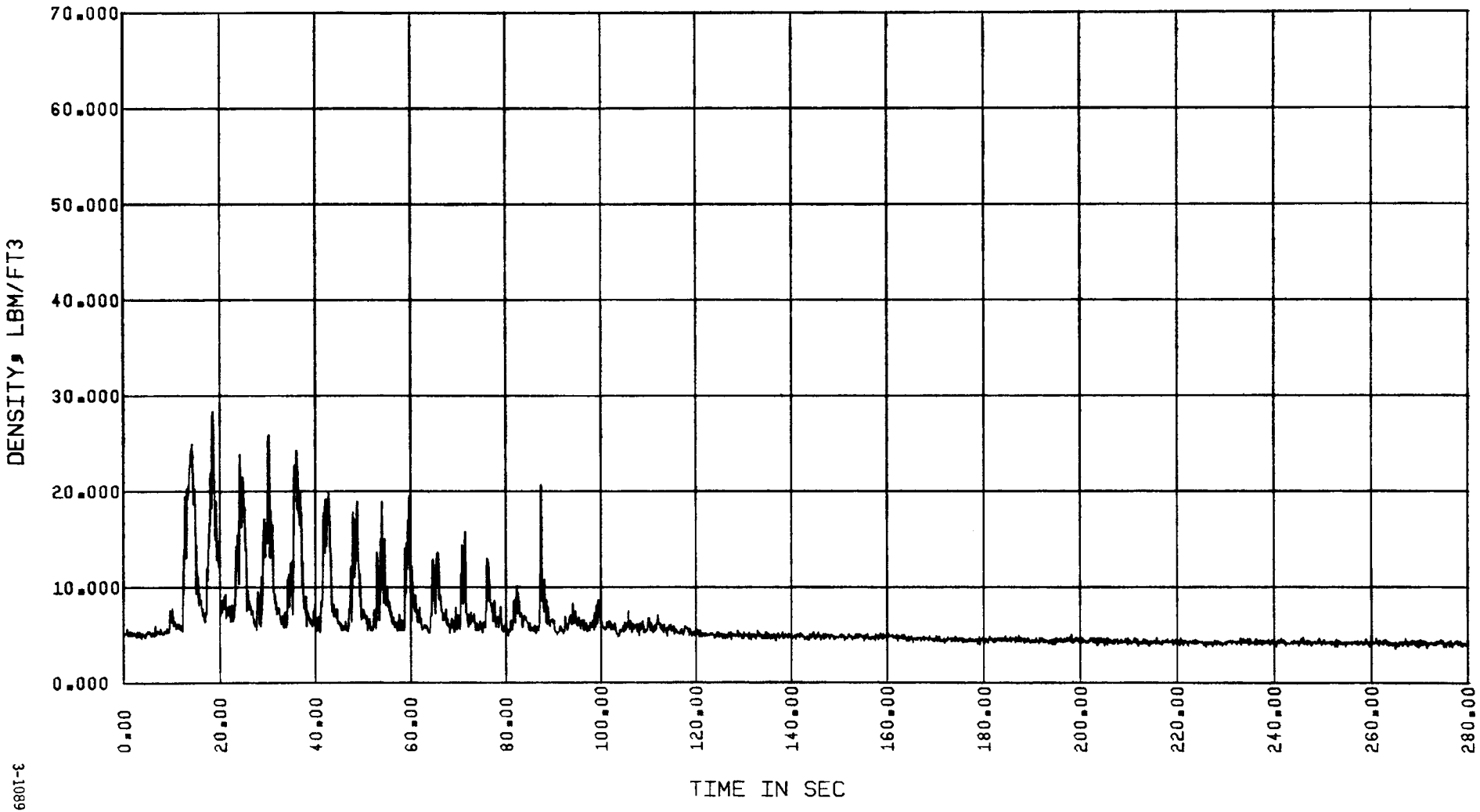
TEST 1511/1000 PSIA FW REV BDN
DENSITY BEAM1 GD DISCHARGE
PLOT NO.9



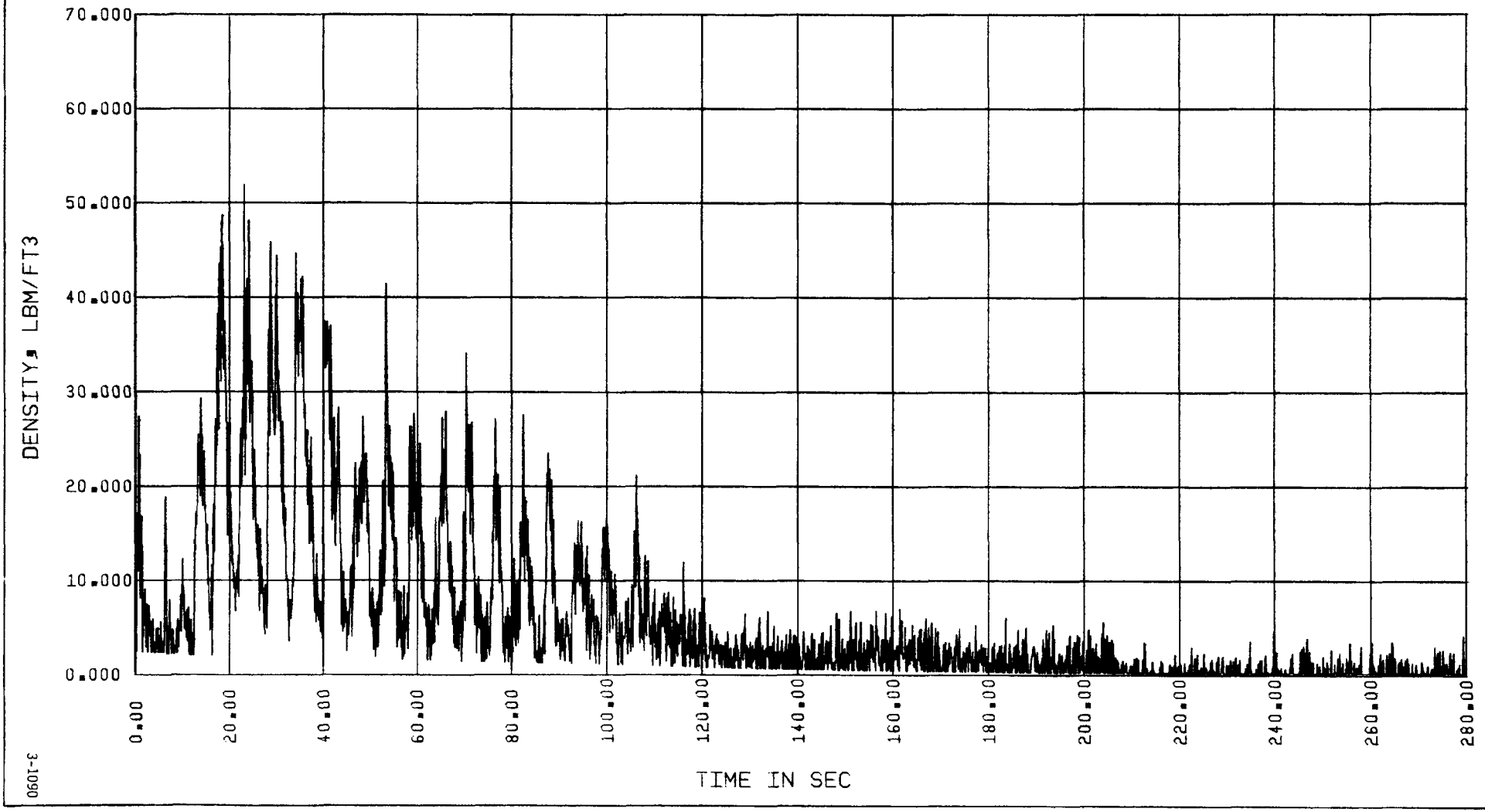
3-1087


TEST 1511/1000 PSIA FW REV BDN
DENSITY BEAM2 GD DISCHARGE
PLOT NO.10
DENSITY, LBM/FT3
70.000
60.000
50.000
40.000
30.000
20.000
10.000
0.000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-1088

TEST 1511/1000 PSIA FW REV BDN
DENSITY BEAM3 GD DISCHARGE
PLOT NO.11

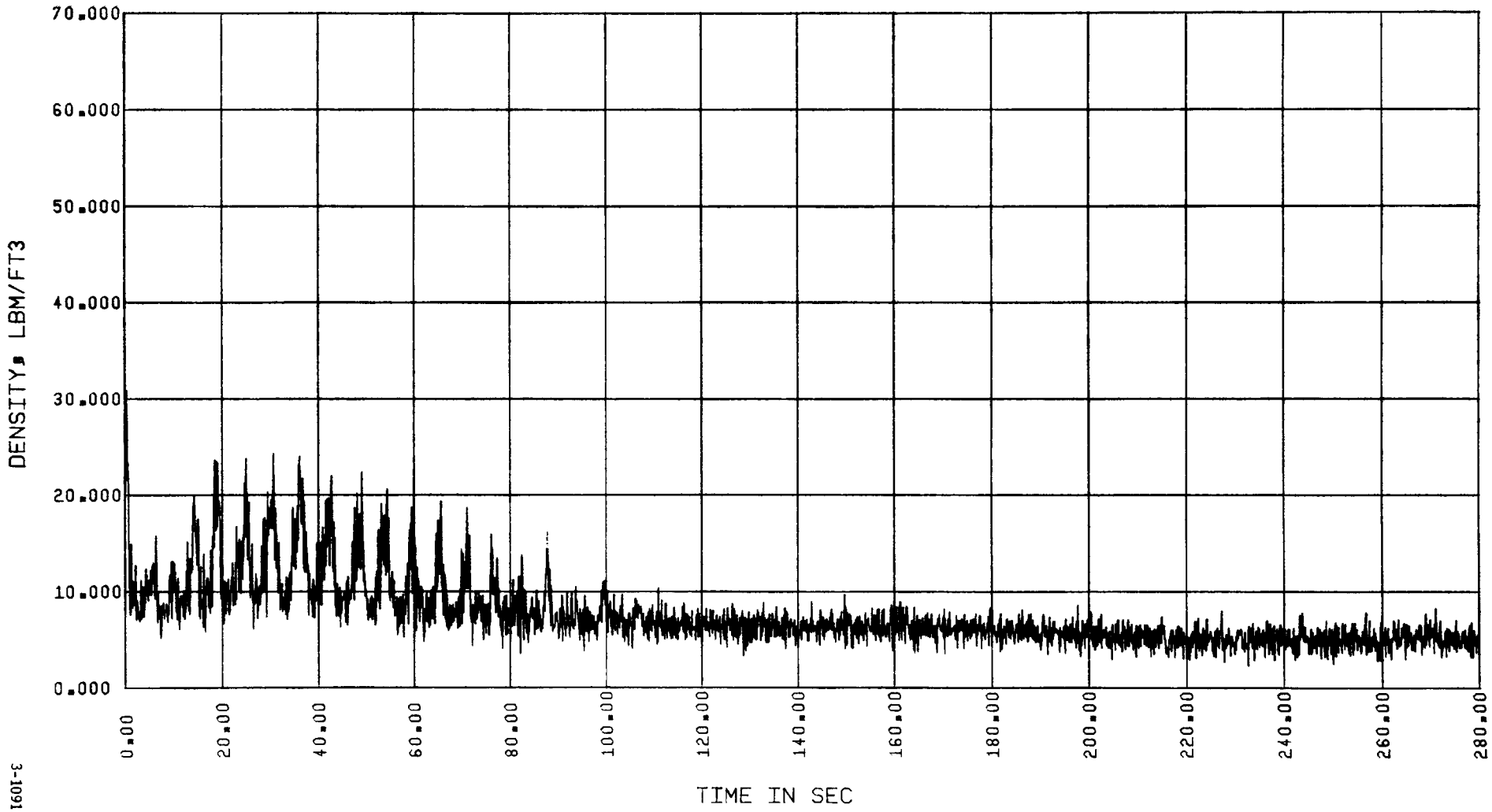


TEST 1511/1000 PSIA FW REV BDN
DENSITY BEAM1 AECL GD
PLOT NO.12



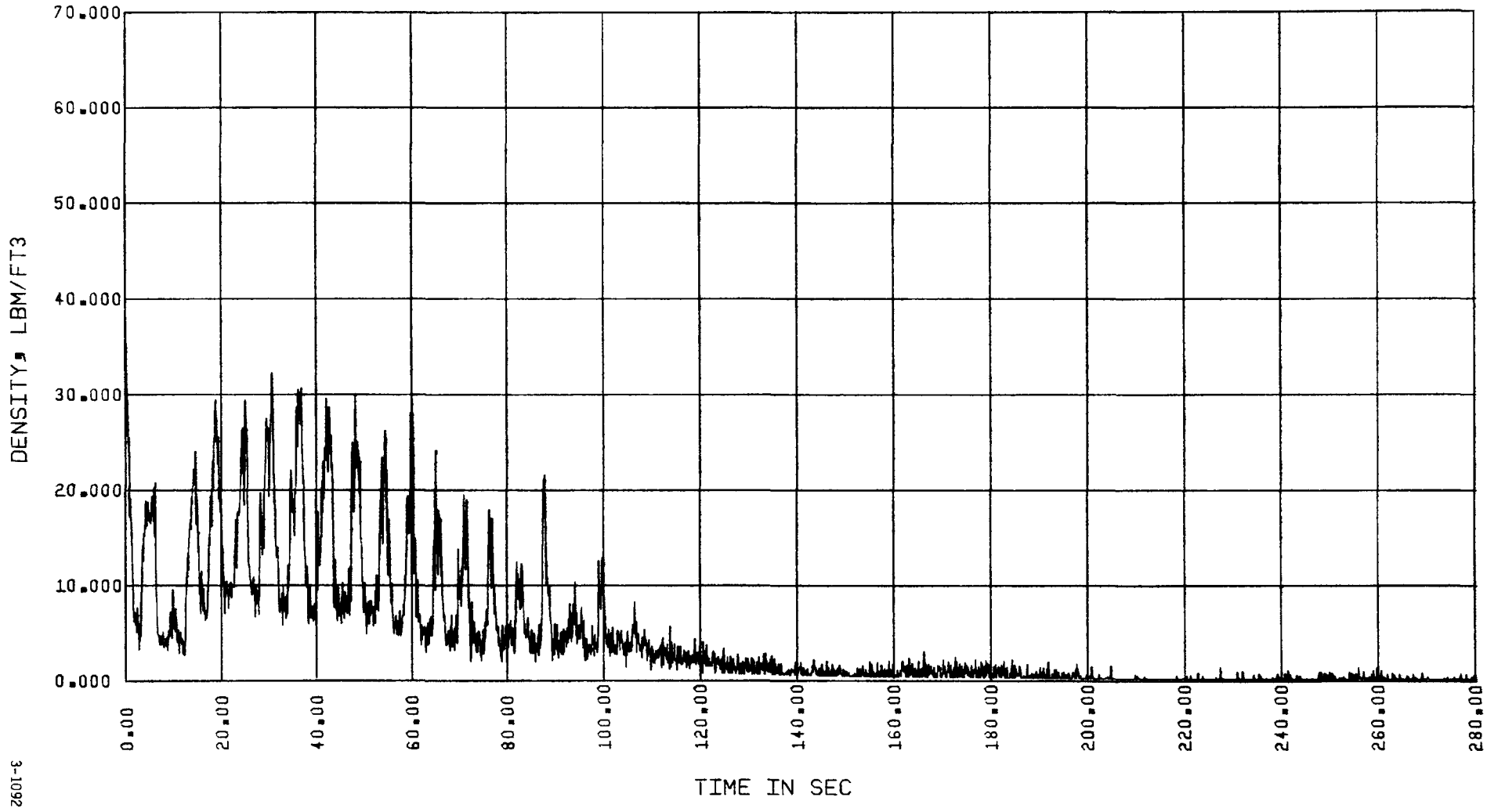
3-1090

TEST 1511/1000 PSIA FW REV BDN
DENSITY BEAM2 AECL GD
PLOT NO.13

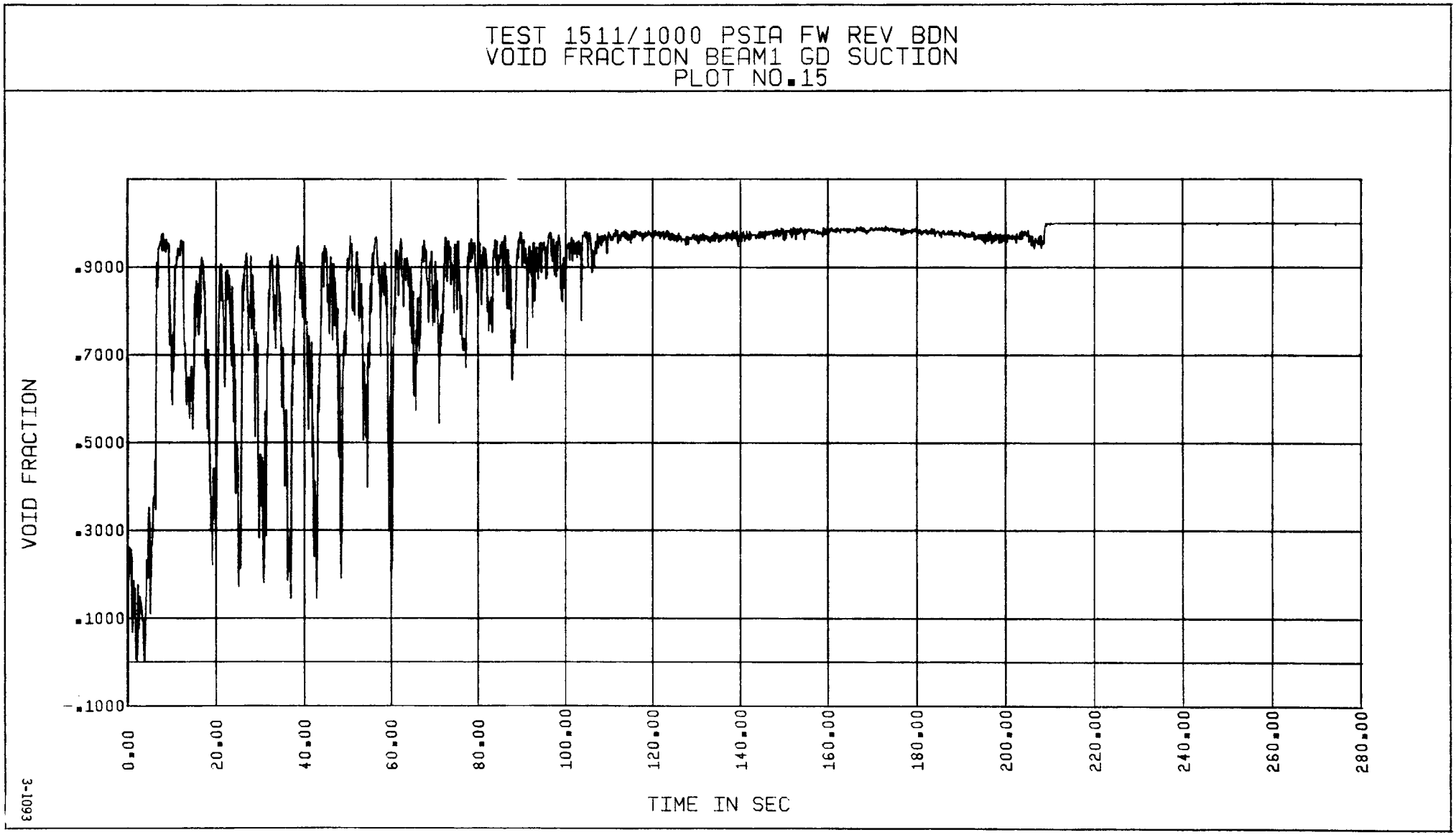


3-1091

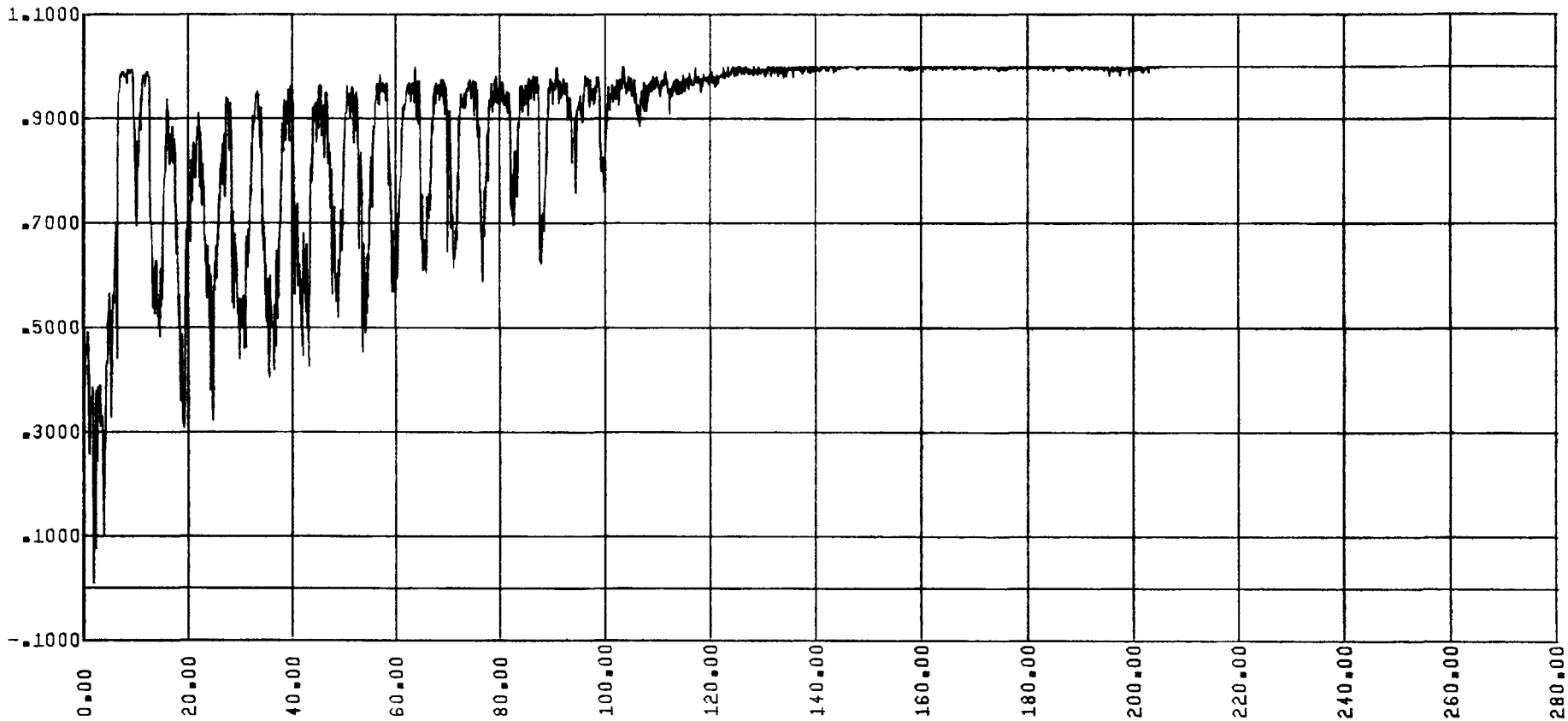
TEST 1511/1000 PSIA FW REV BDN
DENSITY BEAM3 AECL GD
PLOT NO.14



3-1092

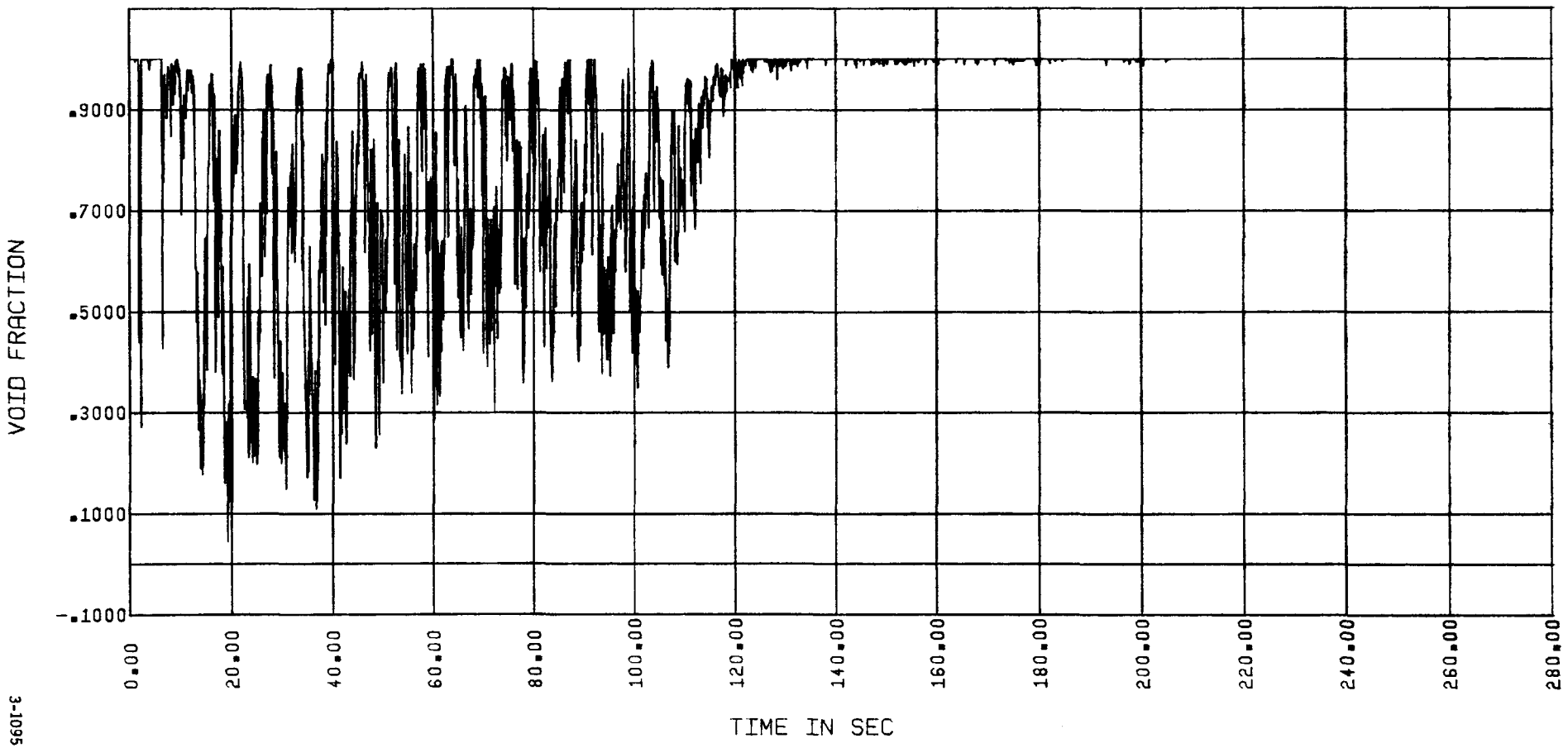

TEST 1511/1000 PSIA FW REV BDN
VOID FRACTION BEAM1 GD SUCTION
PLOT NO.15
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-1093

TEST 1511/1000 PSIA FW REV BDN
VOID FRACTION BEAM2 GD SUCTION
PLOT NO.16

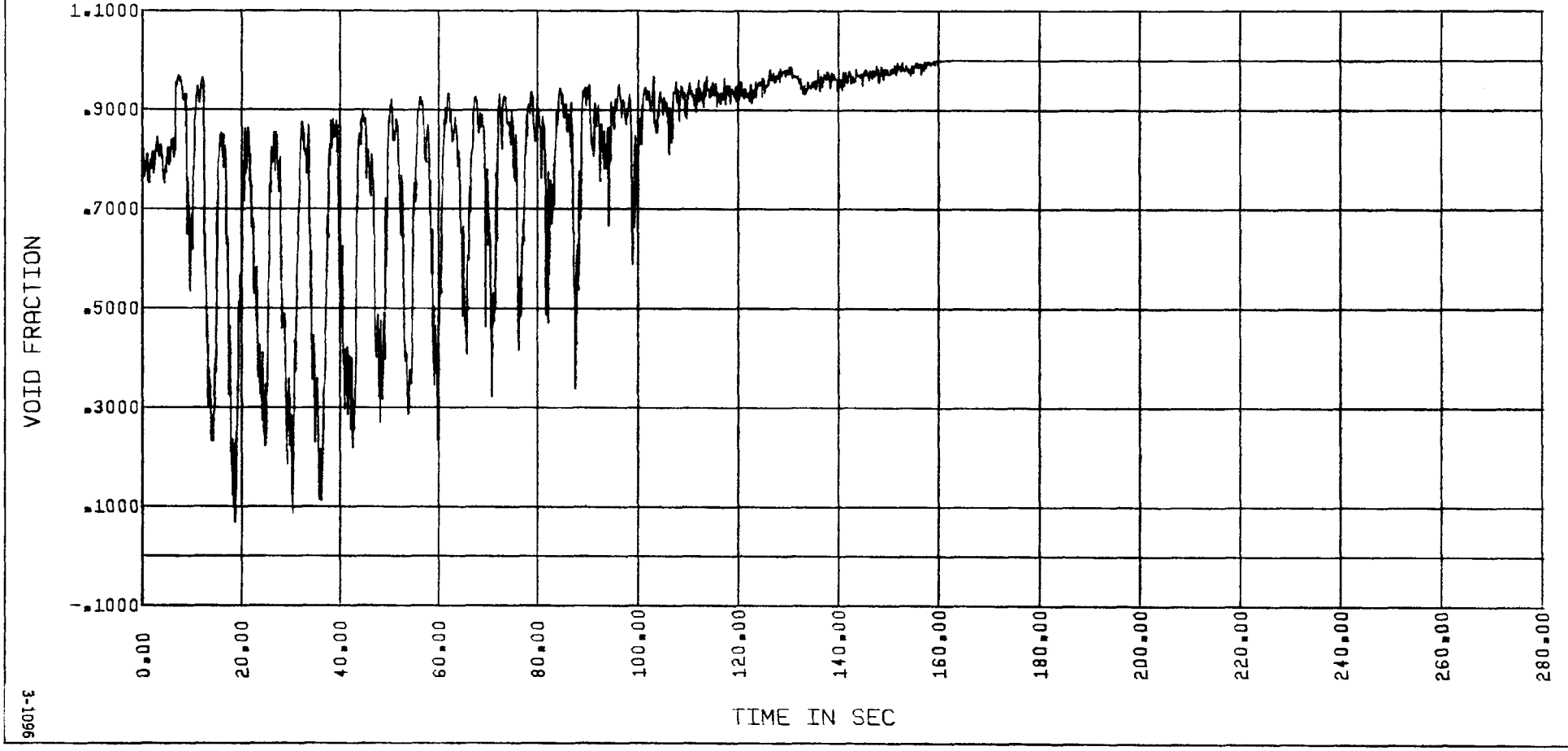


3-1094

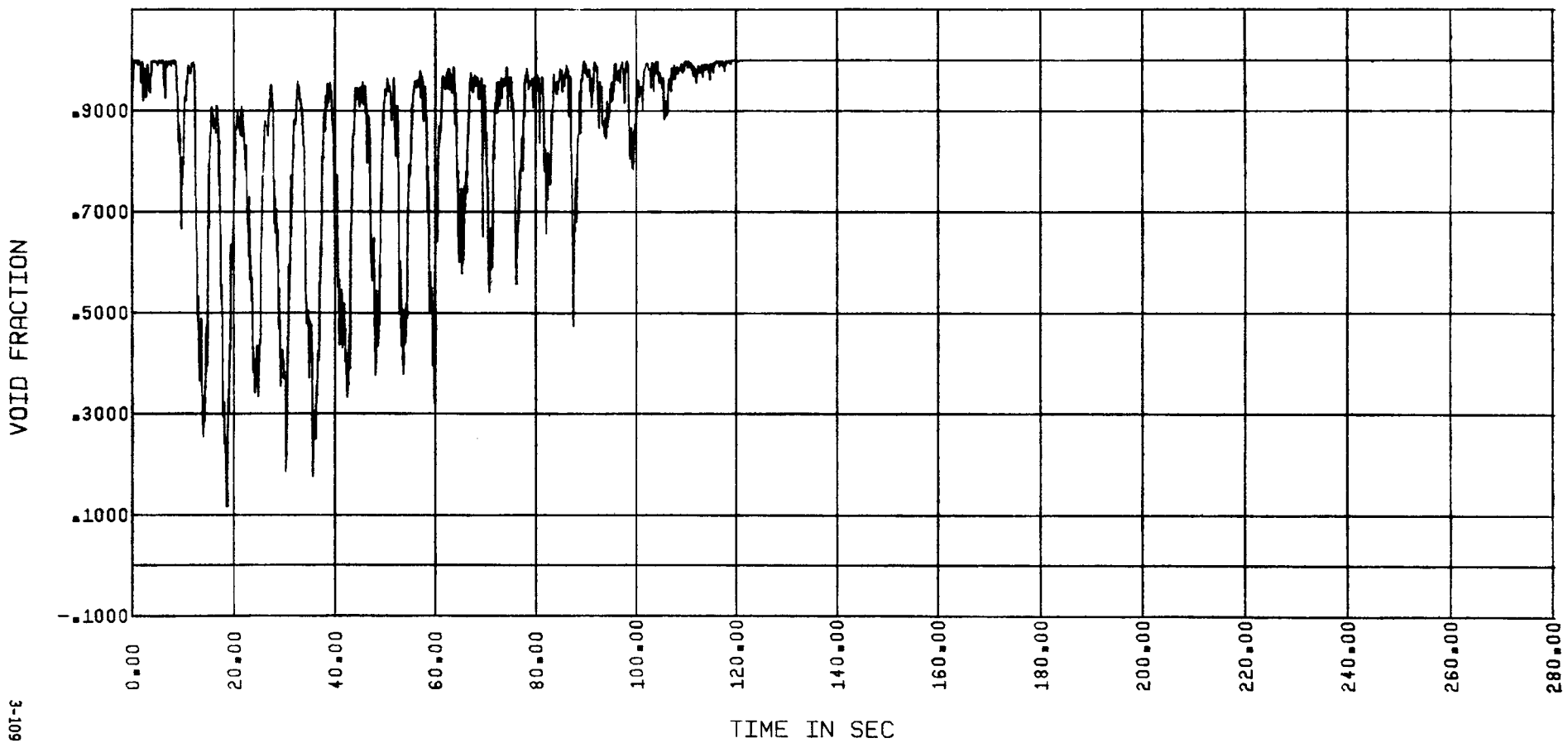
TEST 1511/1000 PSIA FW REV BDN
VOID FRACTION BEAM3 GD SUCTION
PLOT NO.17



TEST 1511/1000 PSIA FW REV BDN
VOID FRACTION BEAM1 GD DISCHAR
PLOT NO. 18

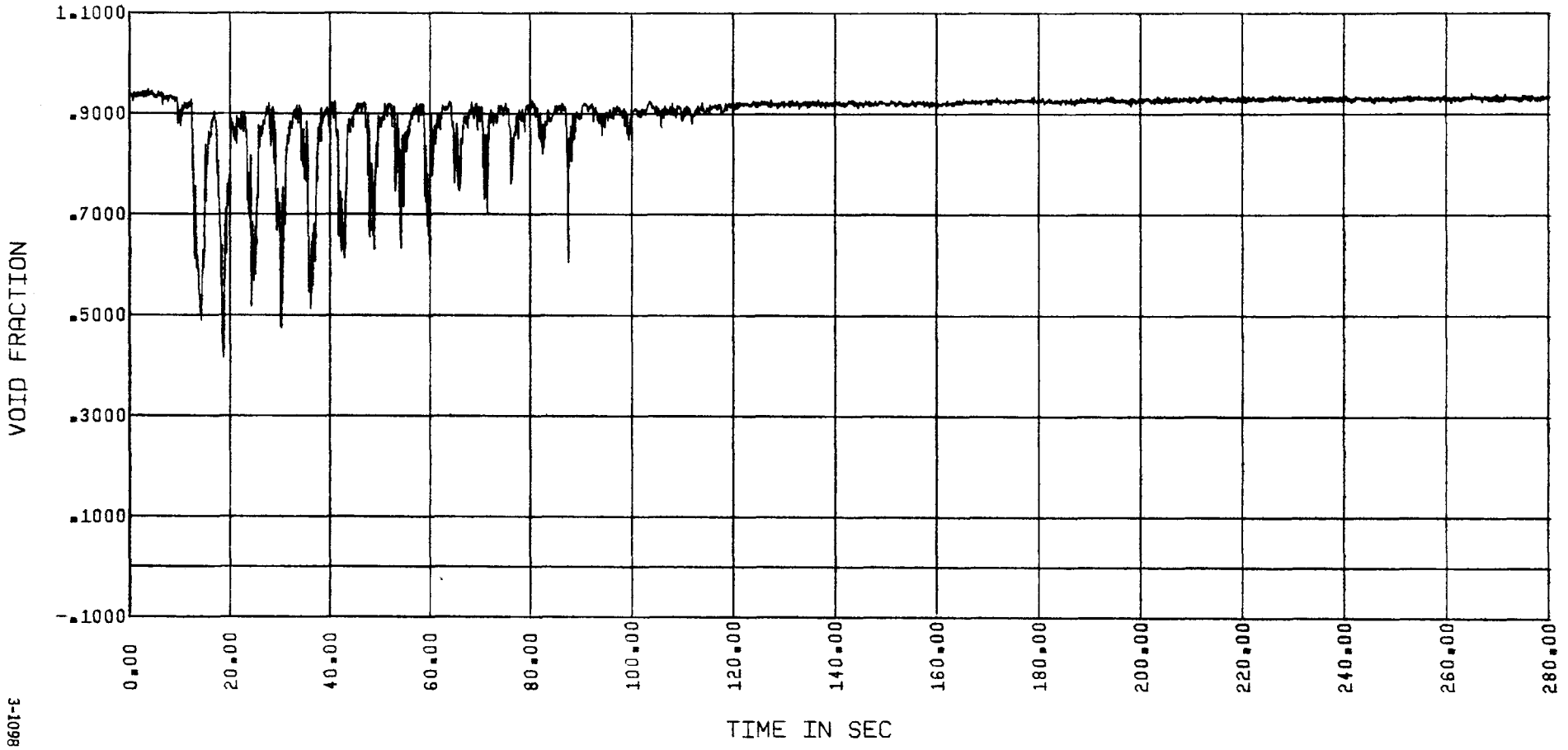


TEST 1511/1000 PSIA FW REV BDN
VOID FRACTION BEAM2 GD DISCHAR
PLOT NO.19



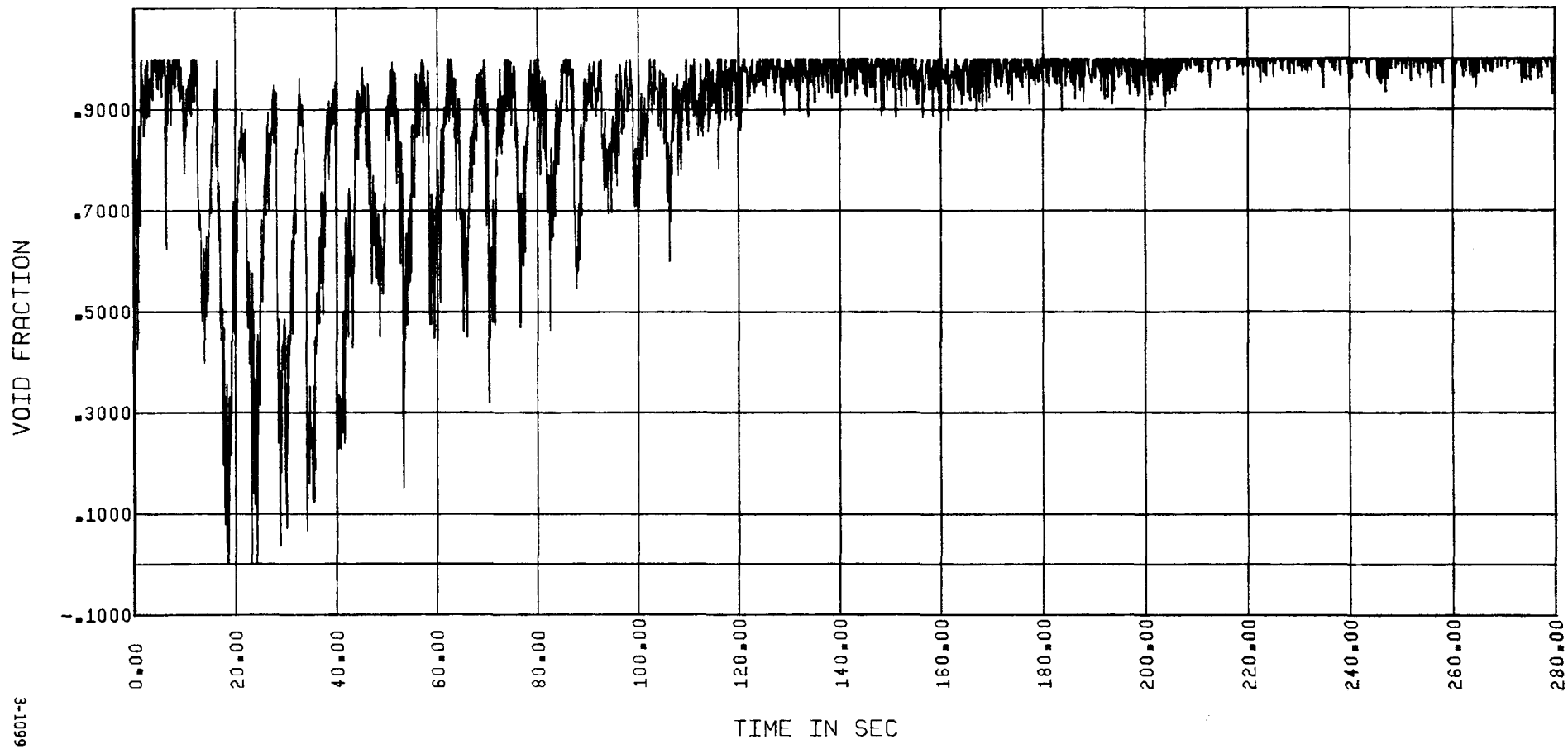
3-1097

TEST 1511/1000 PSIA FW REV BDN
VOID FRACTION BEAM3 GD DISCHAR
PLOT NO.20



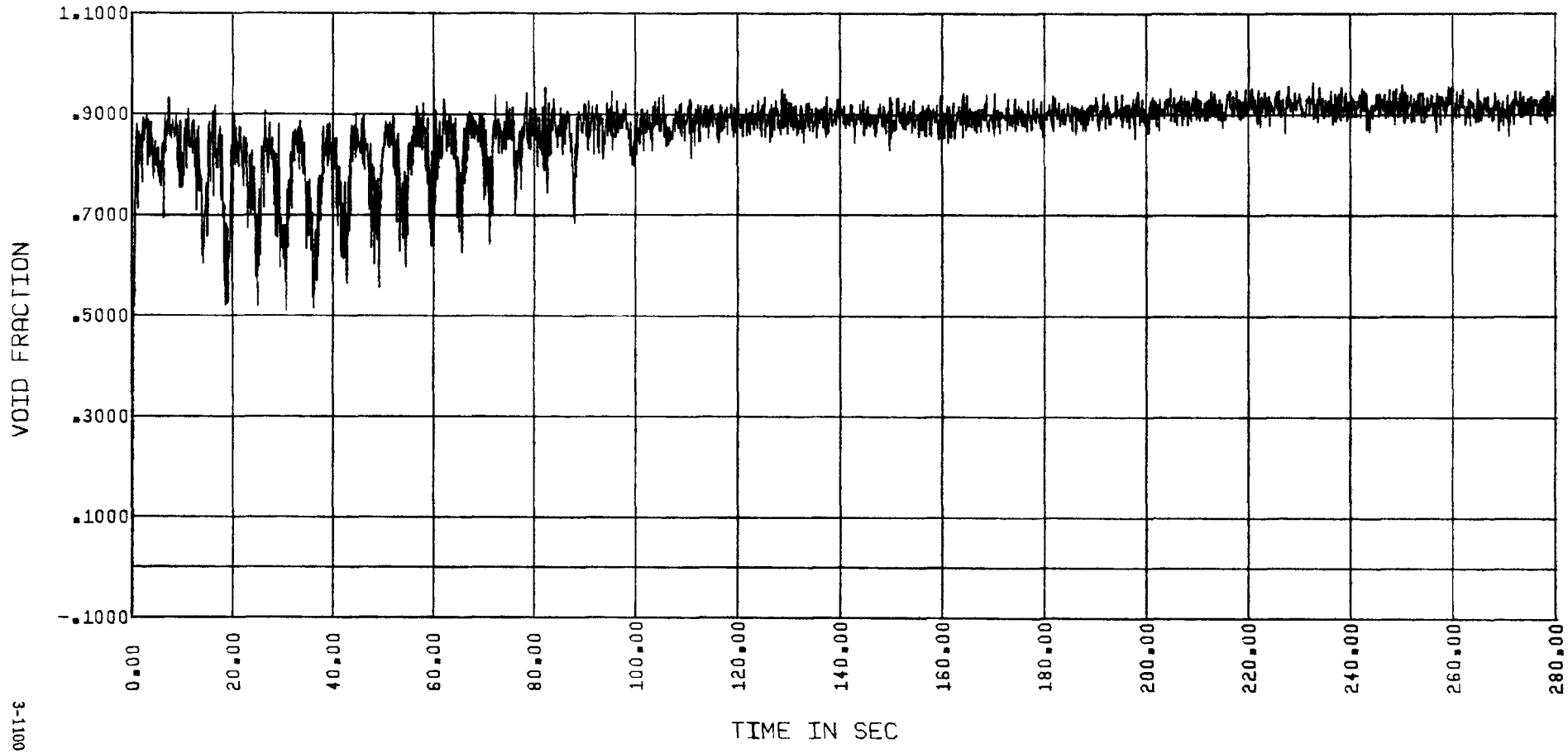
3-1098

TEST 1511/1000 PSIA FW REV BDN
VOID FRACTION BEAM1 AECL GD
PLOT NO.21

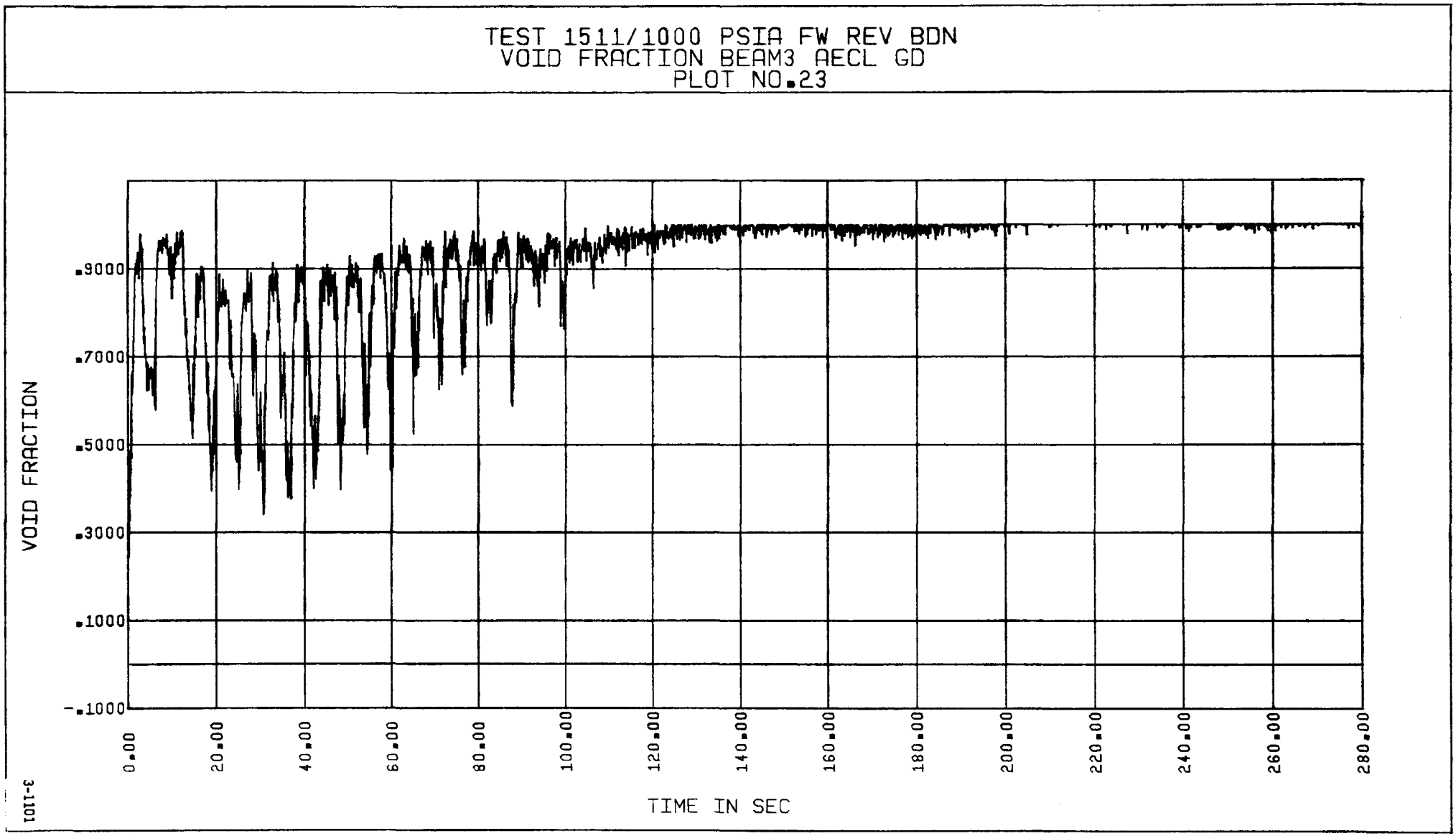


3-1099

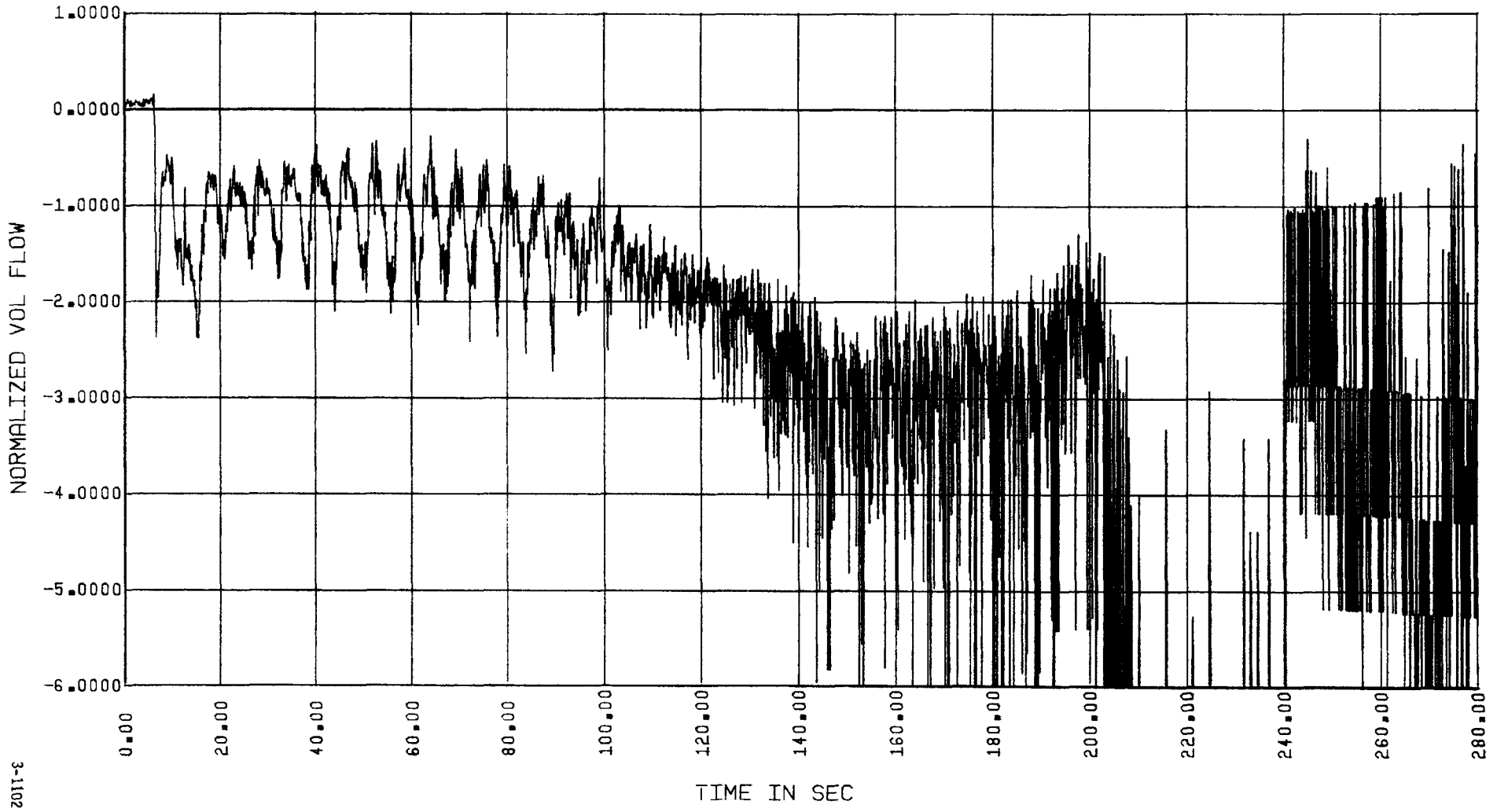
TEST 1511/1000 PSIA FW REV BDN
VOID FRACTION BEAM2 AECL GD
PLOT NO.22



3-1100

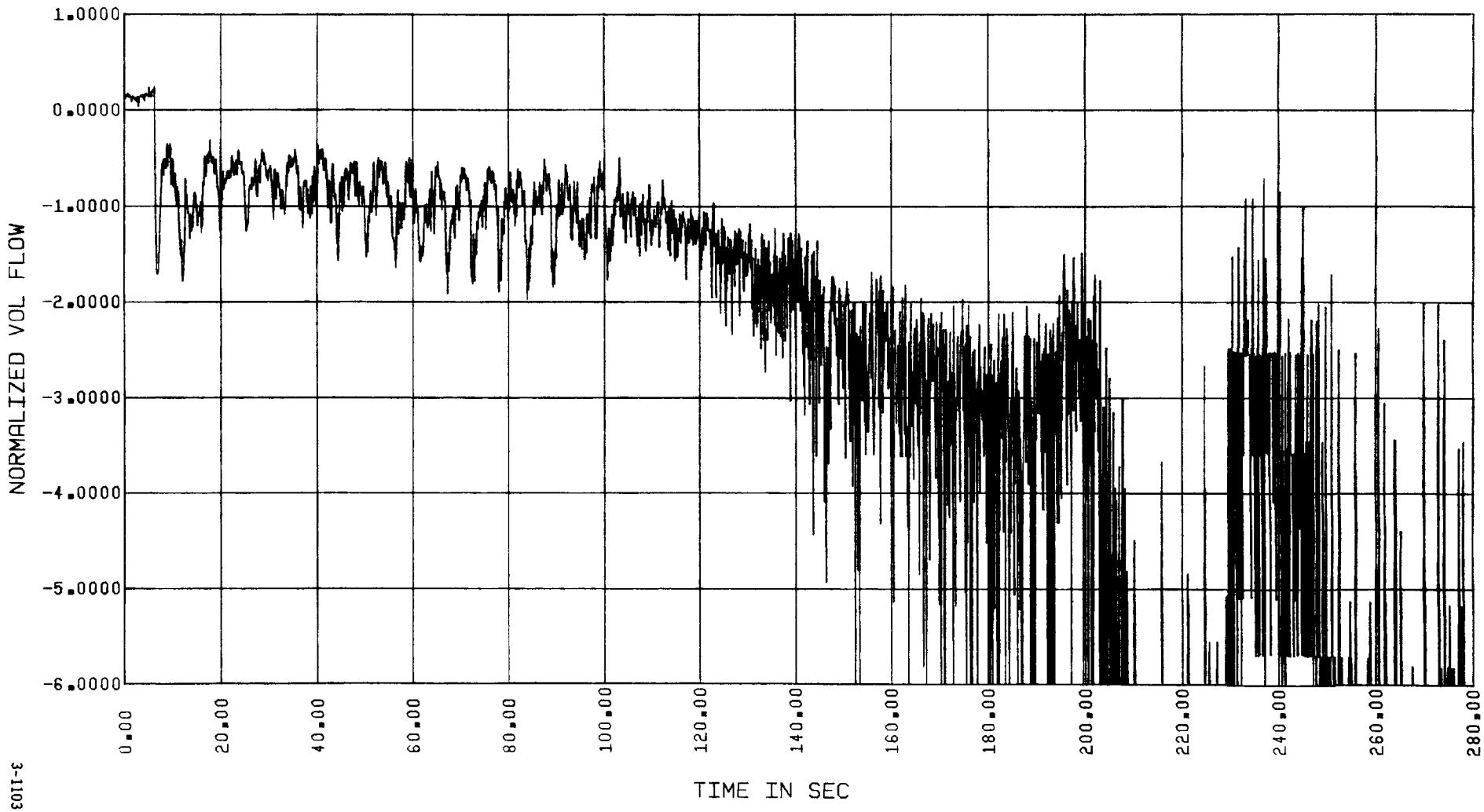

TEST 1511/1000 PSIA FW REV BDN
VOID FRACTION BEAM3 AECL GD
PLOT NO.23
VOID FRACTION
.9000
.7000
.5000
.3000
.1000
-.1000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-1101

TEST 1511/1000 PSIA FW REV BDN
NORM VOL FLOW RATE LO-DD/GD2 S
PLOT NO.24



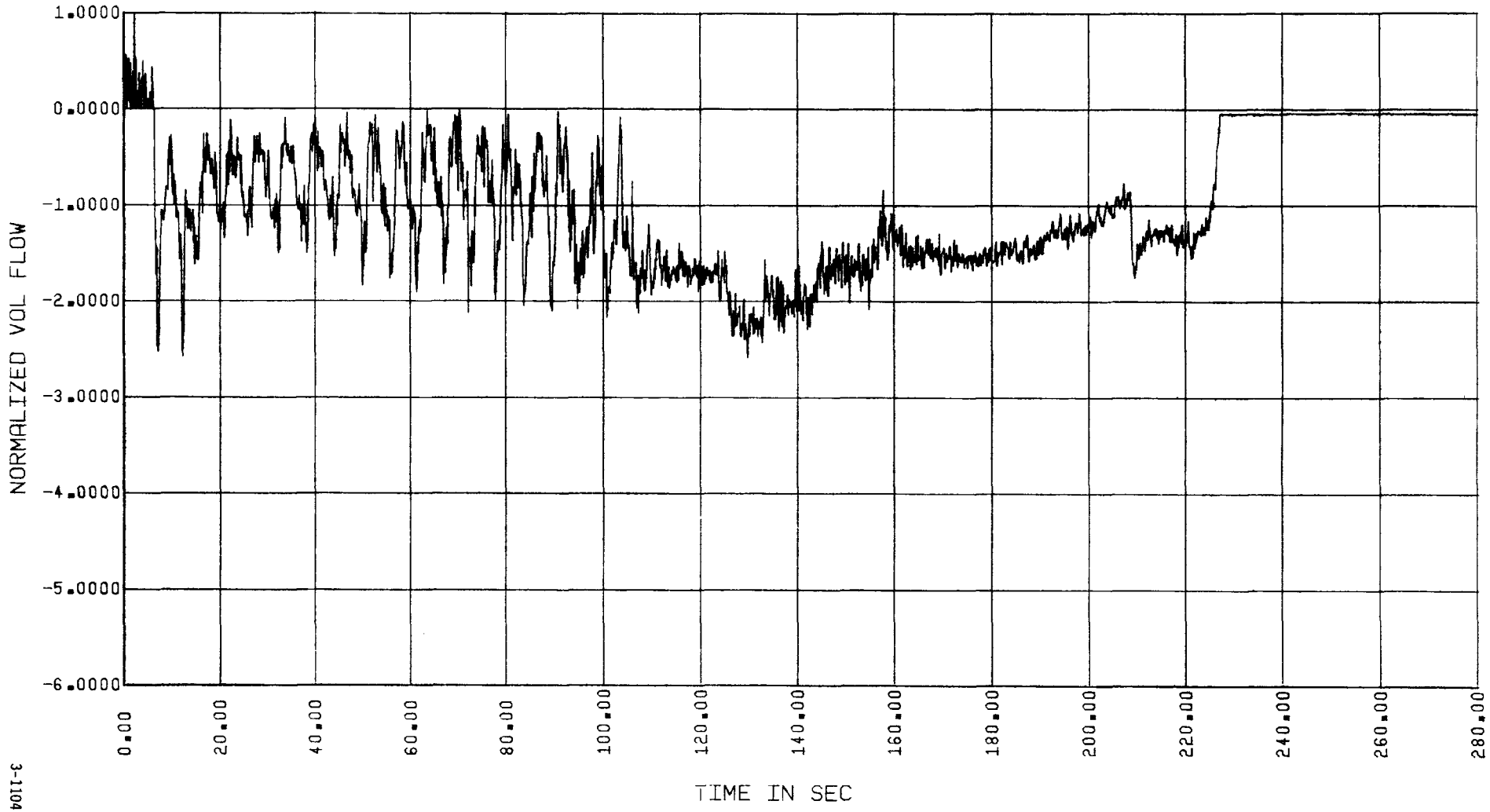
3-1102

TEST 1511/1000 PSIA FW REV BDN
NORM VOL FLOW RATE HI-DD/GD2 S
PLOT NO.25



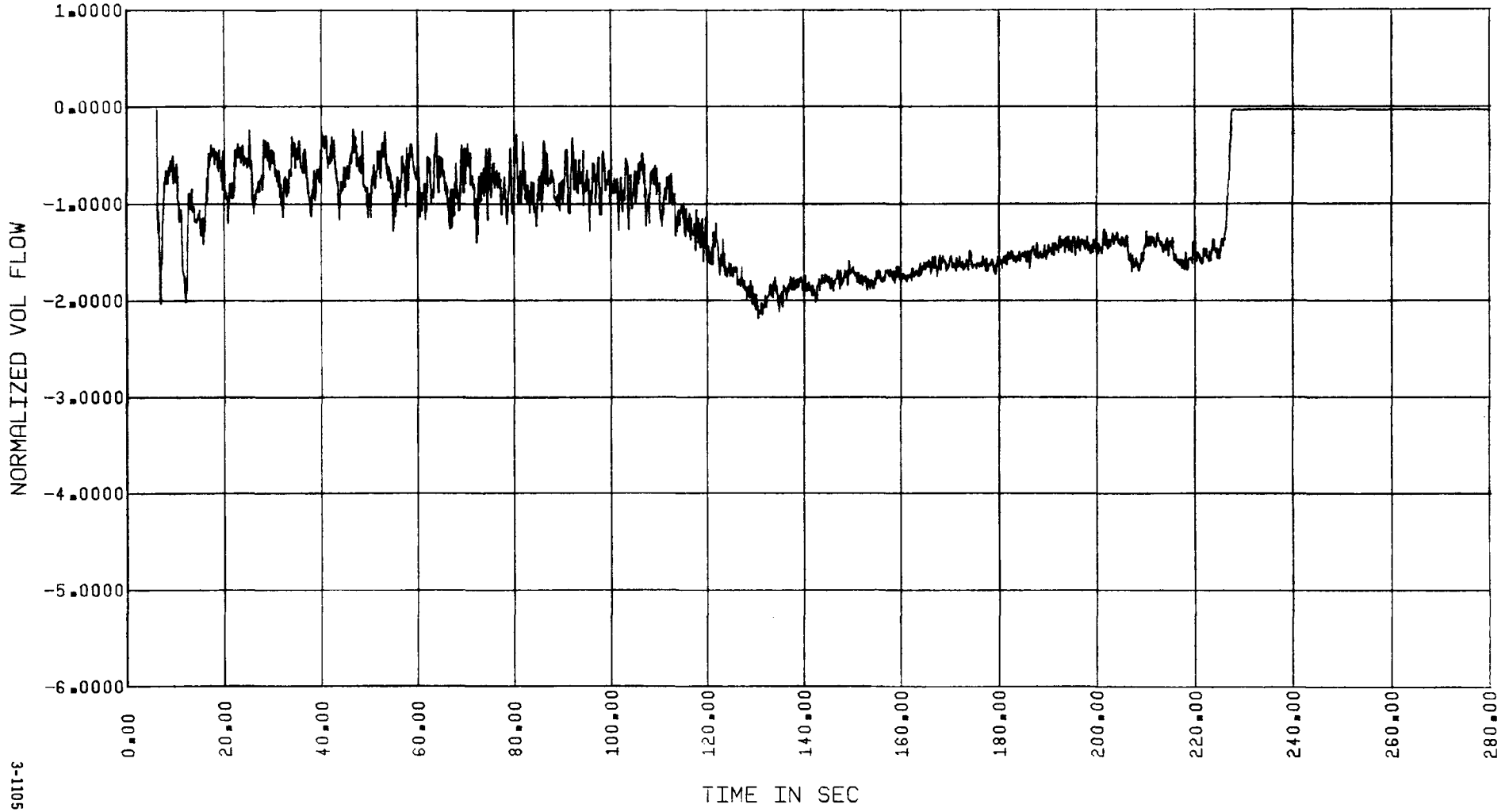
3-1103

TEST 1511/1000 PSIA FW REV BDN
NORM VOL FLOW RATE LO-TM SUCT
PLOT NO.26

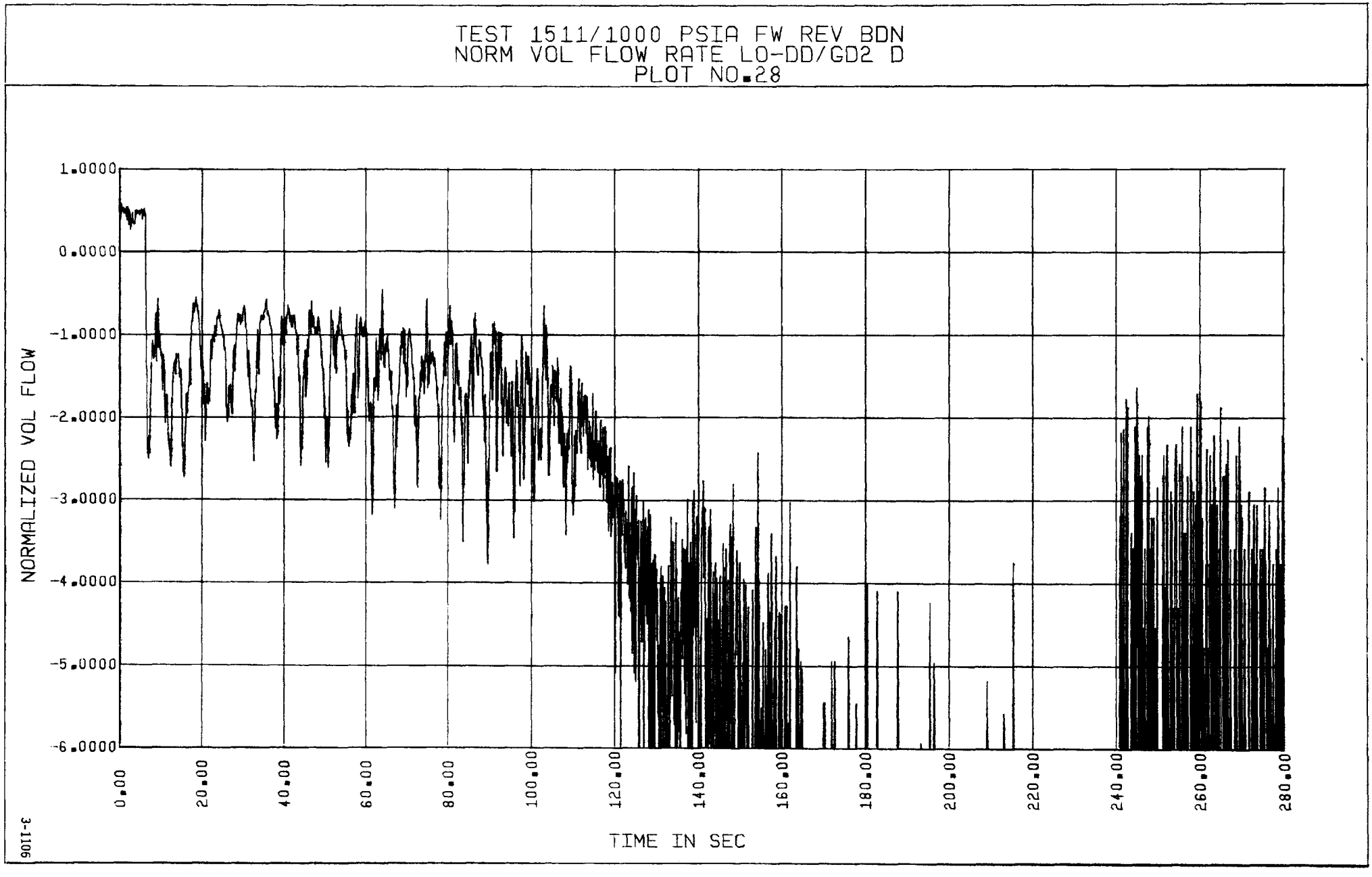


3-1104

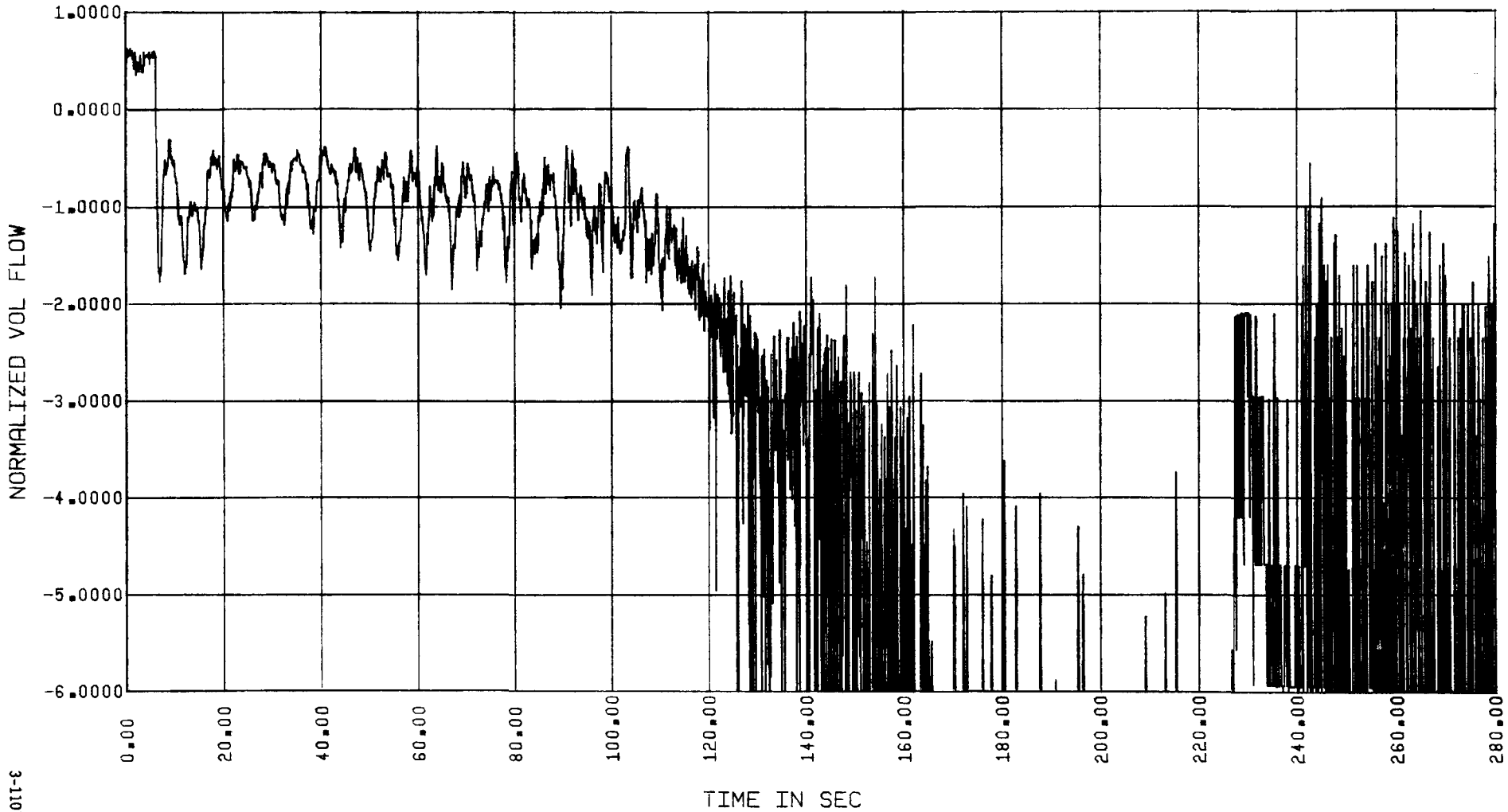
TEST 1511/1000 PSIA FW REV BDN
NORM VOL FLOW RATE HI-TM SUCT
PLOT NO.27



3-1105

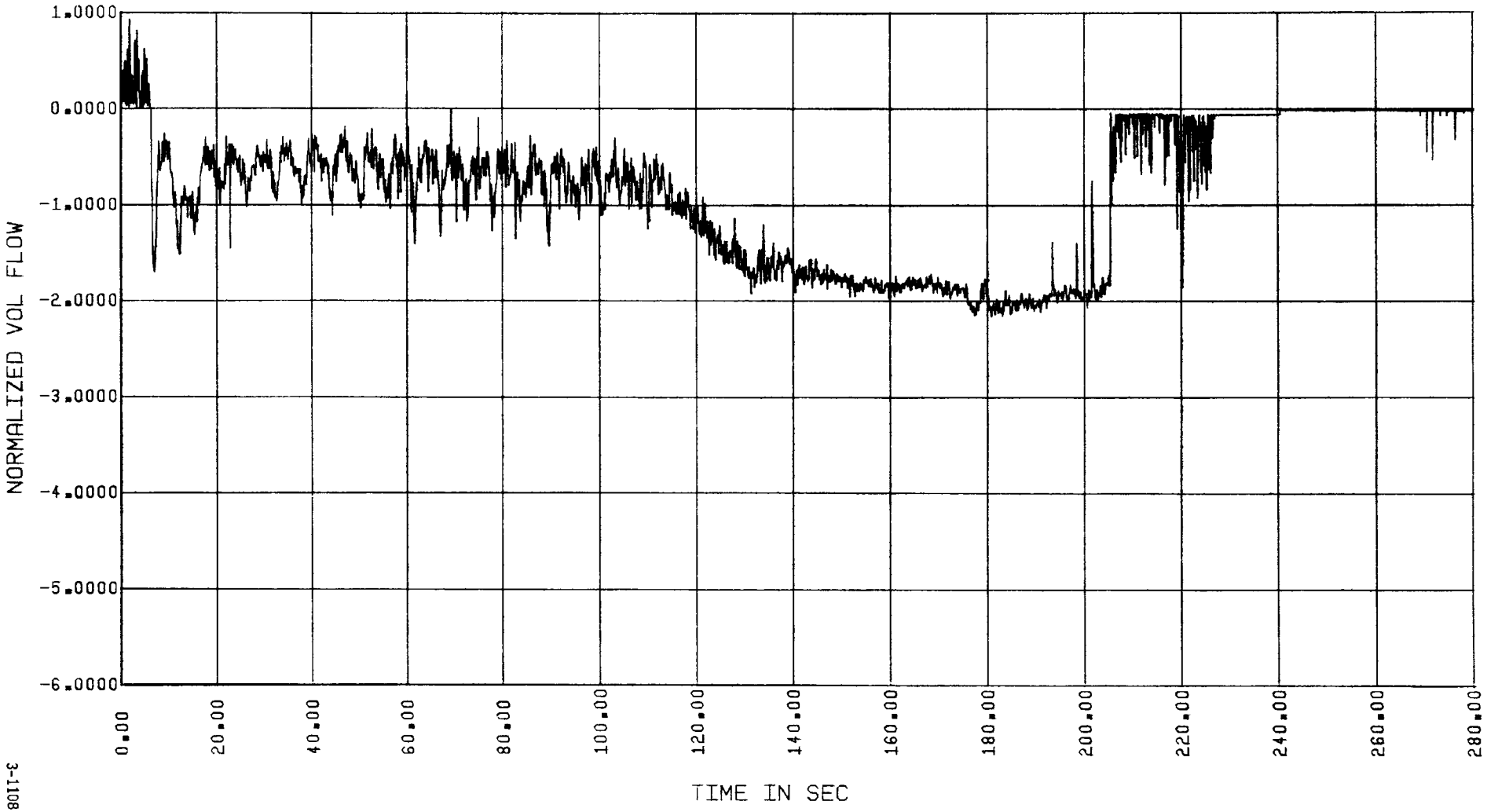

TEST 1511/1000 PSIA FW REV BDN
NORM VOL FLOW RATE LO-DD/GD2 D
PLOT NO.28
NORMALIZED VOL FLOW
1.0000
0.0000
-1.0000
-2.0000
-3.0000
-4.0000
-5.0000
-6.0000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-1106

TEST 1511/1000 PSIA FW REV BDN
NORM VOL FLOW RATE HI-DD/GD2 D
PLOT NO.29



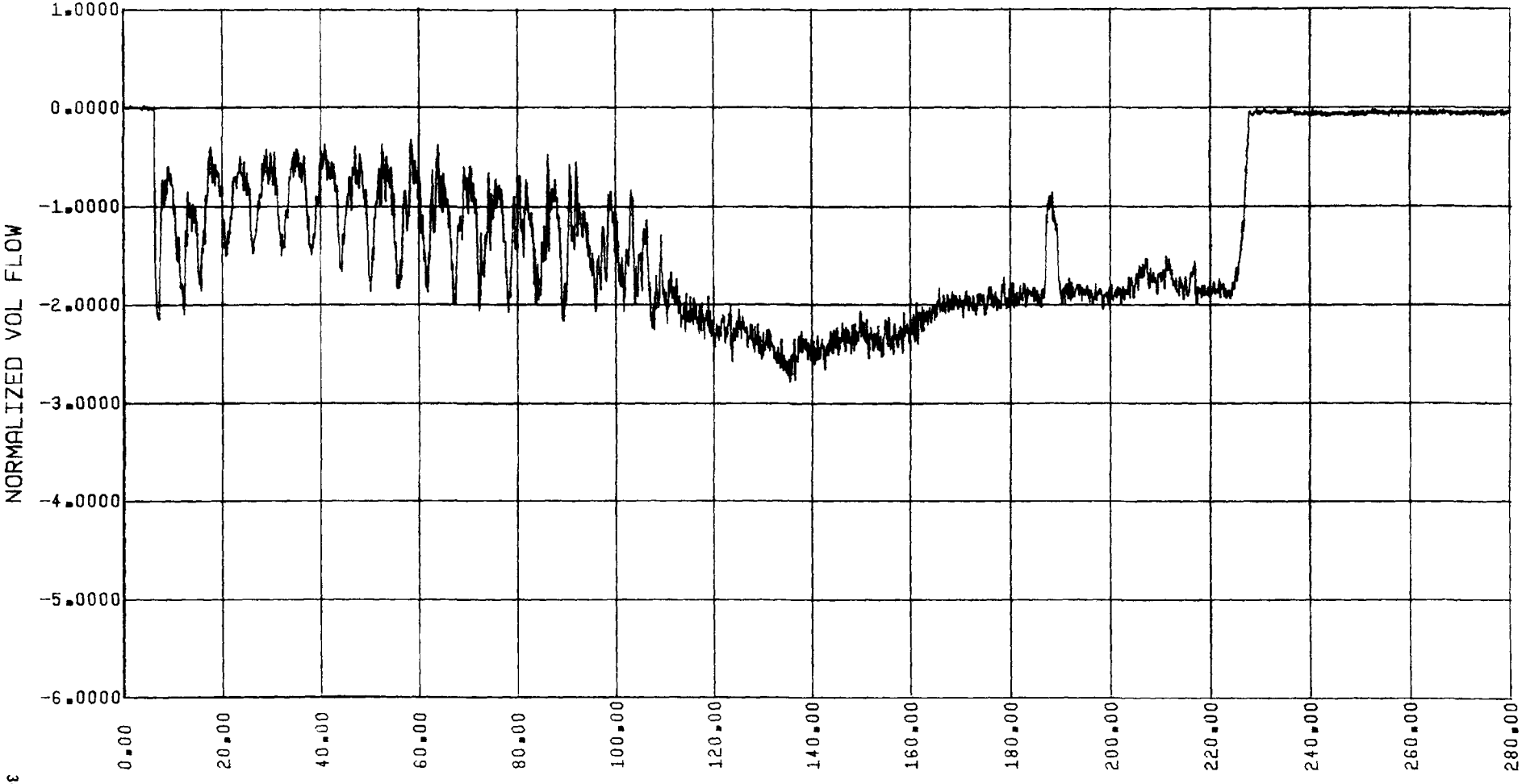
3-1107

TEST 1511/1000 PSIA FW REV BDN
NORM VOL FLOW RATE LO-TM DSCH
PLOT NO.30



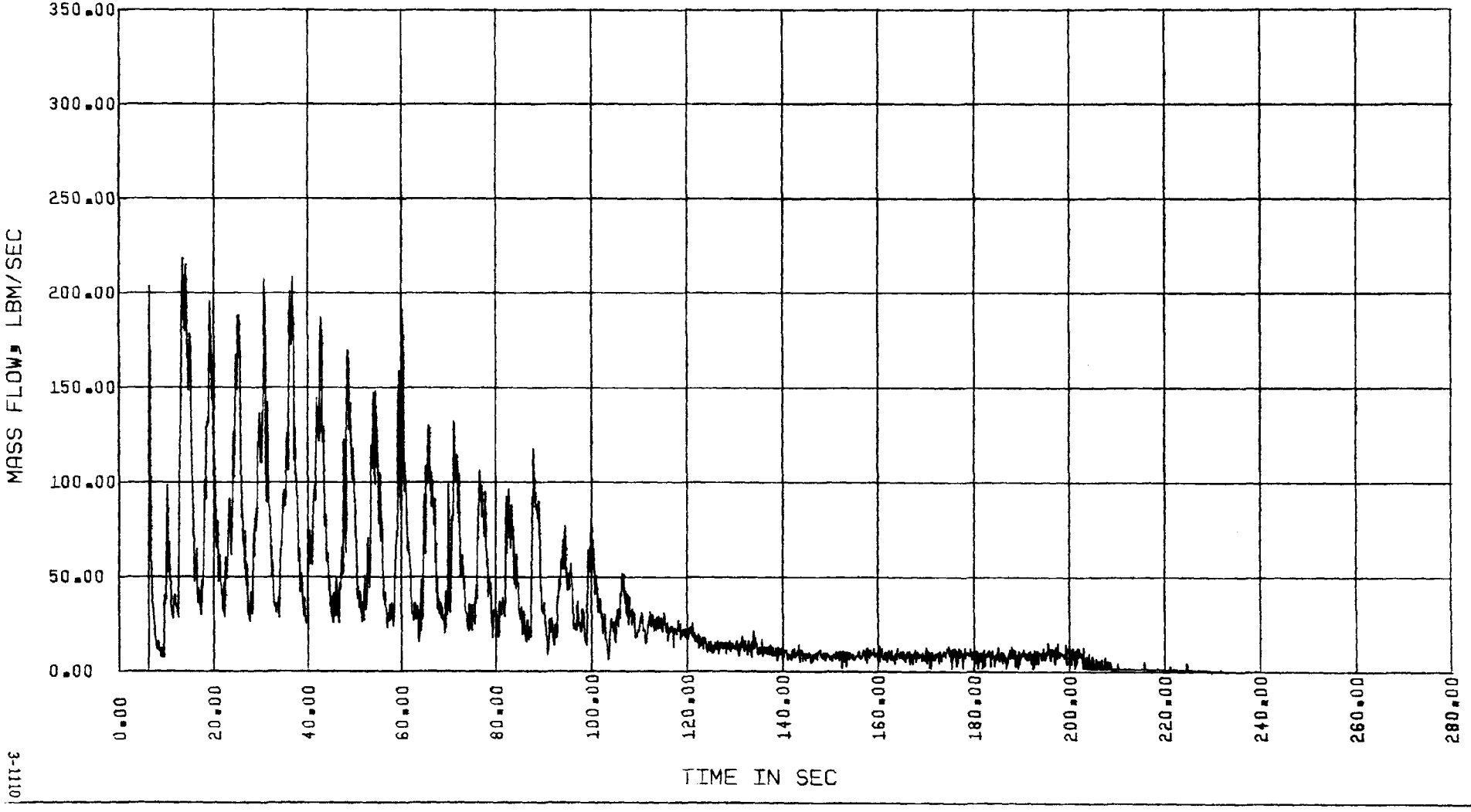
3-1108

TEST 1511/1000 PSIA FW REV BDN
NORM VOL FLOW RATE HI-TM DSCH
PLOT NO.31

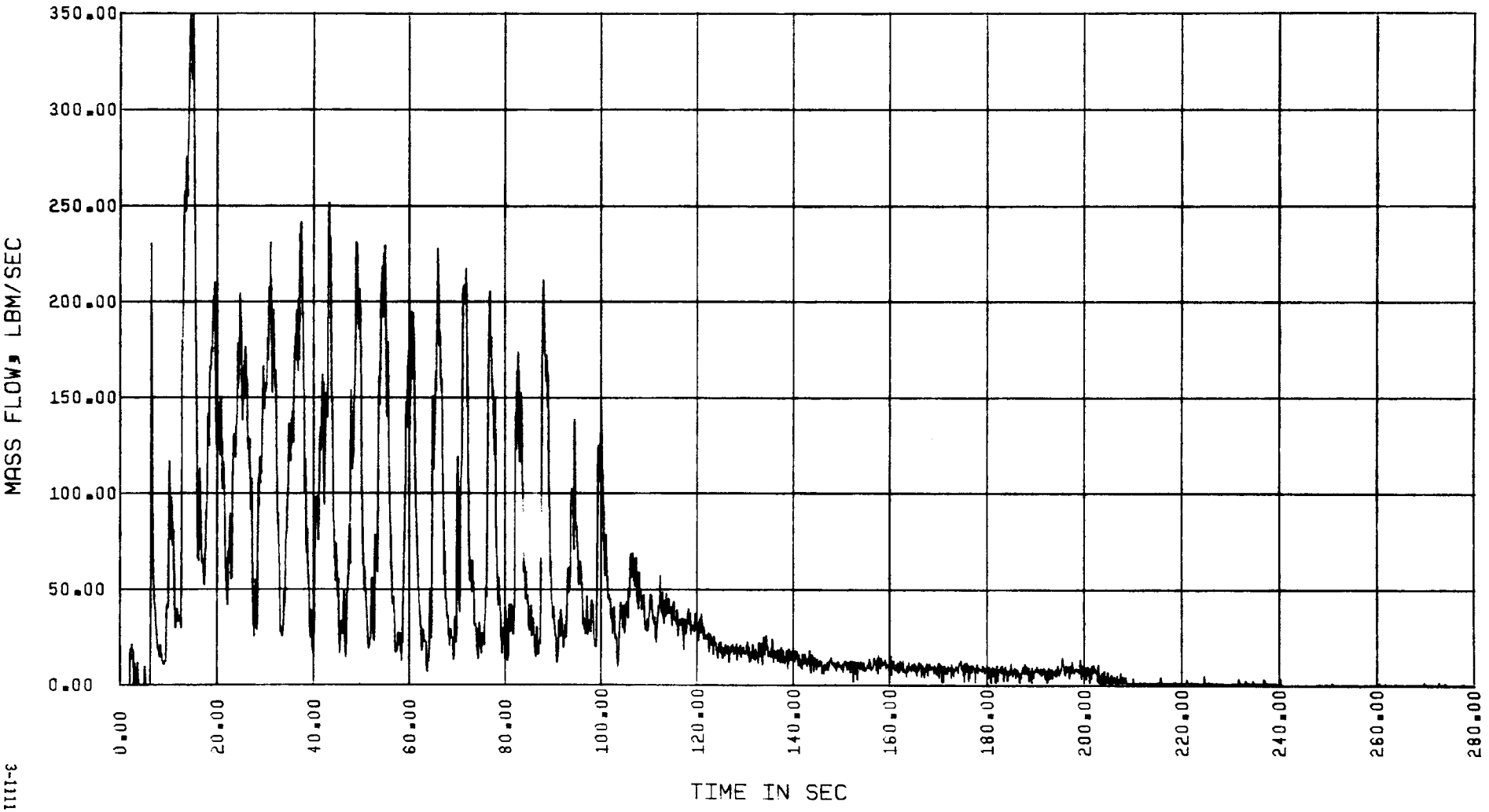


3-1109

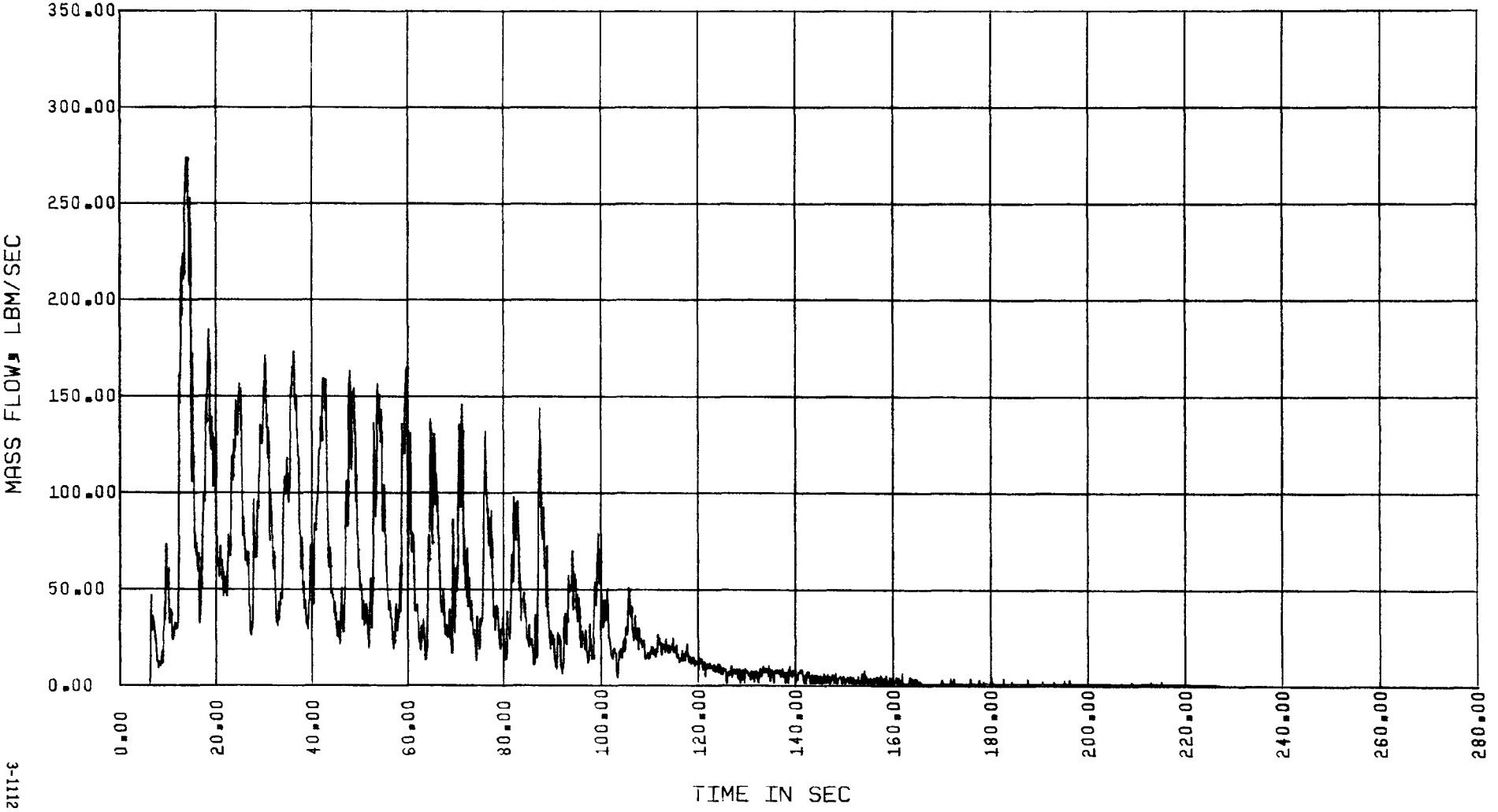
TEST 1511/1000 PSIA FW REV BDN
MASS FLOW RATE HI-DD/GD2 SUCT
PLOT NO.32



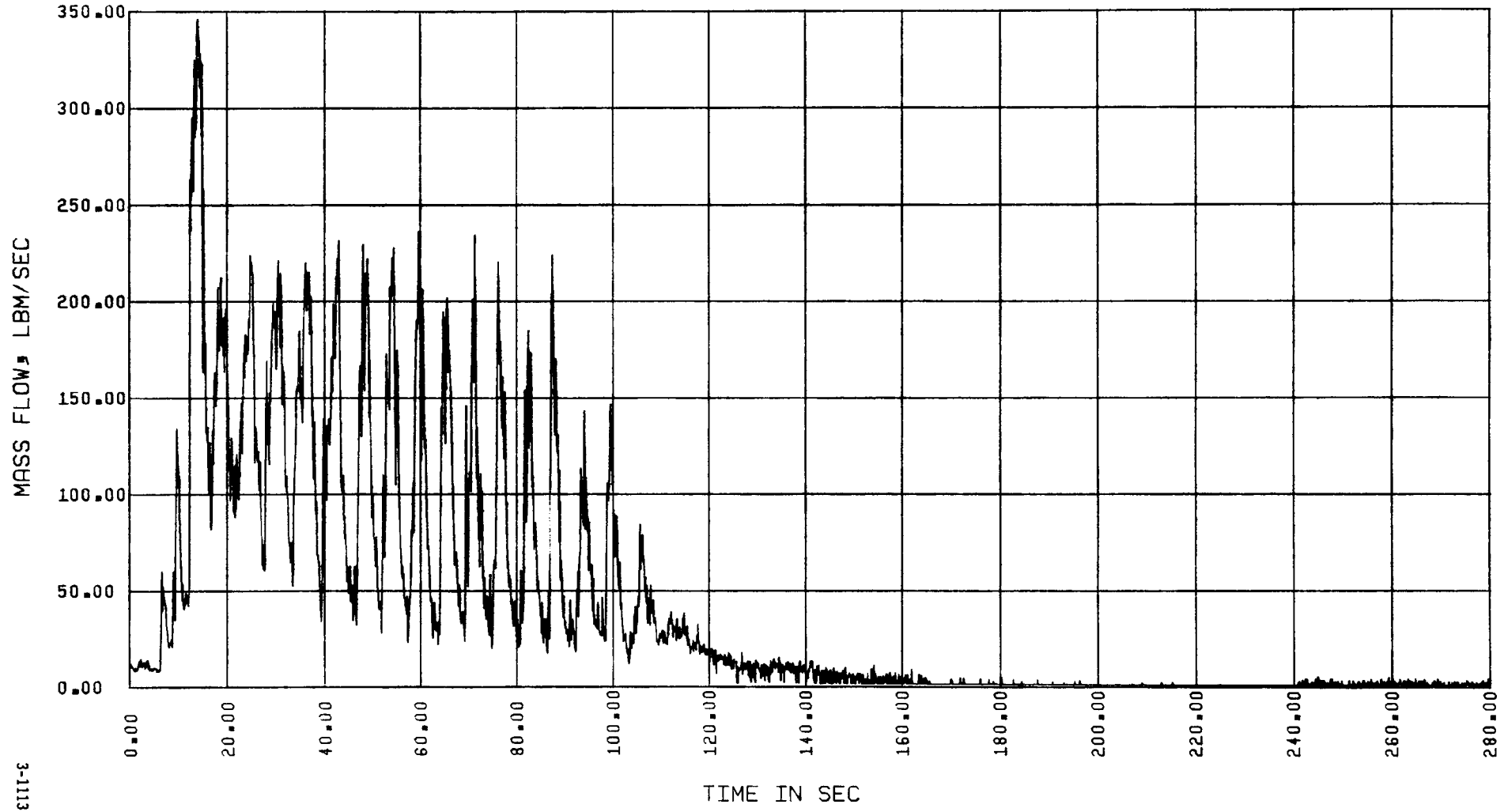
TEST 1511/1000 PSIA FW REV BDN
MASS FLOW RATE LO-DD/GD2 SUCT
PLOT NO.33



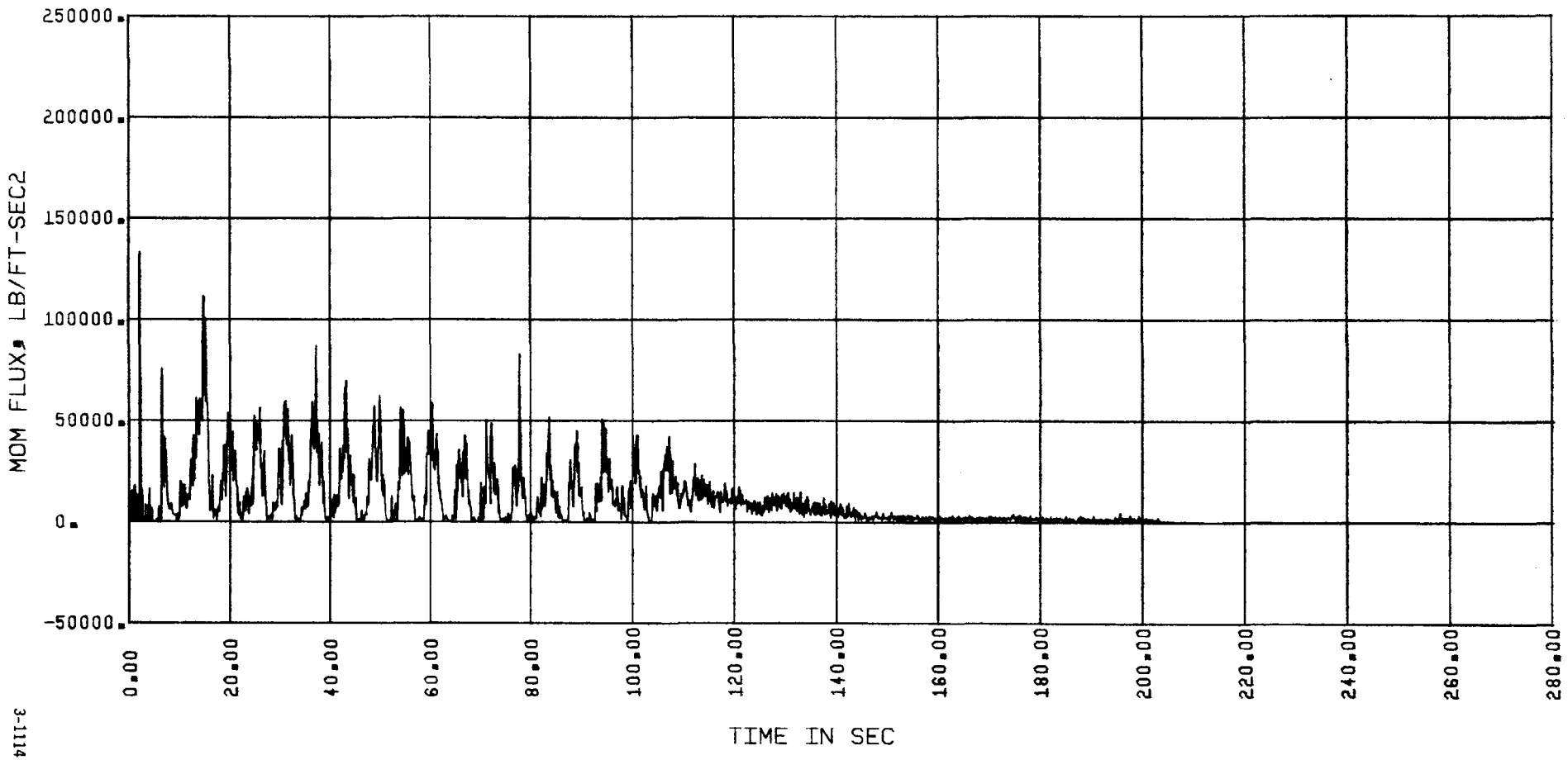
TEST 1511/1000 PSIA FW REV BDN
MASS FLOW RATE HI-DD/GD2 DISCH
PLOT NO.34



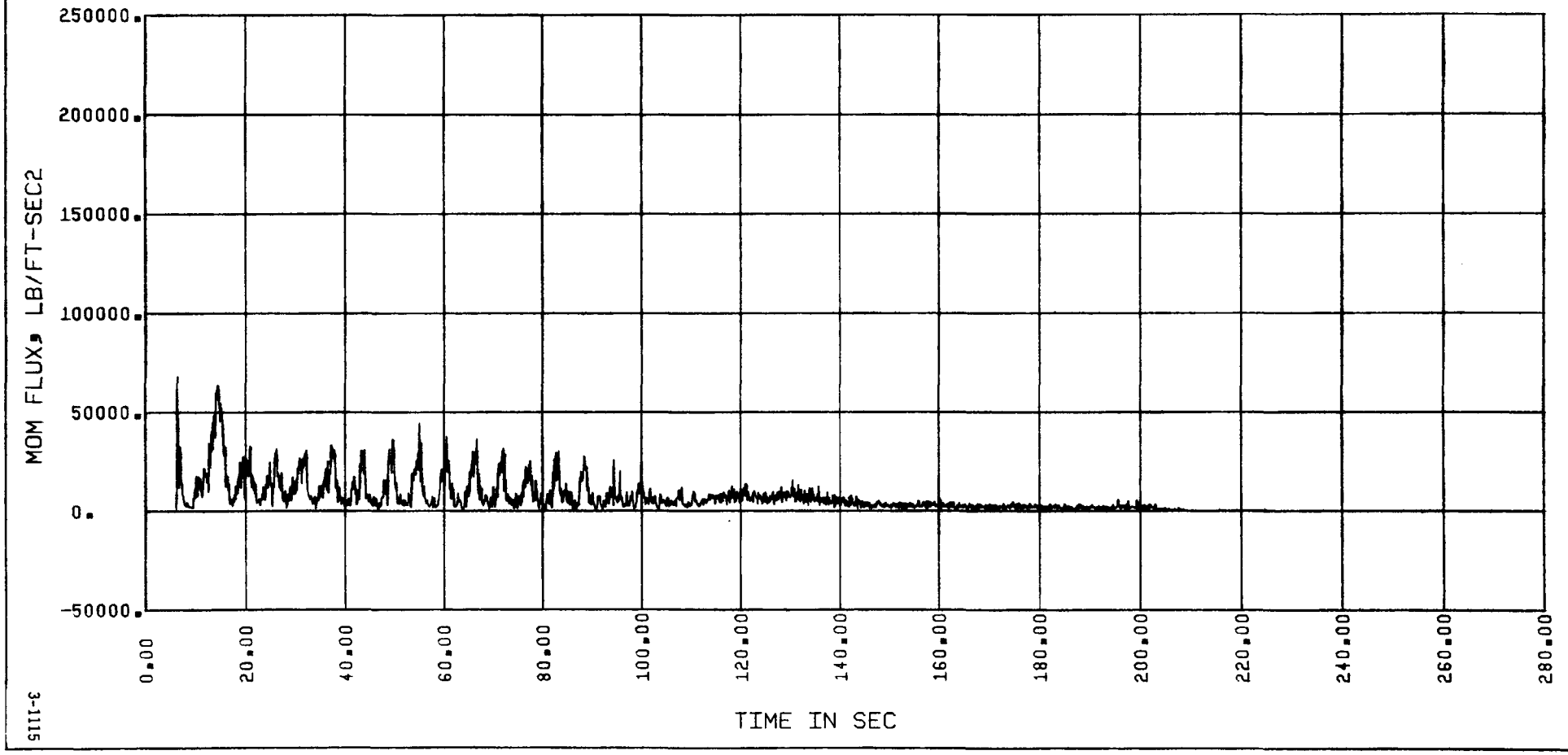
TEST 1511/1000 PSIA FW REV BDN
MASS FLOW RATE LO-DD/GD2 DISCH
PLOT NO.35



TEST 1511/1000 PSIA FW REV BDN
MOMENTUM FLUX GD2/LO-TM SUCT
PLOT NO.36

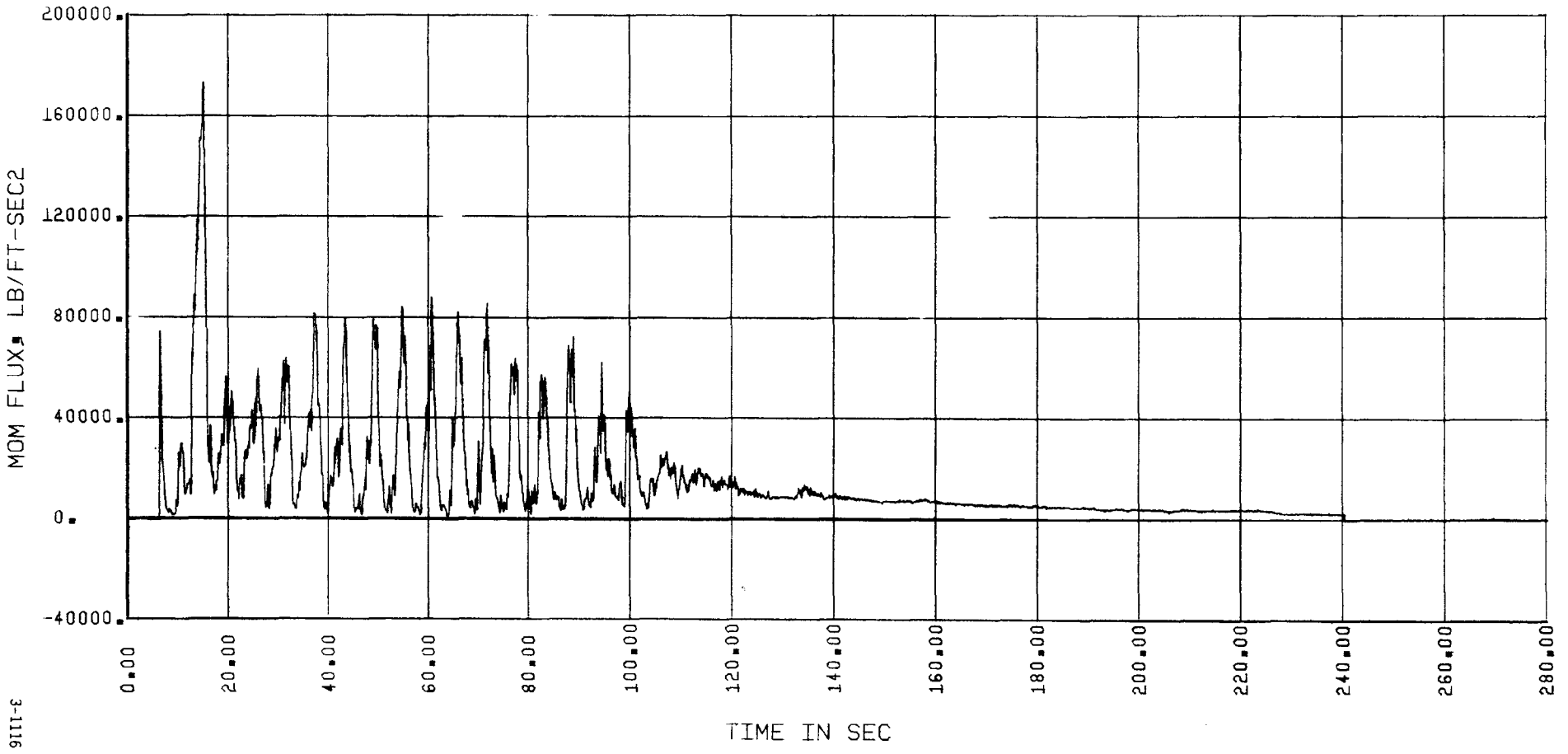


TEST 1511/1000 PSIA FW REV BDN
MOMENTUM FLUX GD2/HI-TM SUCT
PLOT NO.37



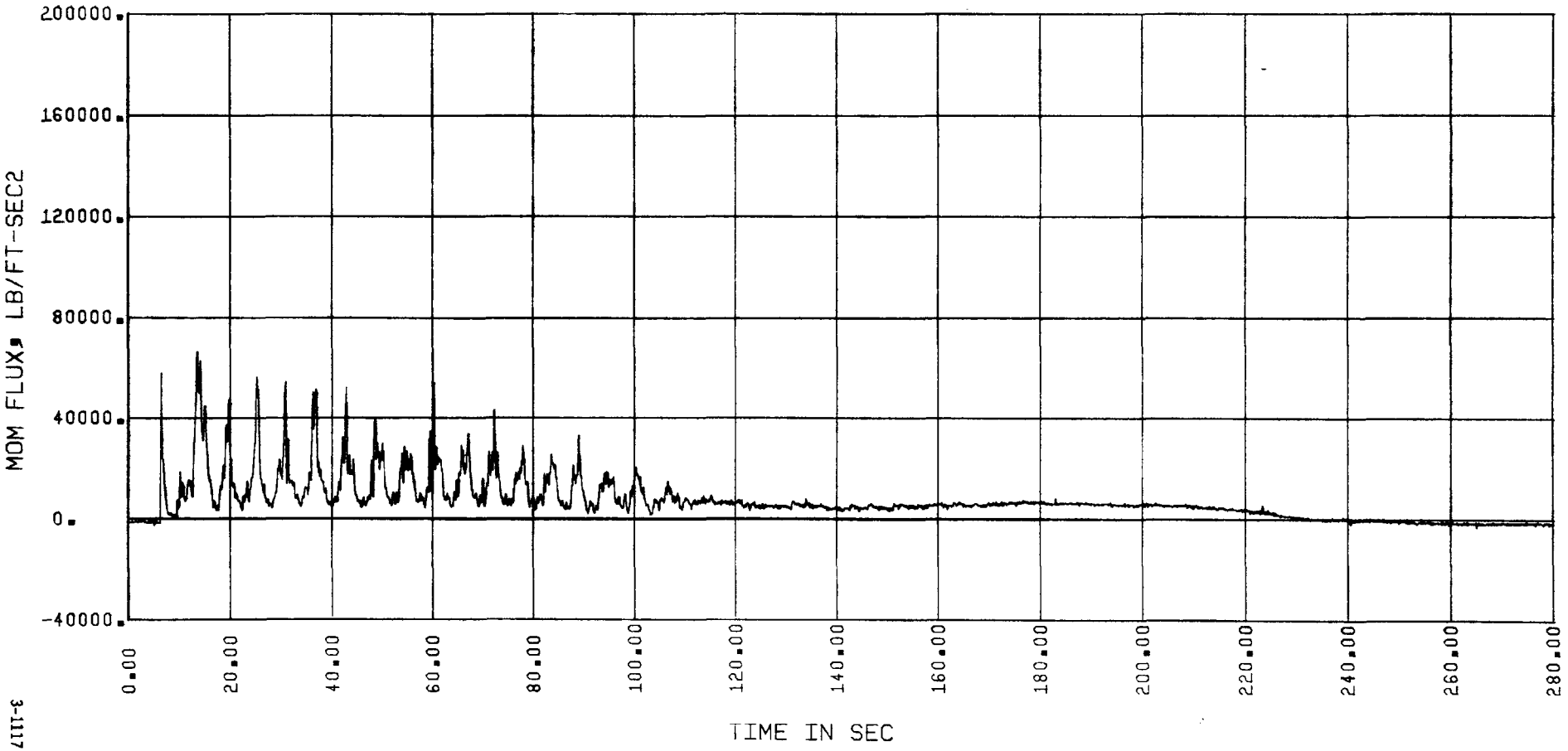
3-1115

TEST 1511/1000 PSIA FW REV BDN
MOMENTUM FLUX LO-DD SUCTION
PLOT NO.38

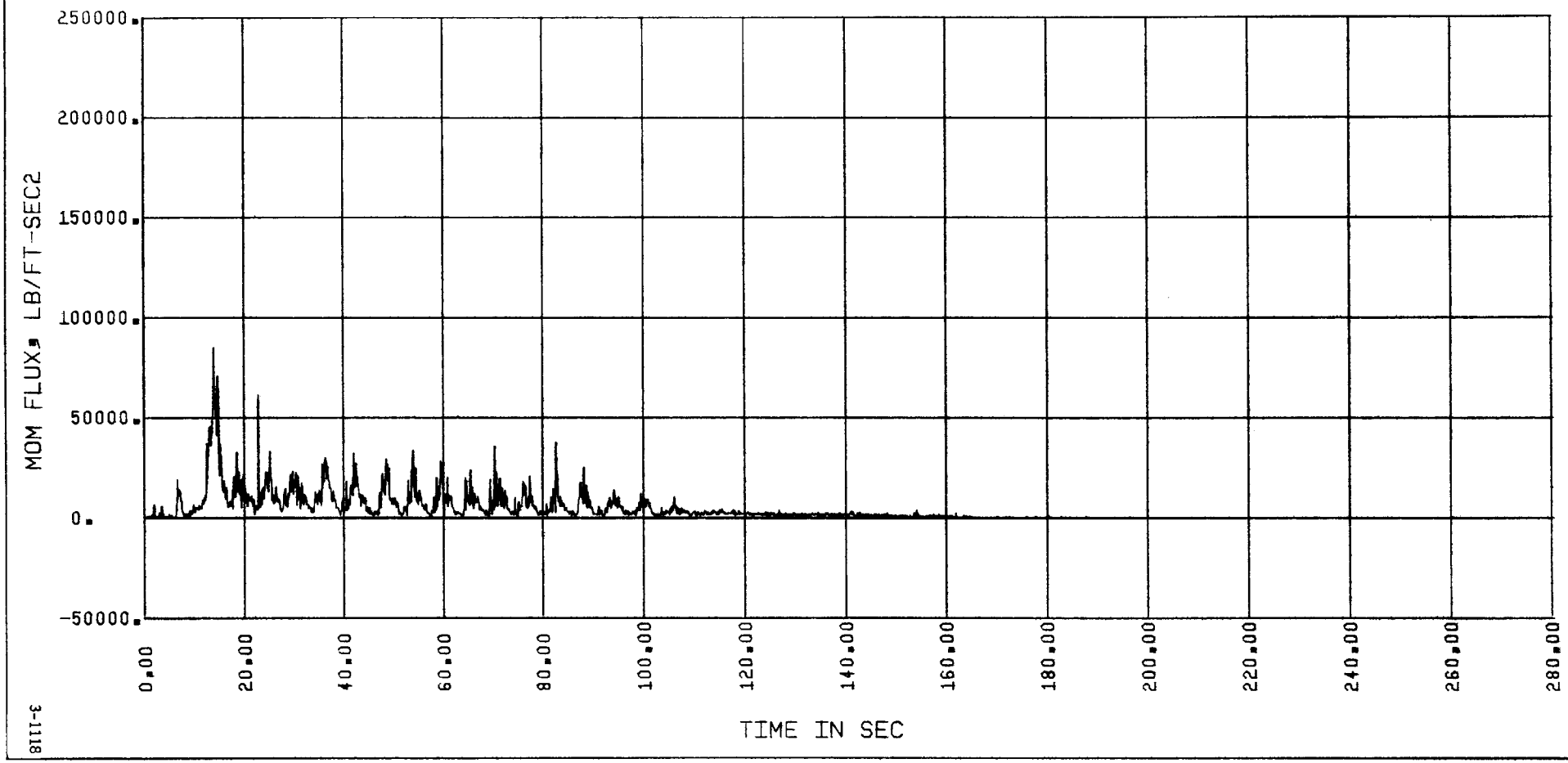


3-1116

TEST 1511/1000 PSIA FW REV BDN
MOMENTUM FLUX HI-DD SUCTION
PLOT NO.39

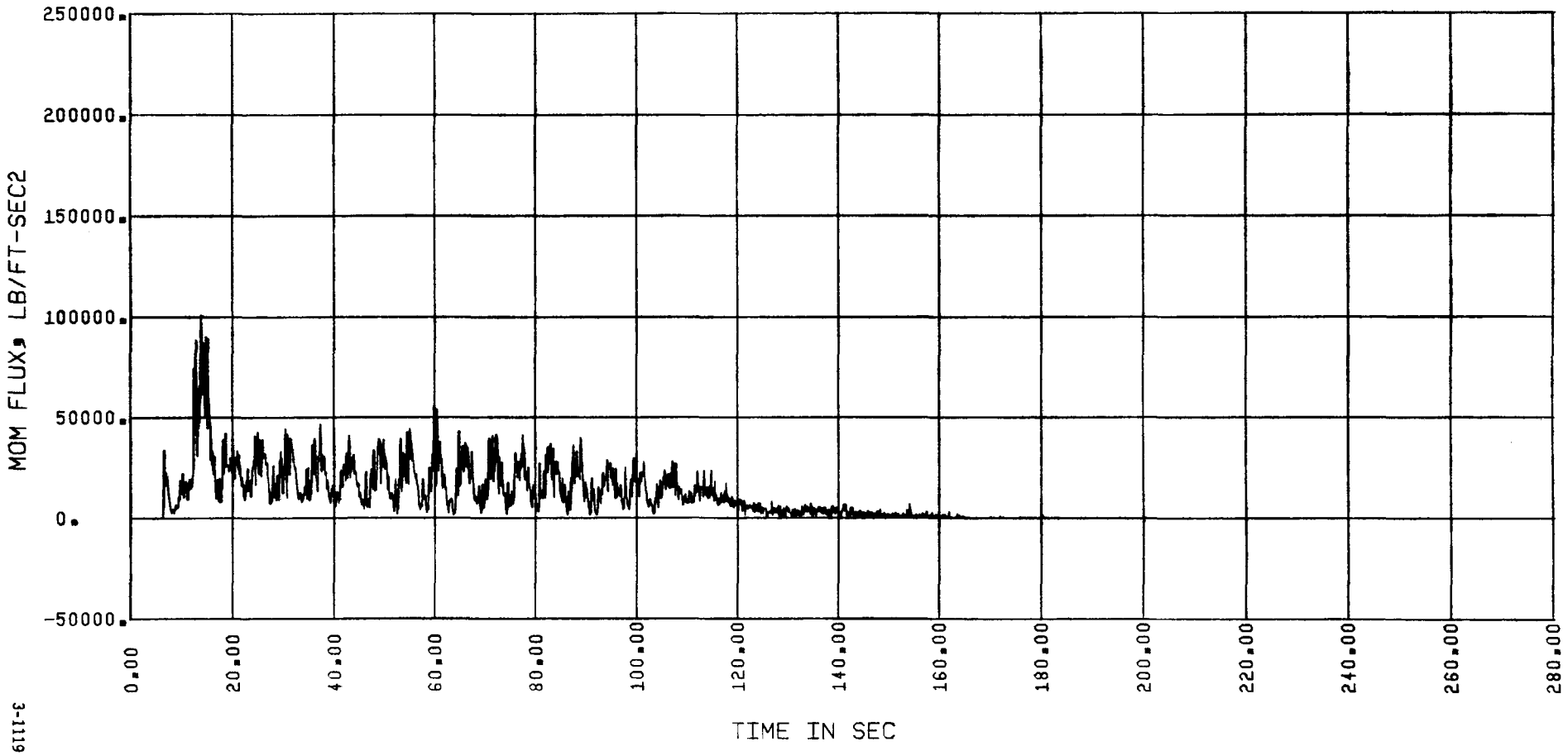


TEST 1511/1000 PSIA FW REV BDN
MOMENTUM FLUX GD2/LO-TM DISCH
PLOT NO.40

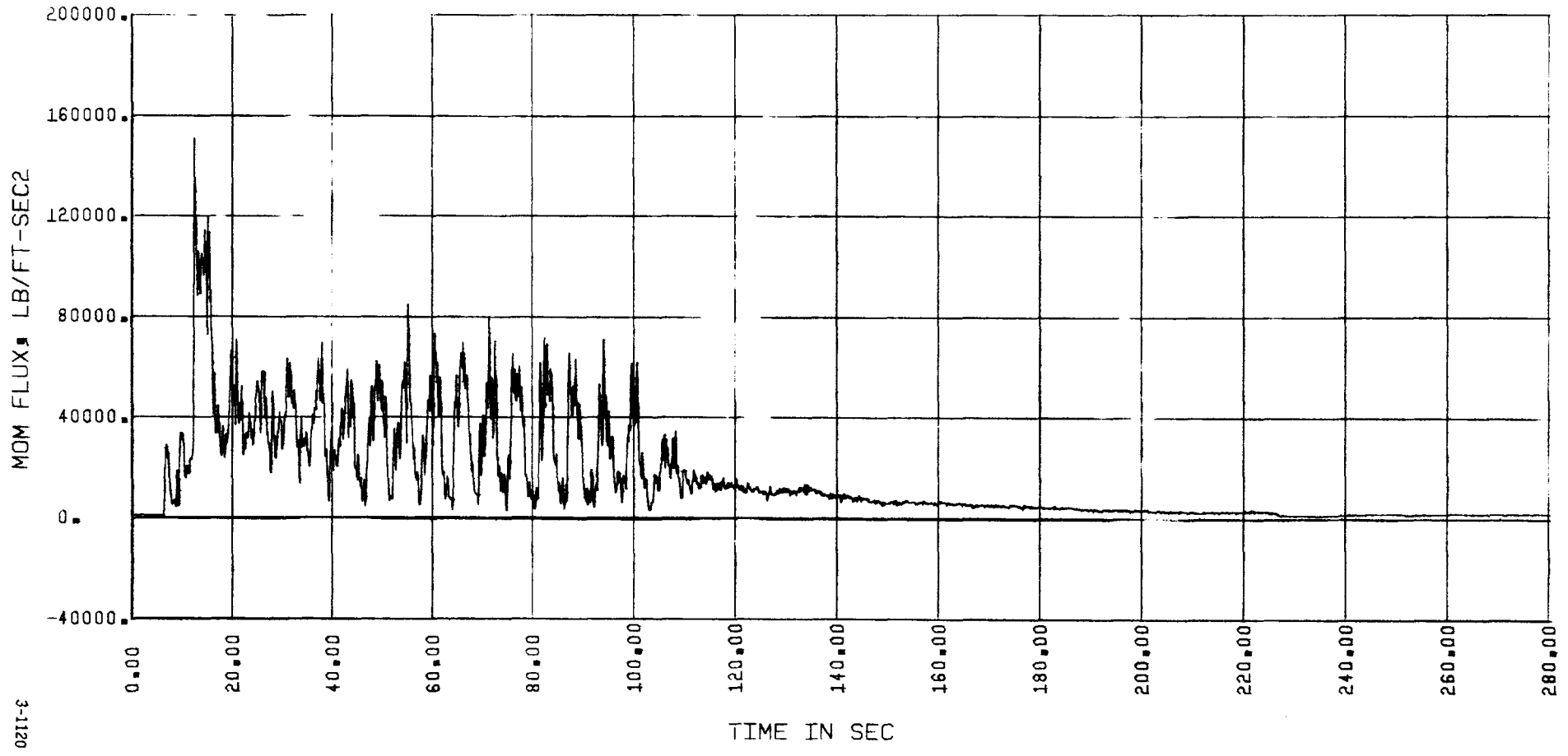


3-1118

TEST 1511/1000 PSIA FW REV BDN
MOMENTUM FLUX GD2/HI-TM DISCH
PLOT NO.41

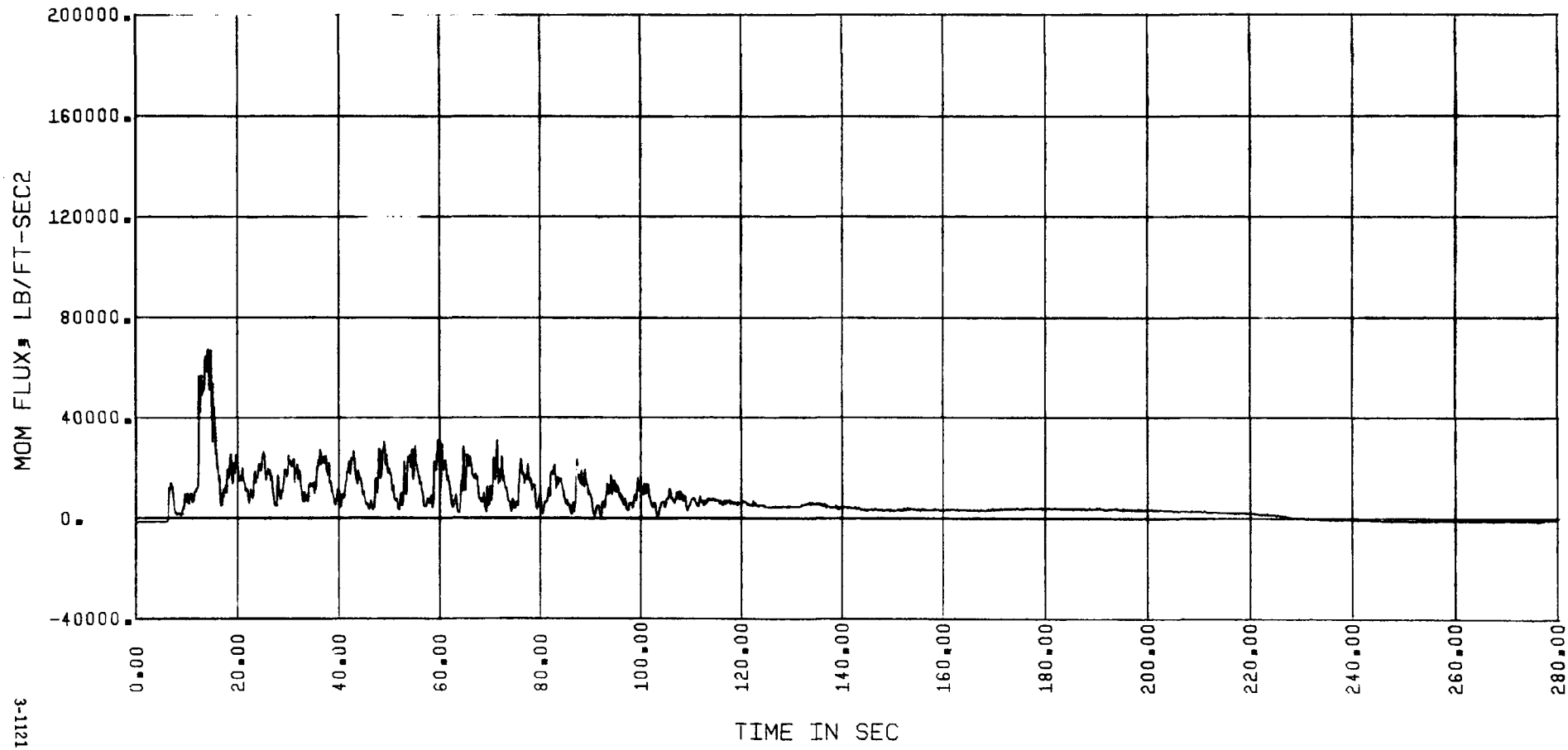


TEST 1511/1000 PSIA FW REV BDN
MOMENTUM FLUX LO-DD DISCHARGE
PLOT NO. 42



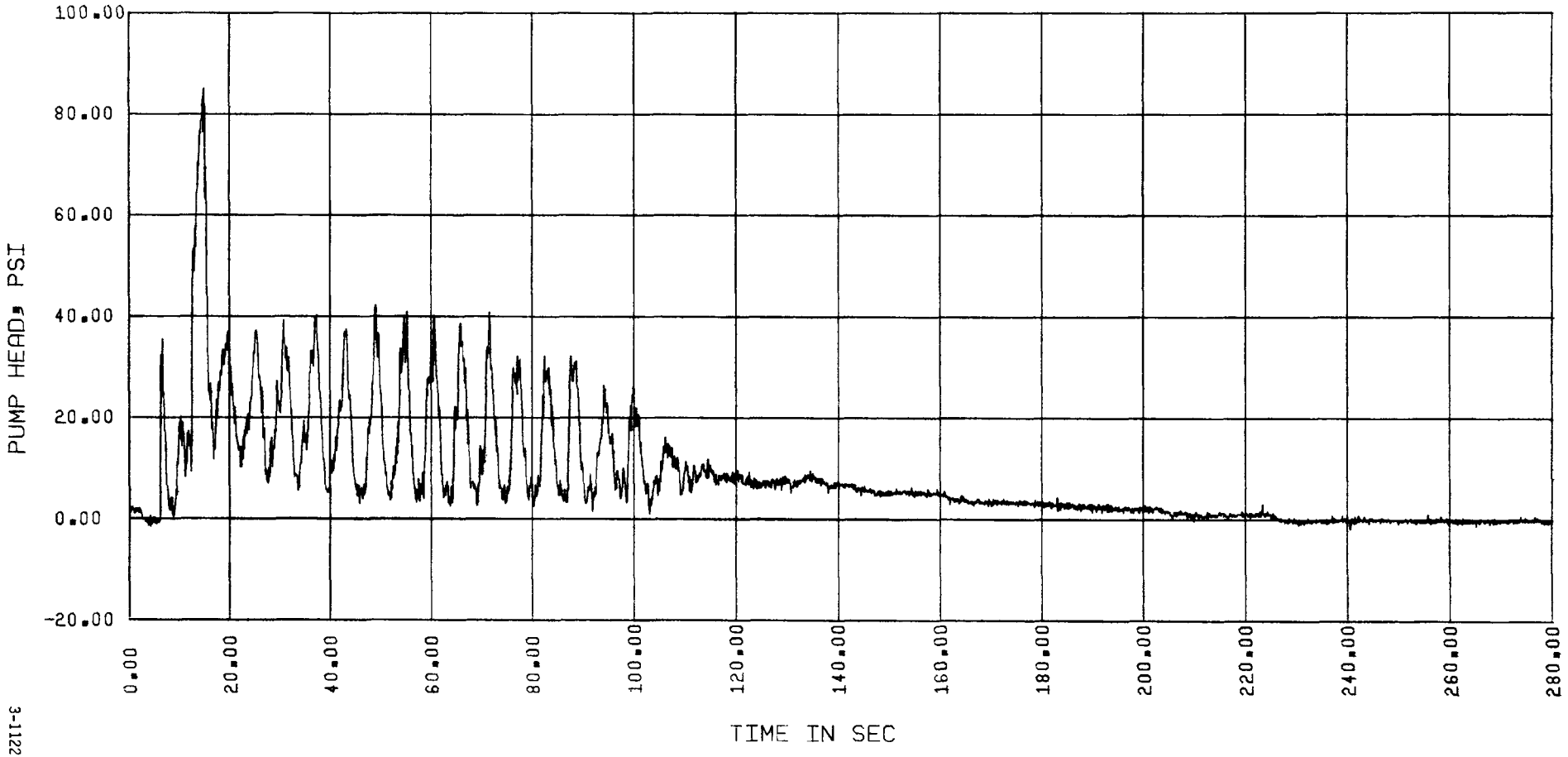
3-1120

TEST 1511/1000 PSIA FW REV BDN
MOMENTUM FLUX HI-DD DISCHARGE
PLOT NO.43



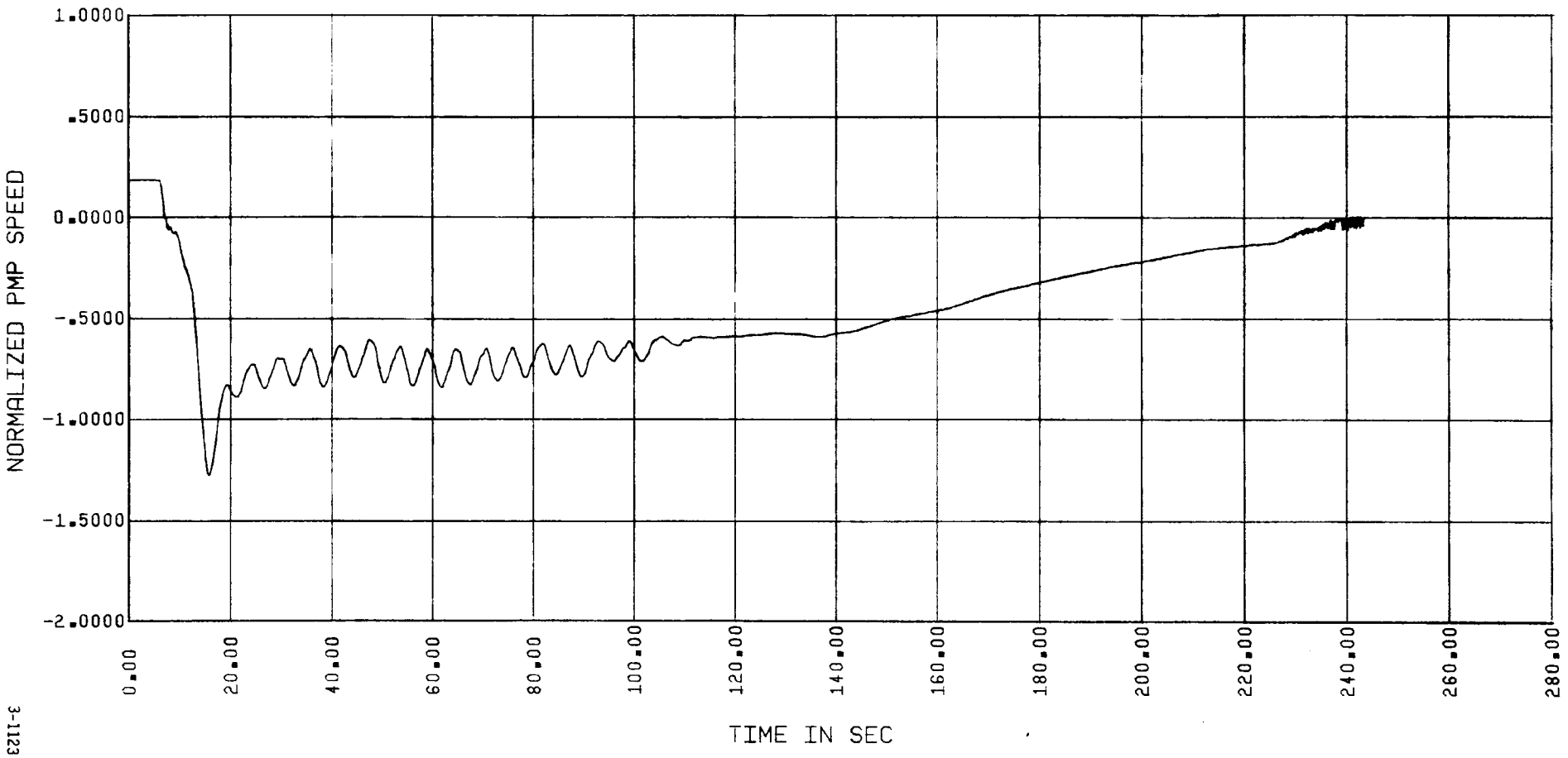
3-1121

TEST 1511/1000 PSIA FW REV BDN
PUMP HEAD IN PSI
PLOT NO.44



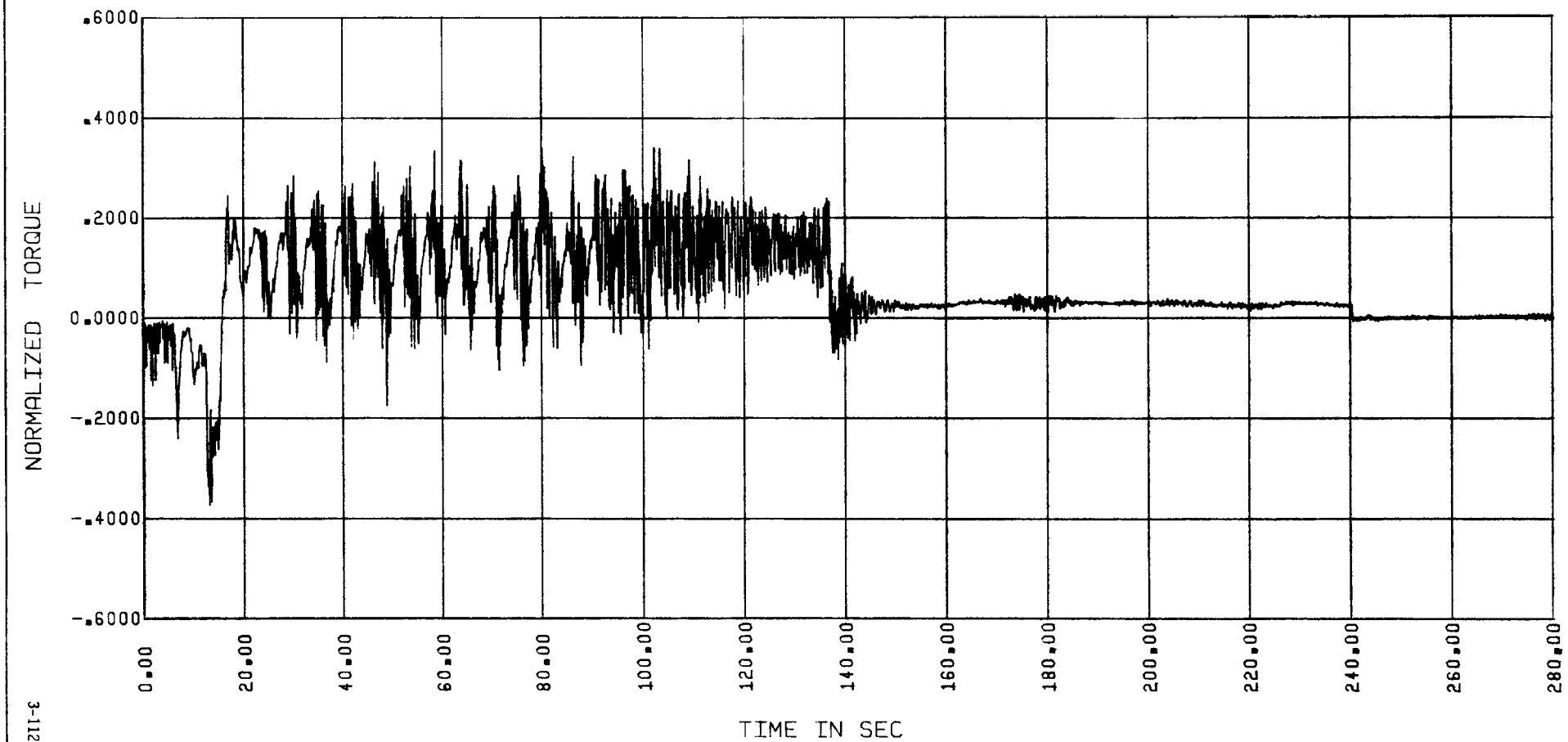
3-1122

TEST 1511/1000 PSIA FW REV BDN
NORM. PUMP SPEED NR=4500
PLOT NO.47

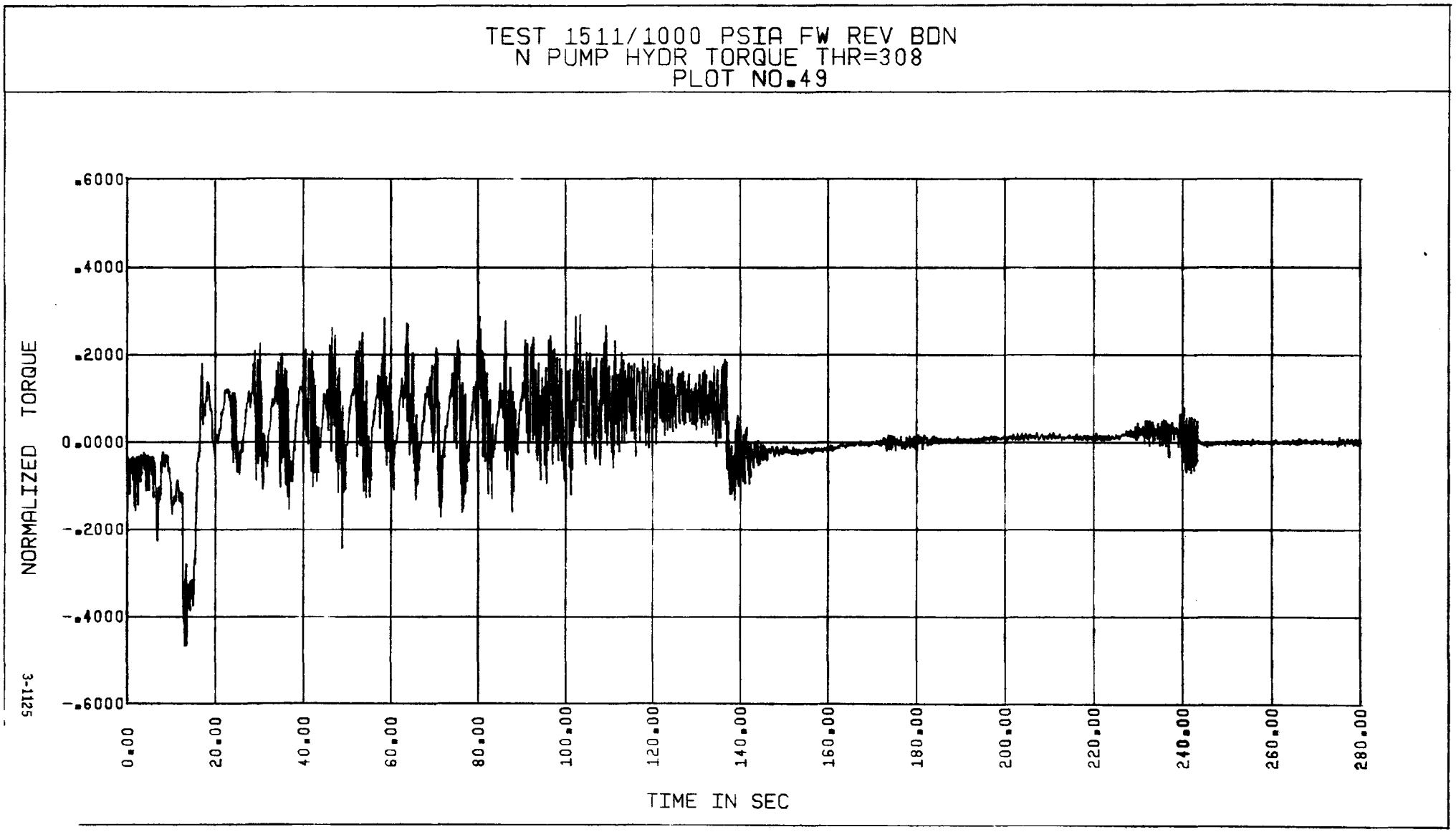


3-1123

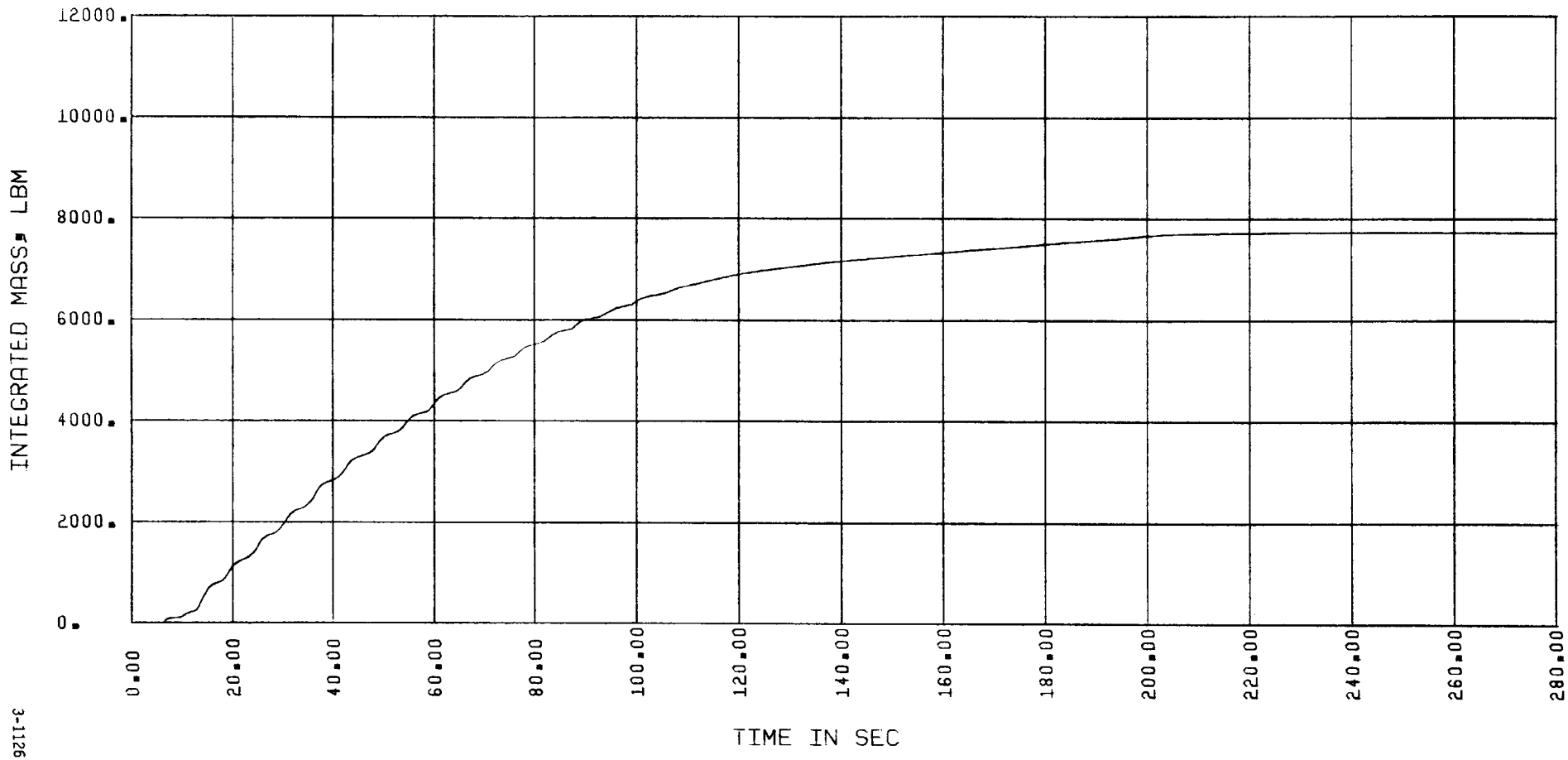
TEST 1511/1000 PSIA FW REV BDN
N PUMP SHAFT TORQUE THR=308
PLOT NO.48



3-1124

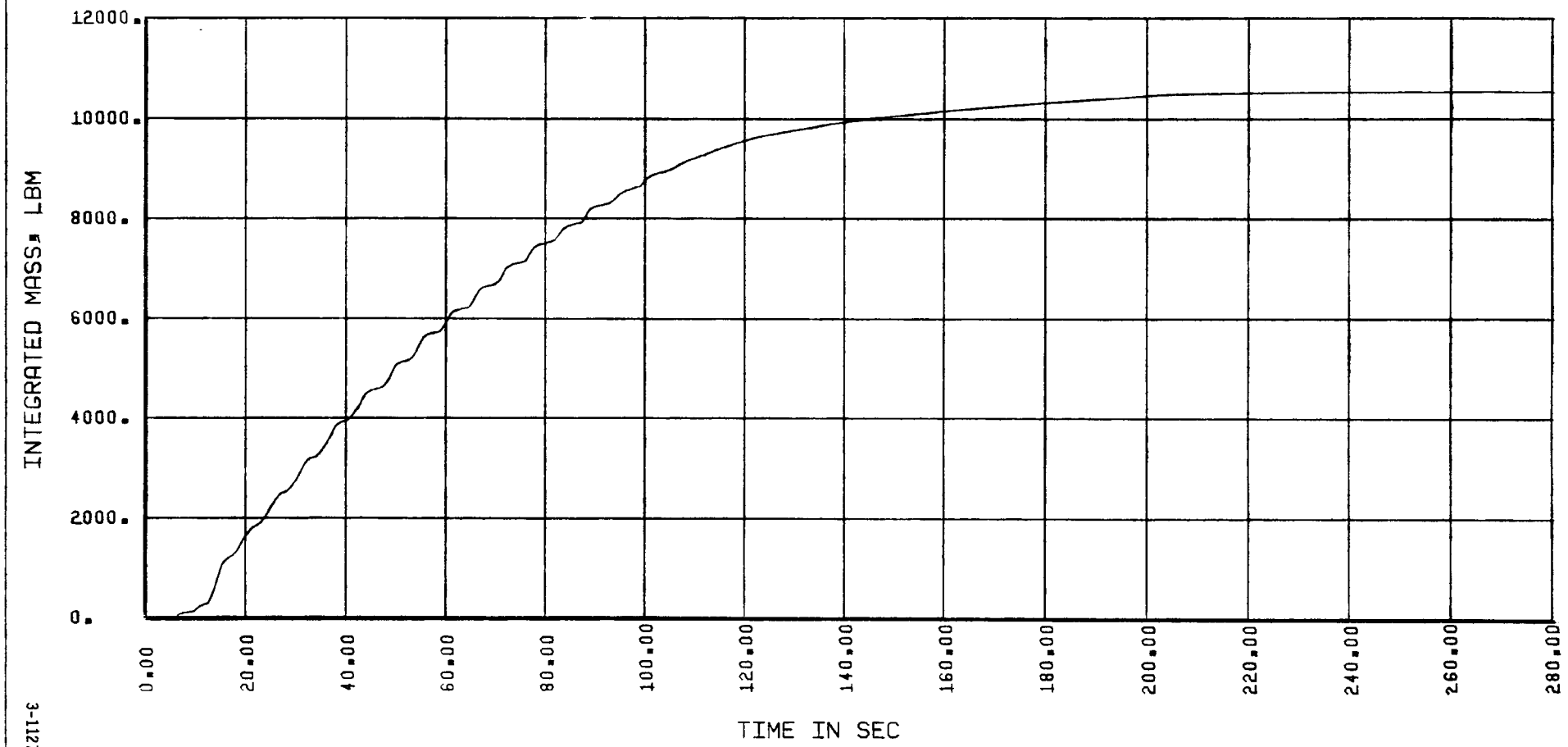

TEST 1511/1000 PSIA FW REV BDN
N PUMP HYDR TORQUE THR=308
PLOT NO.49
NORMALIZED TORQUE
.6000
.4000
.2000
0.0000
-.2000
-.4000
-.6000
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
260.00
280.00
TIME IN SEC
3-1125

TEST 1511/1000 PSIA FW REV BDN
INTEGRATED MASS HI-DD/GD2 SUCT
PLOT NO.50

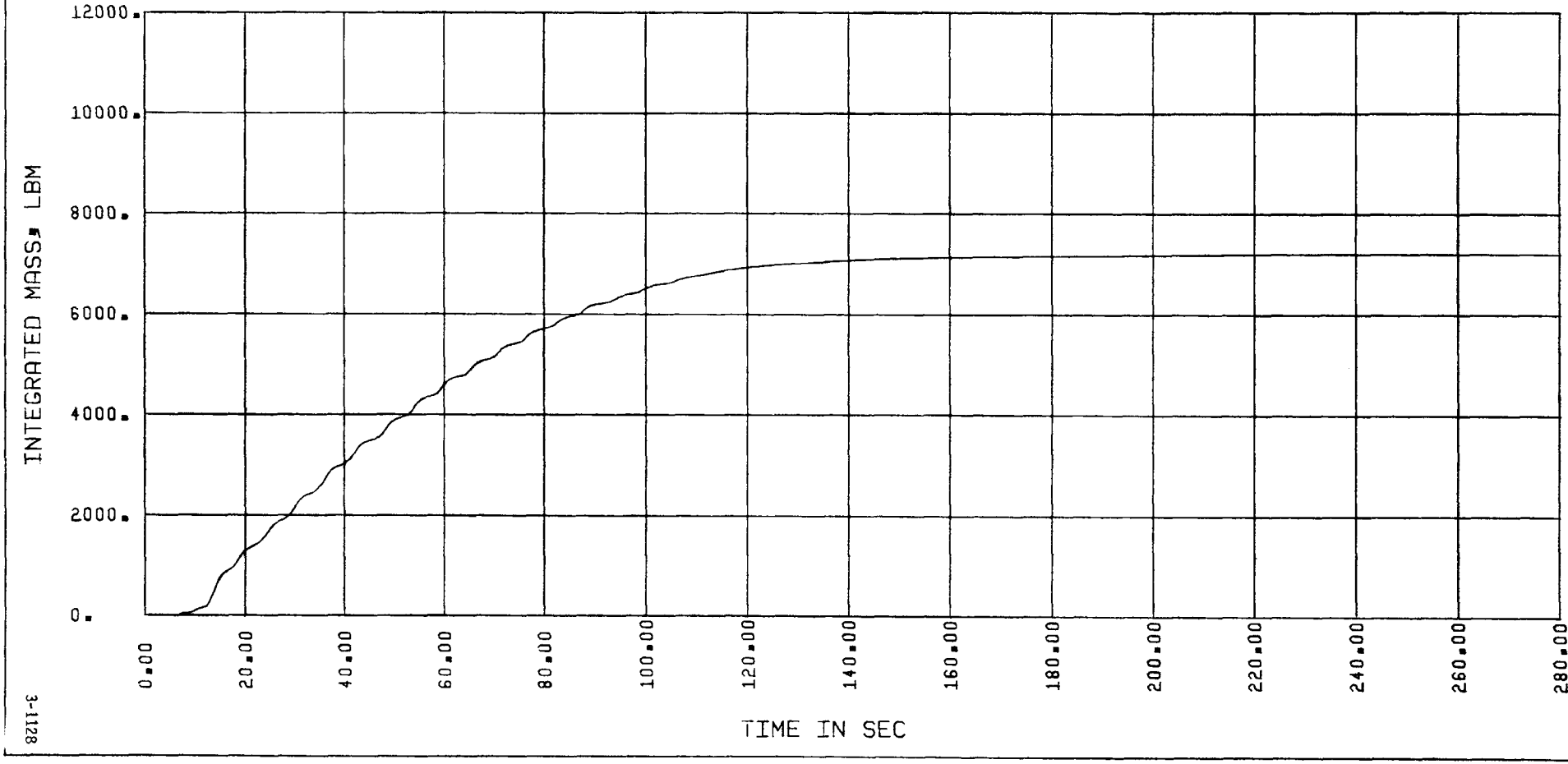


3-1126

TEST 1511/1000 PSIA FW REV BDN
INTEGRATED MASS LO-DD/GD2 SUCT
PLOT NO.51

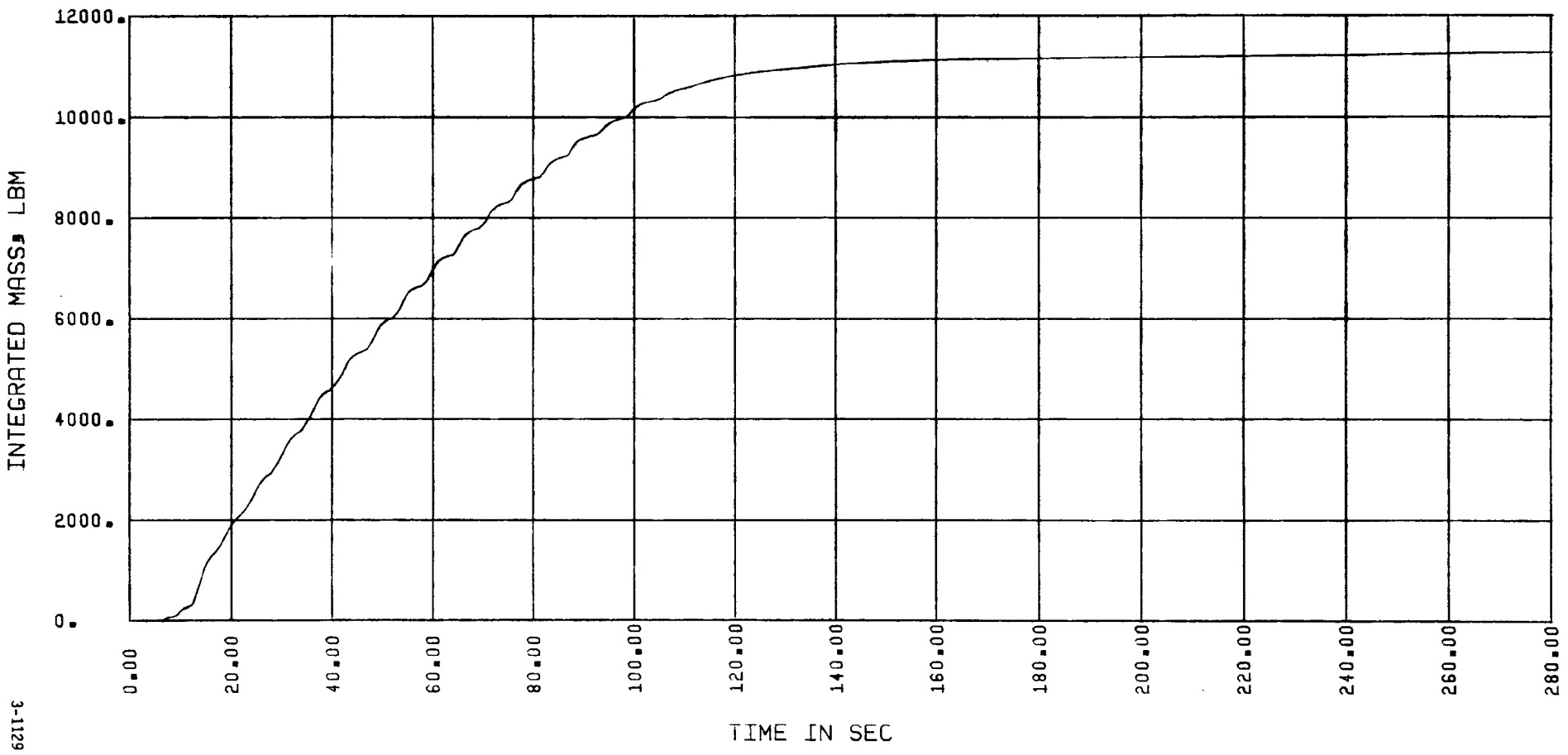


TEST 1511/1000 PSIA FW REV BDN
INTEGRATED MASS HI-DD/GD2 DIS
PLOT NO.52



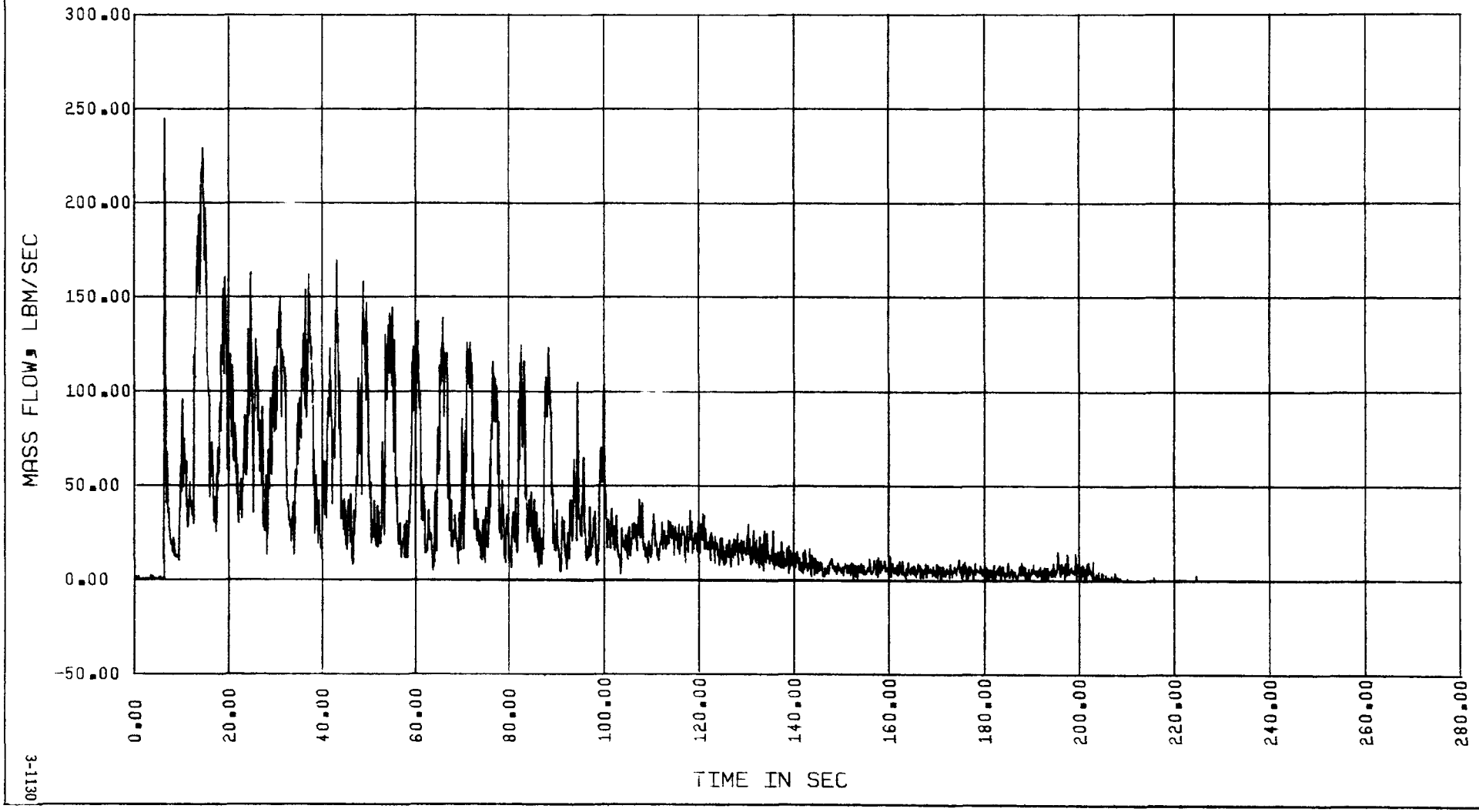
3-1128

TEST 1511/1000 PSIA FW REV BDN
INTEGRATED MASS LO-DD/GD2 DIS
PLOT NO.53



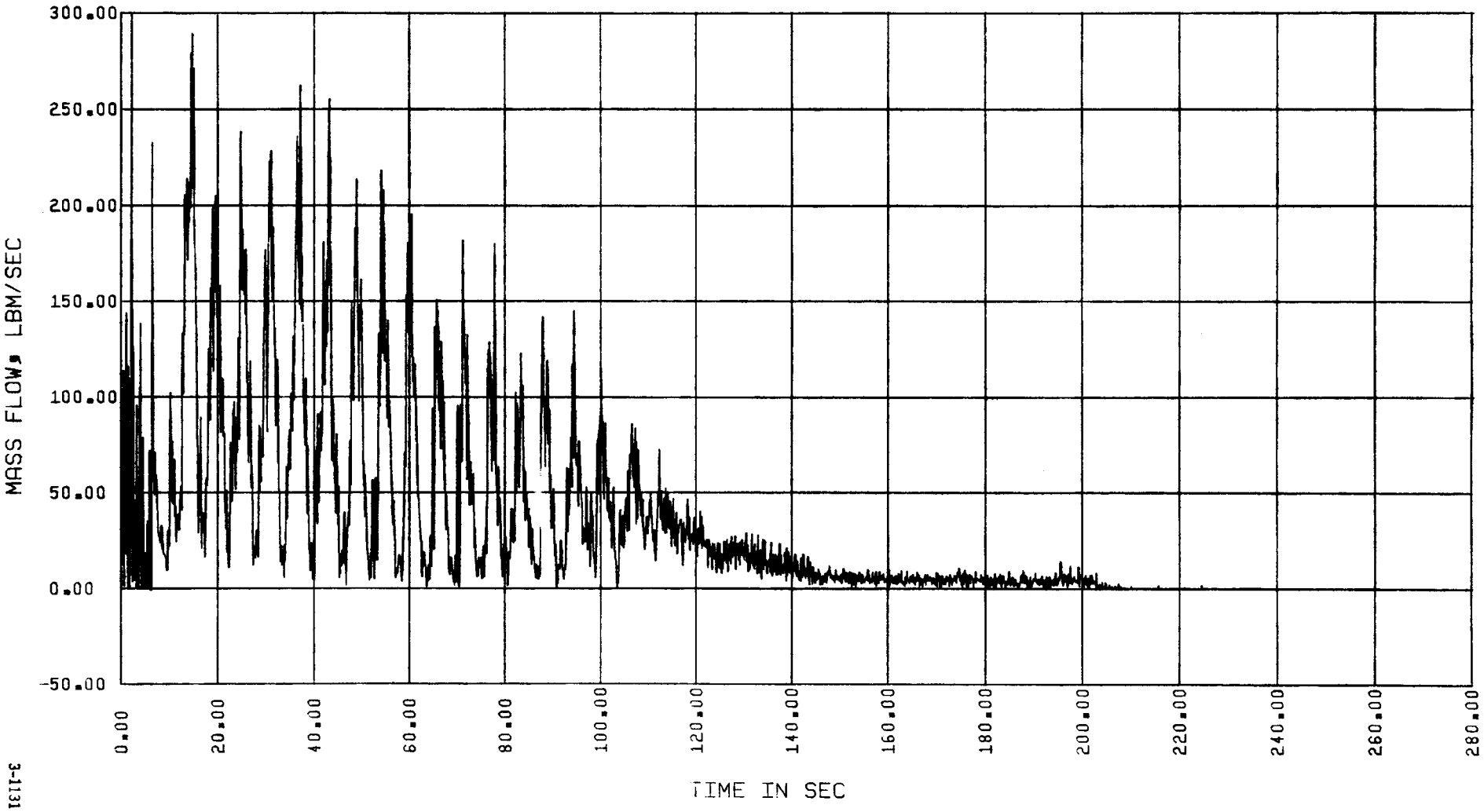
3-1129

TEST 1511/1000 PSIA FW REV BDN
MASS FLOW RATE HI-TM/GD2 SUCT
PLOT NO.54



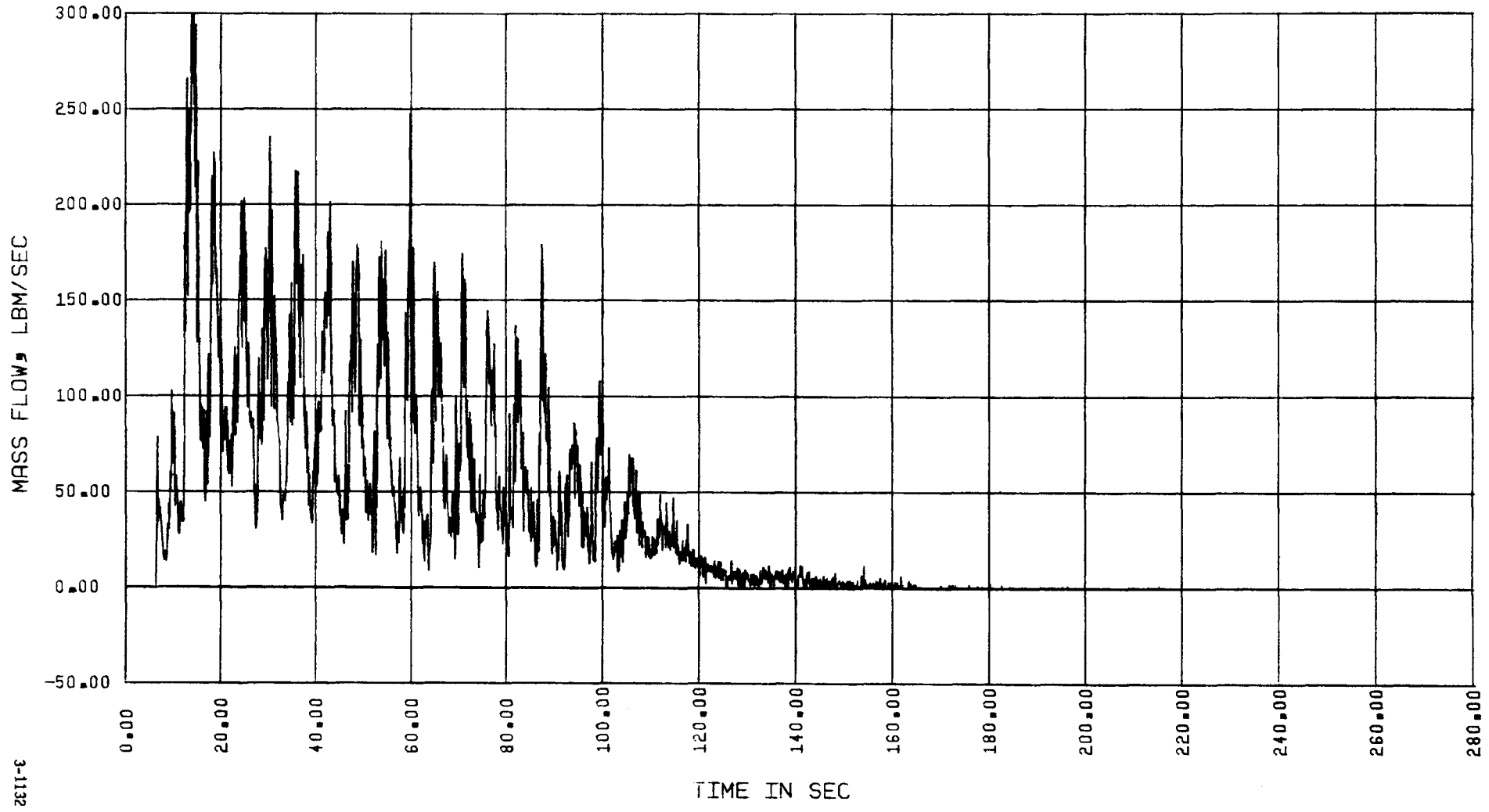
3-1130

TEST 1511/1000 PSIA FW REV BDN
MASS FLOW RATE LO-TM/GD2 SUCT
PLOT NO.55



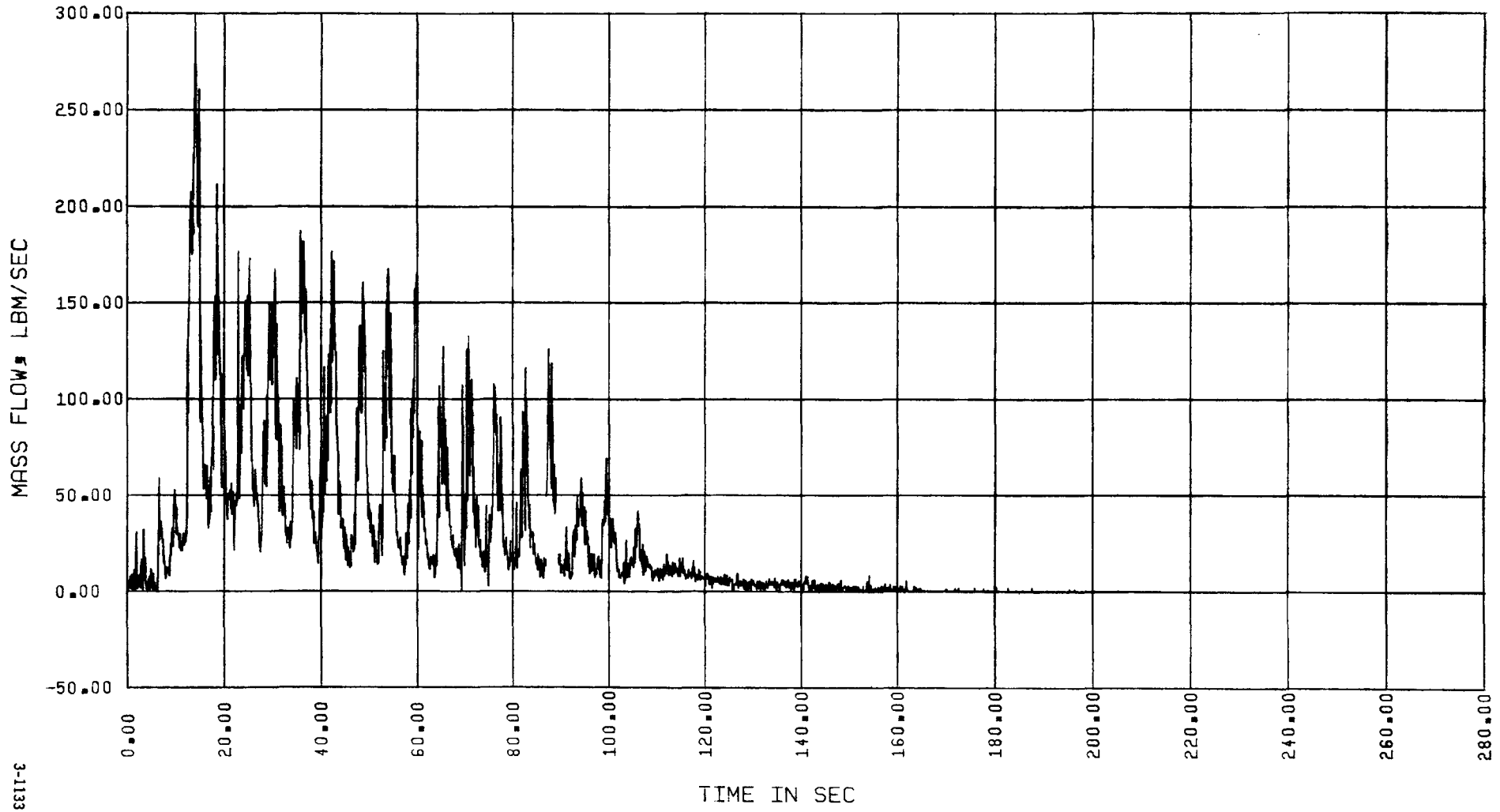
3-1131

TEST 1511/1000 PSIA FW REV BDN
MASS FLOW RATE HI-TM/GD2 DISCH
PLOT NO.56



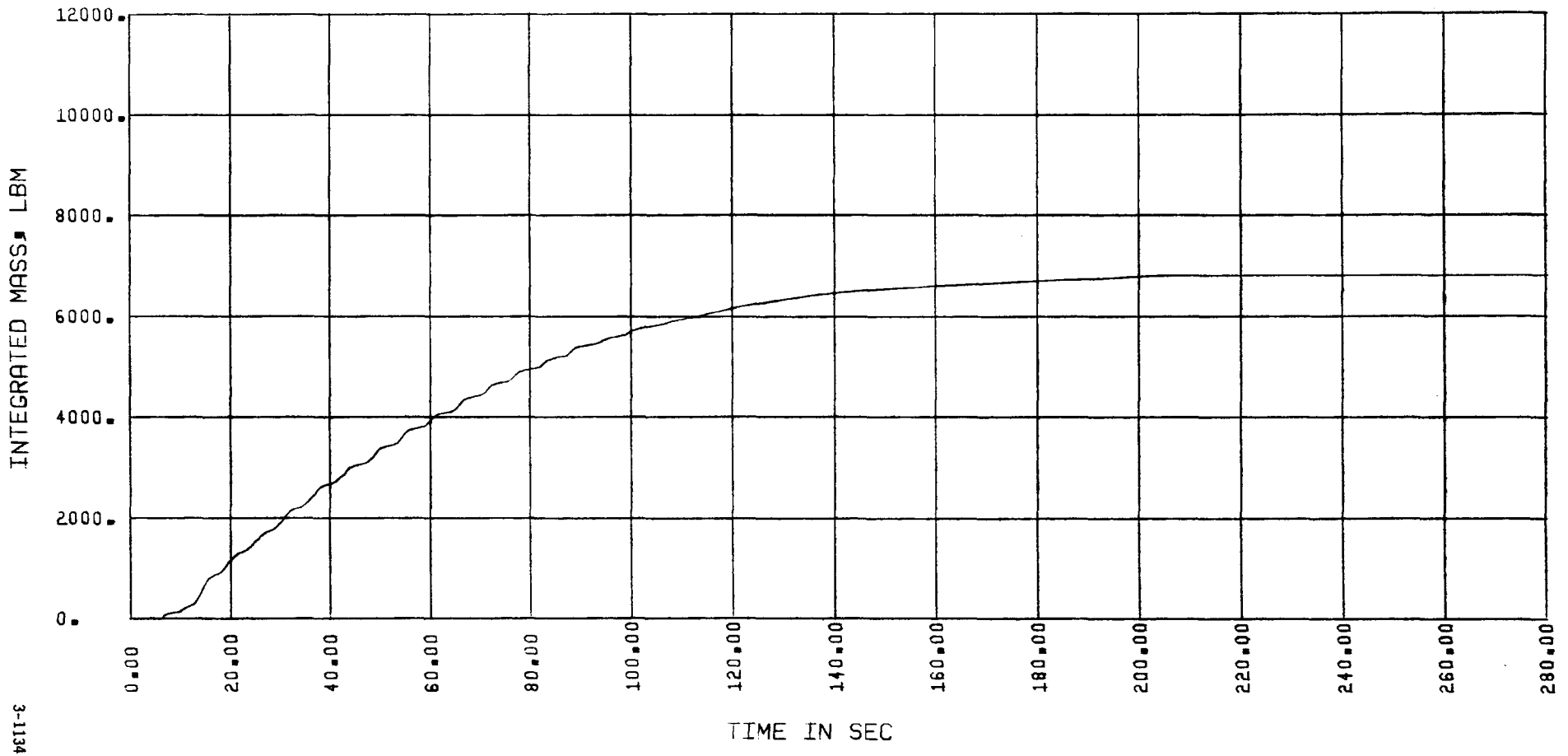
3-1132

TEST 1511/1000 PSIA FW REV BDN
MASS FLOW RATE LO-TM/GD2 DISCH
PLOT NO.57

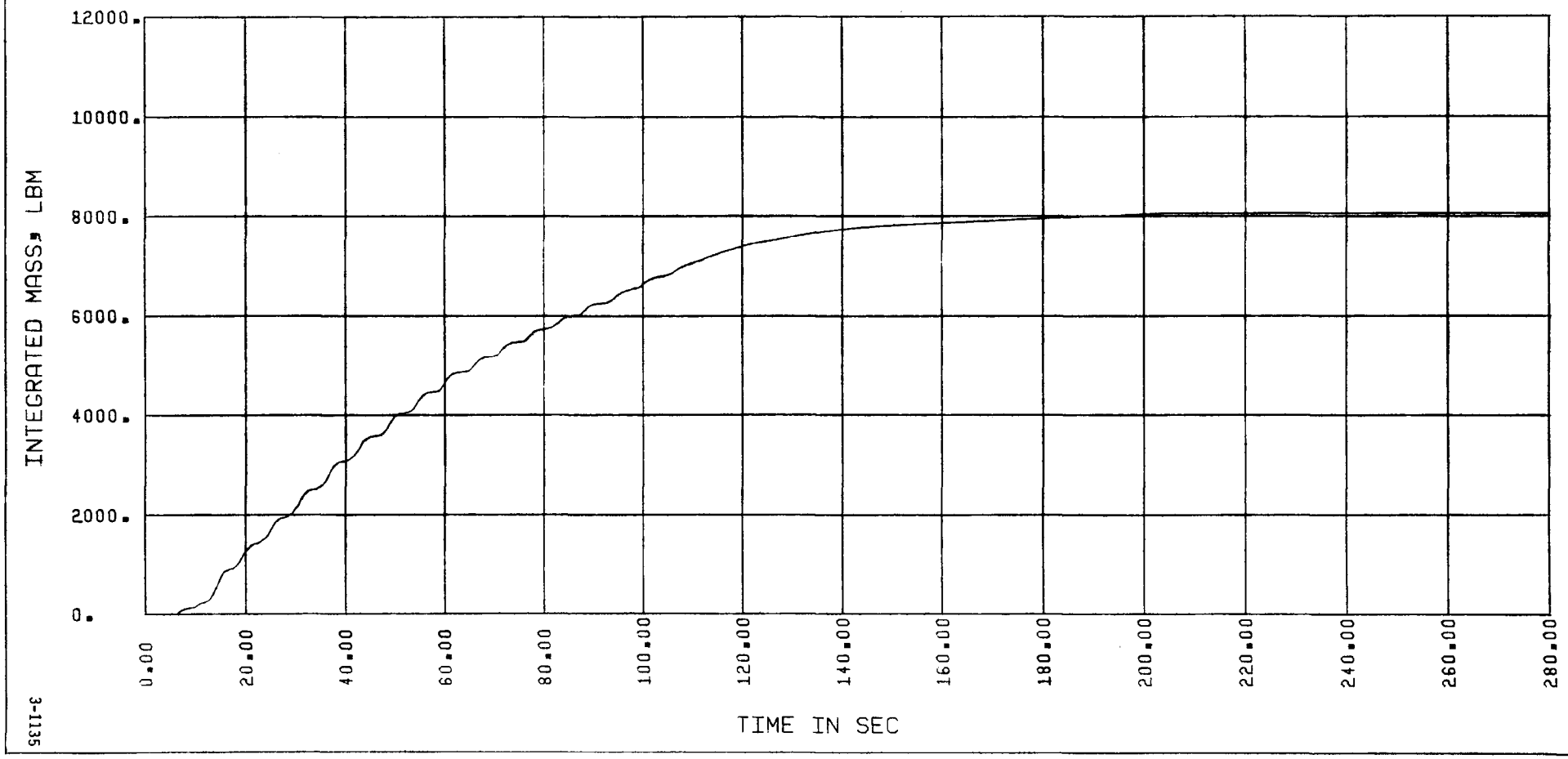


3-1133

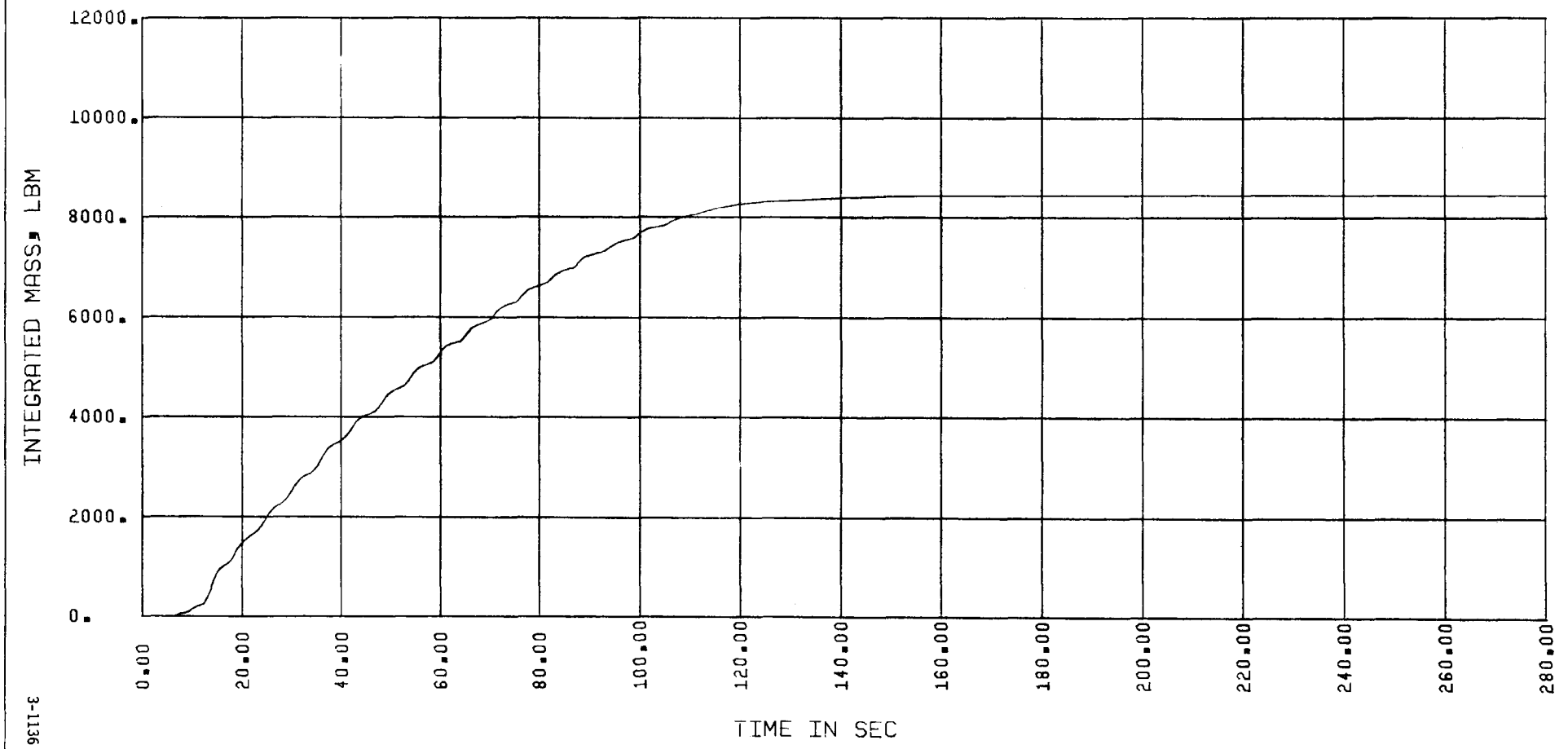
TEST 1511/1000 PSIA FW REV BDN
INTEGRATED MASS HI-TM/GD2 S
PLOT NO.60



TEST 1511/1000 PSIA FW REV BDN
INTEGRATED MASS LO-TM/GD2 S
PLOT NO.61

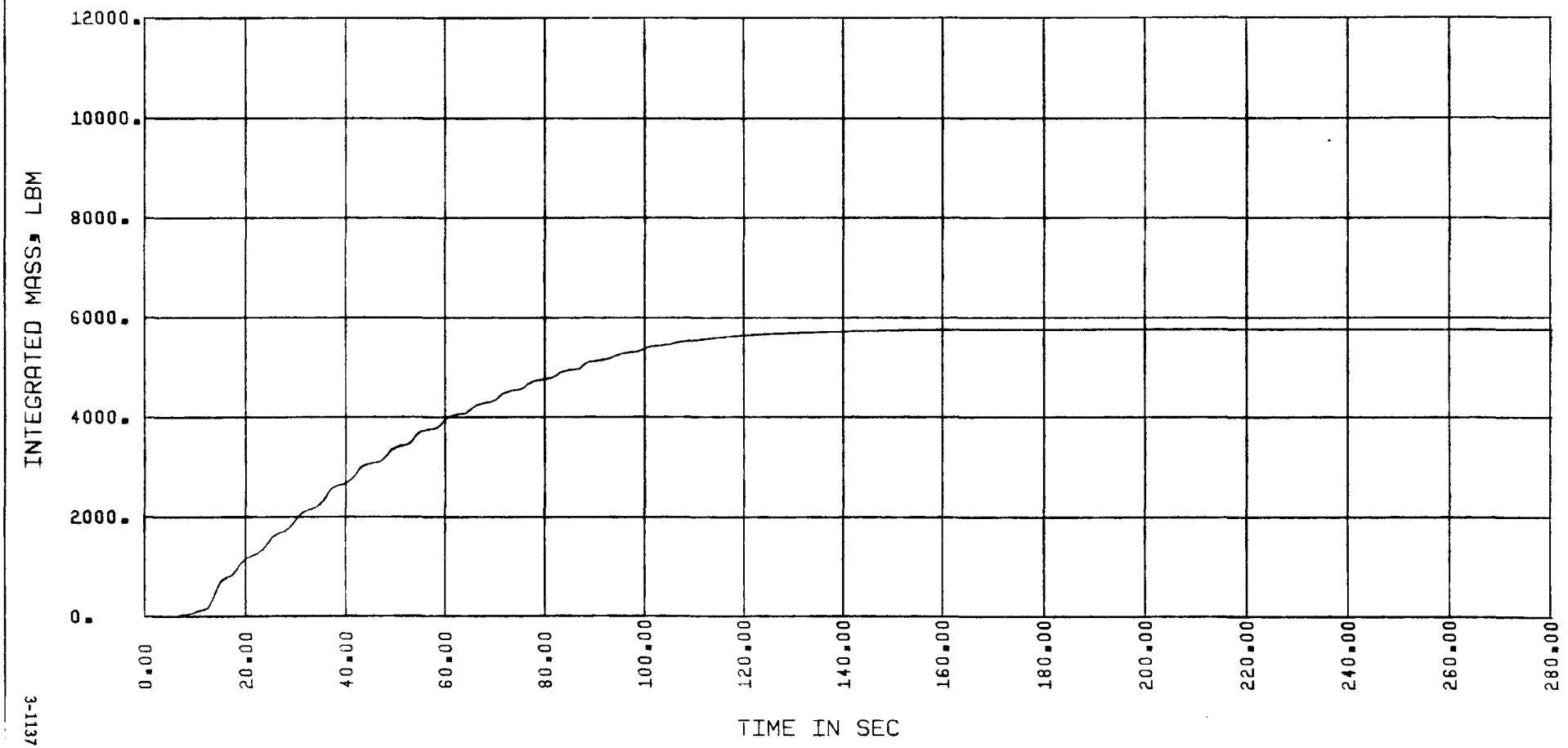


TEST 1511/1000 PSIA FW REV BDN
INTEGRATED MASS HI-TM/GD2 D
PLOT NO.62

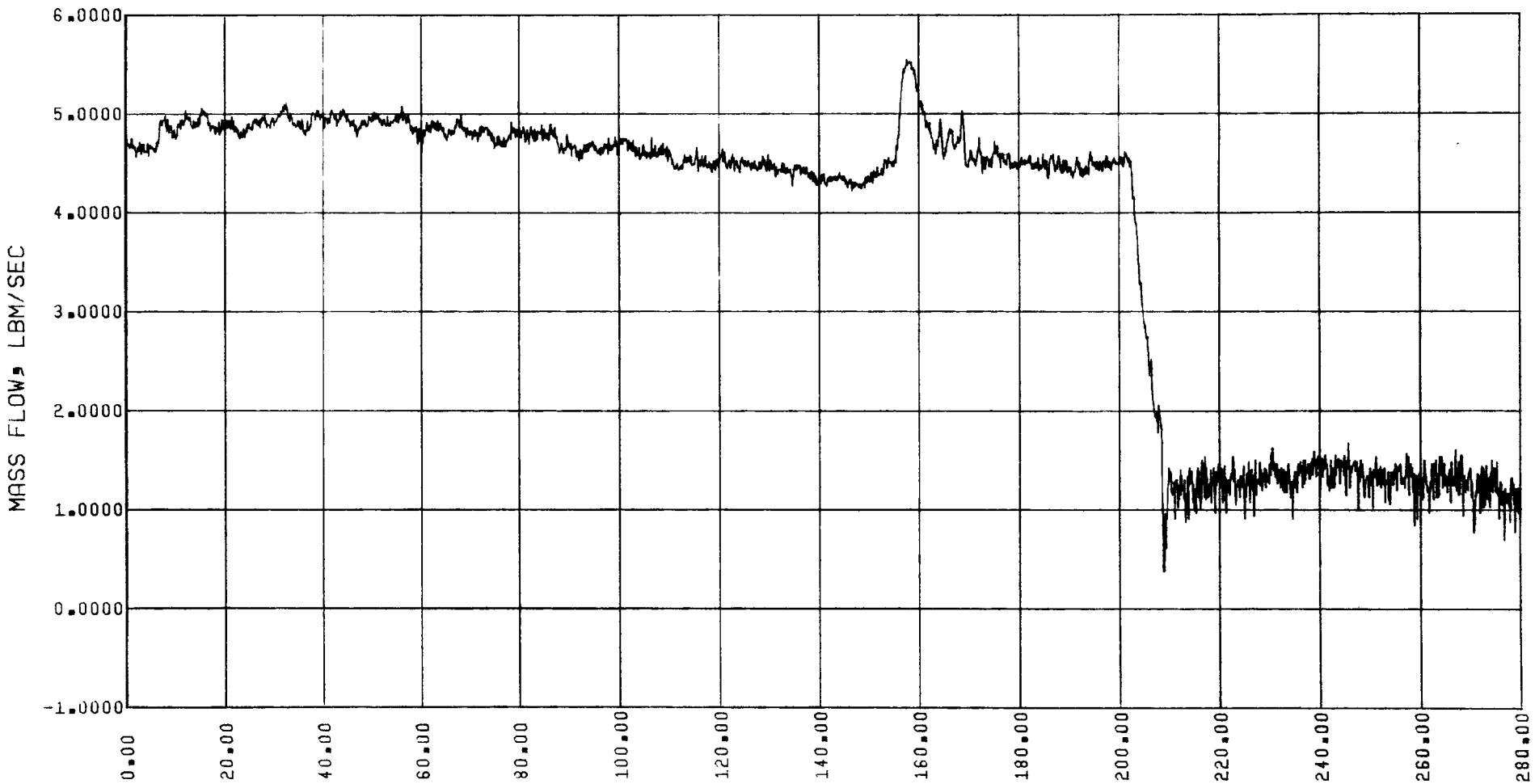


3-1136

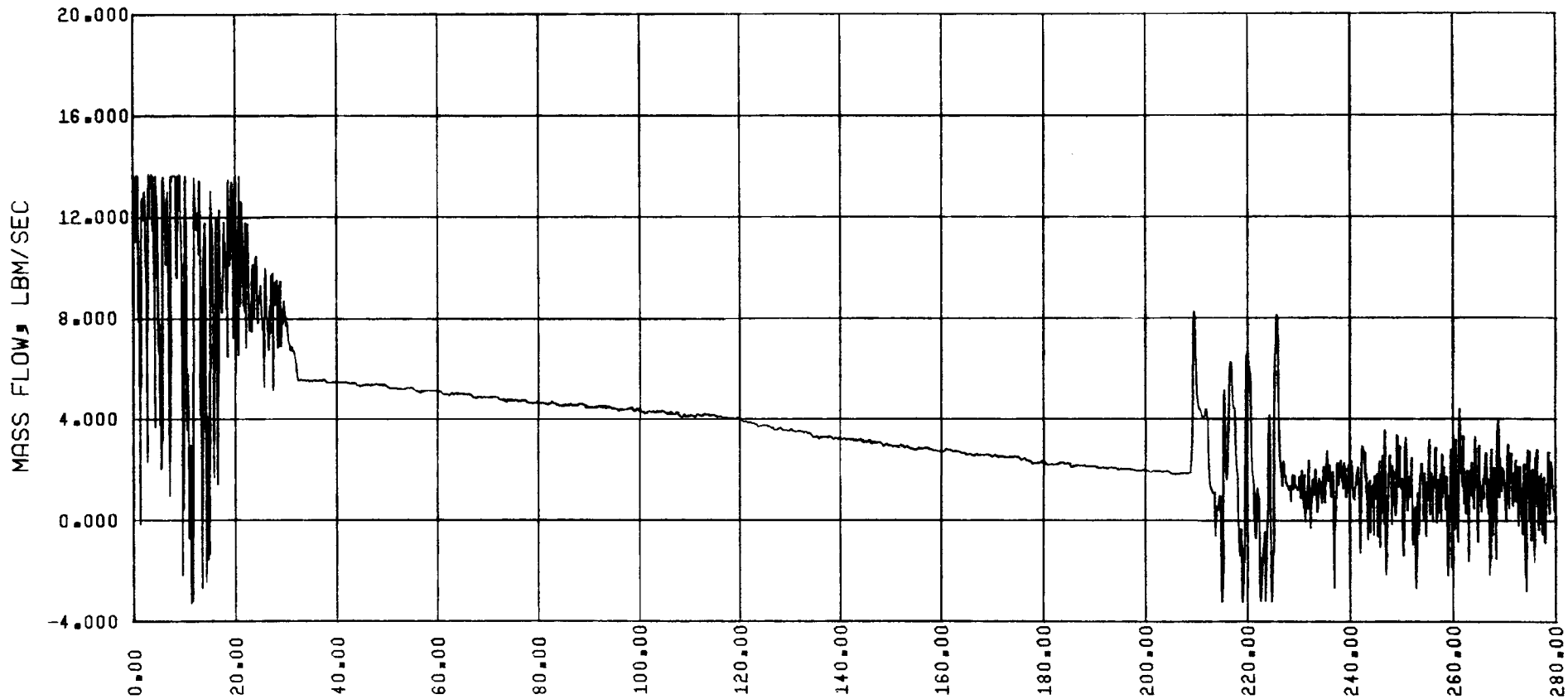
TEST 1511/1000 PSIA FW REV BDN
INTEGRATED MASS LO-TM/GD2 D
PLOT NO.63



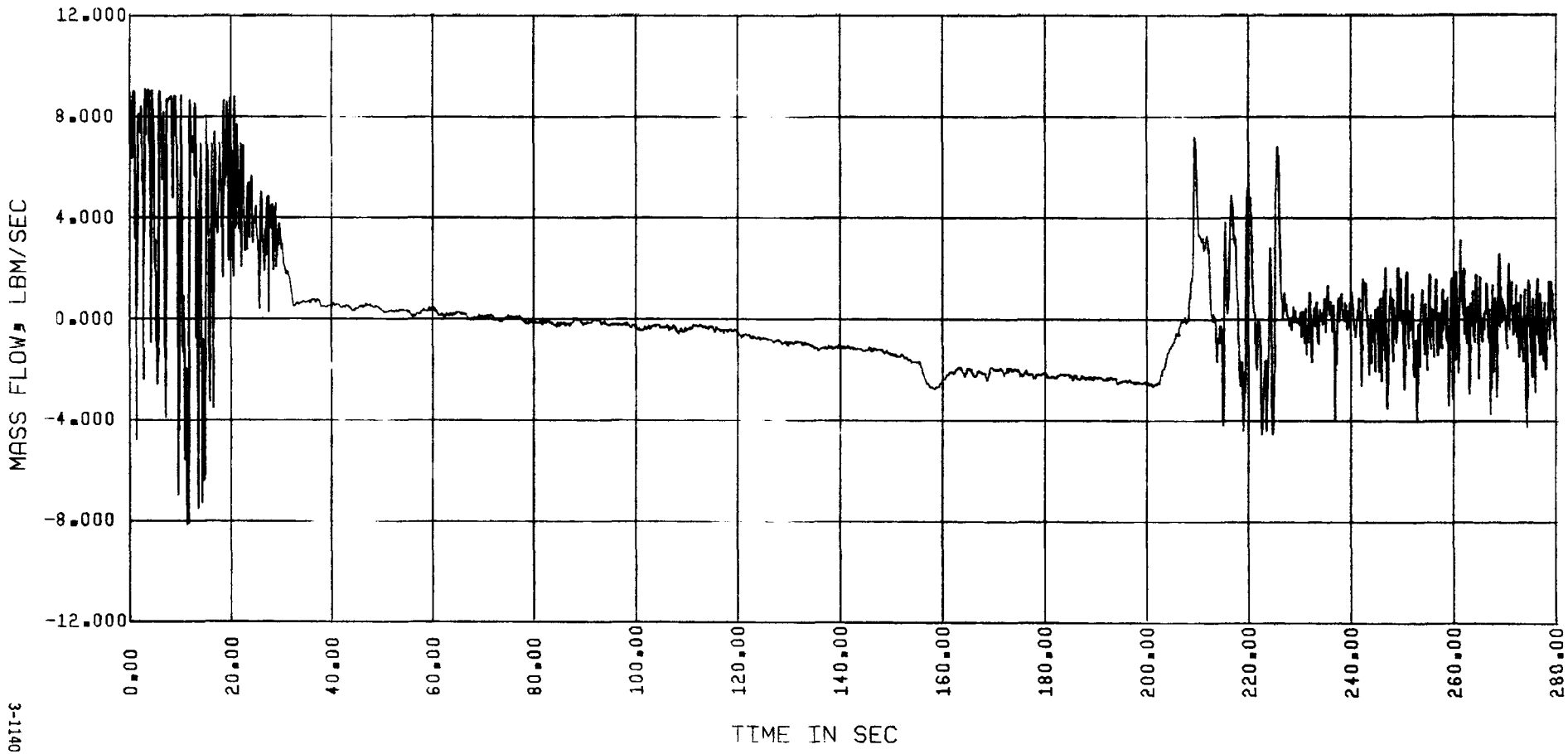
TEST 1511/1000 PSIA FW REV BDN
PUMP INLET INJECTION FLOW
PLOT NO.64



TEST 1511/1000 PSIA FW REV BDN
PUMP OUTLET INJECTION FLOW
PLOT NO.65



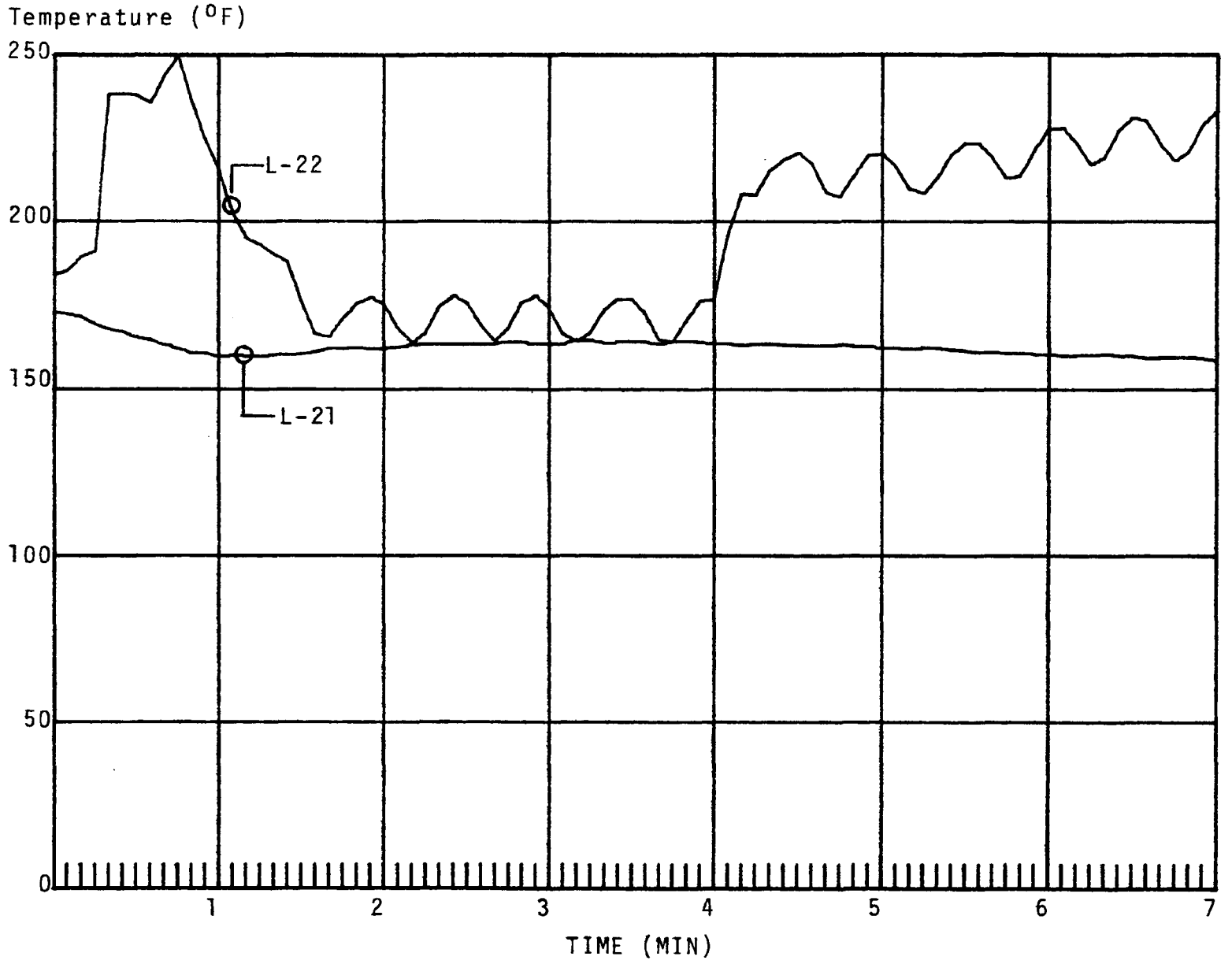
TEST 1511/1000 PSIA FW REV BDN
PUMP SEAL INJ LEAKAGE FLOW
PLOT NO.66



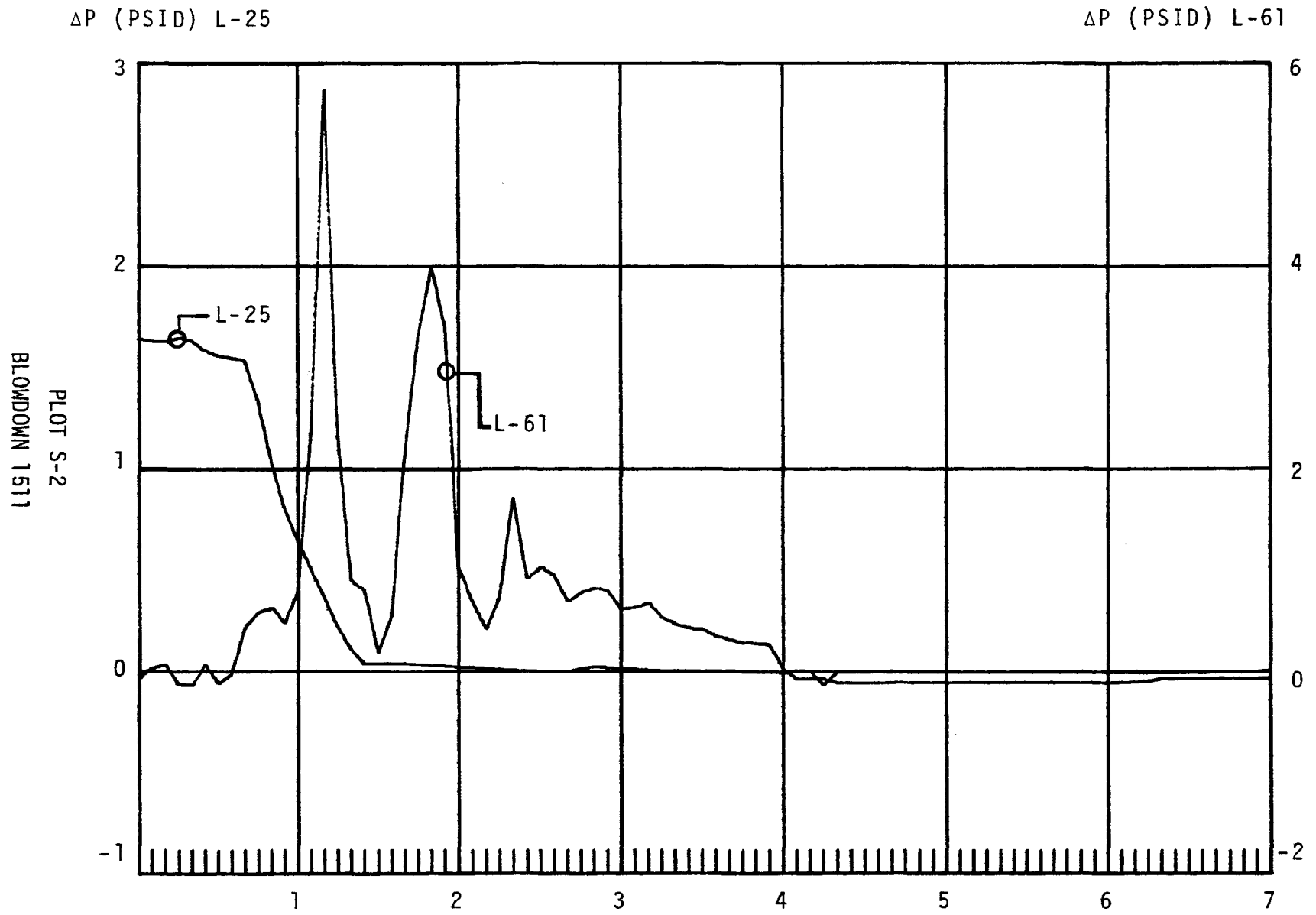
3-1140

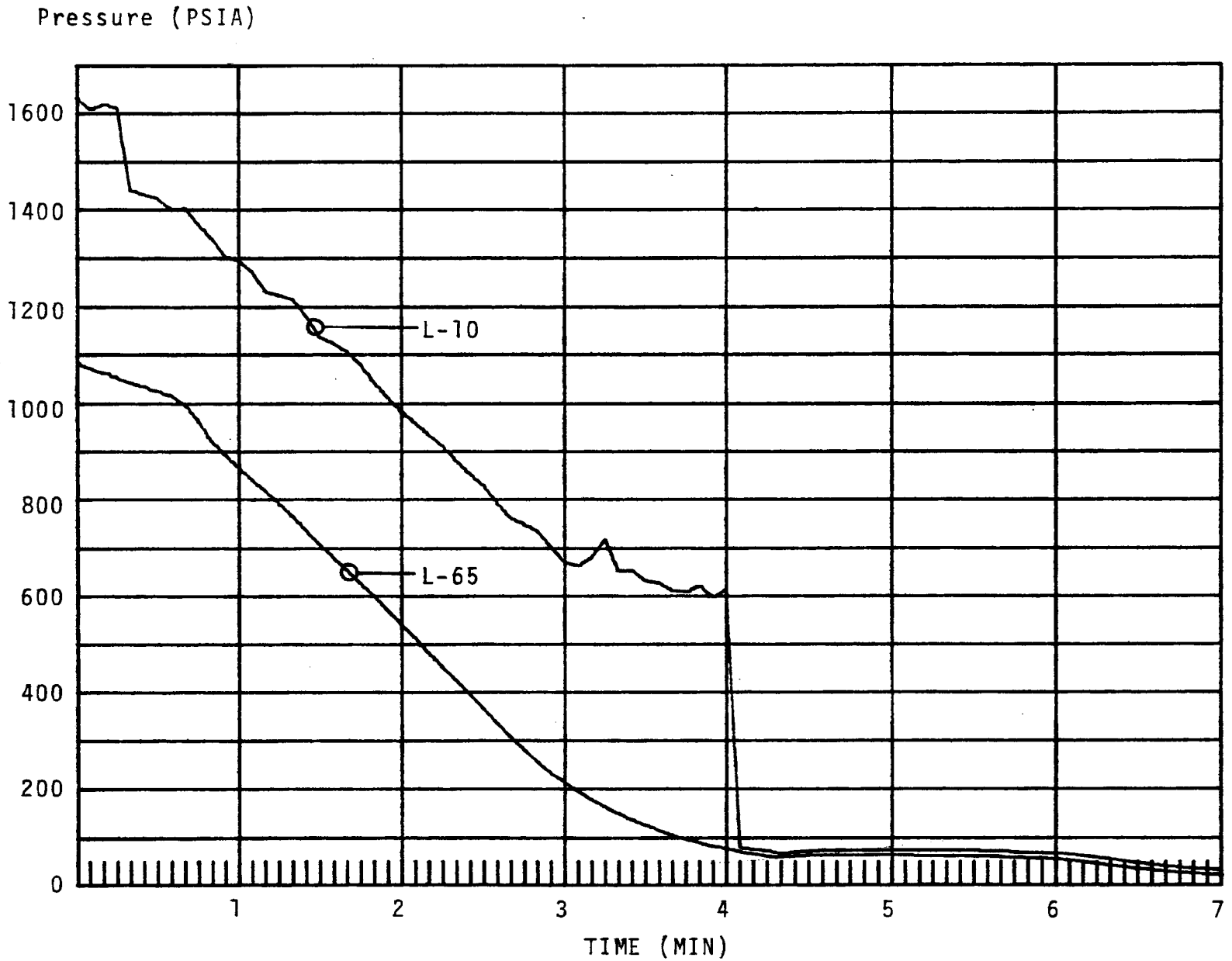
Index Listing
of
SCANNER DATA PLOTS
Test Number (1511)

Plot No.	Location Number	Description of Parameters
S-1	L-21	Pump Injection Inlet Thermocouple
	L-22	Pump Injection Outlet Thermocouple
S-2	L-25	High Pressure Drum Level ΔP Cell
	L-61	Suction Leg to Suction Flange ΔP Cell
S-3	L-10	Pump Injection Inlet Pressure Cell
	L-65	High Pressure Drum Pressure Cell
S-4	L-38	Main Water Orifice ΔP Cell
S-5	L-68	Pump Volute to Impeller Back ΔP Cell

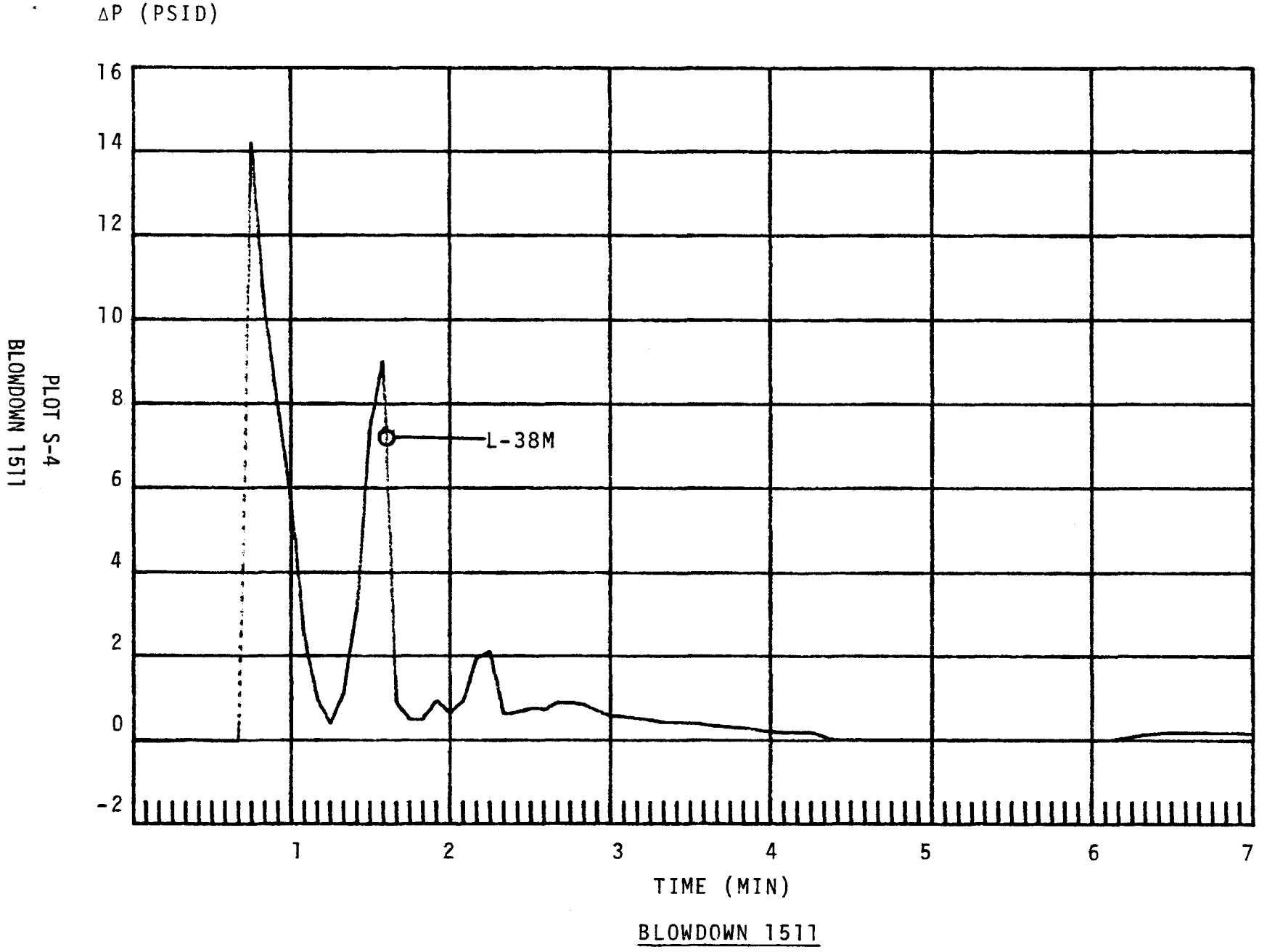


PLOT S-1
BLOWDOWN 1511

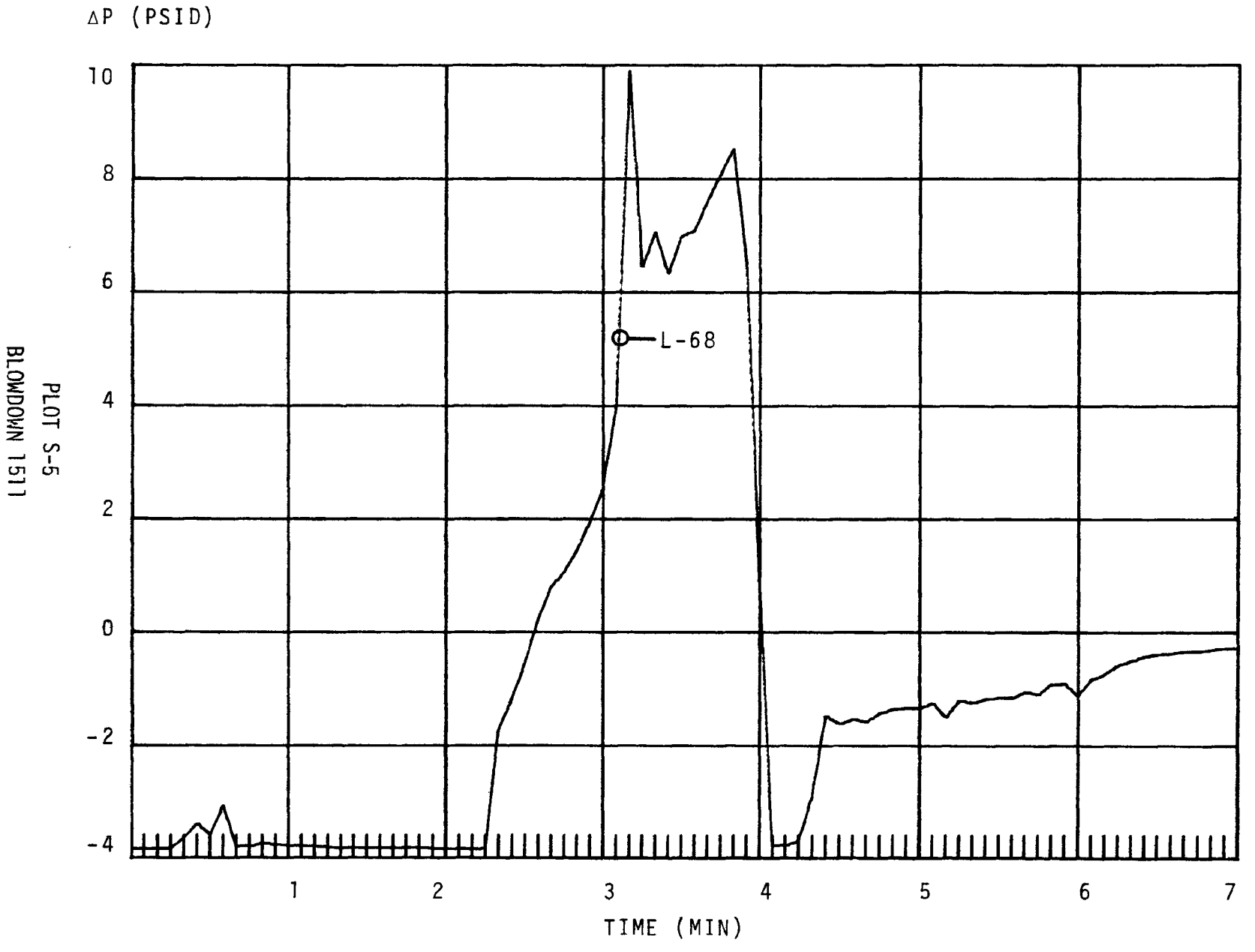

ΔP (PSID) L-25
ΔP (PSID) L-61
3
2
1
0
-1
6
4
2
0
-2
1
2
3
4
5
6
7
L-25
L-61
PLOT S-2
BLOWDOWN 1511



PLOT S-3
BLOWDOWN 1511



PLOT S-4
BLOWDOWN 1511



PLOT S-5
BLOWDOWN 1511

Appendix A

DESCRIPTION OF SCANNER DATA PLOTS

Plots were produced from data acquired by the data scanner during blowdowns. The maximum data scanning rate allowed the recording of each instrument output only once every five seconds. While this was considerably slower than the FM system, the scanner did have one significant advantage. The FM system was limited to 39 instrument inputs while the data scanner was capable of recording output from all 67 instruments. The 39 instruments recorded on the FM were carefully selected and provided the large majority of information required for the transient analysis. However, it became apparent that output from certain other devices might prove useful. These supplementary data were identified and the plots from their output appear in this section.

Table A-1 presents a list of the instruments selected for plotting. L numbers are the Location Numbers used to identify the exact location of the instrument on the test loop. Note that more than one instrument could be connected to a physical point on the loop but only one instrument could be connected to each scanner port. For example L-38 is the location of a pair of differential pressure taps at the main water orifice. Three differential pressure cells were connected to these taps. They were L-38L (low range ΔP cell), L-38M (medium range) and L-38H (high range). One of the latter two cells was selected for Plot S-4. For a further discussion of instrumentation, see Section 4 of Volume VII, Test Facility Description.

Table A-1

INSTRUMENTS SELECTED FOR SCANNER PLOTS

L Number	Instrument Description
Plot S-1	
L-21	Pump Injection Inlet Thermocouple
L-22	Pump Injection Outlet Thermocouple
L-50[a]	Main Water Orifice Thermocouple
Plot S-2	
L-25	High Pressure Drum Level ΔP Cell
L-61	Suction Leg to Suction Flange ΔP Cell
Plot S-3	
L-10	Pump Injection Pressure Cell
L-65	High Pressure Drum Pressure Cell
Plot S-4	
L-38	Main Water Orifice ΔP Cell
Plot S-5	
L-68	Pump Volute to Impeller Back ΔP Cell

[a] L-50 is plotted for Phase I tests only. Additionally for Phase I tests, Plot S-1A is provided to present the temperature histories at L-21 and L-22 on an expanded vertical scale.

Each plot is briefly discussed below.

Plot S-1 The relative difference in temperature between the inlet and outlet injection streams was a good indication of what effects injection flow might have. The temperature at L-21, injection inlet temperature, indicated the feedwater temperature and remained relatively constant. The outlet injection stream was either a mixture of hot system water and cooler feedwater or all feedwater. If the outlet temperature measured at L-22 was the same as the inlet temperature at L-21 an inflow of cooler feedwater into the system was indicated. When the difference between the temperatures at L-22 and L-21 was greater than approximately 5°F, hot system water was flowing out the test pump leakoff. If this flow was excessive the temperature at L-22 rose to a temperature approaching that of the system. Steps were taken to prevent the temperature at L-22 from exceeding 212°F whenever possible. During blowdowns the feedwater pressure (L-10) was automatically controlled. The value of this pressure effected the injection flow and therefore the temperature at L-22.

The Phase I plots include the temperature at L-50, the main water orifice thermocouple, as well as at L-21 and L-22. Additionally, for Phase I tests, Plot S-1A is provided to present the histories of temperatures at L-21 and L-22 on an expanded vertical scale similar to that used in Plot S-1 for the Phase II tests.

Plot S-2 Two types of differential pressure cells are plotted on this graph. The initial water level in the high pressure drum may be calculated using the differential pressure labeled L-25 on this plot (See Section 2.3.1 of Volume VII, Test Facility Description). The differential pressure cell located at L-25 gives an indication of the rate at which the high pressure drum emptied and the time that the water level passed the bottom tap of the ΔP cell. This tap was located approximately 22 inches above the drum bottom.

The differential pressure cell at L-61 gives the pressure drop from the suction instrument spool to the test pump suction flange, and measured the pressure drop due to the instrument spool piece and suction pipe, including the two elbows in the suction piping.

Plot S-3 Two pressures are plotted on this graph. This pressure transducer at L-10 recorded the feedwater pressure and can be related to Plot S-1 to understand feedwater/leakoff variations during the transient. As noted in Section 2 of Volume III, various post-blowdown procedures were tried in Phase II testing. The effects of these procedures can be seen in Plots S-1 and S-3 for the same Phase II tests. Shutting off the test pump injection flow caused the pressure at L-10 to drop to system pressure because this pressure cell was located on the downstream side of the test pump manual injection flow valve. Shutting off the injection flow to the booster pumps while the test pump injection was on usually caused a noticeable rise in the pressure at L-10. For example, see Plot S-3 of Blowdown 1351. In this figure the pressure at L-10 maintained a fairly constant differential until time 2:25 when it made a sharp rise due to the shutoff of the booster pump injections. At time 3:05 the test pump injection was shut off and the pressure at L-10 follows system pressure from this point on.

The pressure at L-65 is the pressure at the high pressure drum.

Plot S-4 The main water orifice ΔP cell is plotted in this figure. Either L-38M or L-38H was selected depending on the range of values attained during the transient. This plot provided information on flow through the main water orifice. Care should be used in applying the plotted data because two-phase conditions existed at the orifice during some part of each transient.

Plot S-5 The differential pressure at L-68 is included in this package of plots because it was felt that it might contribute some useful information on conditions inside the pump during transient operation. The transducer at L-68 measured the differential pressure between a tap located in the discharge volute of the test pump and a tap immediately behind the impeller. This latter tap was located in the injection/leakoff area. In blowdown 1267 this cell appears to have saturated at about four mintues.

All plots presented in this section were produced with the program "TP4TPT" which is described in Volume VIII, Data Processing Methods. Each value is plotted

at five-second intervals with whole minutes marked by vertical lines. All plots begin at the time the data scanner was started.

The approximate time of rupture of the disc assembly relative to the events on other scanner plots may be estimated from L-65 of Plot S-3 for each test.