MCR-79-560
Contract NAS9-15302

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Volume II

Interim Report

May 1979

1/10 Scale Model Test Data

Analysis and Test for Space Shuttle Propellant Dynamics (1/10th Scale Model Test Results)

(NASA-CR-160245) ANALYSIS AND TEST FOR SPACE SHUTTLE PROPELLANT DYNAMICS (1/10TH SCALE MODEL TEST RESULTS). VOLUME 2: 1/10TH SCALE MODEL TEST DATA Interim Report, May 1978 - May 1979 (Martin Marietta Corp.) HC A18/MF A01 G3/28 N79-25241 Unclas 23410

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MCR-79-560
Contract NAS9-15302

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May 1979

1/10 Scale Model Test Data

ANALYSIS AND TEST FOR SPACE SHUTTLE PROPELLANT DYNAMICS (1/10th SCALE MODEL TEST RESULTS)

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FOREWORD

This report, prepared by the Martin Marietta Corporation, Denver Division, under contract NAS9-15302, presents the results of an analytical and experimental study of Space Shuttle propellant dynamics during ET/Orbiter separation in the RTLS (return to launch site) mission abort sequence. The study employed a 1/10th scale model of the ET LOX tank. The study was performed from May 1978 to May 1979 and was administered by the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, under the direction of Mr. Mark Craig.

This report is published in two volumes:

Volume I Technical Discussion
Volume II 1/10 Scale Model Test Data

In addition to this report, a high speed 16 mm movie has been produced which documents the test results.

ABSTRACT

This report presents the results of Phase II of an experimental investigation of Space Shuttle propellant dynamics during ET/Orbiter separation in the RTLS (return to launch site) mission abort sequence. This phase (II) of the study employed a 1/10th scale model of the ET LOX Tank. Phase I employed a 1/60th scale model and the results are summarized in Reference 1. During the RTLS abort sequence, the ET and orbiter separate under aerodynamic loading, with propellant remaining in the ET. The separation event includes a seven second decelerating coast period during which the residual propellant accelerates relative to the ET/orbiter. At separation, ET clearance is primarily provided by aerodynamics acting on the ET to move it away. The motion of the propellant, primarily LOX, significantly influences the resulting ET motion and could cause the ET to recontact the orbiter. A test program was conducted in the NASA KC-135 "Zero G" aircraft using a 1/10th scale model of the ET LOX Tank. Low g parabolas were flown from which thirty tests were selected for evaluation. The objective was to acquire data on the nature of low g propellant reorientation, in the ET LOX Tank, and to measure the forces exerted on the tank by the moving propellant. The data will provide a basis for correlation with an analytical model of the slosh phenomenon in Phase III of this contract.

SCOPE

Thirty sets of test data were selected from the 89 "Low G" aircraft tests flown by the NASA KC-135 "Zero G" aircraft. The list of selected tests with their accompanying test conditions are delineated in Table A-1. The data for each test consists of two major parts: (1) the time history plots of digitalized data (in engineering units), and (2) the time history plots of the load cell data transformed to the tank axis system. The transformed load cell data was developed for future analytical comparisons. Therefore, this data was transformed and plotted from the time at which the aircraft Z axis acceleration passed through 1g. There are 14 time history plots per test condition. Table A-2 delineates the contents of each plot.

TABLE A-1. TESTS SELECTED FOR ANALYTICAL CORRELATION

Test Number	Liquid	Baffles	Acceleration (G)	Orientation (Deg)	Fill Volume (%)
1.0-1	EMPTY	NO	0.1	13	0
1.1-3	FREON 113		0.2		5
1.2-2					10
1.3-3					15
1.4-1			0.1		5
1.5-3					10
1.6-3					15
2.1-3		YES			1
2.2-3					5
2.3-3					10
2.4-2					15
2.5-3			0.2		1
2.6-3					3
2.7-2					10
2.8-2					15
3.1-1				30	1
3.2-2					5
3.3-2					10
3.4-3					15
3.5-3				0	10
3.6-2				0	5
4.1-3	WATER		0.1	13	2
4.2-3					5.5
4.3-2					10
4.4-2					16
4.5-1					25
4.6-1			0.2		2
4.7-2					5.5
4.8-1					10
4.9-3					16

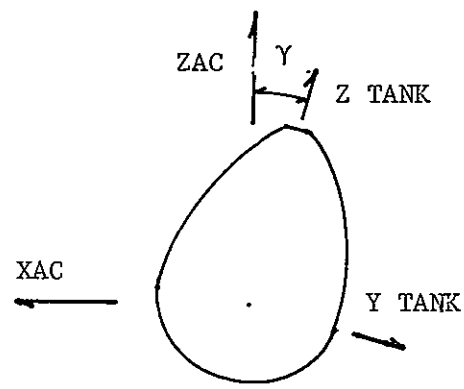
TABLE A-2. DESCRIPTION OF TIME HISTORY PLOT DATA

Plot Vertical Axis Parameter (1)		Description
LOAD V1 LB	-	Vertical Load Cell, F1 (Pounds)
LOAD V2 LB	-	Vertical Load Cell, F2 (Pounds)
LOAD H1 LB	-	Horizontal Load Cell, F3 (Pounds)
AY G	-	Aircraft Y Acceleration (g's)
10AX G	-	Aircraft Fine X Acceleration (g's)
AZ G	-	Aircraft Z Acceleration (g's)
10AZ G	-	Aircraft Fine Z Acceleration (g's)
Time Pulse	-	Film Synchronization Pulse (on/off) (2)
Z-Load	-	Tank Axis System Z Force (Pounds) (3)
Y-Load	-	Tank Axis System Y Force (Pounds)
Moment	-	Tank Axis X Moment (inch-pounds)
AC YAC	-	Aircraft Y Acceleration Measured from time of one-g (g's)
AC XAC	-	Aircraft X Acceleration Measured from time of one-g (g's)
AC ZAC	-	Aircraft Z Acceleration Measured from time of one-g (g's)

(1) The Horizontal Axis of each plot is time in seconds.

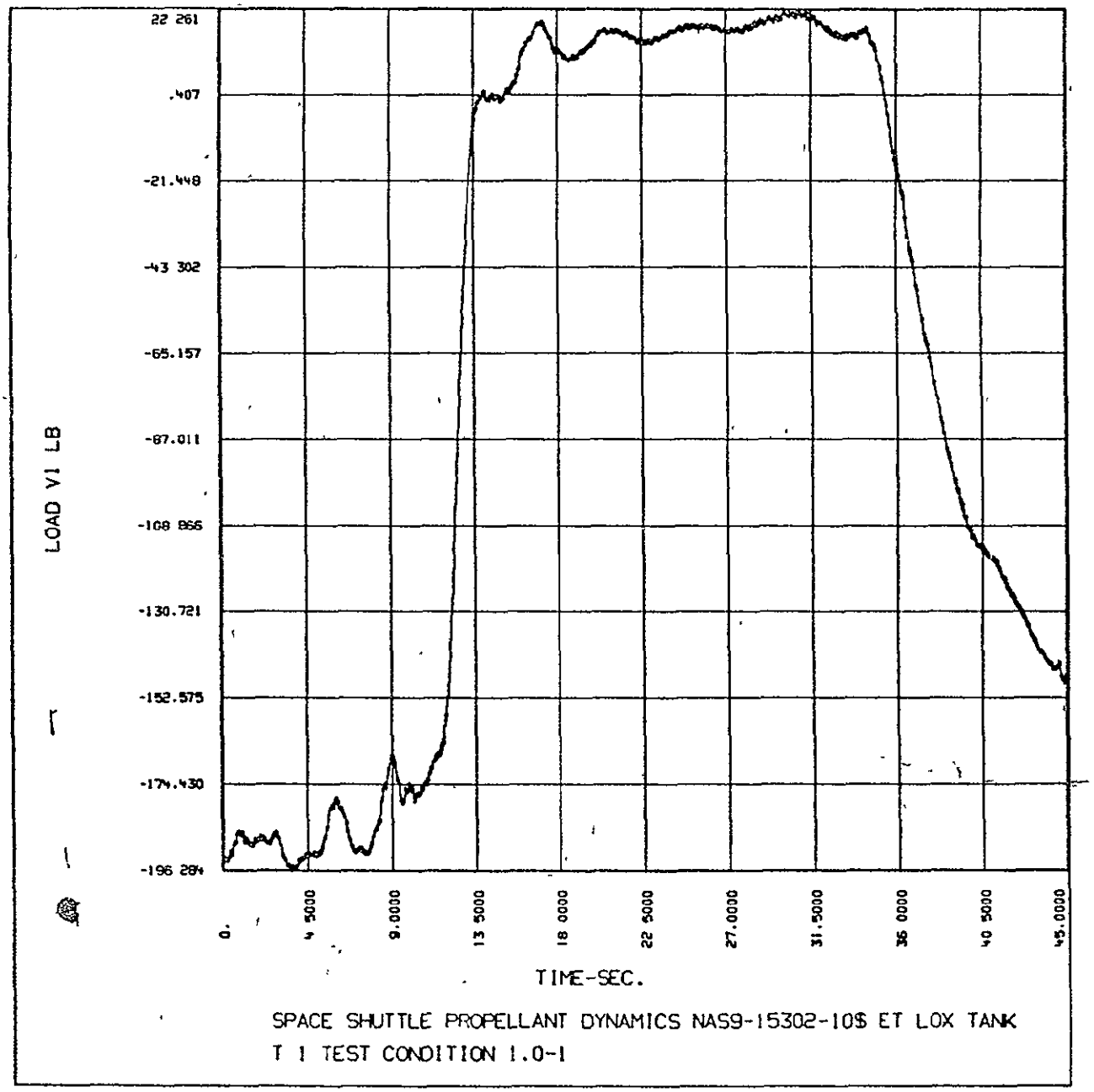
(2) Timing signal normally at a positive voltage. A negative voltage spike indicates a timing mark which corresponds to test fixture synchronization lights "on" in the film data.

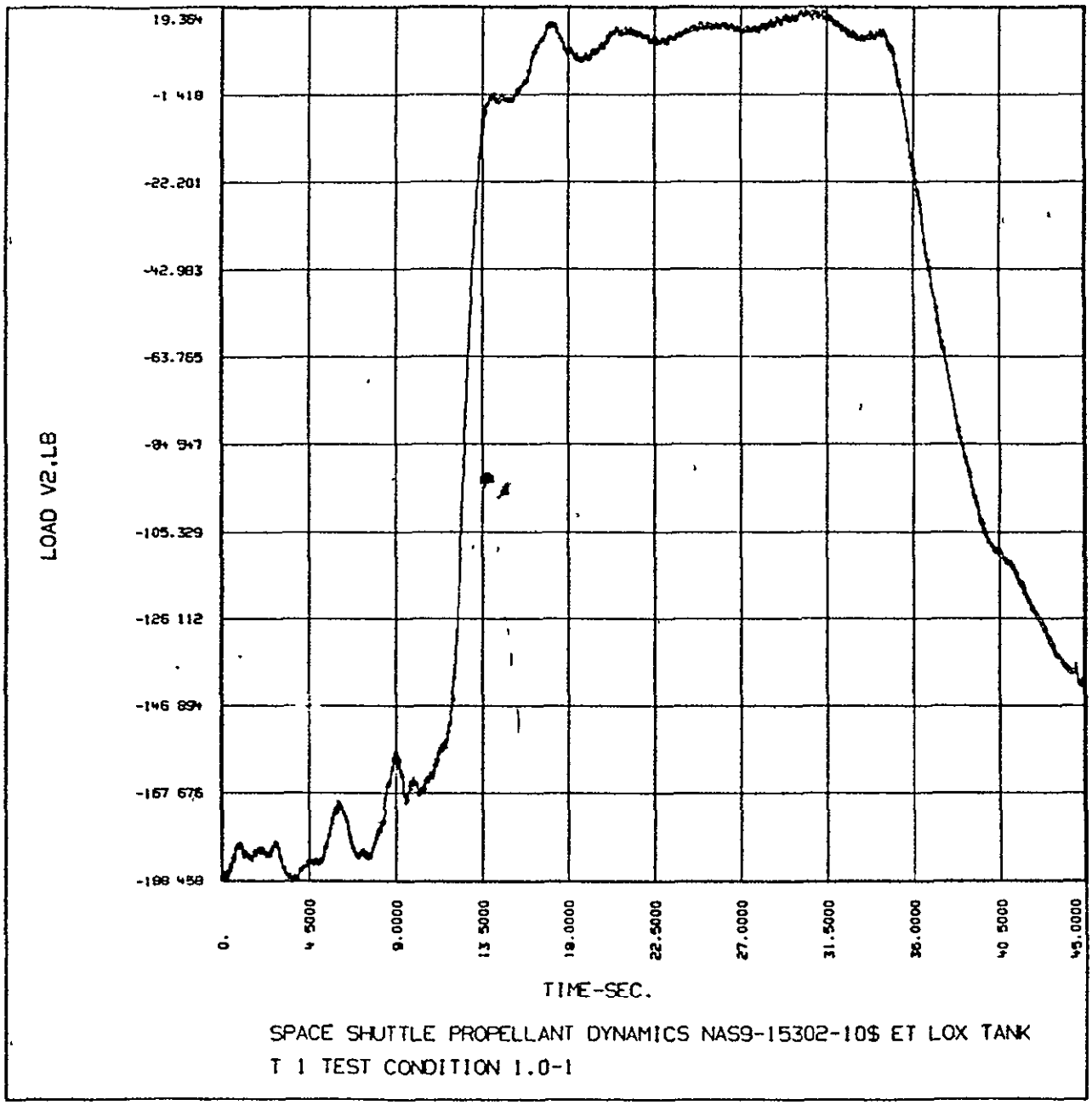
(3)



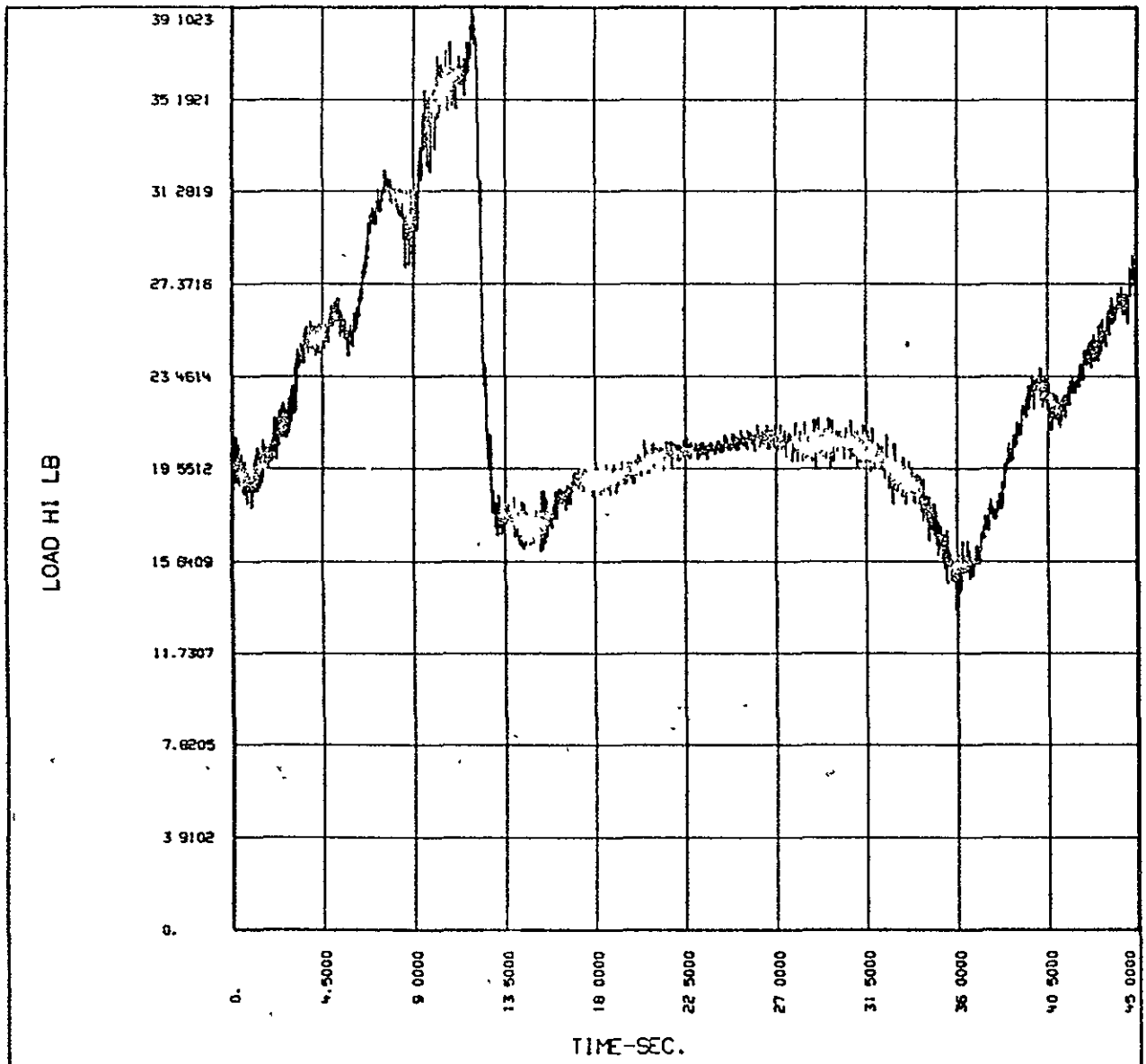
Test Data Condition 1.0-1

No Baffles
Test Fluid — N/A
Orientation — 13°
Fill Volume — 0%
Target Acceleration—0.2 g

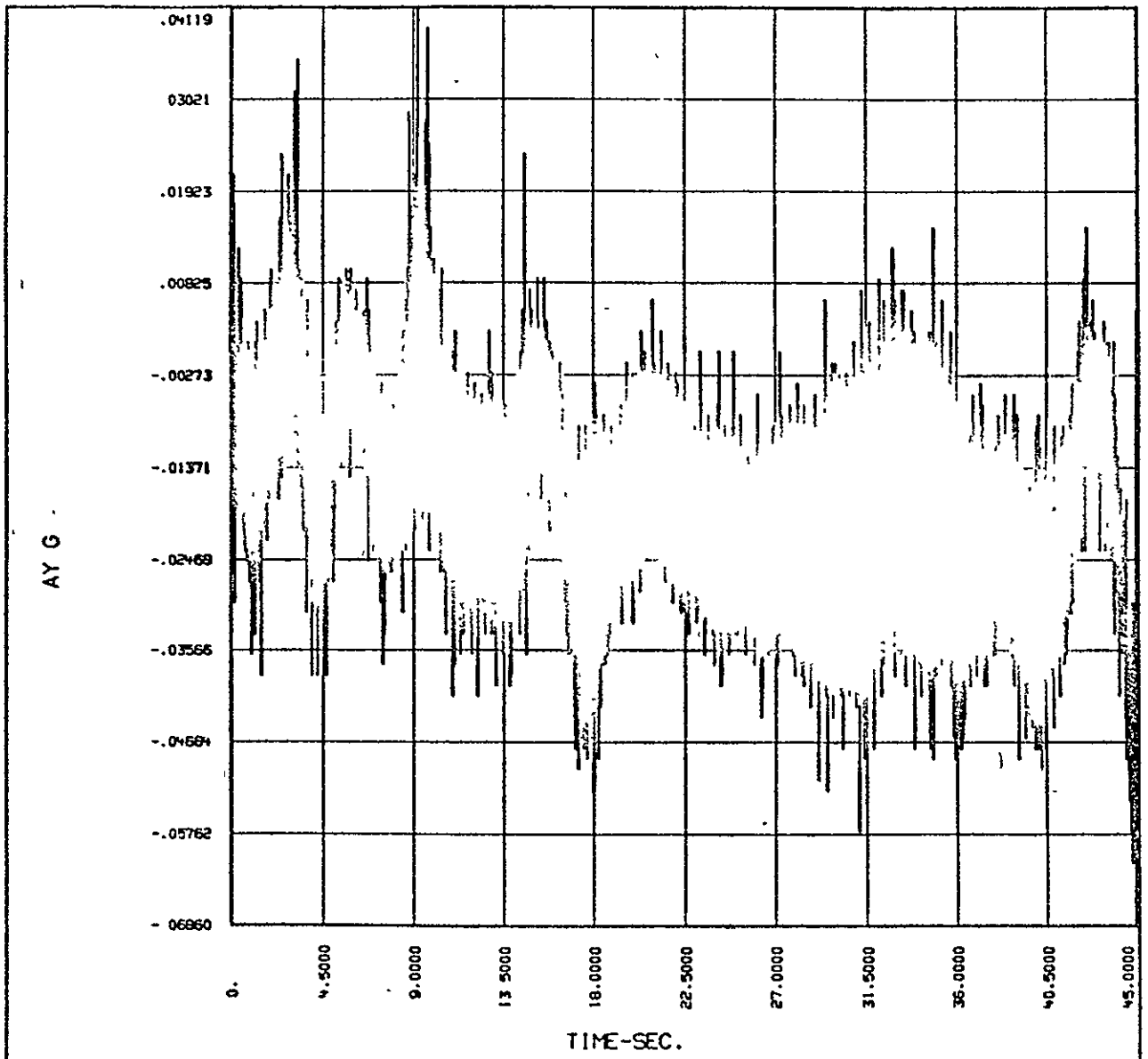

22 261
.407
-21.448
-43 302
-65.157
-87.011
-108 866
-130.721
-152.575
-174.430
-196 284
LOAD V1 LB
0.
4 5000
9.0000
13 5000
18 0000
22 5000
27.0000
31.5000
36 0000
40 5000
45.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.0-1



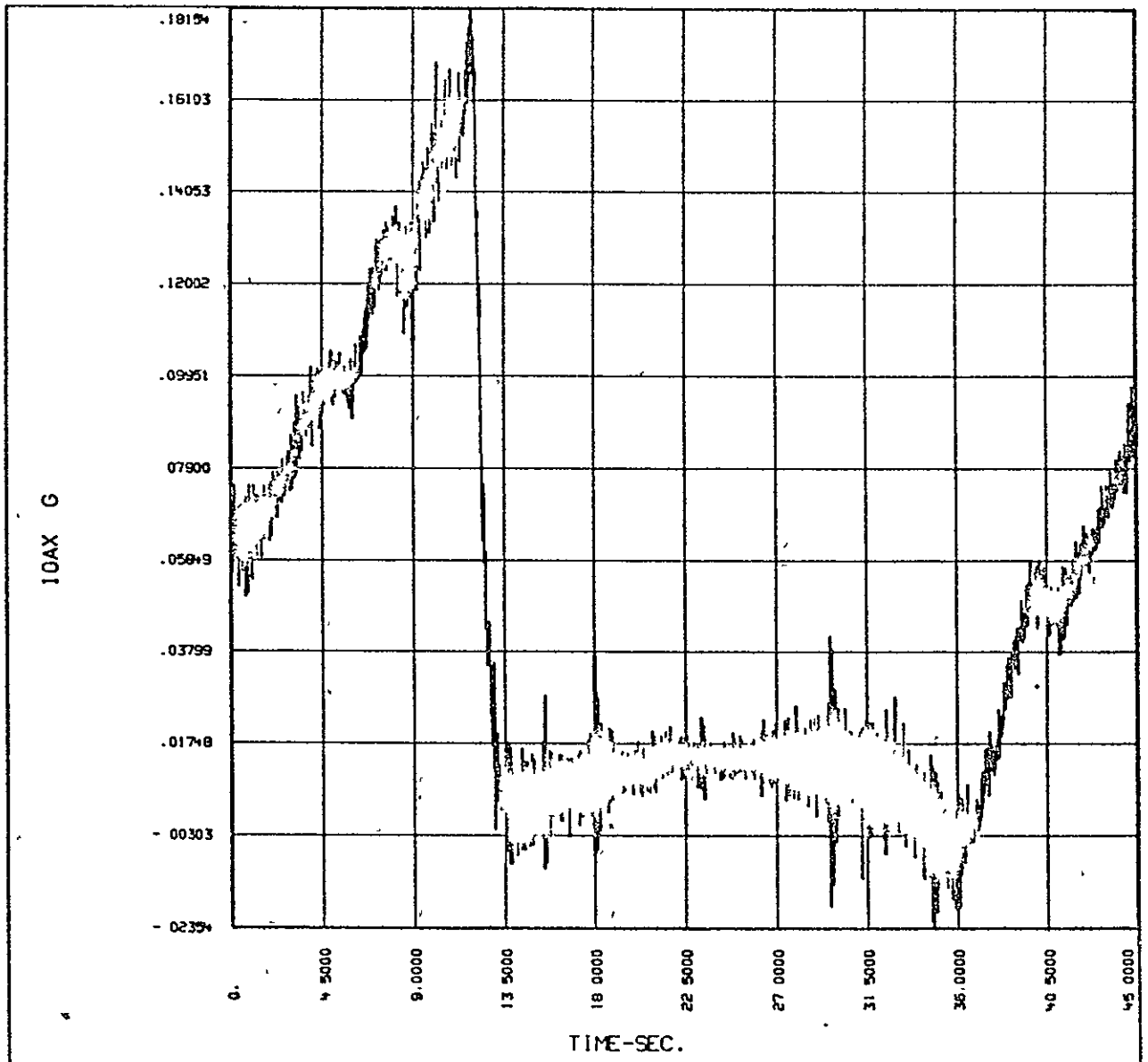
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.0-1



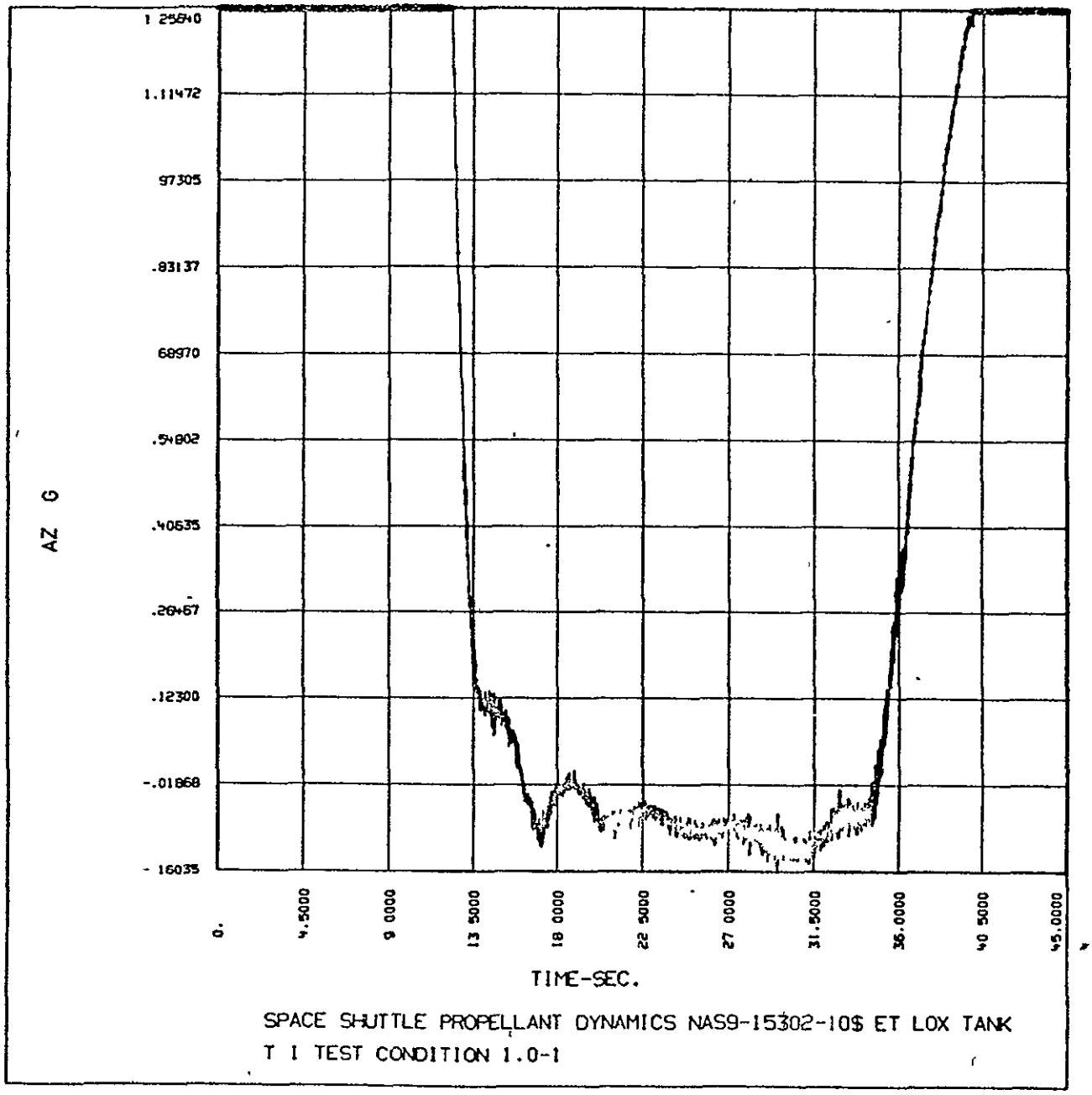
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.0-1

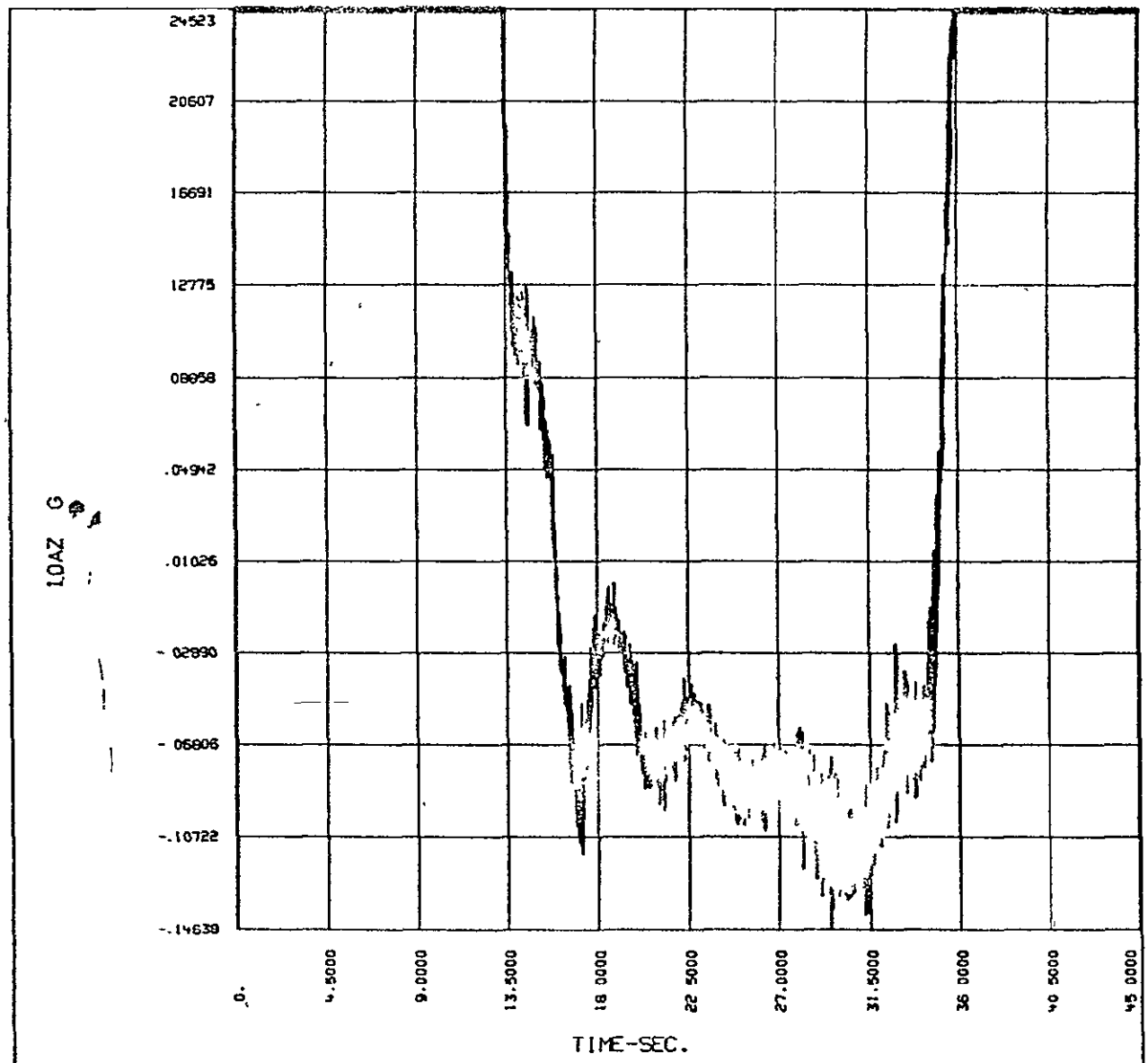


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.0-1

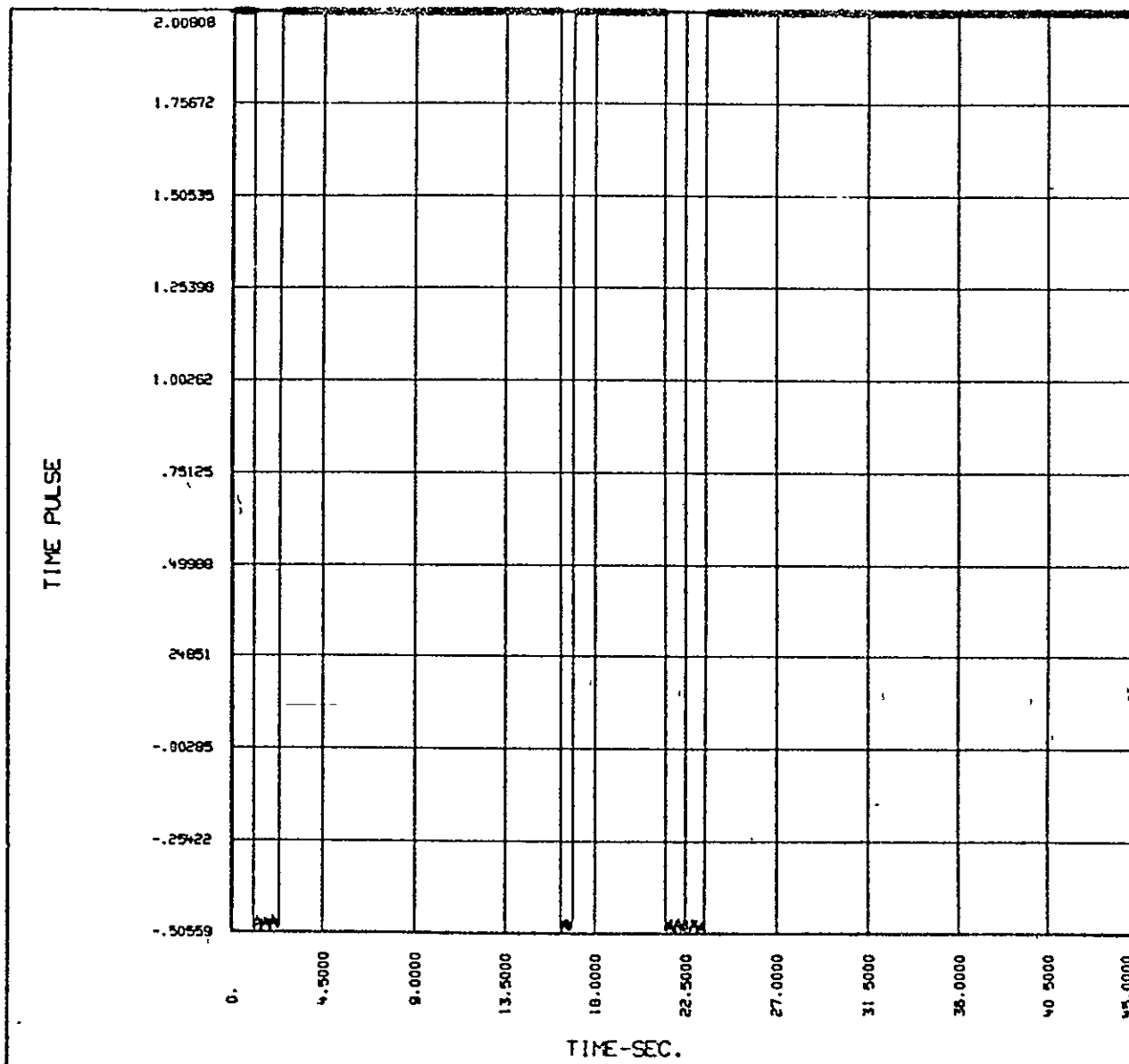


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.0-1

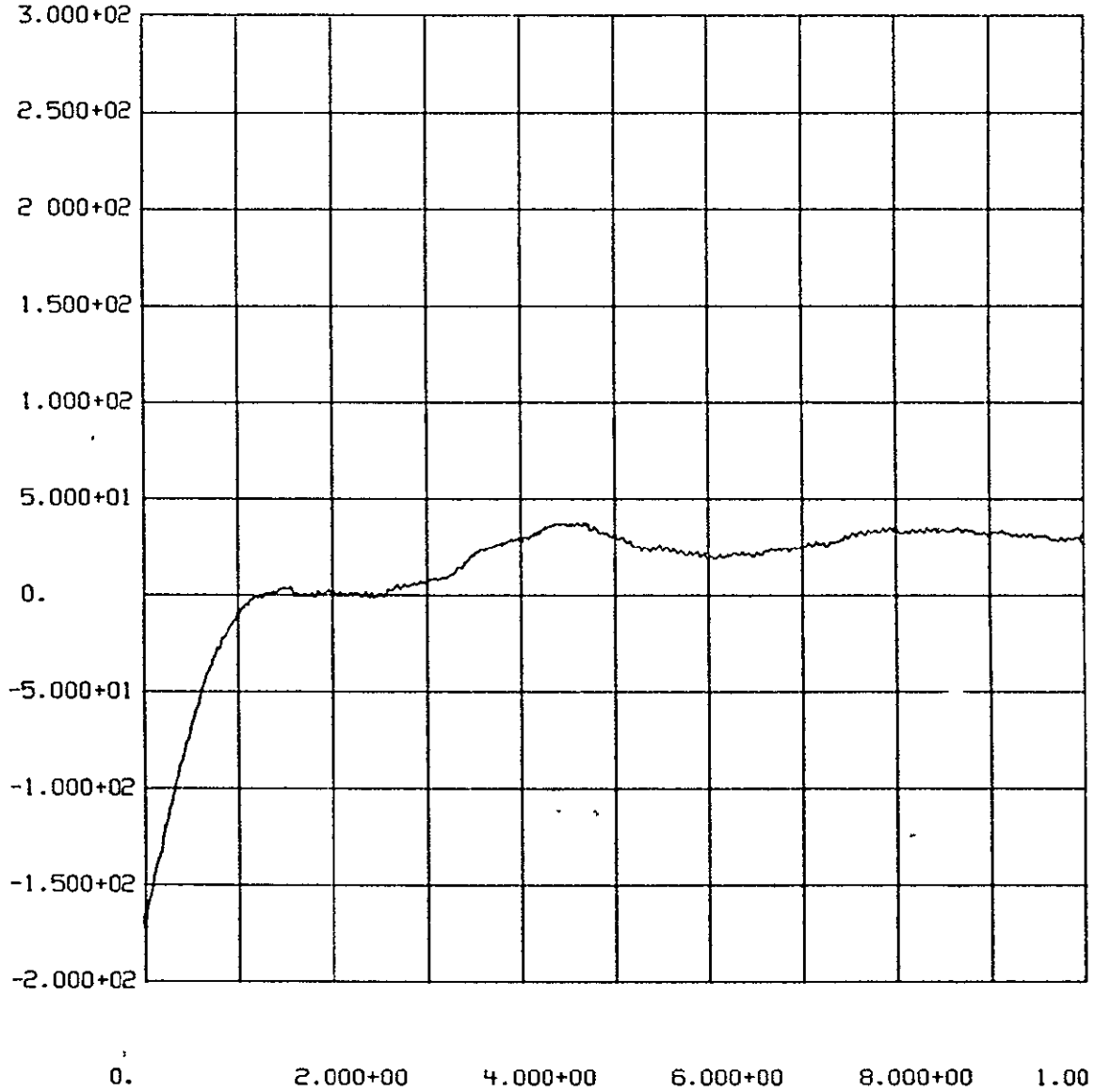

1 25640
1.11472
97305
.83137
68970
.54802
.40635
.26467
.12300
-.01868
- 16035
AZ G
0.
4.5000
9 0000
13 5000
18 0000
22 5000
27 0000
31.5000
36.0000
40 5000
45.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T I TEST CONDITION 1.0-1



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.0-1

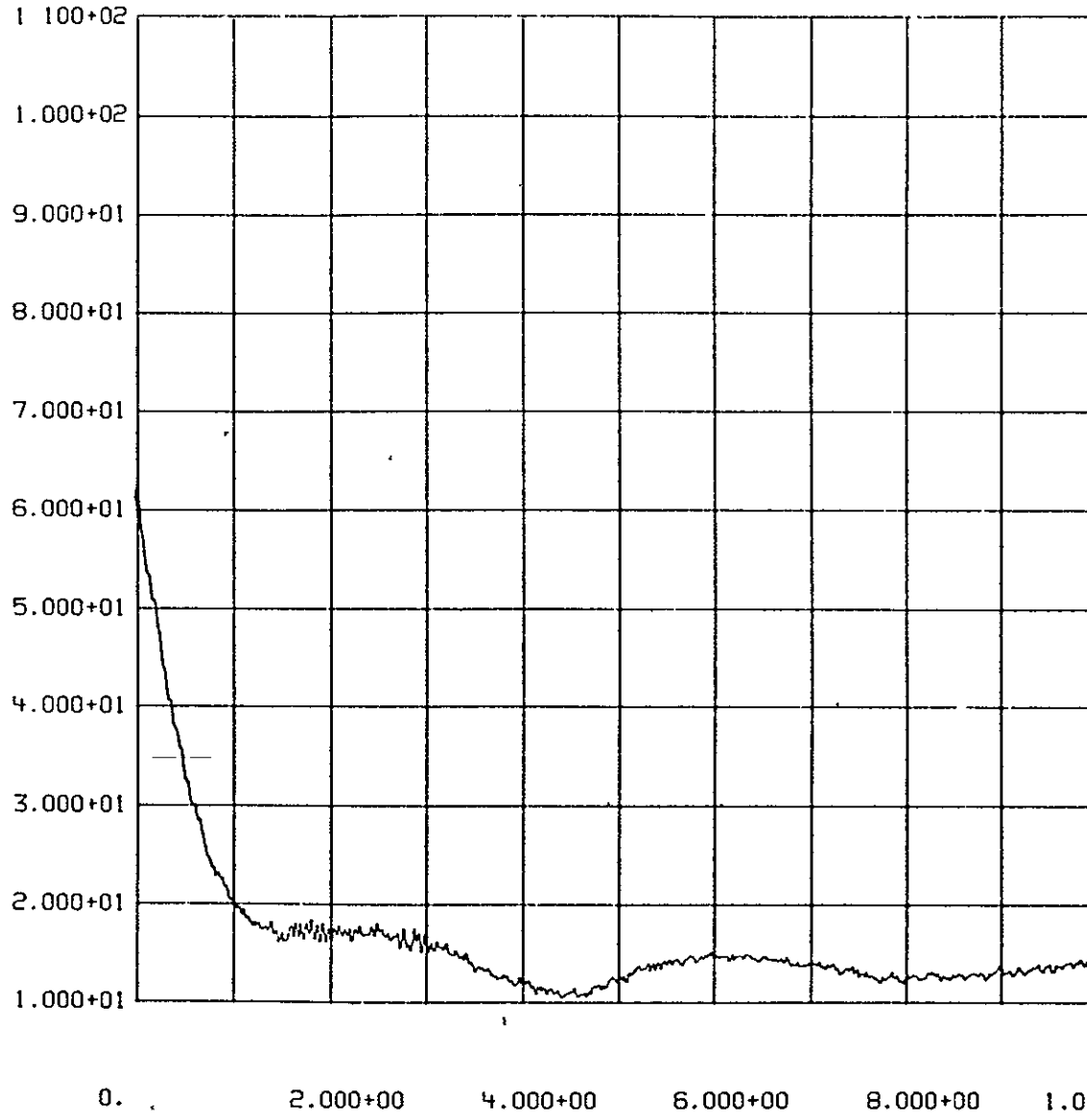


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.0-1



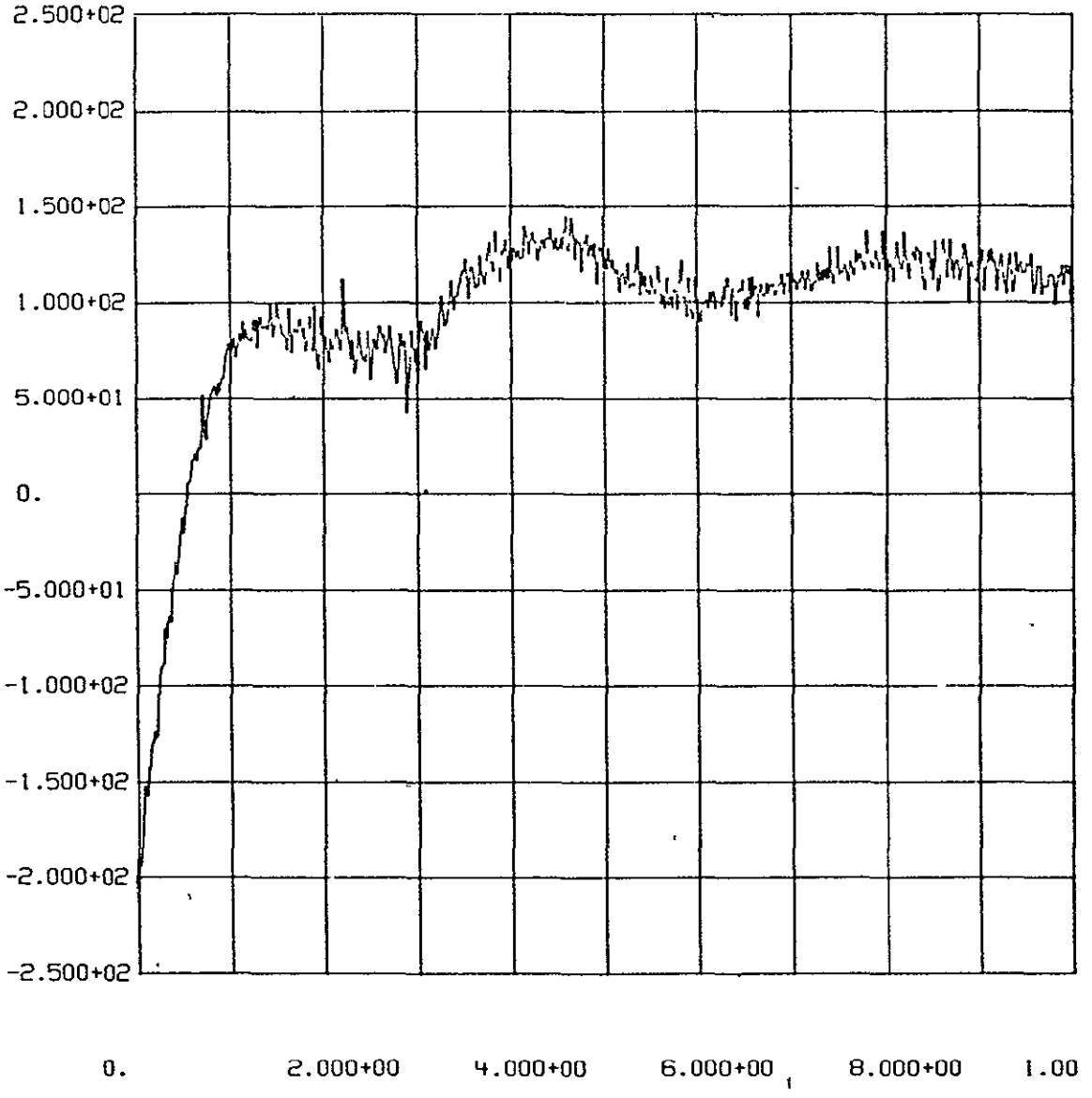
Z-LOAD VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.0-1 *UNFILT*



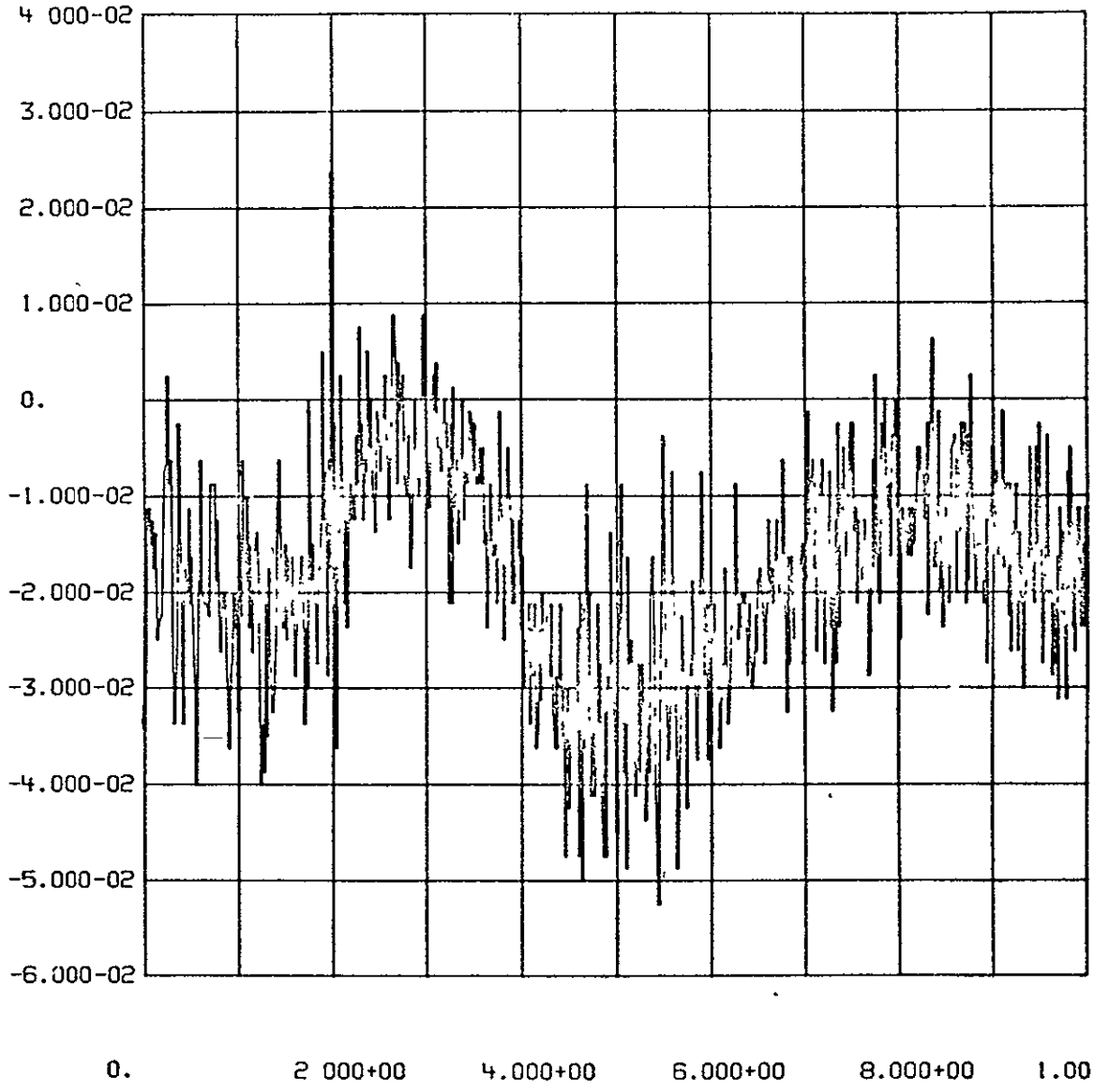
Y-LOAD VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.0-1 *UNFILT*



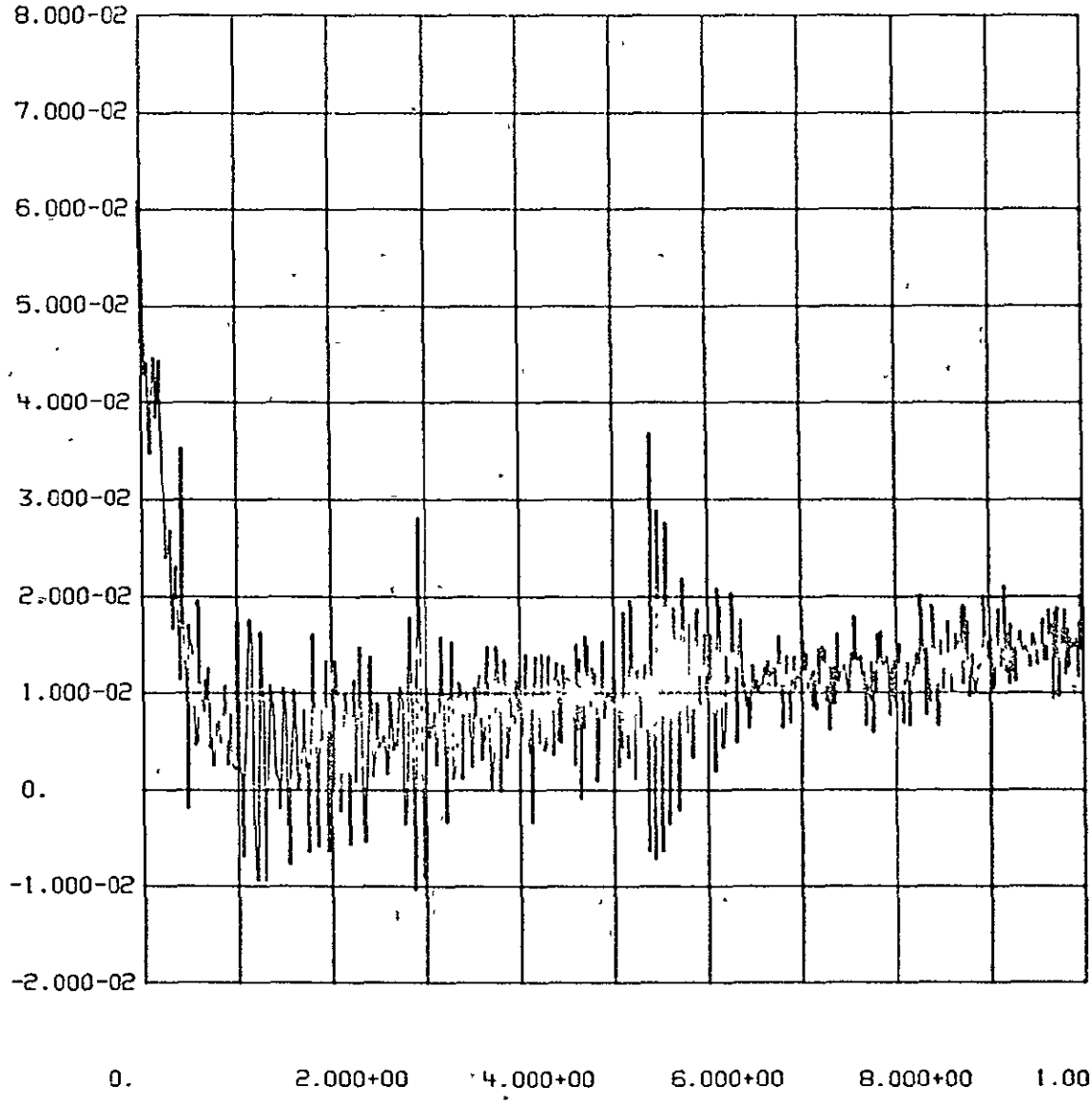
MOMENT VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.0-1 *UNFILT*



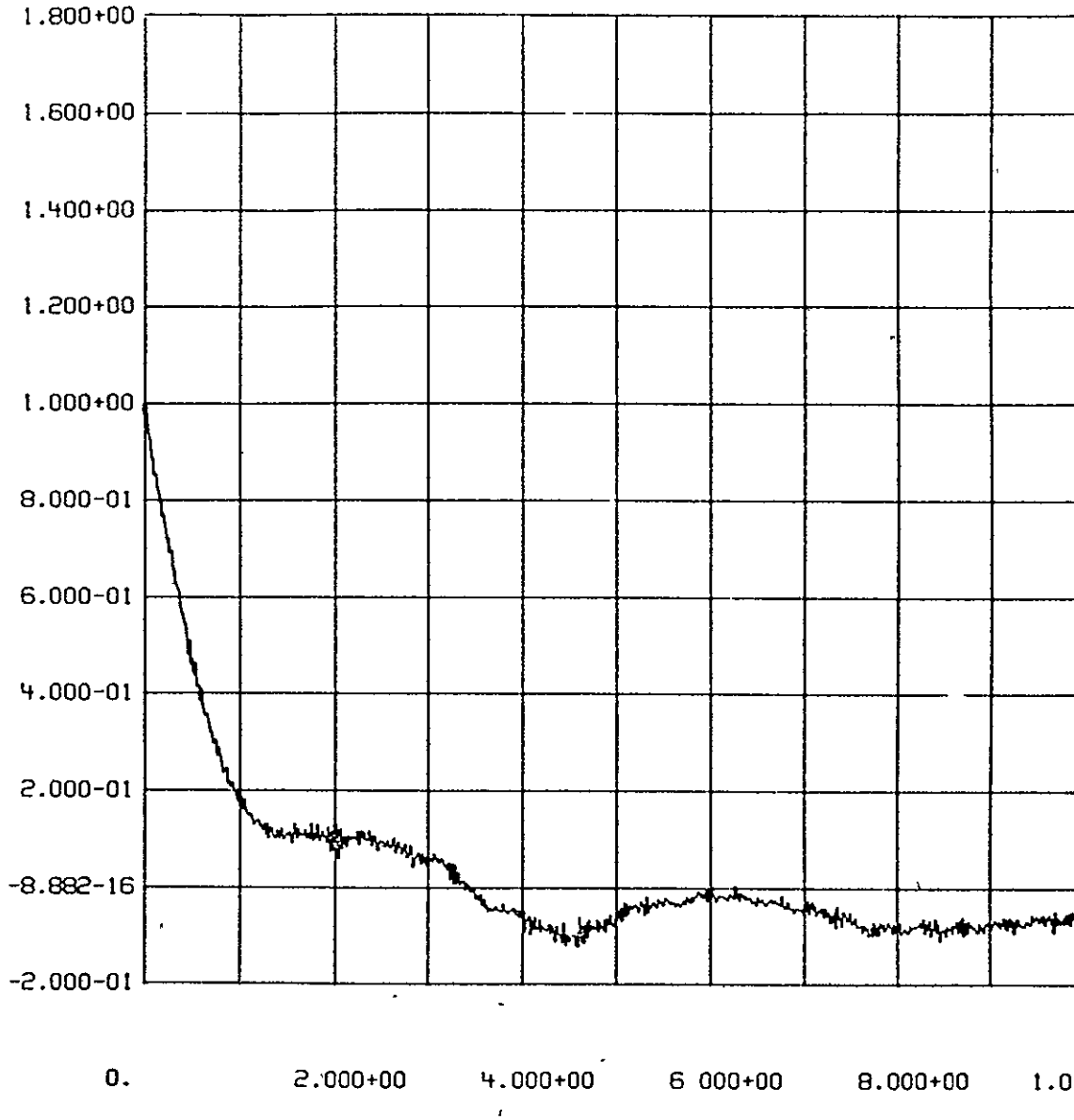
AC YAC VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.0-1 *UNFILT*



AC XAC VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.0-1 *UNFILT*

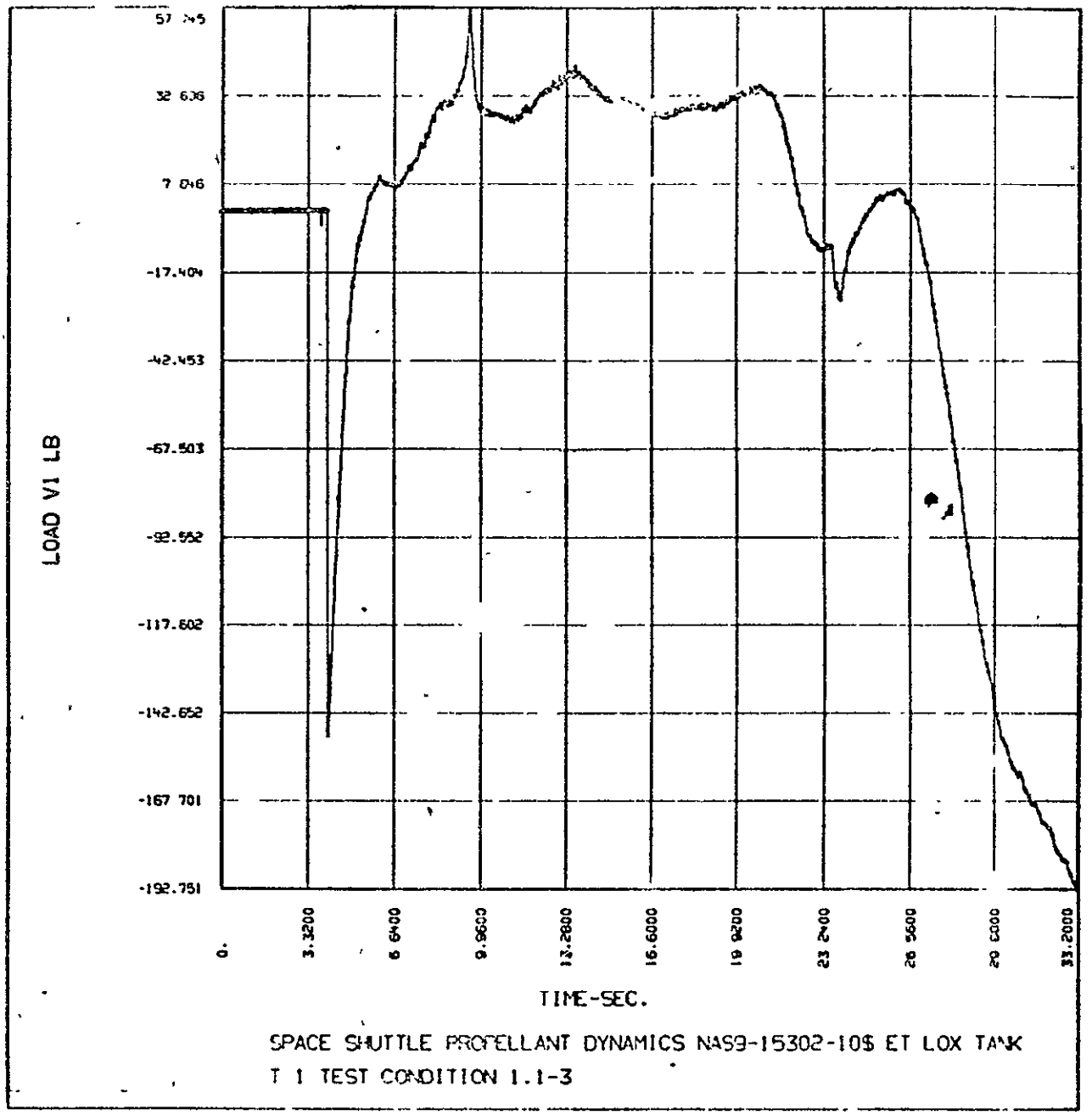


AC ZAC VS TIME

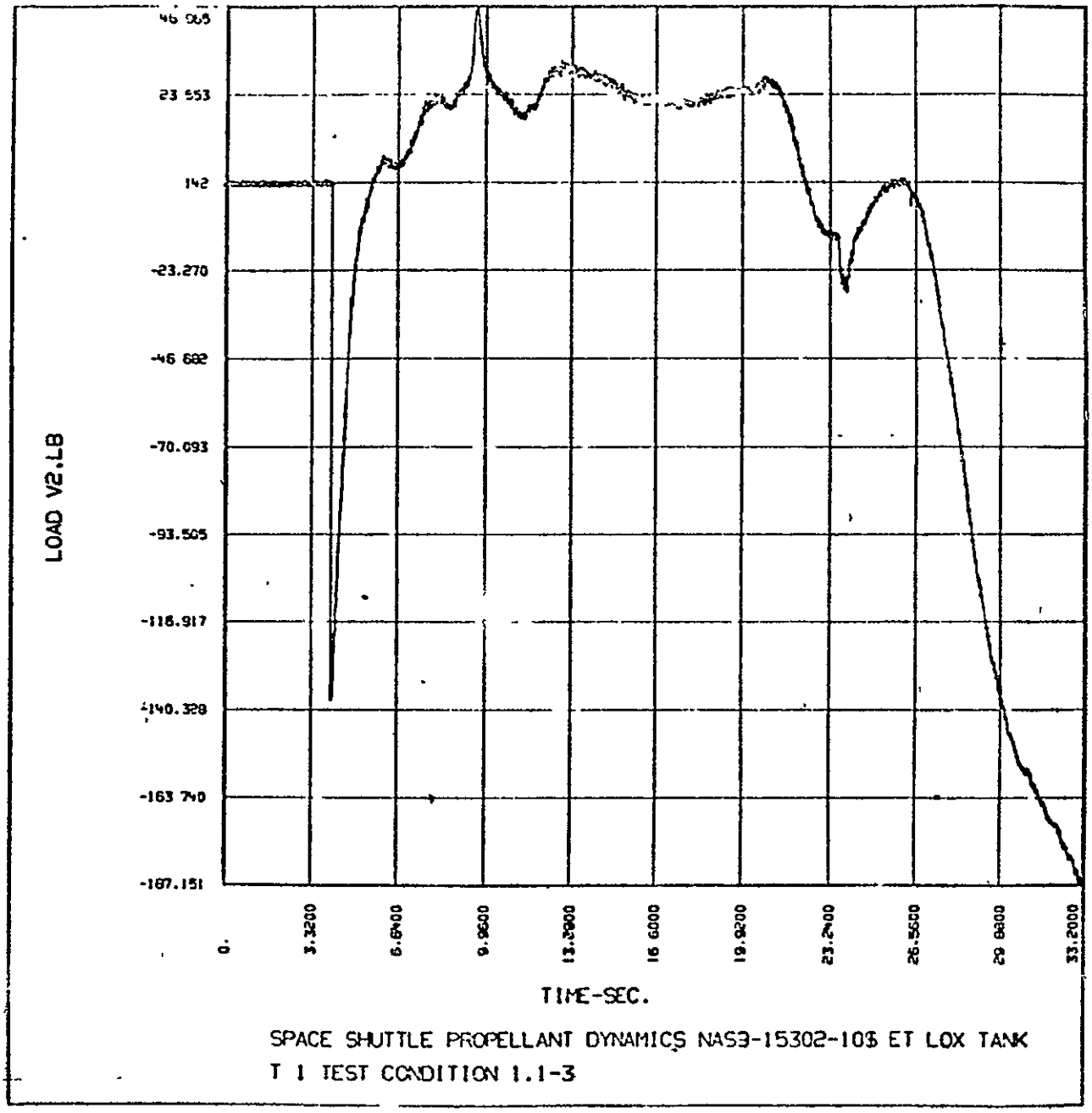
1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.0-1 *UNFILT*

Test Data Condition 1.1-3

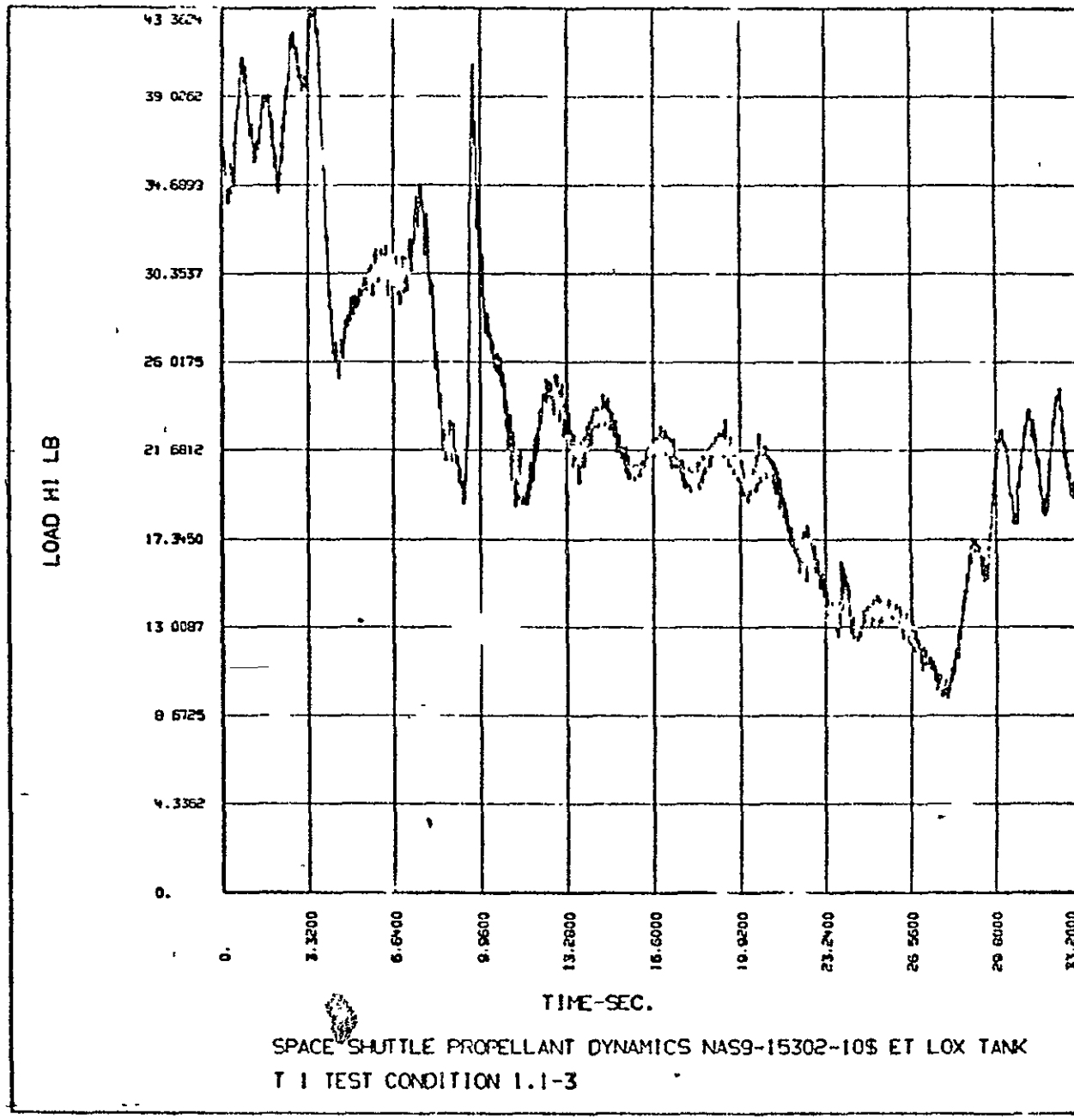
No Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 5%
Target Acceleration–0.2 g



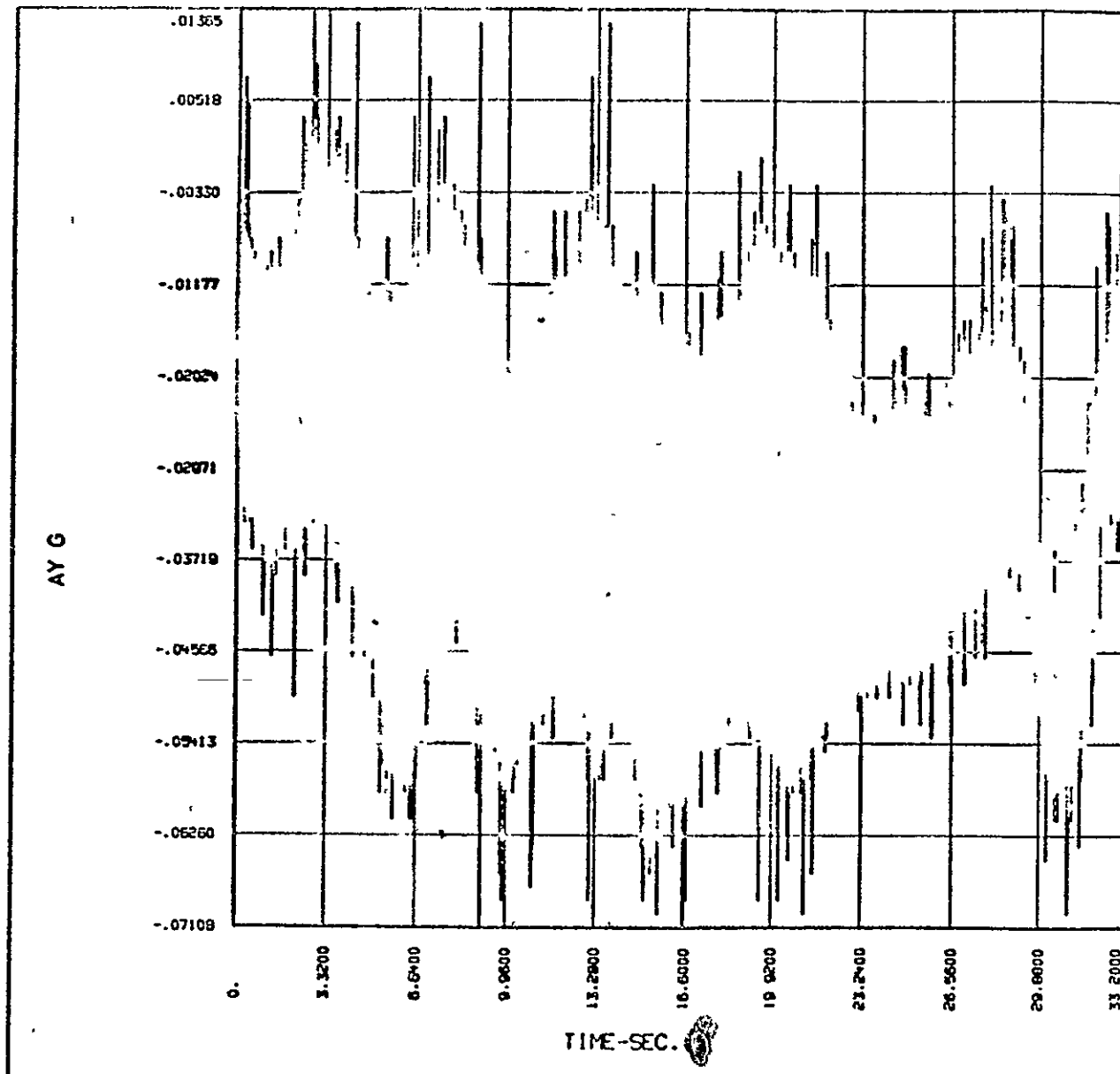
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.1-3


LOAD V2,LB
46.985
23.553
142
-23.270
-46.682
-70.093
-93.505
-116.917
-140.328
-163.740
-187.151
0.
3.3200
6.6400
9.9600
13.2800
16.6000
19.9200
23.2400
26.5600
29.8800
33.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS3-15302-103 ET LOX TANK
T 1 TEST CONDITION 1.1-3

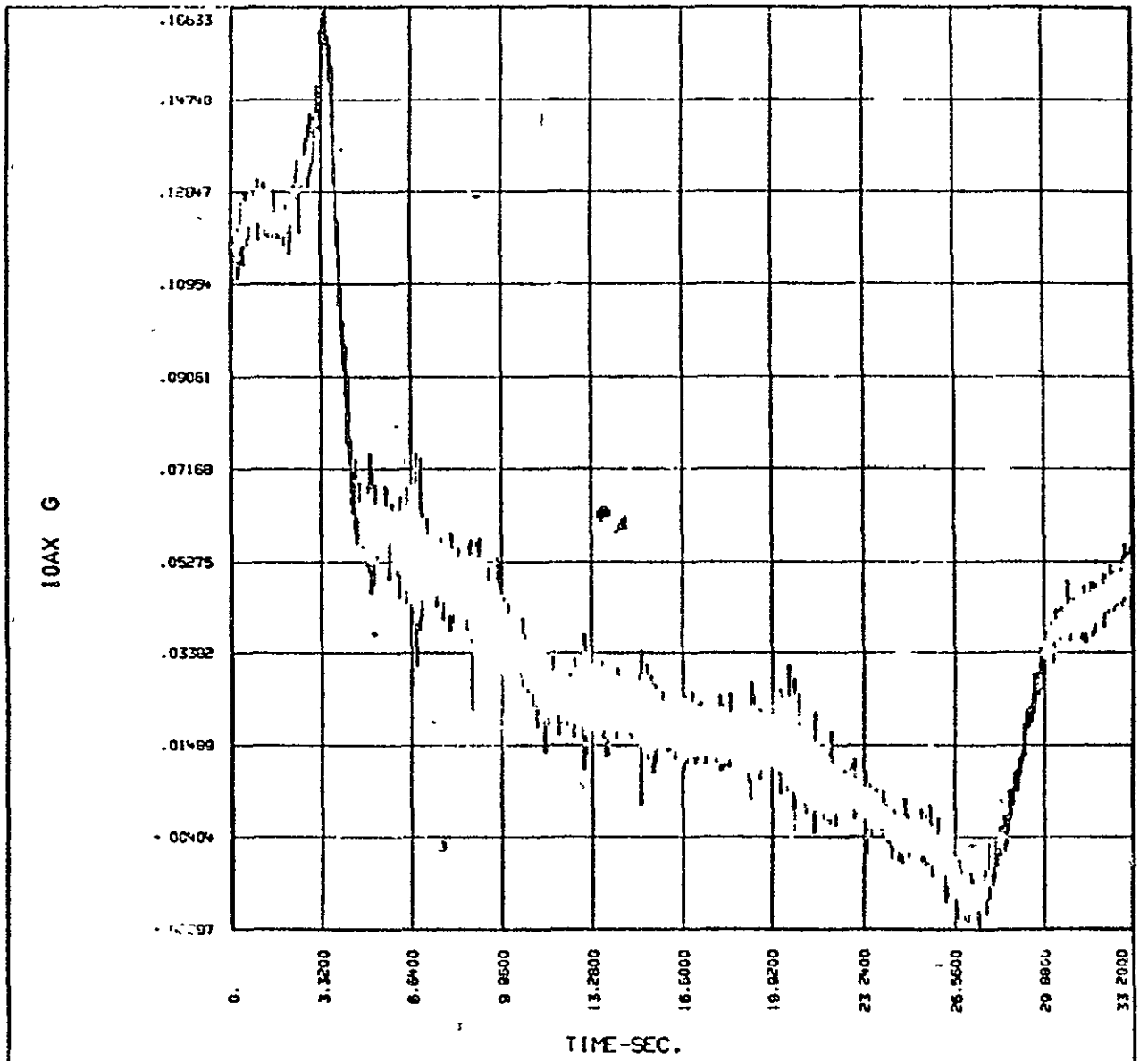
12


LOAD H1 LB
43 3624
39 0262
34.6899
30.3537
26 0175
21 6812
17.3450
13 0087
8 6725
4.3362
0.
0.
3.3200
6.6400
9.9600
13.2800
16.6000
19.9200
23.2400
26 5600
29 8800
33.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.1-3

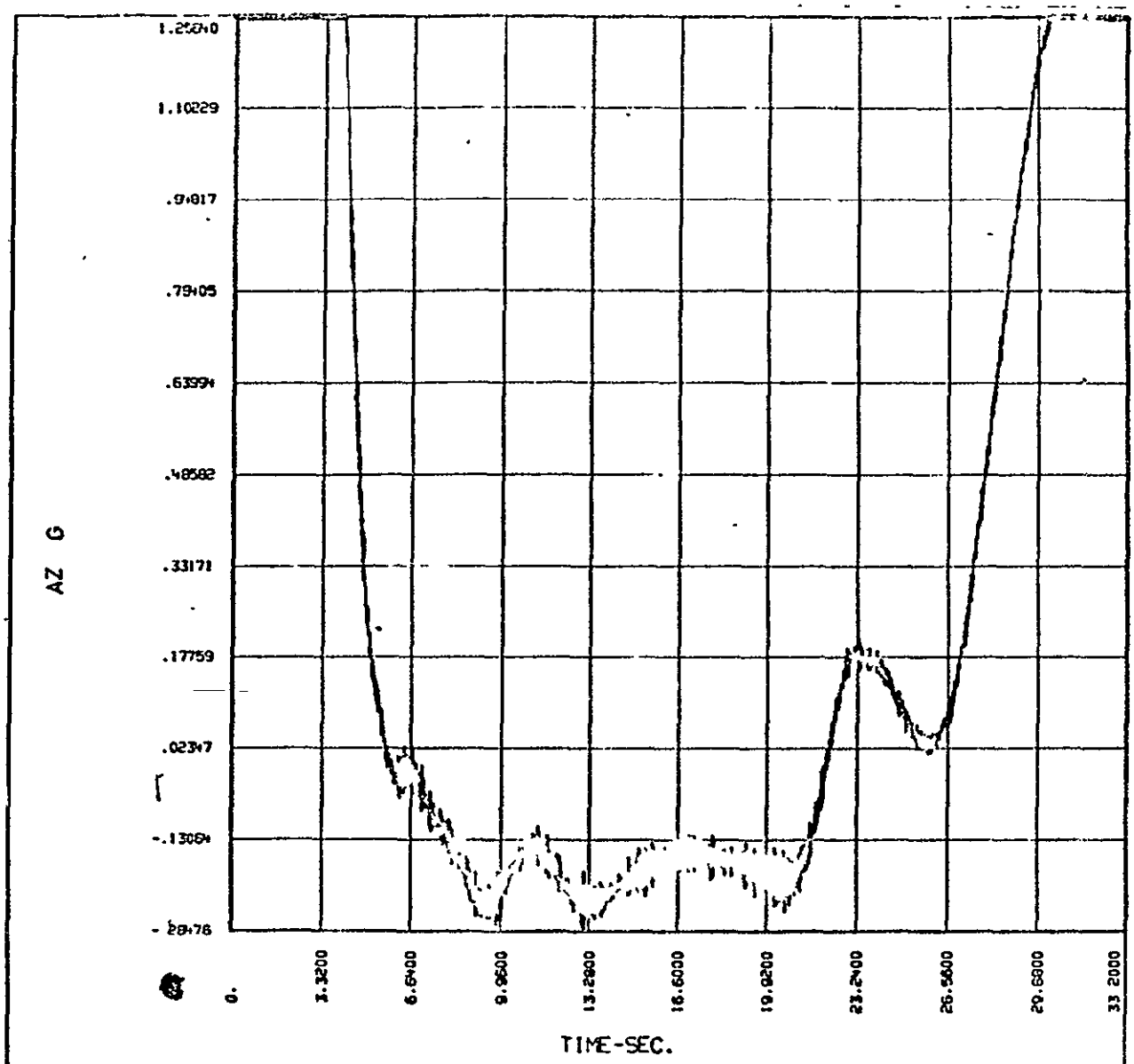
13



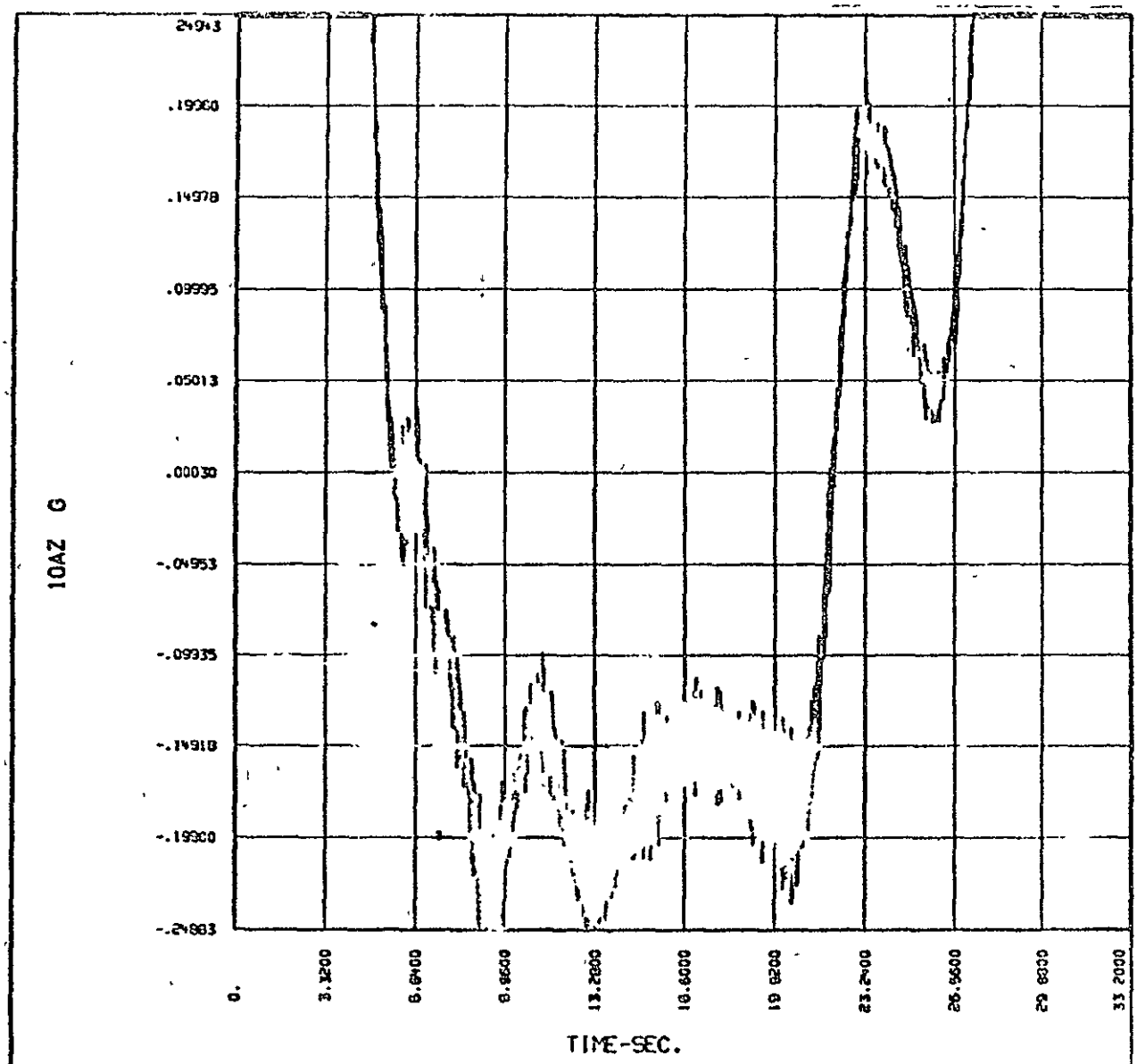
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.1-3



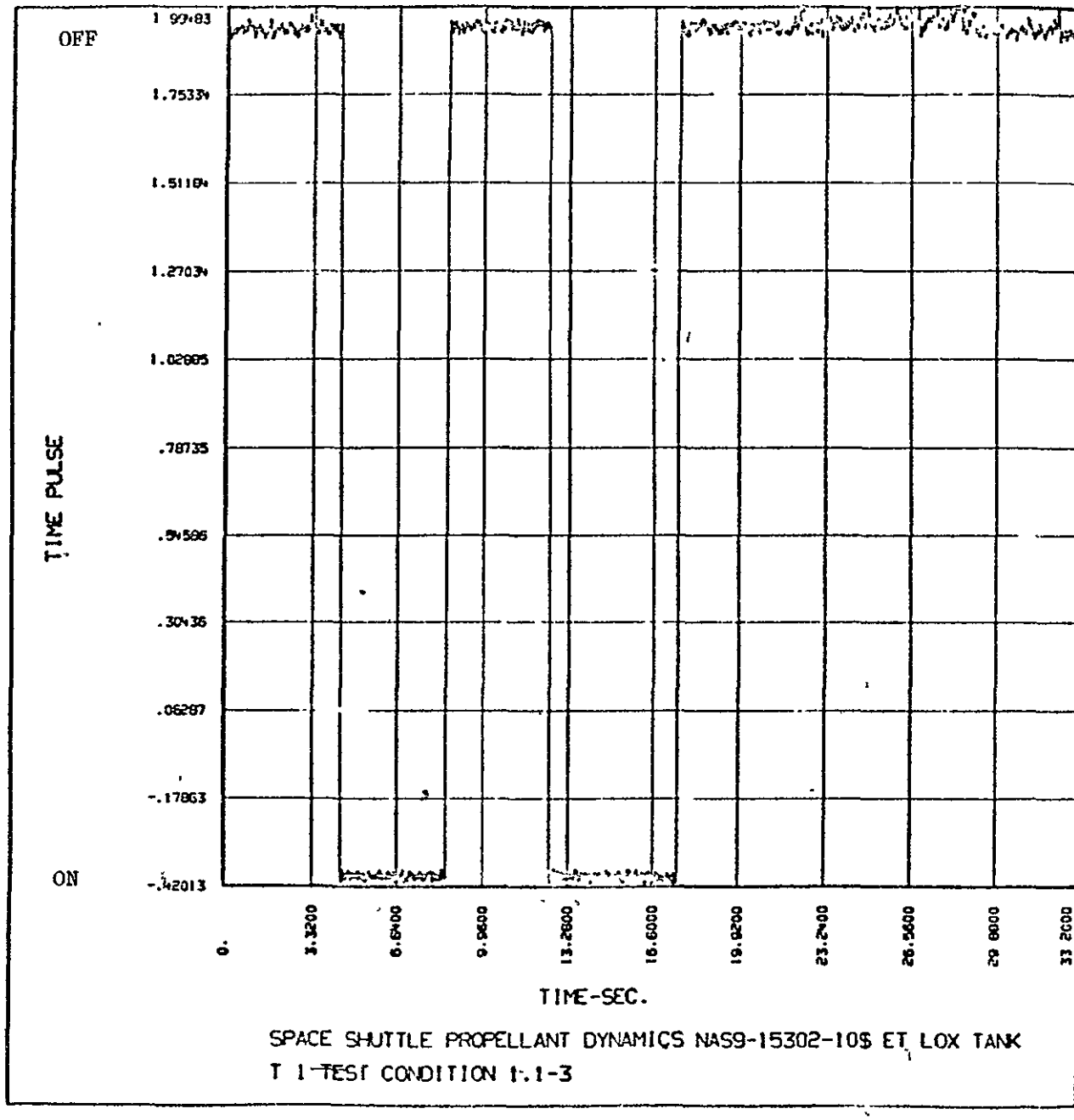
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.1-3

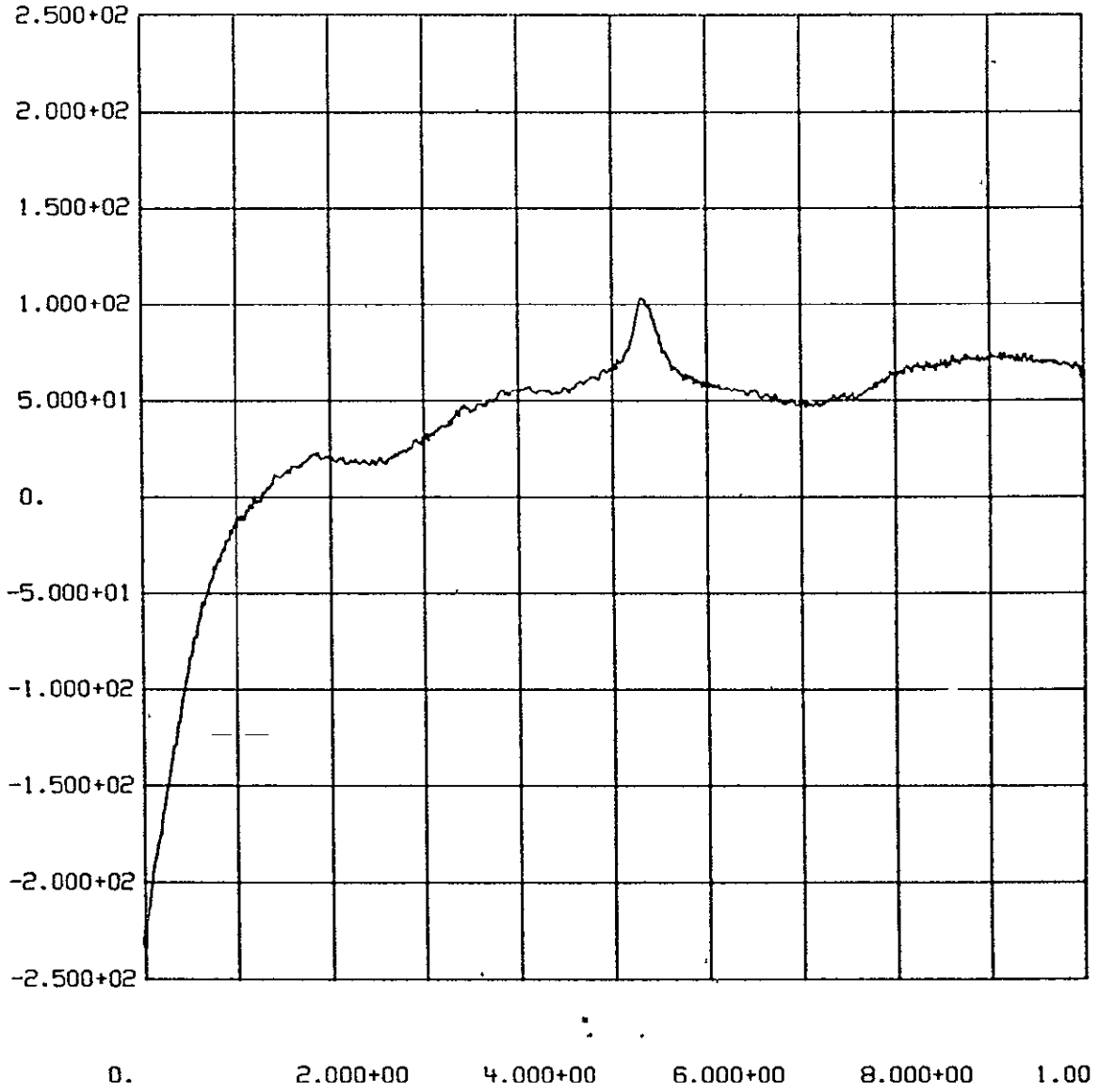


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1—TEST CONDITION 1.1-3



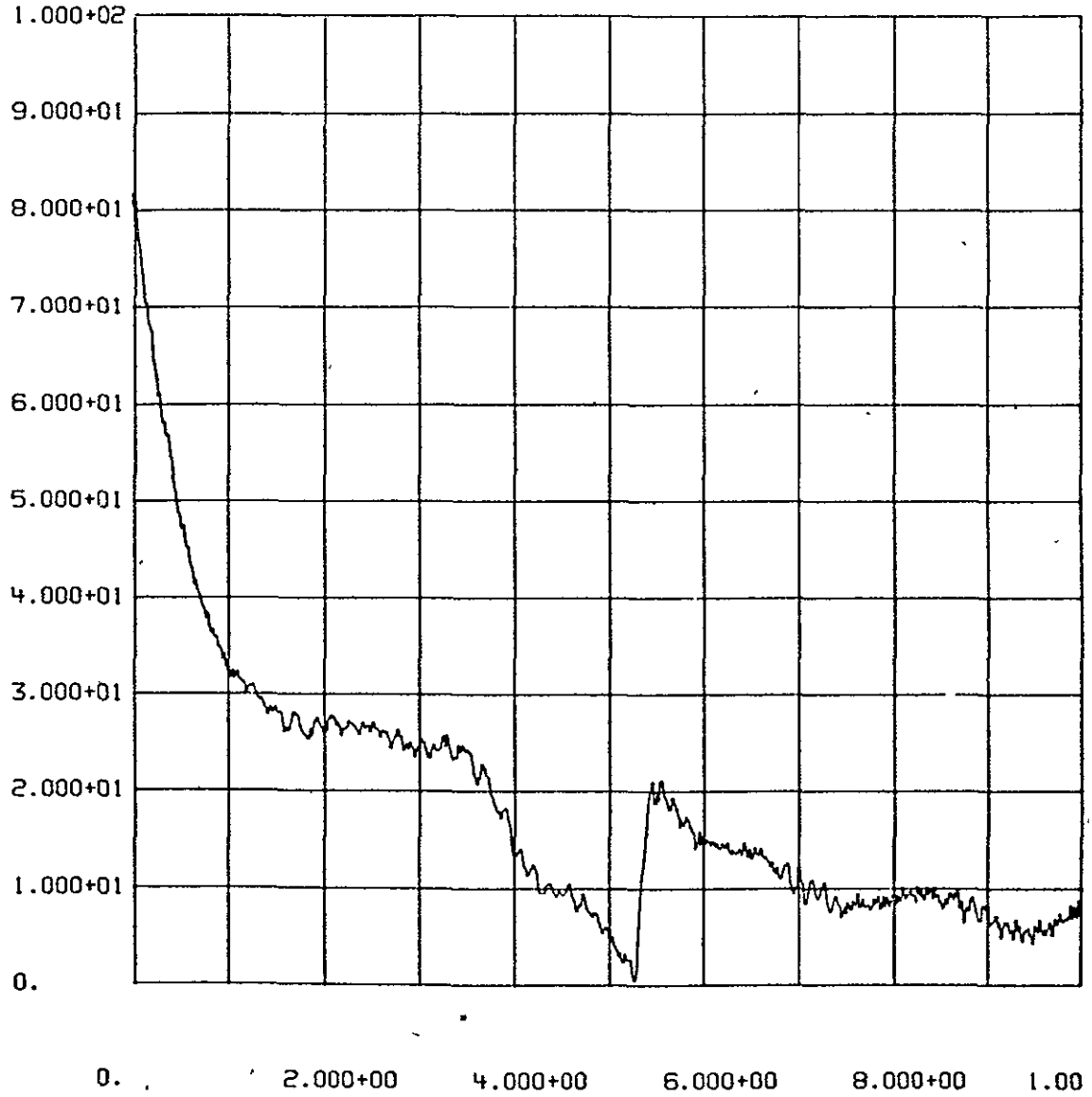
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1-TEST CONDITION 1.1-3


OFF
ON
TIME PULSE
1.99483
1.75334
1.51184
1.27034
1.02885
.78735
.54586
.30436
.06287
-.17863
-.42013
0.
3.3200
6.6400
9.9600
13.2800
16.6000
19.9200
23.2400
26.5600
29.8800
33.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1-TEST CONDITION 1.1-3



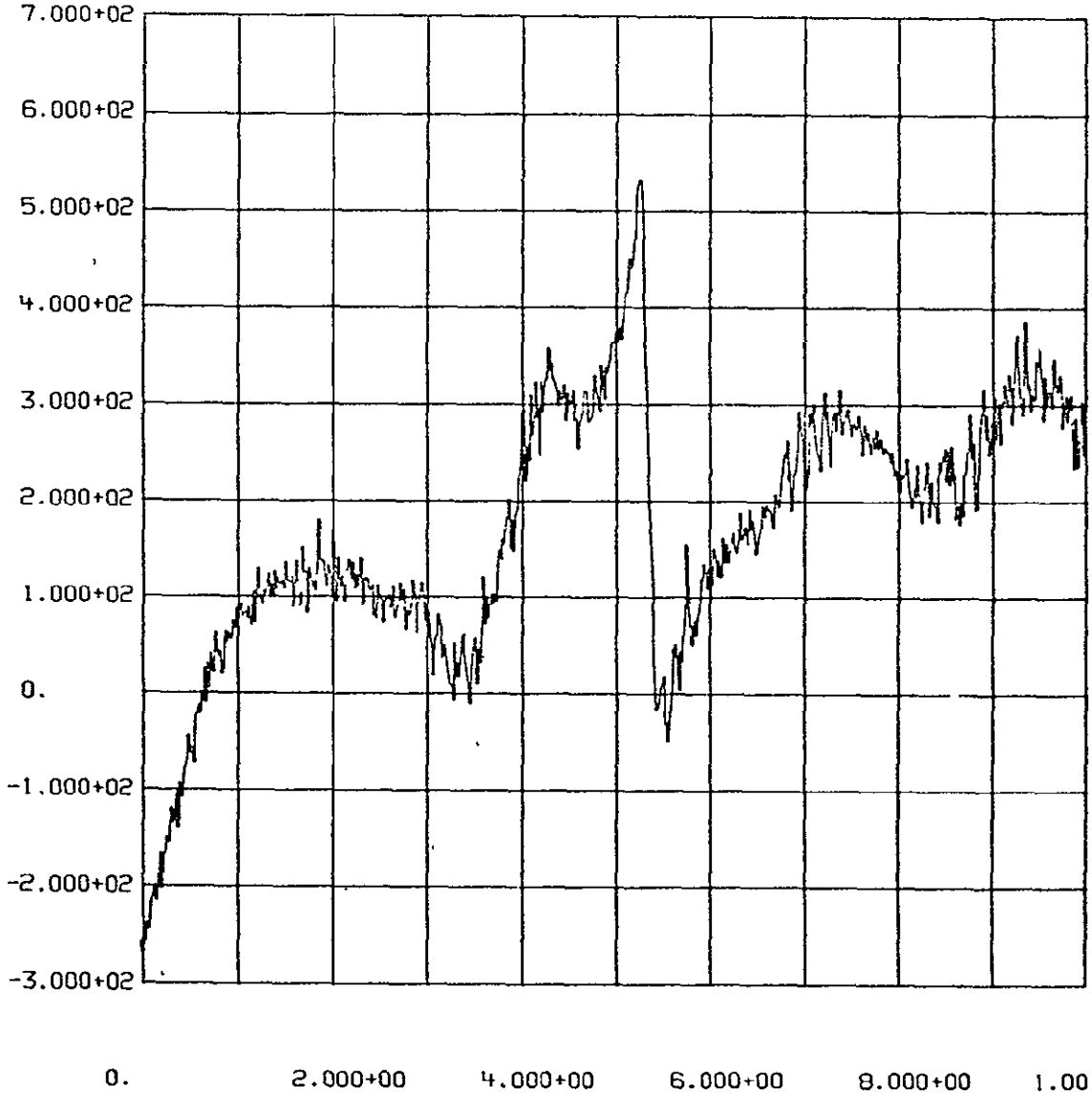
Z-LOAD VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.1-3 *UNFILT*



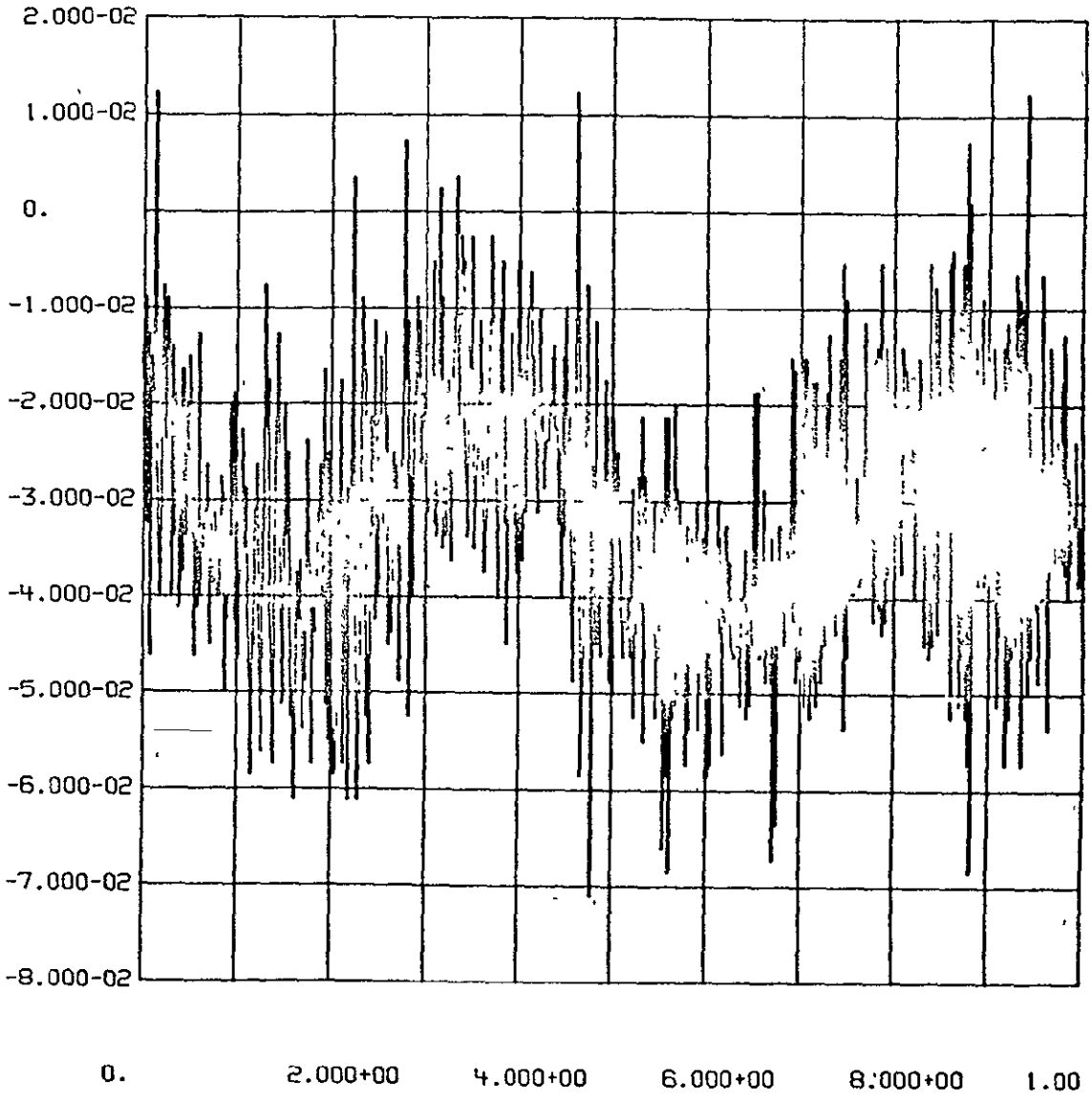
Y-LOAD VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.1-3 *UNFILT*



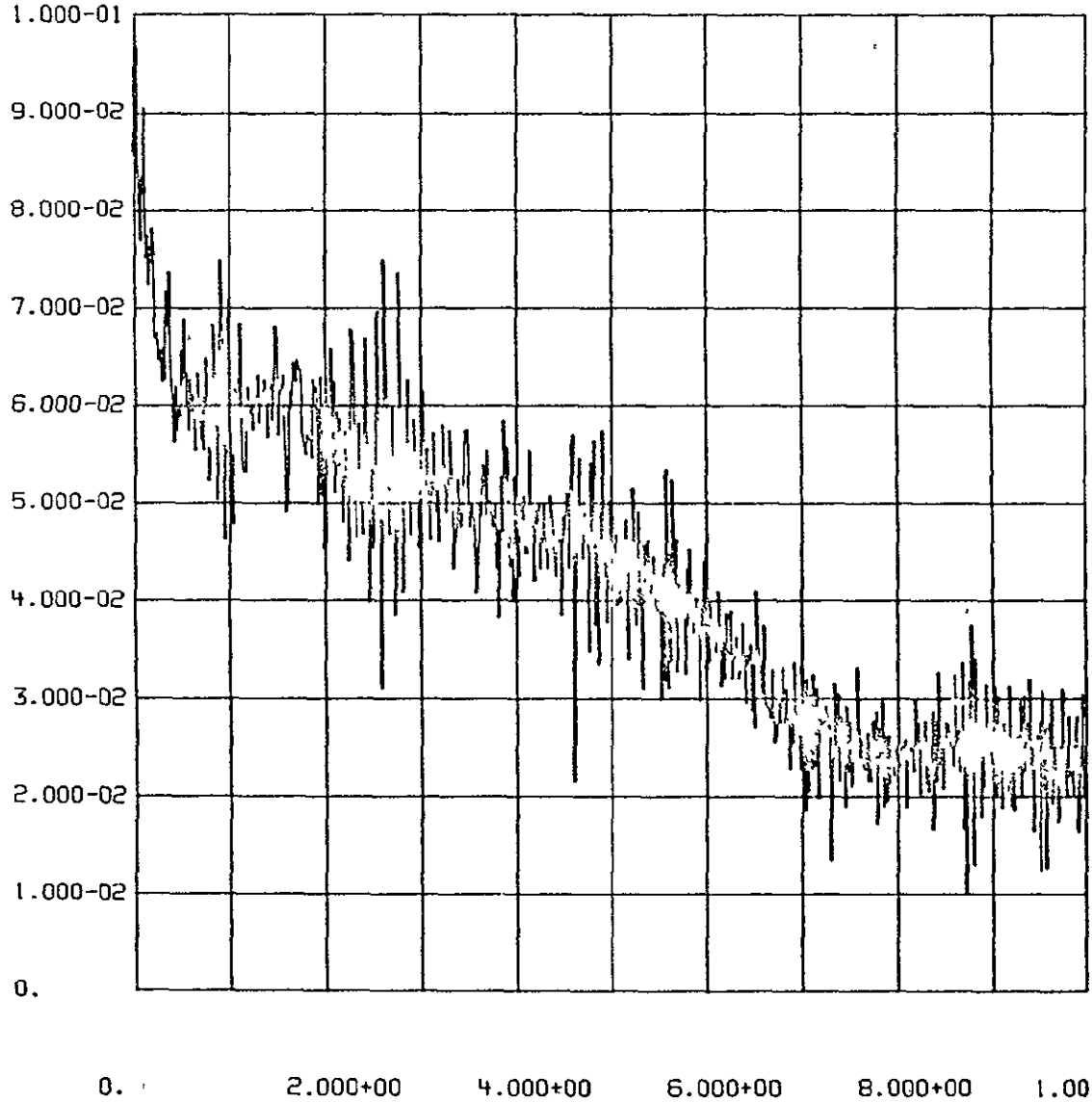
MOMENT VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.1-3 *UNFILT*



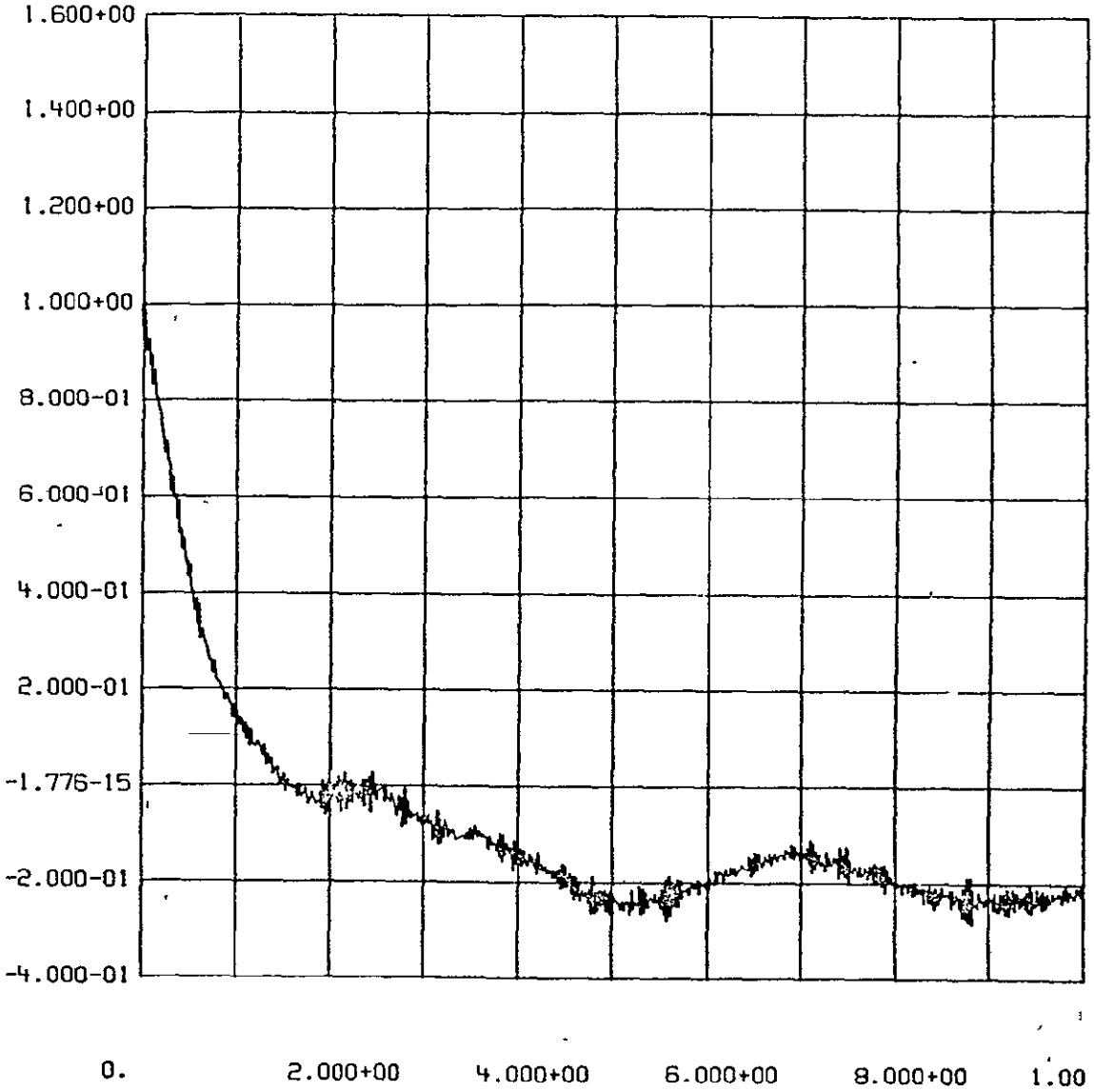
AC YAC VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.1-3 *UNFILT*



AC XAC VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.1-3 *UNFILT*

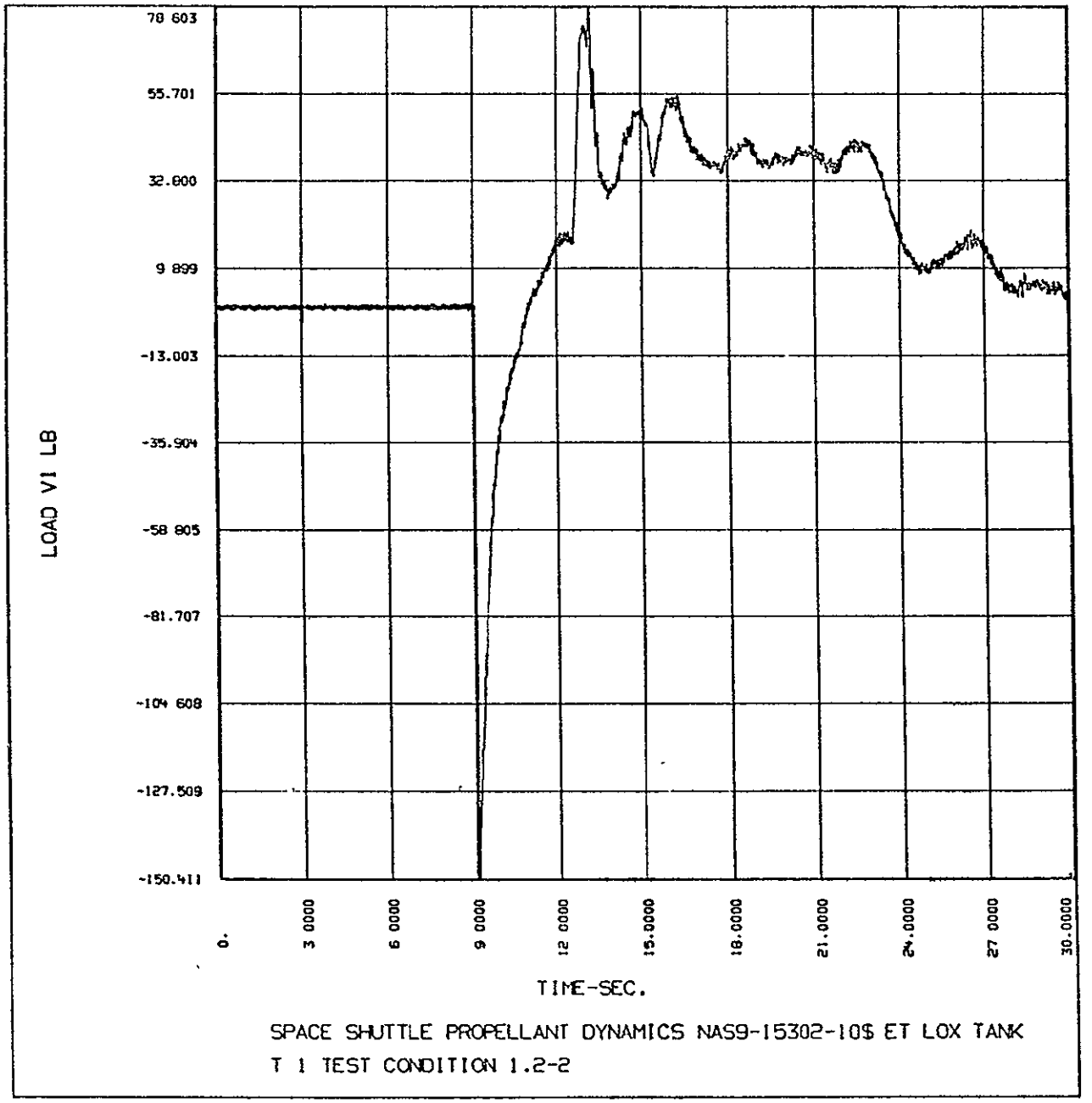


AC ZAC VS TIME

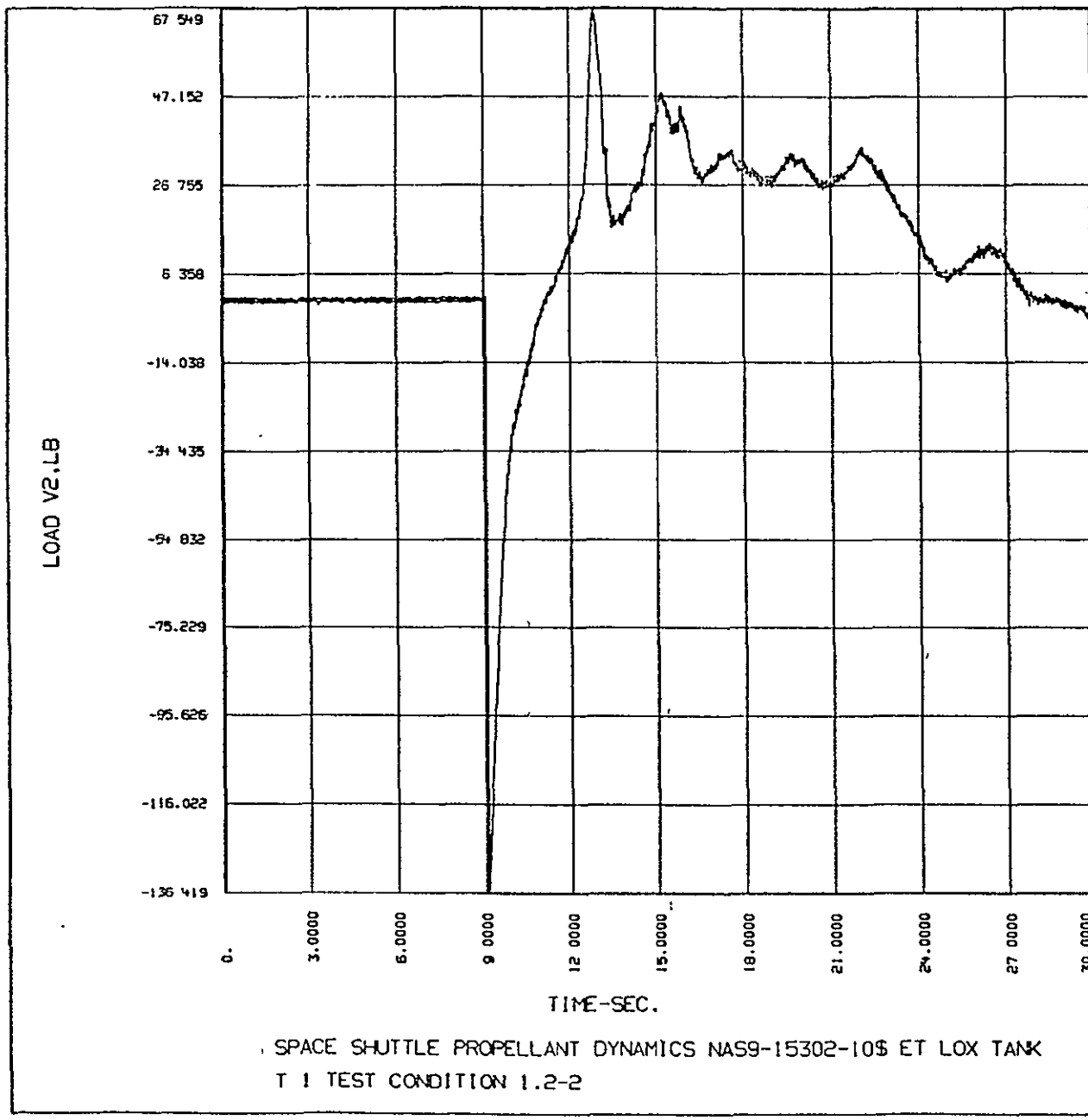
1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.1-3 *UNFILT*

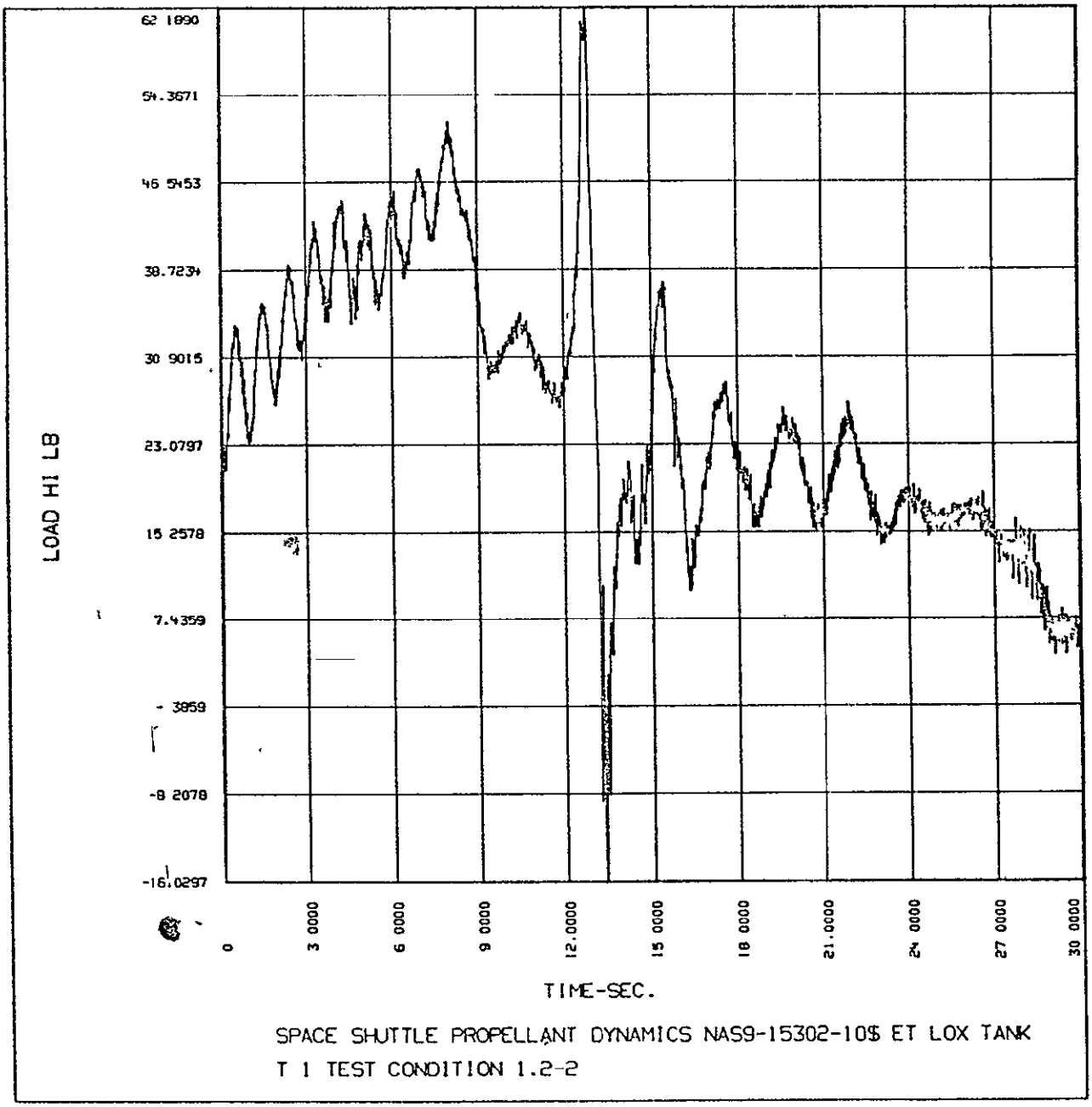
Test Data Condition 1.2-2

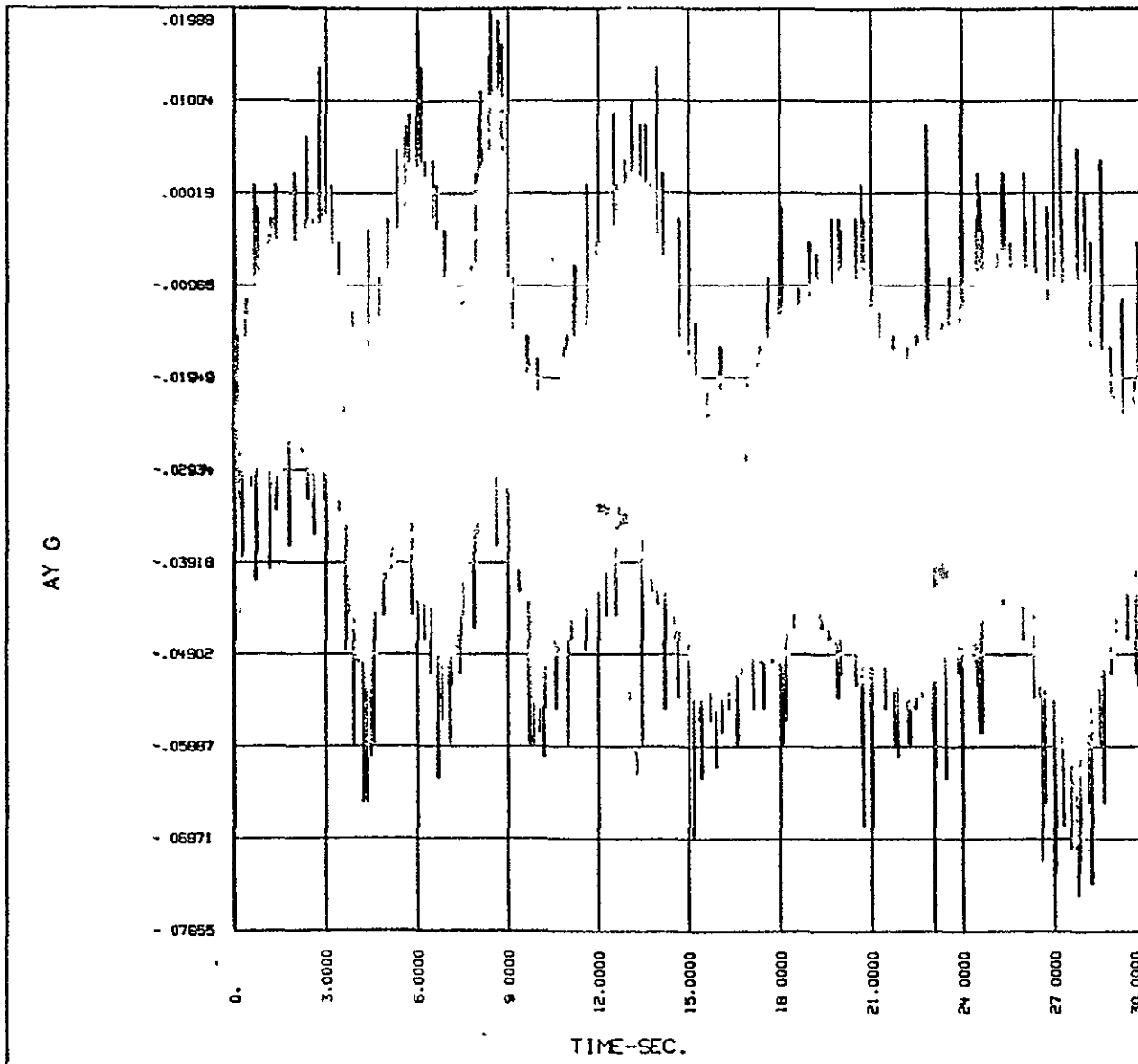
No Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 10%
Target Acceleration–0.2 g



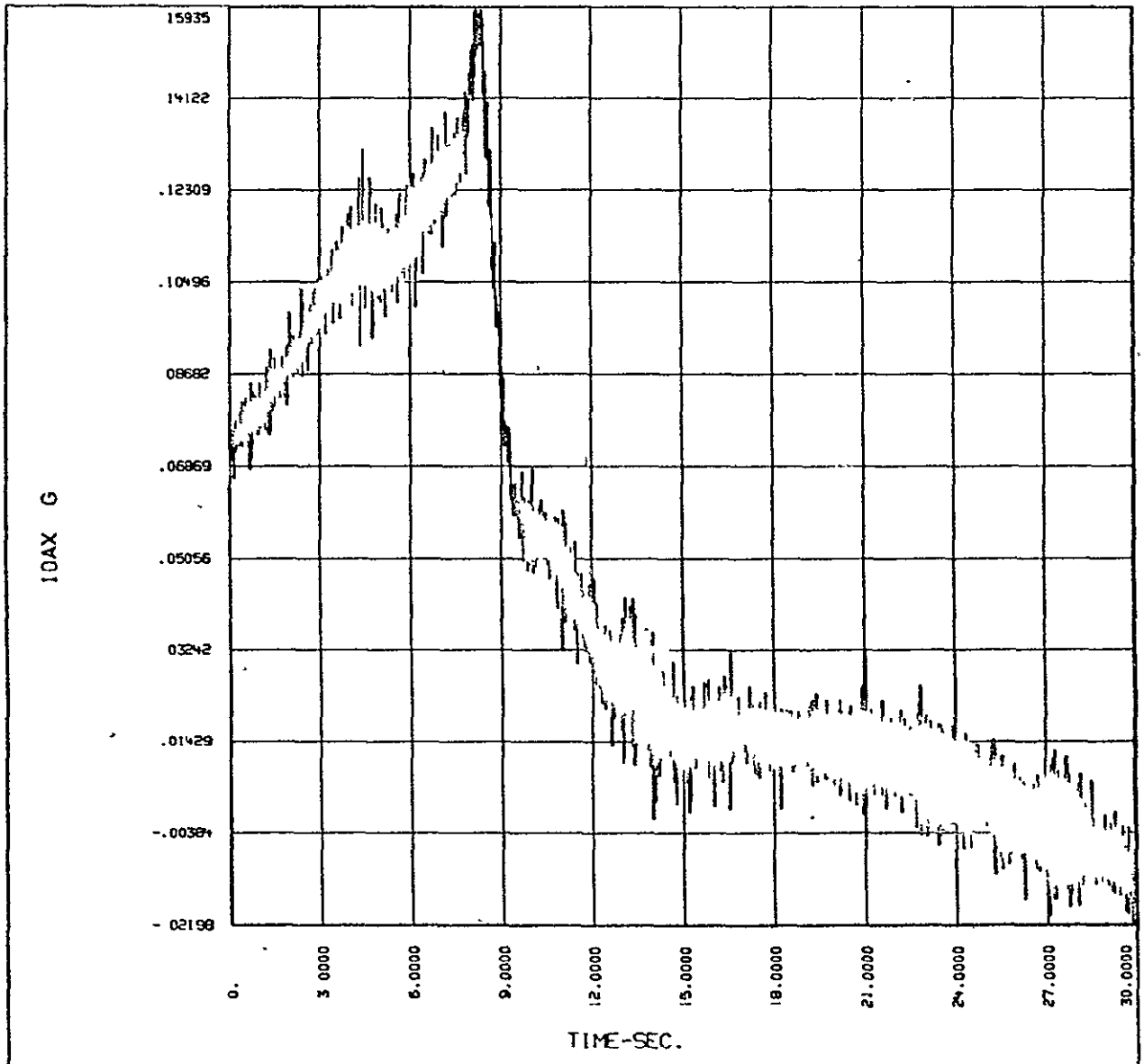
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.2-2


67 549
47.152
26 755
6 358
-14.038
-34 435
-54 832
-75.229
-95.626
-116.022
-136 419
LOAD V2,LB
0.
3.0000
6.0000
9 0000
12 0000
15.0000
18.0000
21.0000
24.0000
27 0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.2-2

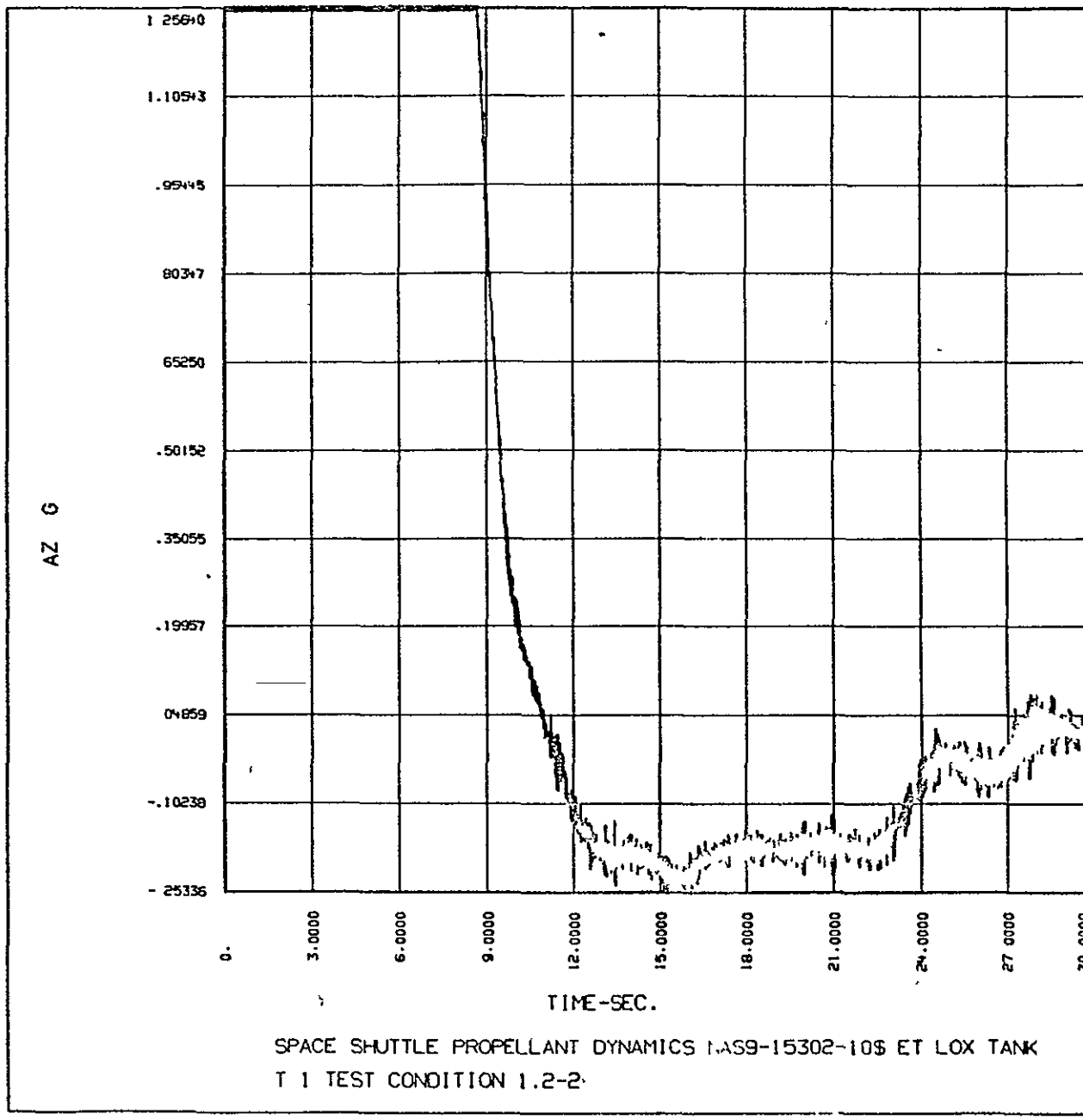

62 1890
54.3671
46 5453
38.7234
30 9015
23.0797
15 2578
7.4359
- 3859
-8 2078
-16.0297
LOAD H1 LB
0
3 0000
6 0000
9 0000
12.0000
15 0000
18 0000
21.0000
24 0000
27 0000
30 0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.2-2

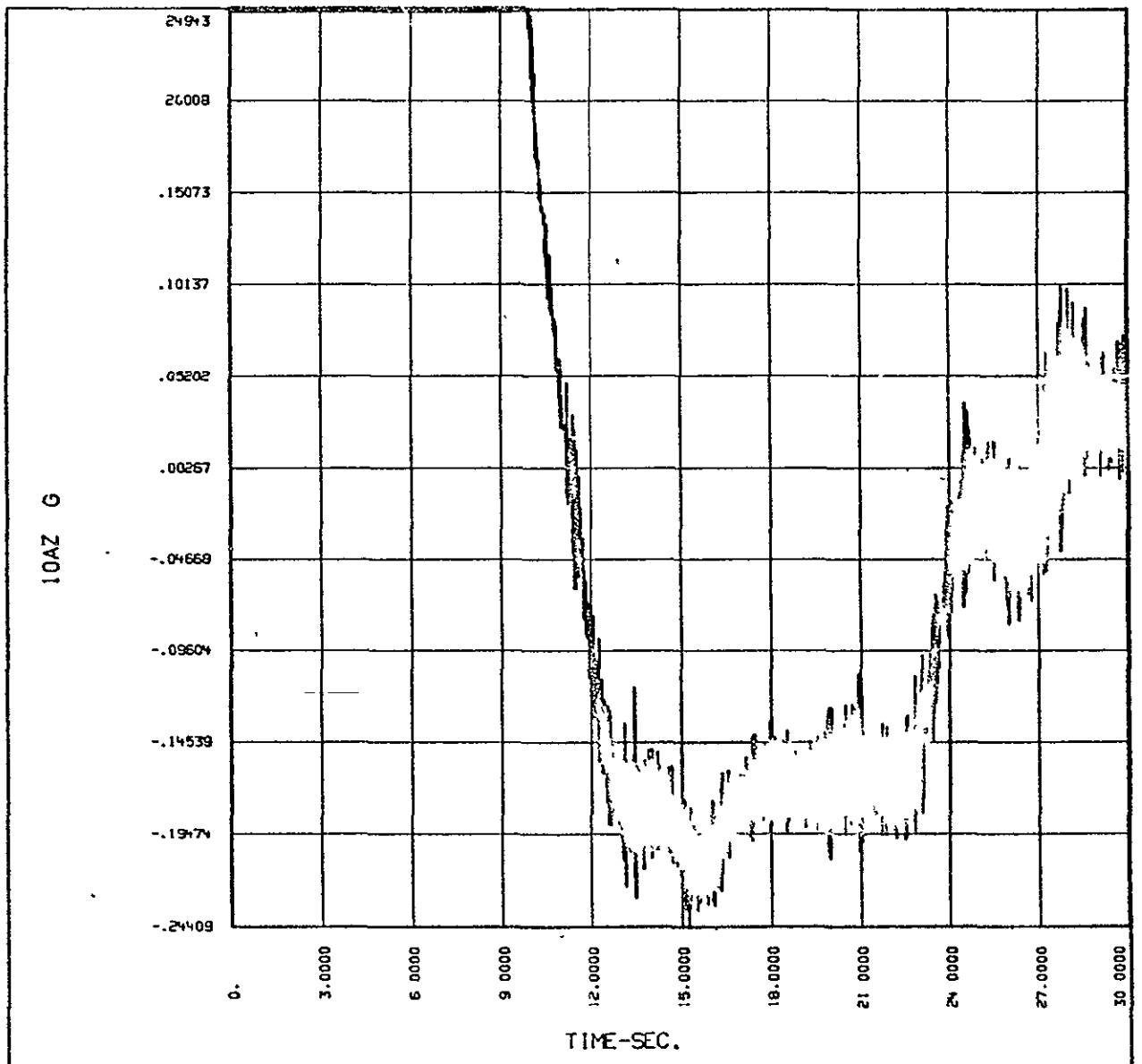


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.2-2

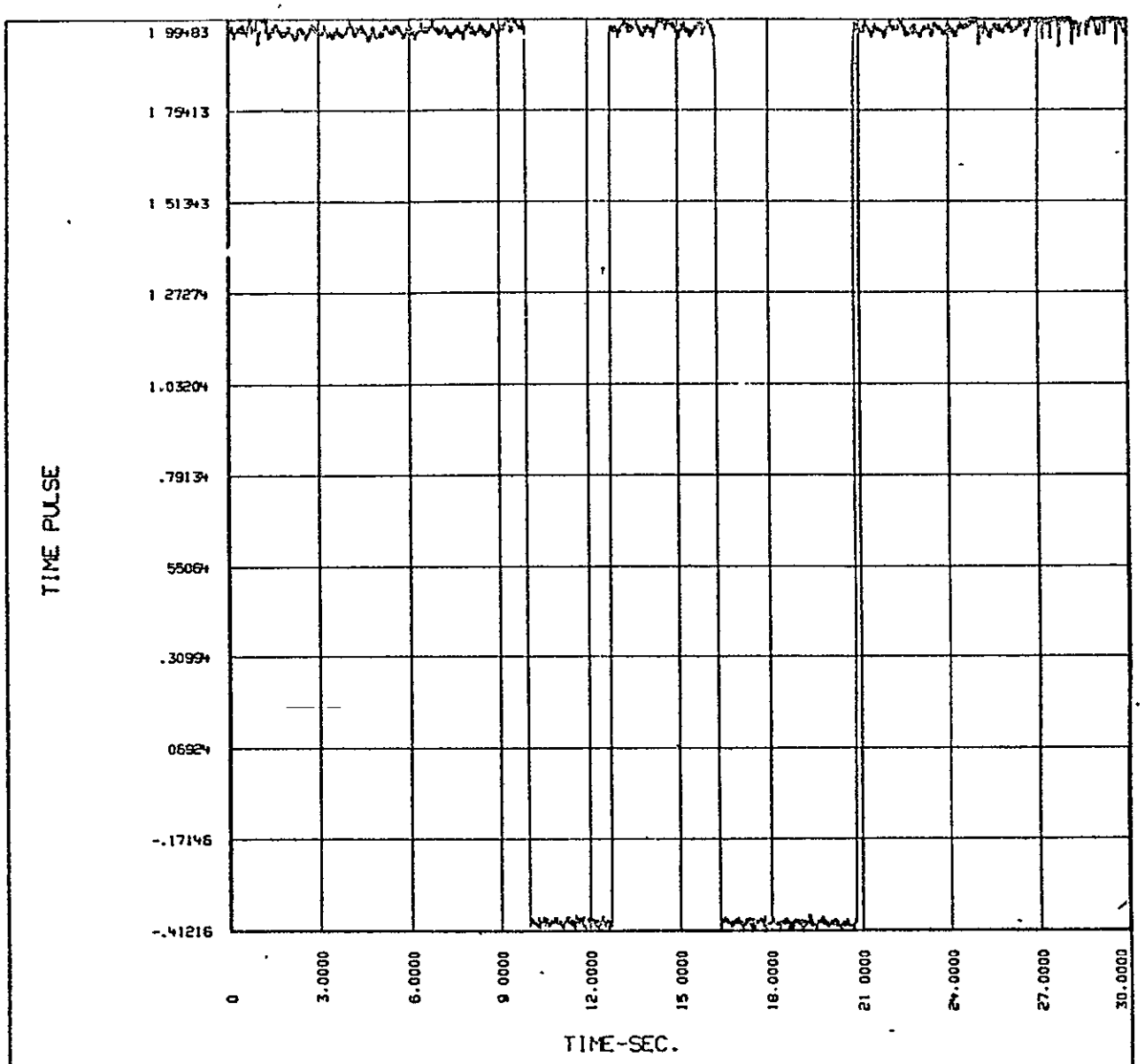


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.2-2

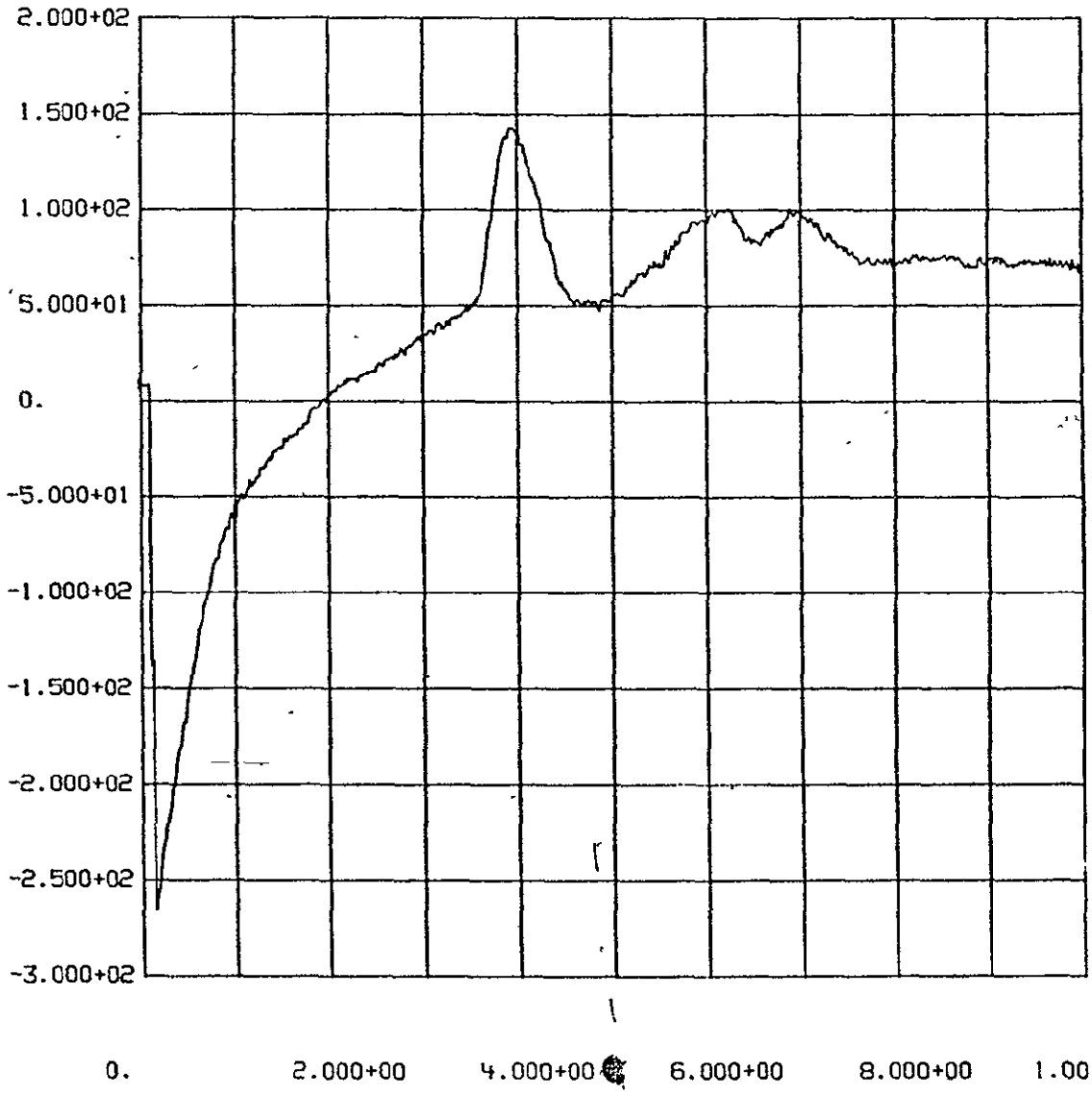

1.25640
1.10543
.95445
80347
65250
.50152
.35055
.19957
04859
-.10238
- 25336
AZ G
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.2-2



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.2-2

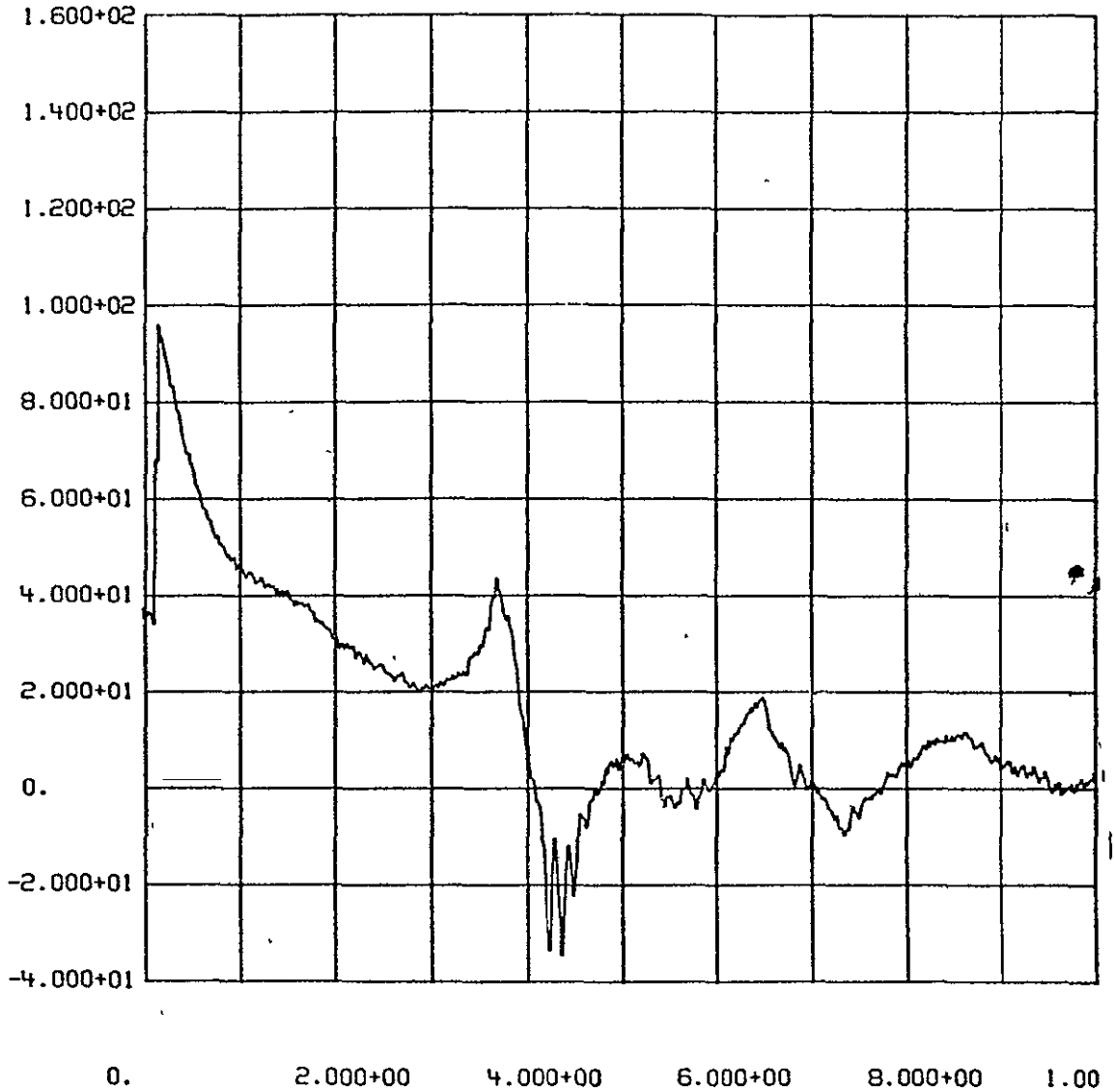


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.2-2



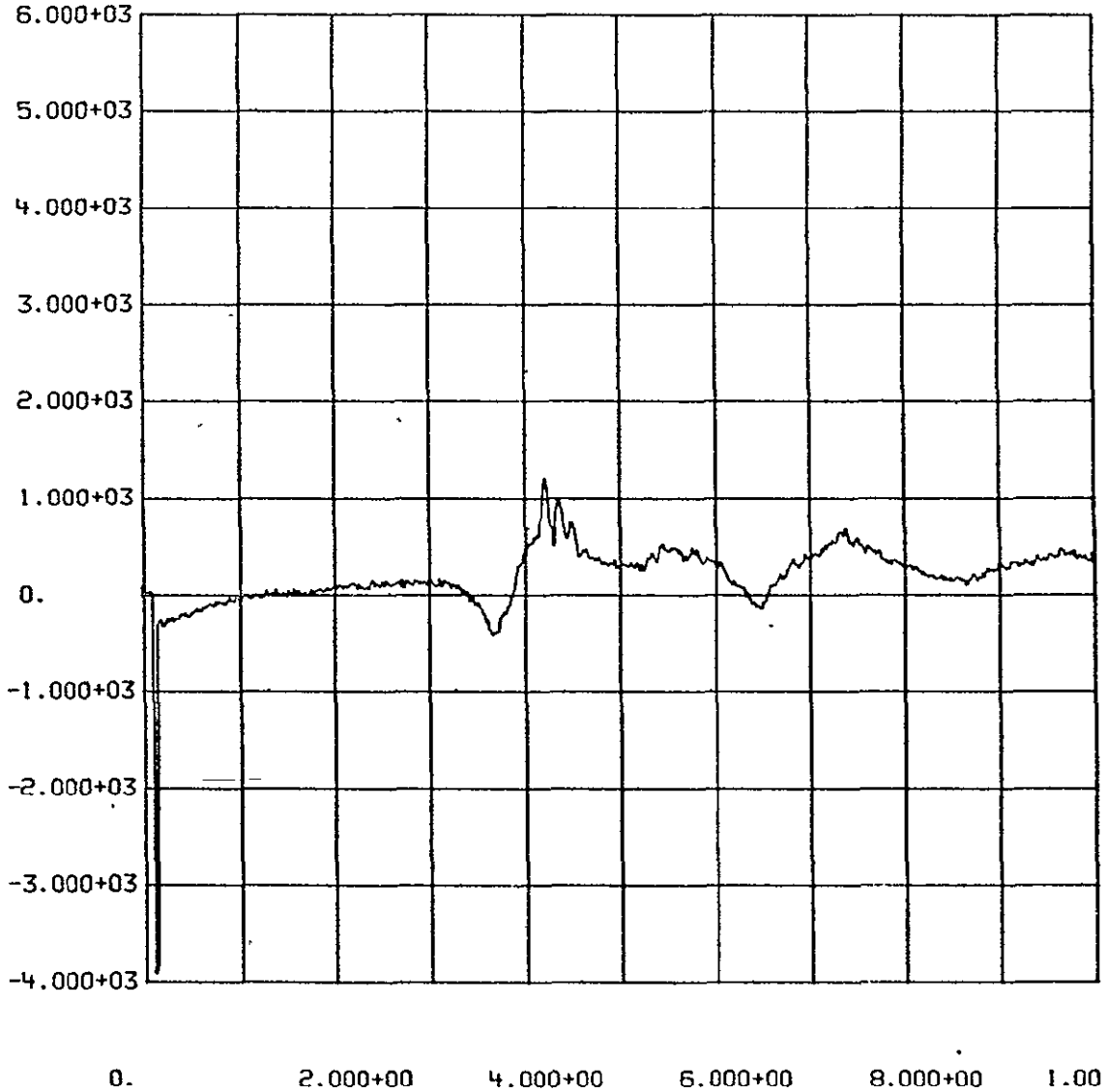
Z-LOAD VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.2-2 * UNFILT *



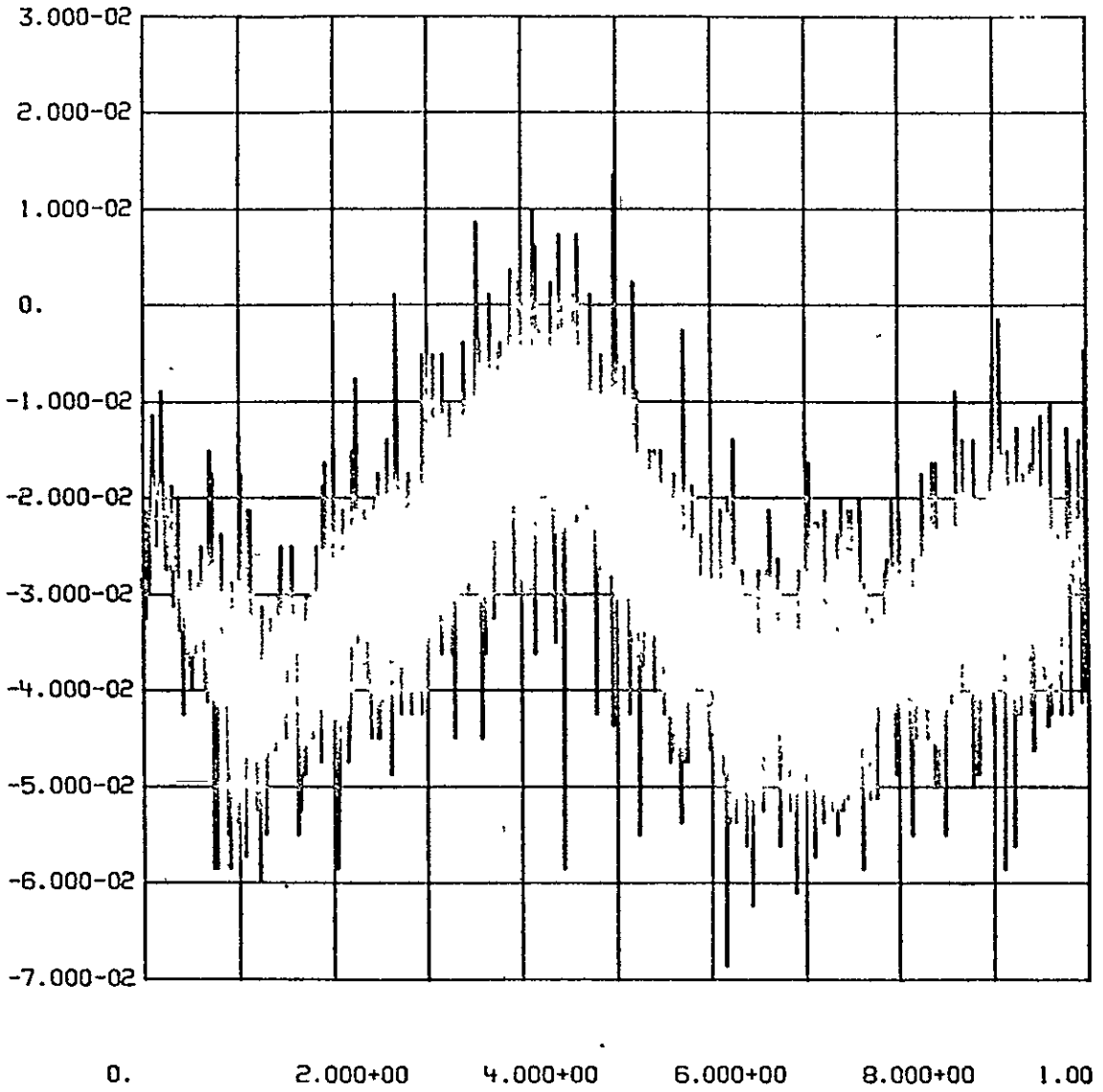
Y-LOAD VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.2-2 * UNFILT *



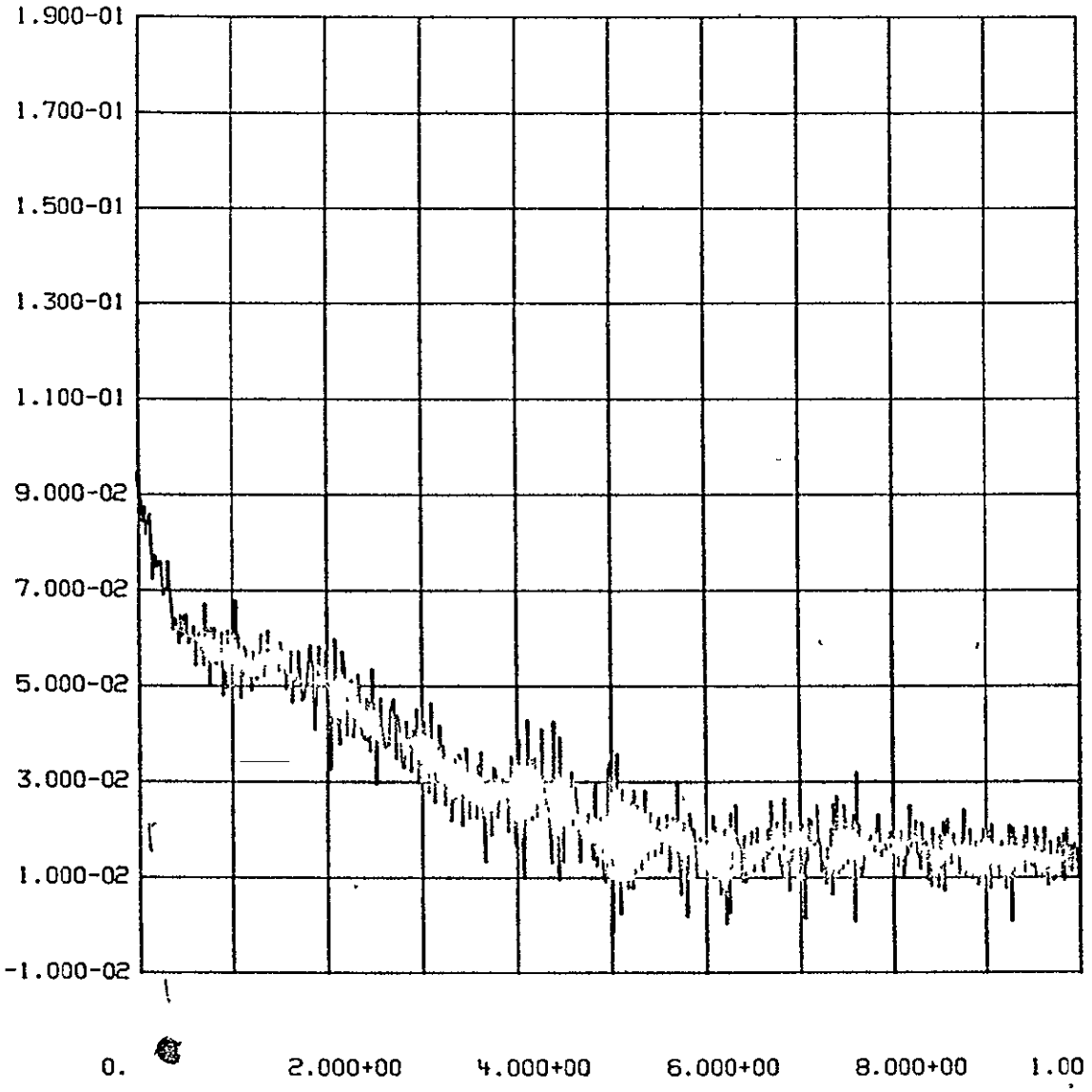
MOMENT VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.2-2 * UNFILT *



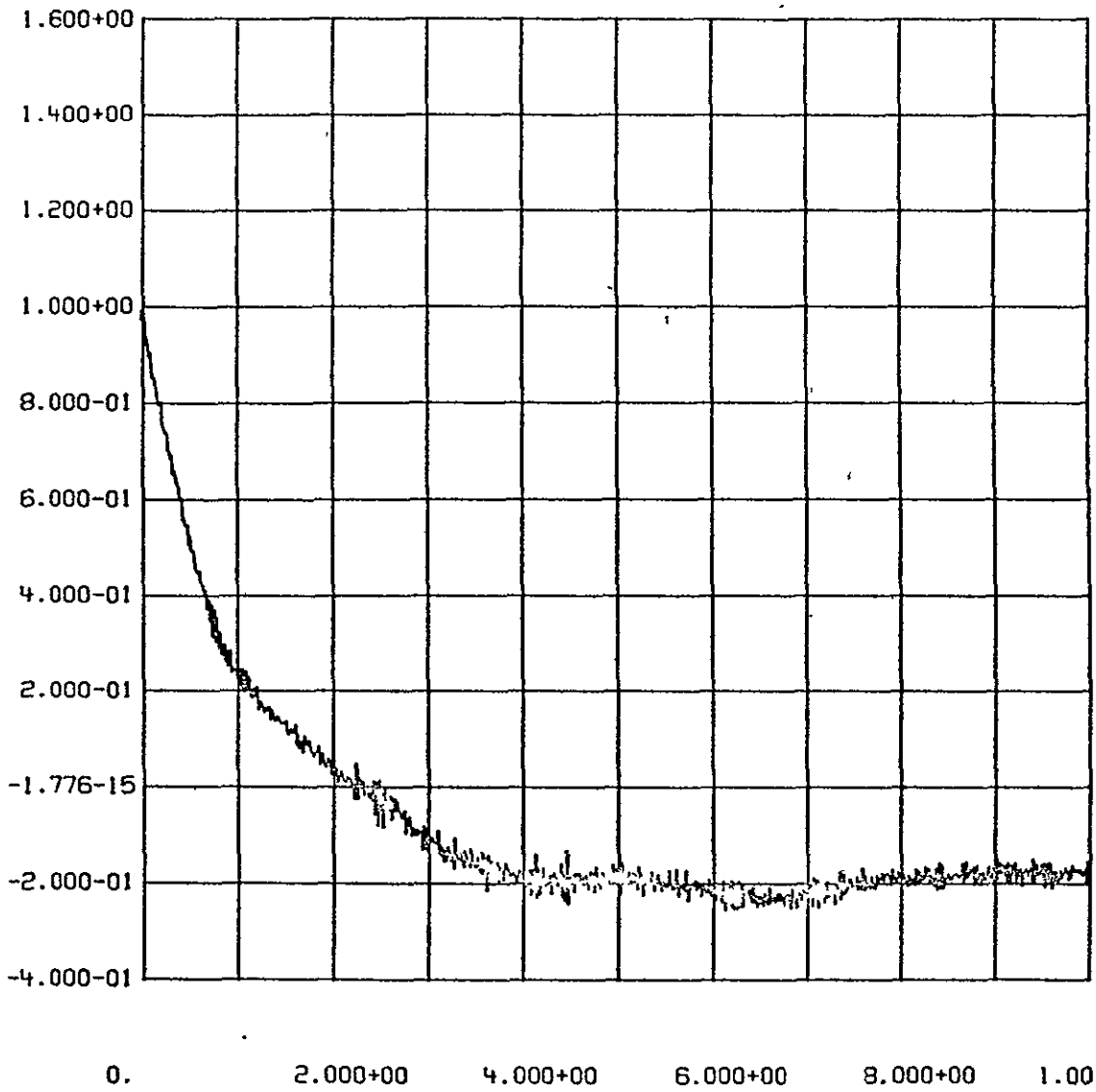
AC YAC VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.2-2 * UNFILT *



AC XAC VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.2-2 * UNFILT *

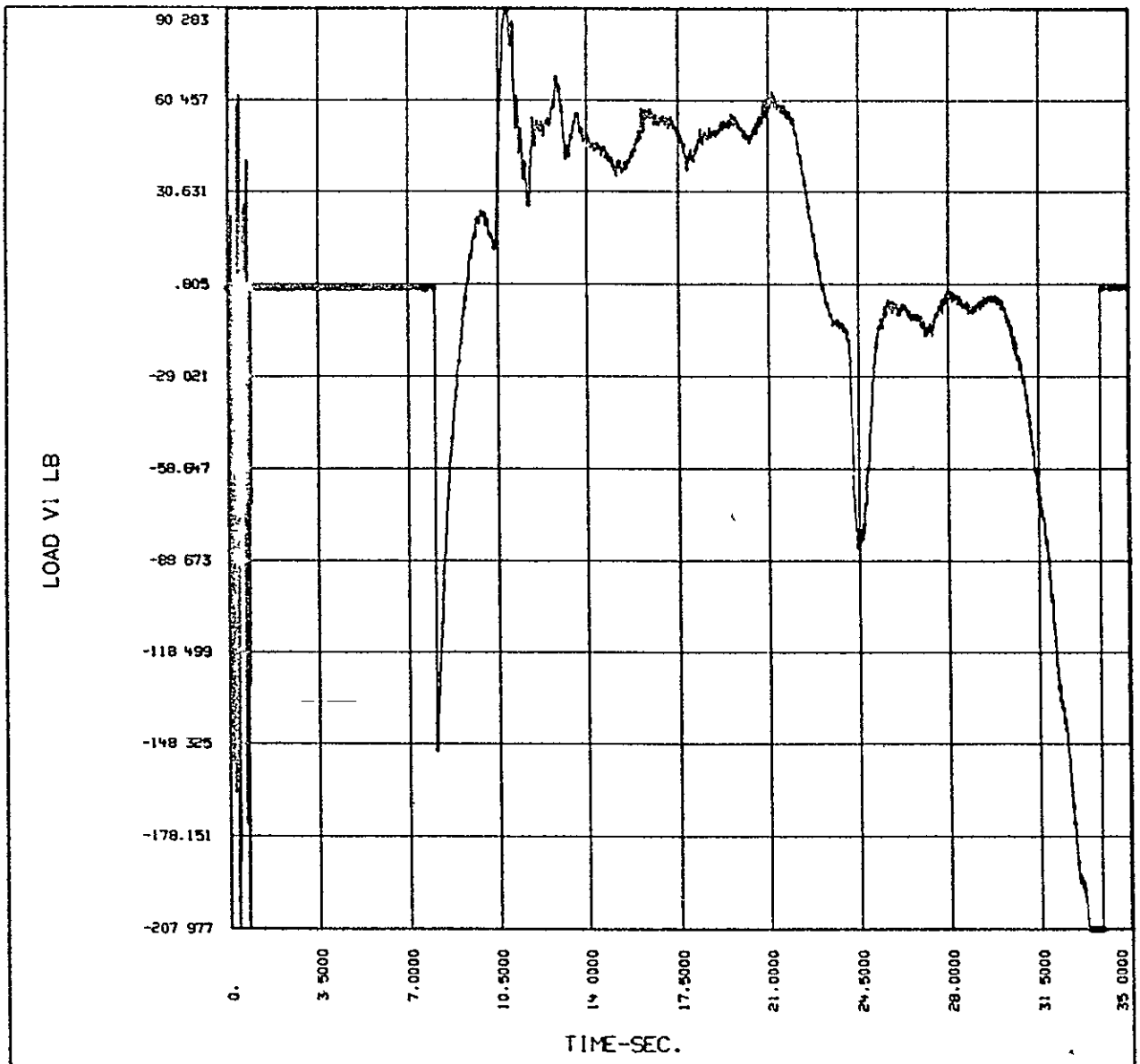


AC ZAC VS TIME

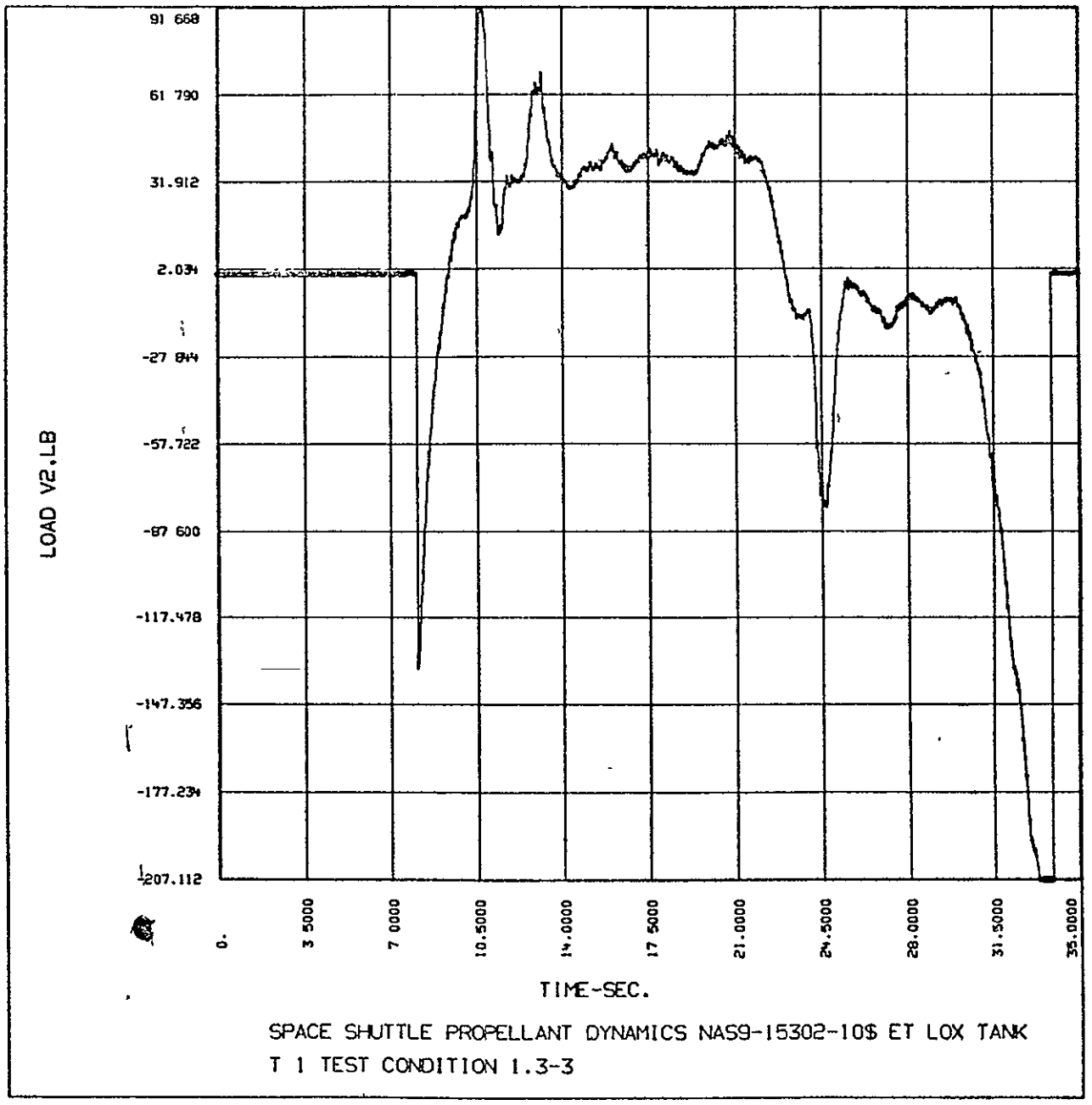
1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.2-2 * UNFILT *

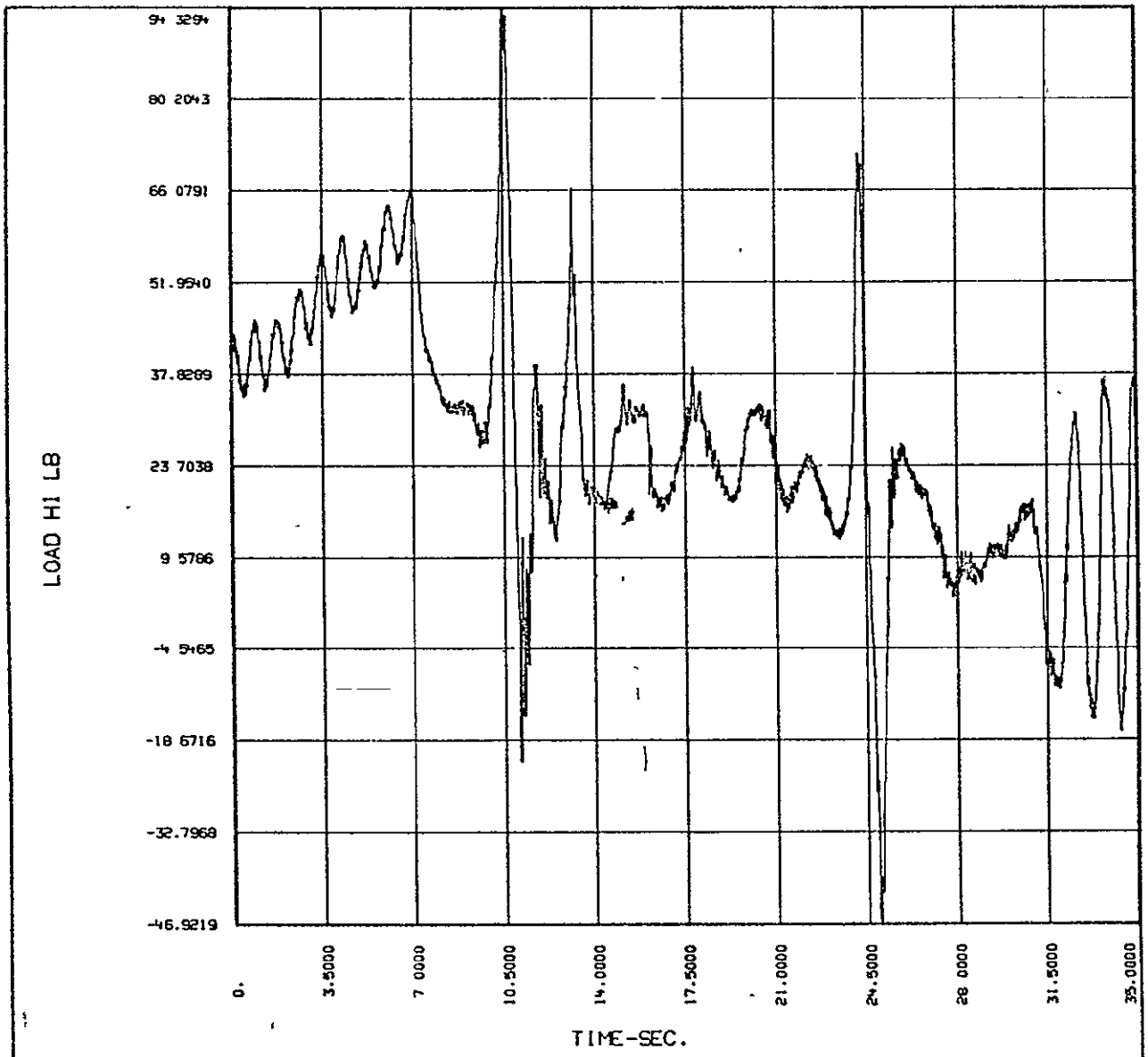
Test Data Condition 1.3-3

No Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 15%
Target Acceleration–0.2 g

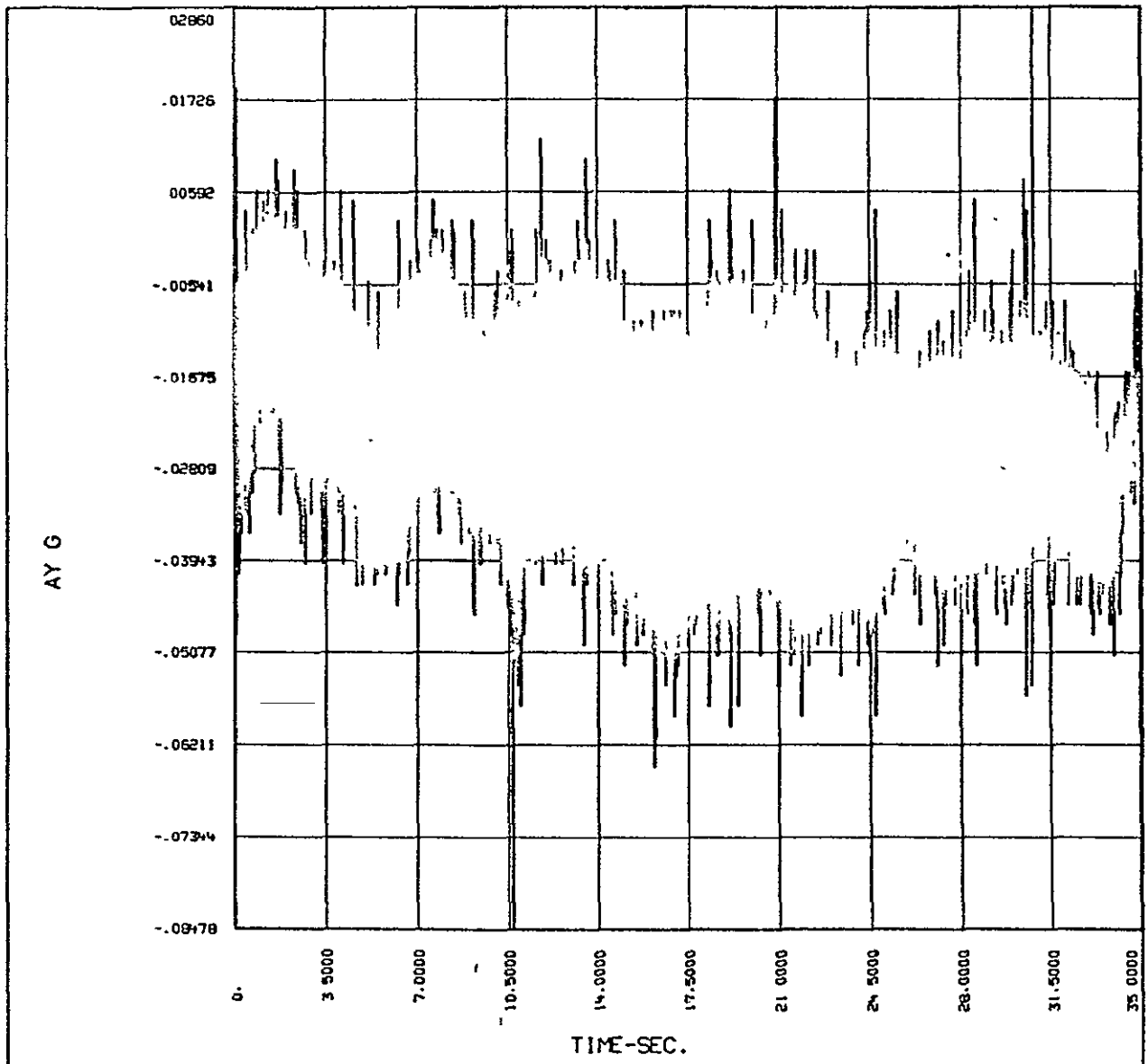


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.3-3

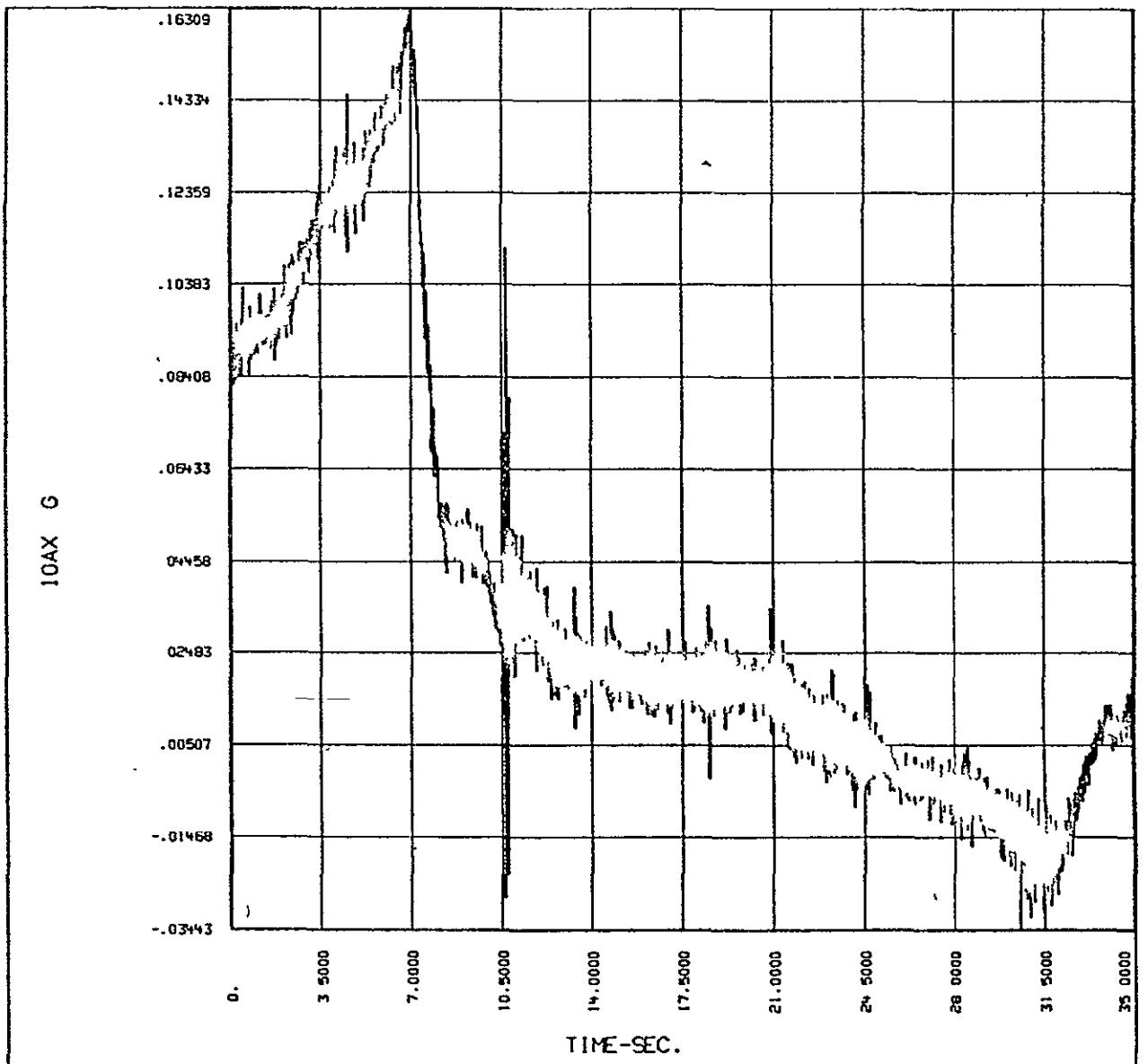

91 668
61 790
31.912
2.034
-27 844
-57.722
-87 600
-117.478
-147.356
-177.234
-207.112
LOAD V2,LB
0.
3 5000
7 0000
10.5000
14.0000
17 5000
21.0000
24.5000
28.0000
31.5000
35.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.3-3



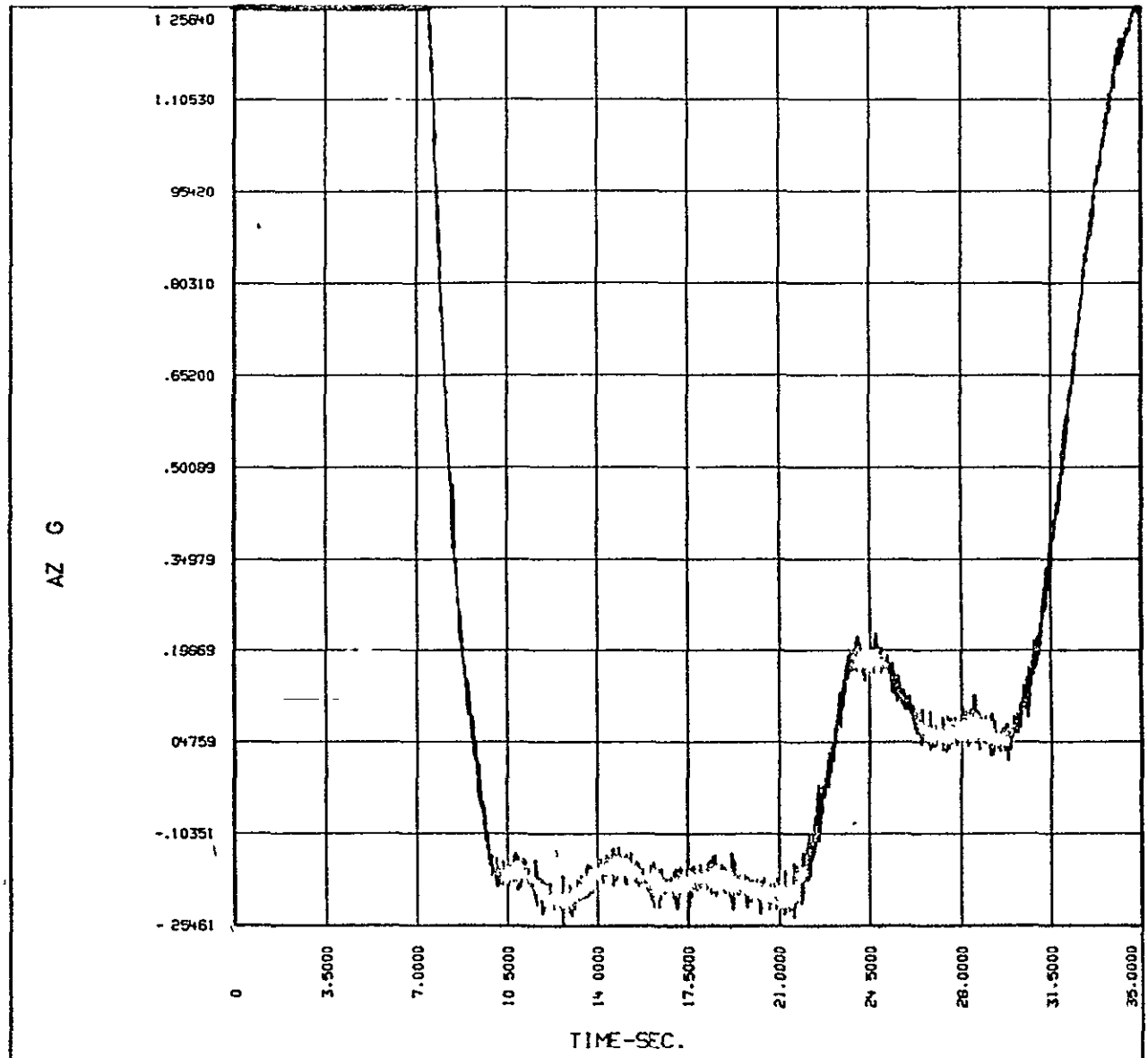
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.3-3



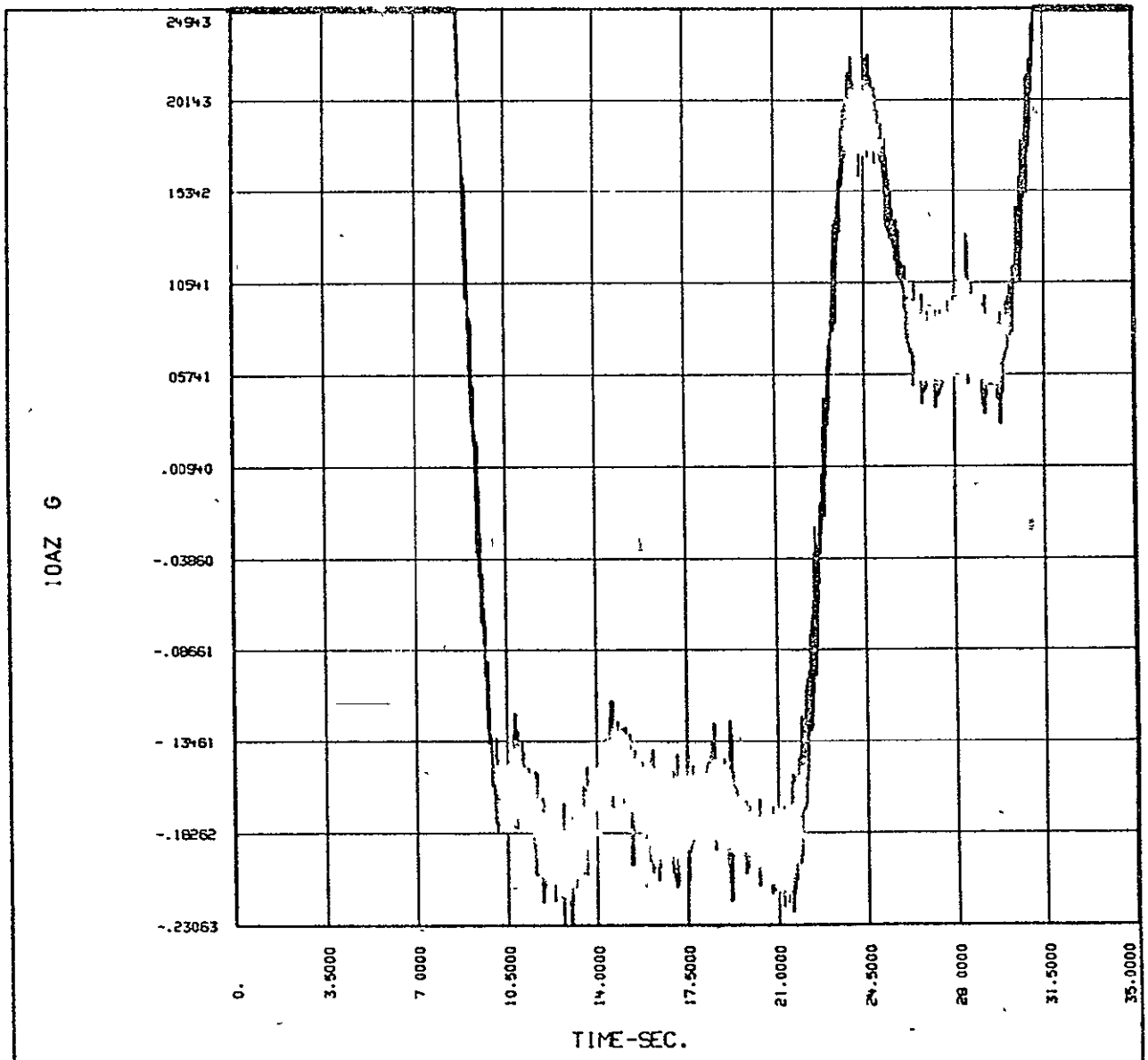
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.3-3



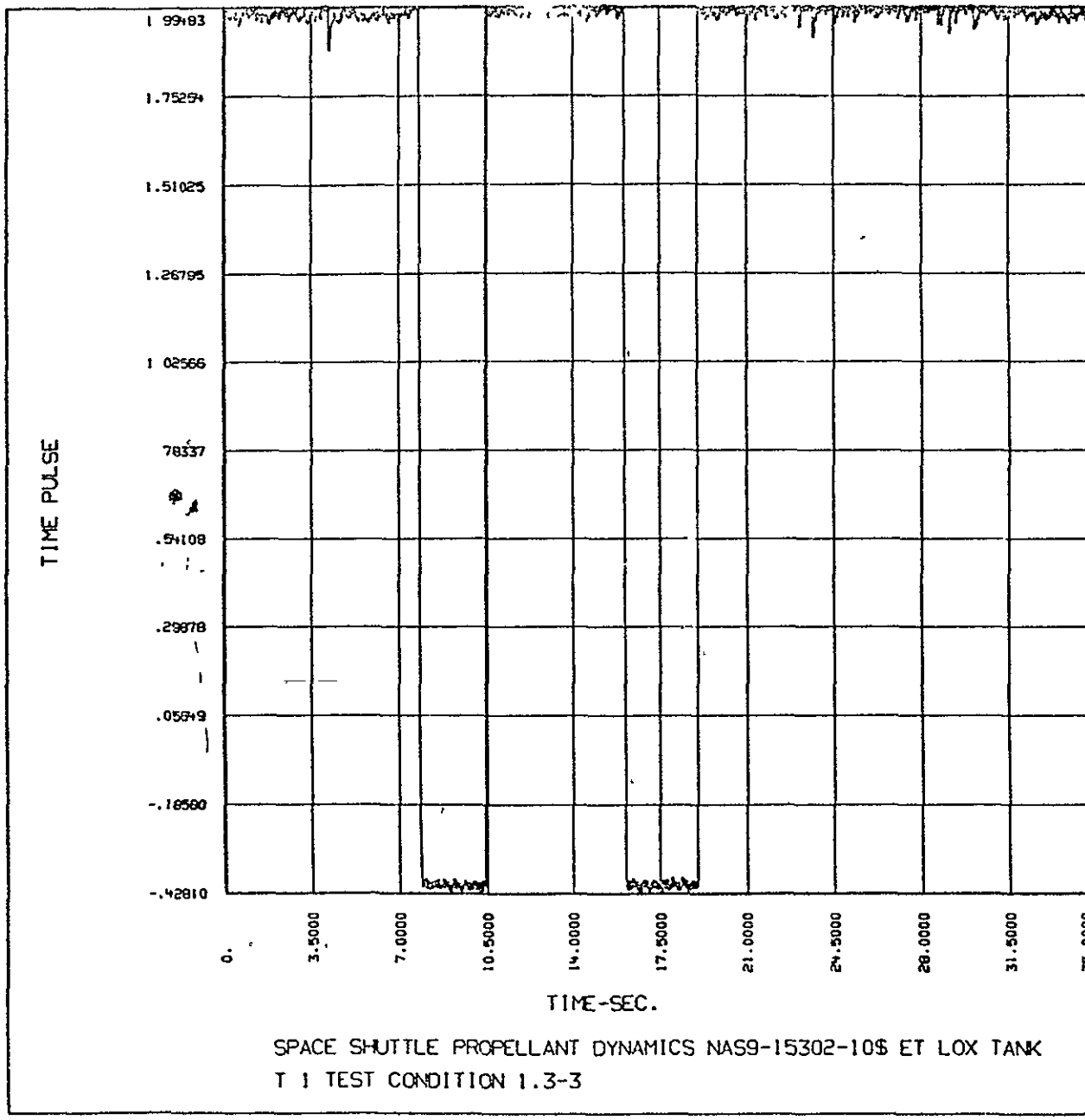
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.3-3

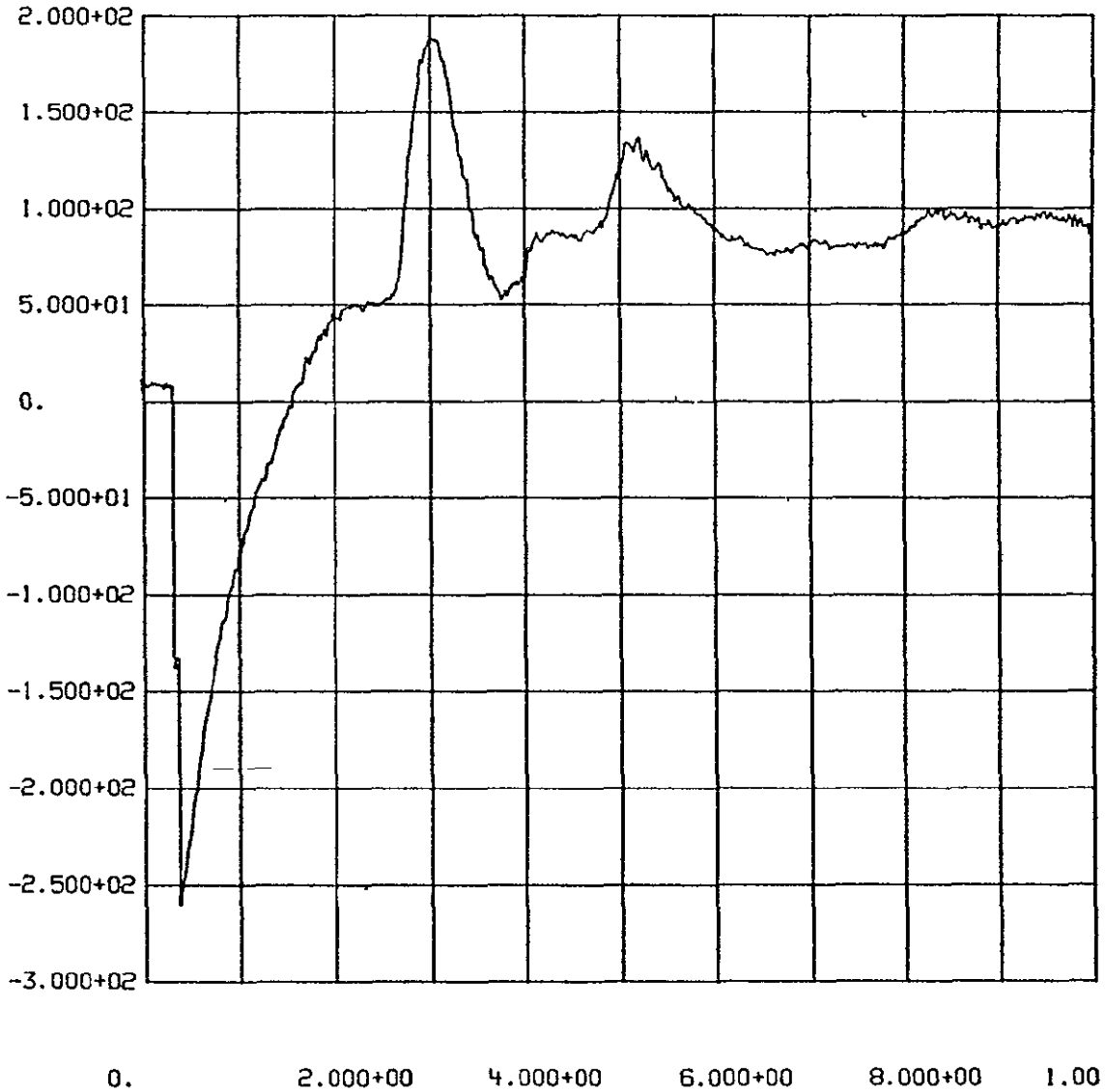


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.3-3



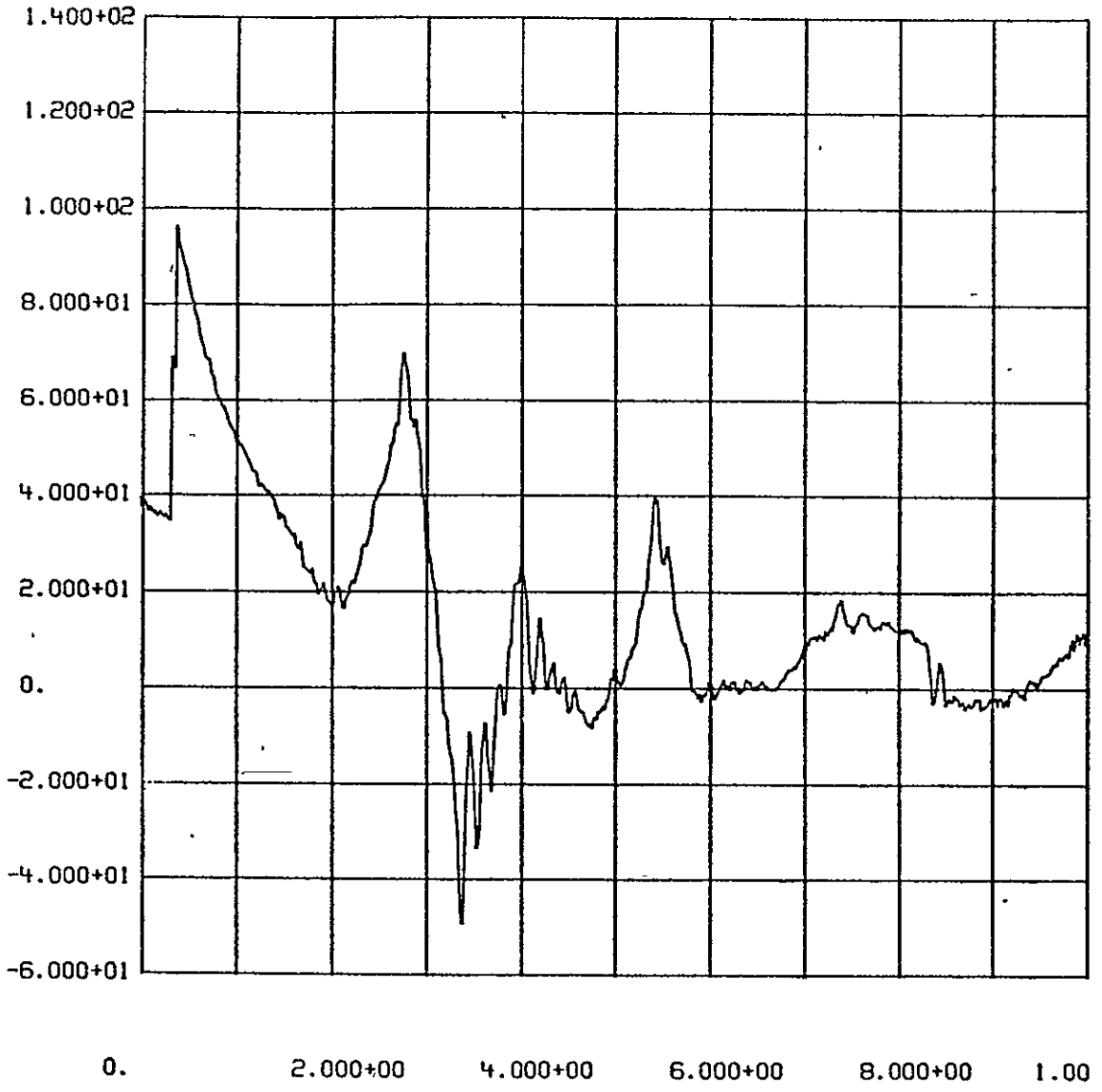
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.3-3


1 99483
1.75254
1.51025
1.26795
1 02566
78337
.54108
.29878
.05649
-.18580
-.42810
TIME PULSE
0.
3.5000
7.0000
10.5000
14.0000
17.5000
21.0000
24.5000
28.0000
31.5000
35.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.3-3



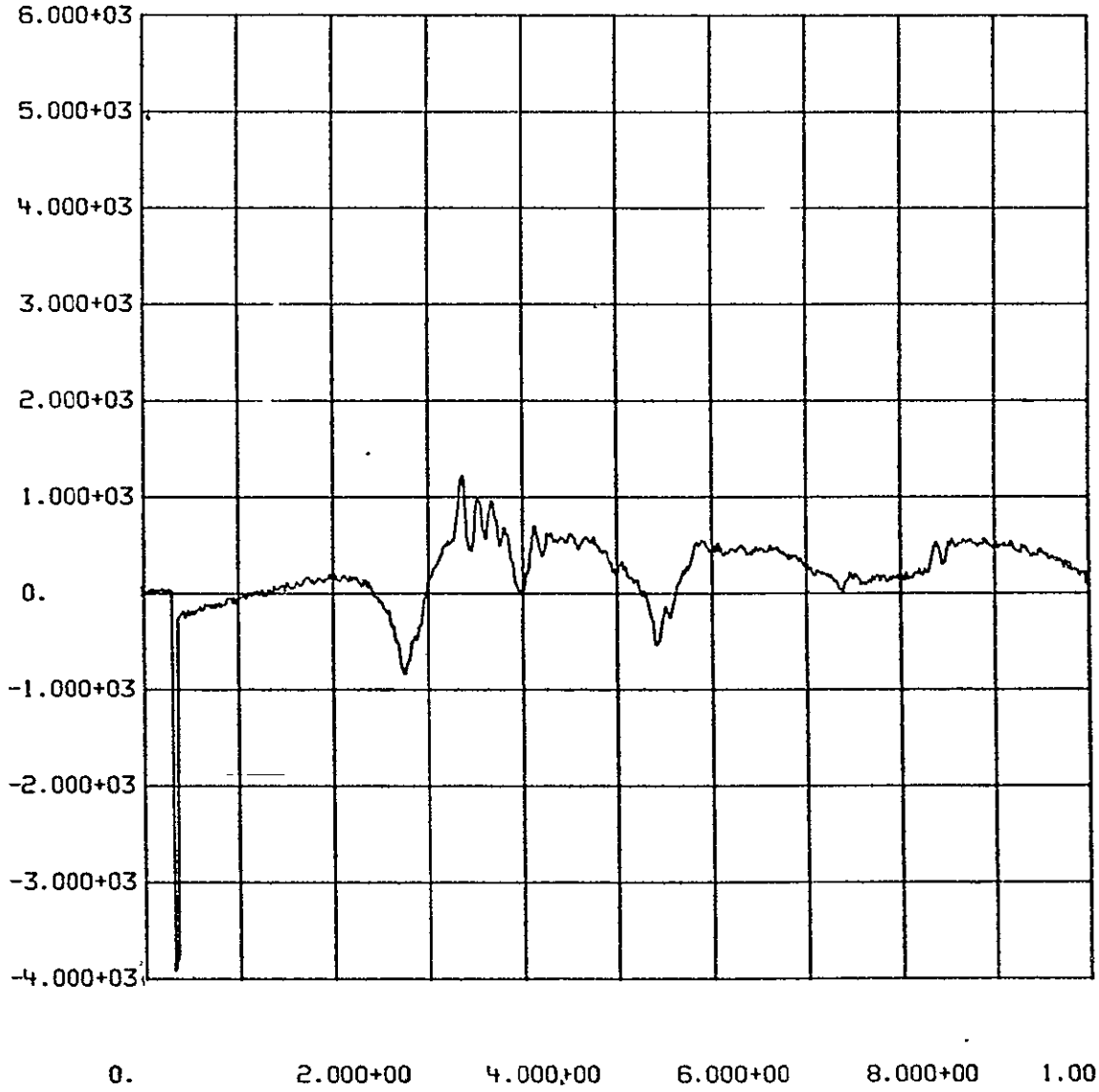
Z-LOAD VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.3-3 * UNFILT *



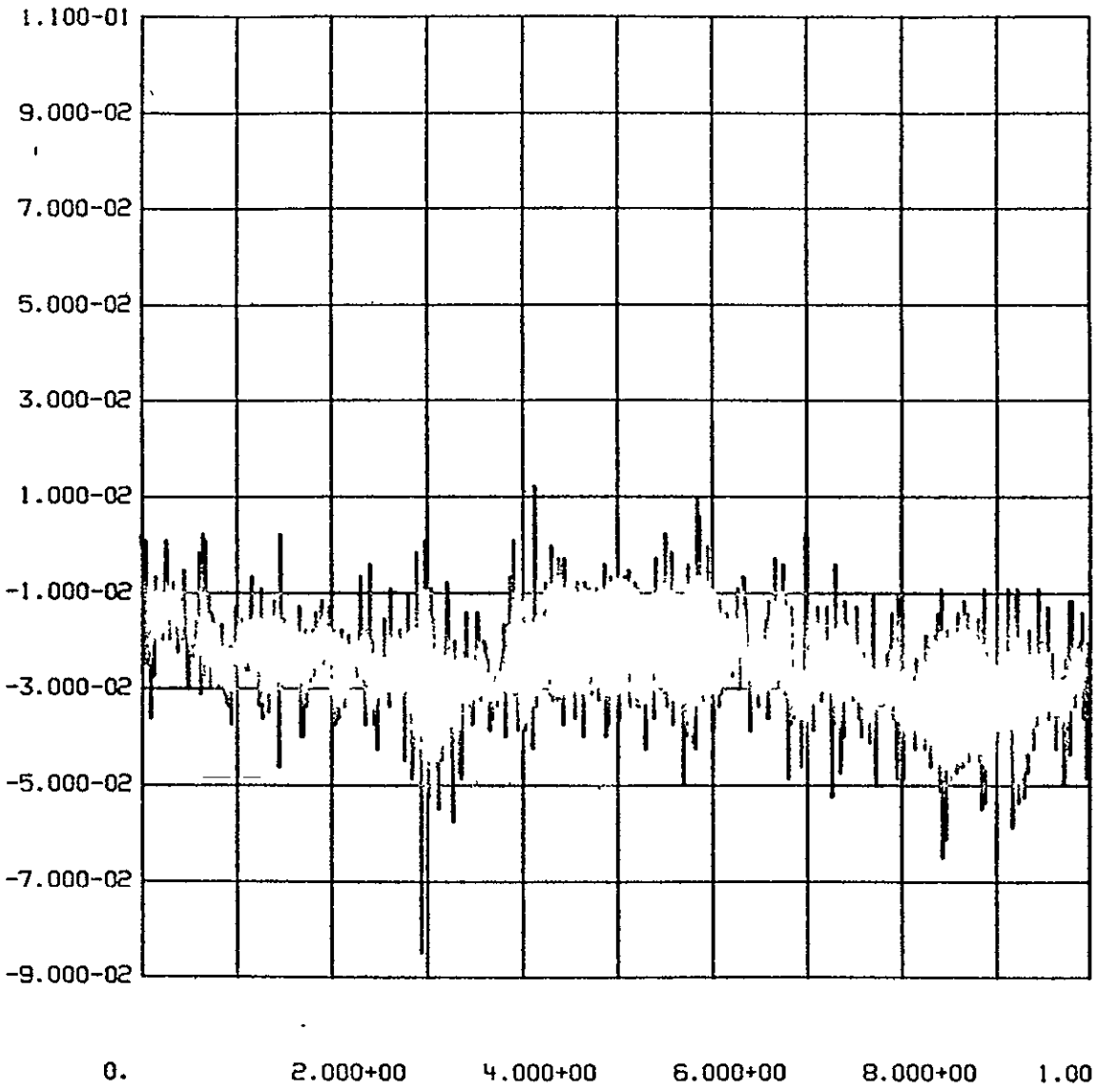
Y-LOAD VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.3-3 * UNFILT *



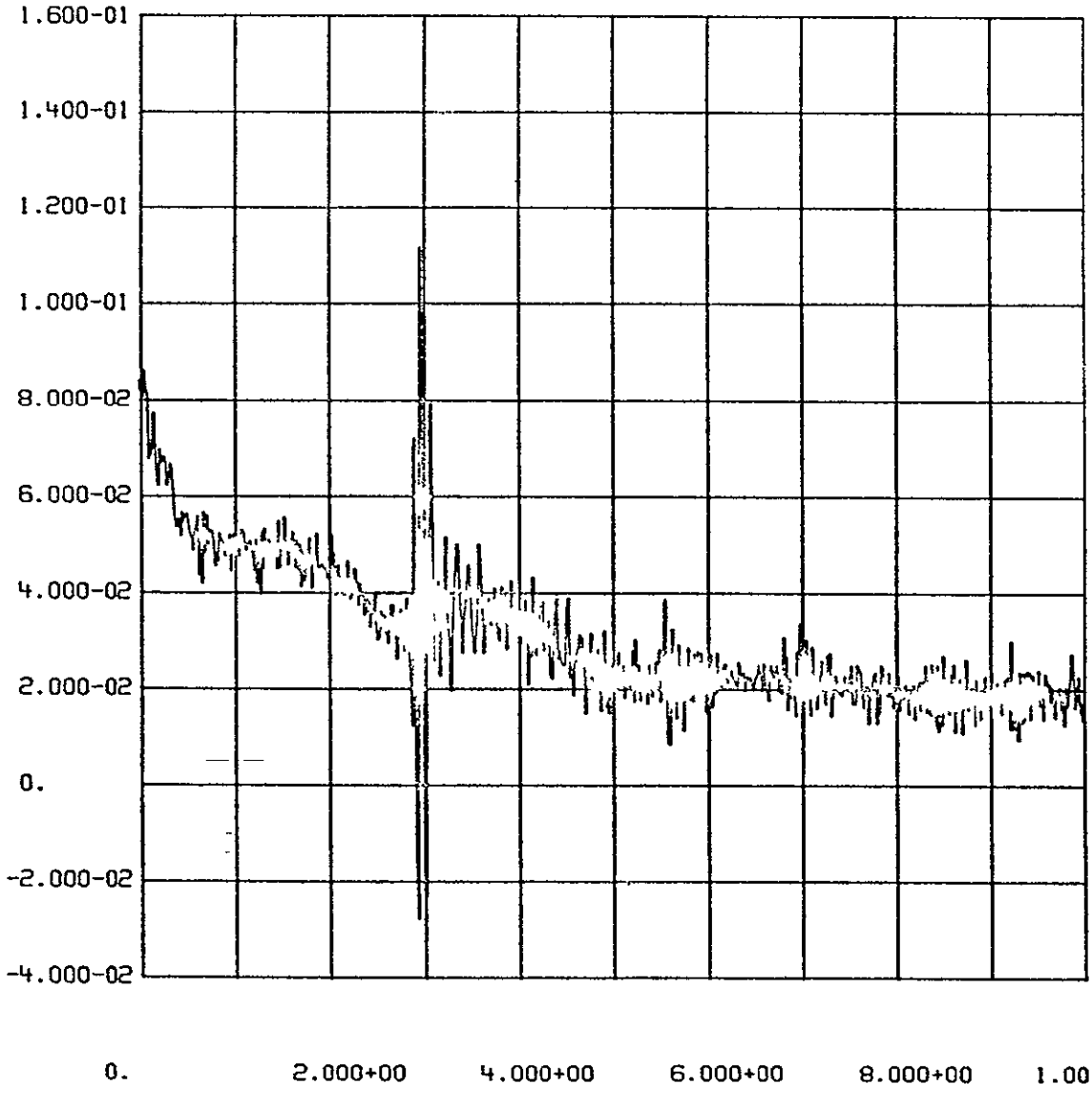
MOMENT VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.3-3 * UNFILT *



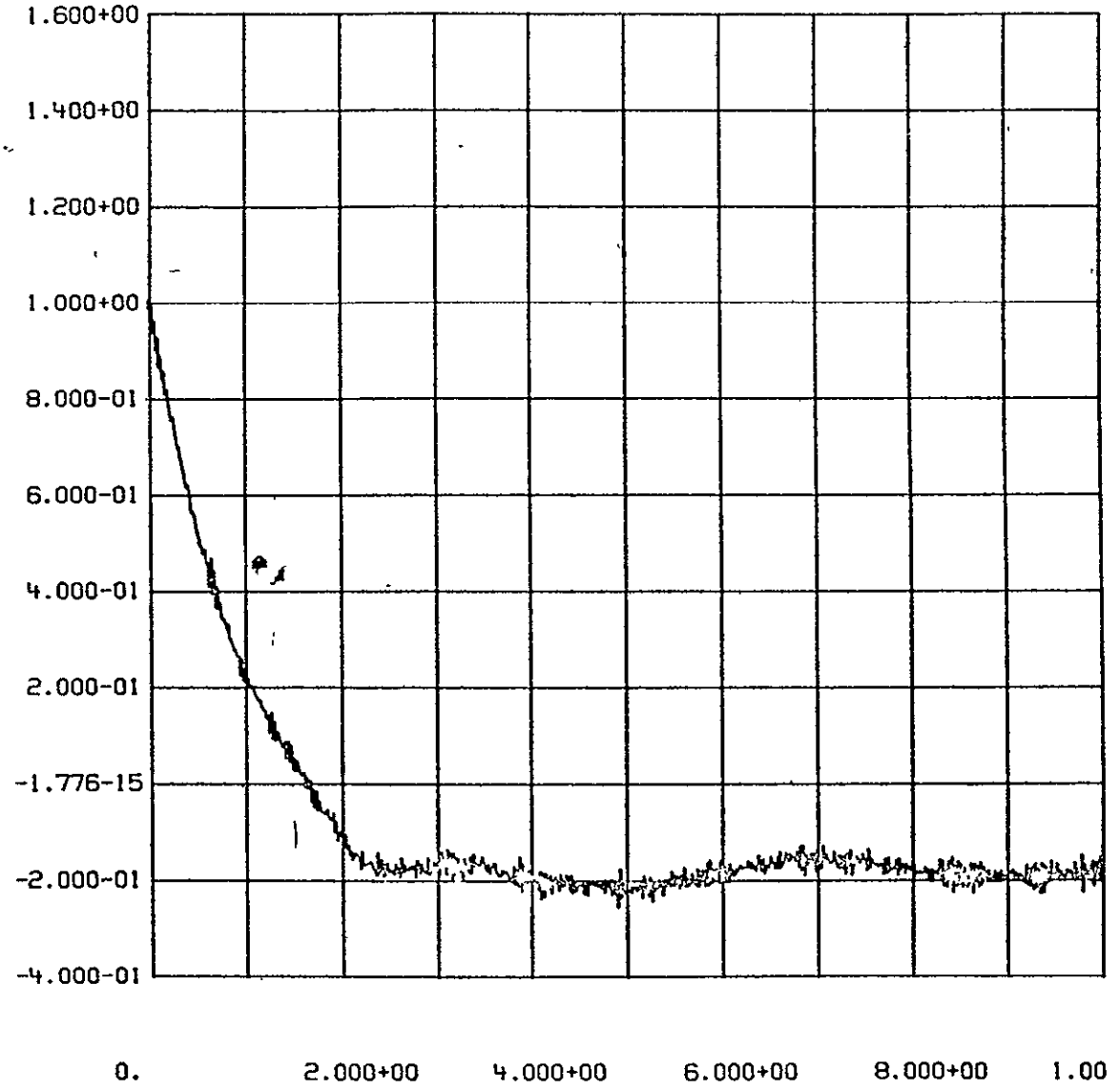
AC YAC VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.3-3 * UNFILT *



AC XAC VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.3-3 * UNFILT *

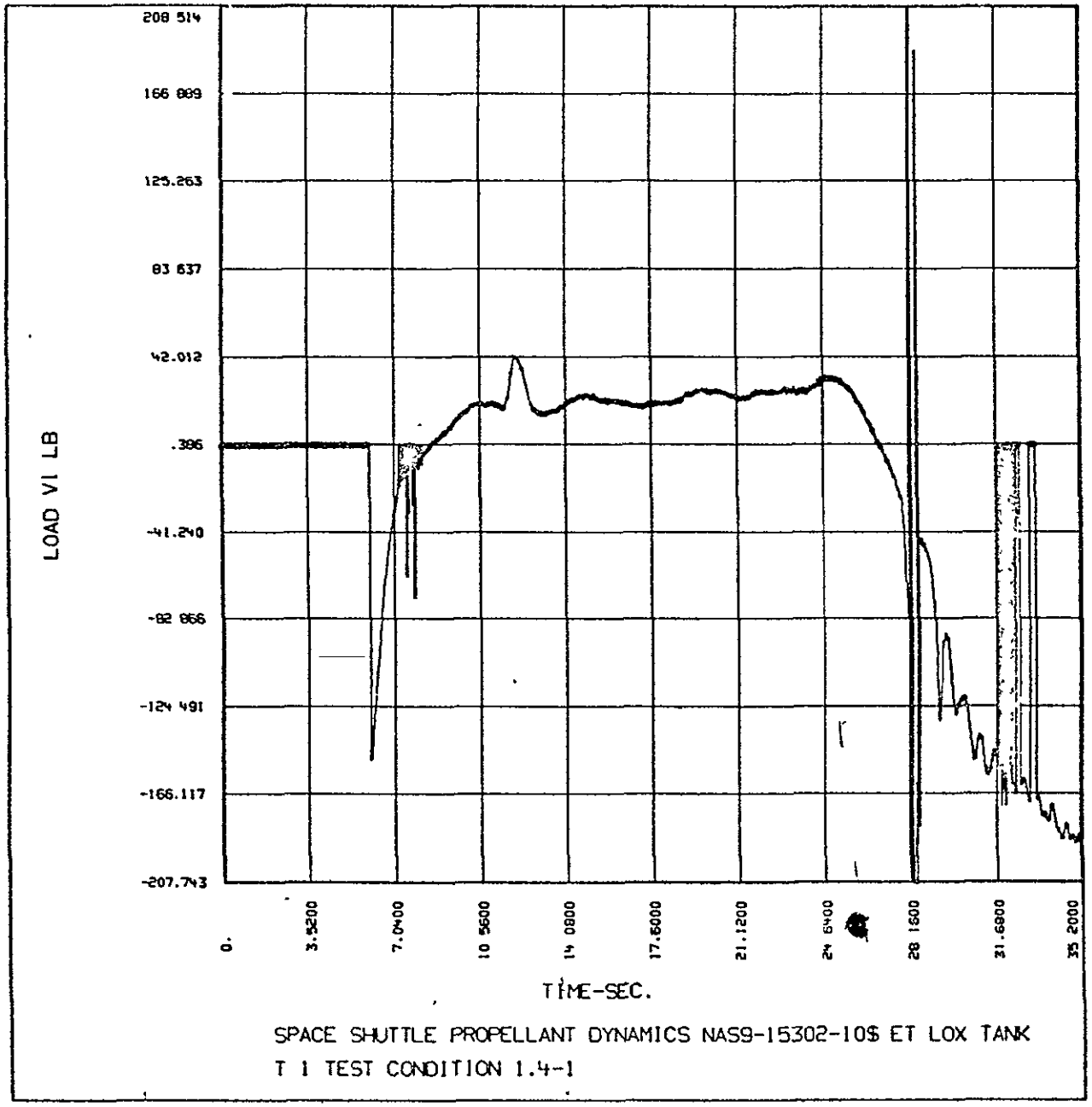


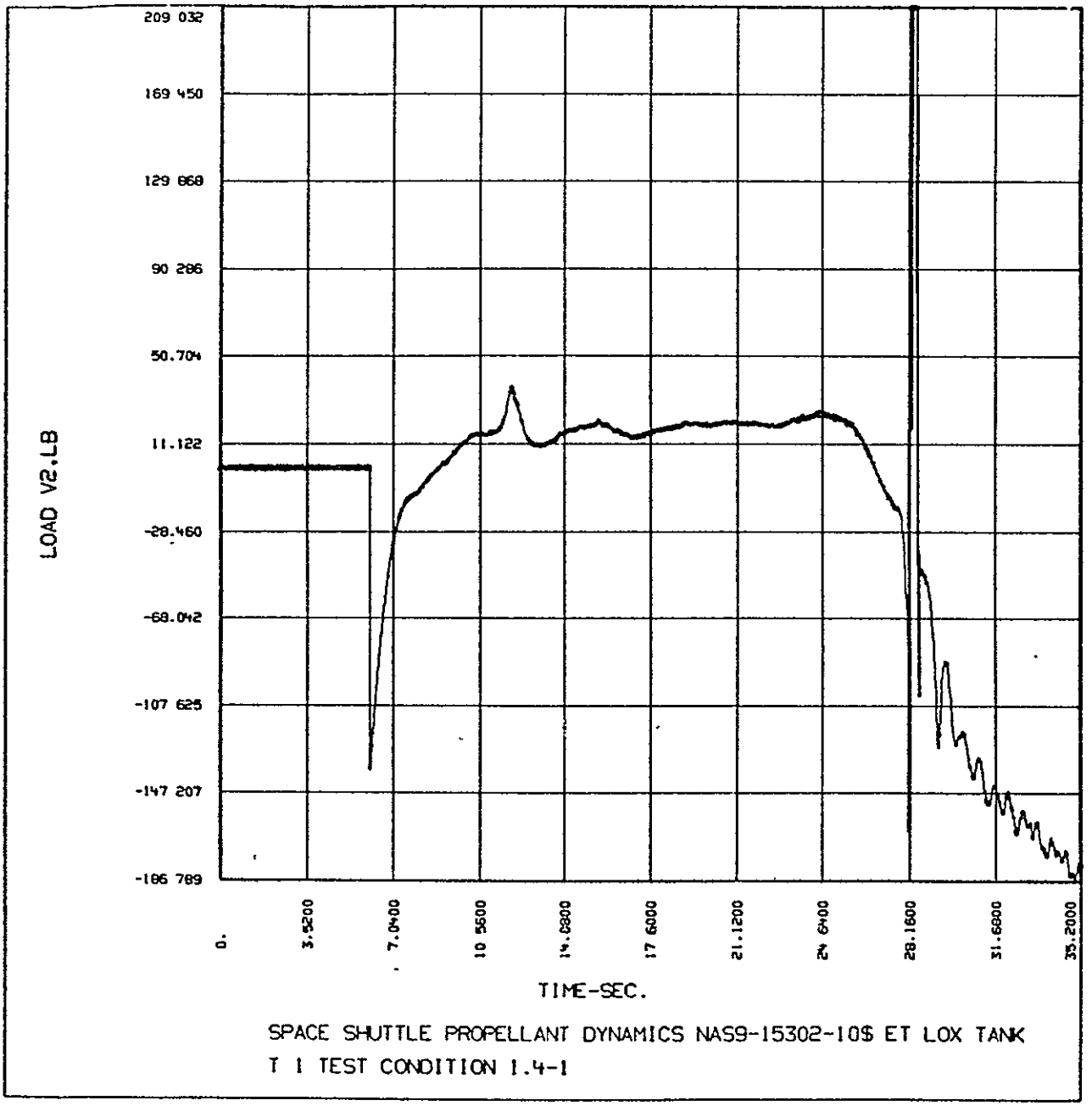
AC ZAC VS TIME

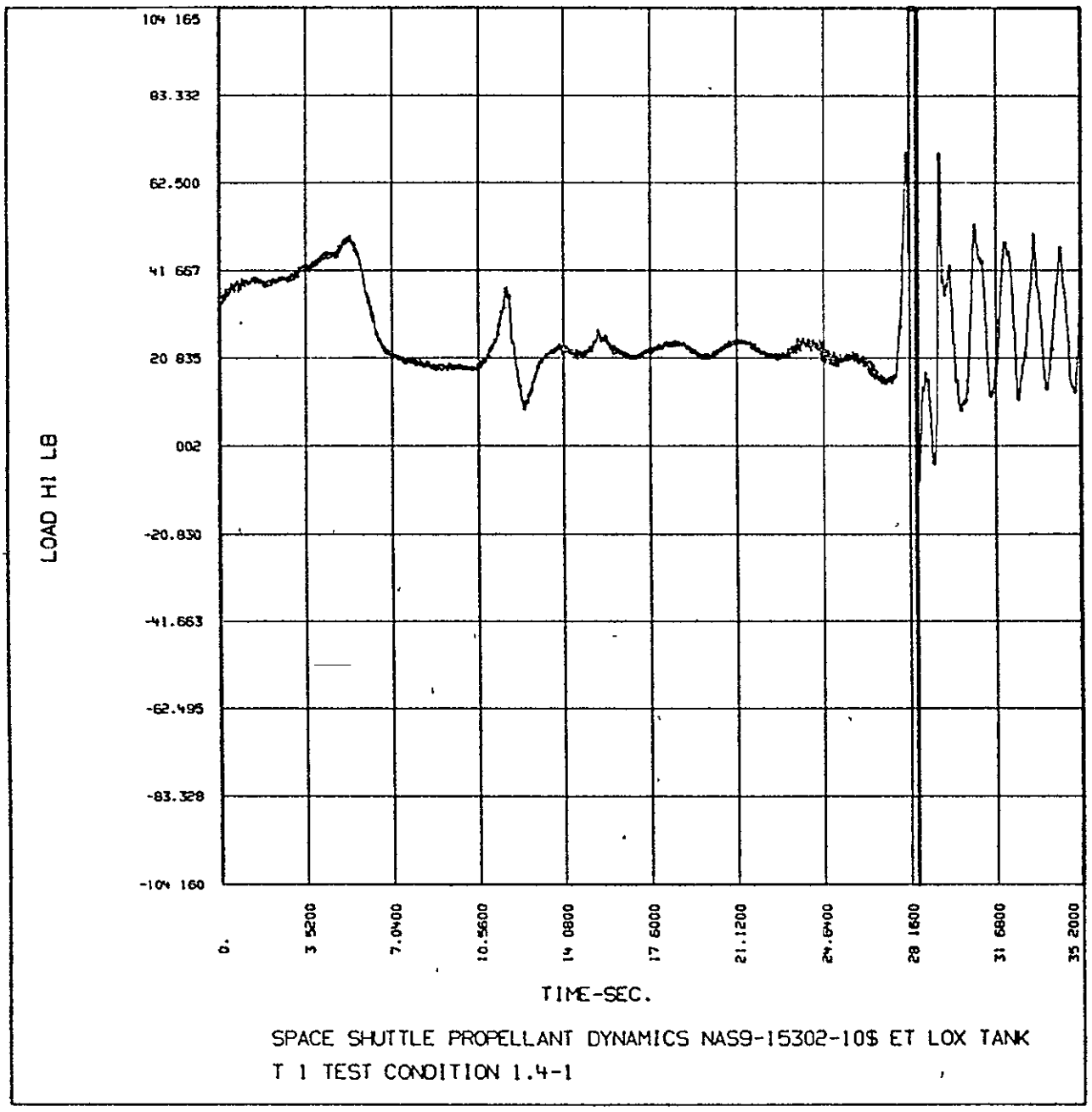
1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.3-3 * UNFILT *

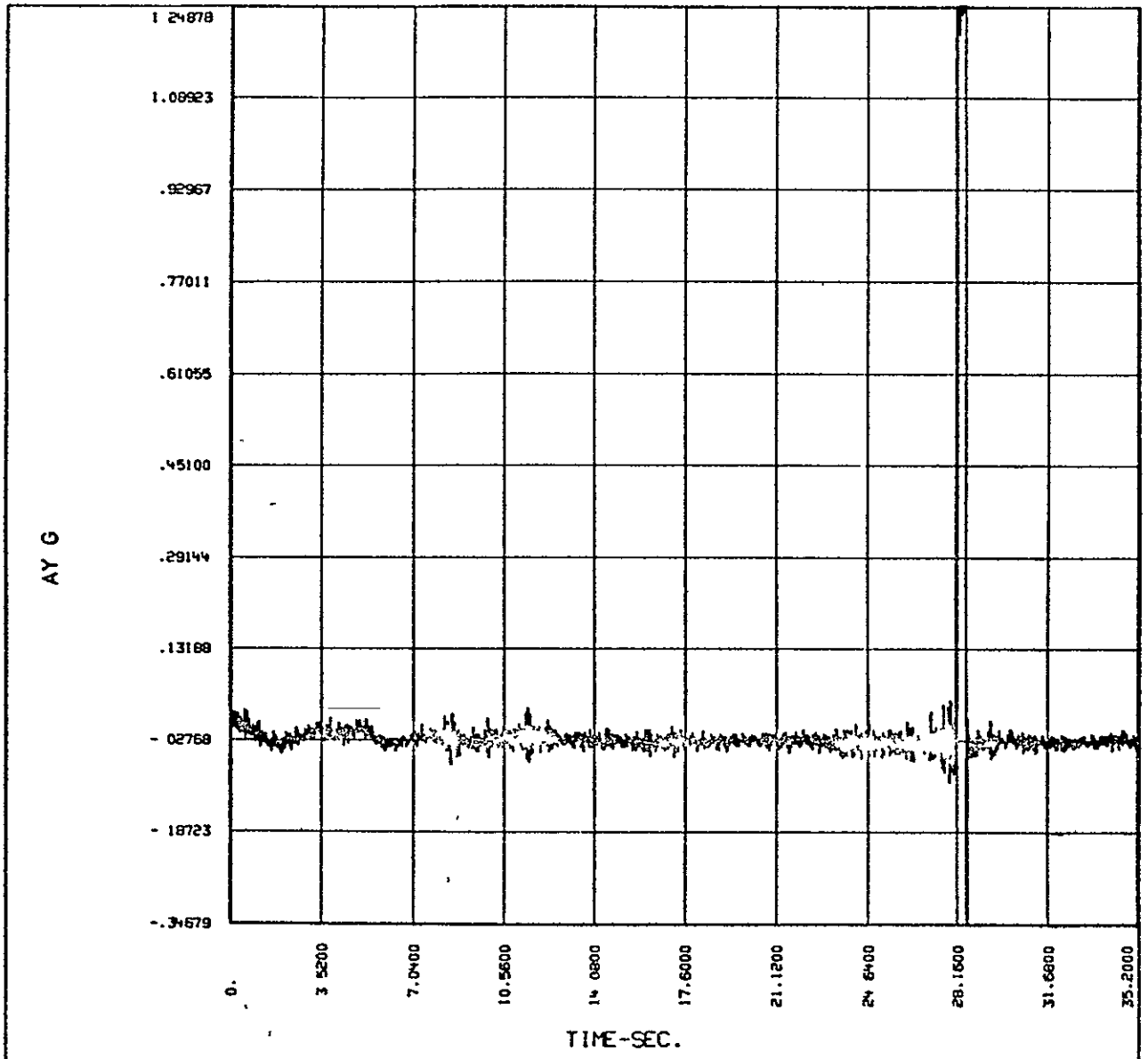
Test Data Condition 1.4-1

No Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 5%
Target Acceleration–0.1 g

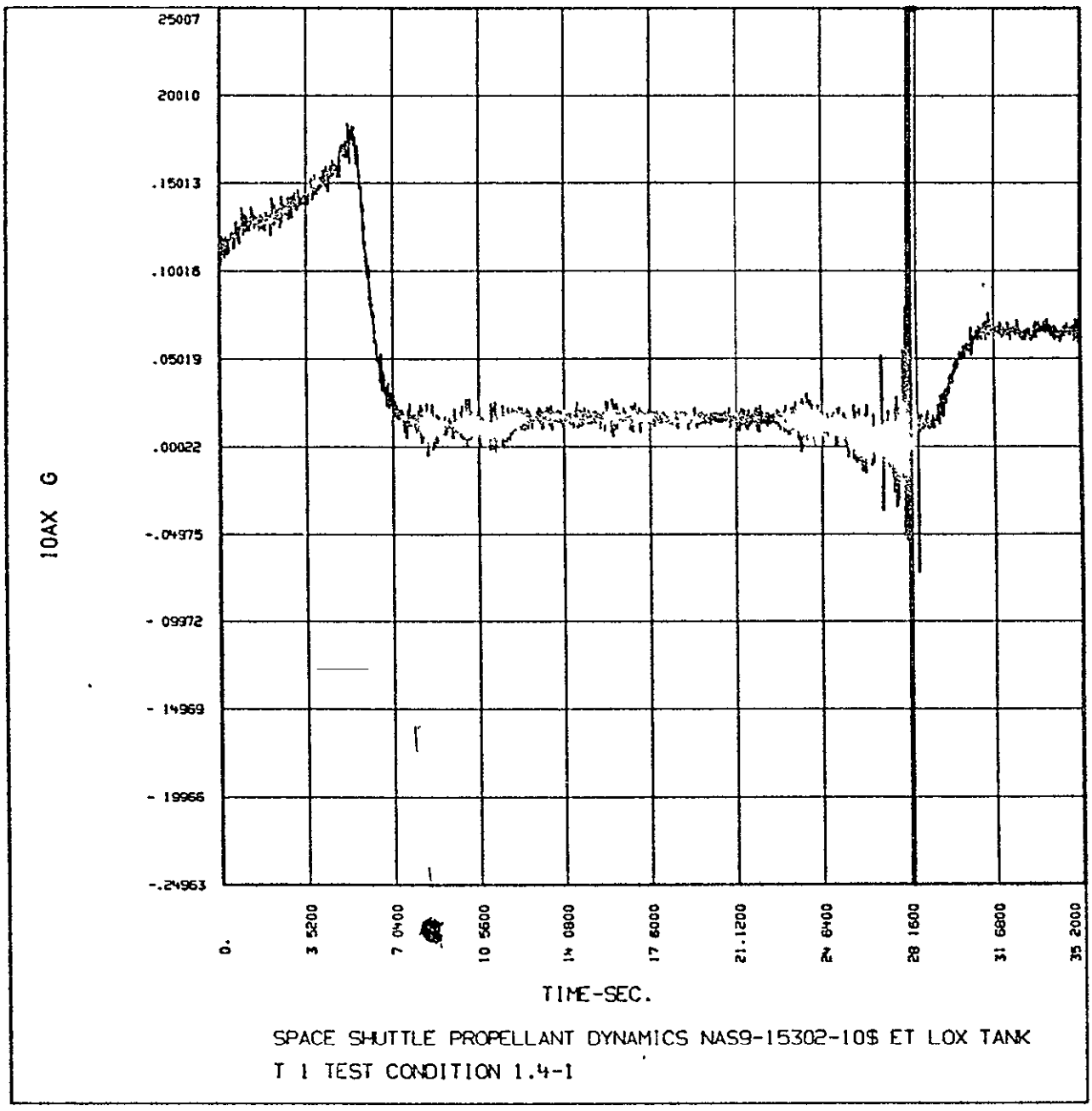

208 514
166 889
125.263
83 637
42.012
.396
-41.240
-82 866
-124 491
-166.117
-207.743
LOAD VI LB
0.
3.5200
7.0400
10 5600
14 0800
17.6000
21.1200
24 6400
28 1600
31.6800
35 2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.4-1

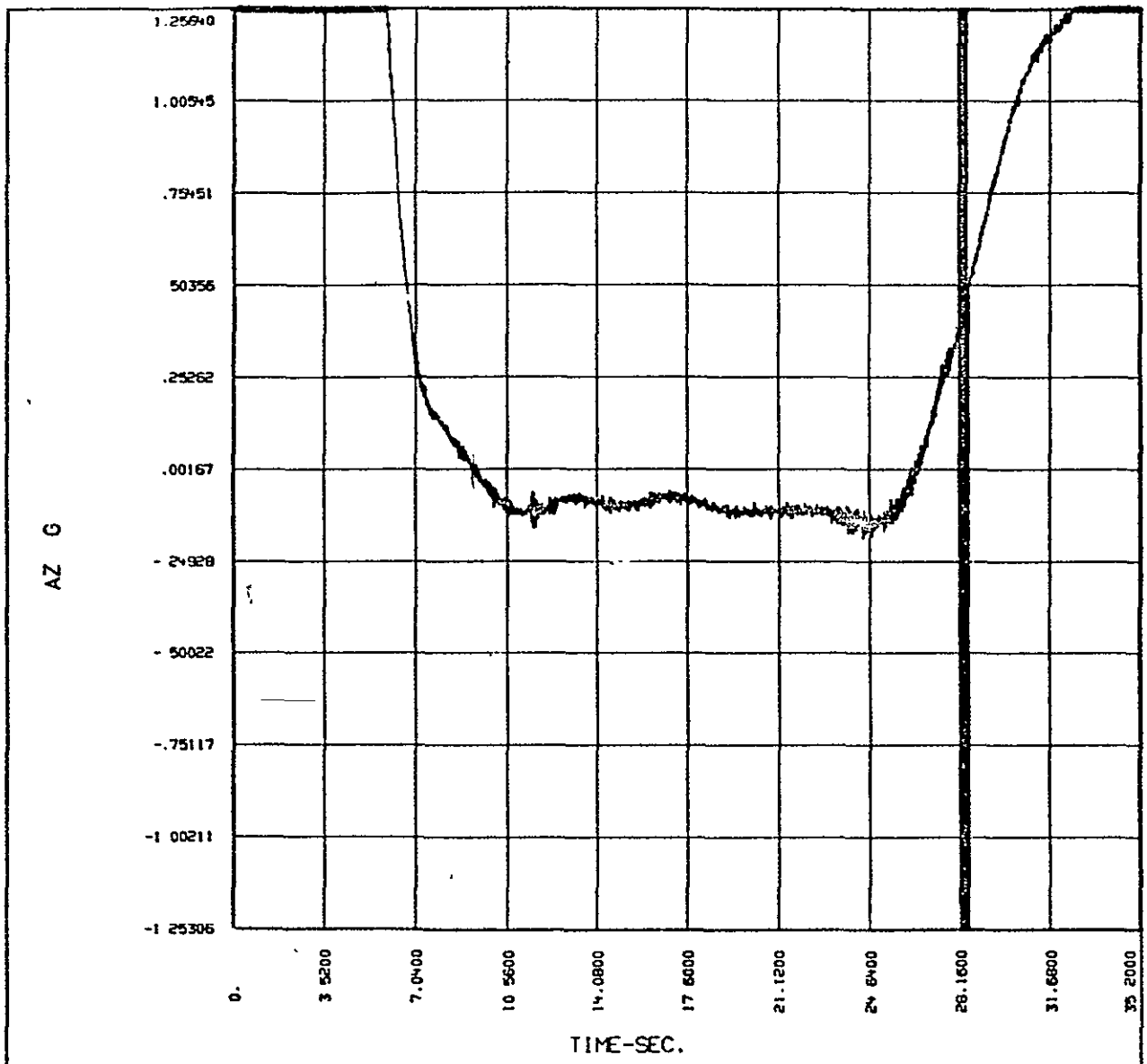

209 032
169 450
129 868
90 286
50.704
11.122
-28.460
-68.042
-107 625
-147 207
-186 789
LOAD V2,LB
0.
3.5200
7.0400
10 5600
14.0800
17 6000
21.1200
24 6400
28.1600
31.6800
35.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.4-1


104 165
83.332
62.500
41 667
20 835
002
-20.830
-41.663
-62.495
-83.328
-104 160
LOAD H1 LB
0.
3 5200
7.0400
10.5600
14 0800
17 6000
21.1200
24.6400
28 1600
31 6800
35 2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.4-1

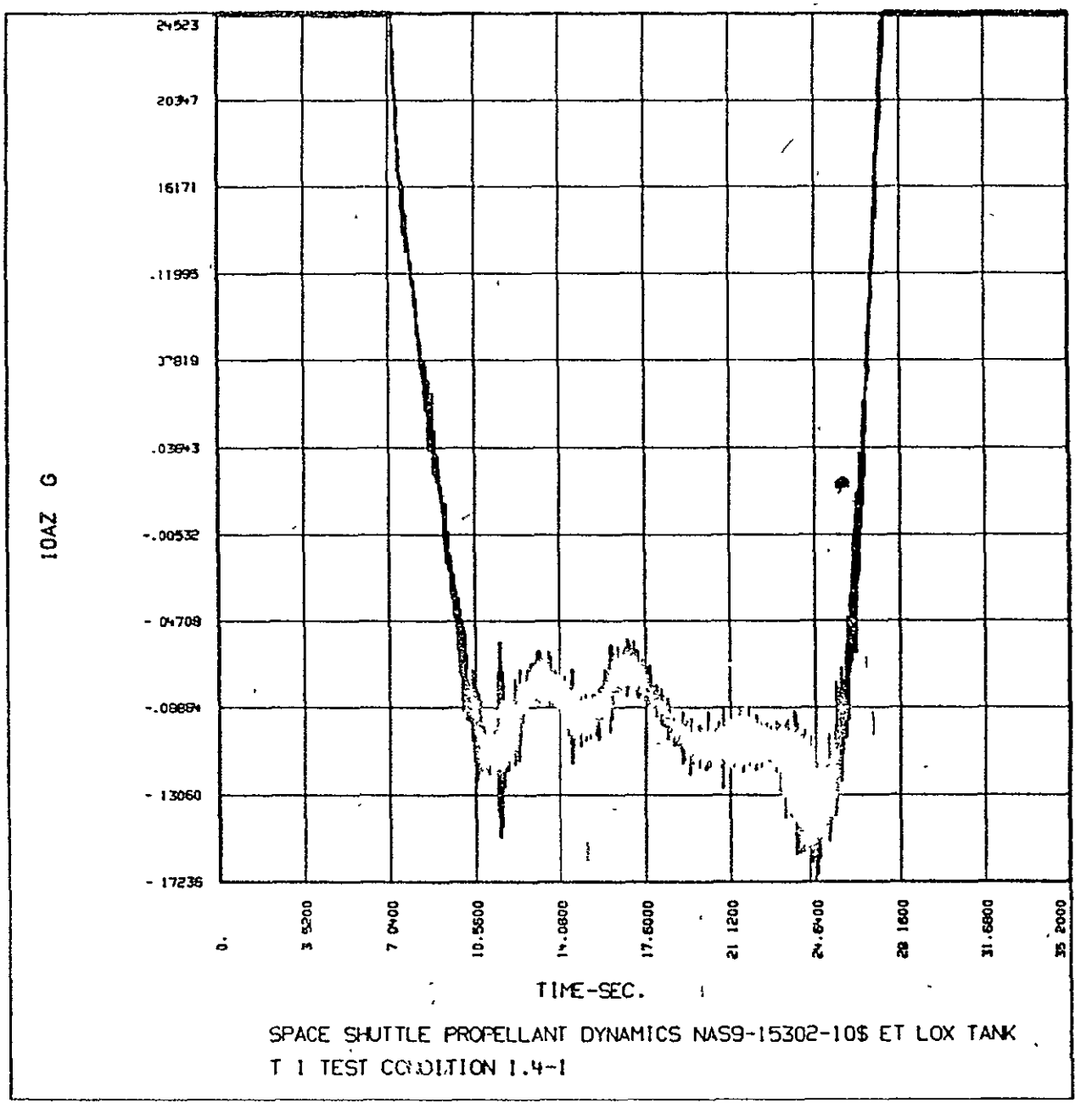


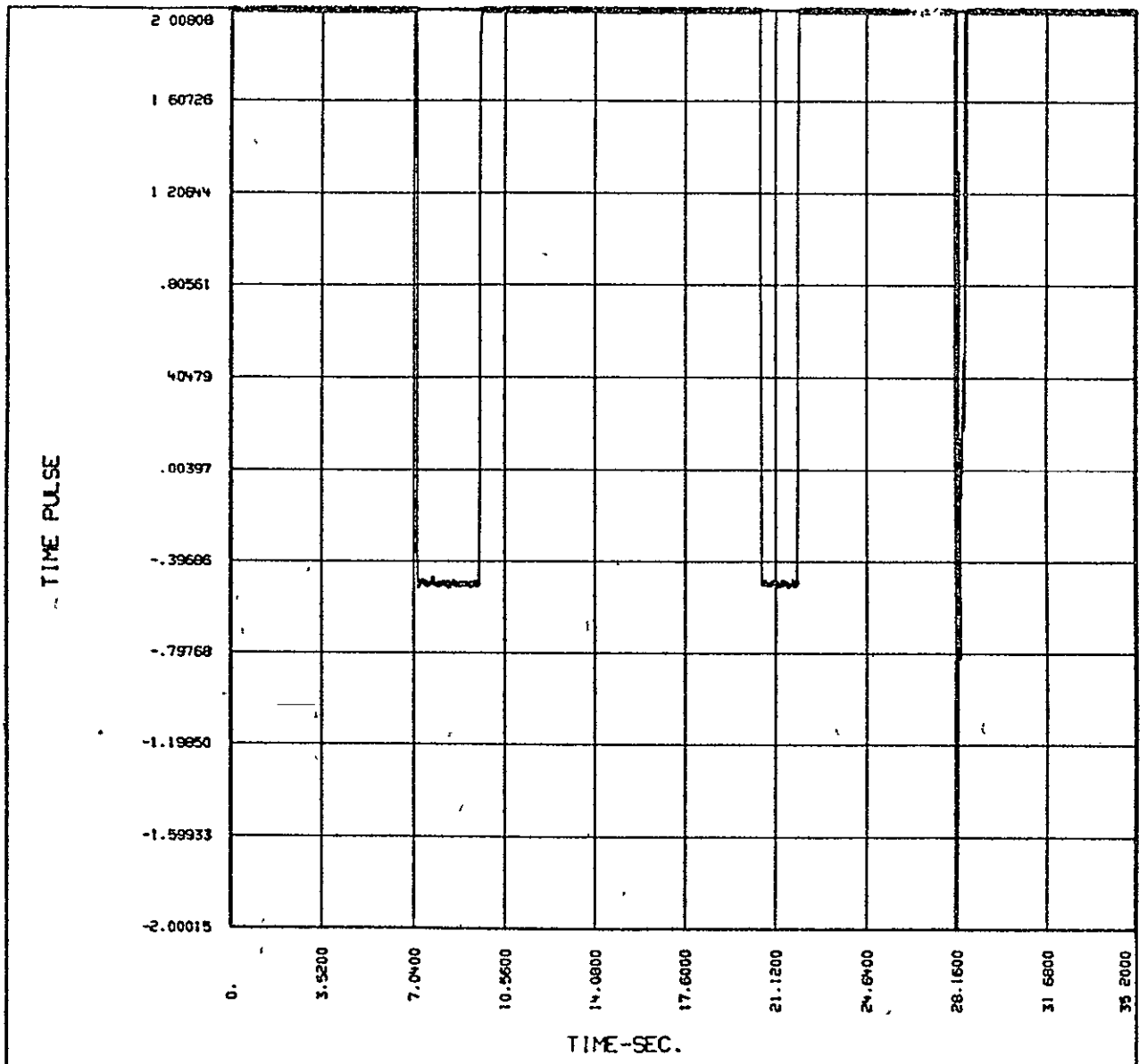
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.4-1


25007
20010
.15013
.10016
.05019
.00022
-.04975
- 09972
- 14969
- 19966
-.24963
10AX G
0.
3 5200
7 0400
10 5600
14 0800
17 6000
21.1200
24 6400
28 1600
31 6800
35 2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.4-1

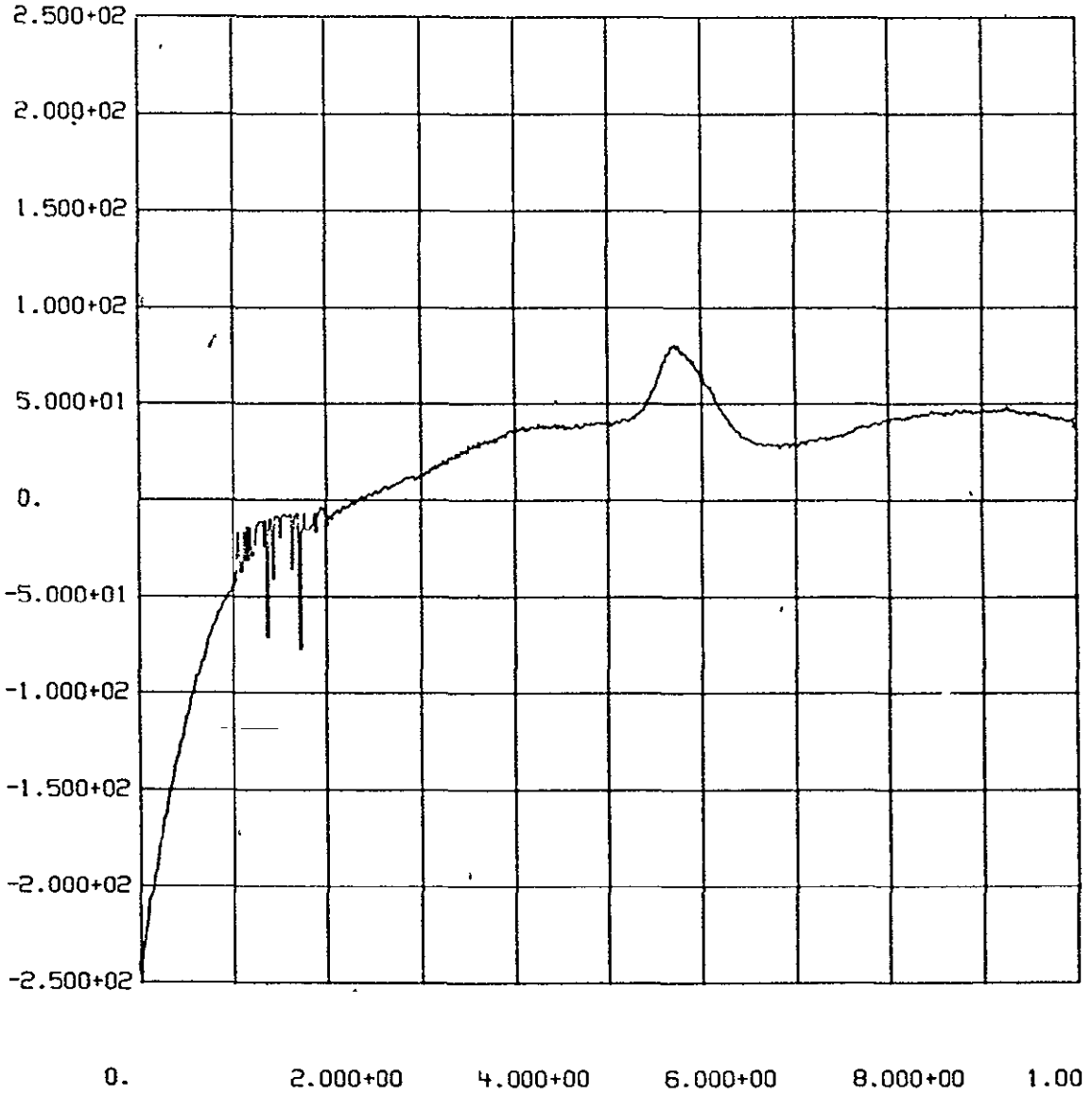


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.4-1


24523
20347
16171
.11995
37819
.03643
-.00532
- 04709
-.08884
- 13060
- 17236
10AZ G
0.
3 5200
7 0400
10.5600
14.0800
17.6000
21 1200
24.6400
28 1600
31.6800
35 2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.4-1

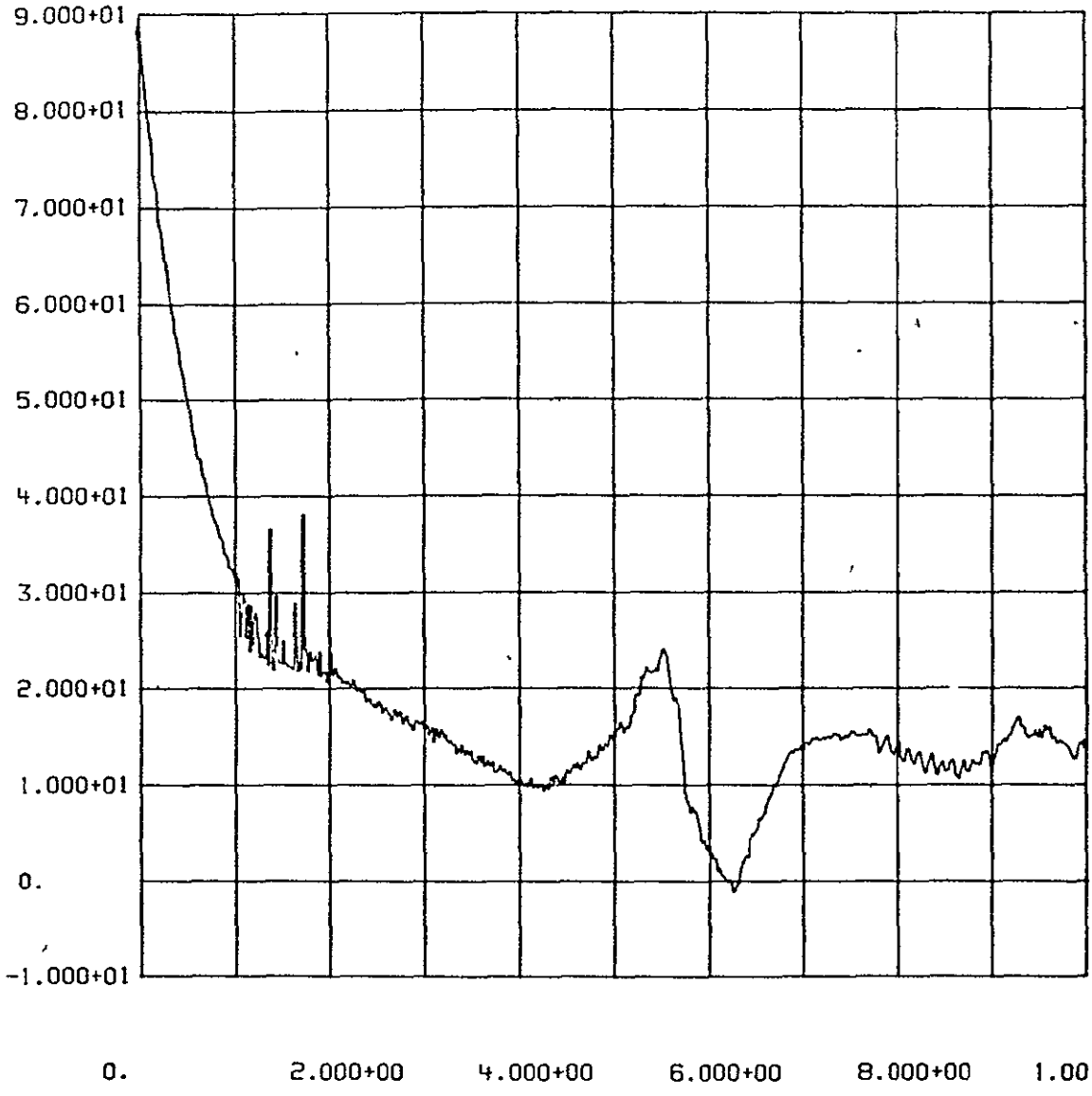


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.4-1



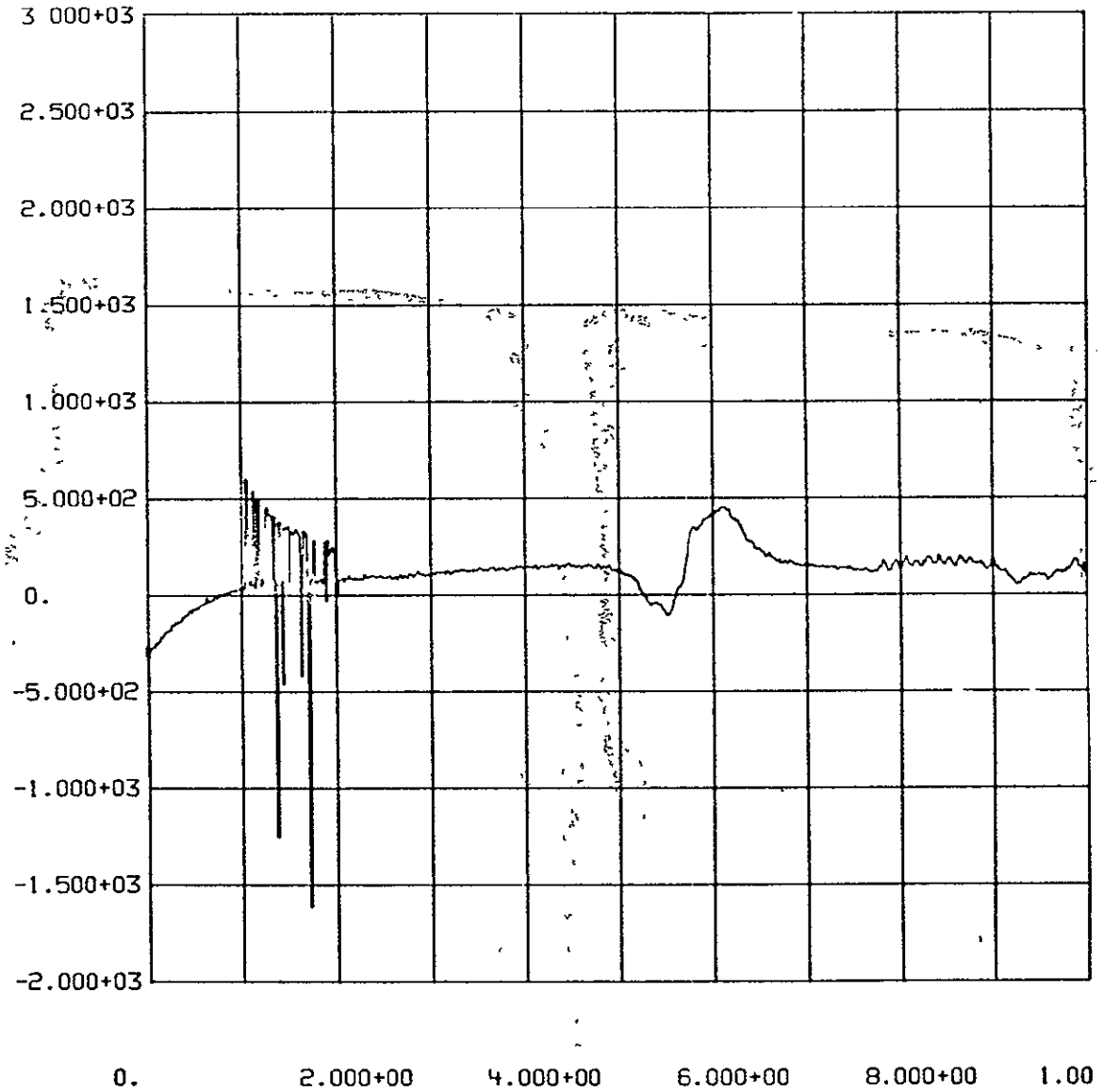
Z-LOAD VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.4-1 *UNFILT*



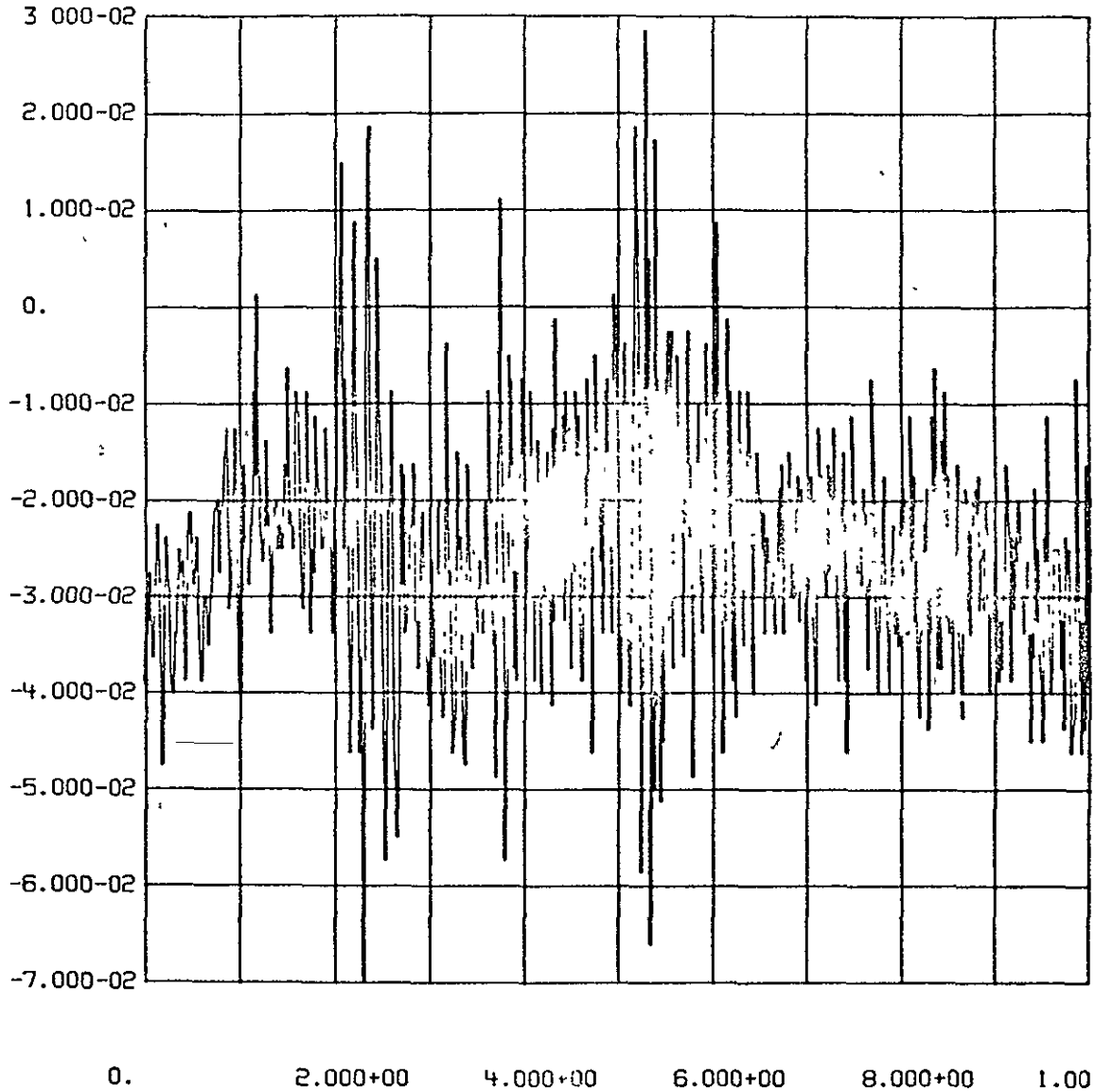
Y-LOAD VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.4-1 *UNFILT*



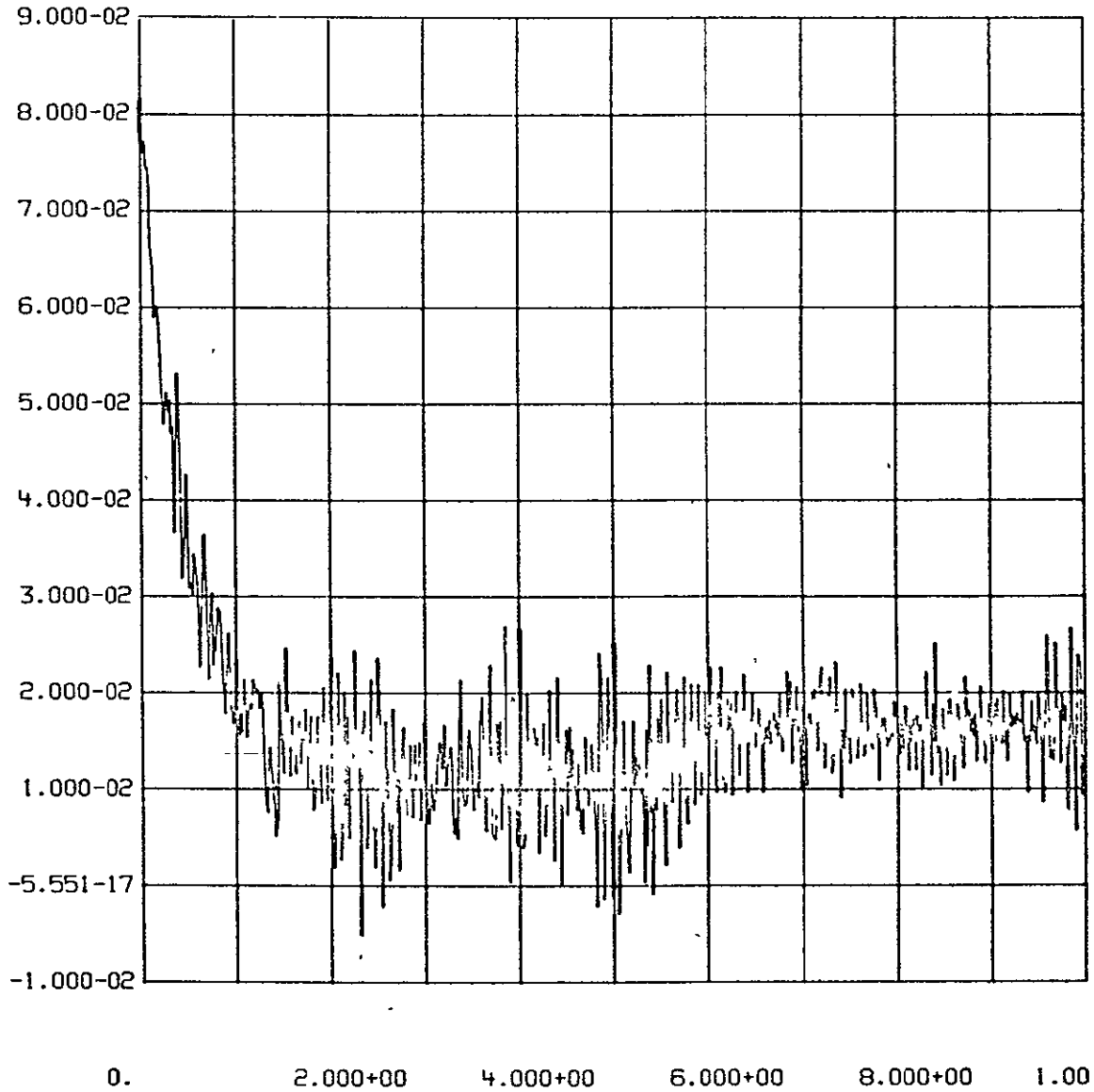
MOMENT VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.4-1 *UNFILT*



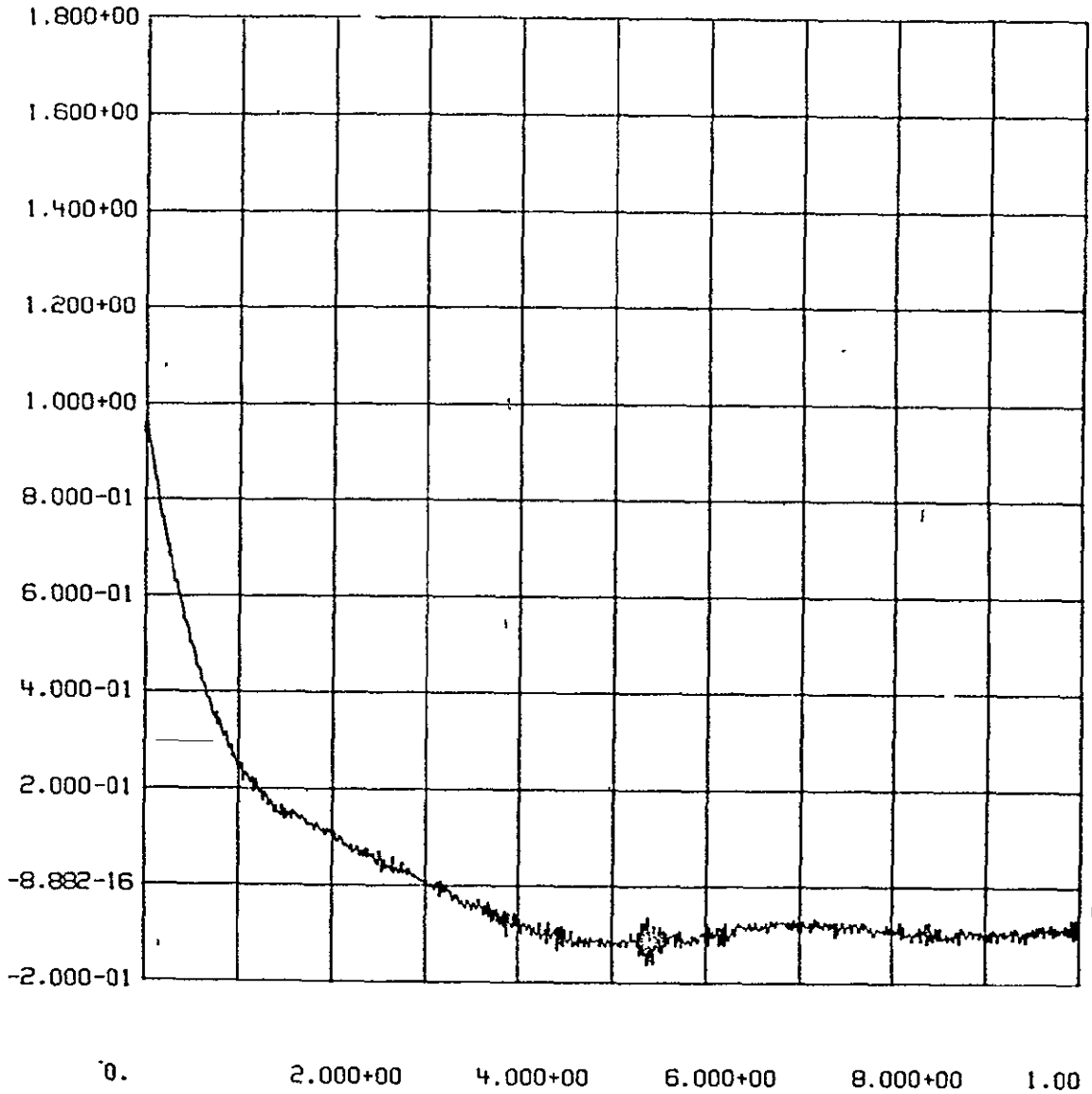
AC YAC VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.4-1 *UNFILT*



AC XAC , VS TIME

1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.4-1 *UNFILT*

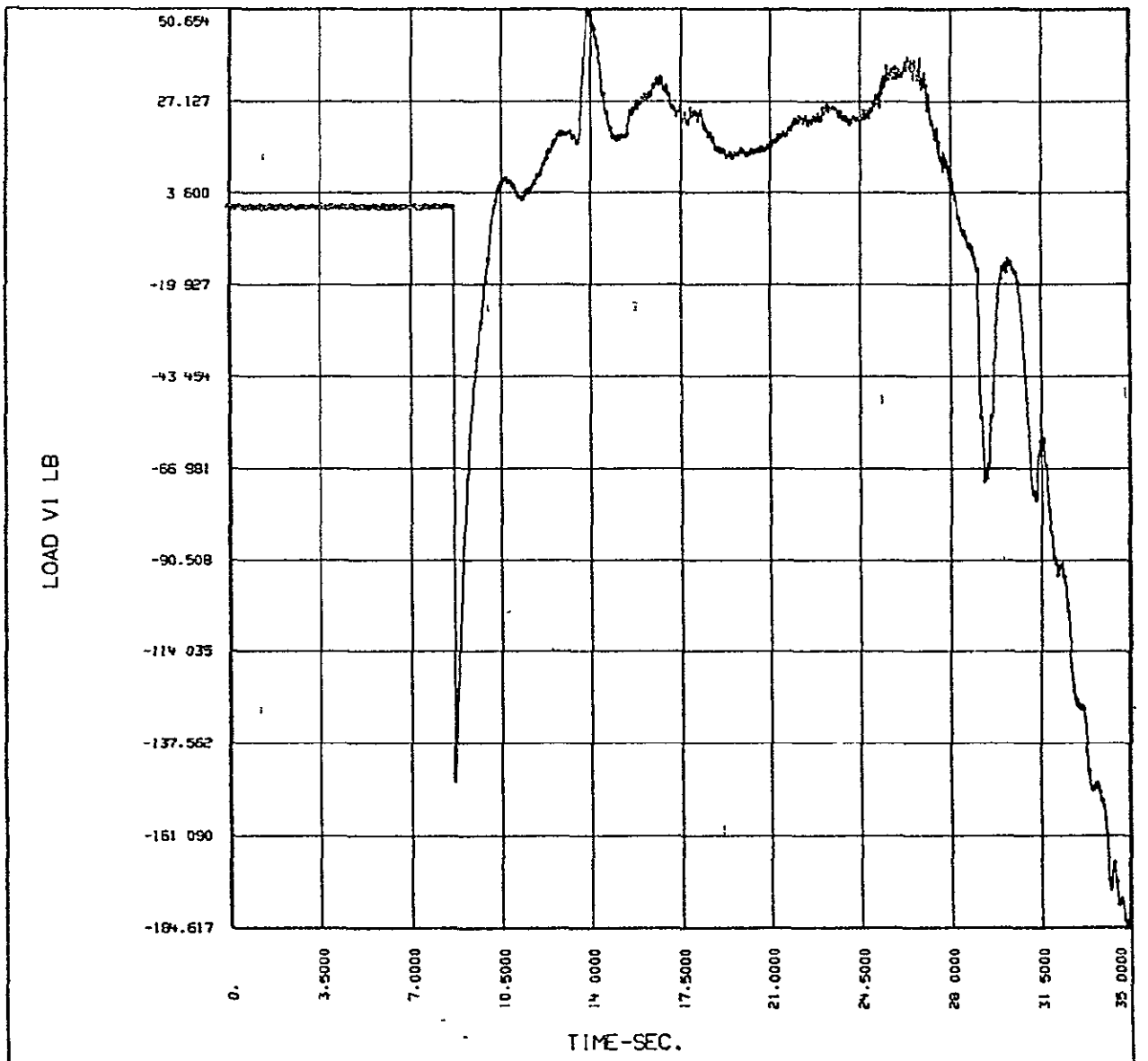


AC ZAC VS TIME

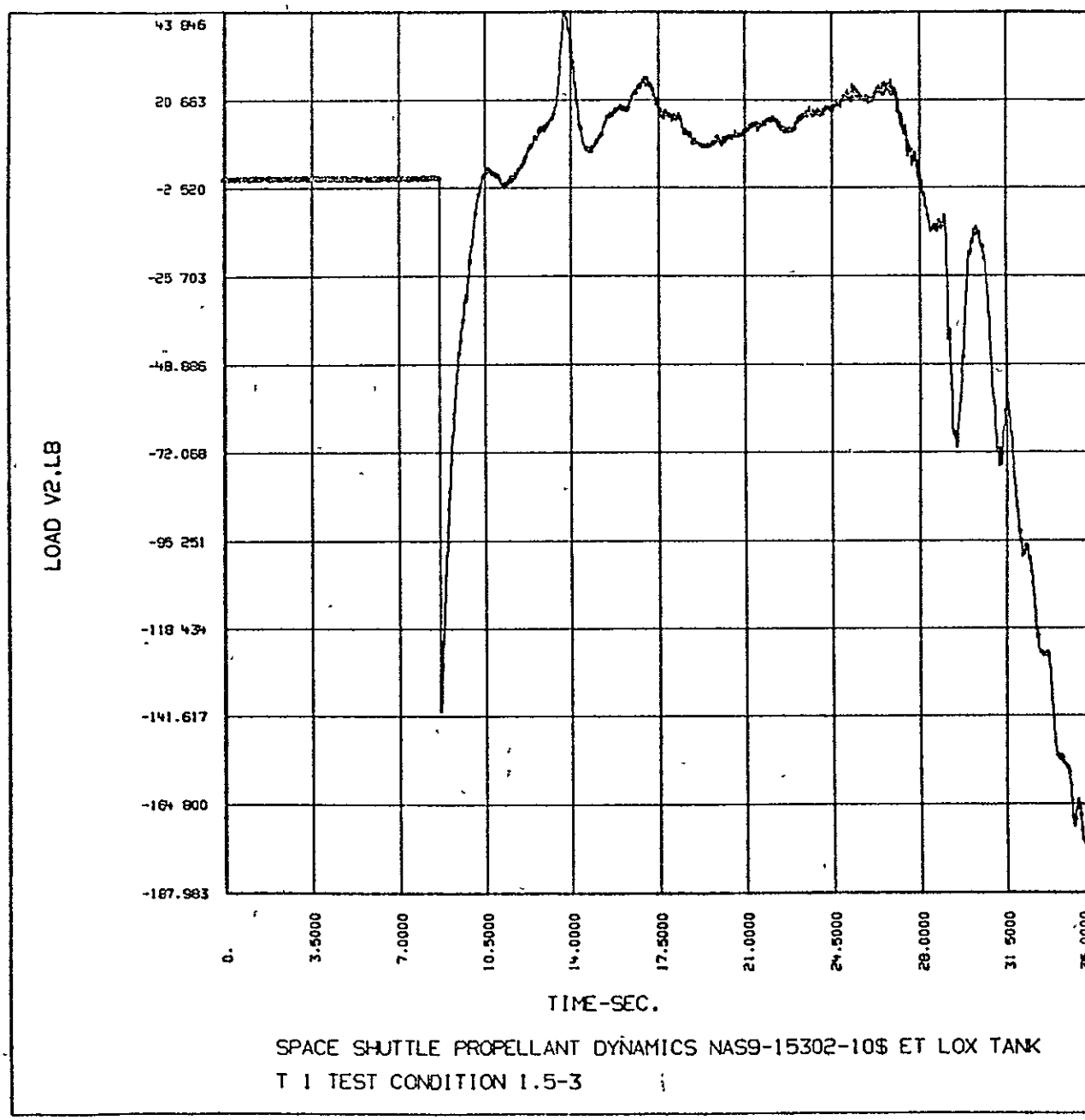
1 FLT 1 27AP79 FLIGHT 1 TEST CONDITION 1.4-1 *UNFILT*

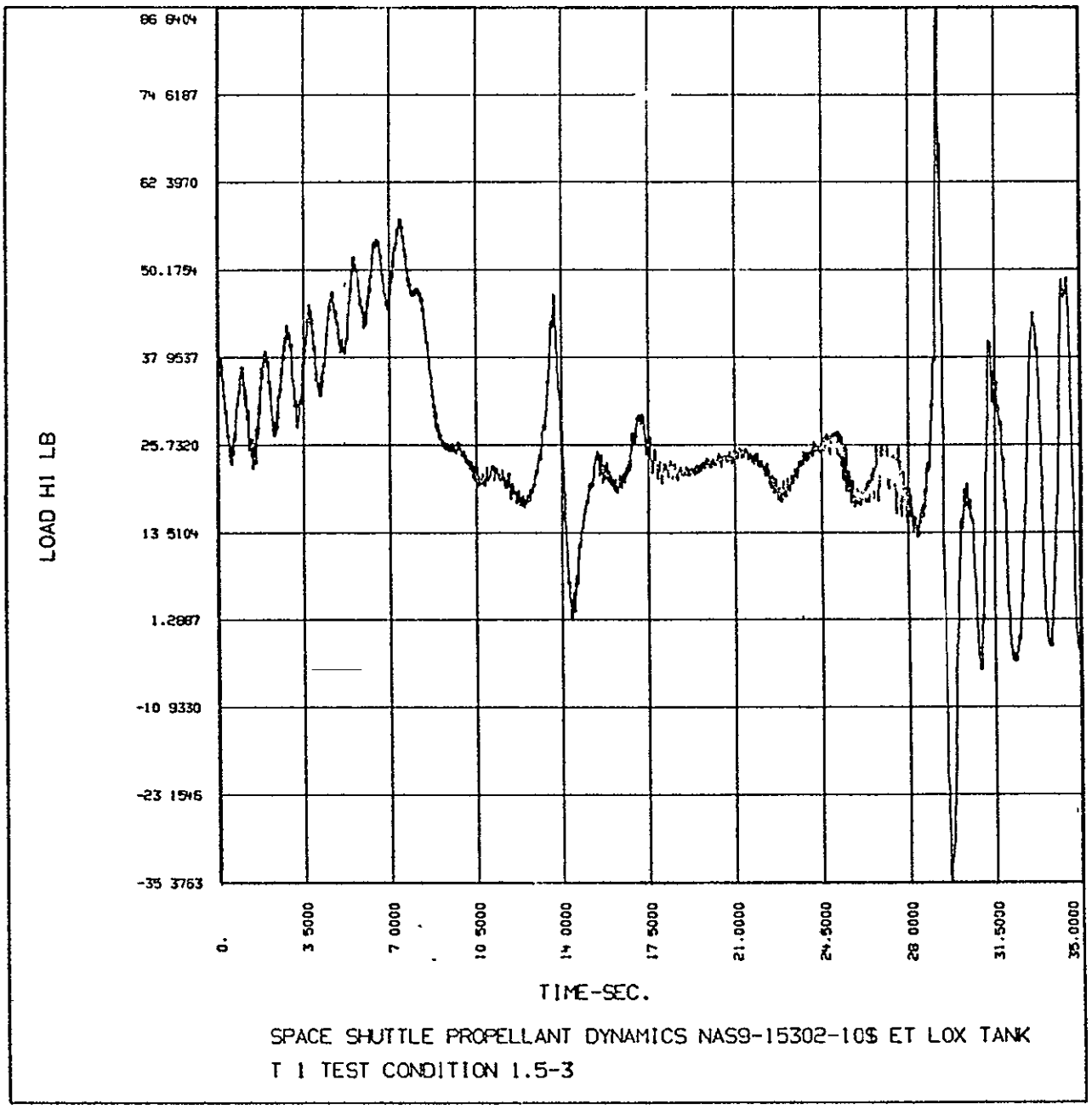
Test Data Condition 1.5-3

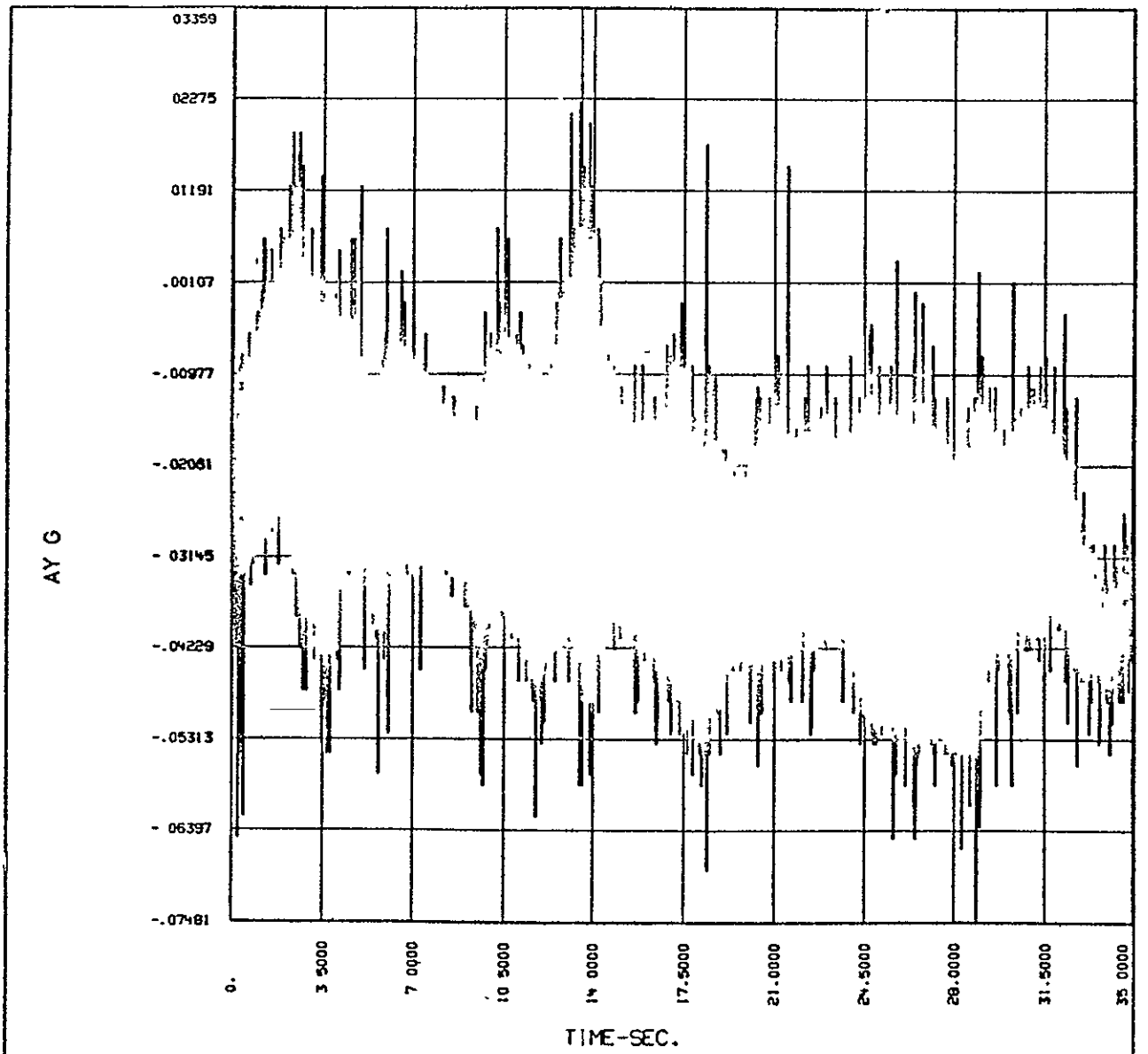
No Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 10%
Target Acceleration–0.1 g



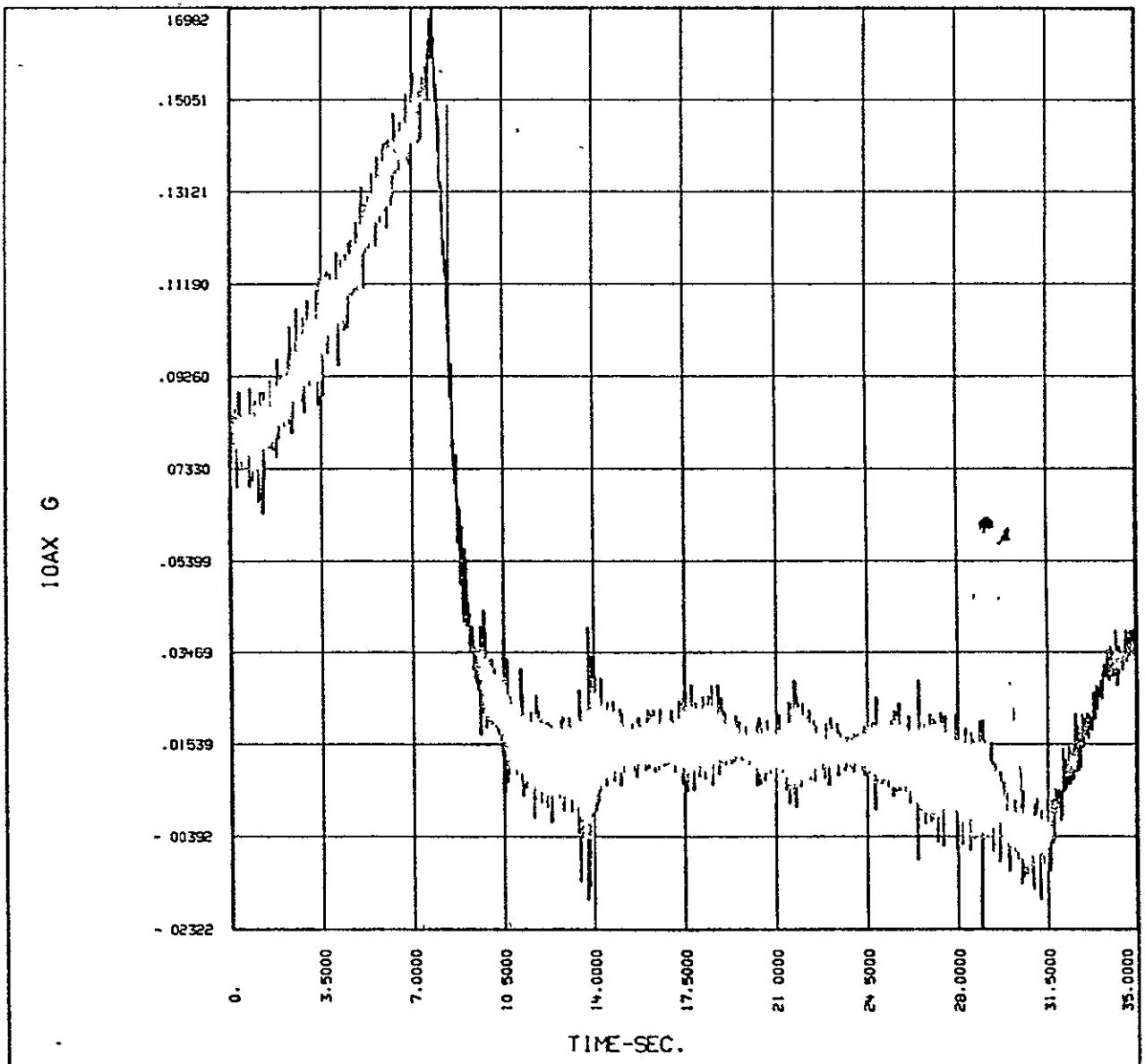
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.5-3


43 846
20 663
-2 520
-25 703
-48.886
-72.068
-95 251
-118 434
-141.617
-164 800
-187.983
LOAD V2,LB
0.
3.5000
7.0000
10.5000
14.0000
17.5000
21.0000
24.5000
28.0000
31 5000
35 0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.5-3

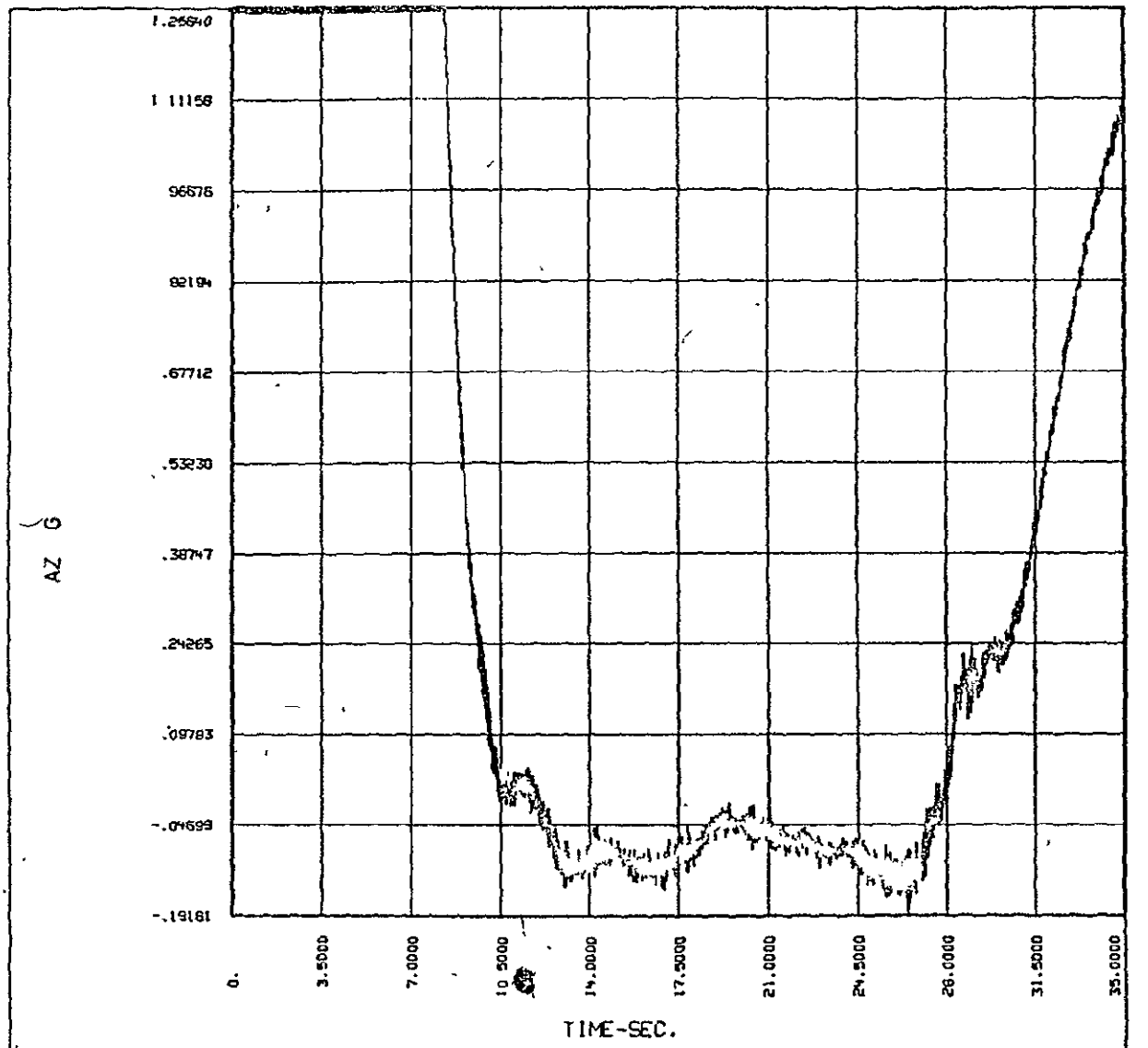

86 8404
74 6187
62 3970
50.1754
37 9537
25.7320
13 5104
1.2887
-10 9330
-23 1546
-35 3763
LOAD H1 LB
0.
3 5000
7 0000
10 5000
14 0000
17 5000
21.0000
24.5000
28 0000
31.5000
35.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.5-3



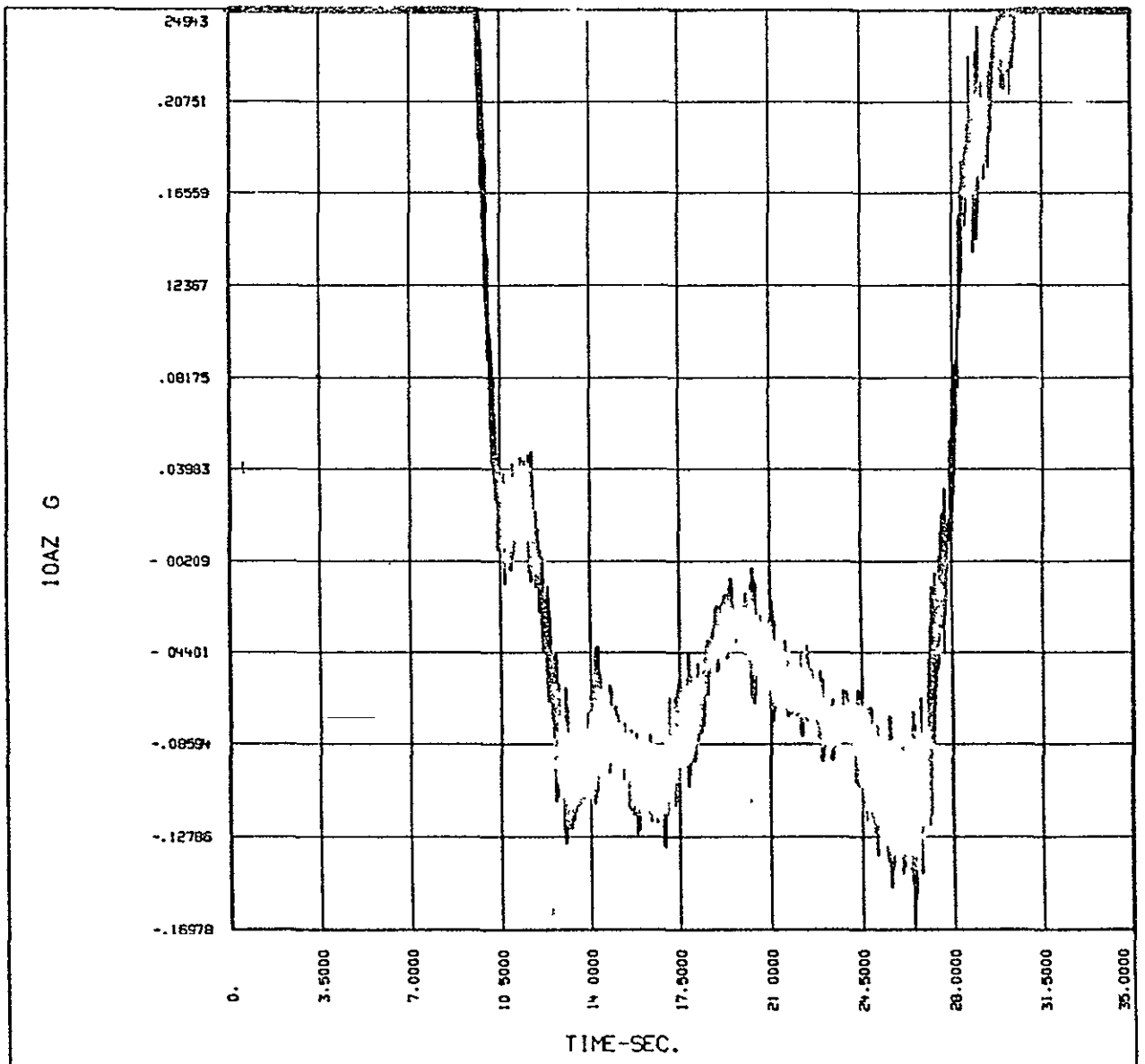
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
,T 1 TEST CONDITION 1.5-3



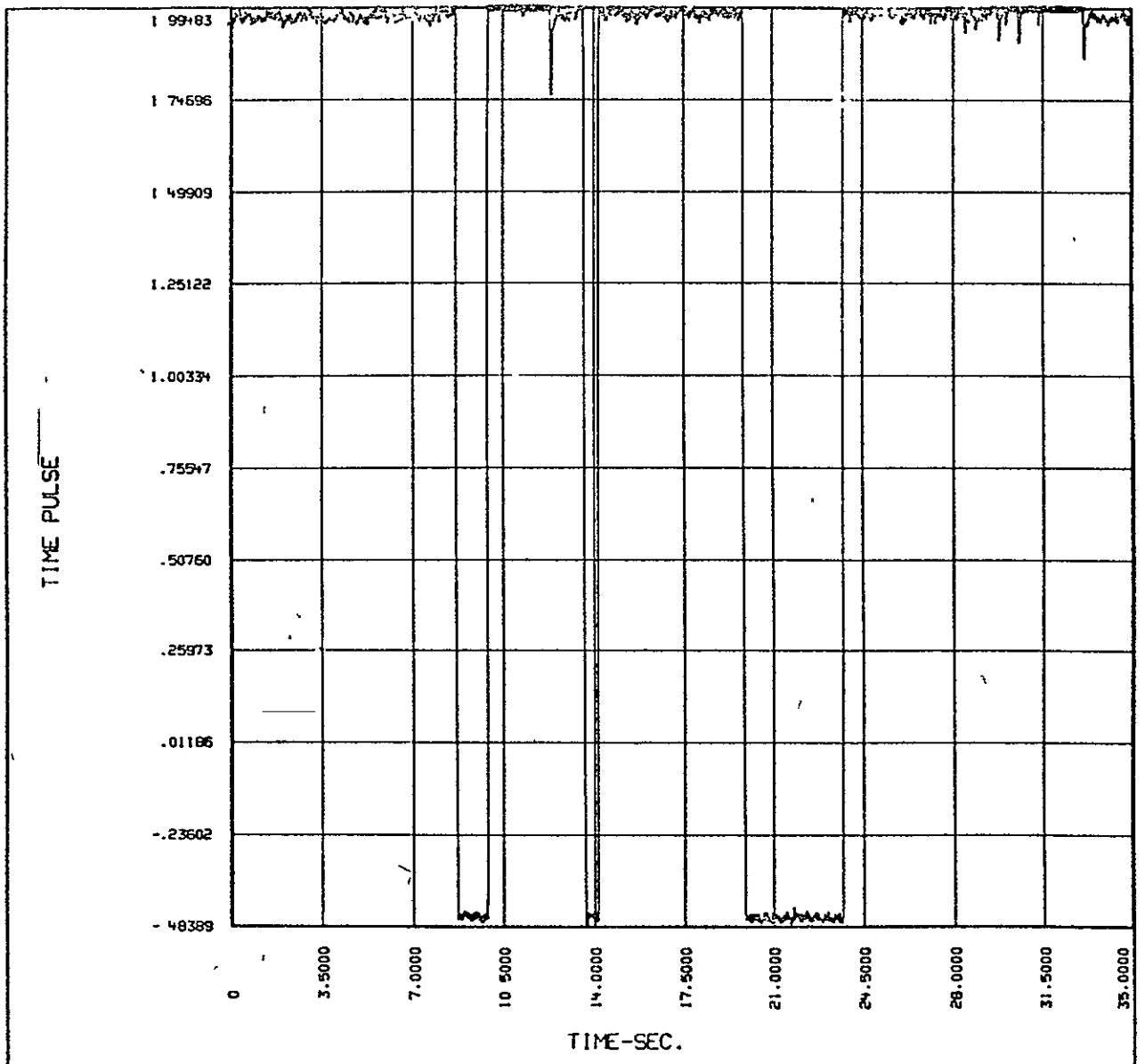
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.5-3



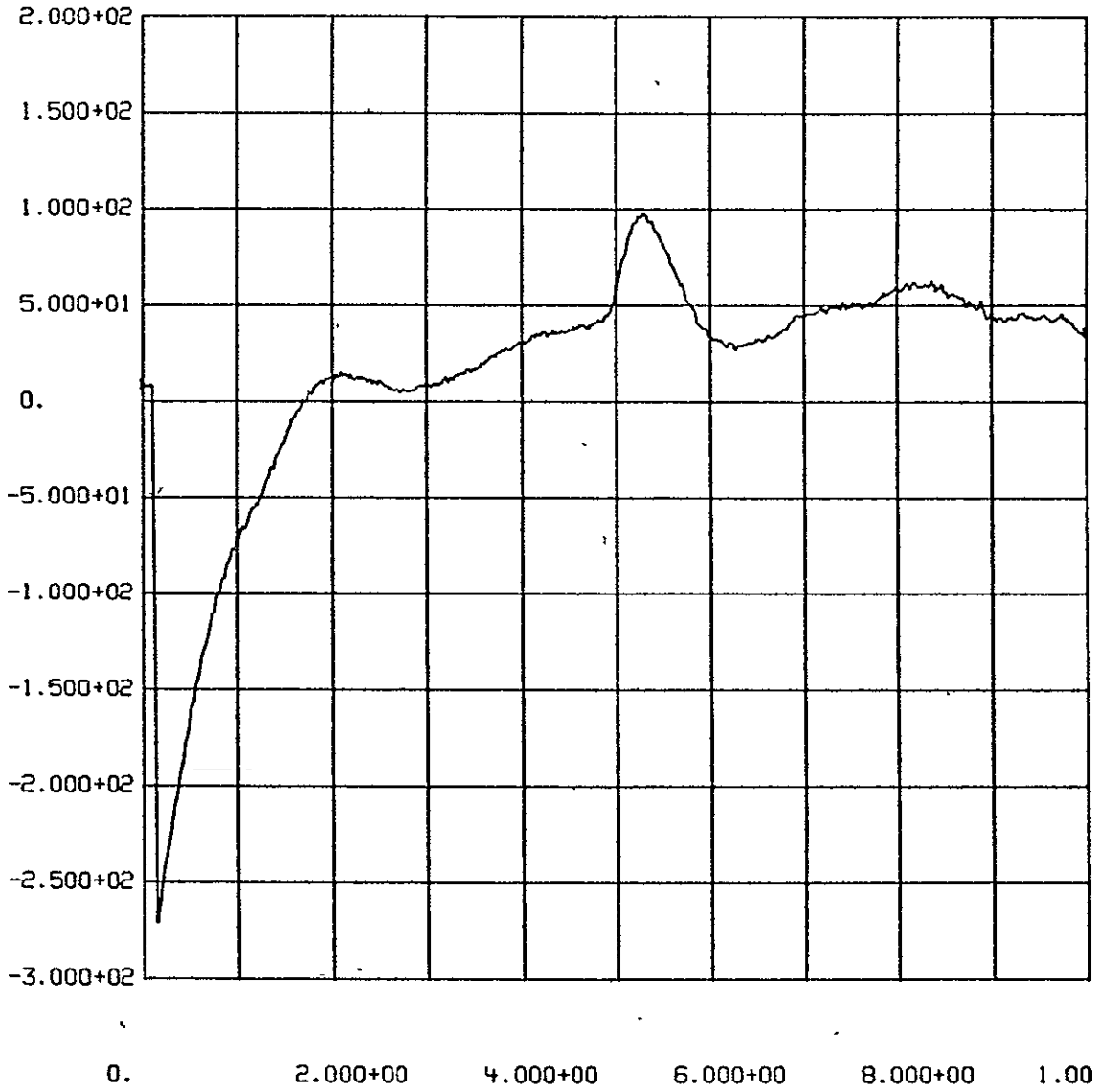
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.5-3



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.5-3

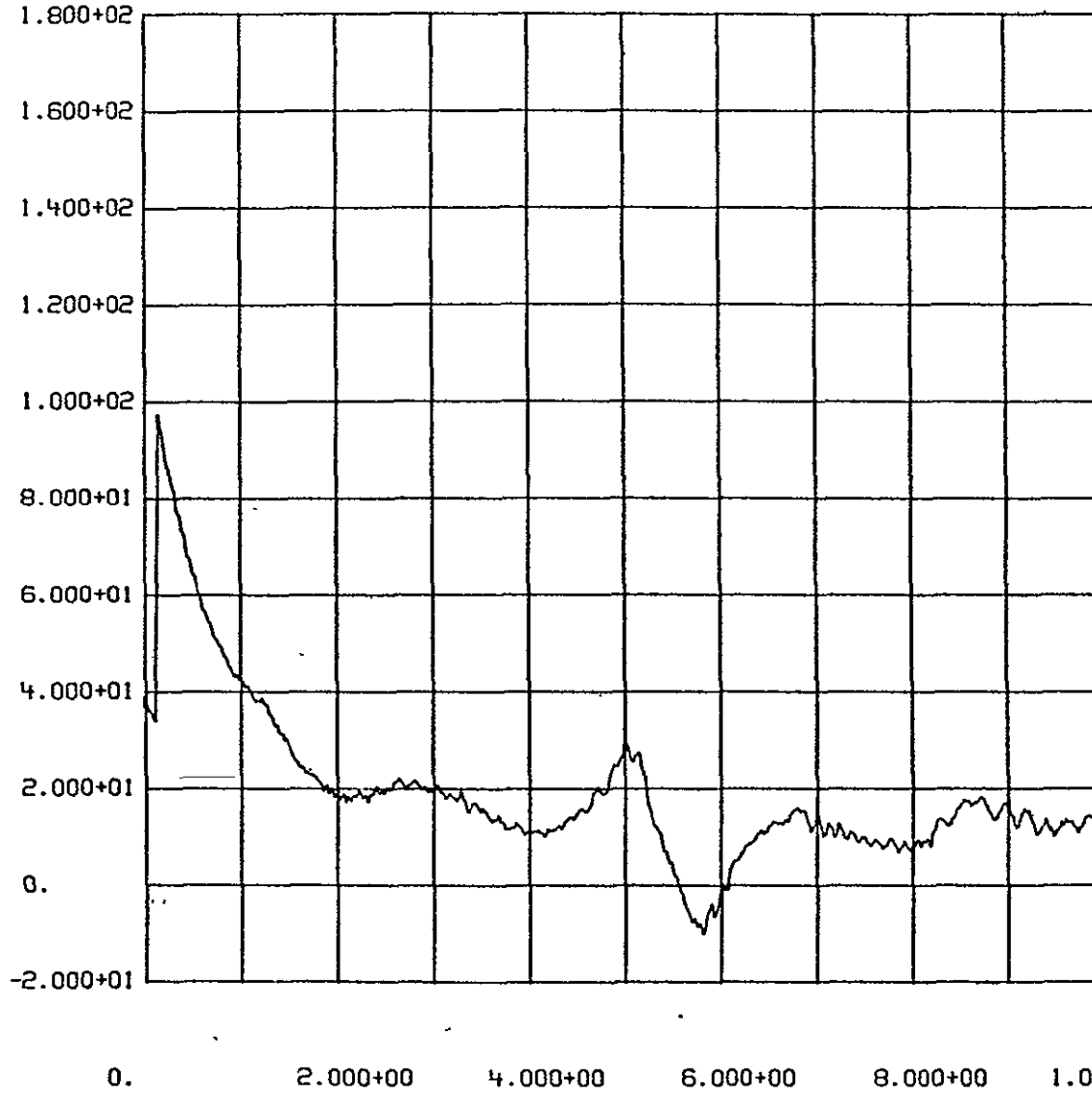


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
T 1 TEST CONDITION 1.5-3



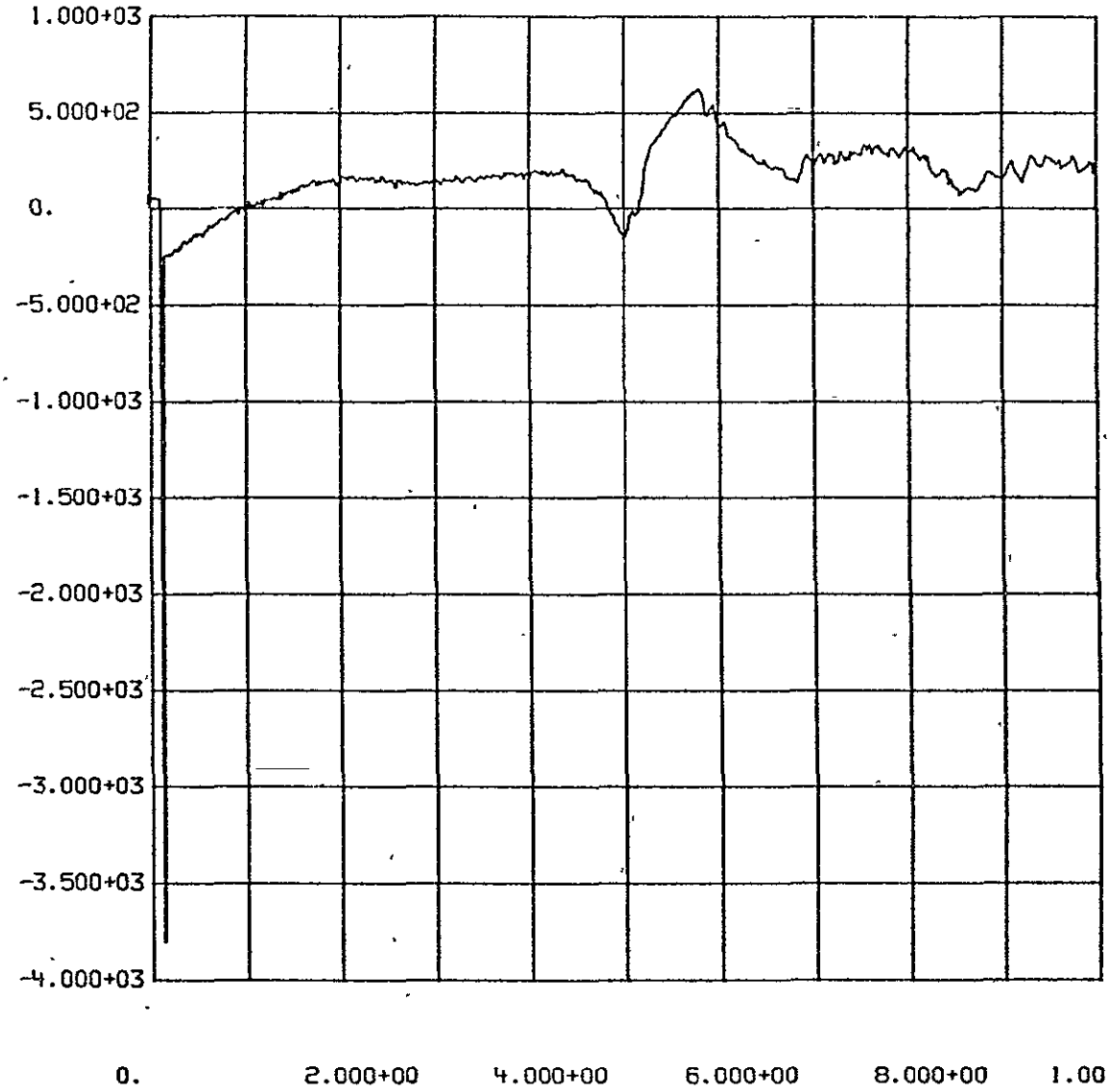
Z-LOAD VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.5-3 * UNFILT *



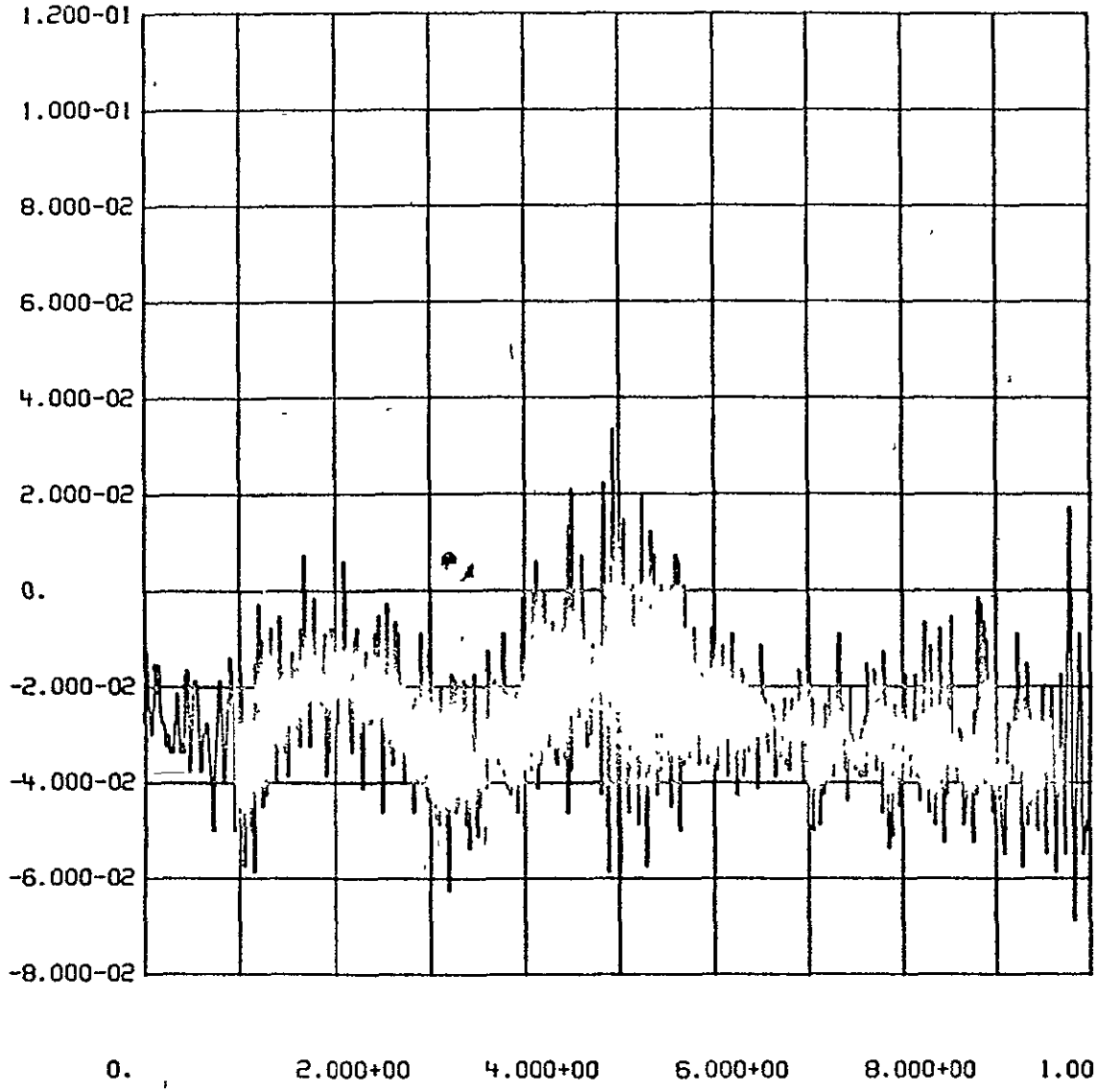
Y-LOAD VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.5-3 * UNFILT *



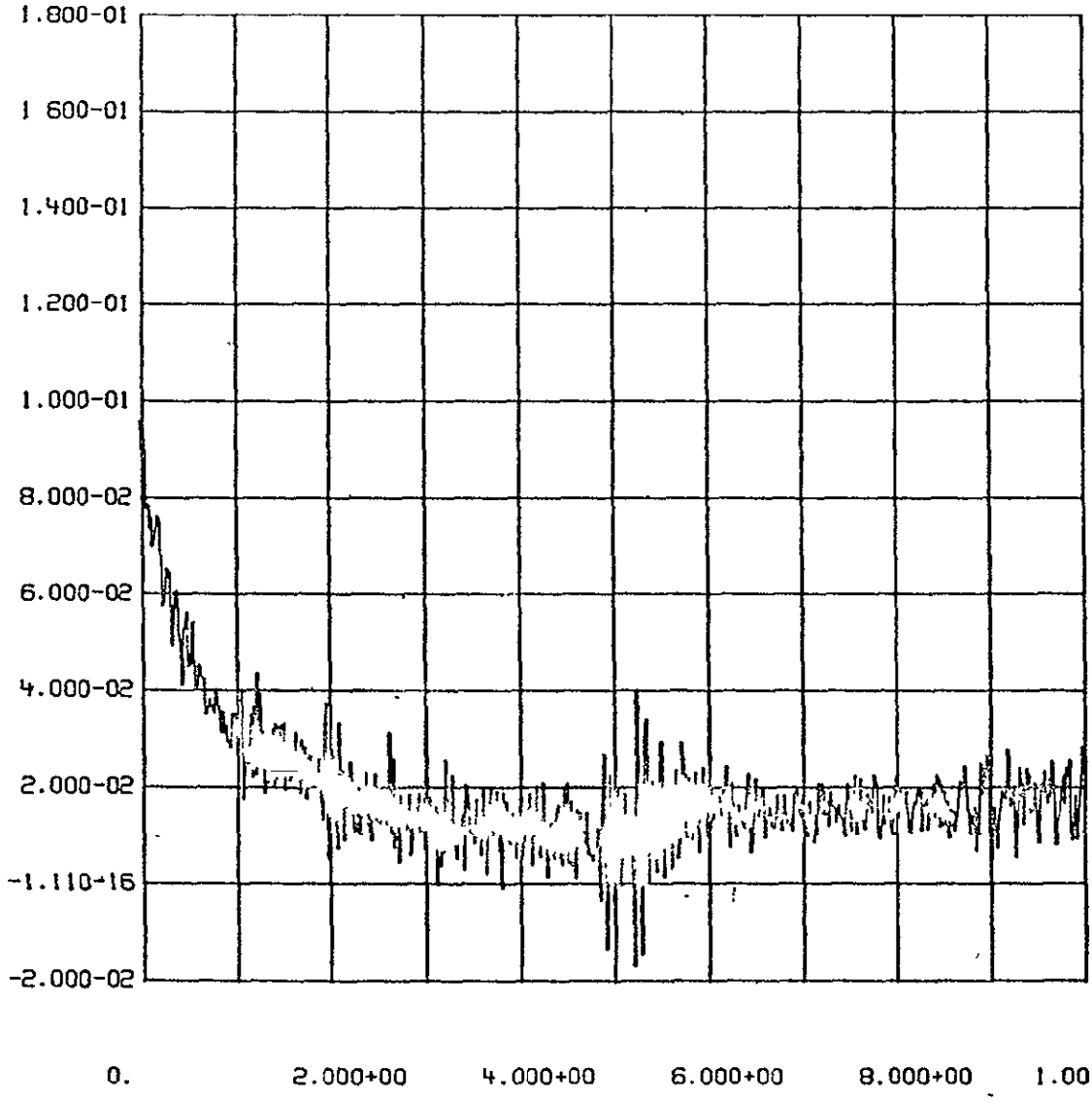
MOMENT VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.5-3 * UNFILT *



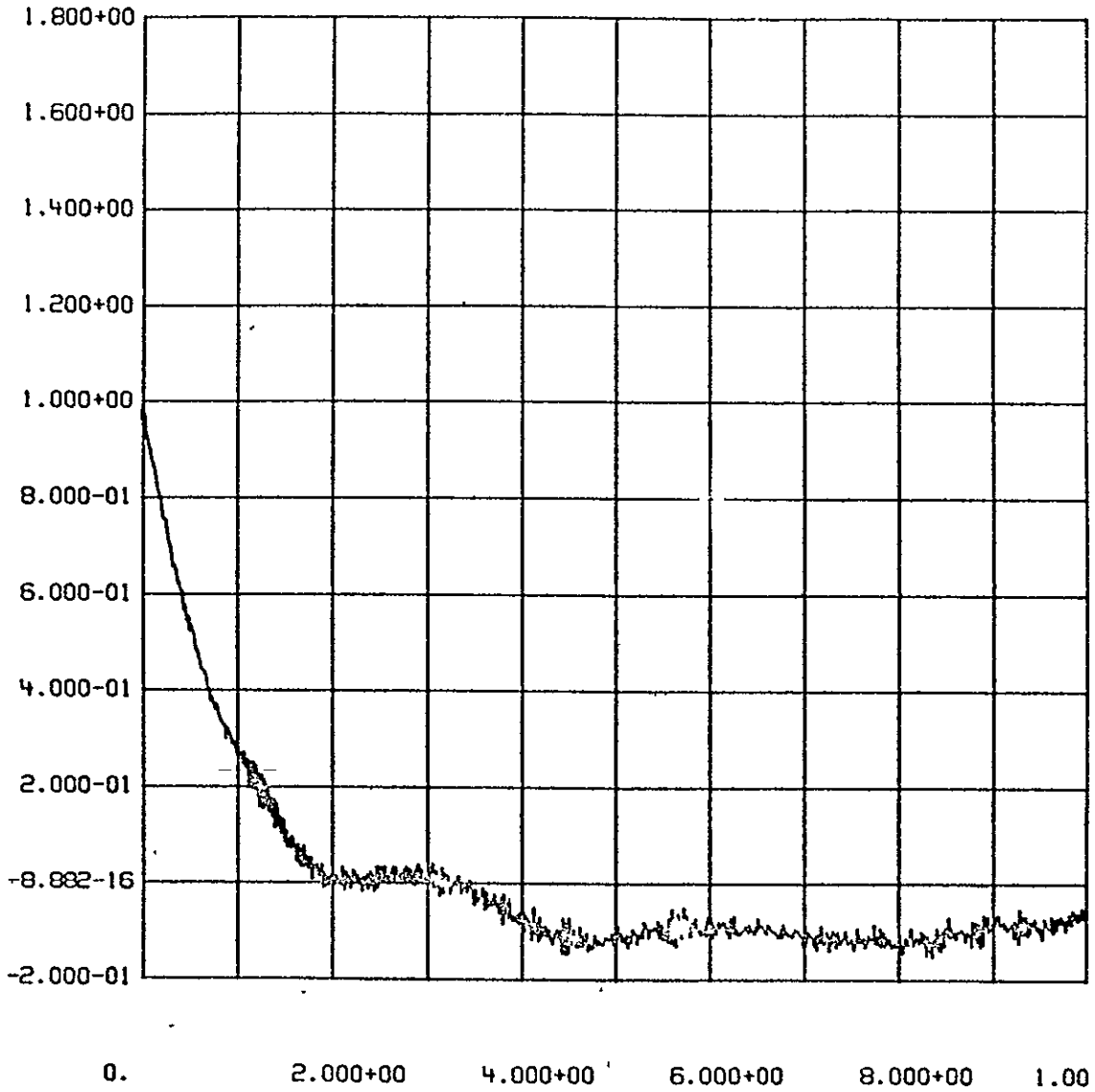
AC YAC VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.5-3 * UNFILT *



AC XAC VS TIME

1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.5-3 * UNFILT *



AC ZAC VS TIME

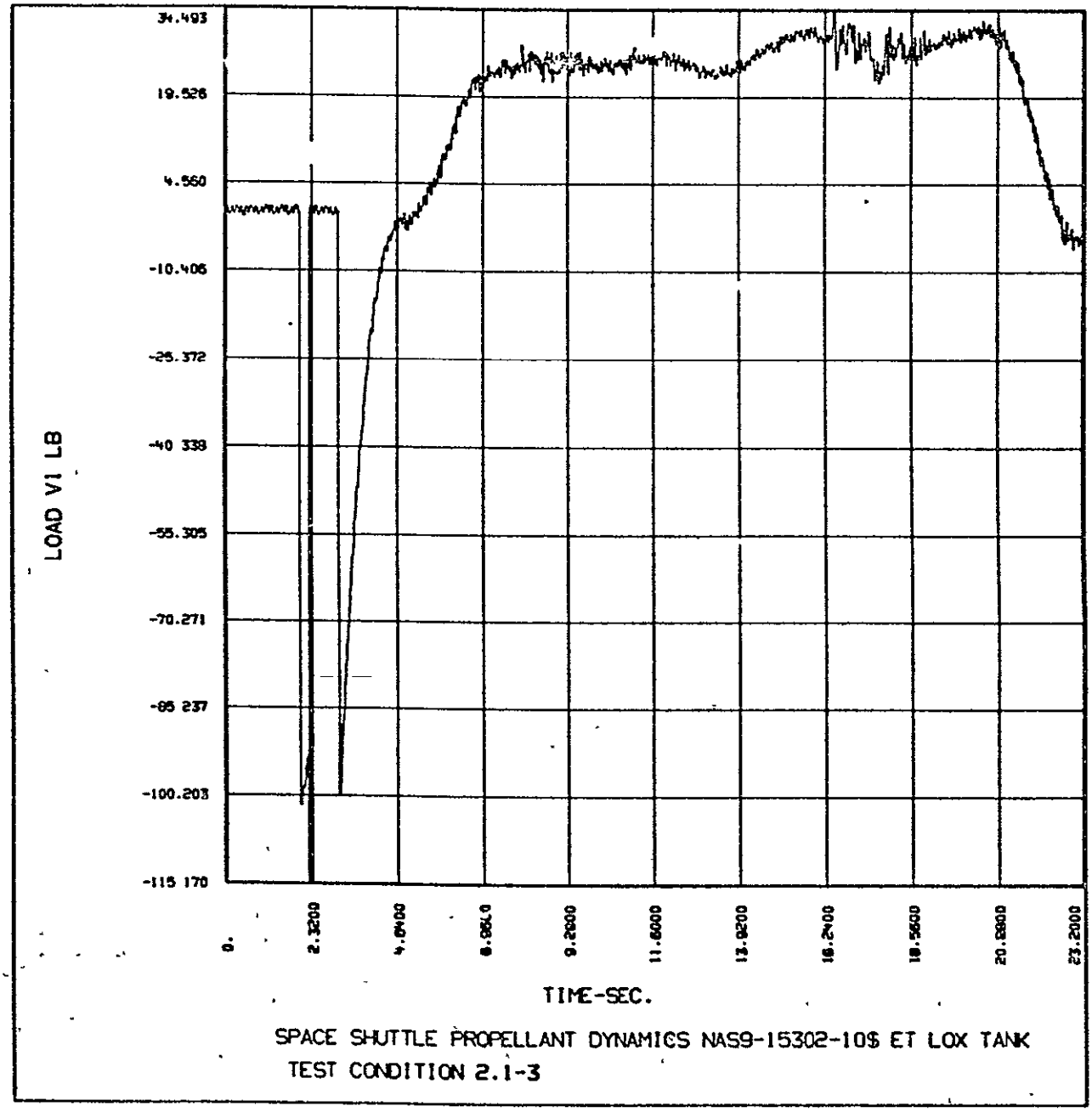
1 FLT 1 08JA79 FLIGHT 1 TEST CONDITION 1.5-3 * UNFILT *

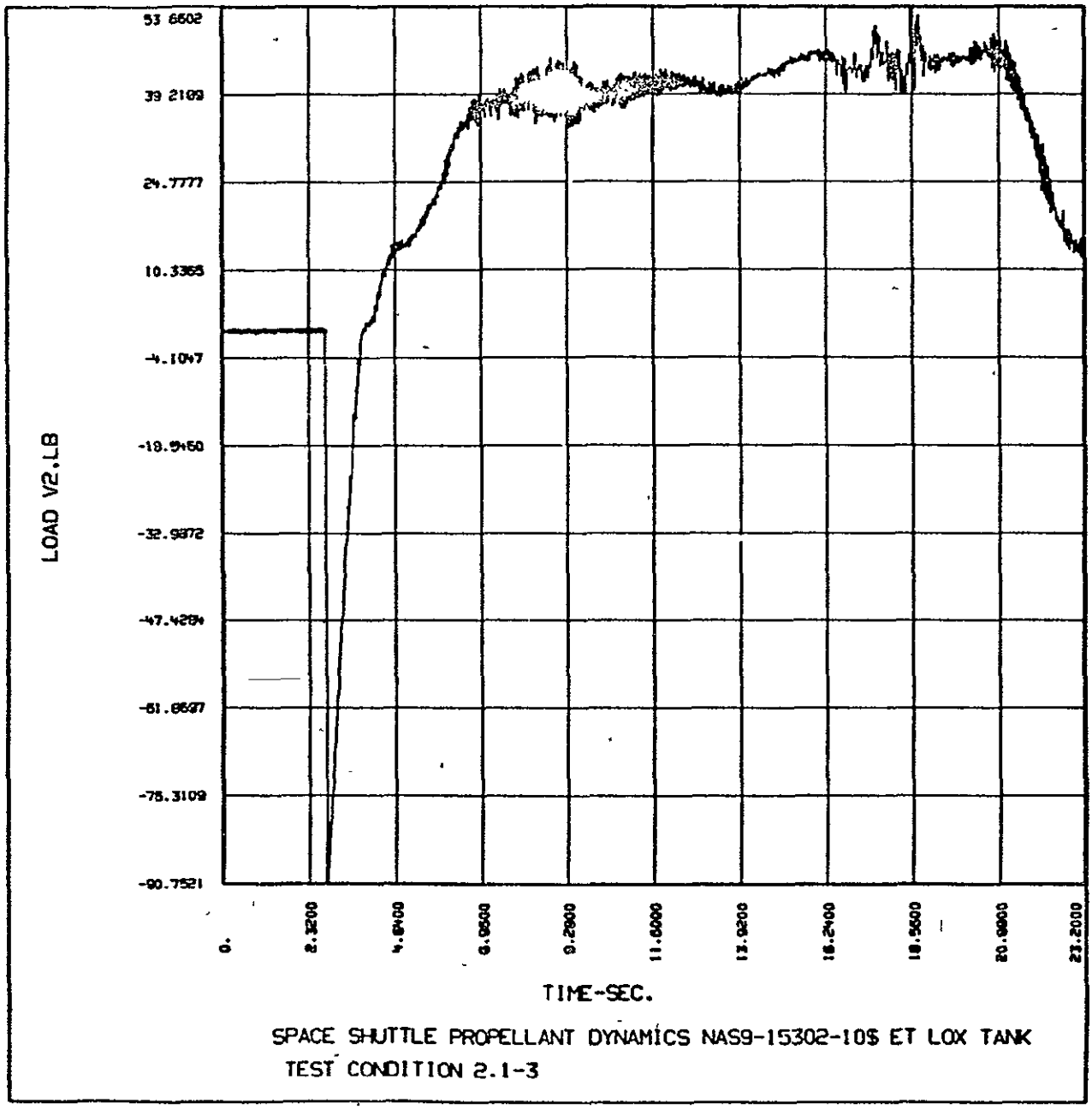
Test Data Condition 1.6-3

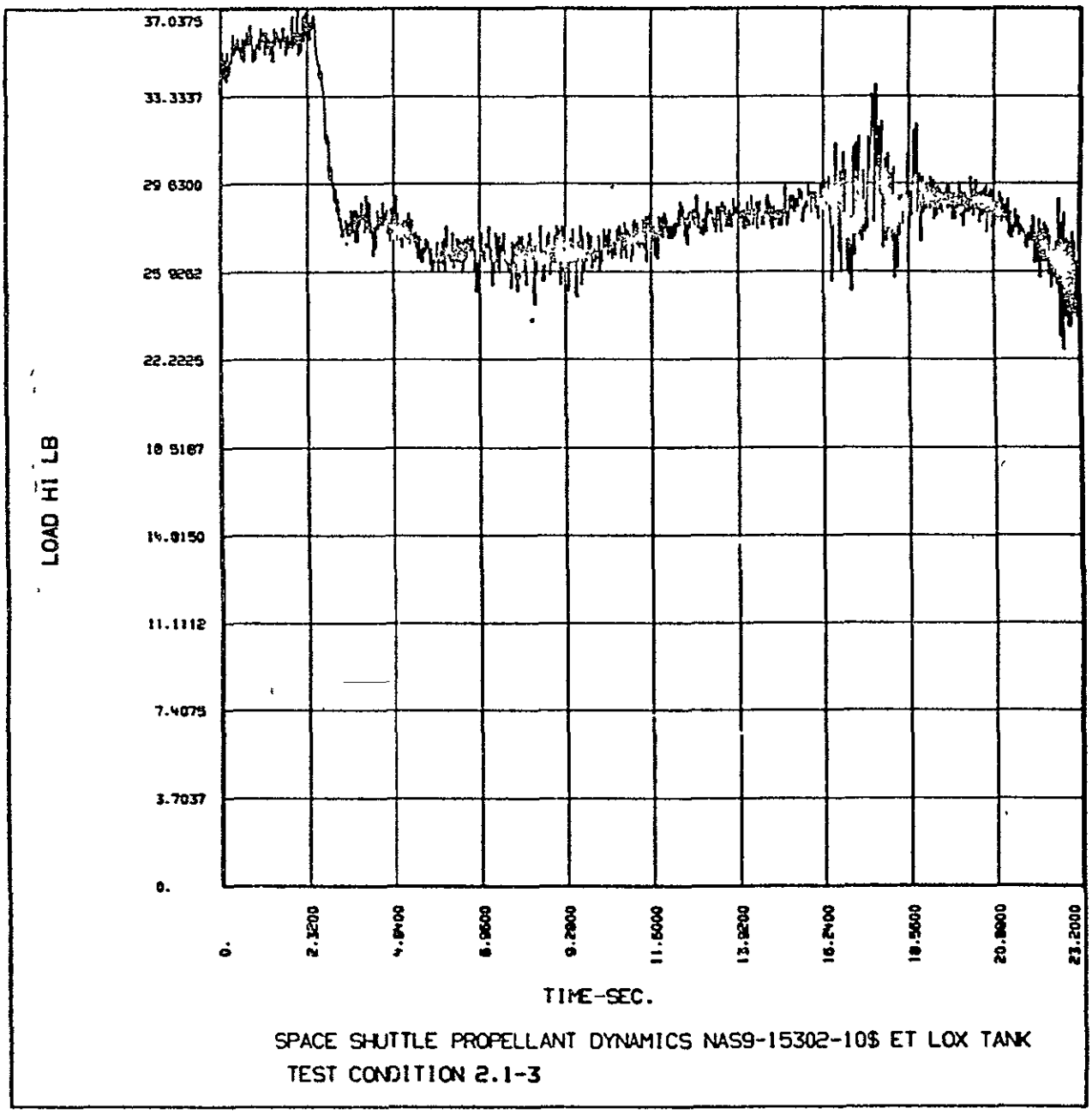
No Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 15%
Target Acceleration–0.1 g
(Flight Data Not Recorded)

Test Data Condition 2.1-3

Baffles
Test Fluid — FC 113
Orientation — 13°
Fill Volume—1%
Target Acceleration—0.1 g

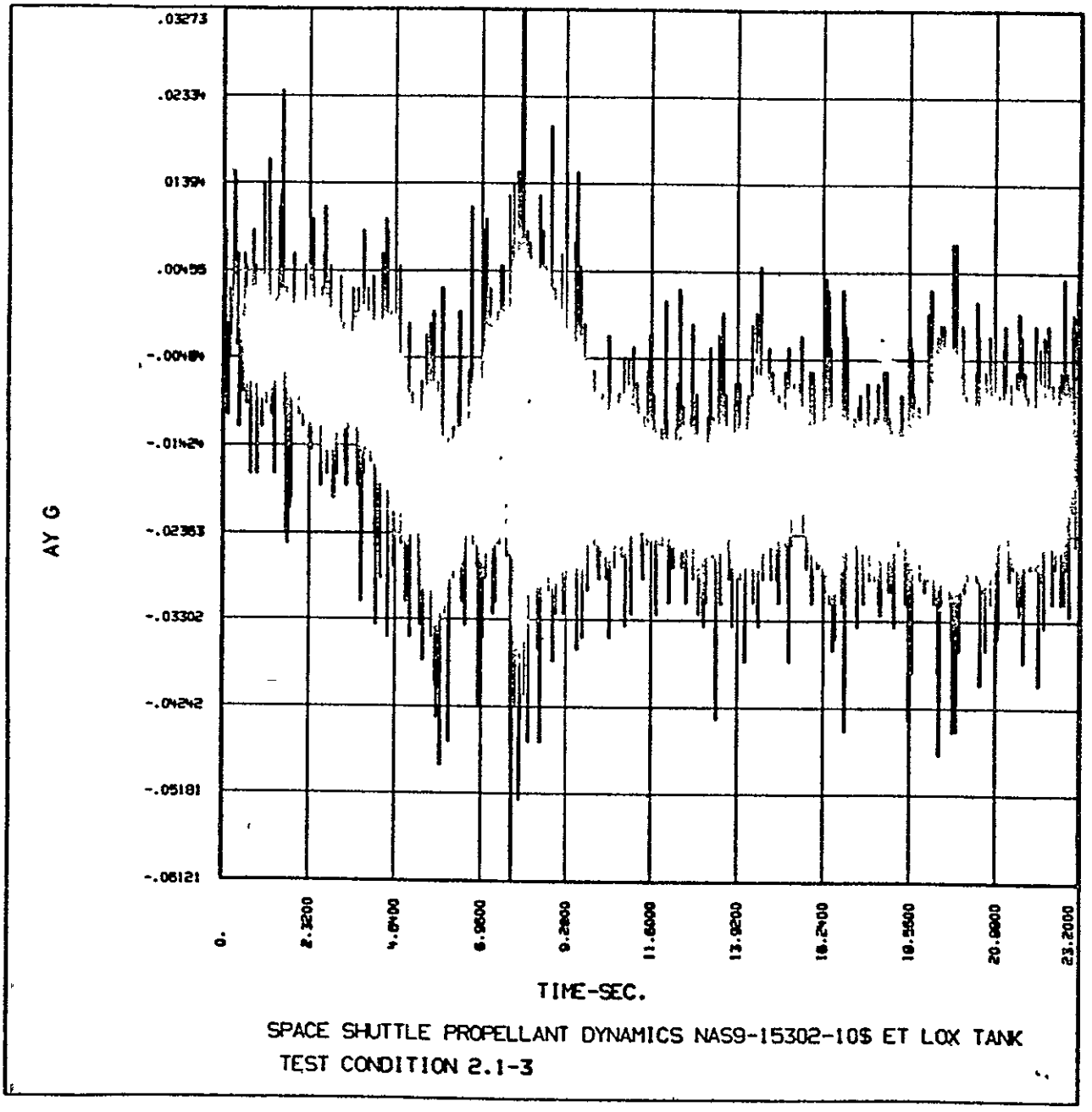

34.493
19.526
4.560
-10.406
-25.372
-40 338
-55.305
-70.271
-85 237
-100.203
-115 170
LOAD V1 LB
0.
2.3200
4.6400
6.9600
9.2800
11.6000
13.9200
16.2400
18.5600
20.8800
23.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.1-3

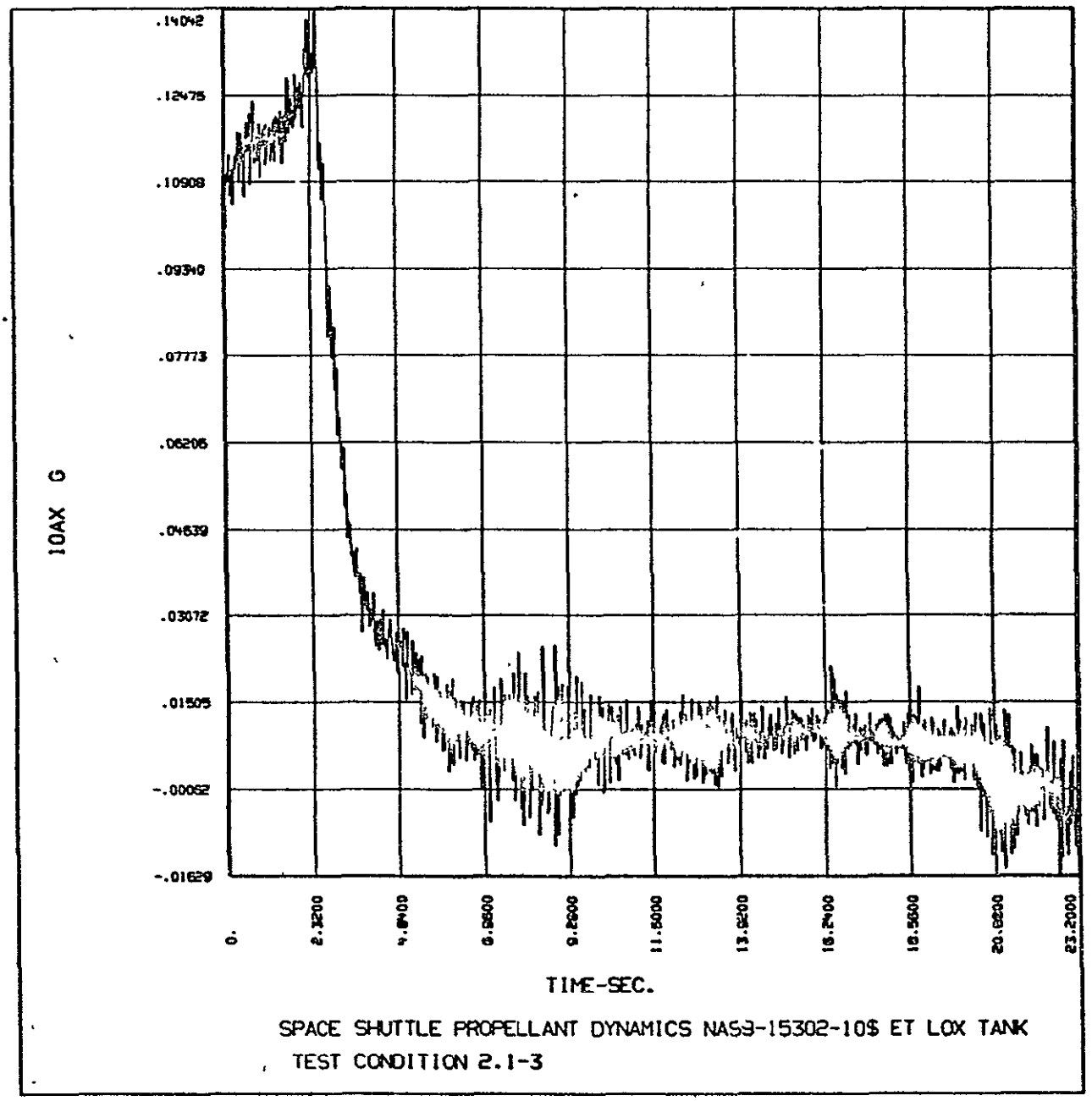

53.6602
39.2109
24.7777
10.3365
-4.1047
-18.9460
-32.9872
-47.4284
-61.8697
-76.3109
-90.7521
LOAD V2,LB
0.
2.3200
4.6400
6.9600
9.2800
11.6000
13.9200
16.2400
18.5600
20.9800
23.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.1-3



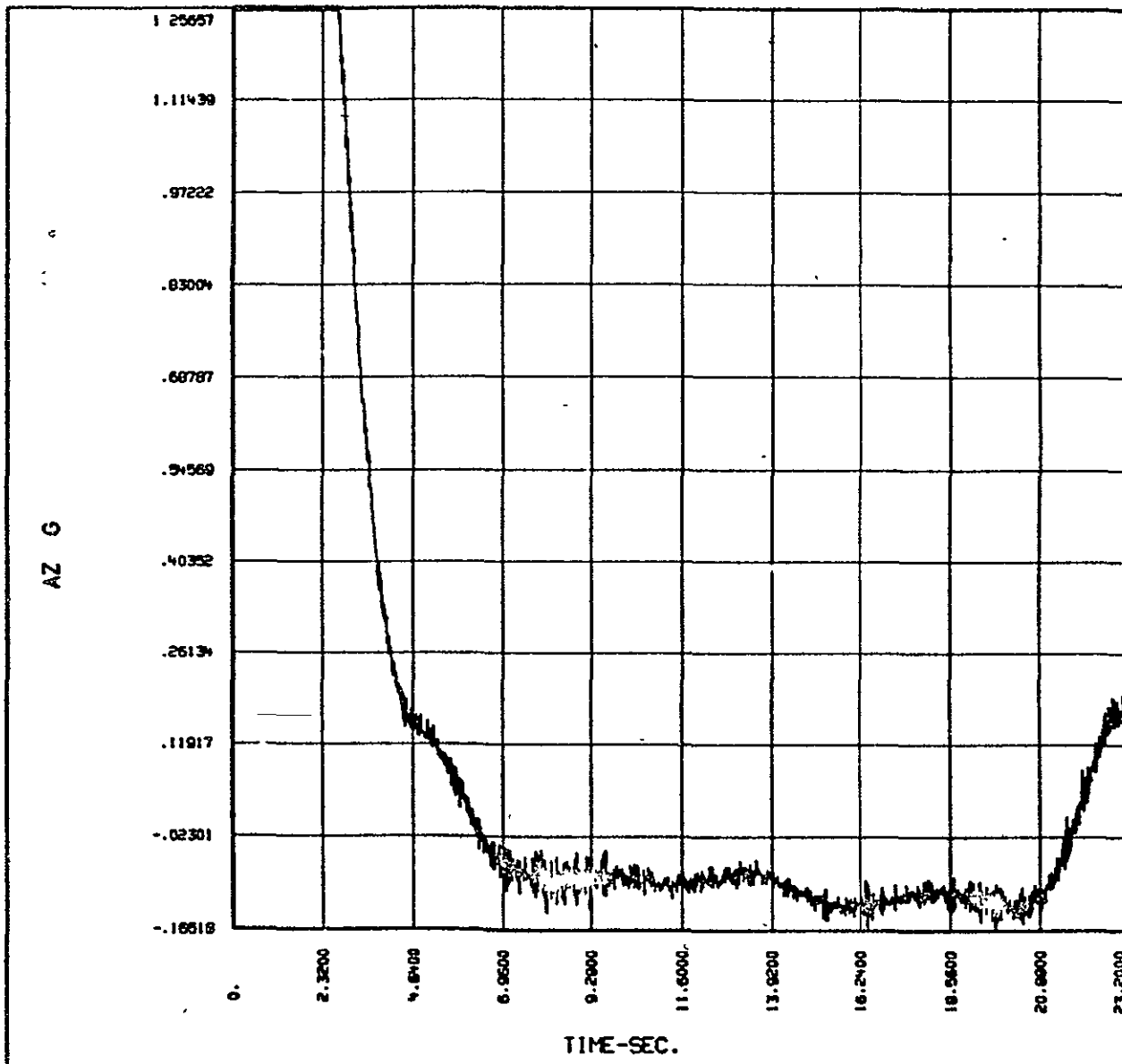
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.1-3

C-2

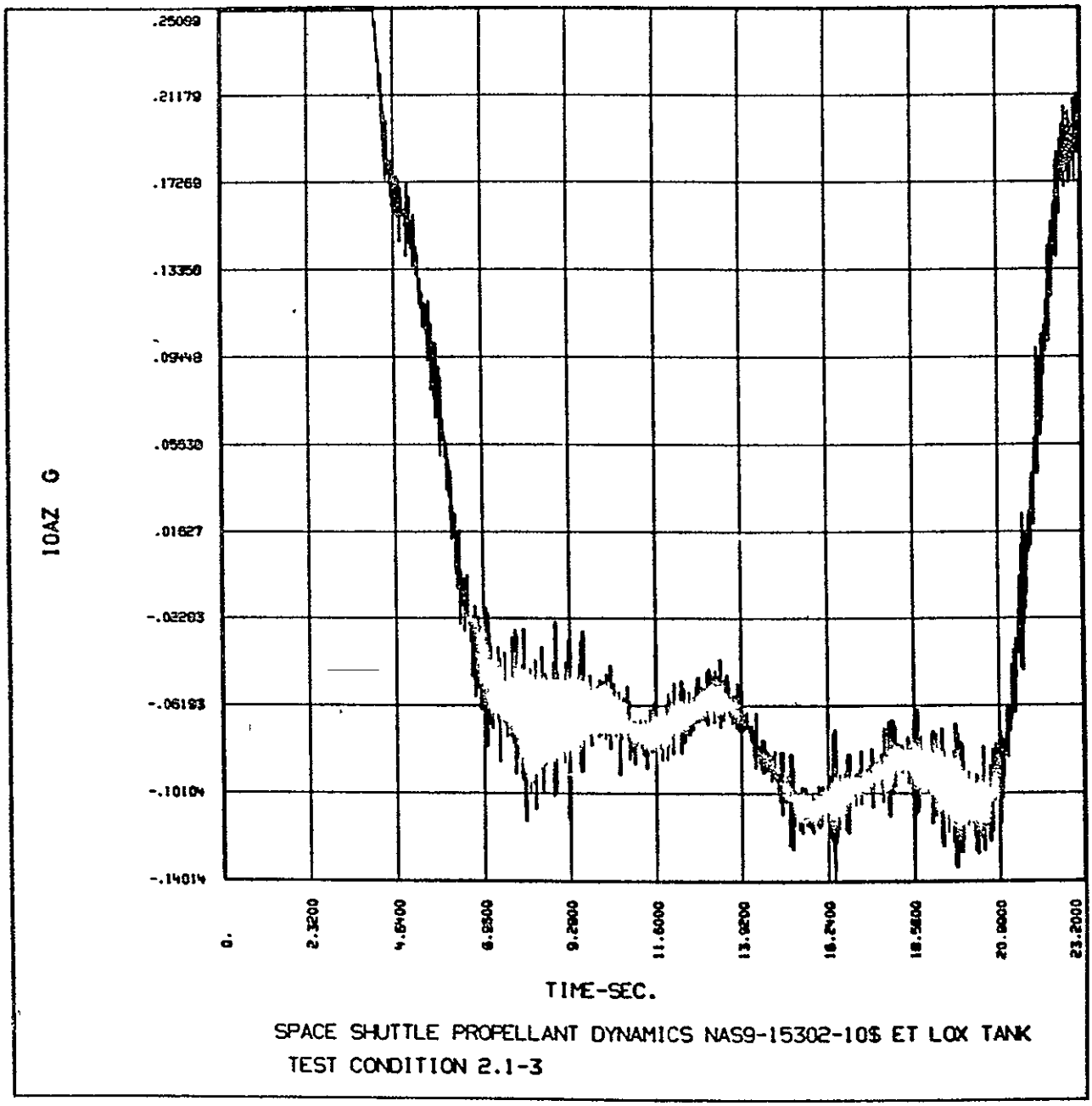

.03273
.02334
.01394
.00455
-.00484
-.01424
-.02363
-.03302
-.04242
-.05181
-.06121
AY G
0.
2.3200
4.6400
6.9600
9.2800
11.6000
13.9200
16.2400
18.5600
20.8800
23.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.1-3

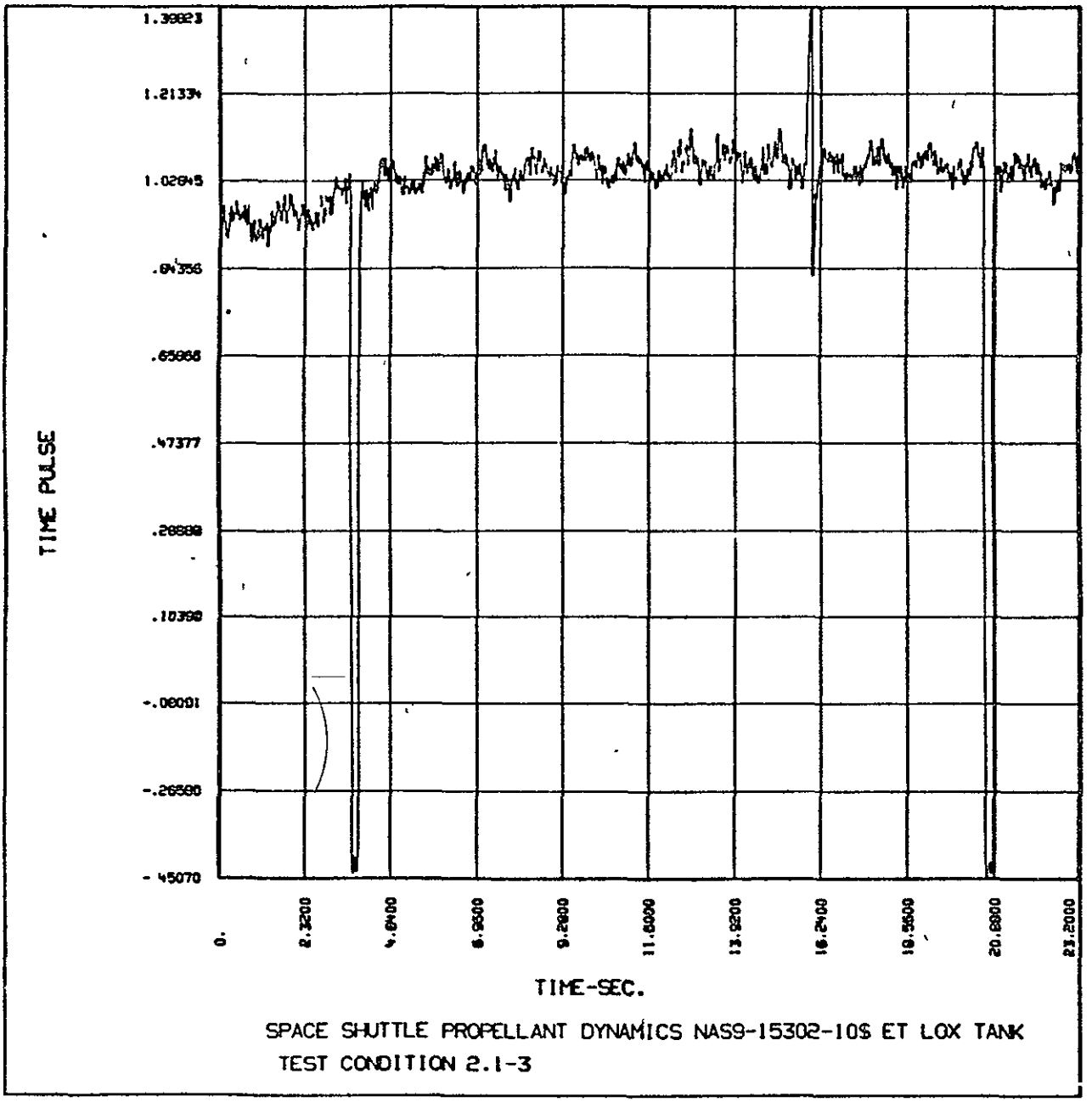


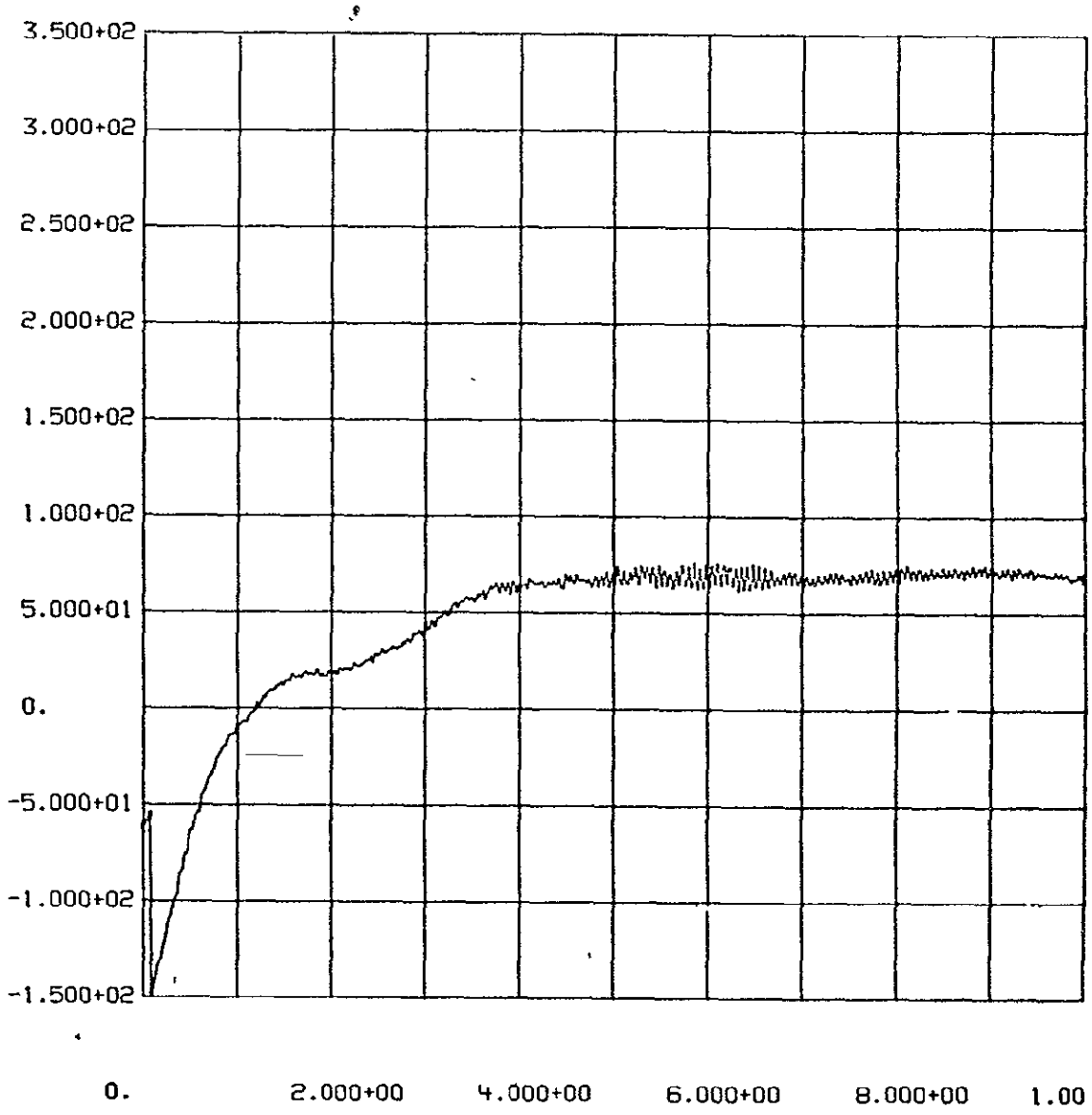
SPACE SHUTTLE PROPELLANT DYNAMICS NAS3-15302-10$ ET LOX TANK
TEST CONDITION 2.1-3



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.1-3

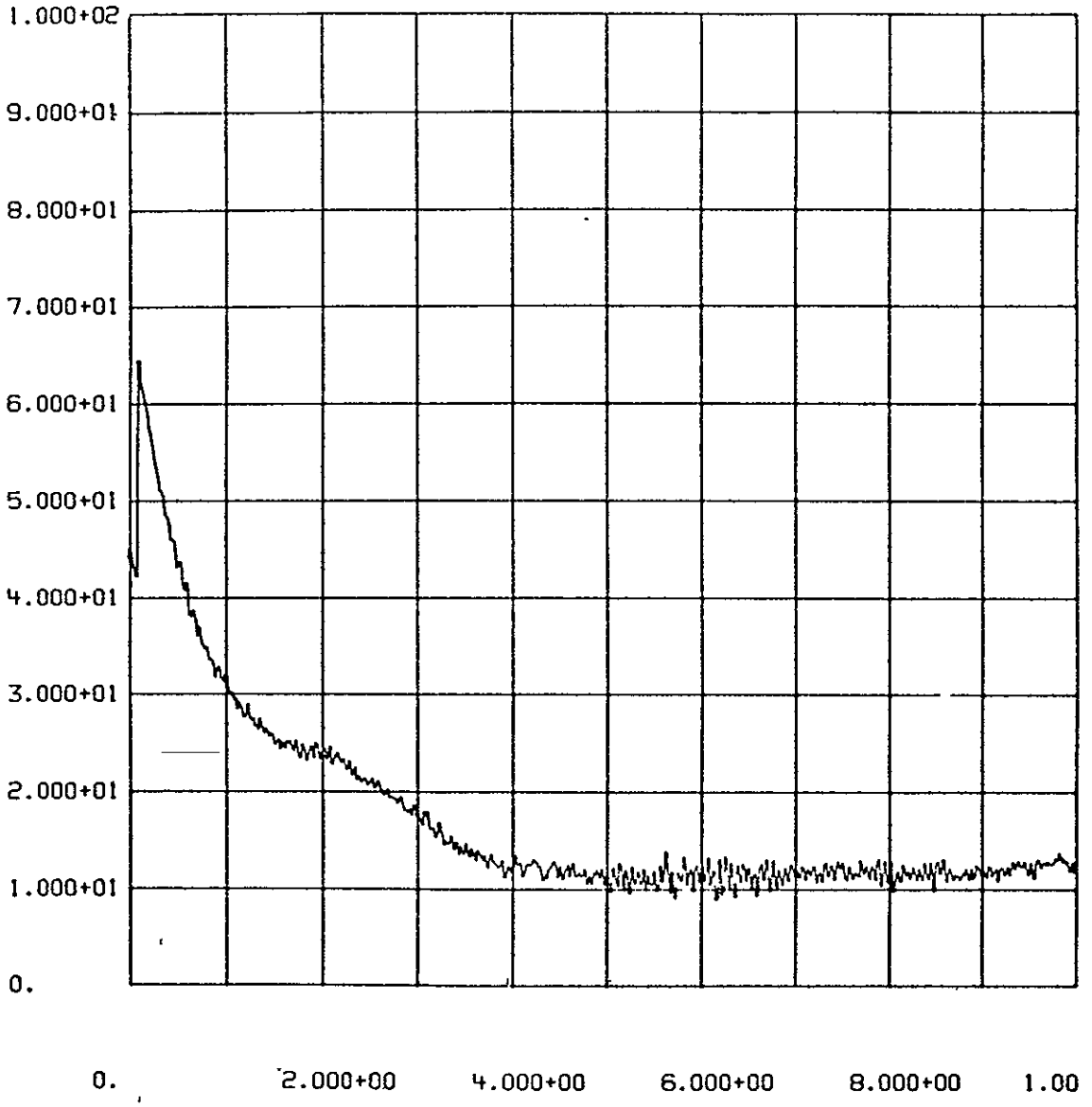

.25099
.21179
.17269
.13350
.09440
.05530
.01627
-.02203
-.06193
-.10104
-.14014
IOAZ G
0.
2.3200
4.6400
6.9600
9.2800
11.6000
13.9200
16.2400
18.5600
20.8800
23.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.1-3


1.39823
1.21334
1.02845
.64356
.65866
.47377
.28888
.10398
-.08001
-.26580
- 45070
TIME PULSE
0.
2.3200
4.6400
6.9600
9.2800
11.6000
13.9200
16.2400
18.5600
20.8800
23.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.1-3



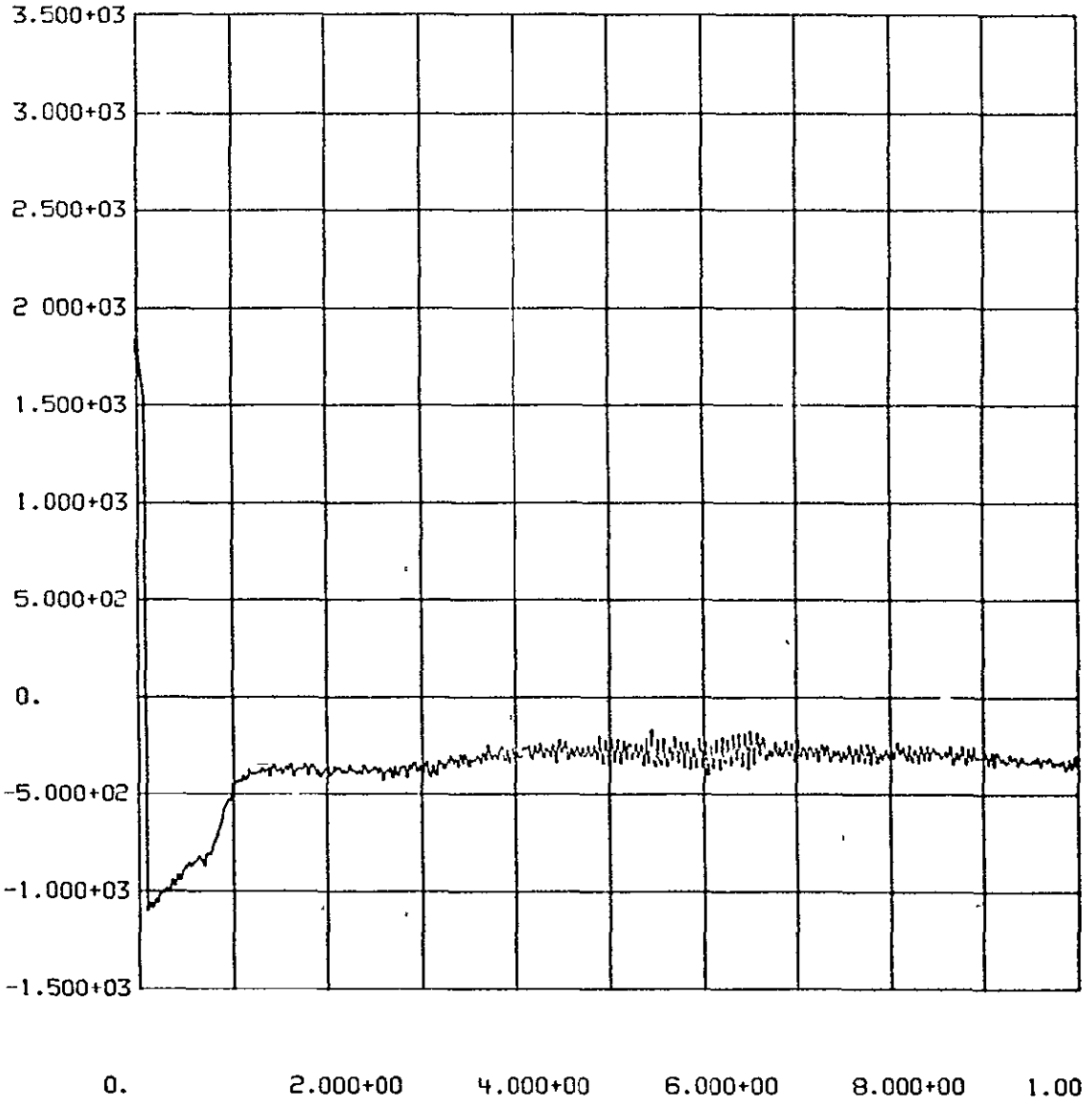
Z-LOAD VS TIME

1. FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.1-3 *UNFILT*



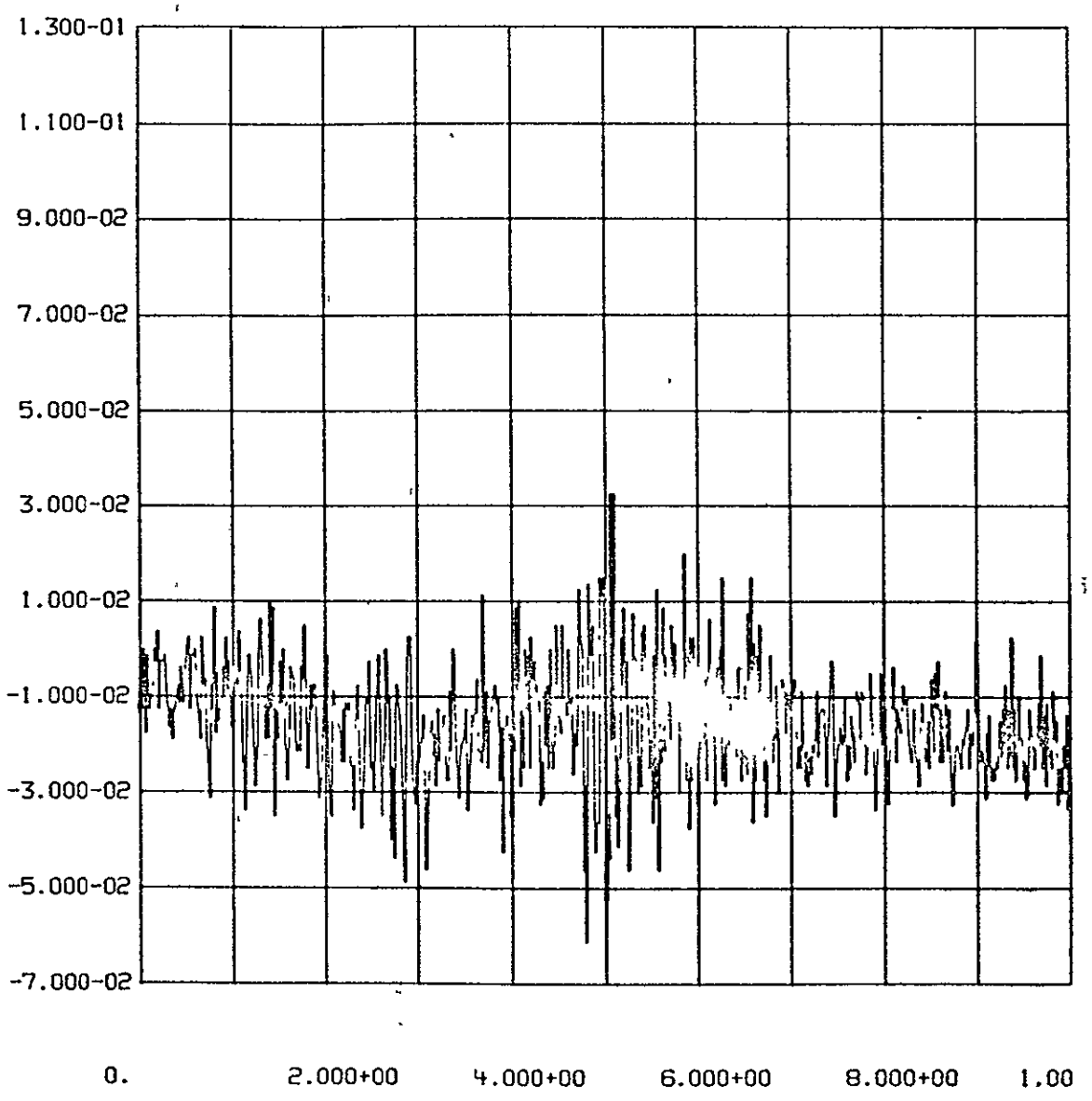
Y-LOAD VS TIME

1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.1-3 *UNFILT*



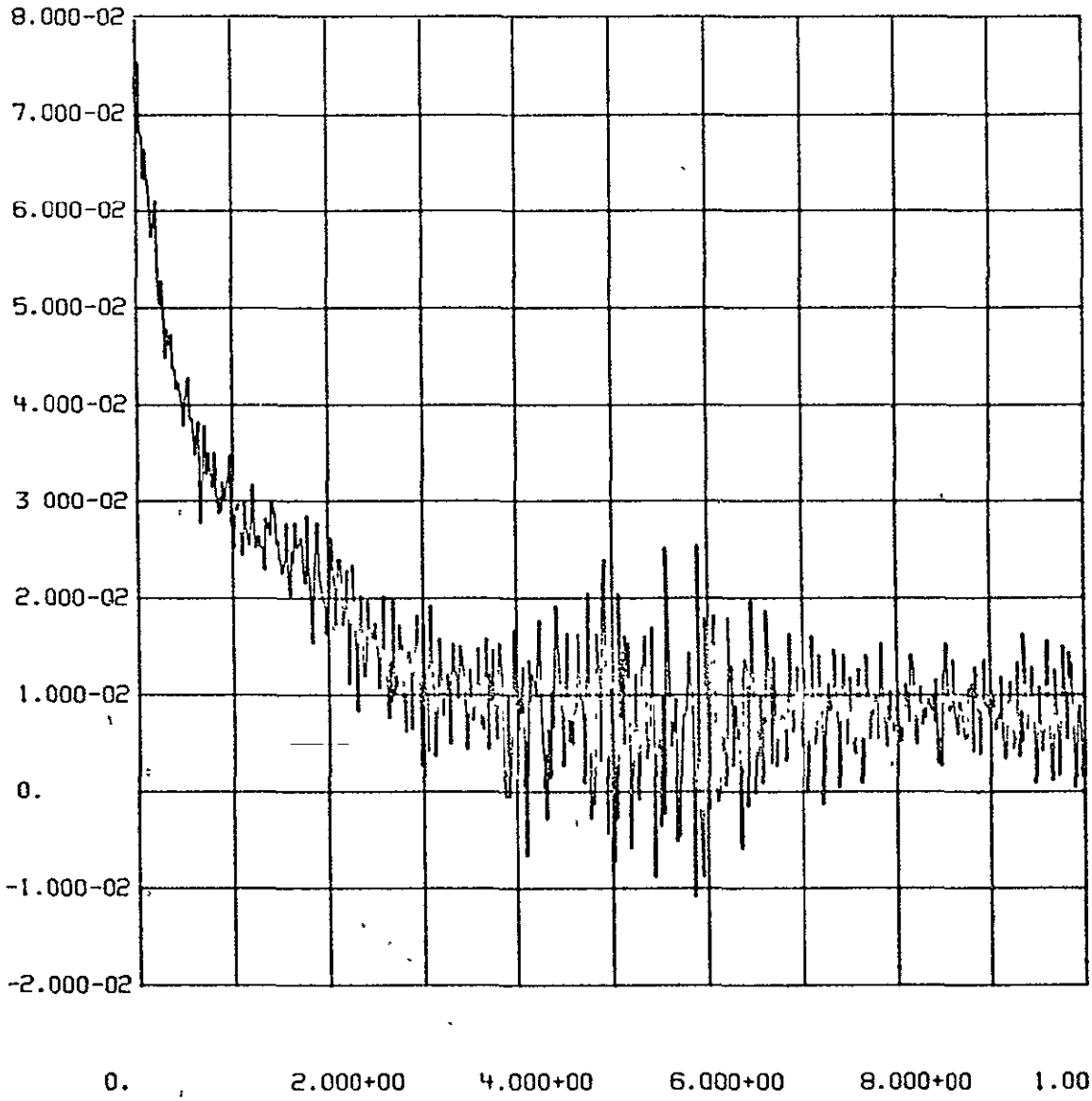
MOMENT VS TIME

1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.1-3 *UNFILT*



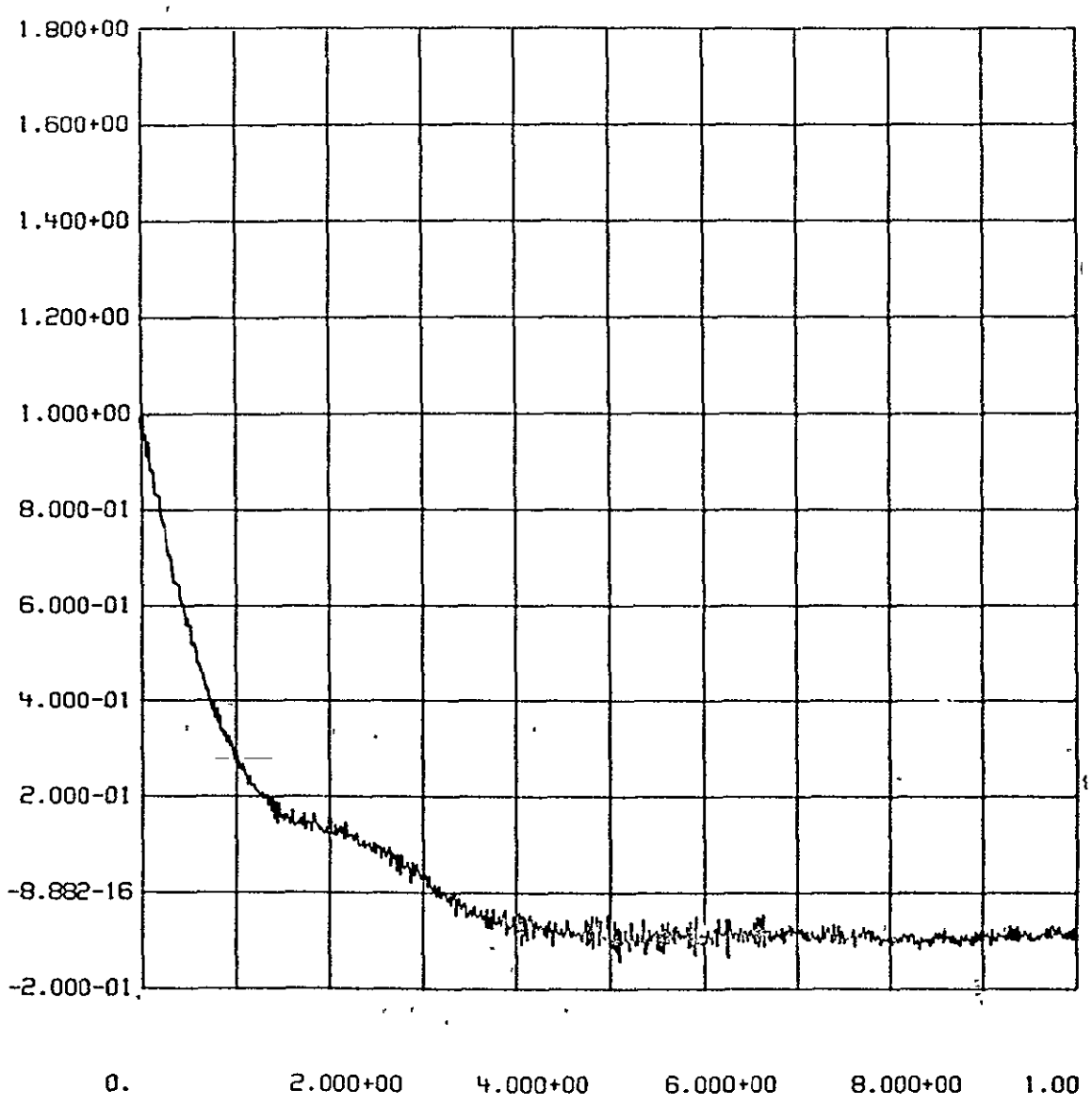
AC YAC VS TIME

1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.1-3 *UNFILT*



AC XAC VS TIME

1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.1-3 *UNFILT*

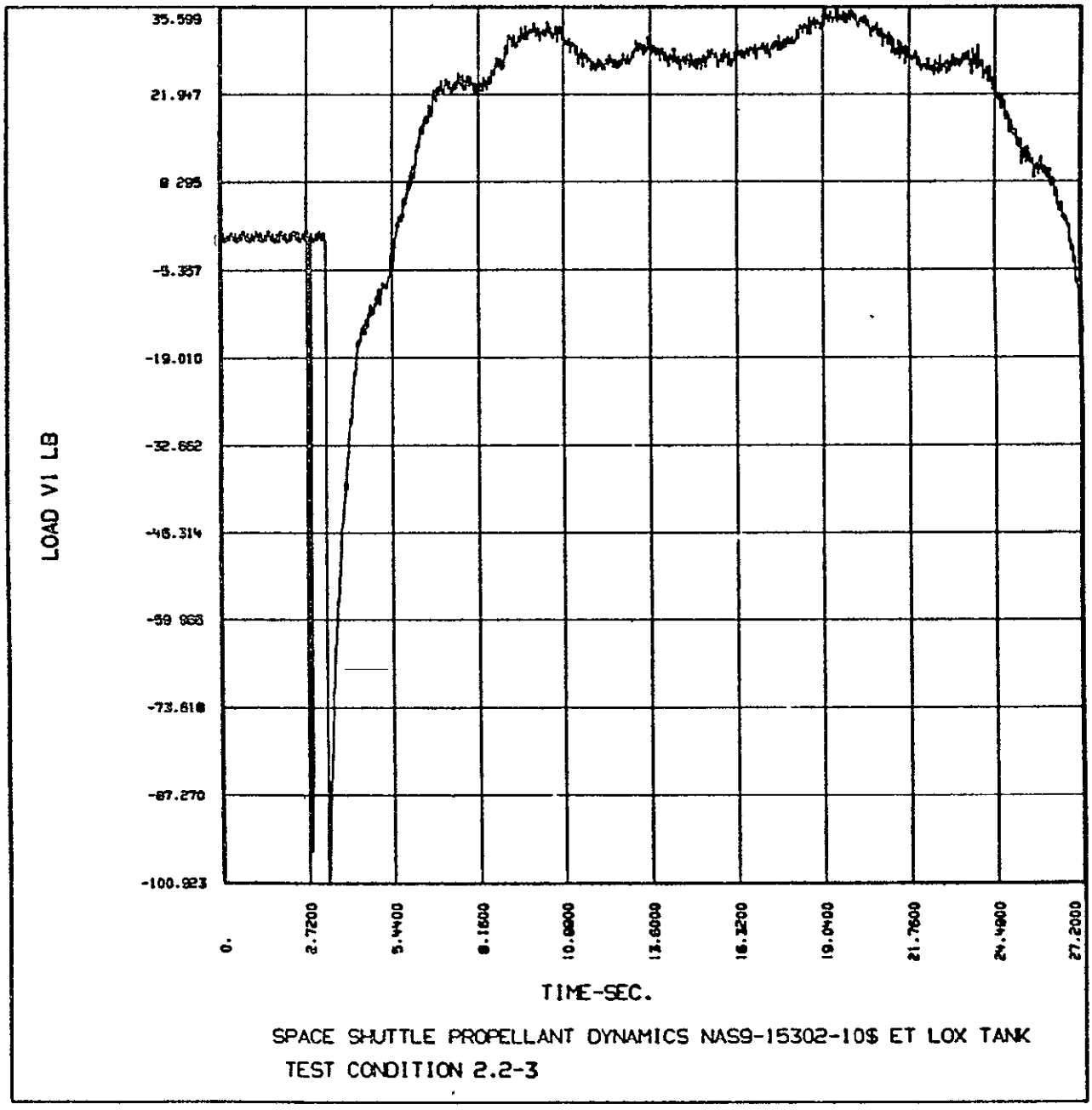


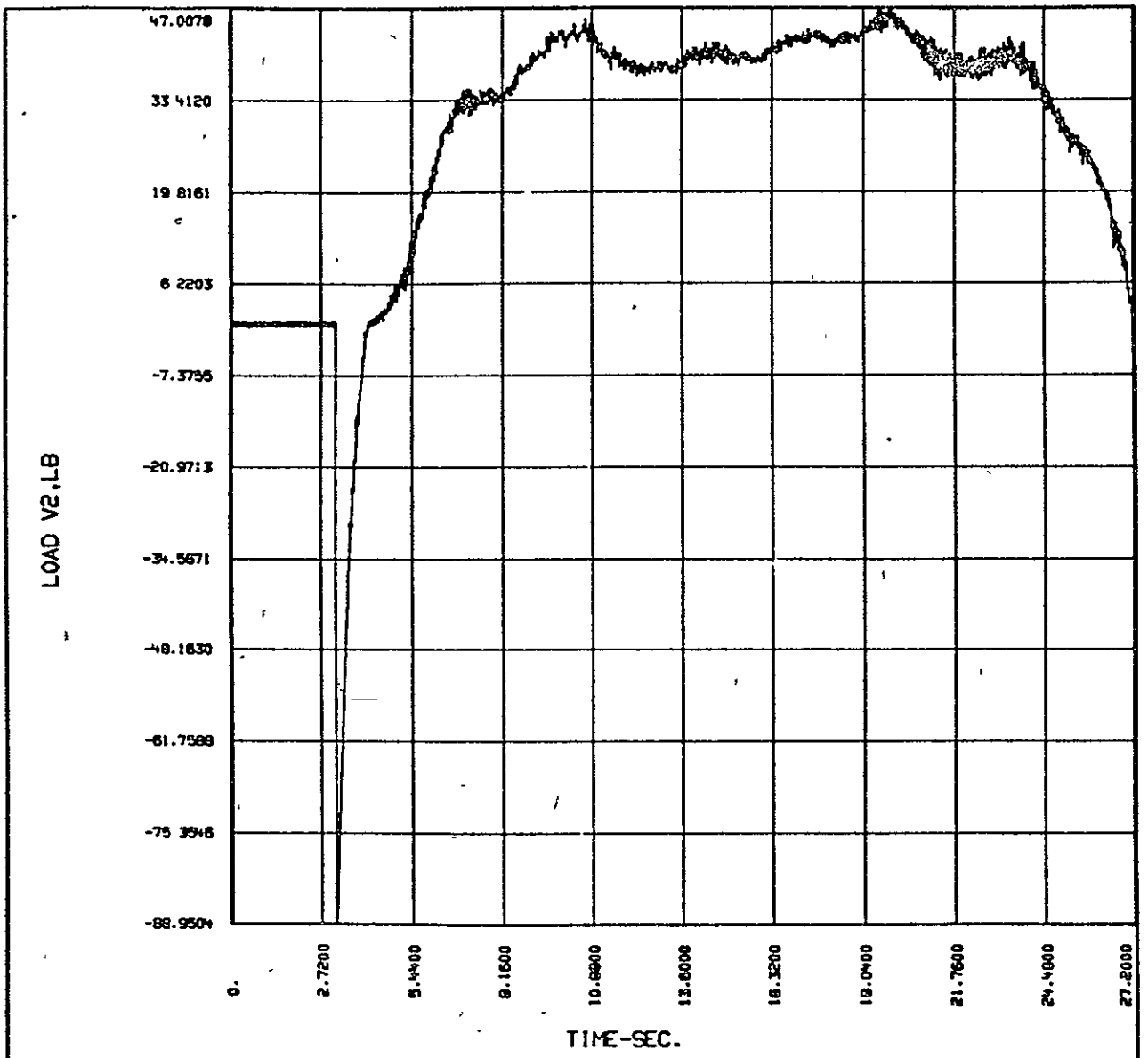
AC ZAC VS TIME

1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.1-3 *UNFILT*

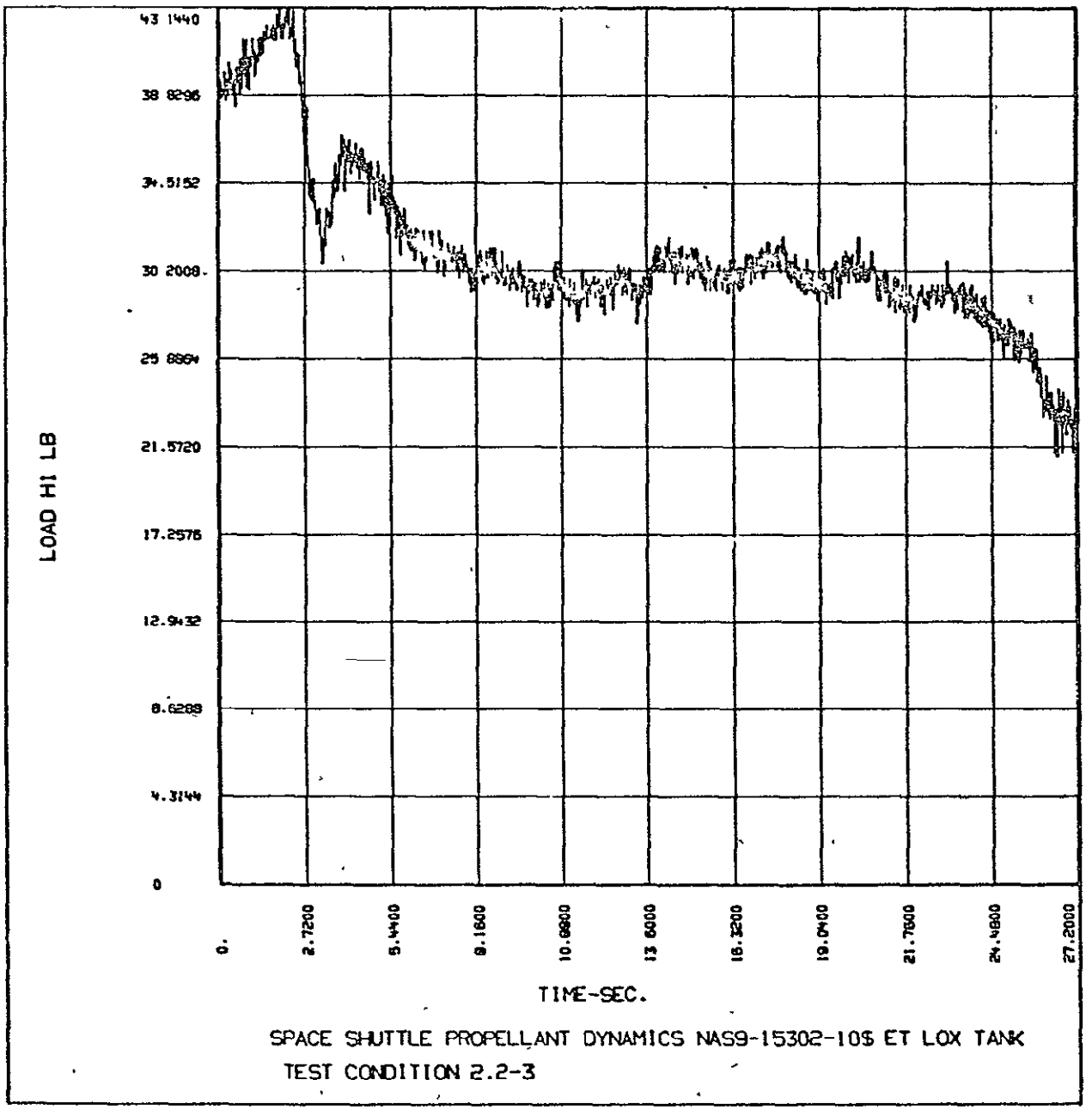
Test Data Condition 2.2-3

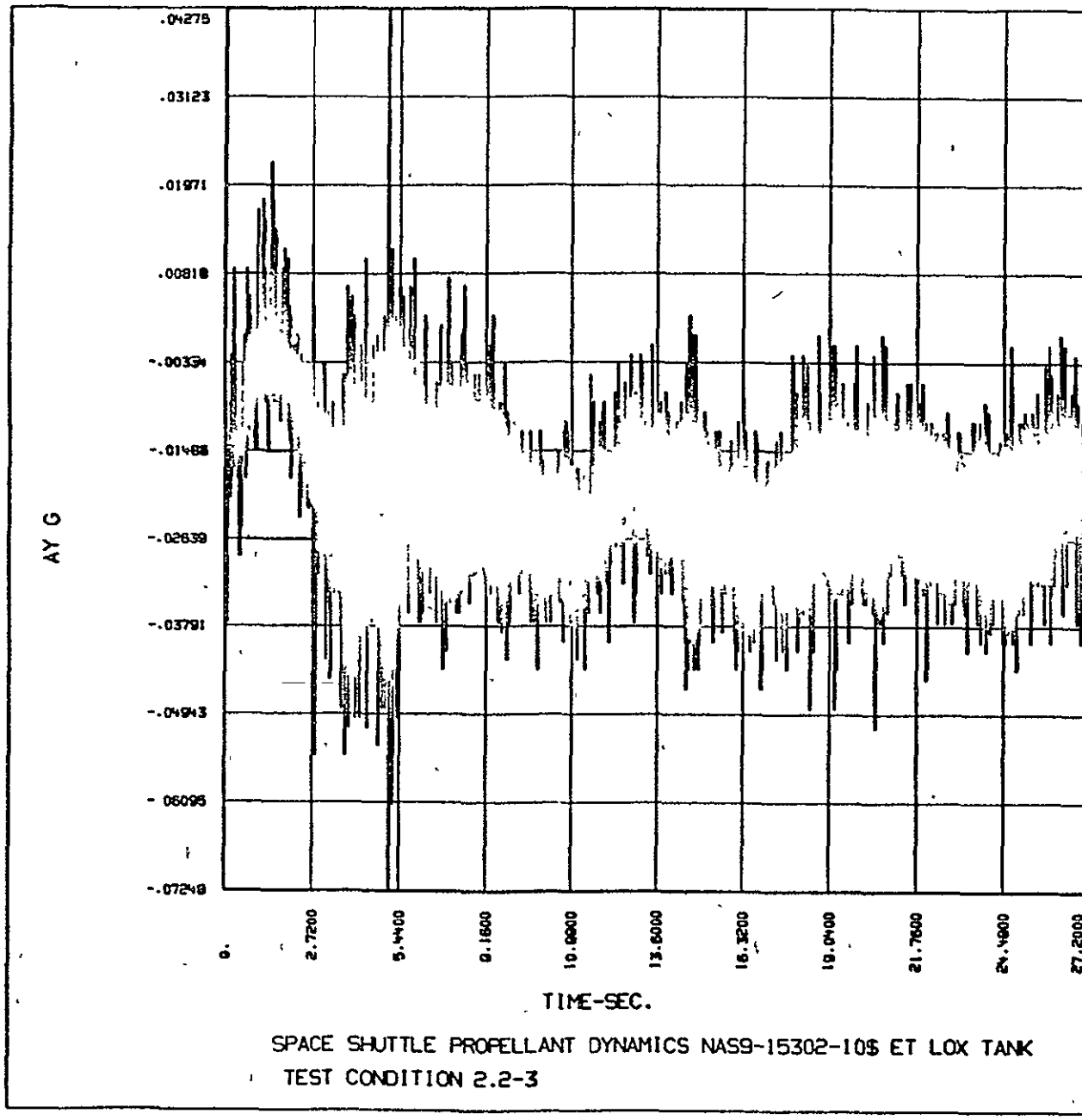
Baffles
Test Fluid – FC 113
Orientation 13°
Fill Volume – 5%
Target Acceleration–0.1 g

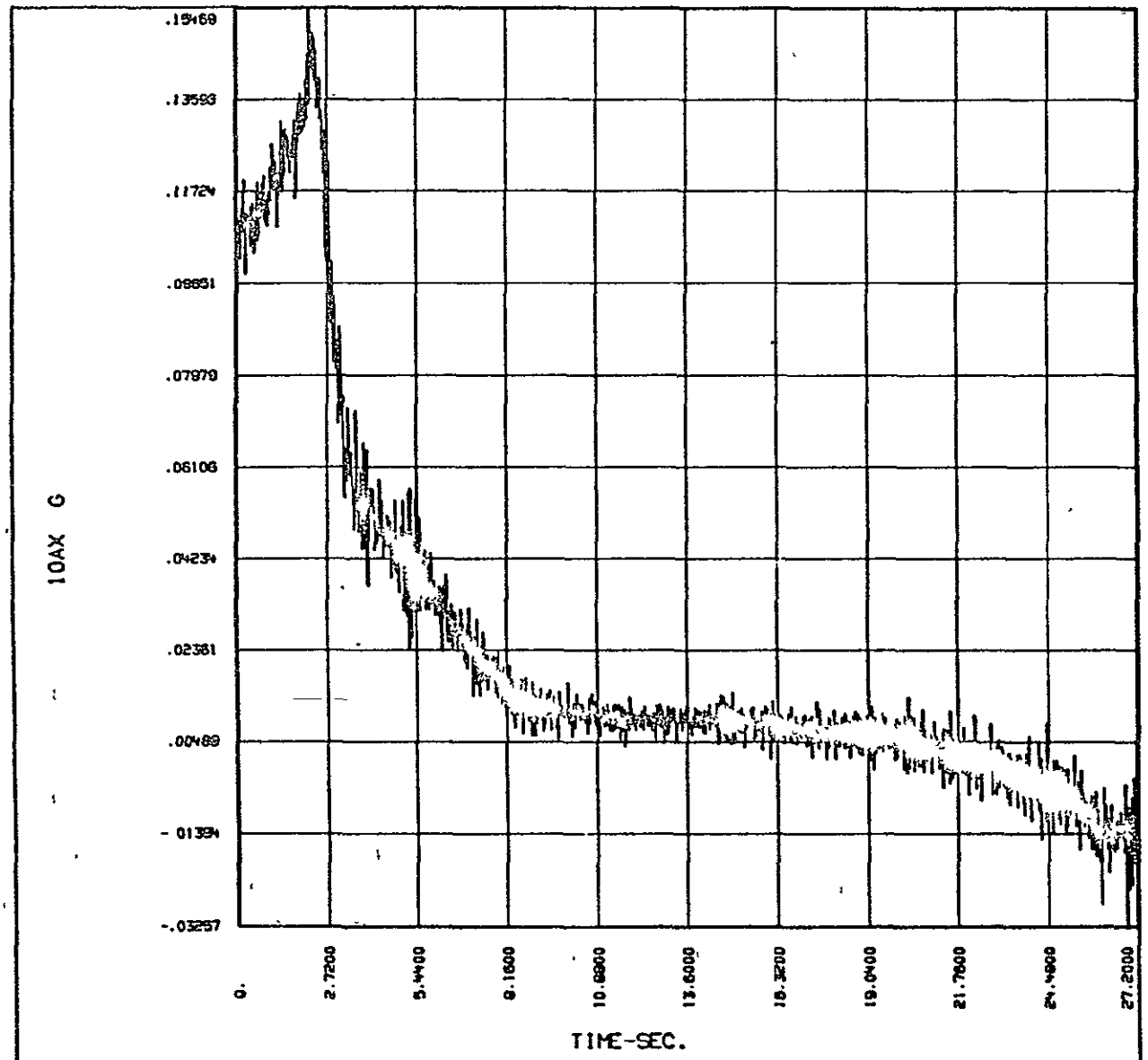

35.599
21.947
0.295
-5.357
-19.010
-32.662
-46.314
-59.966
-73.618
-87.270
-100.923
LOAD V1 LB
0.
2.7200
5.4400
8.1600
10.8800
13.6000
16.3200
19.0400
21.7600
24.4800
27.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.2-3



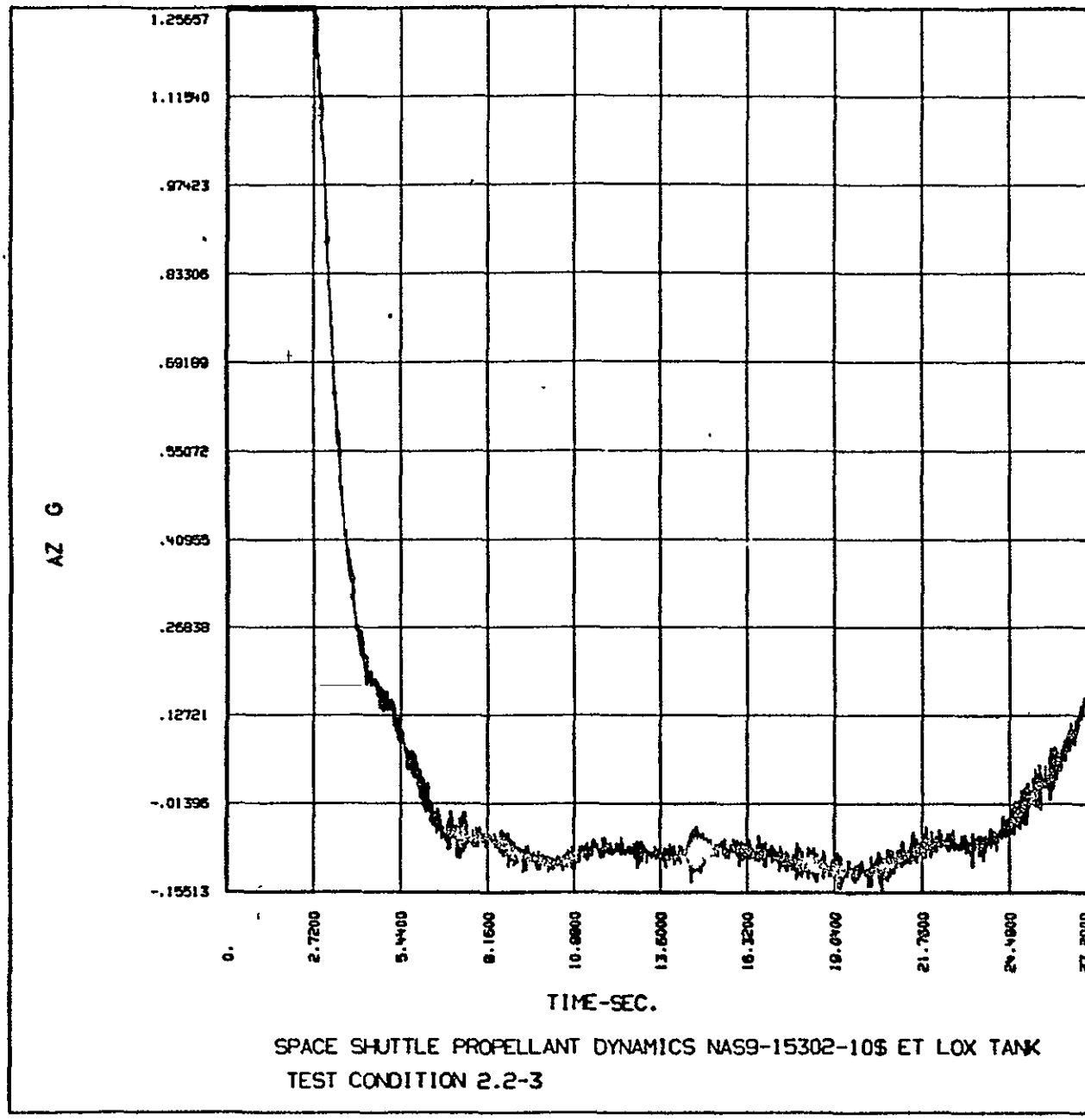
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.2-3

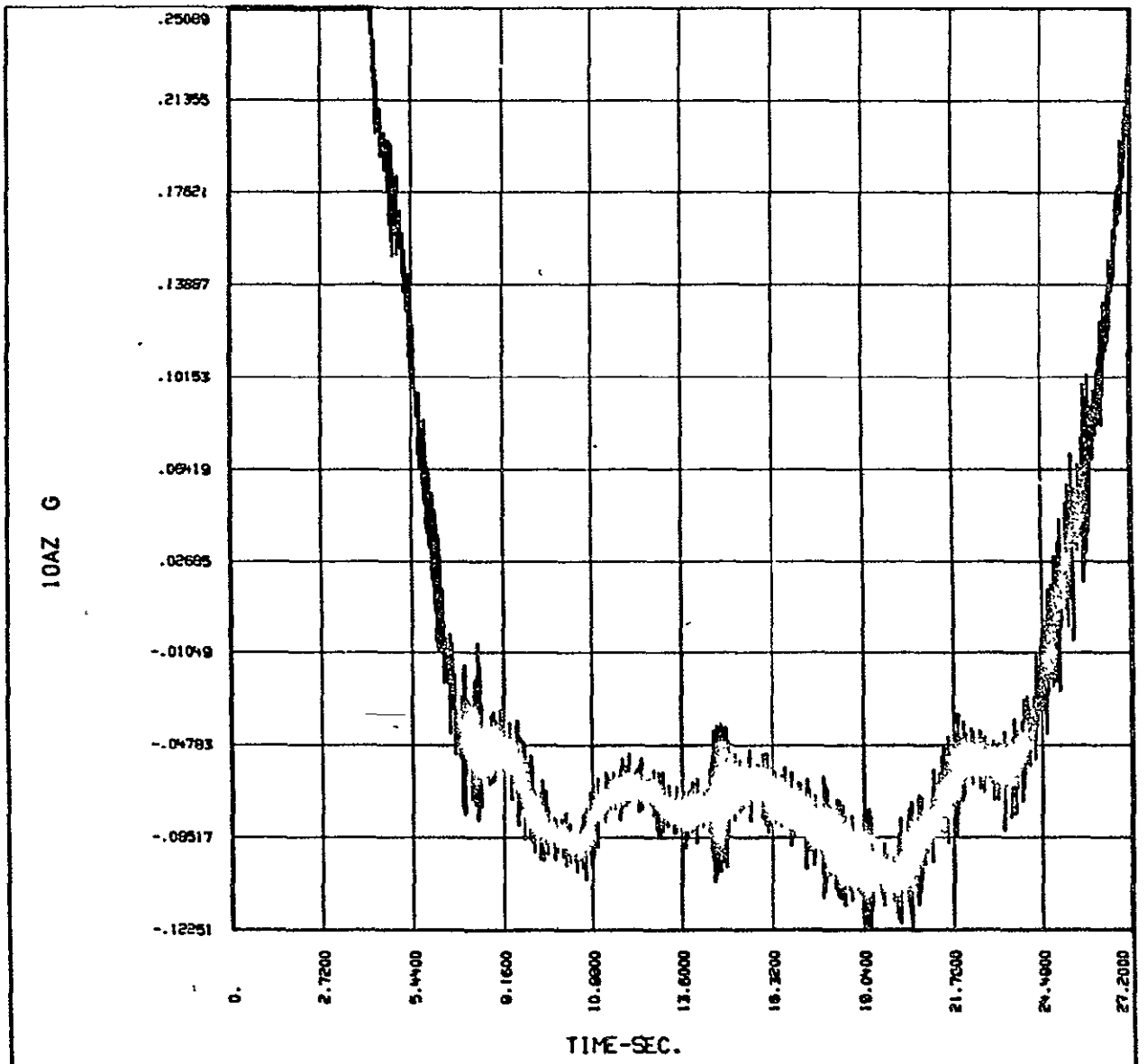

LOAD H1 LB
43 1440
38 8296
34.5152
30 2008
25 8864
21.5720
17.2576
12.9432
8.6288
4.3144
0
0.
2.7200
5.4400
8.1600
10.8800
13 6000
16.3200
19.0400
21.7600
24.4800
27.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.2-3


.04275
.03123
.01971
.00818
-.00334
-.01488
-.02639
-.03791
-.04943
-.06095
-.07248
AY G
0.
2.7200
5.4400
8.1600
10.8800
13.6000
16.3200
19.0400
21.7600
24.4800
27.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.2-3

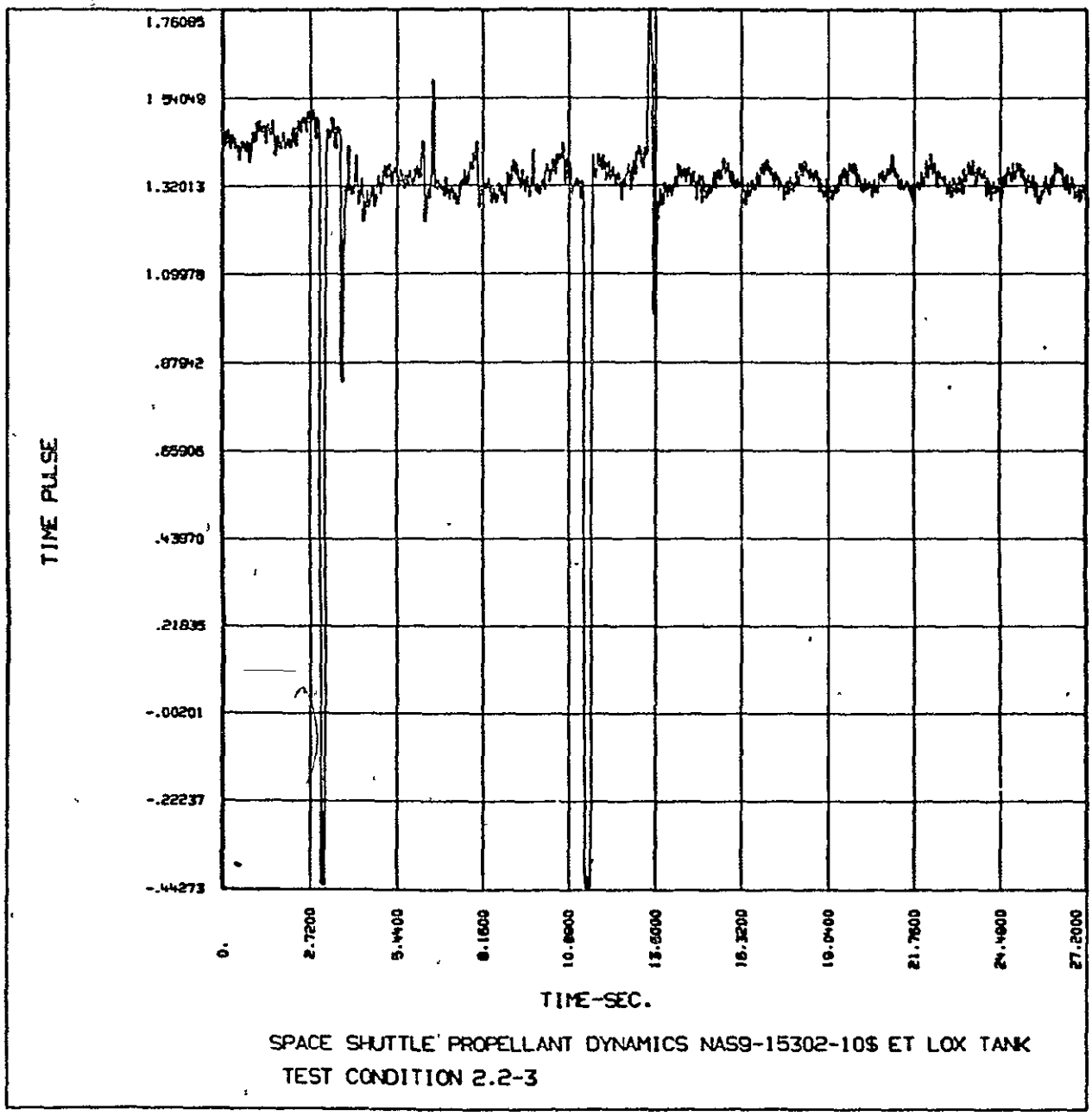


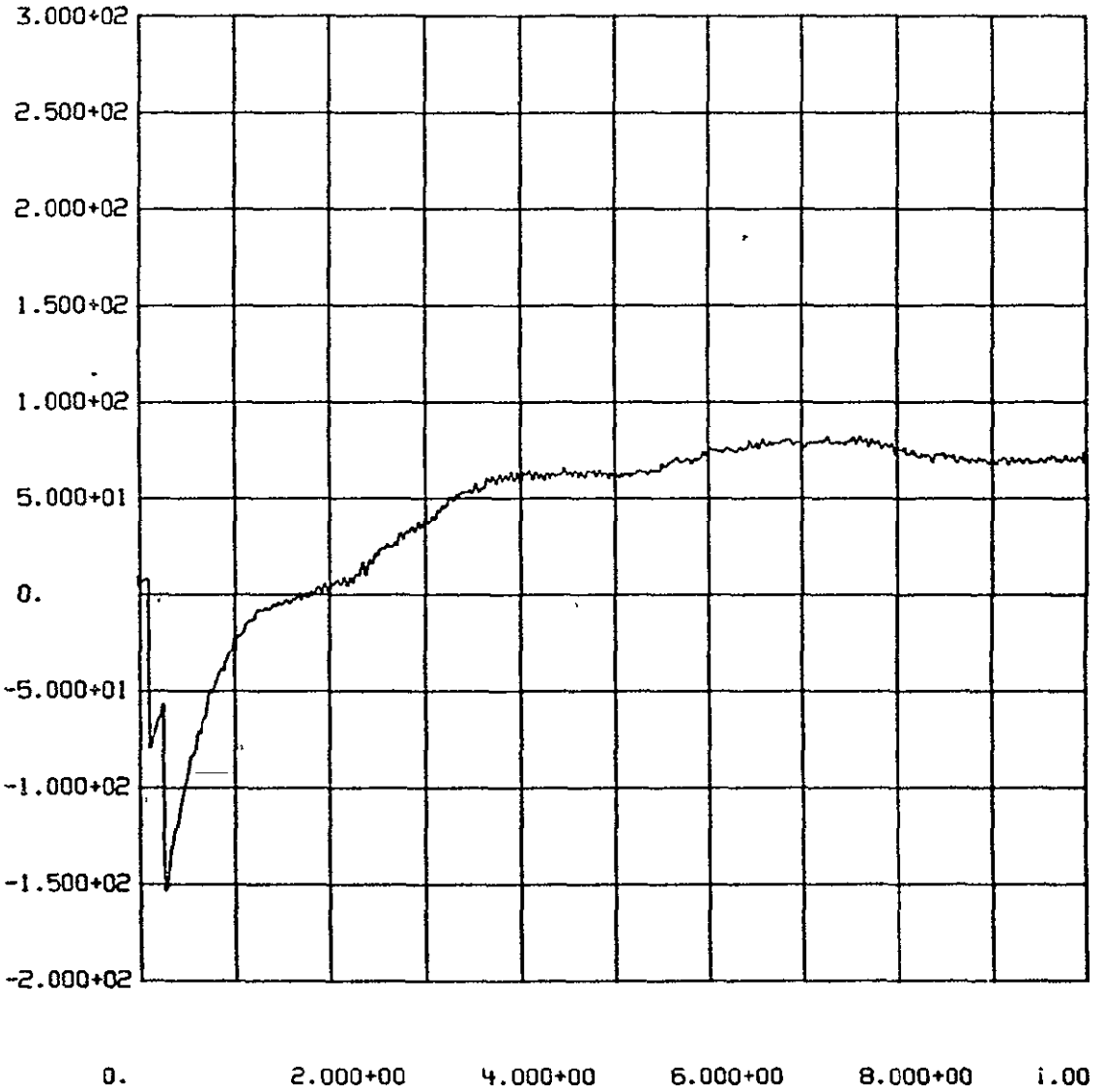
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.2-3


1.25657
1.11540
.97423
.83306
.69189
.55072
.40955
.26838
.12721
-.01396
-.15513
AZ G
0.
2.7200
5.4400
8.1600
10.8800
13.6000
16.3200
19.0400
21.7600
24.4800
27.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.2-3



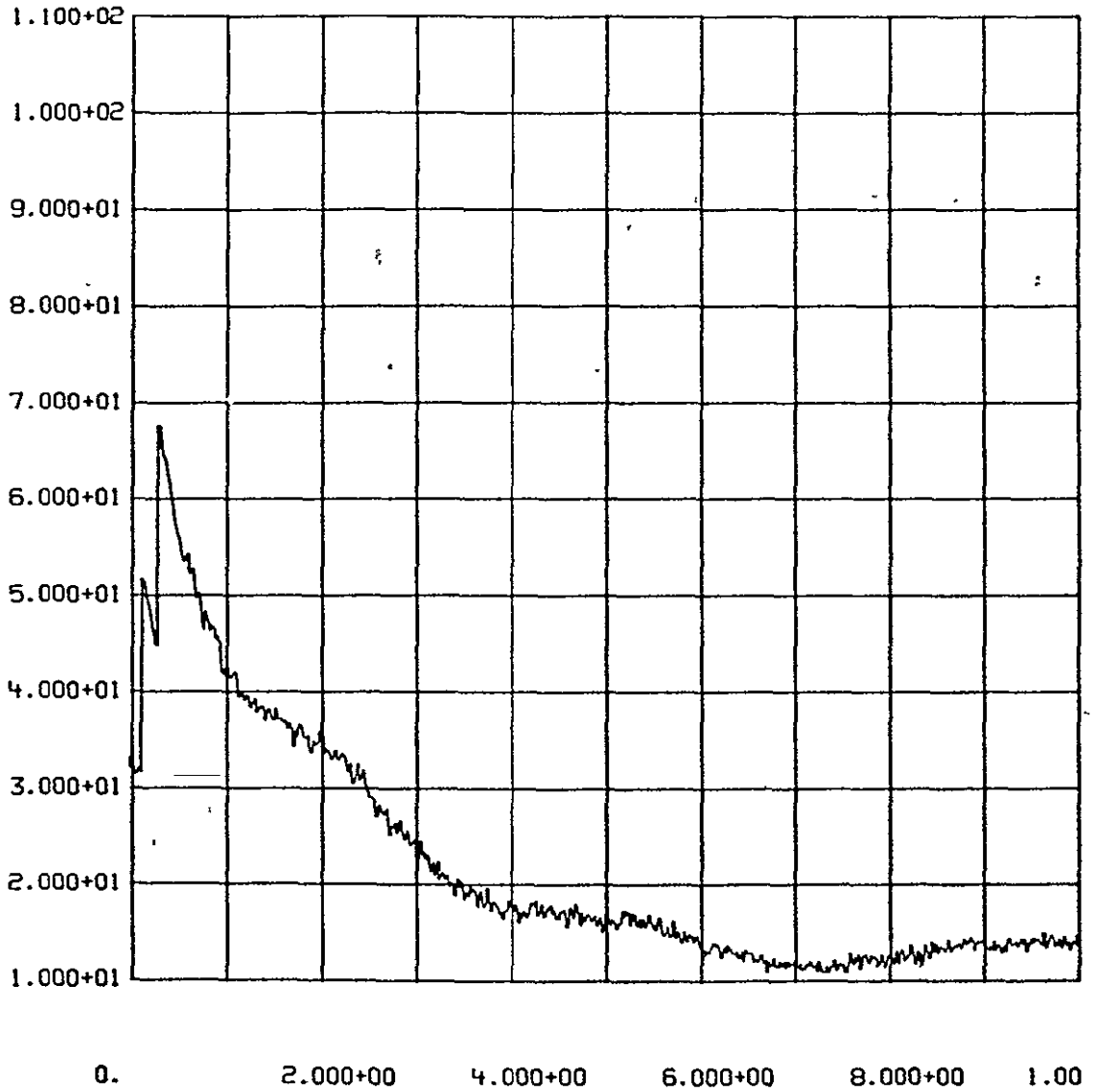
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.2-3


1.76085
1.54049
1.32013
1.09978
.87942
.65906
.43870
.21835
-.00201
-.22237
-.44273
TIME PULSE
0.
2.7200
5.4400
8.1600
10.8800
13.6000
16.3200
19.0400
21.7600
24.4800
27.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.2-3



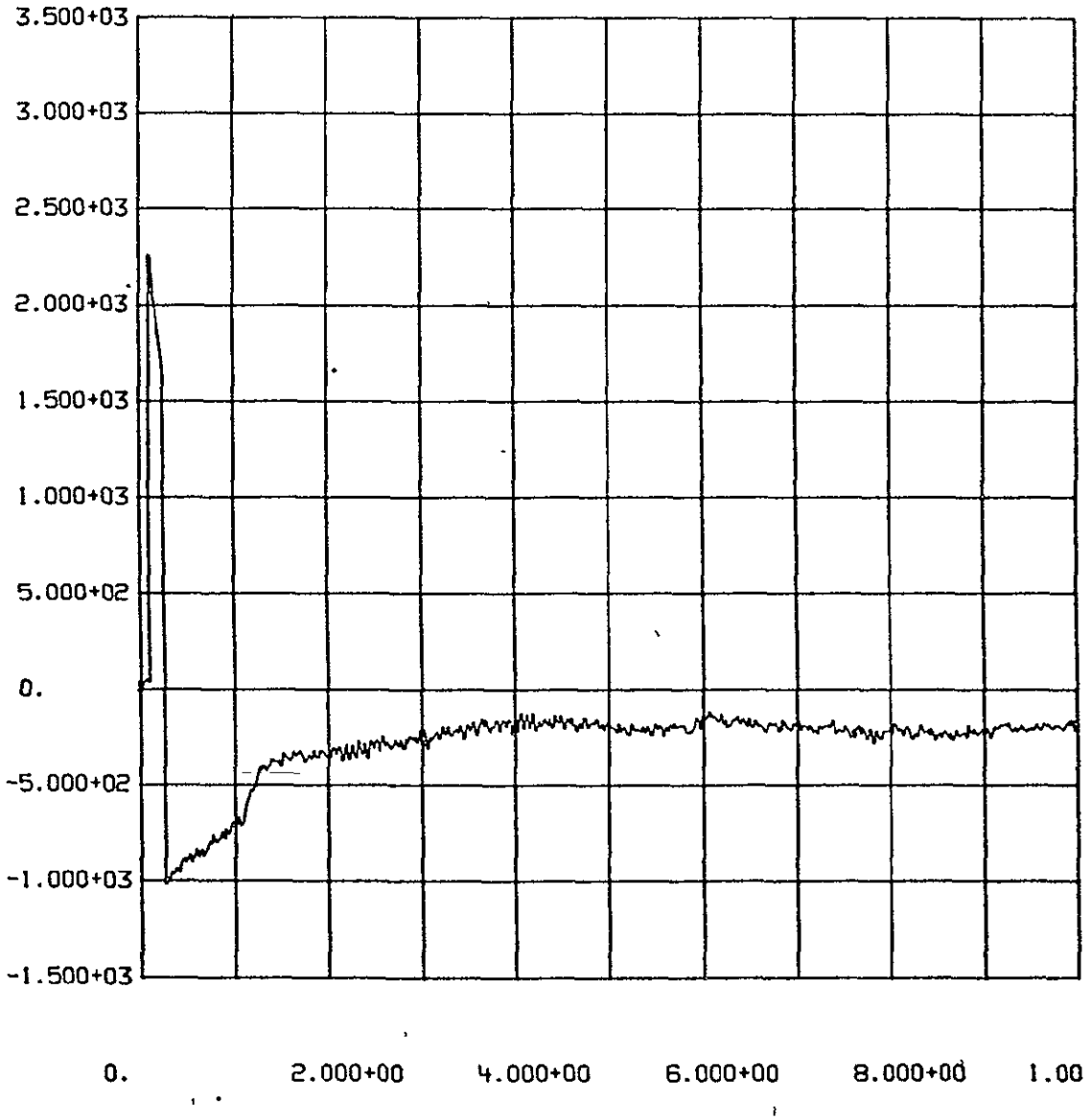
Z-LOAD VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.2-3 * UNFILT *



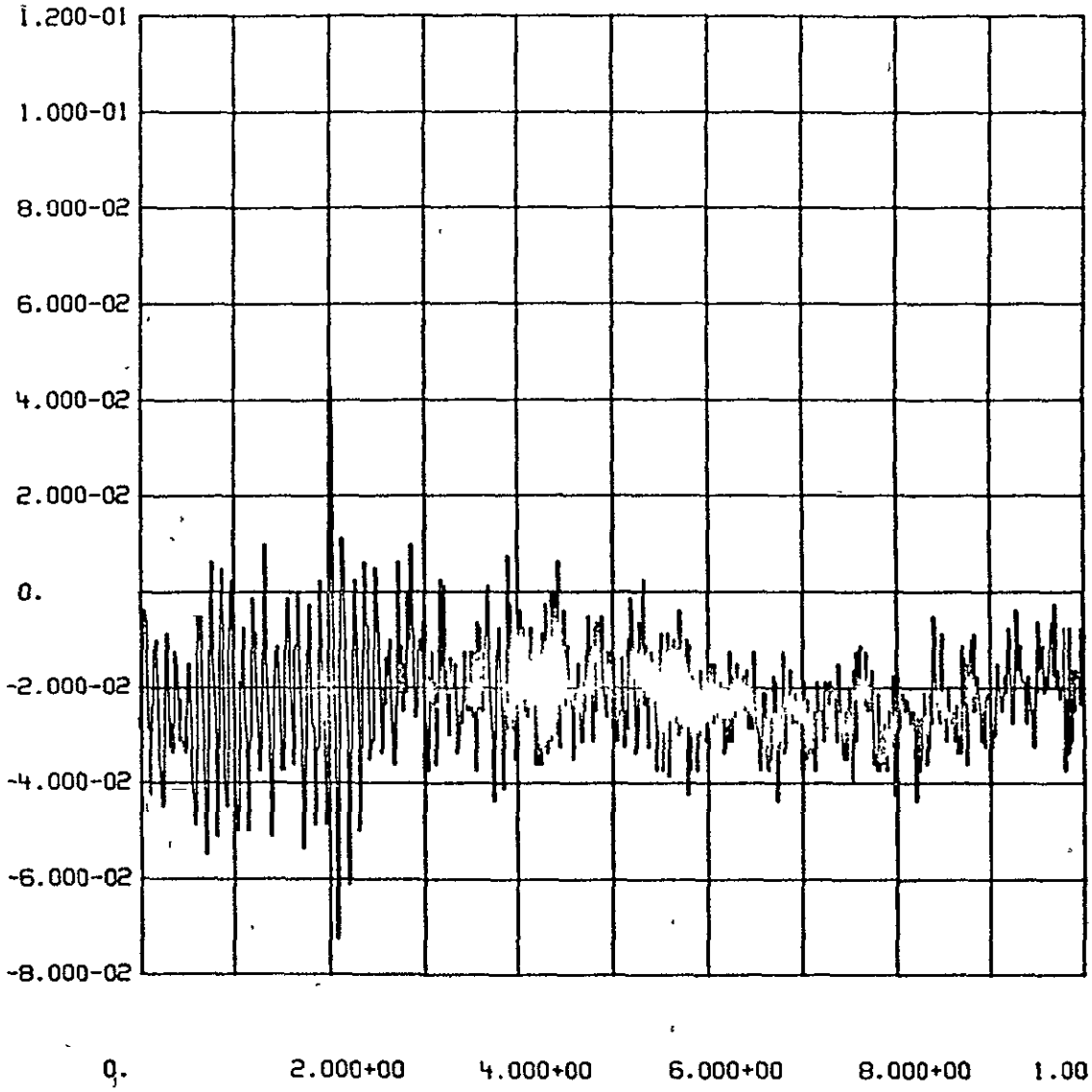
Y-LOAD VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.2-3 * UNFILT *



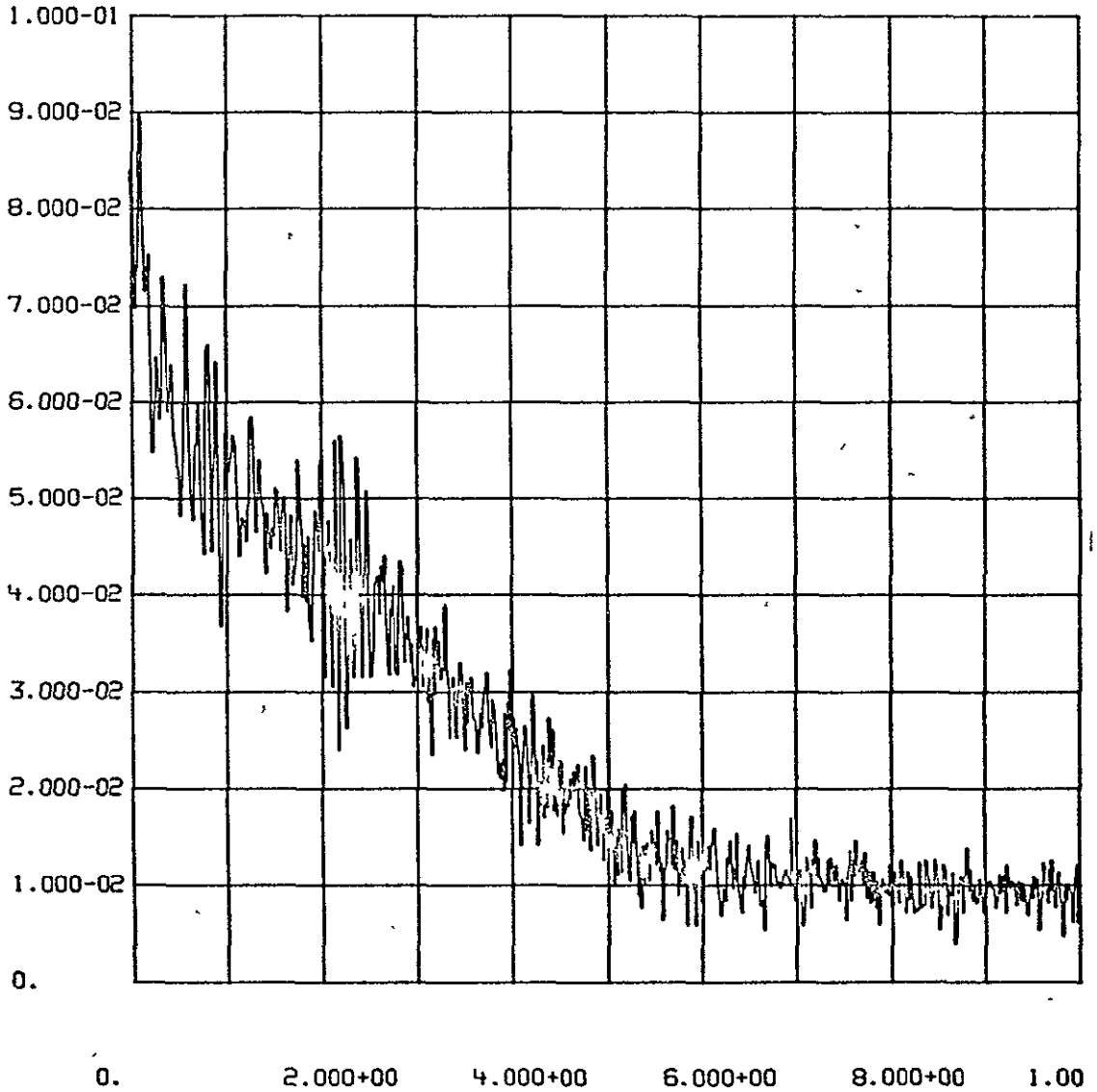
MOMENT VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.2-3 * UNFILT *



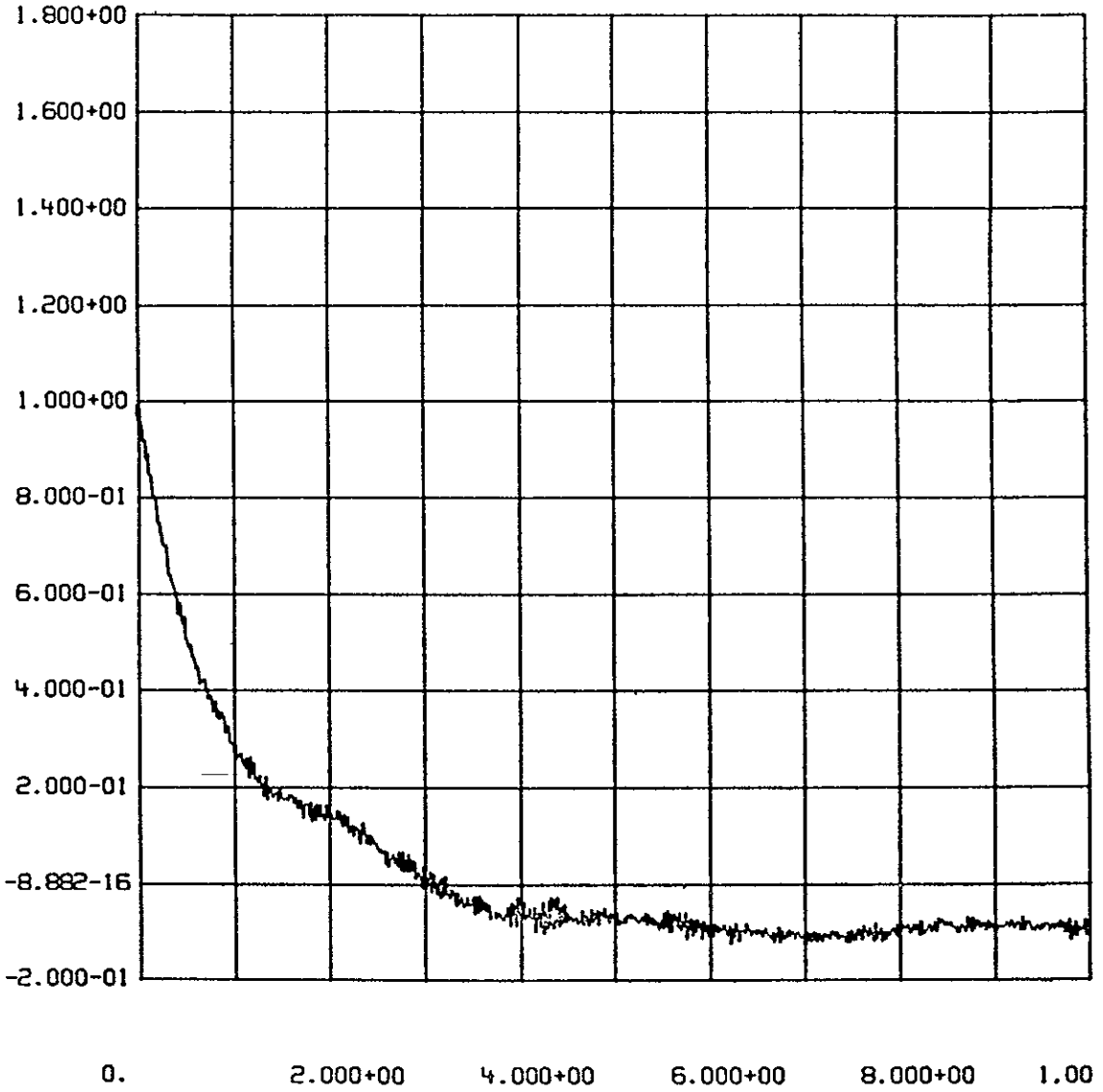
AC YAC VS TIME

.1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.2-3 * UNFILT *



AC XAC VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.2-3 * UNFILT *

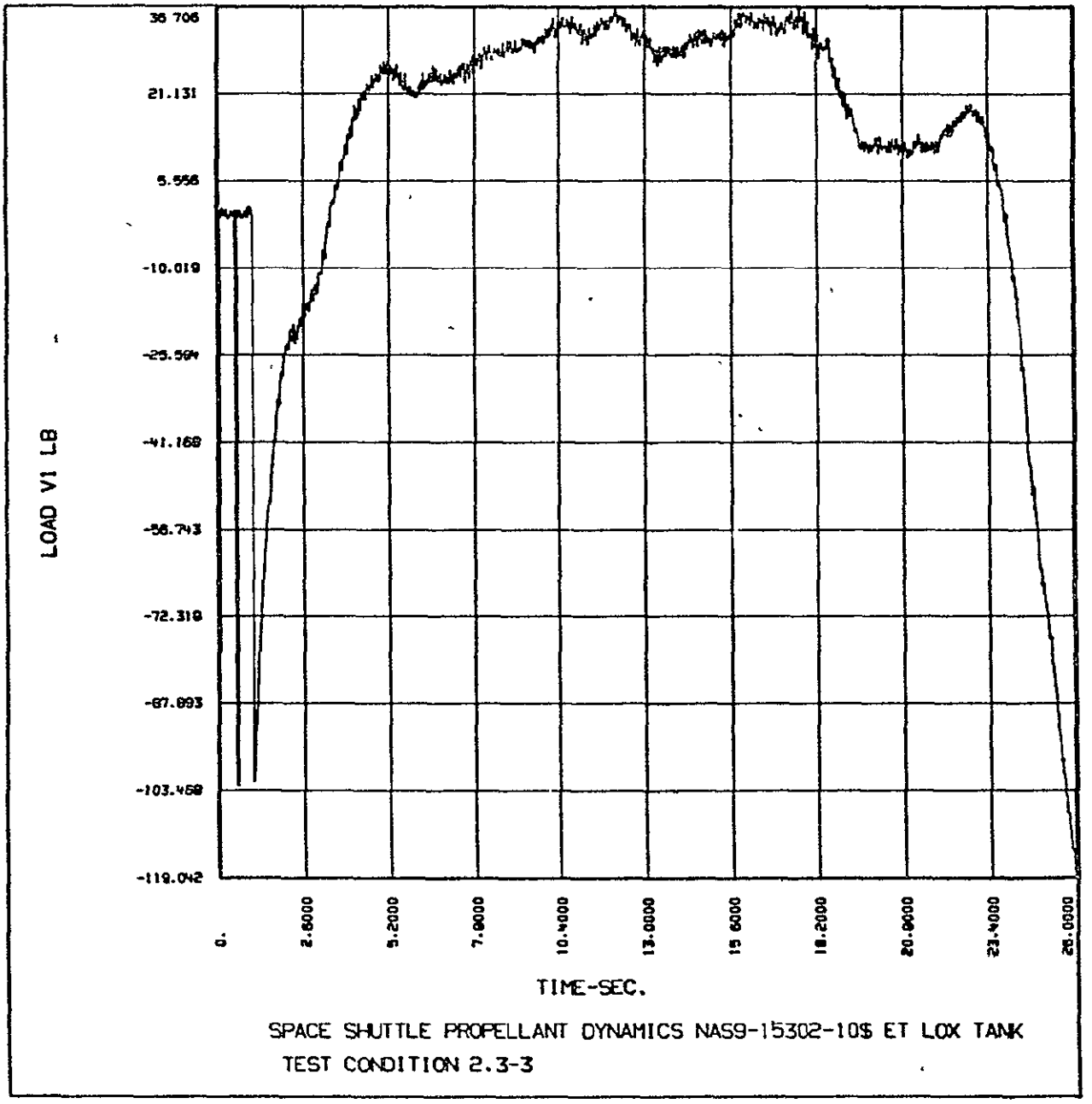


AC ZAC VS TIME

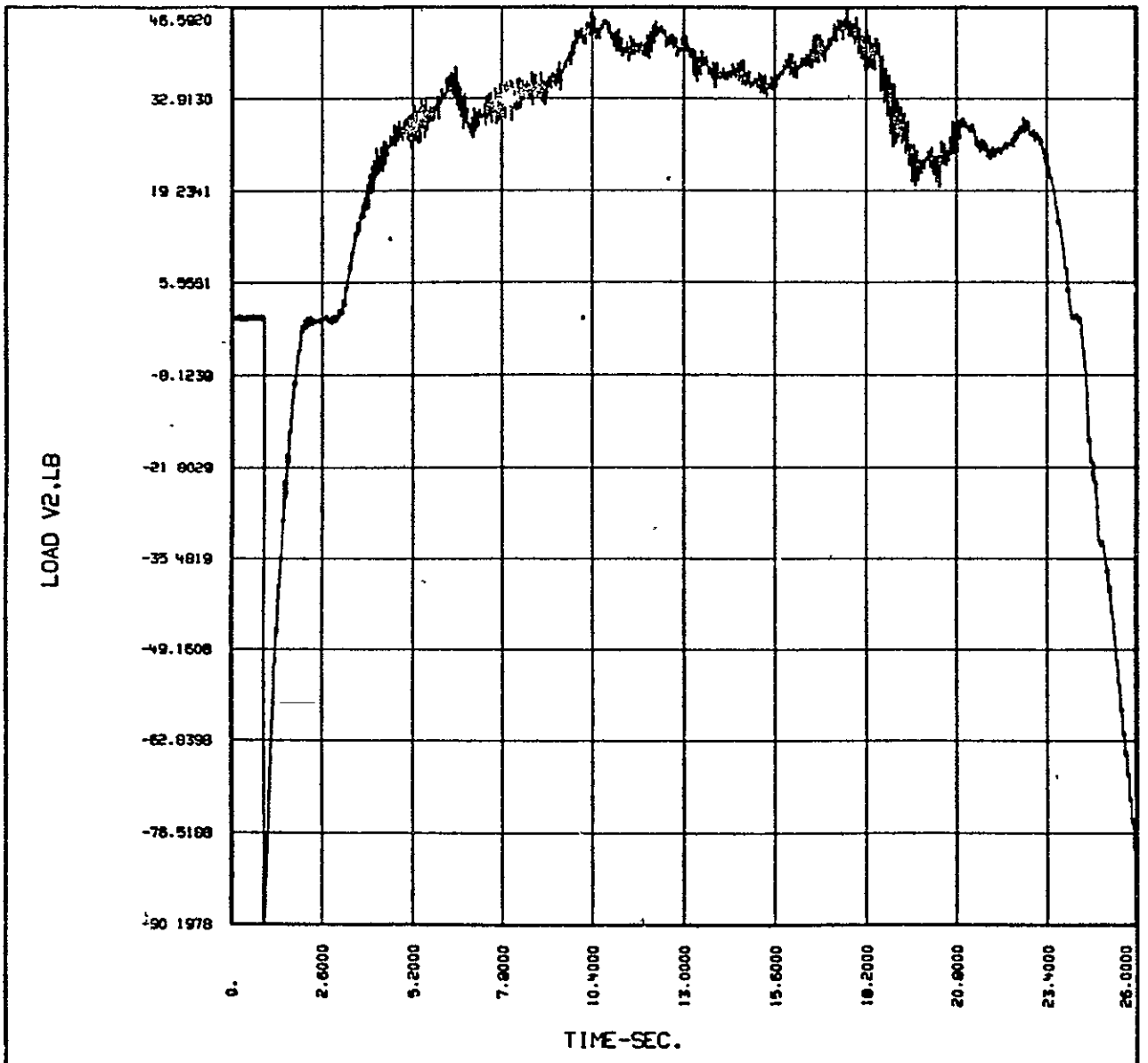
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.2-3 * UNFILT *

Test Data Condition 2.3-3

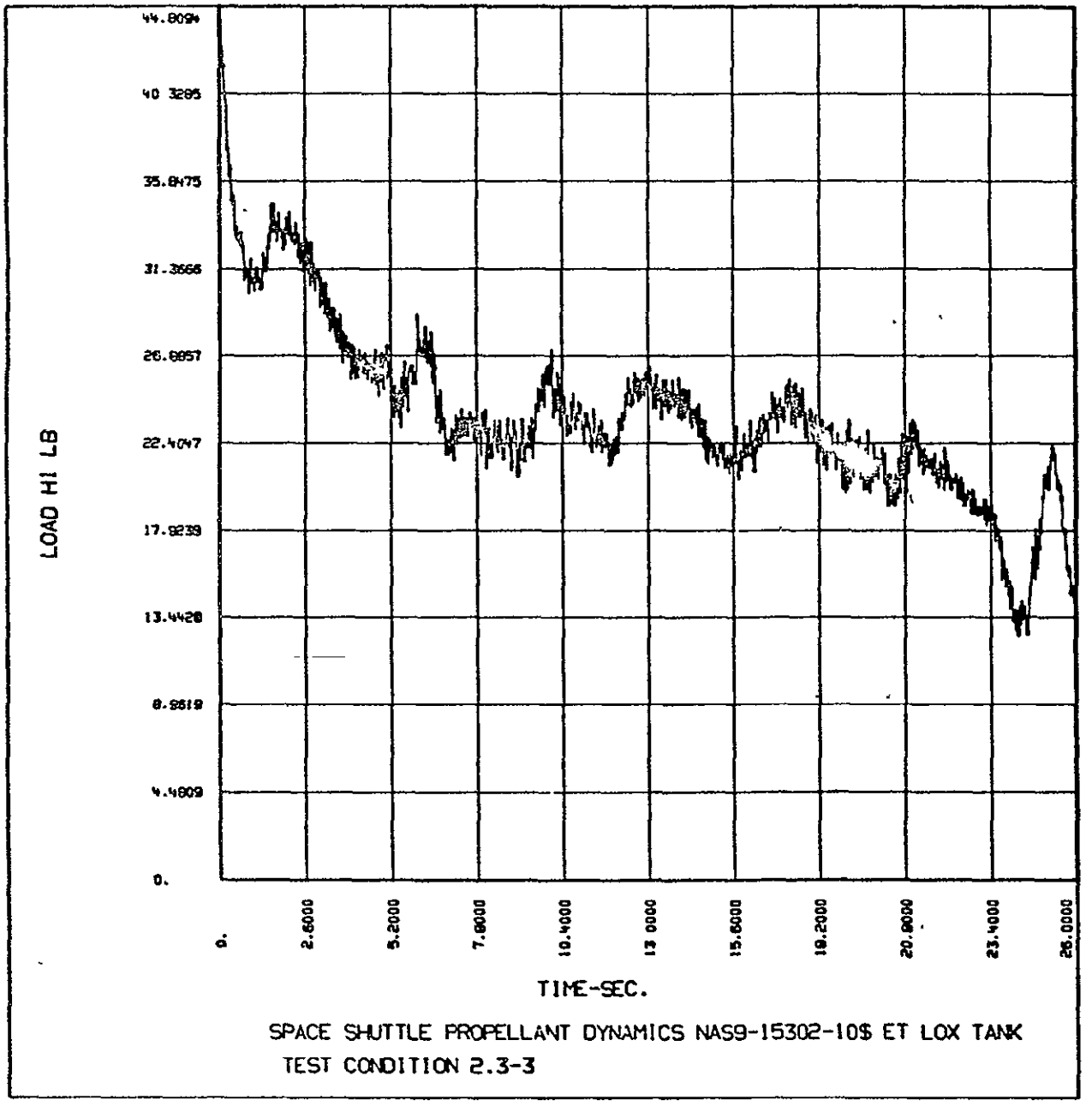
Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 10%
Target Acceleration – 0.1 g

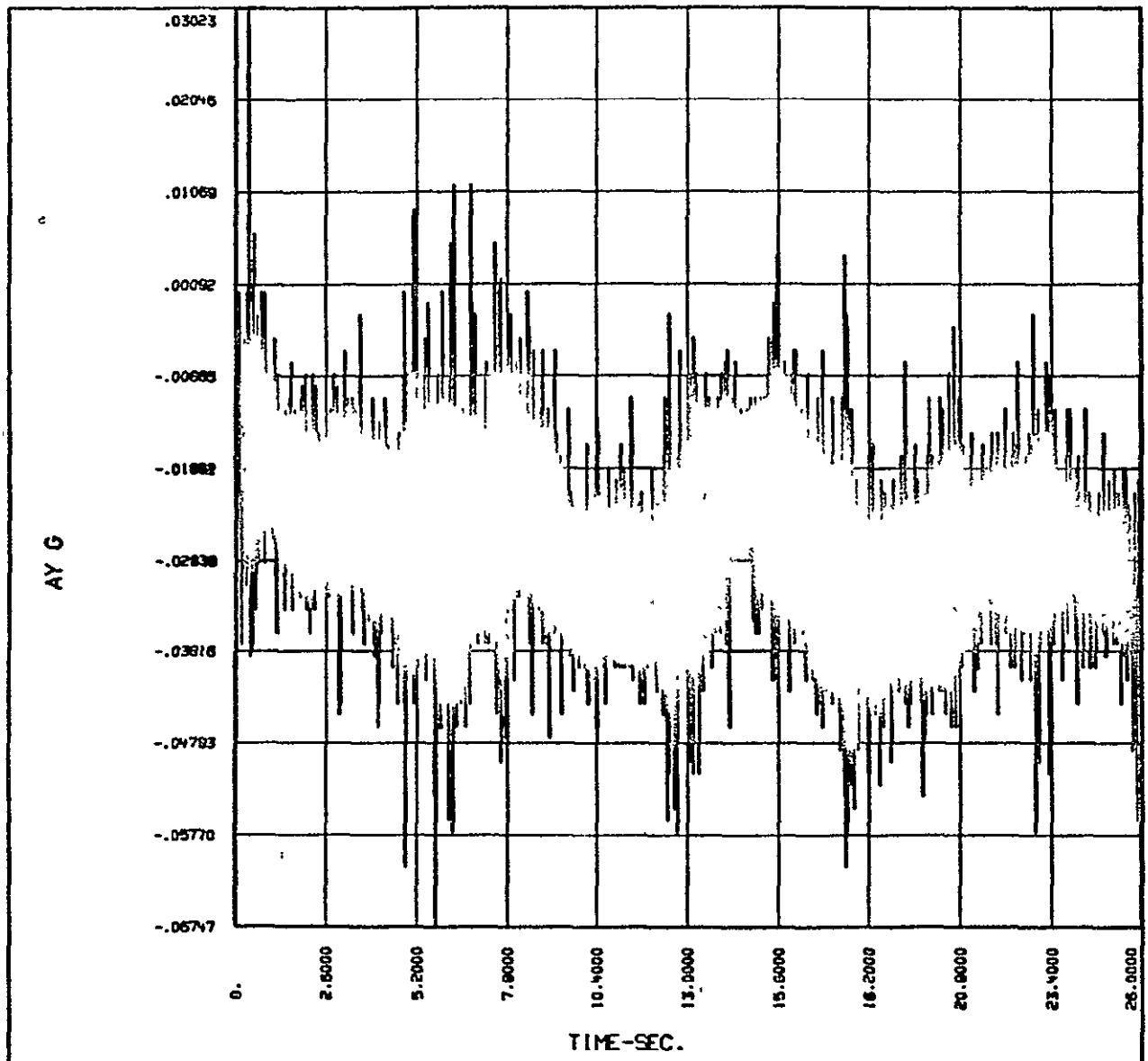


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.3-3

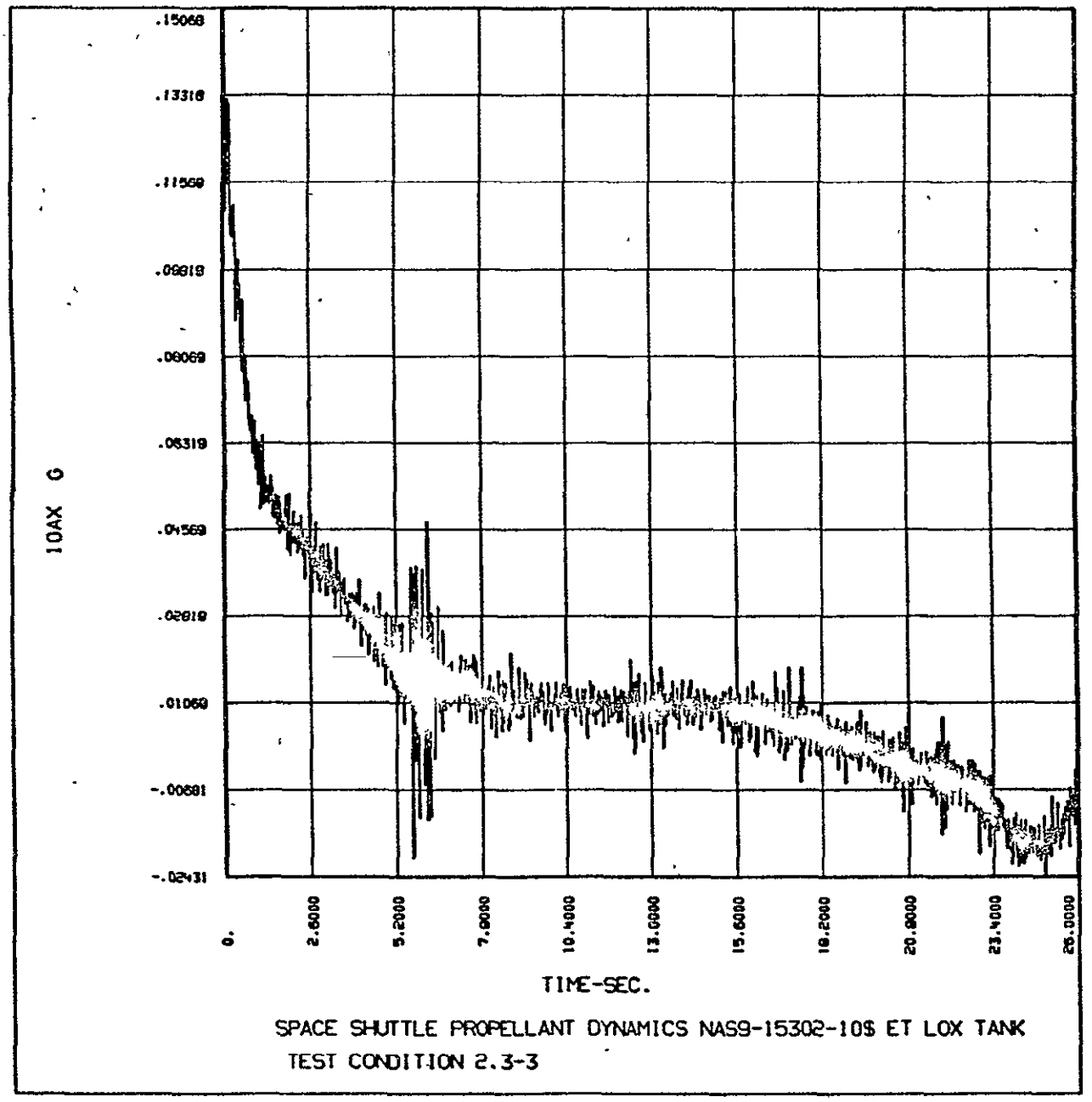


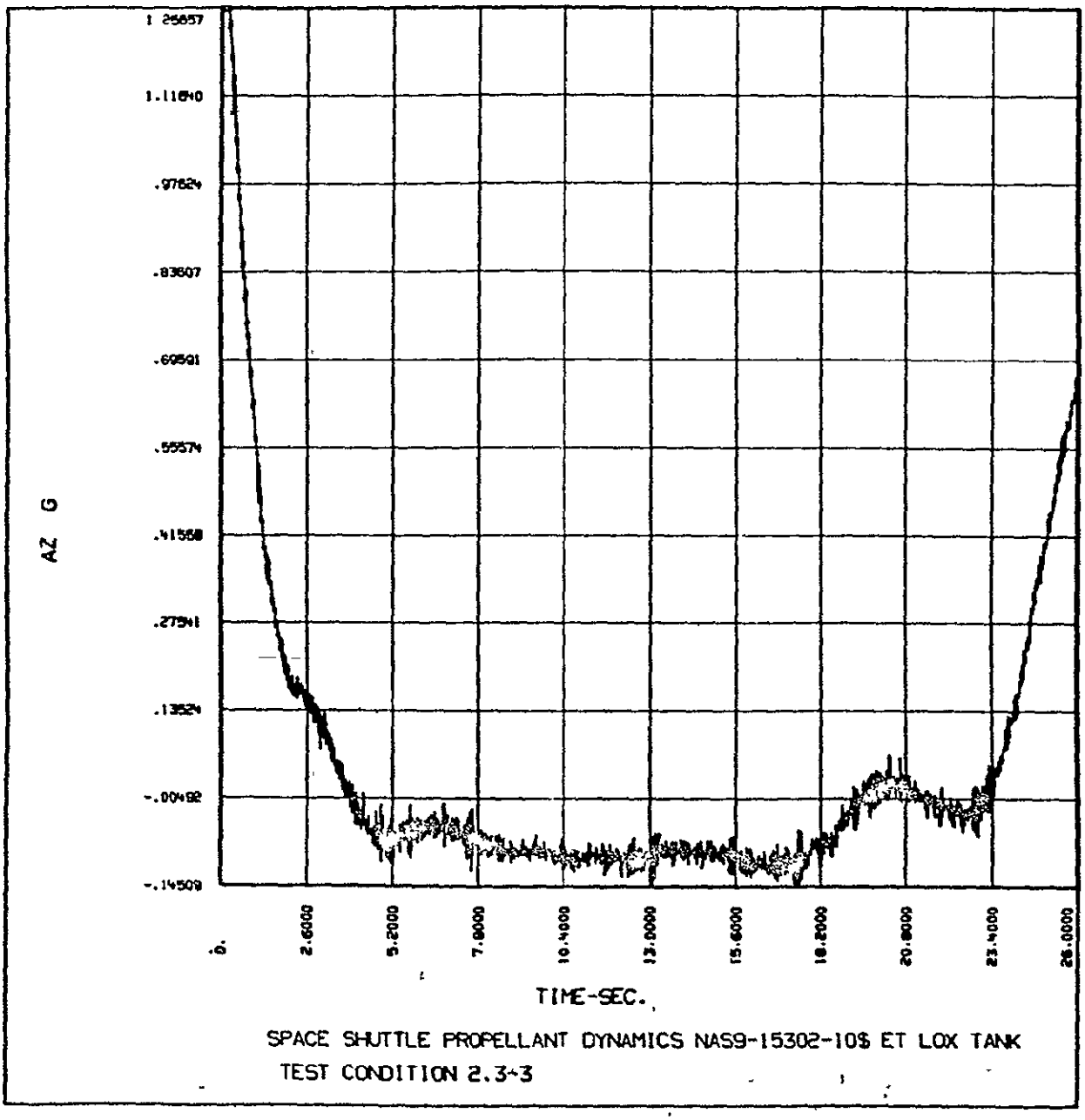
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.3-3


44.8094
40 3285
35.8475
31.3666
26.8857
22.4047
17.9239
13.4428
8.9619
4.4809
0.
LOAD HI LB
0.
2.6000
5.2000
7.8000
10.4000
13 0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.3-3



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.3-3


.15068
.13318
.11569
.09819
.08069
.06319
.04569
.02819
.01069
-.00681
-.02431
10AX G
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.3-3


1.25657
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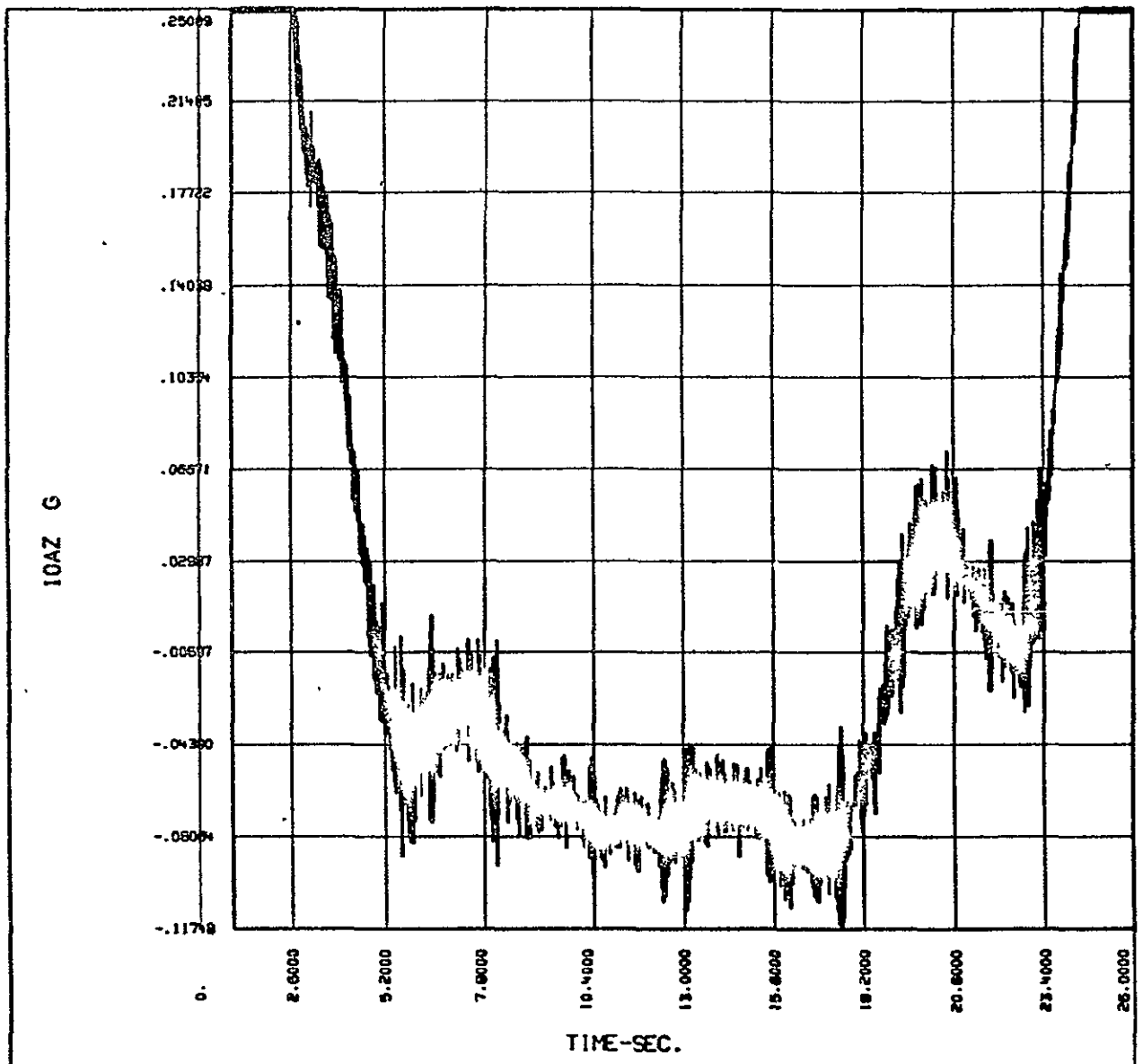
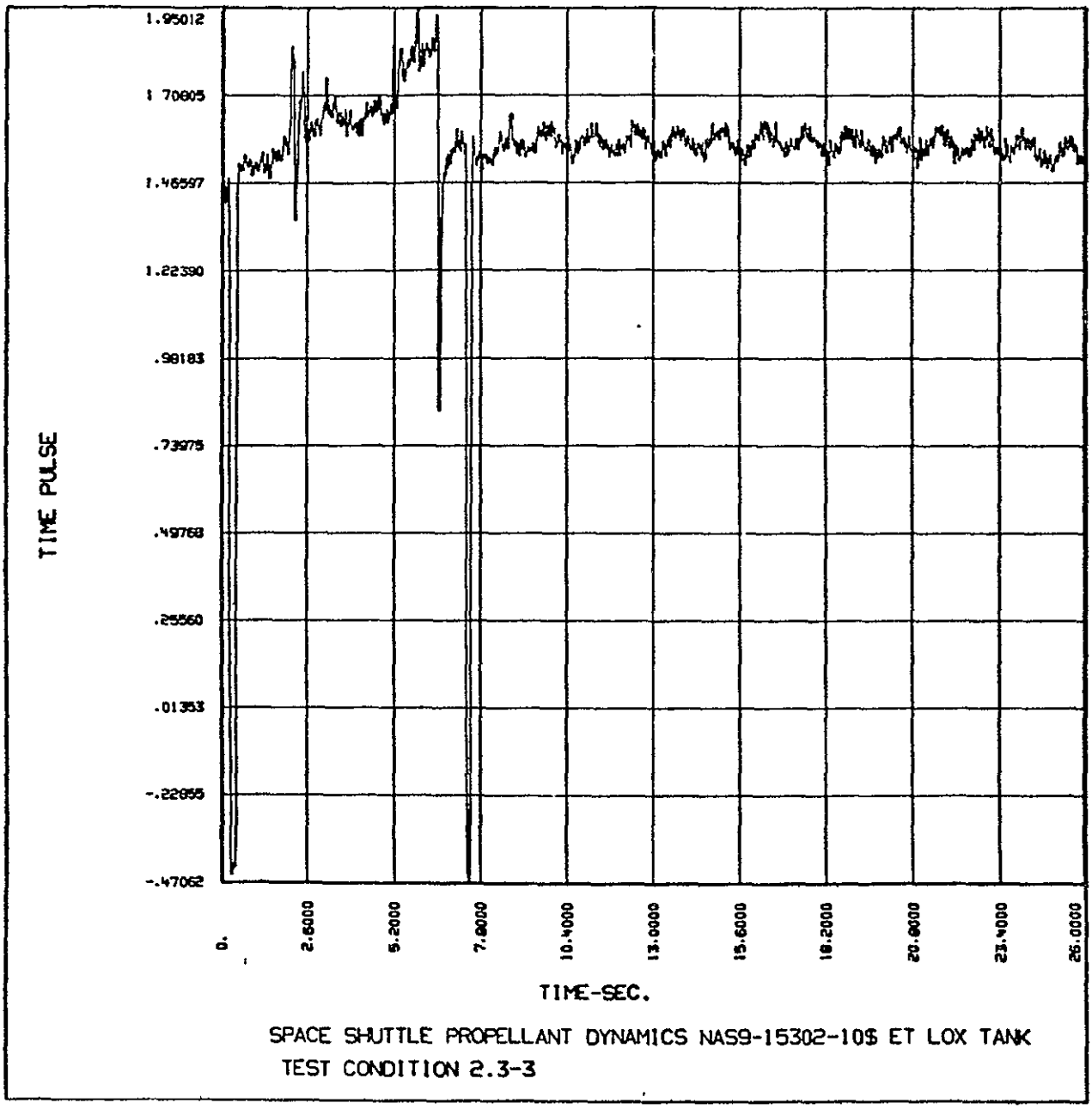
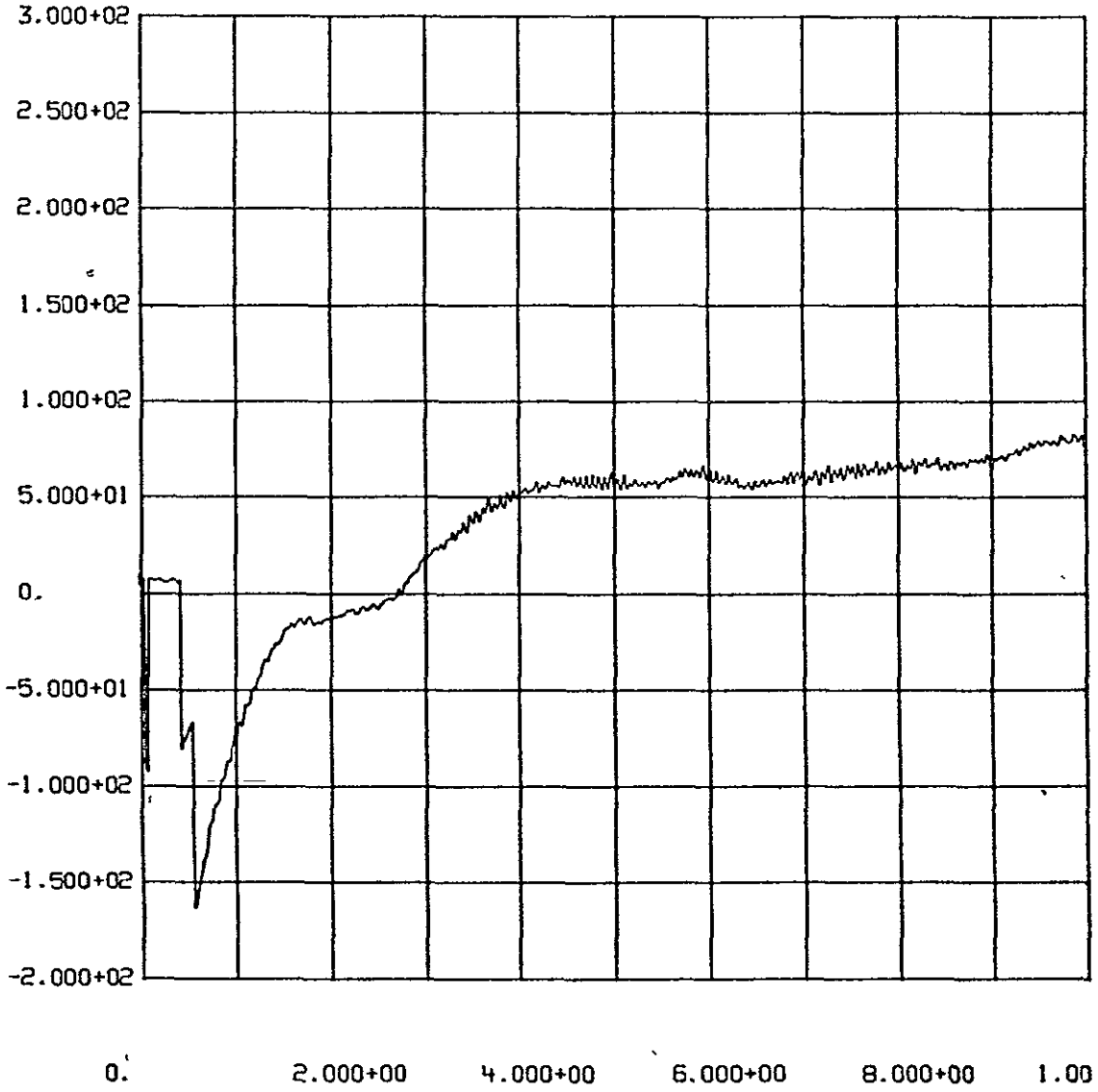
.97624
.83607
.69591
.55574
.41558
.27541
.13524
-.00492
-.14509
AZ G
.0
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.3-3



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.3-3

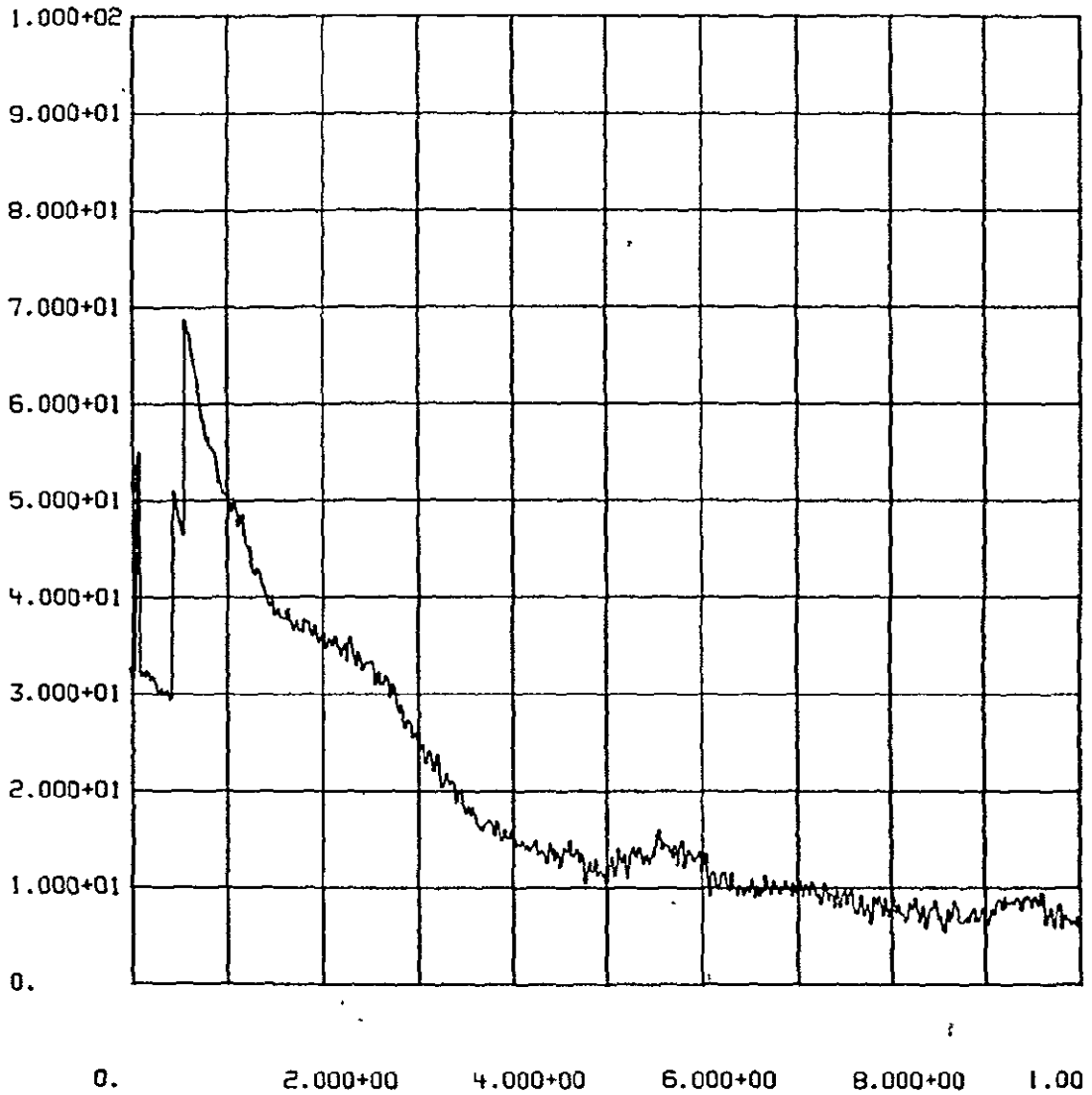


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.3-3



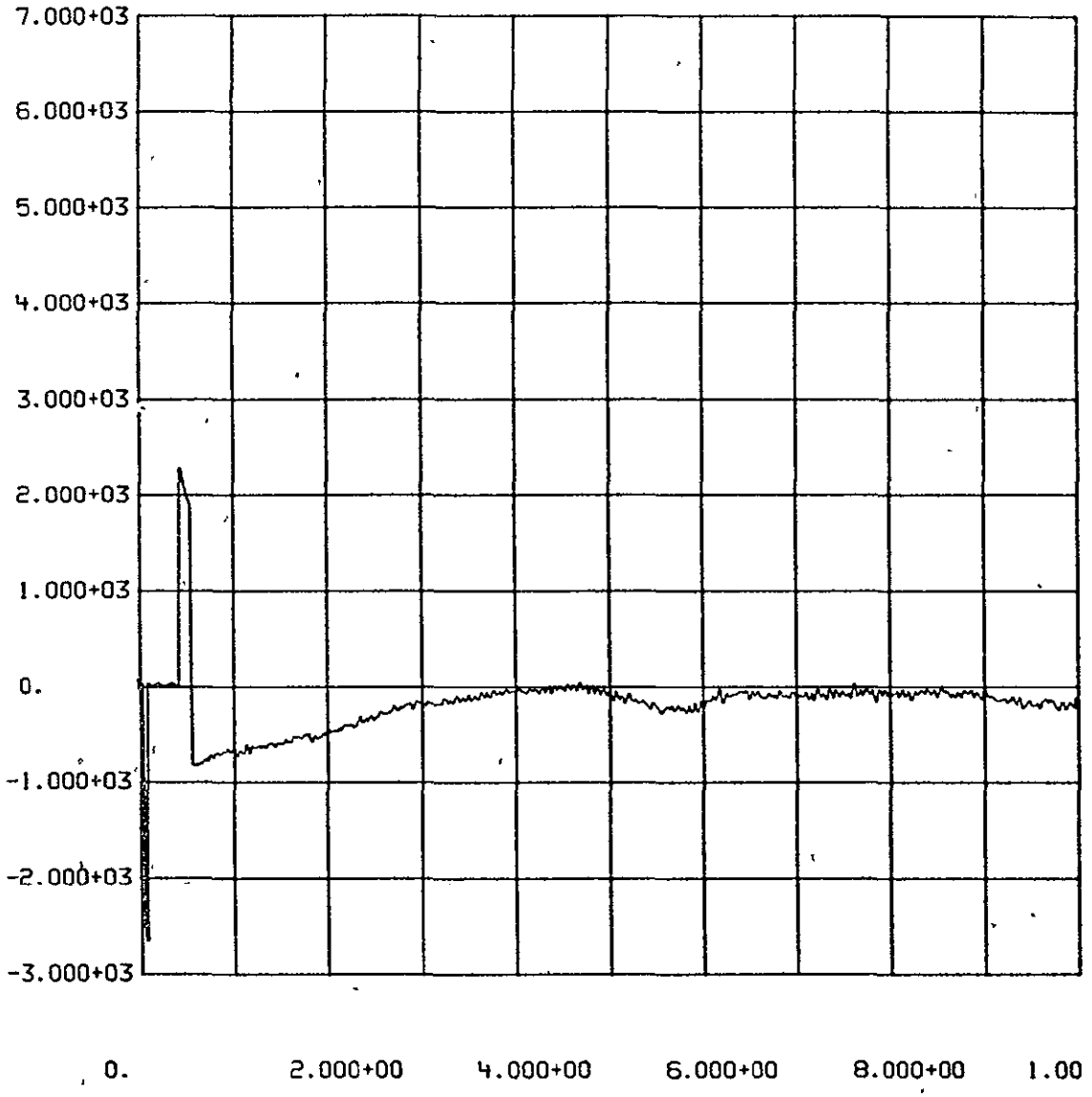
Z-LOAD VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.3-3 * UNFILT *



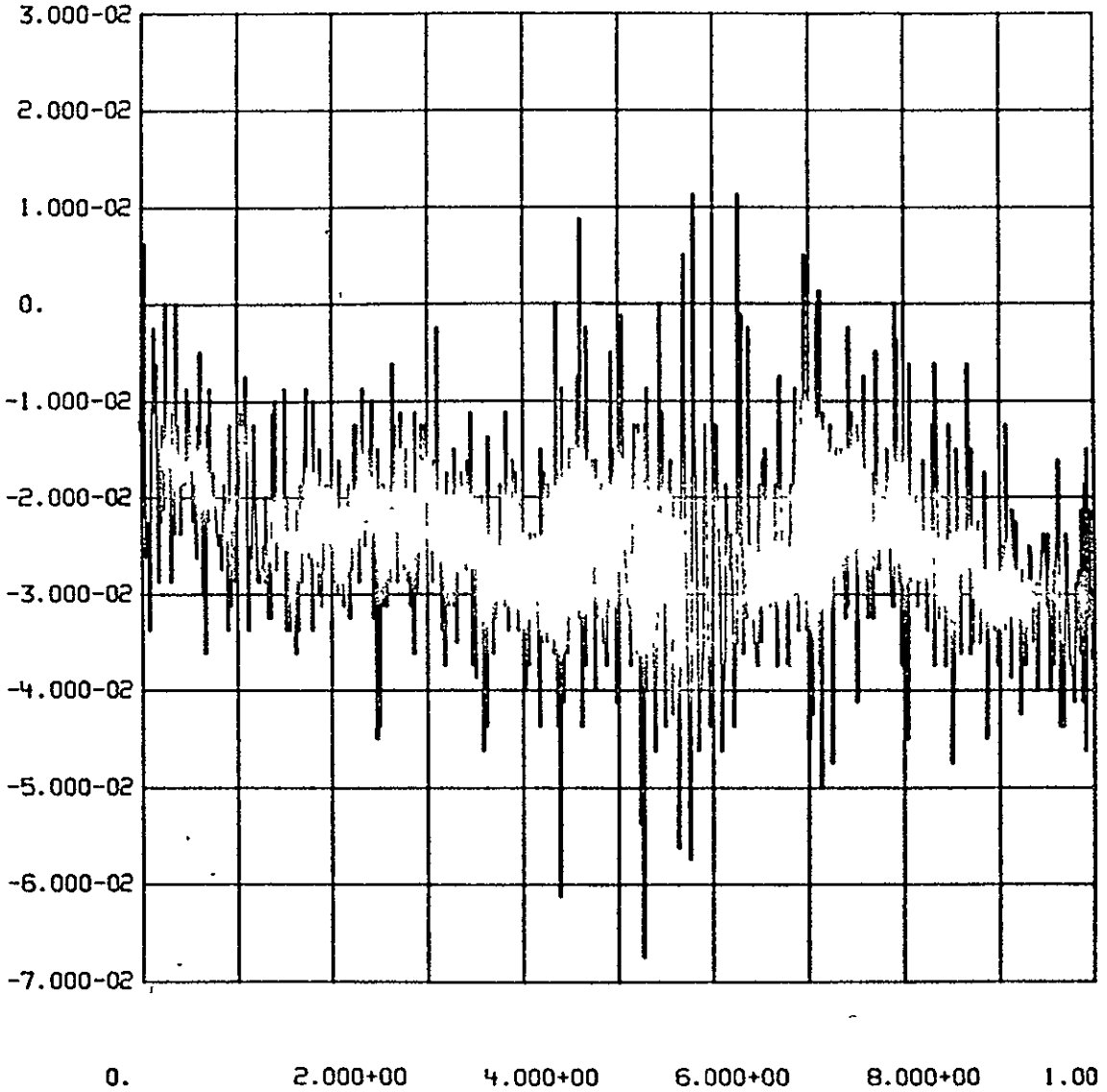
Y-LOAD VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.3-3 * UNFILT *



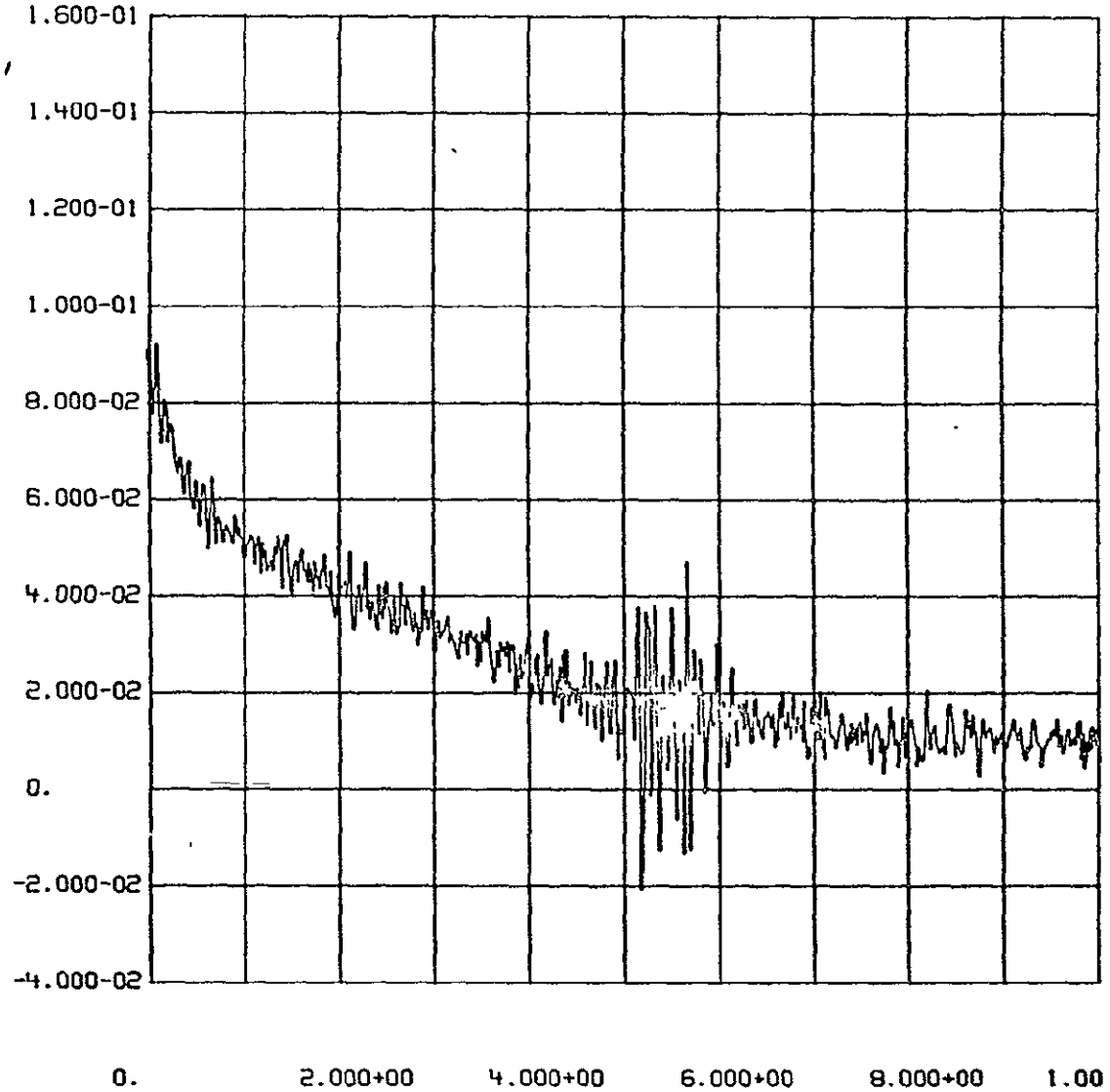
MOMENT VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.3-3 * UNFILT *



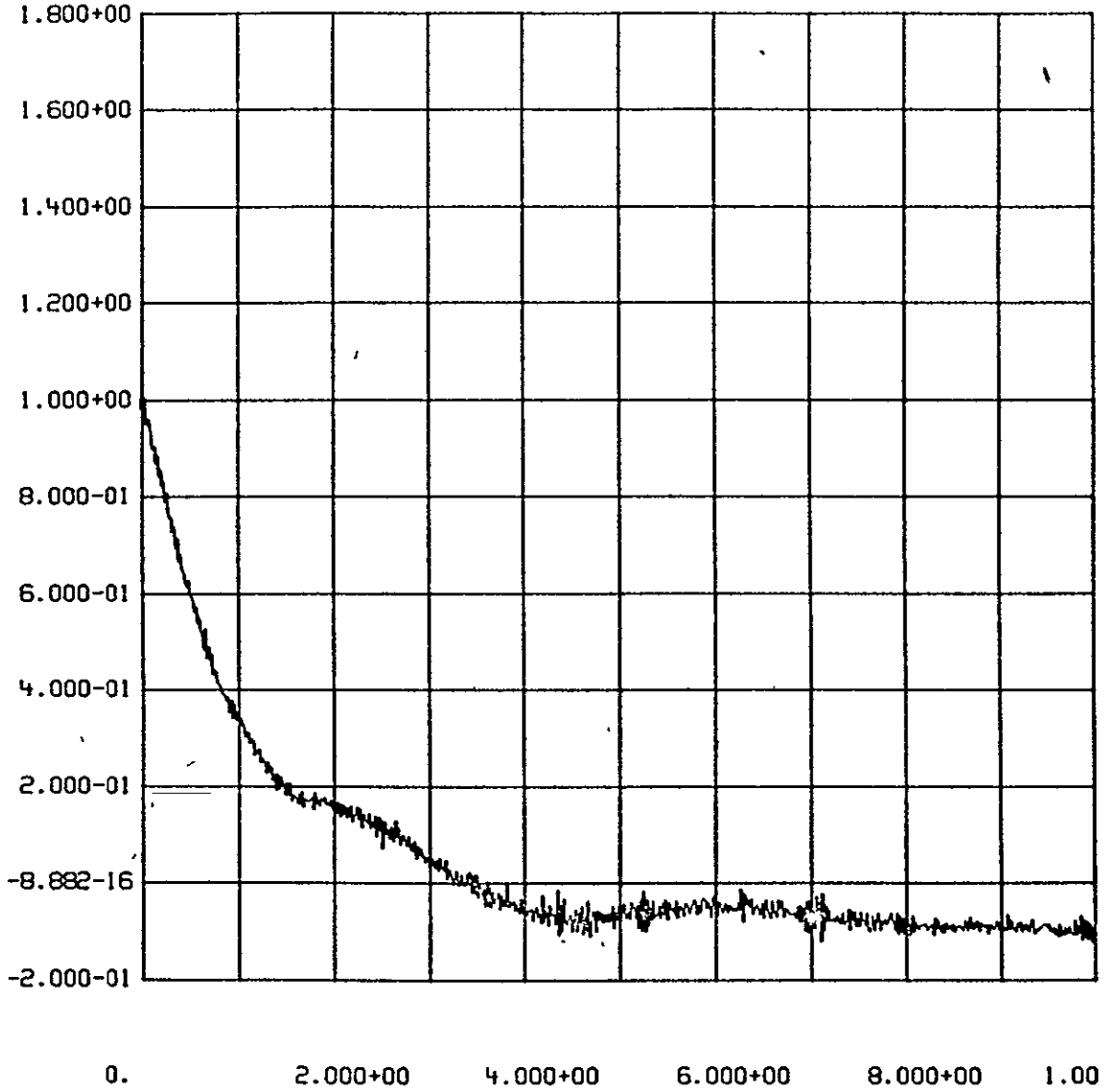
AC YAC VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.3-3 * UNFILT *



AC XAC VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.3-3 * UNFILT *

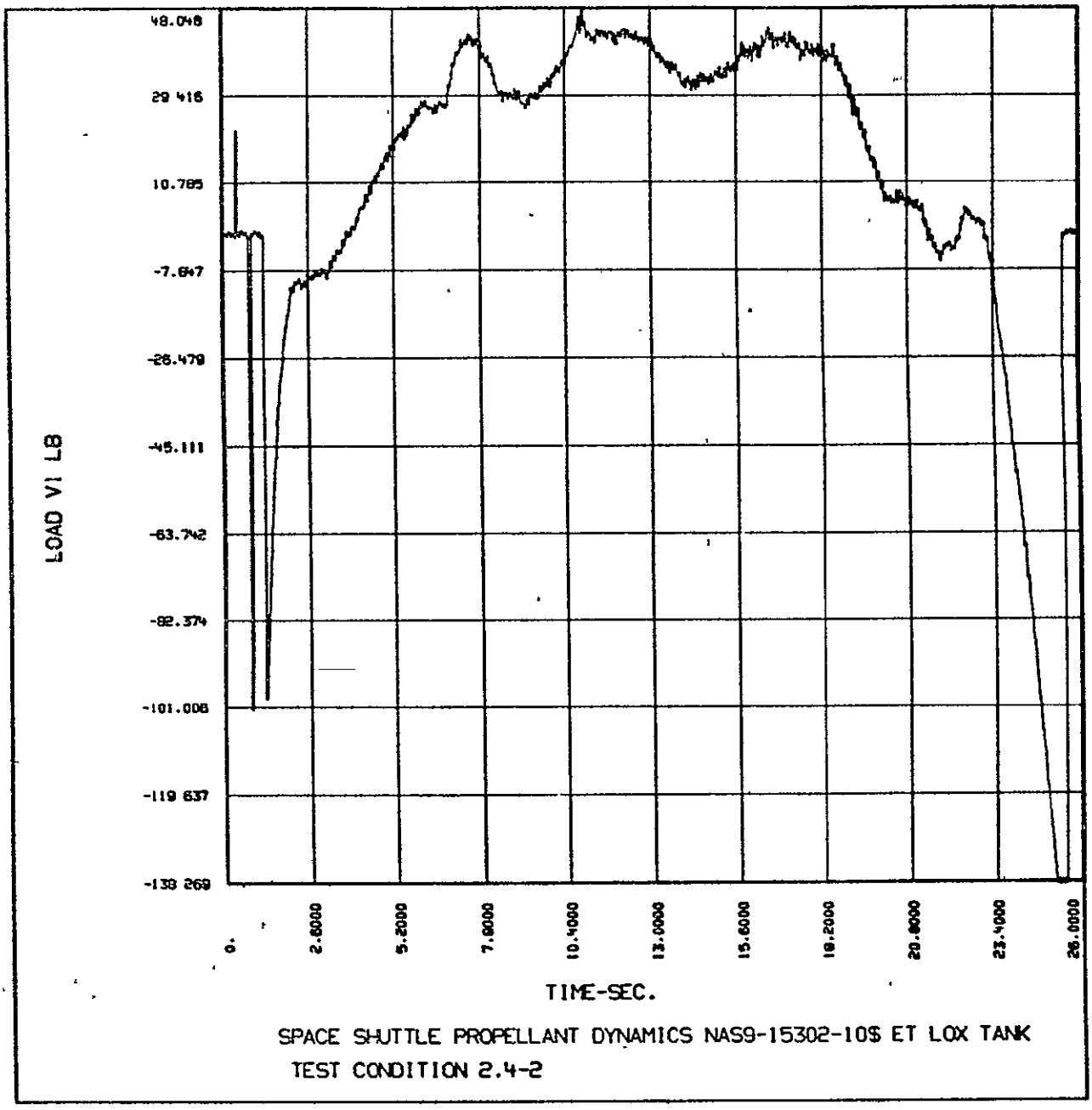


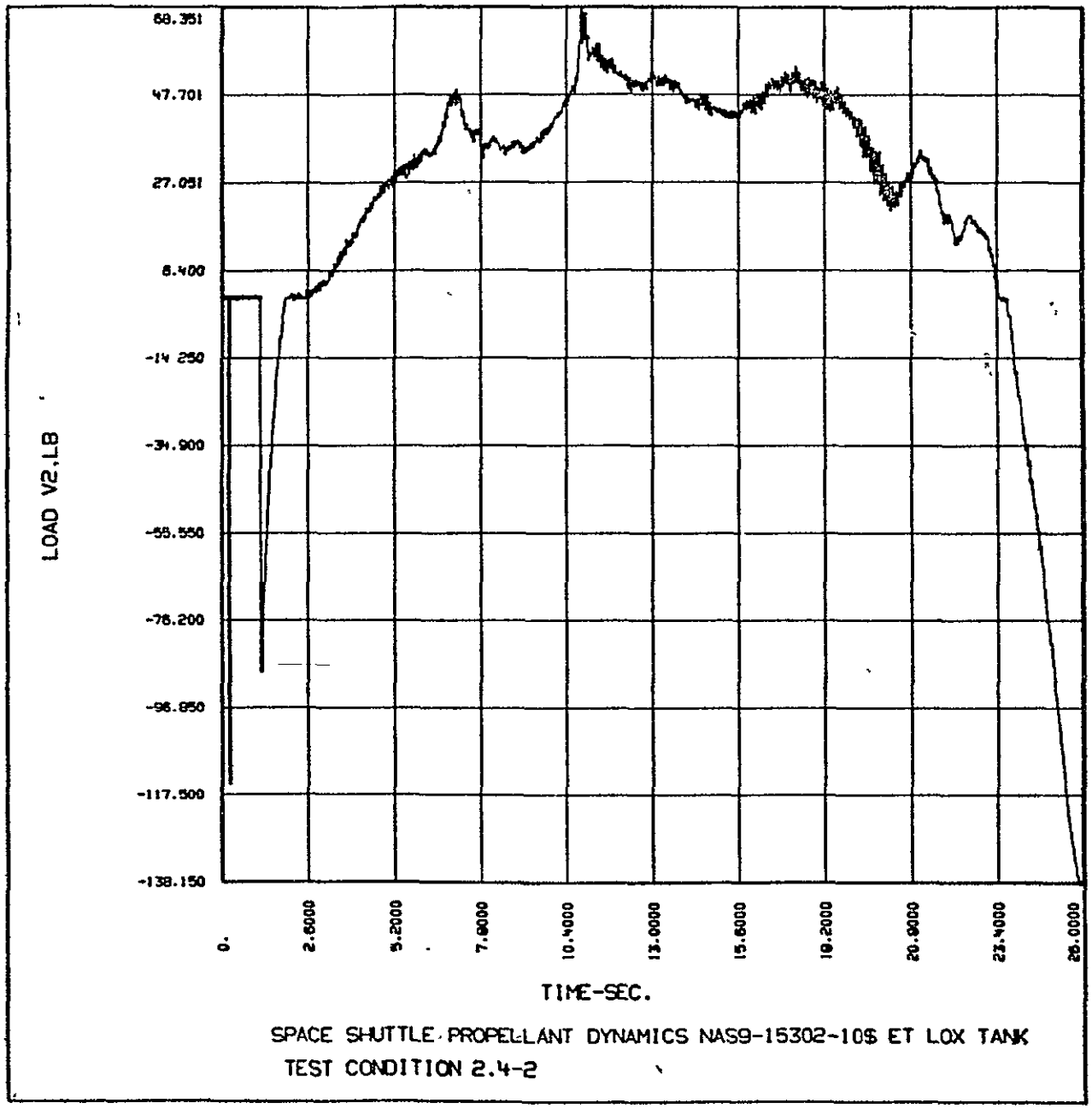
AC ZAC VS TIME

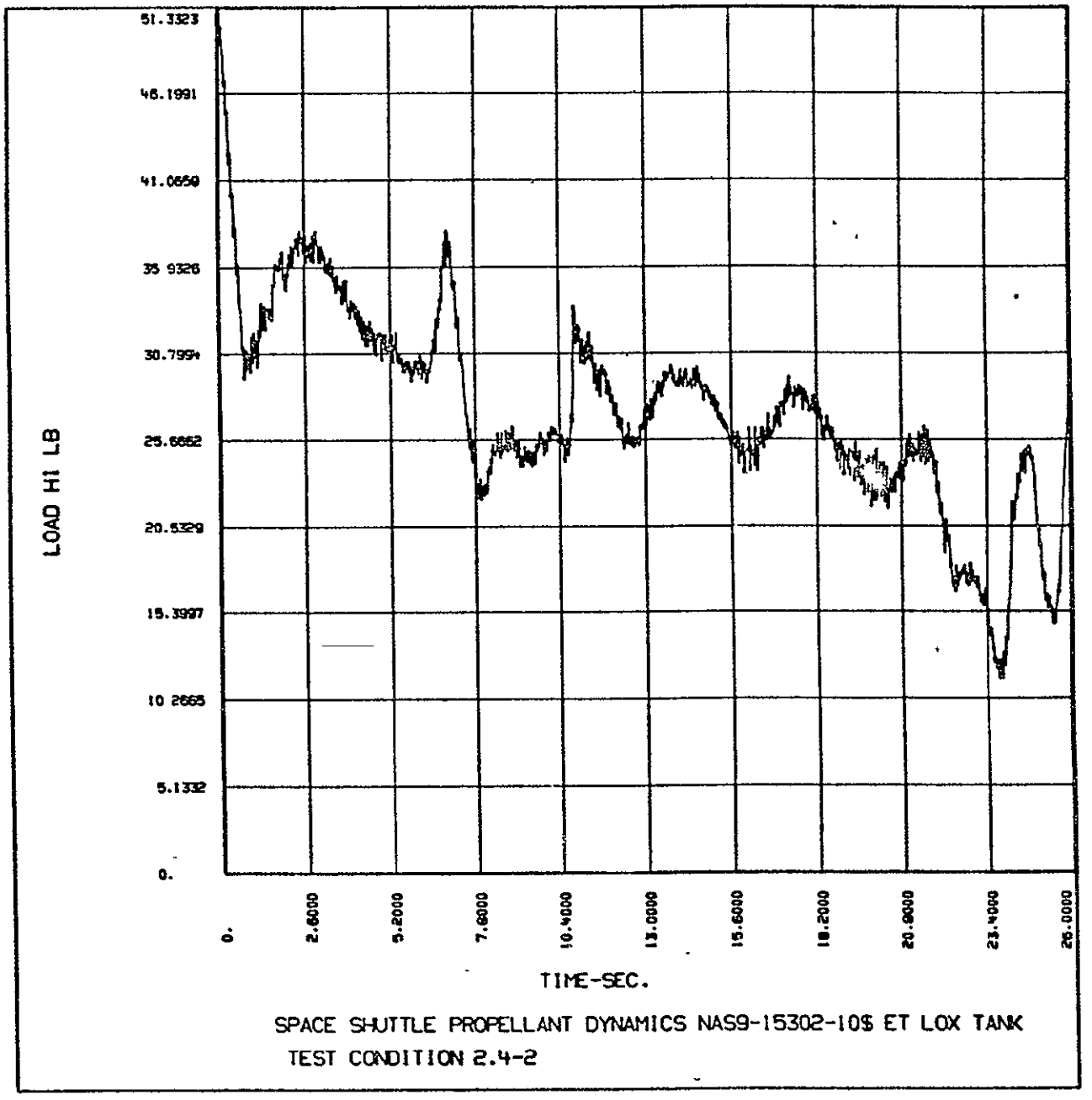
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.3-3 * UNFILT *

Test Data Condition 2.4-2

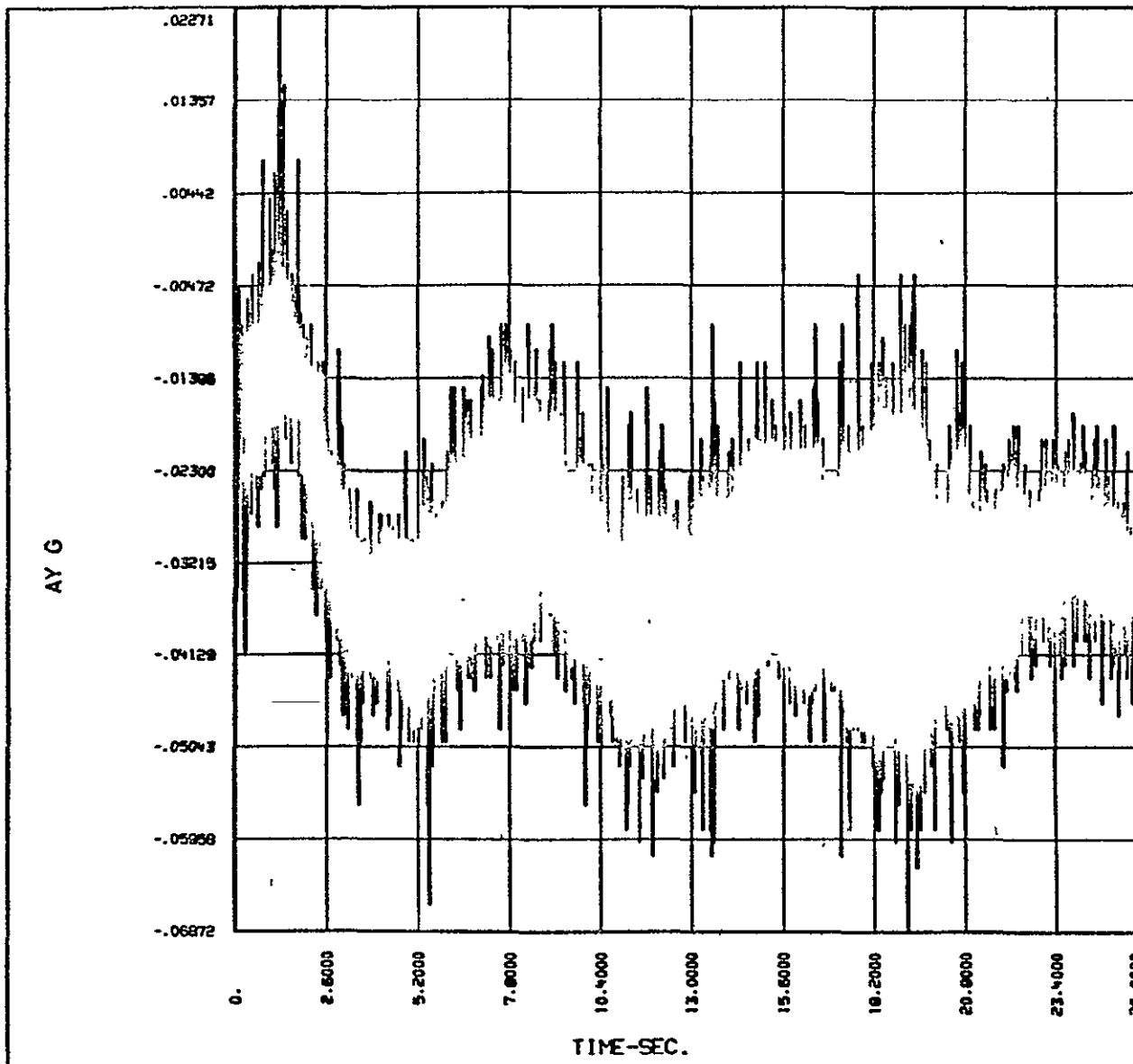
Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 15%
Target Acceleration–0.1 g


48.048
29.416
10.785
-7.847
-26.479
-45.111
-63.742
-82.374
-101.006
-119.637
-138.269
LOAD V1 LB
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.4-2

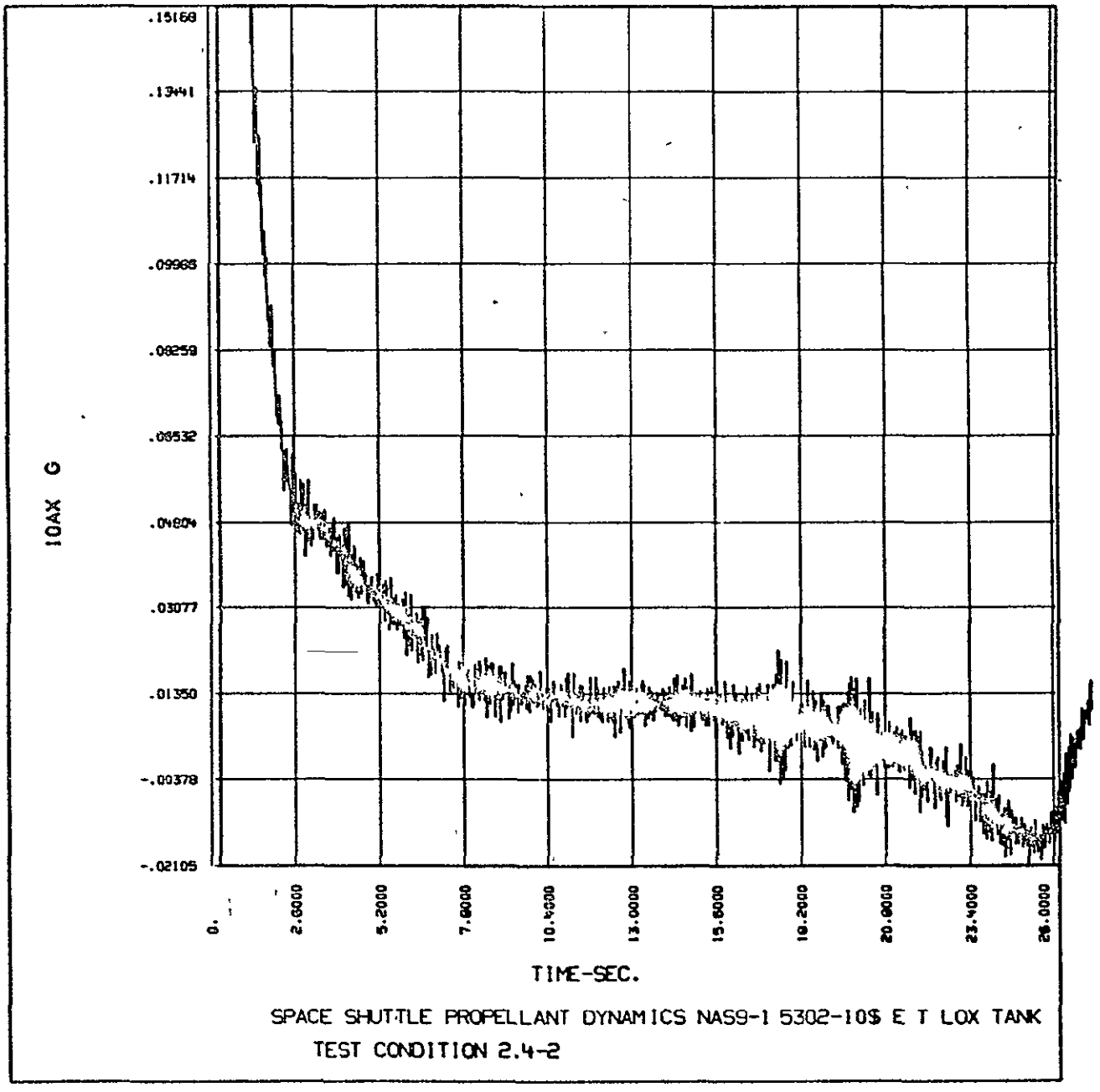

68.351
47.701
27.051
6.400
-14.250
-34.900
-55.550
-76.200
-96.850
-117.500
-138.150
LOAD V2,LB
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.4-2

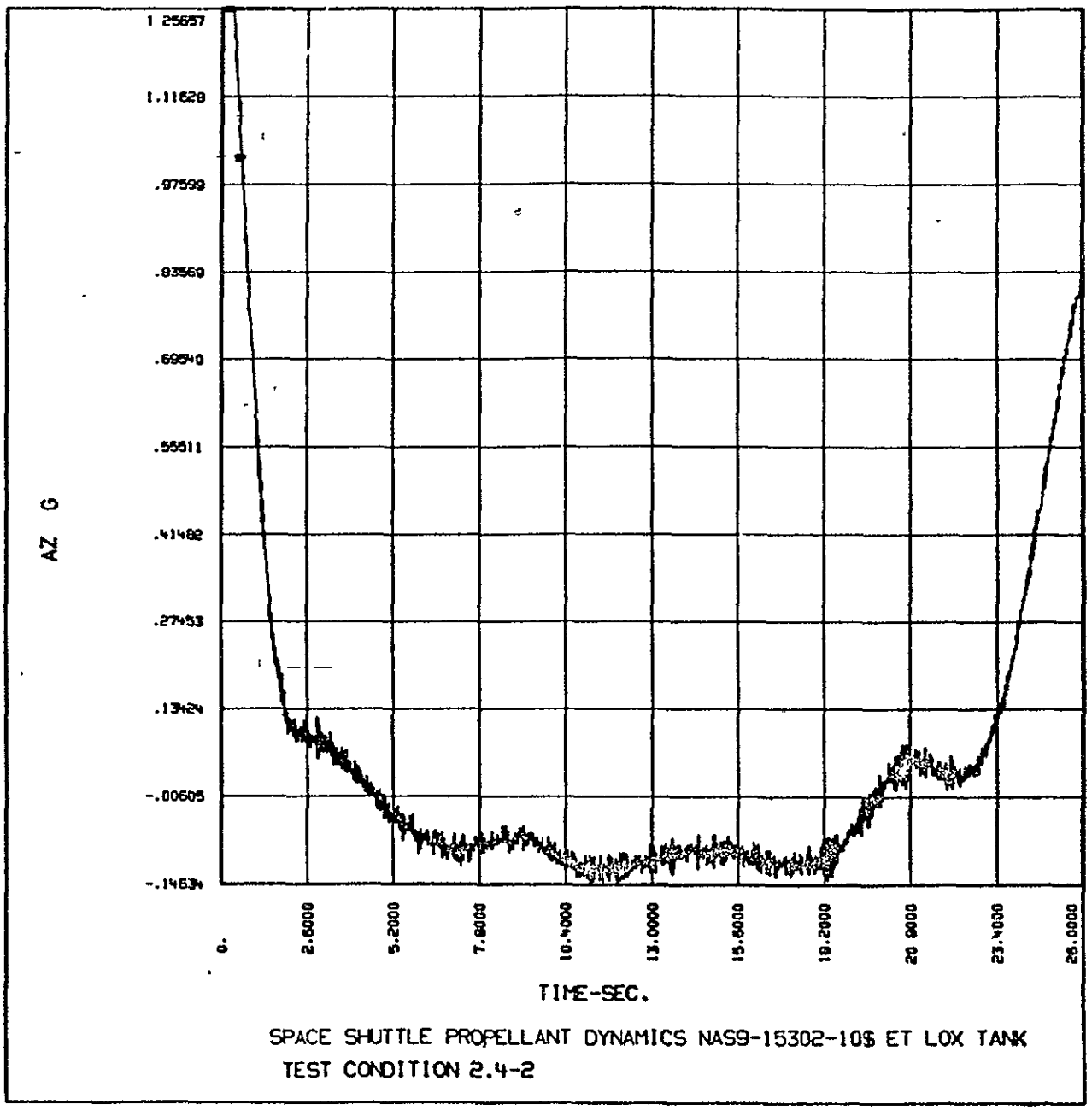


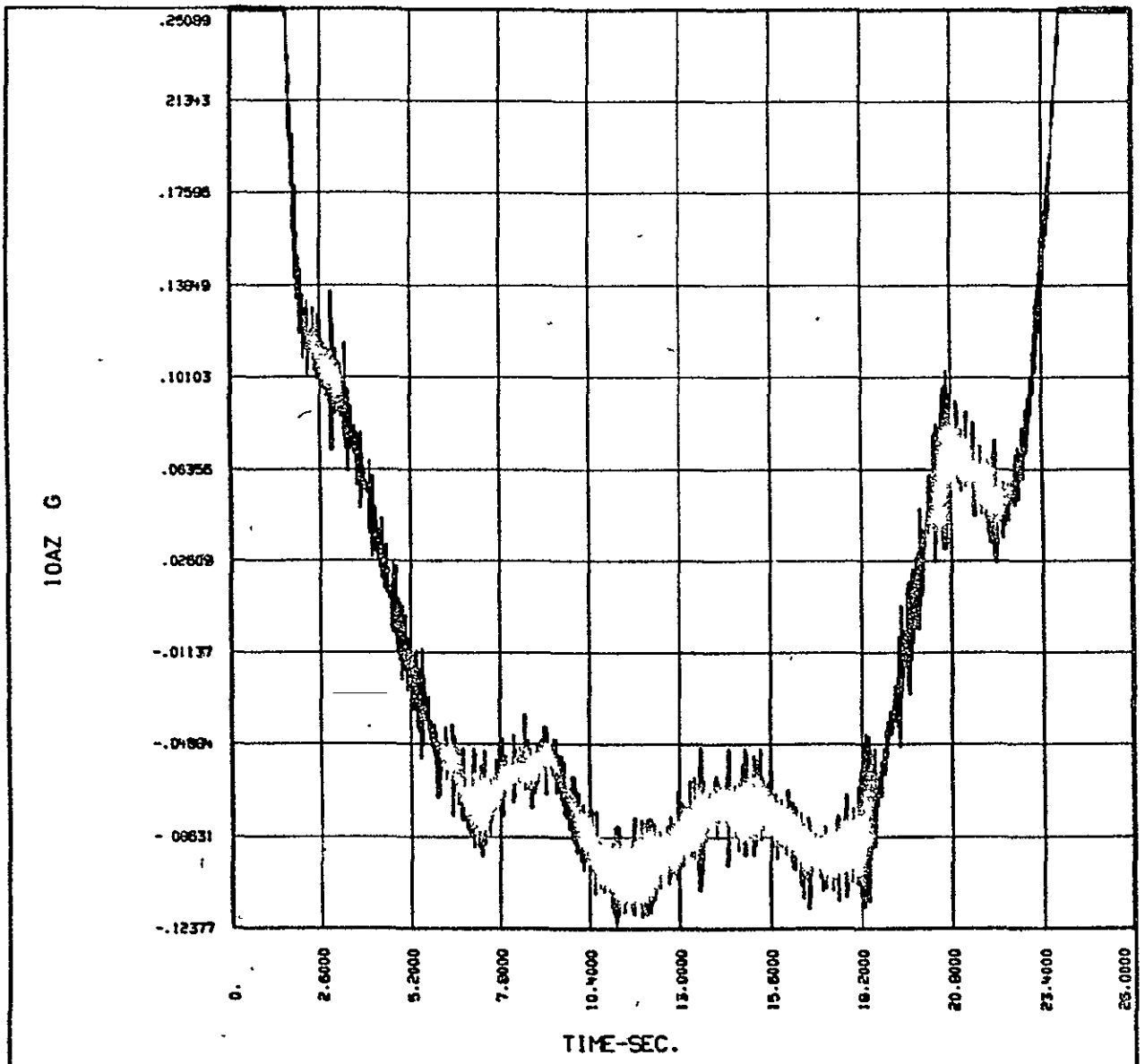
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.4-2



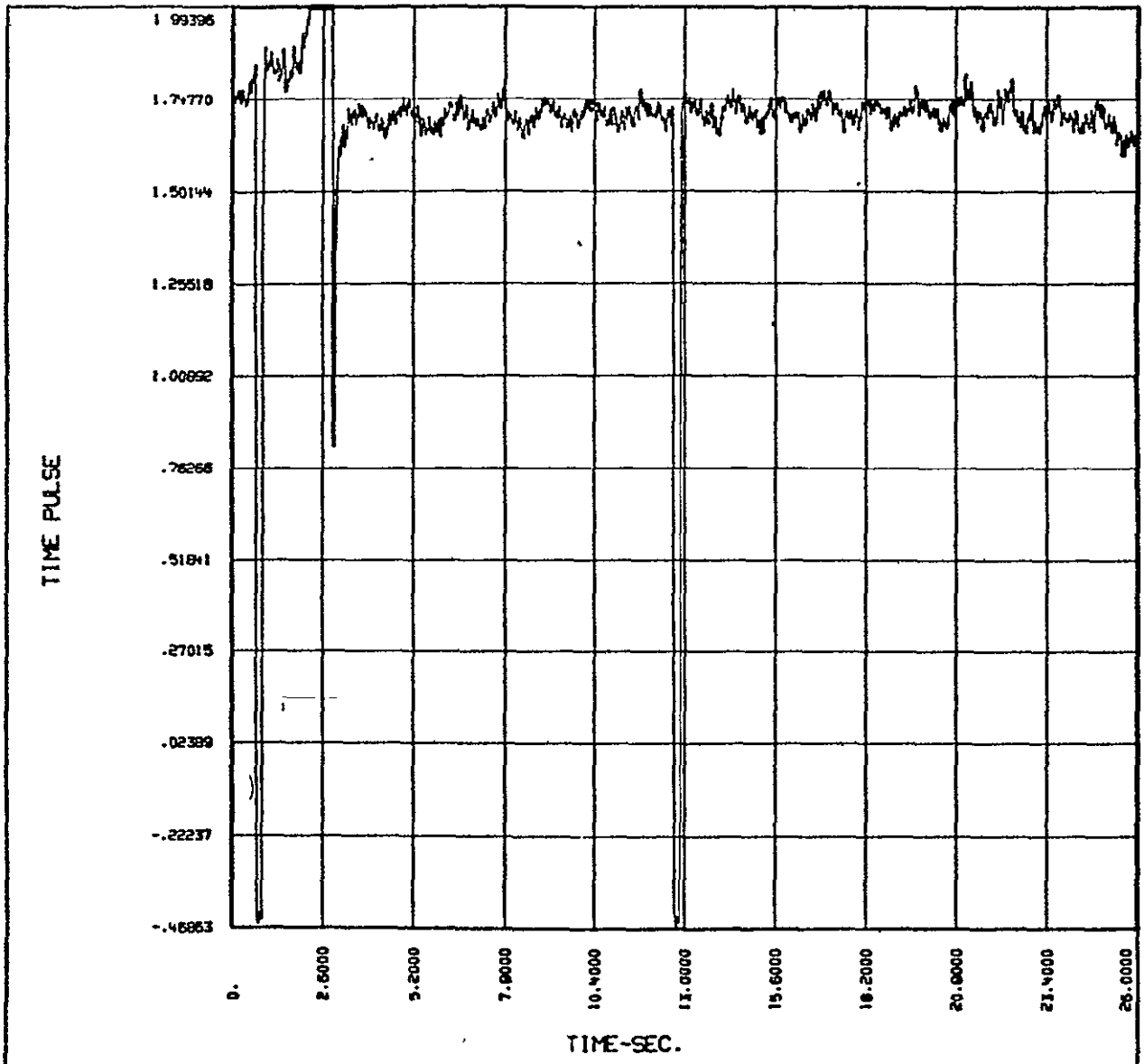
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.4-2


.15168
.13441
.11714
.09988
.08259
.06532
.04804
.03077
.01350
-.00378
-.02105
10AX G
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-1 5302-10$ E T LOX TANK
TEST CONDITION 2.4-2

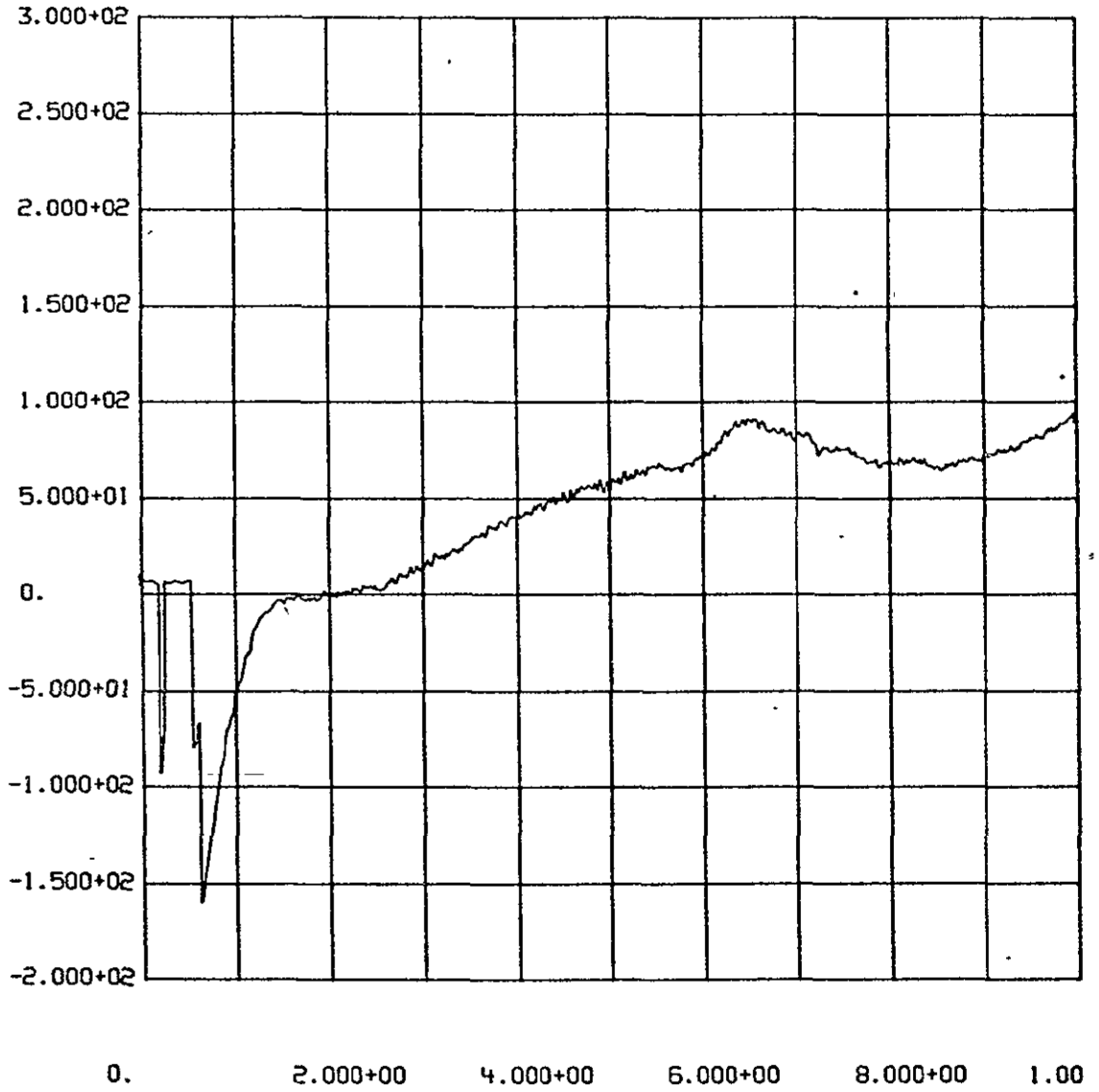

1.25657
1.11628
.97599
.83569
.69540
.55511
.41482
.27453
.13424
-.00605
-.14634
AZ G
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.4-2



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.4-2

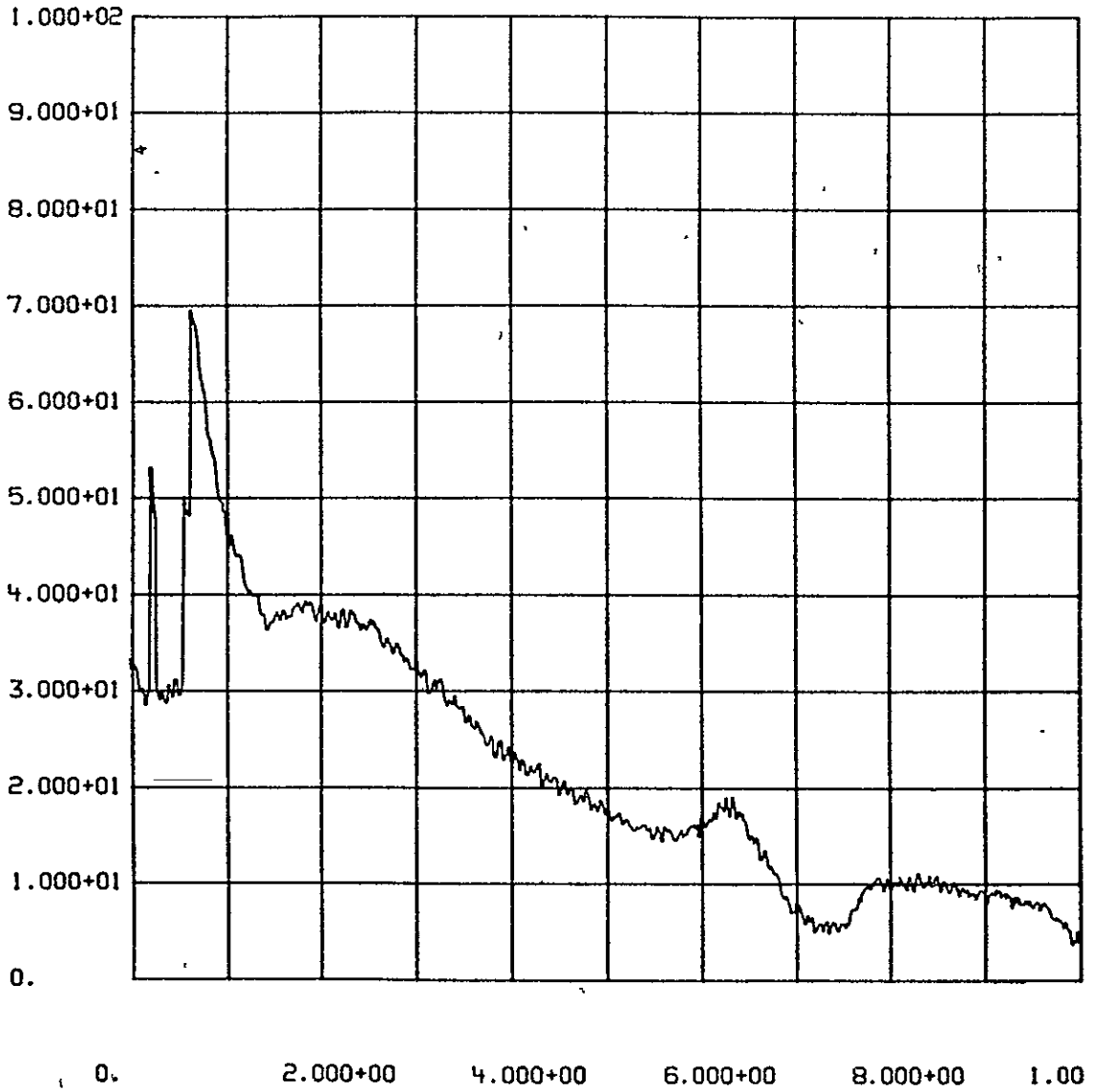


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.4-2



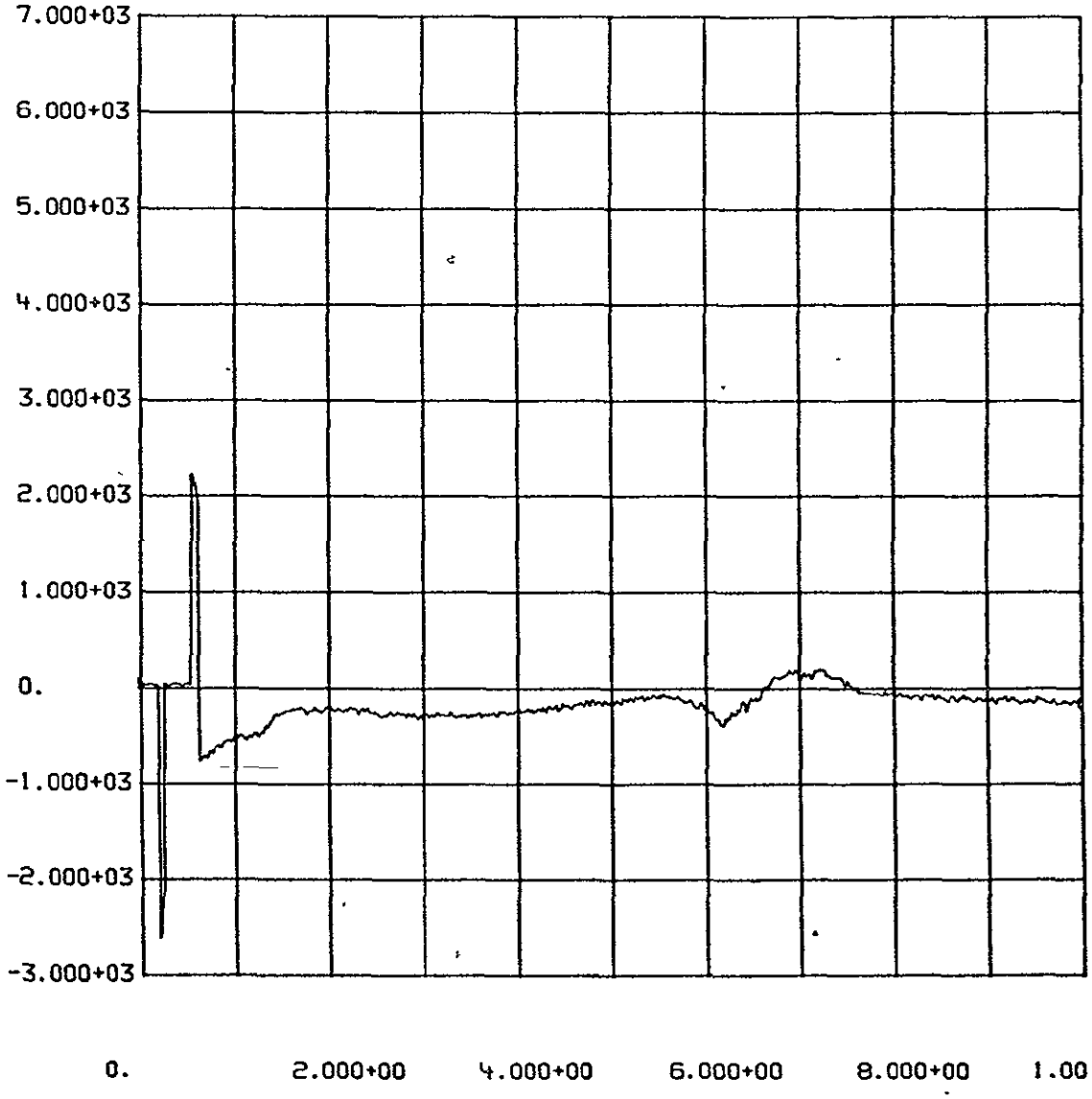
Z-LOAD VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.4-2 * UNFILT *



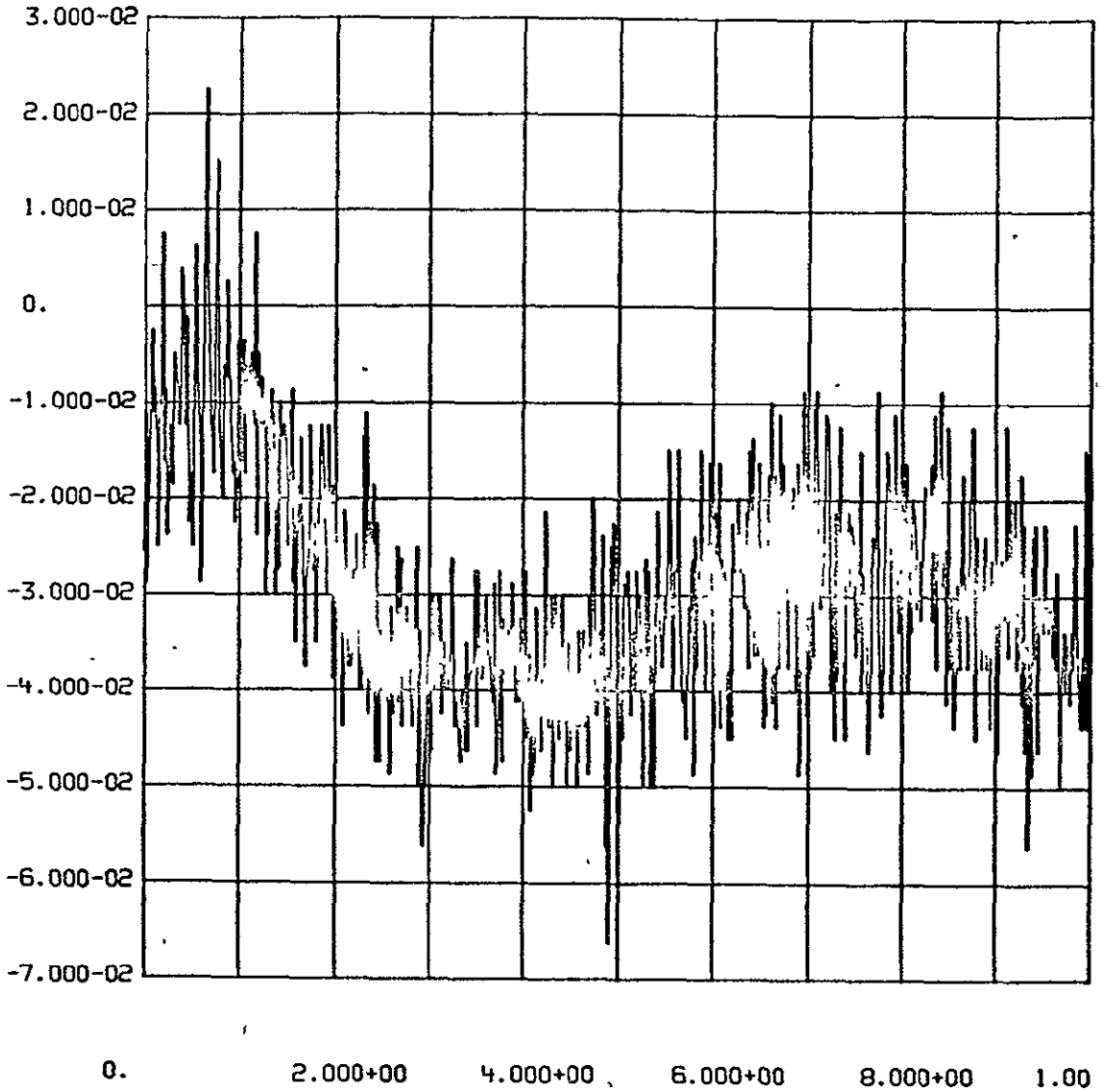
Y-LOAD VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.4-2 * UNFILT *



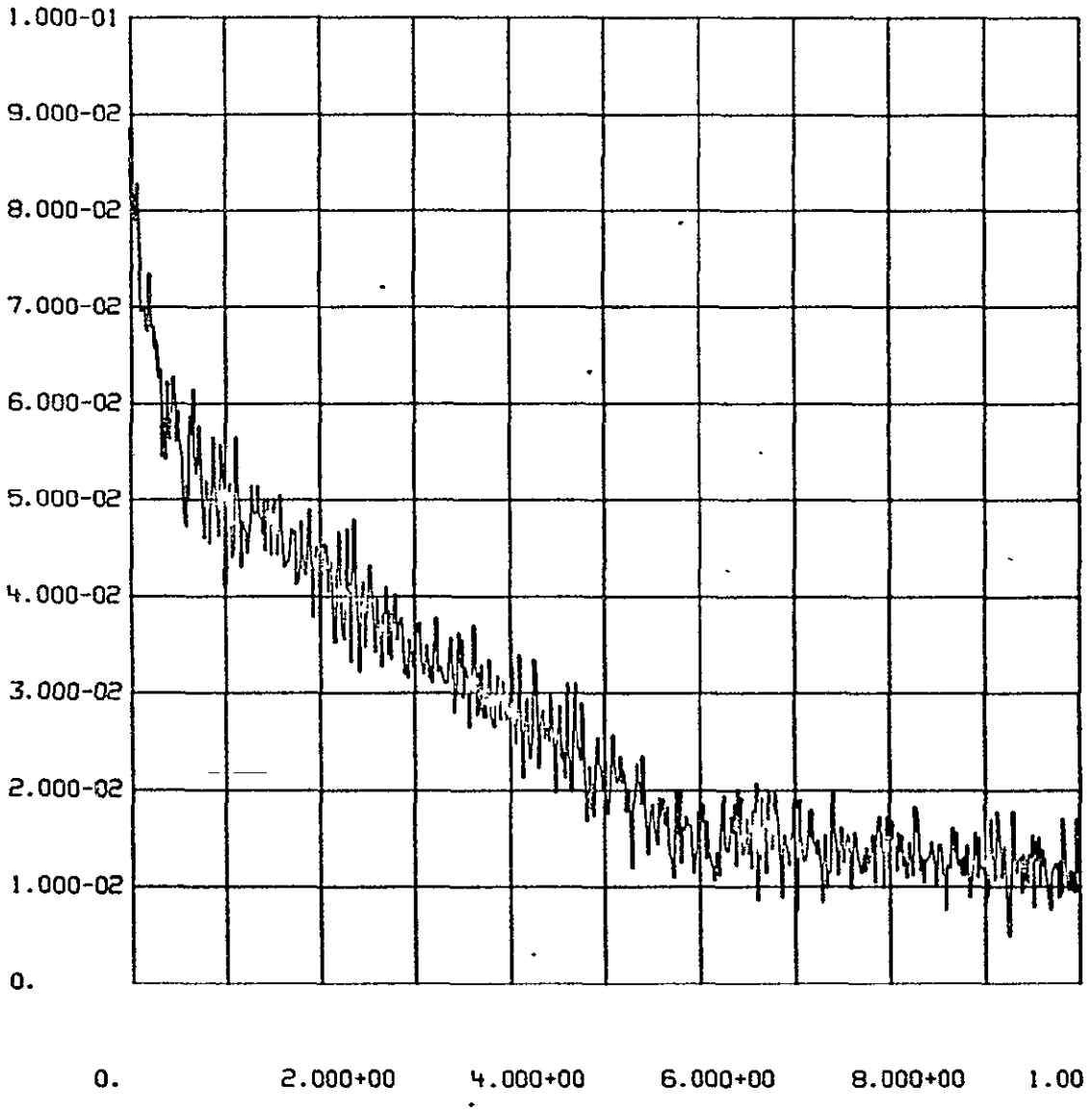
MOMENT VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.4-2 * UNFILT *



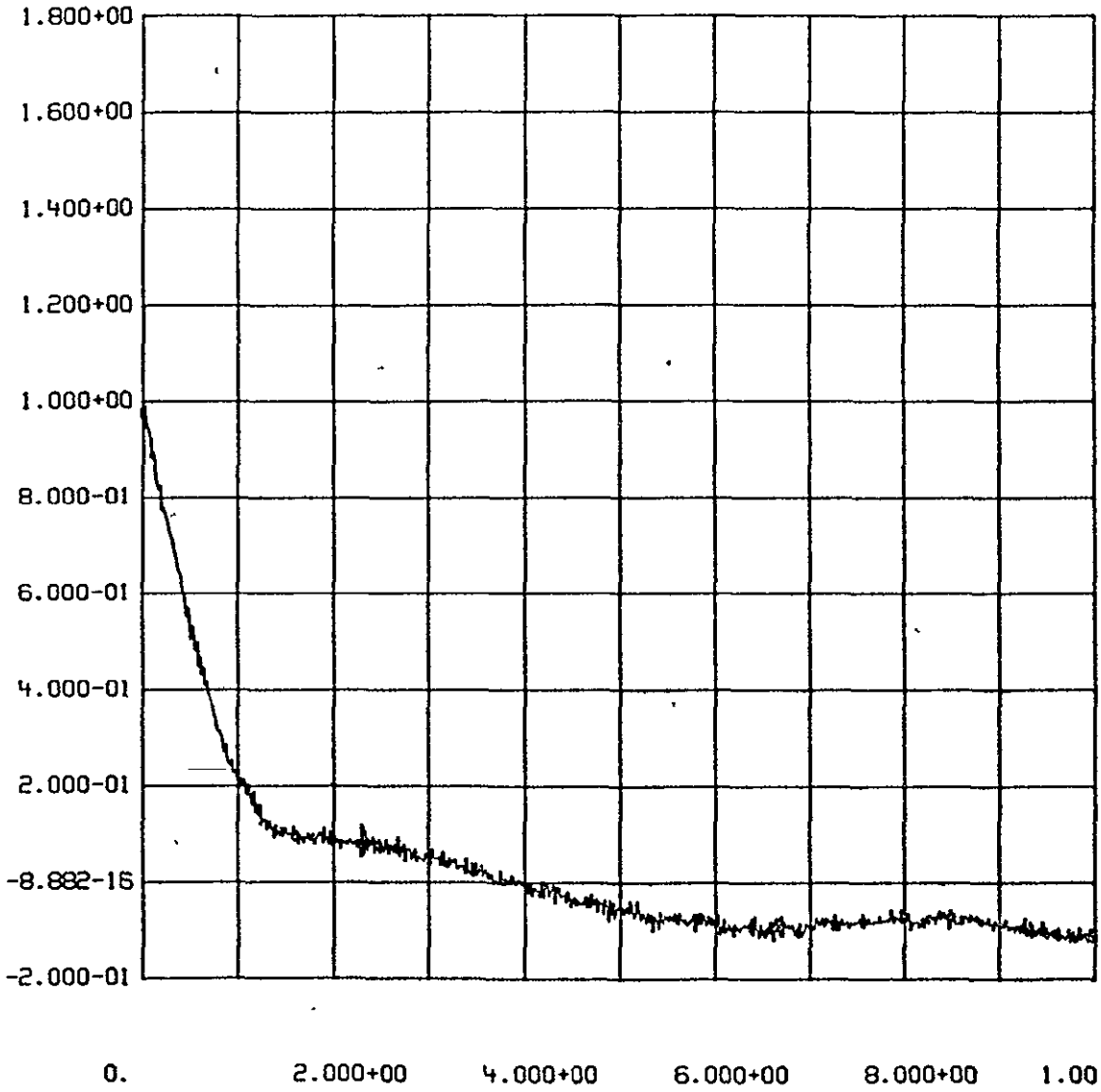
AC YAC VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.4-2 * UNFILT *



AC XAC VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.4-2 * UNFILT *

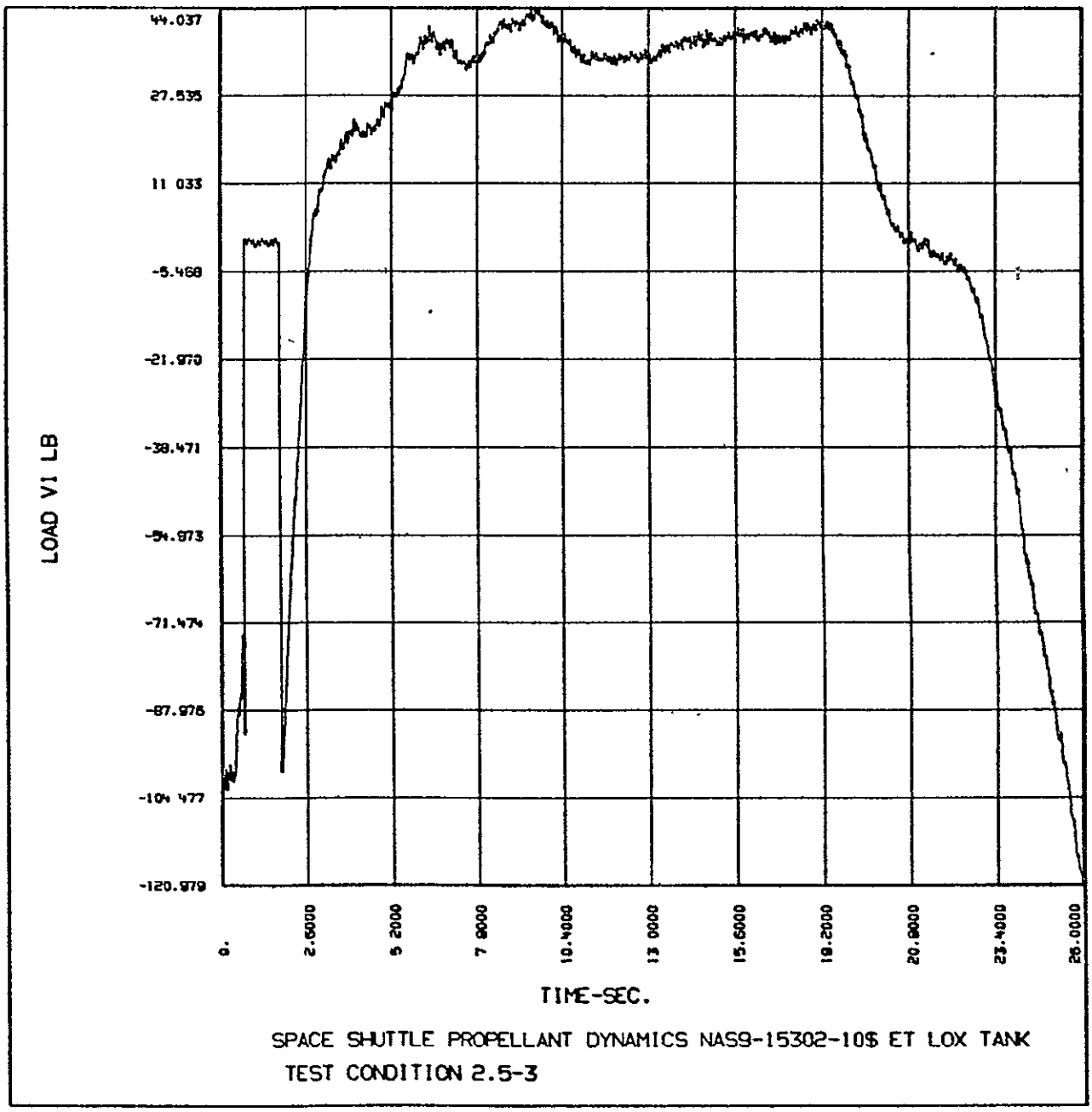


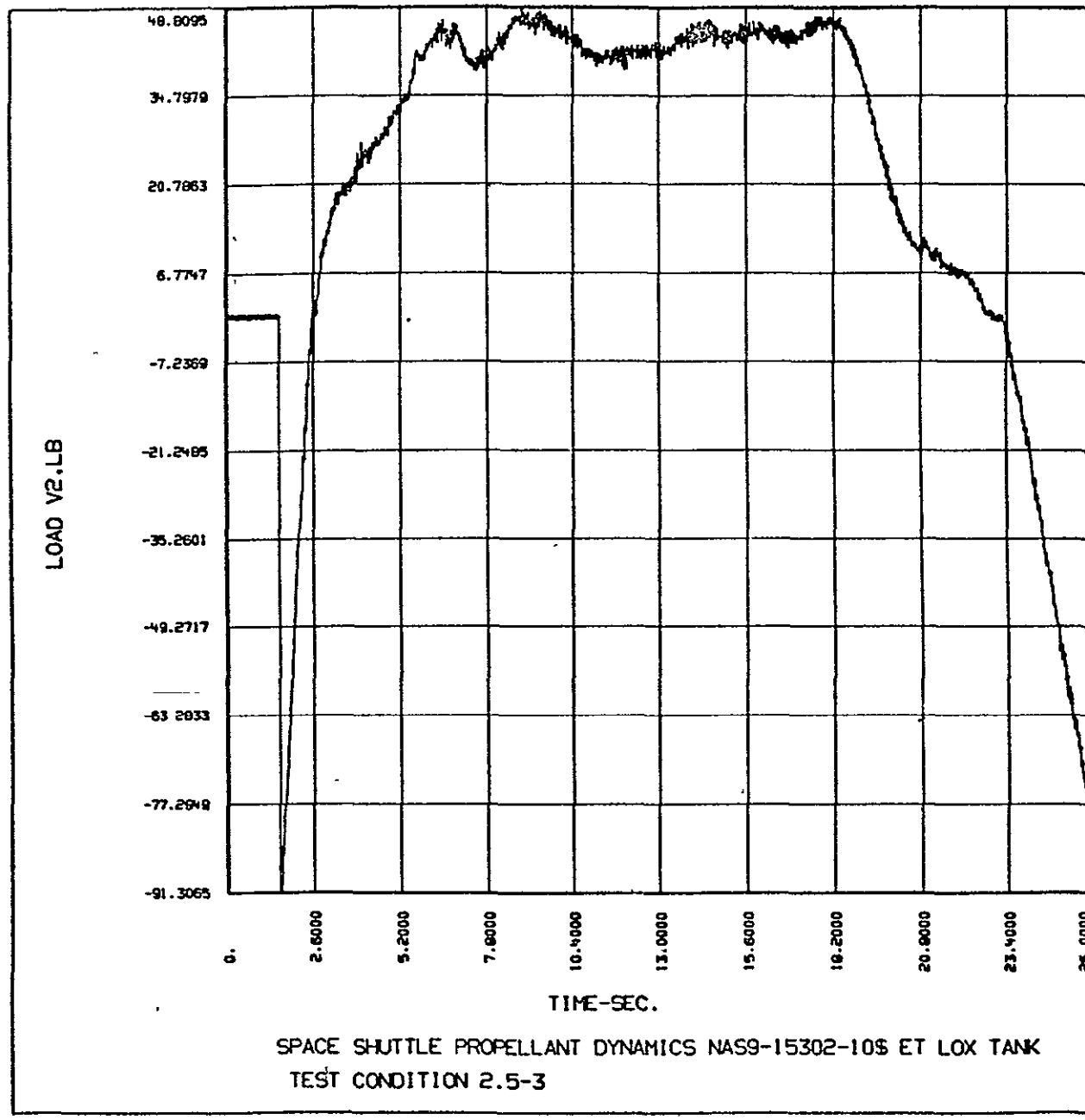
AC ZAC VS TIME

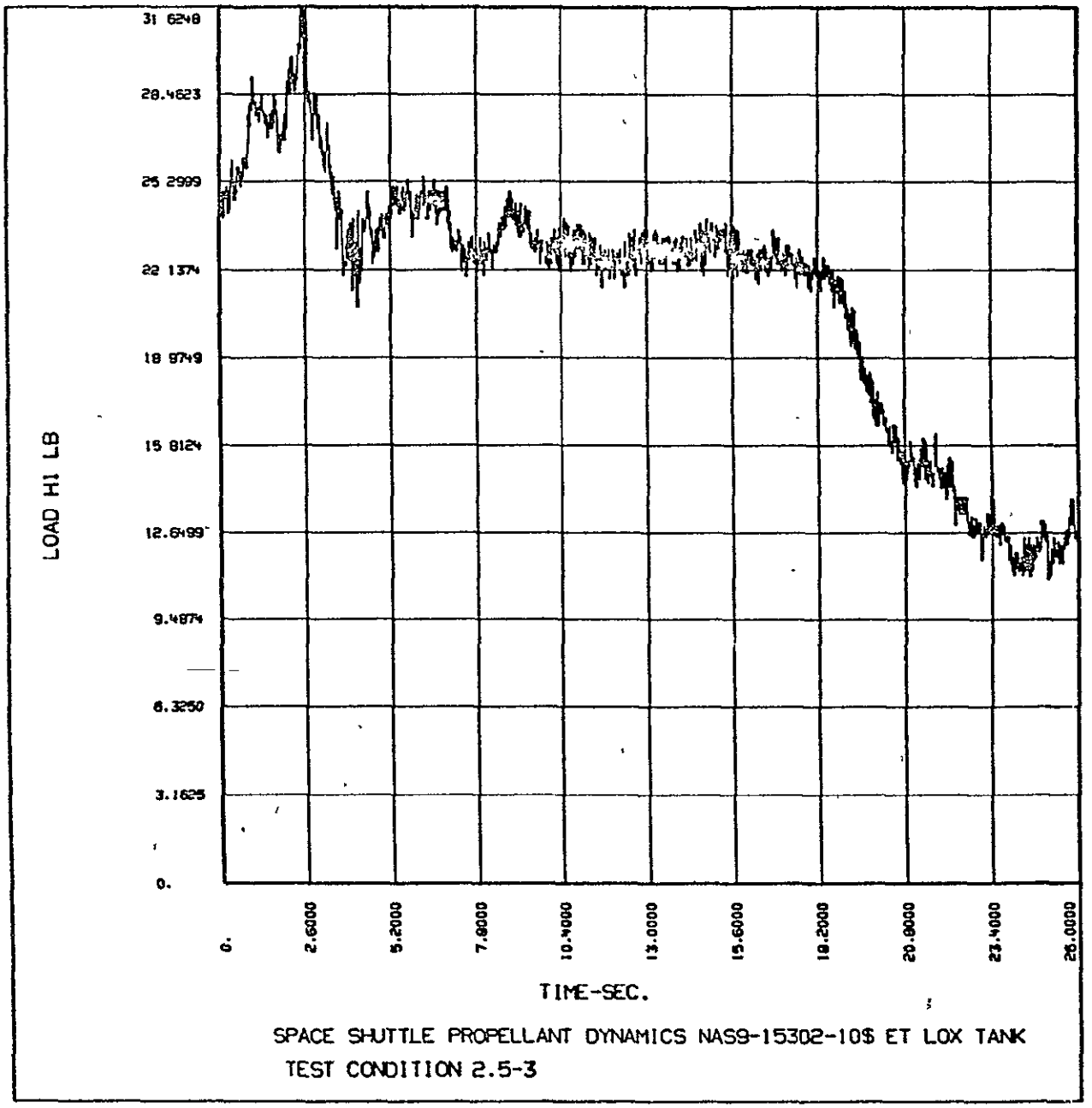
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.4-2 * UNFILT *

Test Data Condition 2.5-3

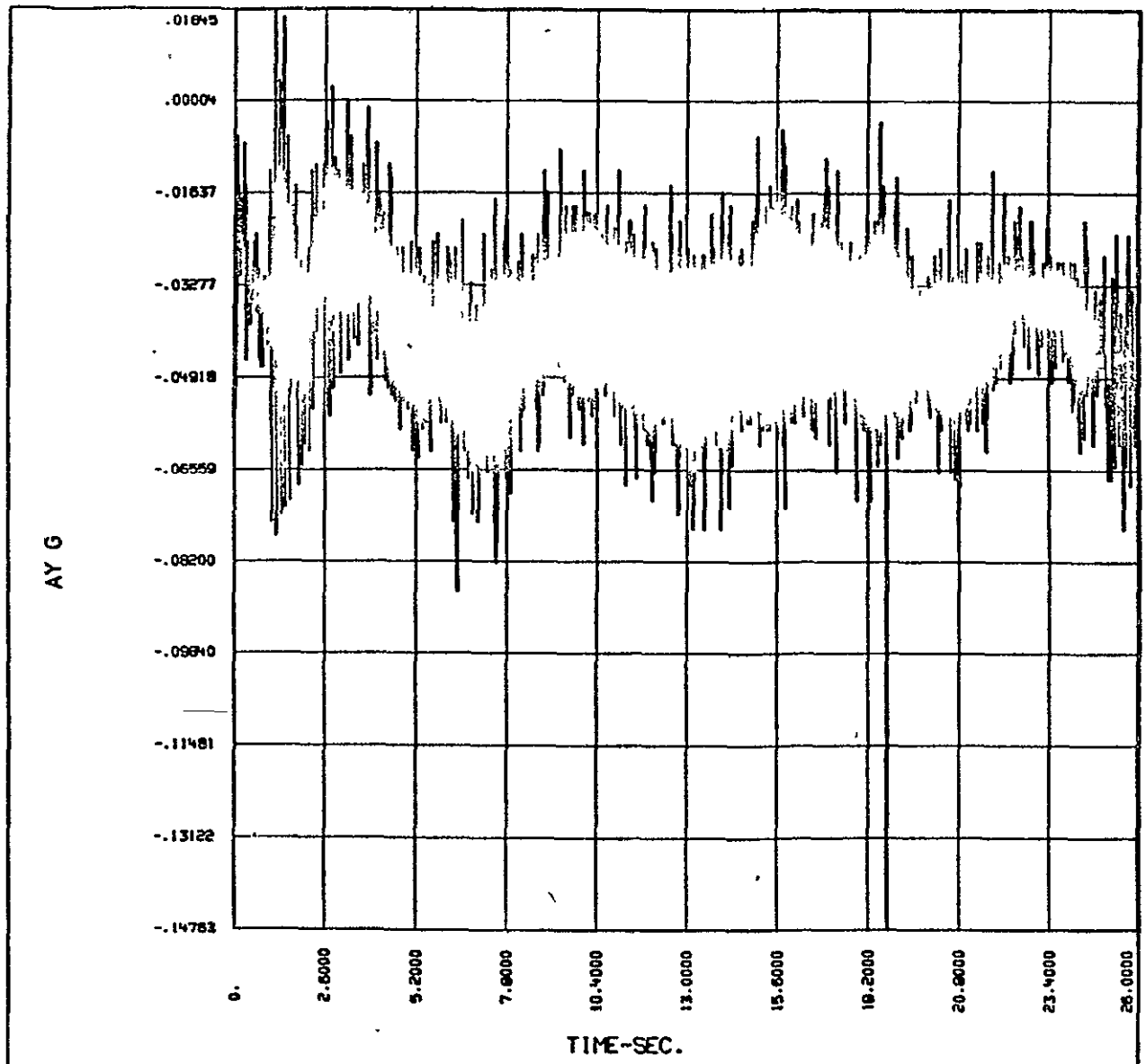
Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 1%
Target Acceleration–0 2 g


44.037
27.535
11 033
-5.468
-21.970
-38.471
-54.973
-71.474
-87.976
-104 477
-120.979
LOAD V1 LB
0.
2.6000
5 2000
7 8000
10.4000
13 0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.5-3

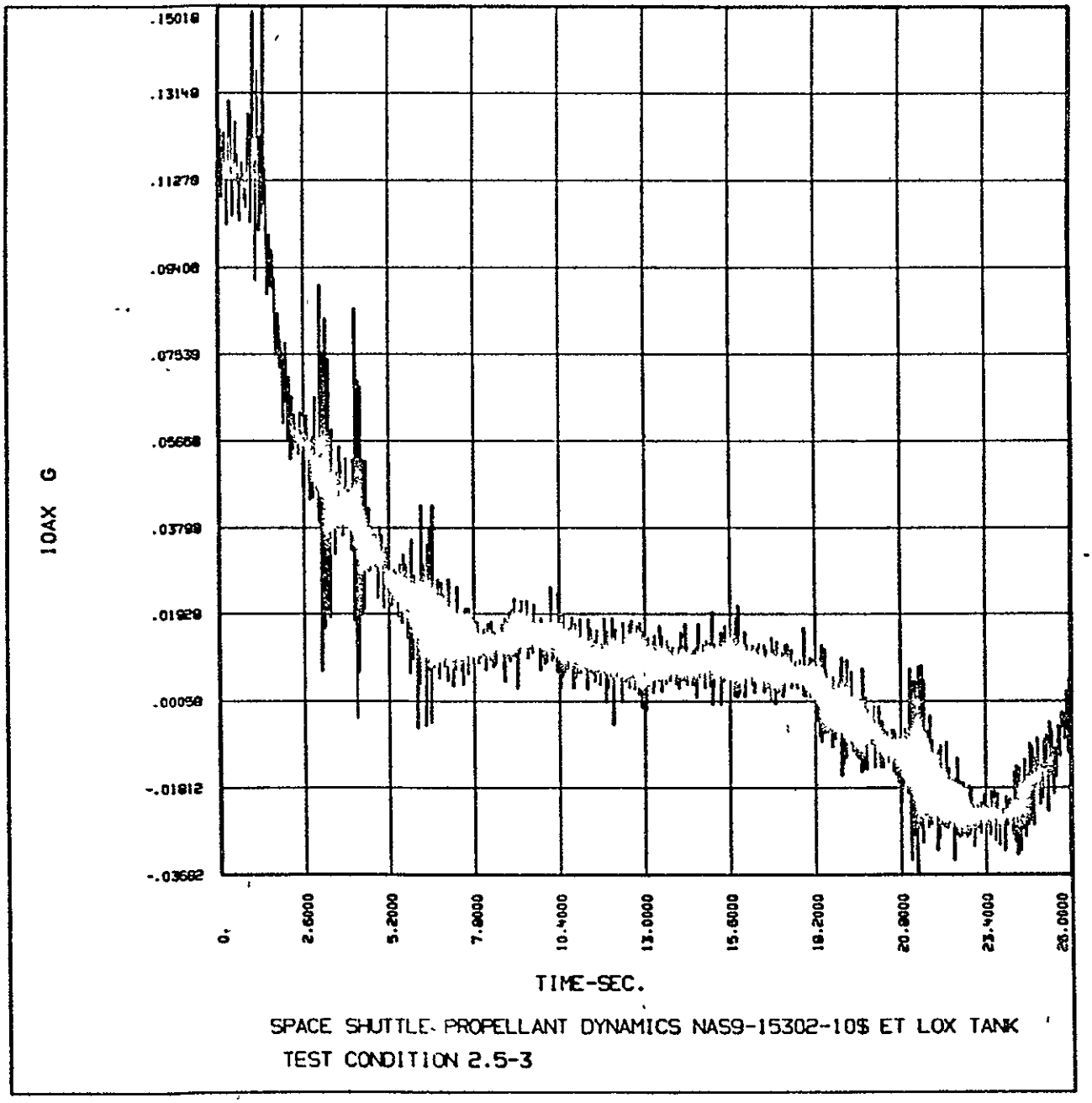

48.8095
34.7979
20.7863
6.7747
-7.2369
-21.2485
-35.2601
-49.2717
-63.2833
-77.2949
-91.3065
LOAD V2.LB
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.5-3

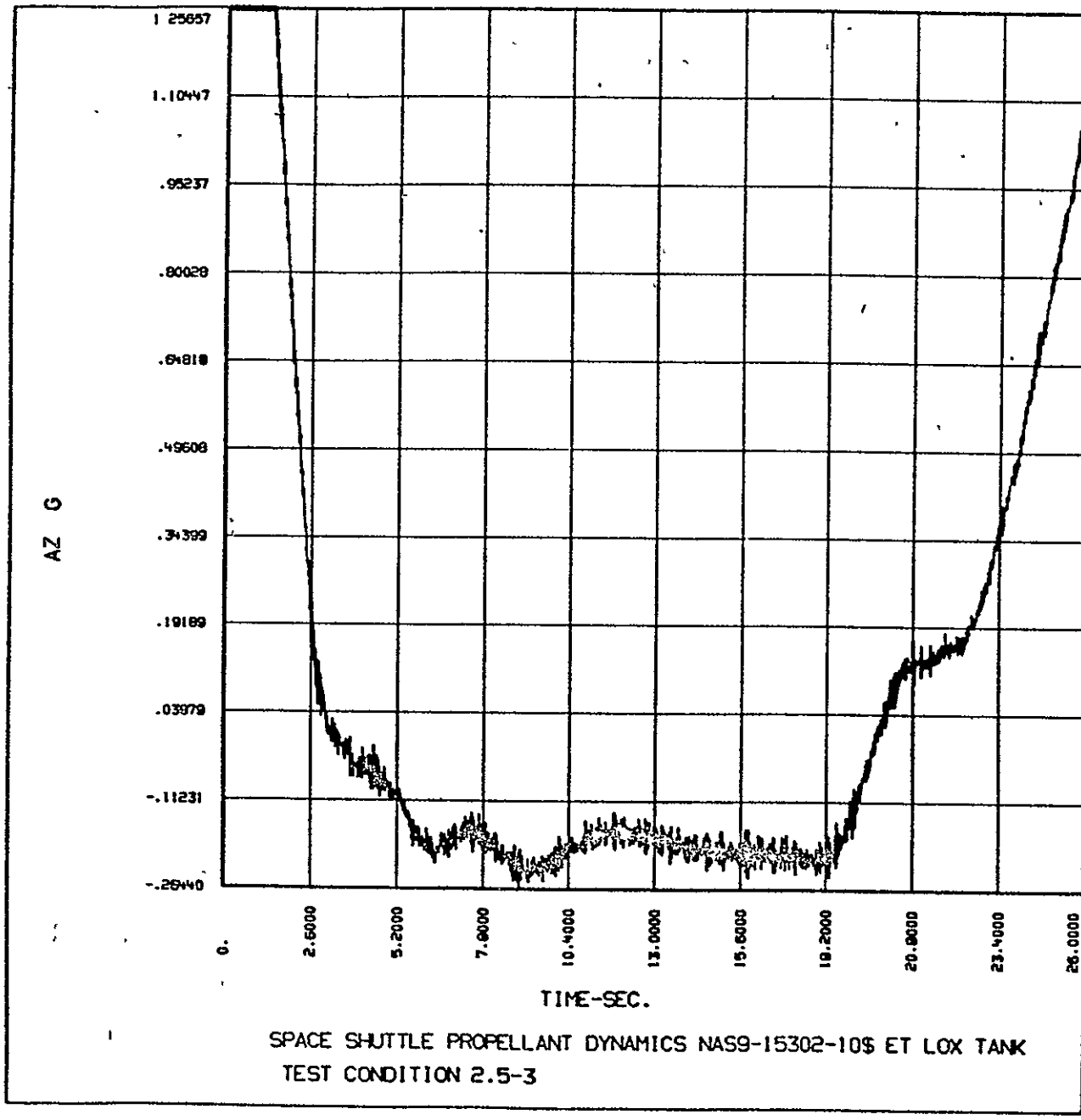


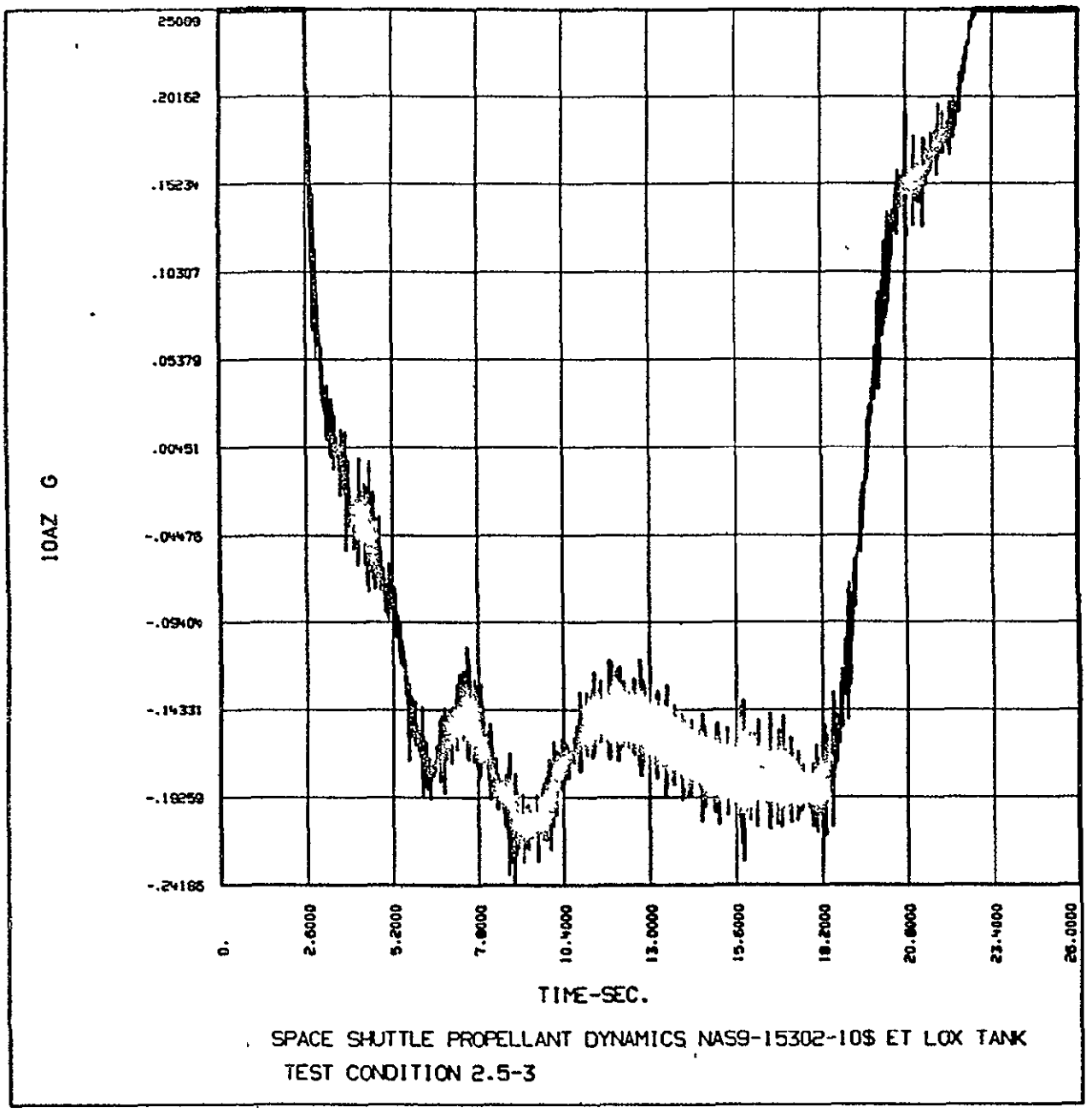
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.5-3

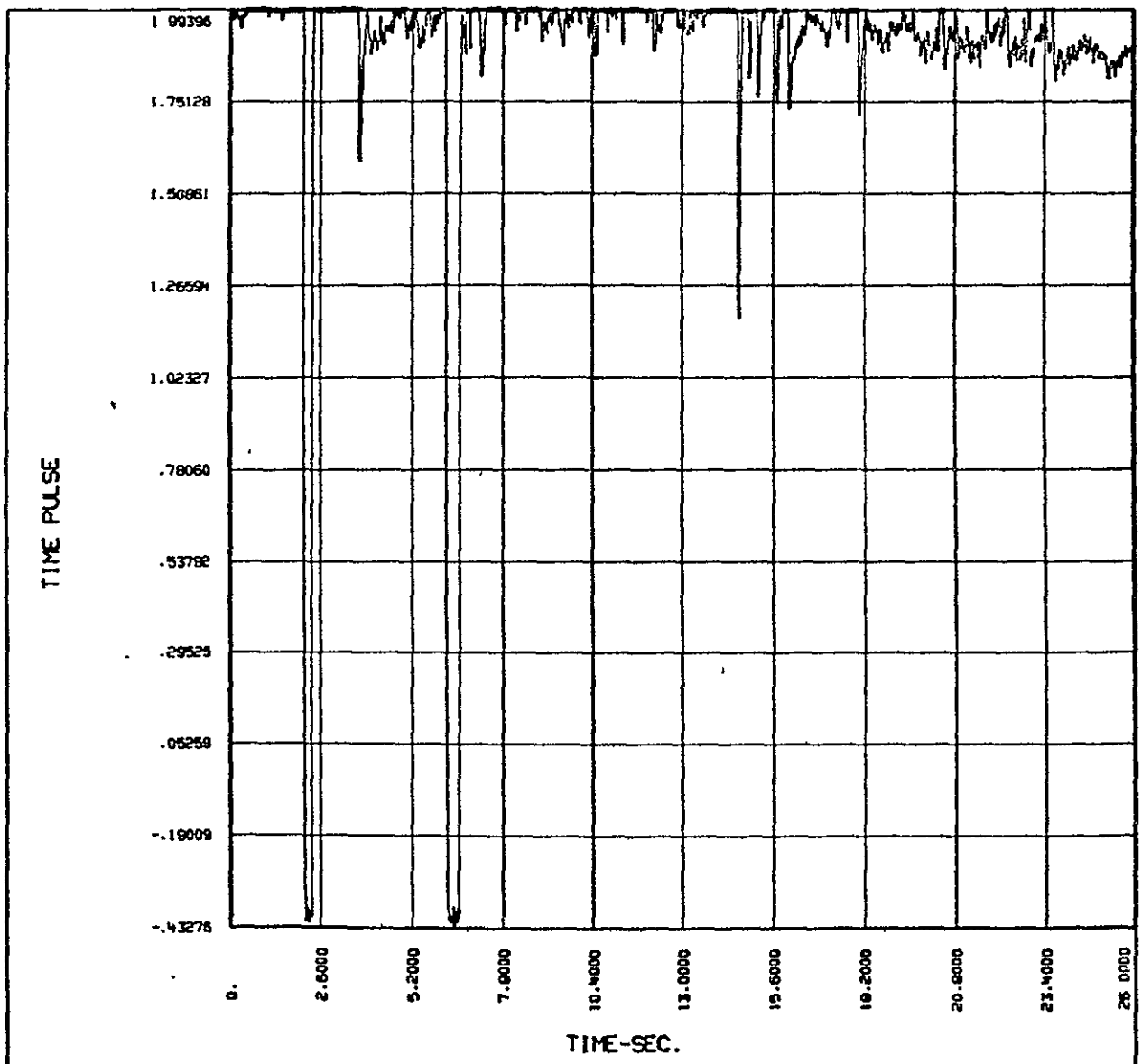


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.5-3

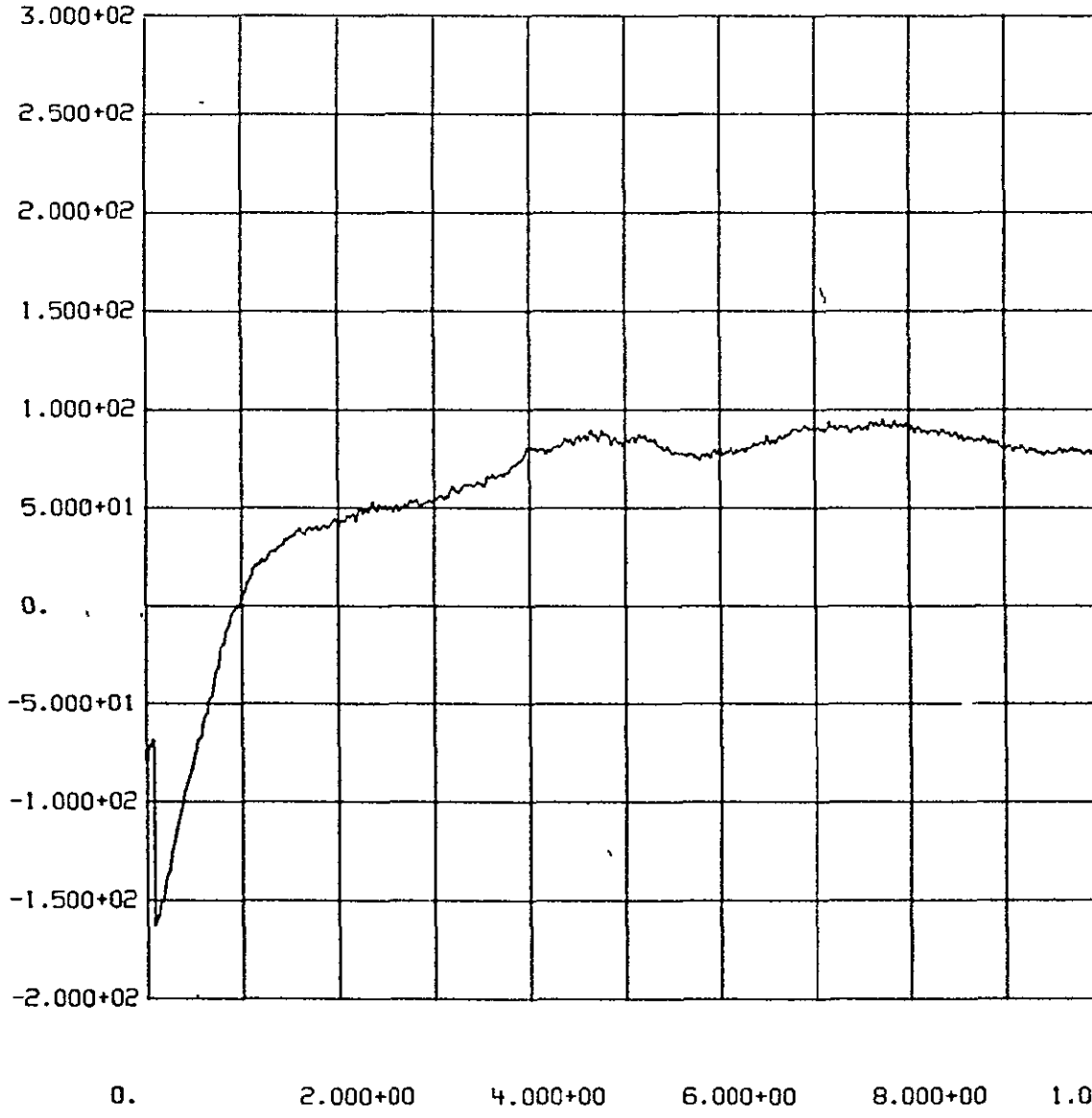

.15018
.13149
.11278
.09408
.07539
.05668
.03799
.01929
.00058
-.01812
-.03682
IOAX G
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.5-3


1.25657
1.10447
.95237
.80028
.64818
.49608
.34399
.19189
.03979
-.11231
-.26440
AZ G
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.5-3


10AZ G
.25009
.20162
.15234
.10307
.05379
.00451
-.04476
-.09404
-.14331
-.19259
-.24186
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.5-3

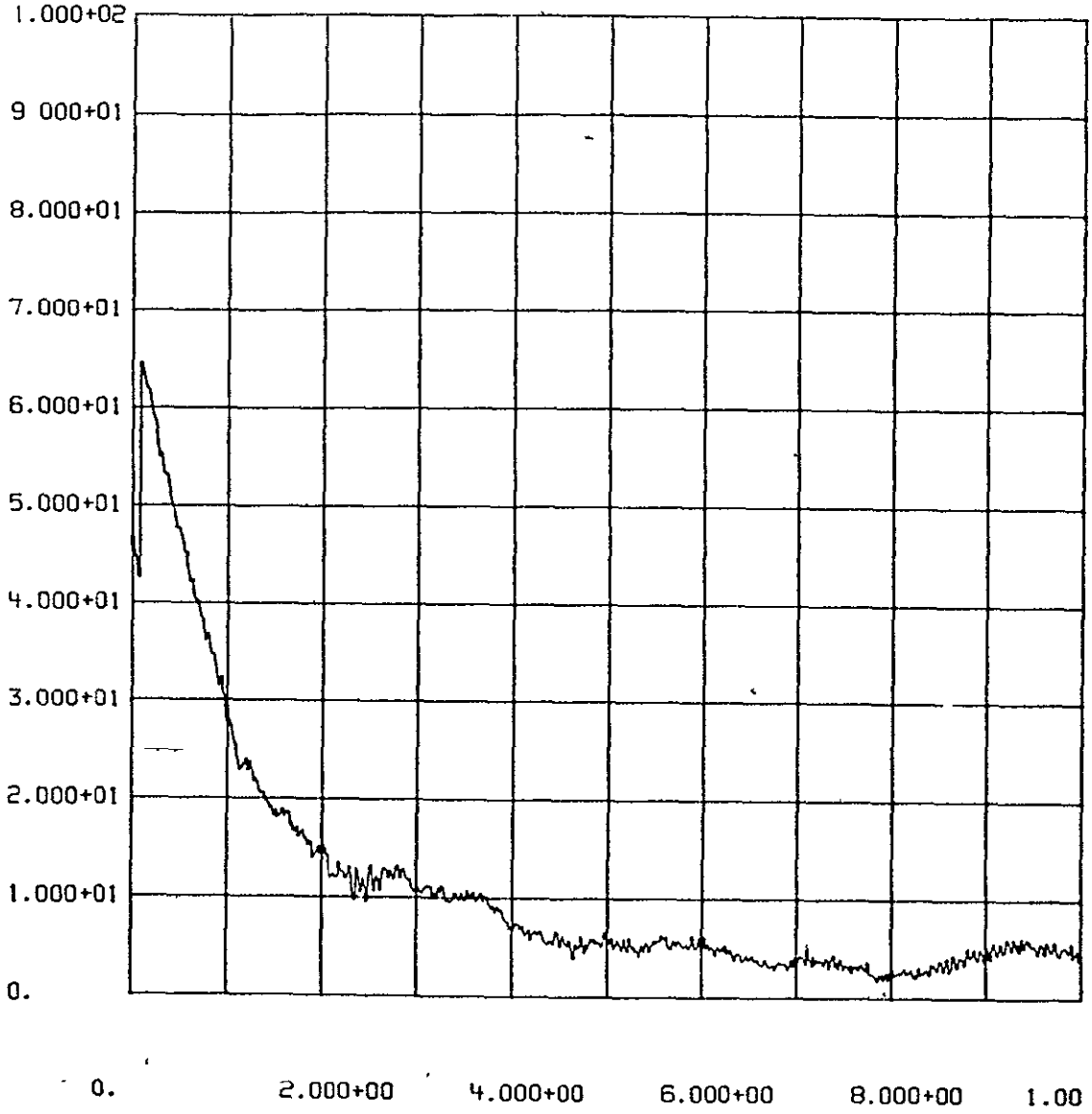


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.5-3



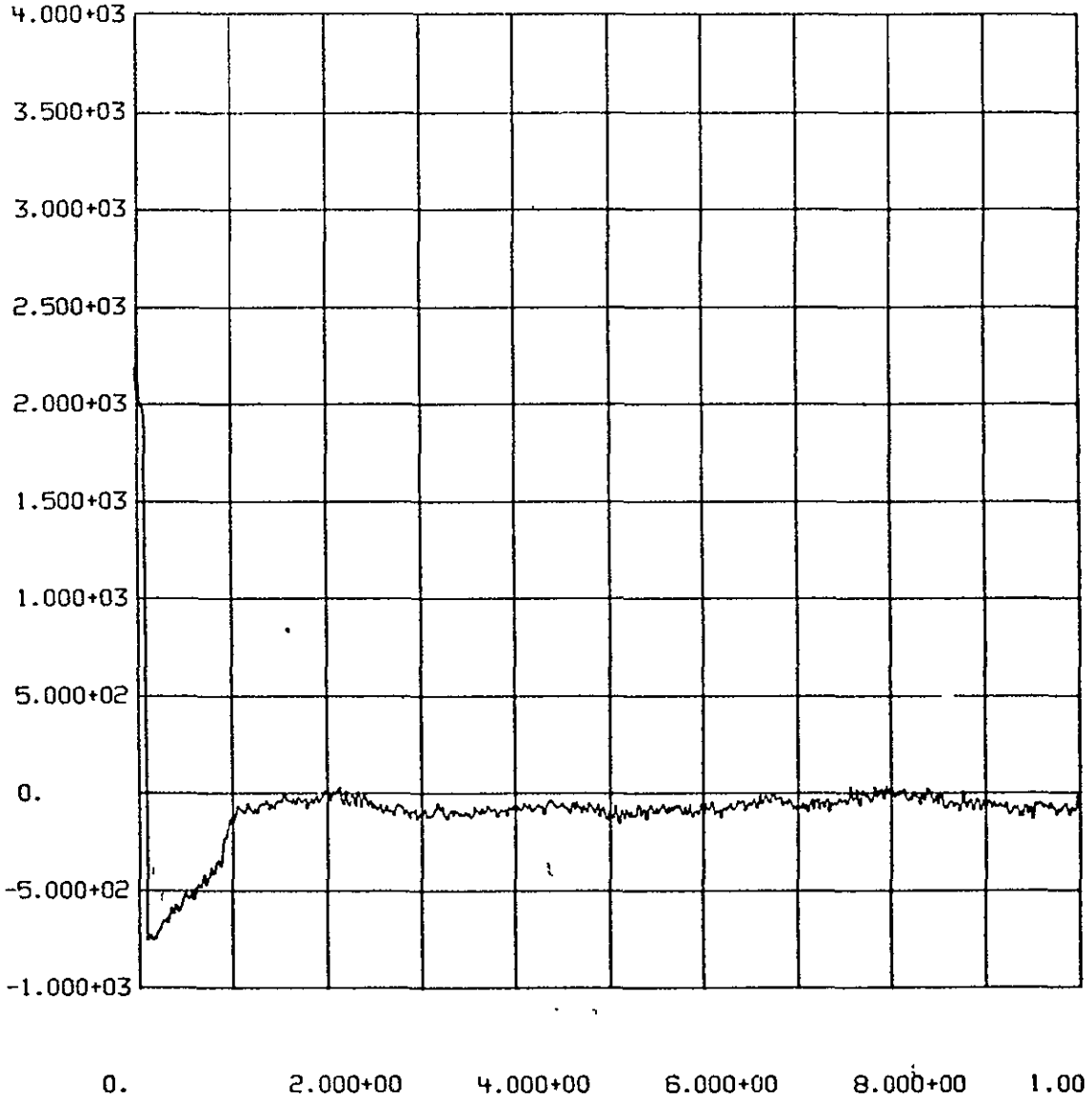
Z-LOAD VS TIME

1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.5-3 *UNFILT*



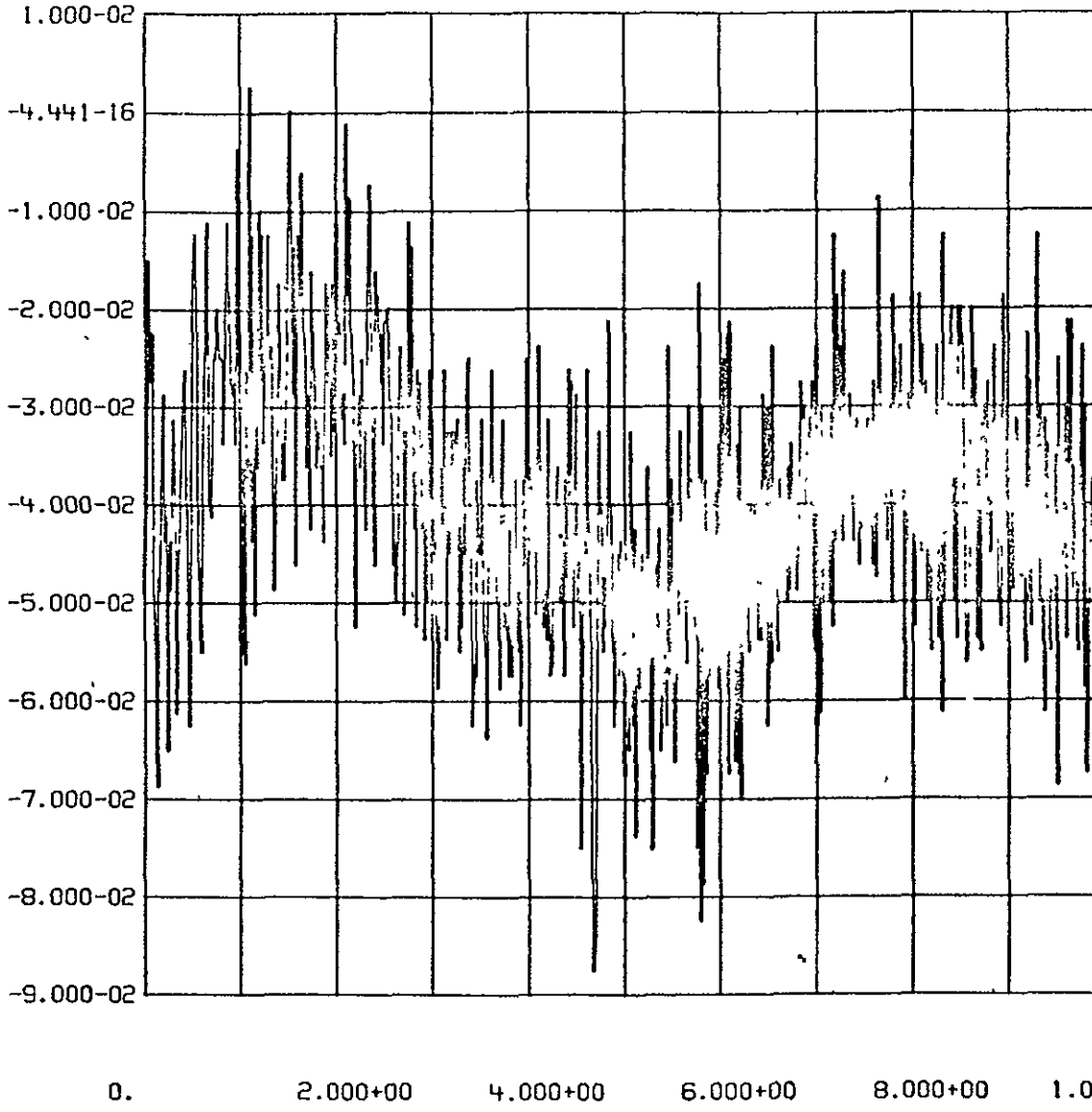
Y-LOAD VS TIME

1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.5-3 *UNFILT*



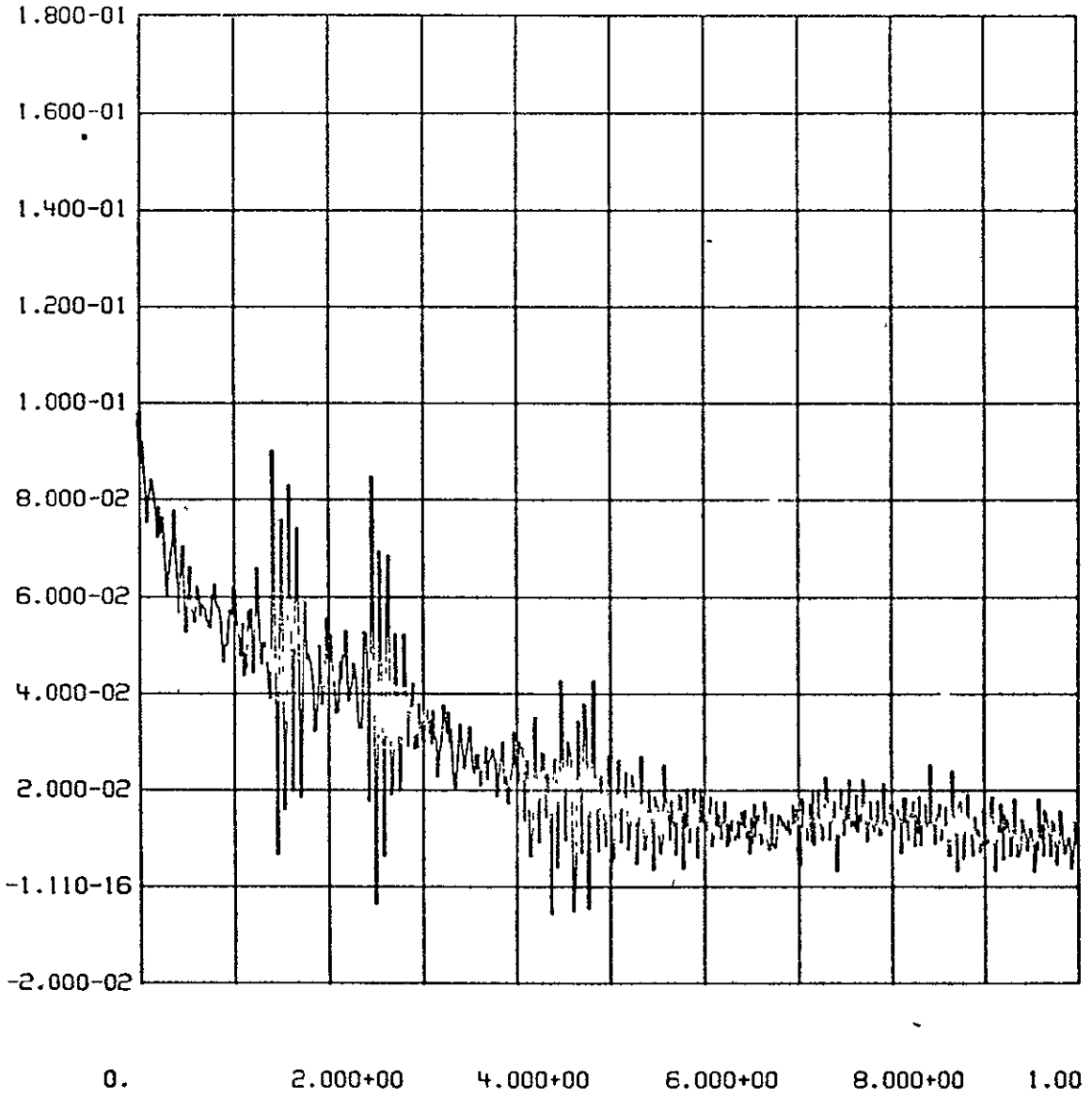
MOMENT VS TIME

1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.5-3 *UNFILT*



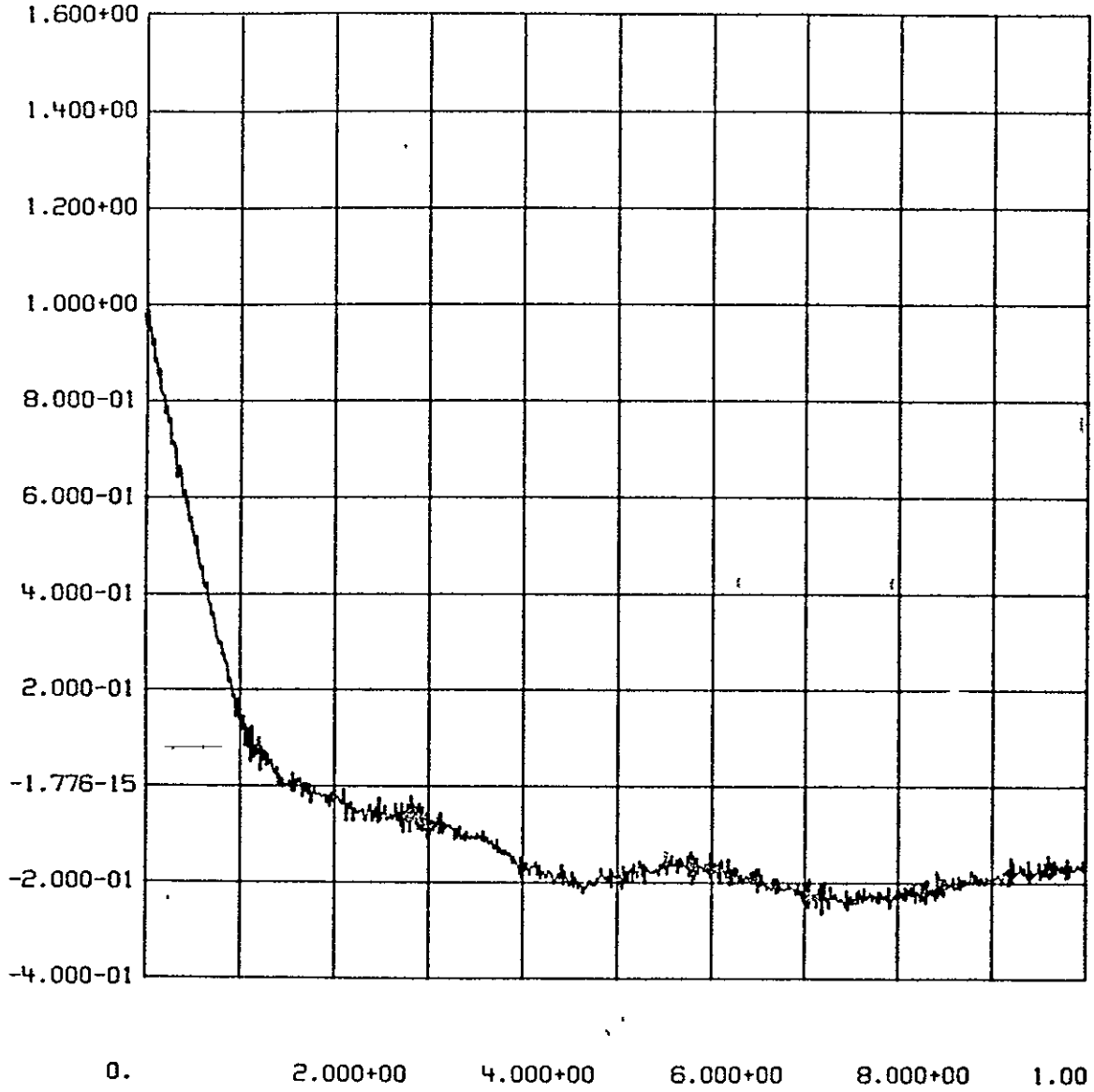
AC YAC VS TIME

1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.5-3 *UNFILT*



AC XAC VS TIME

1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.5-3 *UNFILT*

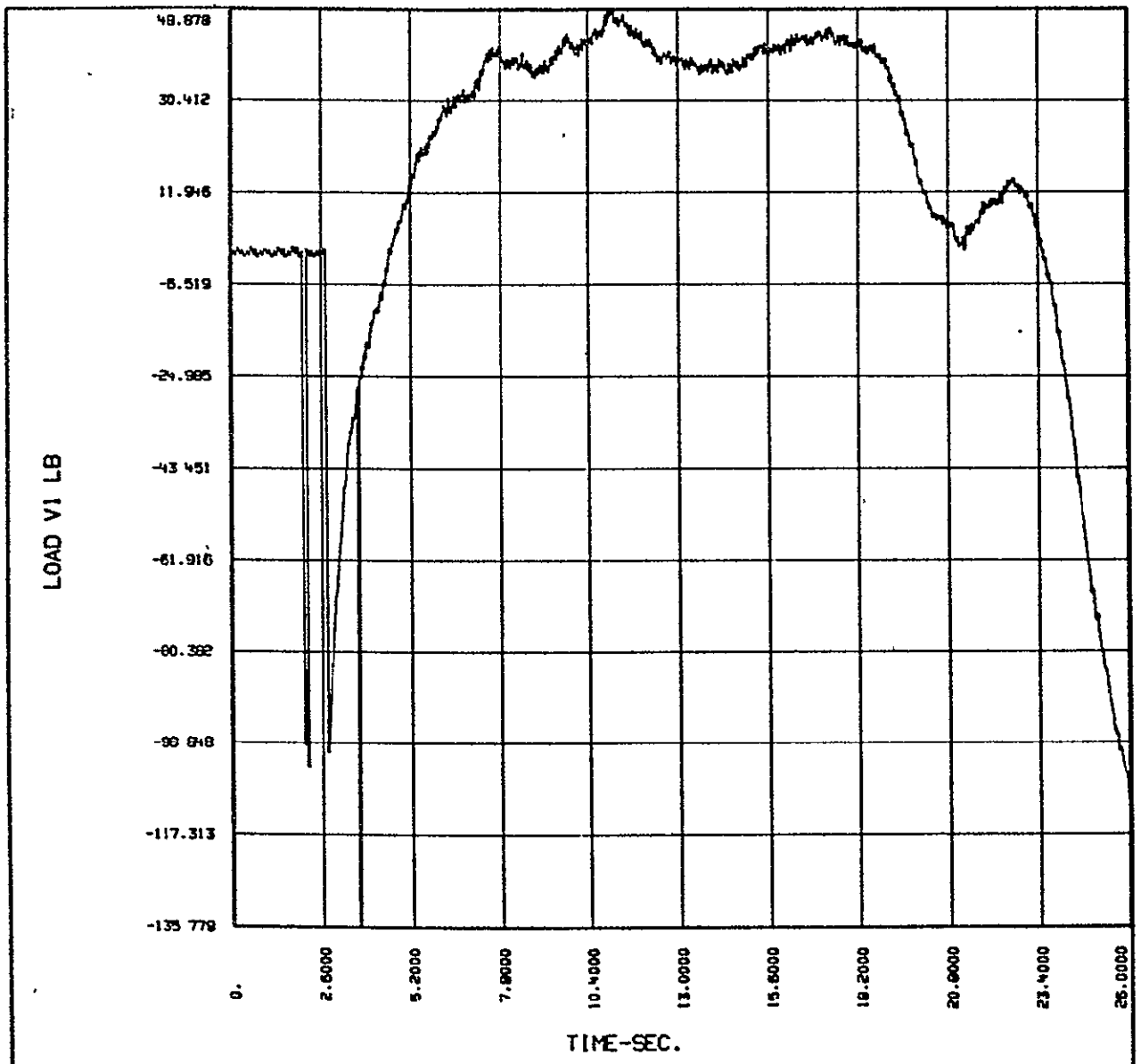


AC ZAC VS TIME

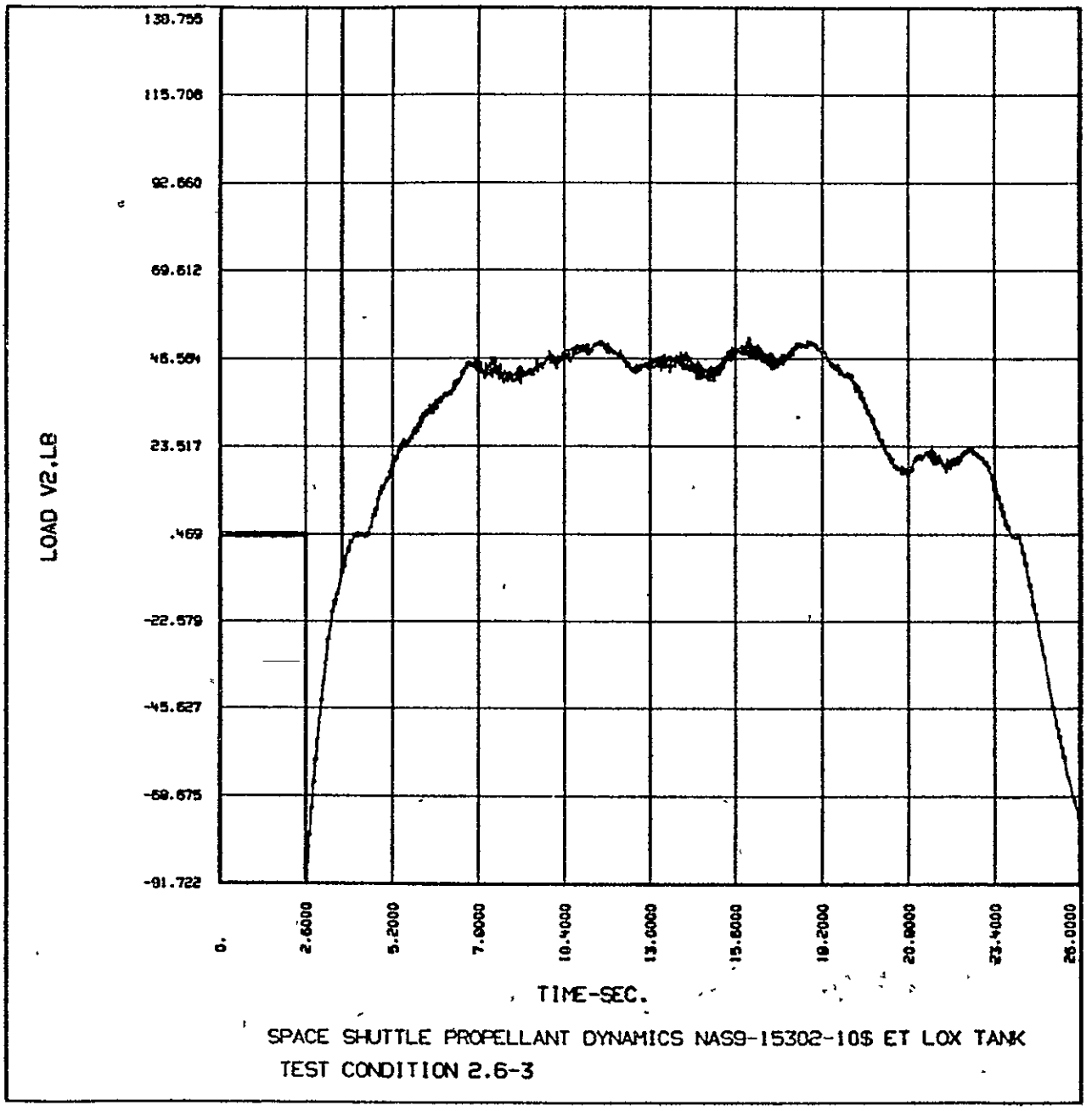
1 FLT 2 27AP79 FLIGHT 2 TEST CONDITION 2.5-3 *UNFILT*

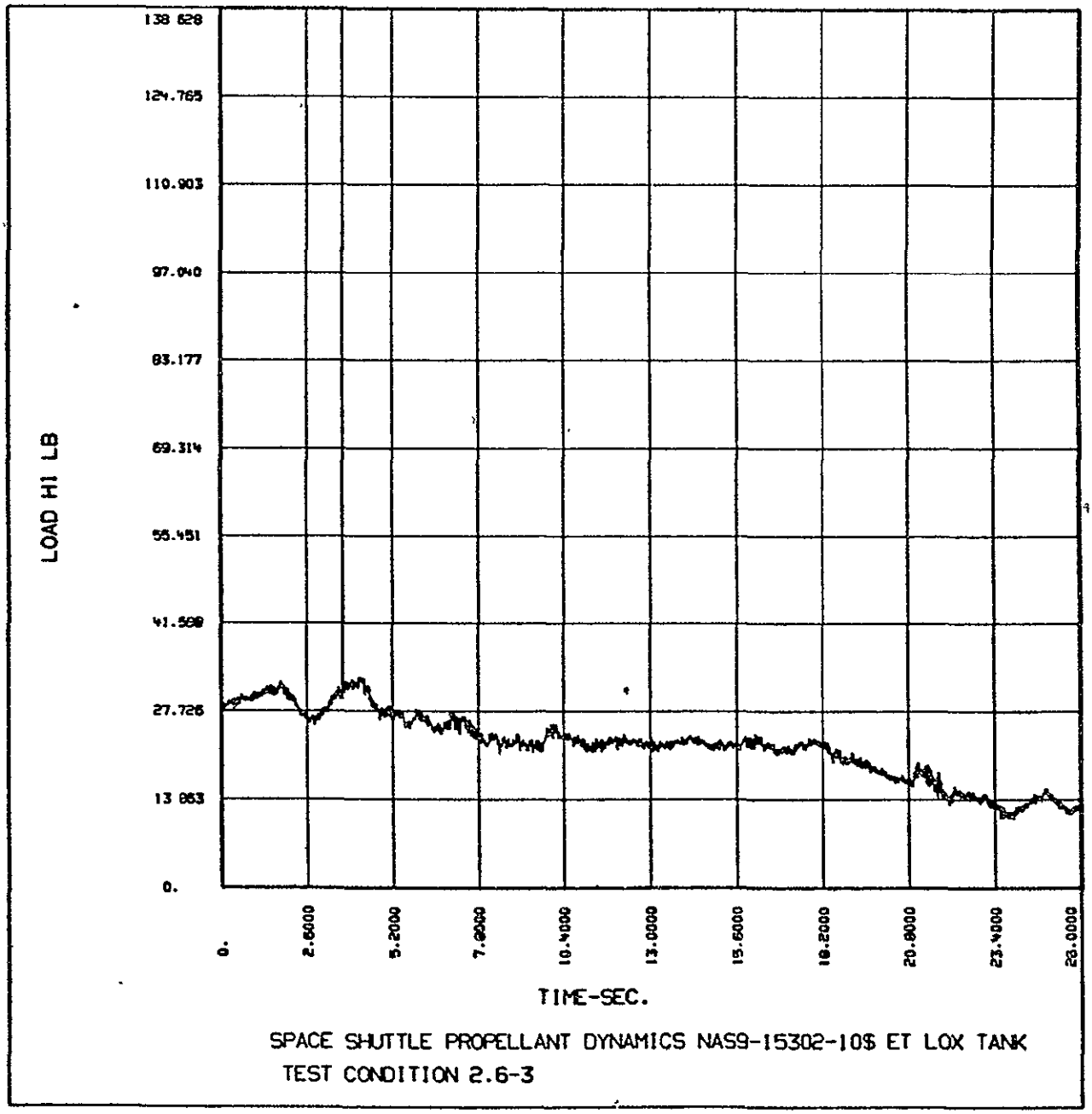
Test Data Condition 2.6-3

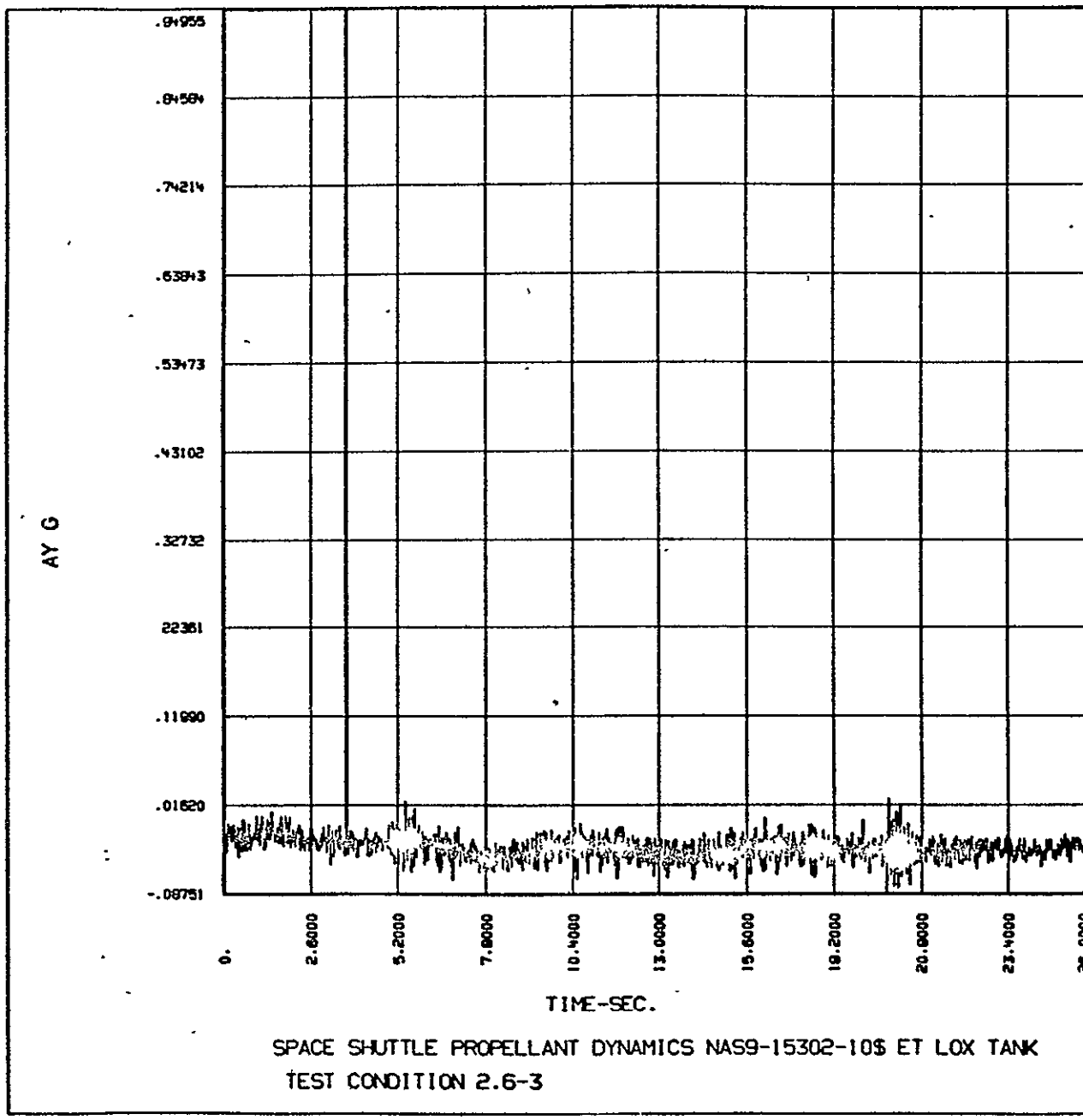
Baffles
Test Fluid — FC 113
Orientation — 13°
Fill Volume — 3%
Target Acceleration—0.2 g



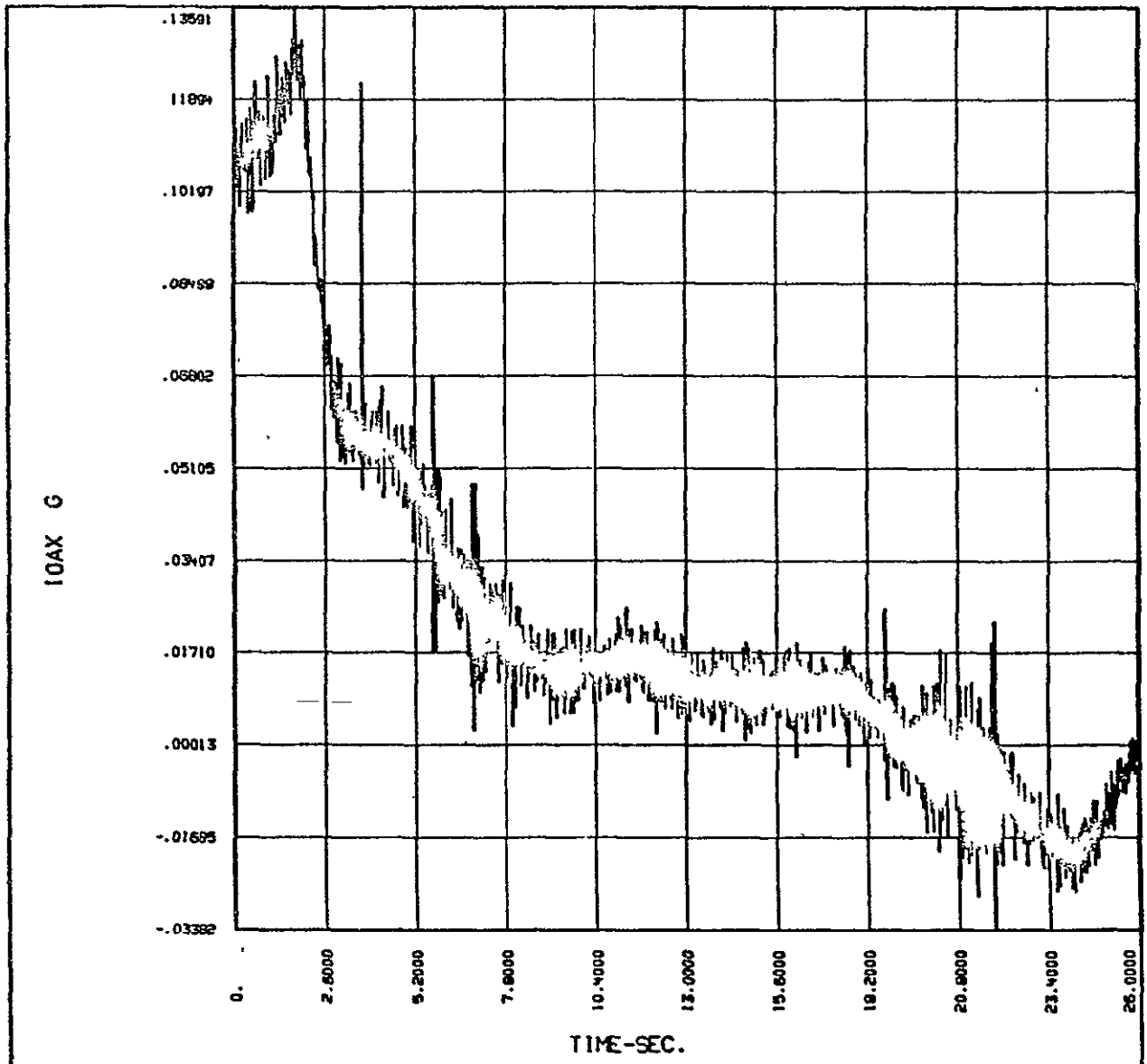
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.6-3


138.756
115.708
92.660
69.612
46.564
23.517
.469
-22.579
-45.627
-68.675
-91.722
LOAD V2,LB
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.6-3

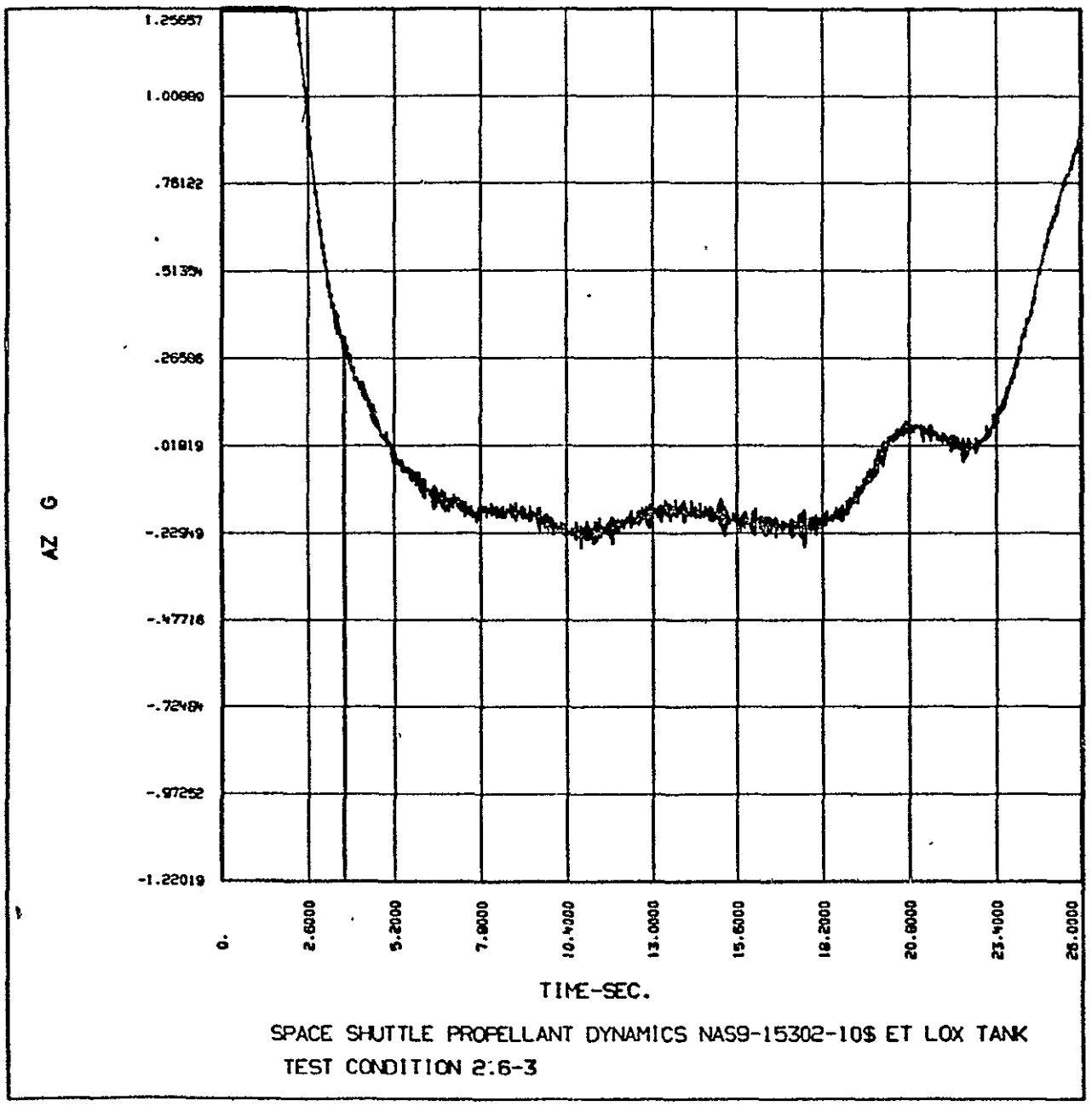

LOAD HI LB
138.628
124.765
110.903
97.040
83.177
69.314
55.451
41.588
27.726
13.863
0.
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.6-3

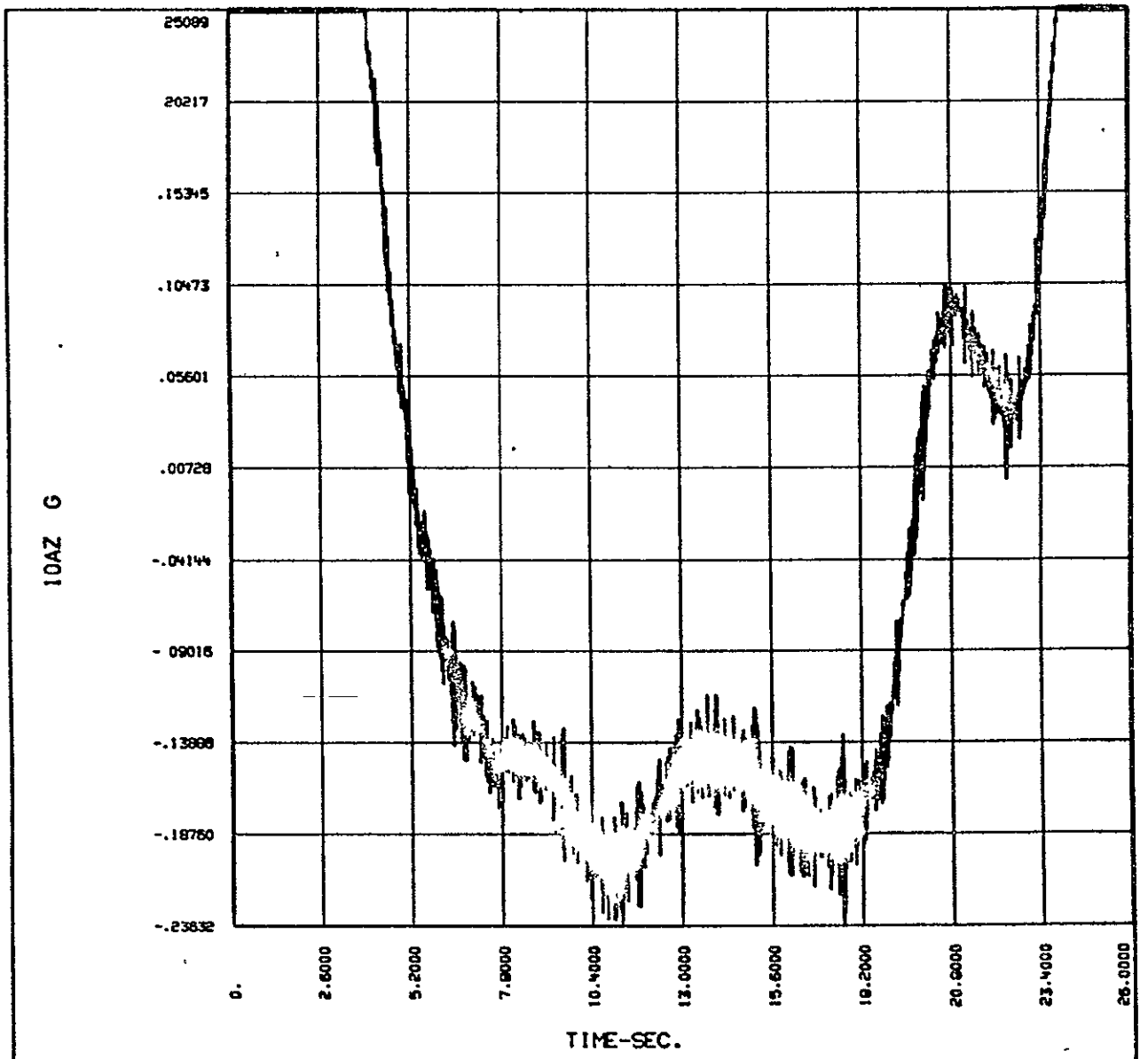

.84955
.84584
.74214
.63843
.53473
.43102
.32732
22361
.11990
.01620
-.08751
AY G
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.6-3

(NO DATA)

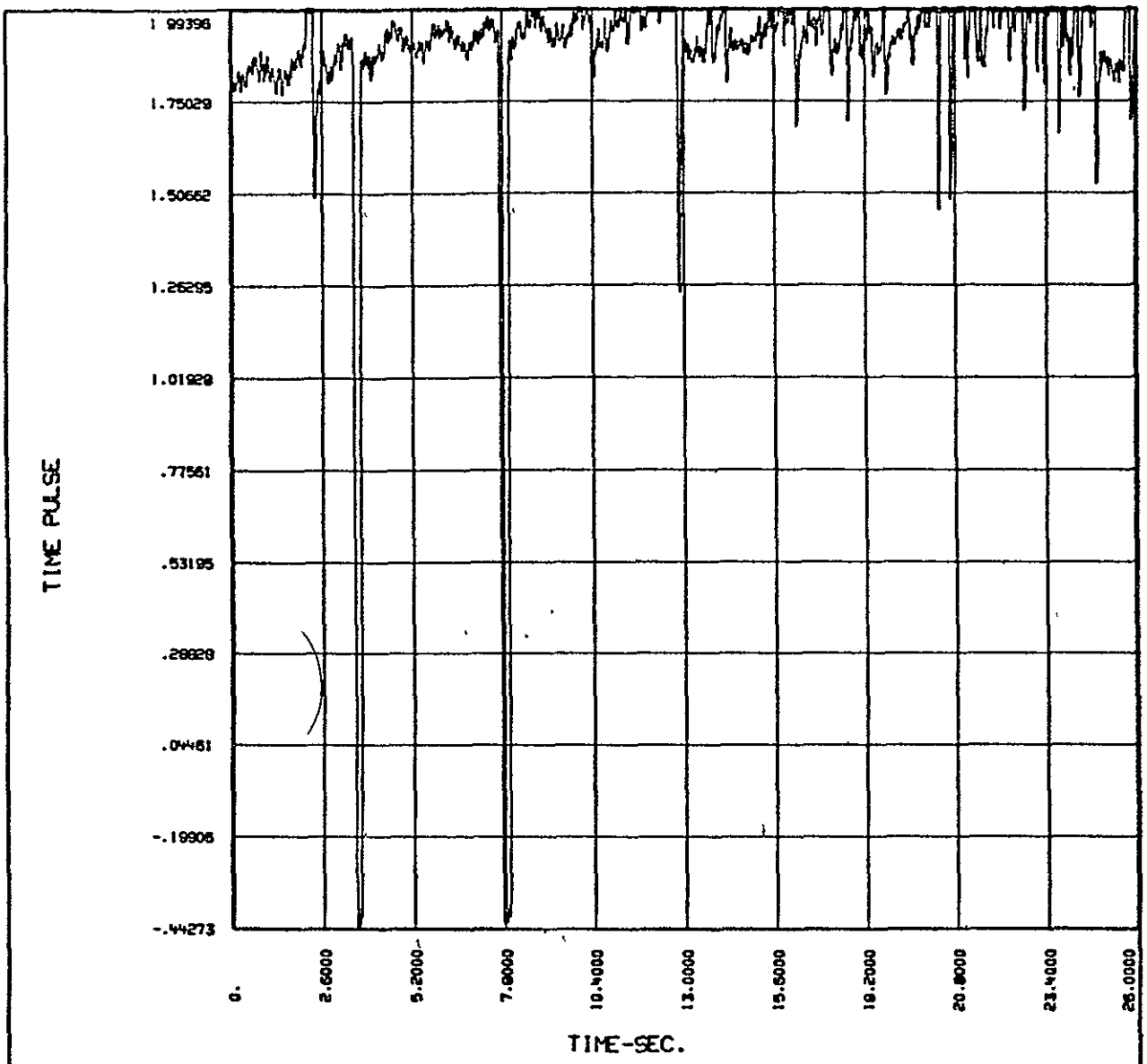


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.6-3

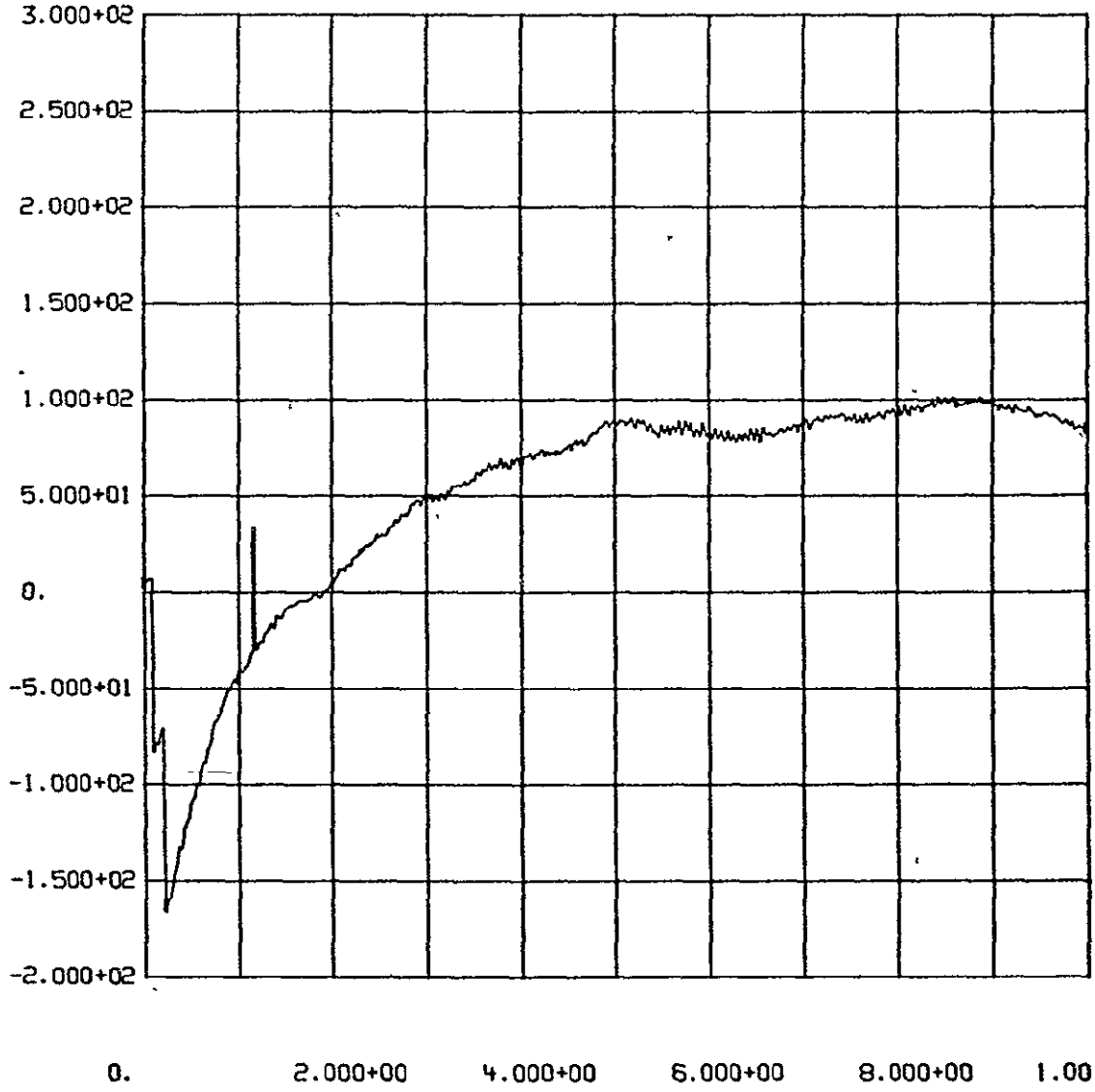

1.25657
1.00000
.78122
.51354
.26586
.01819
-.22949
-.47718
-.72484
-.97252
-1.22019
AZ G
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2:6-3



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.6-3

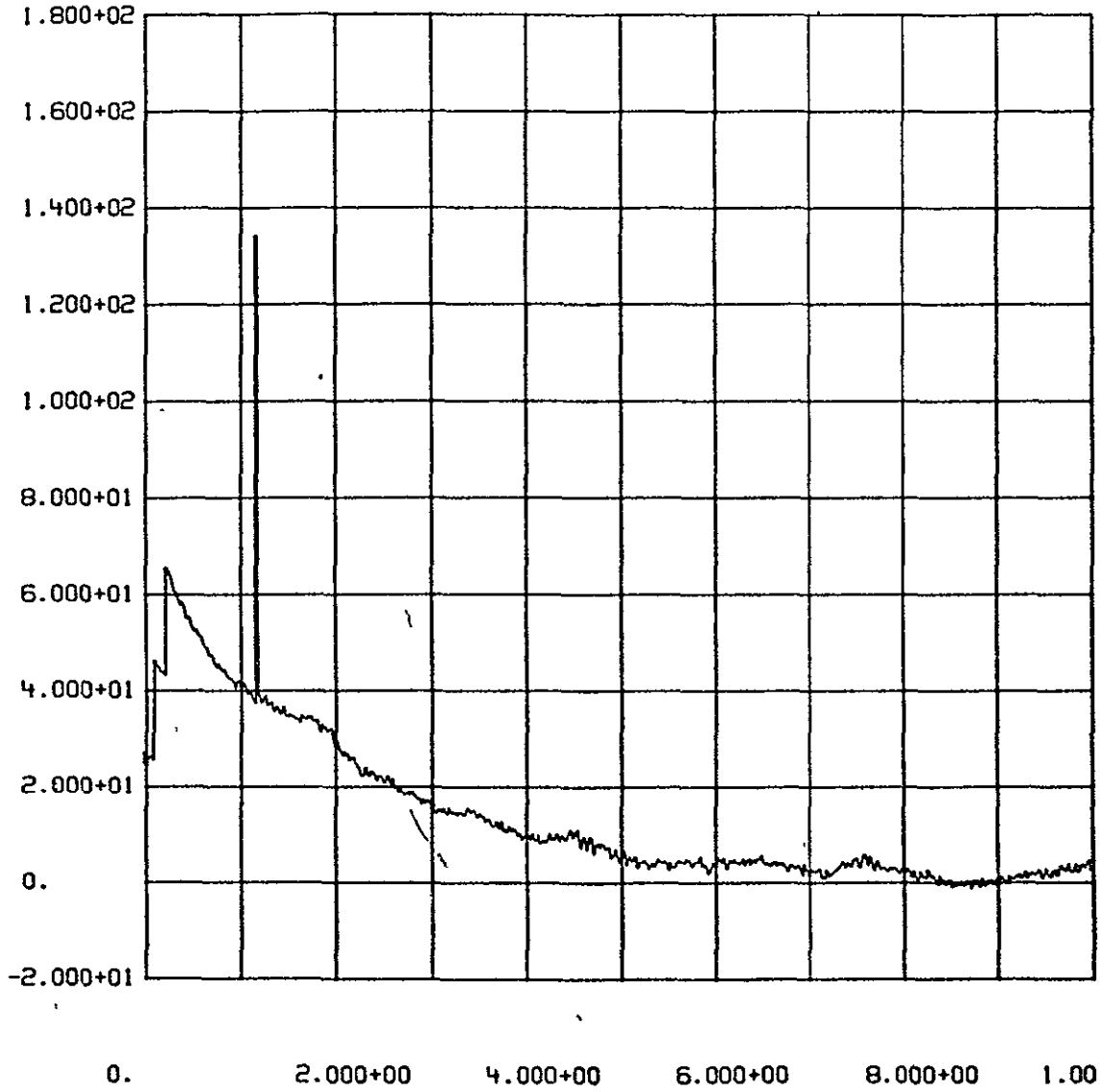


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.6-3



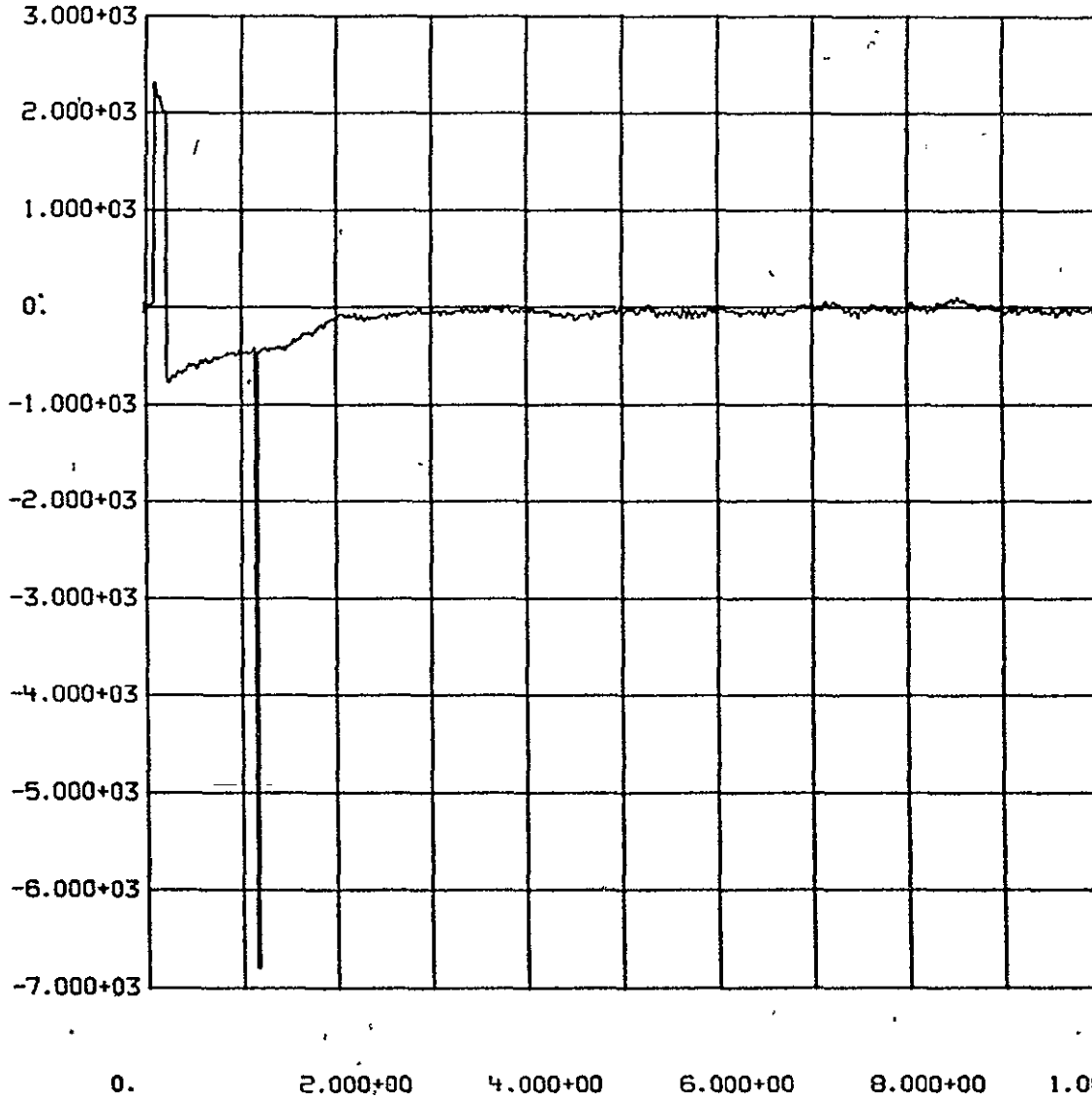
Z-LOAD VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.6-3 * UNFILT *



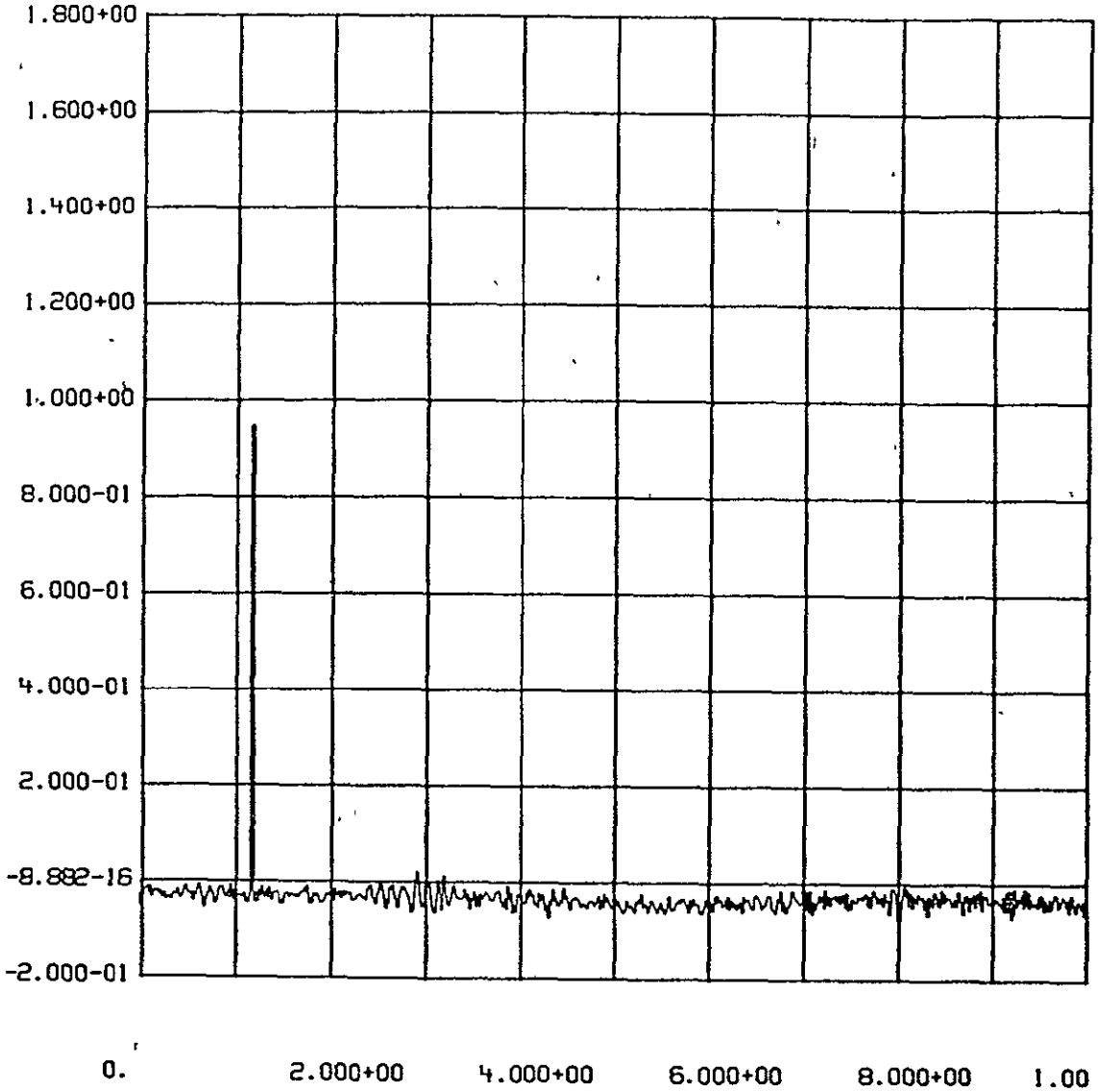
Y-LOAD VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.6-3 * UNFILT *



MOMENT VS TIME

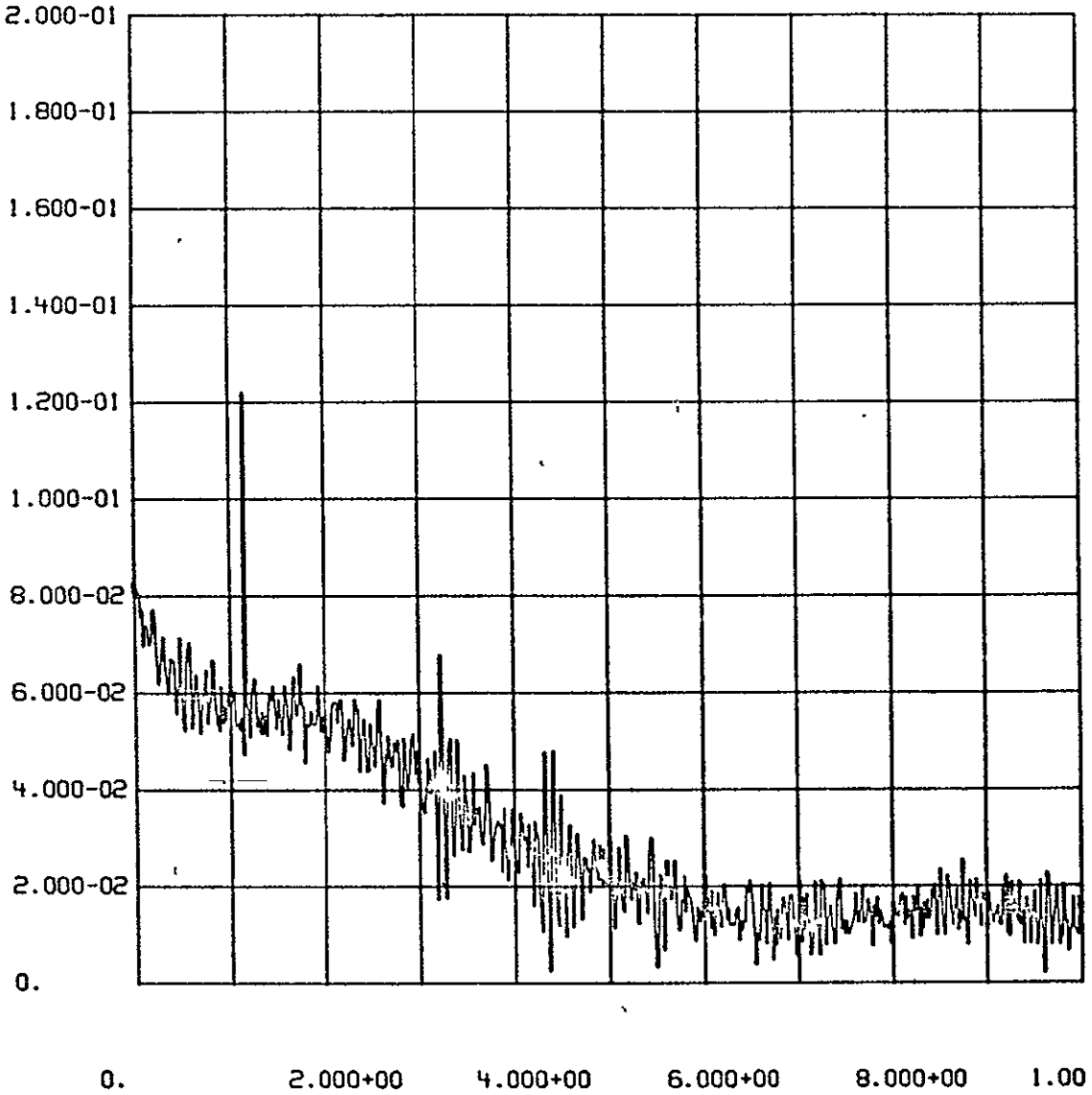
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.6-3 * UNFILT *



AC YAC VS TIME

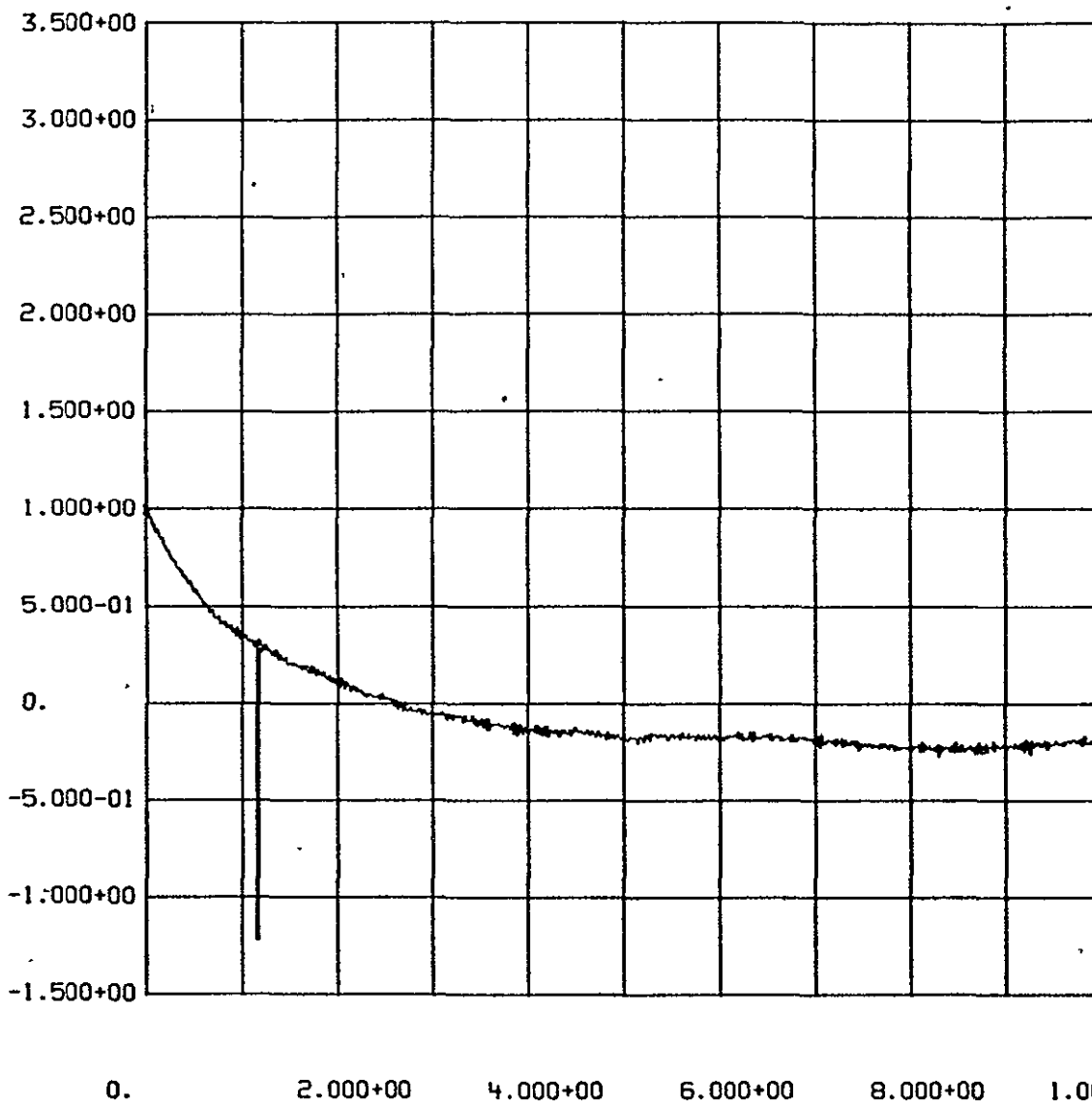
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.6-3 * UNFILT *

(NO DATA)



AC XAC VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.6-3 * UNFILT *

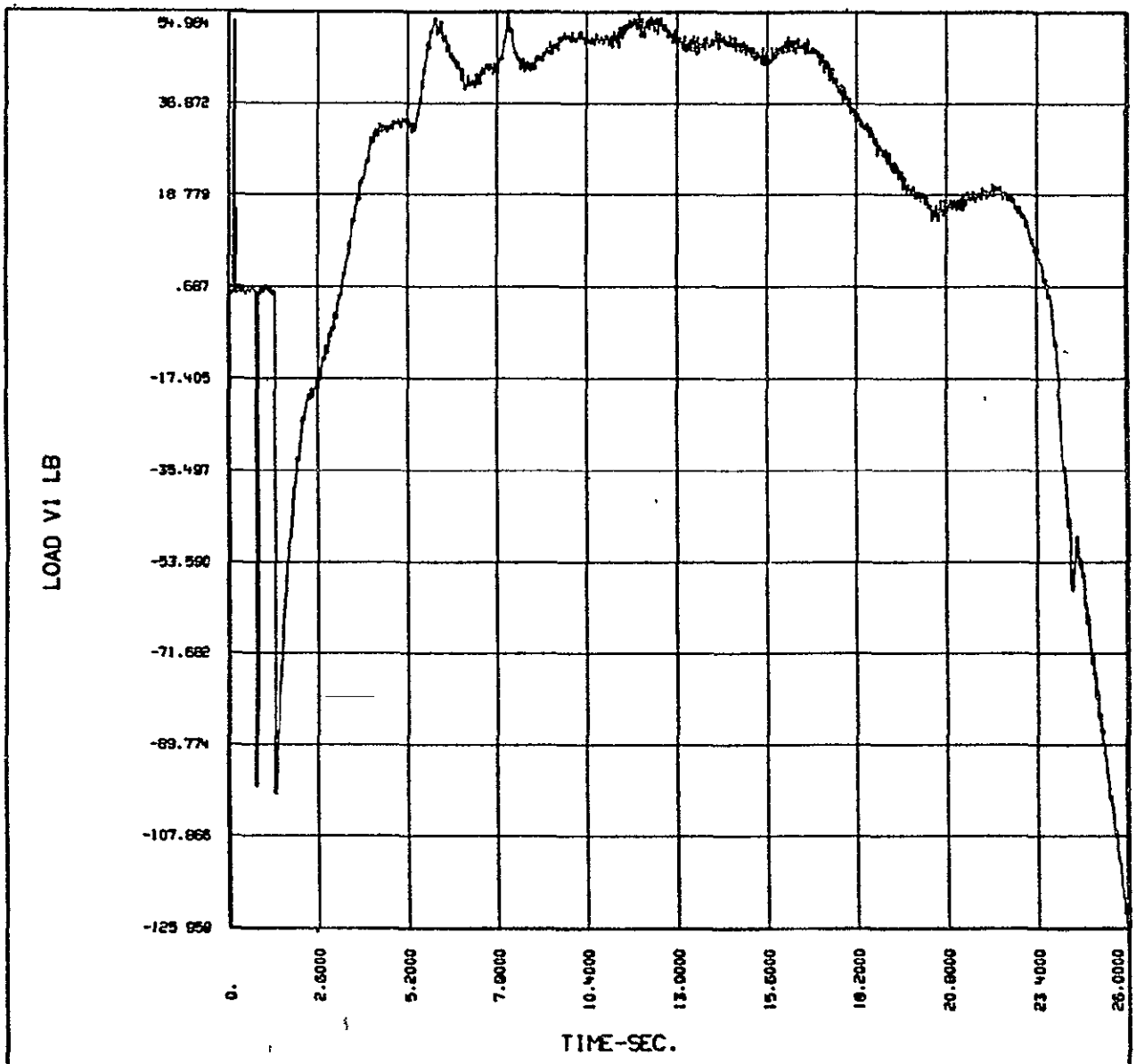


AC ZAC VS TIME

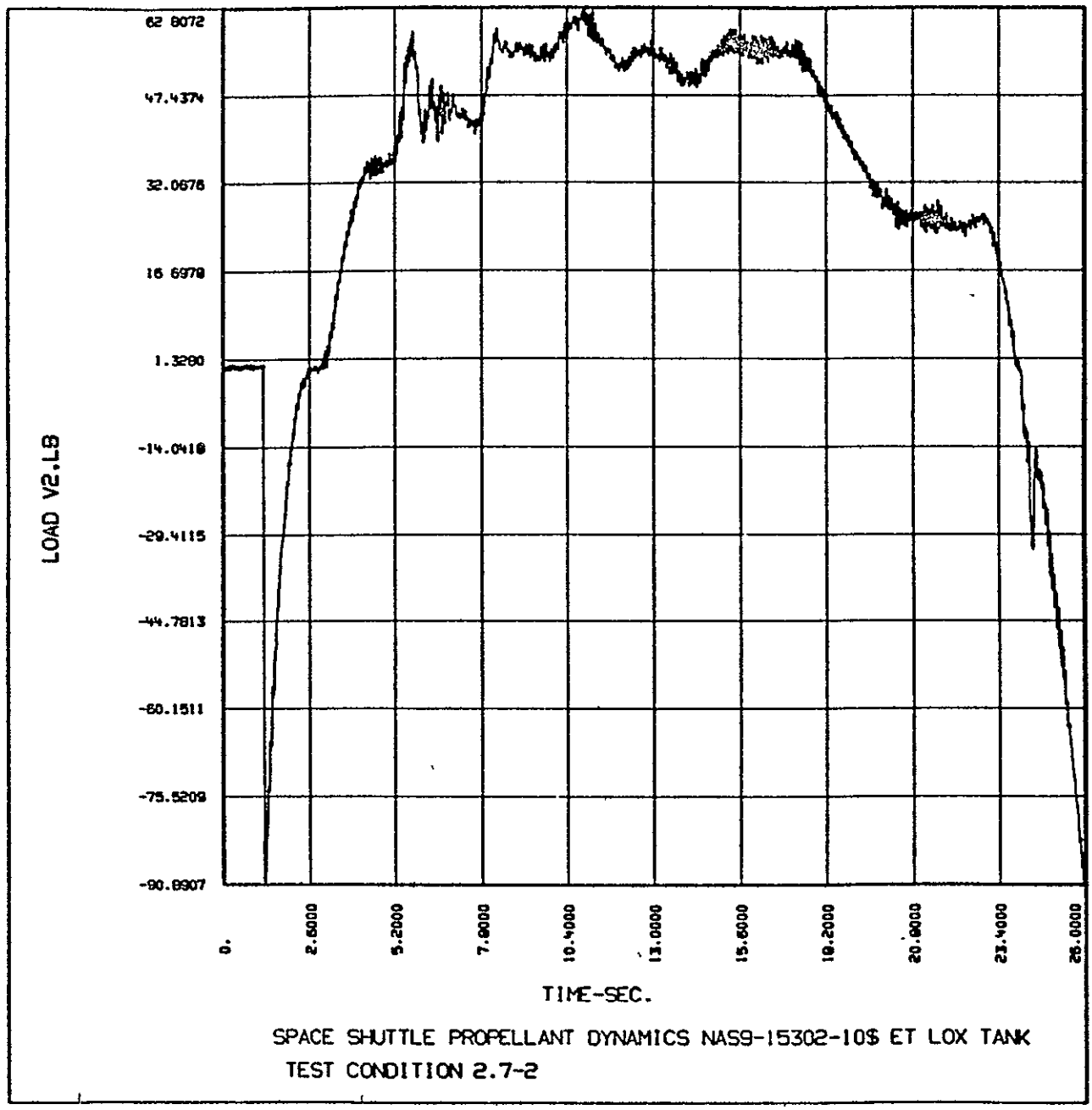
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.6-3 * UNFILT *

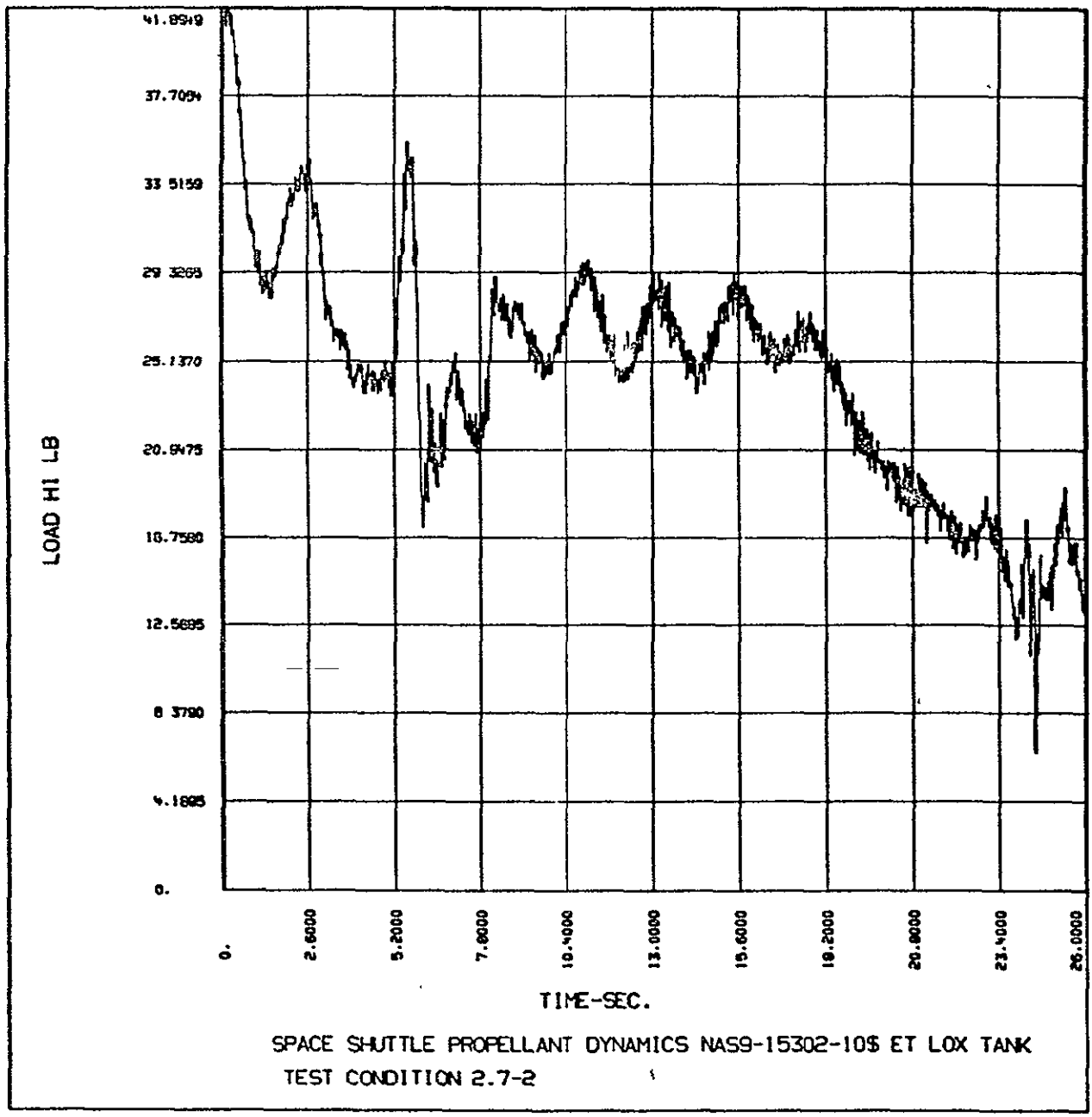
Test Data Condition 2.7-2

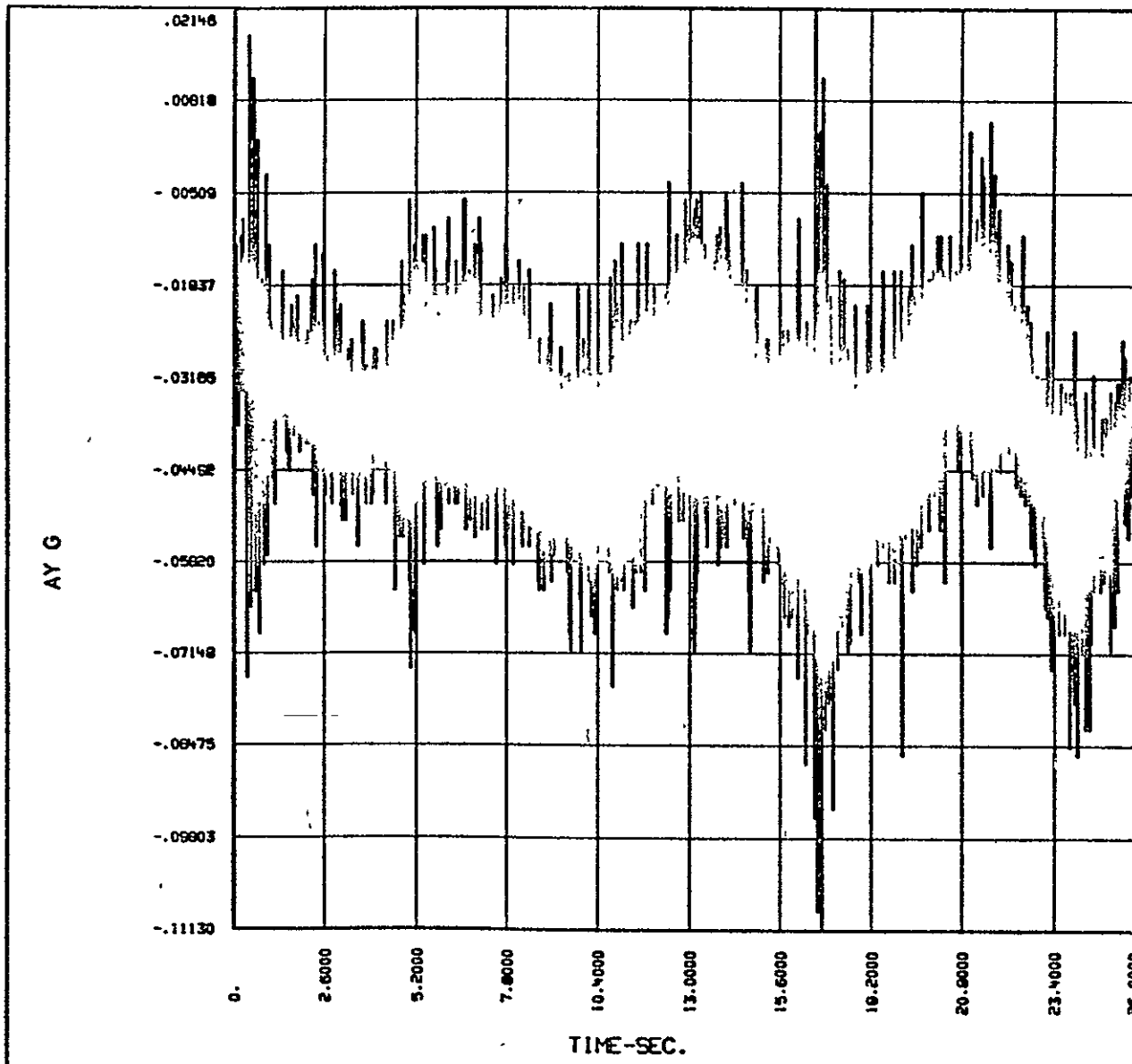
Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 10%
Target Acceleration—0.2 g



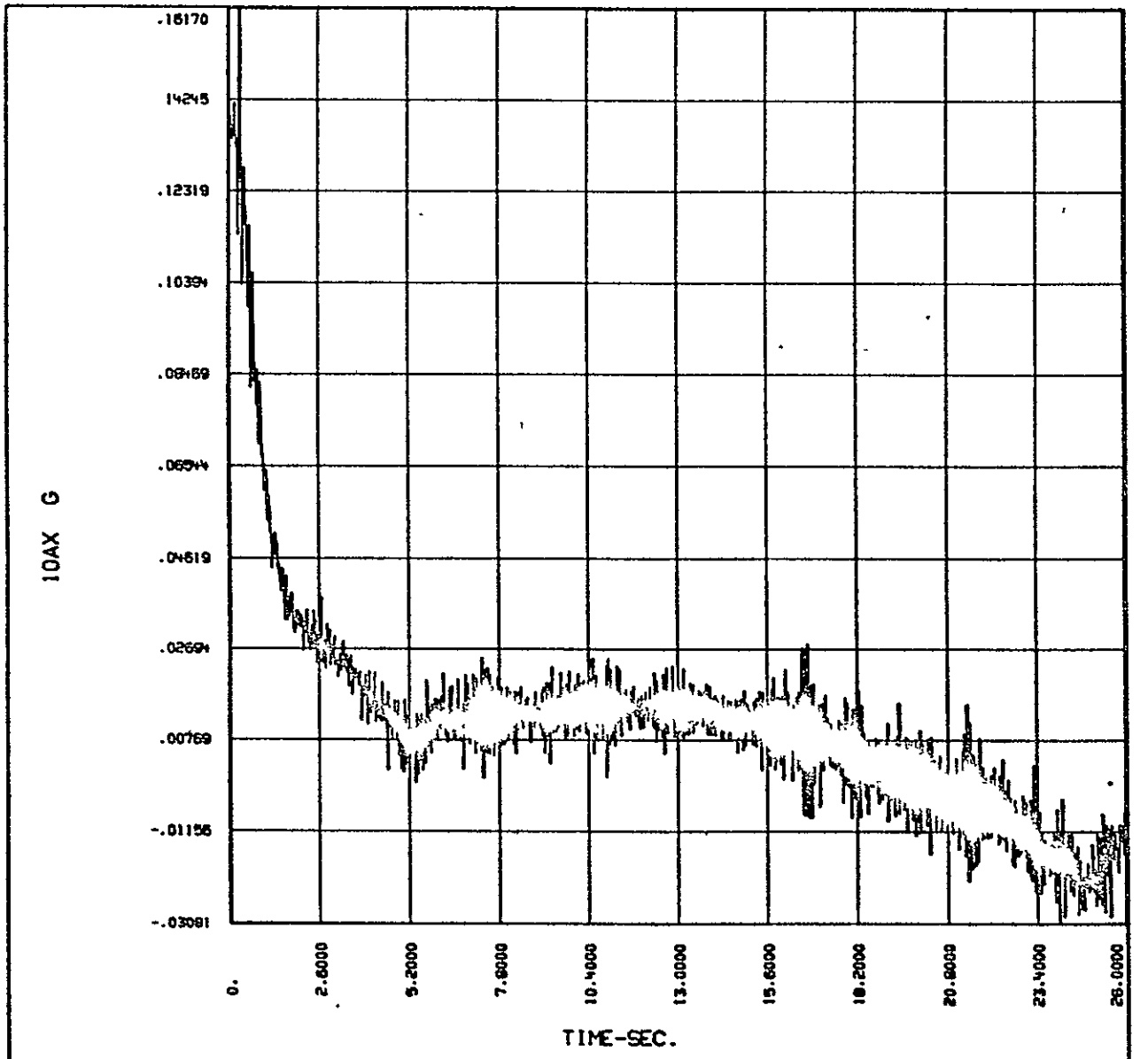
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.7-2


62.8072
47.4374
32.0676
16.6978
1.3280
-14.0418
-29.4115
-44.7813
-60.1511
-75.5209
-90.8907
LOAD V2.LB
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.7-2

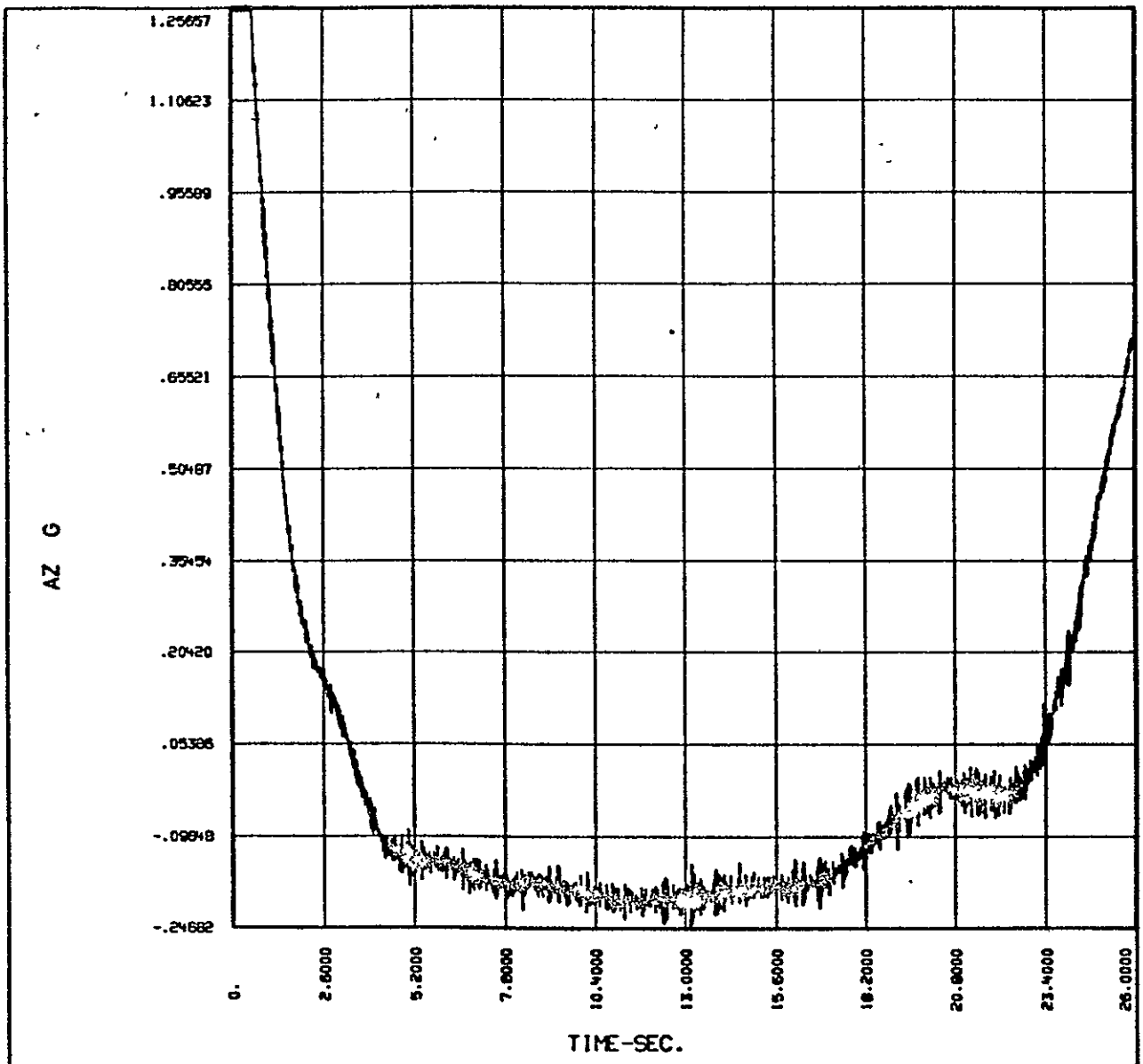

LOAD H1 LB
41.8949
37.7094
33.5159
29.3205
25.1370
20.9475
16.7580
12.5685
8.3790
4.1895
0.
0.
2.6000
5.2000
7.8000
10.4000
13.0000
15.6000
18.2000
20.8000
23.4000
26.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.7-2



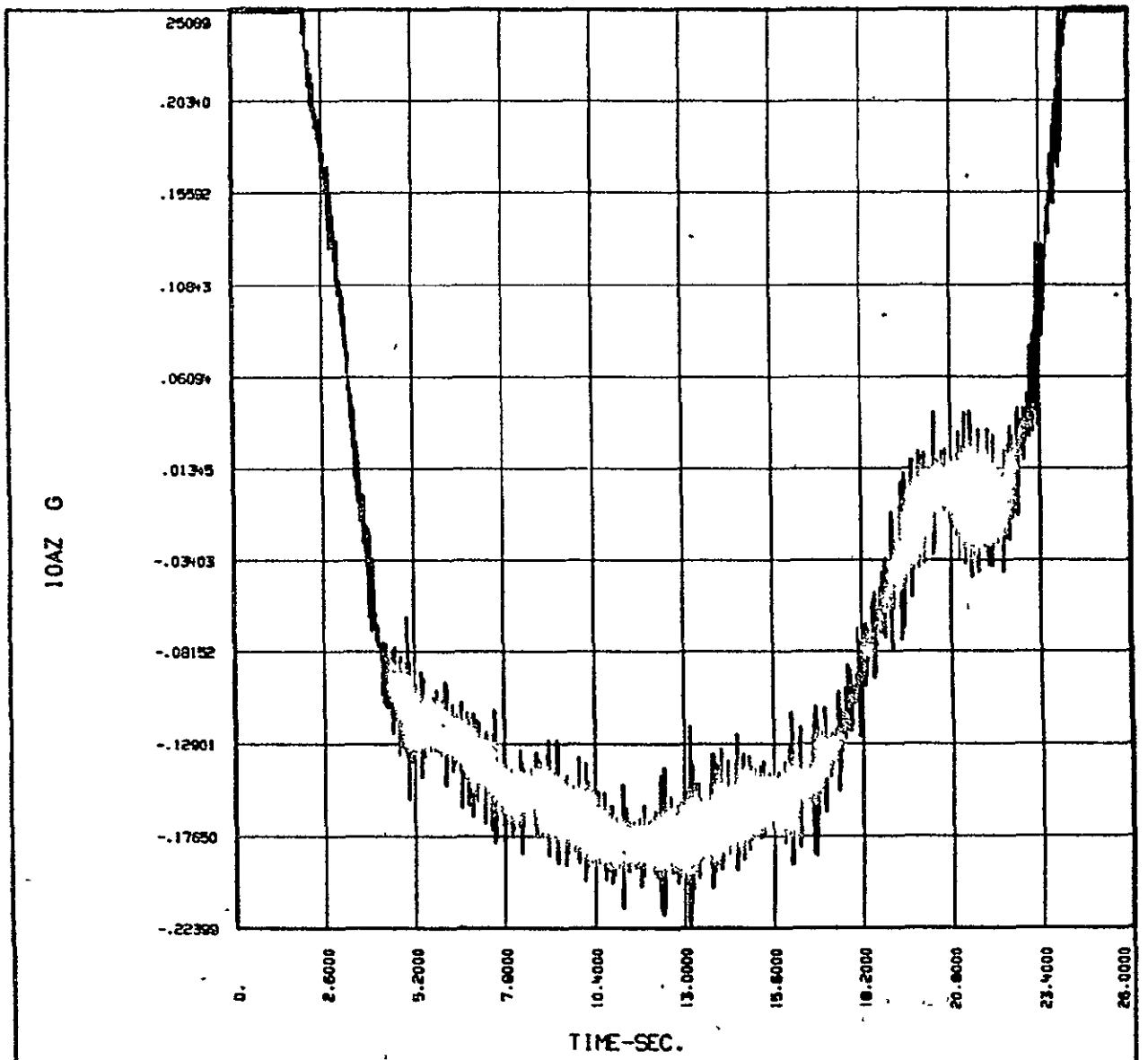
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.7-2



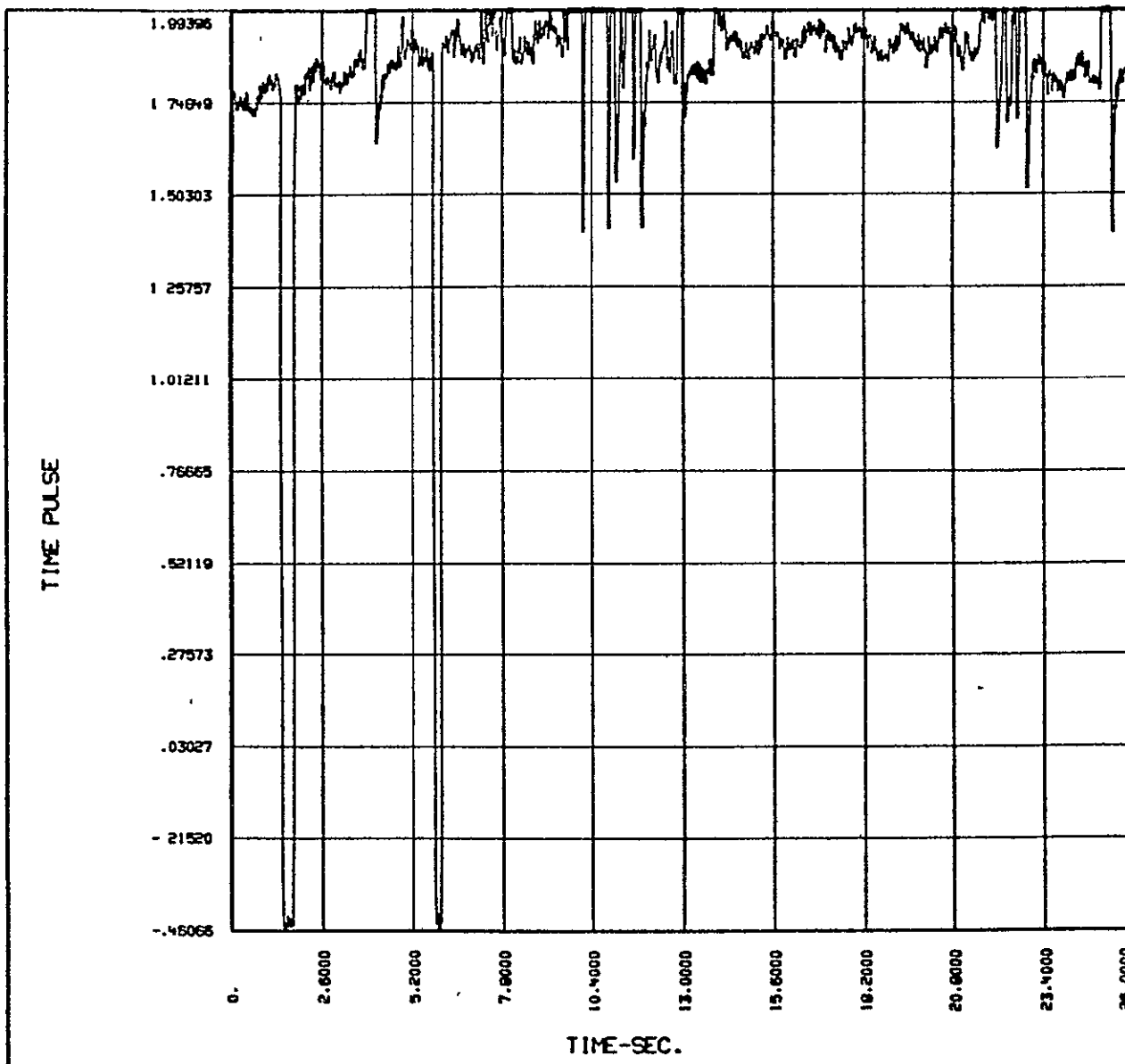
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.7-2



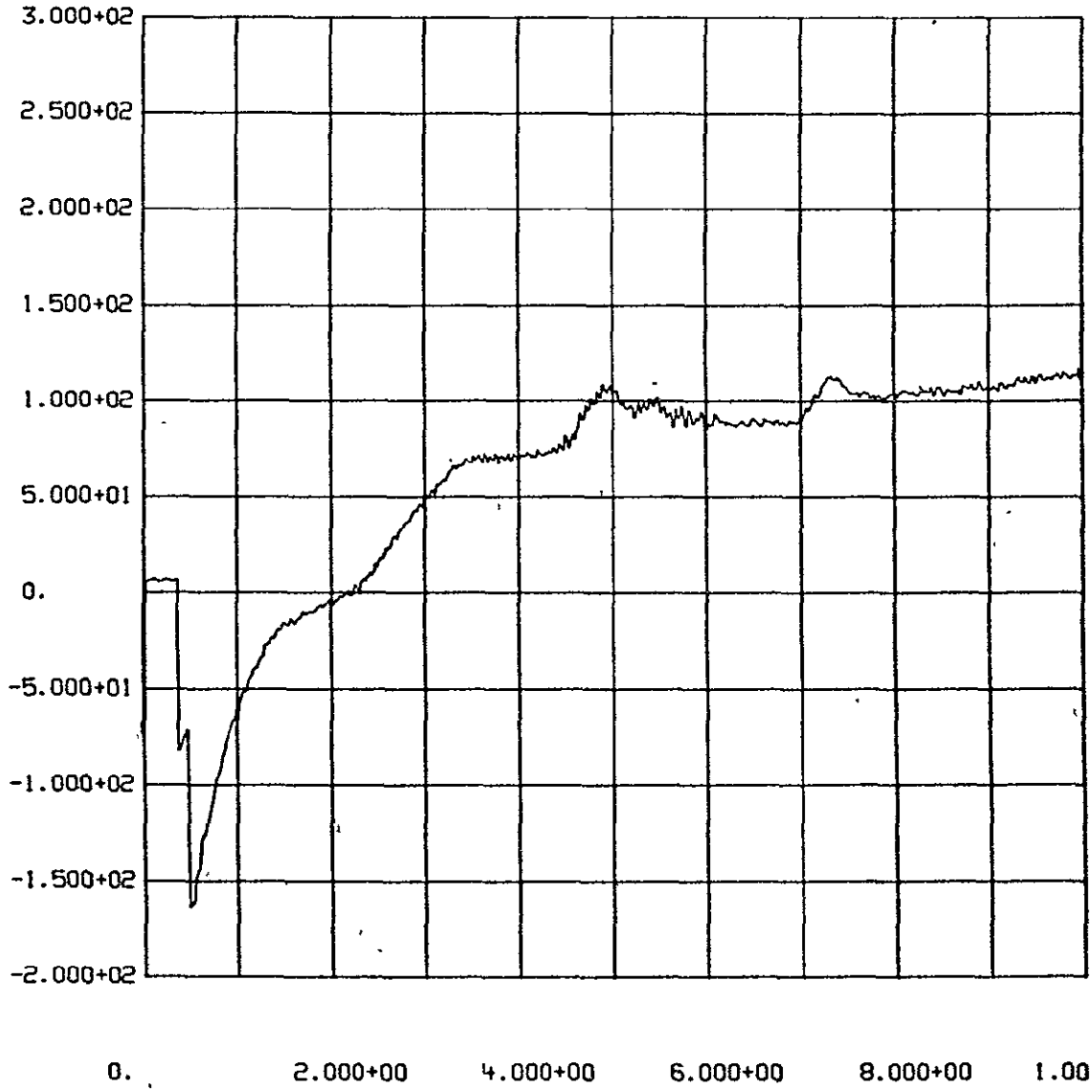
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.7-2



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.7-2

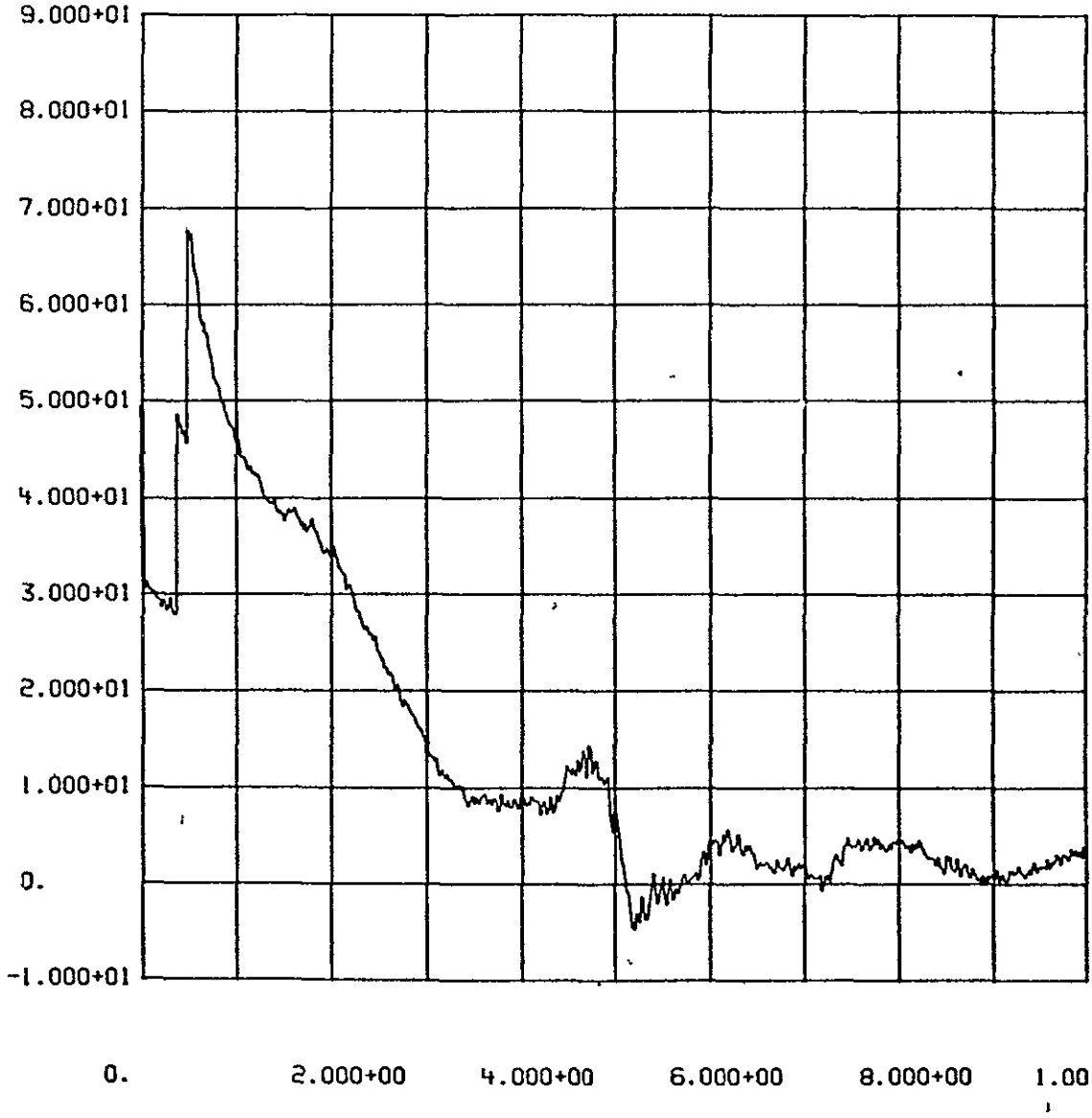


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.7-2



Z-LOAD VS TIME

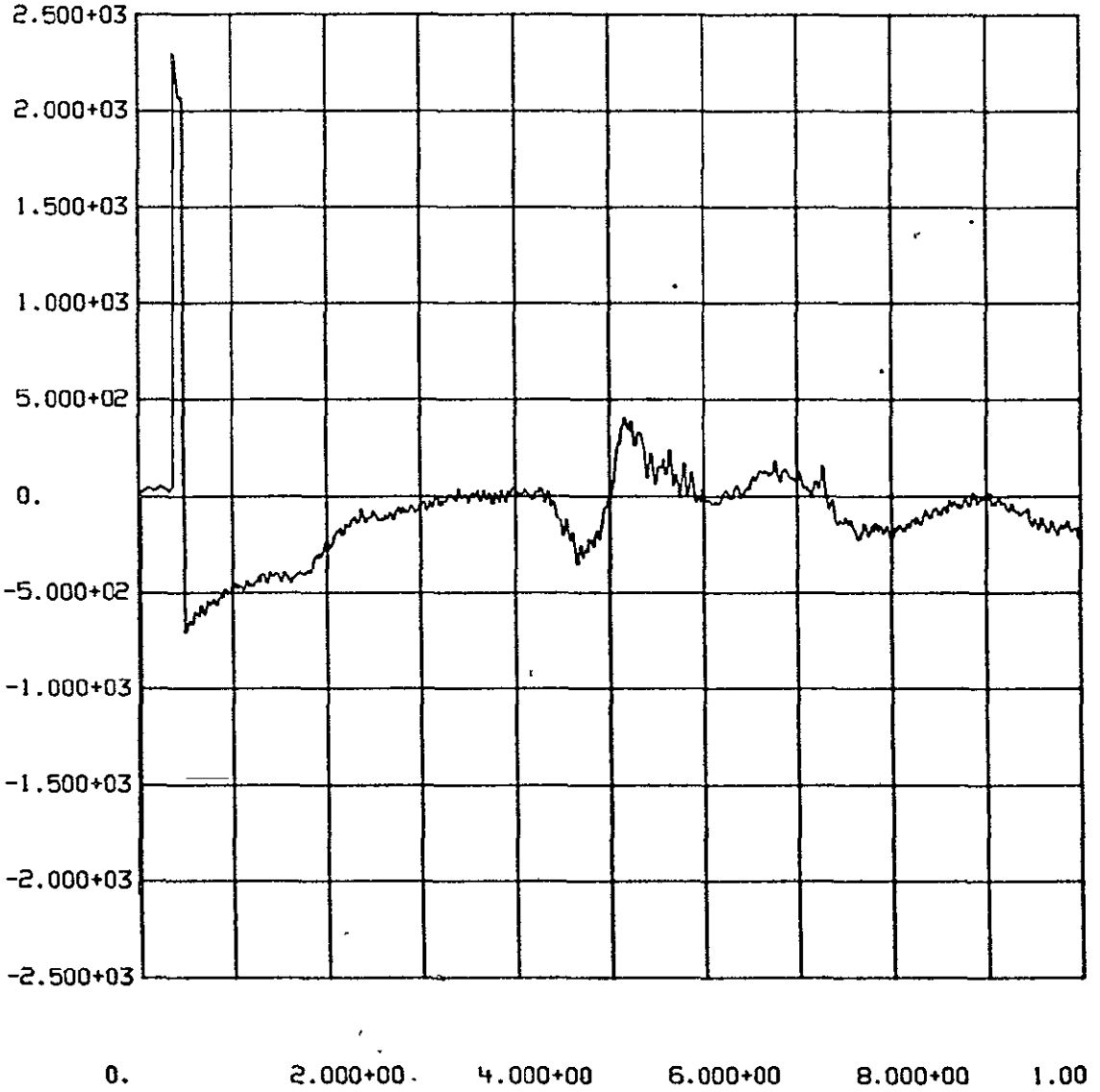
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.7-2 * UNFILT *



Y-LOAD VS TIME

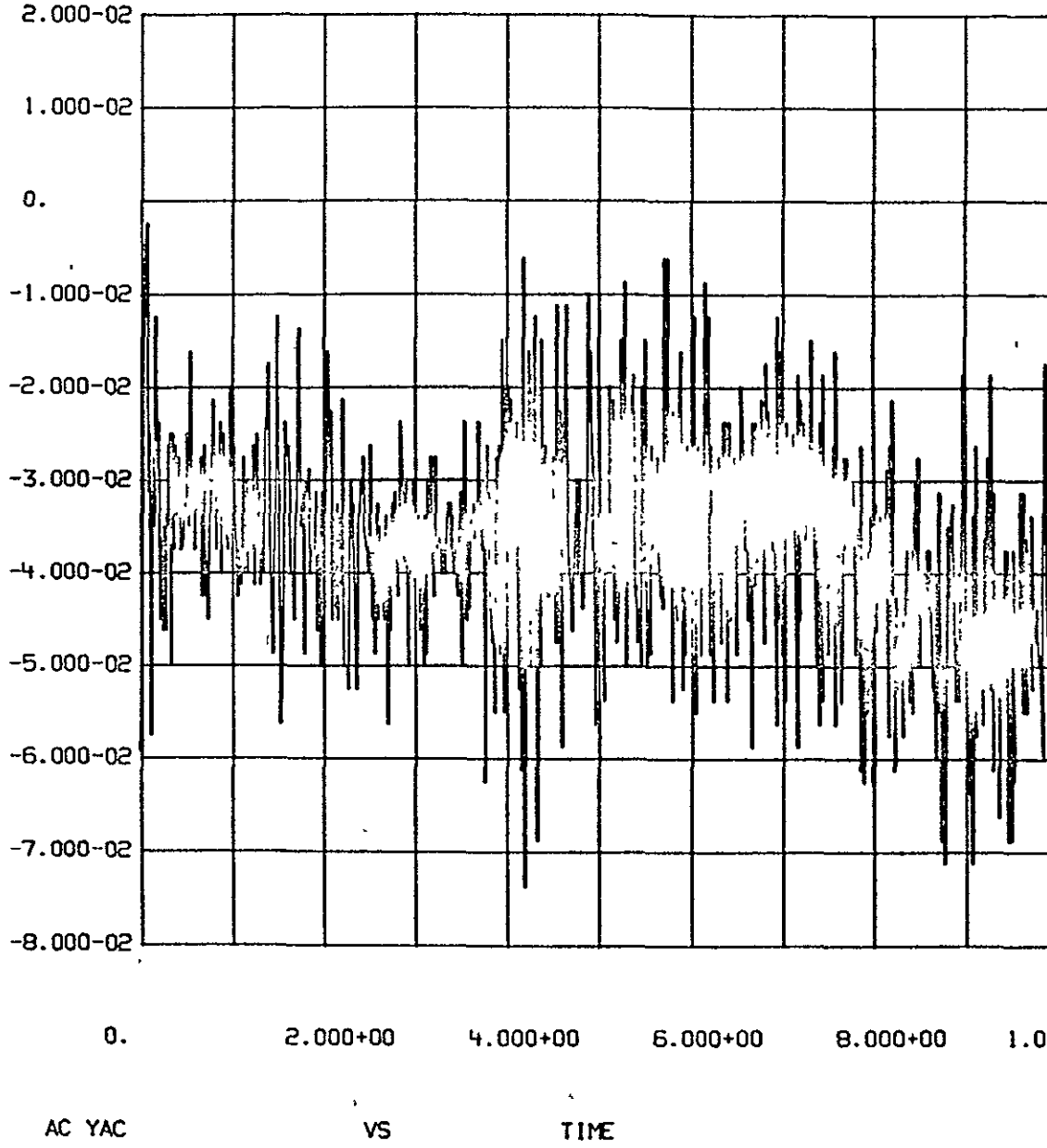
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.7-2 * UNFILT *

C-3



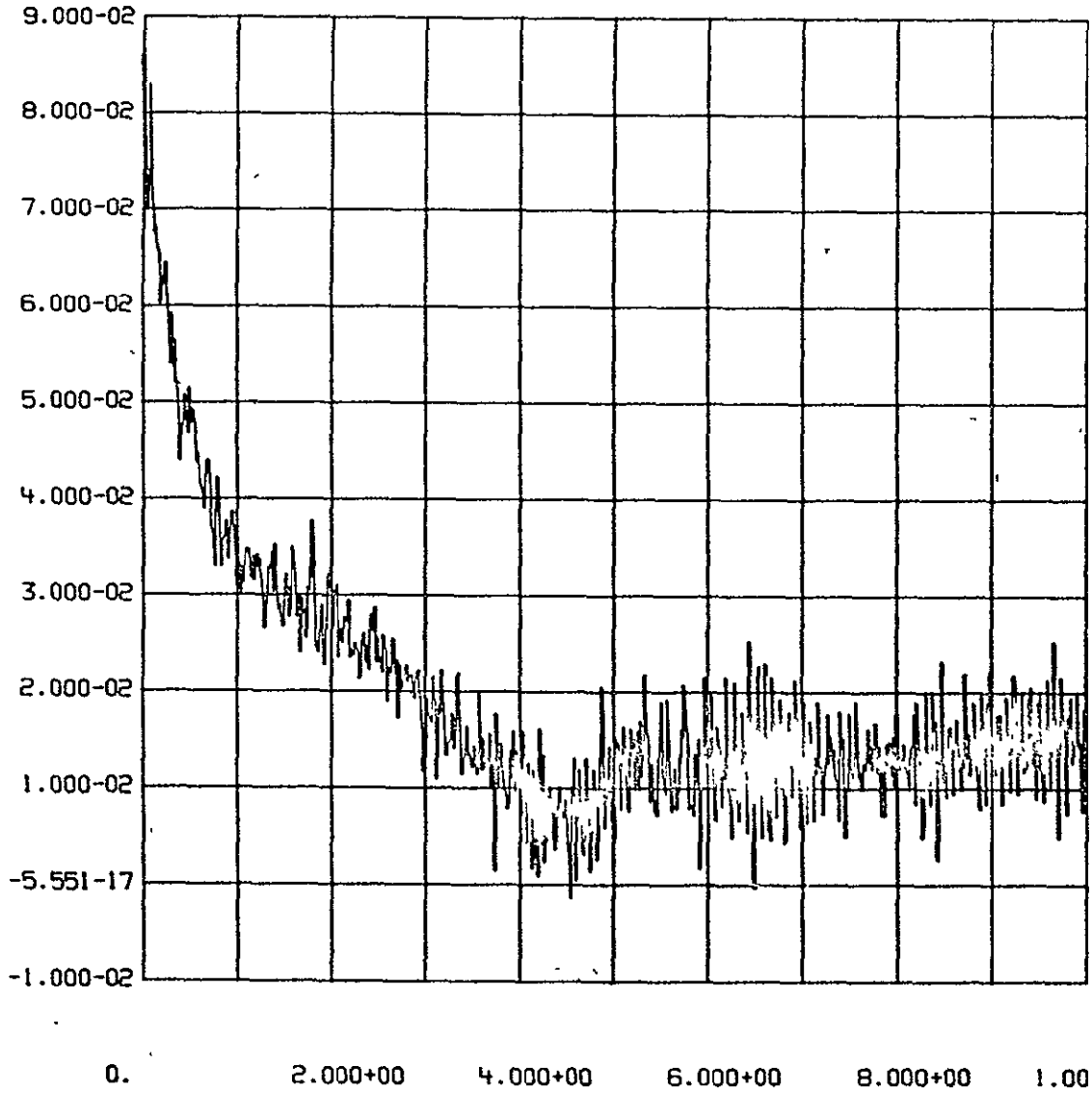
MOMENT VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.7-2 * UNFILT *



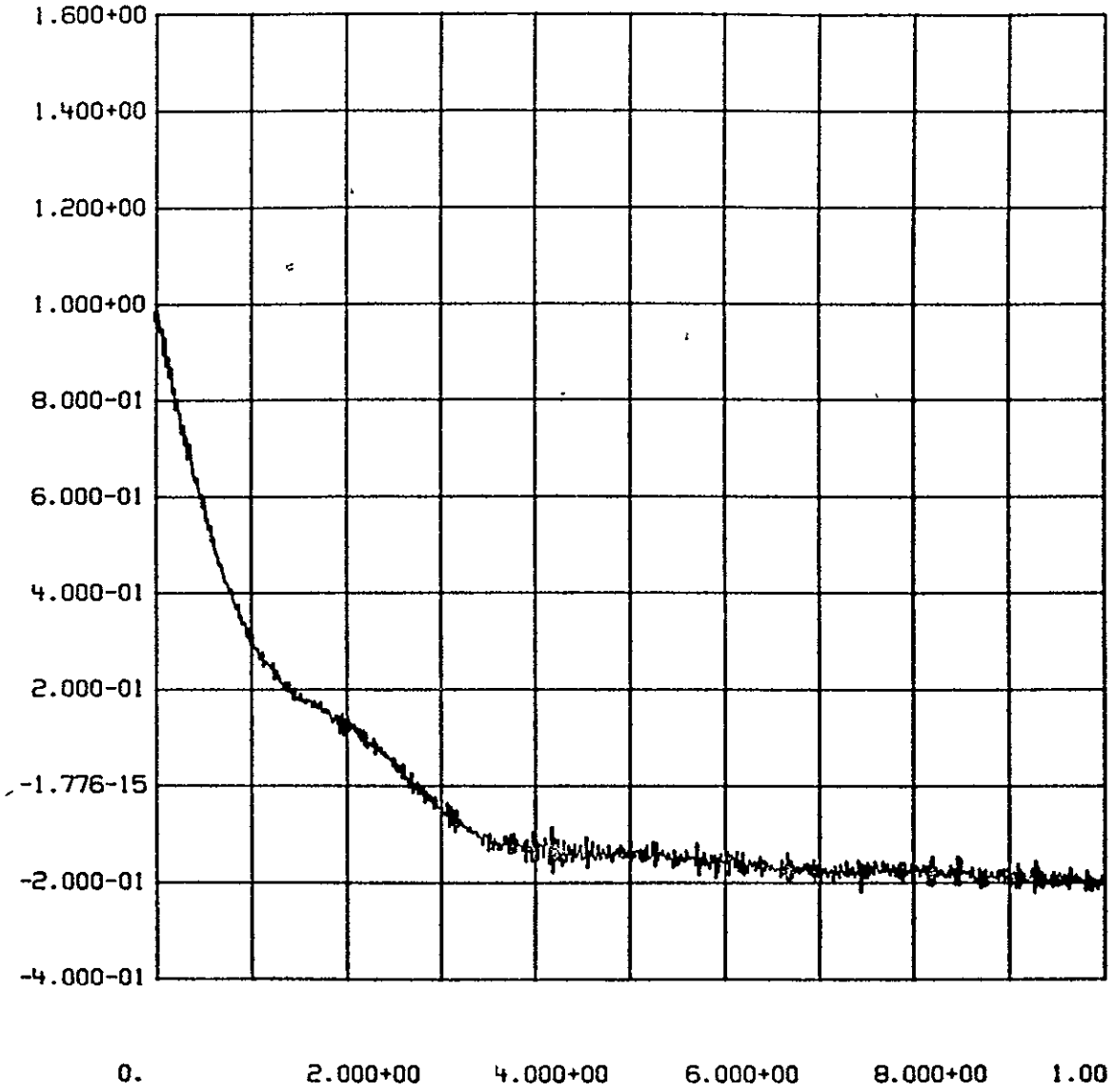
AC YAC VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.7-2 * UNFILT *



AC XAC VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.7-2 * UNFILT *

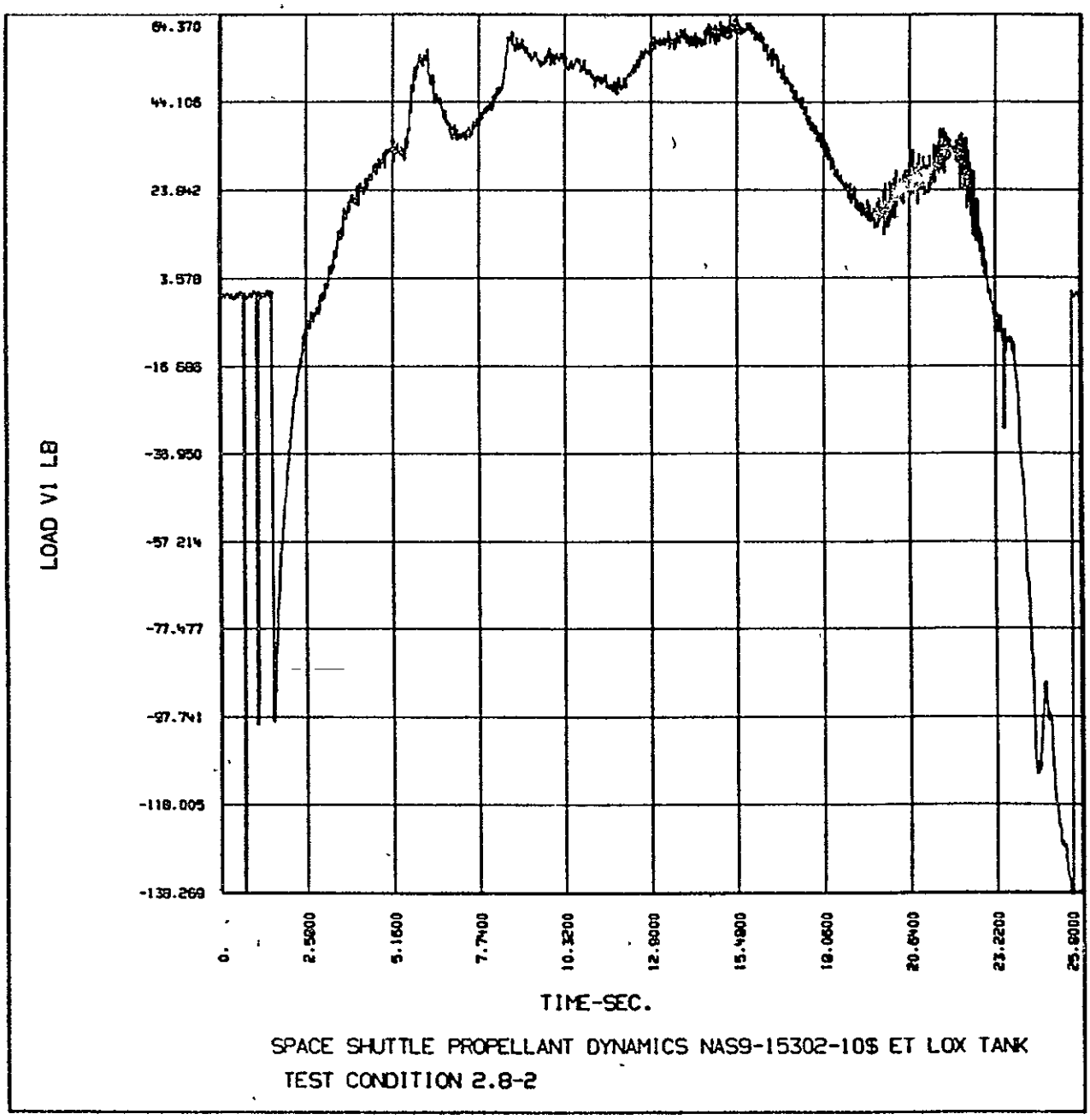


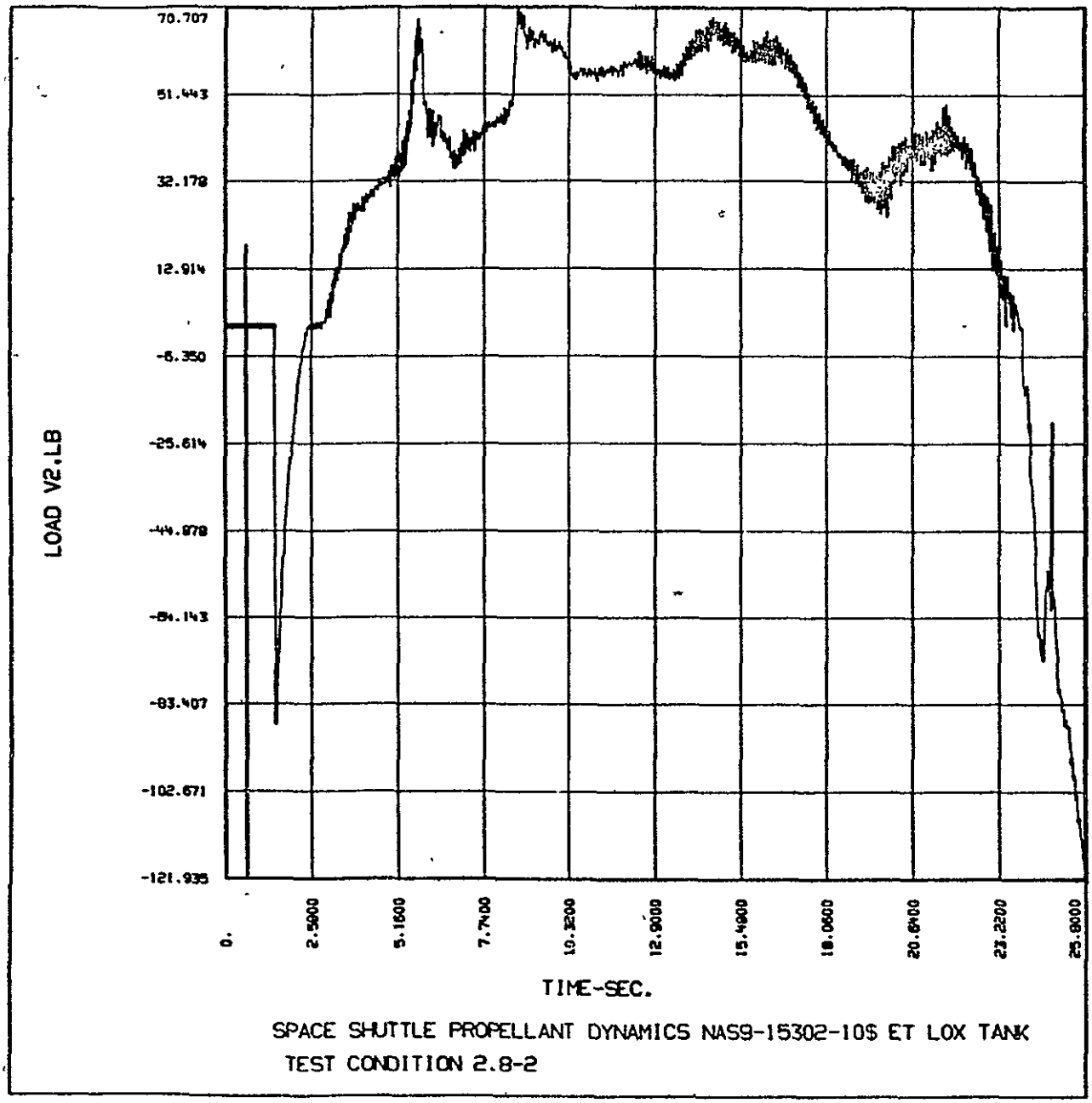
AC ZAC VS TIME

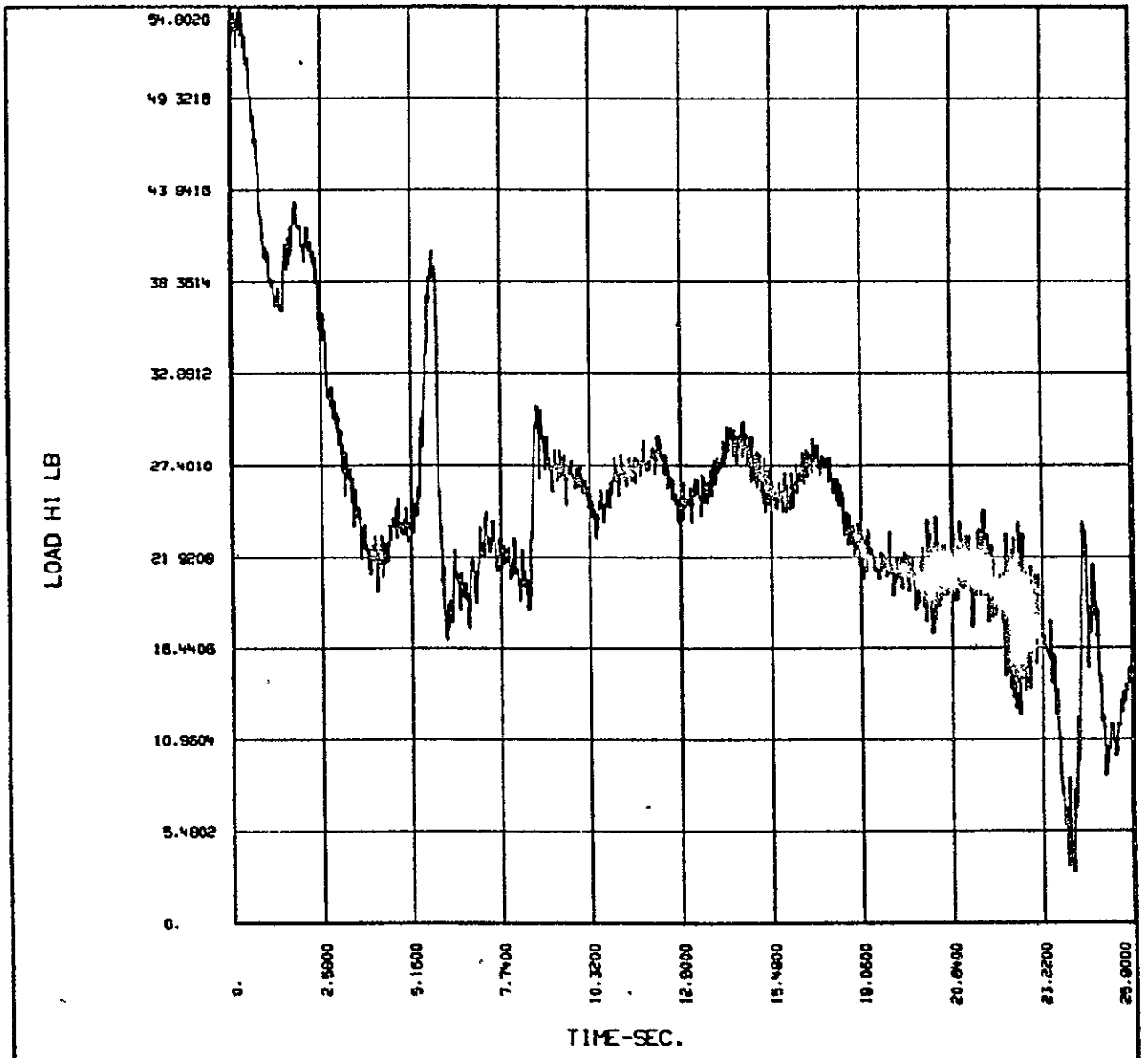
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.7-2 * UNFILT *

Test Data Condition 2.8-2

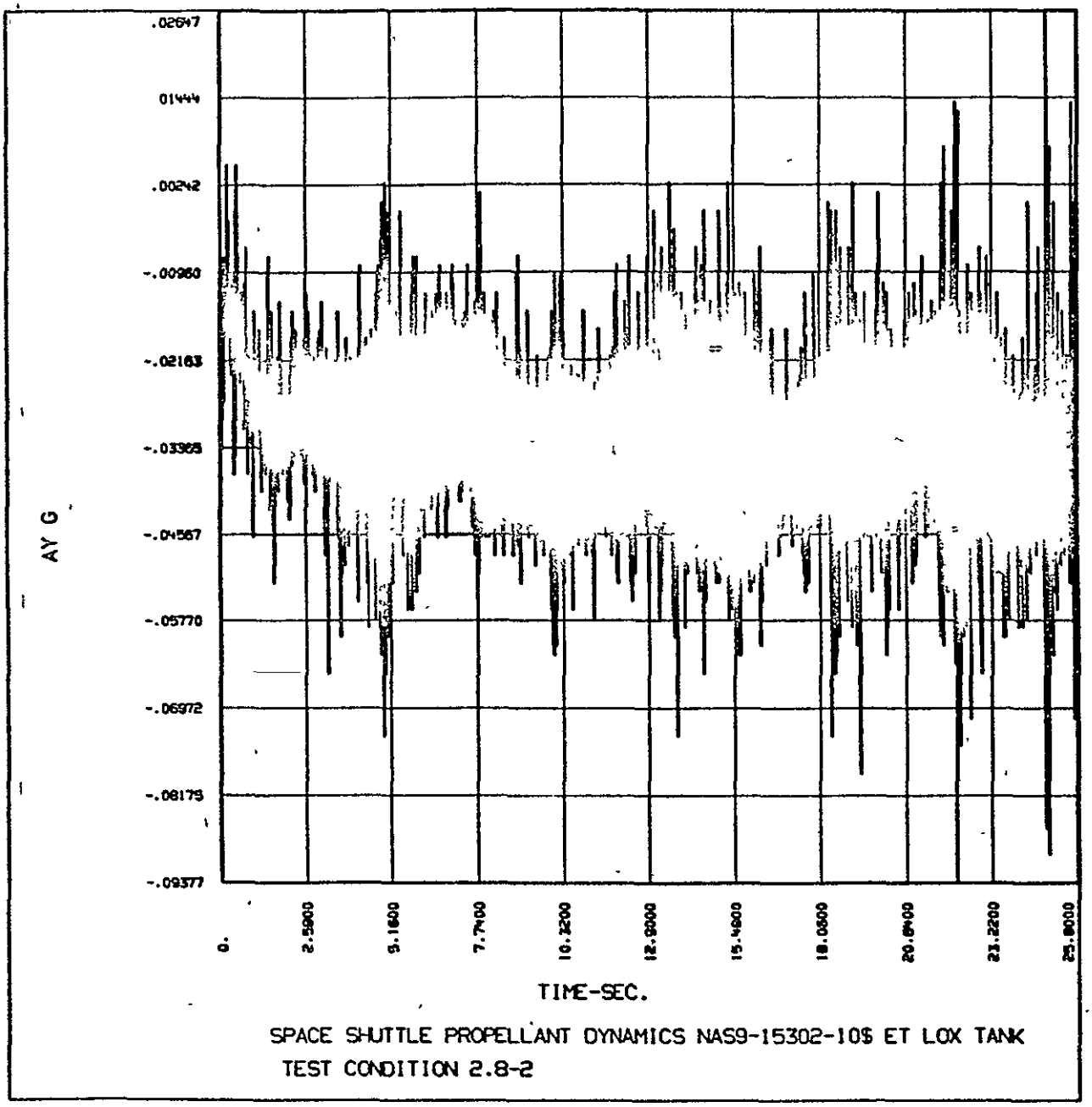
Baffles
Test Fluid – FC 113
Orientation – 13°
Fill Volume – 15%
Target Acceleration–0 2 g

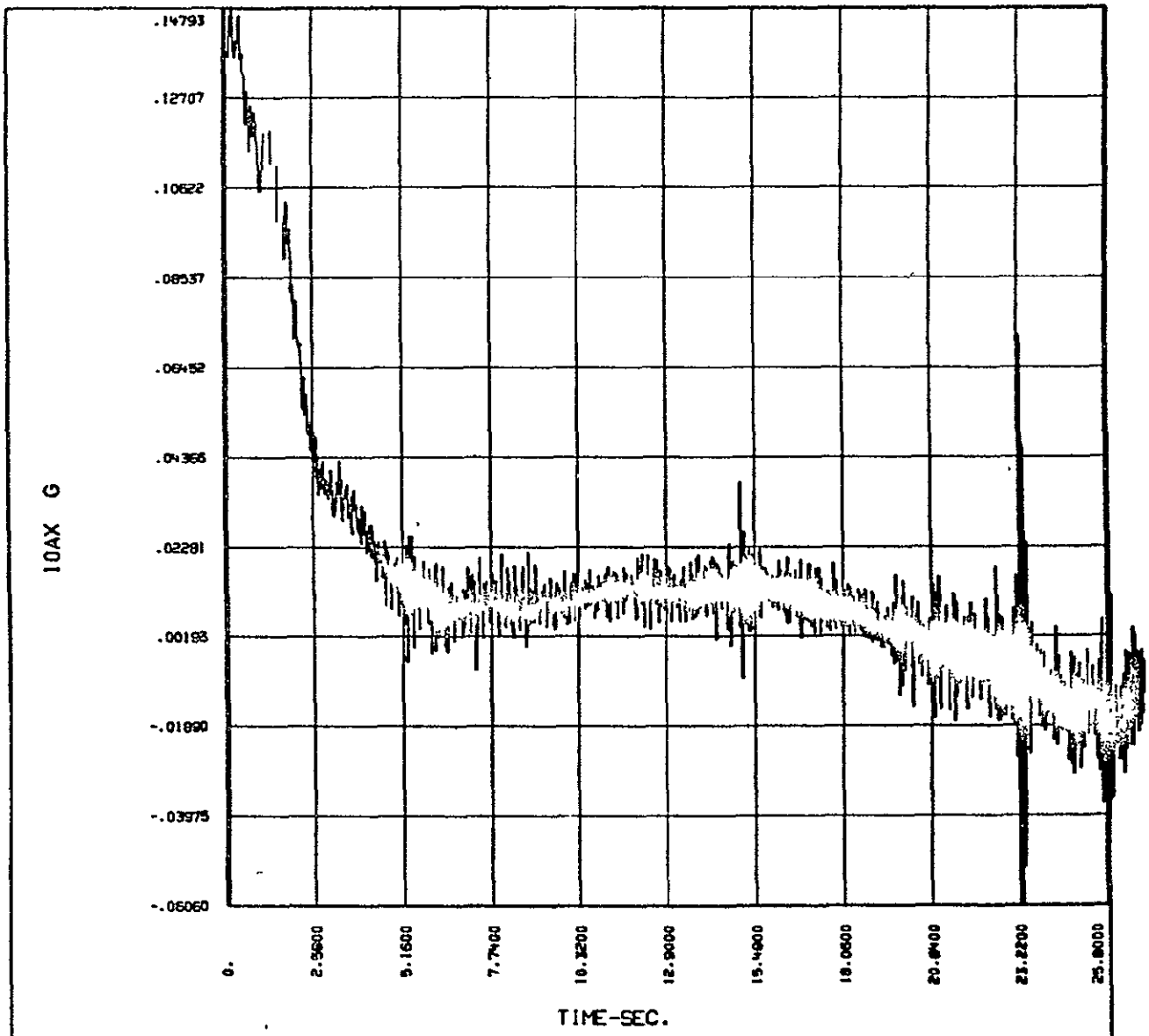

64.370
44.106
23.842
3.578
-16.686
-38.950
-57.214
-77.477
-97.741
-118.005
-138.269
LOAD V1 LB
0.
2.5800
5.1600
7.7400
10.3200
12.9000
15.4800
18.0600
20.6400
23.2200
25.8000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.8-2


70.707
51.443
32.178
12.914
-6.350
-25.614
-44.878
-64.143
-83.407
-102.671
-121.935
LOAD V2,LB
0.
2.5800
5.1600
7.7400
10.3200
12.9000
15.4800
18.0600
20.6400
23.2200
25.8000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.8-2

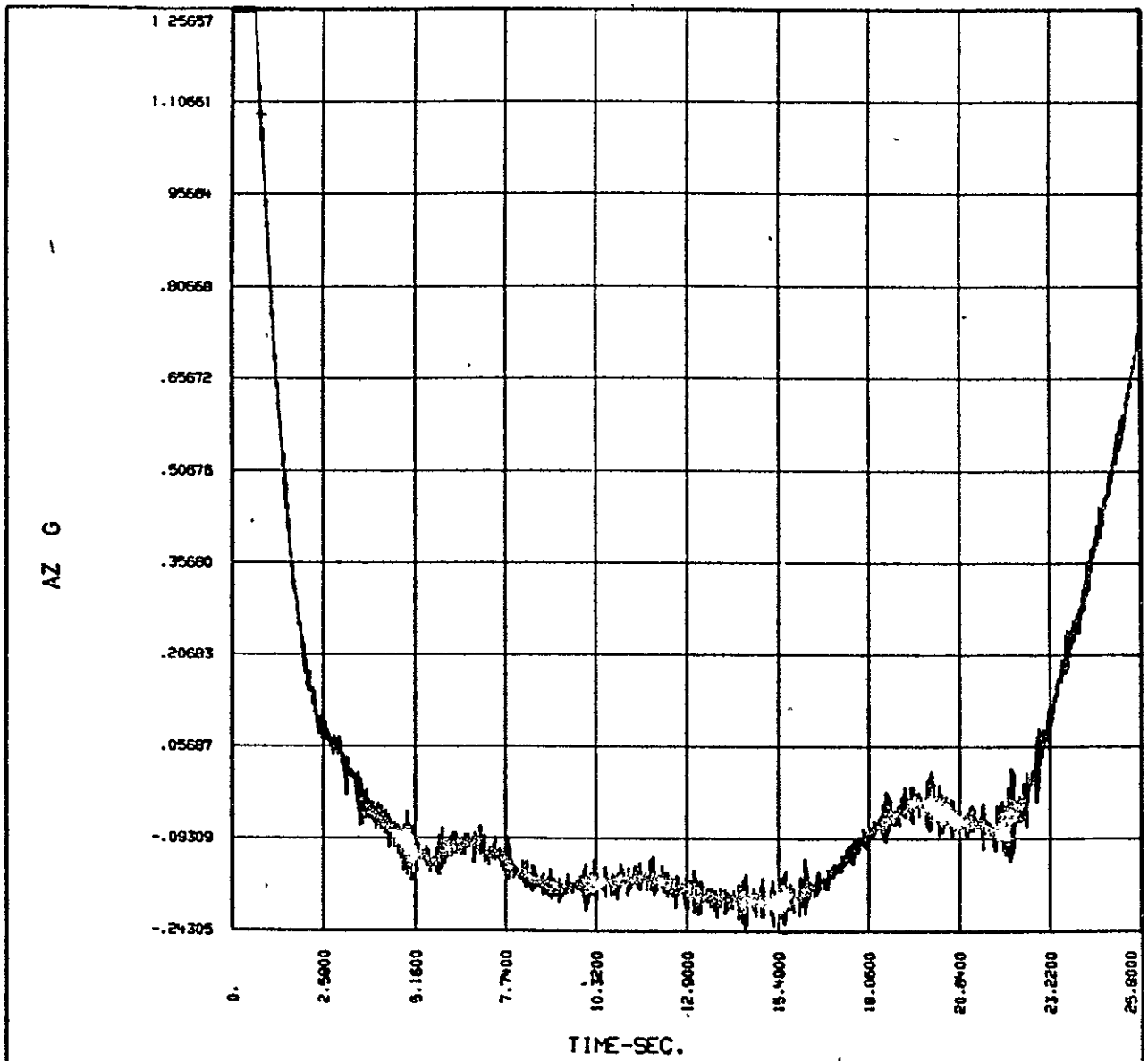


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.8-2

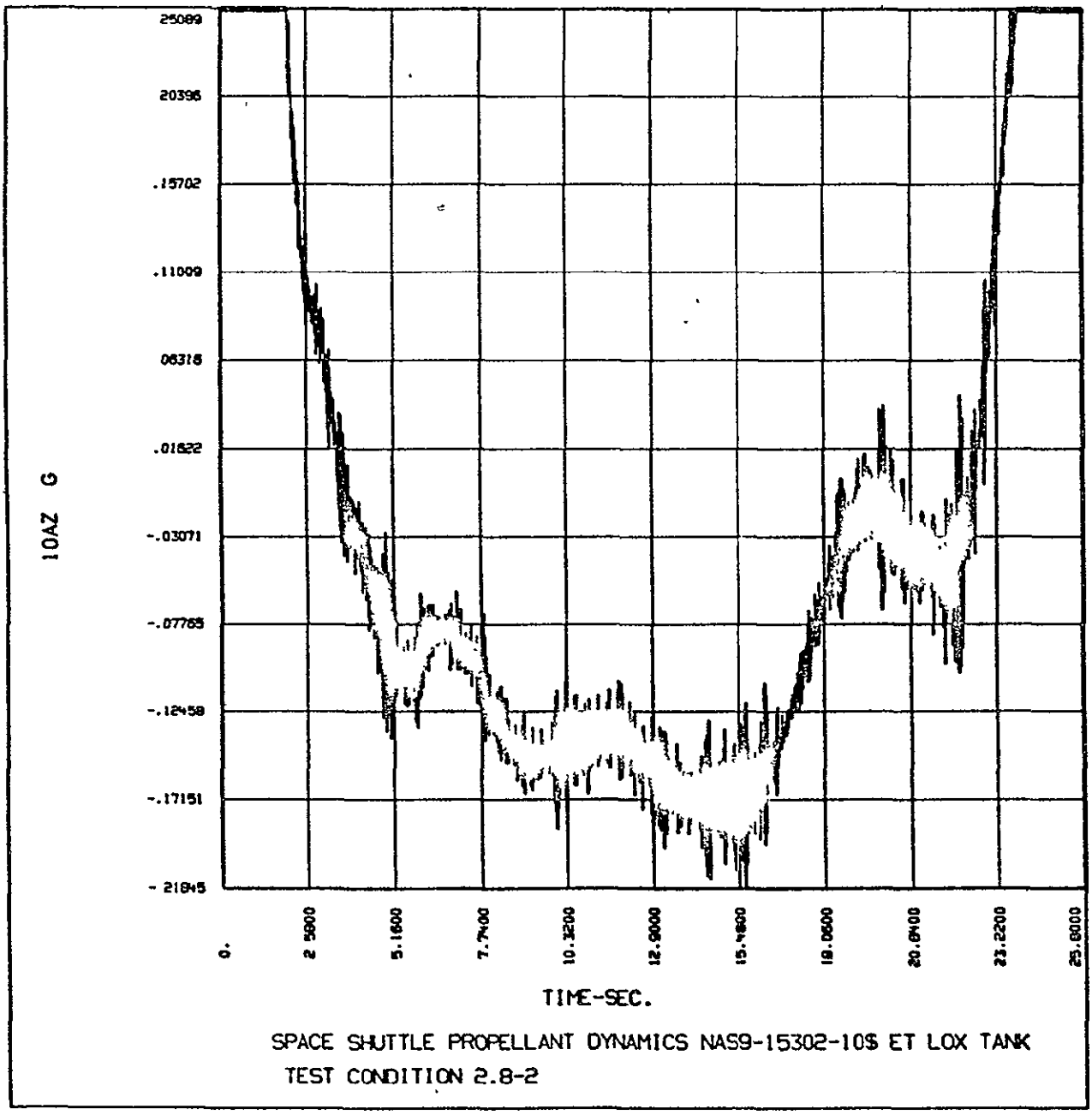

.02647
01444
.00242
-.00960
-.02163
-.03365
-.04567
-.05770
-.06972
-.08175
-.09377
AY G
0.
2.5900
5.1800
7.7400
10.3200
12.9000
15.4800
18.0600
20.6400
23.2200
25.8000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.8-2



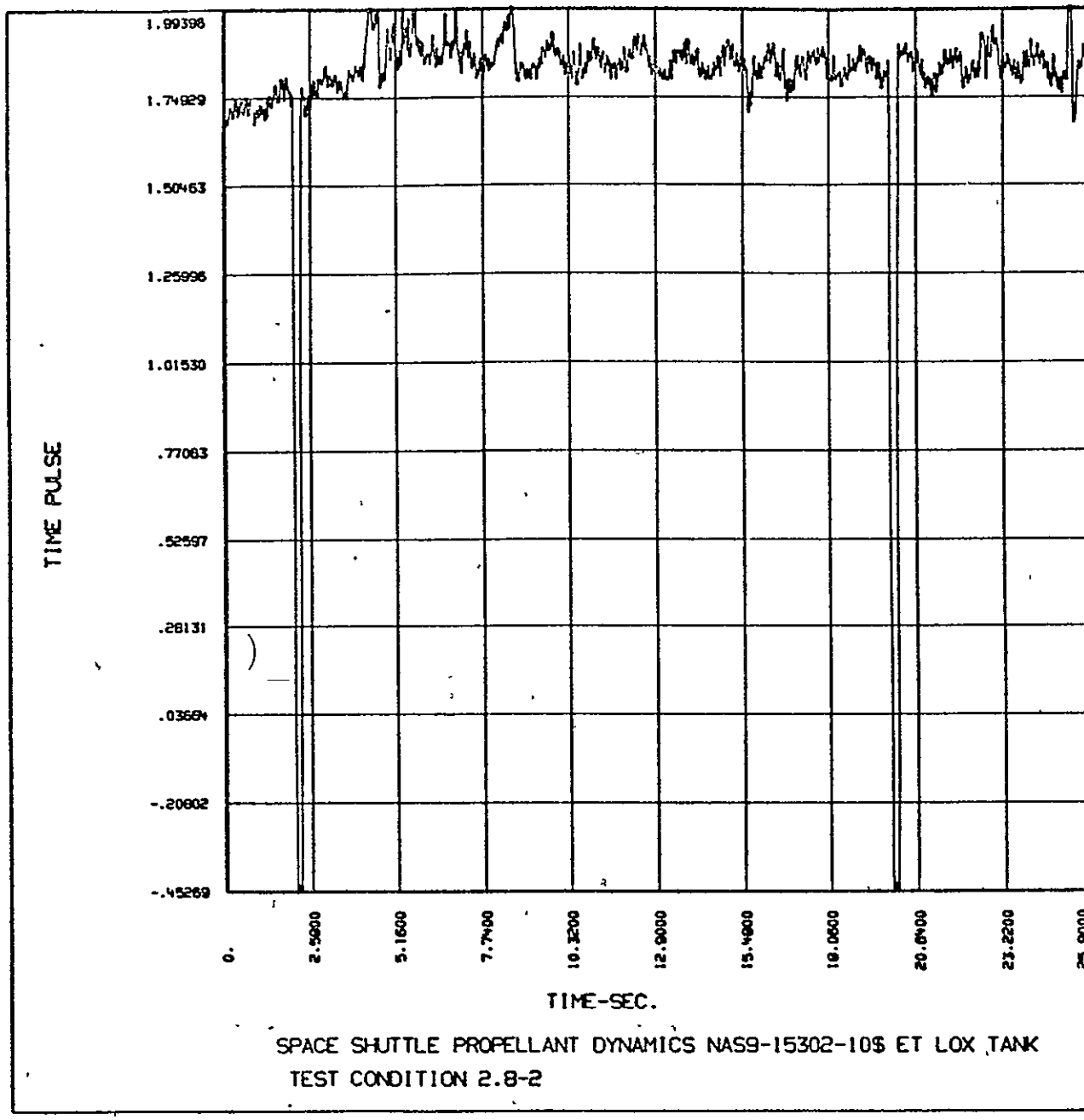
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.8-2

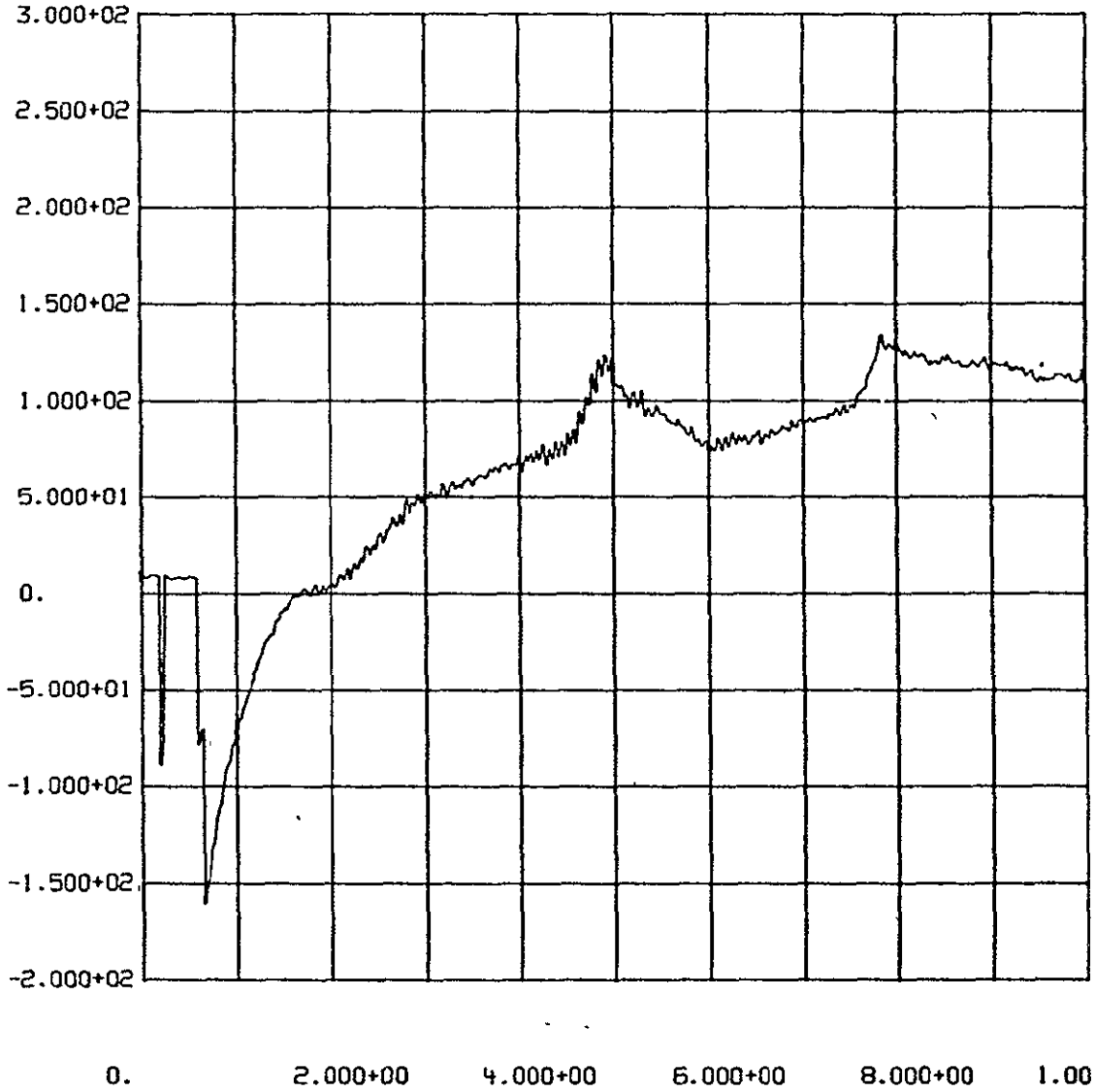


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.8-2



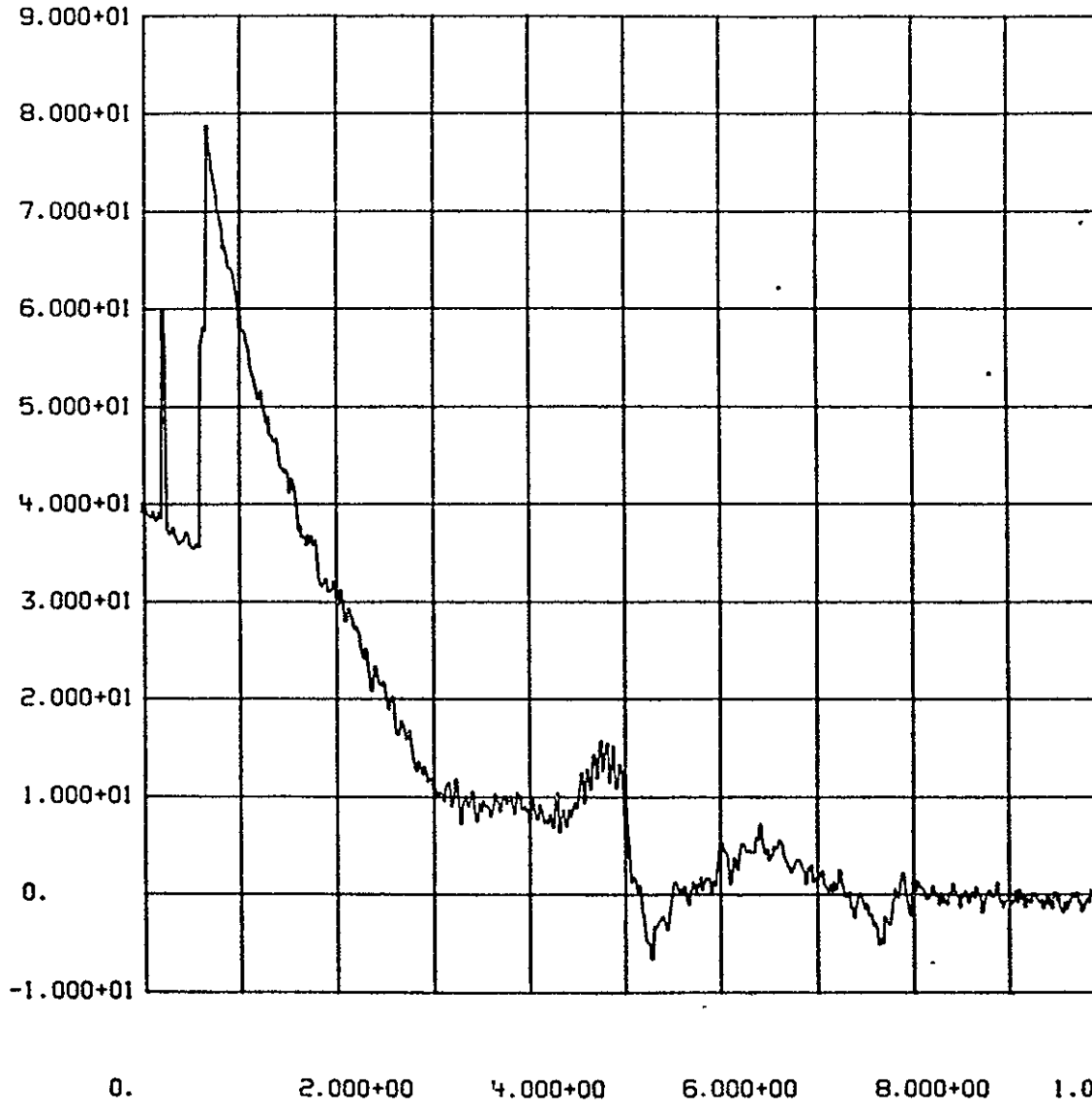
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.8-2


1.99398
1.74929
1.50463
1.25996
1.01530
.77063
.52597
.28131
.03664
-.20802
-.45269
TIME PULSE
0.
2.5800
5.1600
7.7400
10.3200
12.9000
15.4800
18.0600
20.6400
23.2200
25.8000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 2.8-2



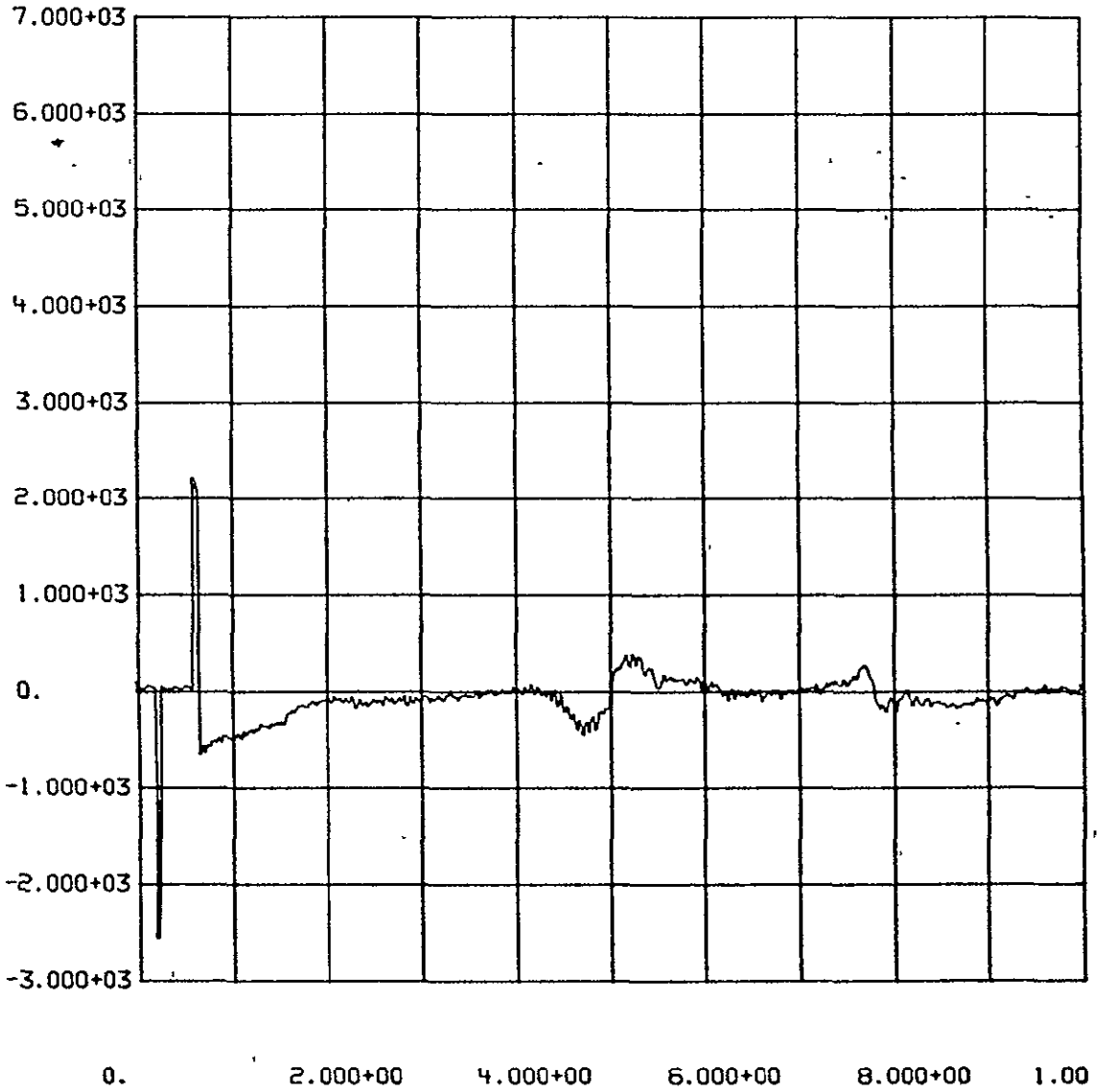
Z-LOAD VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.8-2 * UNFILT *



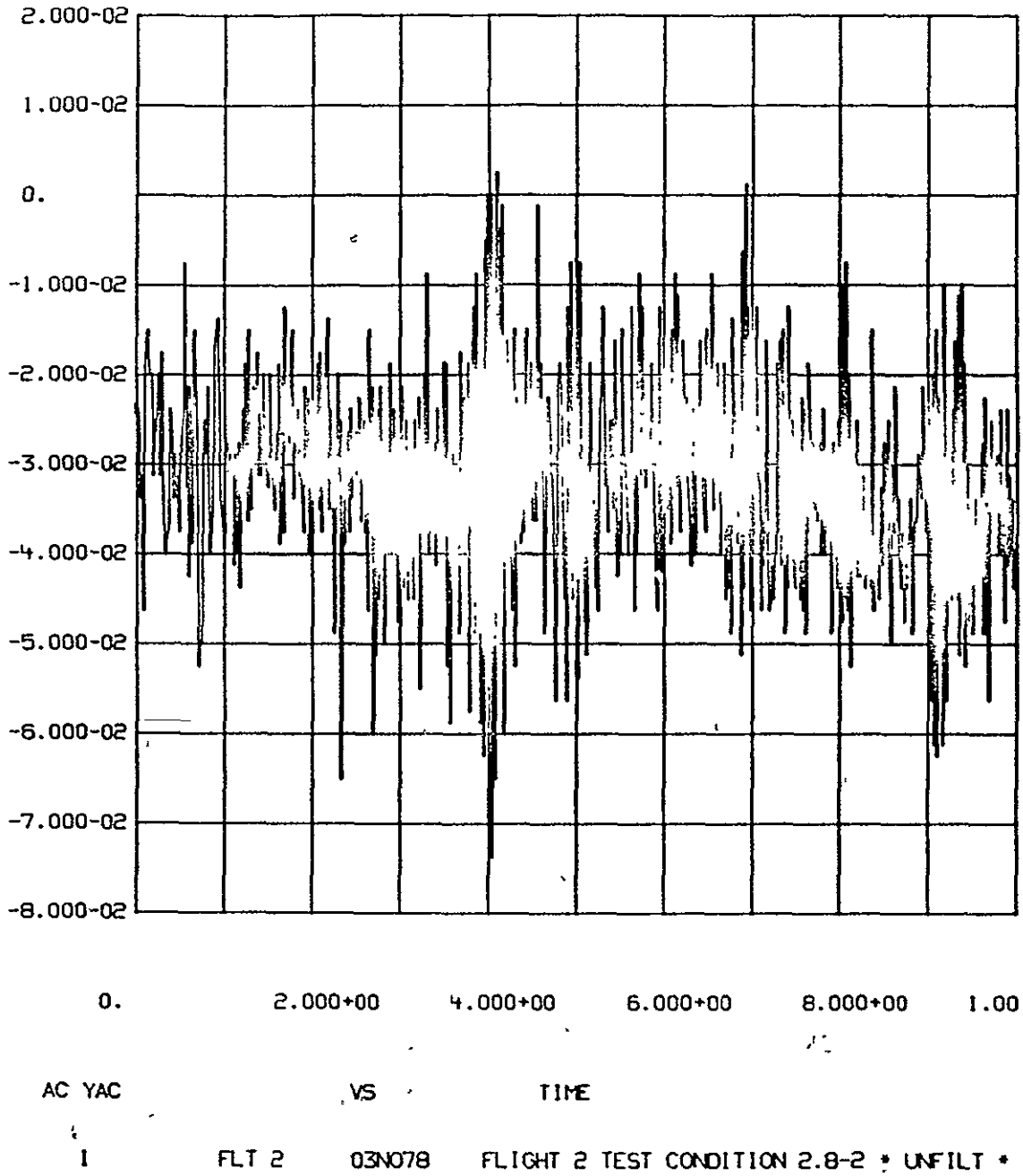
Y-LOAD VS TIME

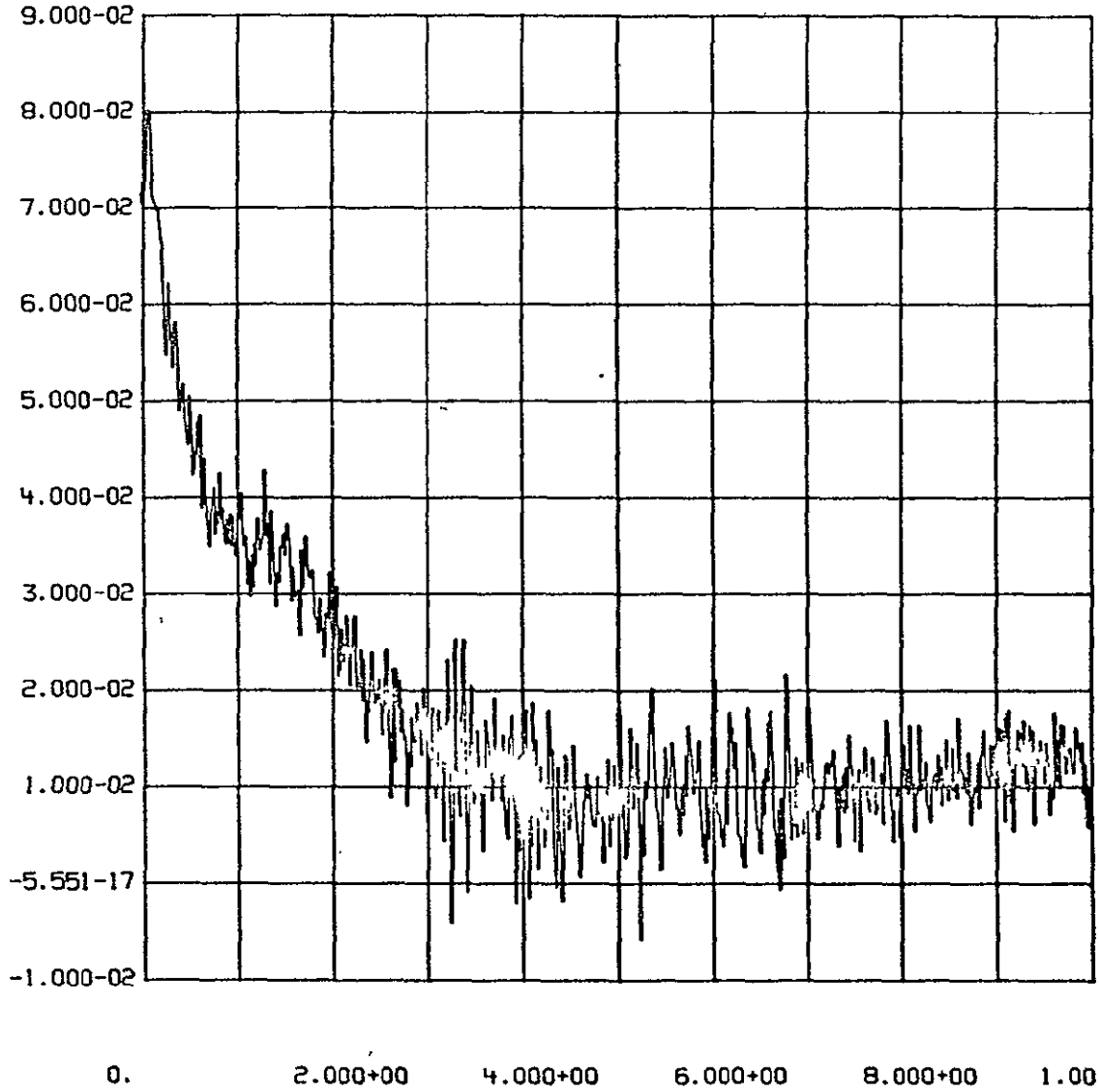
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.8-2 * UNFILT *



MOMENT VS TIME

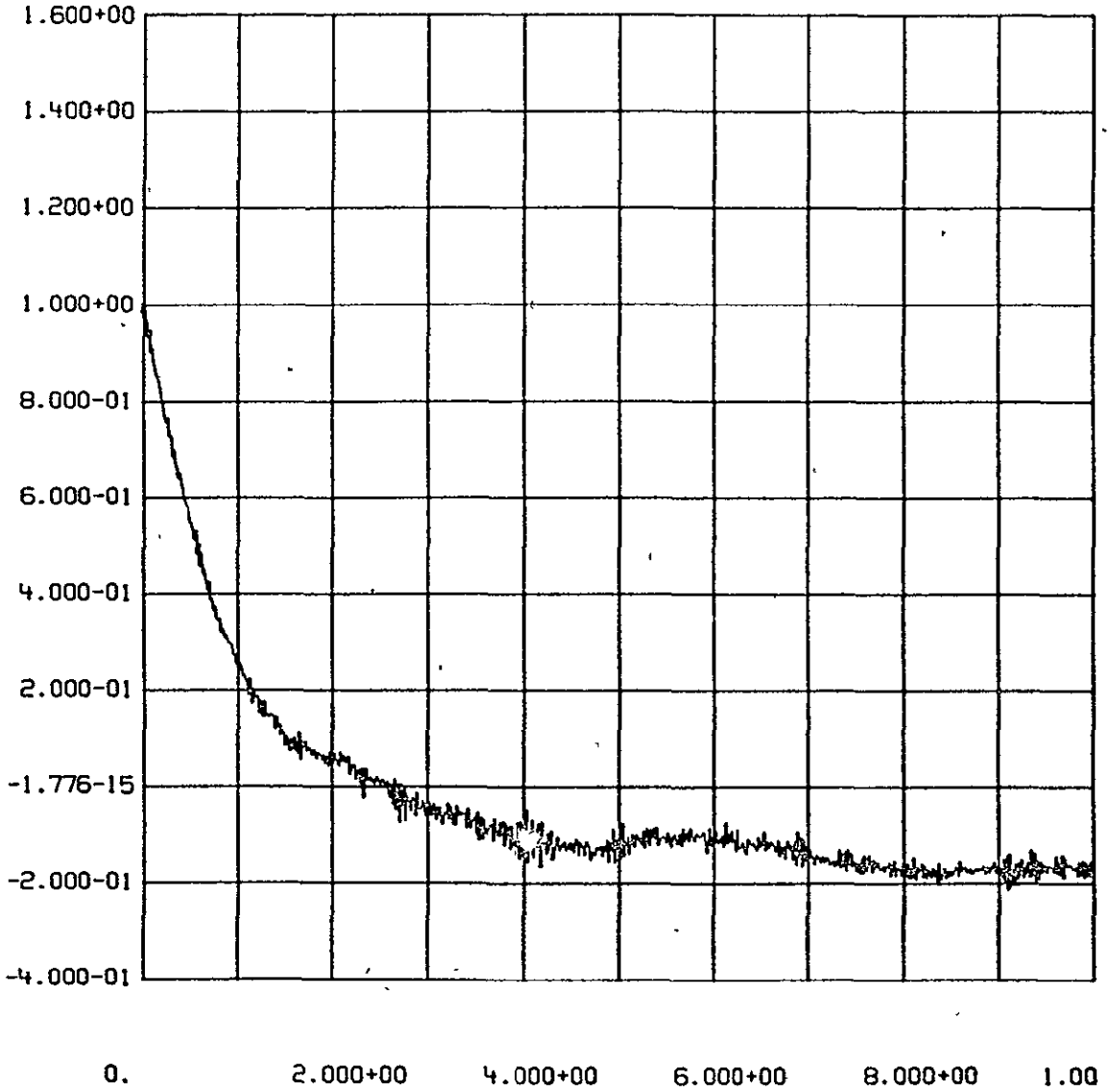
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.8-2 * UNFILT *


2.000-02
1.000-02
0.
-1.000-02
-2.000-02
-3.000-02
-4.000-02
-5.000-02
-6.000-02
-7.000-02
-8.000-02
0.
2.000+00
4.000+00
6.000+00
8.000+00
1.00
AC YAC
VS
TIME
1
FLT 2
03N078
FLIGHT 2 TEST CONDITION 2.8-2 * UNFILT *



AC XAC VS TIME

1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.8-2 * UNFILT *

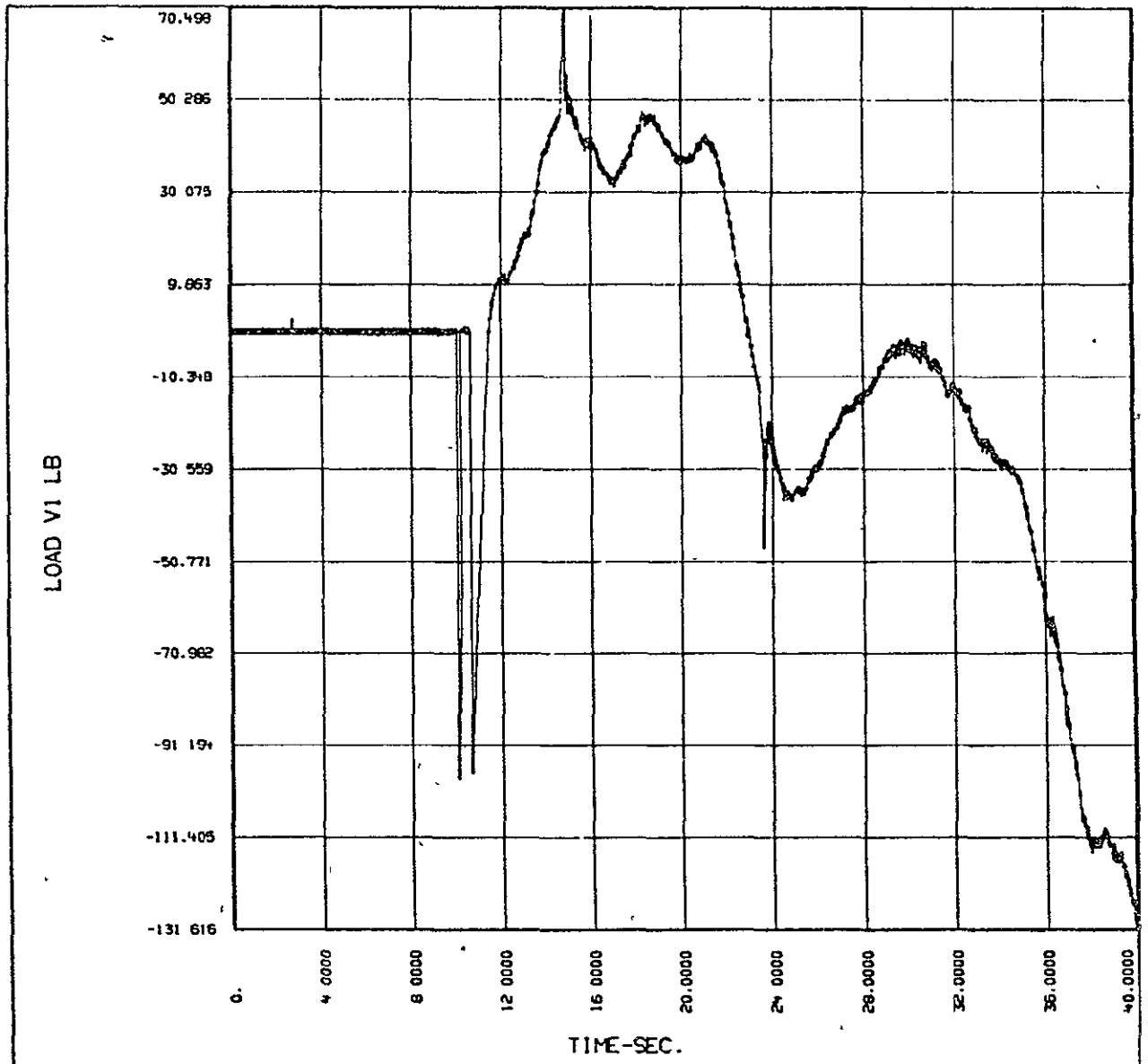


AC ZAC VS TIME

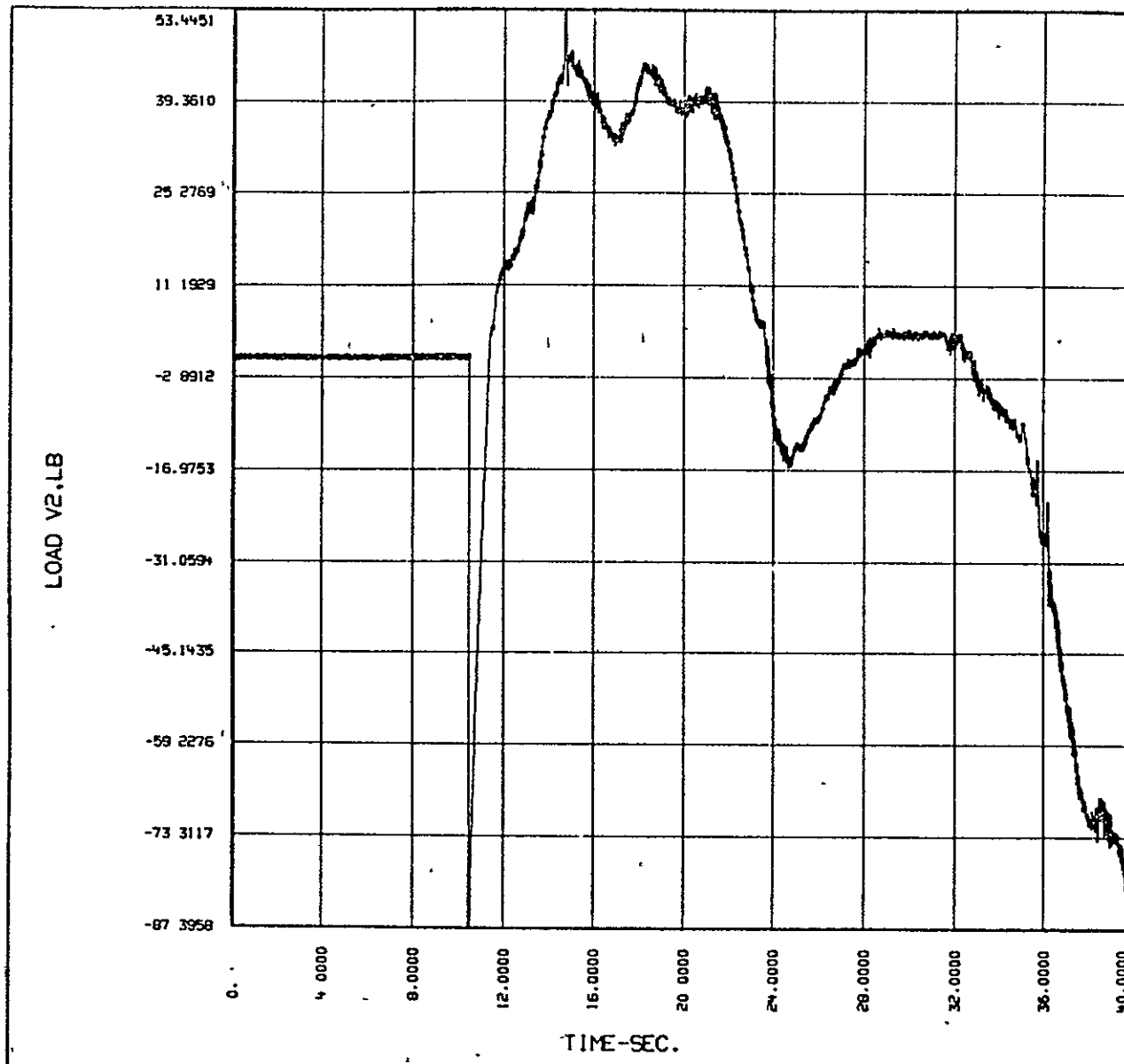
1 FLT 2 03N078 FLIGHT 2 TEST CONDITION 2.8-2 * UNFILT *

Test Data Condition 3.1-1

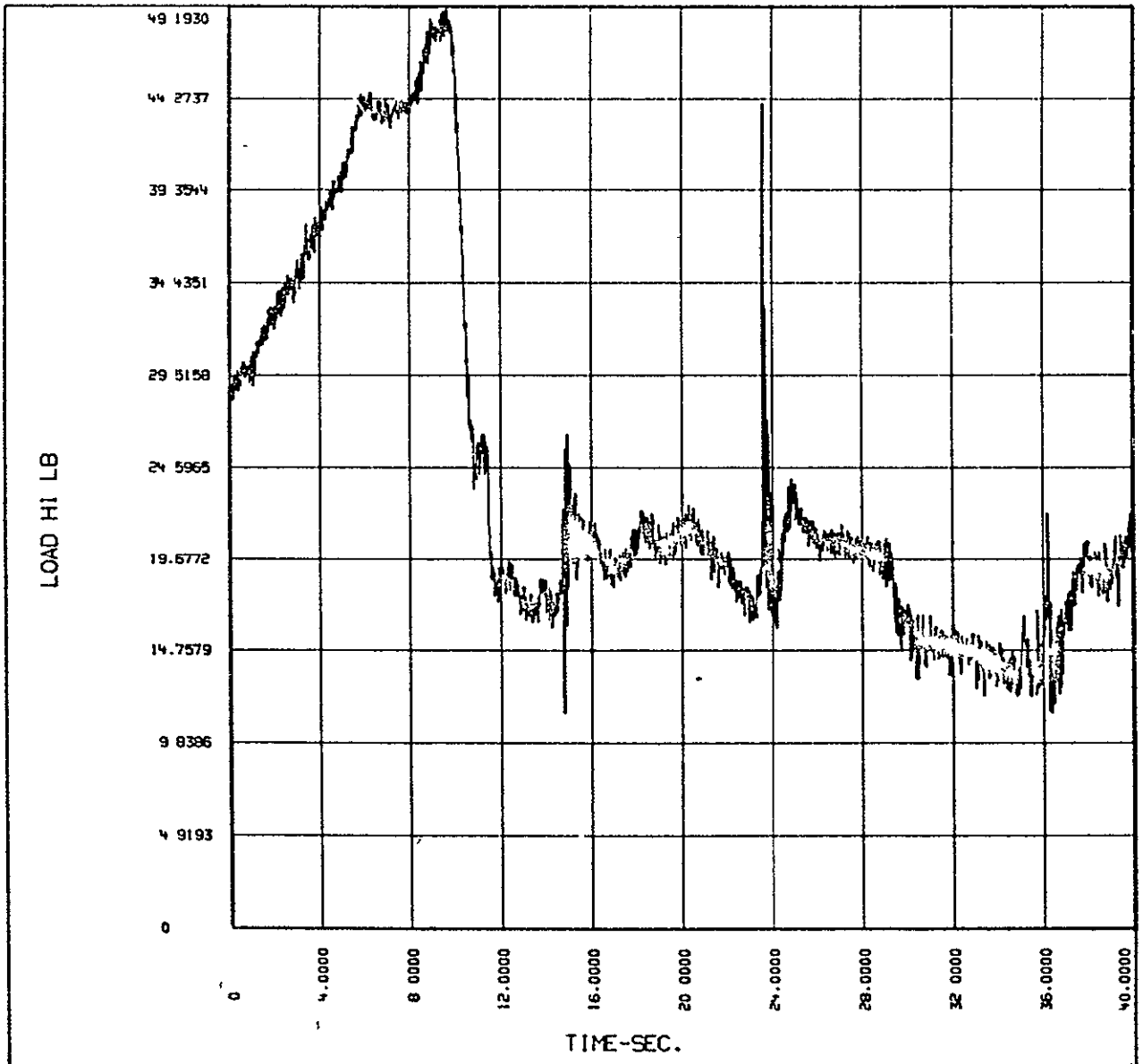
Baffles
Test Fluid – FC 113
Orientation – 30°
Fill Volume – 1%
Target Acceleration–0 2 g



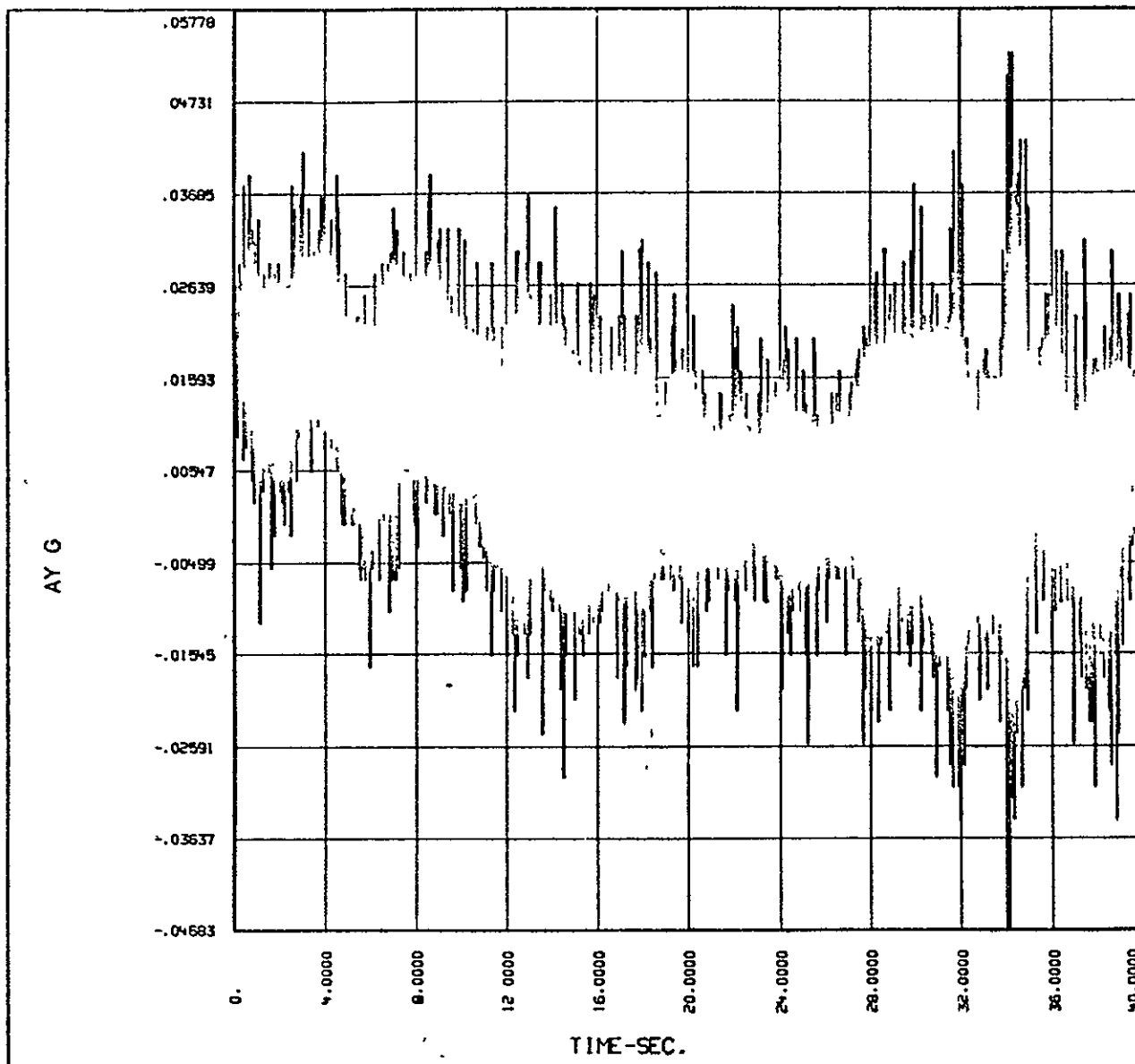
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.1-1



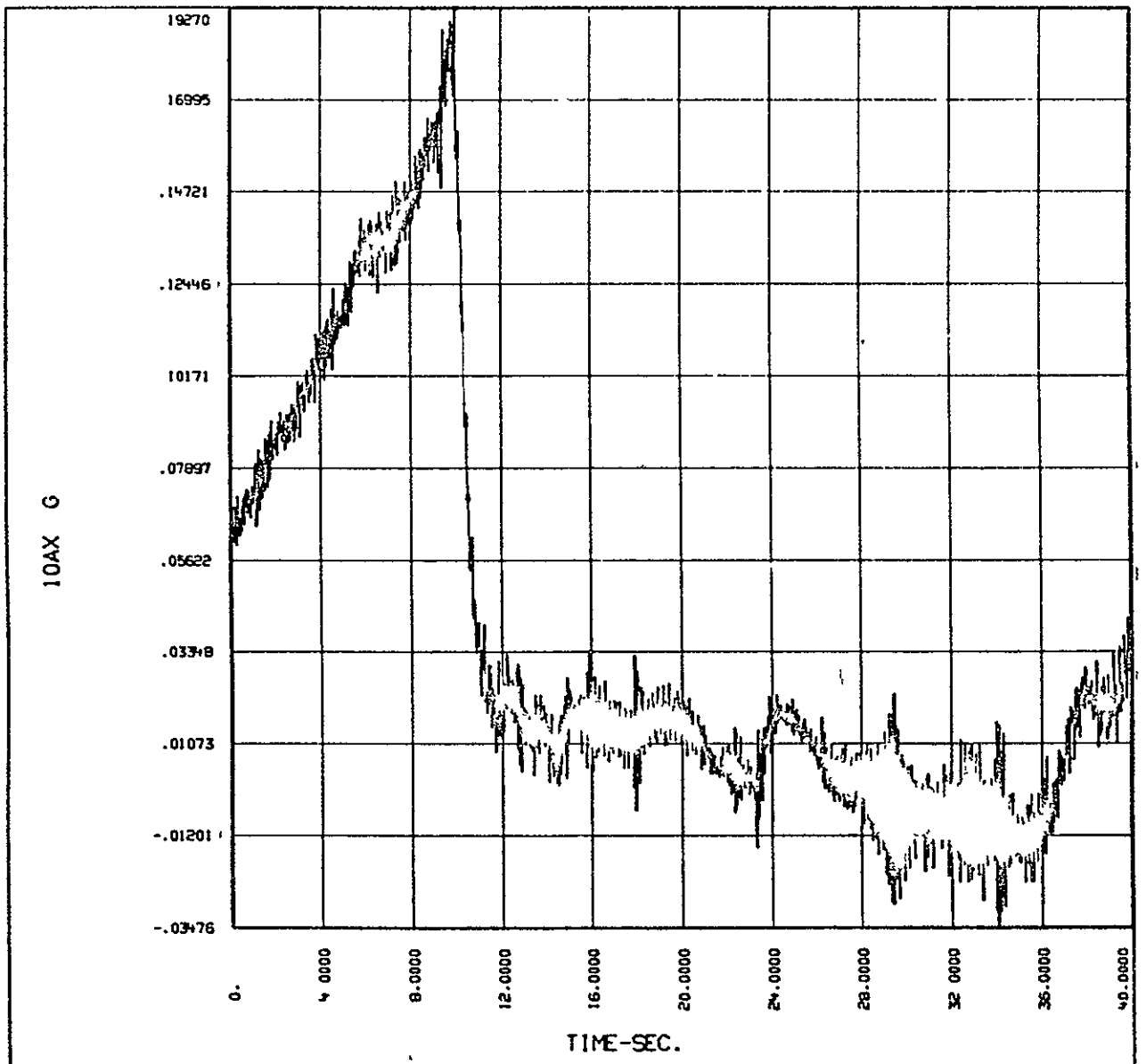
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.1-1



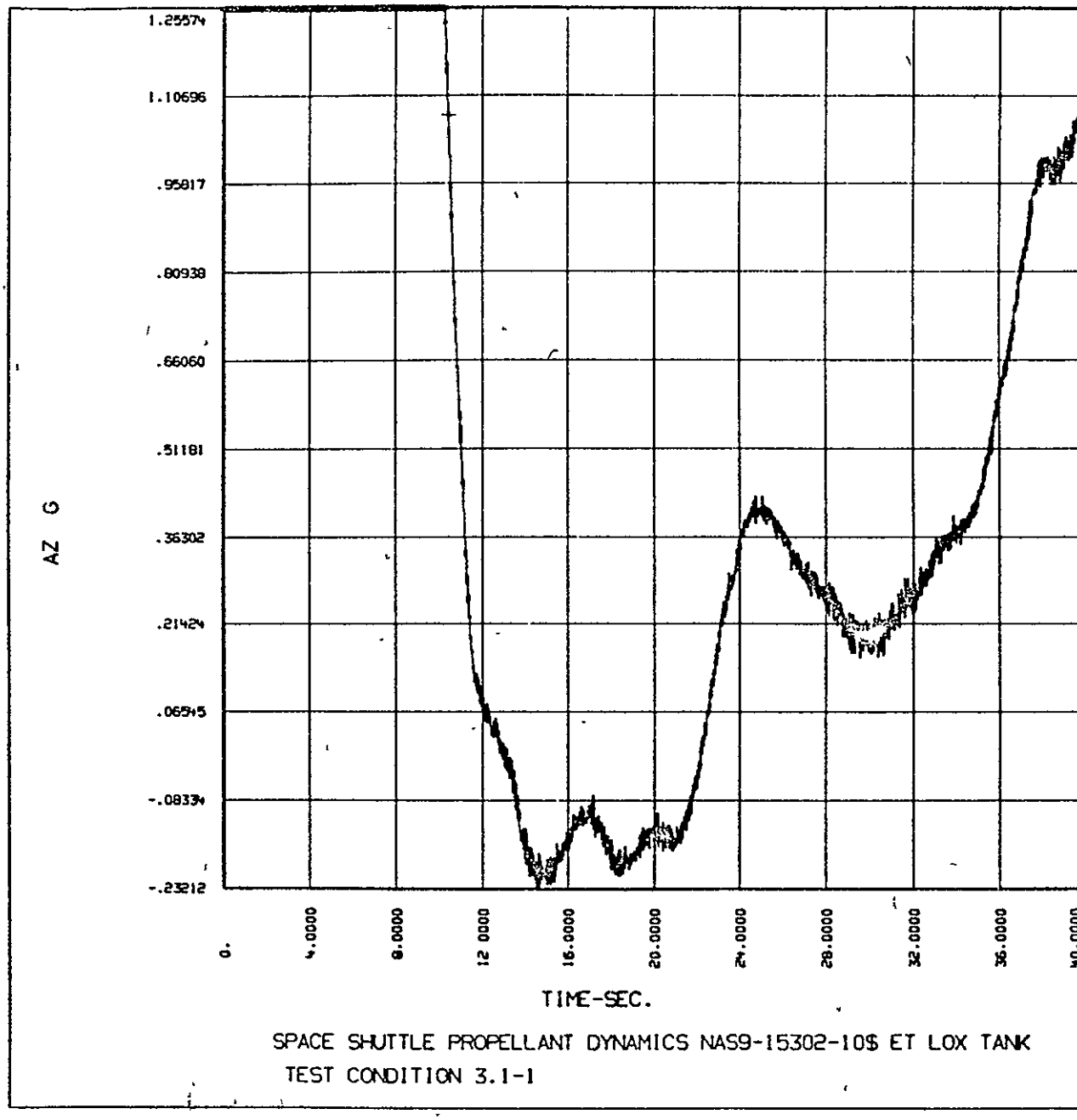
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.1-1

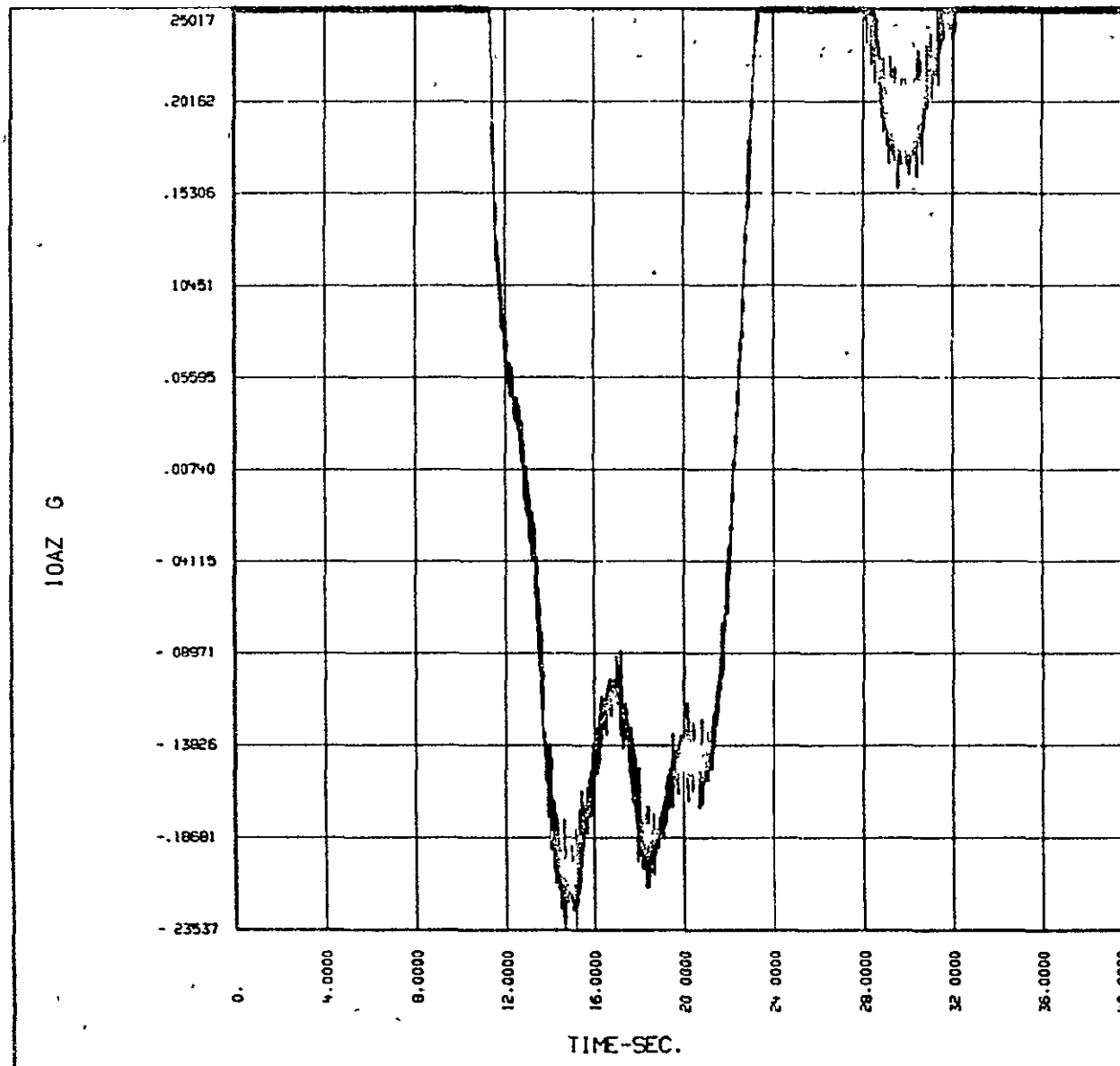


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.1-1

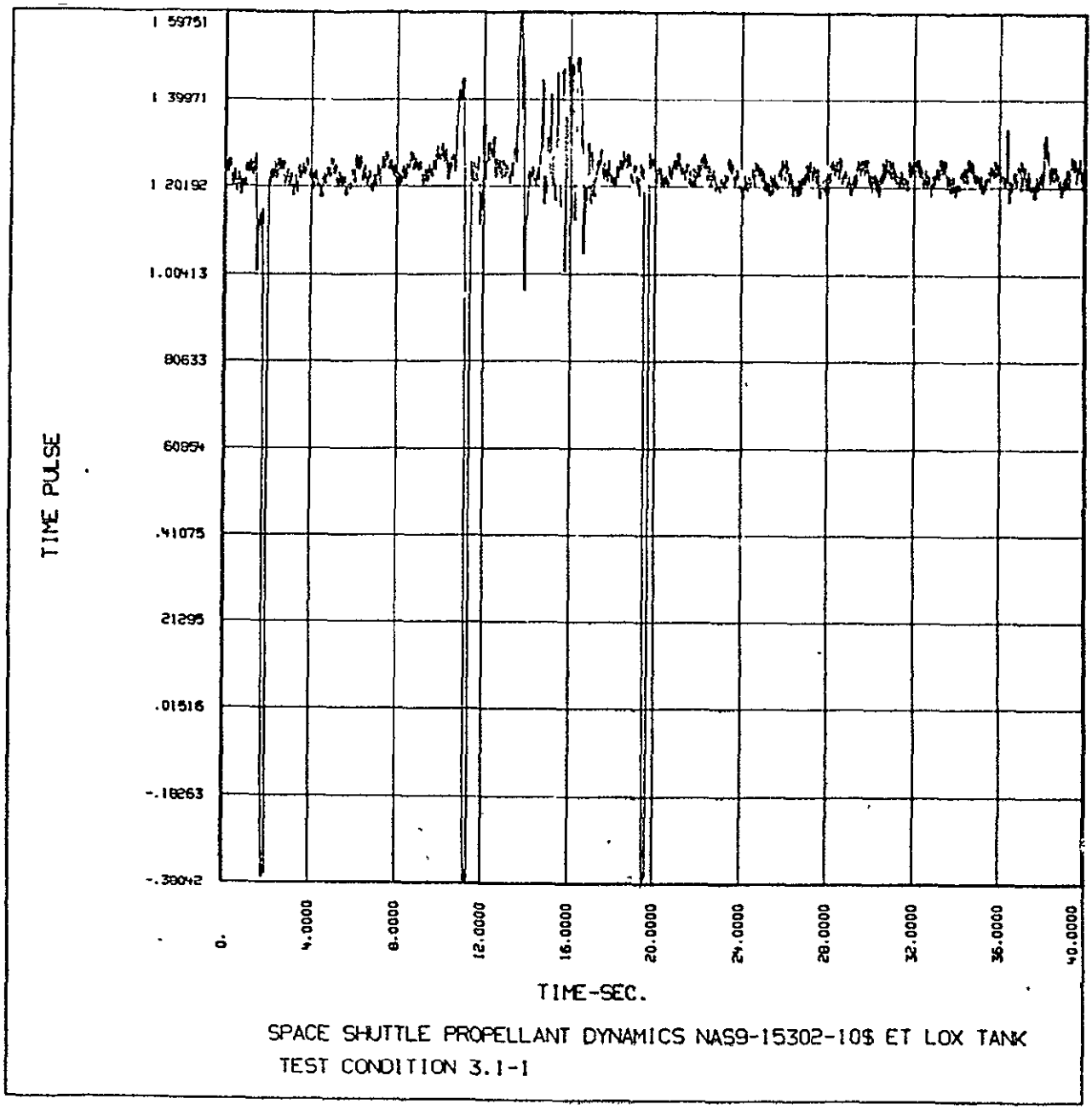


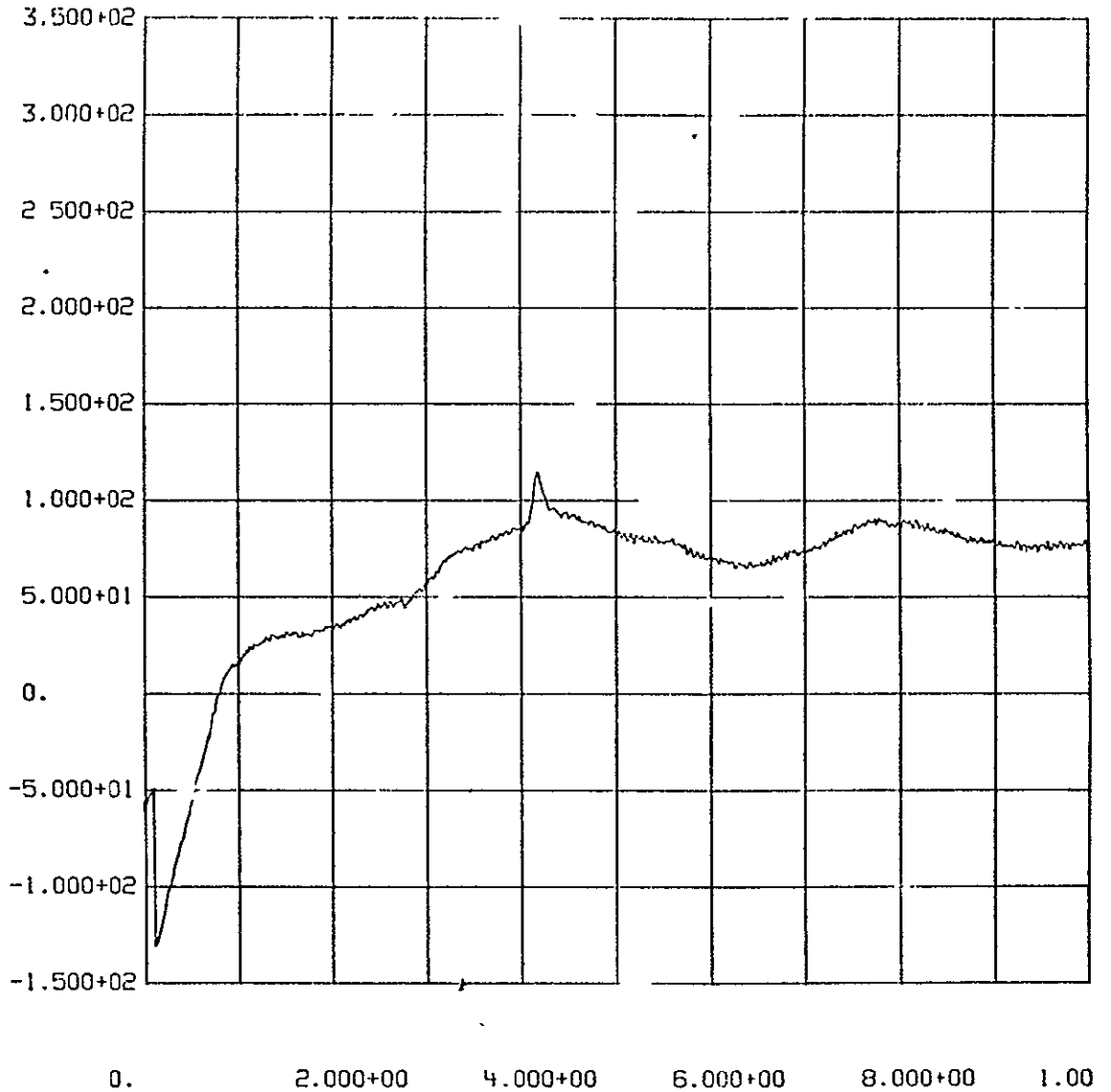
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.1-1


1.25574
1.10696
.95817
.80938
.66060
.51181
.36302
.21424
.06545
-.08334
-.23212
AZ G
0.
4.0000
8.0000
12.0000
16.0000
20.0000
24.0000
28.0000
32.0000
36.0000
40.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.1-1



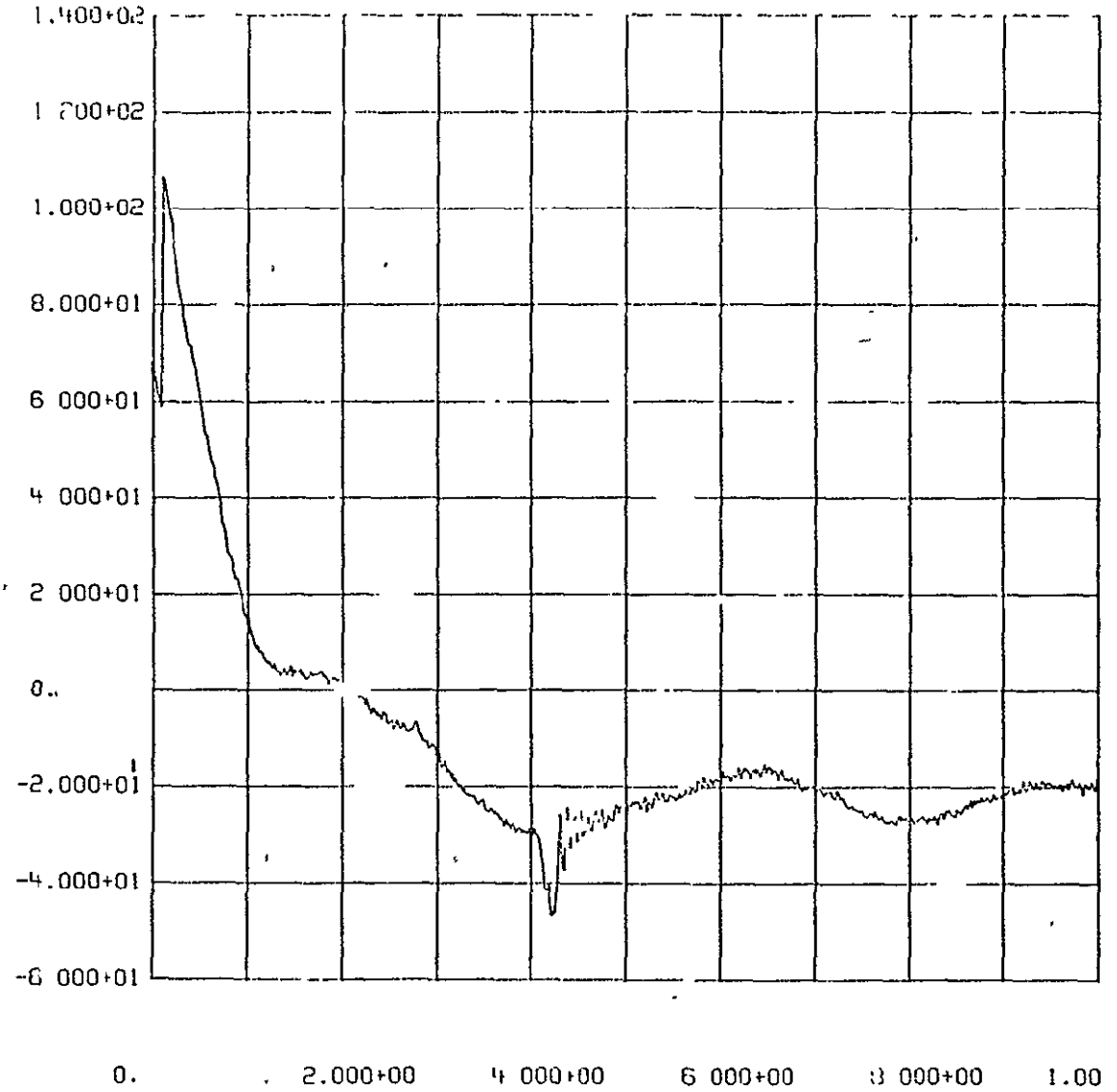
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.1-1


1 59751
1 39971
1 20192
1.00413
80633
60854
.41075
21295
.01516
-.18263
-.38042
TIME PULSE
0.
4.0000
8.0000
12.0000
16.0000
20.0000
24.0000
28.0000
32.0000
36.0000
40.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.1-1



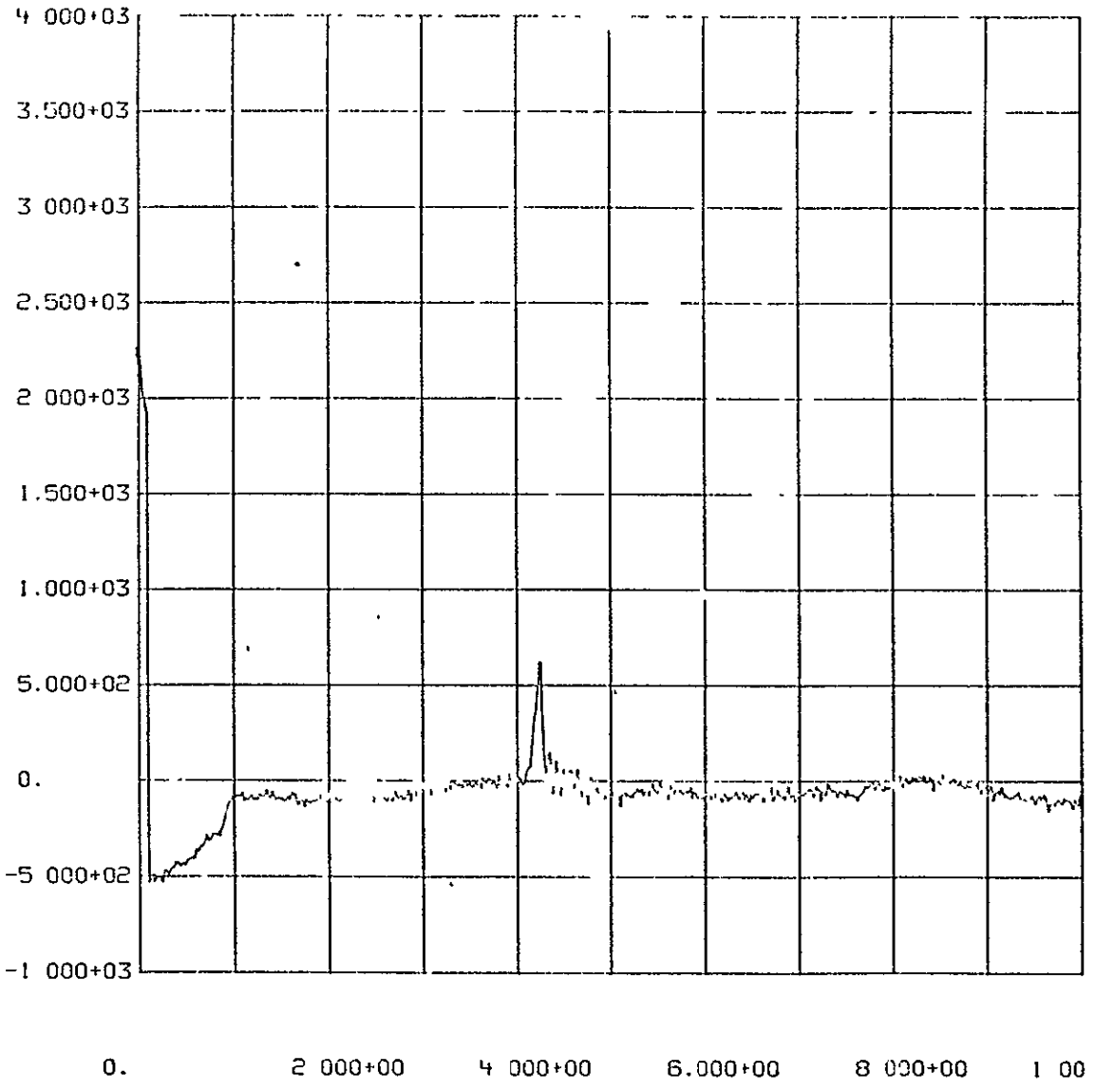
Z-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.1-1 * UNFILT *



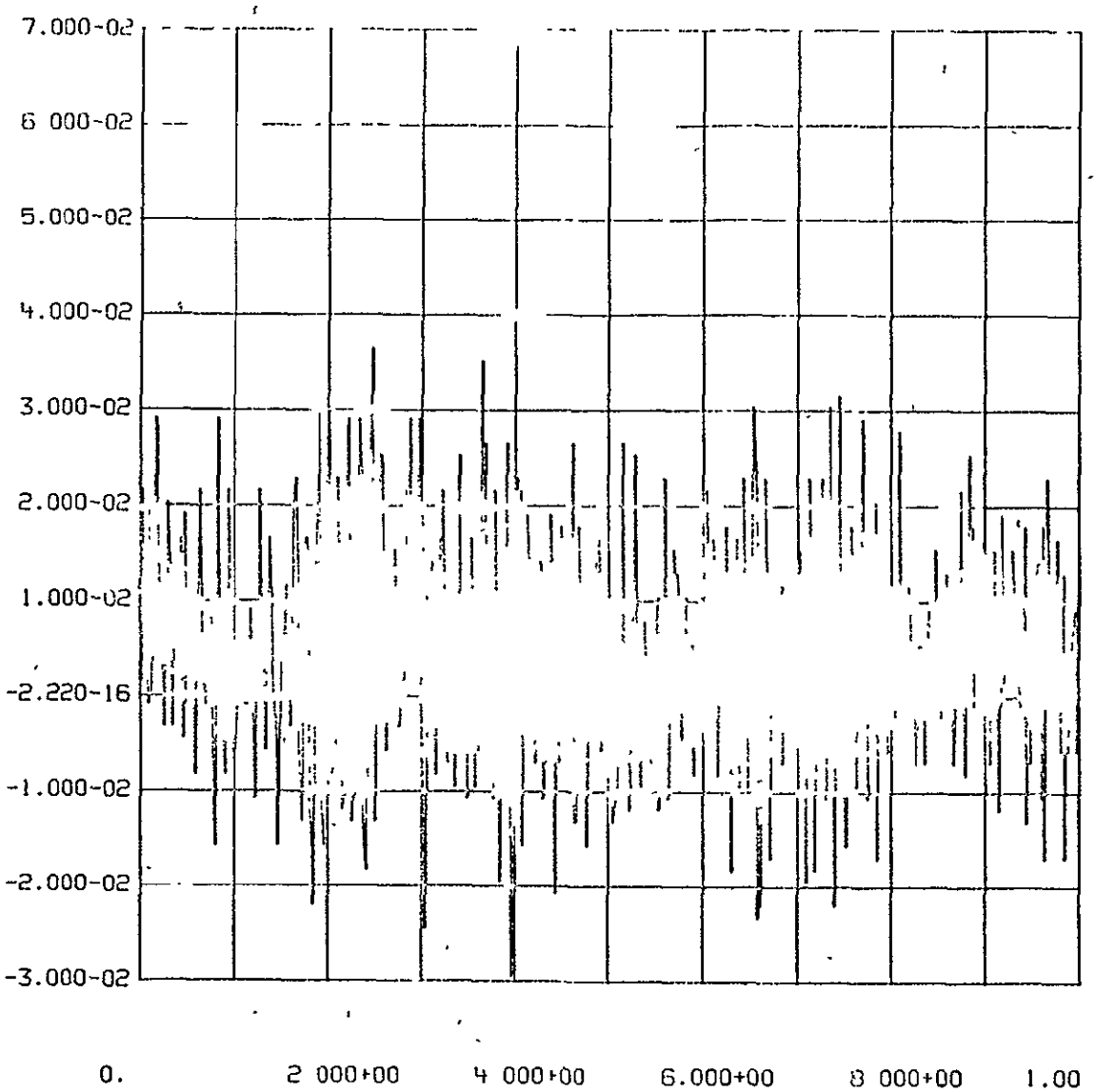
Y-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.1-1 * UNFILT *



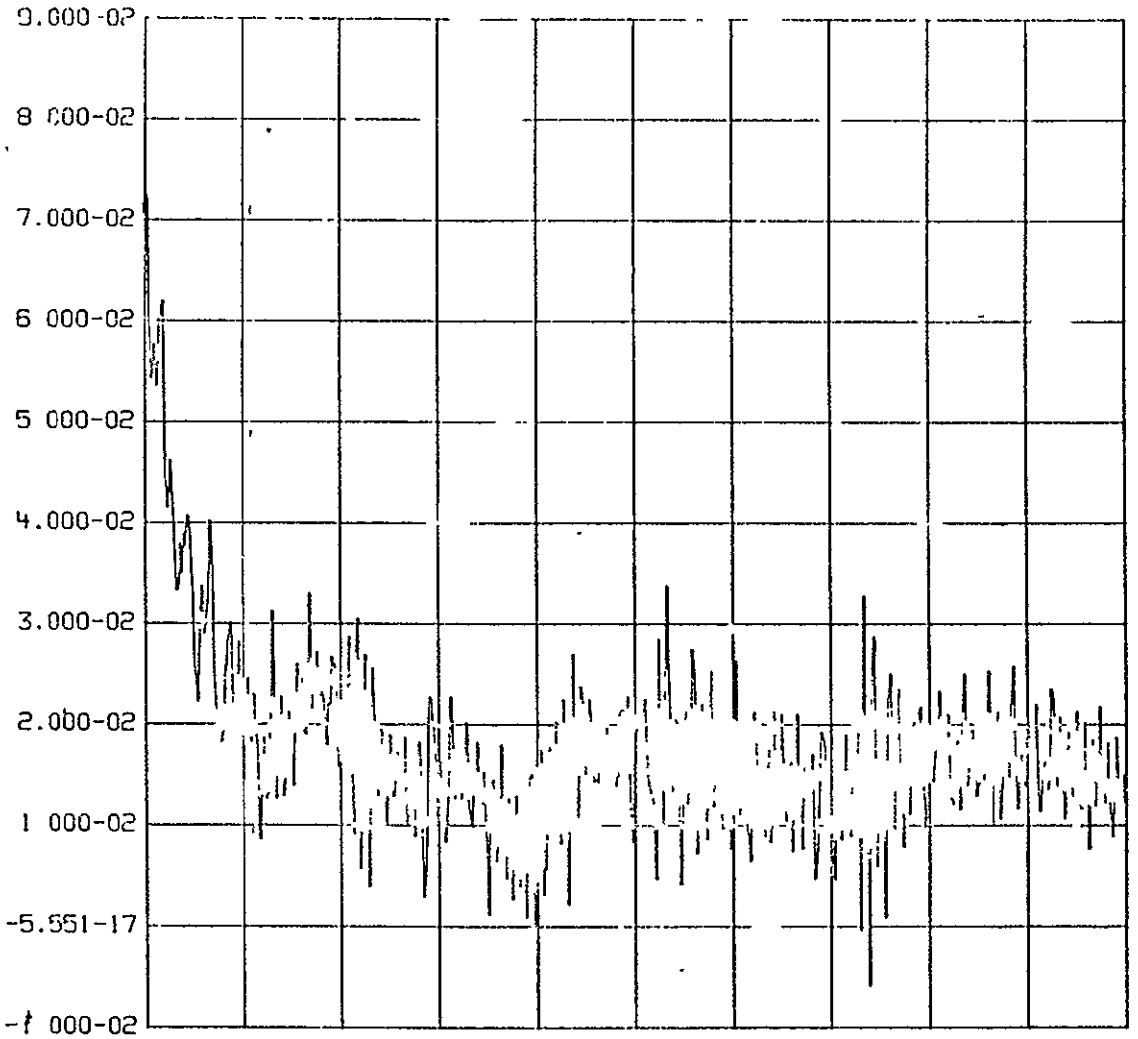
MOMENT VS TIME

1 FLT 3 07N078 FLICHT 3 TEST CCNDITION 3.1-1 * UNFILT *



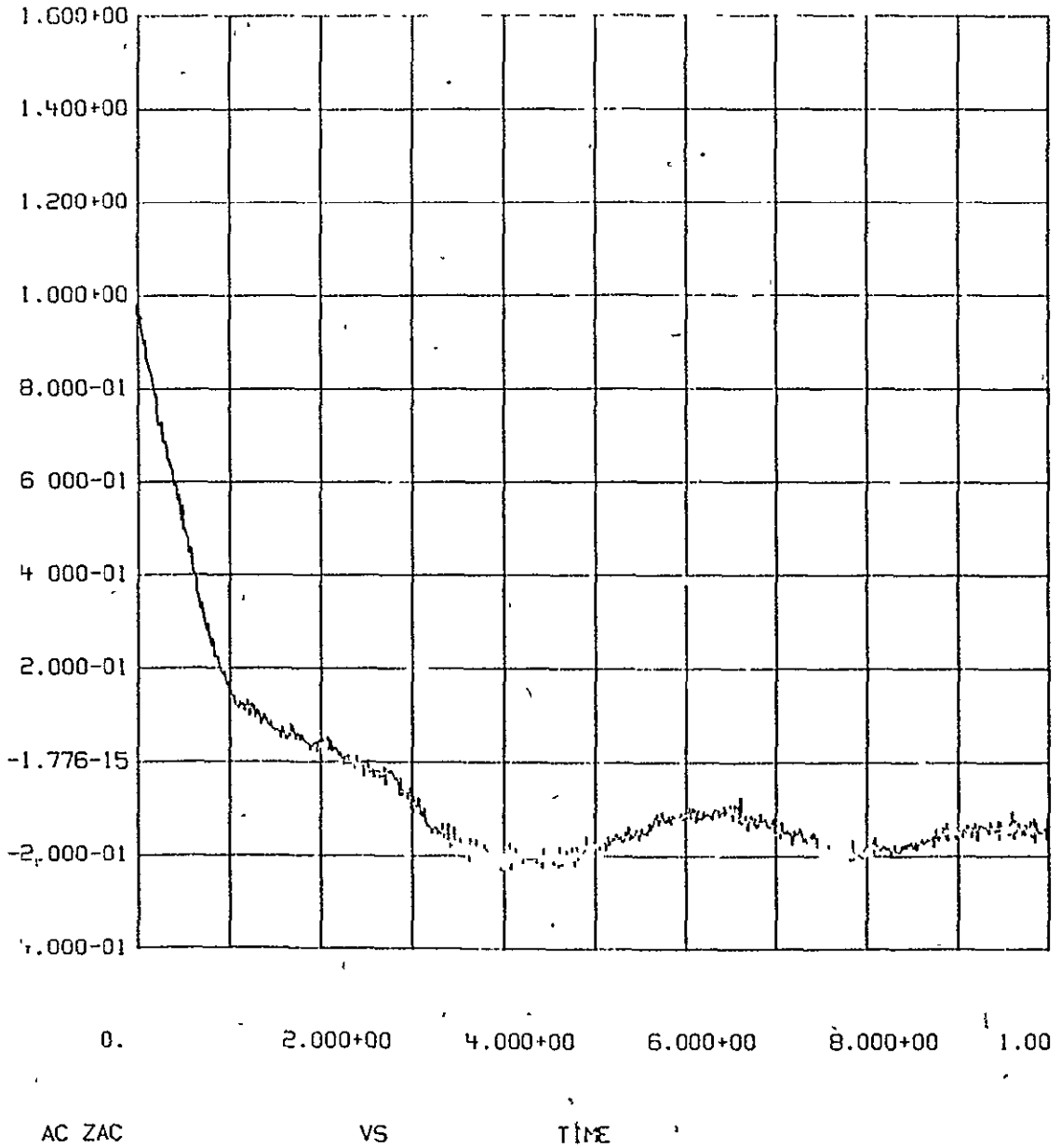
AC YAC VS TIME

1 FLT 3 0 NO78 FLIGHT 3 TEST CONDITION 3.1-1 * UNFILT *



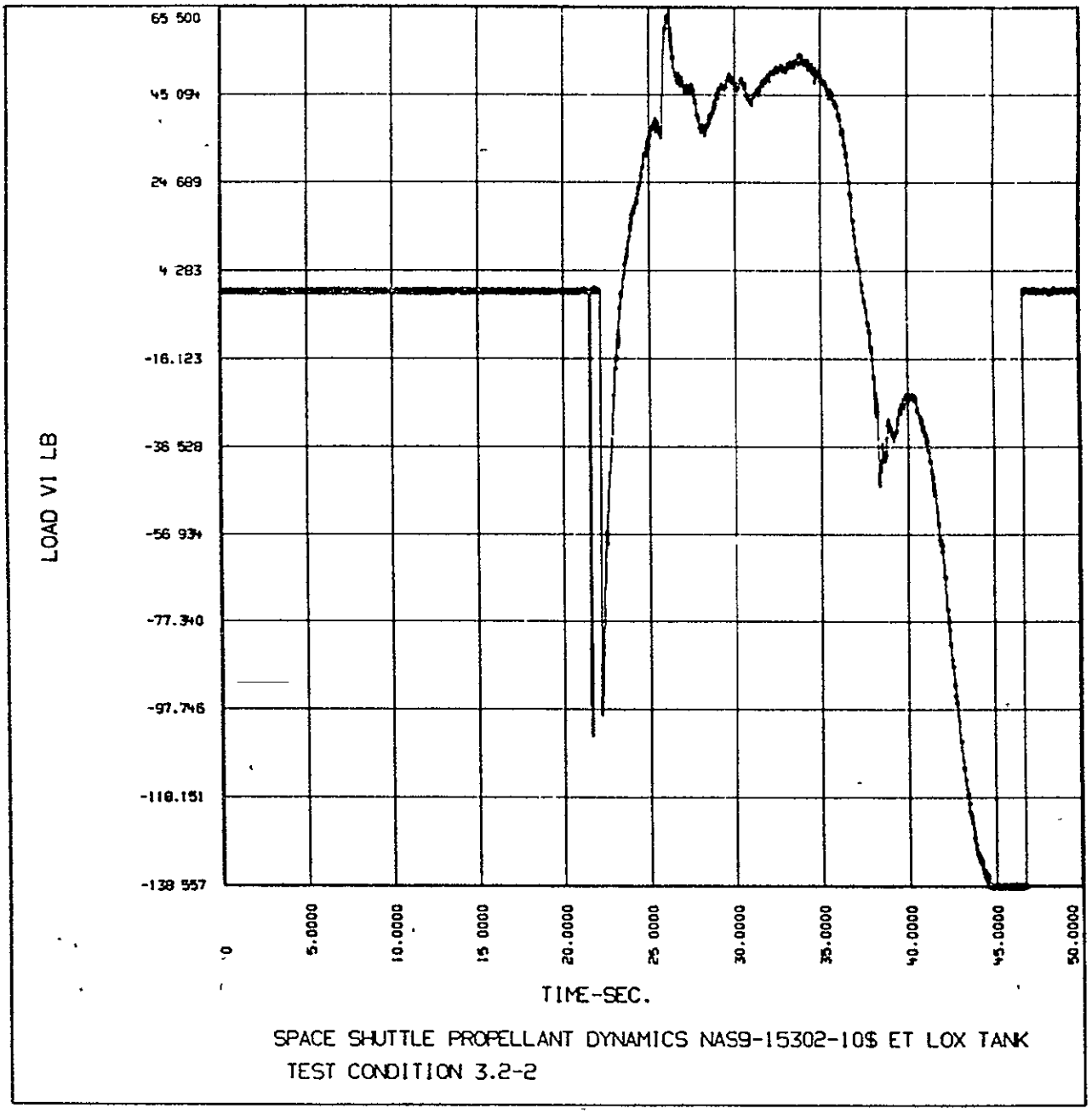
AC XAC VS TIME

1 FLT 3 07NOV78 FLIGHT 3 TEST CONDITION 3.1-1 * UNFILT *

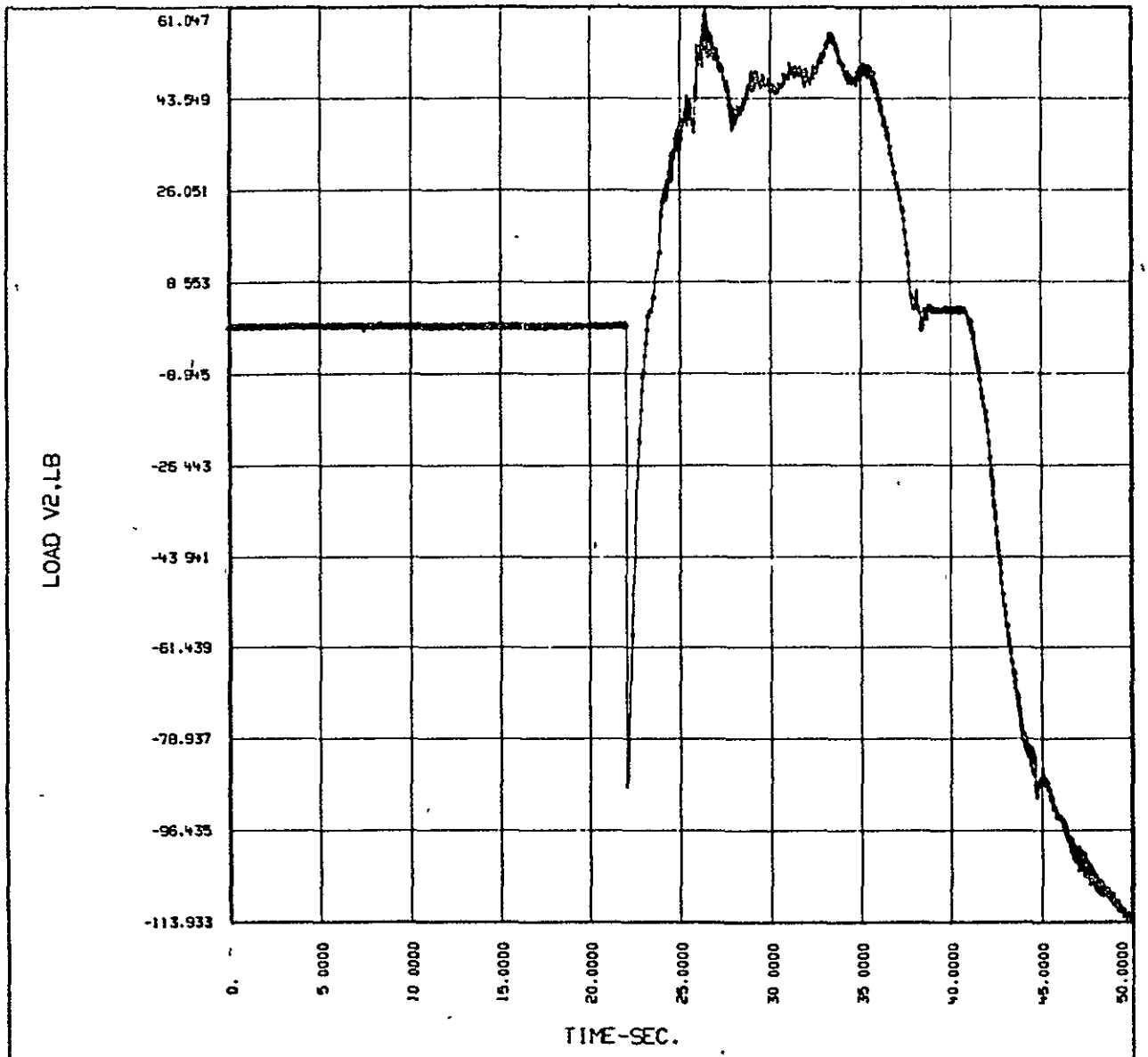

1.600+00
1.400+00
1.200+00
1.000+00
8.000-01
6 000-01
4 000-01
2.000-01
-1.776-15
-2.000-01
0.
2.000+00
4.000+00
6.000+00
8.000+00
1.00
AC ZAC
VS
TIME
1
FLT 3
07N078
FLIGHT 3 TEST CONDITION 3 1-1 * UNFILT *

Test Data Condition 3.2-2

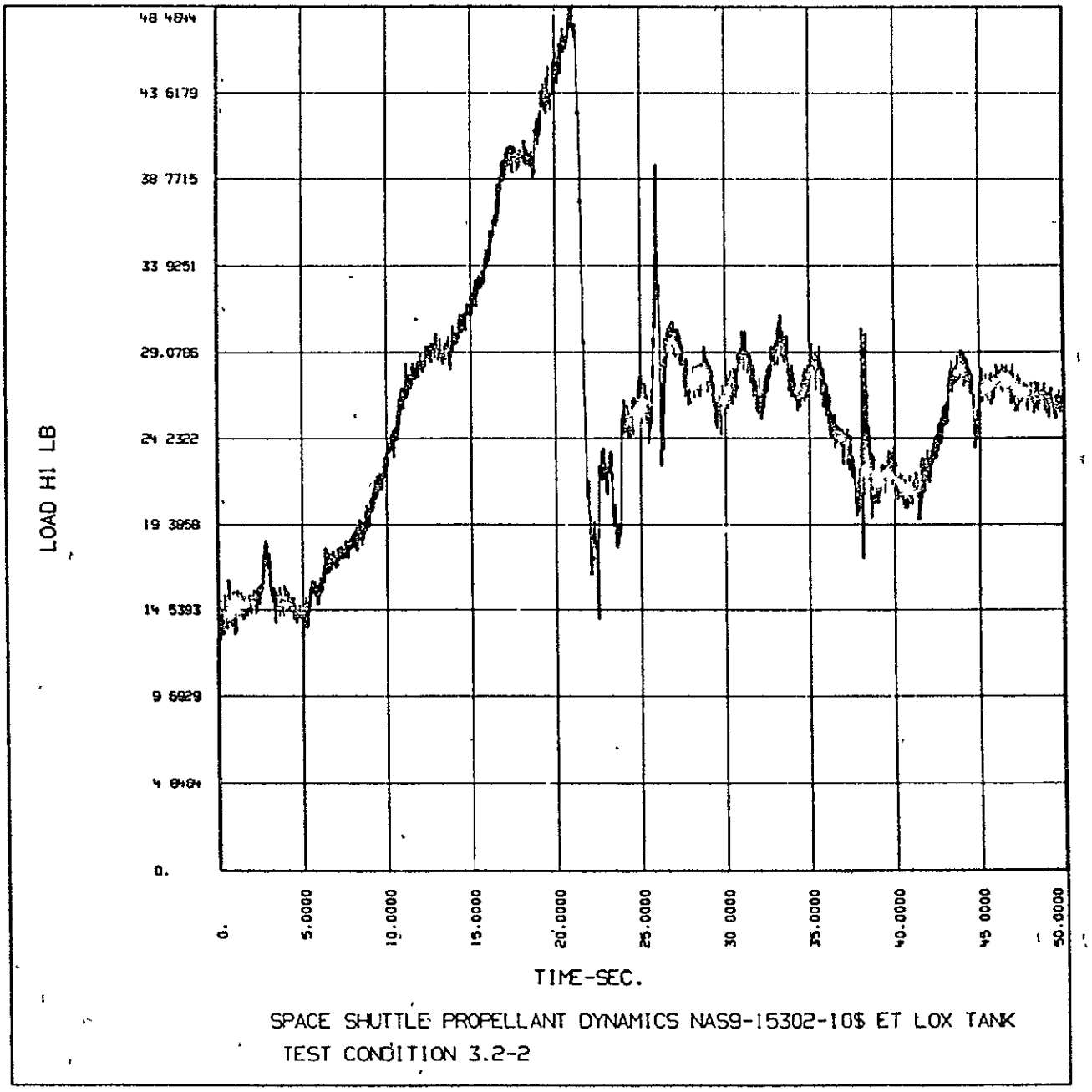
Baffles
Test Fluid — FC 113
Orientation — 30°
Fille Volume — 5%
Target Acceleration — 0.2 g

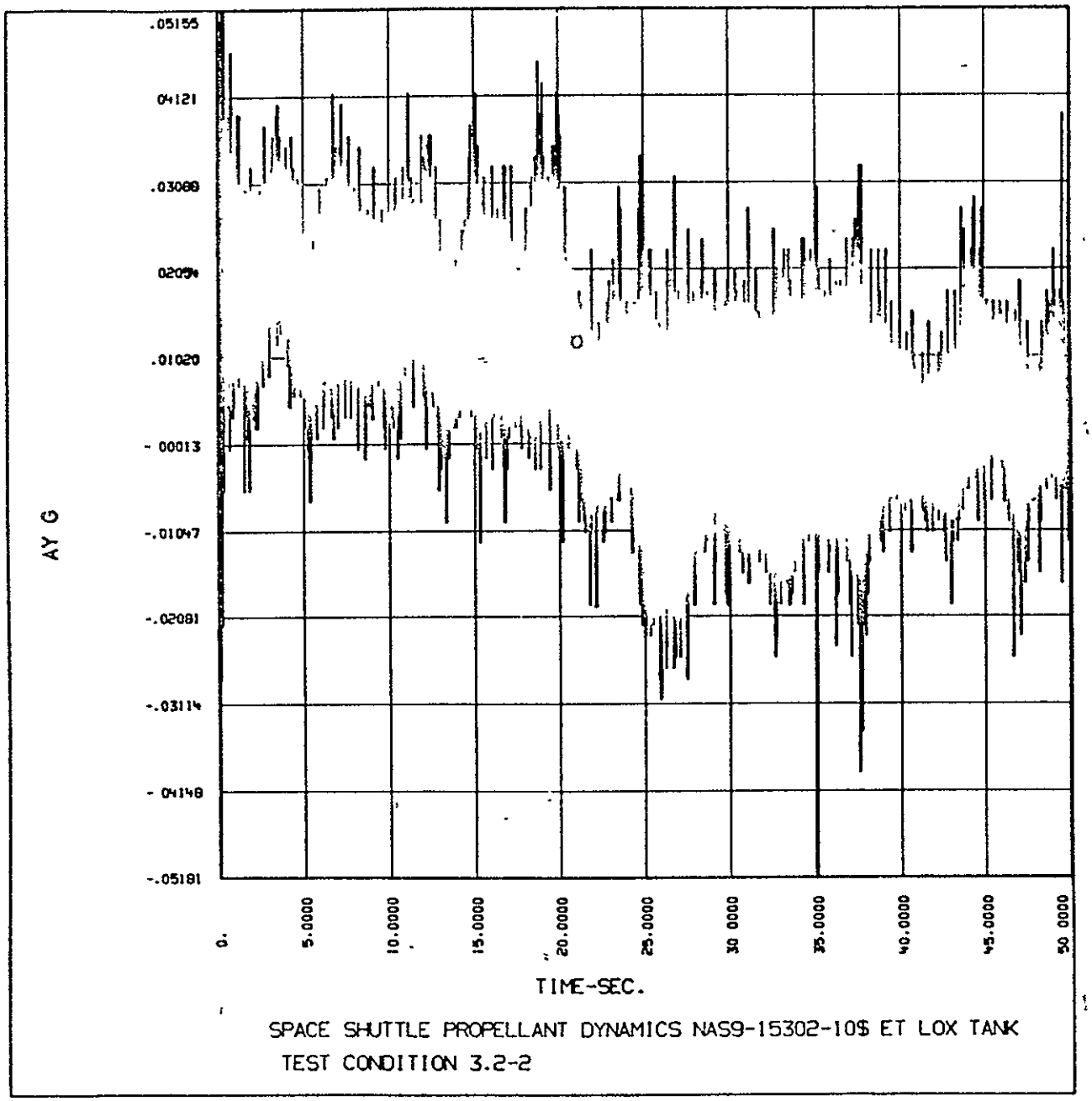


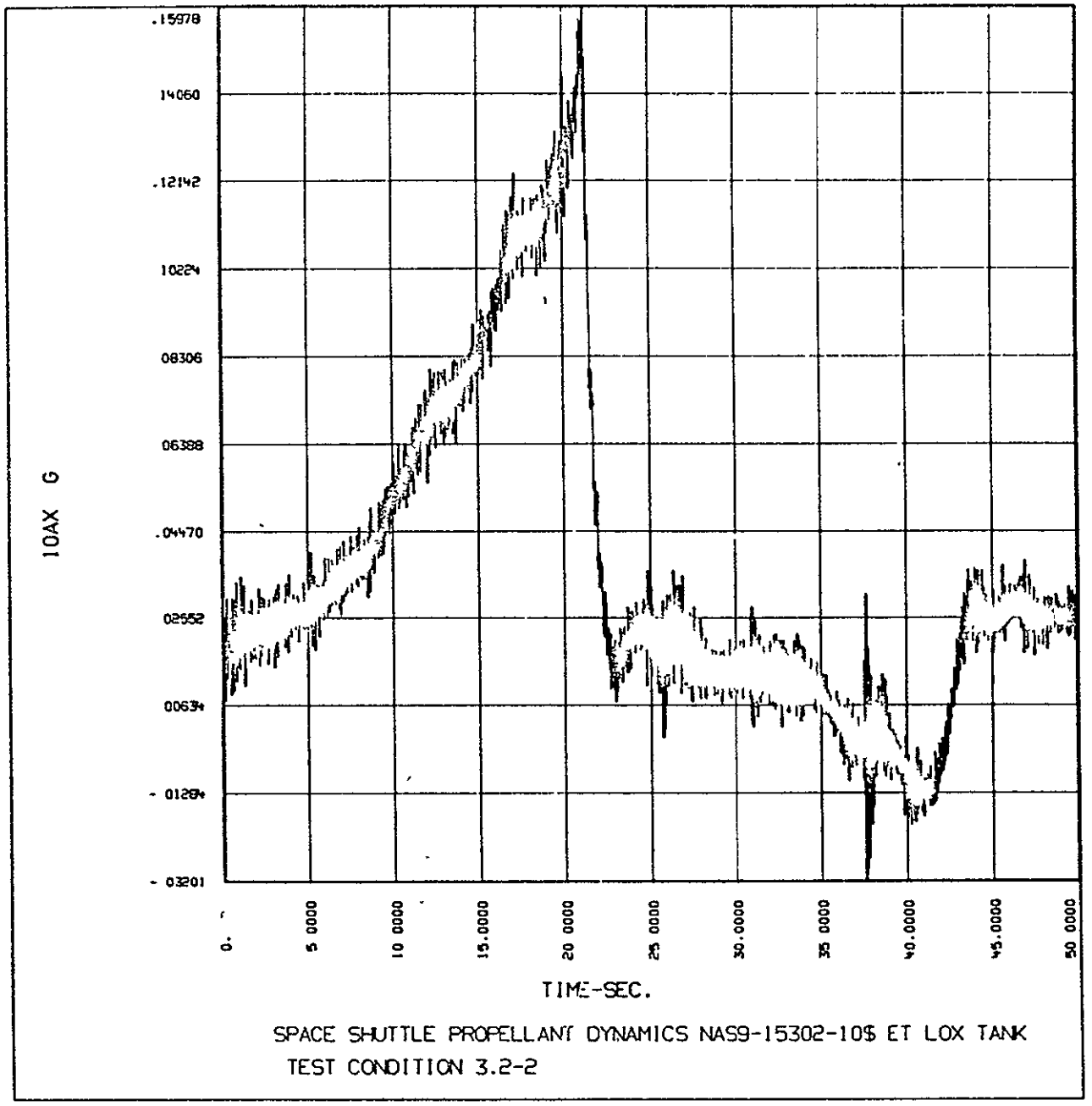
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.2-2



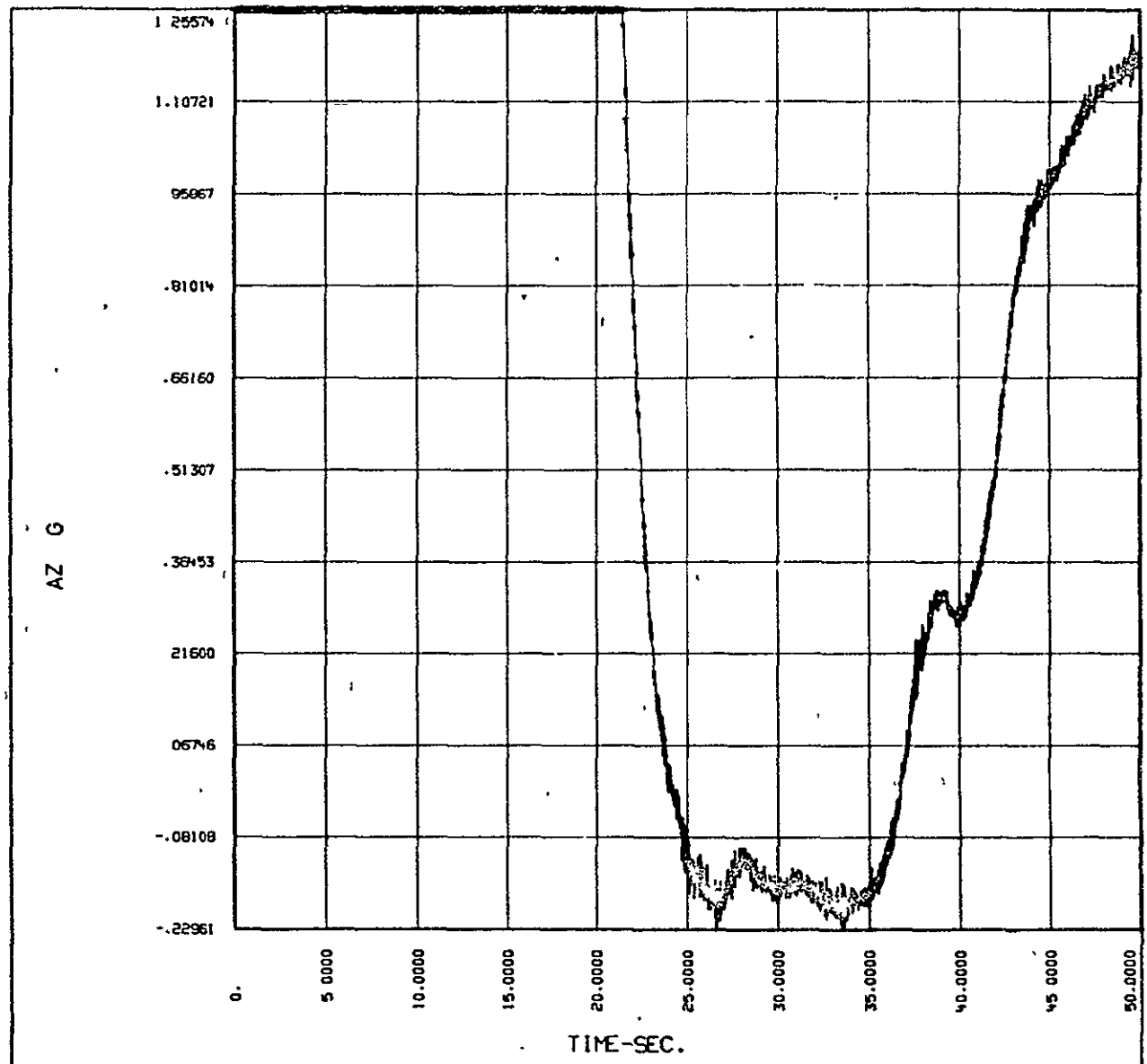
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.2-2


LOAD H1 LB
48 4844
43 6179
38 7715
33 9251
29.0786
24 2322
19 3858
14 5393
9 6929
4 8464
0.
0.
5.0000
10.0000
15.0000
20.0000
25.0000
30 0000
35.0000
40.0000
45 0000
50.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.2-2

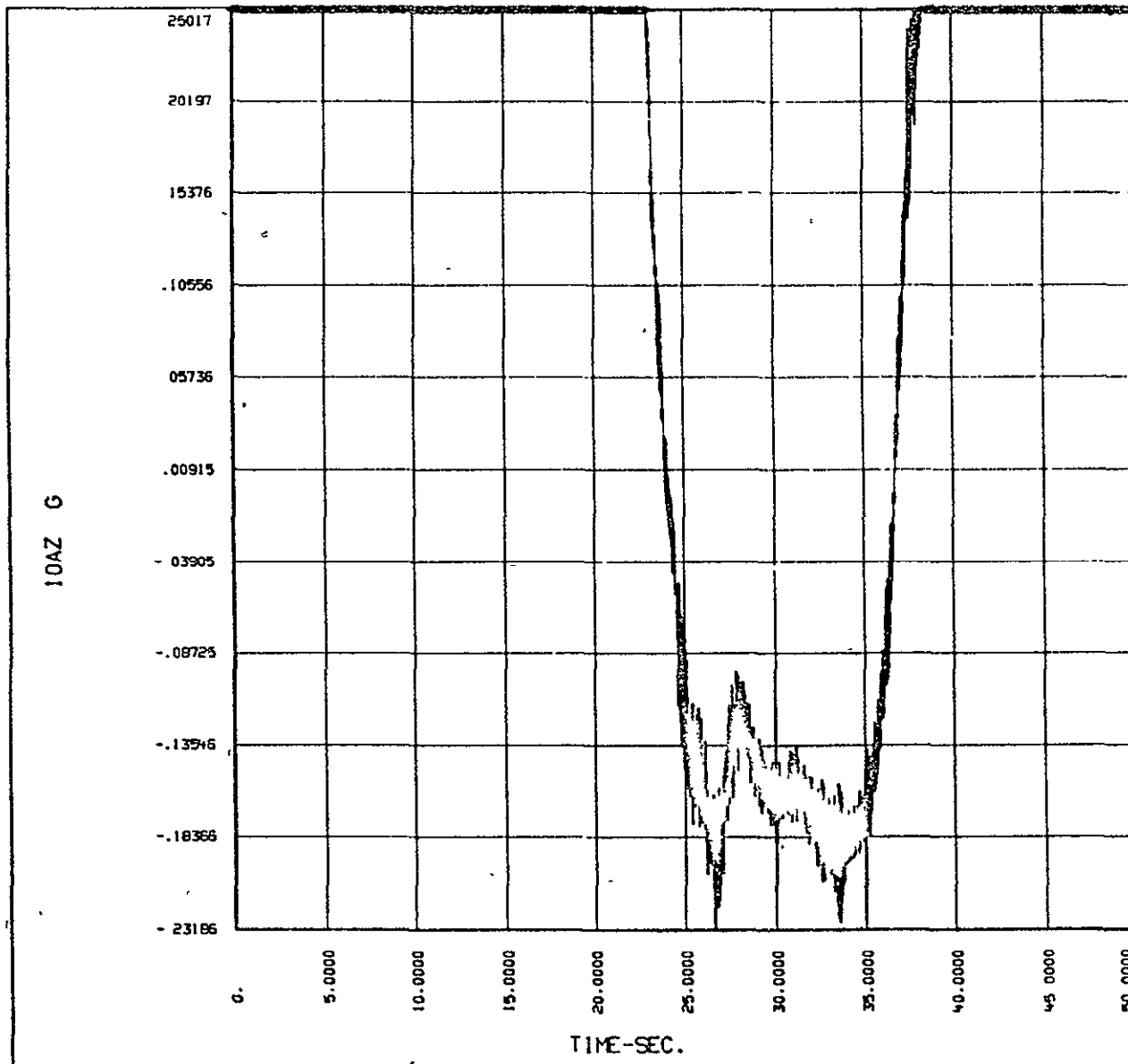

.05155
04121
.03088
02054
.01020
- 00013
-.01047
-.02081
-.03114
- 04148
-.05181
AY G
0.
5.0000
10.0000
15.0000
20.0000
25.0000
30 0000
35.0000
40.0000
45.0000
50 0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.2-2



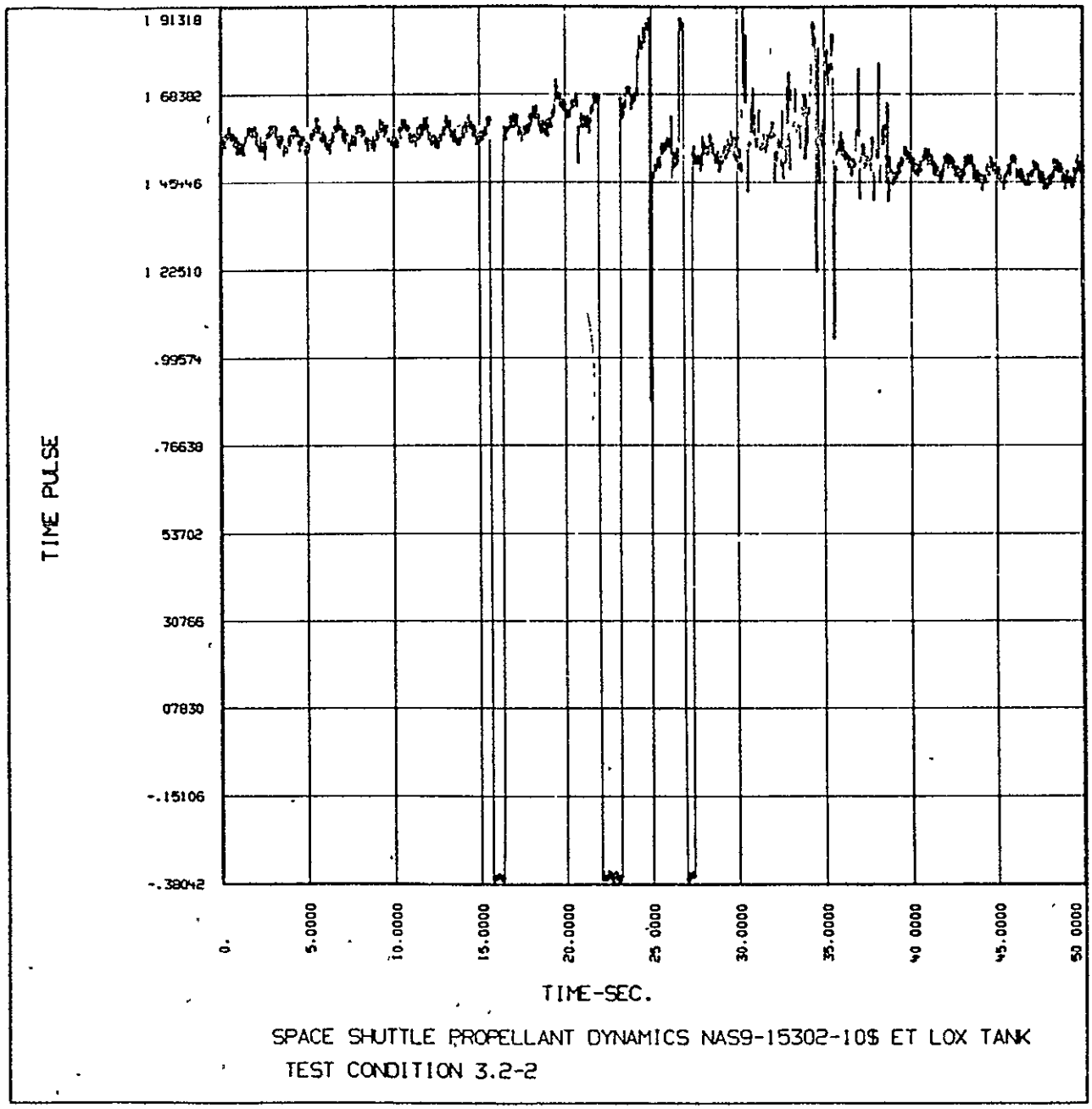
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.2-2

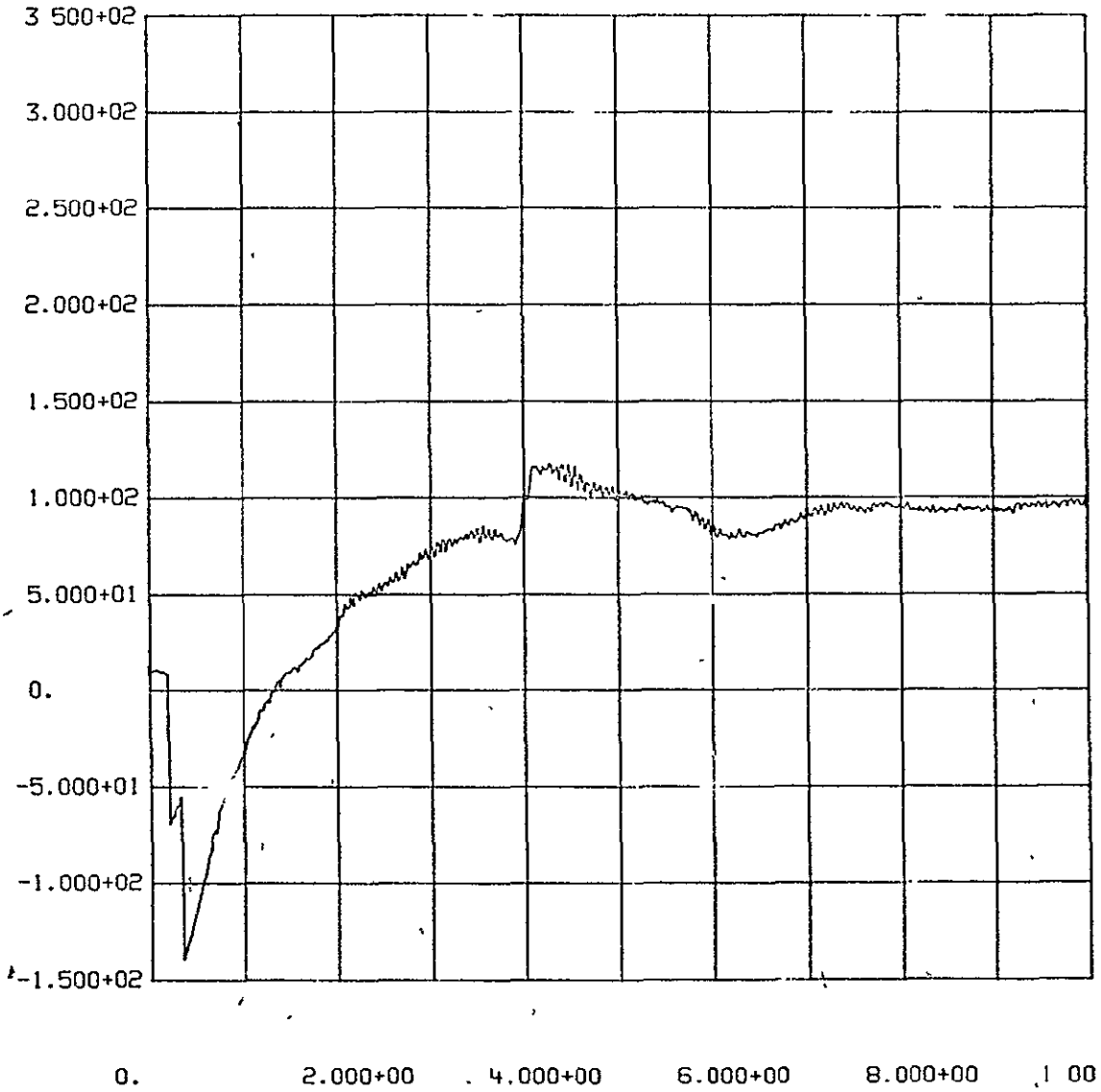


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.2-2



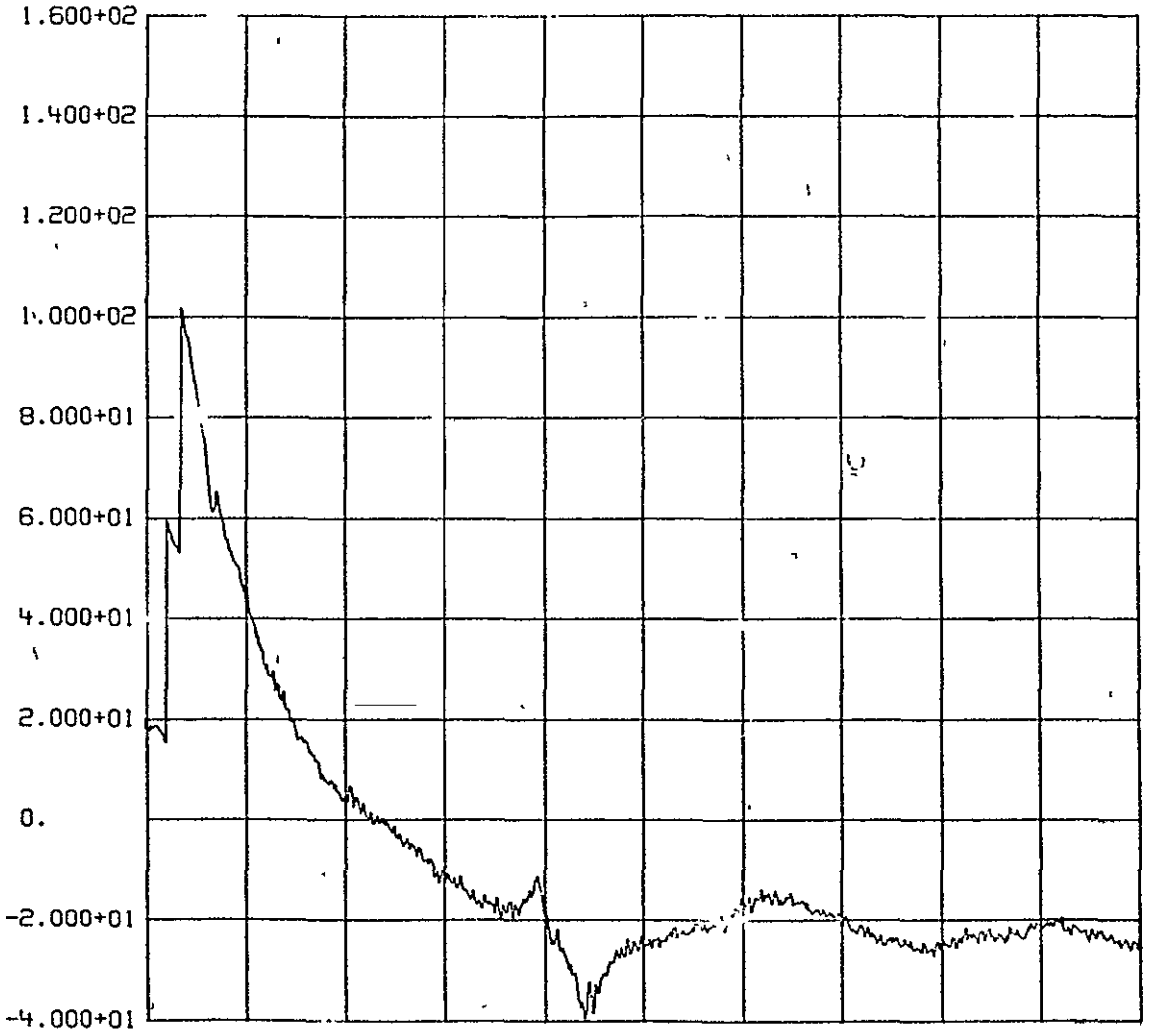
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.2-2


1 91318
1 68382
1 45446
1 22510
.99574
.76638
53702
30766
07830
-.15106
-.38042
TIME PULSE
0.
5.0000
10.0000
15.0000
20.0000
25.0000
30.0000
35.0000
40.0000
45.0000
50.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.2-2



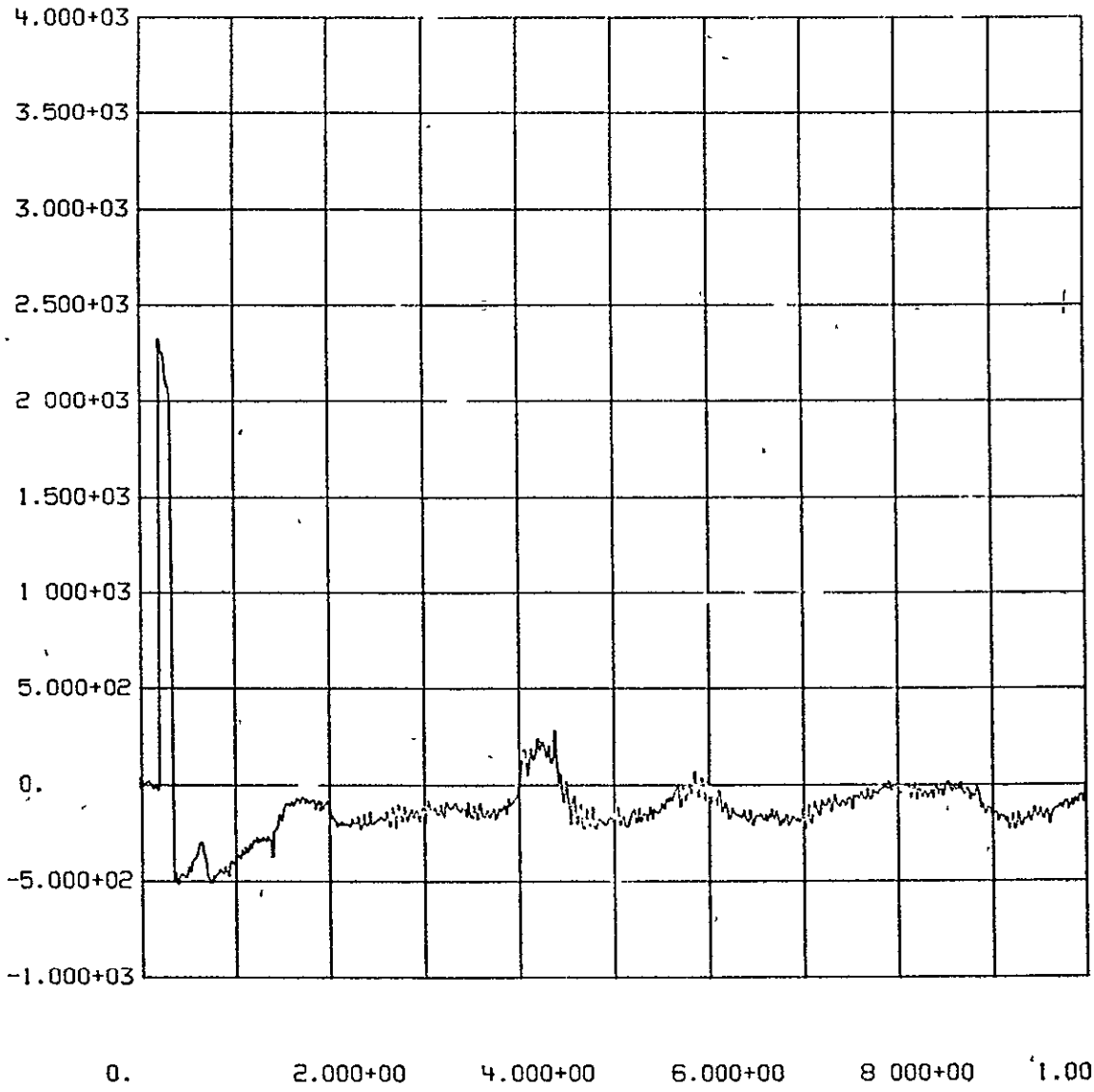
Z-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.2-2 * UNFILT *



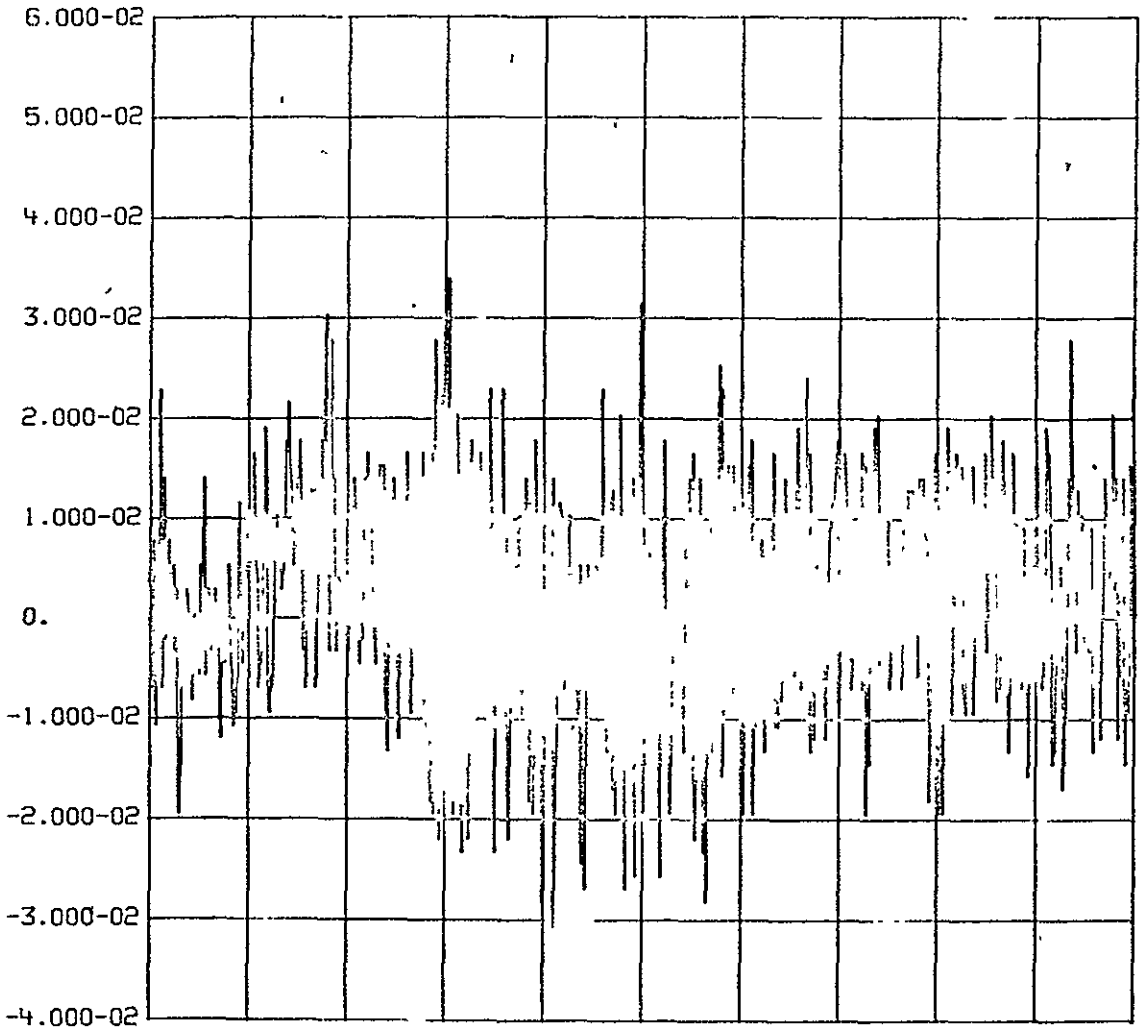
Y-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.2-2 * UNFILT *



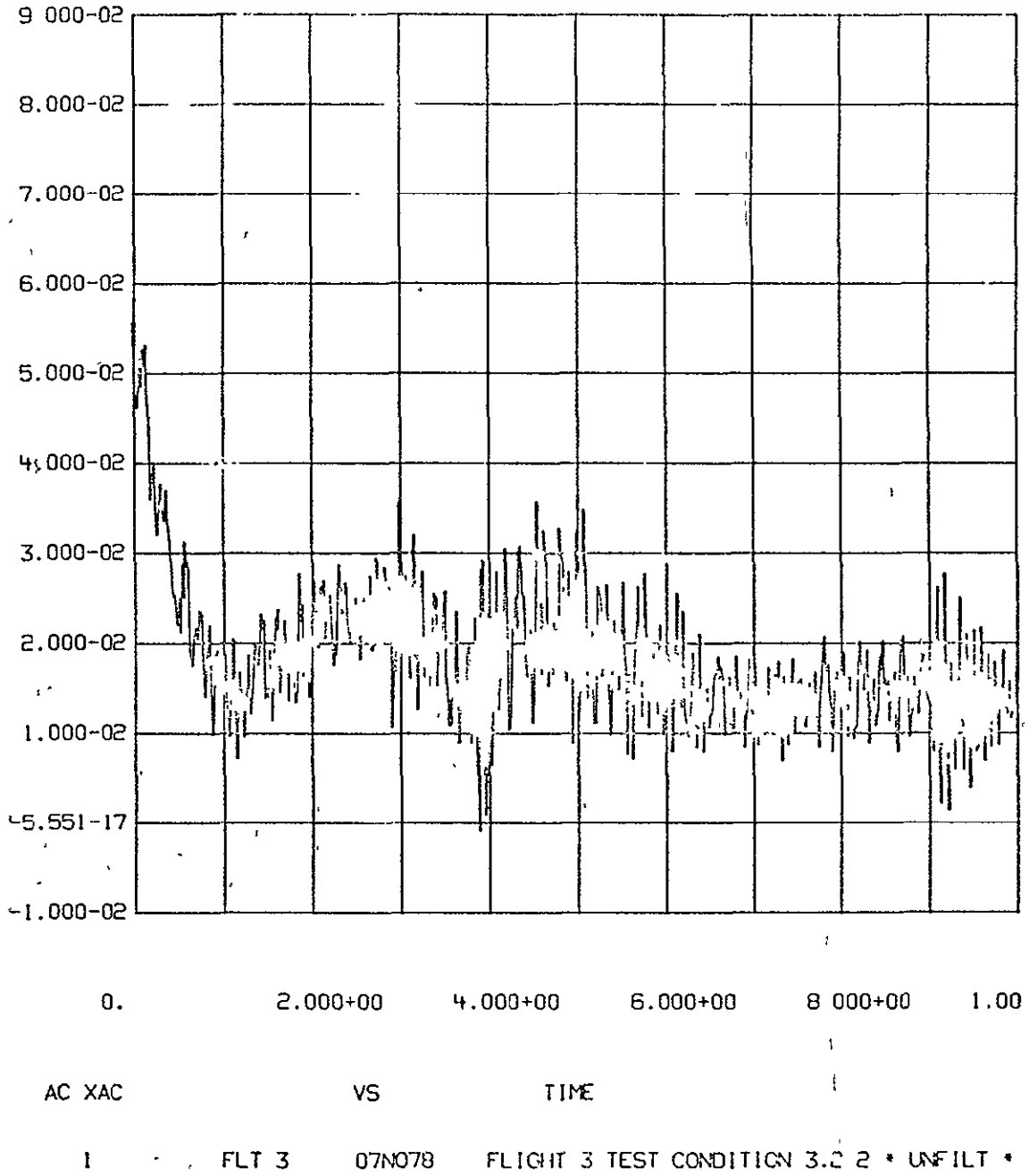
MOMENT VS ME

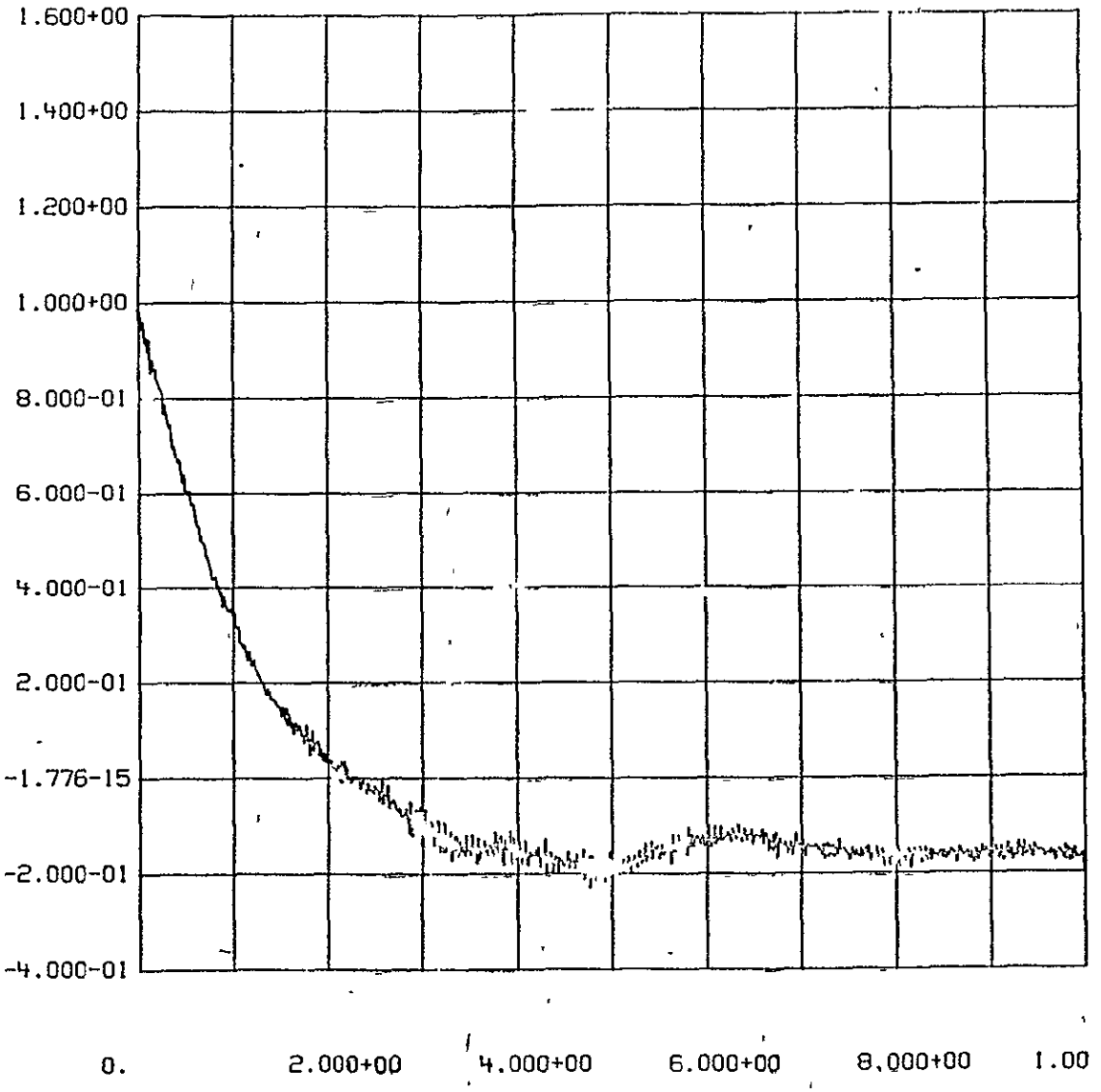
1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.2-2 * UNFILT *



AC YAC VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3-2-2 * UNFILT *


9 000-02
8.000-02
7.000-02
6.000-02
5.000-02
4.000-02
3.000-02
2.000-02
1.000-02
-5.551-17
-1.000-02
0.
2.000+00
4.000+00
6.000+00
8 000+00
1.00
AC XAC
VS
TIME
1
FLT 3
07N078
FLIGHT 3 TEST CONDITION 3.2 2 * UNFILT *

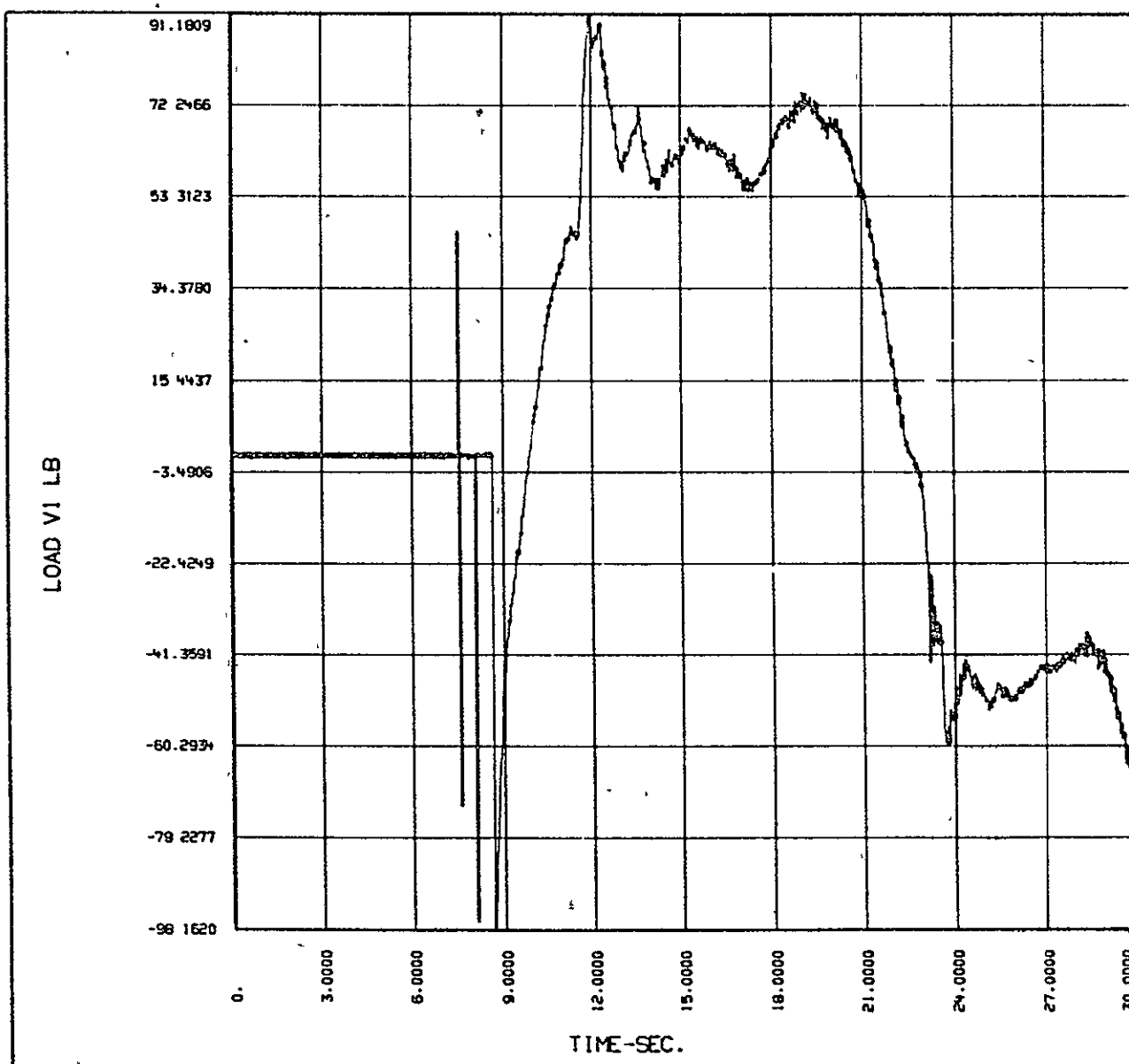


AC ZAC VS TIME

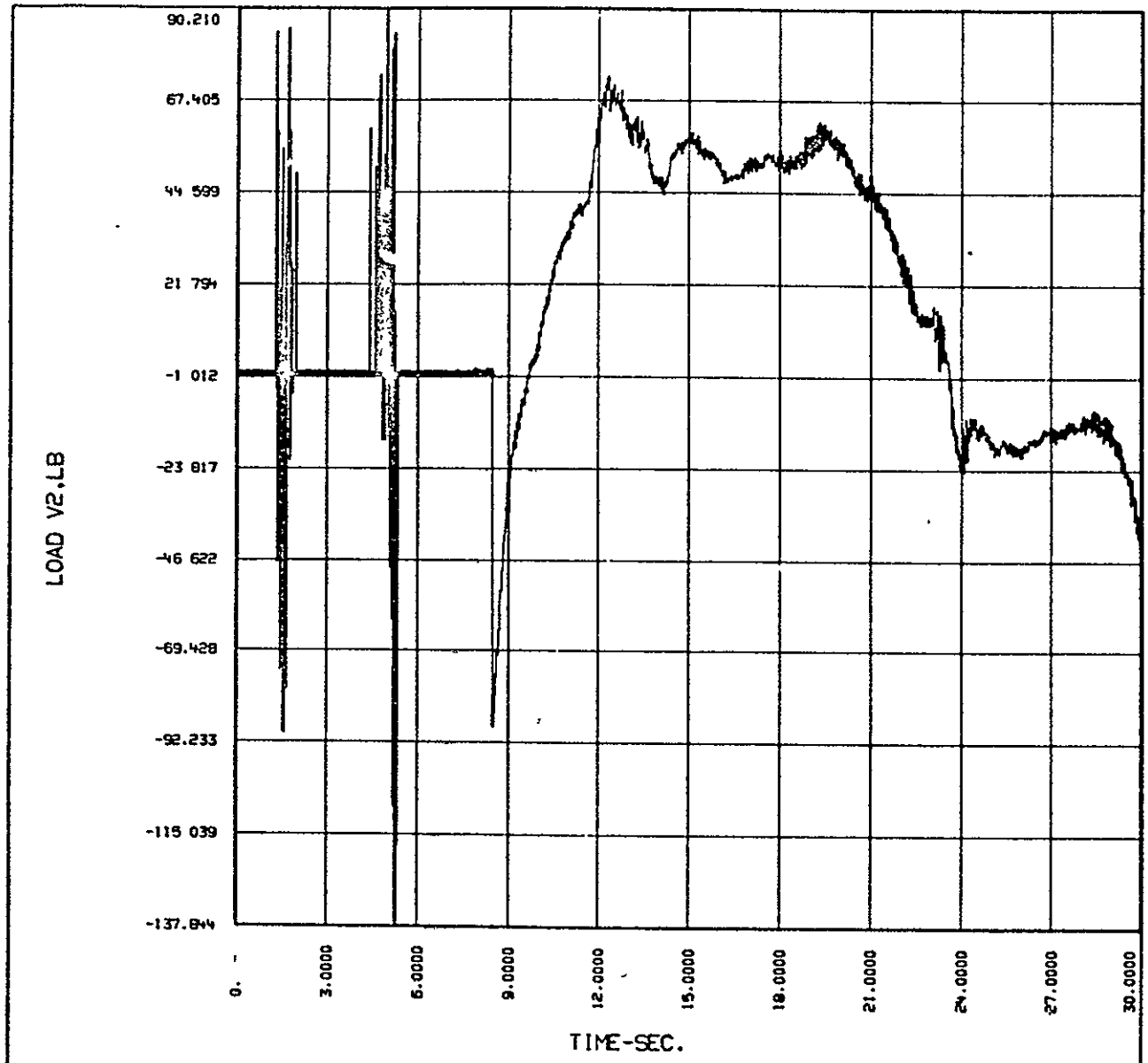
1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.2-2 * UNFILT *

Test Data Condition 3.3-2

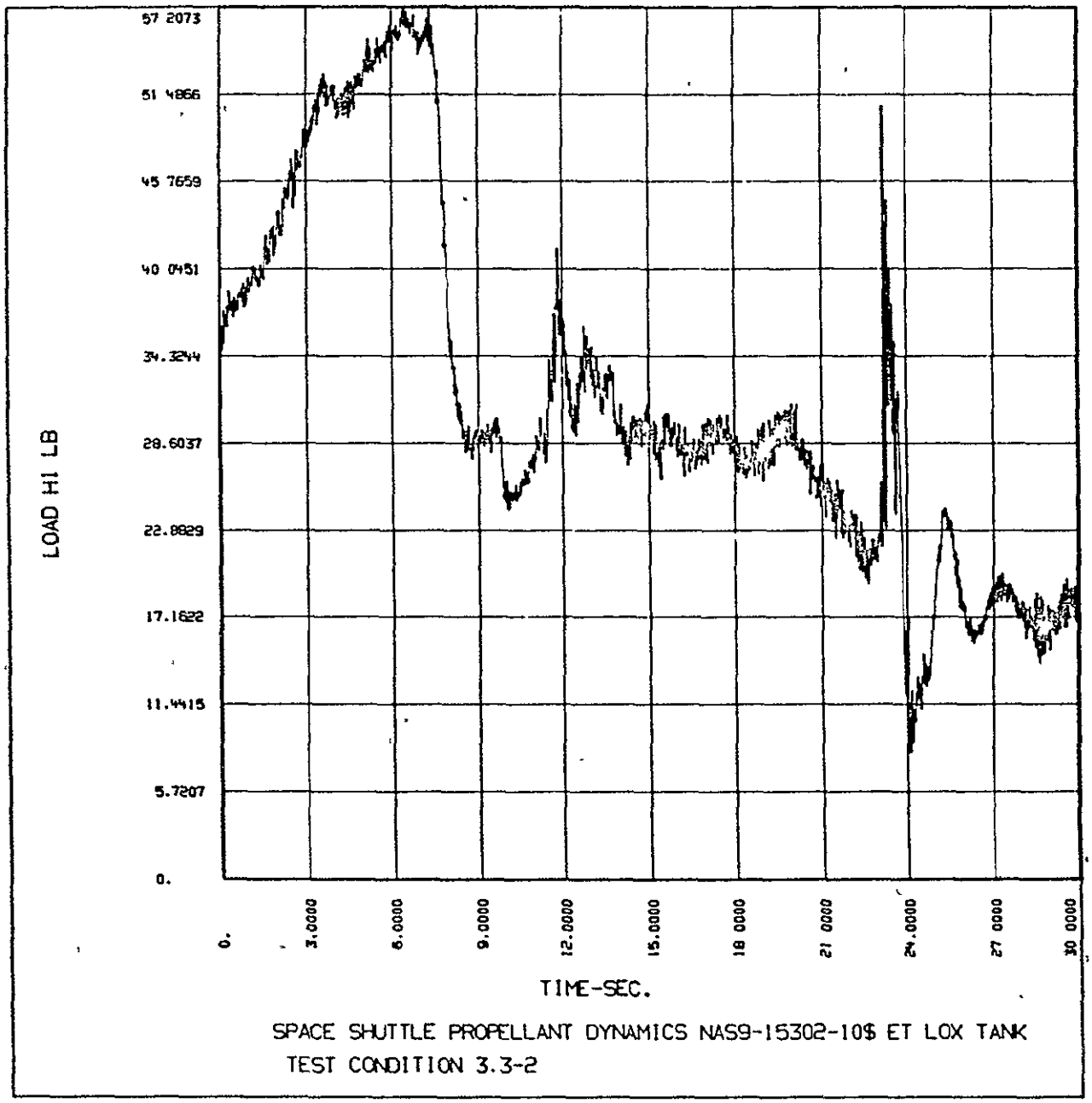
Baffles
Test Fluid – FC 113
Orientation – 30°
Fill Volume – 10%
Target Acceleration–0.2 g

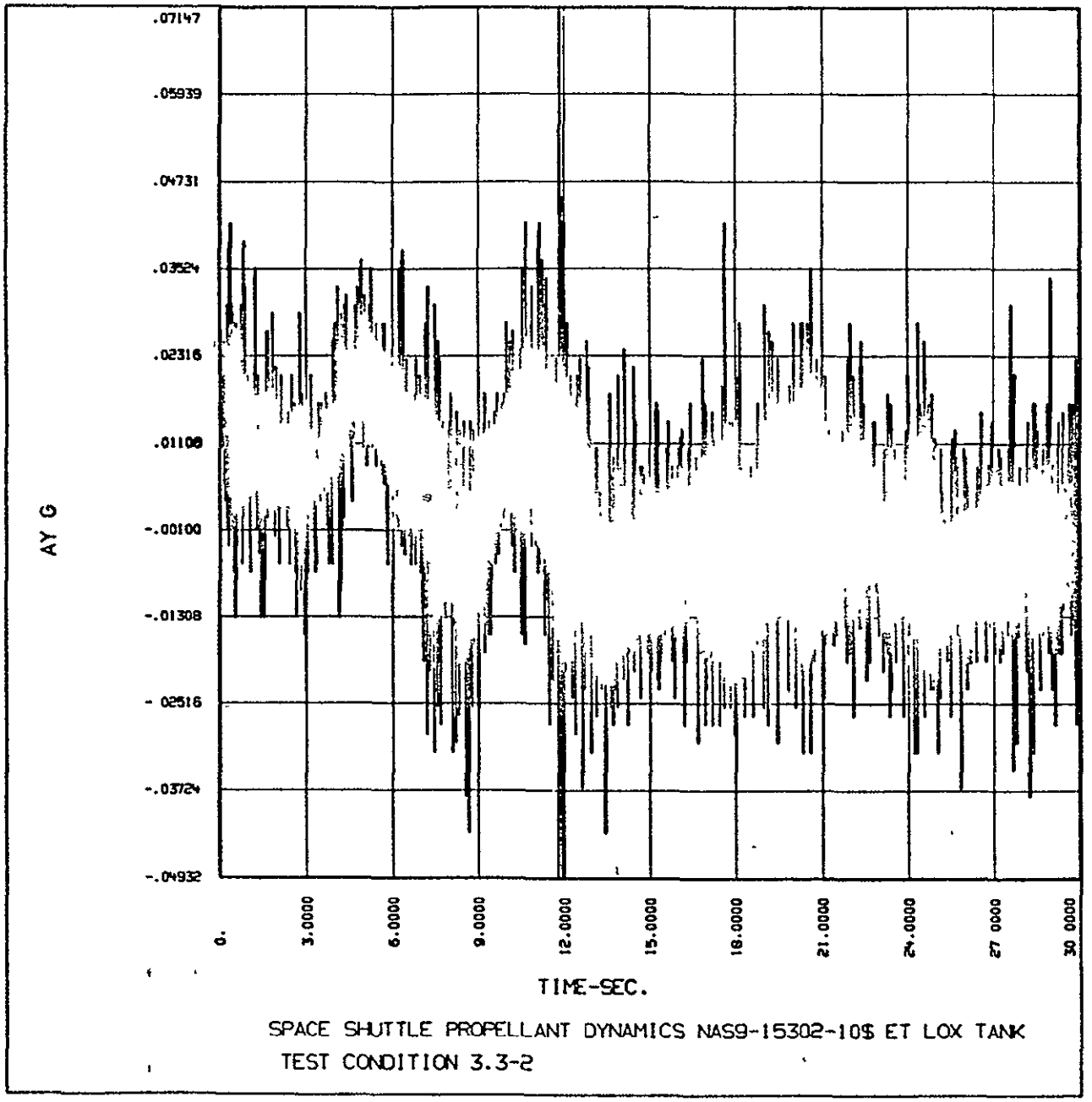


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.3-2



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.3-2


57 2073
51 4866
45 7659
40 0451
34.3244
28.6037
22.8829
17.1622
11.4415
5.7207
0.
LOAD H1 LB
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18 0000
21 0000
24.0000
27 0000
30 0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.3-2


.07147
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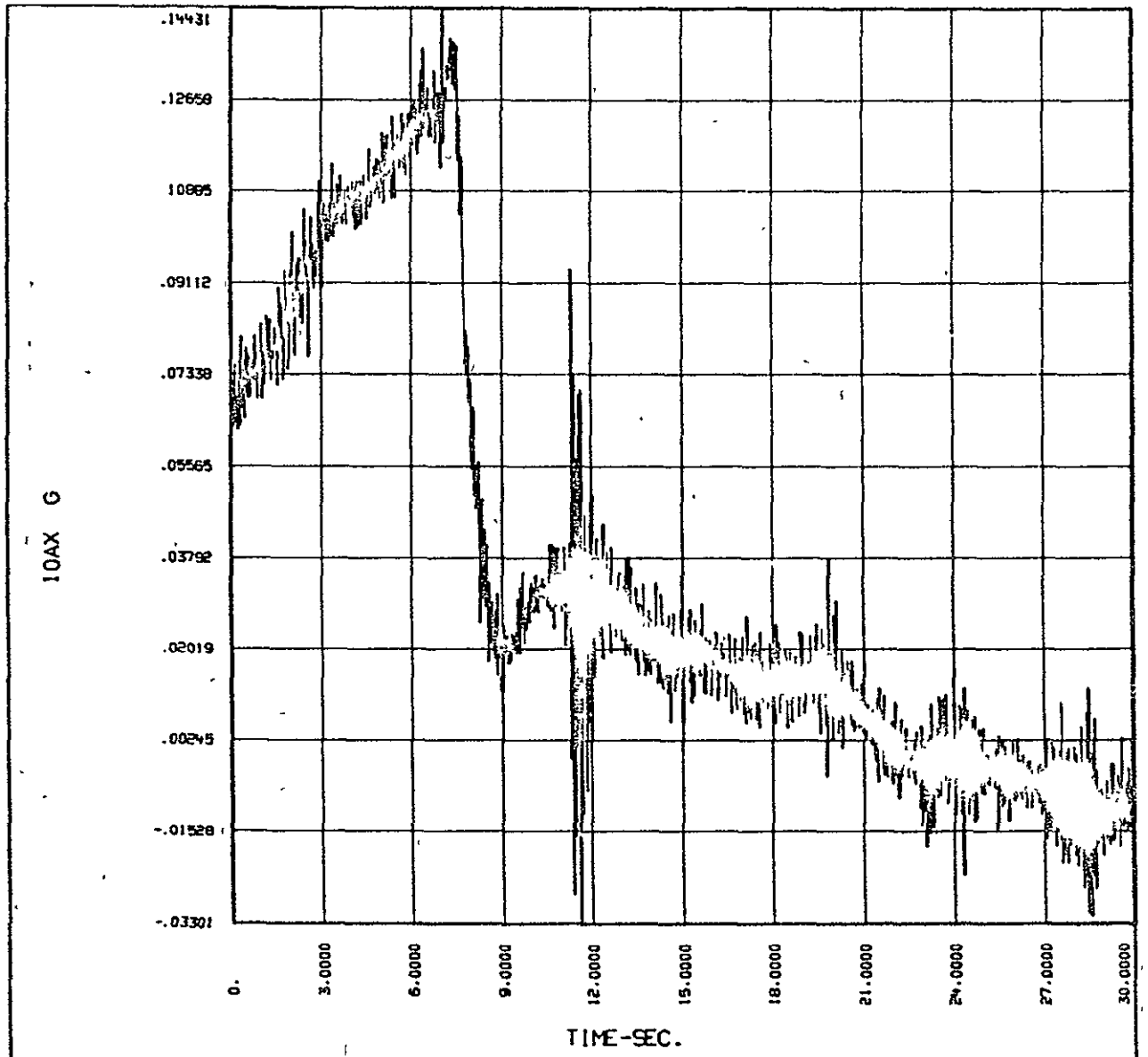
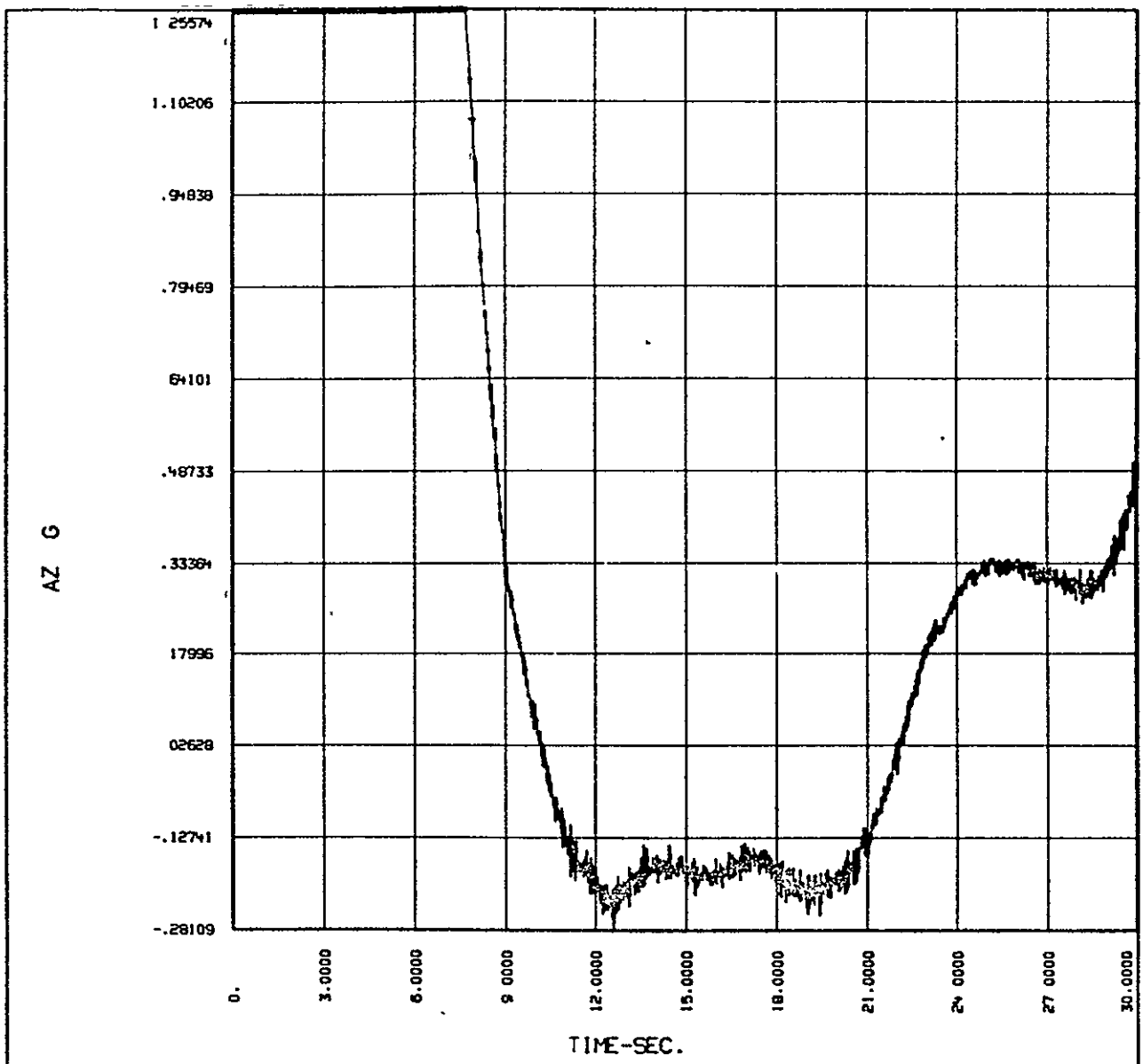
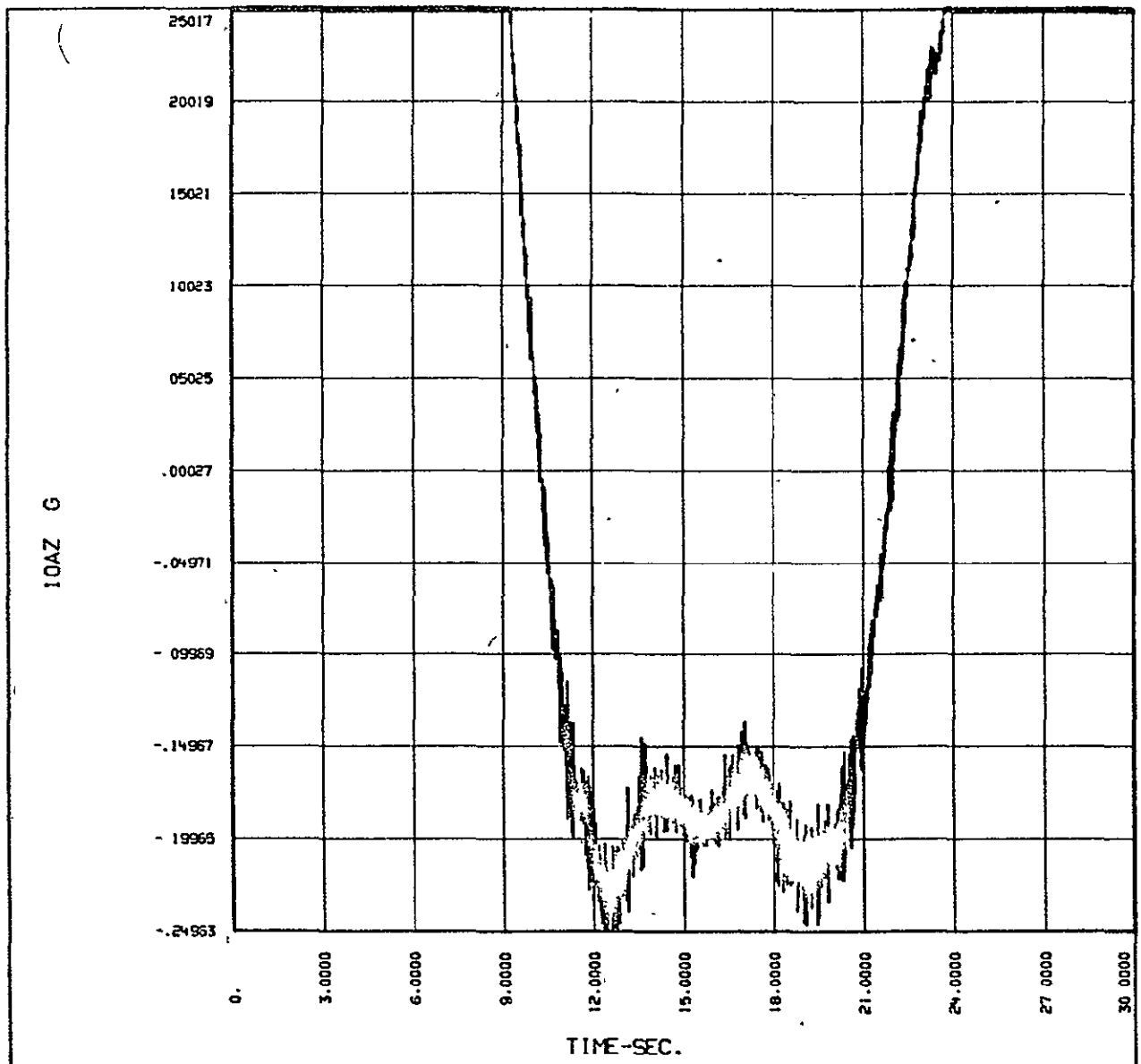
.04731
.03524
.02316
.01108
-.00100
-.01308
-.02516
-.03724
-.04932
AY G
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.3-2



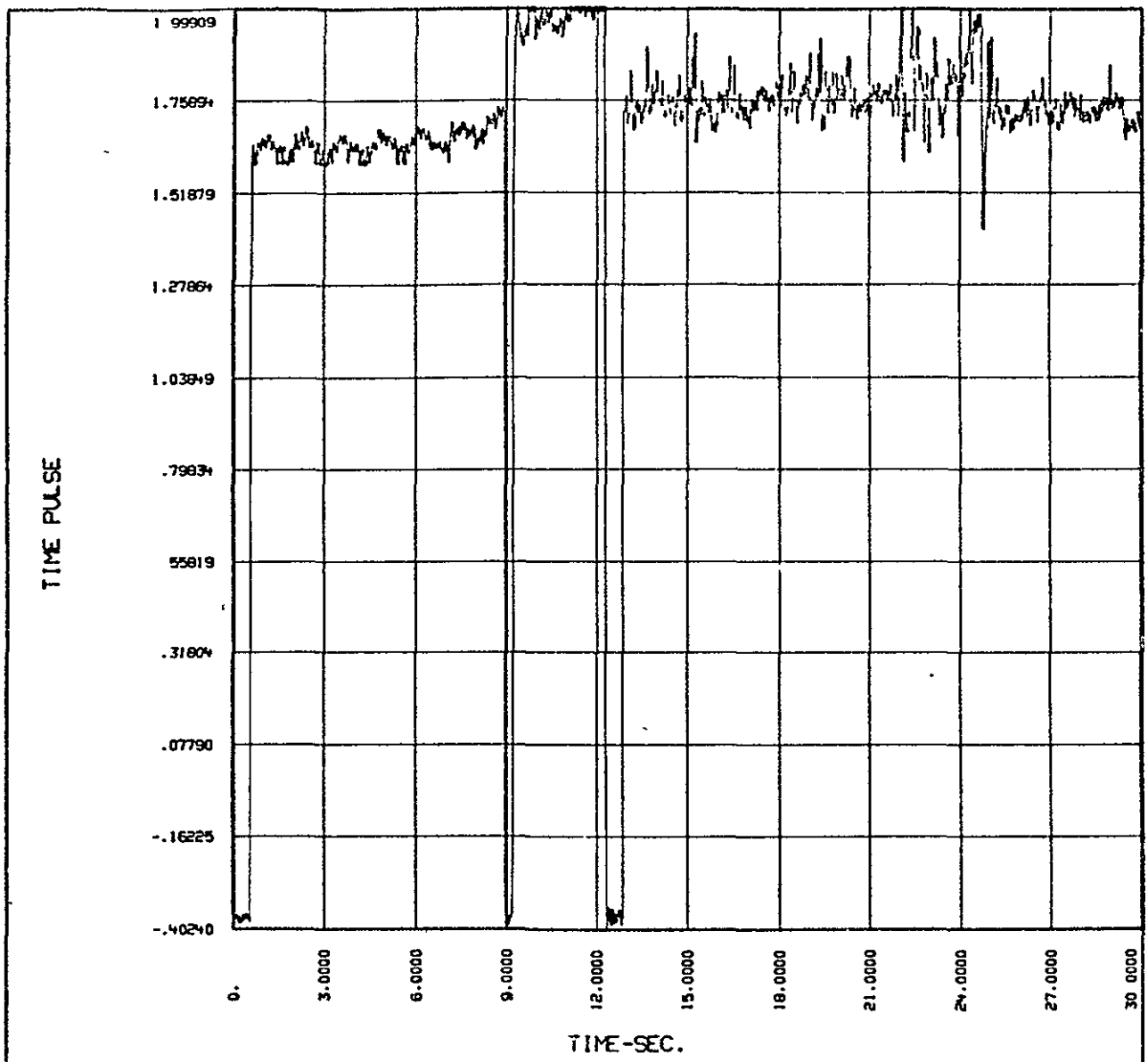
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.3-2



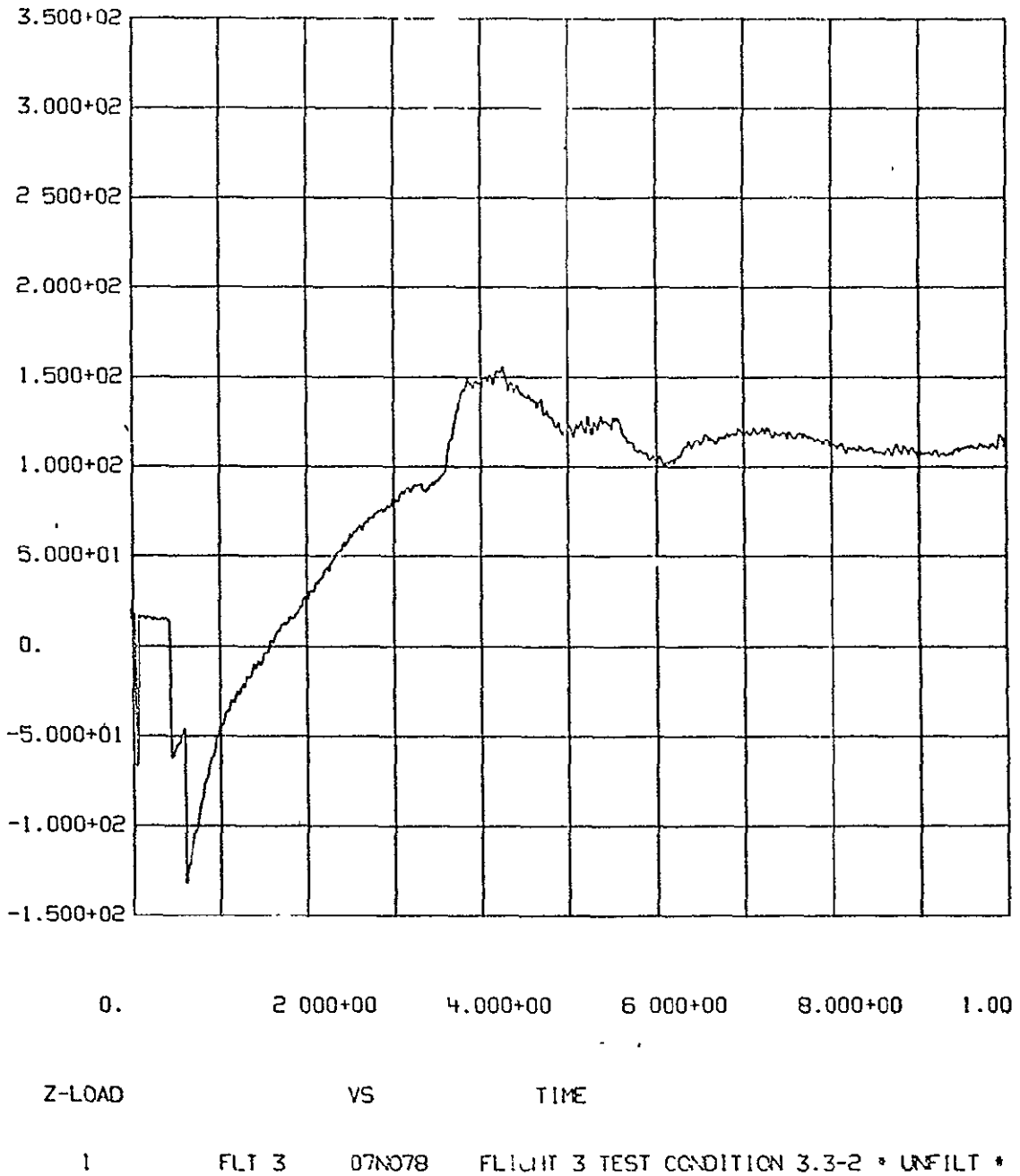
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.3-2

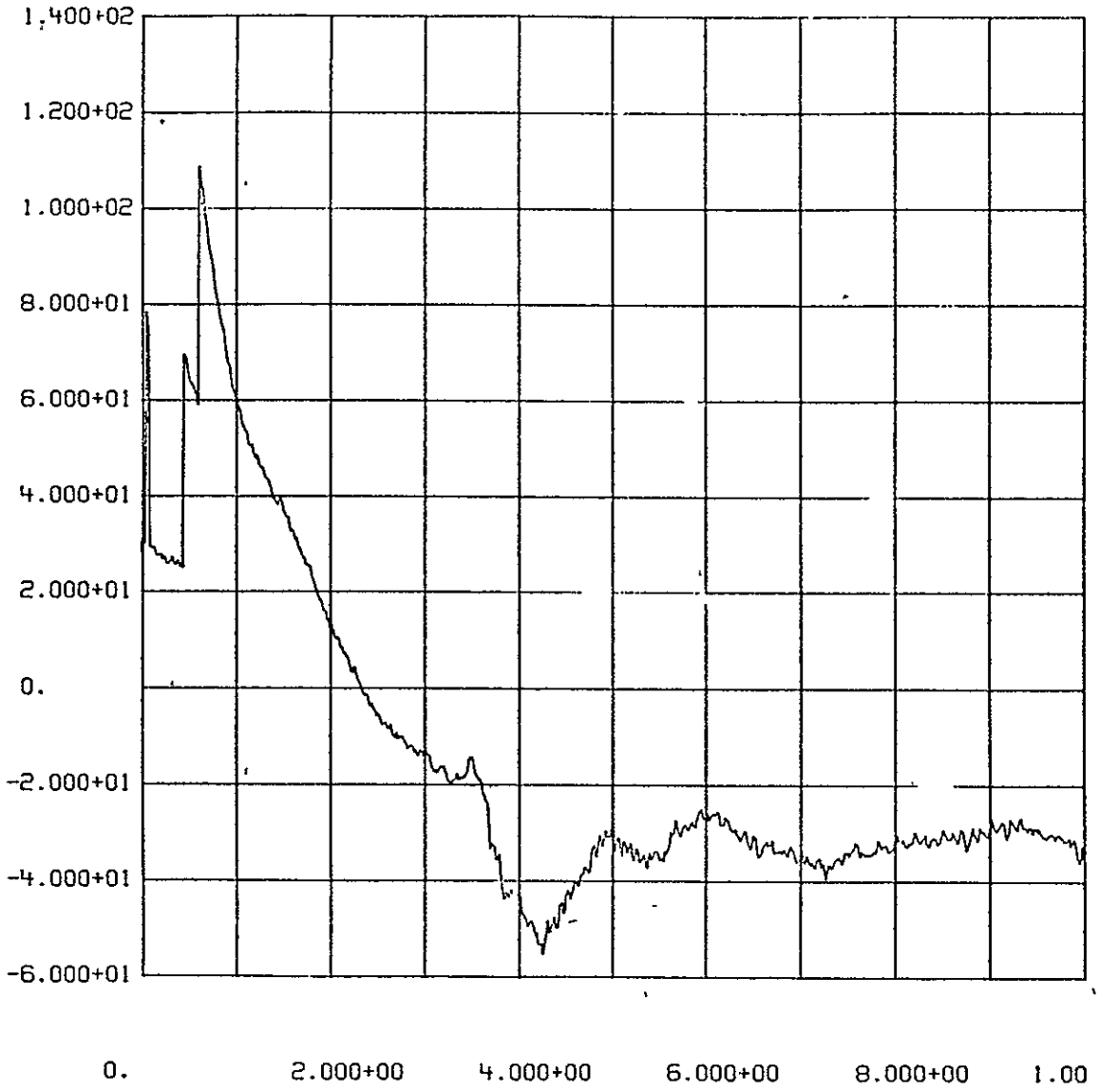


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.3-2



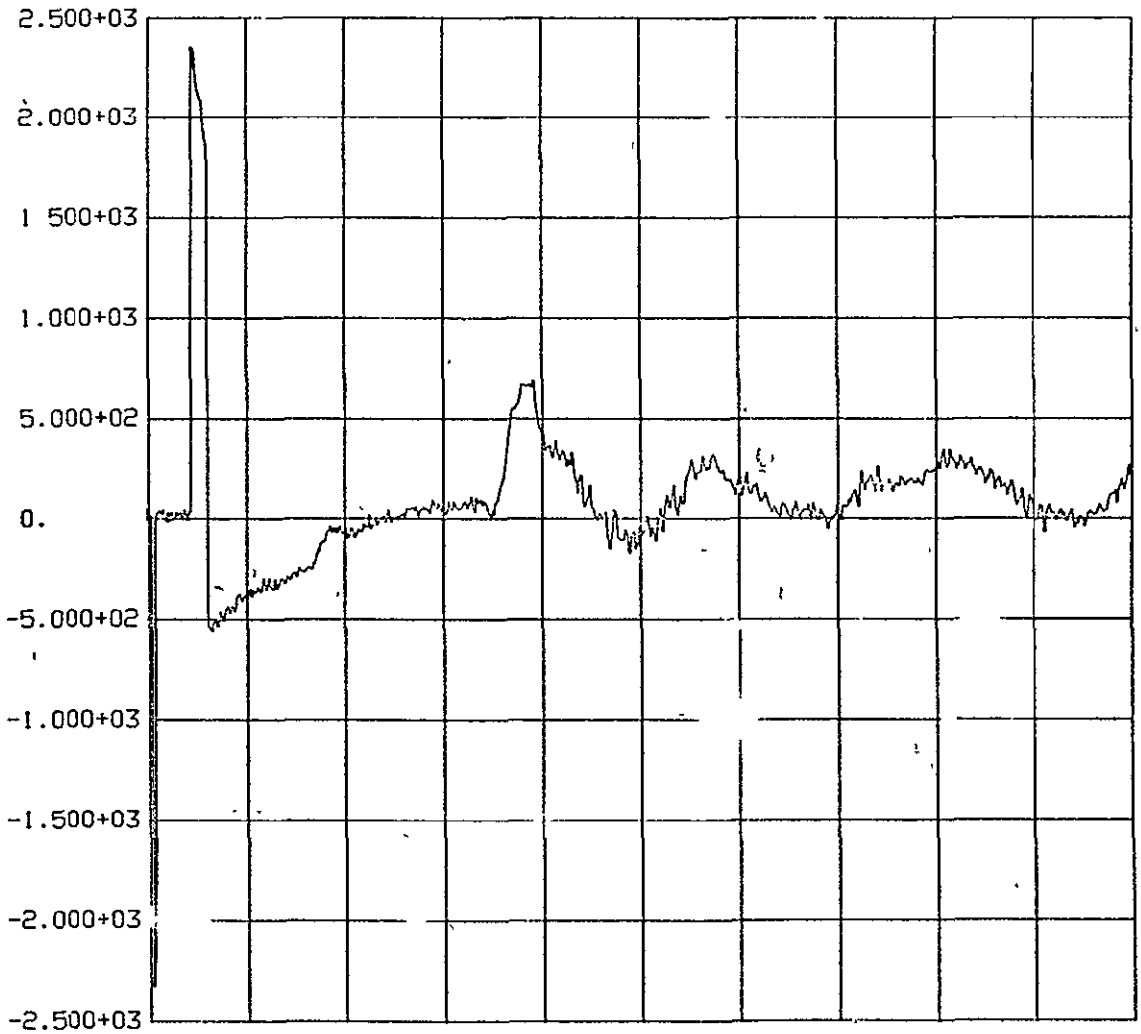
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.3-2


3.500+02
3.000+02
2 500+02
2.000+02
1.500+02
1.000+02
5.000+01
0.
-5.000+01
-1.000+02
-1.500+02
0.
2 000+00
4.000+00
6 000+00
8.000+00
1.00
Z-LOAD
VS
TIME
1
FLT 3
07N078
FLIGHT 3 TEST CONDITION 3.3-2 * UNFILT *



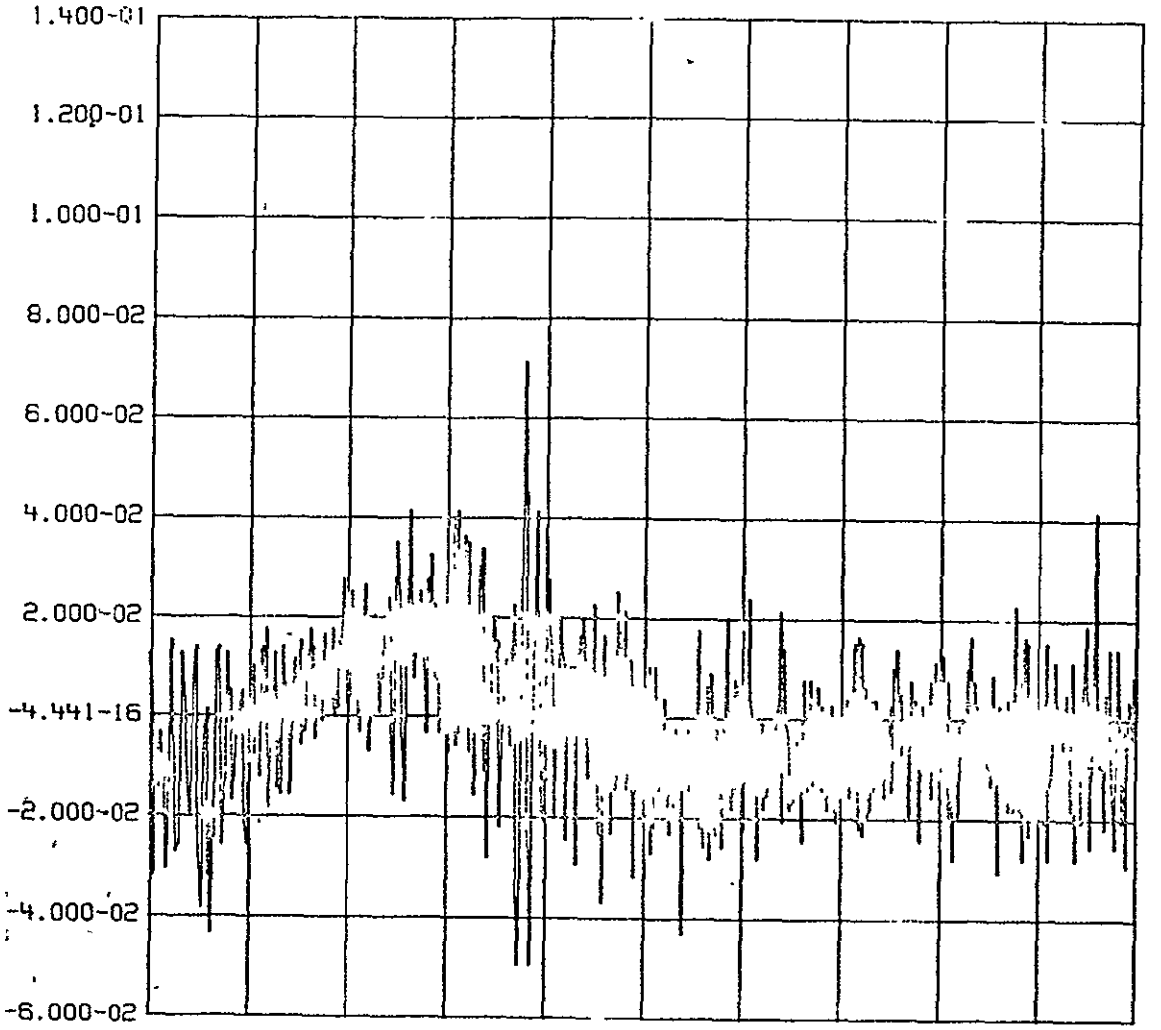
Y-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.3-2 * UNFILT *

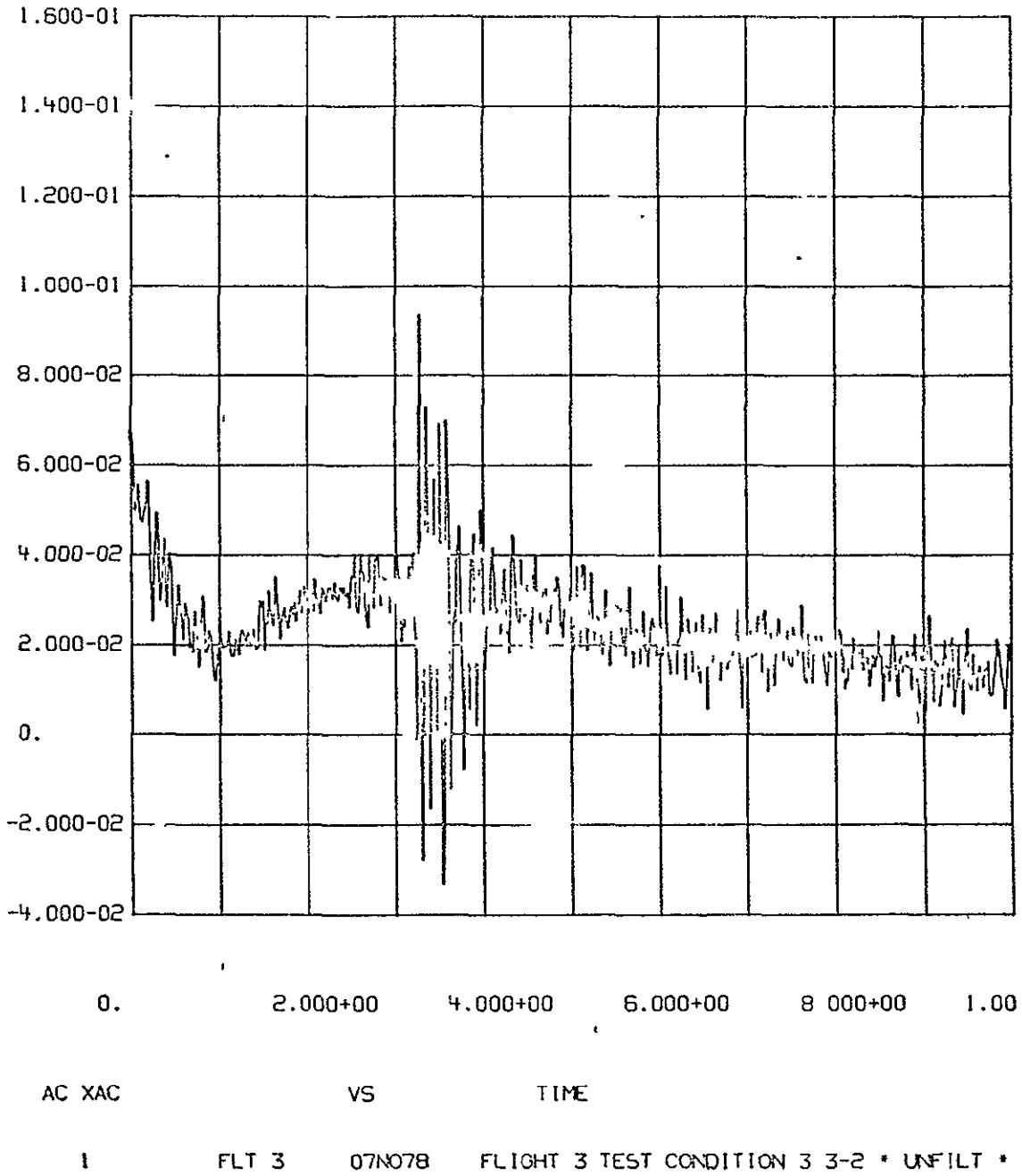


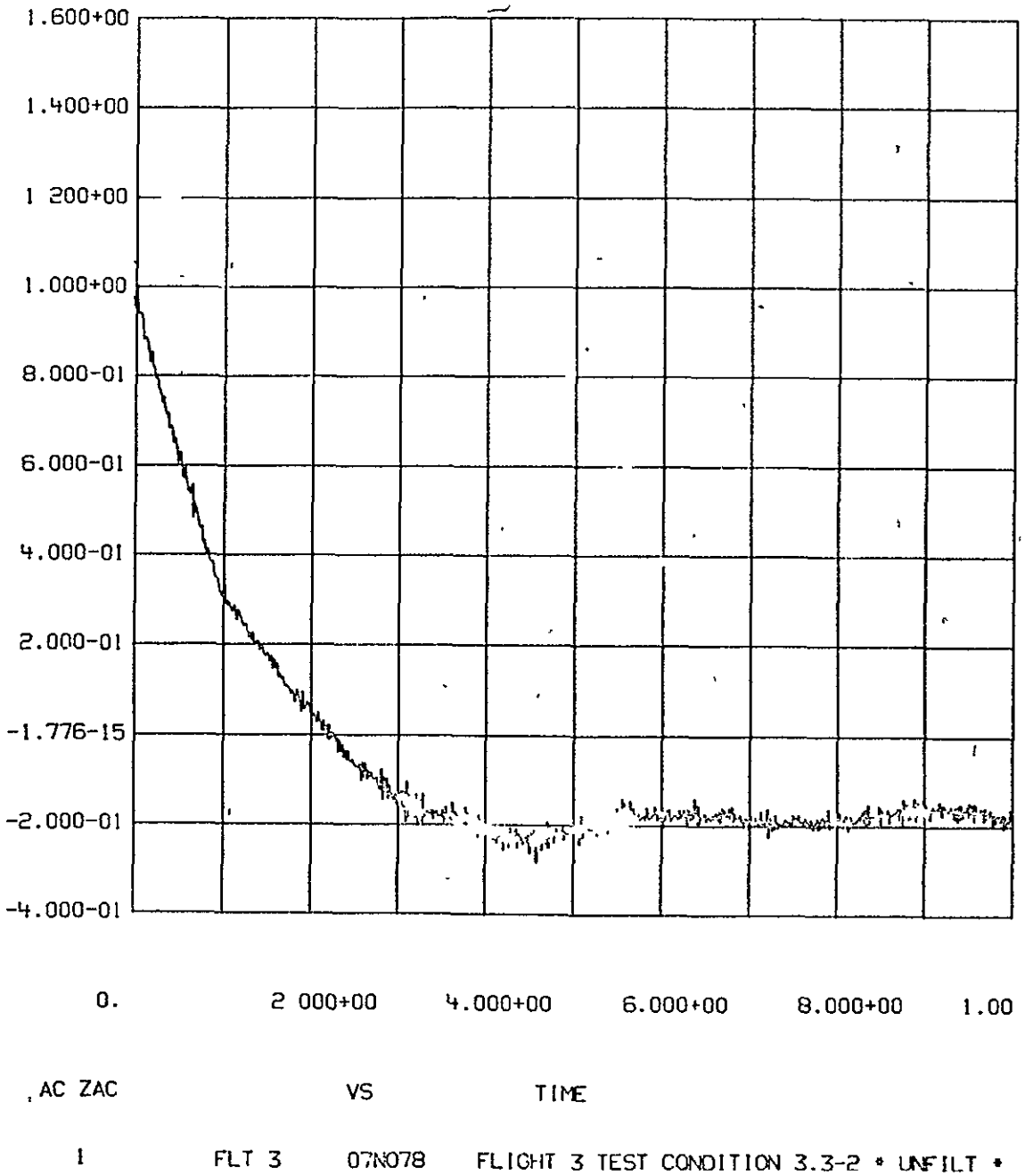
MOMENT VS TIME

1 FLT 3 0 N078 FLIGHT 3 TEST CONDITION 3.3-2 * UNFILT *



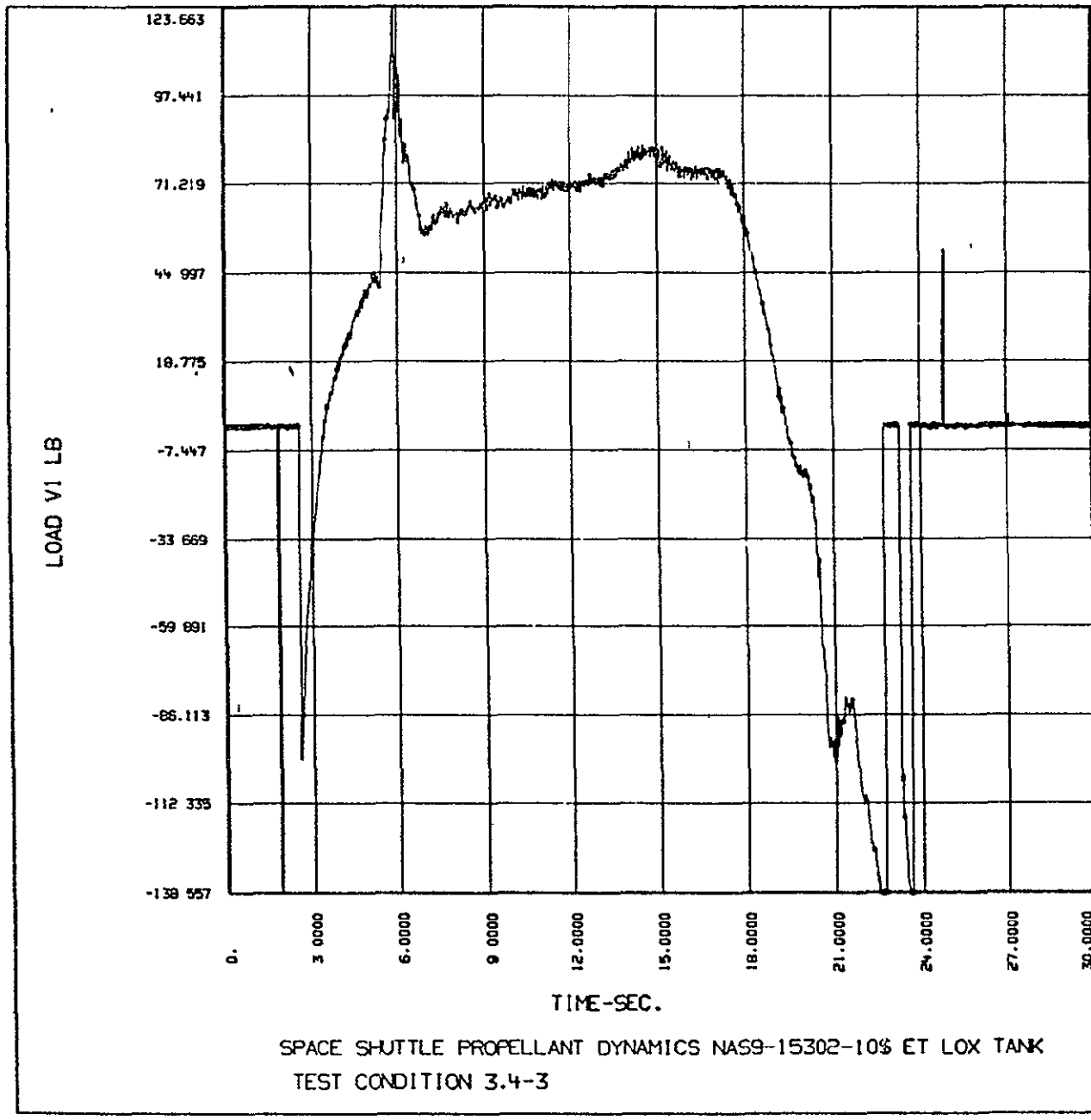
1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.3-2 * UNFILT *

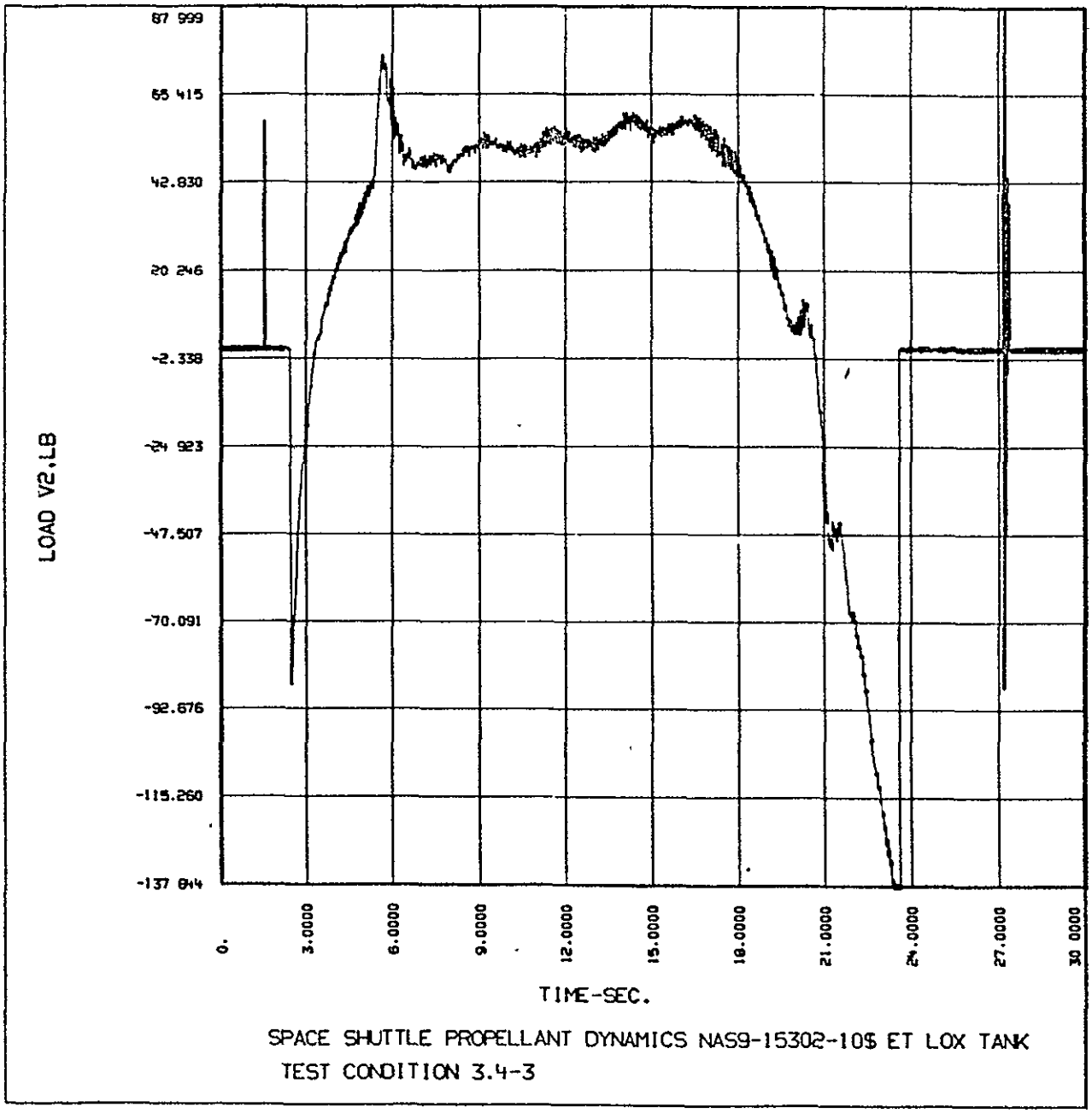

1.600-01
1.400-01
1.200-01
1.000-01
8.000-02
6.000-02
4.000-02
2.000-02
0.
-2.000-02
-4.000-02
0.
2.000+00
4.000+00
6.000+00
8 000+00
1.00
AC XAC
VS
TIME
1
FLT 3
07N078
FLIGHT 3 TEST CONDITION 3 3-2 * UNFILT *

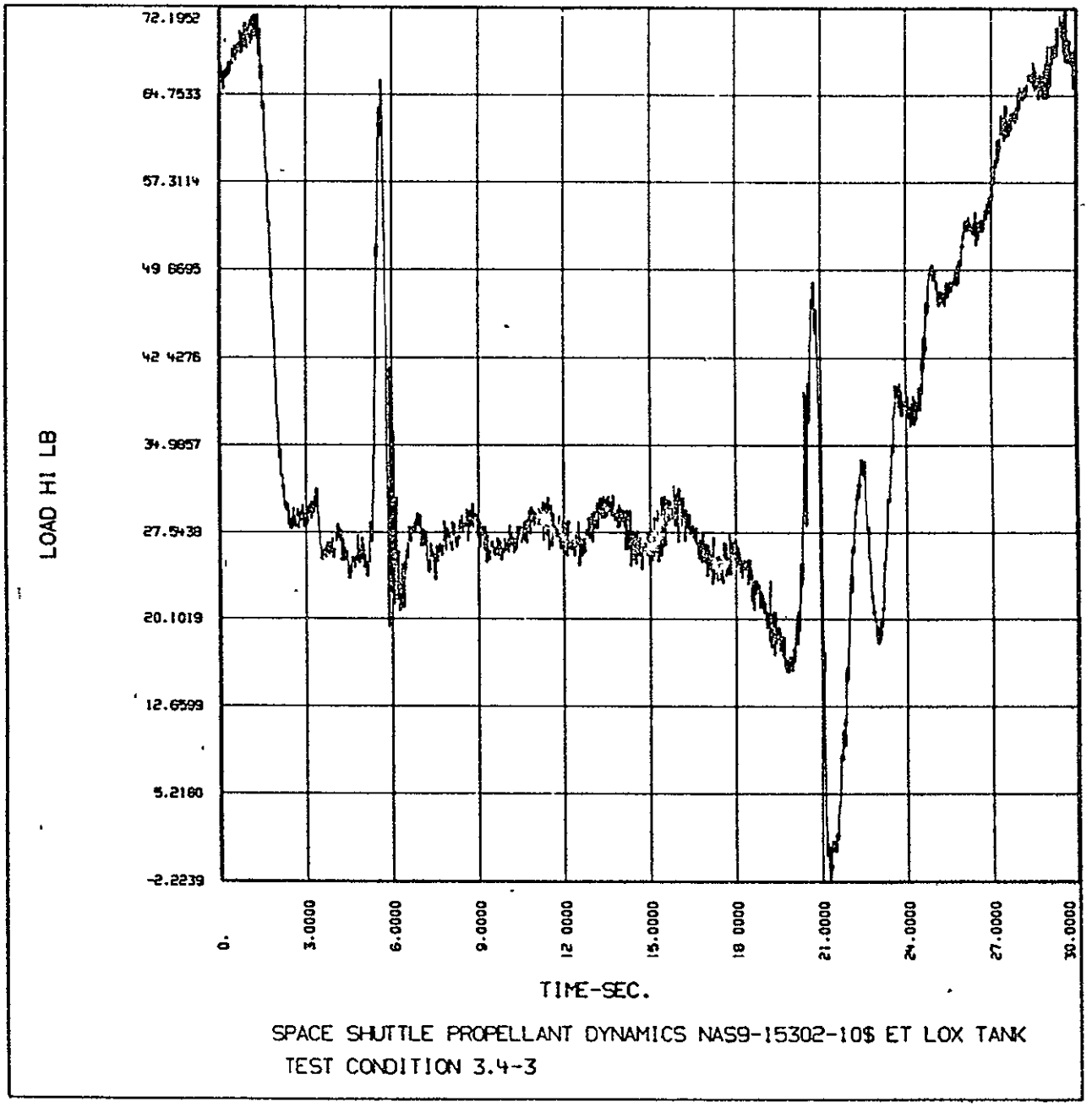

1.600+00
1.400+00
1 200+00
1.000+00
8.000-01
6.000-01
4.000-01
2.000-01
-1.776-15
-2.000-01
-4.000-01
0.
2 000+00
4.000+00
6.000+00
8.000+00
1.00
AC ZAC
VS
TIME
1
FLT 3
07N078
FLIGHT 3 TEST CONDITION 3.3-2 * UNFILT *

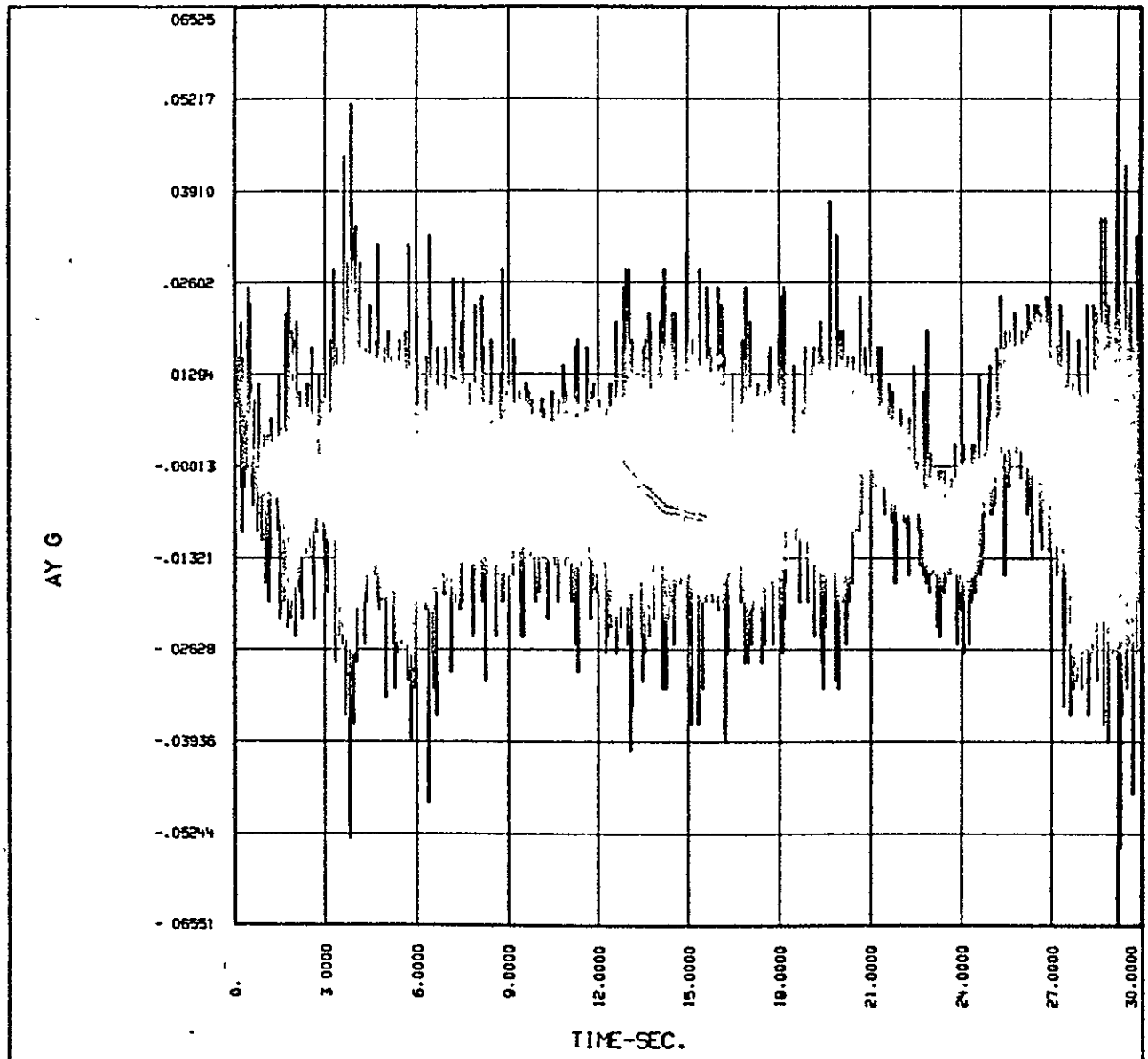
Test Data Condition 3.4-3

Baffles
Test Fluid – FC 113
Orientation – 30°
Fill Volume – 15%
Target Acceleration–0.2 g

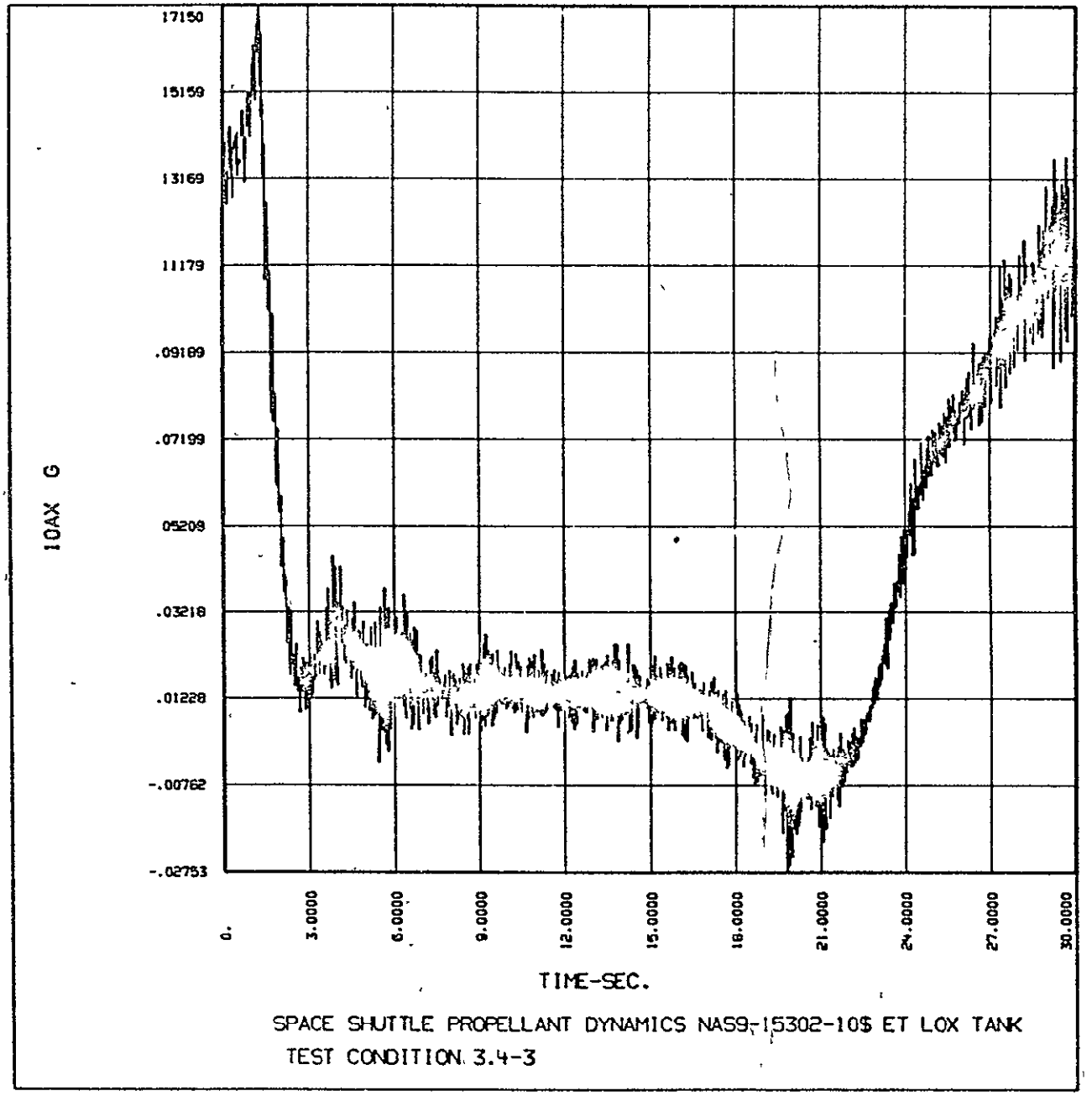

123.663
97.441
71.219
44 997
18.775
-7.447
-33 669
-59 891
-86.113
-112 335
-138 557
LOAD V1 LB
0.
3 0000
6.0000
9 0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10% ET LOX TANK
TEST CONDITION 3.4-3

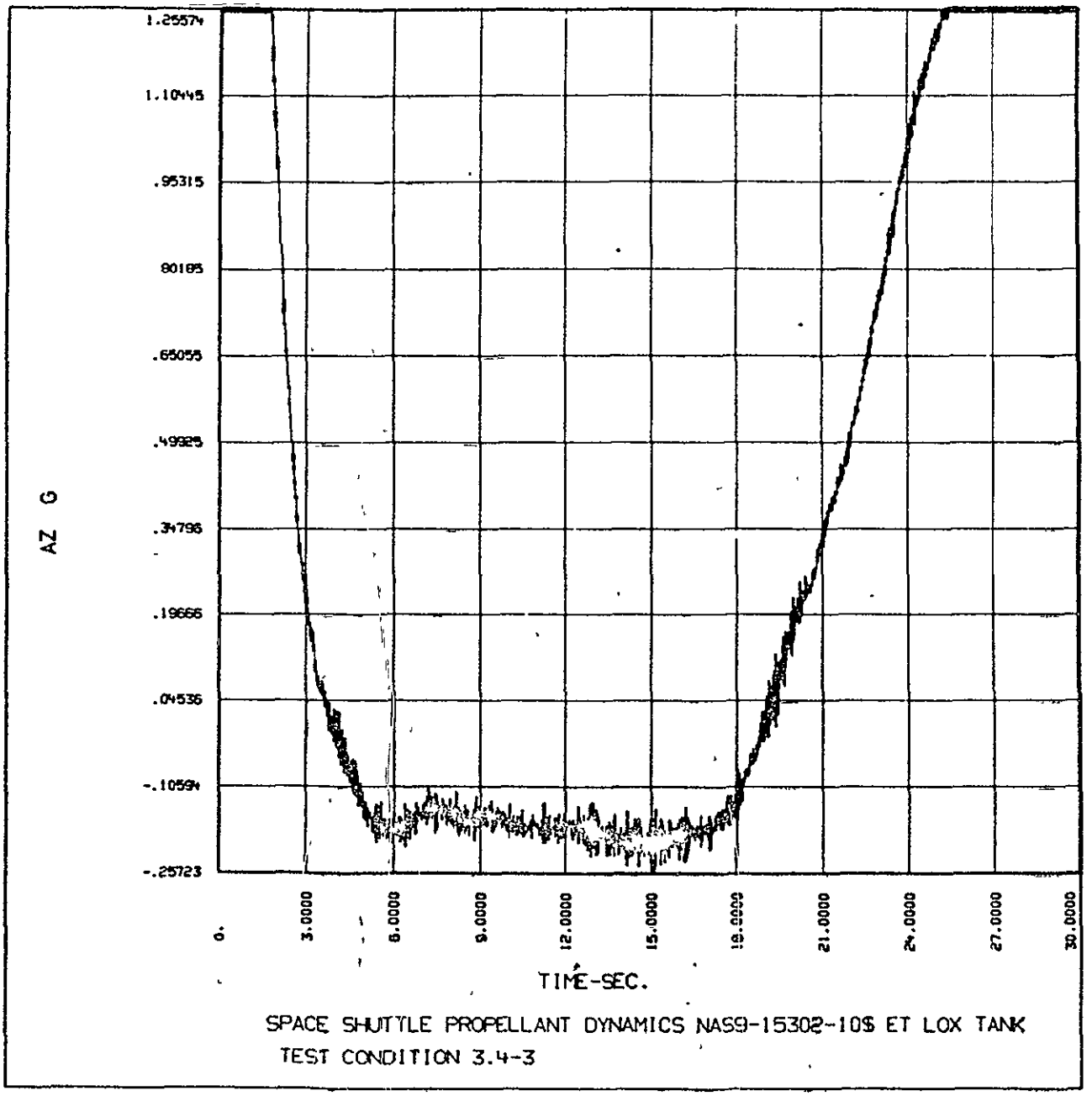

87 999
65 415
42.830
20 246
-2.338
-24 923
-47.507
-70.091
-92.676
-115.260
-137 844
LOAD V2,LB
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30 0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.4-3

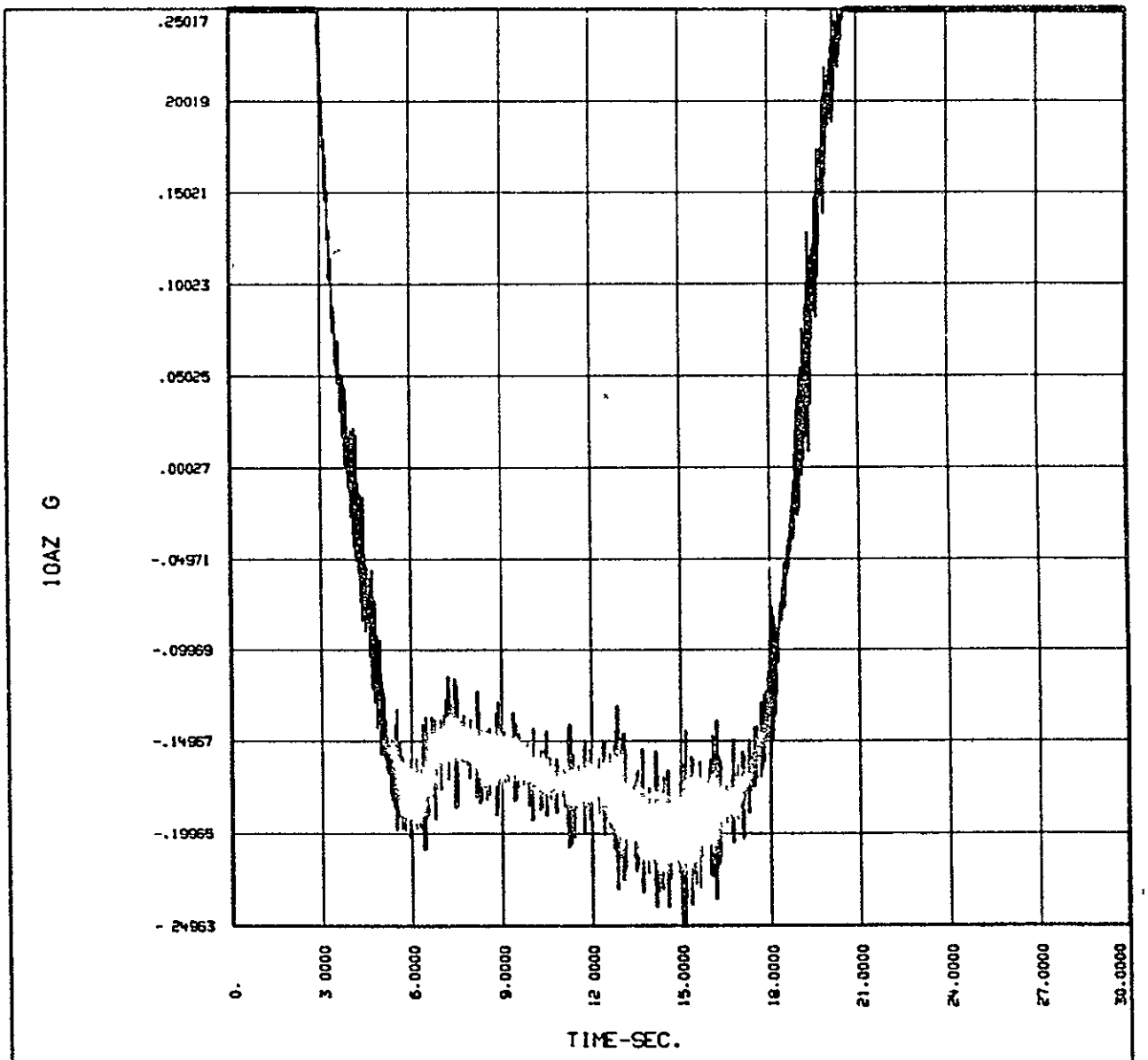

72.1952
64.7533
57.3114
49.8695
42.4276
34.9857
27.5438
20.1019
12.6599
5.2180
-2.2239
LOAD H1 LB
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.4-3



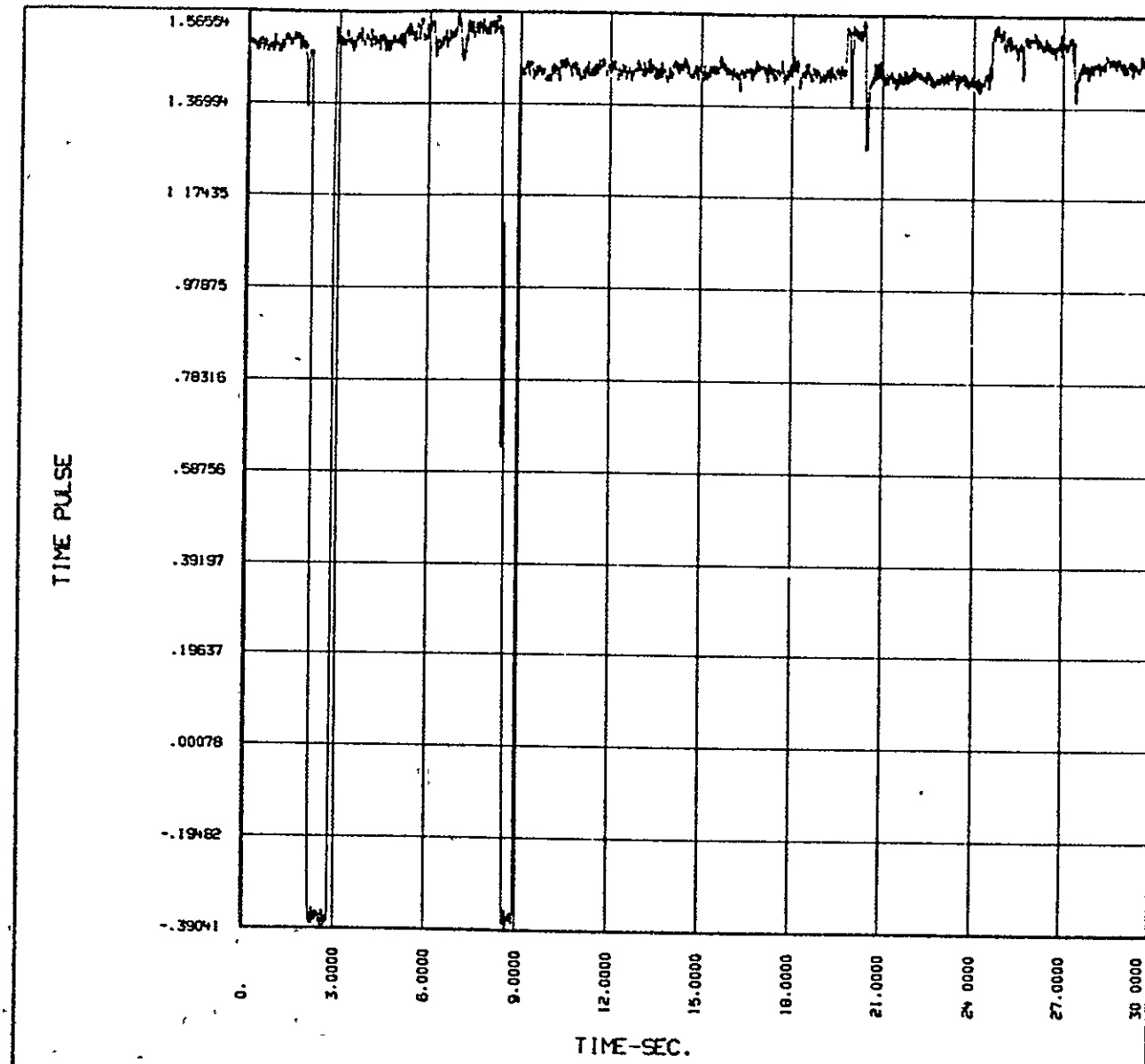
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.4-3


17150
15159
13169
11179
.09189
.07199
05209
.03218
.01228
-.00762
-.02753
10AX G
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.4-3

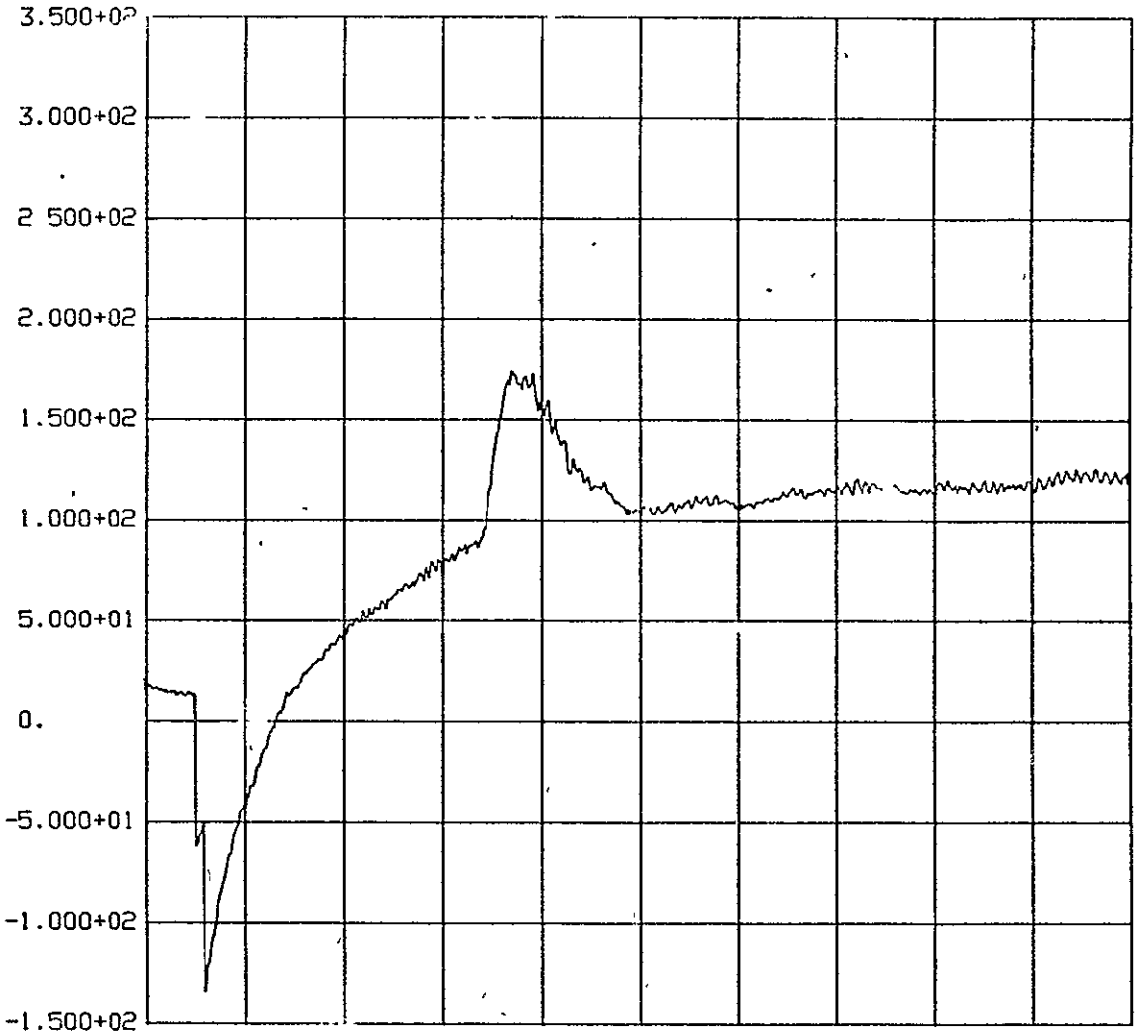

1.25574
1.10445
.95315
.80185
.65055
.49925
.34796
.19666
.04536
-.10594
-.25723
AZ G
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.4-3



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.4-3

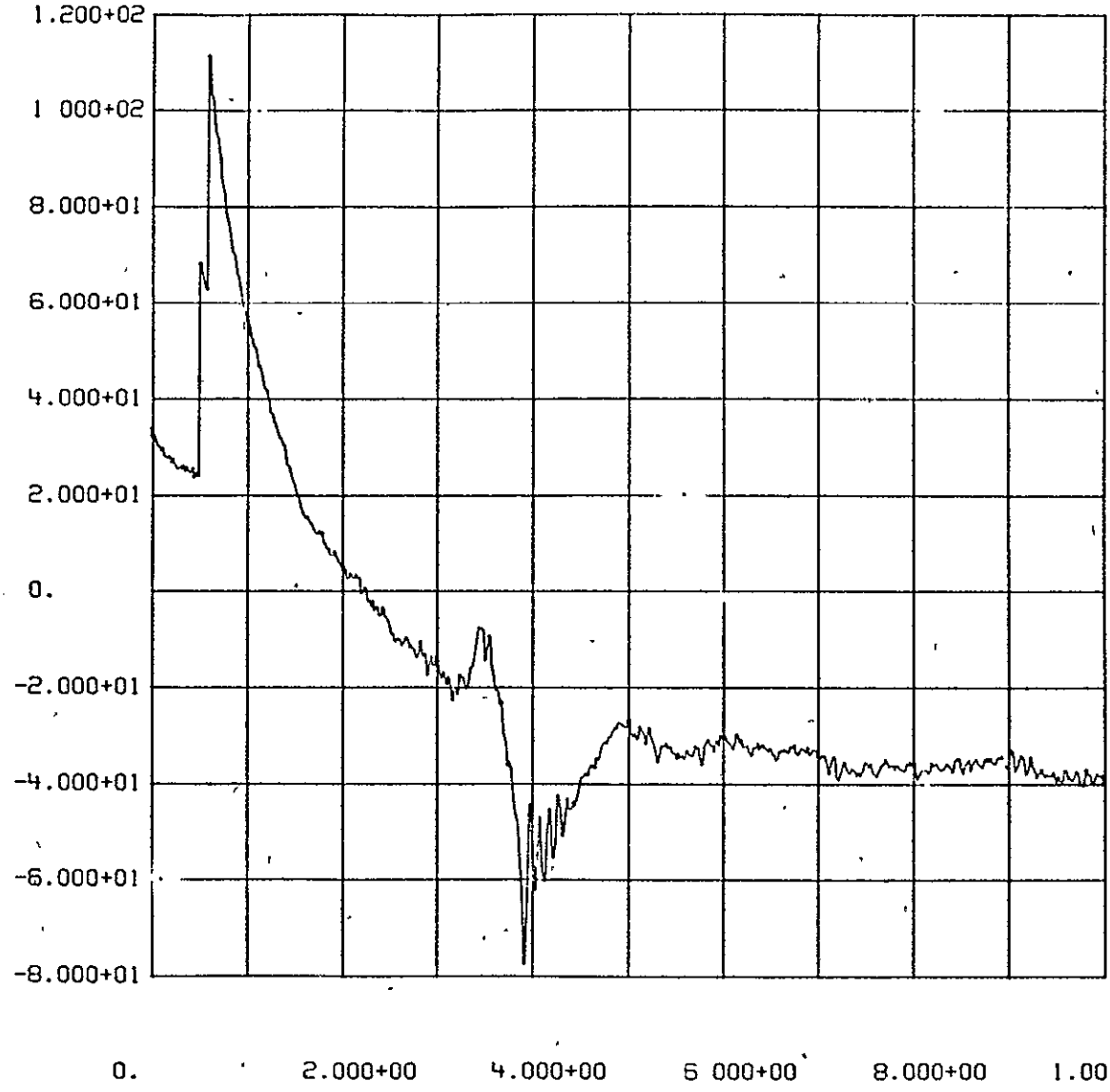


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.4-3



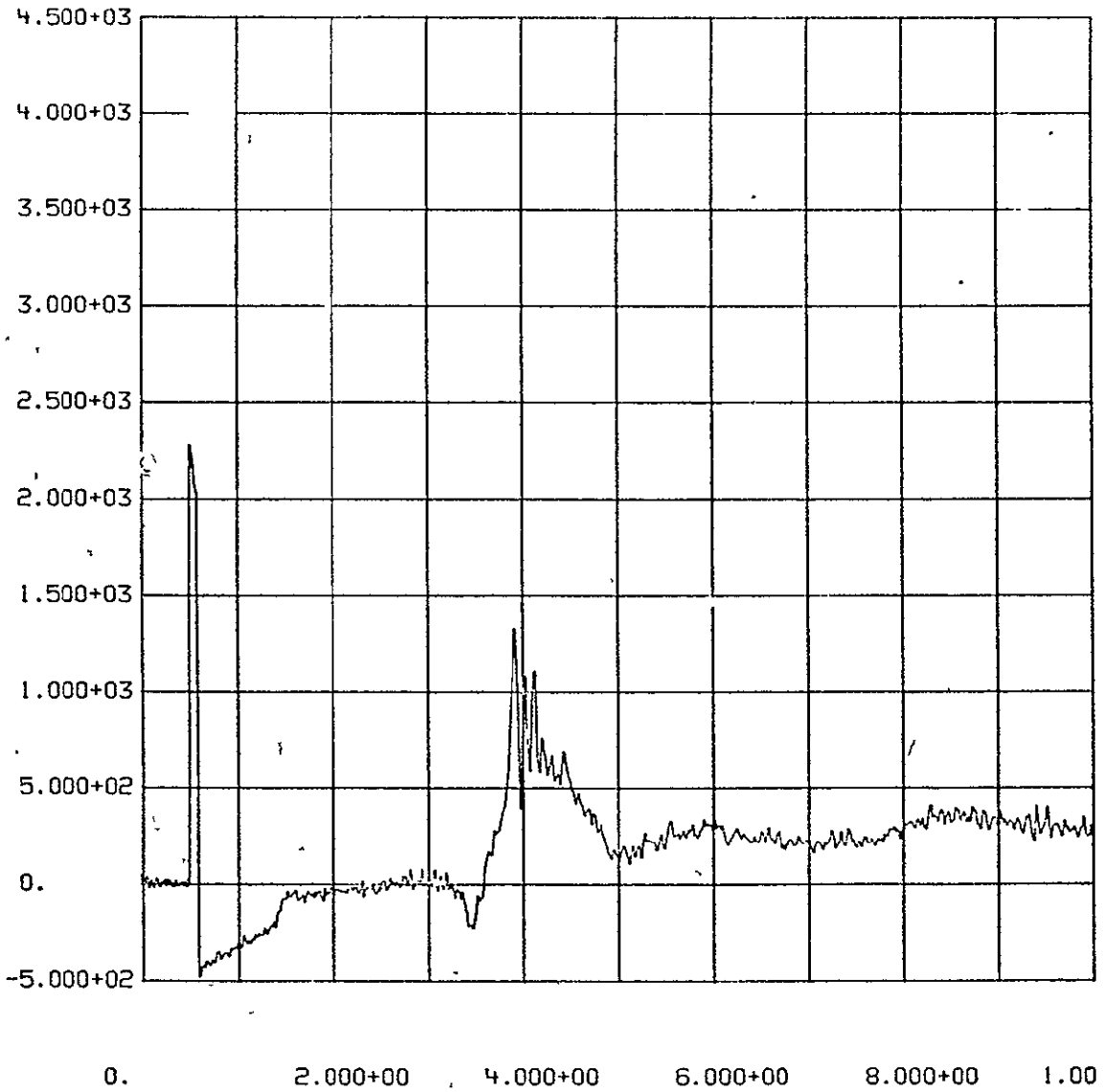
Z-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.4-3 * UNFILT *



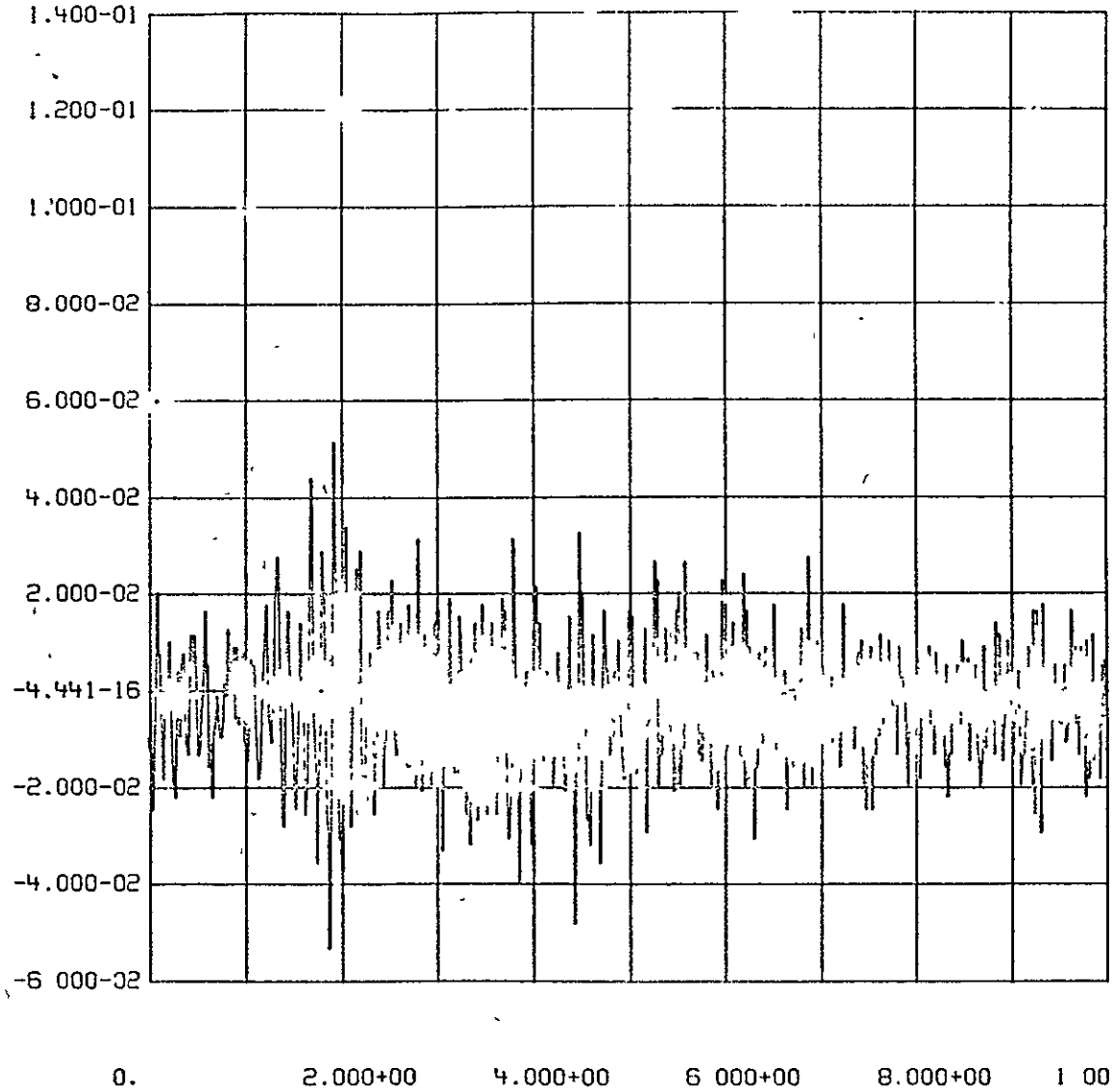
Y-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.4-3 * UNFILT *



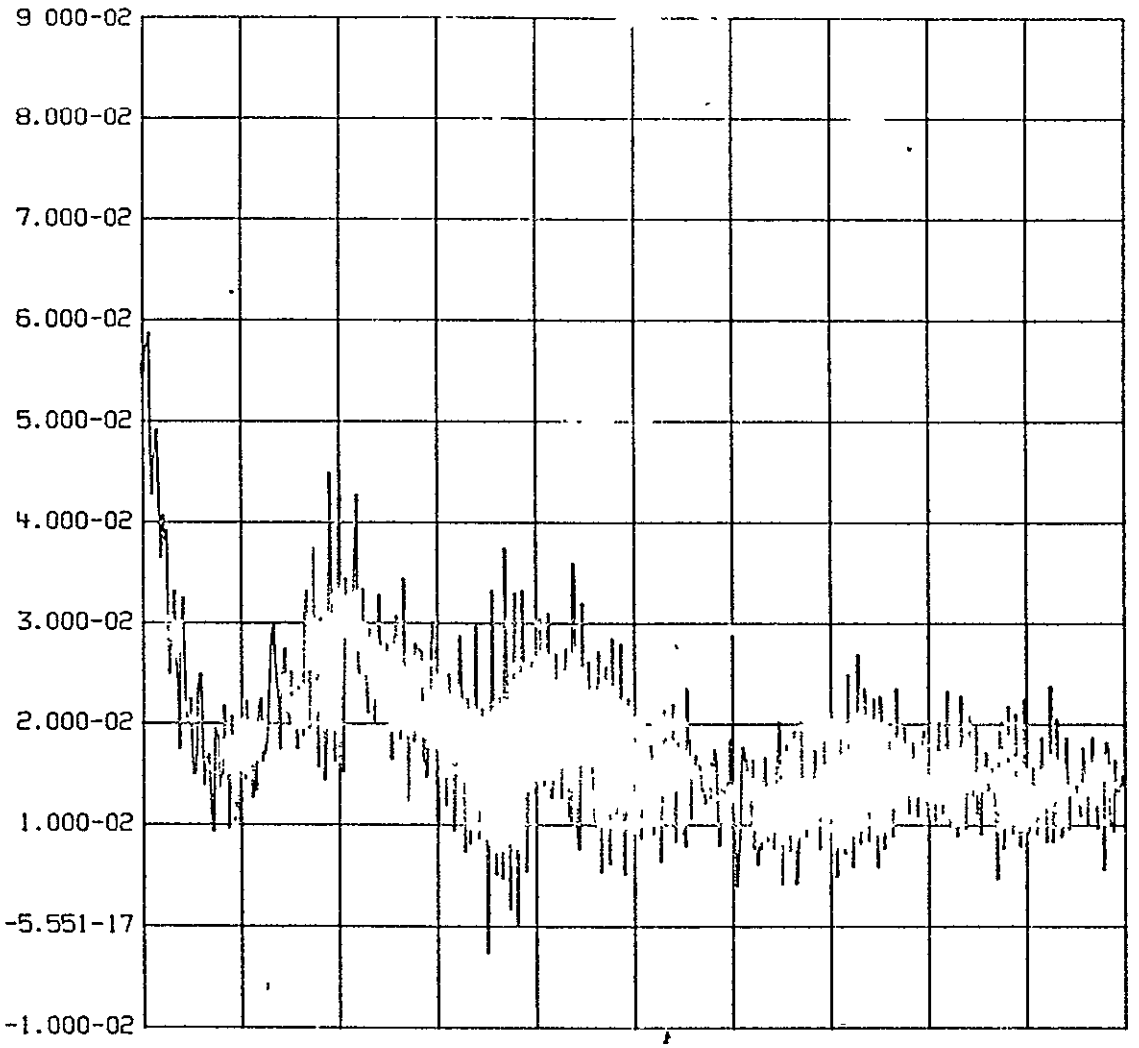
MOMENT VS TIME

FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.4-3 * UNFILT *



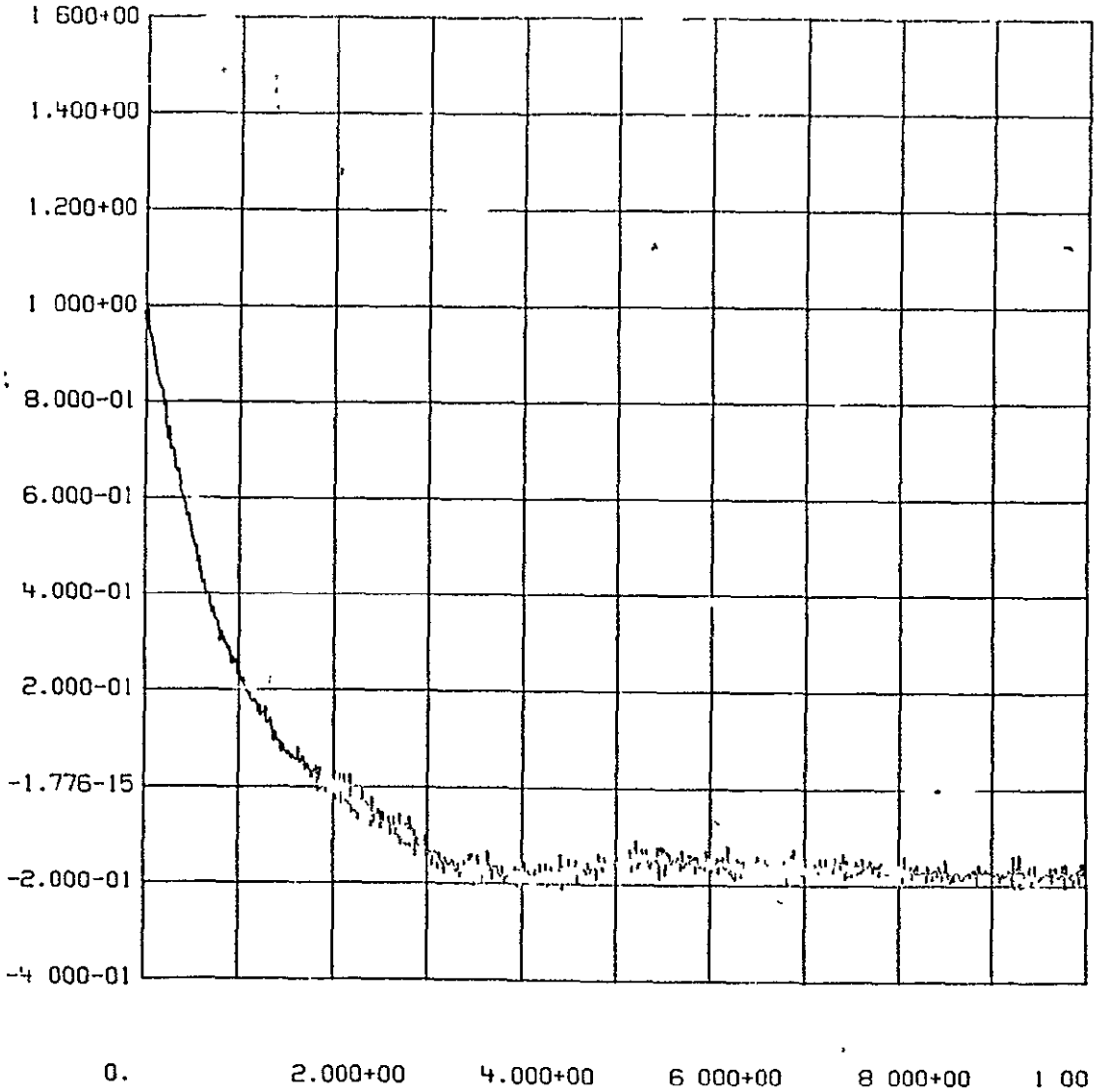
AC YAC VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.4-3 * UNFILT *



AC XAC VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.4-3 * UNFILT *

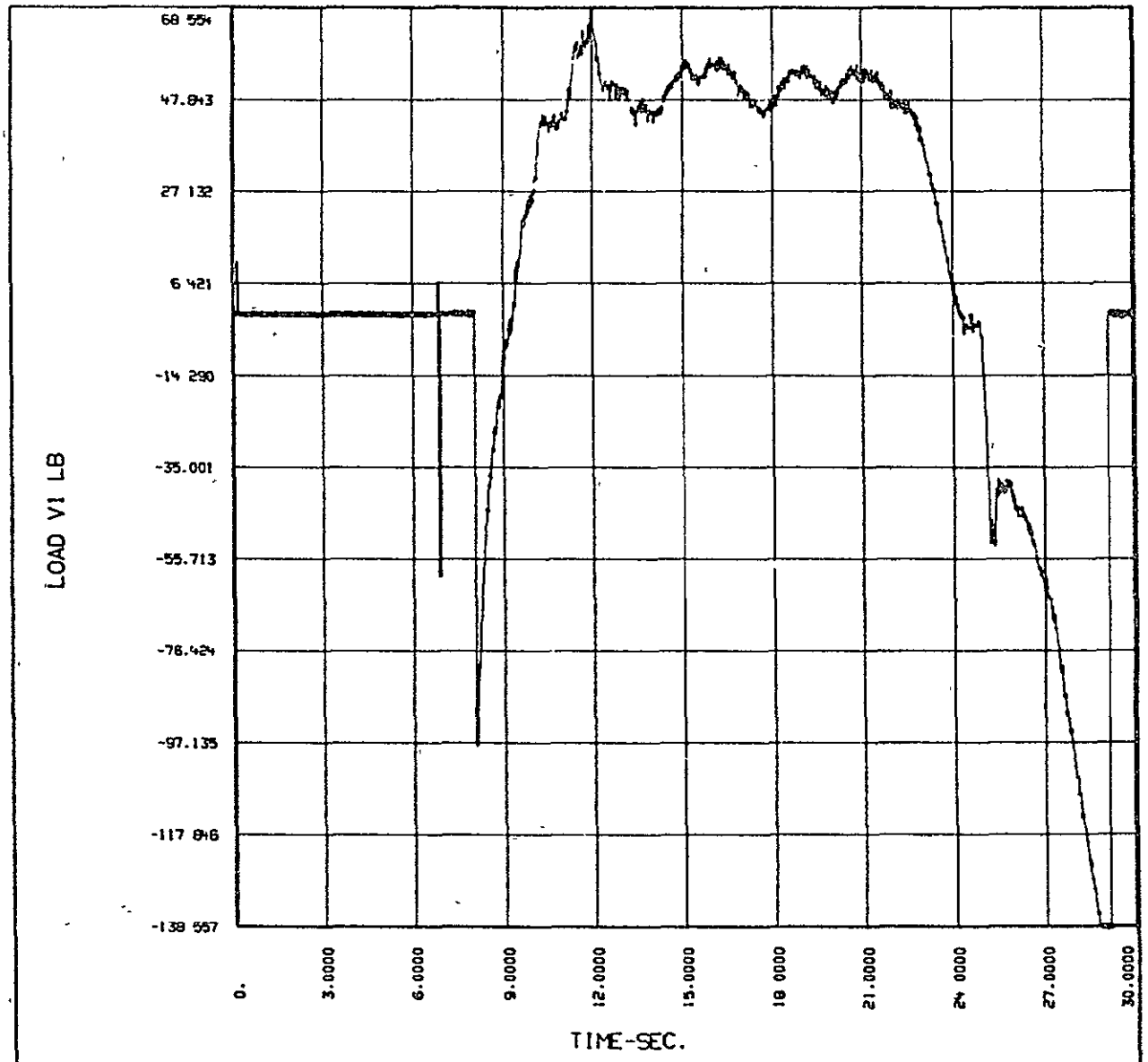


AC ZAC VS TIME

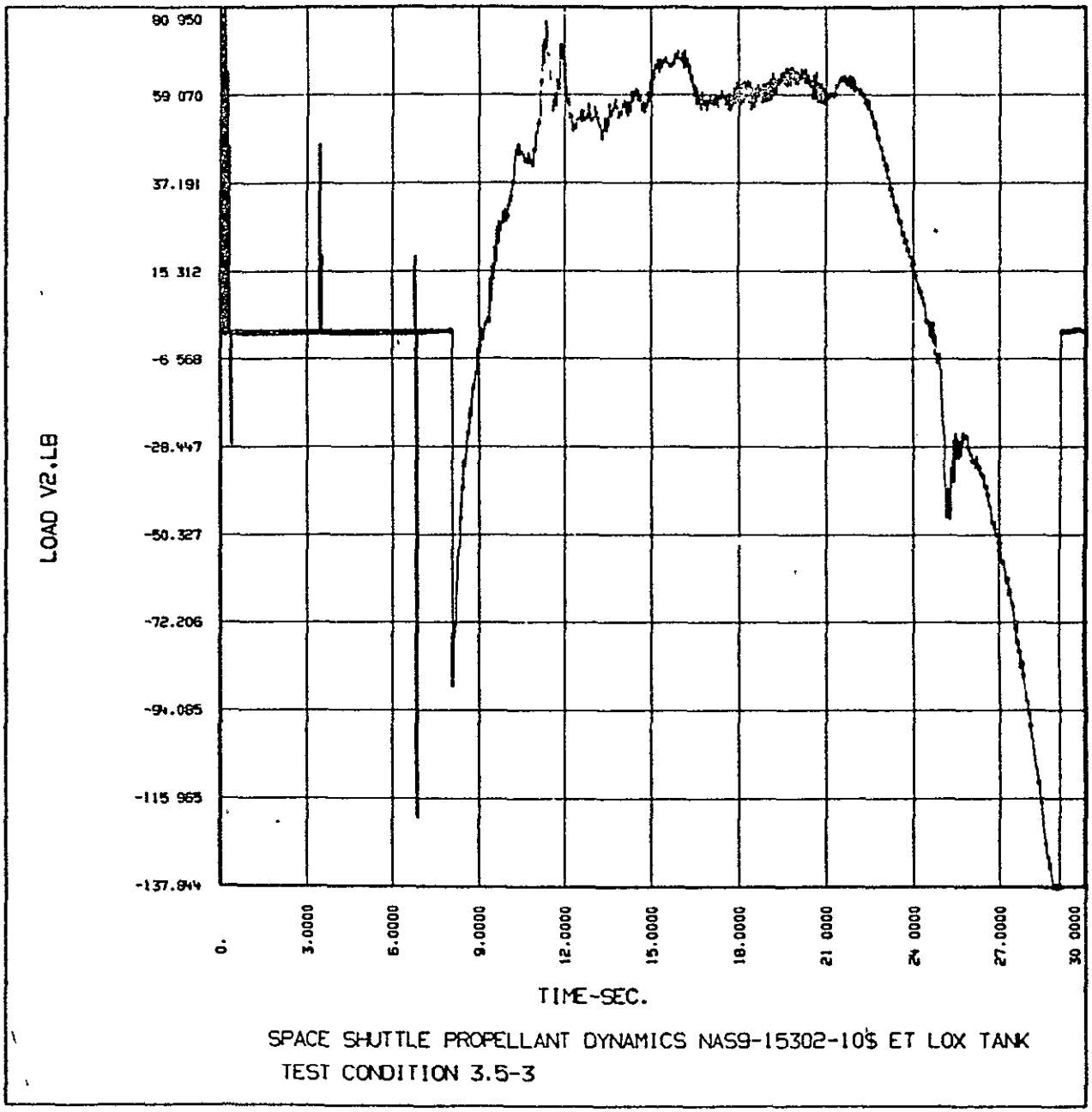
1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.4-3 * UNFILT *

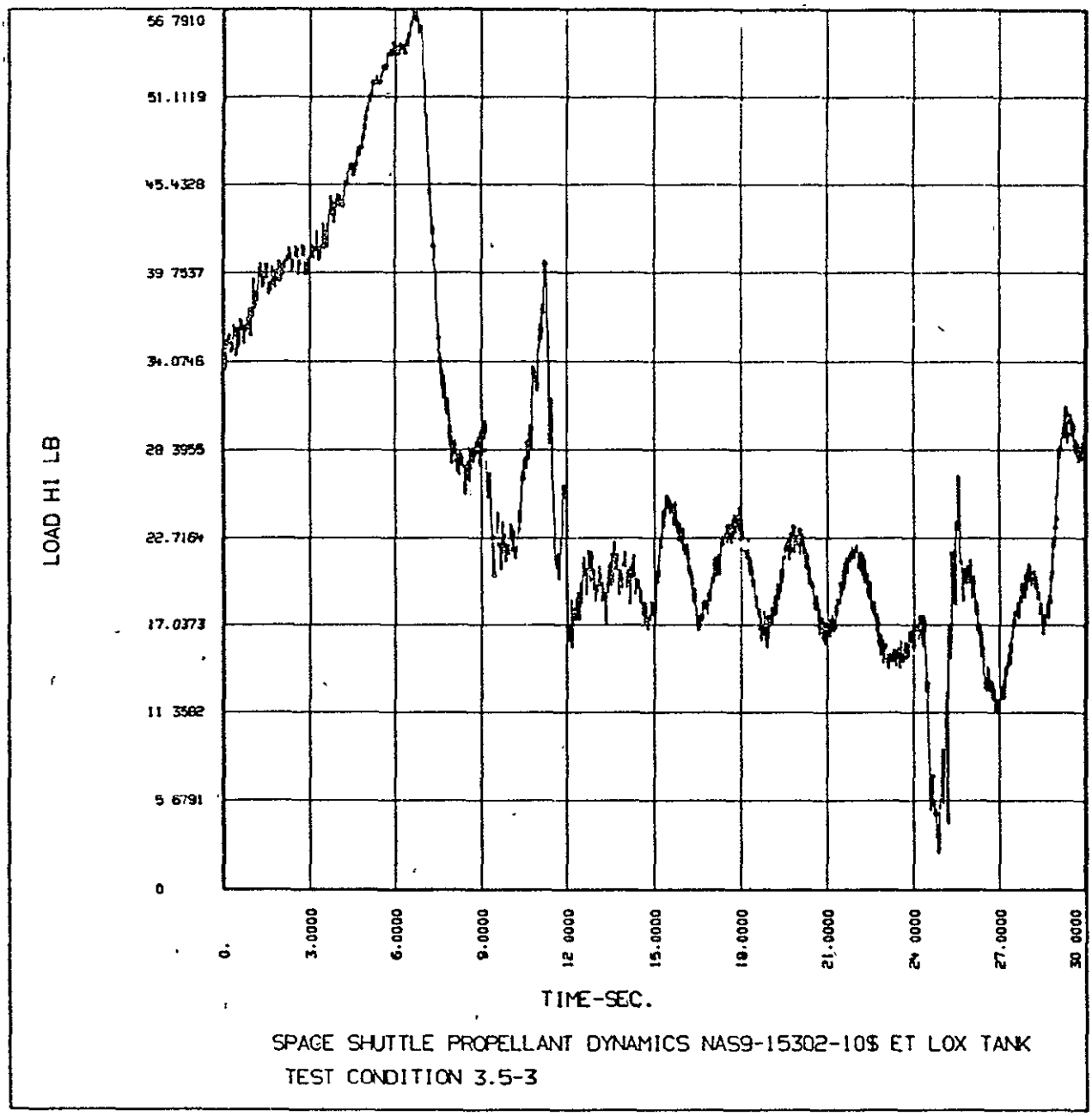
Test Data Condition 3.5-3

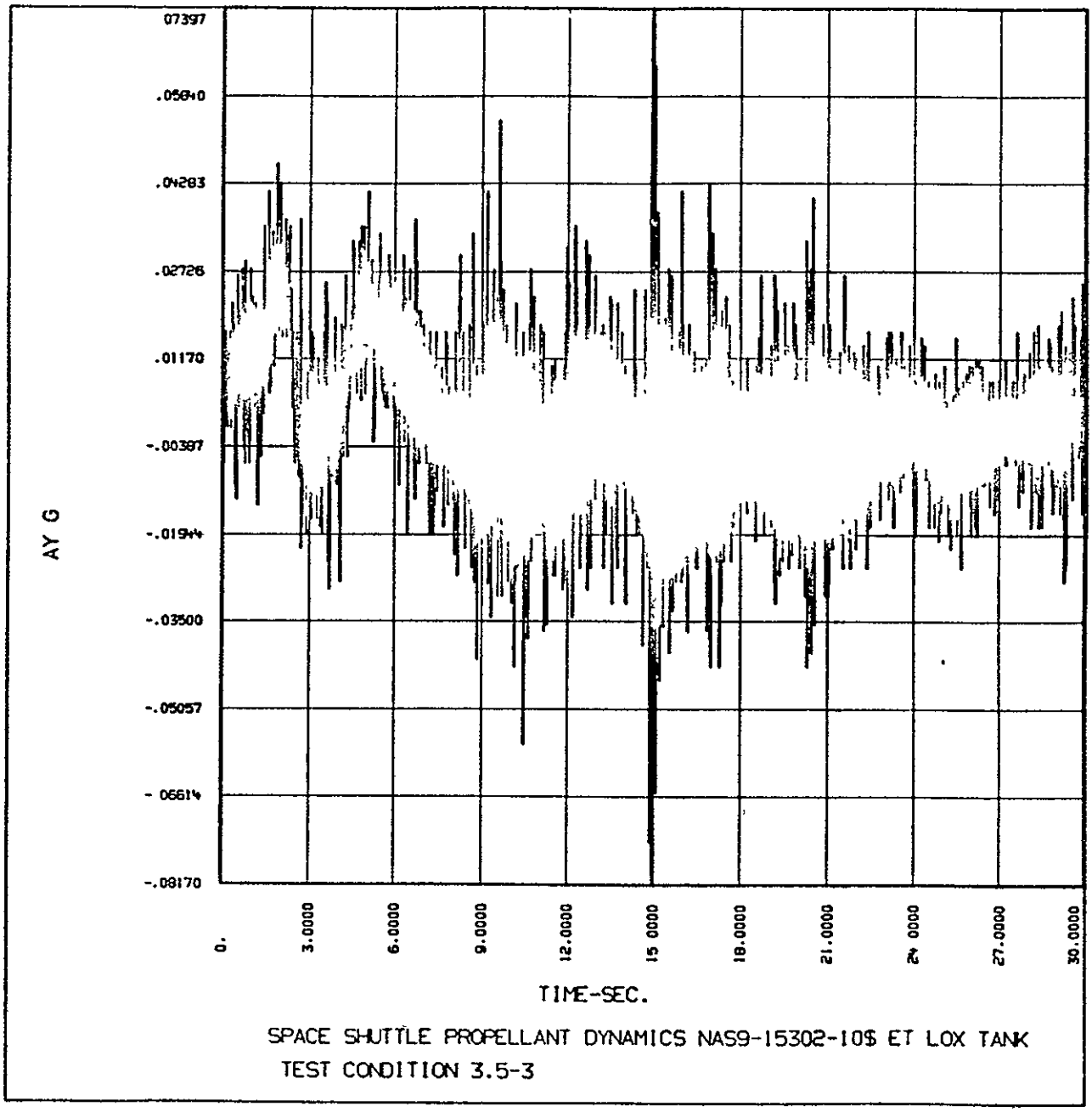
Baffles
Test Fluid – FC 113
orientation – 0°
Fill Volume – 10%
Target Acceleration–0.2 g

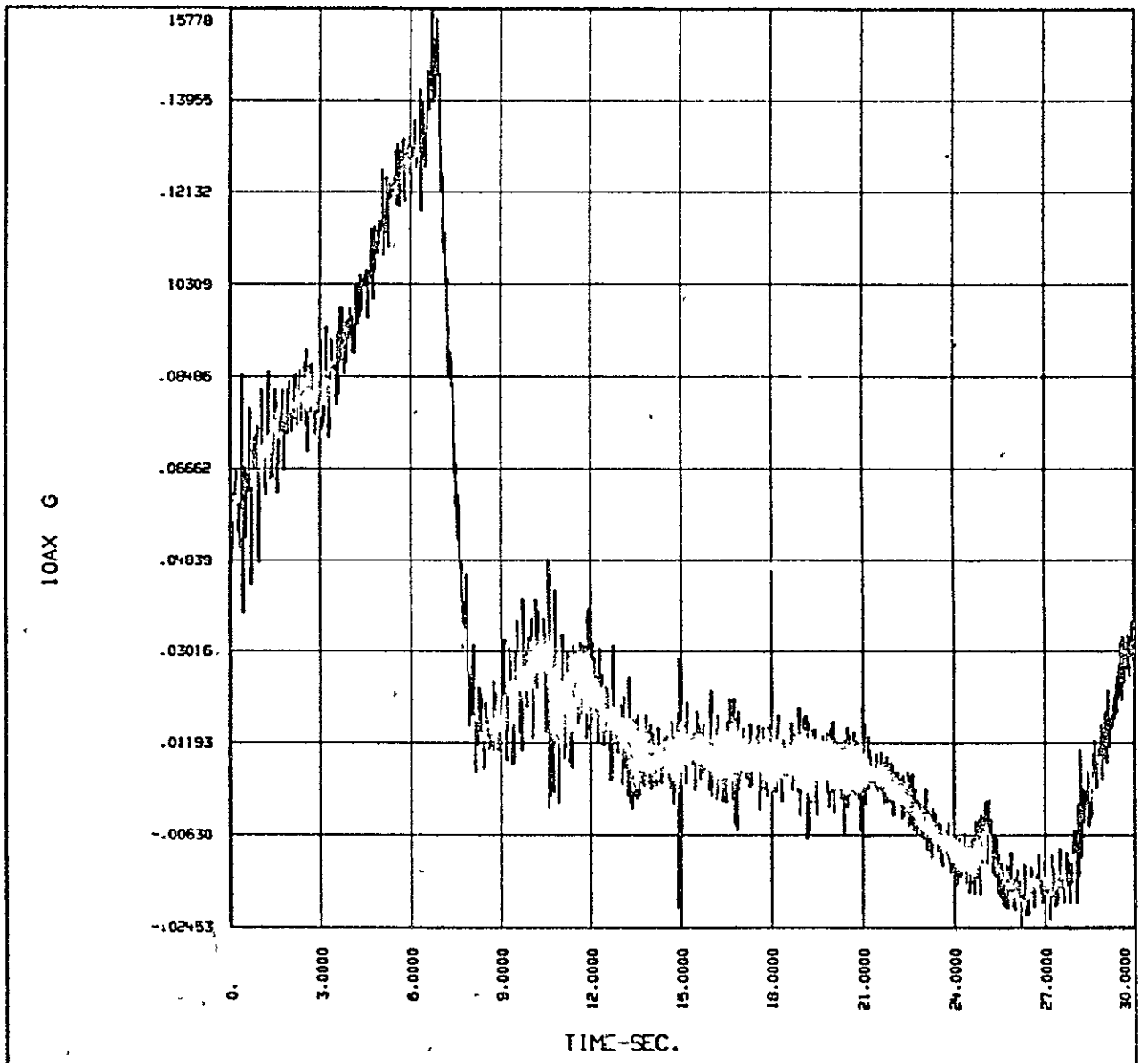


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.5-3

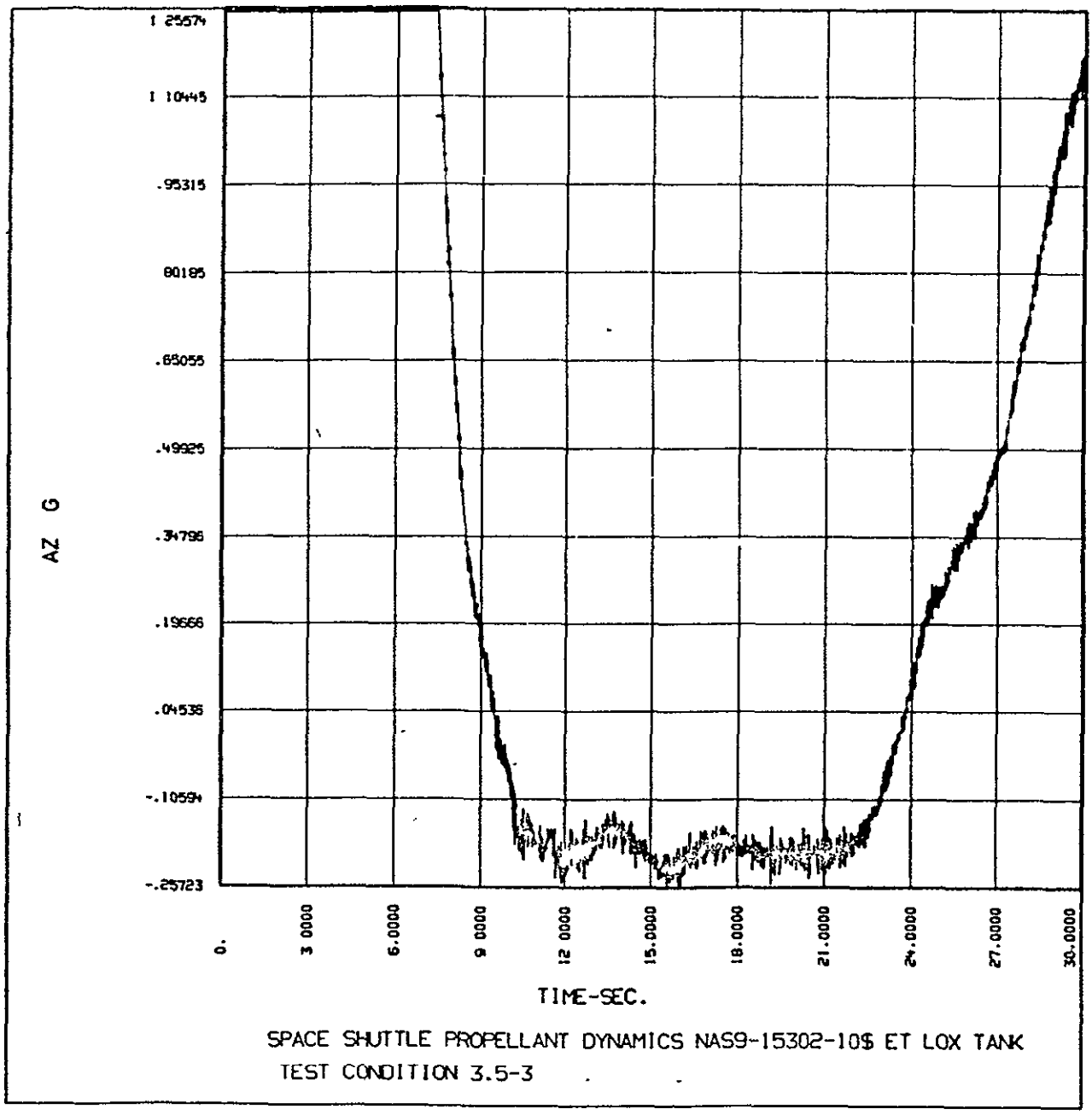

LOAD V2,LB
80 950
59 070
37.191
15 312
-6 568
-28.447
-50.327
-72.206
-94.085
-115 965
-137.844
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21 0000
24 0000
27.0000
30 0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.5-3

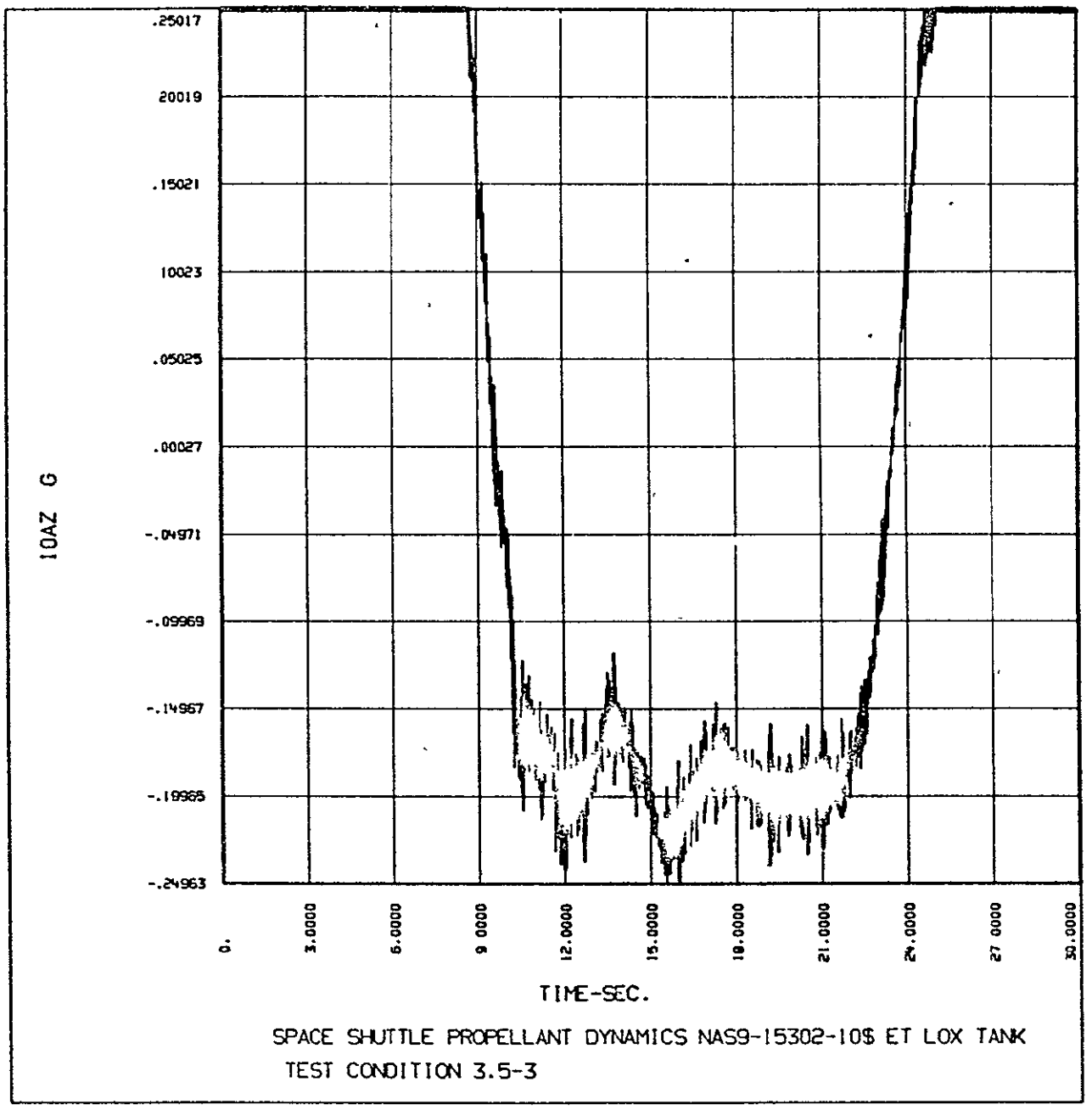

56 7910
51.1119
45.4328
39 7537
34.0746
28 3955
22.7164
17.0373
11 3582
5 6791
0
LOAD H1 LB
0.
3.0000
6.0000
9.0000
12 0000
15.0000
18.0000
21.0000
24 0000
27.0000
30 0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.5-3

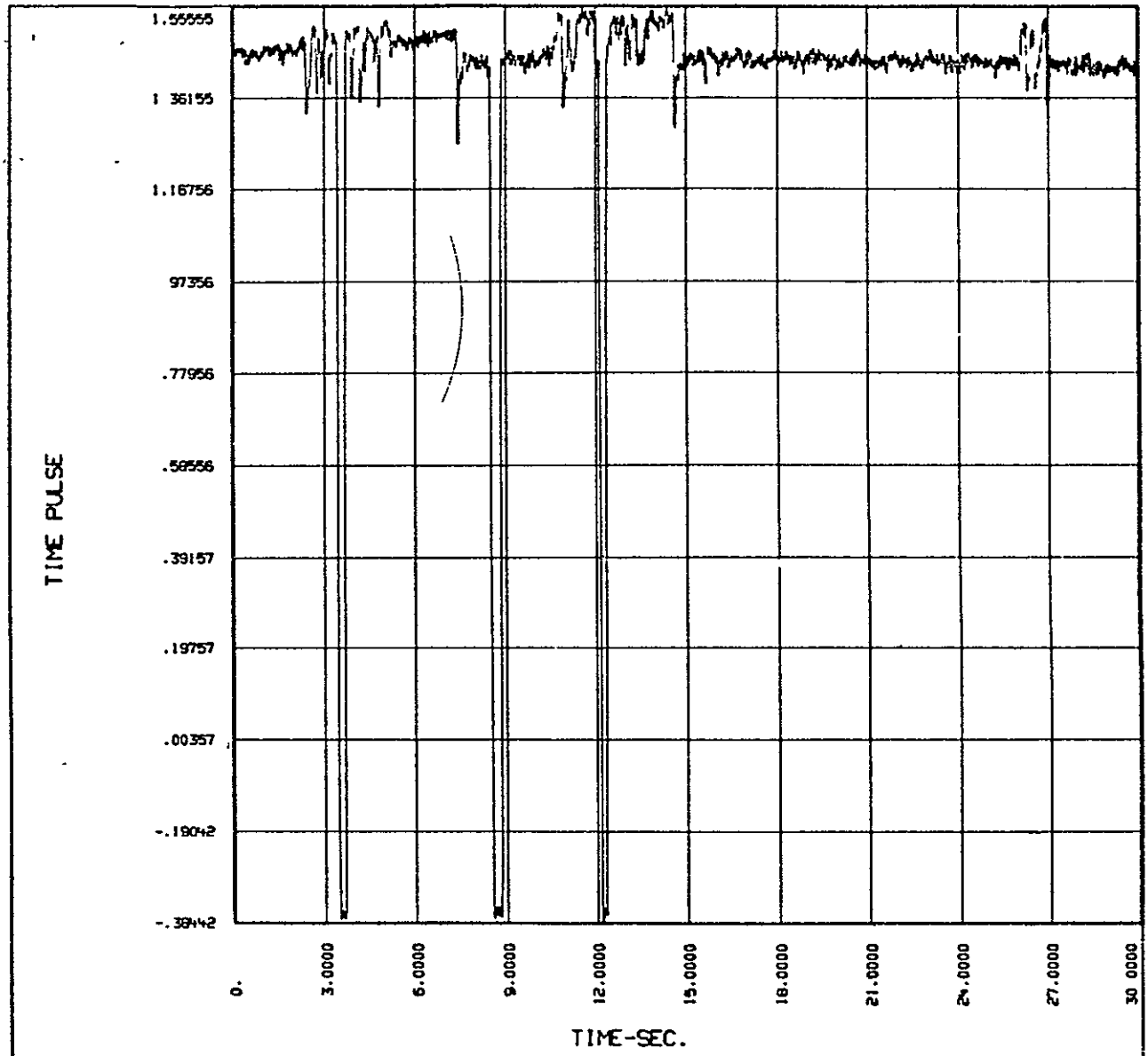

07397
.05840
.04283
.02726
.01170
-.00387
-.01944
-.03500
-.05057
- 06614
-.08170
AY G
0.
3.0000
6.0000
9.0000
12.0000
15 0000
18.0000
21.0000
24 0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.5-3



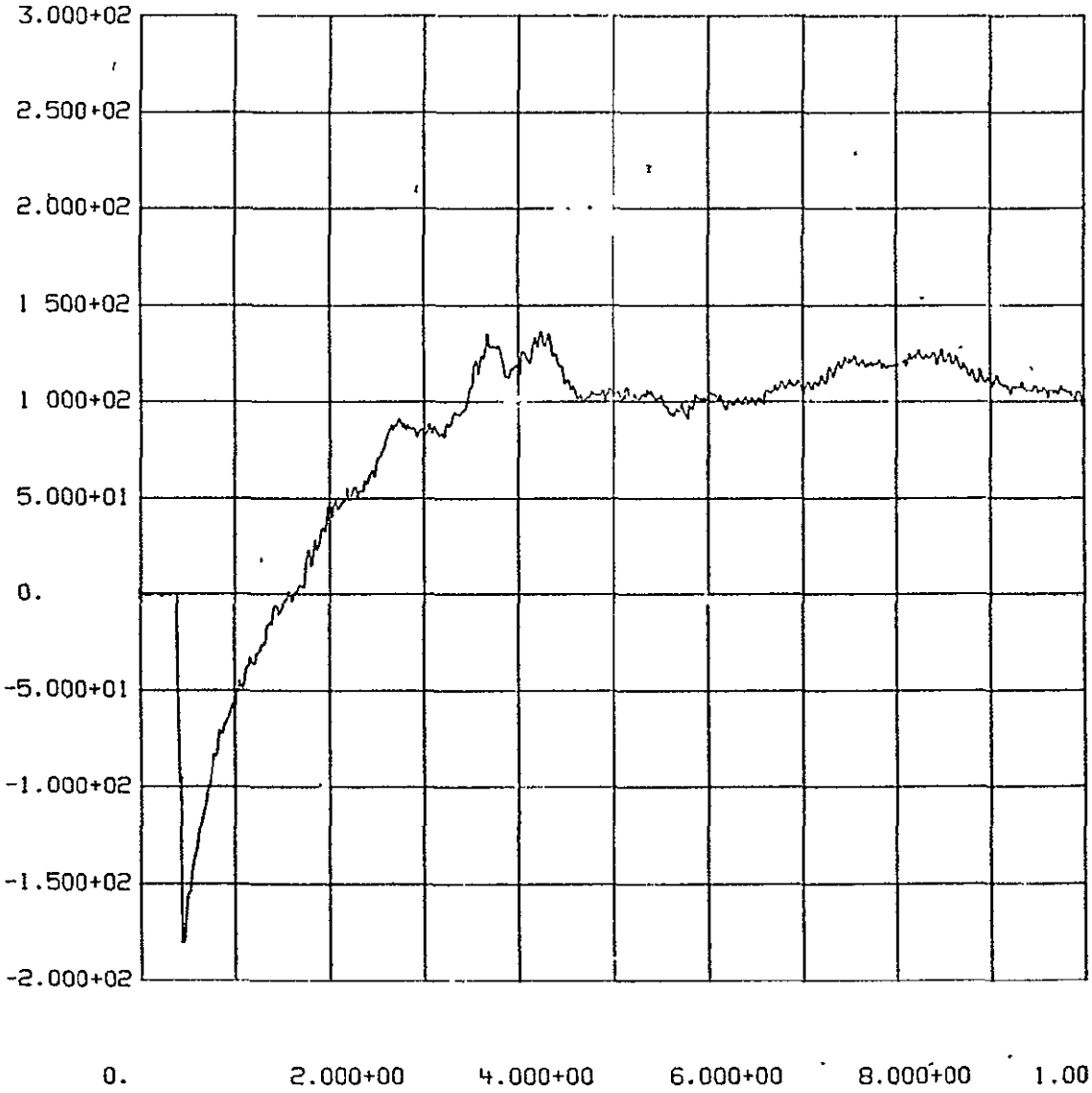
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.5-3


1.25574
1.10445
.95315
.80185
.65055
.49925
.34796
.19666
.04536
-.10594
-.25723
AZ G
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.5-3


.25017
20019
.15021
10023
.05025
.00027
-.04971
-.09969
-.14967
-.19965
-.24963
10AZ G
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.5-3

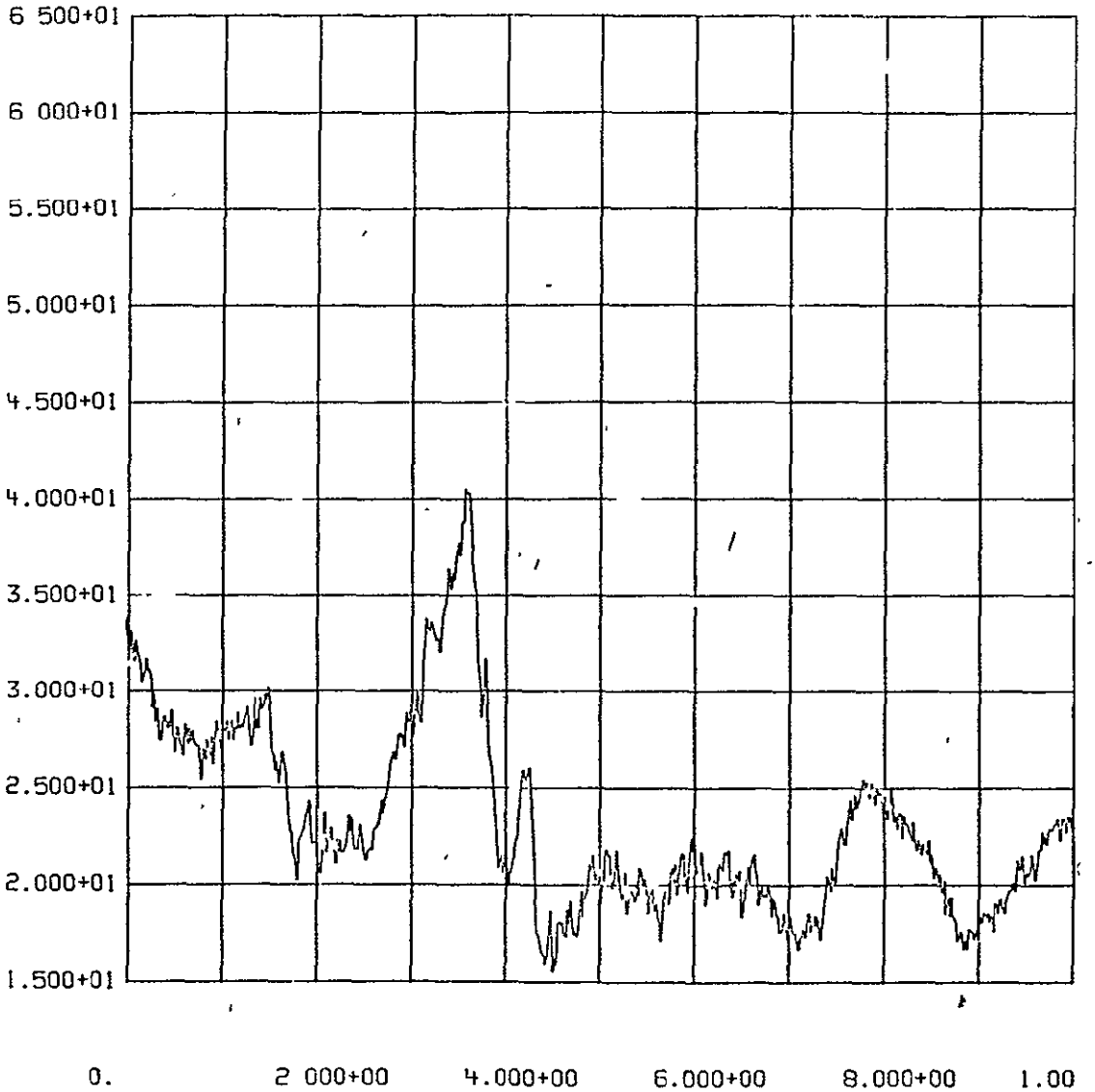


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.5-3



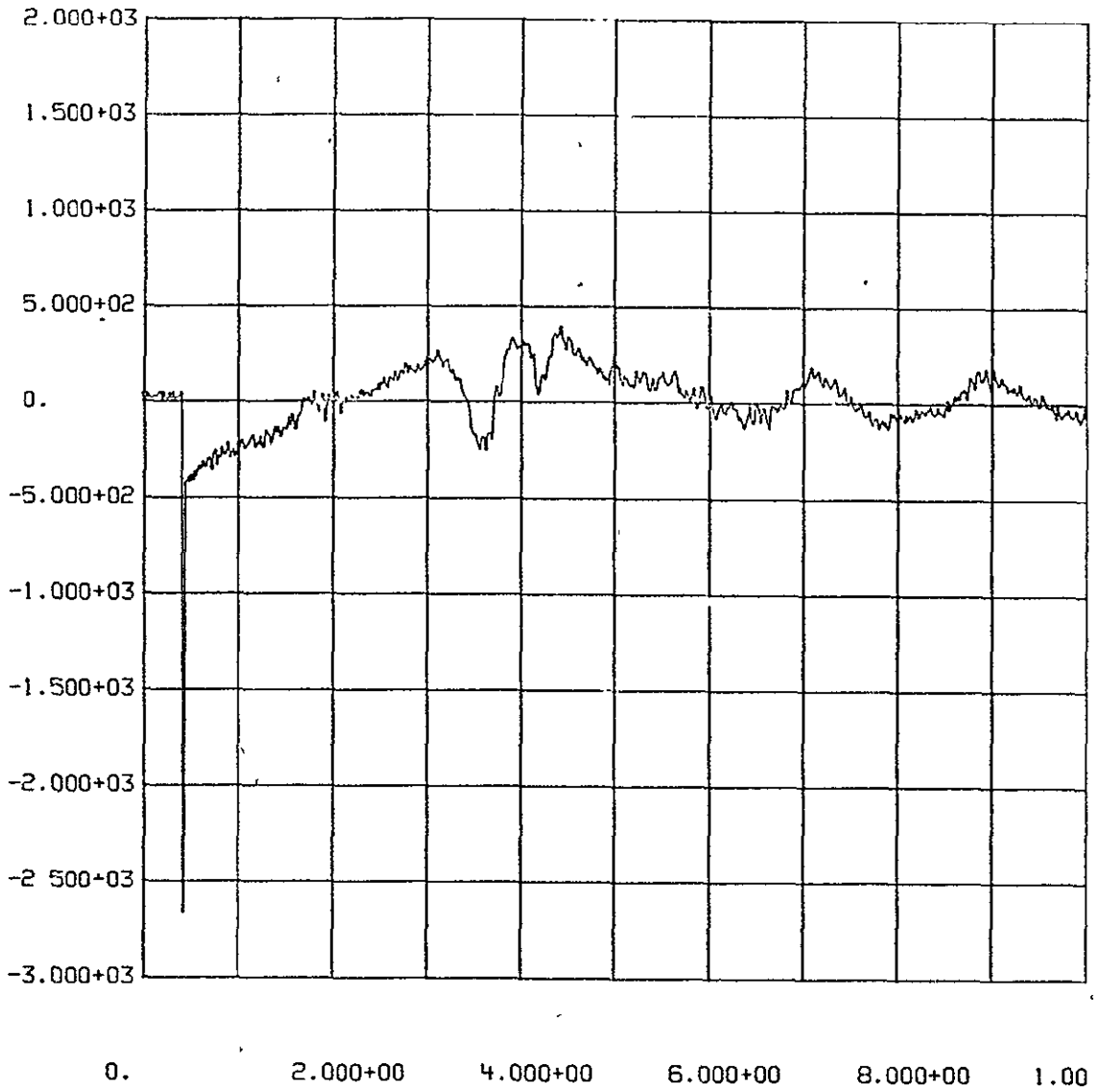
Z-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3 5-3 * UNFILT *



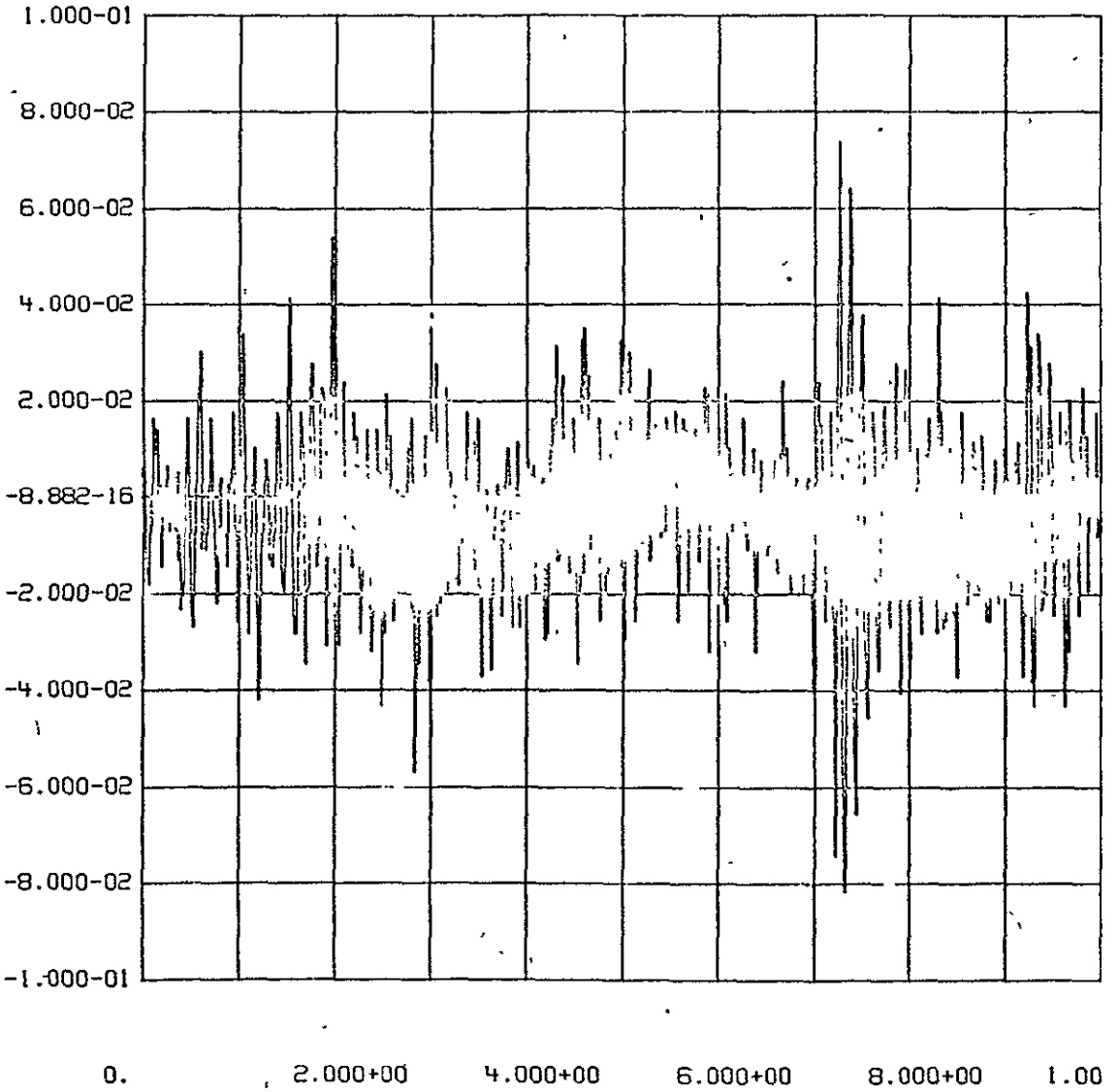
Y-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3 5-3 * UNFILT *



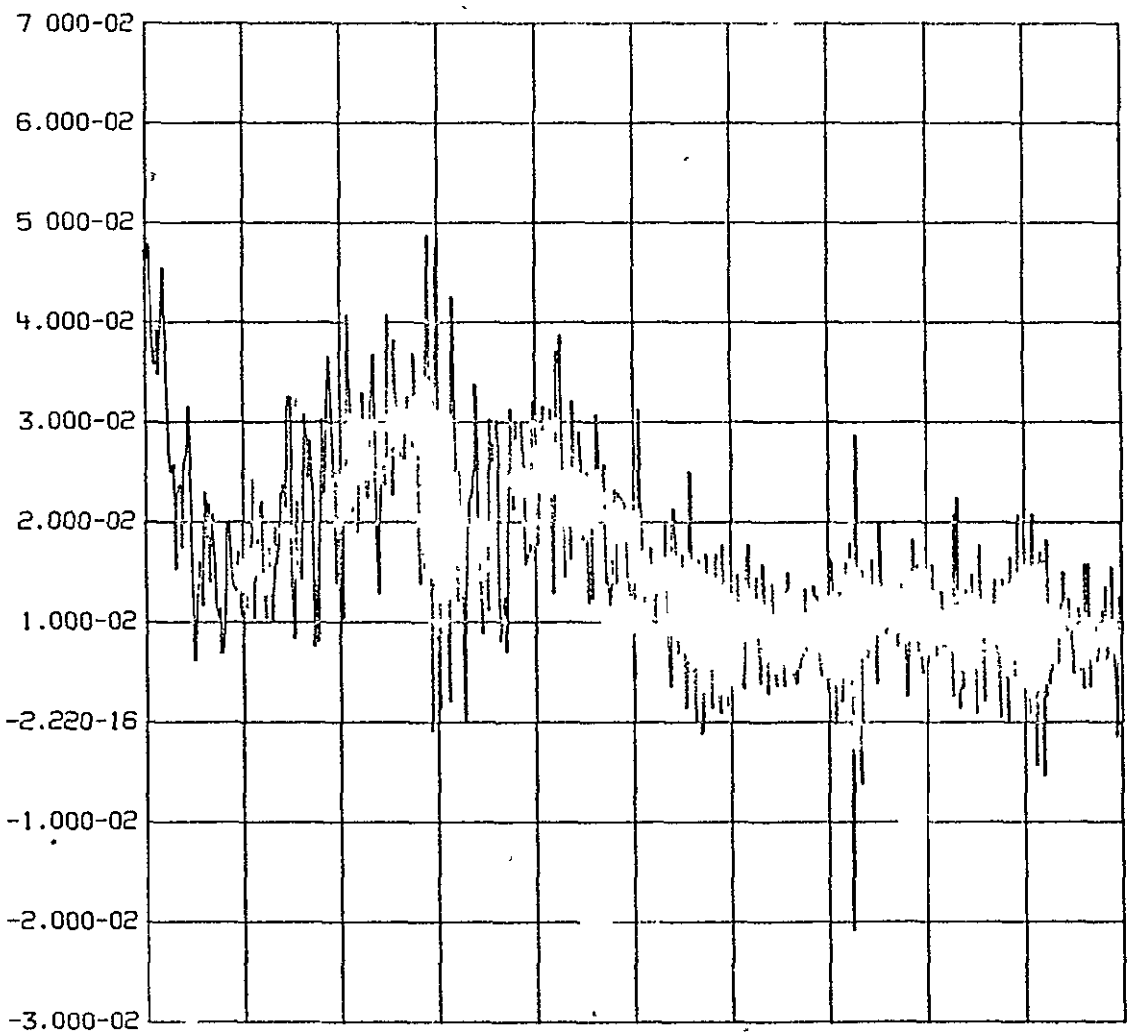
MOMENT VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.5-3 * UNFILT *



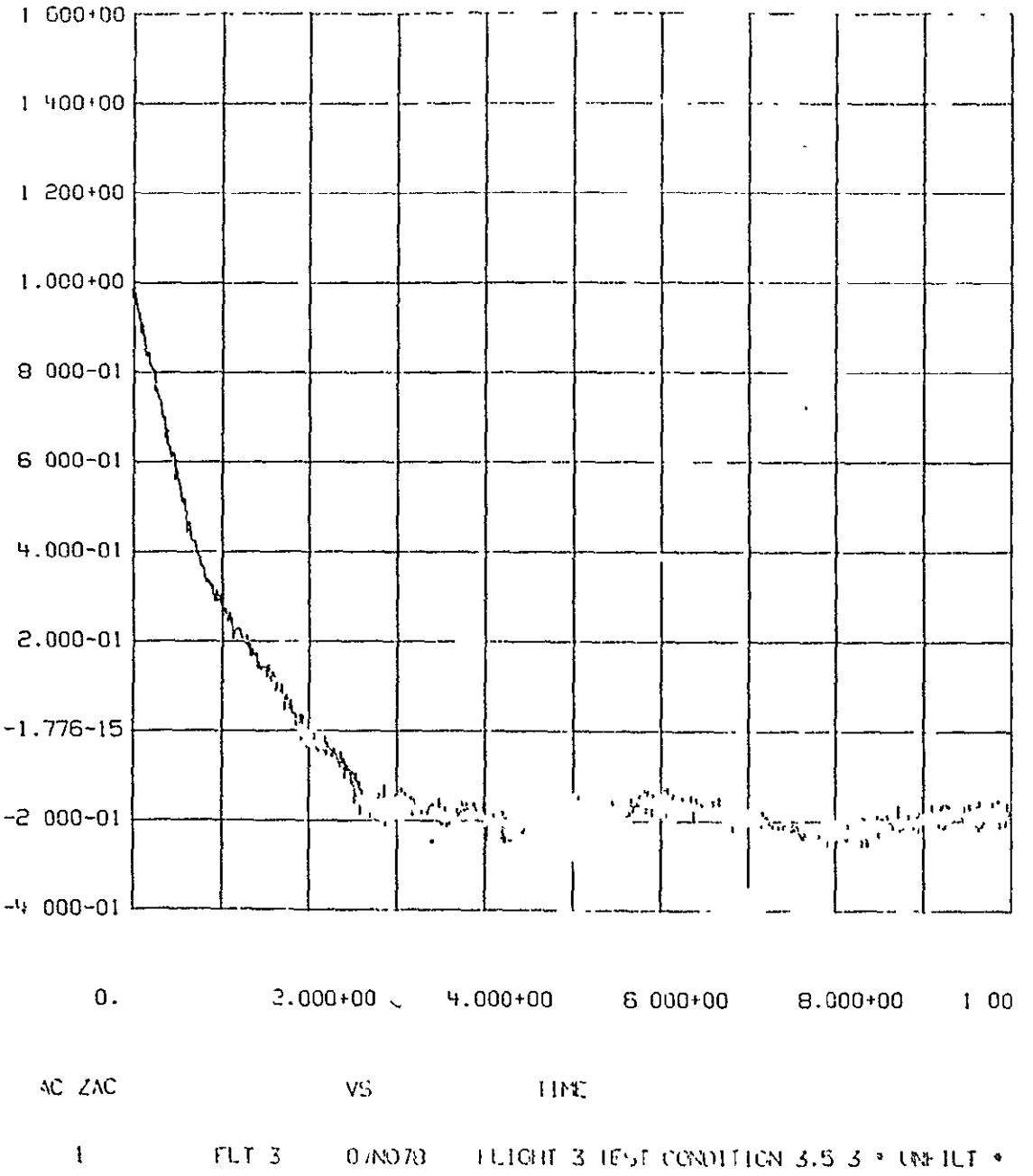
AC YAC VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3 5-3 * UNFILT *



AC XAC VS TIME

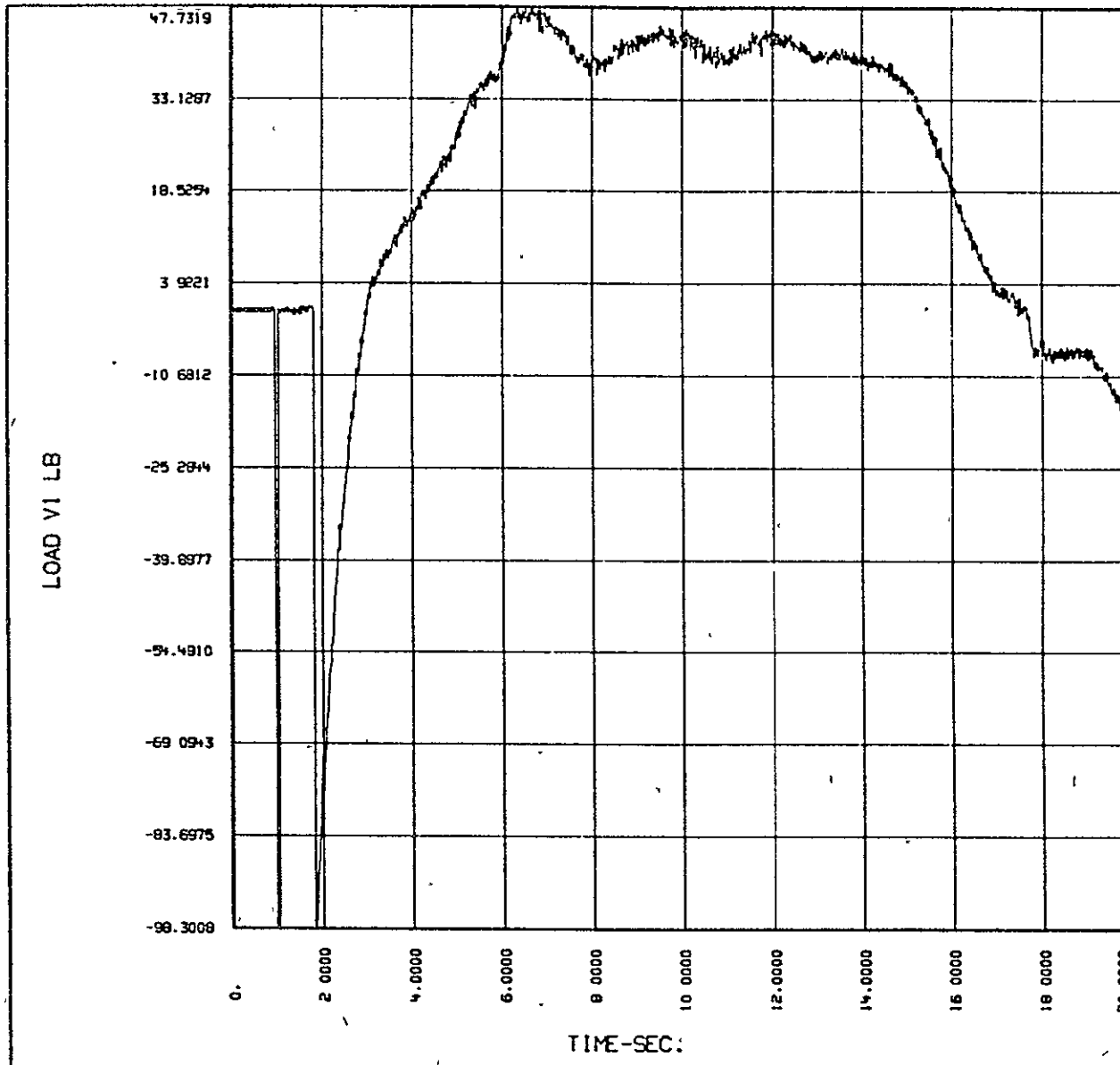
1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.5-3 * UNFILT *


1 600+00
1 400+00
1 200+00
1.000+00
8 000-01
6 000-01
4.000-01
2.000-01
-1.776-15
-2 000-01
-4 000-01
0.
2.000+00
4.000+00
6 000+00
8.000+00
1 00
AC ZAC
VS
TIME
1
FLT 3
0/N070
FLIGHT 3 TEST CONDITION 3.5 3 * UNFILT *

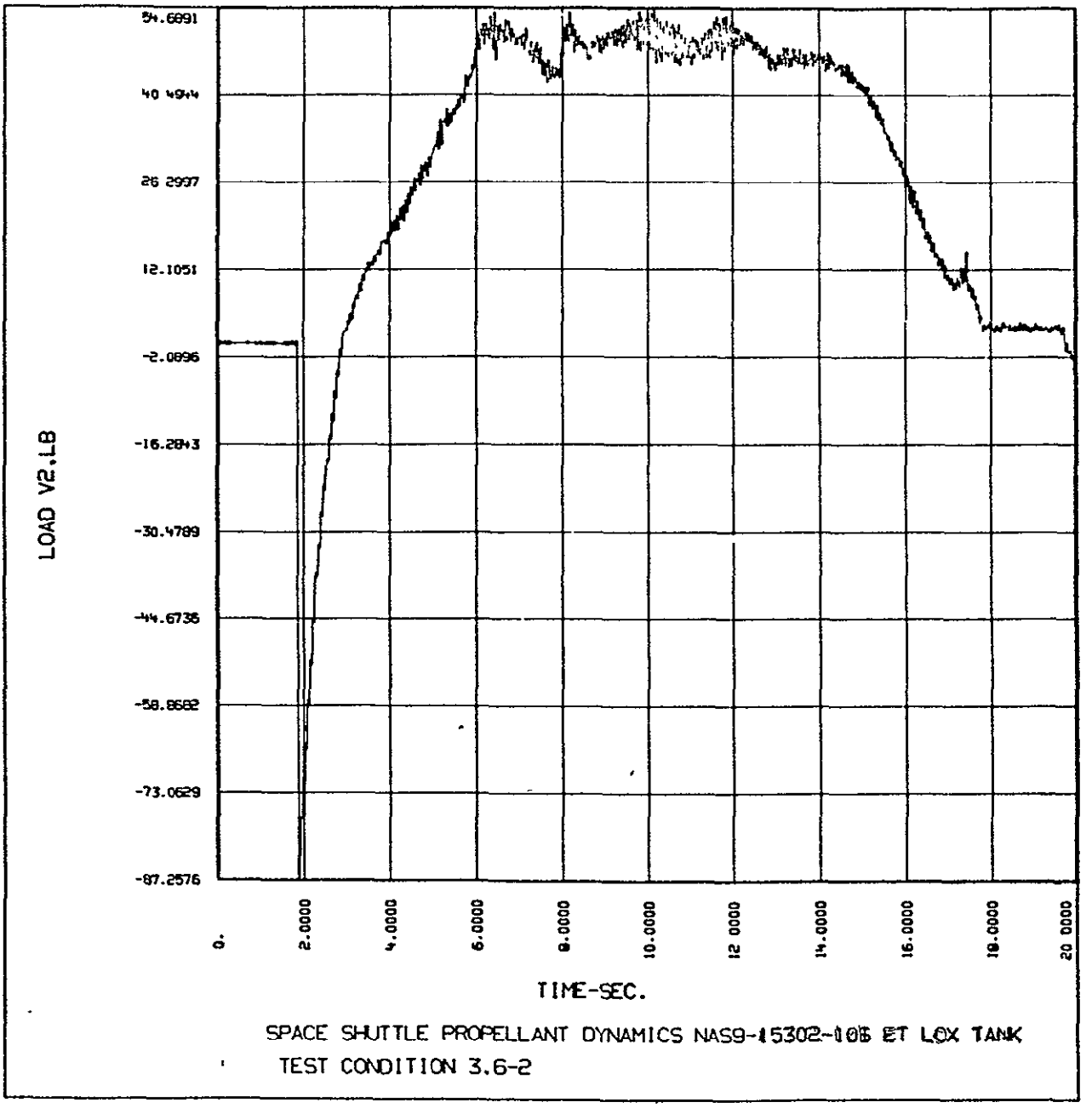
Test Data Condition 3.6-2

Baffles

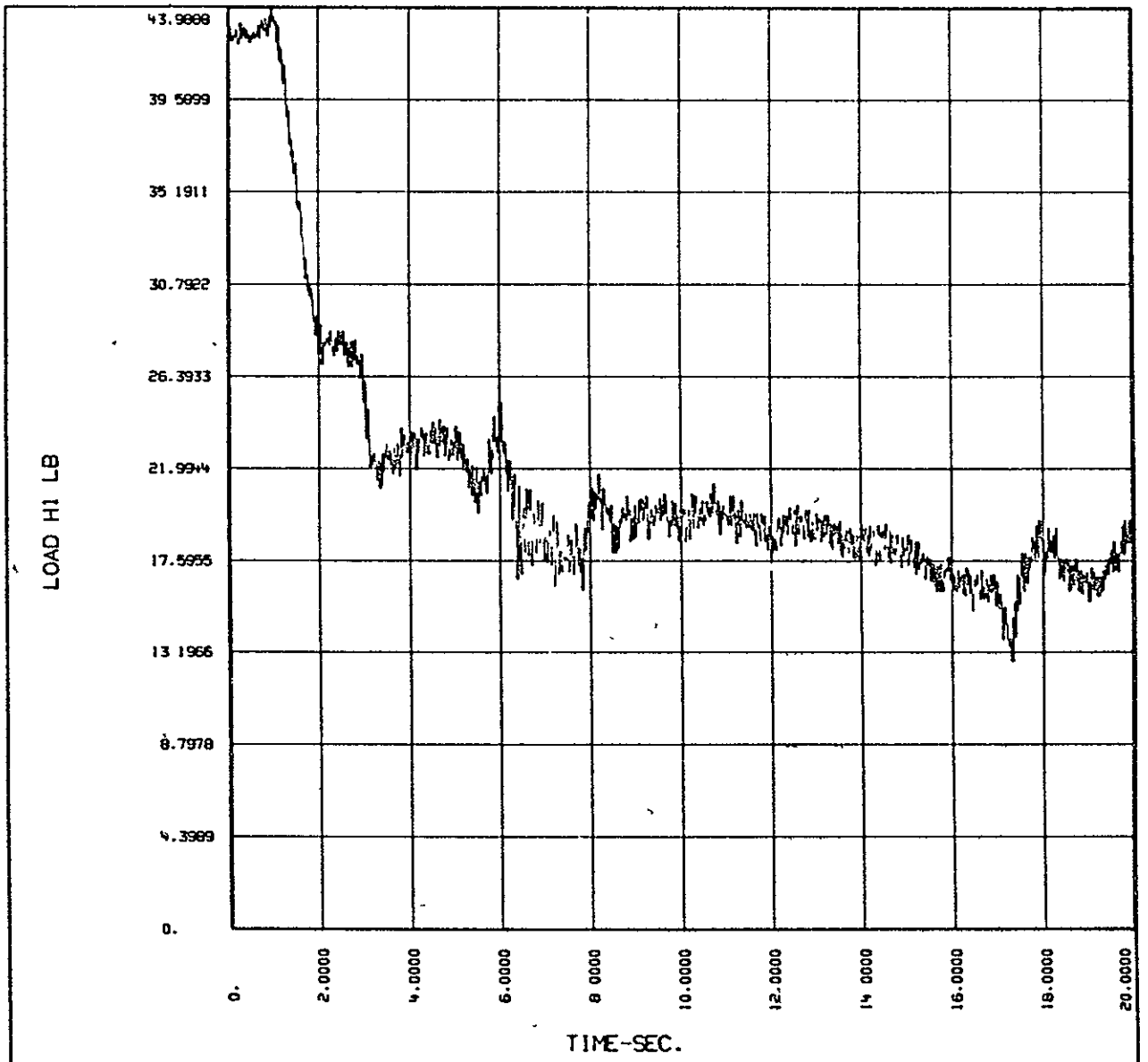
Test Fluid — FC 113
Orientation — 0°
Fill Volume — 5%
Target Acceleration — 0 2 g



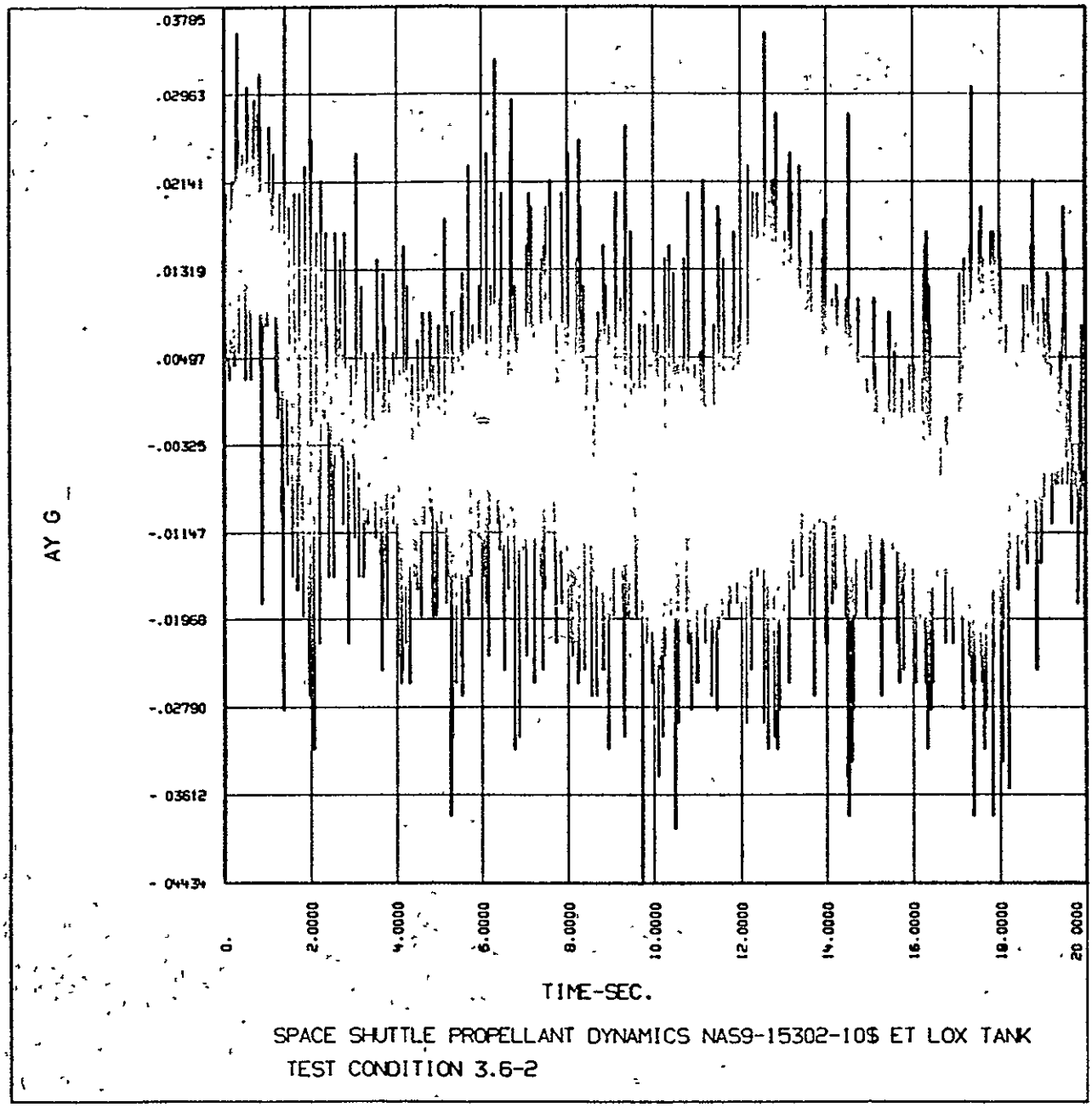
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.6-2

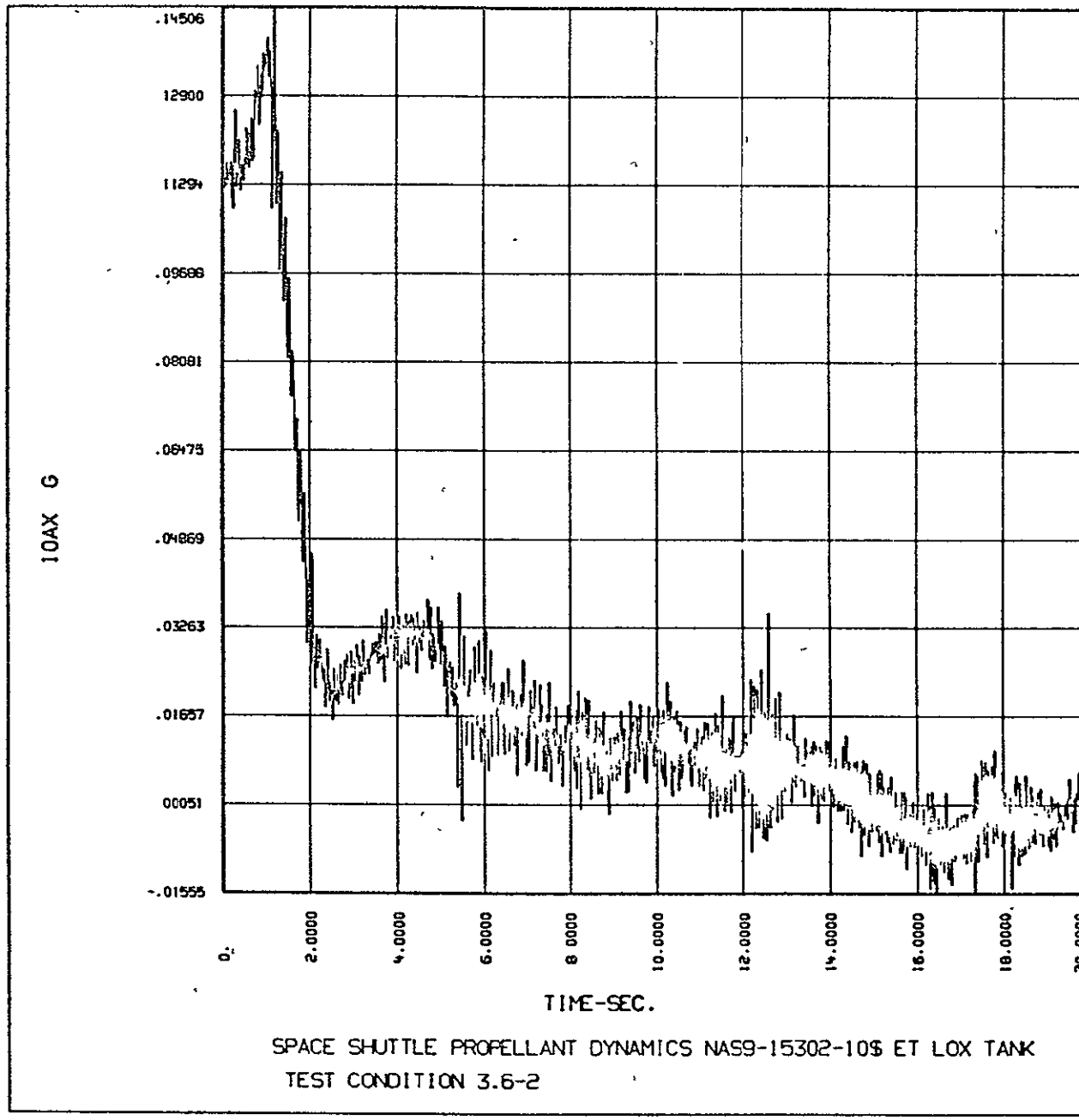

54.6891
40.4944
26.2997
12.1051
-2.0896
-16.2843
-30.4789
-44.6736
-58.8682
-73.0629
-87.2576
LOAD V2,LB
0.
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
20.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-106 ET LOX TANK
TEST CONDITION 3.6-2

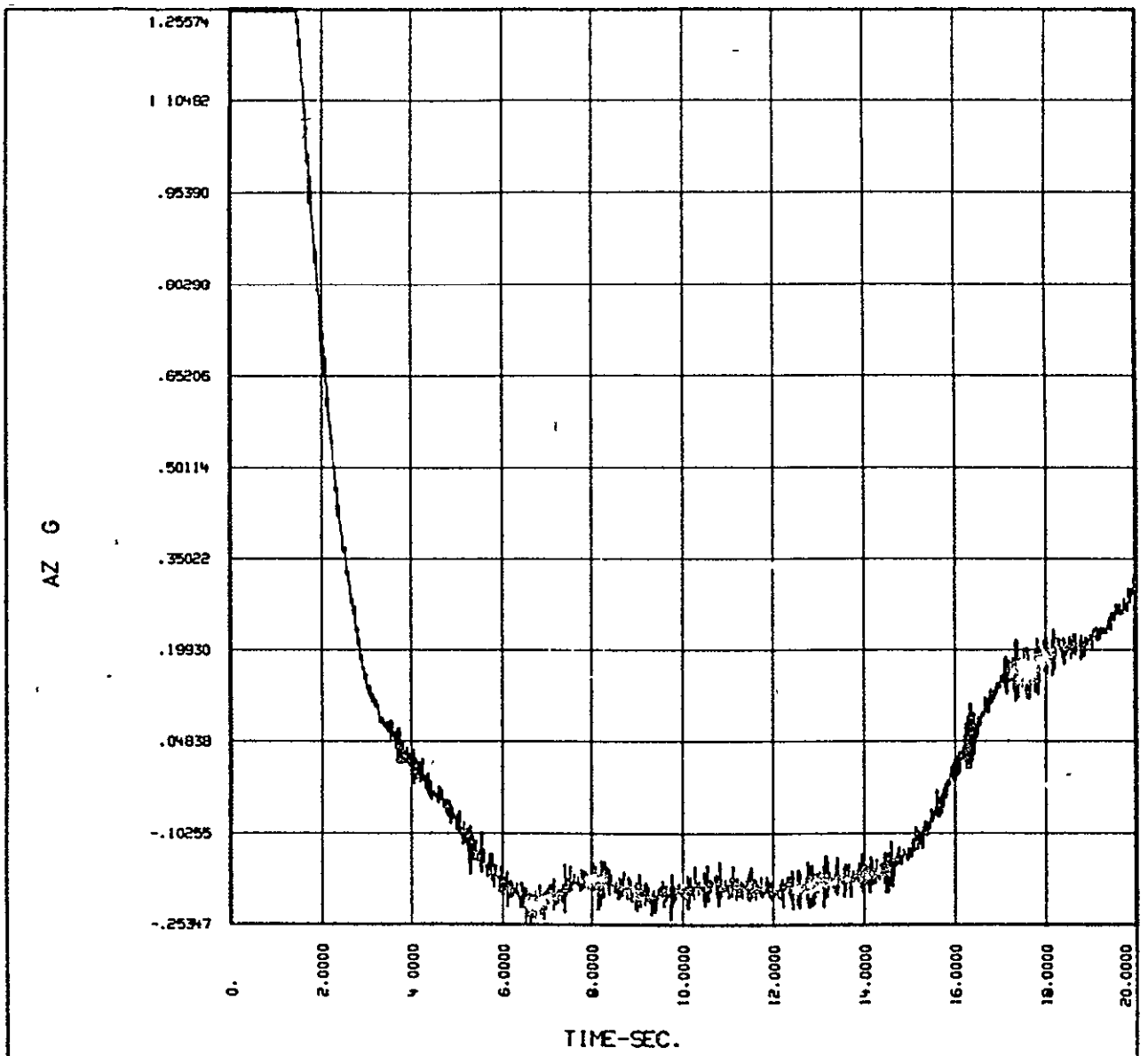
C-4



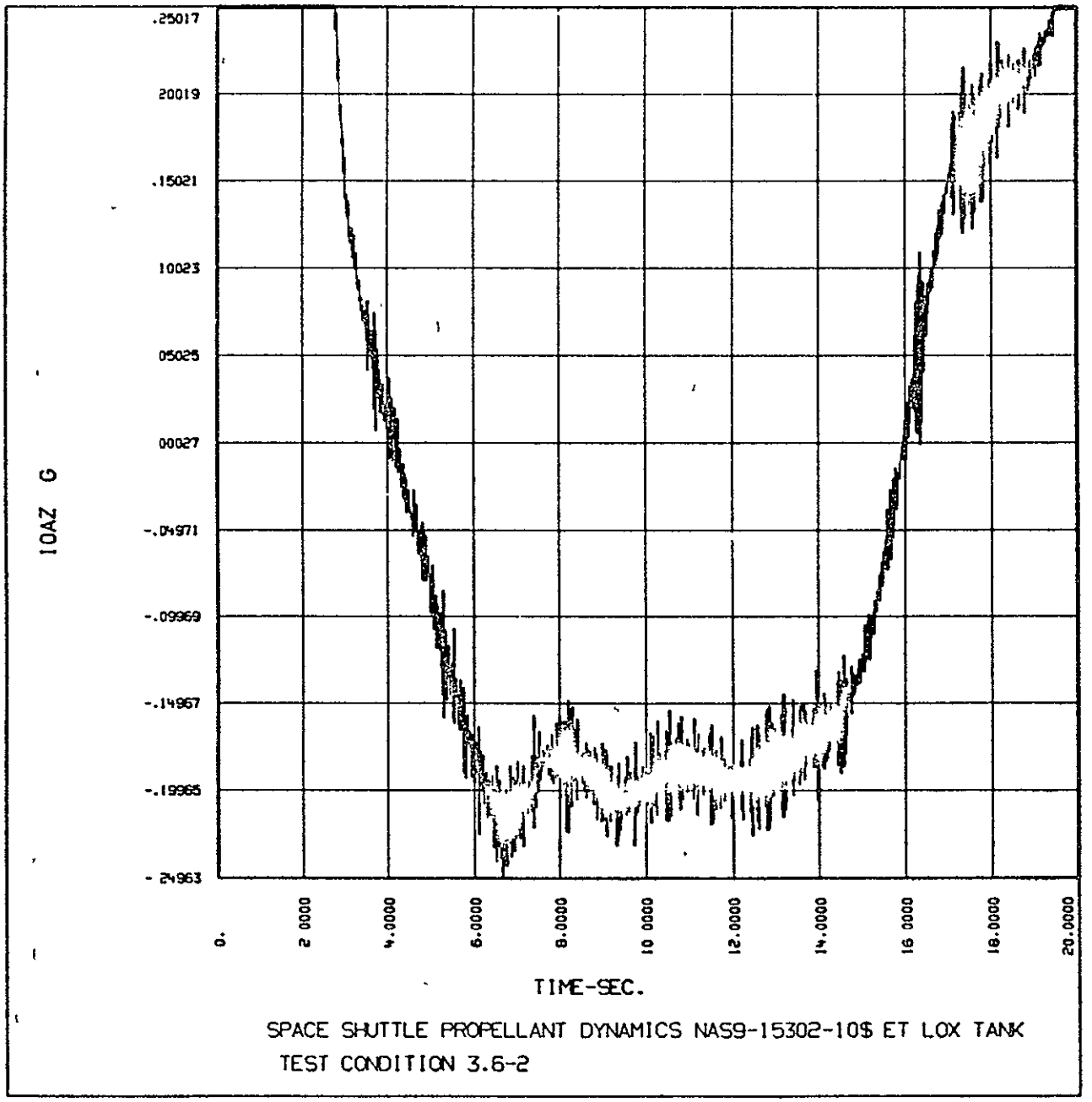
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.6-2

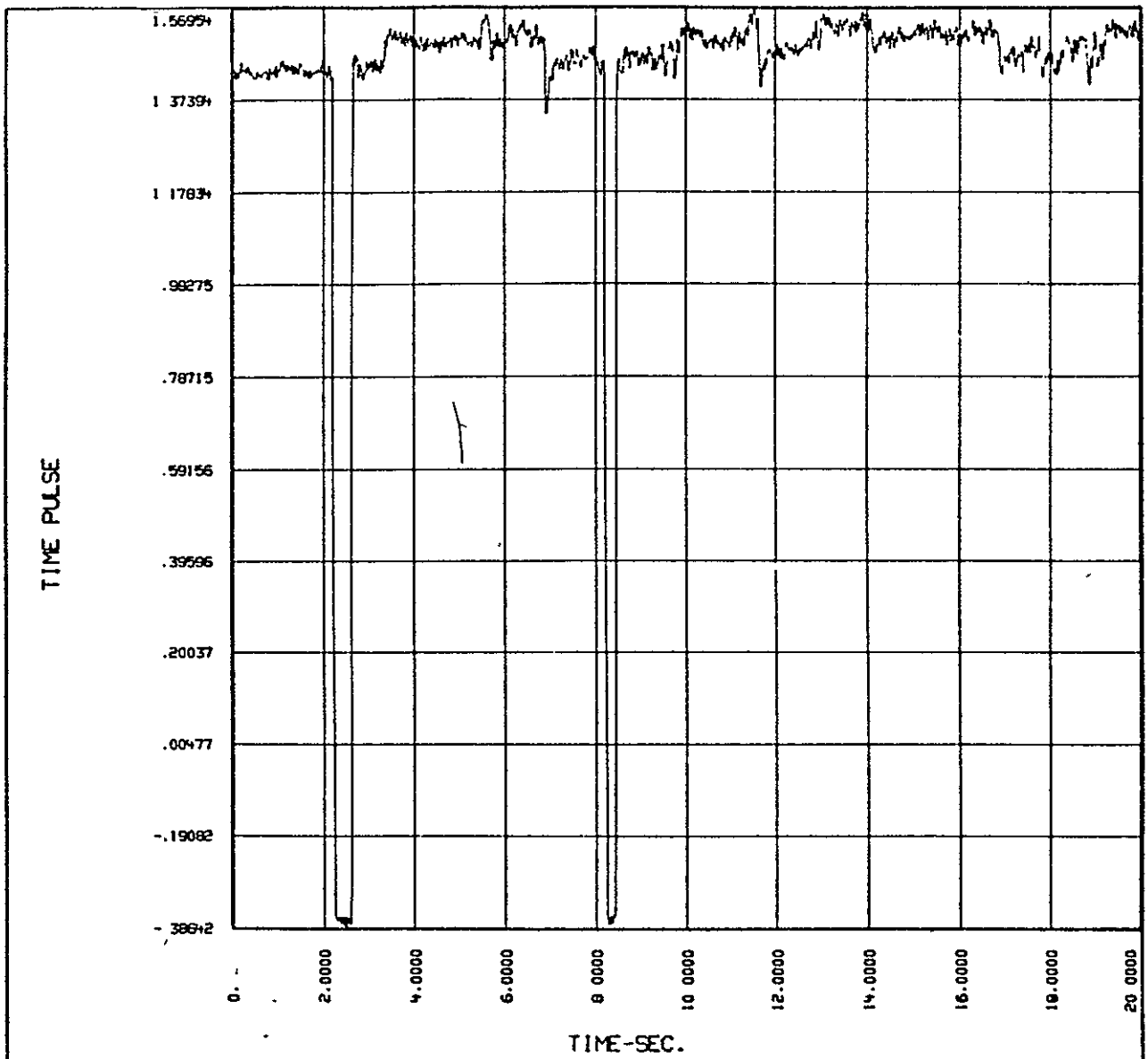

.03785
.02963
.02141
.01319
.00497
-.00325
-.01147
-.01968
-.02790
- 03612
- 04434
AY G
0.
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
20.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.6-2


.14506
12900
11294
.09688
.08081
.06475
.04869
.03263
.01657
00051
-.01555
10AX G
0.
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
20.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.6-2

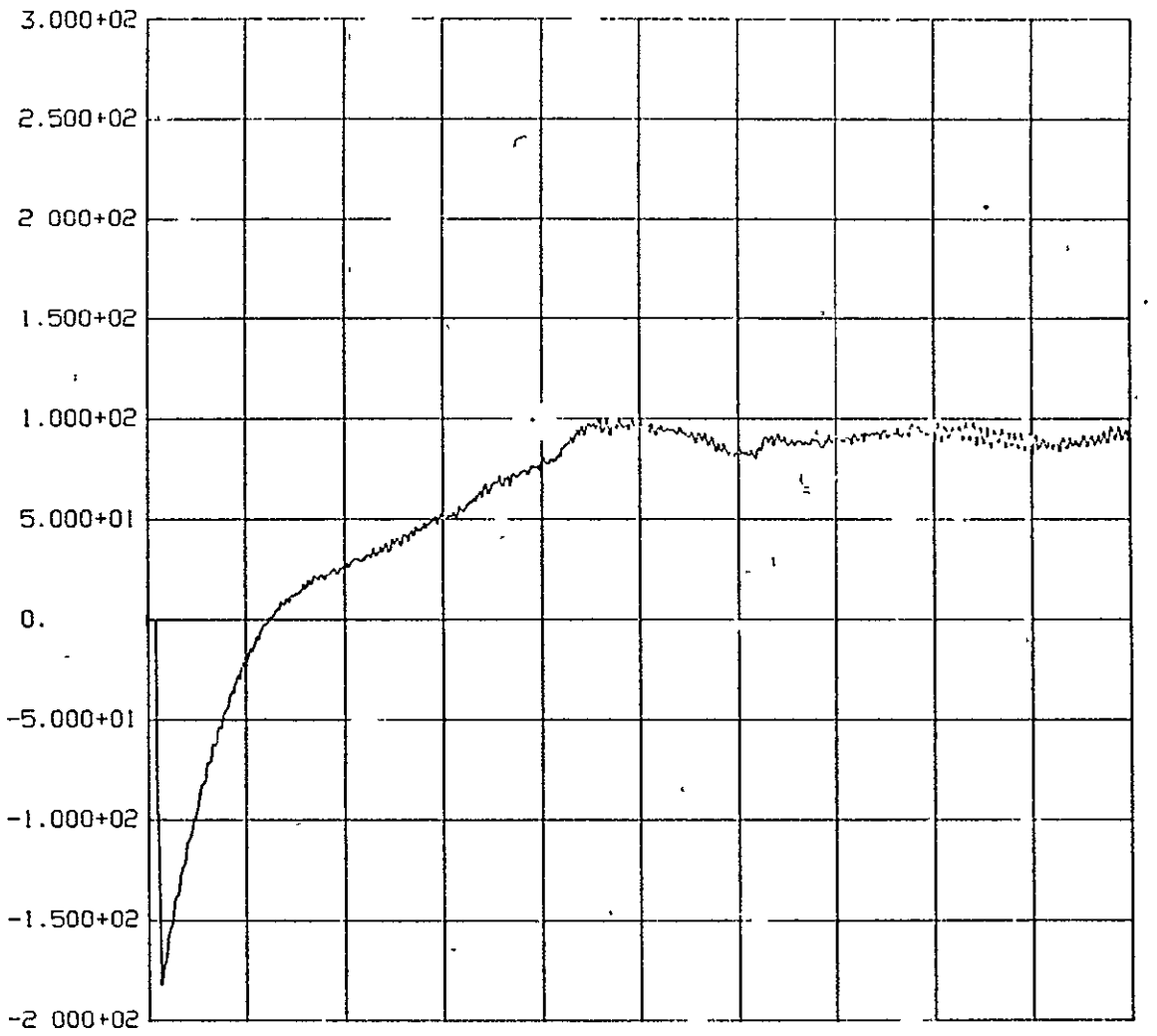


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.6-2


.25017
20019
.15021
10023
05025
00027
-.04971
-.09969
-.14967
-.19965
- 24963
10AZ G
0.
2.0000
4.0000
6.0000
8.0000
10.0000
12.0000
14.0000
16.0000
18.0000
20.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.6-2

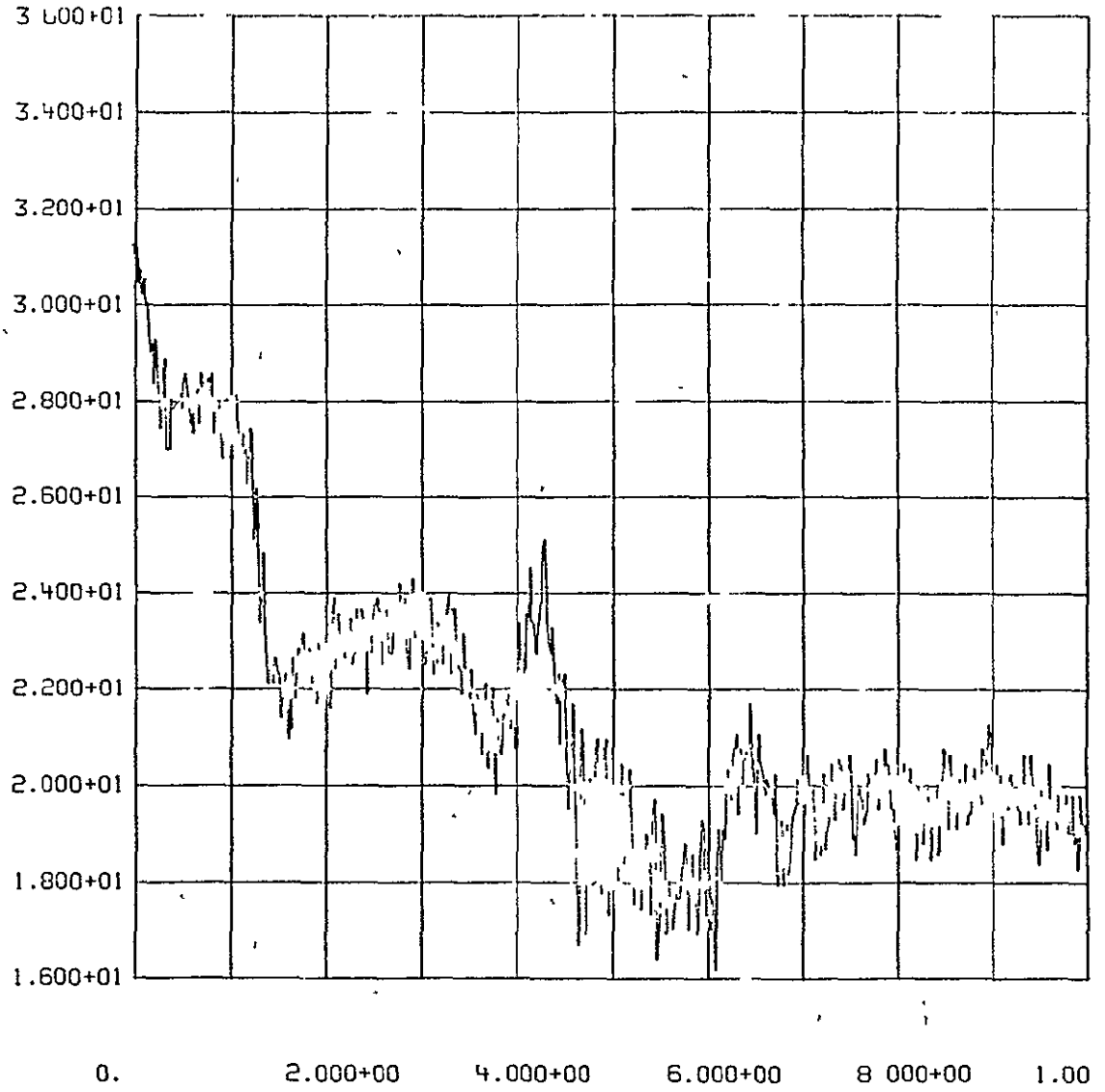


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 3.6-2



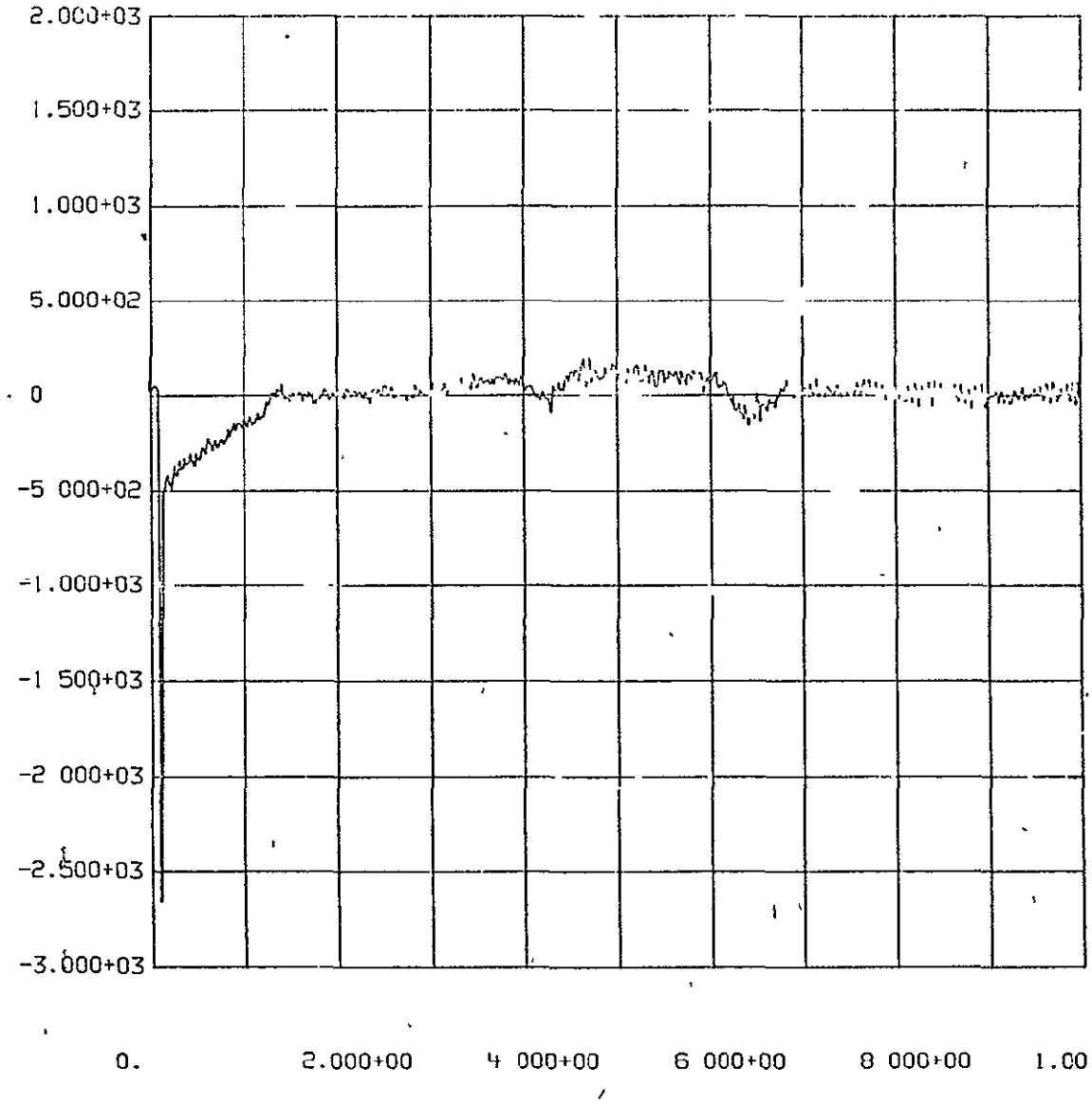
Z-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.6-2 * UNFILT *



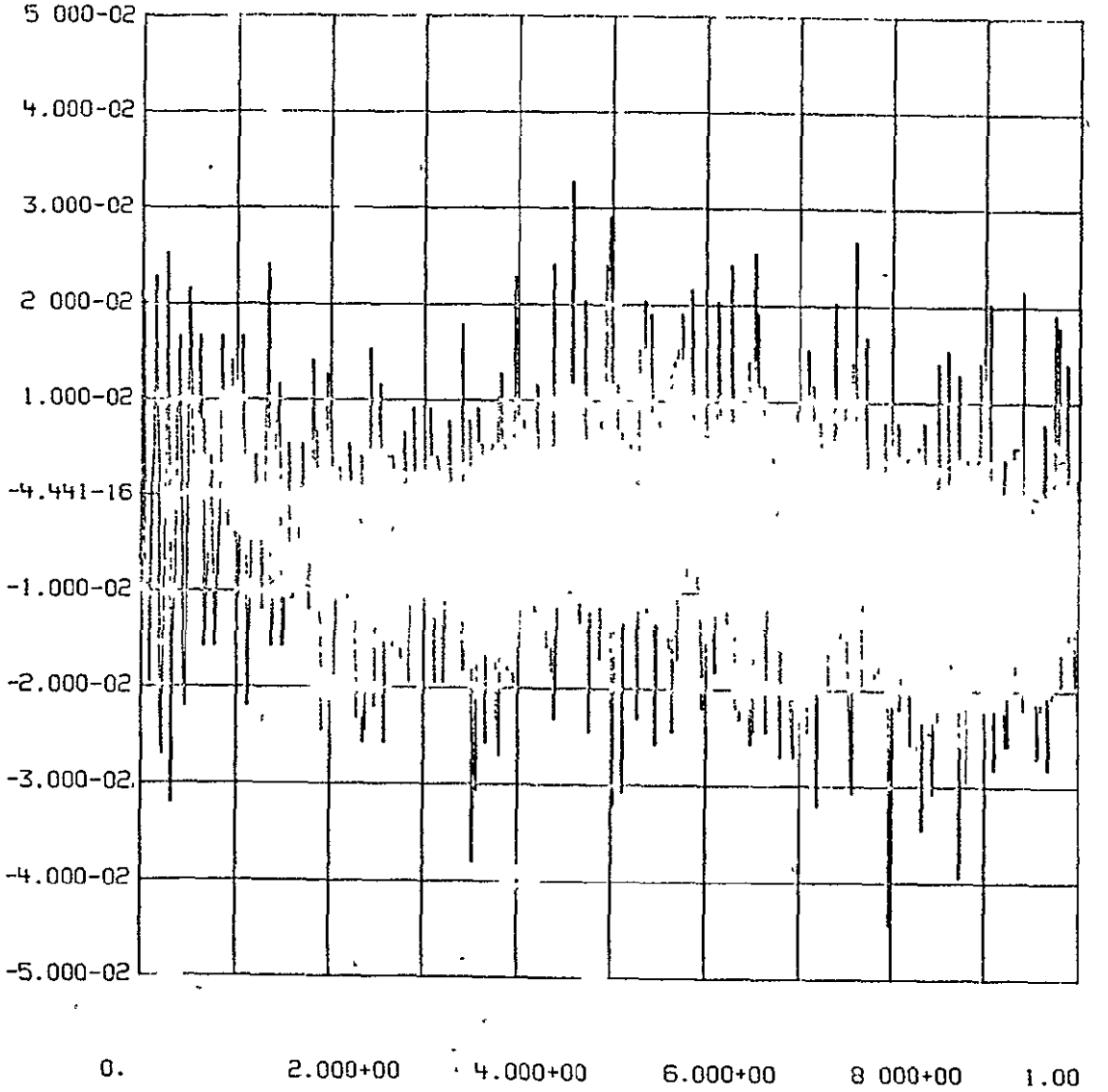
Y-LOAD VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.6-2 * UNFILT *



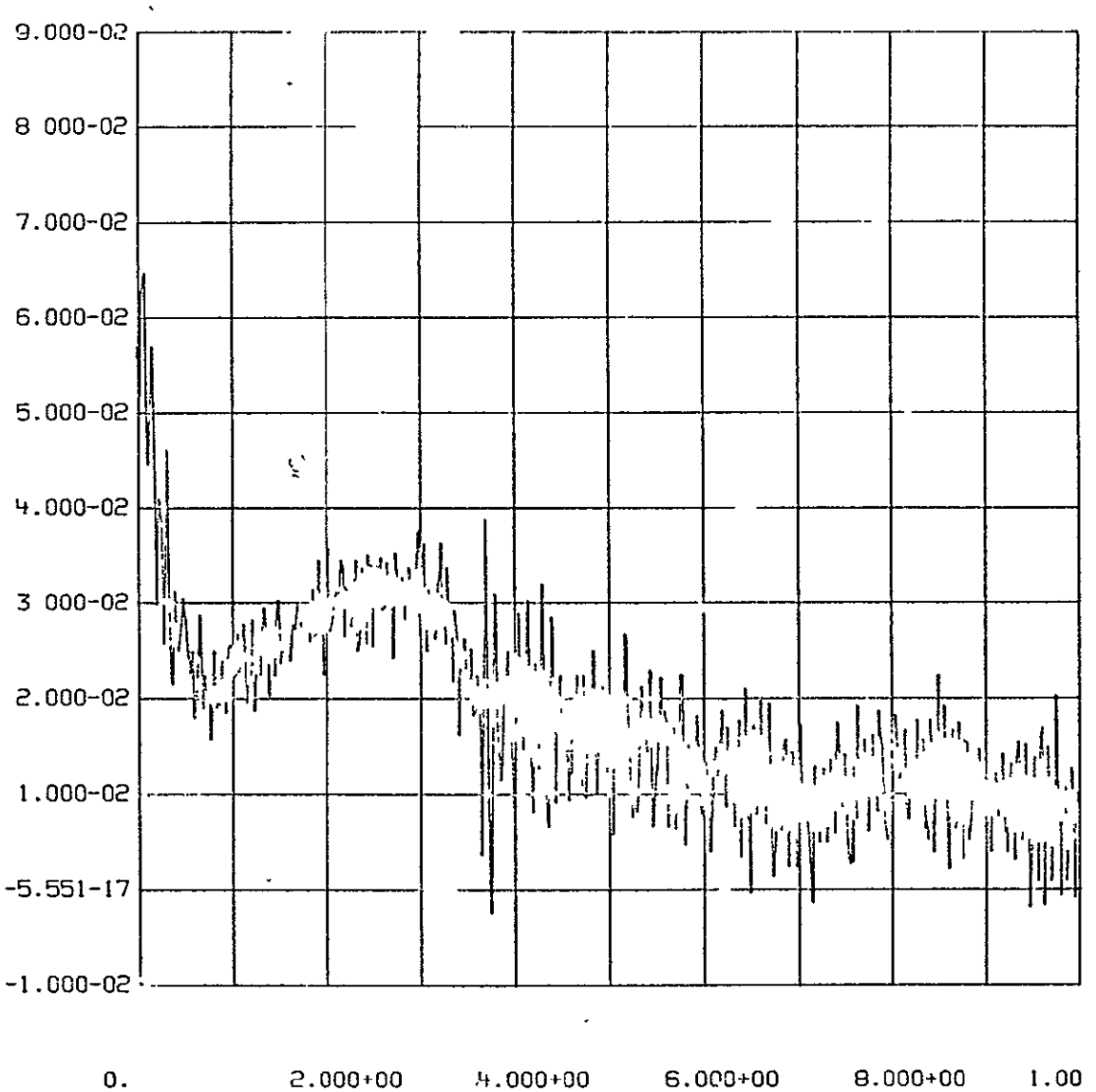
MOMENT VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3 6-2 * UNFILT *



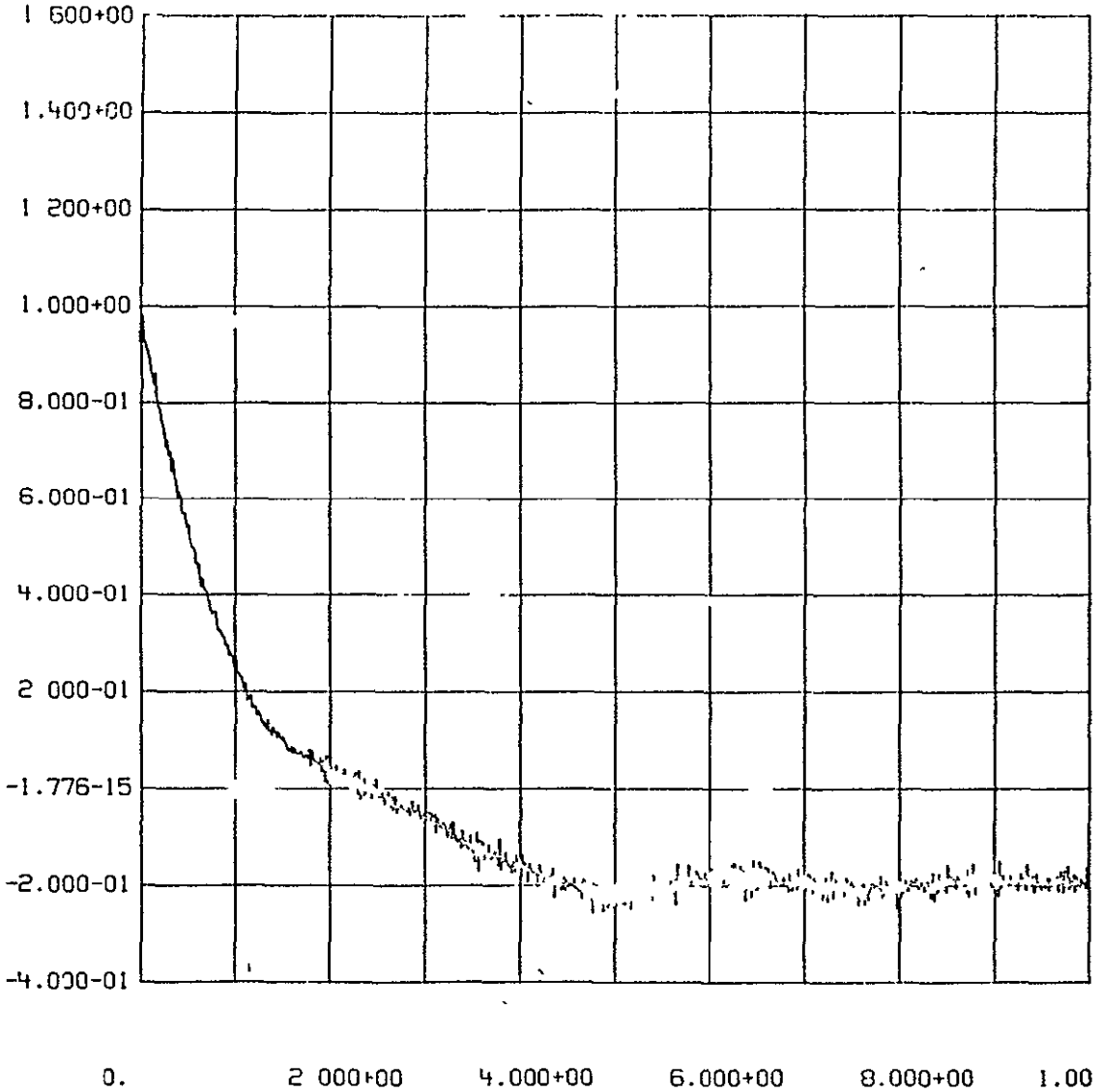
AC YAC VS TIME

1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3 6-2 * UNFILT *



AC XAC VS TIME

I FLT 3 07N078 FLIGHT 3 TEST CONDITION 3 6-2 * UNFILT *

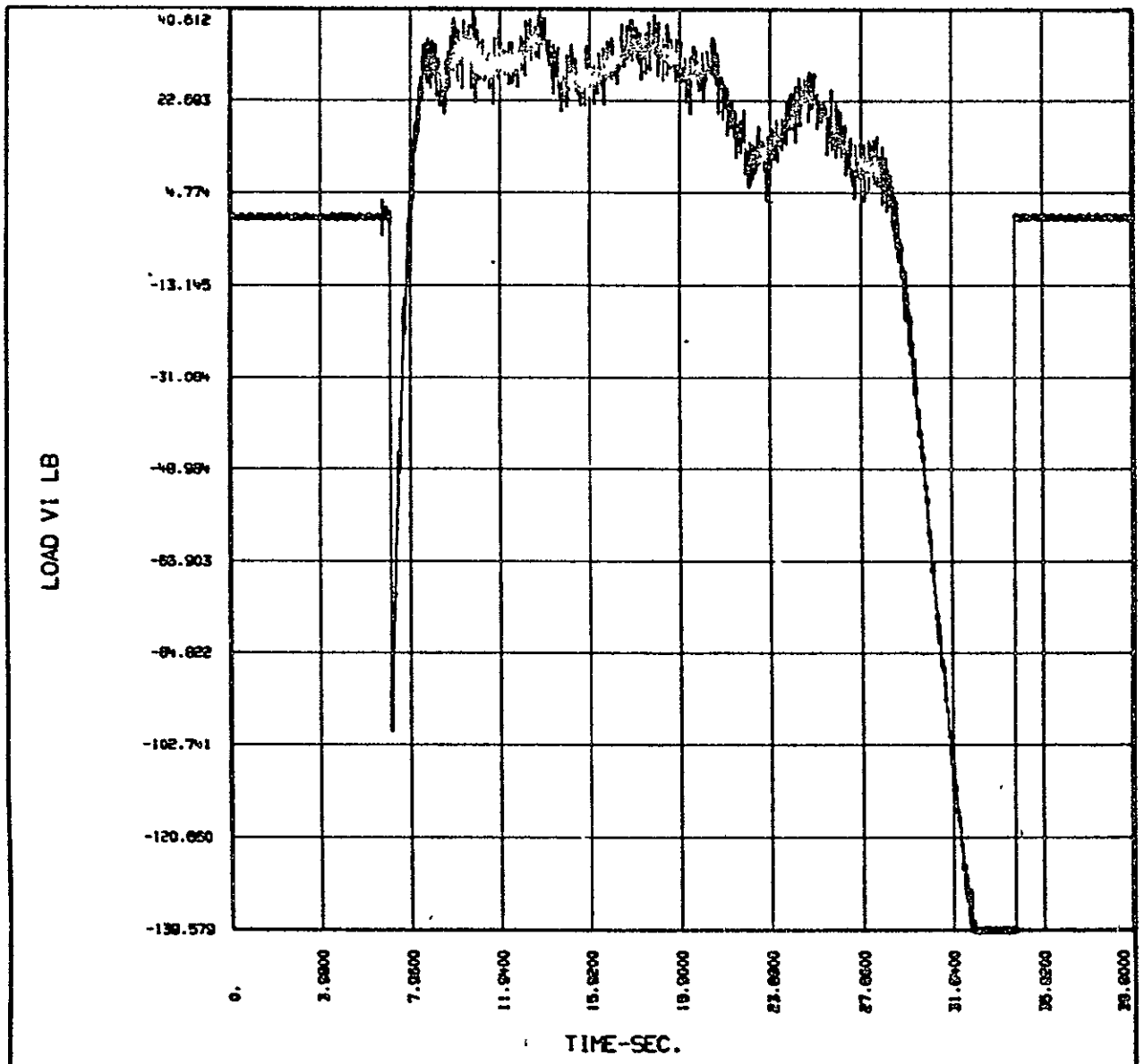


AC ZAC VS TIME

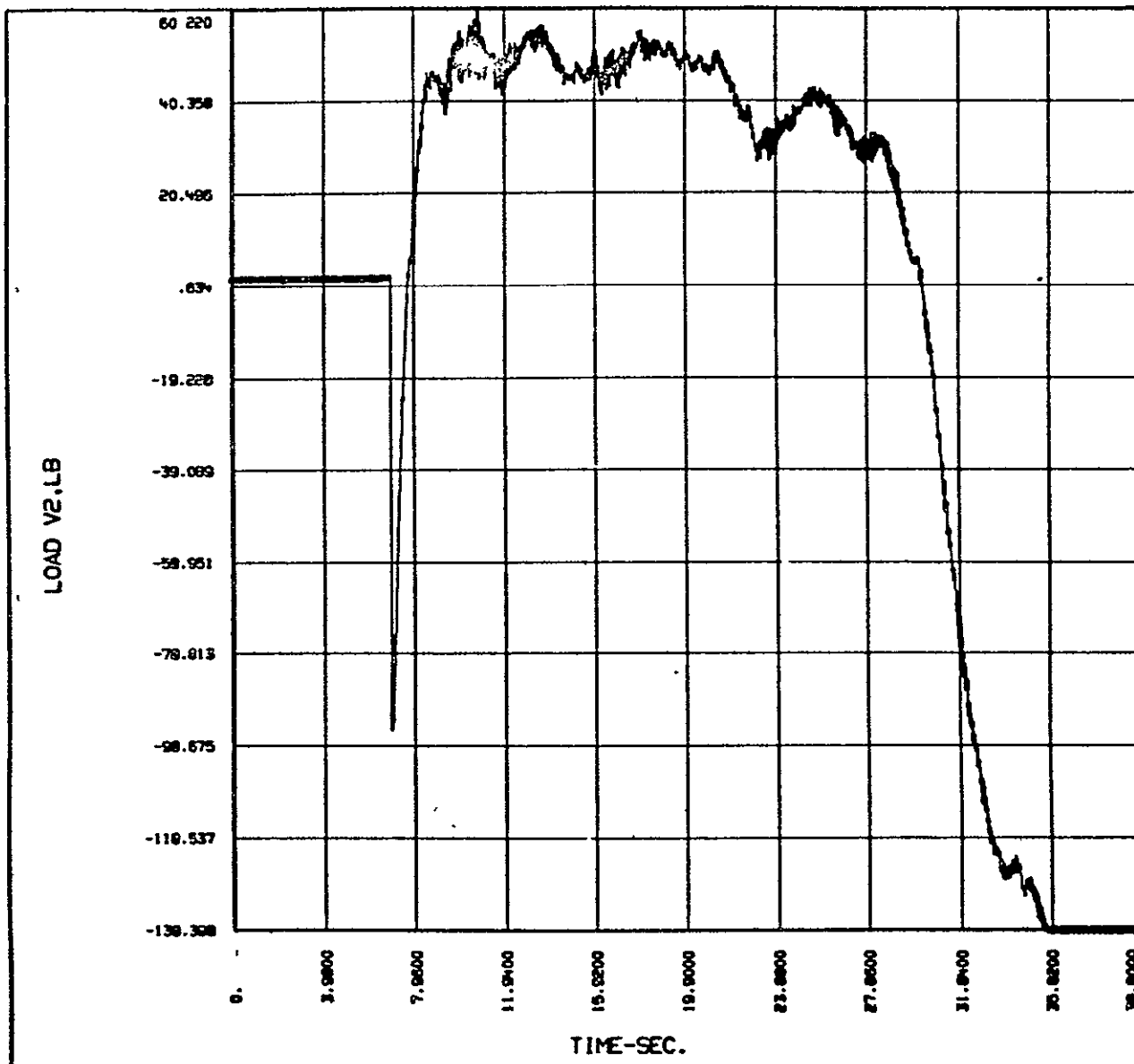
1 FLT 3 07N078 FLIGHT 3 TEST CONDITION 3.6-2 * UNFILT *

Test Data Condition 4.1-3

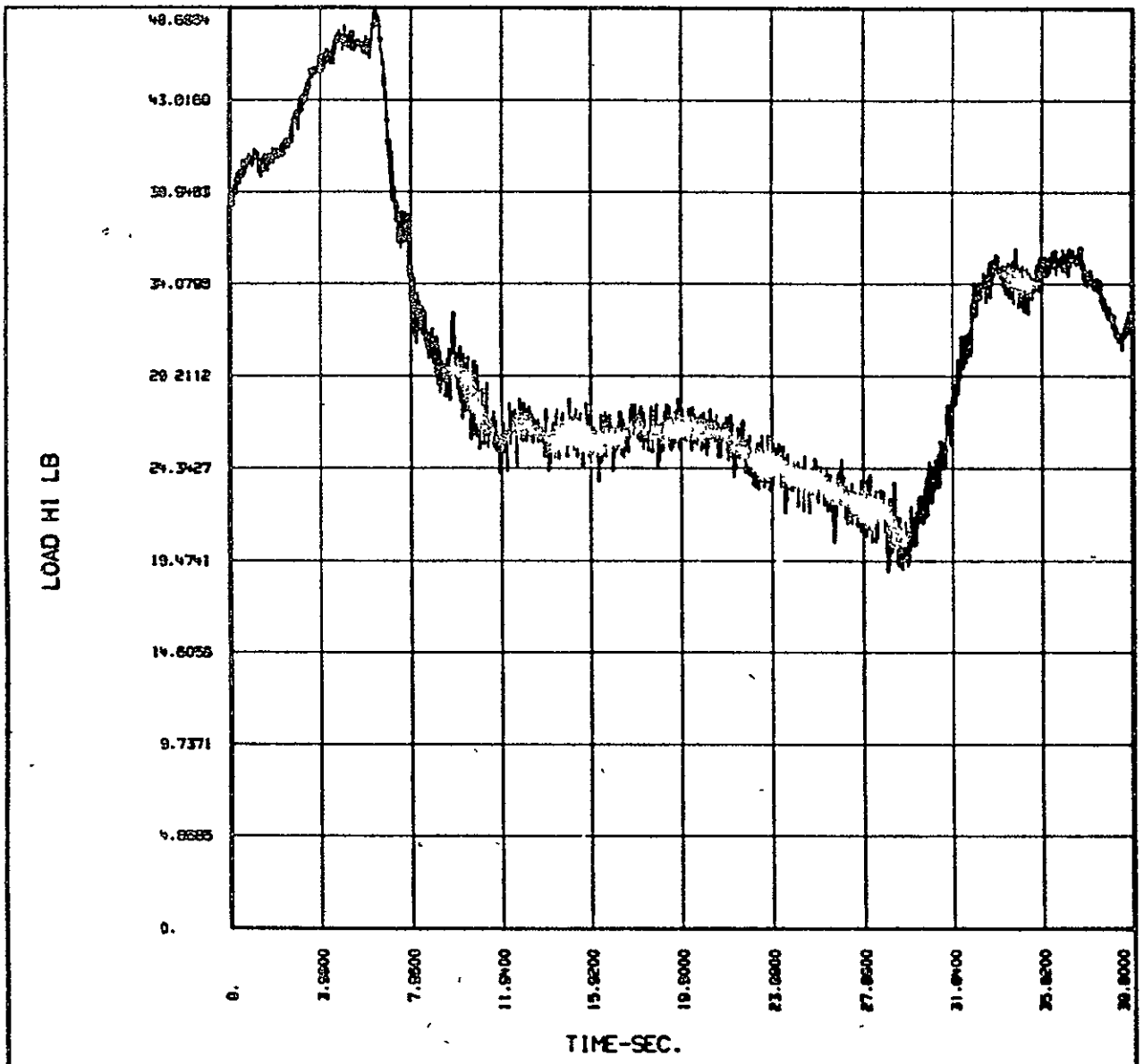
Baffles
Test Fluid – Water
Orientation – 13°
Fill Volume – 2%
Target Acceleration–0.1g



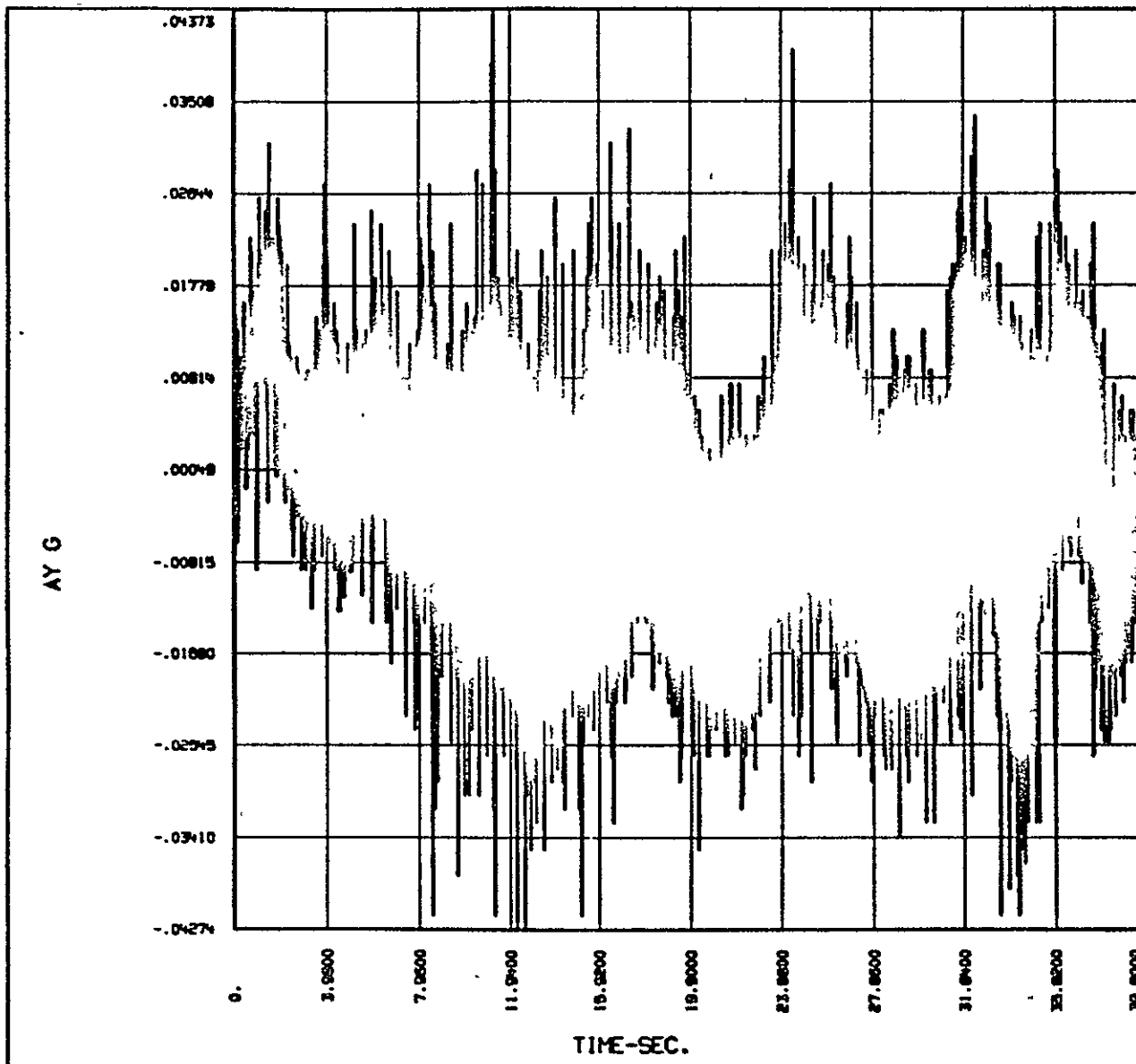
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.1-3



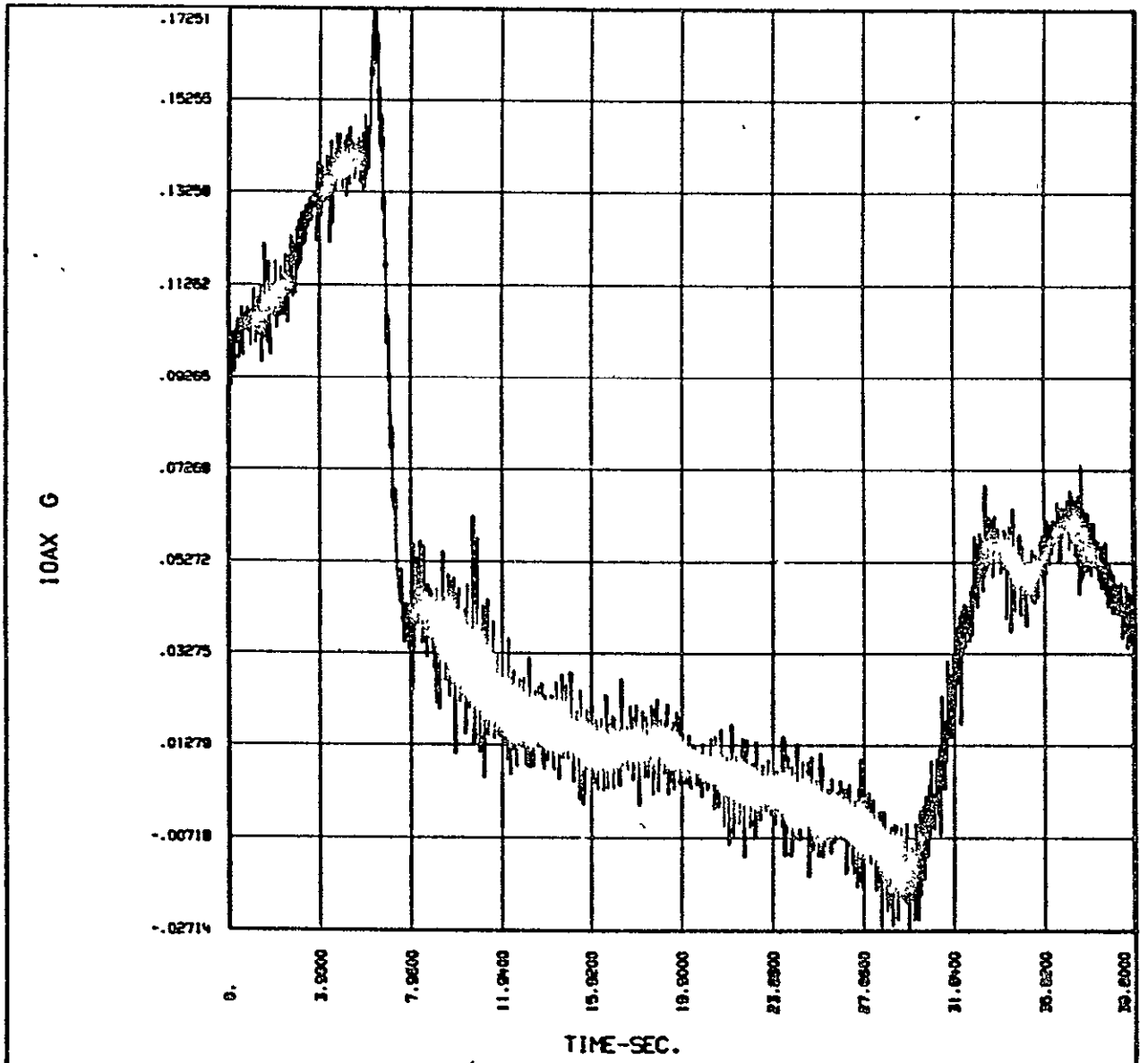
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.1-3



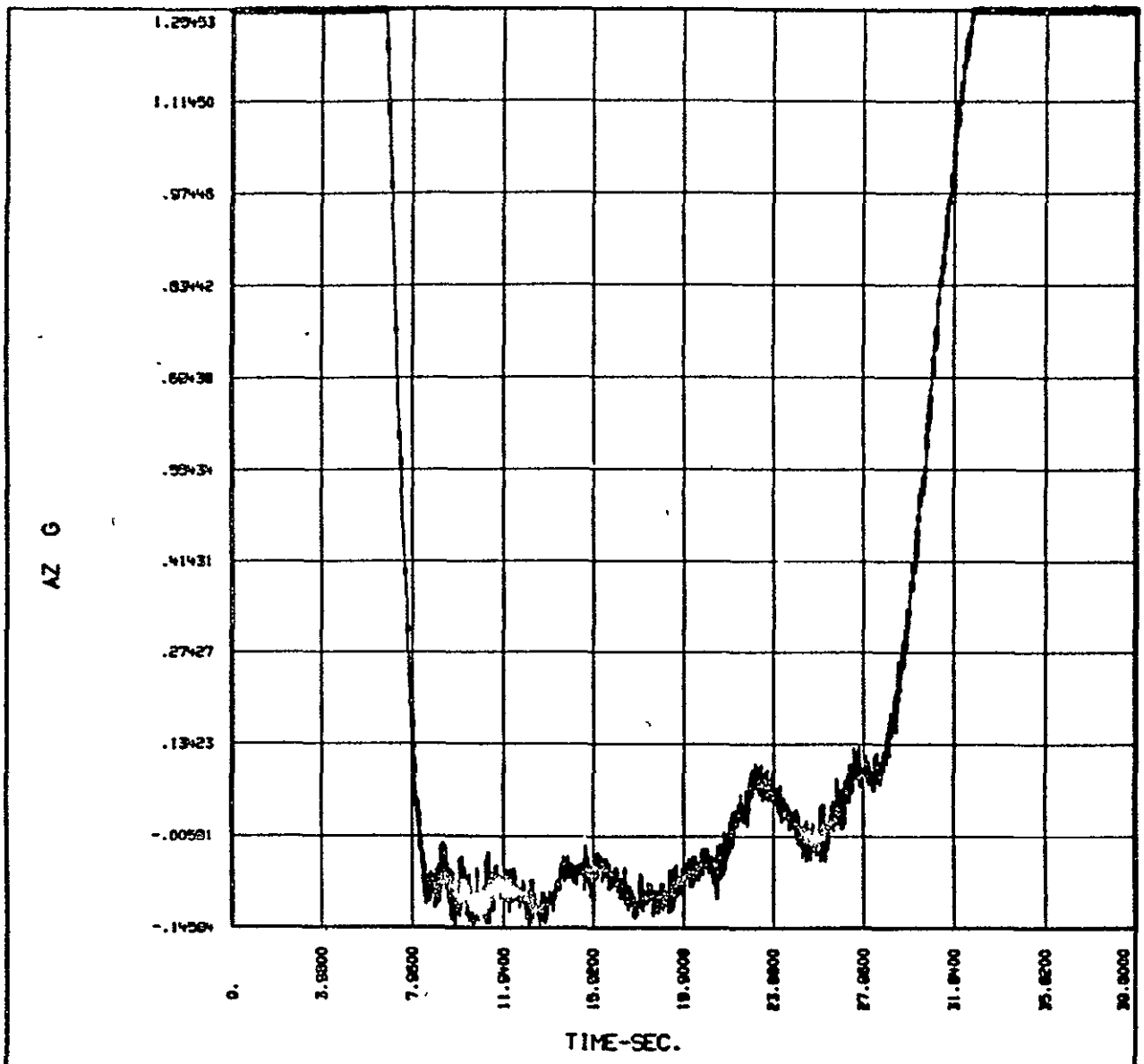
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.1-3



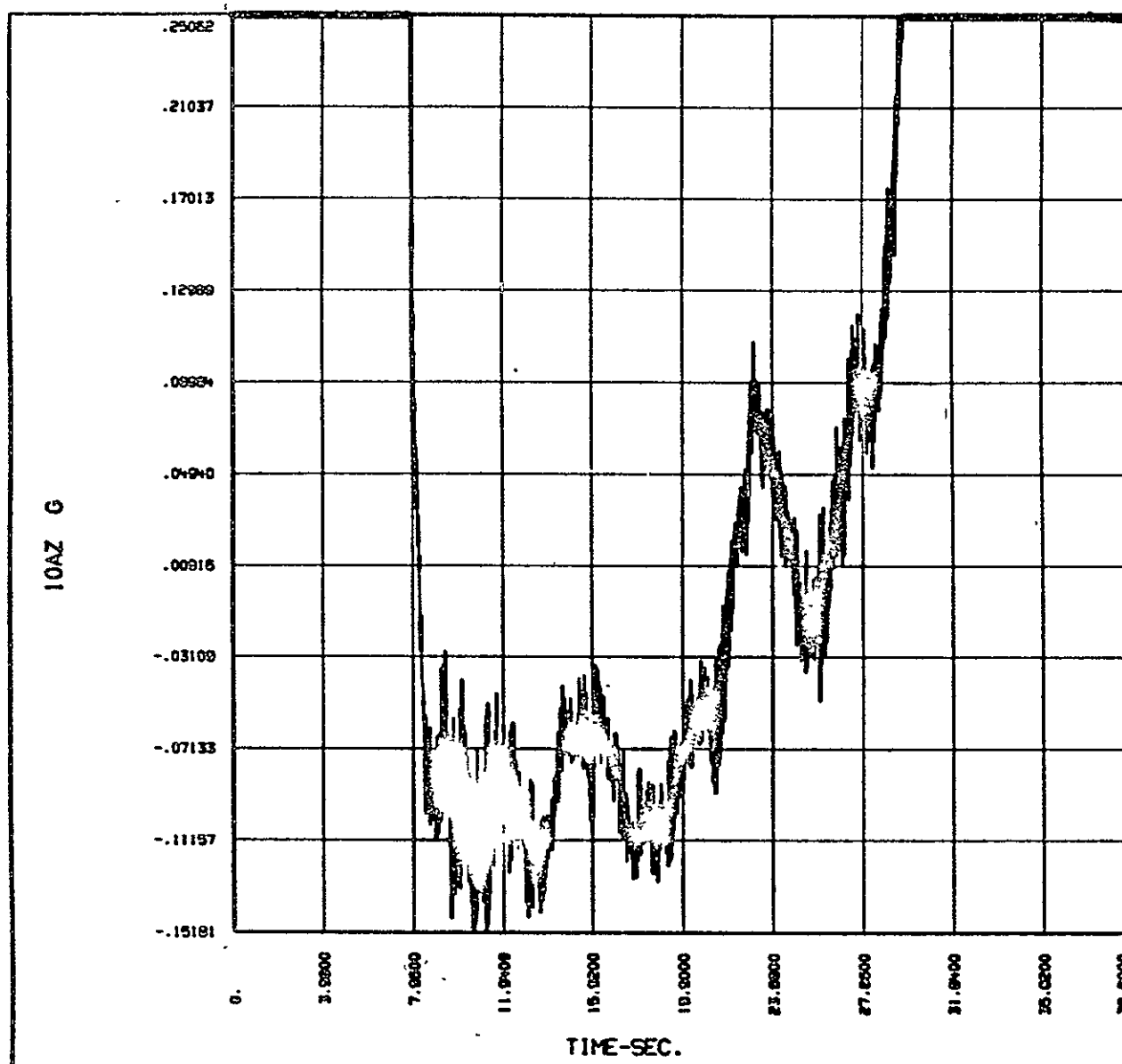
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.1-3



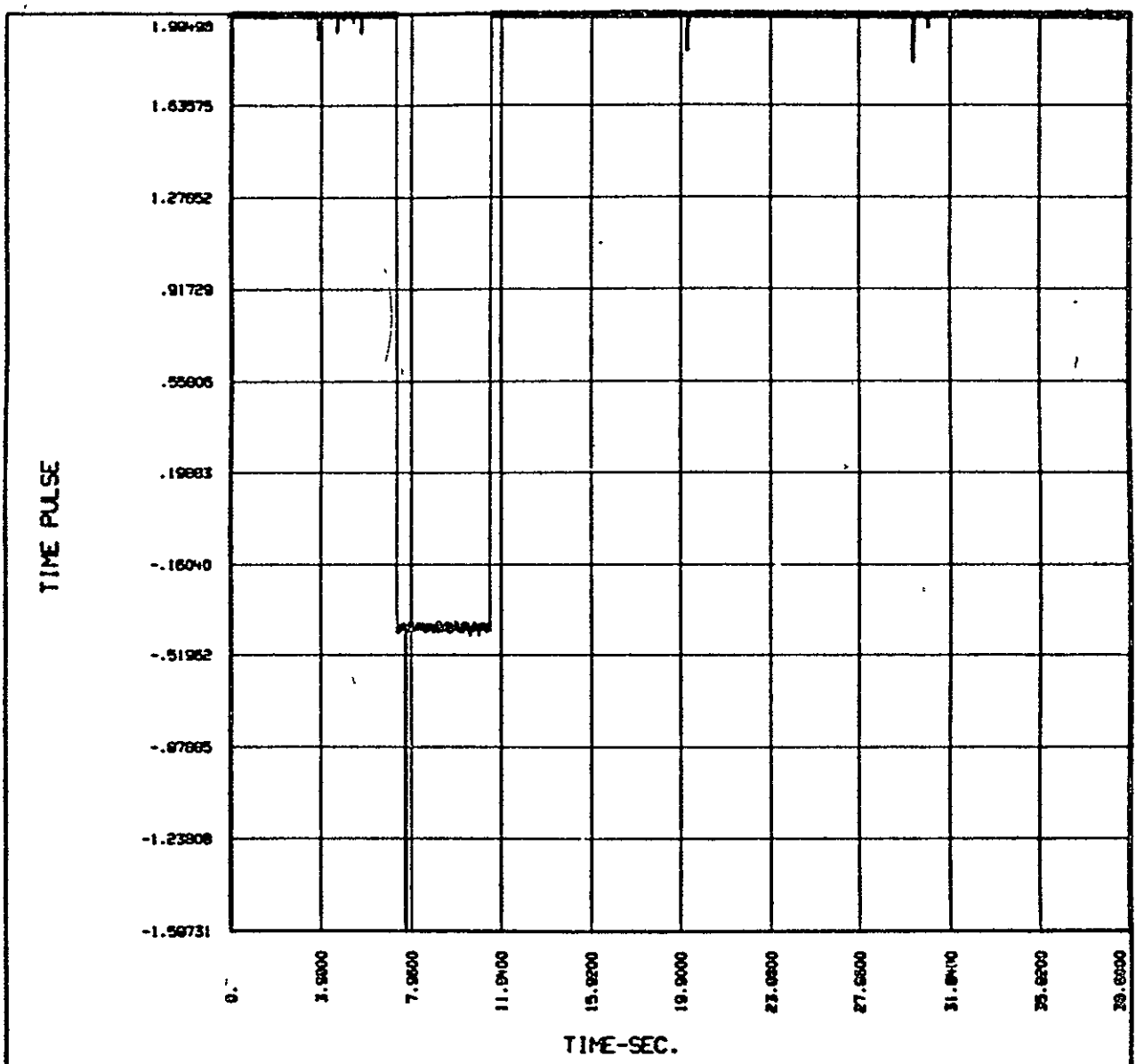
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.1-3

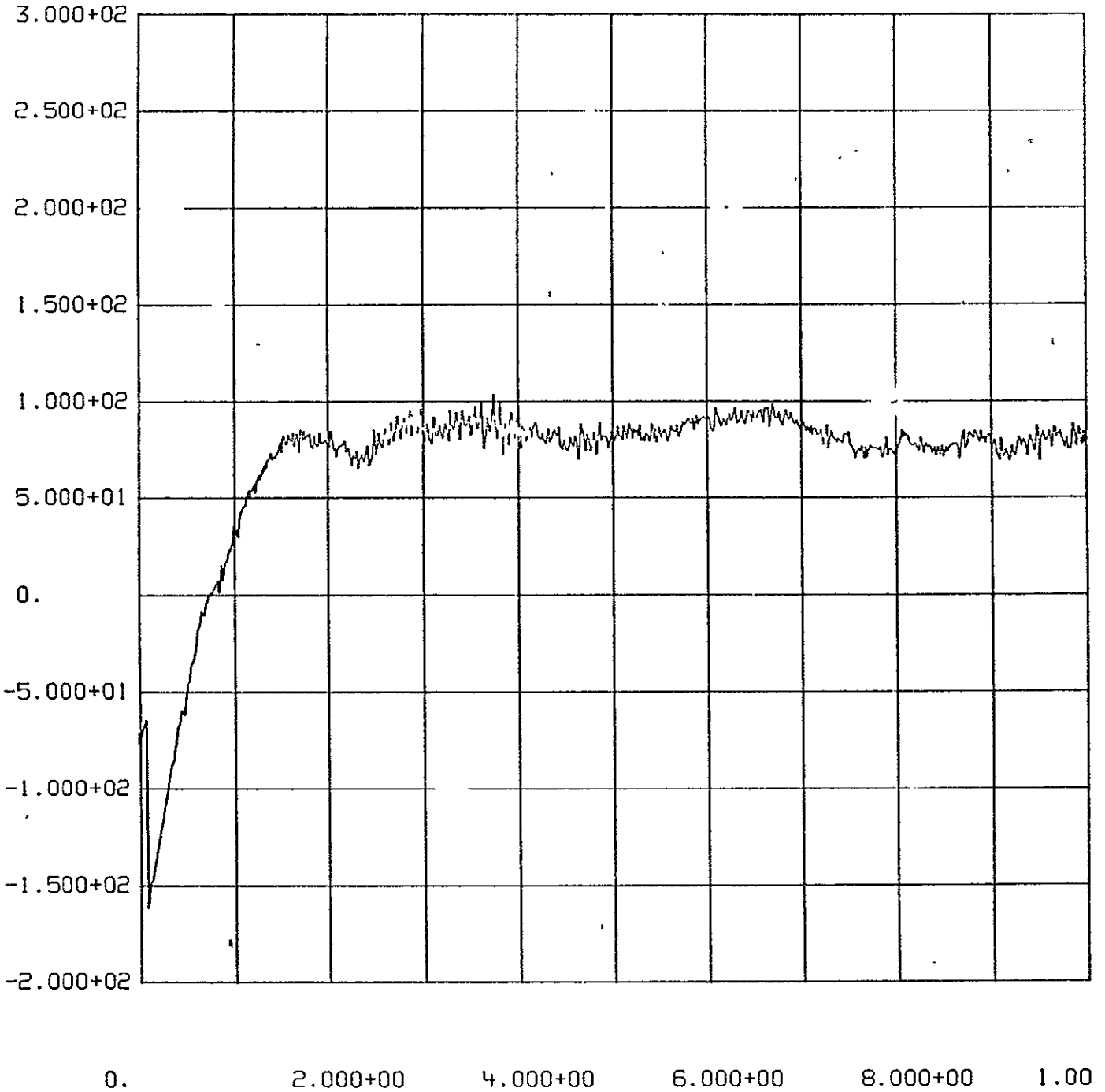


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.1-3



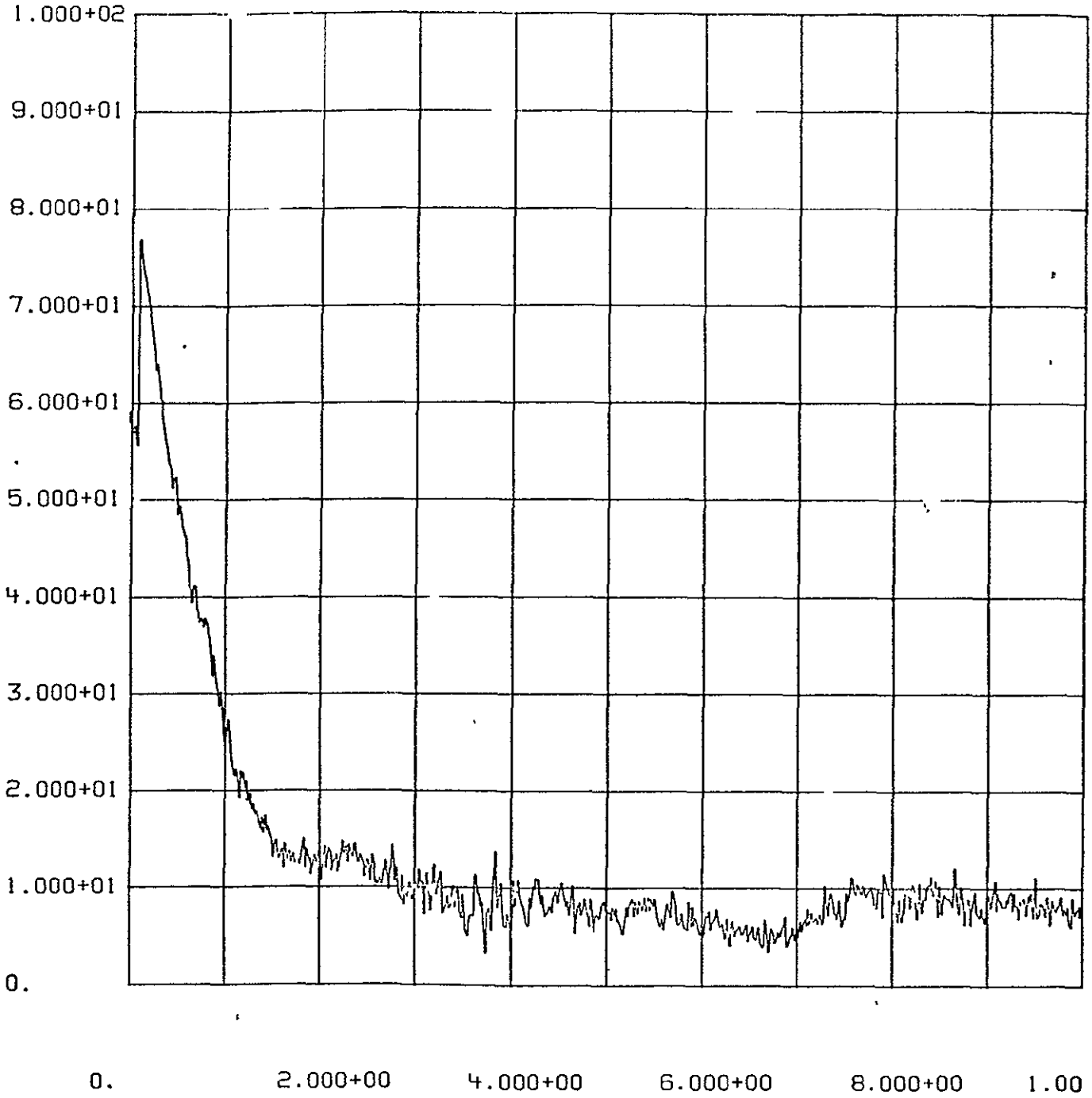
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.1-3


1.99498
1.63575
1.27652
.91729
.55806
.19883
-.16040
-.51962
-.87885
-1.23808
-1.59731
TIME PULSE
0.
3.9800
7.9600
11.9400
15.9200
19.9000
23.8800
27.8600
31.8400
35.8200
39.8000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.1-3



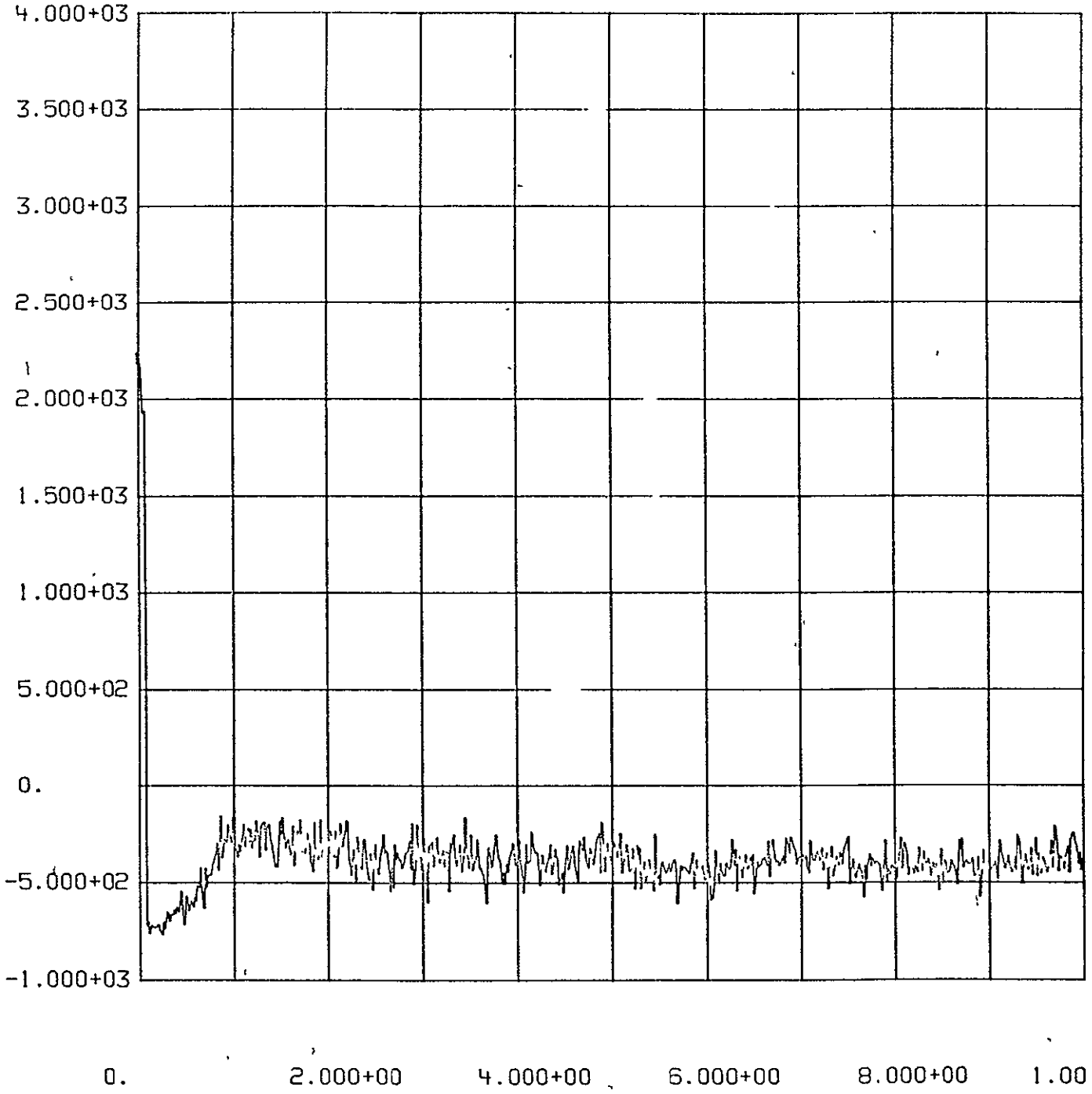
Z-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.1-3 * UNFILT *



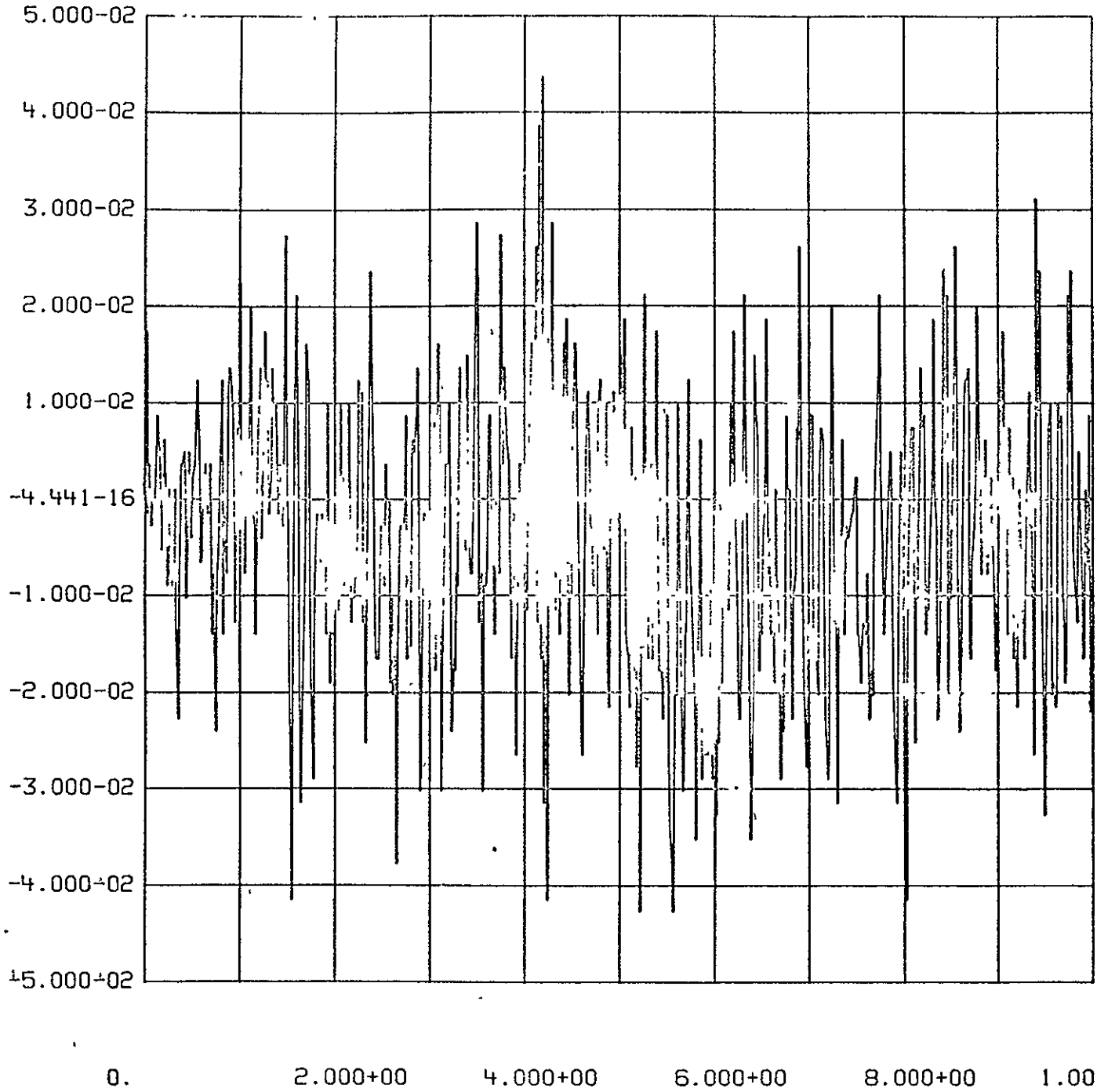
Y-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.1-3 * UNFILT *



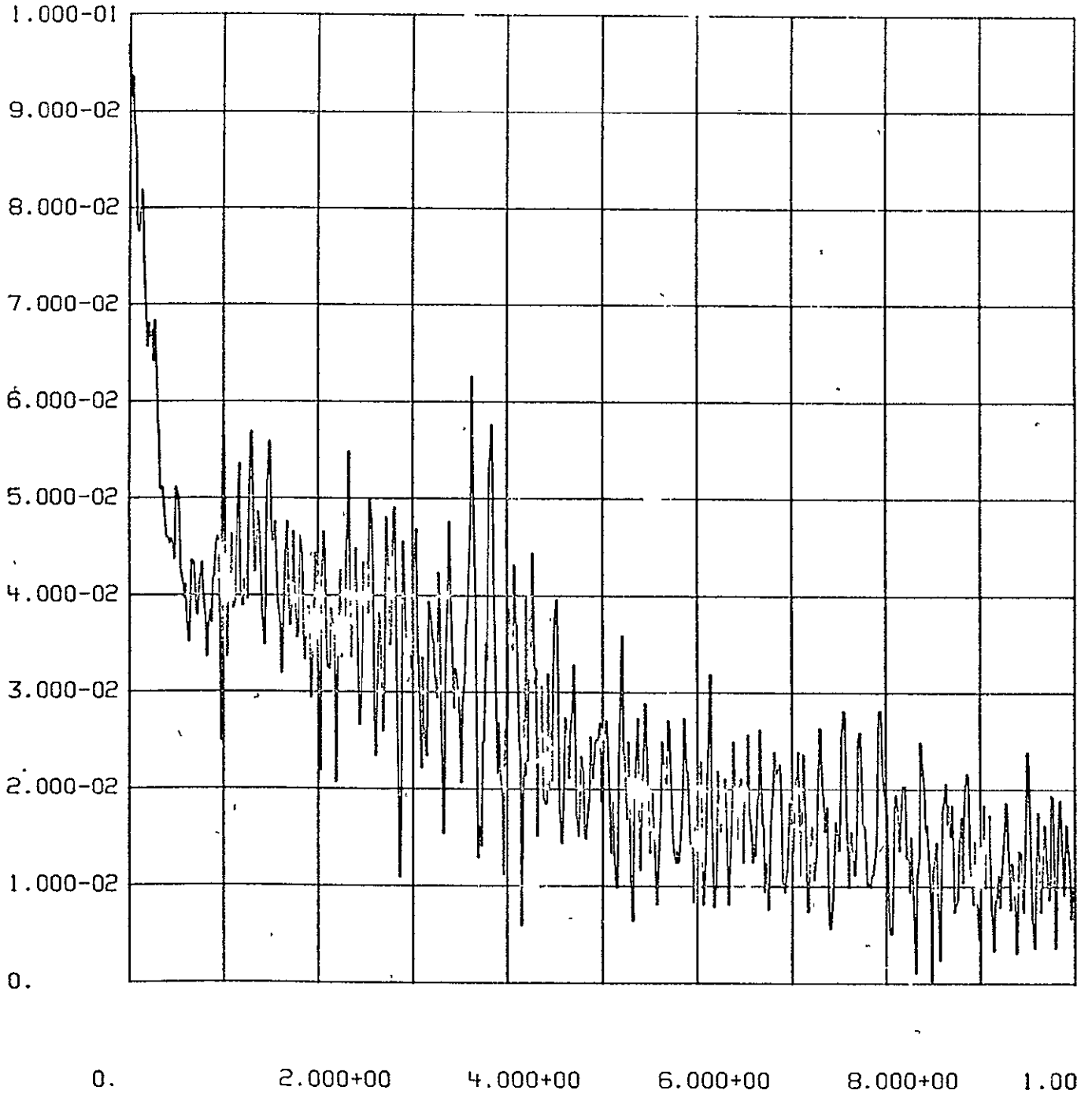
MOMENT VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.1-3 * UNFILT *



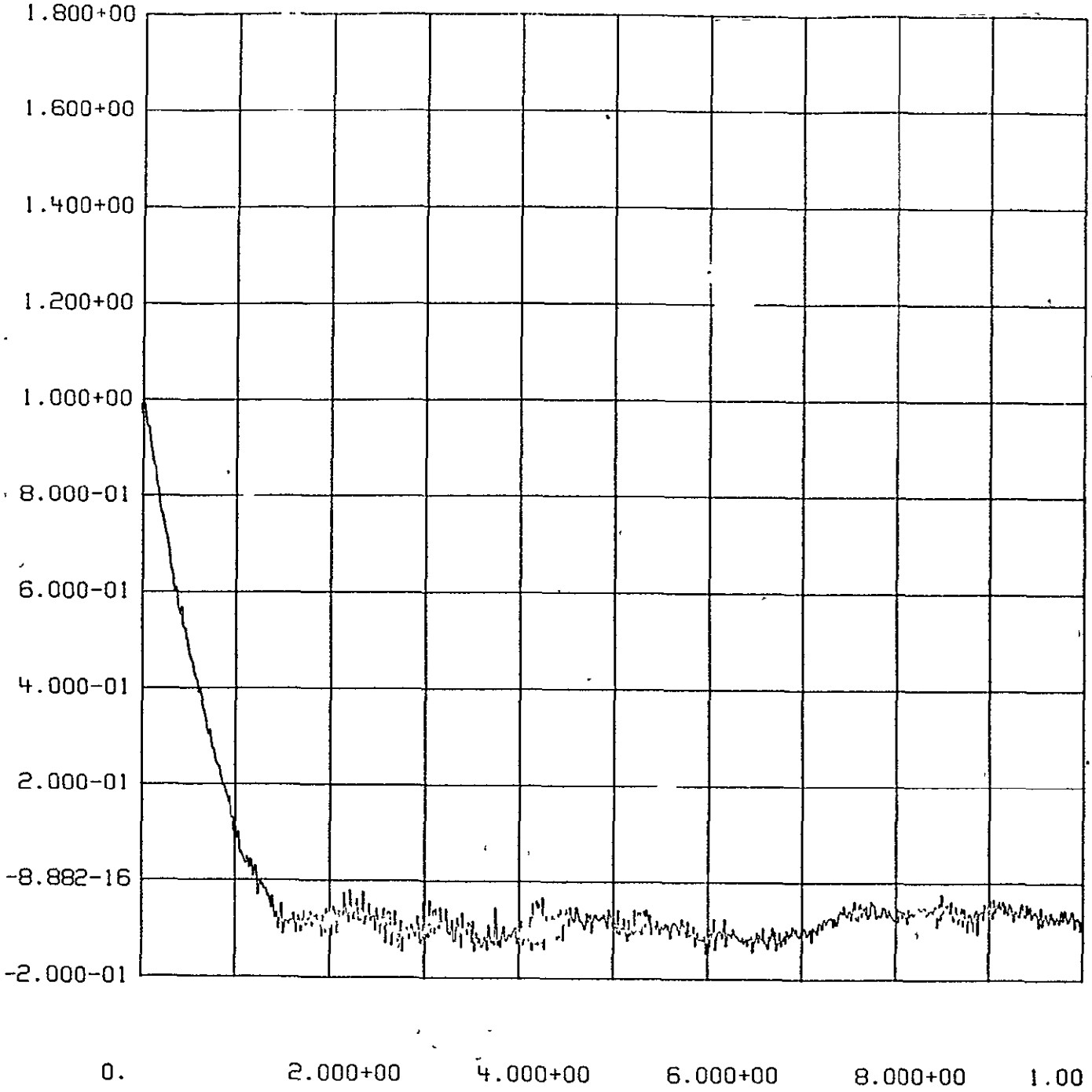
AC YAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.1-3 * UNFILT *



AC XAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.1-3 * UNFILT *

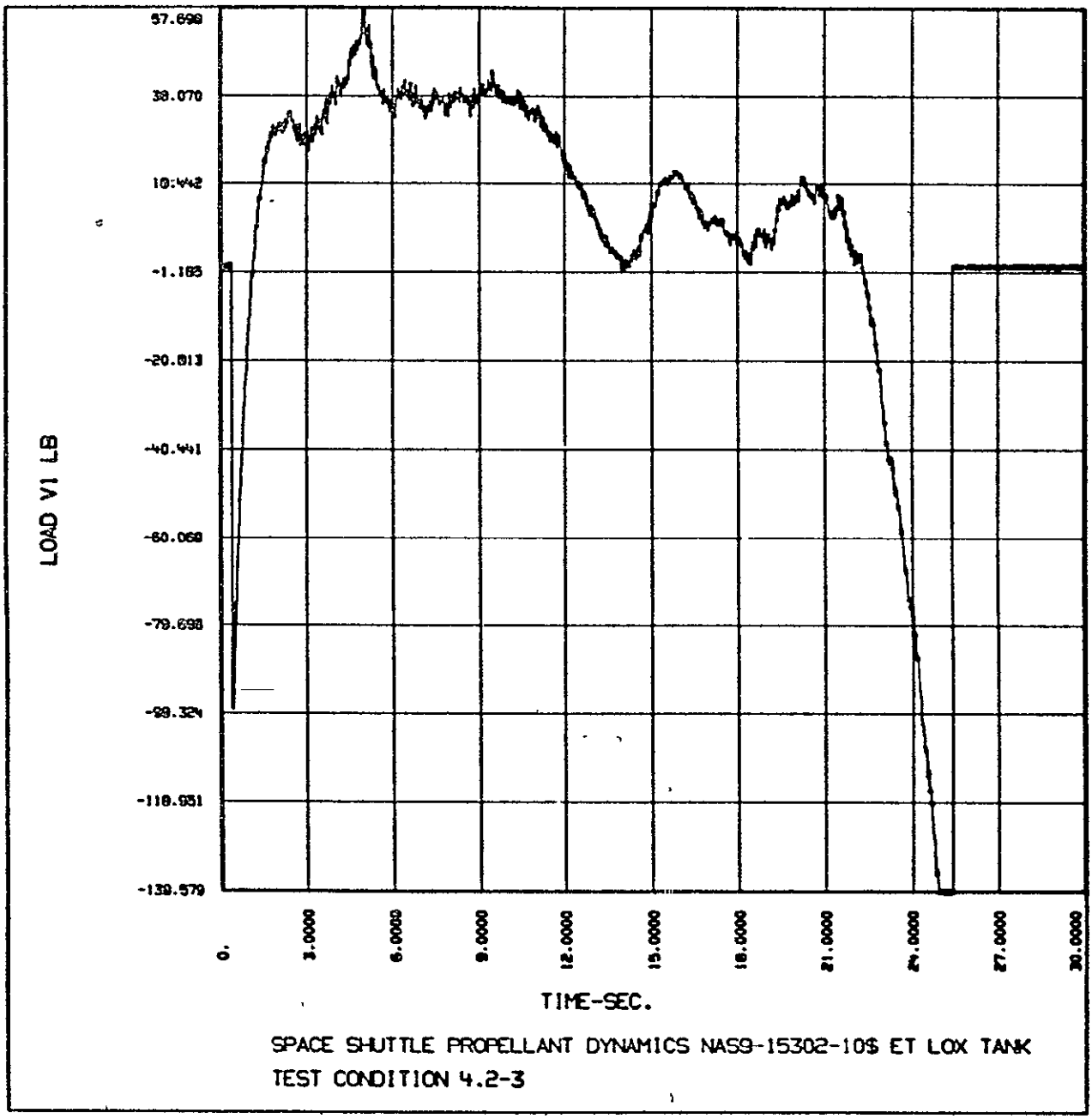


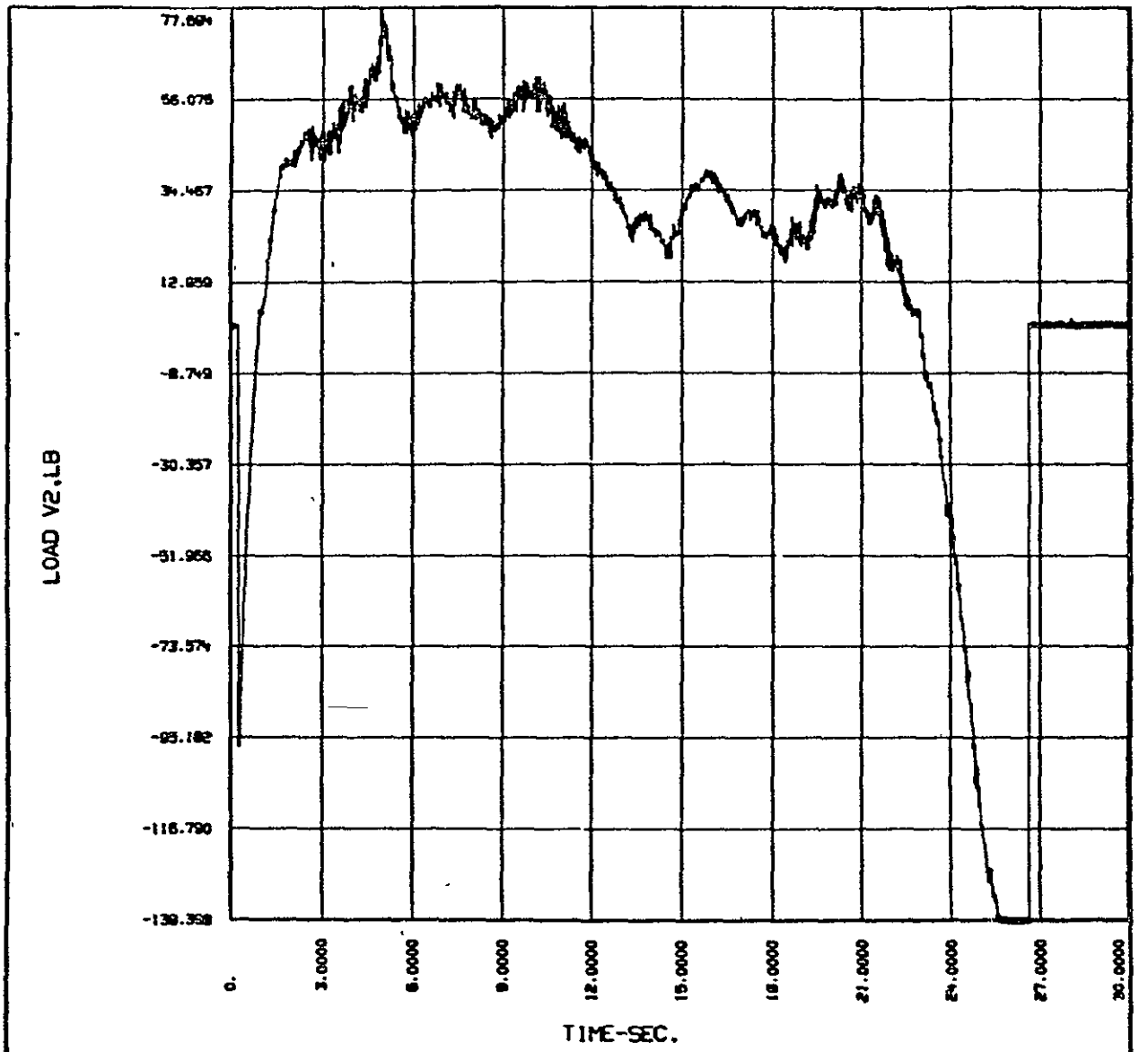
AC ZAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.1-3 * UNFILT *

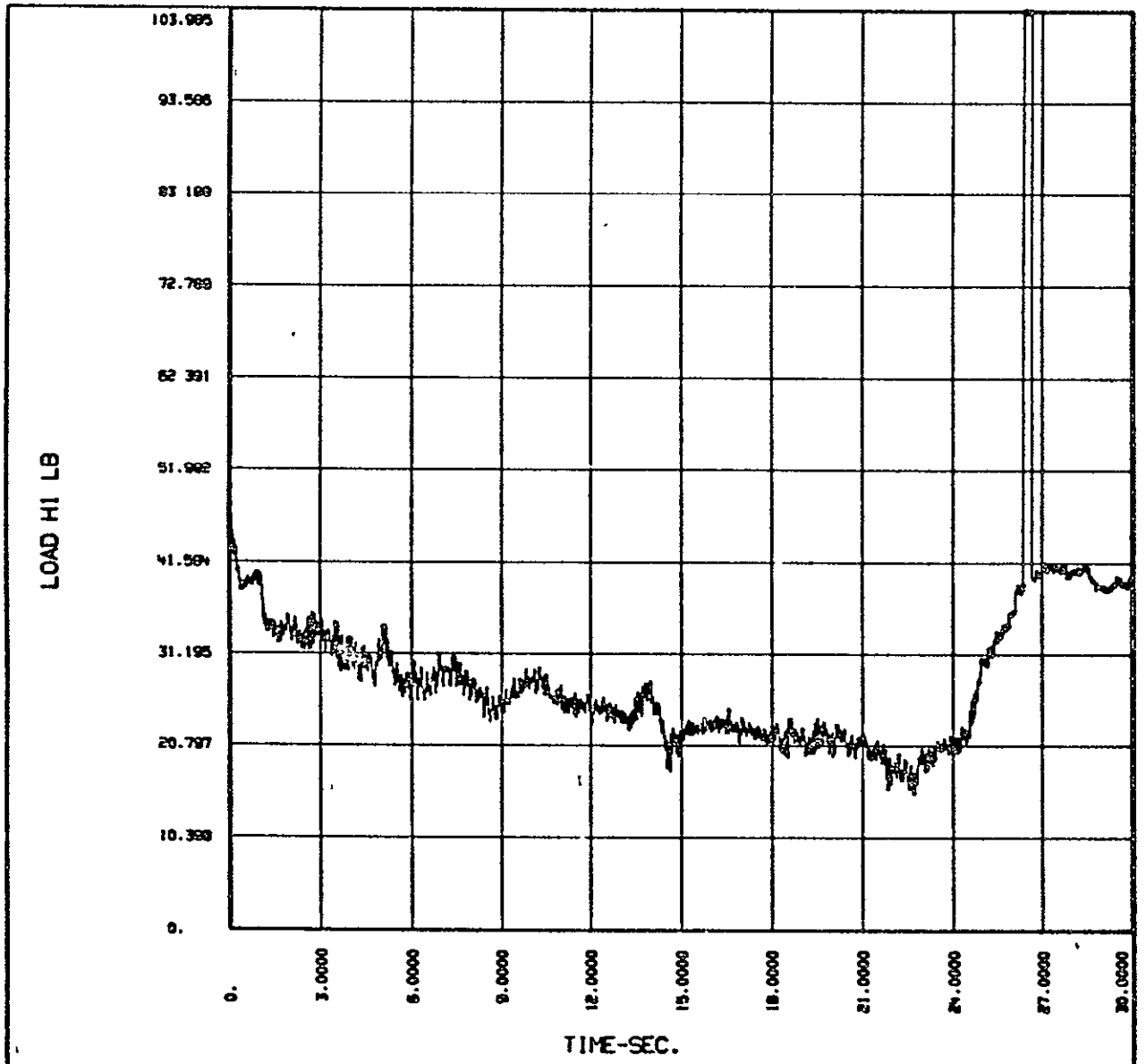
Test Data Condition 4.2-3

Baffles
Test Fluid — Water
Orientation — 13°
Fill Volume — 5.5%
Target Acceleration—0.1 g

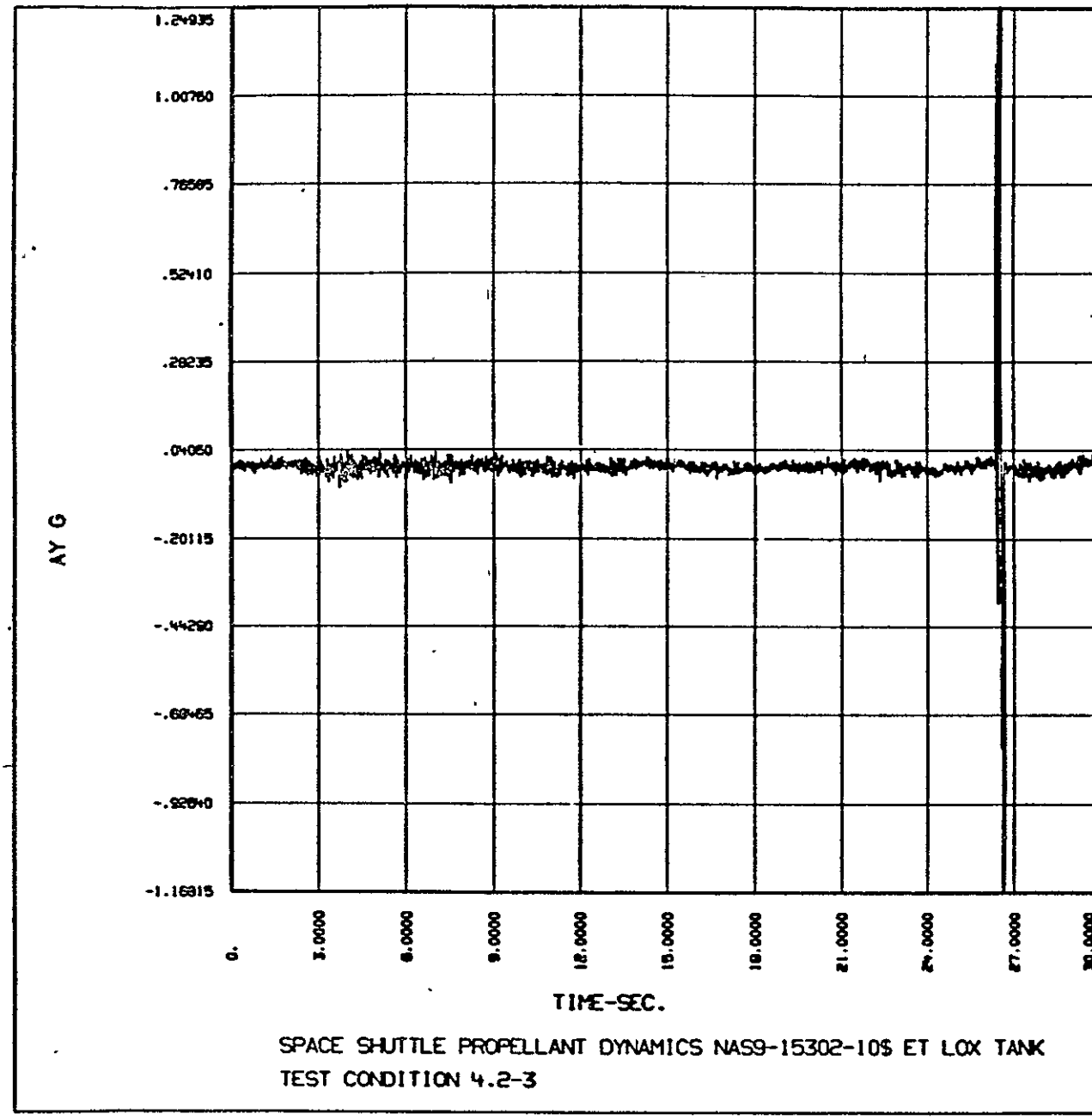

57.698
38.070
10.442
-1.185
-20.813
-40.441
-60.069
-79.698
-99.324
-118.951
-138.579
LOAD V1 LB
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.2-3

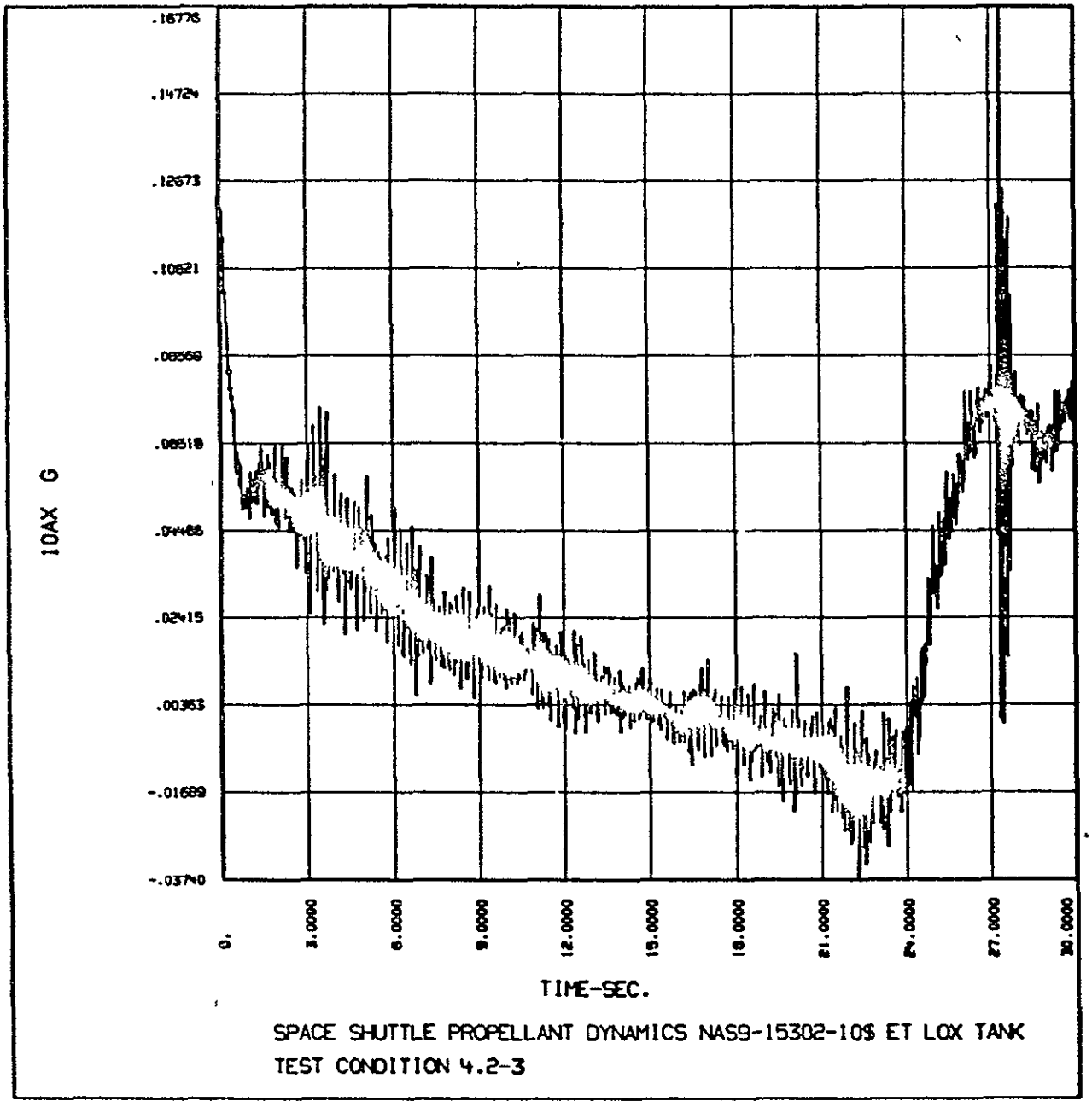


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.2-3

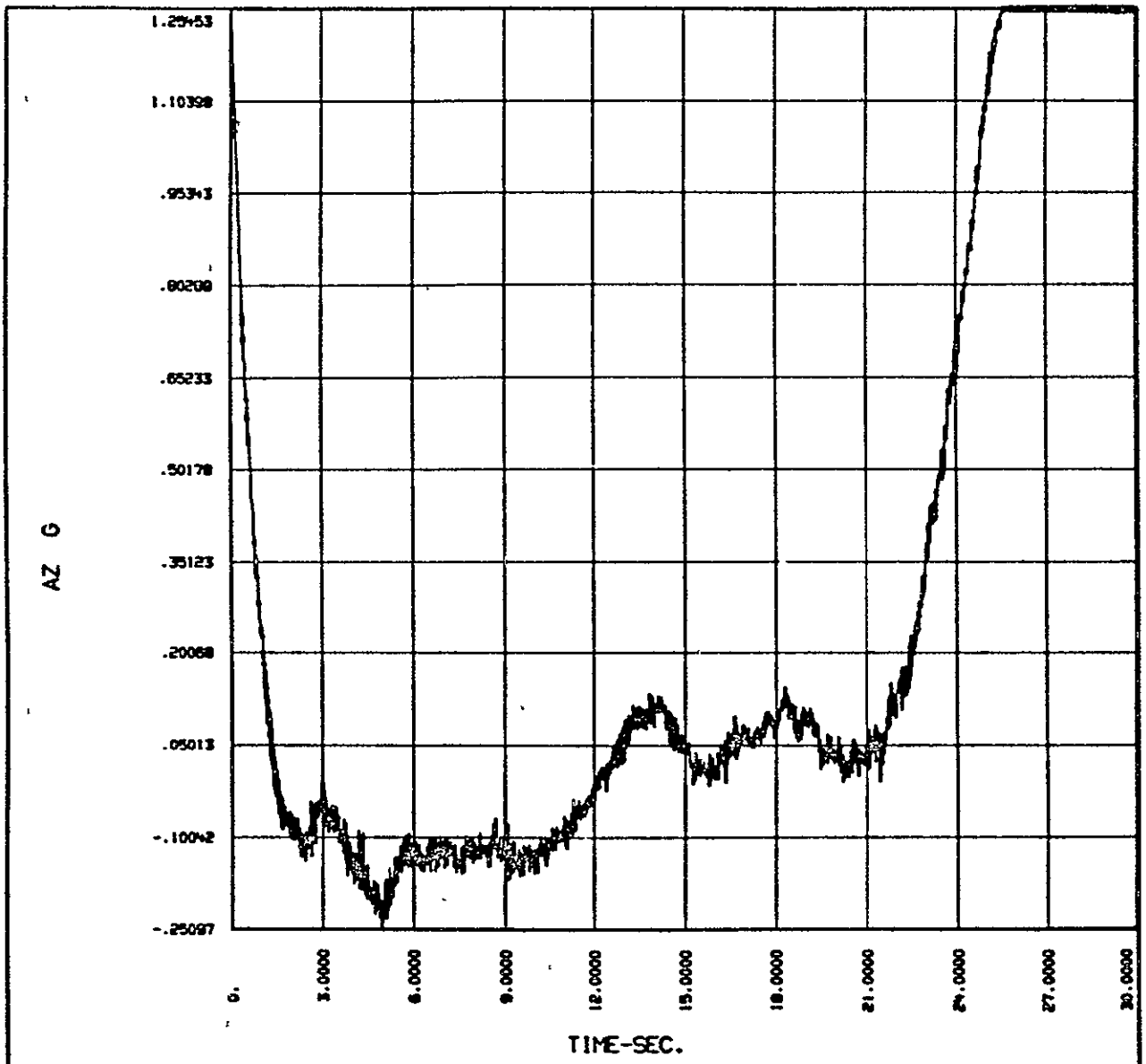


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.2-3

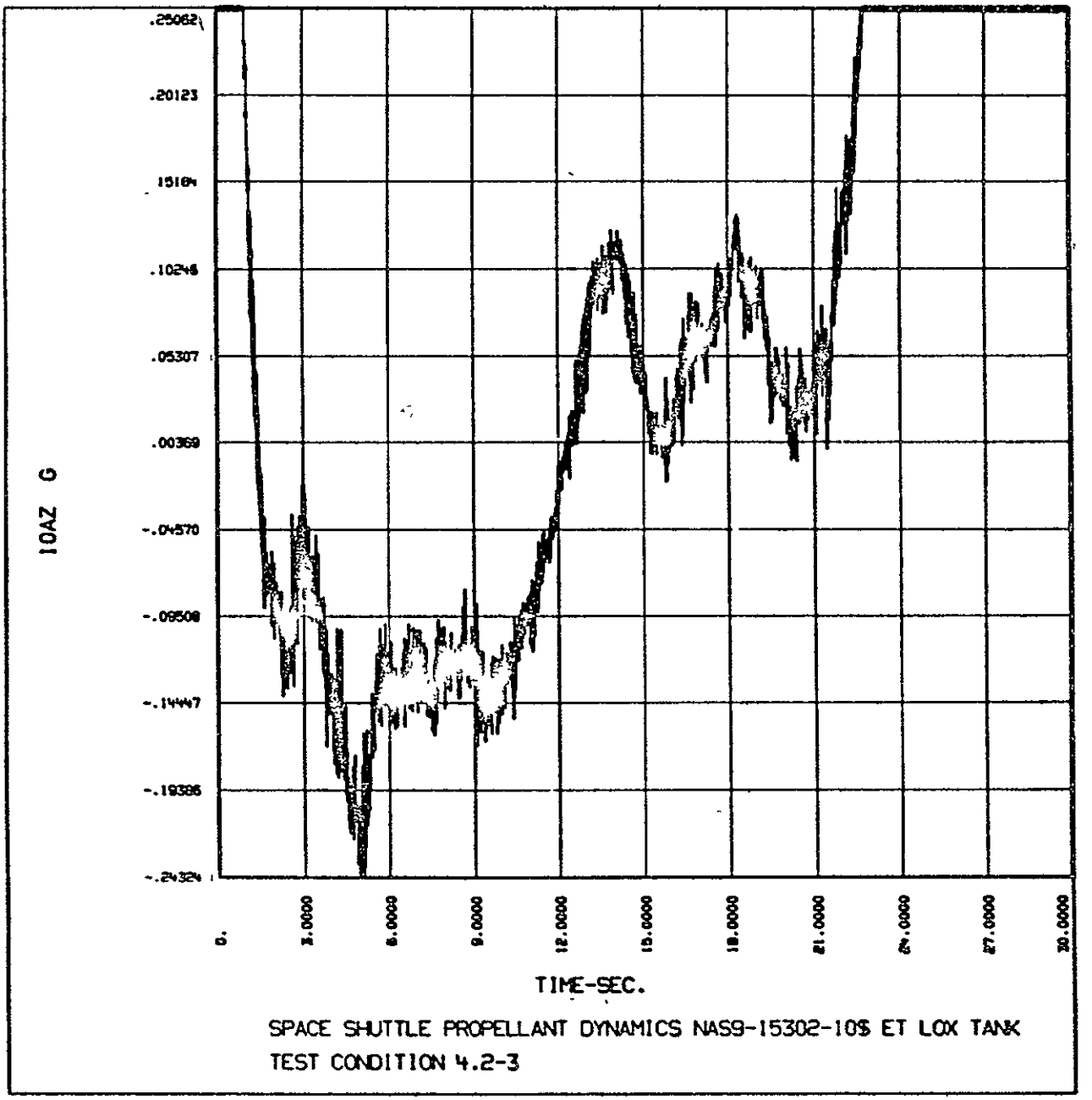

1.24935
1.00760
.76585
.52410
.28235
.04060
-.20115
-.44290
-.68465
-.92640
-1.16815
AY G
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.2-3

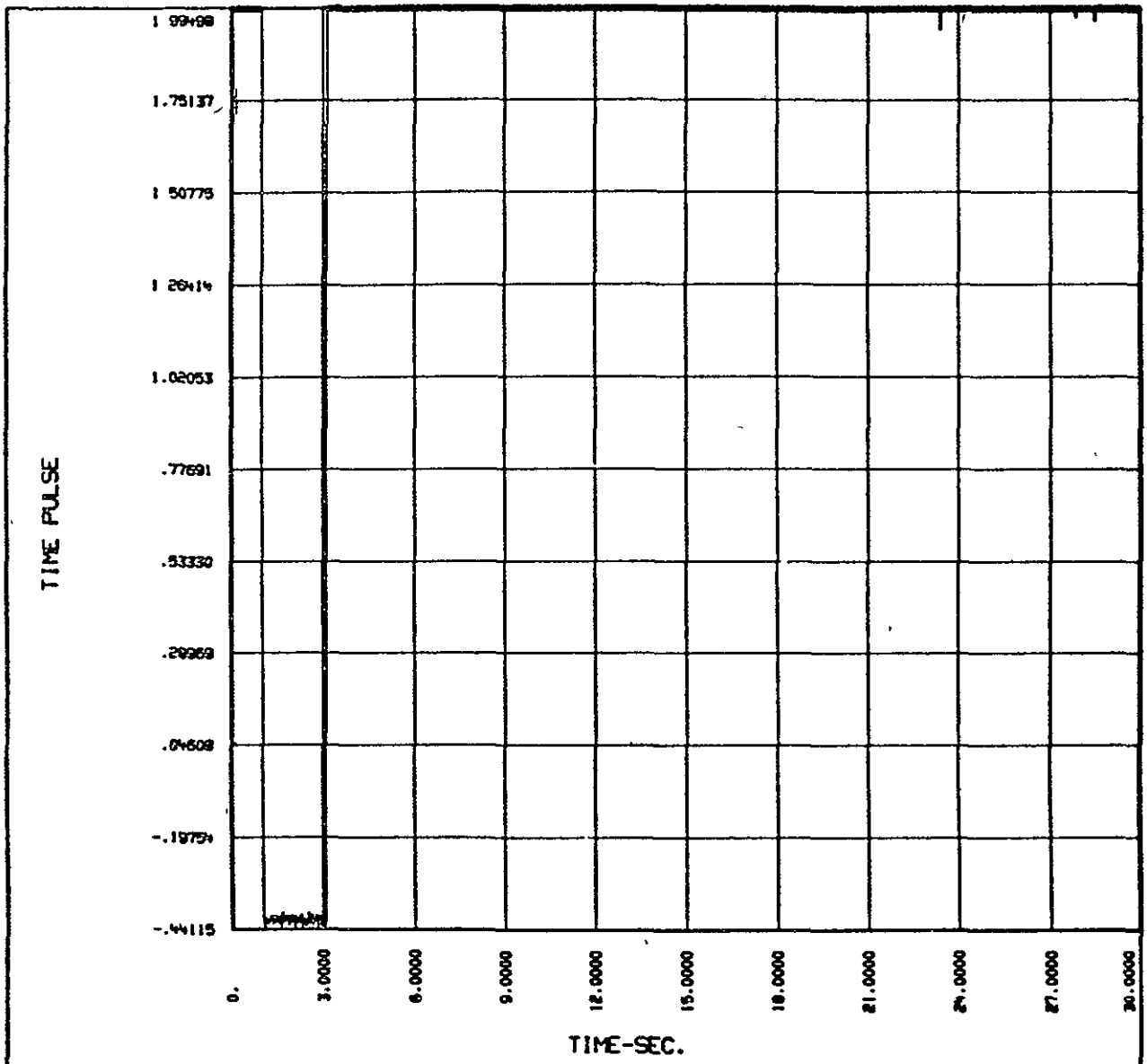


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.2-3

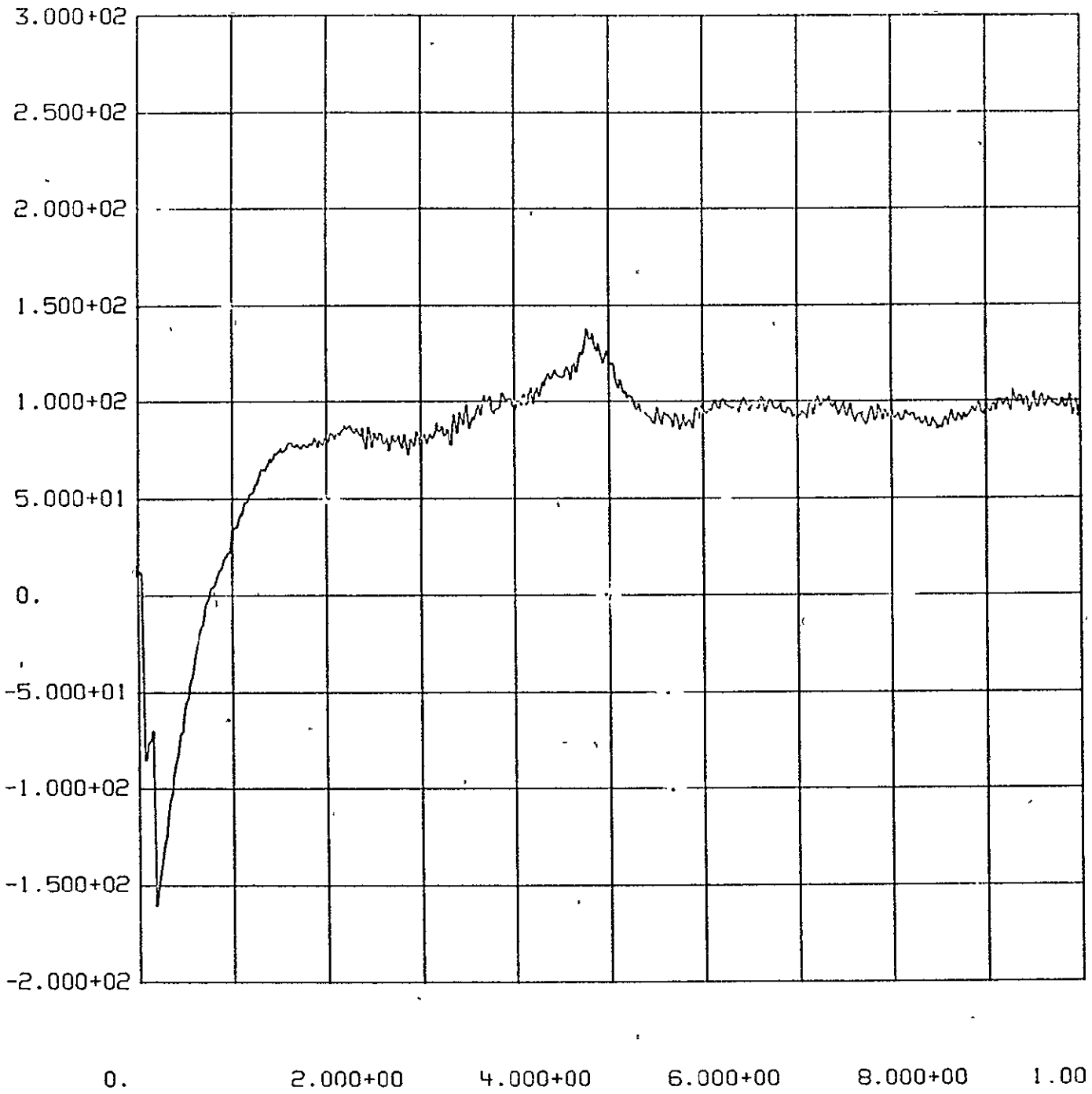


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.2-3


.25062
.20123
.15184
.10246
.05307
.00369
-.04570
-.09508
-.14447
-.19386
-.24324
10AZ G
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.2-3

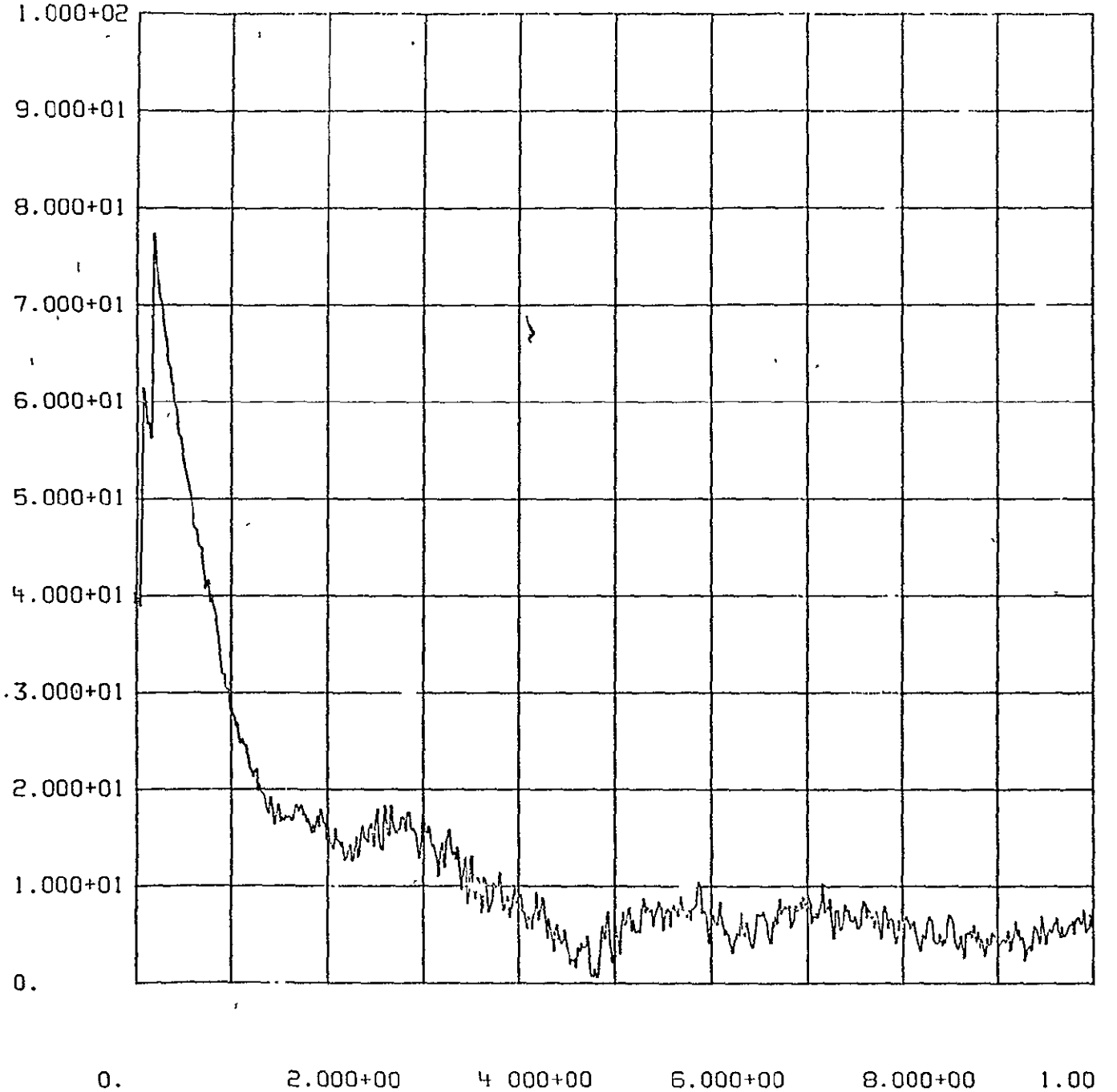


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.2-3



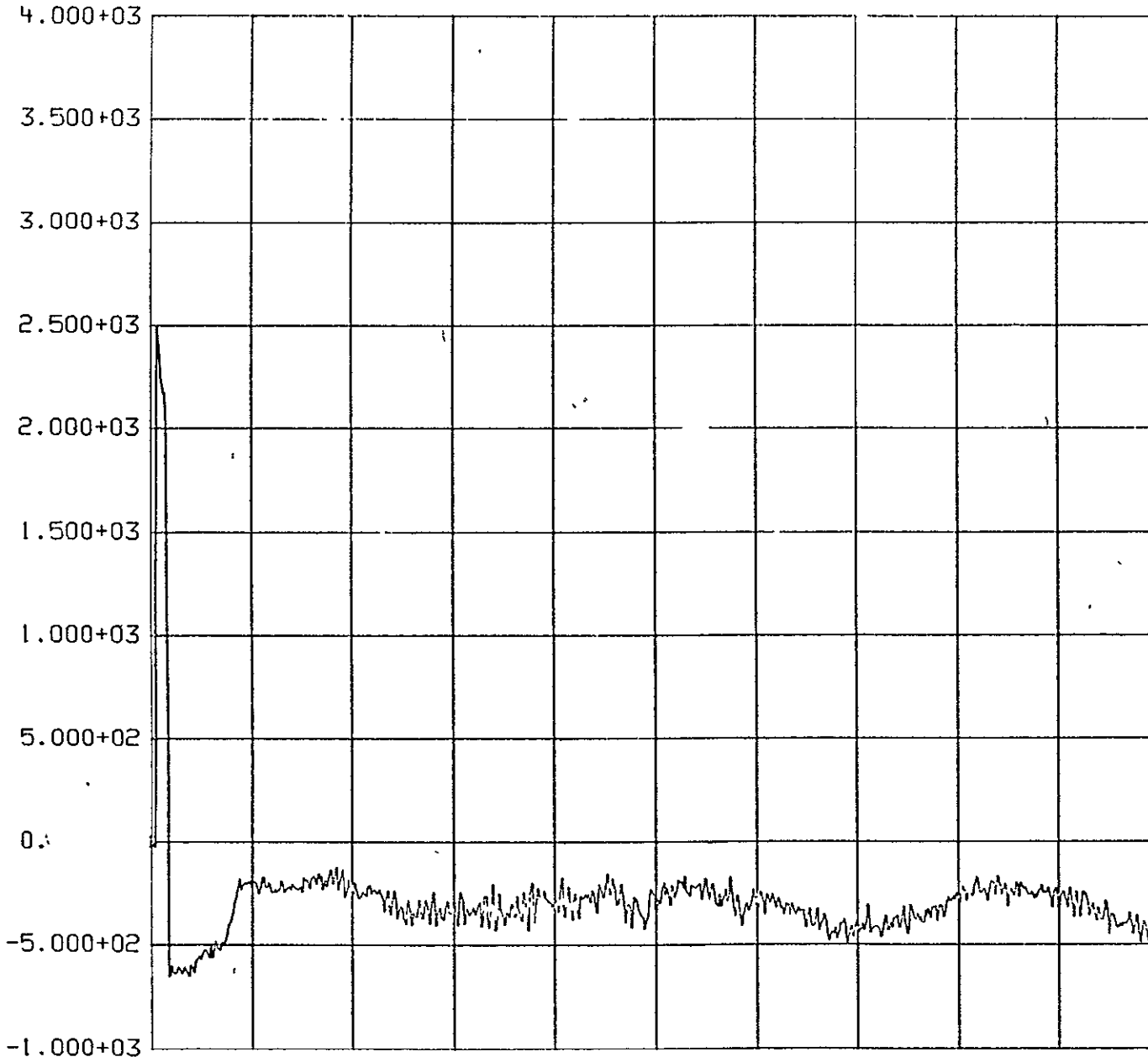
Z-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.2-3 * UNFILT *



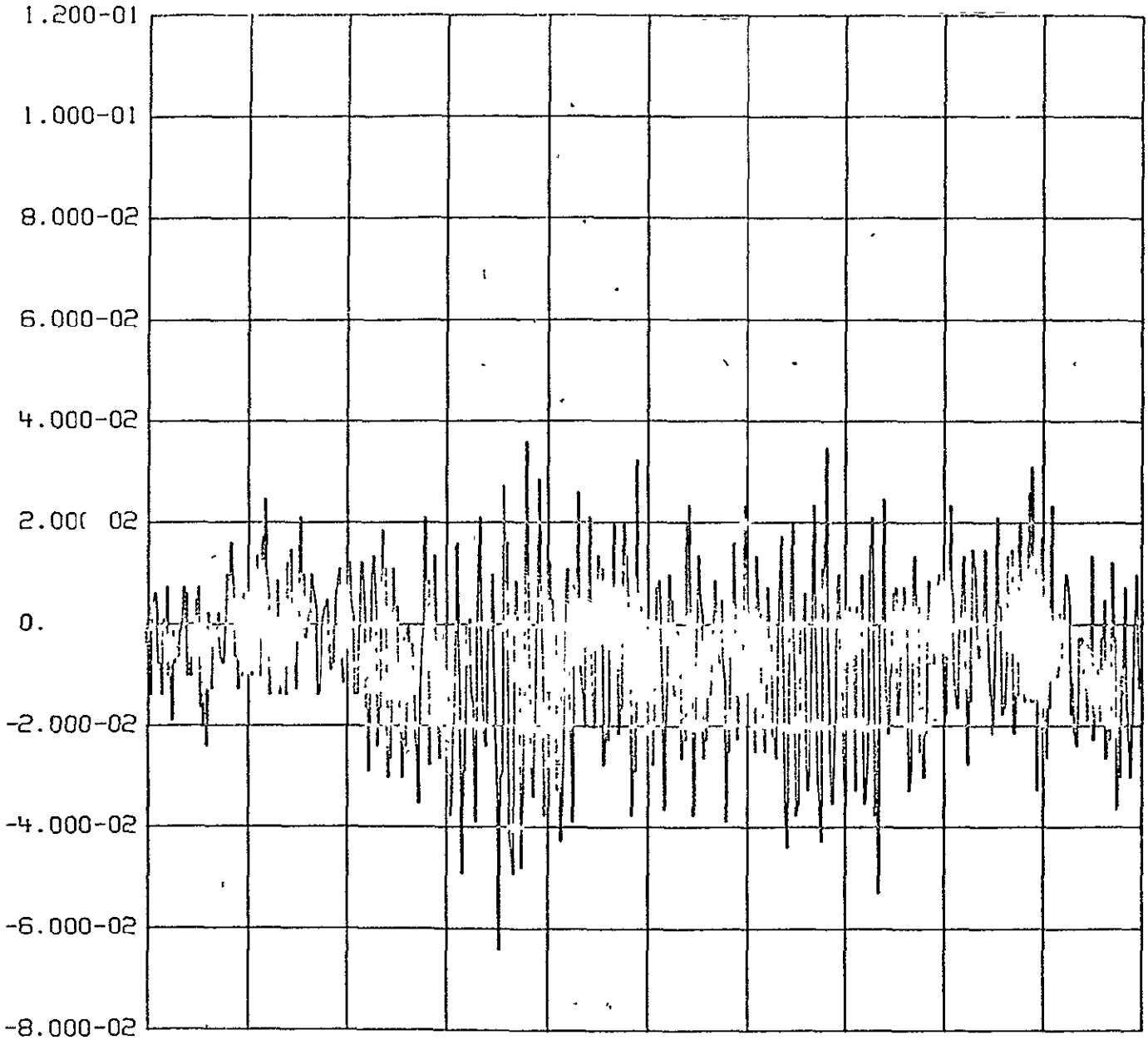
Y-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.2-3 * UNFILT *



MOMENT VS TIME

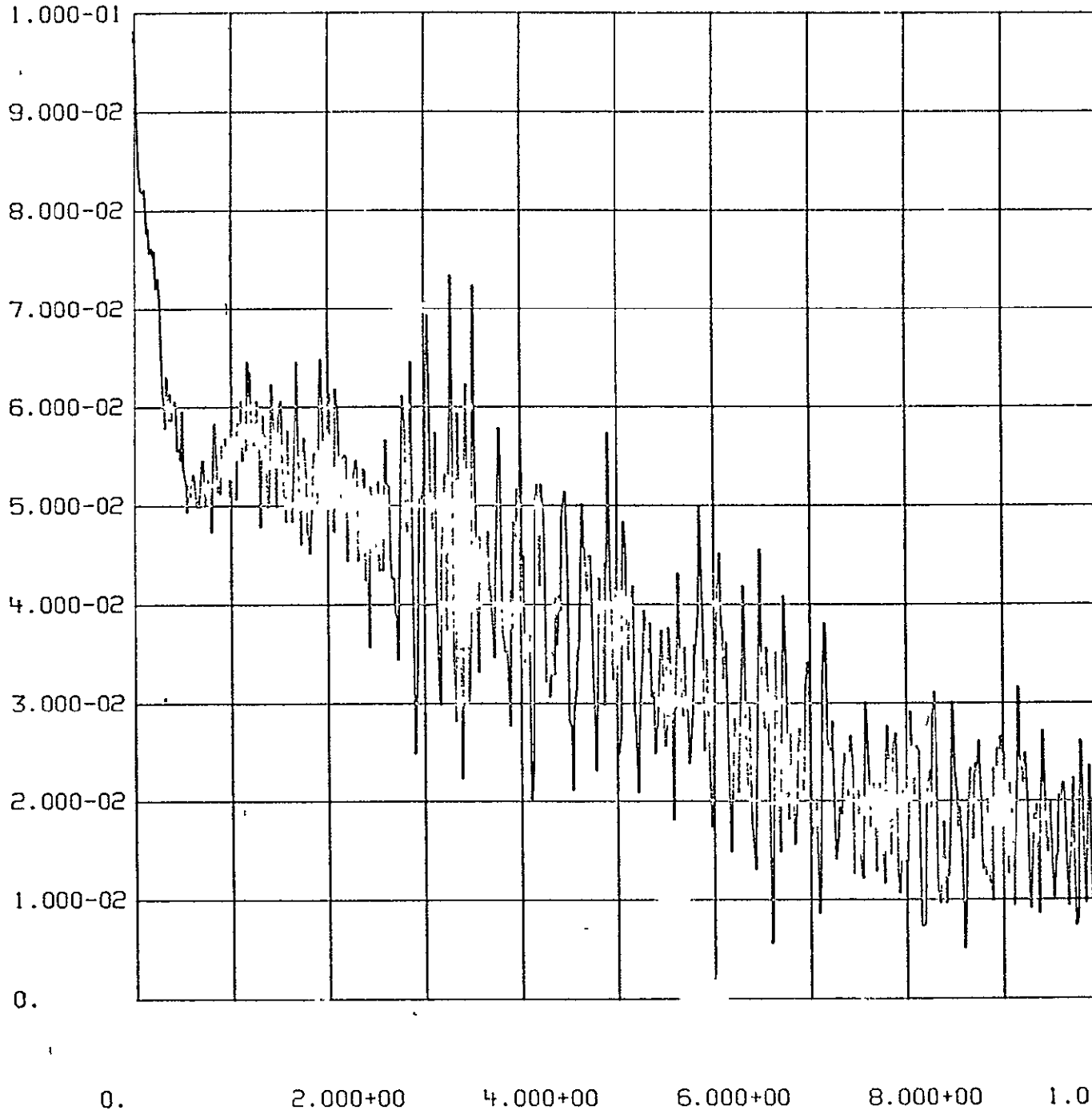
1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.2-3 * UNFILT *



0. 2.000+00 4.000+00 6.000+00 8 000+00 1.00

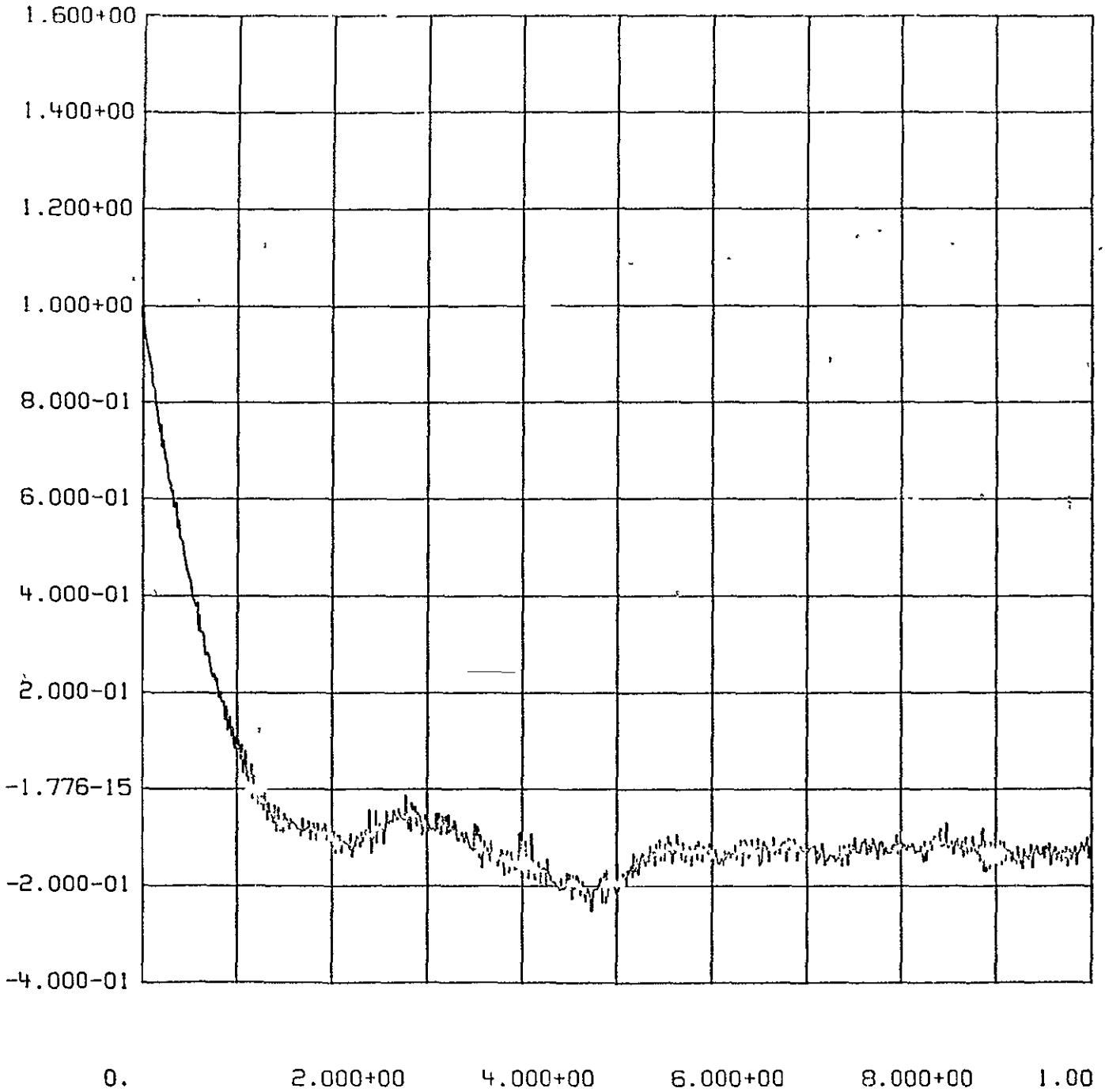
AC YAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.2-3 * UNFILT *



AC XAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.2-3 * UNFILT *

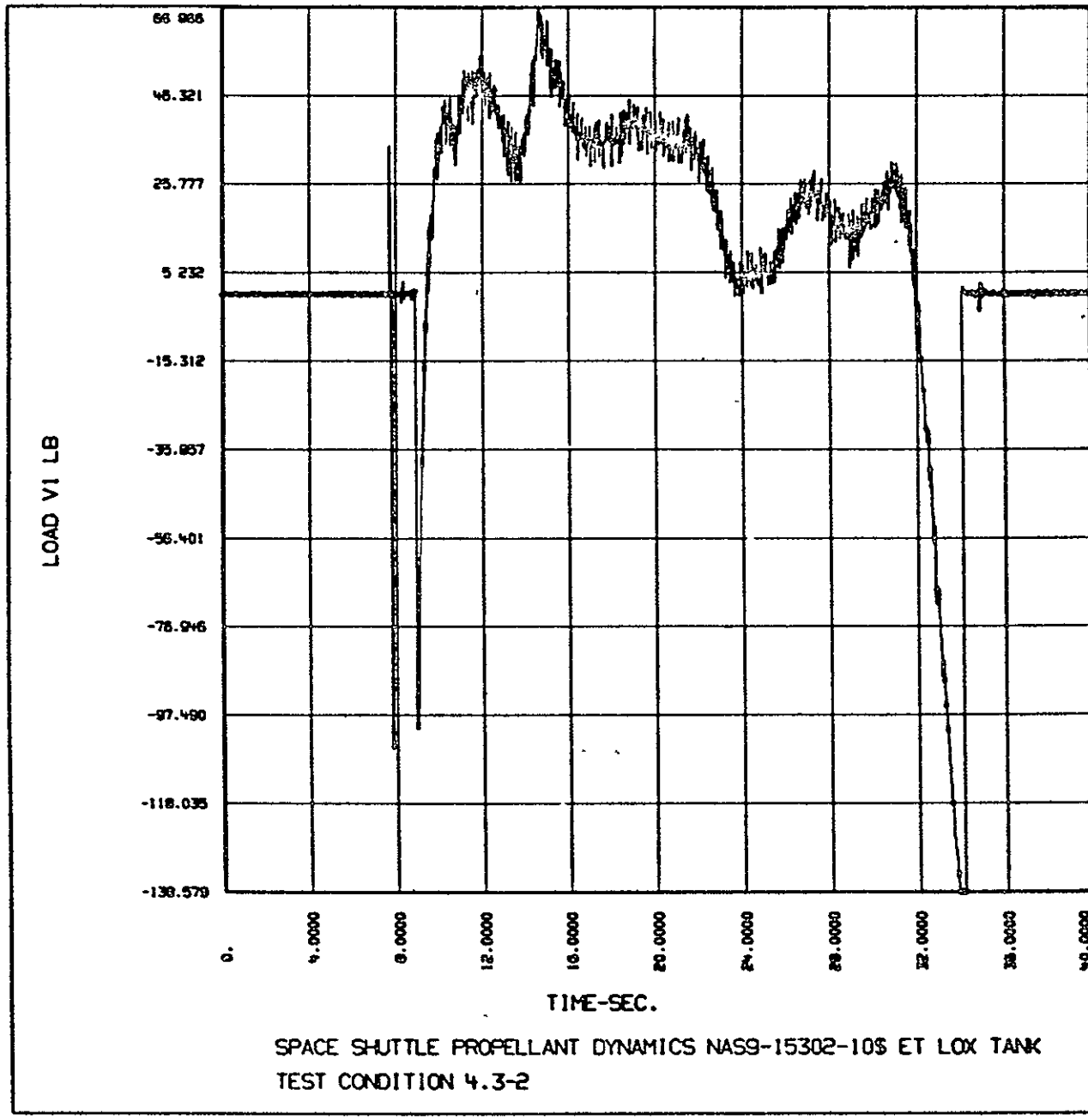


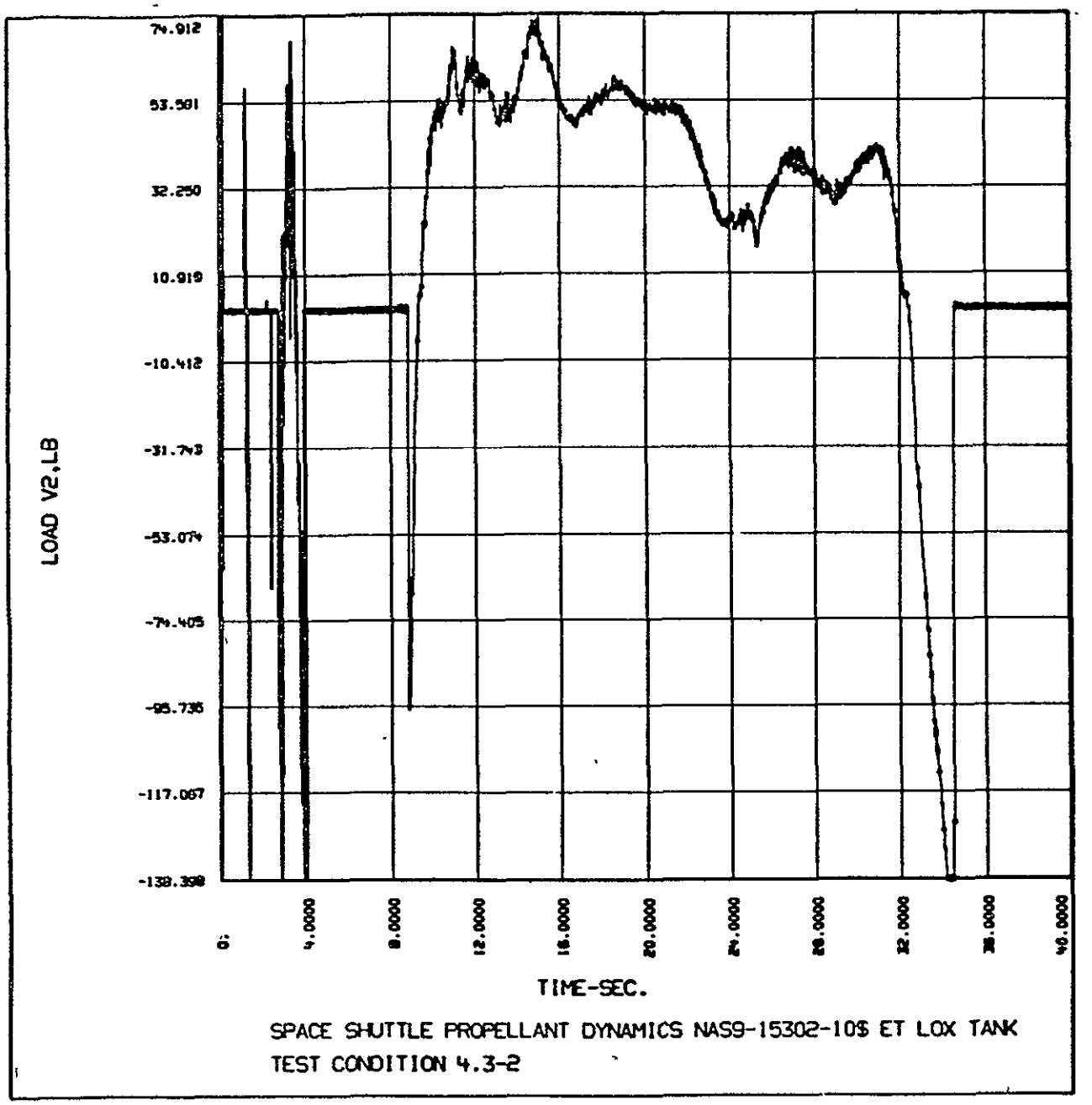
AC ZAC VS TIME

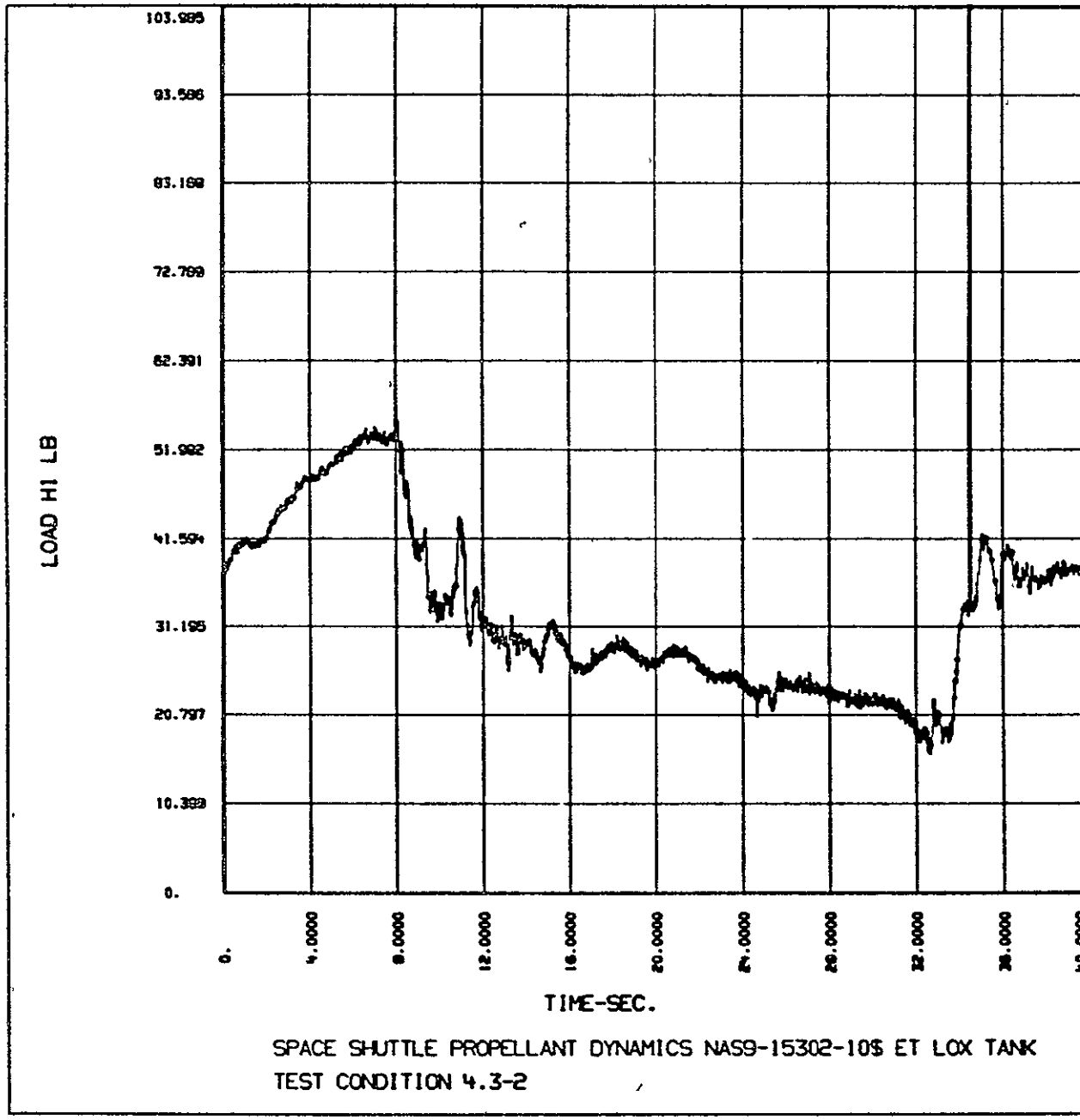
1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.2-3 * UNFILT *

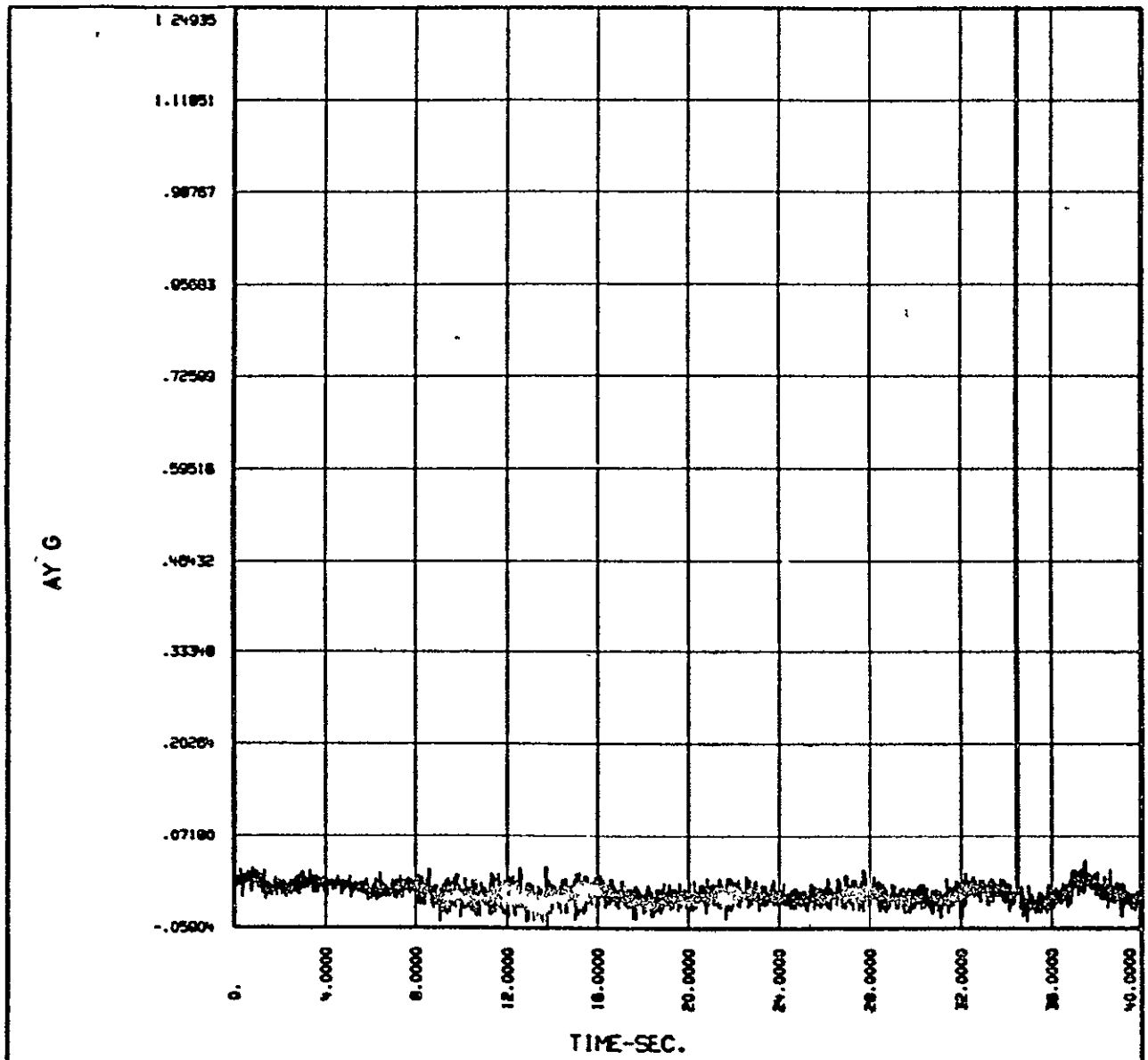
Test Data Condition 4.3-2

Baffles
Test Fluid – Water
Orientation – 13°
Fill Volume – 10%
Target Acceleration–0 1 g

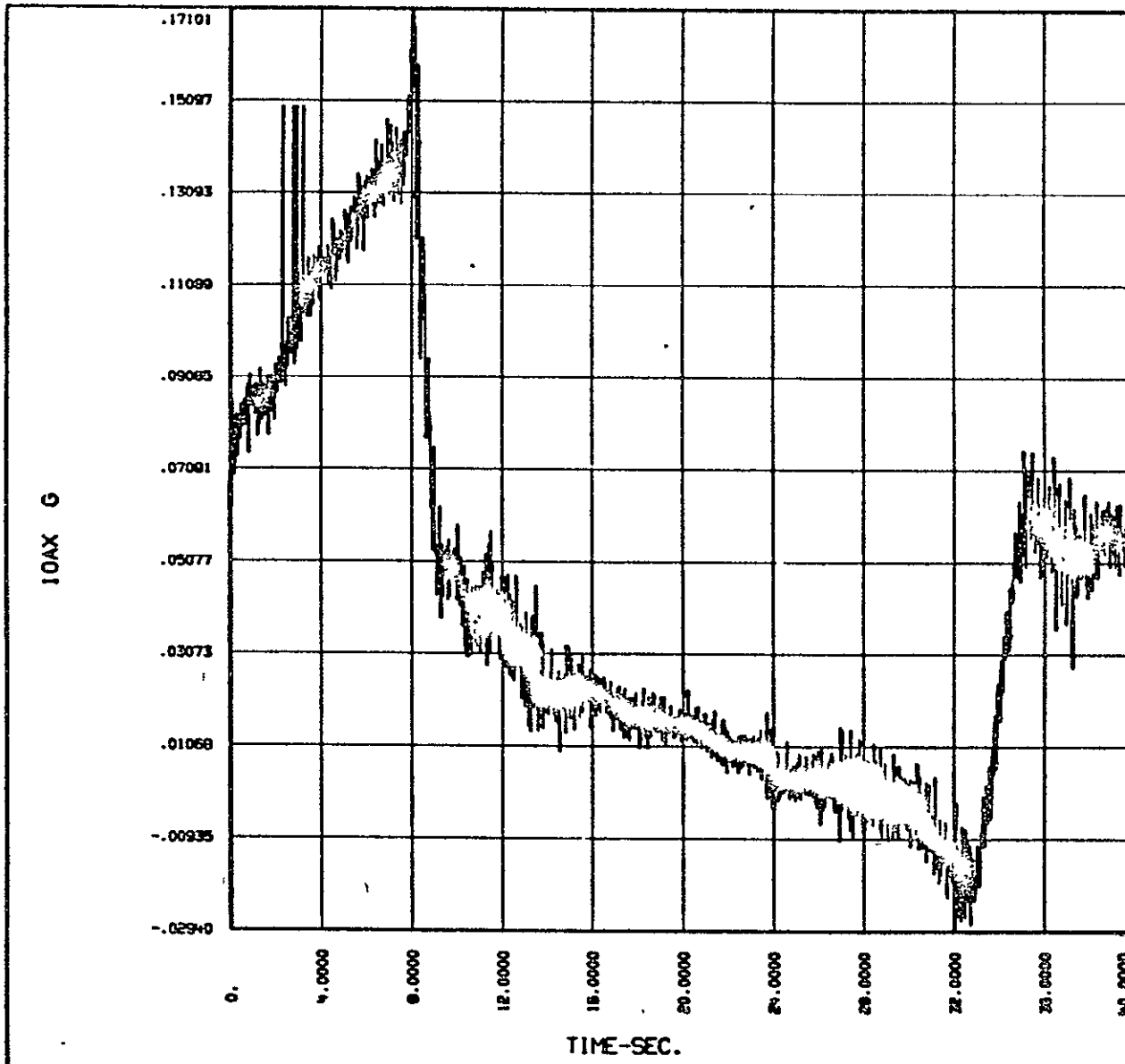

LOAD V1 LB
66.986
46.321
25.777
5.232
-15.312
-35.857
-56.401
-76.946
-97.490
-118.035
-138.579
0.
4.0000
8.0000
12.0000
16.0000
20.0000
24.0000
28.0000
32.0000
36.0000
40.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.3-2


74.912
53.581
32.250
10.919
-10.412
-31.743
-53.074
-74.405
-95.736
-117.067
-138.398
LOAD V2,LB
0.
4.0000
8.0000
12.0000
16.0000
20.0000
24.0000
28.0000
32.0000
36.0000
40.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.3-2

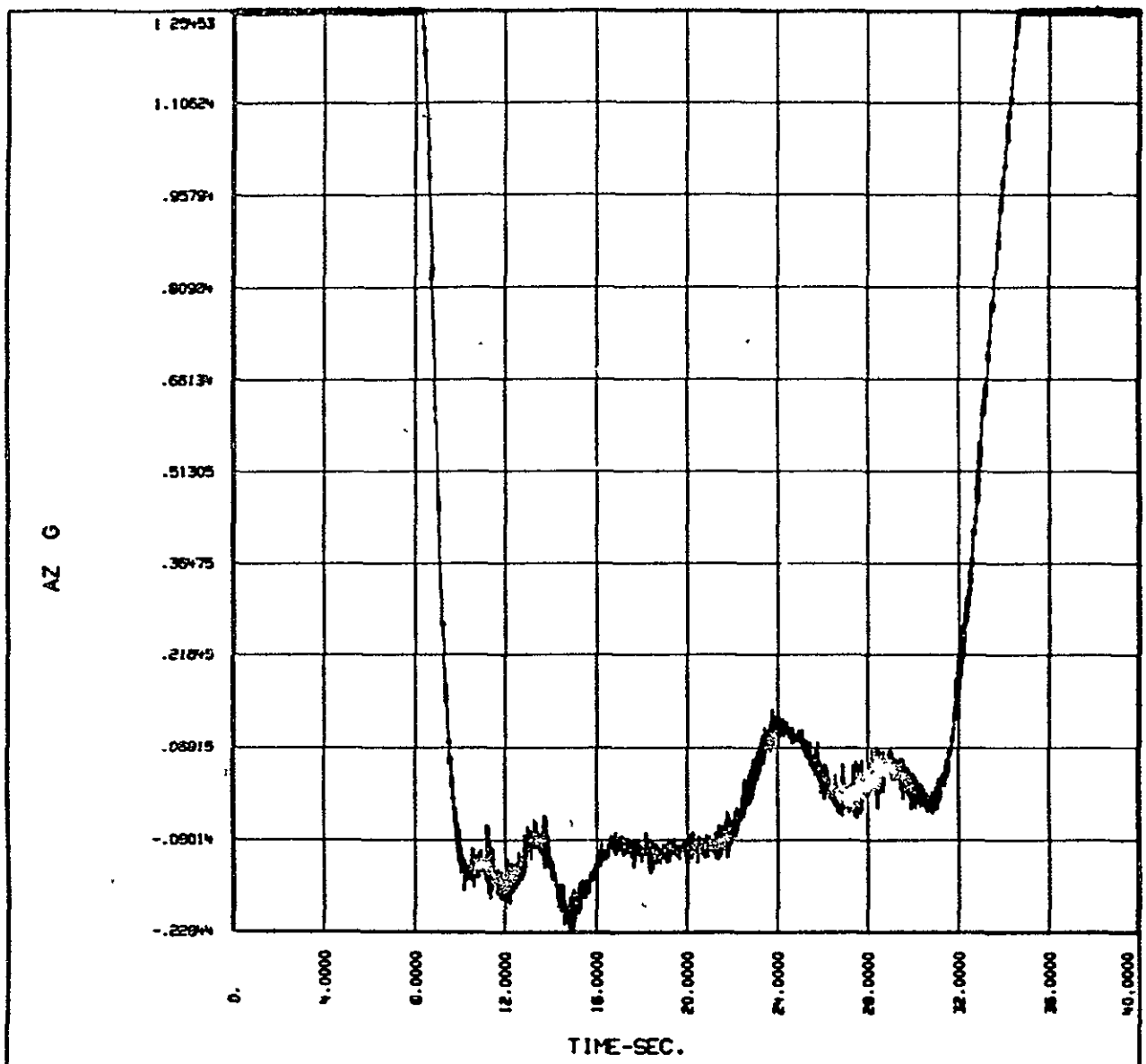

LOAD H1 LB
103.985
93.586
83.188
72.789
62.391
51.992
41.594
31.195
20.797
10.398
0.
0.
4.0000
8.0000
12.0000
16.0000
20.0000
24.0000
28.0000
32.0000
36.0000
40.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.3-2



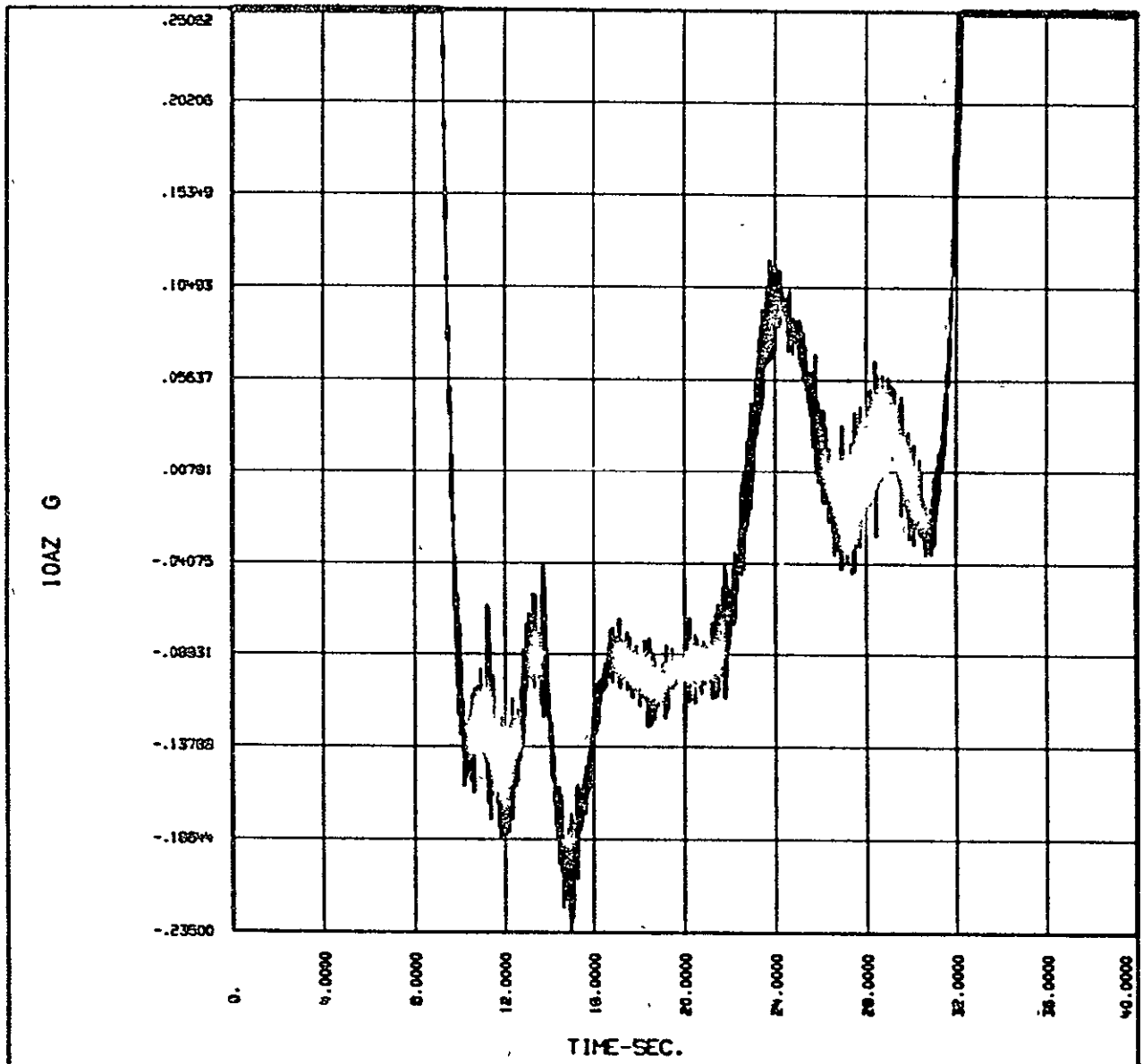
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.3-2



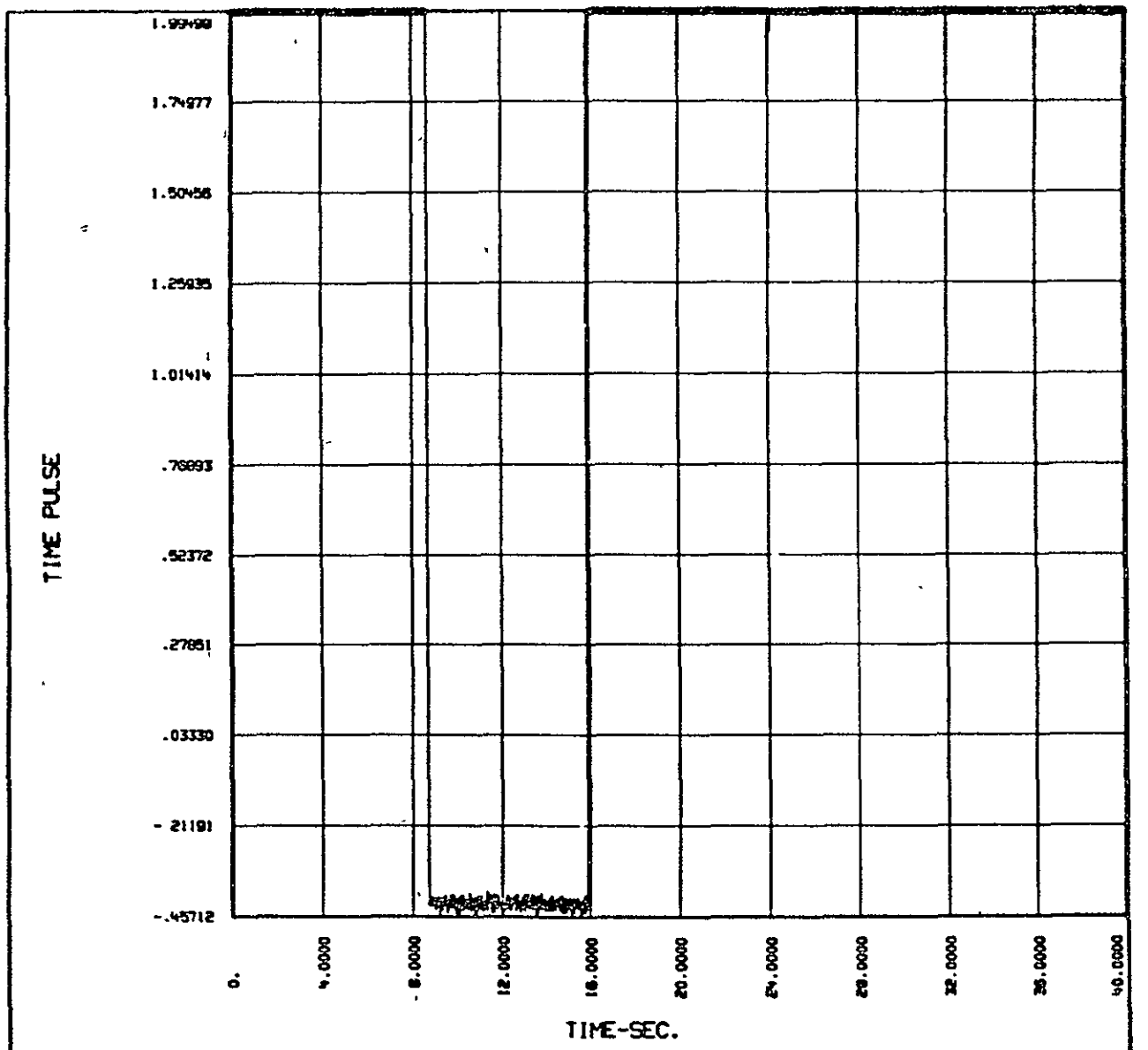
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.3-2



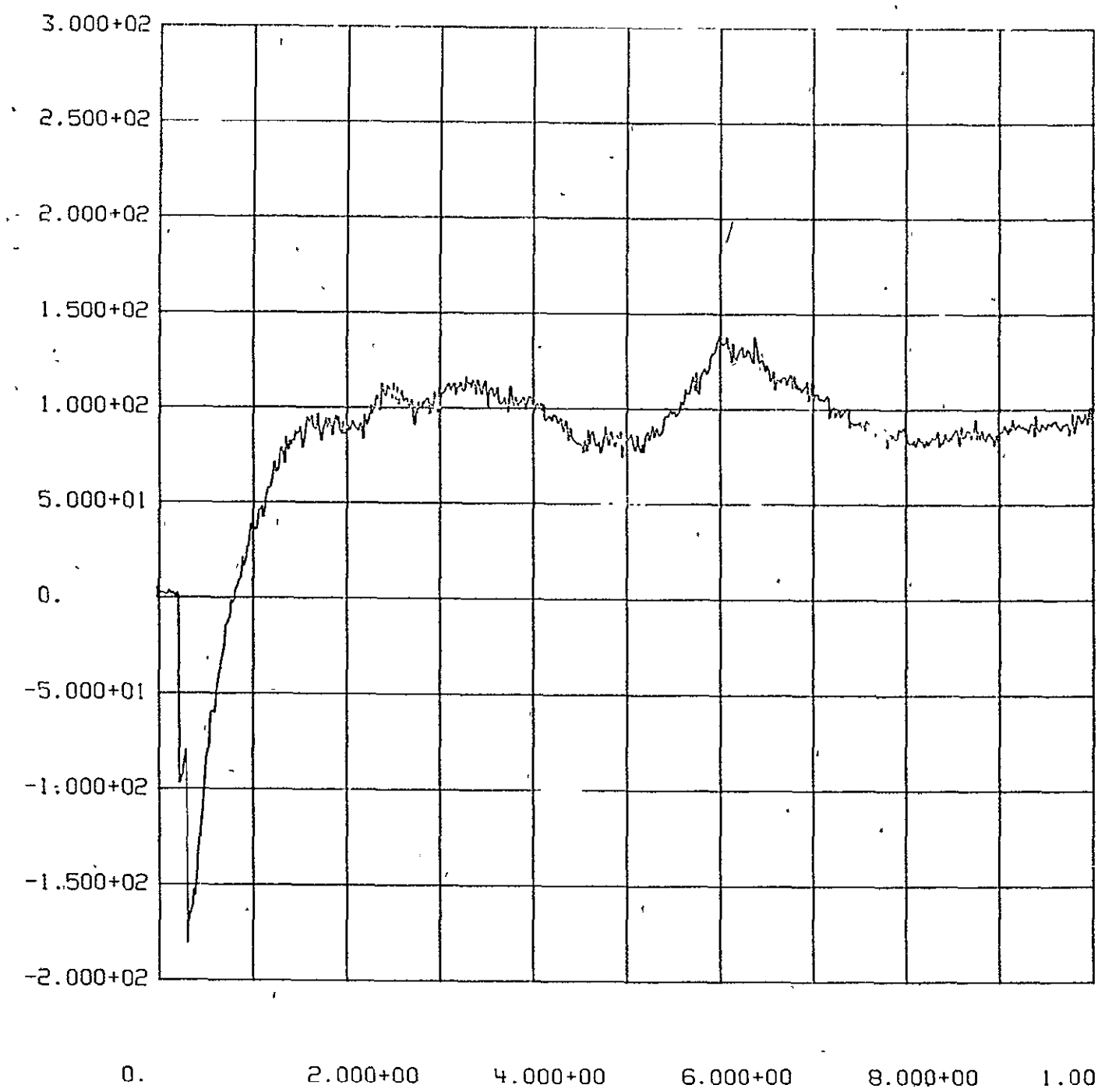
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.3-2



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.3-2

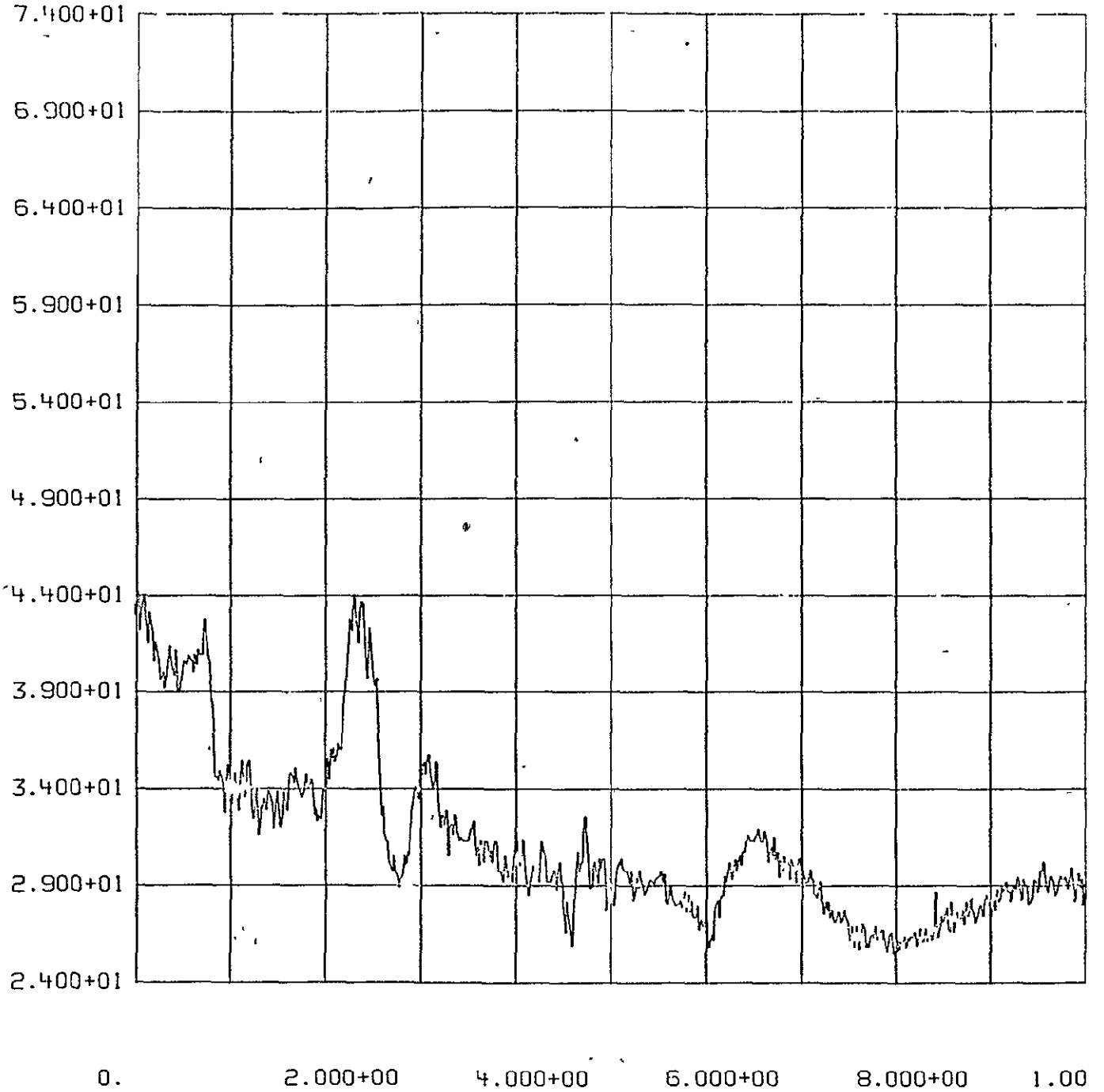


- SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.3-2



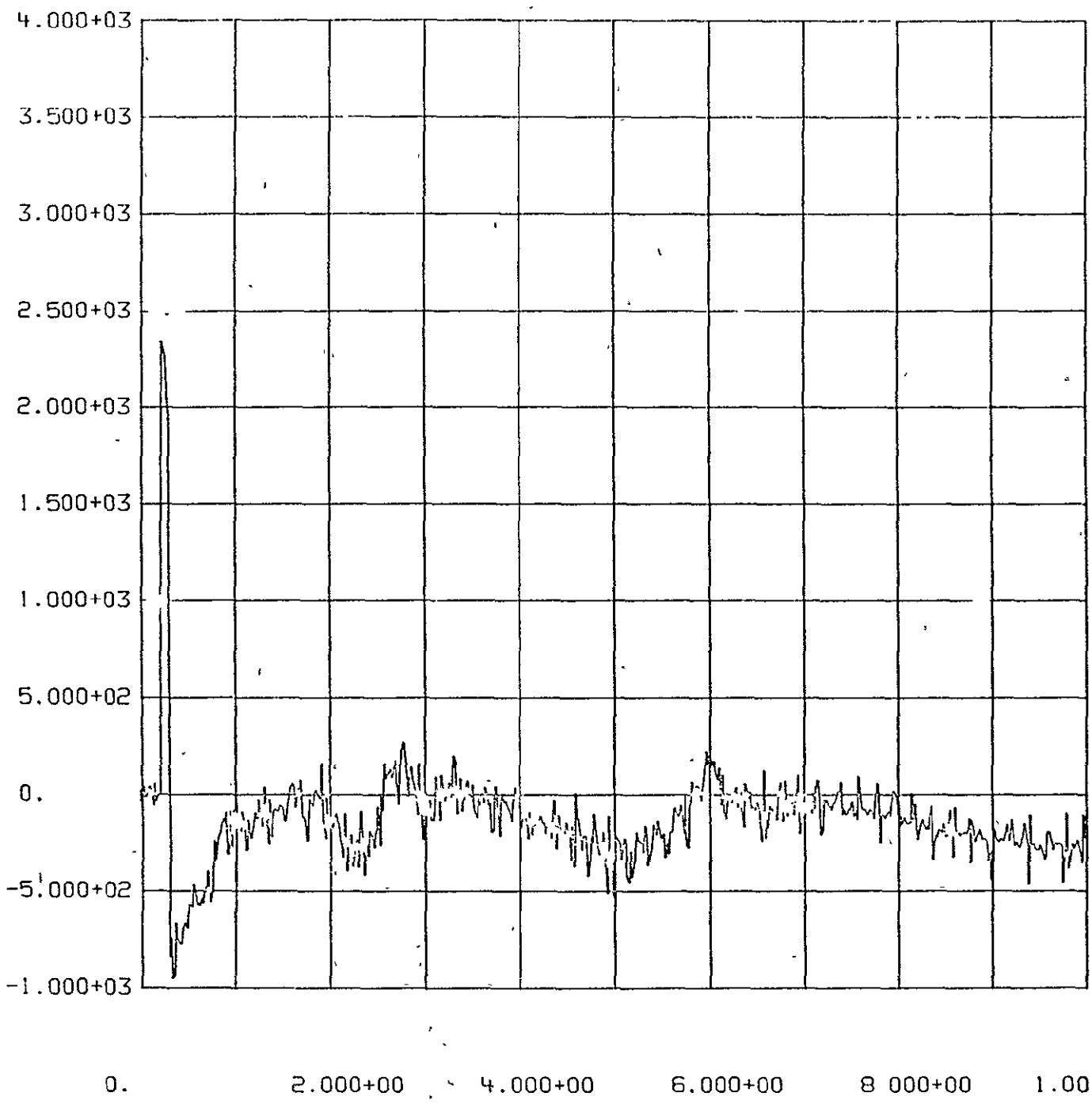
Z-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.3-2 * UNFILT *



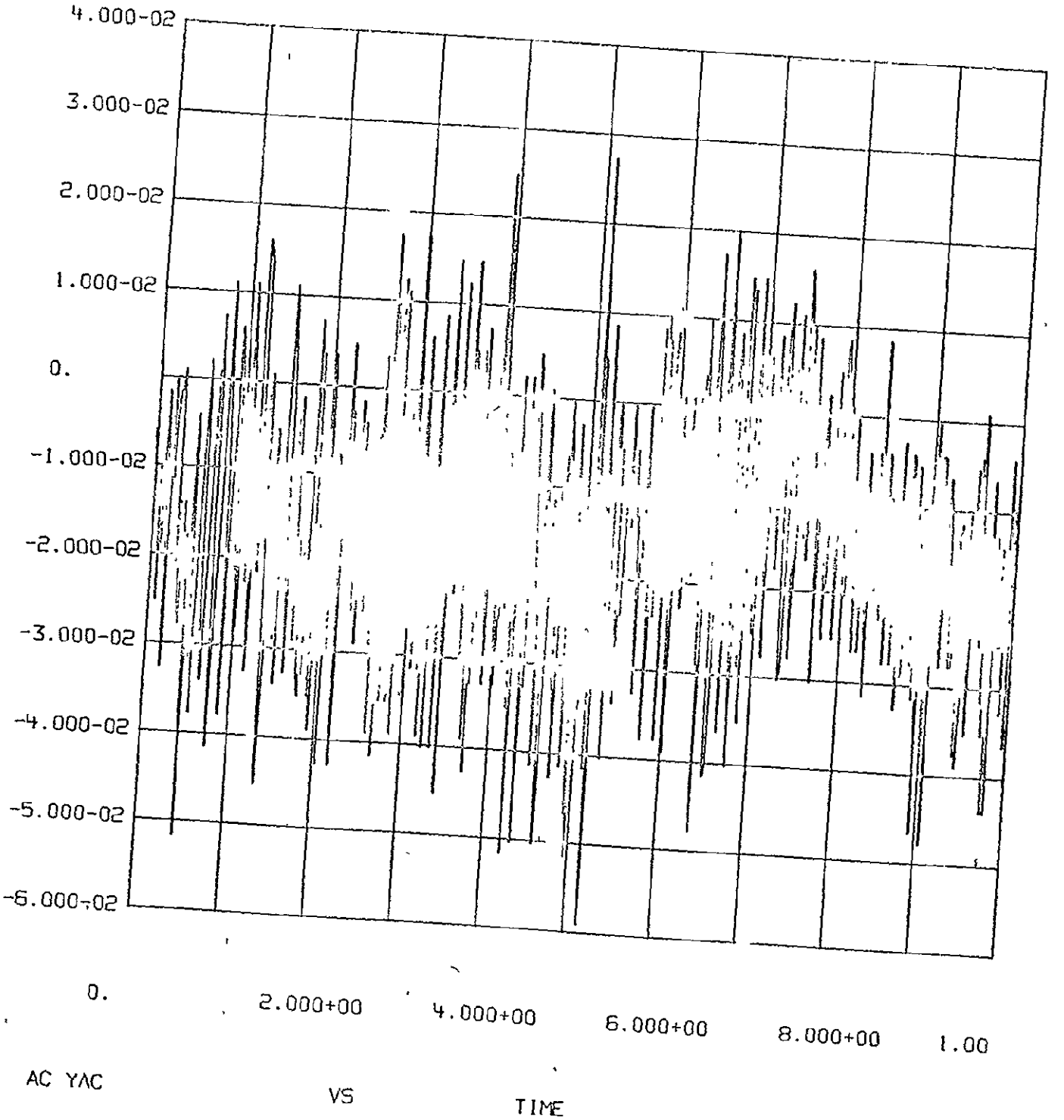
Y-LOAD VS TIME

1 FLT 3 06NO78 FLIGHT 4 TEST CONDITION 4.3-2 * UNFILT *

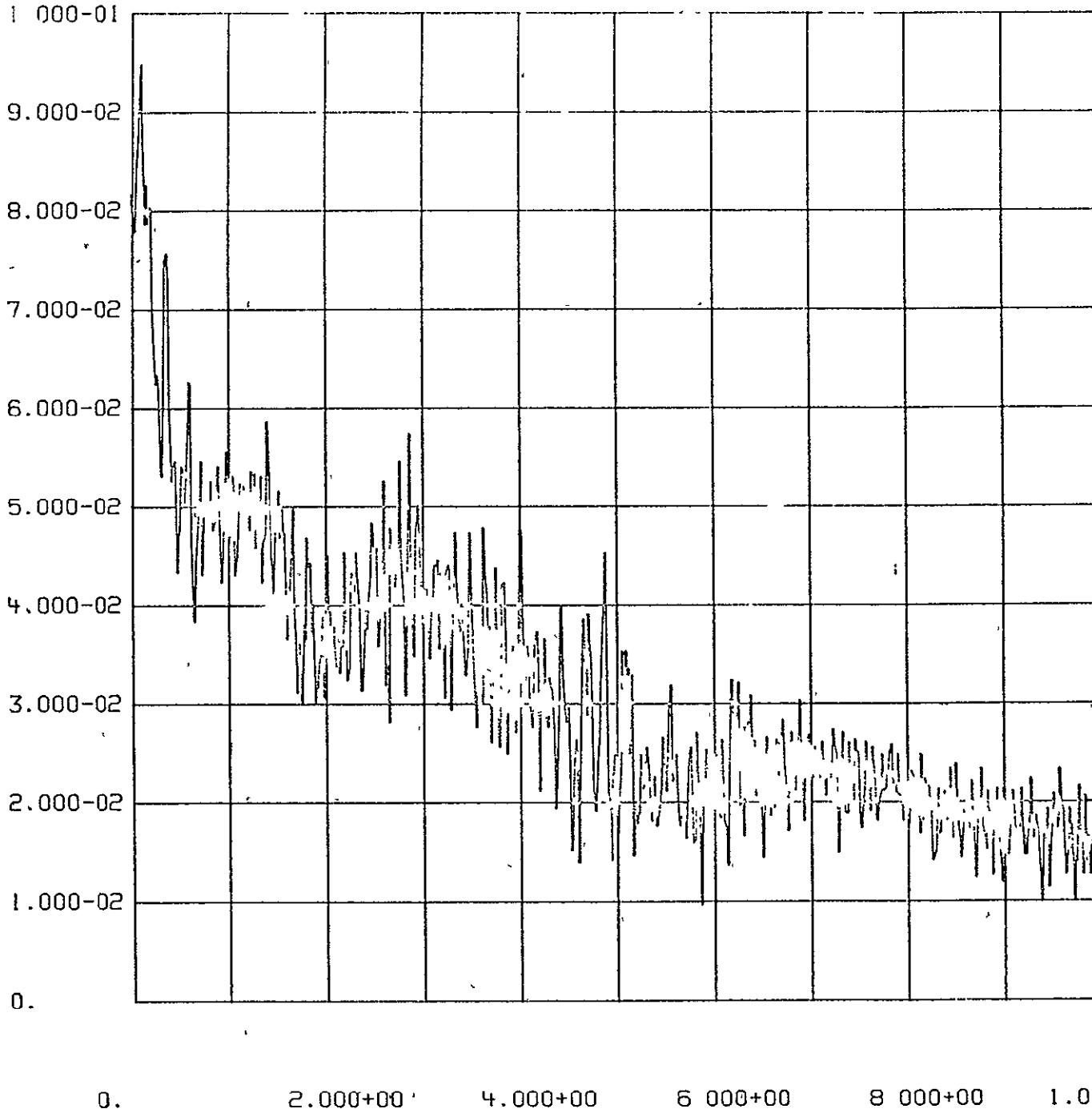


MOMENT VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.3-2 * UNFILT *

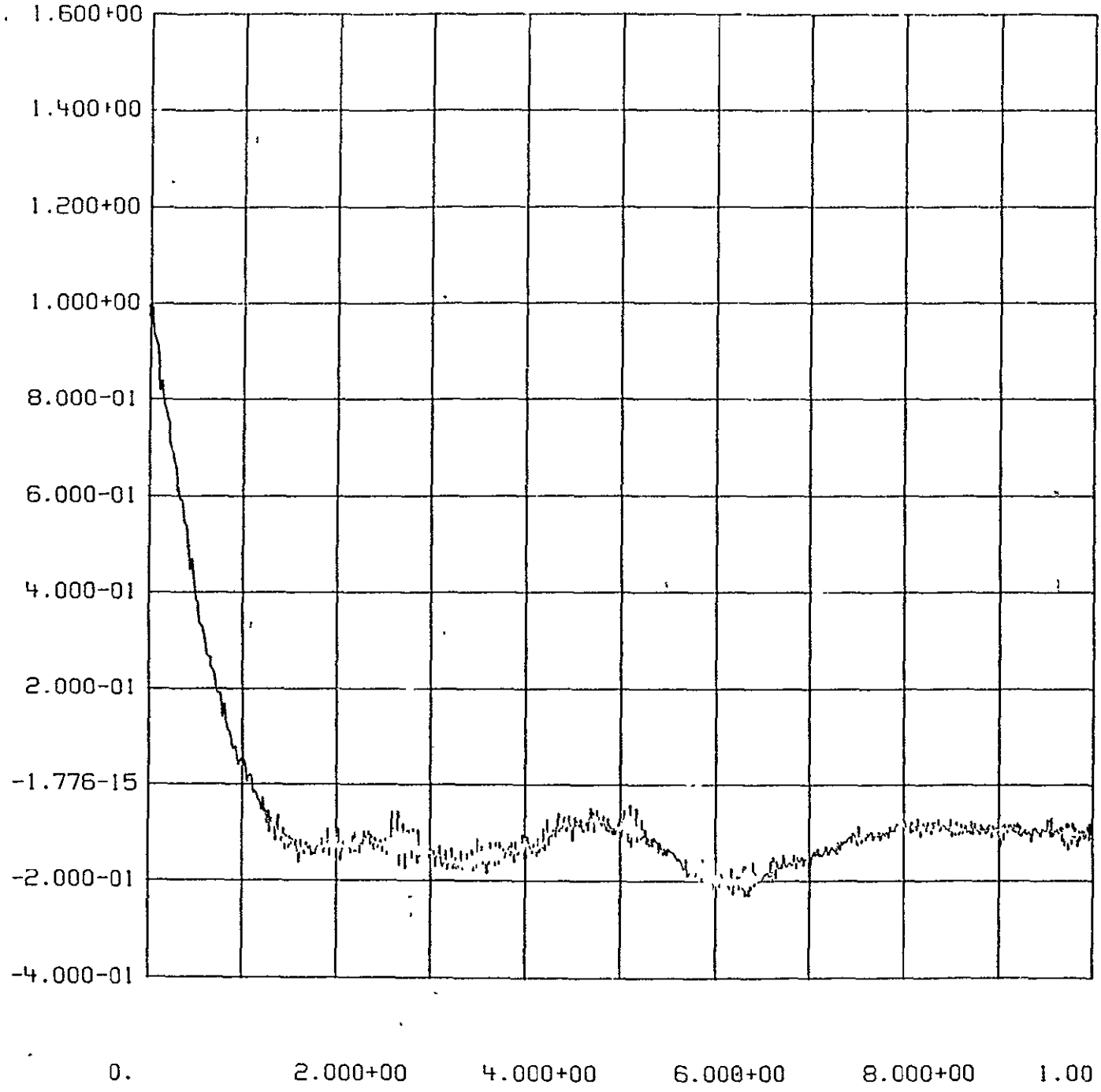


1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.3-2 * UNFILT *



AC XAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.3-2 * UNFILT *

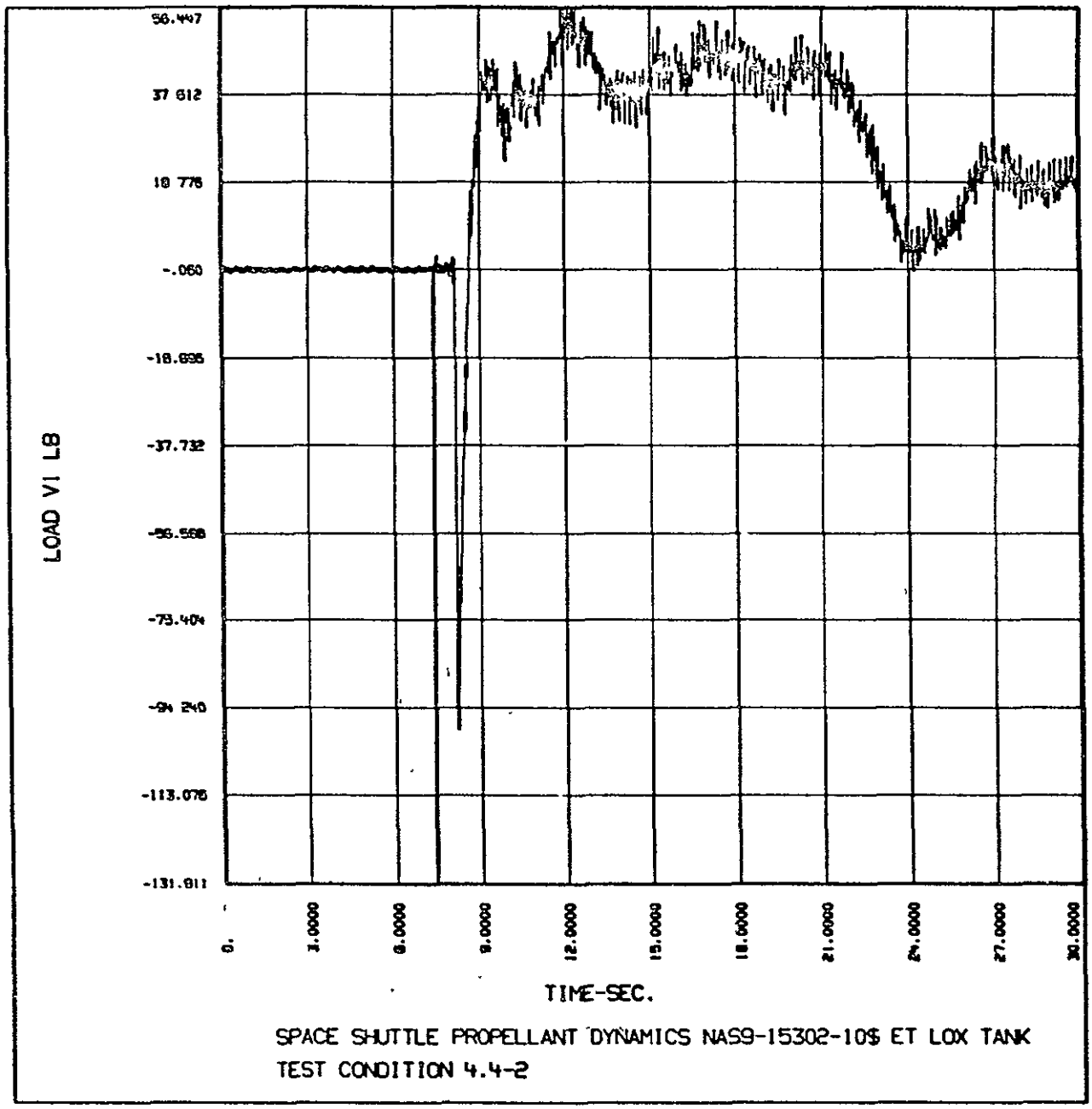


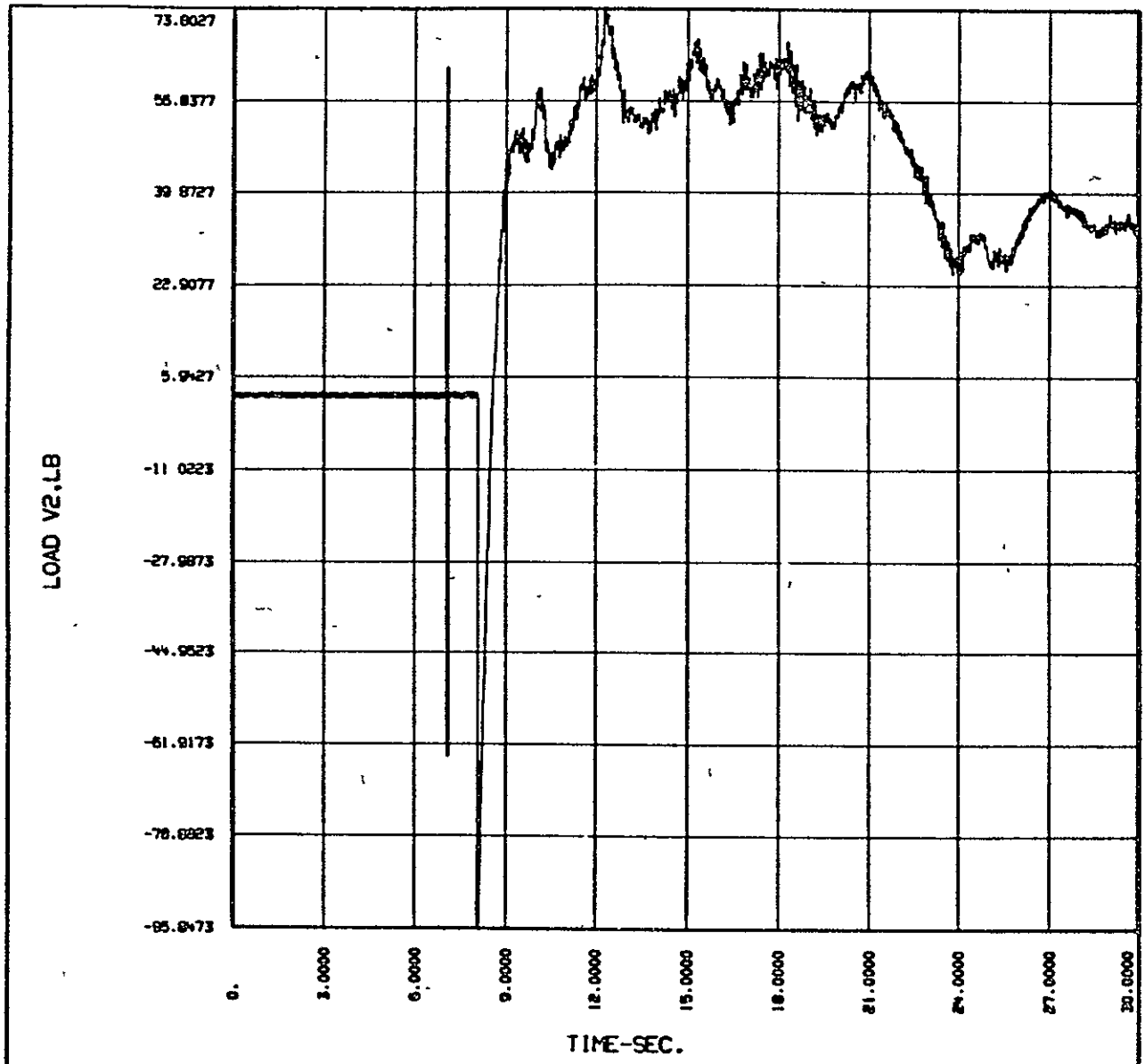
AC ZAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.3-2 * UNFILT *

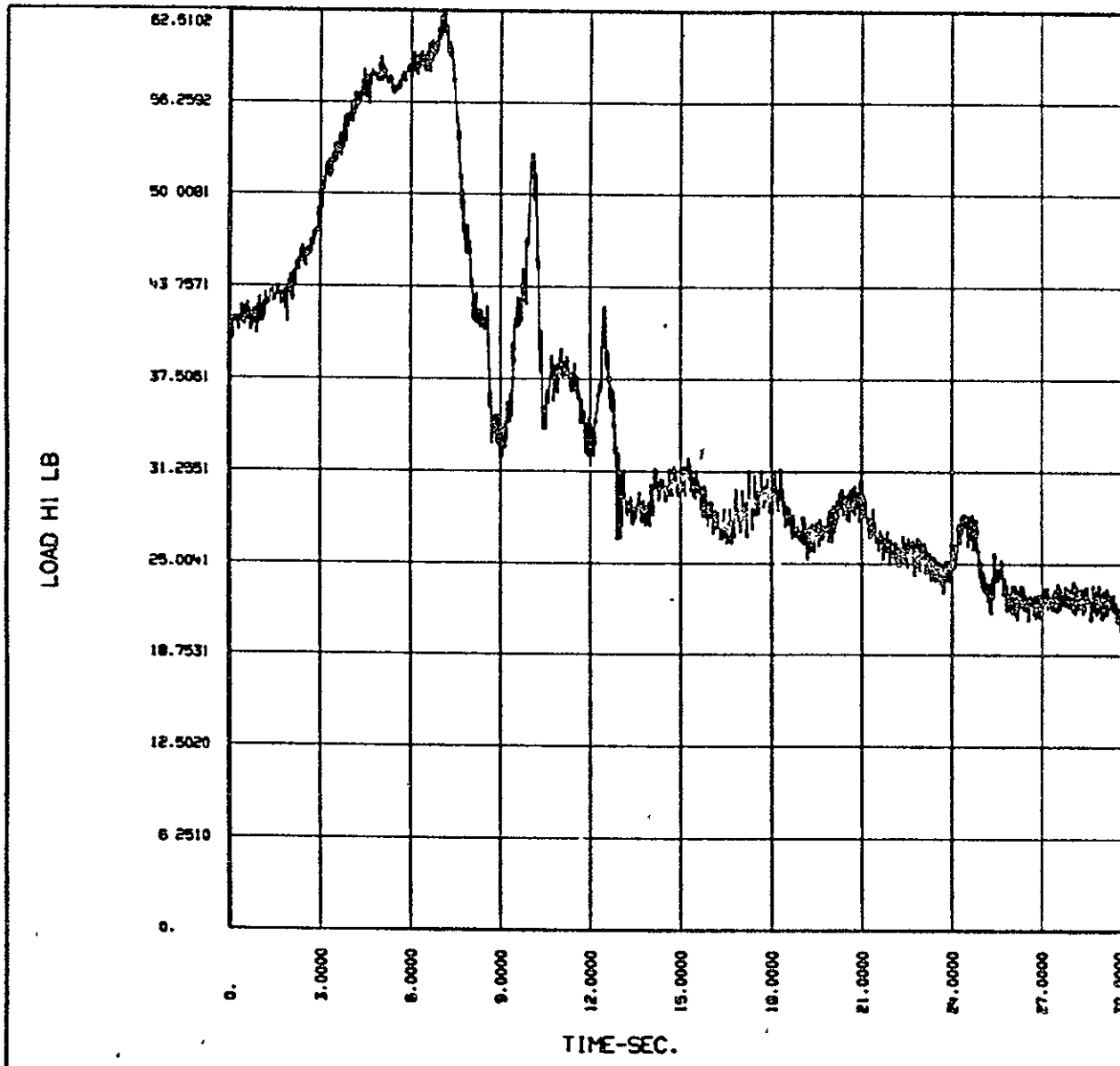
Test Data Condition 4.4-2

Baffles
Test Fluid – Water
Orientation – 13°
Fill Volume – 16%
Target Acceleration–0.1 g

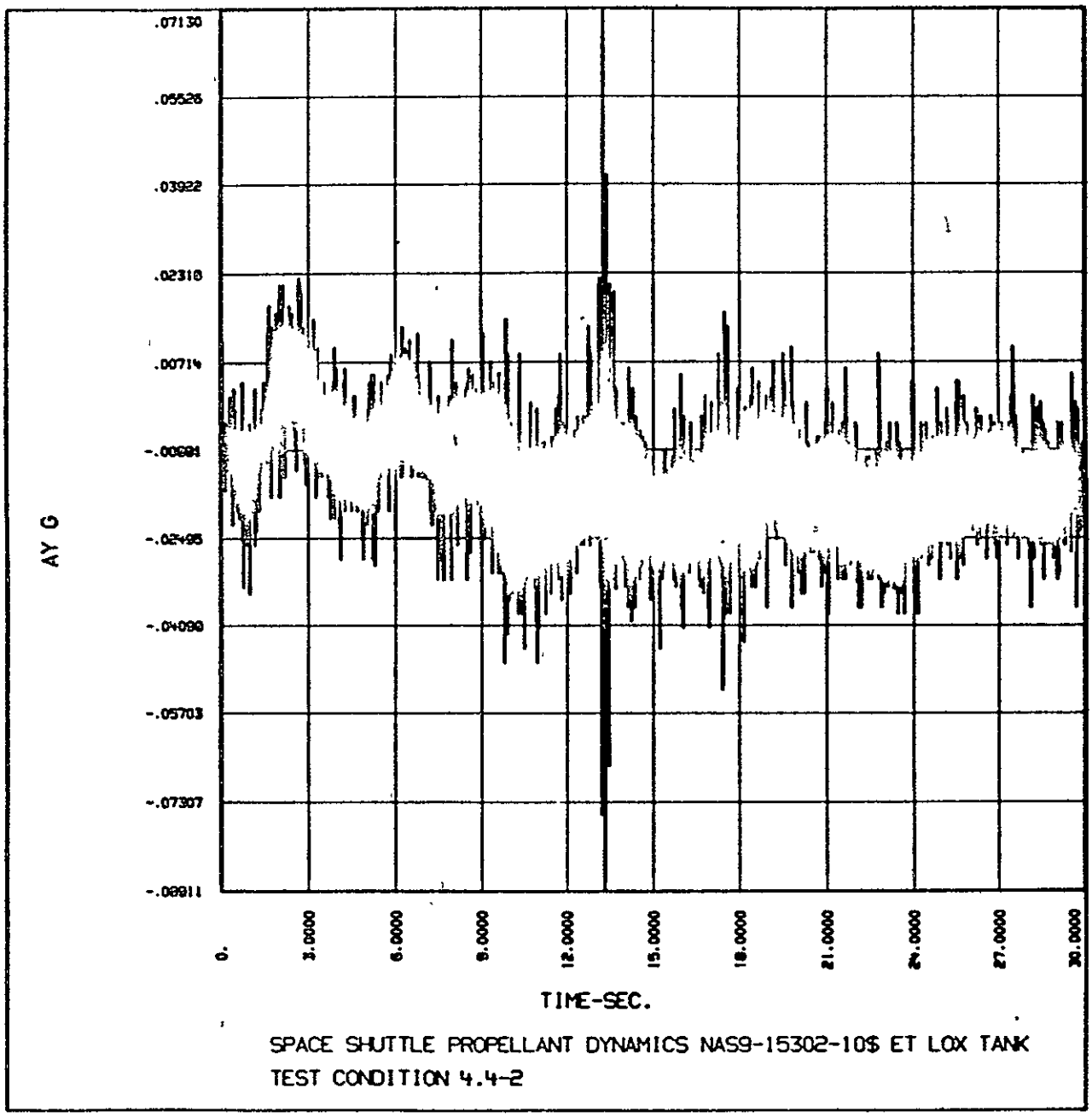

56.447
37.612
18.776
-.060
-18.896
-37.732
-56.568
-75.404
-94.240
-113.076
-131.911
LOAD V1 LB
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.4-2

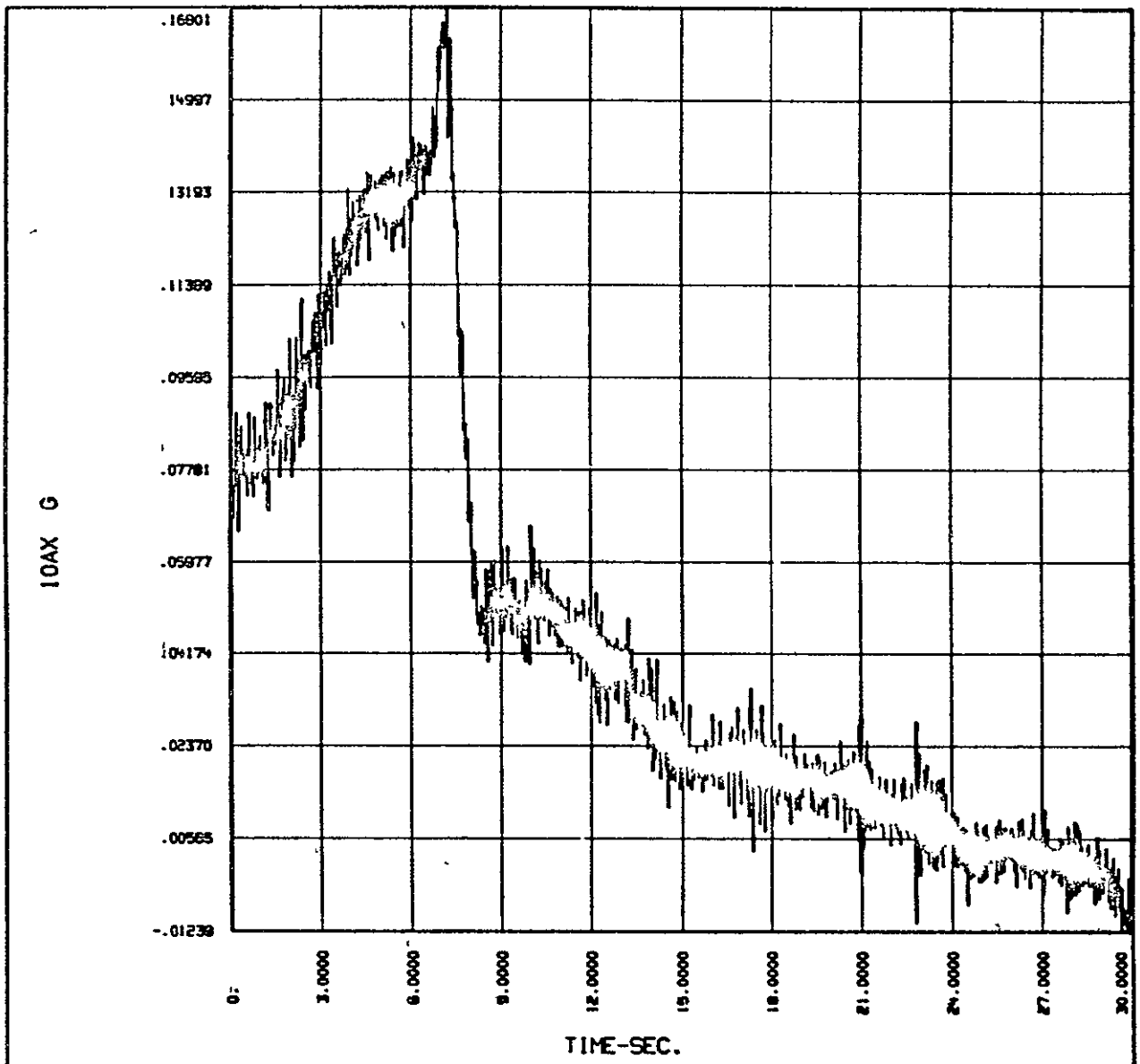


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.4-2

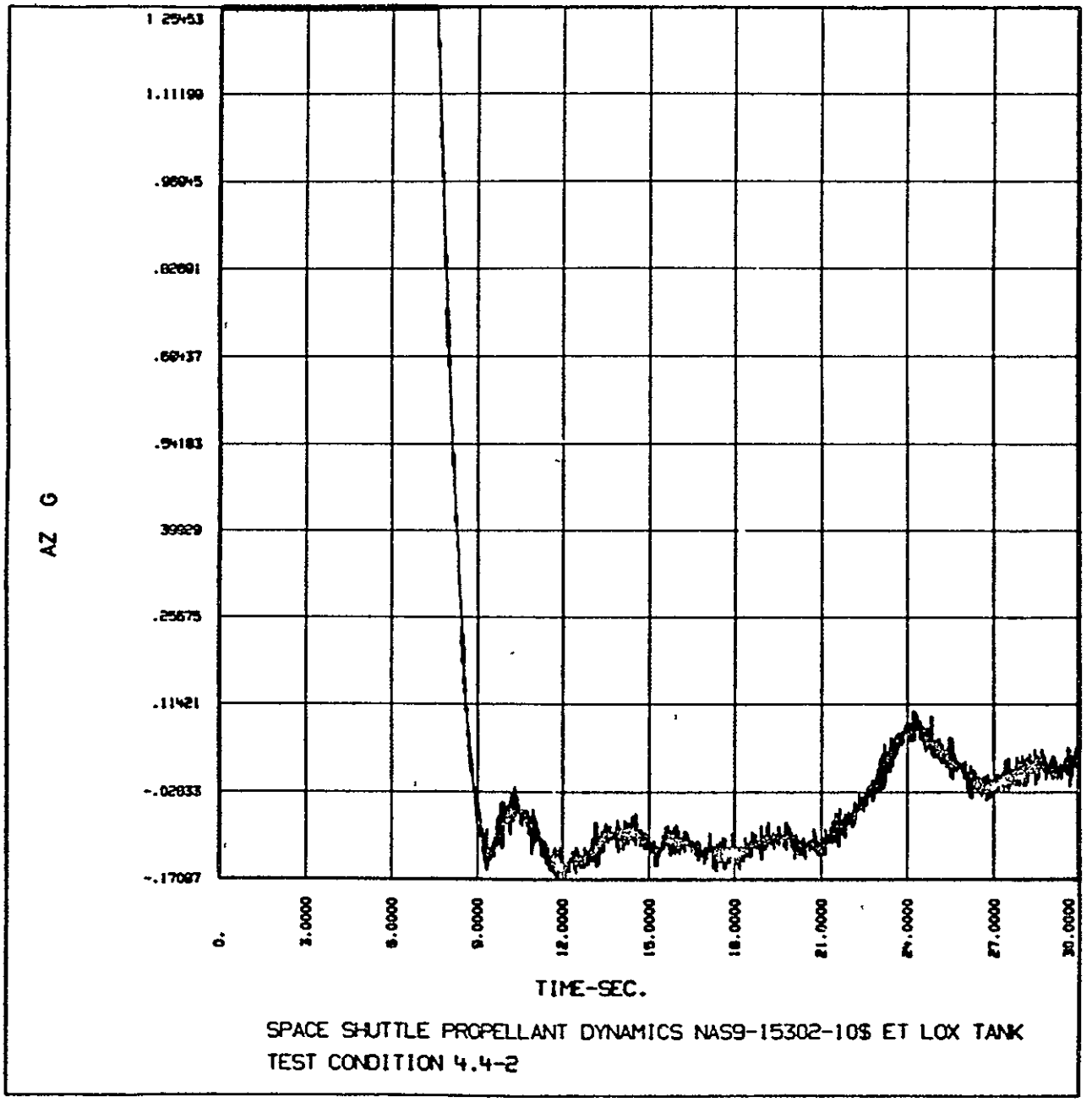


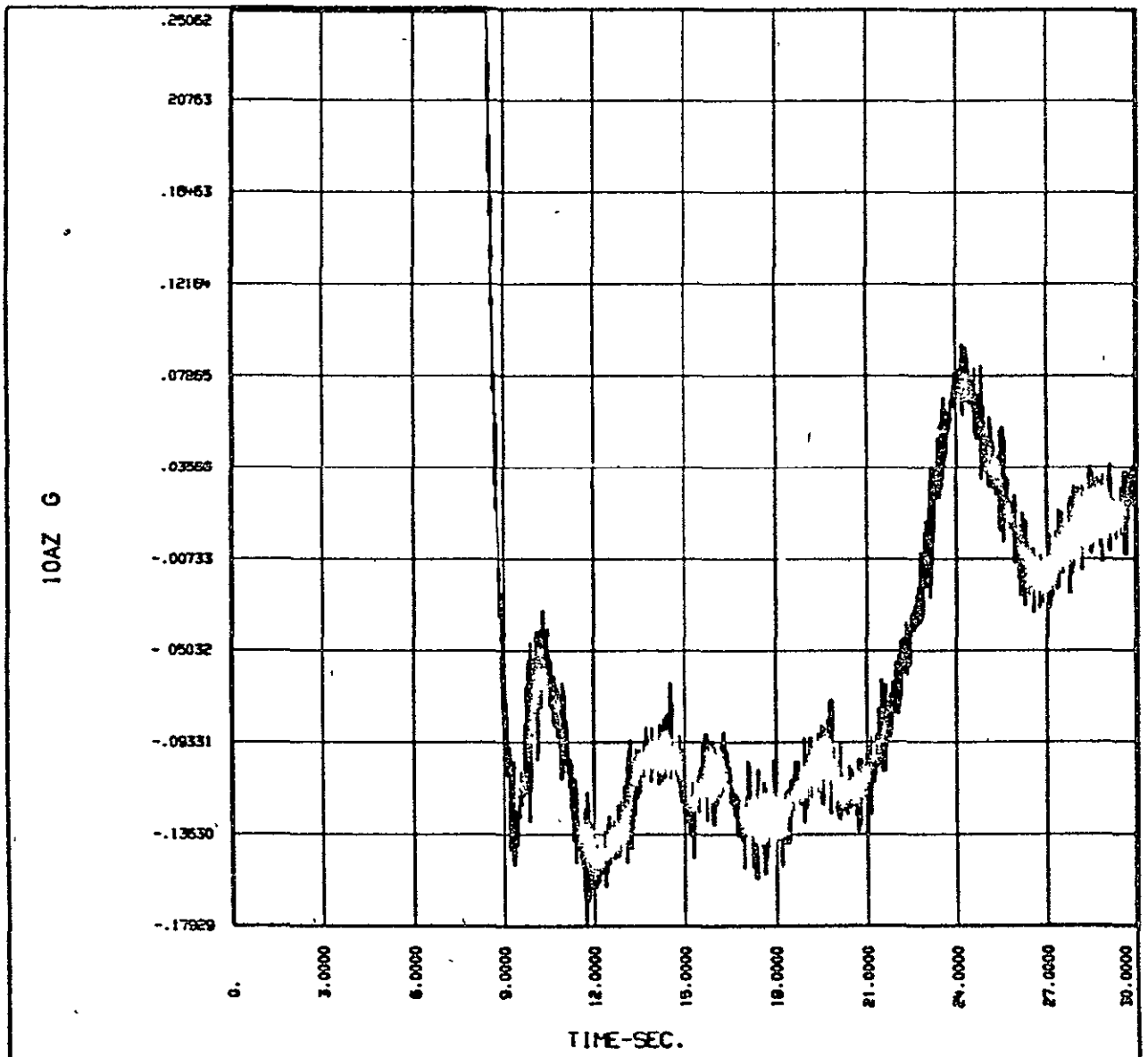
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.4-2


.07130
.05526
.03922
.02318
.00714
-.00891
-.02495
-.04099
-.05703
-.07307
-.08911
AY G
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.4-2

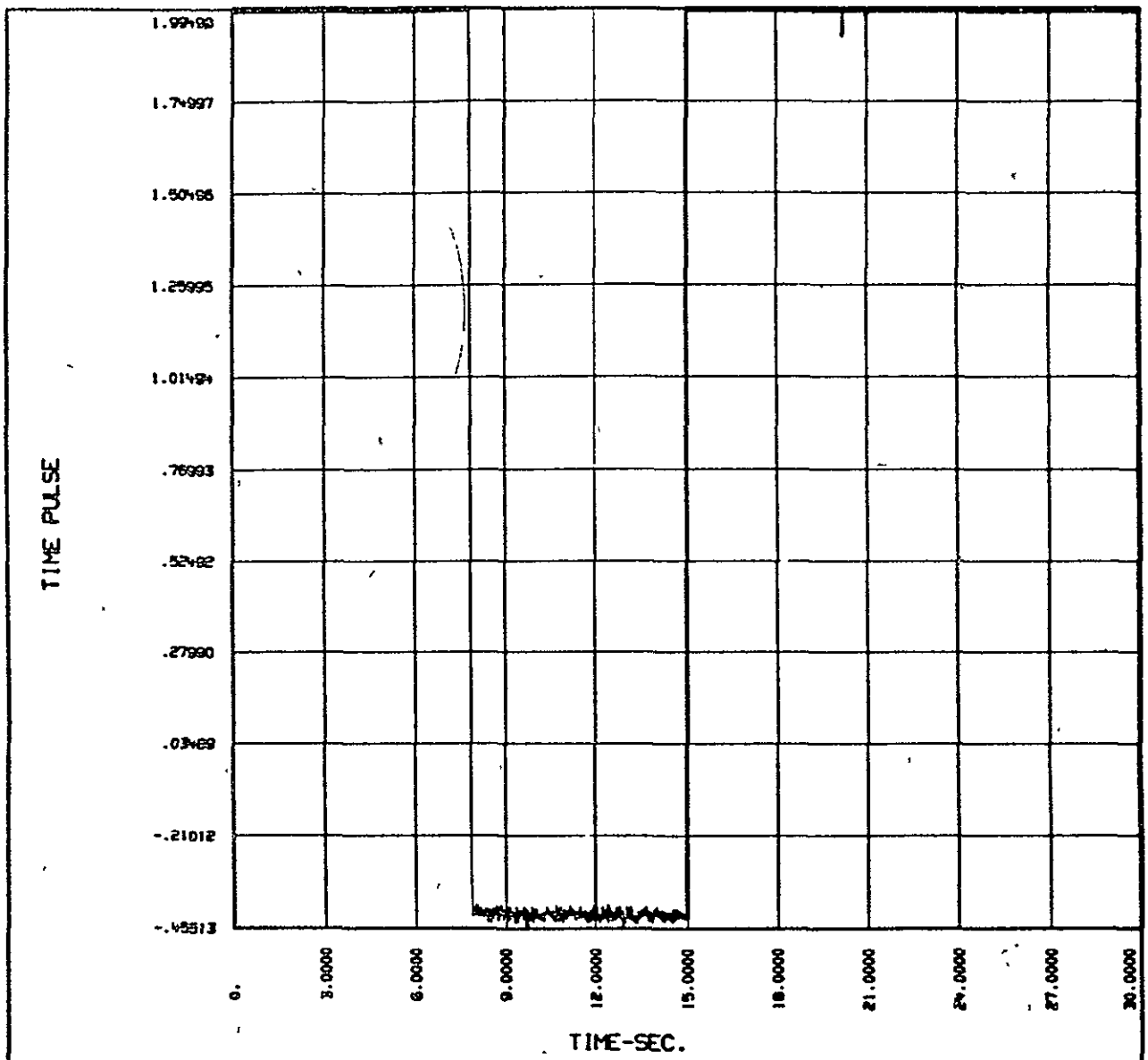


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.4-2

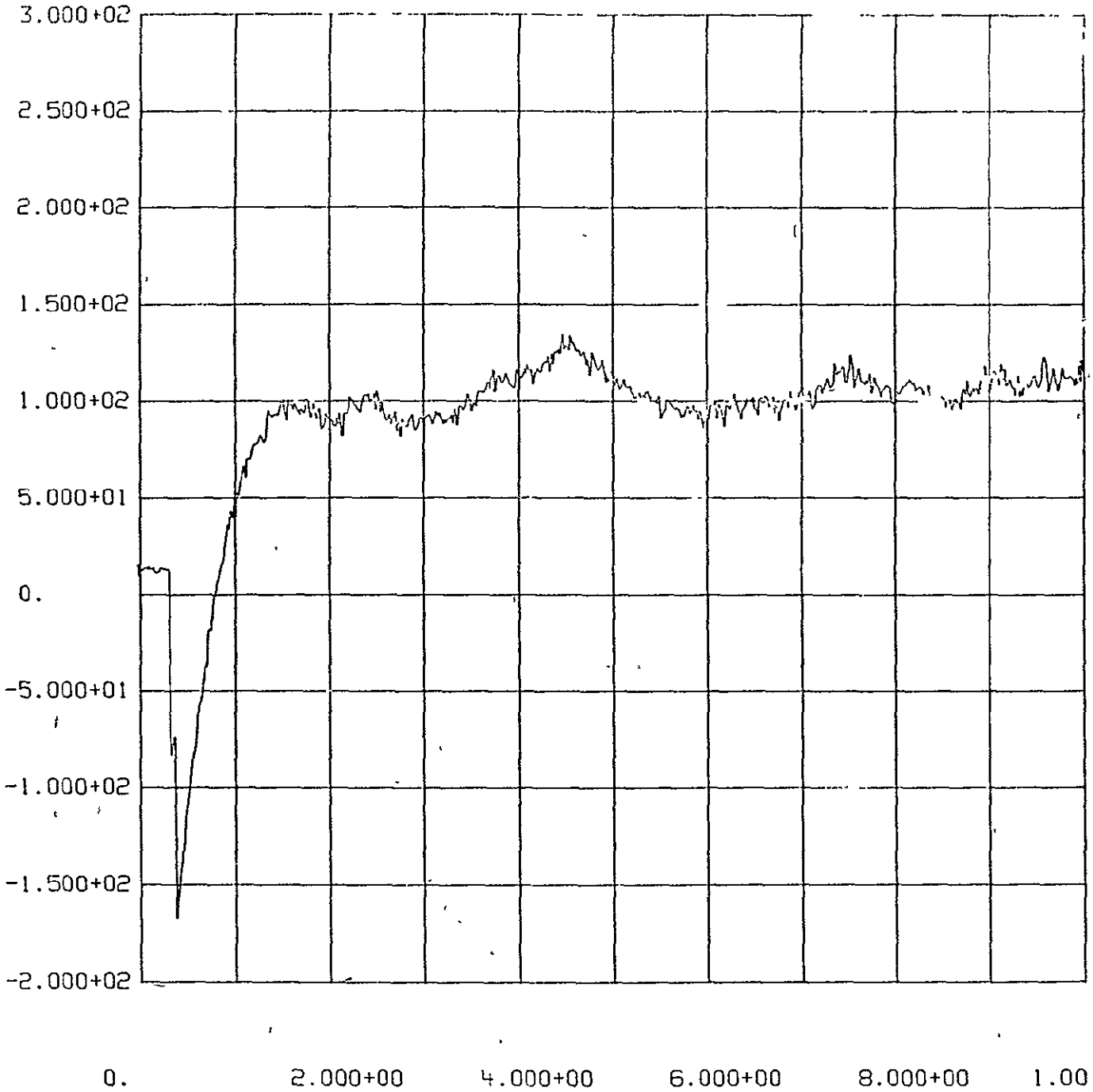

1.25453
1.11199
.96945
.82691
.68437
.54183
.39929
.25675
.11421
-.02833
-.17087
AZ G
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.4-2



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.4-2

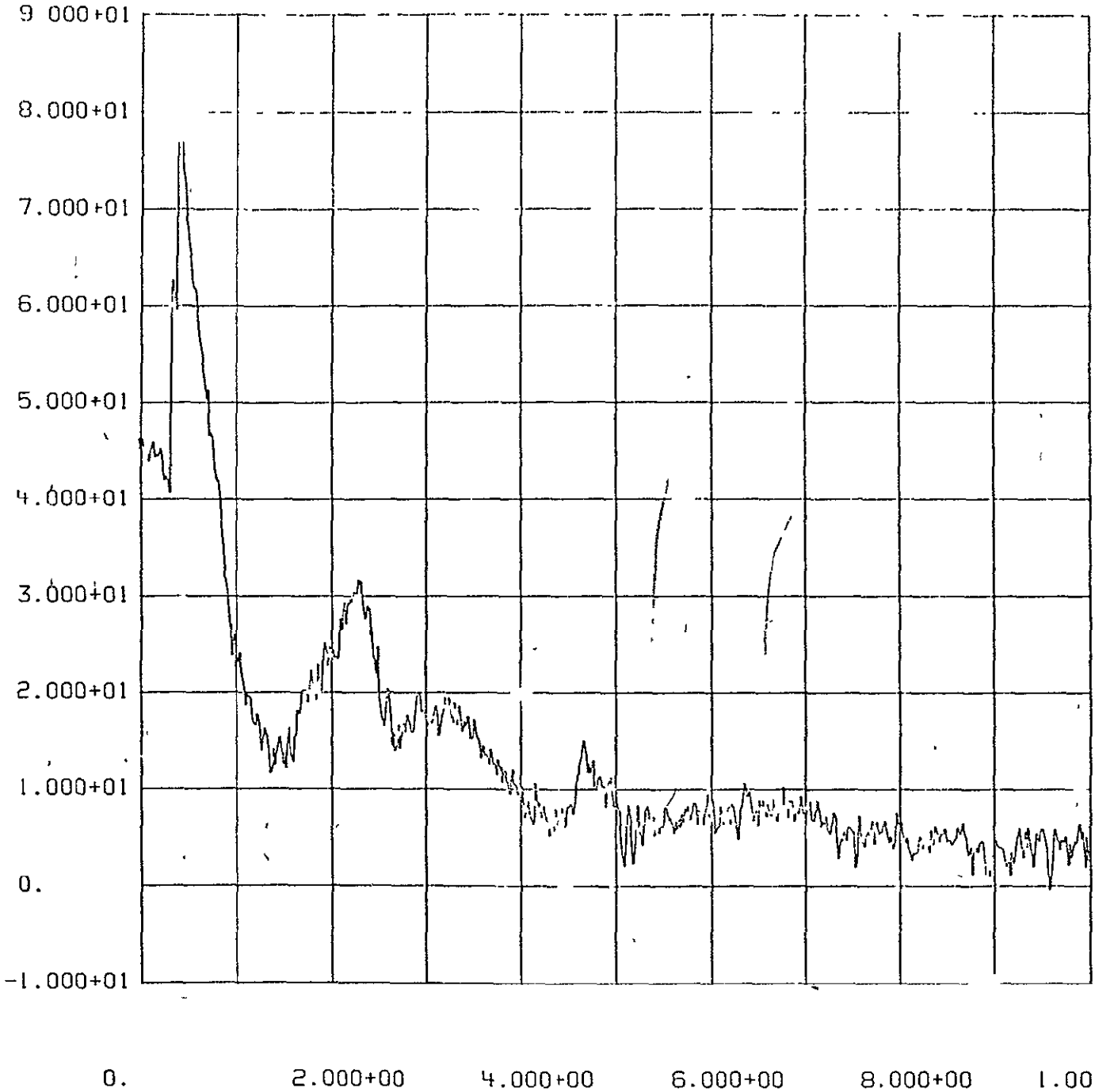


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.4-2



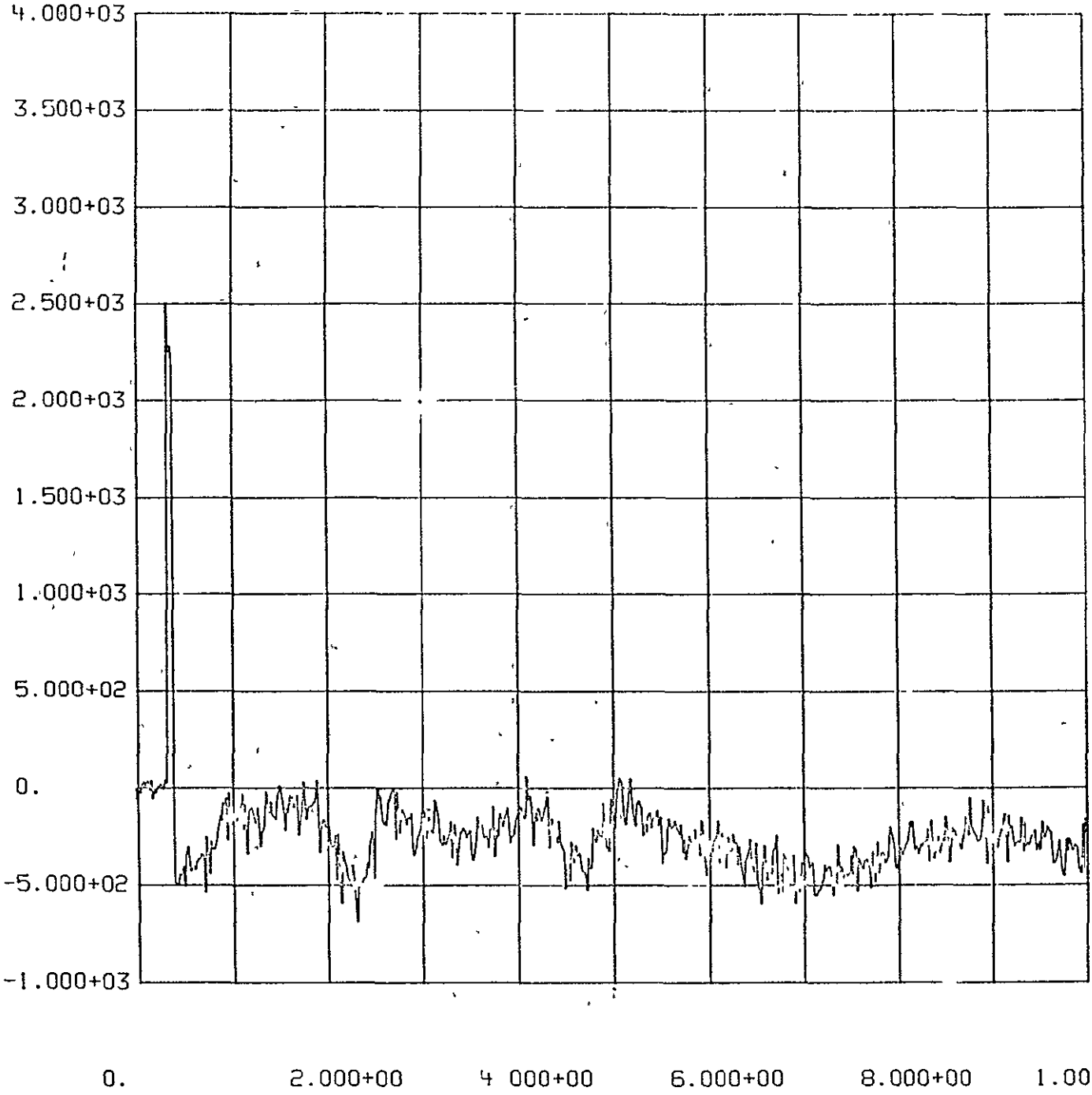
Z-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.4-2 * UNFILT *



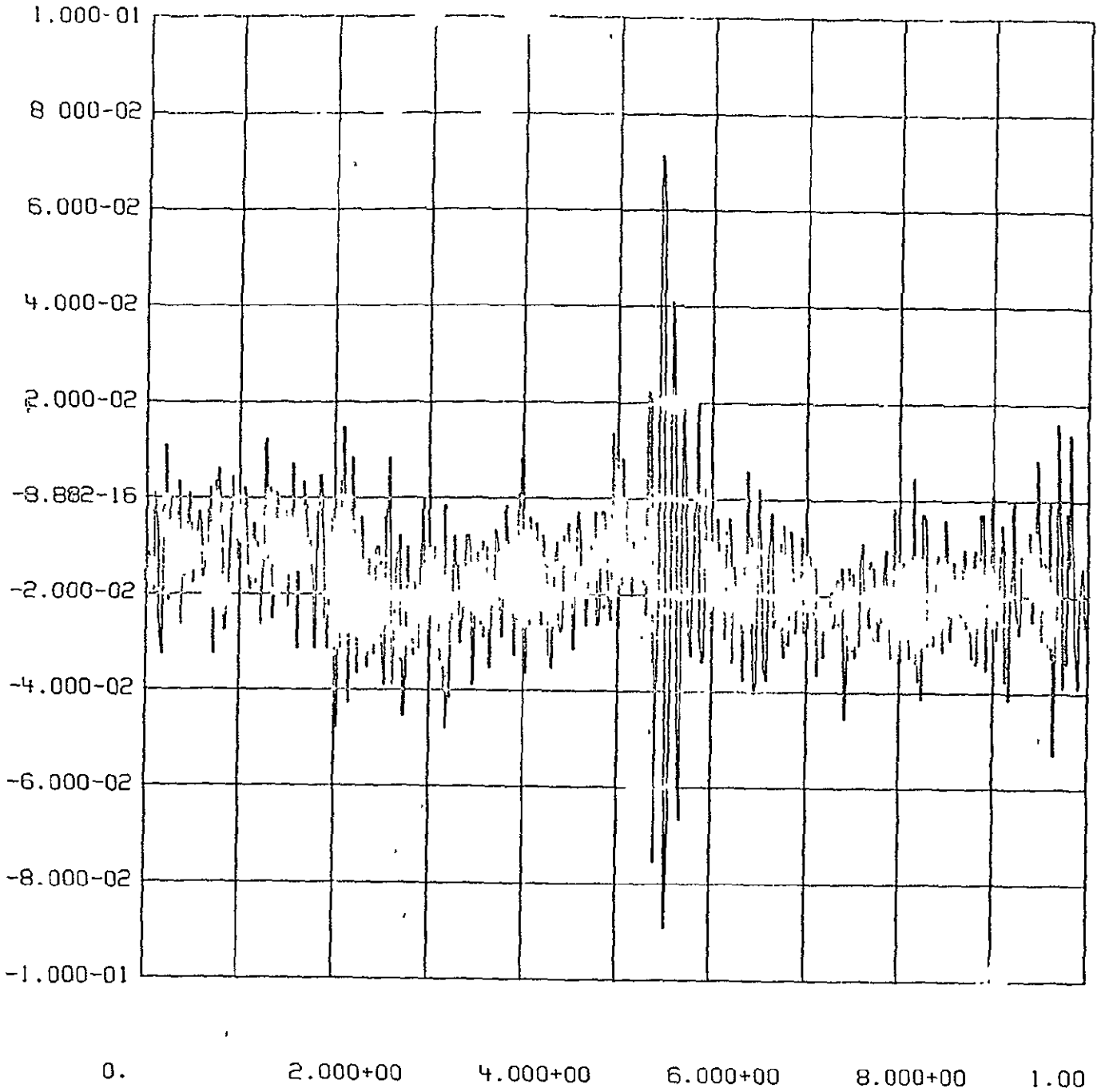
Y-LOAD VS TIME

1 U FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.4-2 * UNFILT *



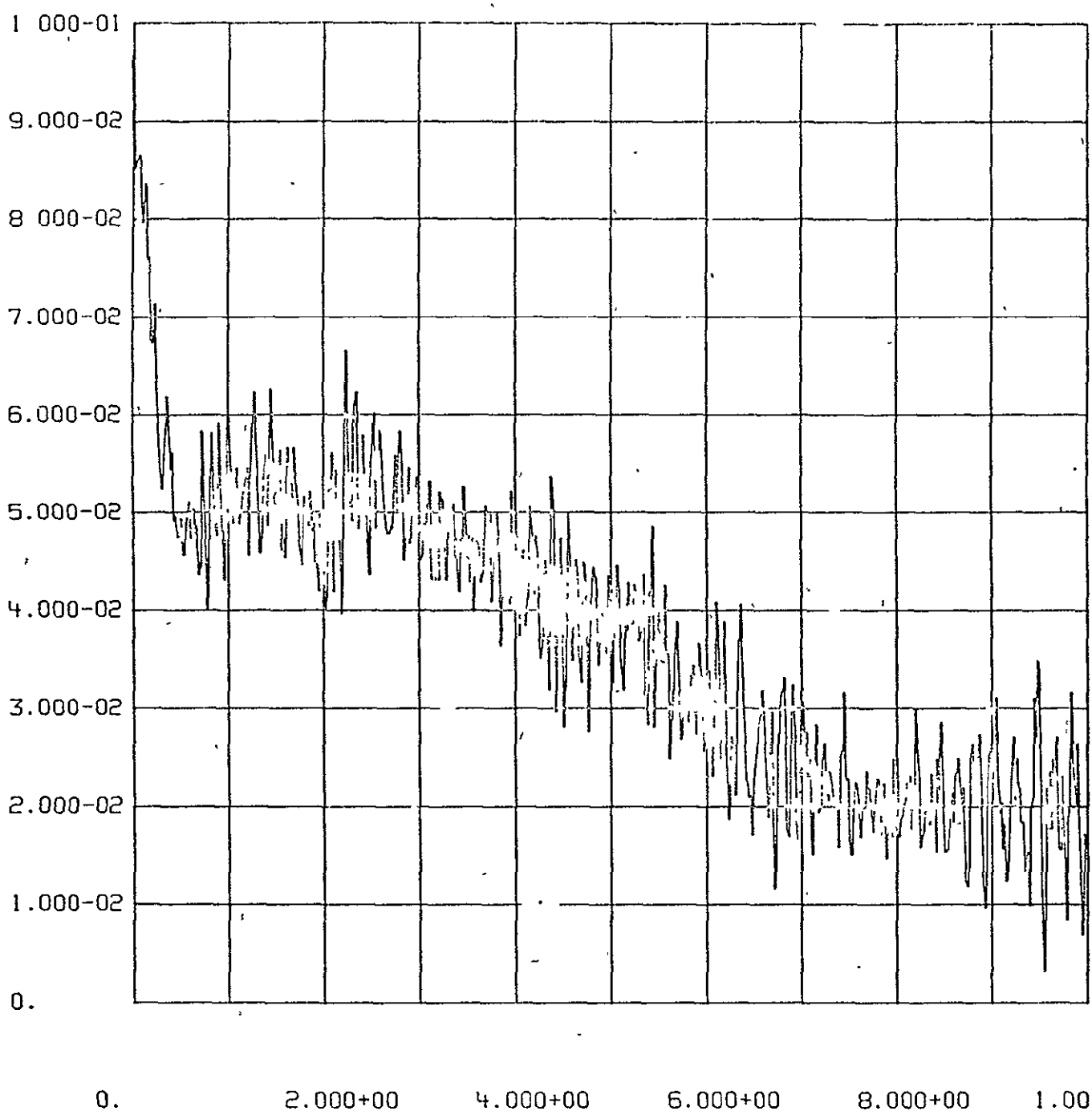
MOMENT VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.4-2 * UNFILT *



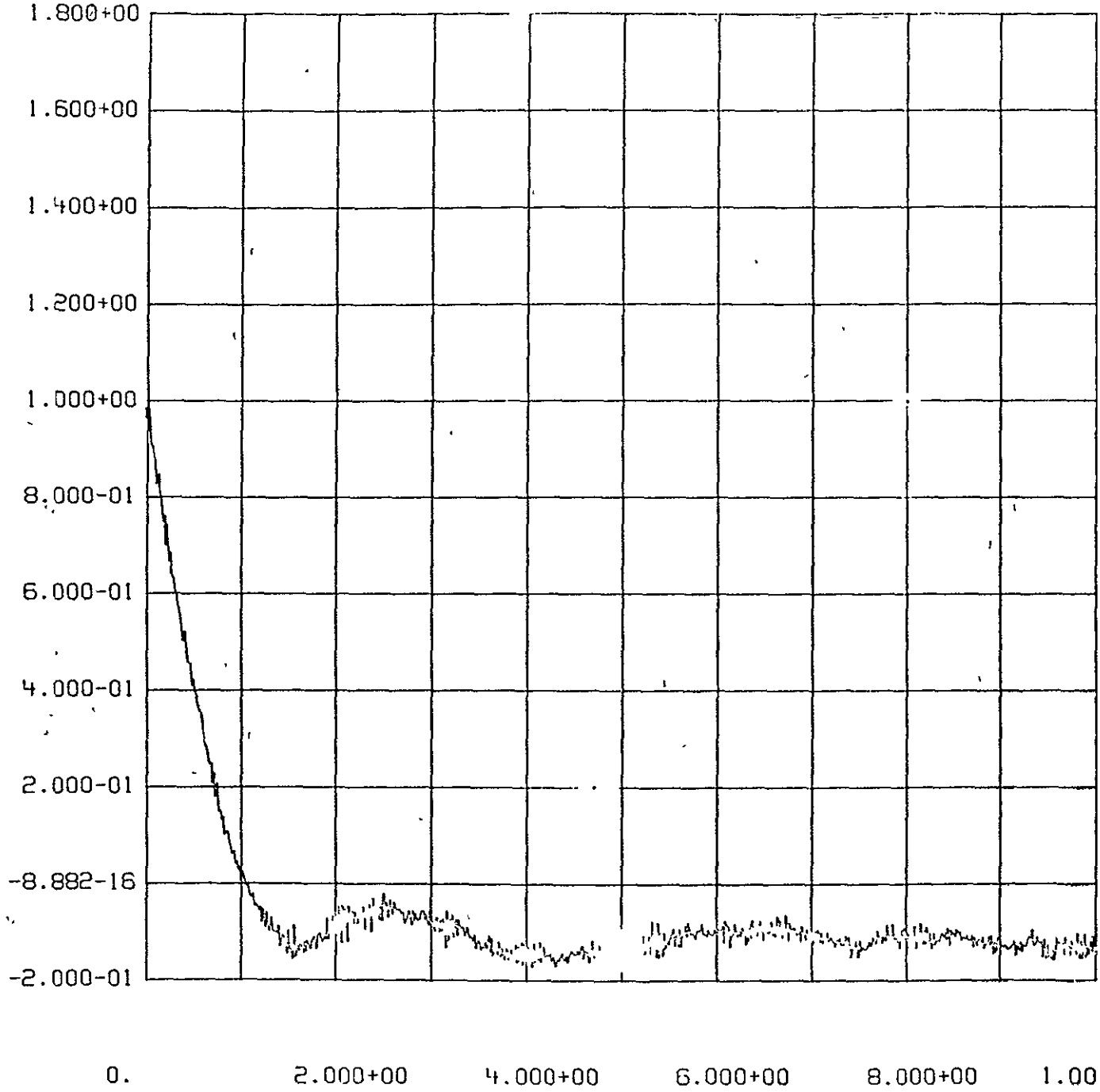
AC YAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4 4-2 * UNFILT *



AC XAC VS TIME

1 FLT 3 0GN078 FLIGHT 4 TEST CONDITION. 4 4-2 * UNFILT *

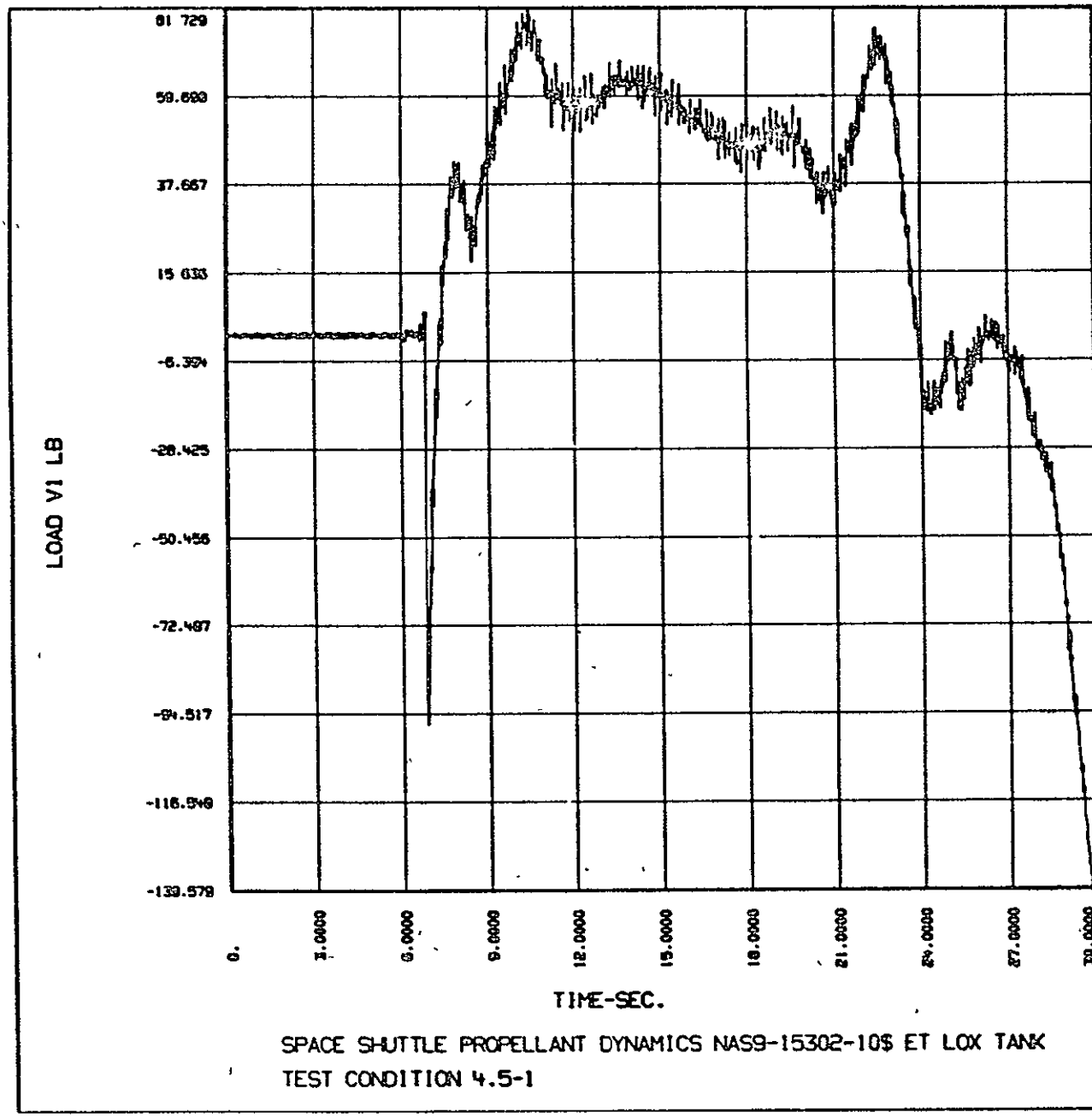


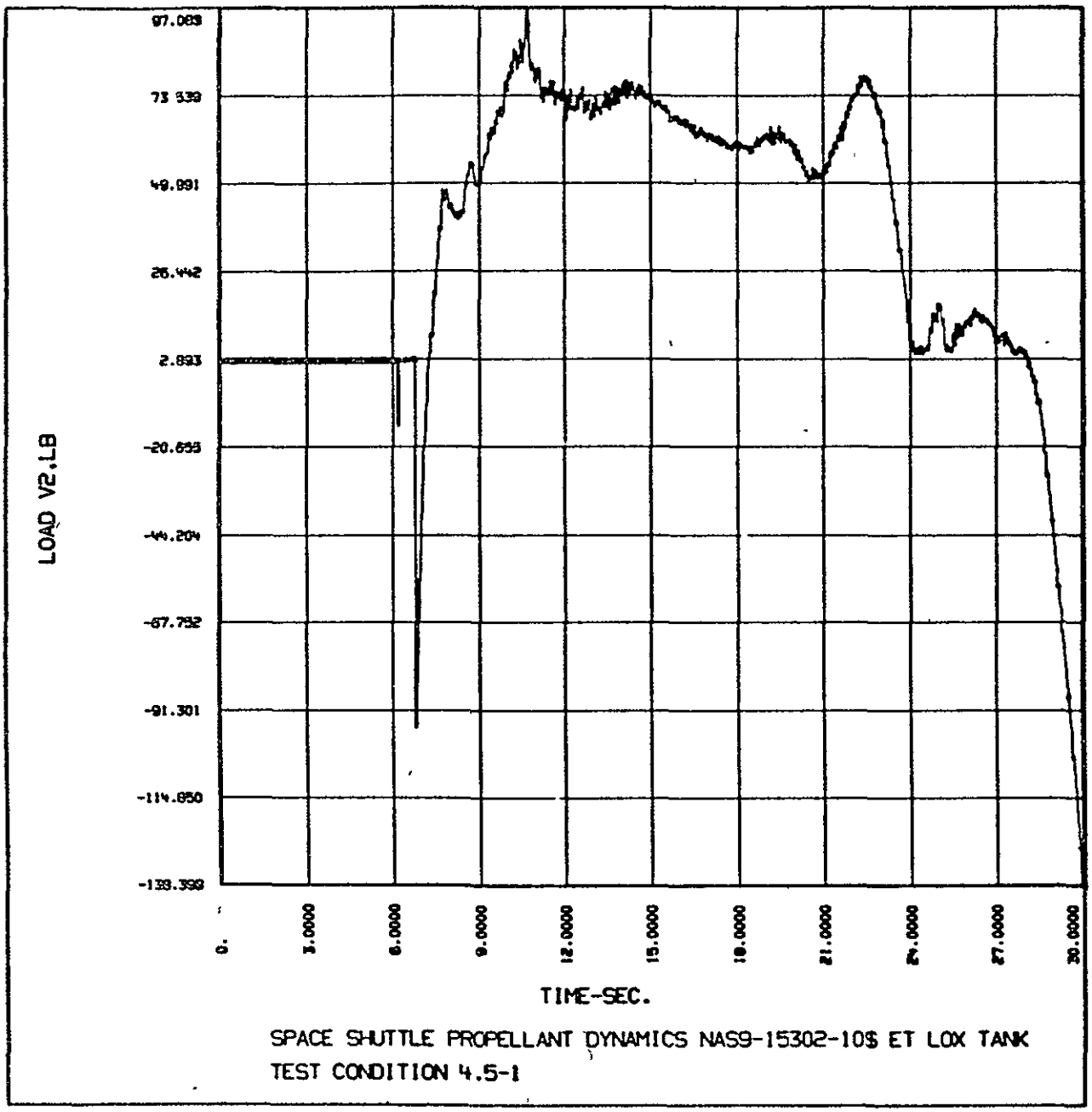
AC ZAC VS TIME

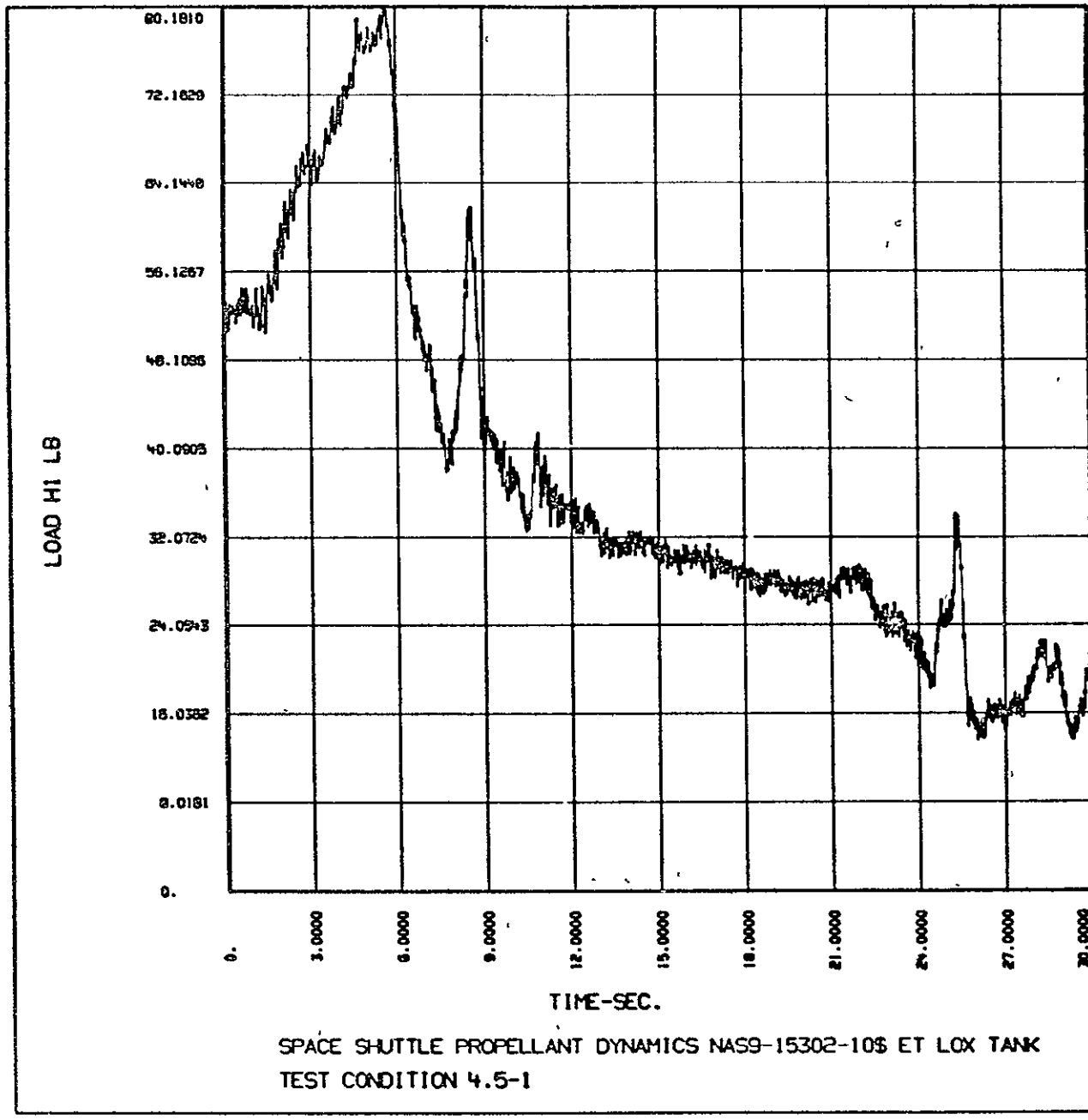
1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.4-2 * UNFILT *

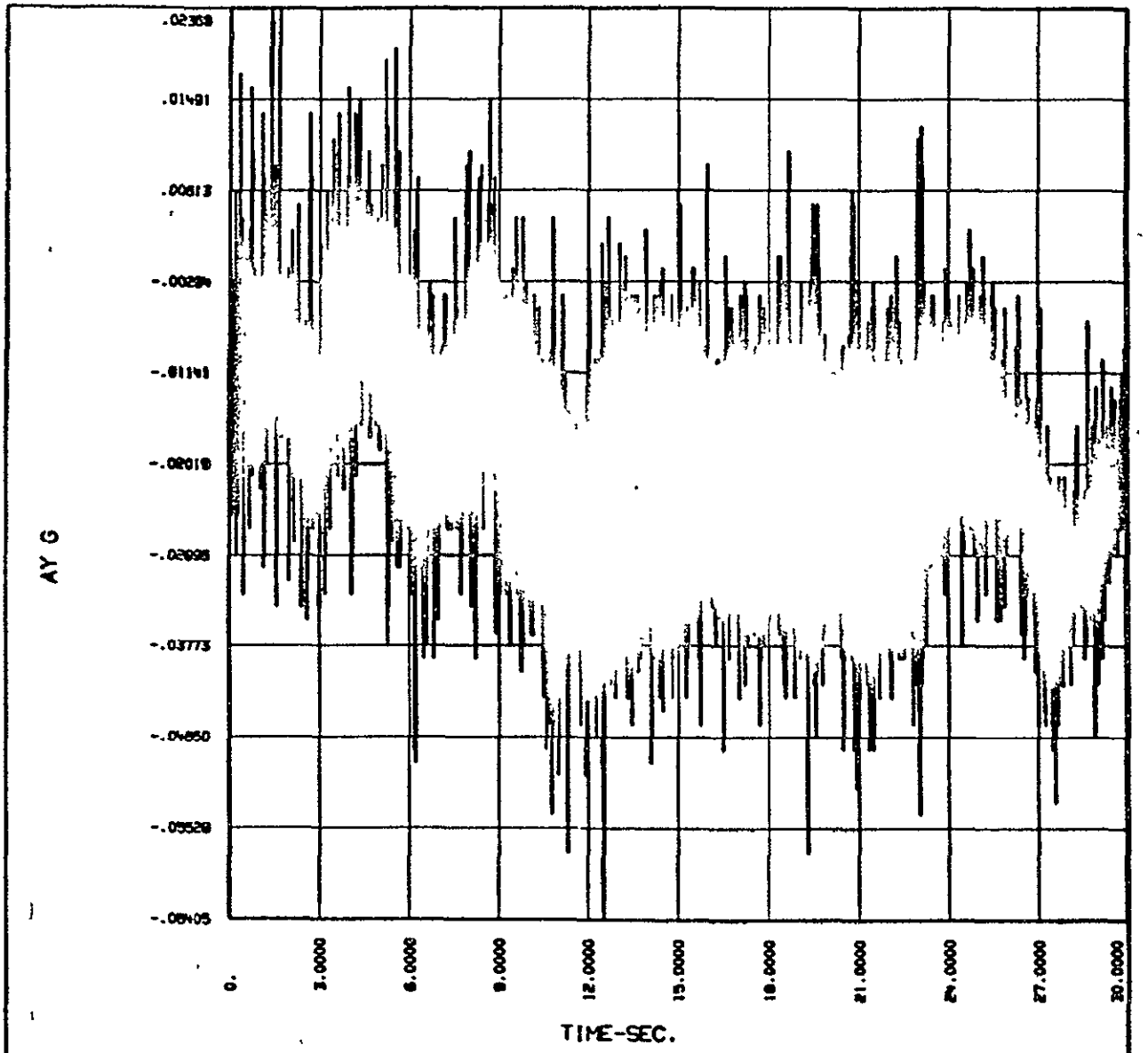
Test Data Condition 4.5-1

Baffles
Test Fluid – Water
Orientation – 13°
Fill Volume – 25%
Target Acceleration— 0.1 g

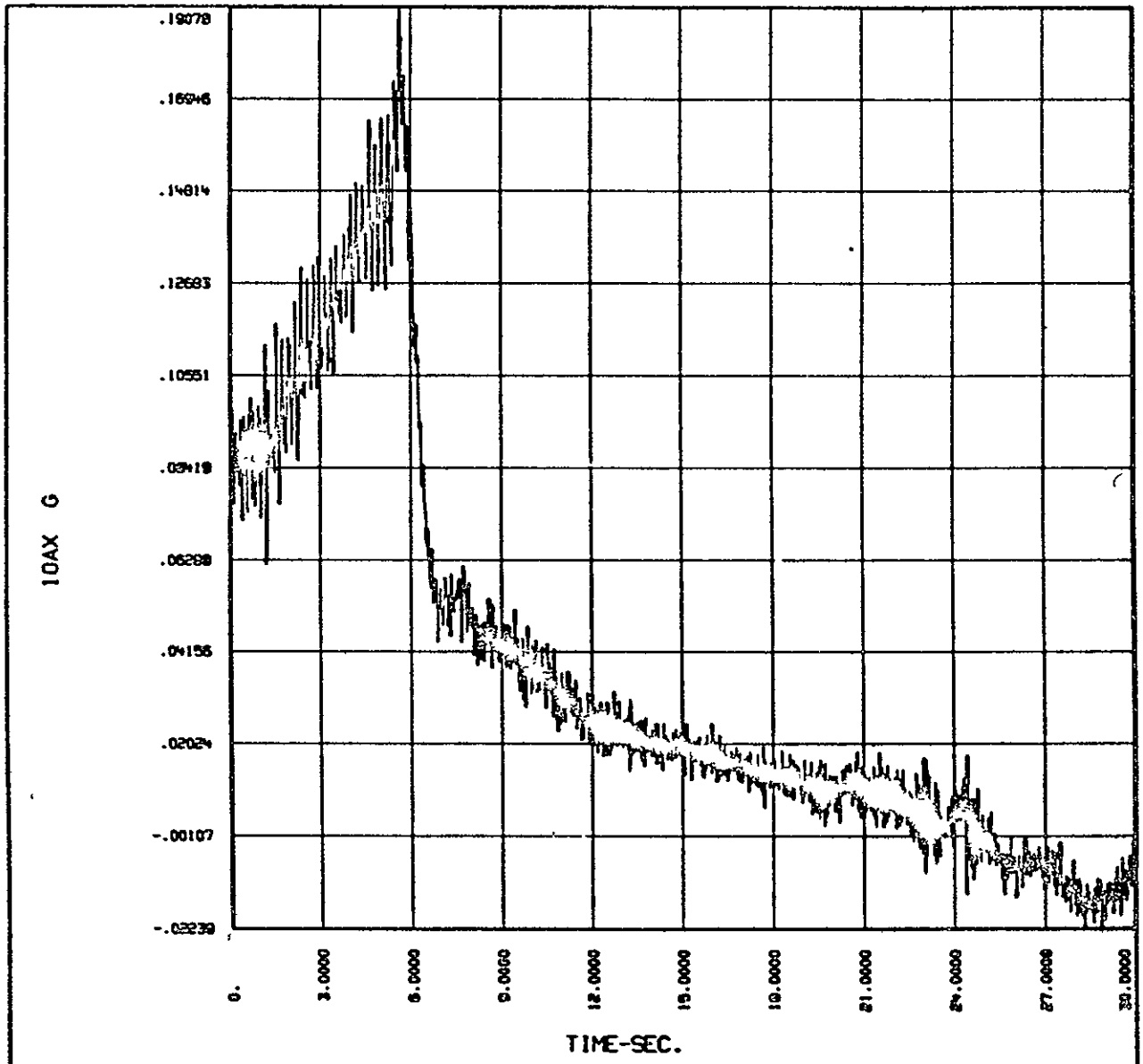

81.729
59.698
37.667
15.633
-6.394
-28.425
-50.456
-72.487
-94.517
-116.548
-139.579
LOAD V1 LB
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.5-1


97.083
73.339
49.091
26.442
2.893
-20.655
-44.204
-67.752
-91.301
-114.850
-138.399
LOAD V2,LB
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.5-1

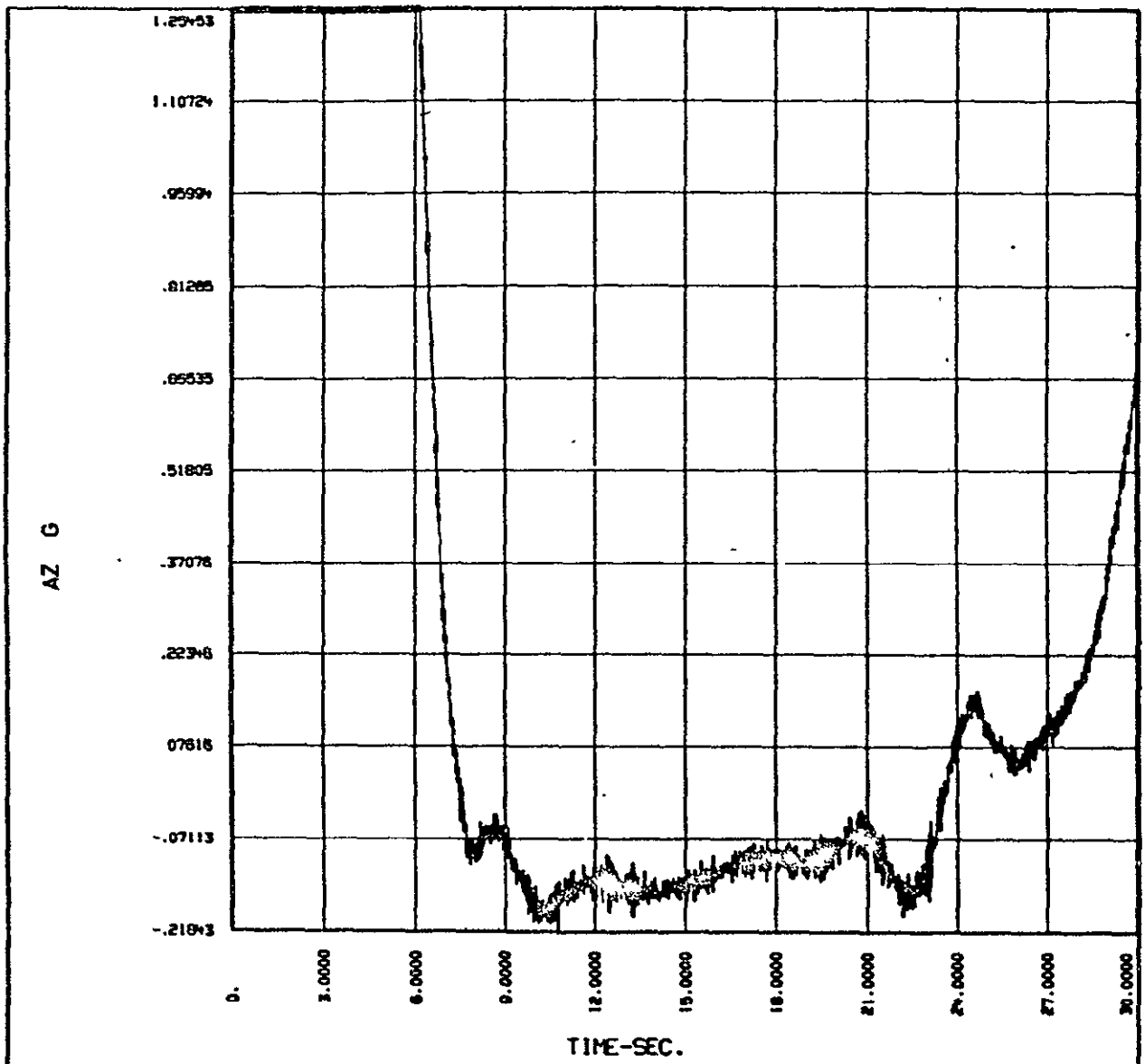

LOAD H1 LB
80.1810
72.1629
64.1448
56.1267
48.1086
40.0905
32.0724
24.0543
16.0362
8.0181
0.
0.
3.0000
6.0000
9.0000
12.0000
15.0000
18.0000
21.0000
24.0000
27.0000
30.0000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.5-1



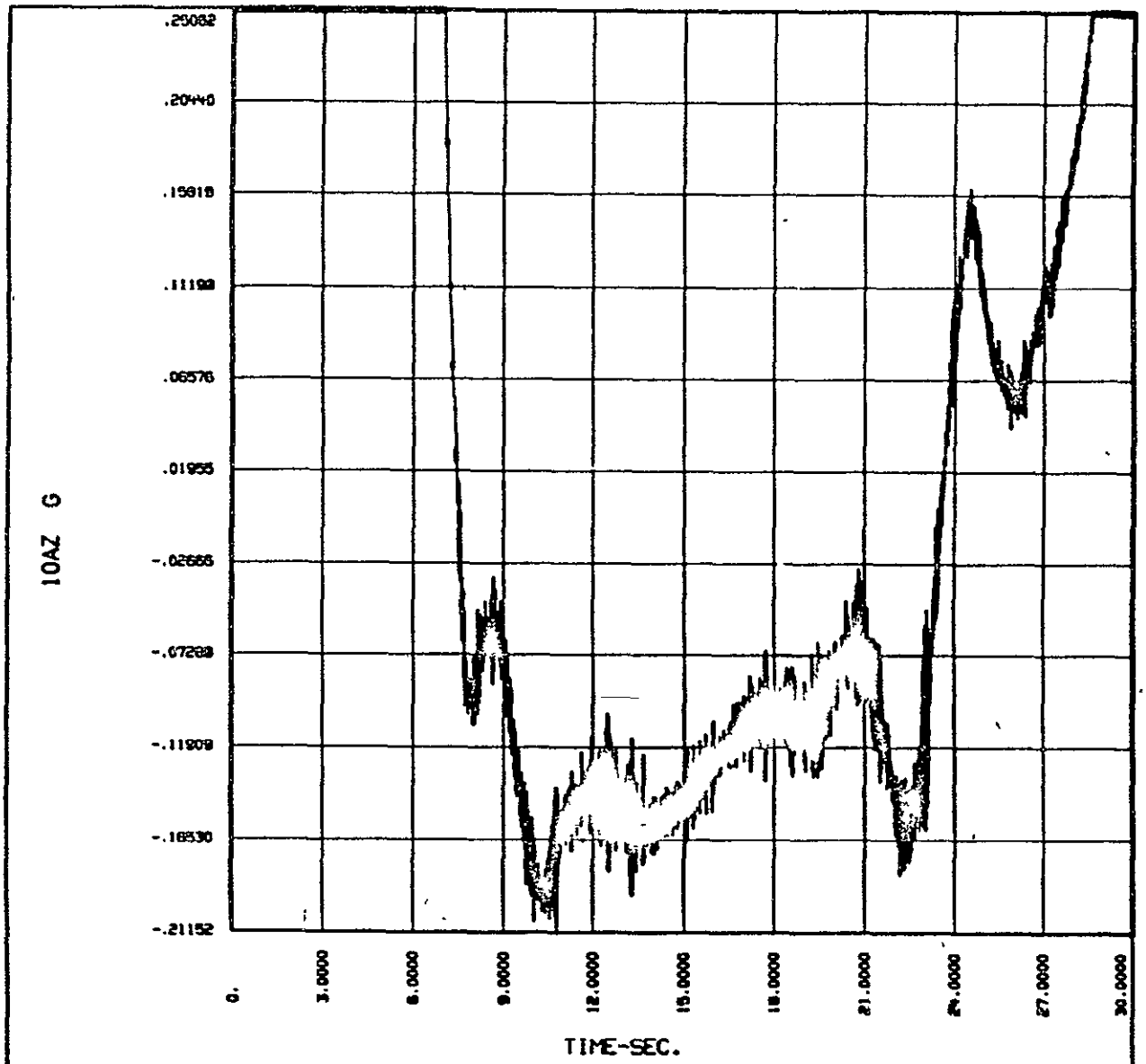
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.5-1



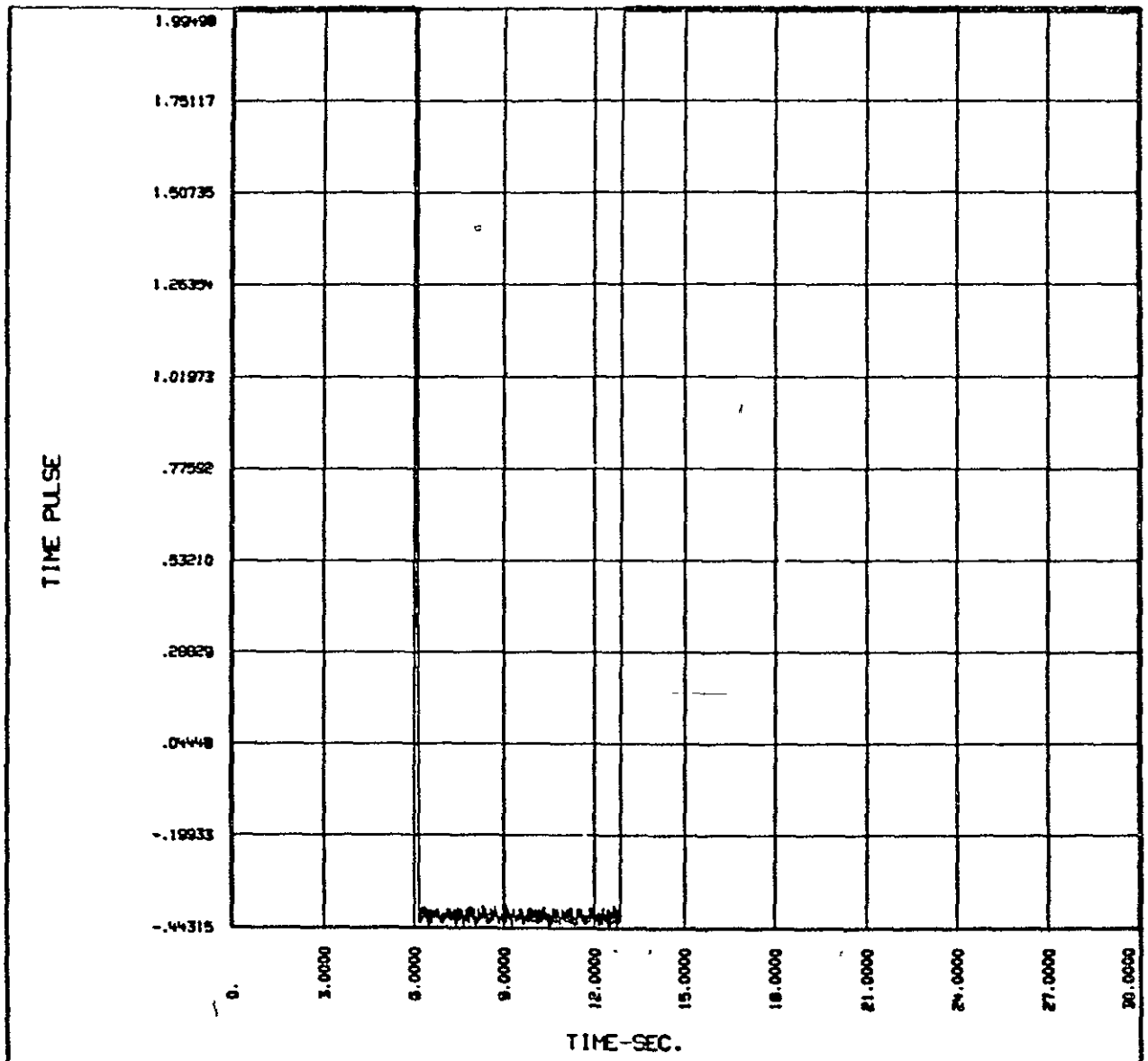
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.5-1



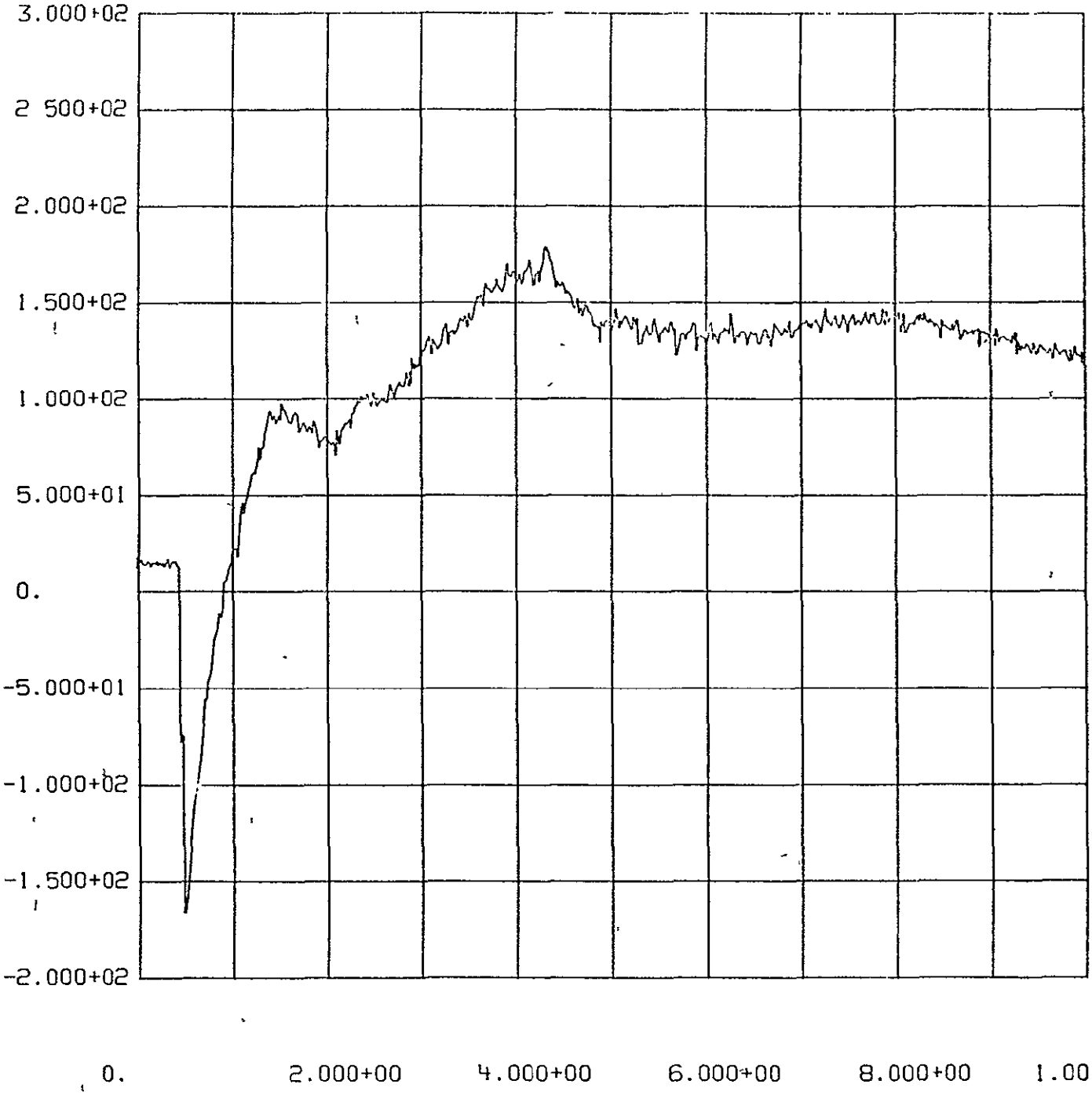
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.5-1



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.5-1

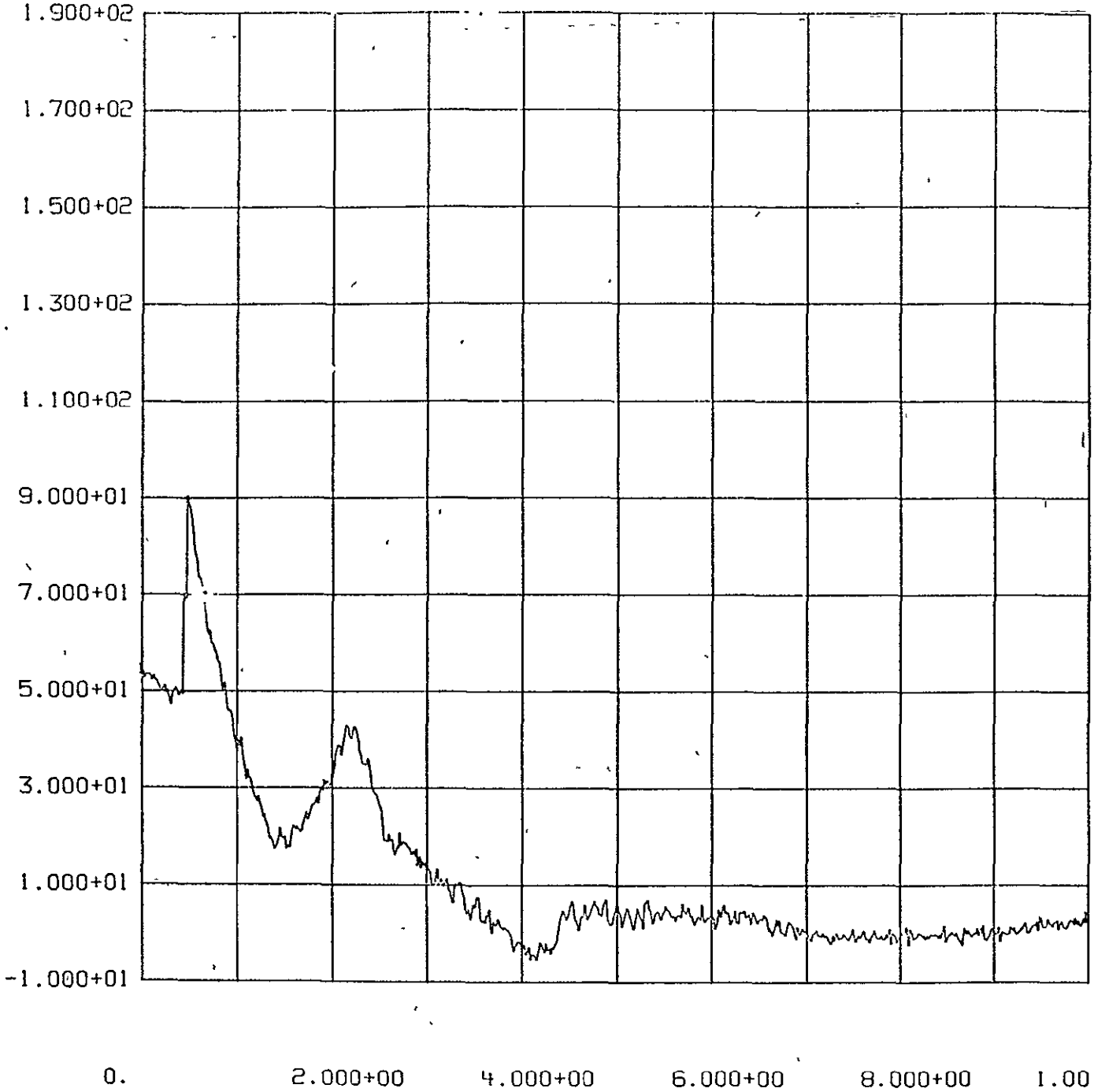


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.5-1



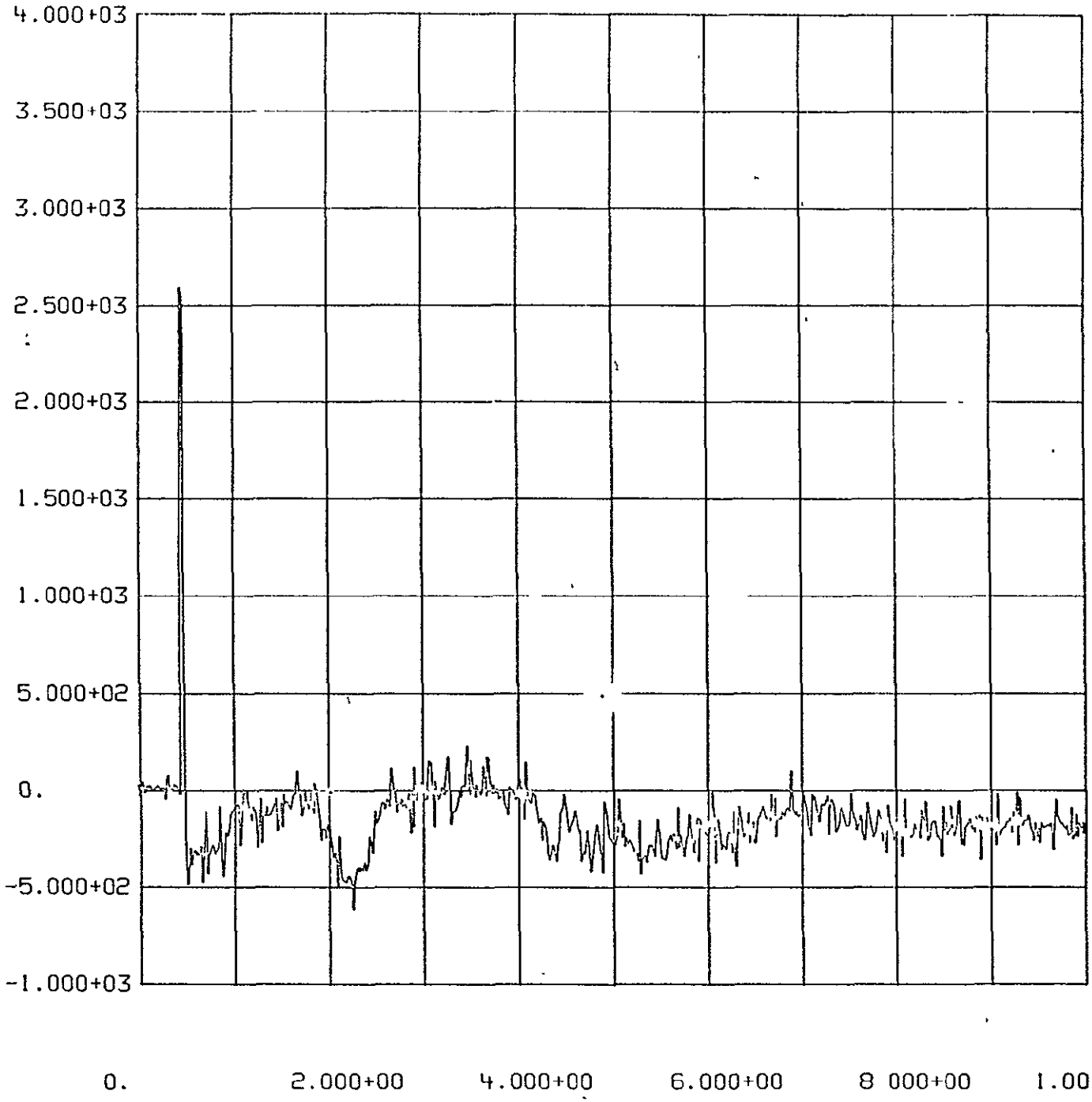
Z-LOAD VS TIME

FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.5-1 * UNFILT *



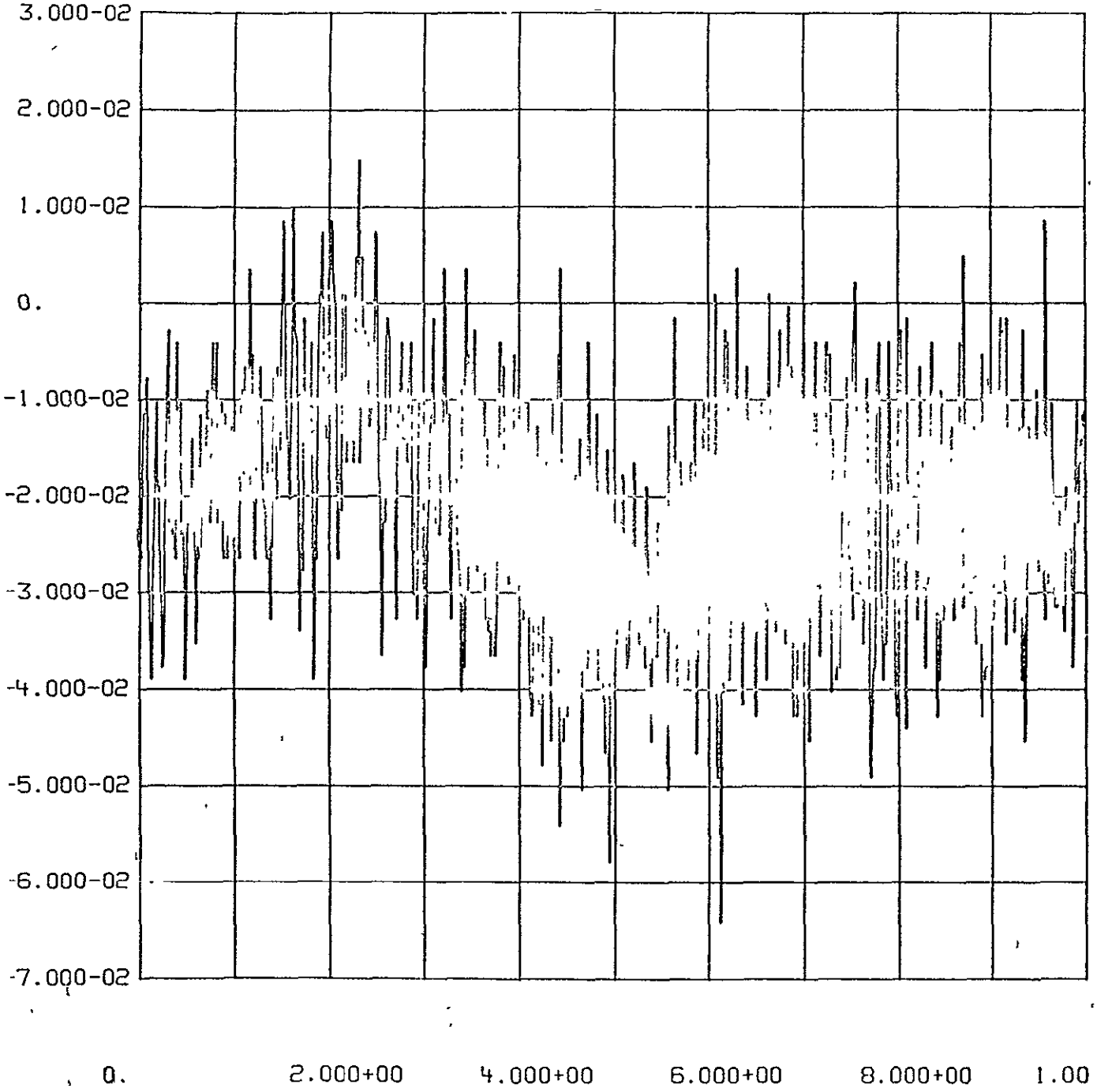
Y-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.5-1 * UNFILT *



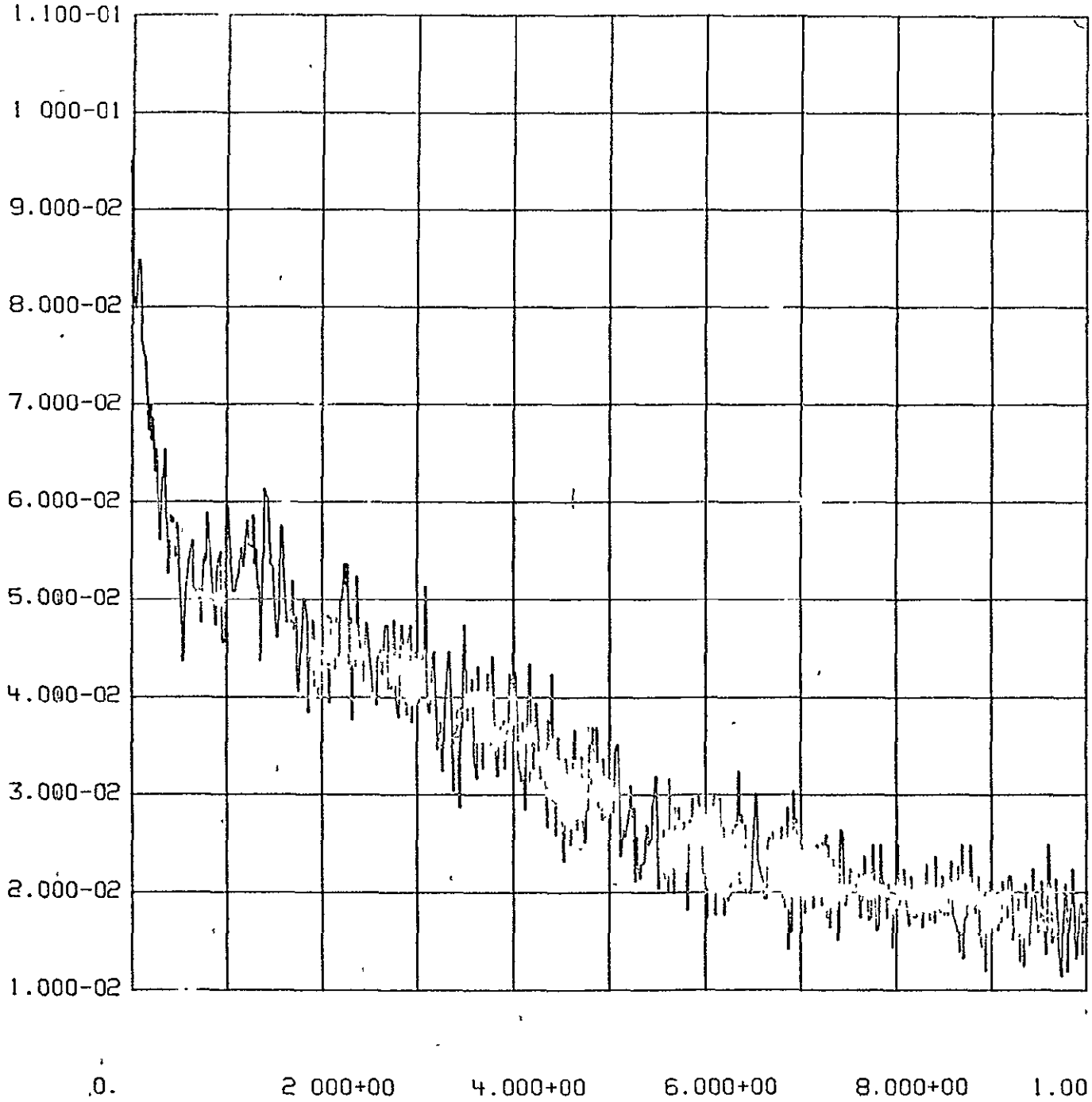
MOMENT VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.5-1 * UNFILT *



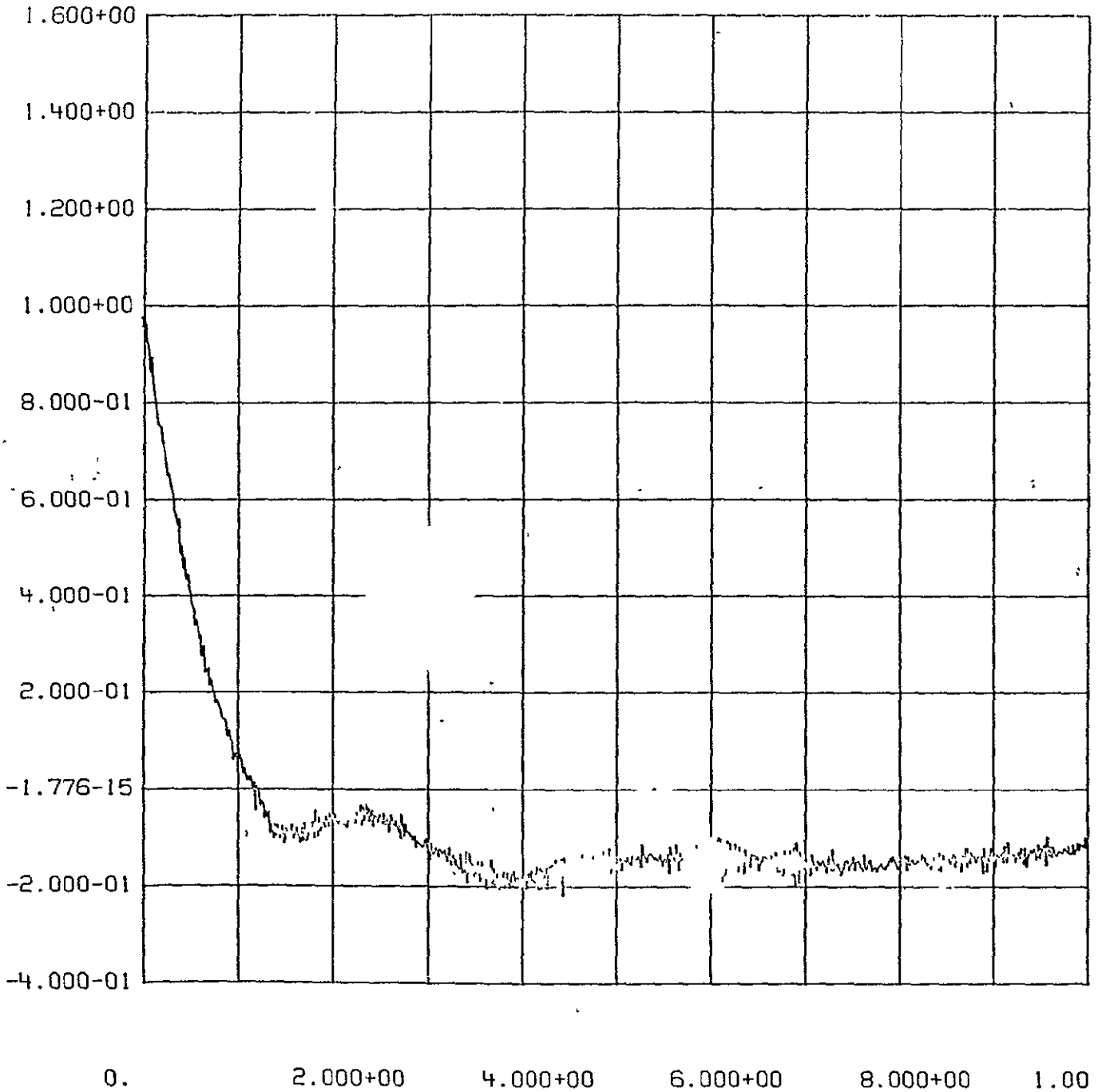
AC YAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.5-1 * UNFILT *



AC XAC VS TIME

FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.5-1 * UNFILT *

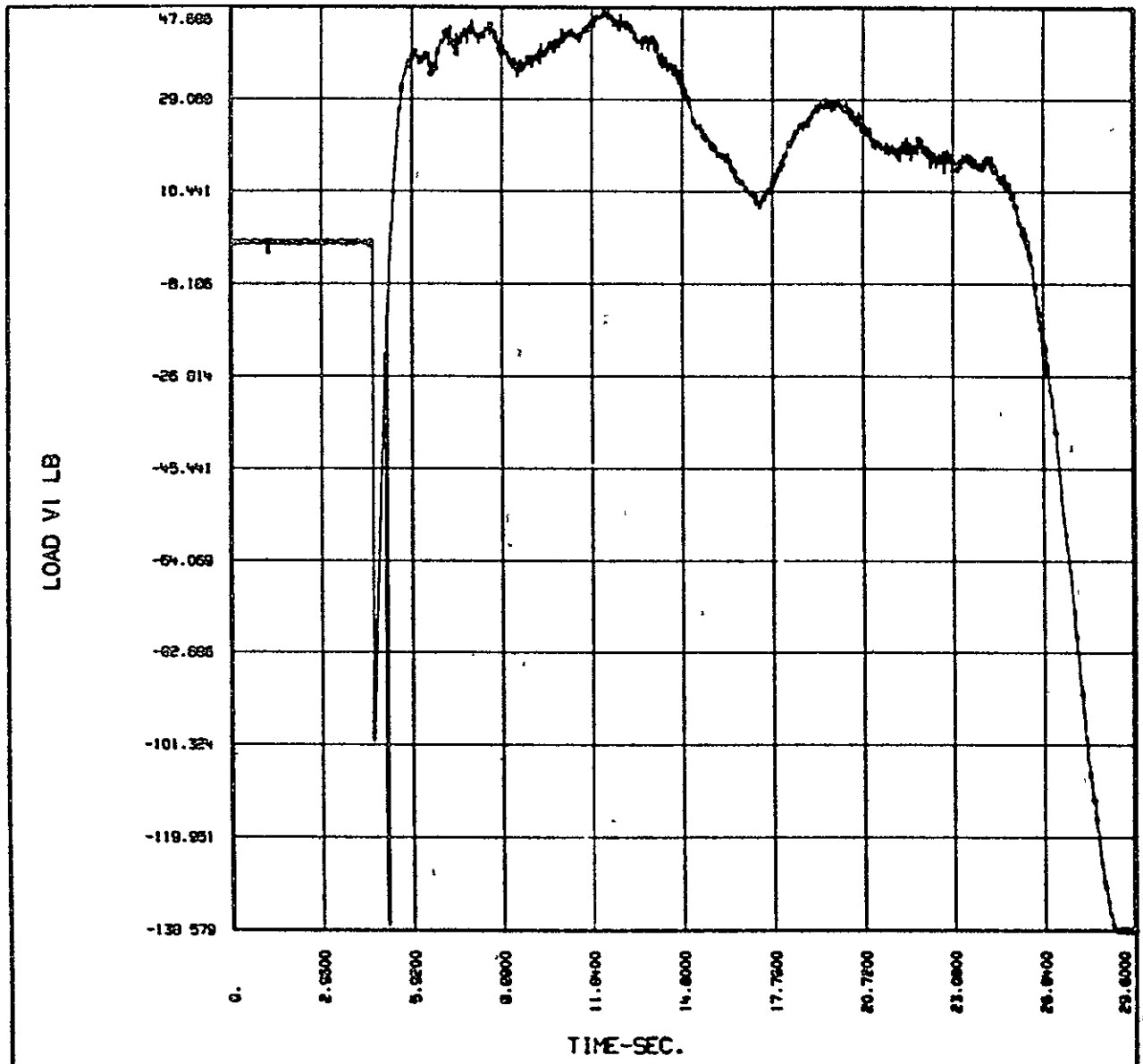


AC ZAC VS TIME

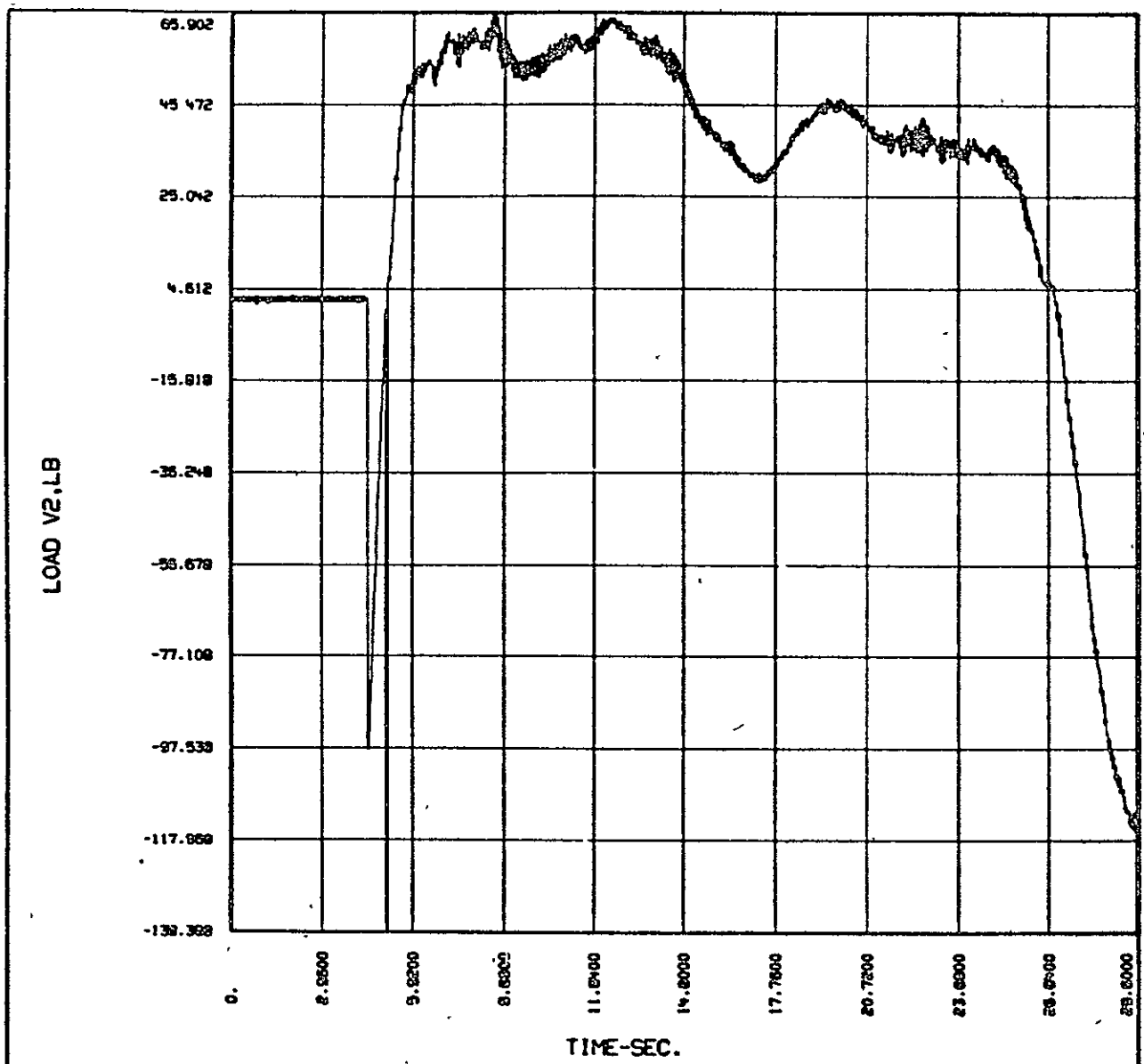
1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.5-1 * UNFILT *

Test Data Condition 4.6-1

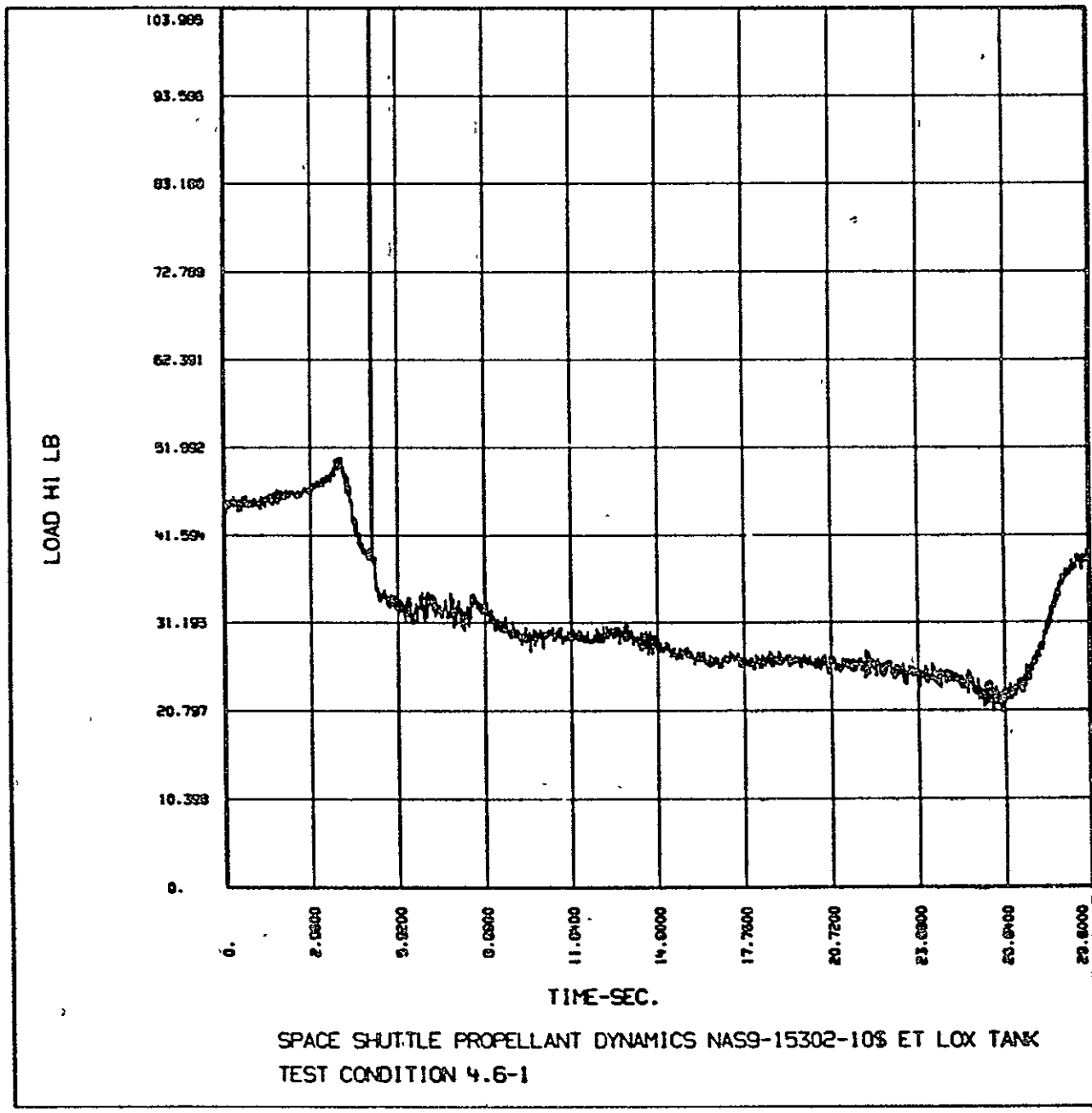
Baffles
Test Fluid – Water
Oreintation – 13°
Fill Volume – 2%
Target Acceleration–0.2 g

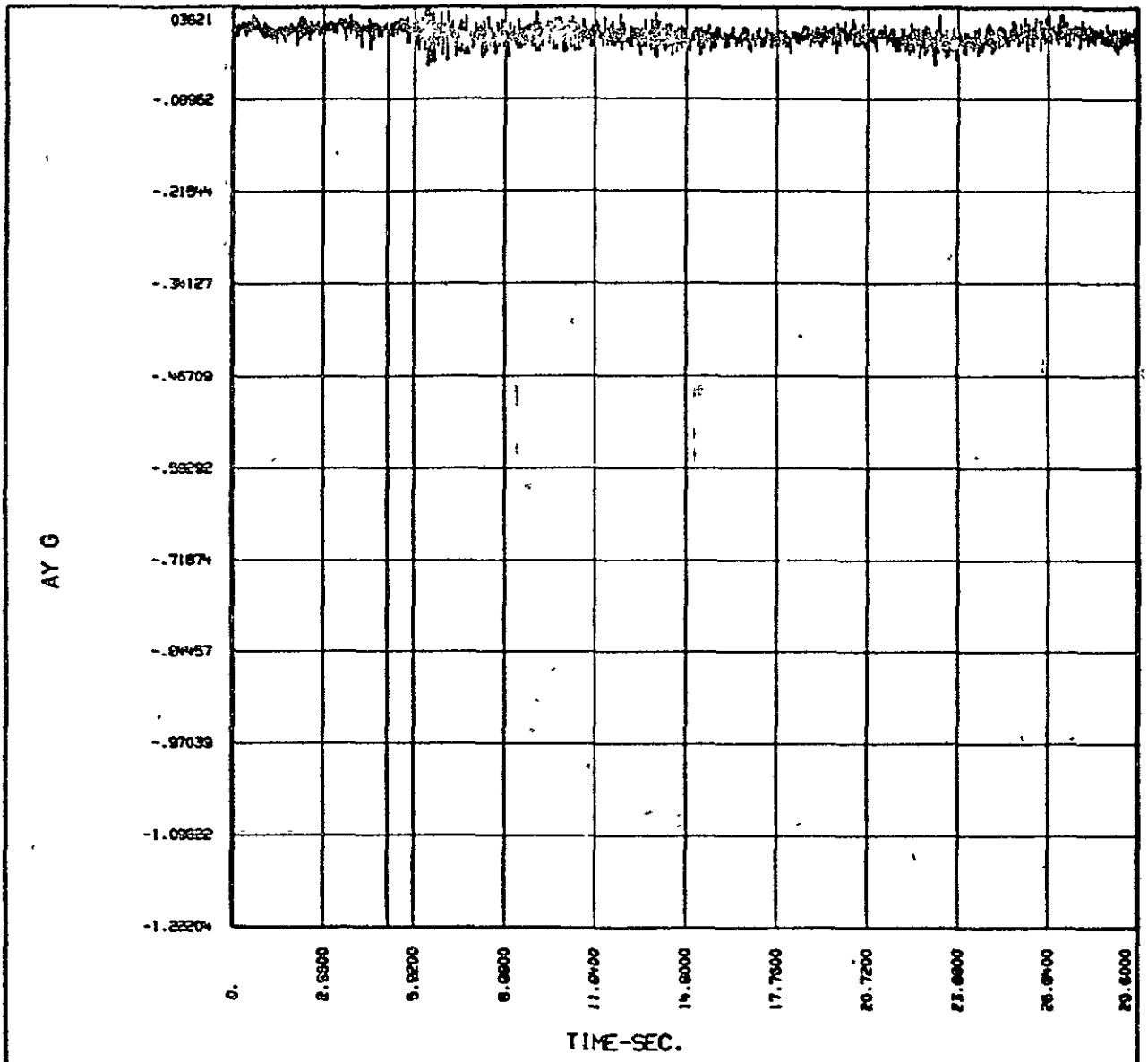


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.6-1

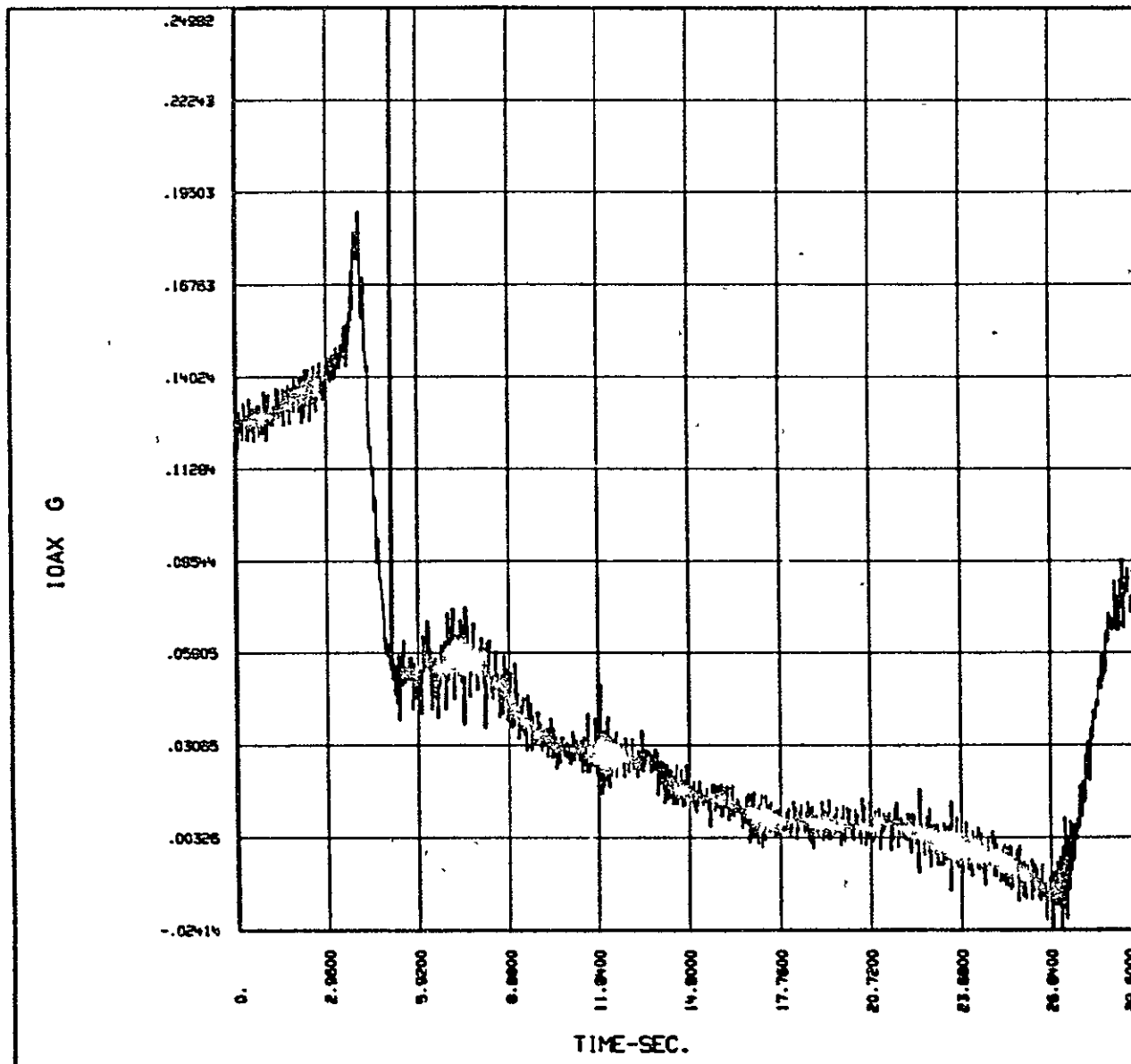


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.6-1

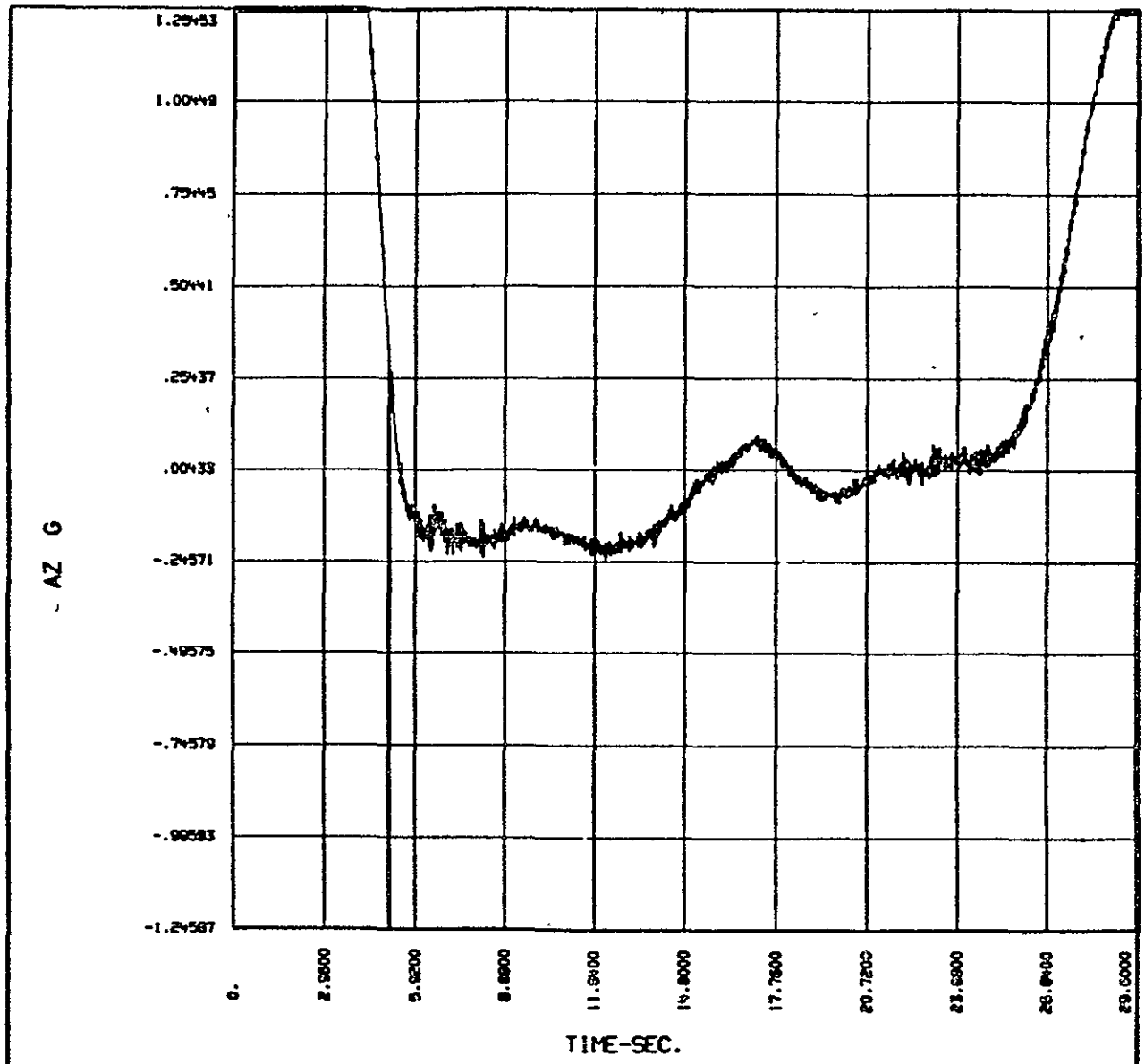

LOAD H1 LB
103.986
93.586
83.188
72.789
62.391
51.992
41.594
31.195
20.797
10.398
0.
0.
2.5600
5.1200
8.0800
11.0400
14.0000
17.7600
20.7200
23.6800
26.6400
29.6000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10% ET LOX TANK
TEST CONDITION 4.6-1



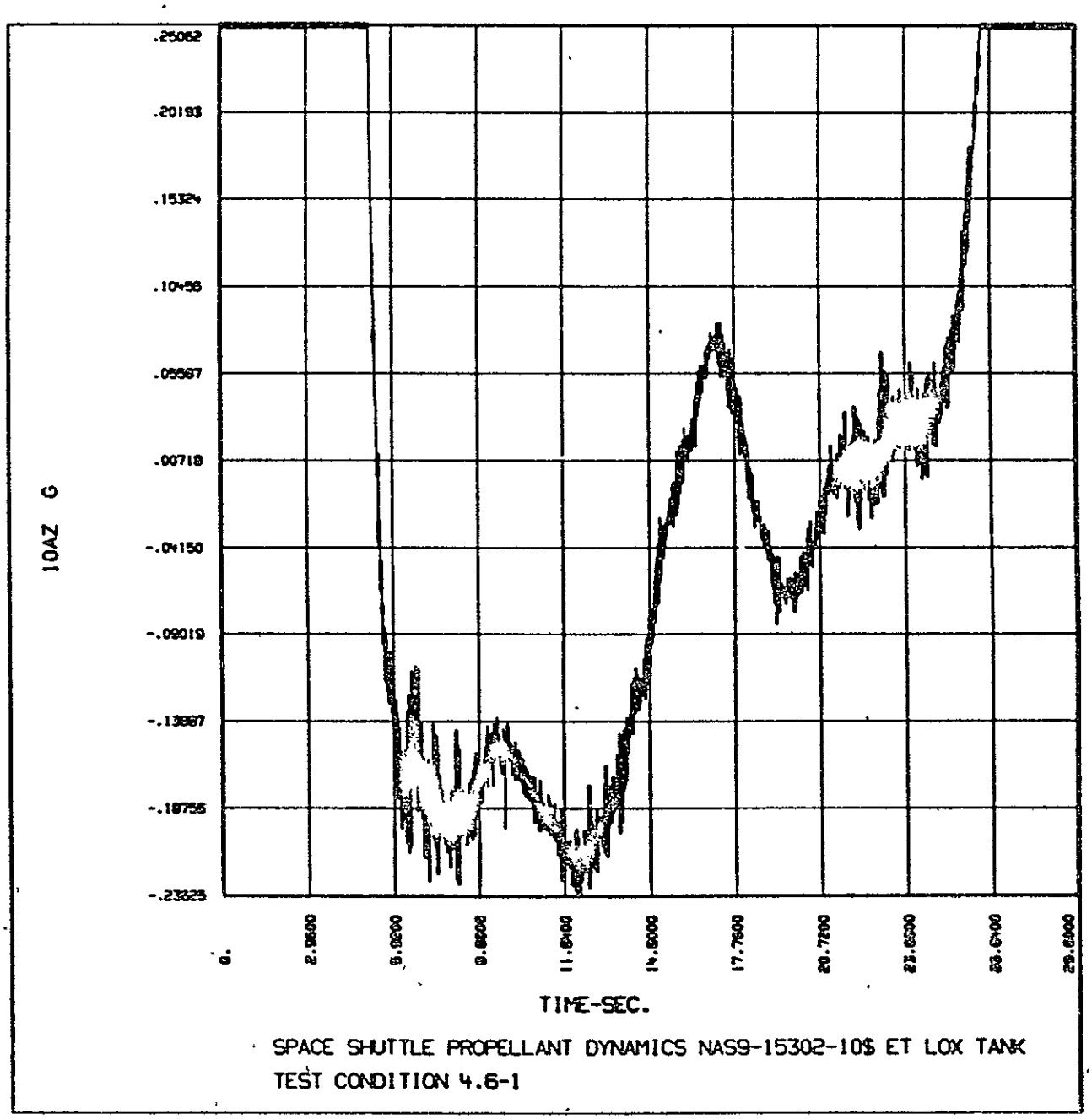
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.6-1



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.6-1



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.6-1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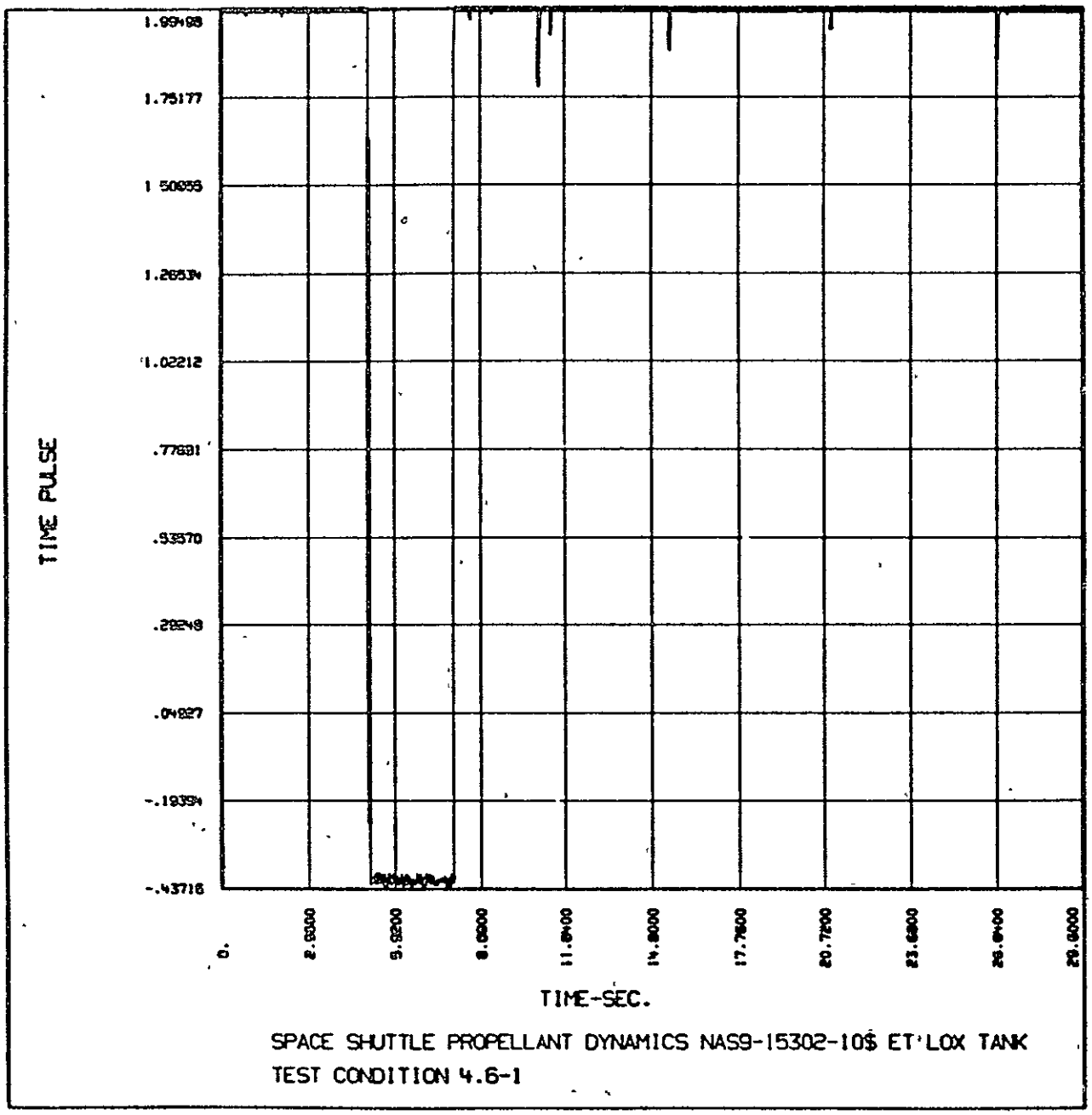
.20193
.15324
.10455
.05587
.00718
-.04150
-.09019
-.13887
-.18756
-.23625
0.
2.9600
5.9200
8.8800
11.8400
14.8000
17.7600
20.7200
23.6800
26.6400
29.6000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.6-1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.04927
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-.43716
TIME PULSE
0.
2.9300
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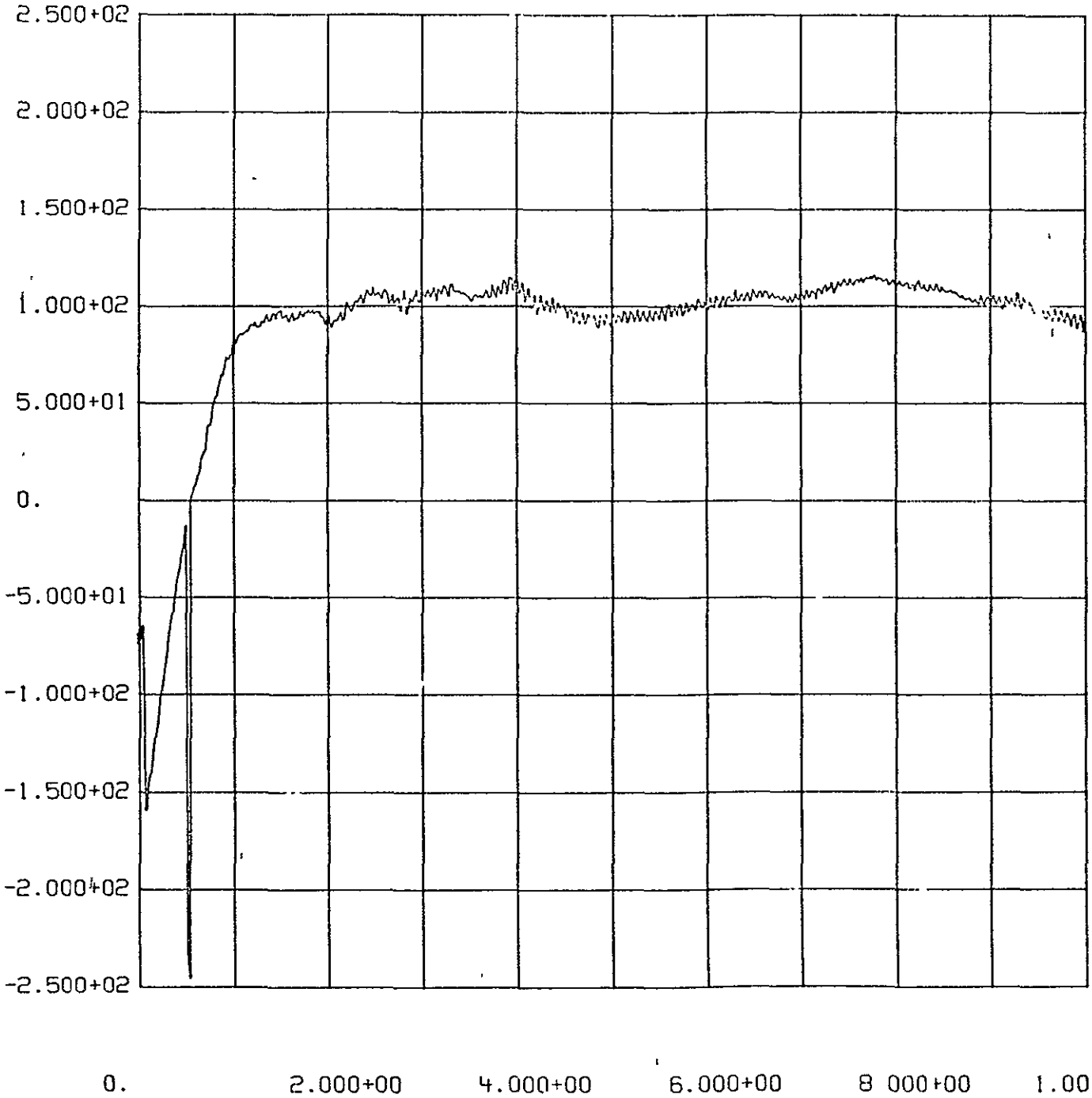
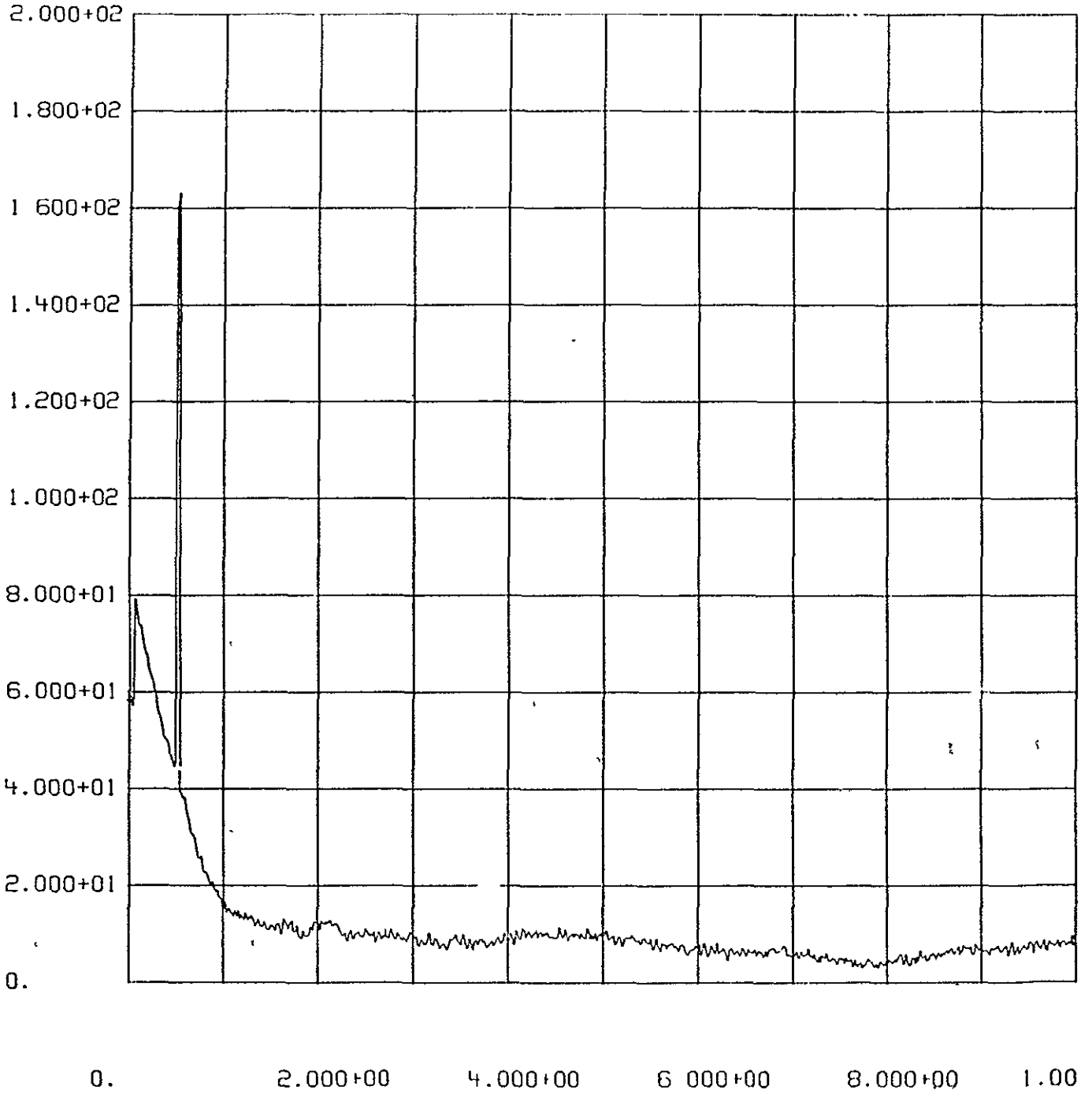
8.7500
11.6400
14.8000
17.7600
20.7200
23.6800
26.6400
29.6000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.6-1



Z-LOAD VS TIME

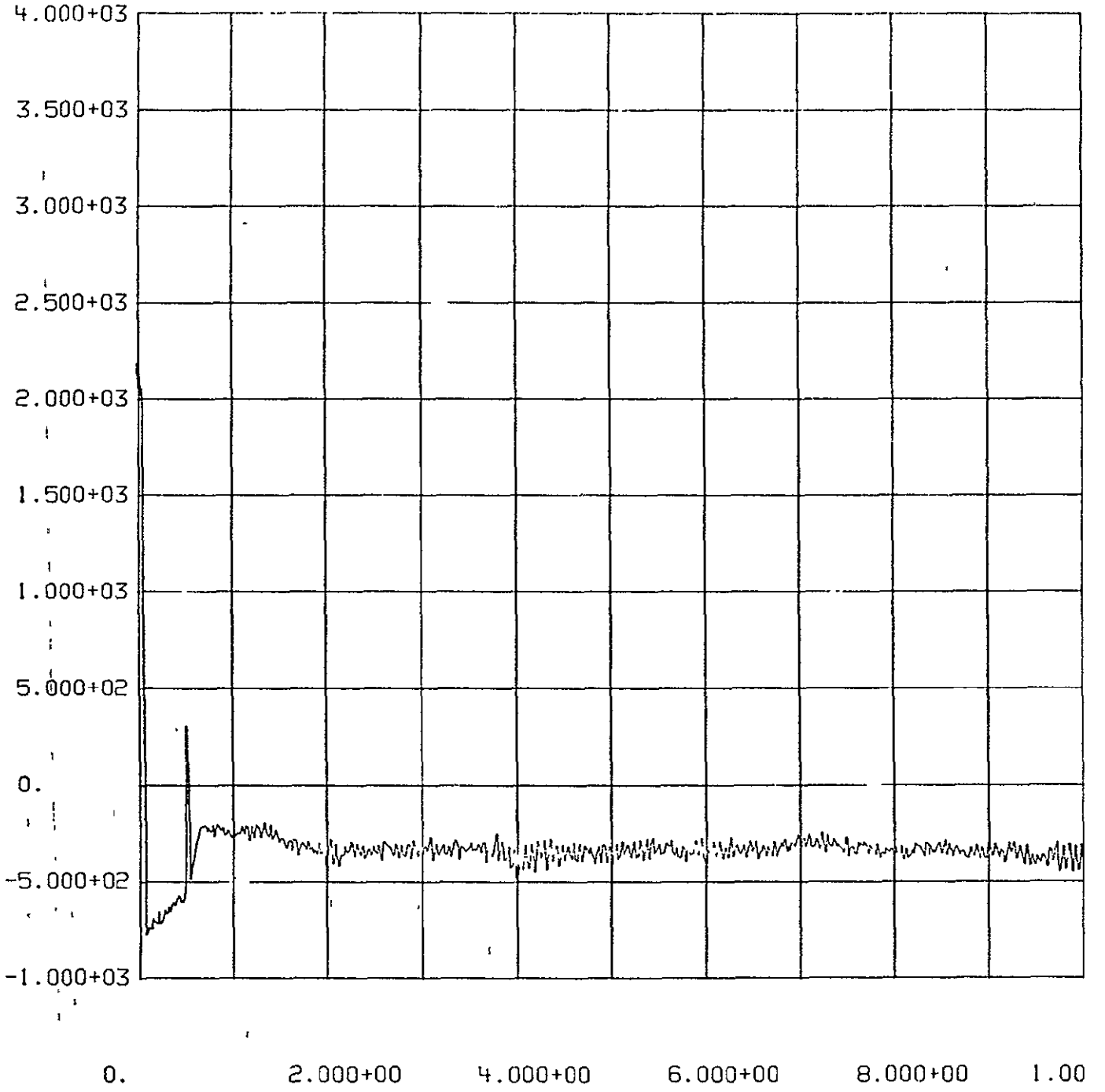
1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4 6-1 * UNFILT *

C-5



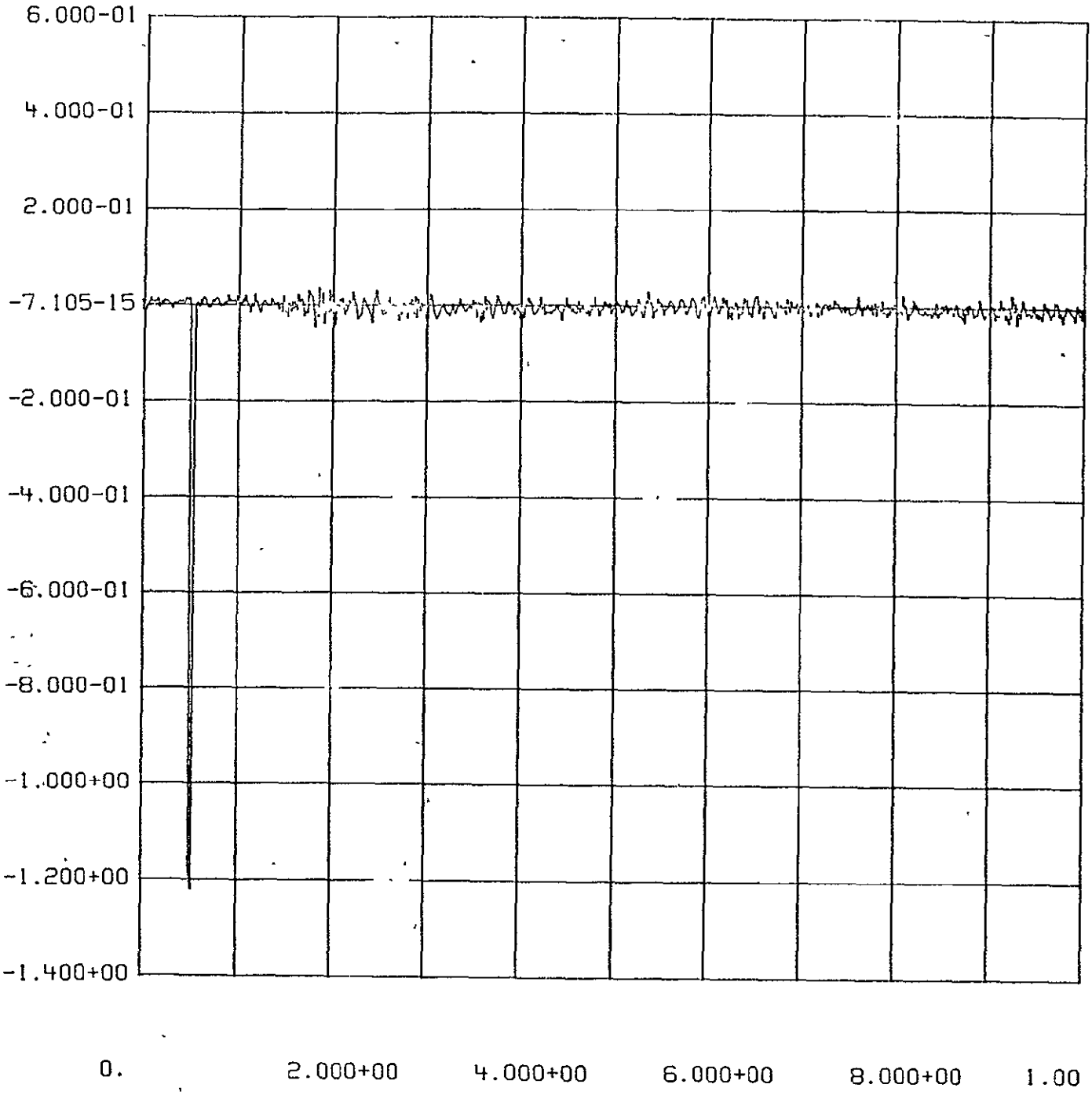
Y-LOAD VS TIME

1 FLT 3 06NO78 FLIGHT 4 TEST CONDITION 4.6-1 * UNFILT *



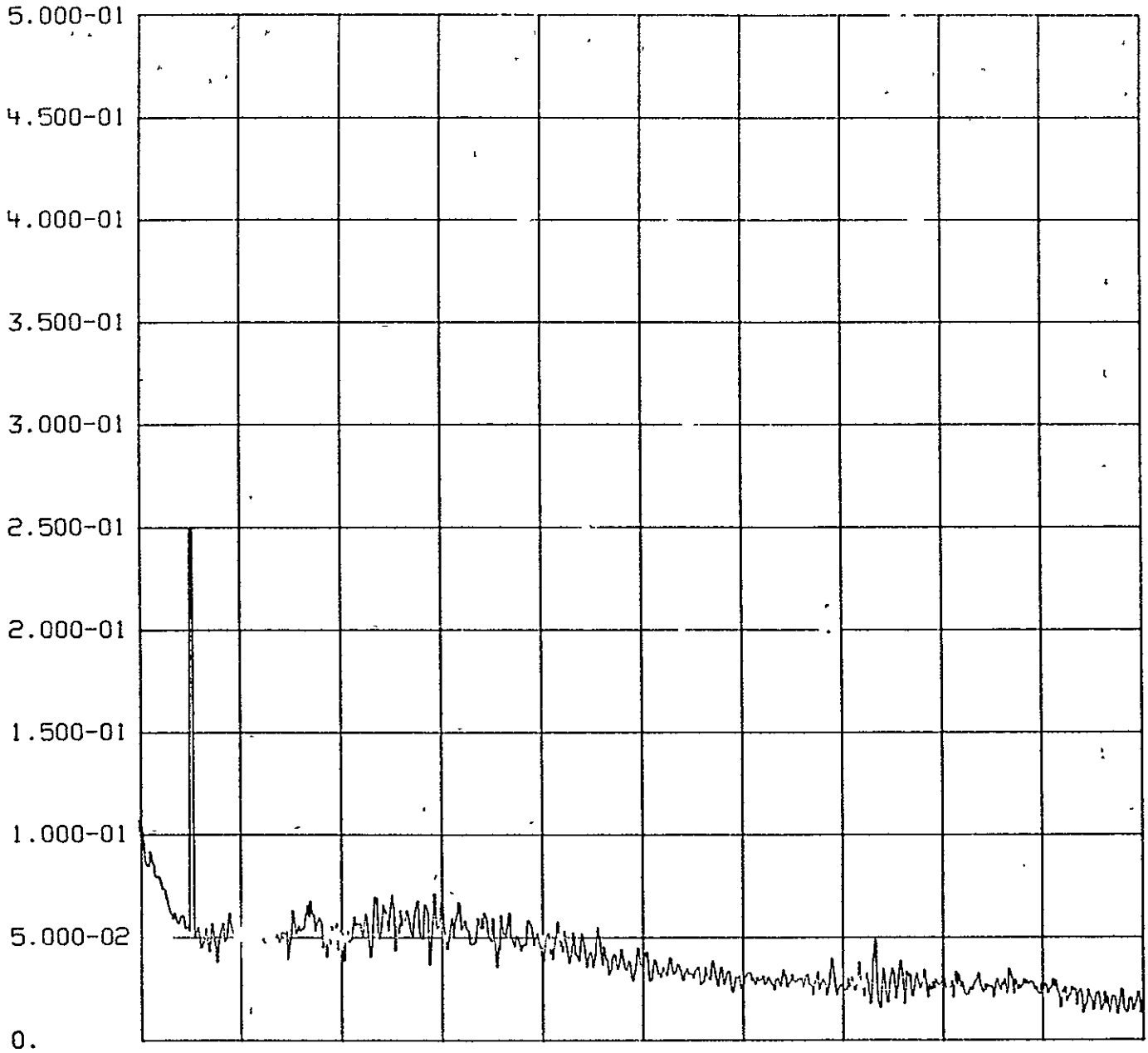
MOMENT VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4 6-1 * UNFILT *



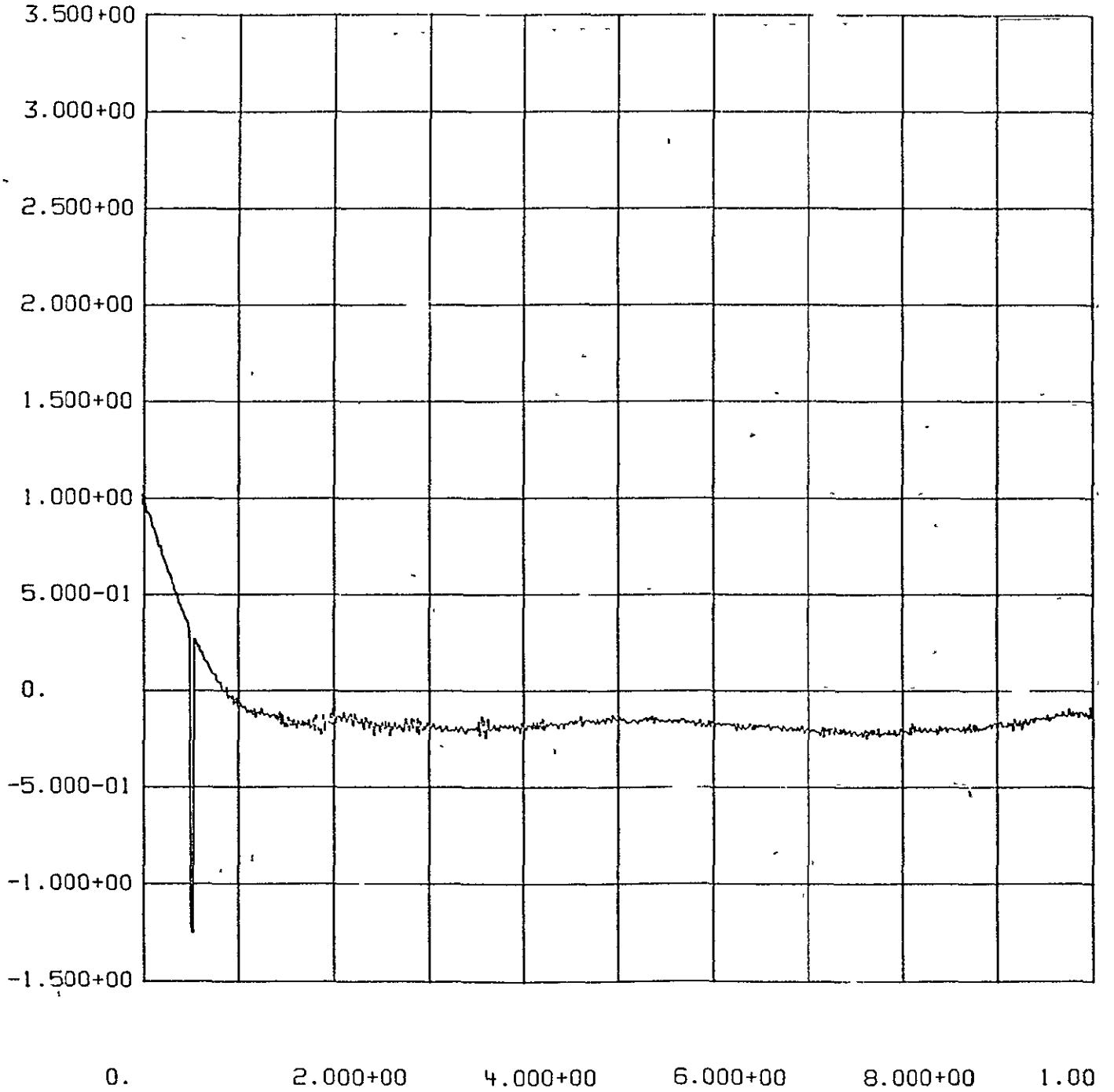
AC YAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.6-1 * UNFILT *



AC XAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.6-1 * UNFILT *

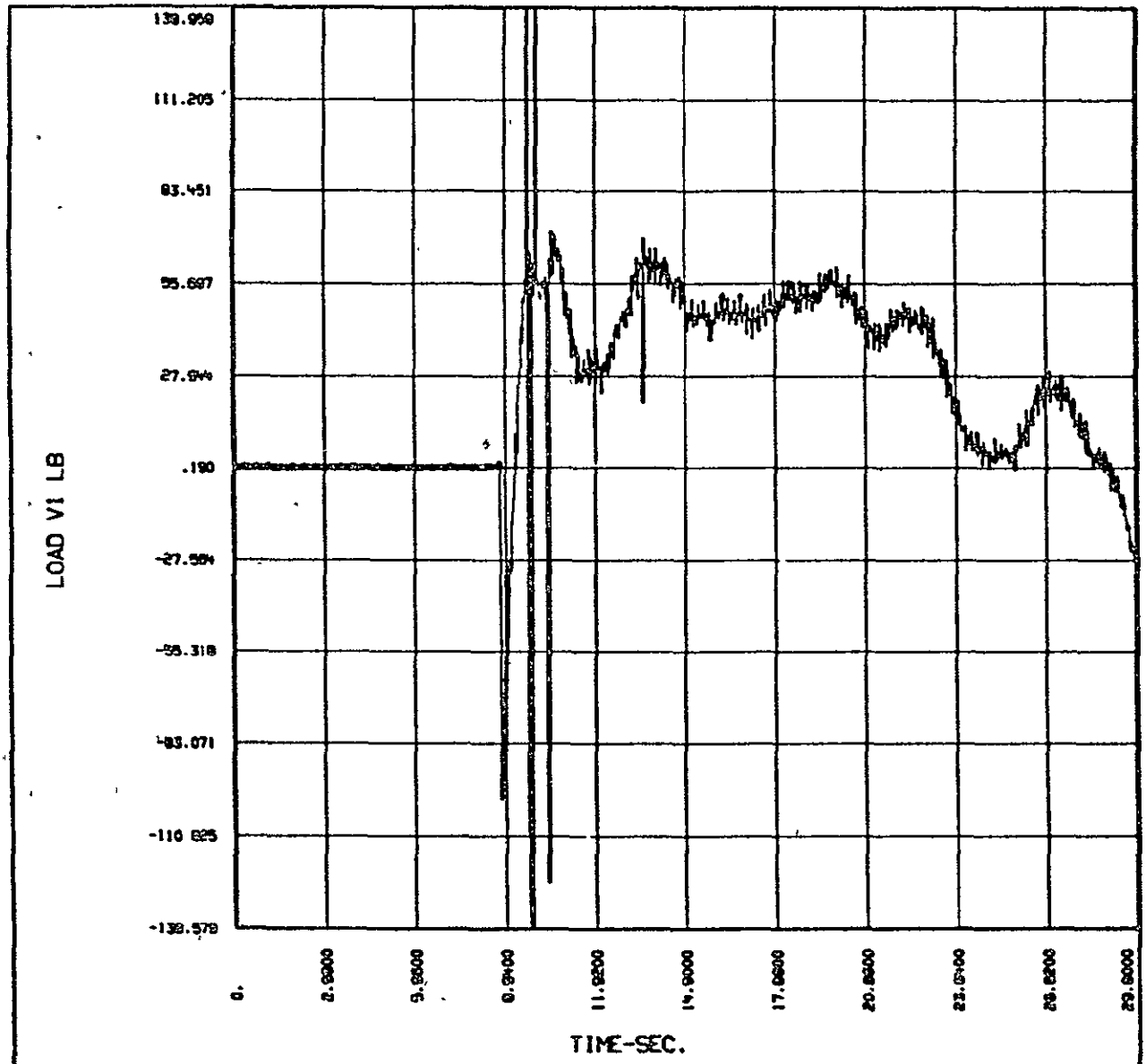


AC ZAC VS TIME

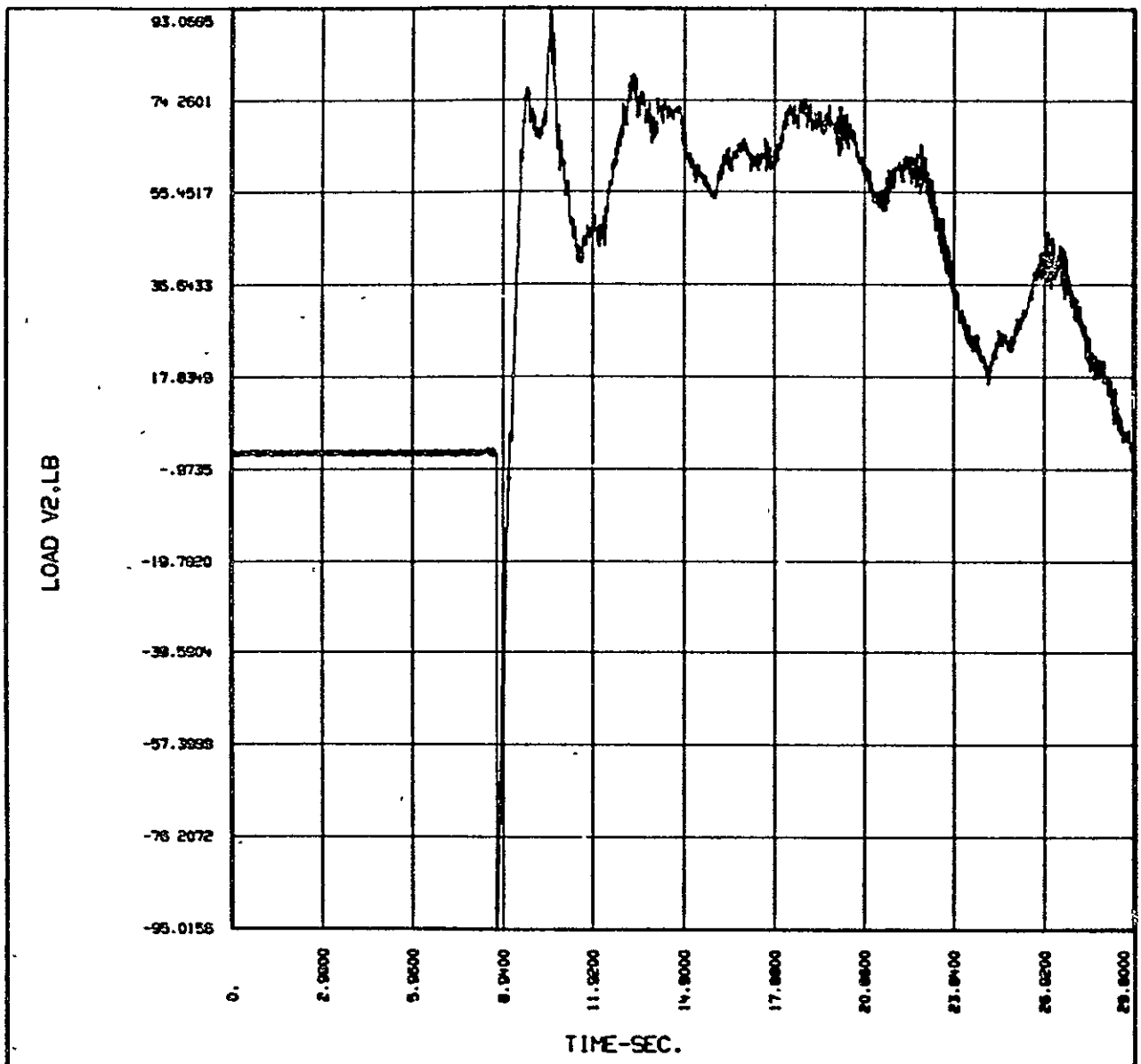
1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.6-1 * UNFILT *

Test Data Condition 4.7-2

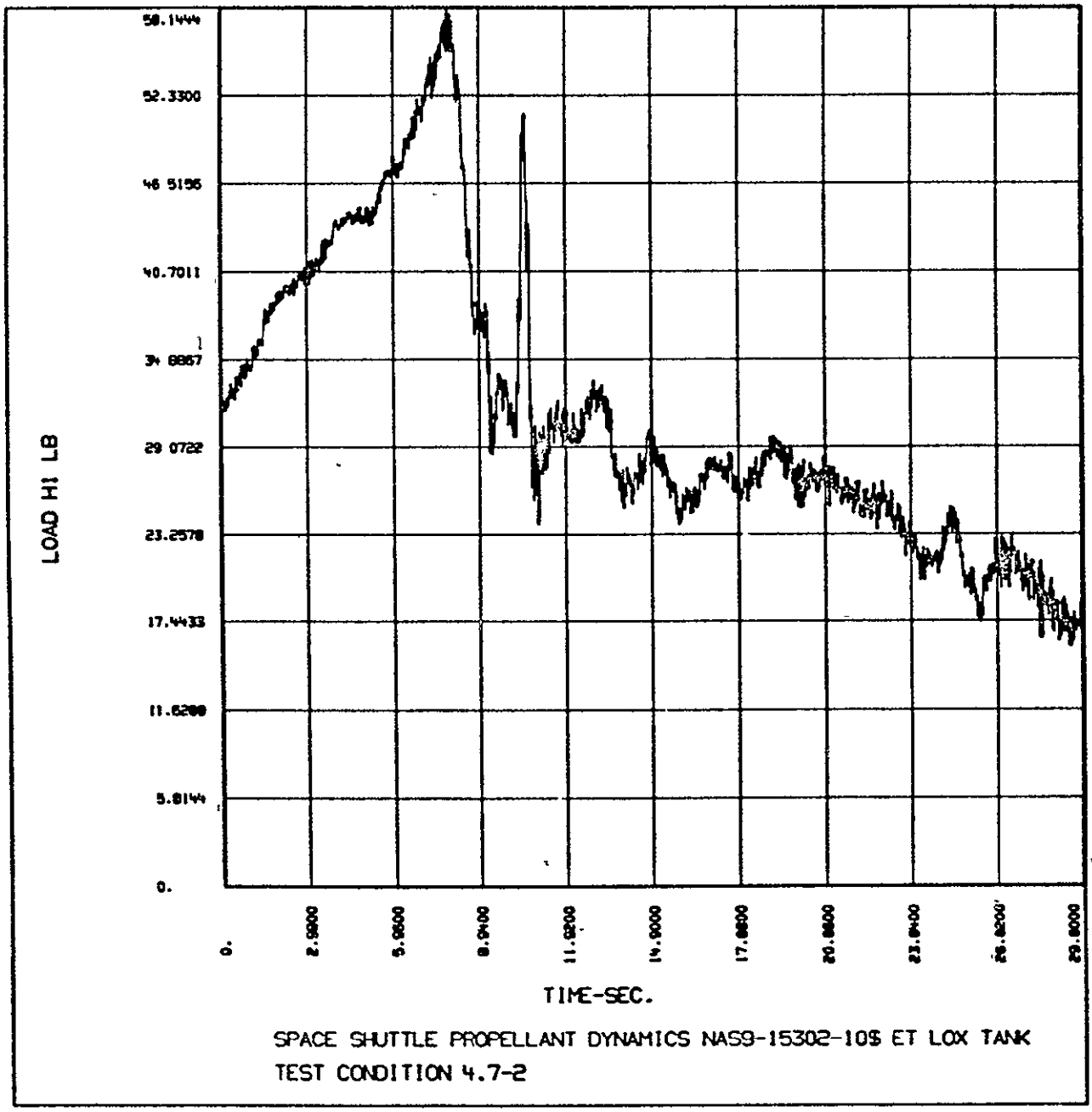
Baffles
Test Fluid – Water
Orientation – 13°
Fill Volume – 5.5%
Target Acceleration–0.2 g



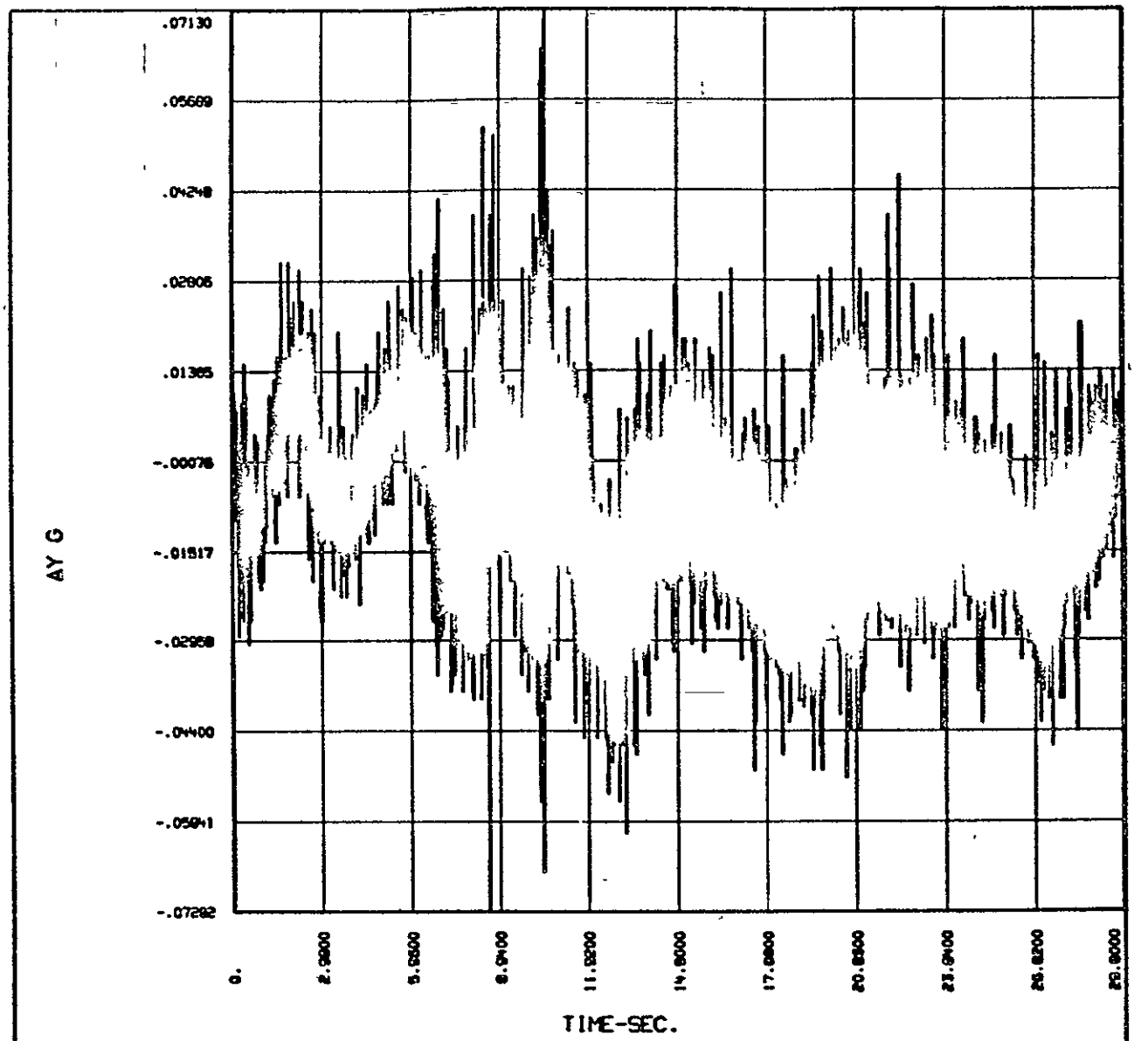
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.7-2



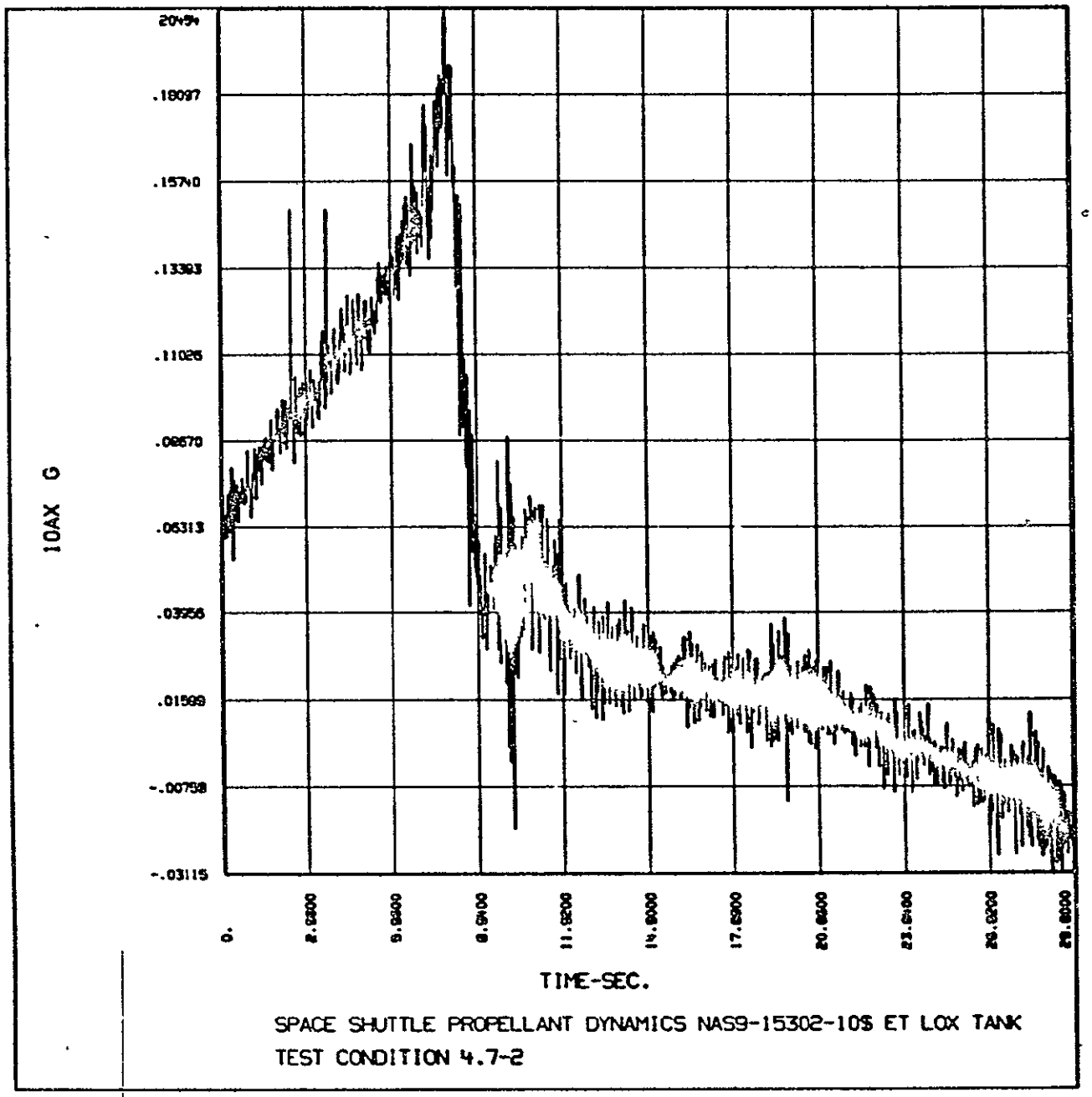
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.7-2



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.7-2



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.7-2


20454
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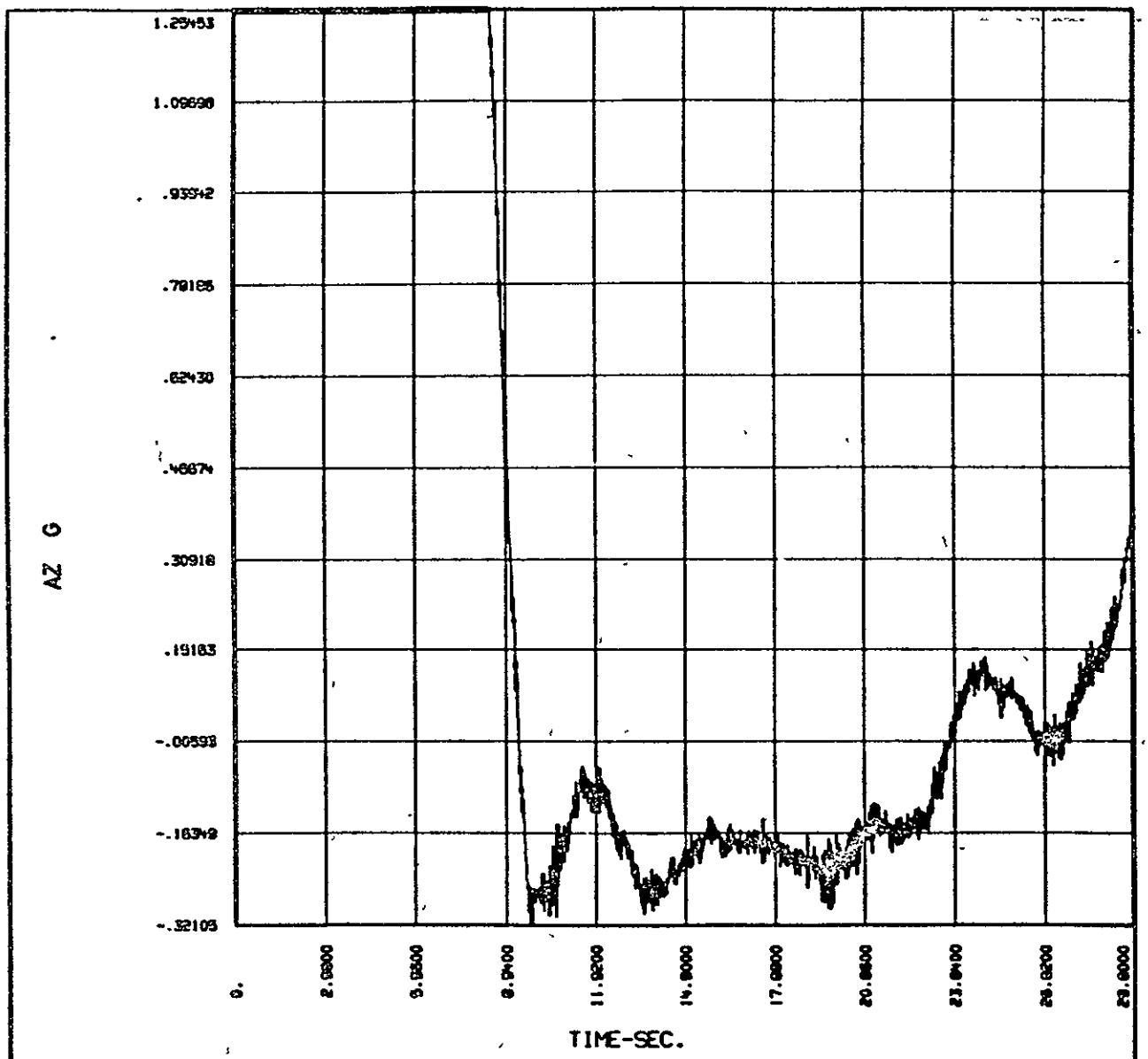
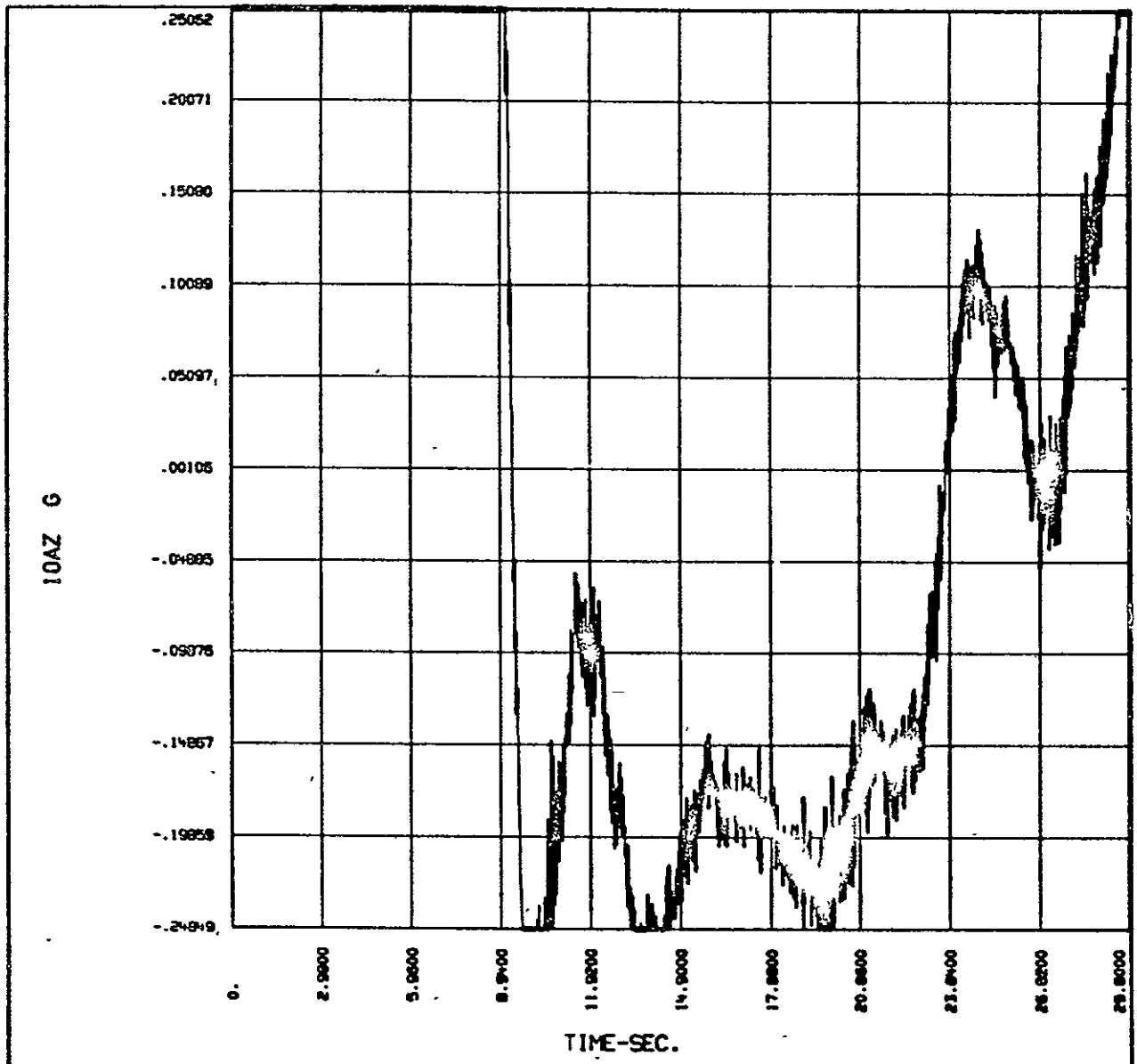
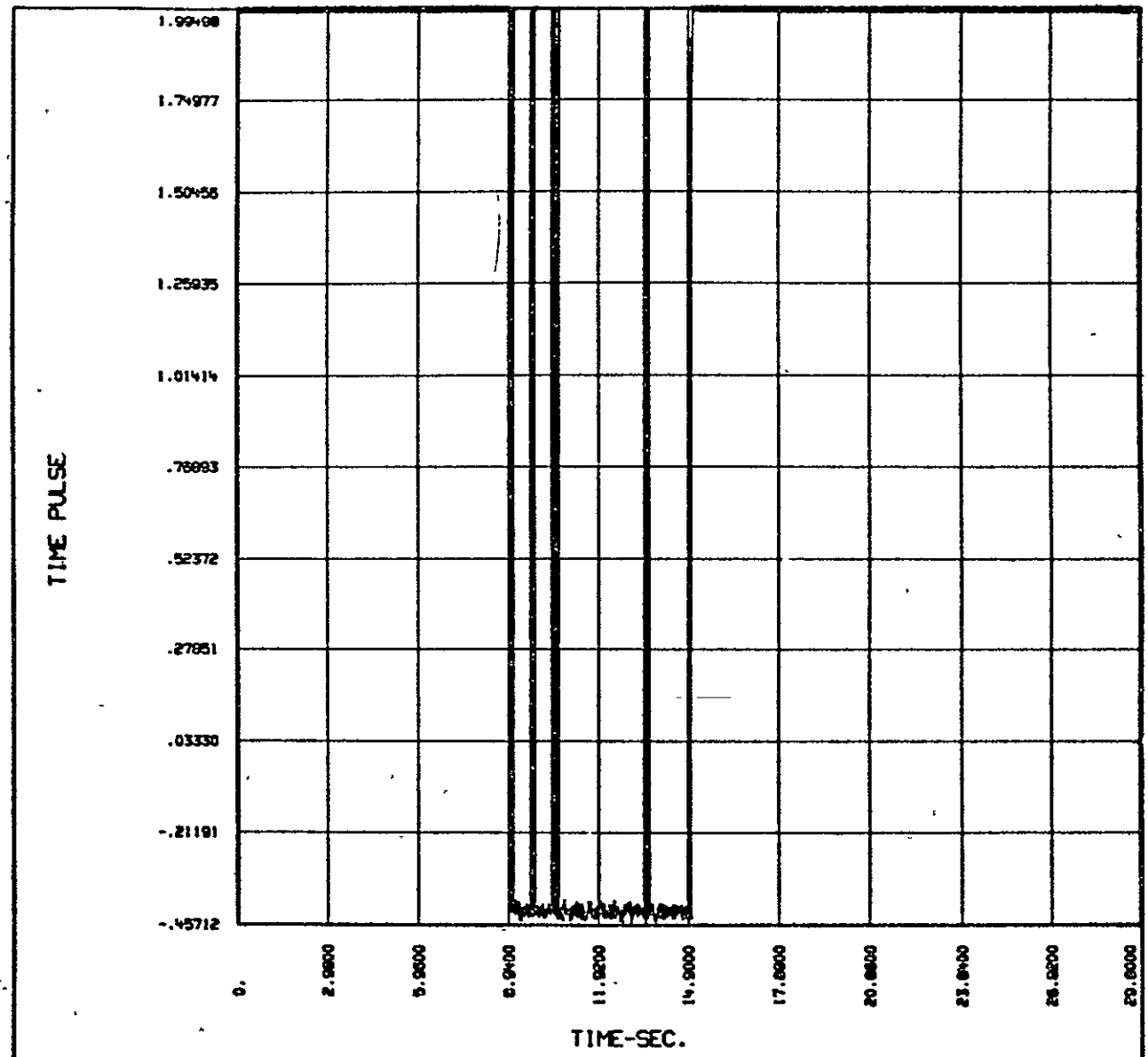
0.
2.9200
5.8400
8.7600
11.6800
14.6000
17.5200
20.4400
23.3600
26.2800
29.2000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10S ET LOX TANK
TEST CONDITION 4.7-2



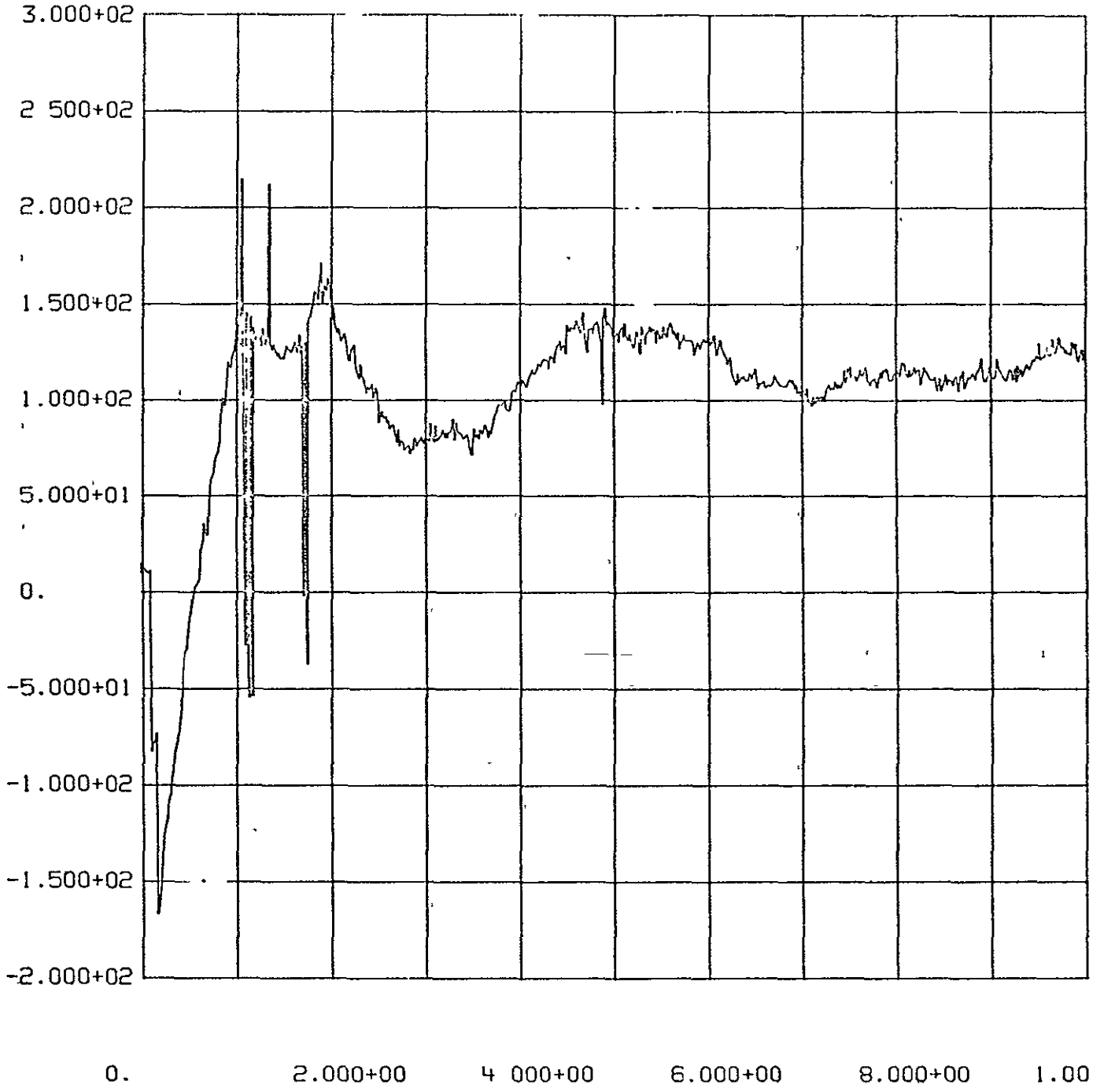
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.7-2



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.7-2

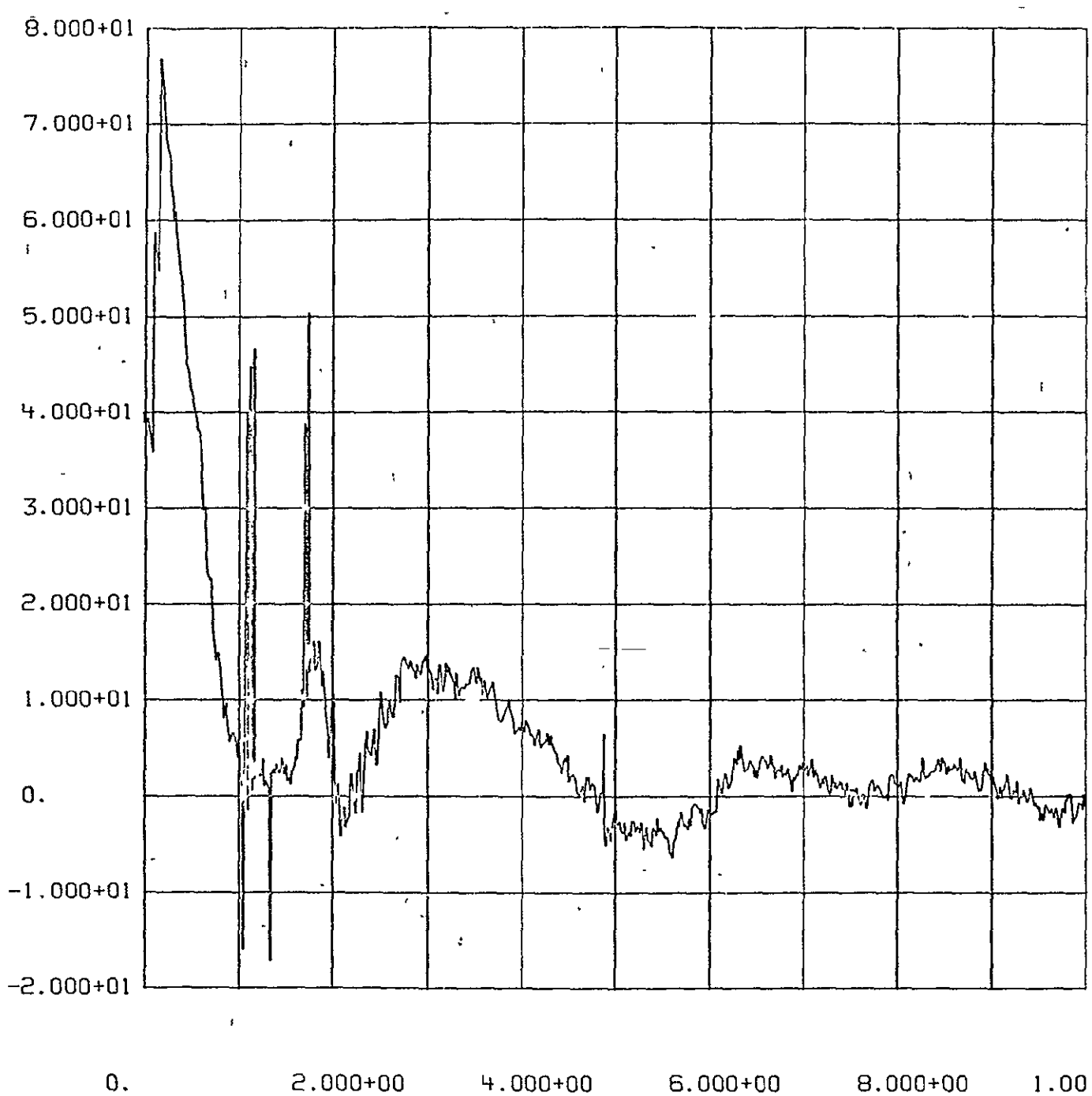


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.7-2



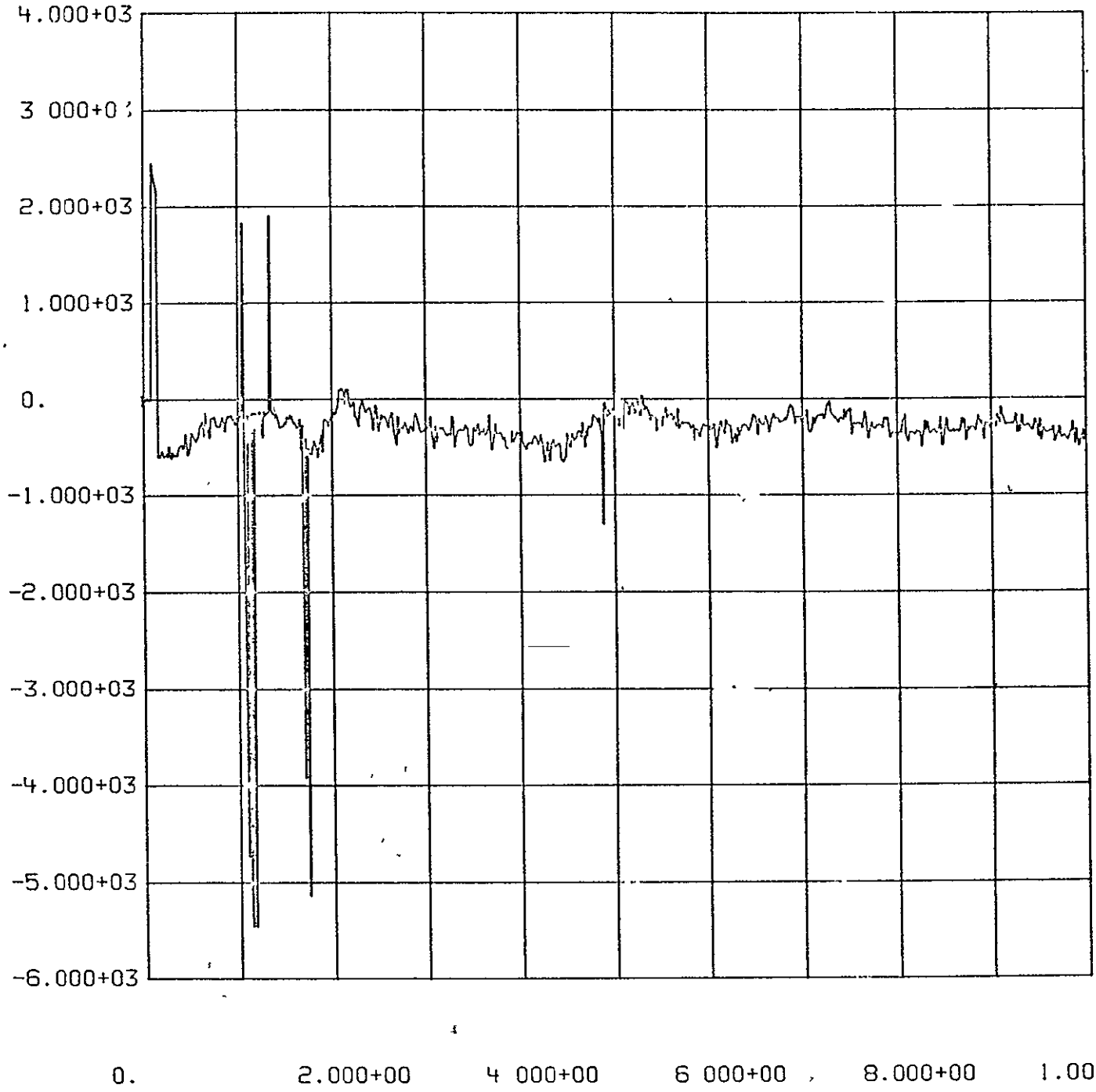
Z-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.7-2 * UNFILT *



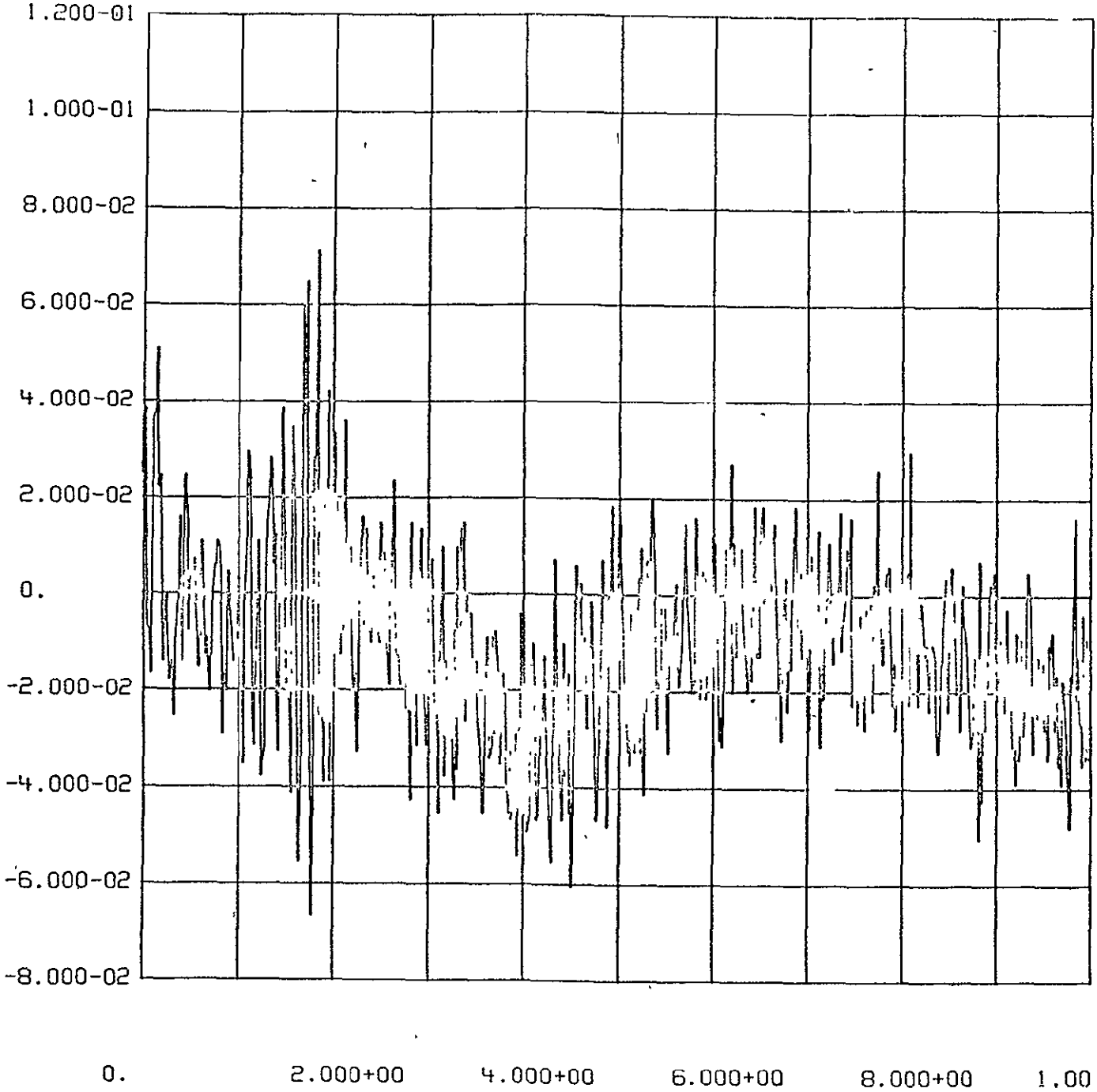
Y-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.7-2 * UNFILT *



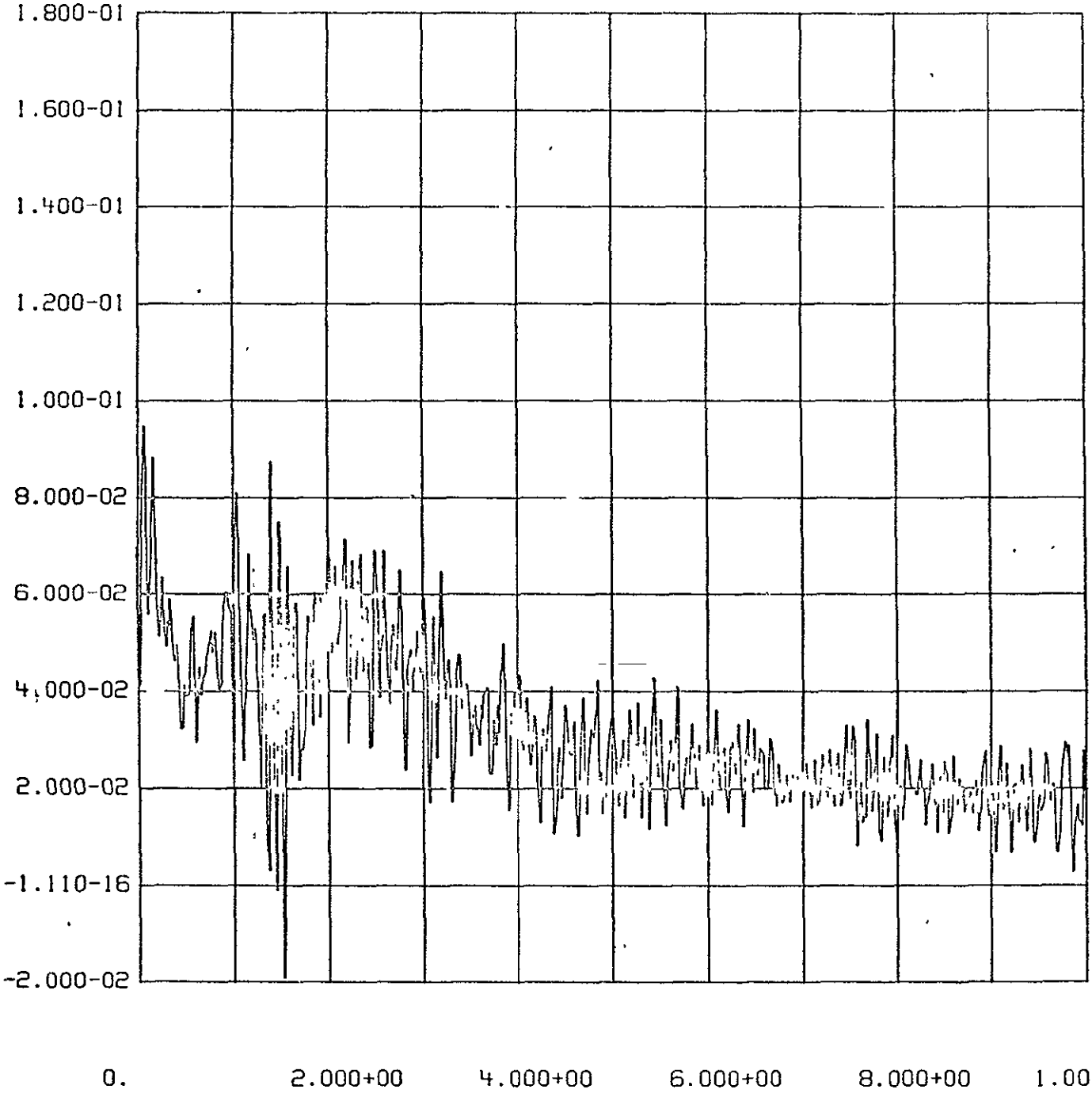
MOMENT VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.7-2 * UNFILT *



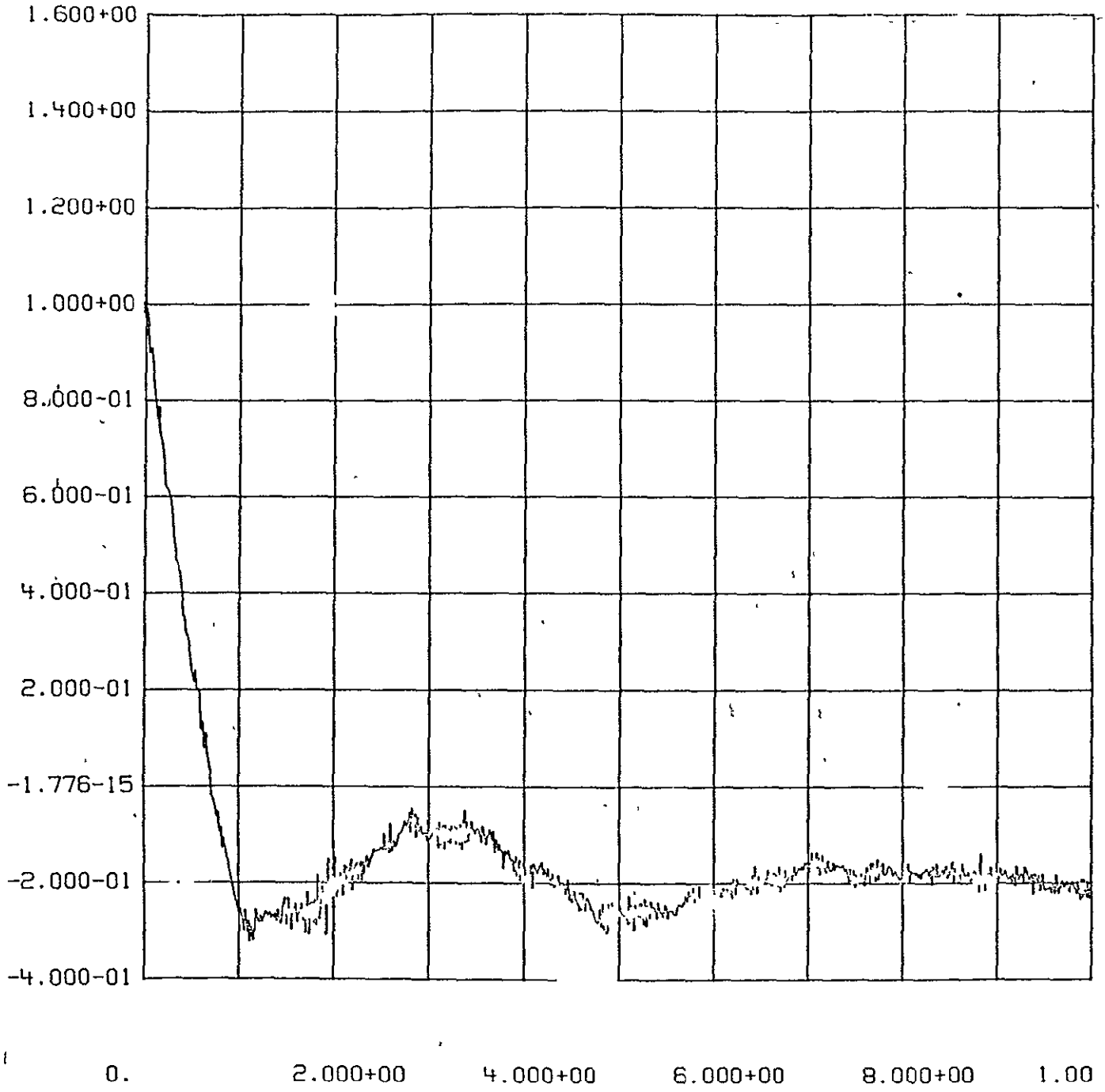
AC YAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.7-2 * UNFILT *



AC XAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.7-2 * UNFILT *

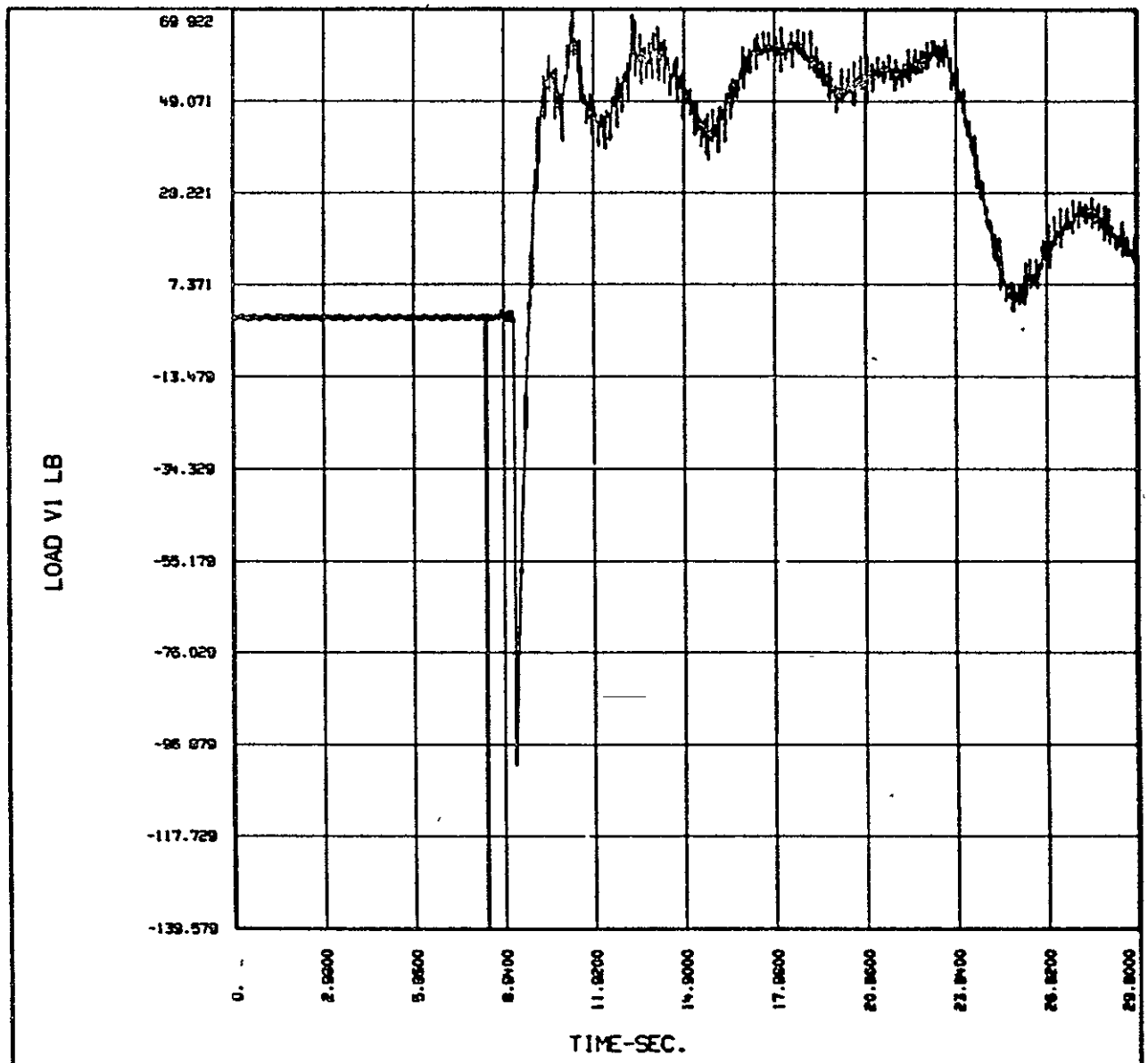


AC ZAC VS TIME

FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.7-2 * UNFILT *

Test Data Condition 4.8-1

Baffles
Test Fluid – Water
Orientation – 13°
Fill Volume – 10%
Target Acceleration–0.2 g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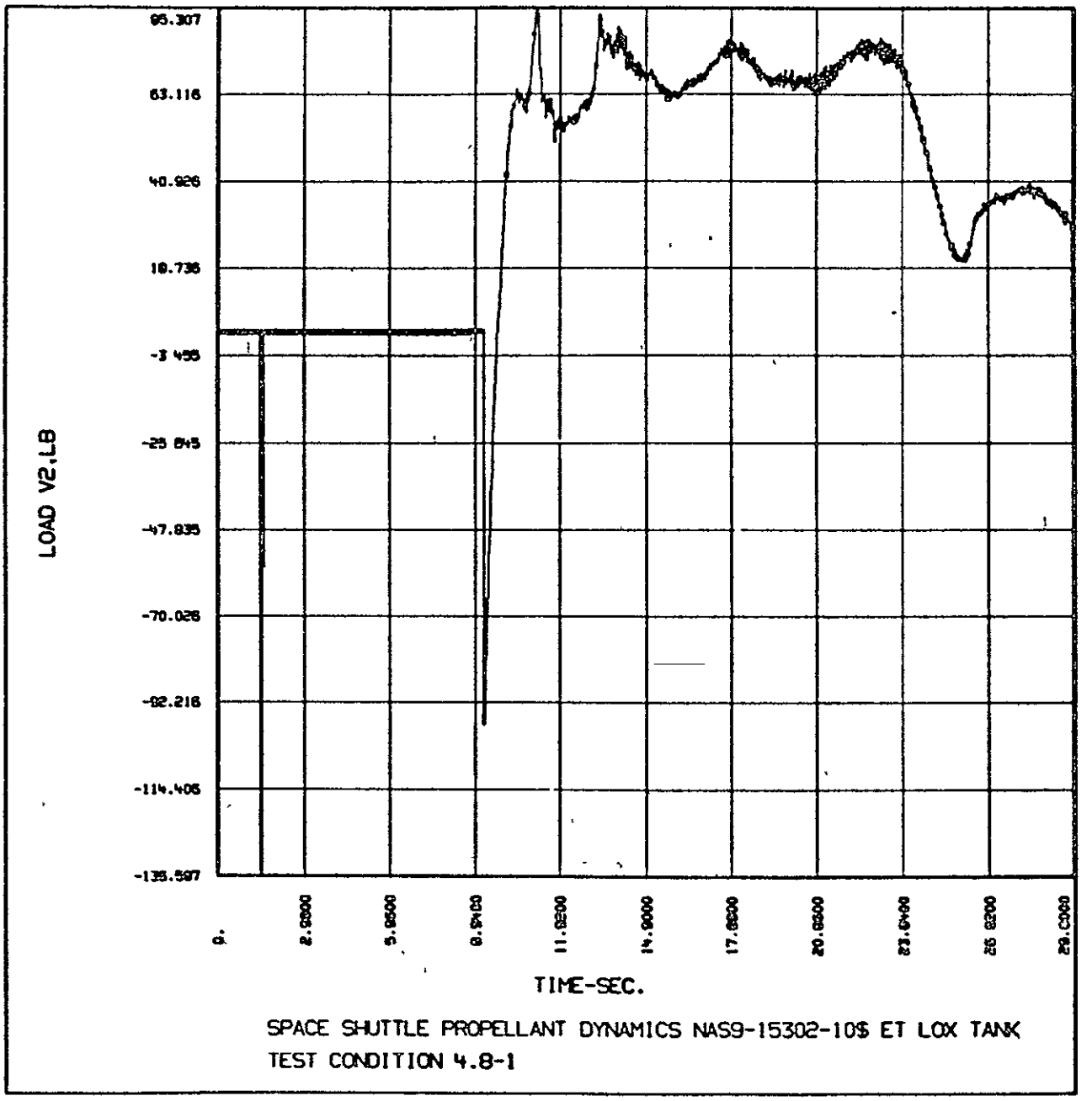
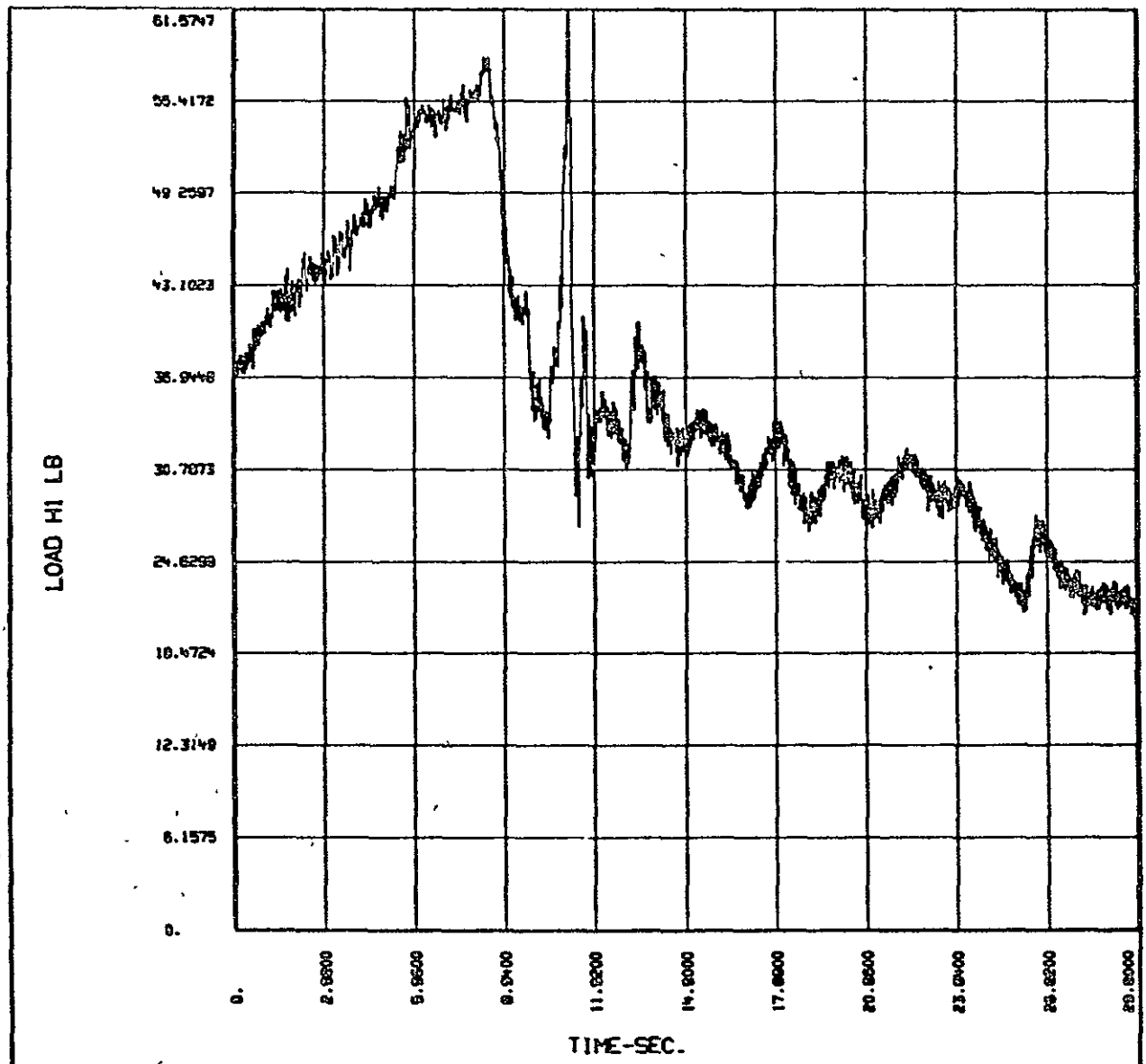
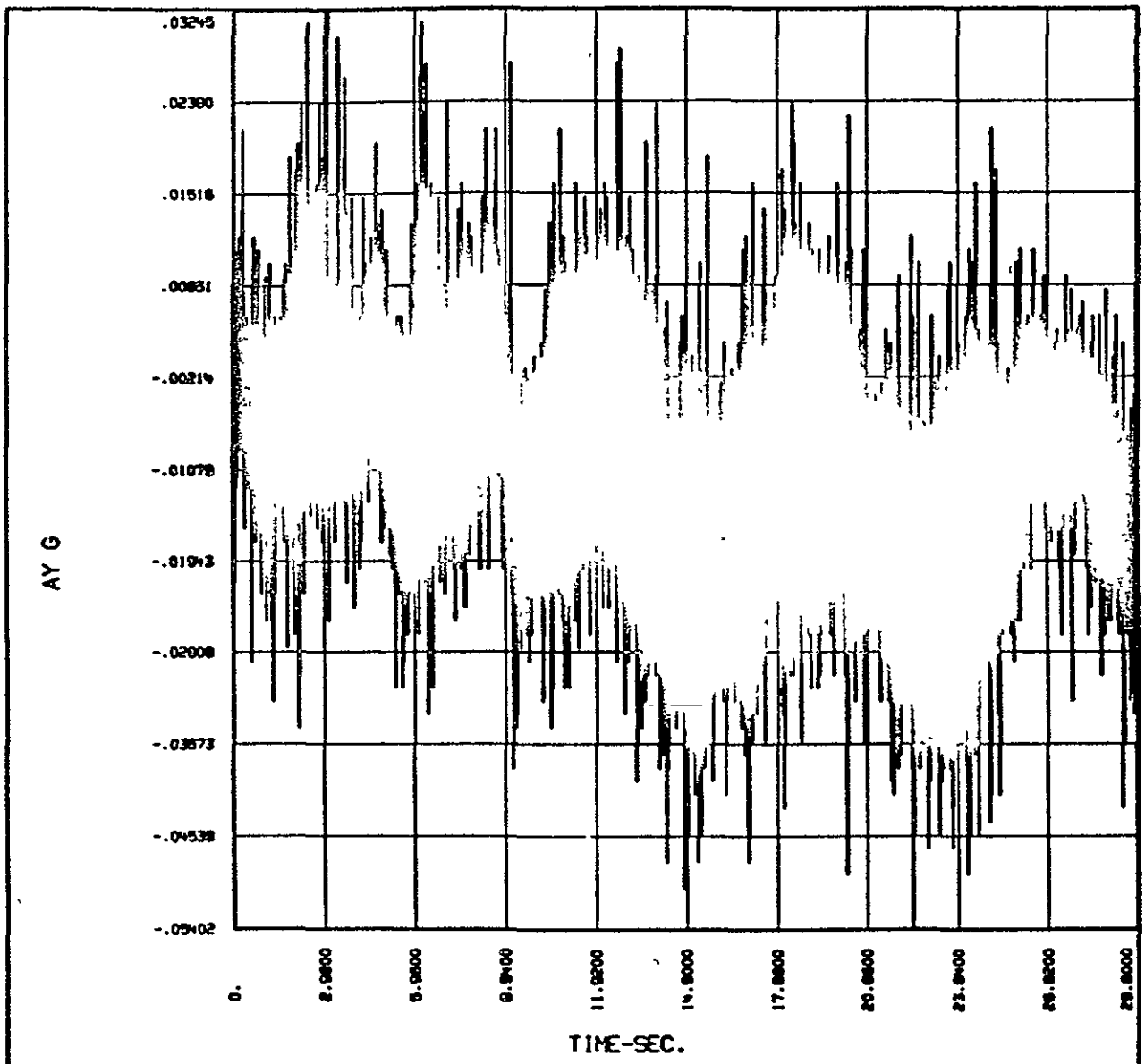
29.221
7.371
-13.479
-34.329
-55.179
-76.029
-96.879
-117.729
-139.579
LOAD V1 LB
0.
2.9500
5.9500
8.9400
11.9200
14.9000
17.9600
20.8600
23.8400
26.8200
29.8000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.8-1



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.8-1



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.8-1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AY G
0.
2.9800
5.9600
8.9400
11.9200
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17.8800
20.8600
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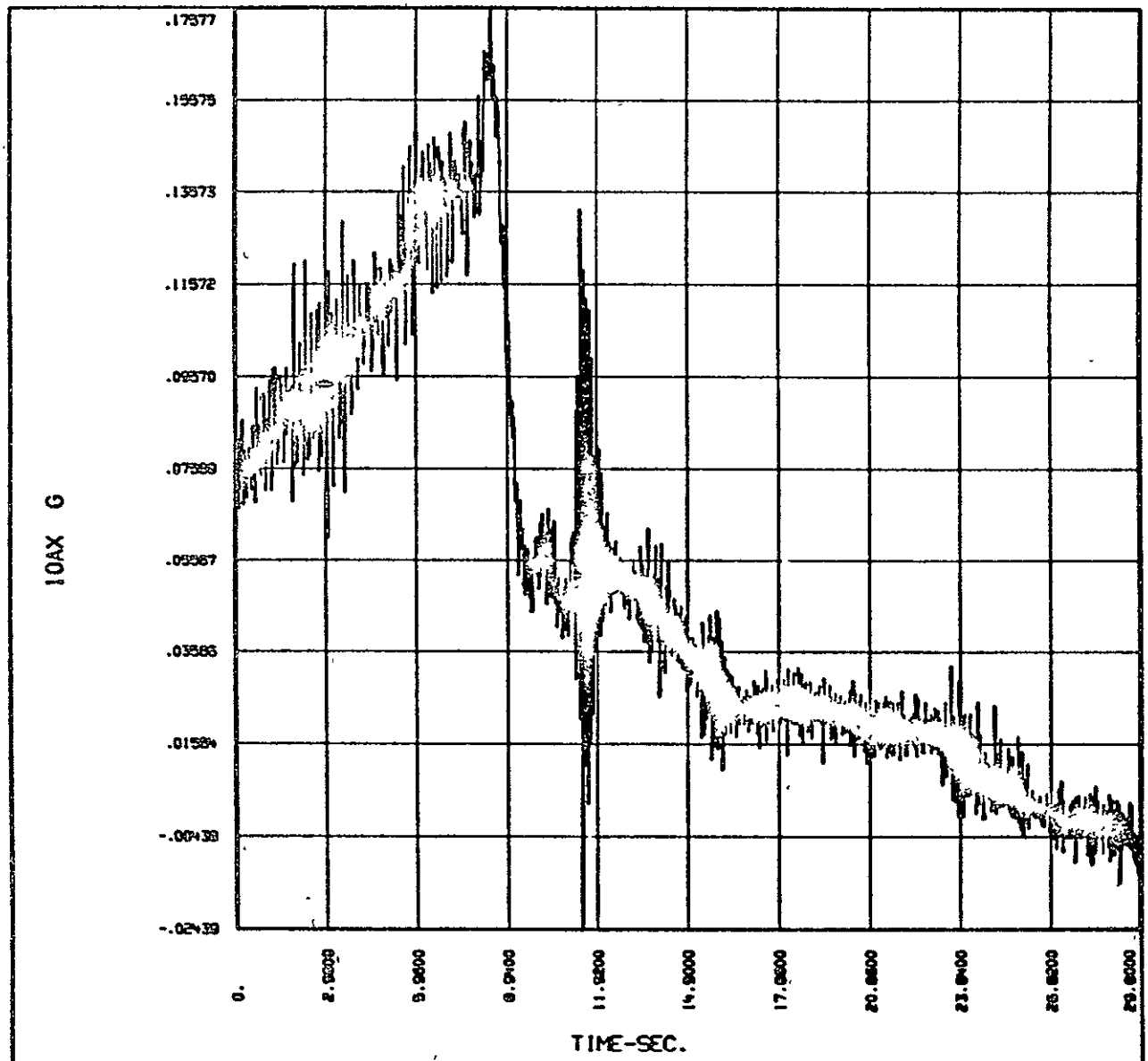
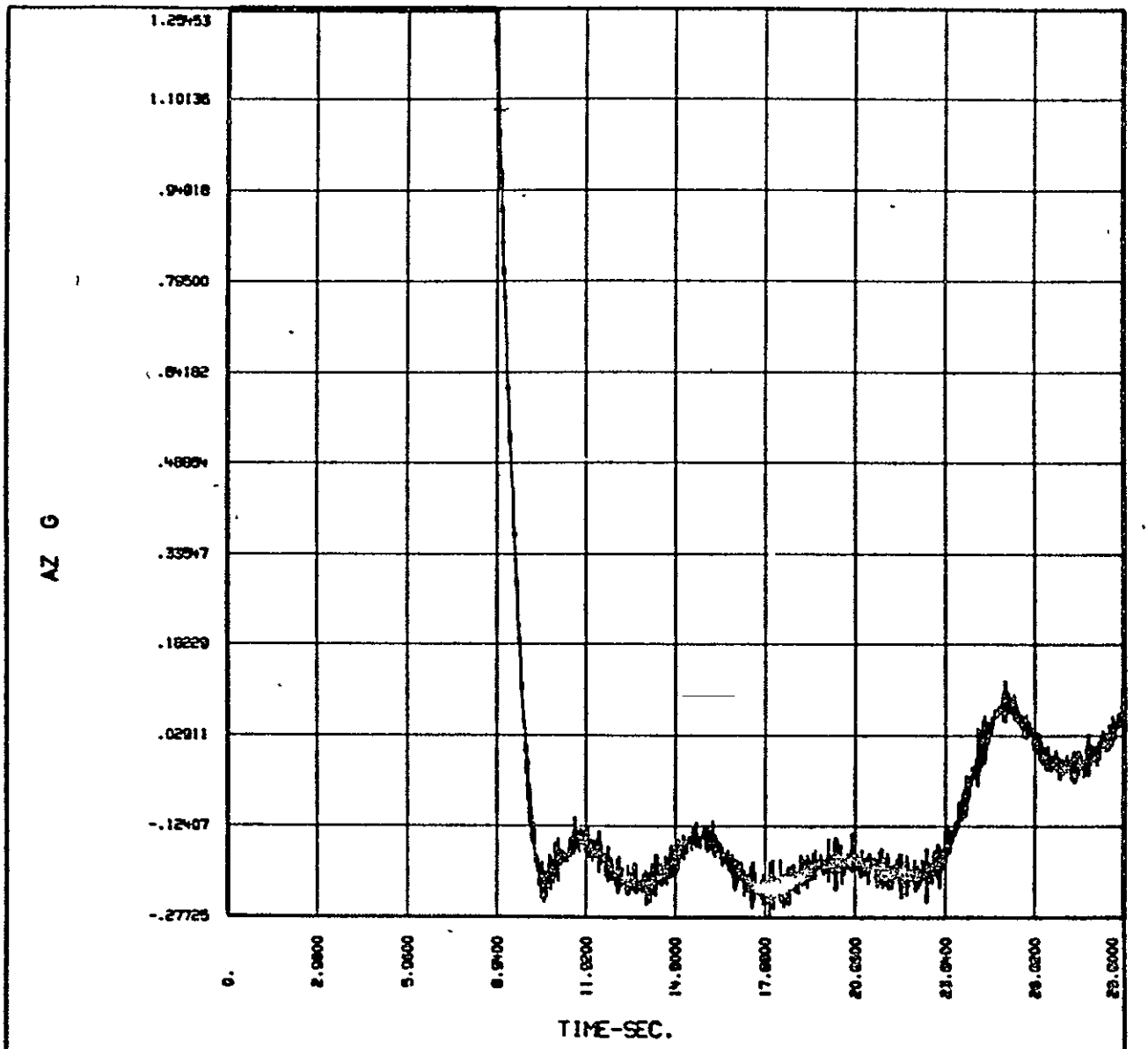
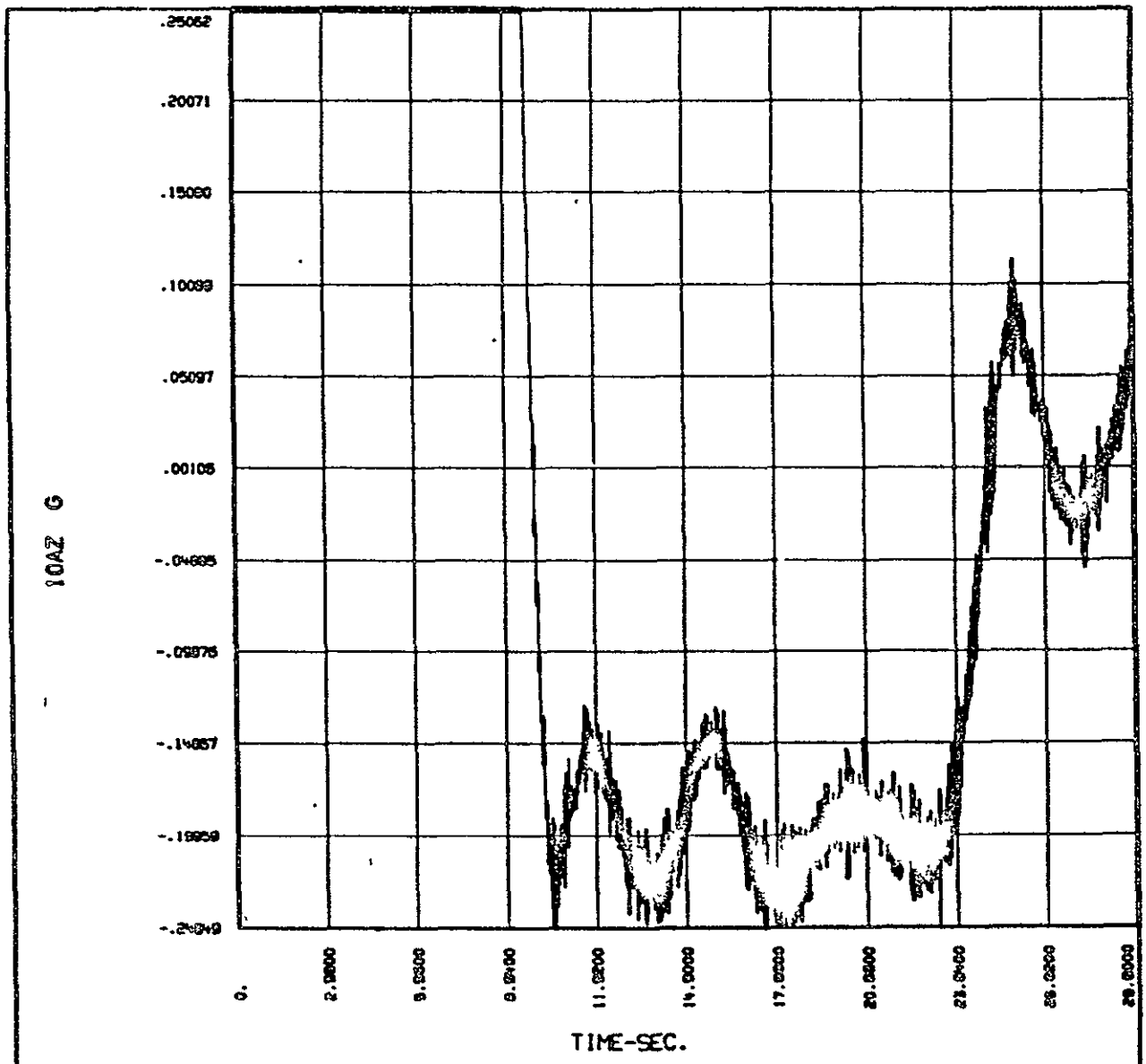
26.8200
29.8000
TIME-SEC.
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.8-1



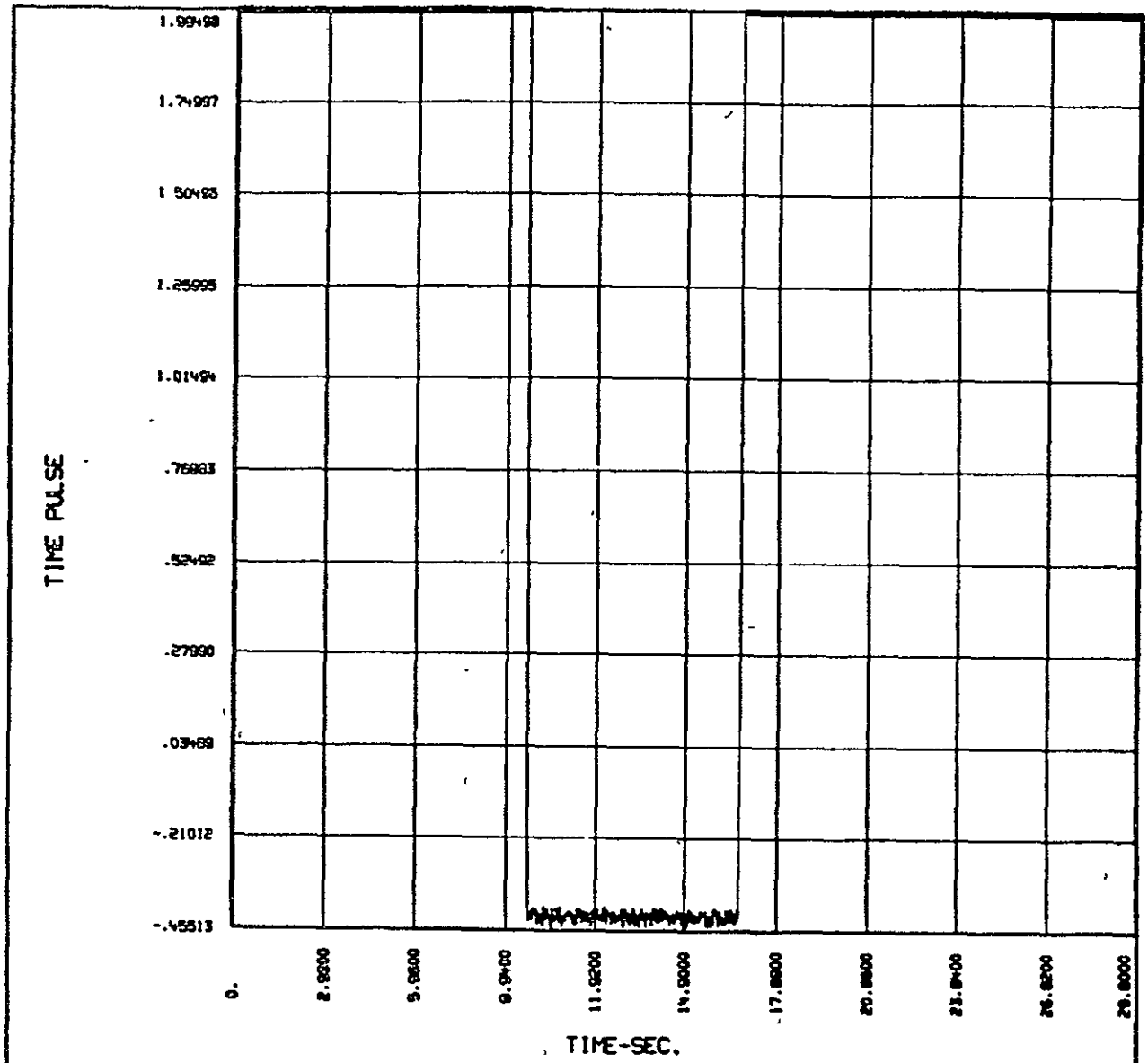
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.8-1



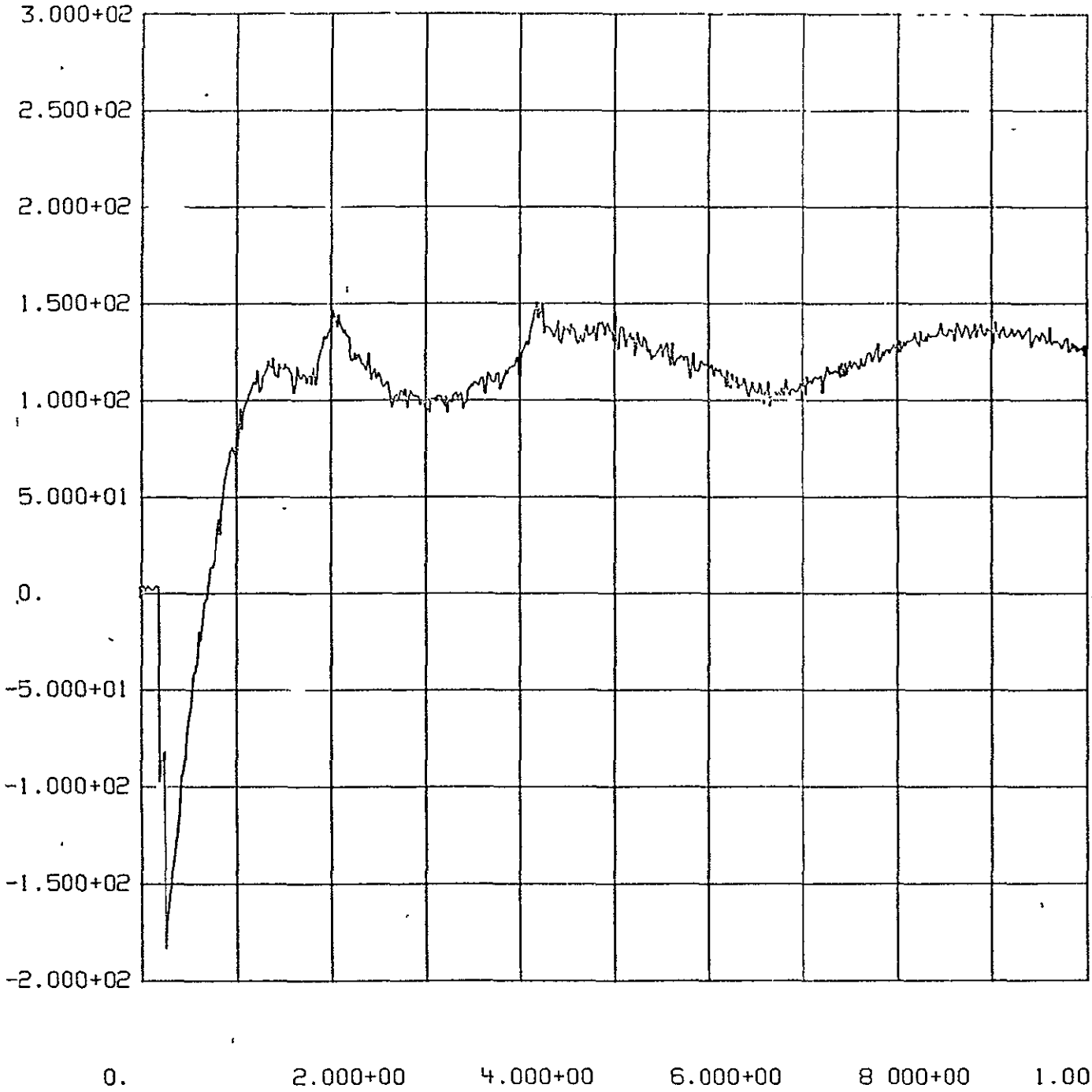
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET, LOX TANK
TEST CONDITION 4.8-1



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.8-1

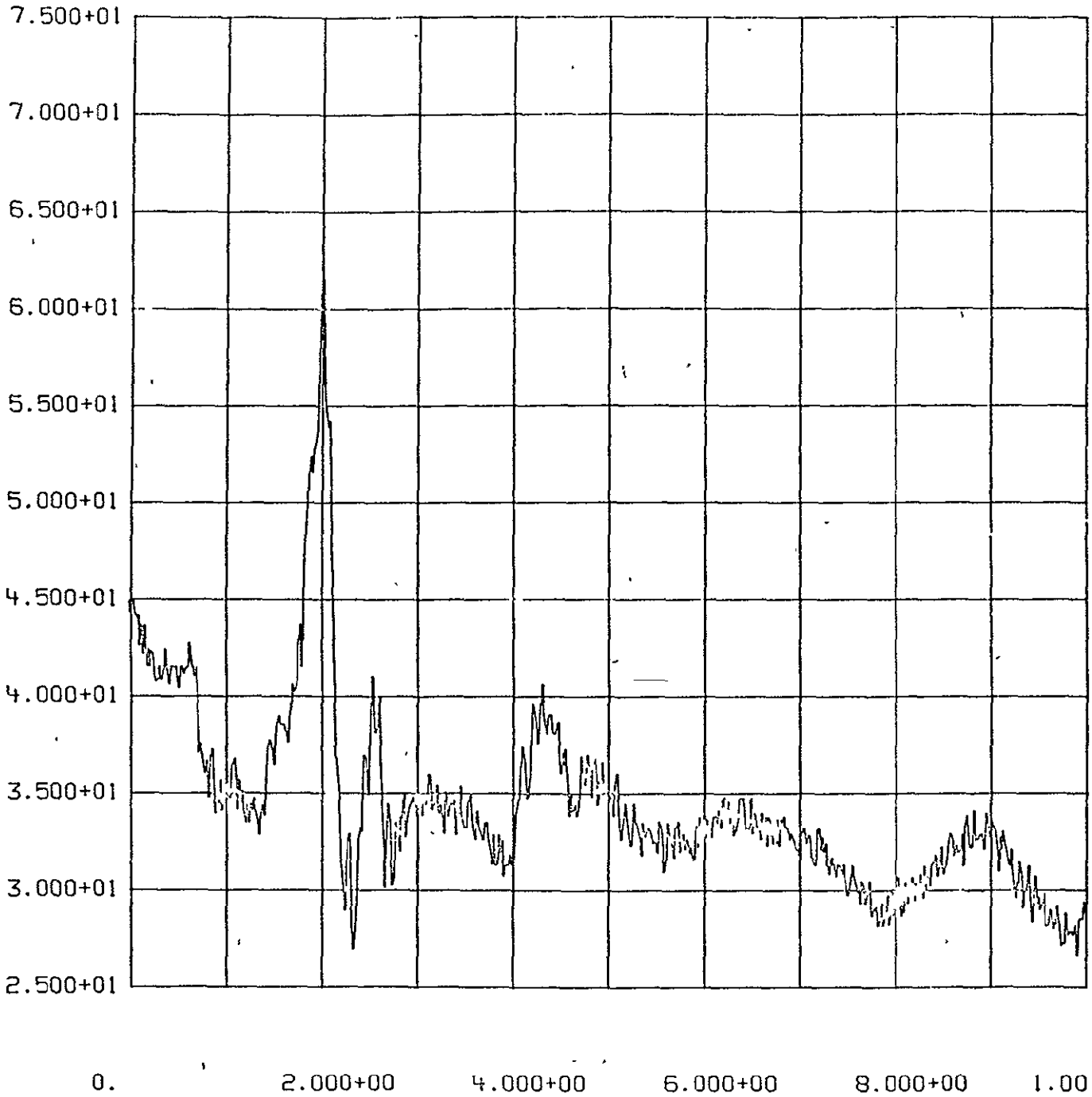


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.8-1



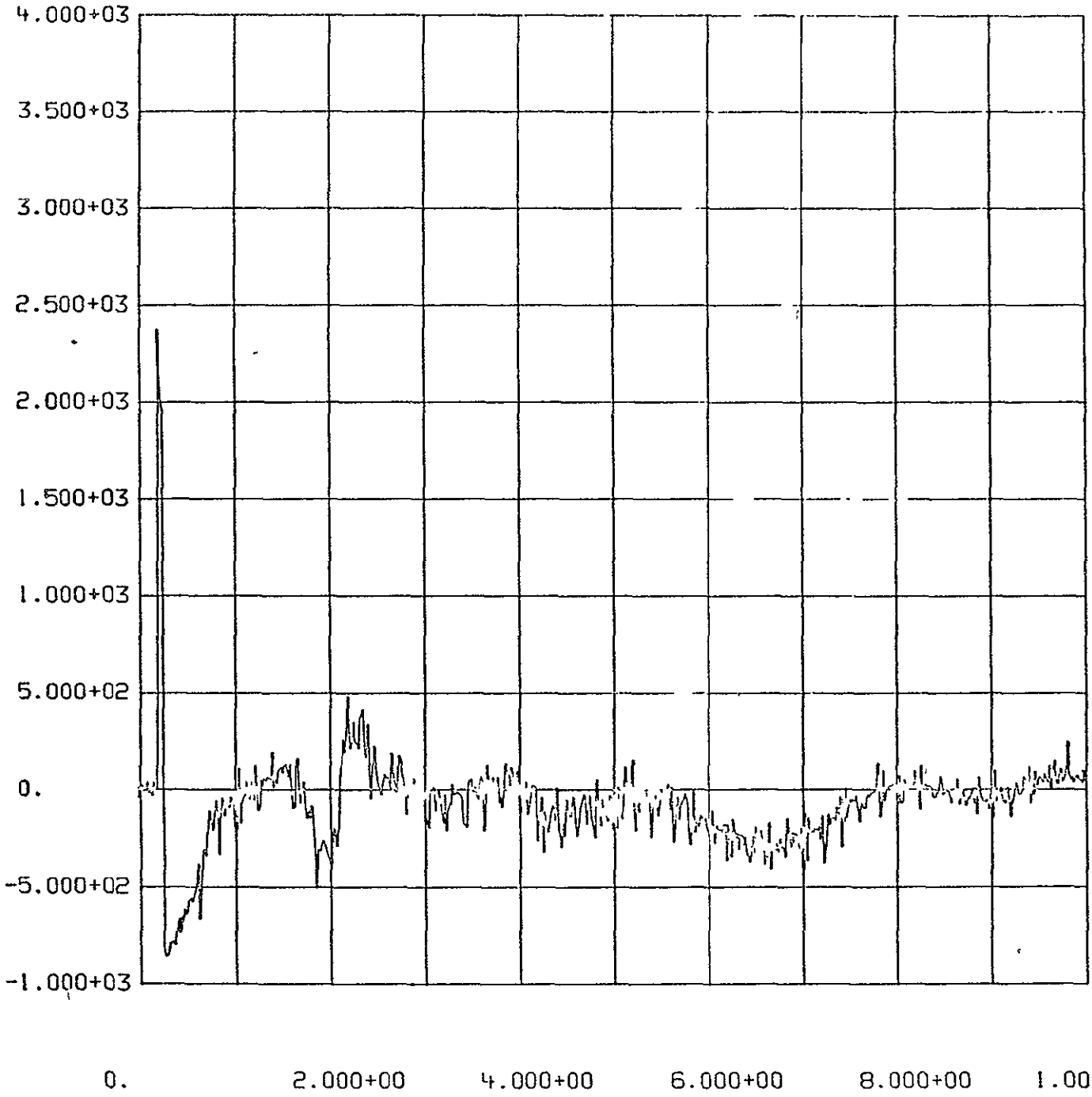
Z-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.8-1 * UNFILT *



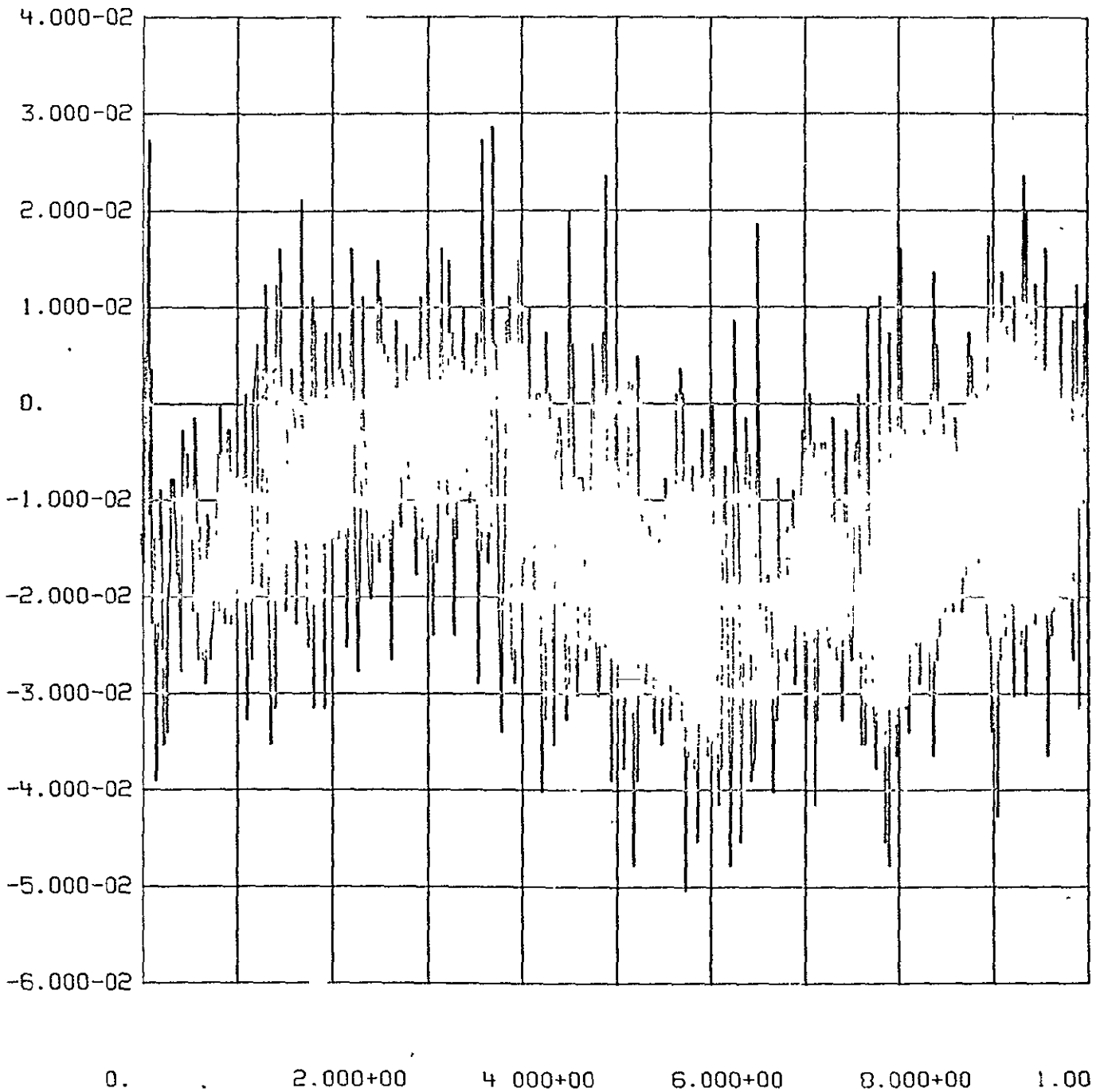
Y-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4 8-1 * UNFILT *



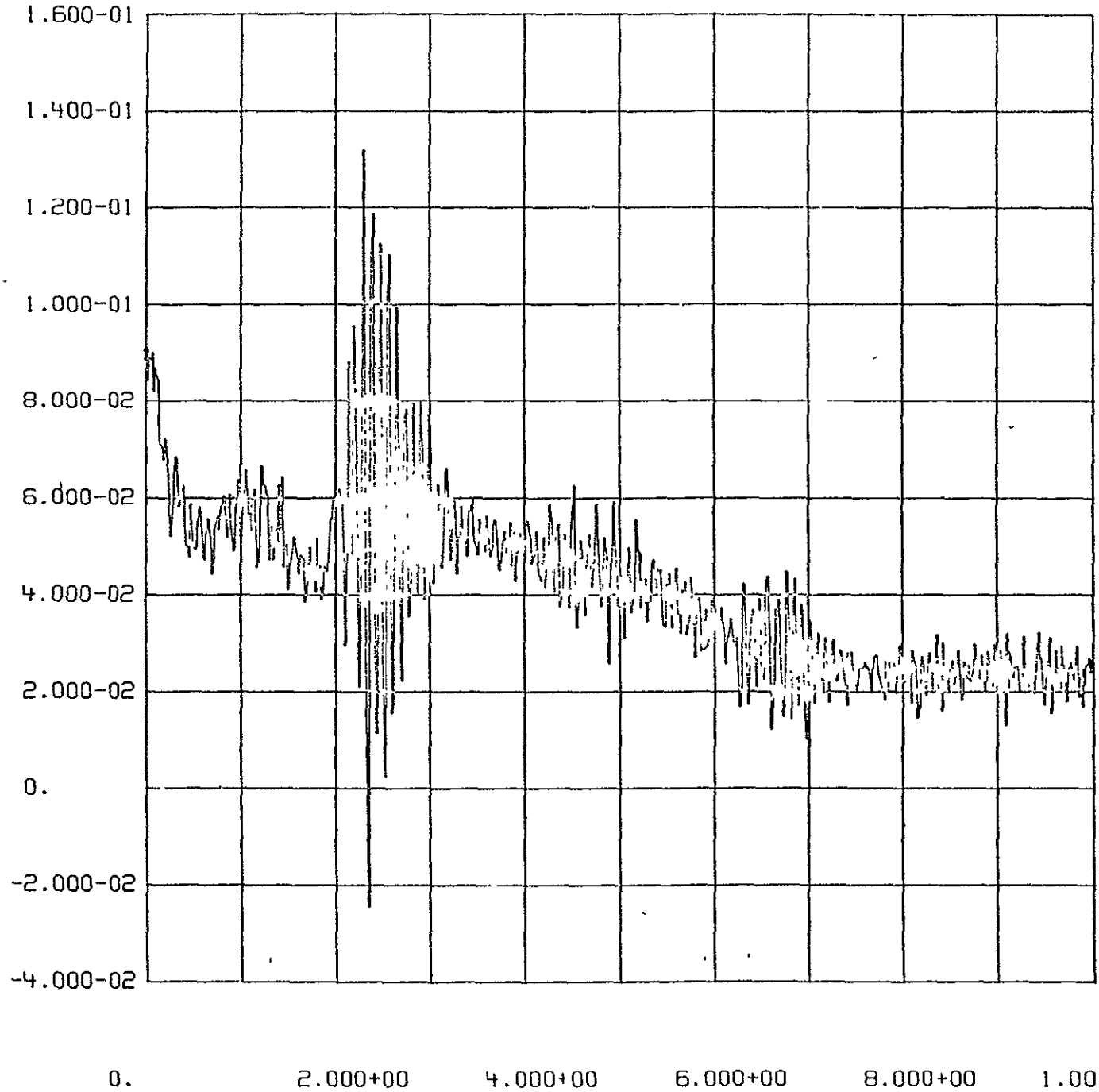
MOMENT VS TIME

1 FLT 3 OGN078 FLIGHT 4 TEST CONDITION 4.8-1 * UNFILT *



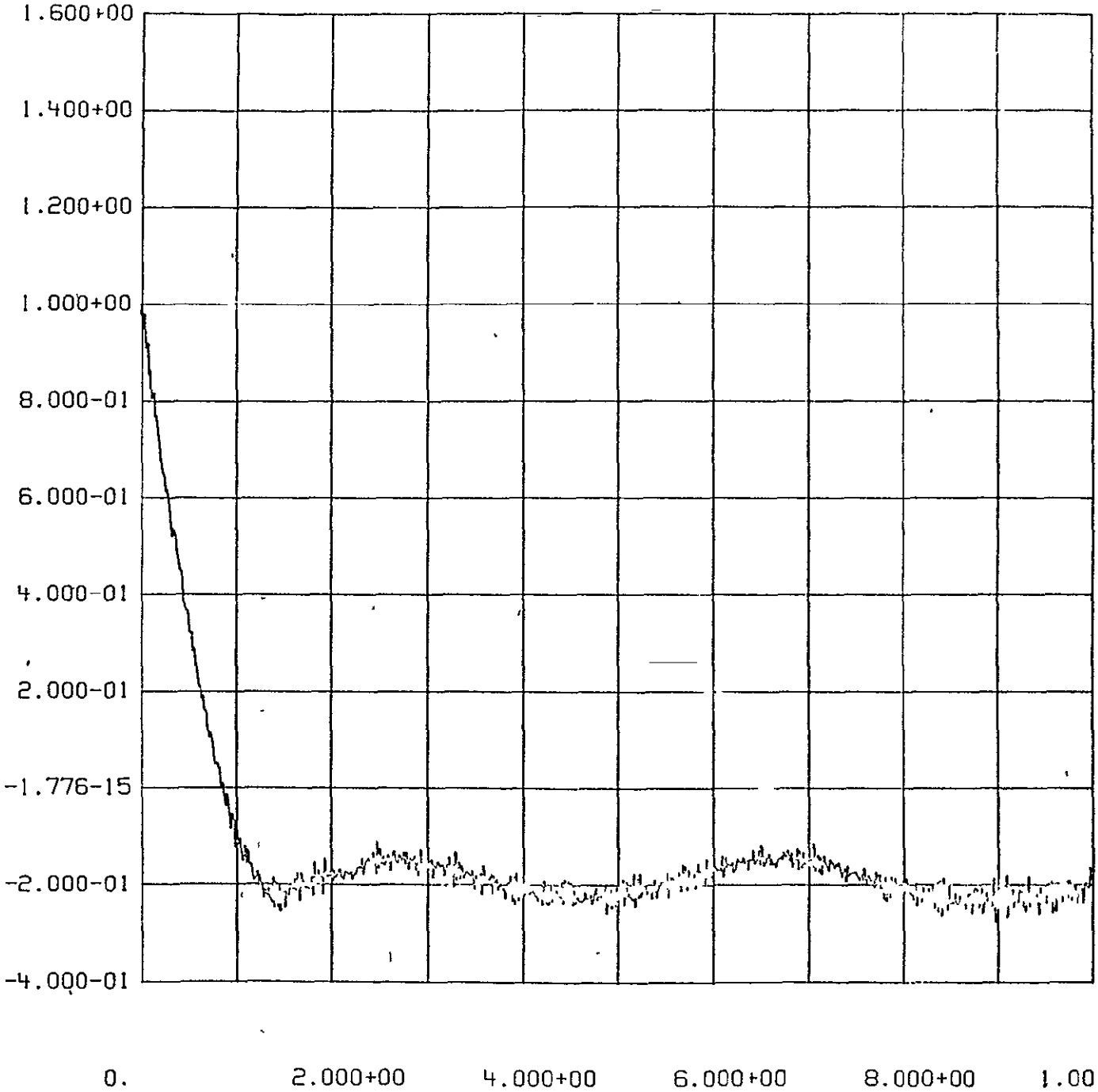
AC YAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.8-1 * UNFILT *



AC XAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.8-1 * UNFILT *

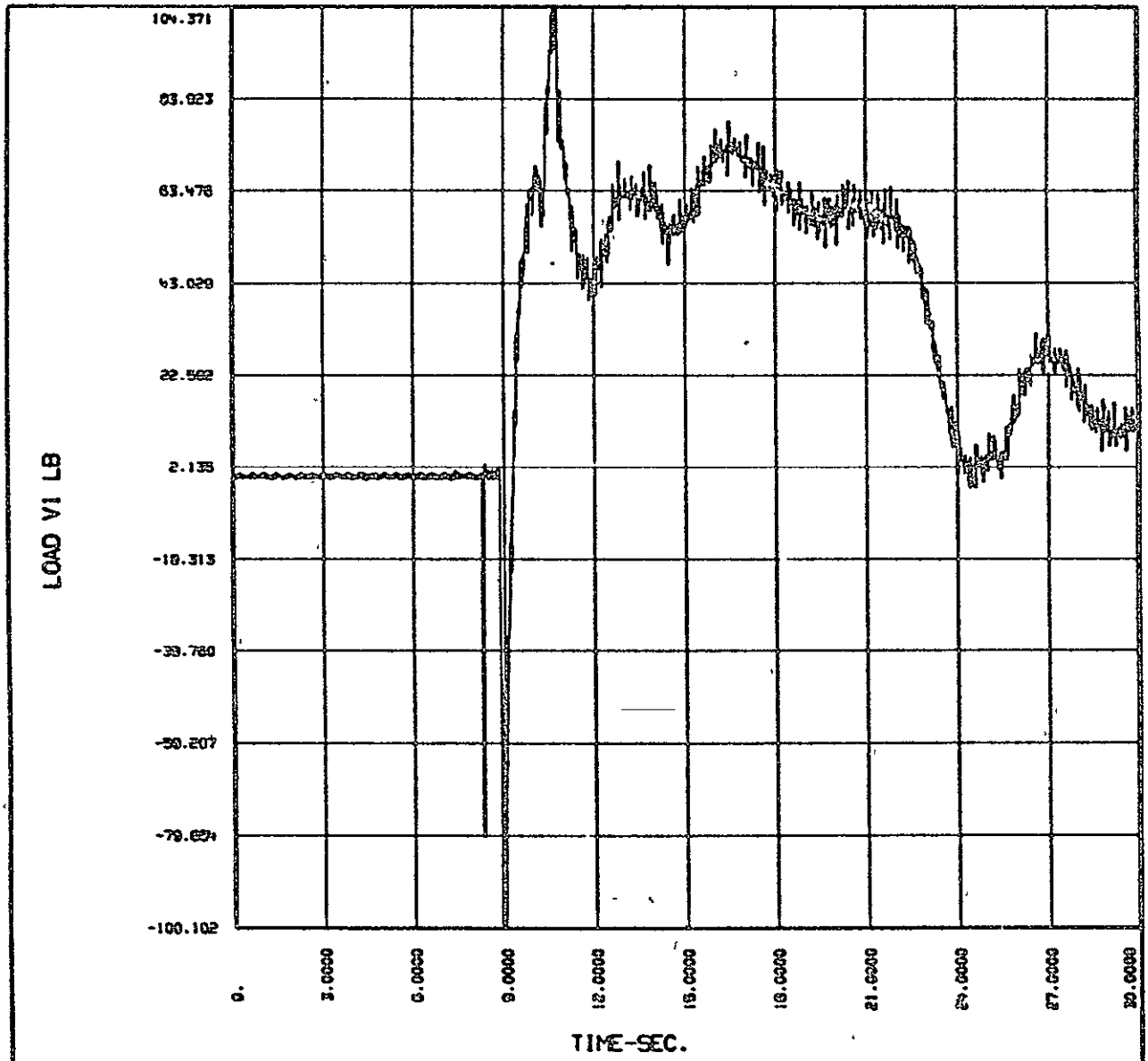


AC ZAC VS TIME

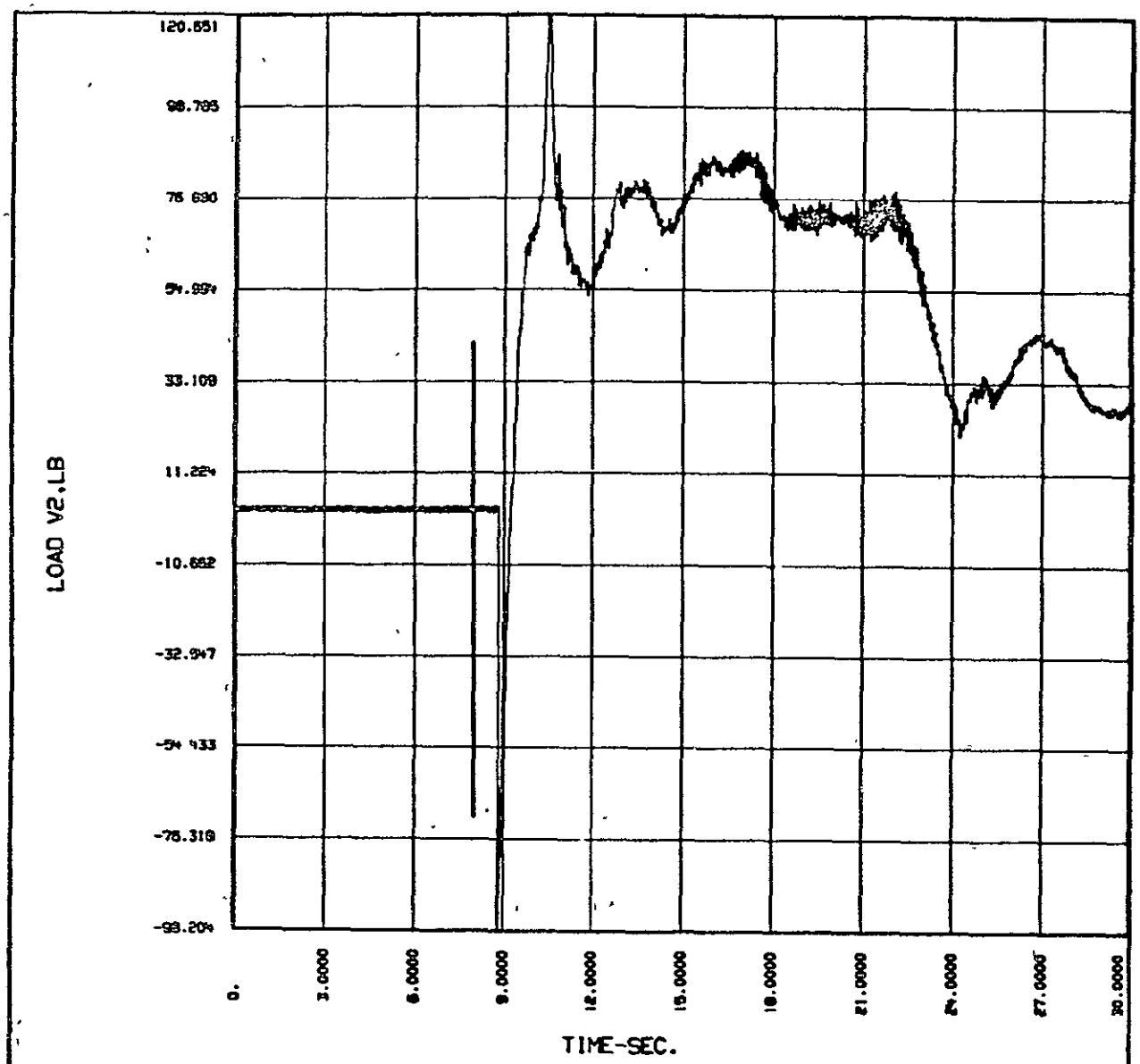
1 FLT 3 06NO78 FLIGHT 4 TEST CONDITION 4.8-1 * UNFILT *

Test Data Condition 4.9-3

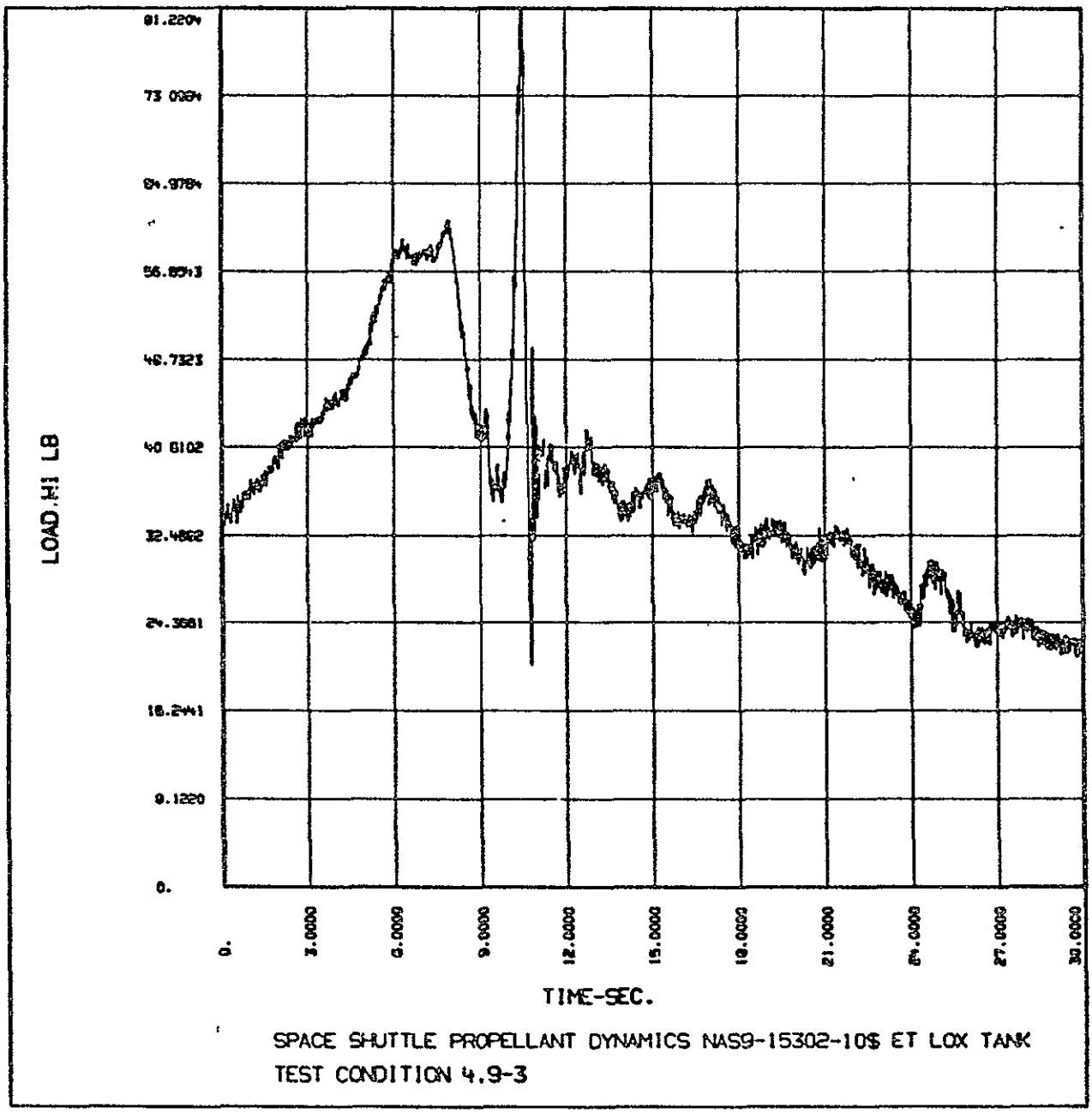
Baffles
Test Fluid – Water
Orientation – 13°
Fill Volume – 16%
Target Acceleration–0.2 g



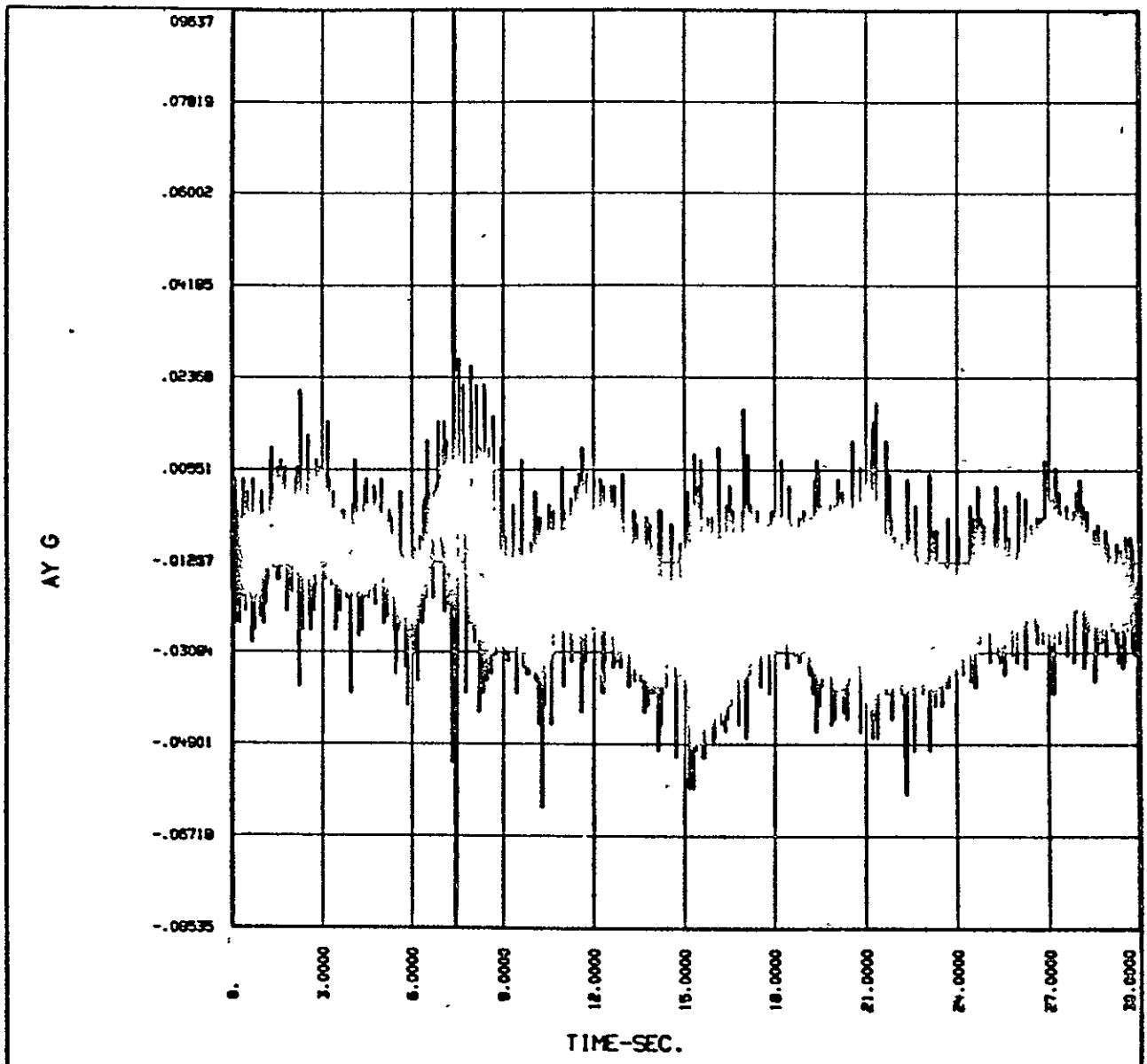
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.9-3



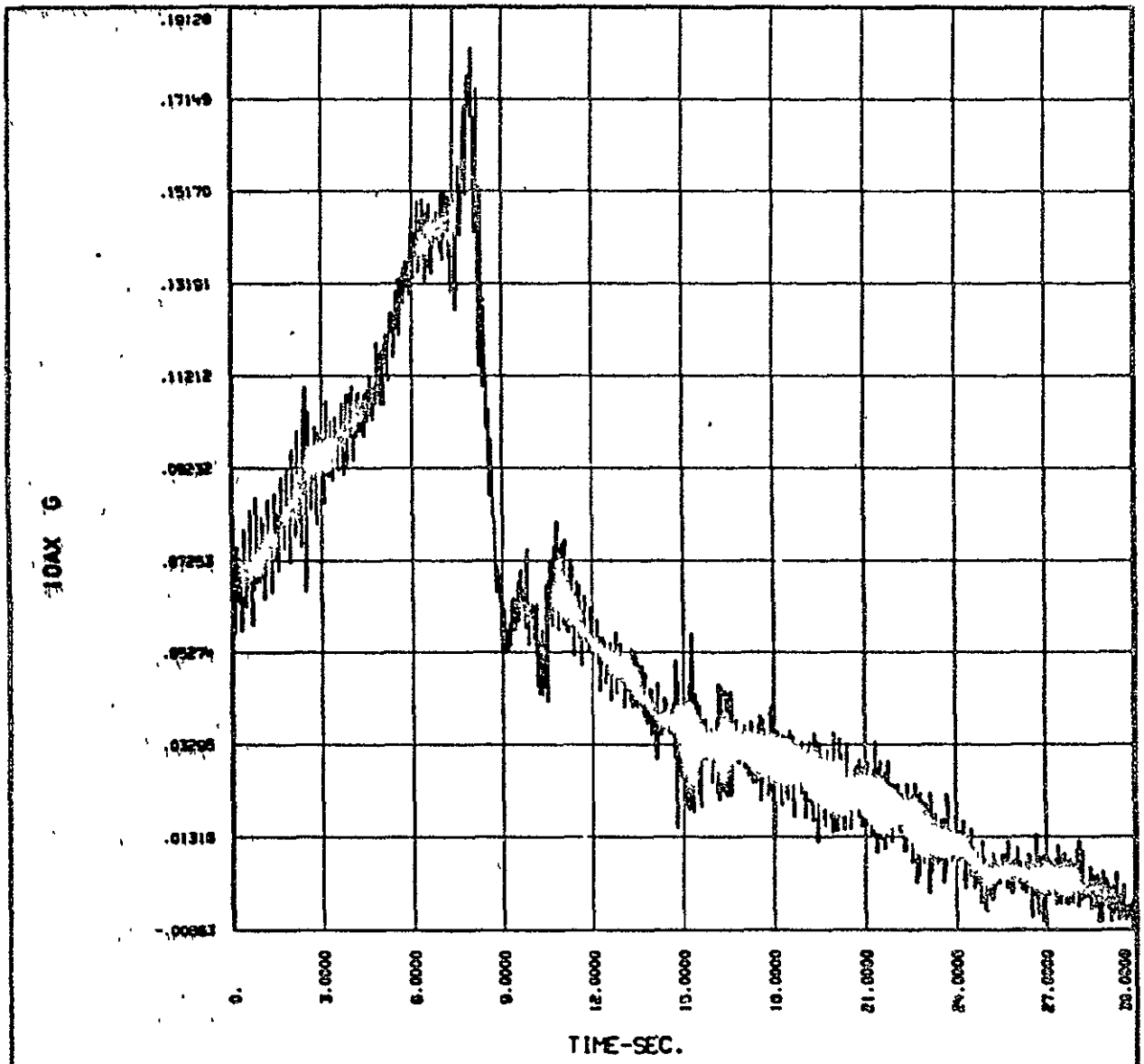
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.9-3



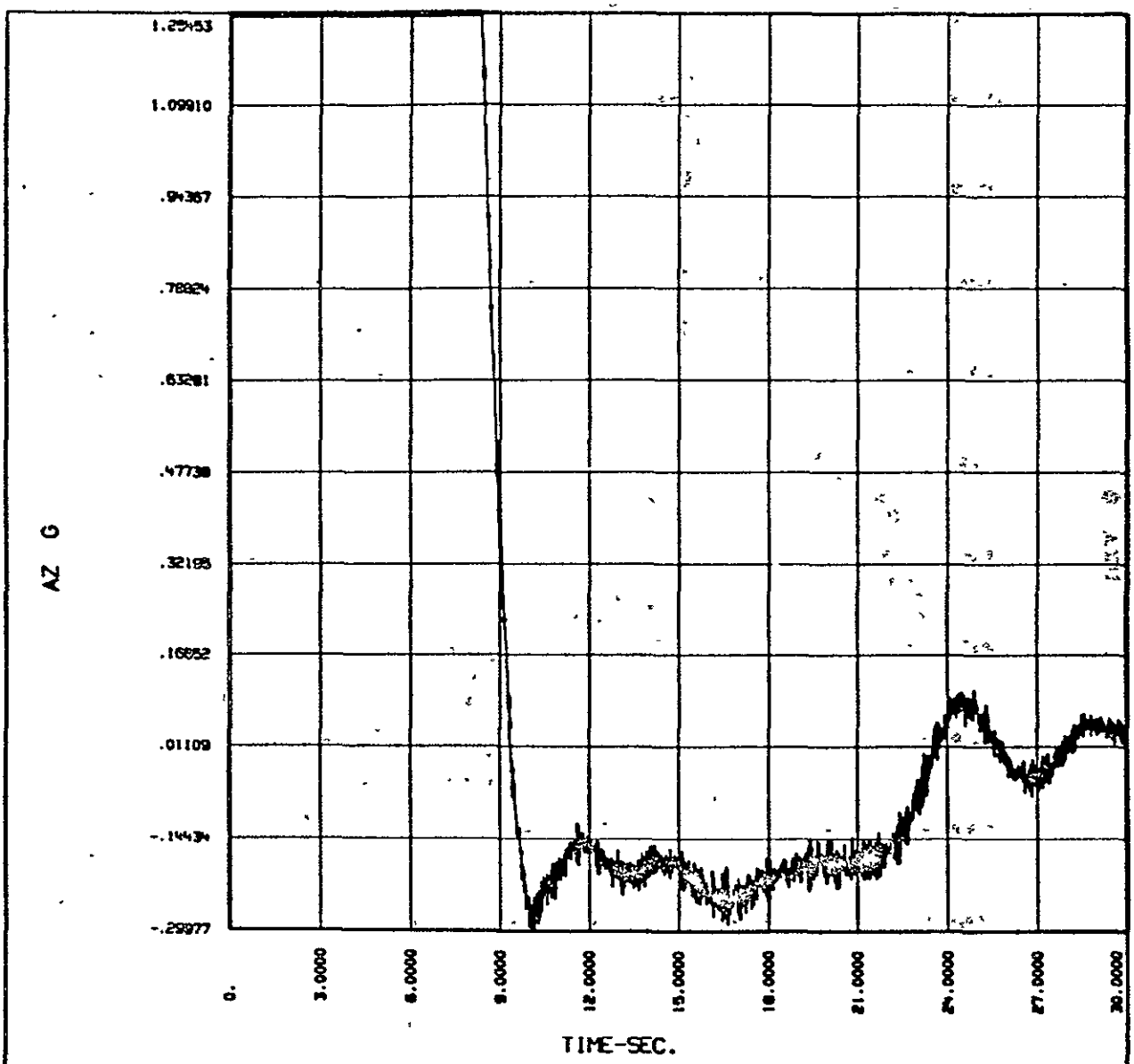
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.9-3



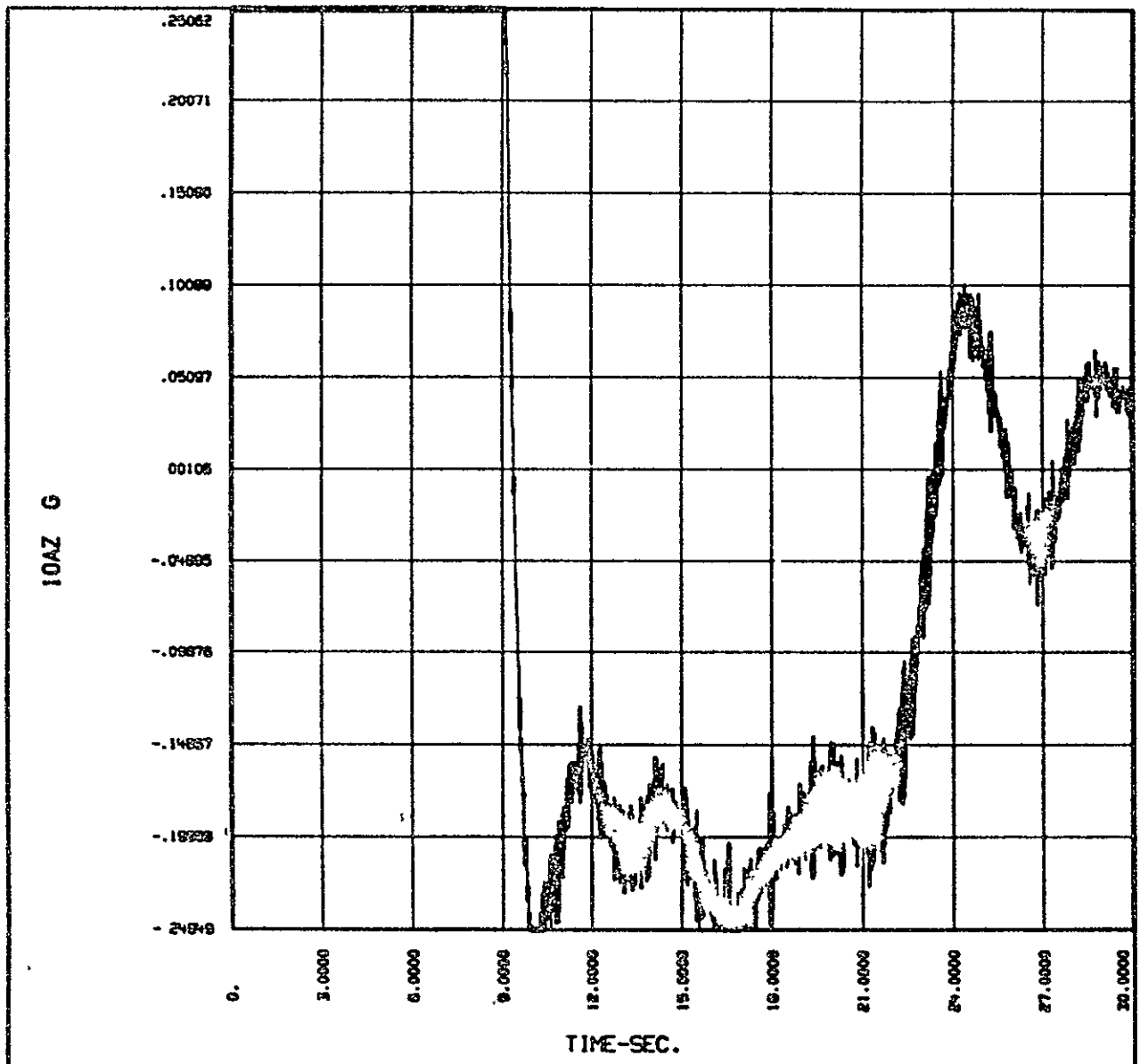
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.9-3



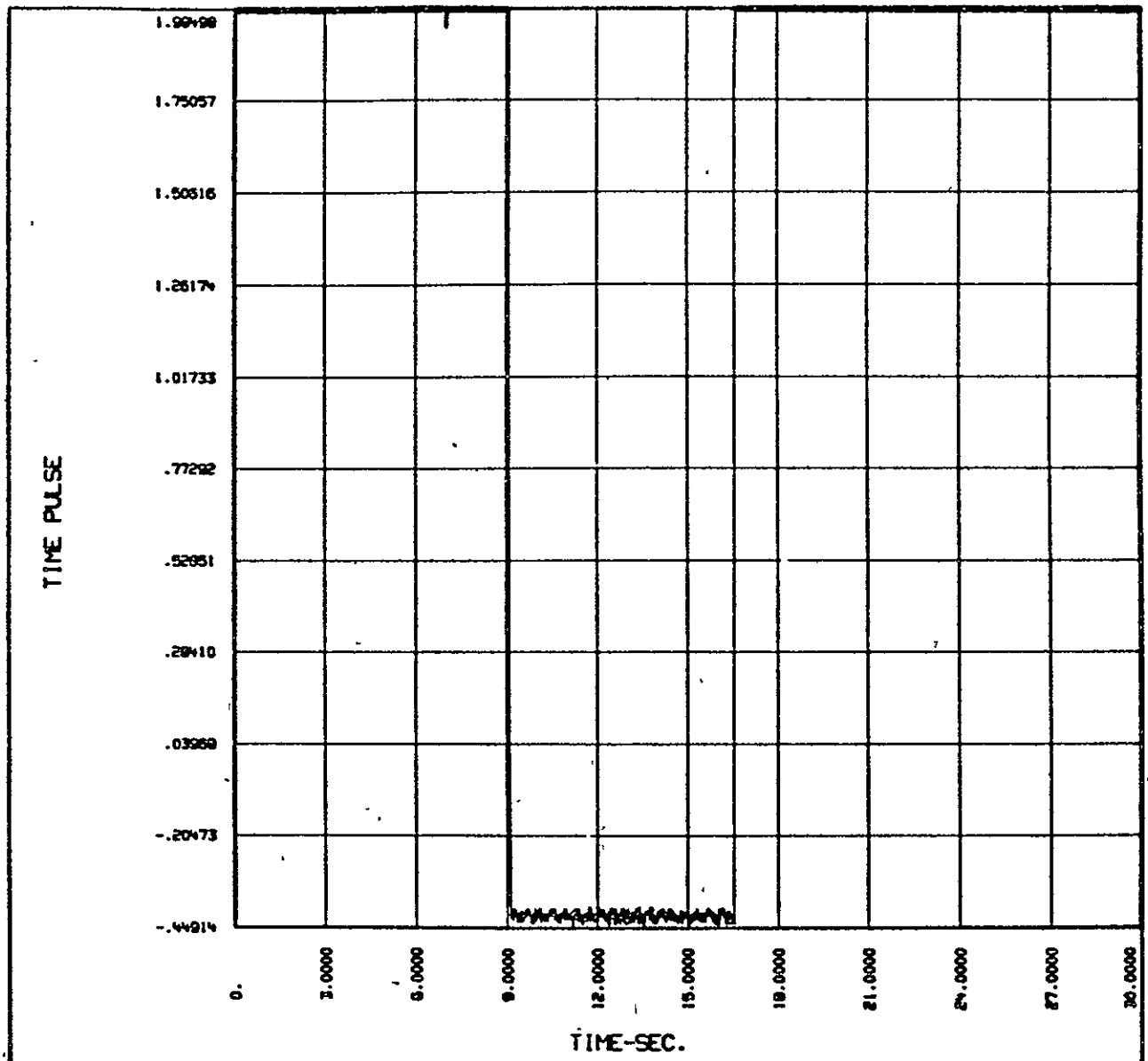
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.9-3



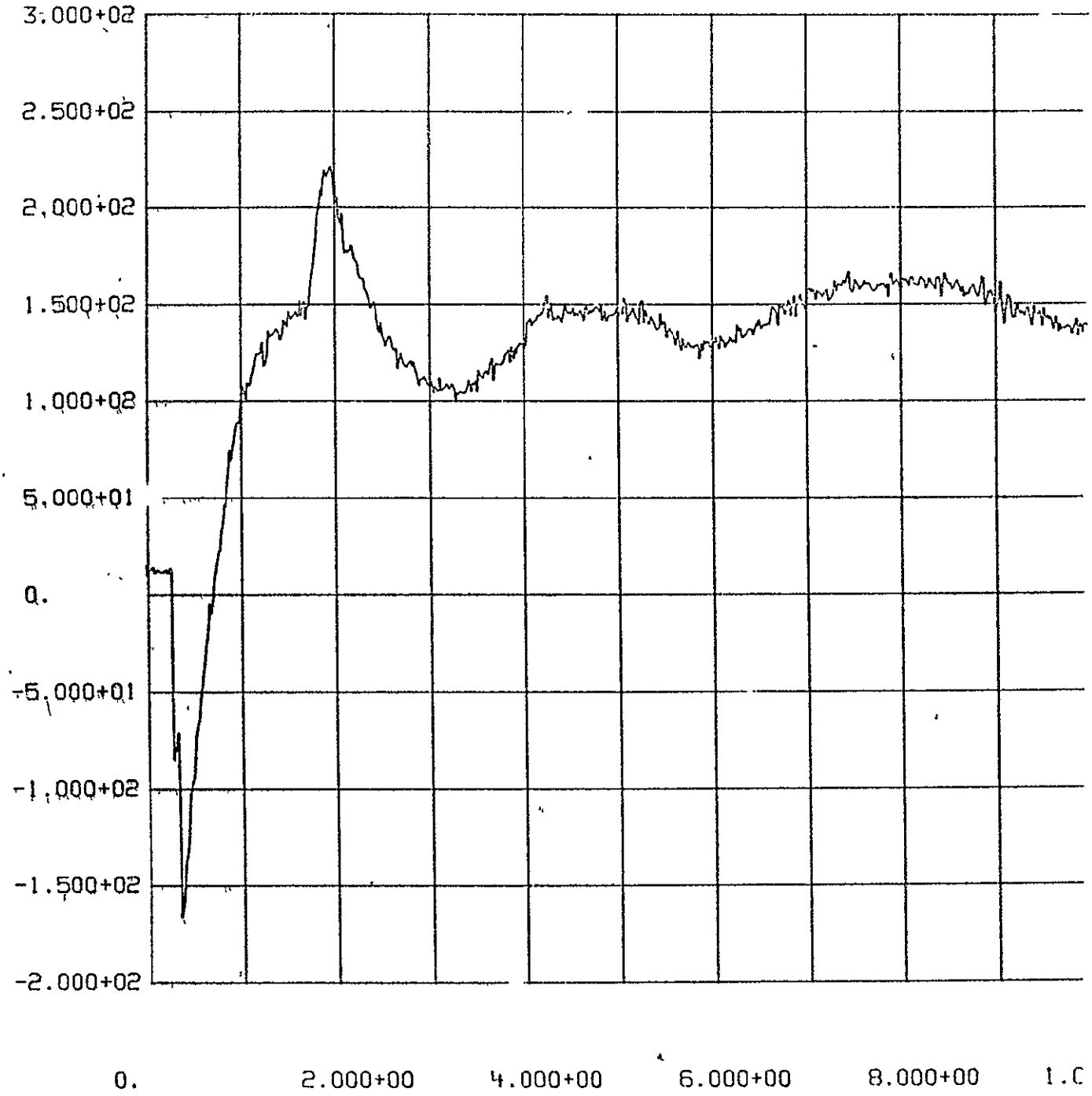
SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.9-3



SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.9-3

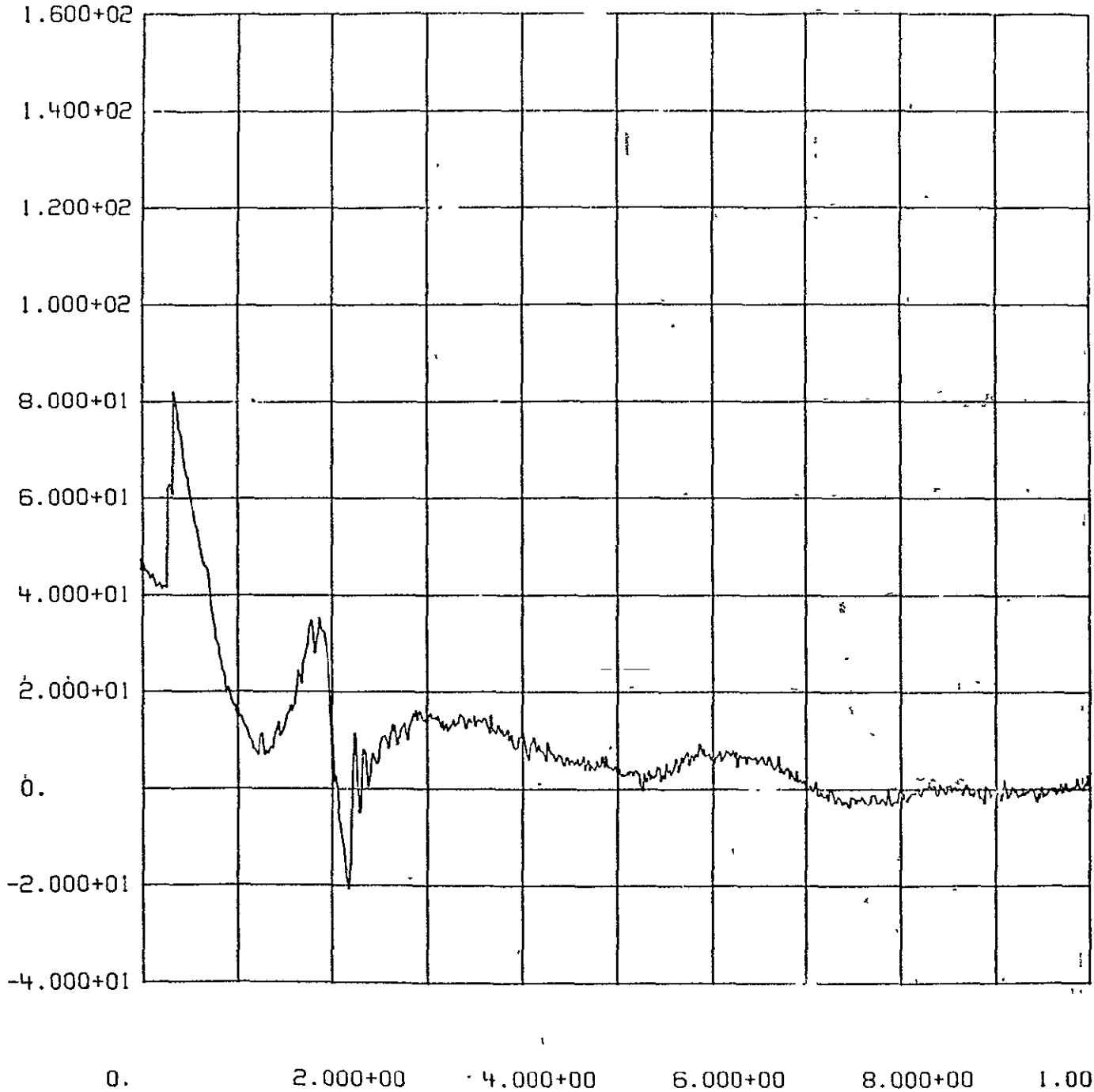


SPACE SHUTTLE PROPELLANT DYNAMICS NAS9-15302-10$ ET LOX TANK
TEST CONDITION 4.9-3



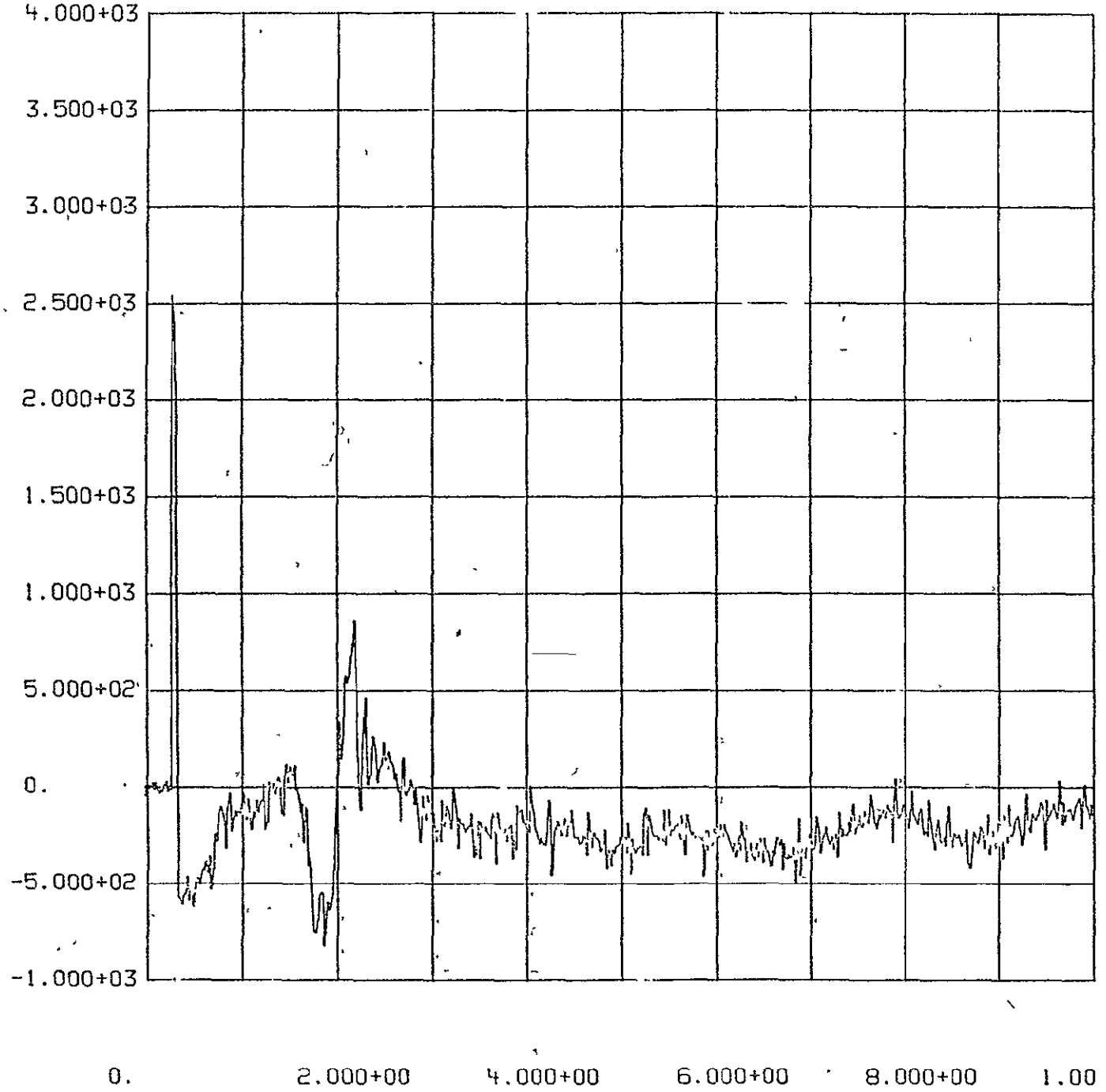
Z-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.9-3 * UNFILT



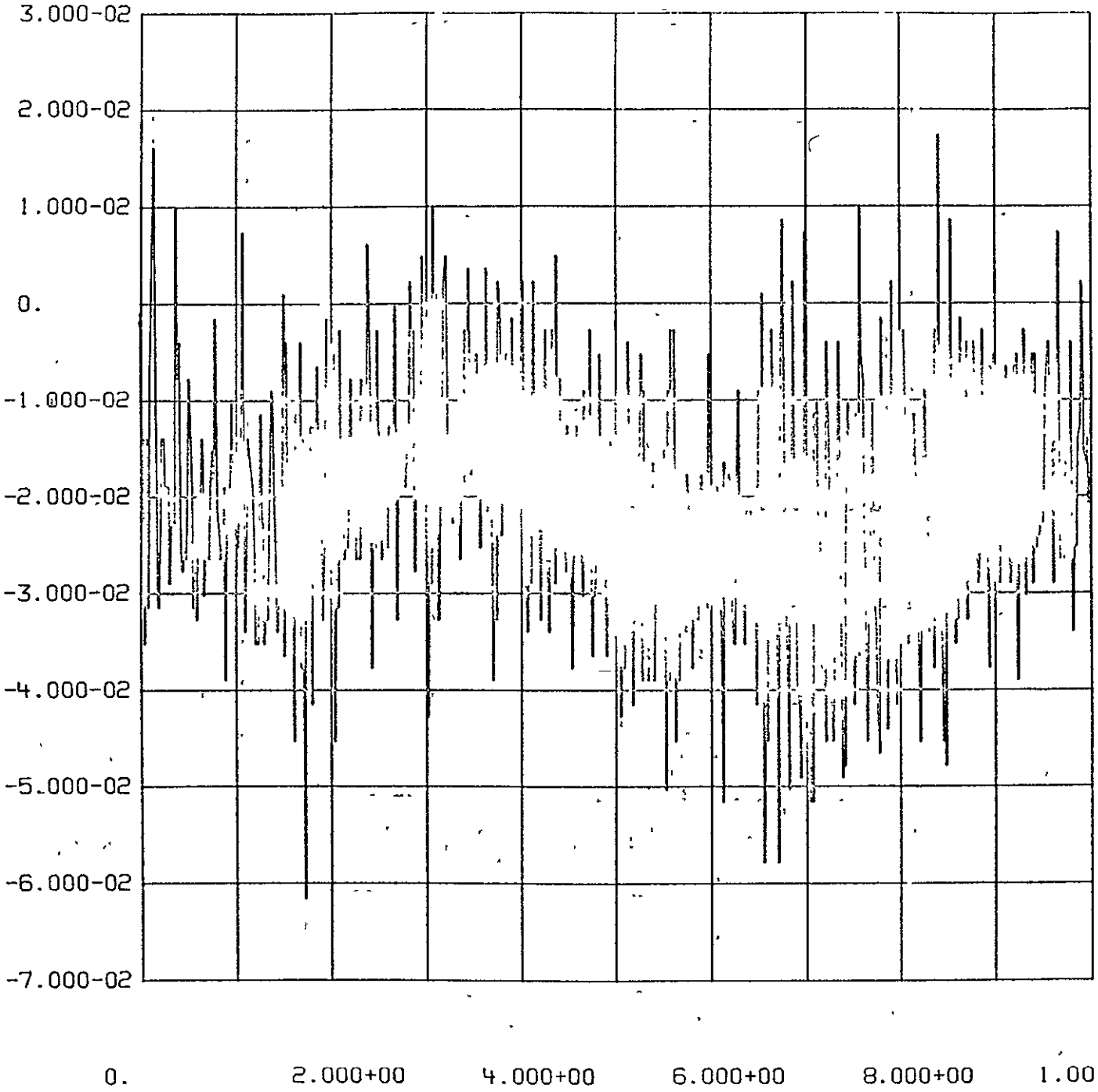
Y-LOAD VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.9-3 * UNFILT *



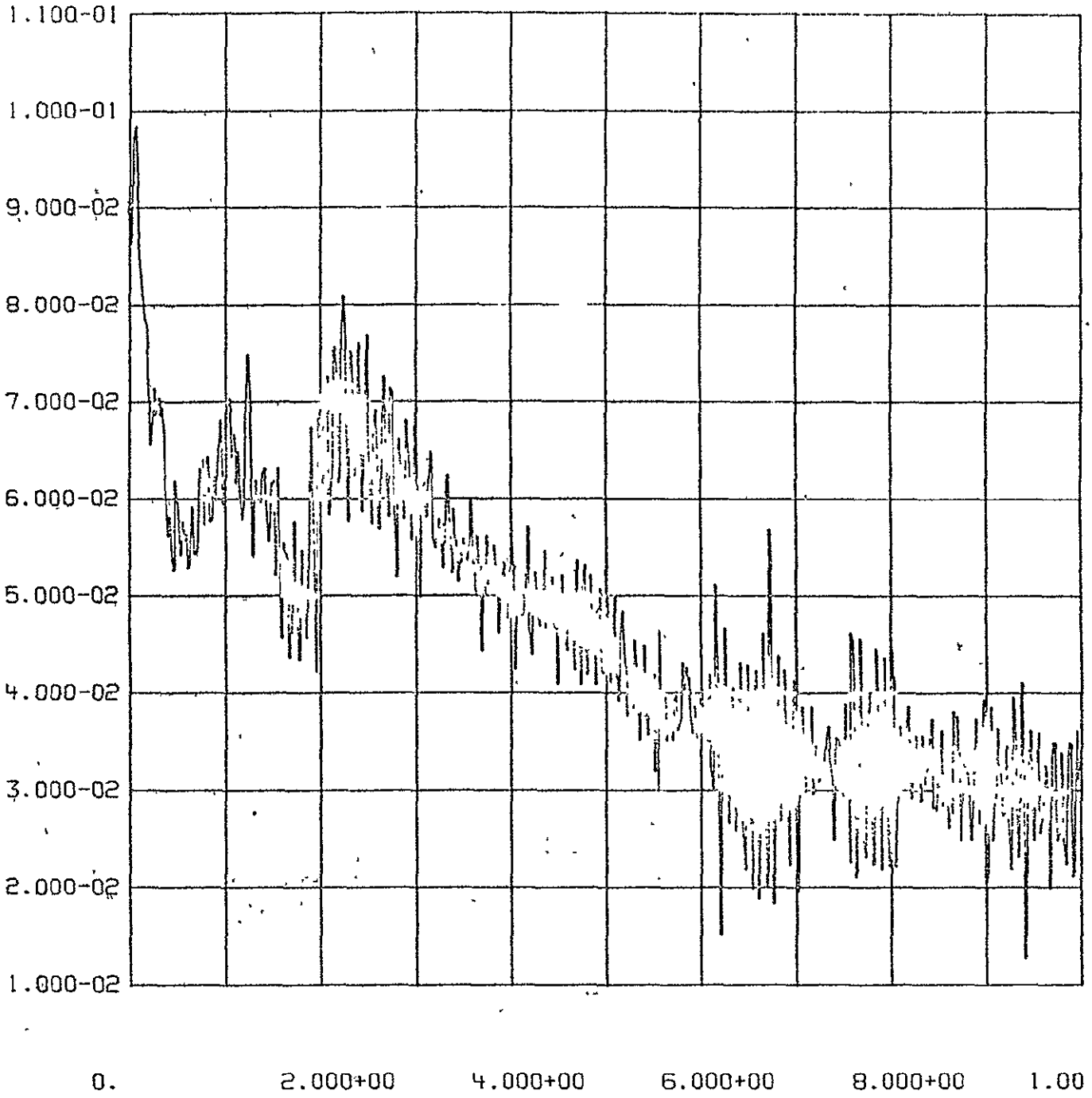
MOMENT VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.9-3 * UNFILT *



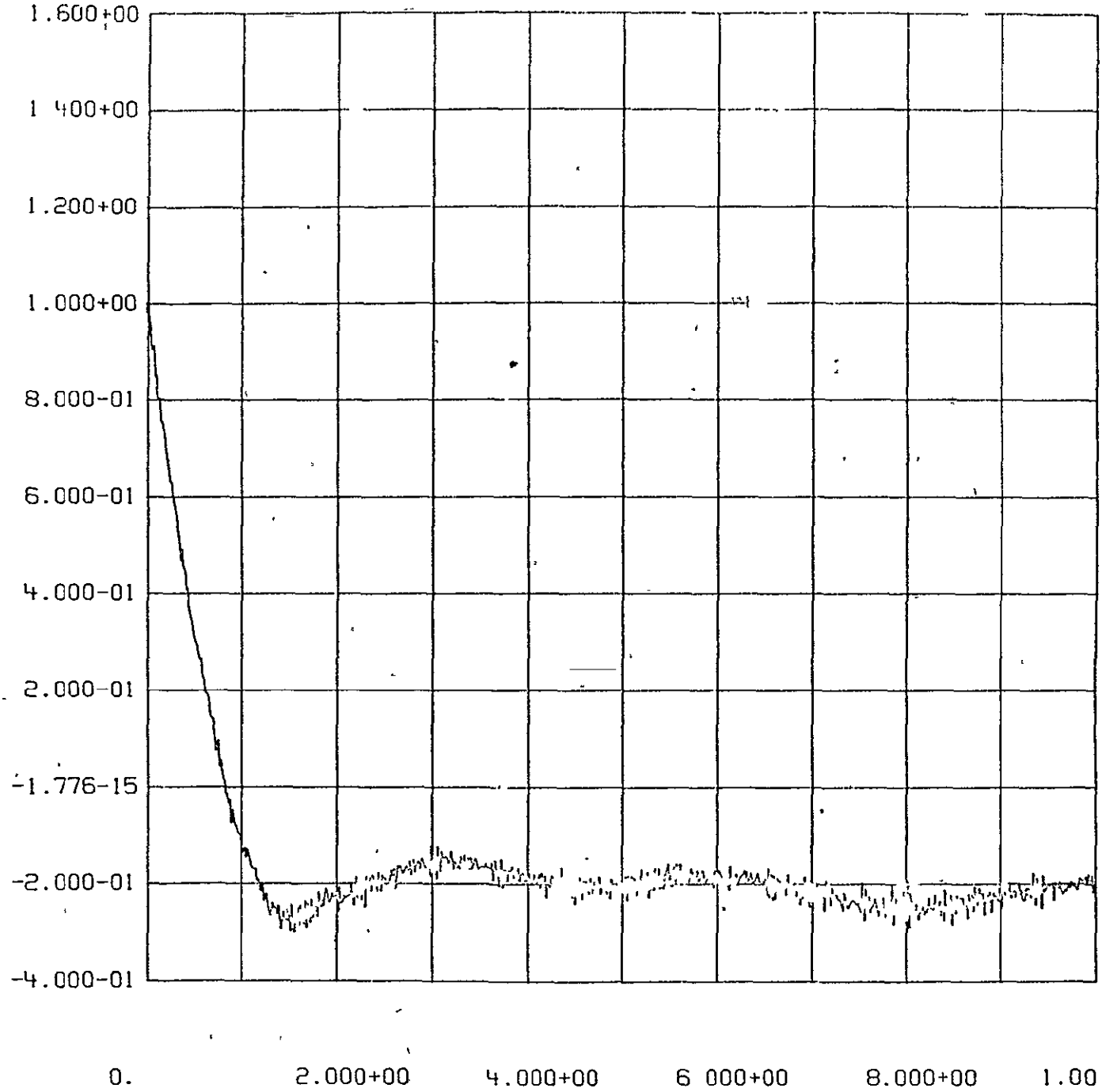
AC YAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4.9-3 * UNFILT *



AC XAC VS TIME

1 FLT 3 06NO78 FLIGHT 4 TEST CONDITION 4.9-3 * UNFILT *



AC ZAC VS TIME

1 FLT 3 06N078 FLIGHT 4 TEST CONDITION 4 9-3 * UNFILT *