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COLUMBIA RIVER ENTRANCE CHANNEL DEEP-DRAFT VESSEL MOTION STUDY.--ETC(U)

SEP 80 S WANG, M KIMBLE, C BUTCHER, G D COX

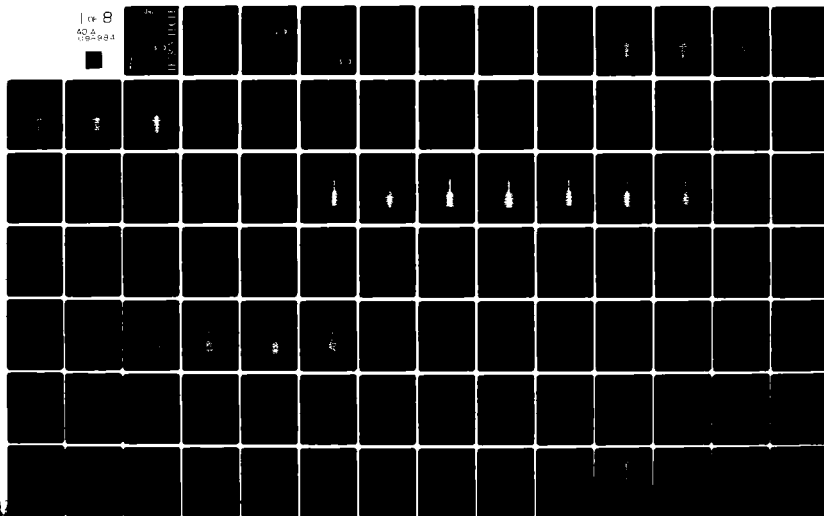
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LEVEL III



**COLUMBIA RIVER ENTRANCE
CHANNEL DEEP-DRAFT VESSEL
MOTION STUDY**

FINAL REPORT

AD A098984

APPENDIX A

PHASE I DATA

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TETRA TECH REPORT NO. TC-3925

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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Columbia River Entrance Channel Deep-Draft Vessel Motion Study, Final Report Appendix A.		Final Report Dec. 78- Sep 80. C. Process 1.
6. AUTHOR(s)		7. PERFORMING ORG. REPORT NUMBER
Shen Wang Michael Kimble Chris Butcher Glenn D. Cox		Tetra Tech Report #TC-3925
8. CONTRACT OR GRANT NUMBER(s)		
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Tetra Tech, Inc. 630 N. Rosemead Blvd. Pasadena, CA 91107		421A-1
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE
Department of the Army Portland District, Corps of Engineers, NPPEN-PL-2 P.O. Box 2946, Portland, Oregon 97208		11 September 1980
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18. SUPPLEMENTARY NOTES		
Presented at ASCE National Convention, 14-18 April 1980 in Portland, Oregon. (Preprint 80-160).		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
Ship Motion, Water Wave Action on Ships, Approach Channels, Entrance Channels, Columbia River.		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
A prototype ship motion monitoring program was initiated by the Portland District U.S. Army Corps of Engineers to provide design criteria for the entrance channel at the mouth of the Columbia River. The contractor's field team boarded deep draft vessels bound to or from the Columbia River and measured vertical acceleration (heave), pitch, roll, yaw, and position as the vessels transited the 5-mile entrance channel. Twenty-nine vessels were monitored in the period May 1978-March 1979, and twenty-four in the period October 1979-April 1980.		

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SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

The final report details the field work data reduction processes, analyses, and results. The raw data is used to calculate vertical motions at the bow, stern, and side of the vessel, and the horizontal motion as the ship transits the entrance. This information is evaluated with respect to environmental conditions and the channel. Results of statistical analyses are shown for characteristics of individual transits, and long-range entrance usage.

Appendices A-K contain the tabulated and plotted motion data, environmental conditions, ship motion variables, and other information collected.

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APPENDIX A
RECORDED AND PROCESSED DATA
COMPILED BY VOYAGES

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Following is a voyage by voyage summary of the data analysis results. Included for each voyage is a tabulation of the statistics, and ship trajectory, time series and cumulative frequency plots. The statistics are presented first and are self-explanatory. Following is the ship trajectory plot which shows the track of the ship through the channel and the time of day at which the voyage started. The small tic marks on the track indicate one minute intervals while the large tic marks indicate five minute intervals. The time series plots are presented next and can be correlated with the trajectory plots so that the motions can be related to the ship position in the channel. Finally, the cumulative frequency plots, which represent the probability of a motion to exceed a given magnitude, are presented. For many of the voyages a 2 or 5 minute interval of the total time series plot is presented on an expanded scale.

As indicated in the text, the processing time for statistical analysis varies from voyage to voyage. The time intervals which the data analysis apply as well as the total data recording times for the 29 voyages are summarized in the following page.

TIME INTERVALS OF DATA RECORDING
AND DATA PROCESSING FOR EACH TRANSIT

VOYAGE NO.	RECORDING TIME		TOTAL RECORDING TIME	PROCESSING TIME		TOTAL PROCESSING TIME	REMARKS
	BEGINNING	END		BEGINNING	END		
1	20:49:00	21:14:16	25m 36s	20:49:00	21:03:00	14m 00s	
2	15:29:00	15:52:59	23m 59s	15:29:00	15:41:30	12m 30s	
3	19:04:01	19:27:29	23m 28s	19:04:01	19:15:01	11m 00s	
4	16:58:00	17:23:48	25m 48s	17:07:00	17:20:00	13m 00s	
5	12:01:03	12:24:59	23m 56s	12:02:03	12:15:45	13m 42s	
6	09:44:02	10:13:00	31m 58s	09:53:02	10:06:03	13m 00s	
7	21:38:05	22:02:00	23m 55s	21:48:05	21:59:35	11m 30s	
8	13:50:00	14:16:58	26m 58s	13:50:00	14:08:00	18m 00s	
9	08:56:00	09:19:02	23m 02s	09:04:18	09:19:02	14m 44s	
10	05:15:00	05:37:59	22m 59s	05:15:00	05:29:30	14m 30s	
11	14:26:01	14:45:03	19m 02s	14:33:31	14:45:03	11m 32s	
12	13:13:00	13:38:59	25m 59s	13:14:00	13:30:00	16m 00s	
13	05:24:00	05:50:59	26m 59s	05:25:00	05:41:30	16m 30s	
14	15:21:00	15:48:58	27m 58s	15:31:00	15:48:58	17m 58s	
15	05:38:00	06:11:58	33m 58s	05:39:36	06:04:30	24m 54s	DATA GAP FROM 06:02:33 to 06:02:40
16	14:36:30	15:09:59	33m 29s	14:43:00	15:09:59	26m 59s	
17	23:44:03	00:04:56	20m 53s	23:46:03	23:57:03	11m 00s	DATA GAP FROM 23:45:45 to 23:49:05
18	06:43:04	07:09:01	25m 57s	06:48:04	06:58:34	10m 30s	
19	07:14:09	07:46:59	32m 50s	07:21:09	07:40:09	19m 00s	
20	00:31:17	00:49:59	18m 42s	00:31:17	00:42:17	11m 00s	
21	07:44:00	08:05:56	21m 56s	07:47:00	07:58:00	11m 00s	
22	05:15:03	05:42:56	27m 53s	05:23:03	05:33:03	10m 00s	
23	23:12:02	23:32:58	20m 56s	23:17:02	23:27:02	10m 00s	
24	09:39:08	09:56:57	17m 49s	09:39:08	09:52:08	13m 00s	
25	21:42:00	22:02:58	20m 58s	21:42:00	21:54:30	12m 30s	
26	12:33:00	12:49:57	16m 57s	12:37:00	12:45:00	8m 00s	
27	23:05:00	23:25:58	20m 58s	23:05:00	23:18:36	13m 36s	
28	04:33:00	04:56:57	23m 57s	04:34:00	04:49:30	15m 30s	
29	08:35:02	09:09:58	34m 56s	08:44:44	09:09:58	25m 14s	

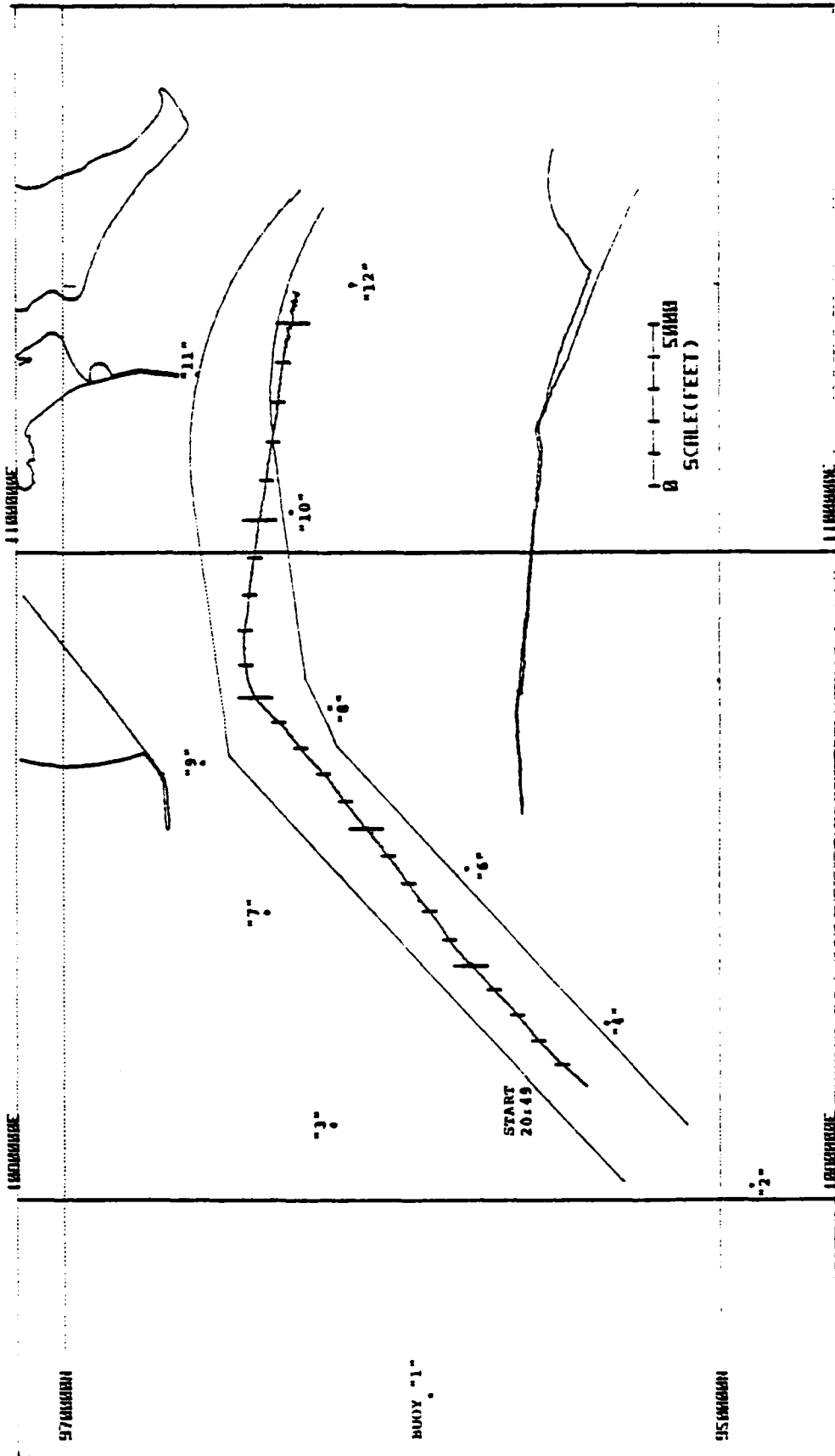
STATISTICAL SUMMARY

VOYAGE NO. 01

	HEAVY LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	- .3	2.5	.9	1.0
ROLL (DEG)	1.5	6.4	2.7	2.9
NO. (FT/SEC/SEC)	- .1	2.4	1.2	1.3
HEAVE (FT)	.1	7.0	2.6	2.9
RON EXCUR. (FT)	.1	20.2	7.3	8.0
STEER EXCUR. (FT)	.1	7.6	3.2	3.6
YIDE EXCUR (FT)	.1	9.0	3.7	4.1

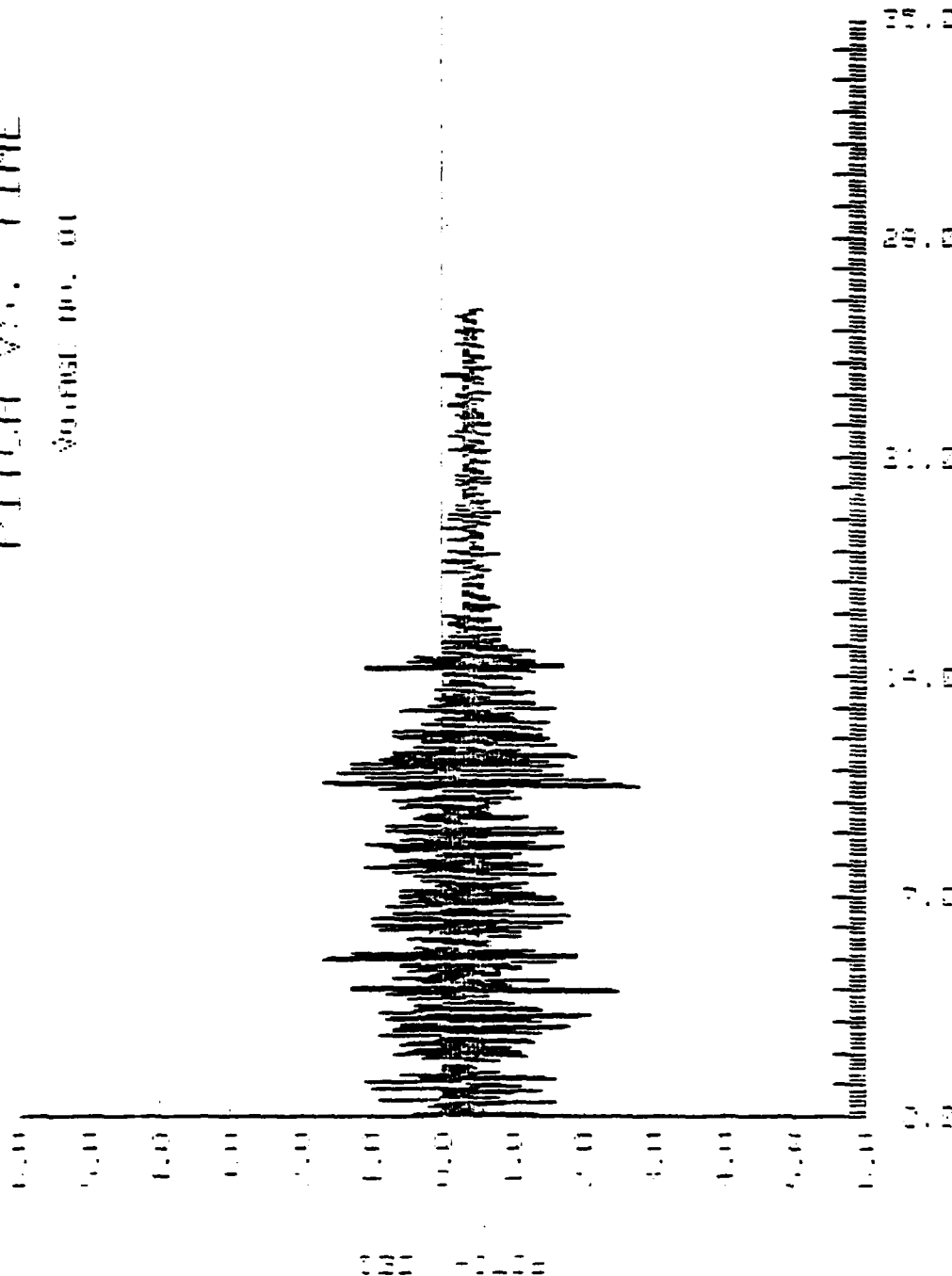
V011156 NO. 01 SHIP TRACK

SCHE 1: 20000



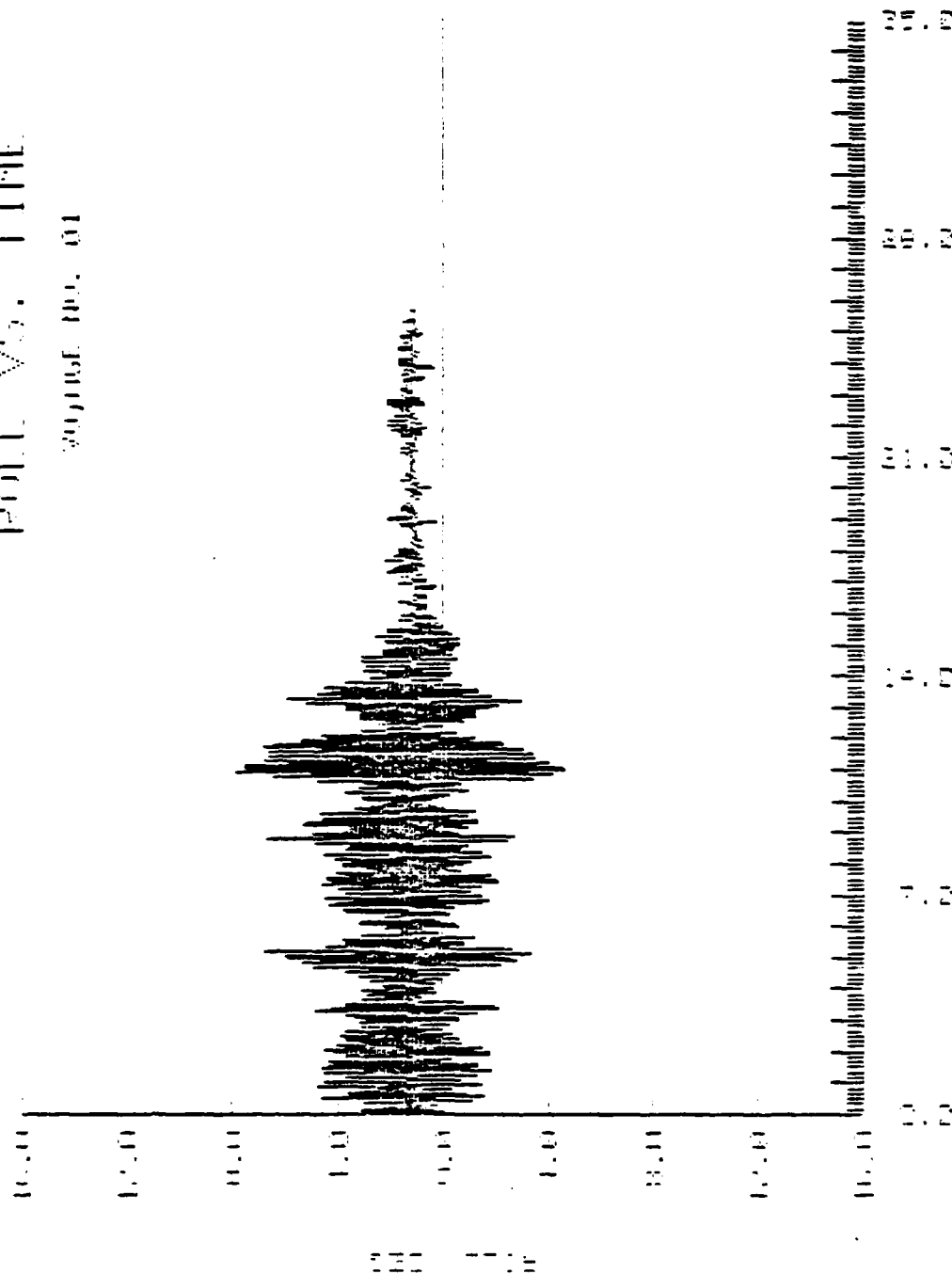
PITCH VOLT. TIME

VOLUME 100. 01



POLL VS. TIME

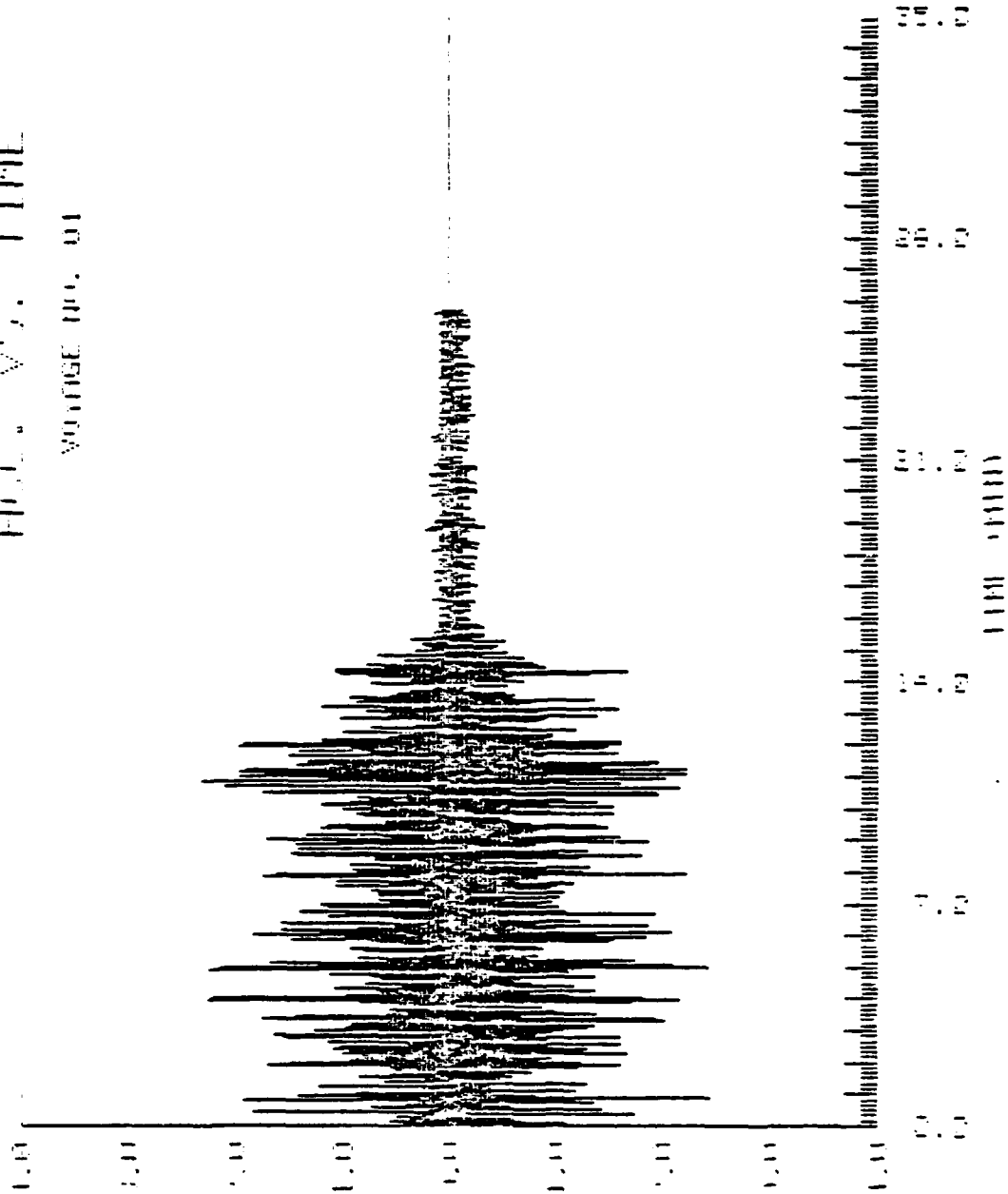
W0106 100. 01



W0106 100. 01

FILE V. TIME

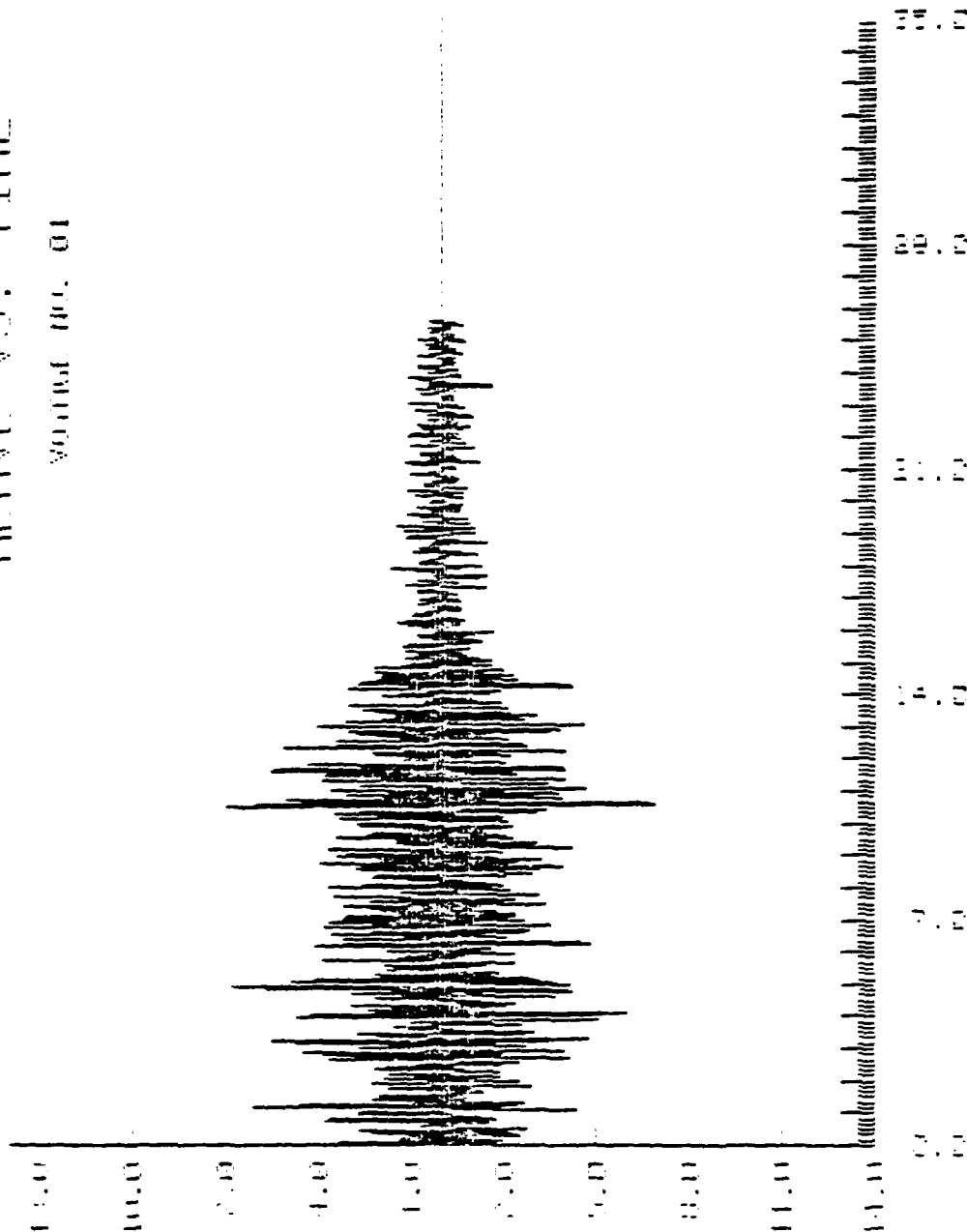
VOICE NO. 01



100 100 100 100

RELATIVE VOLUME TIME

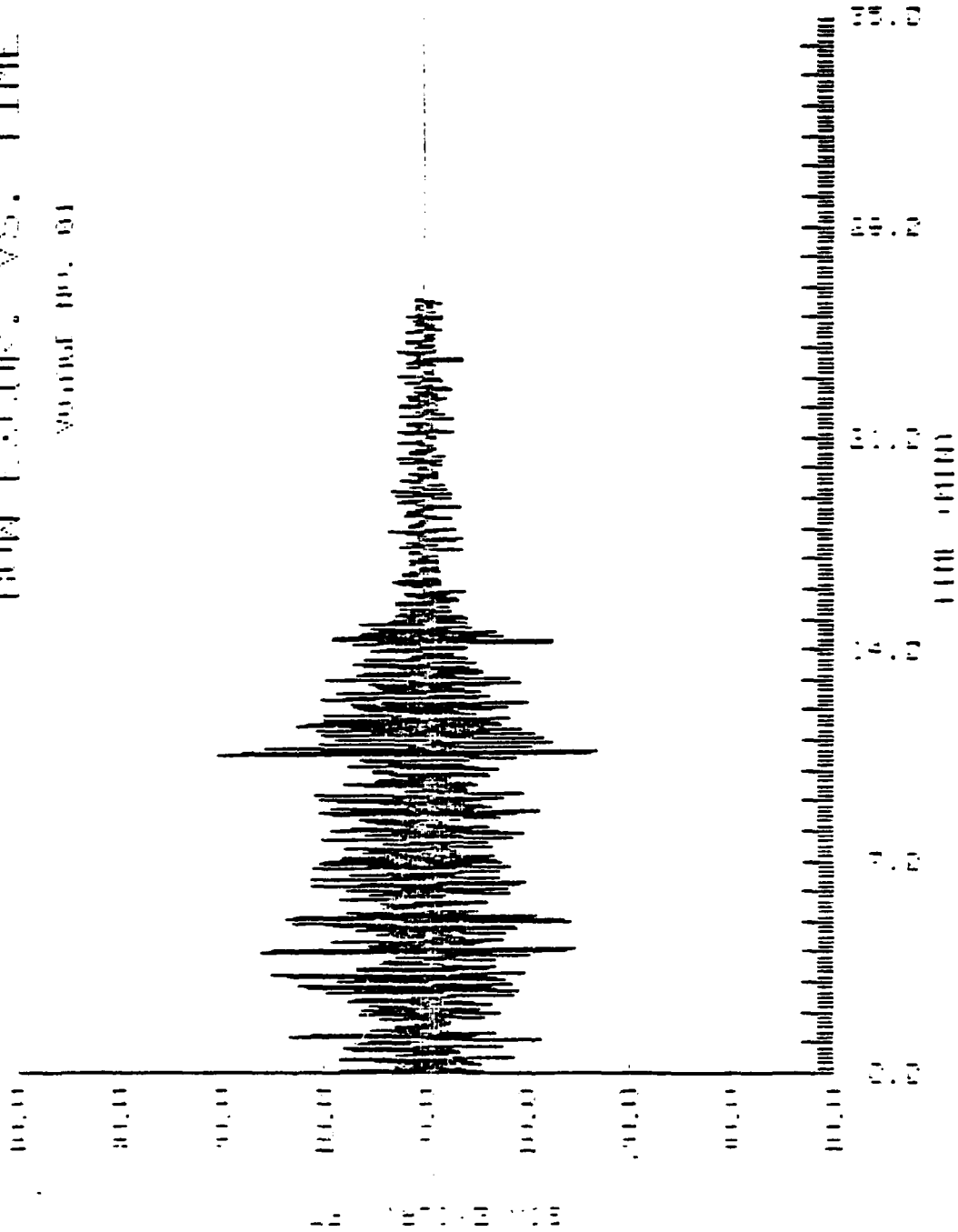
Wavelength 60.01



0.5 0.5

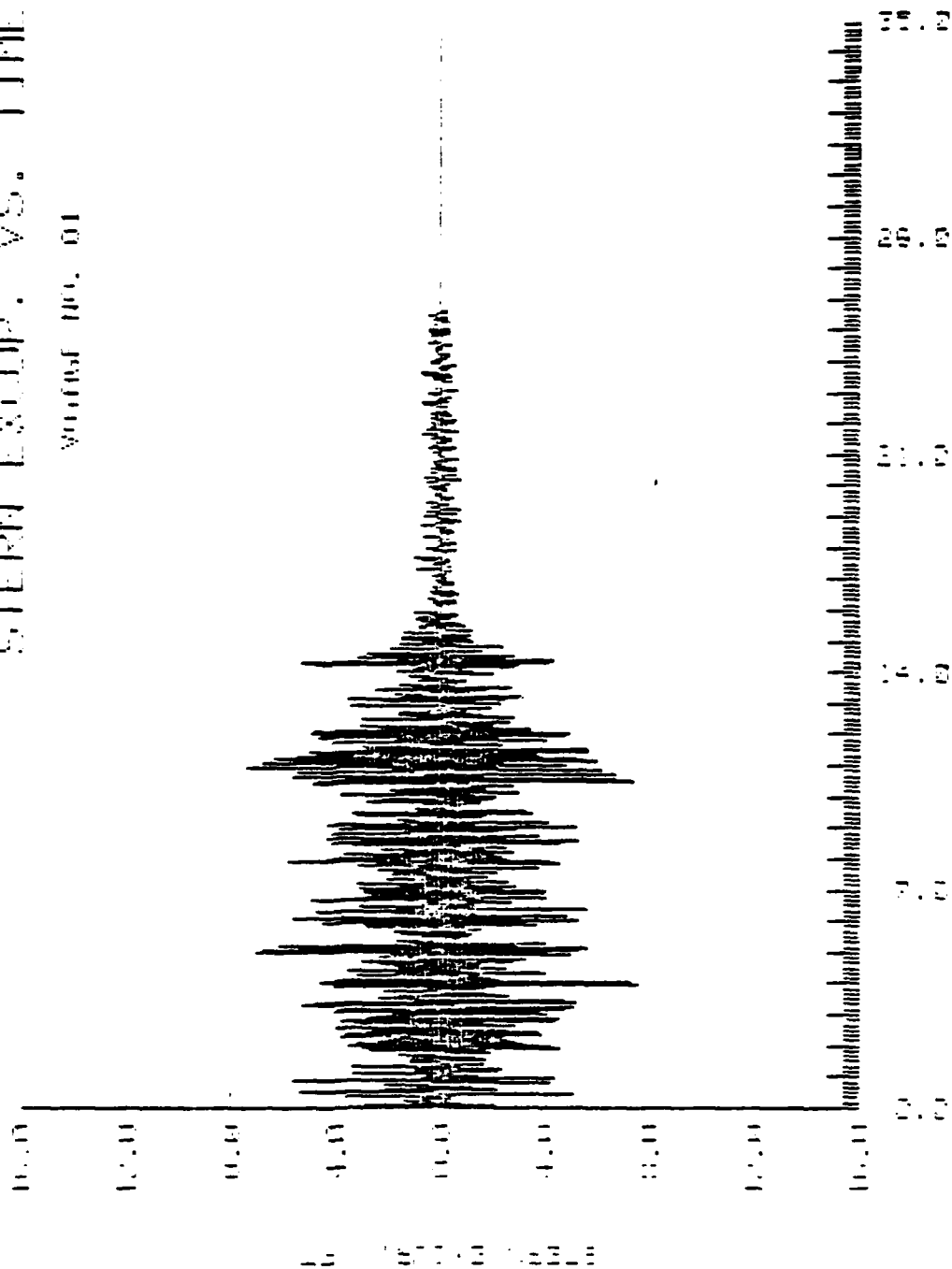
LOW FREQUENCY VS. TIME

WIND NO. 01



STERN EXCIP. VS. TIME

Wavelength 100.01

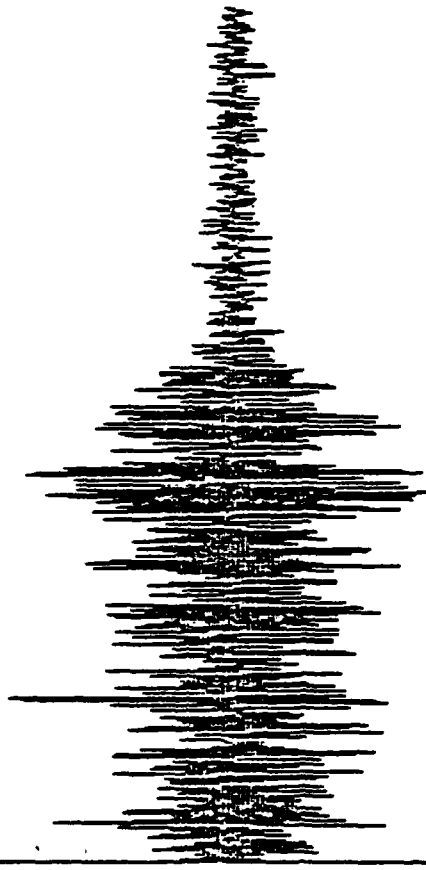


1100 111000

SINE EXCUR. VS. TIME

WAVE NO. 01

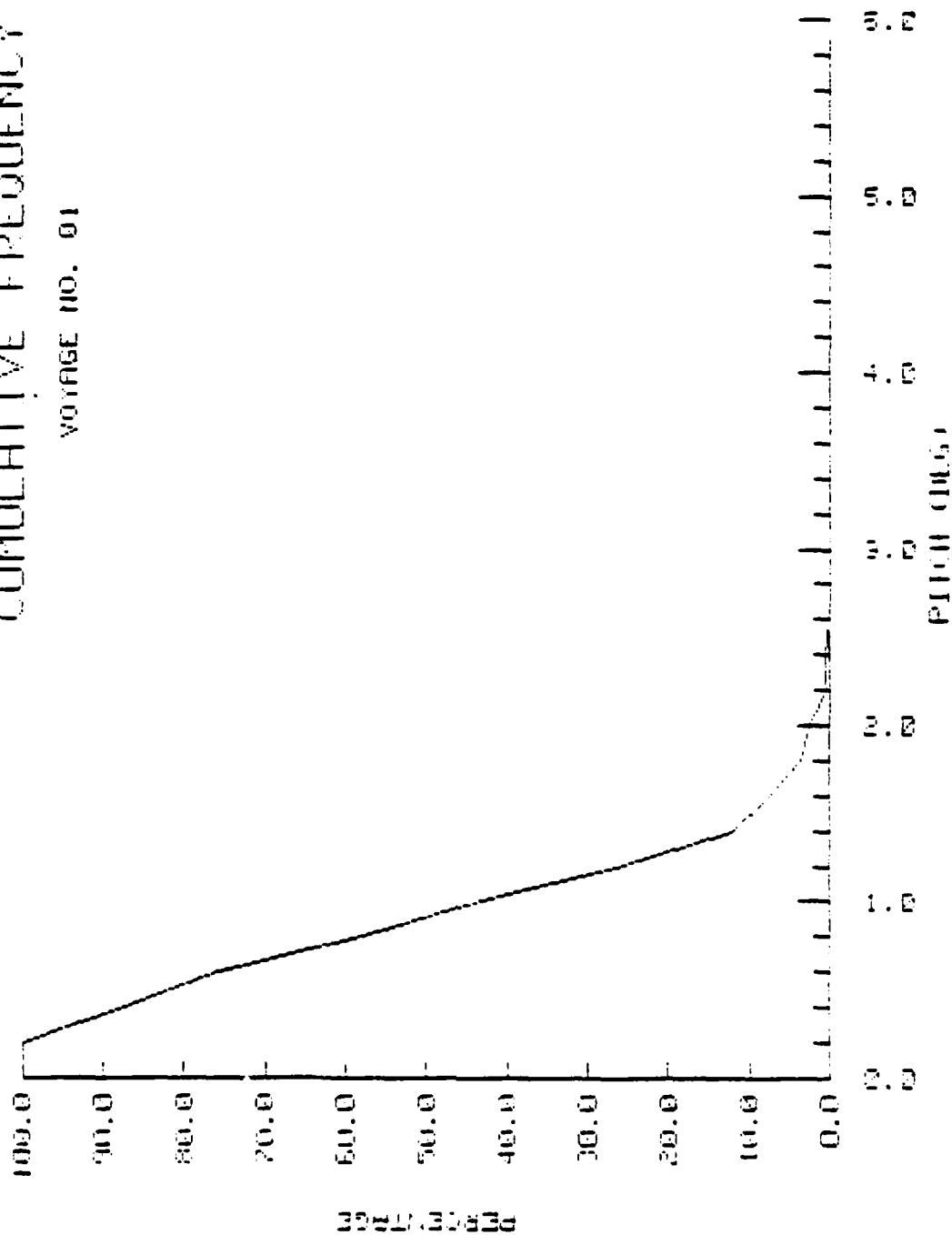
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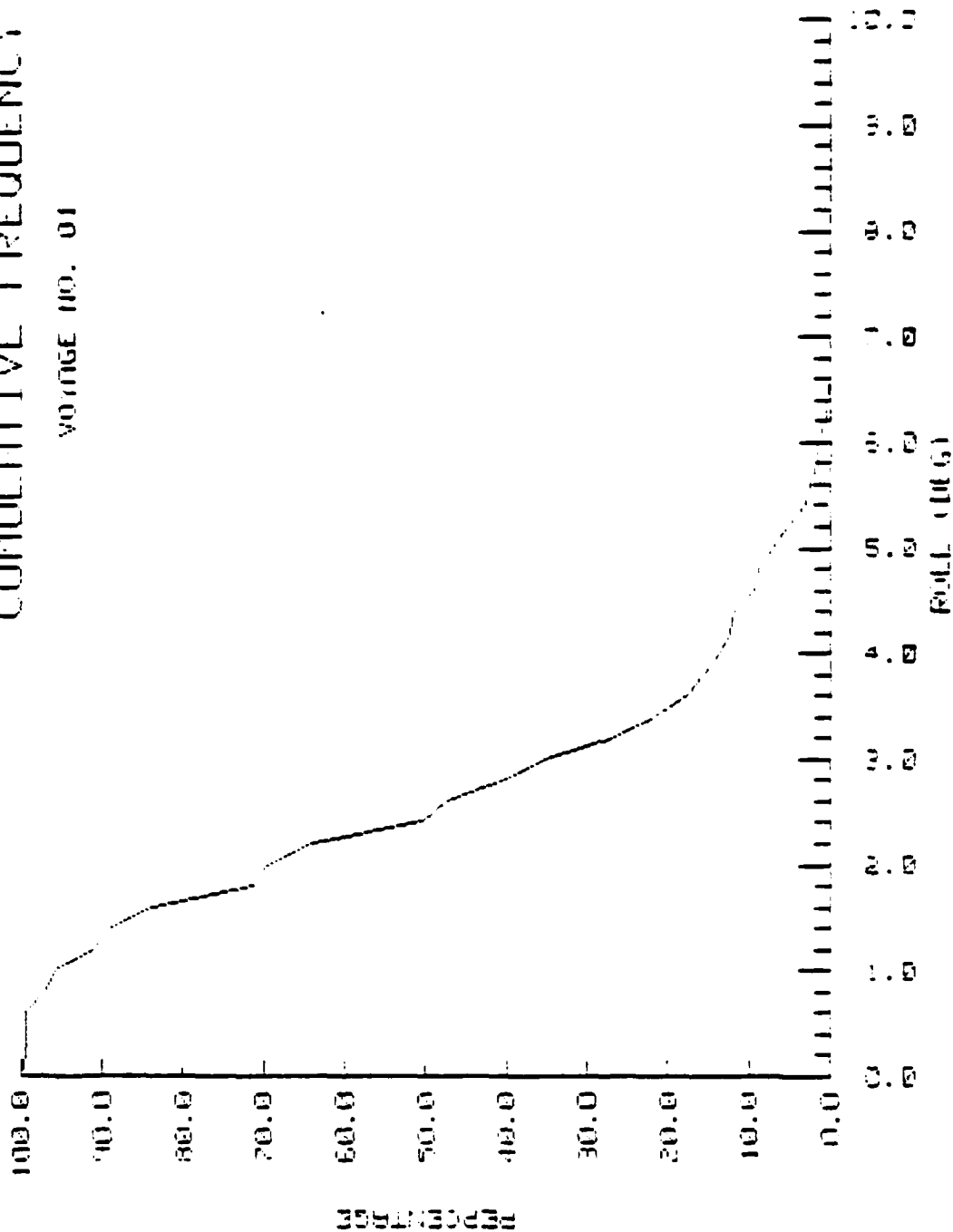
CUMULATIVE FREQUENCY

VOTAGE NO. 01



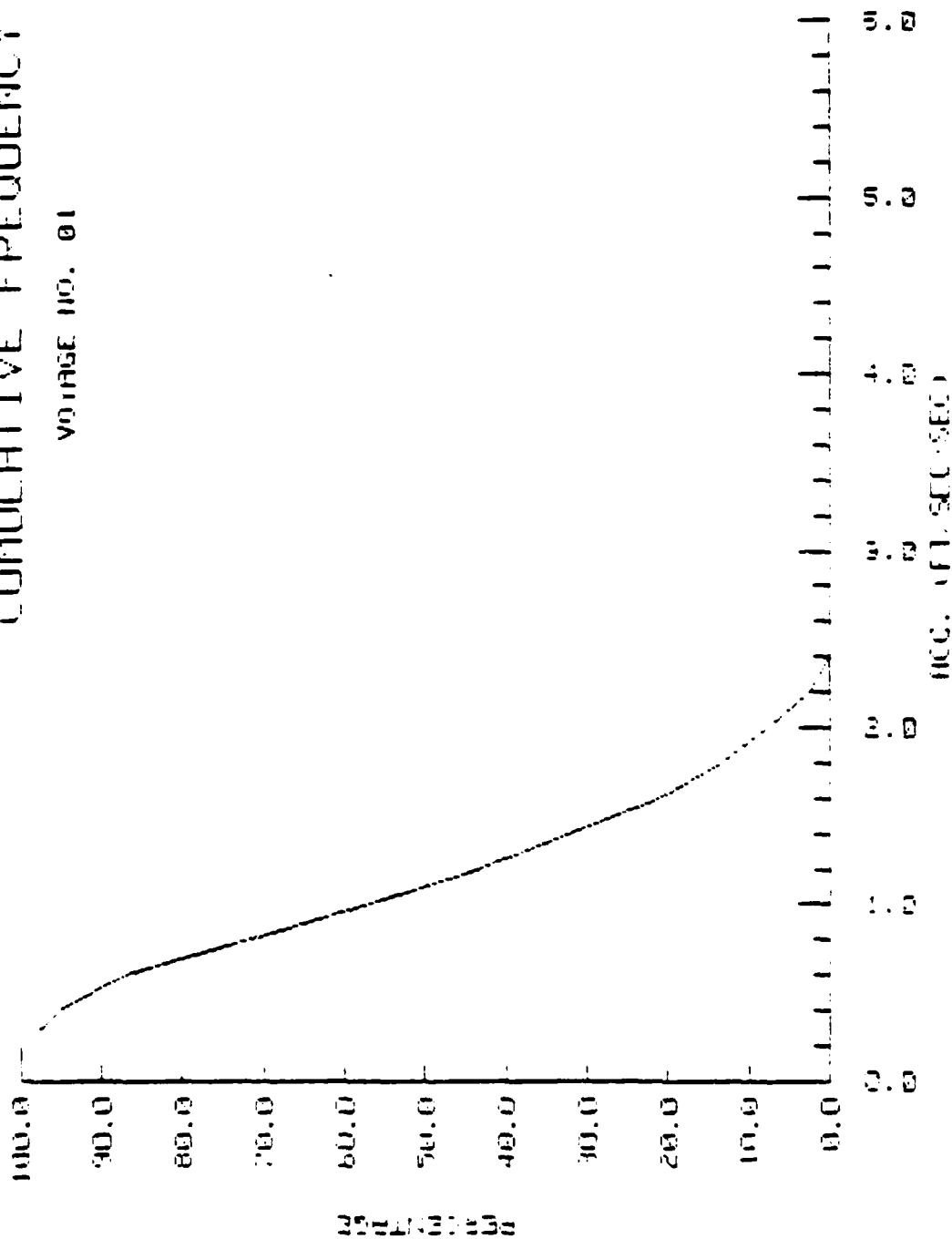
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VOYAGE NO. 01



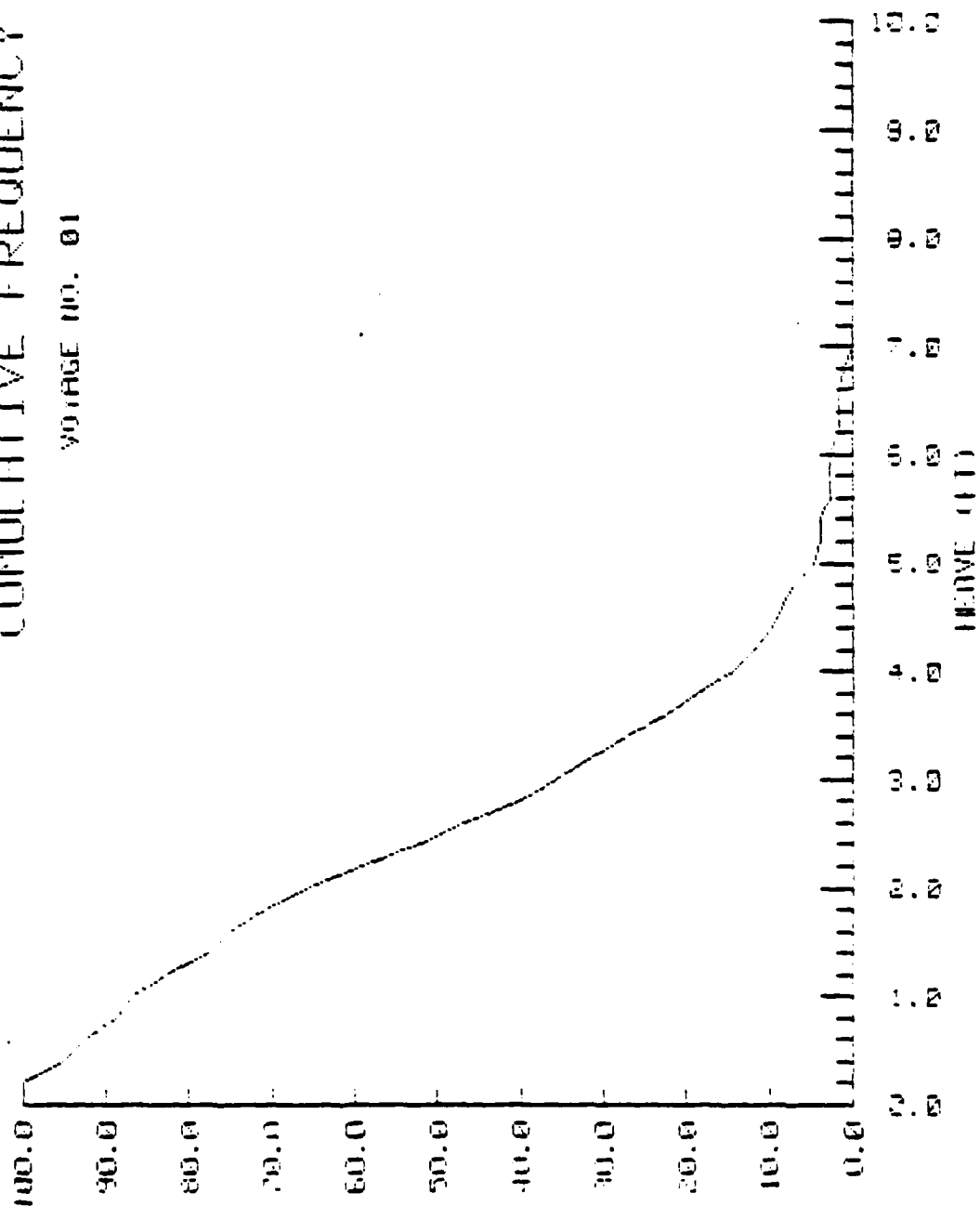
CUMULATIVE FREQUENCY

VOLTAGE NO. 01



CUMULATIVE FREQUENCY

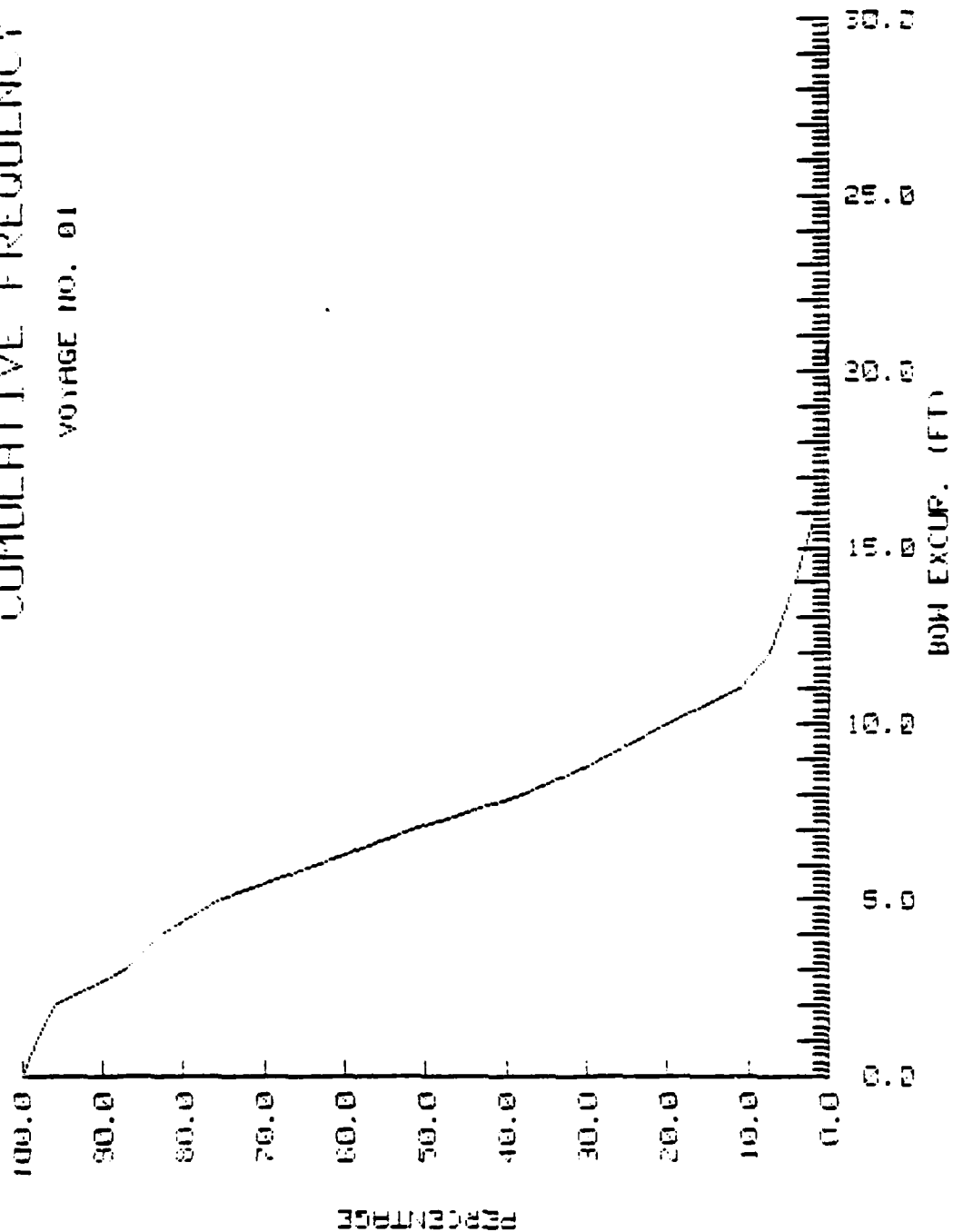
VOLAGE NO. 01



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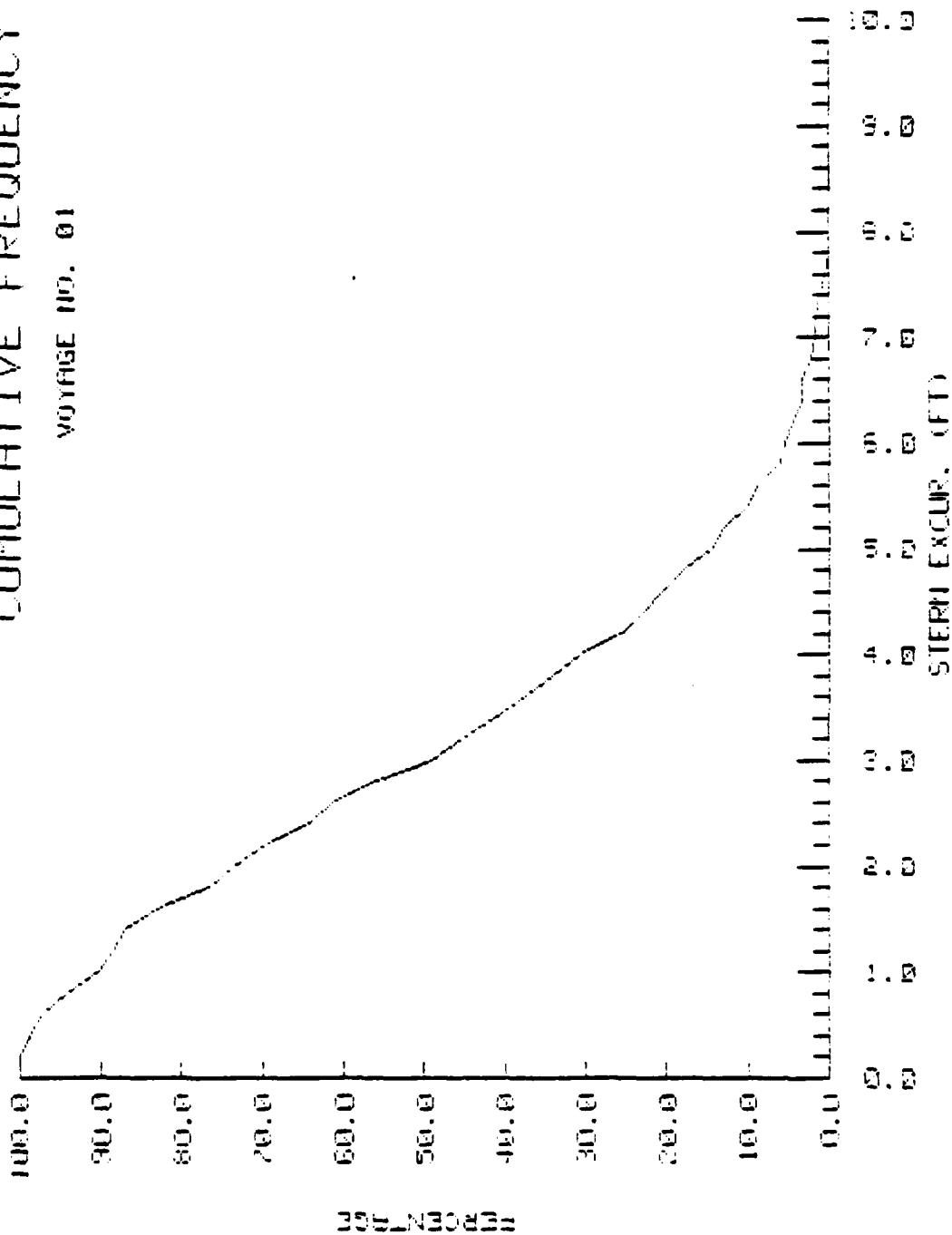
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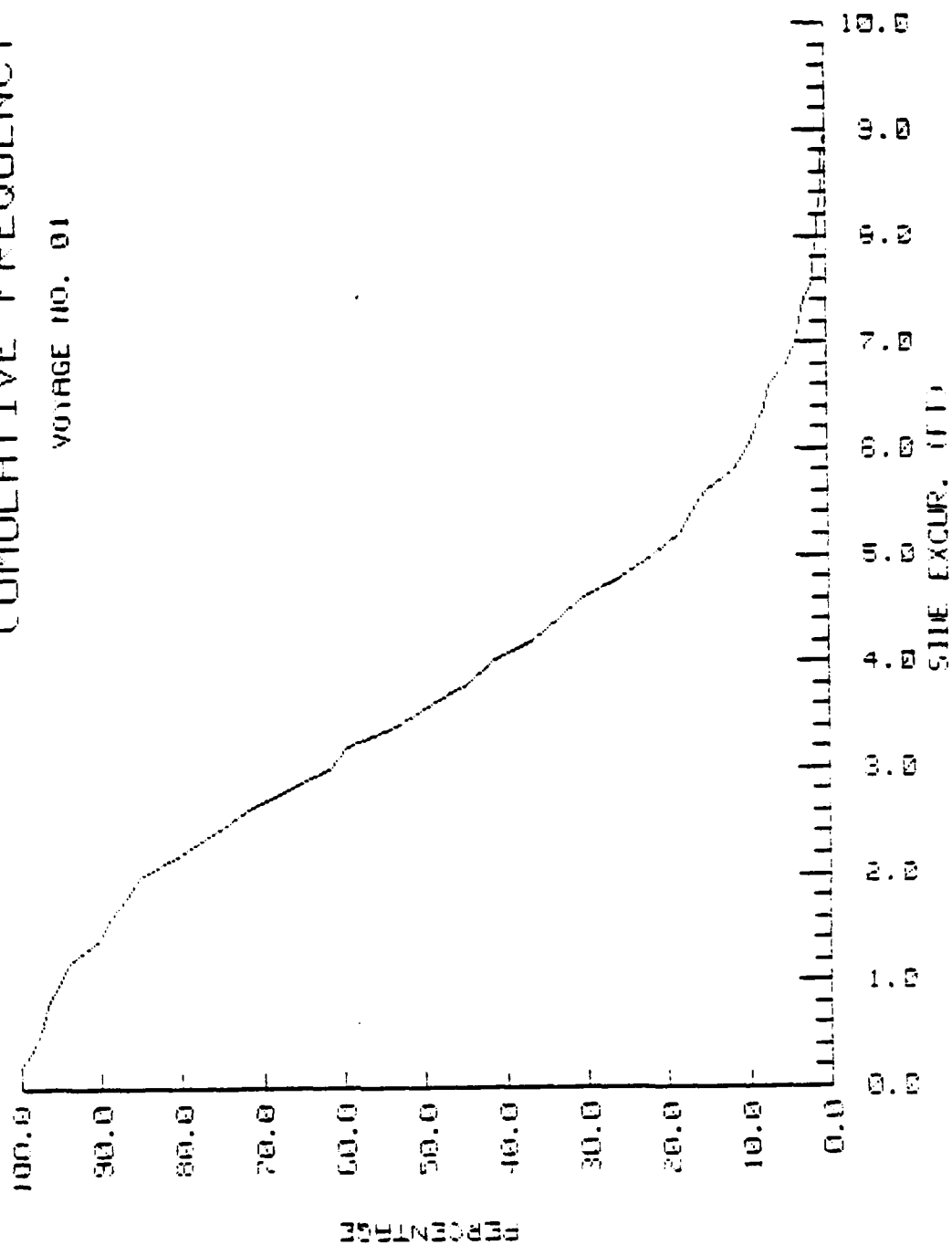
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VOYAGE NO. 01



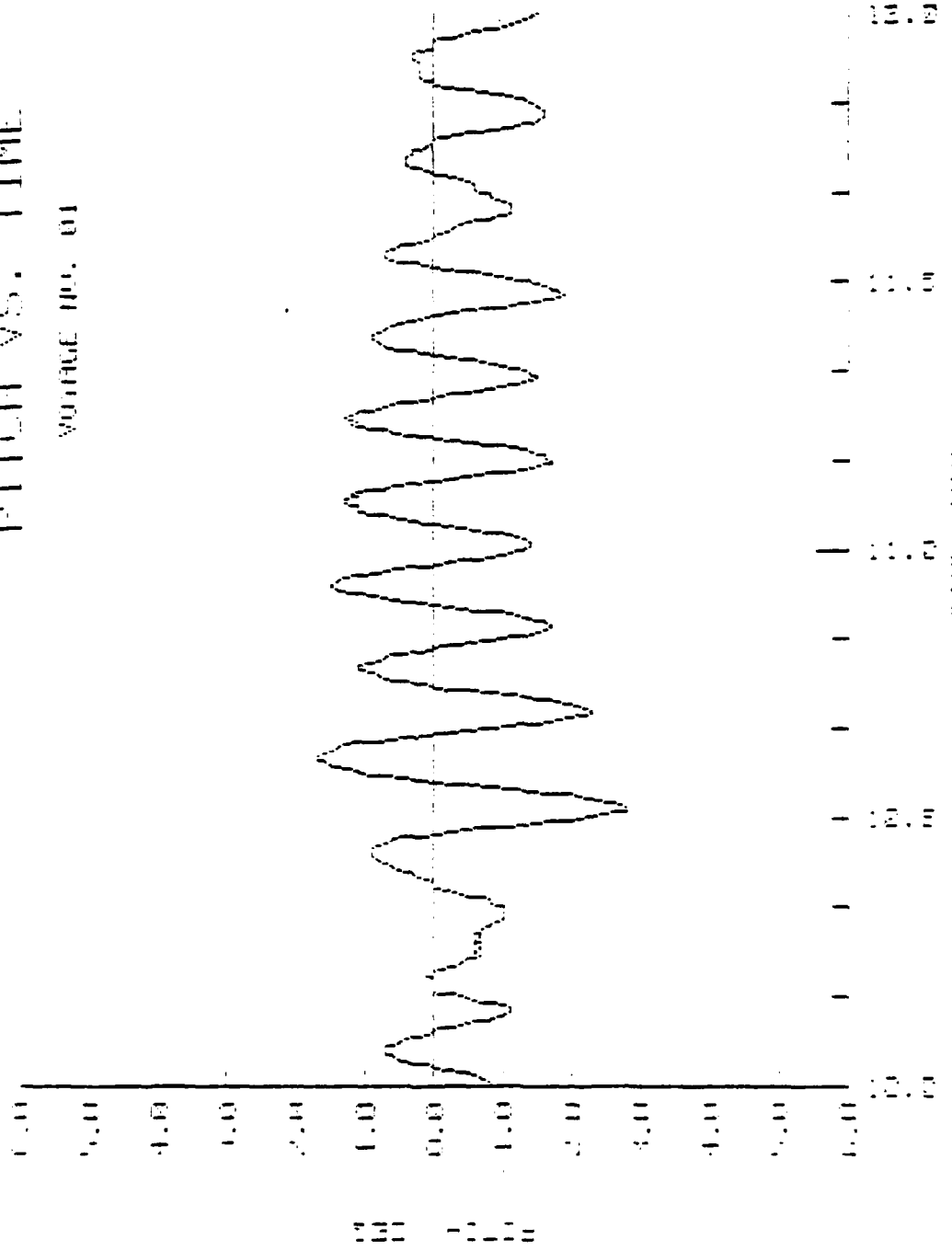
CUMULATIVE FREQUENCY

VOLAGE NO. 01



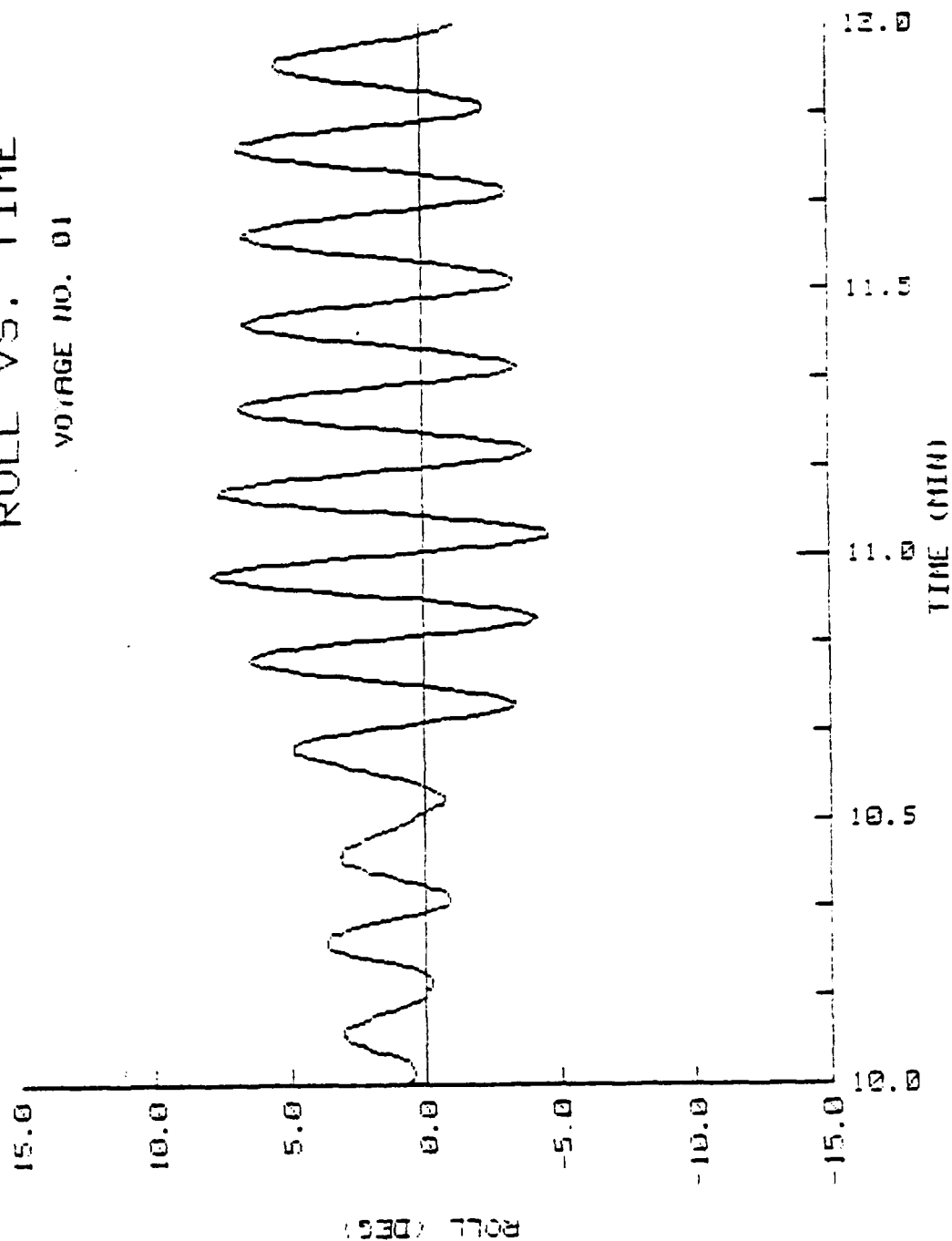
PITCH VS. TIME

VOLUME 100, 01



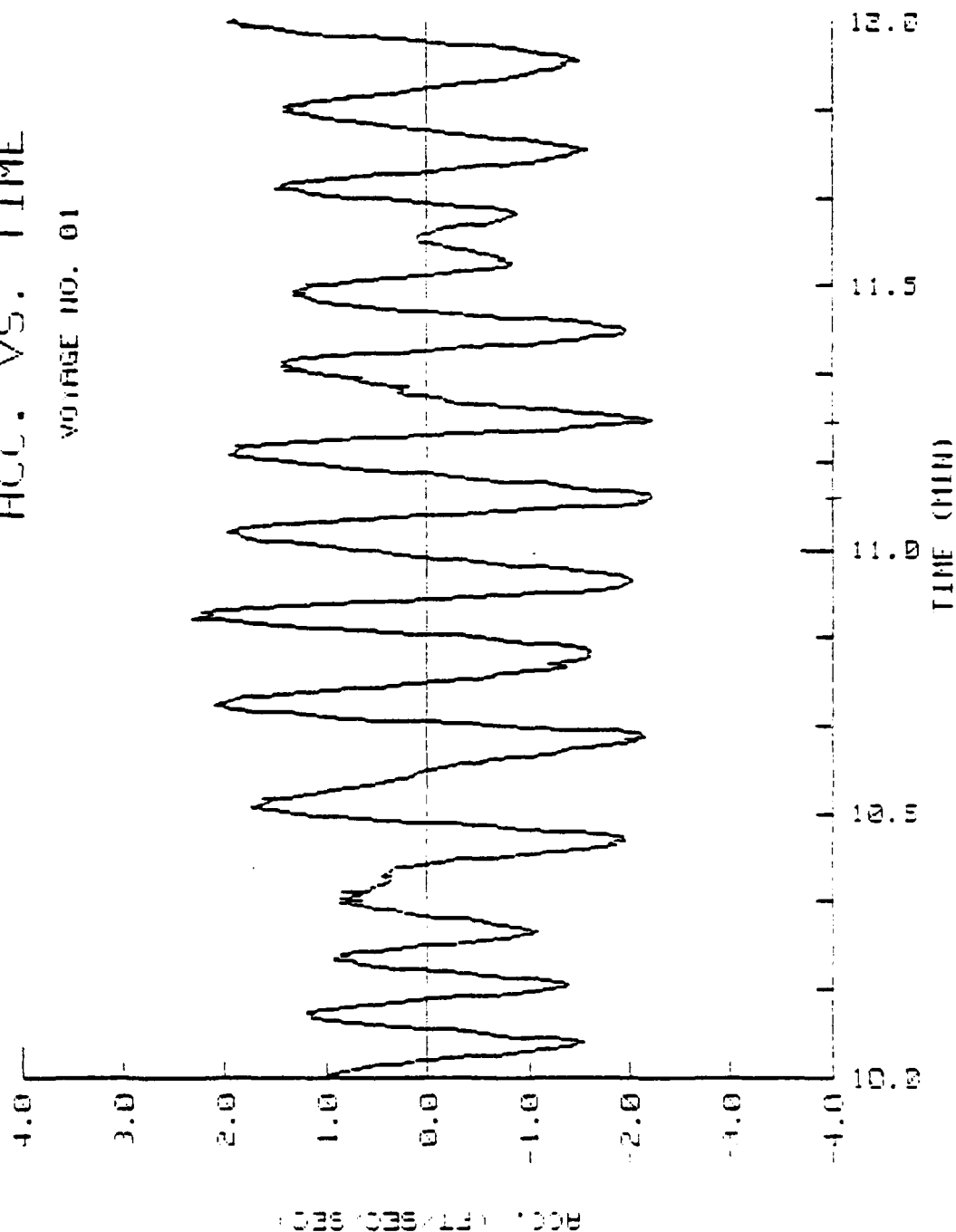
ROLL VS. TIME

VOTAGE NO. 01



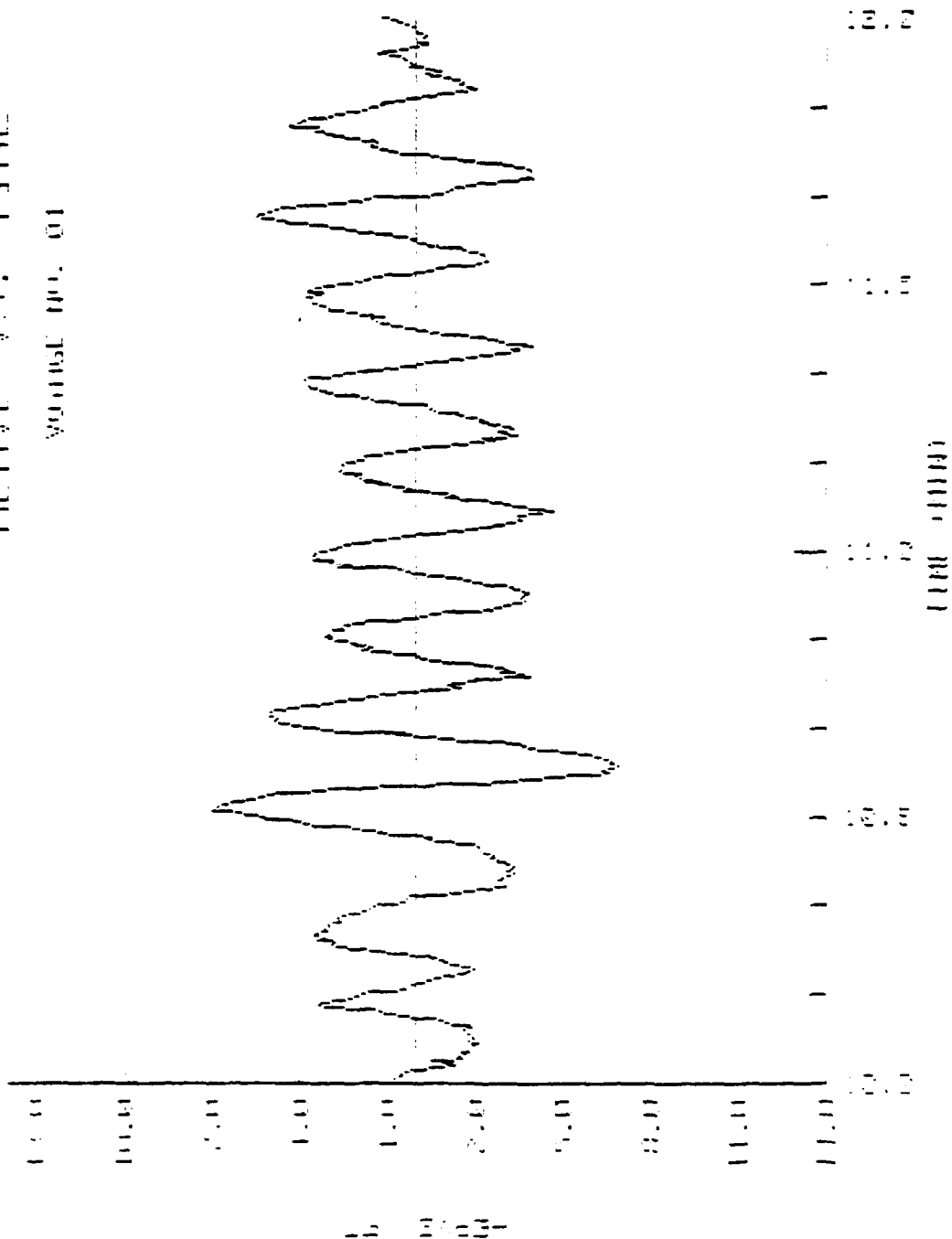
ACC. VS. TIME

VOLUME NO. 01



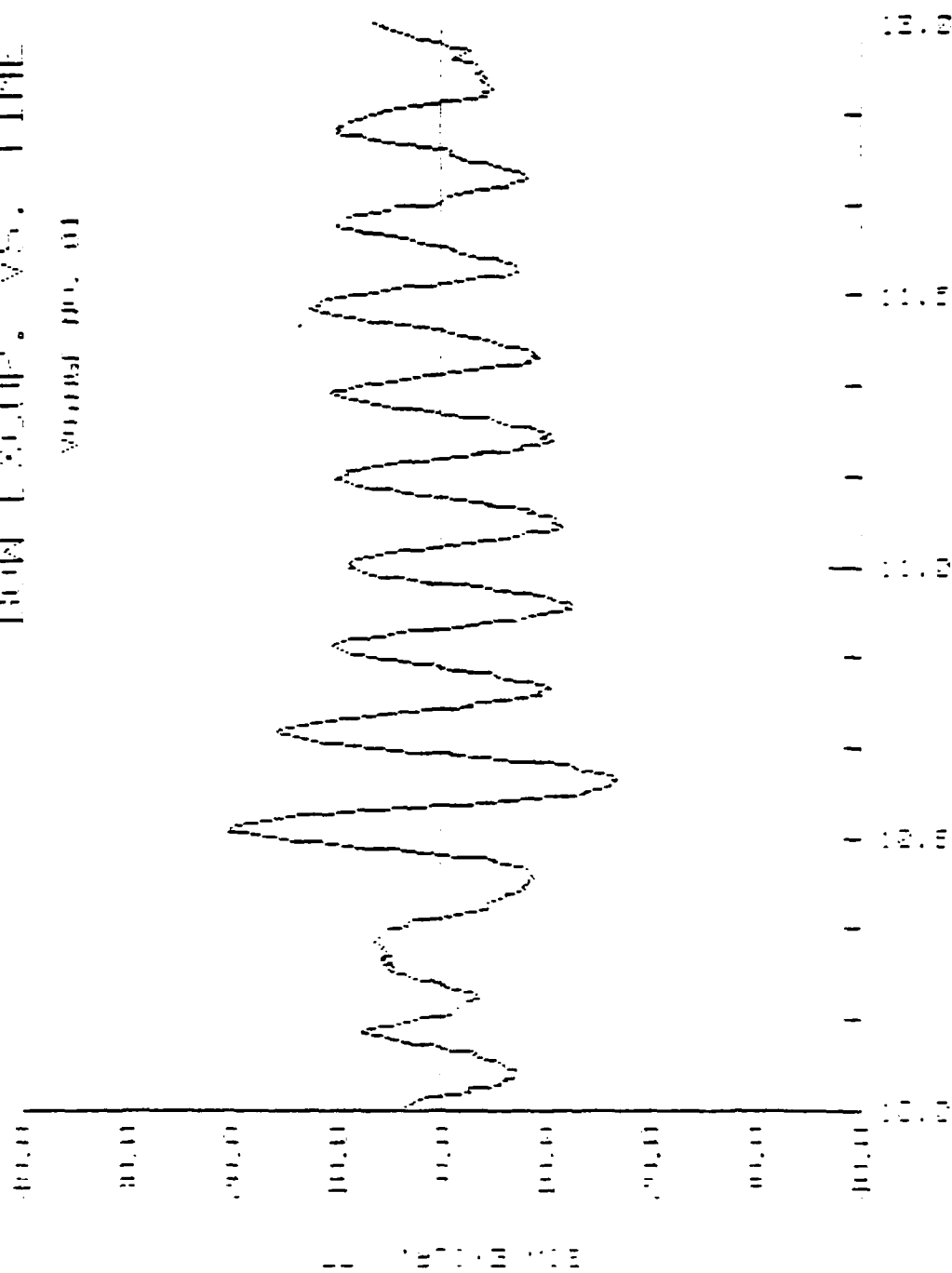
RELATIVE VOLTAGE TIME

VOLTAGE 100.01



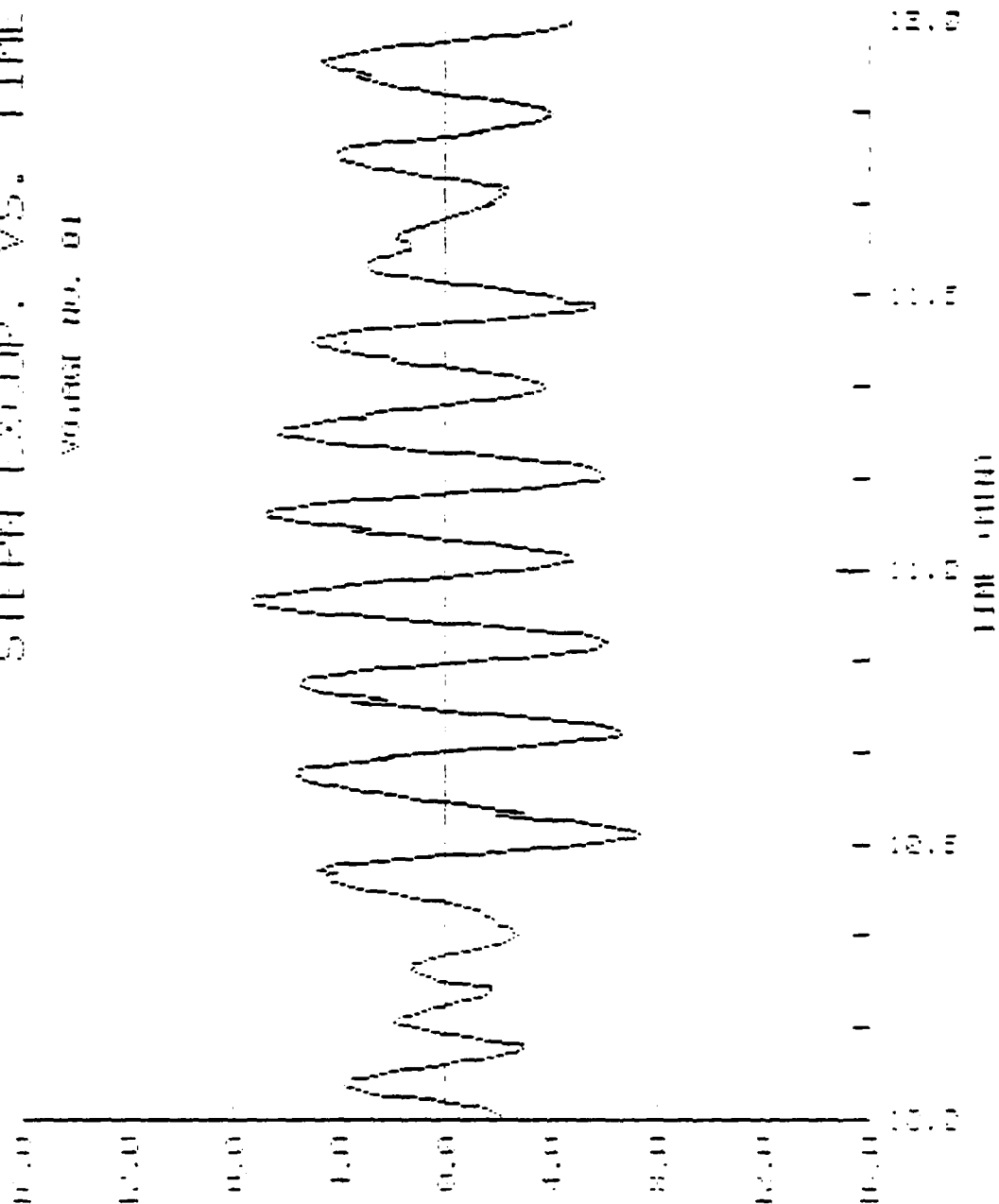
HOW GROUP. VS. TIME

WAVE NO. 01

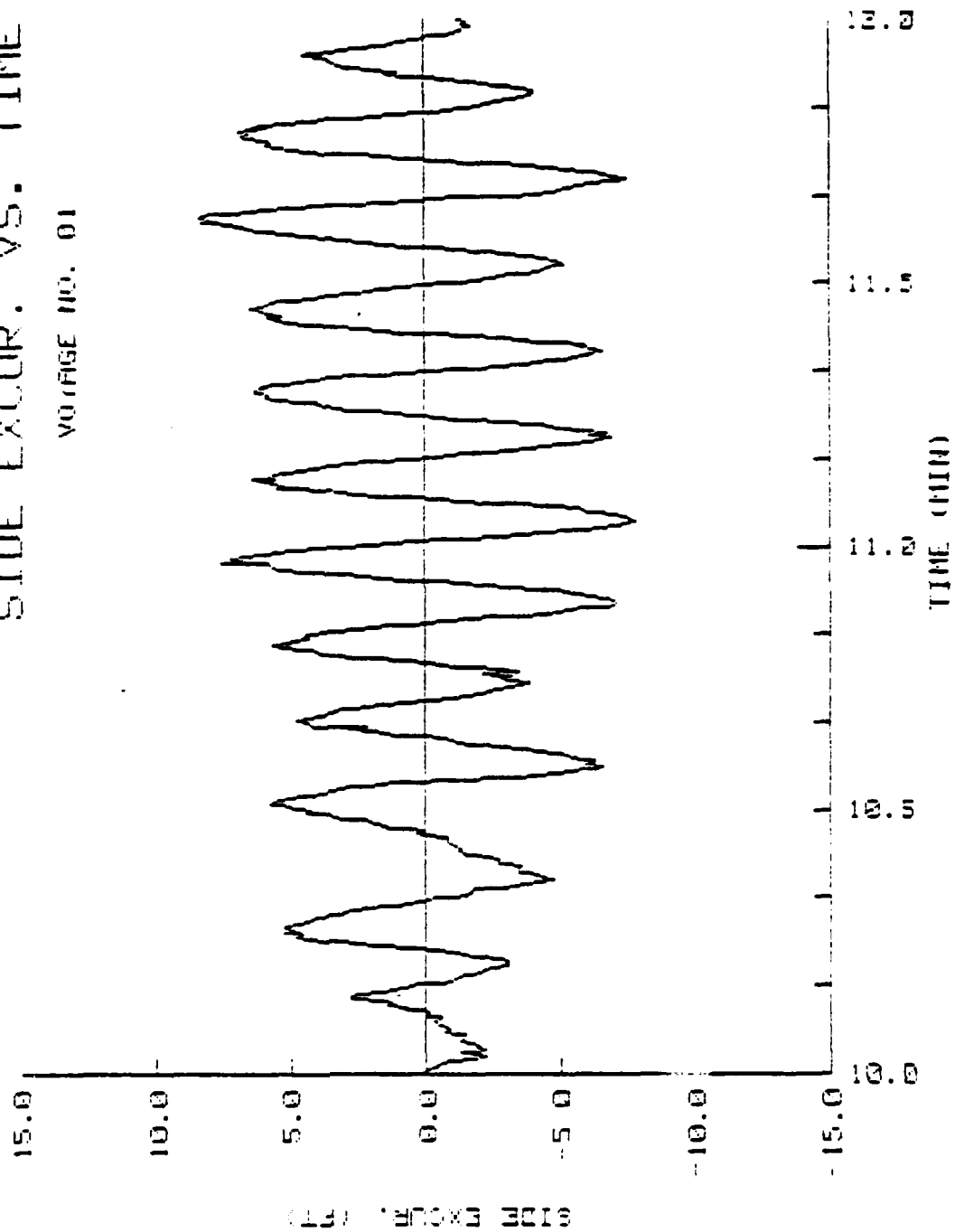


STEPH GROUP. VS. TIME

WAVEFORM NO. 01



SIDE EXCUR. VS. TIME
VOYAGE NO. 01



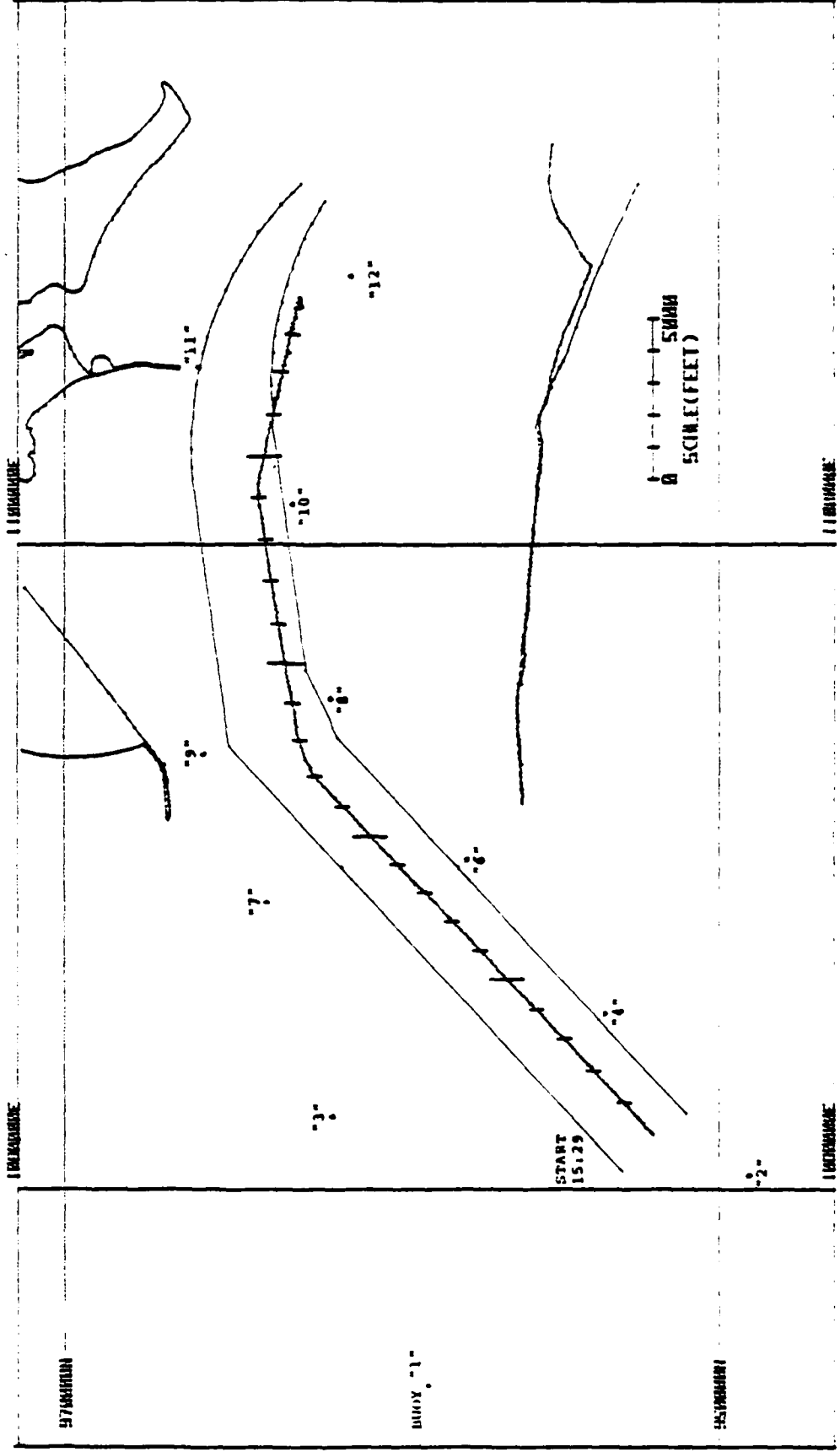
STATISTICAL SUMMARY

VOYAGE NO. 02

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-.4	1.3	.6	.6
ROLL (DEG)	.2	2.9	1.1	1.3
ACC (FT/SEC/SEC)	-.0	1.1	.6	.6
HEAVE (FT)	.0	3.6	1.6	1.8
BOW EXCUR. (FT)	.0	10.4	4.2	4.7
STEER EXCUR. (FT)	.0	3.8	1.5	1.6
SIDE EXCUR (FT)	.0	4.2	1.8	2.0

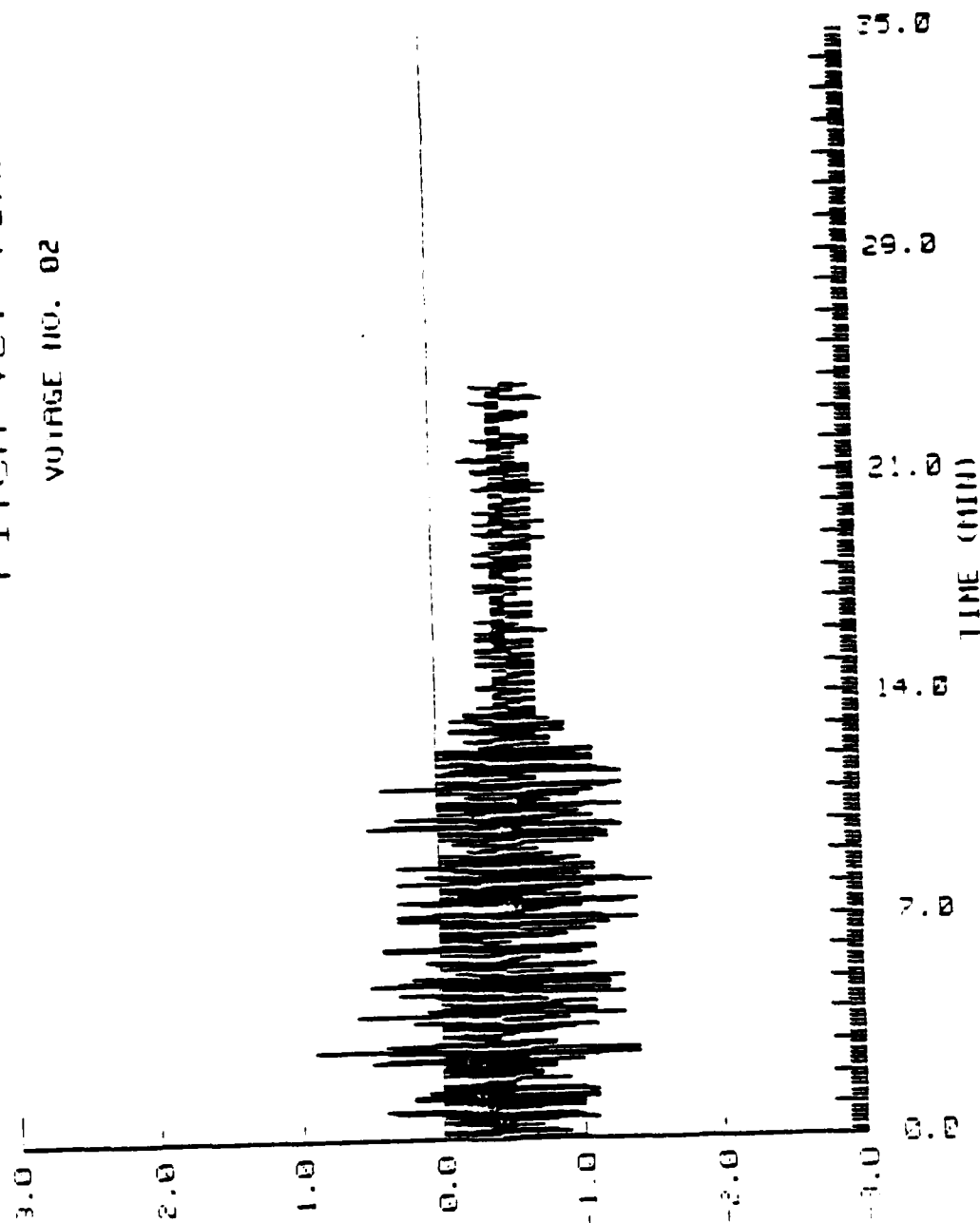
VOYAGE NO. 02 SHIP TRACK

SCALE: 1 INCH = 5 MILES



PITCH VS. TIME

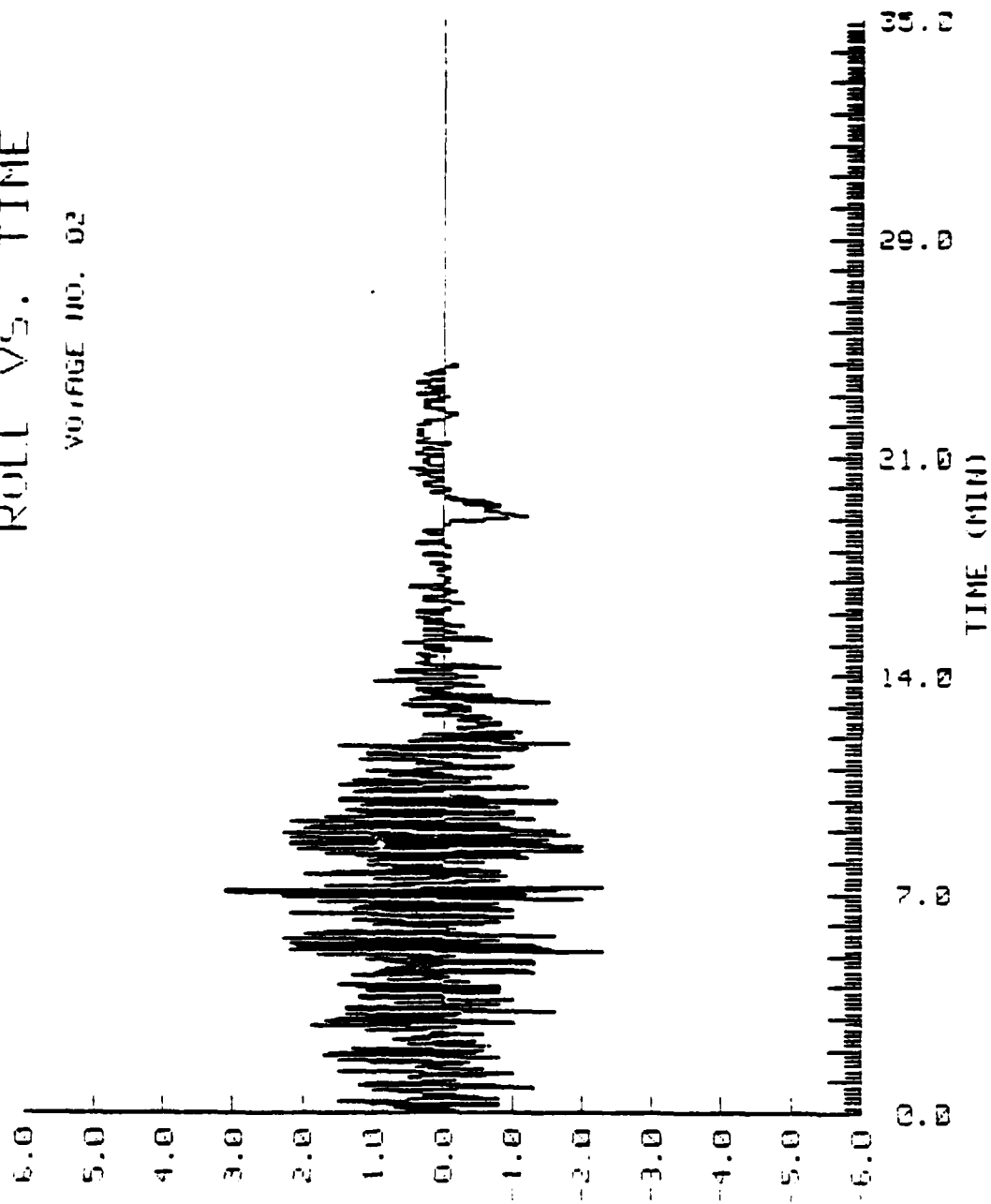
VOLUME NO. 02



930 - 5000

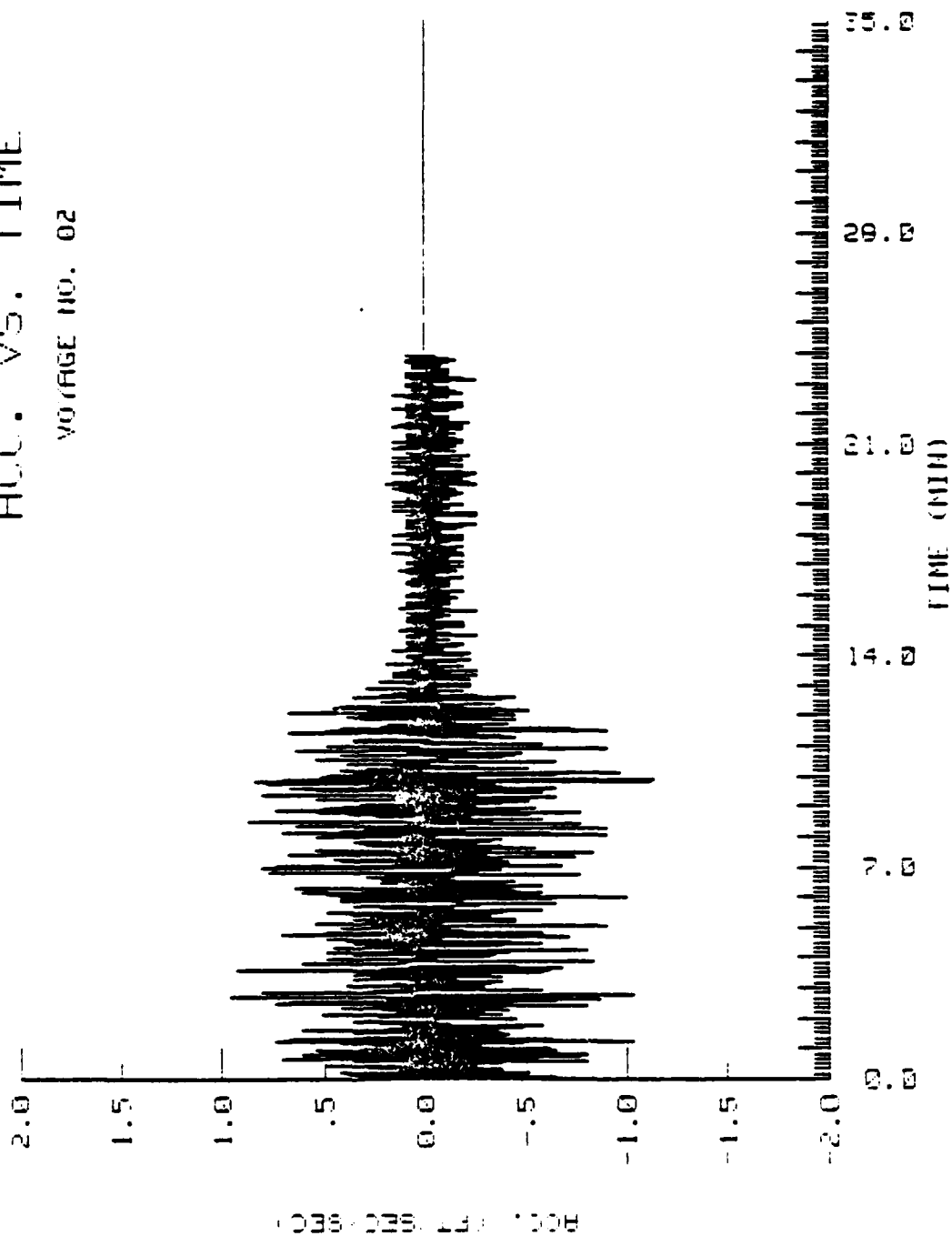
ROLL VS. TIME

VOLUME NO. 02



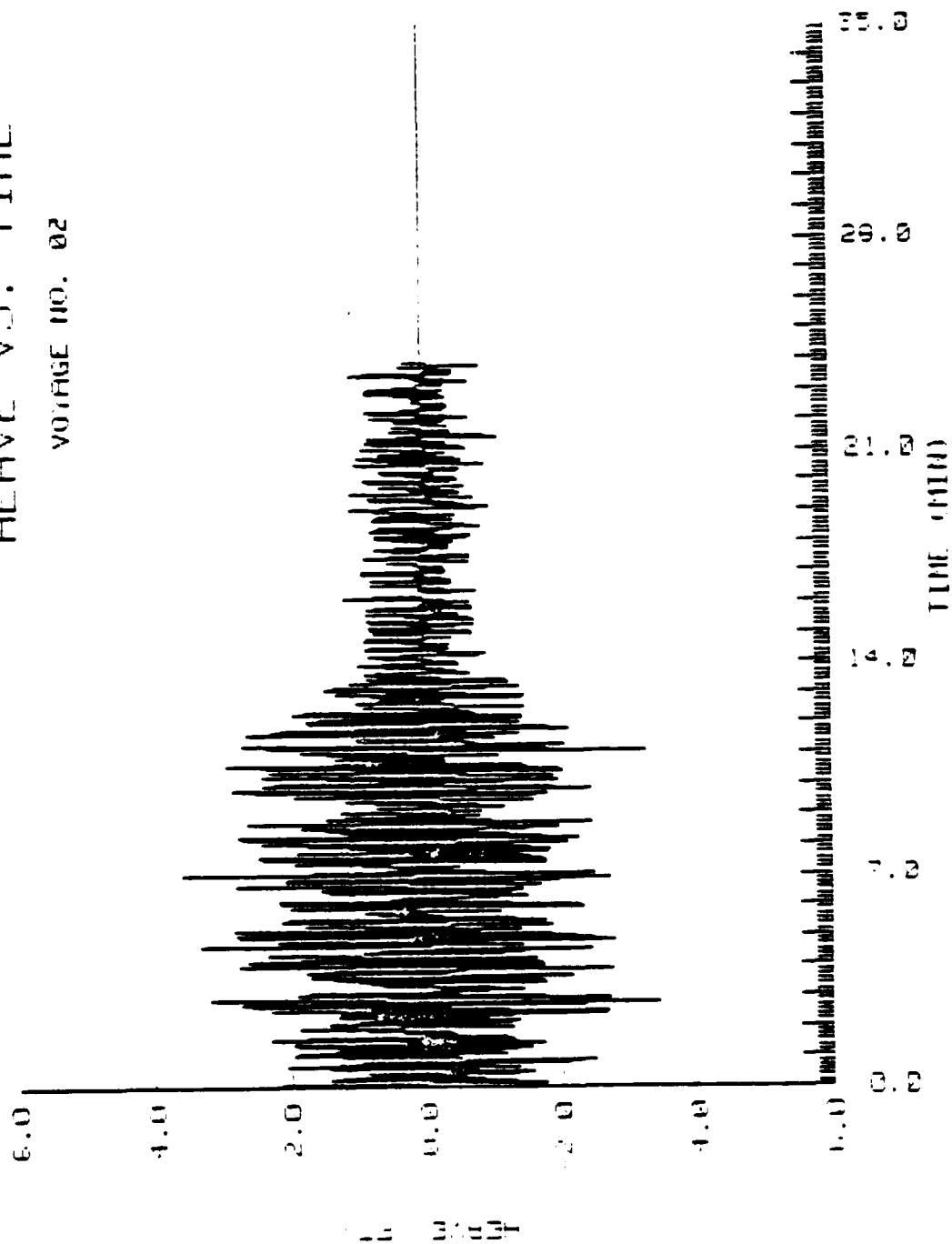
ACC. V5. TIME

VOLUME NO. 02



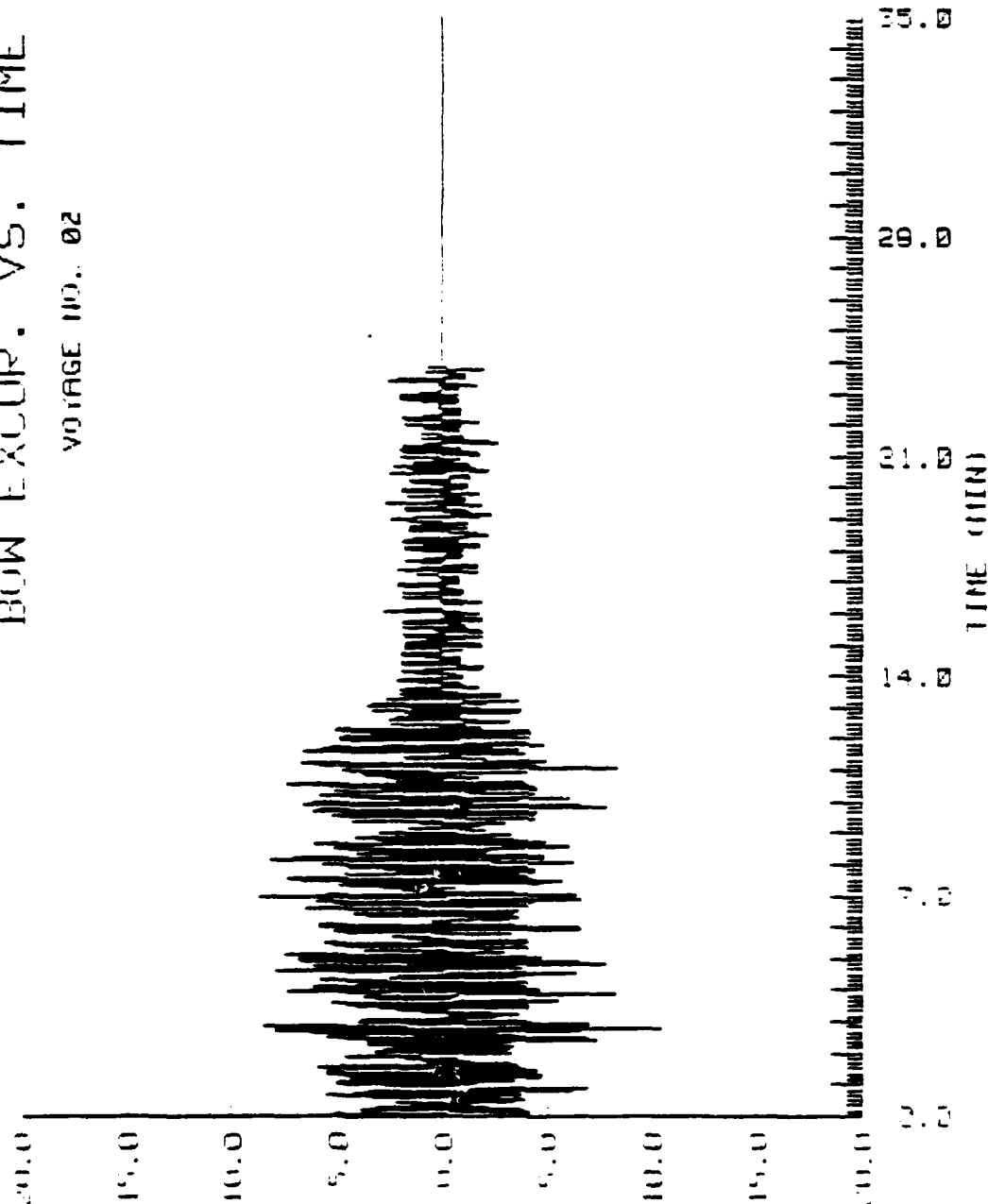
HEAVE VS. TIME

VOYAGE NO. 02



BOW EXCUR. VS. TIME

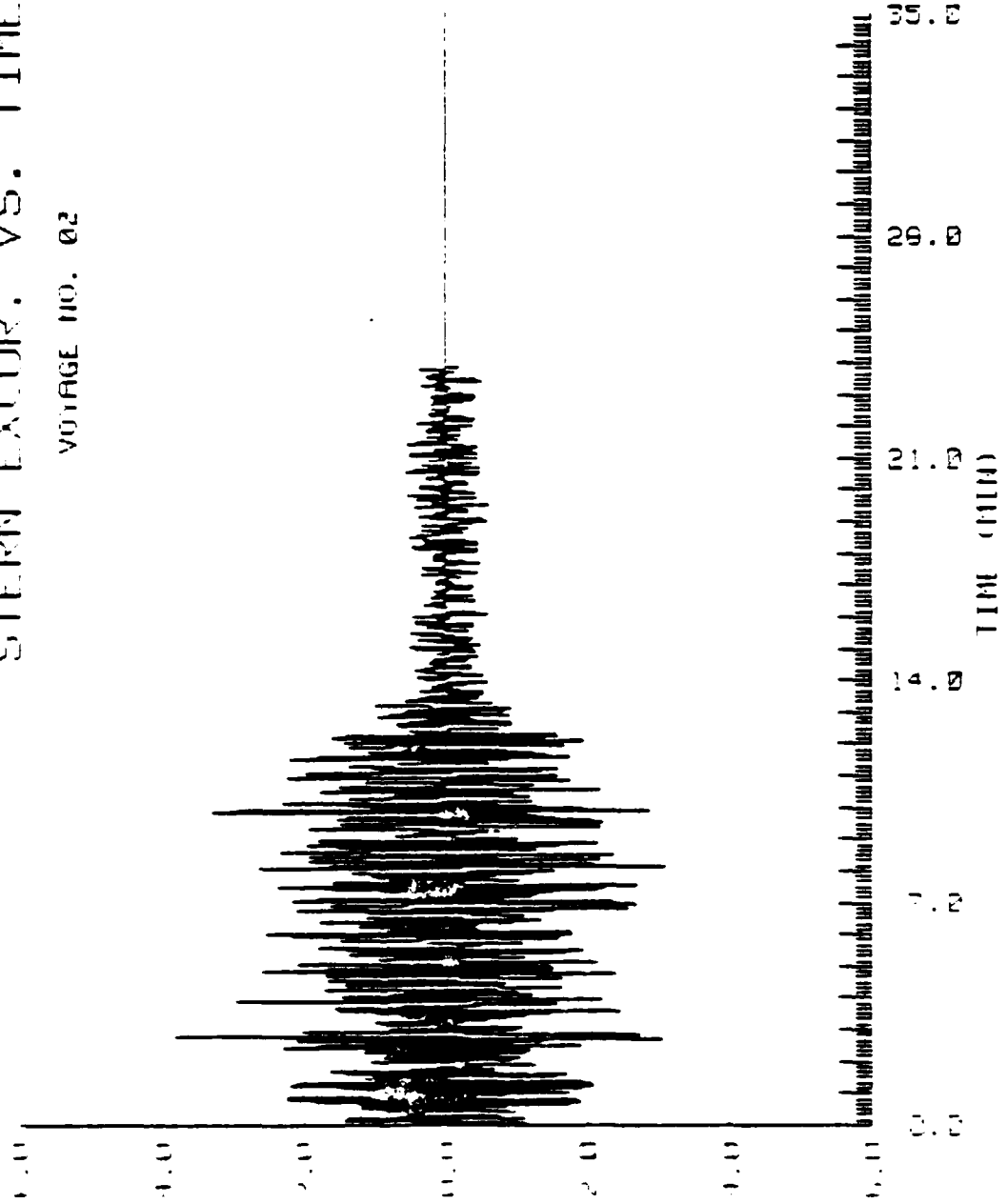
VOTAGE NO.. 02



1 1470-3 033

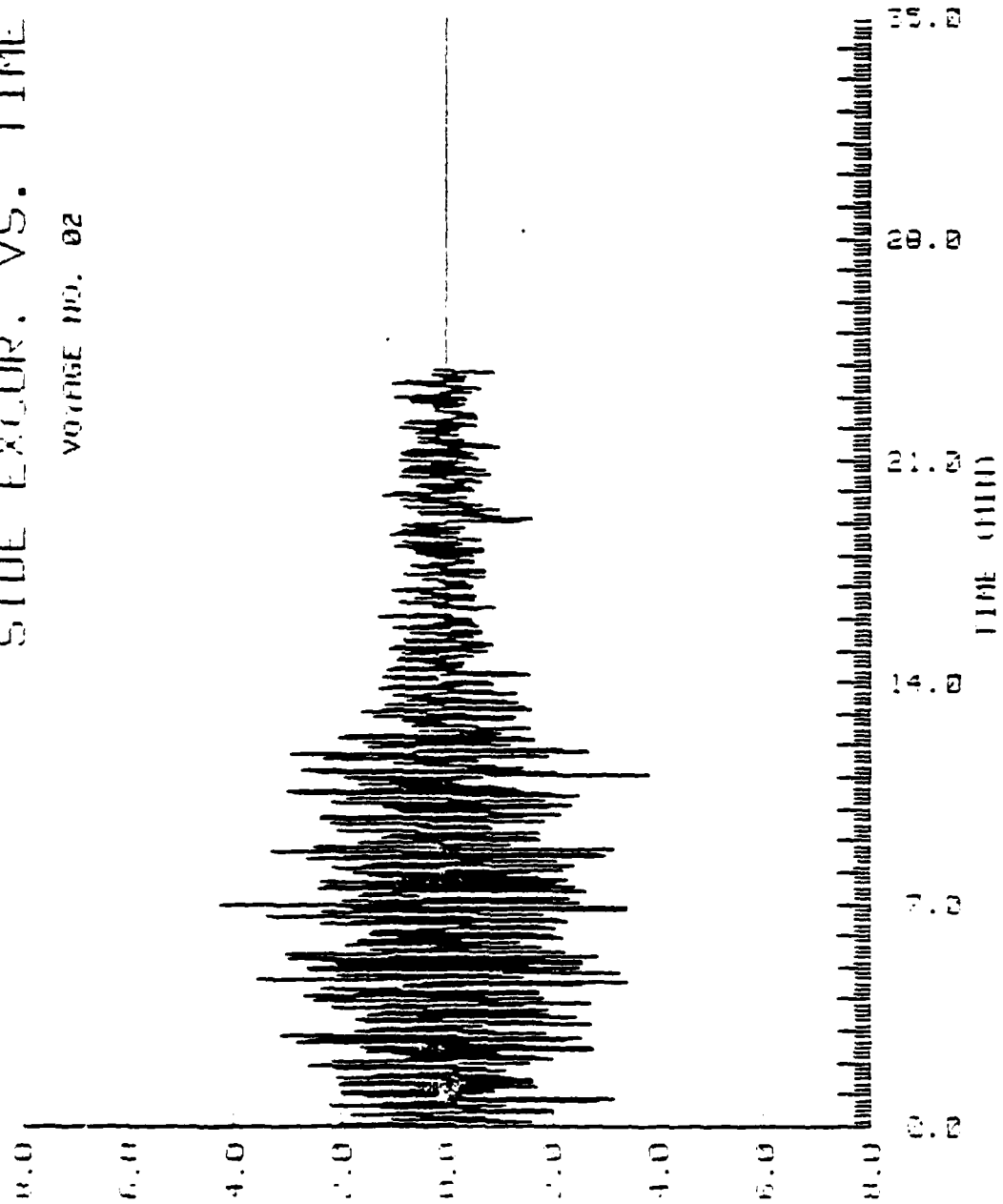
STERN EXCUR. VS. TIME

VOTAGE NO. 02



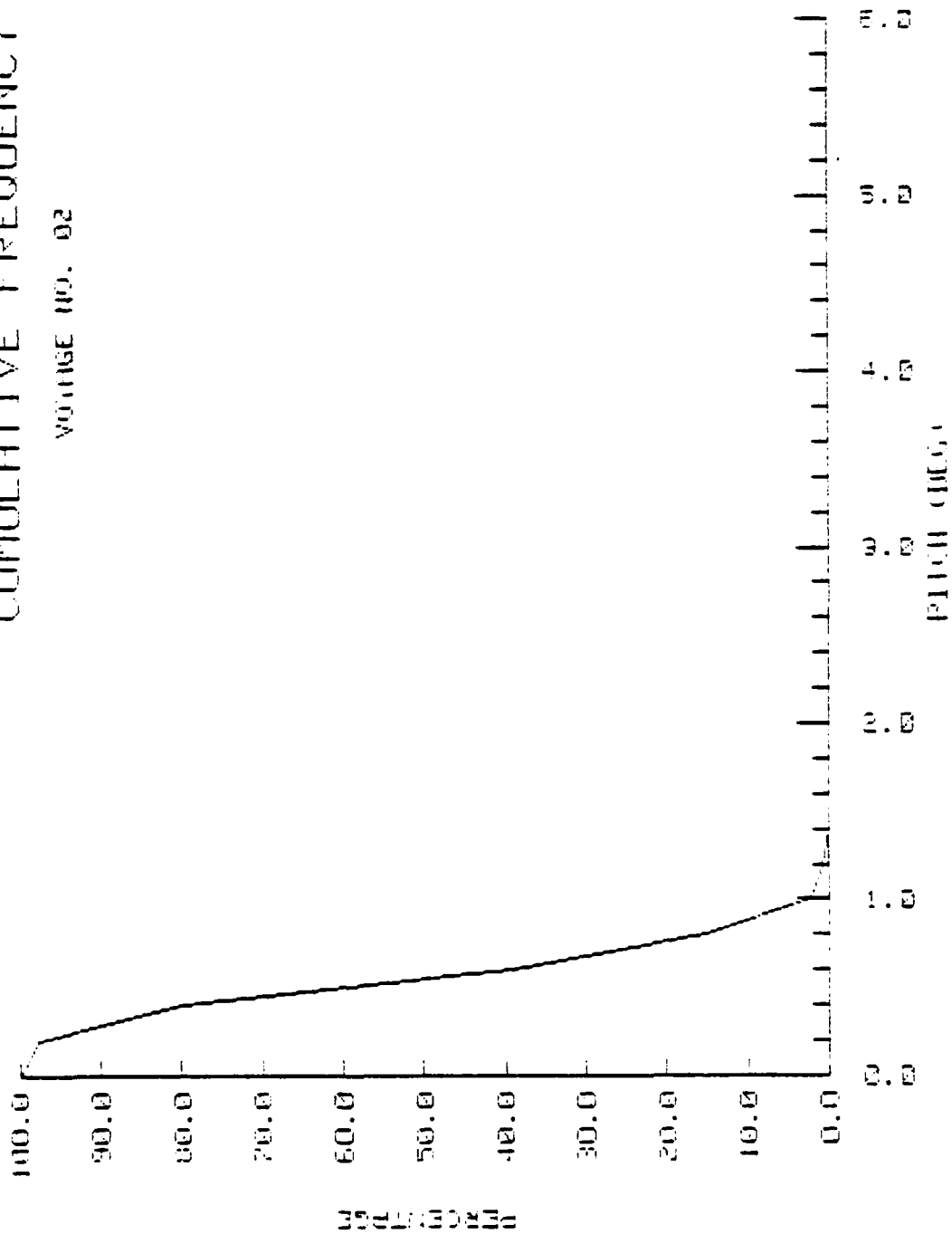
SIDE EXCUR. VS. TIME

VORAGE NO. 02



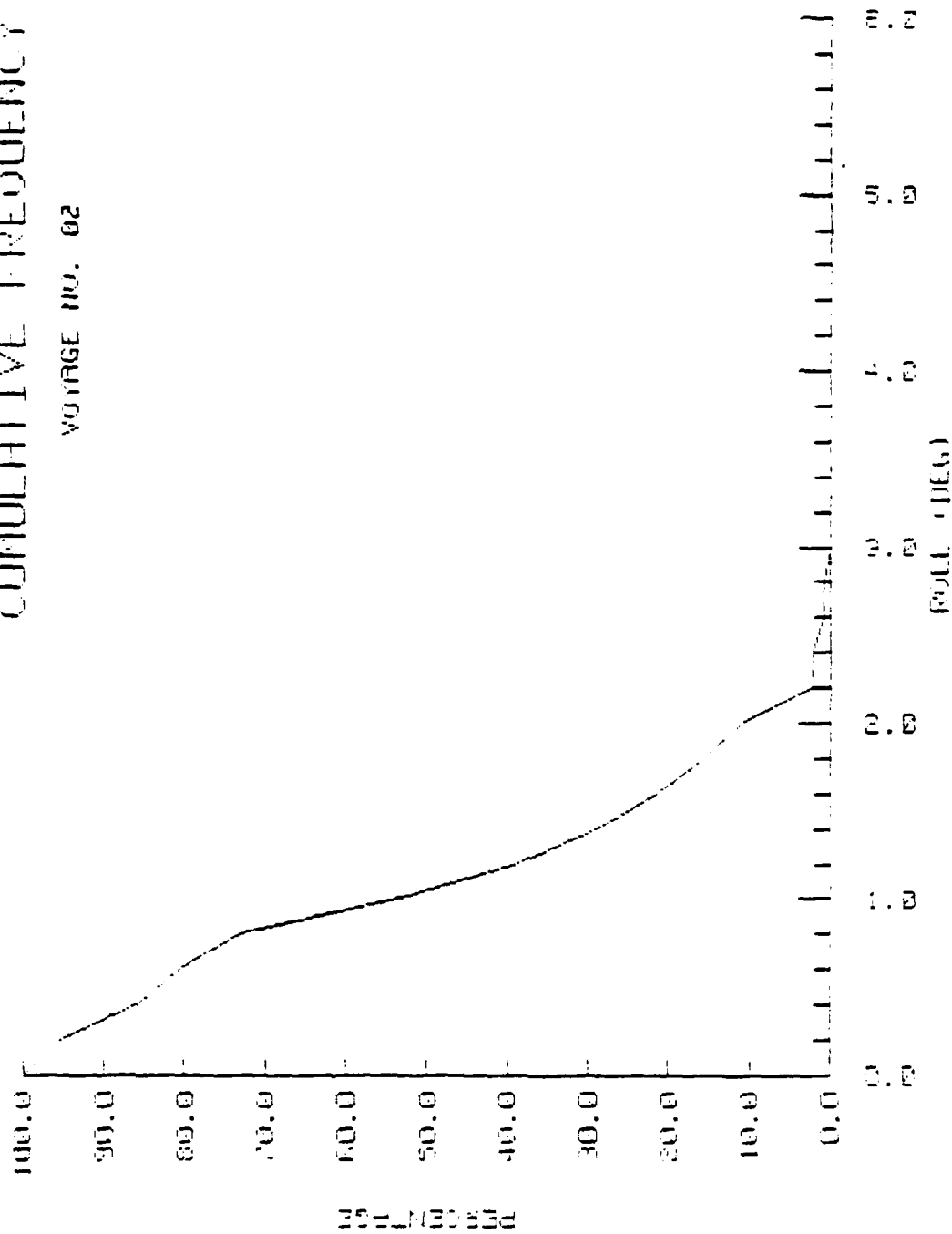
CUMULATIVE FREQUENCY

VOLUME NO. 02



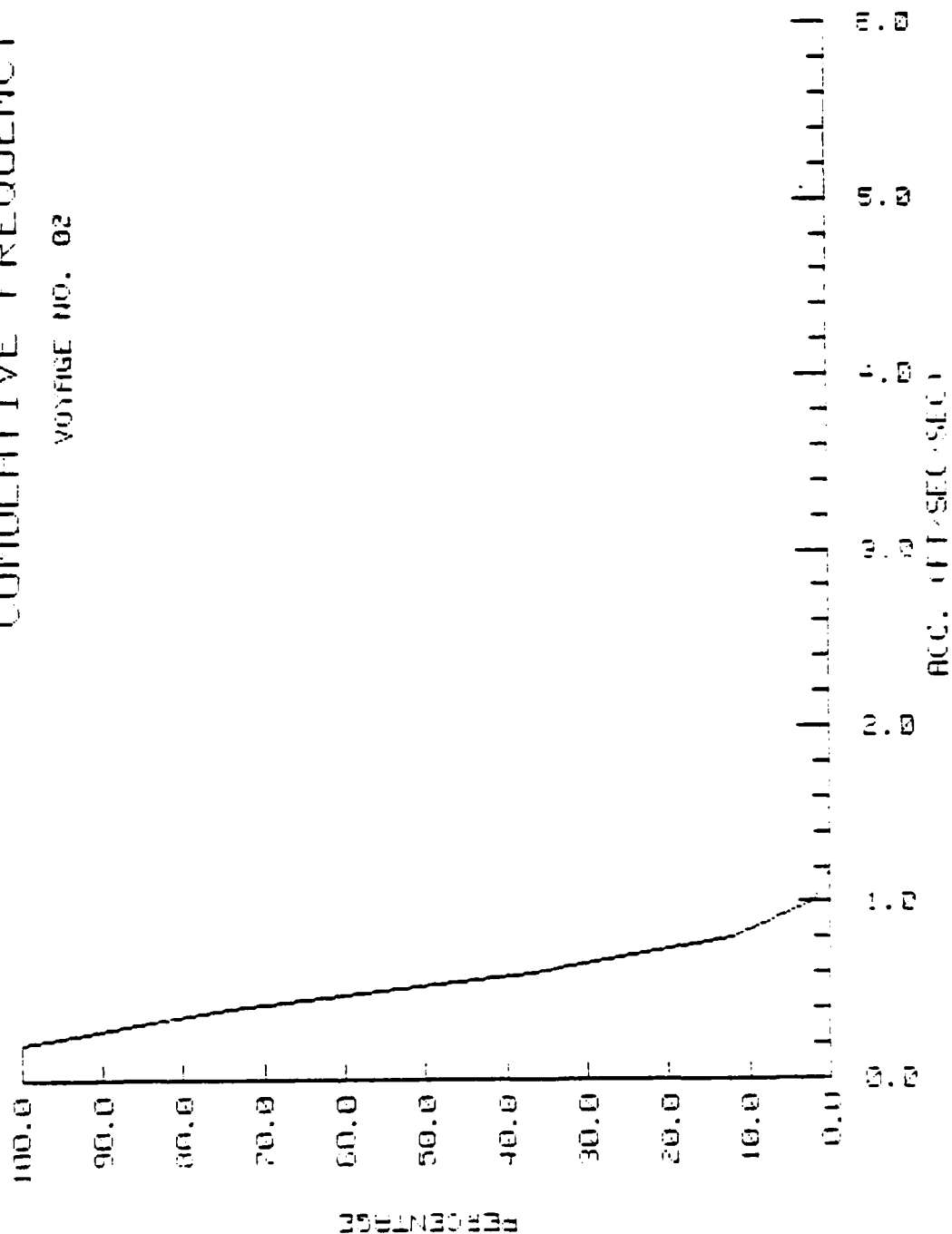
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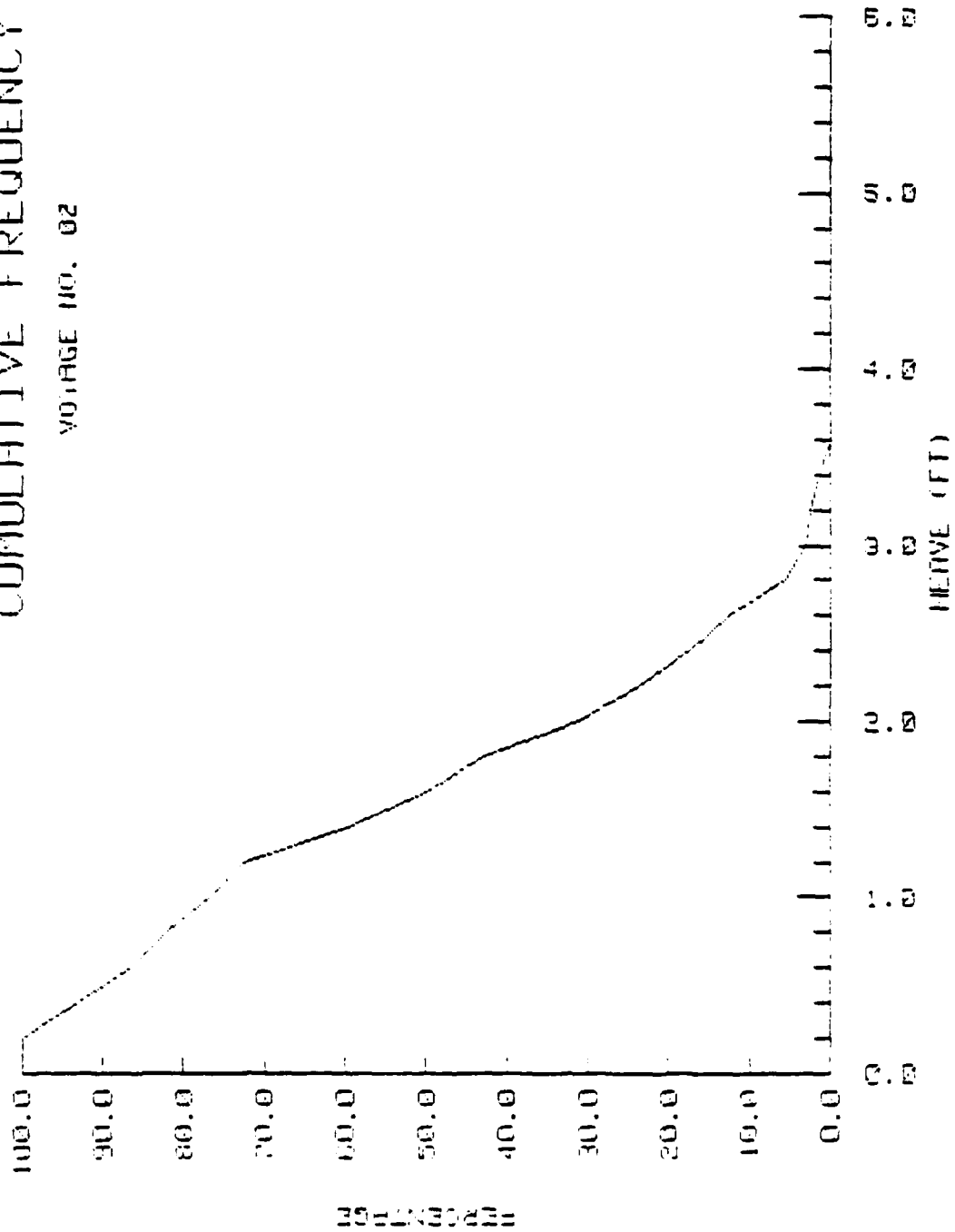
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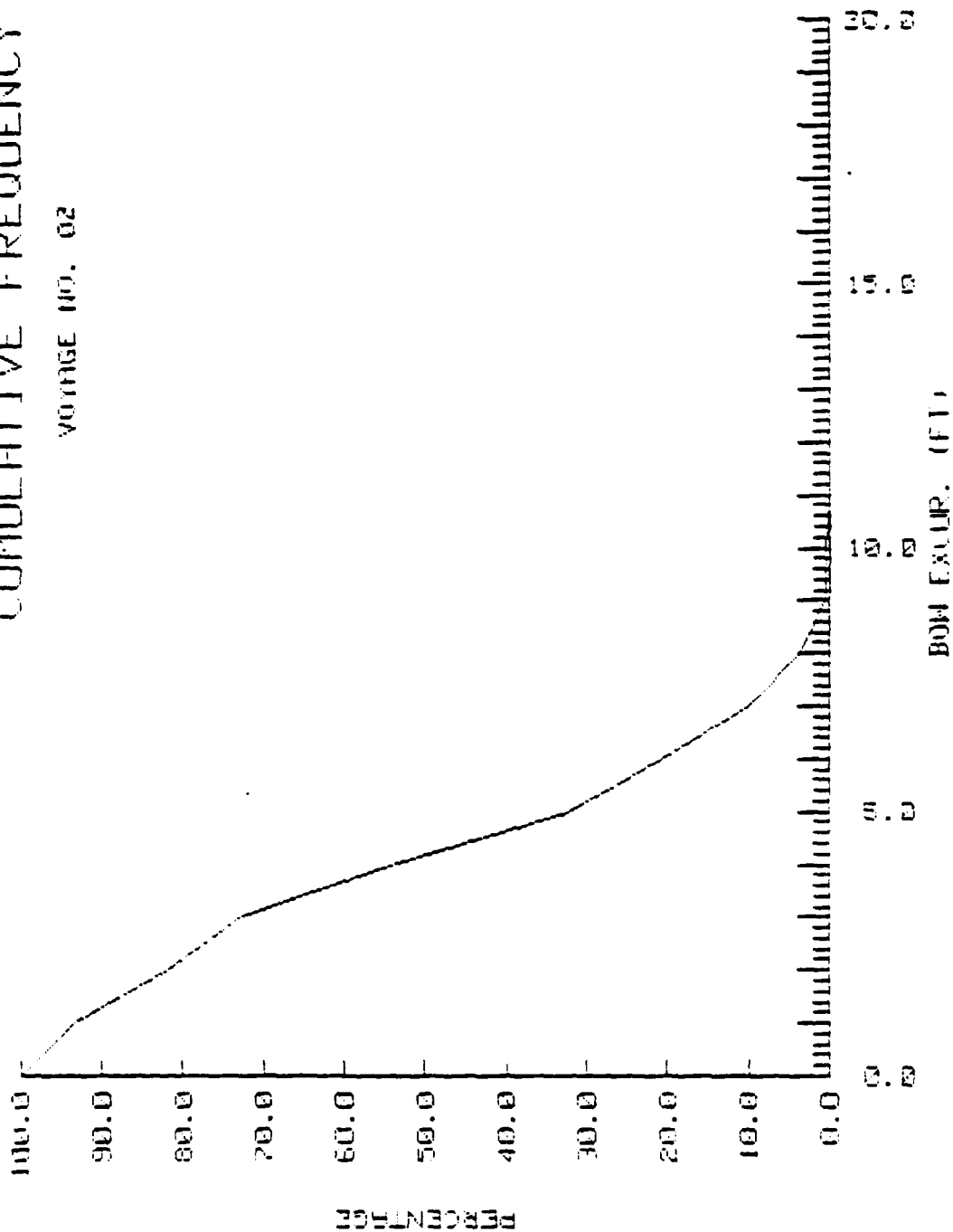
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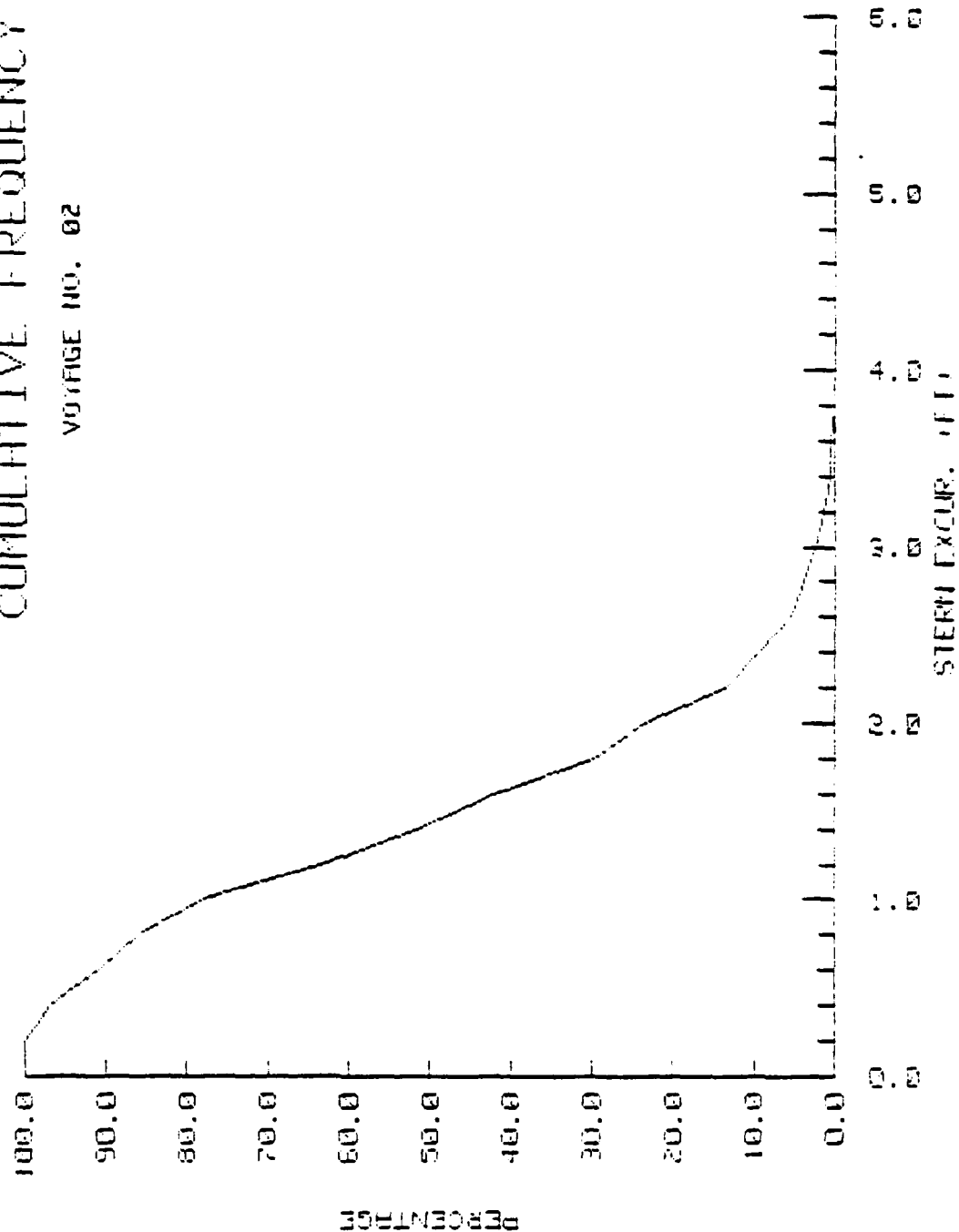
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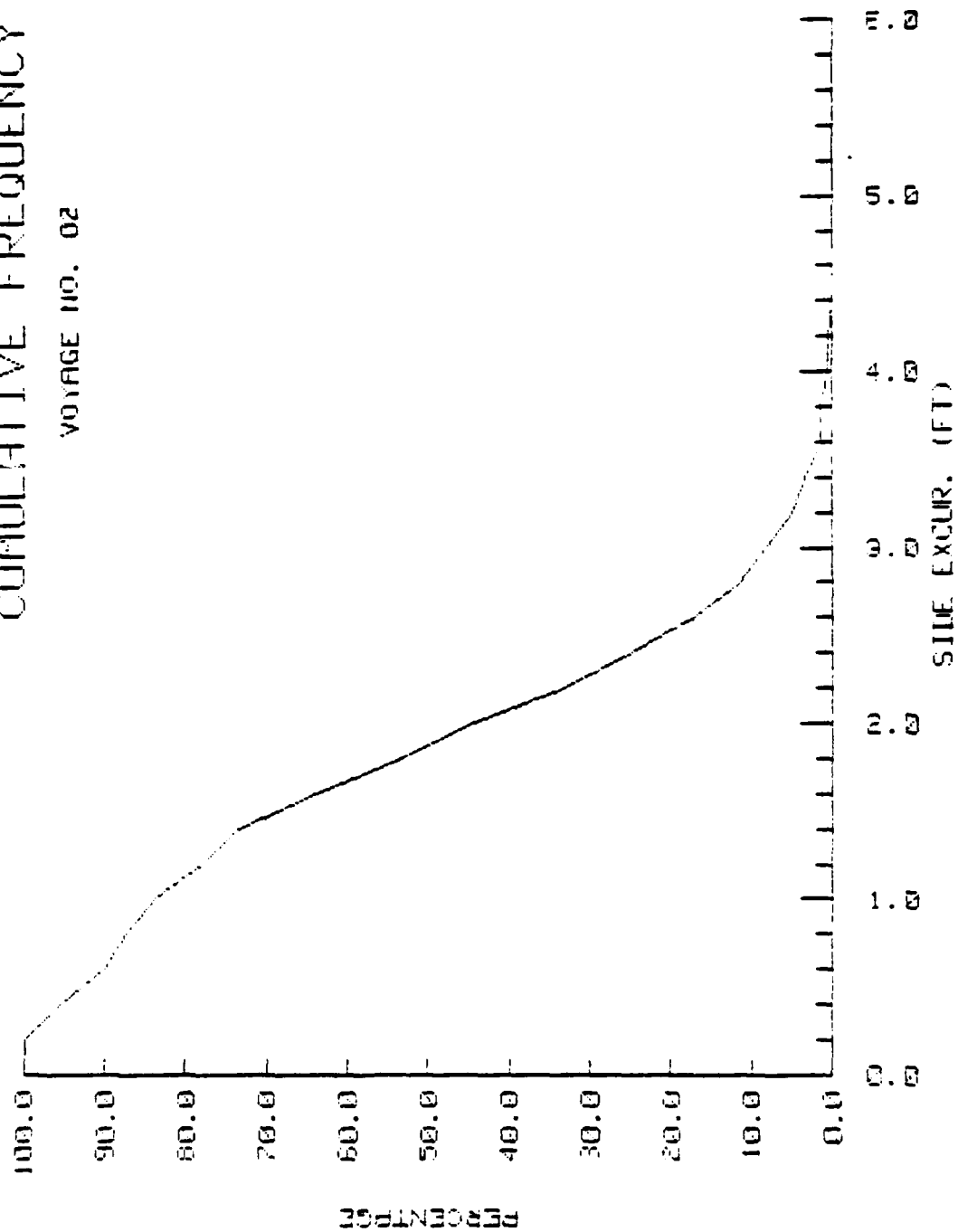
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VOLTAGE NO. 02



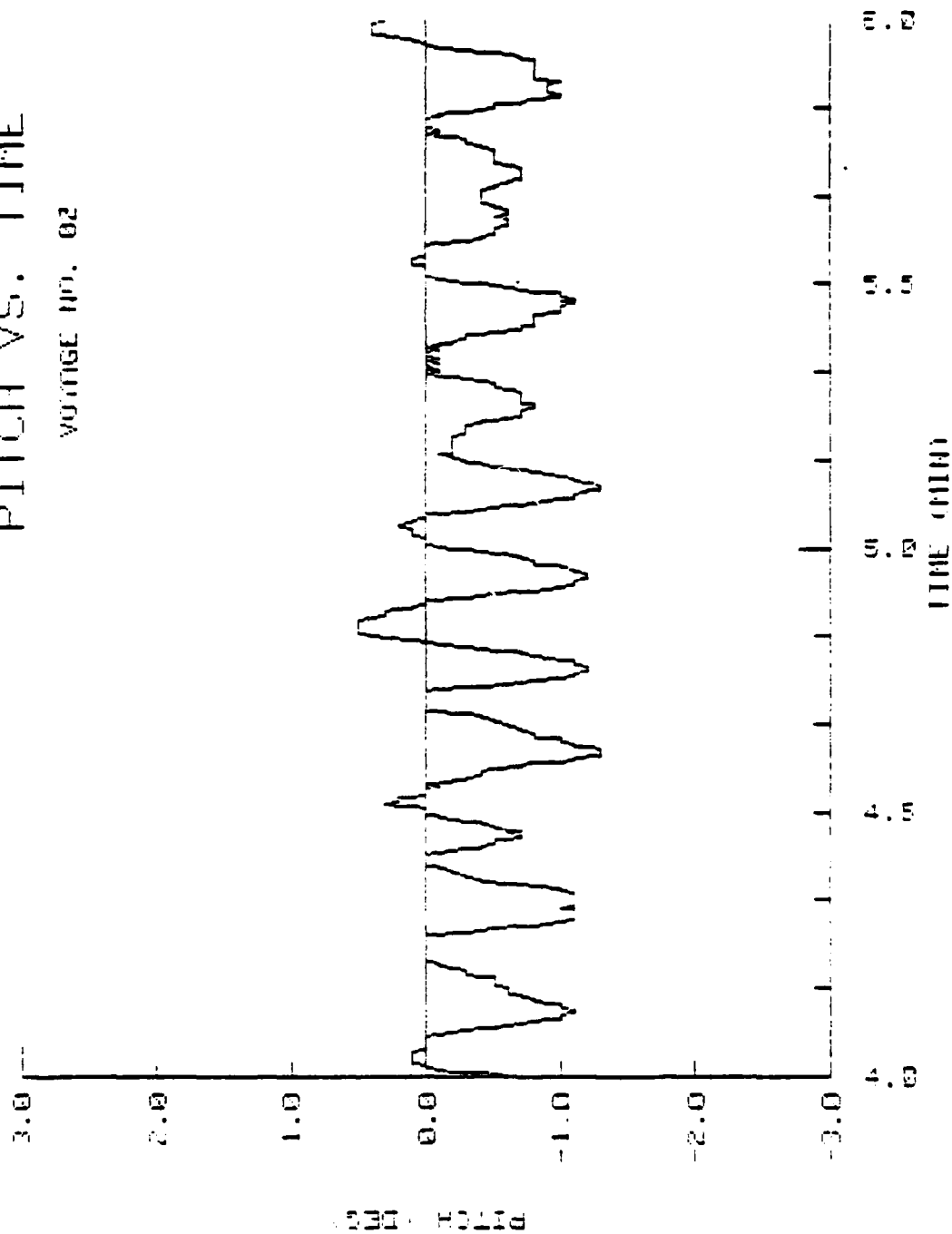
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VOYAGE NO. 02



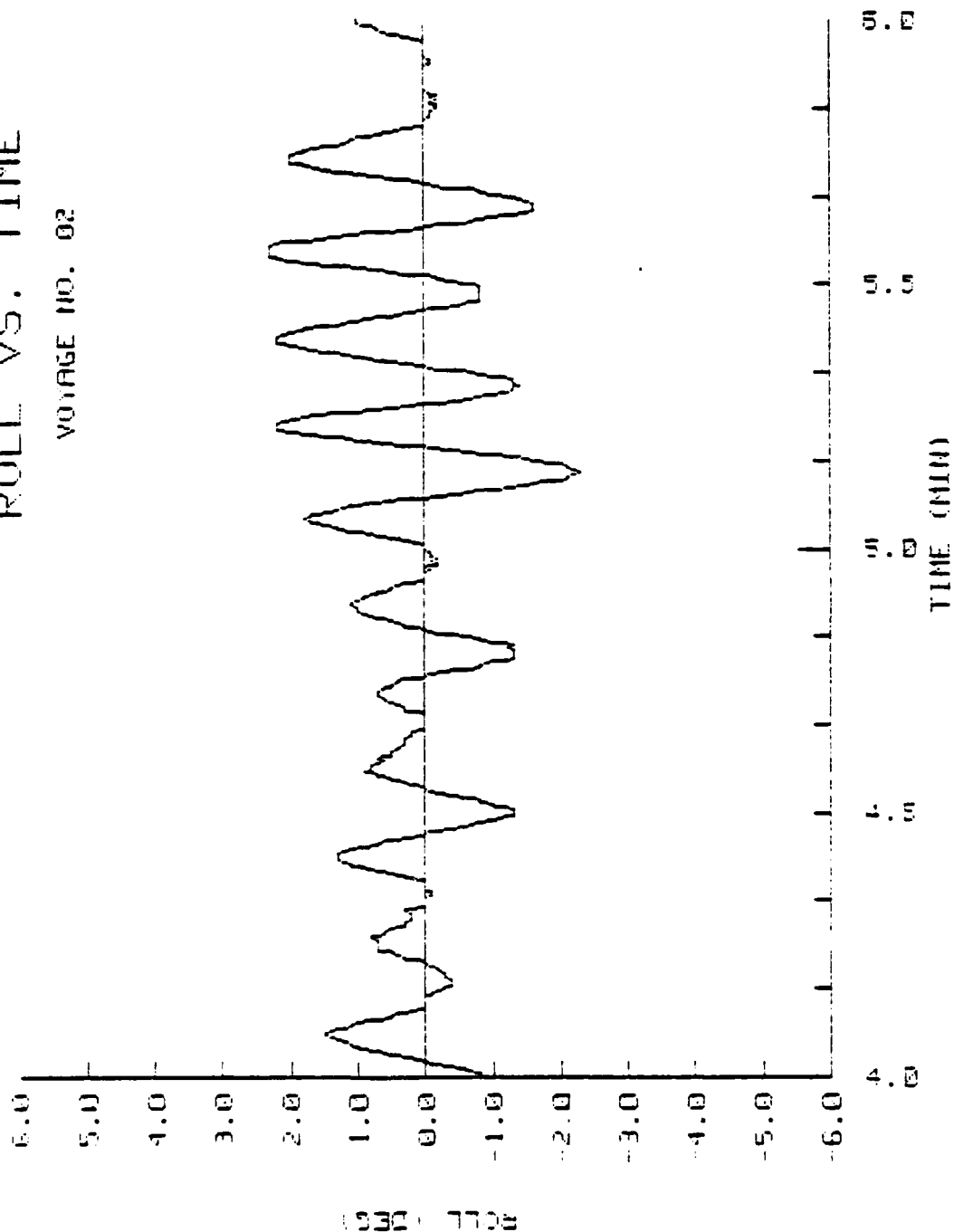
PITCH VS. TIME

VOICE NO. 02



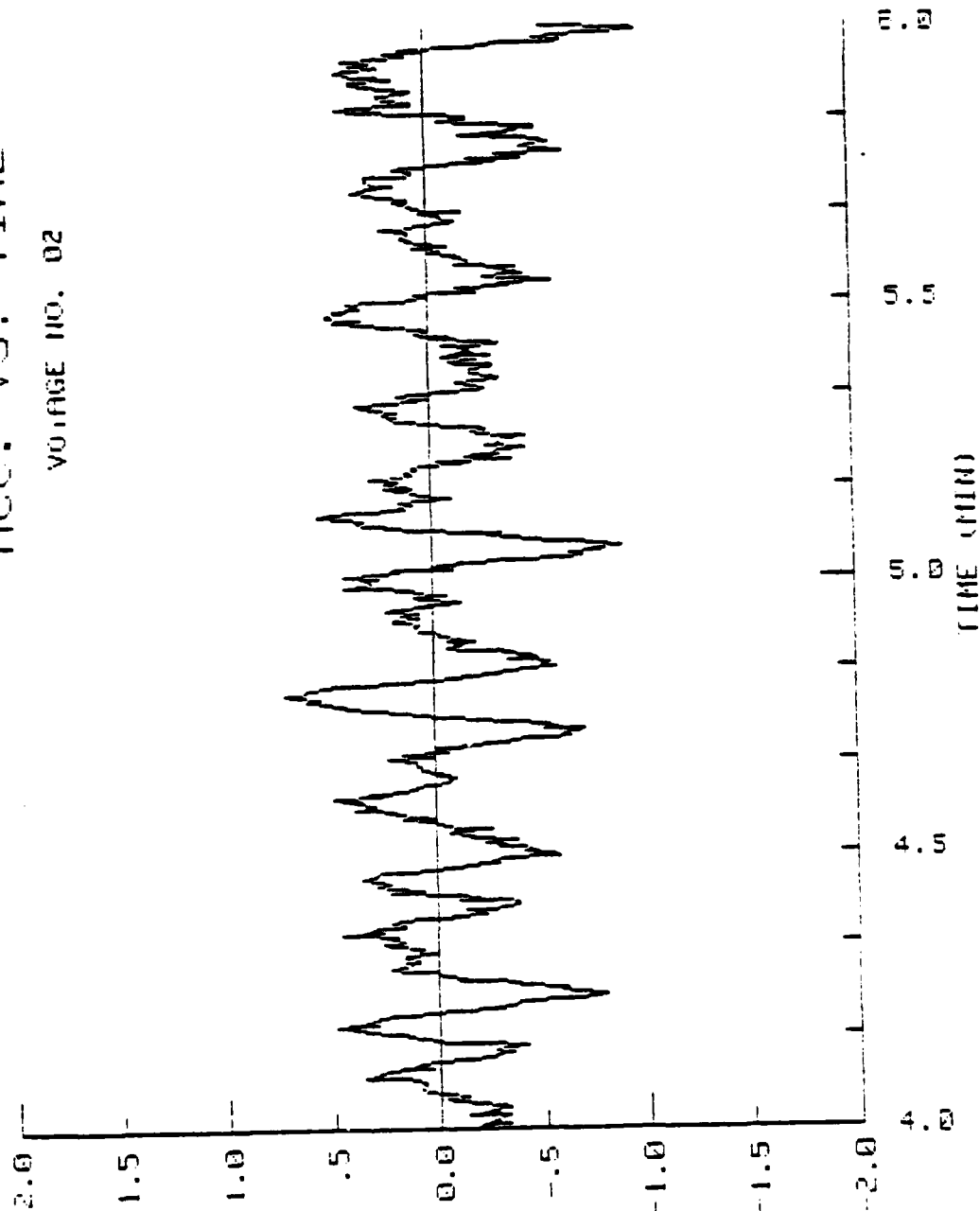
ROLL VS. TIME

VOLTAJE NO. 02



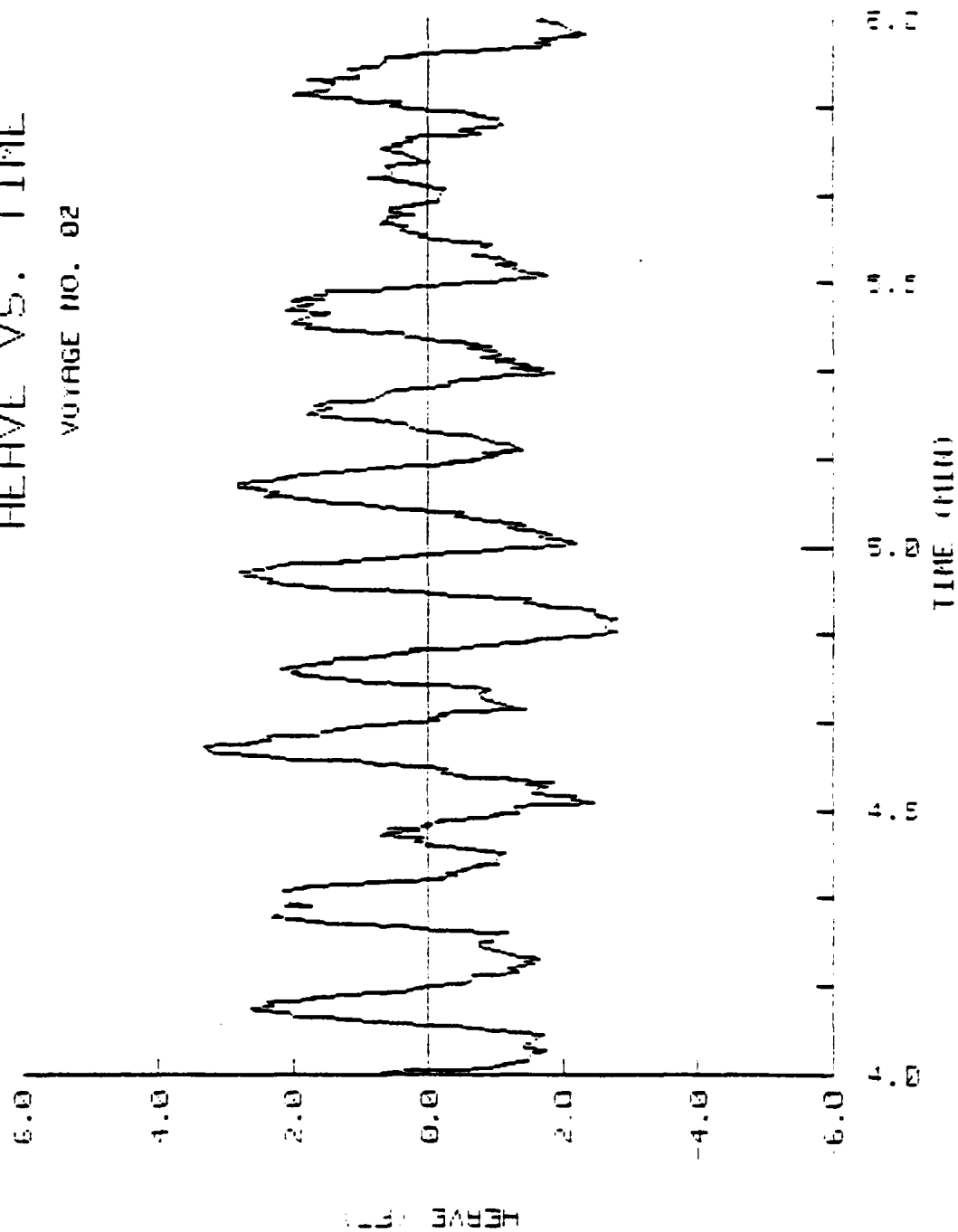
ACC. VS. TIME

VOLAGE NO. 02



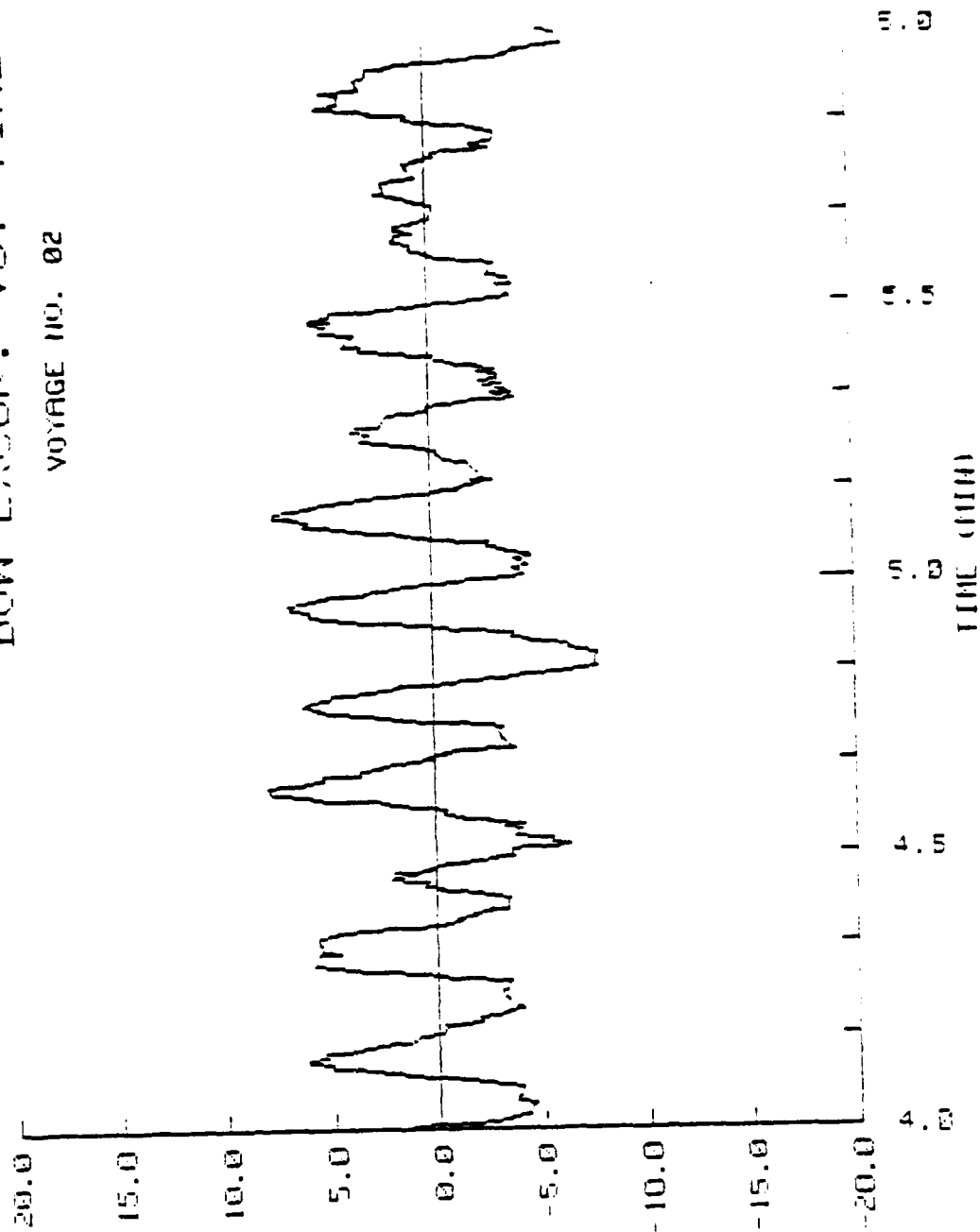
HEAVE VS. TIME

VOTAGE NO. 02



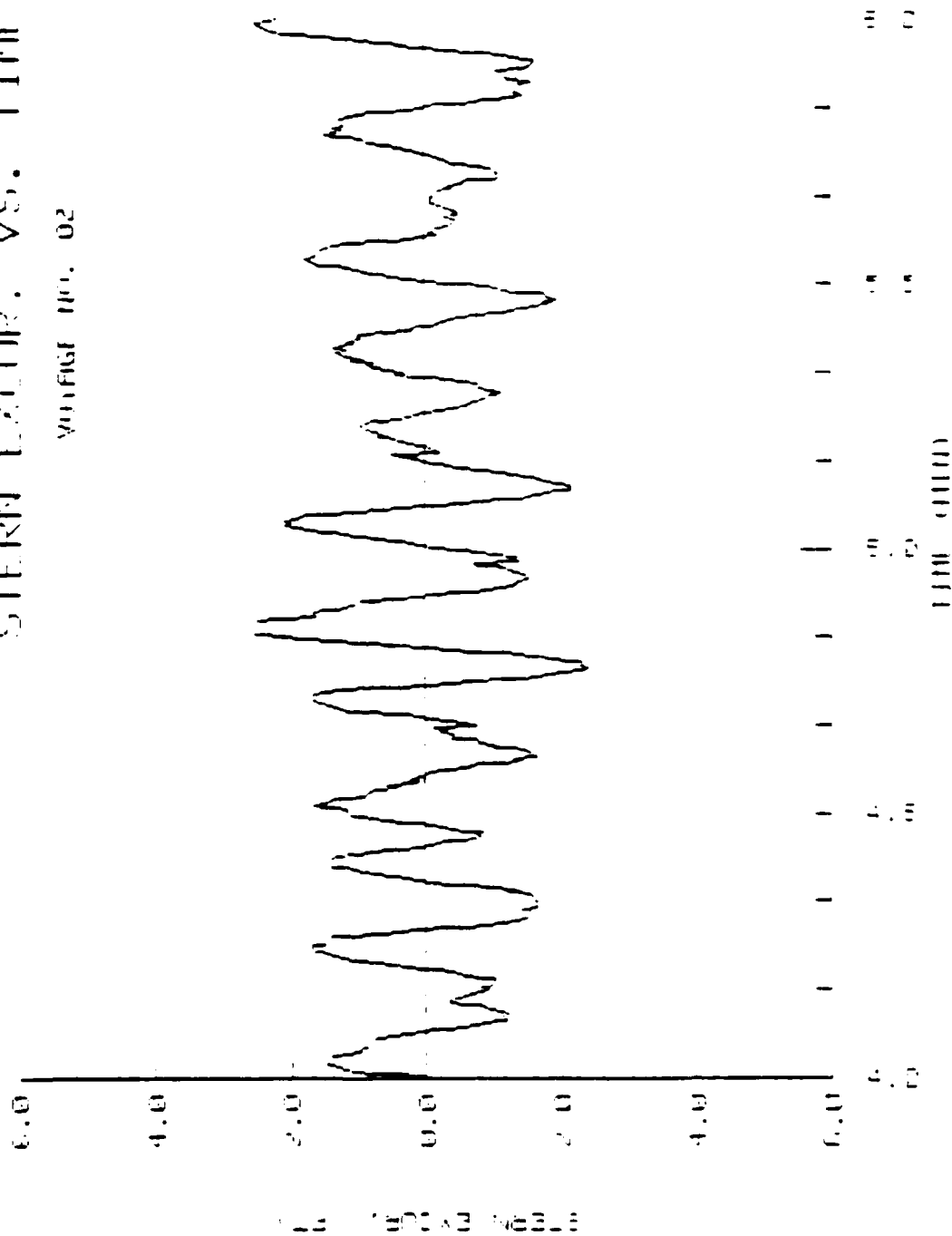
BOW EXCUR. VS. TIME

VOYAGE NO. 02



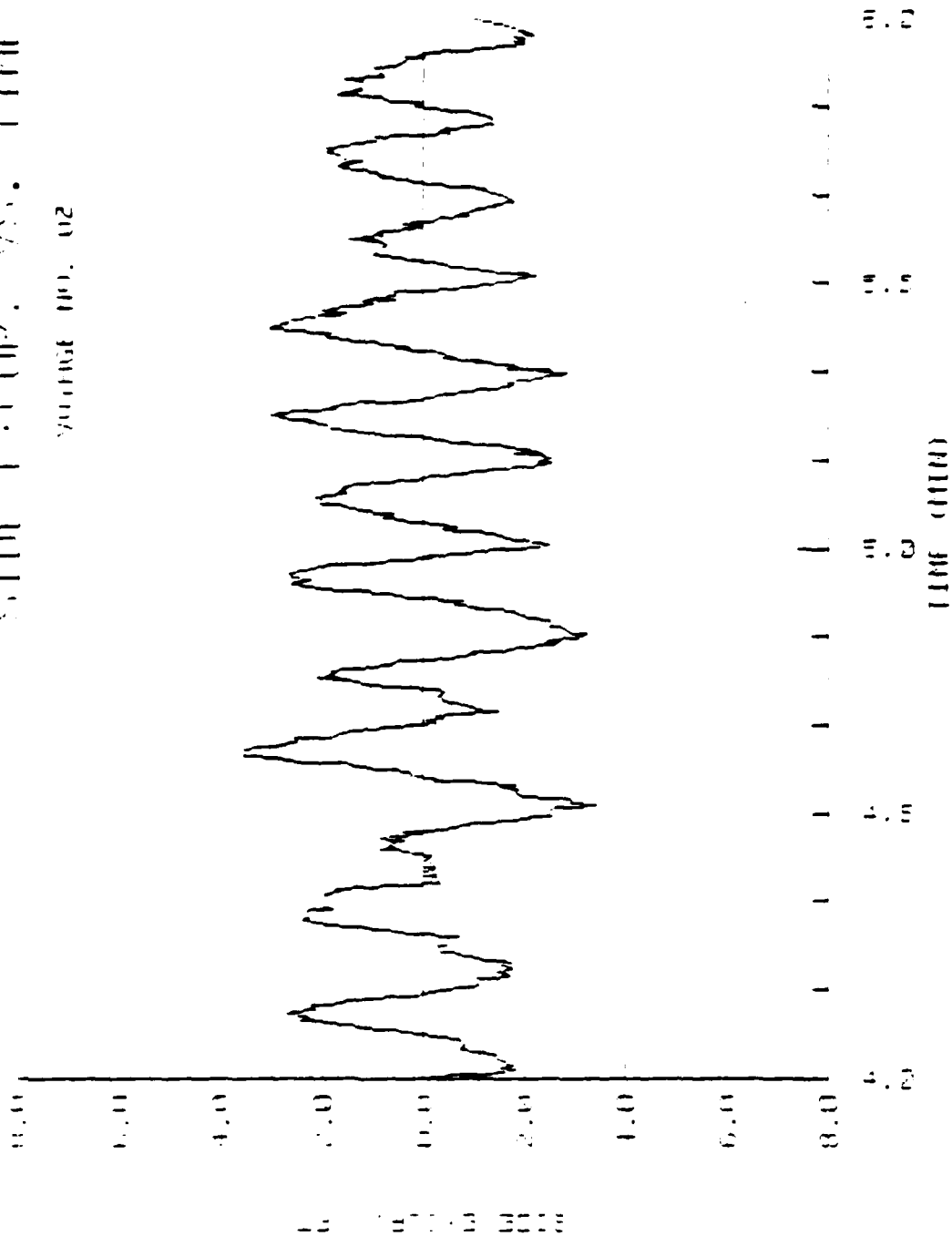
STERN EQUIL. VS. TIME

Y01F01 100. 02



5.1111 1.0000 0.0000 1.1111

0.0000 0.0000 0.0000



STATISTICAL SUMMARY

VOYAGE NO. 03

	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-1.0	.7	.3	.4
ROLL (DEG)	.8	1.4	.6	.7
HEAVE (FT. SEC. SEC.)	.0	1.7	.7	.8
HEAVE (FT.)	.0	2.8	1.1	1.2
BOW EXCUR. (FT.)	.0	6.3	2.6	2.9
STEER EXCUR. (FT.)	.0	2.1	.9	.9
SIDE EXCUR (FT.)	.0	2.5	1.0	1.2

SECRET

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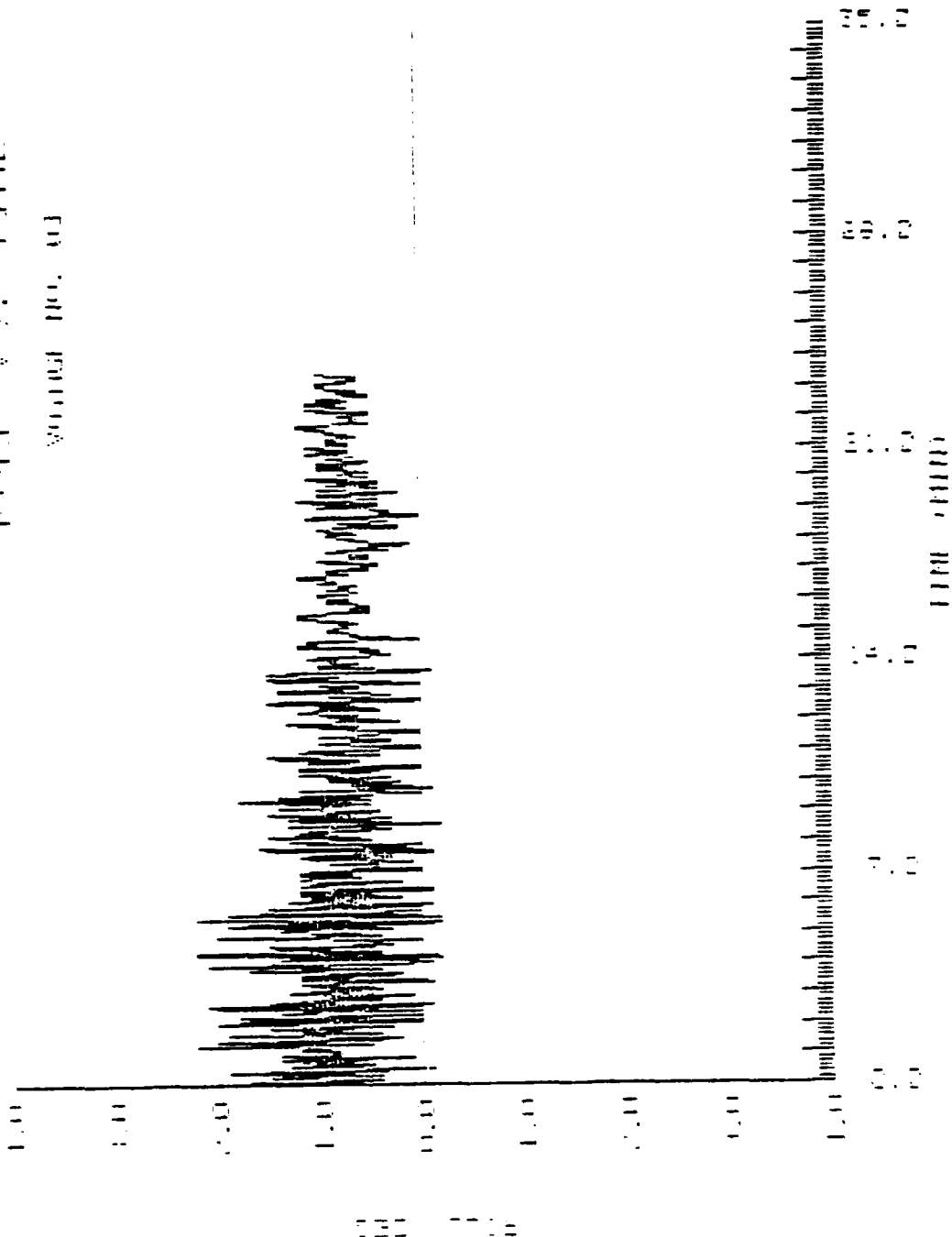
[The page contains dense handwritten notes in cursive script.]

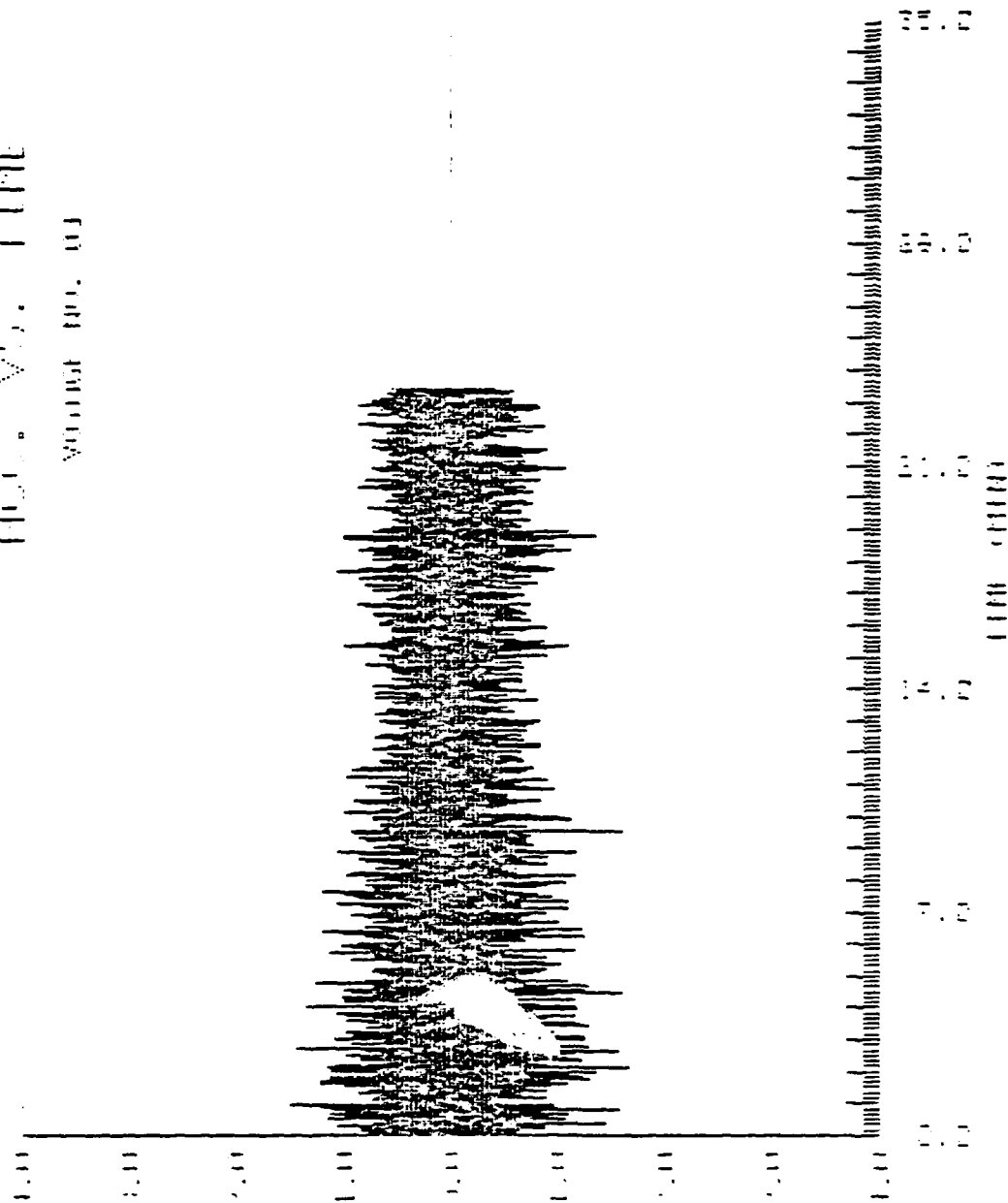
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1841-1842

1941 V. A. 1100

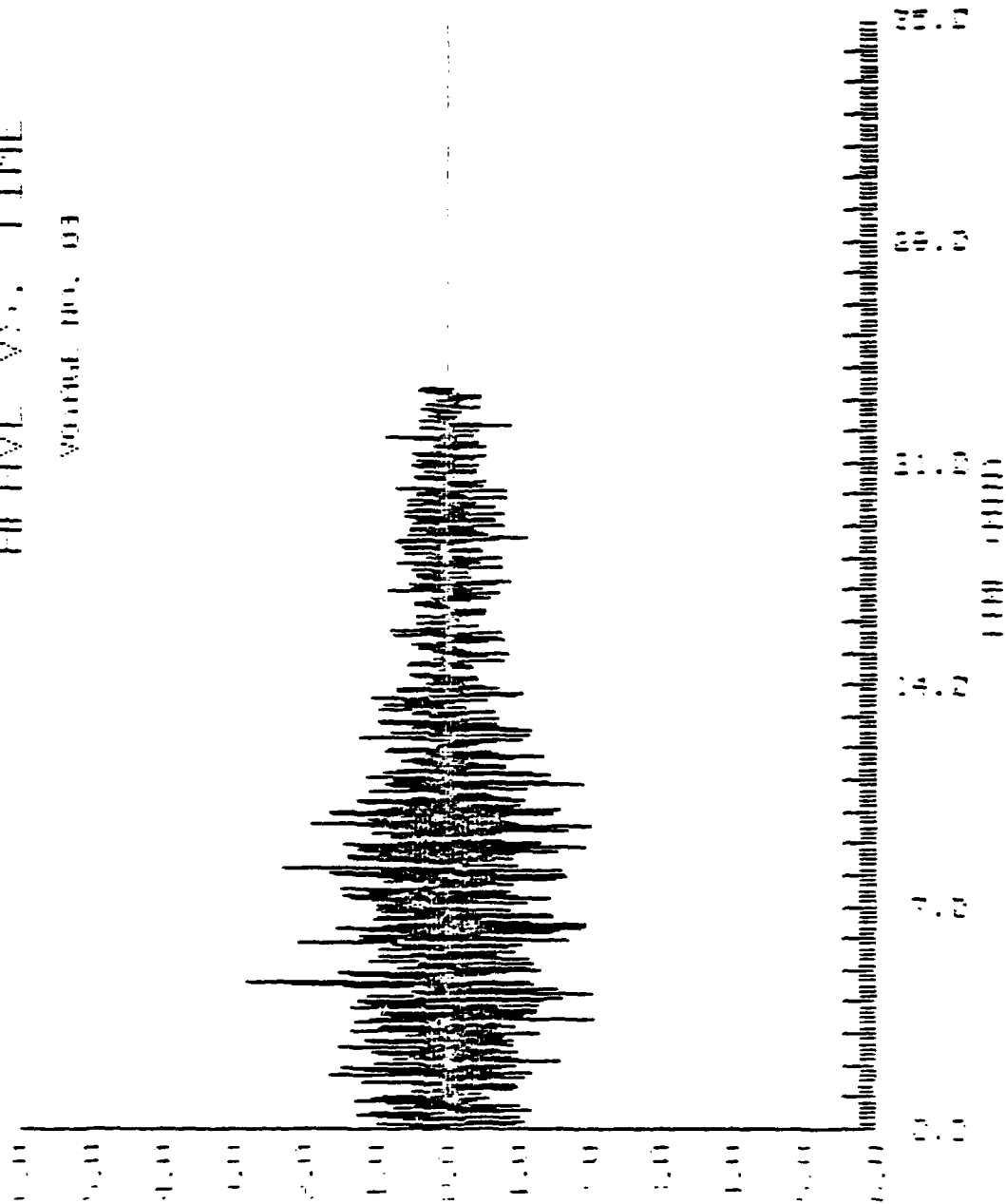
Volume No. 10



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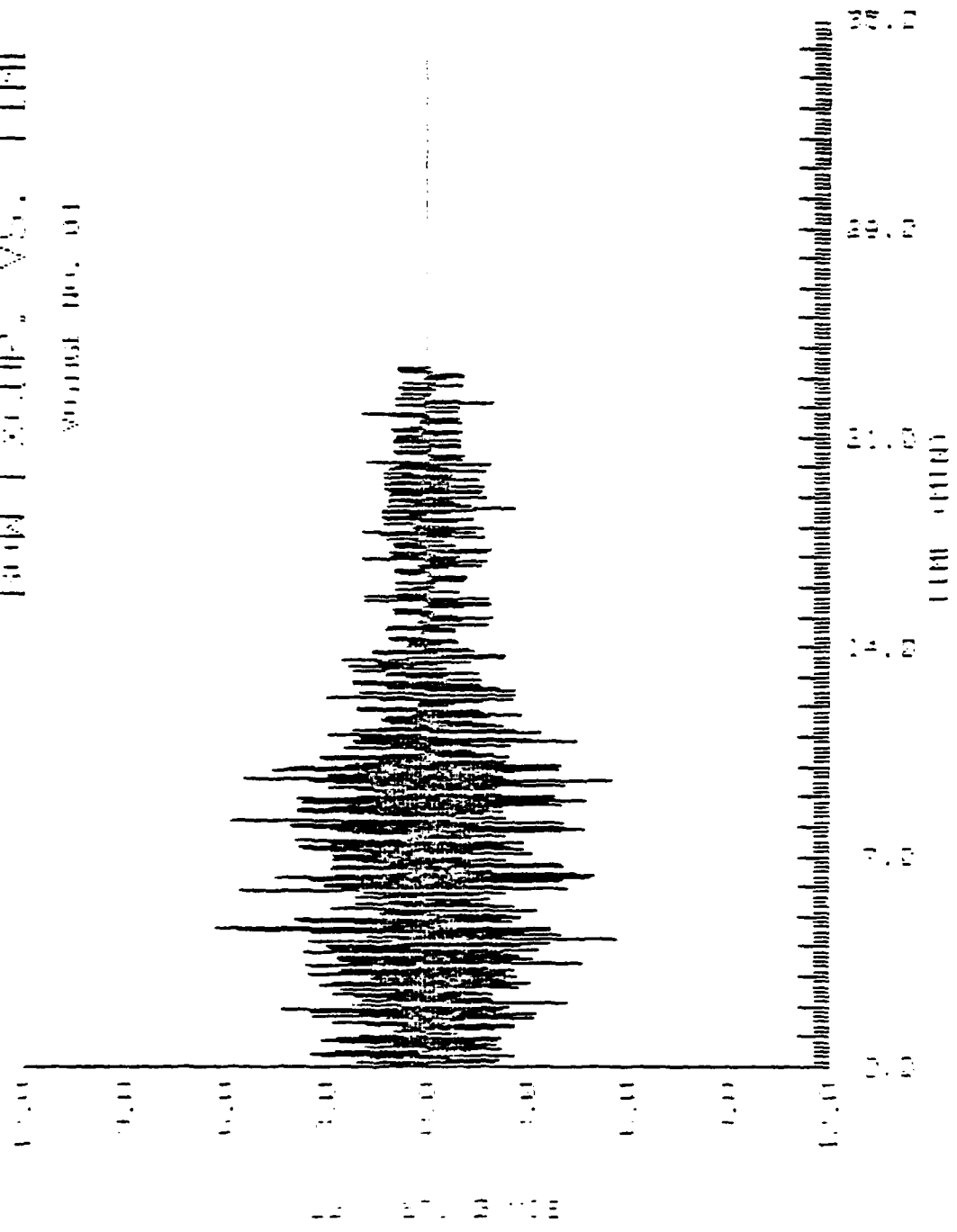
FIVE MIN. TIME

WOUND NO. 03



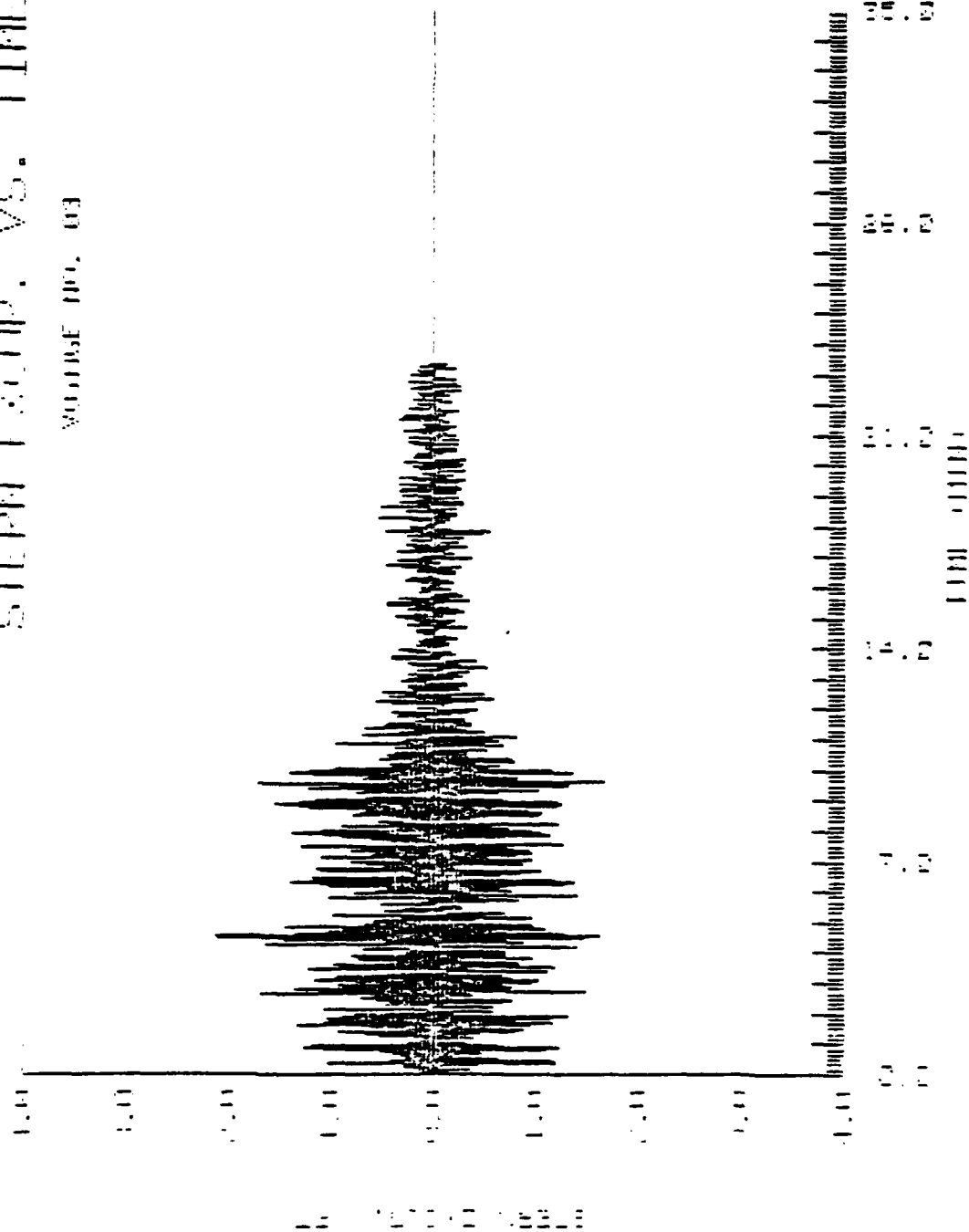
1004 1 20.00P. VS. TIME

WIND NO. 01



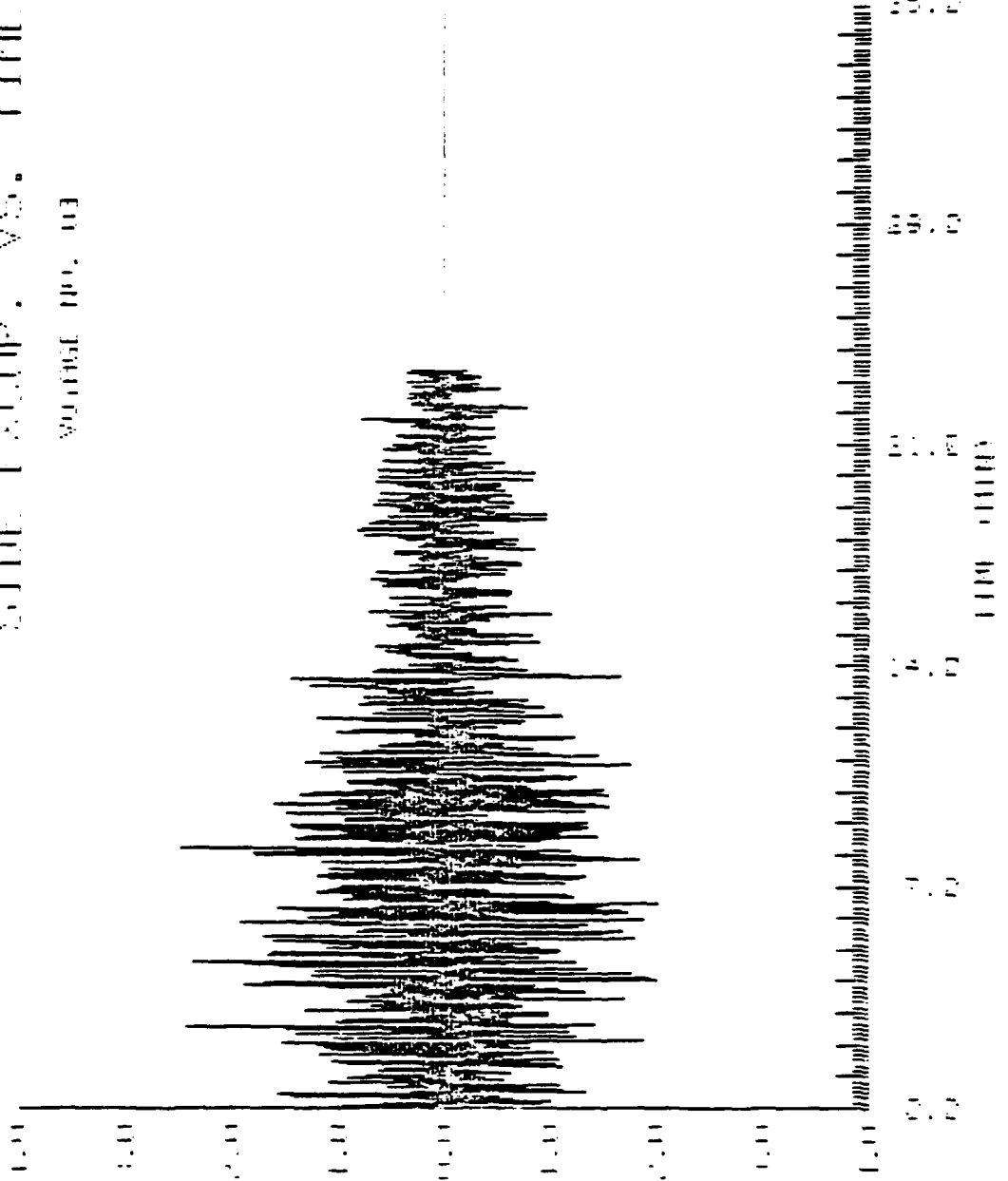
STEPH EQUIP. VS. TIME

VOLUME 100, 03



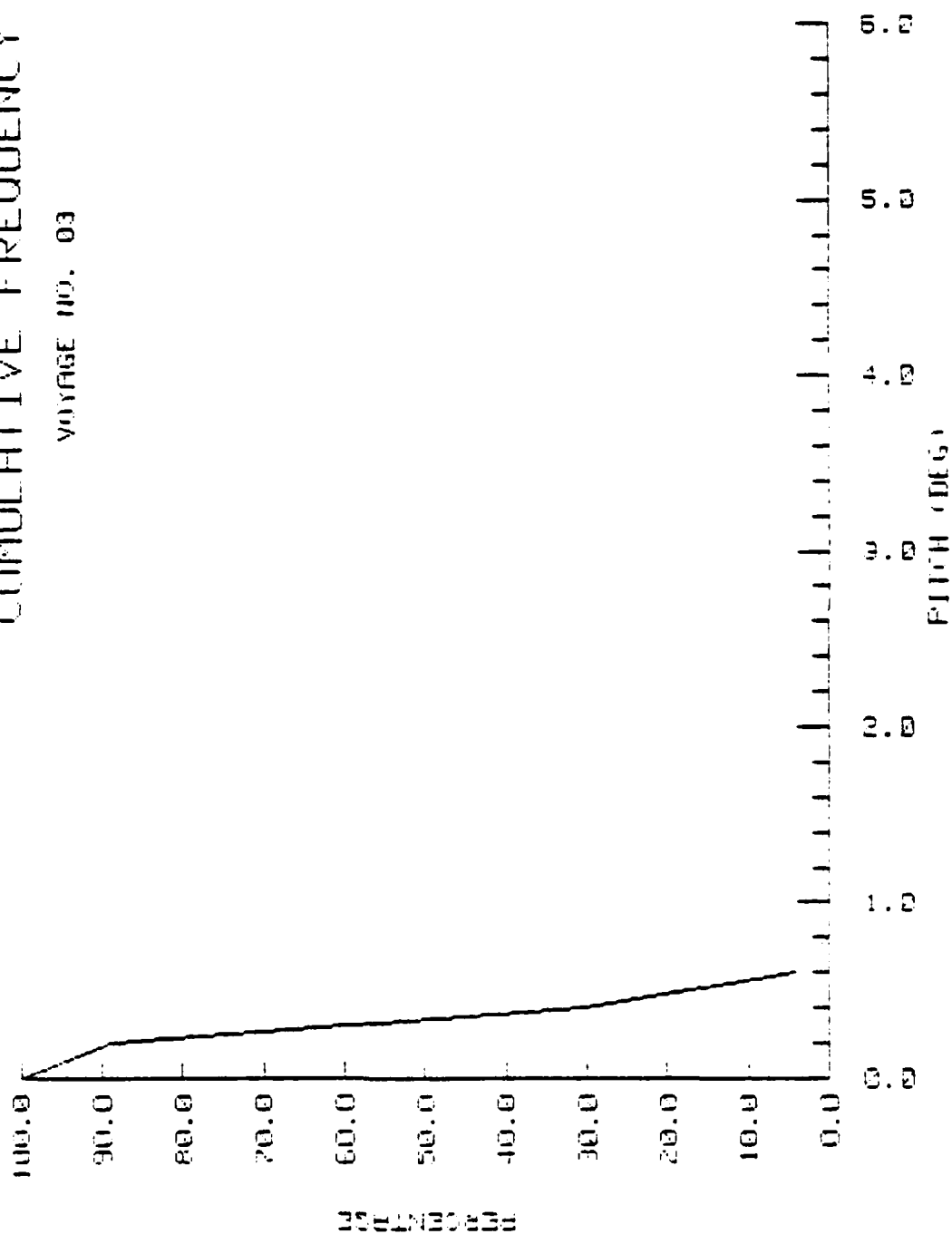
ELITE GROUP, VS. TIME

WAVE NO. 03



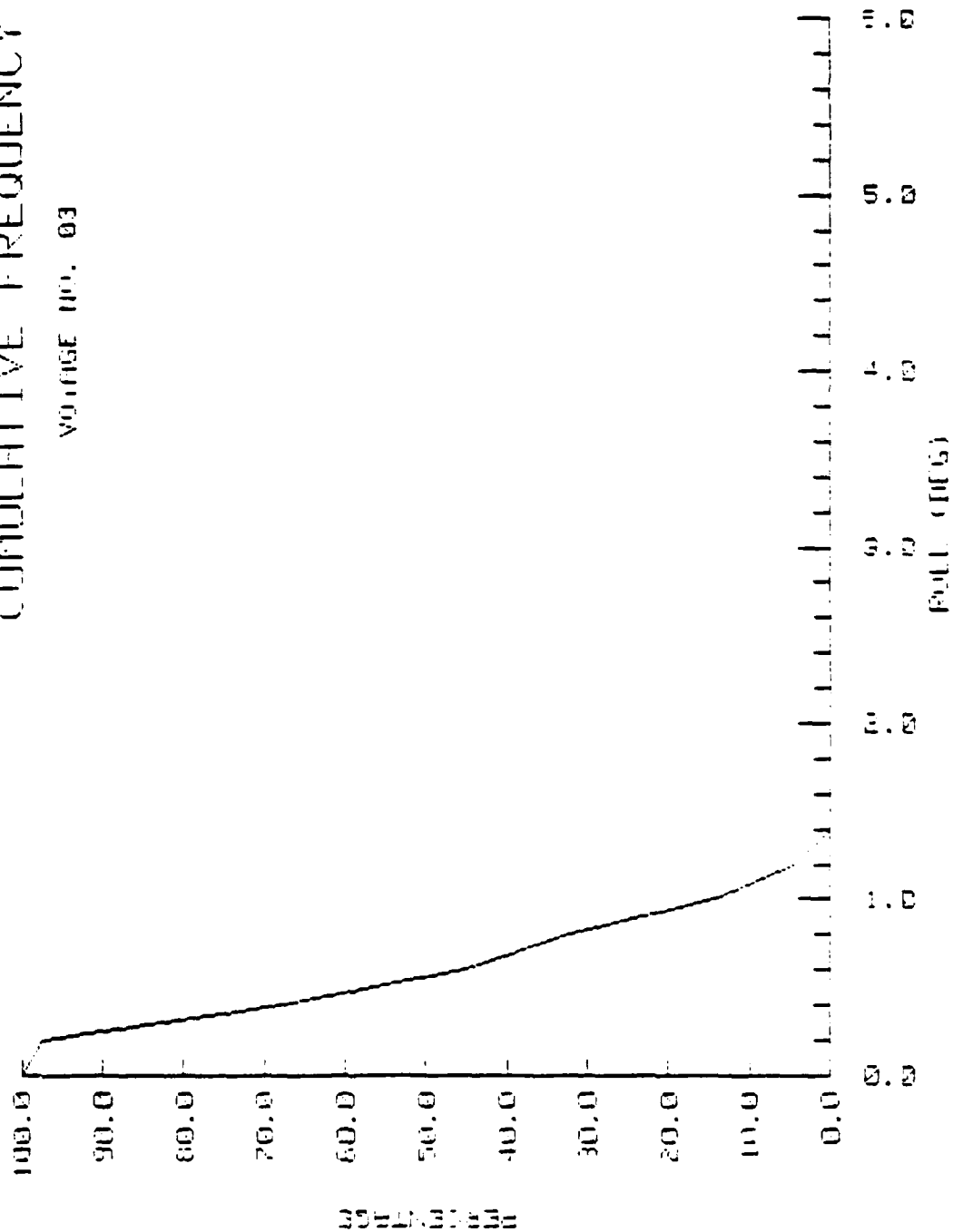
CUMULATIVE FREQUENCY

VOLTAJE NO. 03



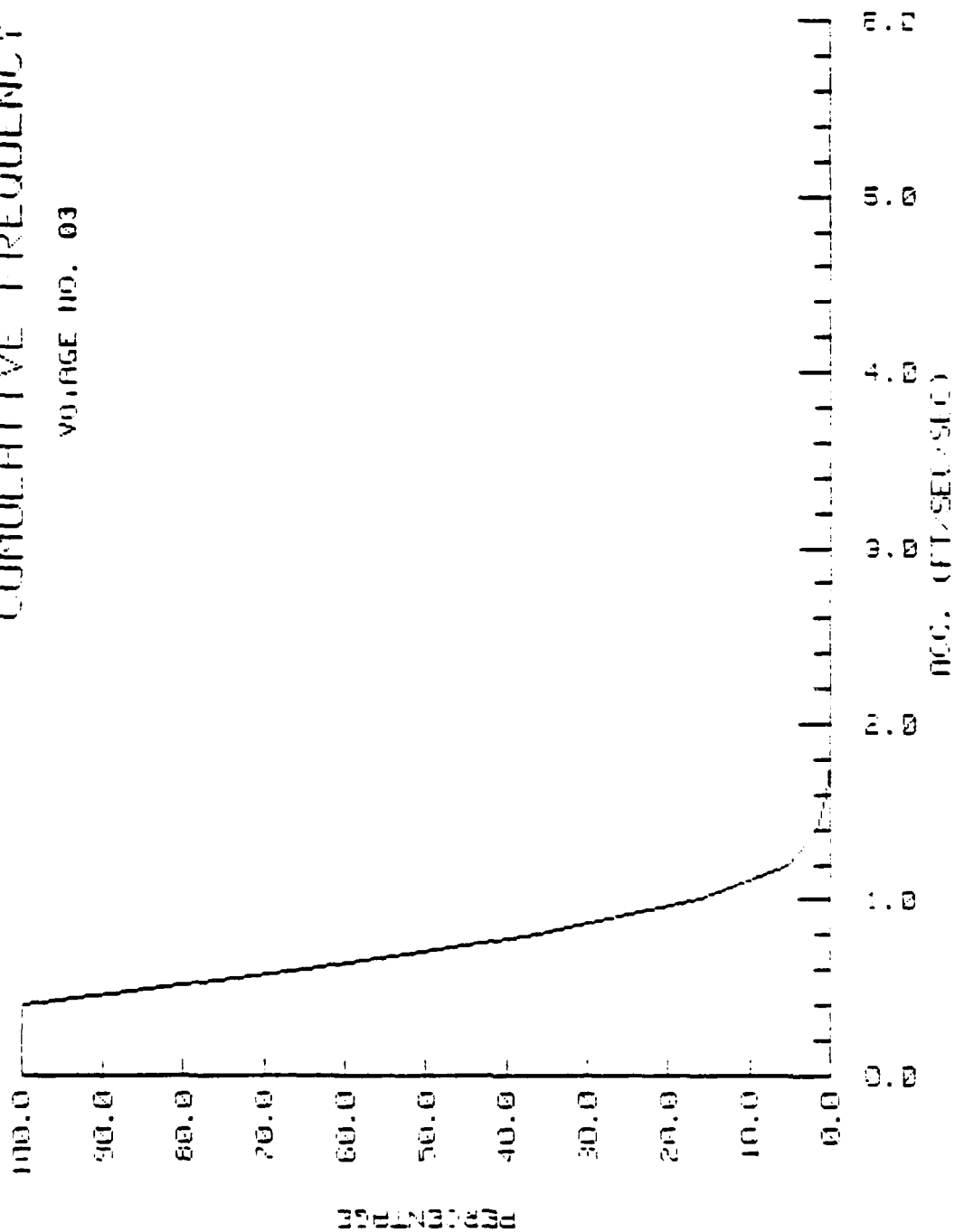
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VOLUME NO. 03



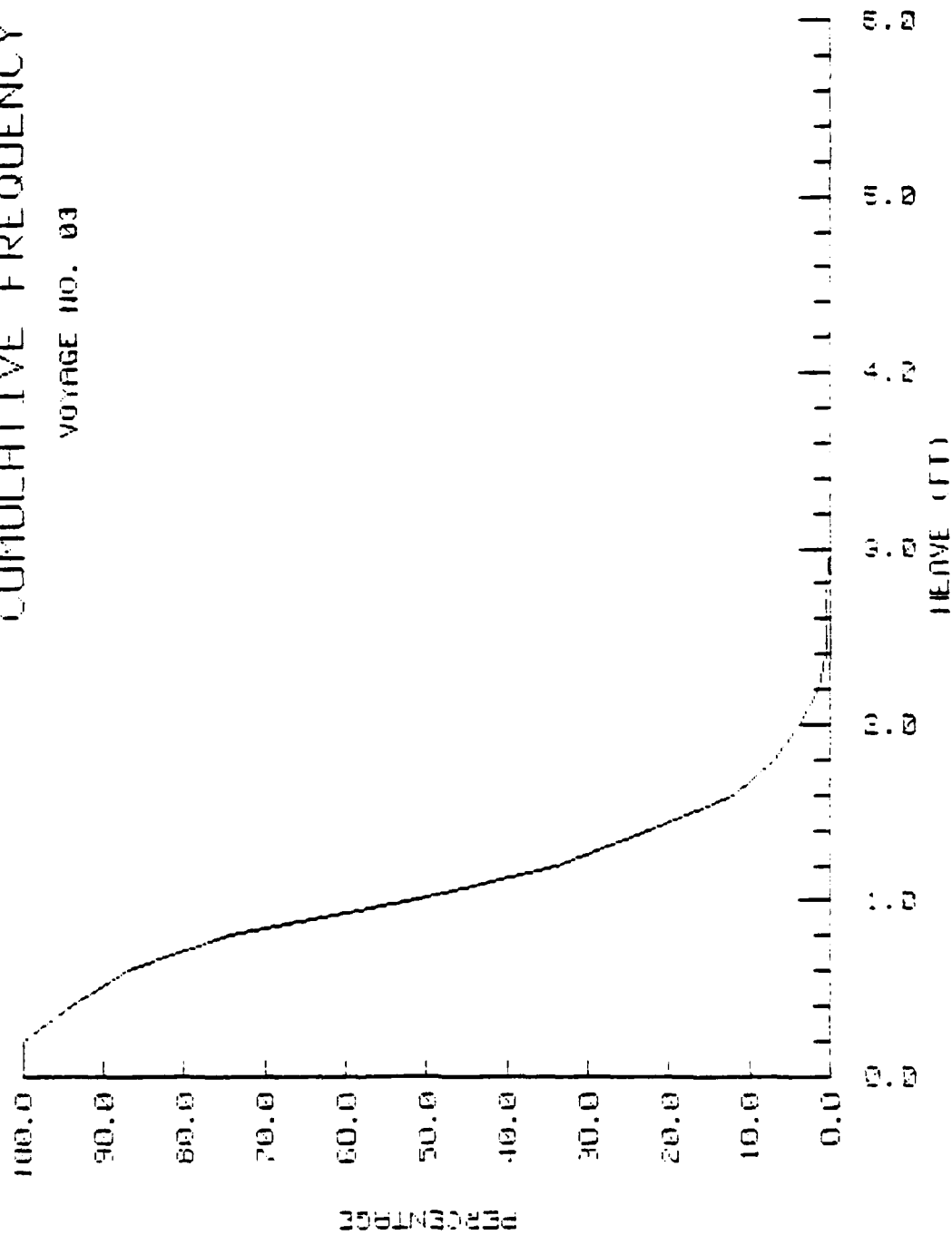
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VOLAGE NO. 03



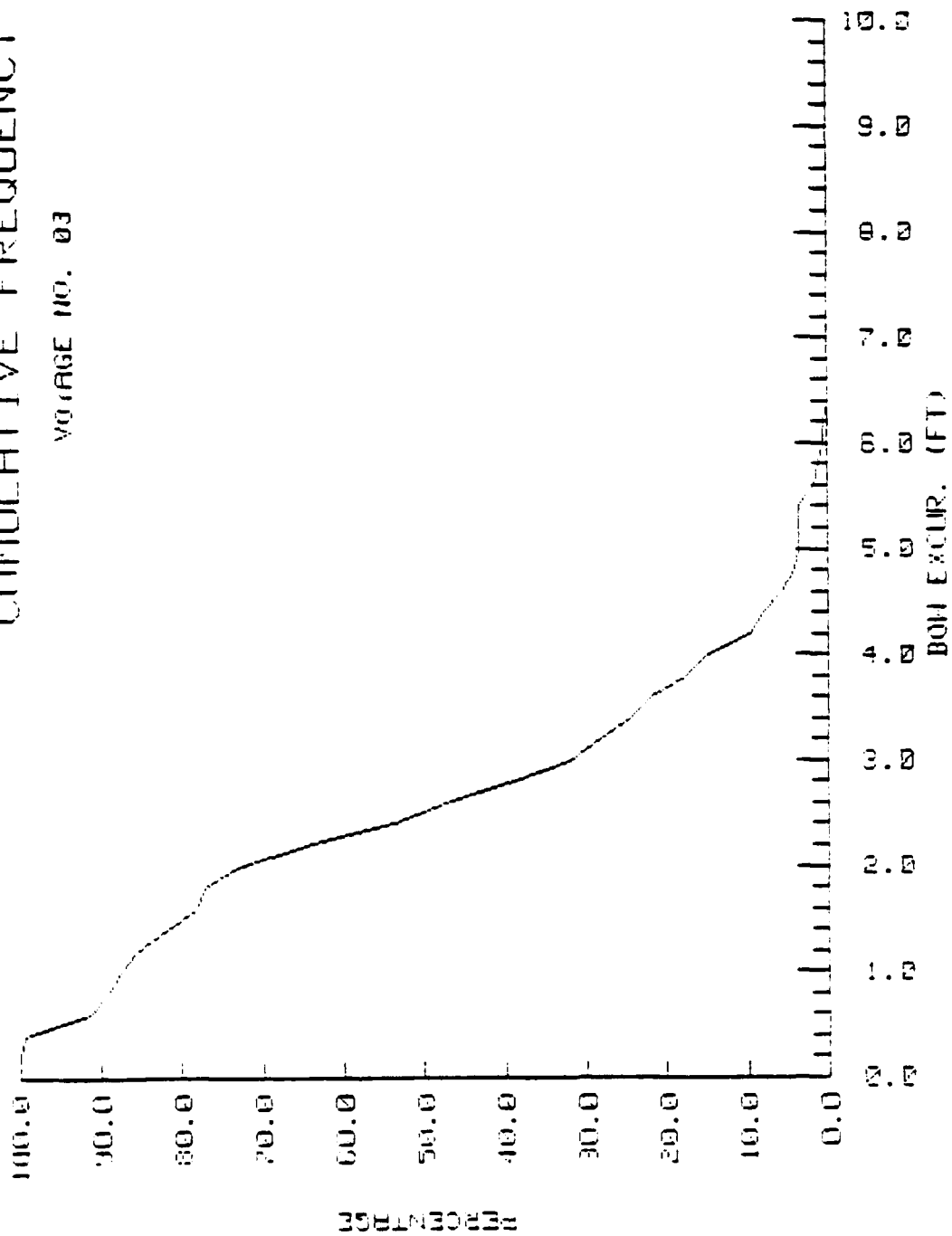
CUMULATIVE FREQUENCY

VOTAGE NO. 03



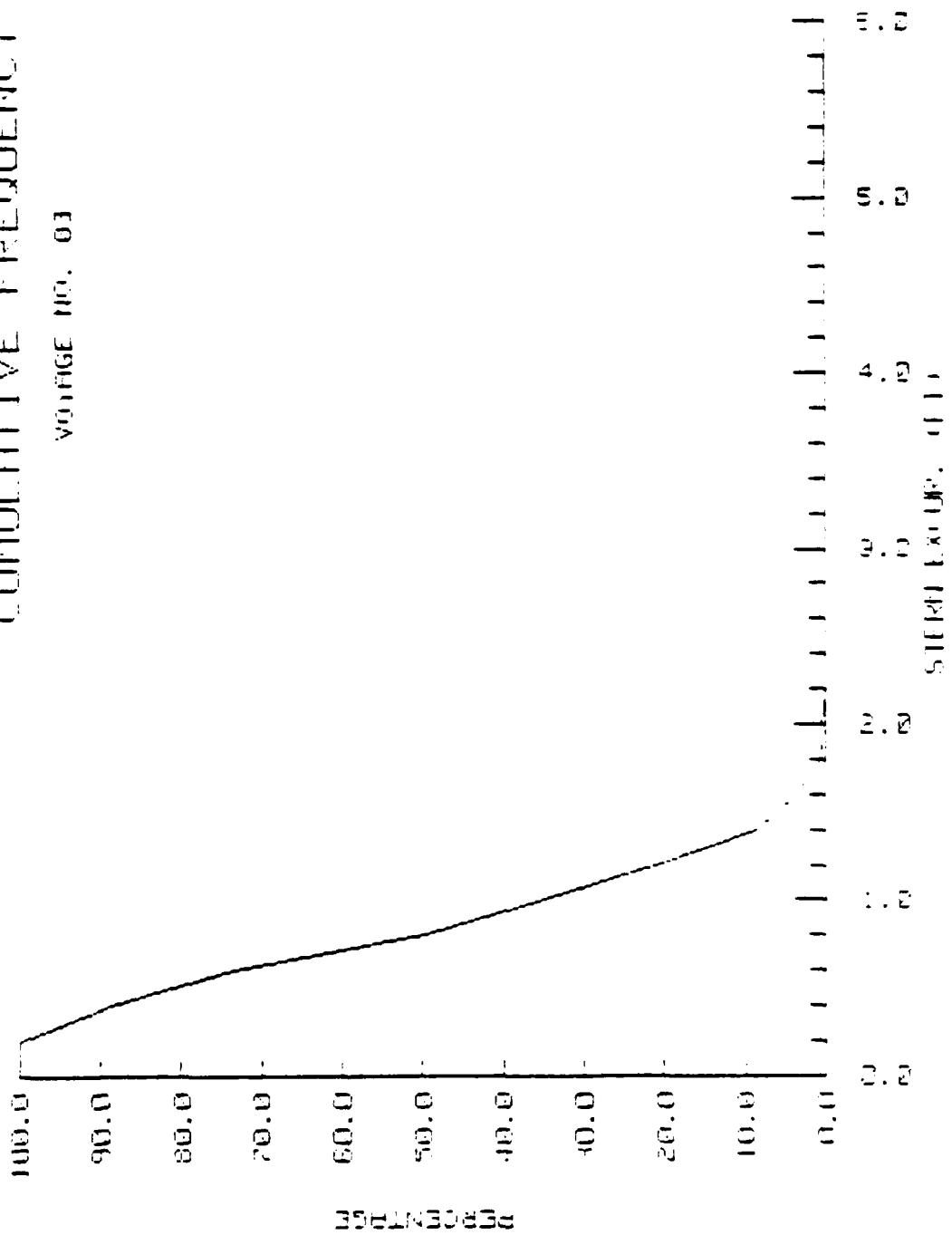
CUMULATIVE FREQUENCY

VOLAGE NO. 03



CUMULATIVE FREQUENCY

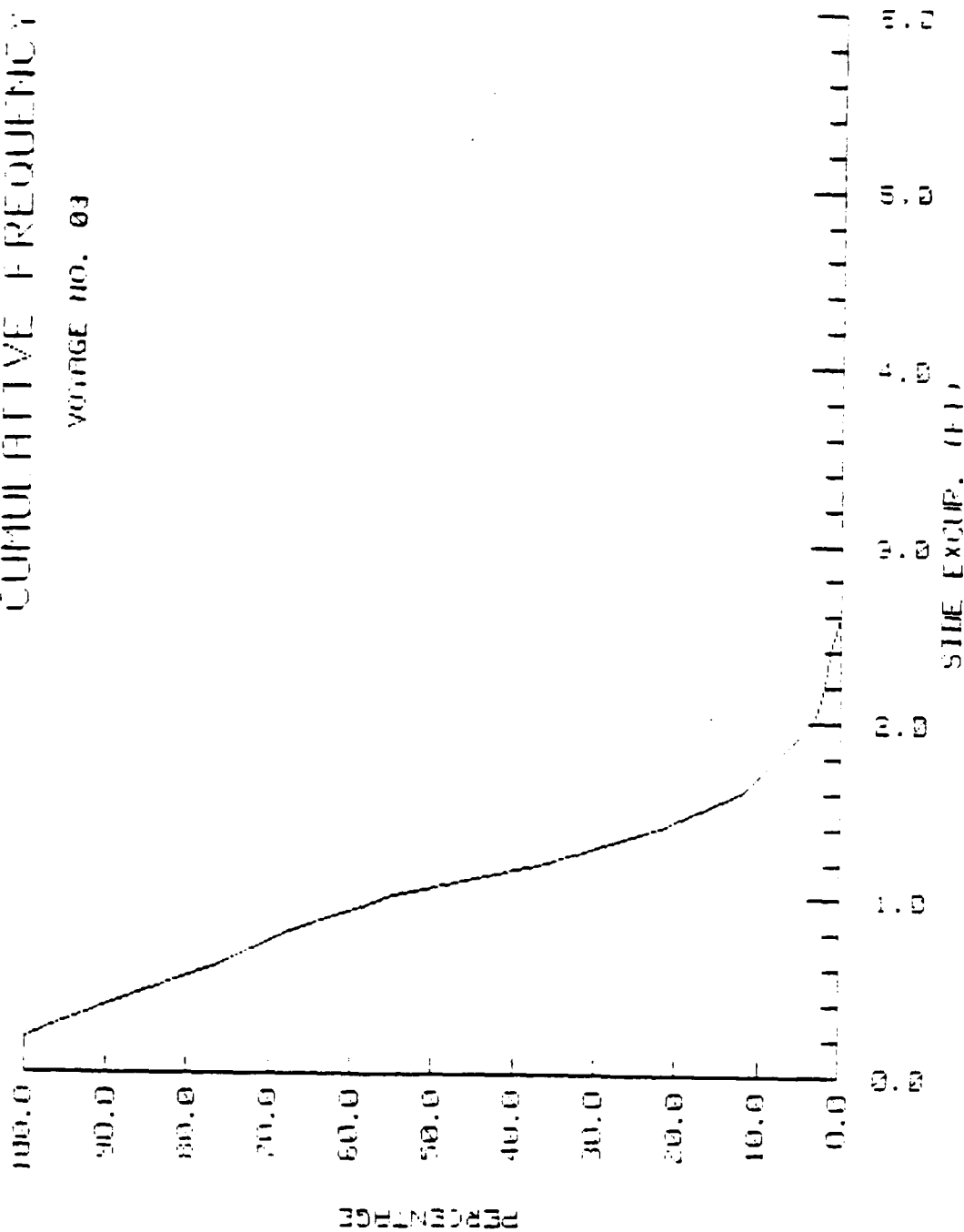
VOLUME NO. 03



STEEL GROUP, 011

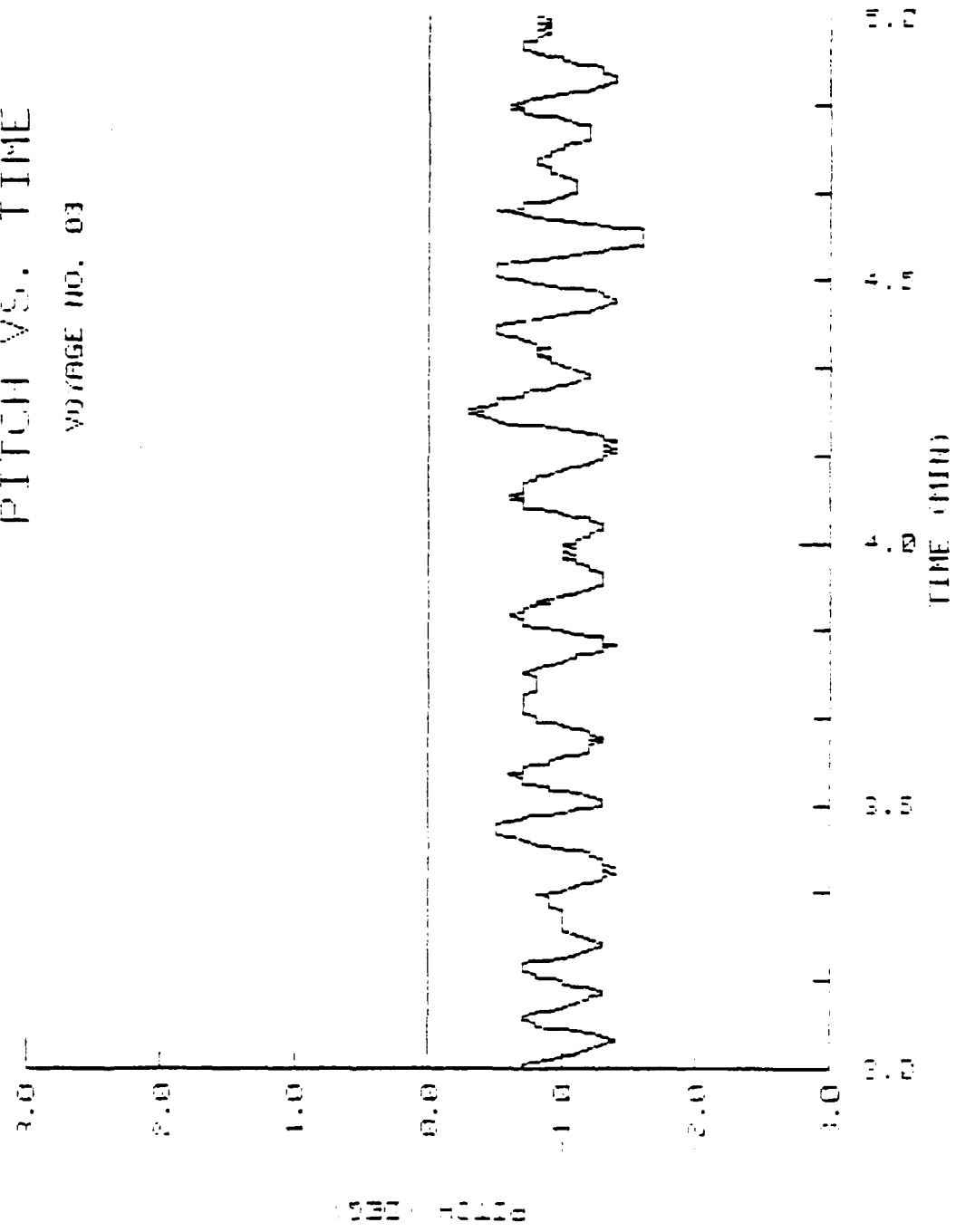
CUMULATIVE FREQUENCY

VOLUME NO. 03



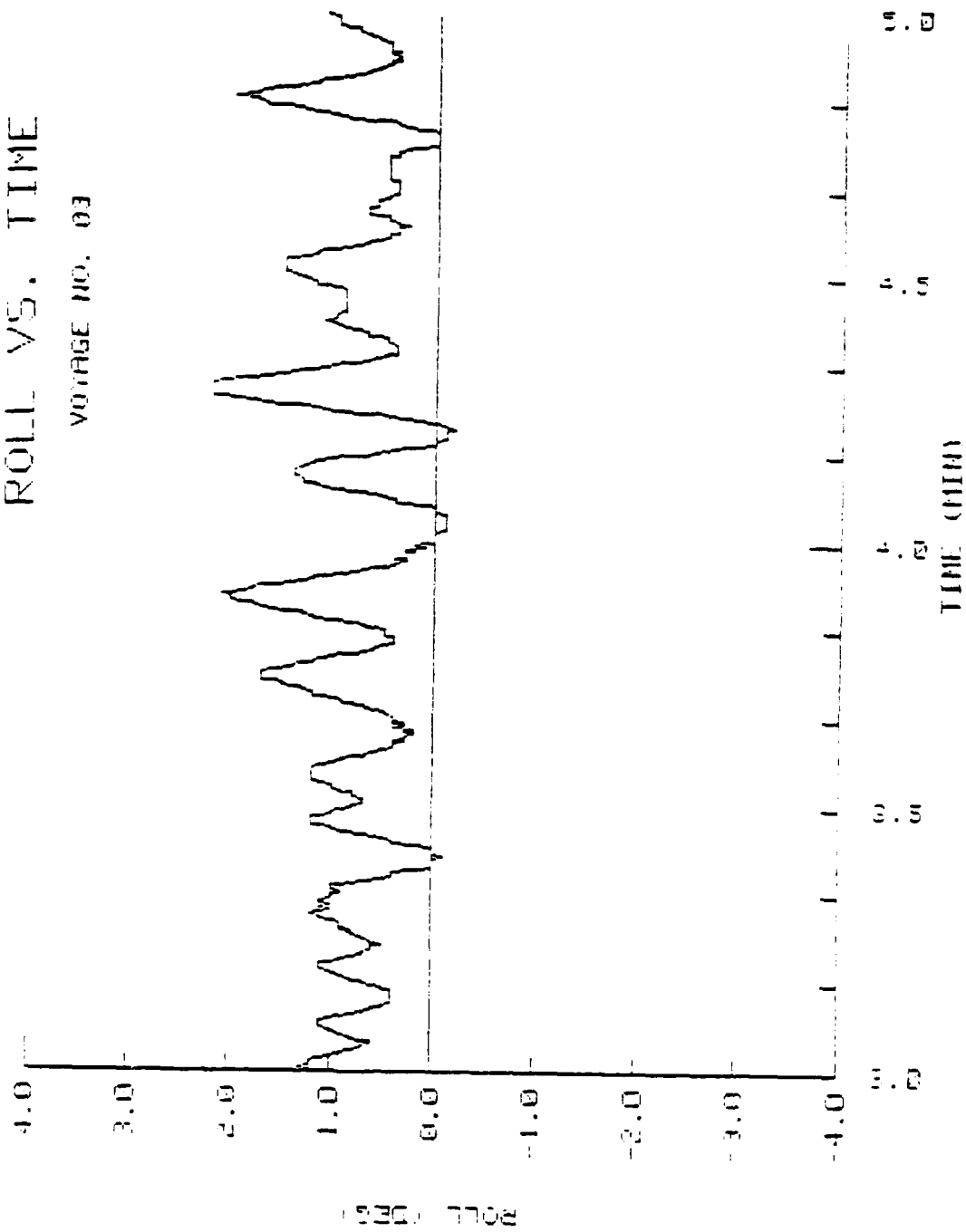
PITCH VS. TIME

VOL/AGE NO. 03



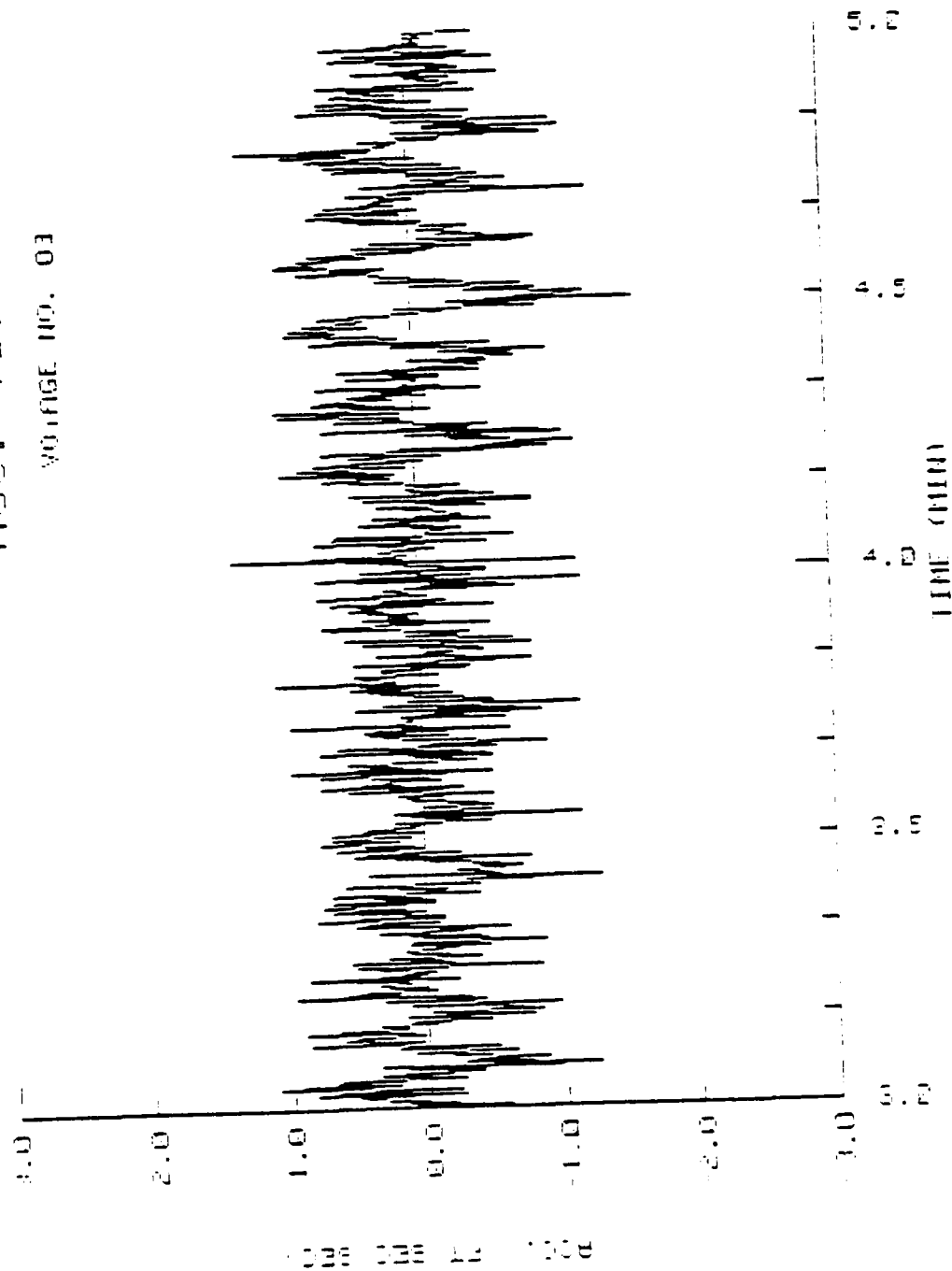
ROLL VS. TIME

VOTAGE NO. 03



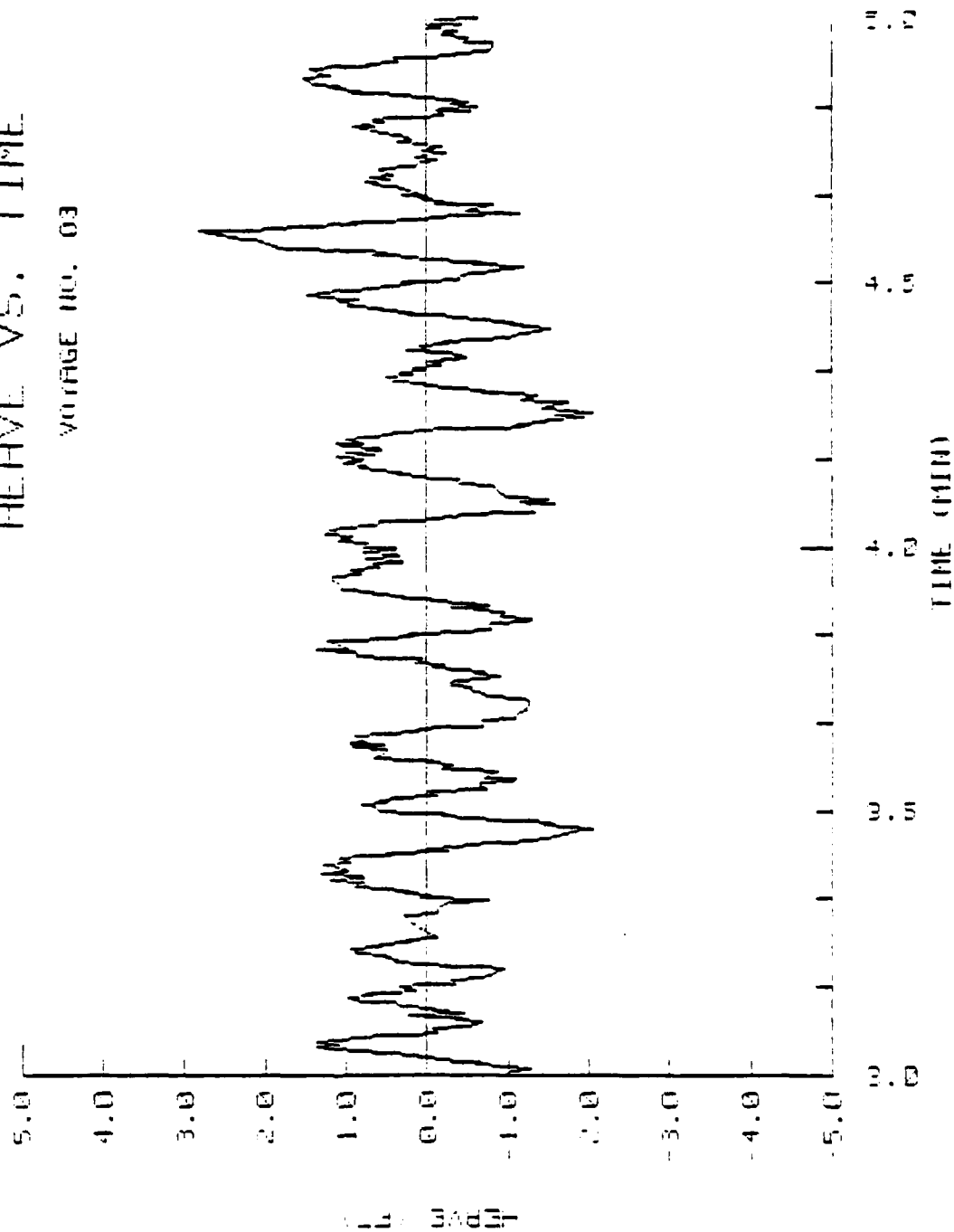
ACC. VS. TIME

VOLUME NO. 03



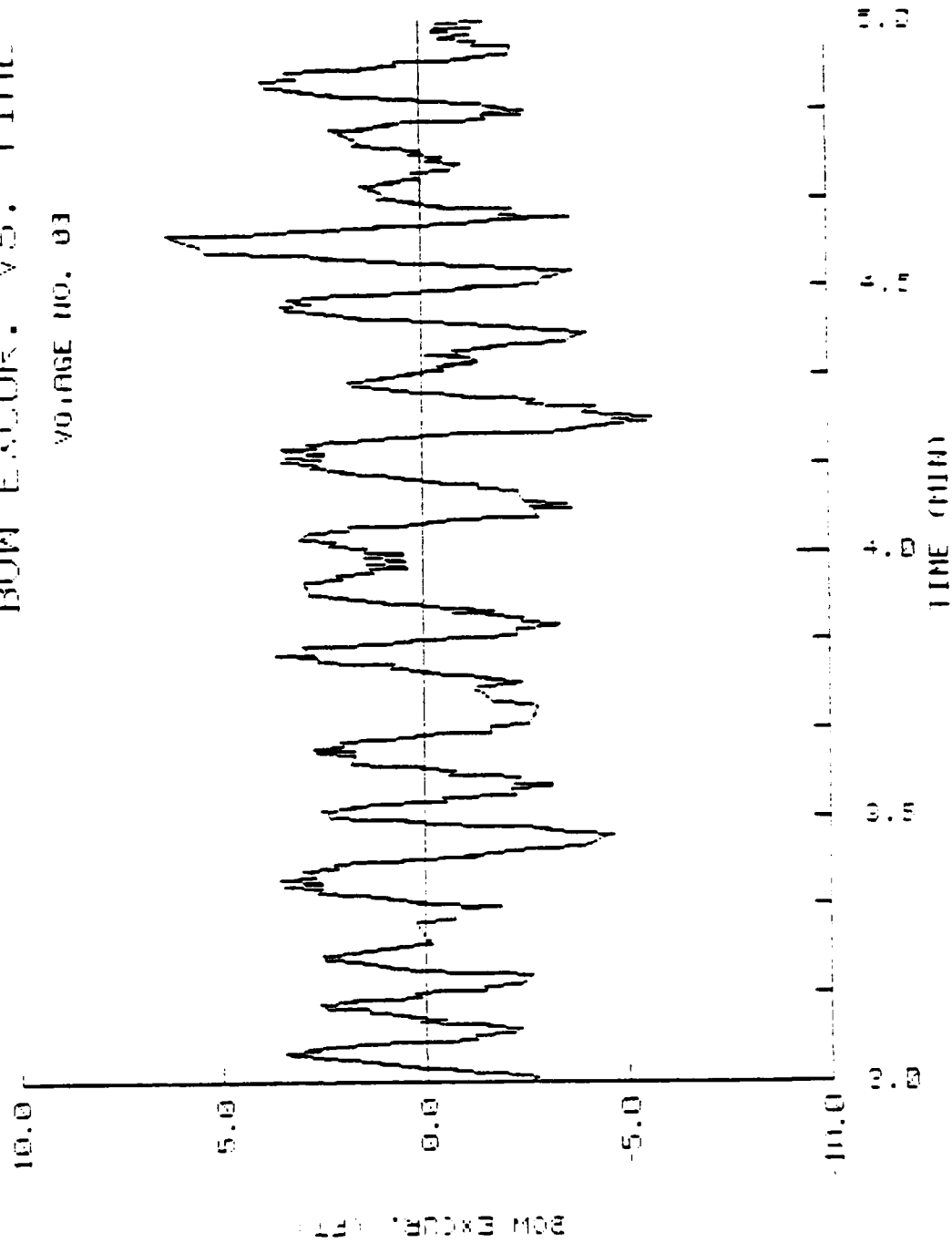
HEAVE VS. TIME

VOLTAGE NO. 03



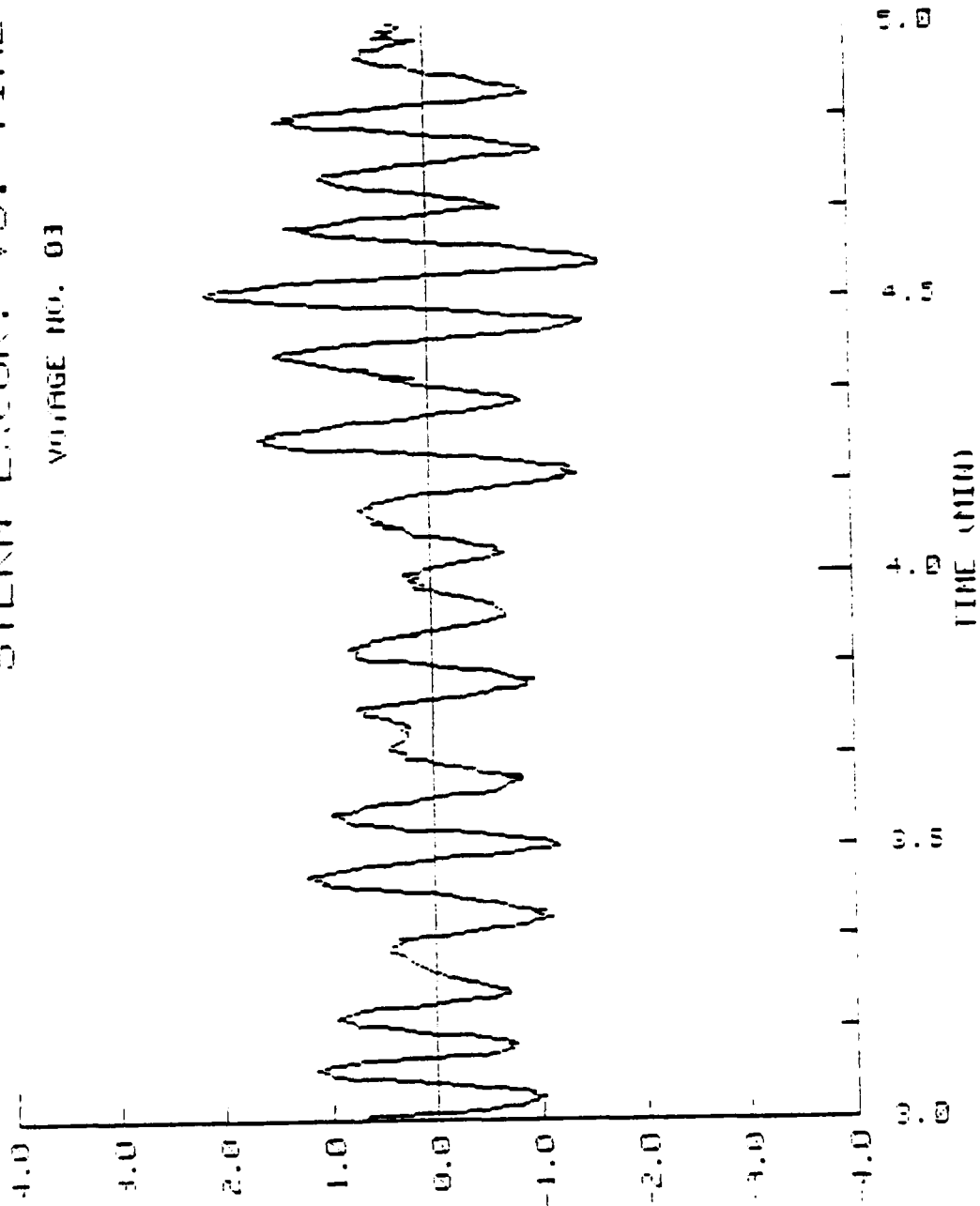
BOW EXCUR. VS. TIME

VOLUME NO. 03



STERN EXCUR. VS. TIME

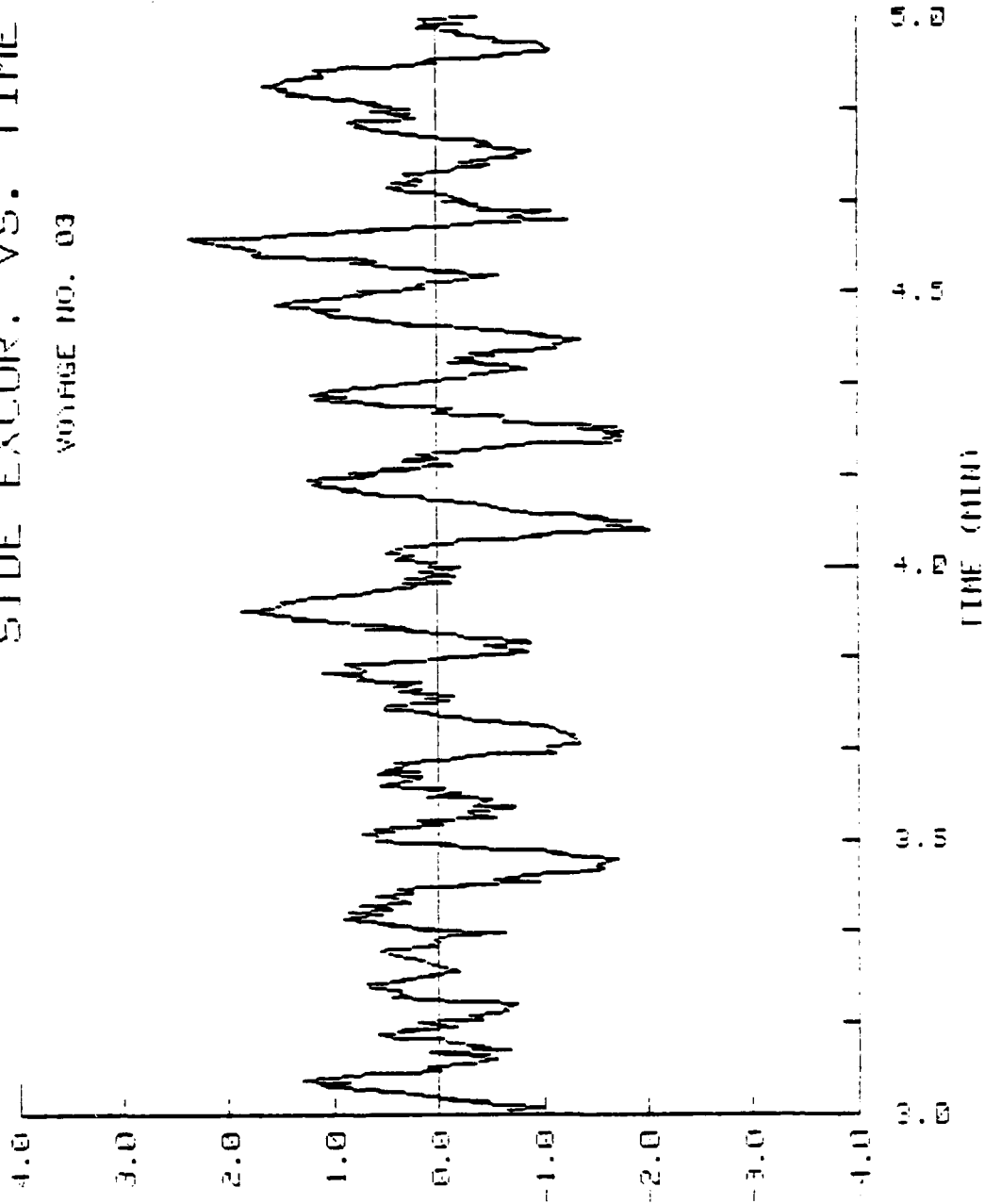
VOLUME NO. 03



STERN EXCUR. (V)

SIDE EXCUR. VS. TIME

VOICE NO. 03



SIDE EXCUR. (V)

STATISTICAL SUMMARY

VOYAGE NO. 04

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-1.6	1.0	.4	.4
ROLL (DEG)	1.0	1.3	.4	.4
HEEL (FT/SEC/SEC)	-1.0	2.2	.7	.8
HEAVE (FT)	.0	4.1	1.5	1.6
FORE EXCUR. (FT)	.0	9.5	2.8	3.3
STERN EXCUR. (FT)	.0	1.8	.8	.8
STAR EXCUR (FT)	.0	4.1	1.4	1.6

VILLAGE NO. 04 500' TRICK

ROUTE : 1 3005

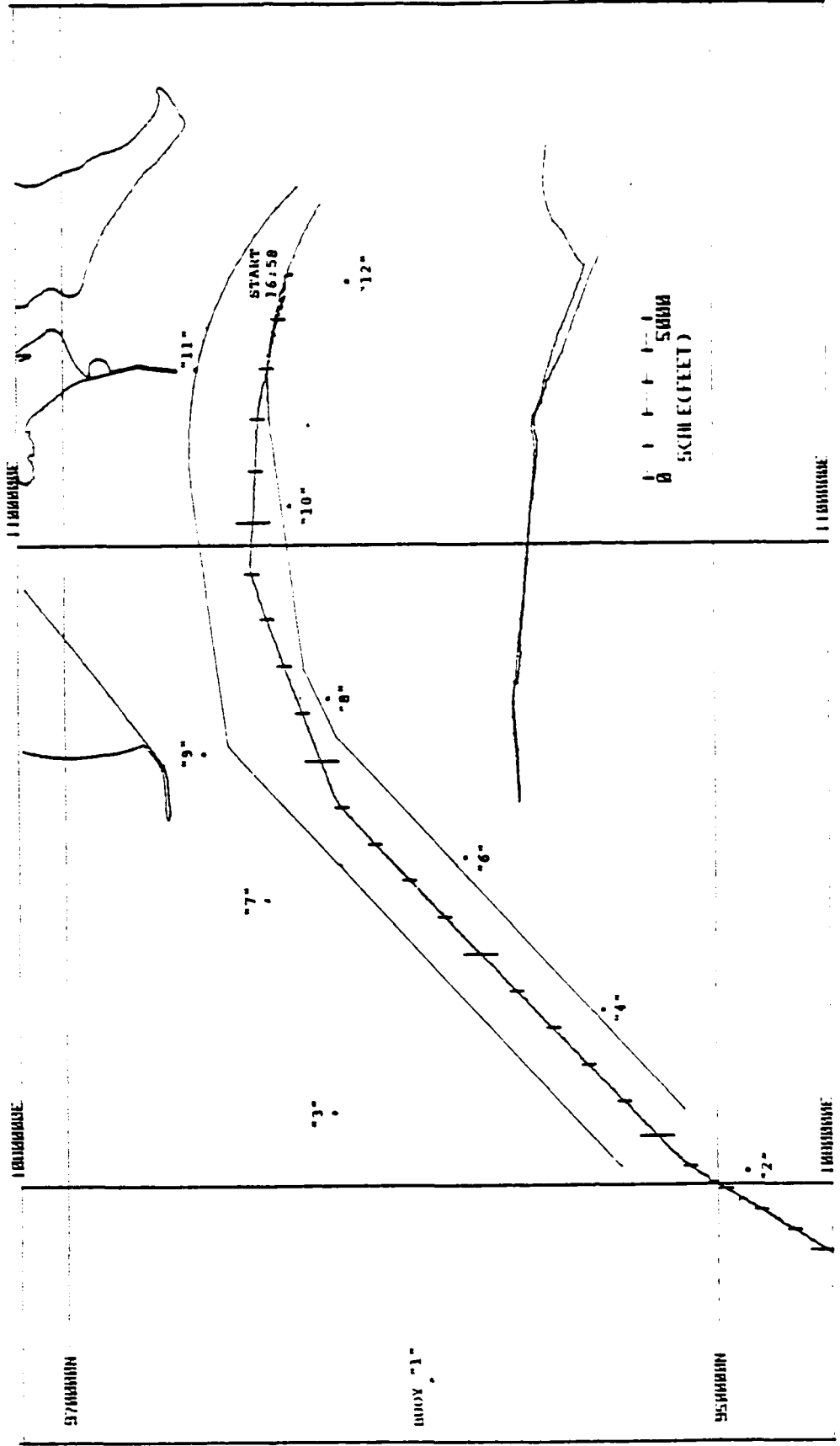
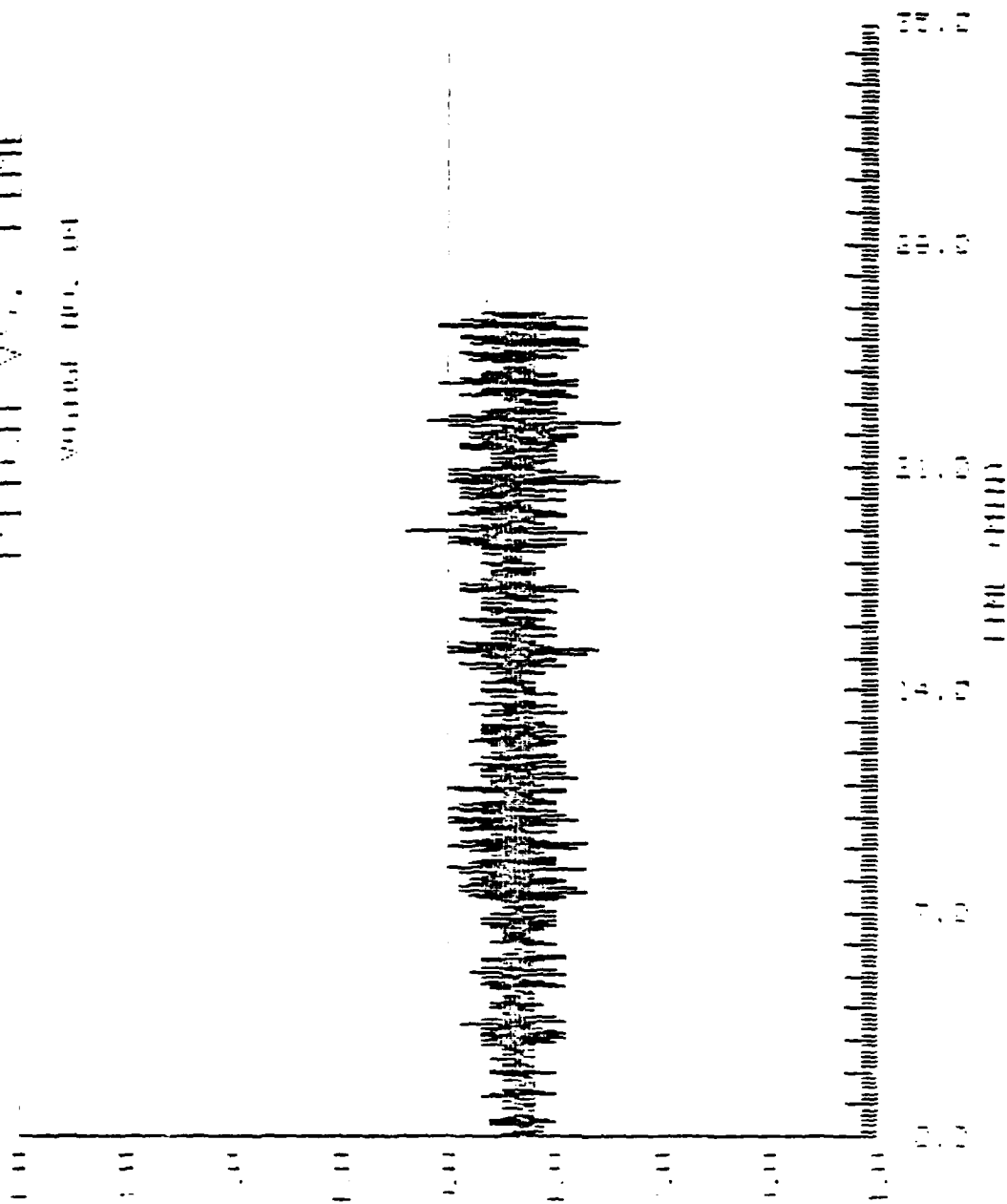


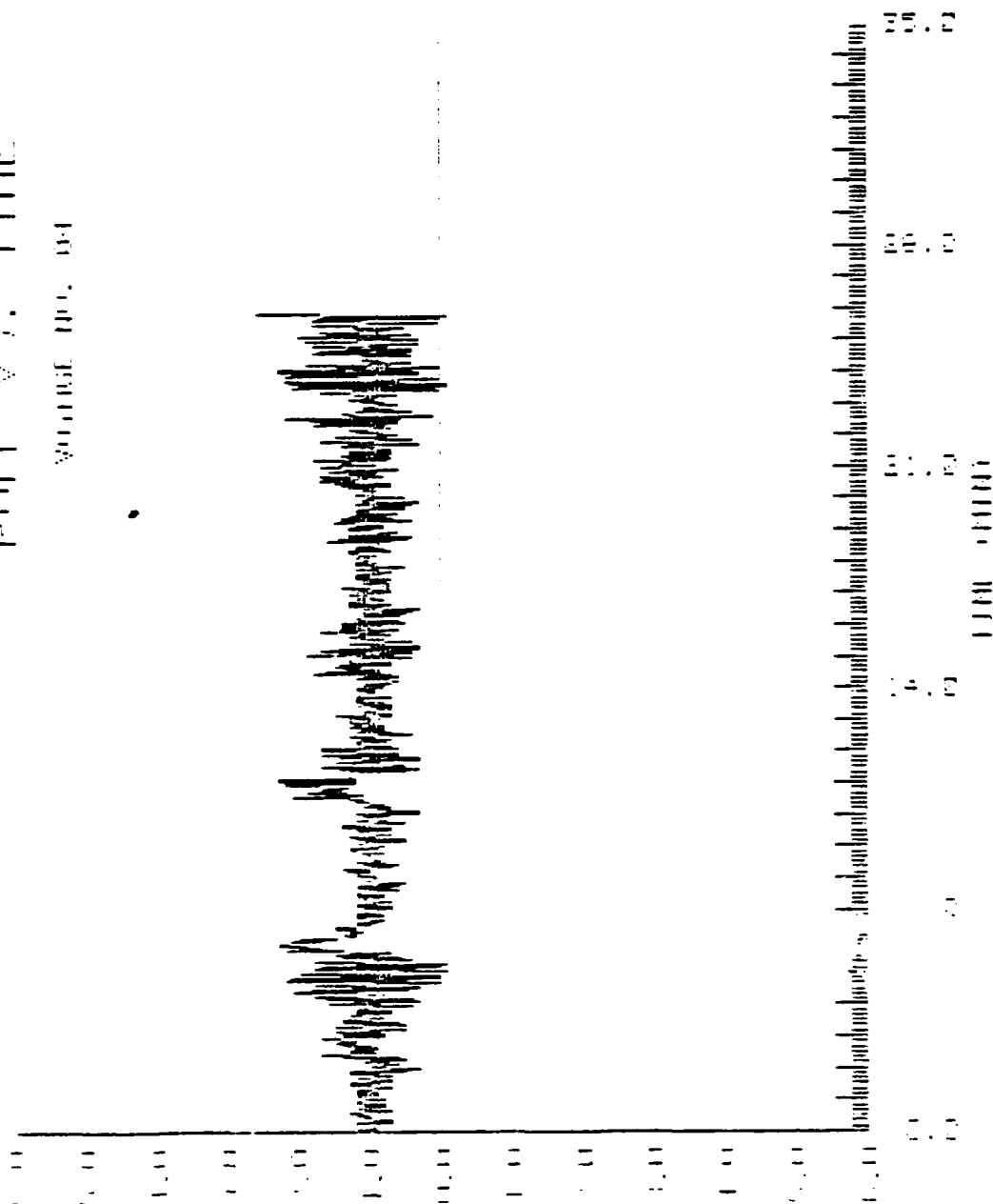
PLATE V. THE

WOUND THE



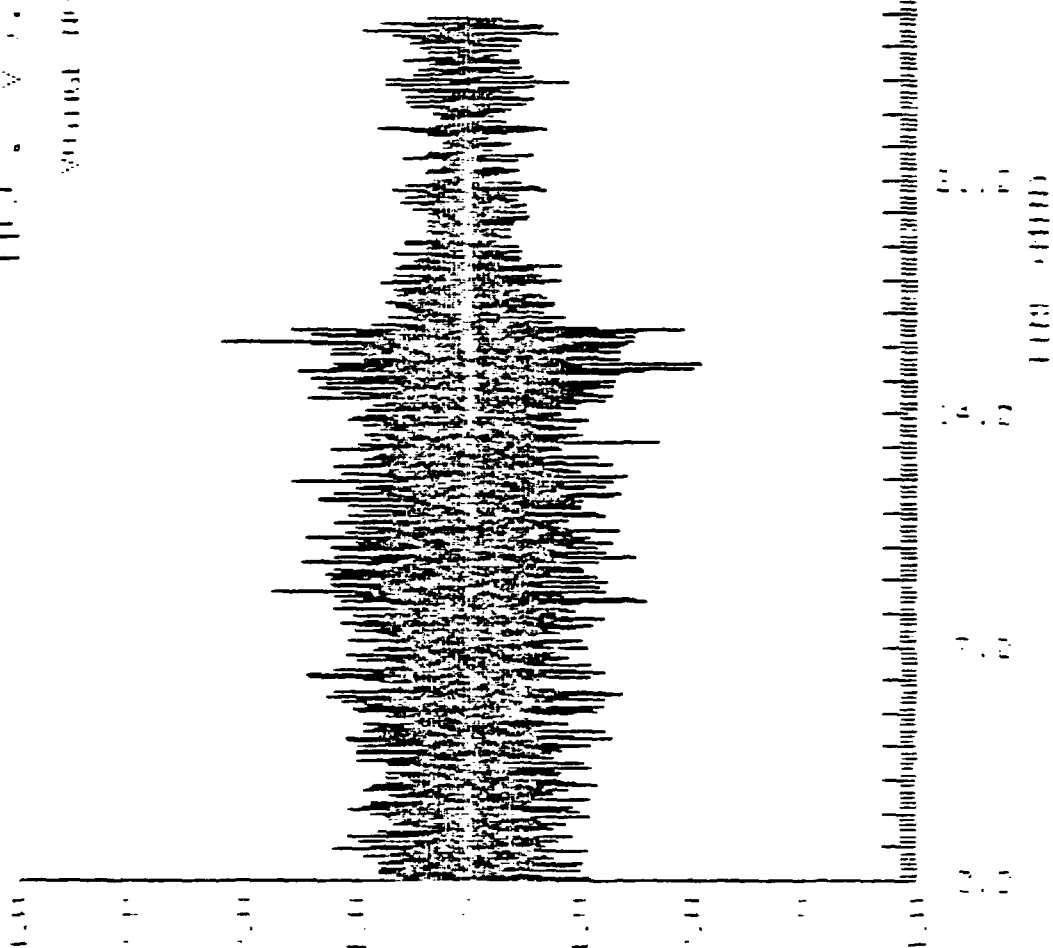
SECRET

WILLIAM W. BROWN



[illegible]

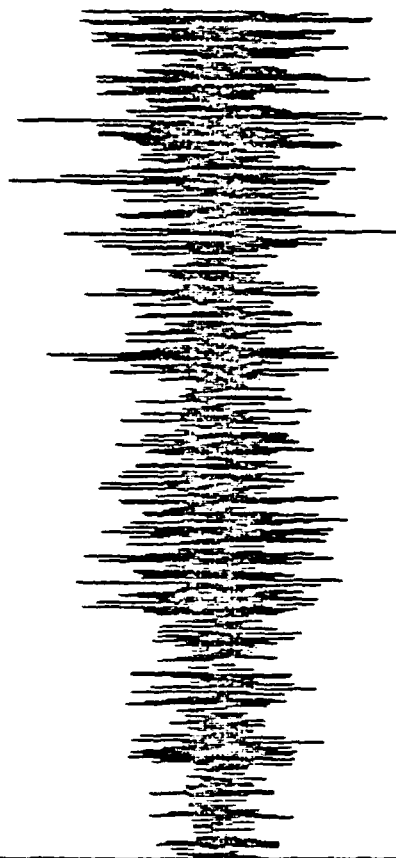
THE UNIVERSITY OF CHICAGO



HOW TO USE THE

VOICE RECORD

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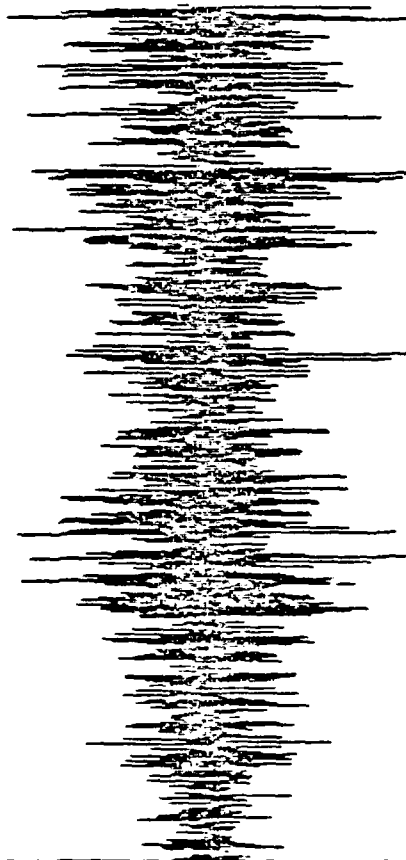
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ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED

DATE 10-10-01 BY 60322

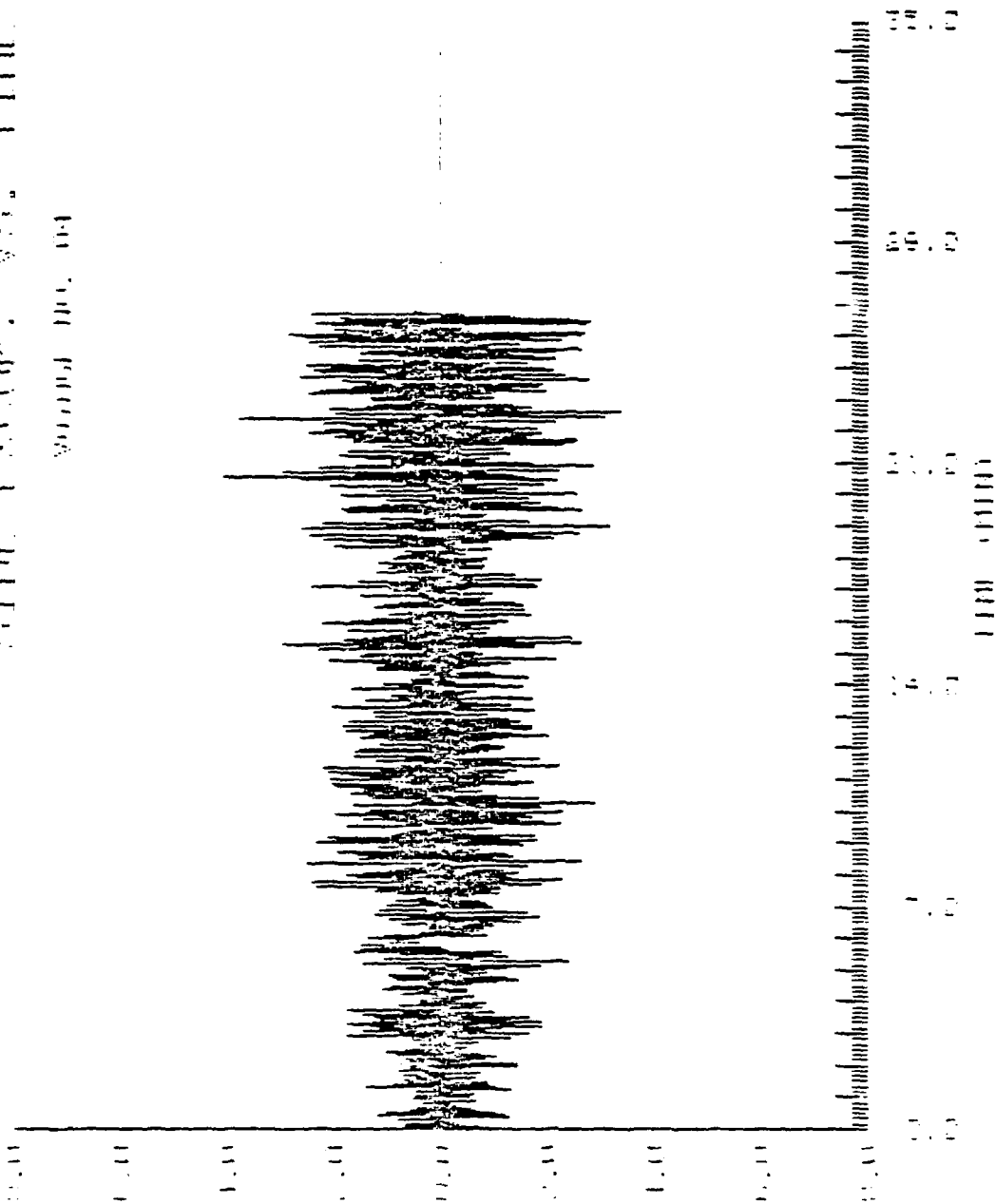


ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED
DATE 10-10-01 BY 60322

10-10-01

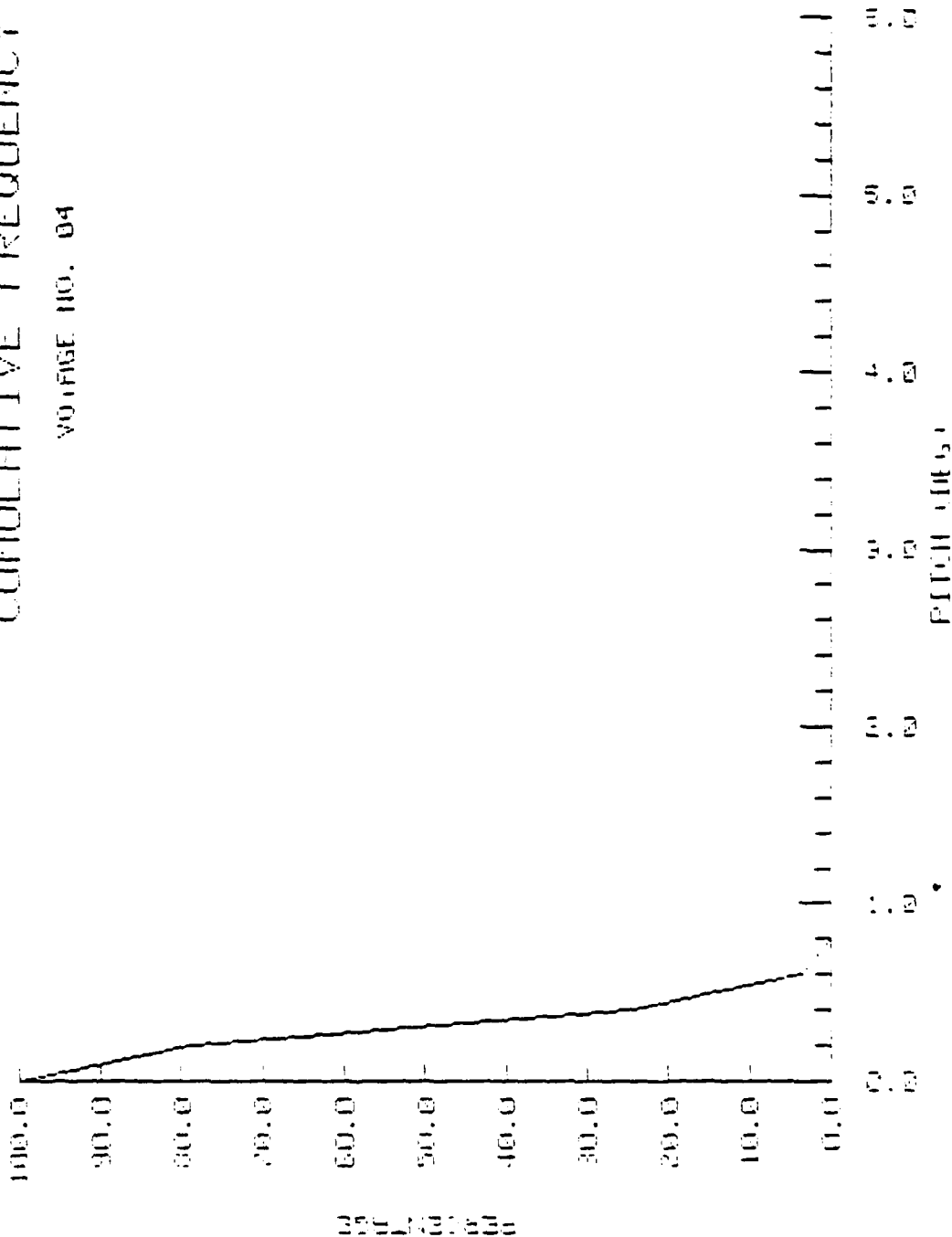
1941-1942, Vol. 1111

Wood No. 101



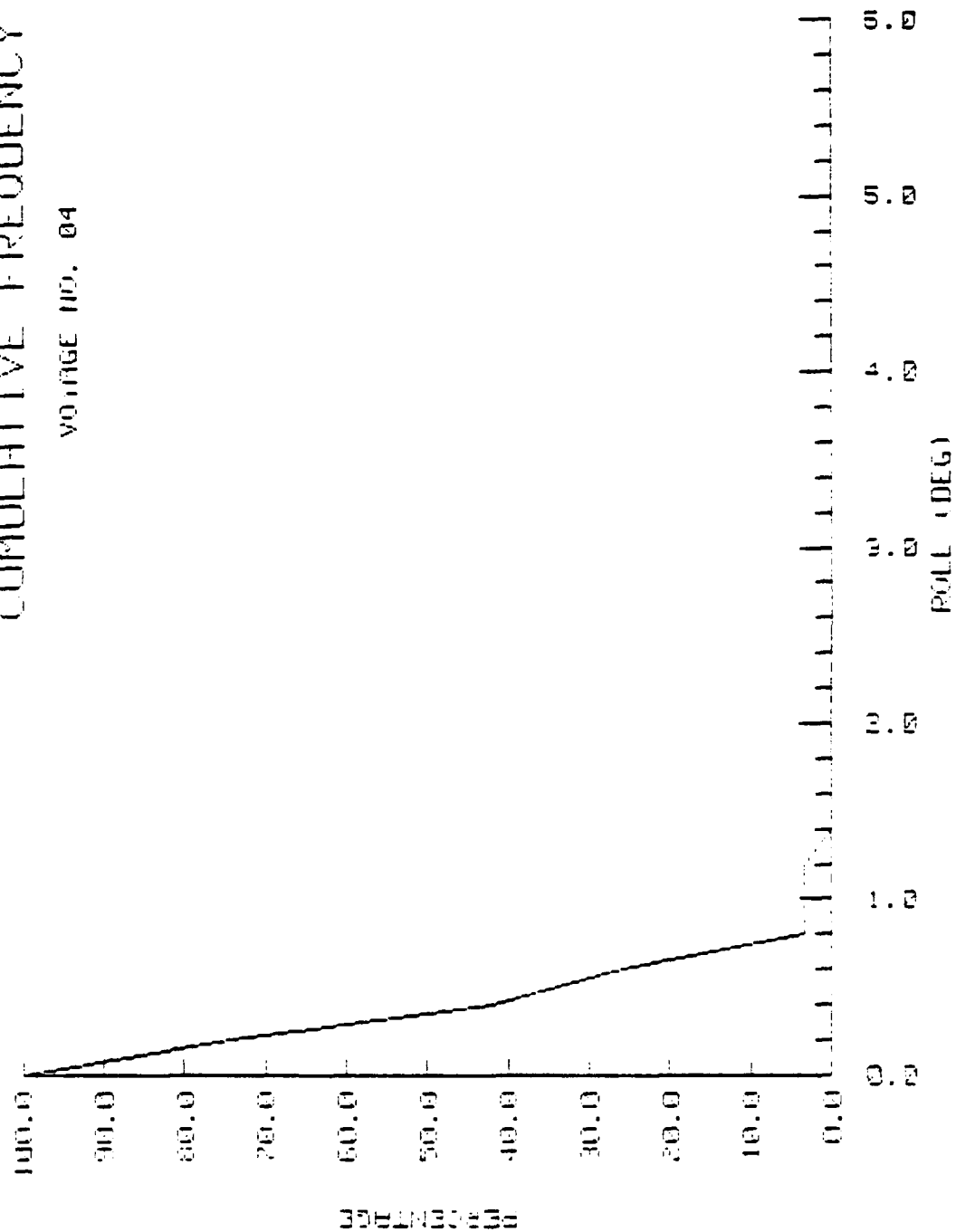
CUMULATIVE FREQUENCY

VOLUME NO. 04



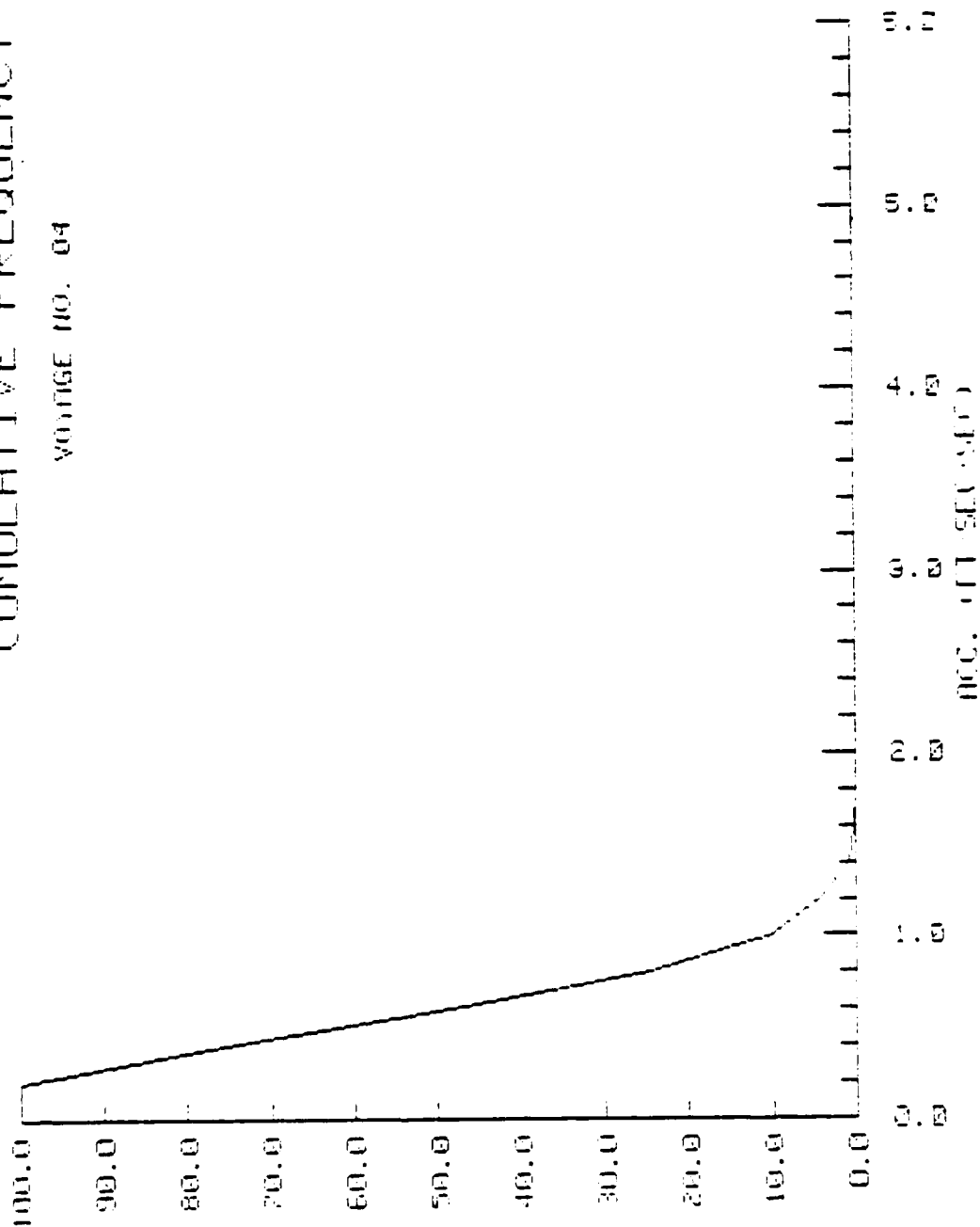
CUMULATIVE FREQUENCY

VOLUME NO. 04



CUMULATIVE FREQUENCY

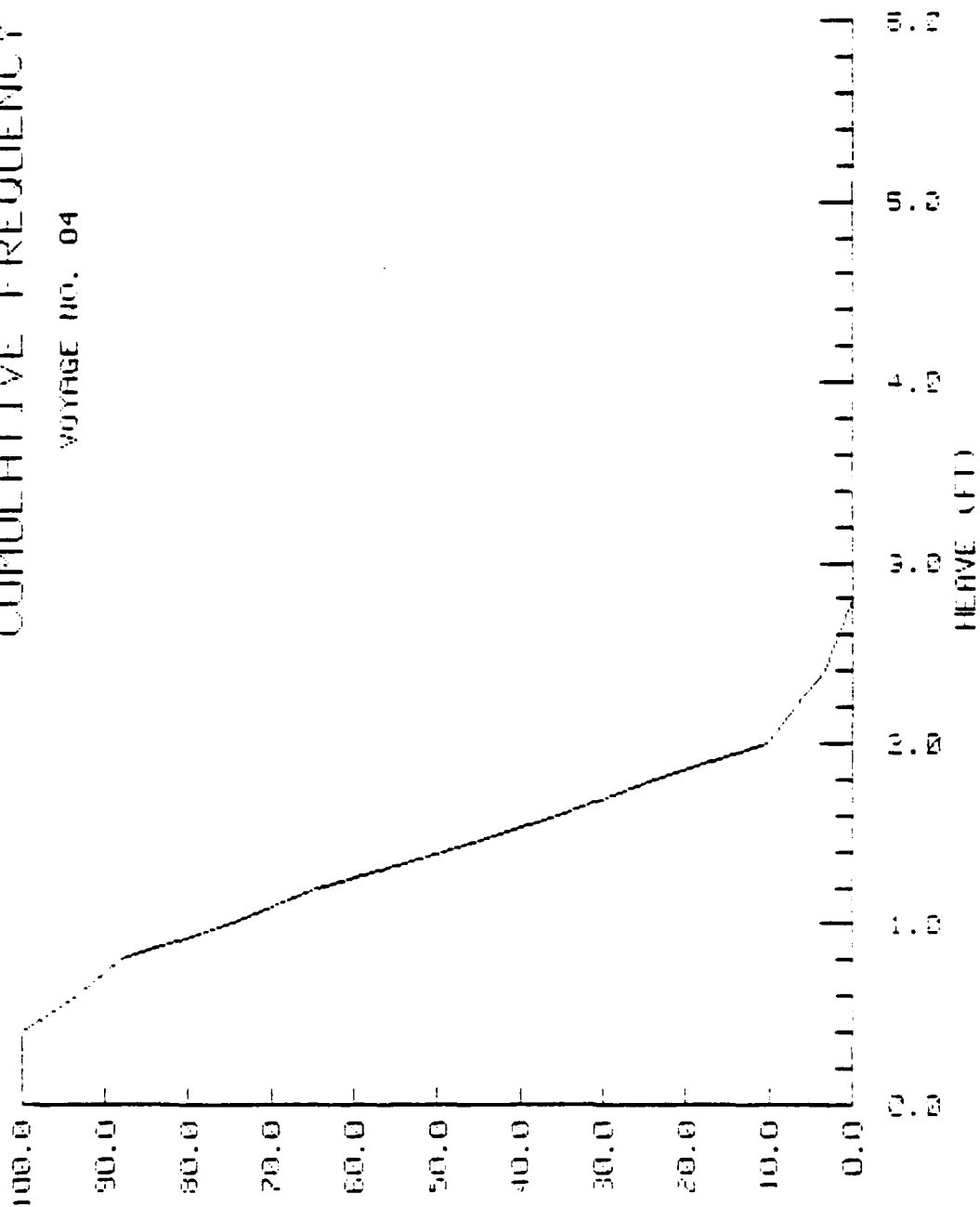
VOLUME NO. 04



PERCENTAGE

CUMULATIVE FREQUENCY

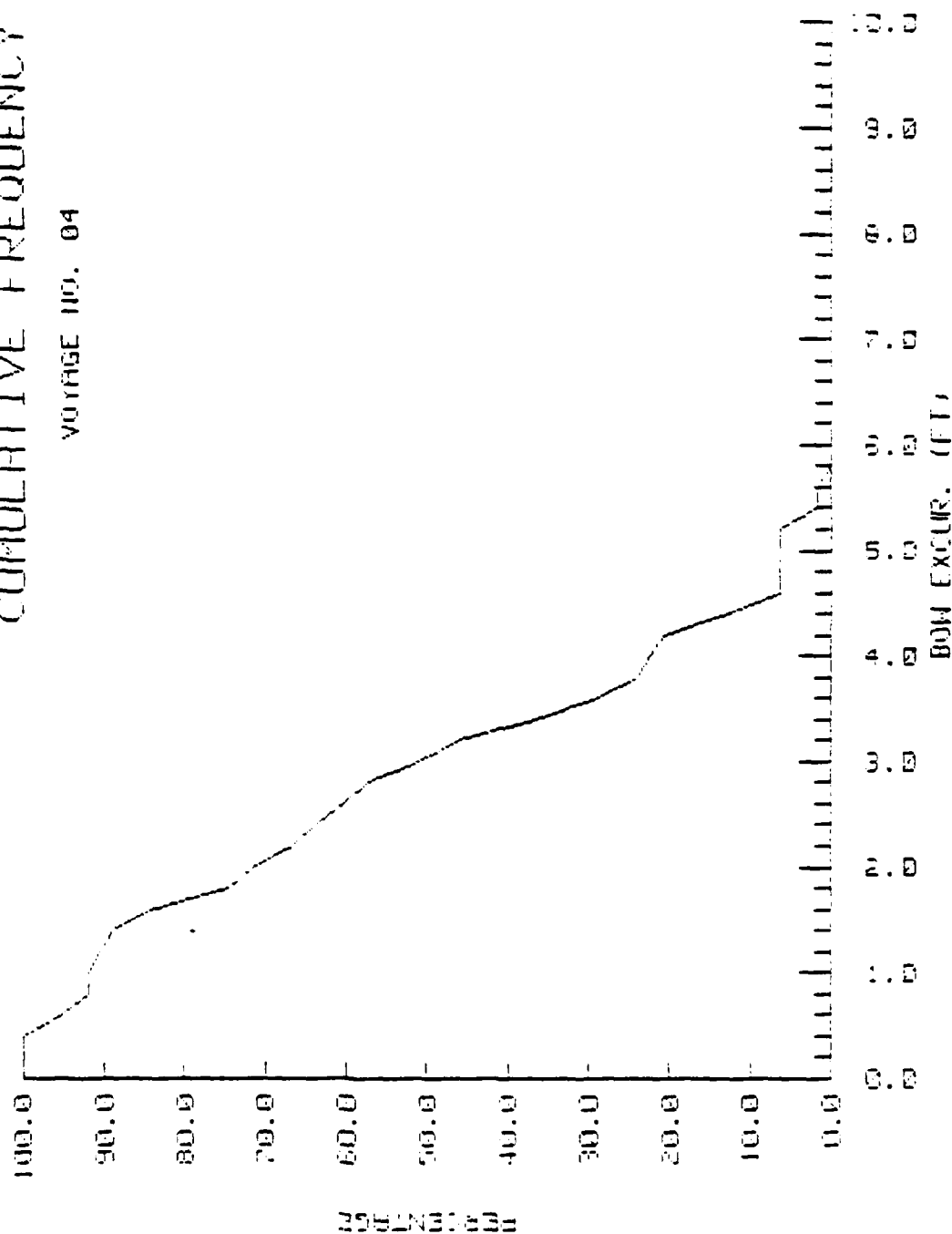
VOYAGE NO. 04



05 04 17 13 5 2 0 0 0 0

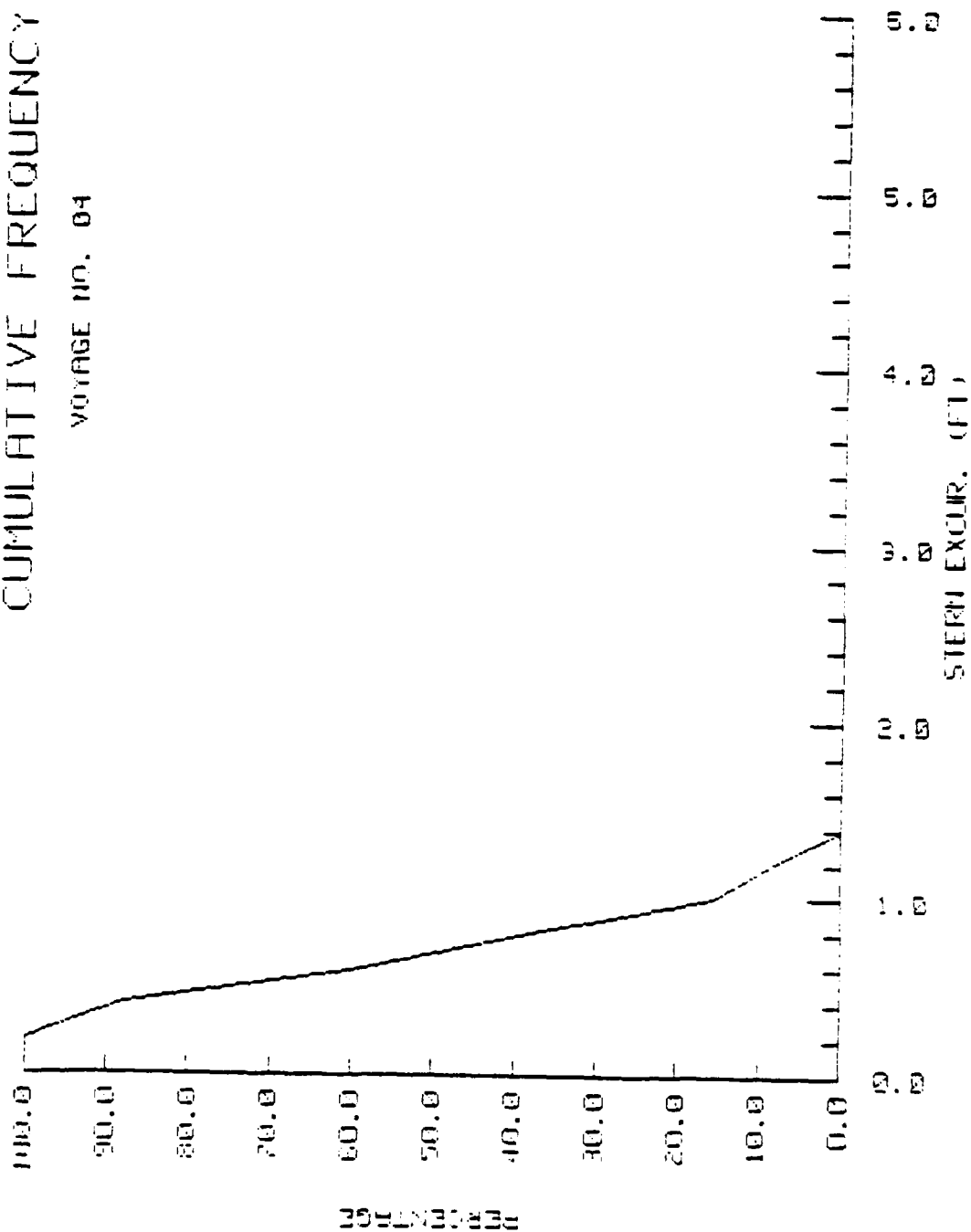
CUMULATIVE FREQUENCY

VOLAGE 110. 04



CUMULATIVE FREQUENCY

VOYAGE NO. 04



CUMULATIVE FREQUENCY

VOLUME NO. '04

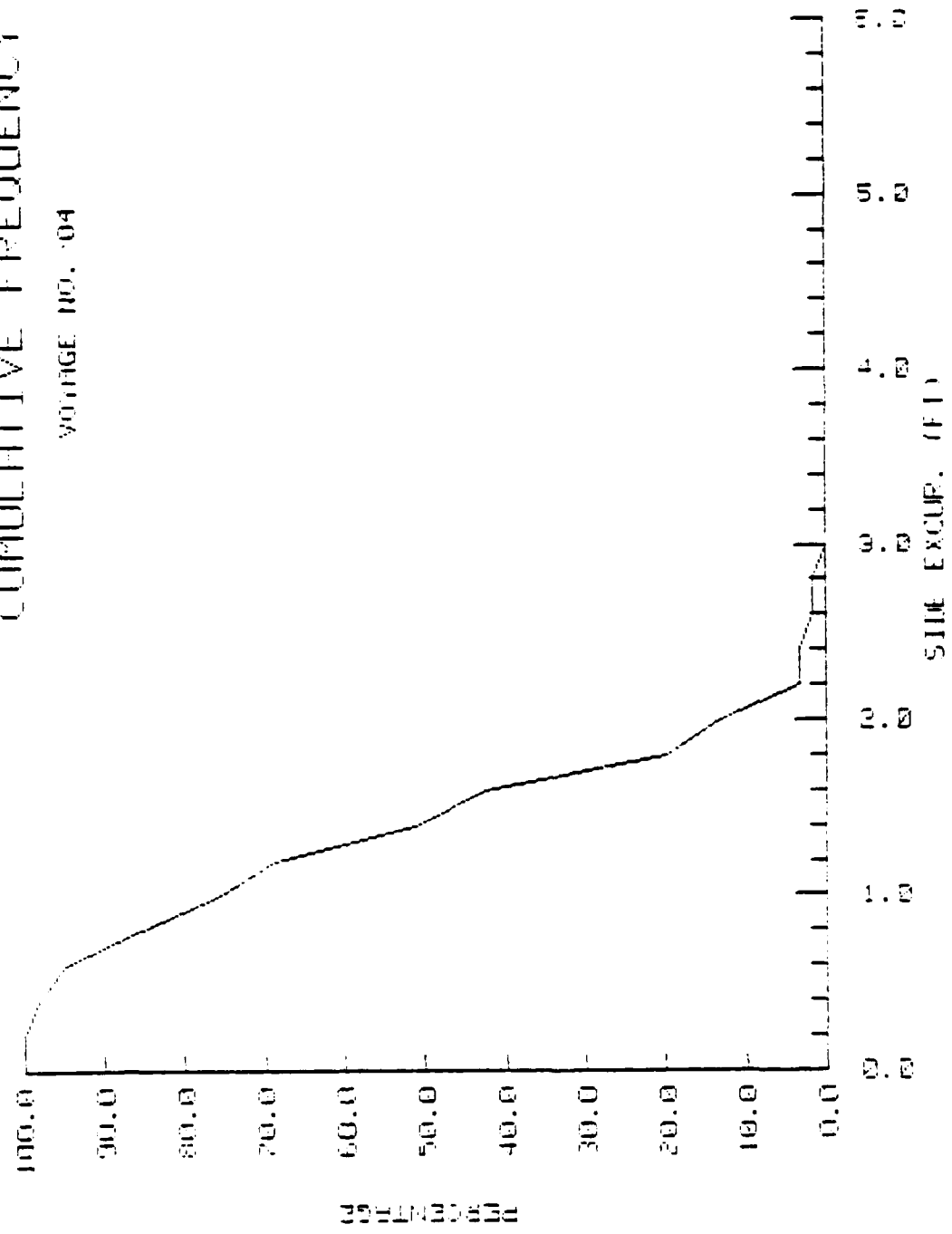
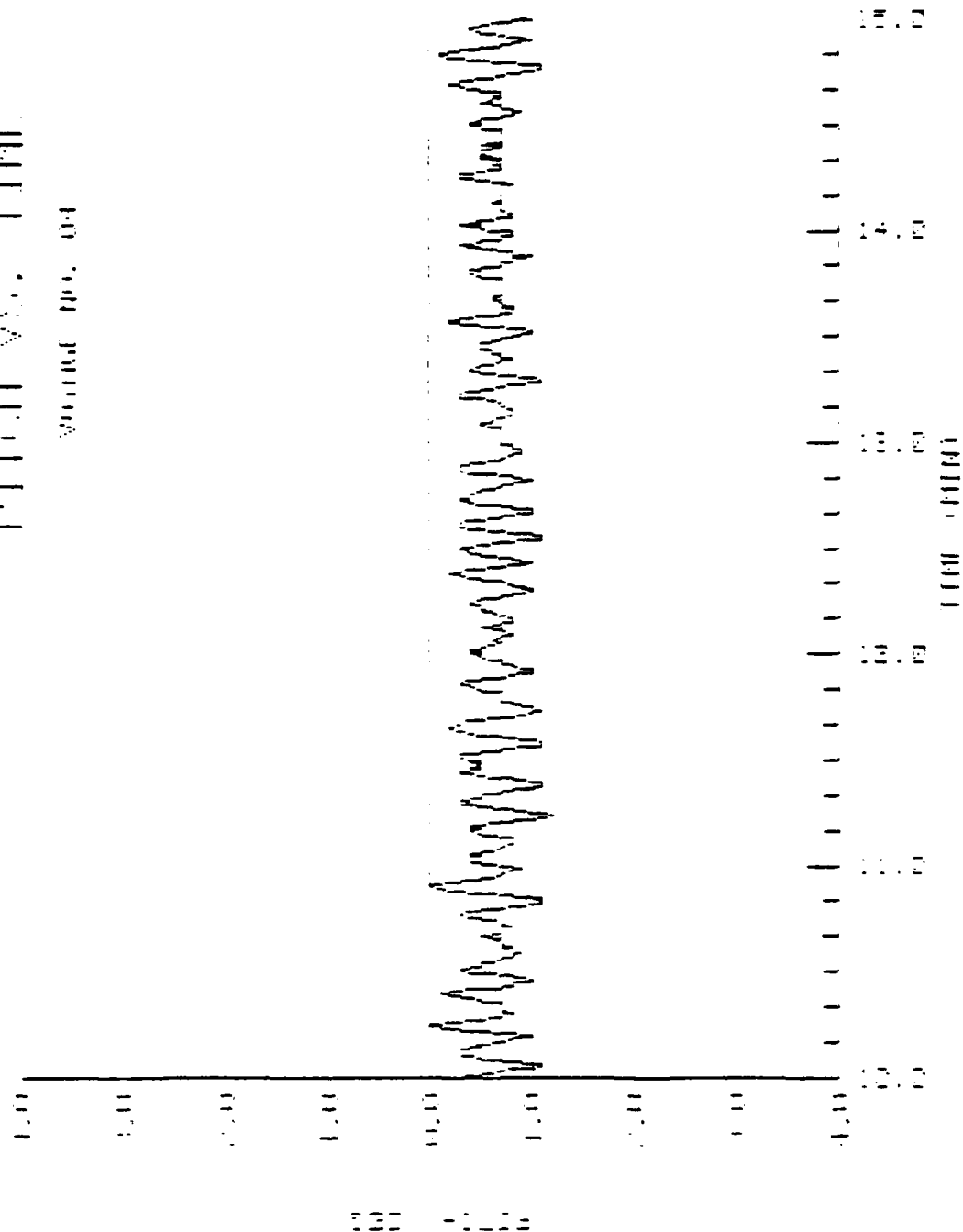


PLATE V. TIME

WIND NO. 04



POLL VS. TIME

WIND NO. 04

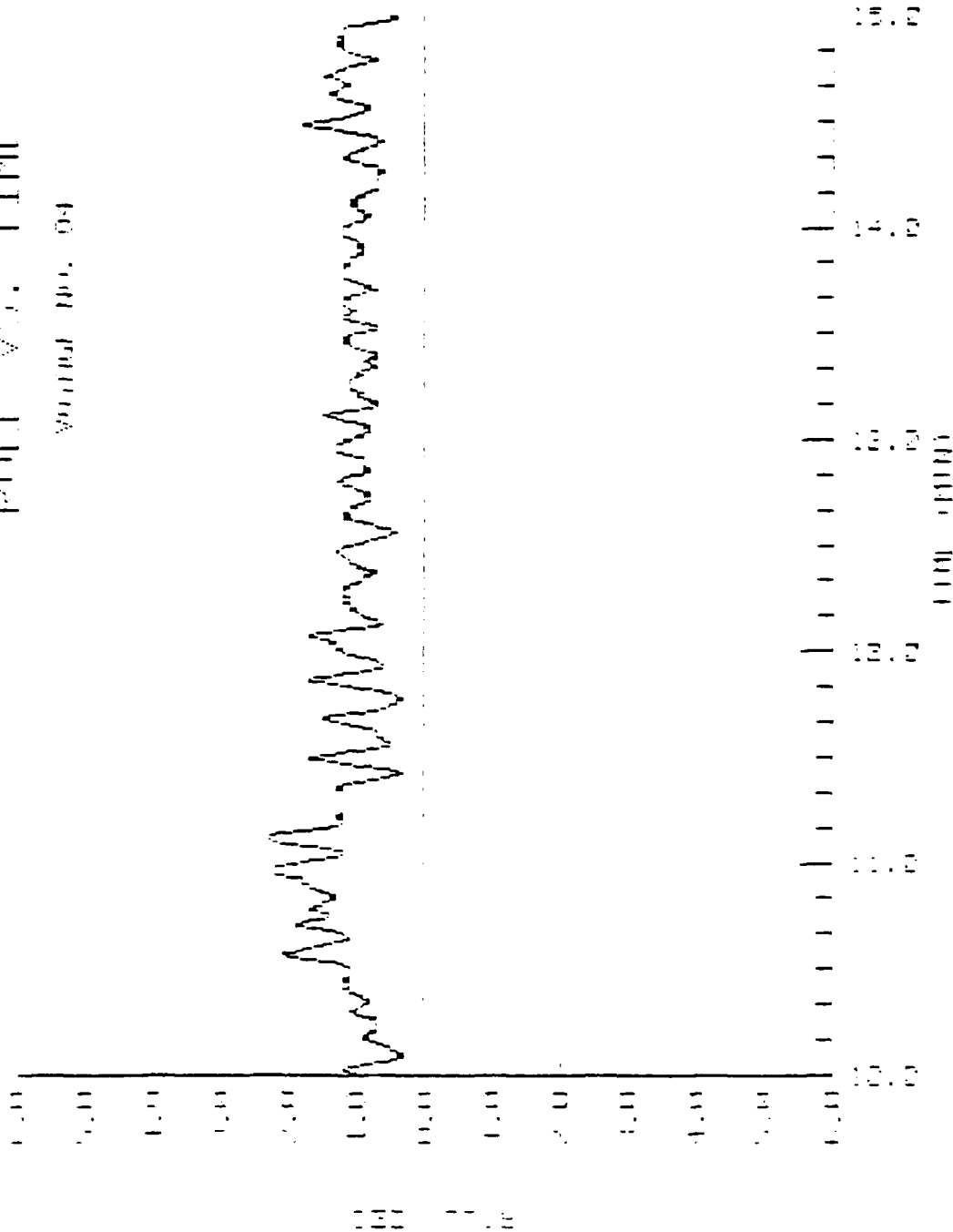


FIG. 1. VS. TIME VOISE NO. 04

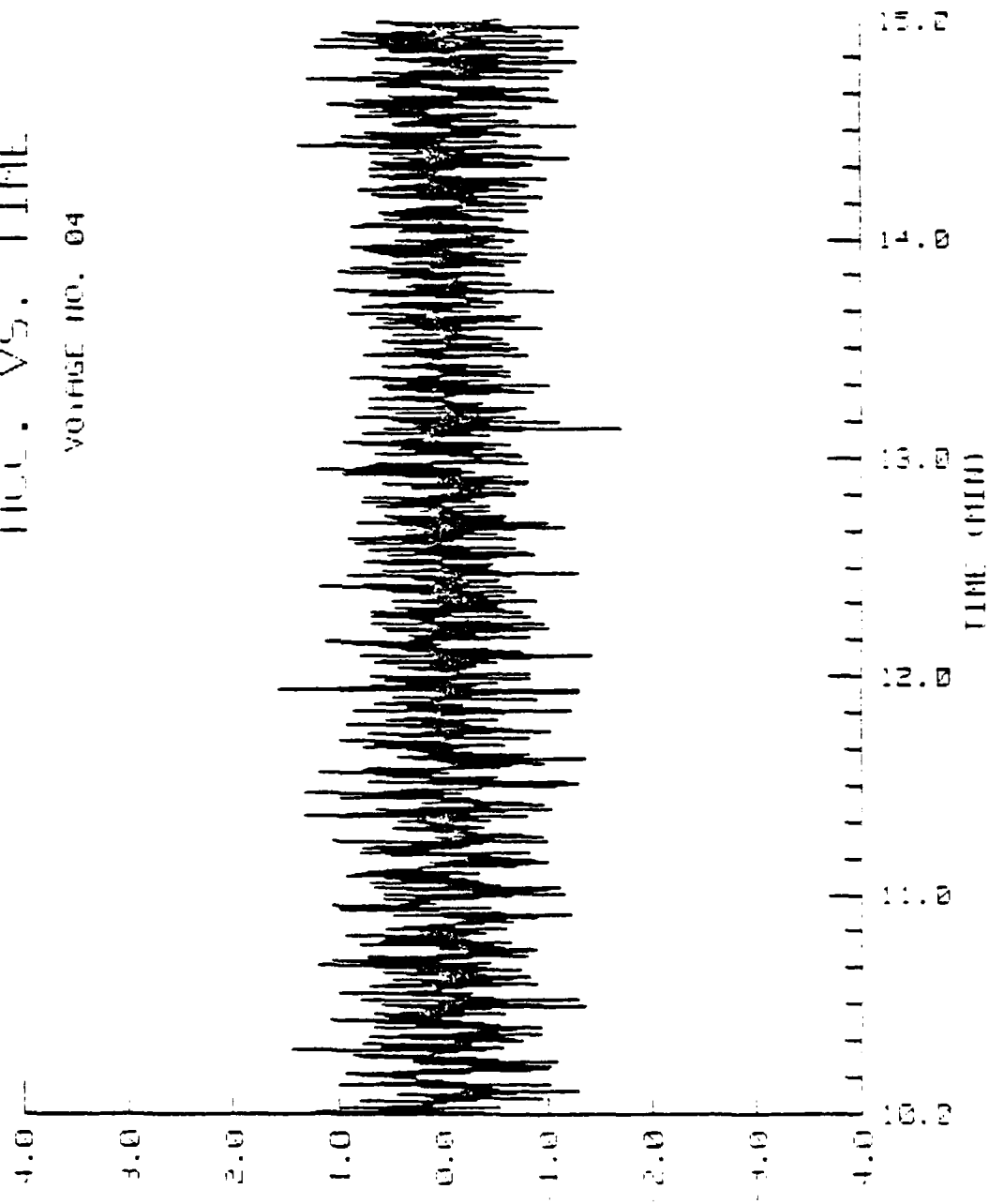
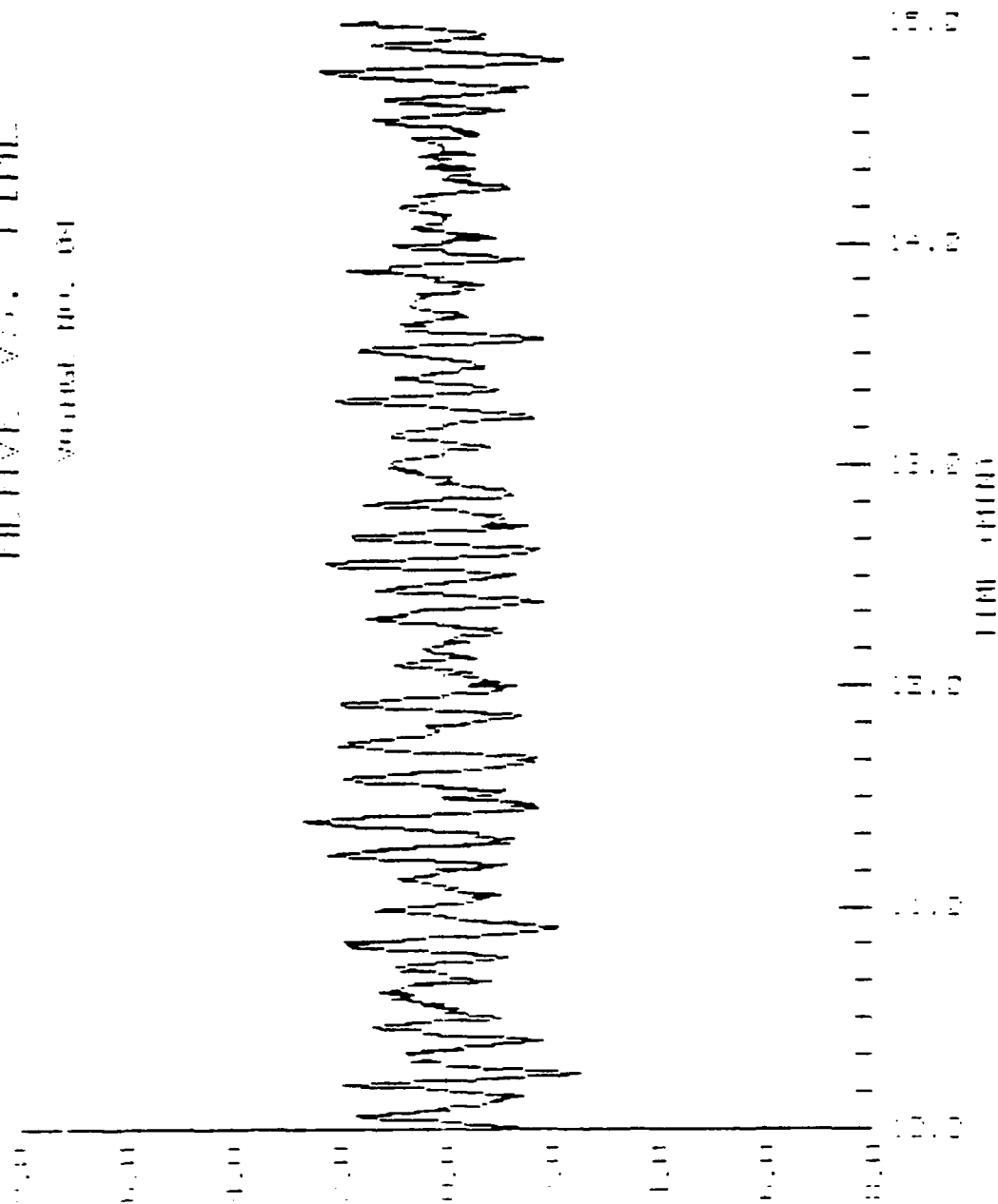


FIG. 1. VS. TIME

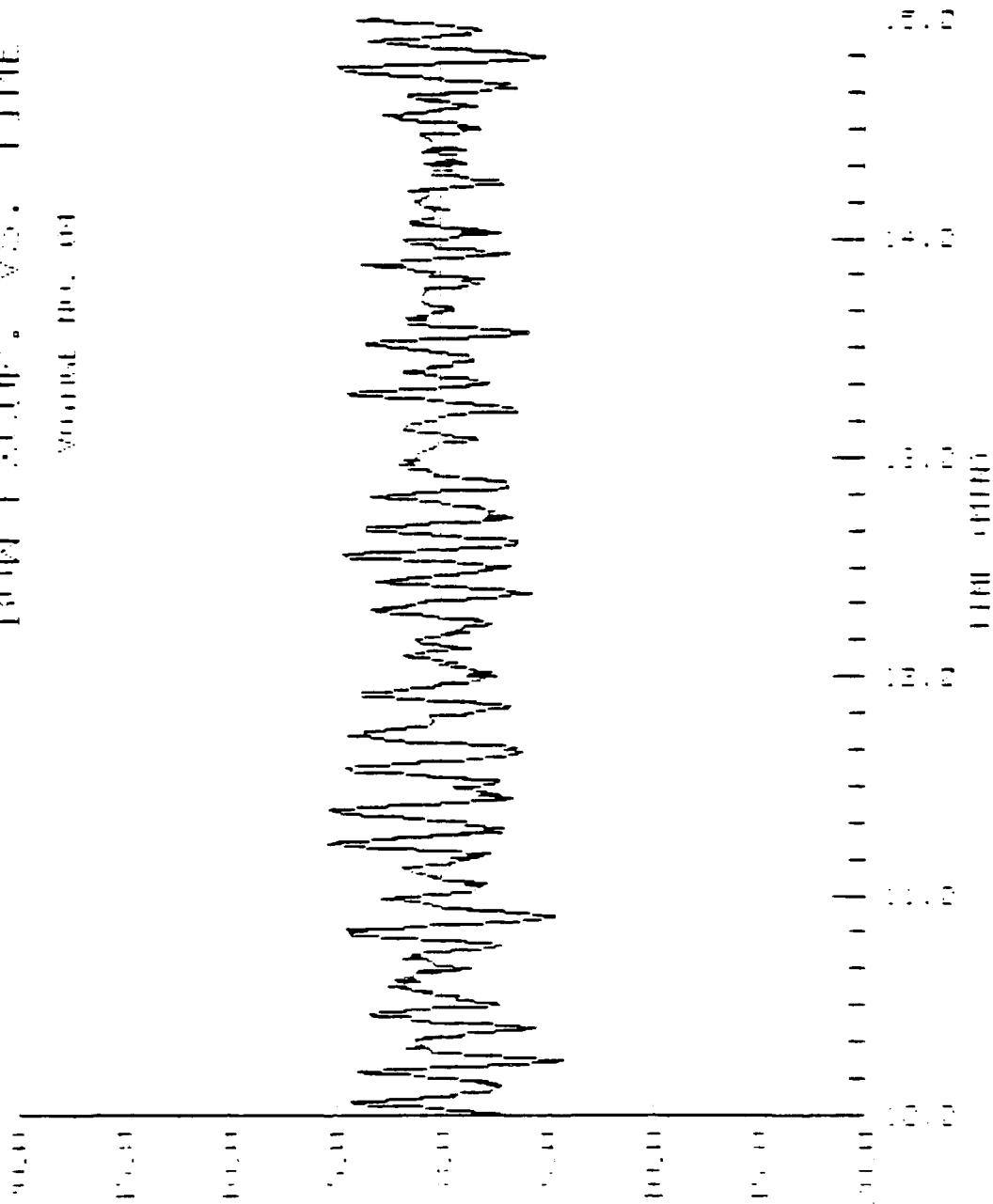
ELIOT, V. L. TIME

WIND, 100, 04



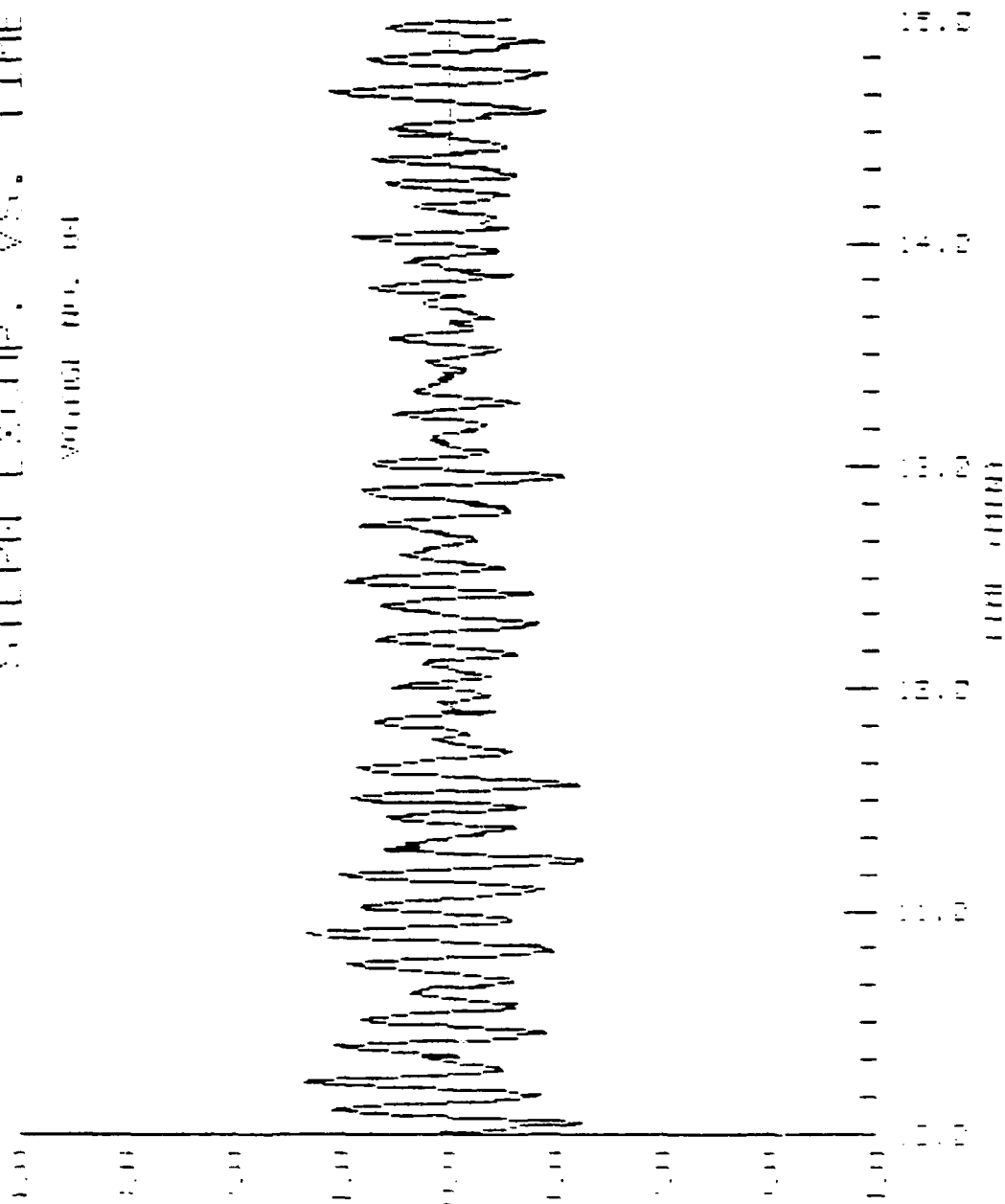
BOOK 130.144. Vols. 1-11

Volume 130.144



SLEEP GROUP, VEG. TIME

WOMEN 100, 101



AD-A098 984

TETRA TECH INC PASADENA CA

F/G 13/10

COLUMBIA RIVER ENTRANCE CHANNEL DEEP-DRAFT VESSEL MOTION STUDY,--ETC(U)

SEP 80 S WANG, M KIMBLE, C BUTCHER, G D COX

DACW57-78-C-0028

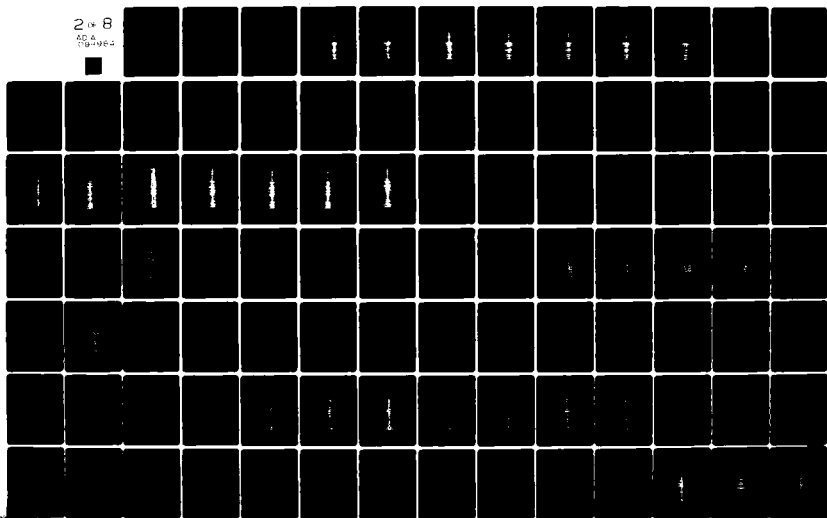
UNCLASSIFIED

TETRAT-TC-3925-APP-A(1)

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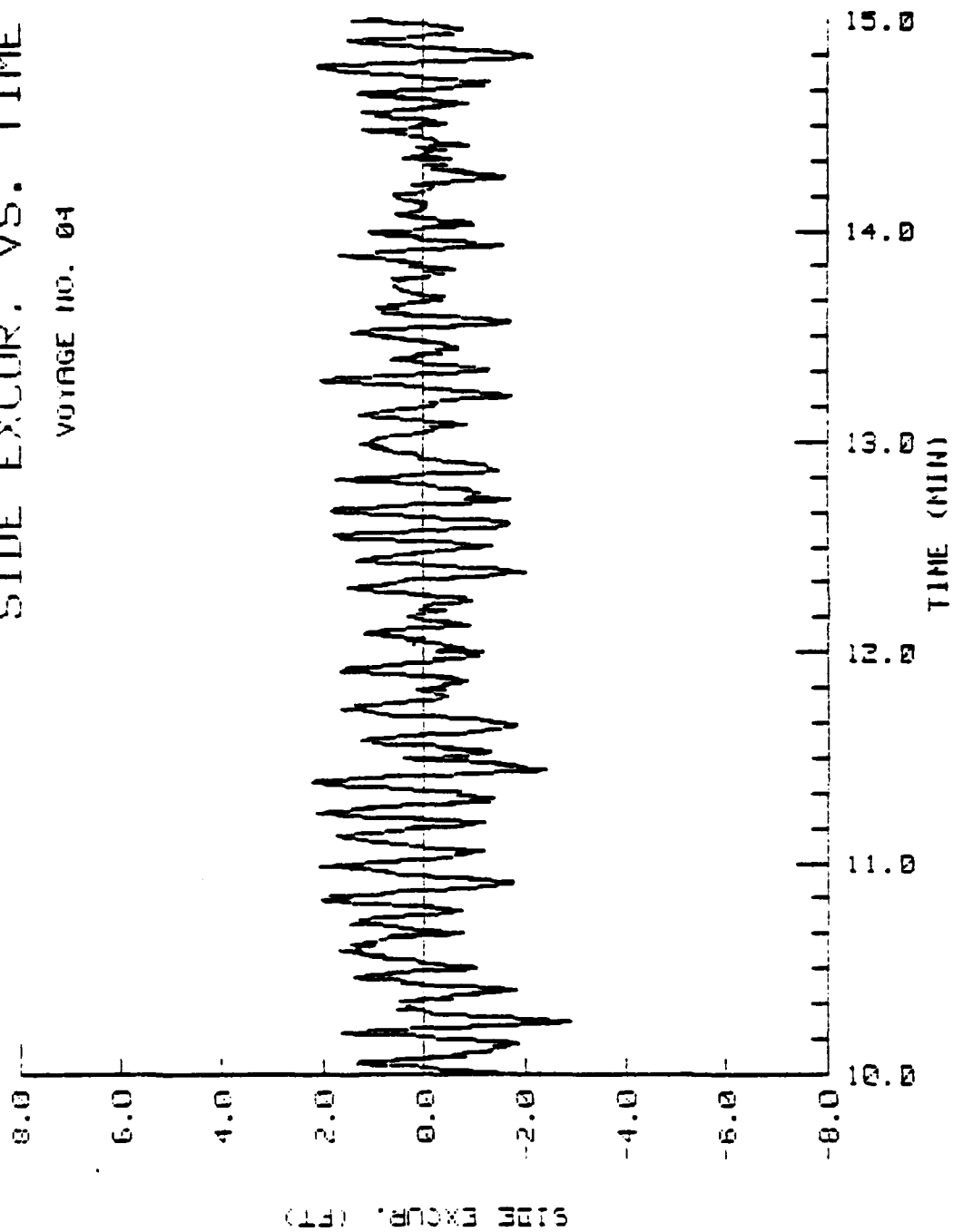
2 of 8

AD-A
19-984



SIDE EXCUR. VS. TIME

VOYAGE NO. 04

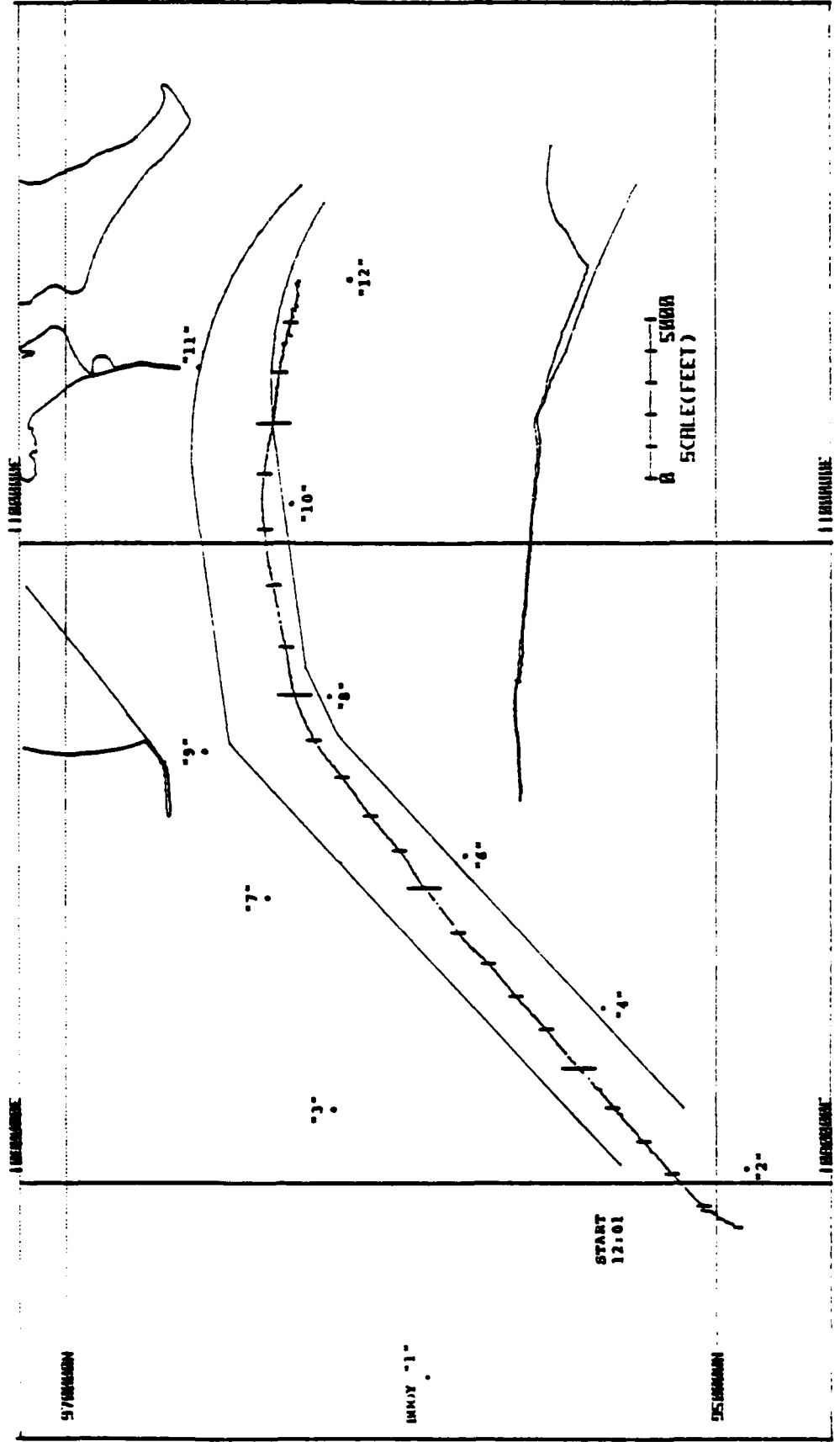


STATISTICAL SUMMARY

VOYAGE NO. 05

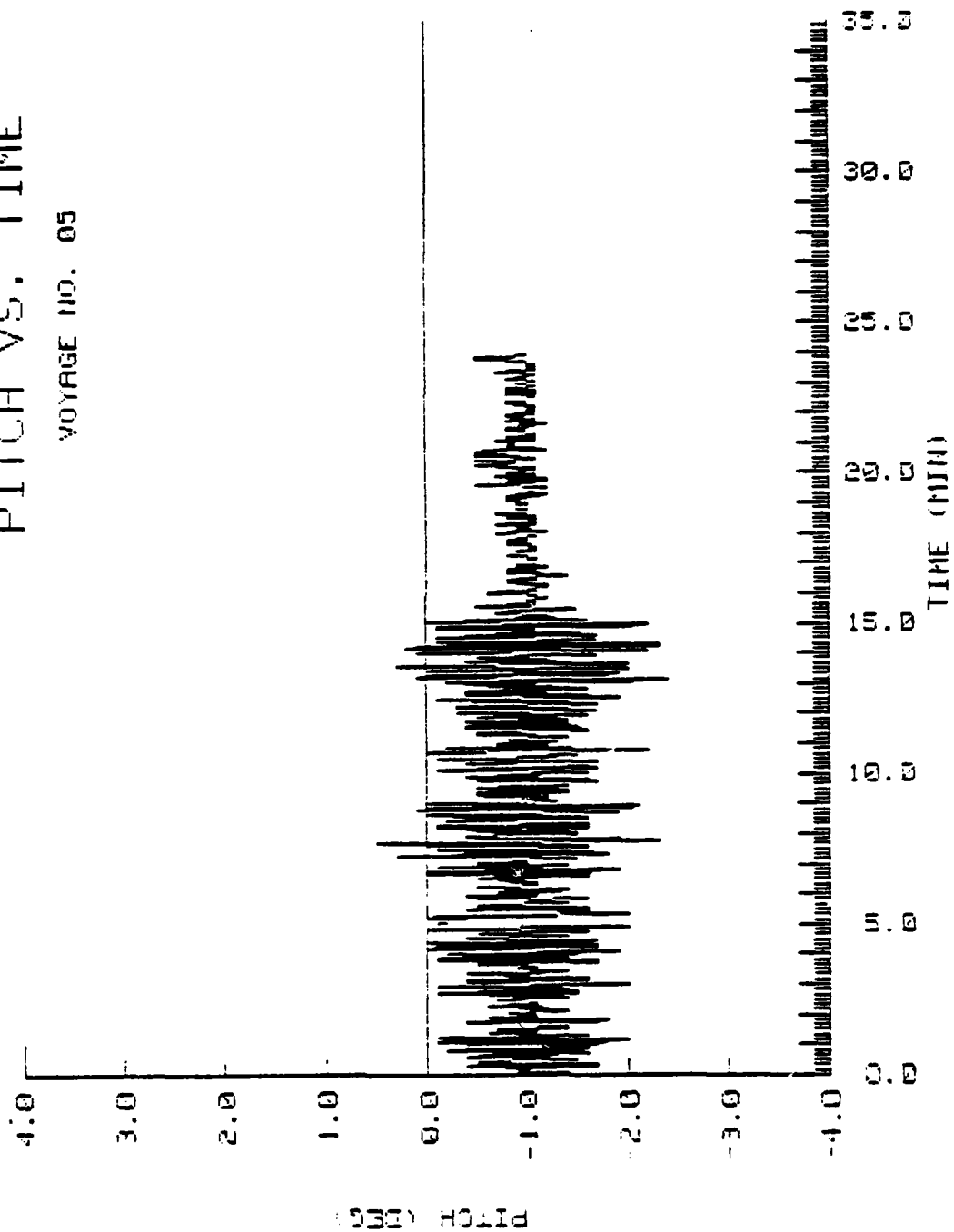
	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-1.0	1.5	.7	.7
ROLL (DEG)	1.5	3.8	1.6	1.8
ACC (FT/SEC/SEC)	-1.1	1.7	.7	.8
HEAVE (FT)	-1.0	4.7	2.0	2.2
BOW EXCUR. (FT)	-1.1	12.6	4.6	5.4
STERN EXCUR. (FT)	.0	4.9	2.0	2.3
SIDE EXCUR (FT)	-1.0	5.7	2.3	2.6

VUYHGE NO. 05 SHIP TRACK SCINE 1: 3000



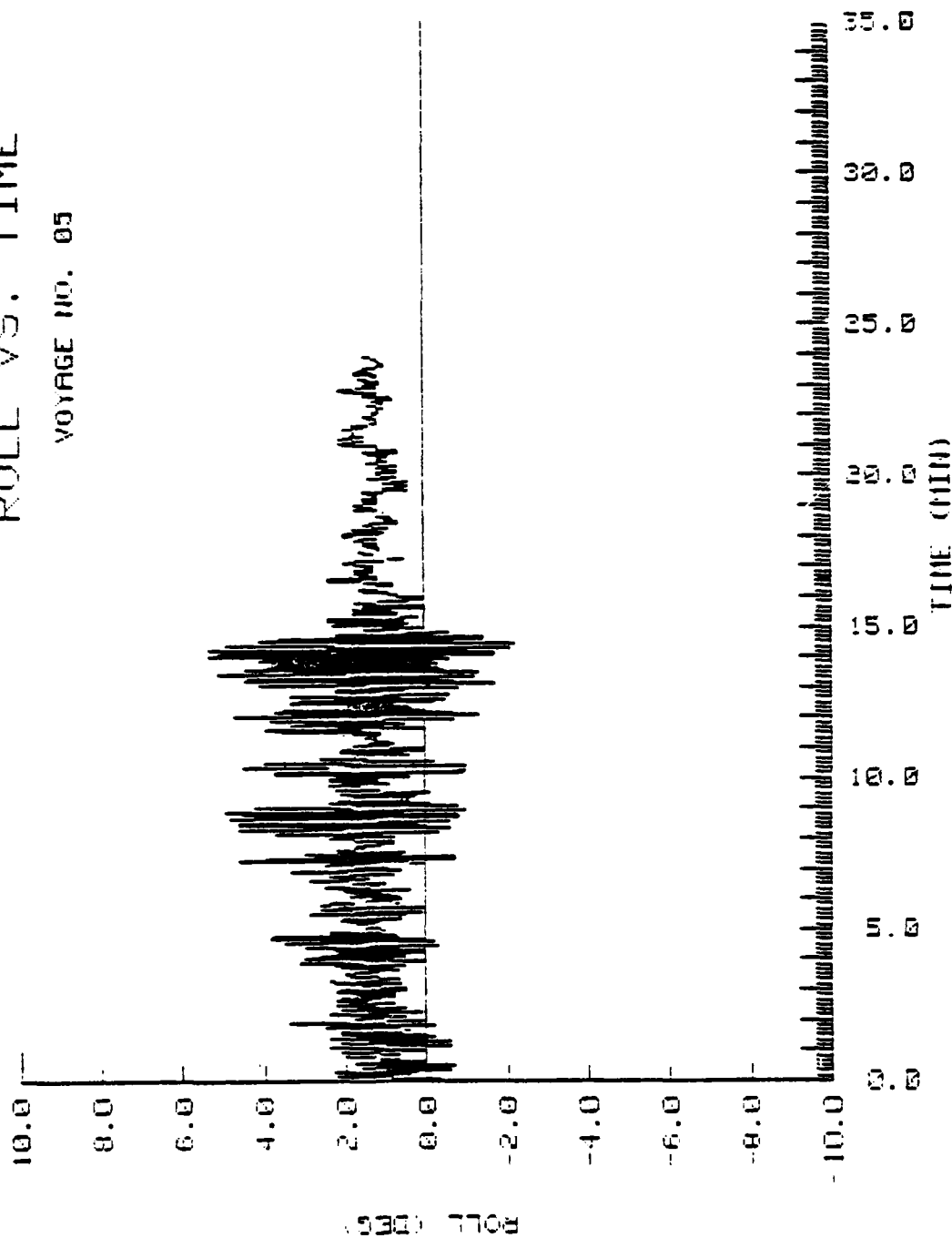
PITCH VS. TIME

VOYAGE NO. 05



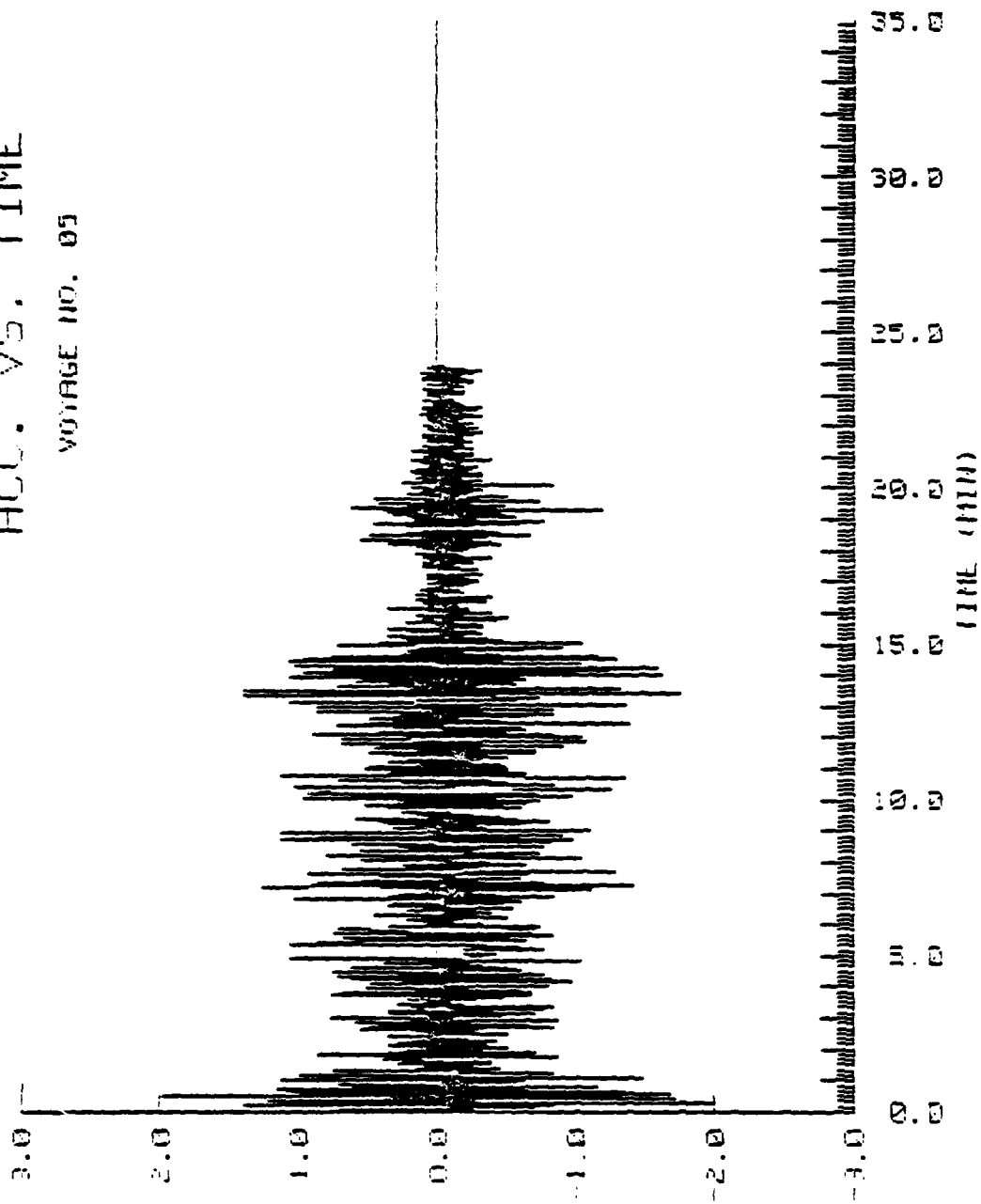
ROLL VS. TIME

VOYAGE NO. 05



ACC. VS. TIME

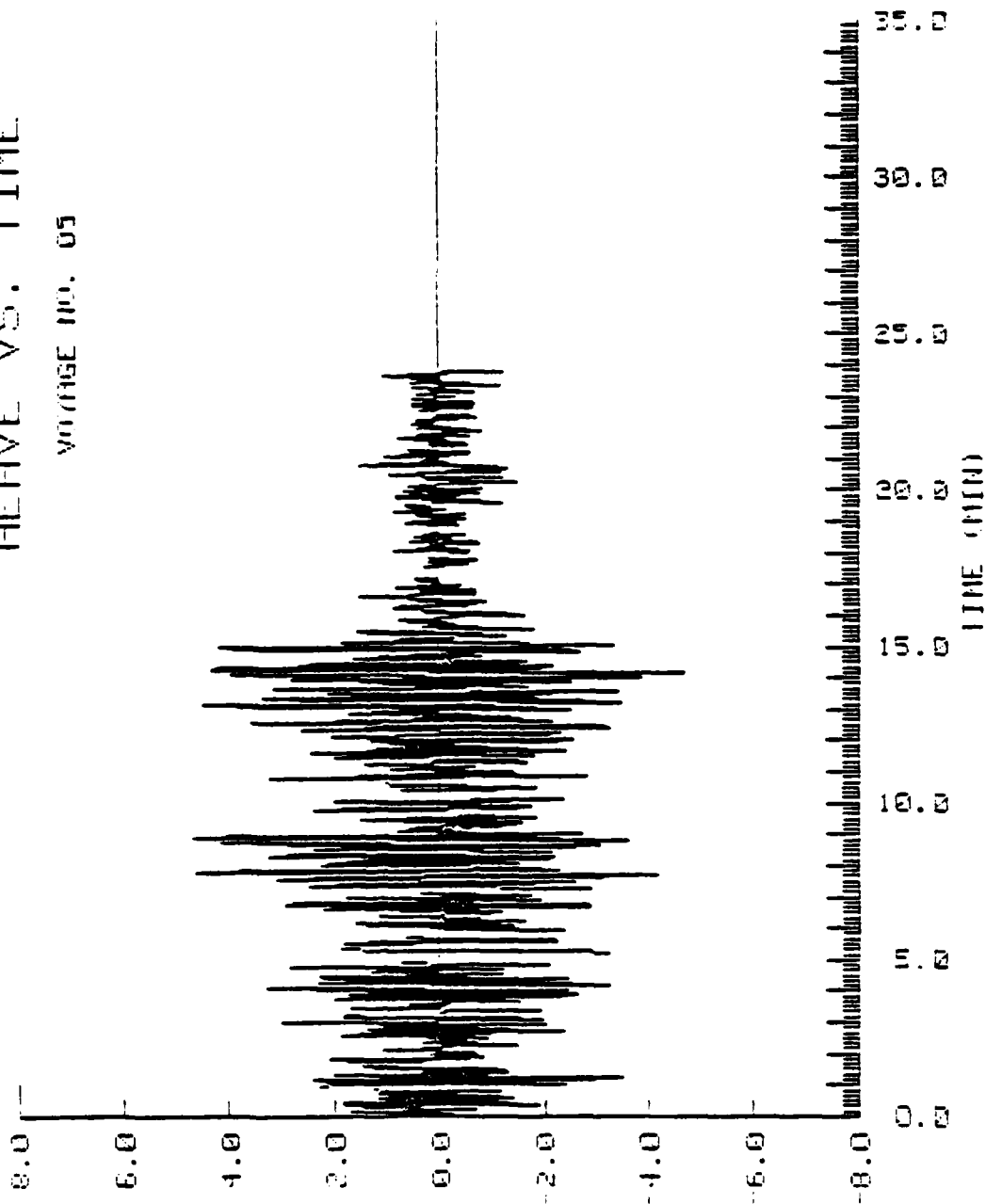
VOLTAJE NO. 05



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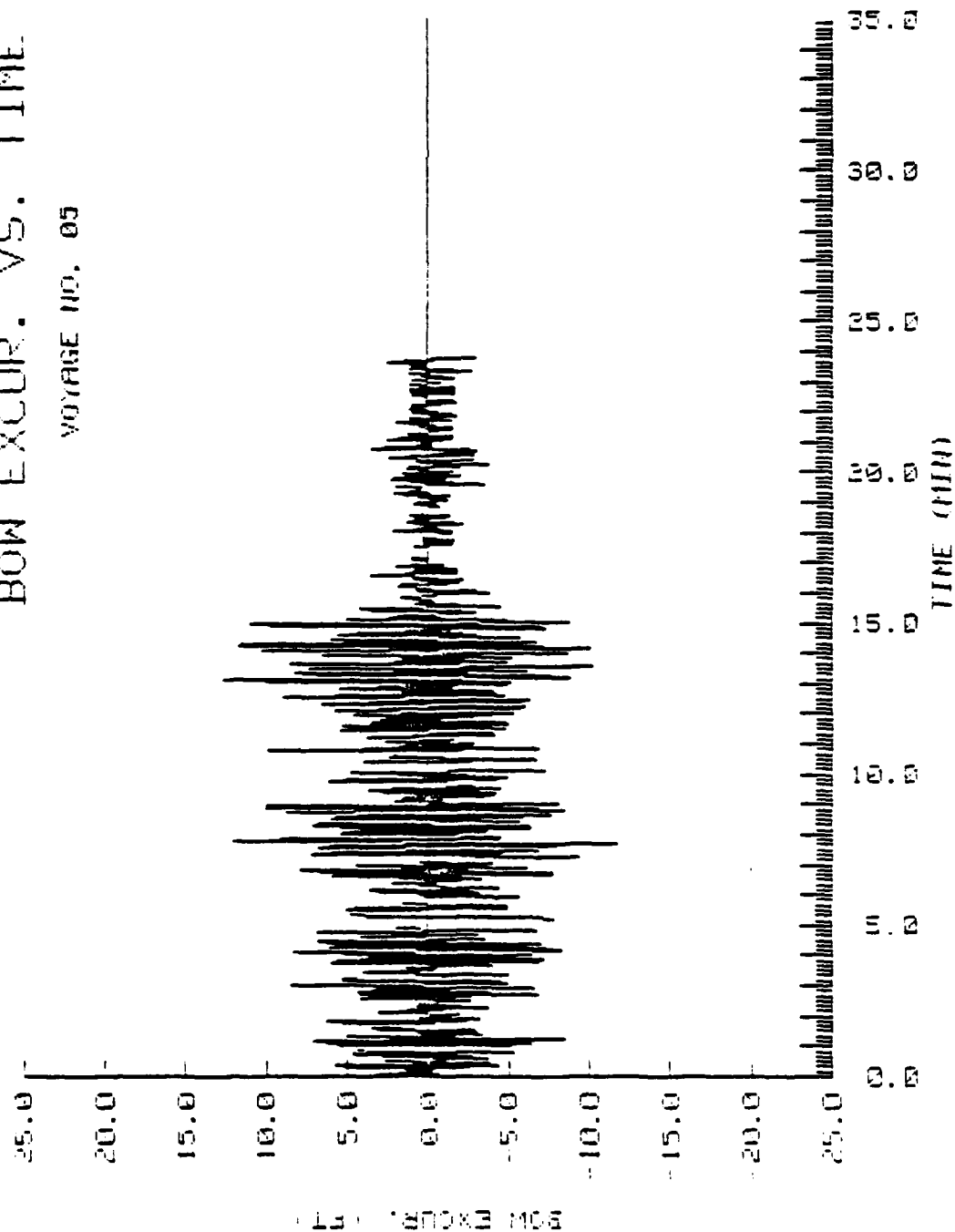
HEAVE VS. TIME

VOLTAJE NO. 05



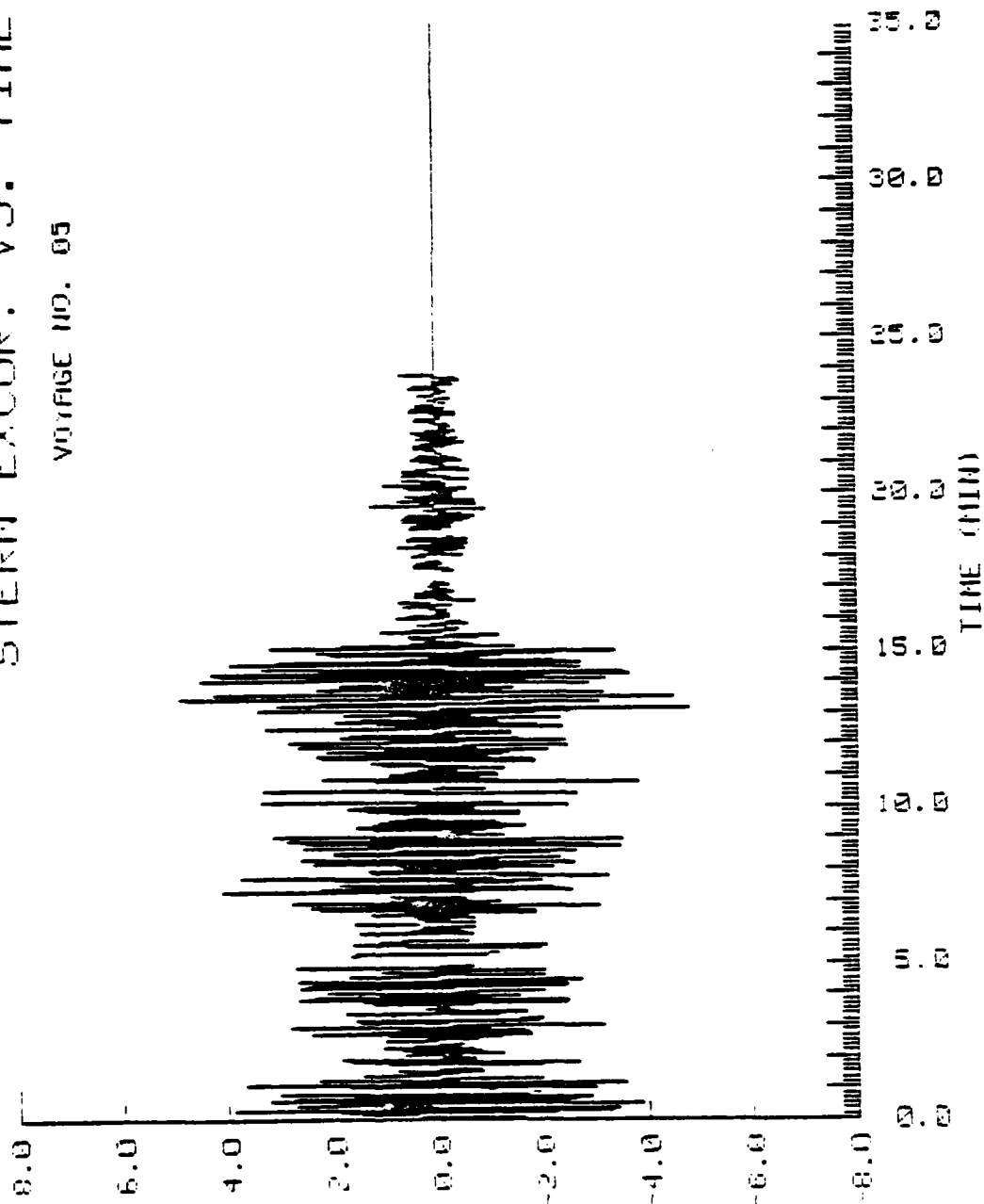
BOW EXCUR. VS. TIME

VOYAGE NO. 05



STERN EXCUR. VS. TIME

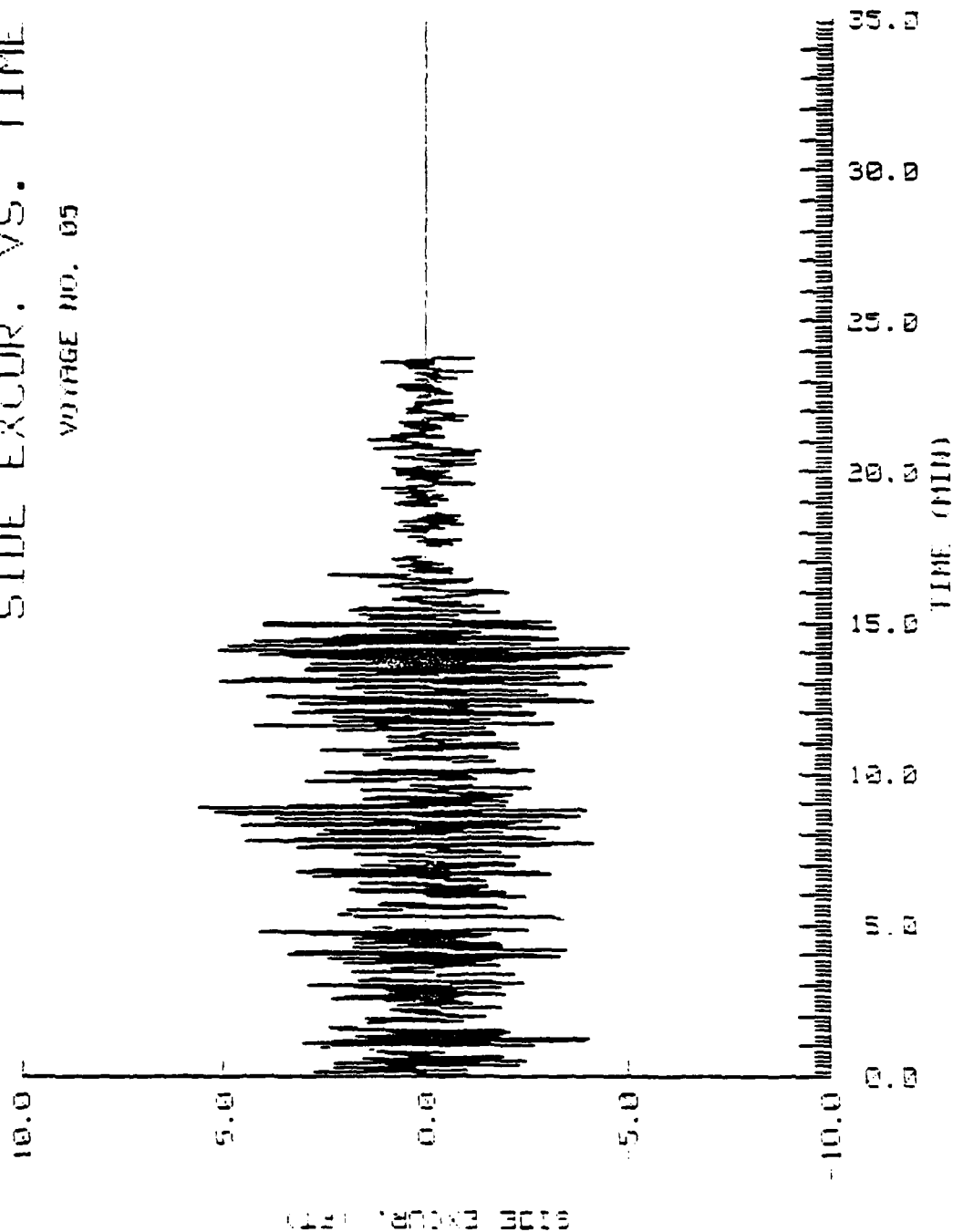
VOYAGE NO. 05



STERN EXCUR. (ST)

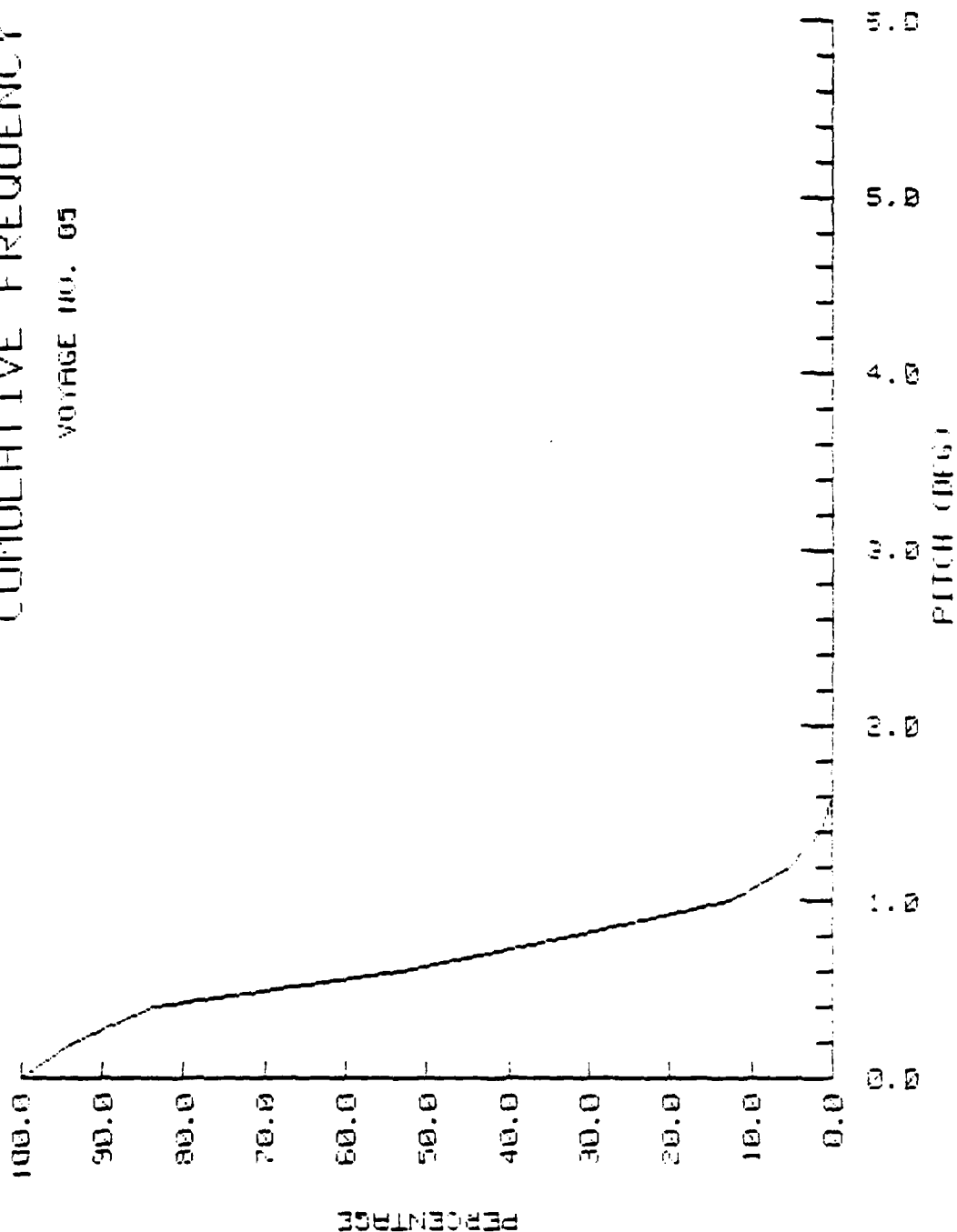
SIDE EXCUR. VS. TIME

VOLTAGE NO. 05



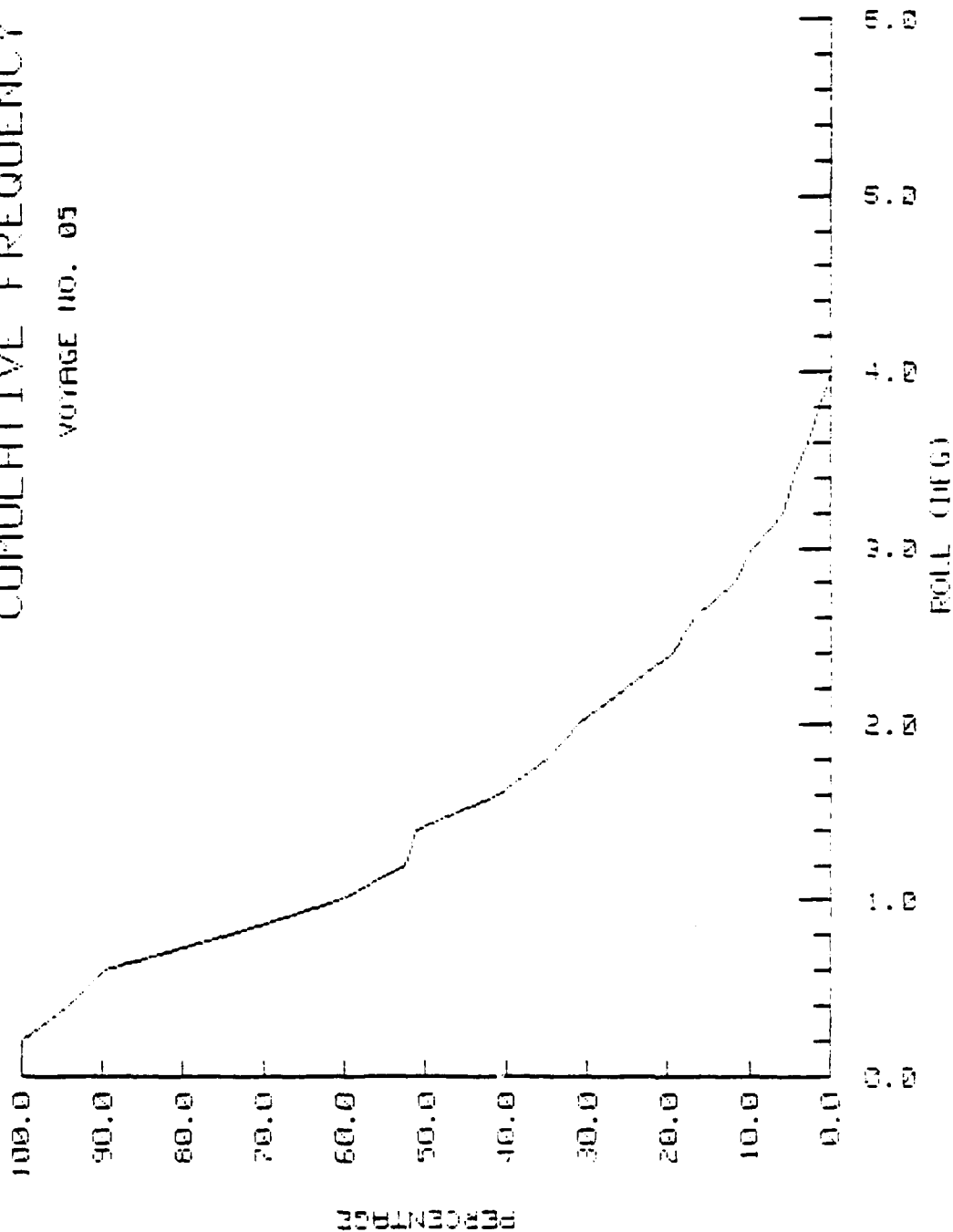
CUMULATIVE FREQUENCY

VOTAGE NO. 05



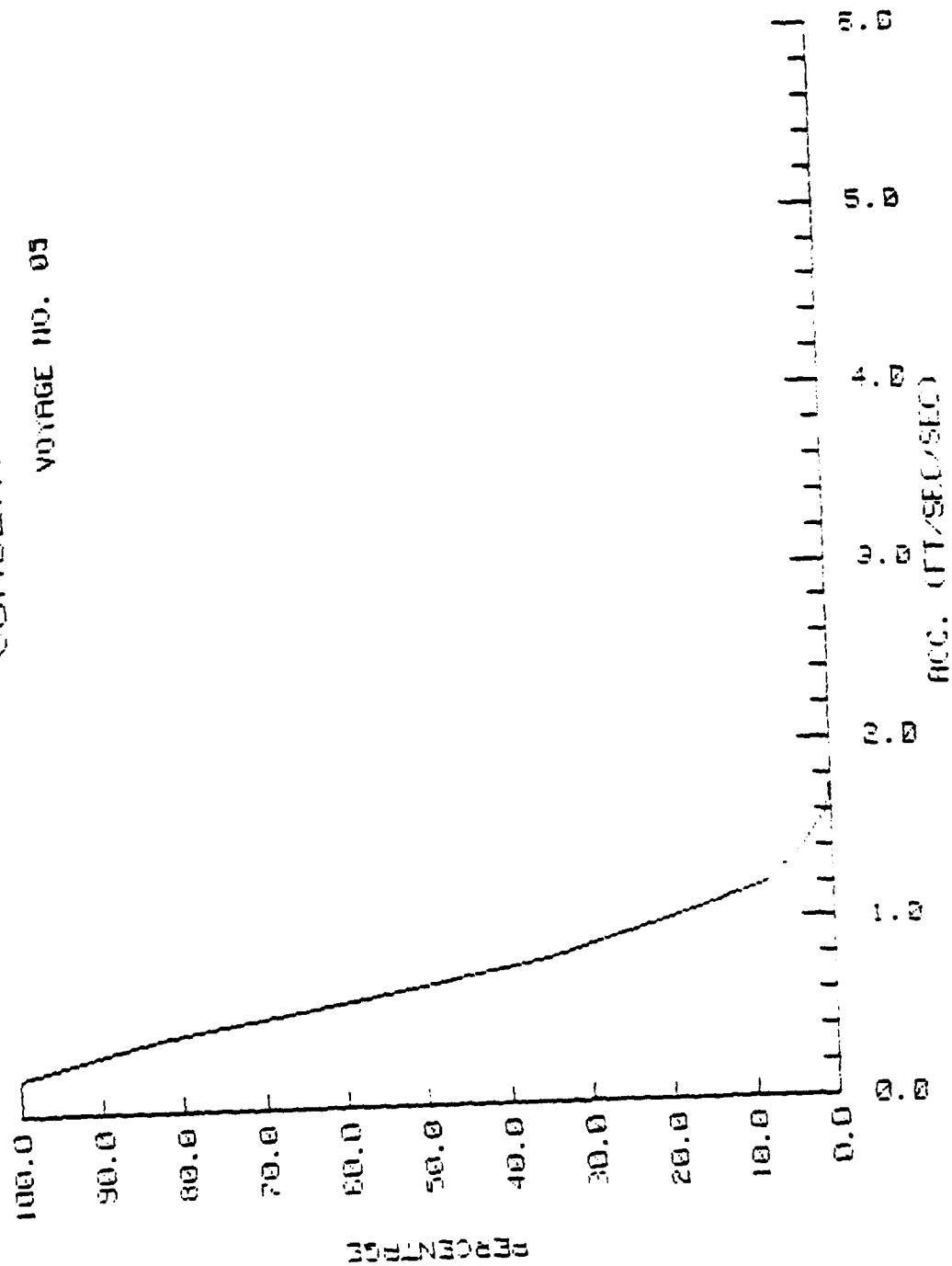
CUMULATIVE FREQUENCY

VOYAGE NO. 05



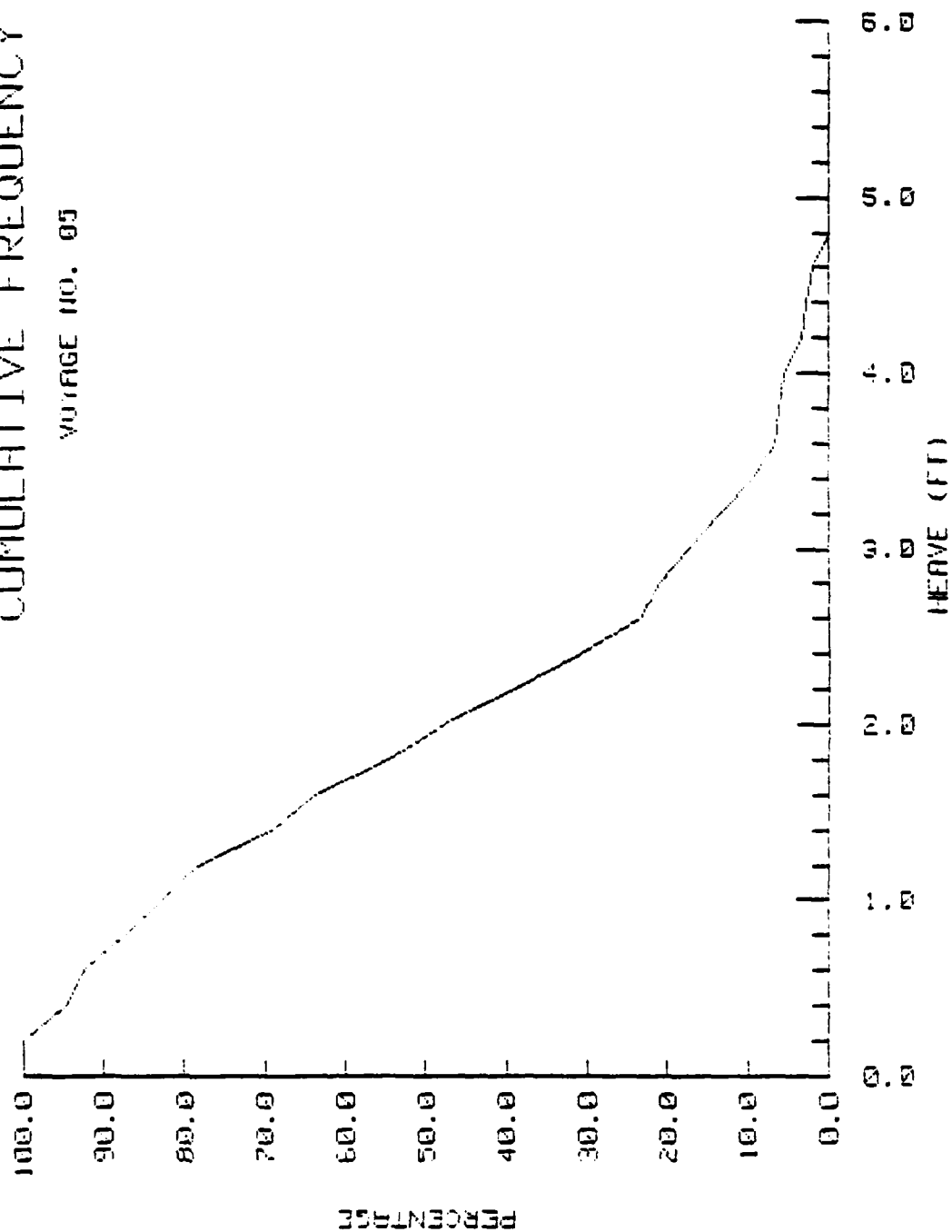
CUMULATIVE FREQUENCY

VOTAGE NO. 05



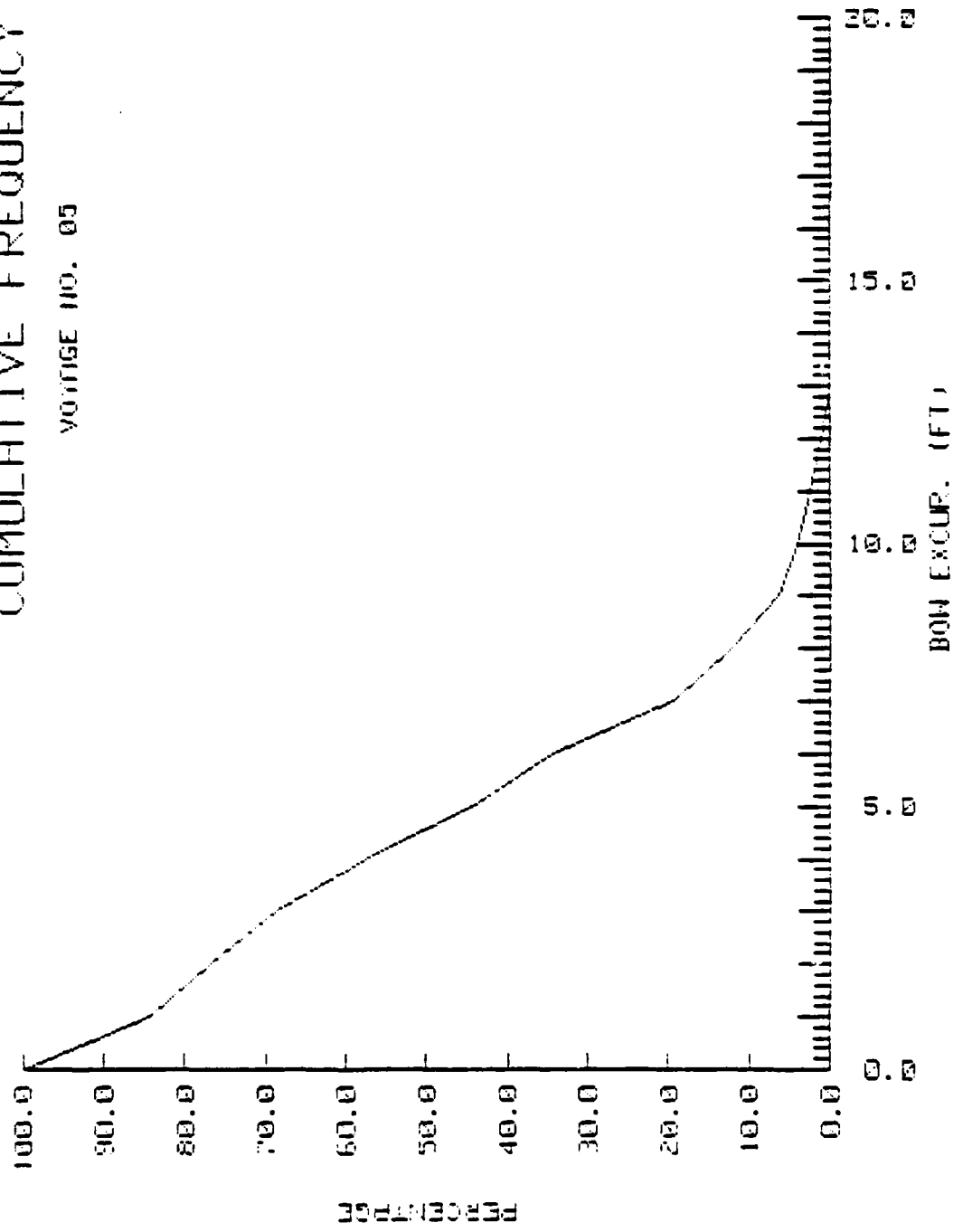
CUMULATIVE FREQUENCY

VOLTAJE NO. 05



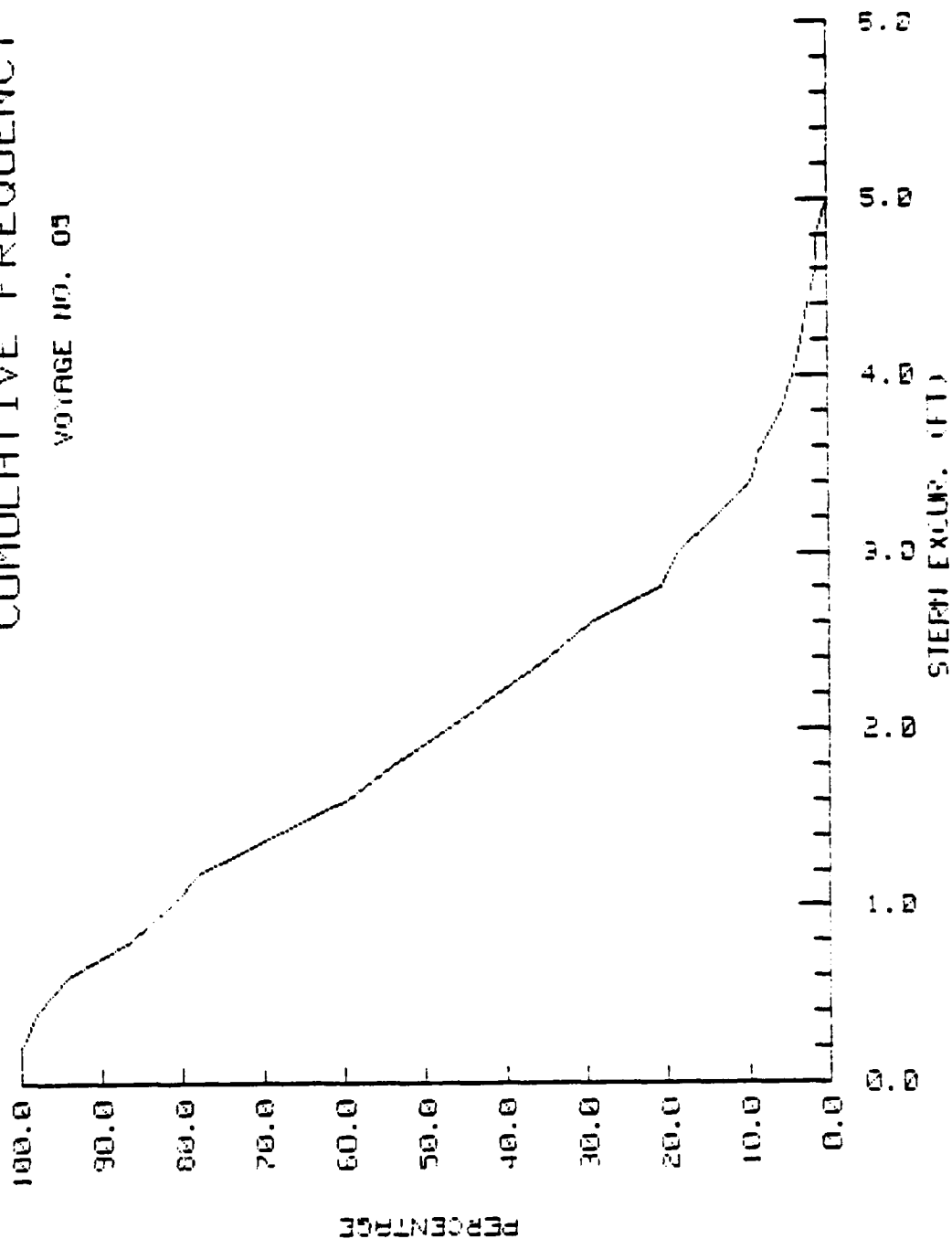
CUMULATIVE FREQUENCY

VOTAGE NO. 05



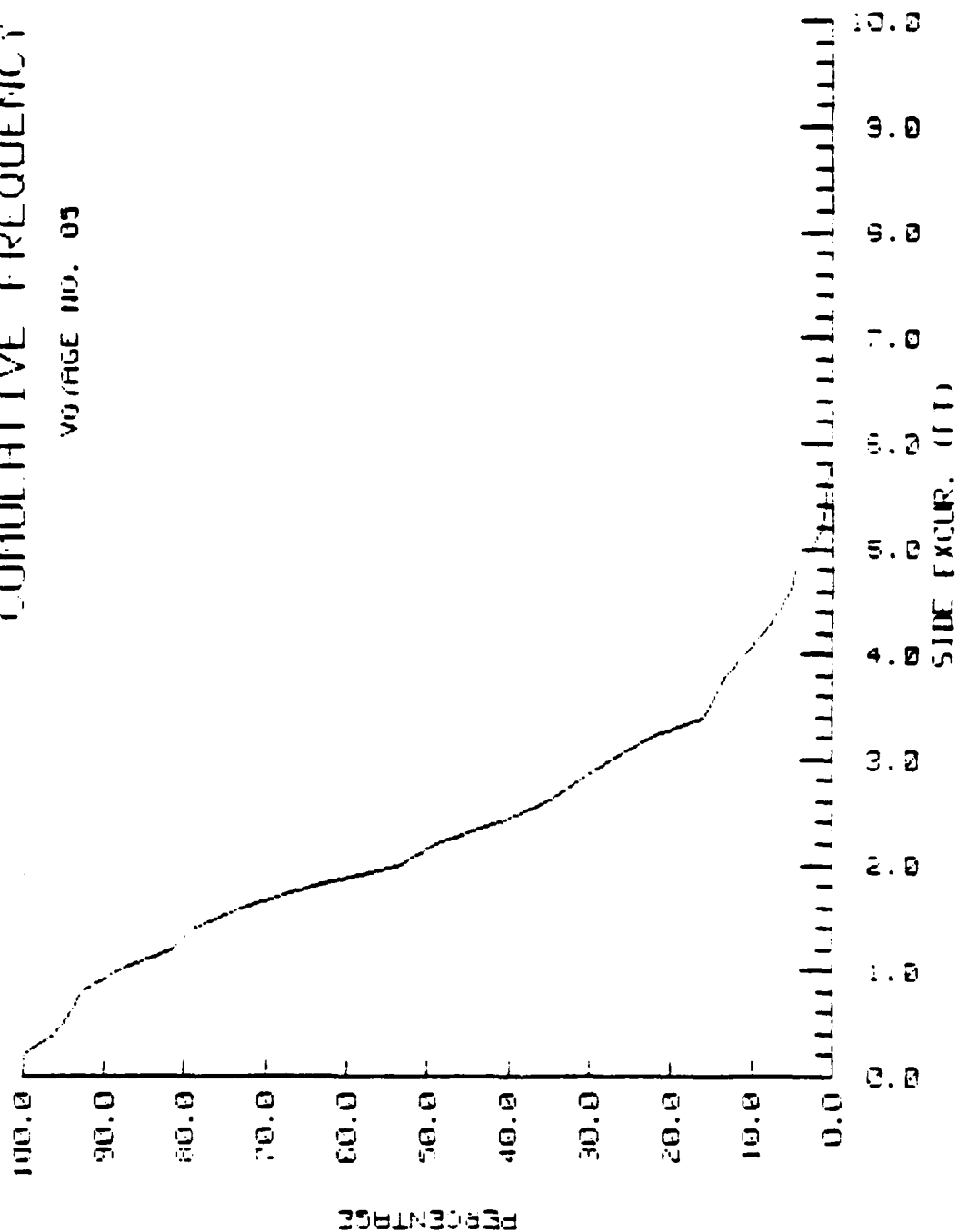
CUMULATIVE FREQUENCY

VOTAGE NO. 03



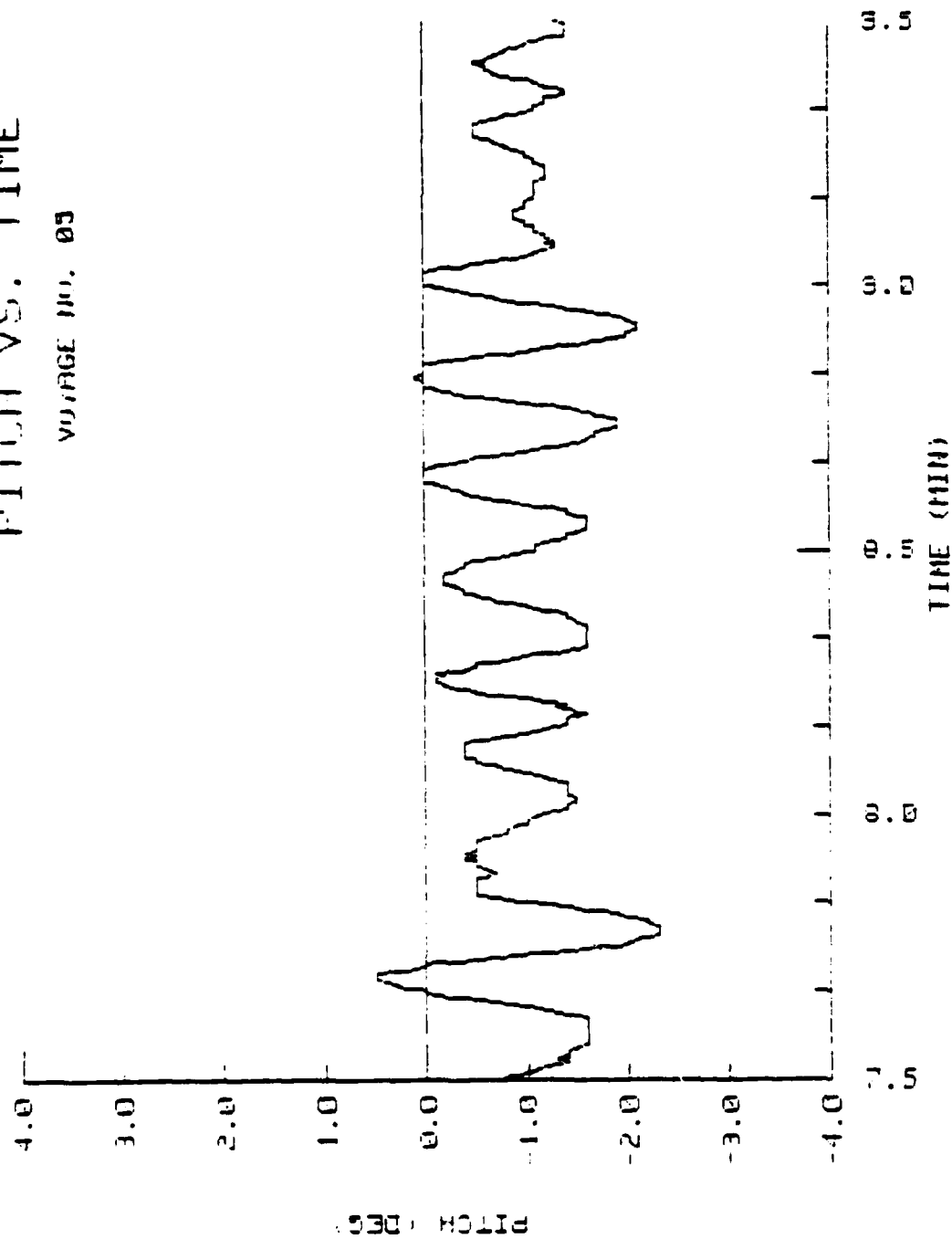
CUMULATIVE FREQUENCY

VOLAGE 110. 05



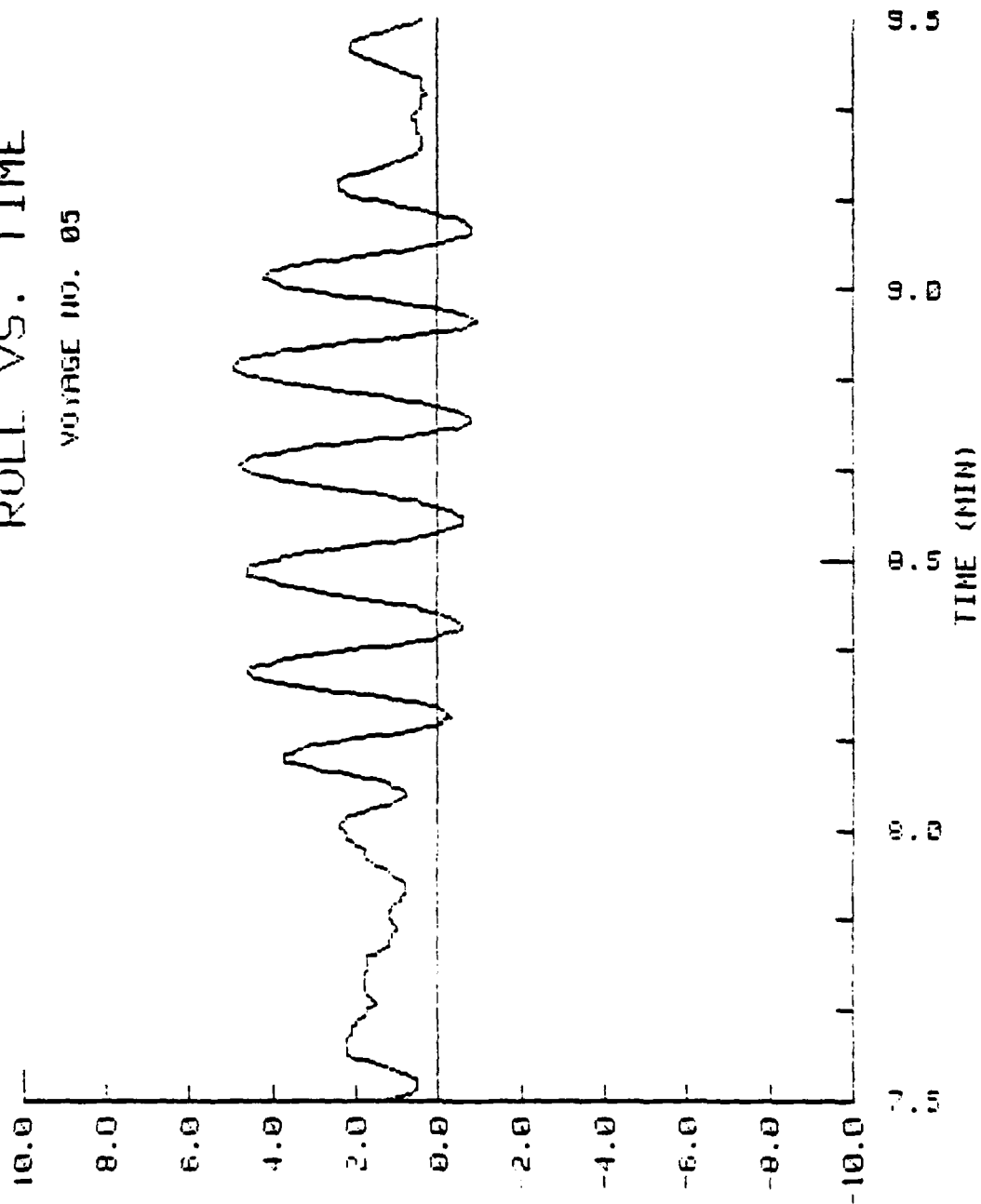
PITCH VS. TIME

WAVEFORM NO. 03



ROLL VS. TIME

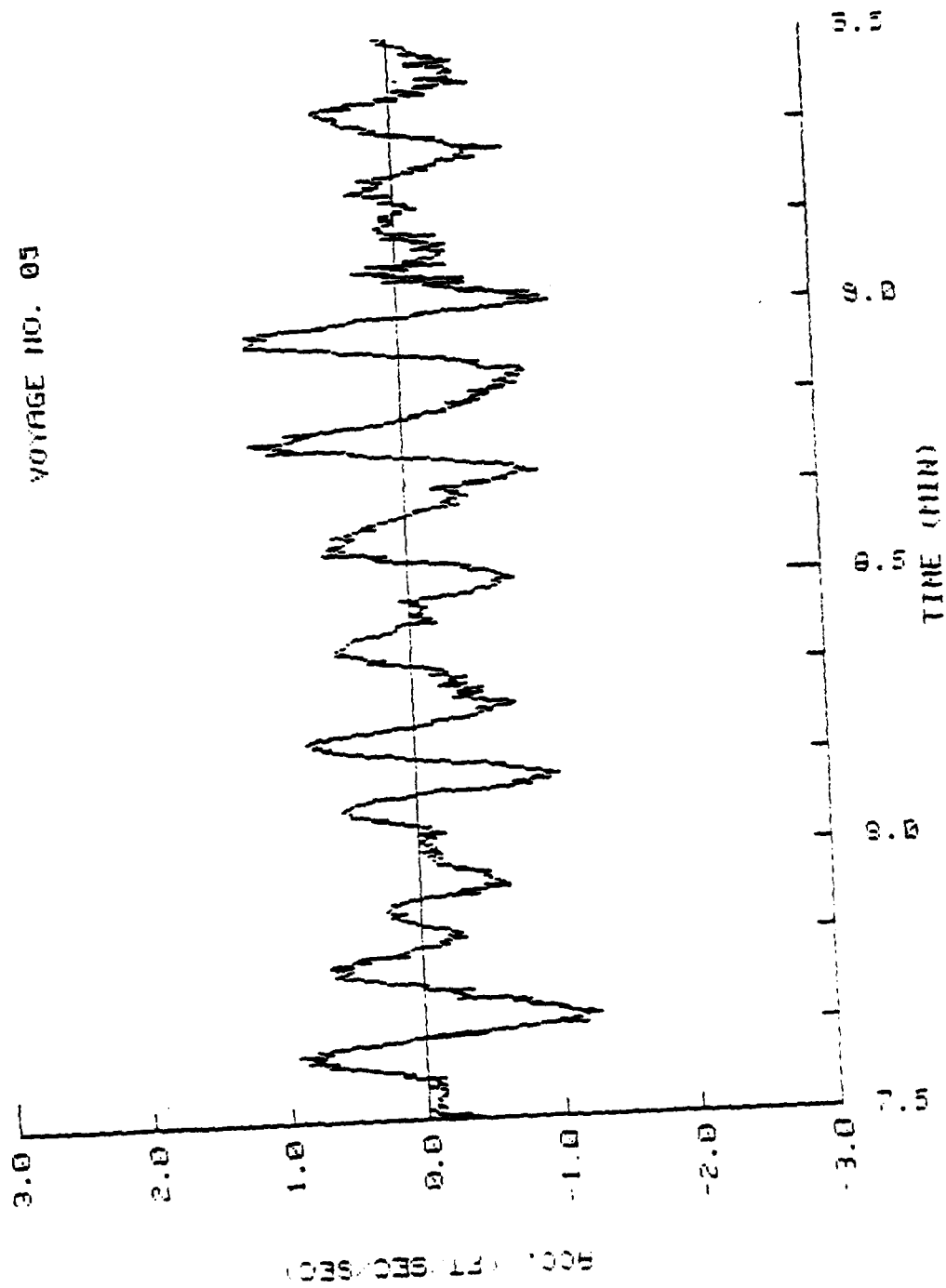
VOLTAGE NO. 05



1930 1700

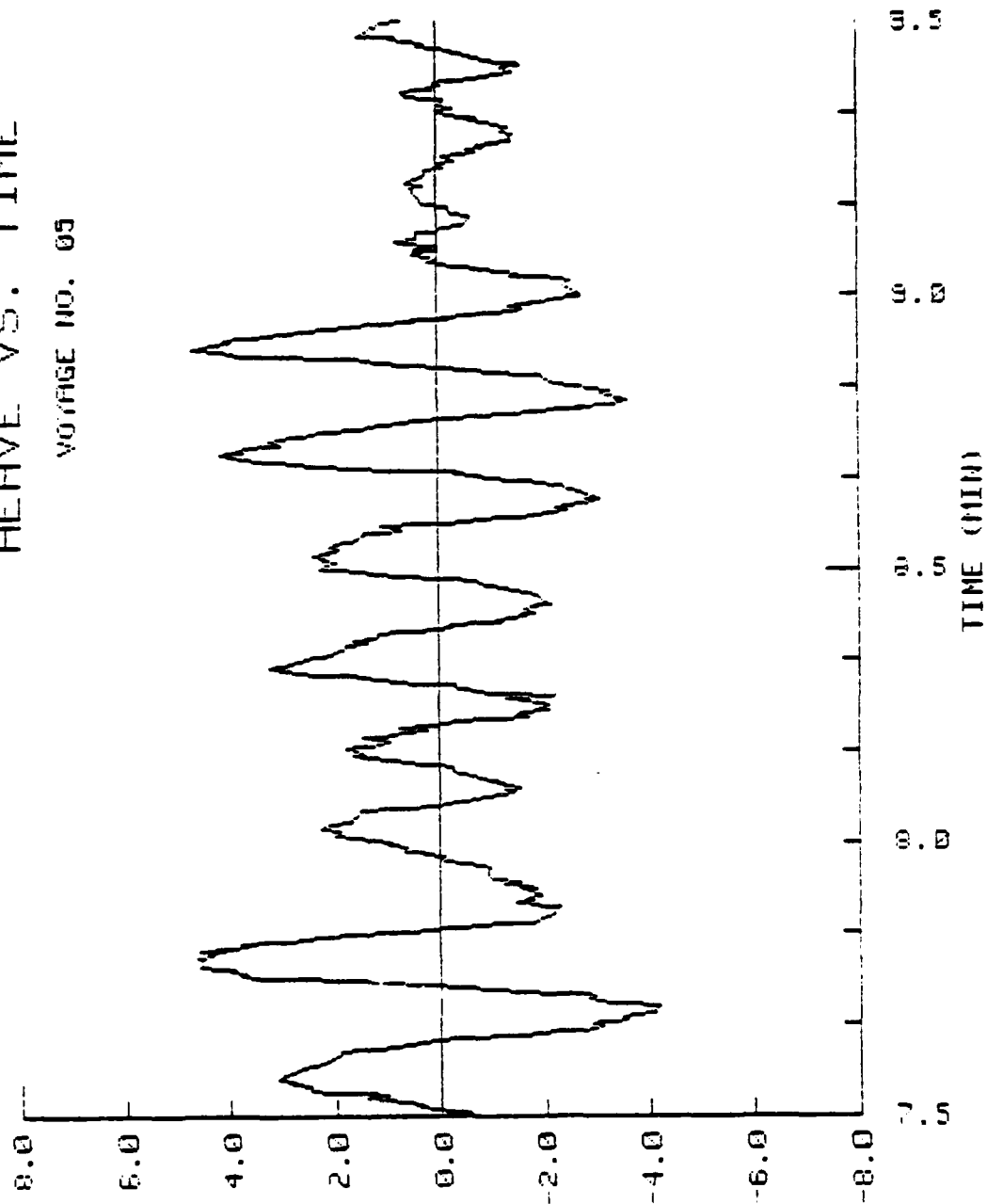
ACC. VS. TIME

VOYAGE NO. 05



HEAVE VS. TIME

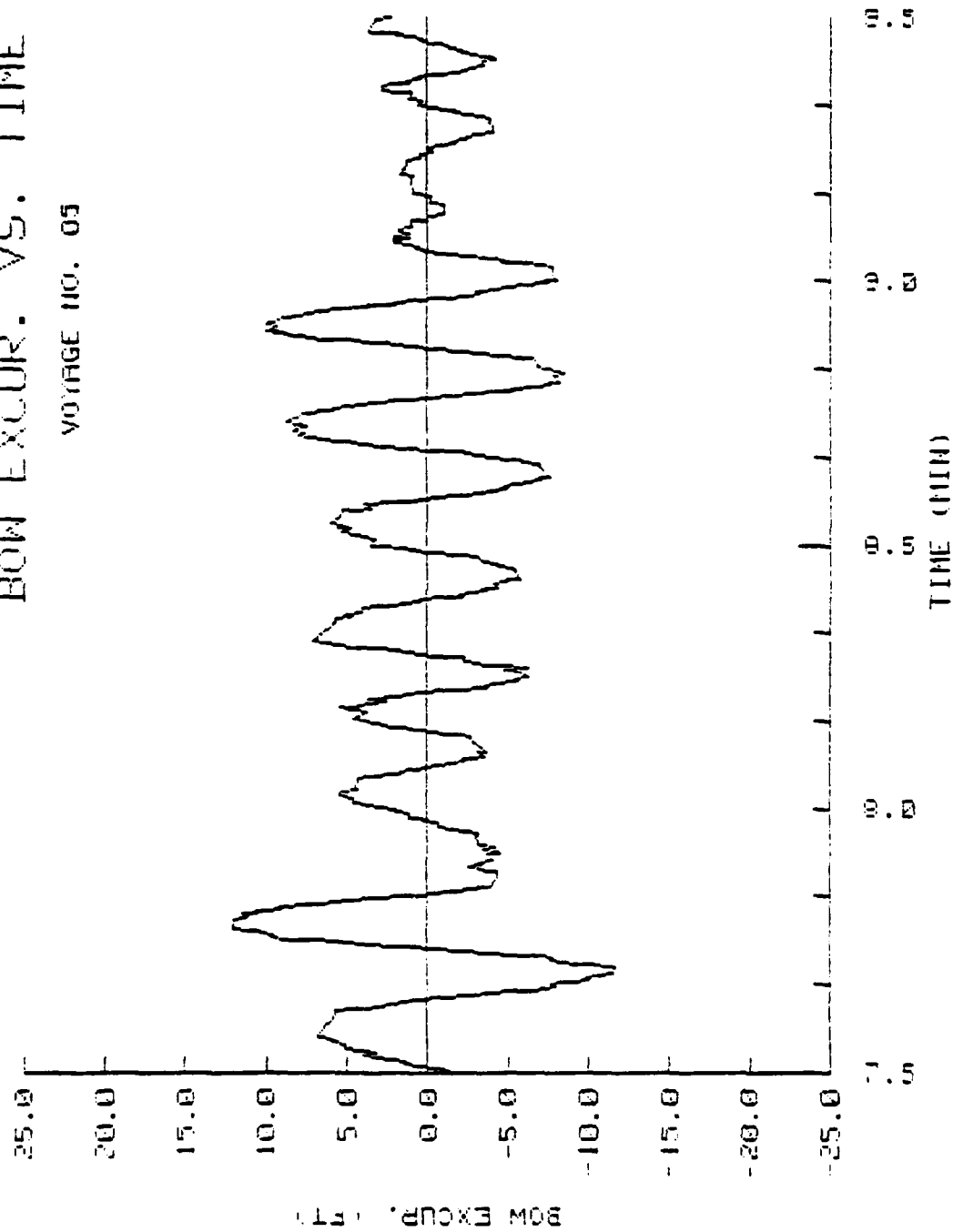
VOLTAJE NO. 05



HEAVE (CM)

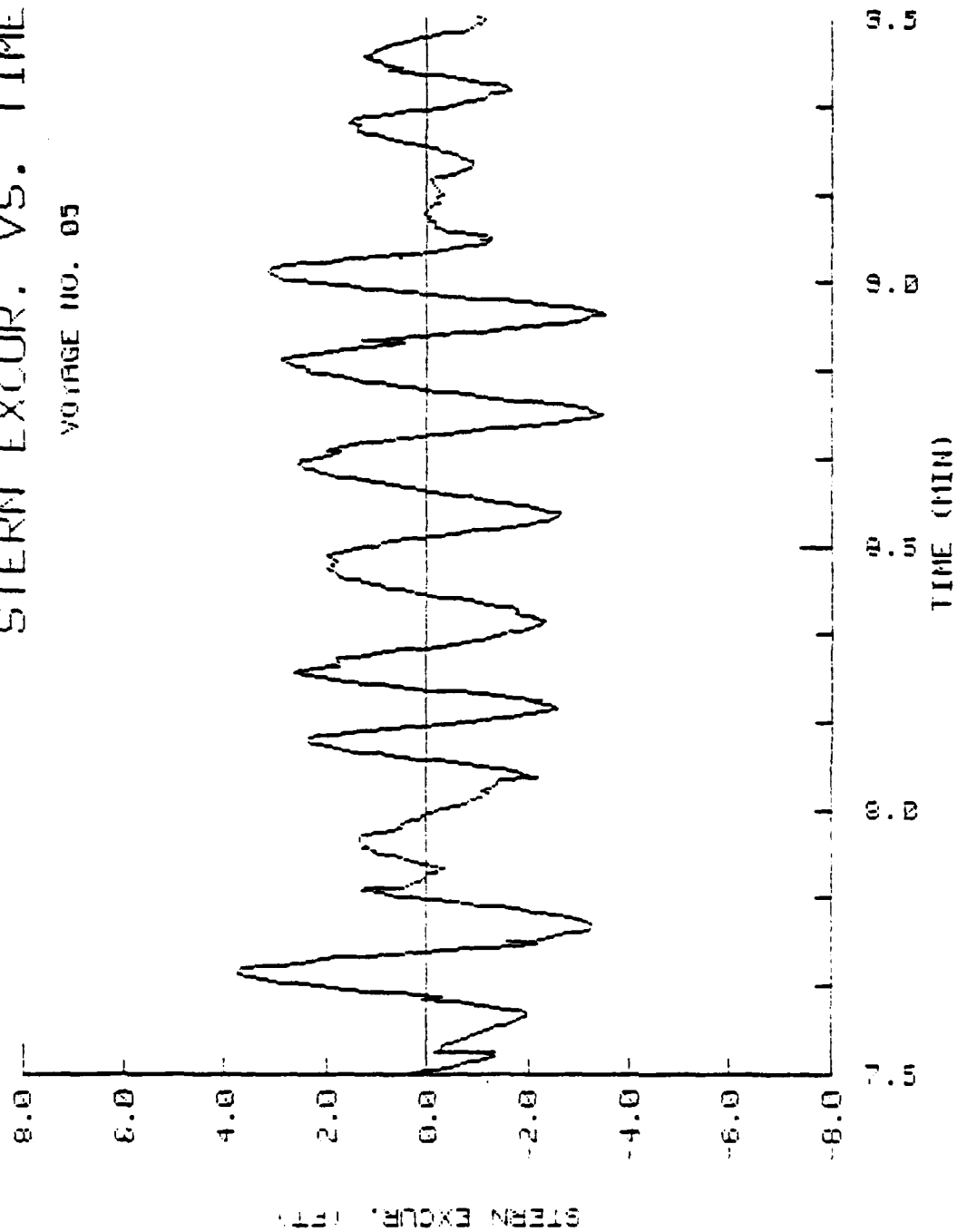
BOW EXCUR. VS. TIME

VOLTAGE NO. 05



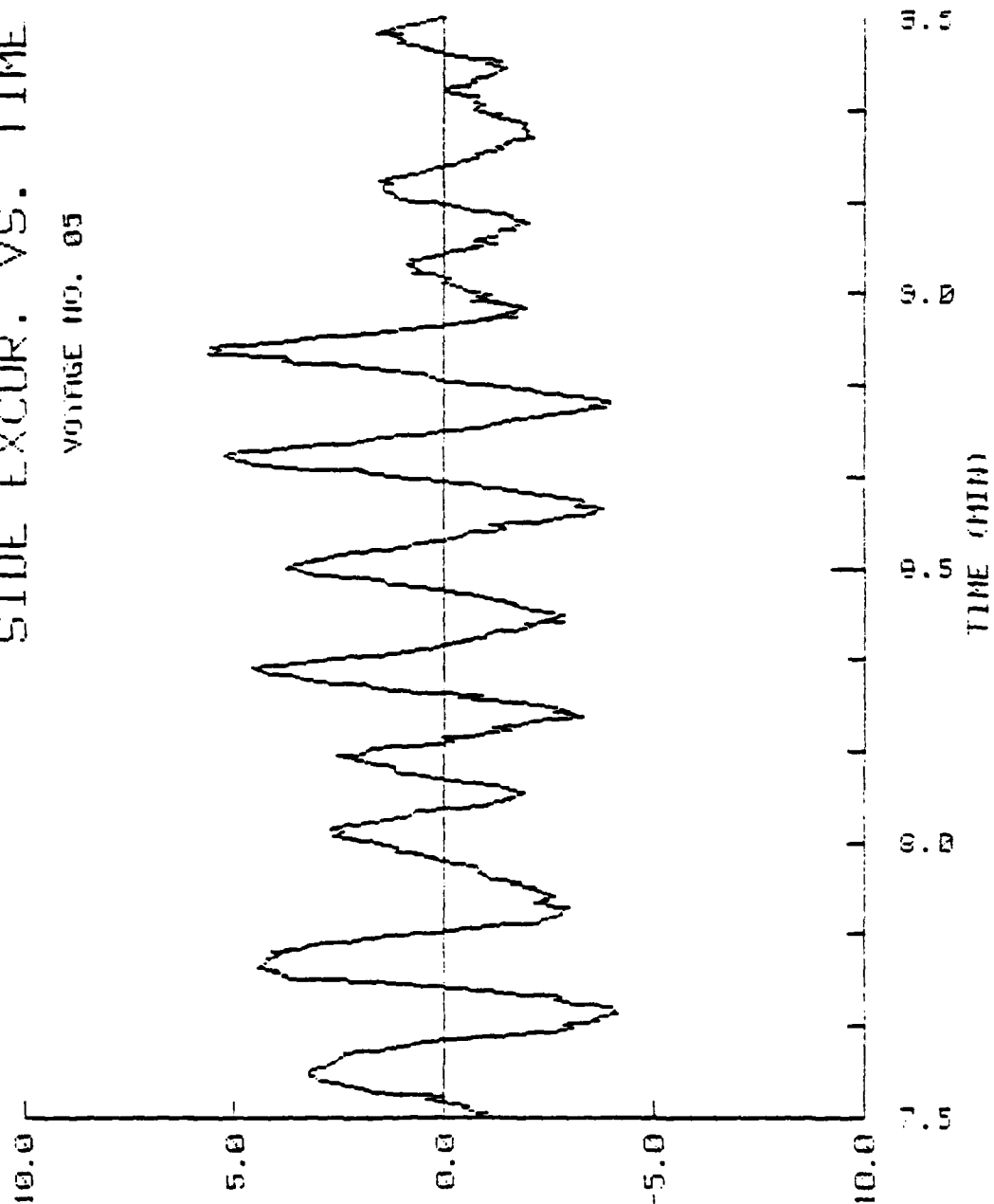
STERN EXCUR. VS. TIME

VOLTAJE 110. 05



SIDE EXCUR. VS. TIME

VOLUME NO. 05



SIDE EXCUR. (V)

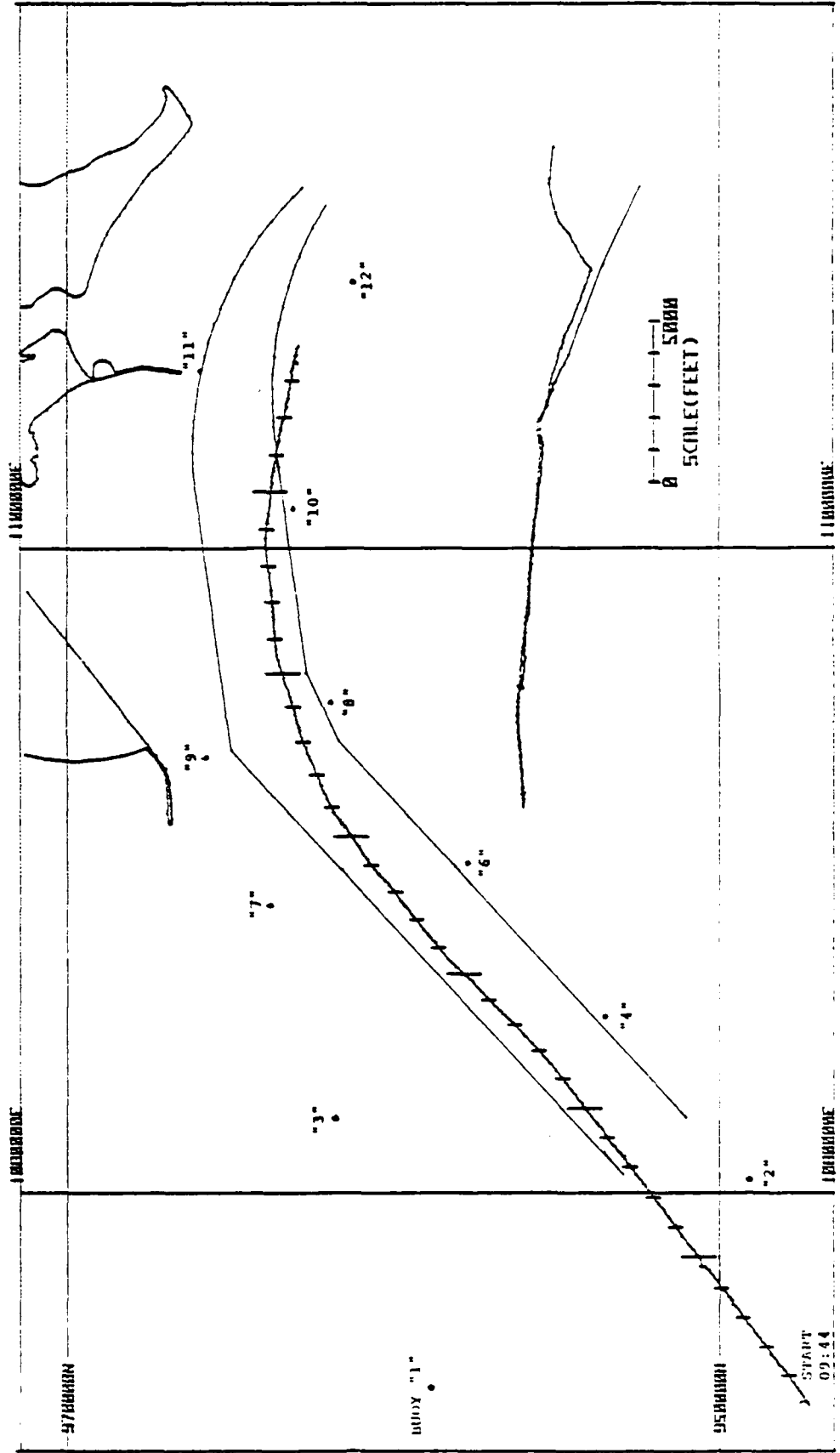
STATISTICAL SUMMARY

VOYAGE NO. 06

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-.7	.9	.4	.4
ROLL (DEG)	1.0	2.8	1.3	1.5
ACC (FT/SEC/SEC)	-.0	1.7	.5	.5
HEAVE (FT)	.0	3.3	1.3	1.5
BOW EXCUR. (FT)	.0	7.8	2.9	3.4
STERN EXCUR. (FT)	.0	2.6	1.0	1.1
SIDE EXCUR (FT)	.0	4.4	1.9	2.1

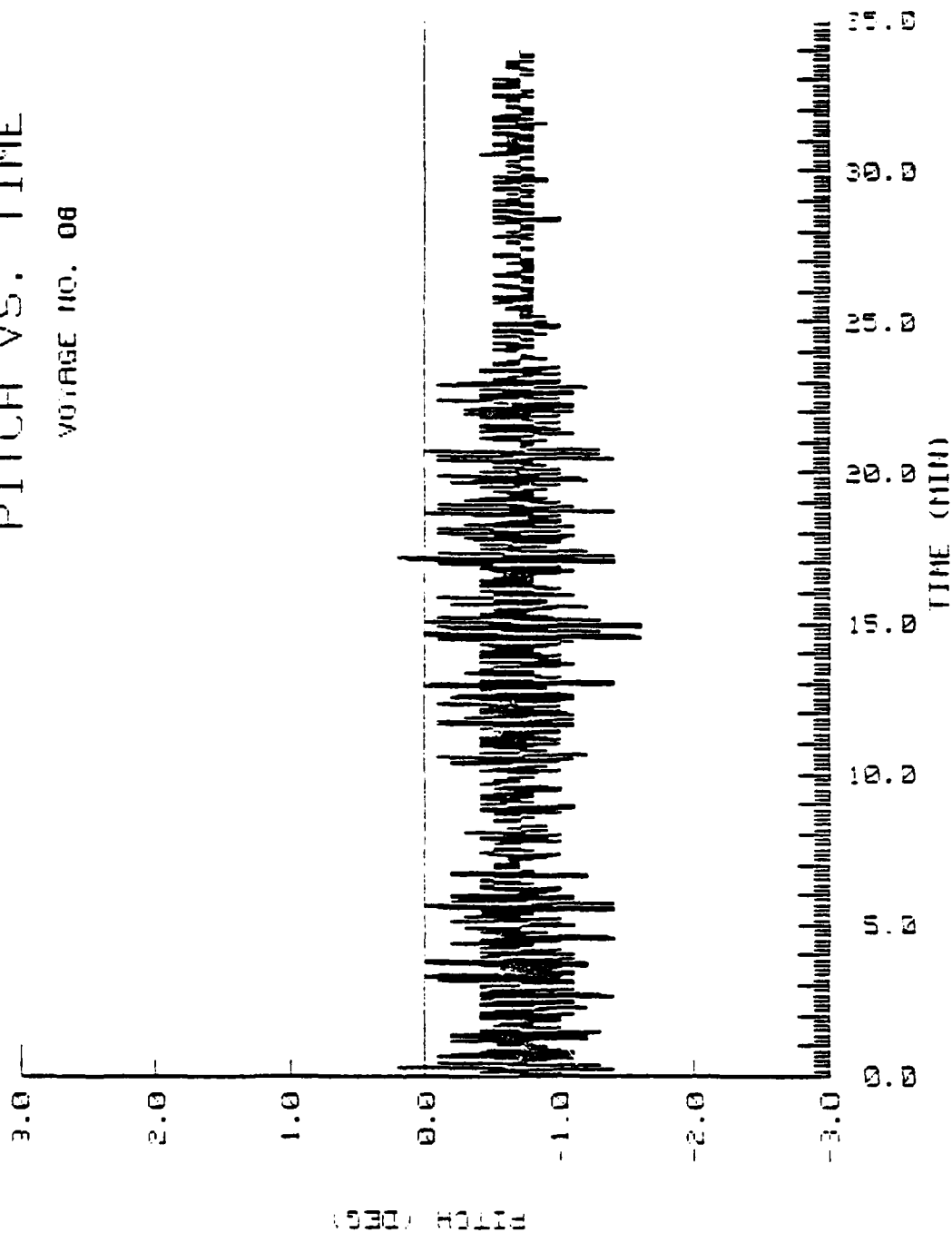
VOYAGE NO. 06 SHIP TRACK

SCALE 1: 300000



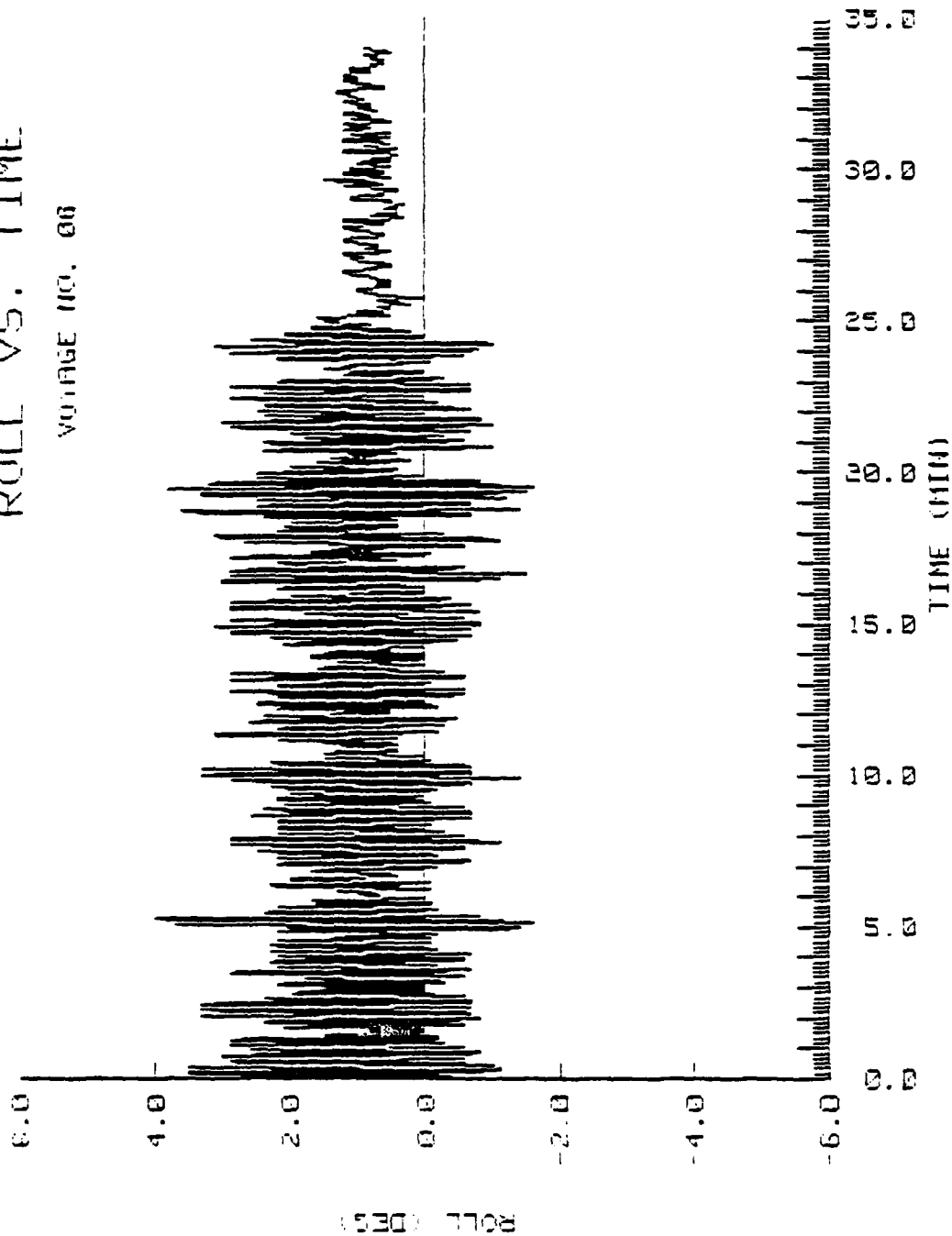
PITCH VS. TIME

VOTAGE NO. 08



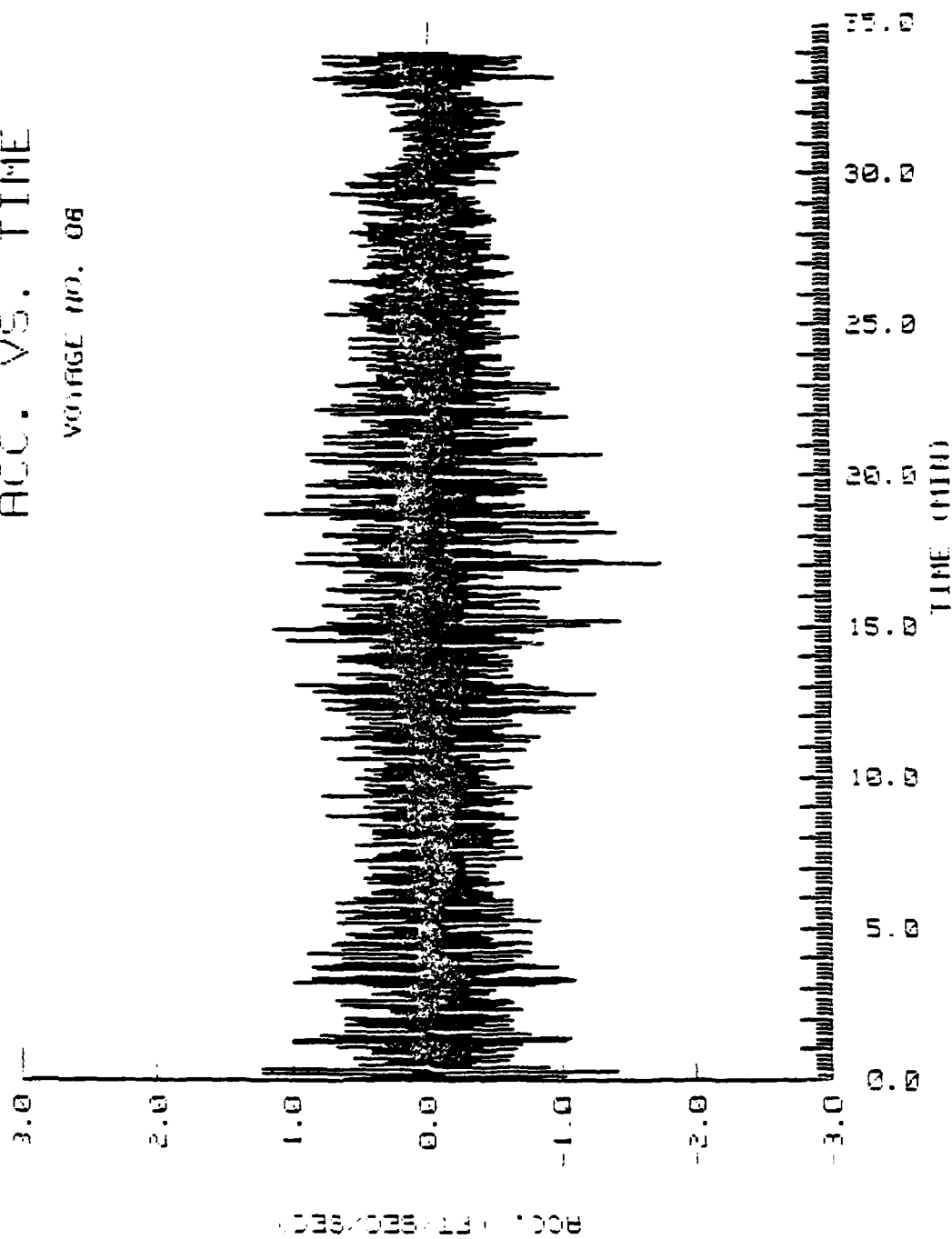
ROLL VS. TIME

VOLUME 110, 00



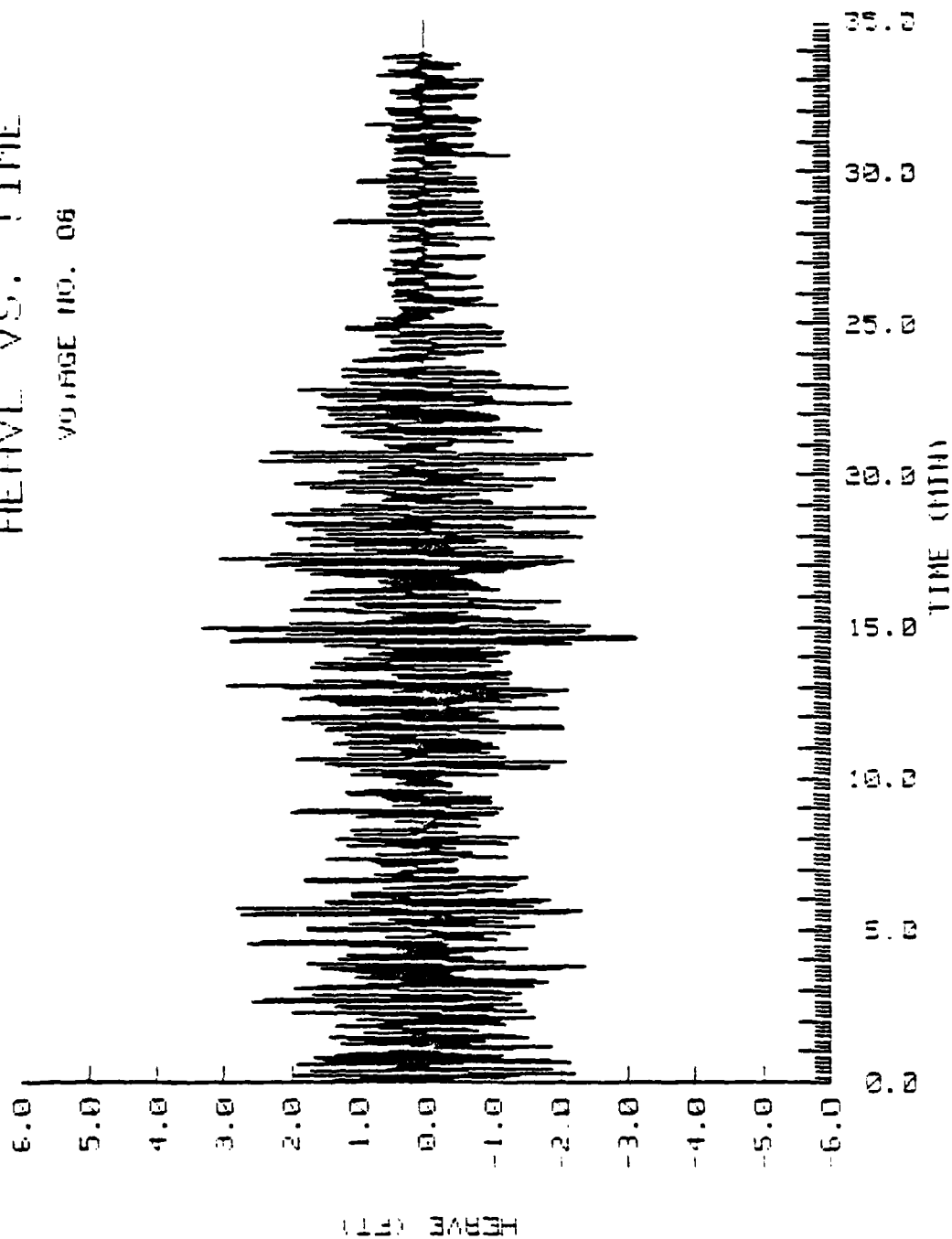
ACC. VS. TIME

VOLUME NO. 08

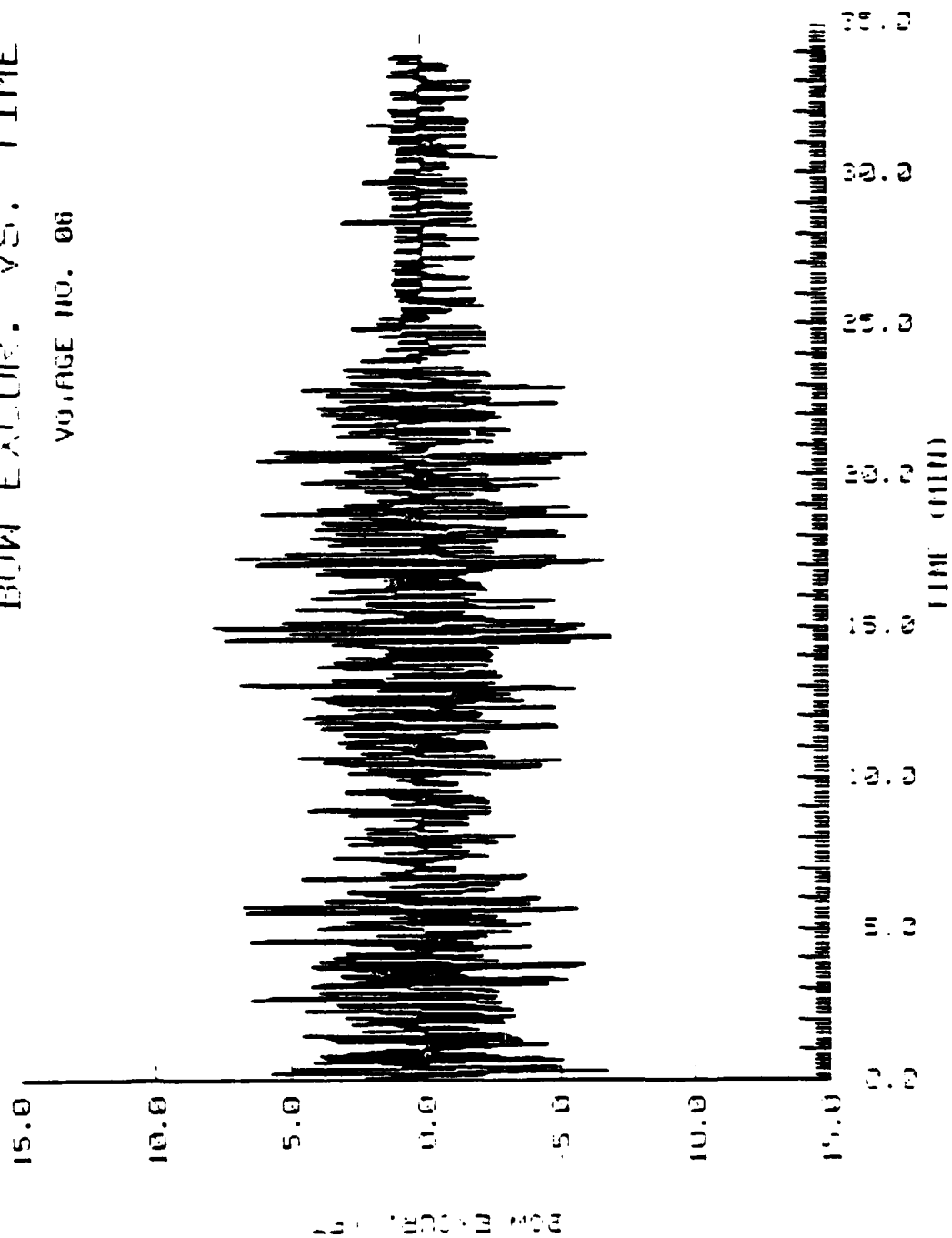


HEAVL VS. TIME

VOLUME NO. 06

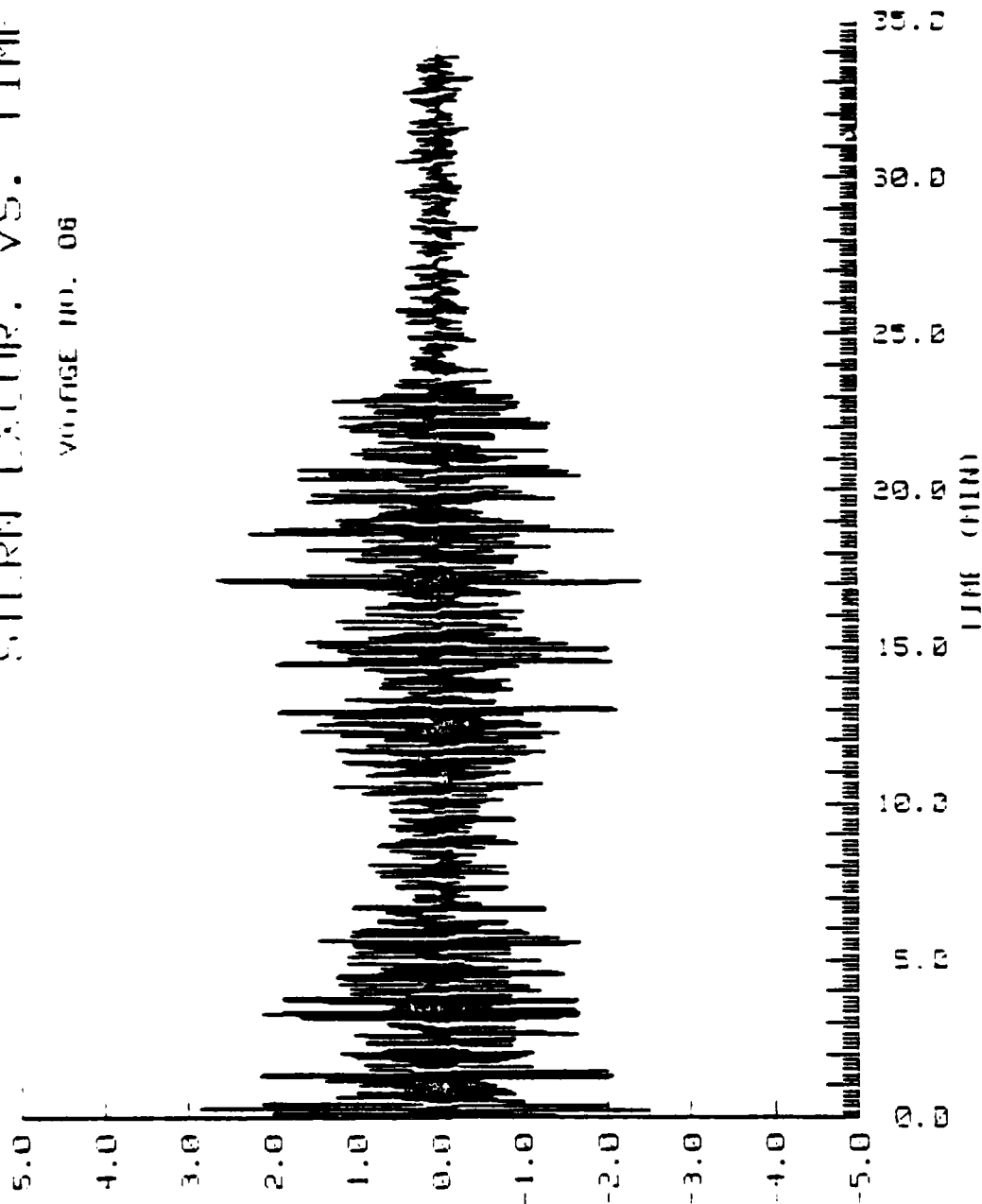


BOW EXCUR. VS. TIME VOLTAGE 110. 06



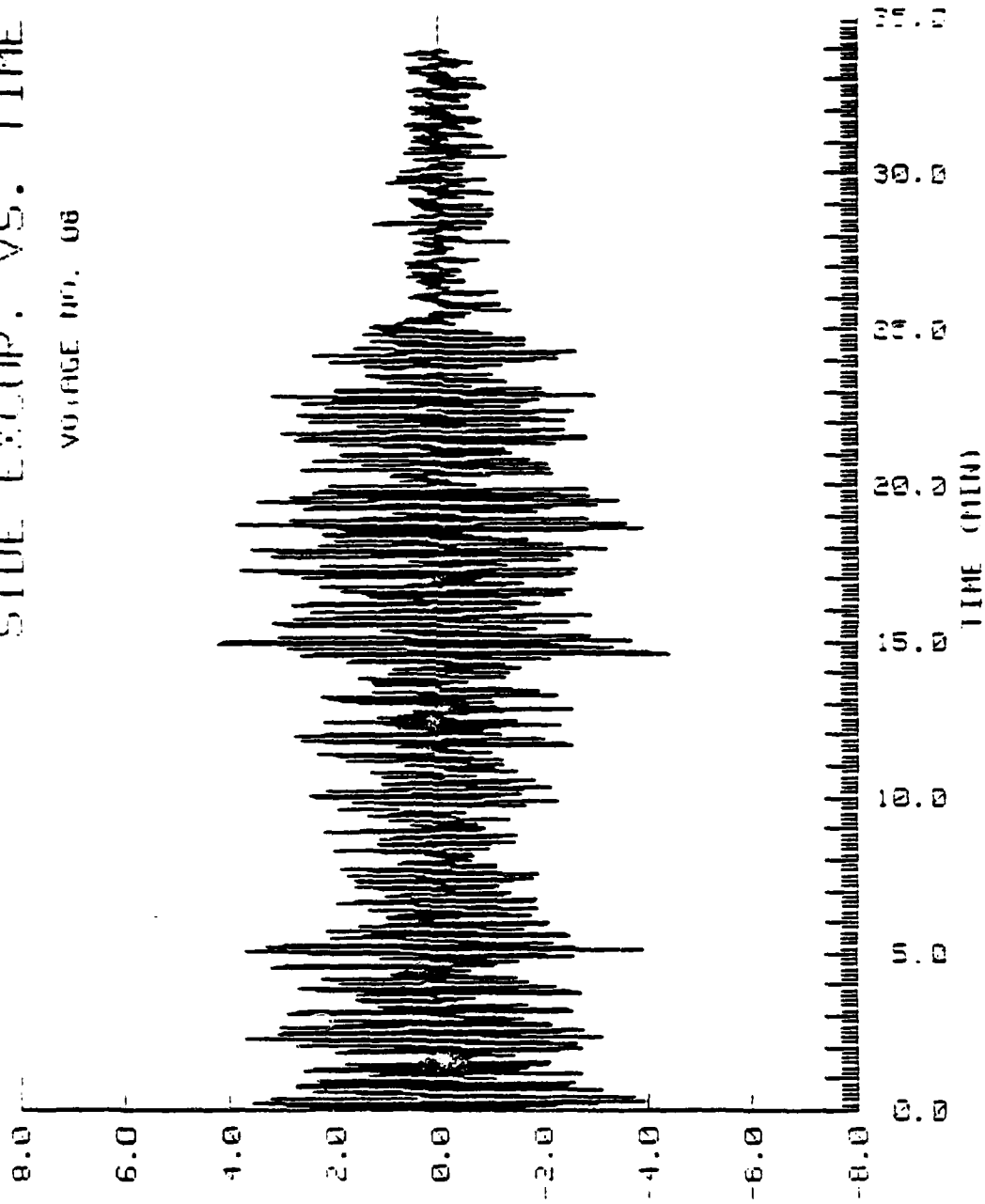
STERN EXCUR. VS. TIME

VOLUME NO. 06



SIDE EXCUR. VS. TIME

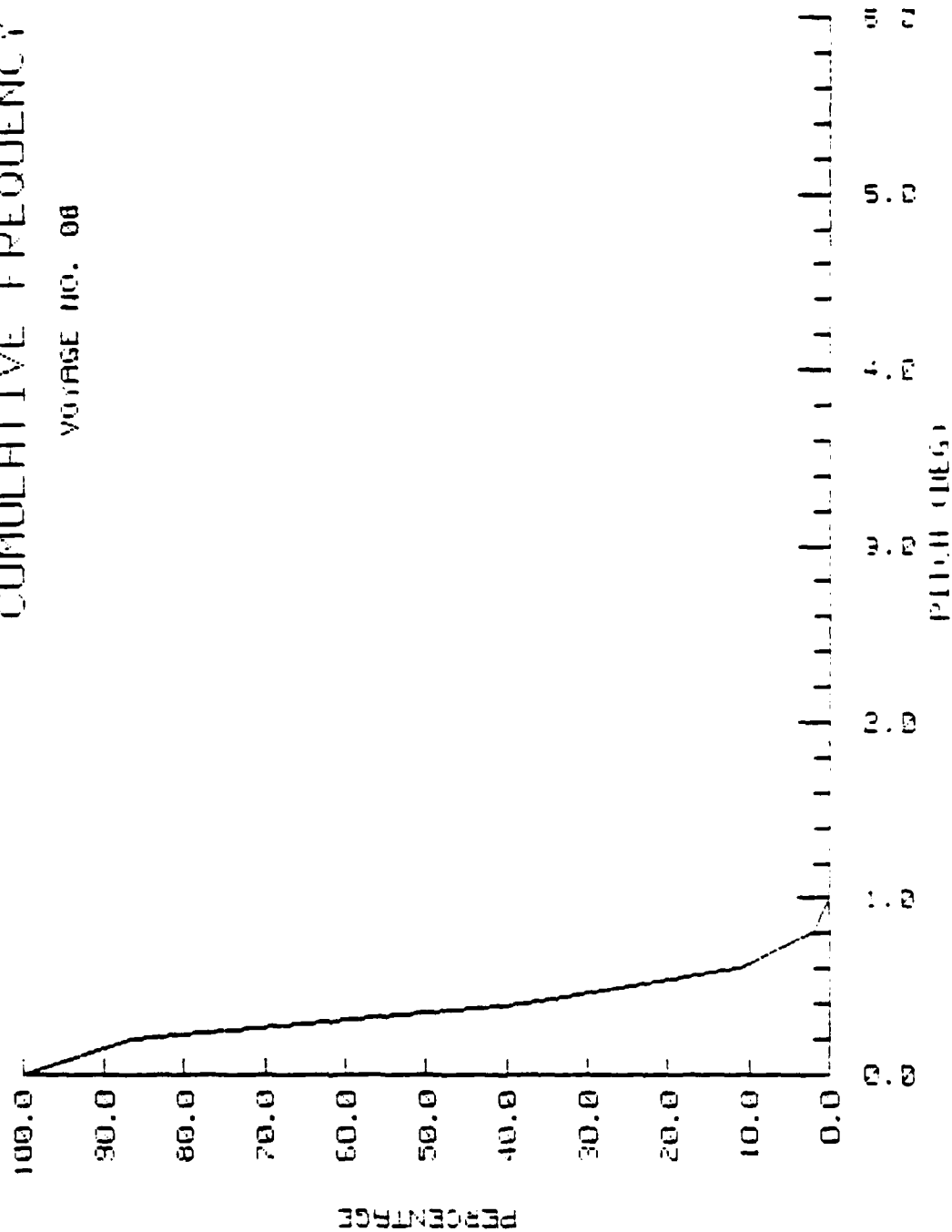
VOLAGE NO. 08



SIDE EXCUR. (FT)

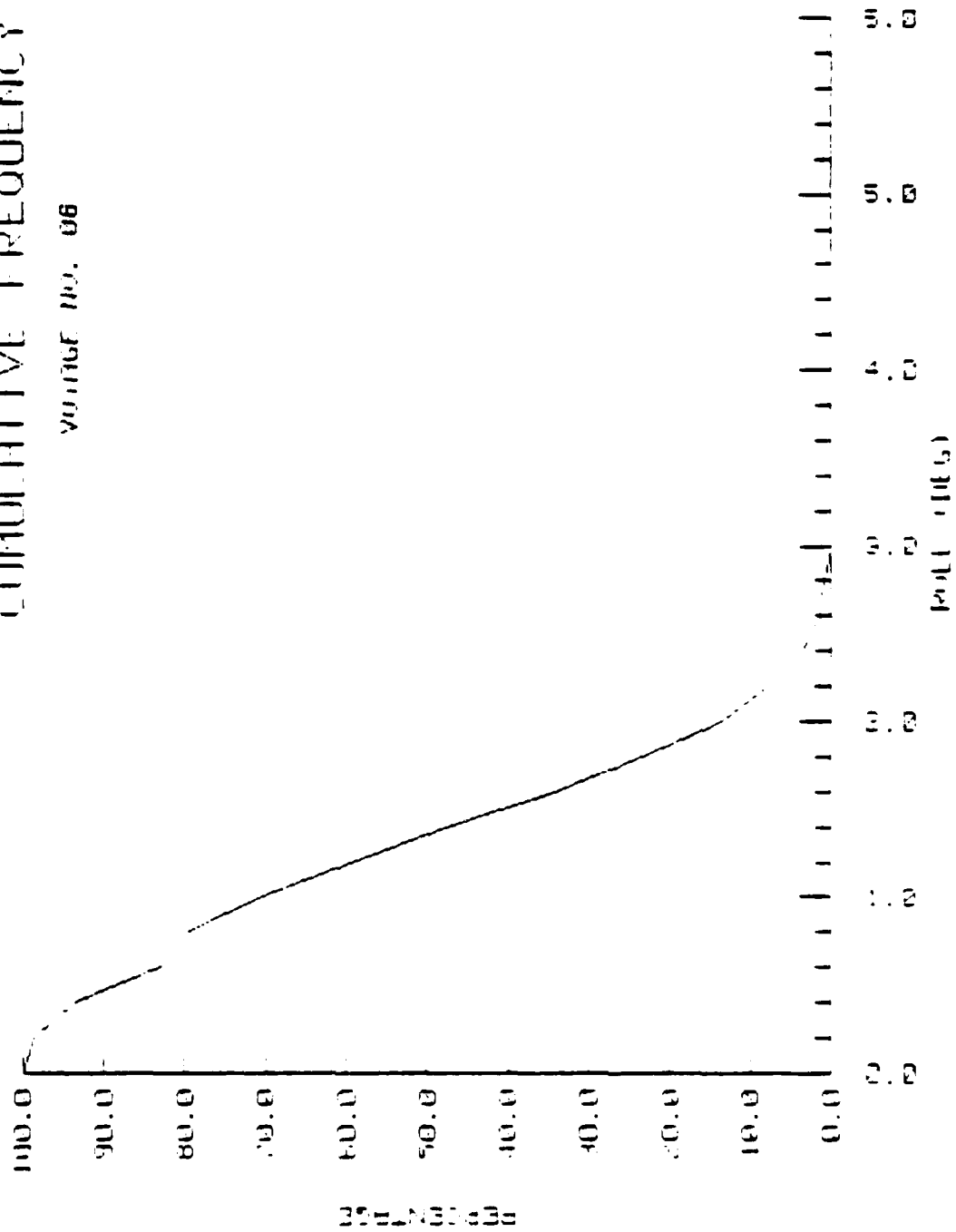
CUMULATIVE FREQUENCY

VOTAGE NO. 00



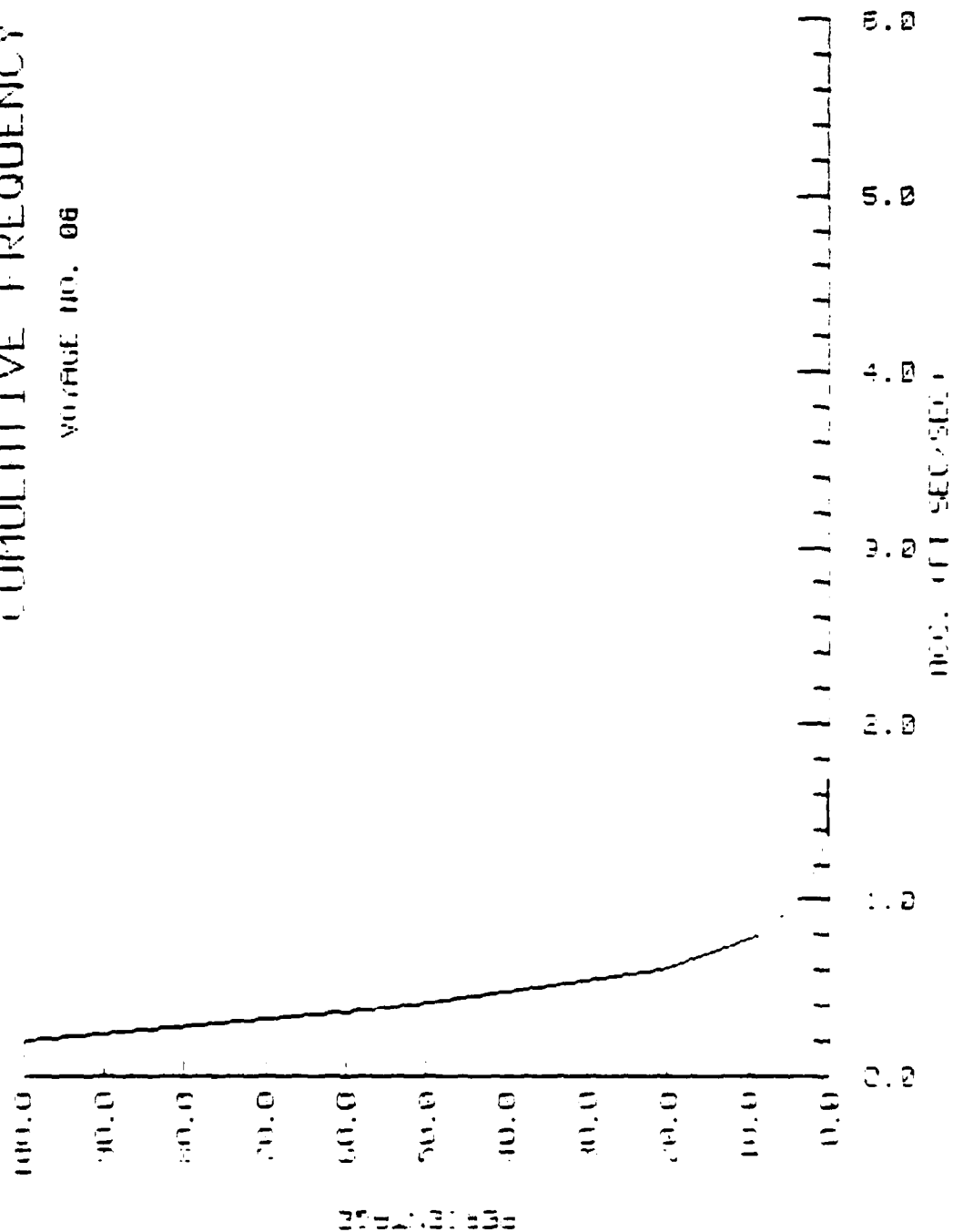
CUMULATIVE FREQUENCY

YOUNG NO. 06



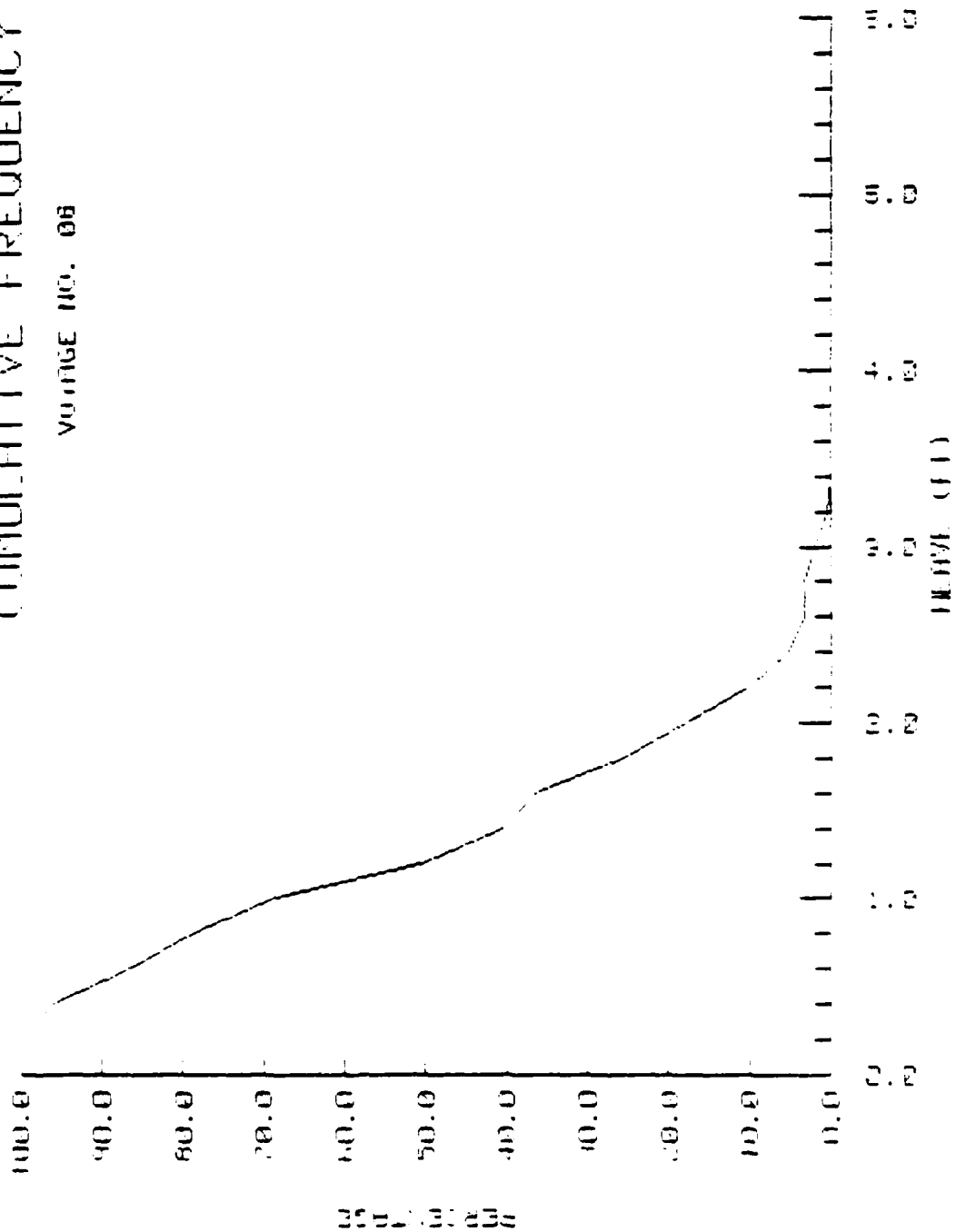
CUMULATIVE FREQUENCY

VOLAGE NO. 08



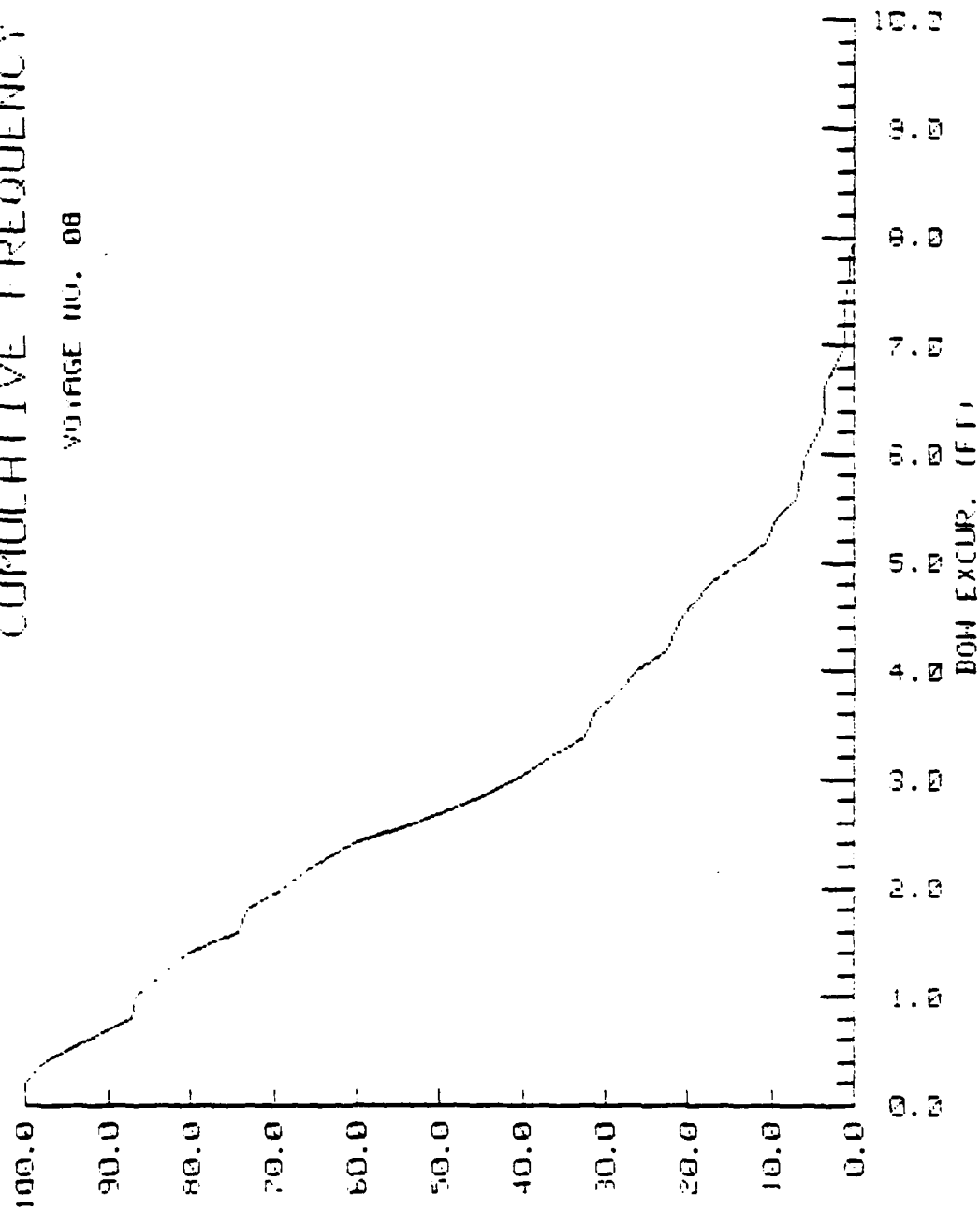
CUMULATIVE FREQUENCY

VOLUME NO. 08



CUMULATIVE FREQUENCY

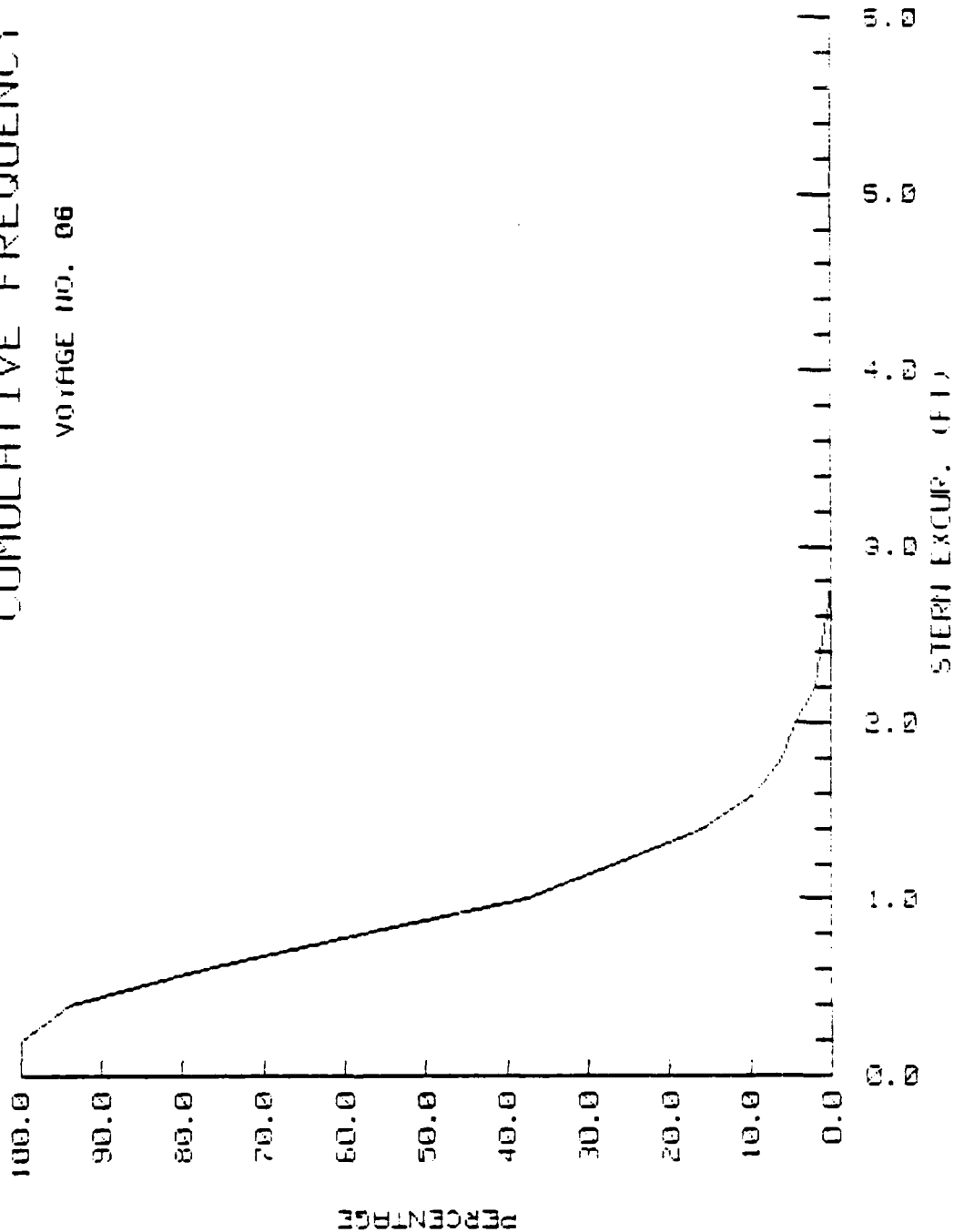
VOLUME NO. 08



25-11-130630

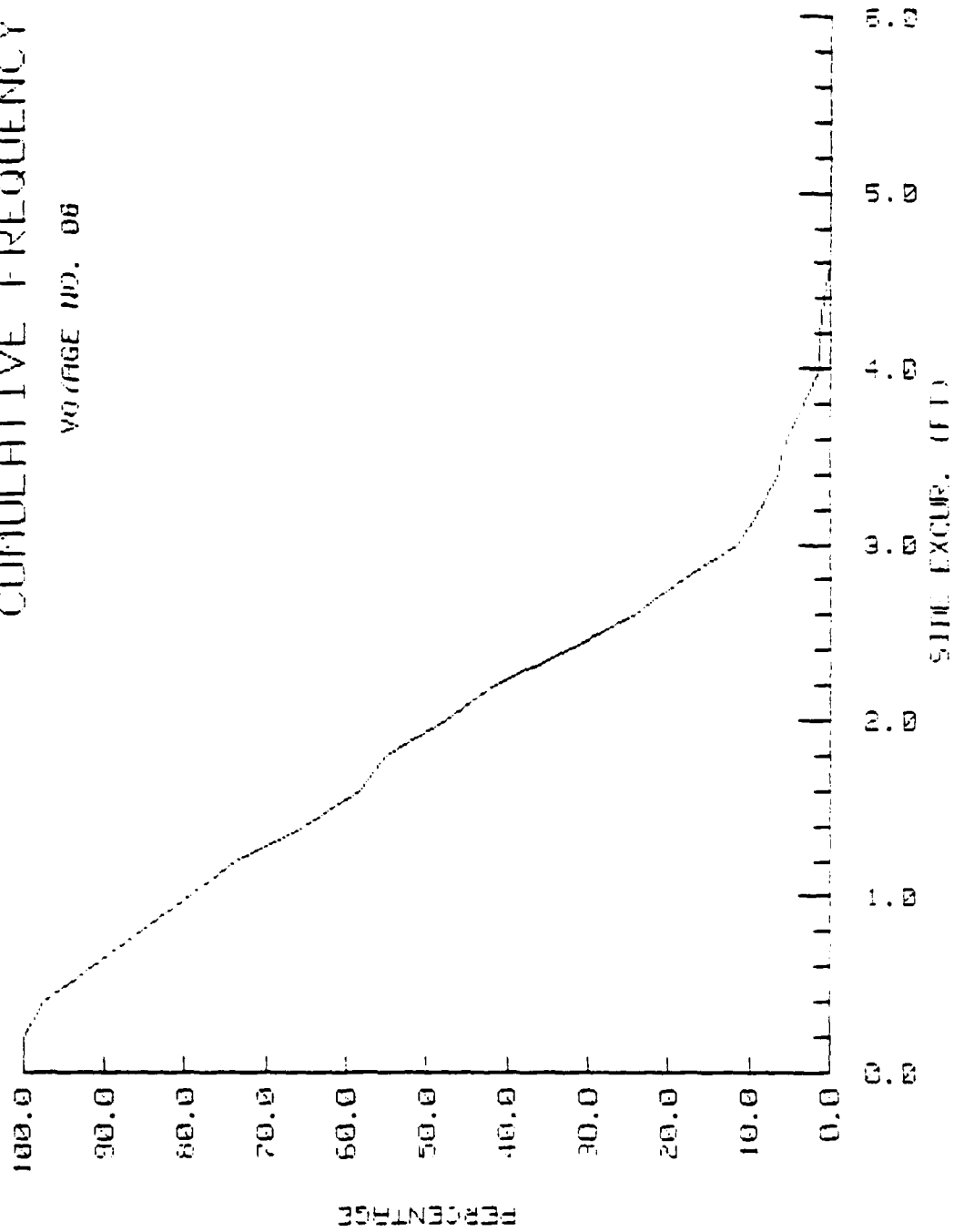
CUMULATIVE FREQUENCY

VOTAGE 100. 06



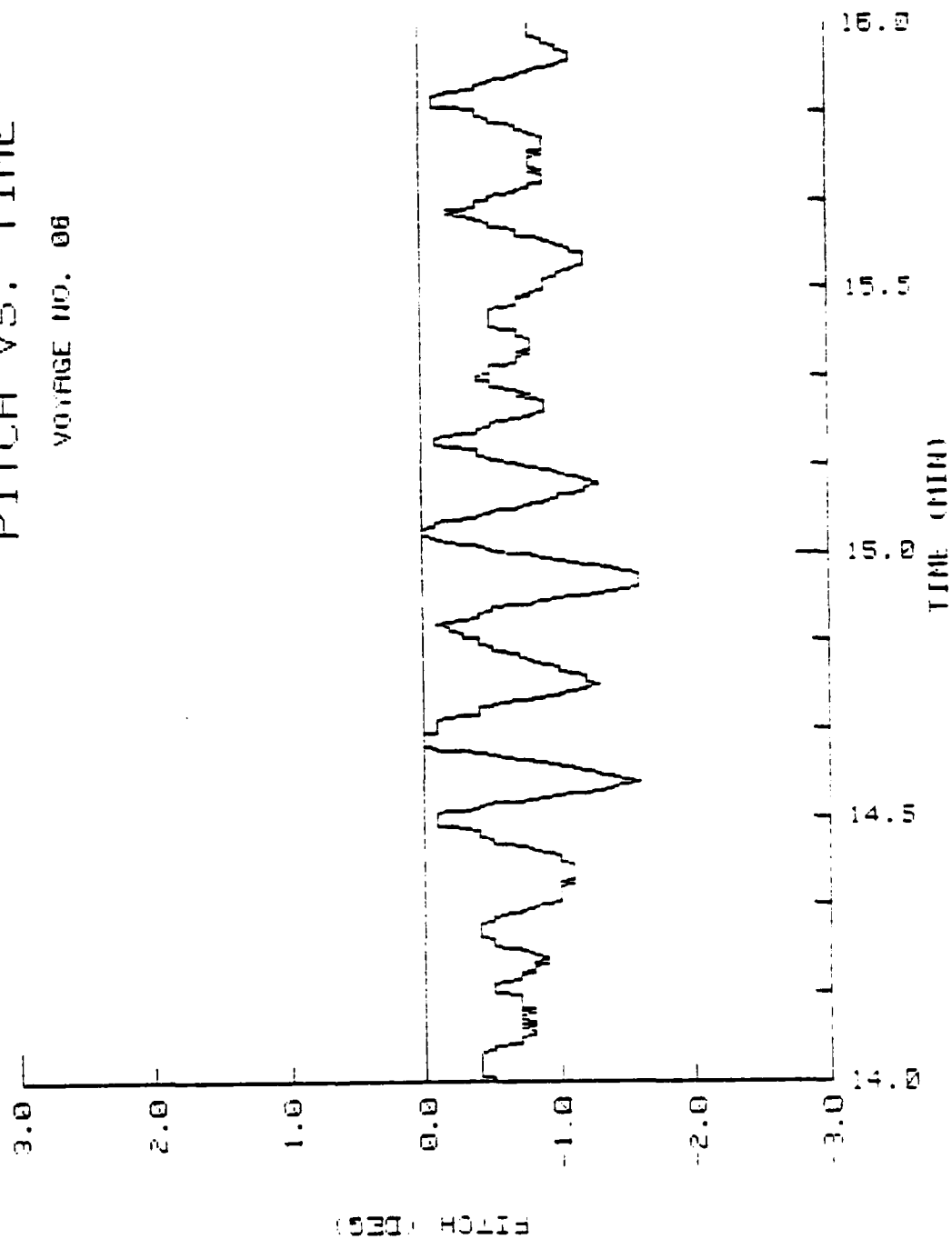
CUMULATIVE FREQUENCY

VOLAGE NO. 08



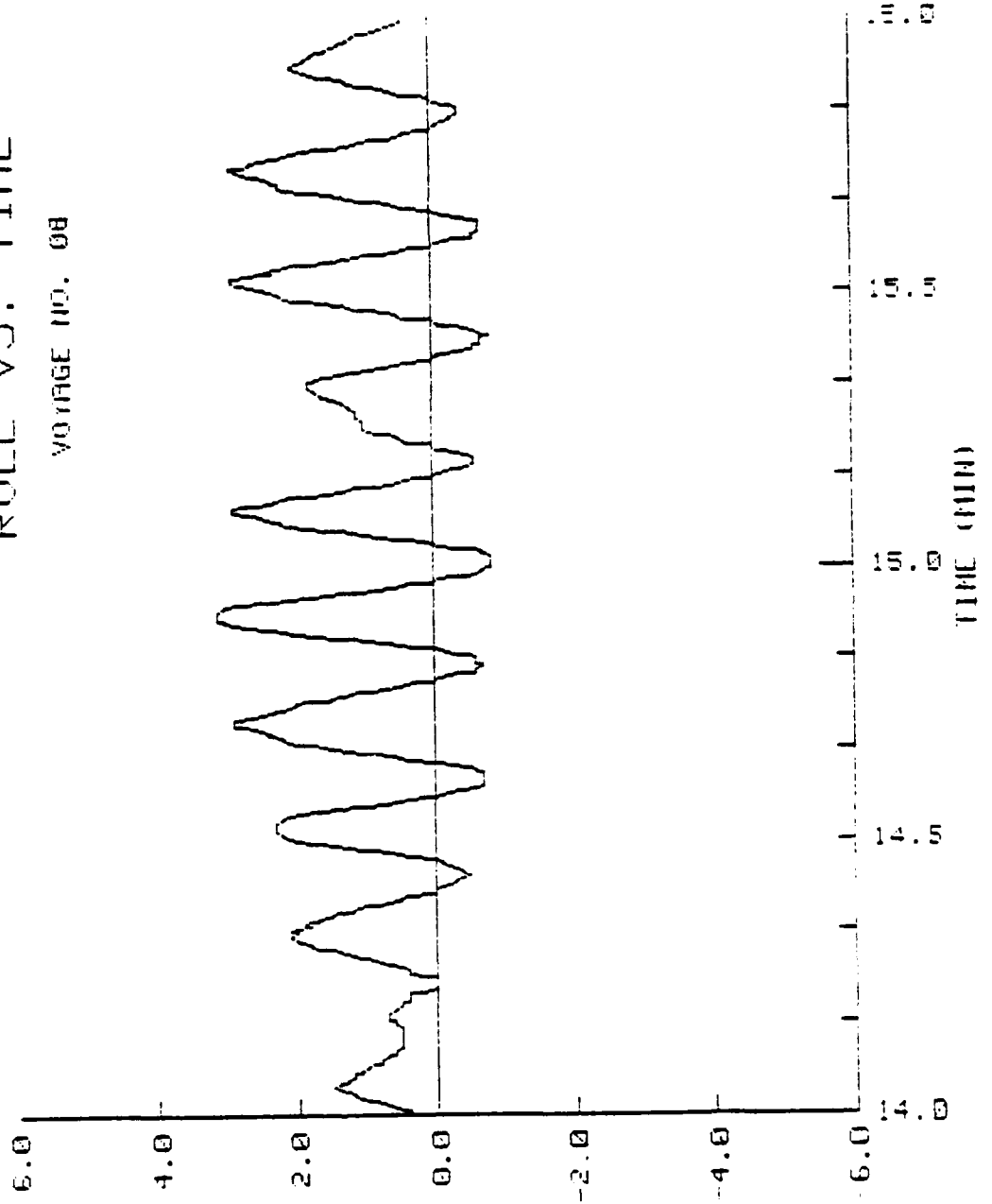
PITCH VS. TIME

VOYAGE NO. 06



ROLL VS. TIME

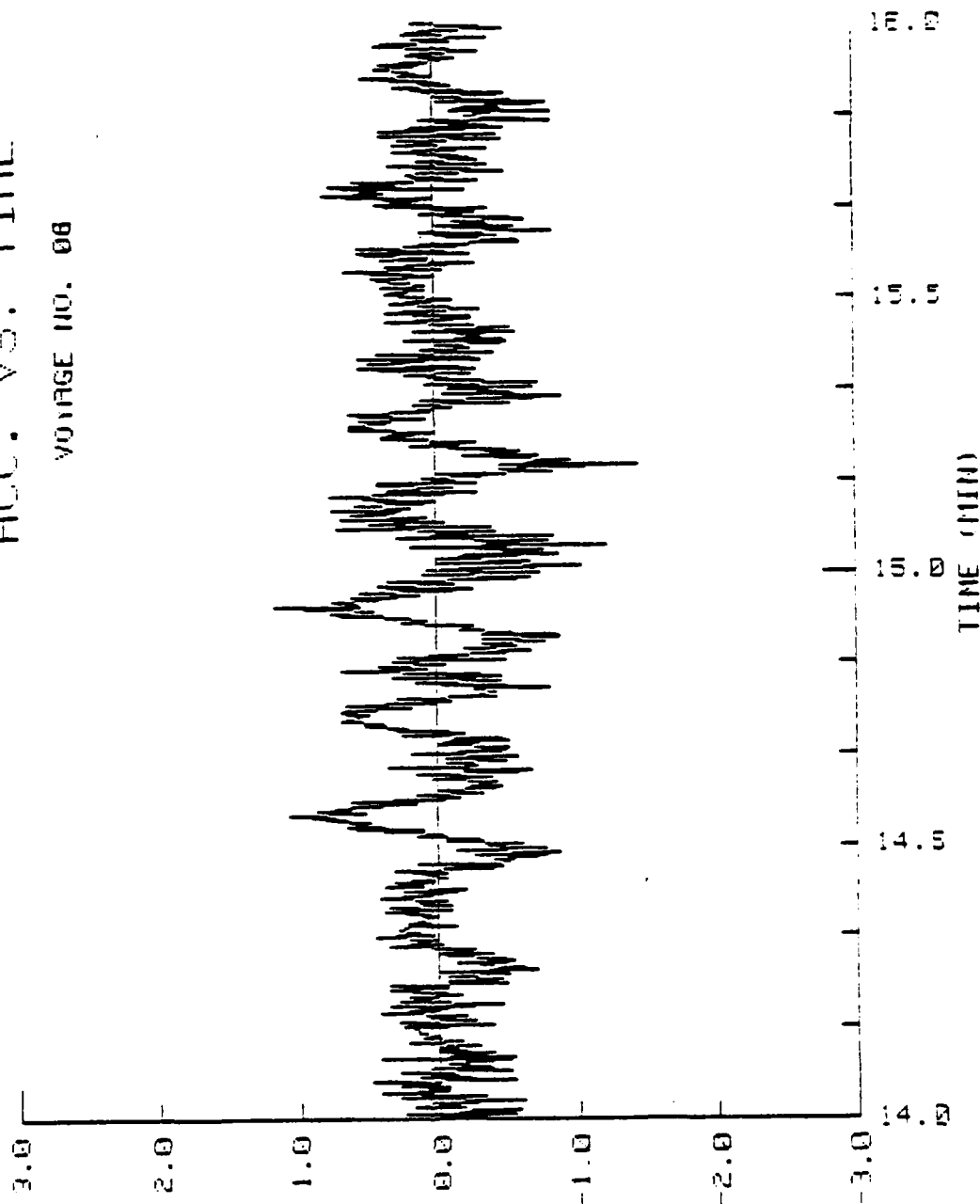
VOLTAGE NO. 08



ROLL (DEG)

ACC. VS. TIME

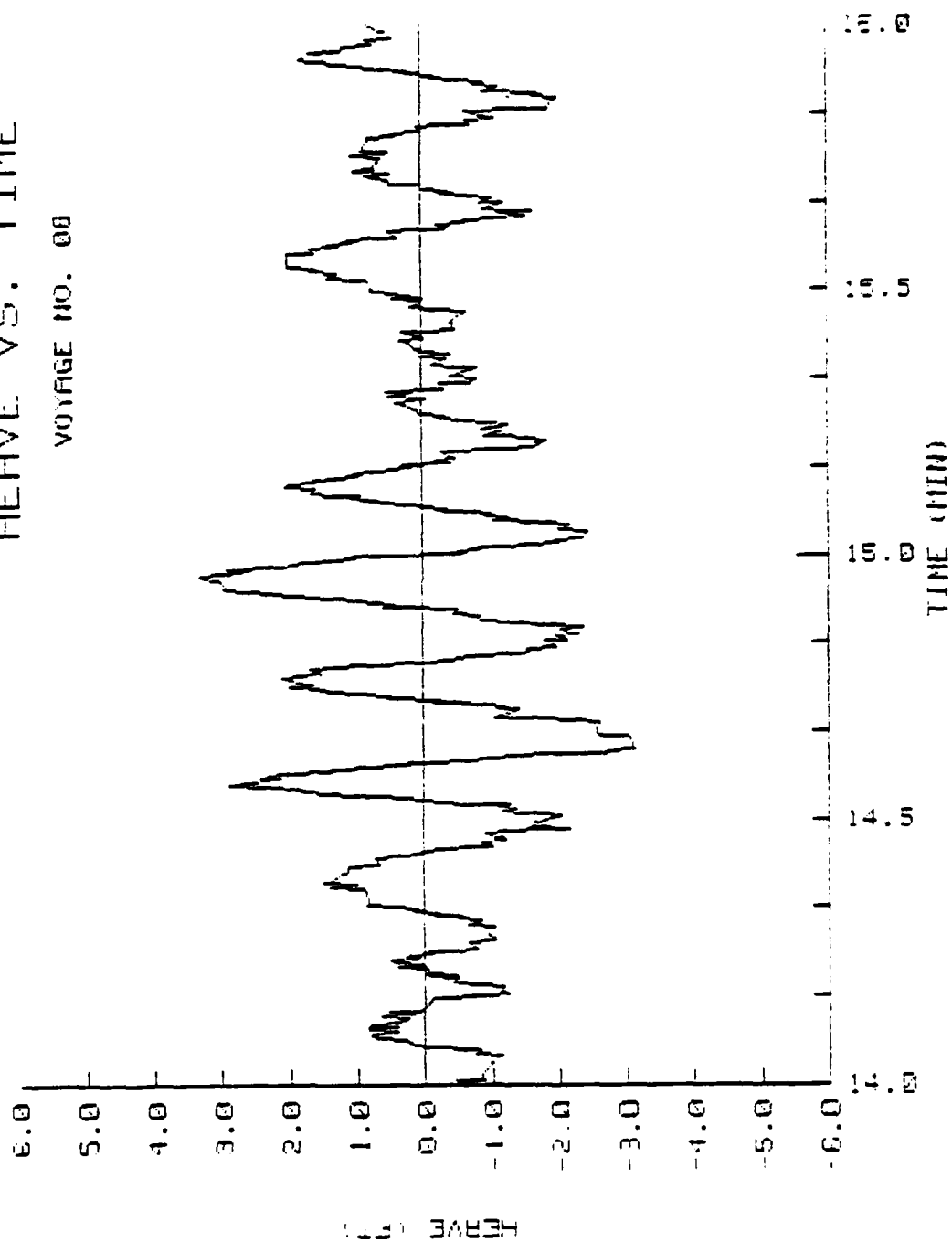
VOLUME NO. 06



ACC. 071.880/880

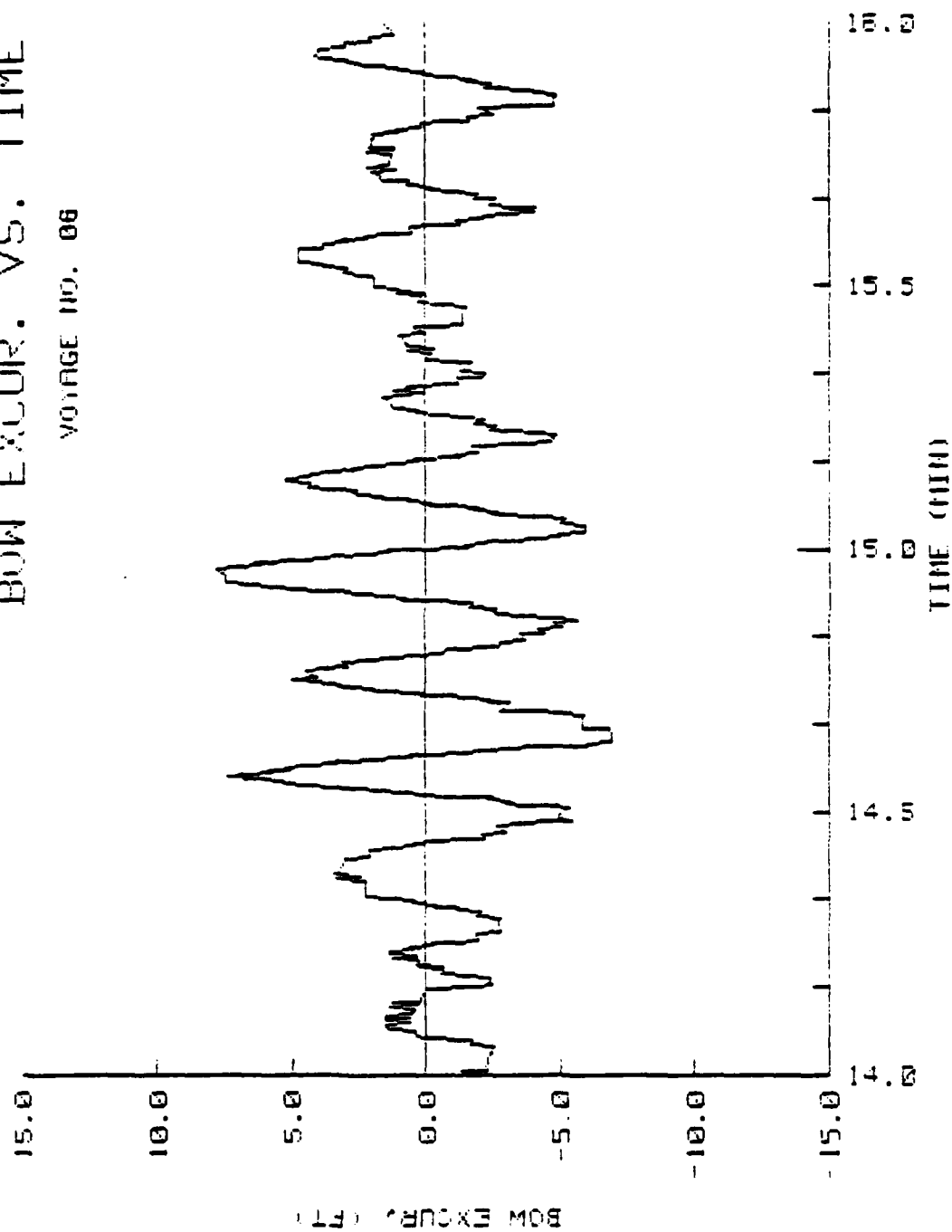
HEAVE VS. TIME

VOYAGE NO. 08



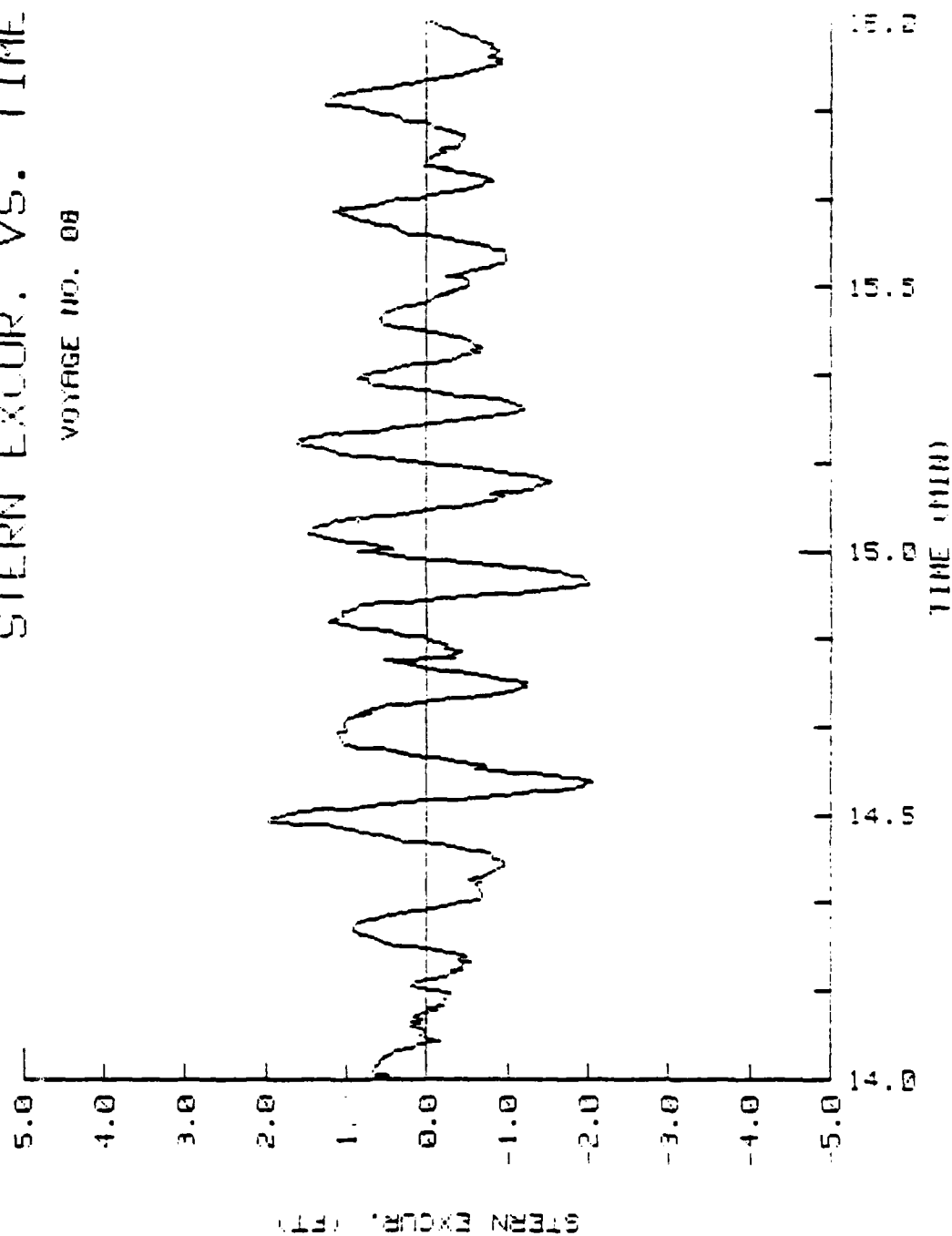
BOW EXCUR. VS. TIME

VOTAGE NO. 06



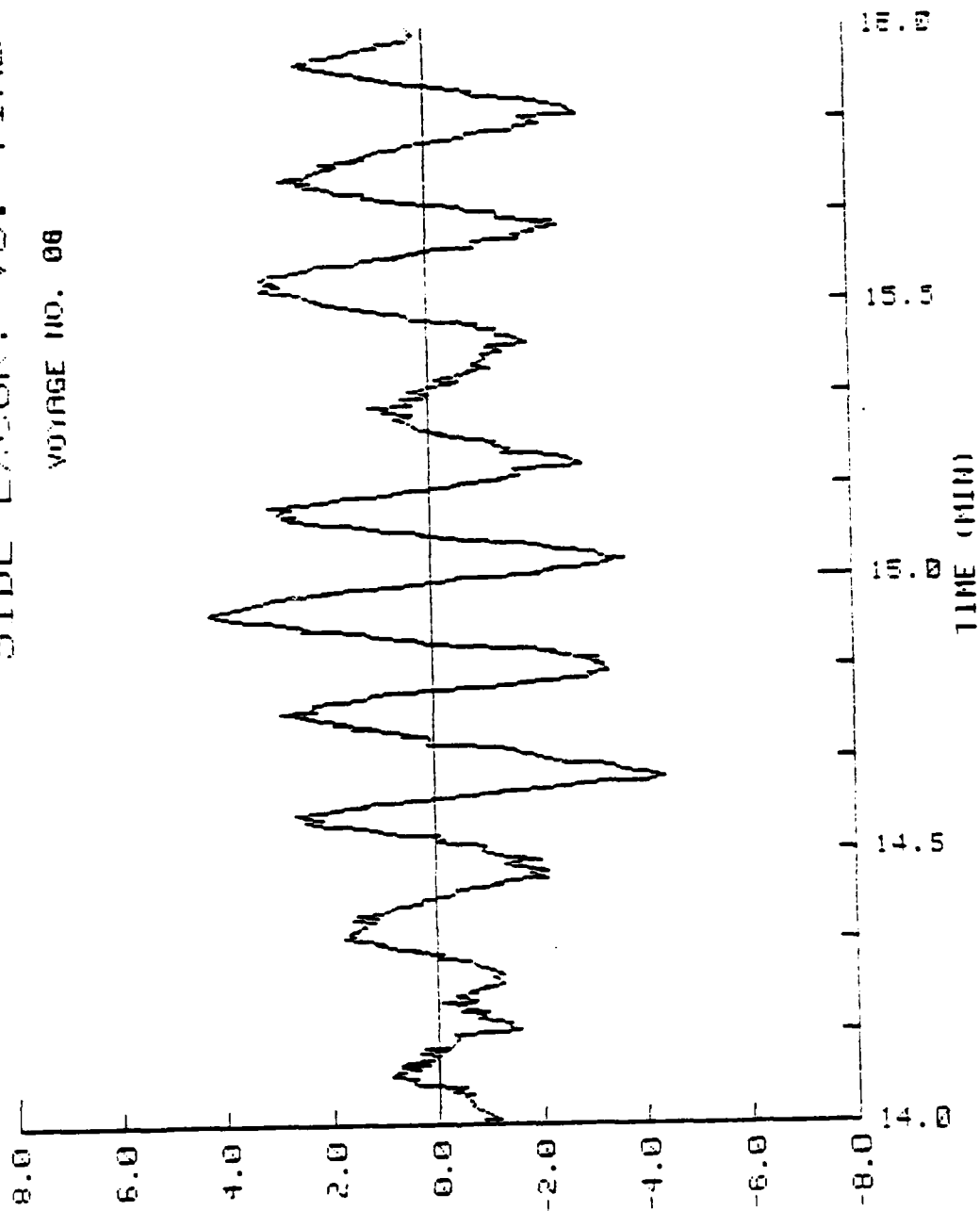
STERN EXCUR. VS. TIME

VOYAGE NO. 08



SIDE EXCUR. VS. TIME

VOTAGE NO. 08



SIDE EXCUR. (V)

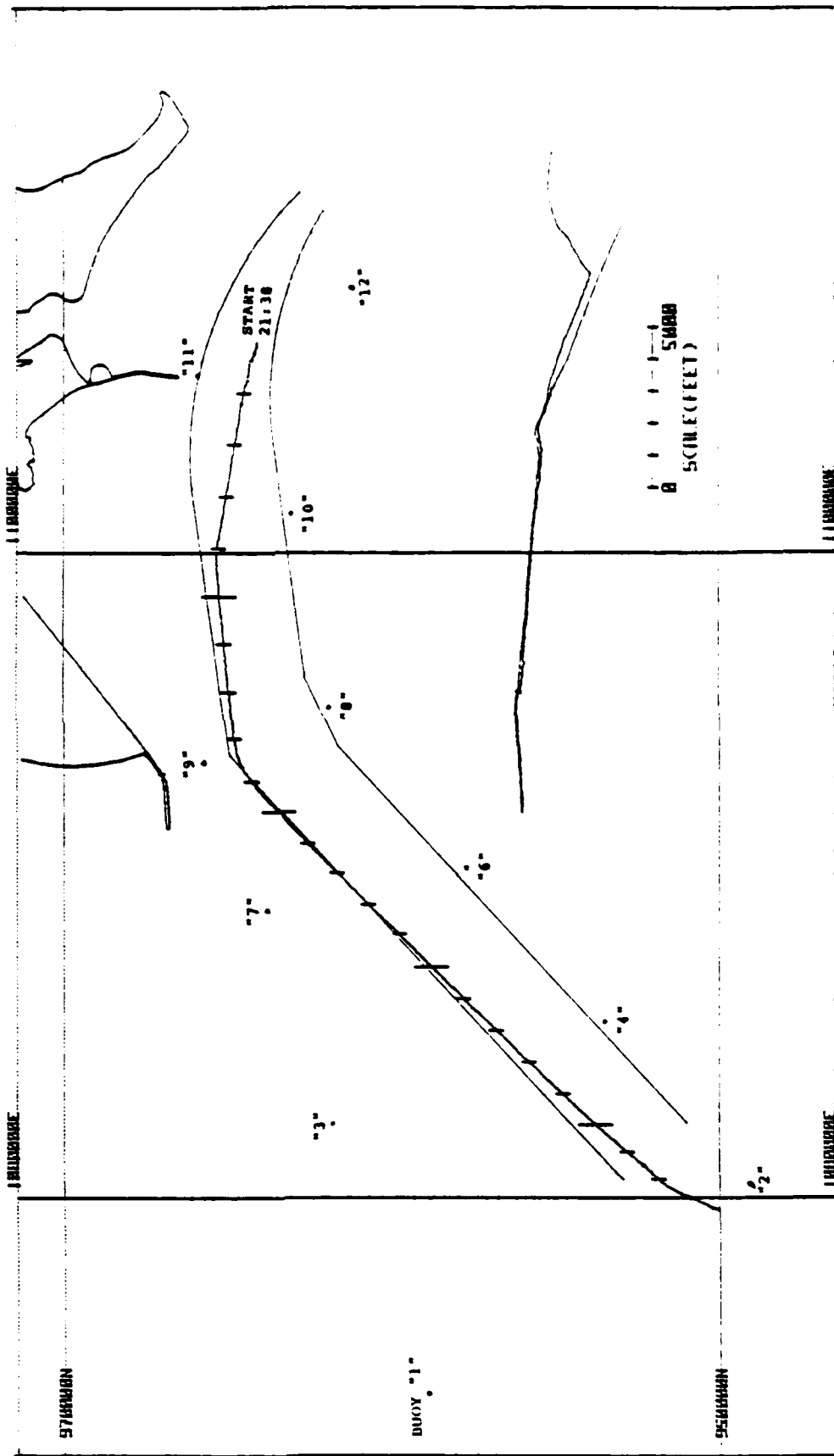
STATISTICAL SUMMARY

VOYAGE NO. 07

	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-.3	.9	.4	.4
ROLL (DEG)	.2	1.3	.5	.5
YAW (FT/SEC/SEC)	.0	1.9	.8	.8
HEAVE (FT)	.0	3.5	1.6	1.7
BOW EXCUR. (FT)	-.0	7.9	3.0	3.4
STERN EXCUR. (FT)	.0	2.5	1.2	1.3
SIDE EXCUR (FT)	.0	3.4	1.6	1.7

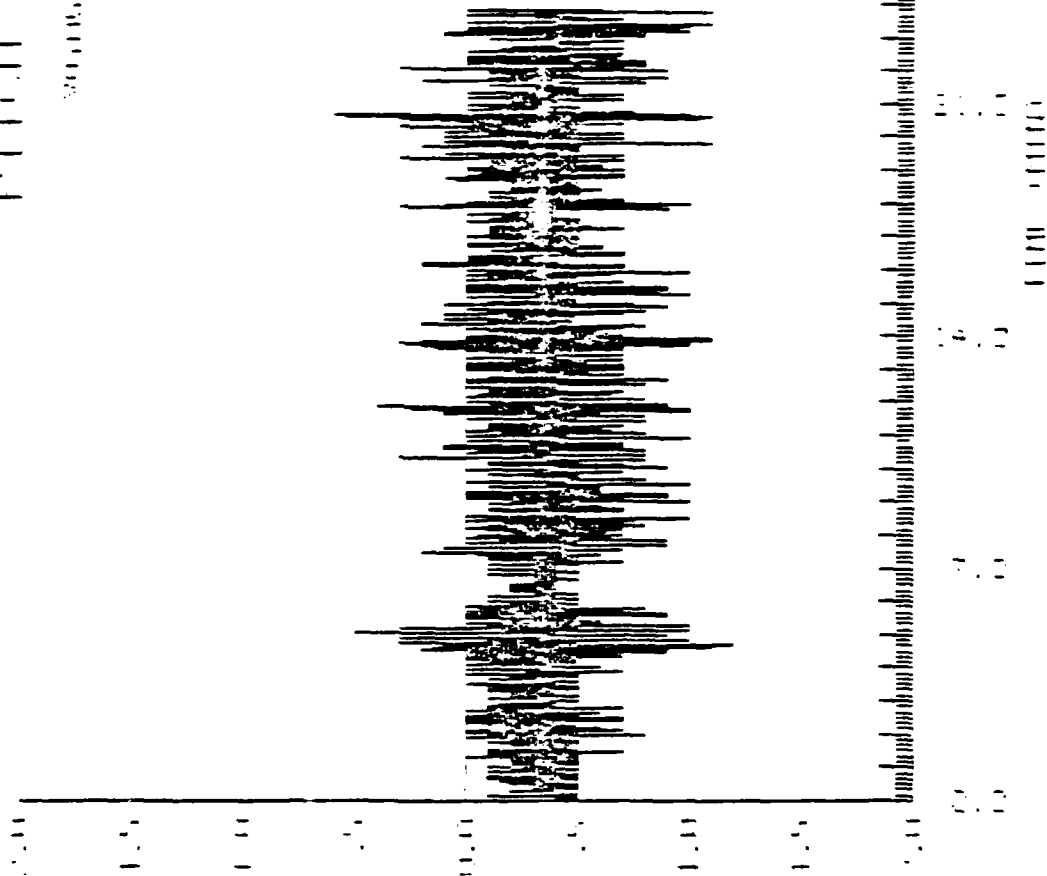
VOYAGE NO. 07 SHIP TRACK

SCALE 1: 30000



— — — — —

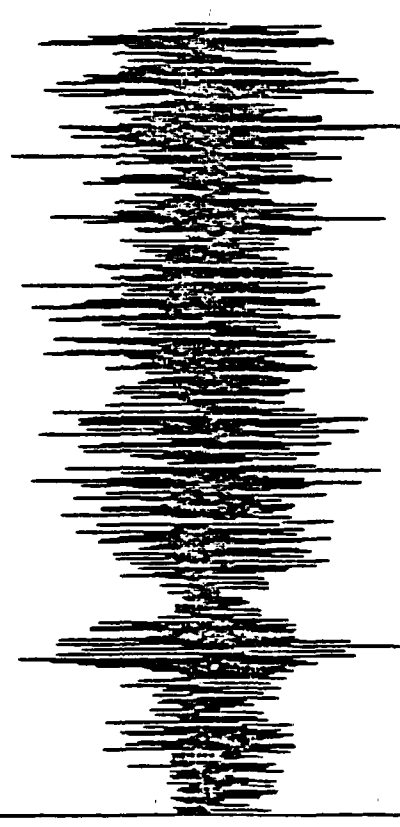
100



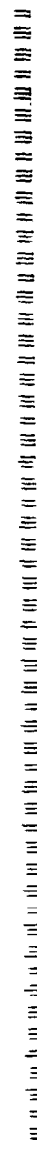
RECEIVED TIME

WINTER 1900, 02

0.00 1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 20.00 21.00 22.00 23.00 24.00

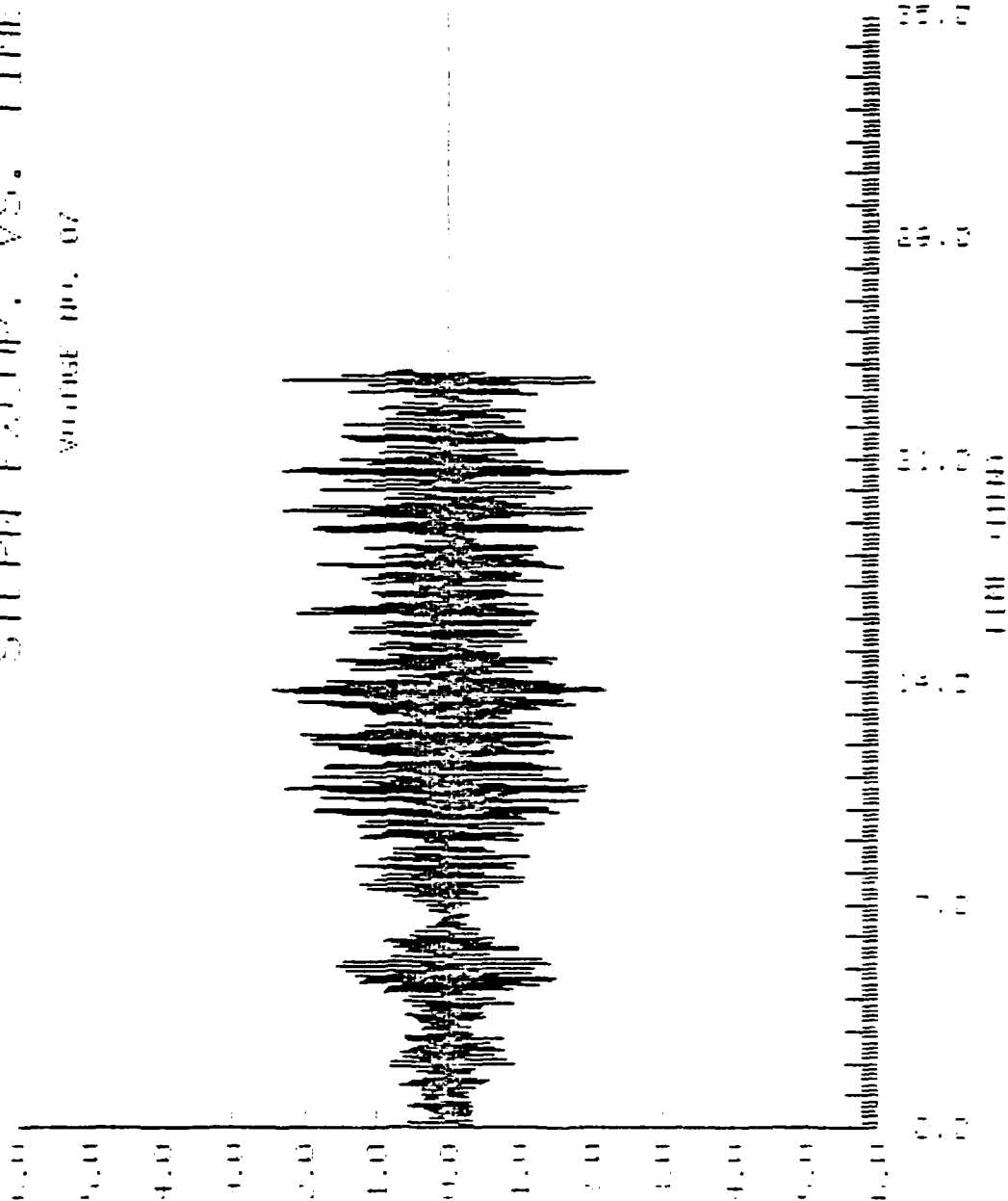


0.00 1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00 11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 20.00 21.00 22.00 23.00 24.00



SUPER EPOCH, VS. TIME

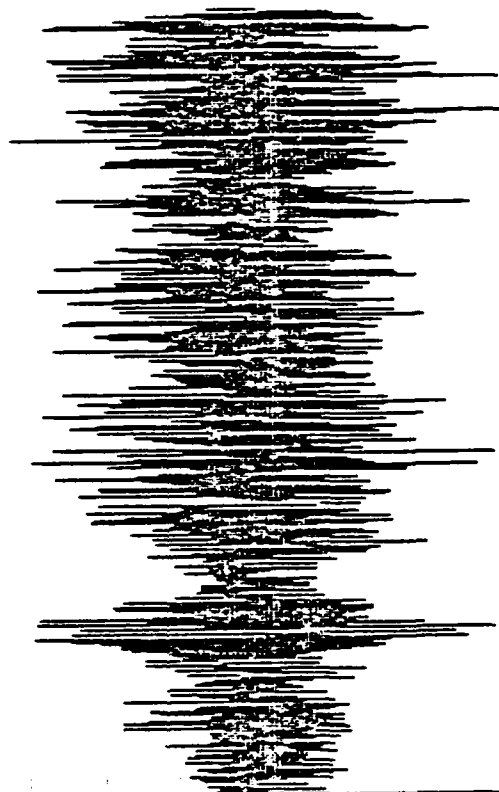
VOLUME NO. 07



51114 LEONARD, VS. TIME

Wavelength 100.07

1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00



1.00 0.50 0.00 -0.50 -1.00 -1.50 -2.00 -2.50 -3.00 -3.50 -4.00 -4.50 -5.00

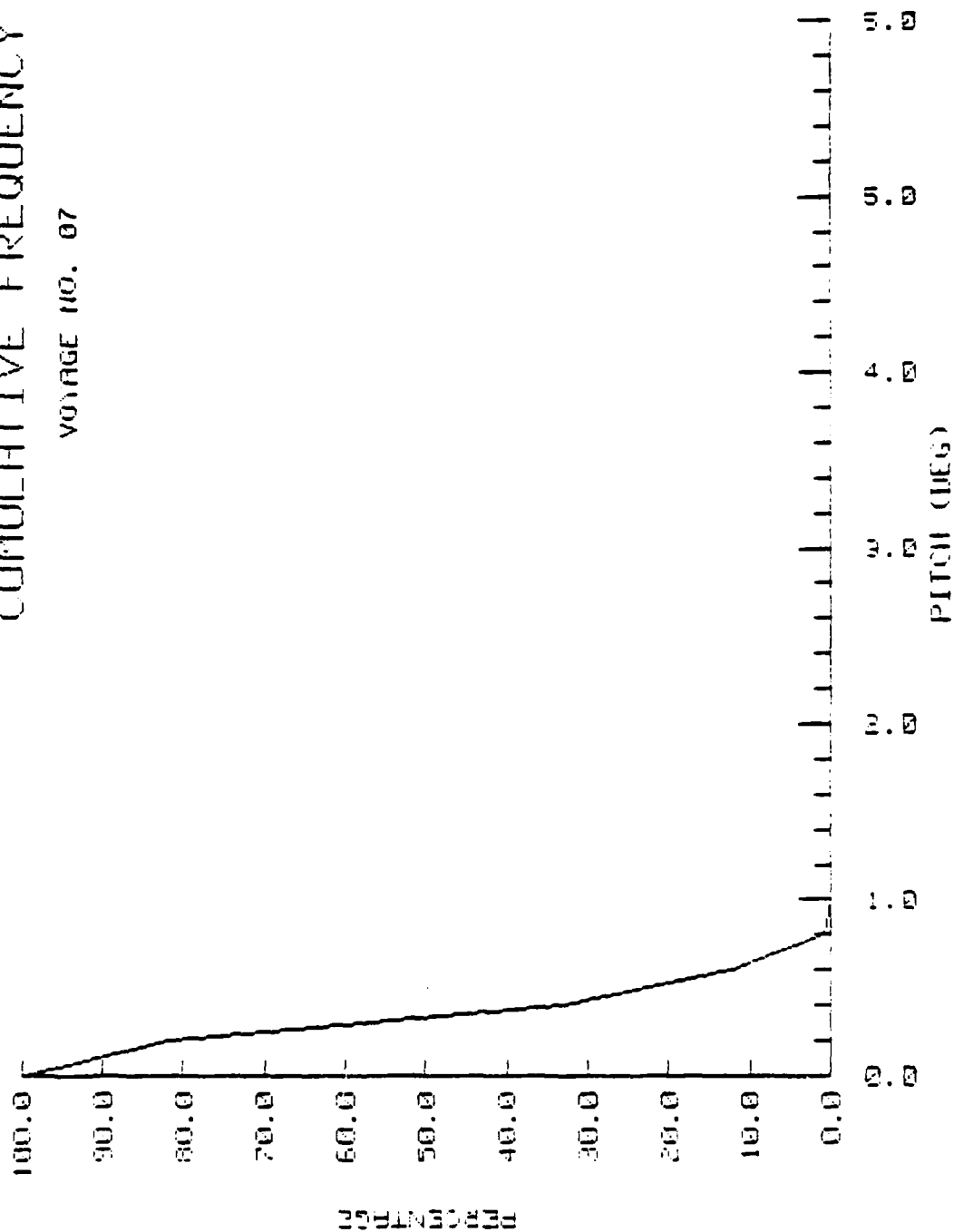
1.00 0.50 0.00 -0.50 -1.00 -1.50 -2.00 -2.50 -3.00 -3.50 -4.00 -4.50 -5.00

1.00 0.50 0.00 -0.50 -1.00 -1.50 -2.00 -2.50 -3.00 -3.50 -4.00 -4.50 -5.00

TIME

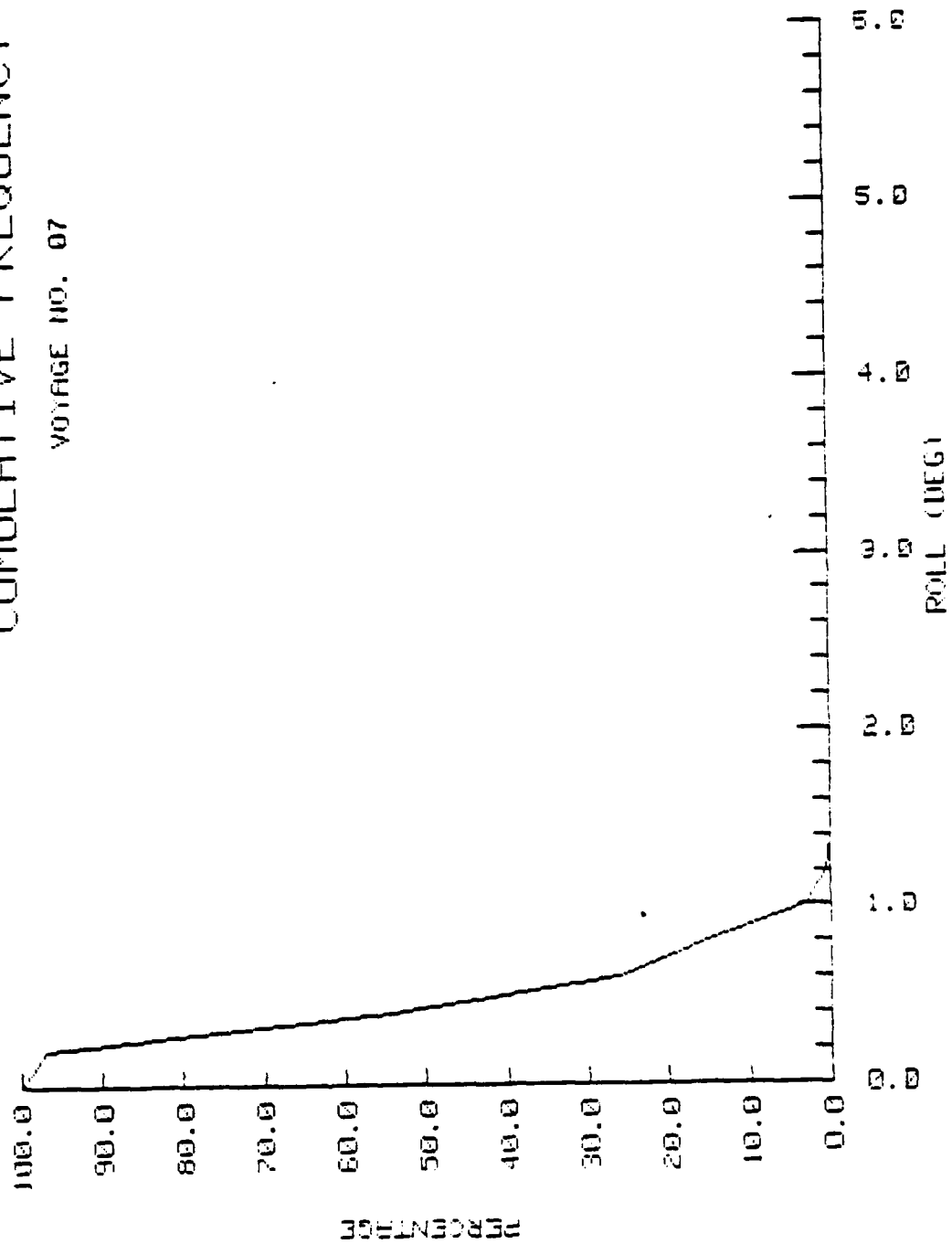
CUMULATIVE FREQUENCY

VOLAGE NO. 07



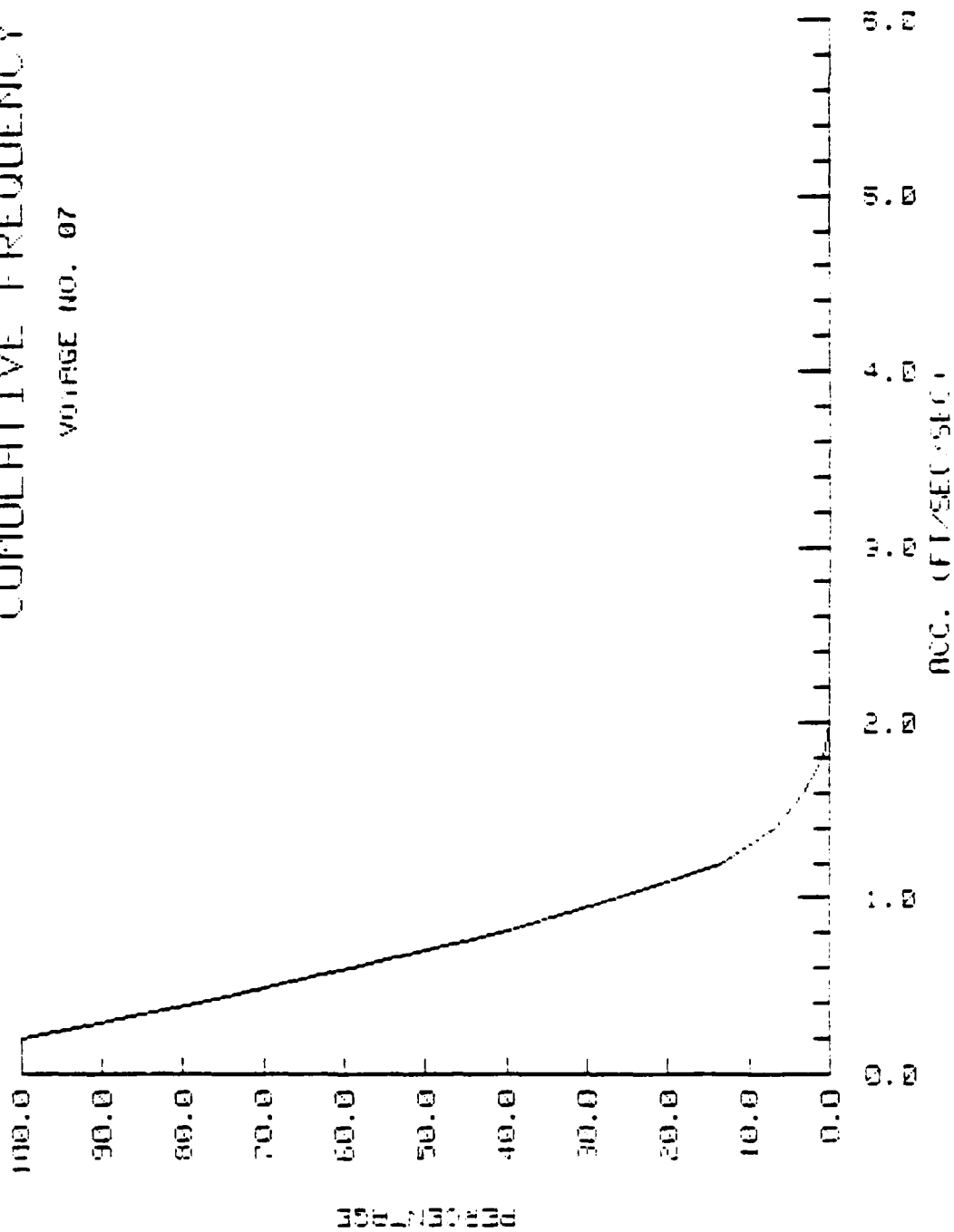
CUMULATIVE FREQUENCY

VOYAGE NO. 07



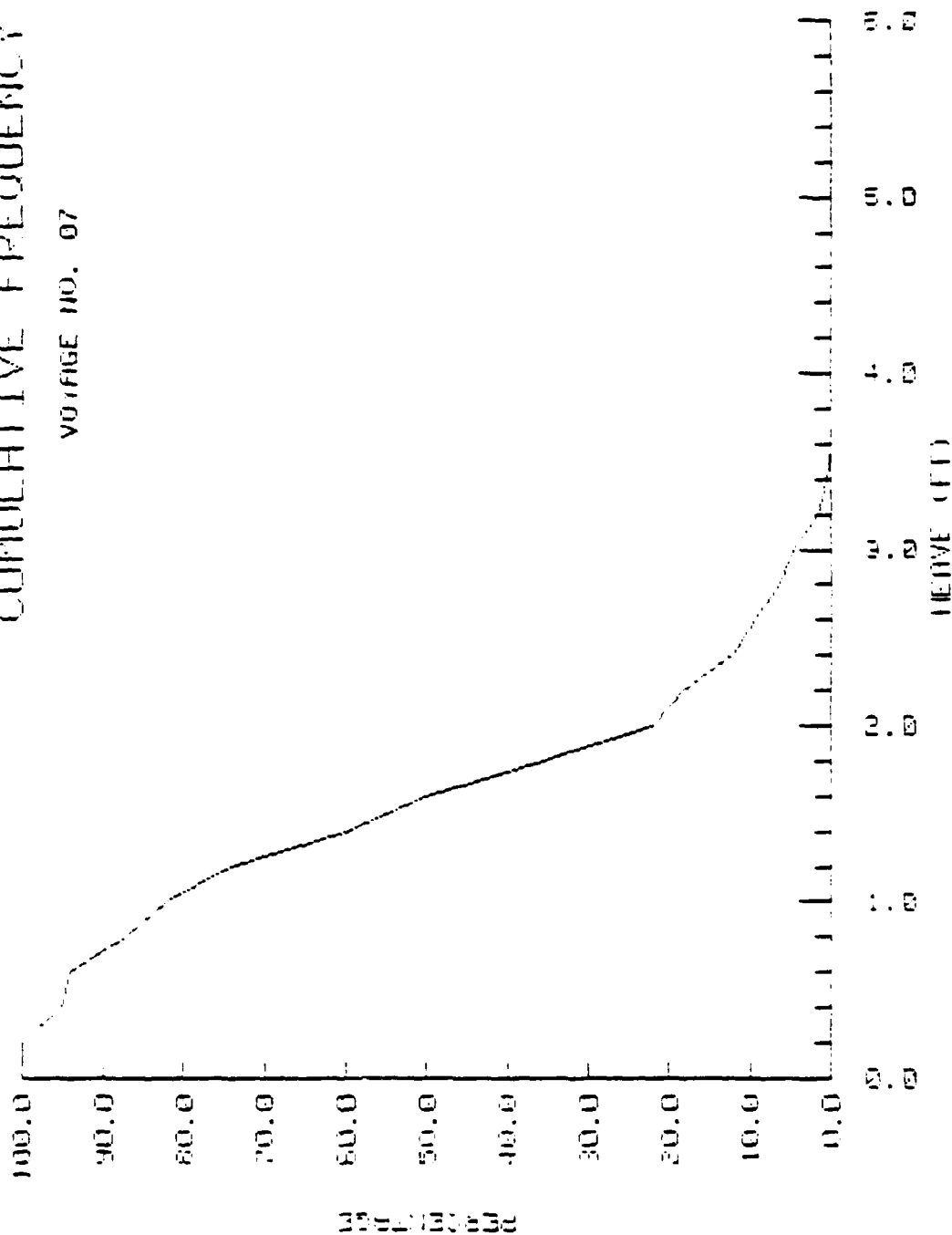
CUMULATIVE FREQUENCY

VOLTAGE NO. 07



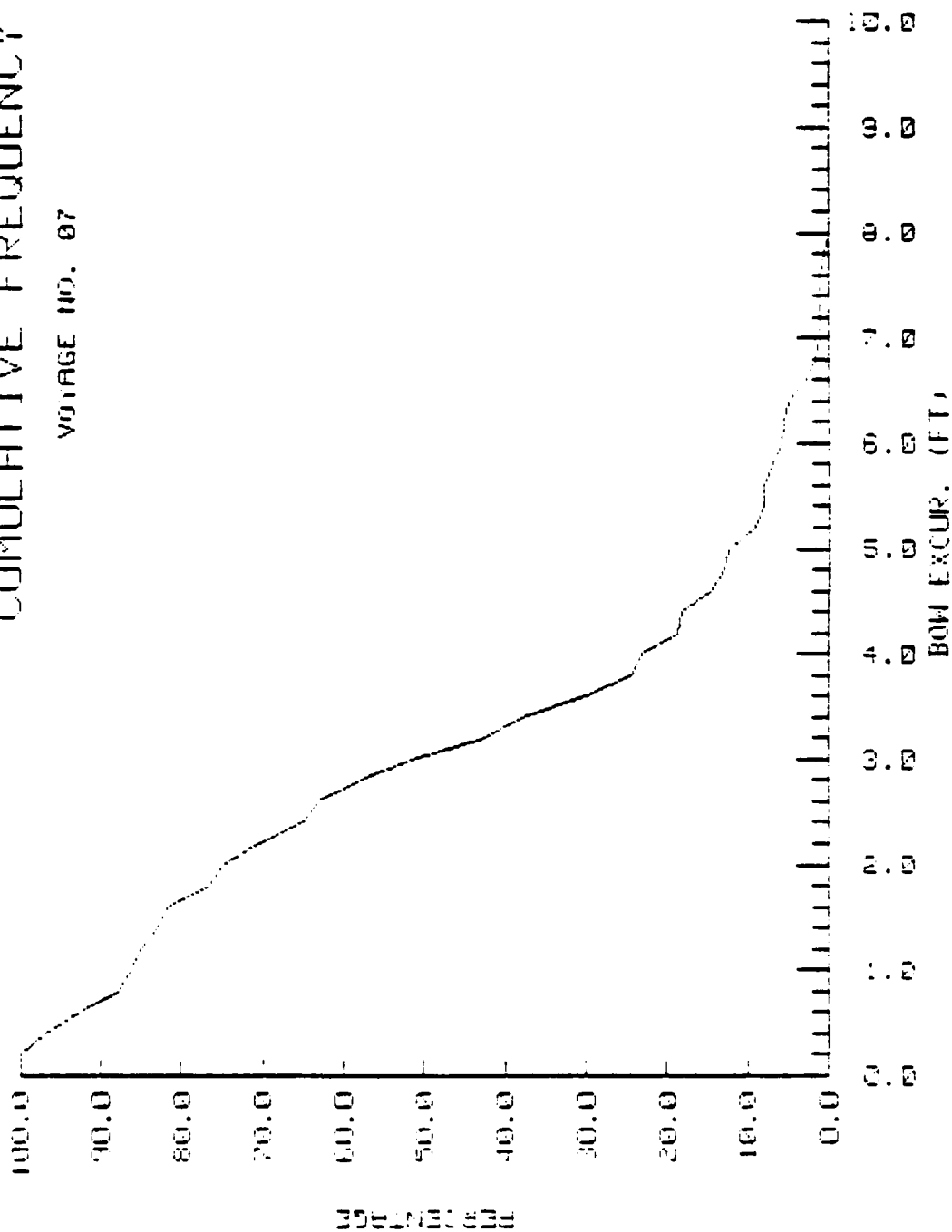
CUMULATIVE FREQUENCY

VOLTAIR NO. 07



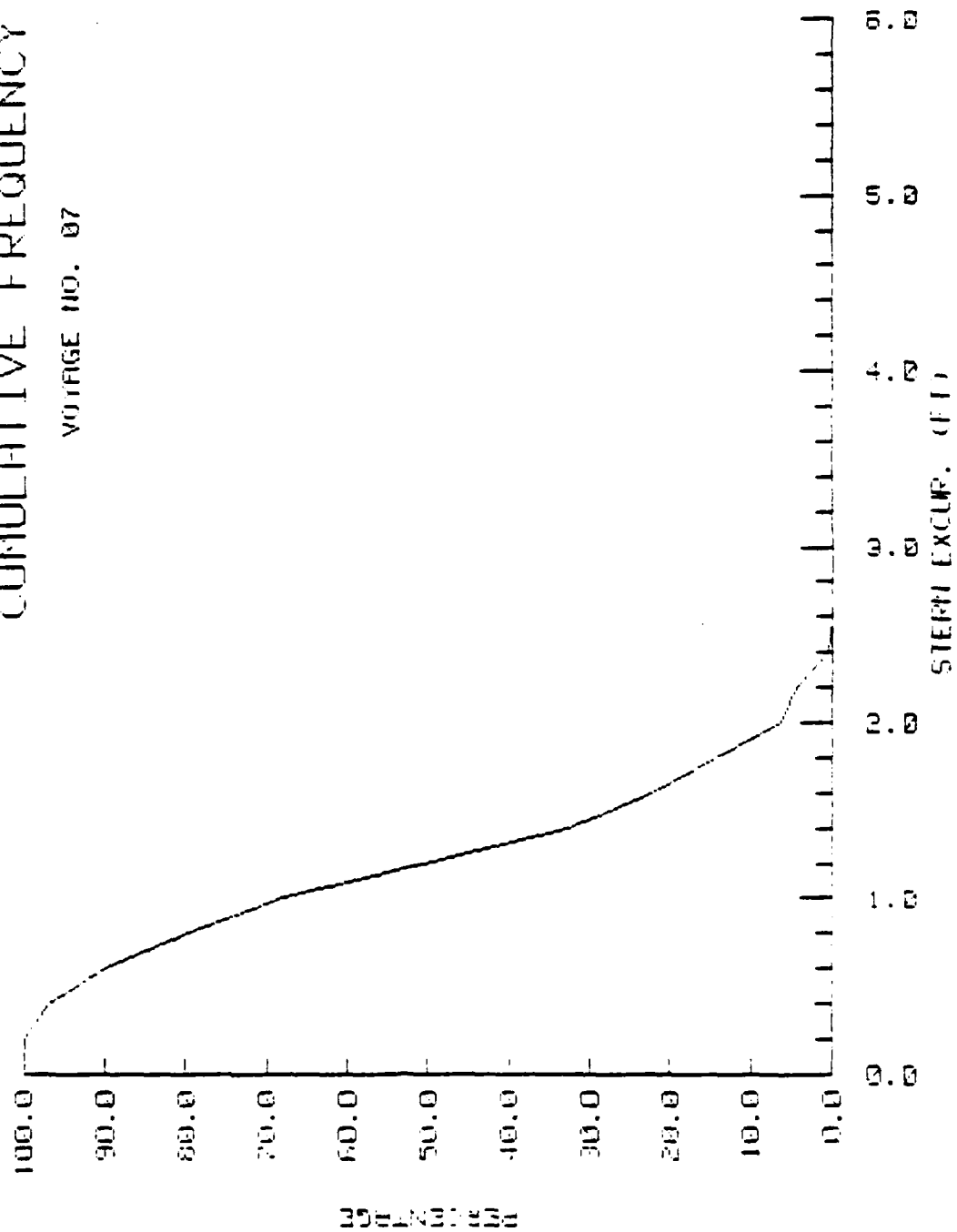
CUMULATIVE FREQUENCY

VOYAGE NO. 87



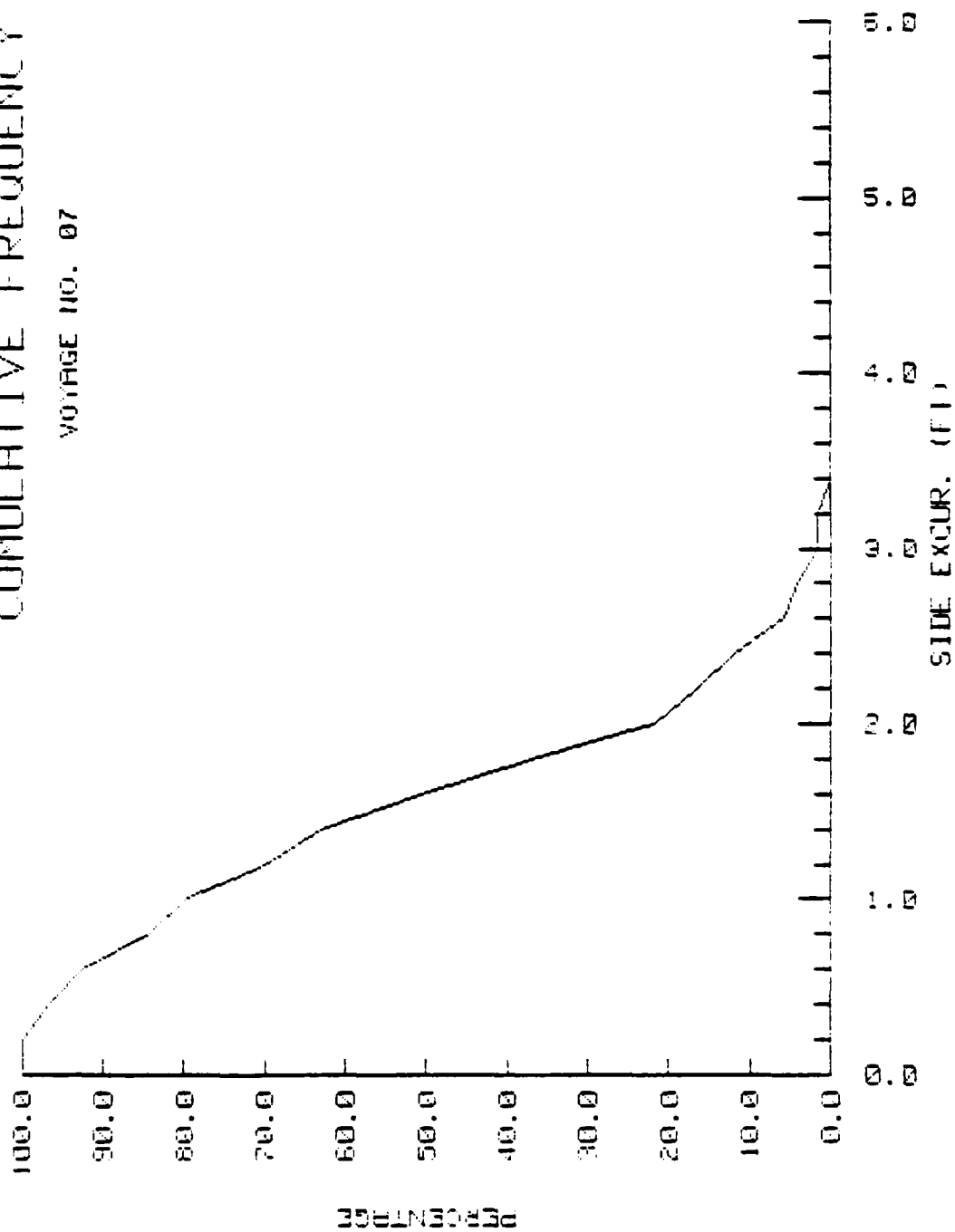
CUMULATIVE FREQUENCY

VOTAGE NO. 07



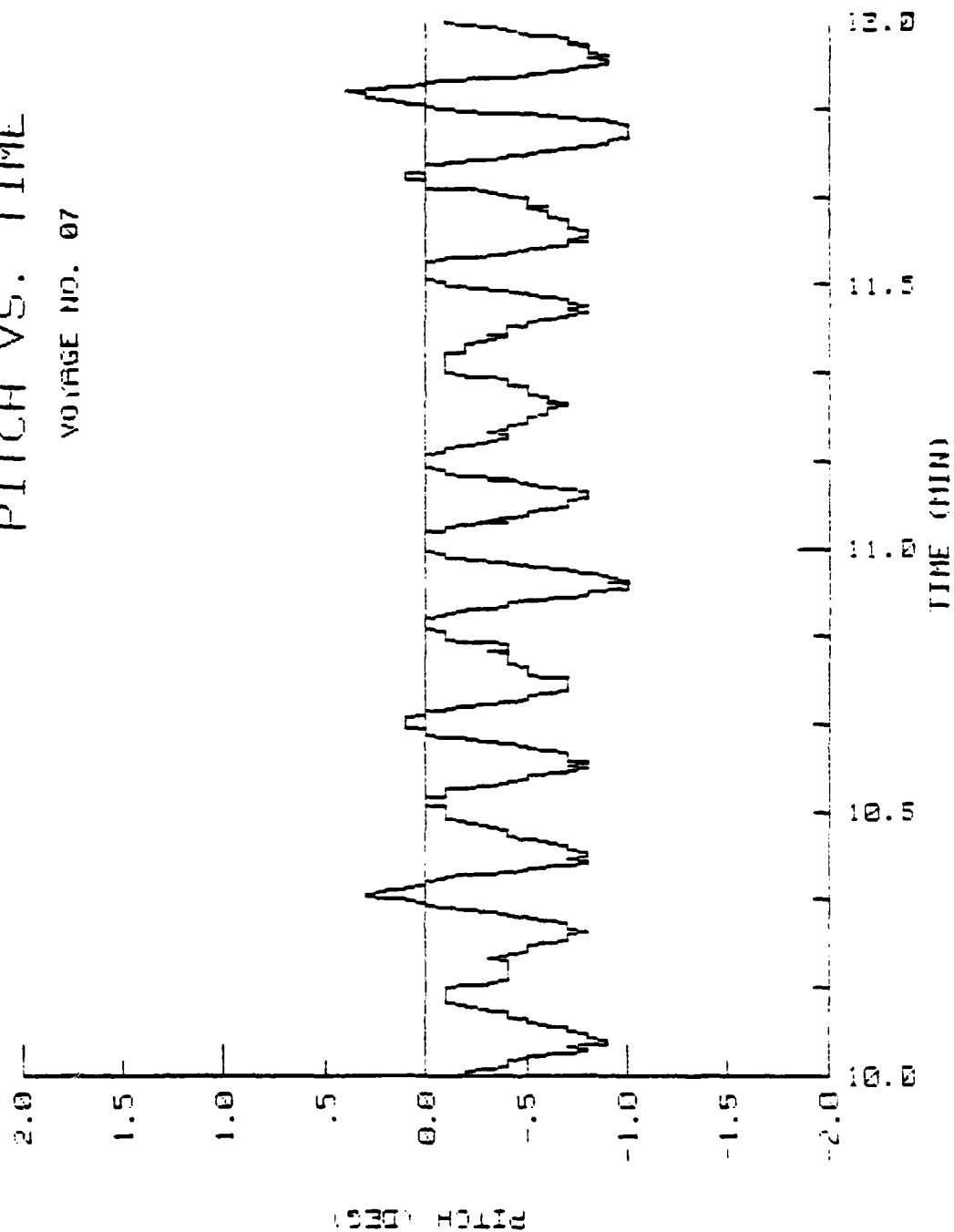
CUMULATIVE FREQUENCY

VOYAGE NO. 07



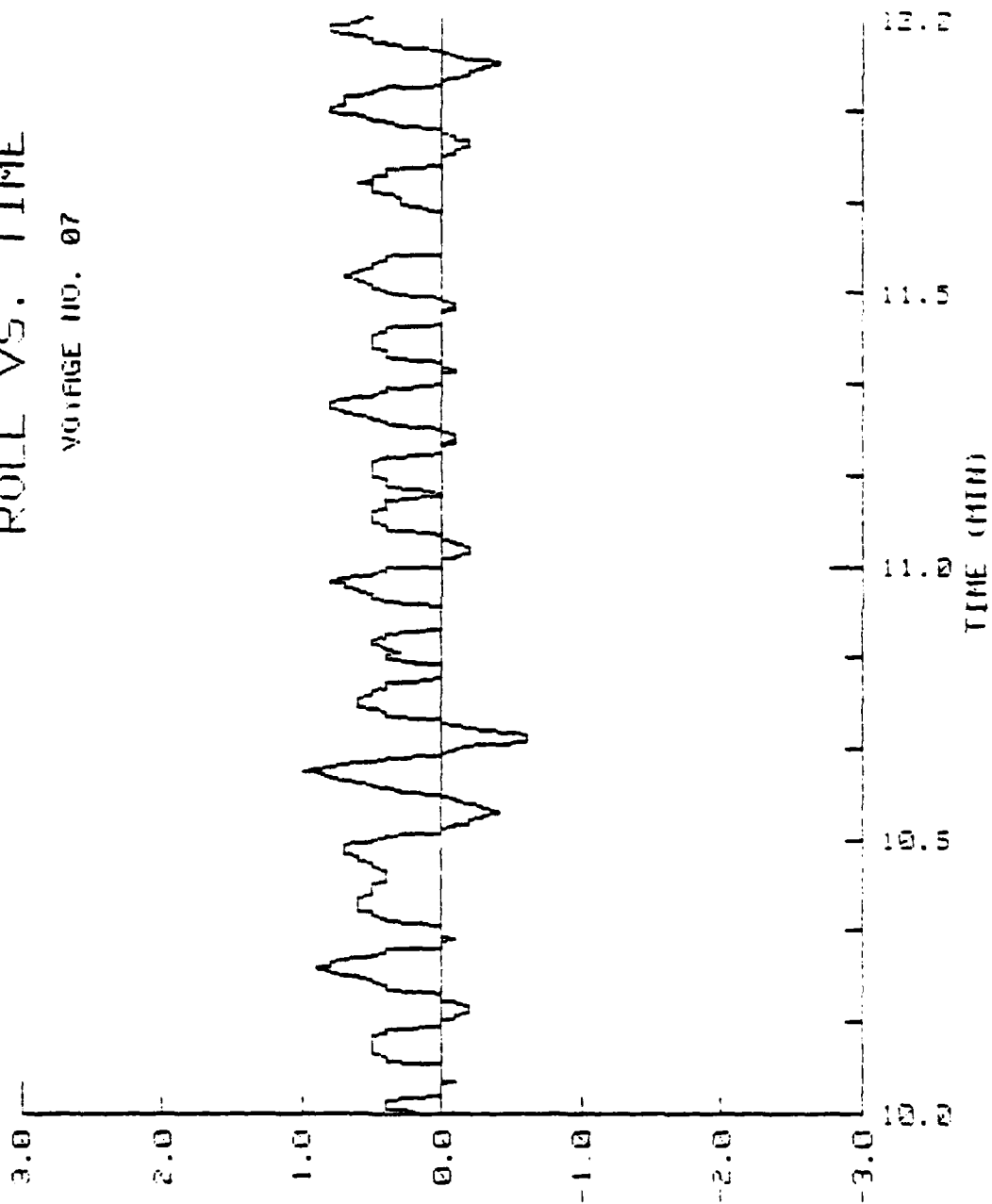
PITCH VS. TIME

VOLTAGE NO. 07



ROLL VS. TIME

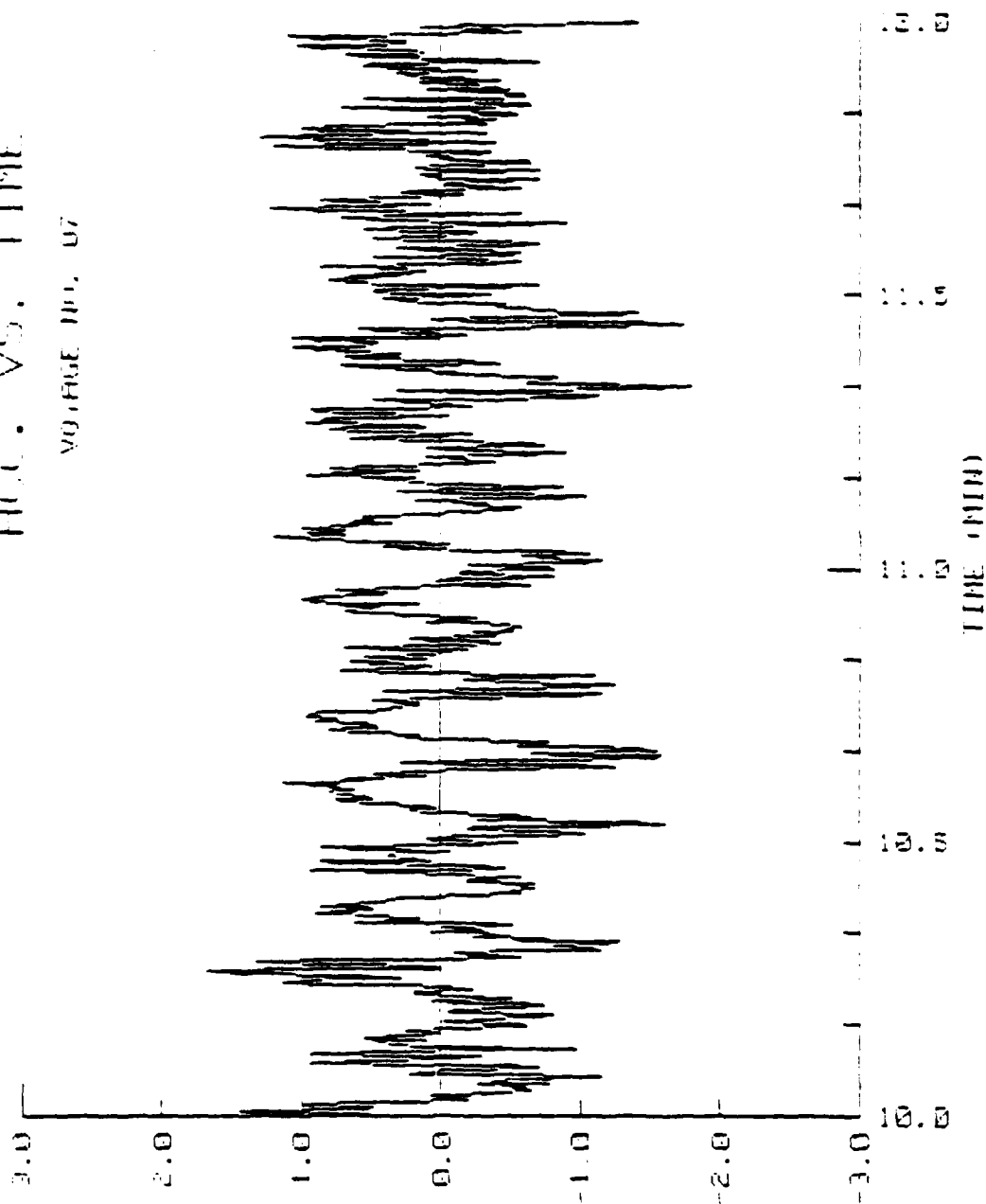
VOYAGE NO. 07



(930) 1705

ACC. VS. TIME

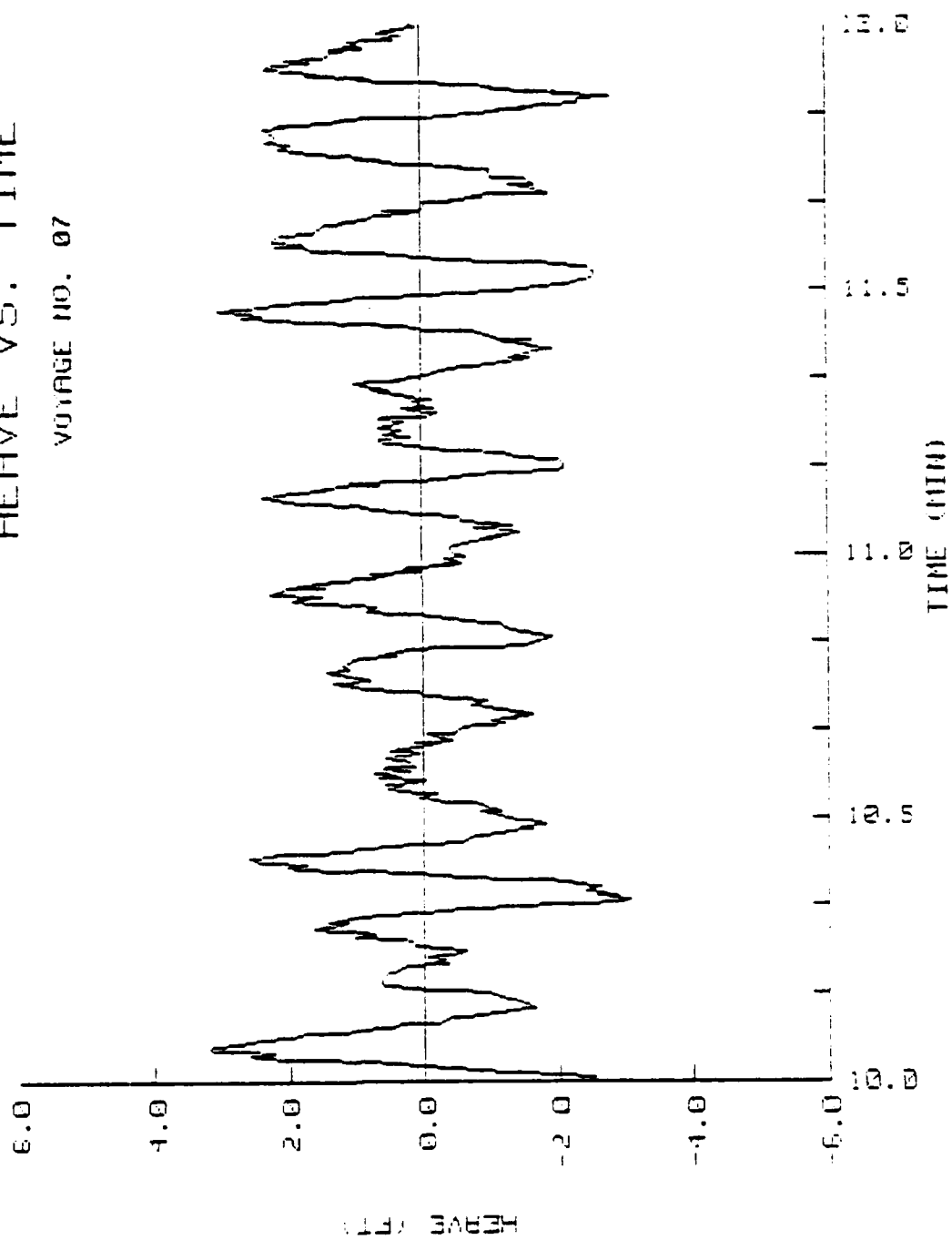
VOLUME 101, 07



ACC. VS. TIME

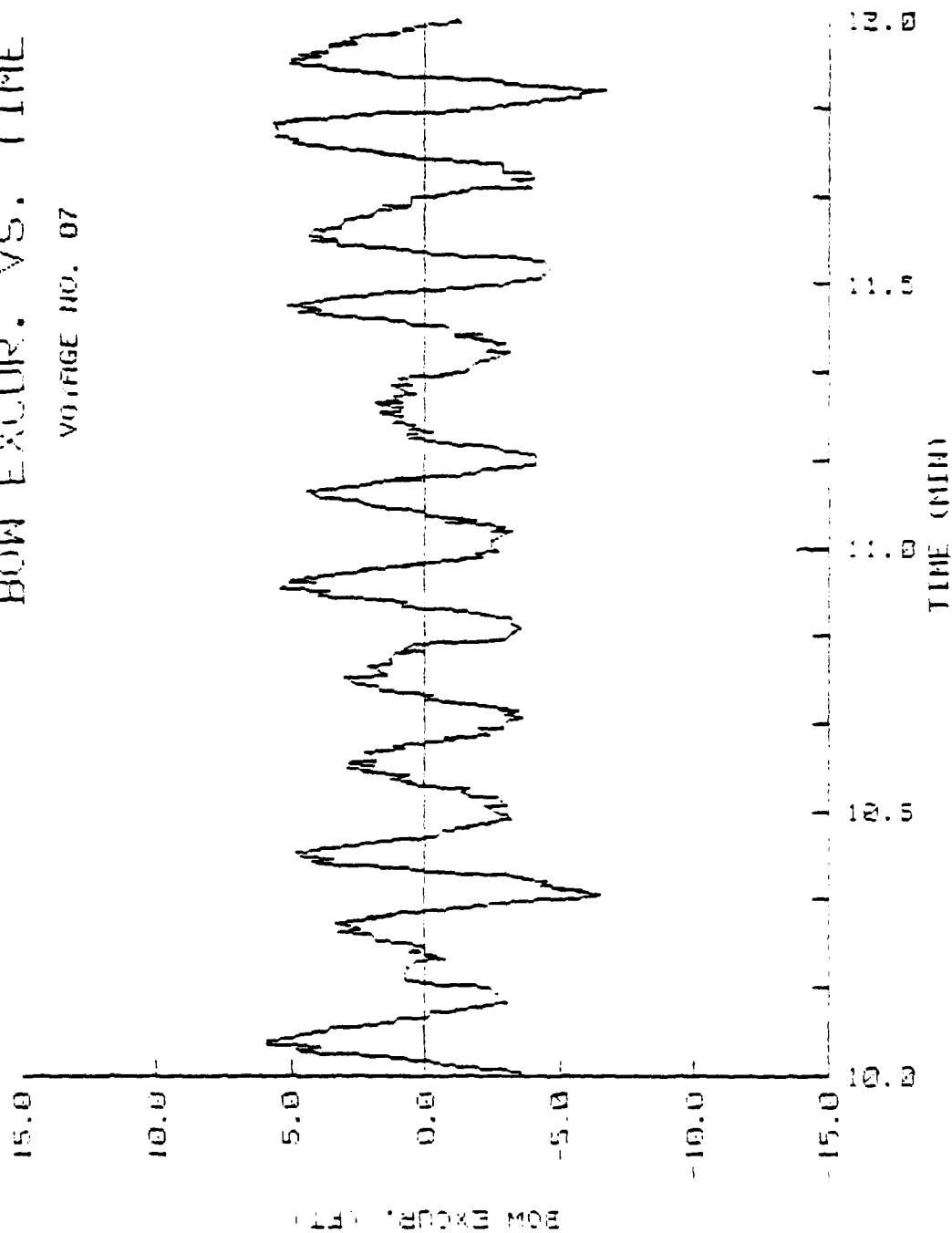
HEAVE VS. TIME

VOYAGE NO. 07



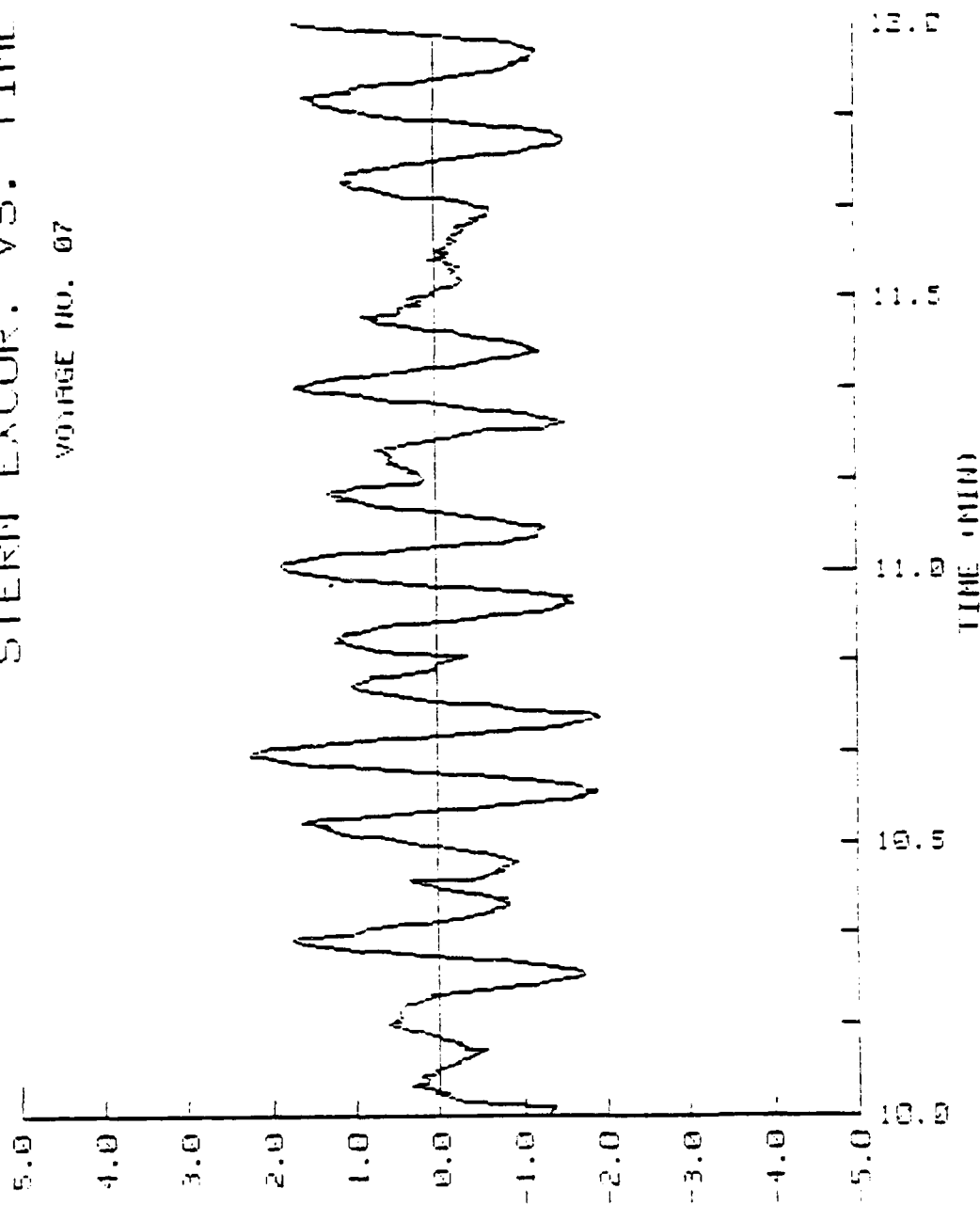
BOW EXCUR. VS. TIME

VOI FIGE NO. 07



STERN EXCUR. VS. TIME

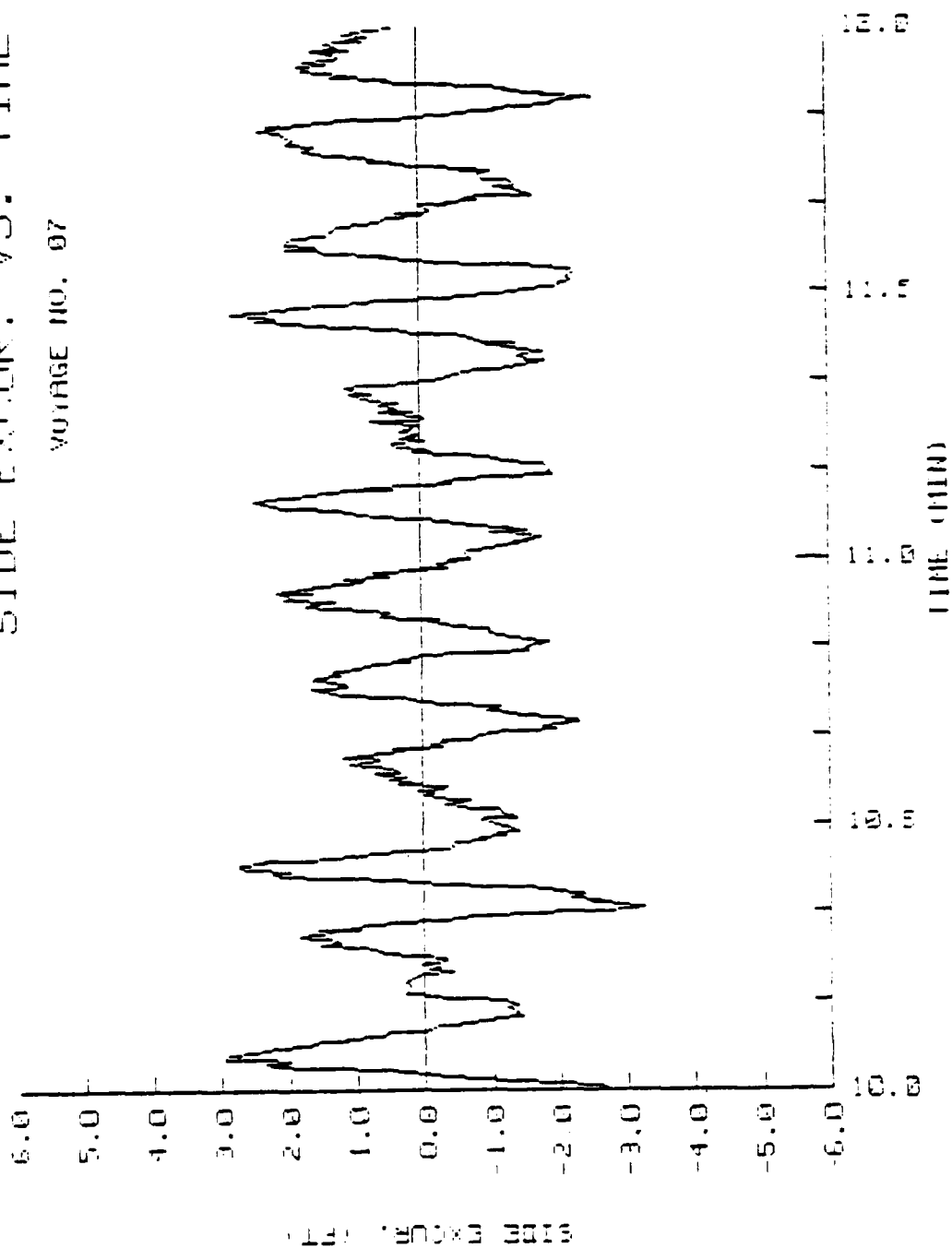
VOLUME NO. 07



STERN EXCUR. (ST)

SIDE EXCUR. VS. TIME

VOLTAGE NO. 07



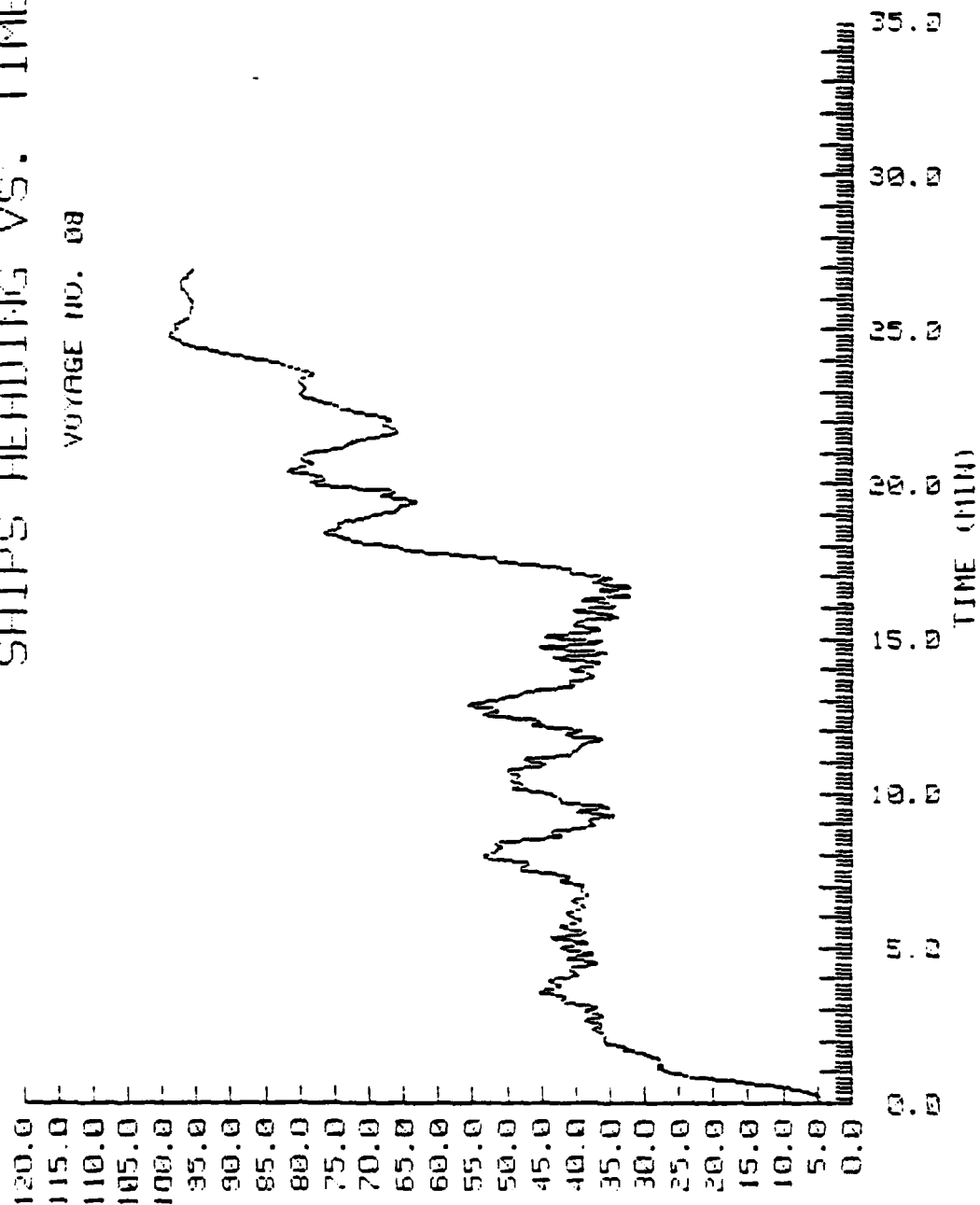
STATISTICAL SUMMARY

VOYAGE NO. 08

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	.3	2.3	.7	.8
ROLL (DEG)	.8	4.8	1.4	1.7
YAW (FT/SEC/SEC)	.0	2.1	.6	.7
HEAVE (FT)	.0	8.0	2.0	2.5
BOW EXCUR. (FT)	-.0	20.3	5.3	6.7
STERN EXCUR. (FT)	.0	6.4	1.8	2.2
SIDE EXCUR (FT)	.0	8.5	2.8	3.3

SHIPS HEADING VS. TIME

VOYAGE NO. 08

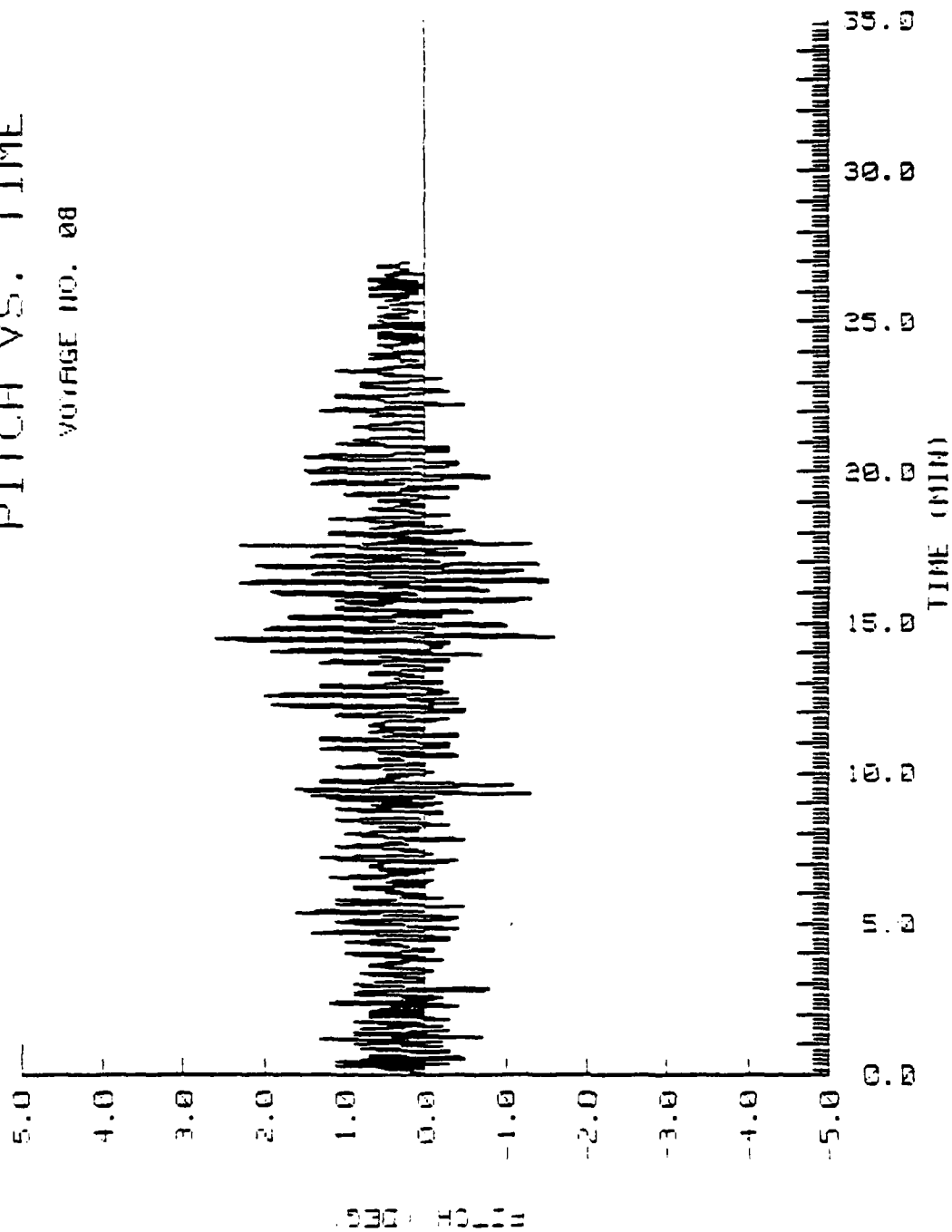


SHIPS HEADING (DEG)

TIME (min)

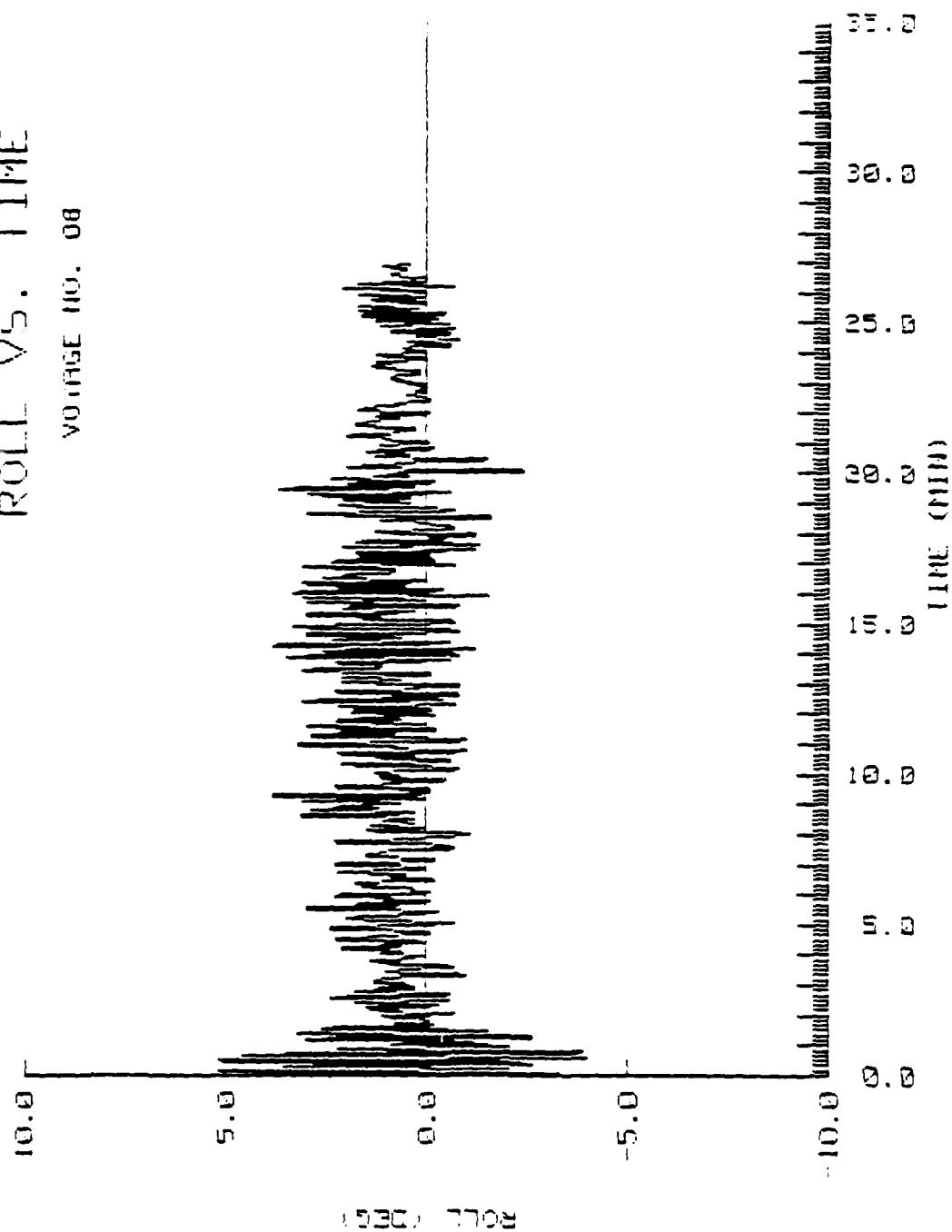
PITCH VS. TIME

VOTAGE NO. 08



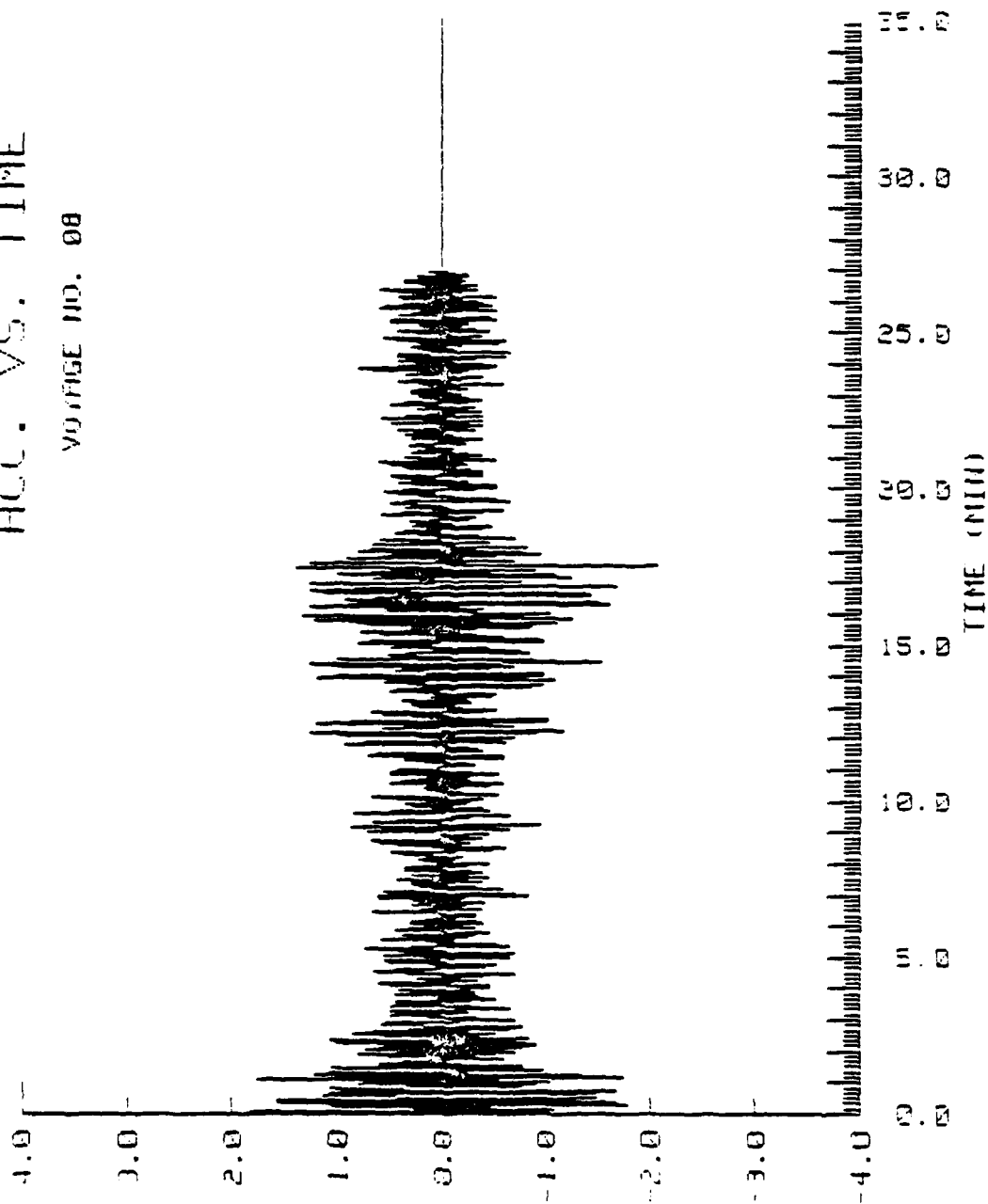
ROLL V5. TIME

VOLUME NO. 08



ACC. VS. TIME

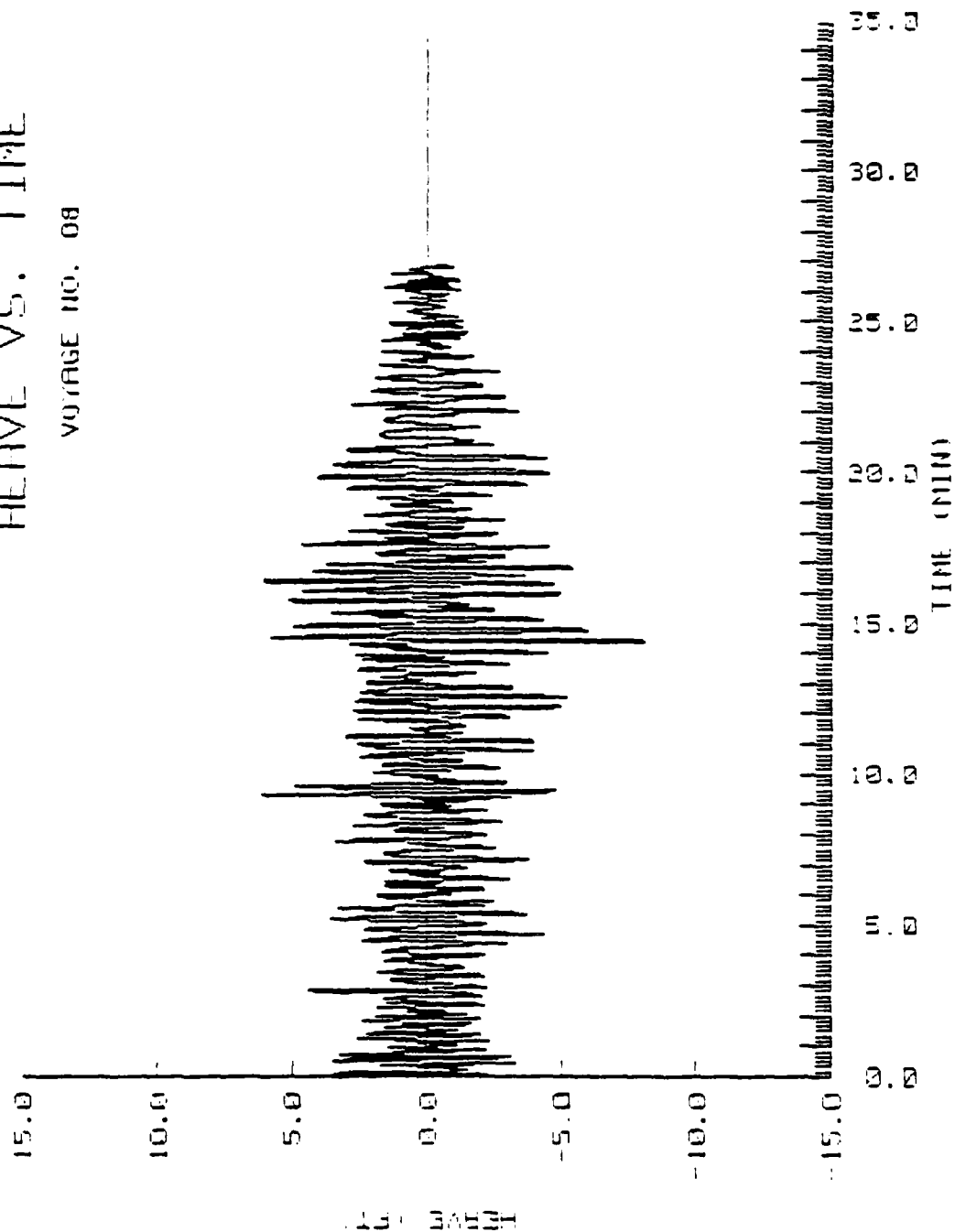
VOYAGE NO. 00



ACC. VS. TIME

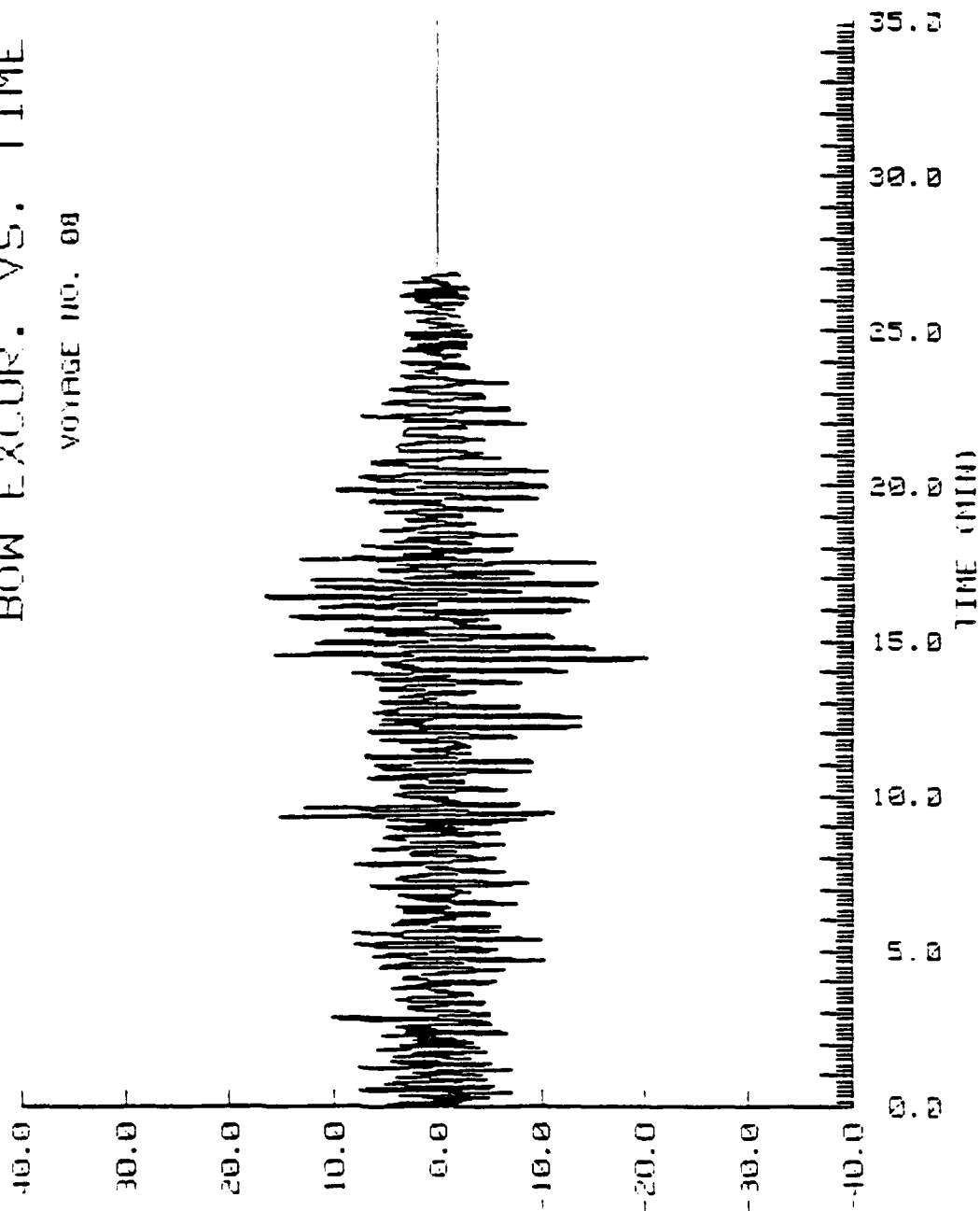
HEAVE VS. TIME

VOLTAJE NO. 08



BOW EXCUR. VS. TIME

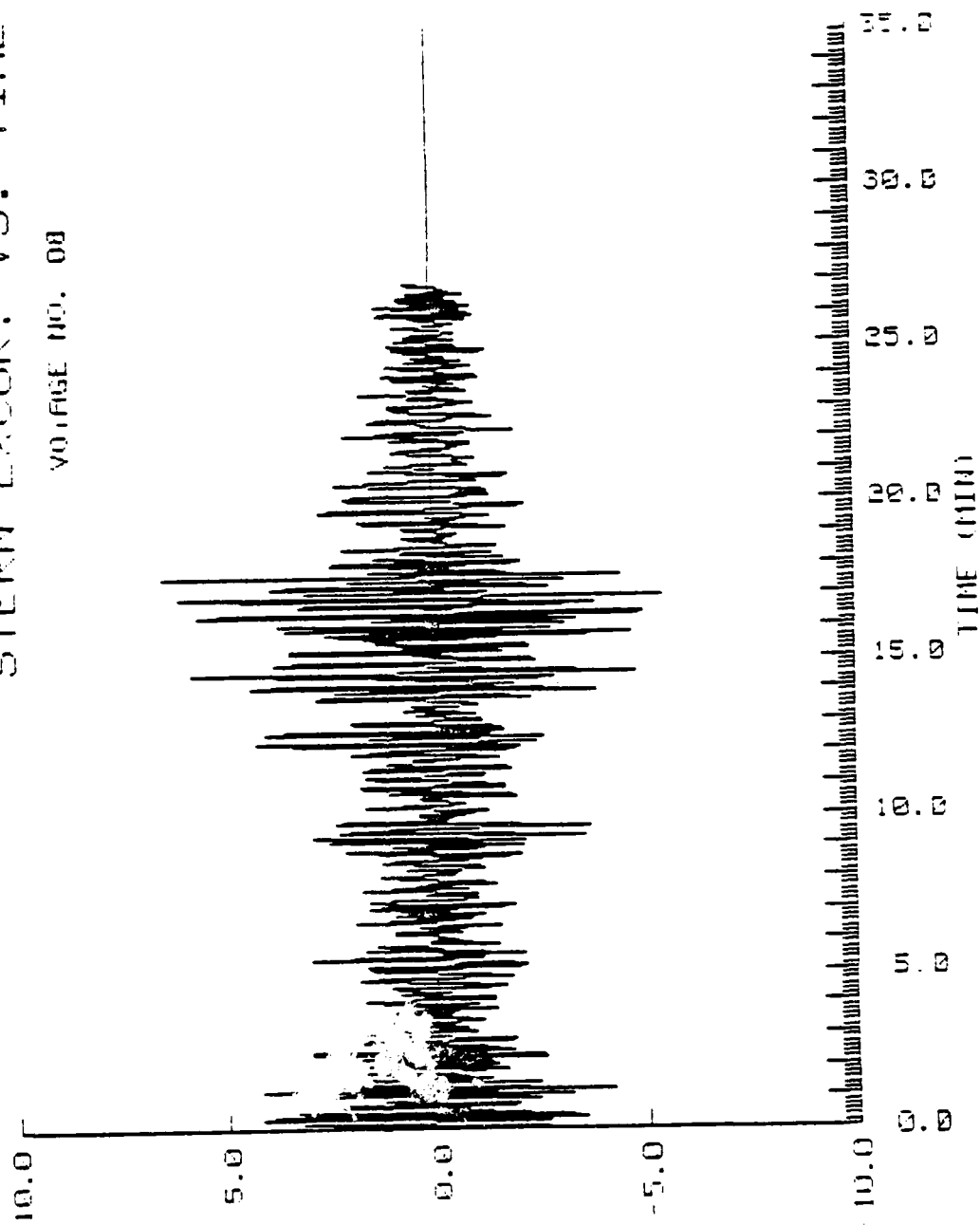
VOLTAGE NO. 08



BOW EXCUR. - 71

STERN EXCUR. VS. TIME

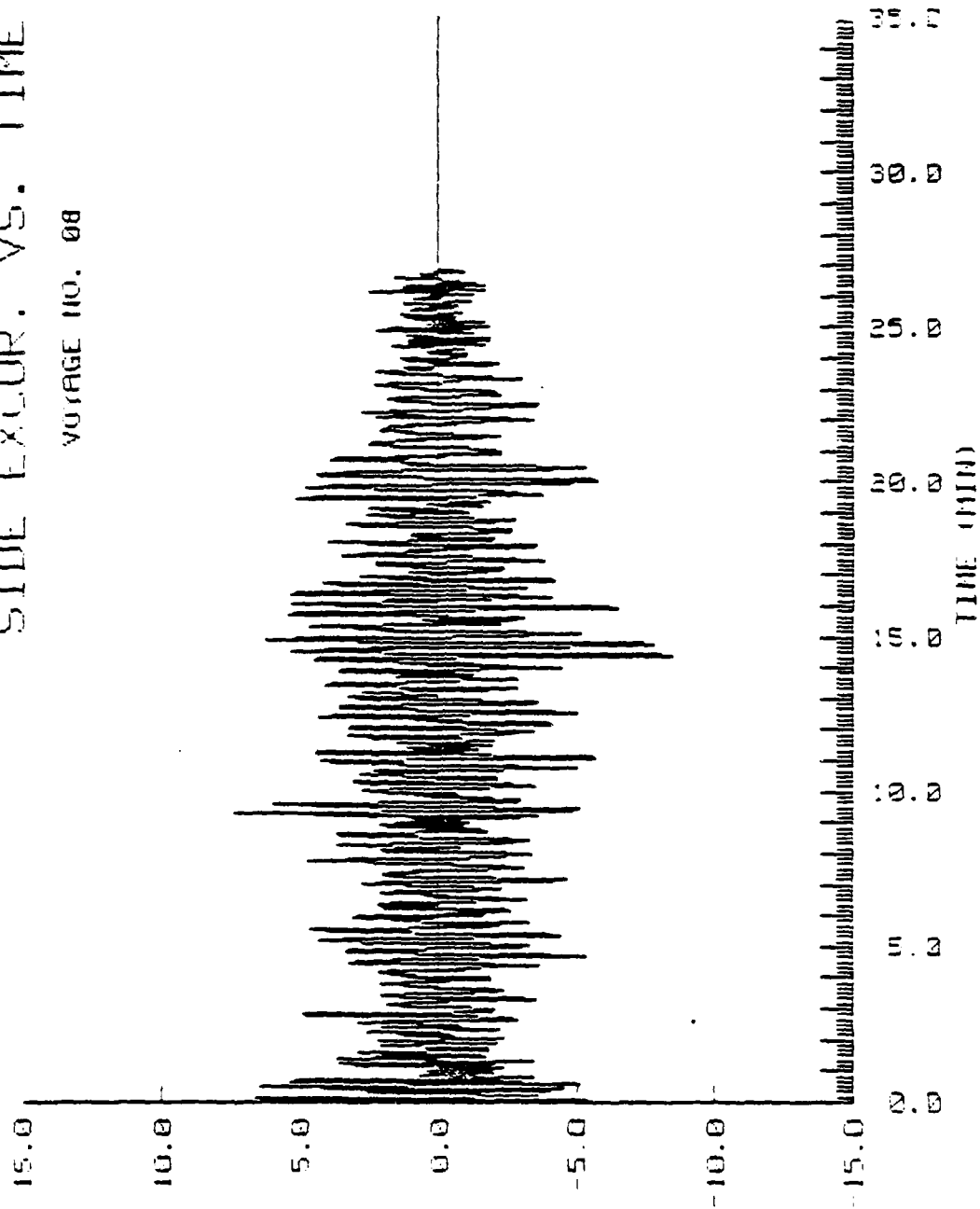
VOICE NO. 08



STERN EXCUR. (FT)

SIDE EXCUR. VS. TIME

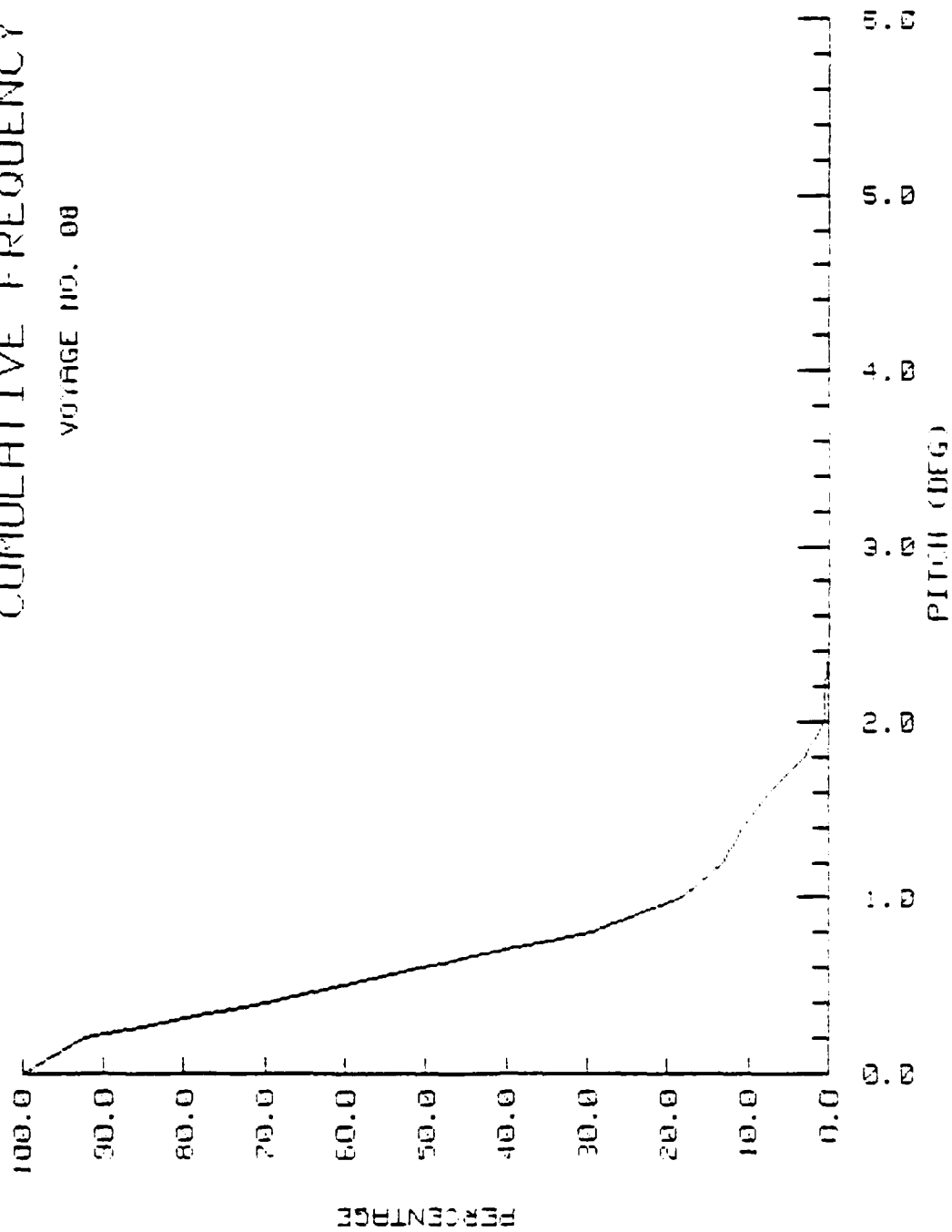
VORAGE 110. 08



SIDE EXCUR. VS. TIME

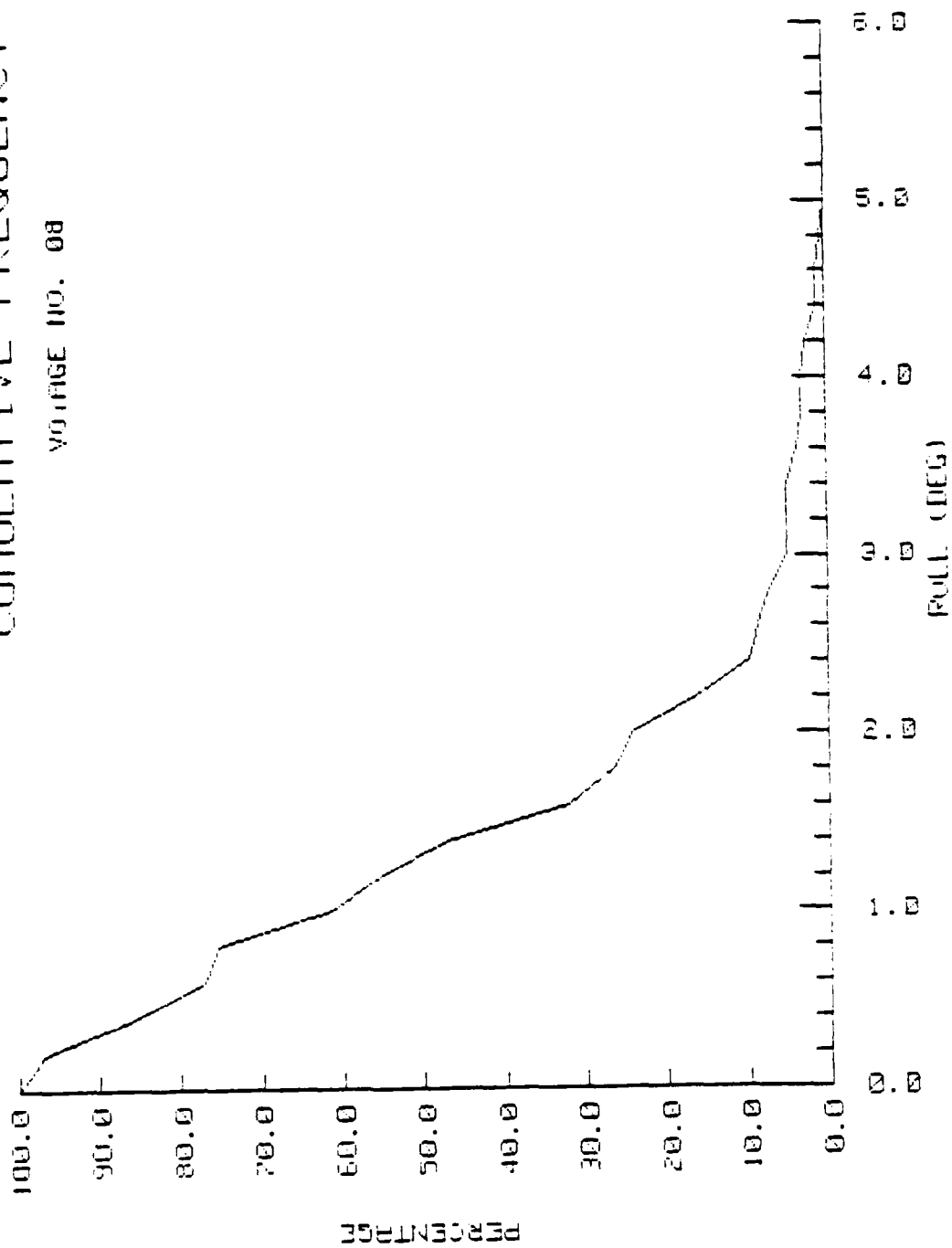
CUMULATIVE FREQUENCY

VOLTAGE NO. 08



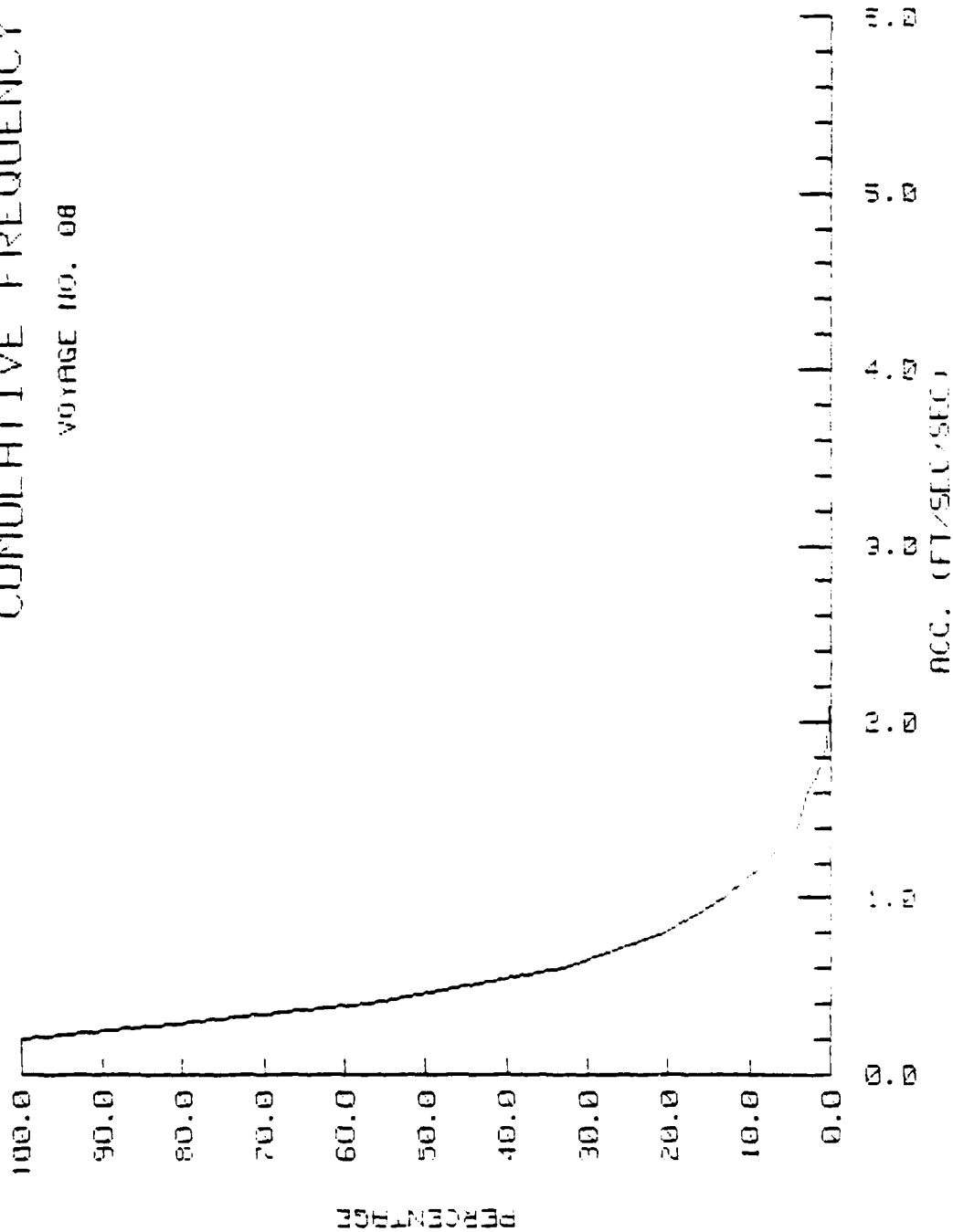
CUMULATIVE FREQUENCY

VOLTAGGE 110. 08



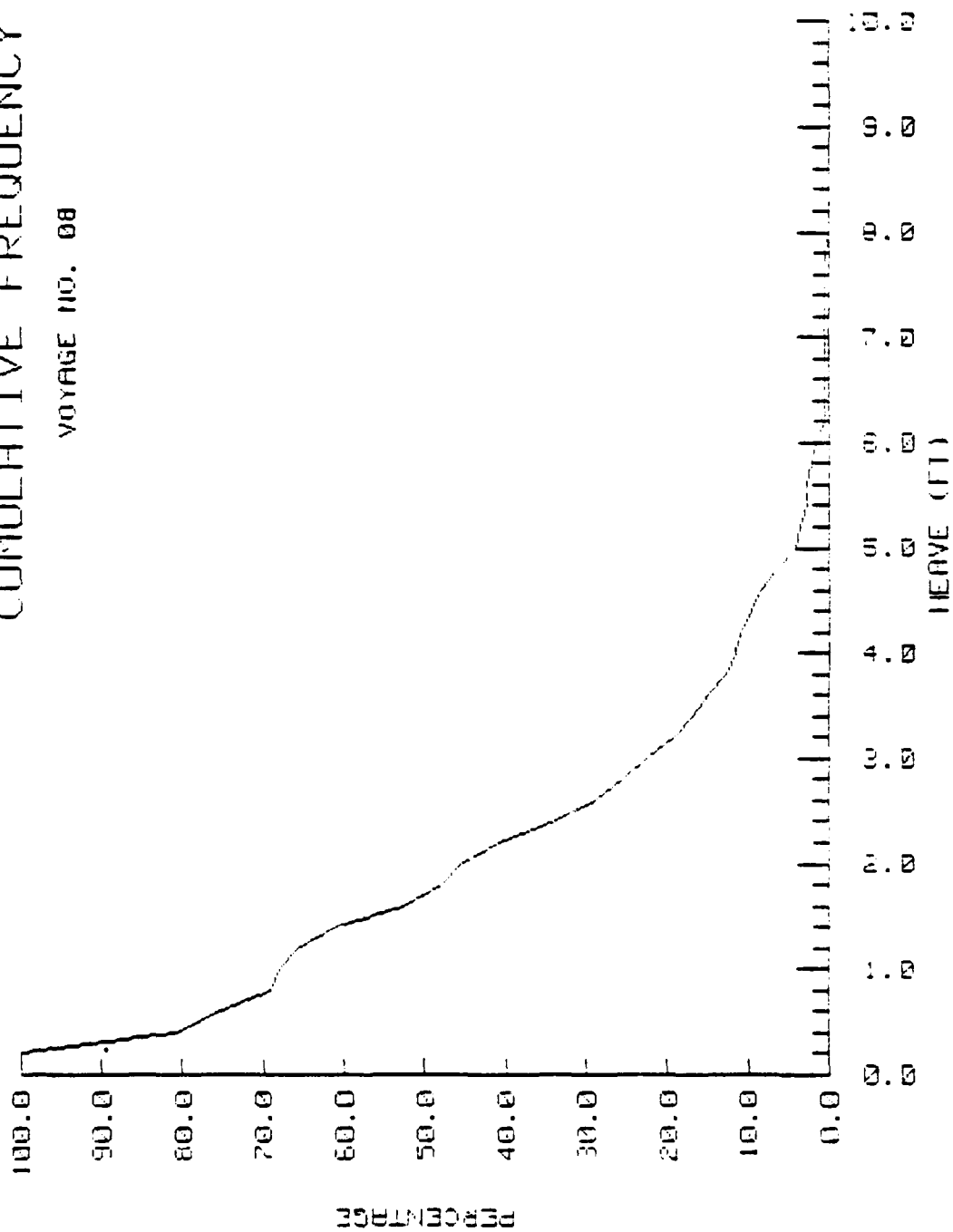
CUMULATIVE FREQUENCY

VOYAGE NO. 08



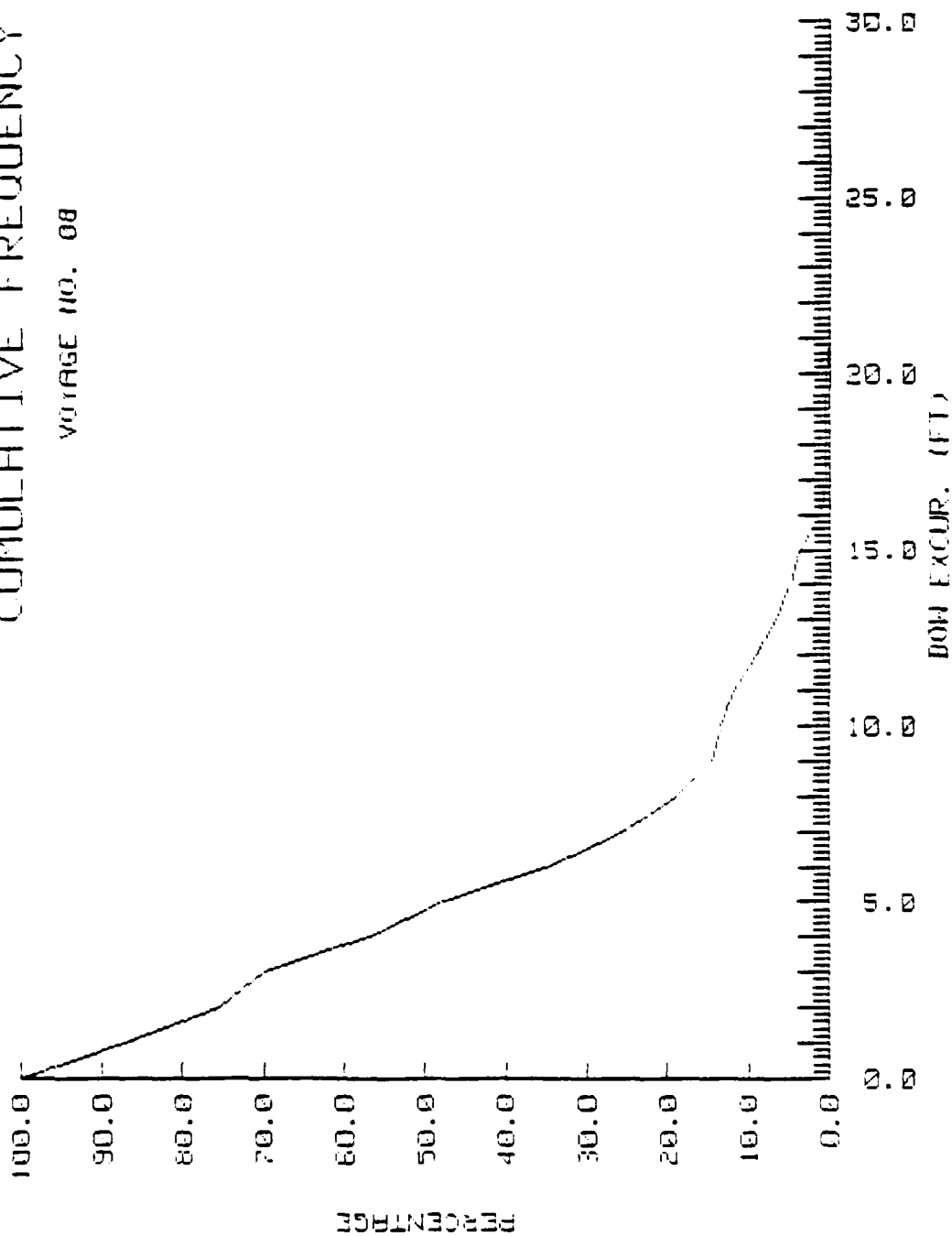
CUMULATIVE FREQUENCY

VOYAGE NO. 08



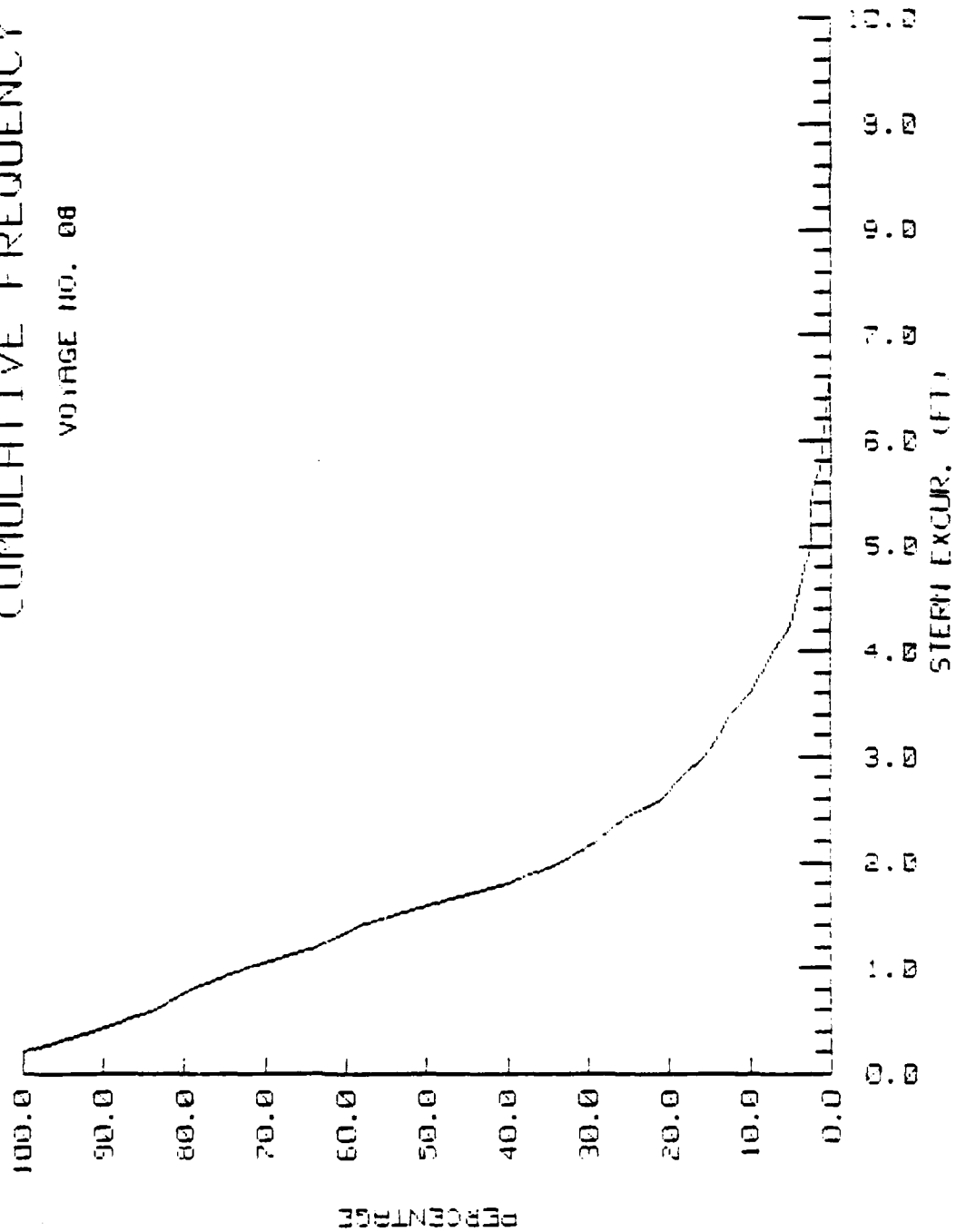
CUMULATIVE FREQUENCY

VOTAGE NO. 08



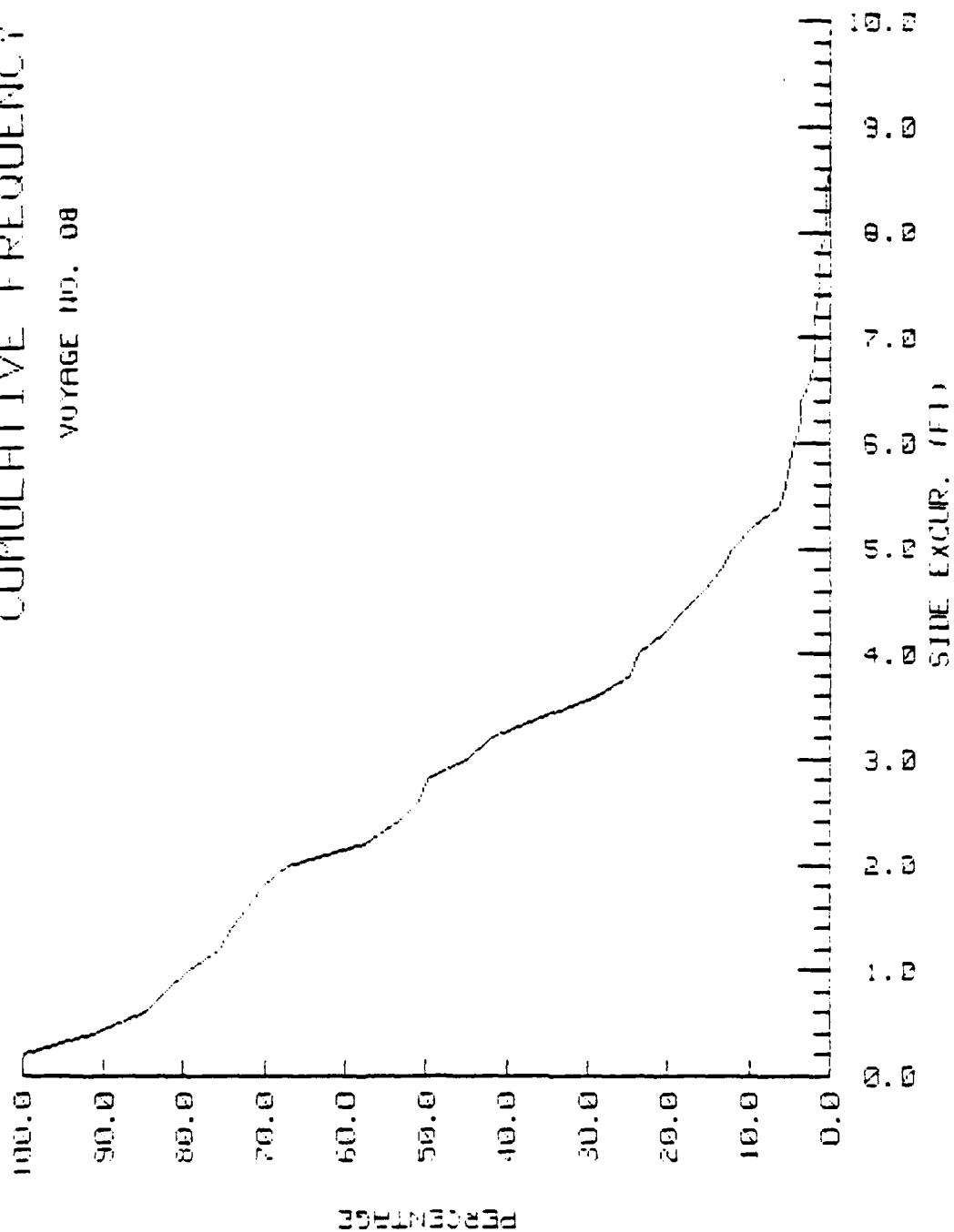
CUMULATIVE FREQUENCY

VOYAGE NO. 08



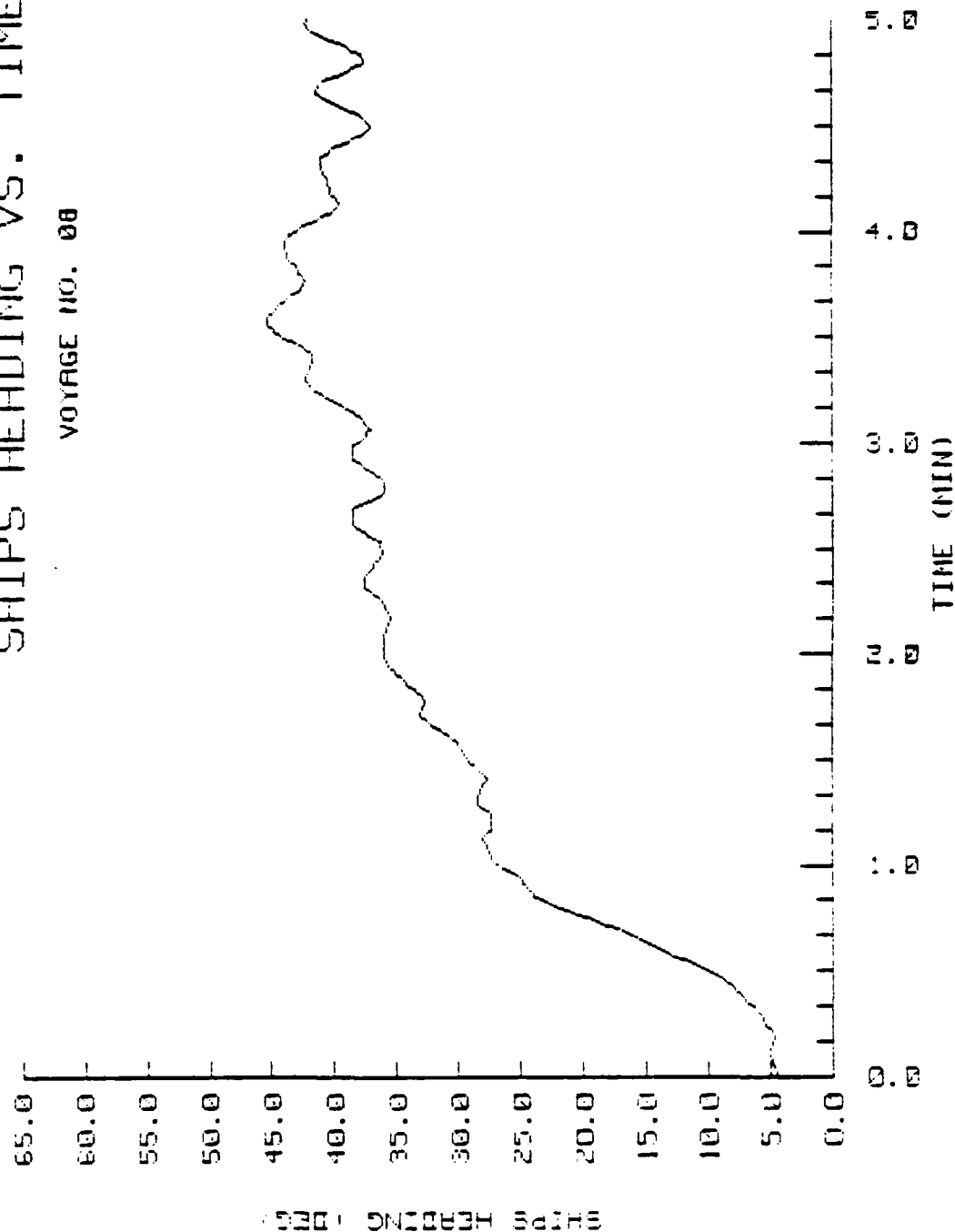
CUMULATIVE FREQUENCY

VOYAGE NO. 08



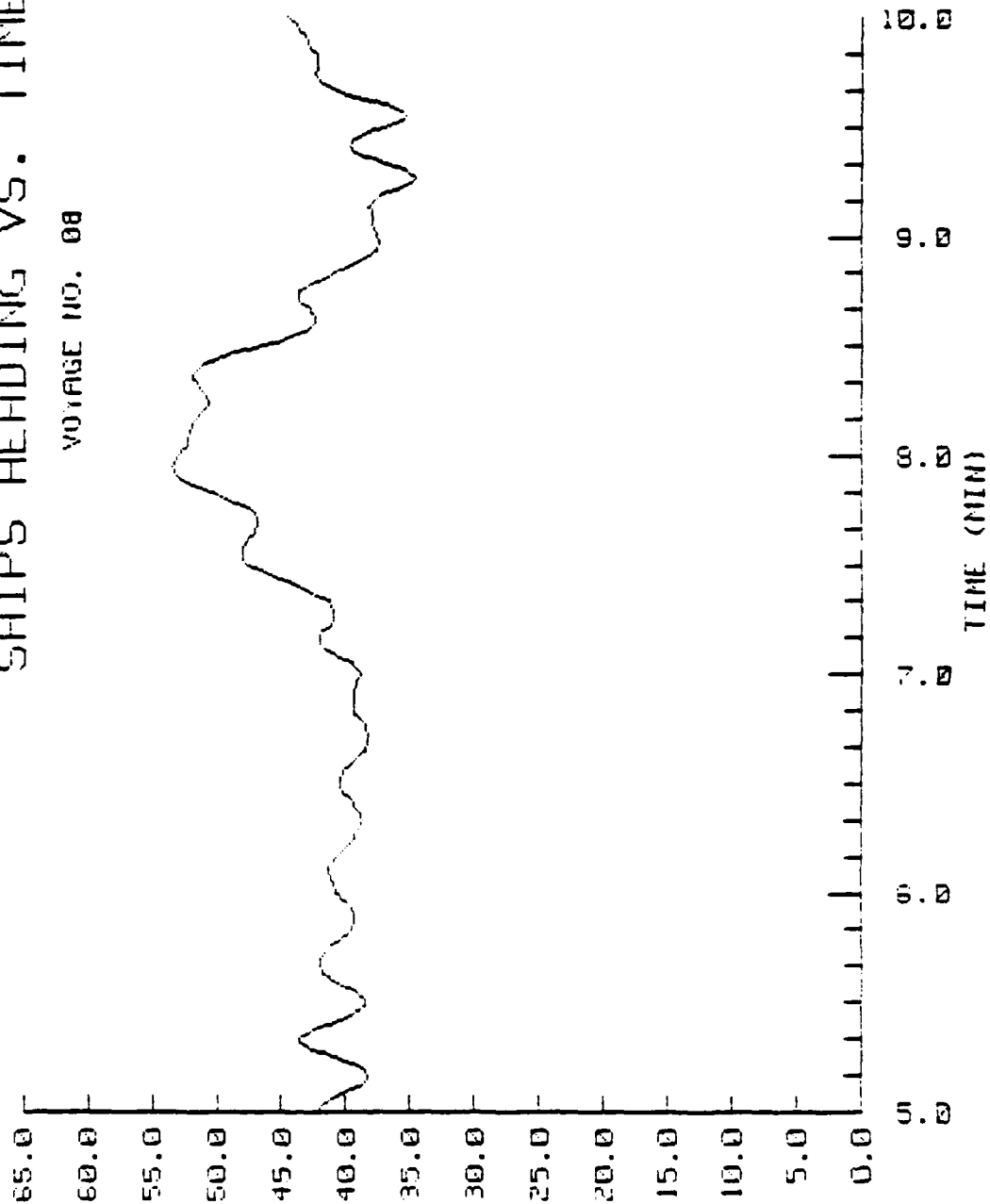
SHIPS HEADING VS. TIME

VOYAGE NO. 08



SHIPS HEADING VS. TIME

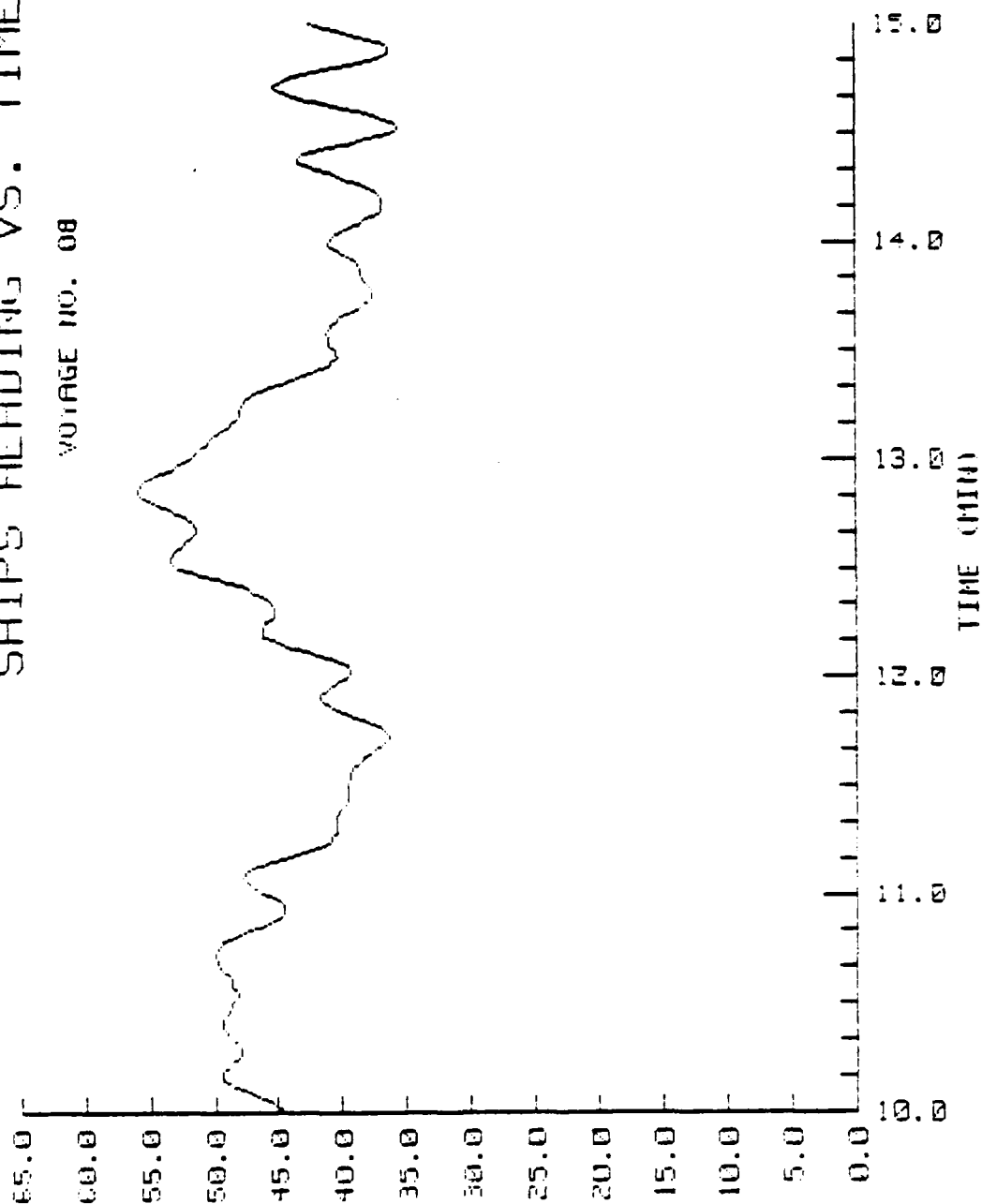
VOYAGE NO. 08



0000 00000000 000000

SHIPS HEADING VS. TIME

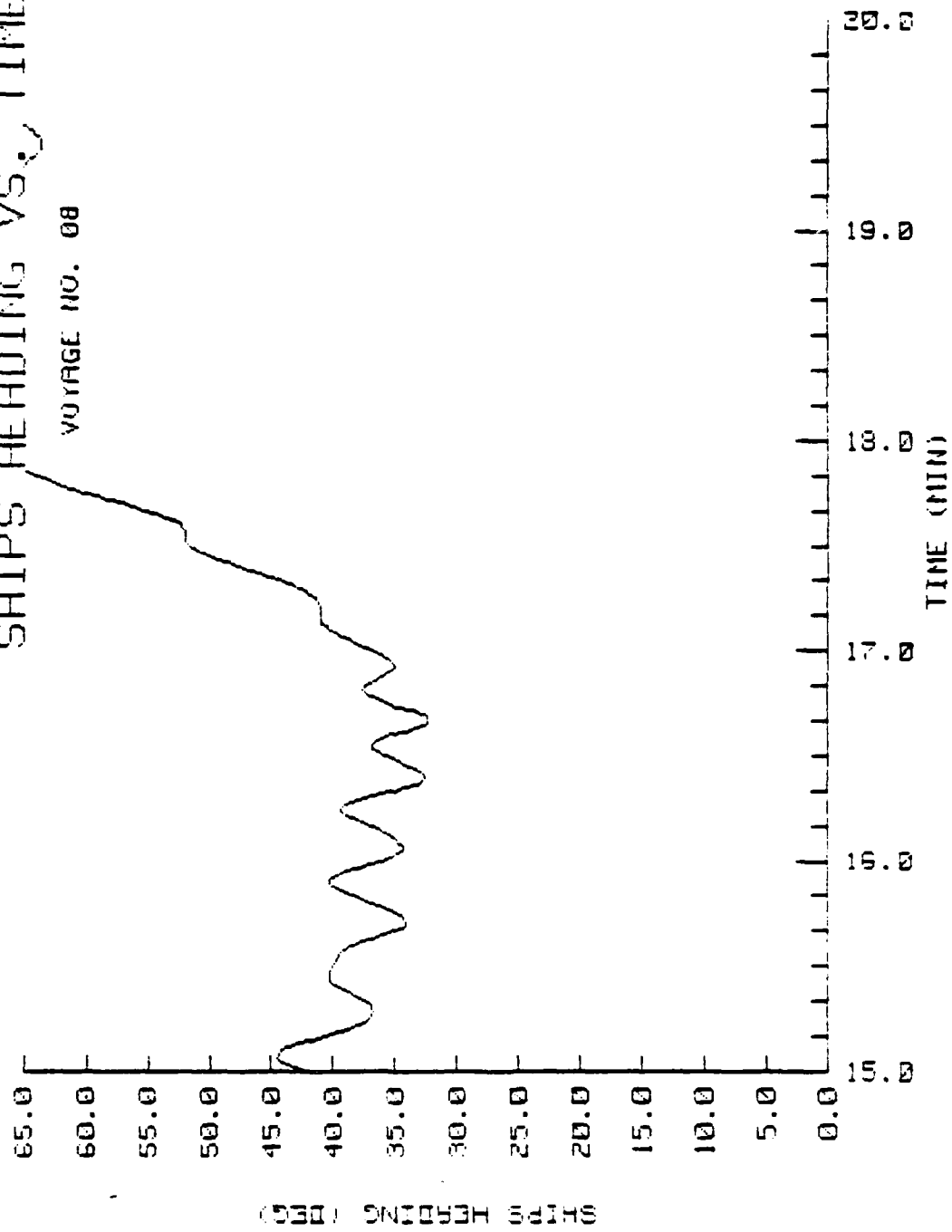
VOTAGE NO. 08



0000 00000000 000000

SHIPS HEADING VS. TIME

VOYAGE NO. 08



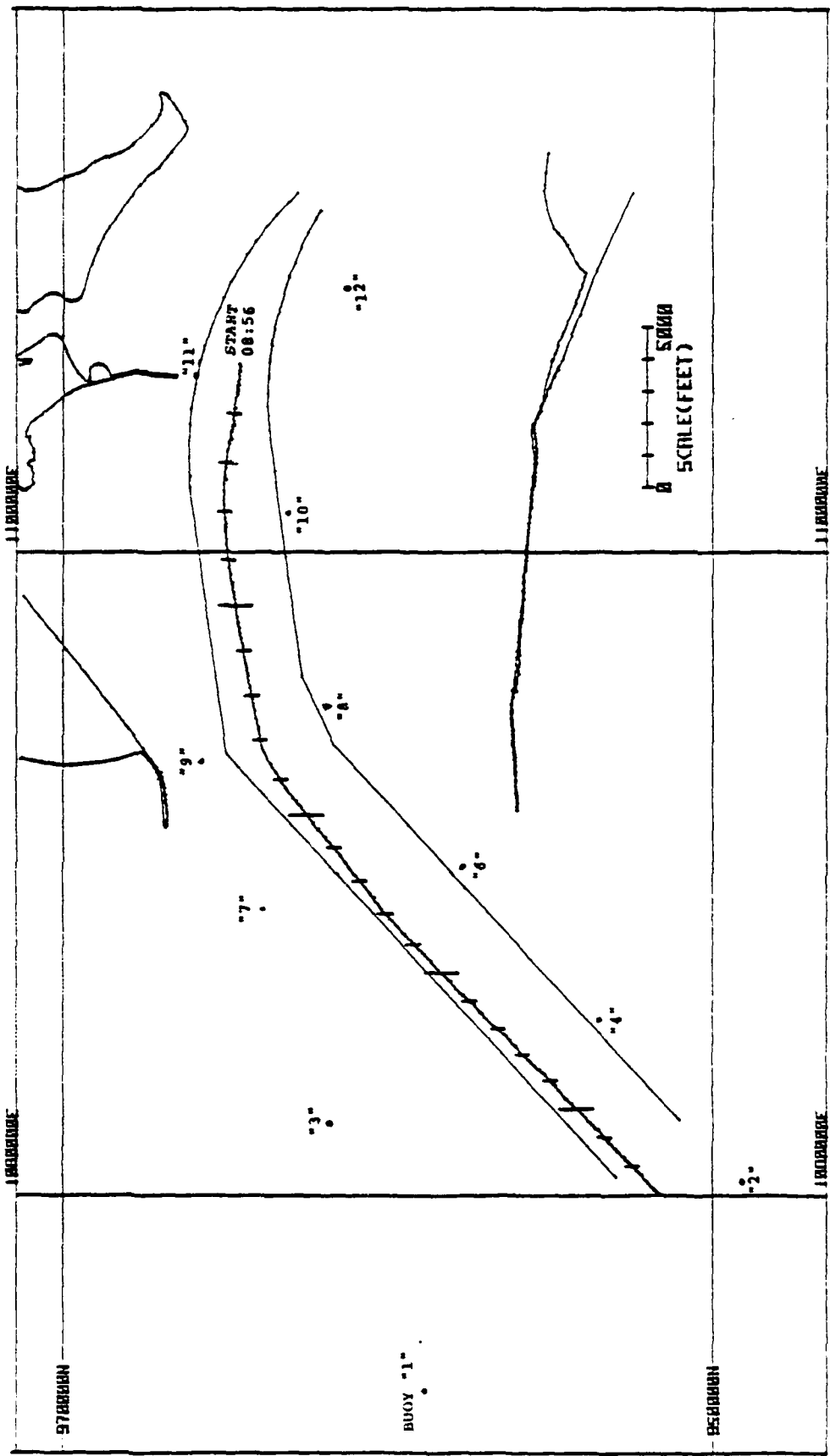
STATISTICAL SUMMARY

VOYAGE NO. 09

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	.4	1.7	.8	.8
ROLL (DEG)	1.0	6.2	2.3	2.6
AO (FT/SEC/SEC)	-.0	5.3	1.8	2.1
HEAVE (FT)	.0	6.6	2.7	3.0
BOW EXCUR. (FT)	.0	13.9	5.9	6.6
STERN EXCUR. (FT)	.0	10.1	3.6	4.1
SIDE EXCUR (FT)	.0	7.3	2.7	3.0

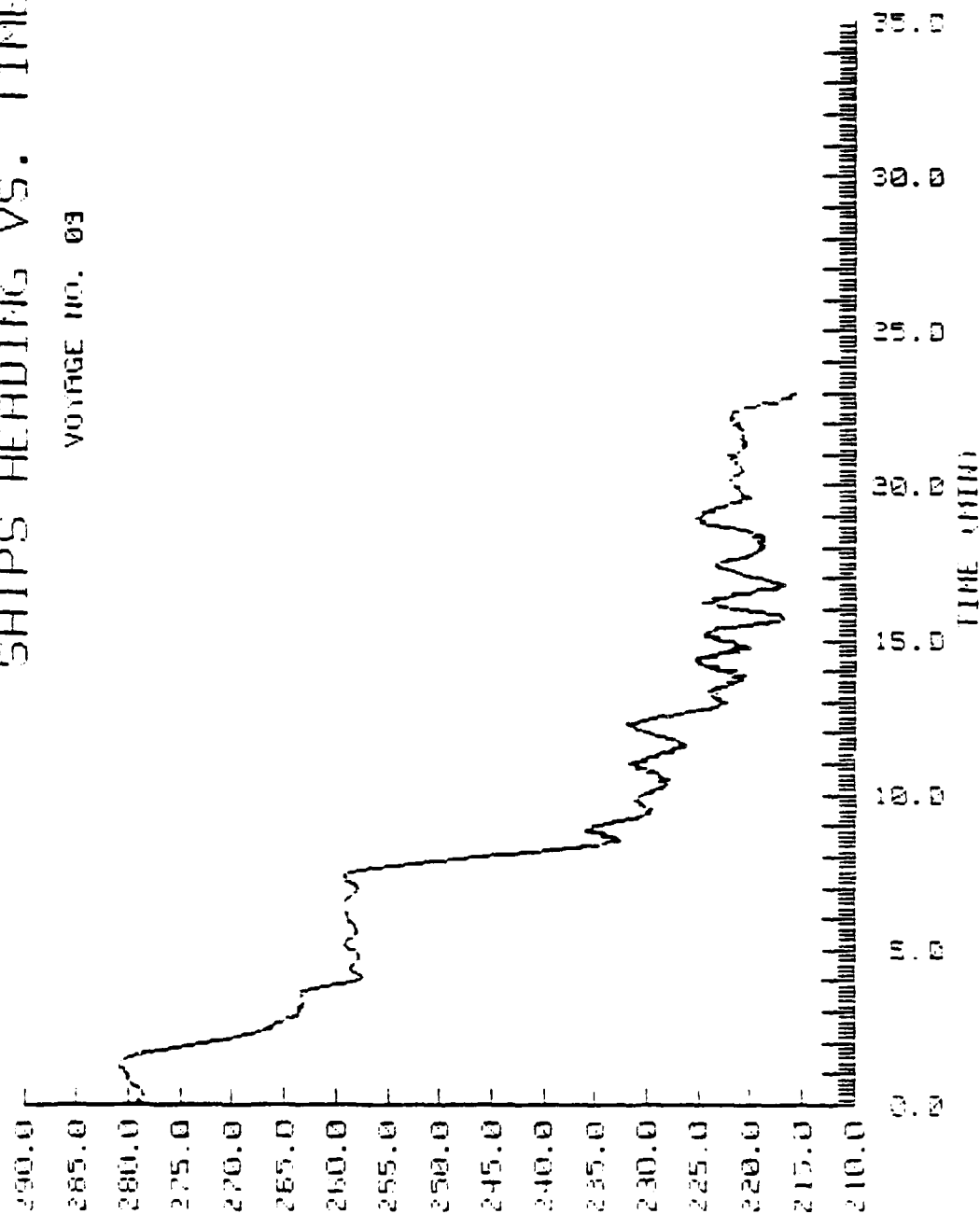
VOYAGE NO. 09 SHIP TRACK

SCALE 1: 30000



SHIPS HEADING VS. TIME

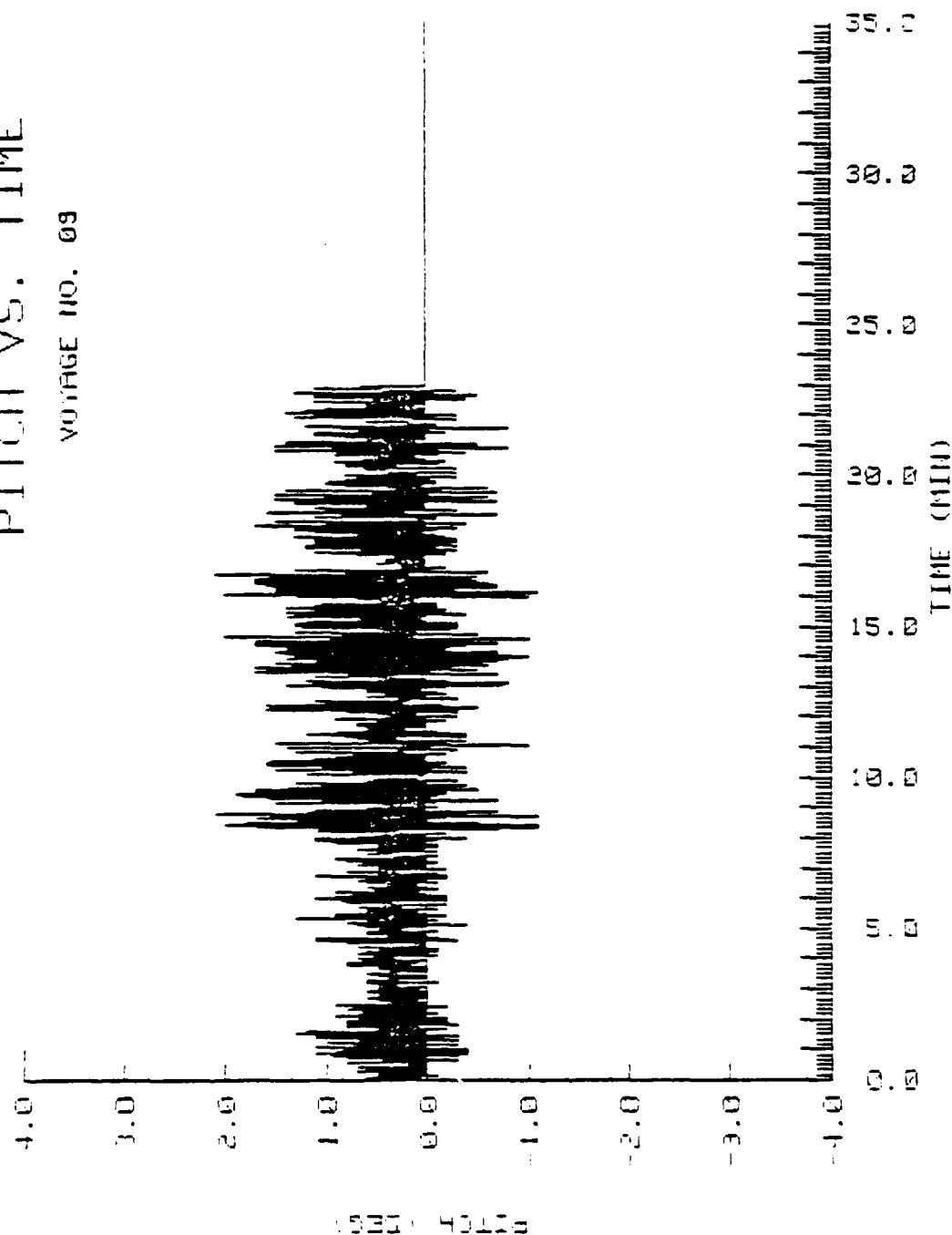
VOYAGE NO. 003



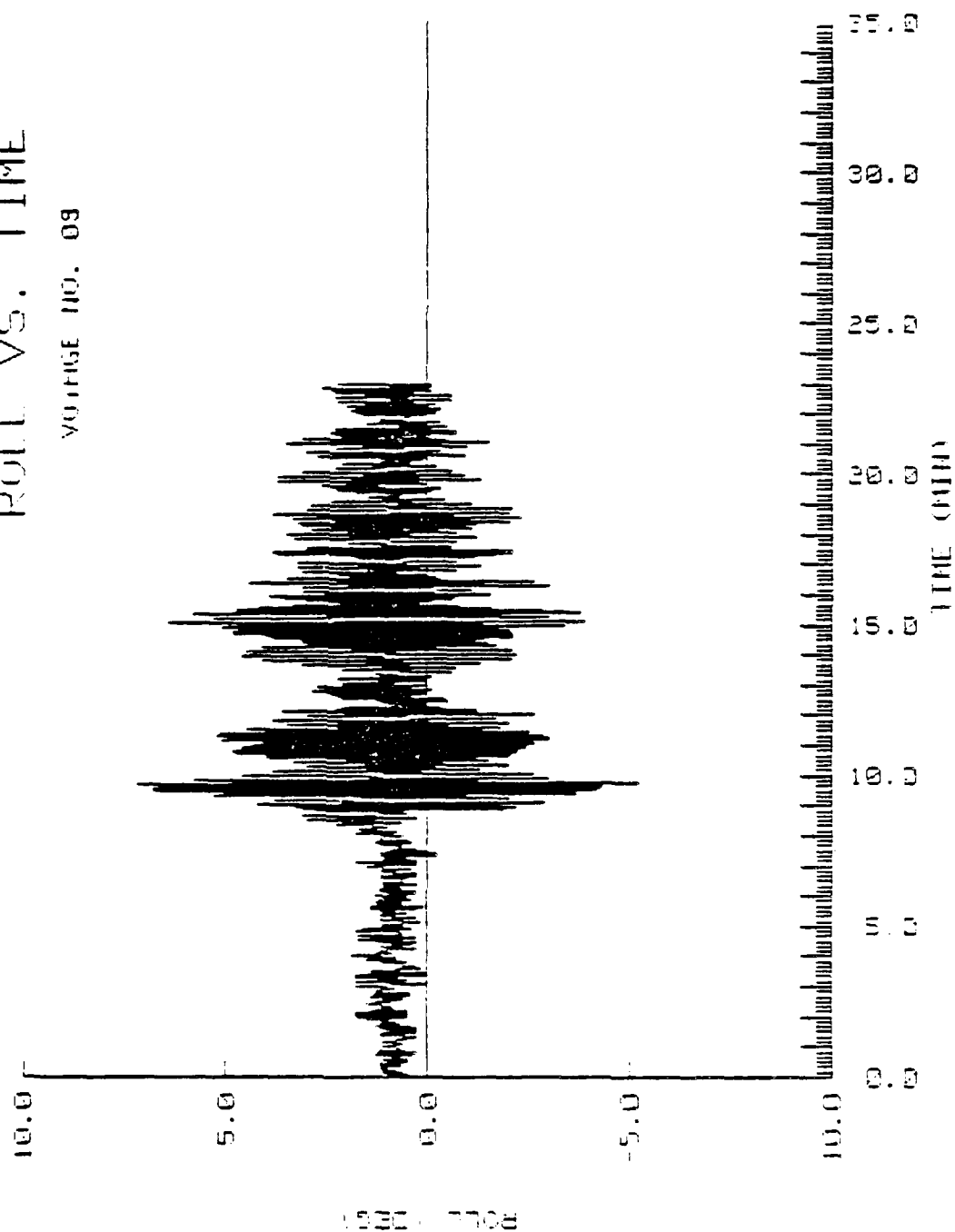
SHIP'S REPORTS

PITCH VS. TIME

VOLTAGE NO. 09

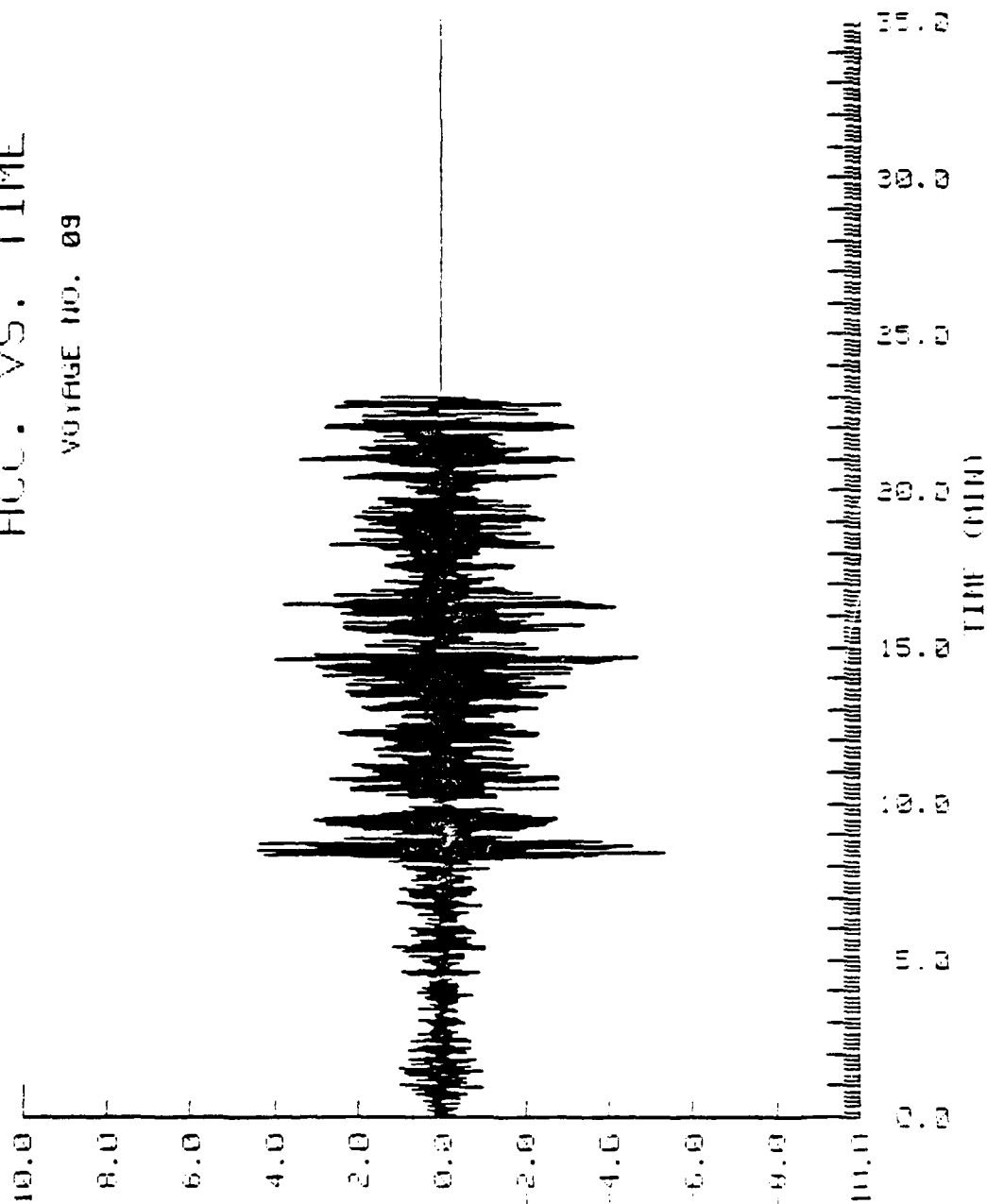


ROLL VS. TIME
VOYAGE NO. 08



ACC. VS. TIME

VOLUME NO. 09



ACC. VS. TIME

AD-A090 904

TETRA TECH INC PASADENA CA

F/6 13/10

COLUMBIA RIVER ENTRANCE CHANNEL DEEP-DRAFT VESSEL MOTION STUDY.—ETC(U)

SEP 80 S WANG, M KIMBLE, C BUTCHER, G D COX

DACW57-78-C-0028

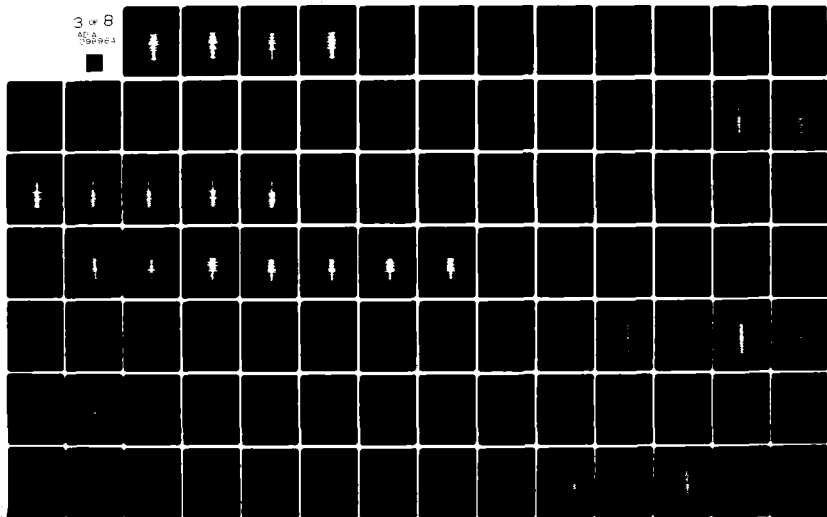
UNCLASSIFIED

TETRAT-TC-3925-APP-A(1)

NL

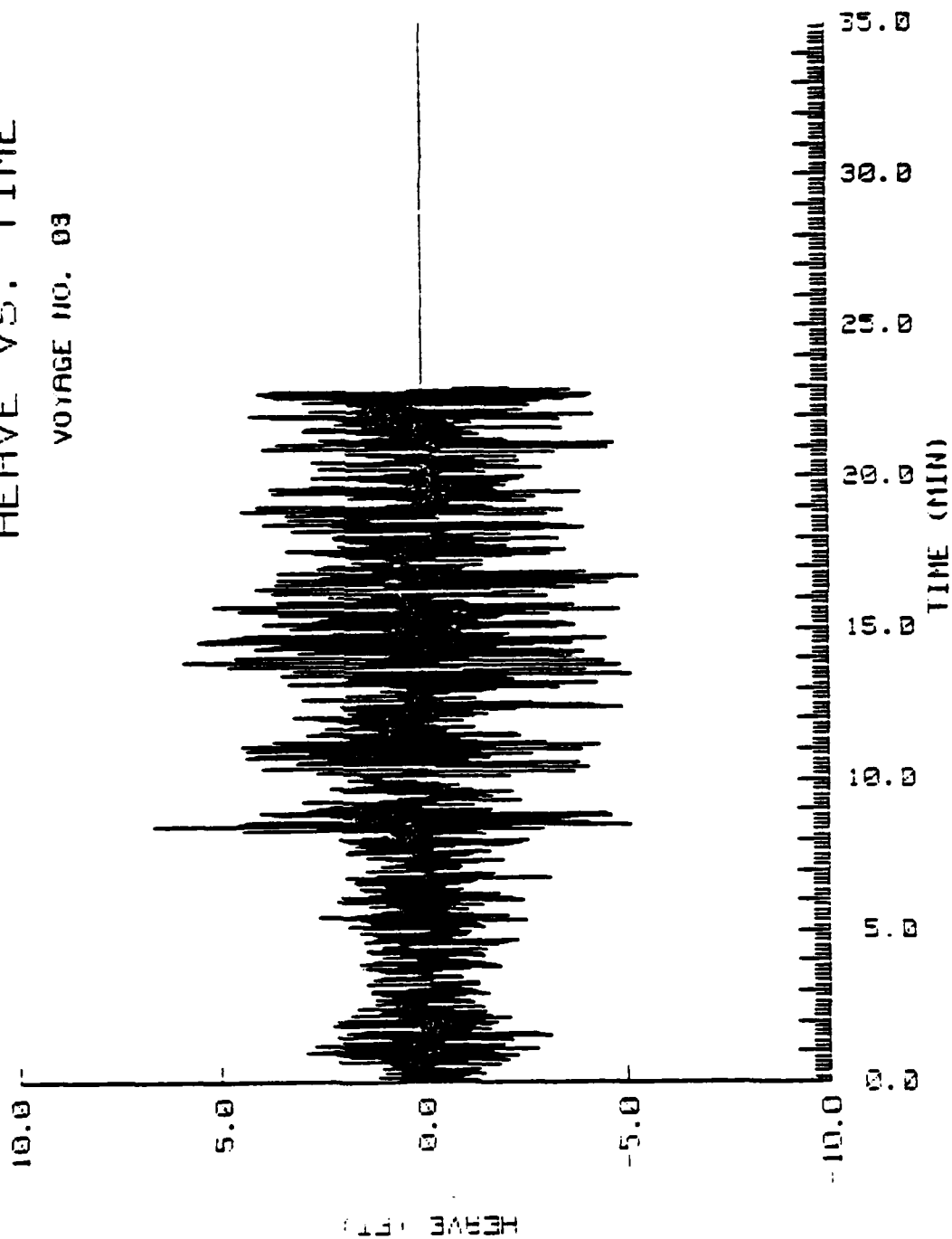
3 of 8

AE 8.0
796 p.4



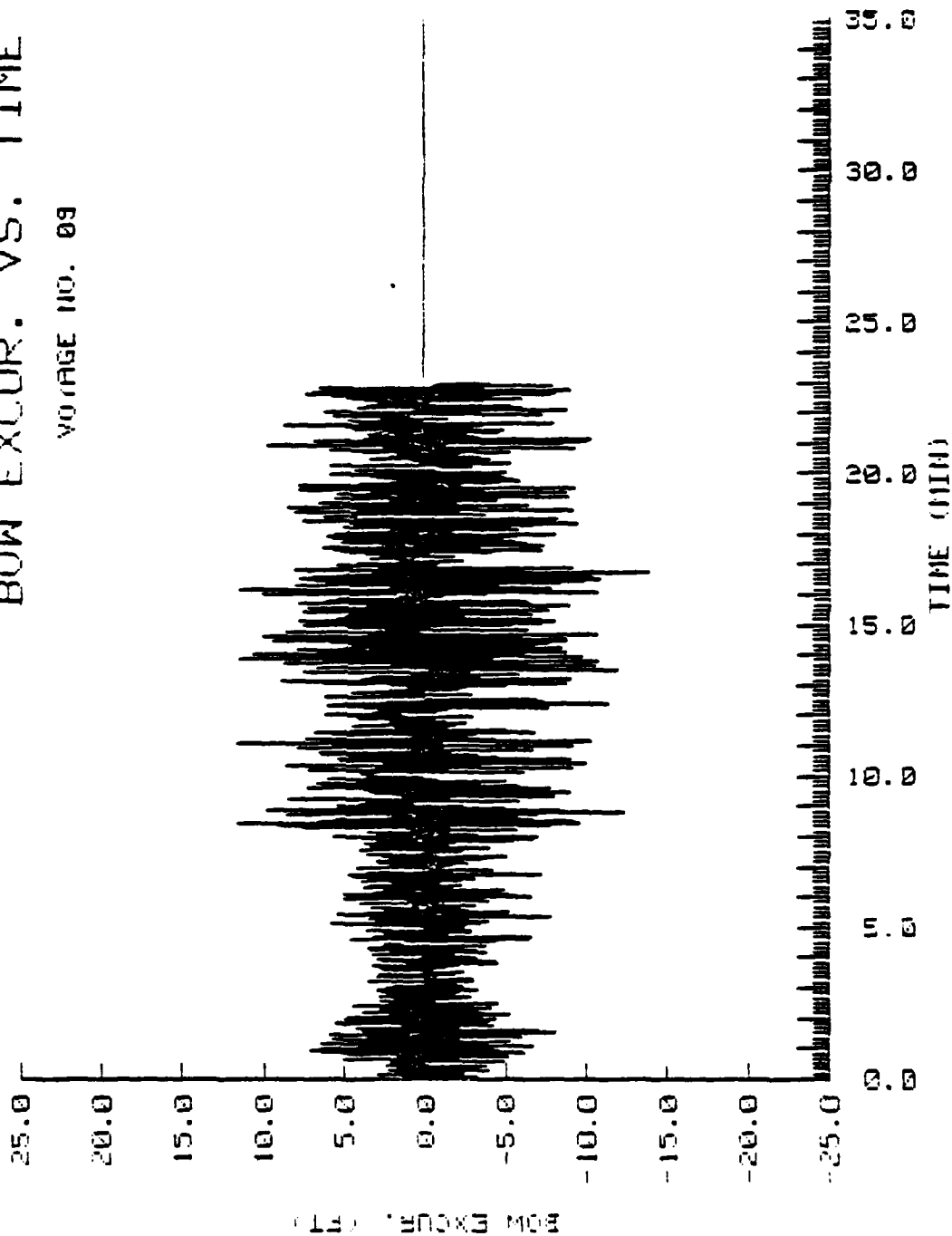
HEAVE VS. TIME

VOYAGE NO. 03



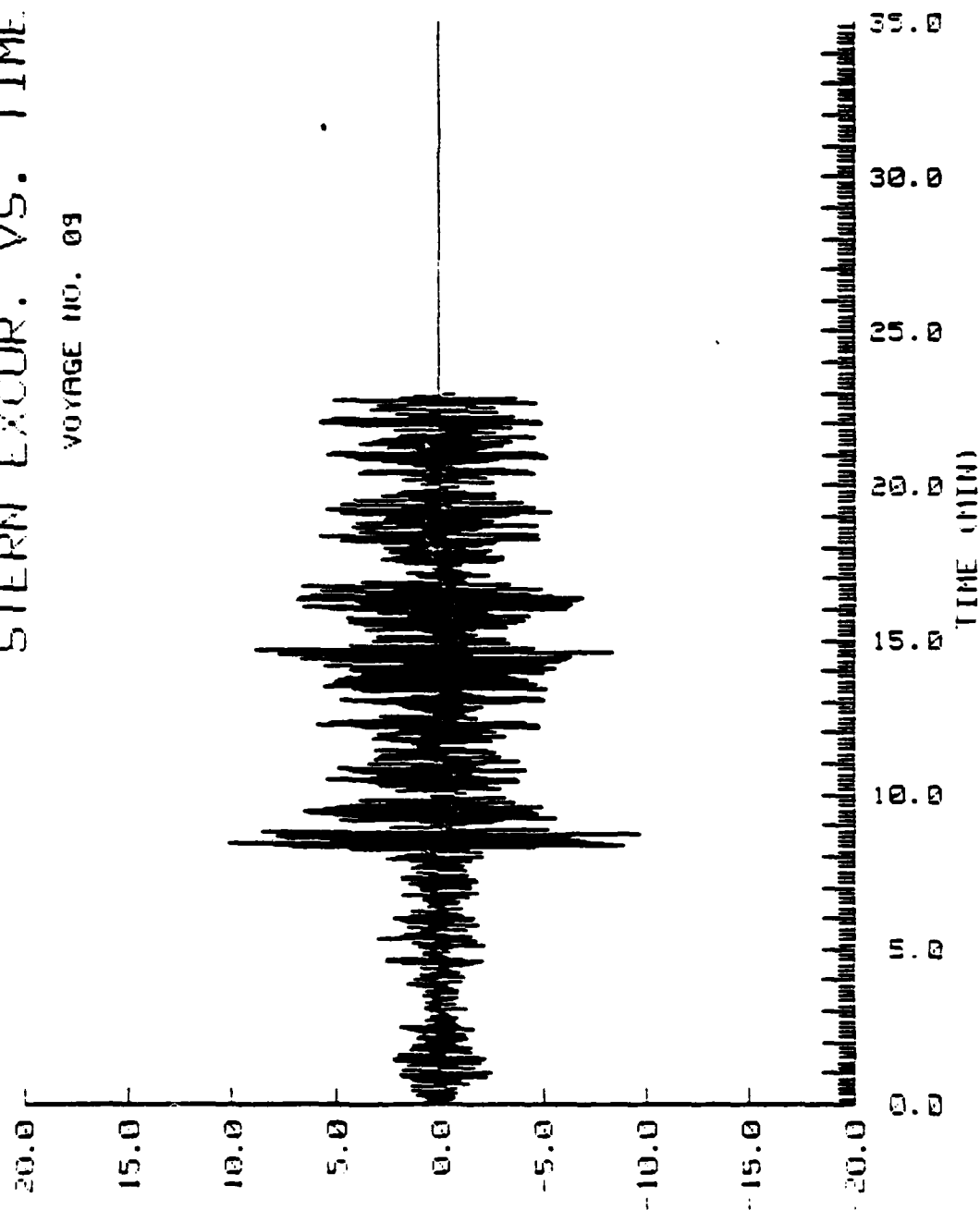
BOW EXCUR. VS. TIME

VOLAGE NO. 09

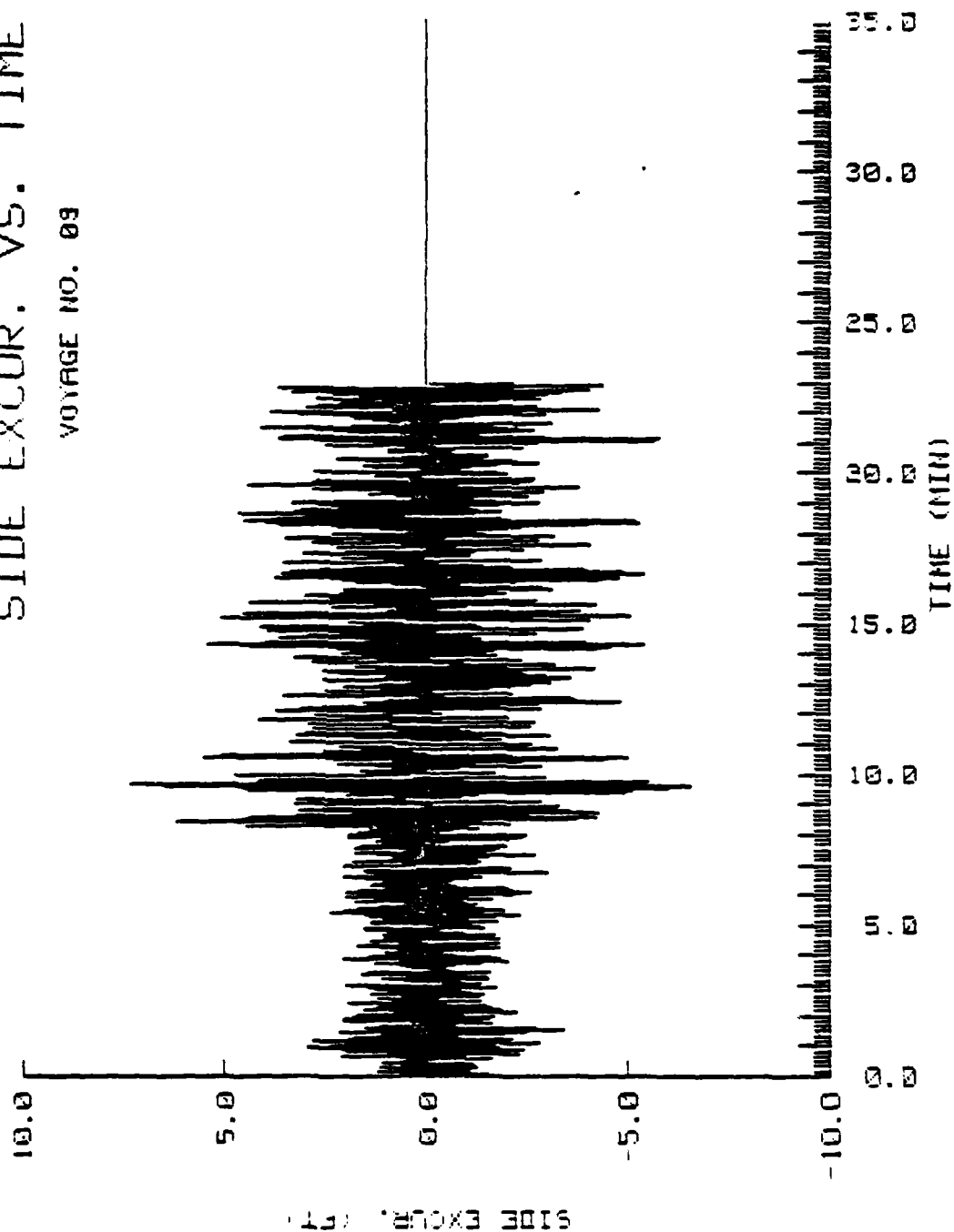


STERN EXCUR. VS. TIME

VOYAGE NO. 09

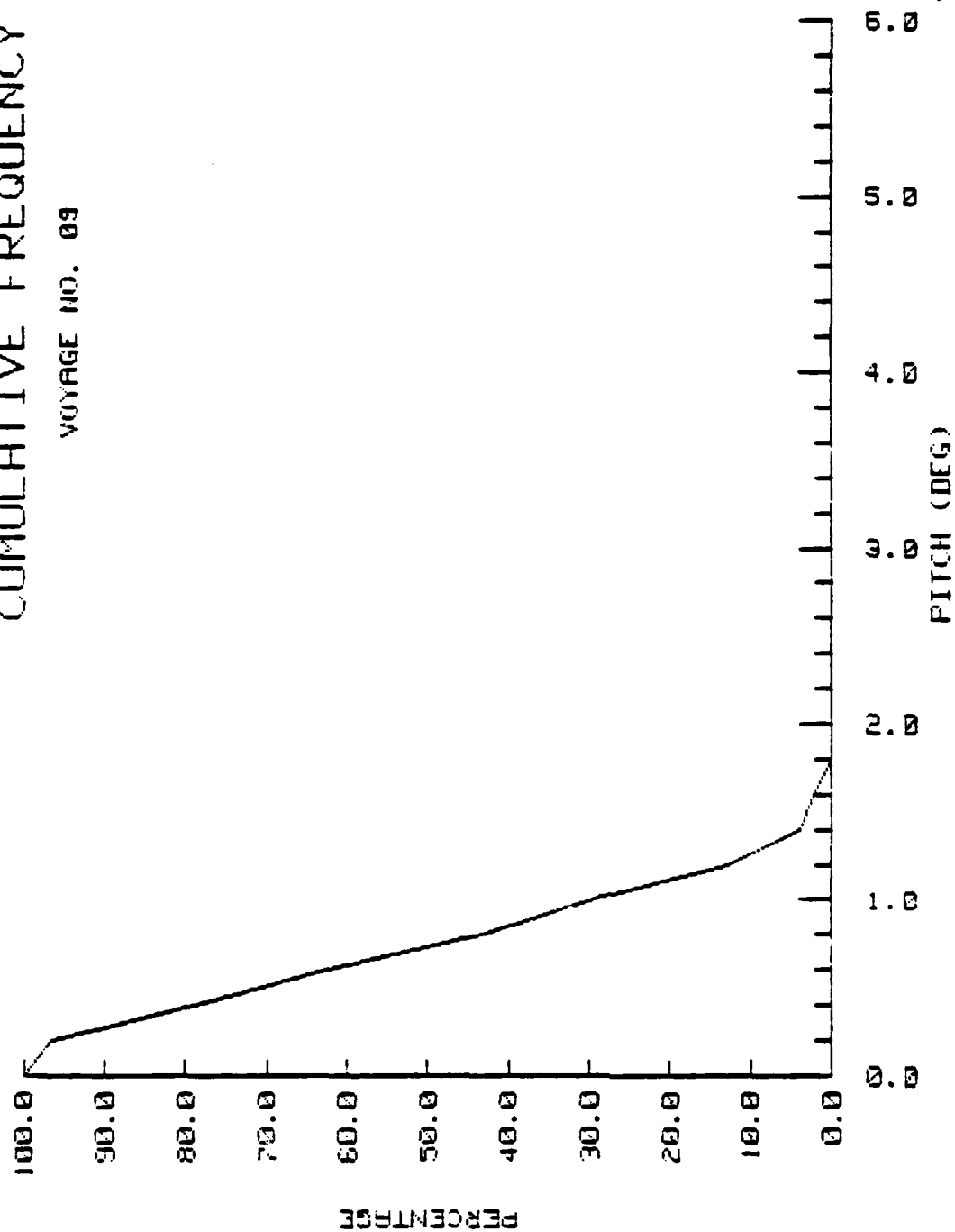


SIDE EXCUR. VS. TIME
VOYAGE NO. 09



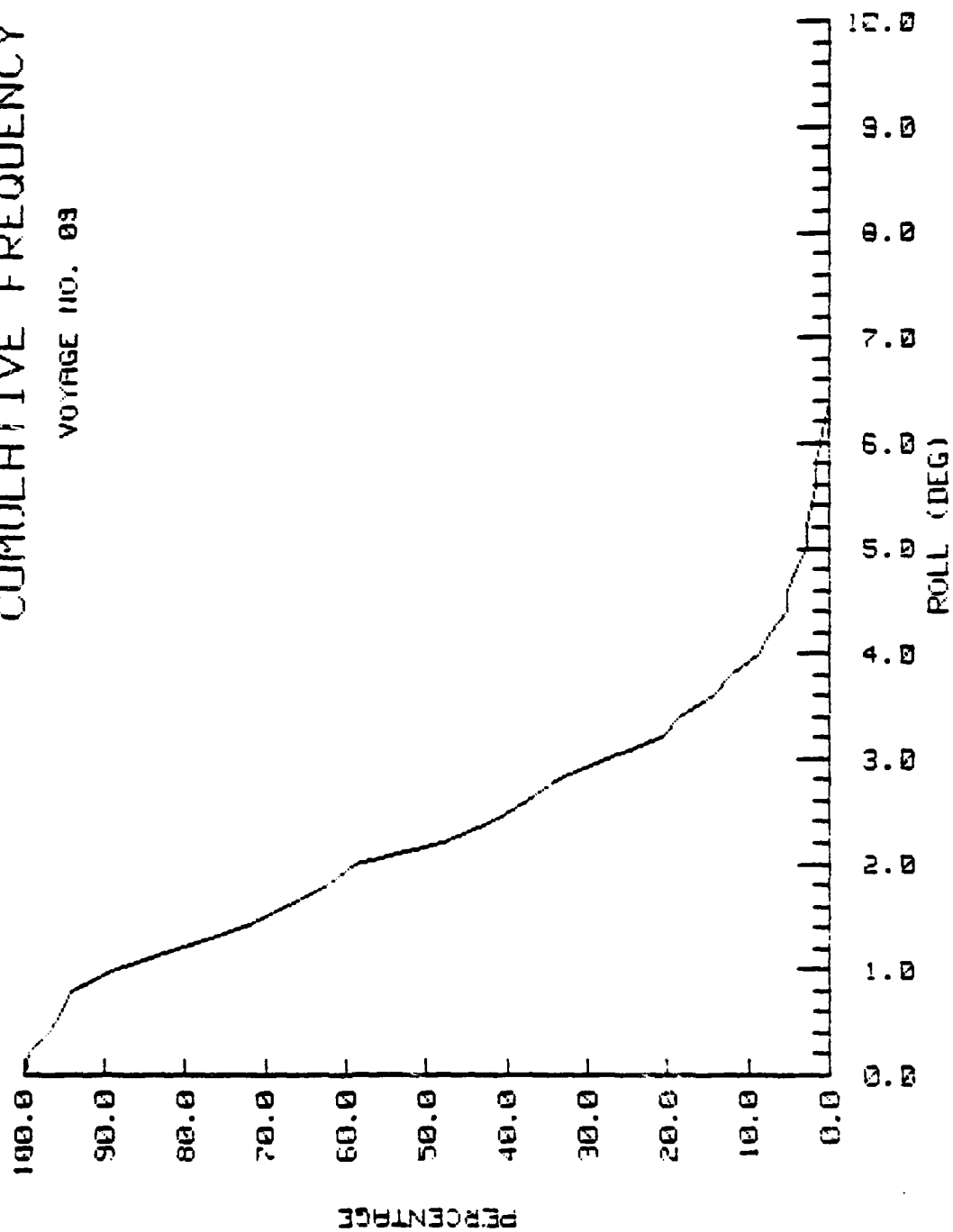
CUMULATIVE FREQUENCY

VOYAGE NO. 09



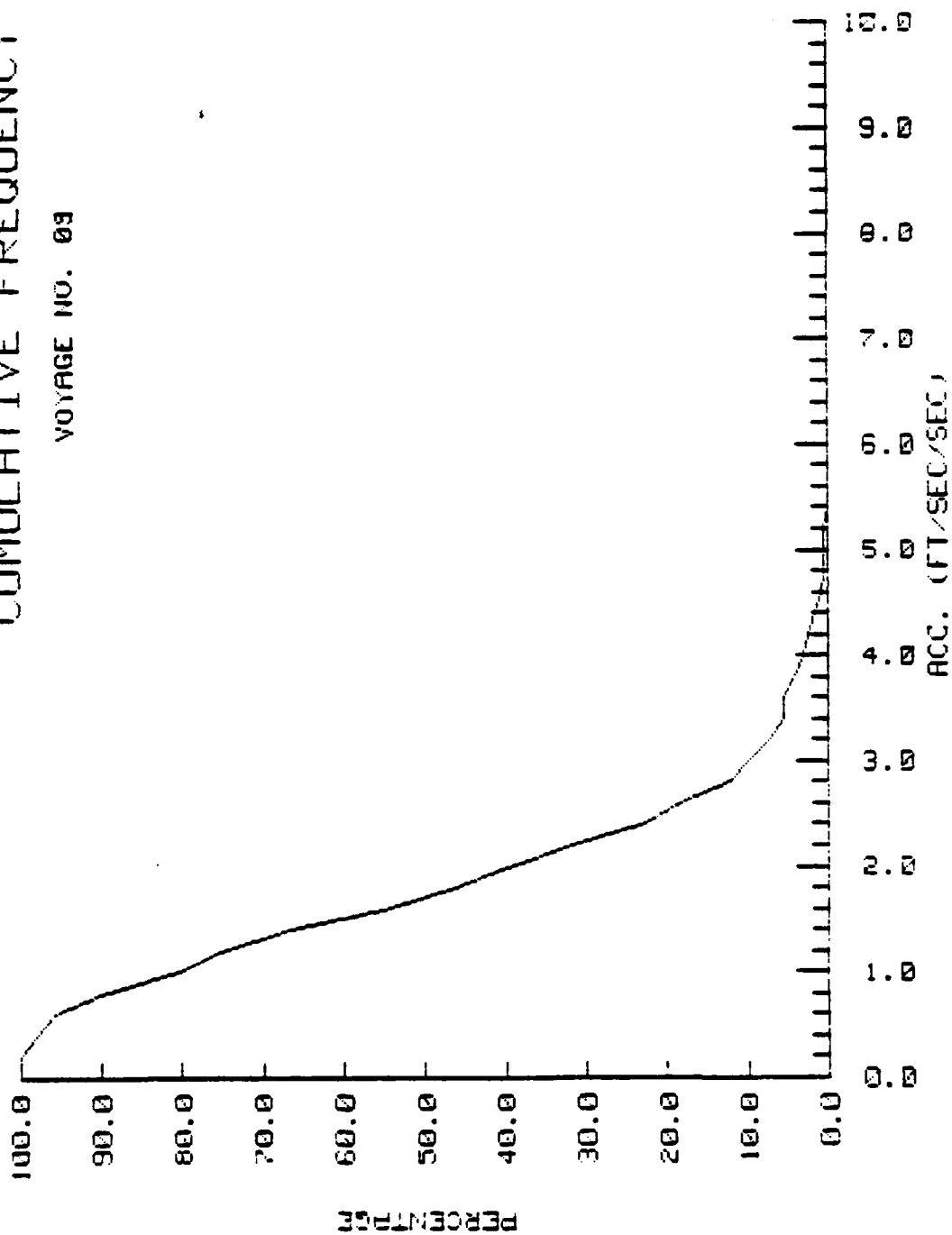
CUMULATIVE FREQUENCY

VOYAGE NO. 03



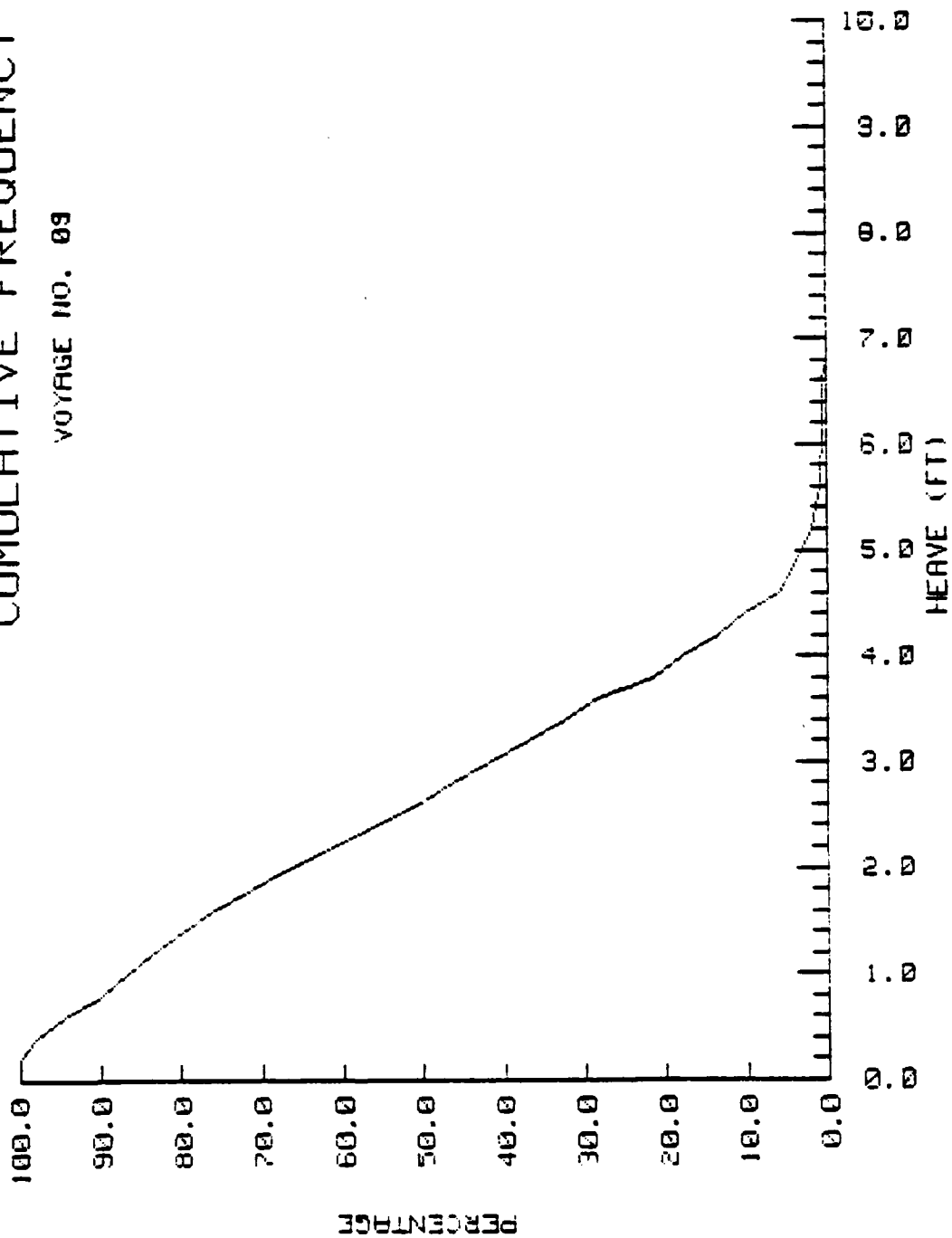
CUMULATIVE FREQUENCY

VOYAGE NO. 03



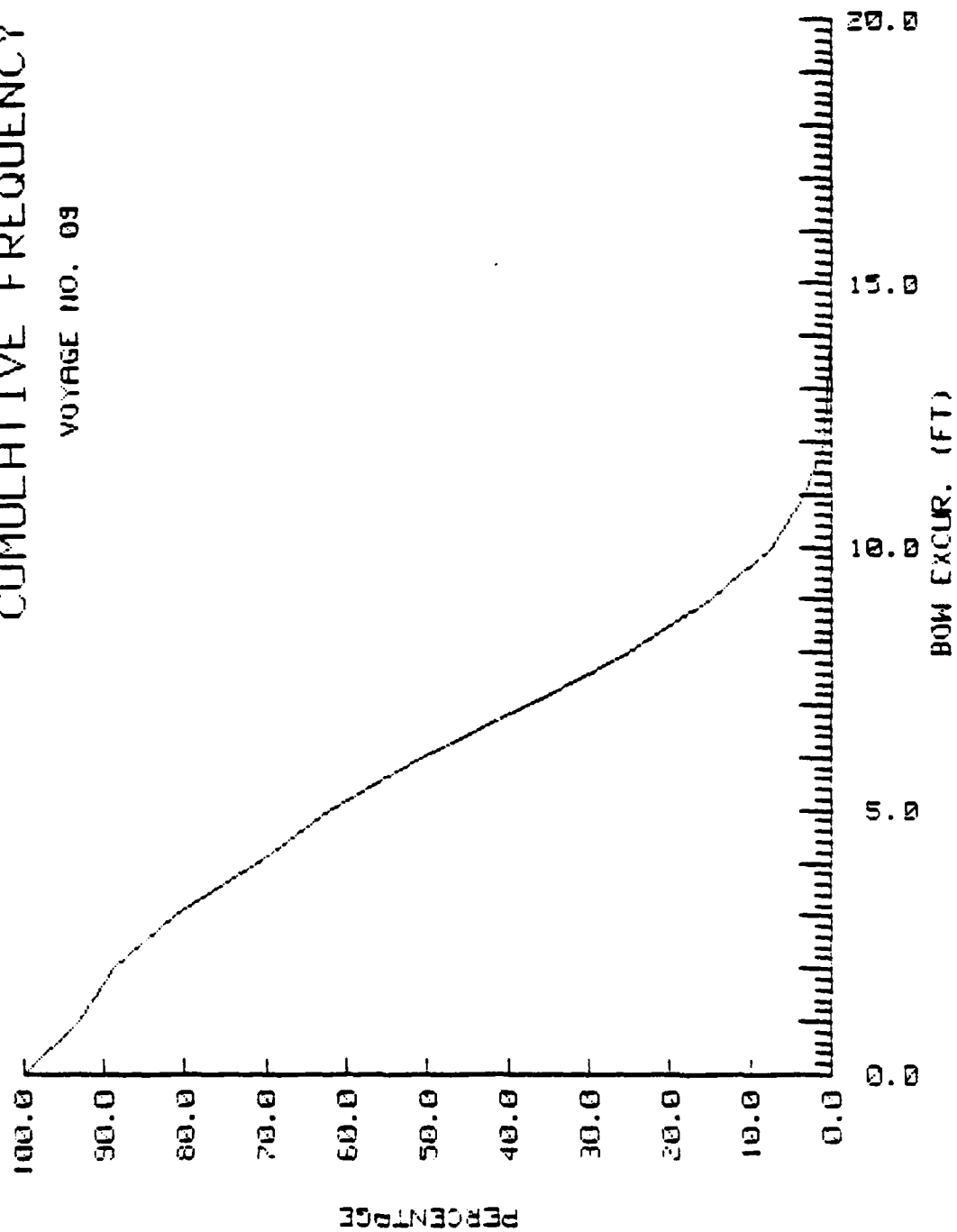
CUMULATIVE FREQUENCY

VOYAGE NO. 09



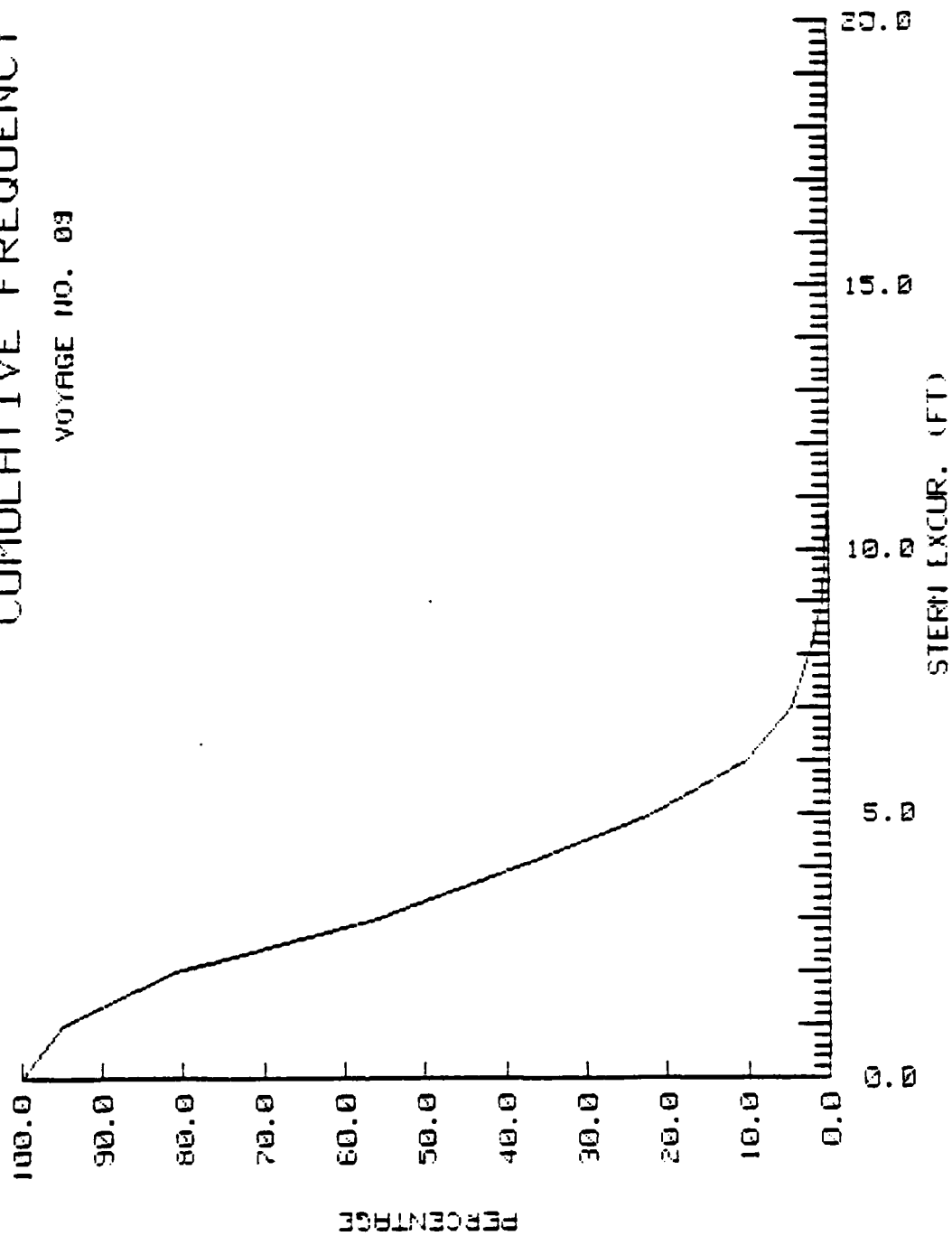
CUMULATIVE FREQUENCY

VOYAGE NO. 03



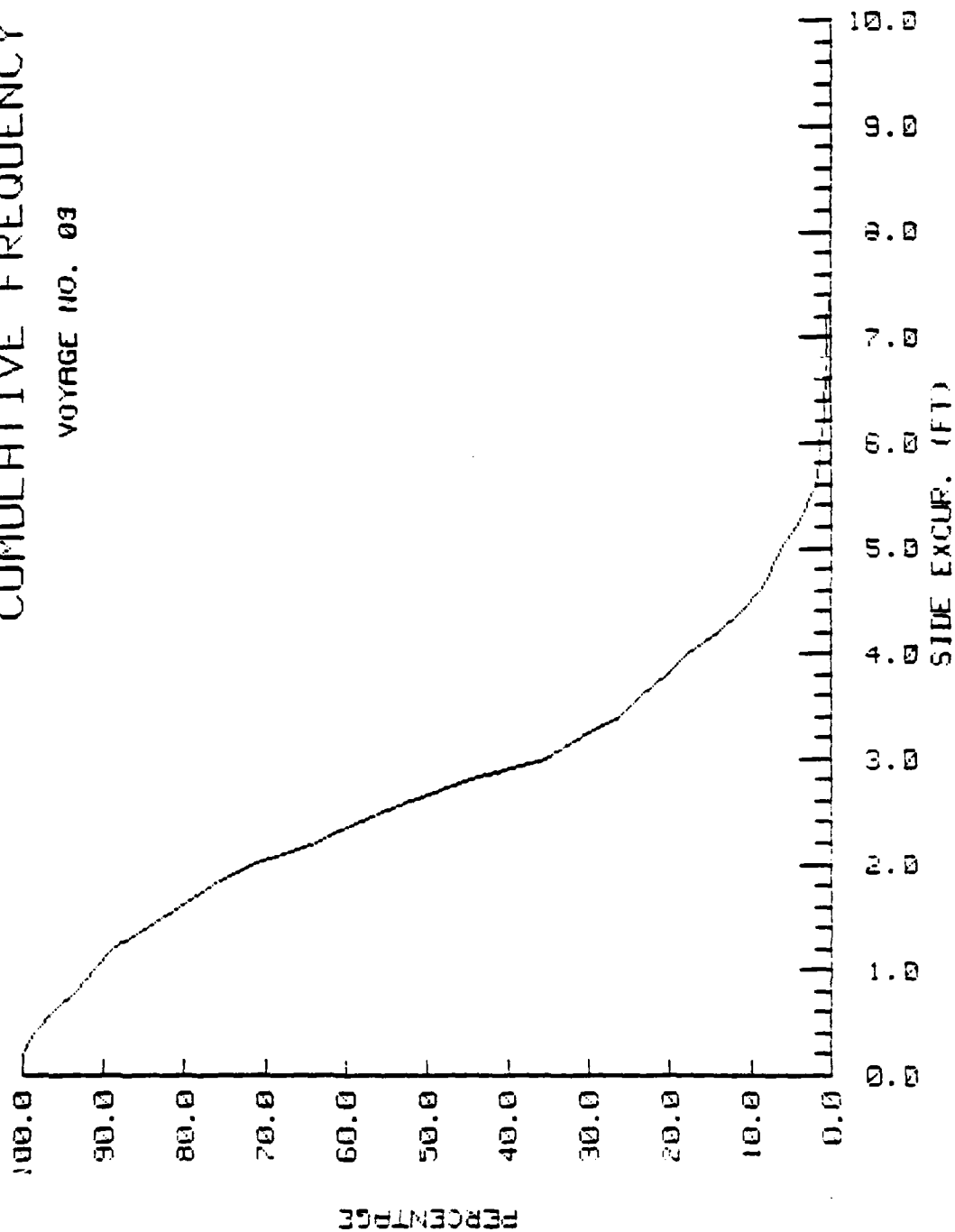
CUMULATIVE FREQUENCY

VOYAGE NO. 03



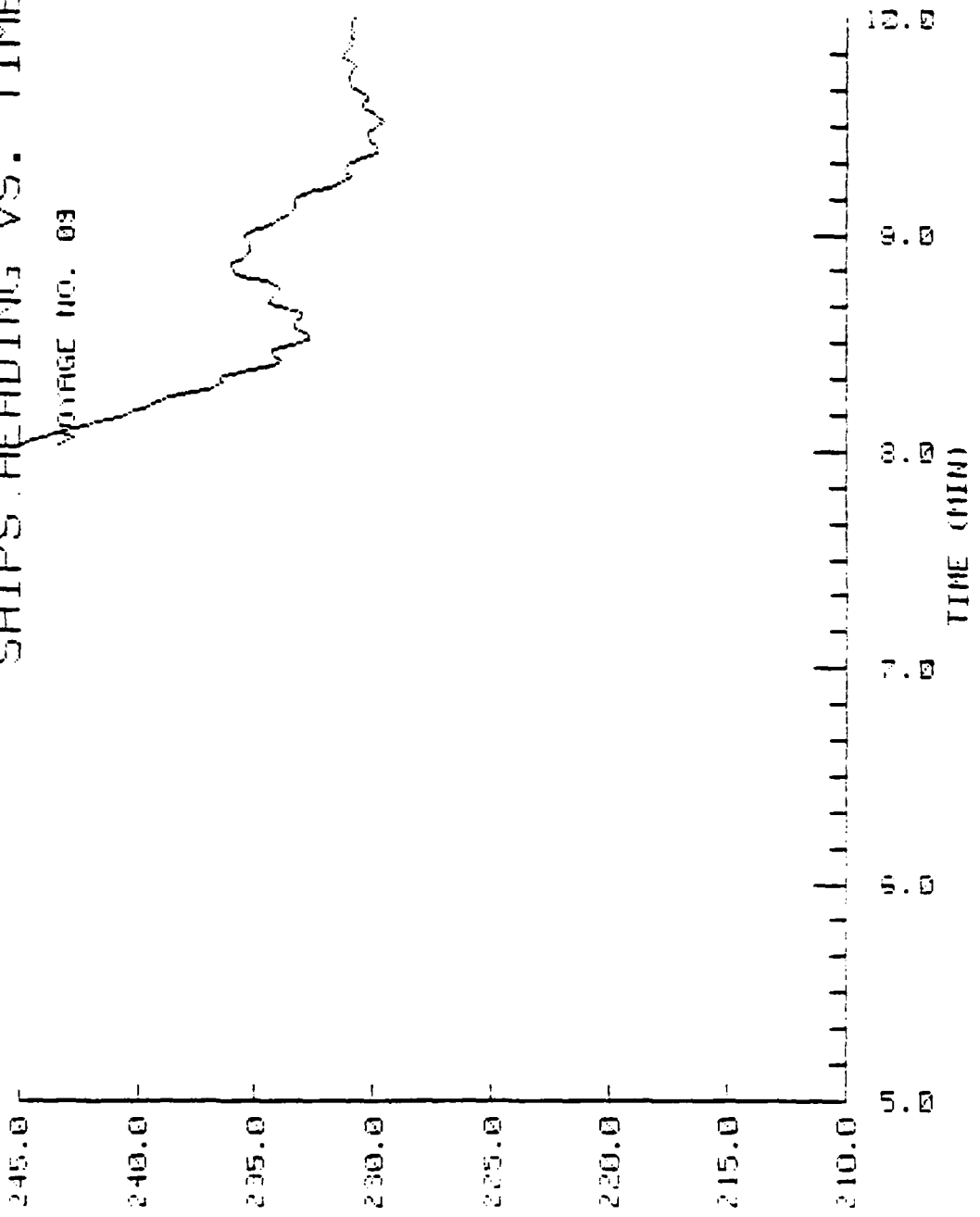
CUMULATIVE FREQUENCY

VOYAGE NO. 03



SHIPS HEADING VS. TIME

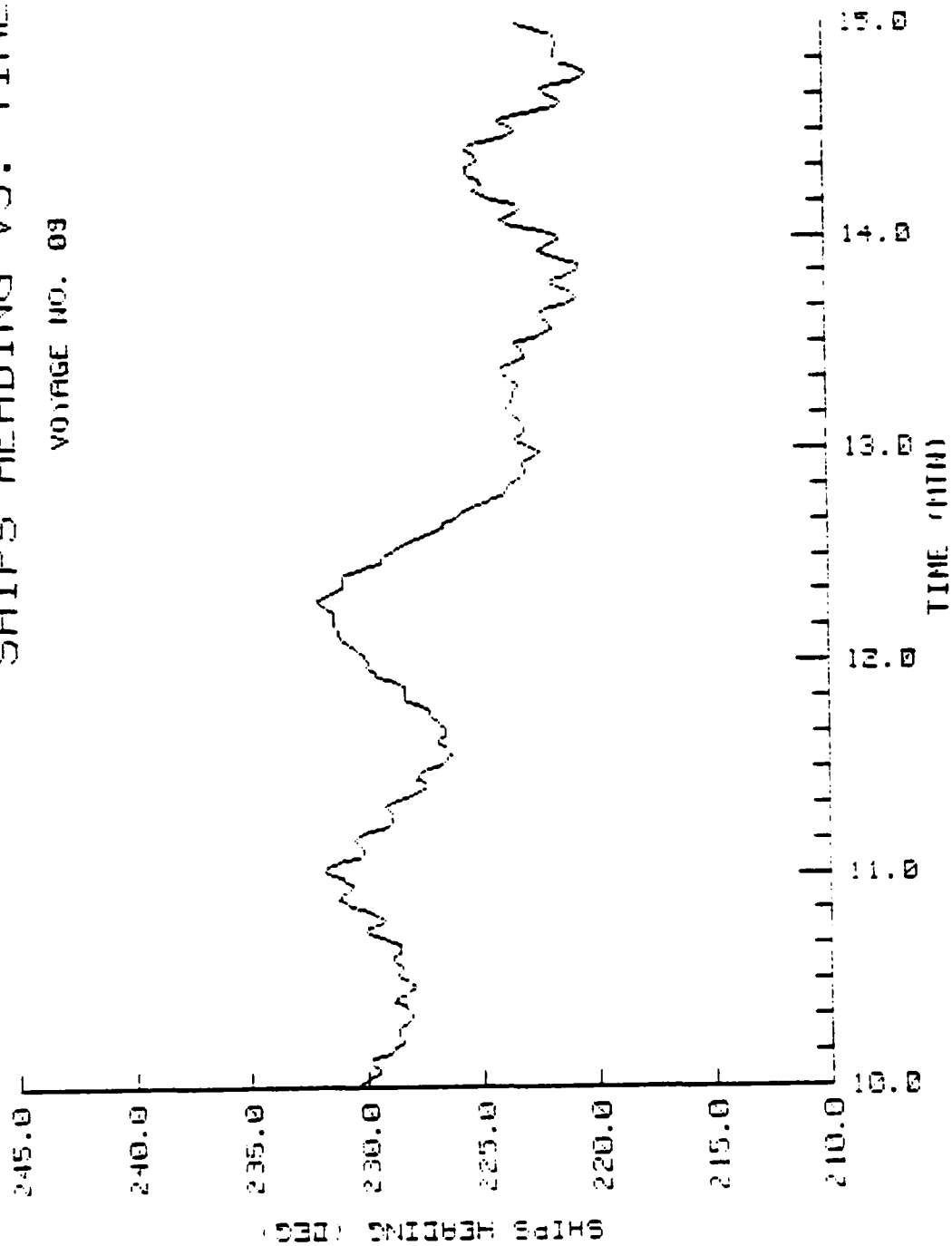
VOYAGE NO. 03



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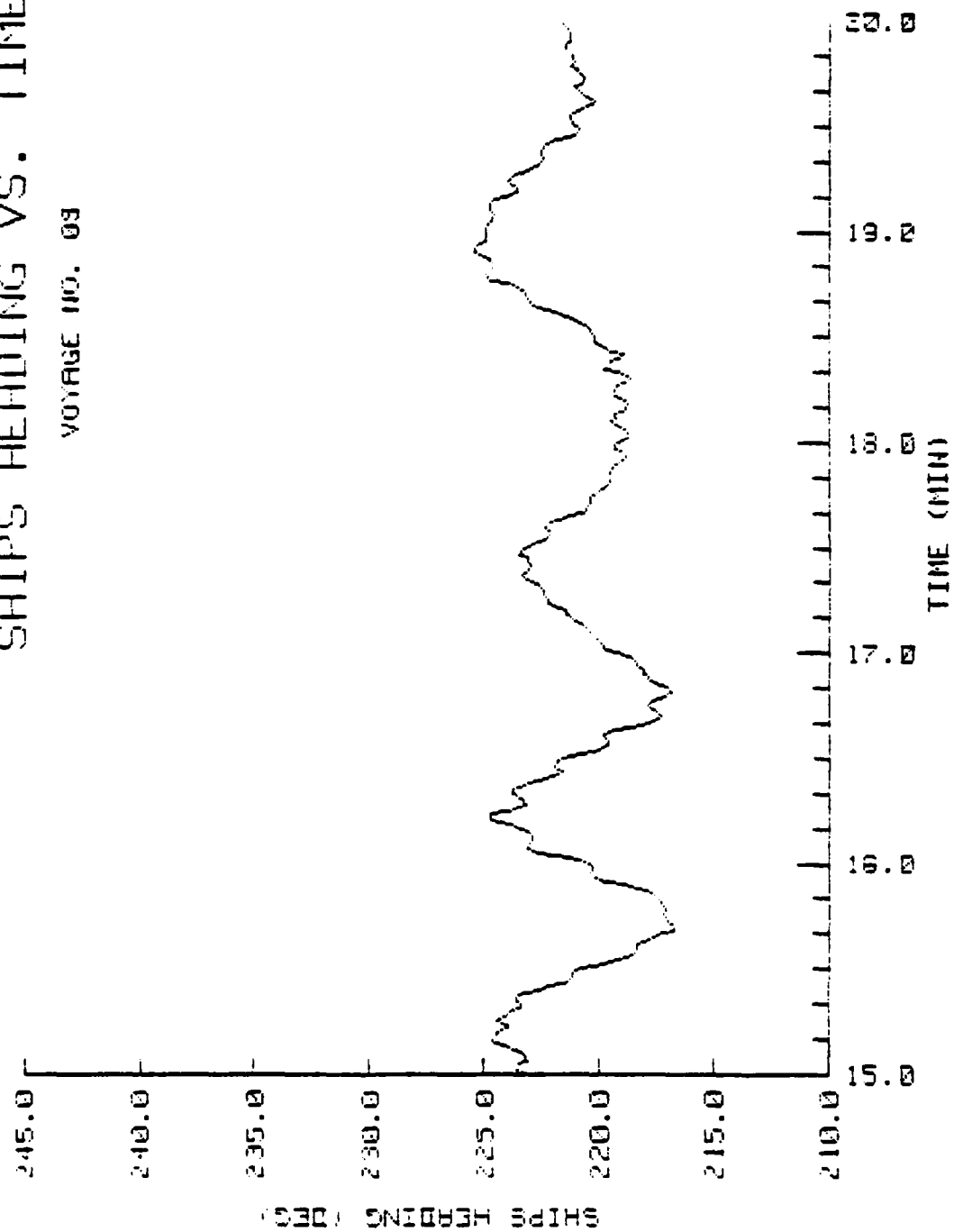
SHIPS HEADING VS. TIME

VOYAGE NO. 09



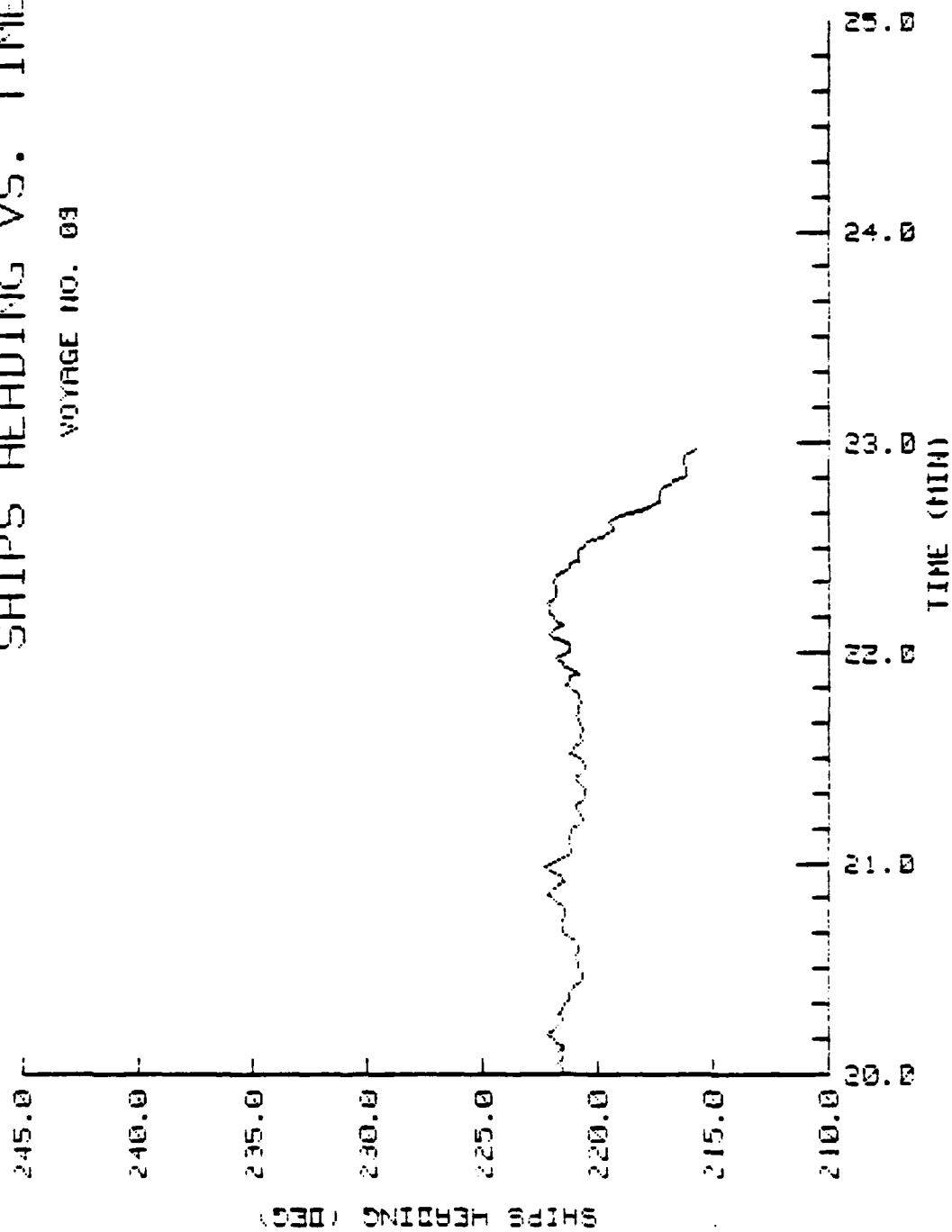
SHIPS HEADING VS. TIME

VOYAGE NO. 03



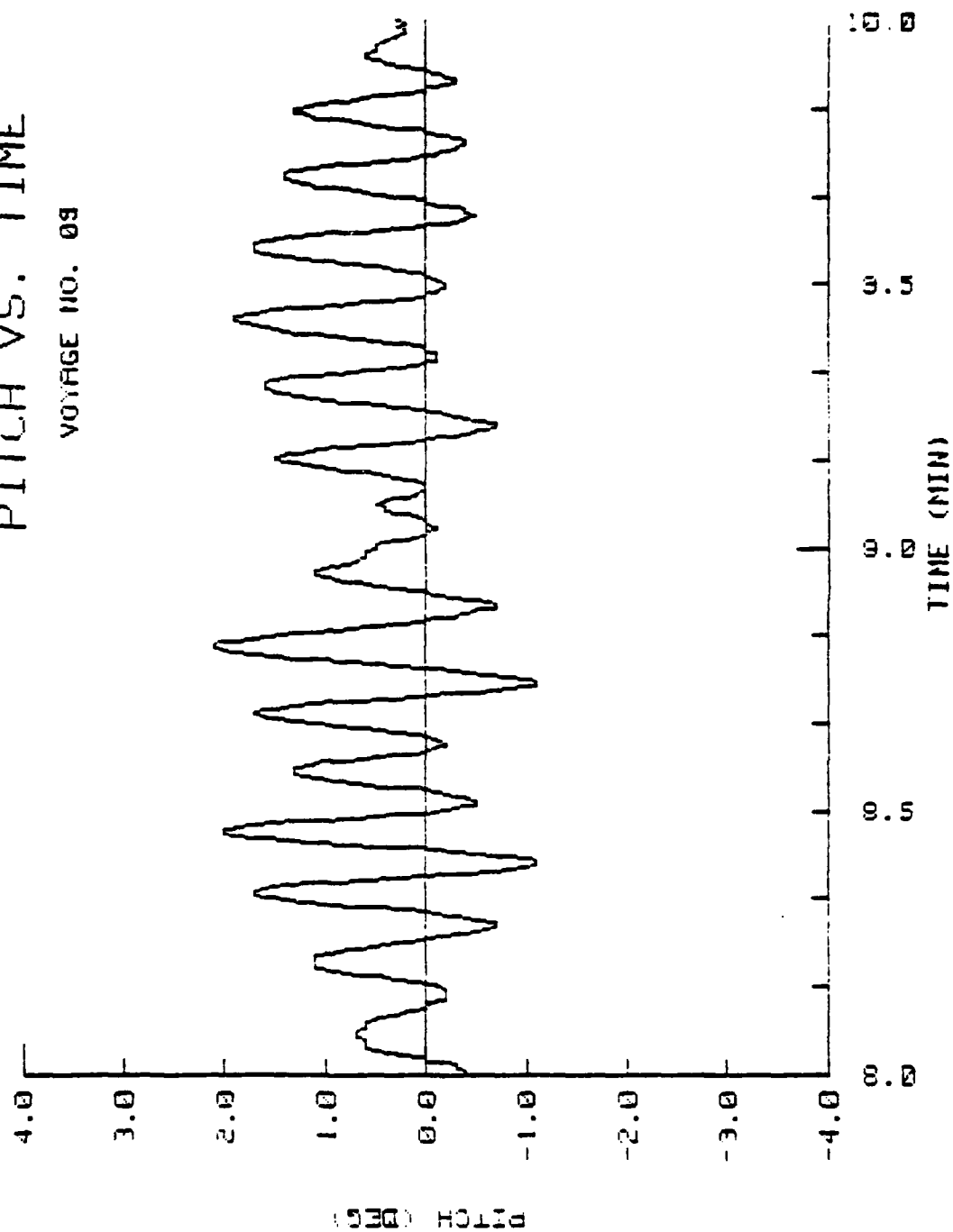
SHIPS HEADING VS. TIME

VOYAGE NO. 03



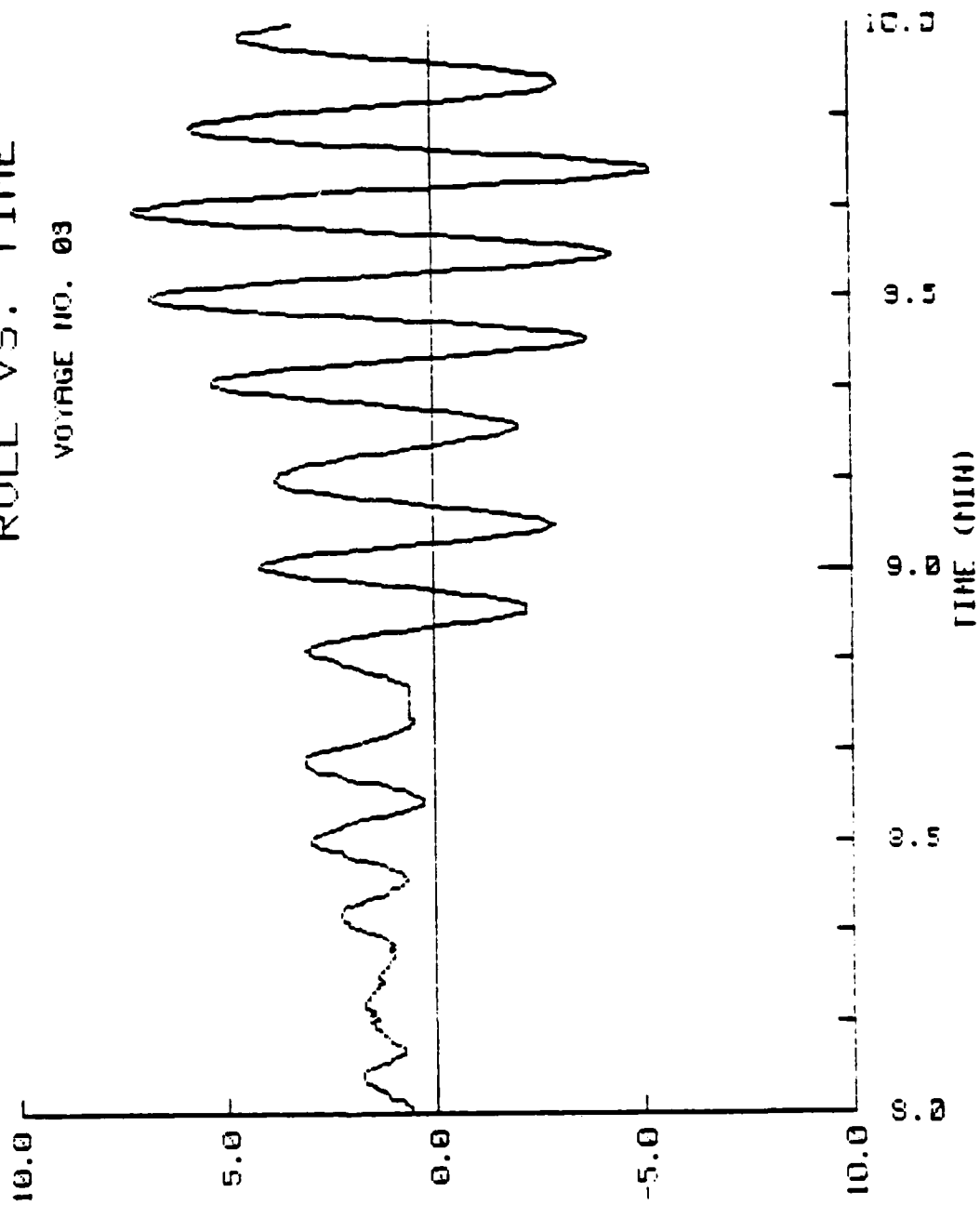
PITCH VS. TIME

VOLTAJE NO. 09



ROLL VS. TIME

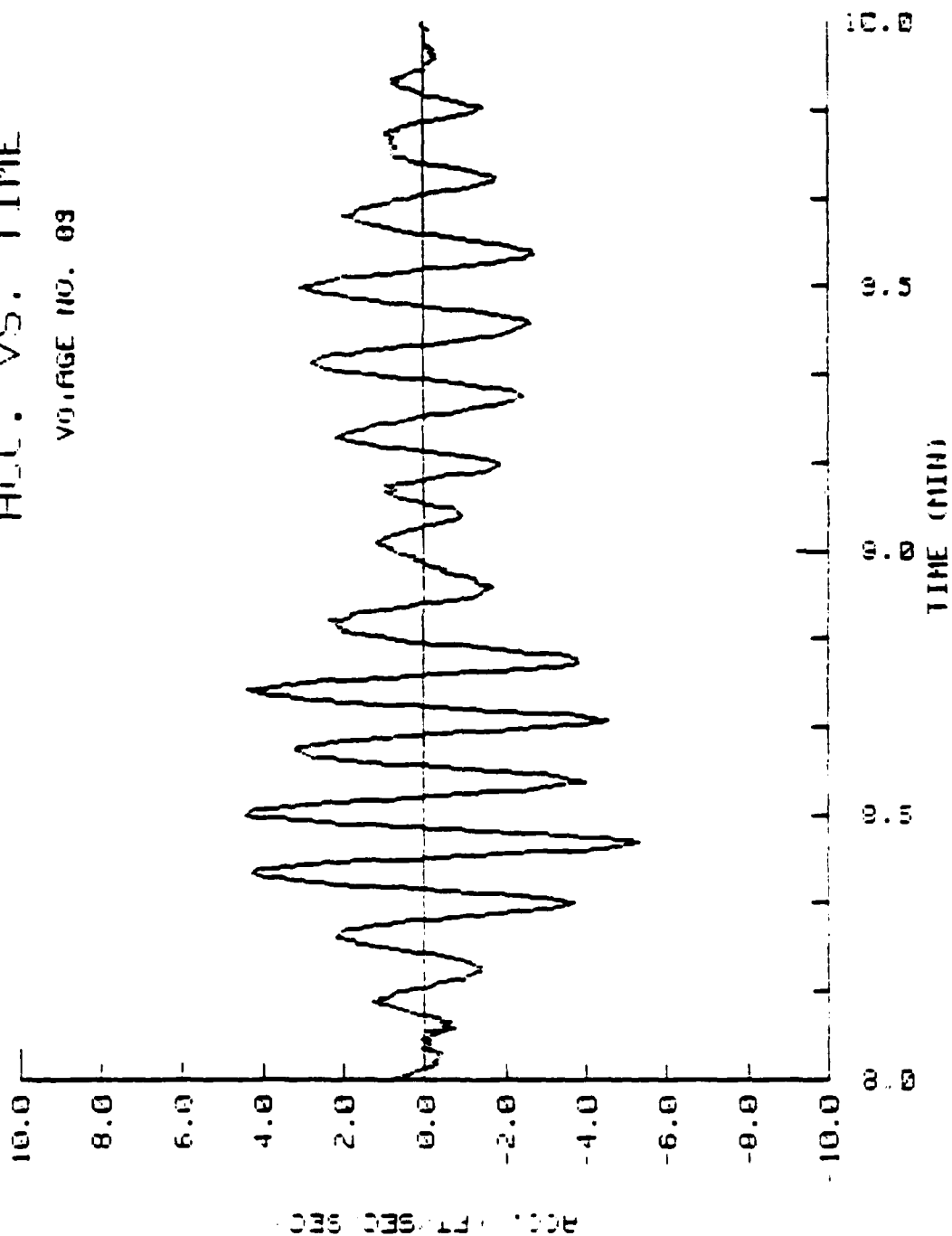
VOYAGE NO. 03



ROLL (DEG)

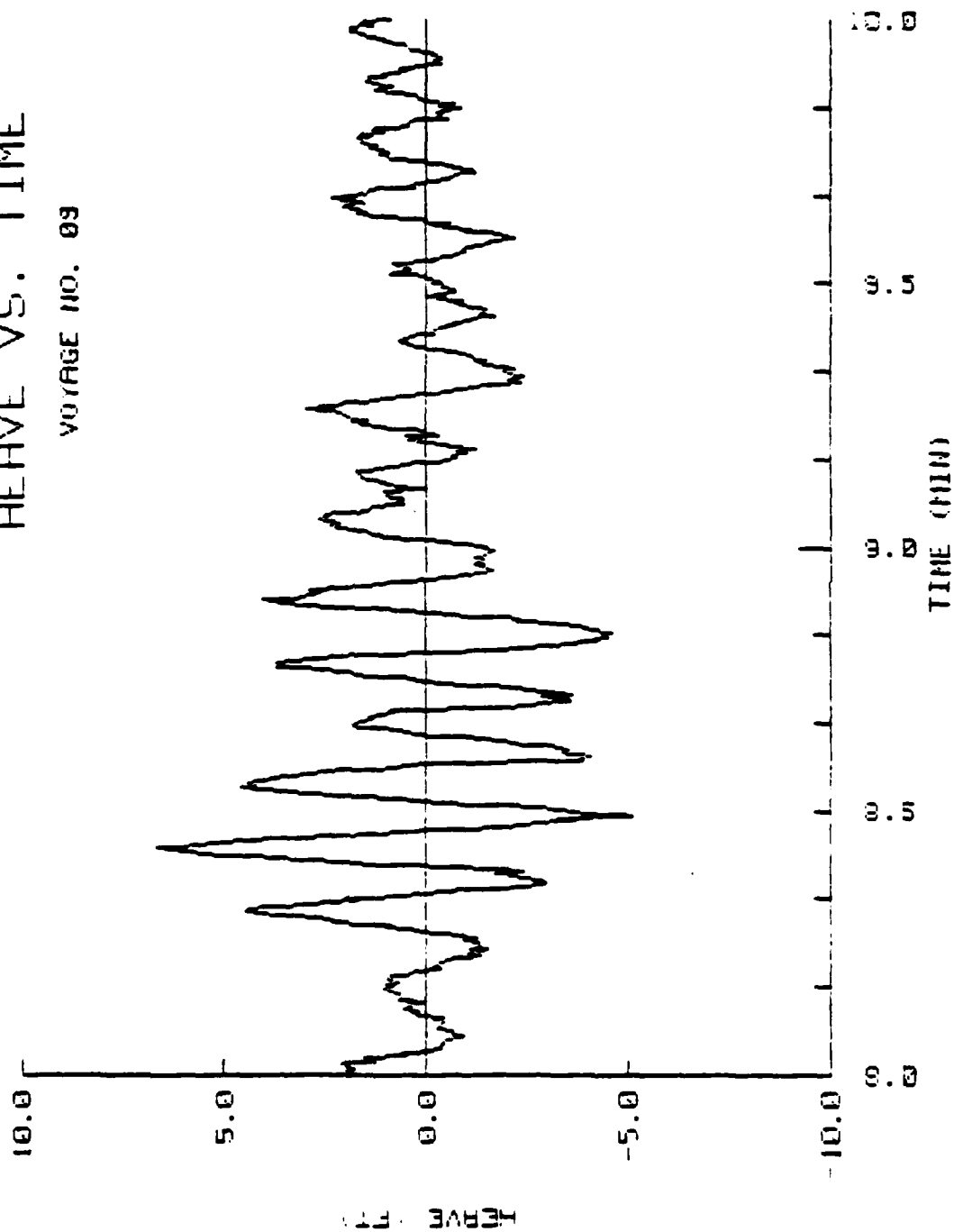
ACC. VS. TIME

VOLAGE NO. 03



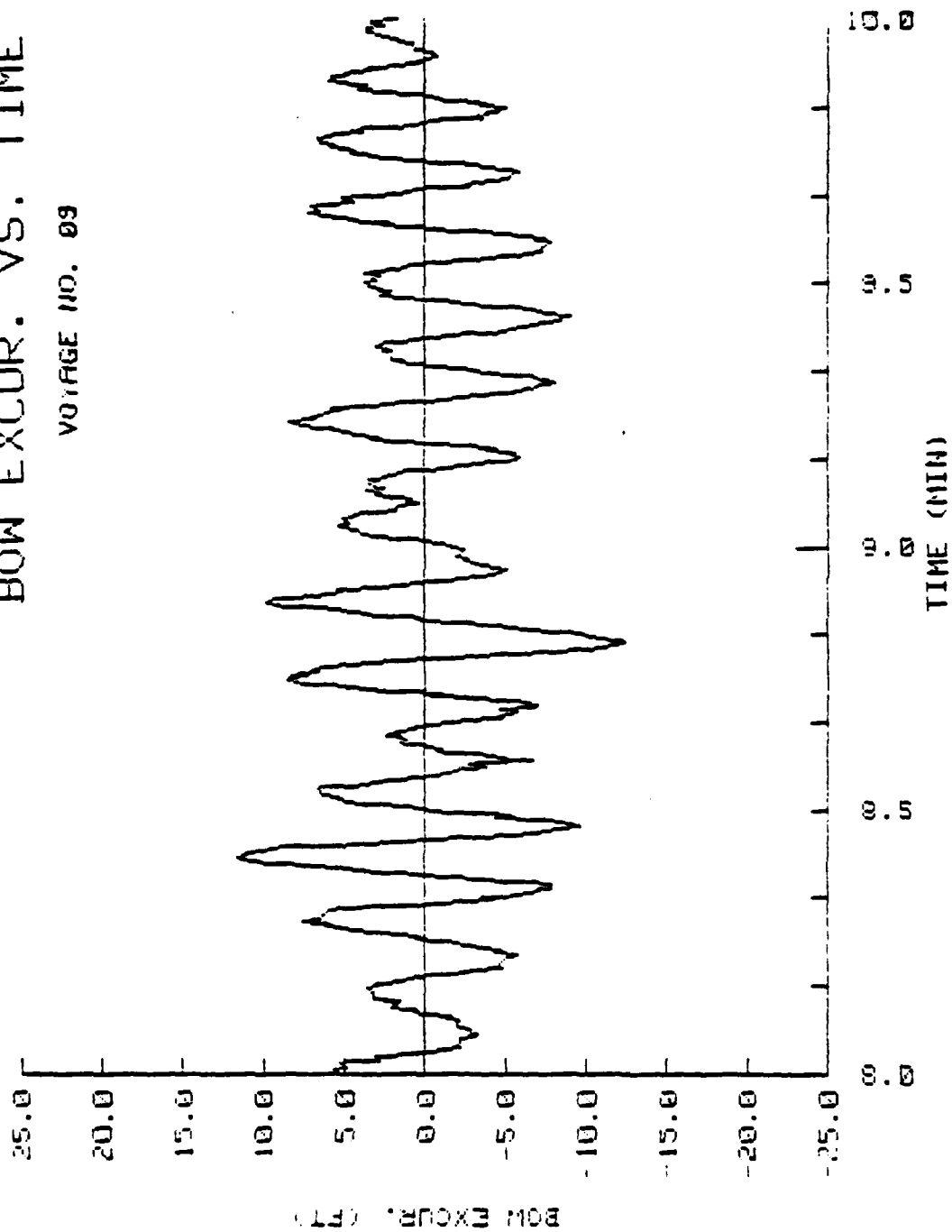
HEAVE VS. TIME

VOYAGE NO. 09



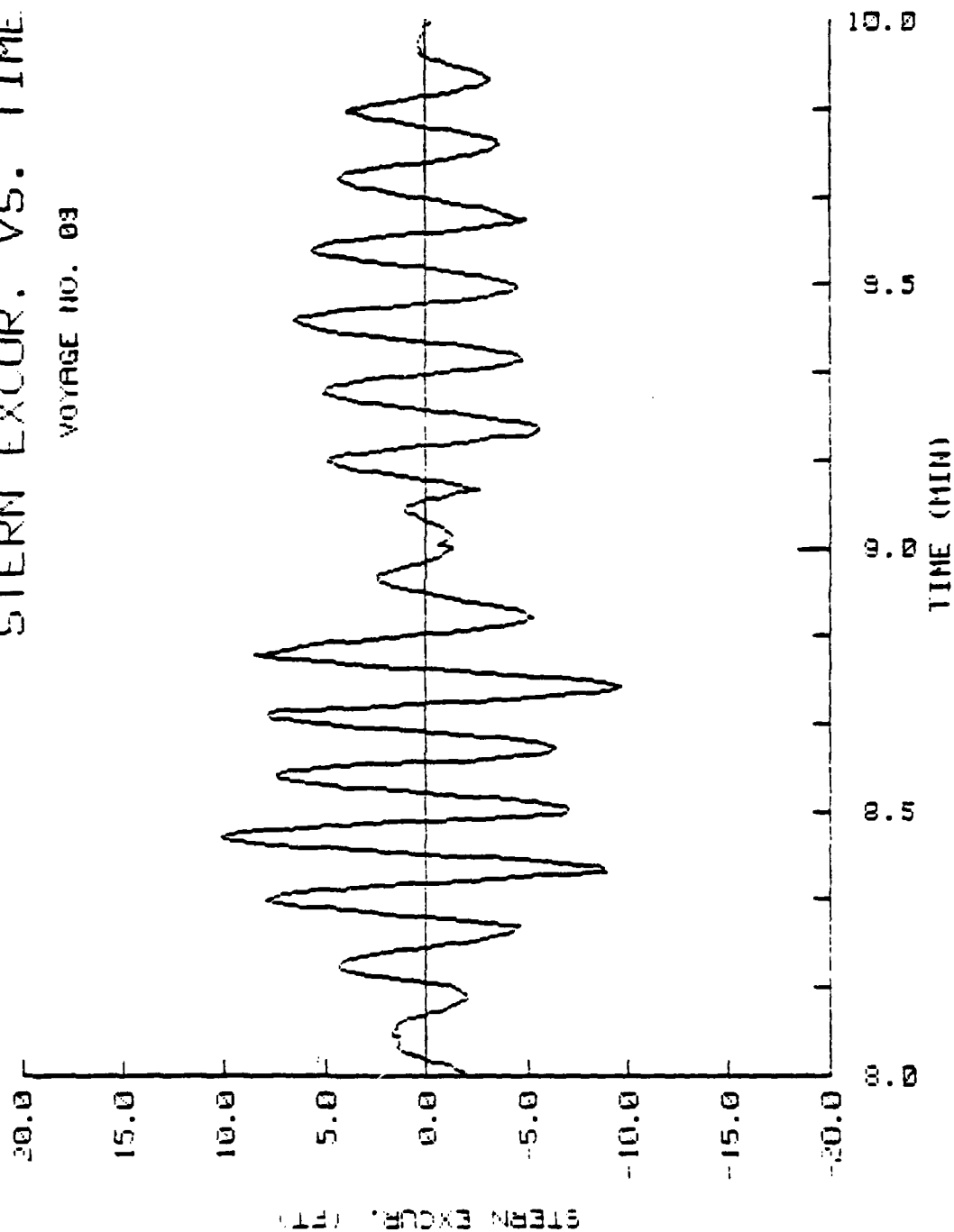
BOW EXCUR. VS. TIME

VOYAGE NO. 09



STERN EXCUR. VS. TIME

VOYAGE NO. 03



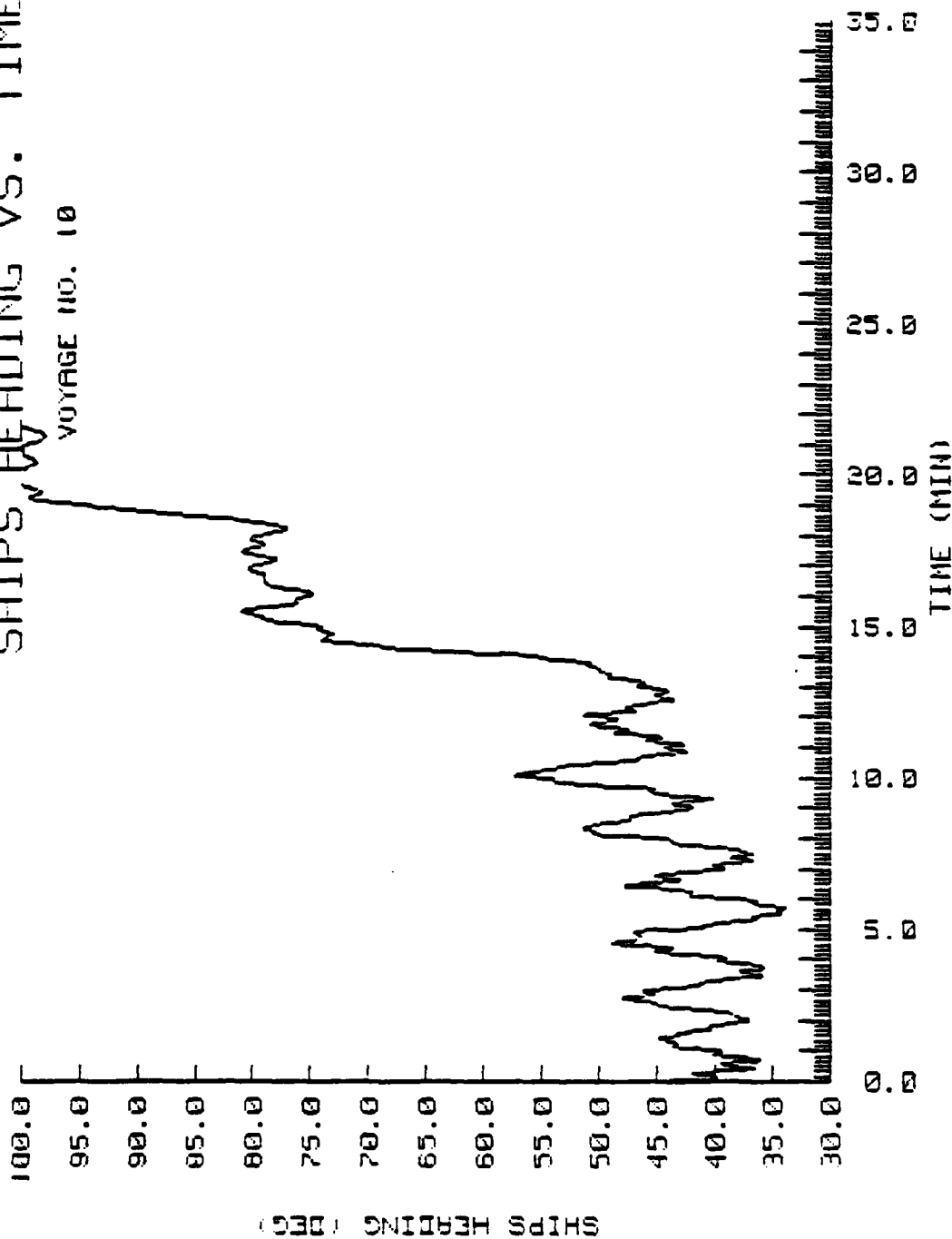
STATISTICAL SUMMARY

VOYAGE NO. 10

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	.5	1.8	.7	.8
ROLL (DEG)	1.0	3.8	1.3	1.5
ACC (FT/SEC/SEC)	.1	1.8	.7	.8
HEAVE (FT)	.0	5.5	2.0	2.3
ROW EXCUR. (FT)	.0	15.0	5.3	6.2
STERN EXCUR. (FT)	.0	5.0	2.0	2.3
SIDE EXCUR (FT)	.0	5.9	2.3	2.7

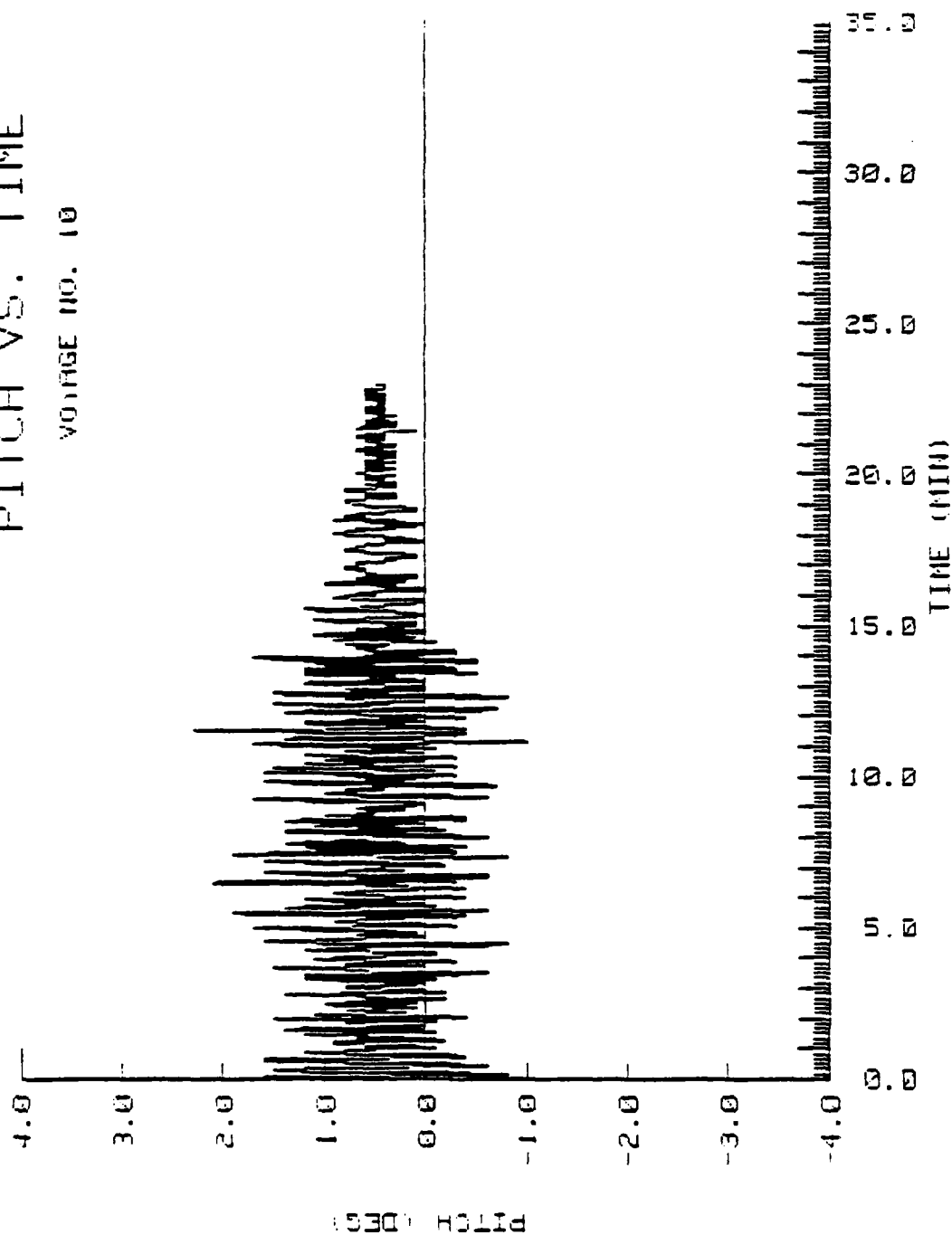
SHIPS HEADING VS. TIME

VOYAGE NO. 10



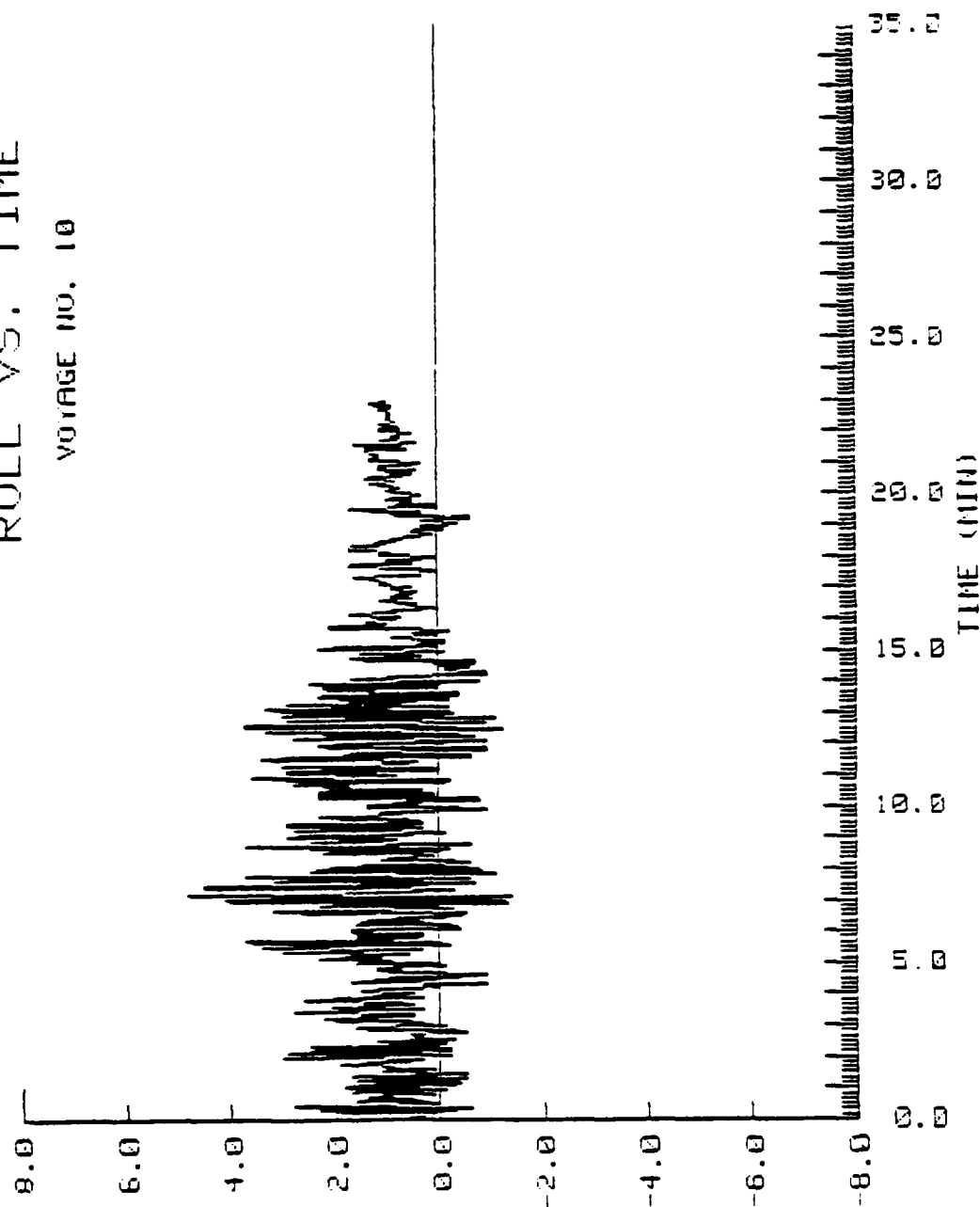
PITCH VS. TIME

VOICE NO. 10



ROLL VS. TIME

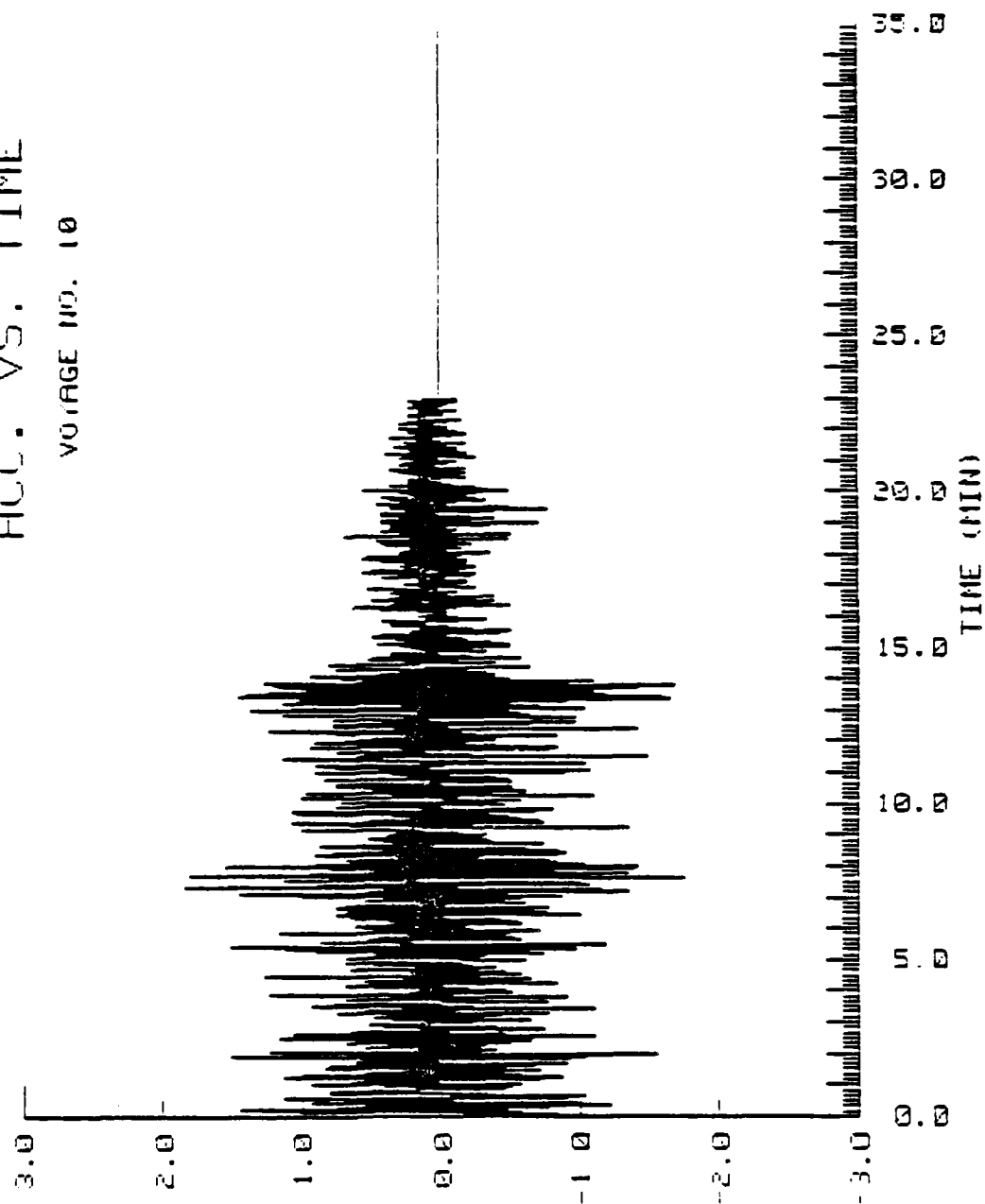
VOTAGE NO. 10



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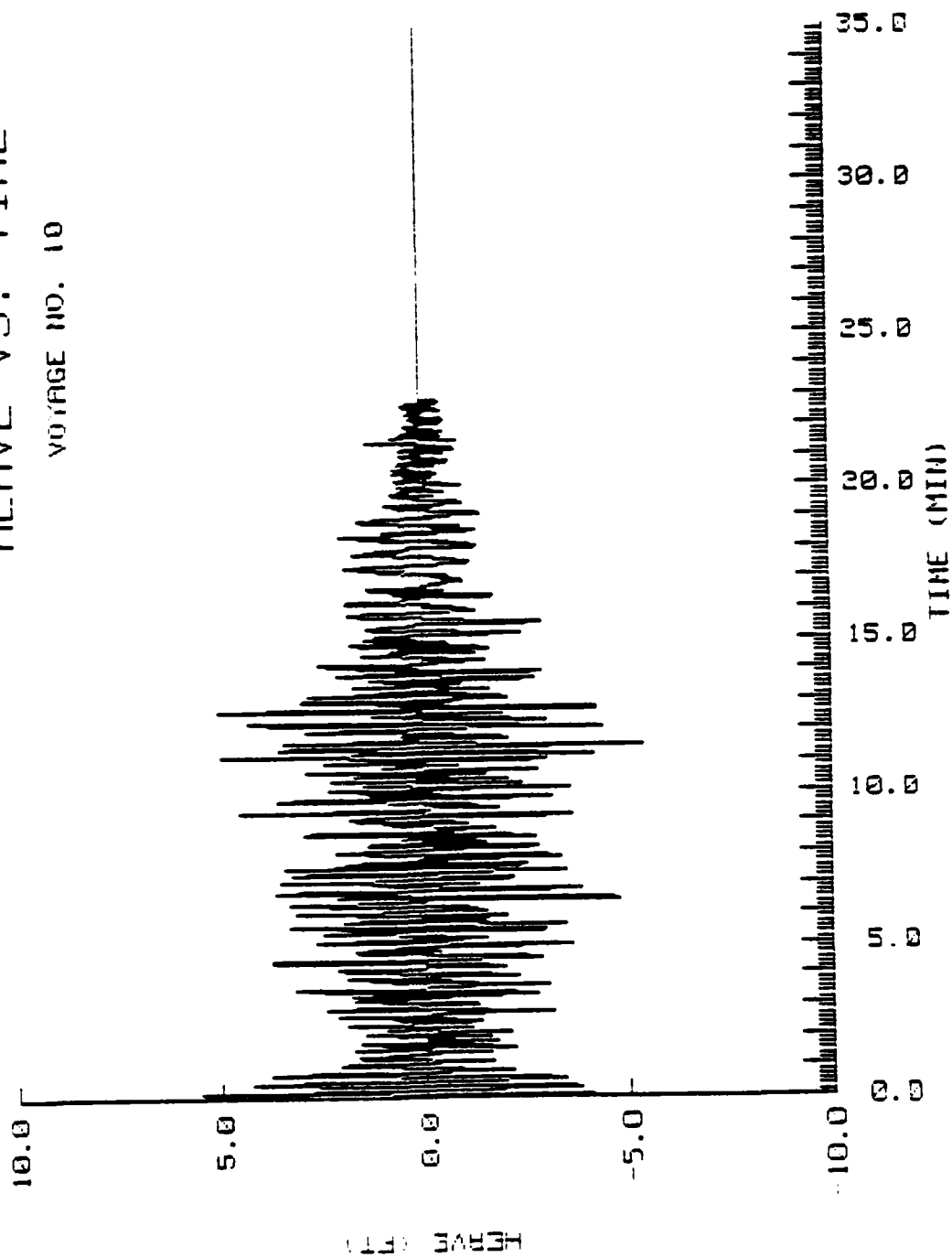
ACC. VS. TIME

VOLTAGE 100. 10



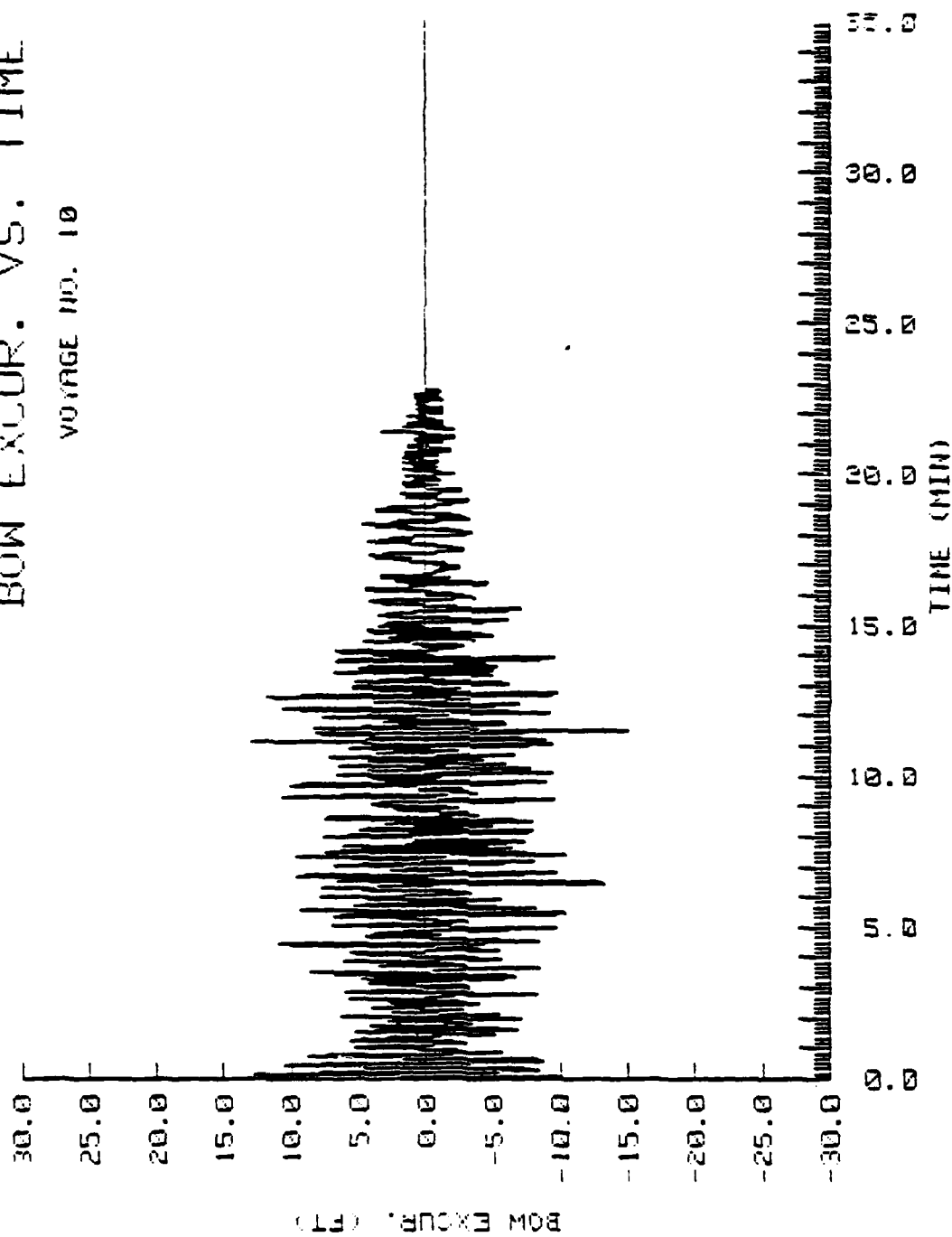
HEAVE VS. TIME

VOTAGE NO. 10



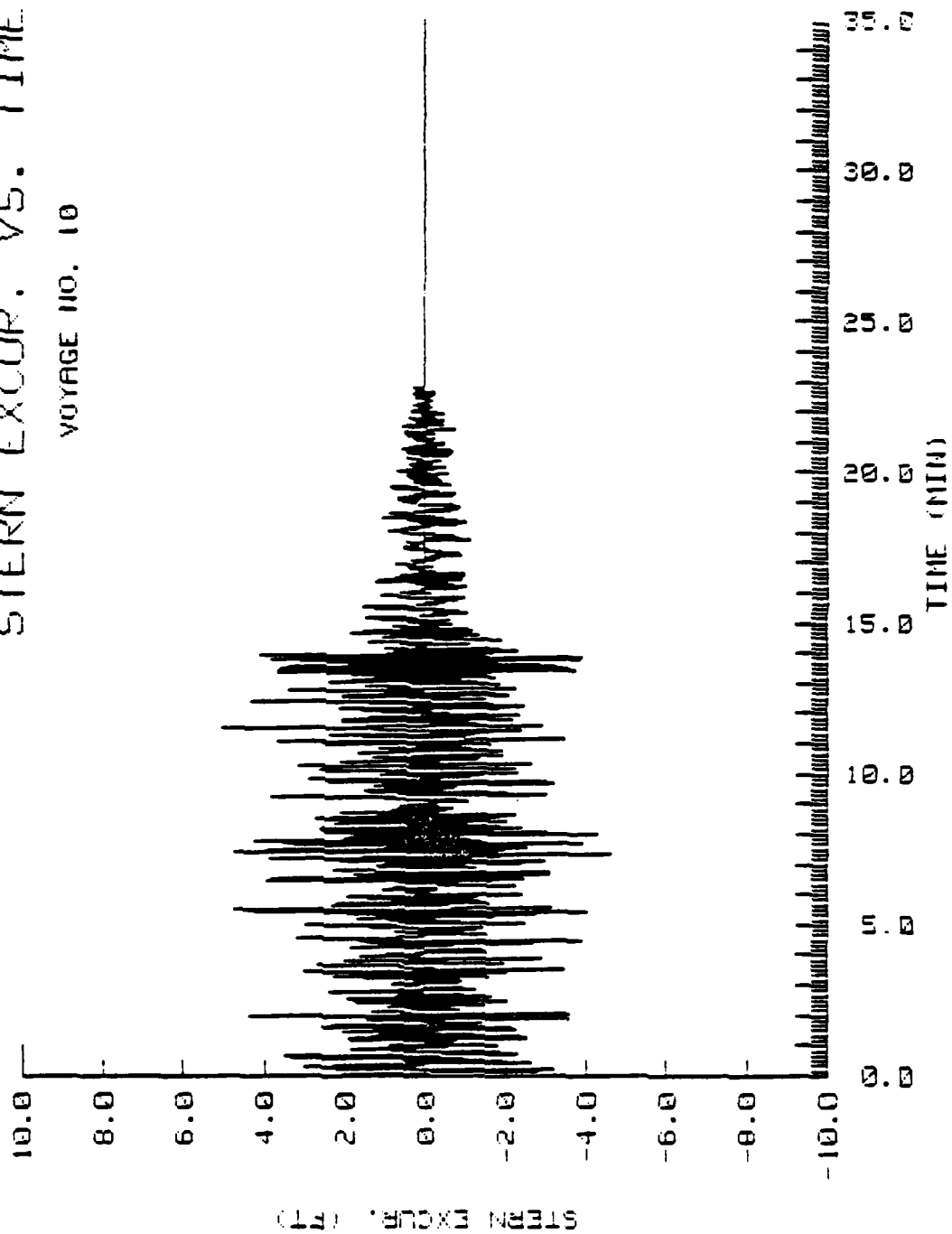
BOW EXCUR. VS. TIME

VOYAGE NO. 10



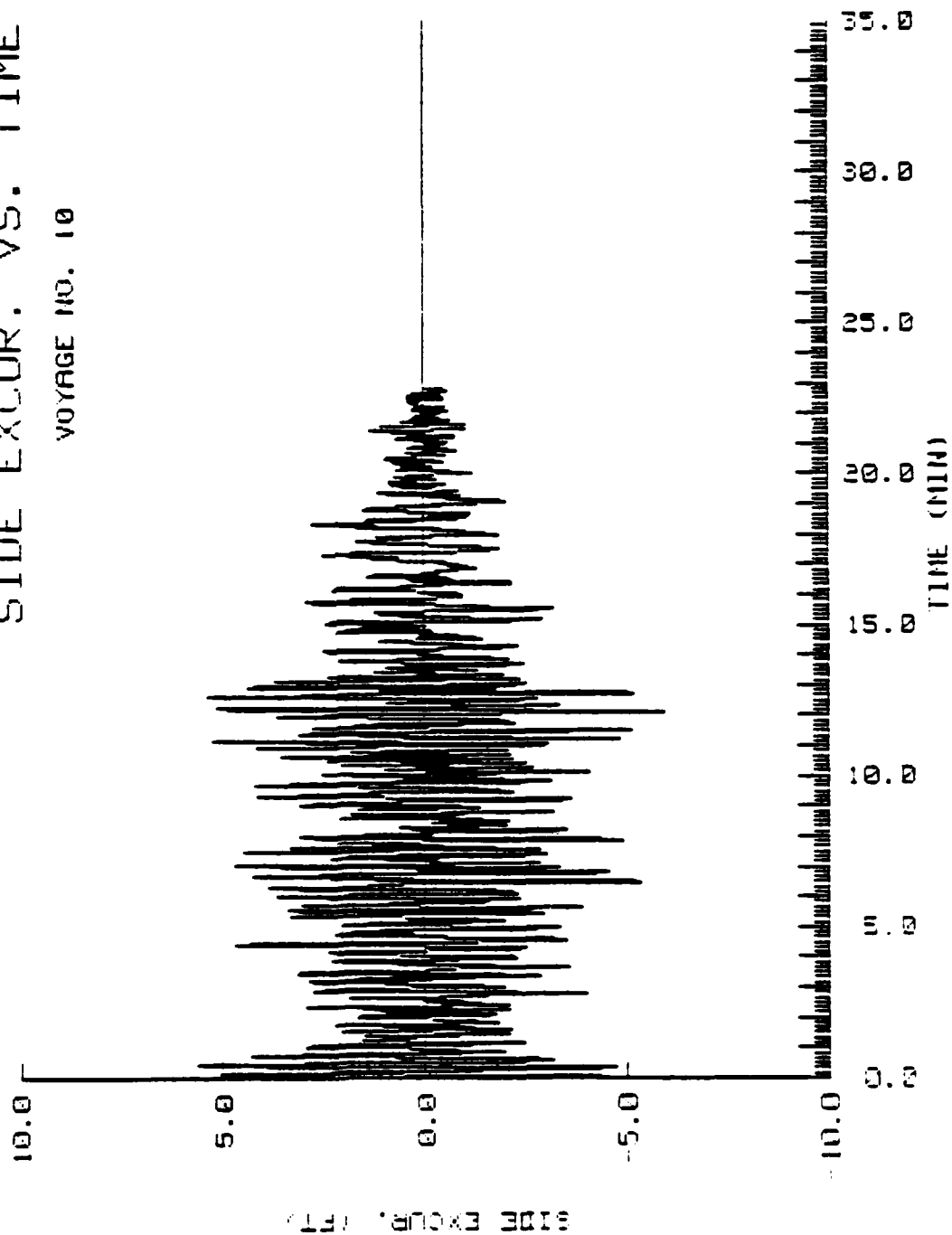
STERN EXCUR. VS. TIME

VOYAGE NO. 10



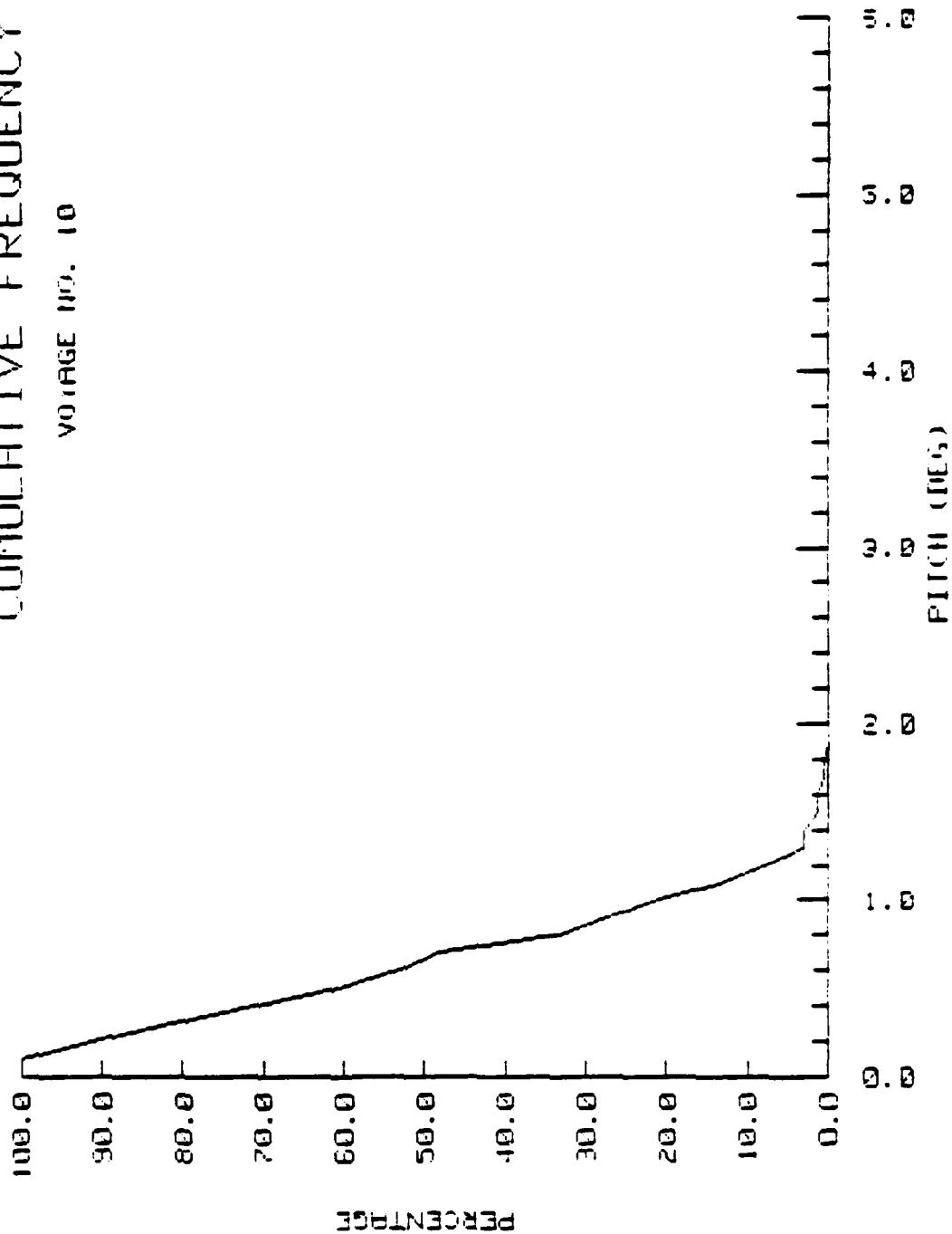
SIDE EXCUR. VS. TIME

VOYAGE NO. 10



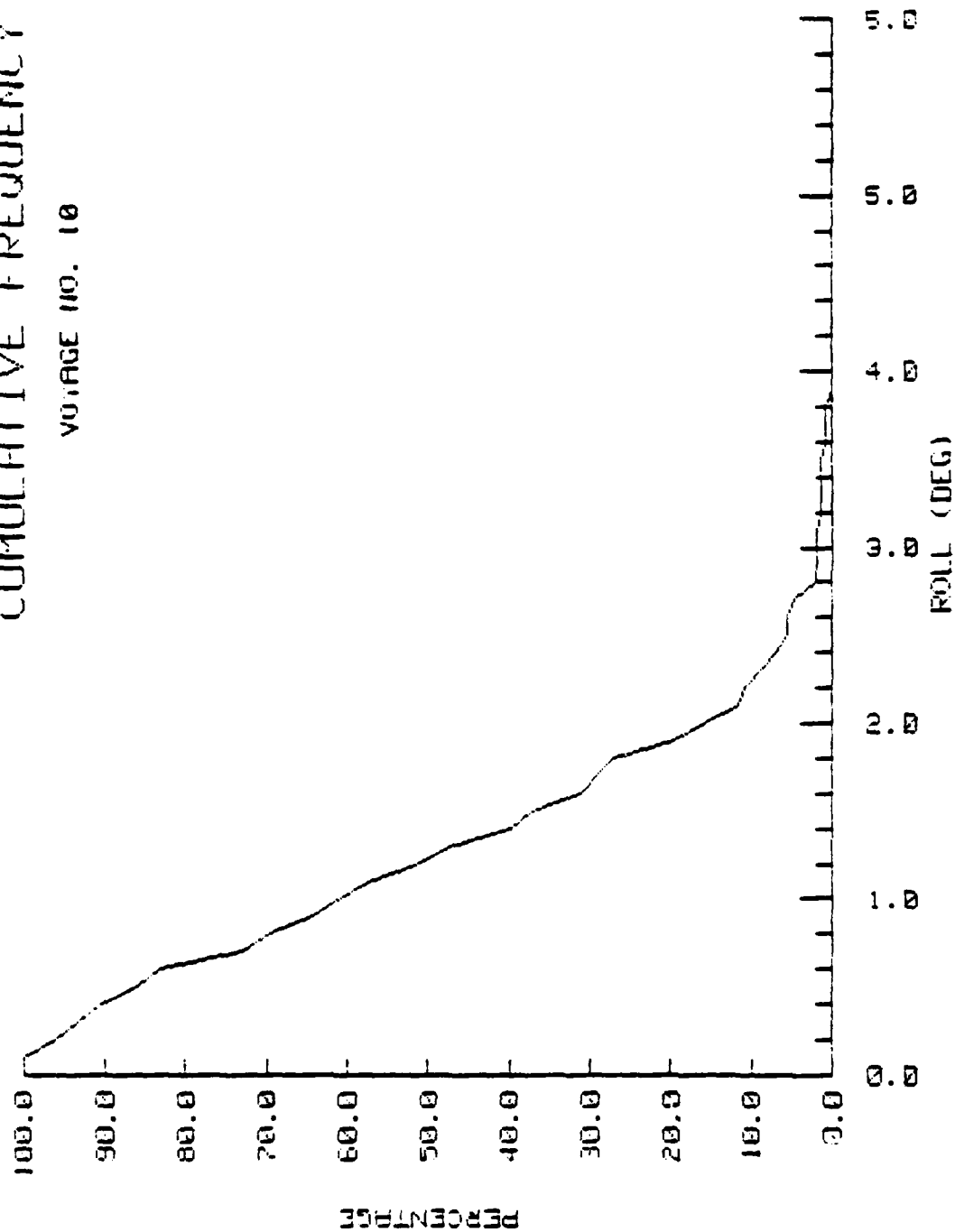
CUMULATIVE FREQUENCY

VOLAGE 110. 10



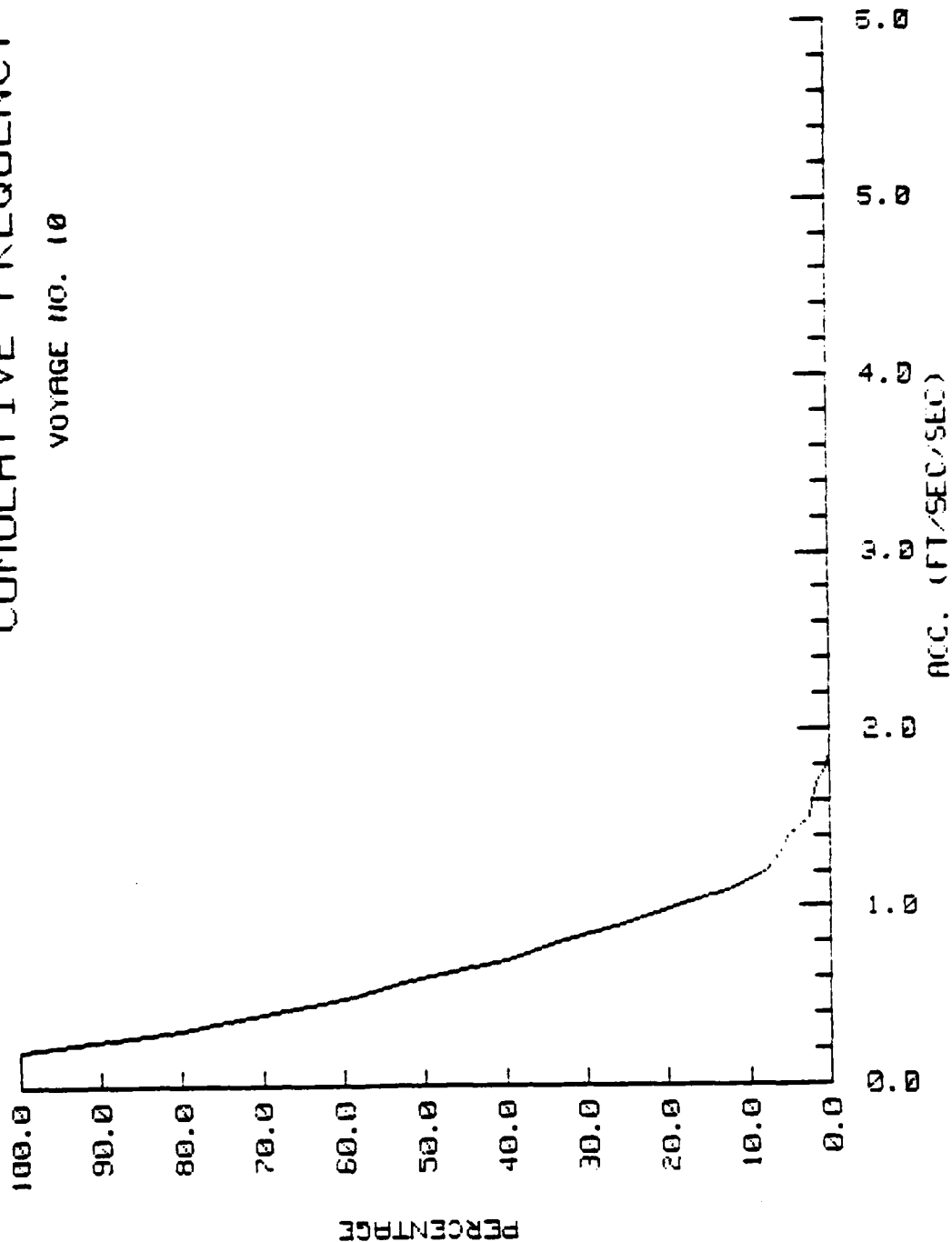
CUMULATIVE FREQUENCY

VOTAGE 110. 10



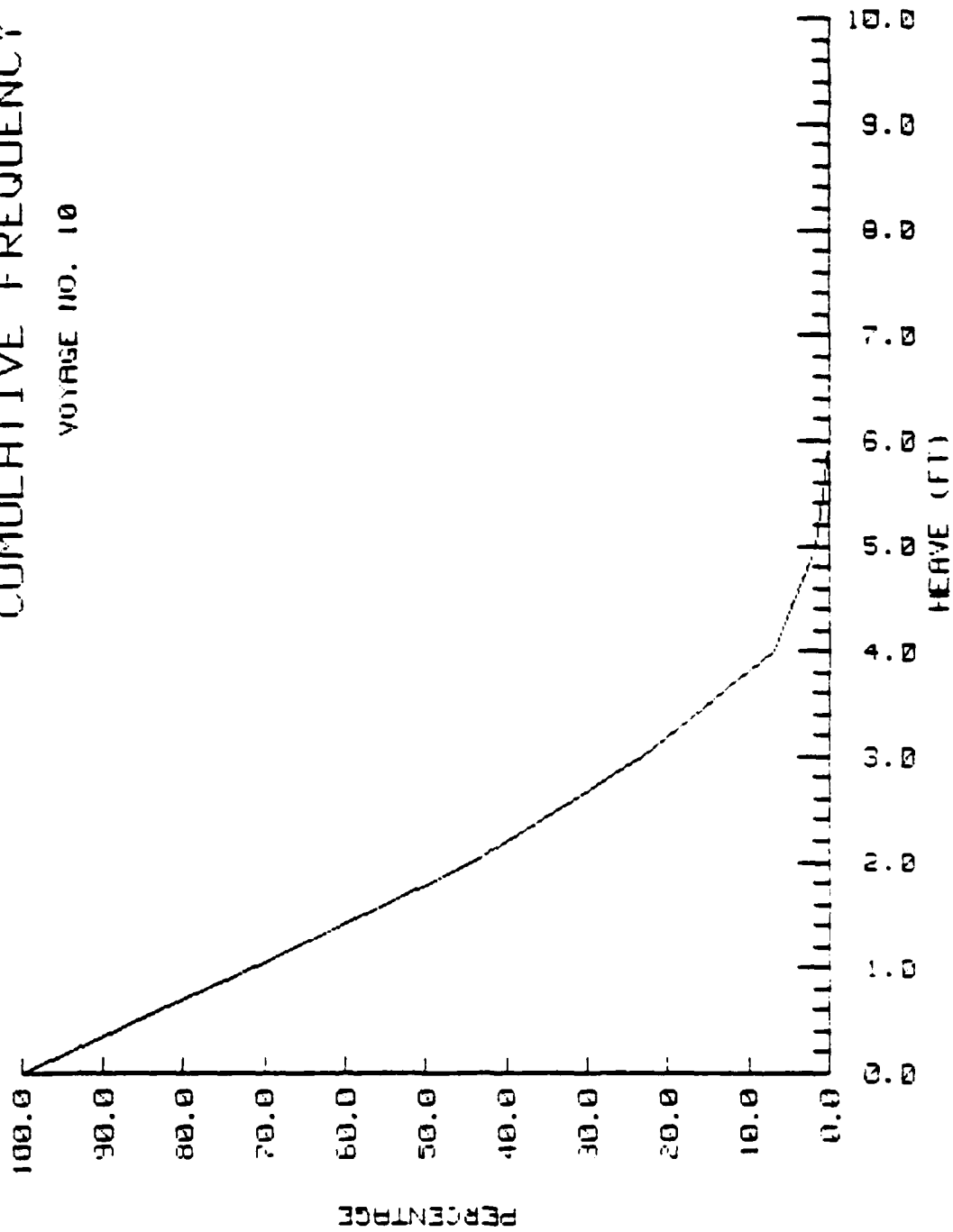
CUMULATIVE FREQUENCY

VOYAGE NO. 10



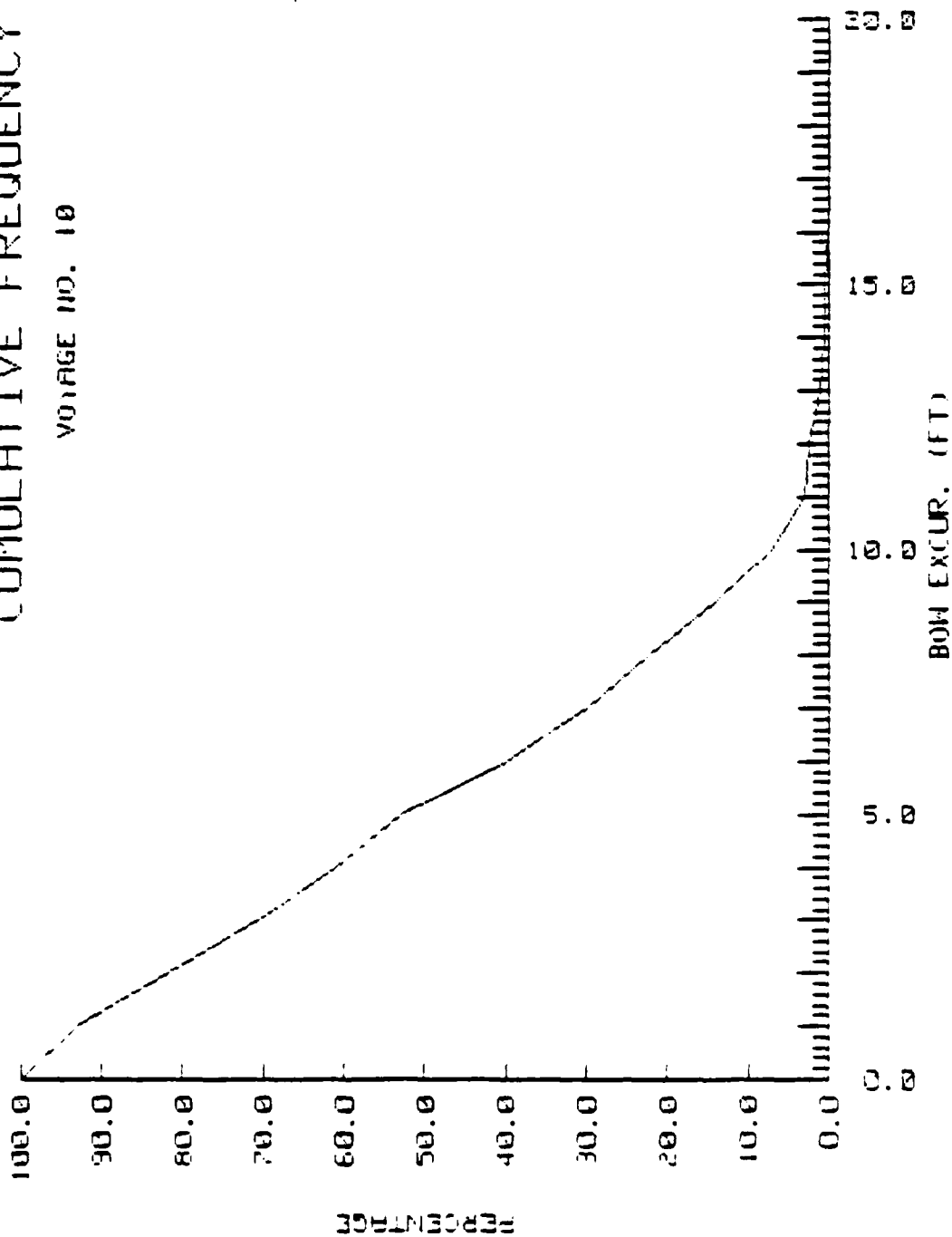
CUMULATIVE FREQUENCY

VOYAGE NO. 10



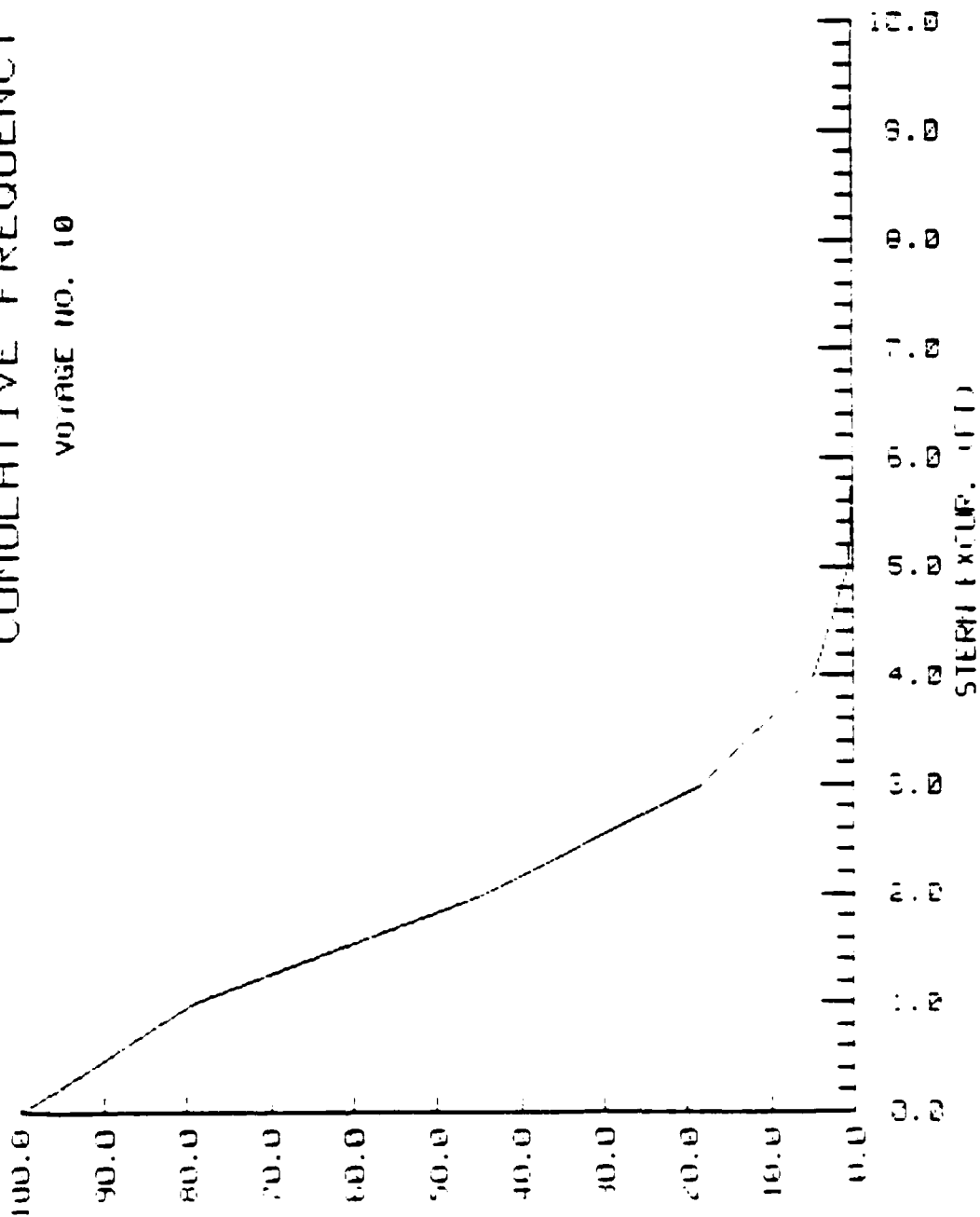
CUMULATIVE FREQUENCY

VOLAGE NO. 10



CUMULATIVE FREQUENCY

VOLUME NO. 10

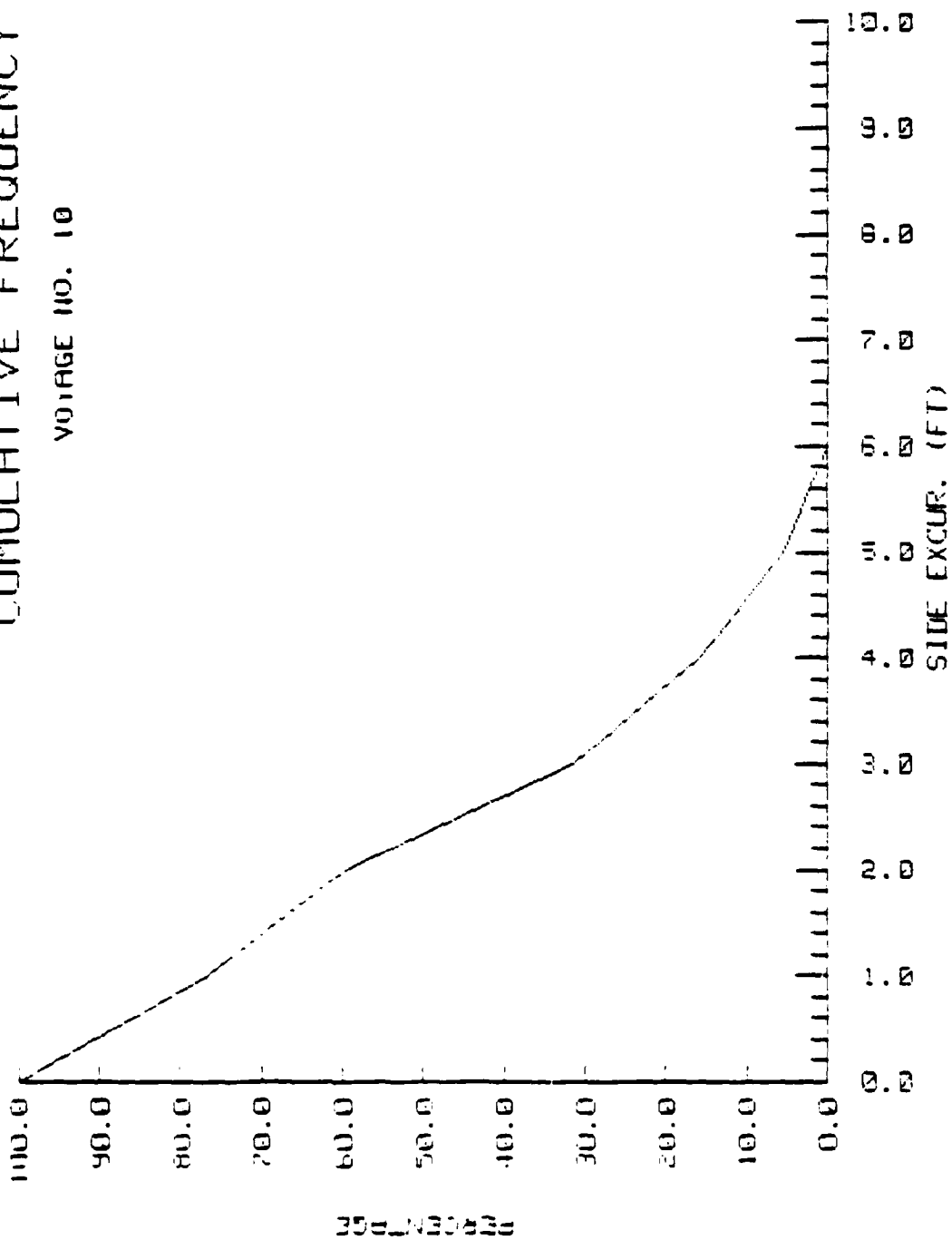


100.0 90.0 80.0 70.0 60.0 50.0 40.0 30.0 20.0 10.0 0.0

STERIL EXPOS. (FD)

CUMULATIVE FREQUENCY

VOIAGE NO. 10

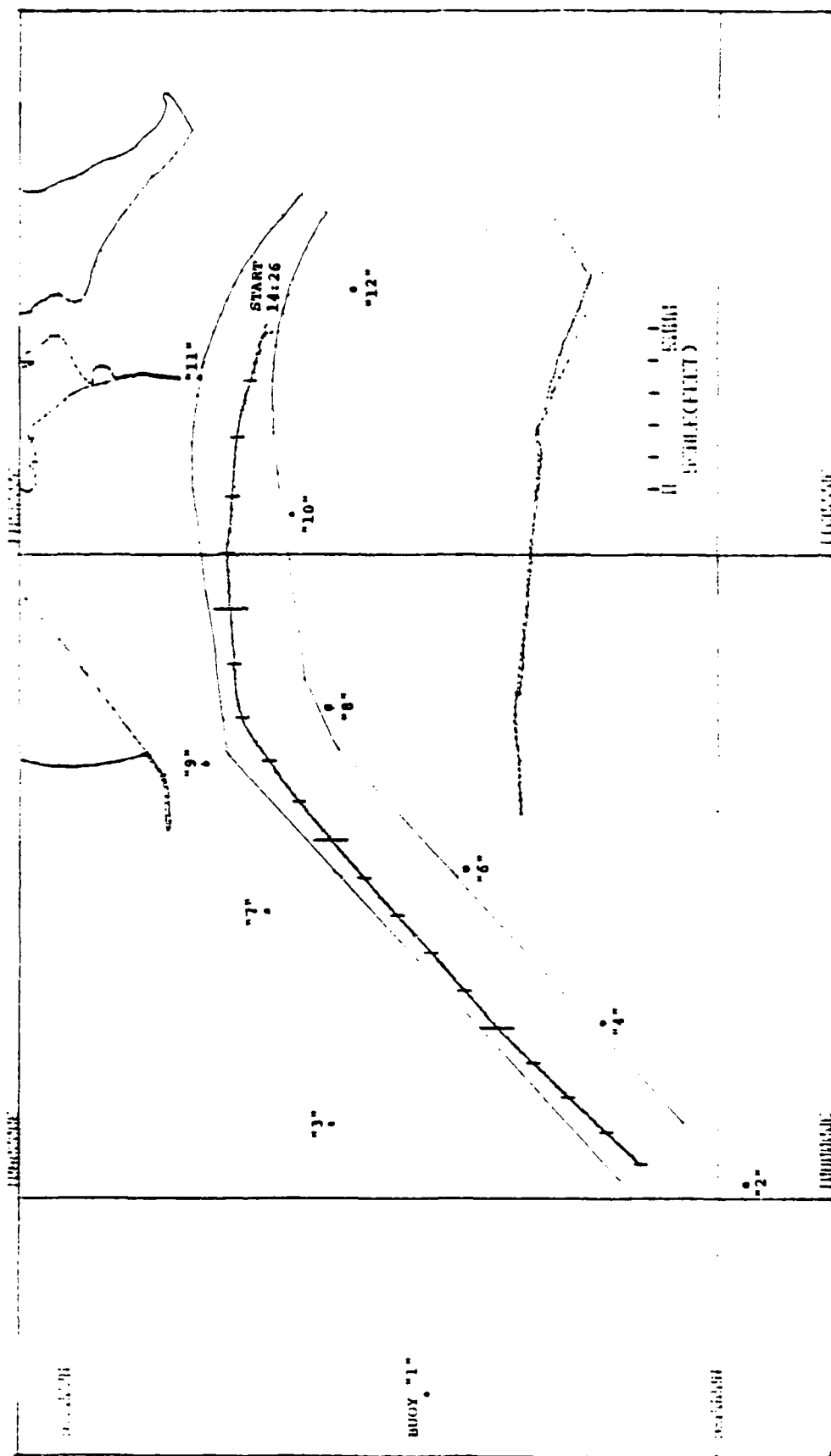


STATISTICAL SUMMARY

VOYAGE NO. 11

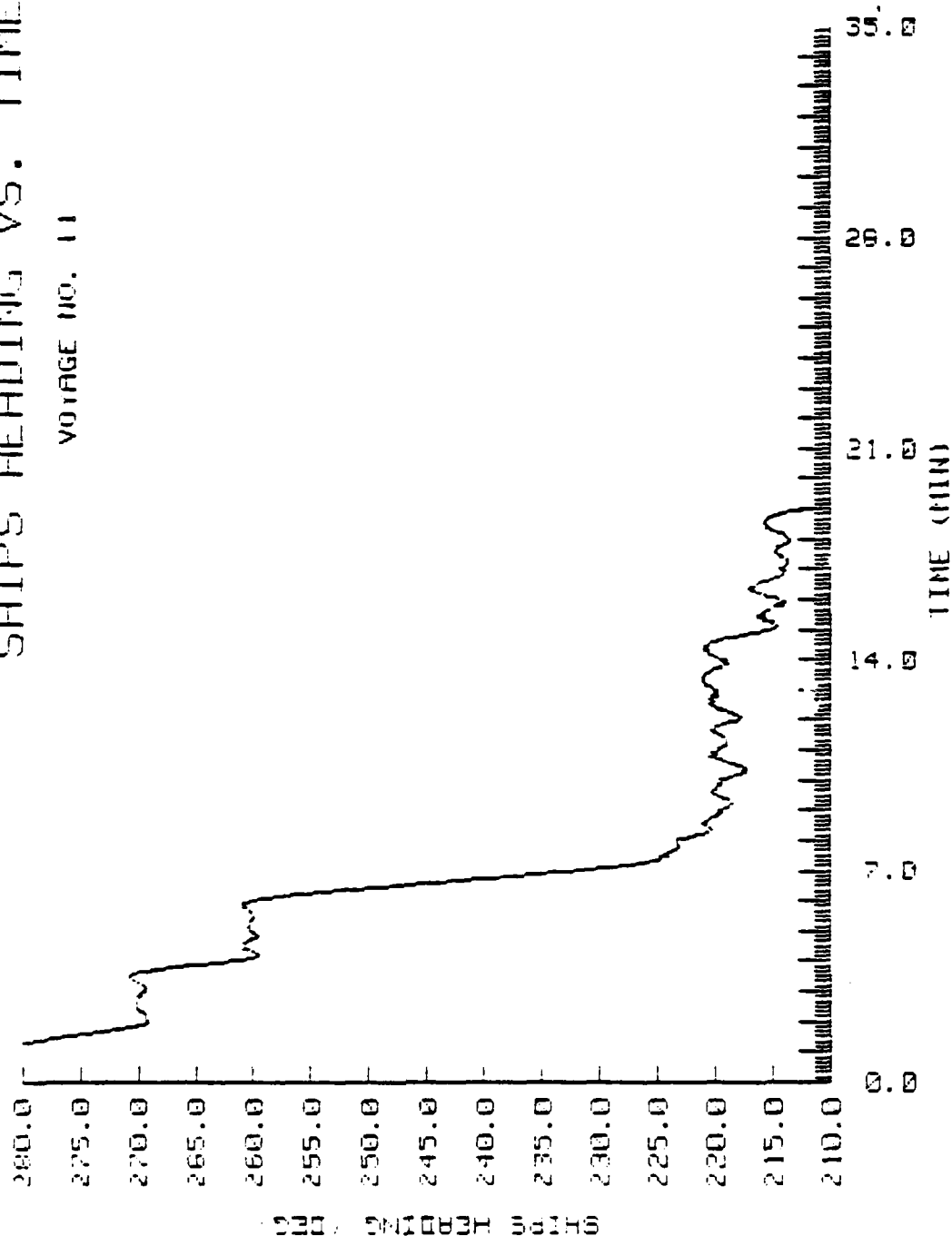
	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	.3	1.2	.5	.5
ROLL (DEG)	.8	2.1	.7	.8
ACC (FT/SEC/SEC)	.1	1.8	.9	1.0
HEAVE (FT)	-.0	4.5	2.0	2.2
BOW EXCUR. (FT)	-.0	10.6	4.2	4.7
STERN EXCUR. (FT)	-.0	3.6	1.8	1.9
SIDE EXCUR (FT)	-.0	4.3	1.9	2.1

100



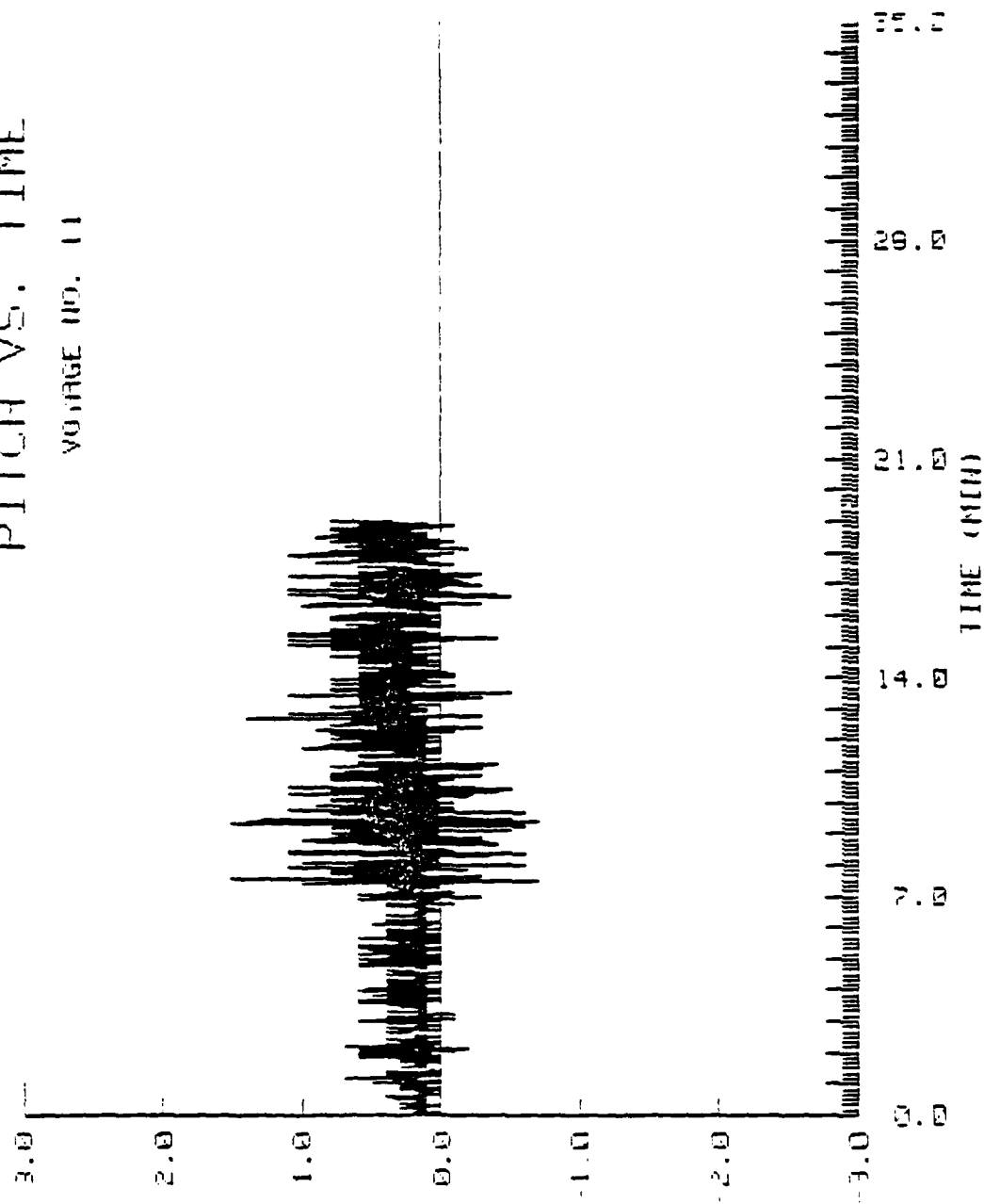
SHIPS HEADING VS. TIME

VOTAGE NO. 11



PITCH VS. TIME

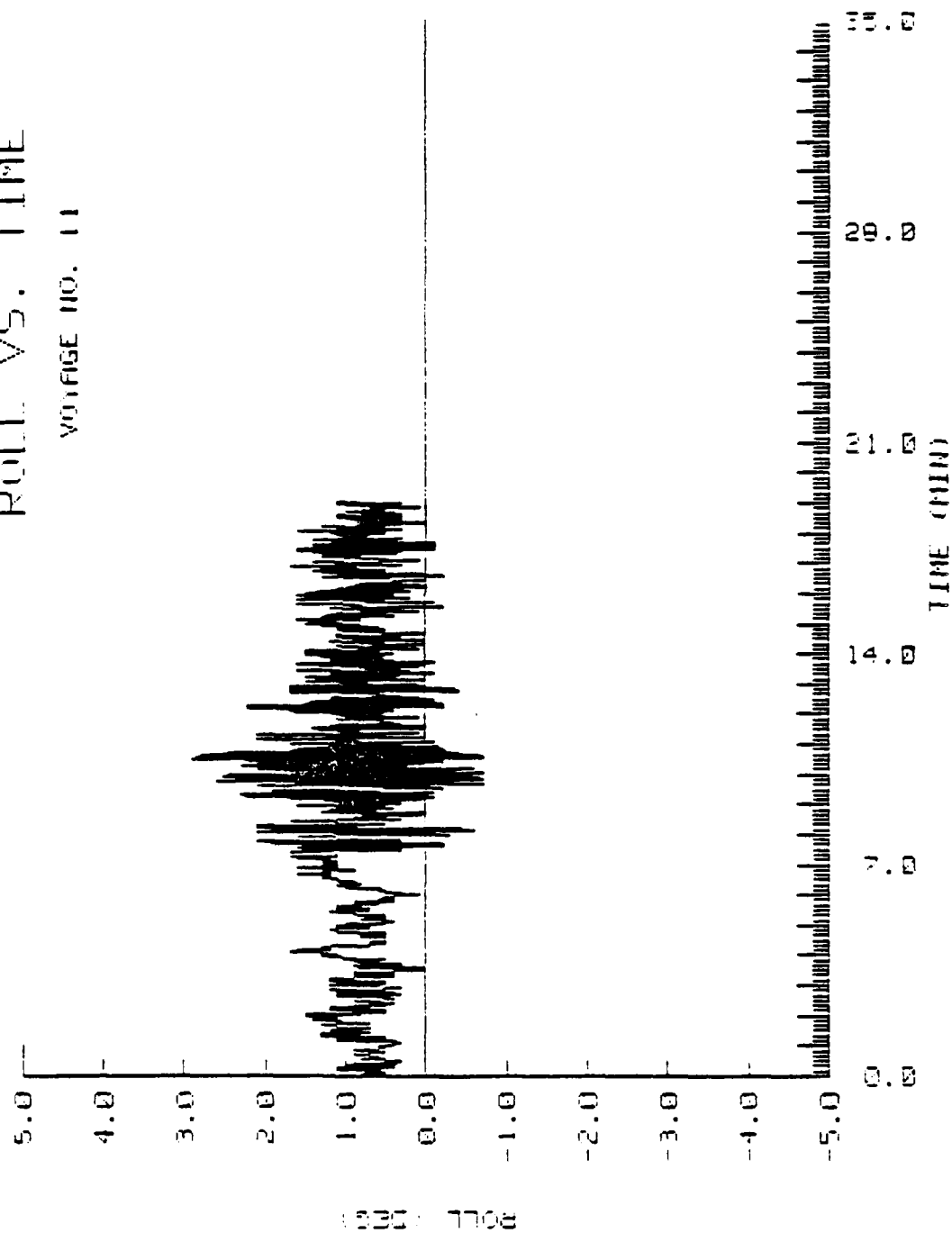
VOLUME NO. 11



1000 - 10000

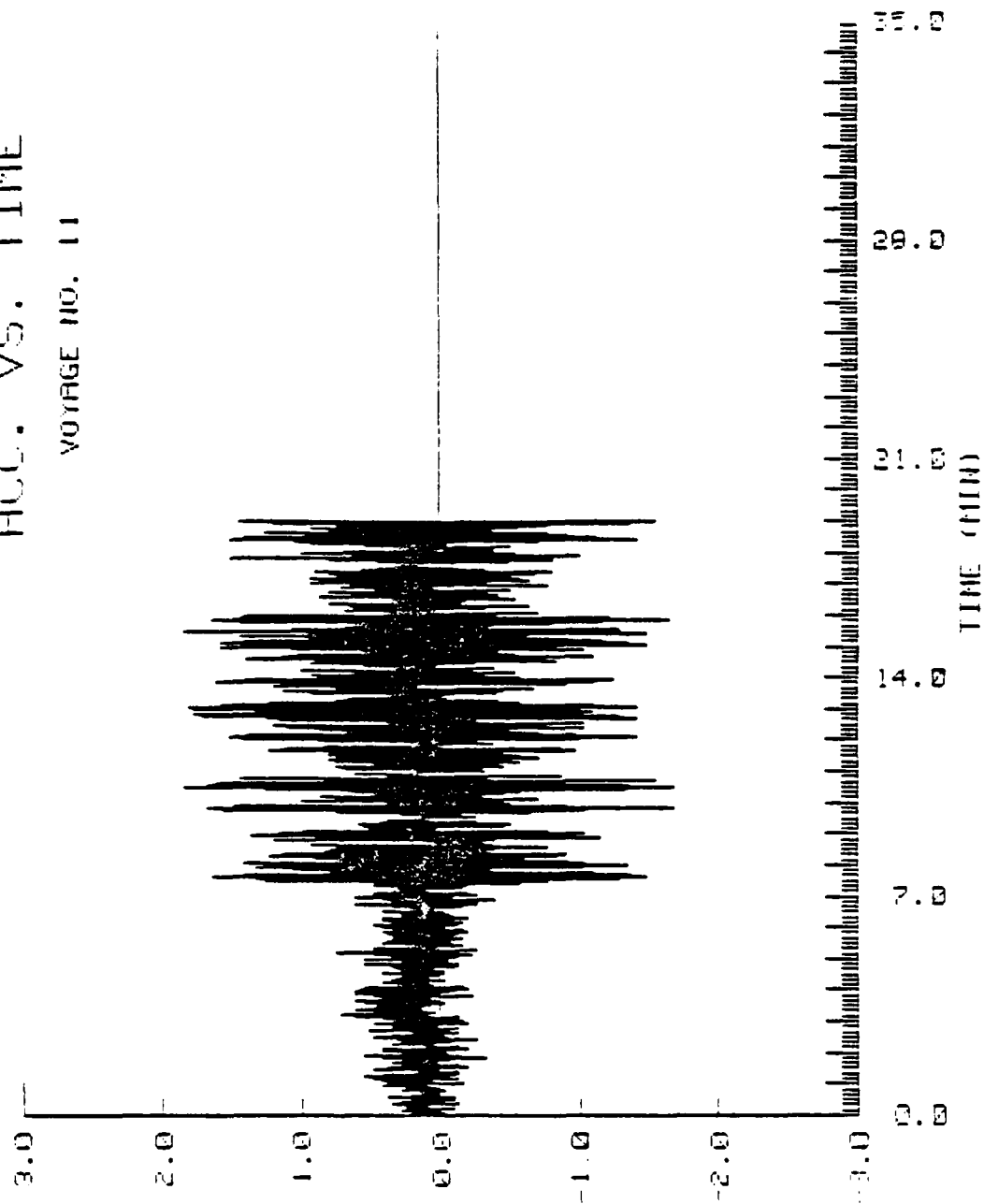
ROLL VS. TIME

VOLTAJE NO. 11



ACC. VS. TIME

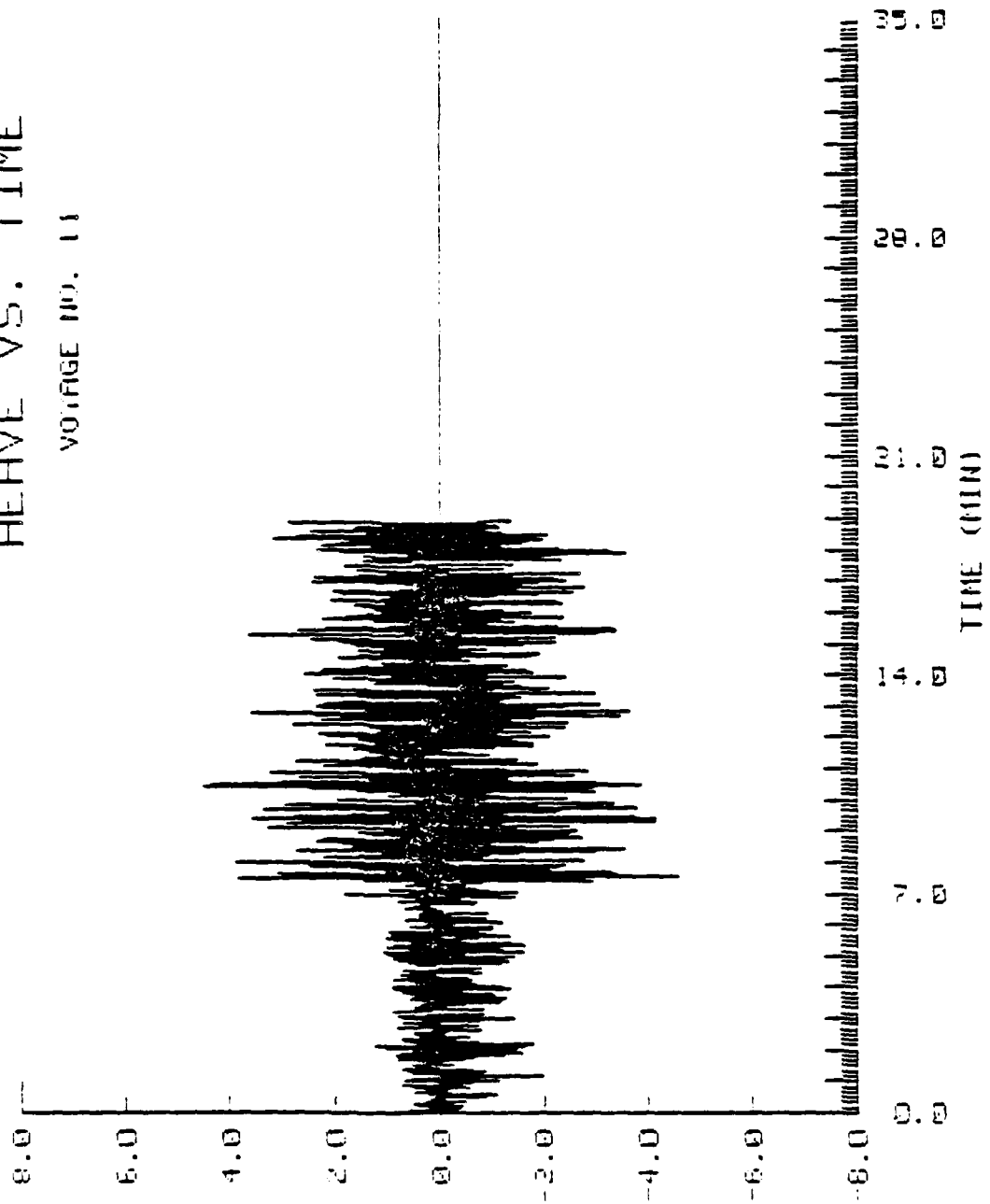
VOYAGE NO. 11



ACC. - FT/SEC-SEC

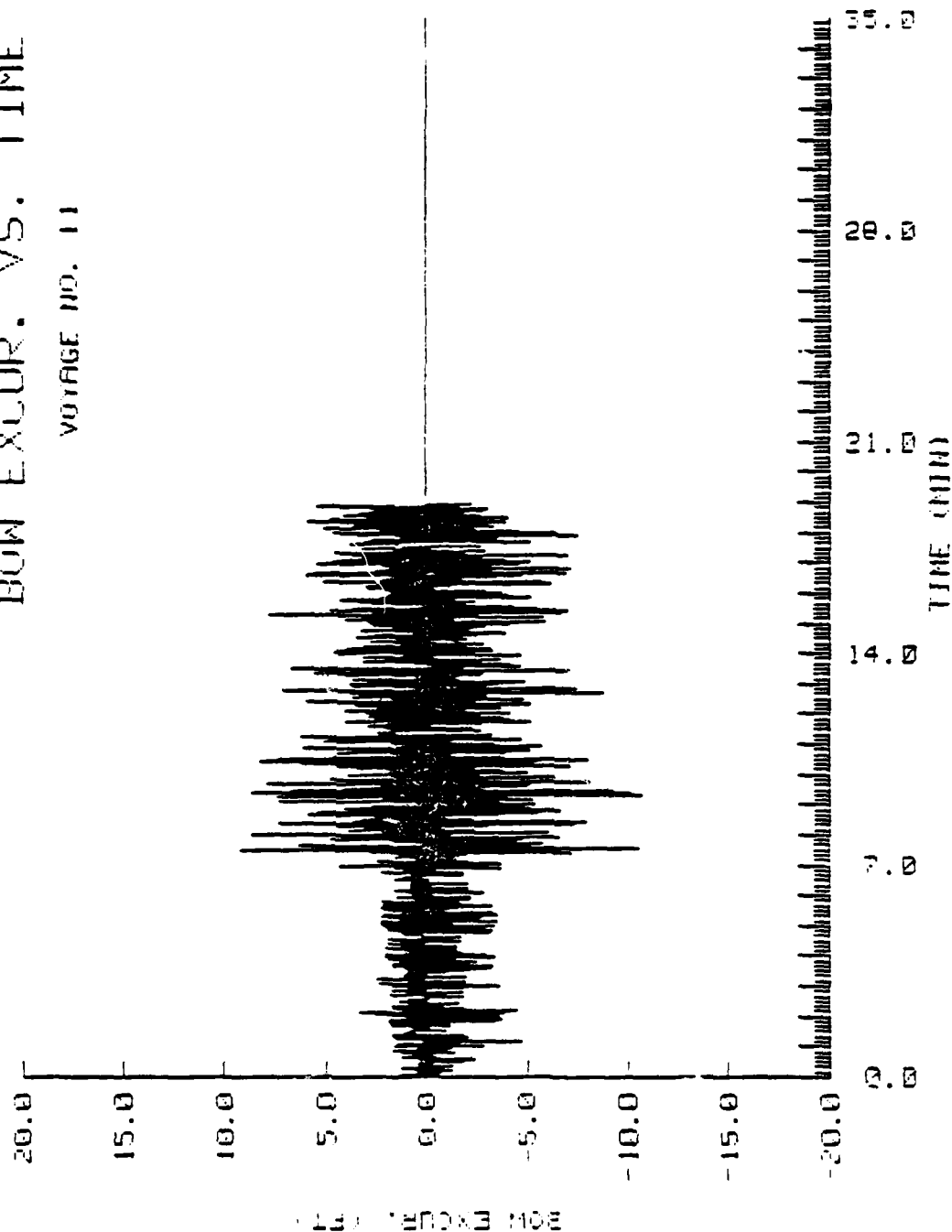
HEAVE VS. TIME

VOLTAGE NO. 11



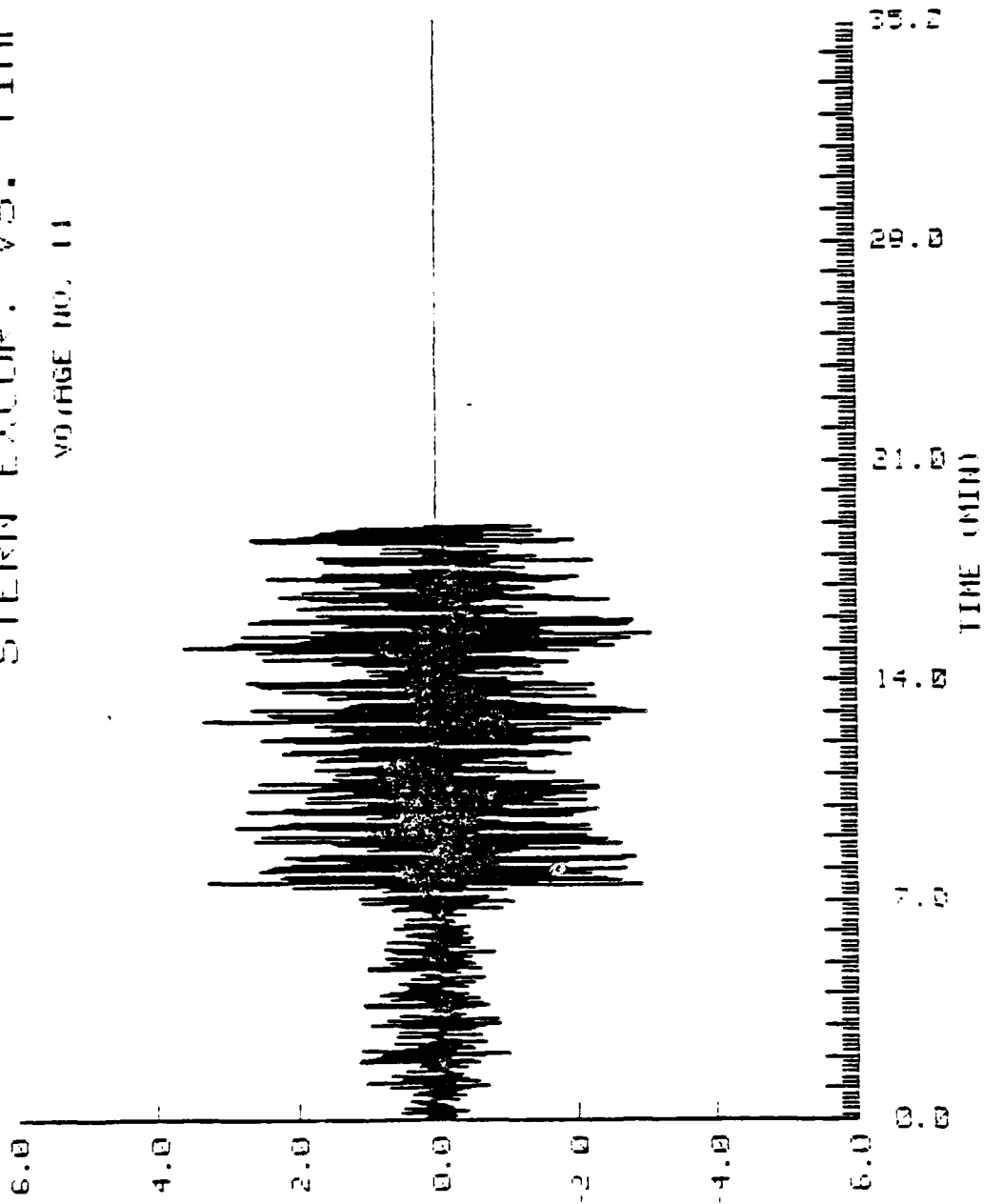
BOW EXCUR. VS. TIME

VOYAGE NO. 11



SIERN EXCUR. VS. TIME

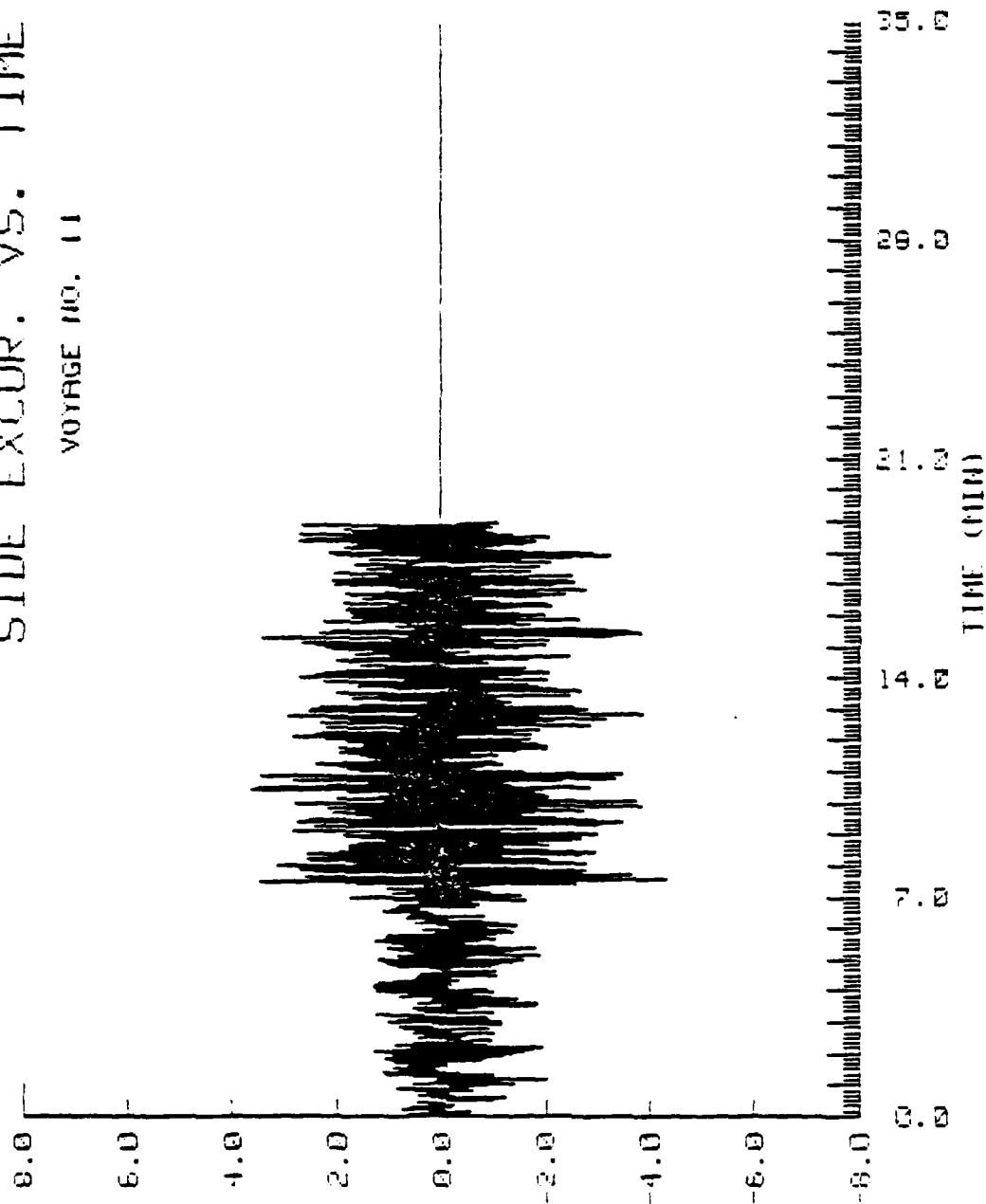
VOLTAJE NO. 11



11-1-1970 83 22315

SIDE EXCUR. VS. TIME

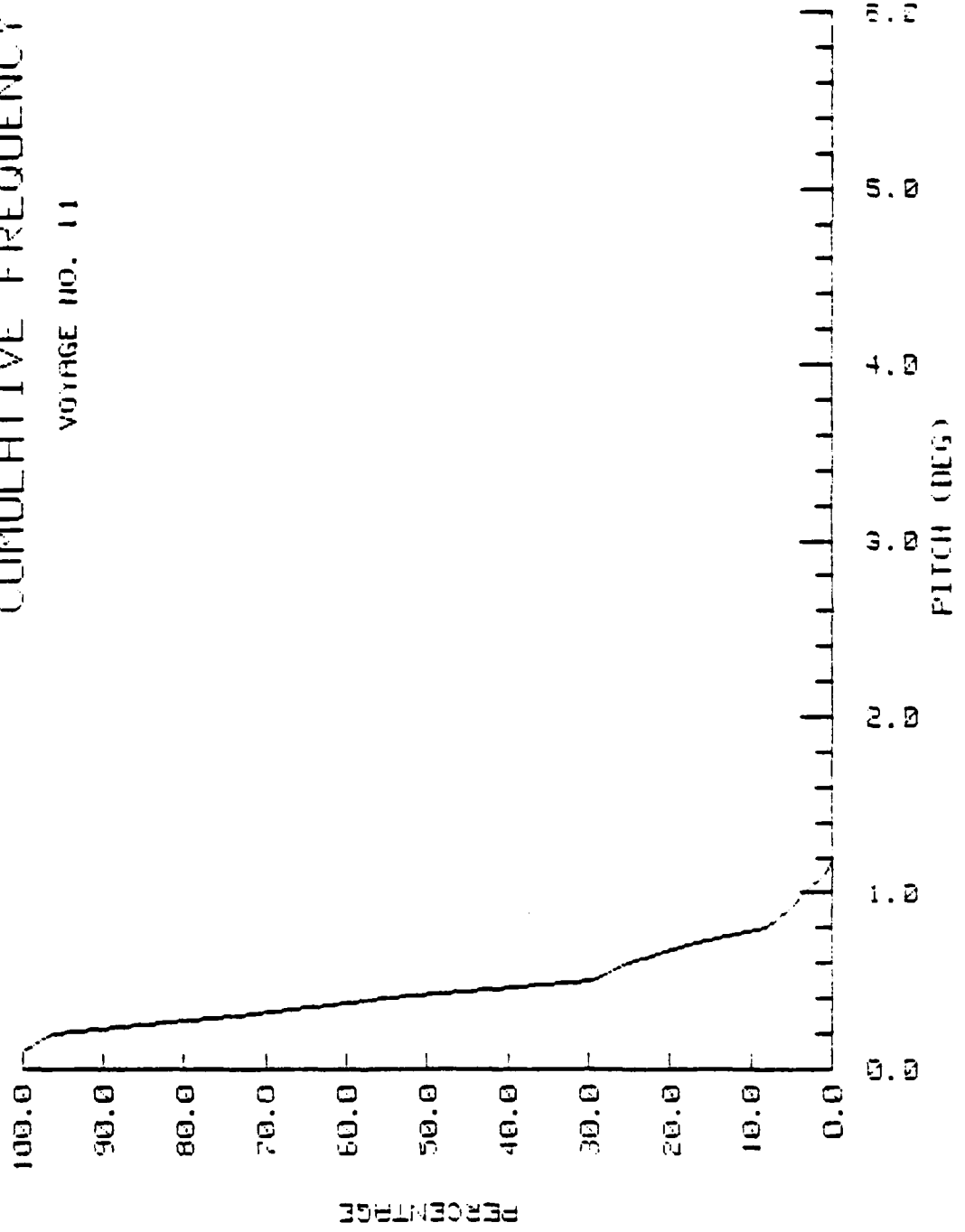
VOYAGE NO. 11



15. 1000000 0000

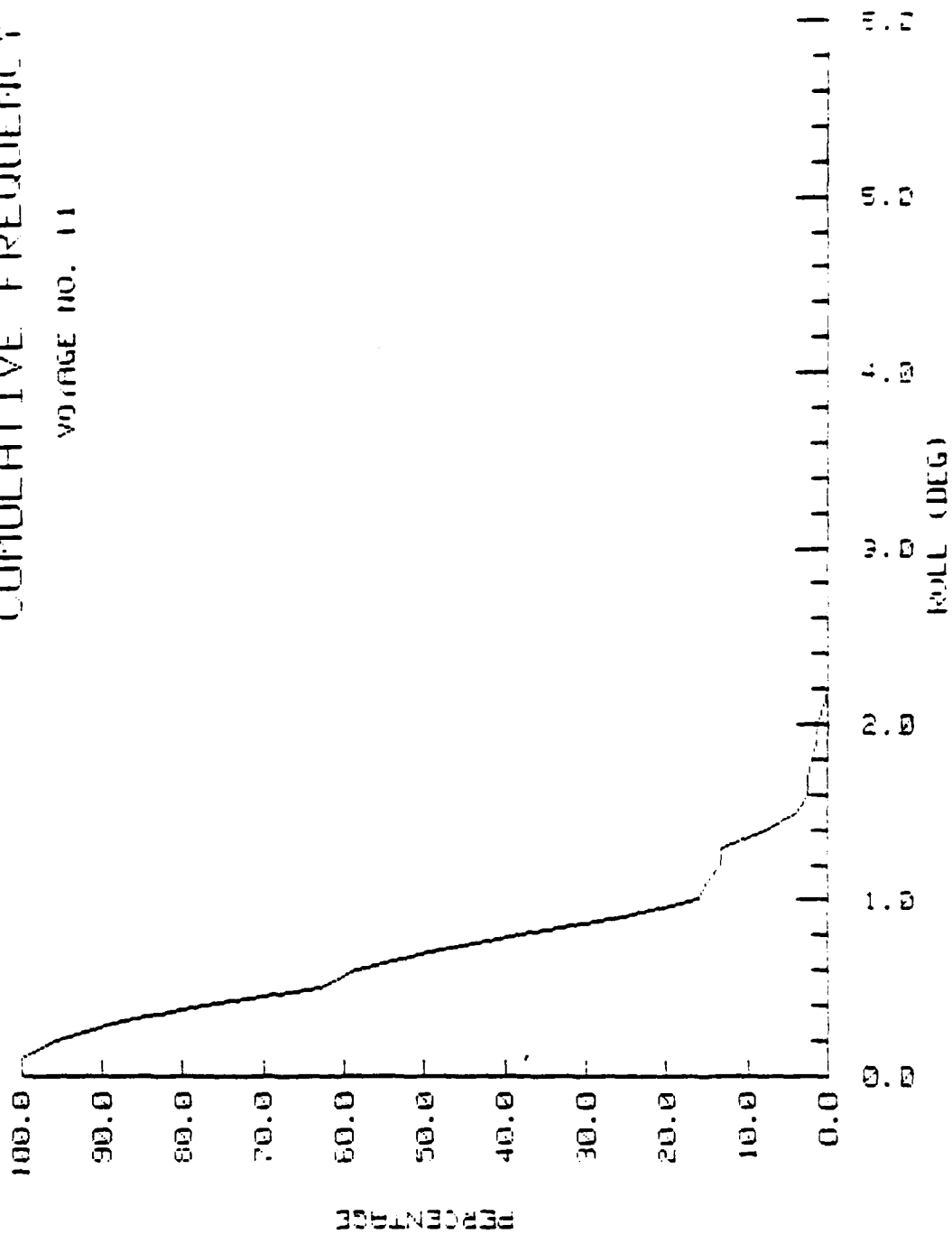
CUMULATIVE FREQUENCY

VOTAGE NO. 11



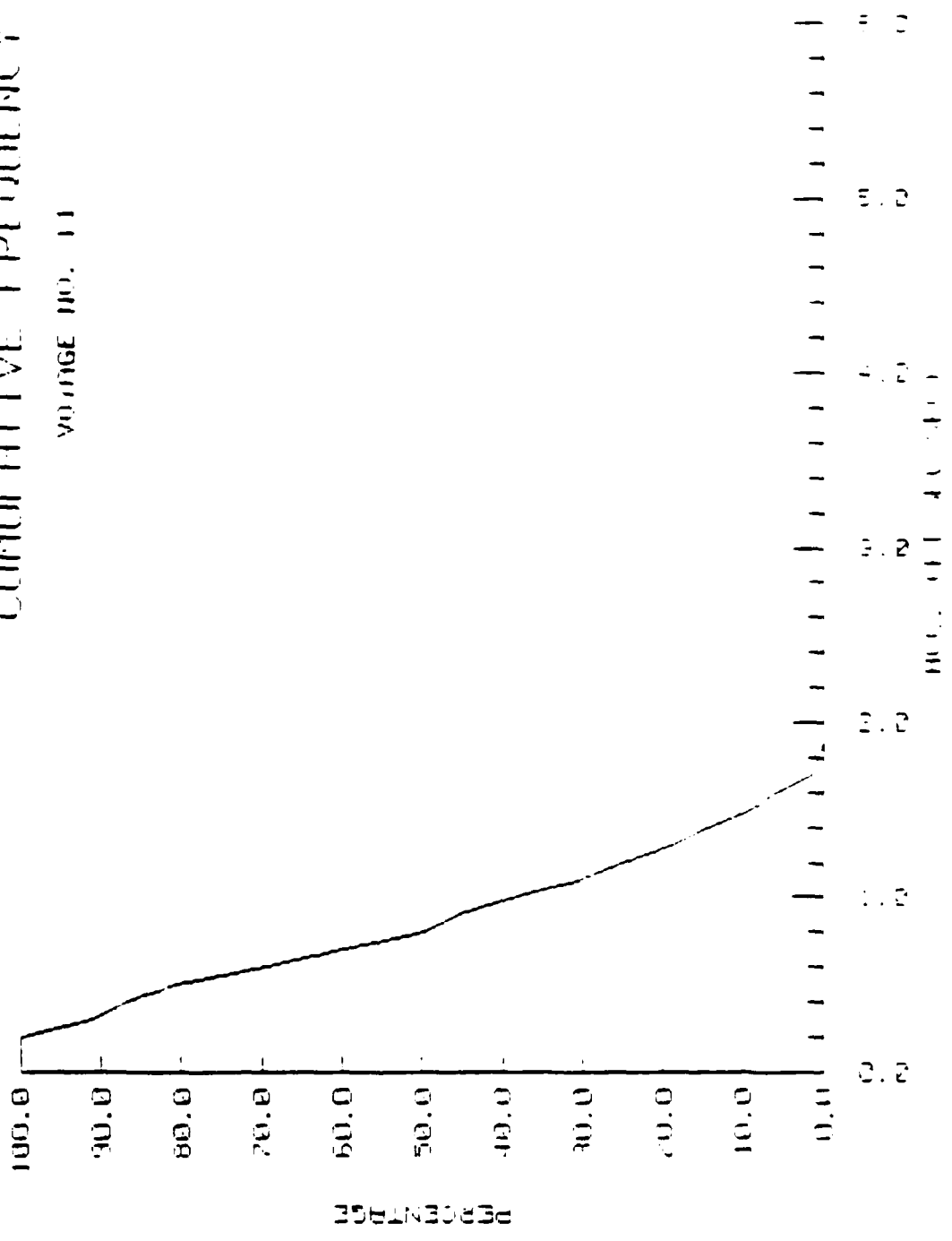
CUMULATIVE FREQUENCY

VOYAGE NO. 11



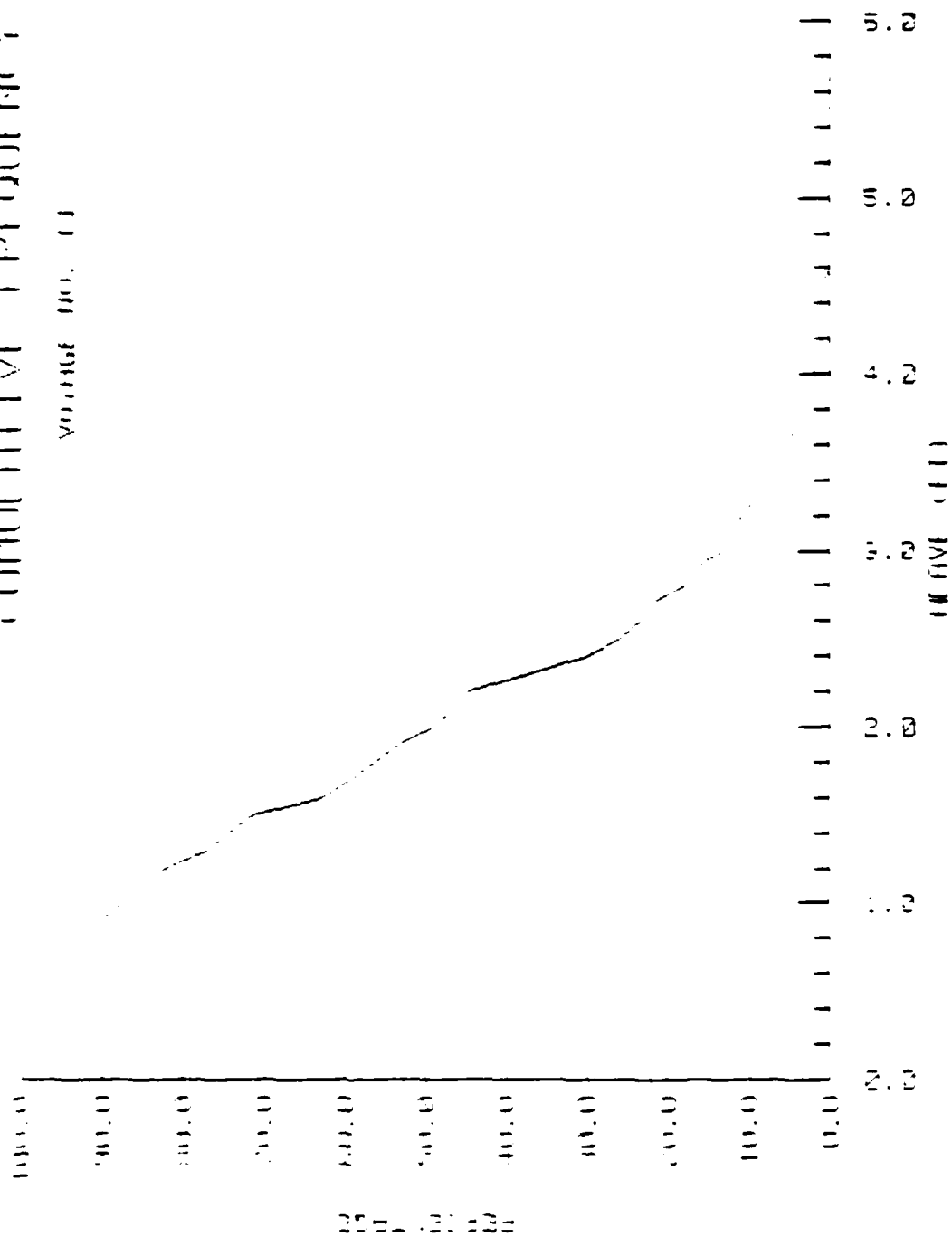
CUMULATIVE FREQUENCY

YOUNGE NO. 11



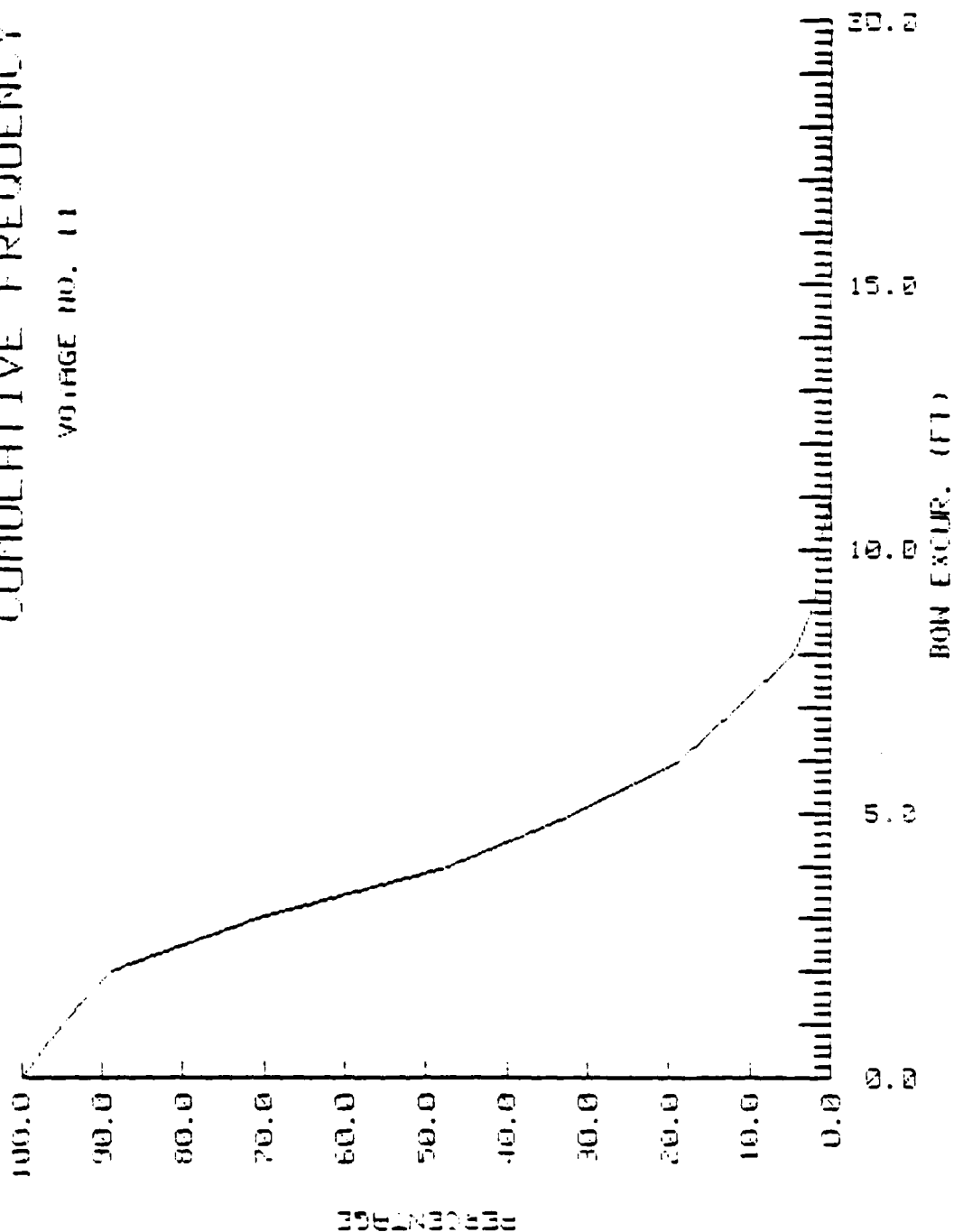
PERCENTAGE OF PLANT

YOUNG (No. 1)



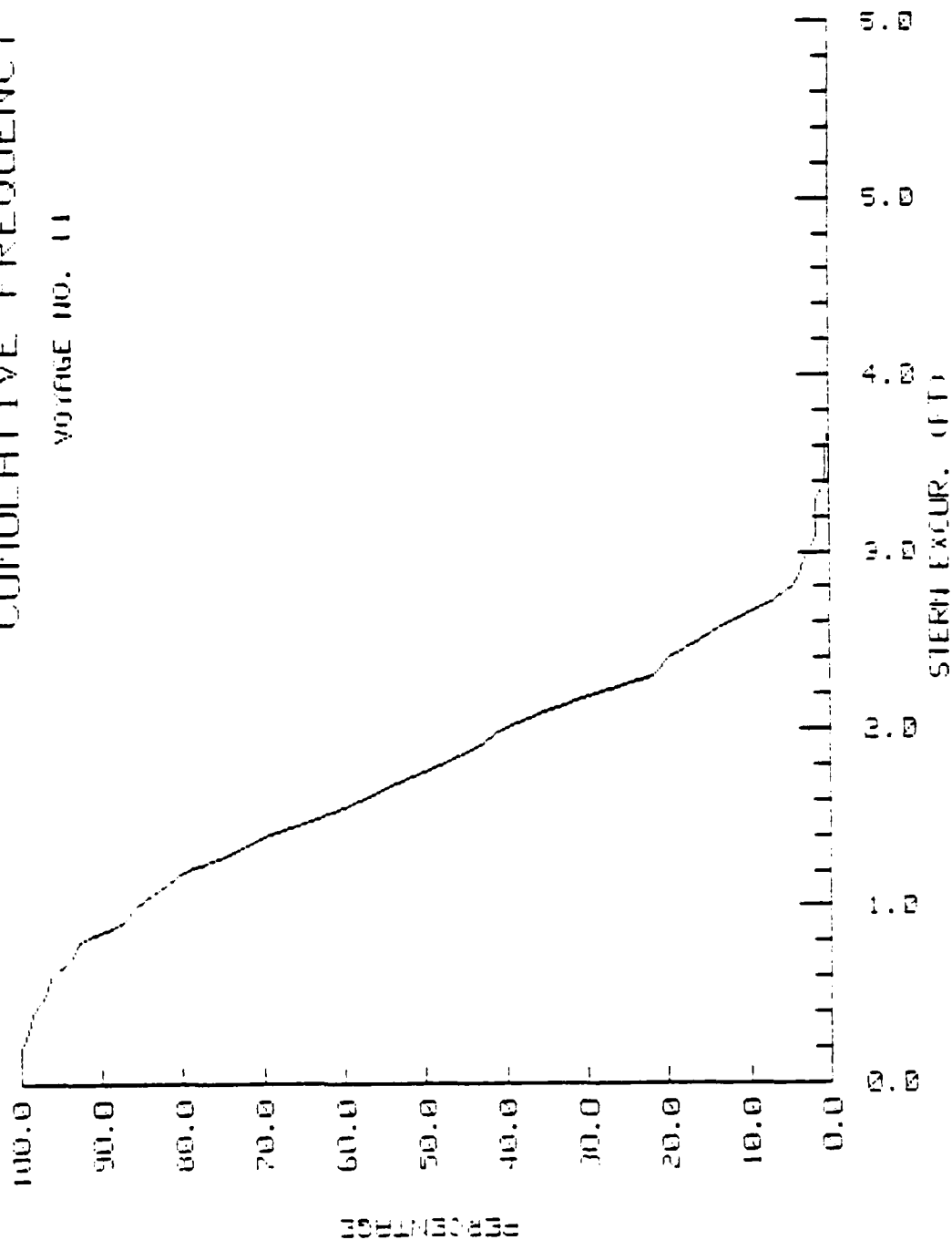
CUMULATIVE FREQUENCY

VOLAGE NO. 11



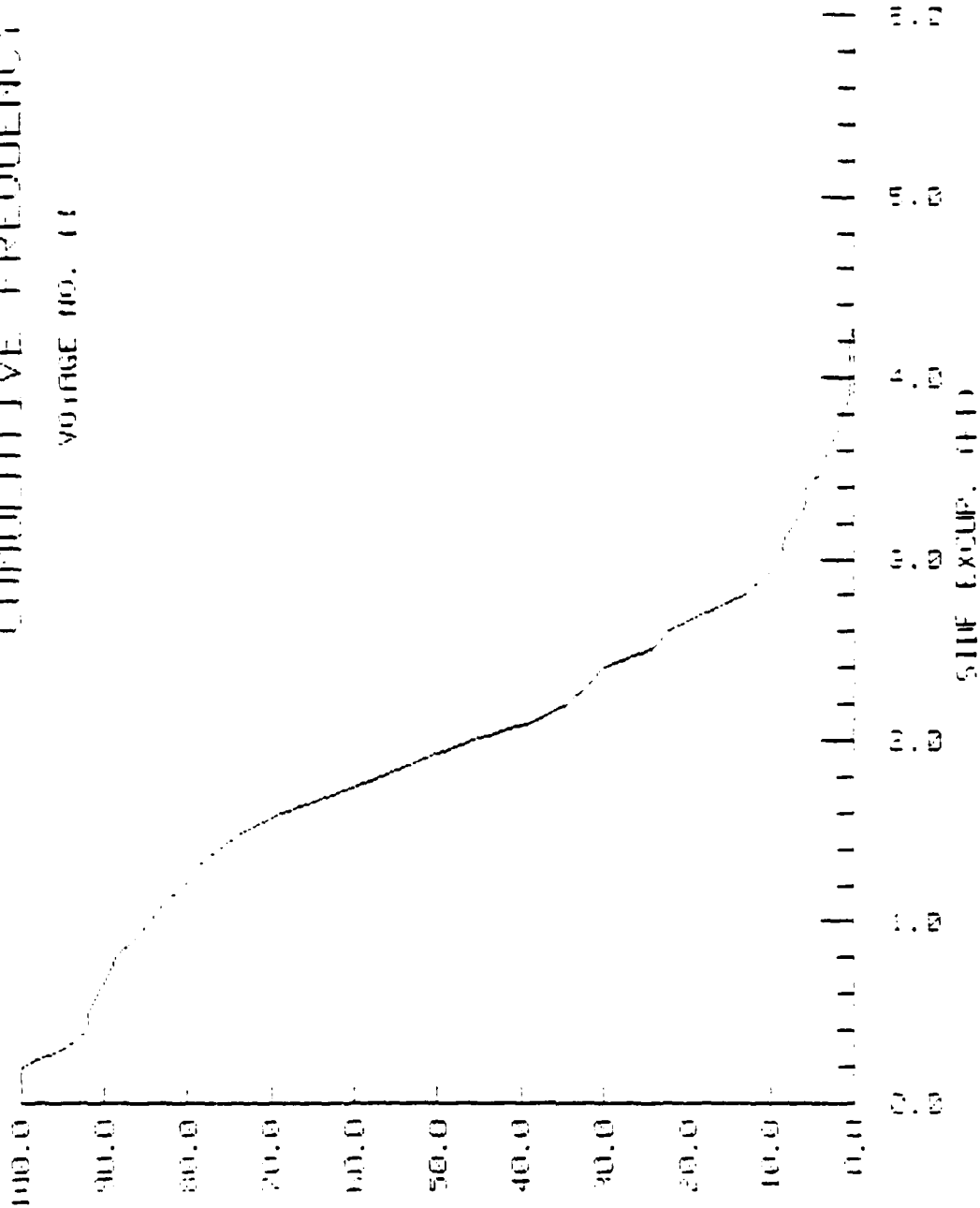
CUMULATIVE FREQUENCY

VOLTAGE NO. 11



CUMULATIVE FREQUENCY

VOLUME NO. 11

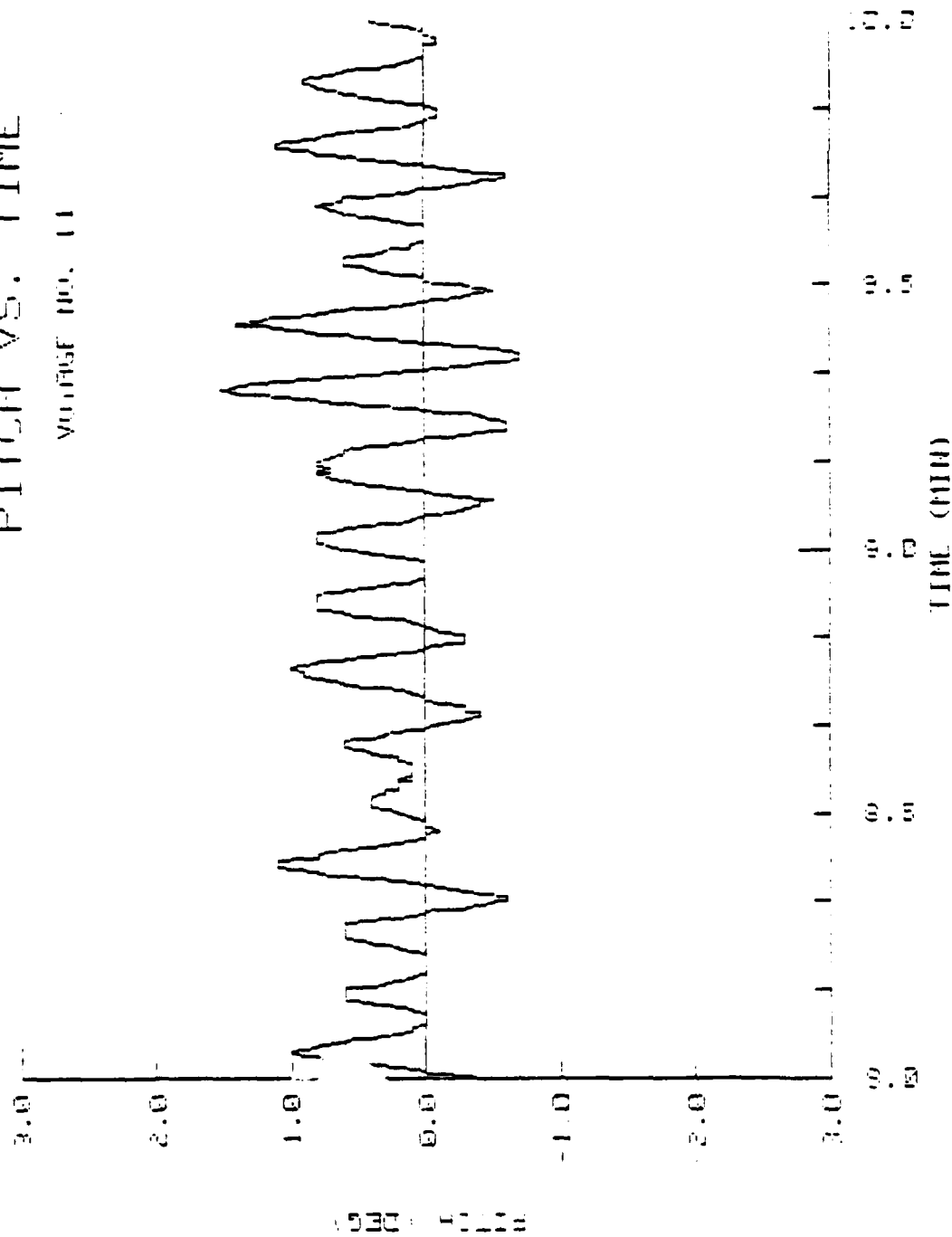


RECEIVED

STUD. EXCISE. (11)

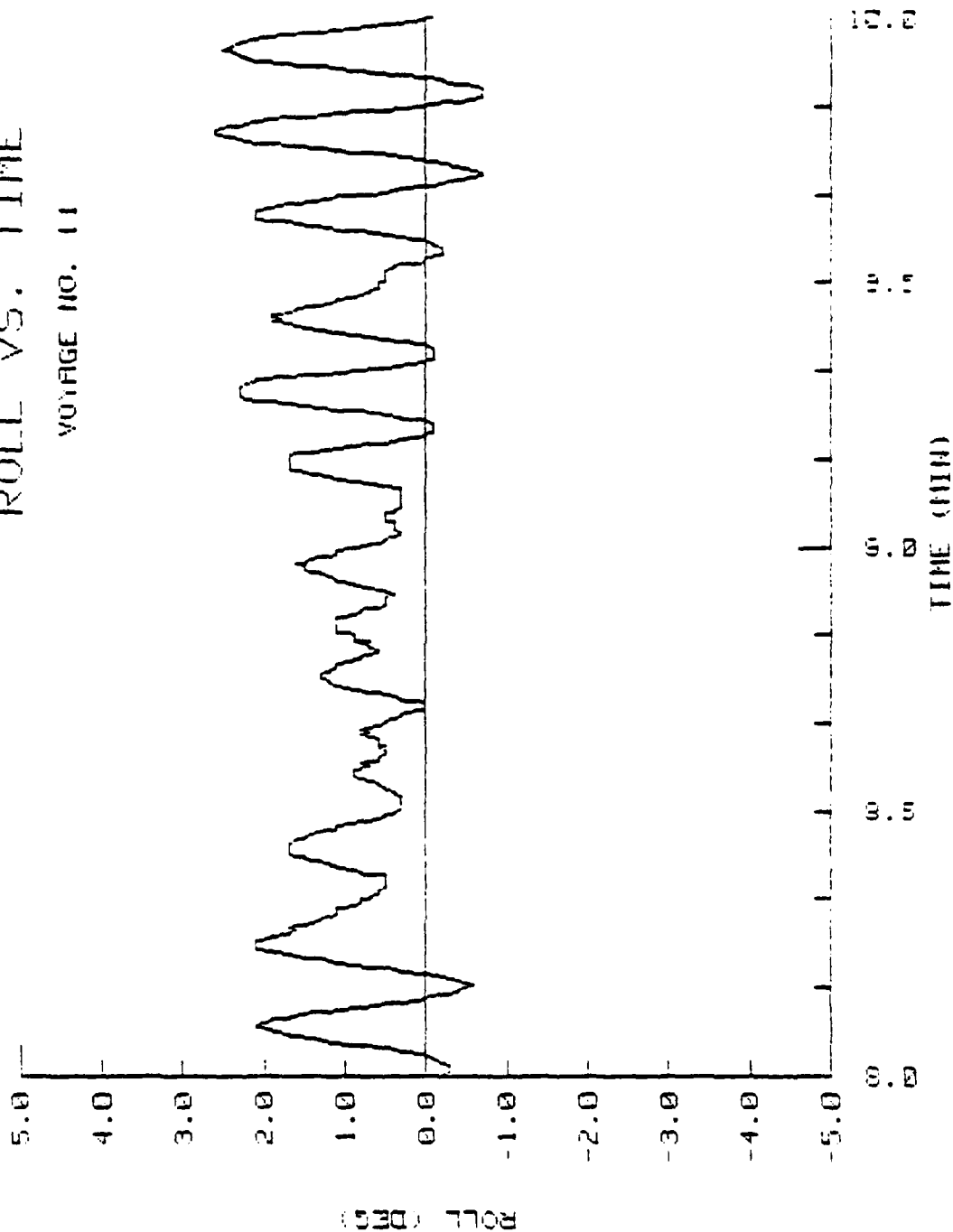
PITCH VS. TIME

VOLUME NO. 11



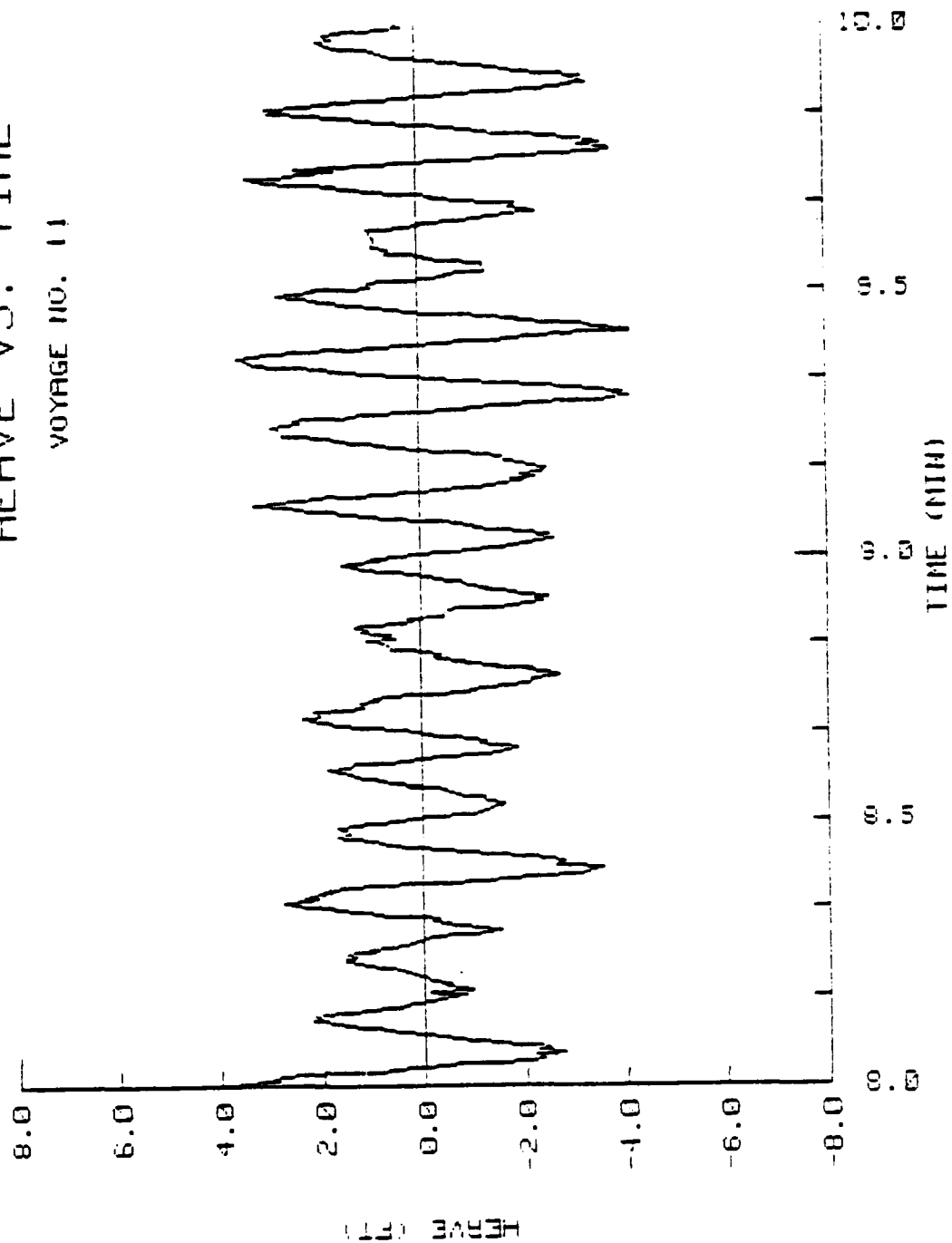
ROLL VS. TIME

VOLUME NO. 11



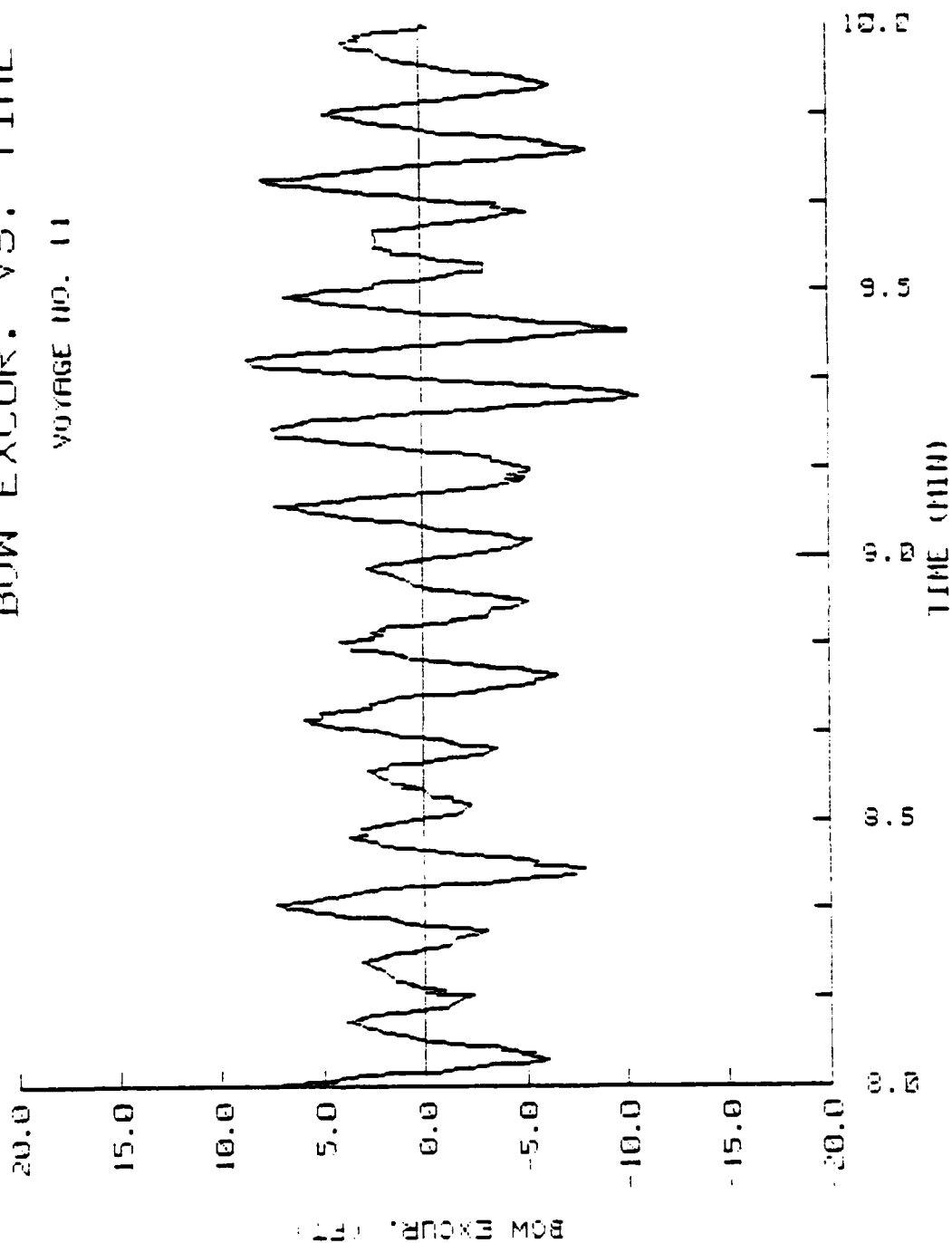
HEAVE VS. TIME

VOYAGE NO. 11



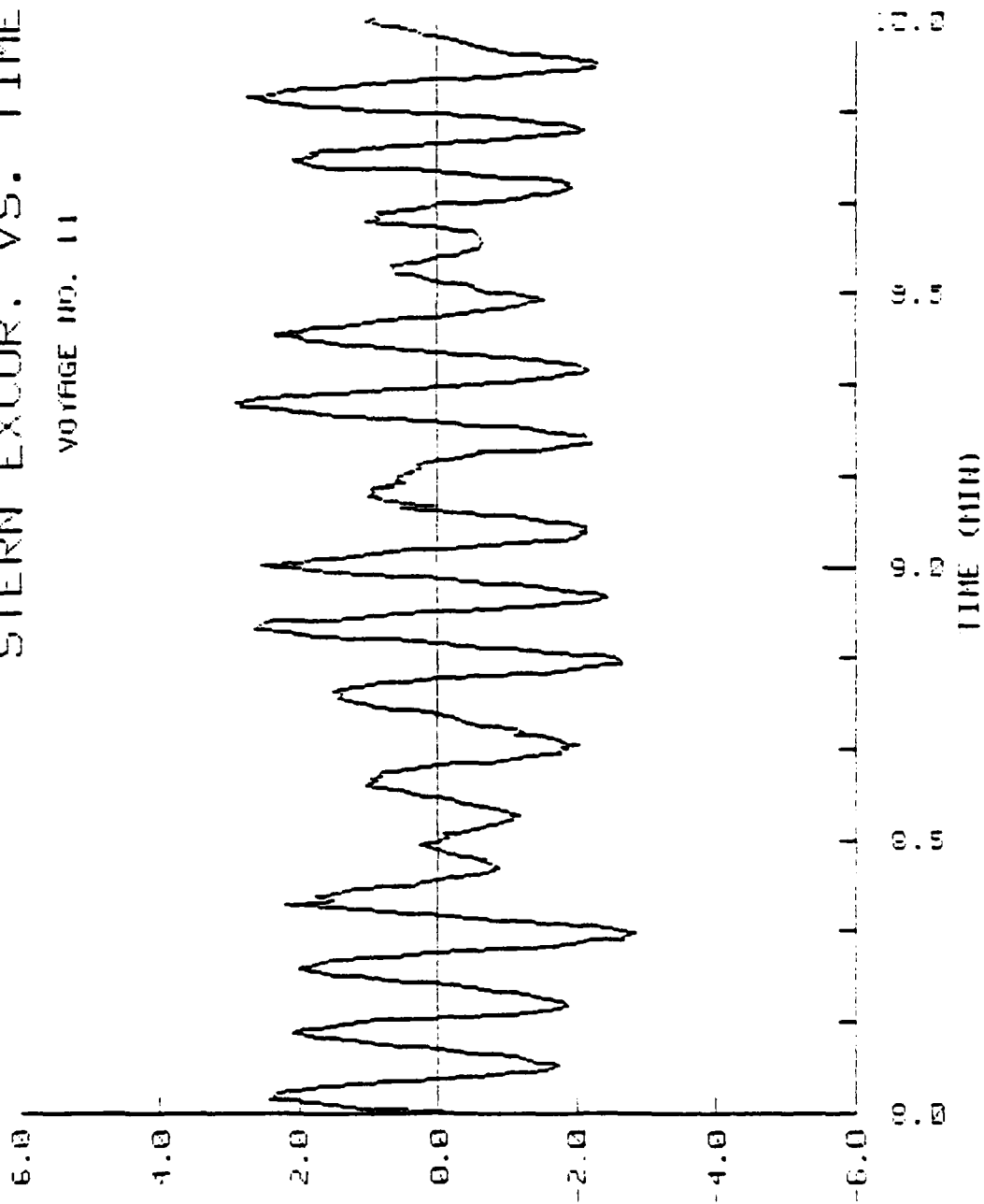
BOW EXCUR. VS. TIME

VOYAGE NO. 11



STERN EXCUR. VS. TIME

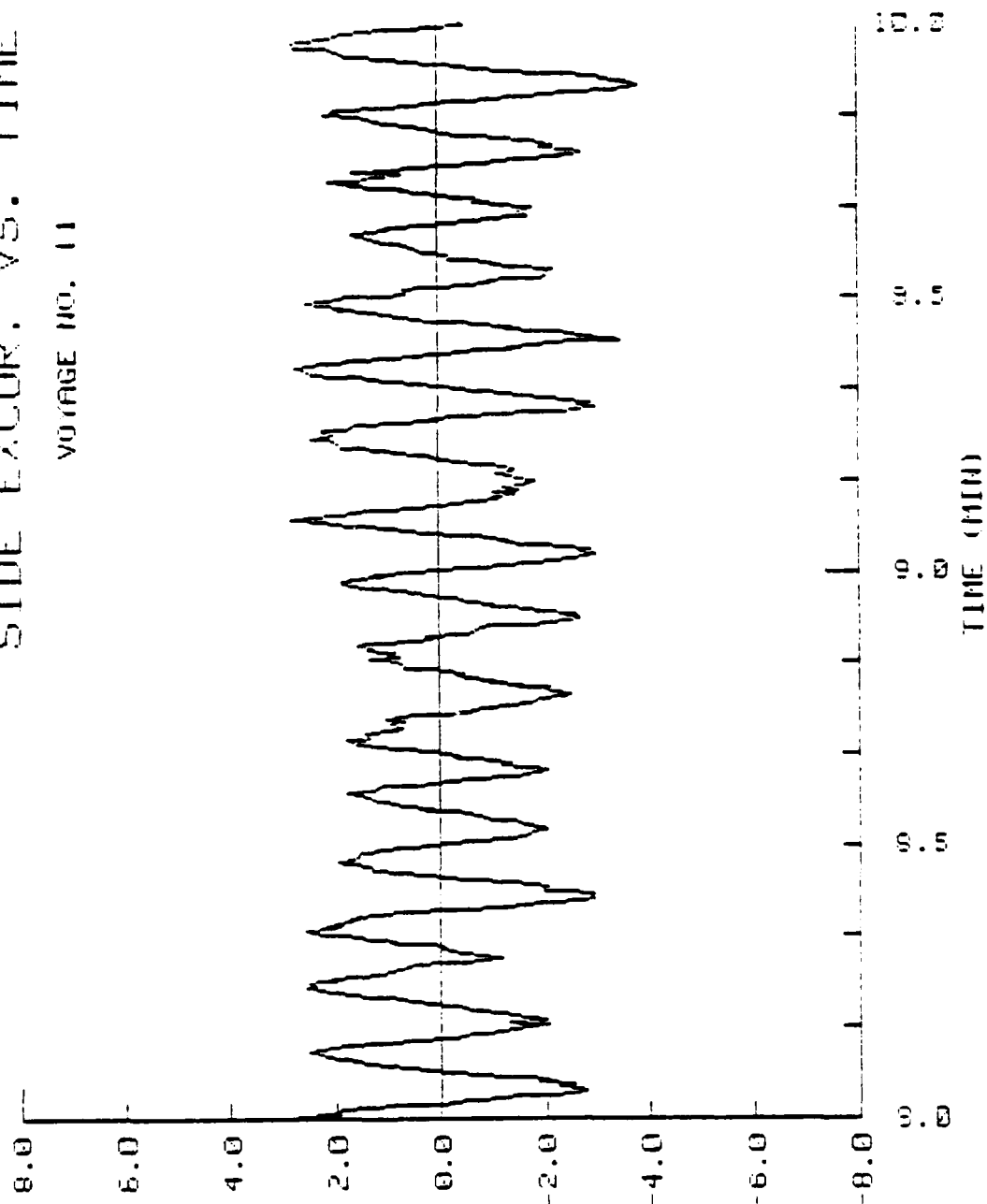
VOLTAJE NO. 11



(11) 000000000000

SIDE EXCUR. VS. TIME

VOLAGE NO. 11



SIDE EXCUR. VS. TIME

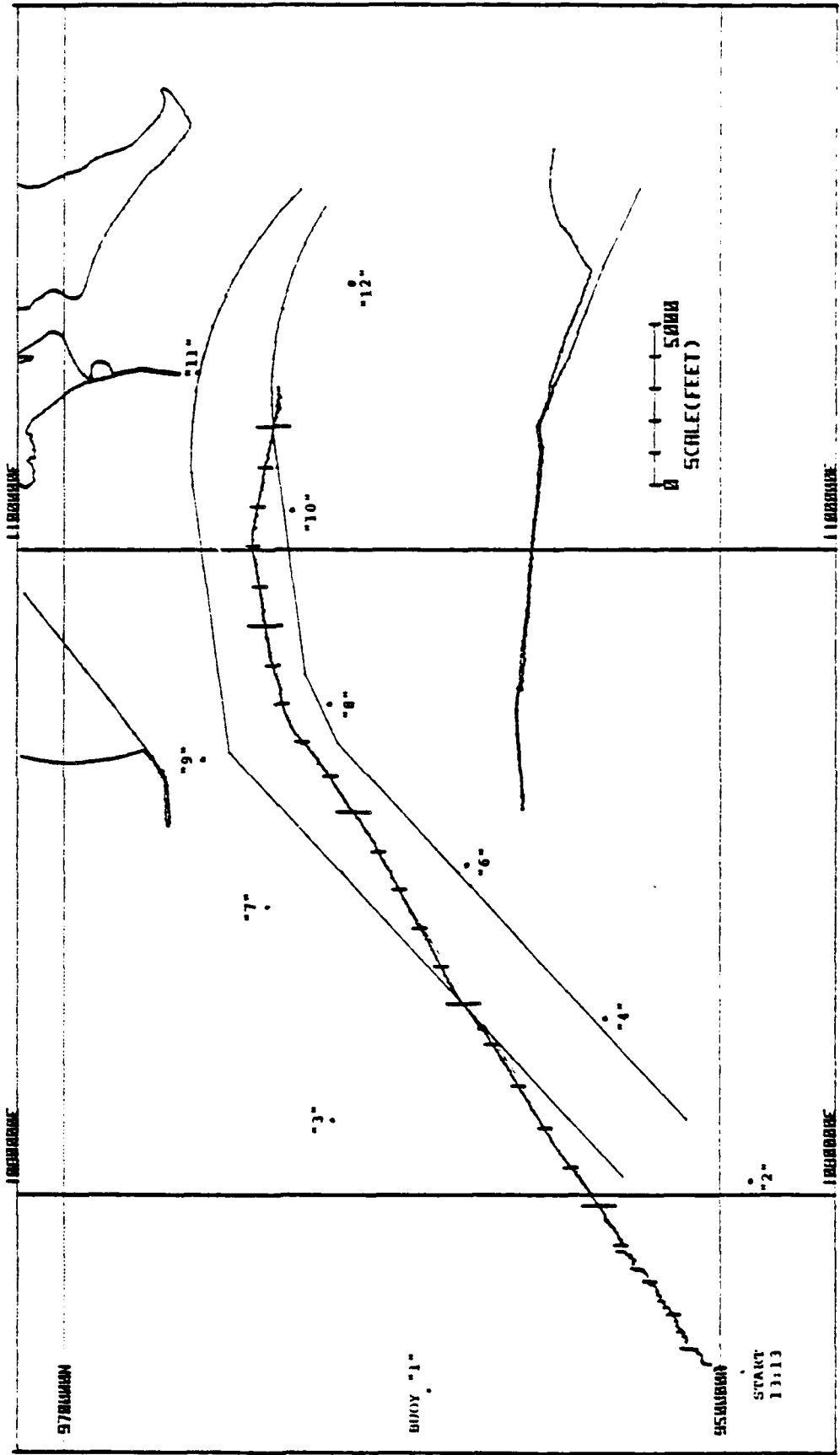
STATISTICAL SUMMARY

VOYAGE NO. 12

	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-.8	.8	.4	.4
ROLL (DEG)	.6	3.4	1.3	1.6
YAW (FT/SEC/SEC)	-.0	2.5	.8	.9
HEAVE (FT)	.0	1.8	.8	.8
BOOM EXCUR. (FT)	.0	6.3	2.4	2.8
STERN EXCUR. (FT)	.0	3.4	1.3	1.5
STAB EXCUR (FT)	.0	3.5	1.2	1.5

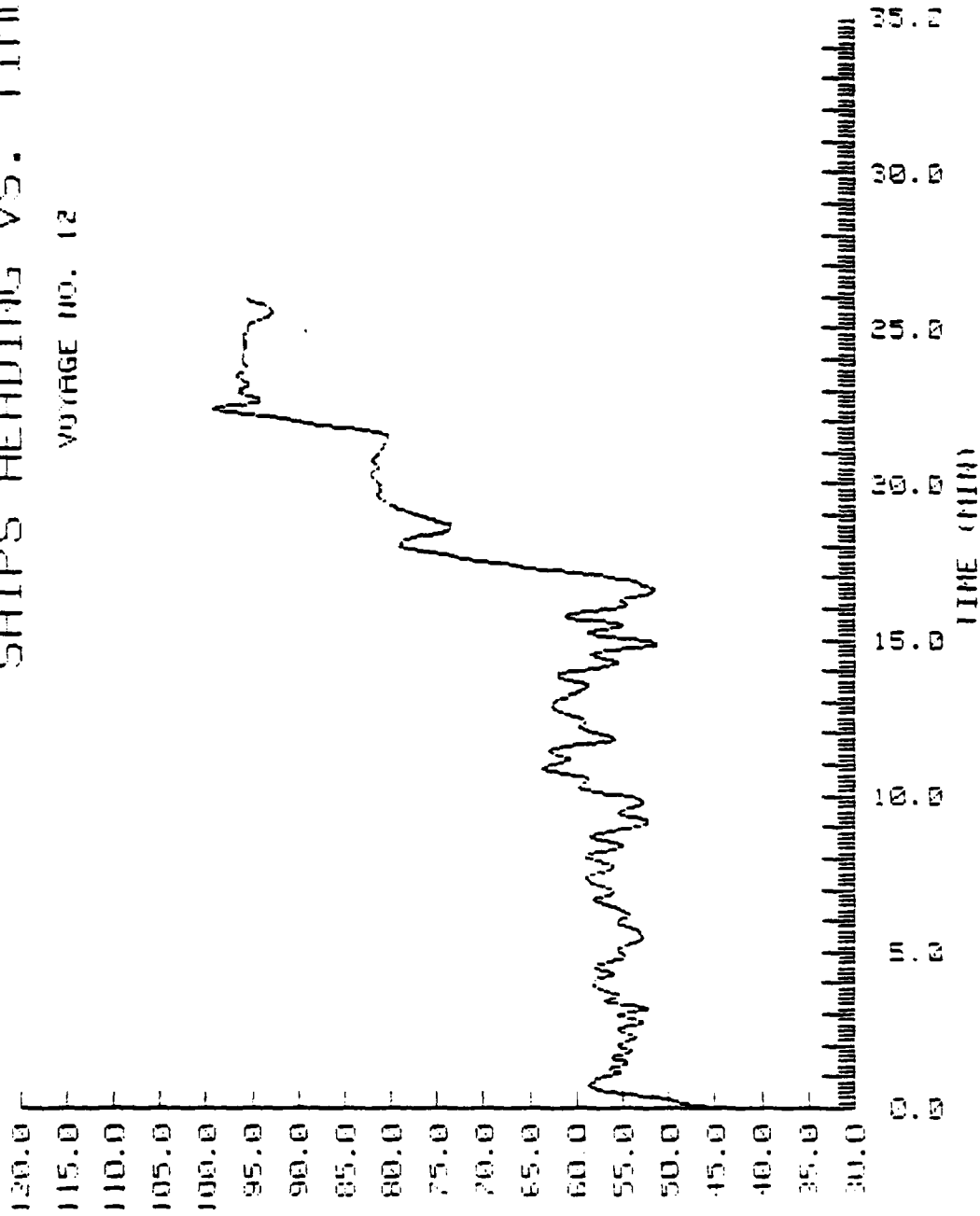
VOYAGE NO. 12 SHIP TRACK

SCALE 1: 30000



SHIPS HEADING VS. TIME

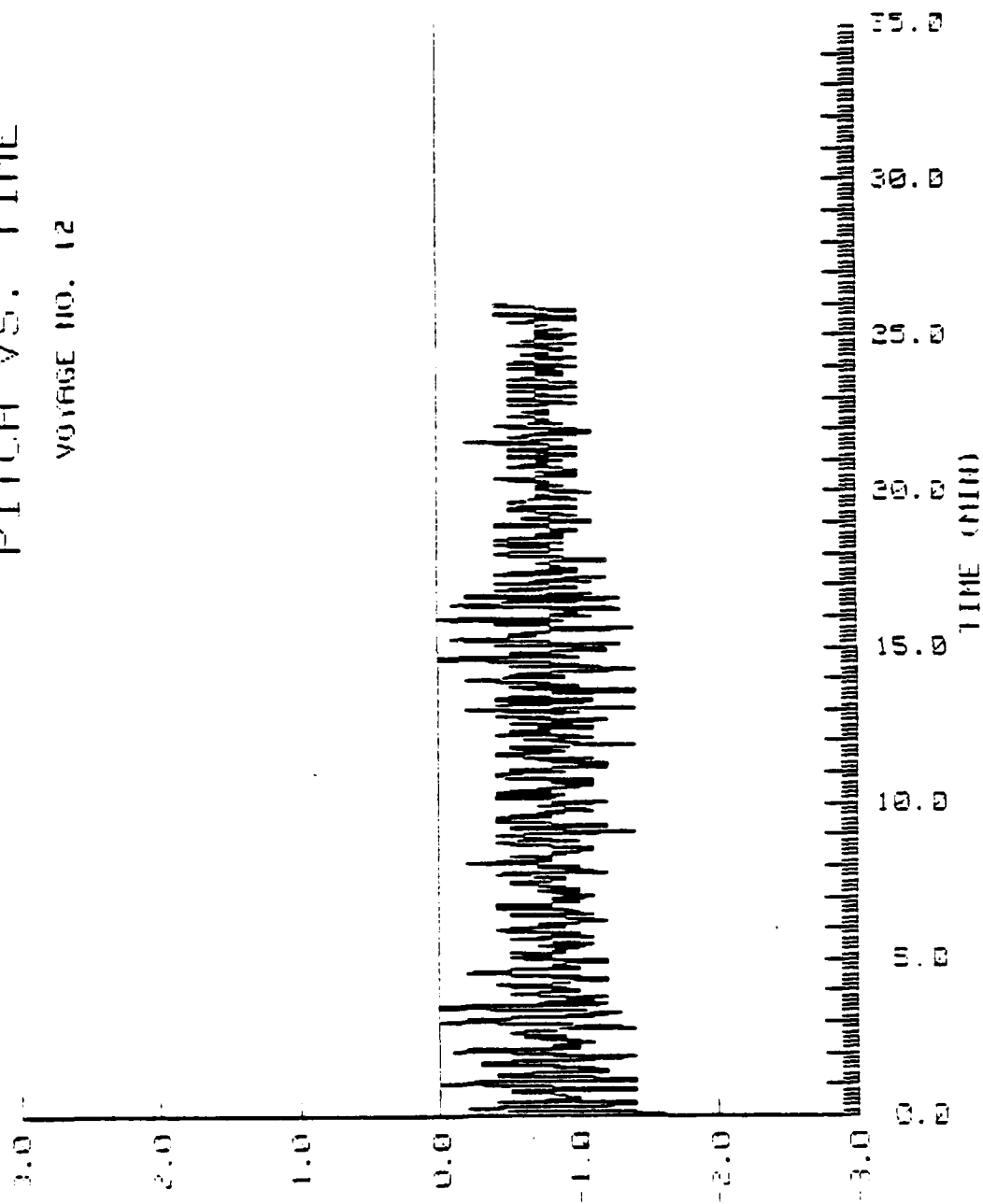
VOYAGE NO. 12



120.0 115.0 110.0 105.0 100.0 95.0 90.0 85.0 80.0 75.0 70.0 65.0 60.0 55.0 50.0 45.0 40.0 35.0 30.0

PITCH VS. TIME

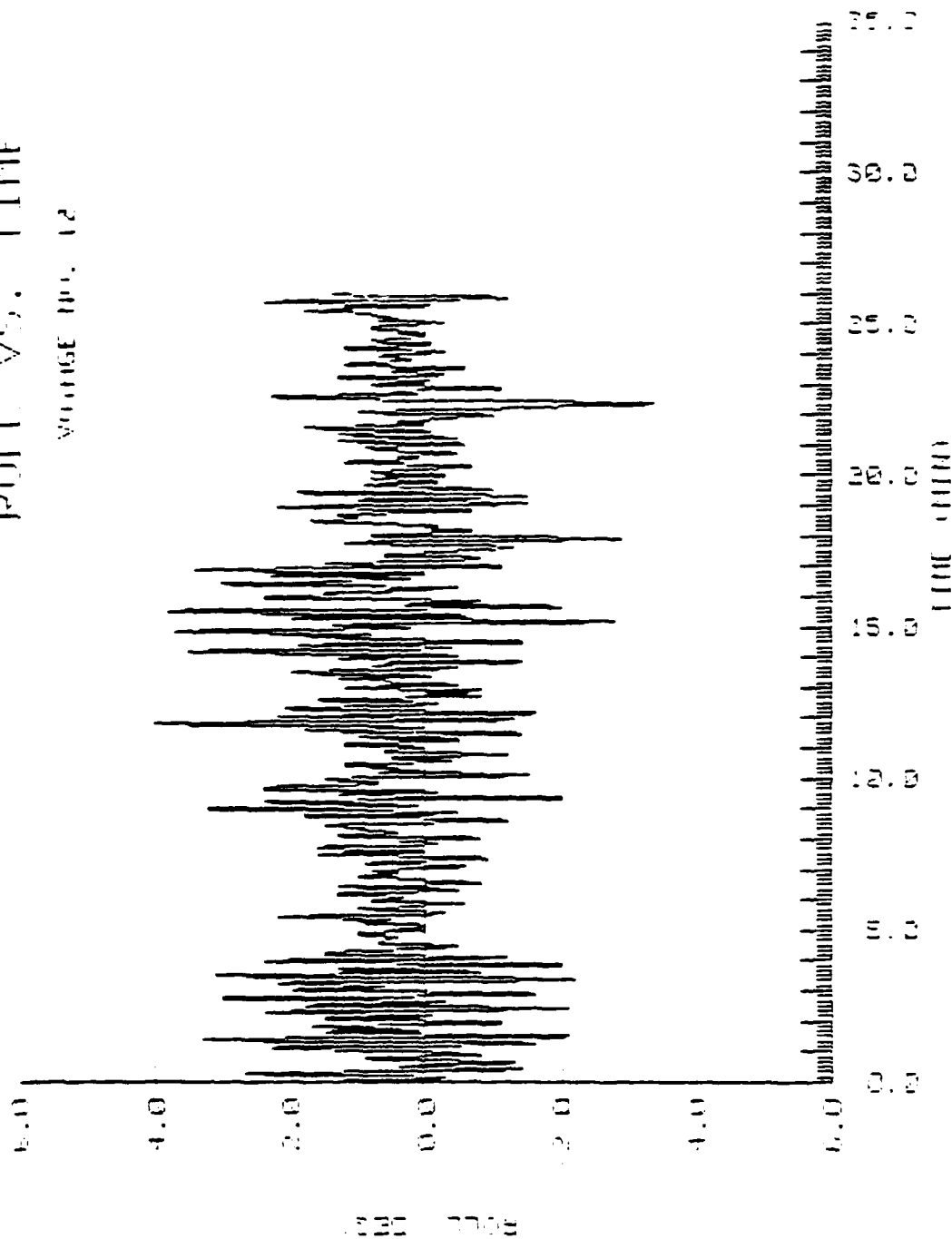
VORAGE NO. 12



1000 10000

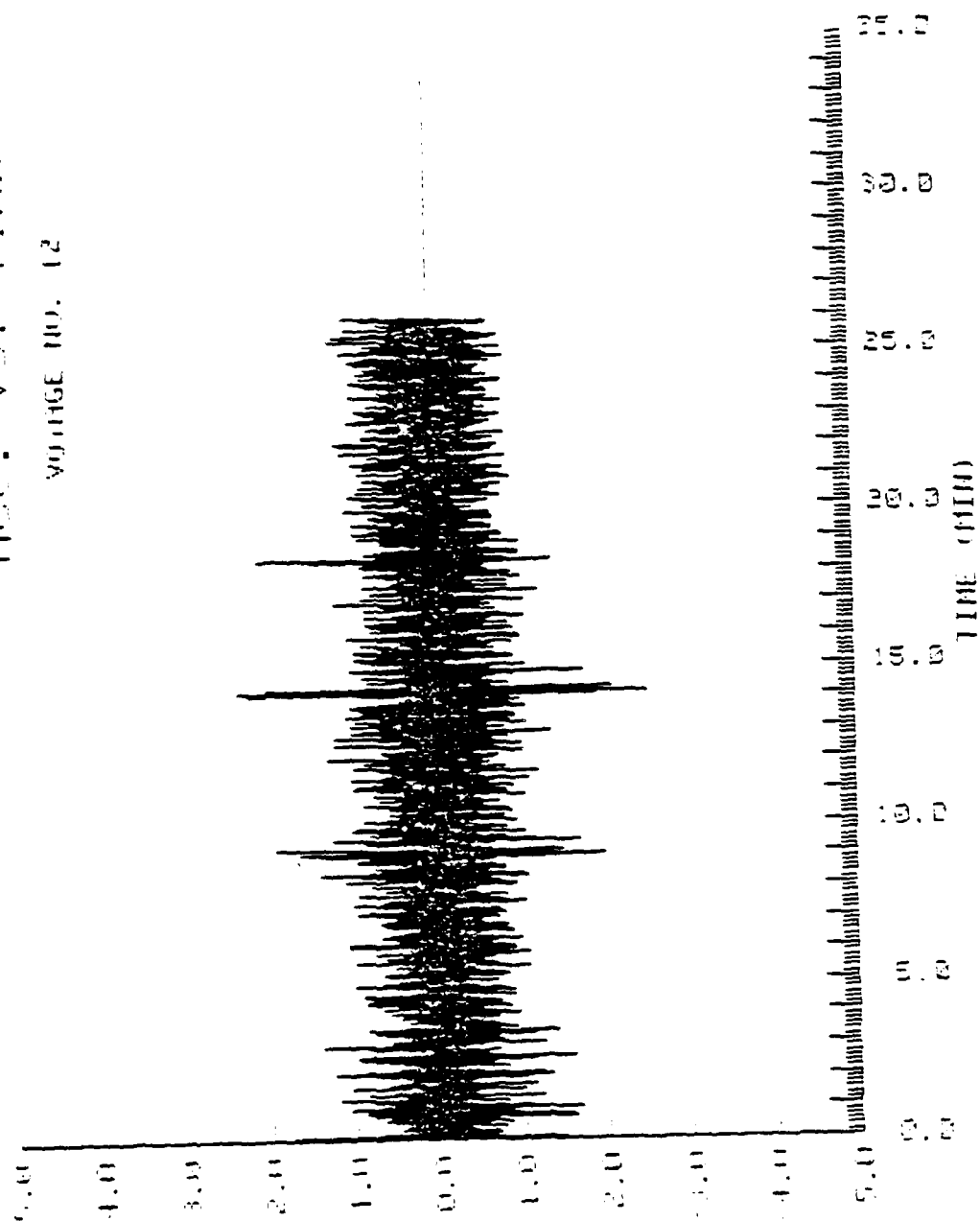
ROLL VIB. TIME

WAVE NO. 12



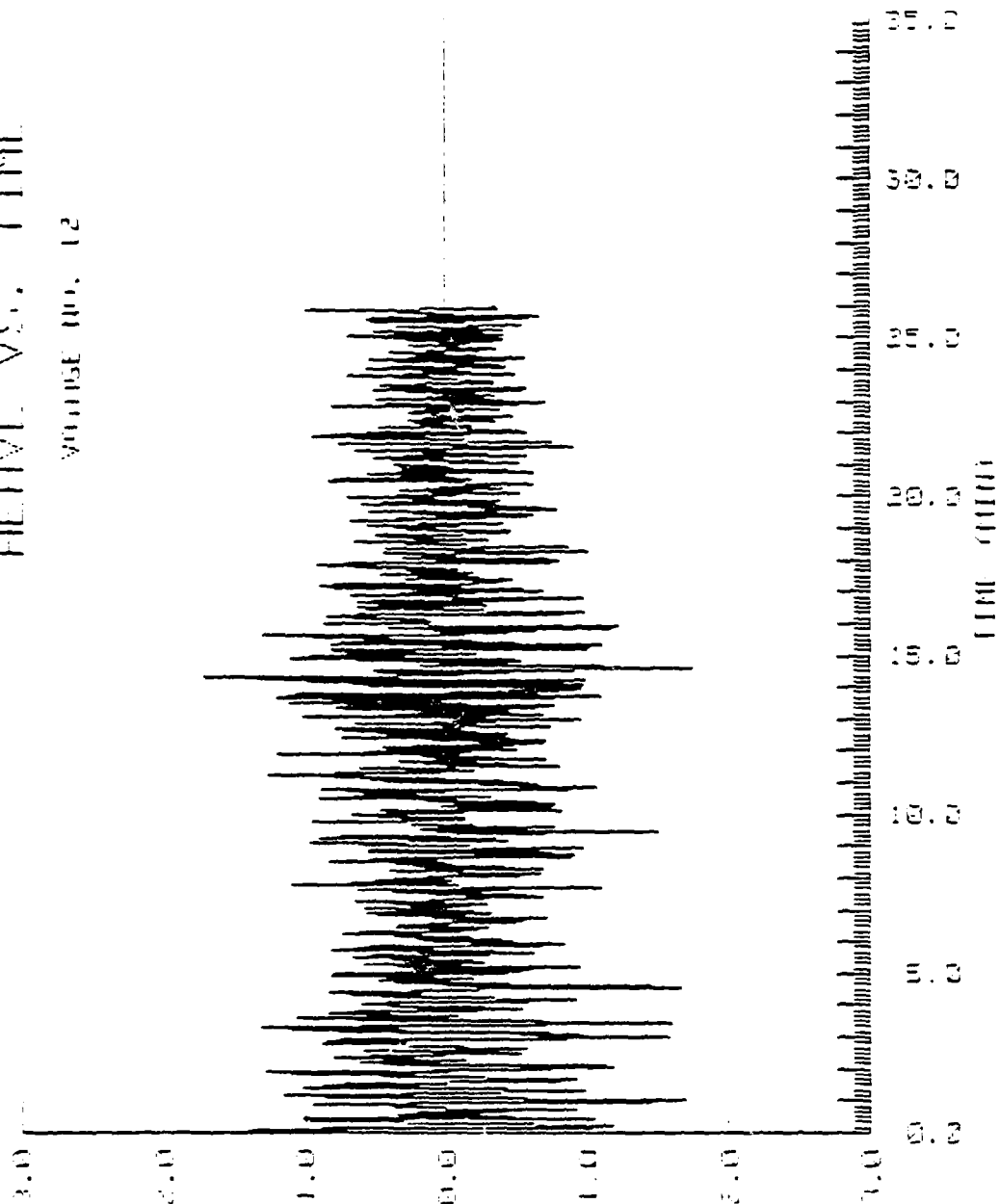
NO. VS. TIME

VOLUME NO. 12



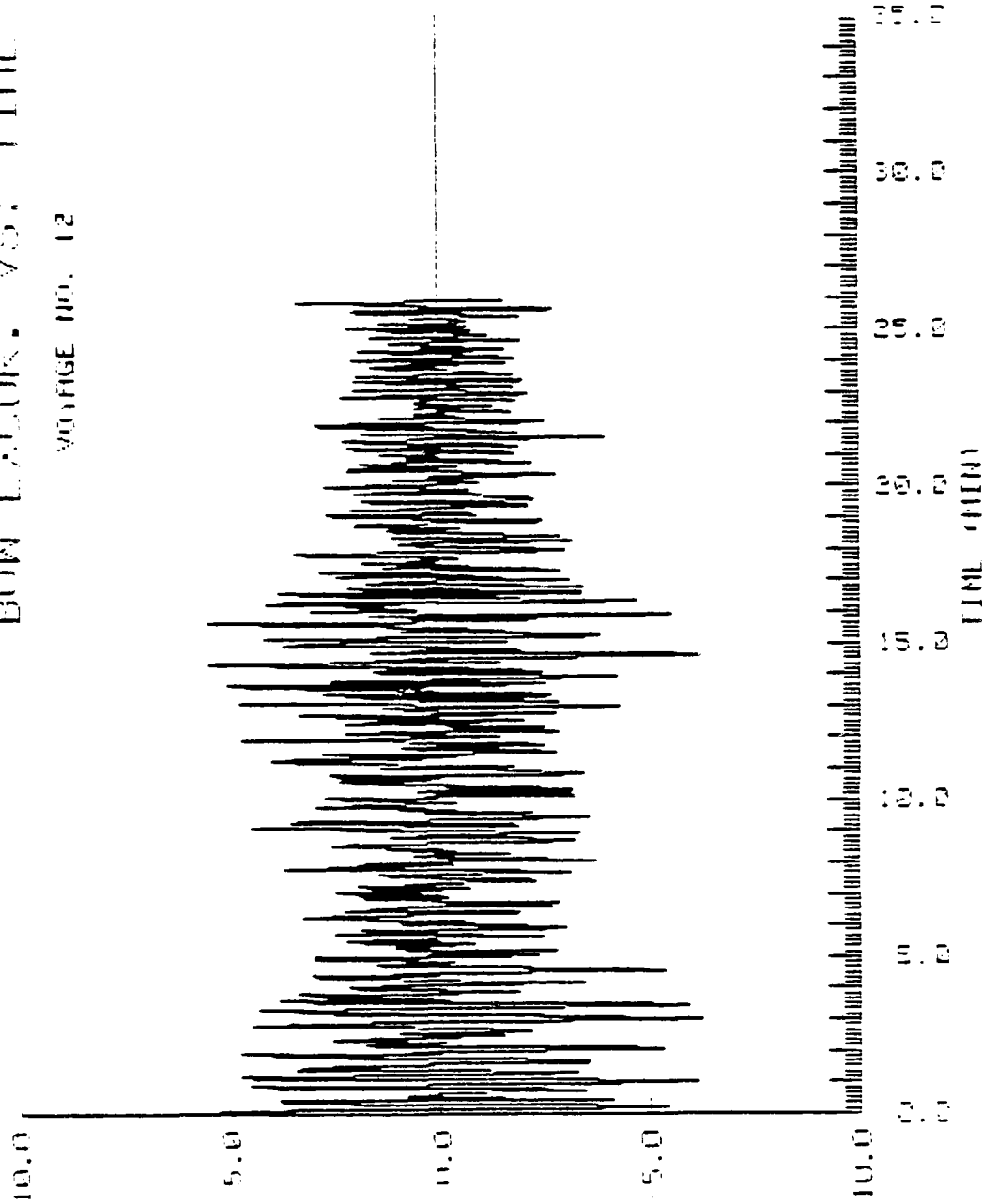
HEAVE VEG. TIME

VOYAGE NO. 12



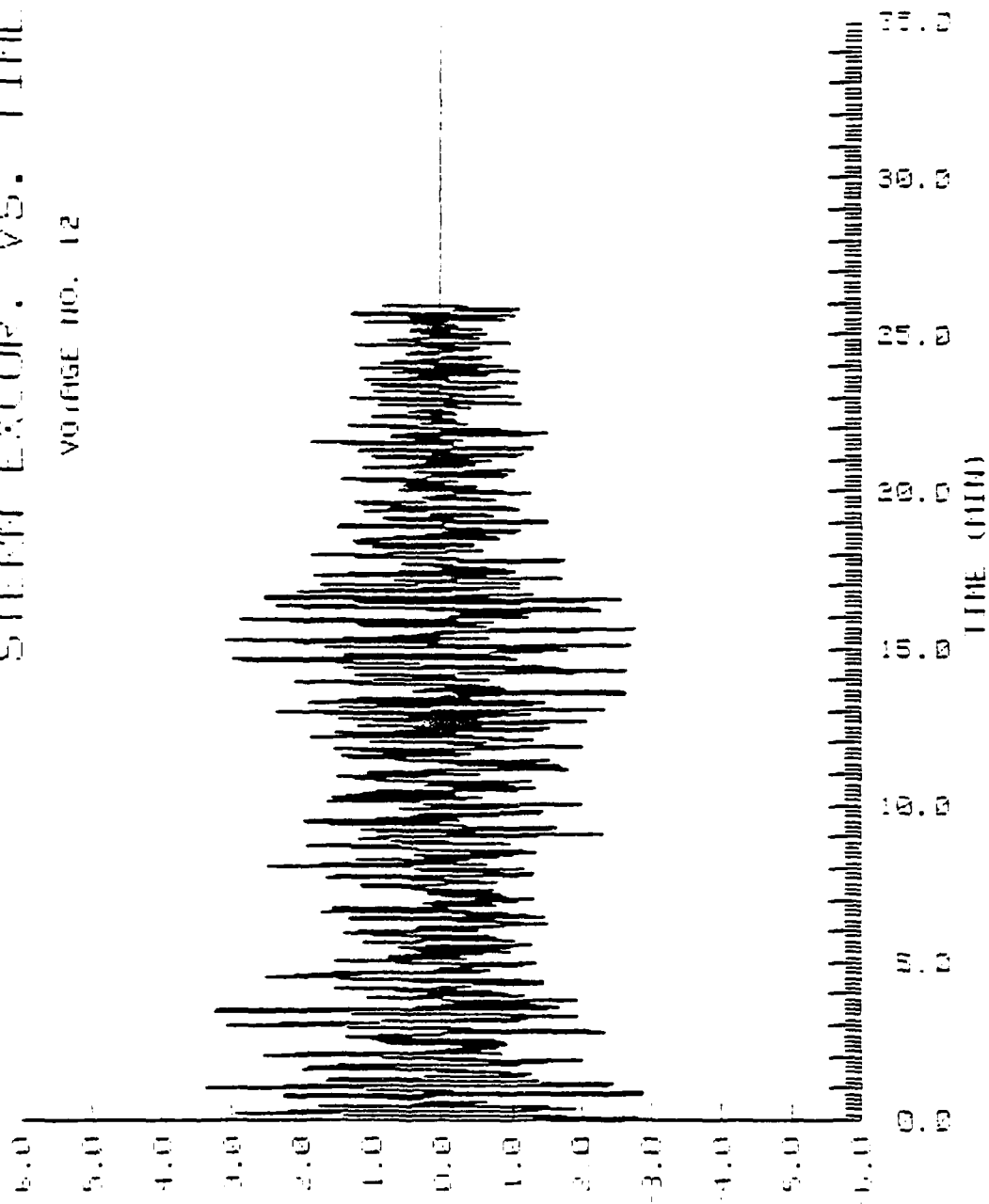
BOW EXCUR. V5: TIML

VOLUME NO. 12

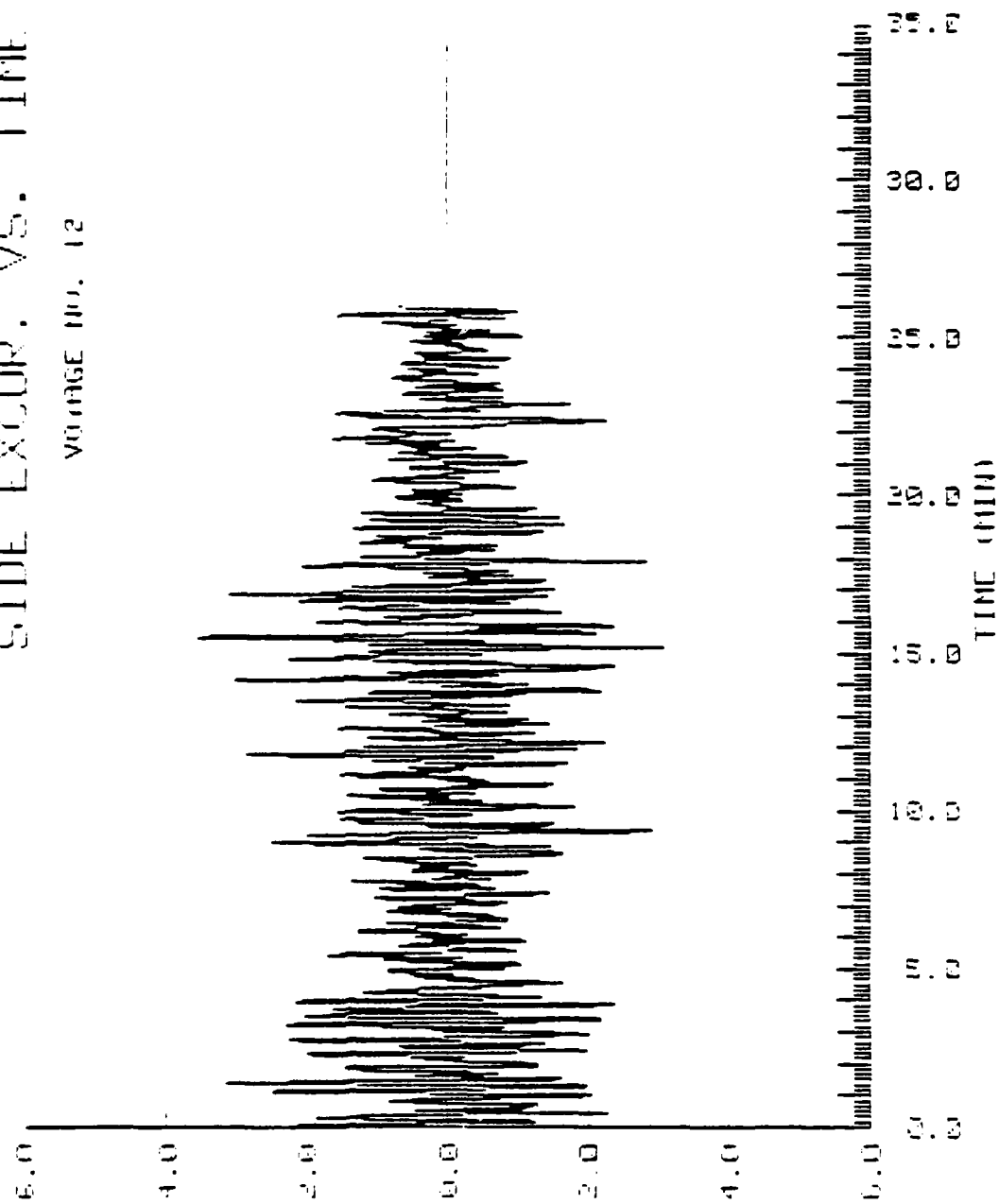


STEM EXCUR. VS. TIME

VOIAGE NO. 12

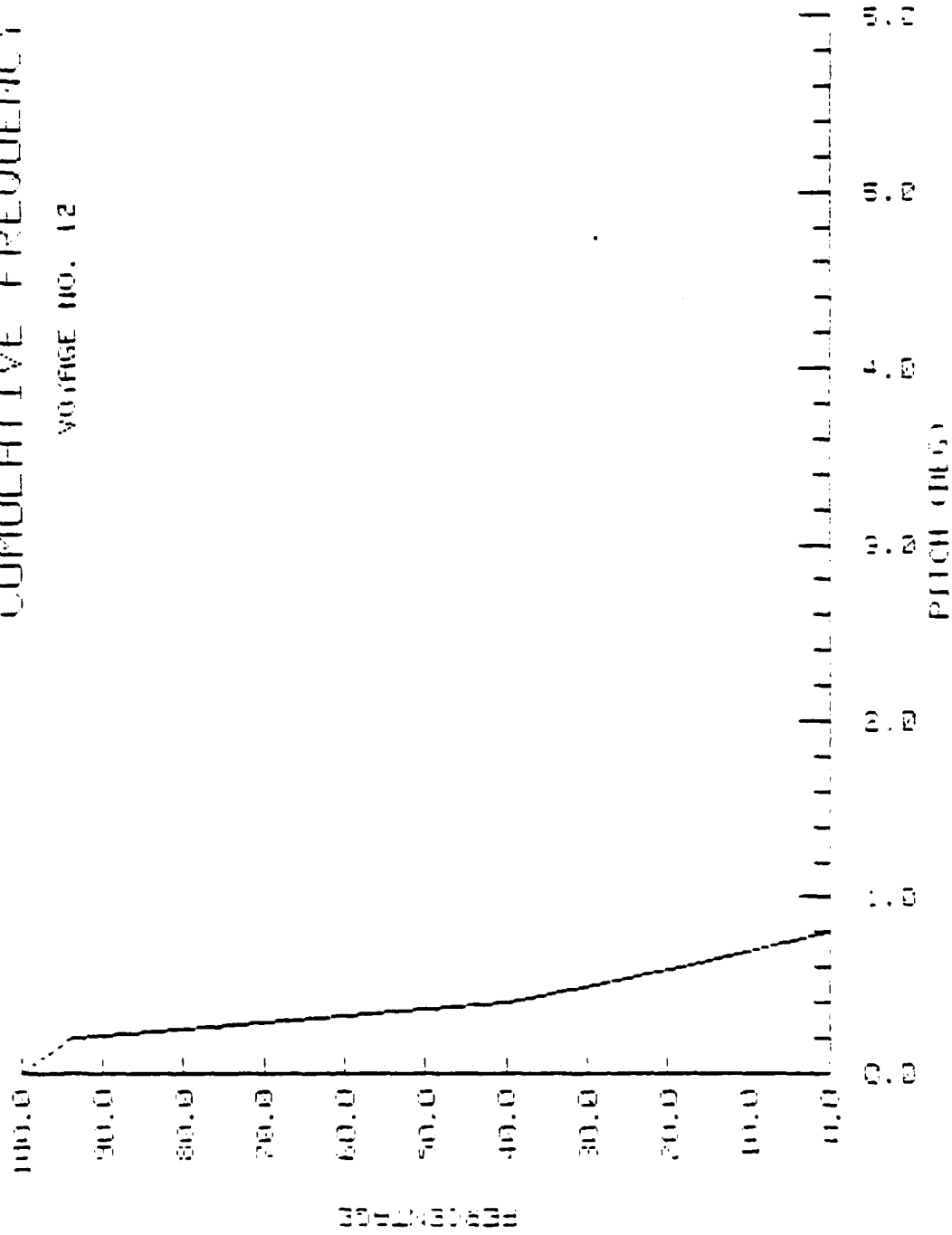


VOLUME IV. 12



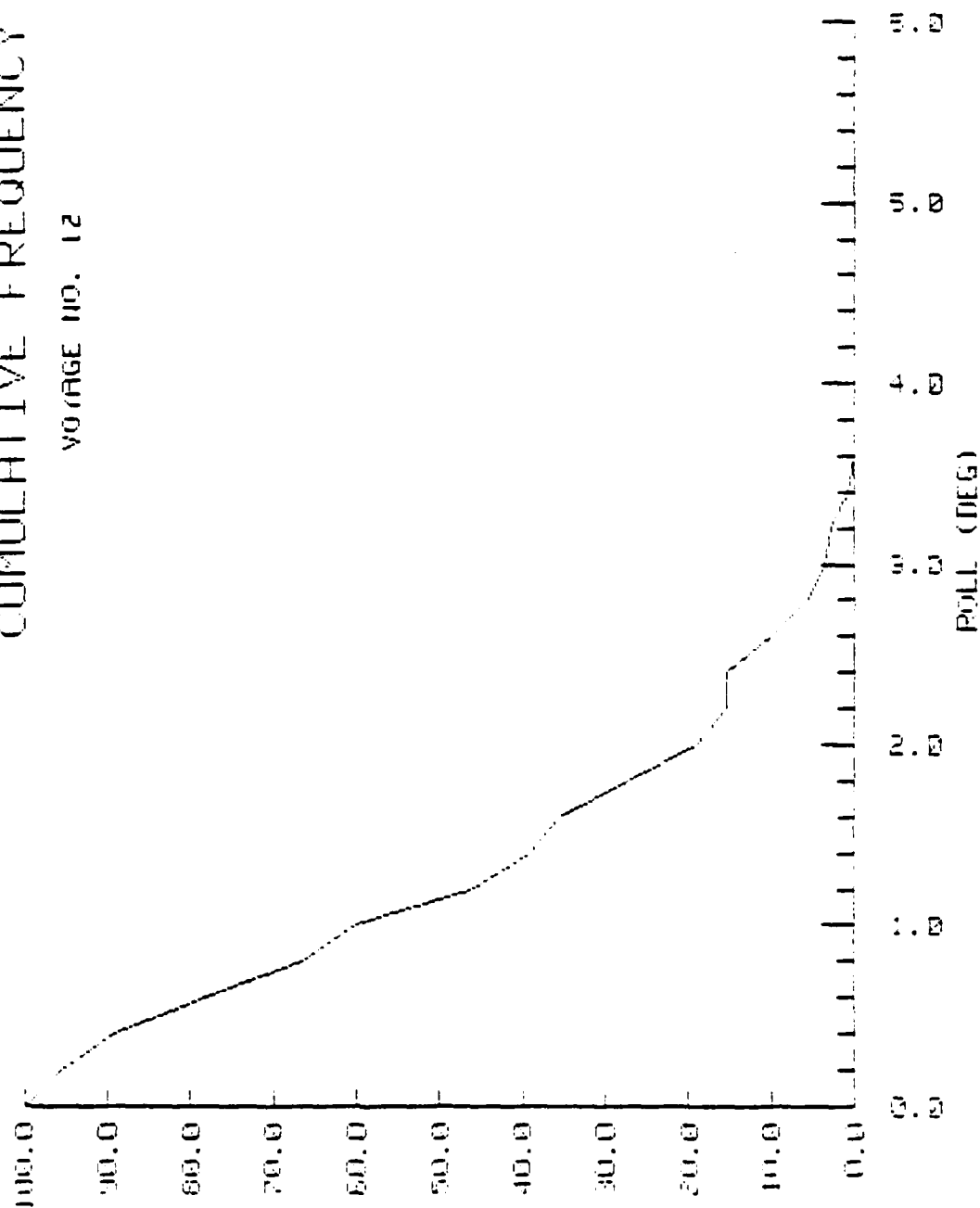
CUMULATIVE FREQUENCY

VOLAGE NO. 12



CUMULATIVE FREQUENCY

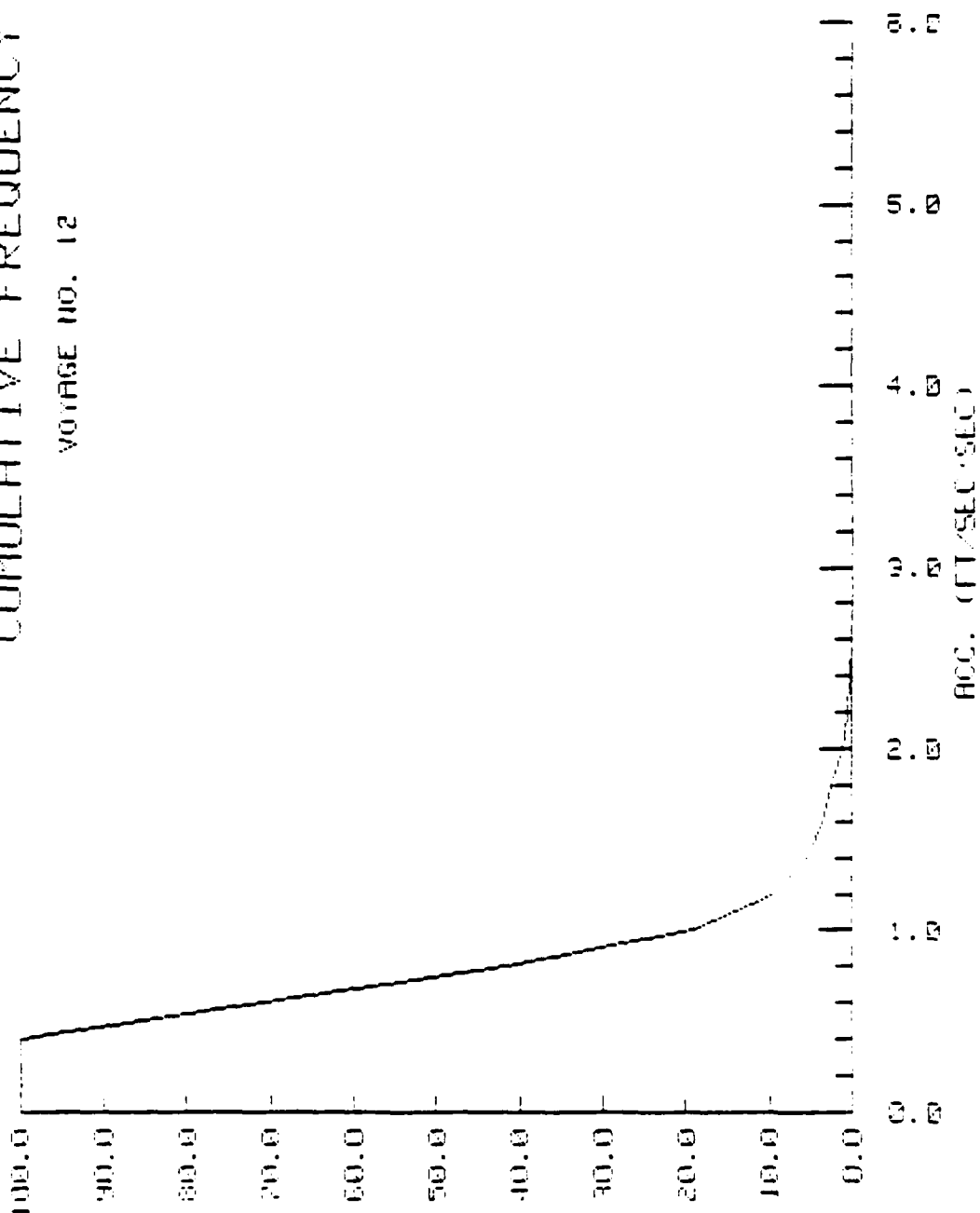
VORAGE NO. 12



11/20/61

CUMULATIVE FREQUENCY

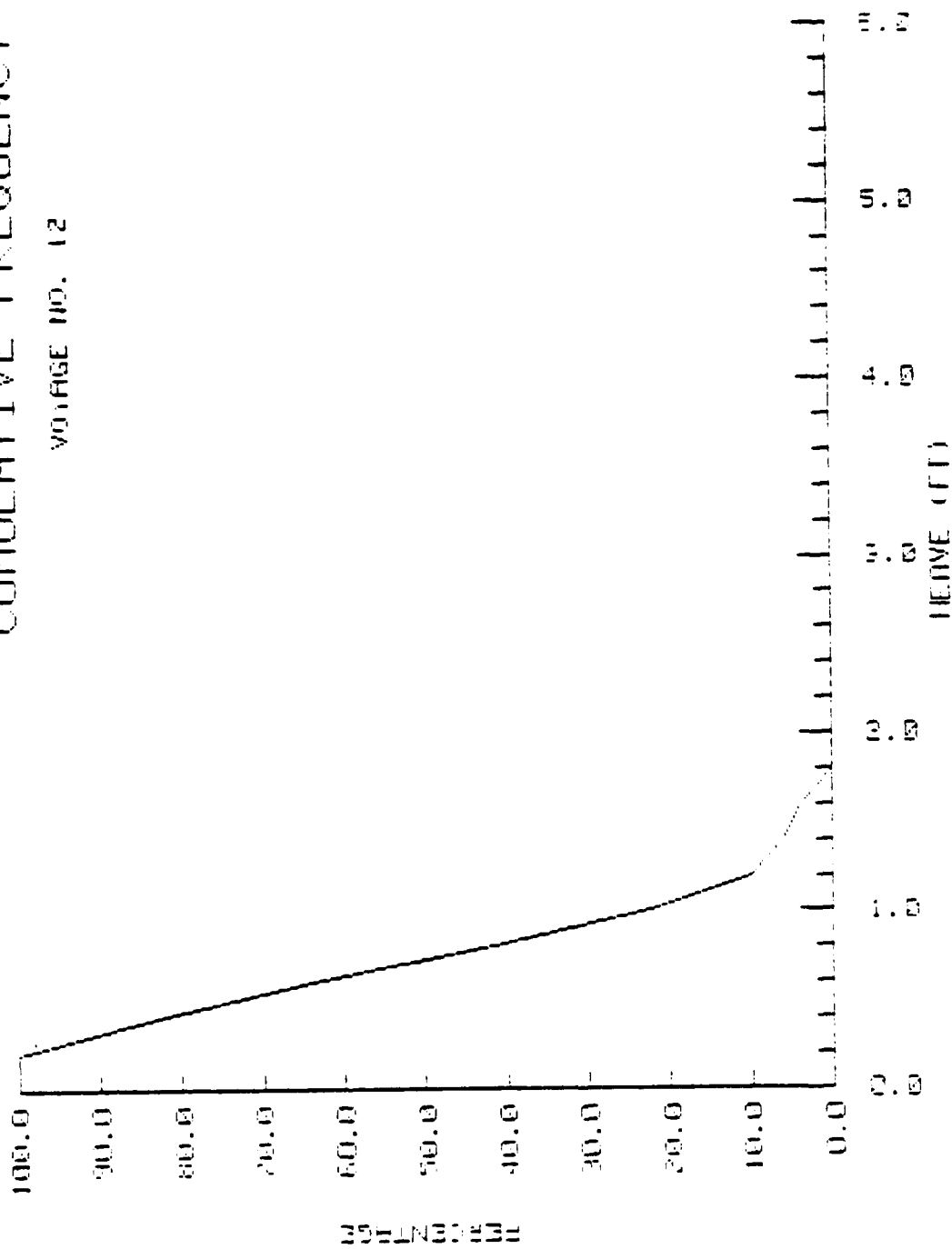
VOTAGE NO. 12



35-17-13-001

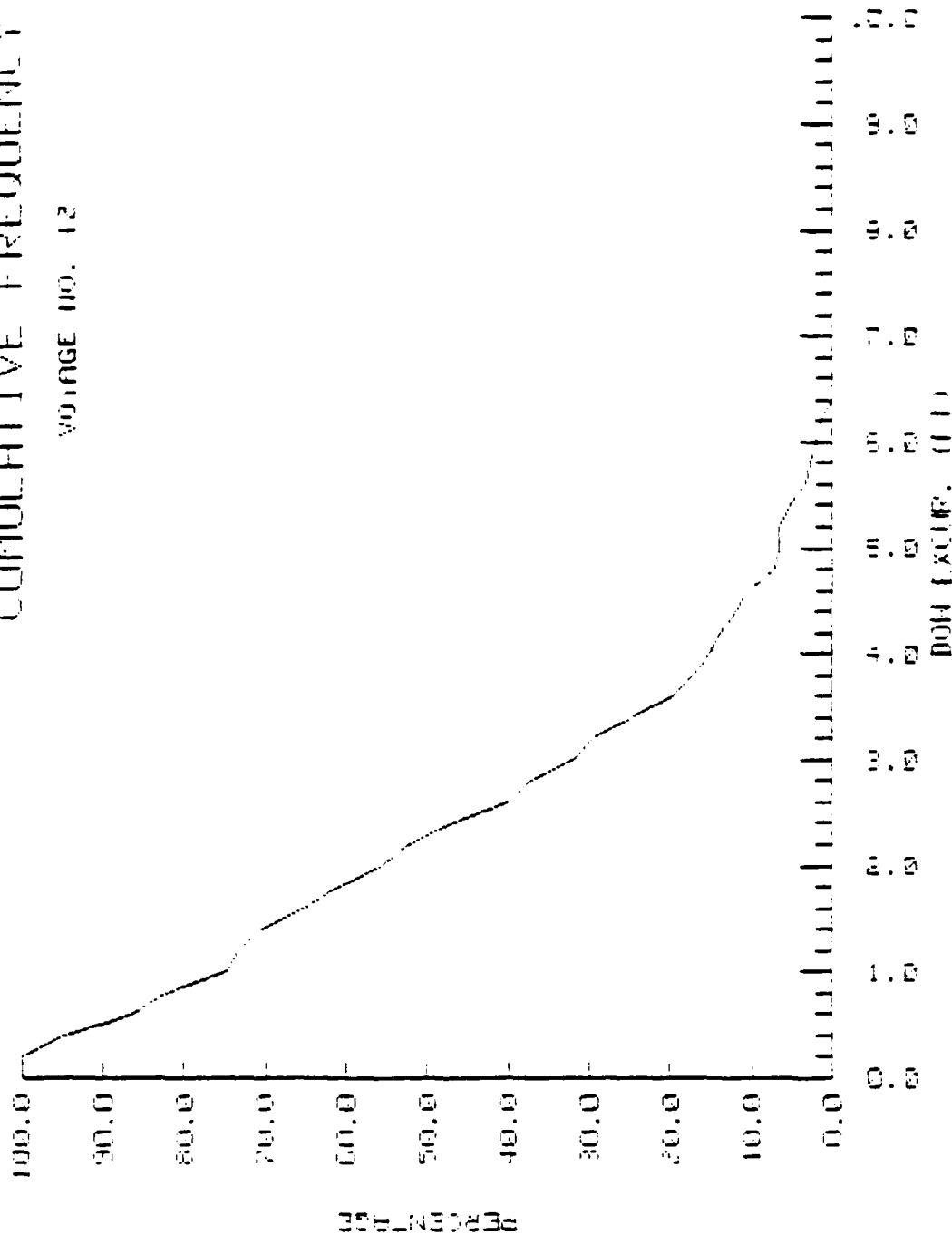
CUMULATIVE FREQUENCY

VOLUME NO. 12



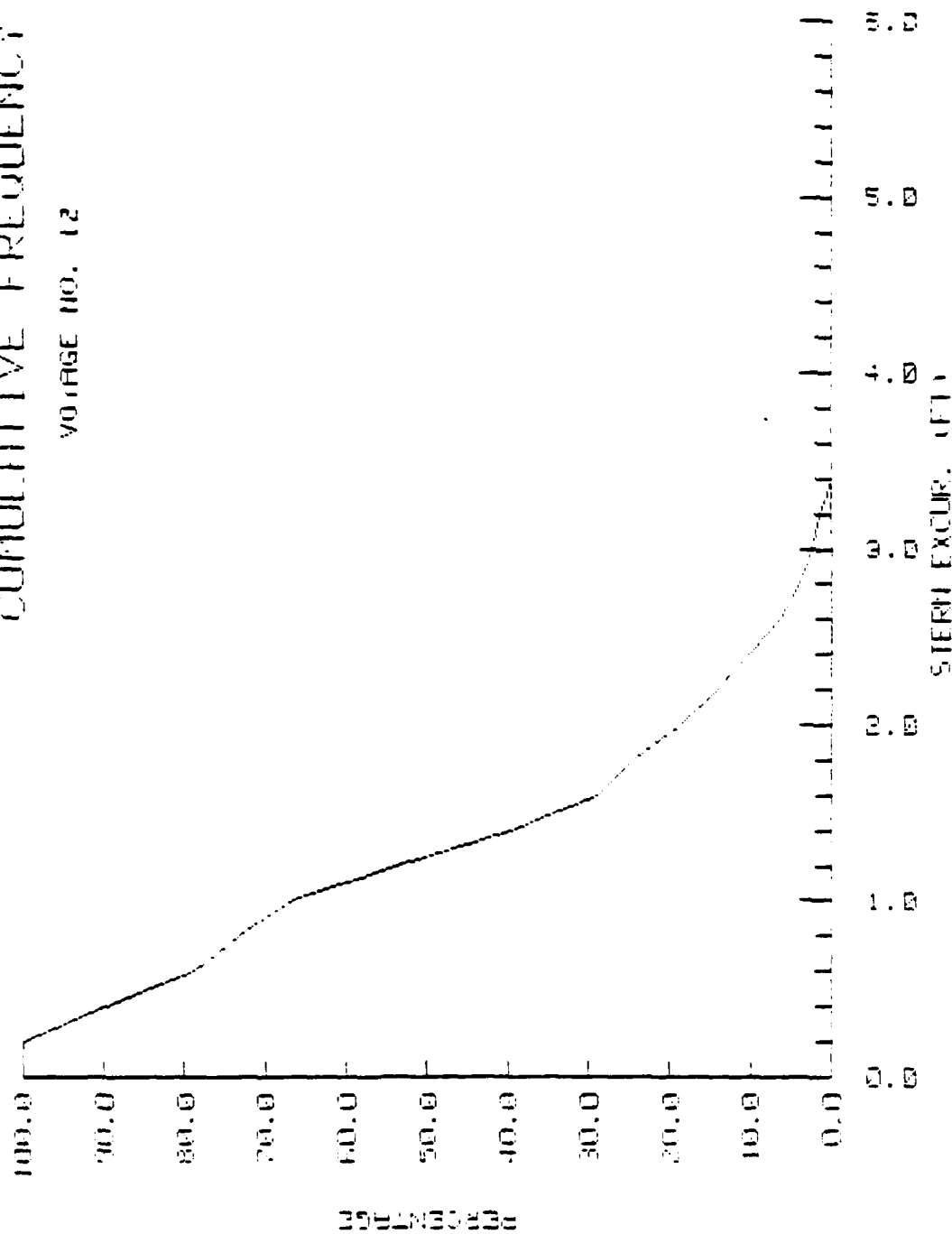
CUMULATIVE FREQUENCY

VOLUME NO. 12



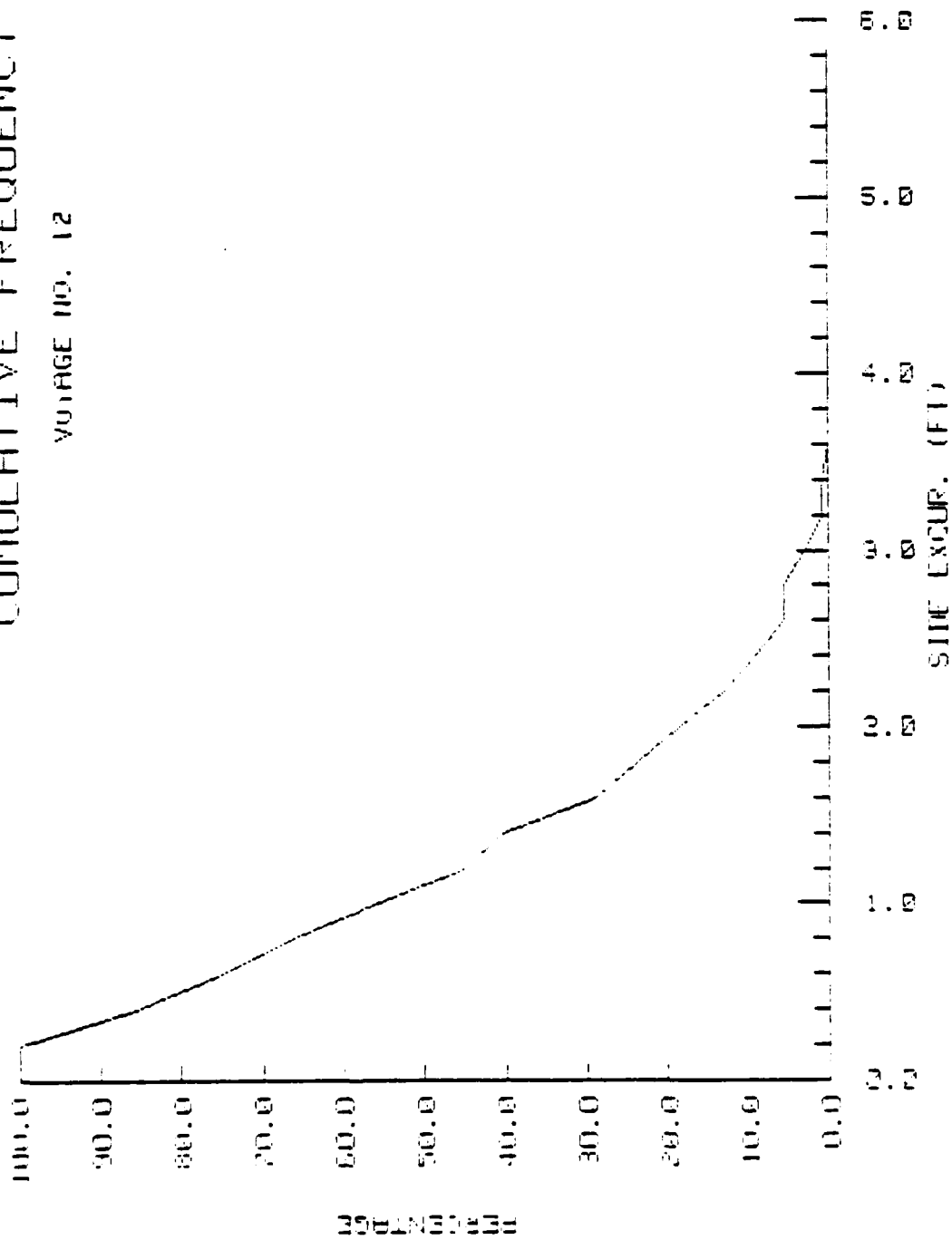
CUMULATIVE FREQUENCY

VOLTAGE NO. 12



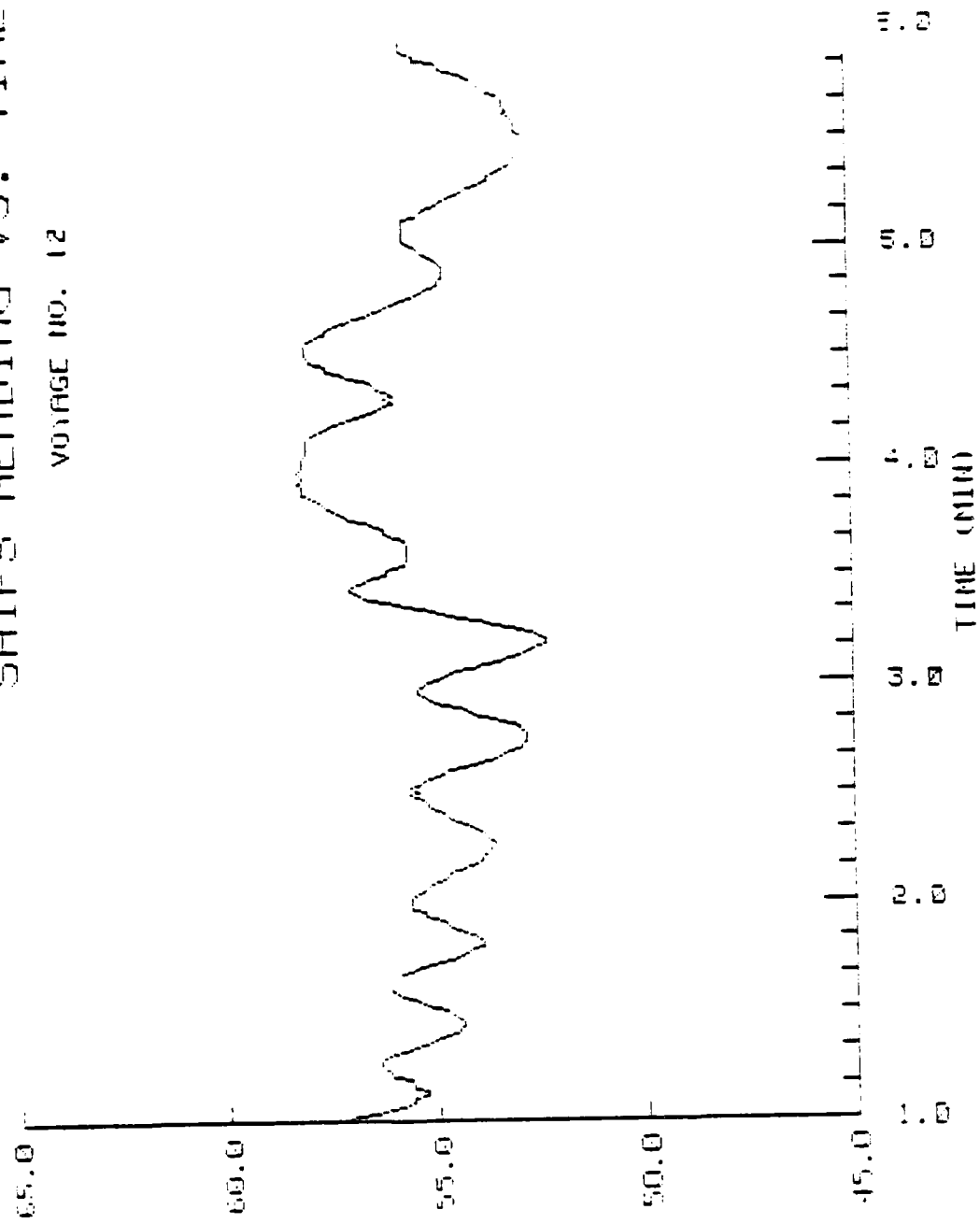
CUMULATIVE FREQUENCY

VOLUME NO. 12



SHIPS HEADING VS. TIME

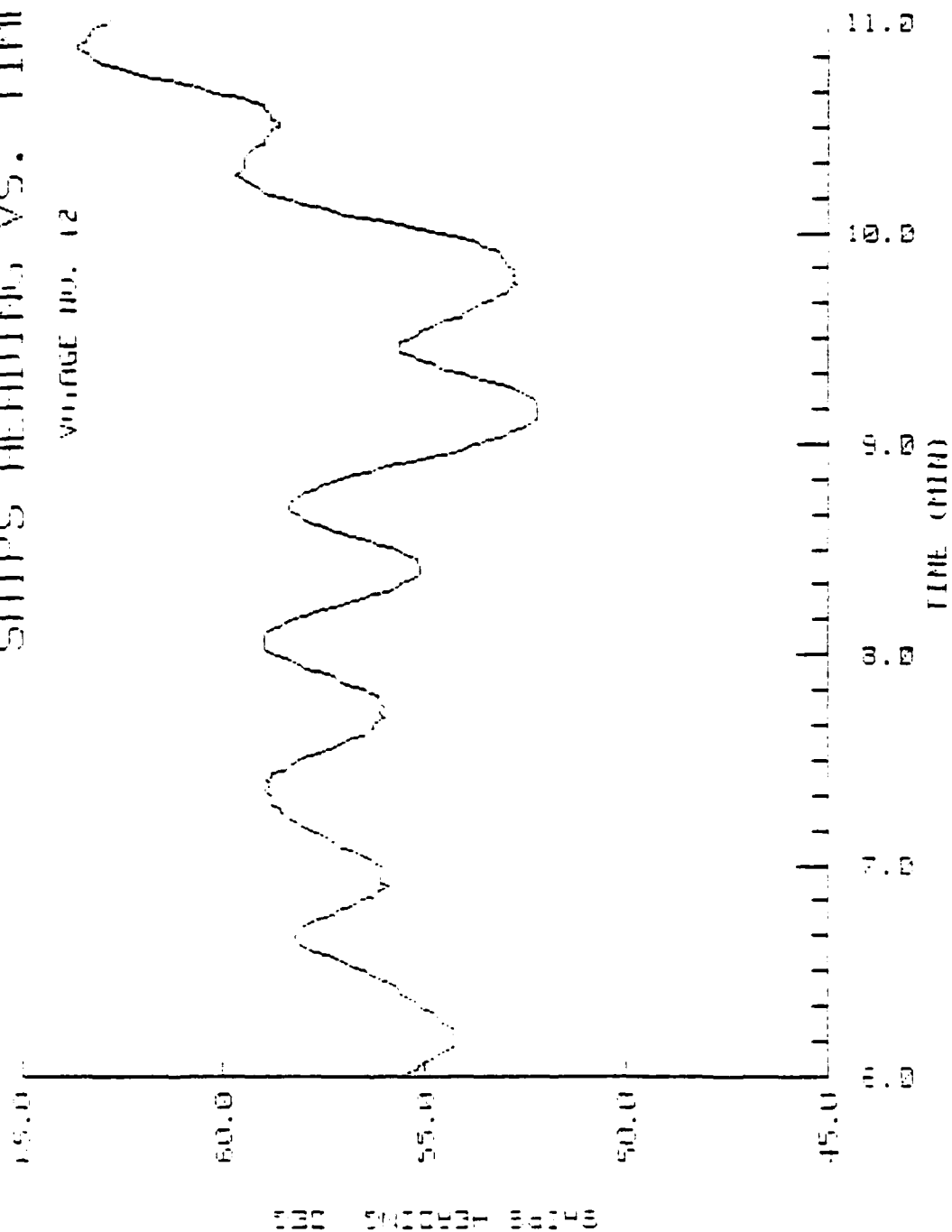
VOLUME NO. 12



SHIPS HEADING VS. TIME

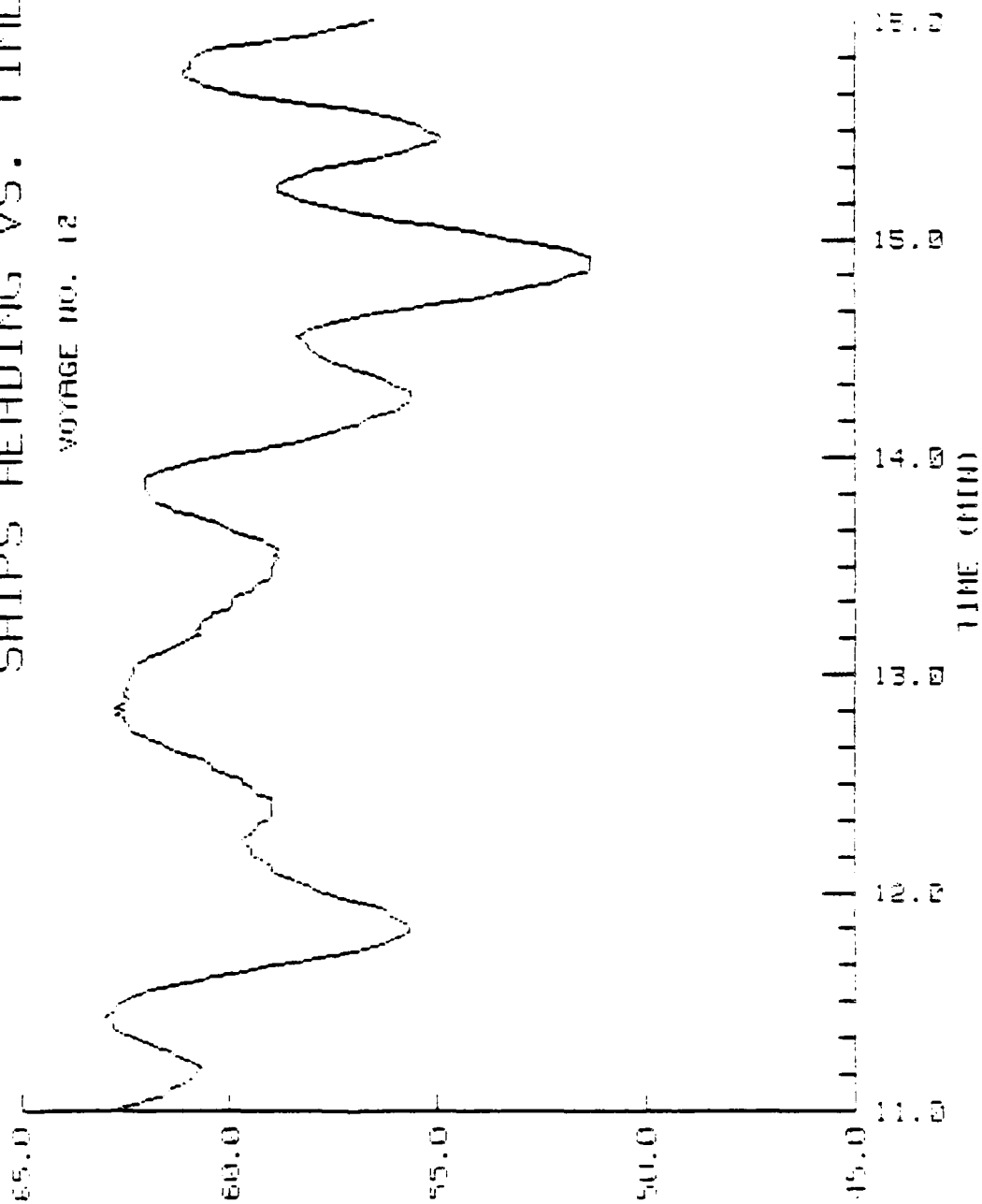
SHIPS HEADING VS. TIME

VOLUME NO. 12



SHIPS HEADING VS. TIME

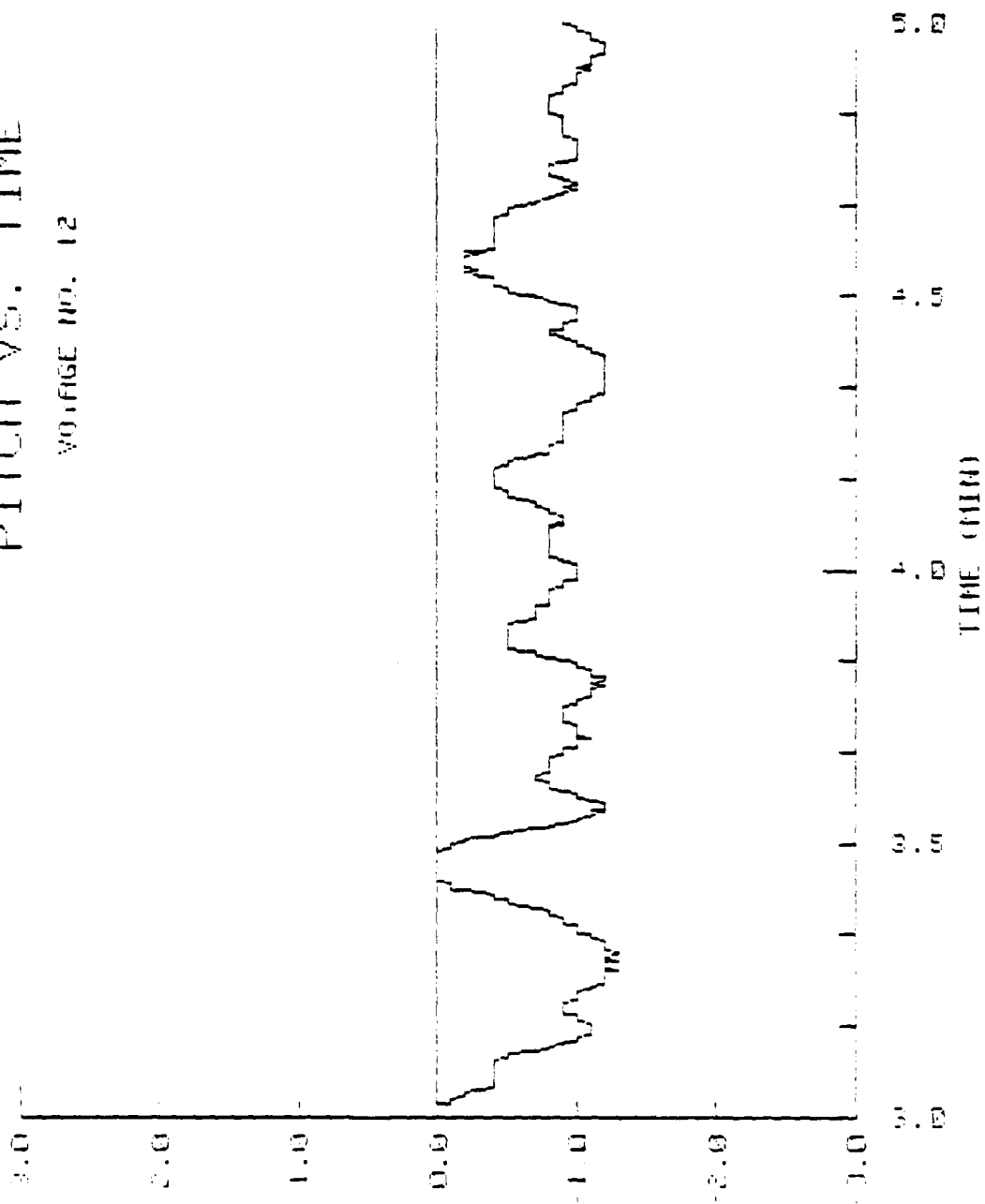
VOYAGE NO. 12



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PITCH VS. TIME

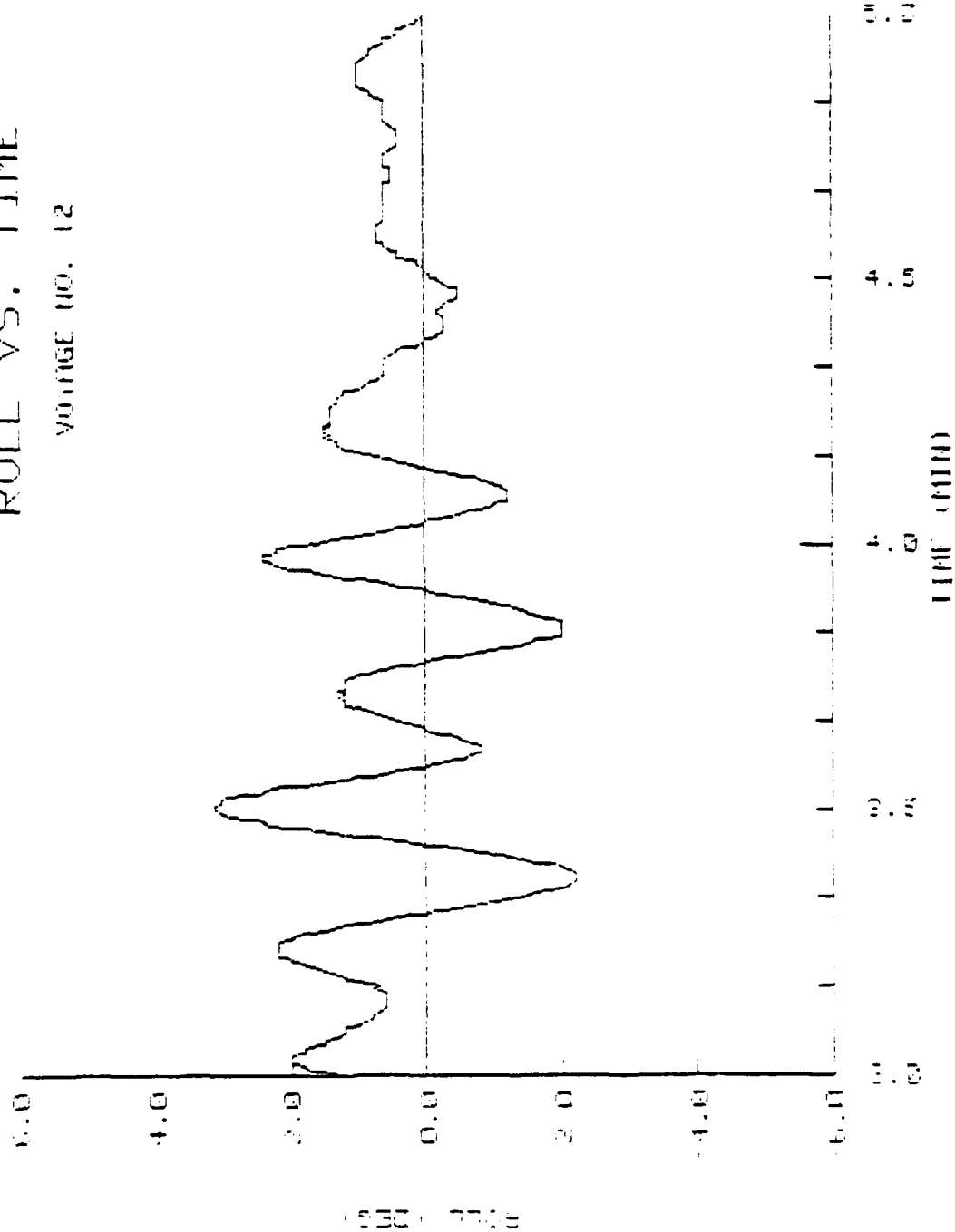
VOICE NO. 12



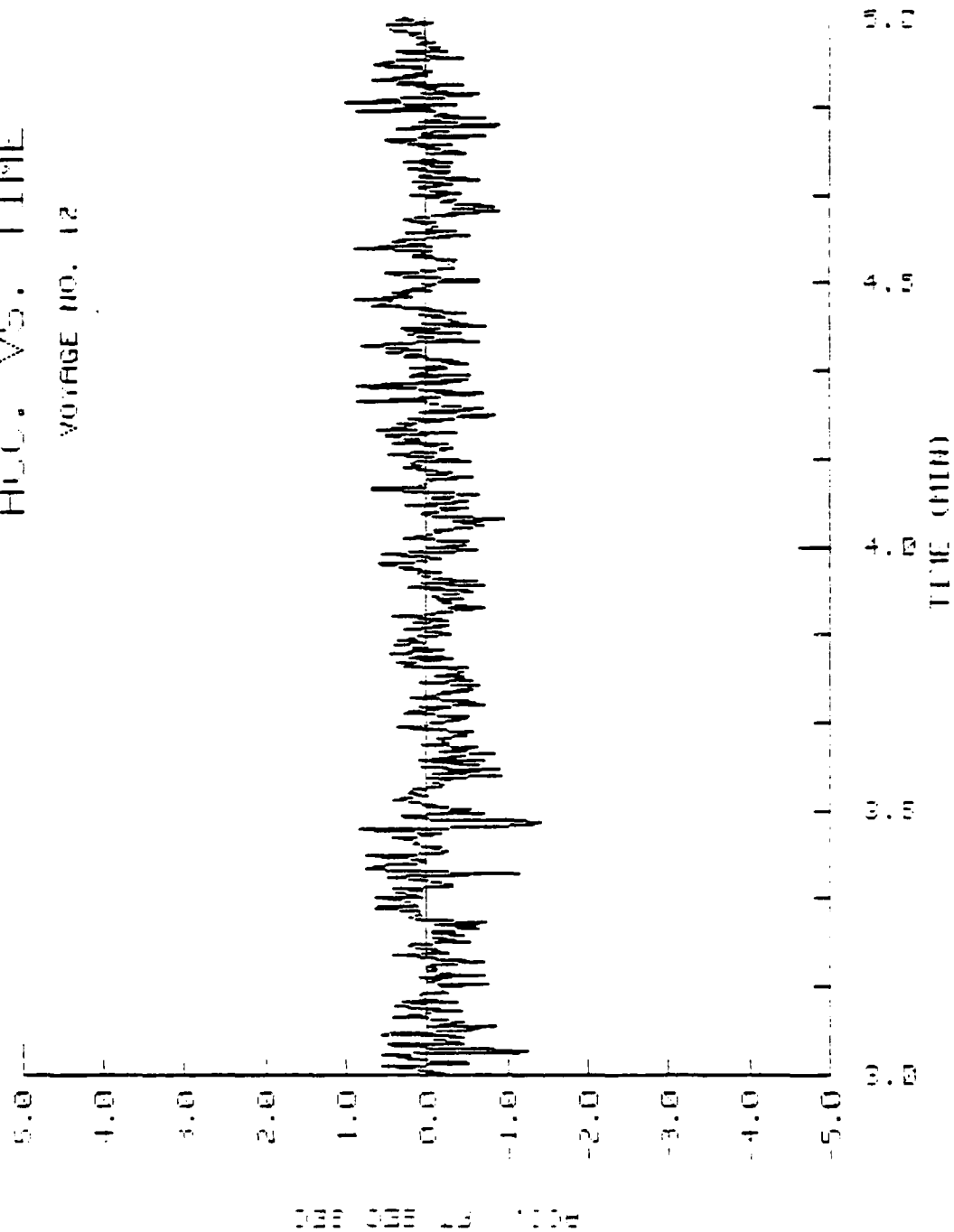
111111

ROLL VS. TIME

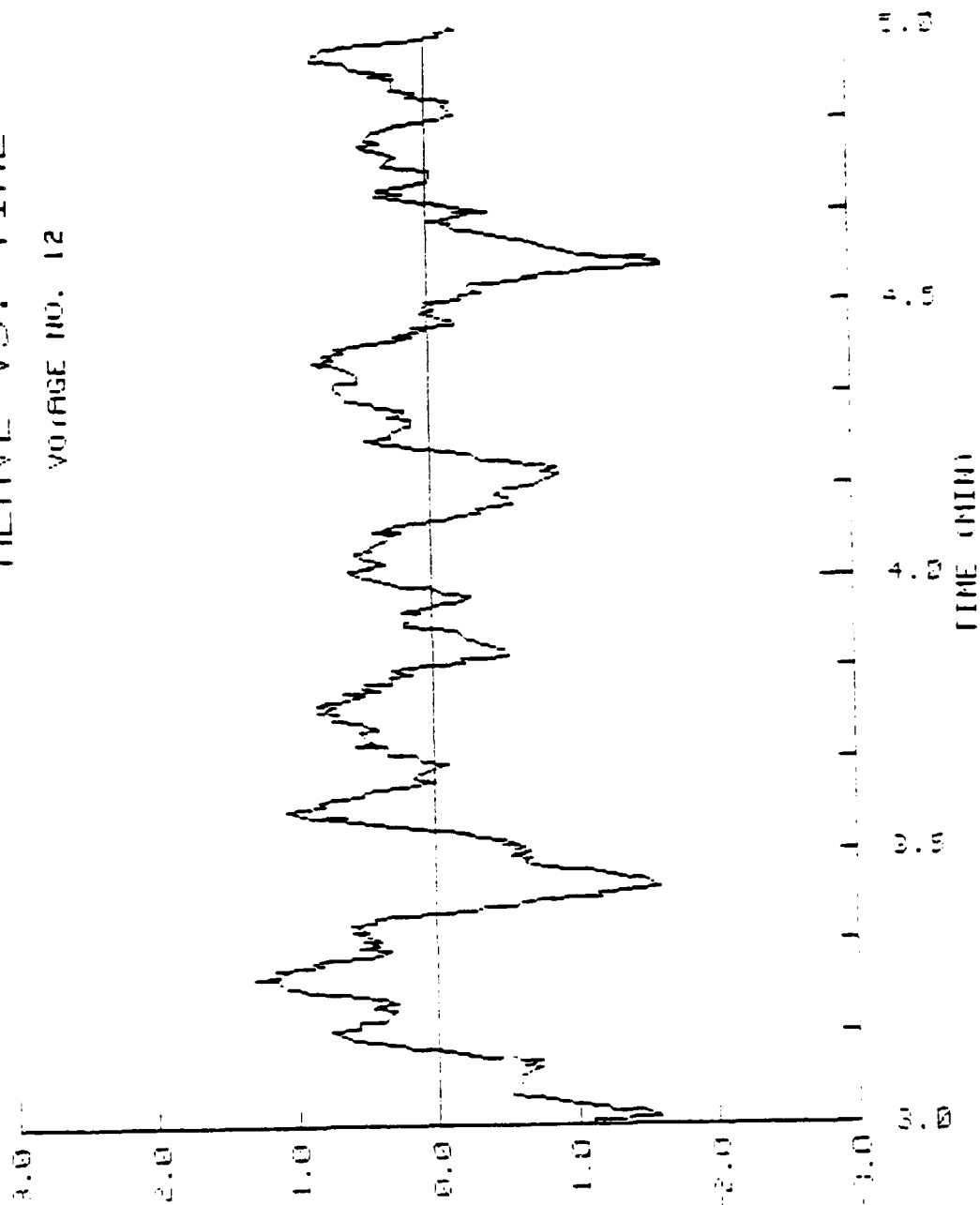
VOYAGE NO. 12



ACC. VS. TIME
VOLTAGE NO. 12

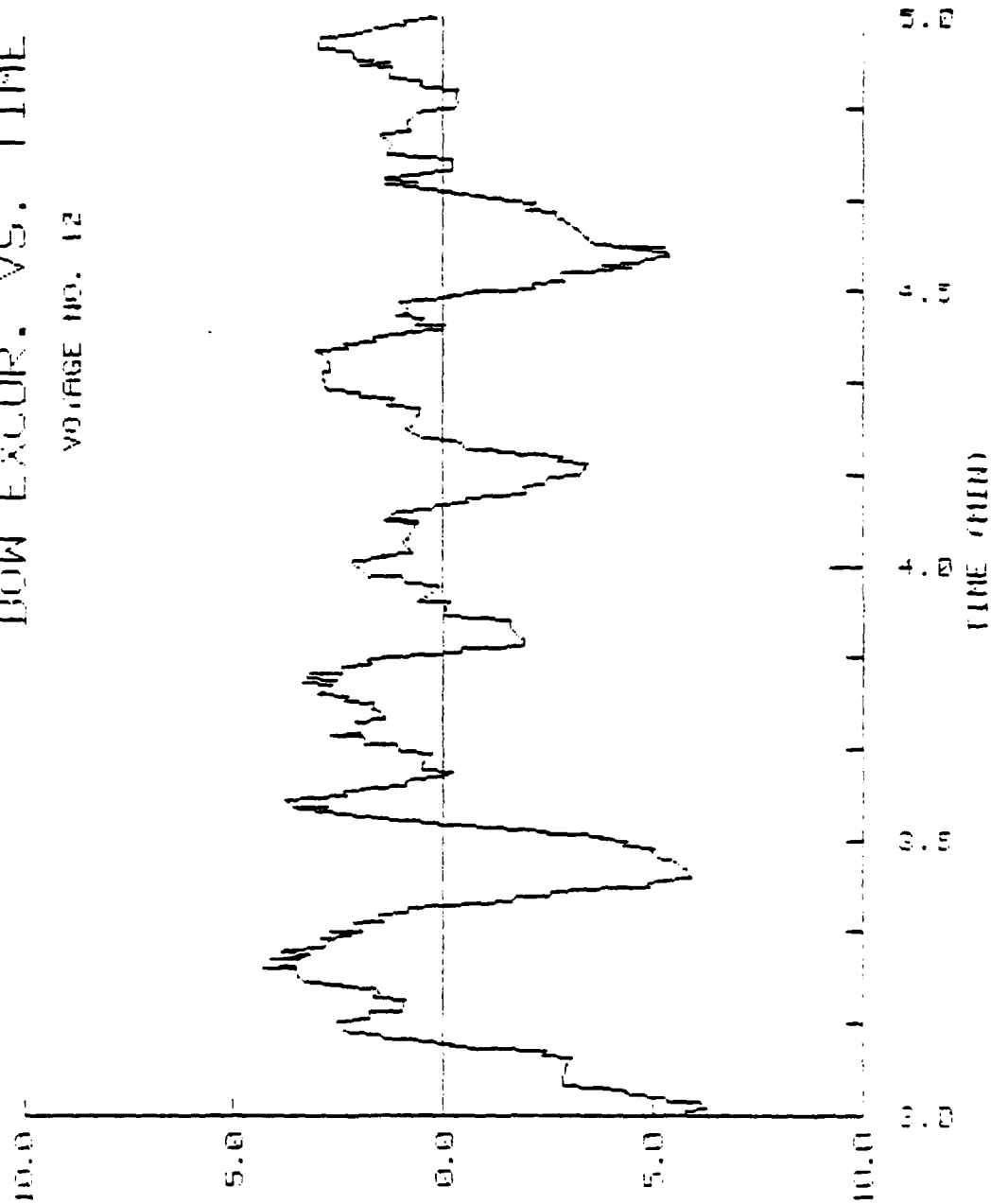


HEAVE VS. TIME
VOLTAGE NO. 12



BOW EXCUR. VS. TIME

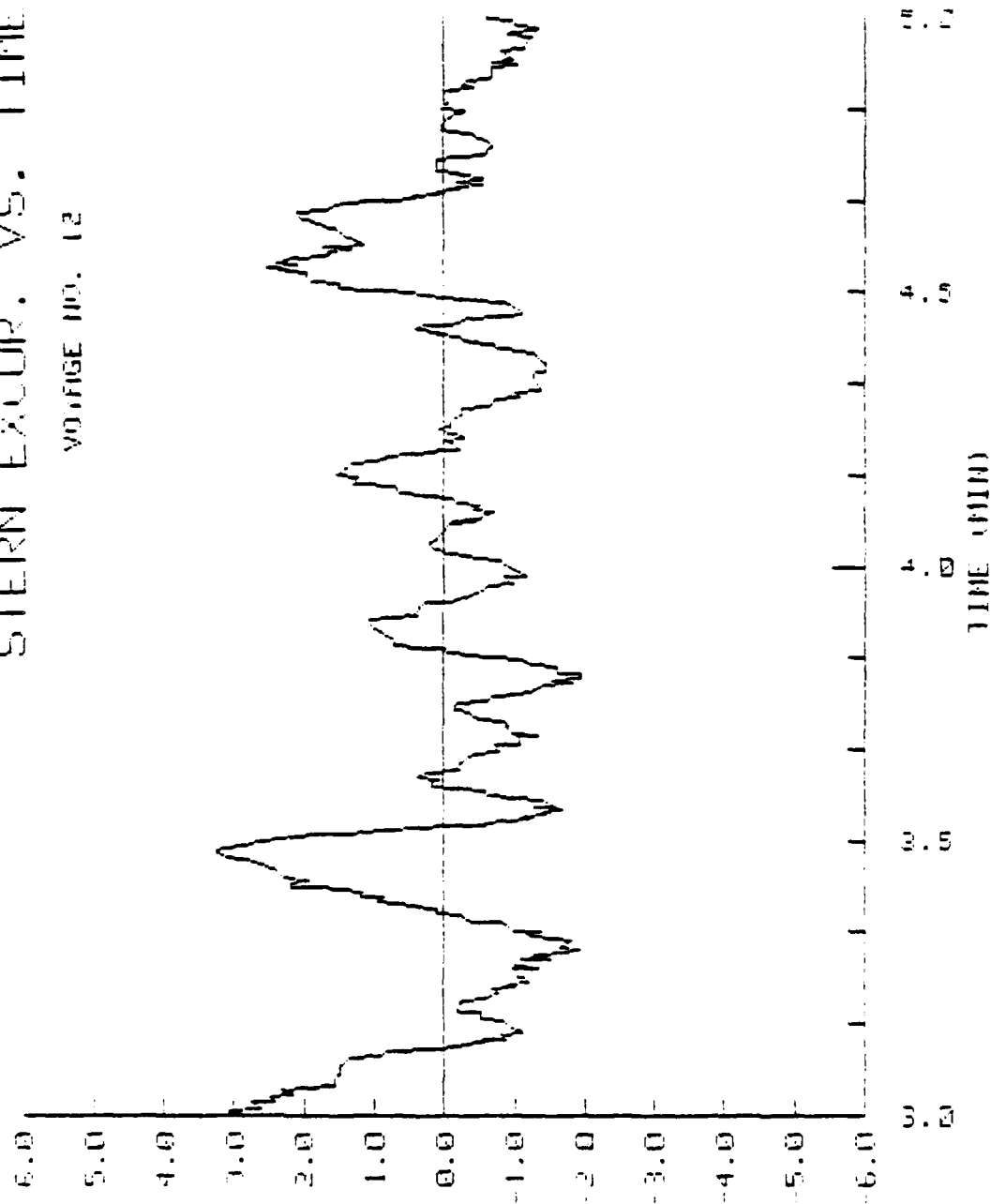
VOLTAGE NO. 12



BOW EXCUR. - 91

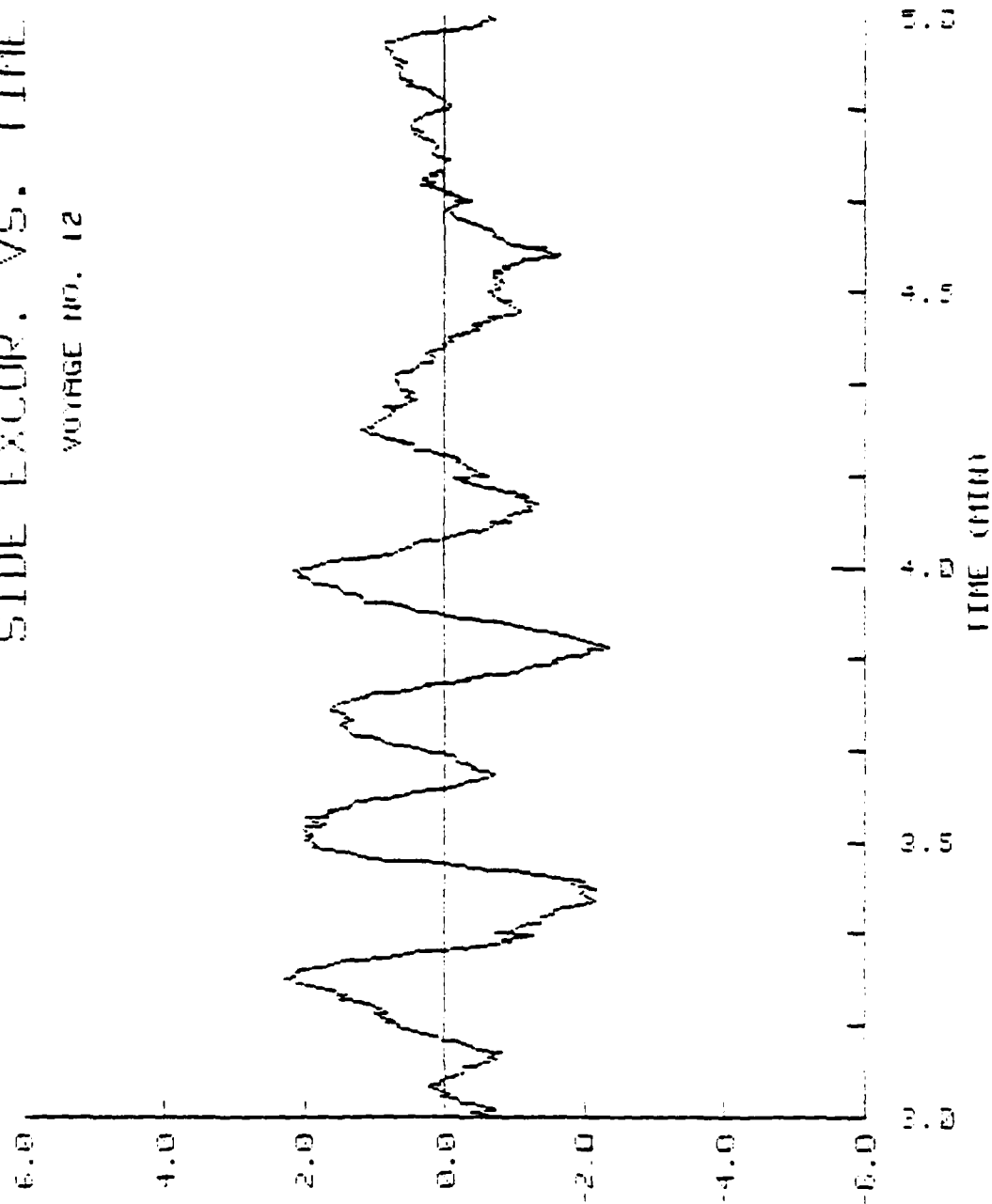
STERN EXCUR. VS. TIME

VOLUME NO. 12



STERN EXCUR. (V)

SIDE EXCUR. VS. TIME
VOTAGE NO. 12



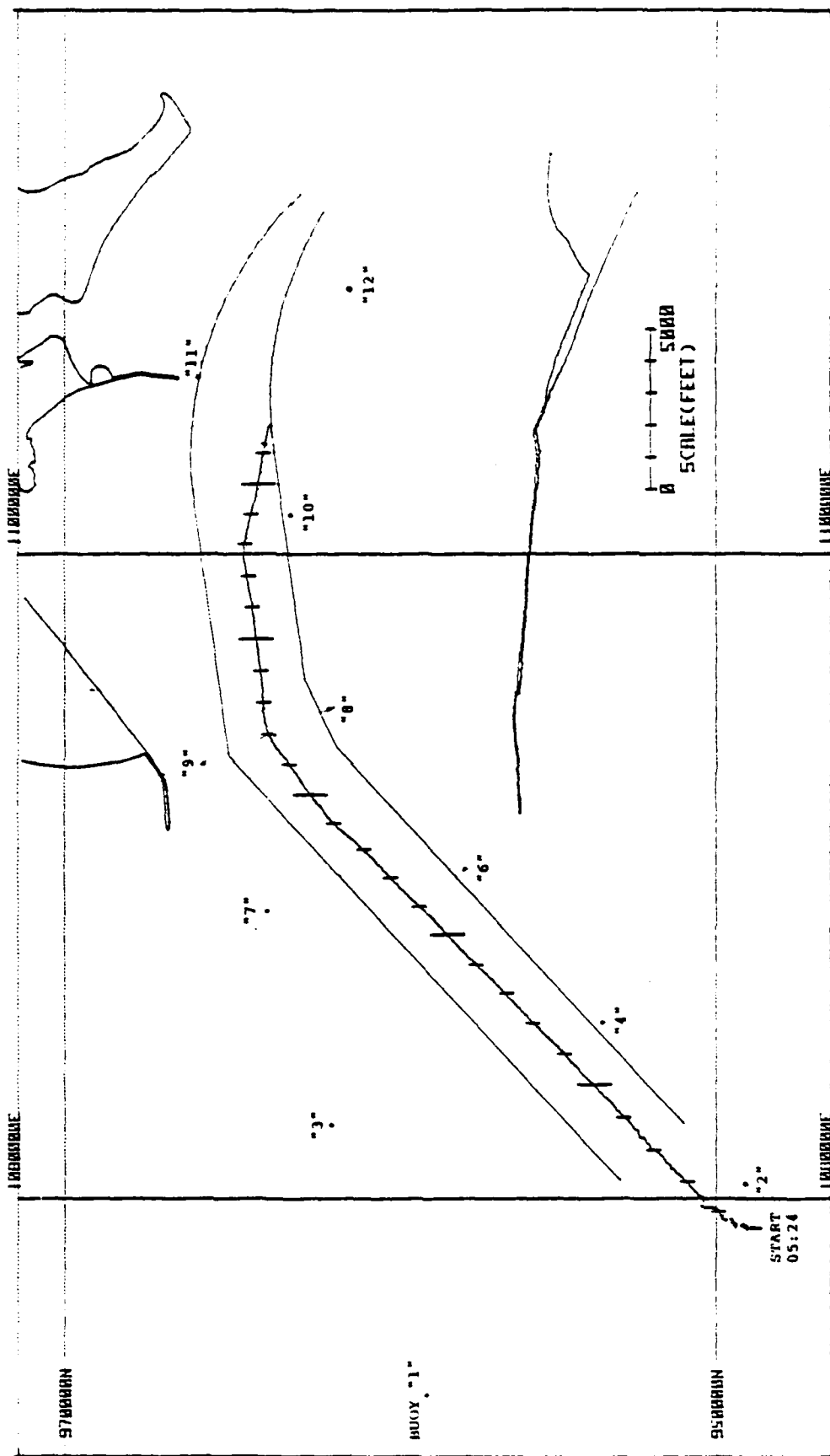
STATISTICAL SUMMARY

VOYAGE NO. 13

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-1.7	.8	.4	.4
ROLL (DEG)	.1	2.3	.8	.9
NO. (FT/SEC/SEC)	-1.1	1.2	.5	.5
HEAVE (FT)	.0	2.9	1.3	1.4
ROLL EXCUR. (FT)	.0	6.9	2.4	3.0
STERN EXCUR. (FT)	.0	2.7	1.0	1.2
SIDE EXCUR (FT)	.0	3.9	1.5	1.7

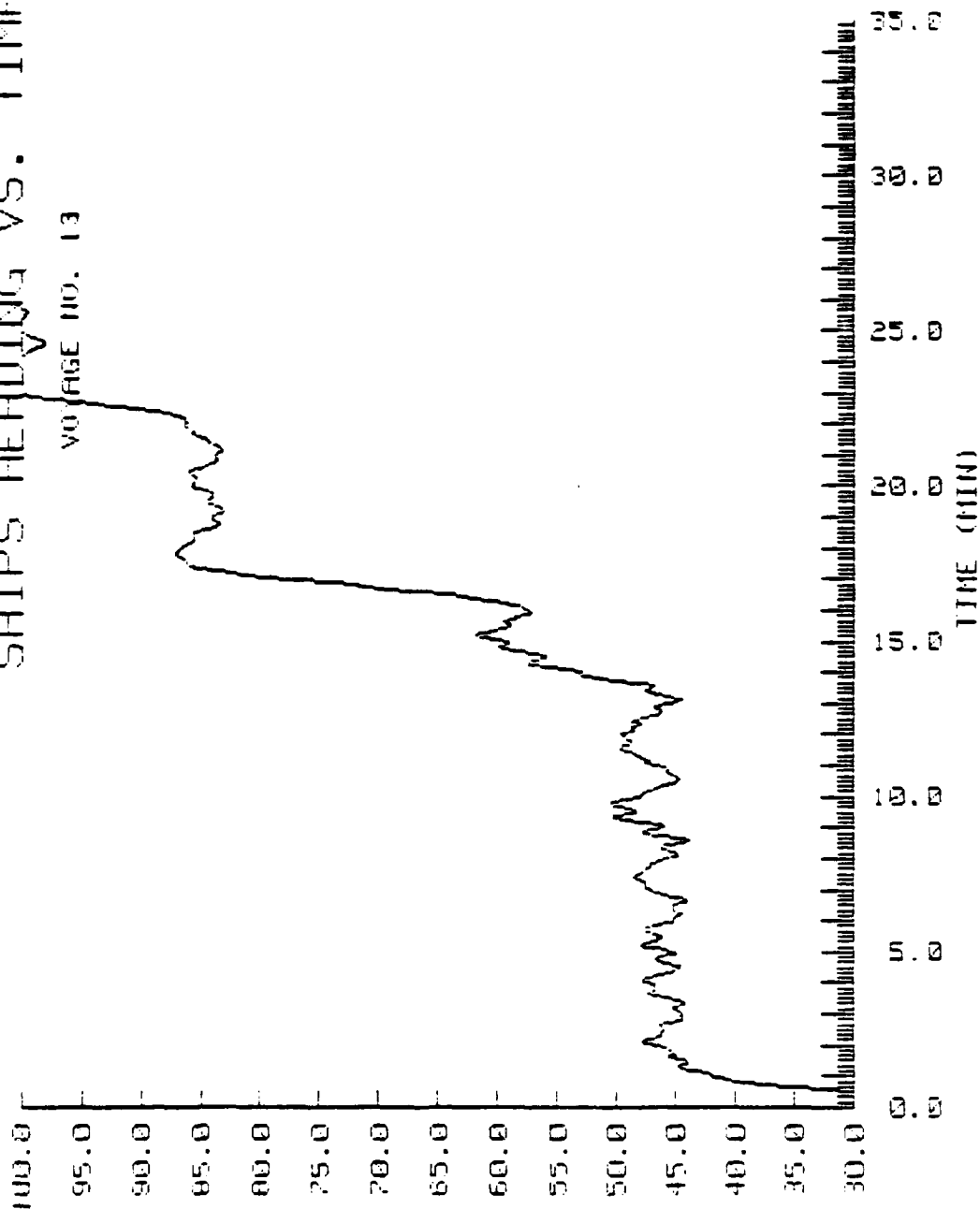
VIIYAGE NO. 13 SHIP TRACK

SCALE : 1 INCH = 5000 FEET



SHIPS HEADING VS. TIME

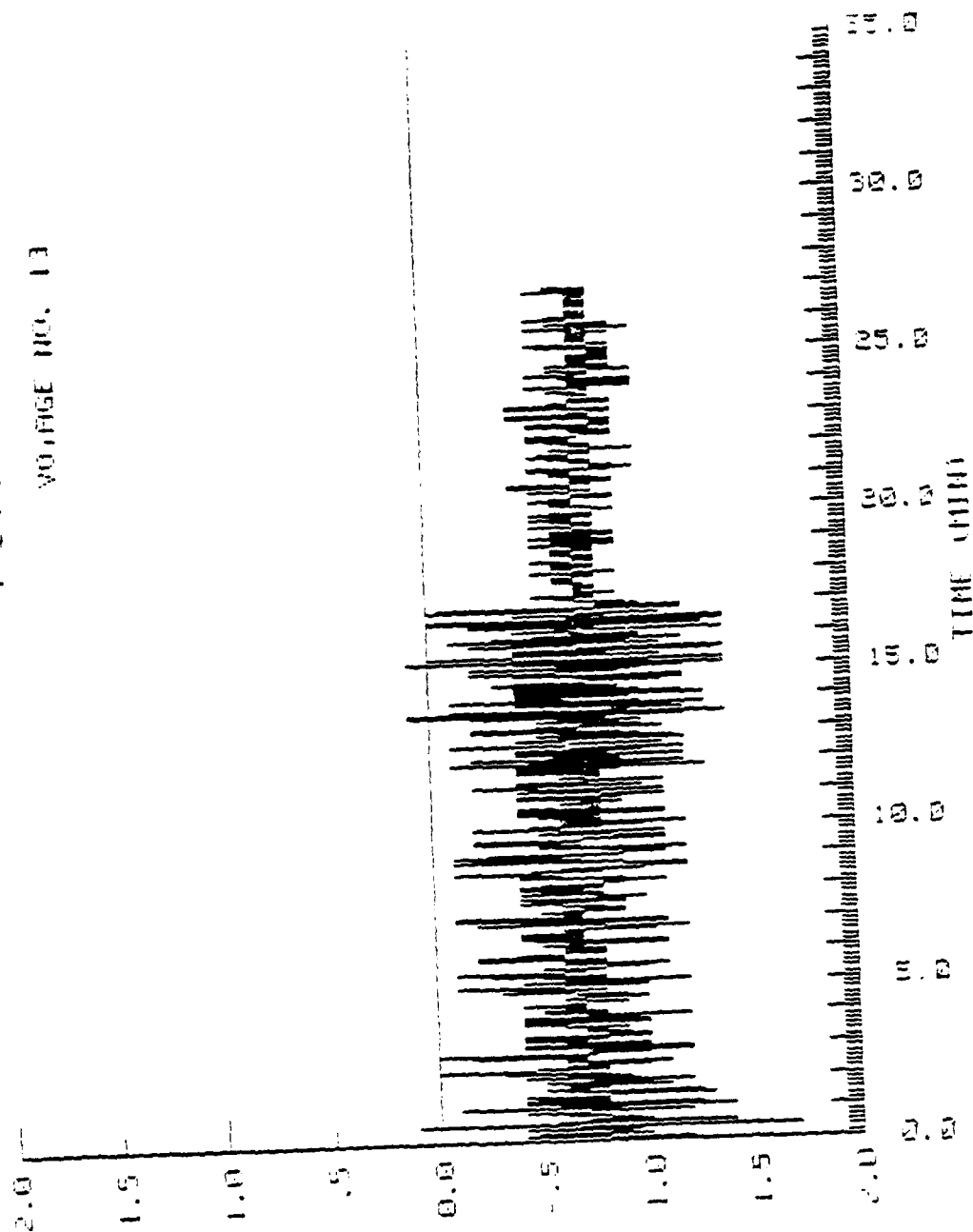
VOYAGE NO. 13



SHIPS HEADING (DEG)

PITCH VS. TIME

VOICE NO. 13

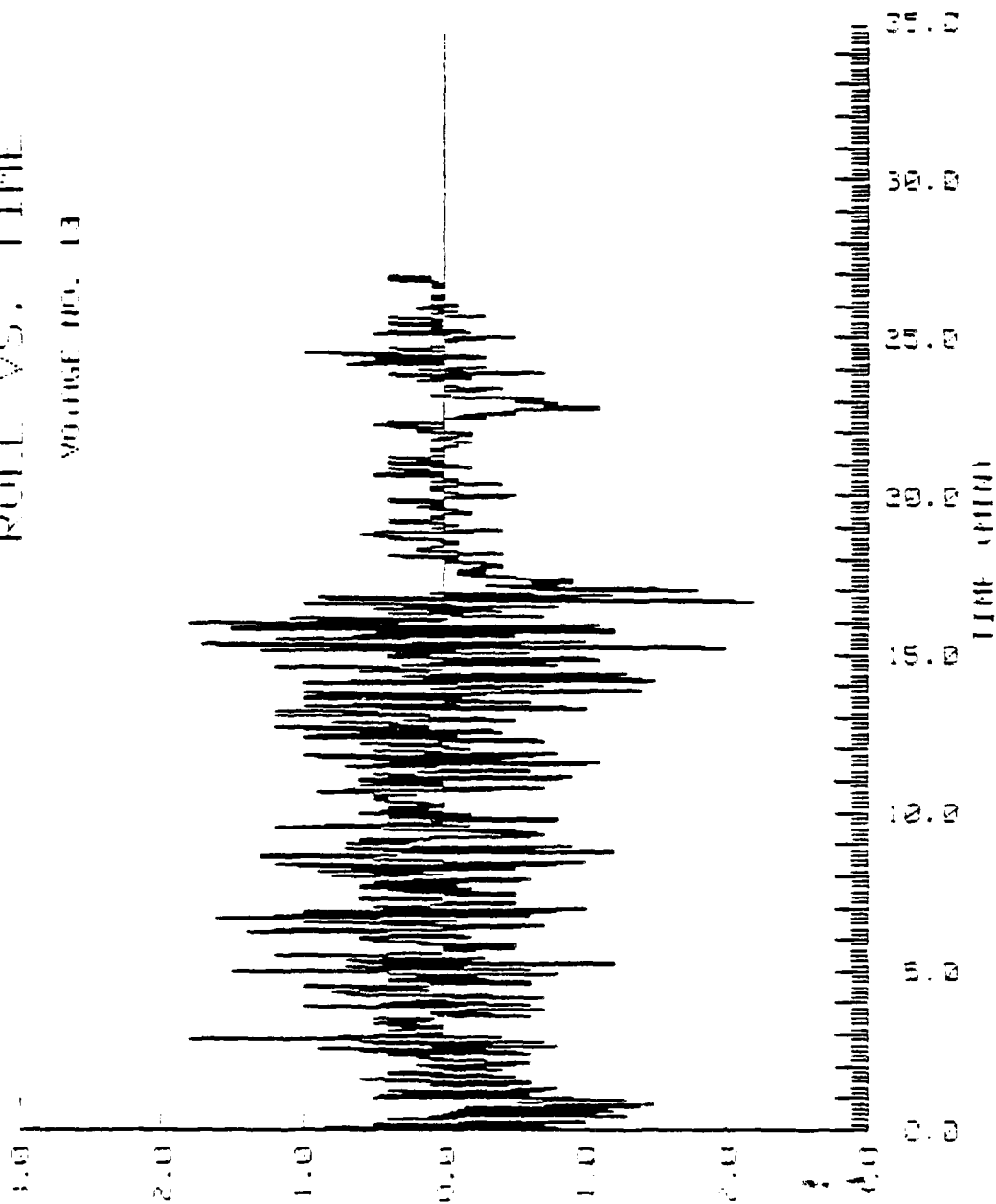


2.0 1.5 1.0 .5 0.0 -.5 -1.0 -1.5 -2.0

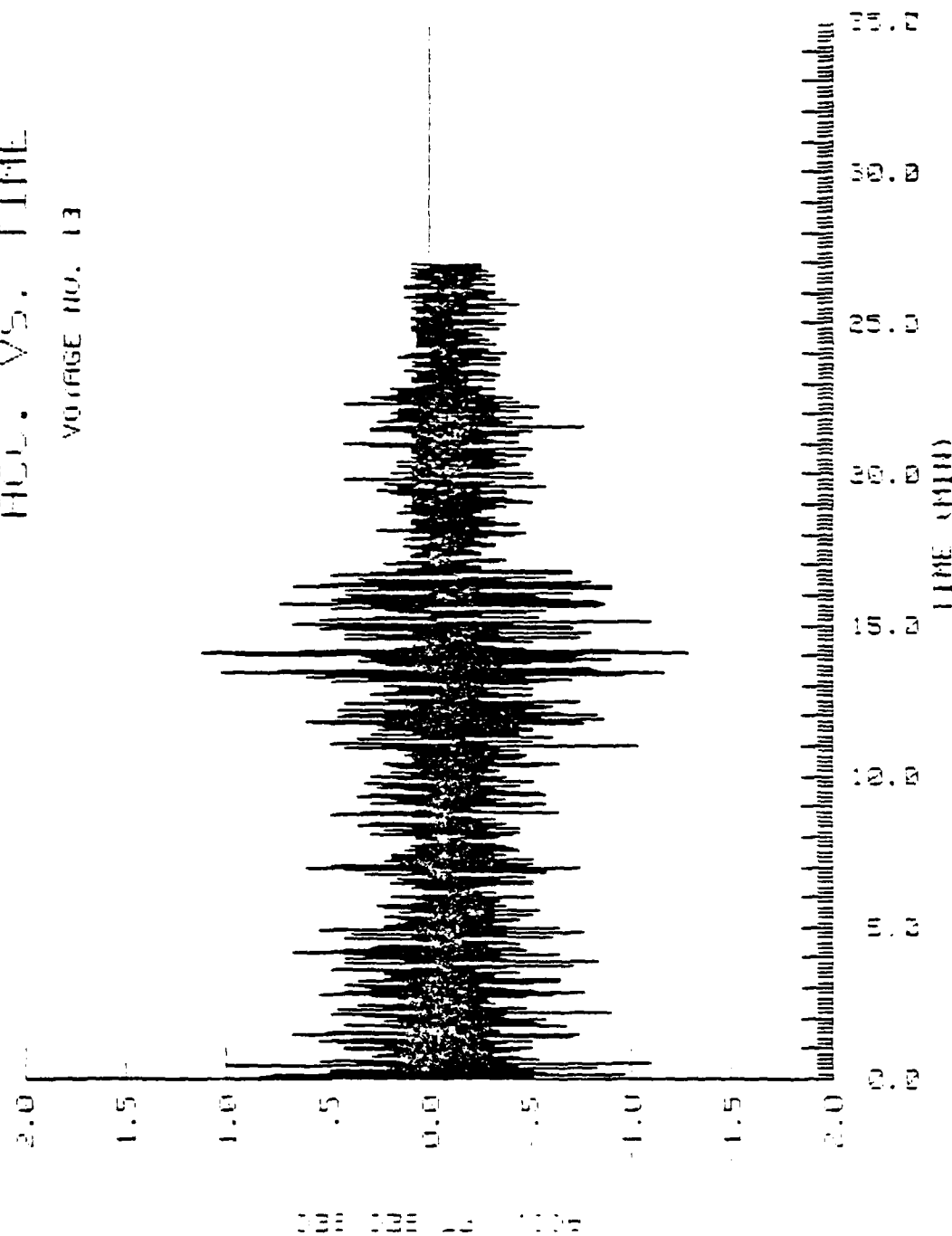
TIME (min)

ROLL VS. TIME

VOYAGE NO. 13

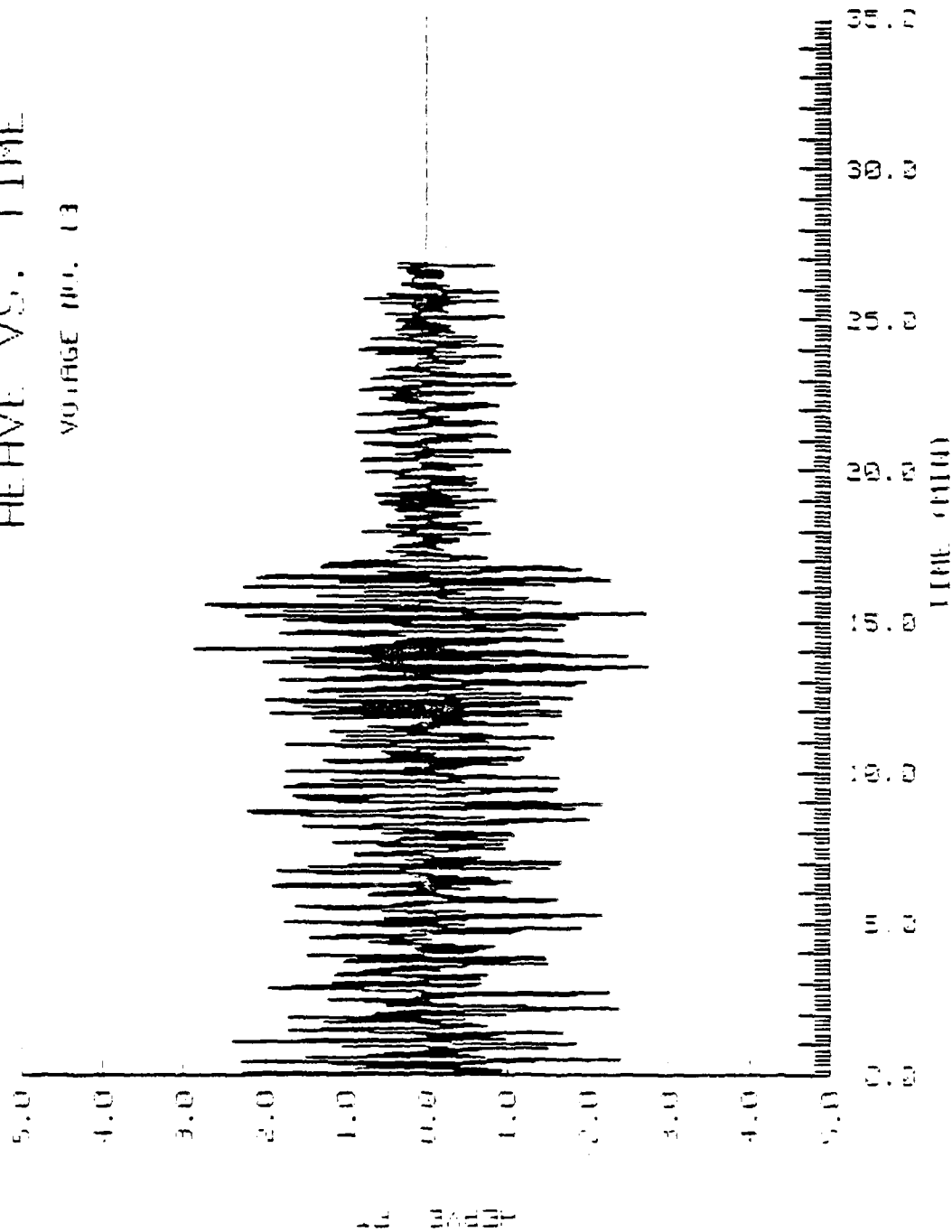


REC. VS. TIME
VOIAGE NO. 13



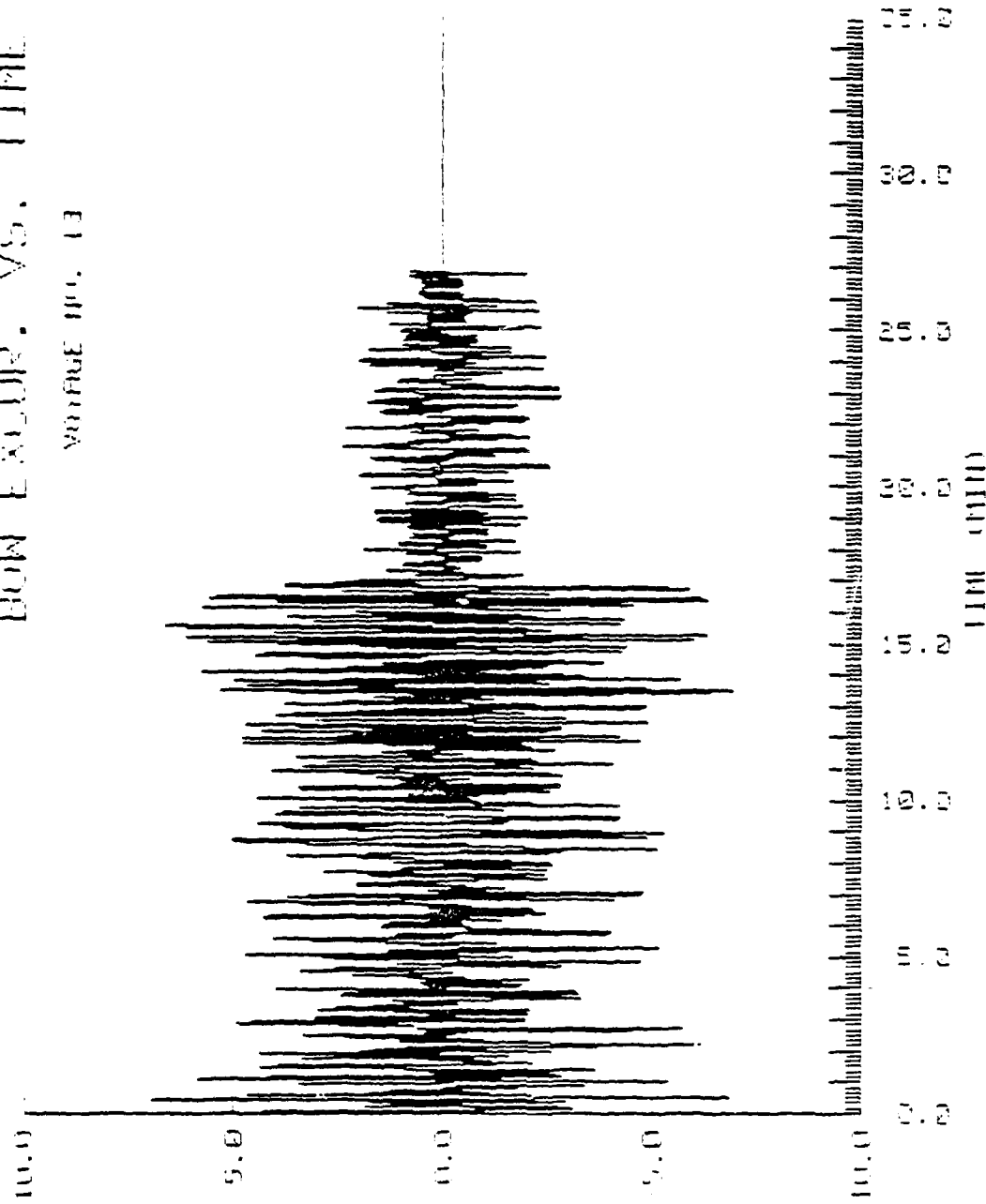
HEAVE VS. TIME

VOLTAGE (mV) (3)



BOW EXCUR. VS. TIME

VOLUME 100, 13



AD-A098 984

TETRA TECH INC PASADENA CA

F/G 13/10

COLUMBIA RIVER ENTRANCE CHANNEL DEEP-DRAFT VESSEL MOTION STUDY.--ETC(U)

SEP 80 S WANG, M KIMBLE, C BUTCHER, G D COX DACW57-78-C-0028

UNCLASSIFIED

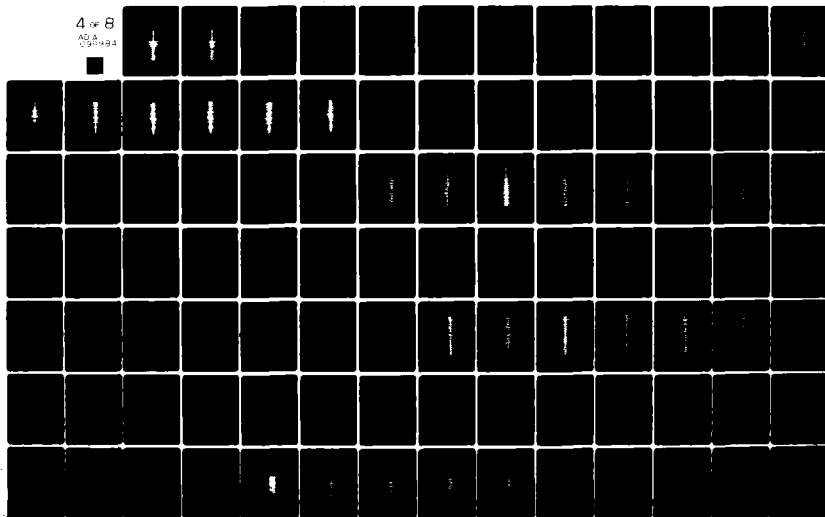
TETRAT-TC-3925-APP-A(1)

NL

4 of 8

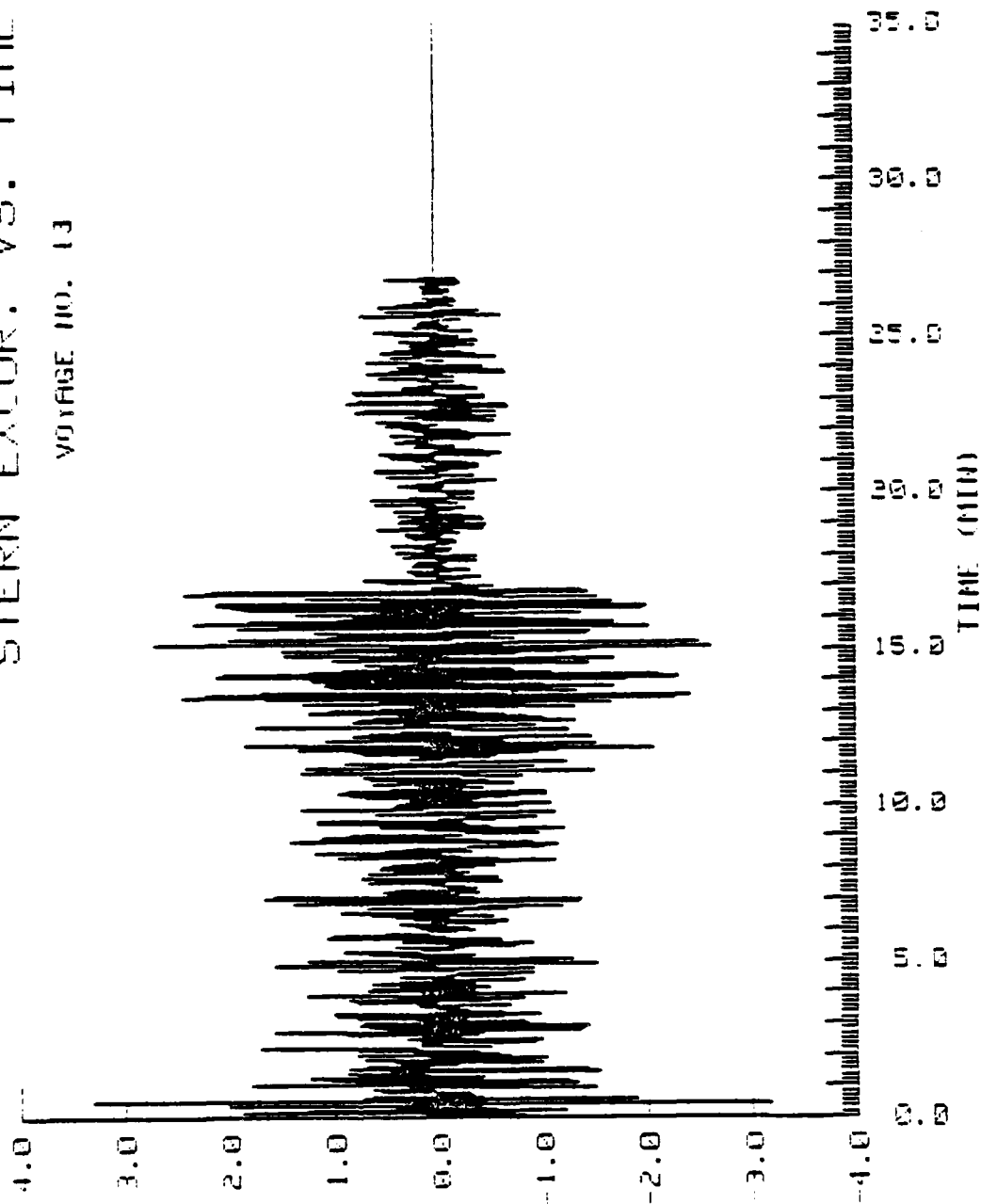
AD-A098 984

098984



STERN EXCUR. VS. TIME

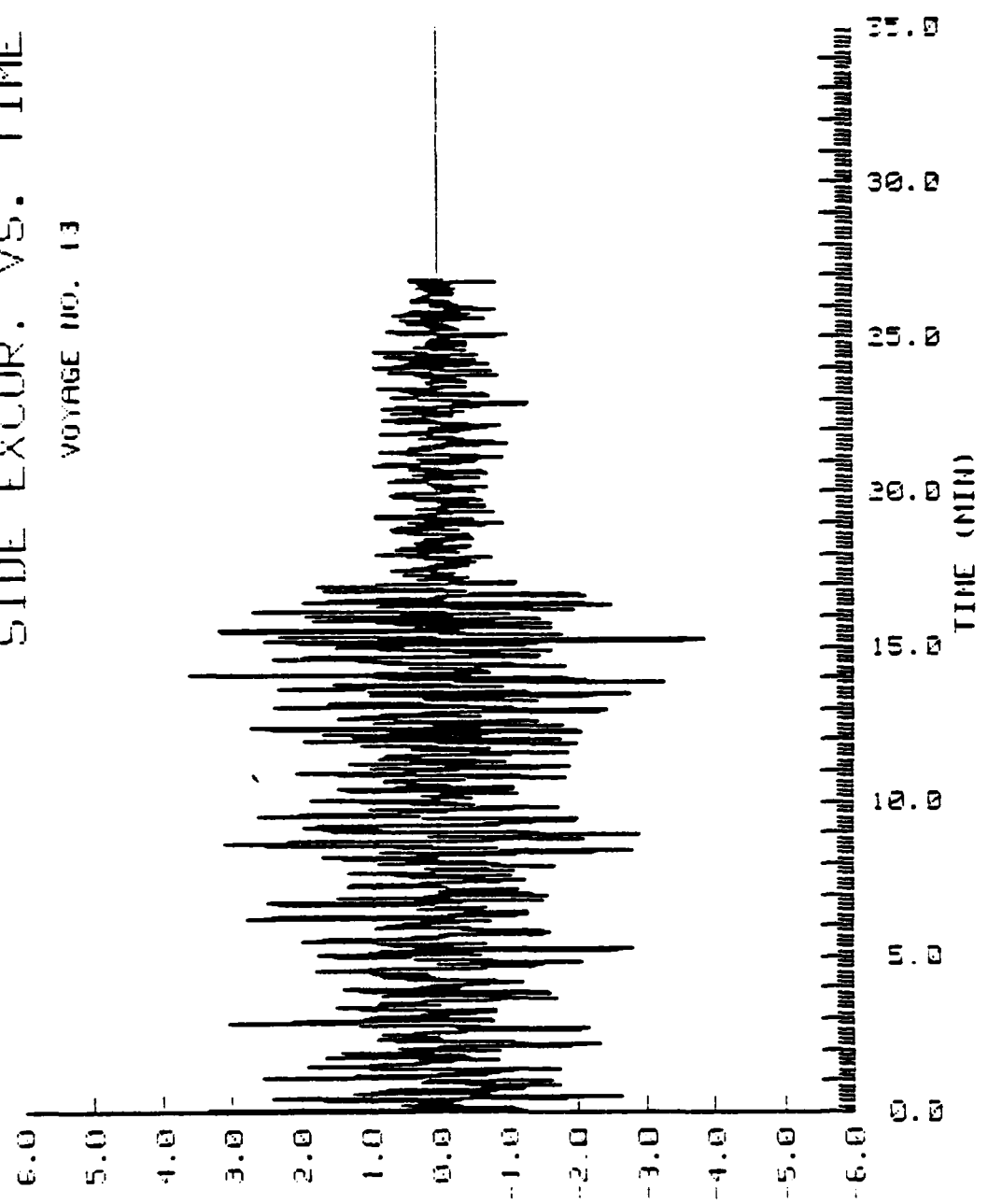
VOYAGE NO. 13



STERN EXCUR. (ST)

SIDE EXCUR. VS. TIME

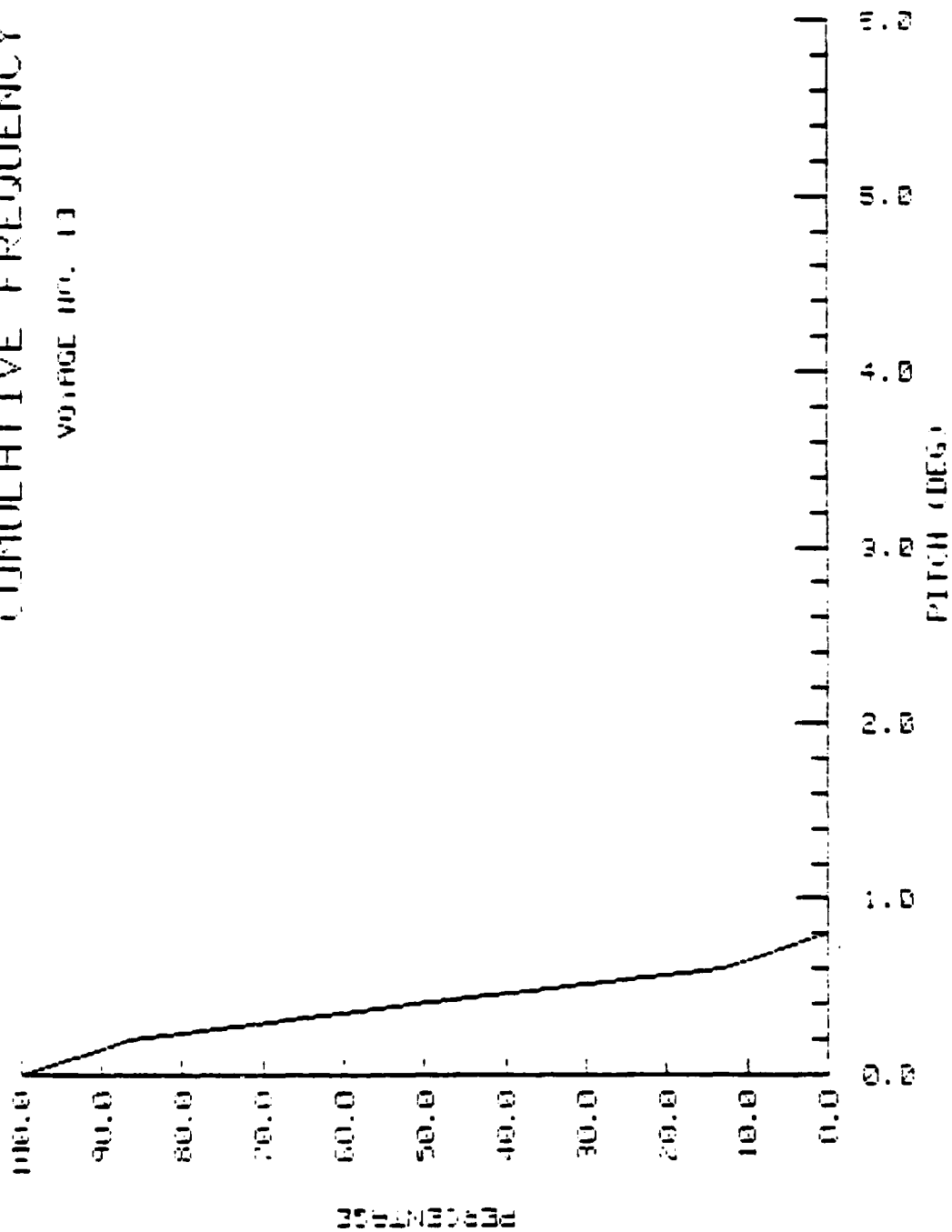
VOYAGE NO. 13



13) VOYAGE NO. 13

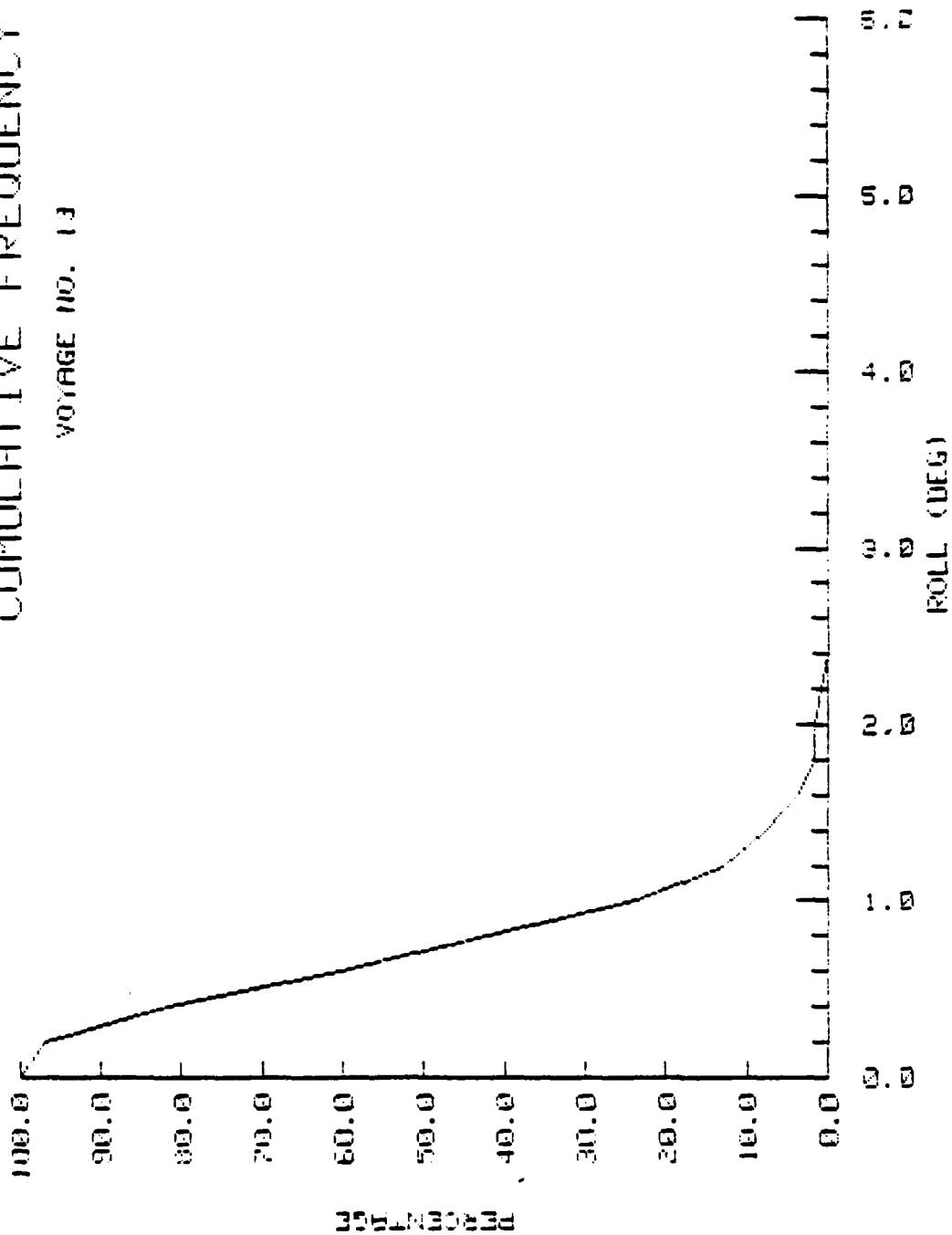
CUMULATIVE FREQUENCY

VOLAGE 100. 13



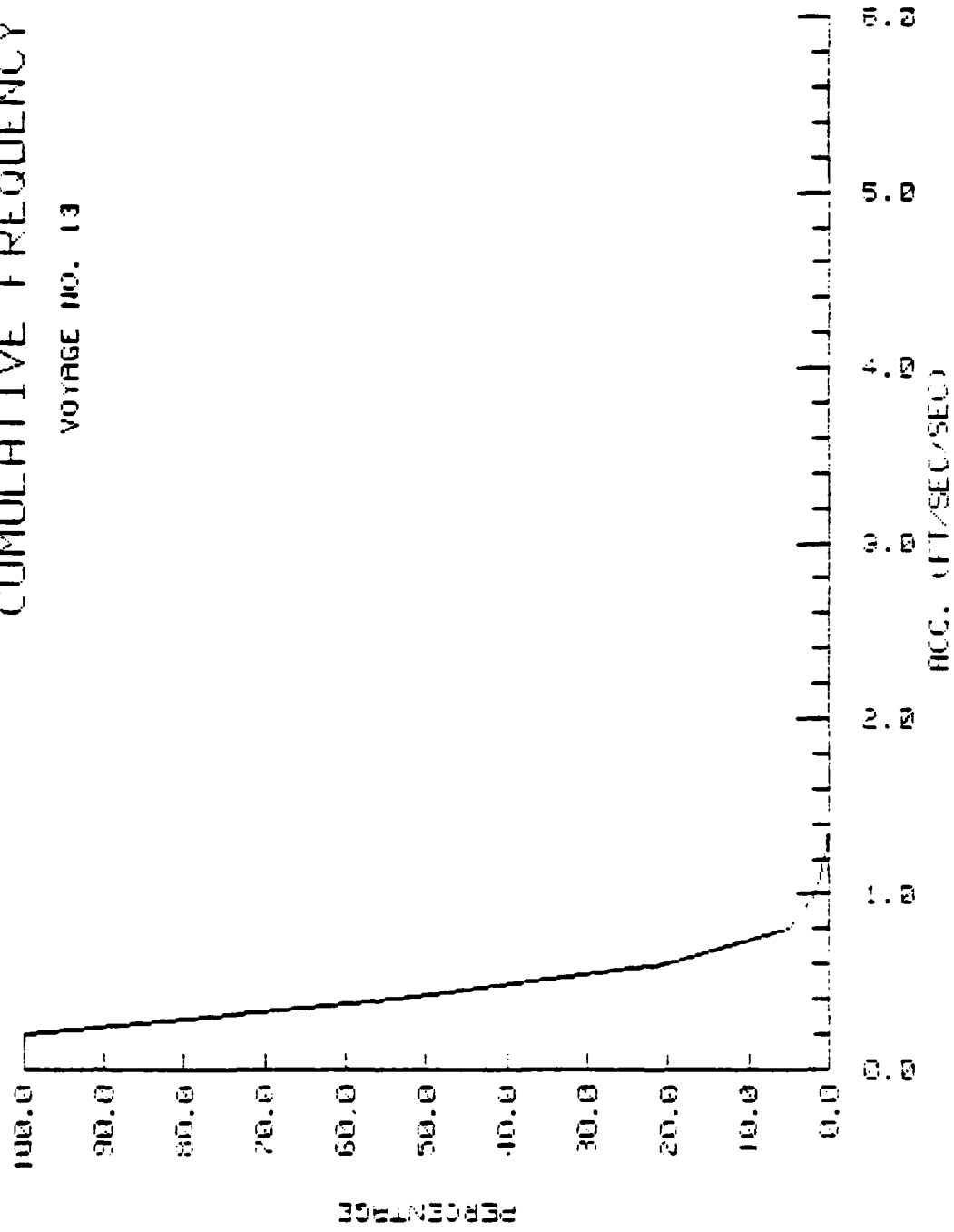
CUMULATIVE FREQUENCY

VOYAGE NO. 13



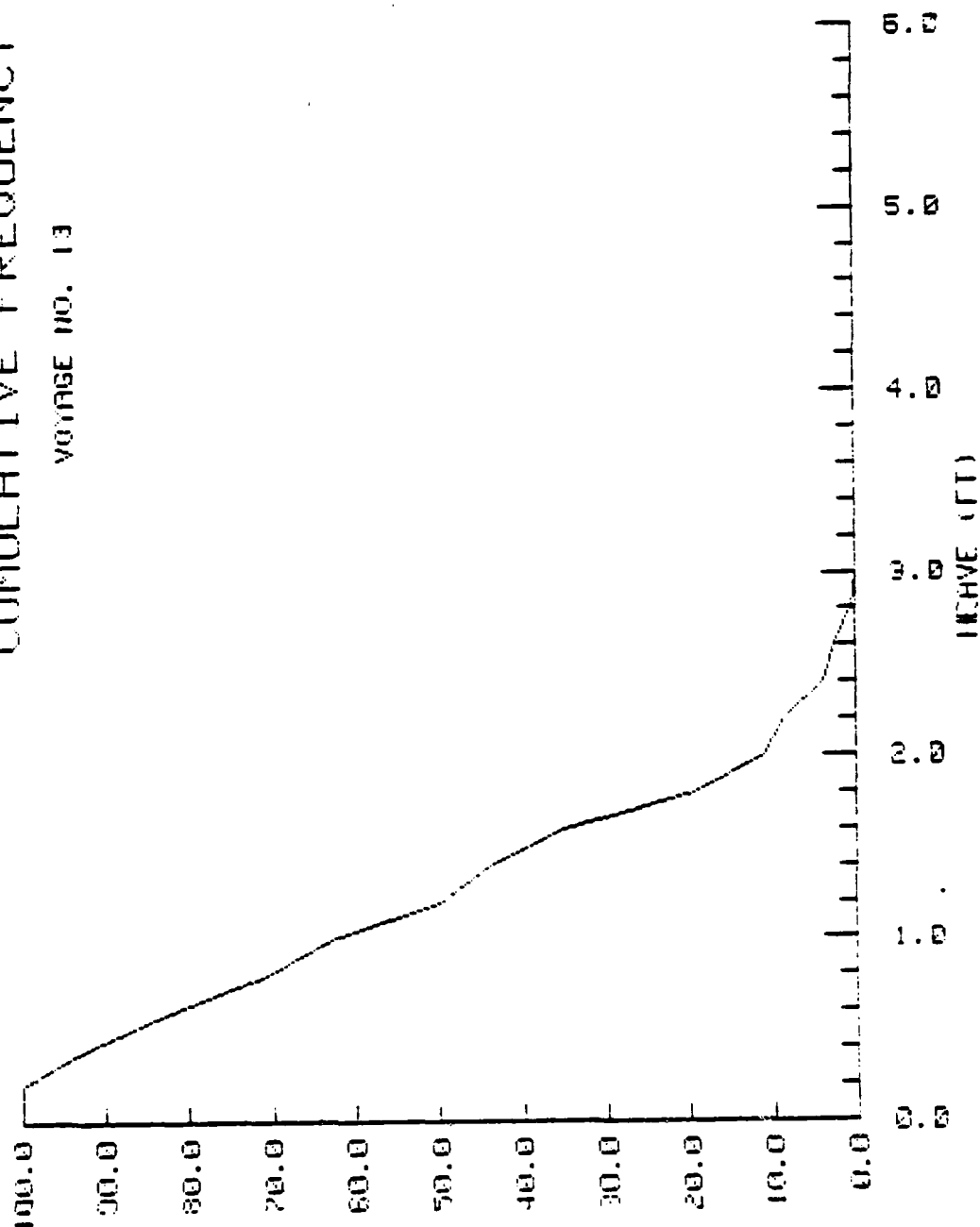
CUMULATIVE FREQUENCY

VOYAGE NO. 13



CUMULATIVE FREQUENCY

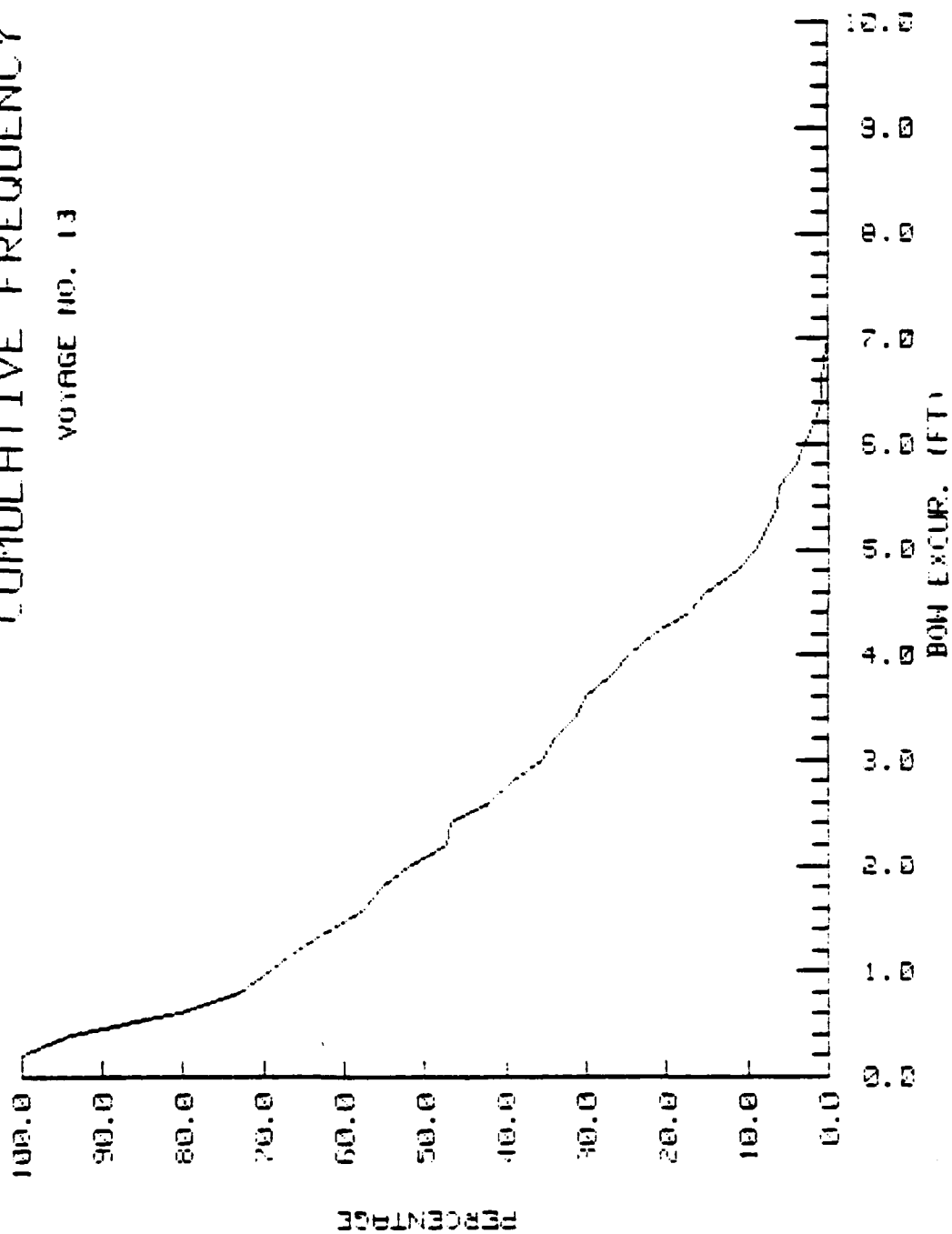
VOYAGE NO. 13



5501-200831

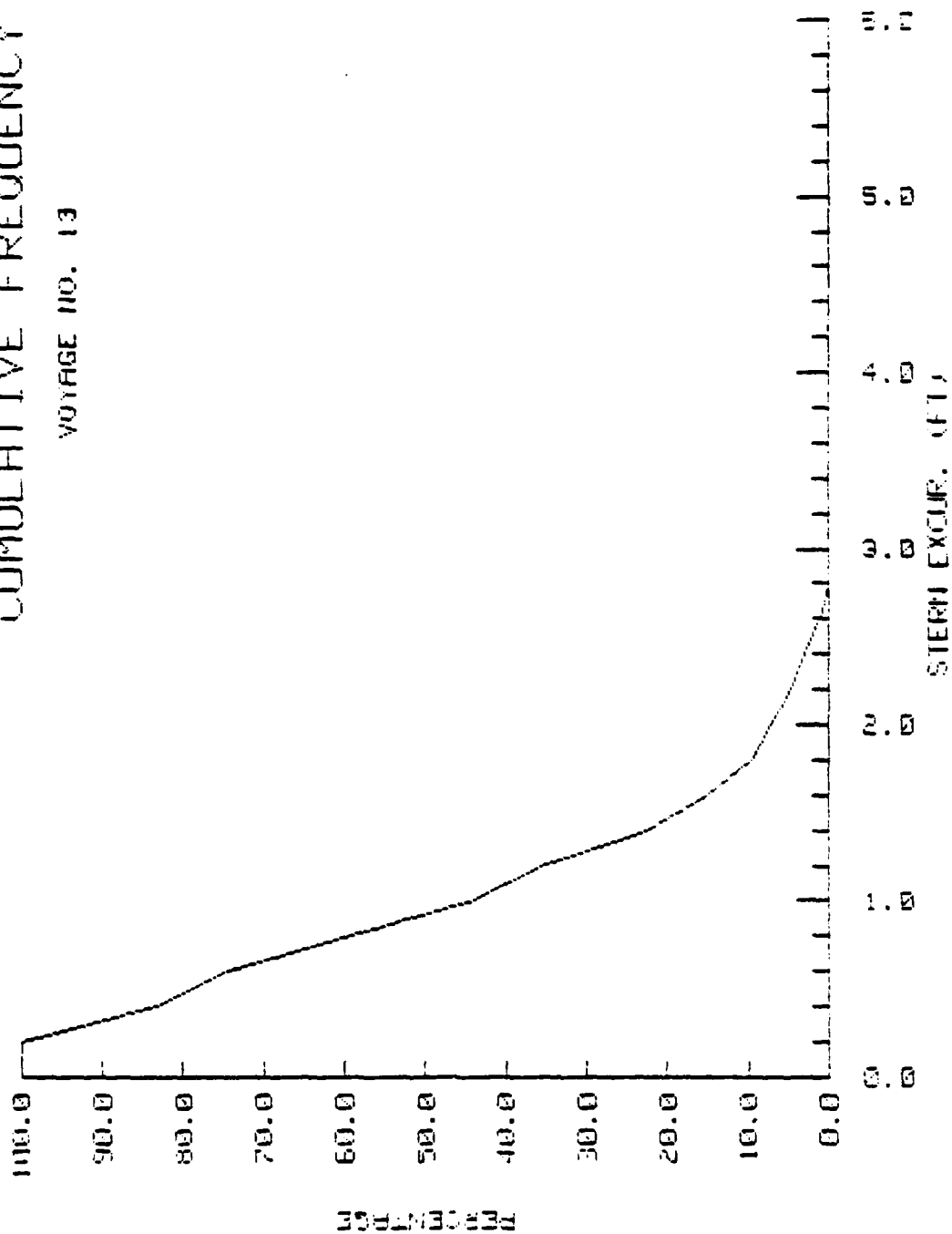
CUMULATIVE FREQUENCY

VOTAGE NO. 13



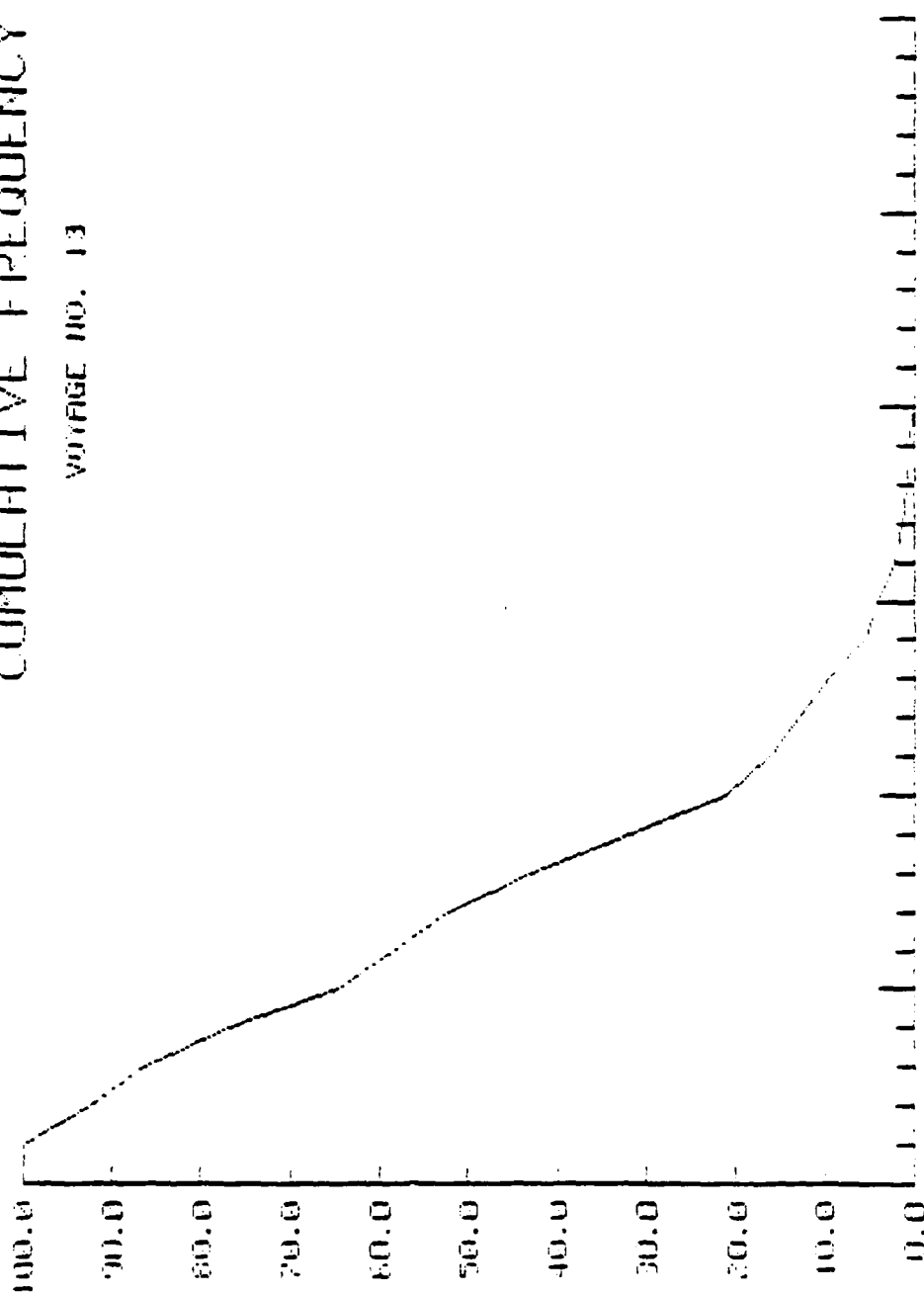
CUMULATIVE FREQUENCY

VOYAGE NO. 13



CUMULATIVE FREQUENCY

VOTAGE NO. 13



SIDE PAGE. 011

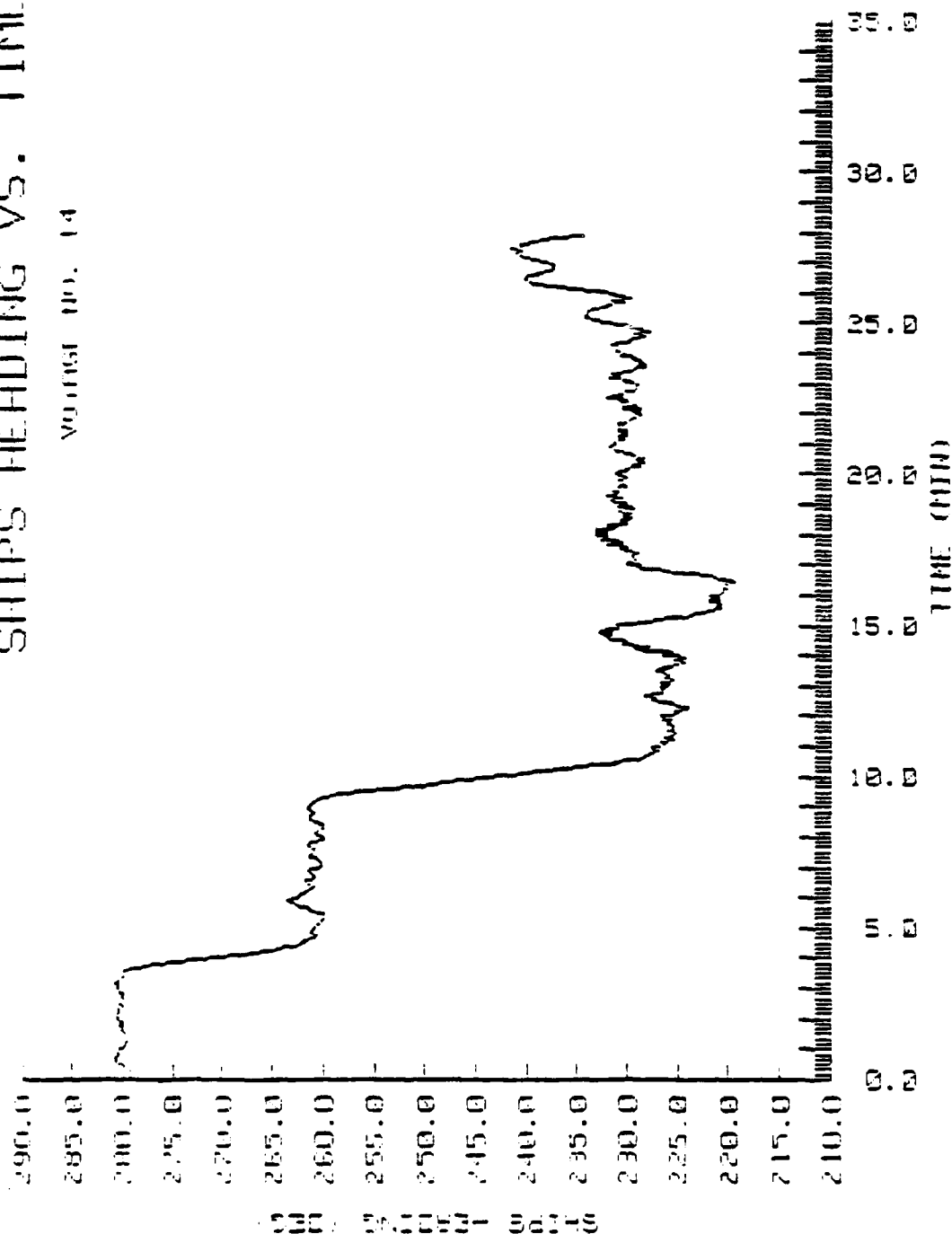
STATISTICAL SUMMARY

VOYAGE NO. 14

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-1.1	2.9	1.2	1.3
ROLL (DEG)	.4	13.4	3.7	4.3
YAW (FT SEC. SEC)	-1.1	5.5	1.9	2.2
HEAVE (FT)	.1	8.4	3.1	3.5
ROLL EXCUR. (FT)	.1	22.6	8.5	9.7
YAW EXCUR. (FT)	.1	12.1	4.5	5.1
HEAVE EXCUR. (FT)	.1	10.1	3.2	3.6

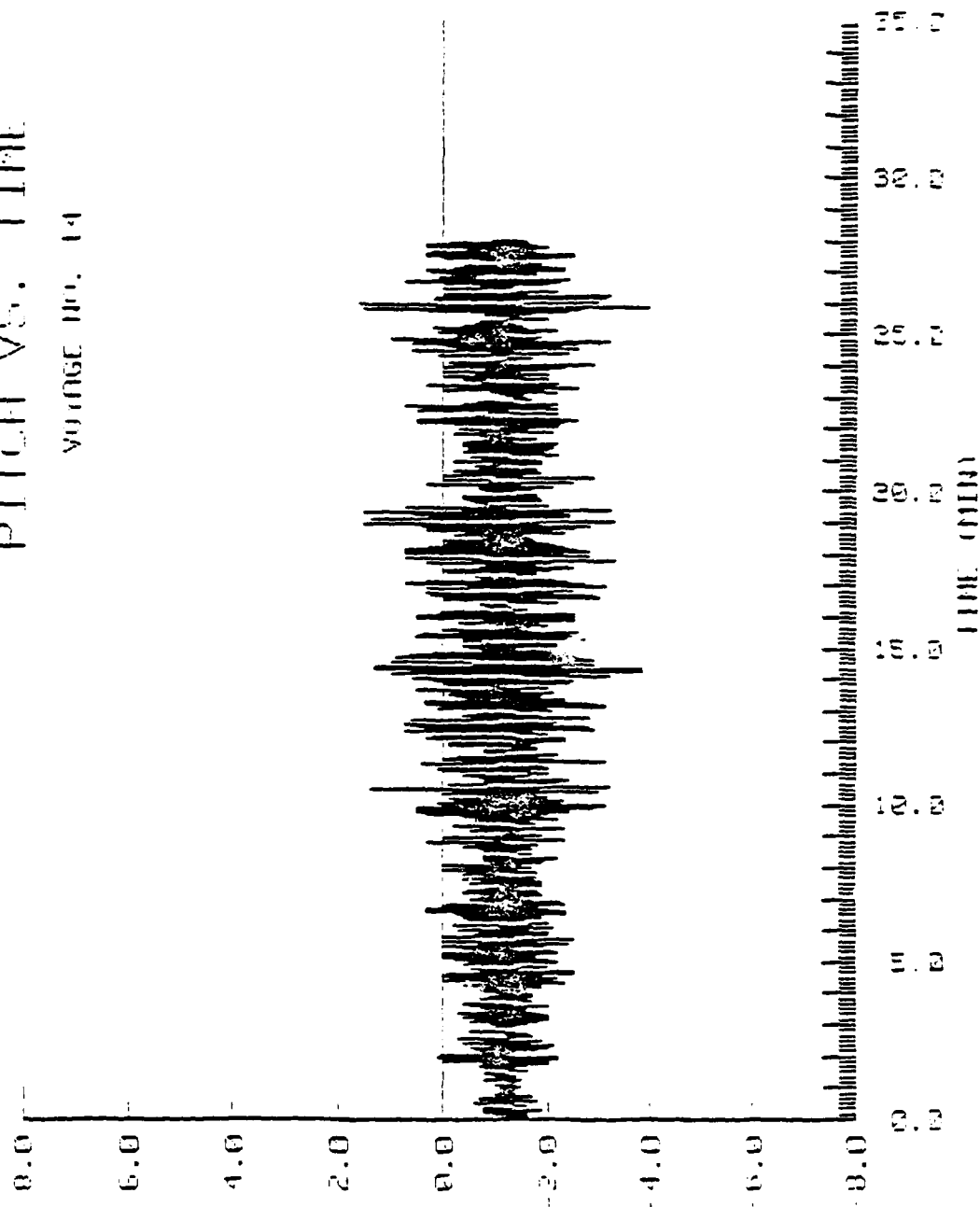
SHIPS HEADING VS. TIME

VOYAGE NO. 14



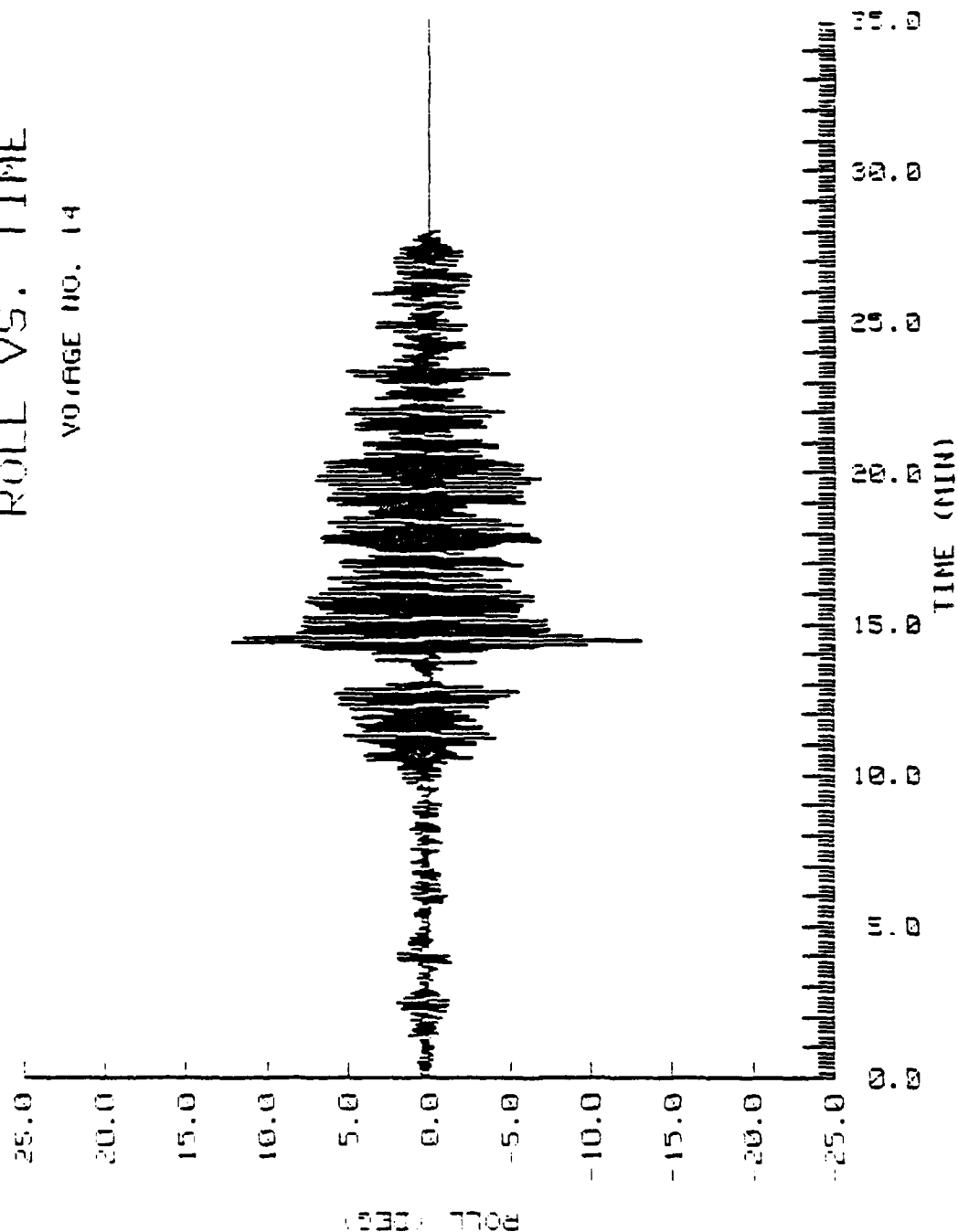
PITCH VS. TIME

VOLUME 100, 14



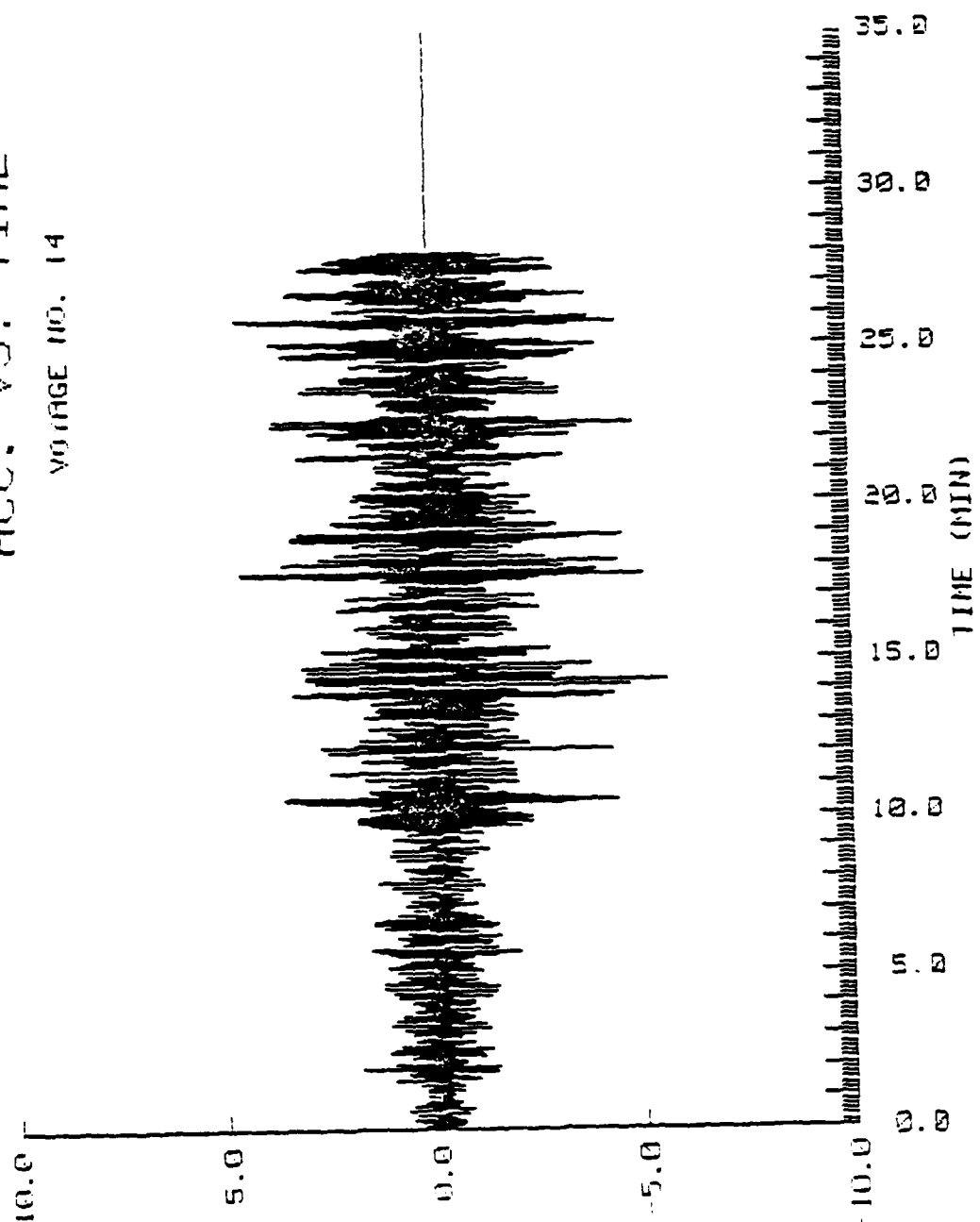
ROLL VS. TIME

VOLUME NO. 14



ACC. VS. TIME

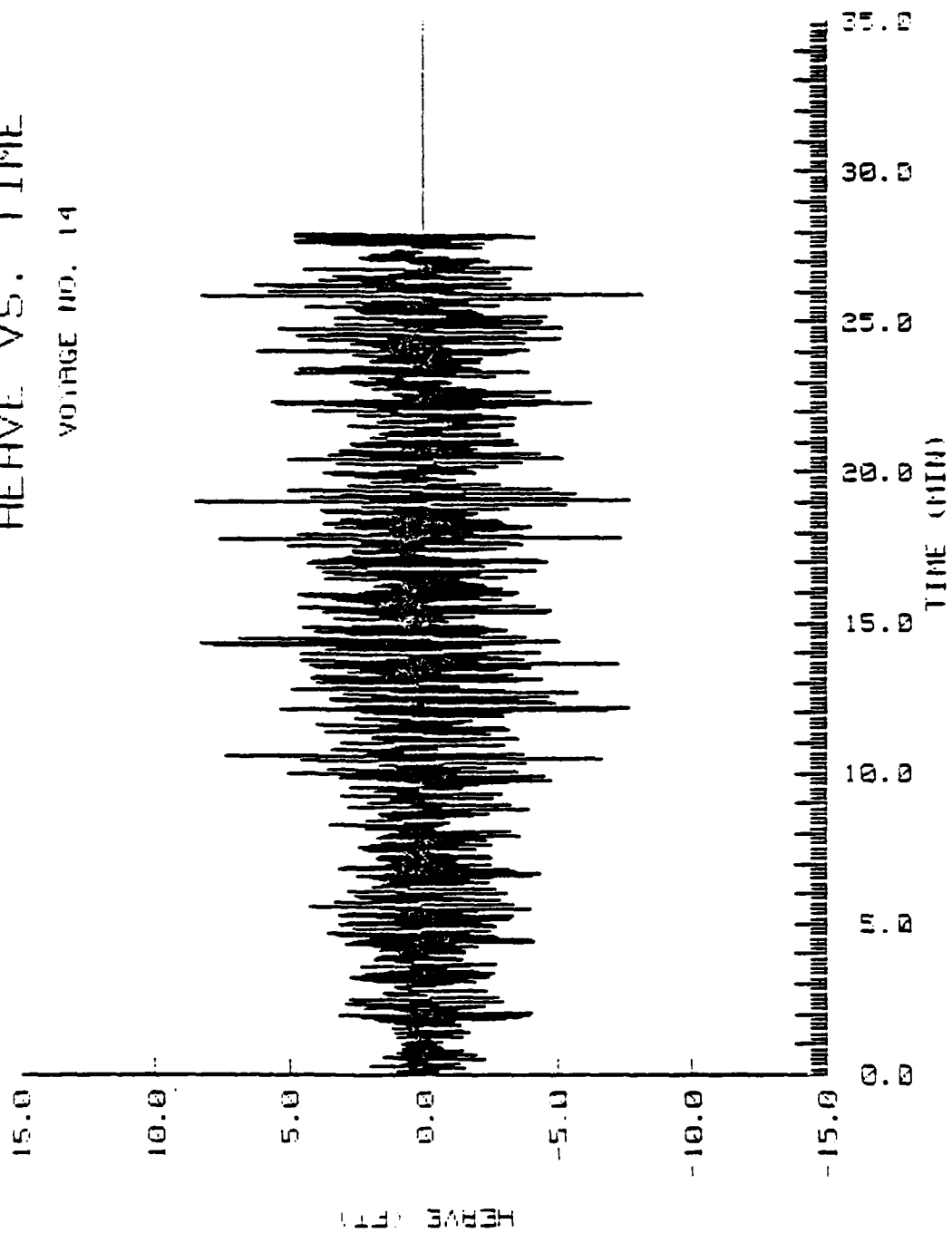
VORAGE NO. 14



ACC. VS. TIME

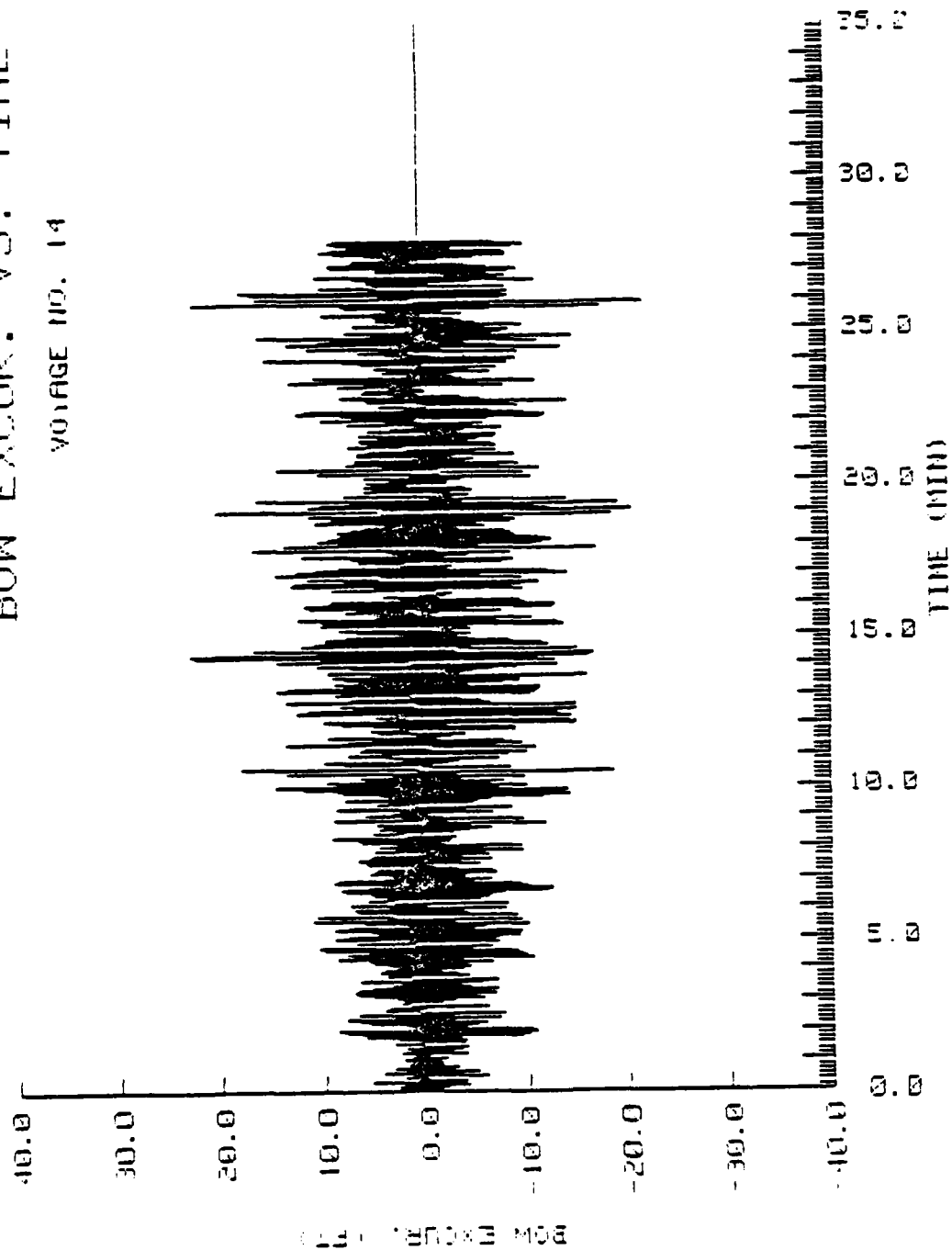
HEAVE VS. TIME

VORAGE NO. 14



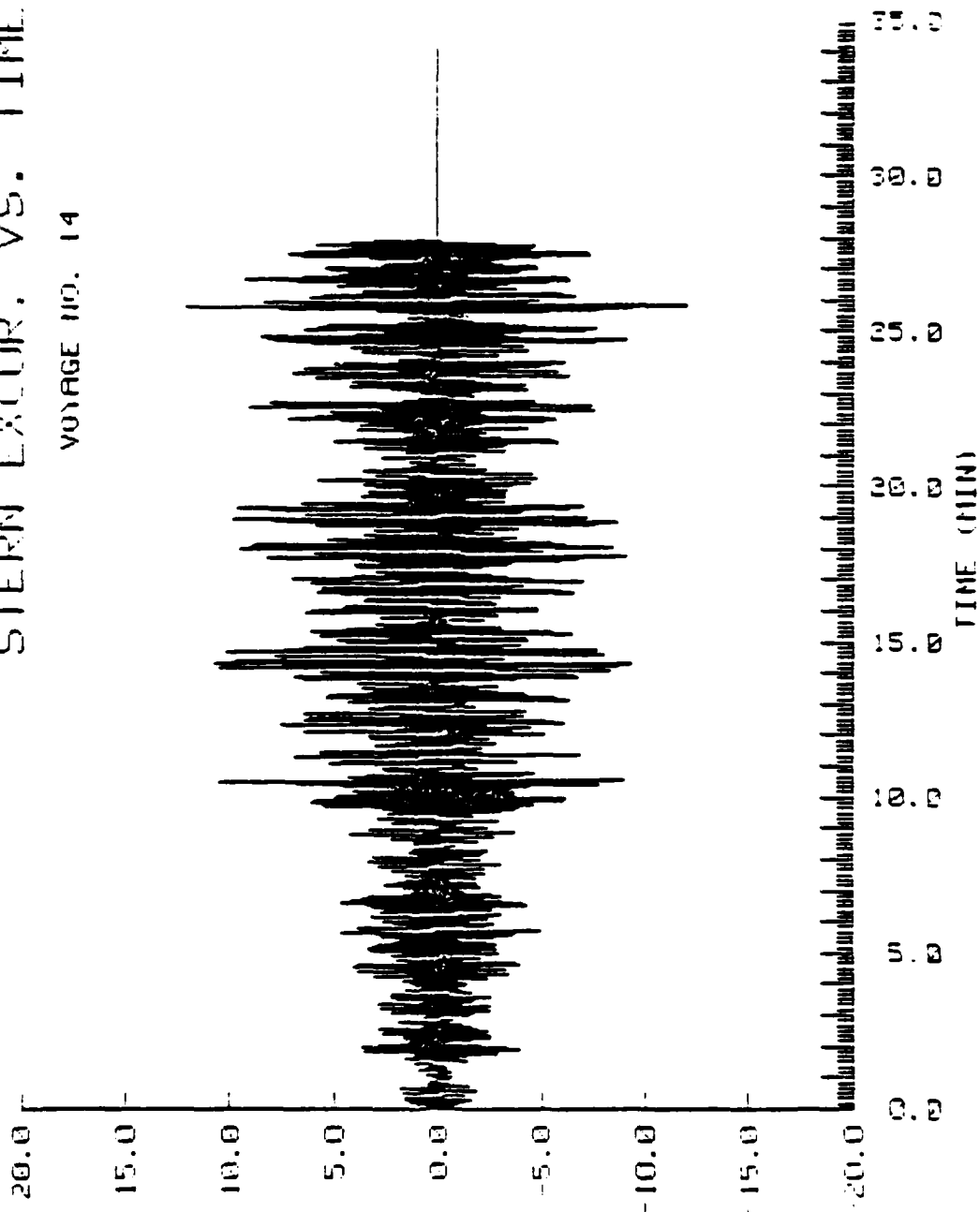
BOW EXCUR. VS. TIME

VOLAGE NO. 14



STERN EXCUR. VS. TIME

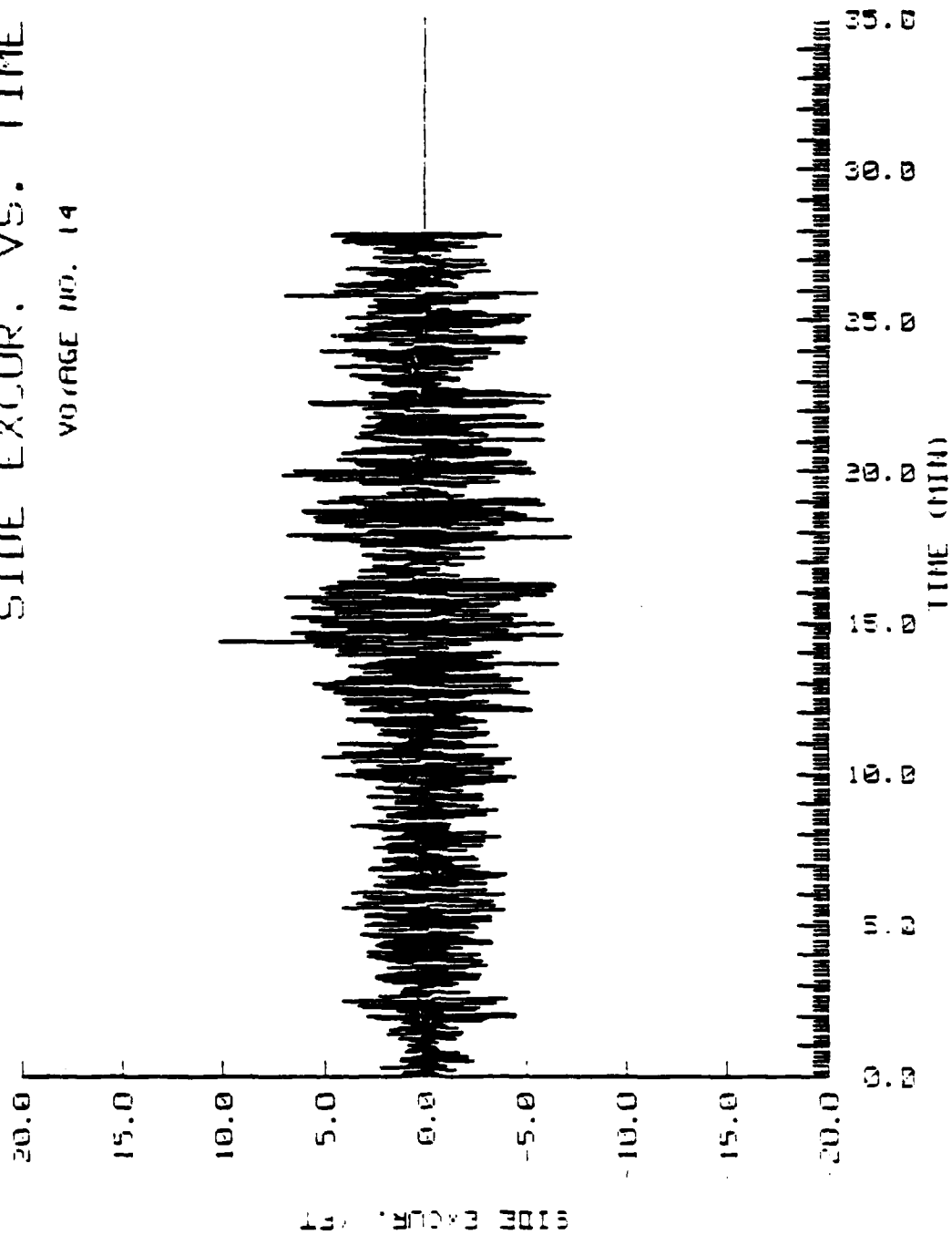
VOYAGE NO. 14



STERN EXCUR. (mm)

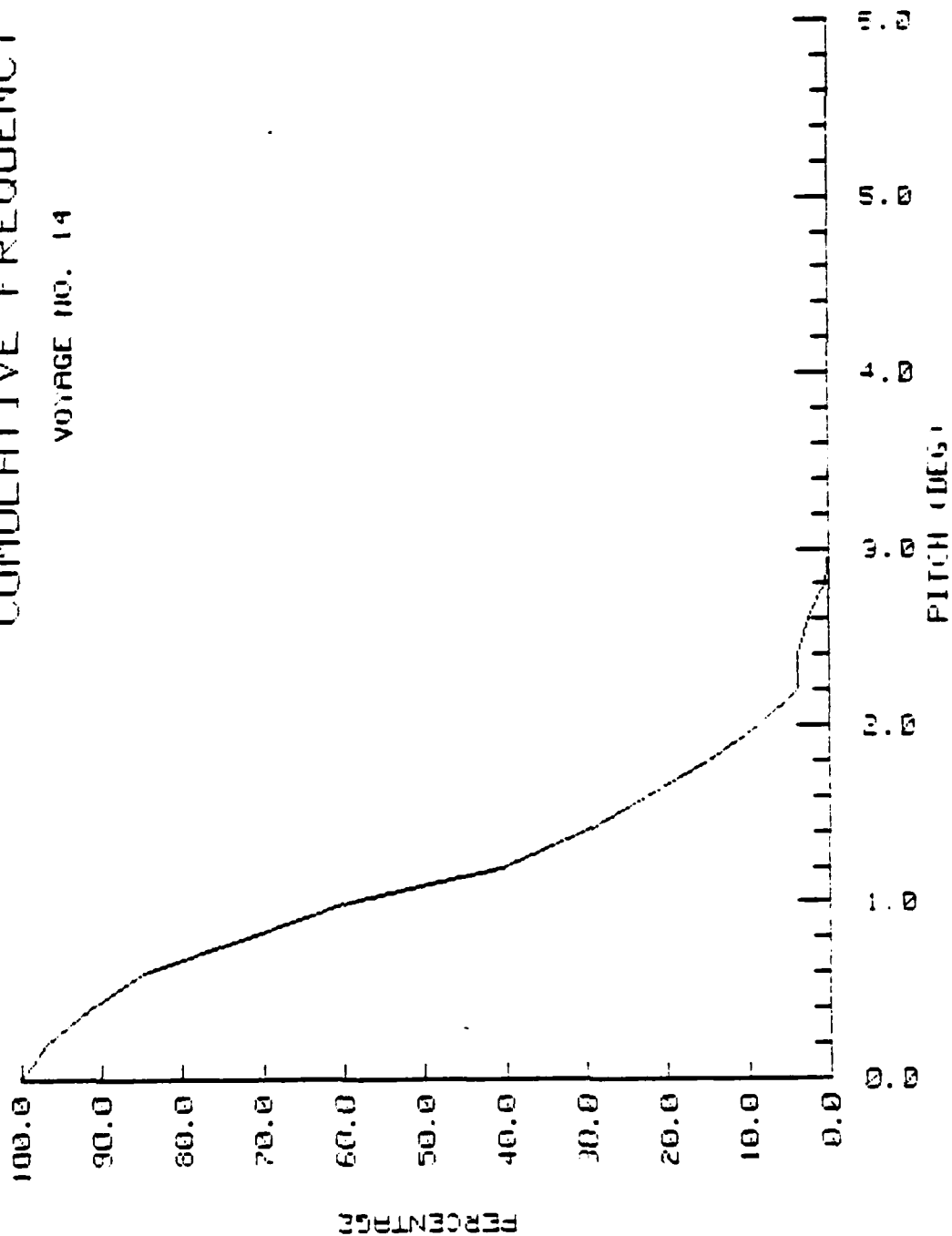
SIDE EXCUR. VS. TIME

VORAGE NO. 14



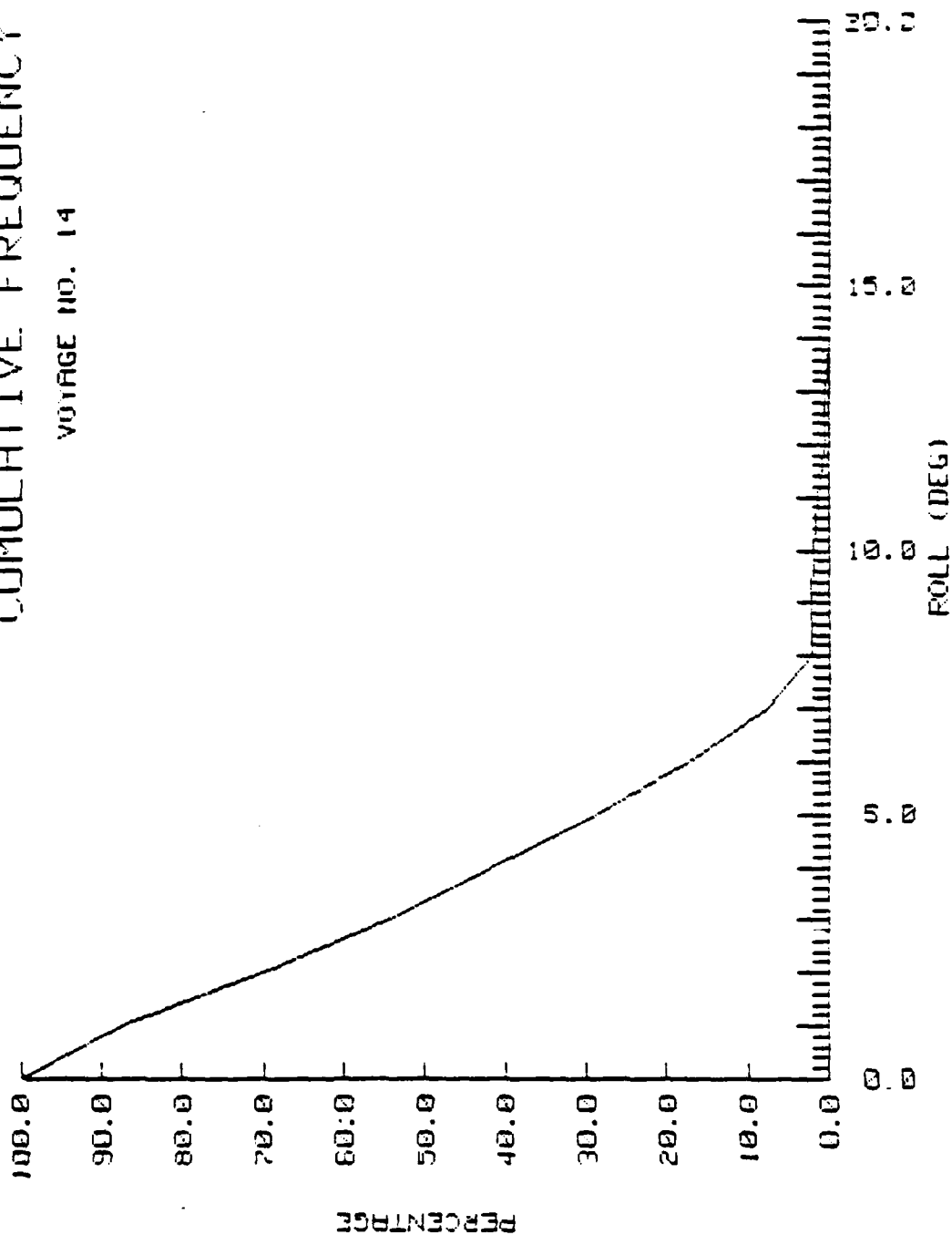
CUMULATIVE FREQUENCY

VOLTAGE NO. 14



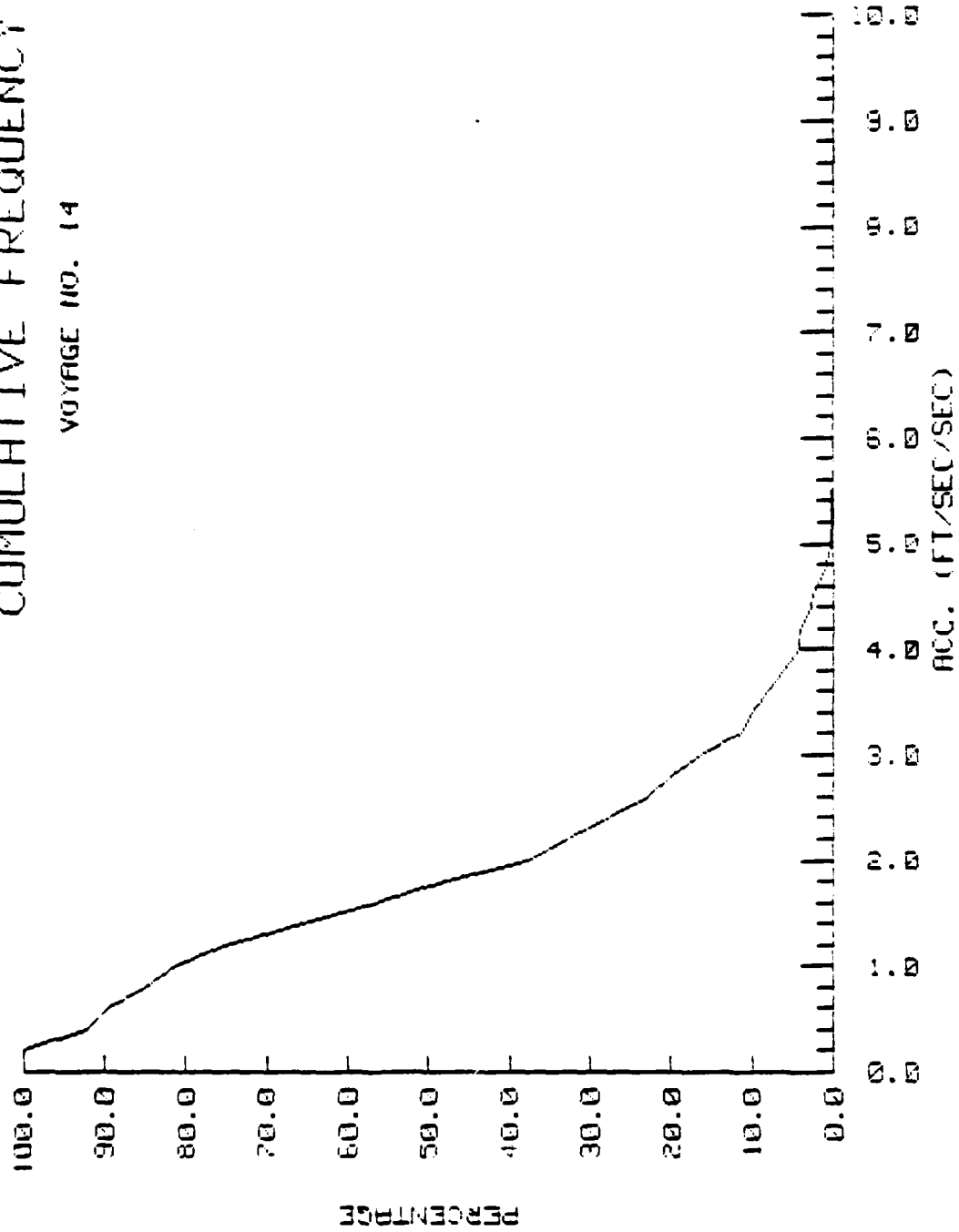
CUMULATIVE FREQUENCY

VOTAGE NO. 14



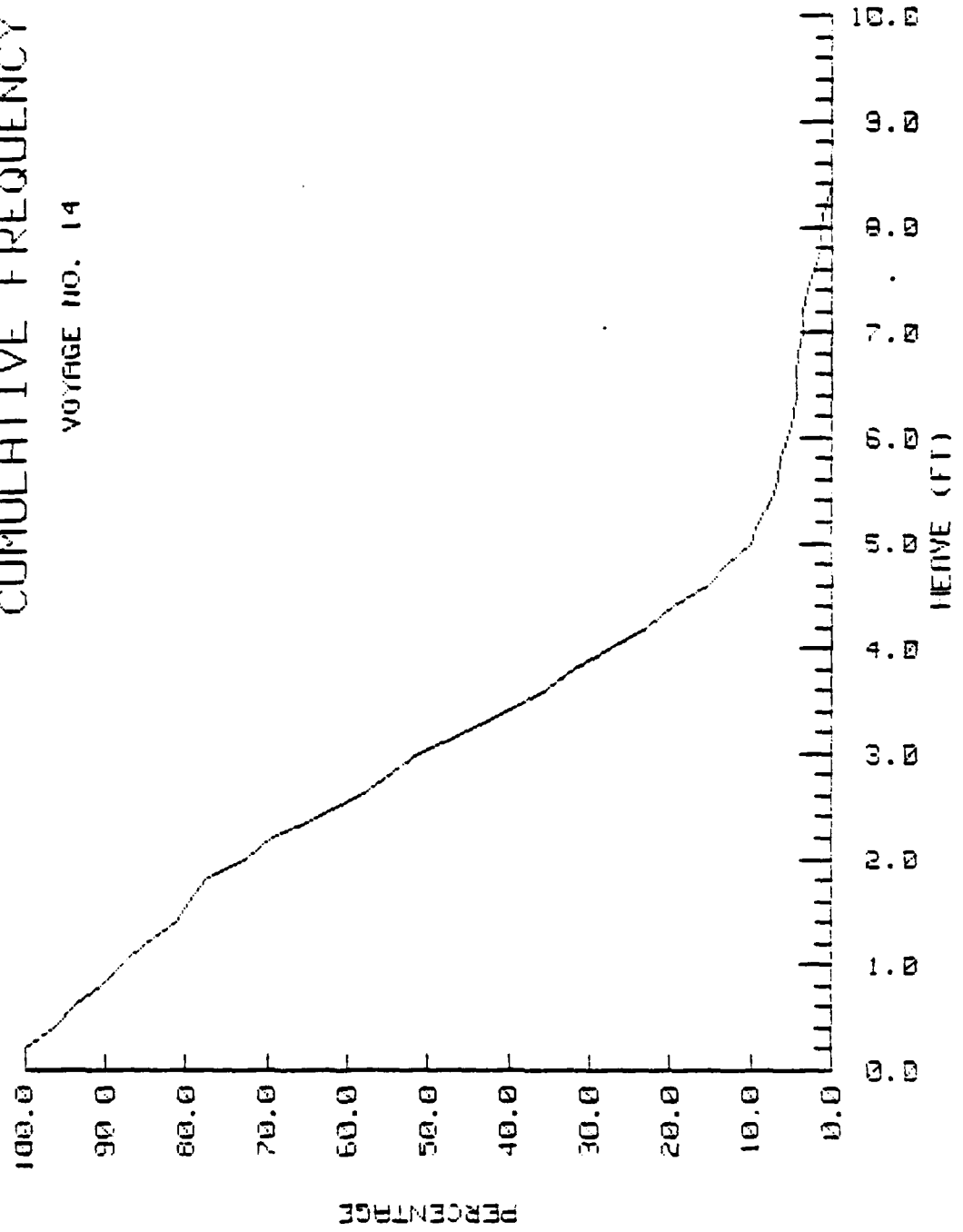
CUMULATIVE FREQUENCY

VOYAGE NO. 14



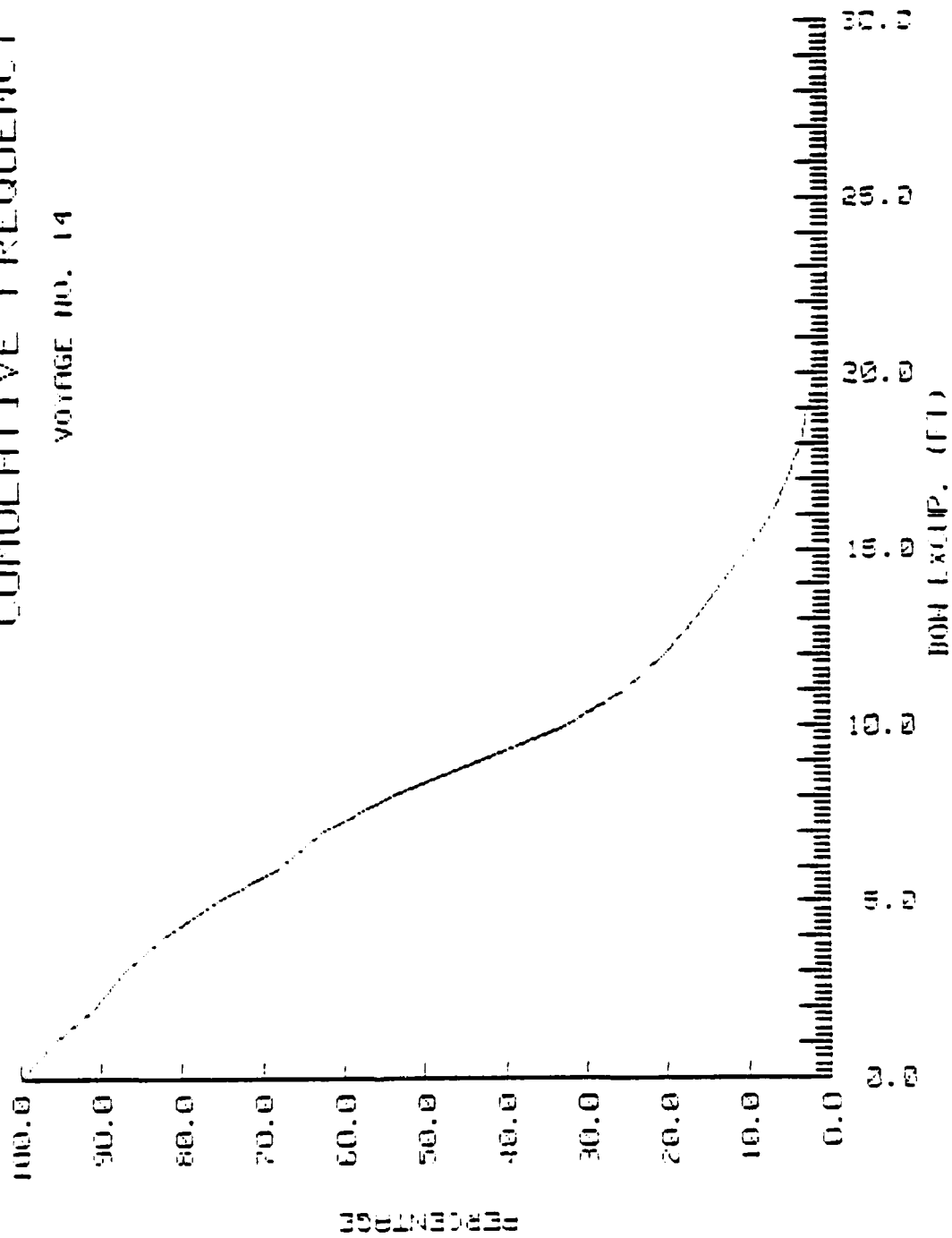
CUMULATIVE FREQUENCY

VOYAGE NO. 14



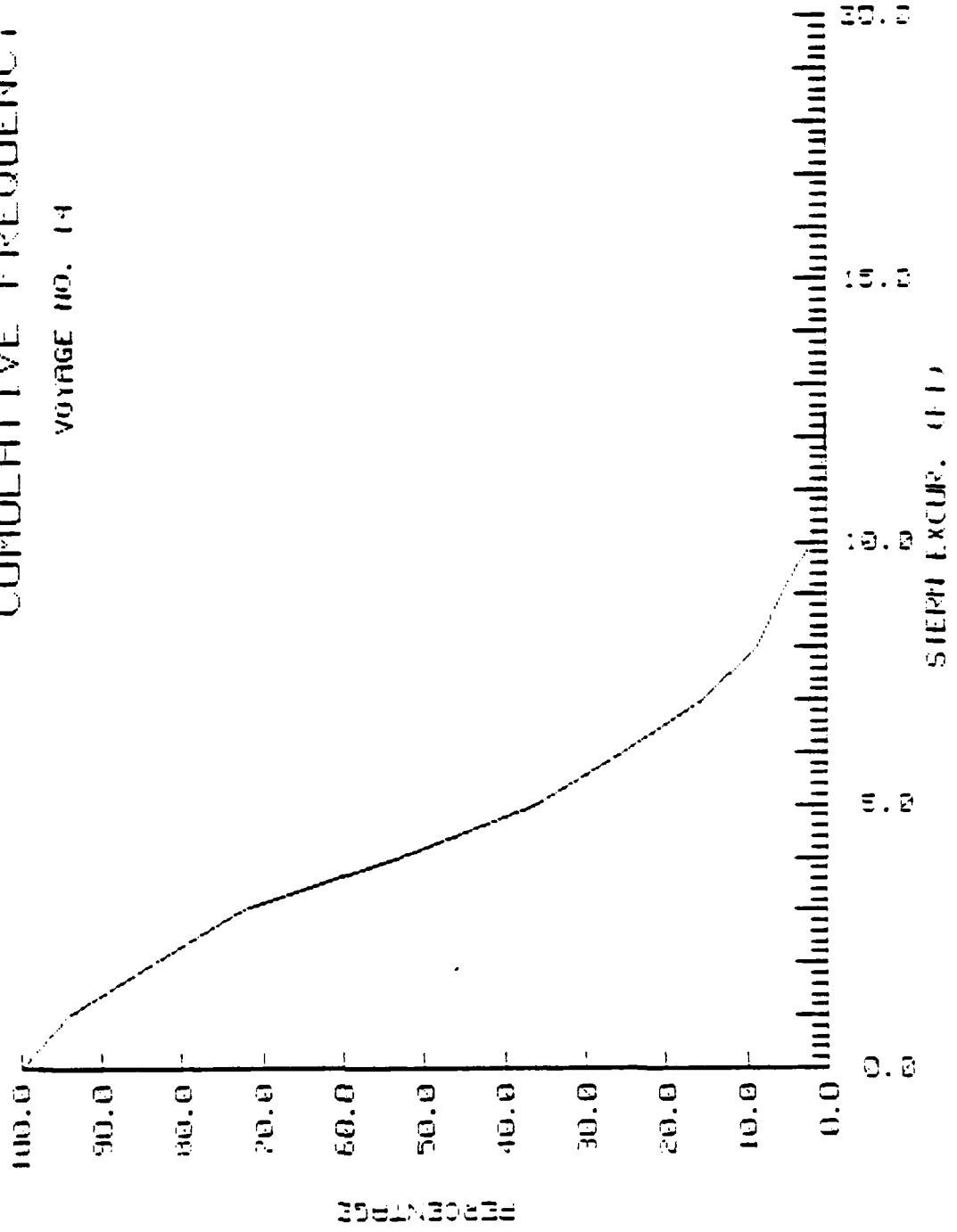
CUMULATIVE FREQUENCY

VOTAGE NO. 14



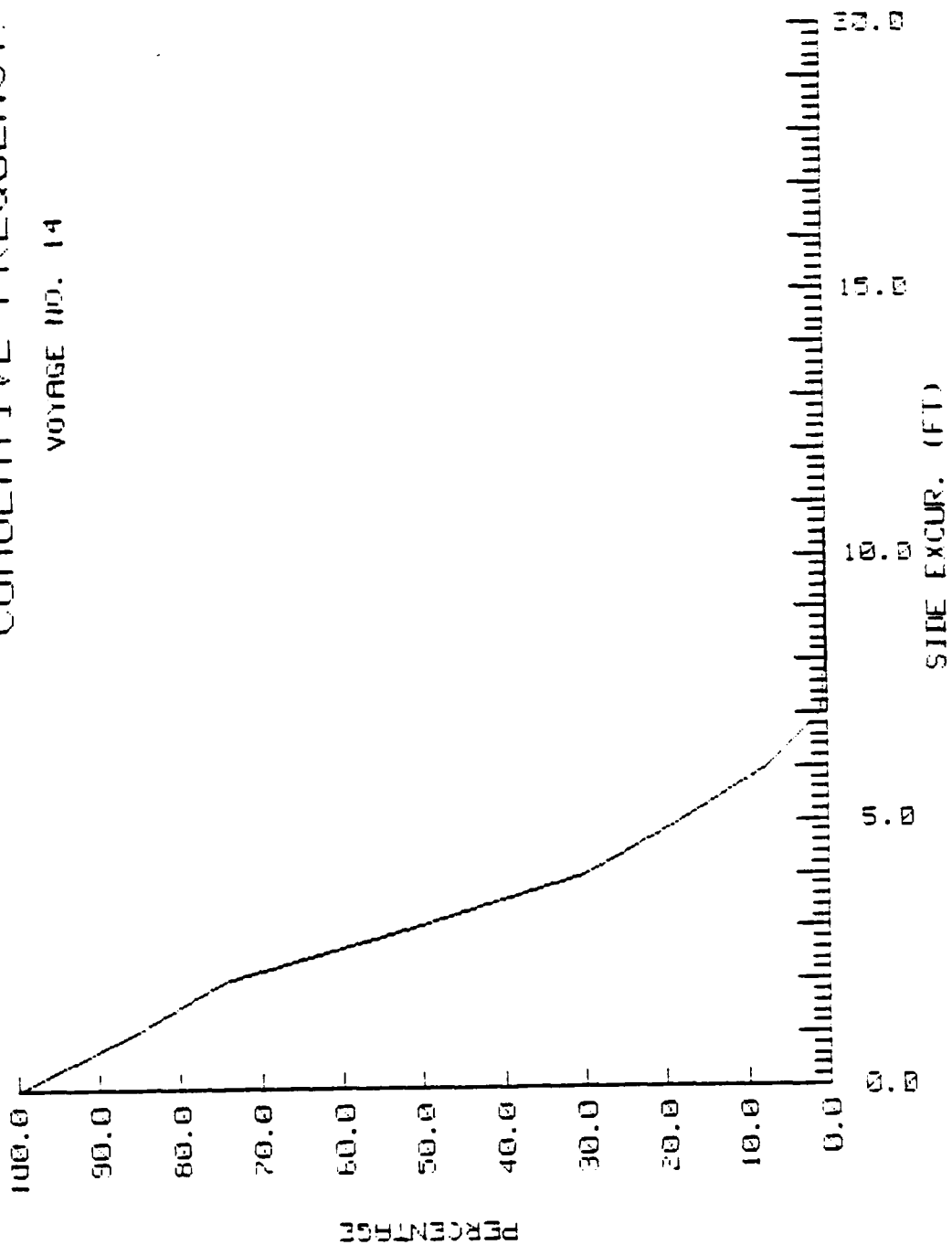
CUMULATIVE FREQUENCY

VOYAGE NO. 14



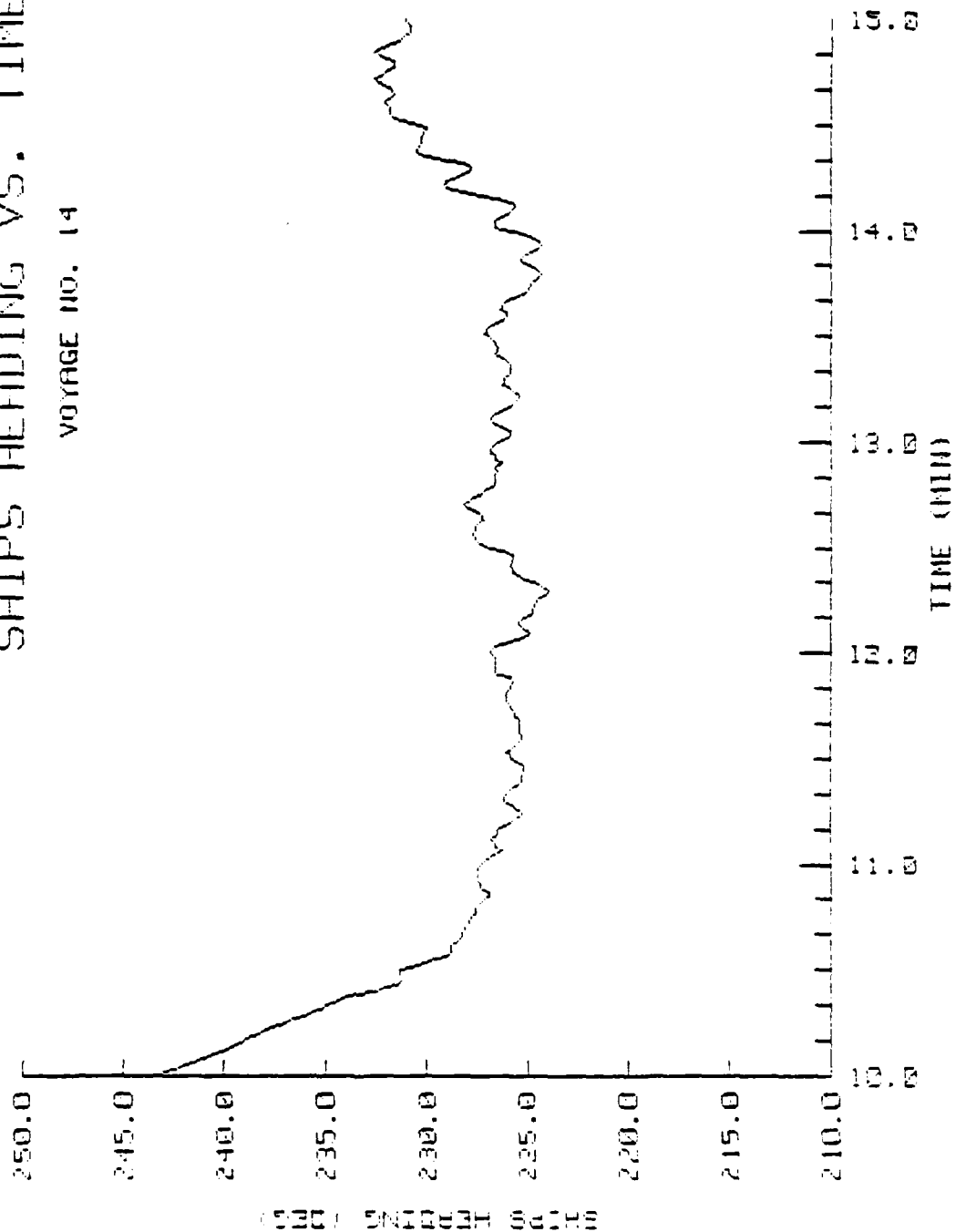
CUMULATIVE FREQUENCY.

VOYAGE NO. 14



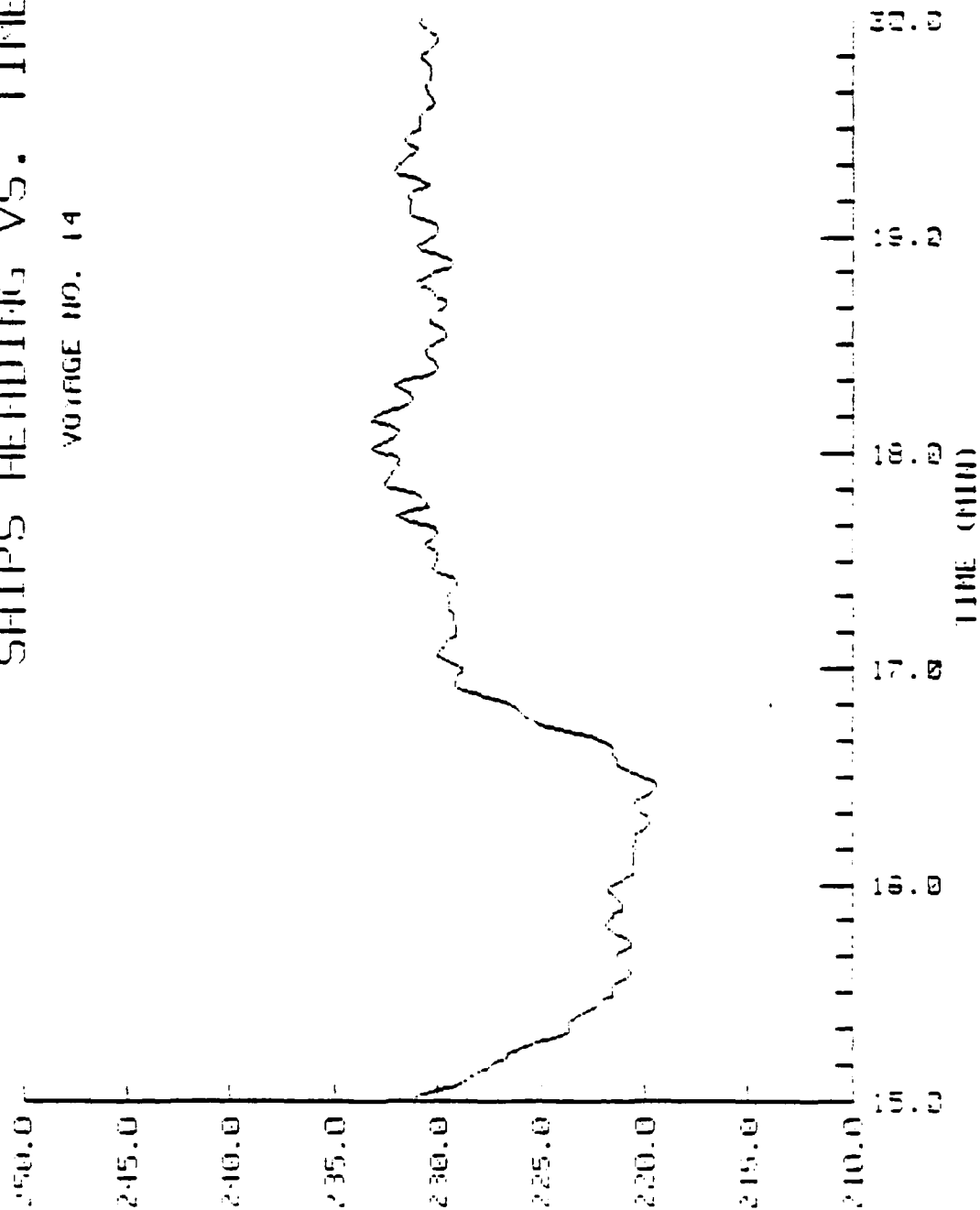
SHIPS HEADING VS. TIME

VOYAGE NO. 14



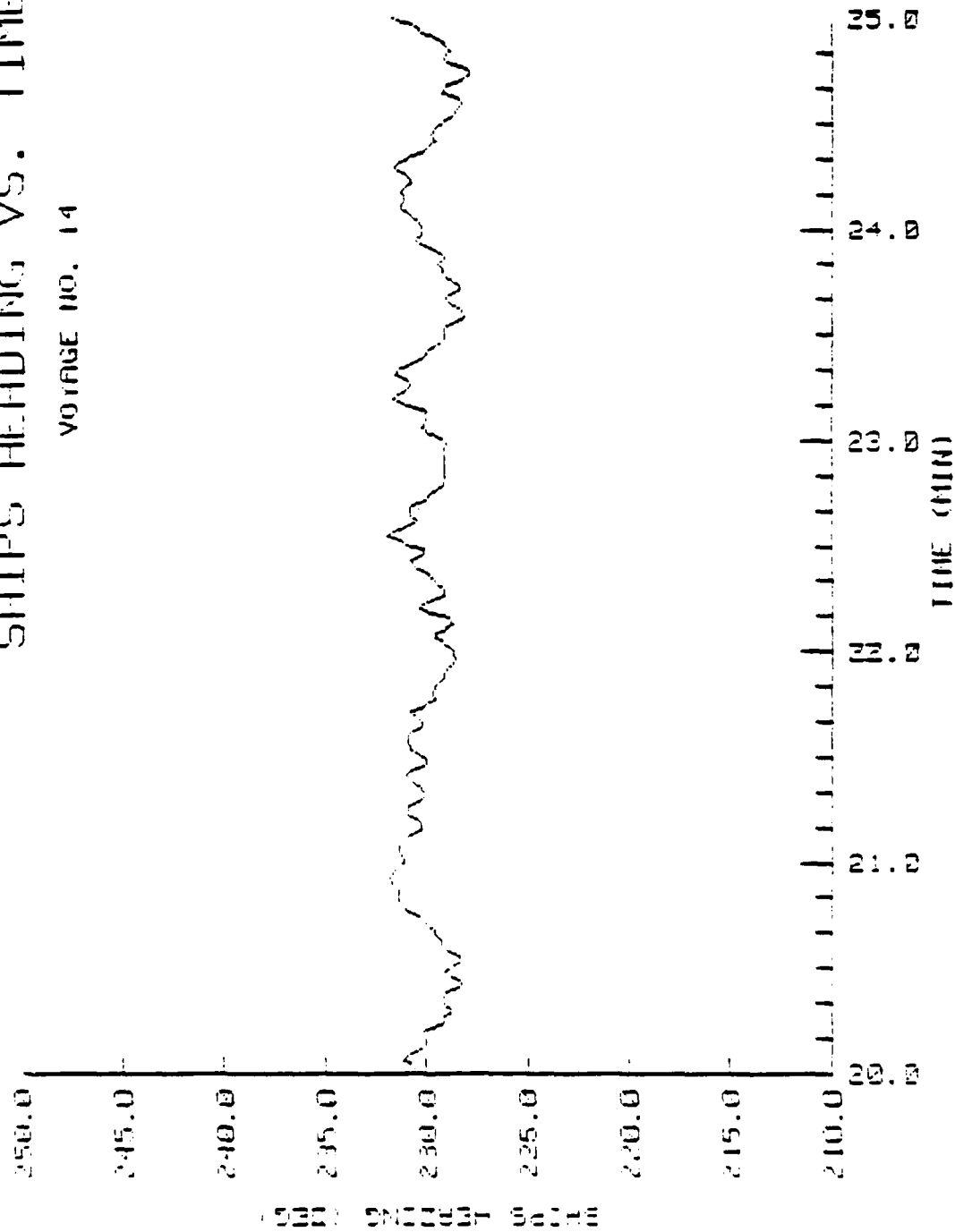
SHIPS HEADING VS. TIME

VOYAGE NO. 14



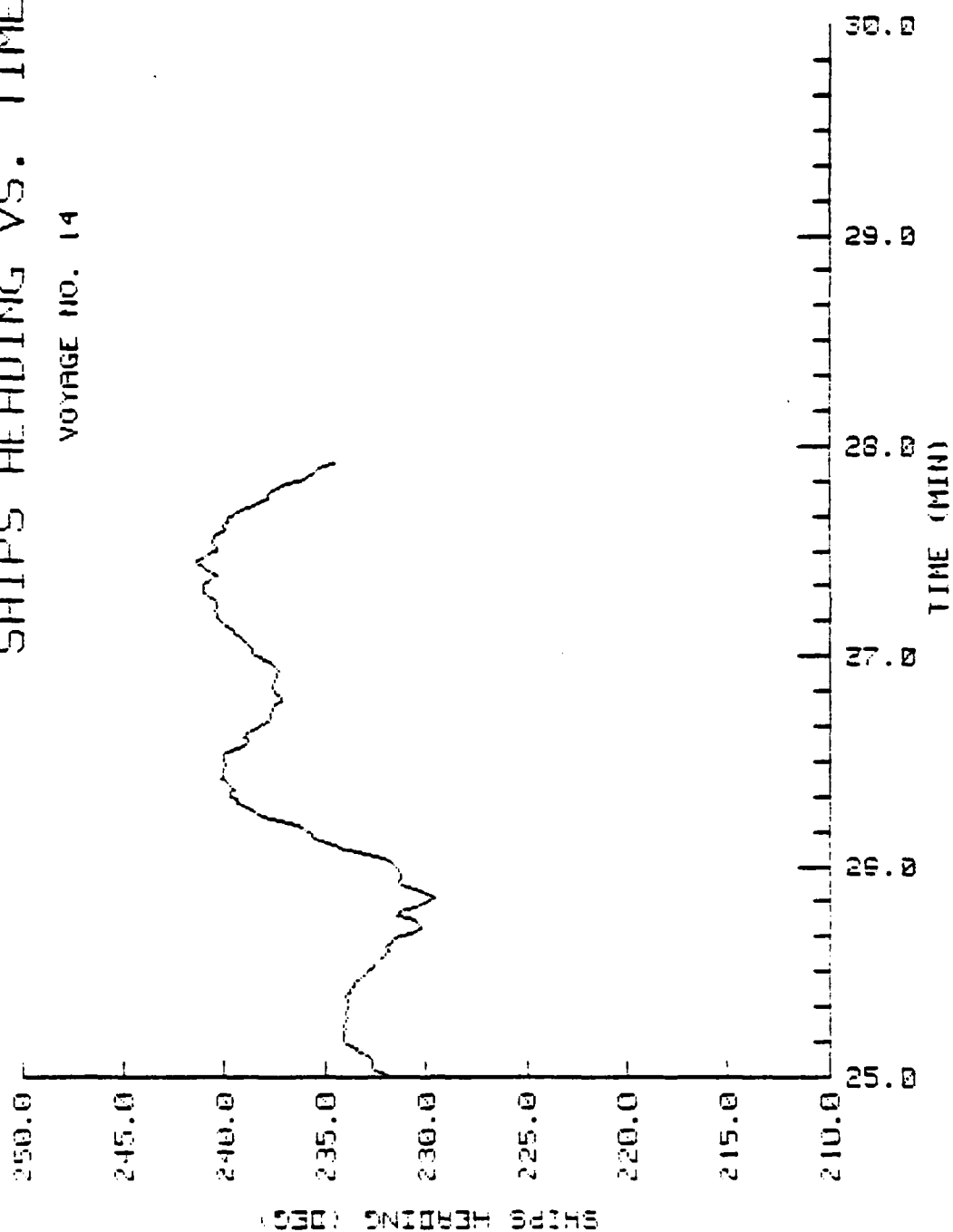
SHIPS HEADING VS. TIME

VOTAGE NO. 14



SHIPS HEADING VS. TIME

VOYAGE NO. 14



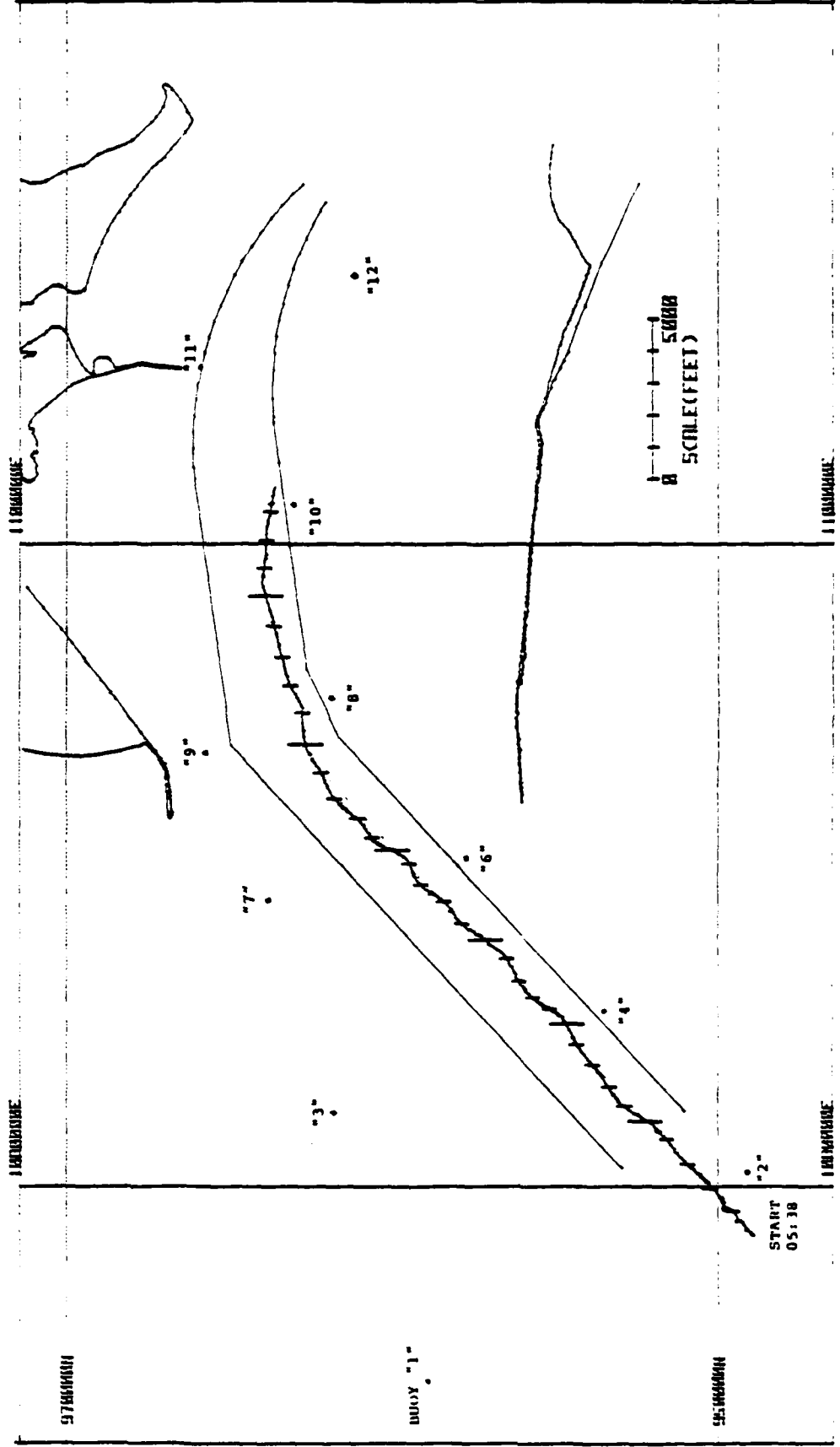
STATISTICAL SUMMARY

VOYAGE NO. 15

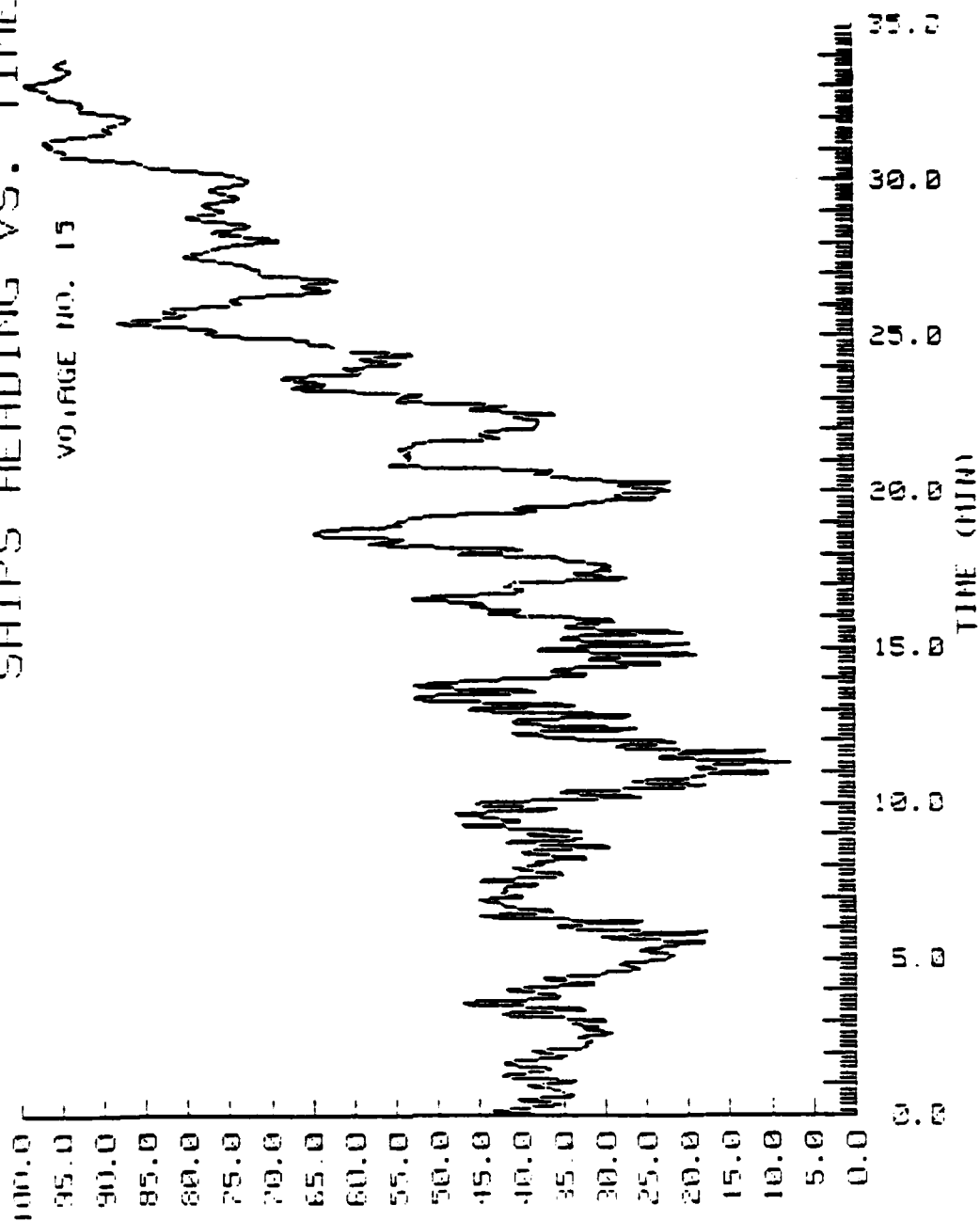
	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-1.1	6.0	1.9	2.1
ROLL (DEG)	1.6	17.5	4.4	5.4
HEAVE (FT)	-0.0	3.7	1.2	1.3
WAVE (FT)	.1	9.7	2.7	3.2
BOW EXCUR. (FT)	.1	16.7	6.0	7.1
STERN EXCUR. (FT)	.1	32.6	9.8	11.6
SIDE EXCUR (FT)	.1	16.1	4.9	5.8

VESSELS NO. 15 SHIP TRACK

SCALE: 1 INCH = 5 MILES



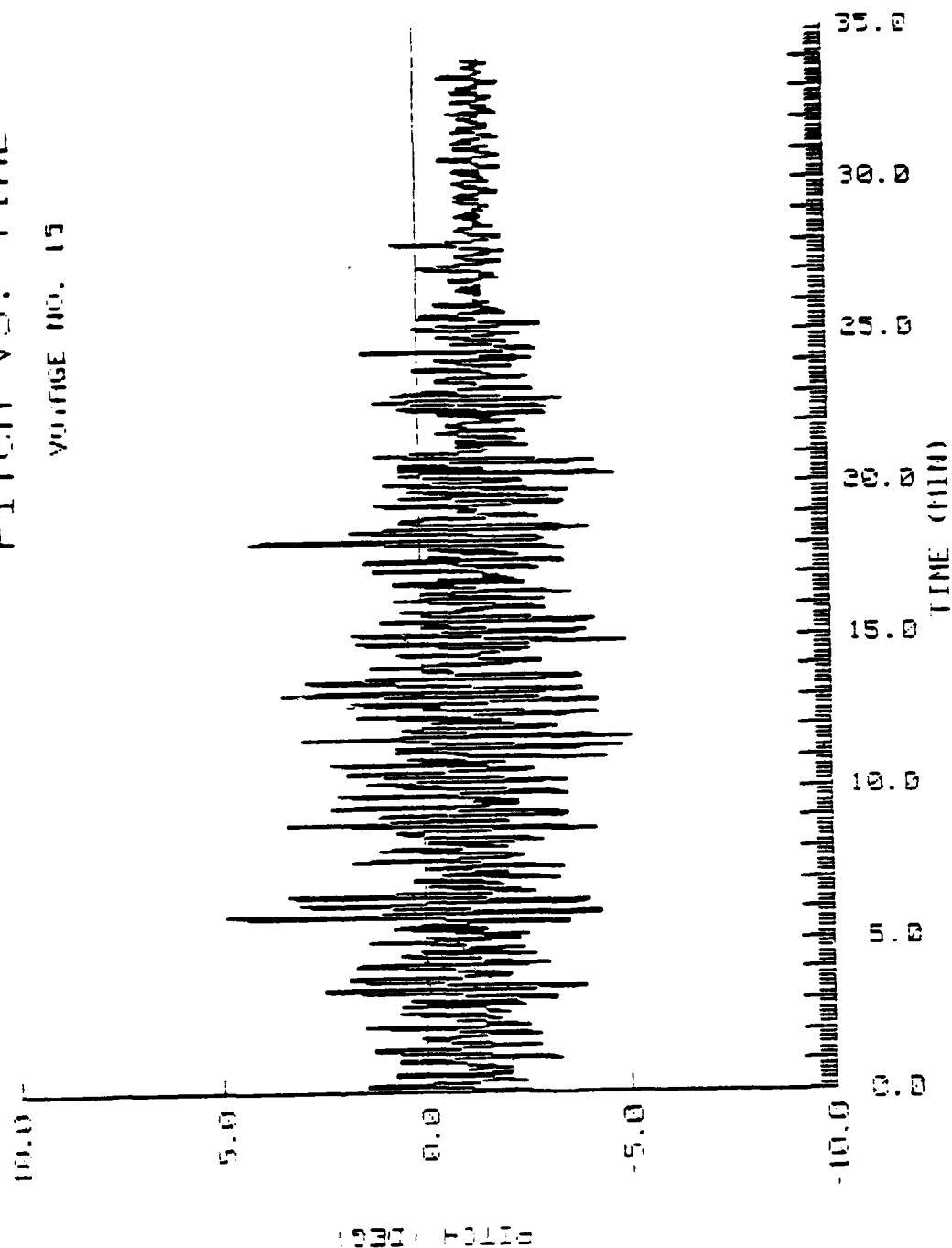
VOLUME NO. 15



020 0410024 34143

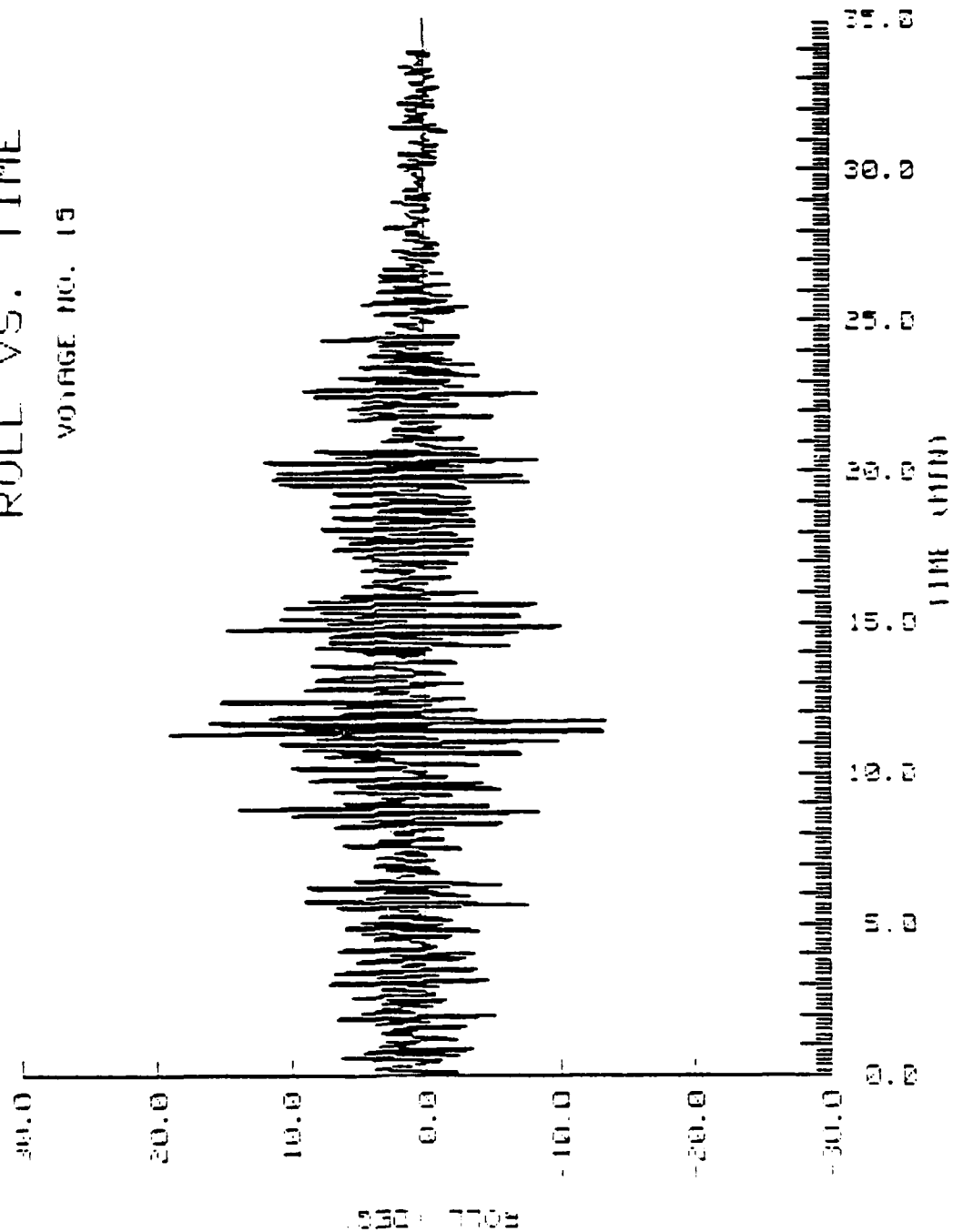
PITCH VS. TIME

VOLUME NO. 15



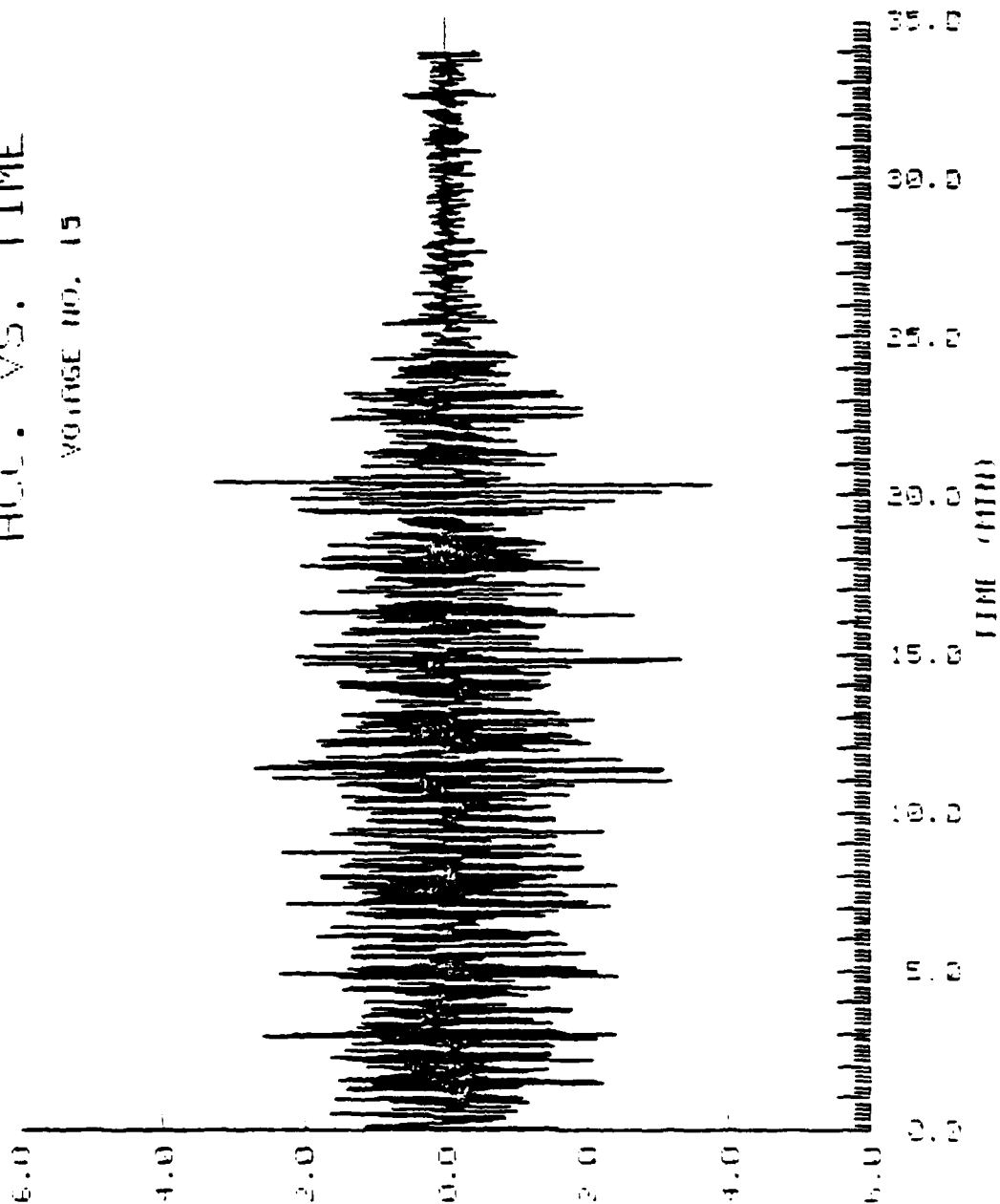
ROLL VS. TIME

VORAGE NO. 15



ACC. VS. TIME

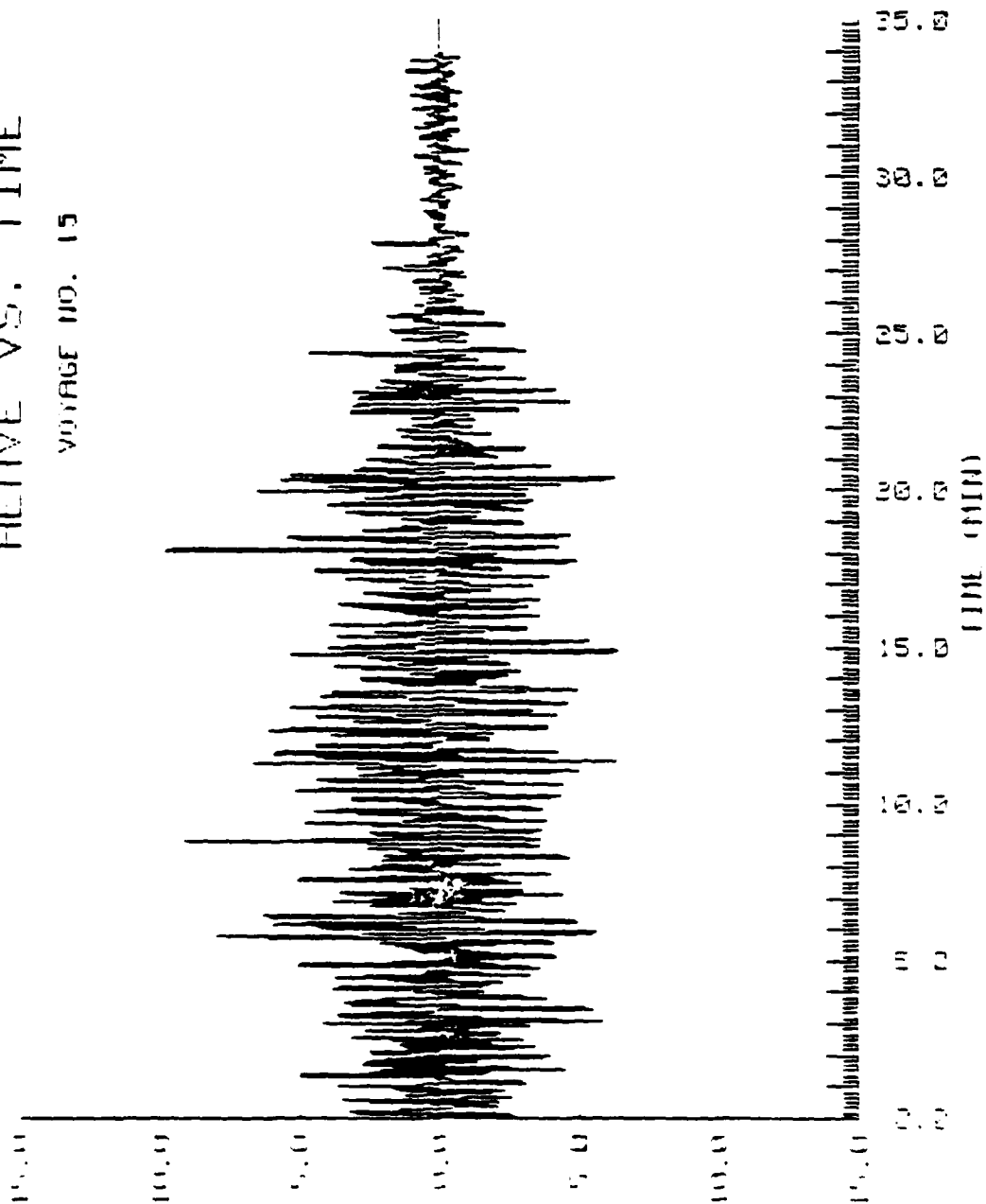
VOLUME NO. 15



100 100 100 100

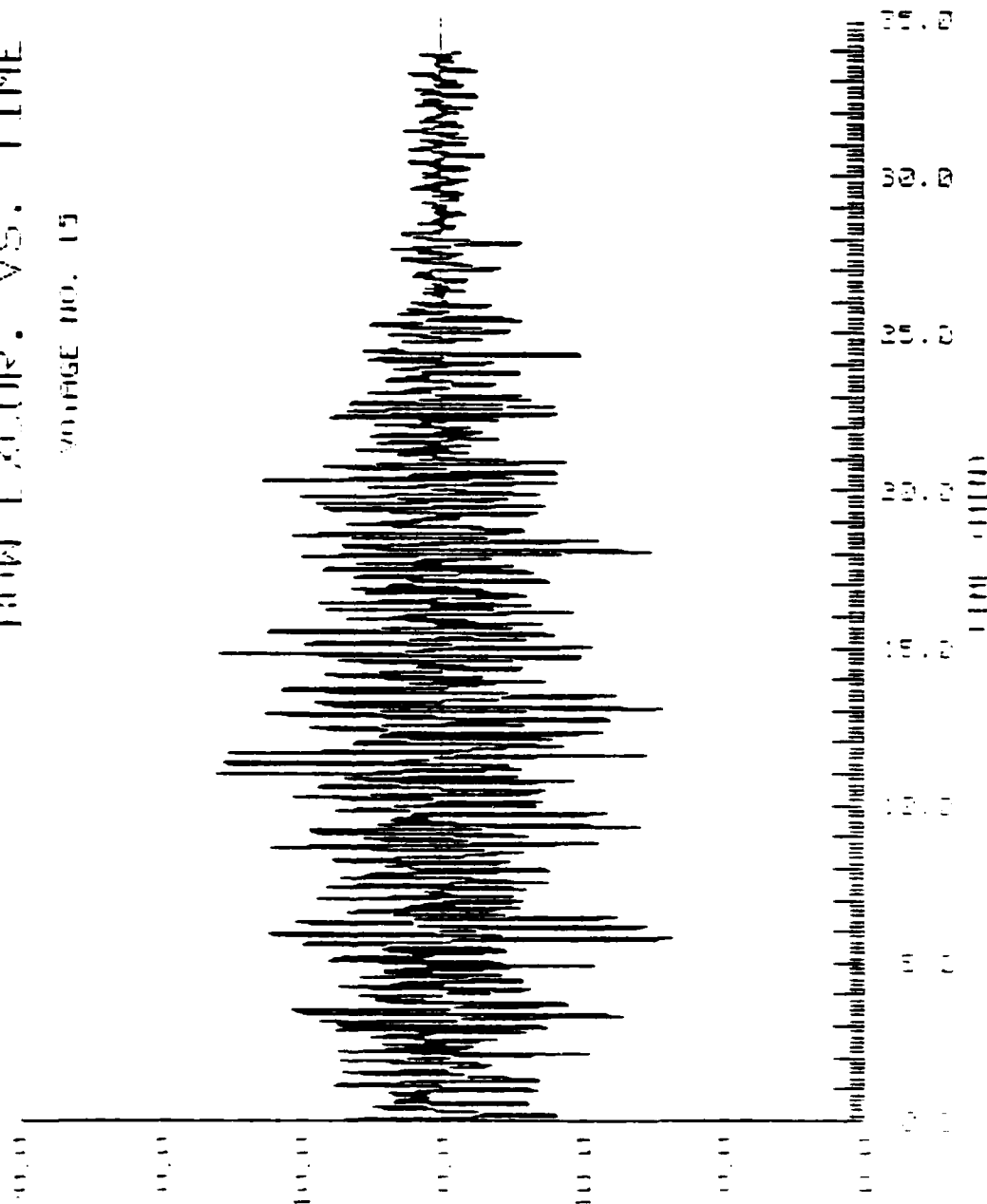
HEIIVE VS. TIME

VOTAGE NO. 15



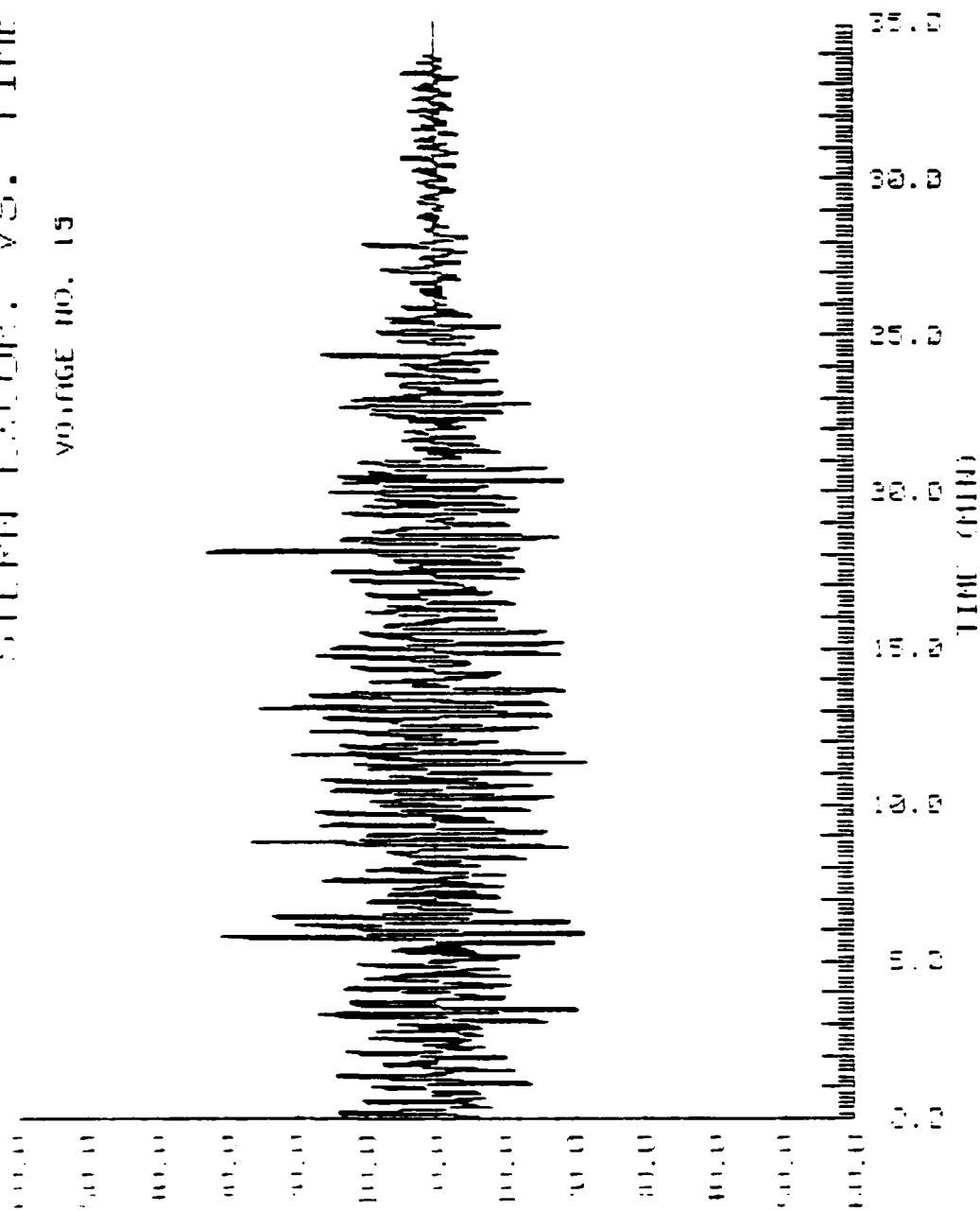
RAW EXCUR. VS. TIME

WAVE NO. 15



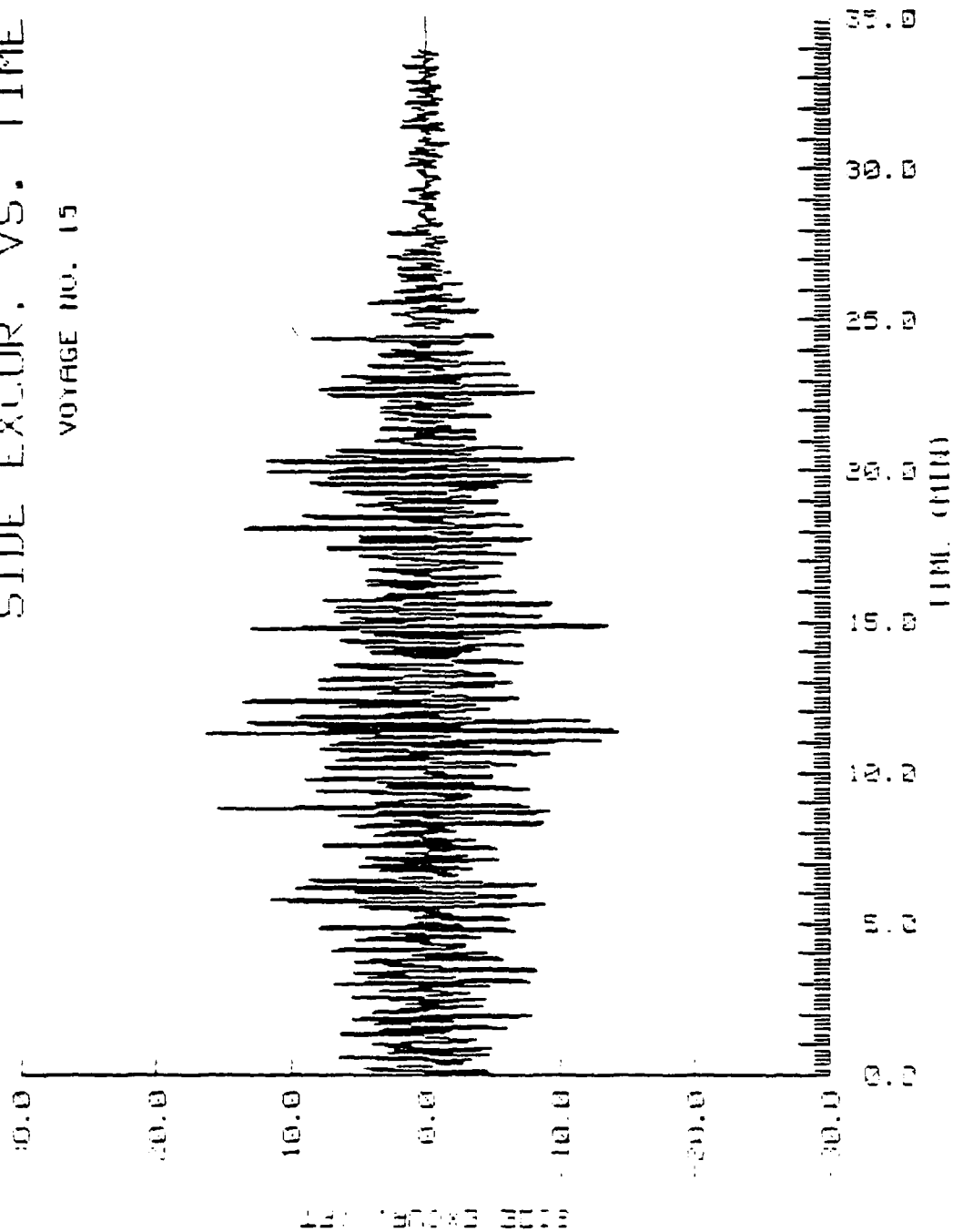
SULPHUR VS. TIME

VOLUME NO. 15



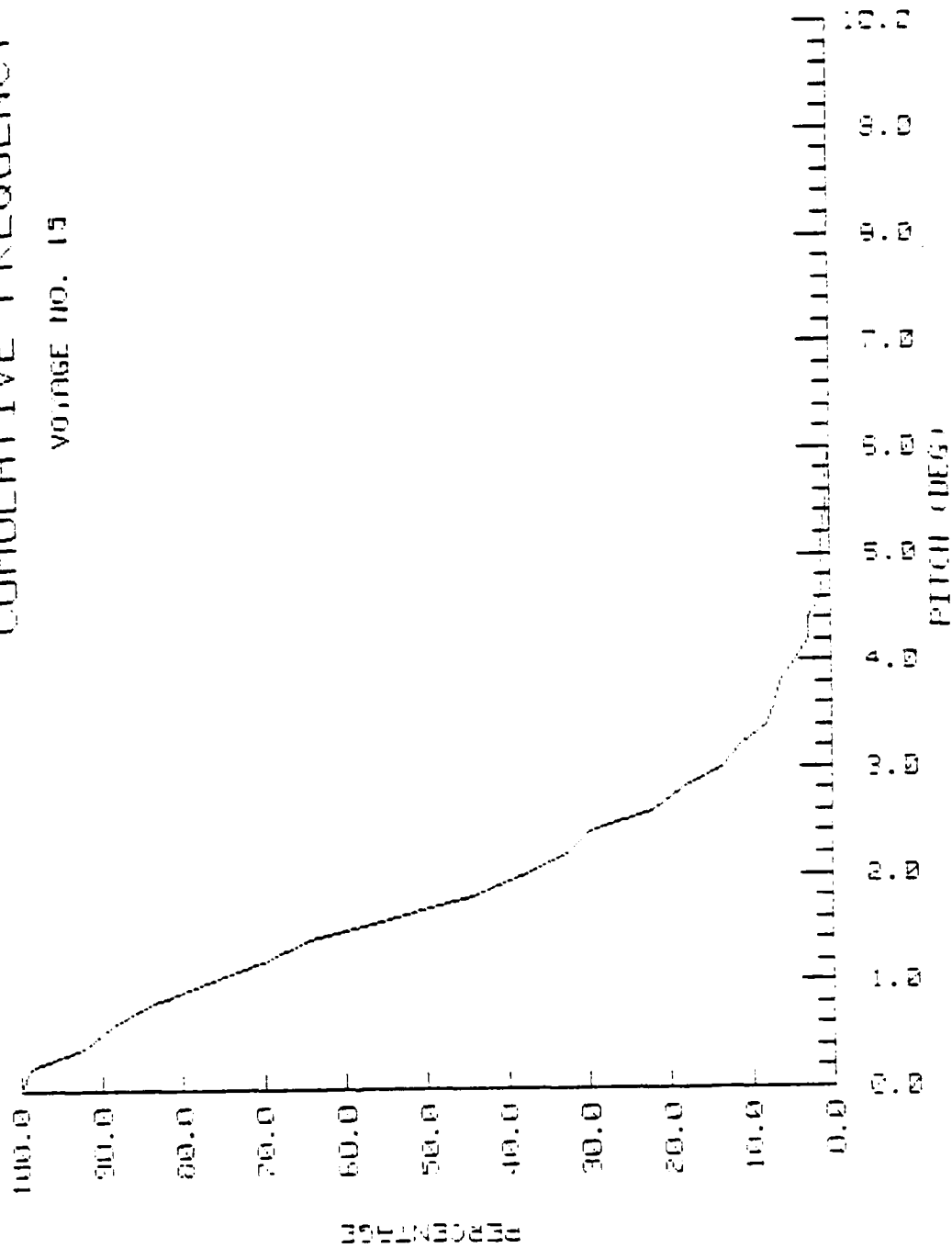
SIDE EXCUR. VS. TIME

VOYAGE NO. 15



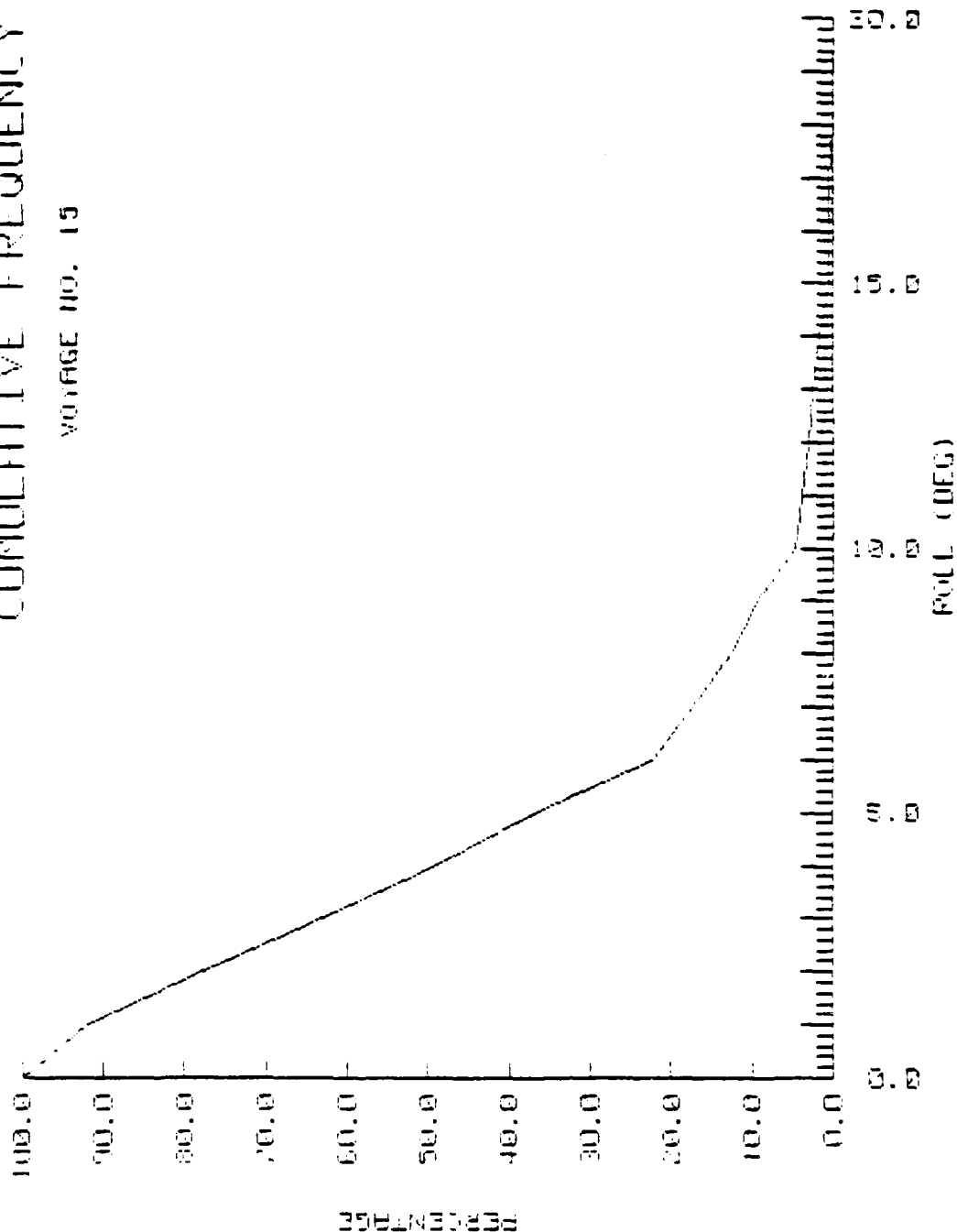
CUMULATIVE FREQUENCY

VOLUME NO. 15



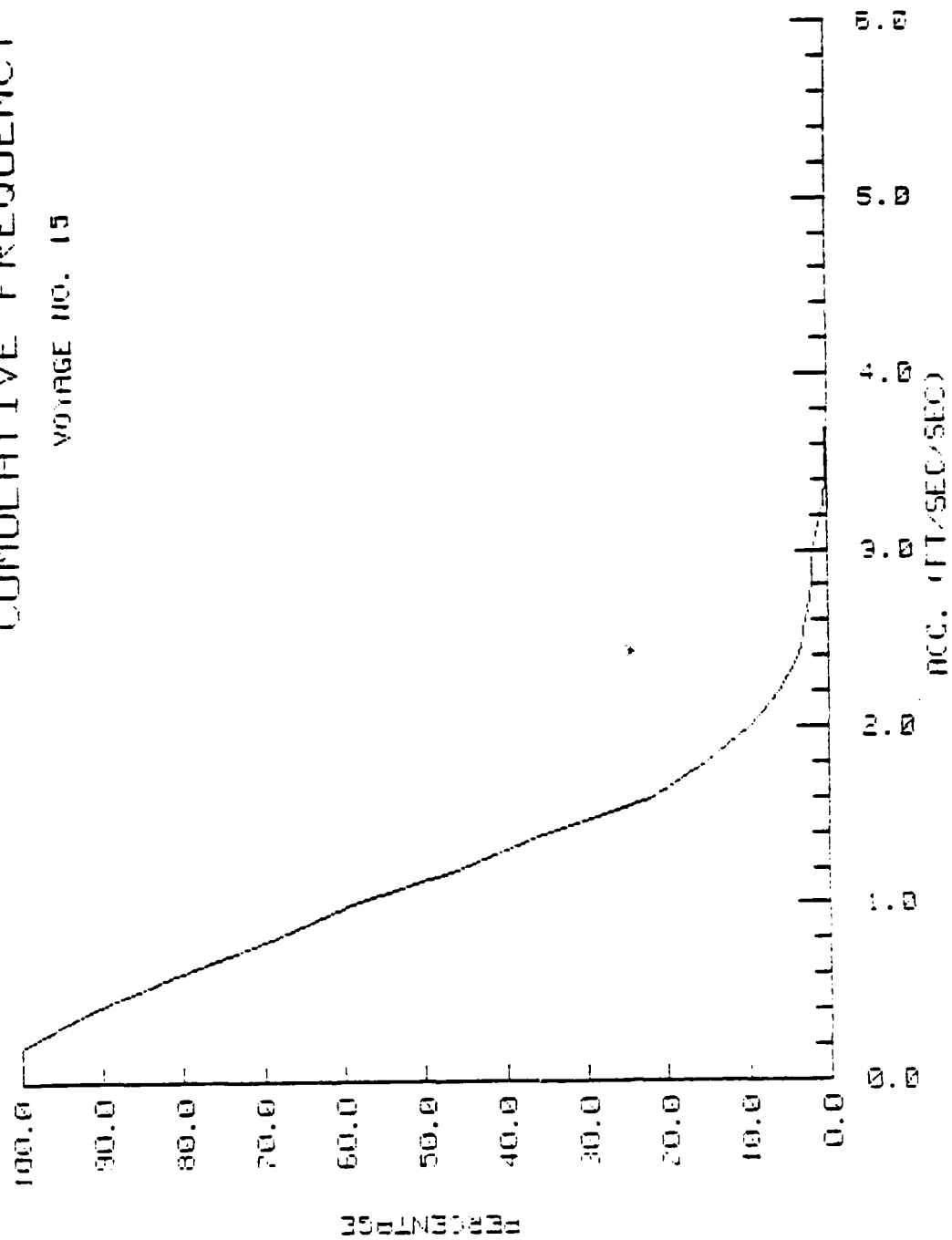
CUMULATIVE FREQUENCY

VOTAGE NO. 15



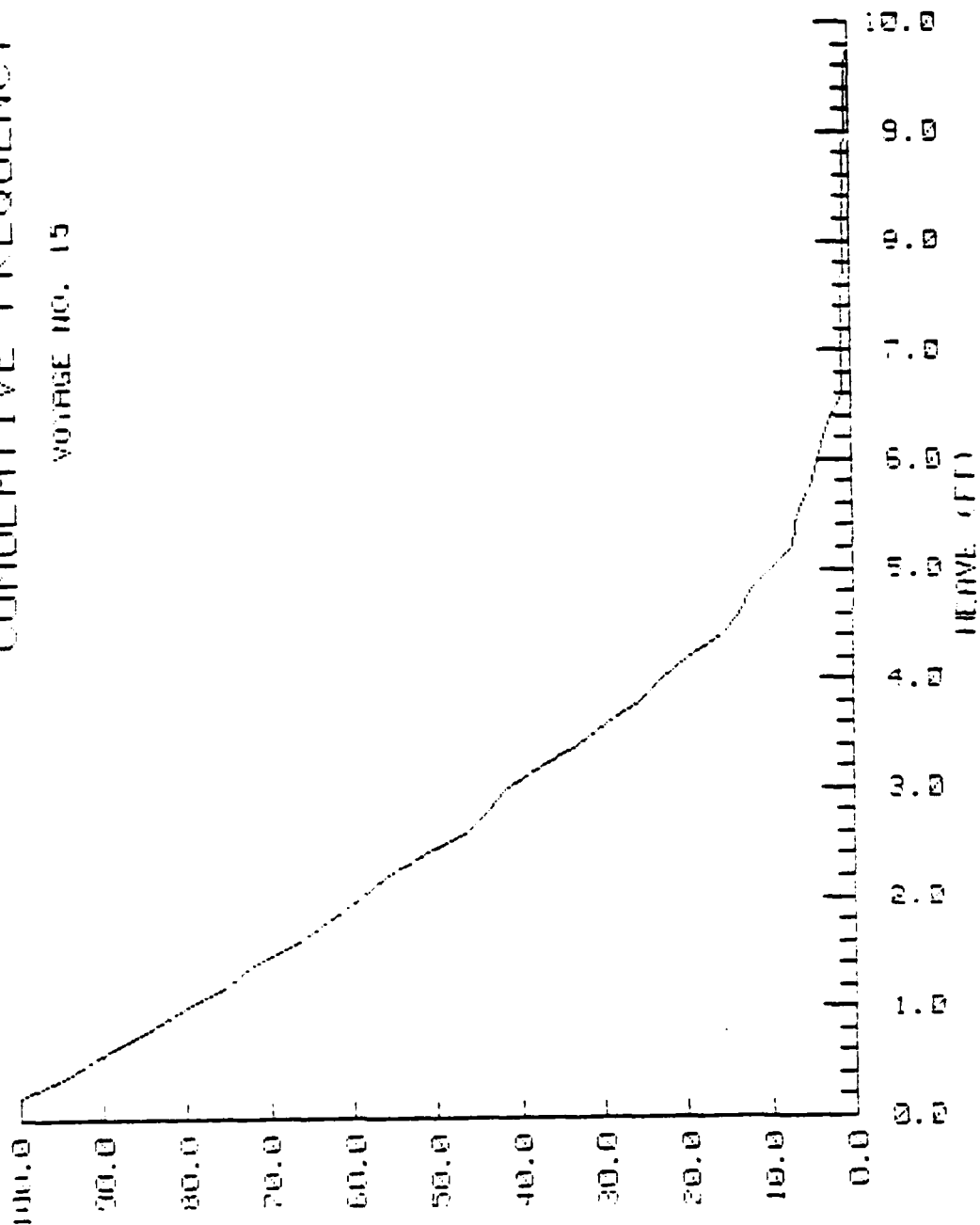
CUMULATIVE FREQUENCY

VOTAGE NO. 15



CUMULATIVE FREQUENCY

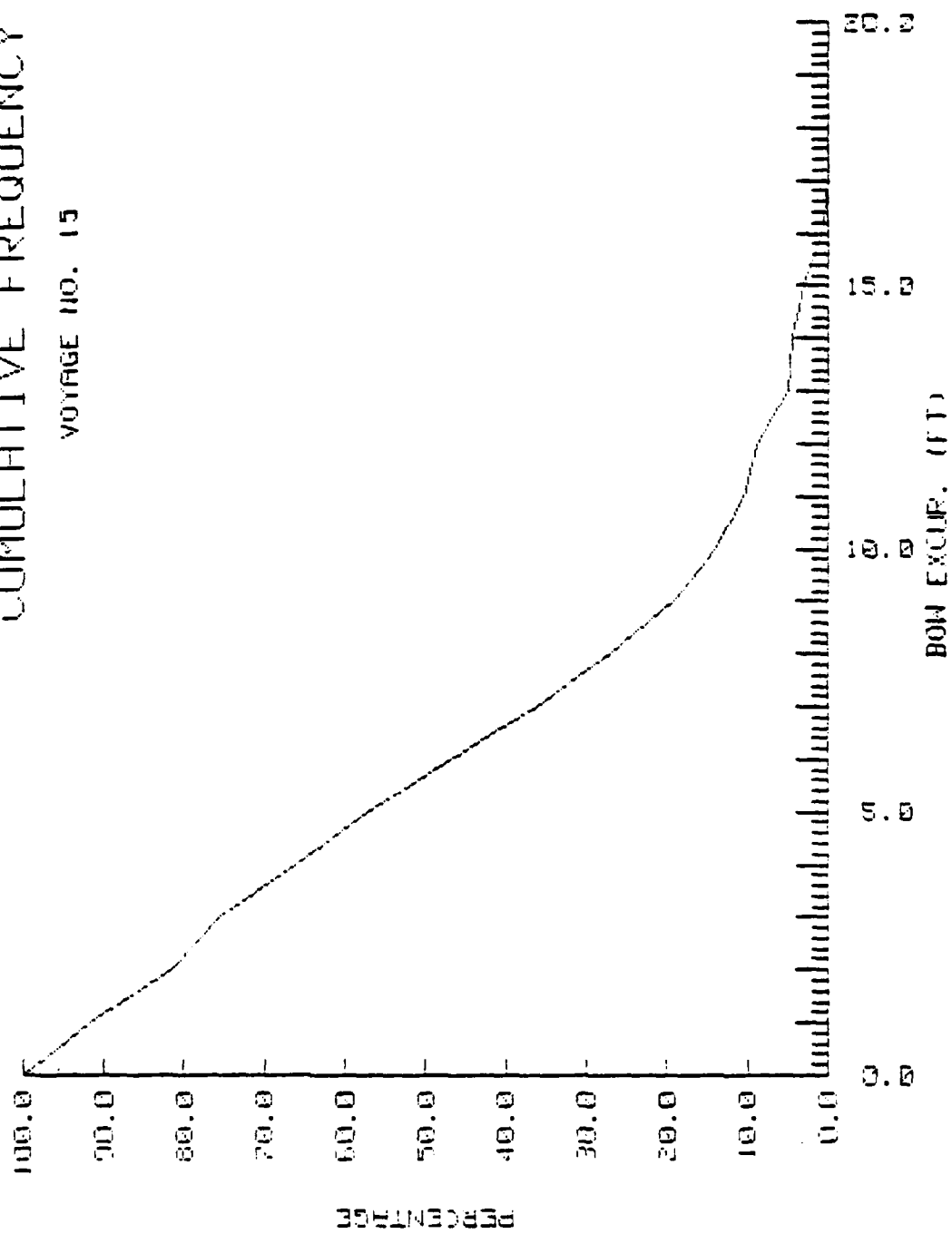
VOLTAGE NO. 15



100.0 90.0 80.0 70.0 60.0 50.0 40.0 30.0 20.0 10.0 0.0

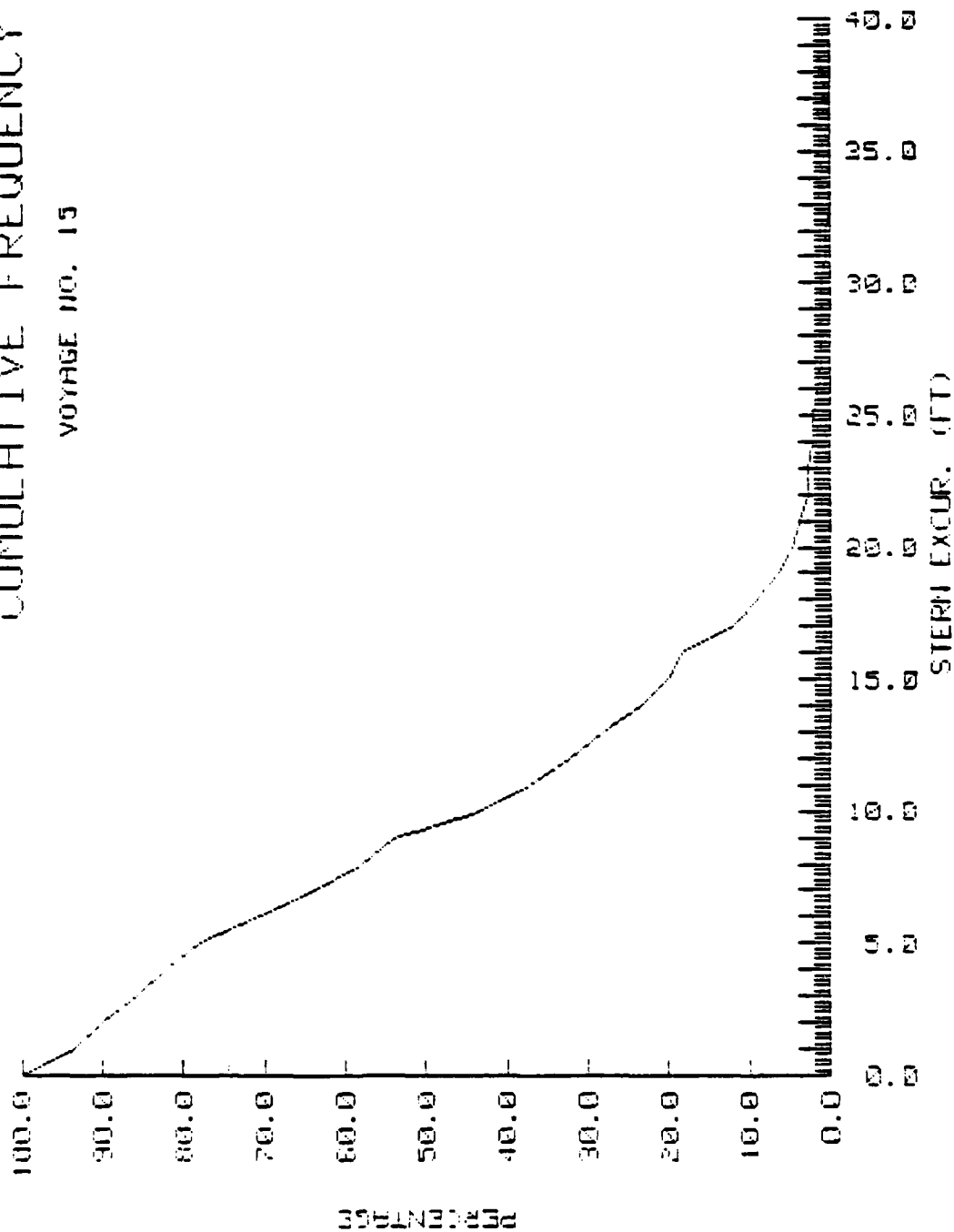
CUMULATIVE FREQUENCY

VOYAGE NO. 15



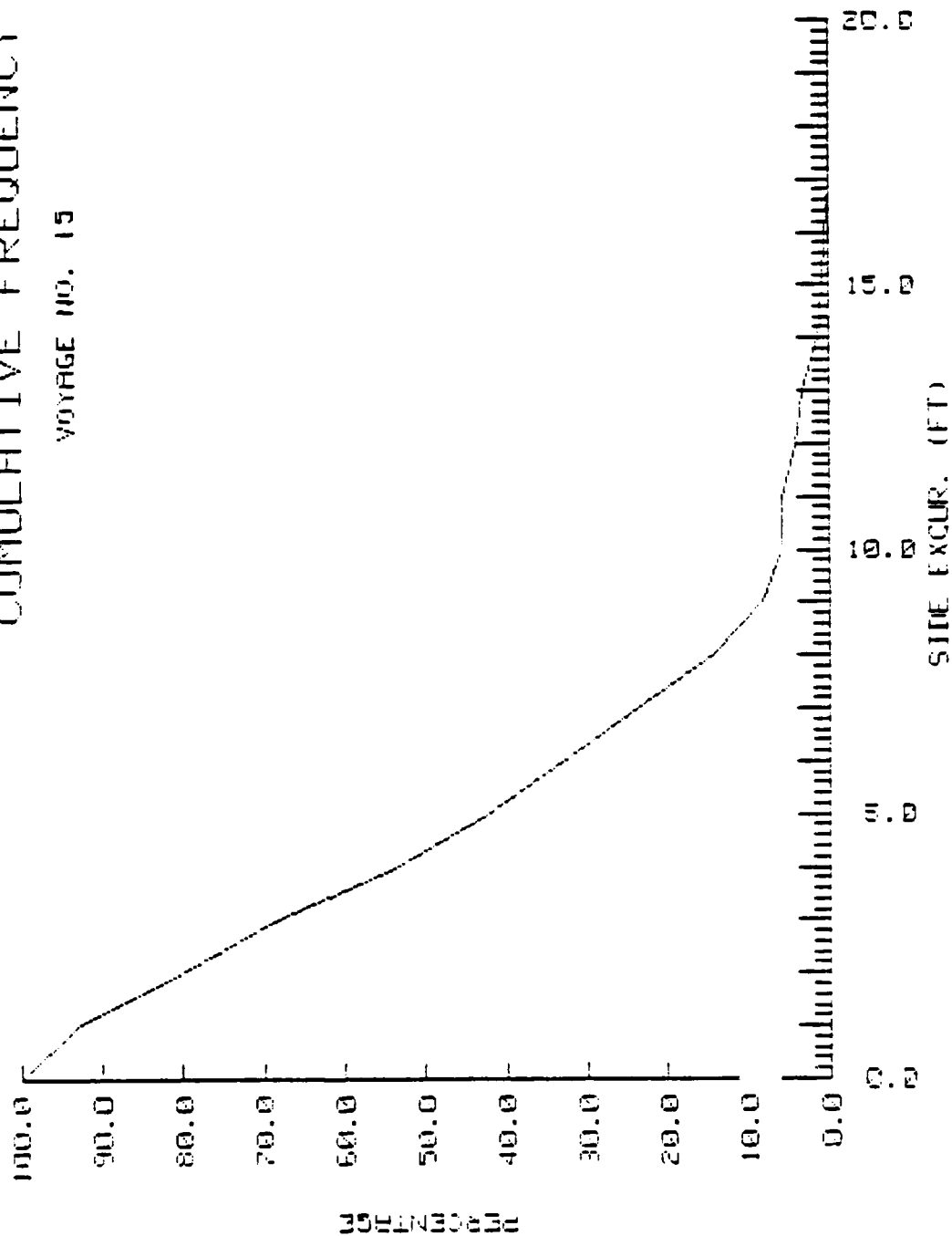
CUMULATIVE FREQUENCY

VOYAGE NO. 15



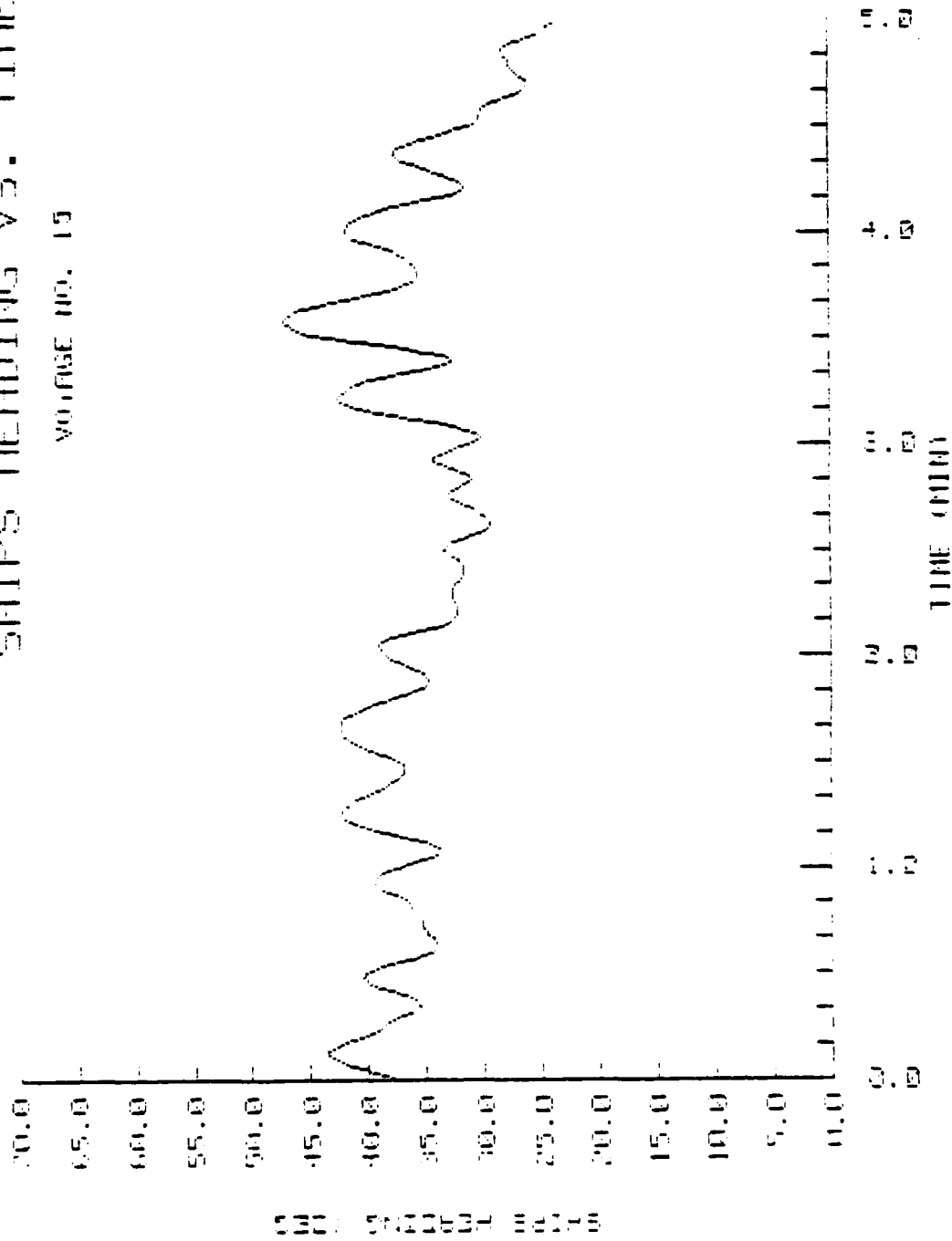
CUMULATIVE FREQUENCY

VOYAGE NO. 15



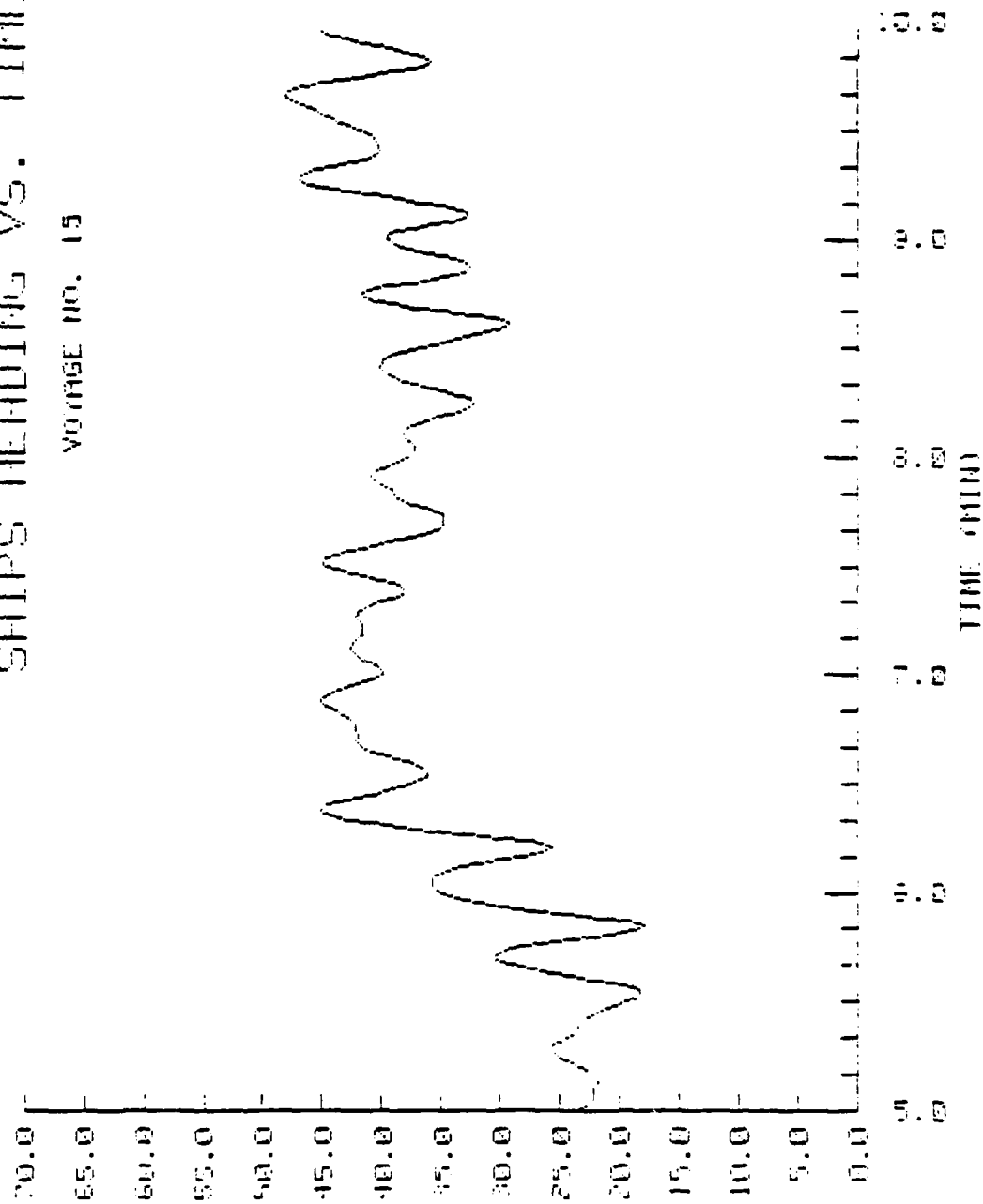
SHIPS WENDING VS. TIME

51.011 3503.00A



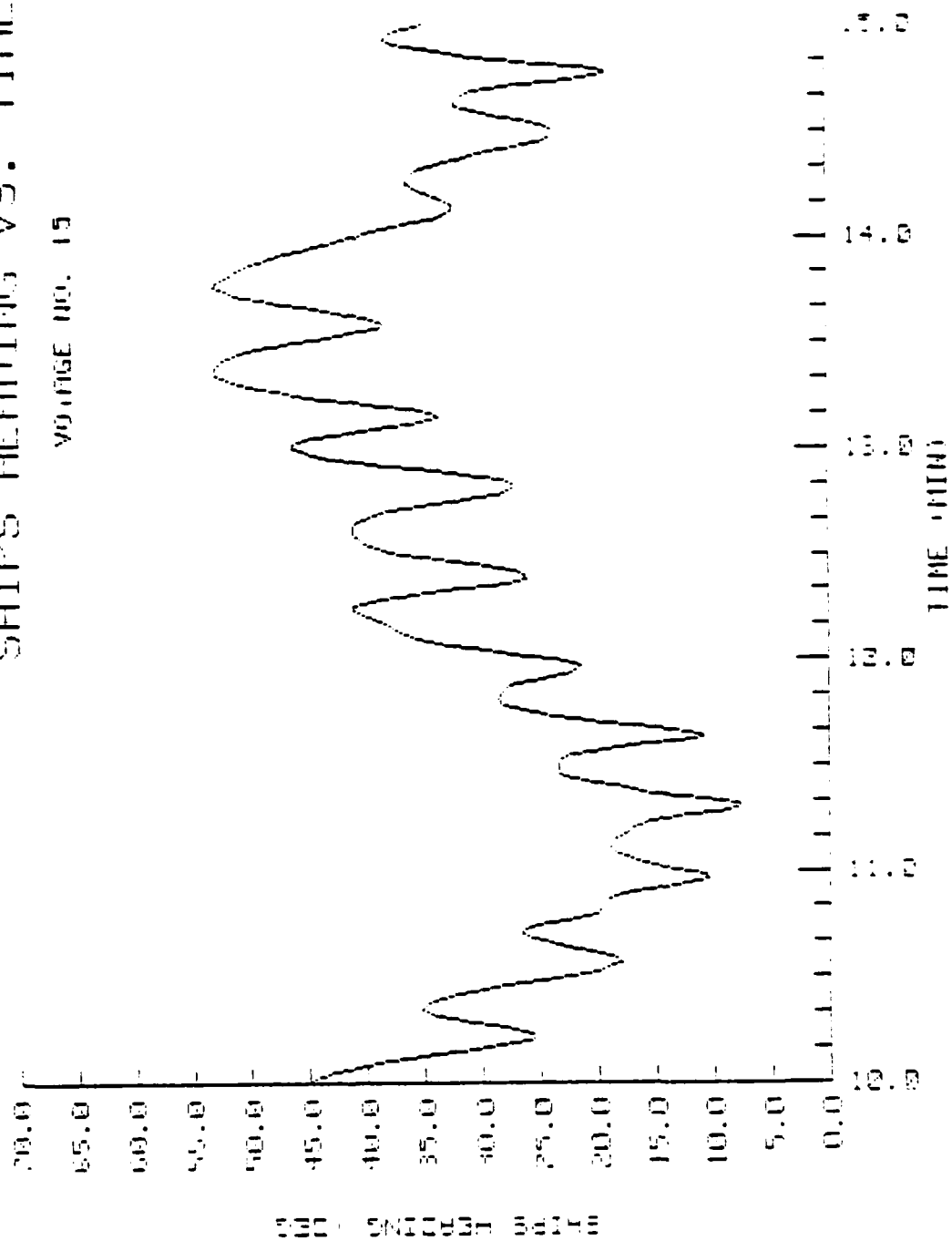
SHIPS HEADING VS. TIME

VOLUME NO. 15



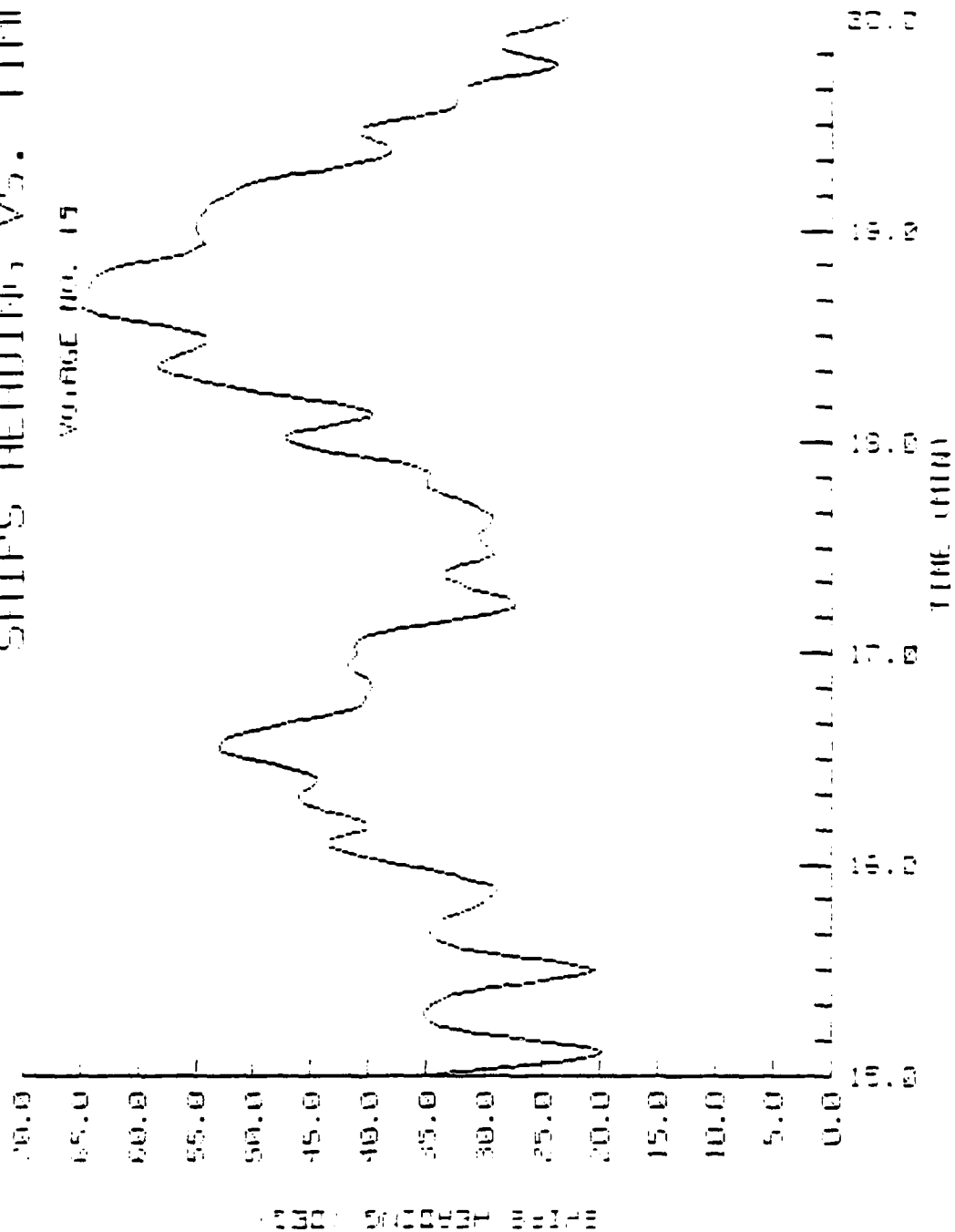
SHIPS HEADING VS. TIME

VOYAGE NO. 15



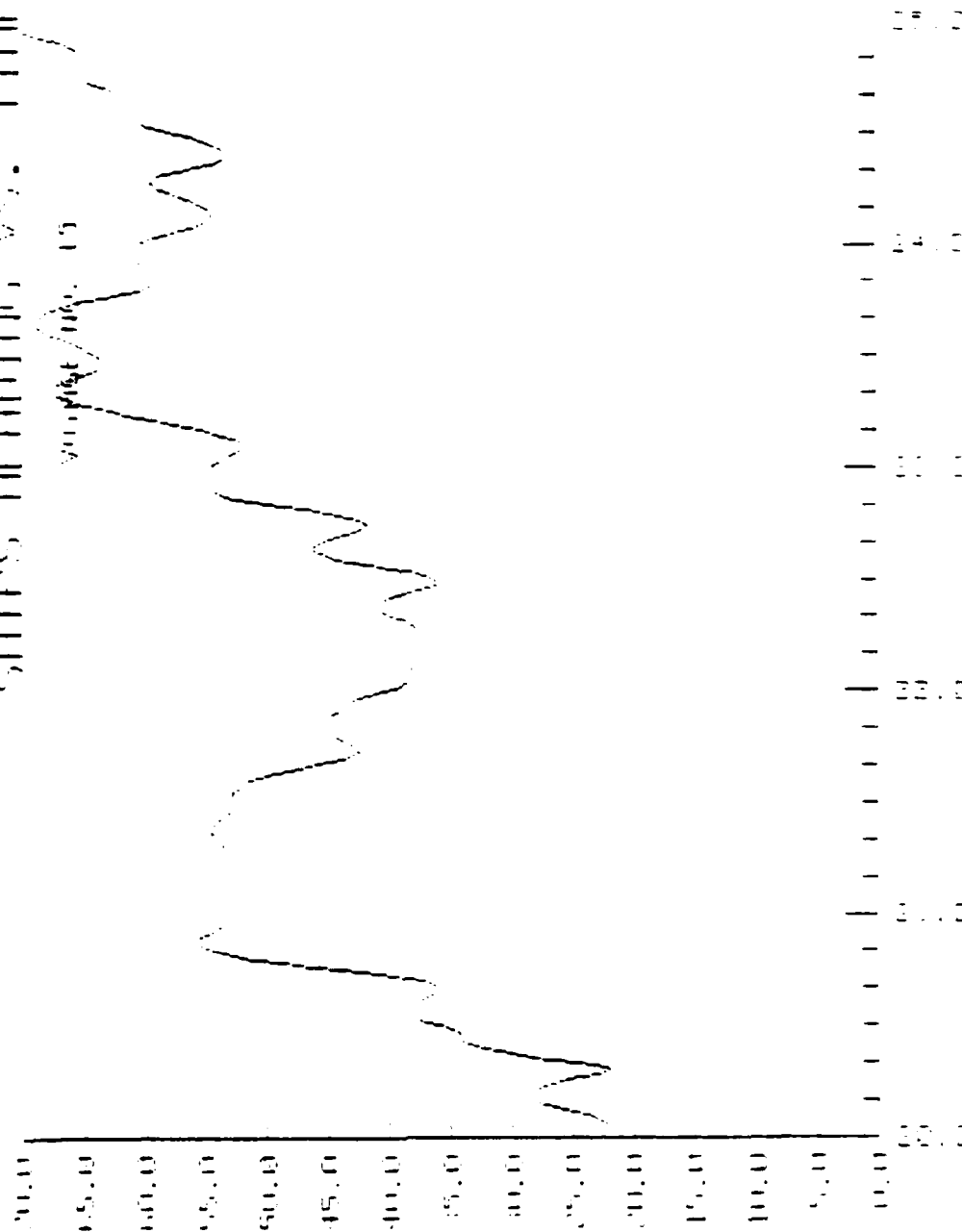
SHIPS HEADING VS. TIME

VOLUME NO. 15



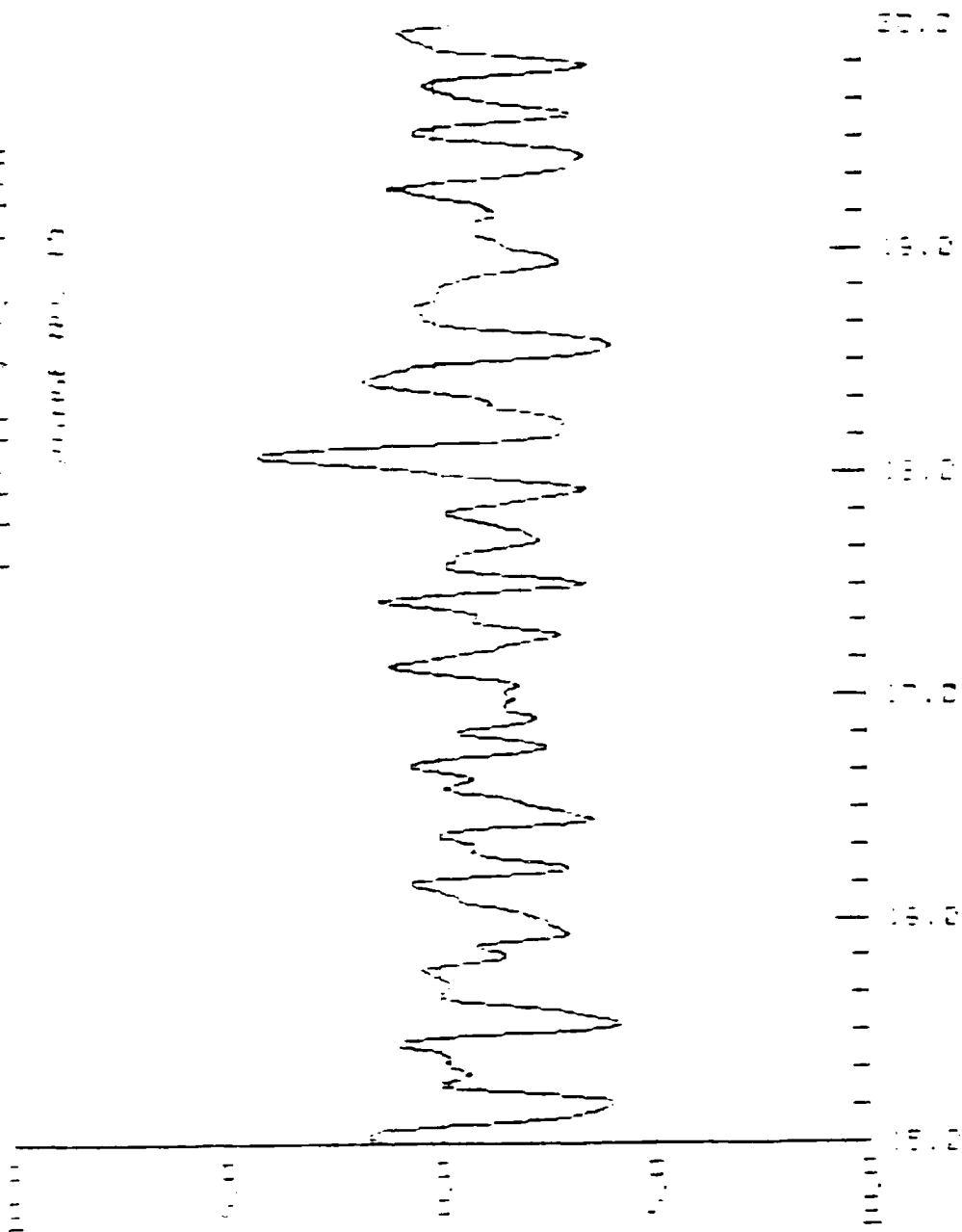
SHIPS IN PORT, VS. TIME

NOV. 15



NOV. 15

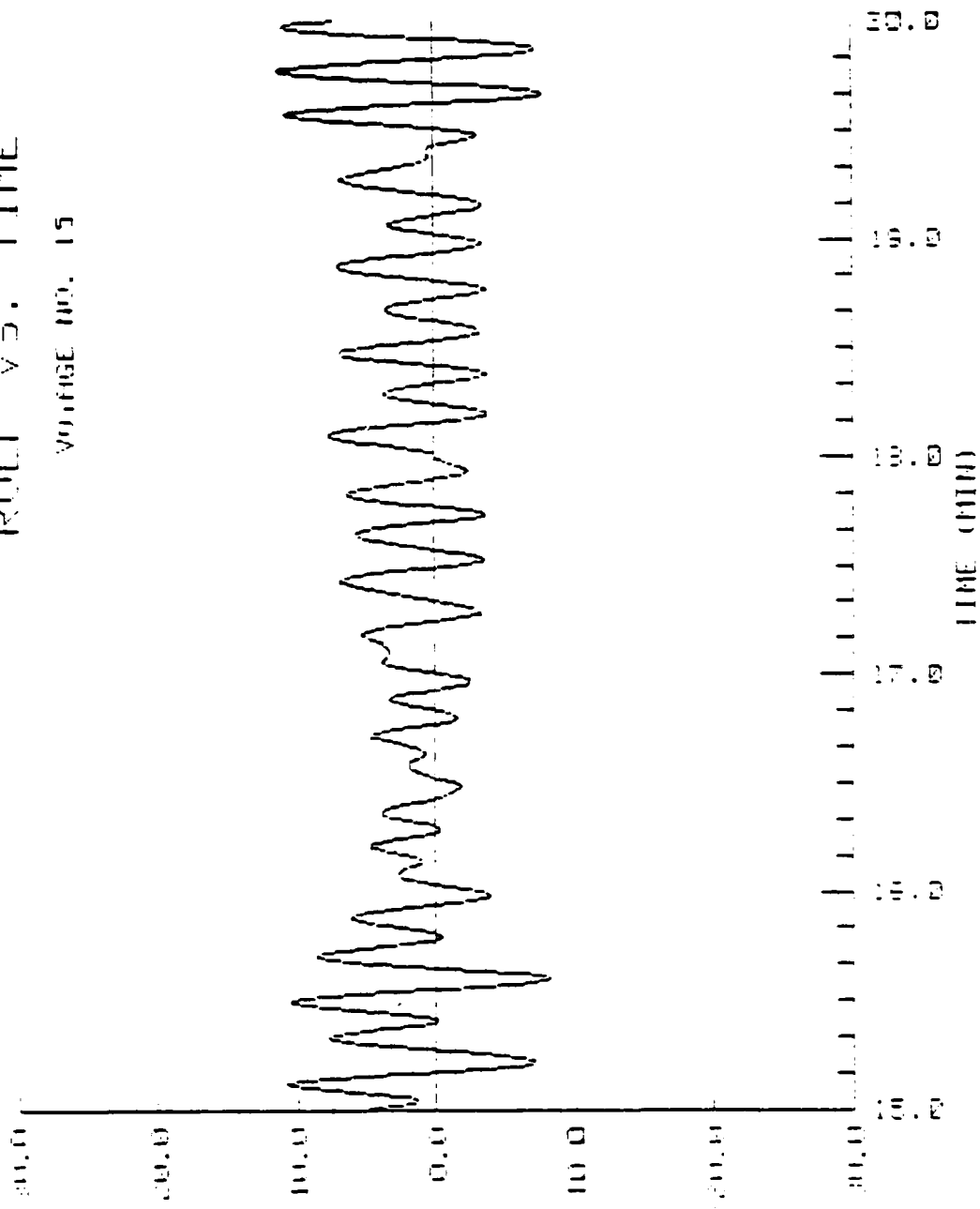
11111 11111 11111
11111 11111 11111



11111 11111

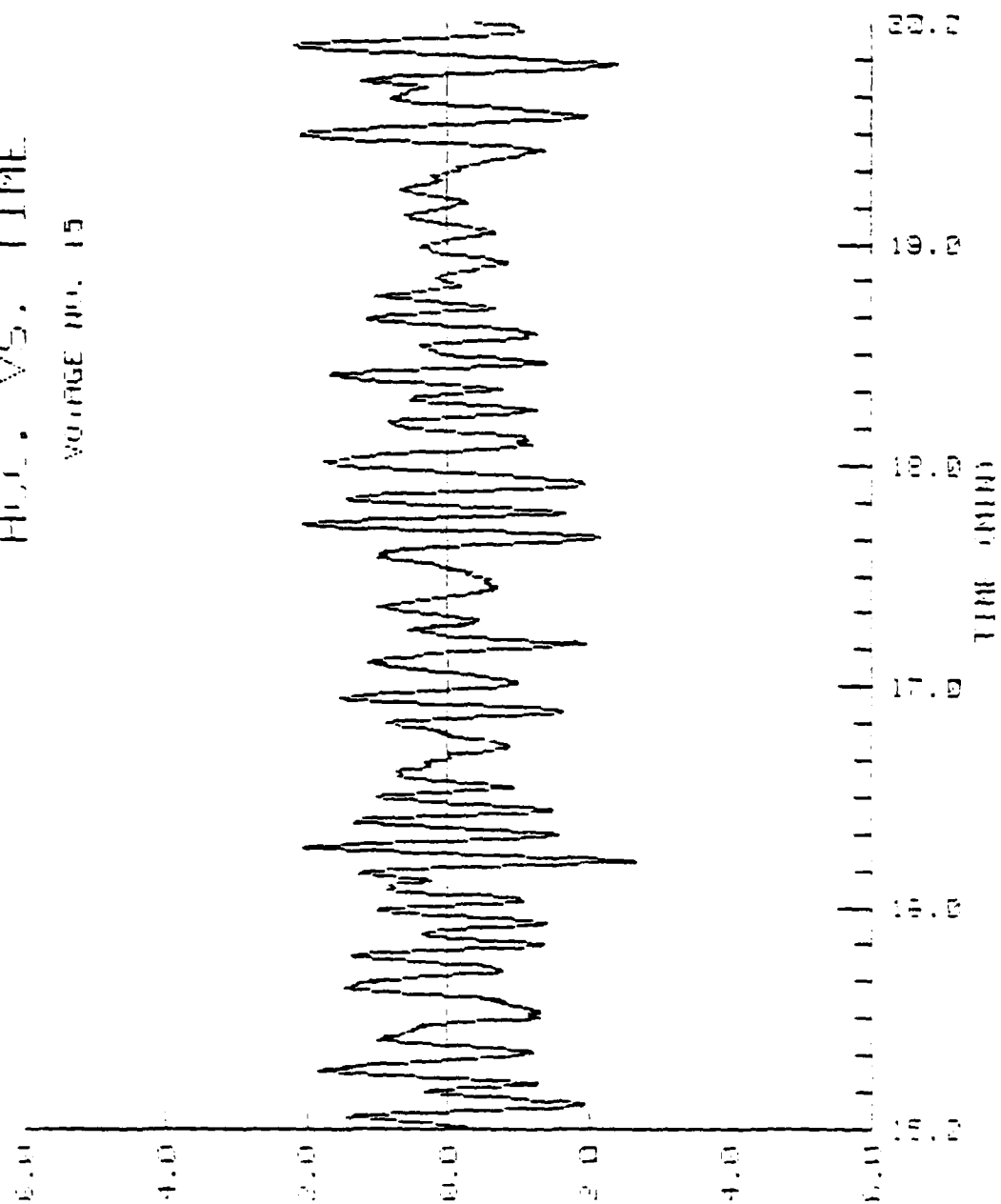
ROLL VS. TIME

VOLUME NO. 15



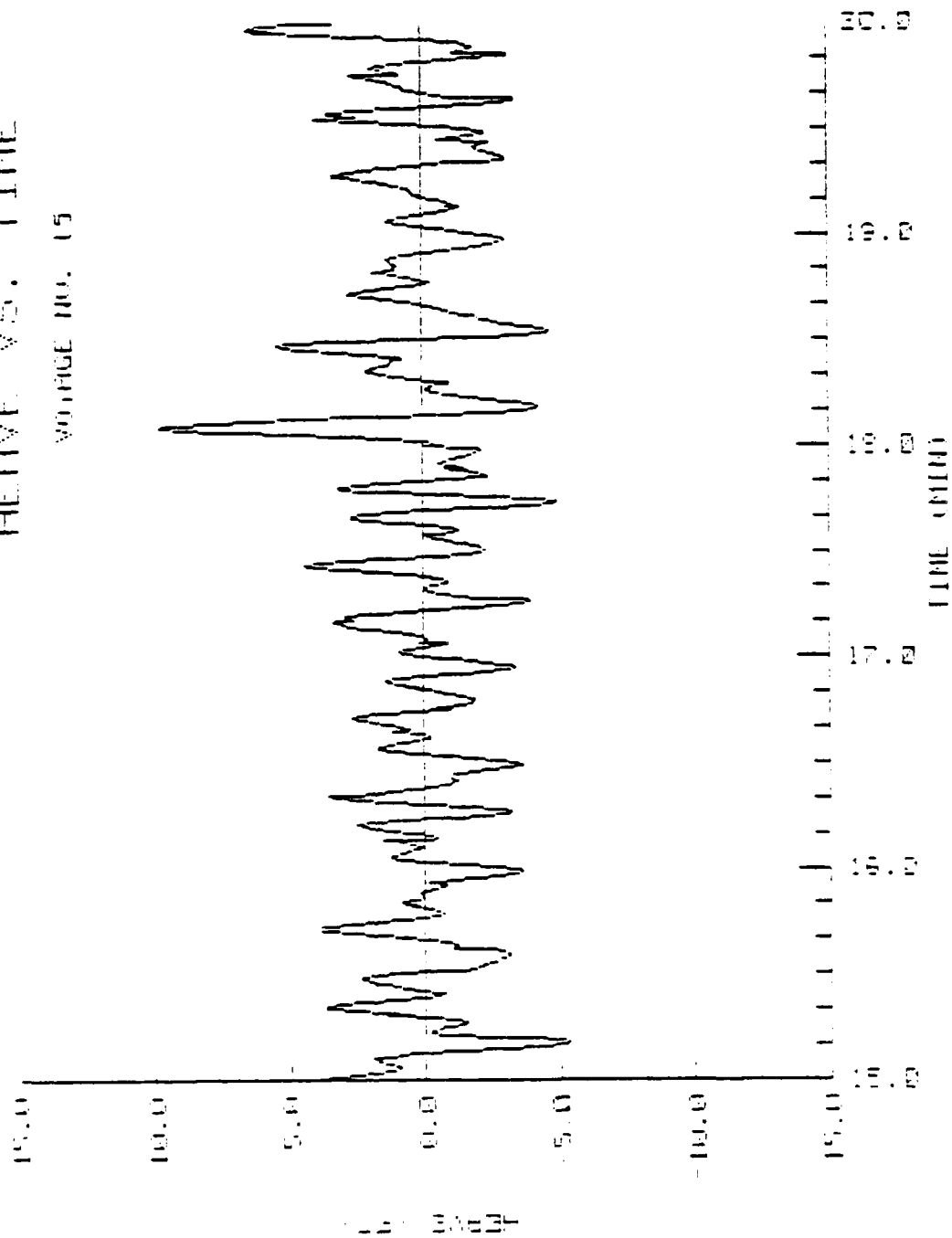
ACC. VS. TIME

VOLUME NO. 15



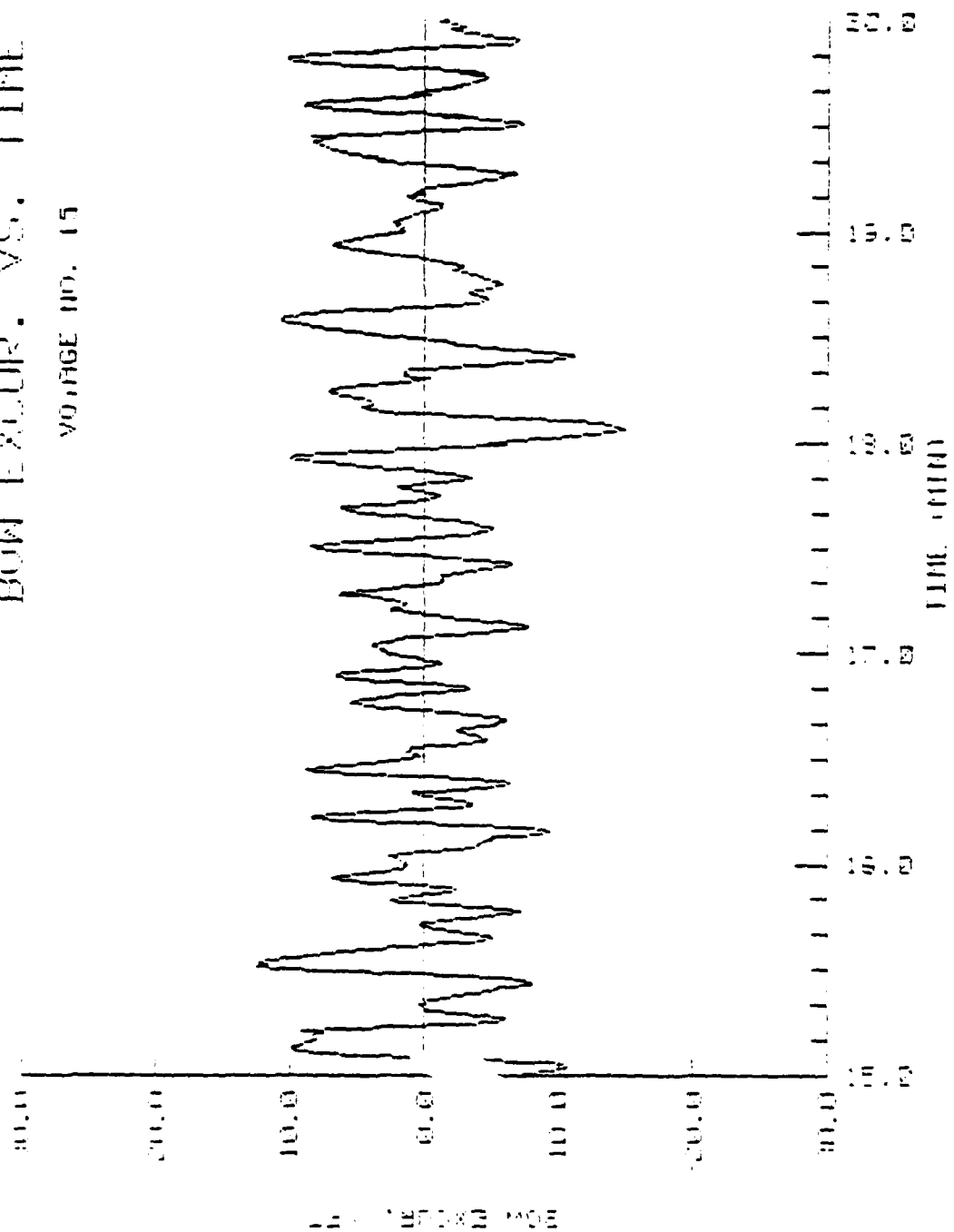
HEAVE VS. TIME

VOICE NO. 15



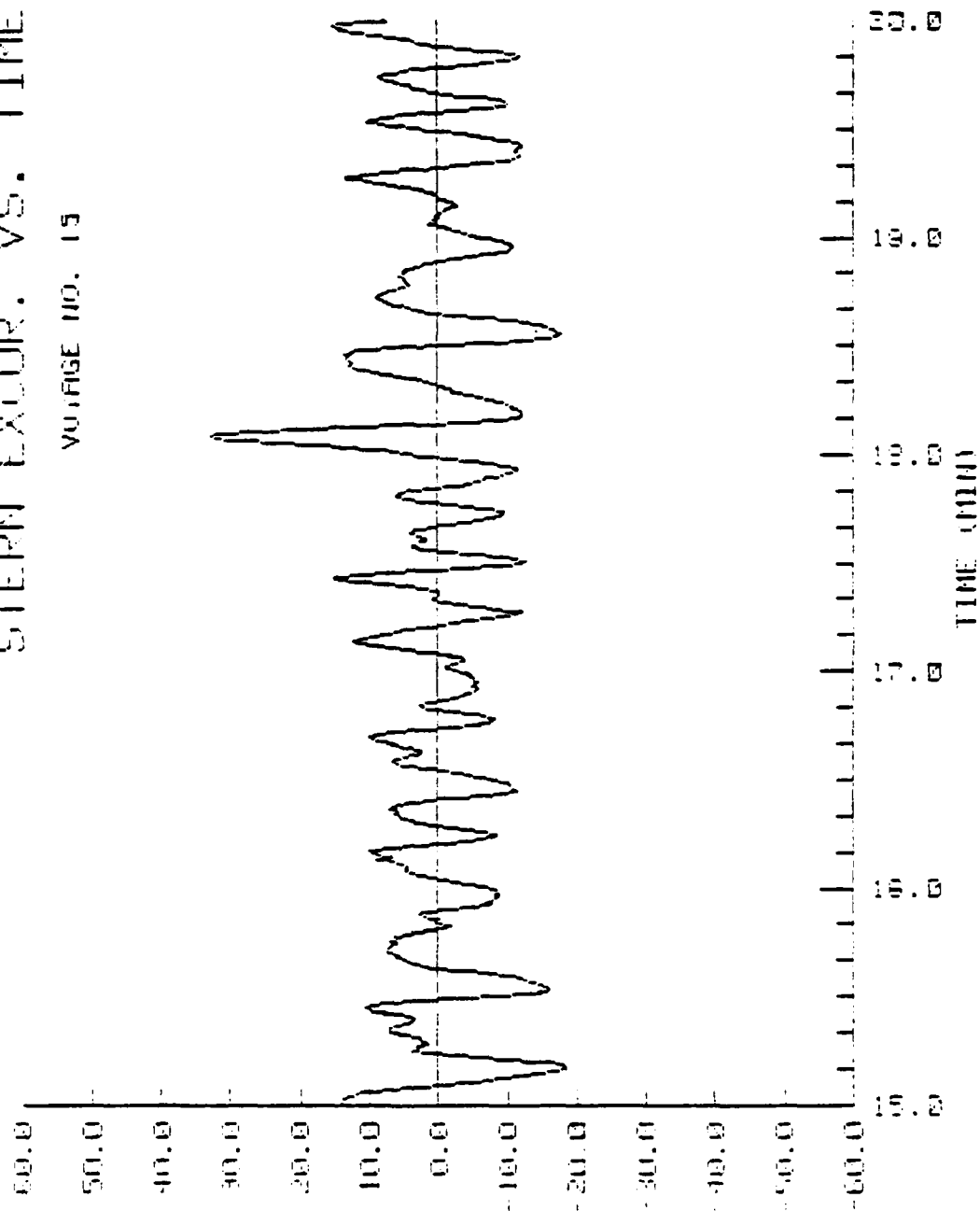
BOW EXCUR. VS. TIME

VOLUME NO. 15



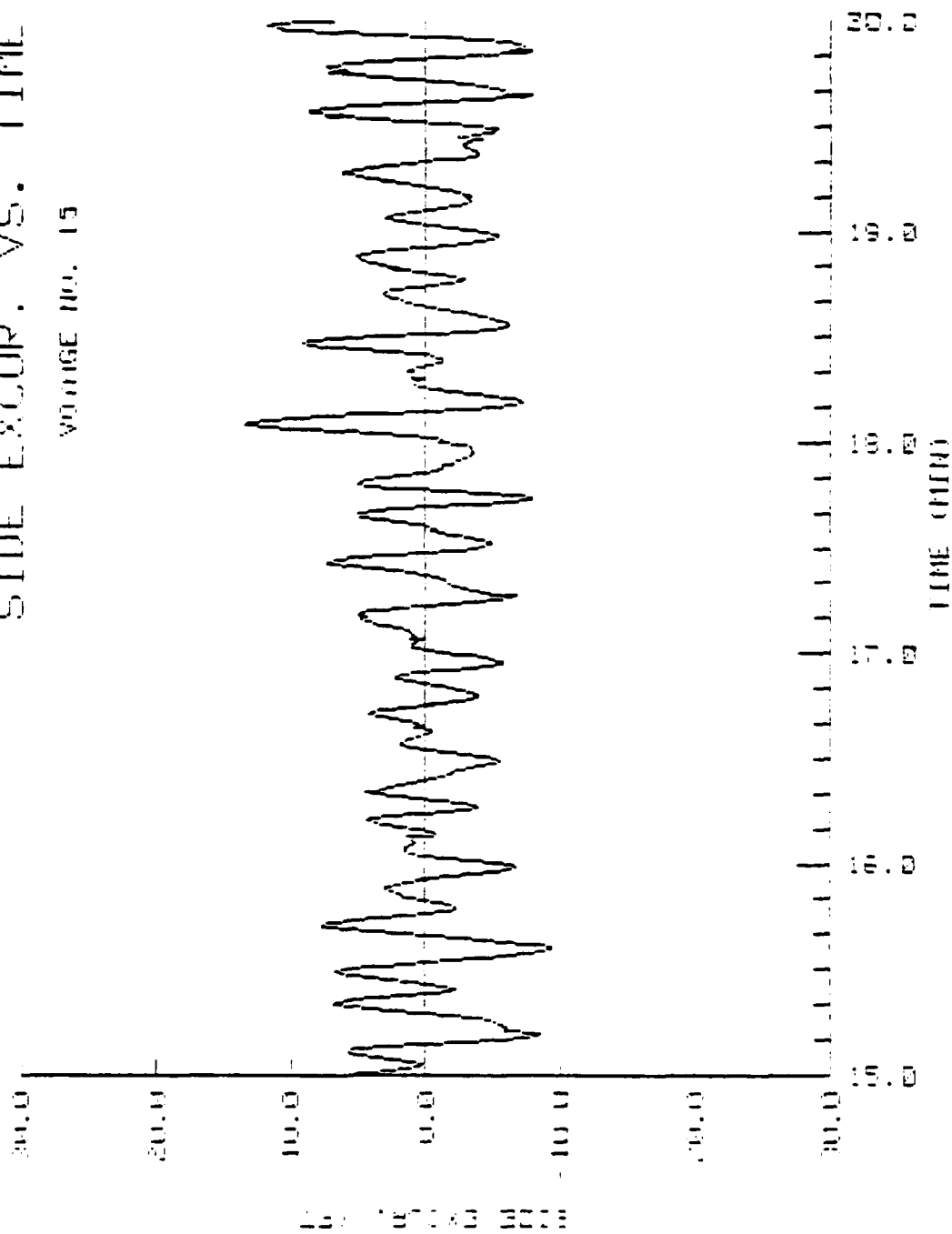
STERN EXCUR. VS. TIME

VOLUME NO. 15



SIDE EXCUR. VS. TIME

WOMGE NO. 15



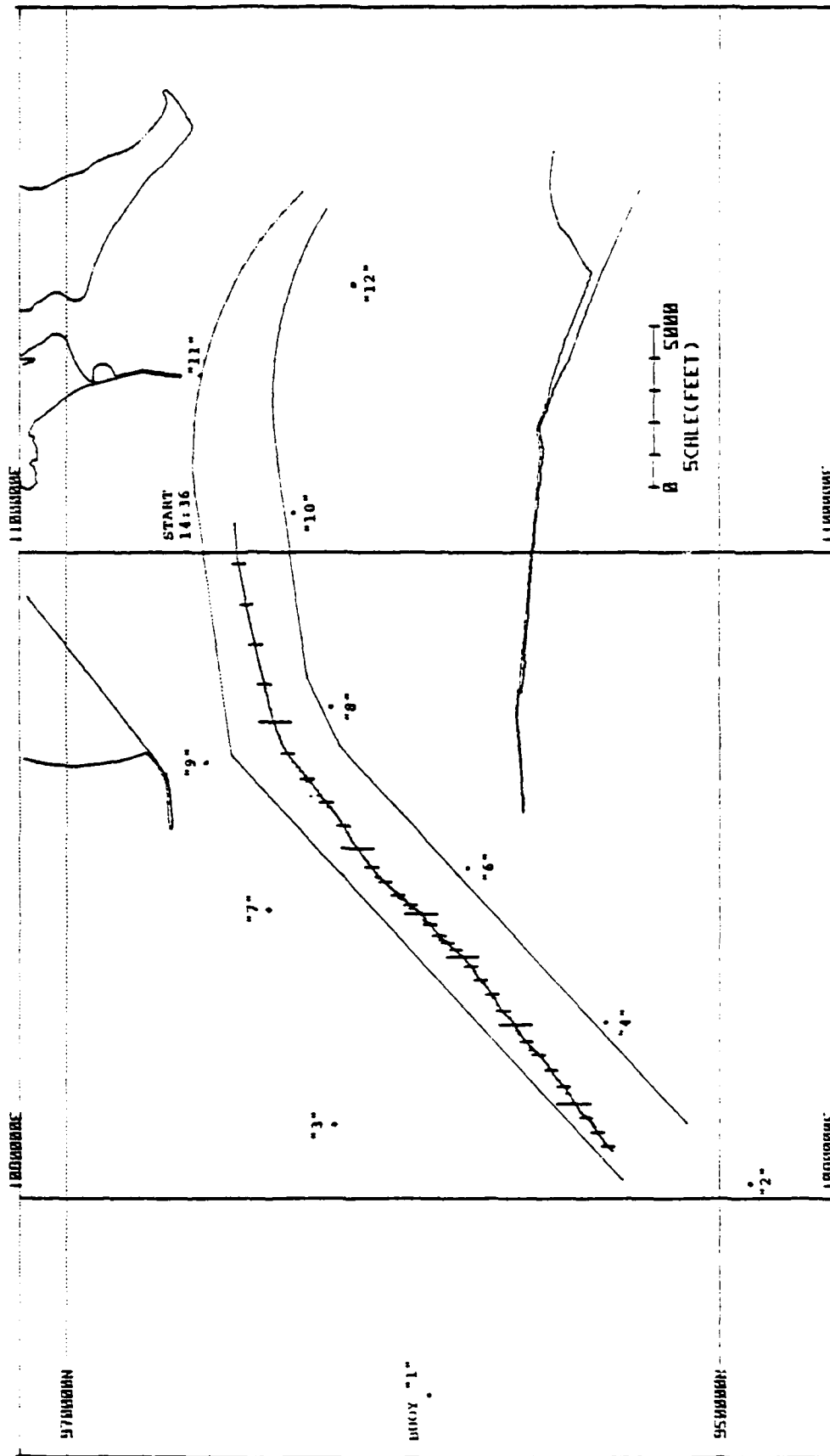
STATISTICAL SUMMARY

VOYAGE NO. 16

	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	FMS
PITCH (DEG)	-0.9	4.9	2.4	2.6
ROLL (DEG)	.6	13.0	5.8	6.4
YAW (FT/SEC/SEC)	-0.1	5.3	2.0	2.3
HEAVE (FT)	.2	8.3	2.3	2.7
ROLL EXCUR. (FT)	.2	21.6	9.9	10.9
PITCH EXCUR. (FT)	.2	27.9	11.4	12.6
YAW EXCUR. (FT)	.2	12.7	4.0	4.7

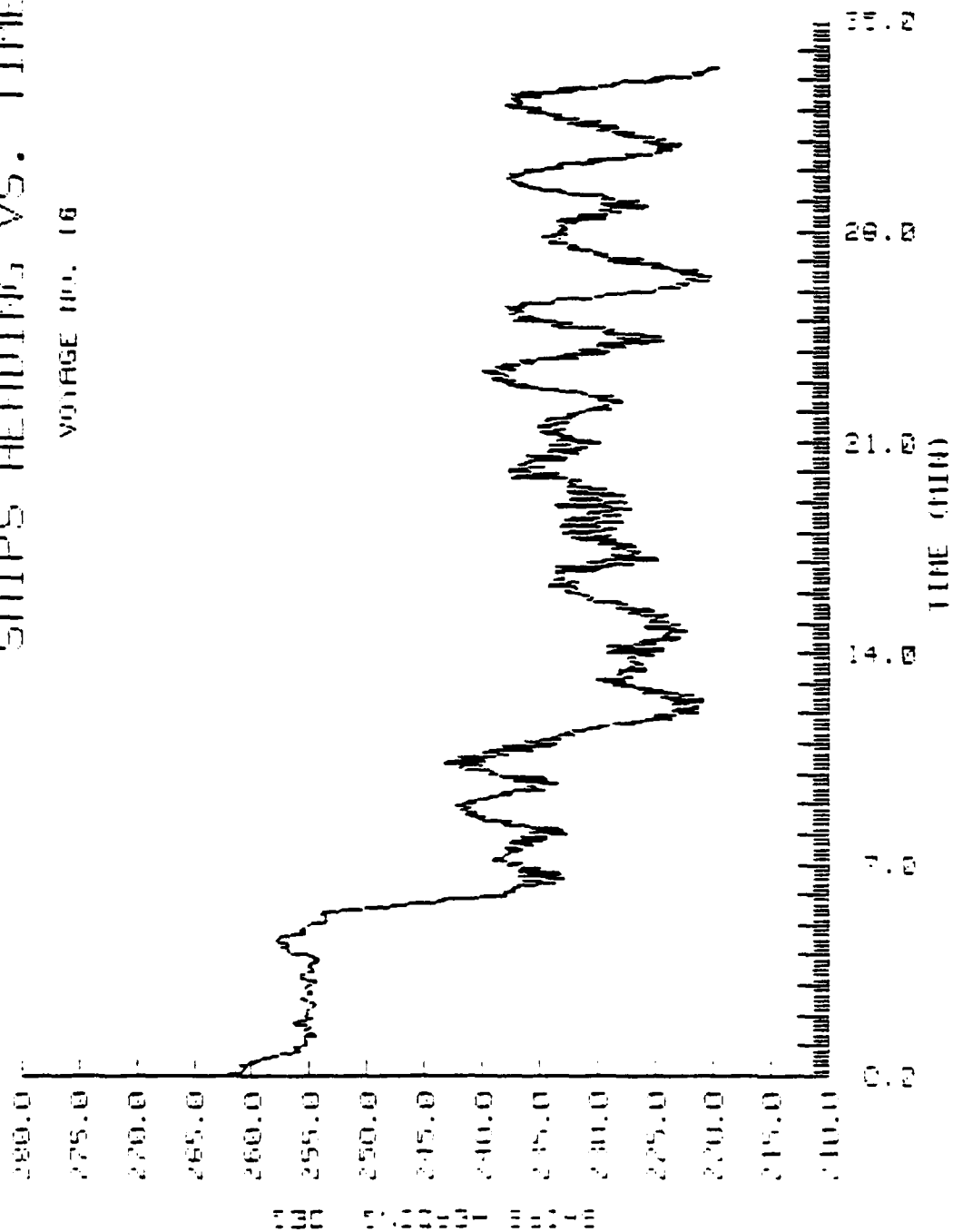
VOLYAGE NO. 16 SHIP TRACK

SCALE 1: 30000



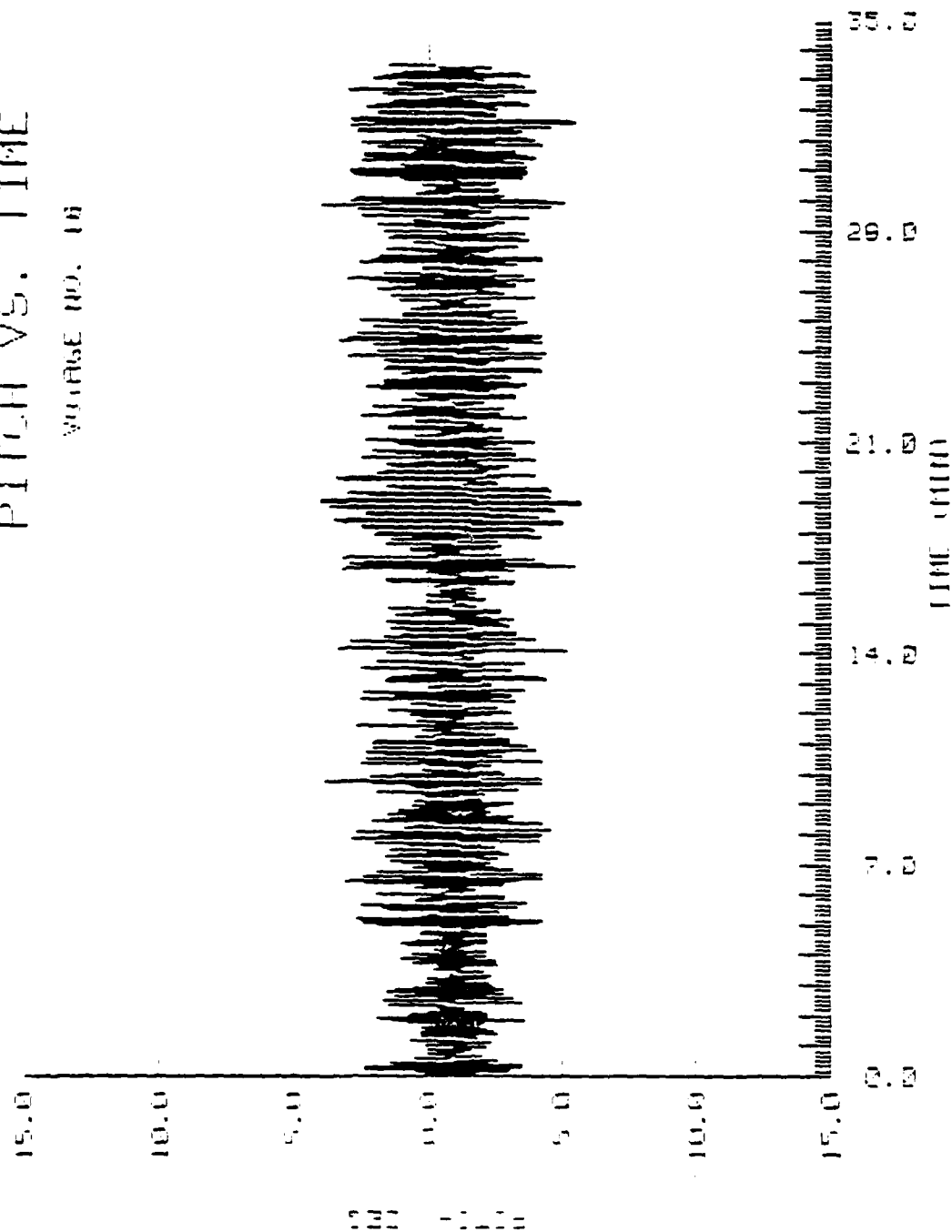
SHIPS HEADING VS. TIME

VOLUME NO. 16



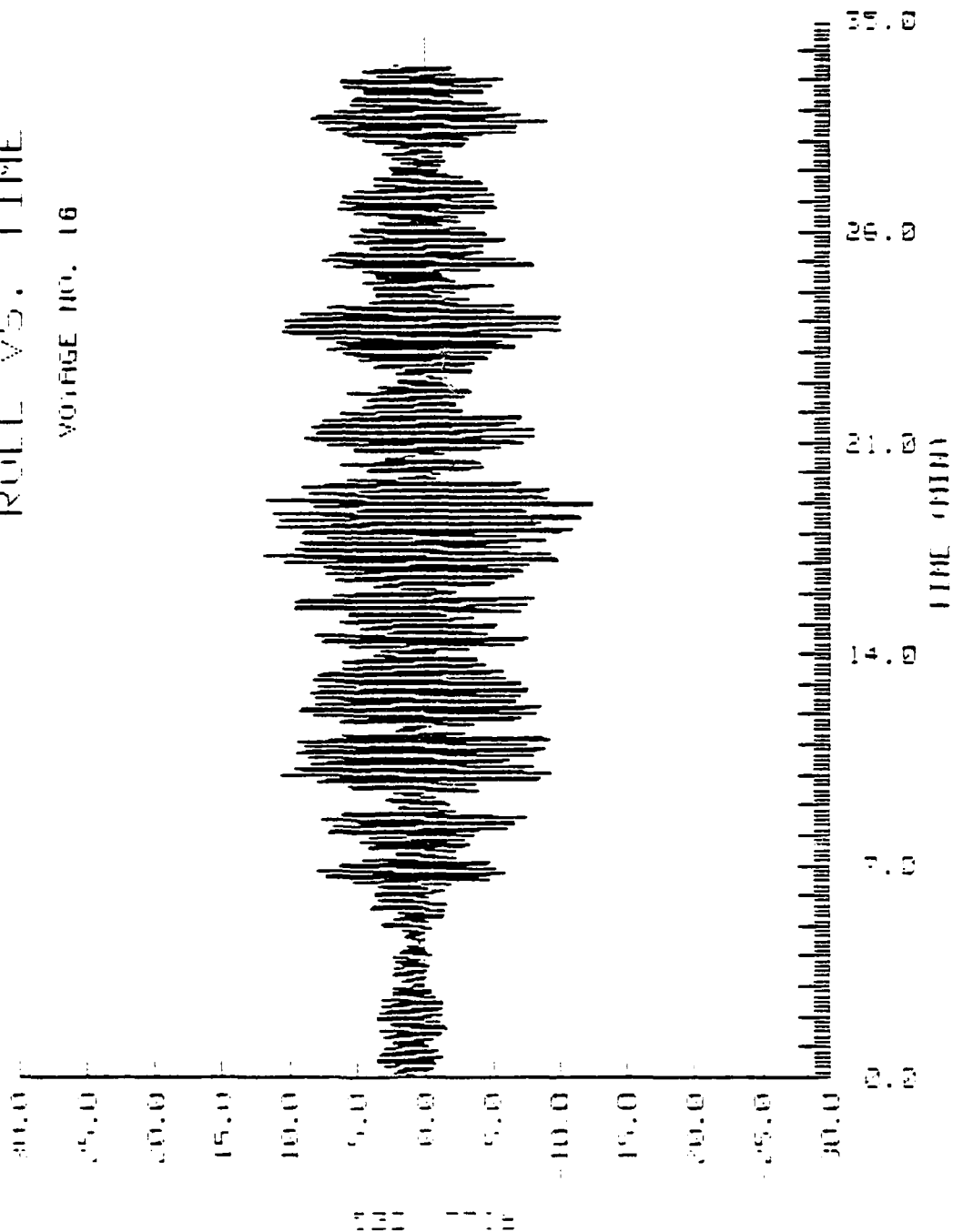
PITCH VS. TIME

WAVE NO. 16



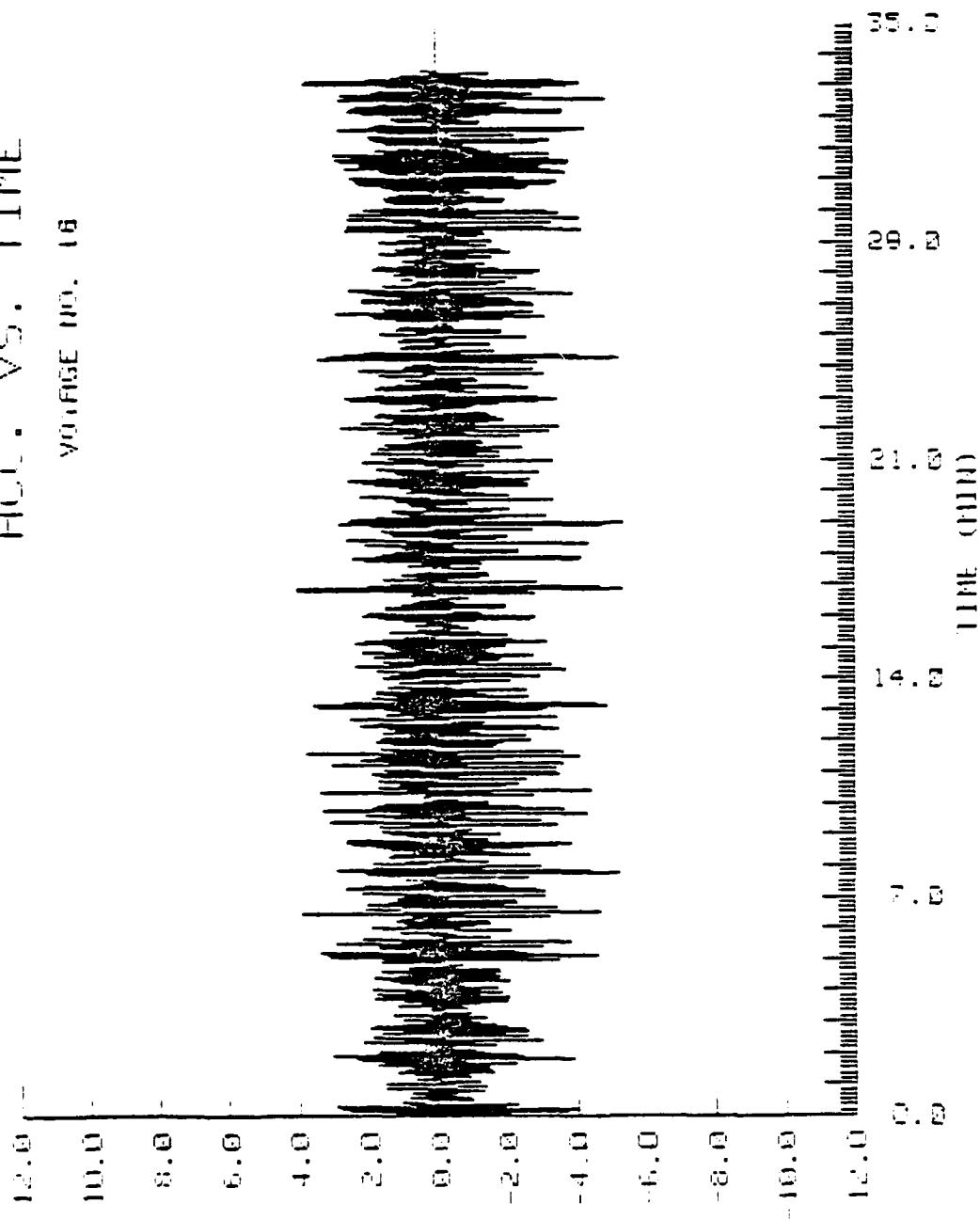
ROLL VS. TIME

VOLUME NO. 16



ACC. VS. TIME

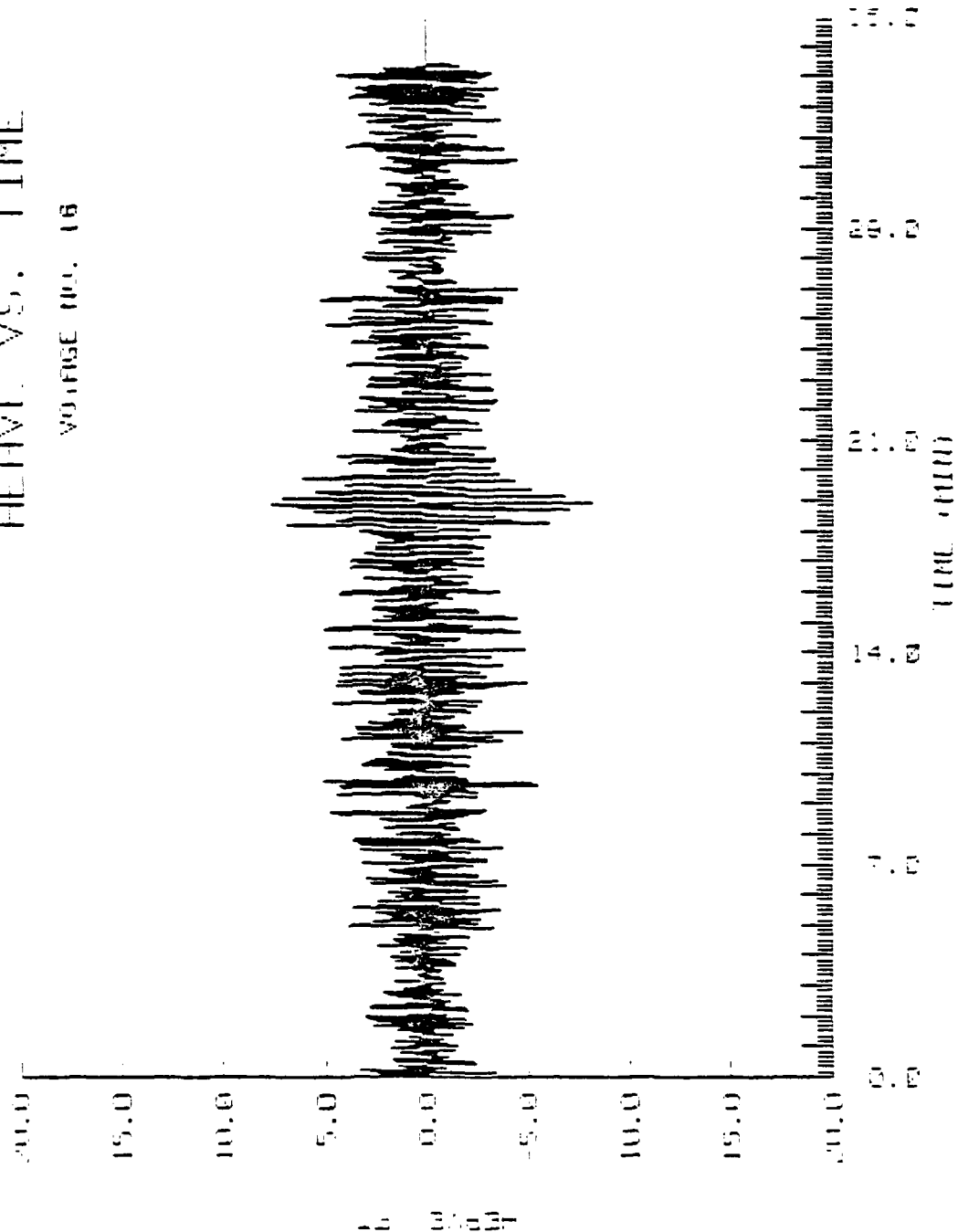
VOLUME NO. 16



1000 1000 1000 1000 1000 1000

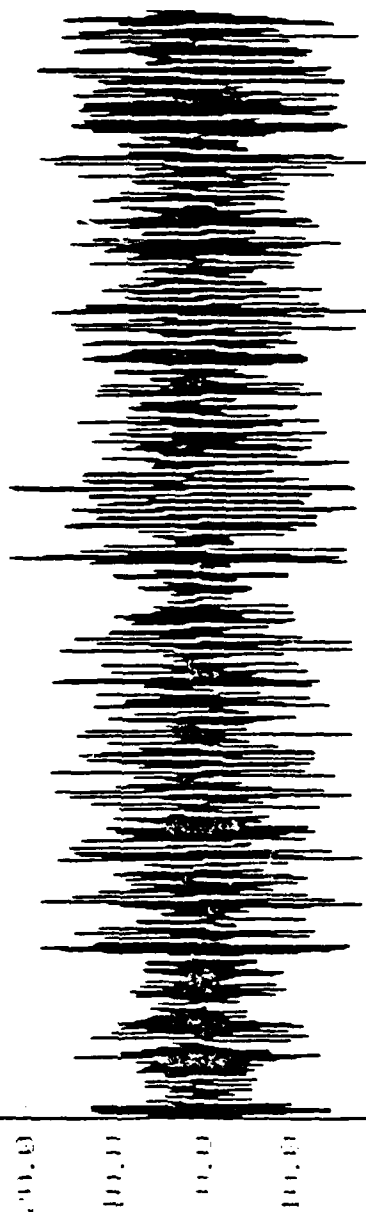
HEPVL VS. TIME

VOLUME 100. 16



11-11-11

W. H. R. 11. 11

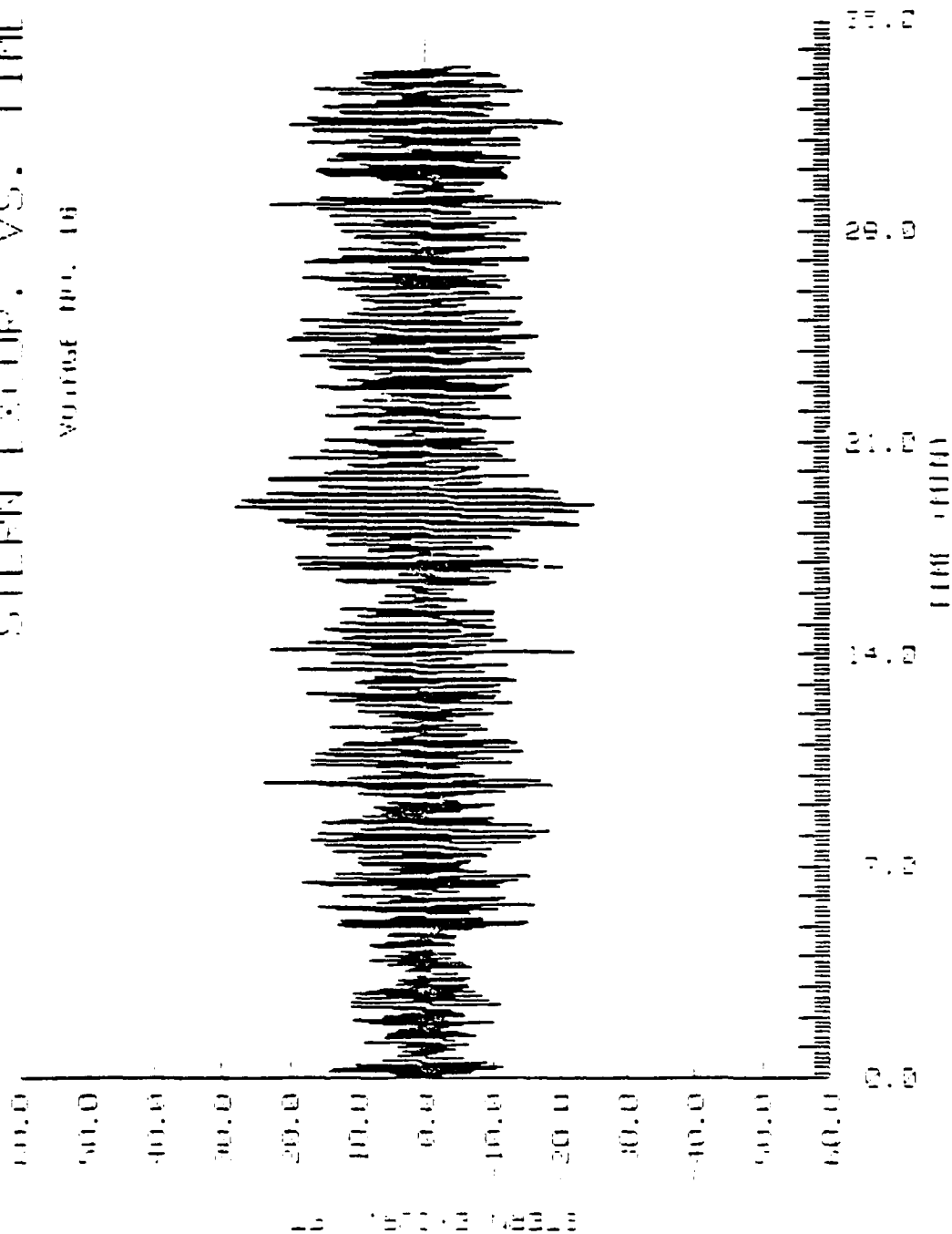
[illegible]

0.2

[illegible]

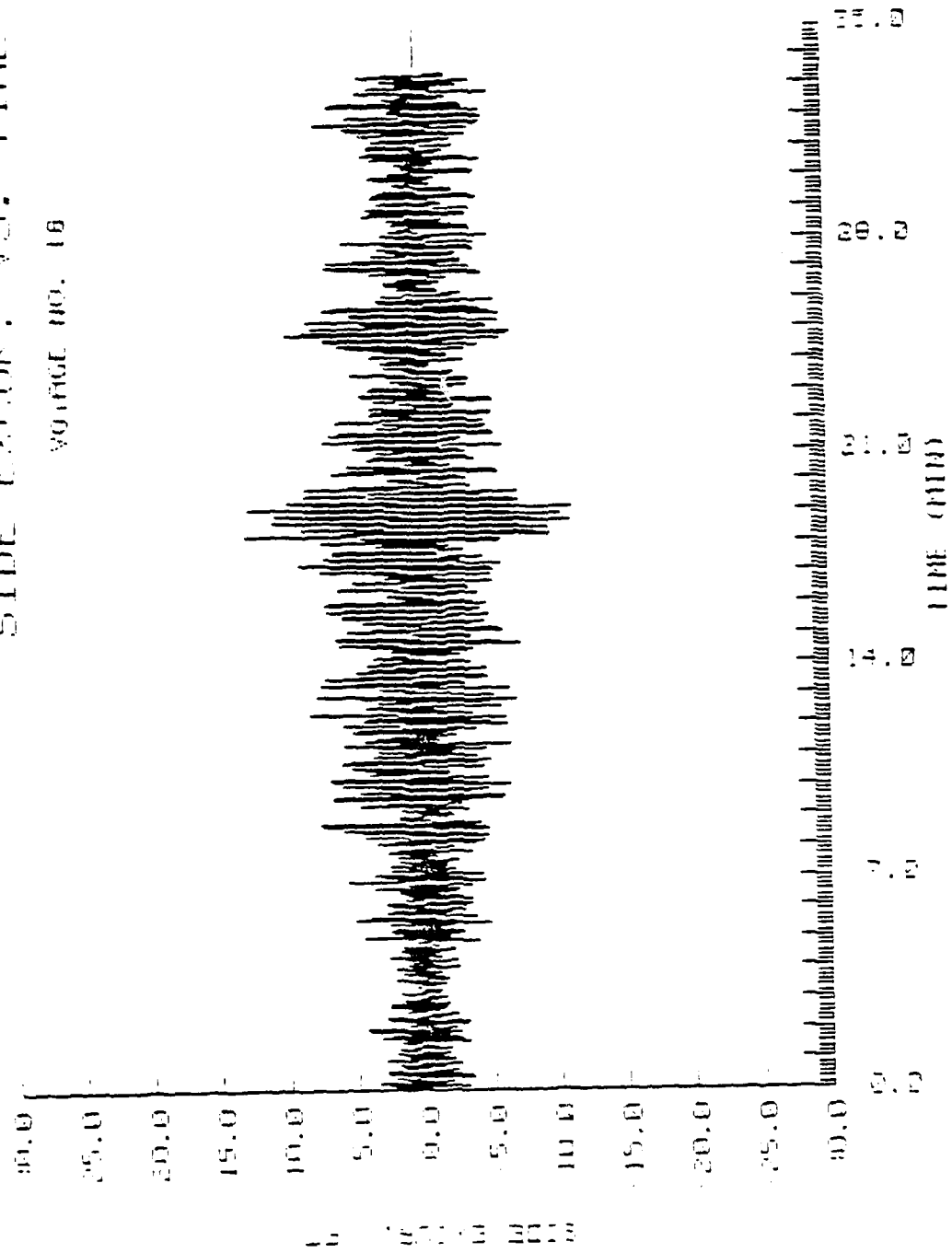
SLEEP ERUP. VS. TIME

VOLUME 100. 10



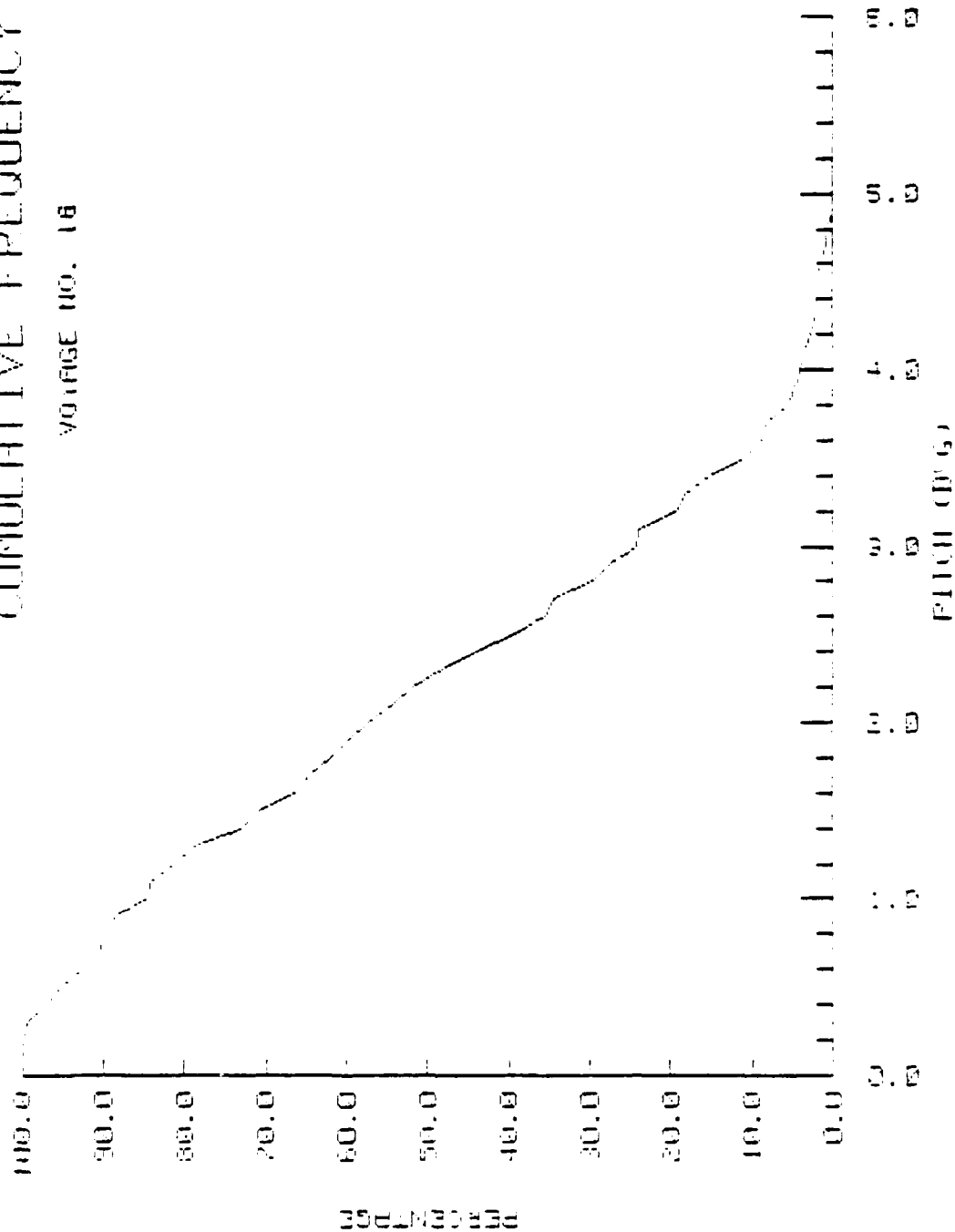
SIDE EXCUR. VS. TIME

VOLUME NO. 18



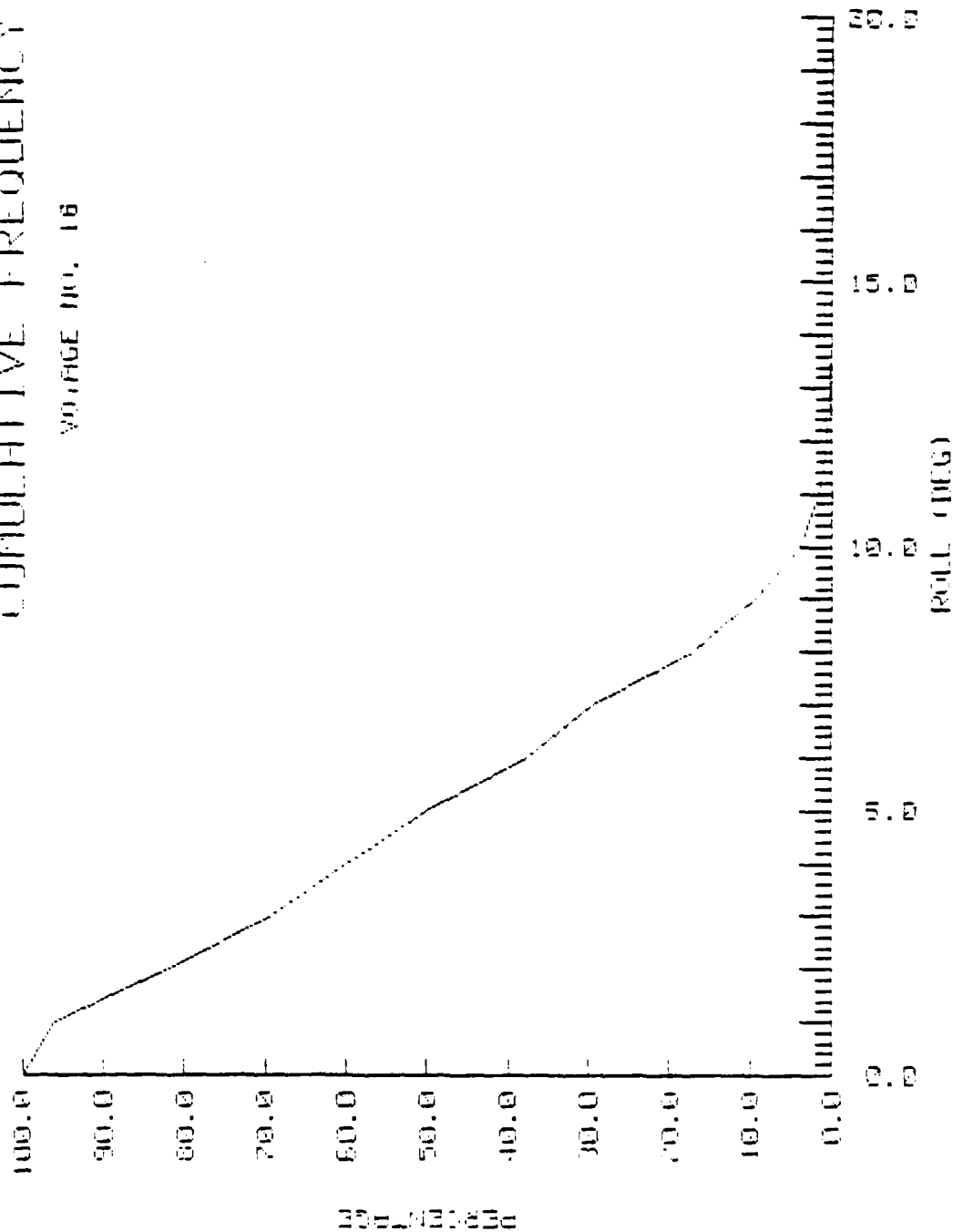
CUMULATIVE FREQUENCY

VOLAGE NO. 18



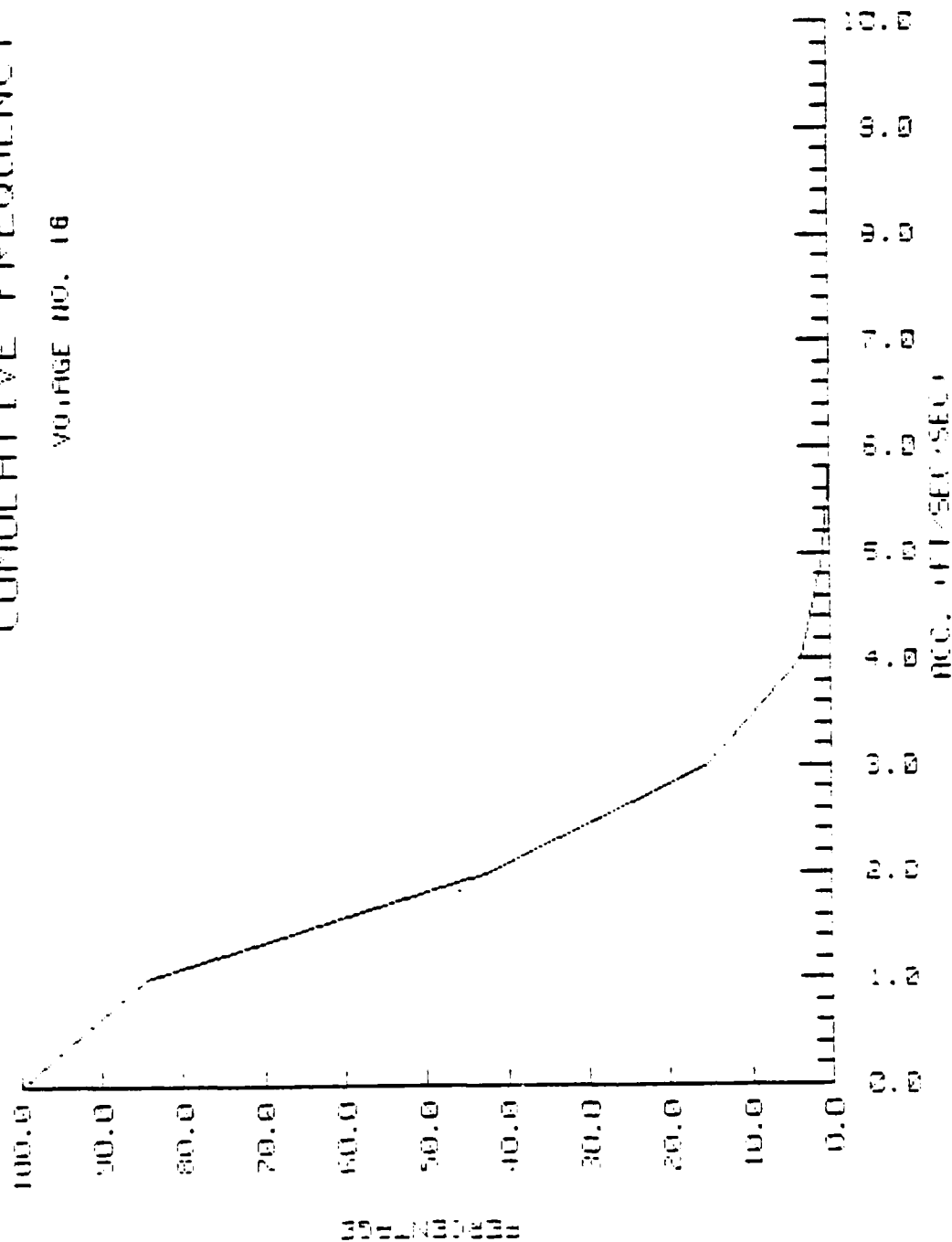
CUMULATIVE FREQUENCY

VOLAGE NO. 16



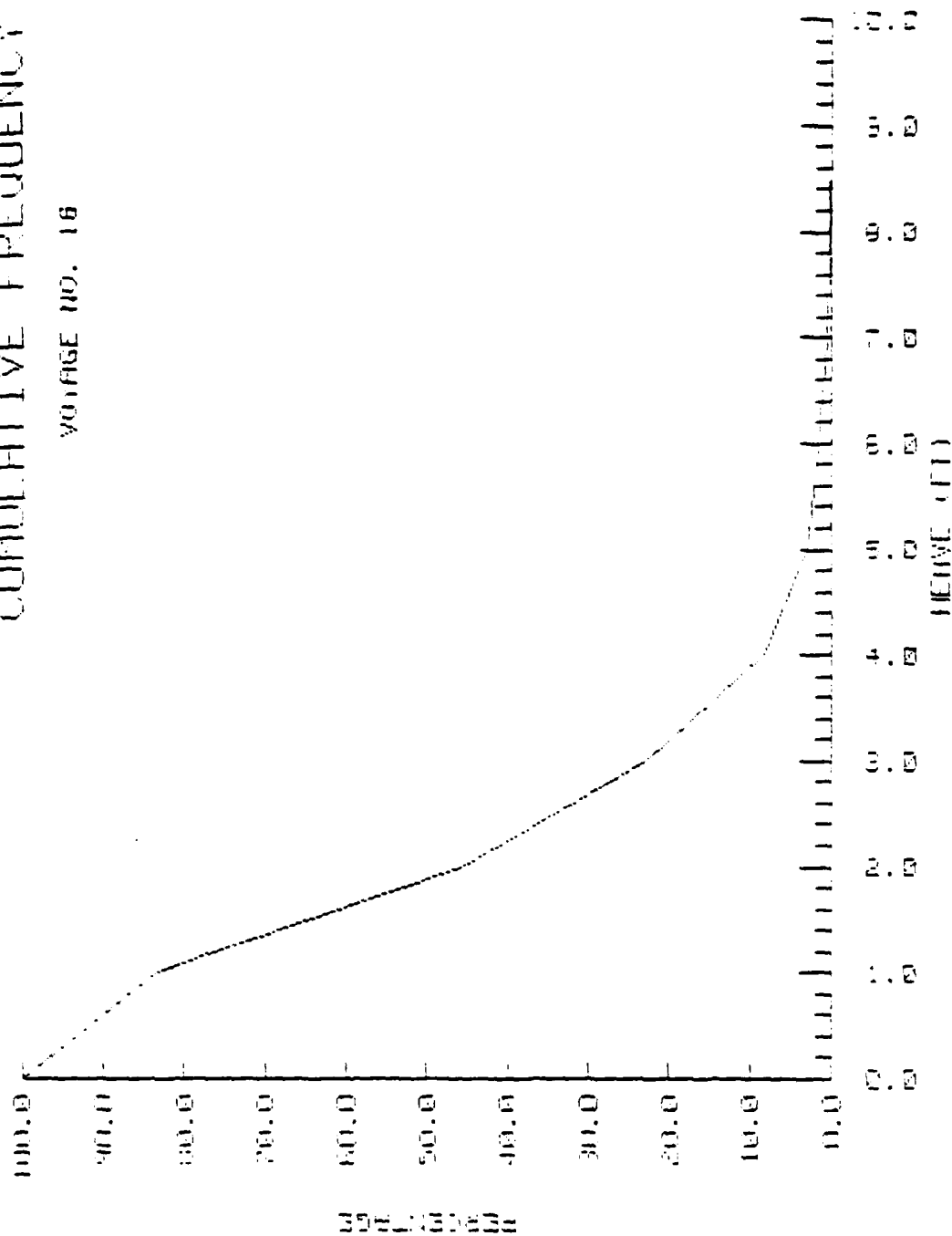
CUMULATIVE FREQUENCY

VOLTAG NO. 16



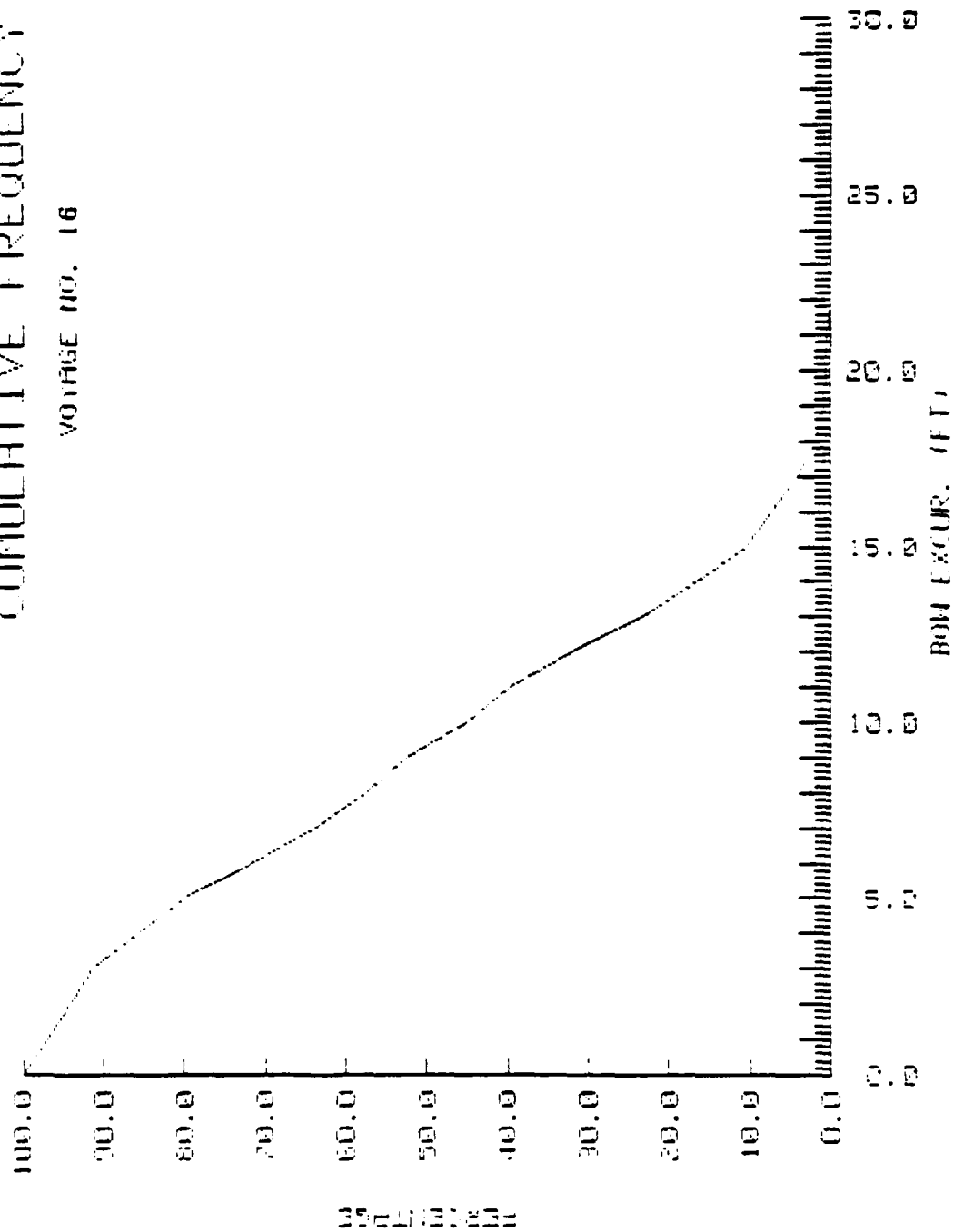
CUMULATIVE FREQUENCY

VOLUME NO. 16



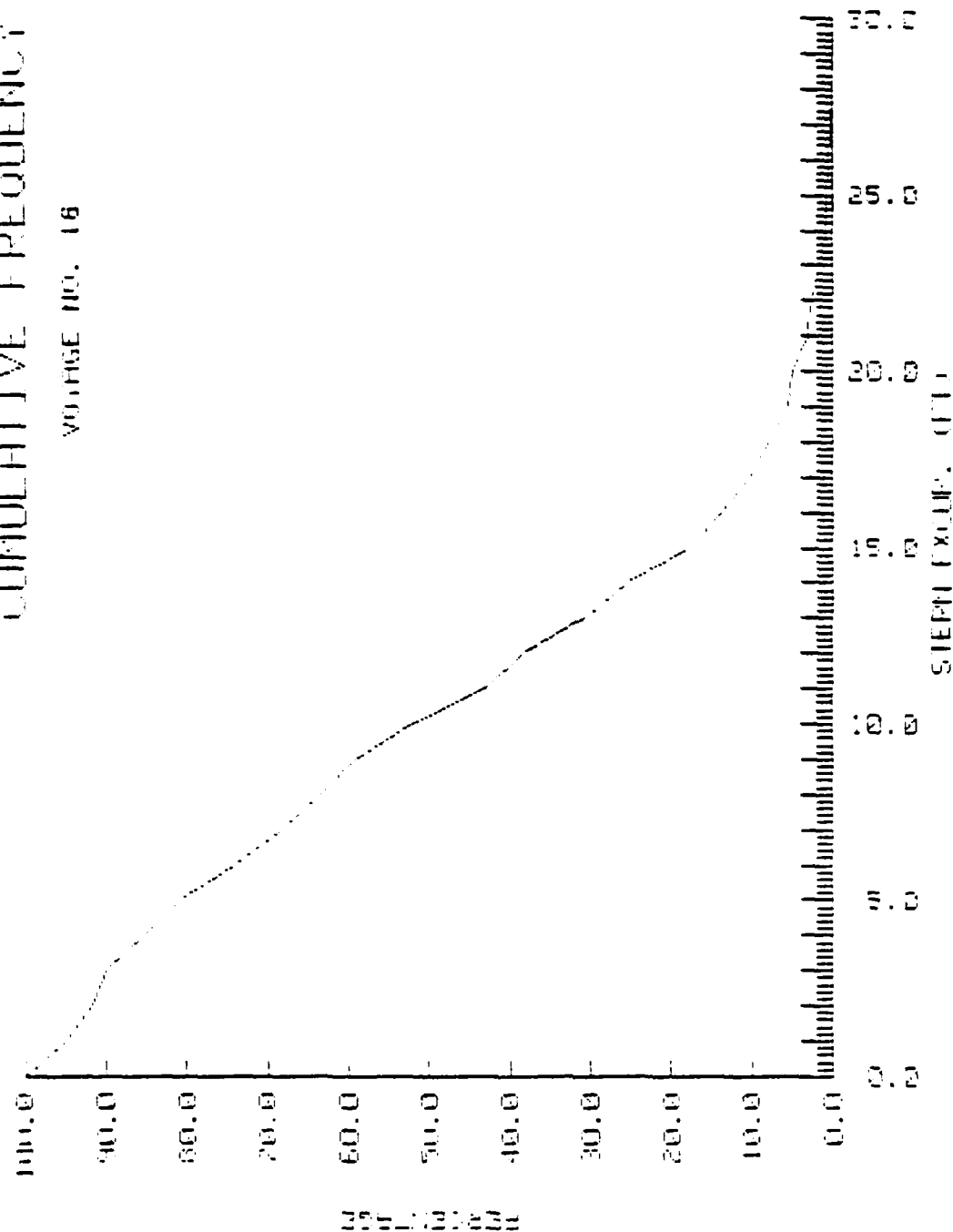
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VOLAGE NO. 16



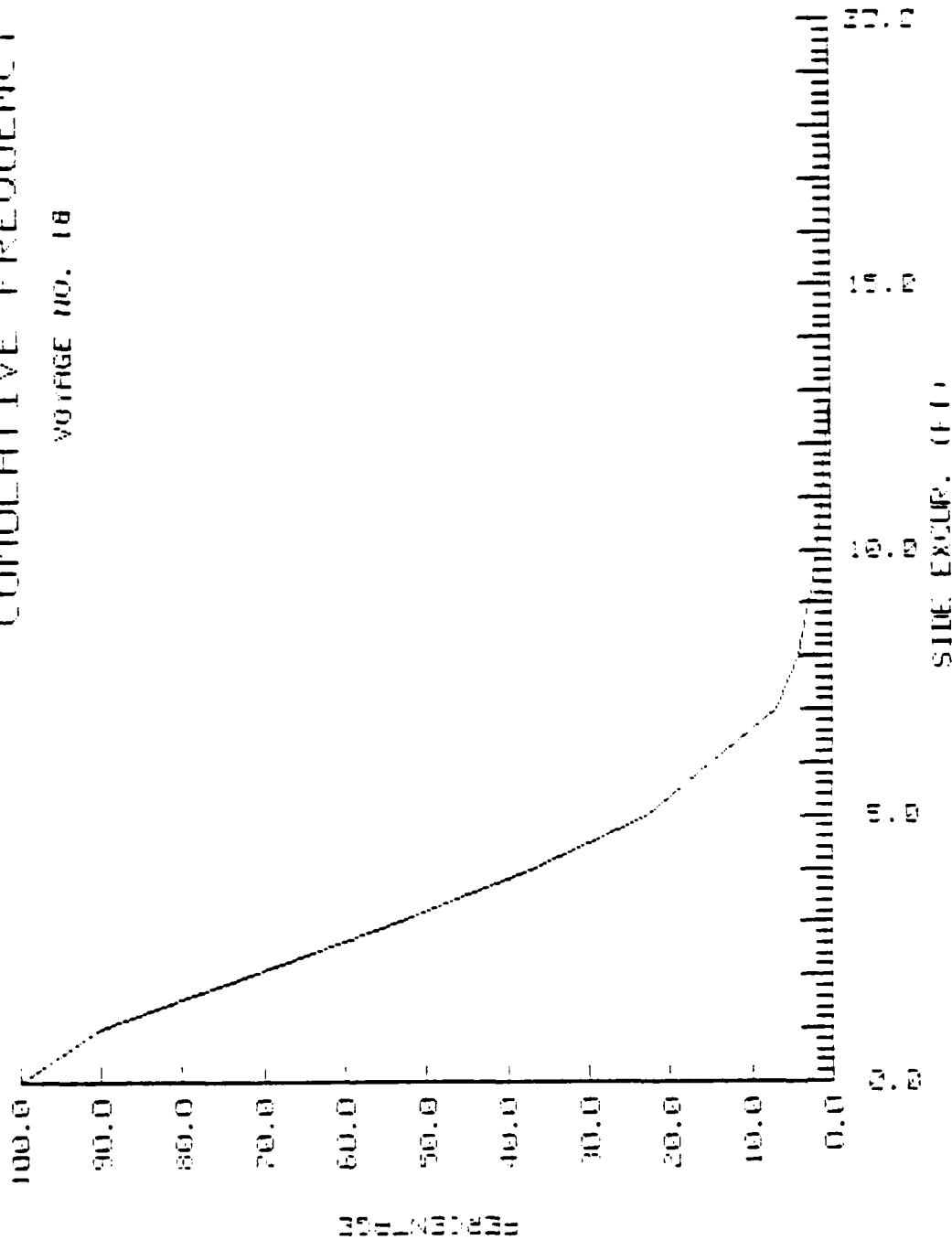
CUMULATIVE FREQUENCY

VOLUME NO. 18



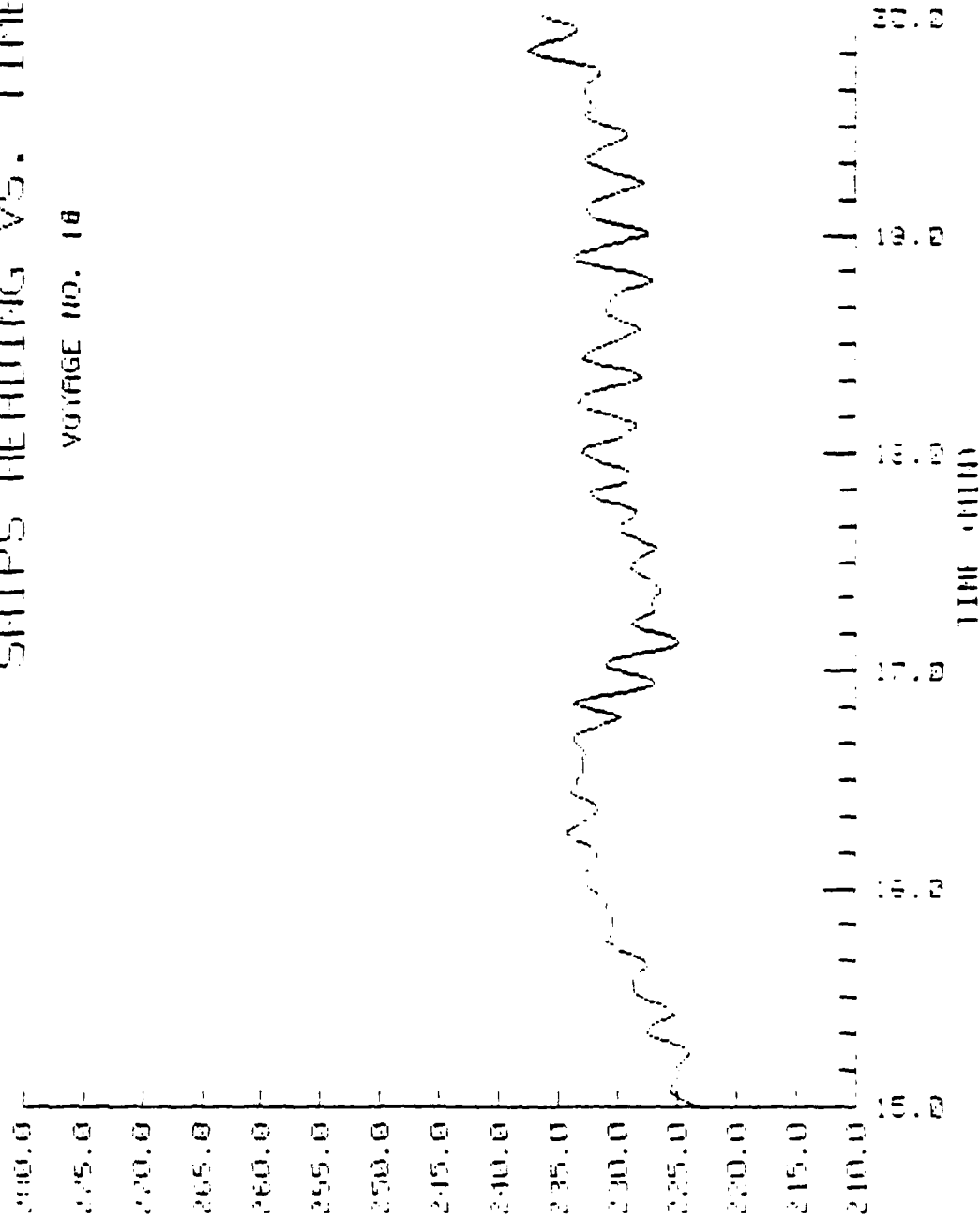
CUMULATIVE FREQUENCY

VOLTAGE NO. 18



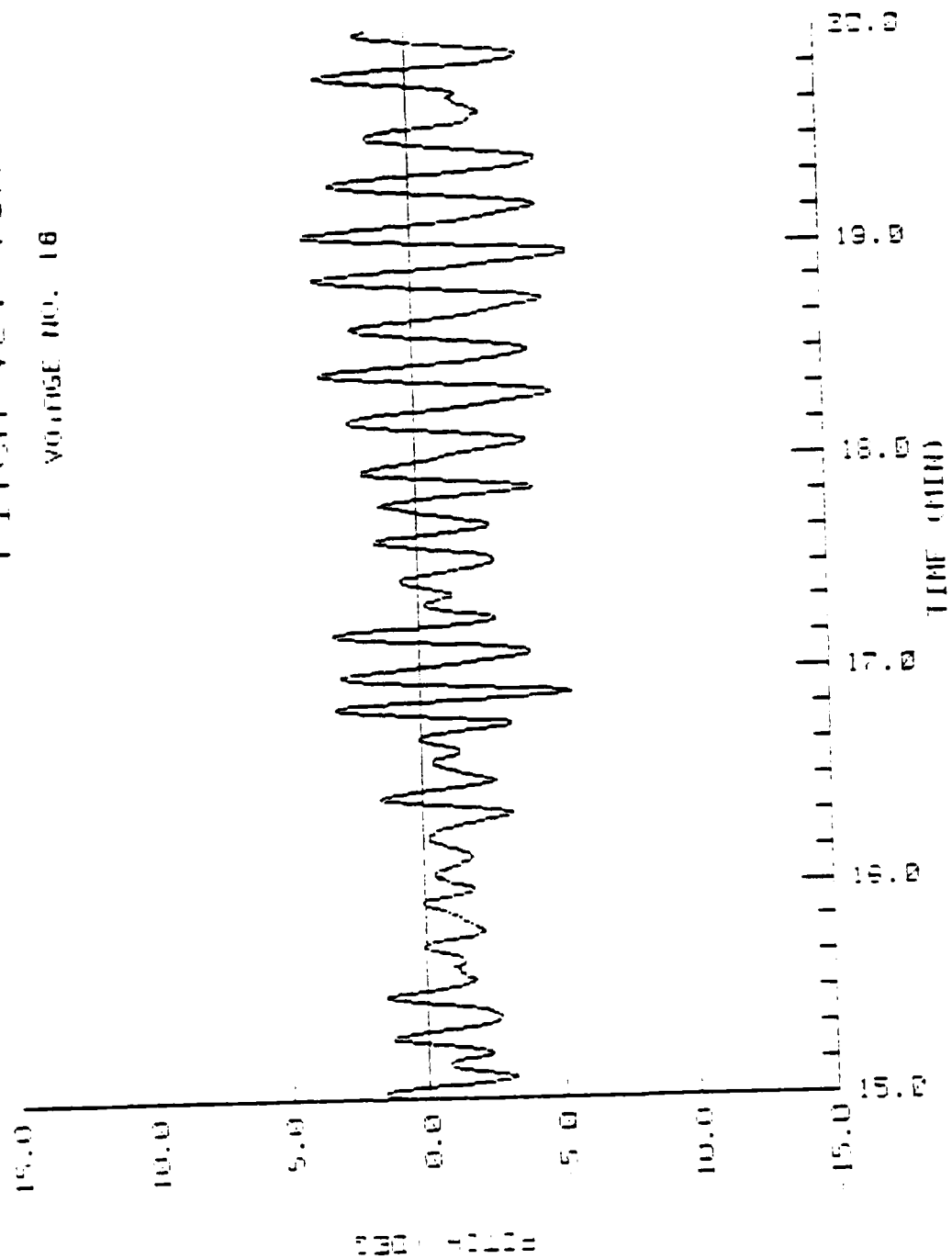
SHIPS HEADING VS. TIME

VOLUME NO. 18



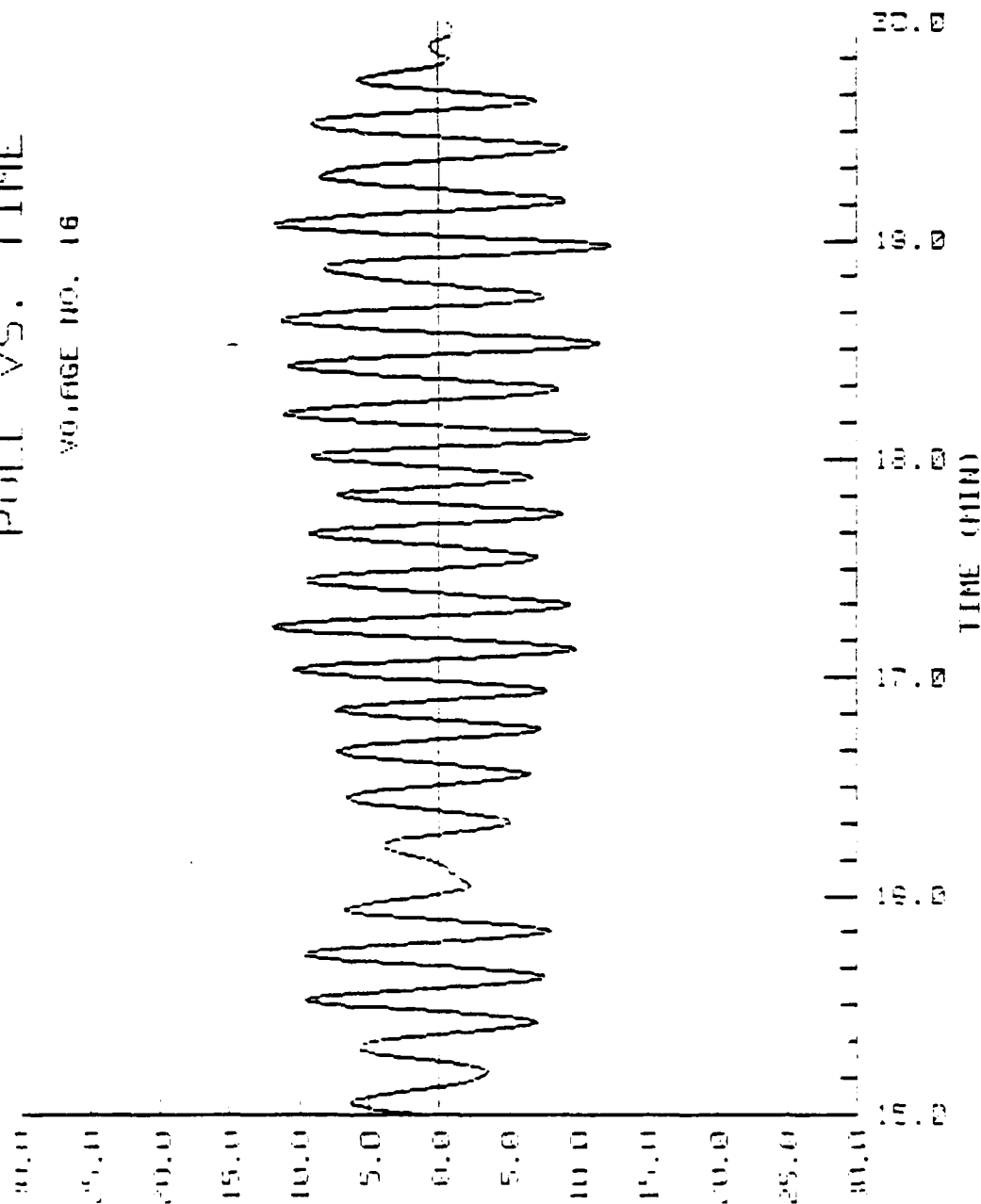
PITCH VS. TIME

VOLUME NO. 16



POLL VS. TIME

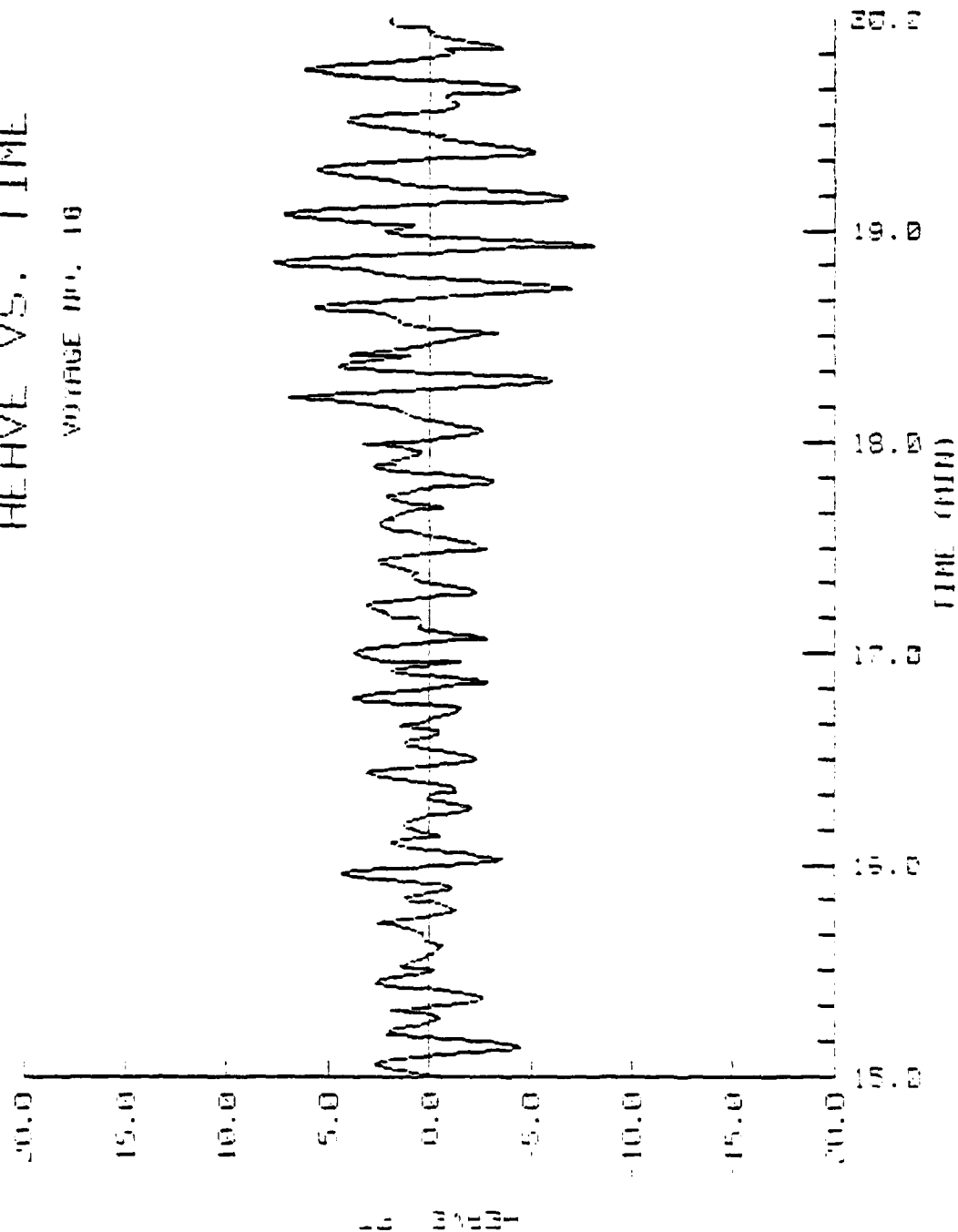
VOLUME NO. 16



130-7705

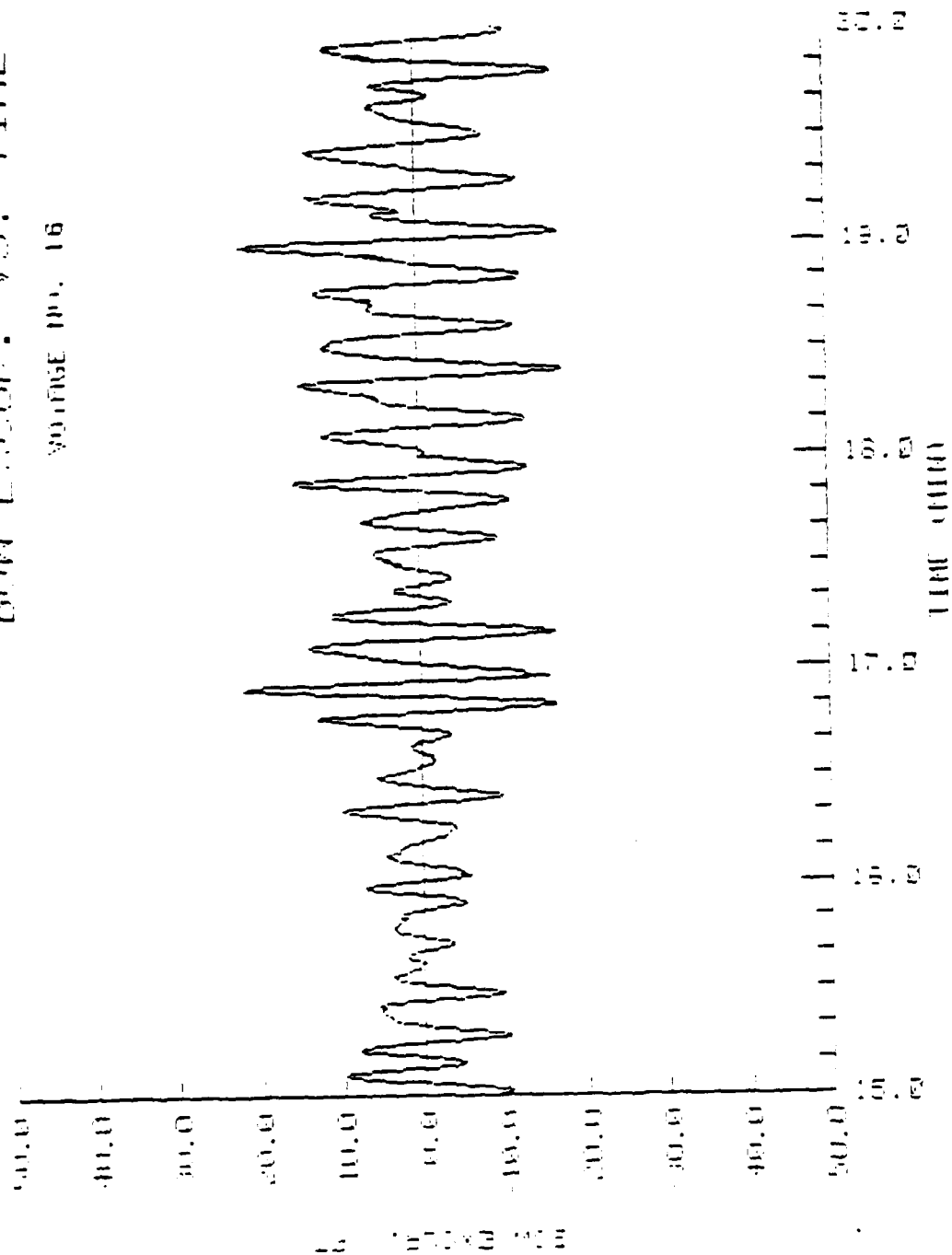
HEAVE VS. TIME

VOLTAGE NO. 16



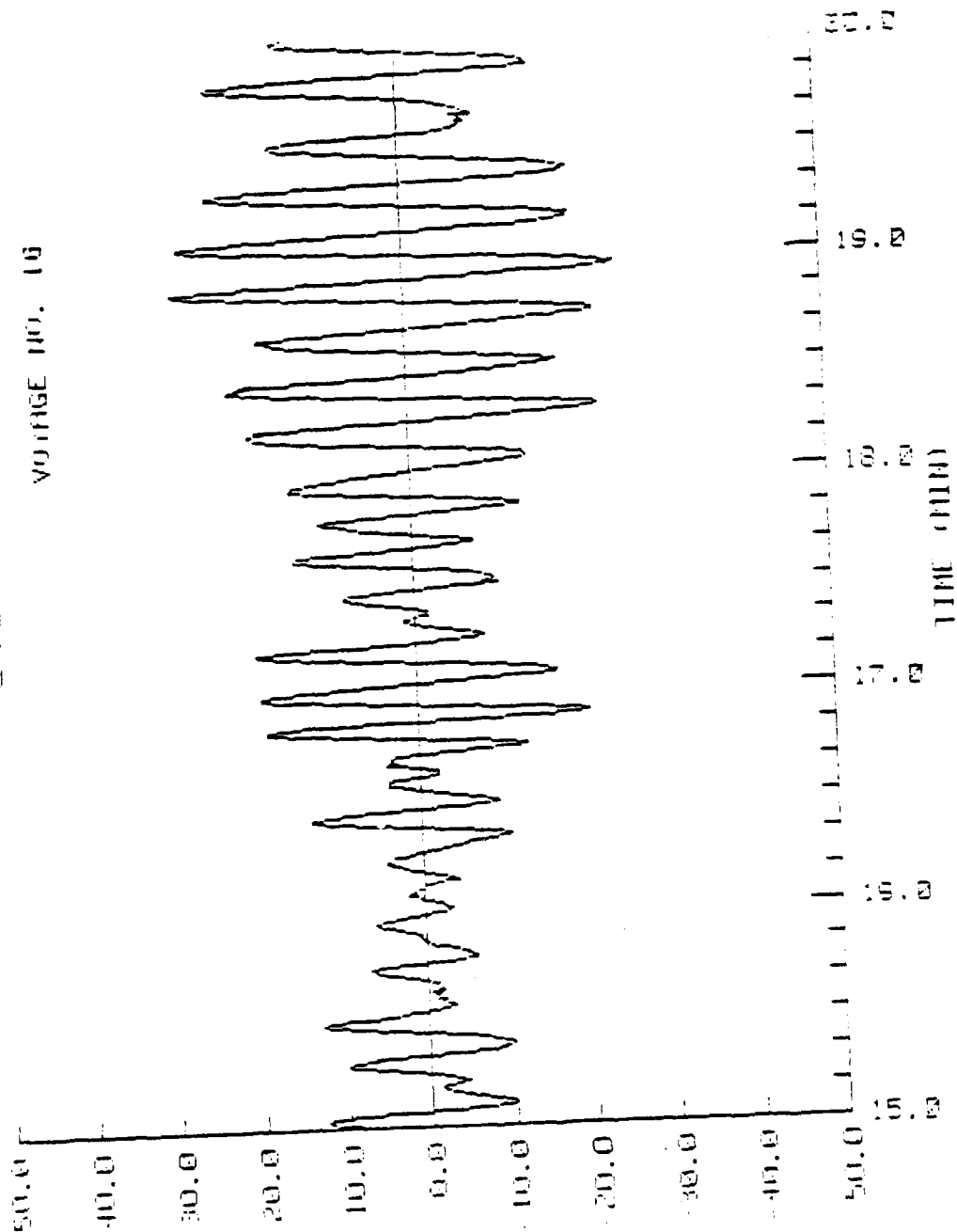
IRON EQUIL. VS. TIME

VOLUME NO. 16



STEPN EXCUR. VS. TIME

VOLTAGE NO. 16



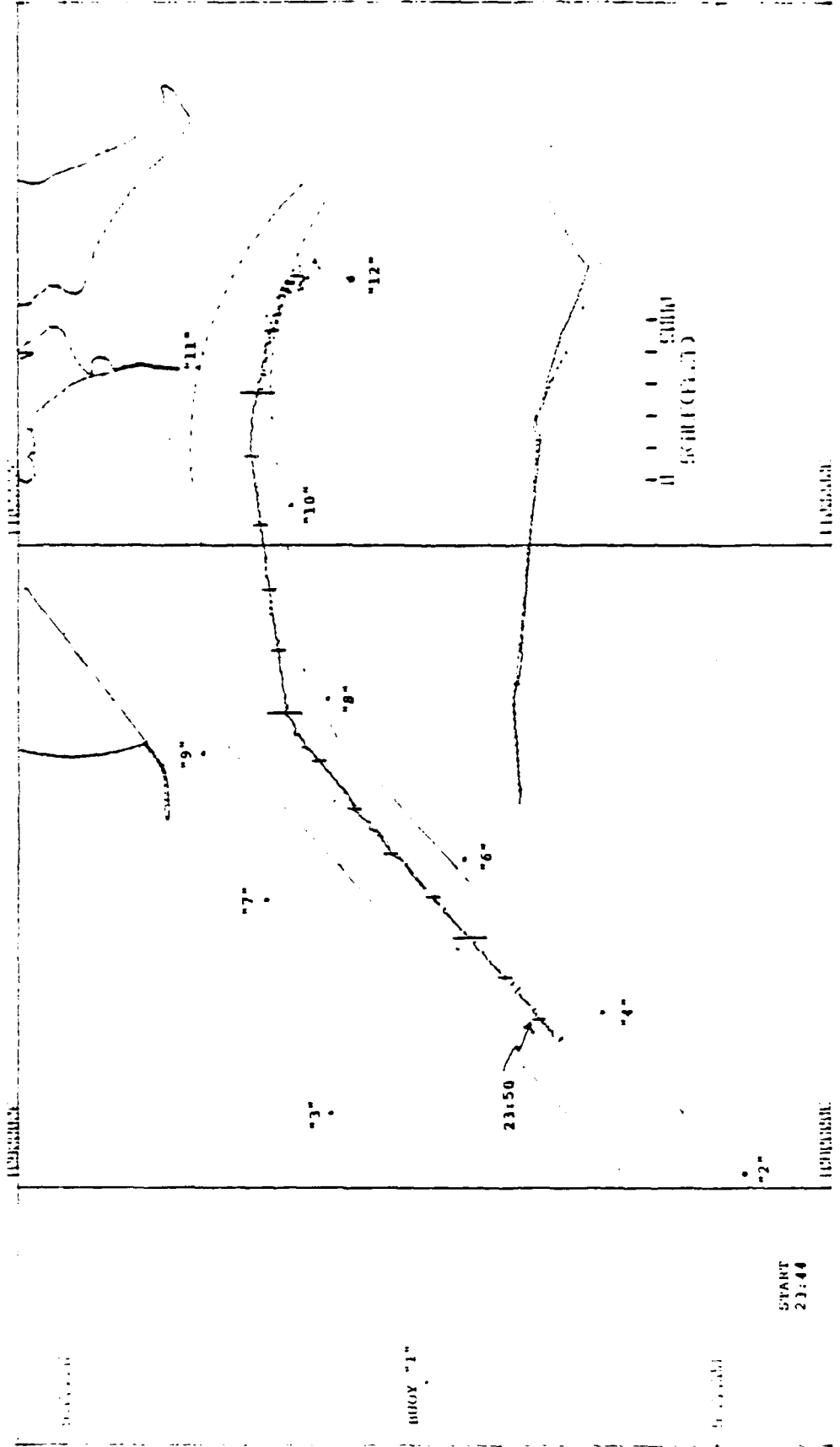
16 - 1000000 2000000

STATISTICAL SUMMARY

VOYAGE NO. 17

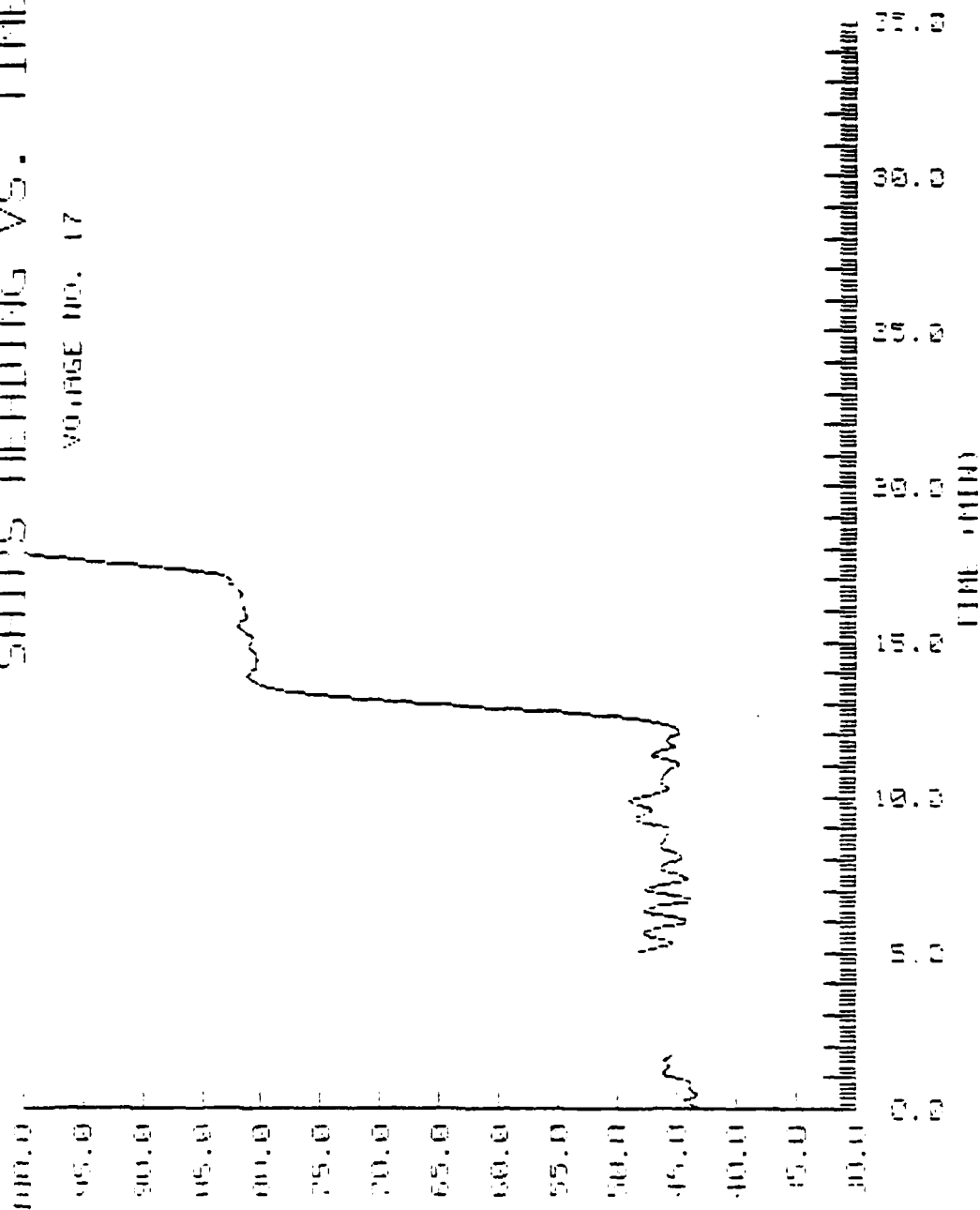
	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
ROLL (DEG.)	-.1	.6	.3	.3
PITCH (DEG.)	.8	1.9	.8	.9
ROLL (FT. SEC. SEC.)	.0	3.6	1.1	1.2
PITCH (FT.)	.0	2.5	.8	.9
ROLL (FOUR. (FT.)	.0	4.6	1.5	1.8
PITCH (FOUR. (FT.)	.0	2.7	1.1	1.2
ROLL (FOUR. (FT.)	.0	3.0	1.0	1.2

Recorded III. 17 0000 10000
 1000 10000

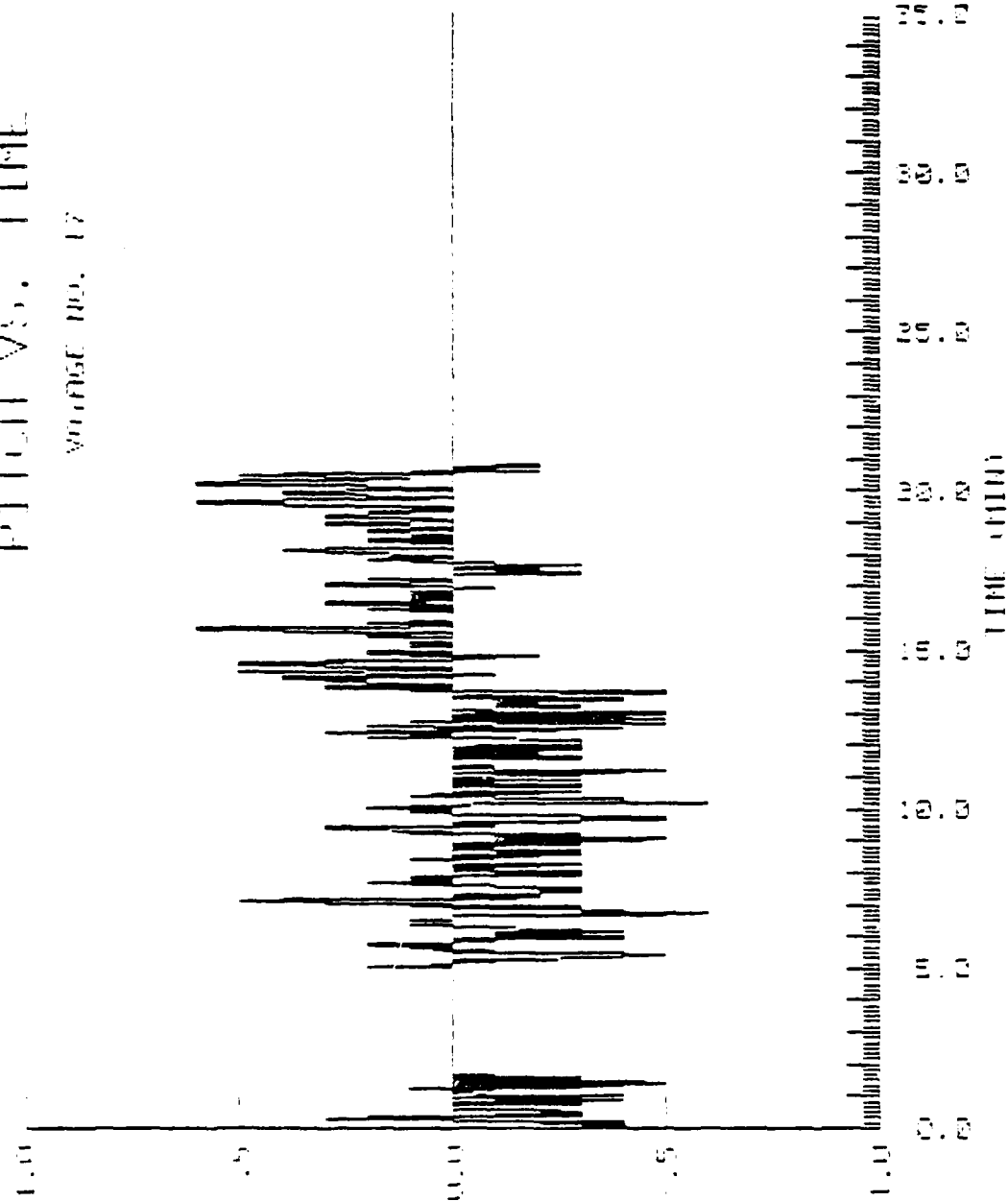


SHIPS HEADING VS. TIME

VOYAGE NO. 17



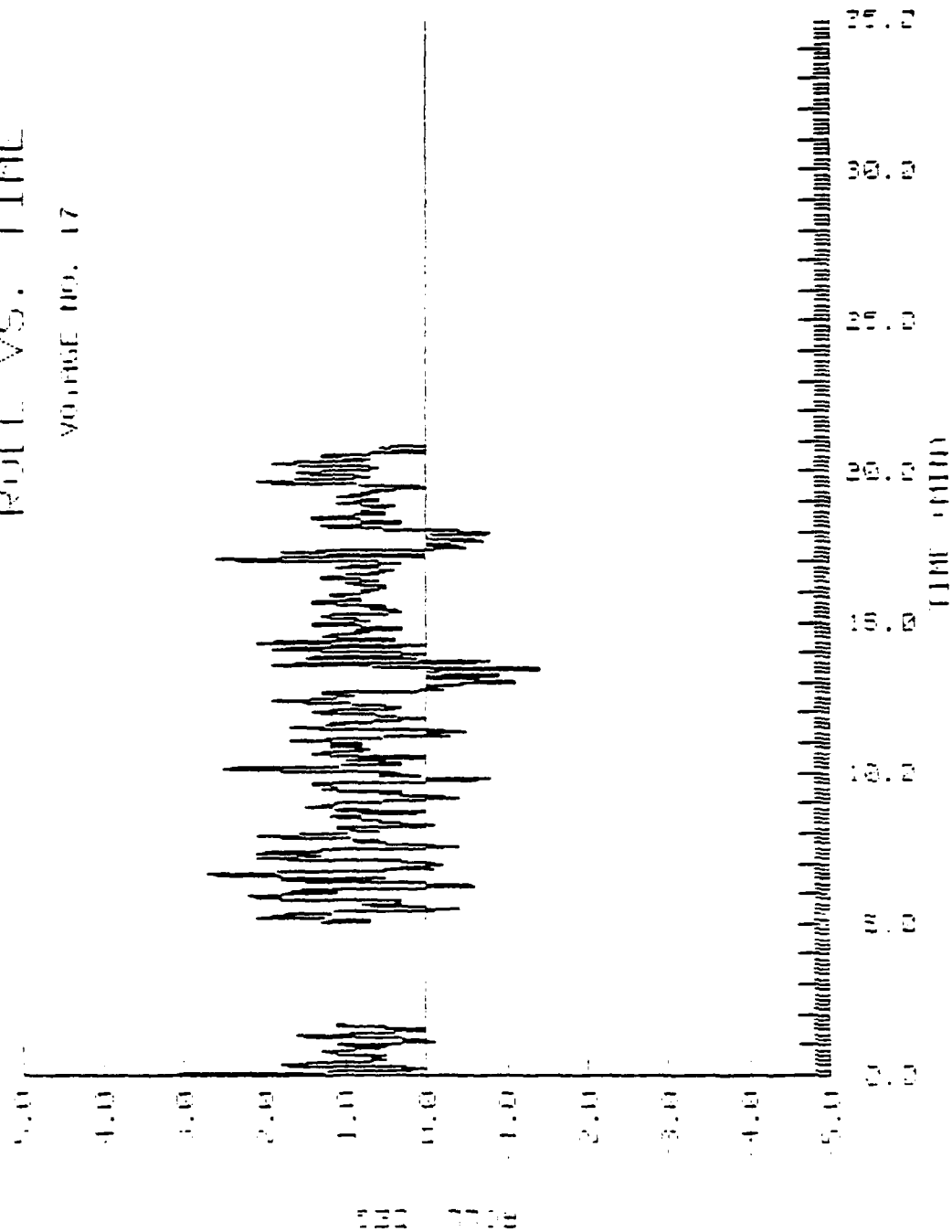
PITCH VS. TIME TRACE NO. 17



17-11-17

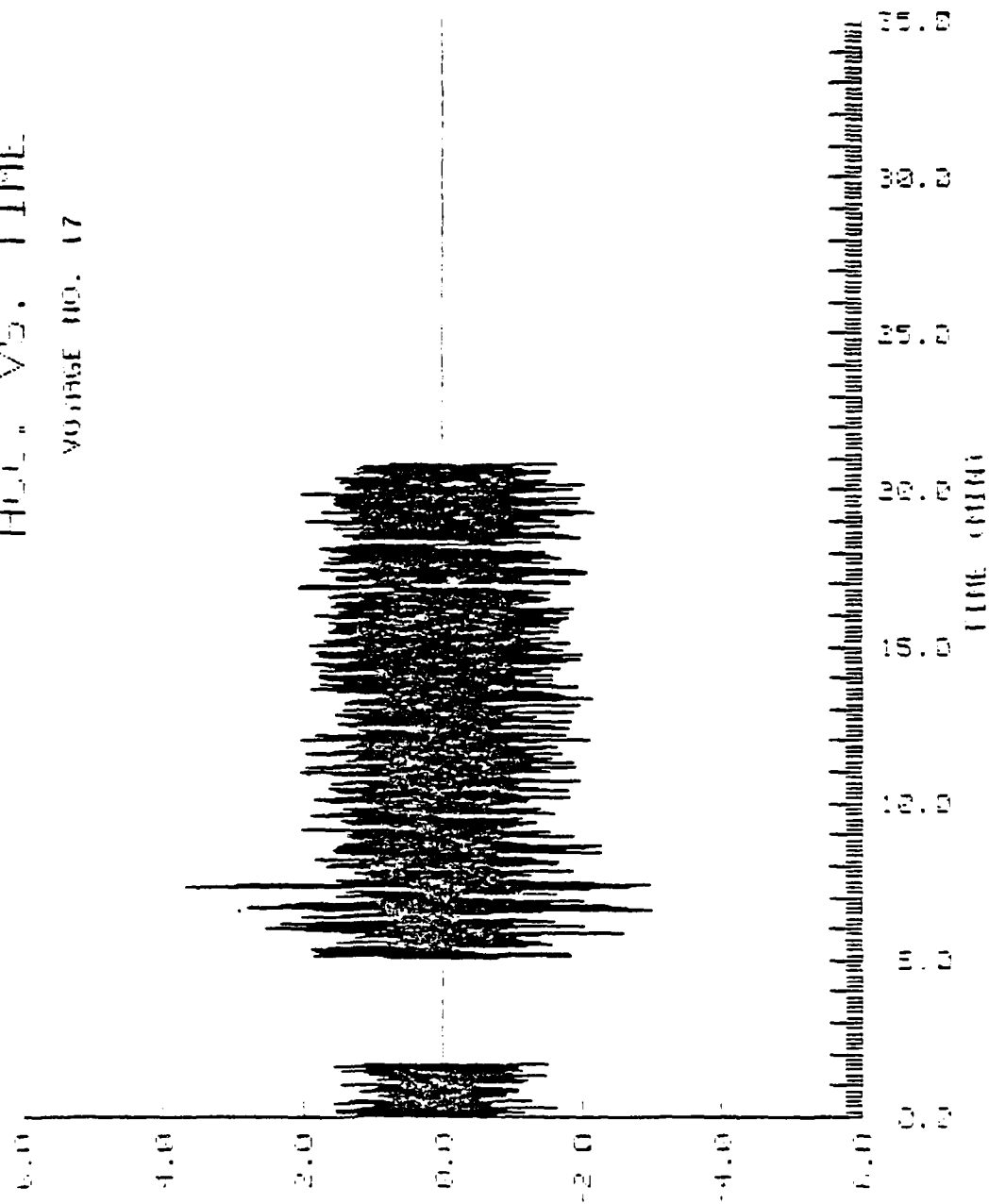
ROLL VS. TIME

VOLUME NO. 17



HCC VS. TIME

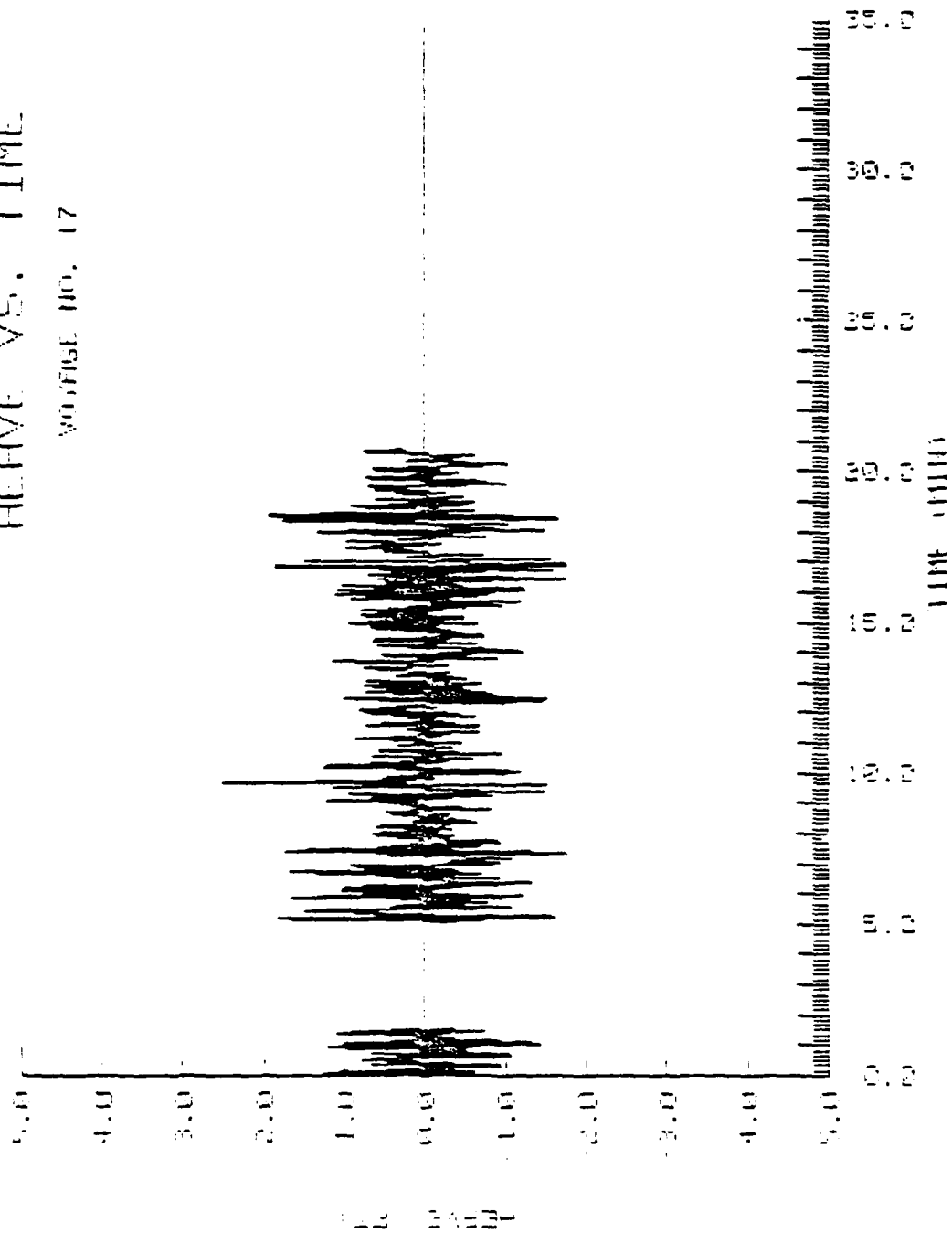
VOLUME NO. 17



100 100 100 100

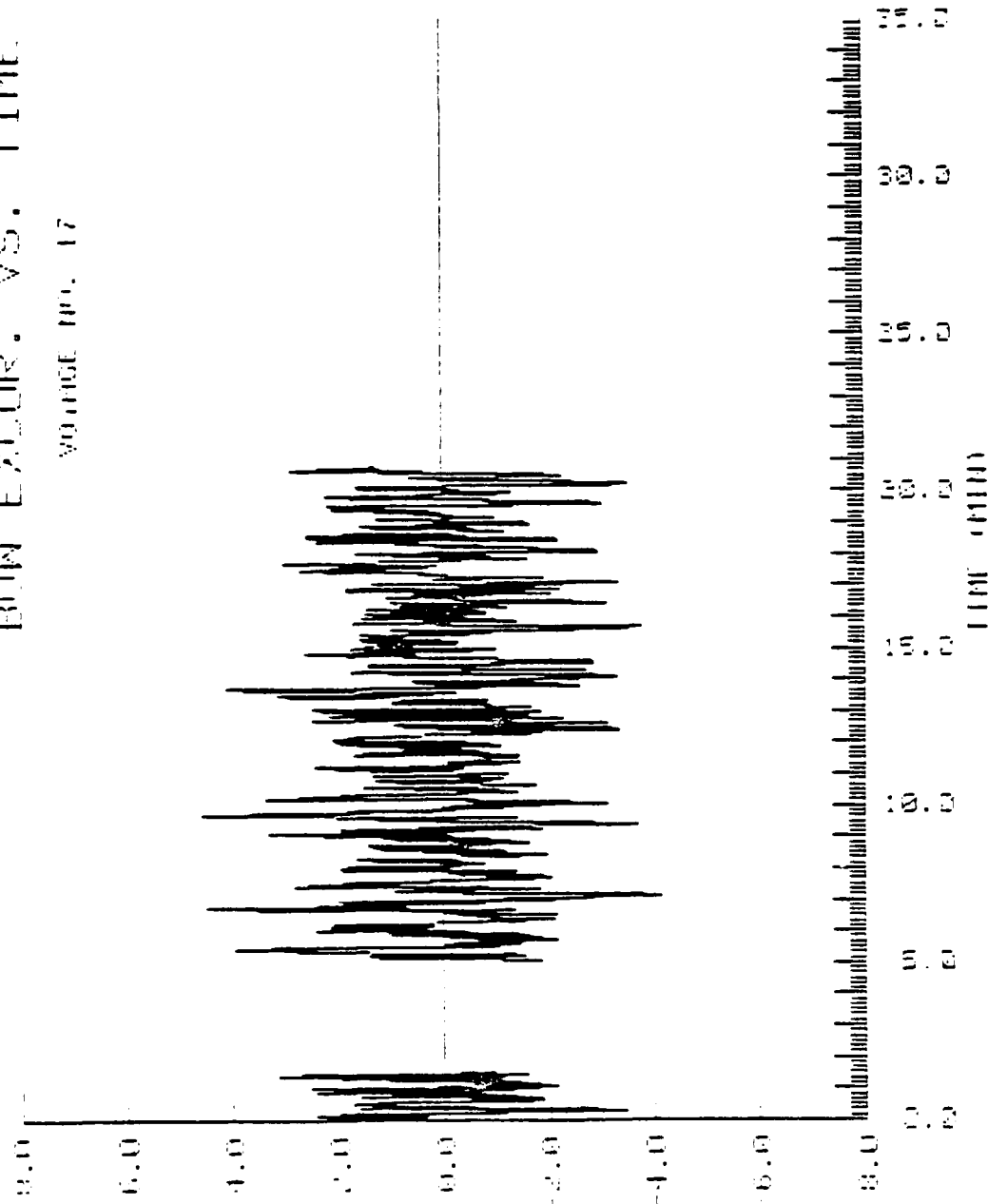
HEEVE VS. TIME

WYTHSE NO. 17



BOW EXCUR. VS. TIME

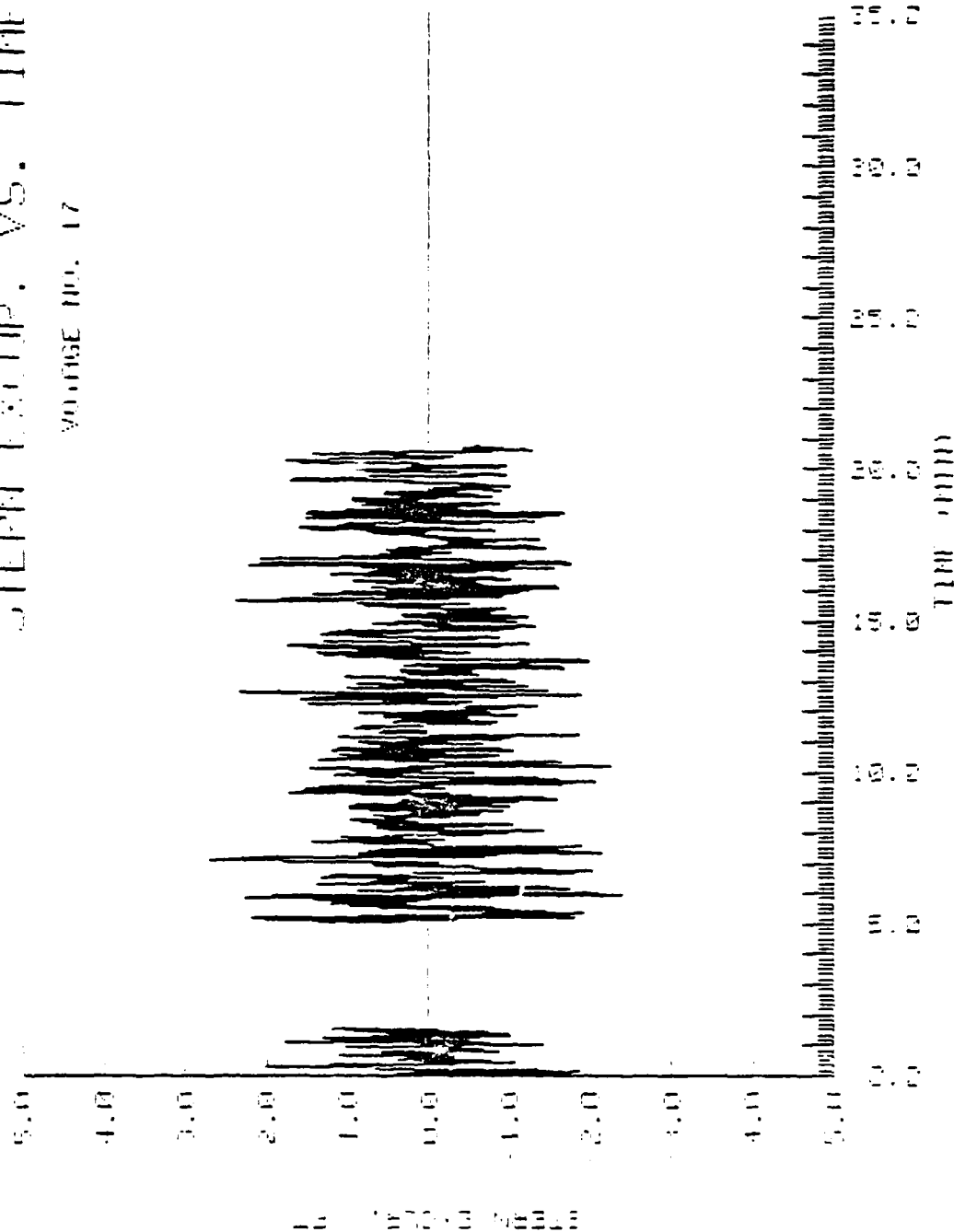
VOYAGE NO. 17



BOW EXCUR. VS. TIME

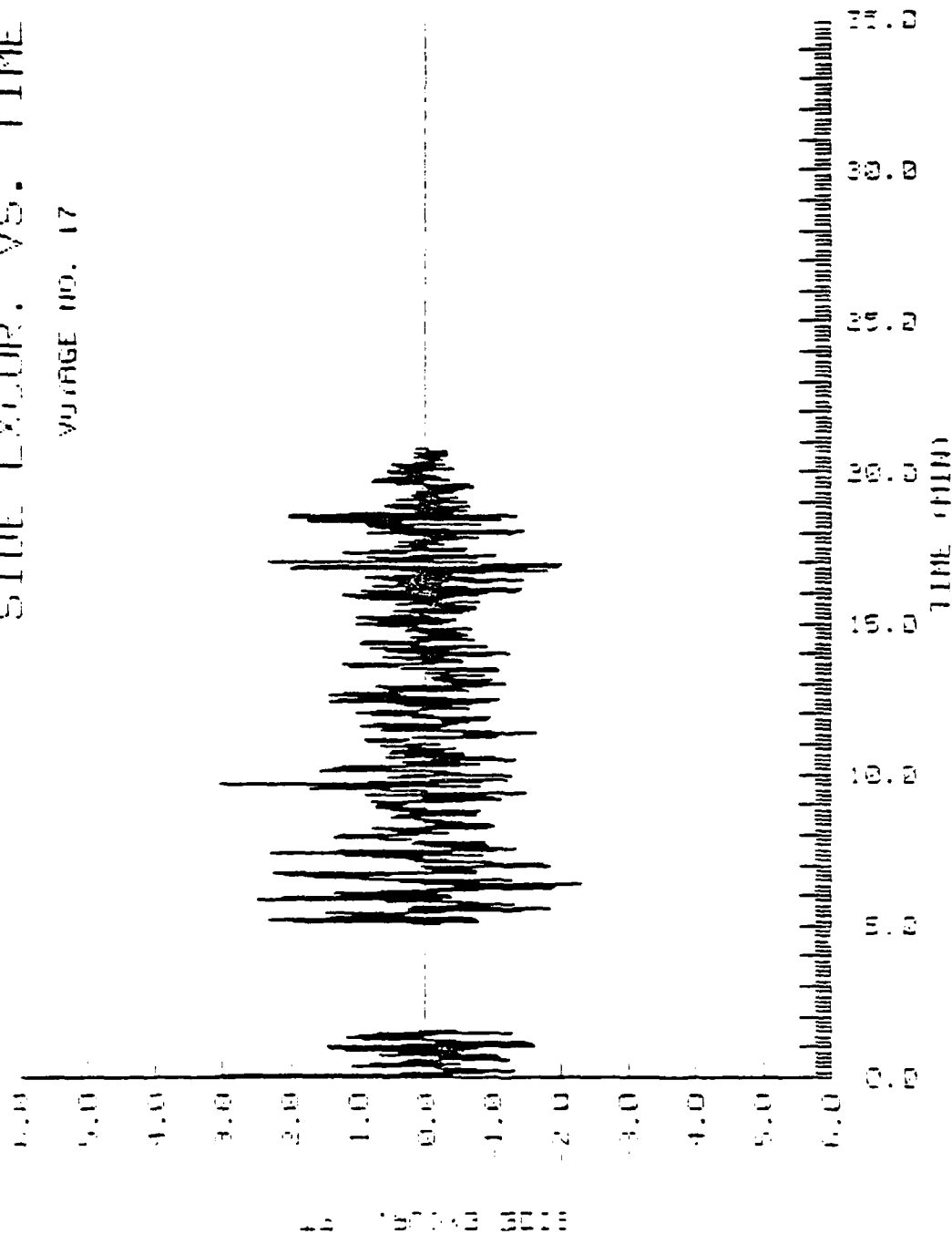
STEPH EXCURP. VS. TIME

VOLUME 100, 17



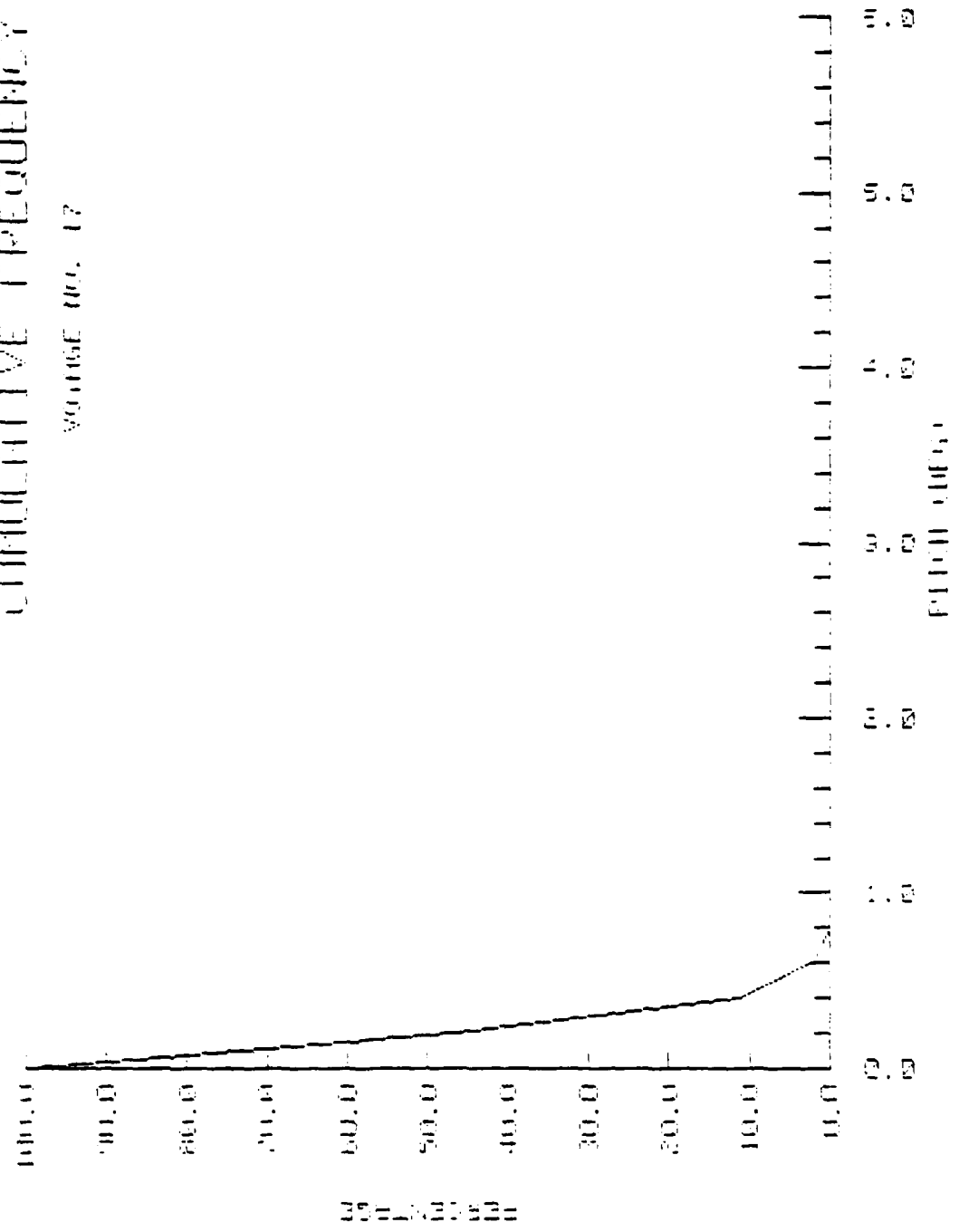
SIDE EXCUR. VS. TIME

WUJAGE NO. 17



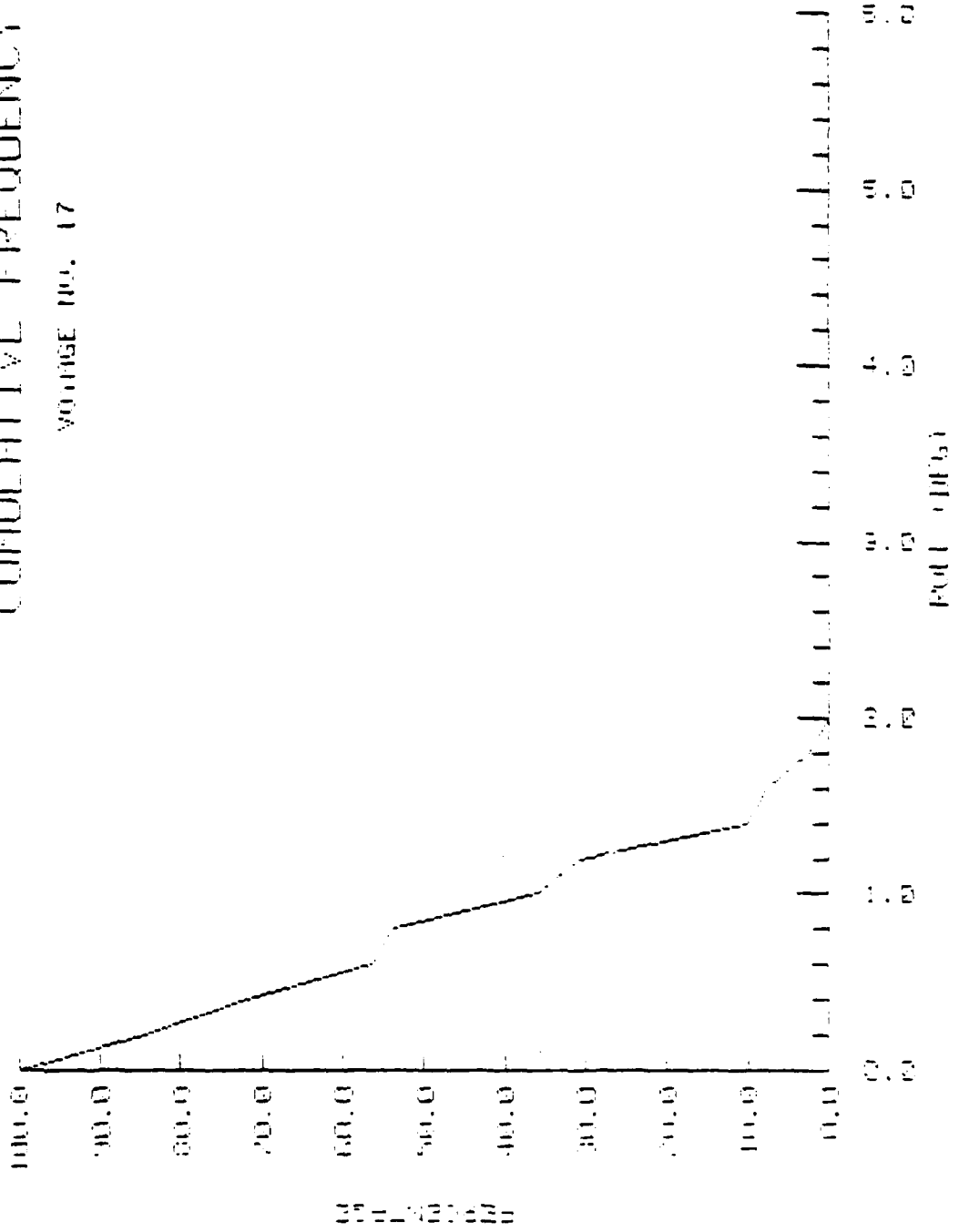
CUMULATIVE FREQUENCY

W006E 000. 17



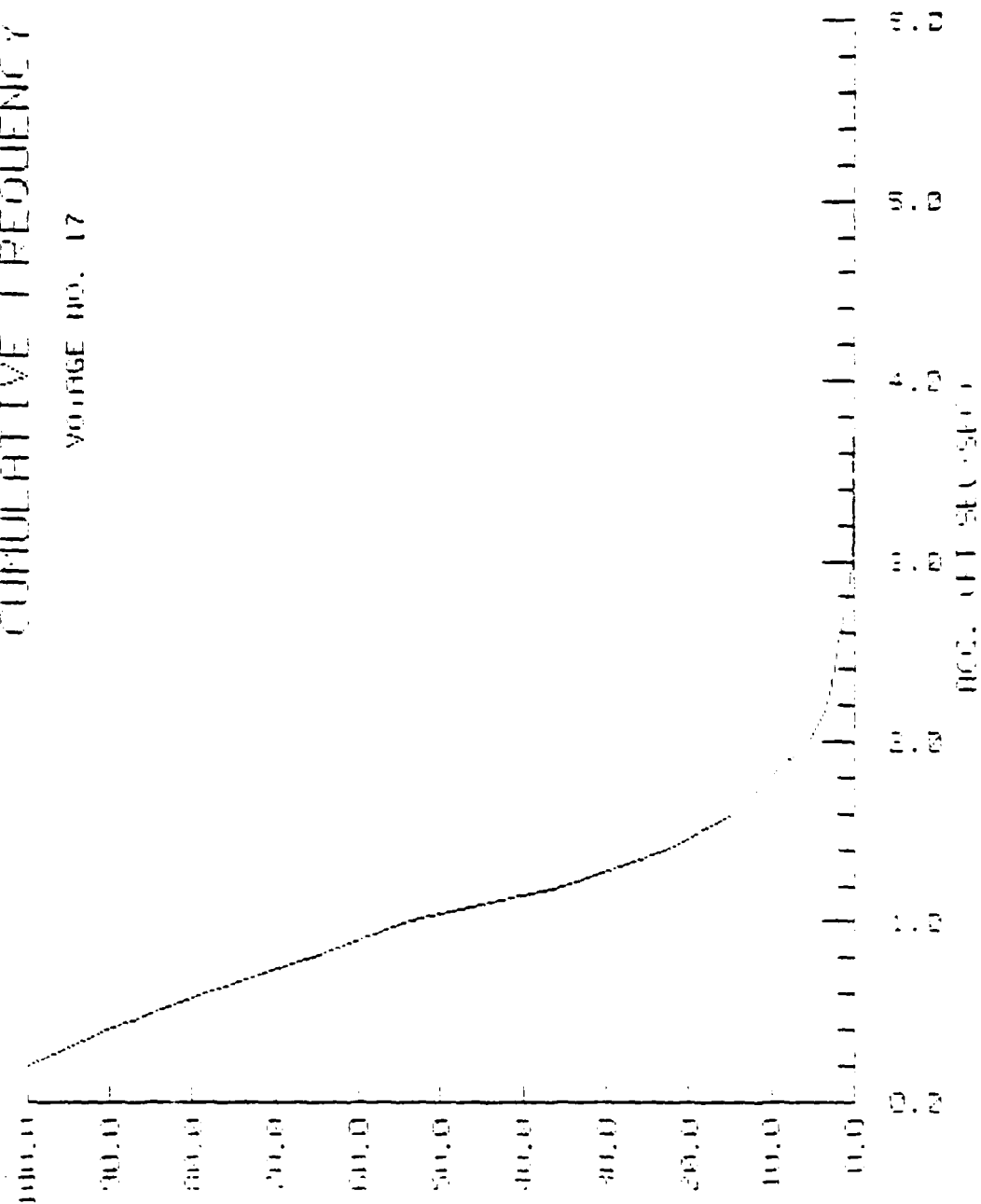
CUMULATIVE FREQUENCY

VOLUME NO. 17



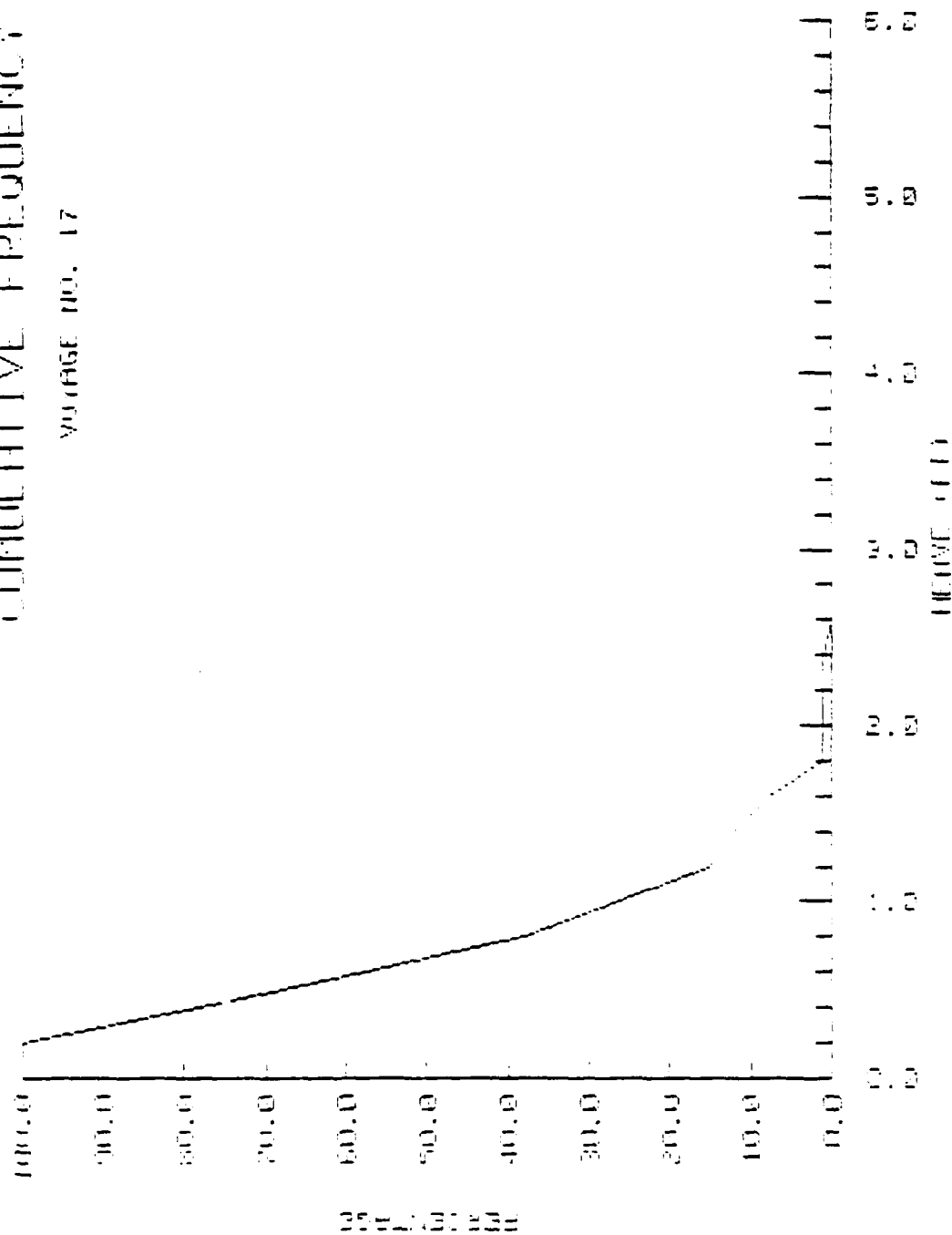
CUMULATIVE FREQUENCY

YOUNGE NO. 17



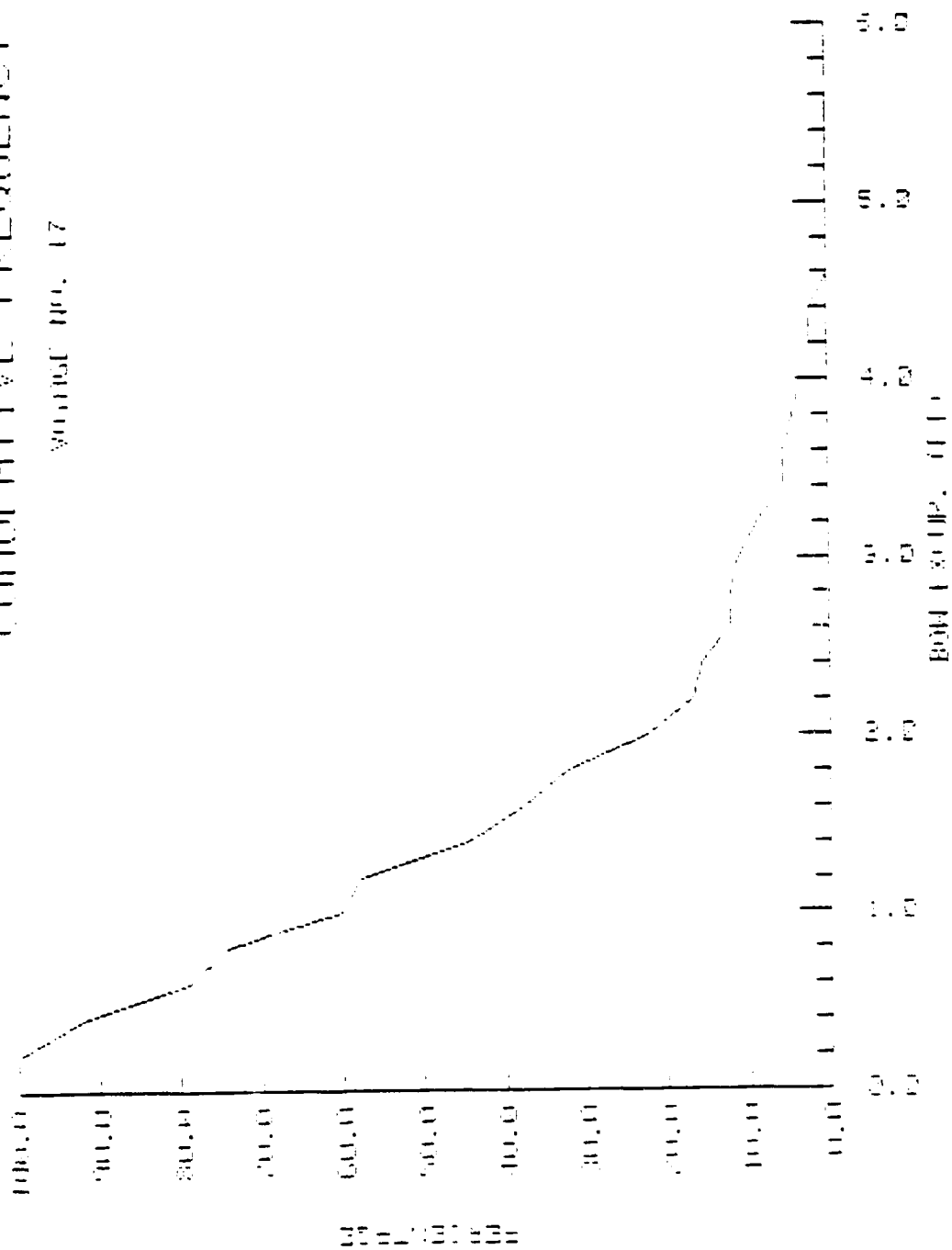
CUMULATIVE FREQUENCY

VOYAGE NO. 17



CUMULATIVE FREQUENCY

YOUNG NO. 17



AD-A098 984

TETRA TECH INC PASADENA CA

F/G 13/10

COLUMBIA RIVER ENTRANCE CHANNEL DEEP-DRAFT VESSEL MOTION STUDY.--ETC(U)

SEP 80 S WANG, M KIMBLE, C BUTCHER, G D COX

DACW57-78-C-0028

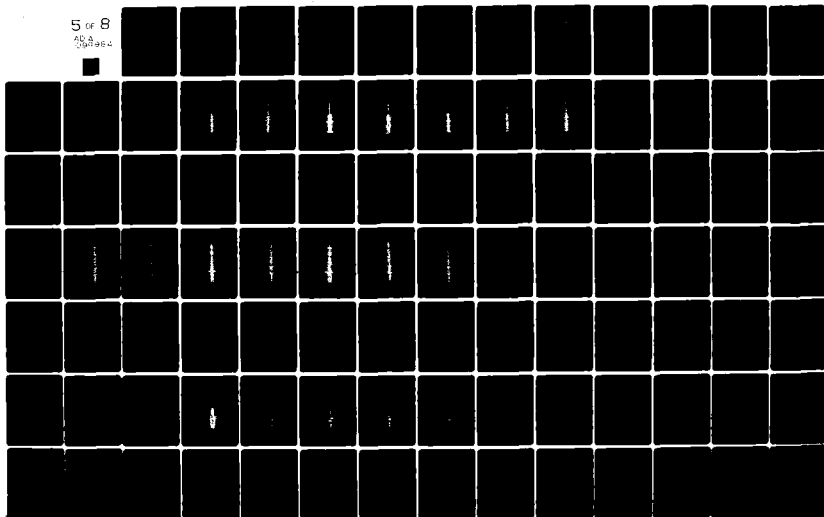
UNCLASSIFIED

TETRA-T-3925-APP-A(1)

NL

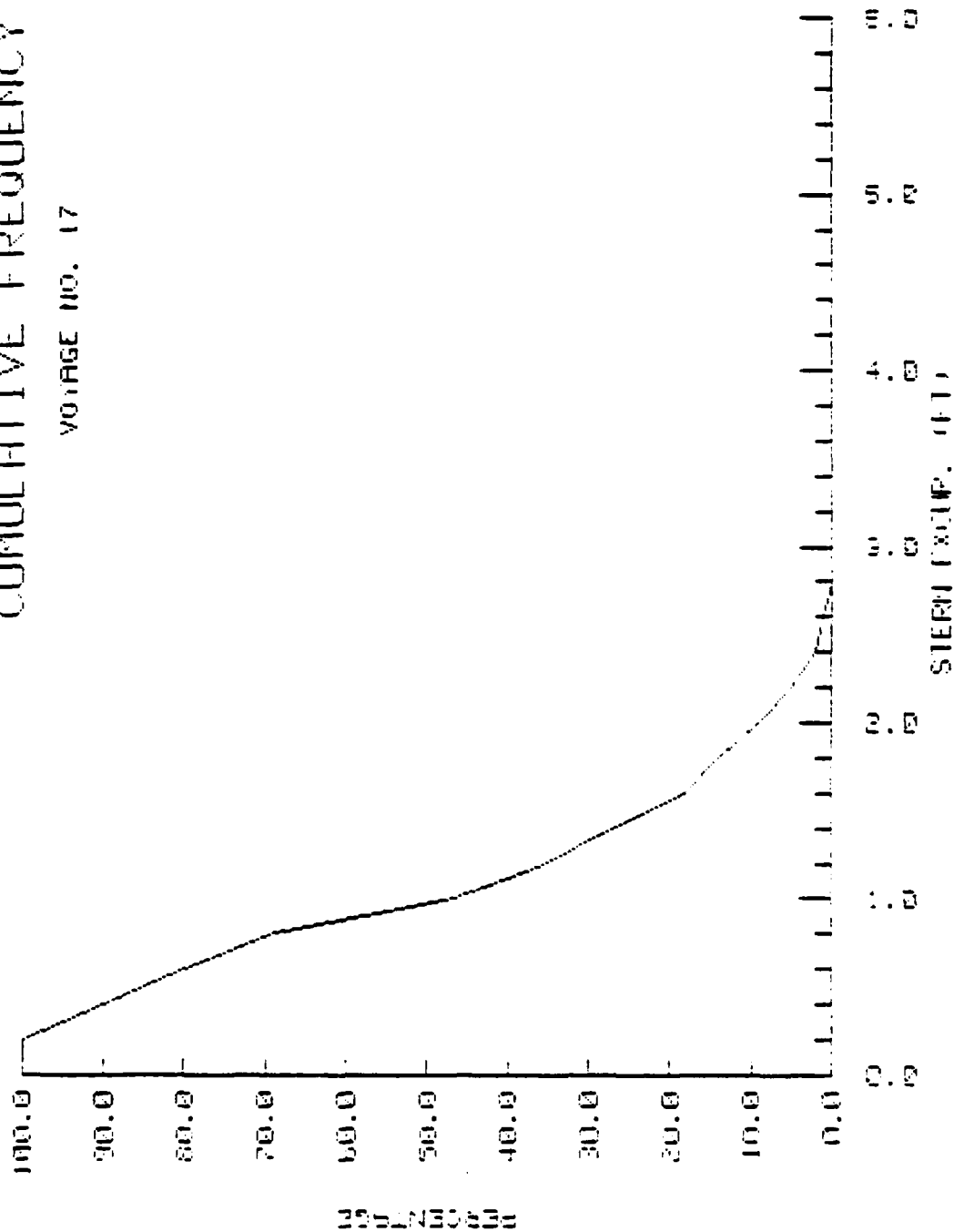
5 of 8

AD-A098 984



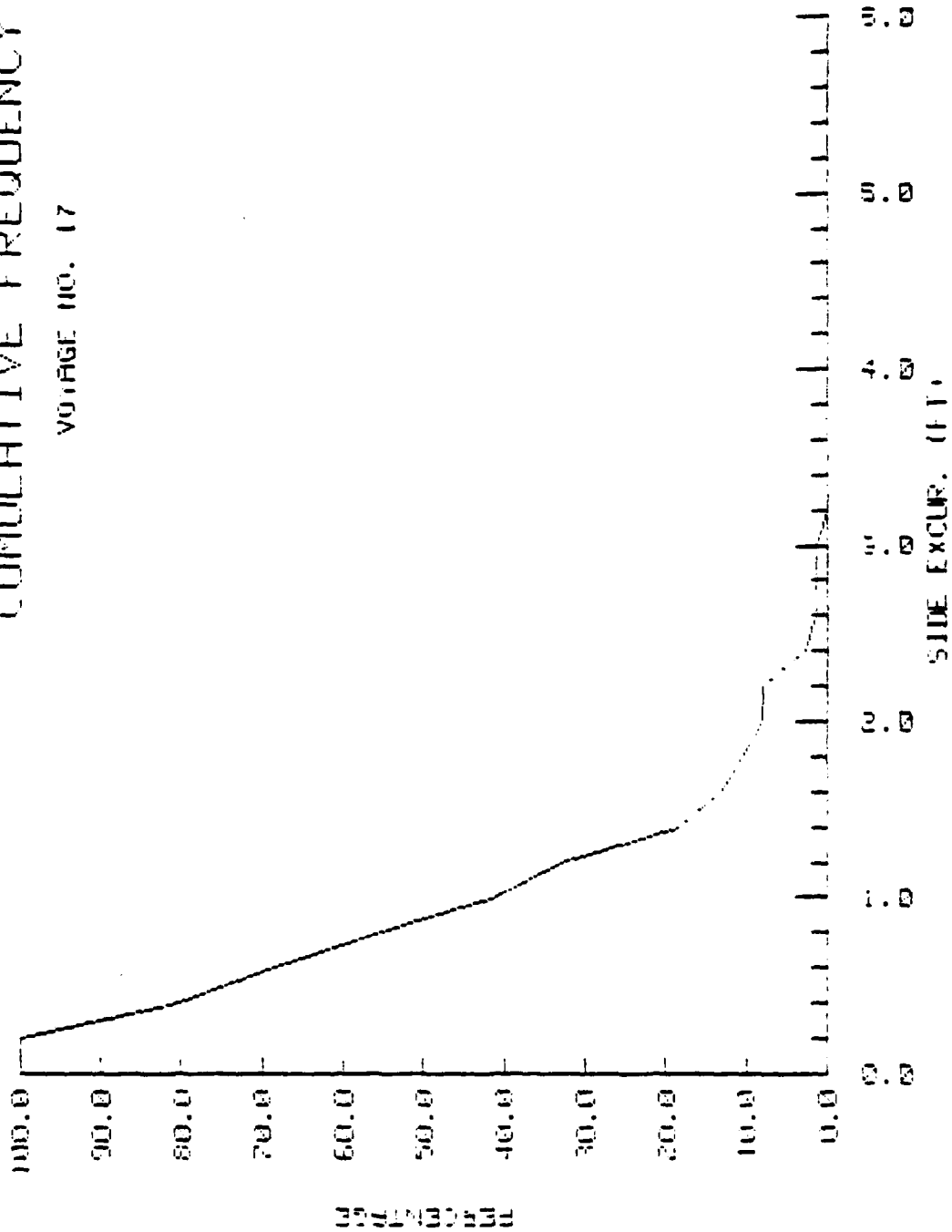
CUMULATIVE FREQUENCY

VOLAGE NO. 17



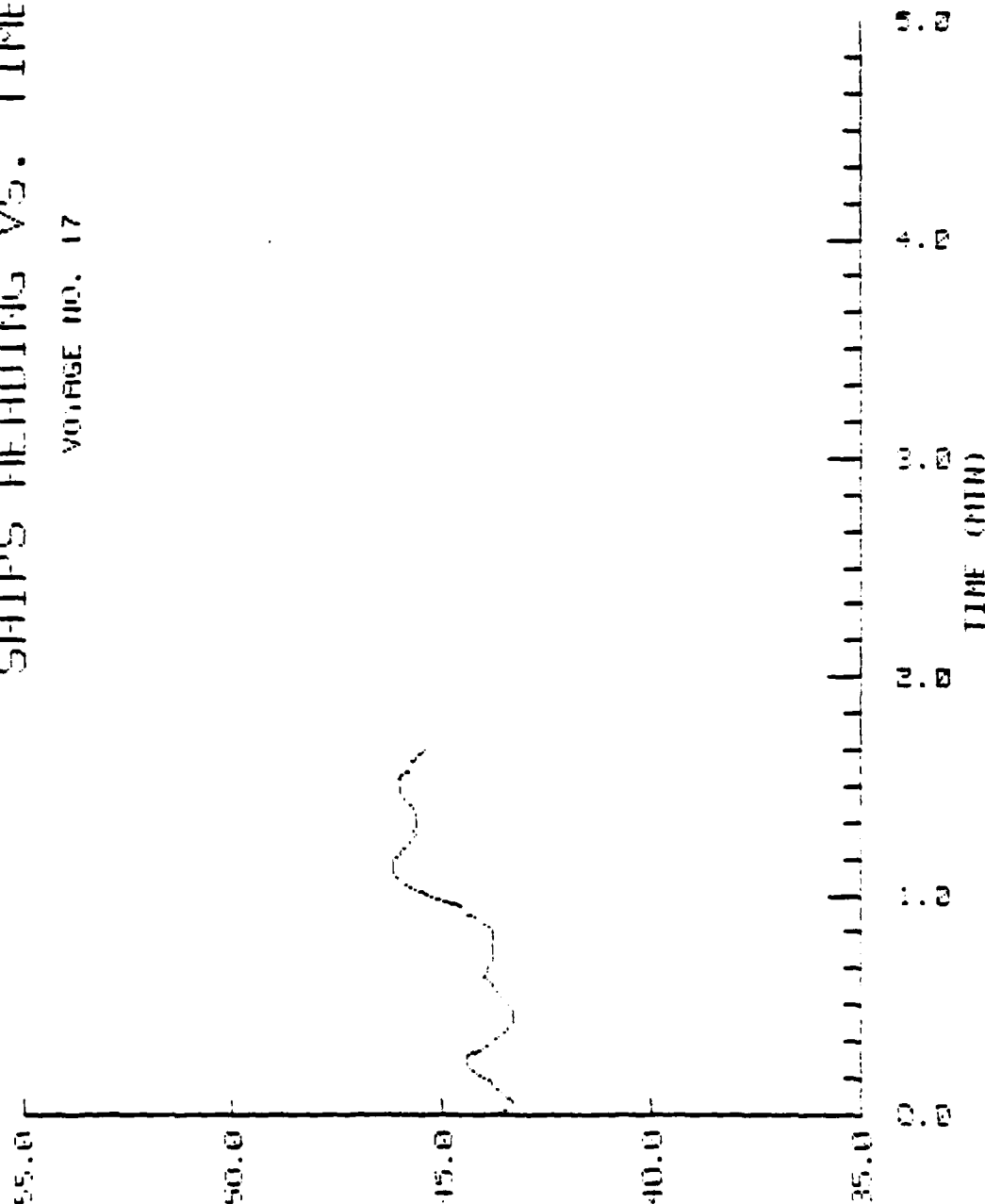
CUMULATIVE FREQUENCY

VOLUME NO. 17



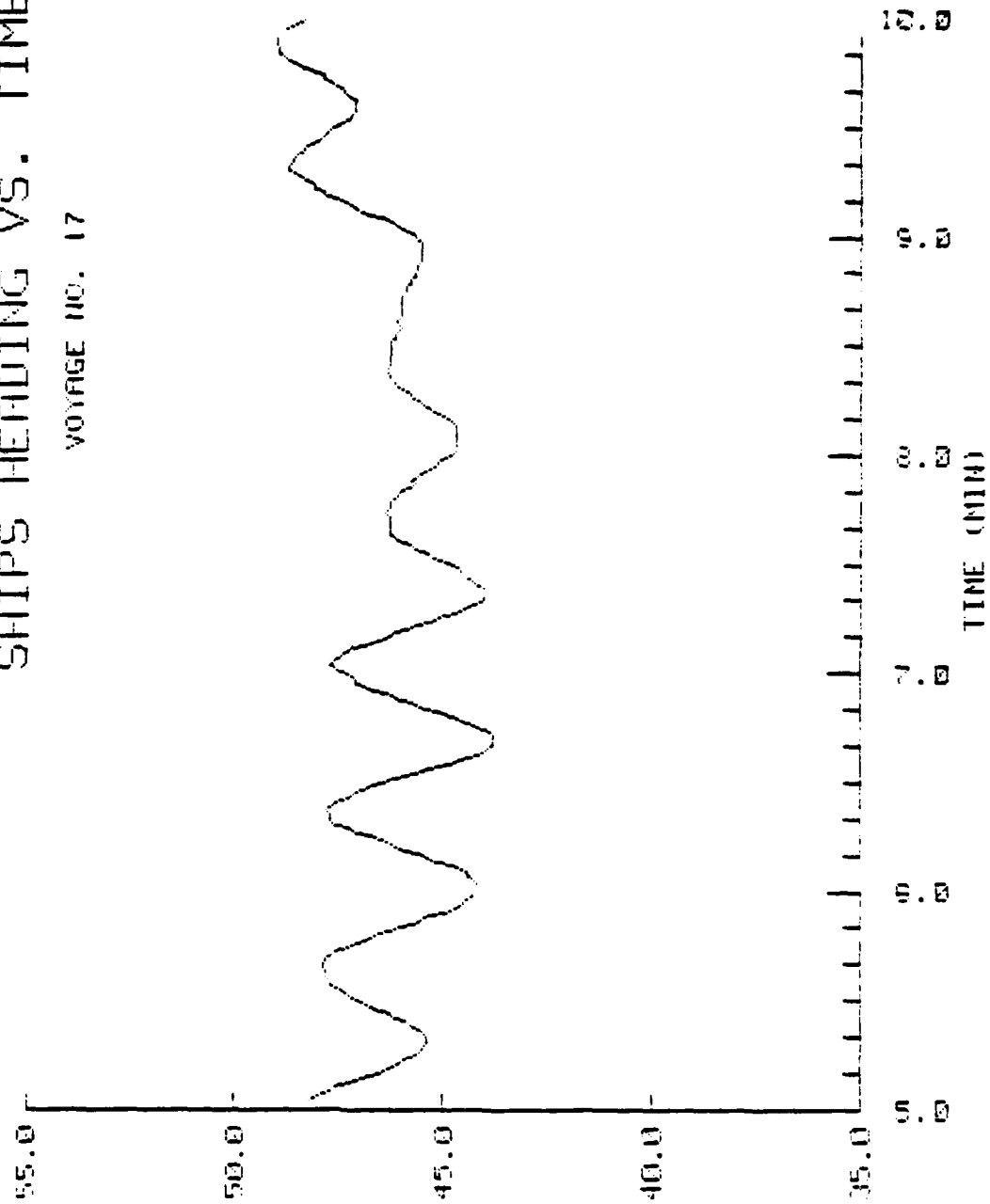
SHIPS HEADING VS. TIME

VOYAGE NO. 17



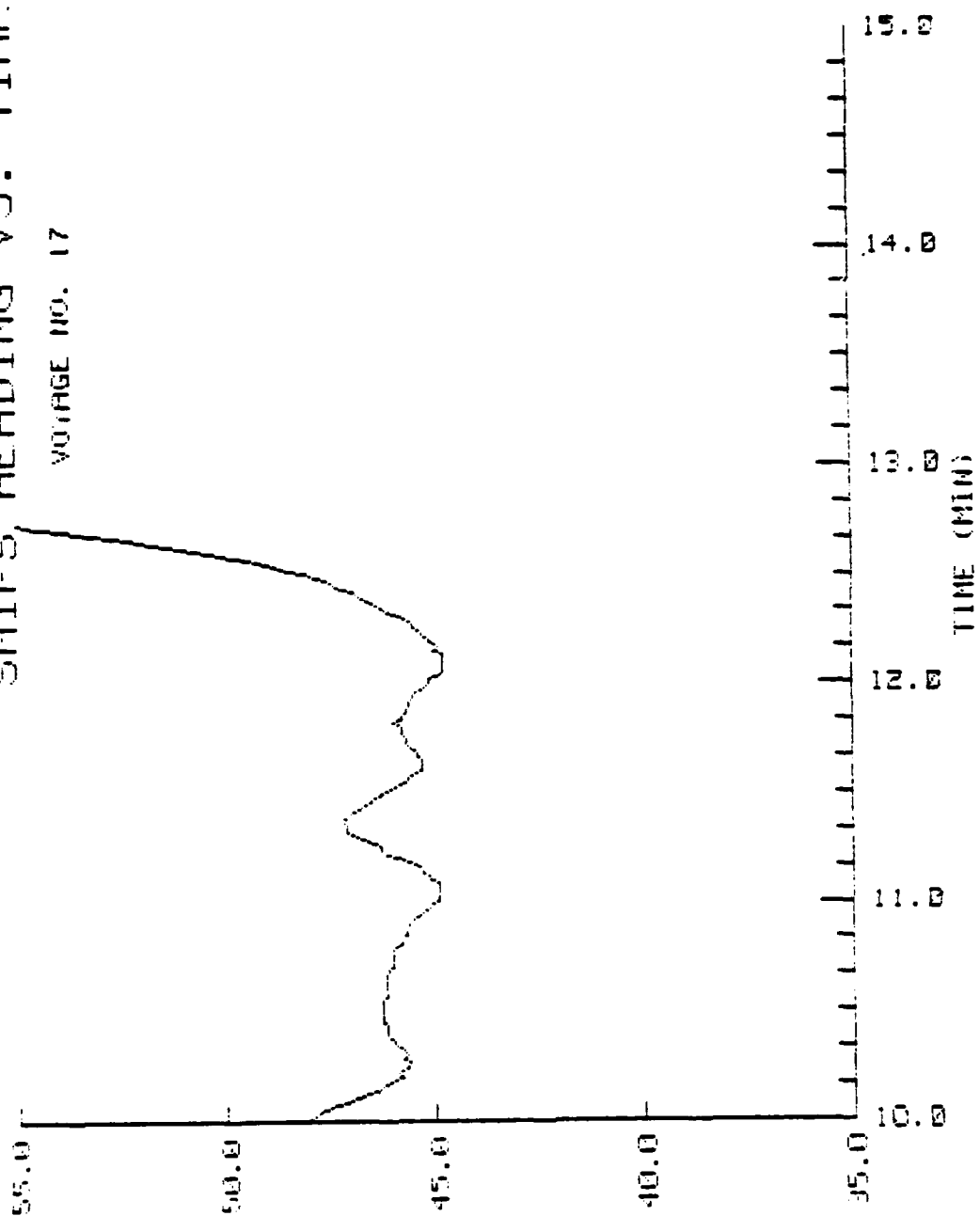
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SHIPS HEADING VS. TIME
VOYAGE NO. 17

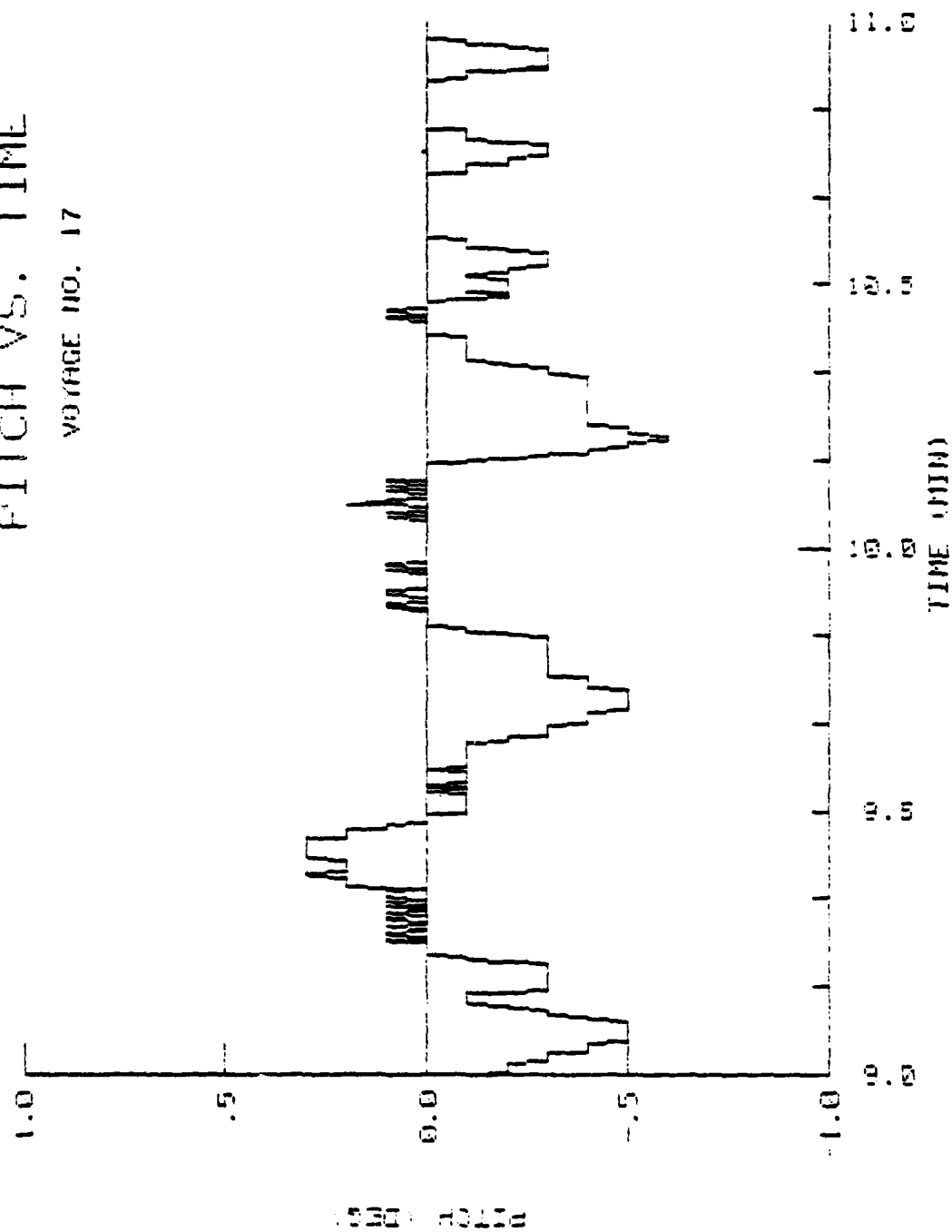


53.0 52.0 51.0 50.0 49.0 48.0 47.0 46.0 45.0 44.0 43.0 42.0 41.0 40.0 39.0 38.0 37.0 36.0 35.0

NO. 17

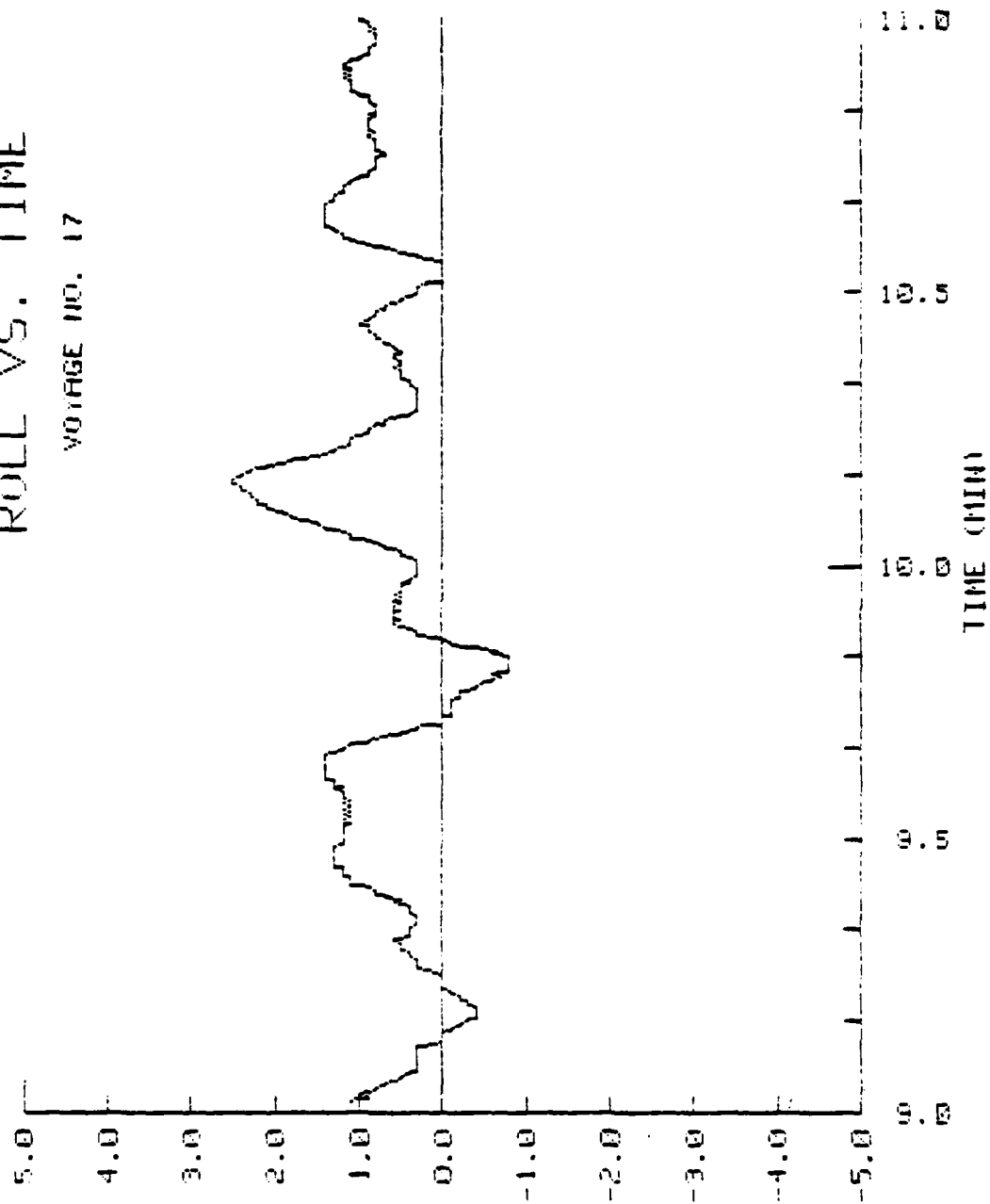
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PITCH VS. TIME VOYAGE NO. 17



ROLL VS. TIME

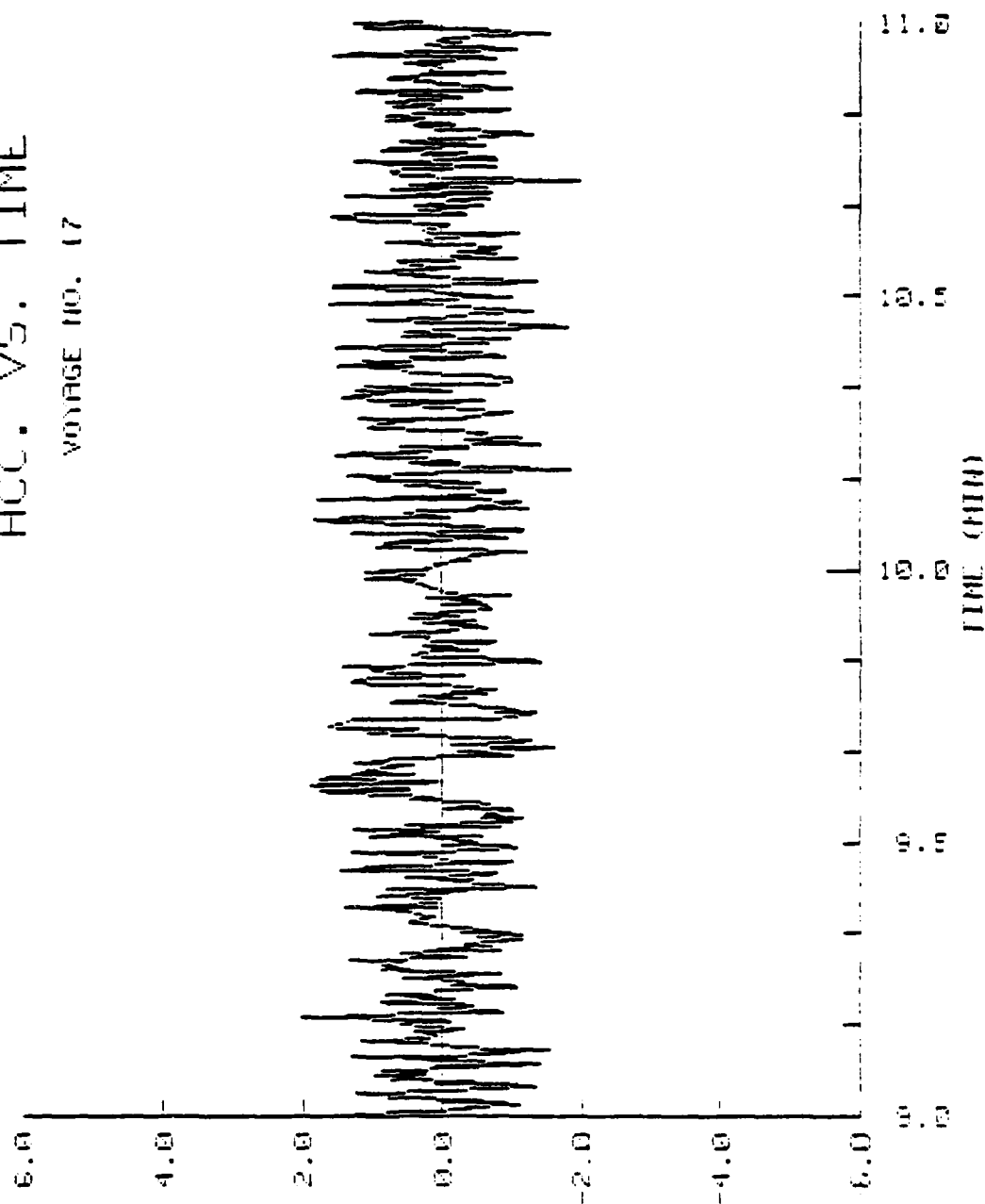
VOTAGE NO. 17



ROLL DEGS

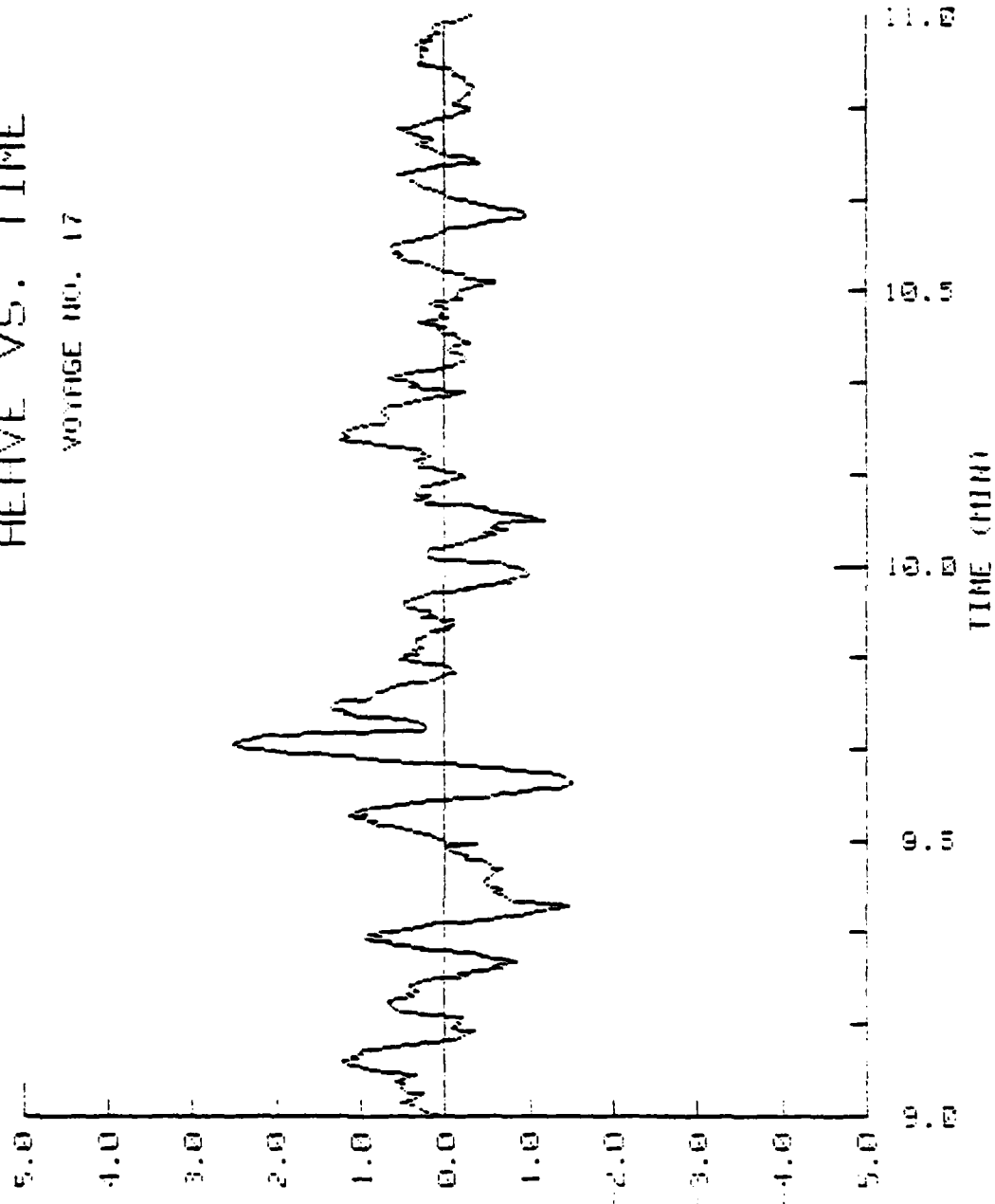
ACC. VS. TIME

VORAGE NO. 17



HEAVE VS. TIME

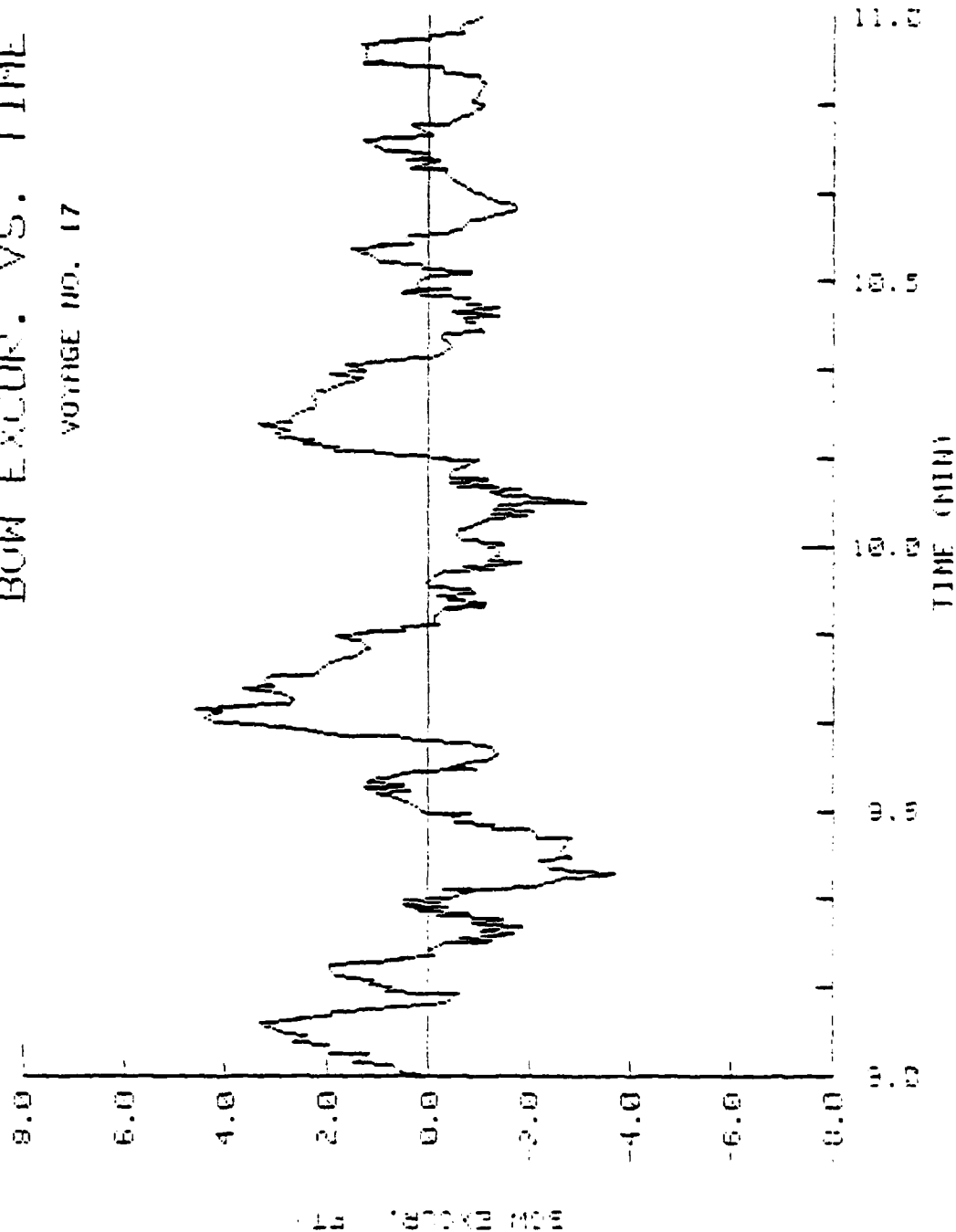
VOTAGE NO. 17



11-34107

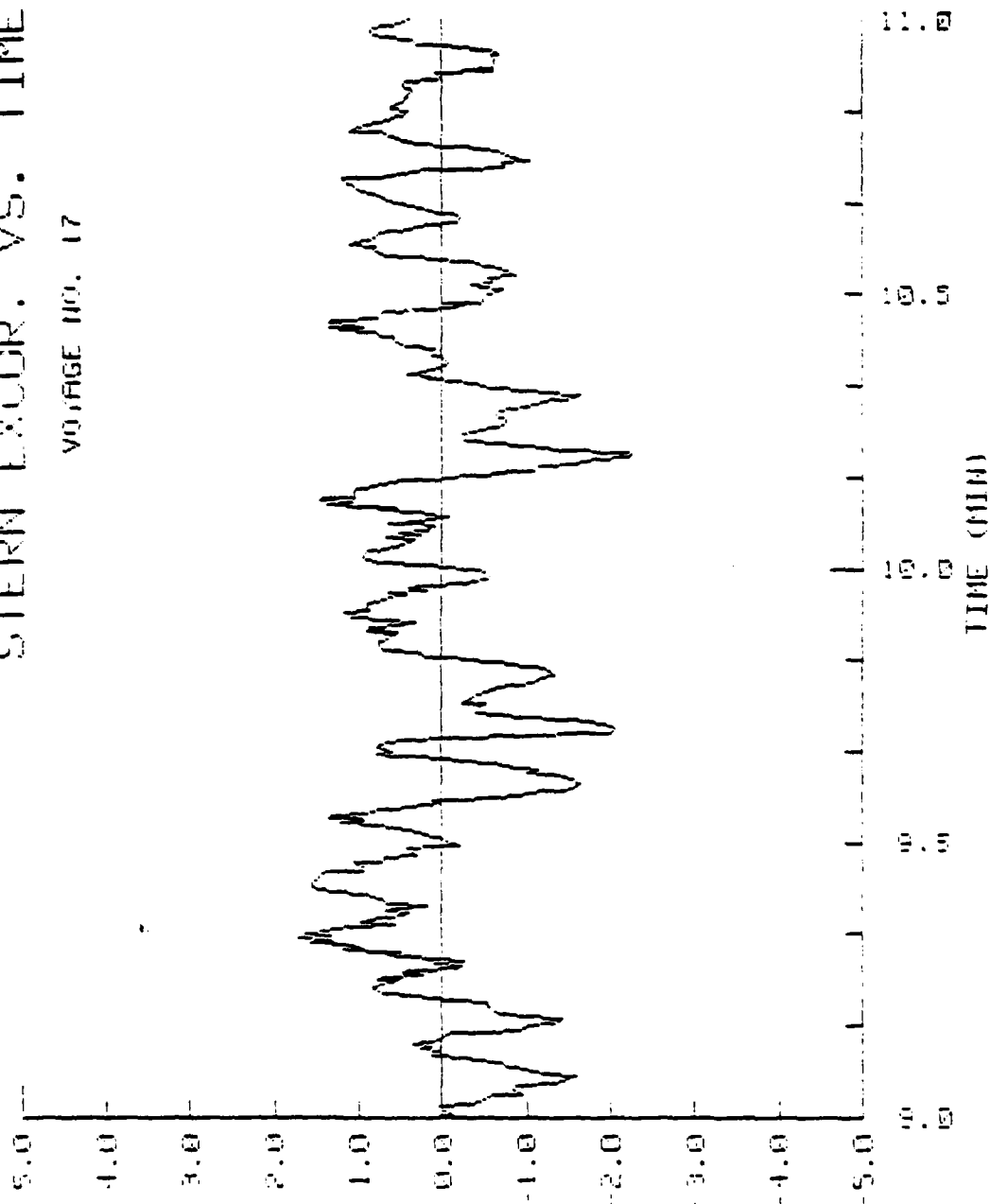
BCW EXCUR. VS. TIME

VOTAGE NO. 17



STERN EXCUR. VS. TIME

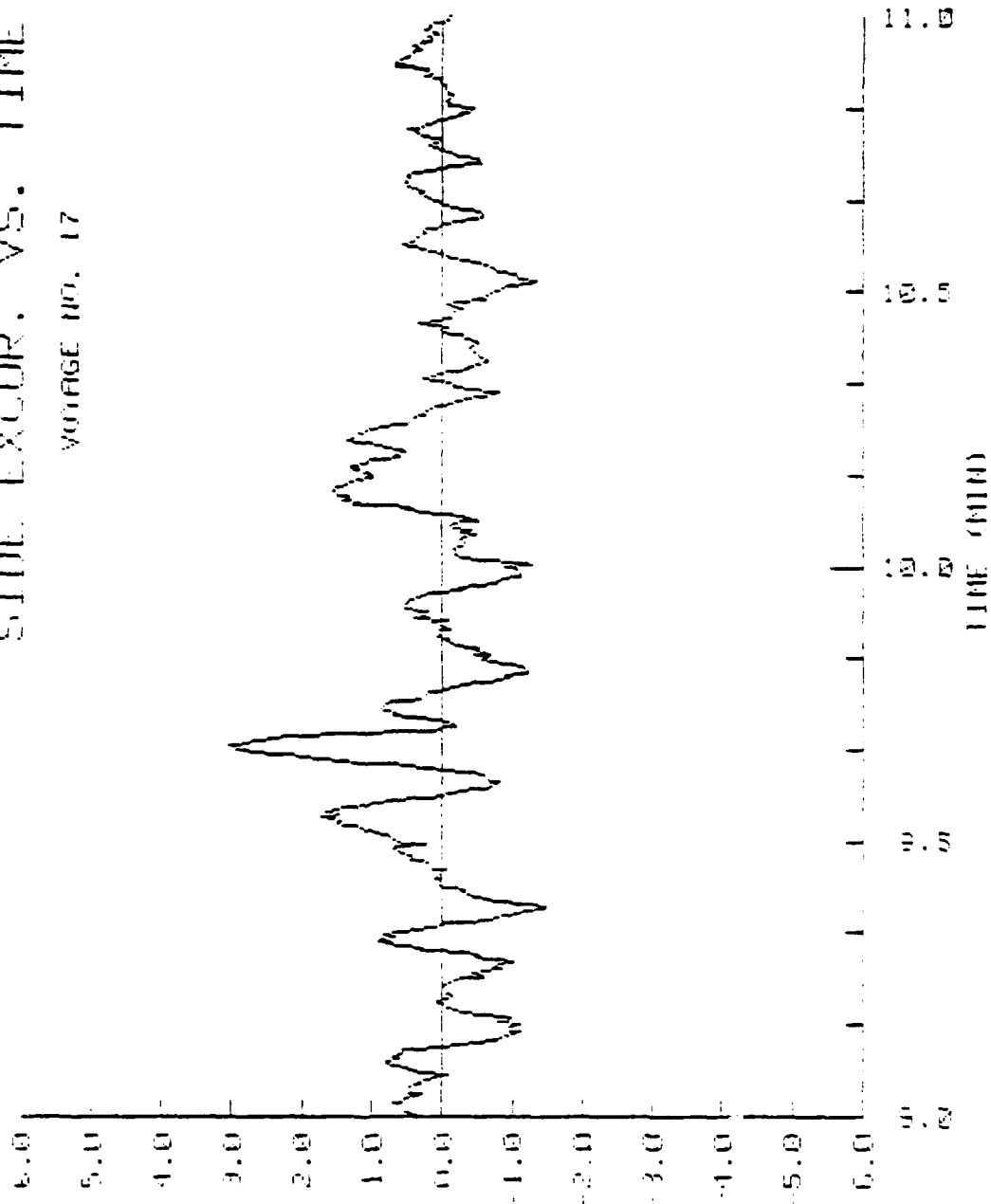
VOLUME NO. 17



STERN EXCUR. 17

SIDE EXCUR. VS. TIME

VOLUME NO. 17



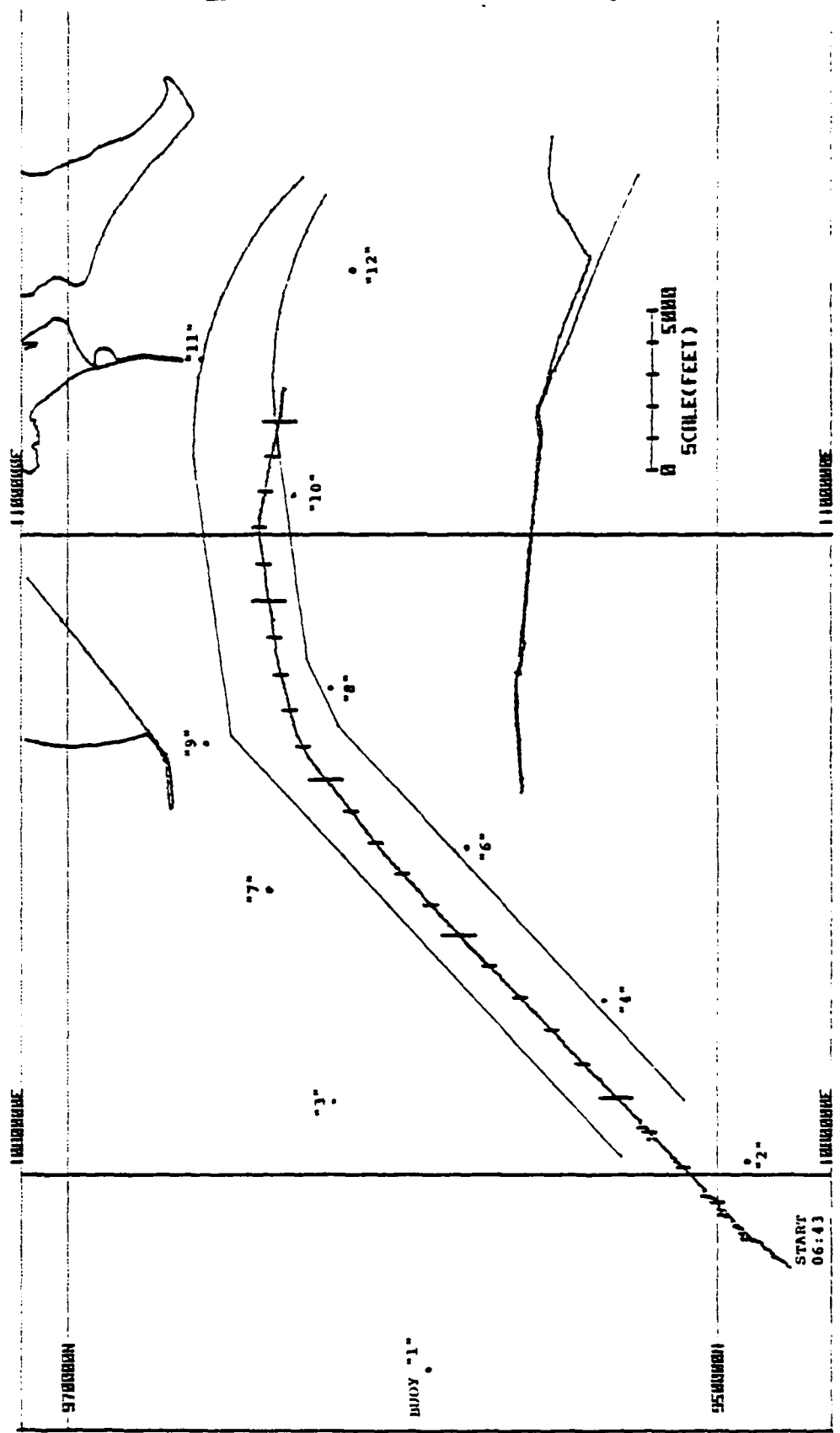
STATISTICAL SUMMARY

VOYAGE NO. 13

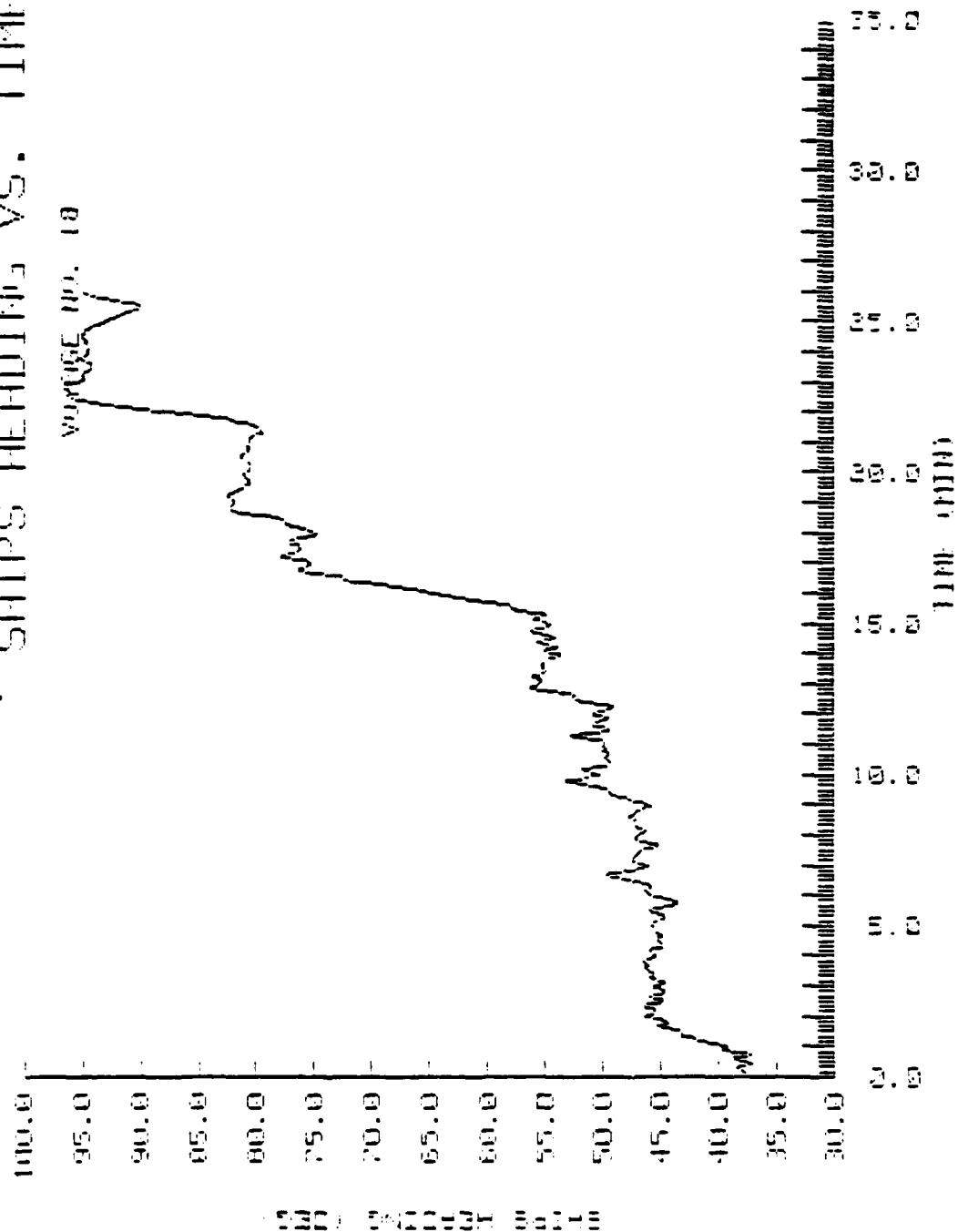
	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-0.1	1.7	.4	.5
ROLL (DEG)	1.0	2.6	1.1	1.2
NO. (FT SEC/SEC)	.0	1.6	.6	.6
HEAVE (FT)	.0	3.8	1.2	1.4
ROLL EXCUR. (FT)	.0	5.1	1.3	1.5
STEEP EXCUR. (FT)	-0.0	12.4	2.6	3.3
SIDE EXCUR (FT)	.0	4.3	1.5	1.7

VOYAGE NO. 10 SHIP TRACK

SCALE 1: 30000

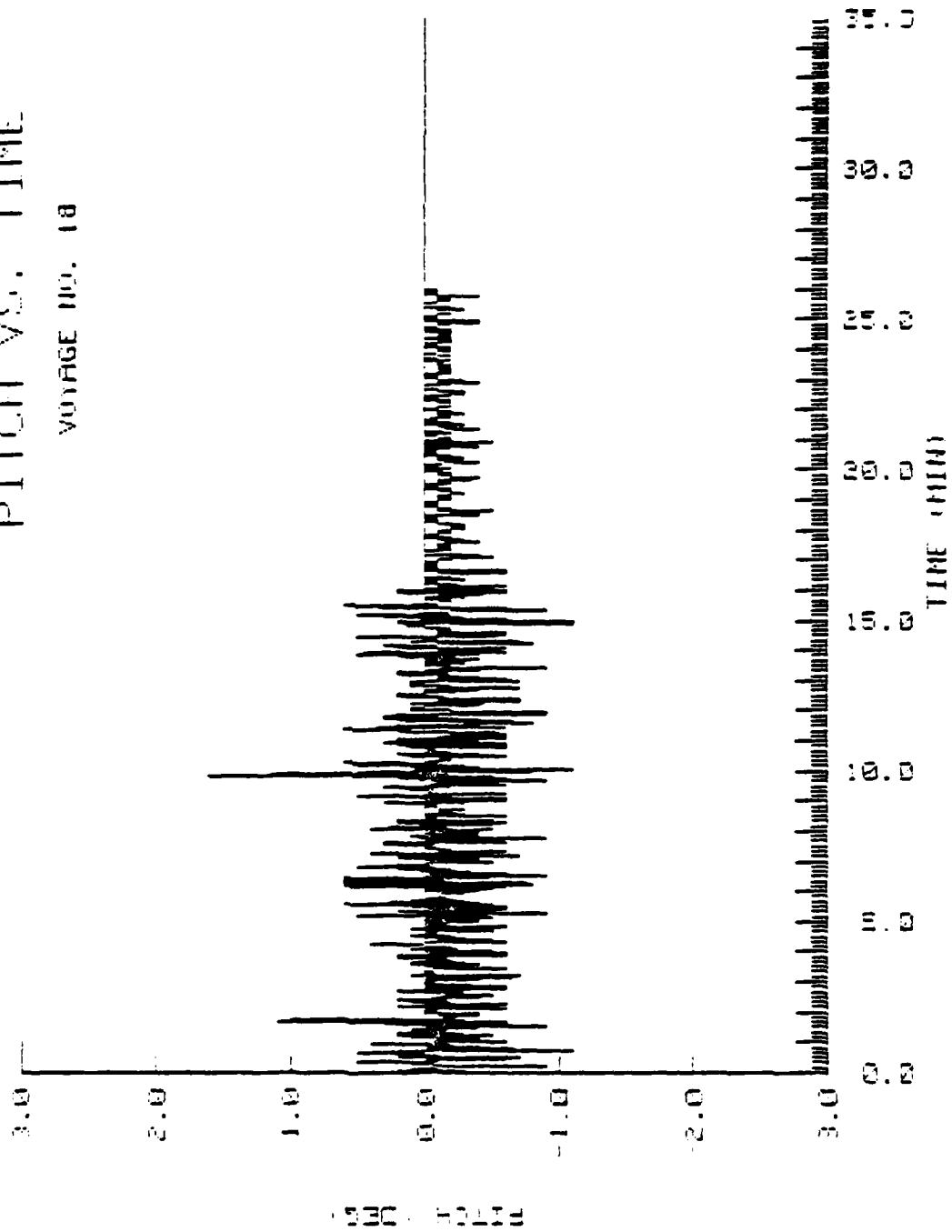


SHIPS HEADING VS. TIME



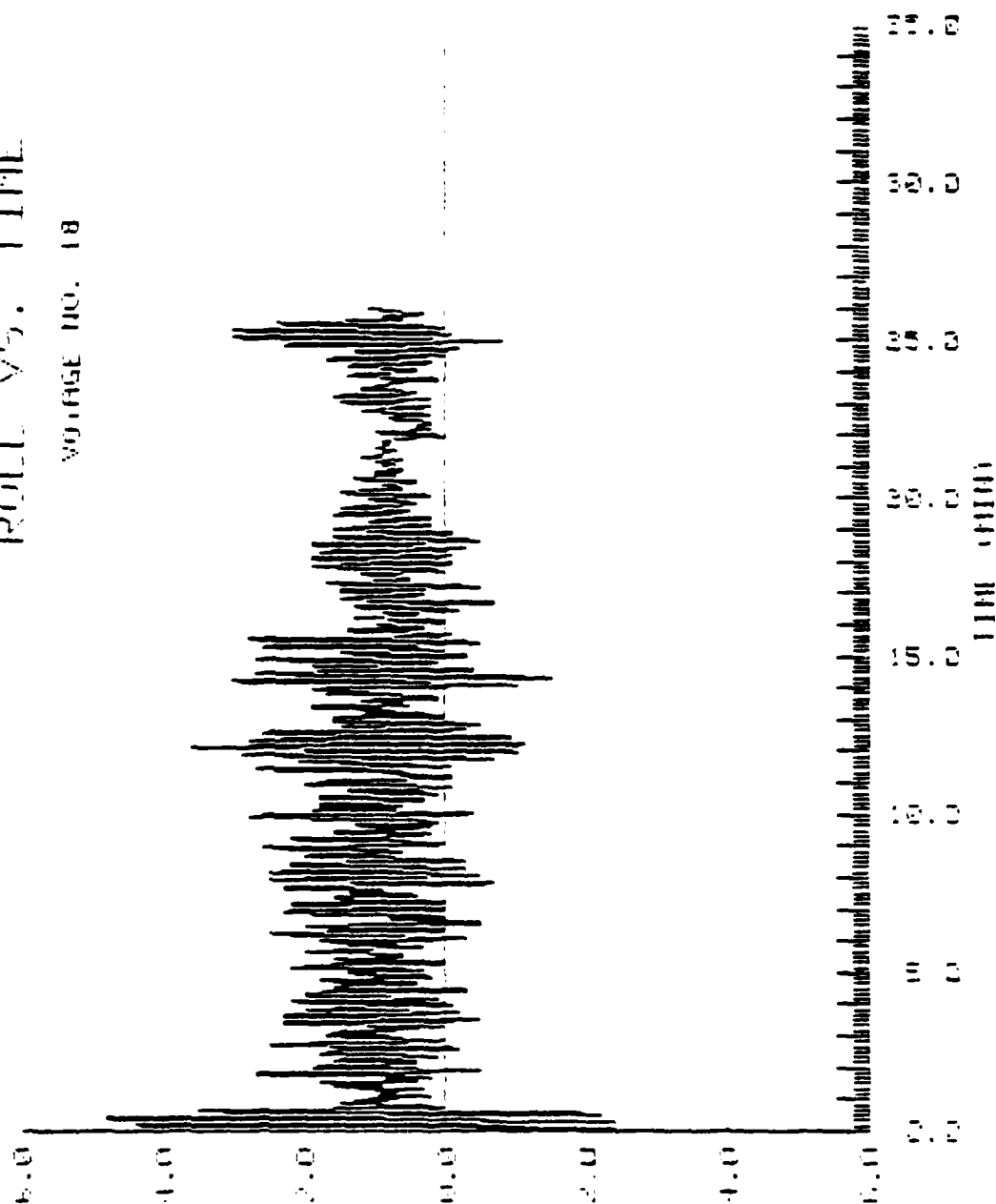
PITCH VS. TIME

VOLUME NO. 18



ROLL V% TIME

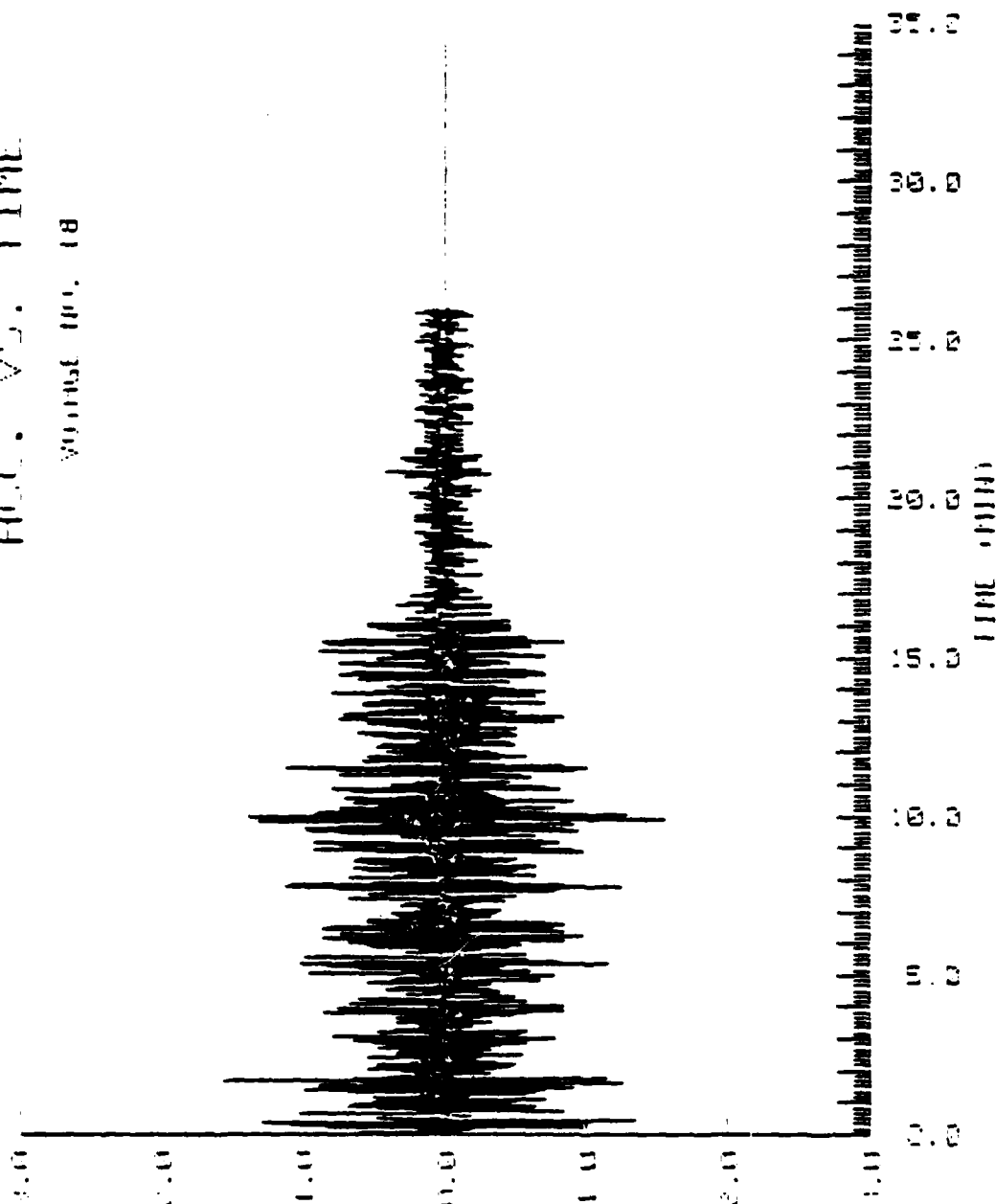
VOLUME NO. 18



220 7706

REC. VS. TIME

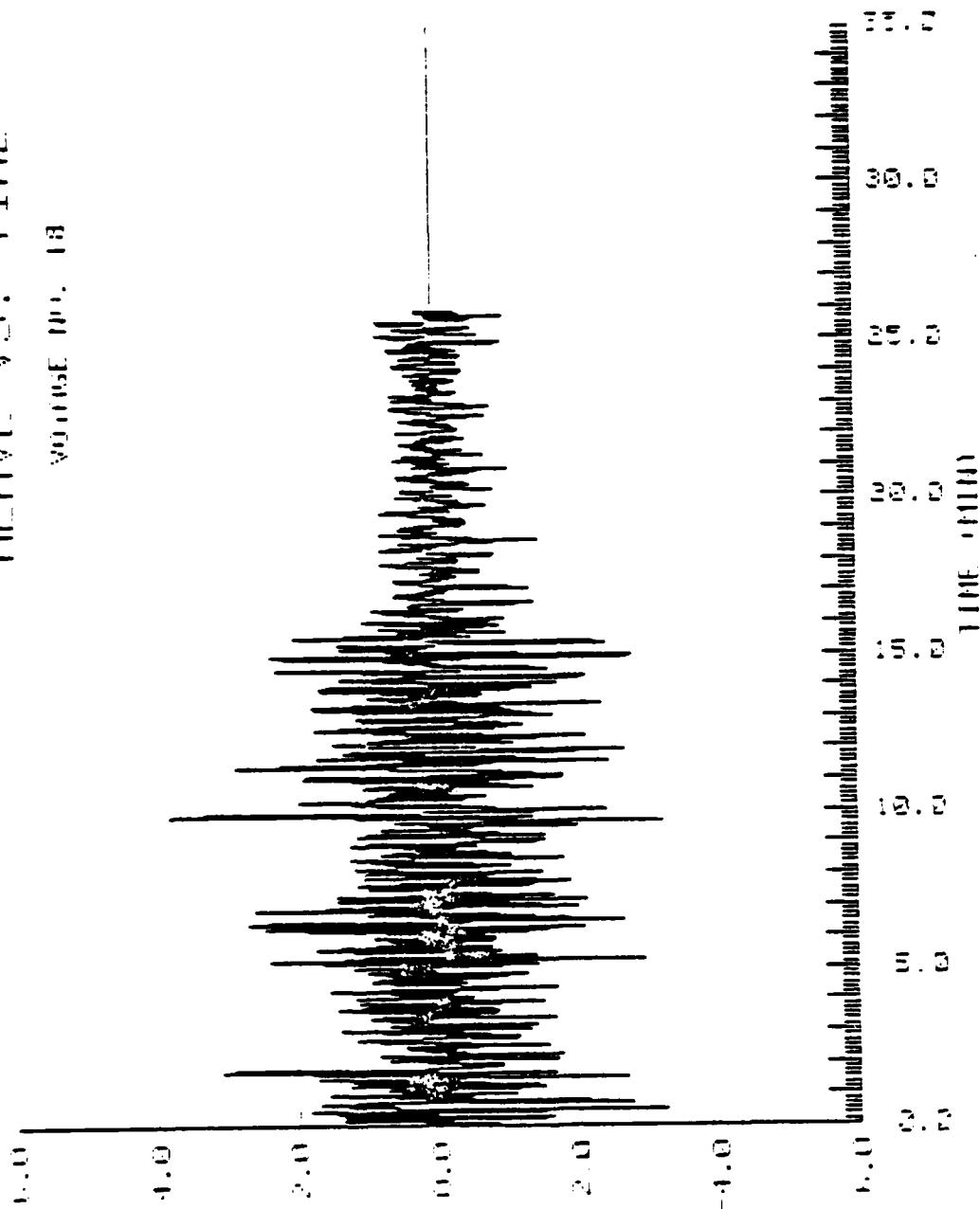
WIND NO. 18



100 100 100 100

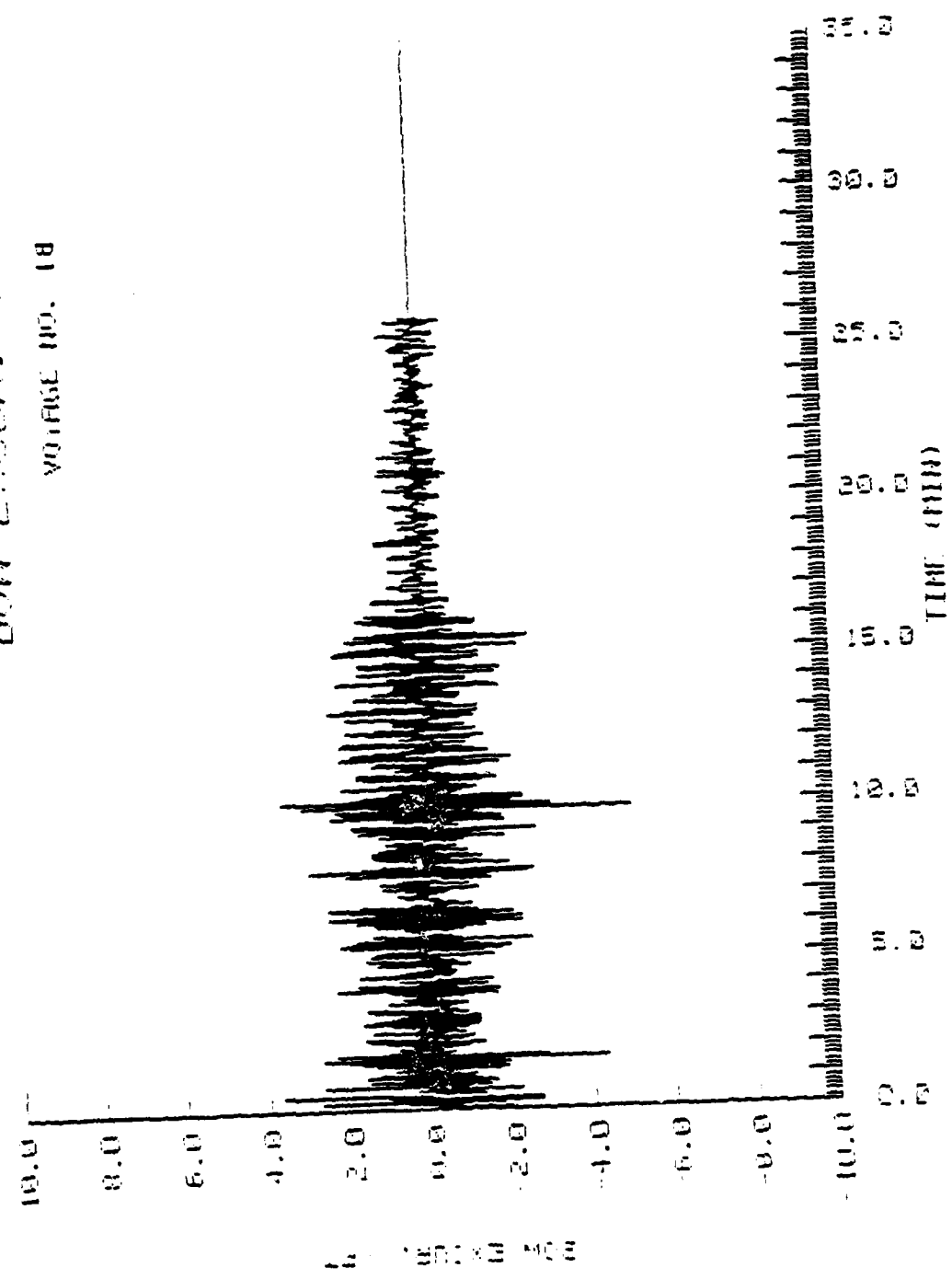
HEAVY VS. TIME

VOLUME 100, 18



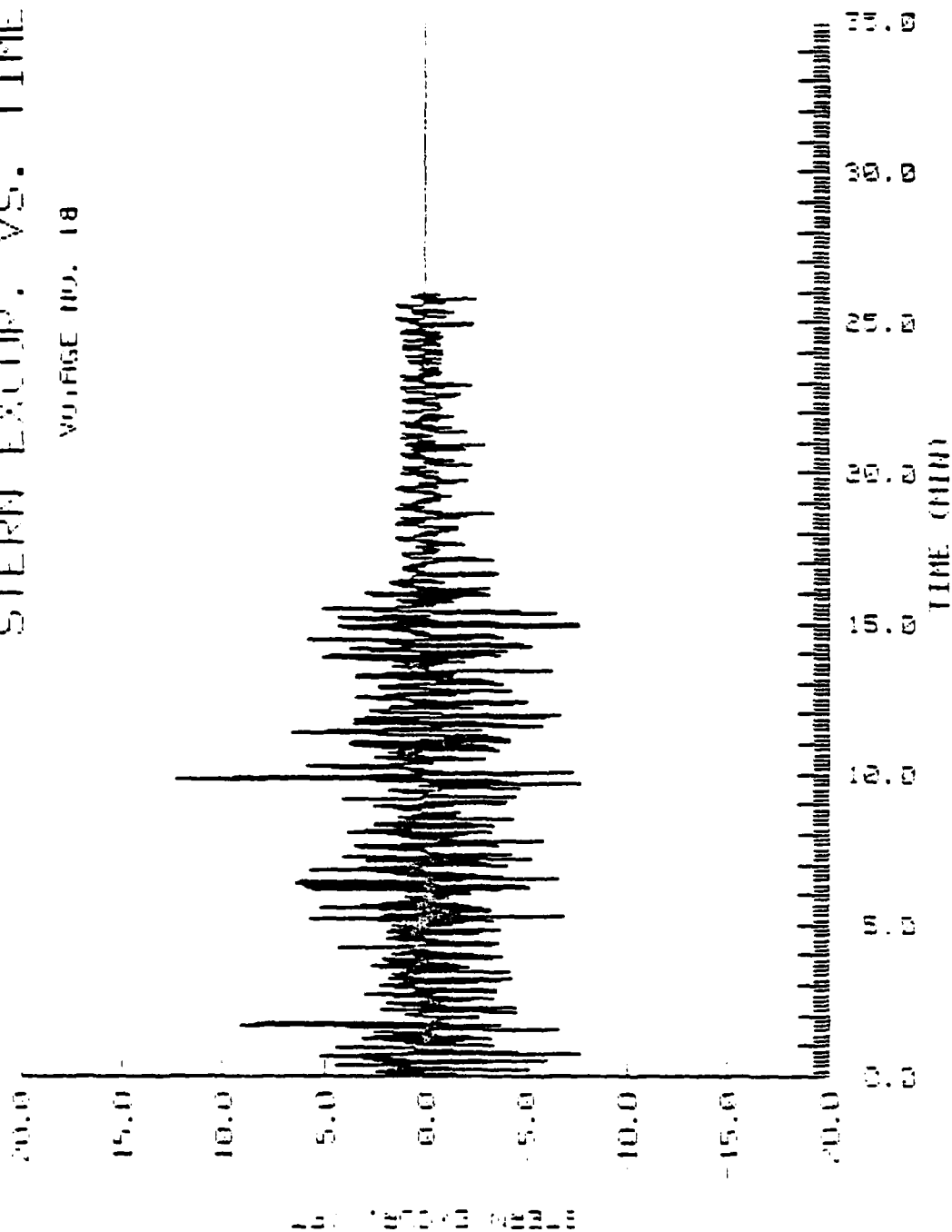
BOM EXCUR. VS. TIME

VOLAGE NO. 18



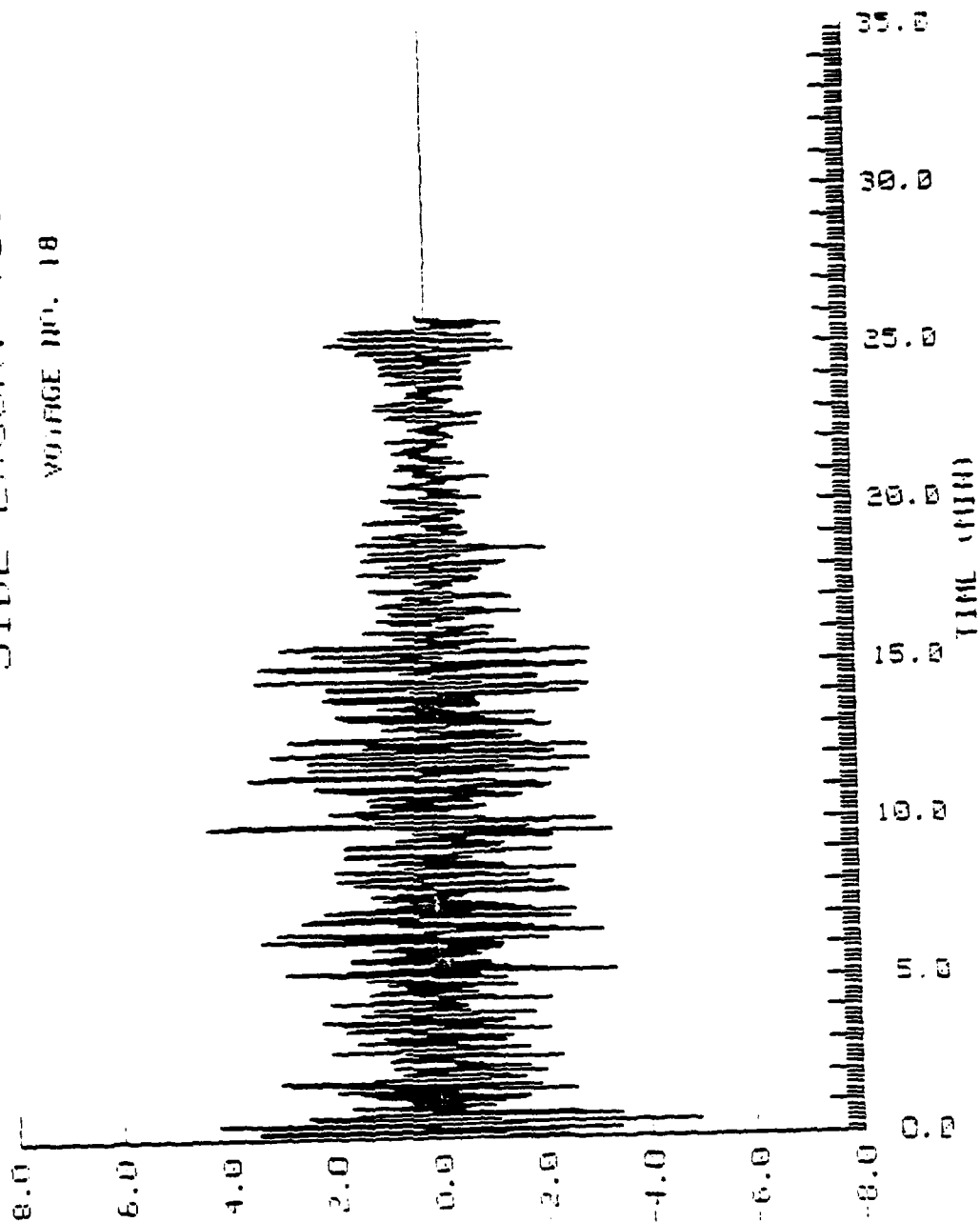
STERN EXCIP. VS. TIME

VOLUME NO. 18



SIDE EXCUR. VS. TIME

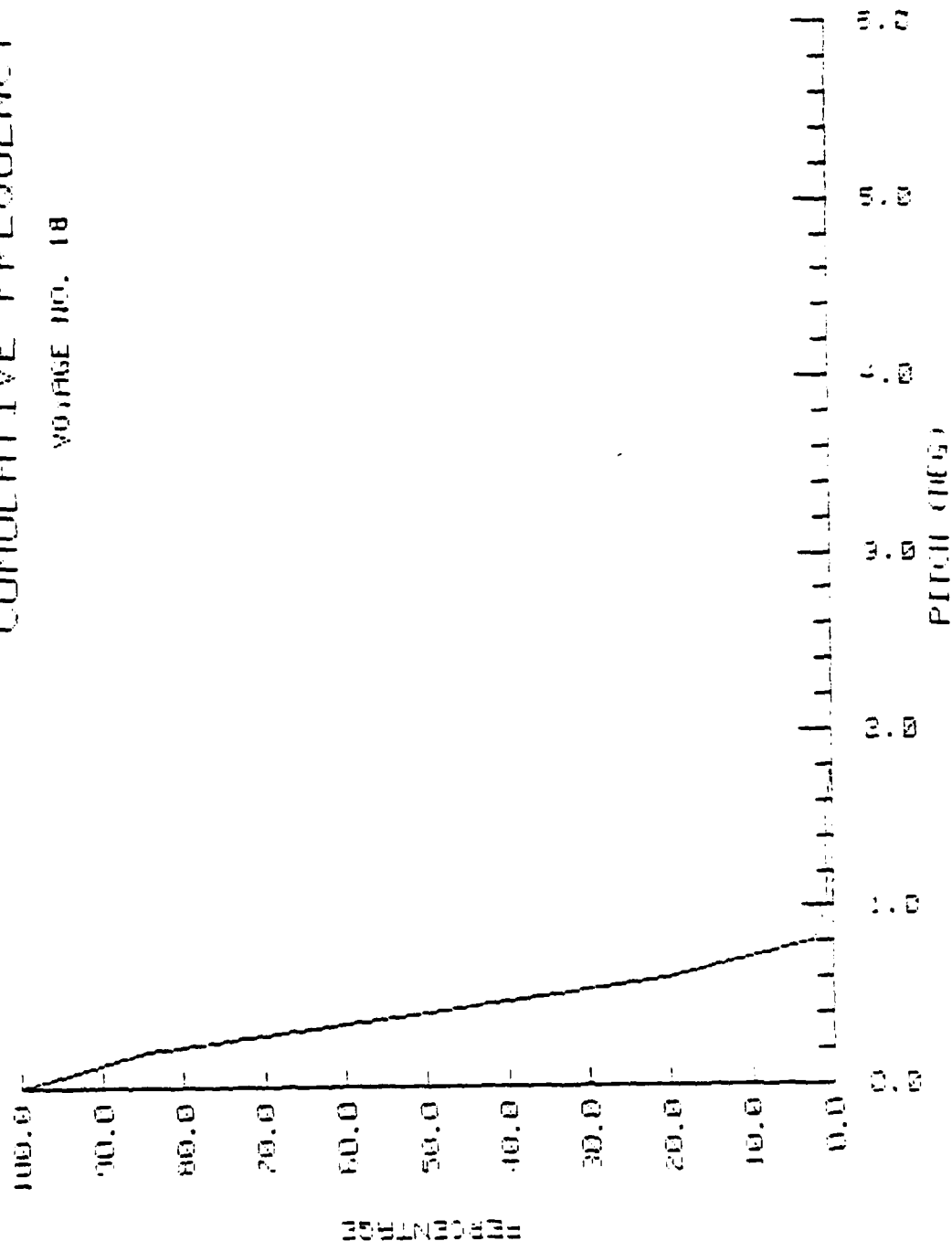
VOICE NO. 18



11. 12000 0016

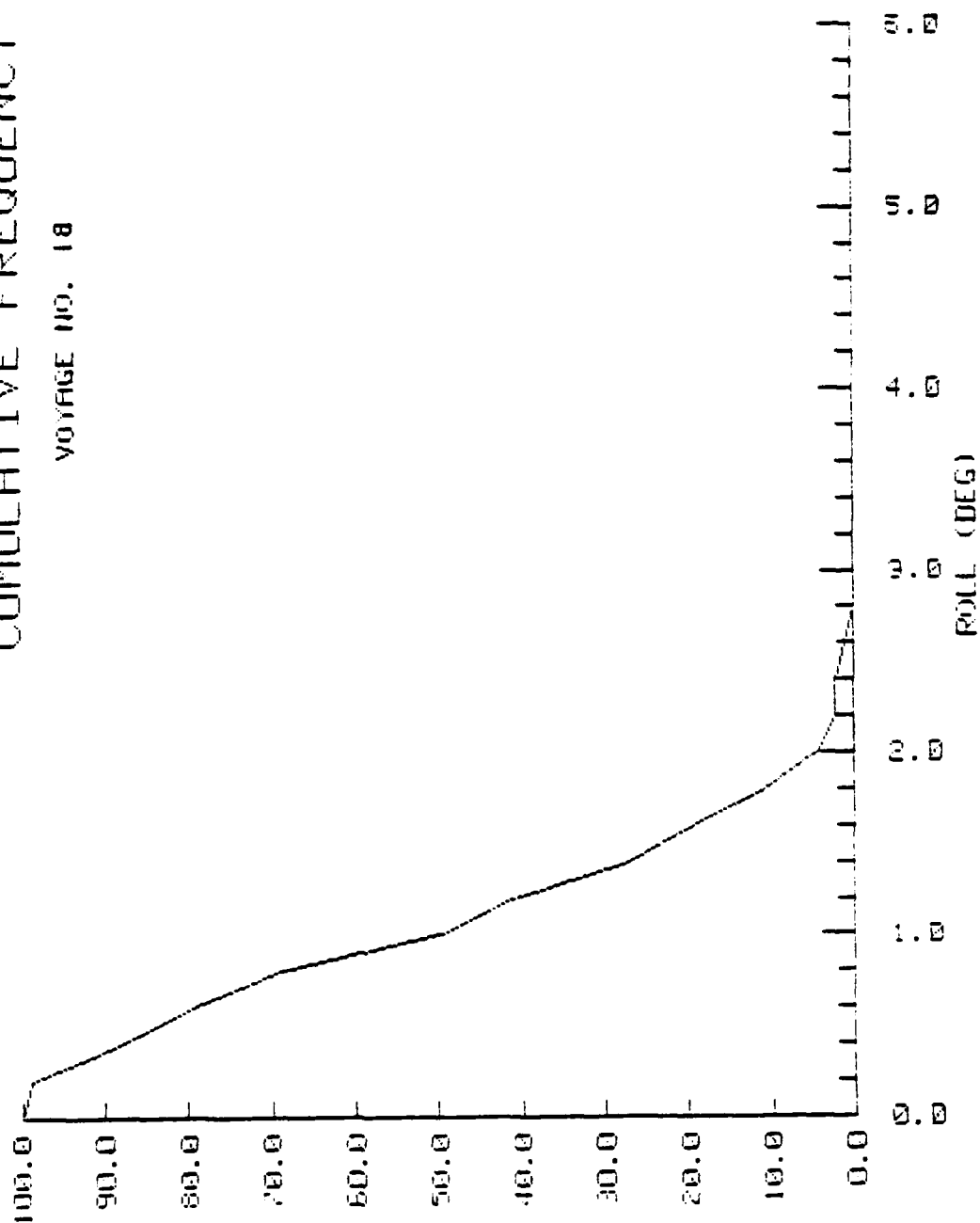
CUMULATIVE FREQUENCY

VOLUME NO. 18



CUMULATIVE FREQUENCY

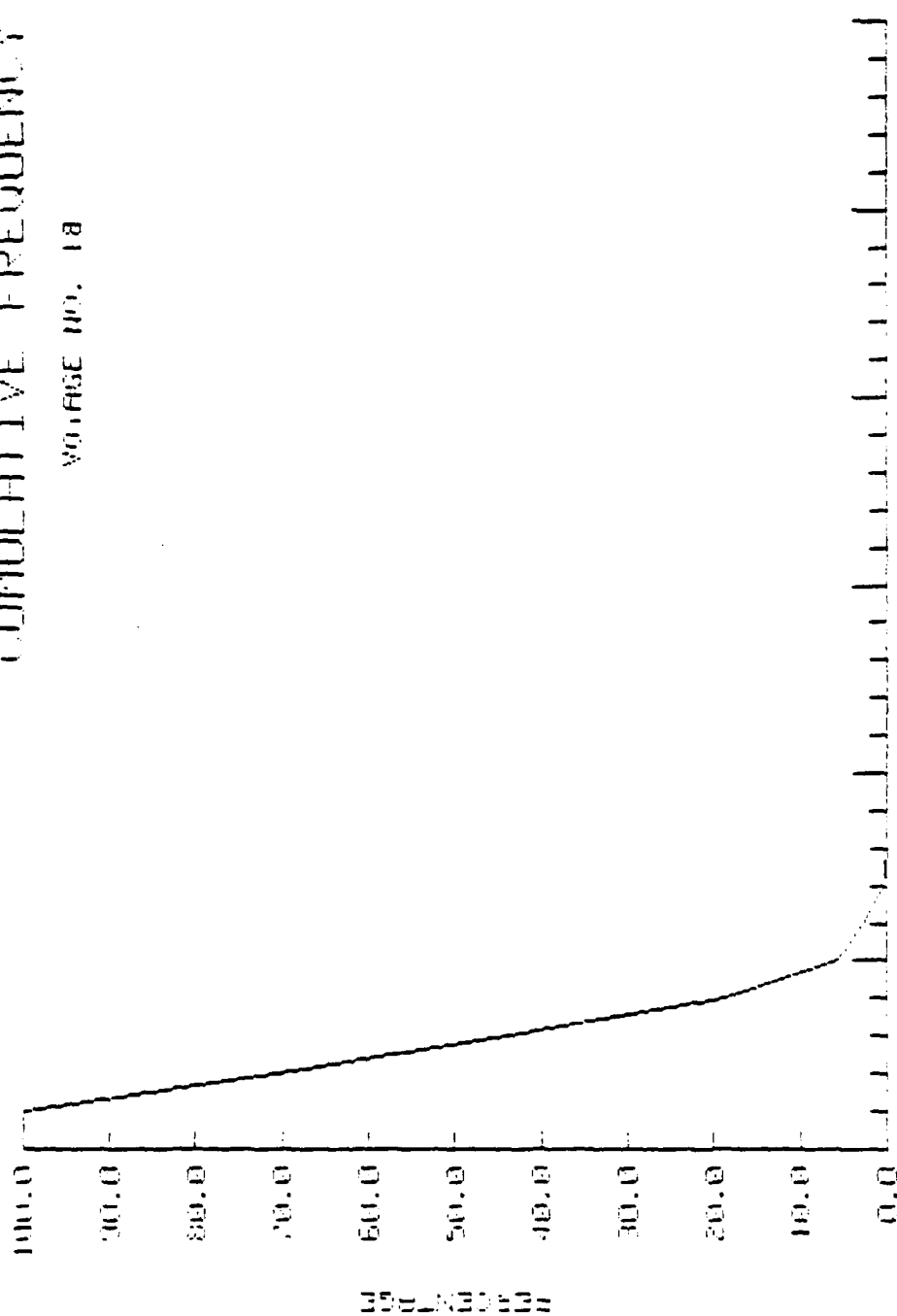
VOYAGE NO. 18



PERCENT

CUMULATIVE FREQUENCY

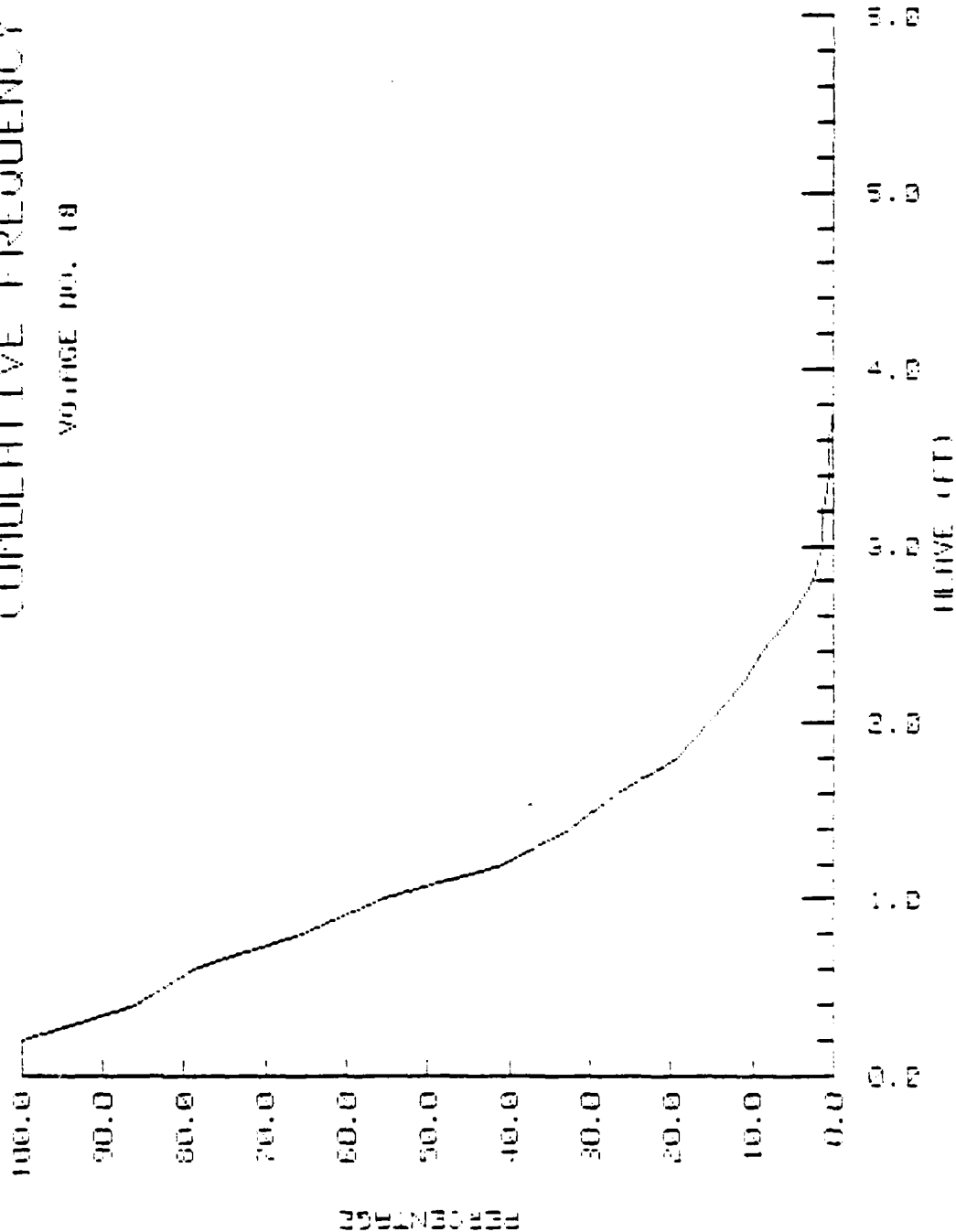
VOLAGE NO. 18



NO. OF SECONDS

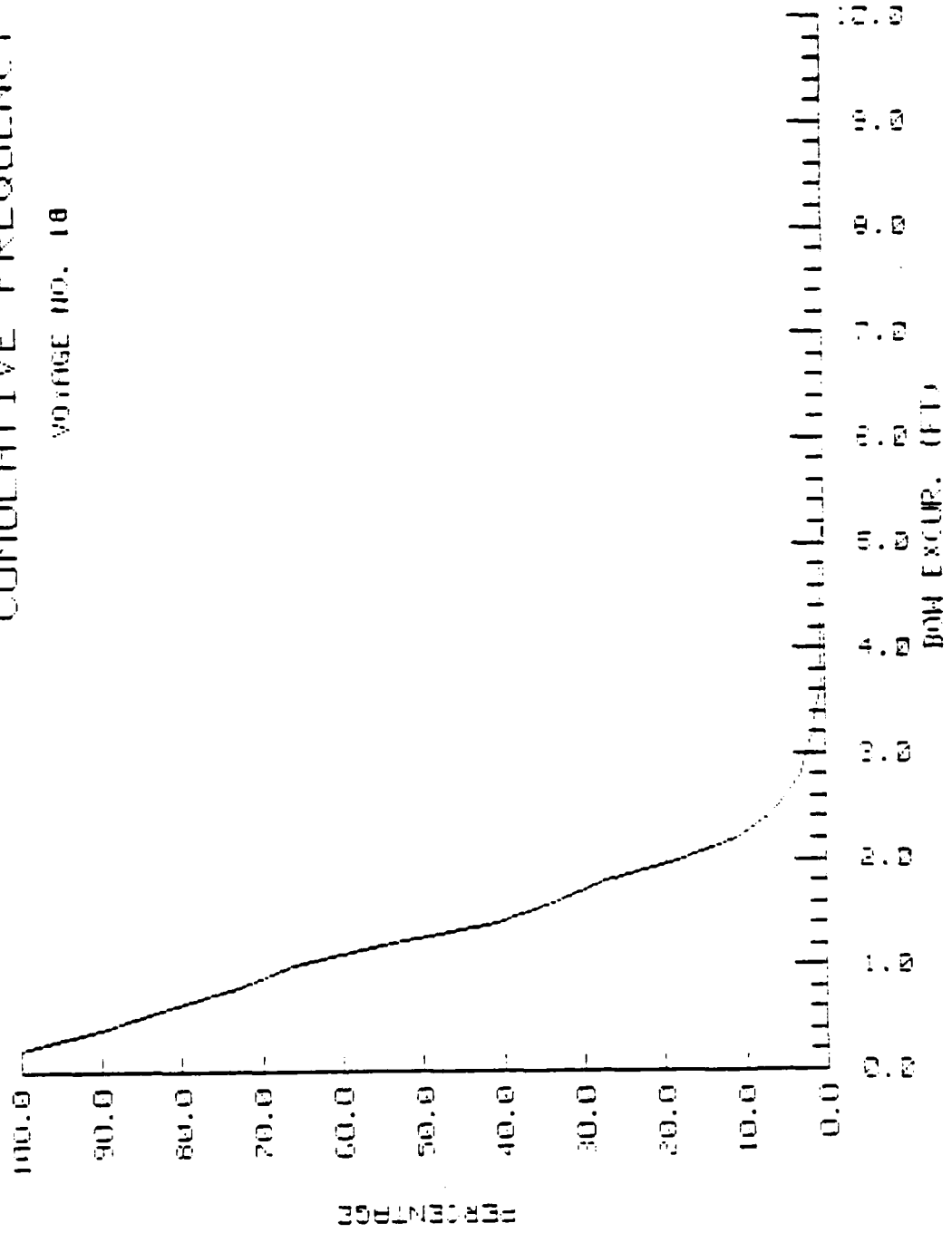
CUMULATIVE FREQUENCY

VOLUME NO. 18



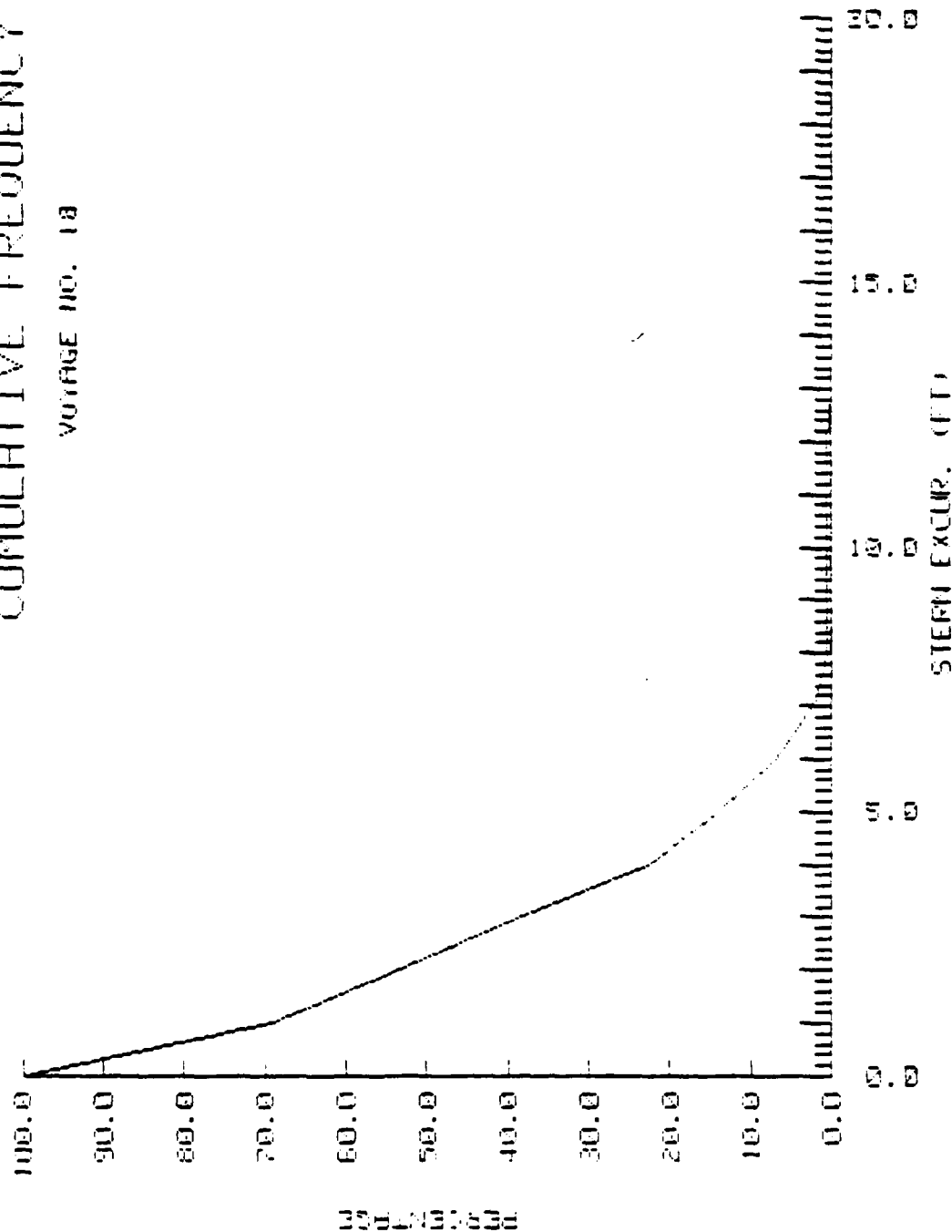
CUMULATIVE FREQUENCY

VOLUME NO. 18



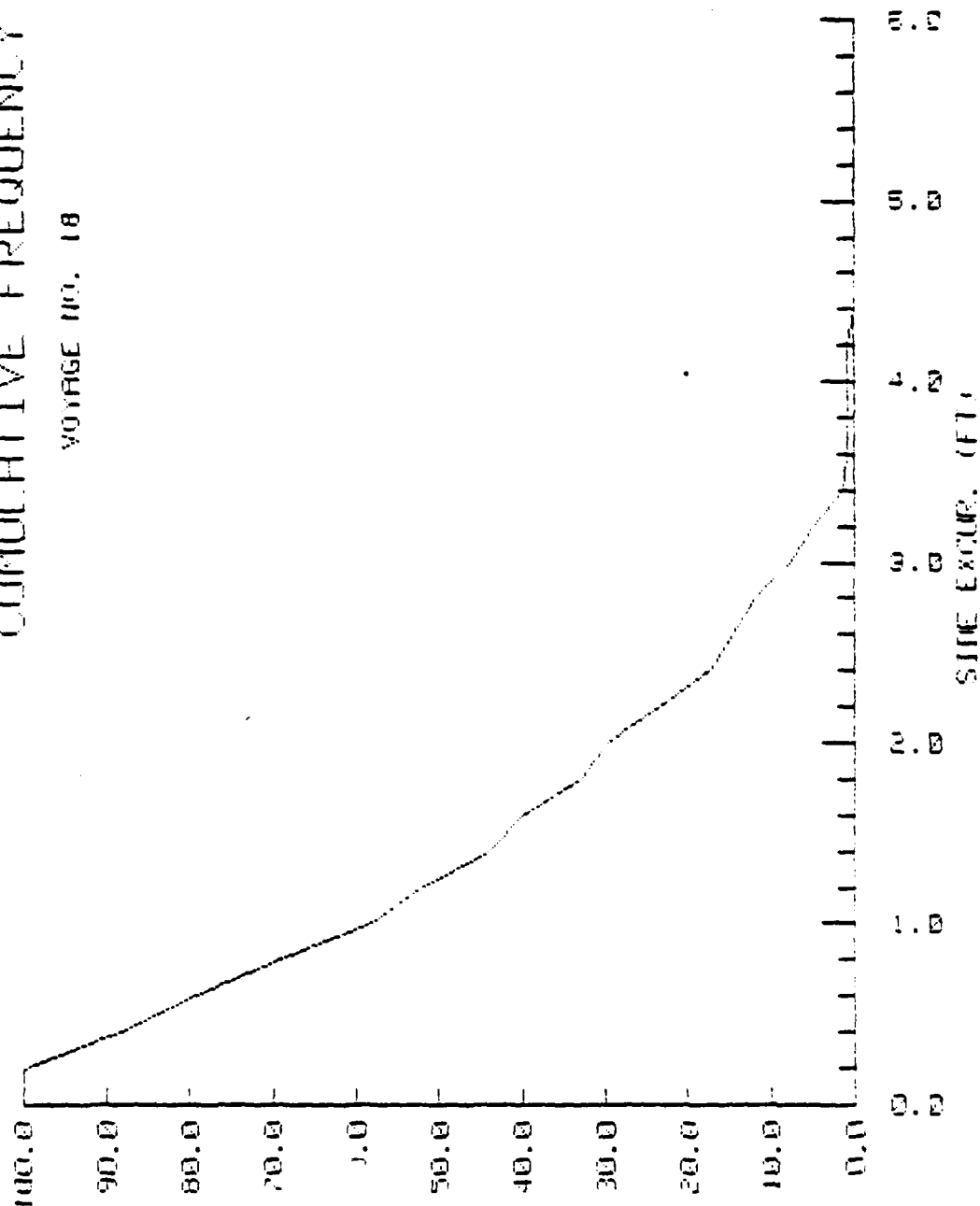
CUMULATIVE FREQUENCY

VOTAGE NO. 18



CUMULATIVE FREQUENCY

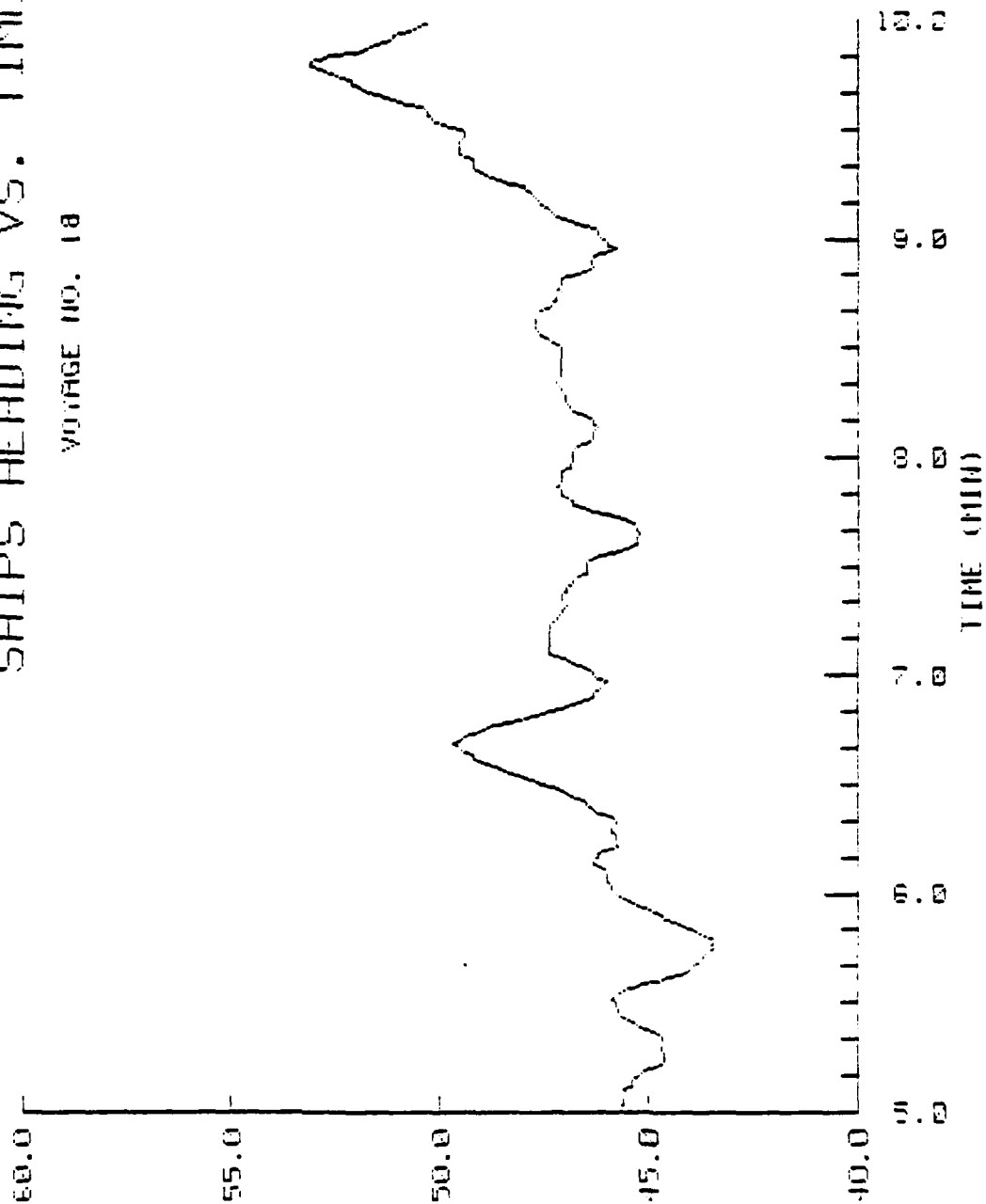
VOYAGE NO. 18



PERCENTAGE

SHIPS HEADING VS. TIME

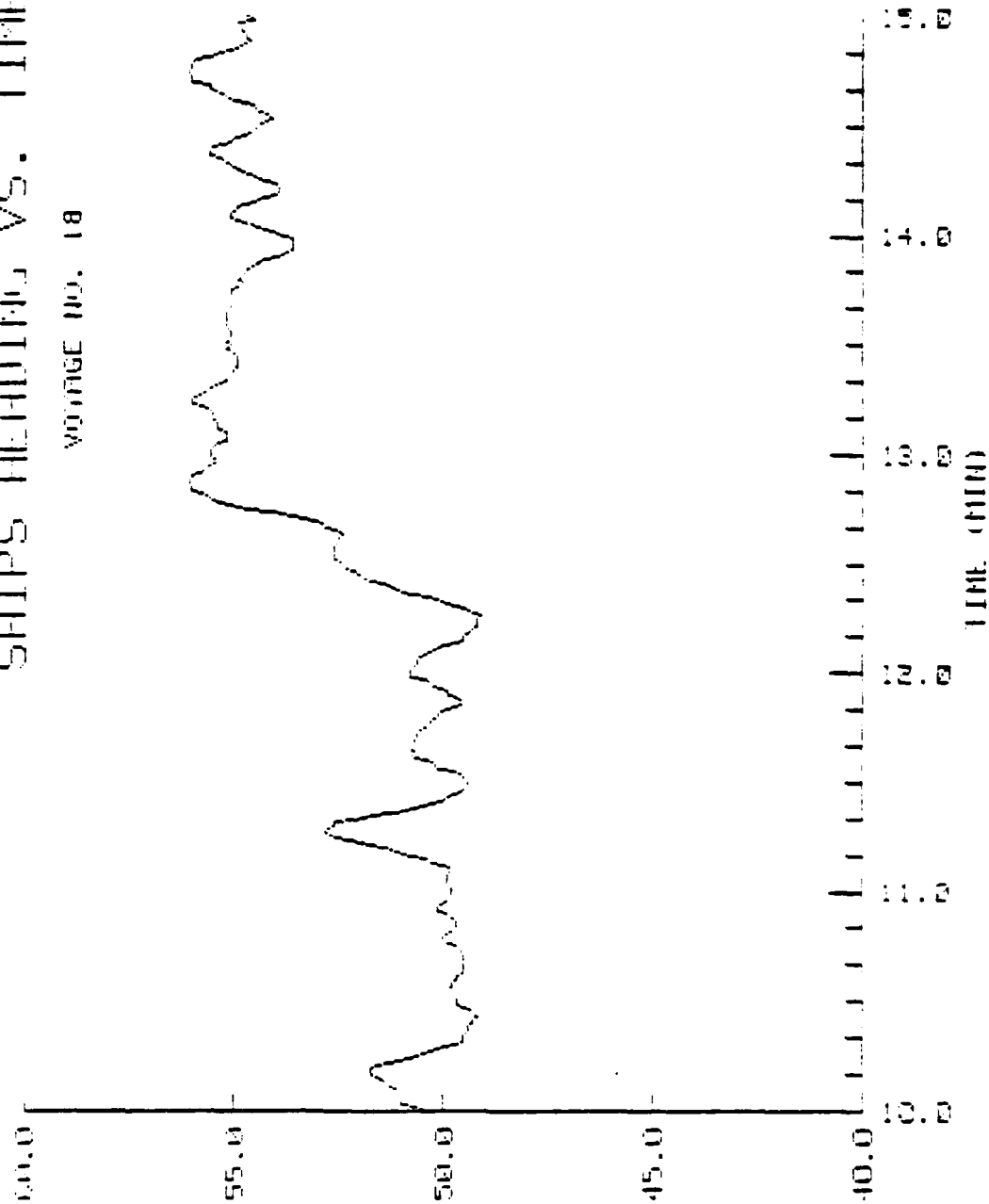
VOTAGE NO. 18



SHIPS HEADING (DEG)

SHIPS HEADING VS. TIME

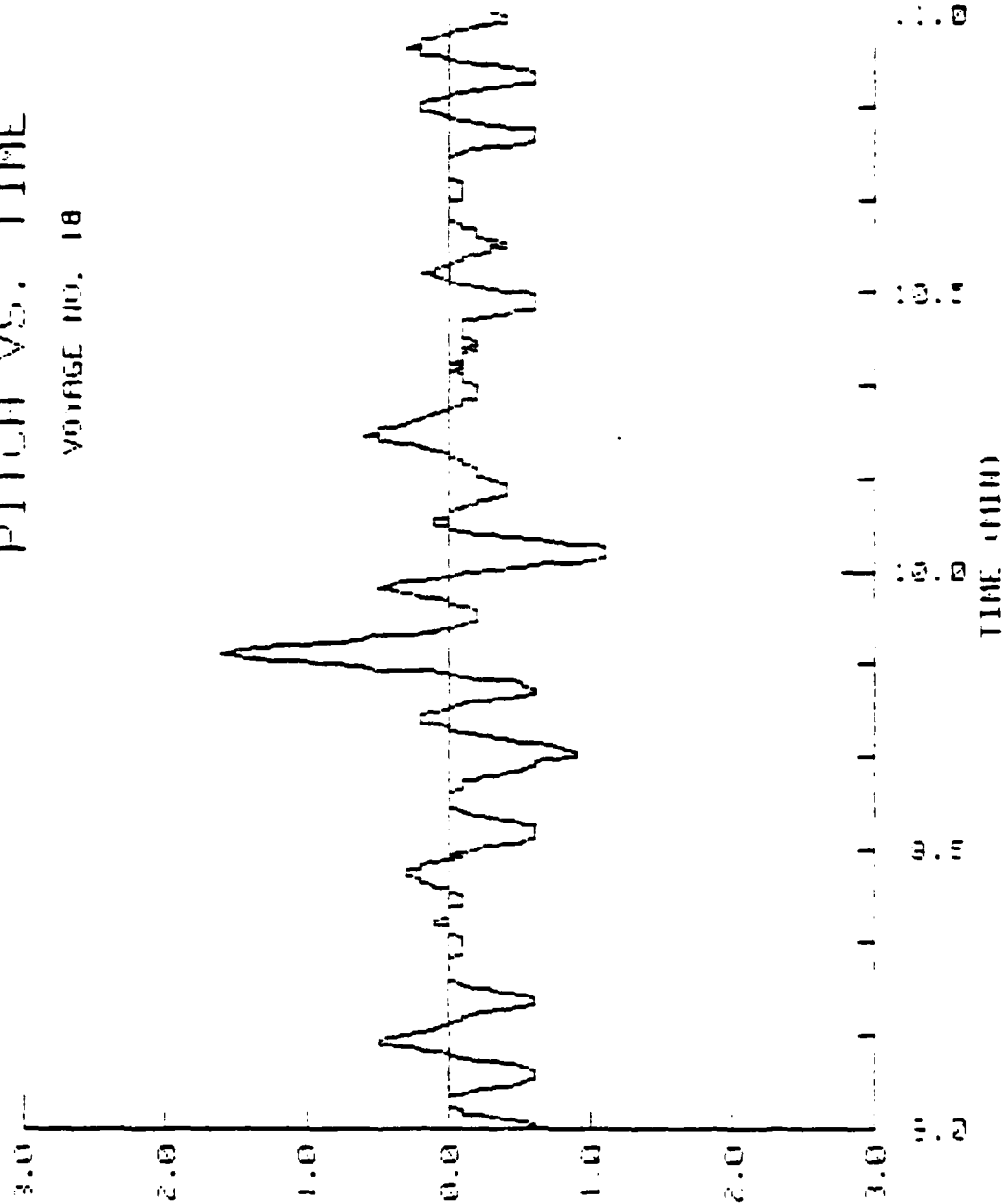
VOLUME NO. 18



SHIPS HEADING VS. TIME

PITCH VS. TIME

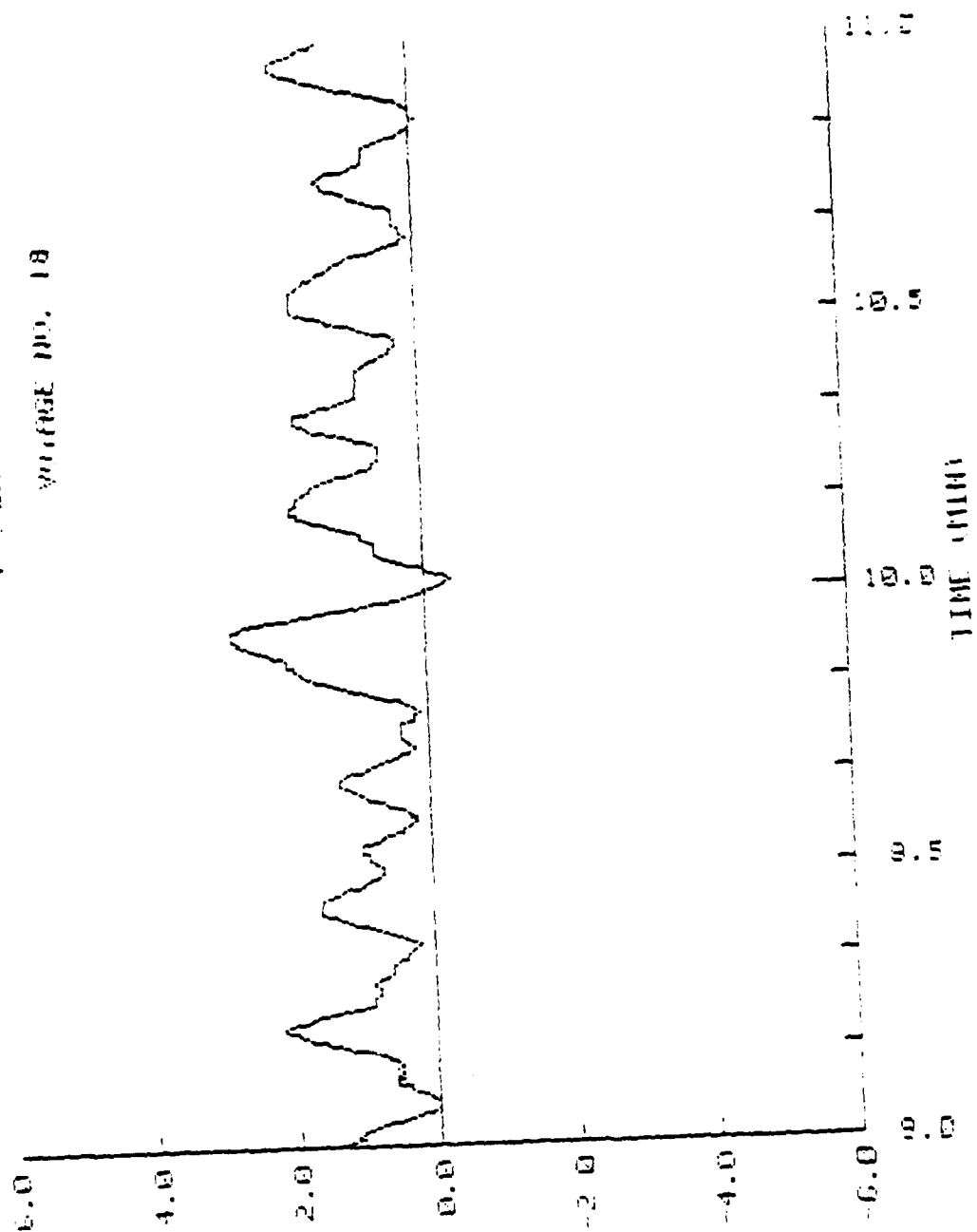
VOLUME NO. 18



100 10000

POLL VS. TIME

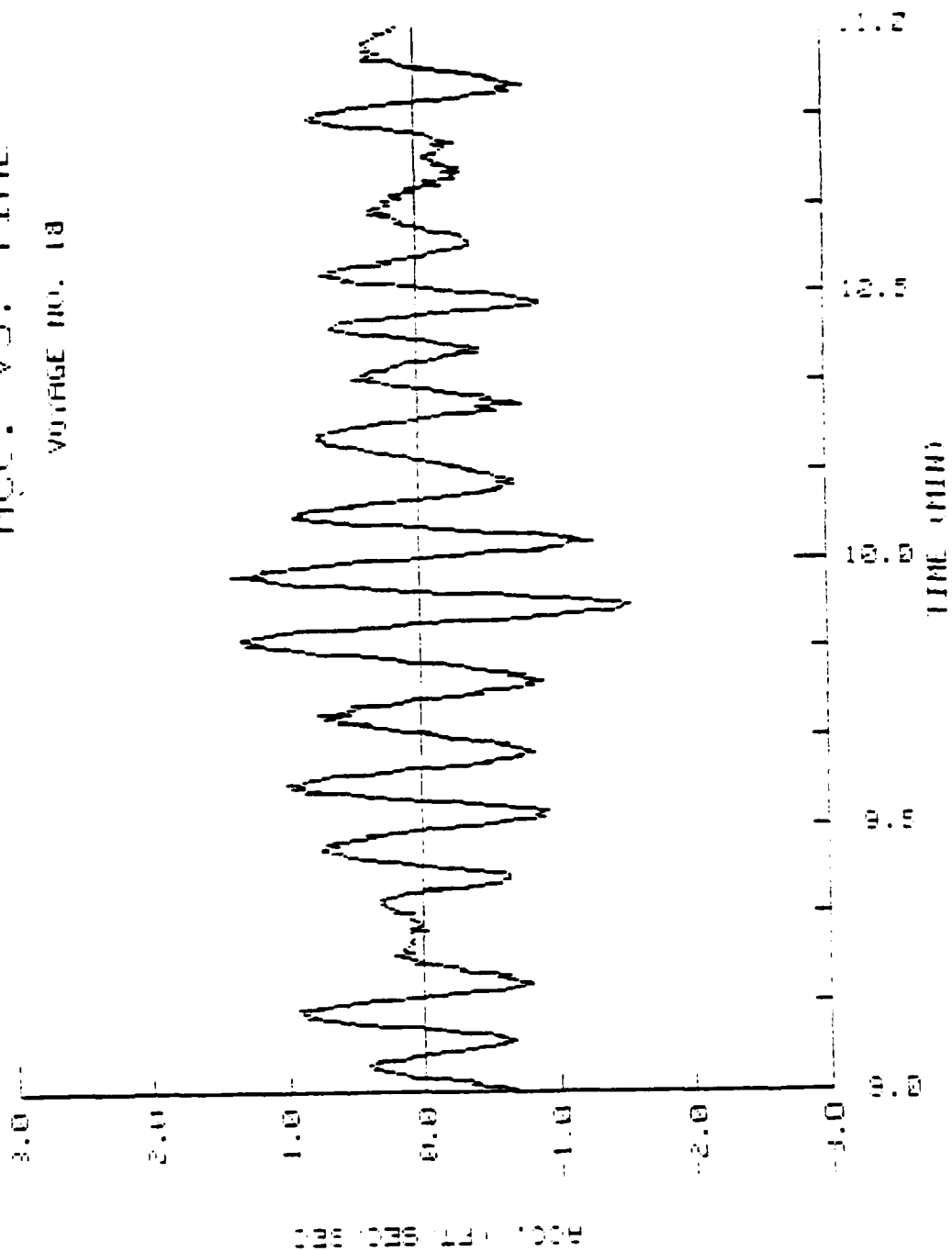
WAVE NO. 18



WAVE NO. 18

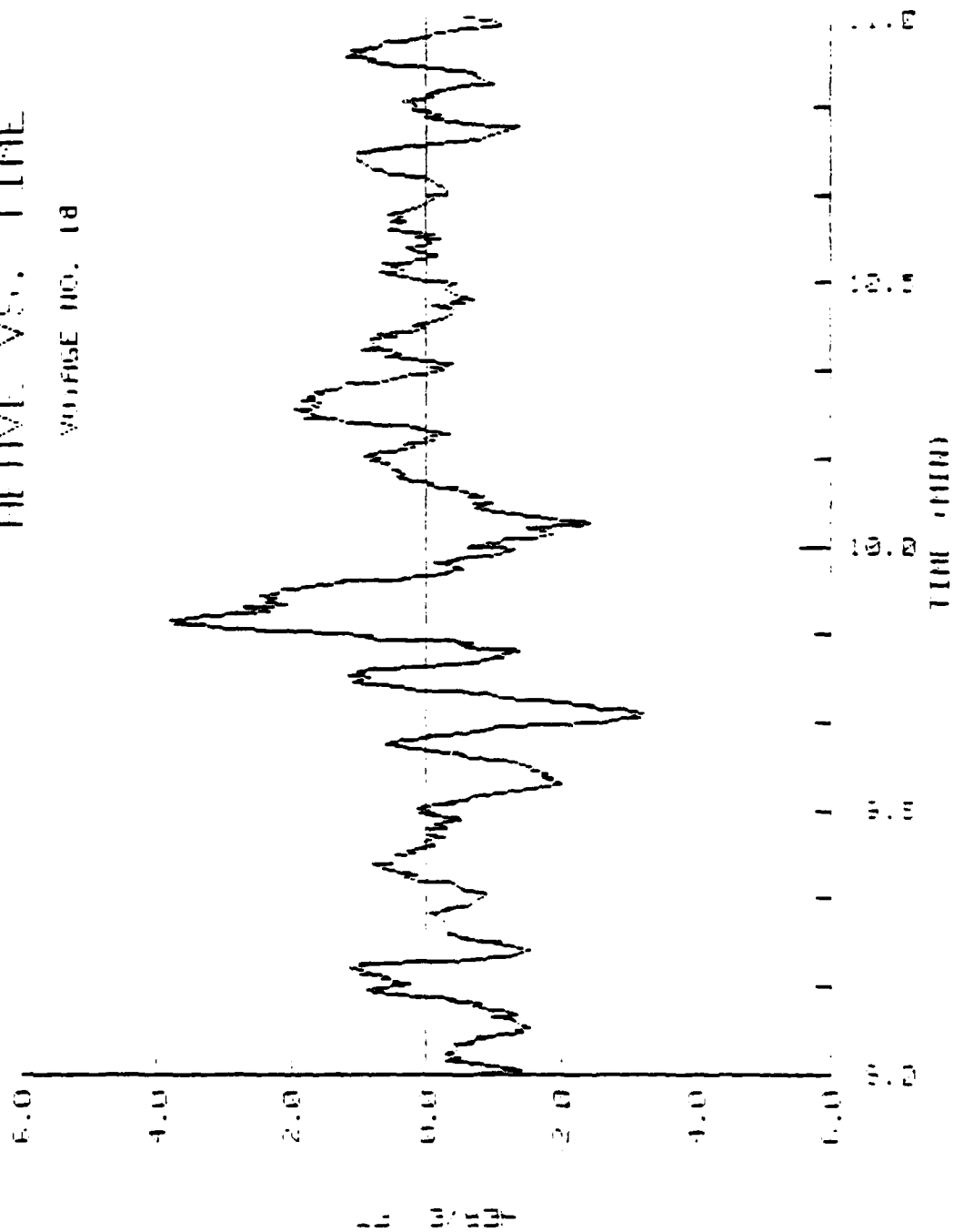
ACC. VS. TIME

VOLTAGE NO. 18



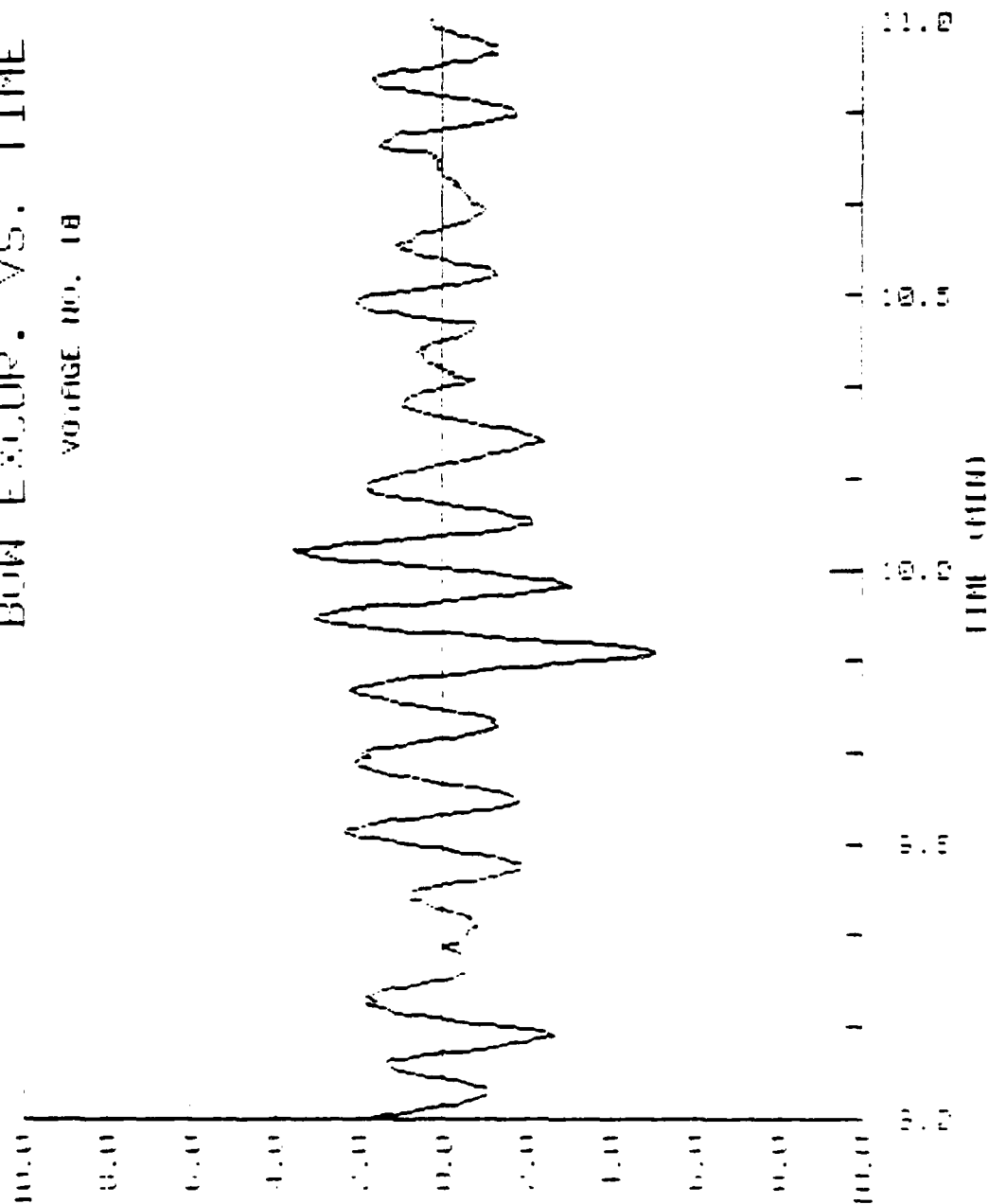
HEAVE VS. TIME

VOYAGE NO. 18



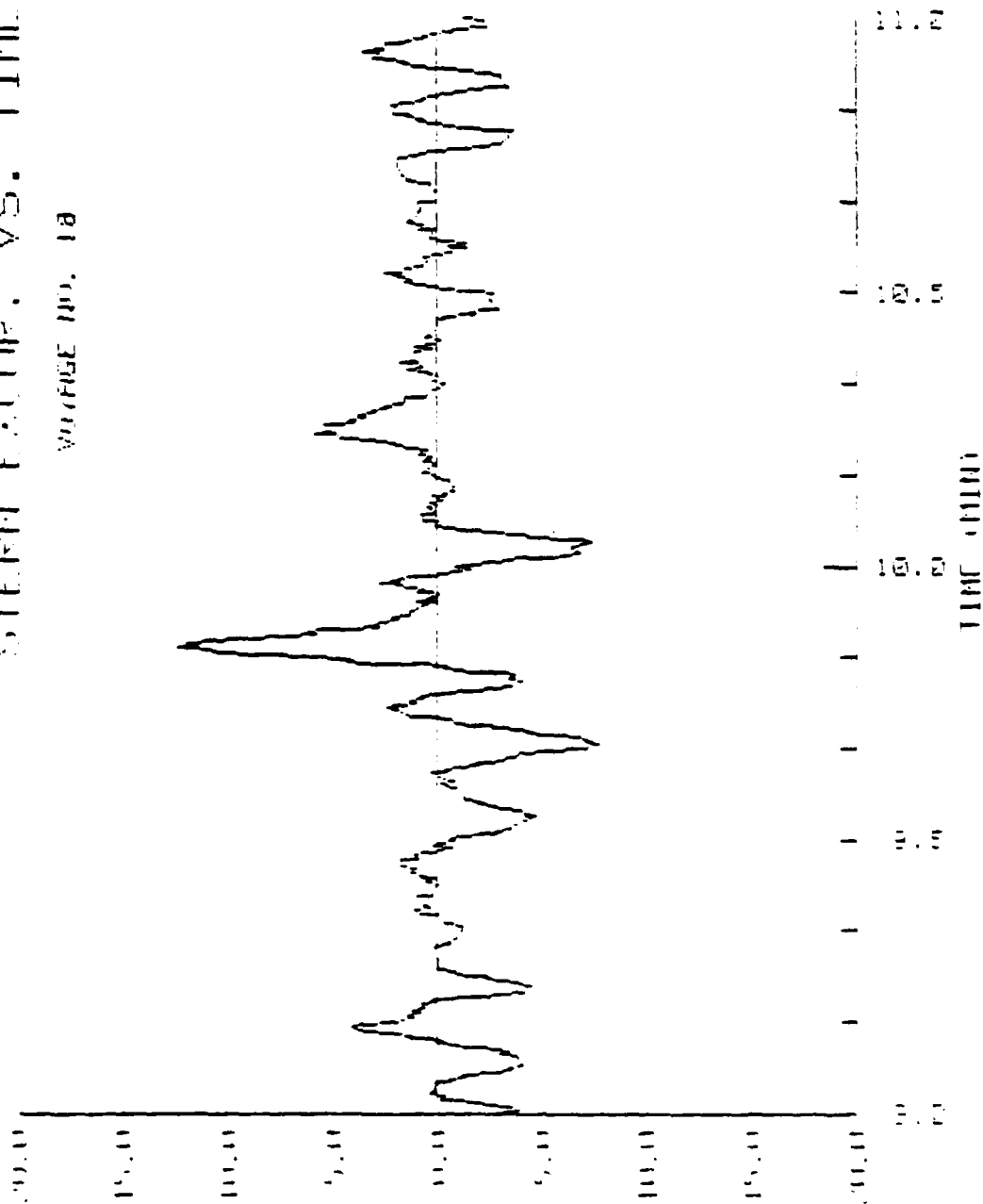
BUN EXCUR. VS. TIME

VOLUME NO. 18



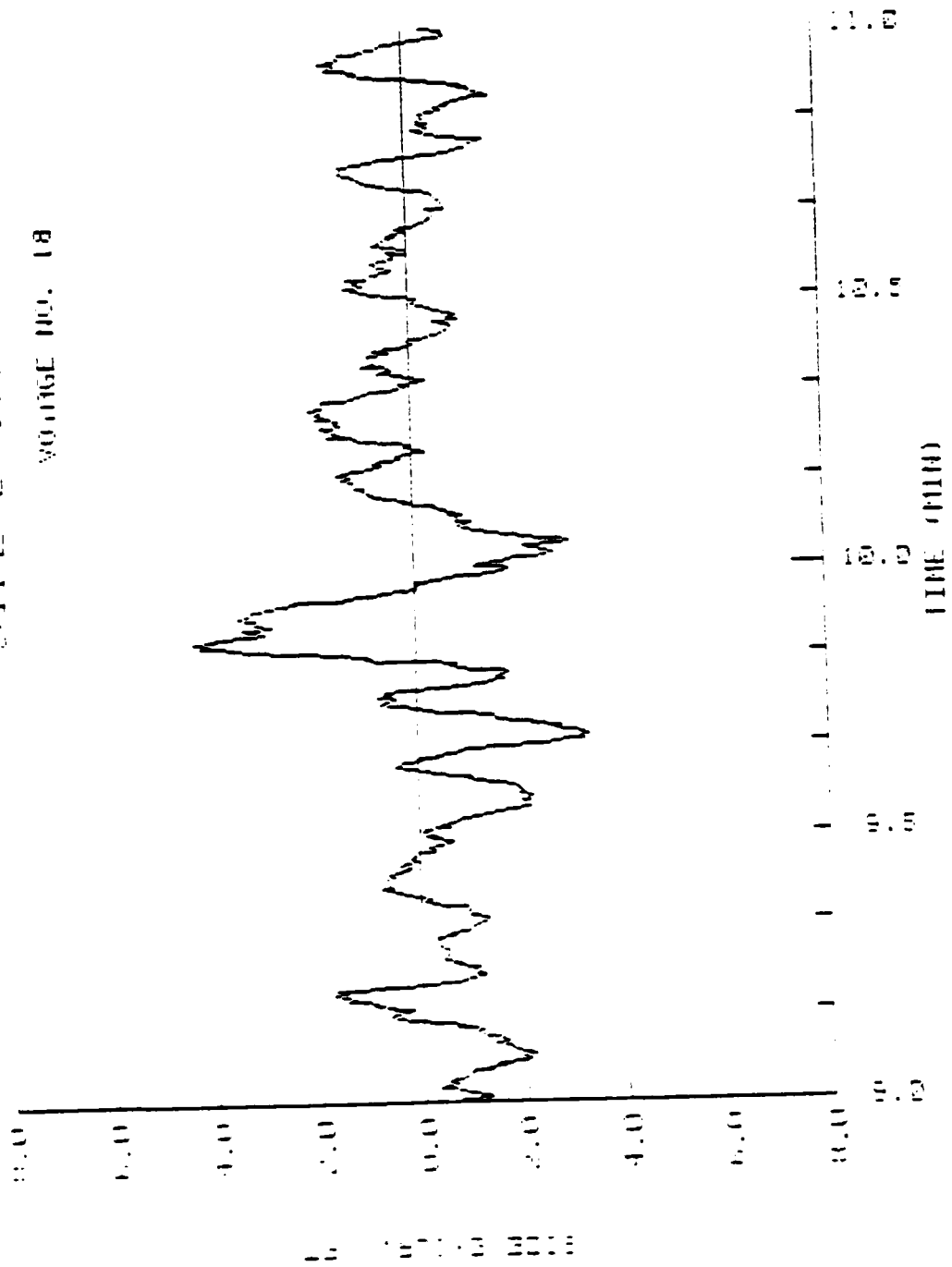
BIERN EXCUR. VS. TIME

WAVE NO. 18



SIDE ESCUP. VS. TIME

VOYAGE NO. 18



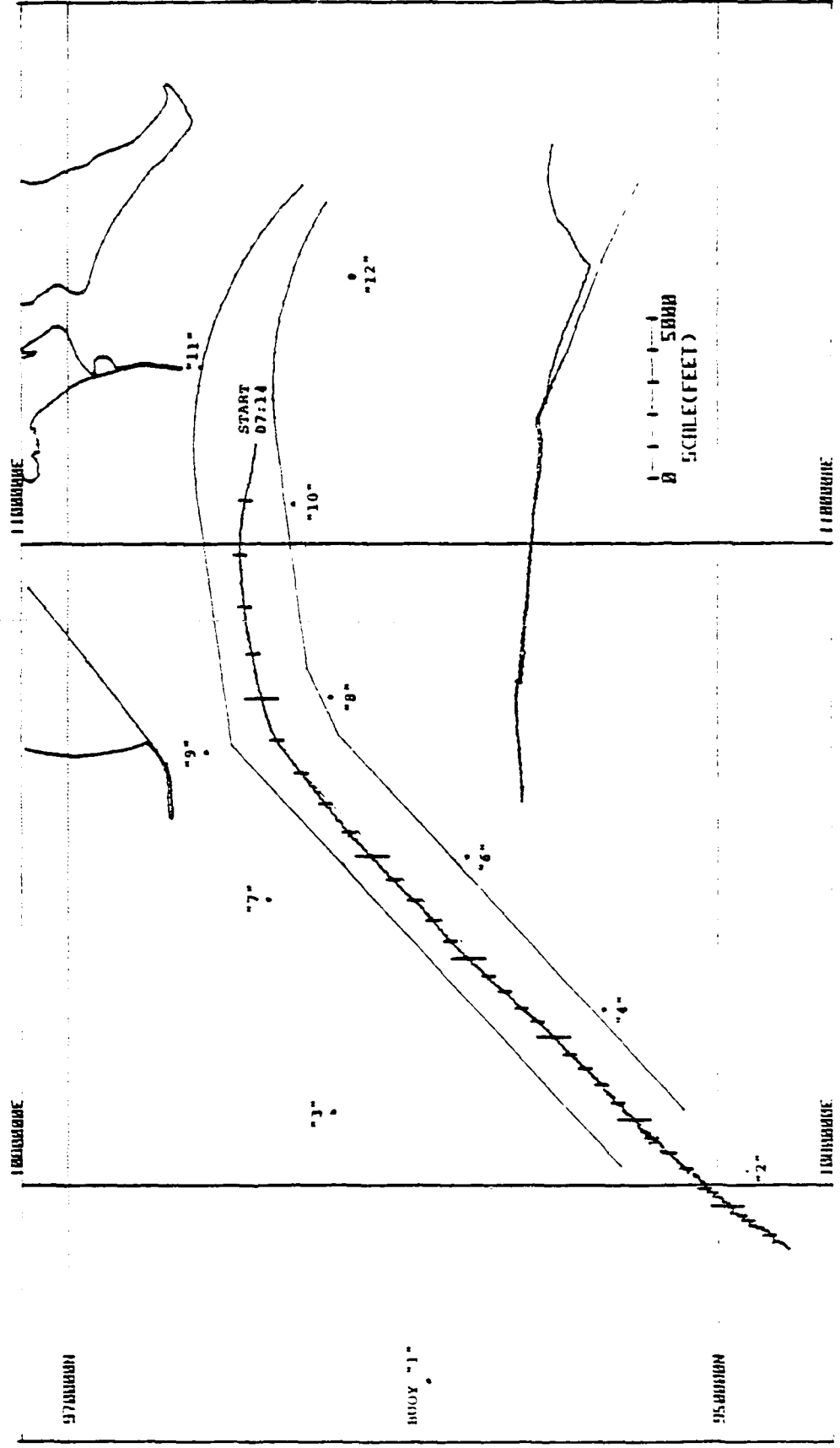
STATISTICAL SUMMARY

VOYAGE NO. 19

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-.1	5.2	1.7	1.9
ROLL (DEG)	.5	14.5	4.4	5.4
YAW (FT/SEC/SEC)	-.0	9.3	2.6	3.1
HEAVE (FT)	.2	12.4	3.7	4.3
ROLL EXCUR. (FT)	.2	19.4	6.9	7.8
STEER EXCUR. (FT)	.2	38.3	10.8	12.6
SIDE EXCUR (FT)	.2	15.5	4.4	5.3

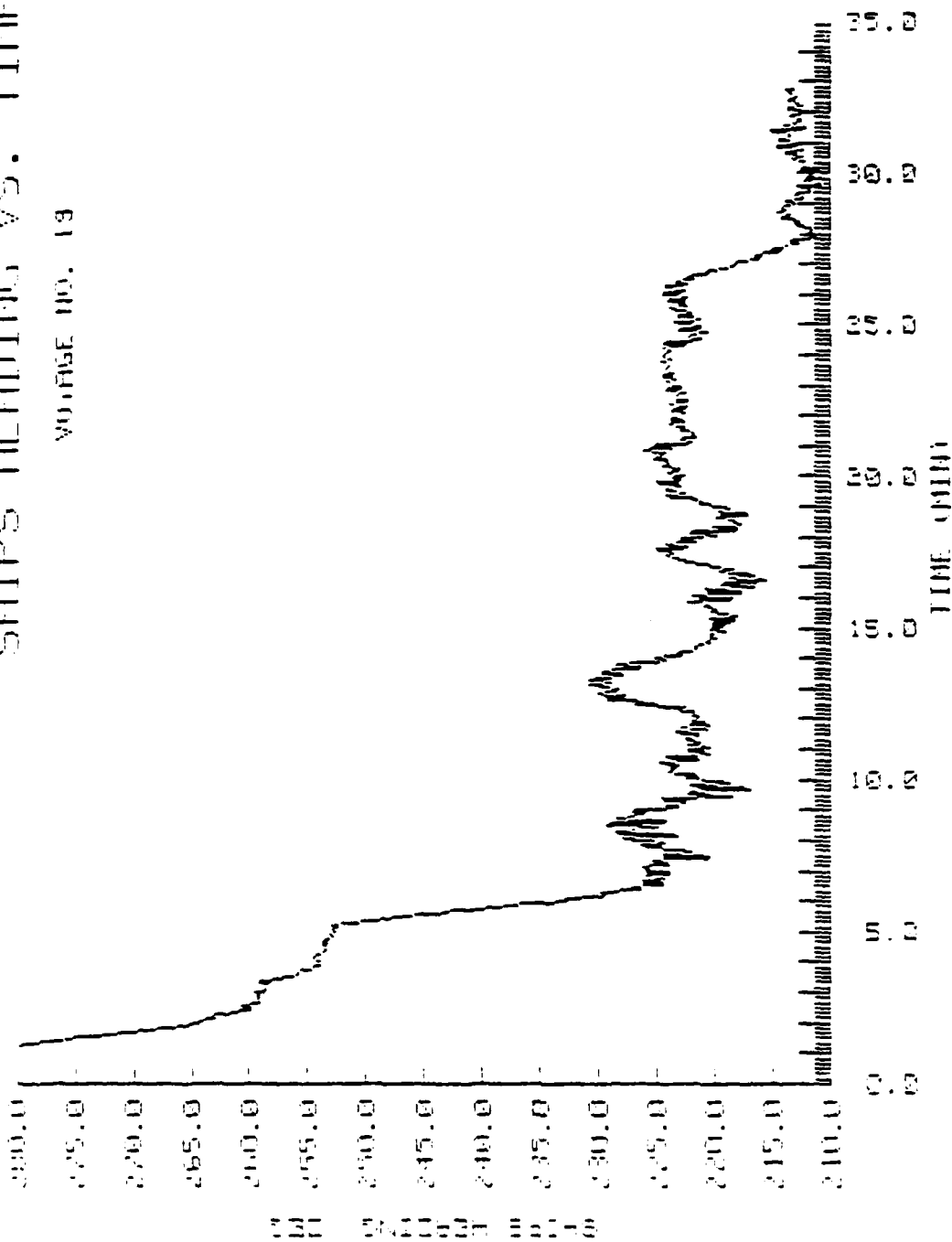
VOYAGE NO. 19 SHIP TRACK

SCALE 1:50000



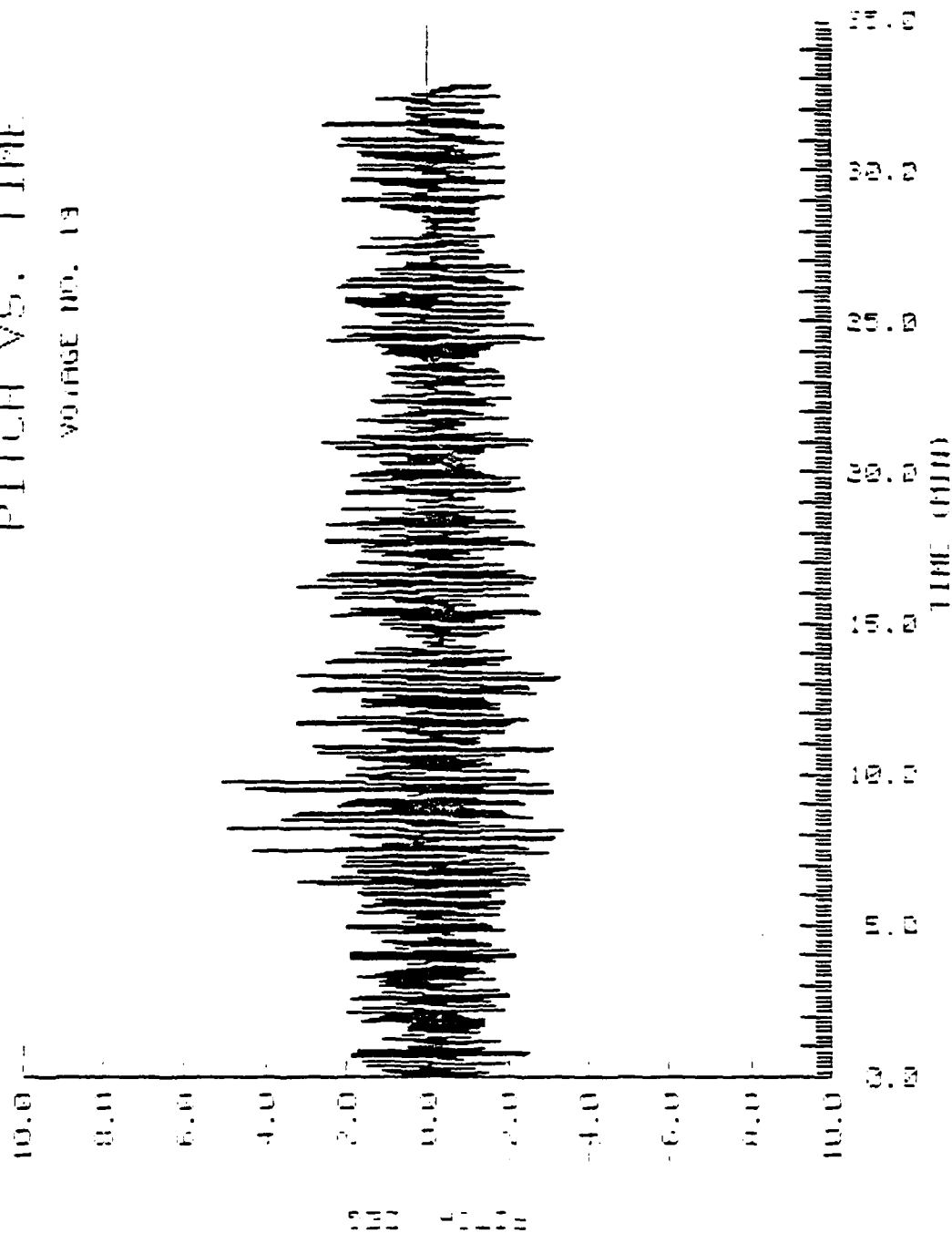
SHIPS HEADING VS. TIME

VOYAGE NO. 13



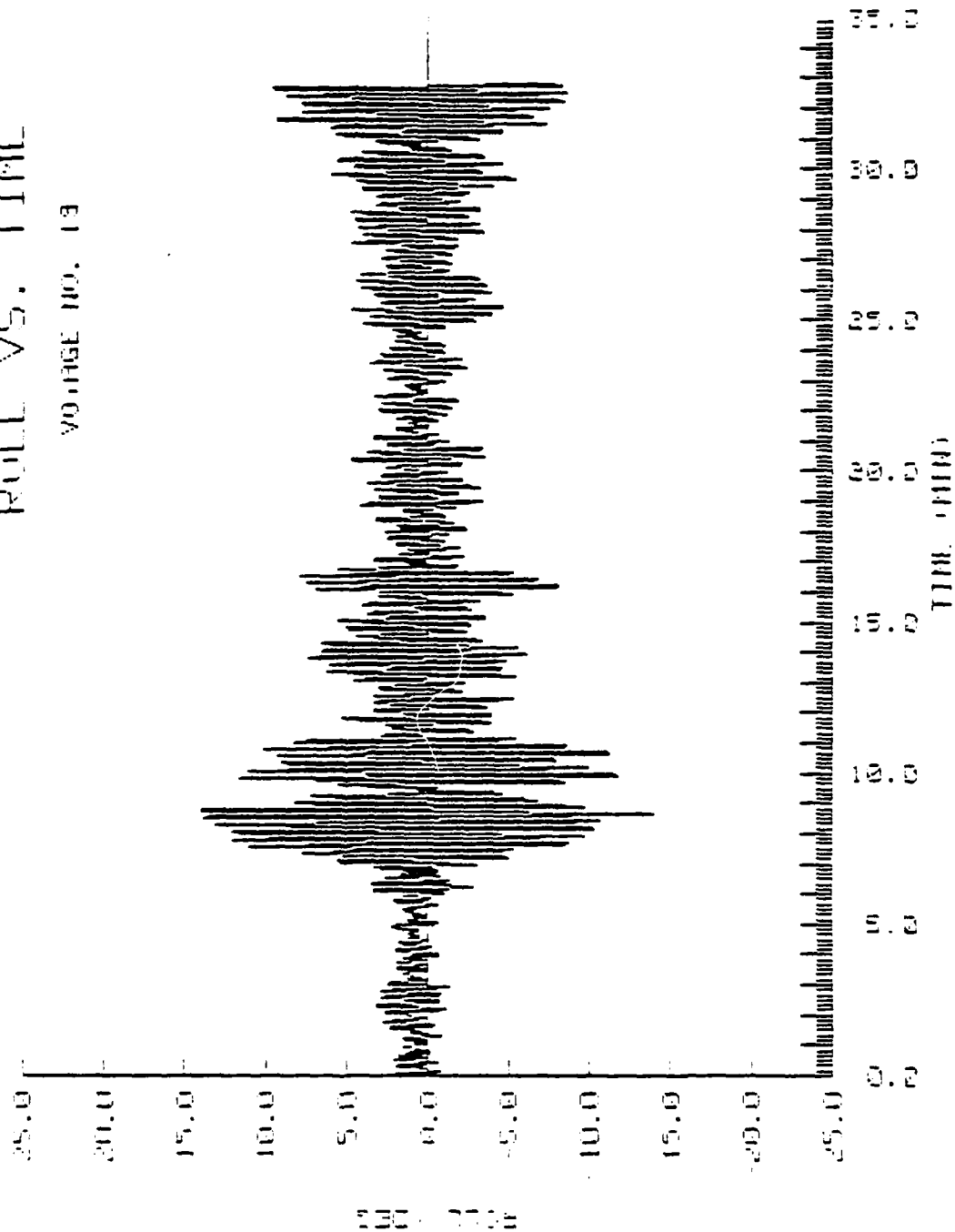
PITCH VS. TIME

VOLUME NO. 13



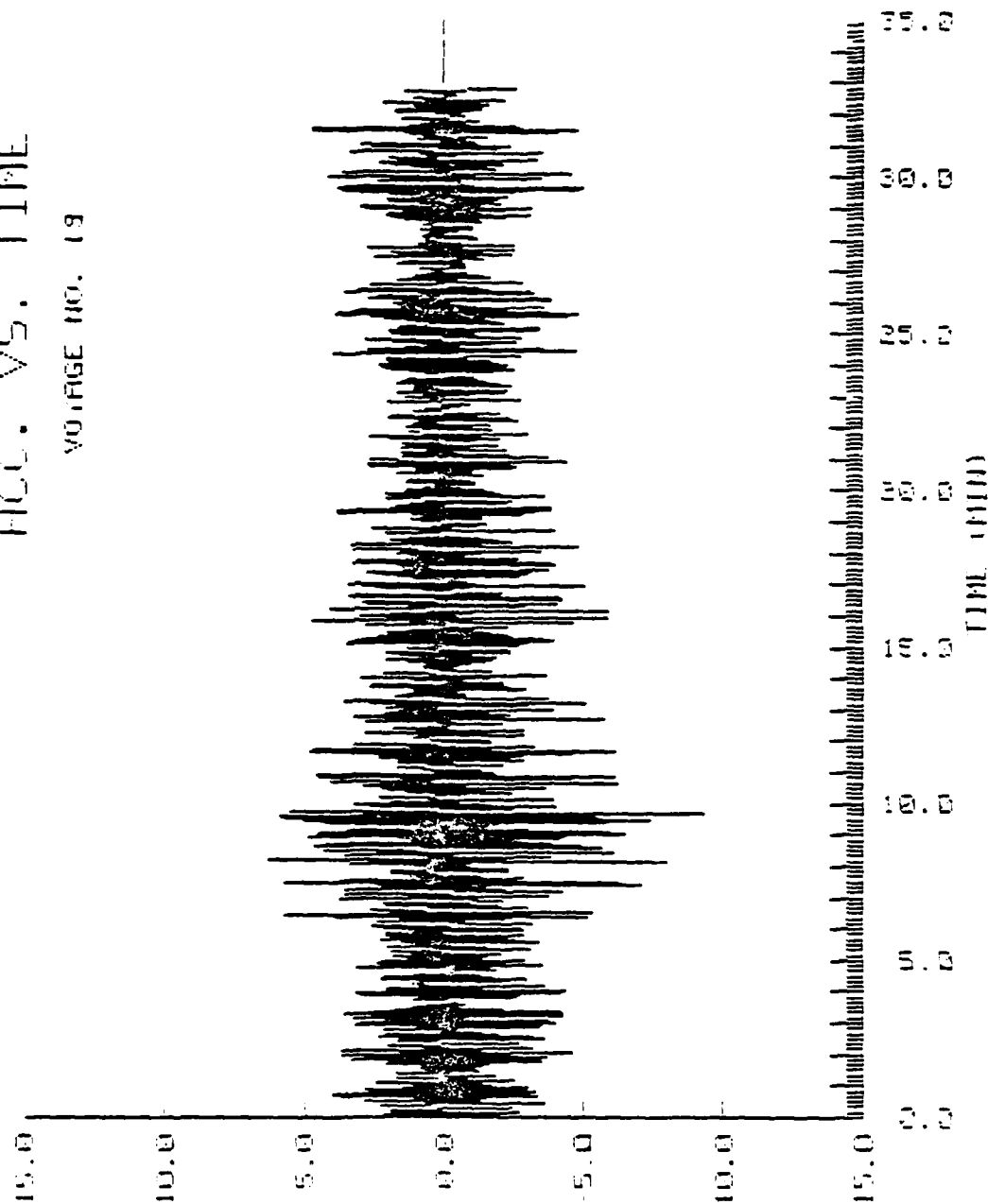
ROLL VS. TIME

VOLUME NO. 13



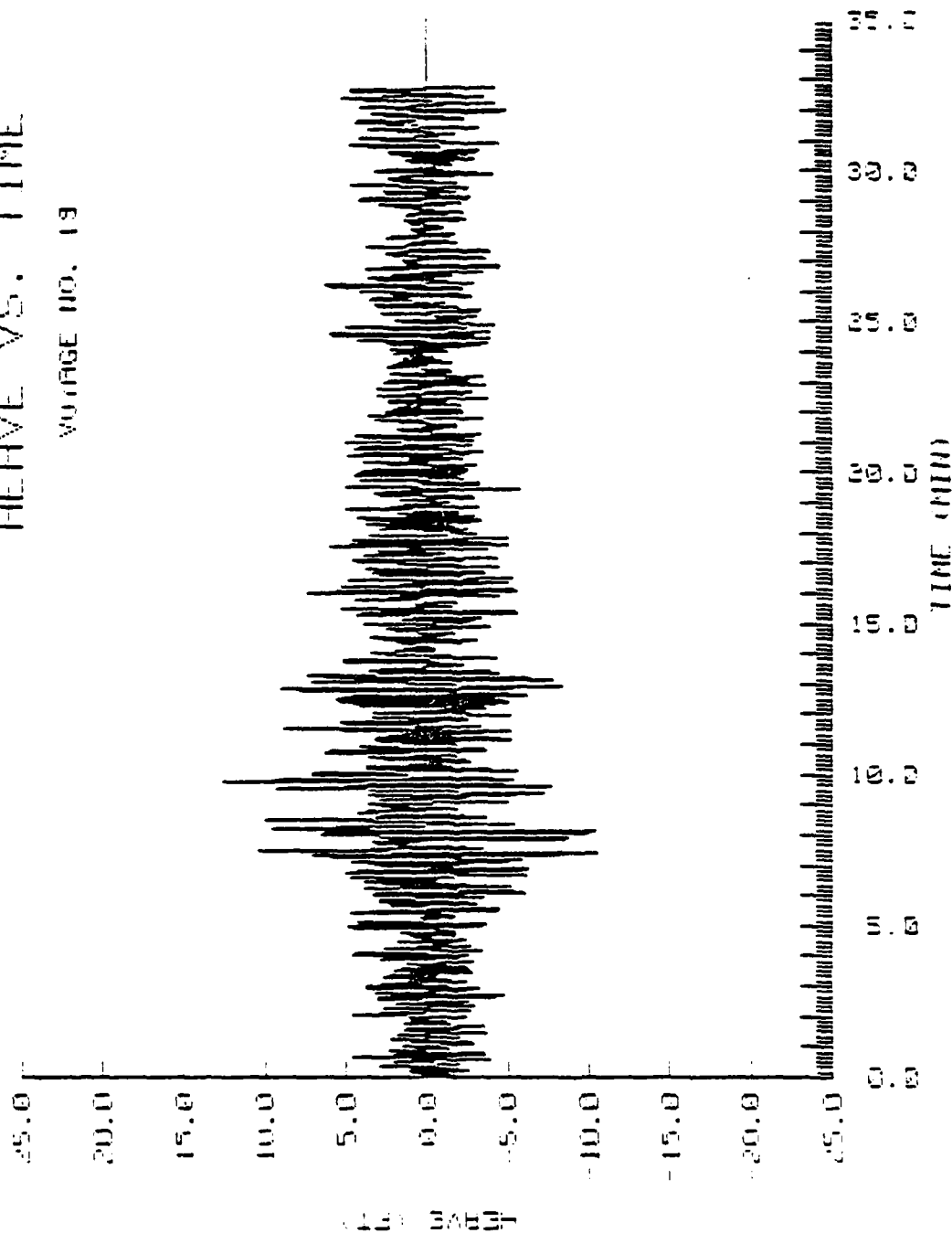
ACC. VS. TIME

VOLUME NO. 19



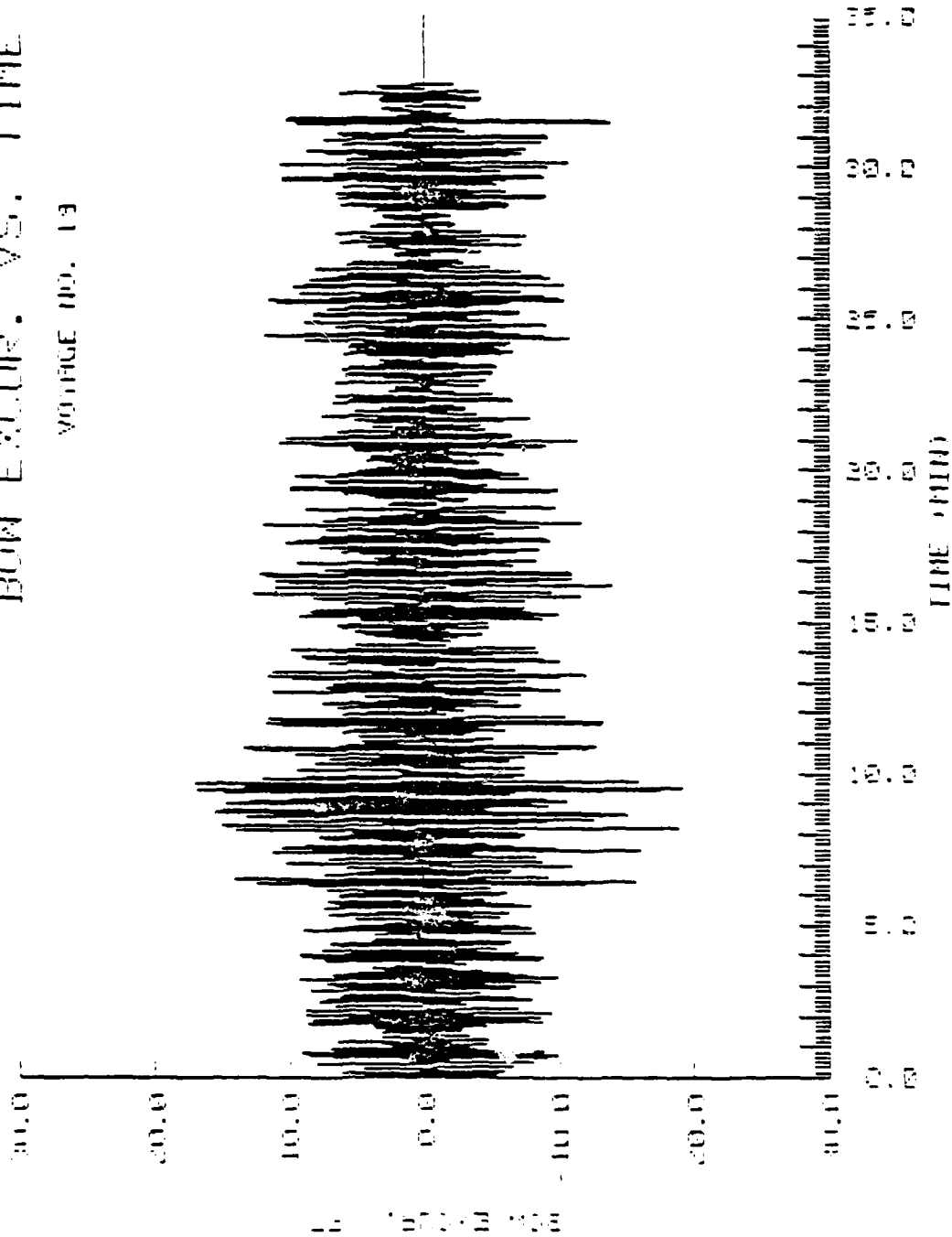
HERVE VS. TIME

VOLUME NO. 13



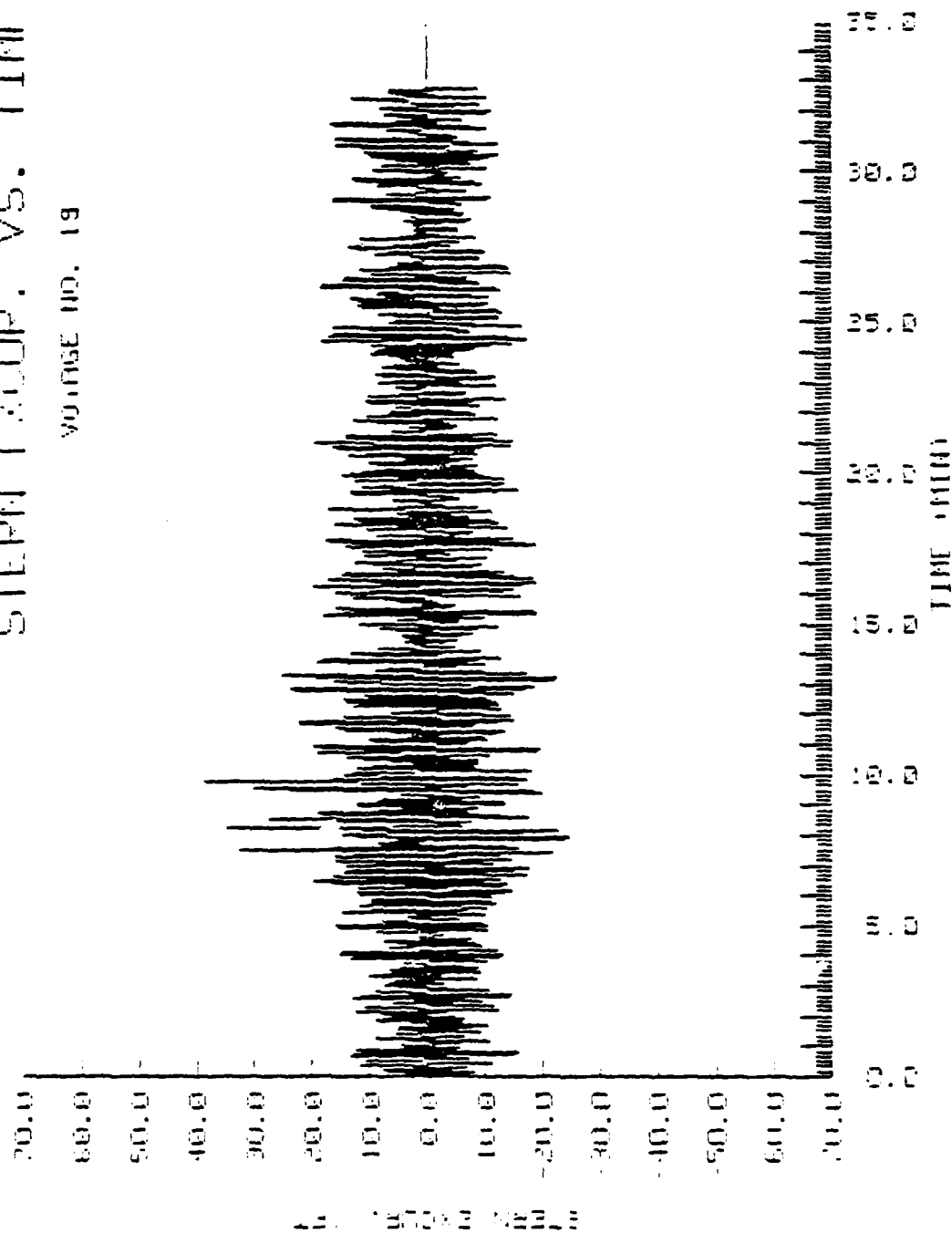
BOW EXCUR. VS. TIME

VOLUME NO. 13



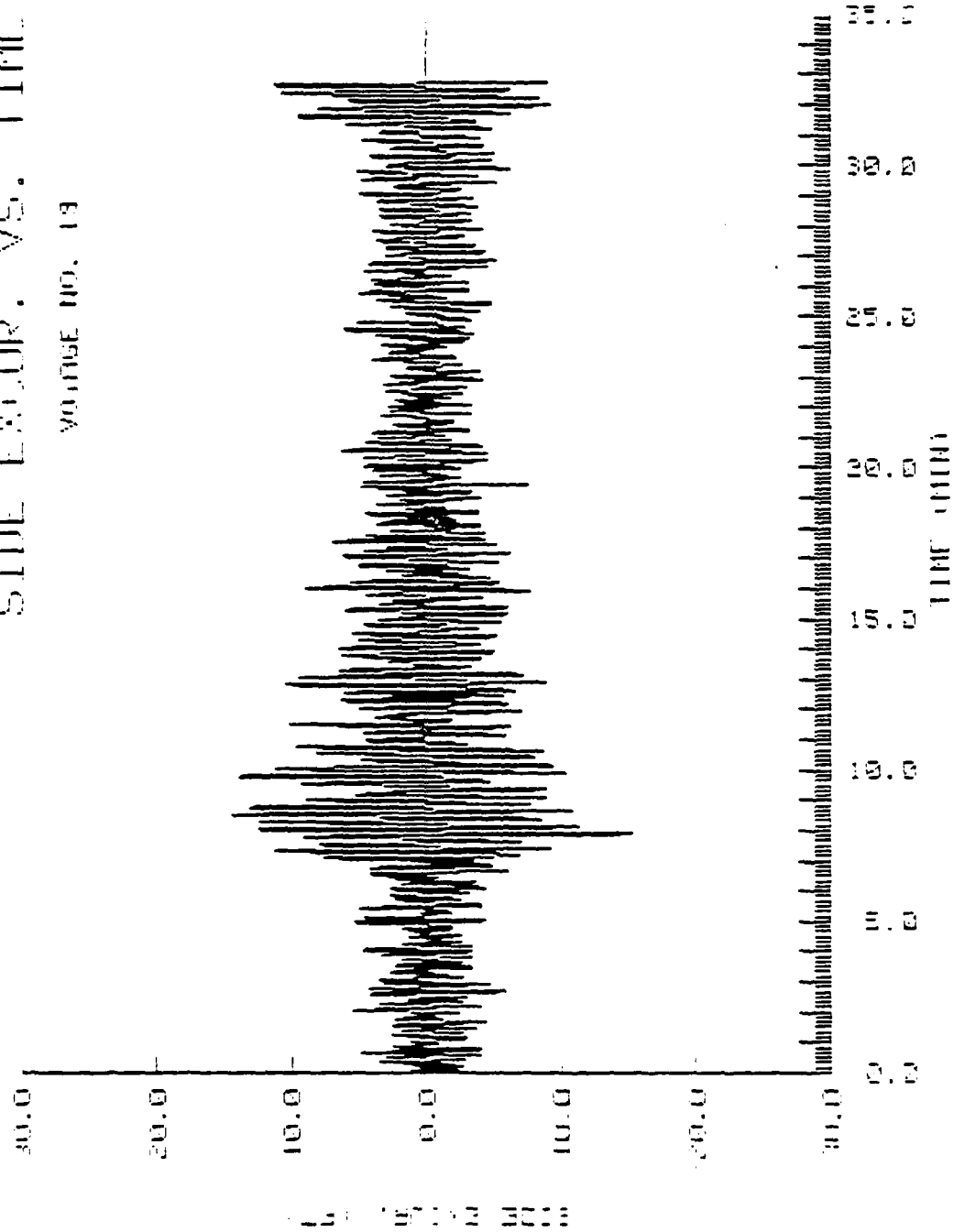
STEPN GROUP. VS. TIME

VOLUME NO. 19



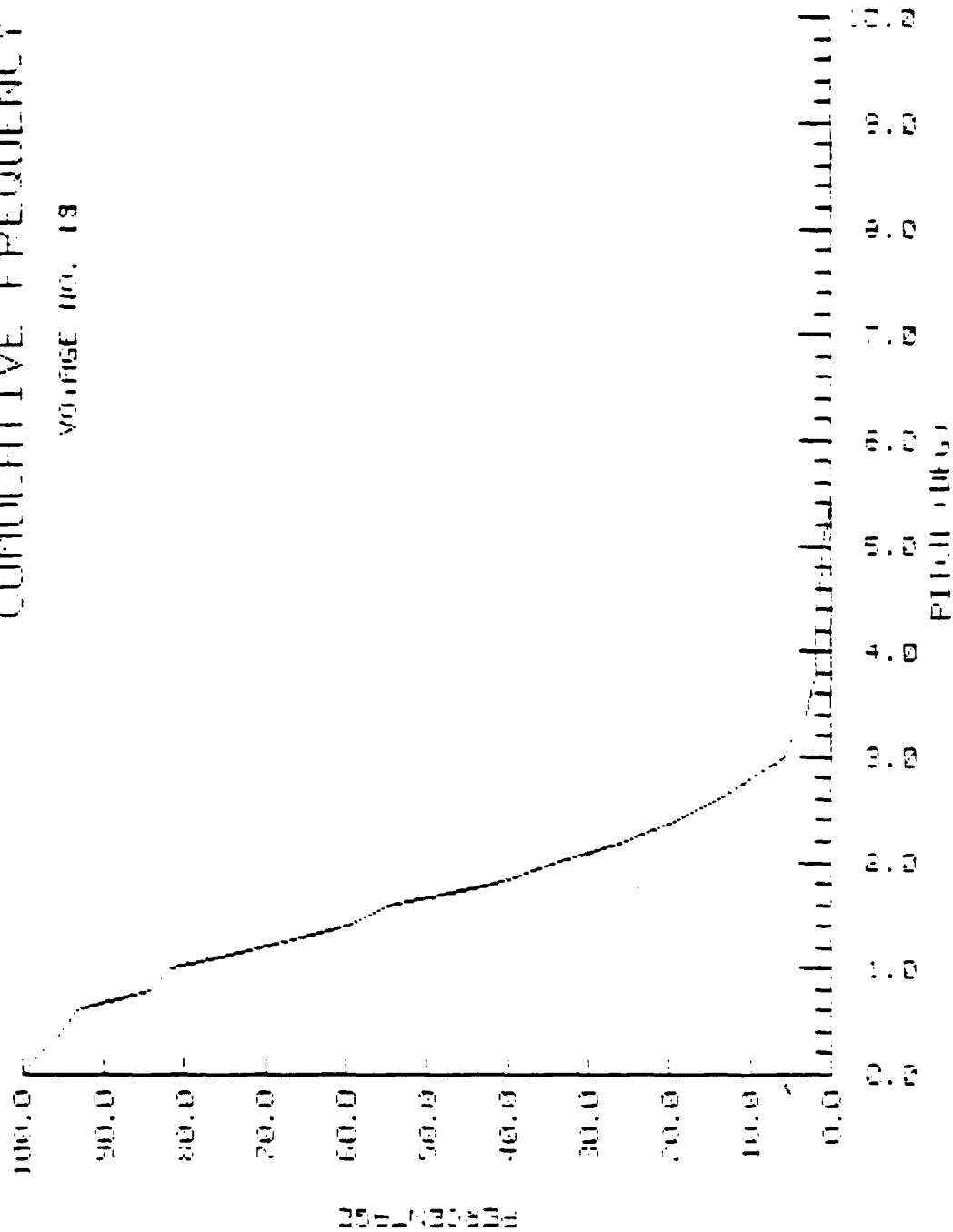
SIDE EXCUR. VS. TIME

VOLUME NO. 13



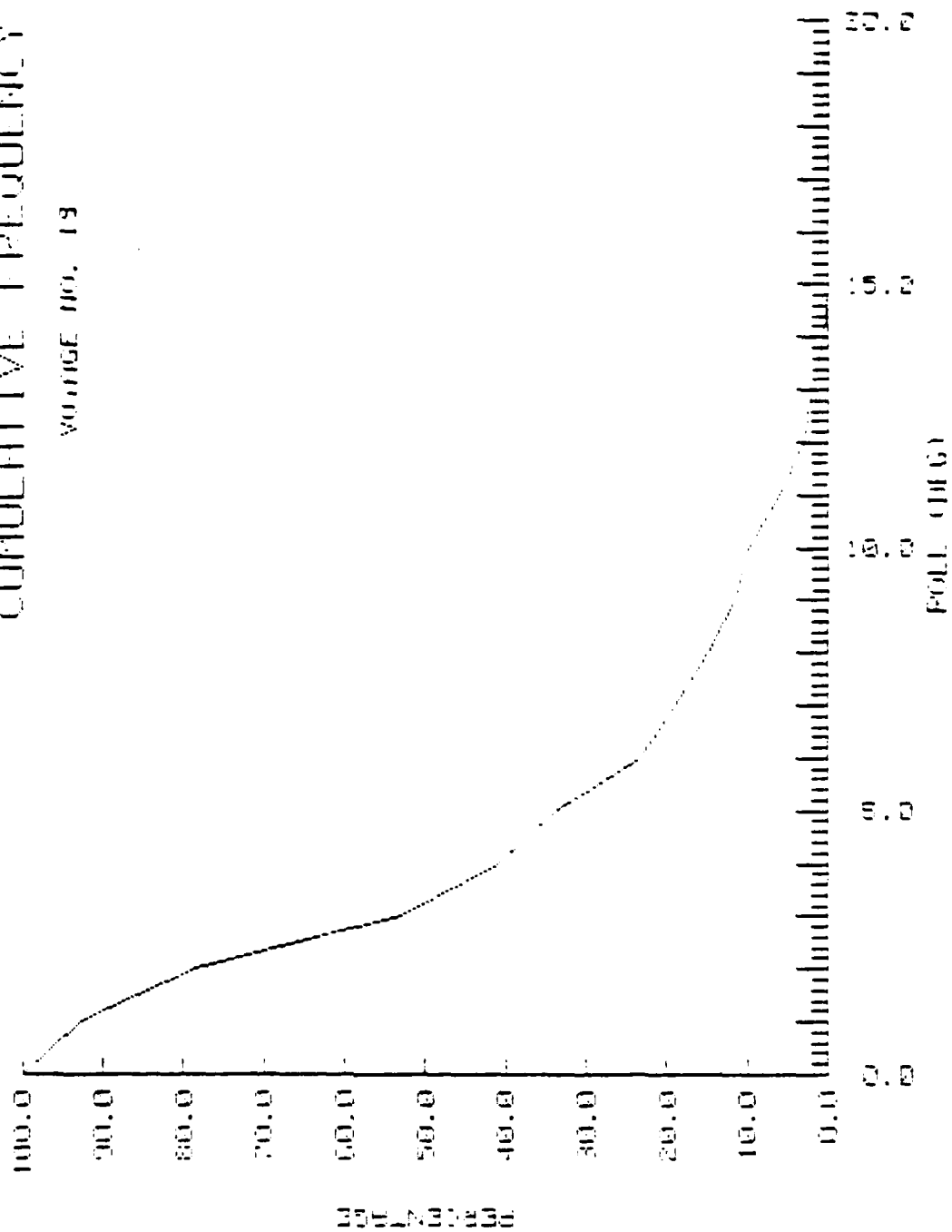
CUMULATIVE FREQUENCY

WAVE NO. 13



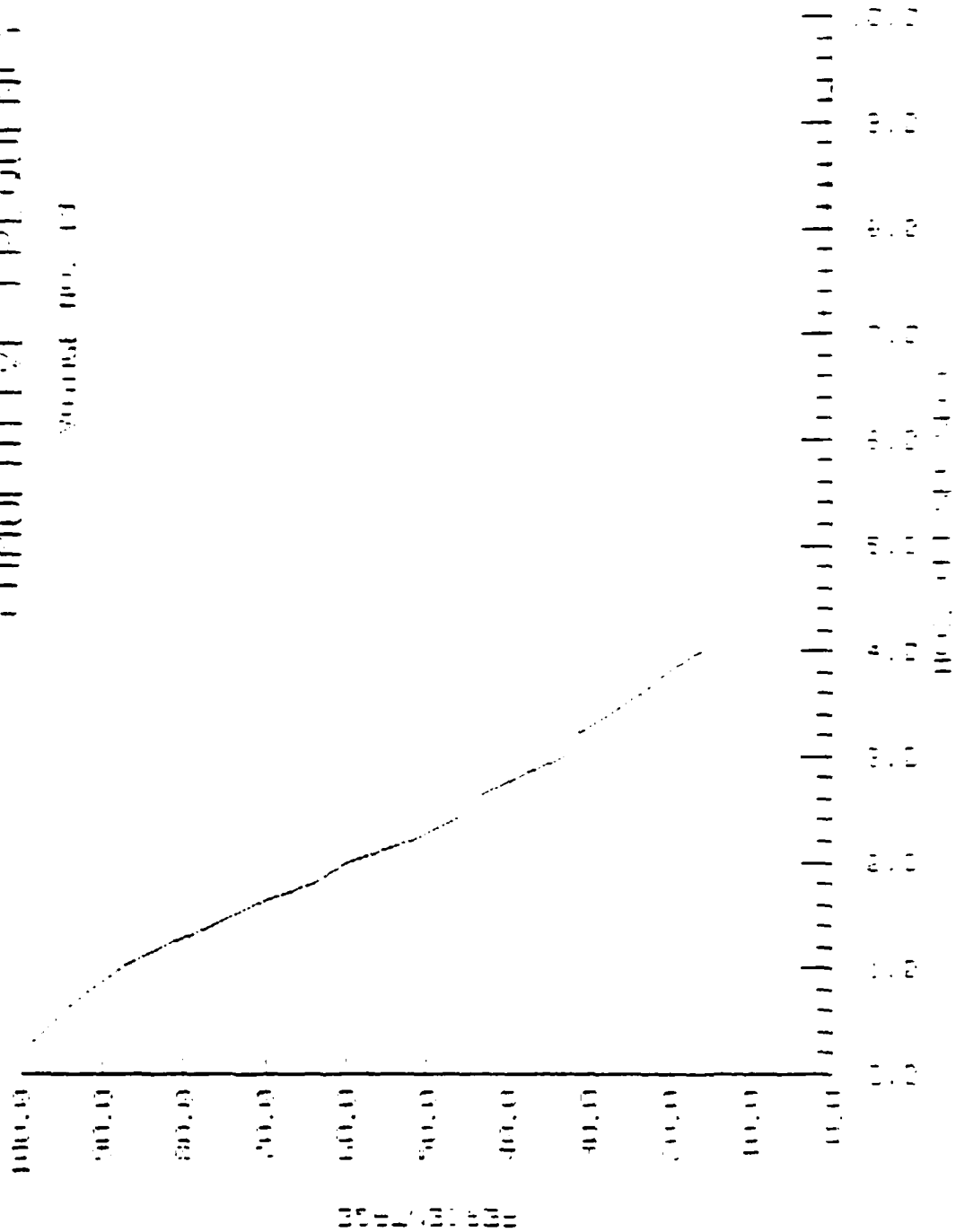
CUMULATIVE FREQUENCY

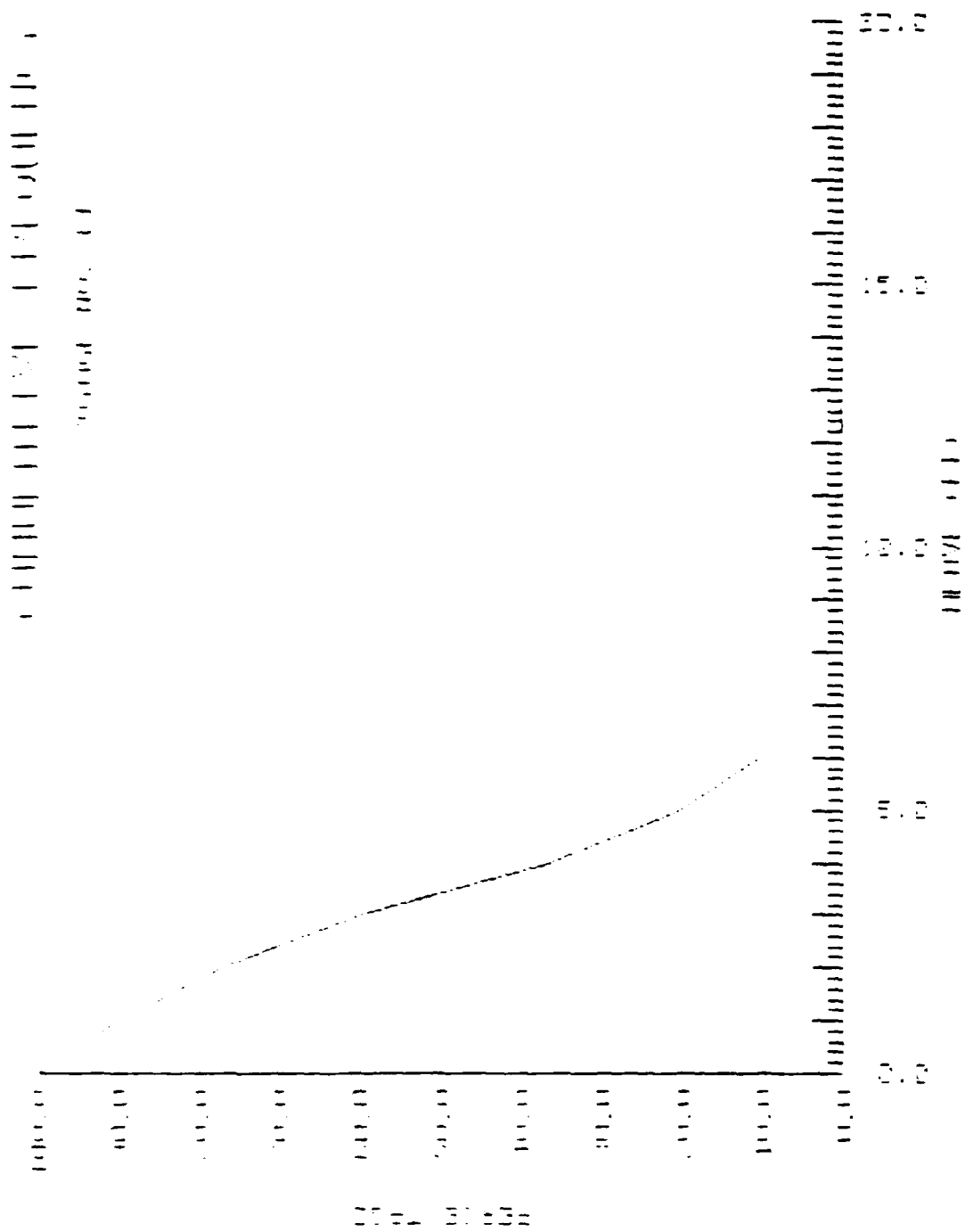
VOLUME NO. 19



CHROMATOPHORE

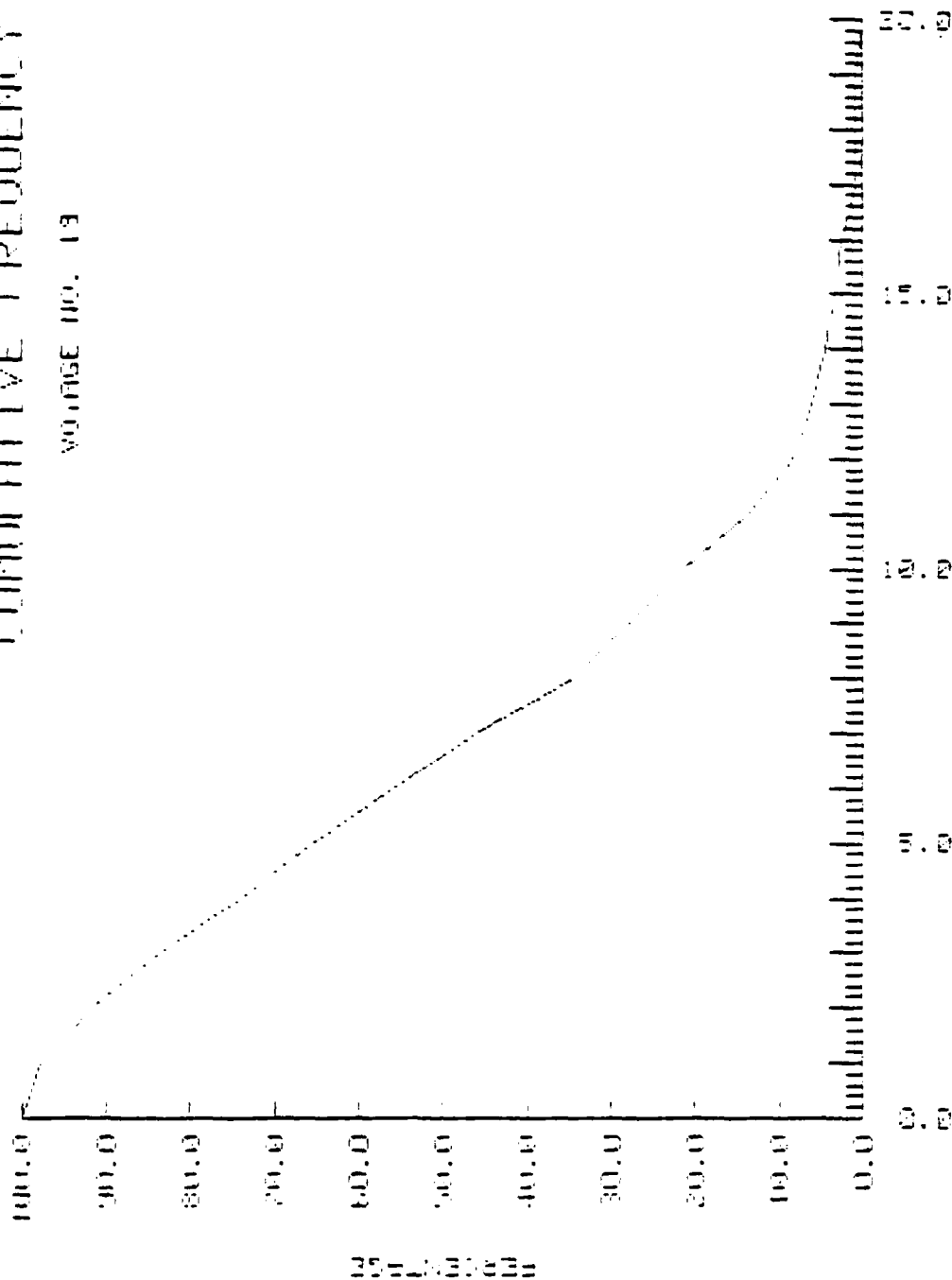
Volume No. 13





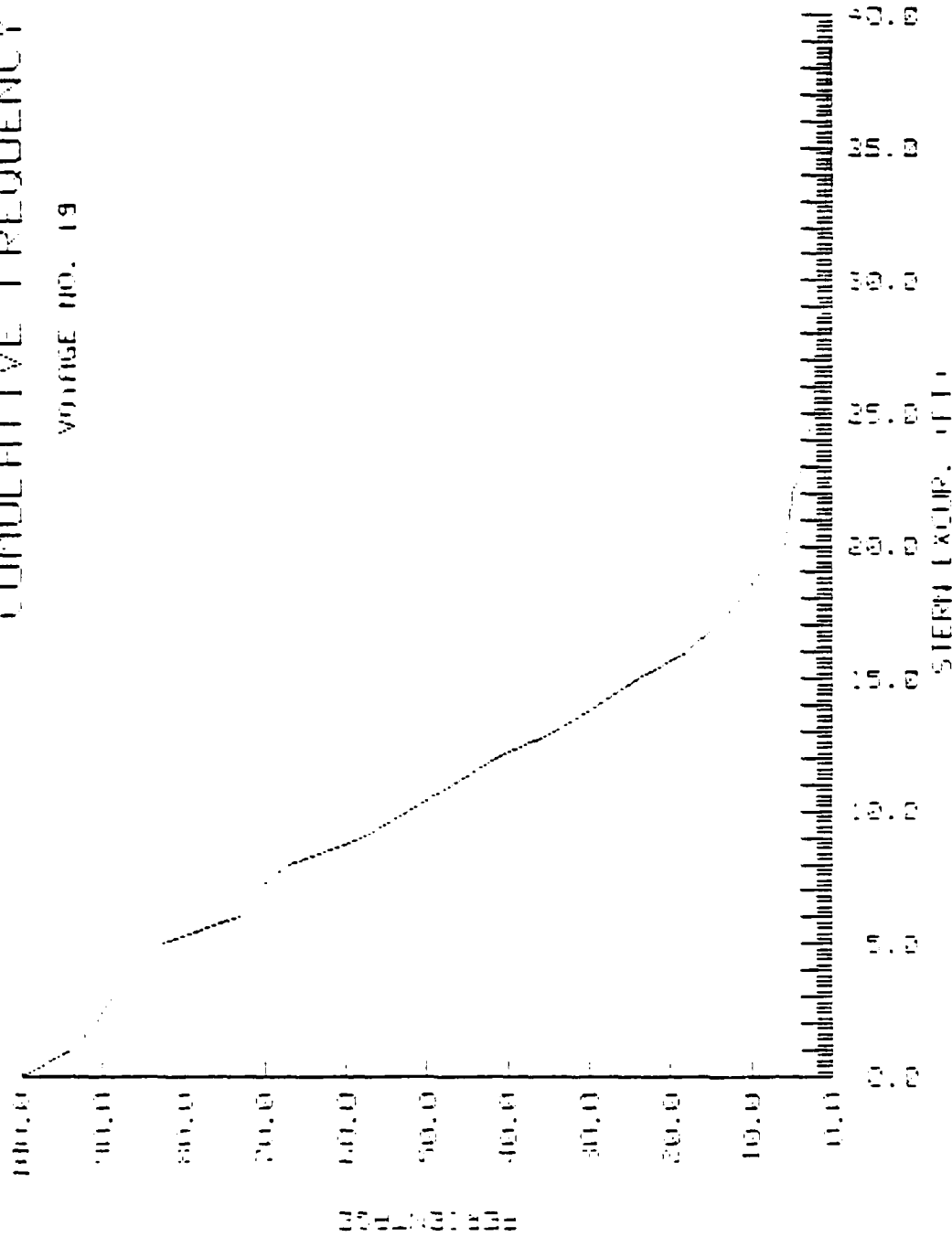
CUMULATIVE FREQUENCY

VOLUME NO. 13



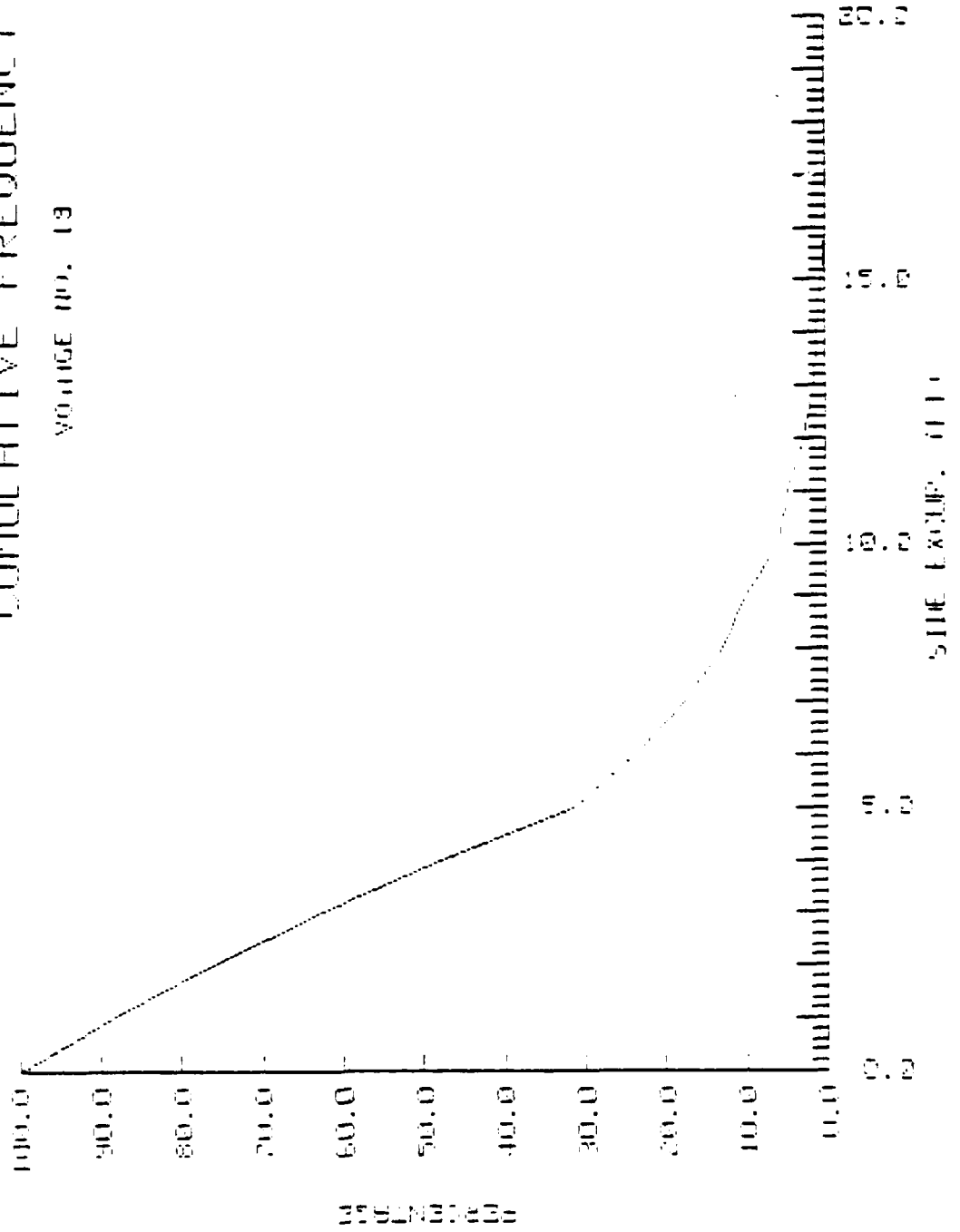
CUMULATIVE FREQUENCY

VOLUME NO. 19



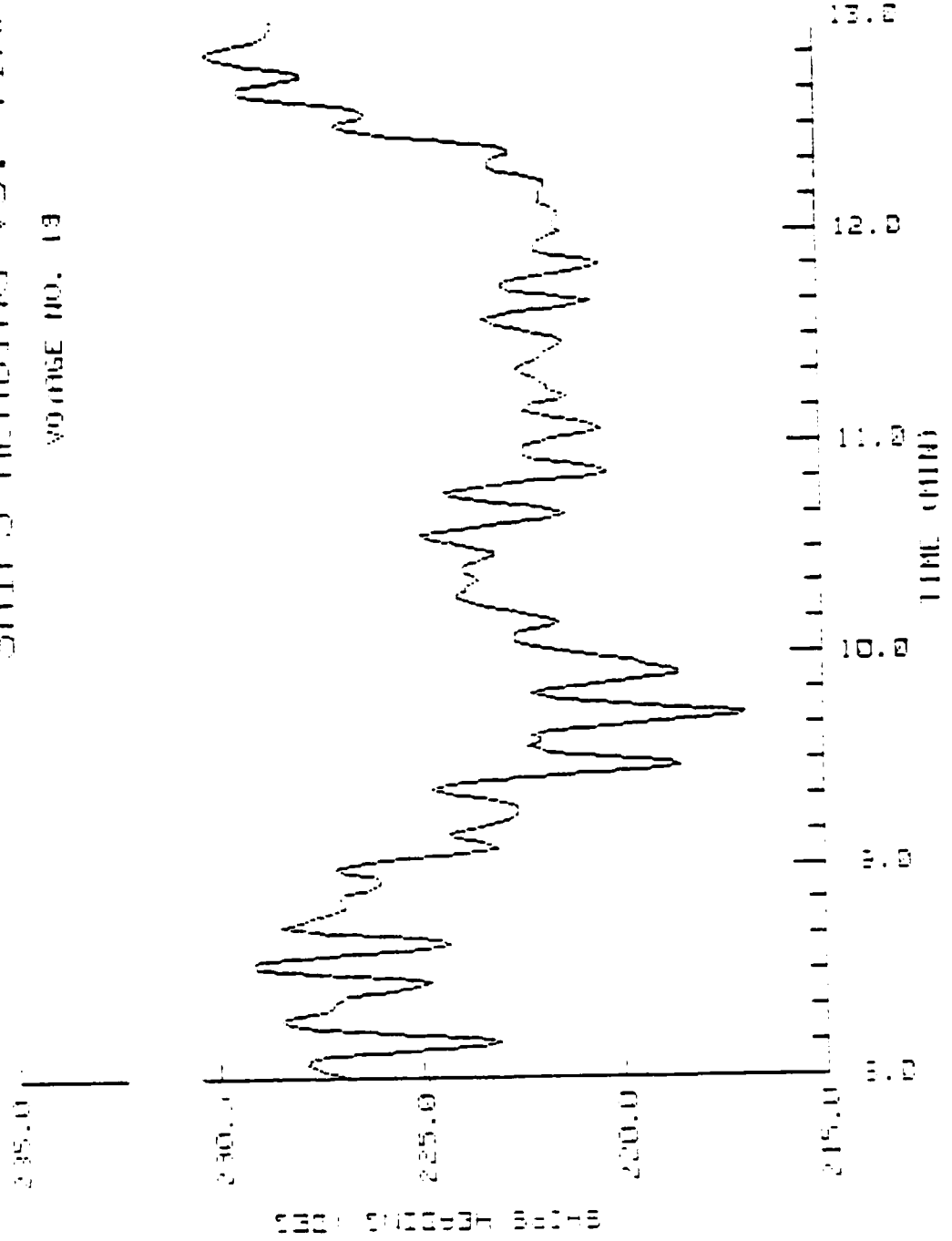
CUMULATIVE FREQUENCY

Y0105E PP. 13



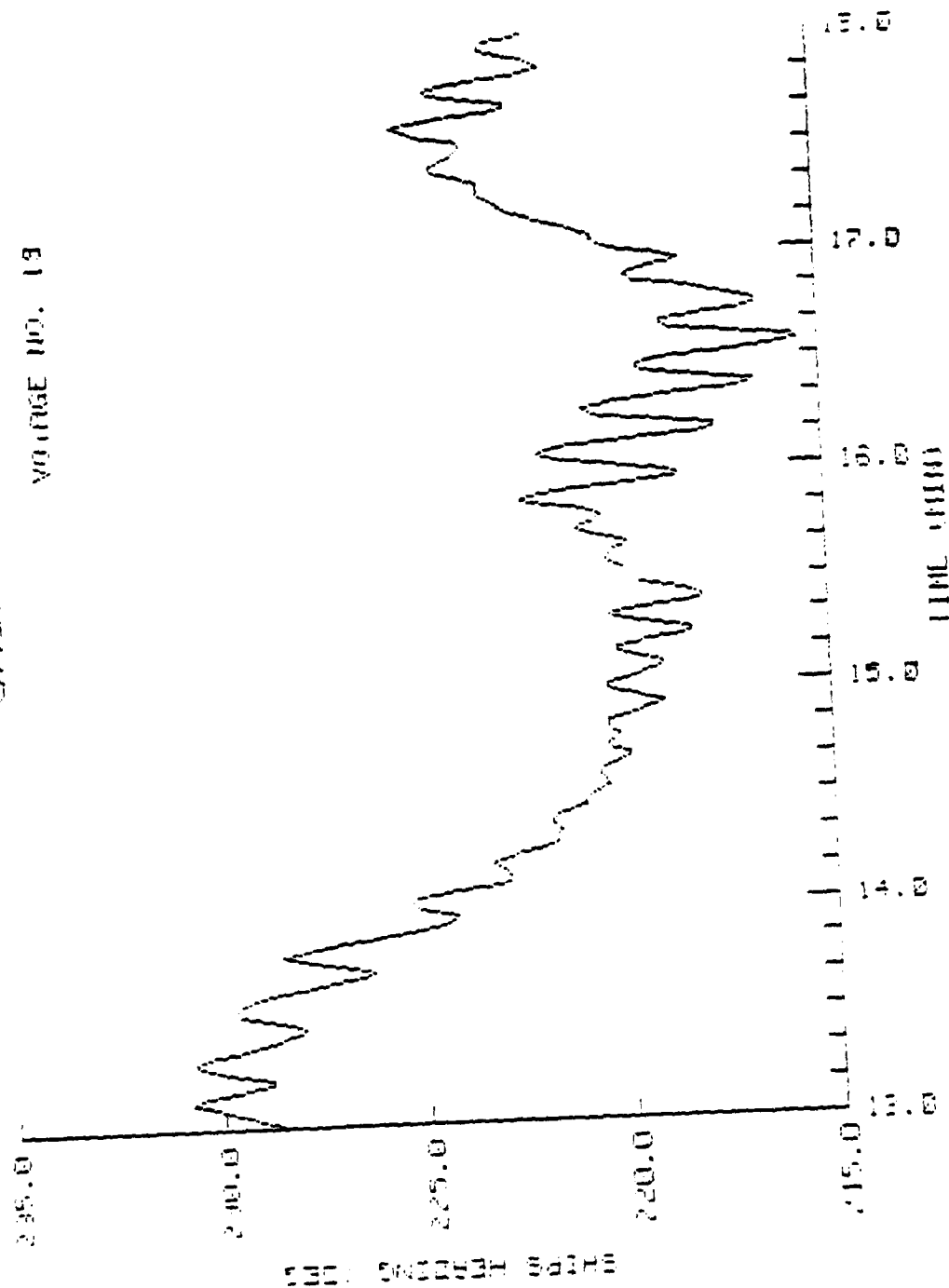
SOLPS HEADING VS. TIME

VOYAGE NO. 13



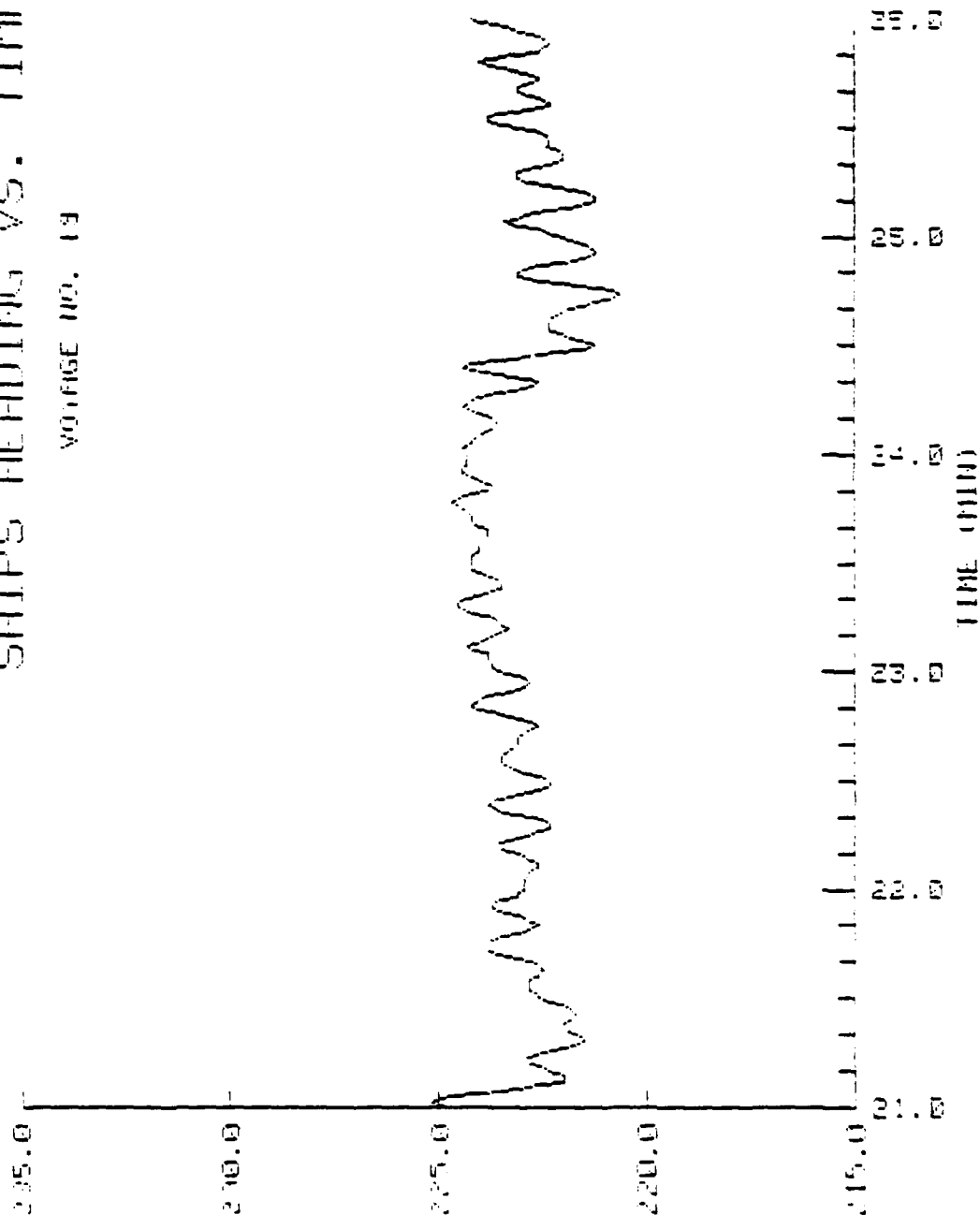
SHIPS HEADING VS. TIME

VOYAGE NO. 13



SHIPS HEADING VS. TIME

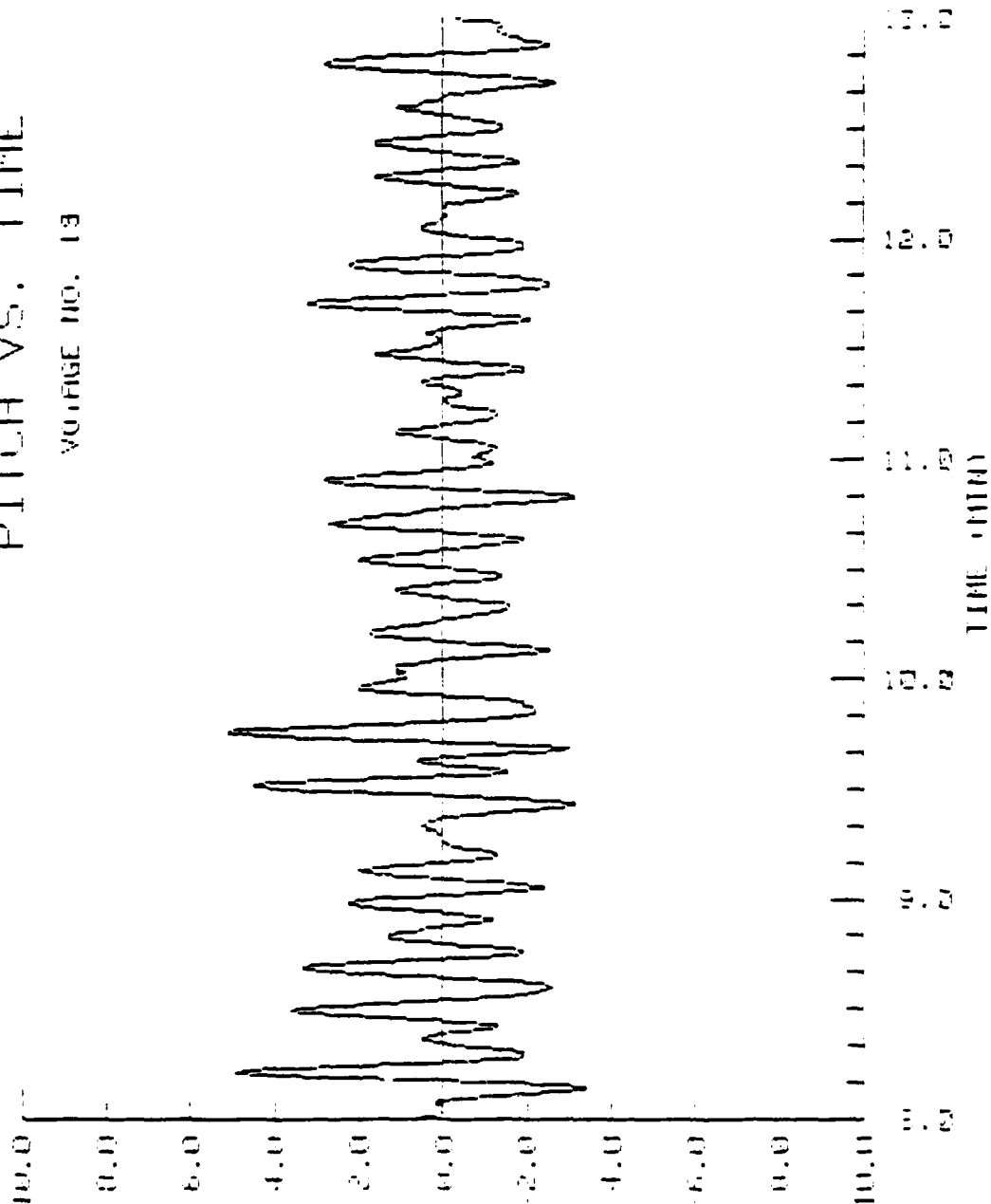
VOYAGE NO. 19



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PITCH VS. TIME

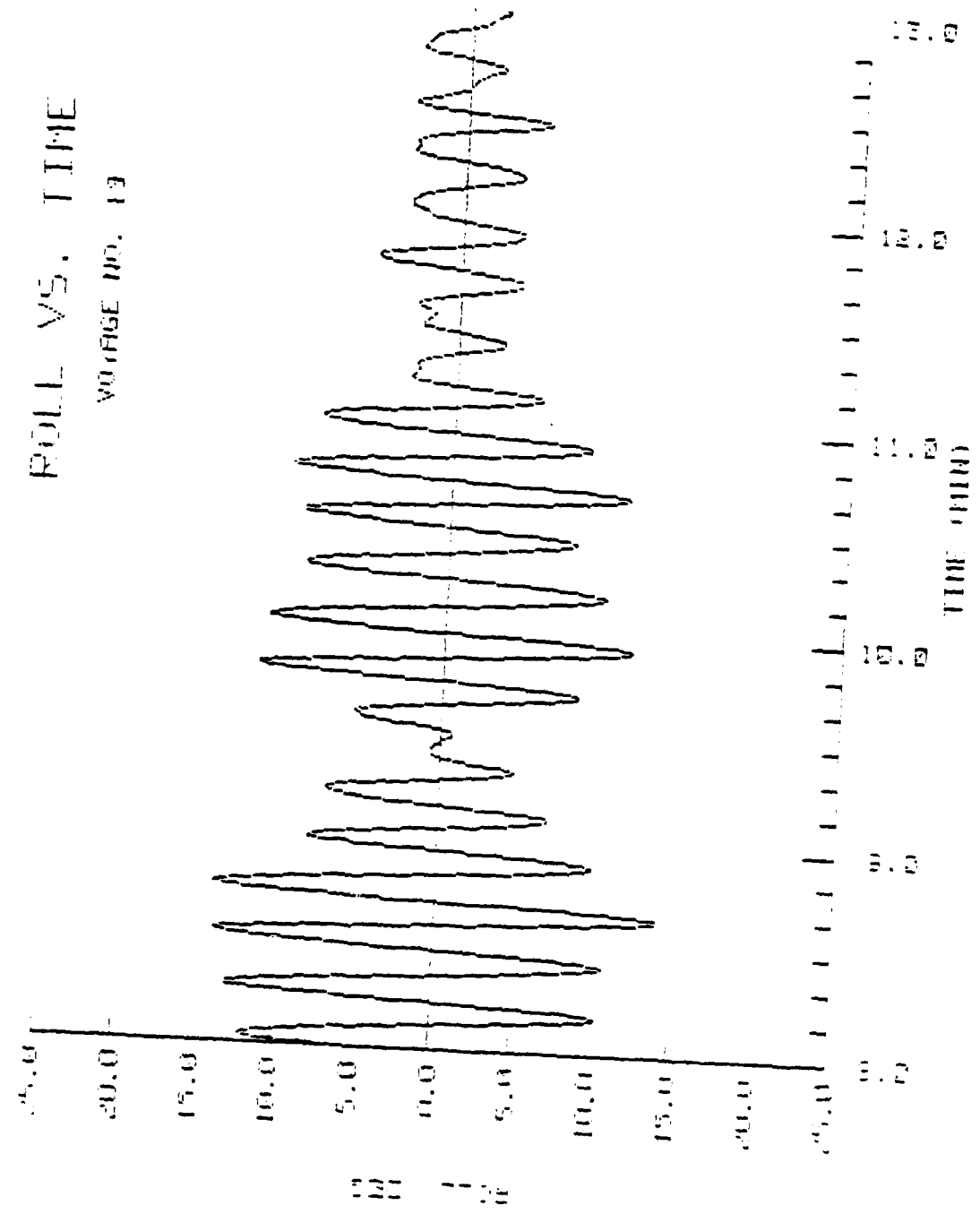
VOLUME NO. 13



530 1111

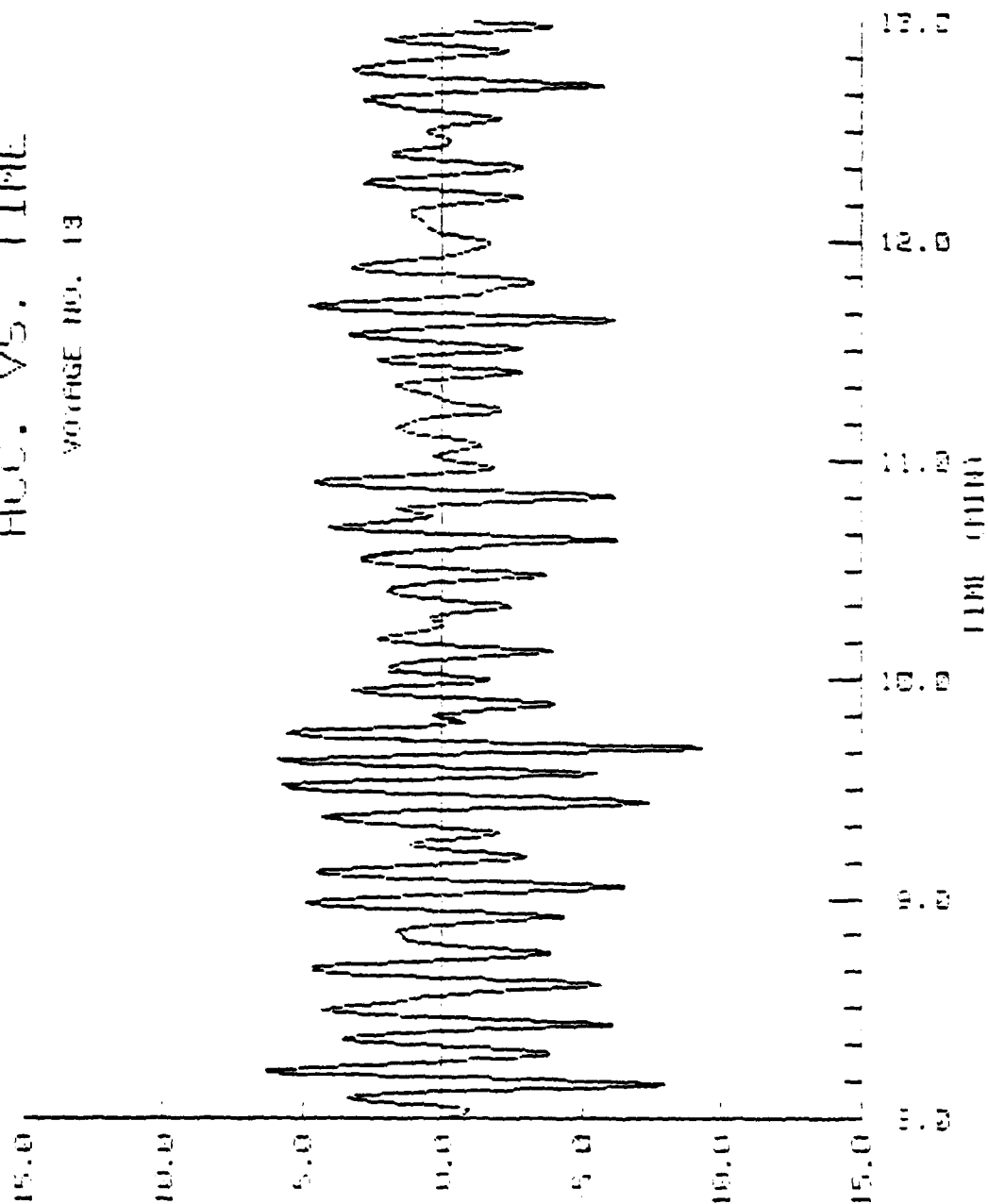
ROLL VS. TIME

VORAGE NO. 13



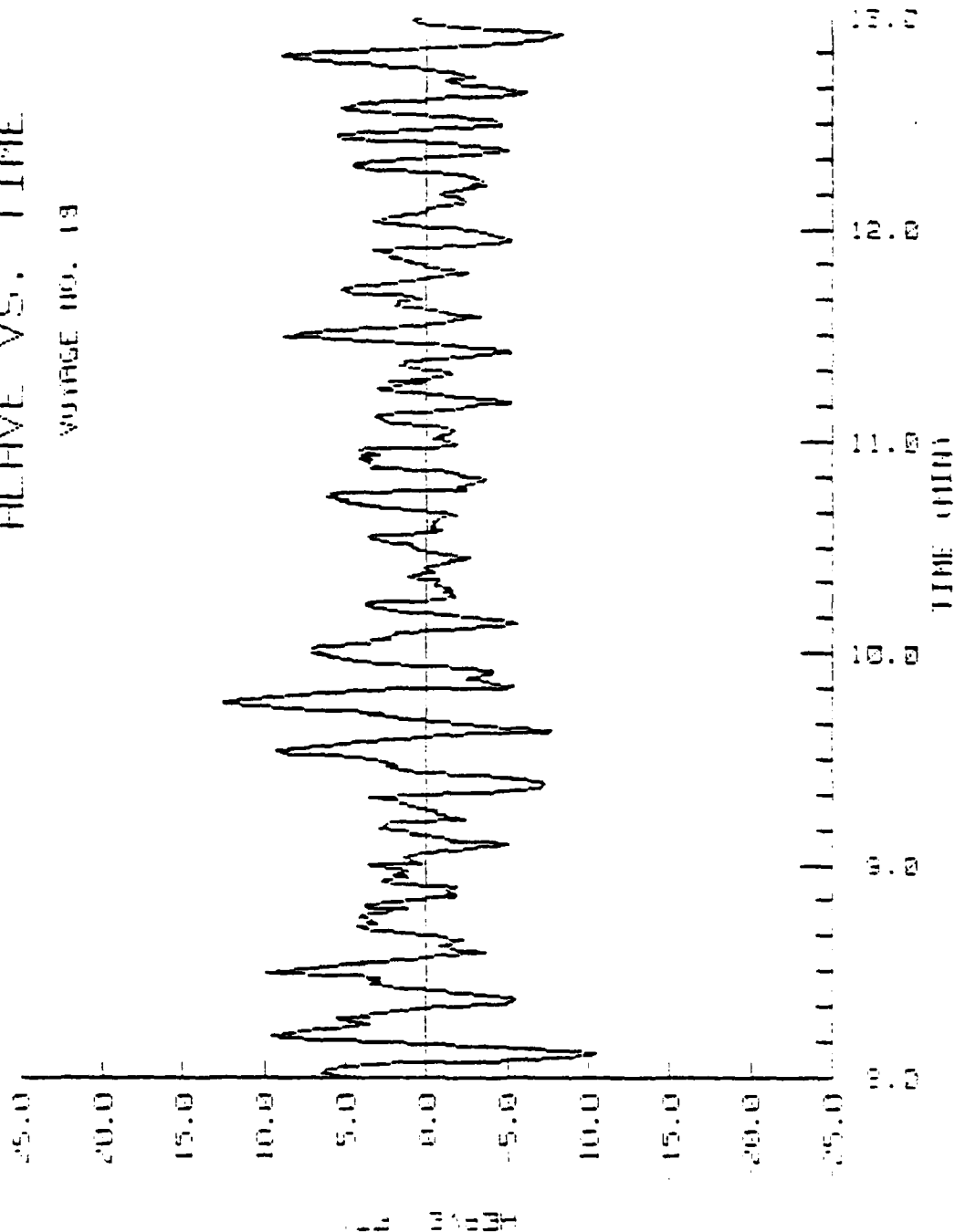
REC. VS. TIME

VOLUME NO. 13



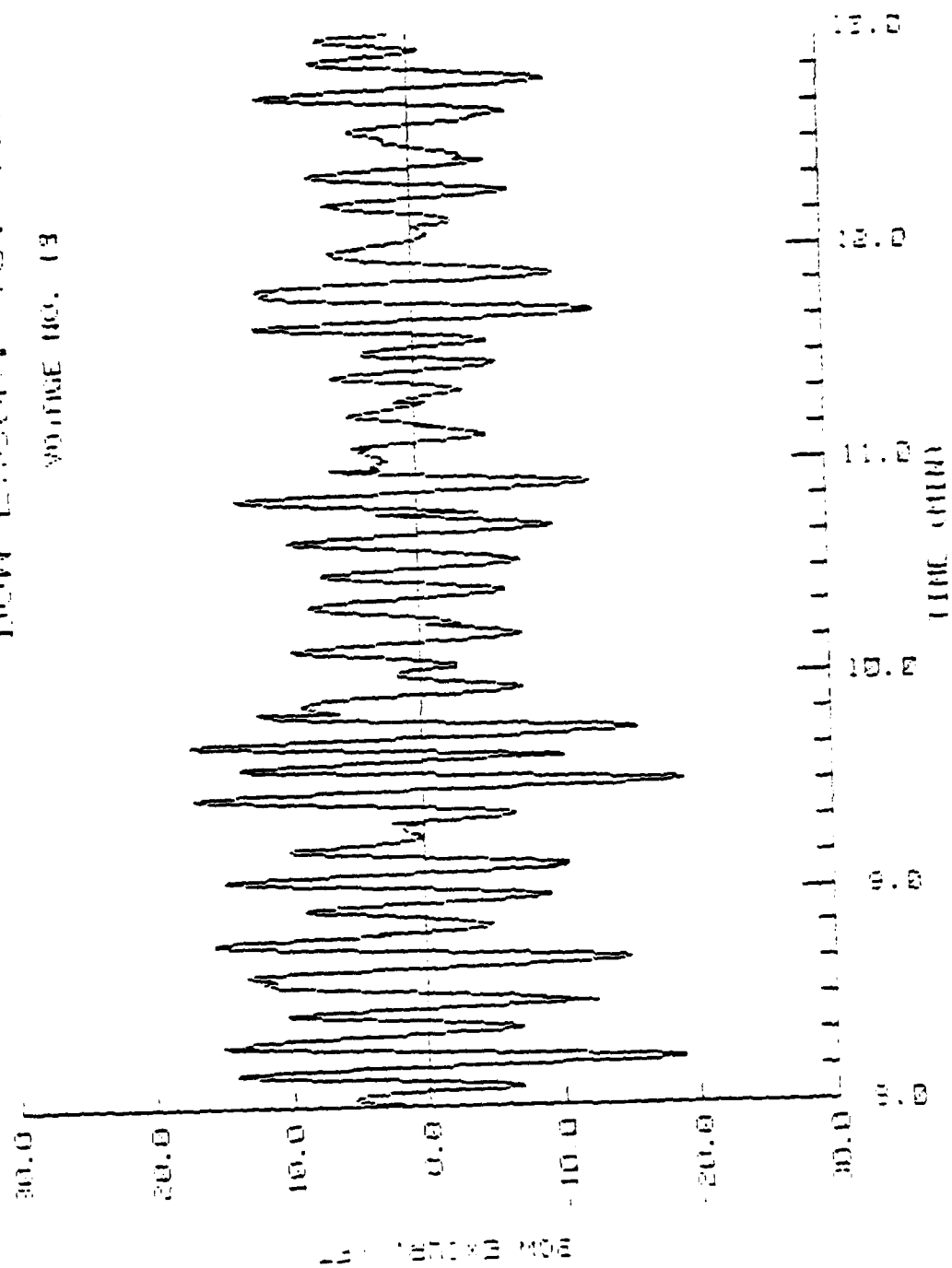
HEAVE VS. TIME

VOTAGE NO. 13



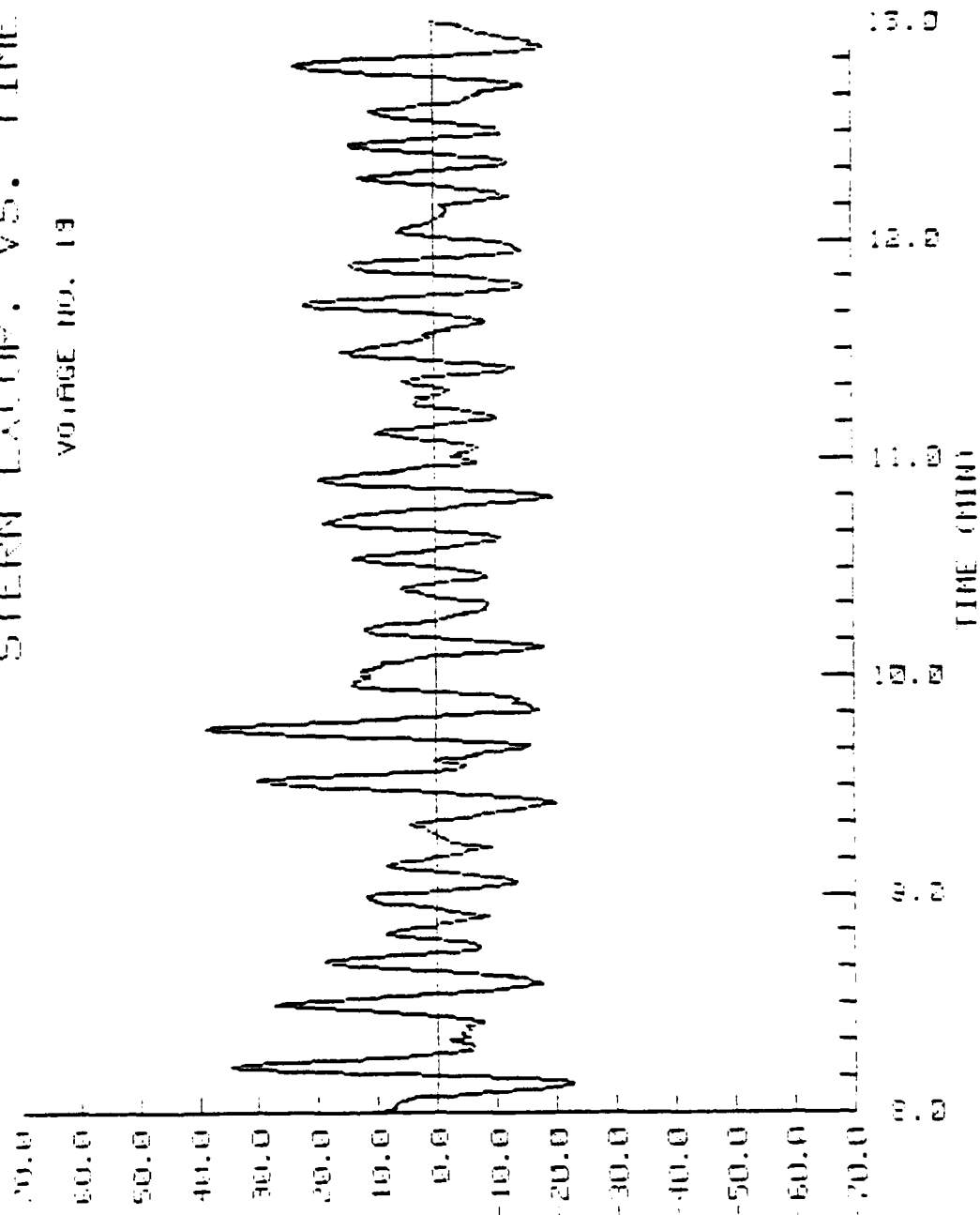
ROM EXCUR. VS. TIME

VOYAGE NO. 13



STERN EXCUP. VS. TIME

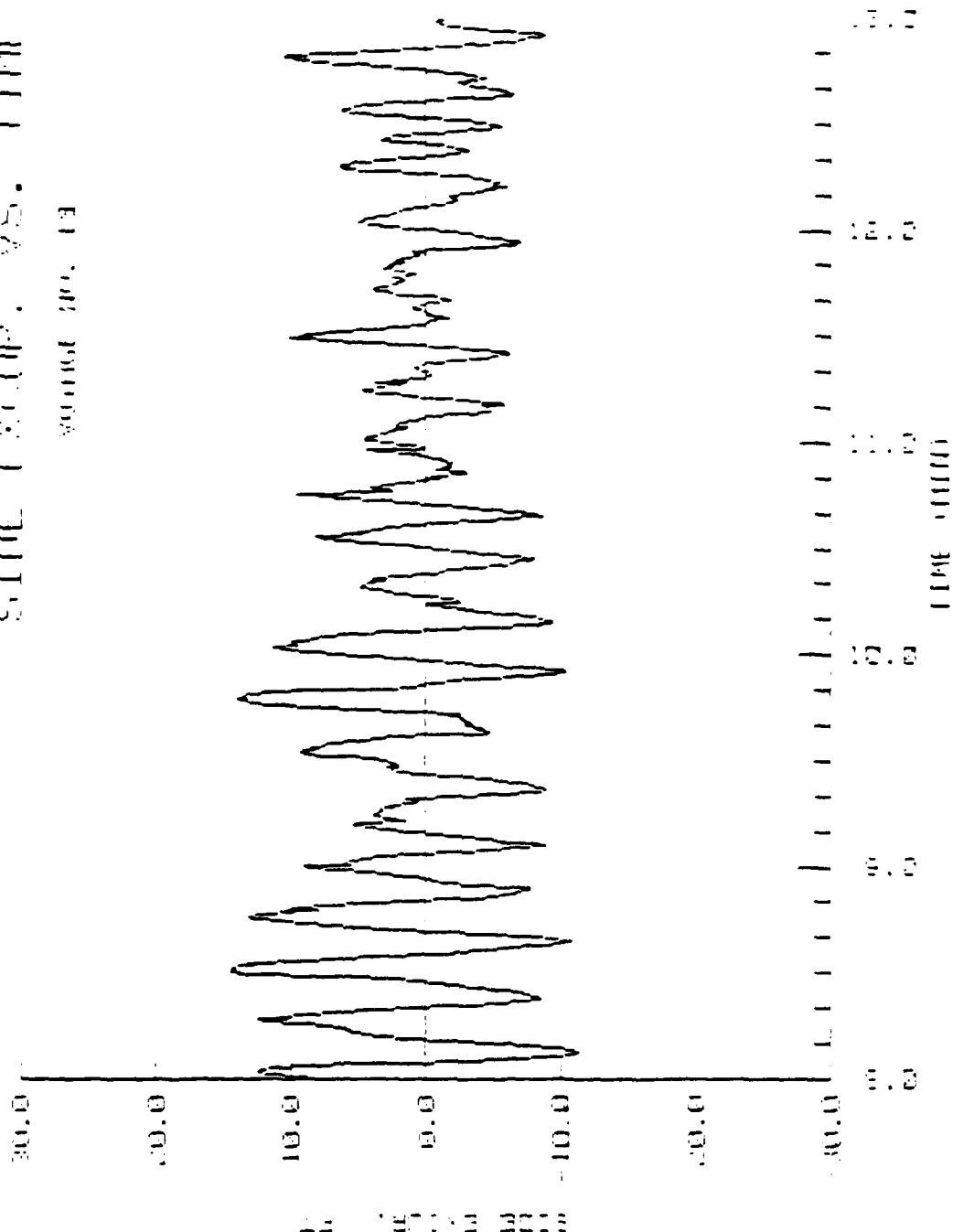
VOLUME NO. 13



STERN EXCUP. VS. TIME

SIGNAL GROUP, VS. TIME

GROUP NO. 13



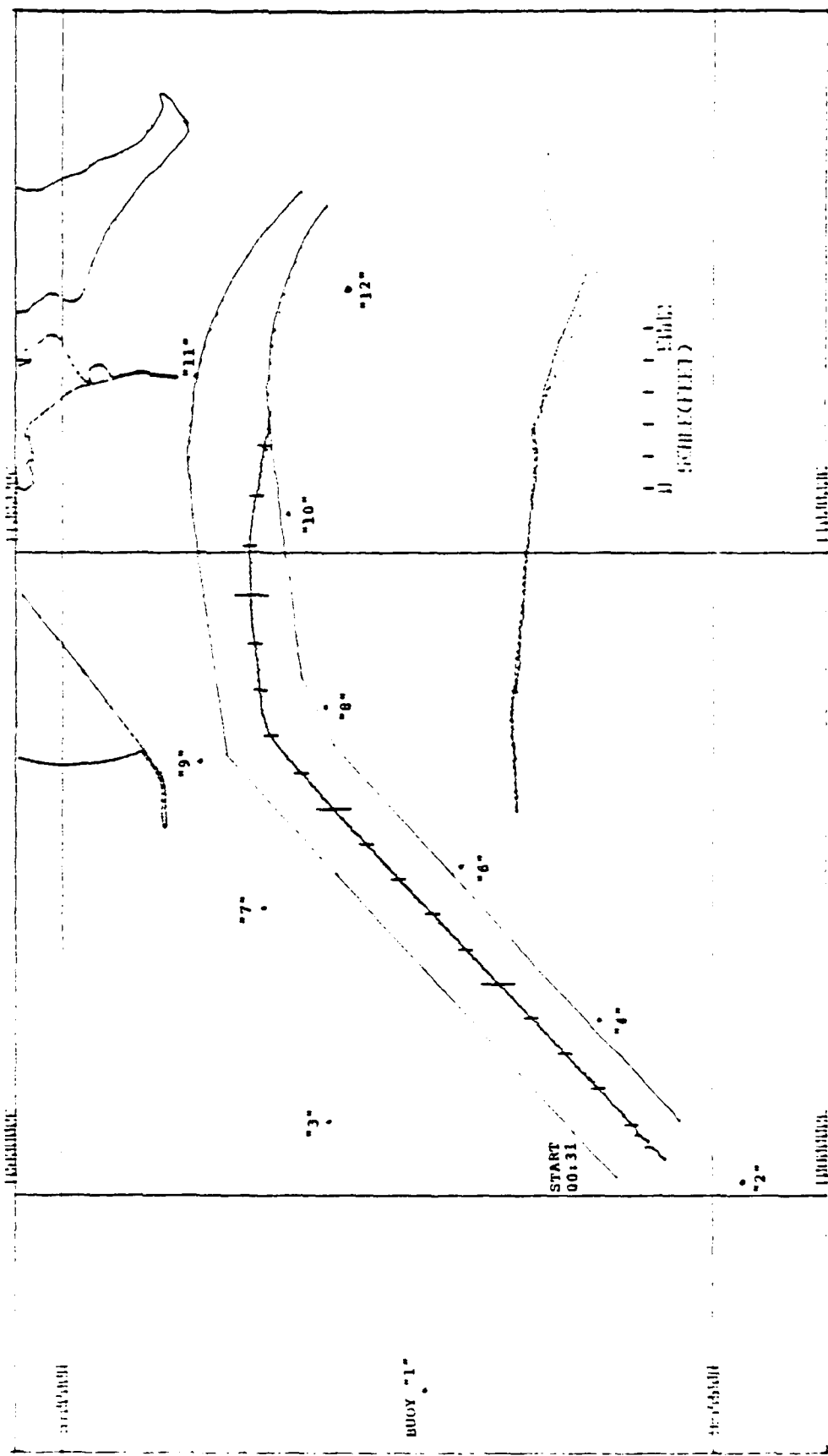
STATISTICAL SUMMARY

VOYAGE NO. 20

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-0.3	1.2	.4	.5
ROLL (DEG)	-0.1	5.7	2.7	3.0
NO. (FT/SEC/SEC)	-0.0	1.3	.4	.5
HEAVE (FT)	.1	2.5	.8	1.0
ROLL EXCUR. (FT)	.1	8.0	2.5	3.1
STERN EXCUR. (FT)	.1	5.7	1.5	1.8
SIDE EXCUR (FT)	.1	5.3	2.6	3.1

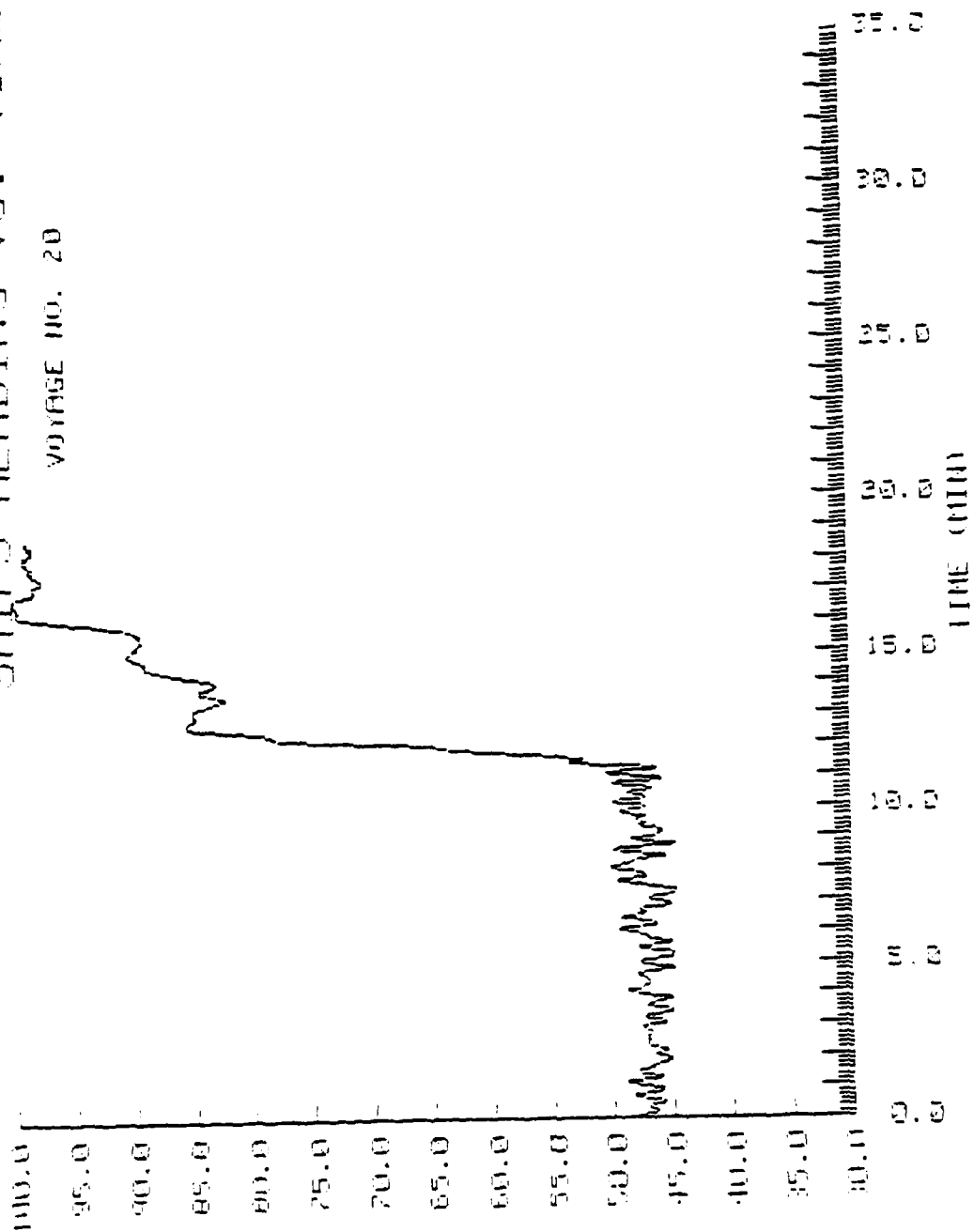
STATION 101. 200 SHIP TRACK

5-10-50



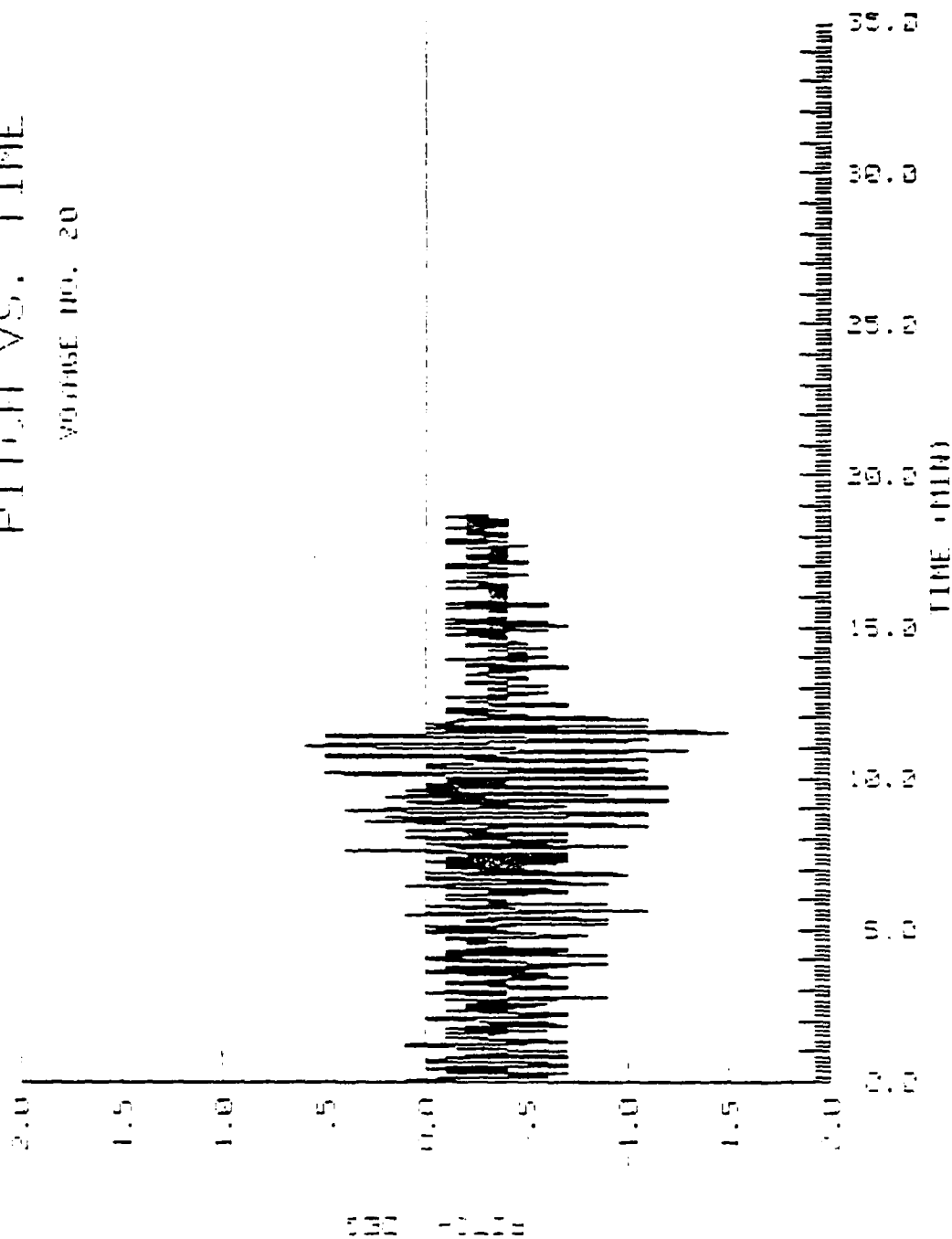
SHIPS HEADING VS. TIME

VOYAGE NO. 20



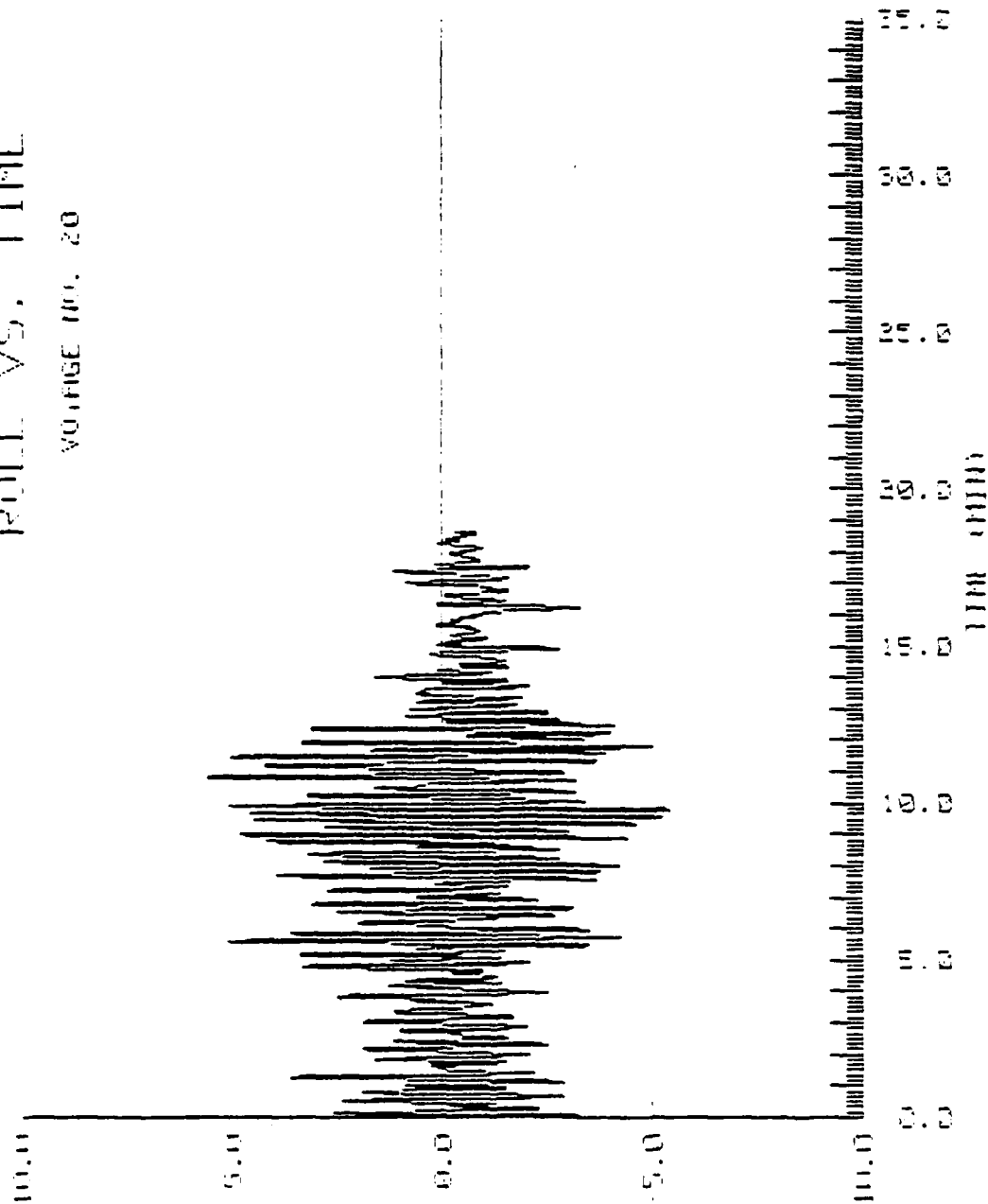
PITCH VS. TIME

VOLUME 100, 20



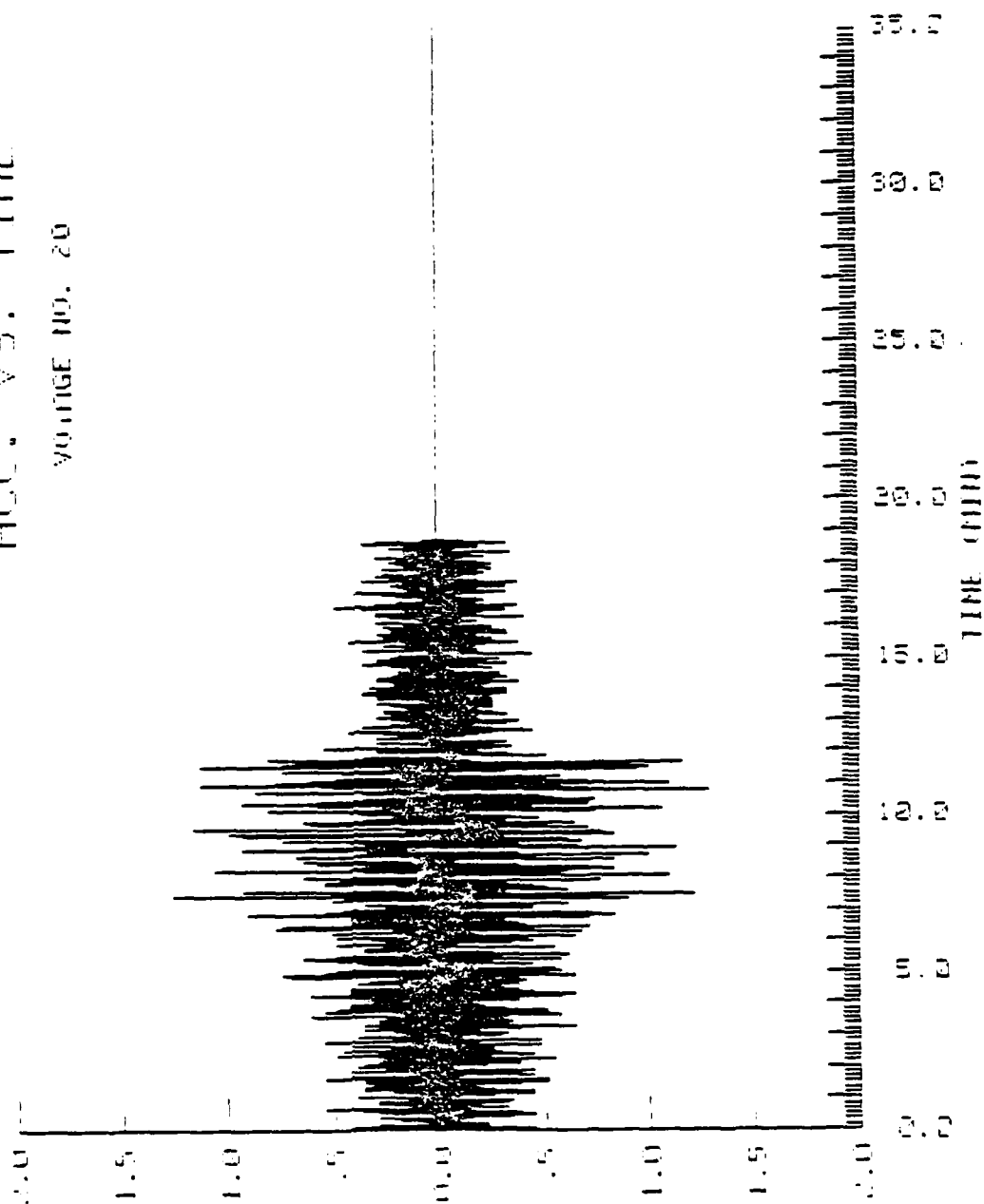
ROLL VS. TIME

VOL/INCH 100, 20



REC. VS. TIME

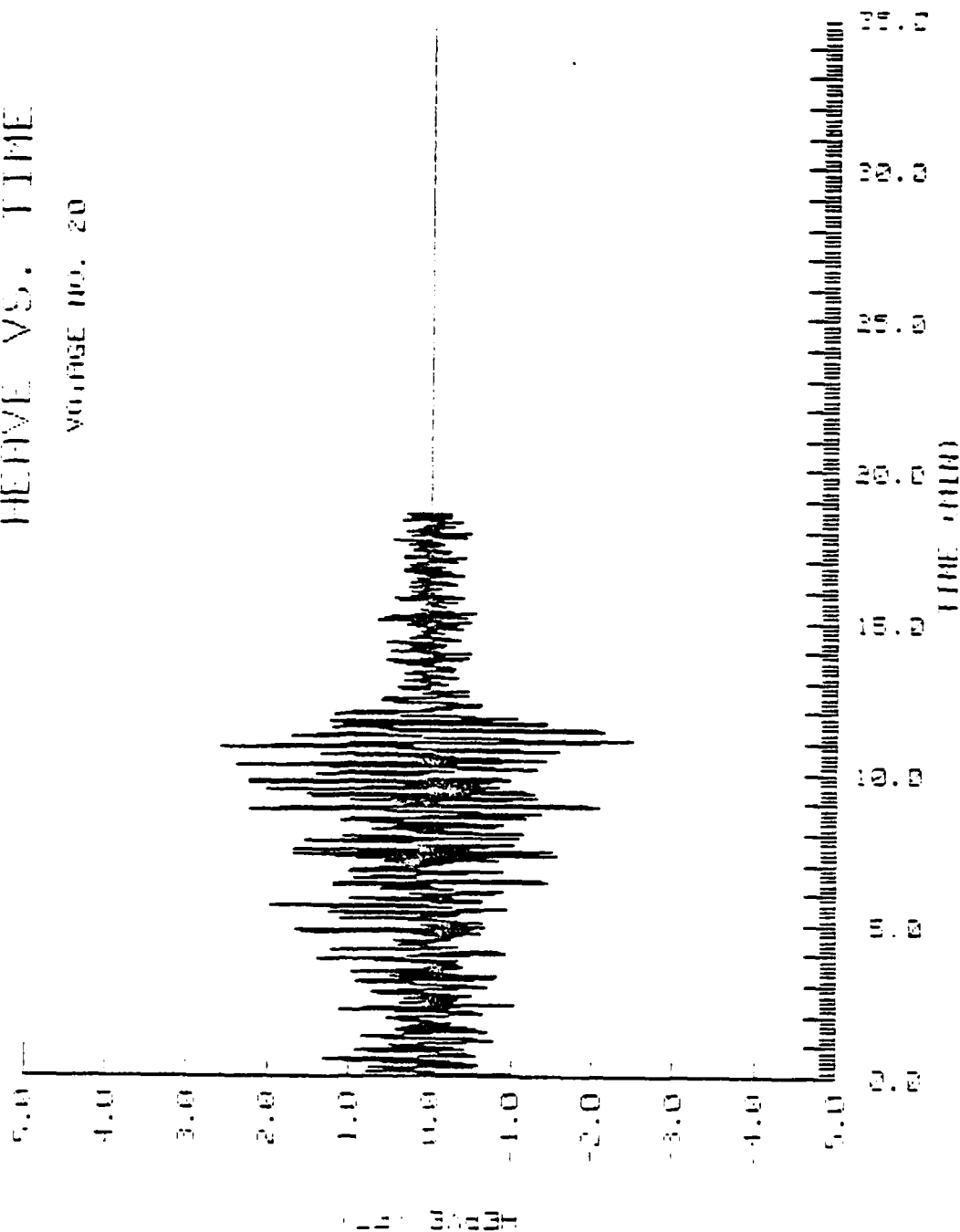
VOLUME NO. 20



100 100 100 100

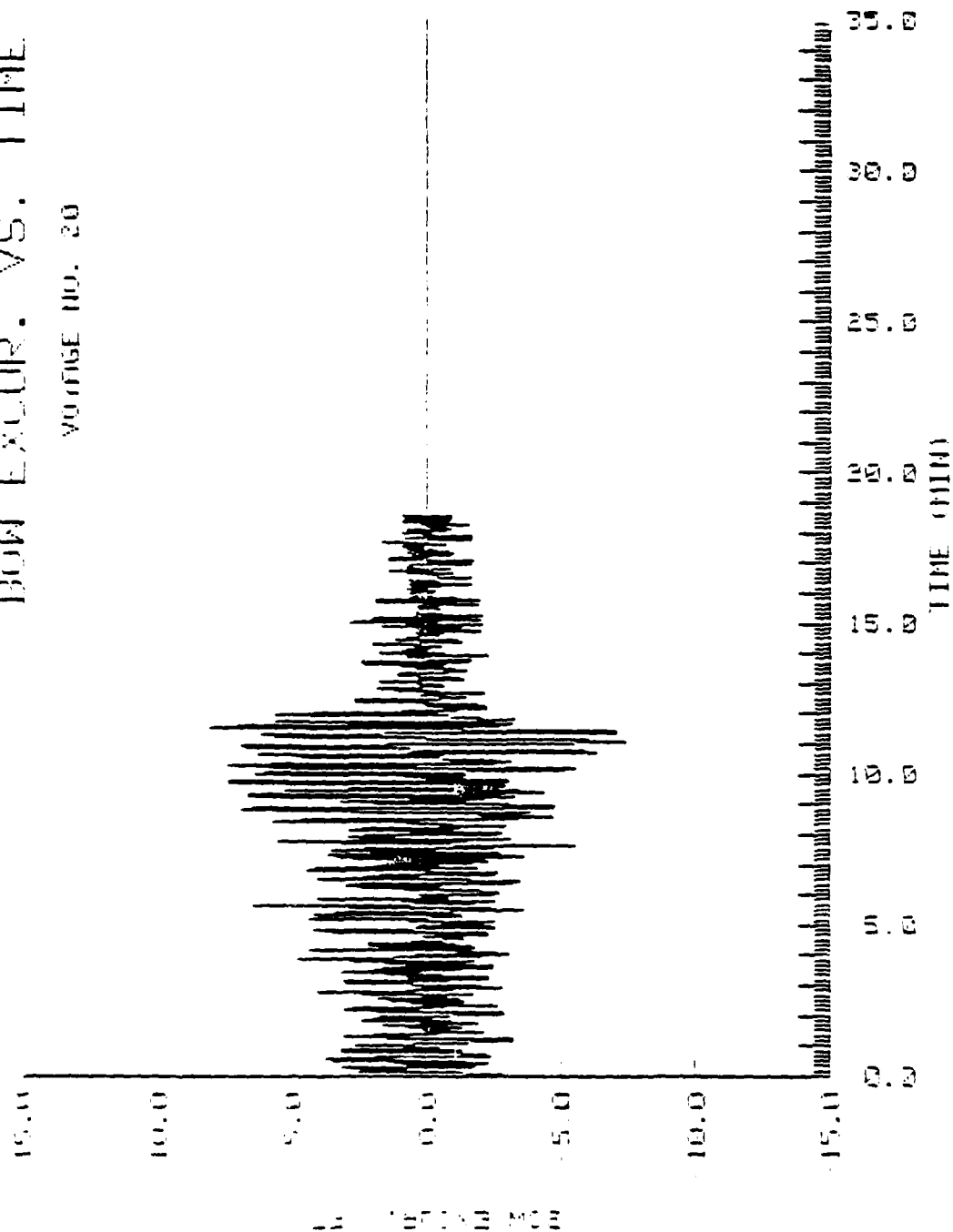
HEAVE VS. TIME

VOLUME NO. 20



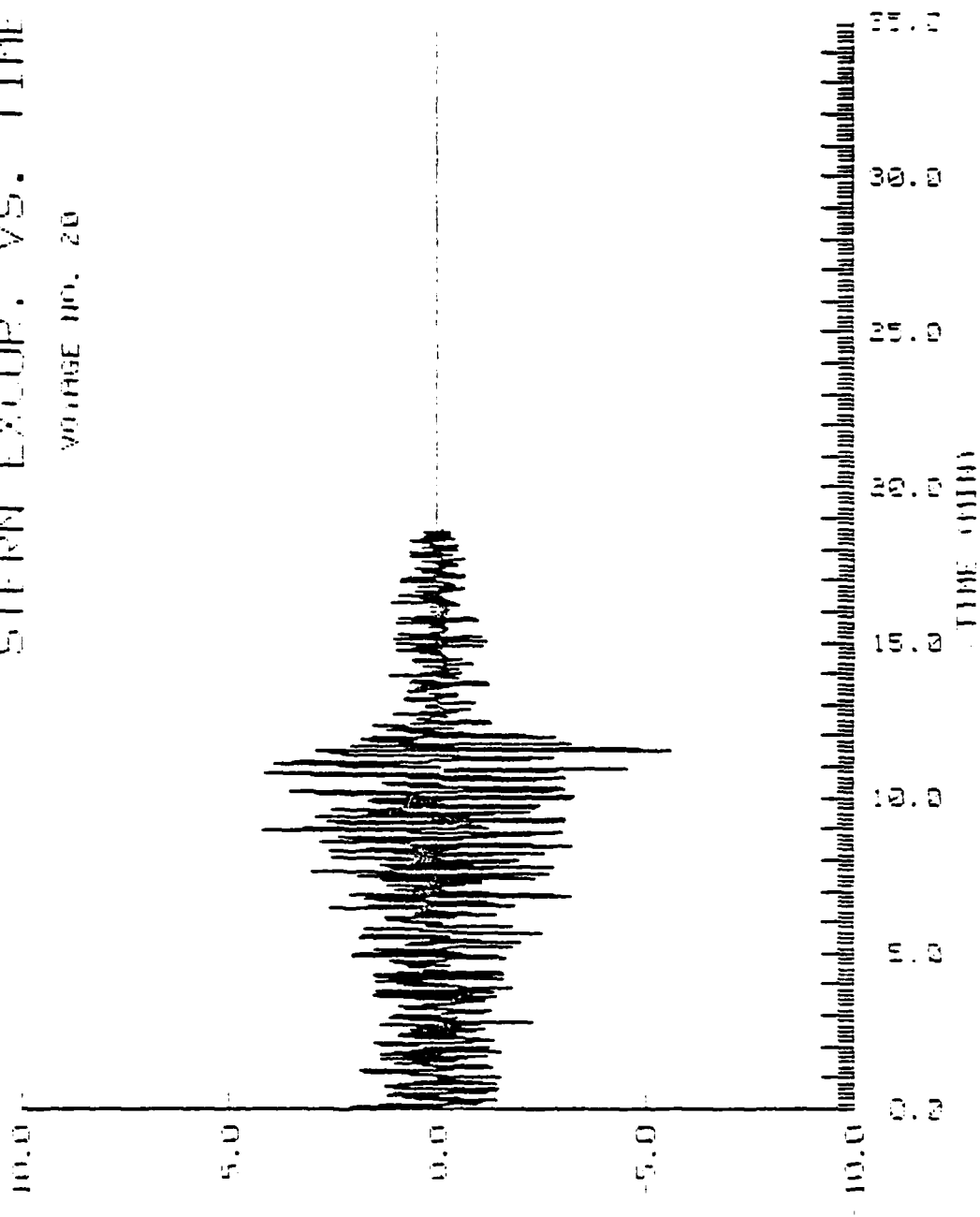
BOW EXCUR. VS. TIME

VOLUME NO. 20



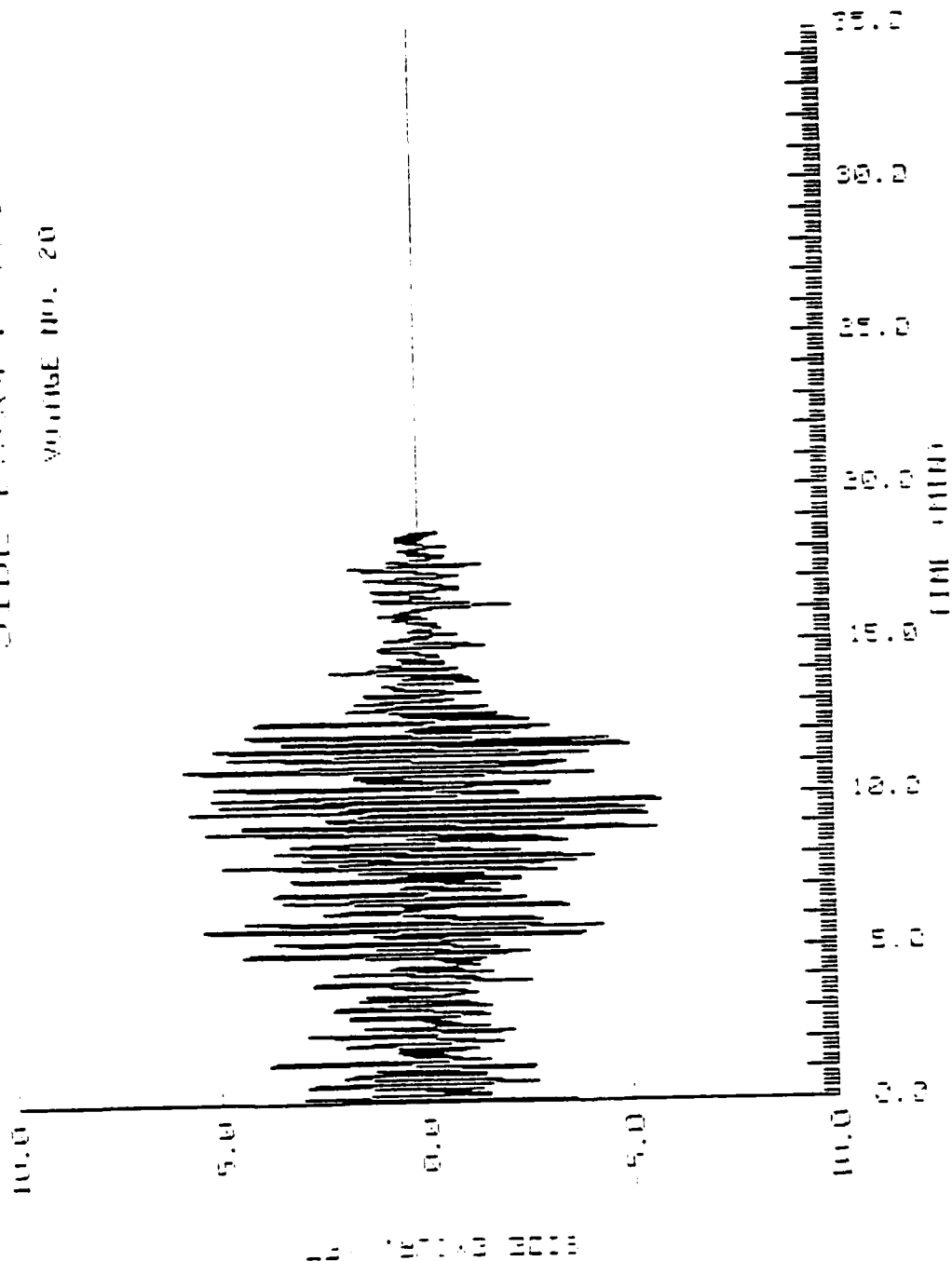
STERN EXCUR. VS. TIME

VOLUME NO. 20



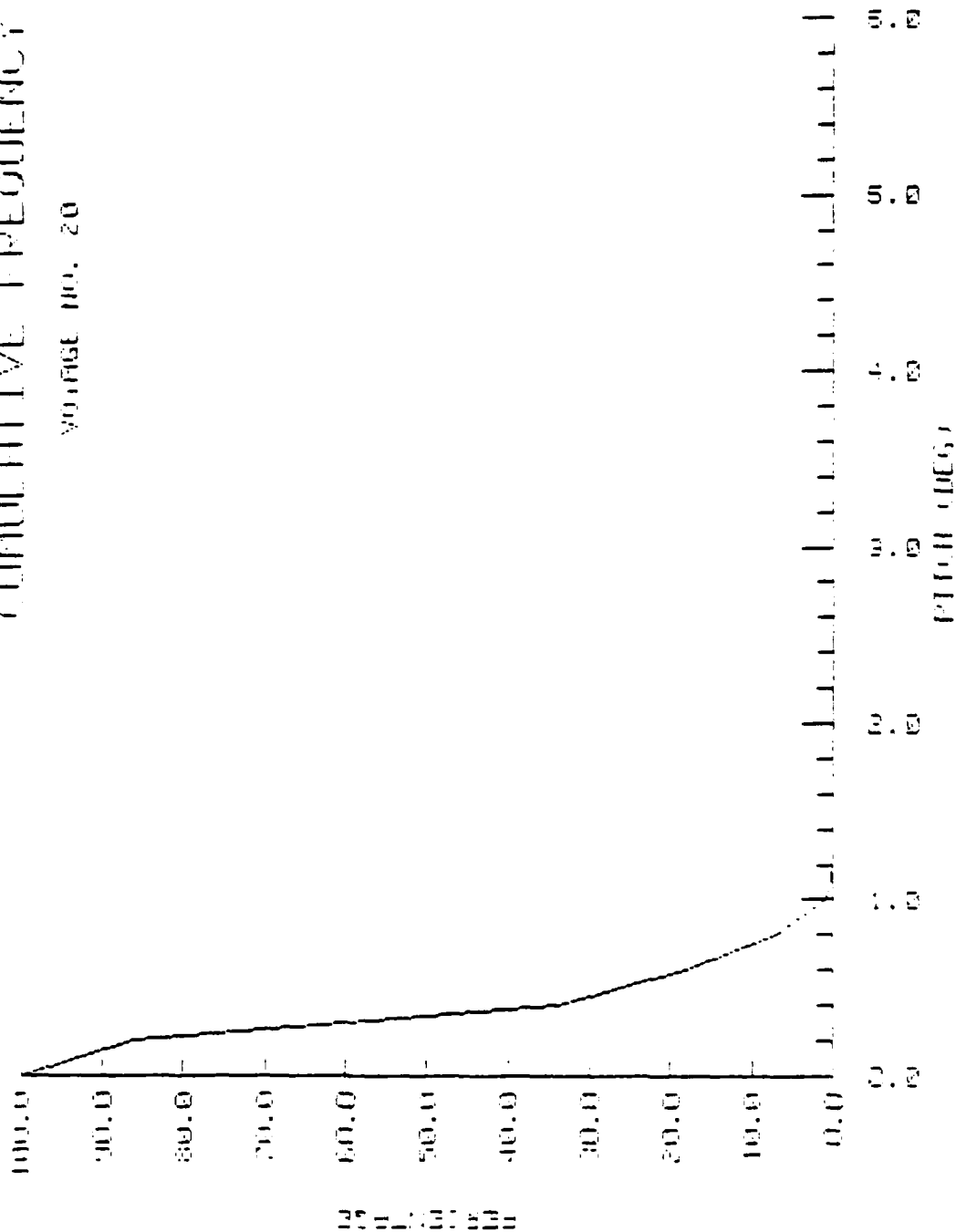
SLIDE GROUP, VS. TIME

YOUNG NO. 20



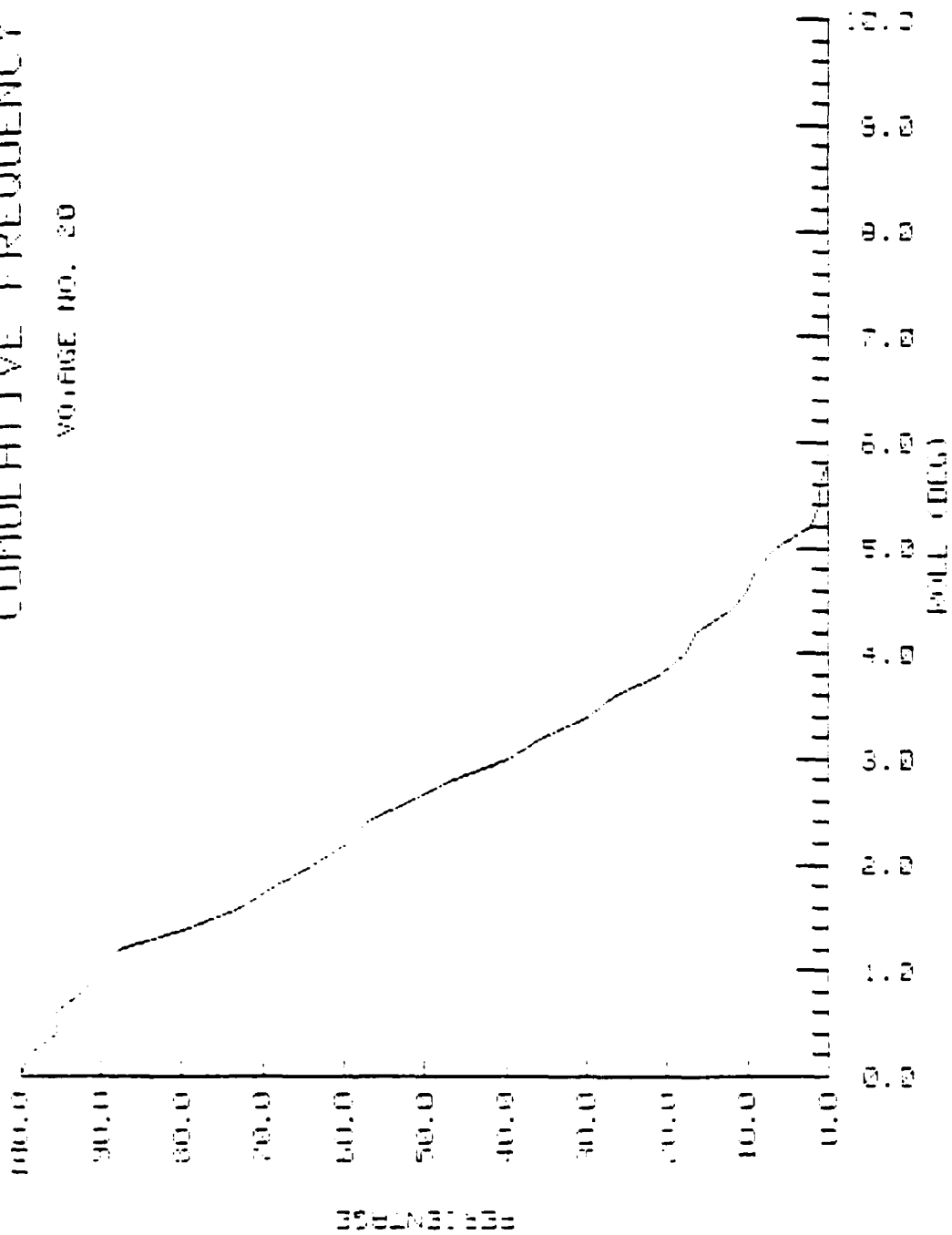
CUMULATIVE FREQUENCY

VOLUME NO. 20



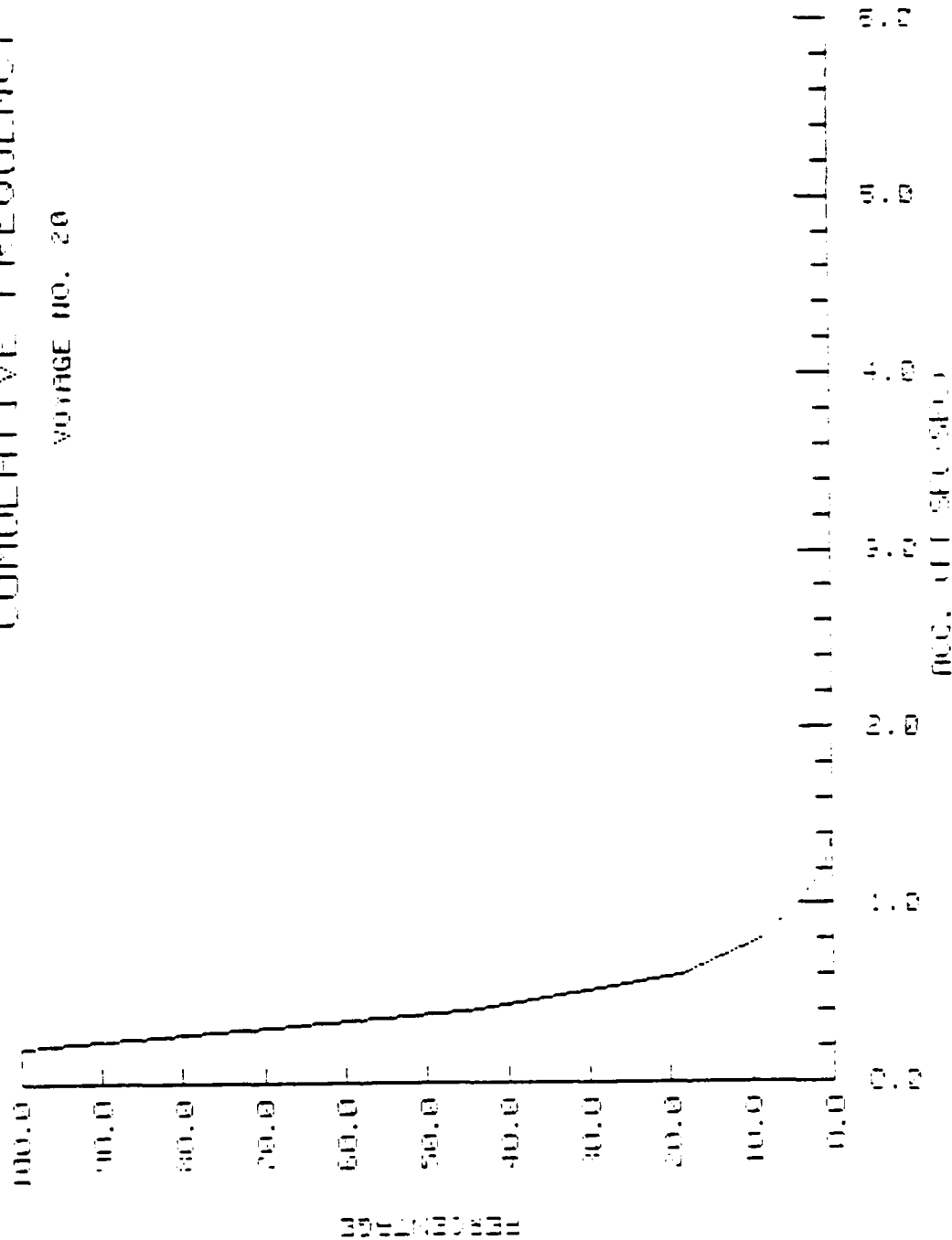
CUMULATIVE FREQUENCY

VOLAGE NO. 20



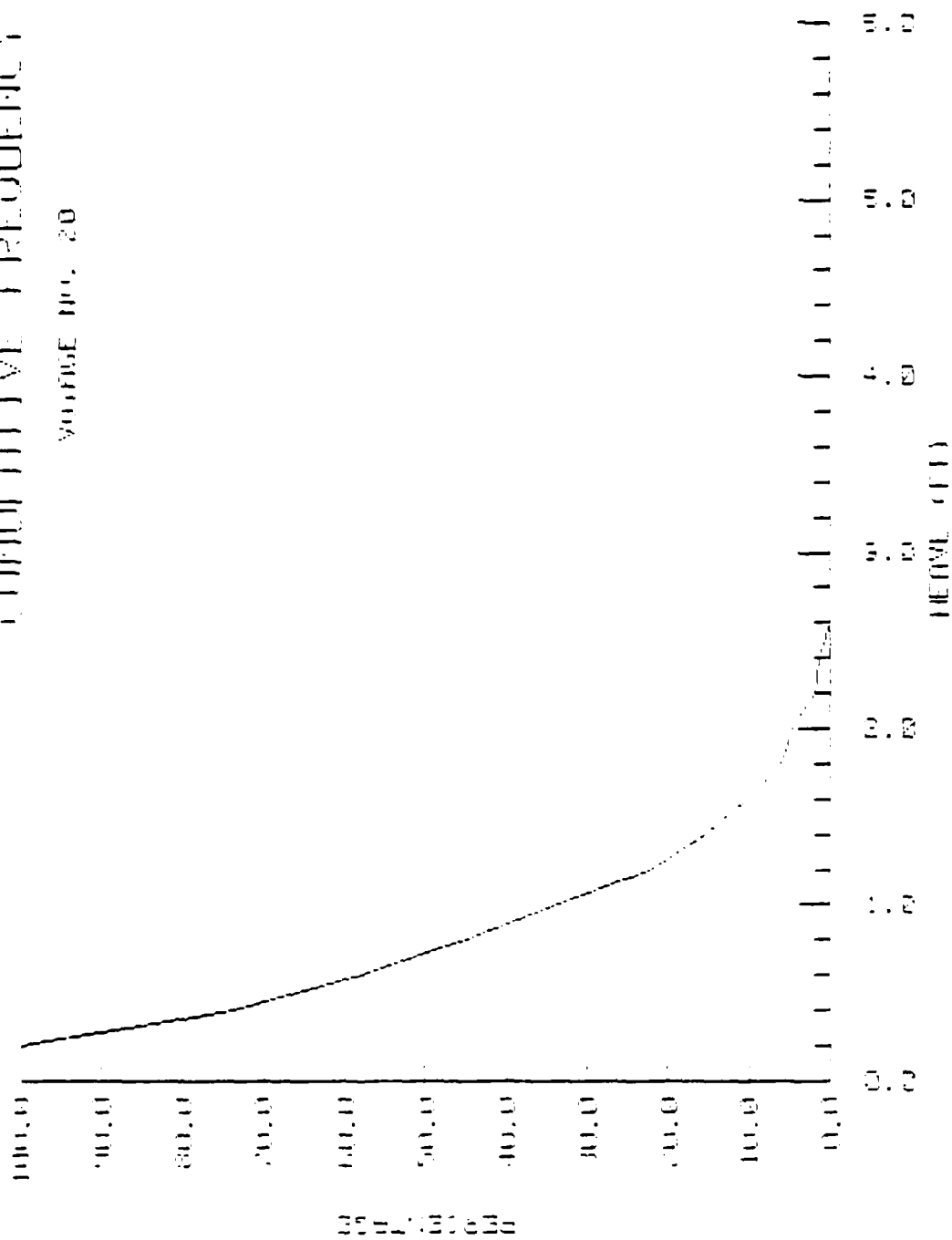
CUMULATIVE FREQUENCY

VOLUME NO. 20



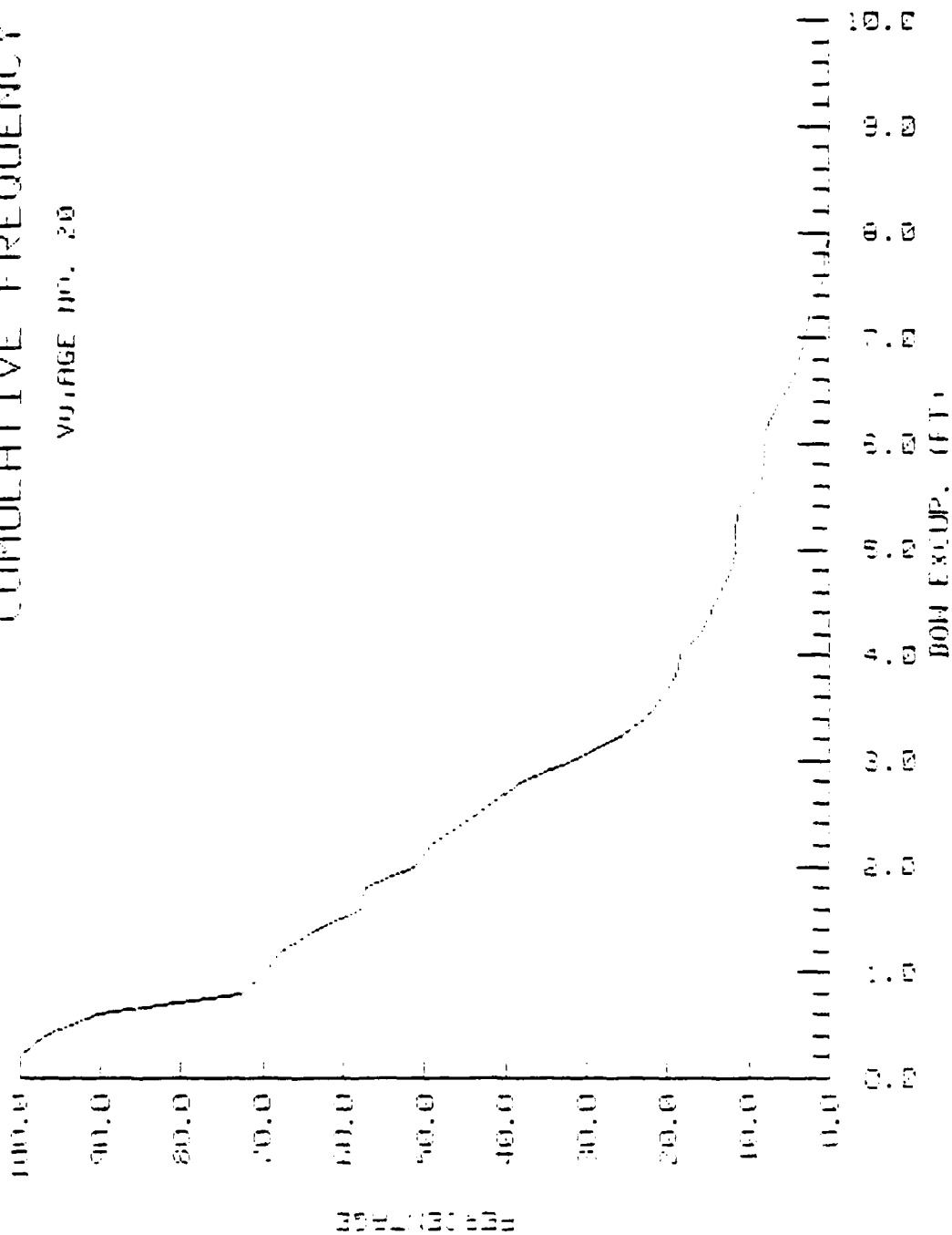
CUMULATIVE FREQUENCY

YOUNG NO. 20



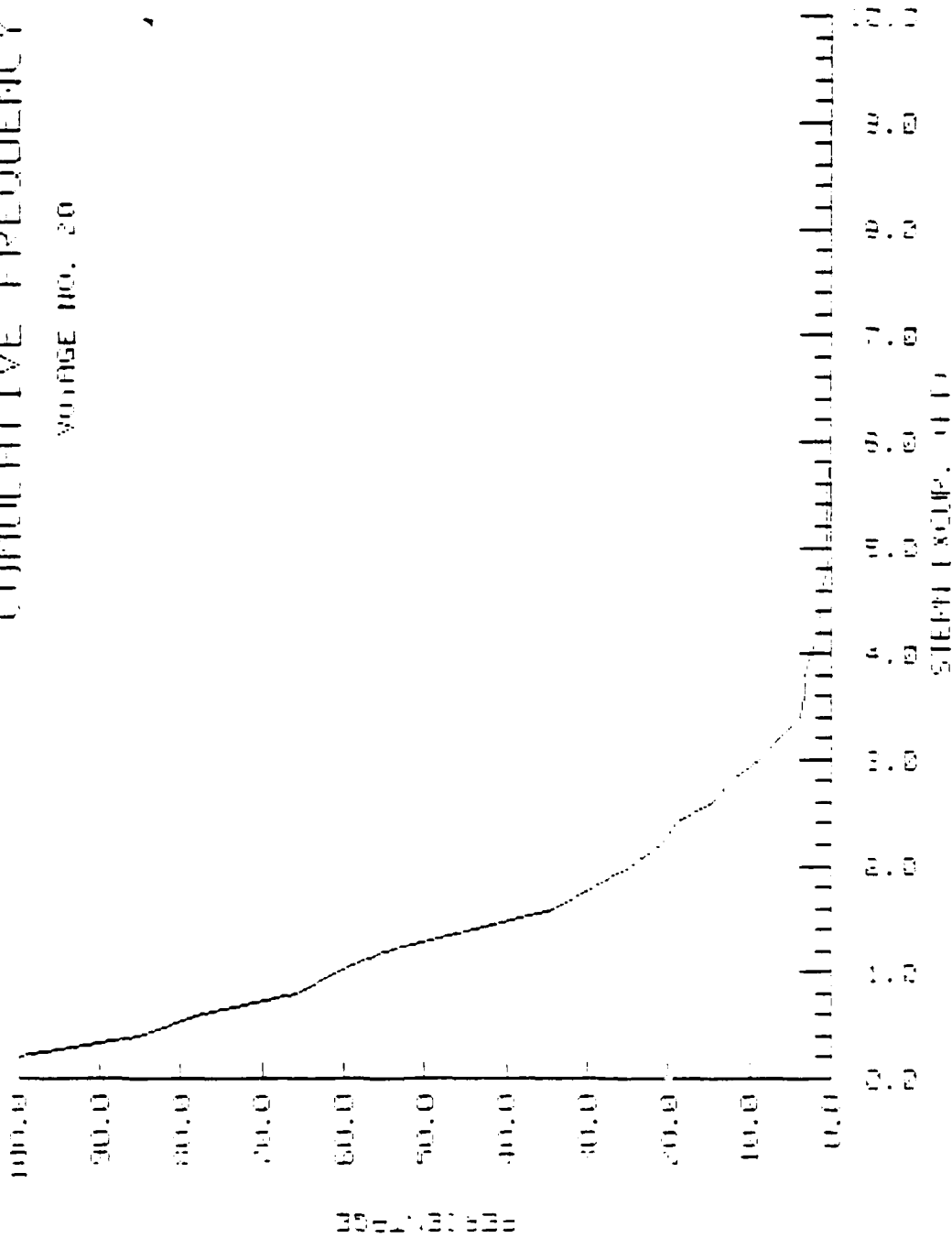
CUMULATIVE FREQUENCY

VOLUME NO. 20



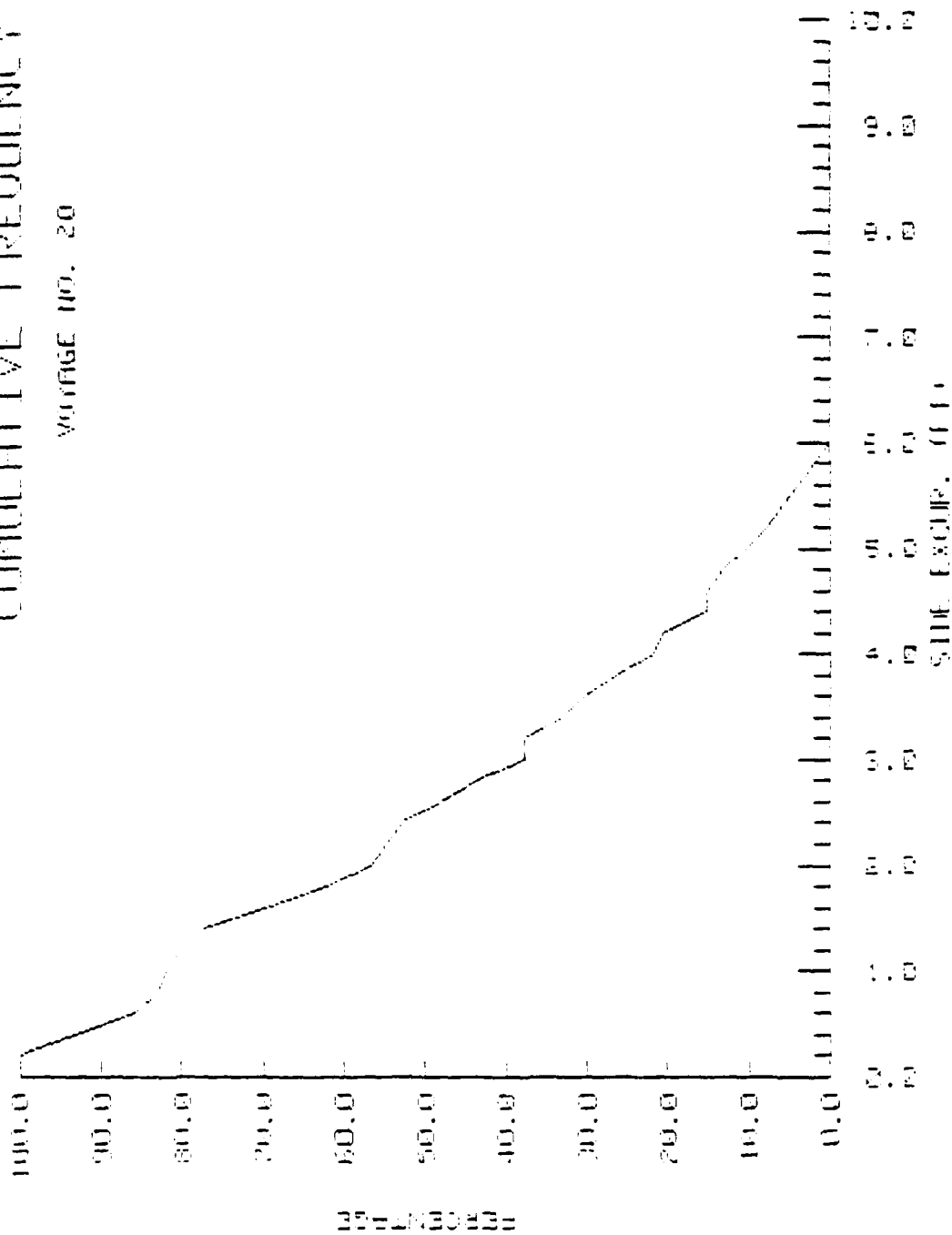
CUMULATIVE FREQUENCY

VOLUME NO. 20



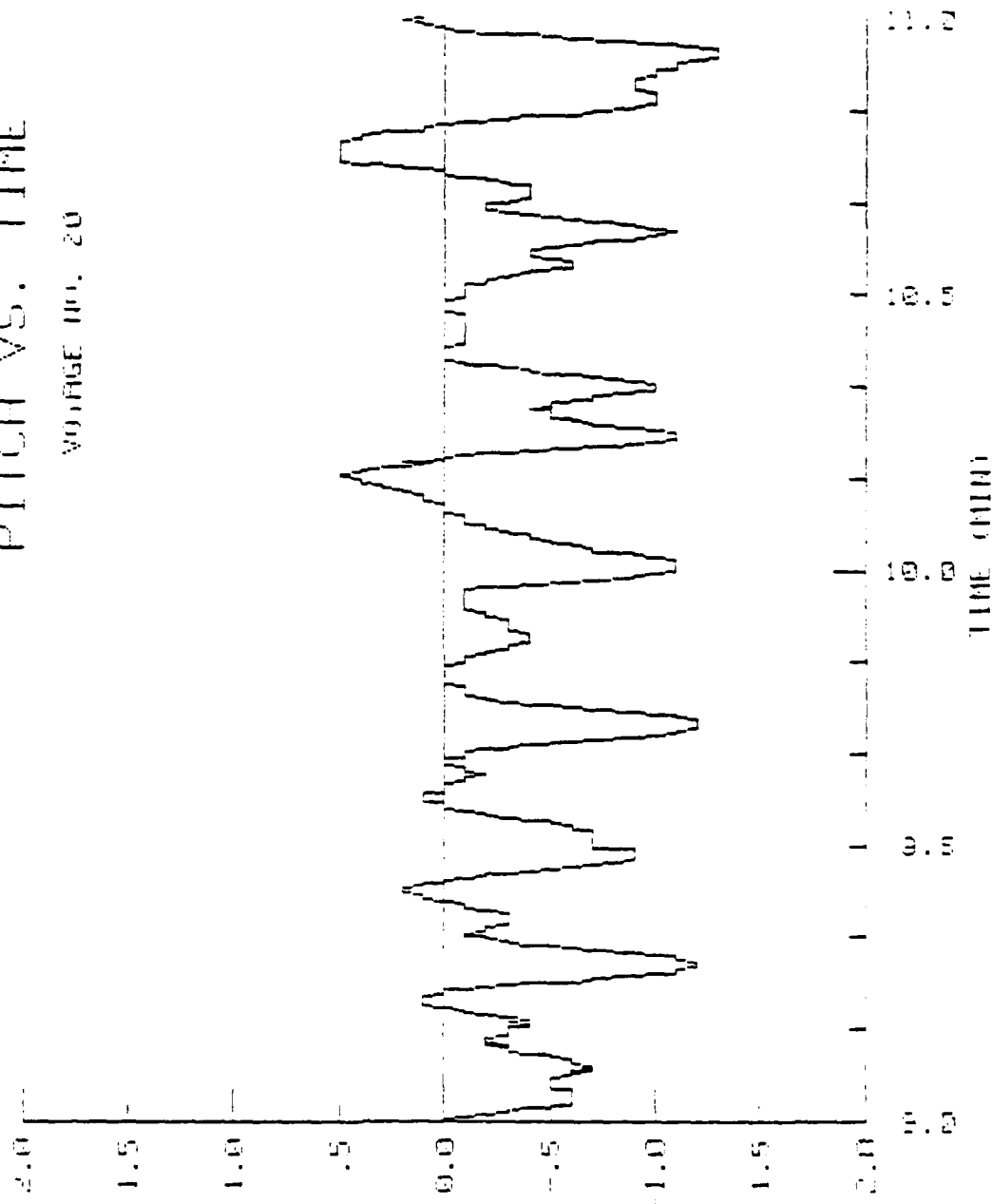
CUMULATIVE FREQUENCY

VORAGE NO. 20



PITCH VS. TIME

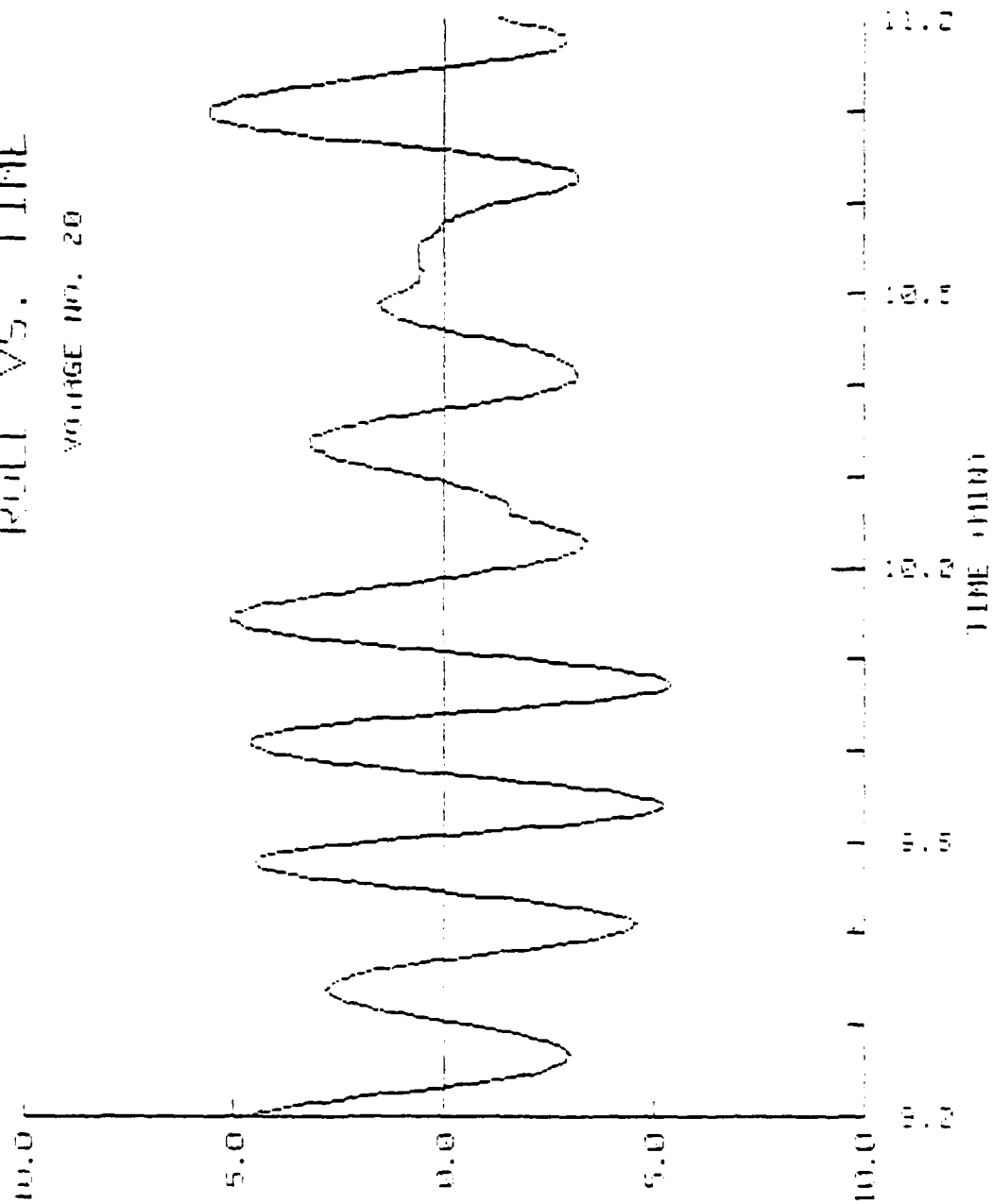
VOLUME 100, 20



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ROLL VS. TIME

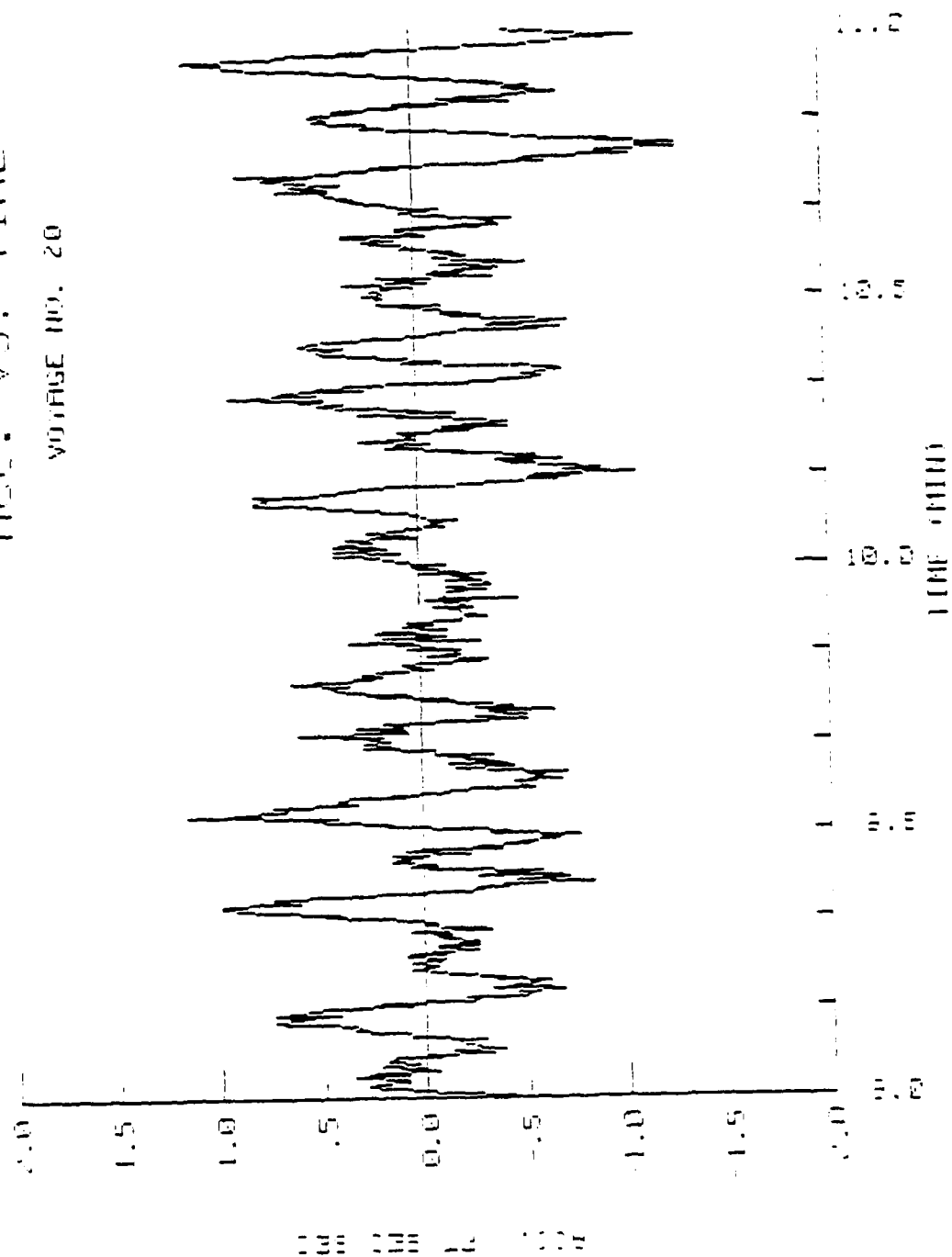
VOLAGE NO. 20



131 17.08

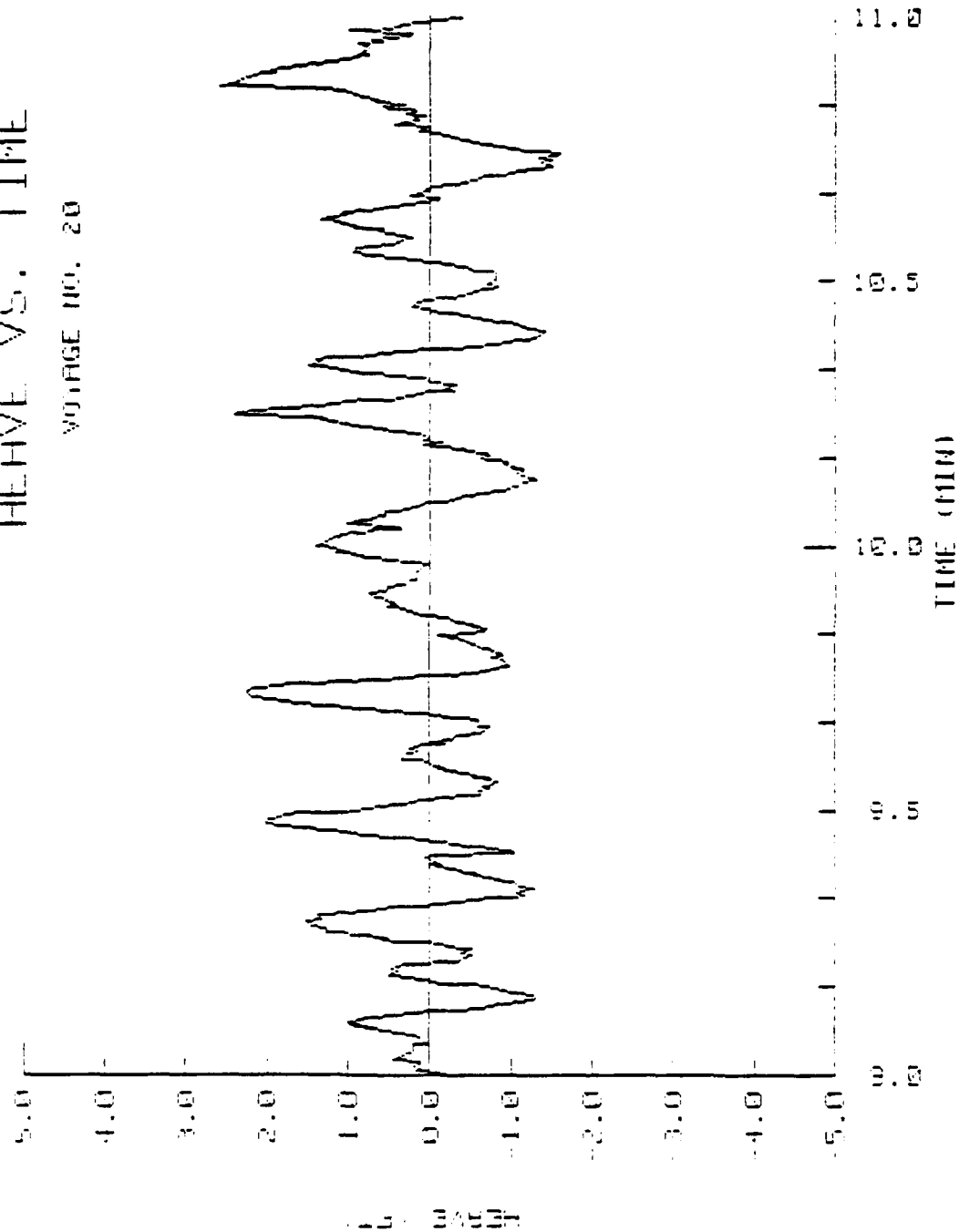
POL. VS. TIME

VOLTAGE NO. 20



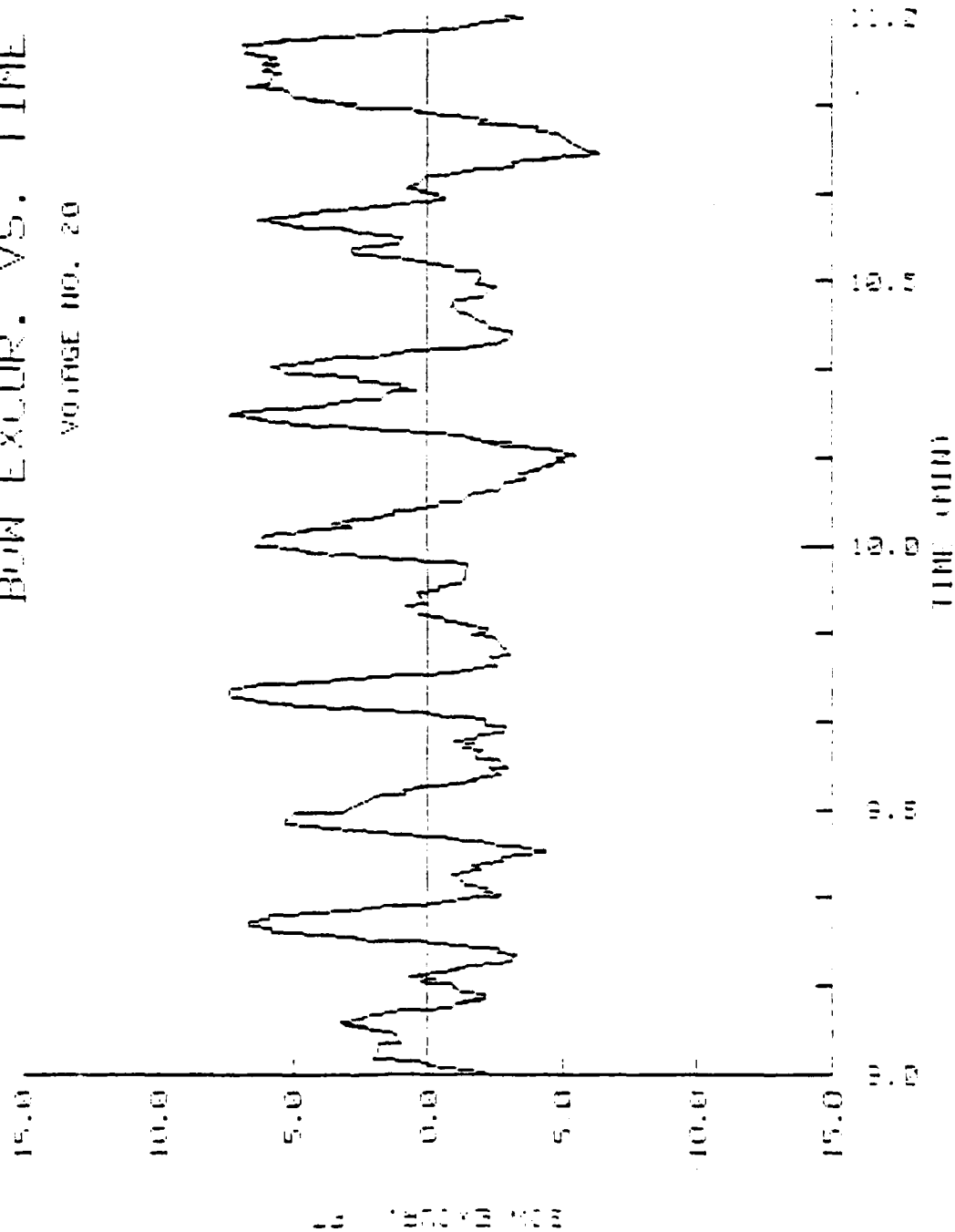
HEAVE VS. TIME

VOLUME NO. 20



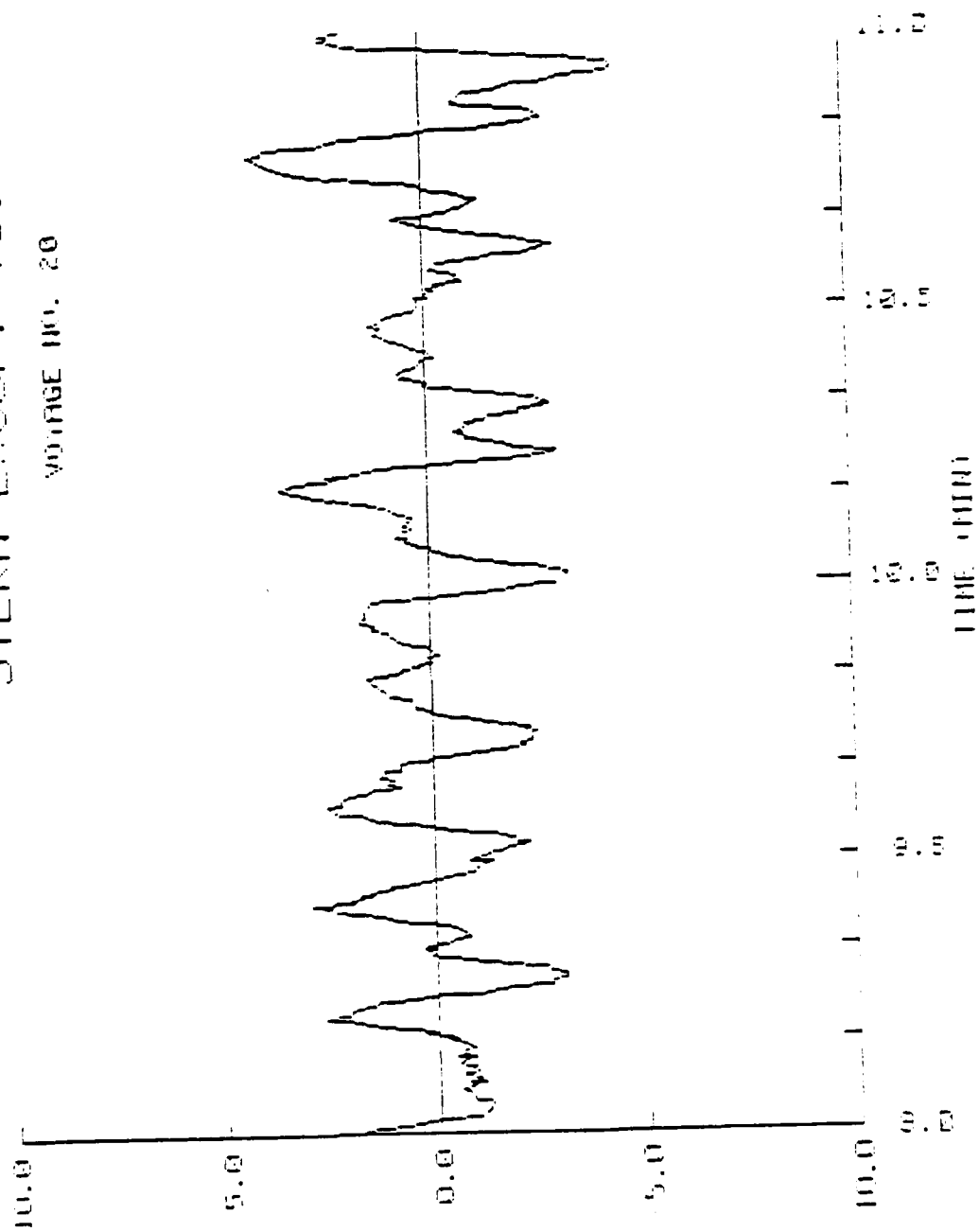
RAW EXCUR. VS. TIME

VOLUME NO. 20



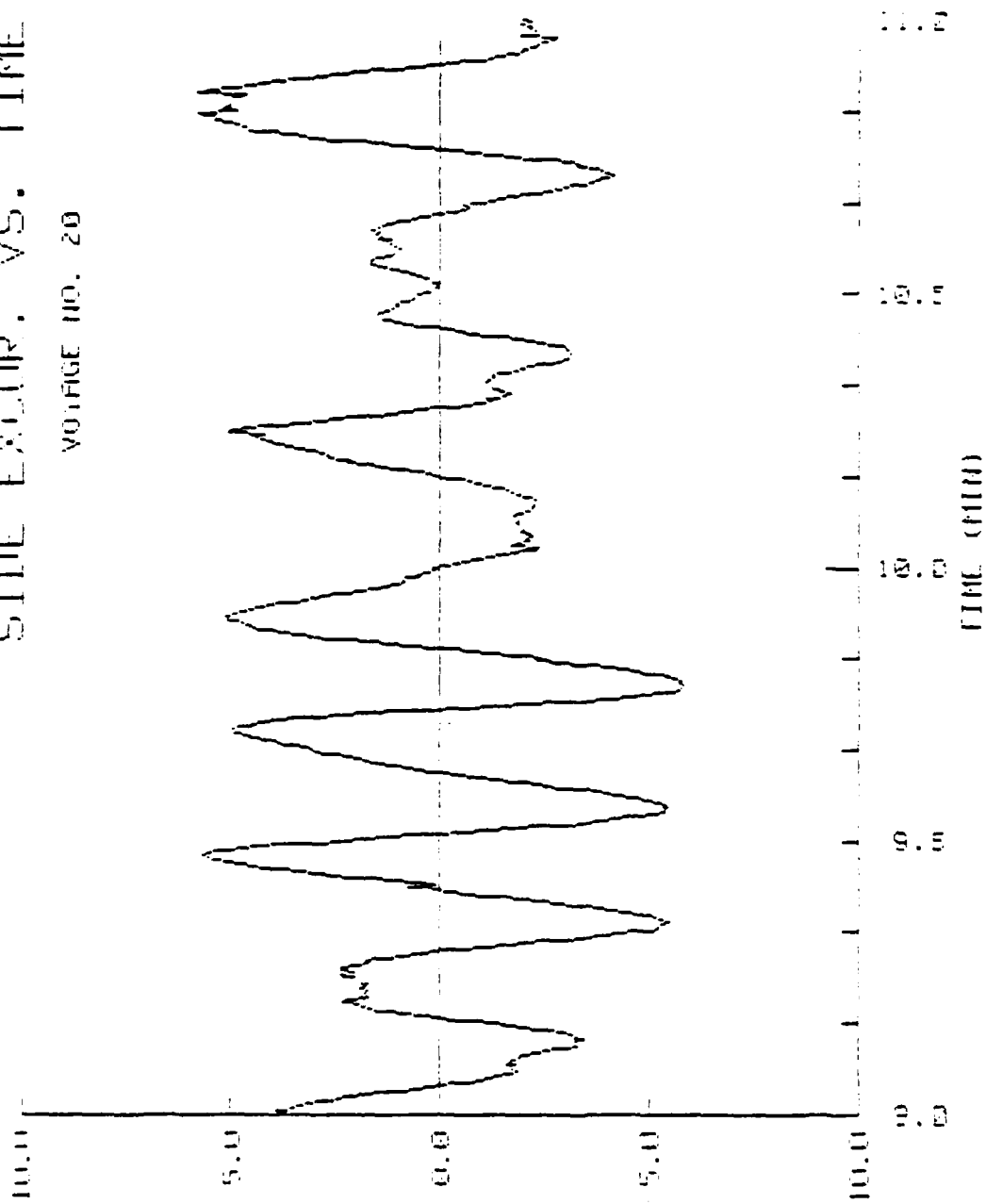
STERN EXCUR. VS. TIME

VOLTAGE NO. 20



SIDE EXCUR. VS. TIME

VOLUME NO. 20

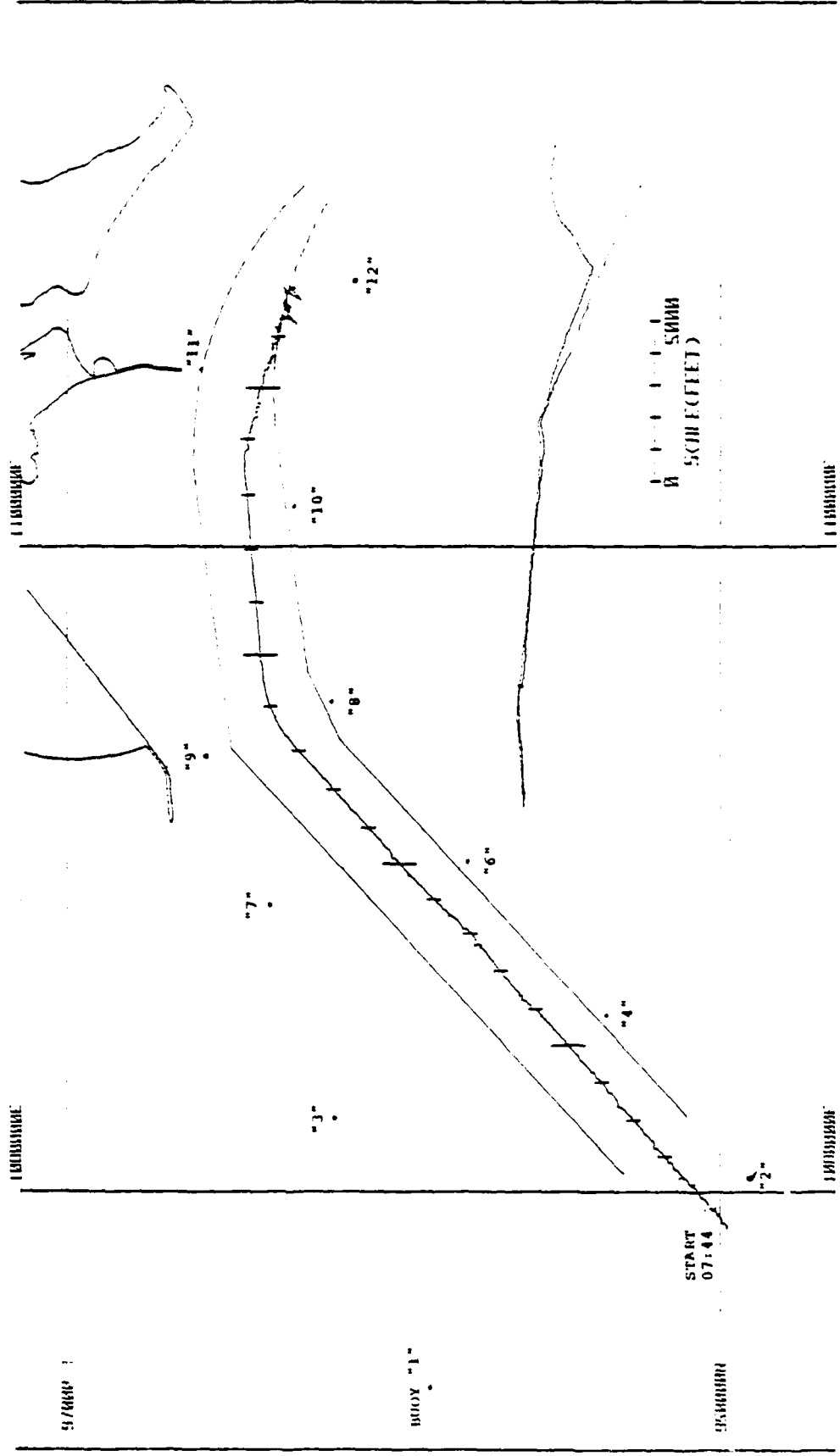


STATISTICAL SUMMARY

VOTAGE (NO. 2)

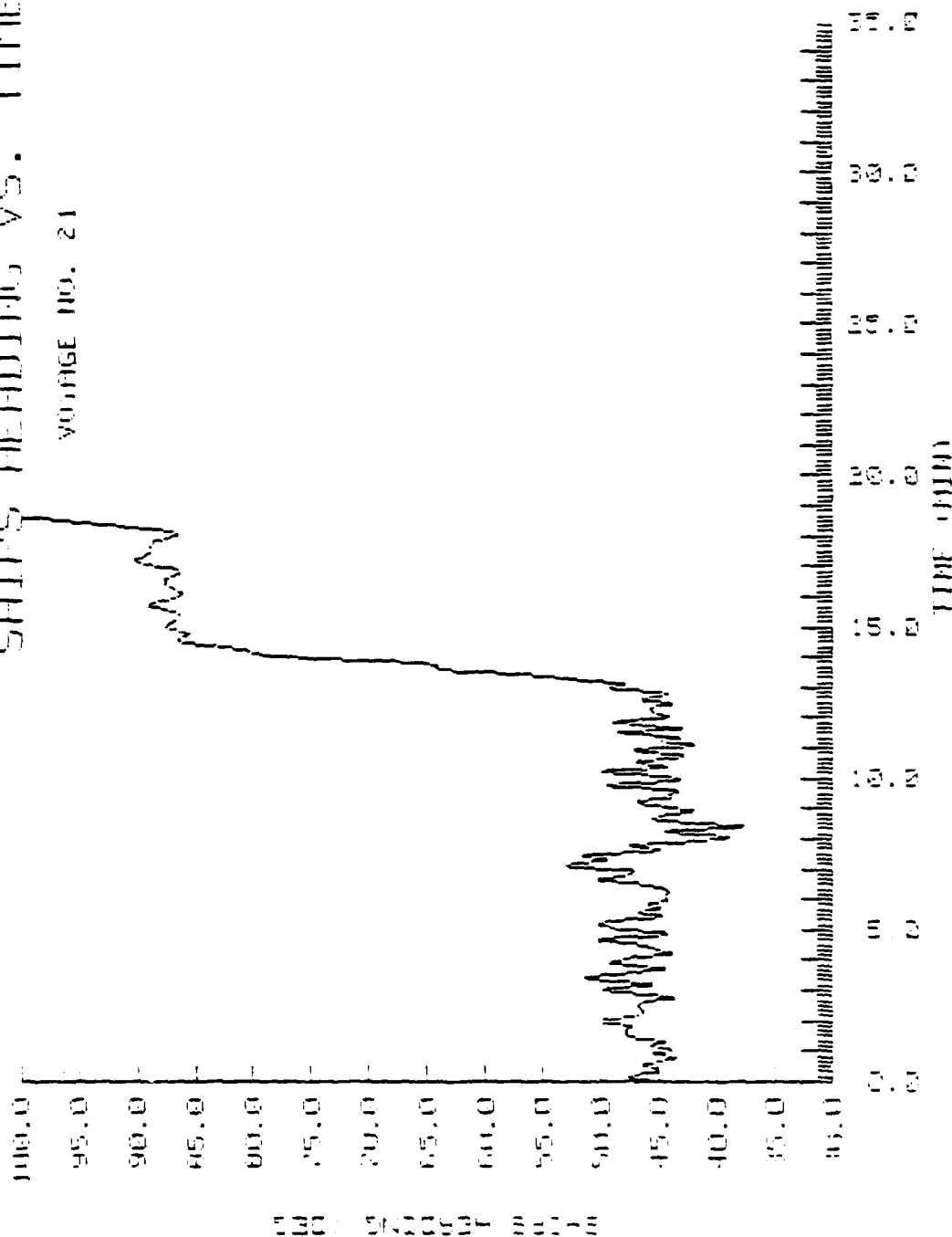
	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	PMS
PEECH (DEG)	-1.9	1.8	.8	.8
FOUL (DEG)	.7	11.7	5.1	5.7
NO. (FT SEC SEC)	-1.0	3.8	1.0	1.2
BLUVE (FT)	.2	4.0	1.6	1.8
BOU EXCUR. (FT)	.2	12.3	4.4	5.3
SLEPH EXCUR. (FT)	.2	7.4	2.7	3.1
SLEPH EXCUR. (FT)	.2	10.4	3.8	4.4

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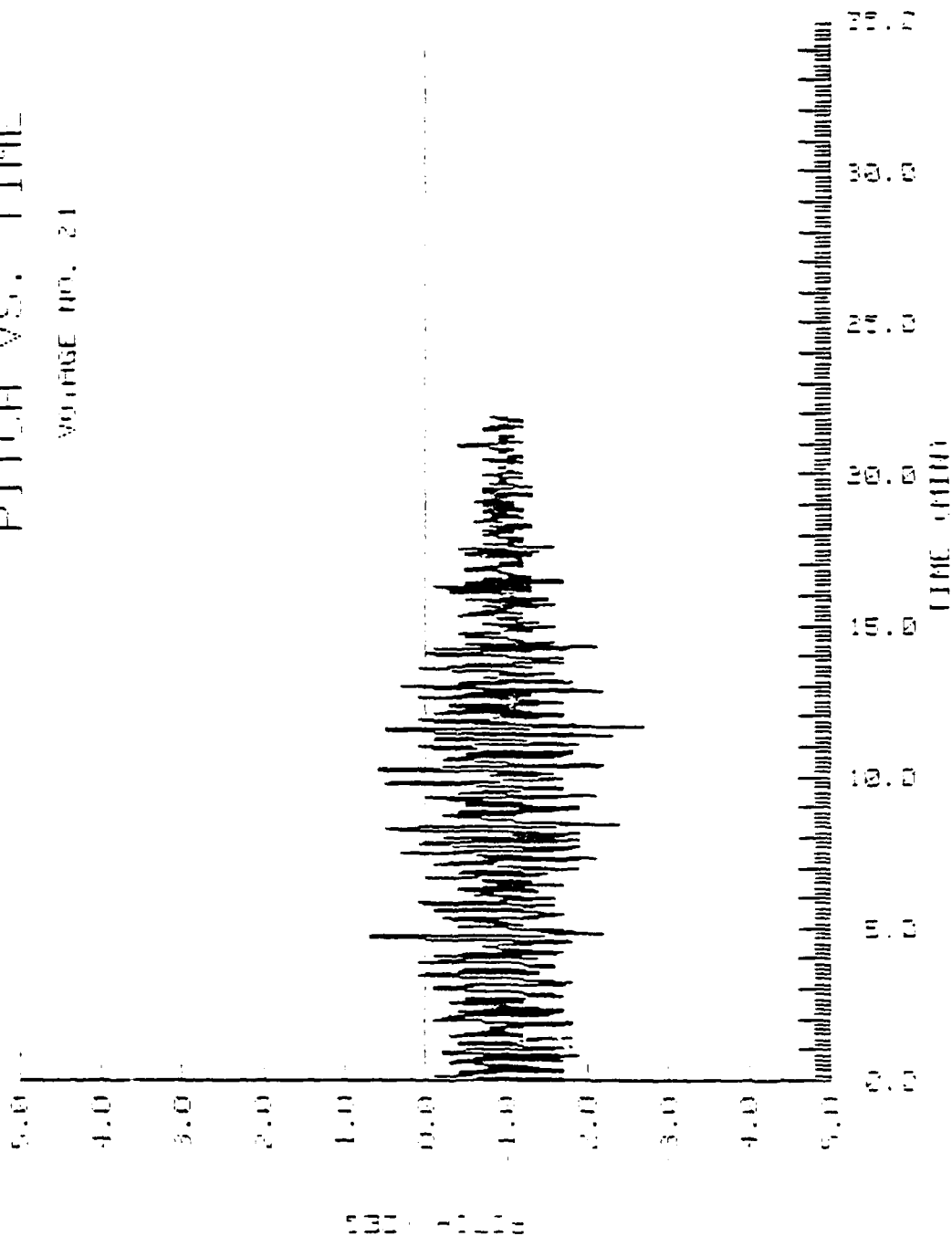
SHIPS HEADING VS. TIME

VOYAGE NO. 21



PITCH VS. TIME

VOLUME NO. 21



PULL VS. TIME WING NO. 21

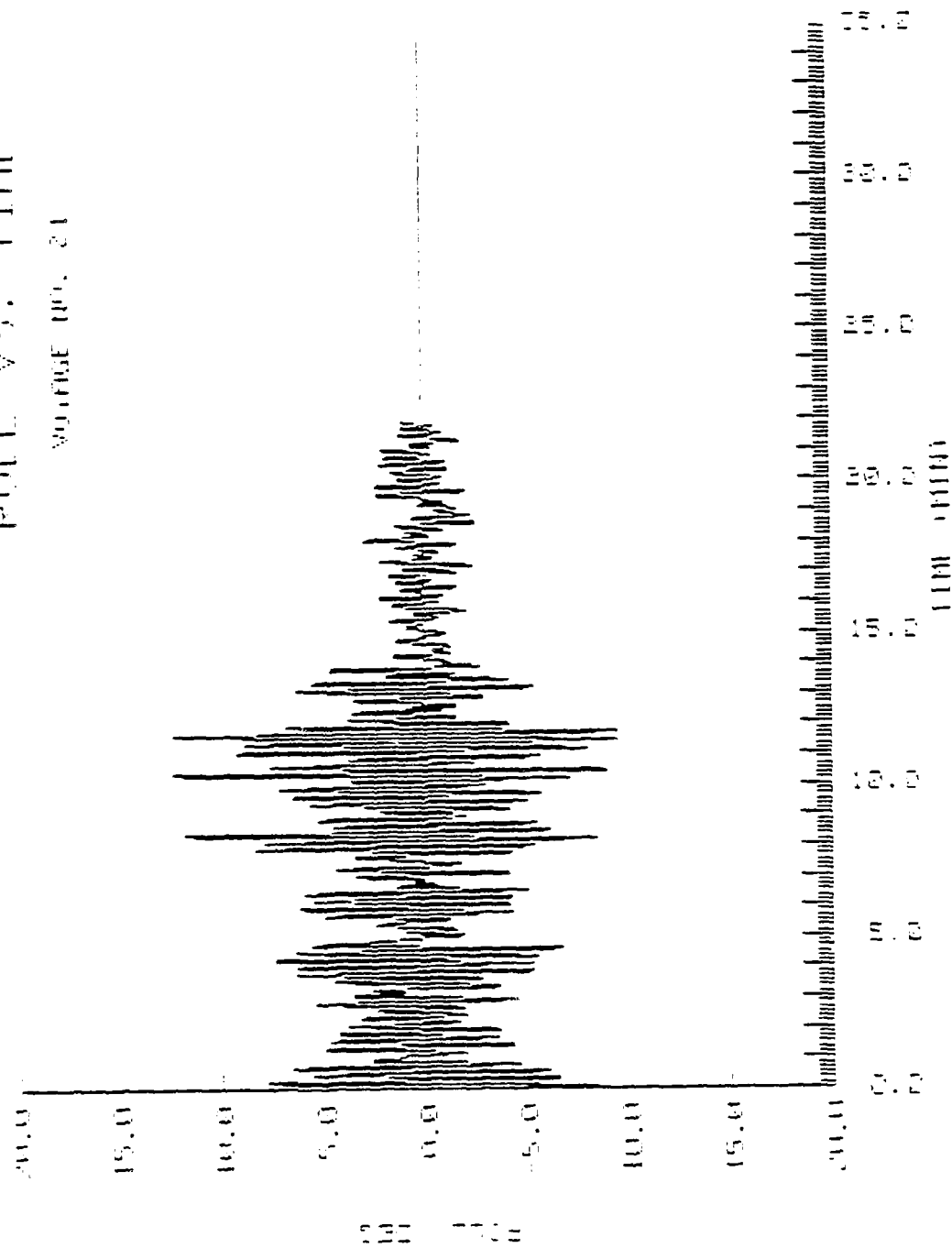
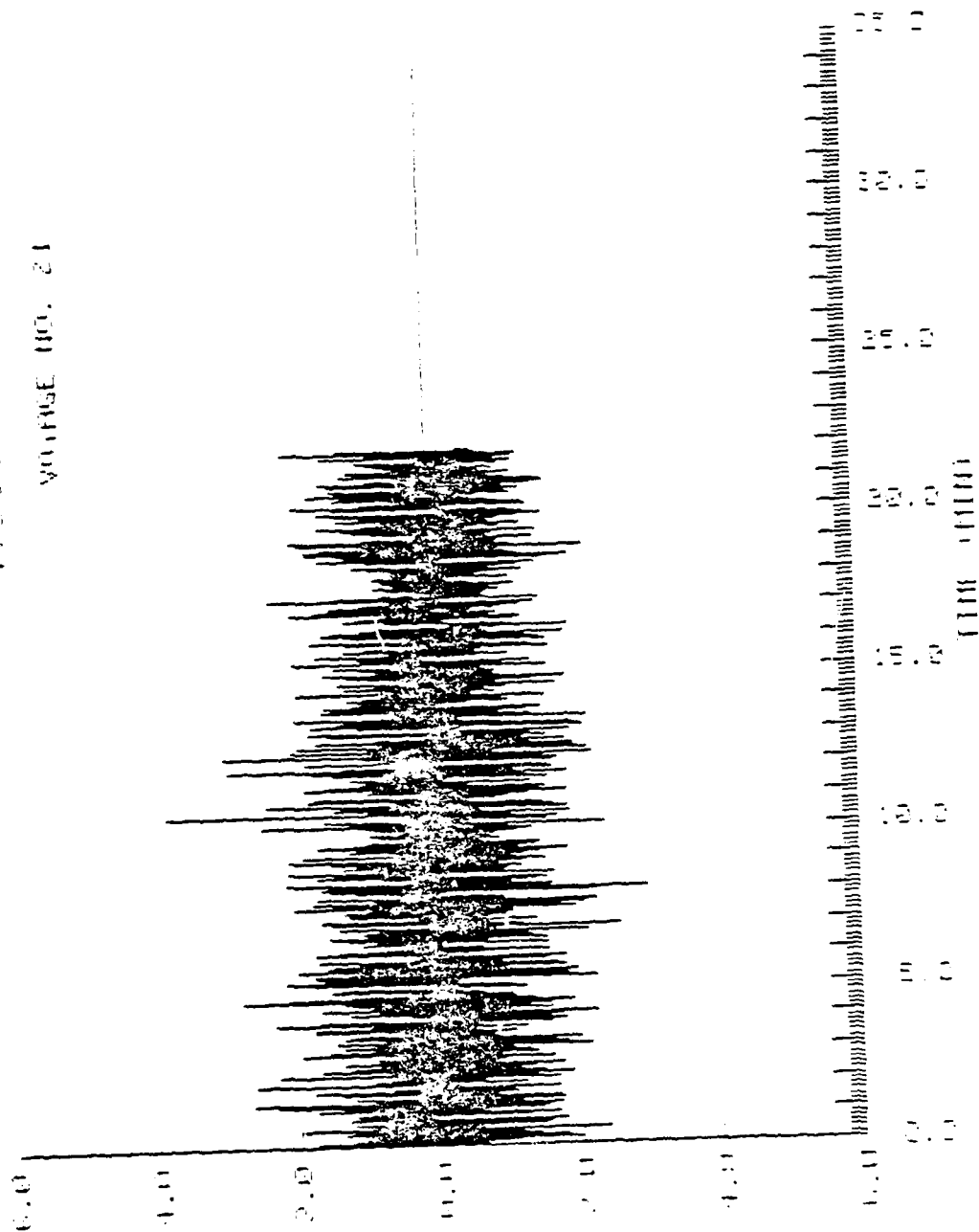


FIG. VS. TIME

YOUNG NO. 21



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F/G 13/10

COLUMBIA RIVER ENTRANCE CHANNEL DEEP-DRAFT VESSEL MOTION STUDY--ETC(U)

SEP 80 S WANG, M KIMBLE, C BUTCHER, G D COX

DACW57-78-C-0028

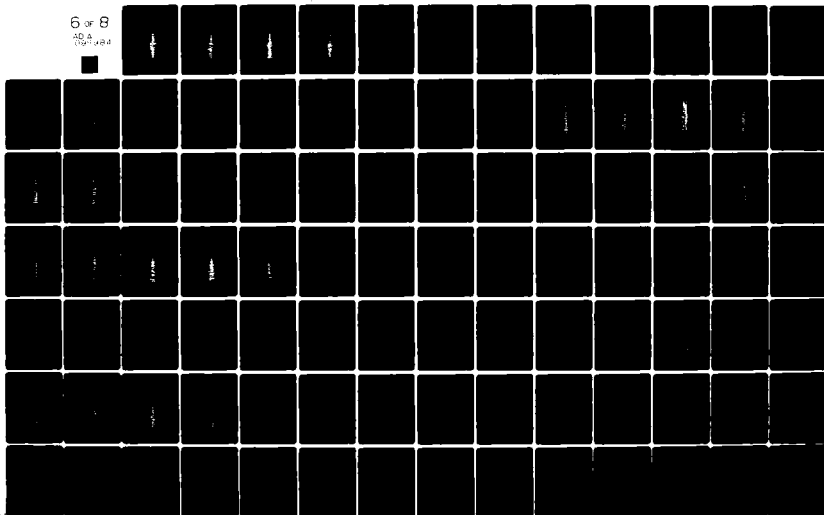
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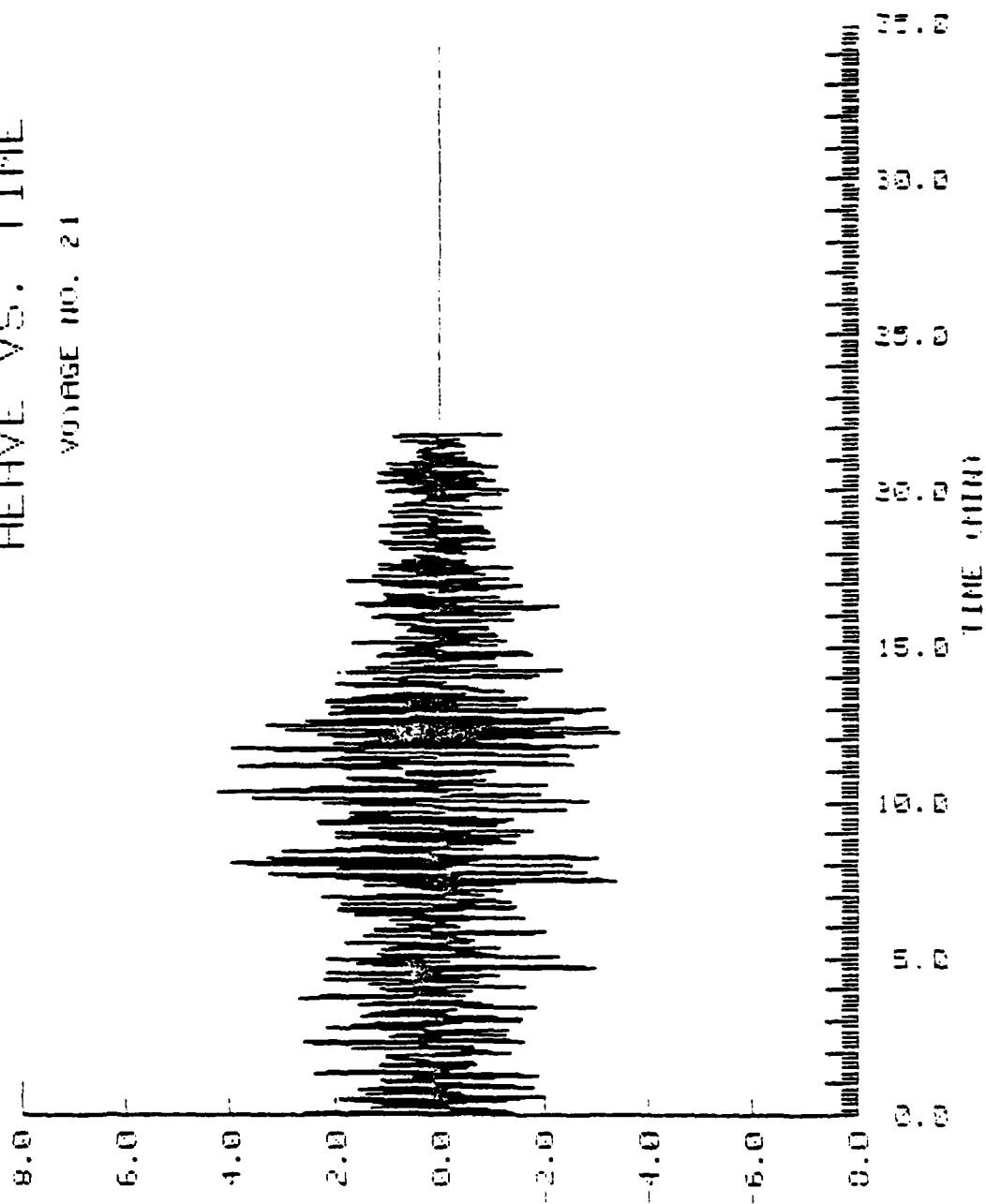
6 of 8

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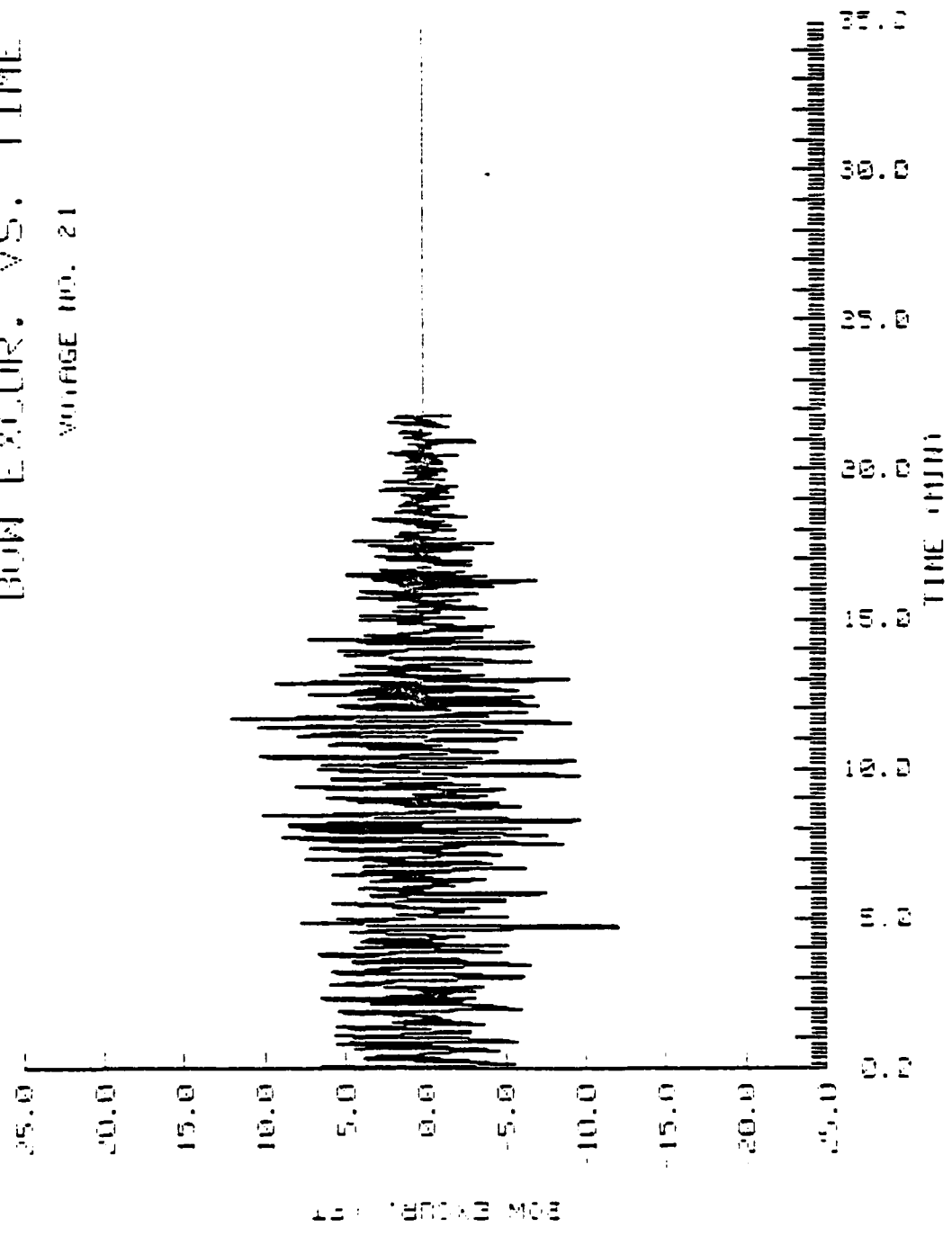
HEAVE VS. TIME

VOYAGE NO. 21



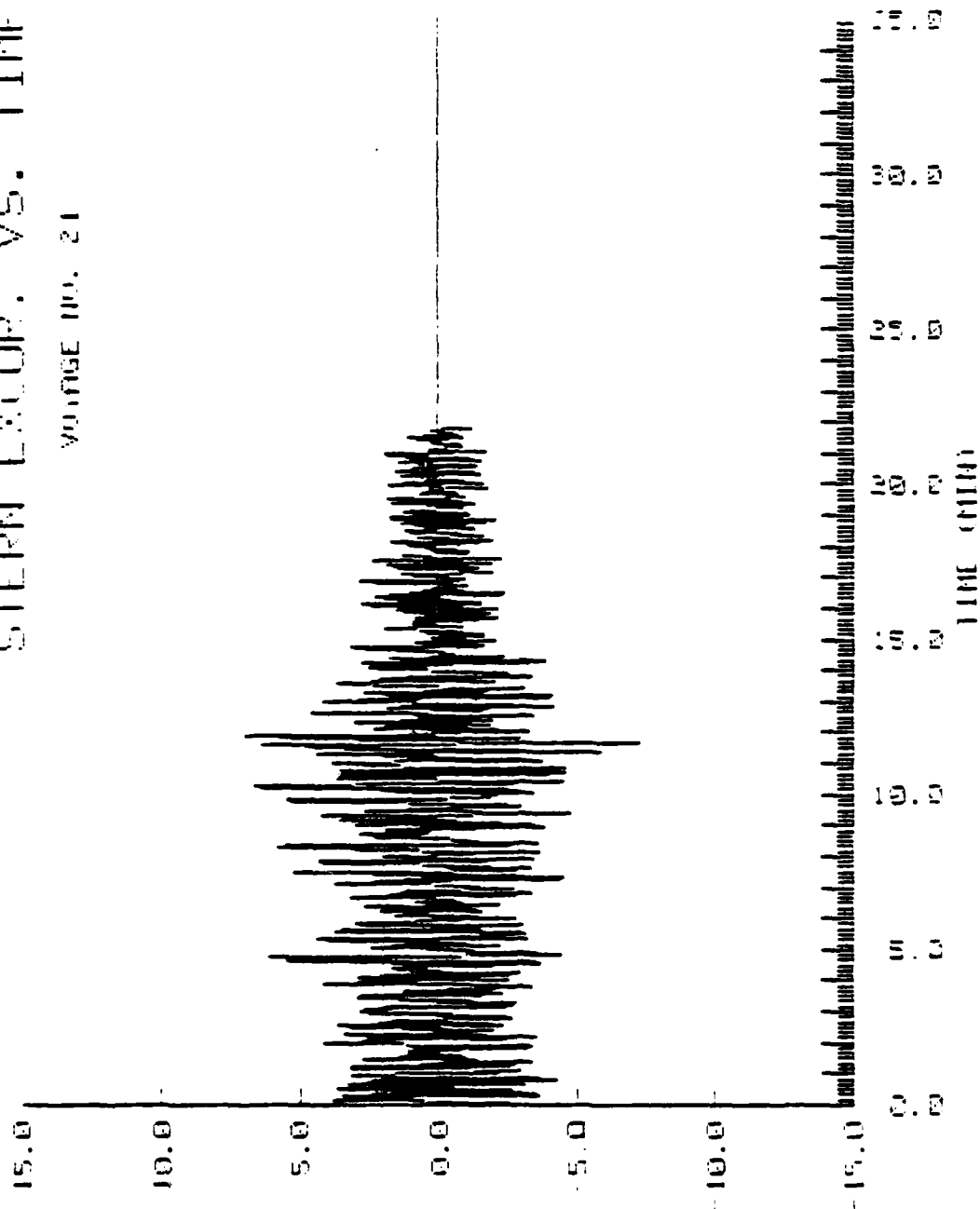
BOW EXCUR. VS. TIME

VOLTAJE NO. 21



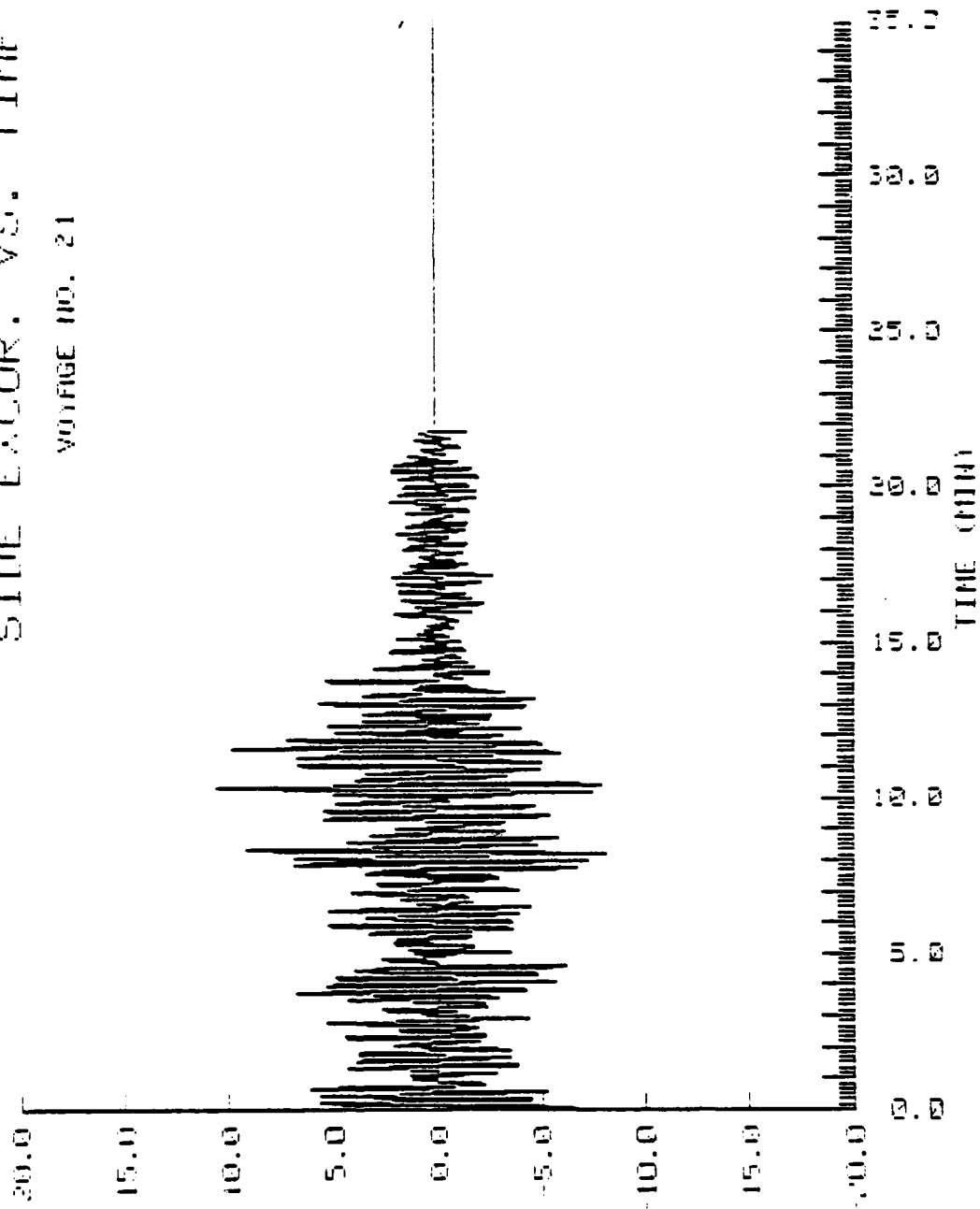
STERN EXCUR. VS. TIME

VOLUME NO. 21



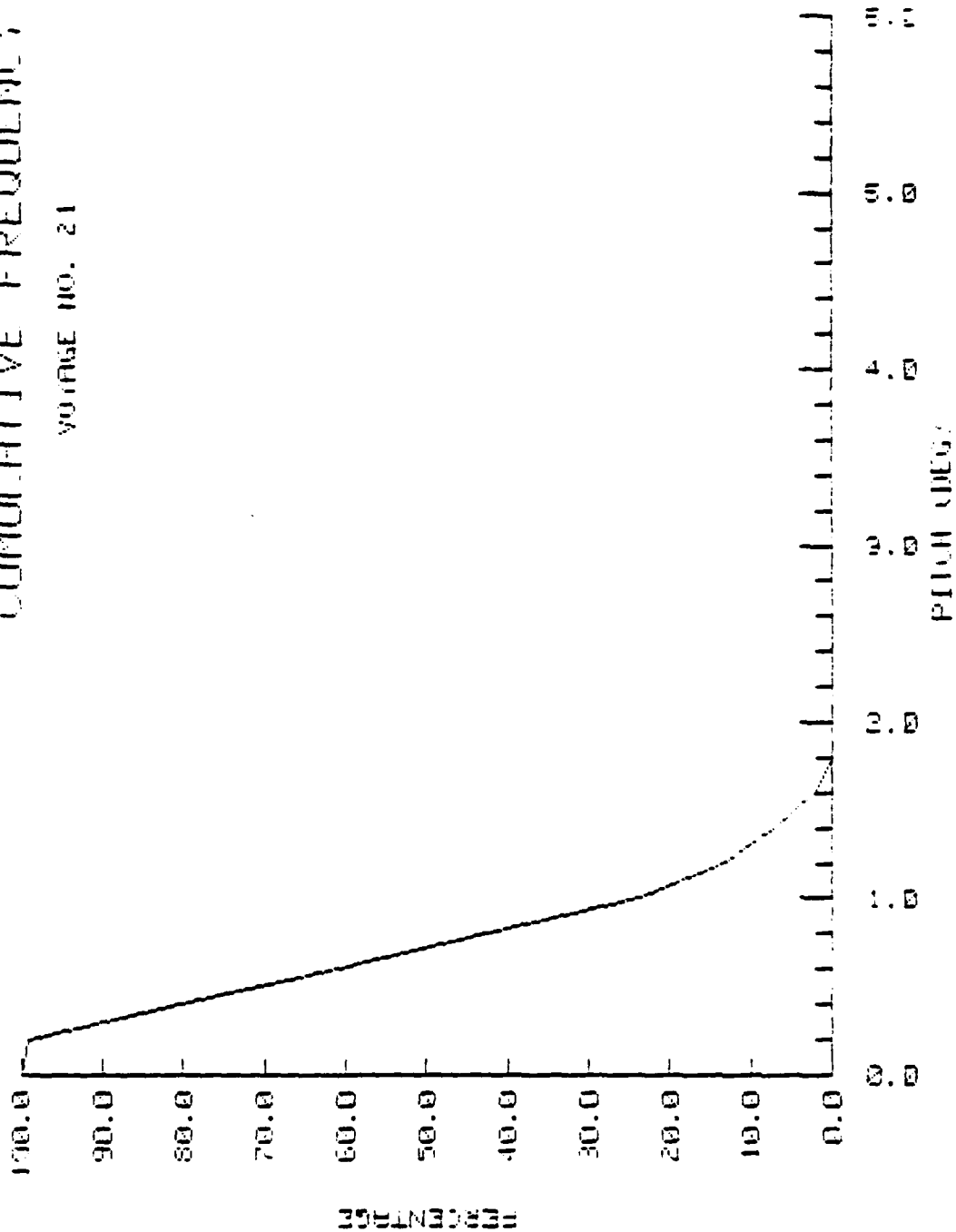
SIDE EXCUR. VS. TIME

WOTAGE NO. 21



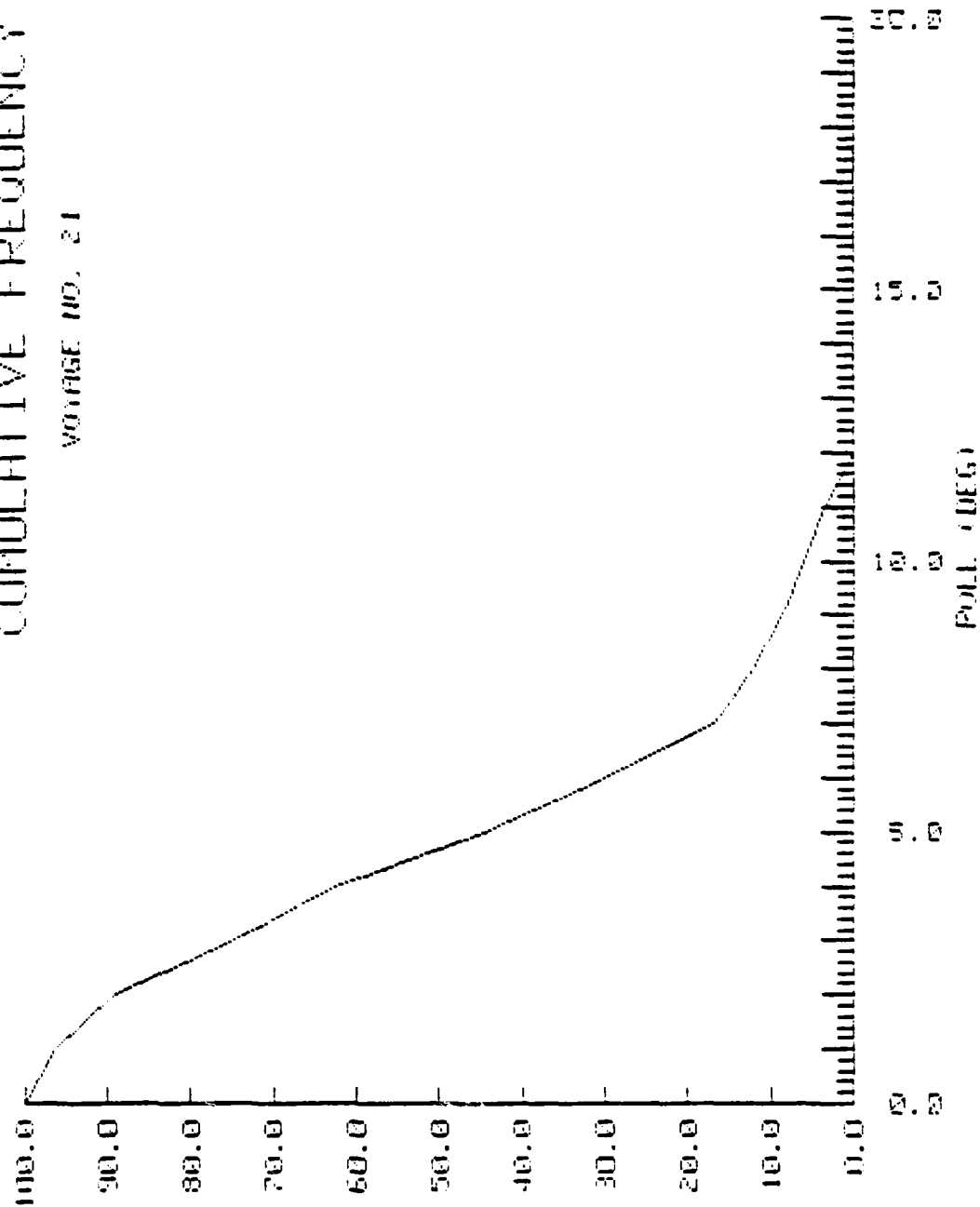
CUMULATIVE FREQUENCY

VOLUME NO. 21



CUMULATIVE FREQUENCY

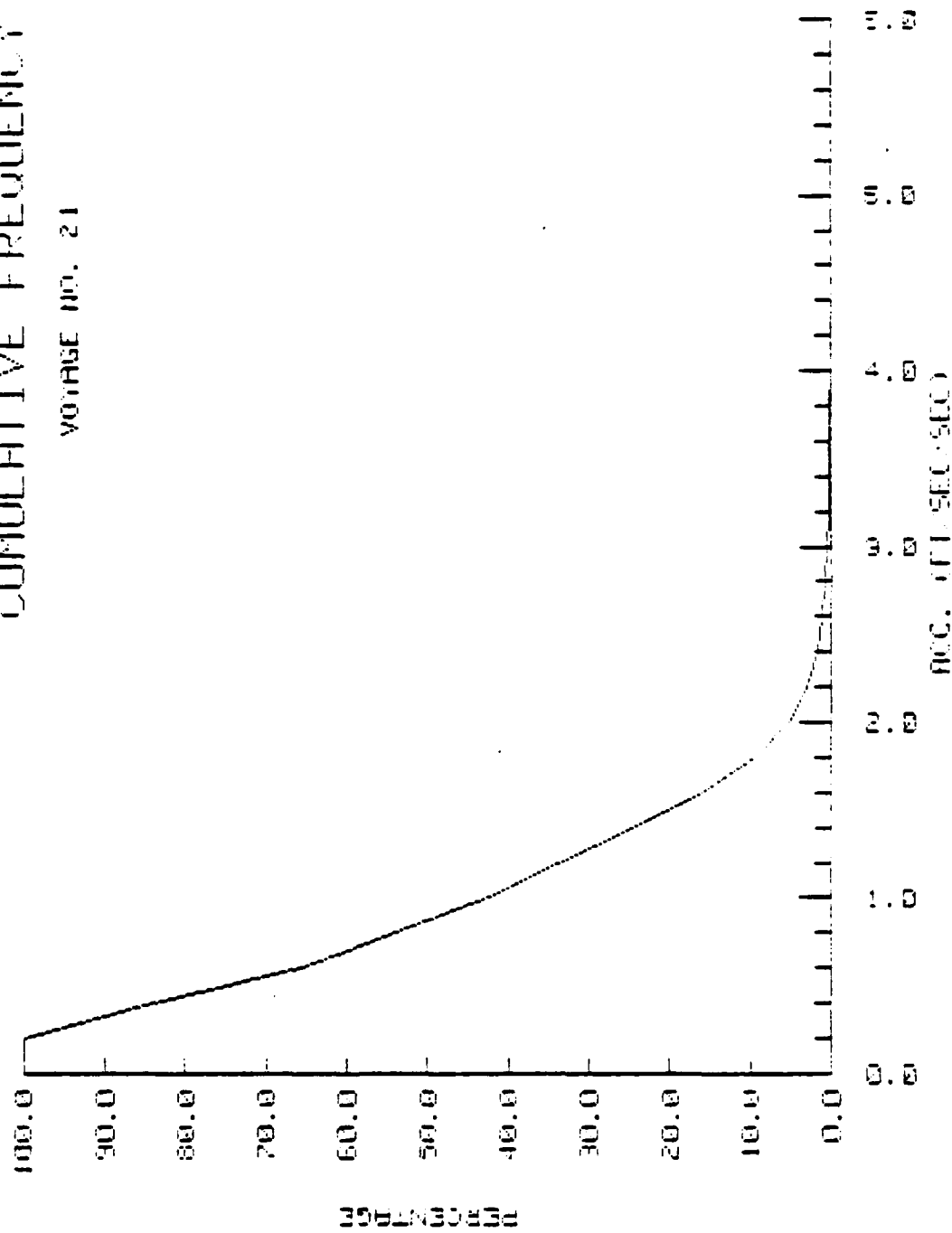
VOLAGE NO. 21



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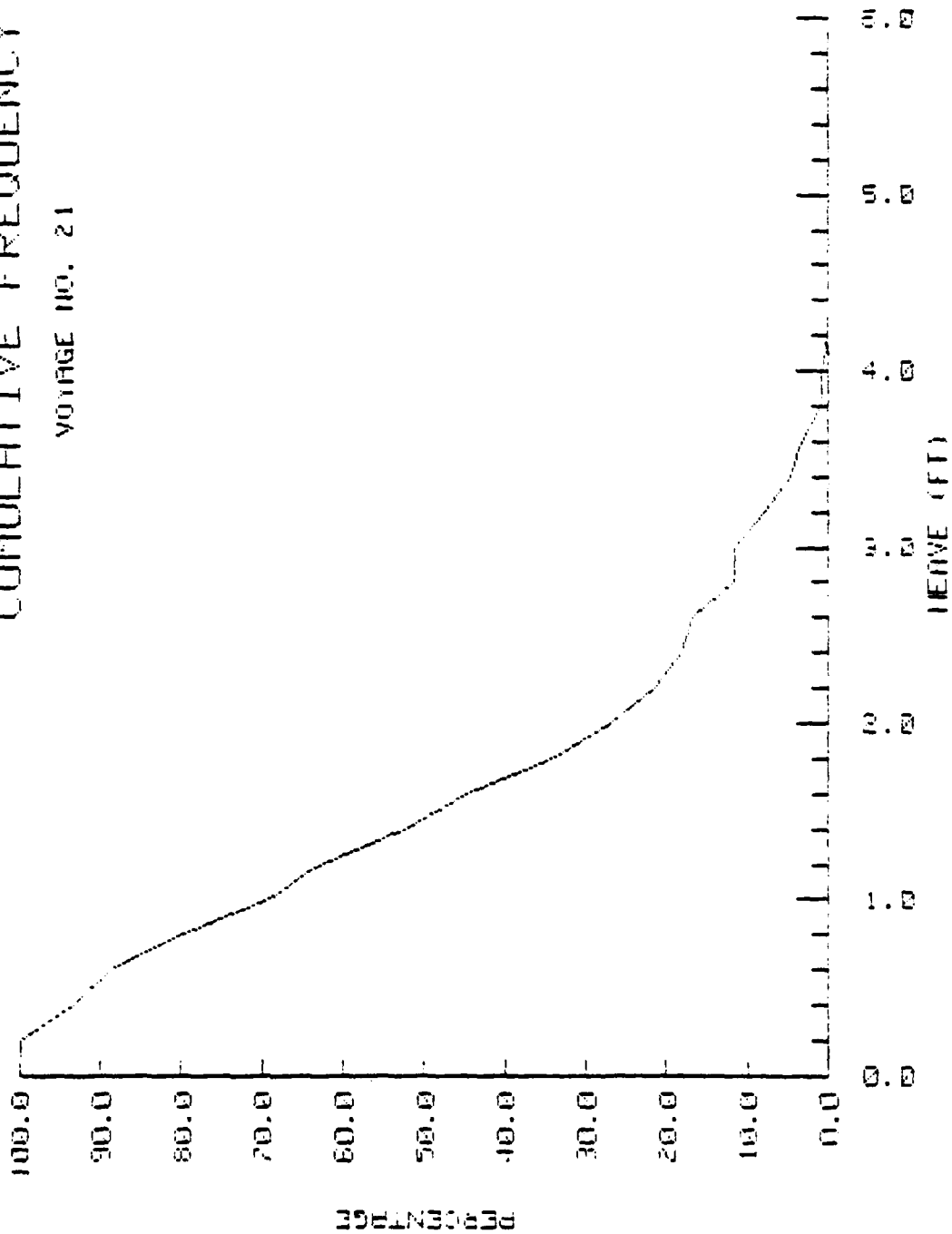
CUMULATIVE FREQUENCY

VOLTAGE NO. 21



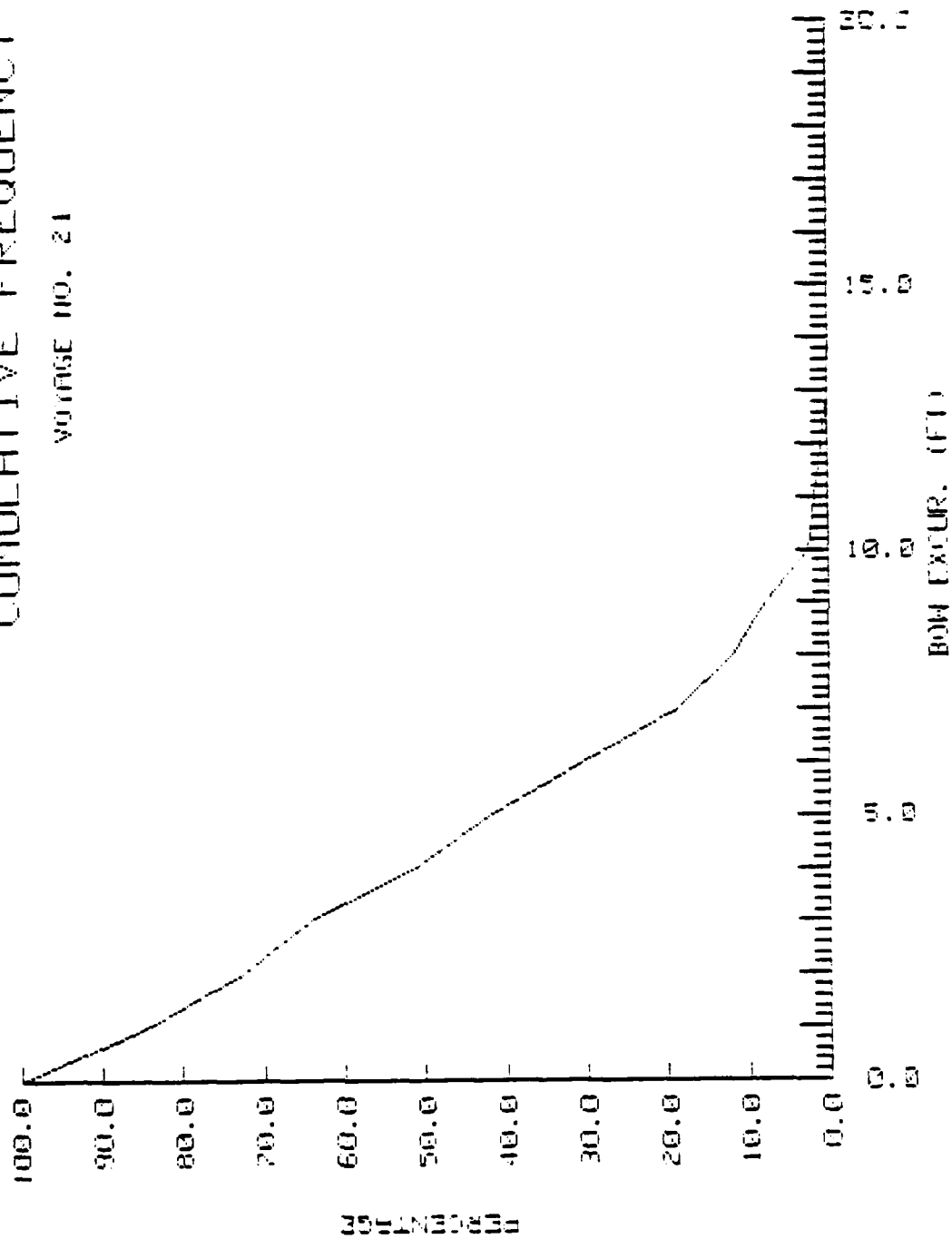
CUMULATIVE FREQUENCY

VOLTAGE NO. 21



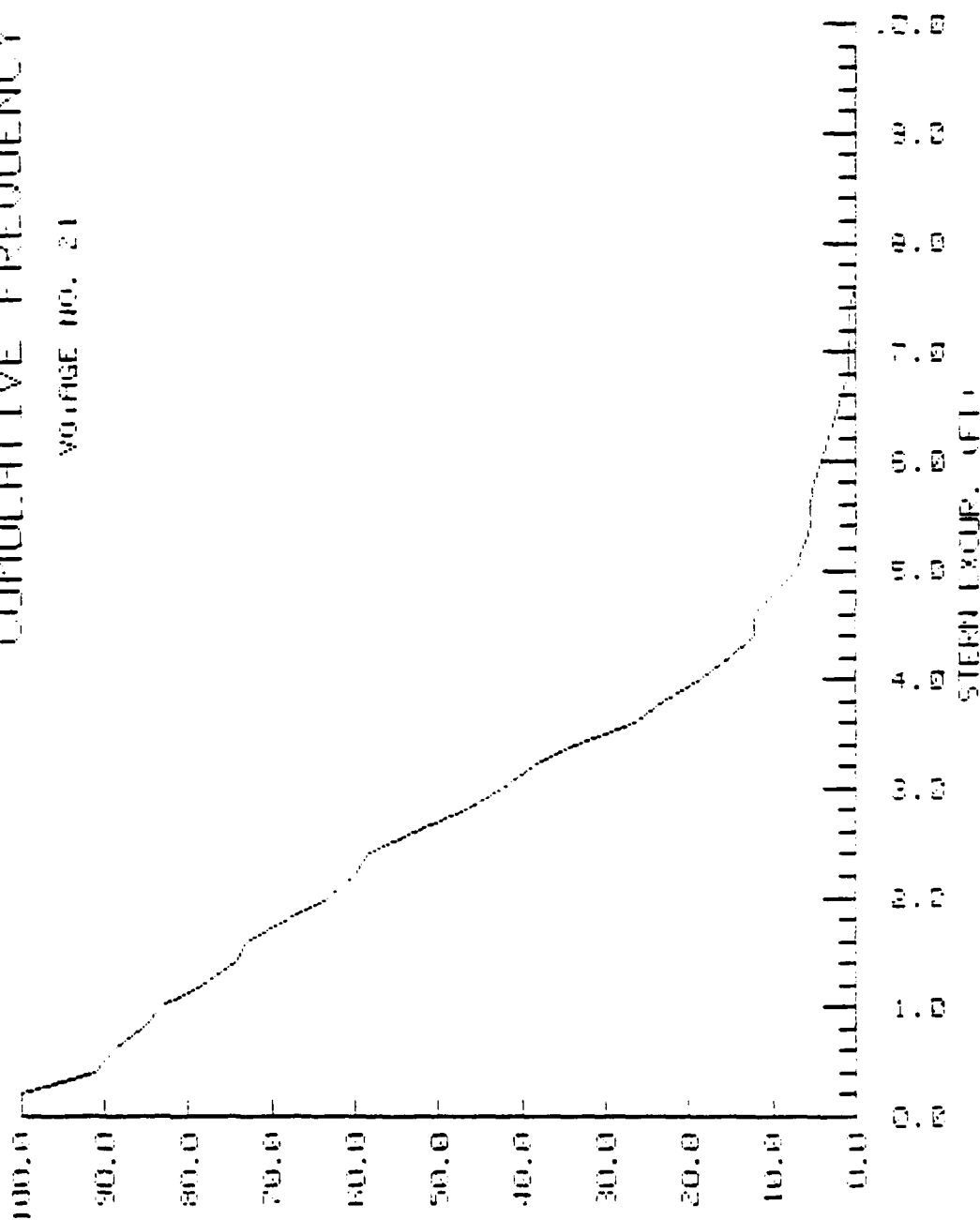
CUMULATIVE FREQUENCY

VOLUME NO. 21



CUMULATIVE FREQUENCY

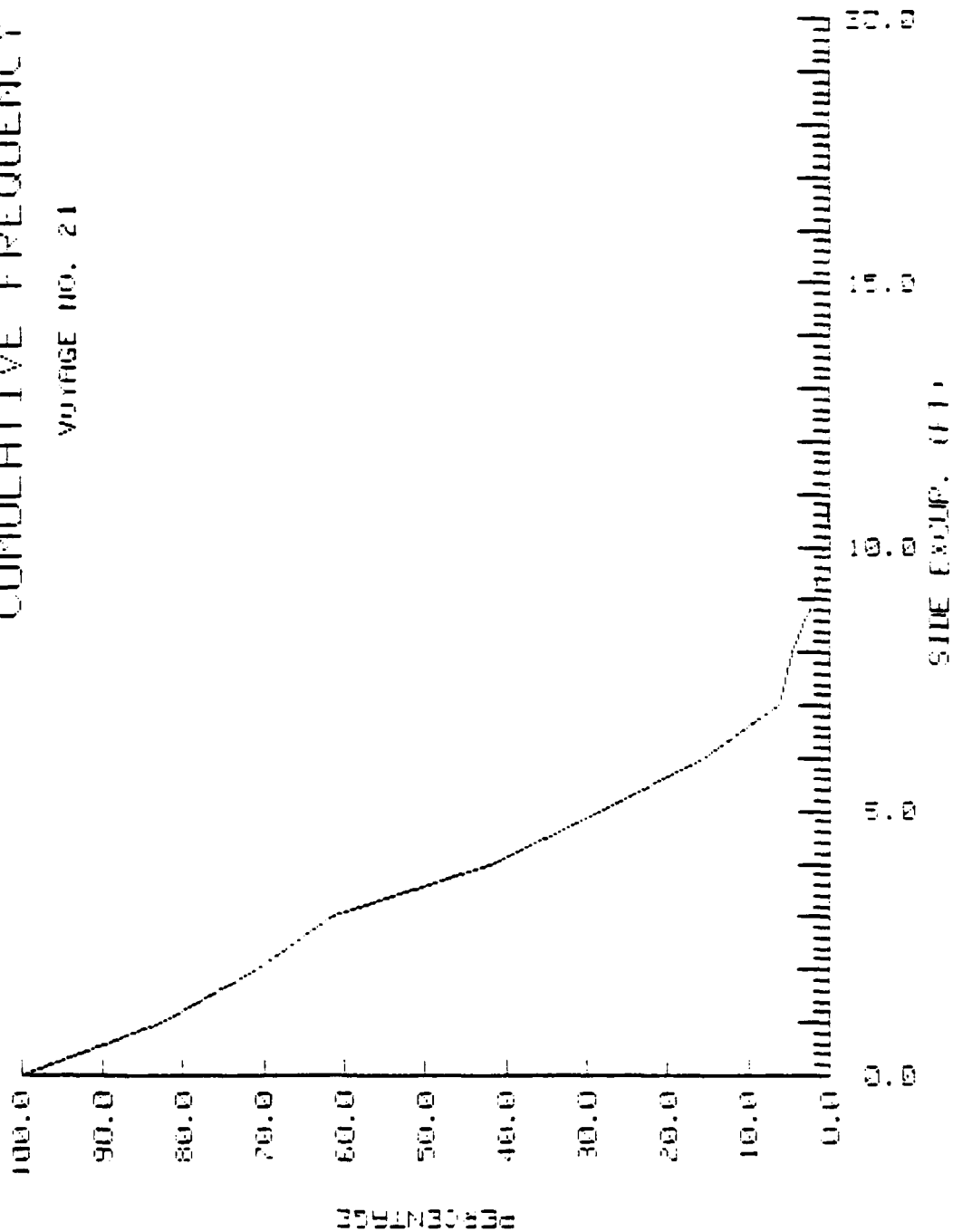
VOYAGE NO. 21



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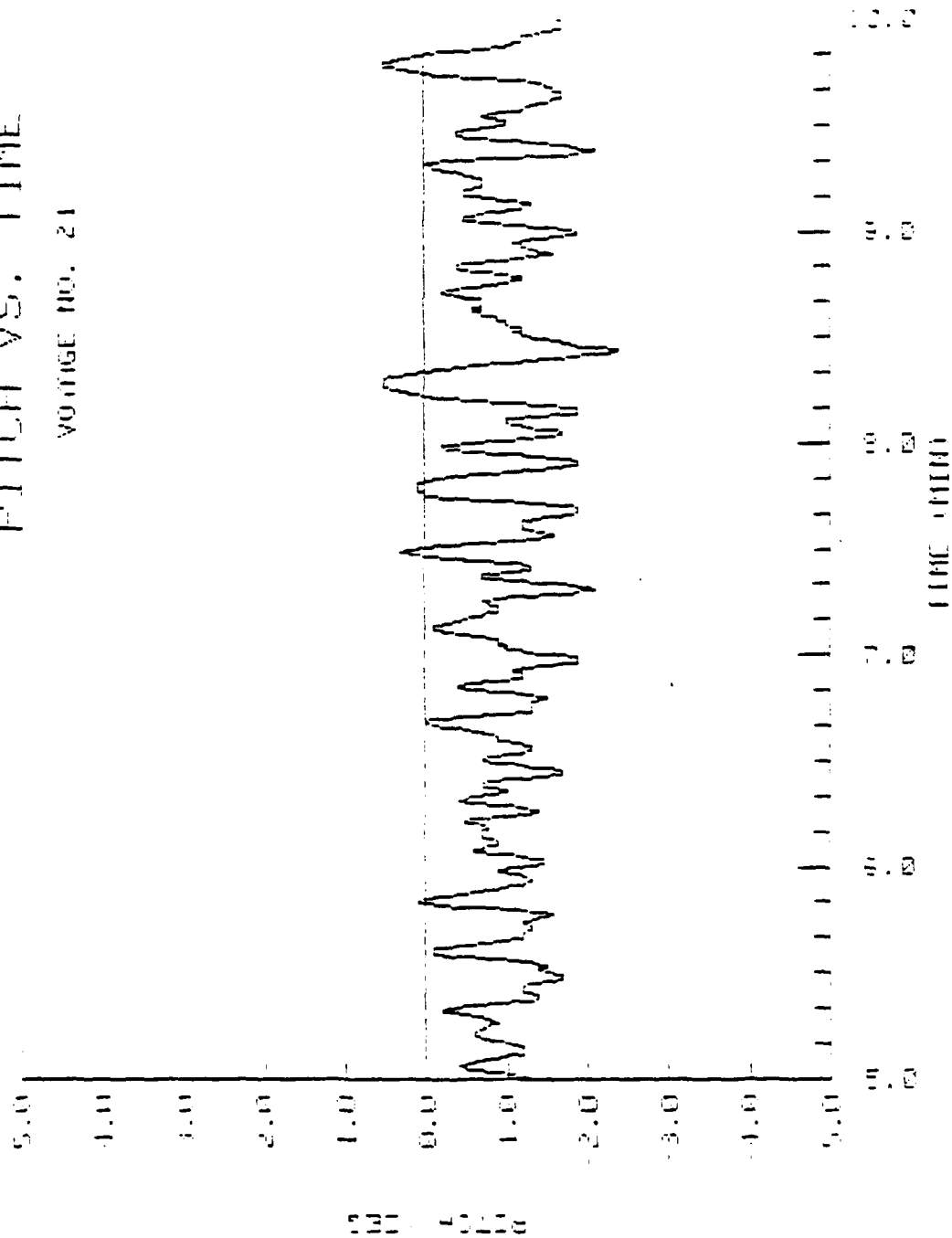
CUMULATIVE FREQUENCY

VORISE NO. 21



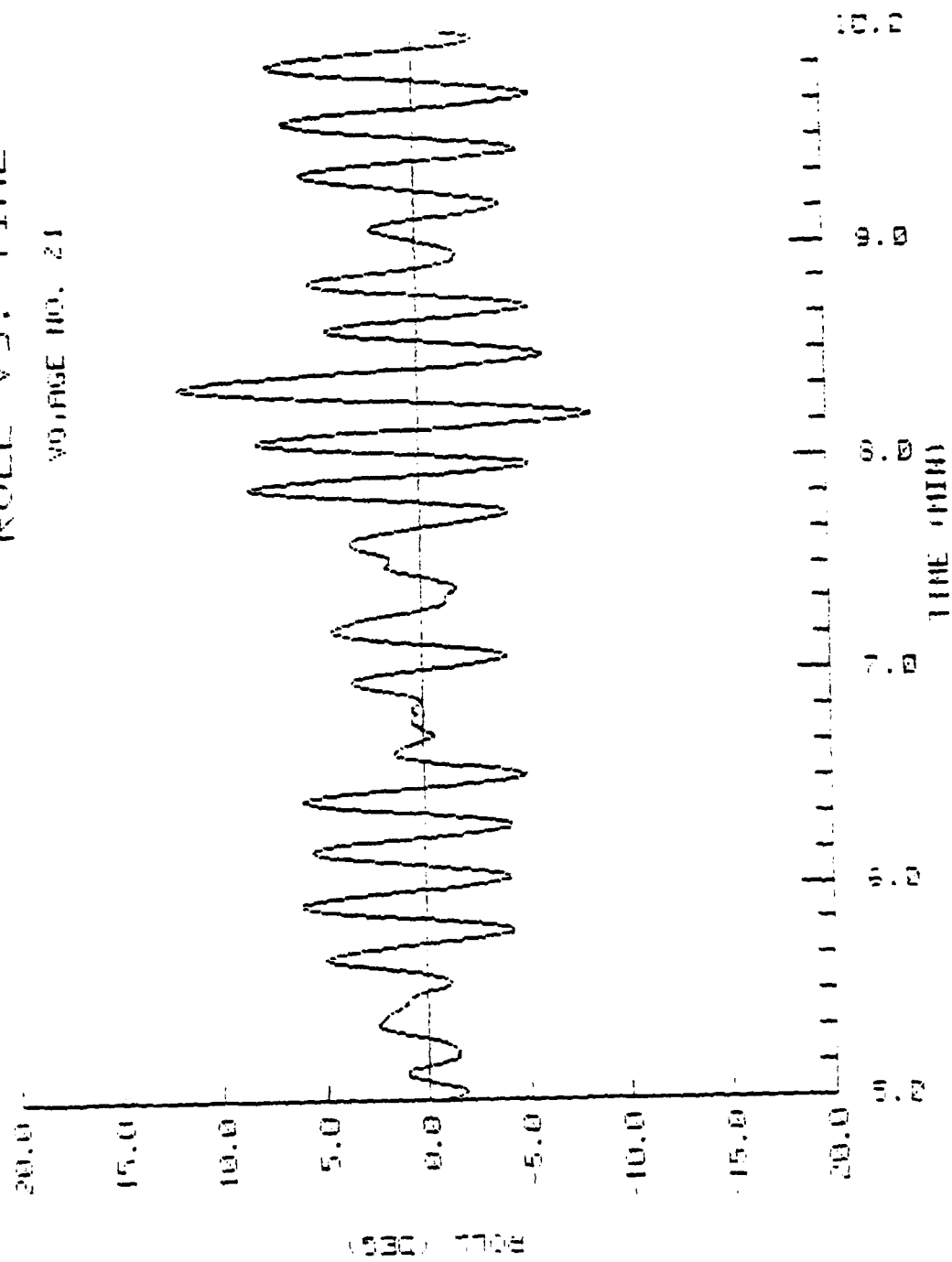
PITCH VS. TIME

VOLUME NO. 21



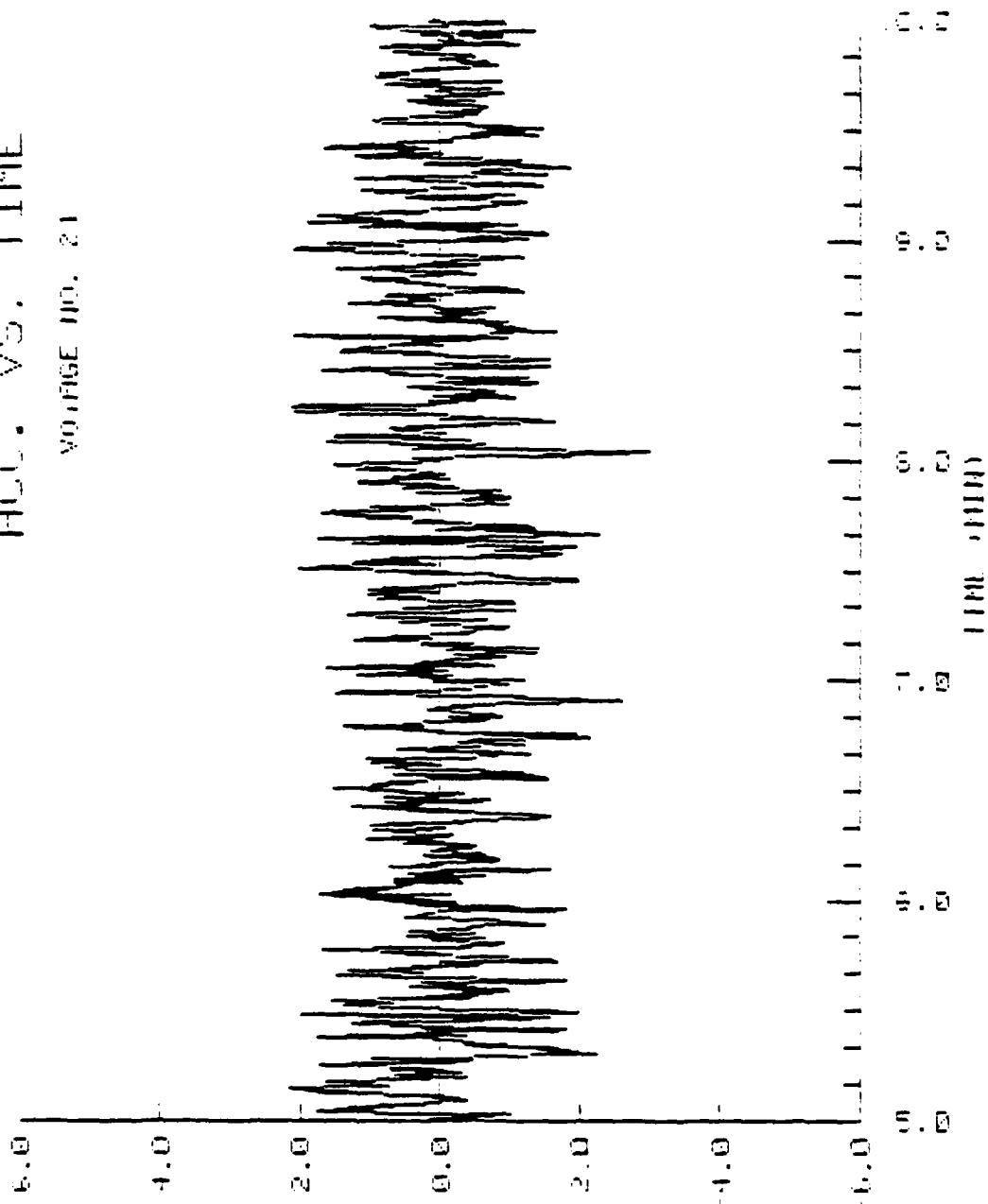
ROLL VS. TIME

VOLUME NO. 21



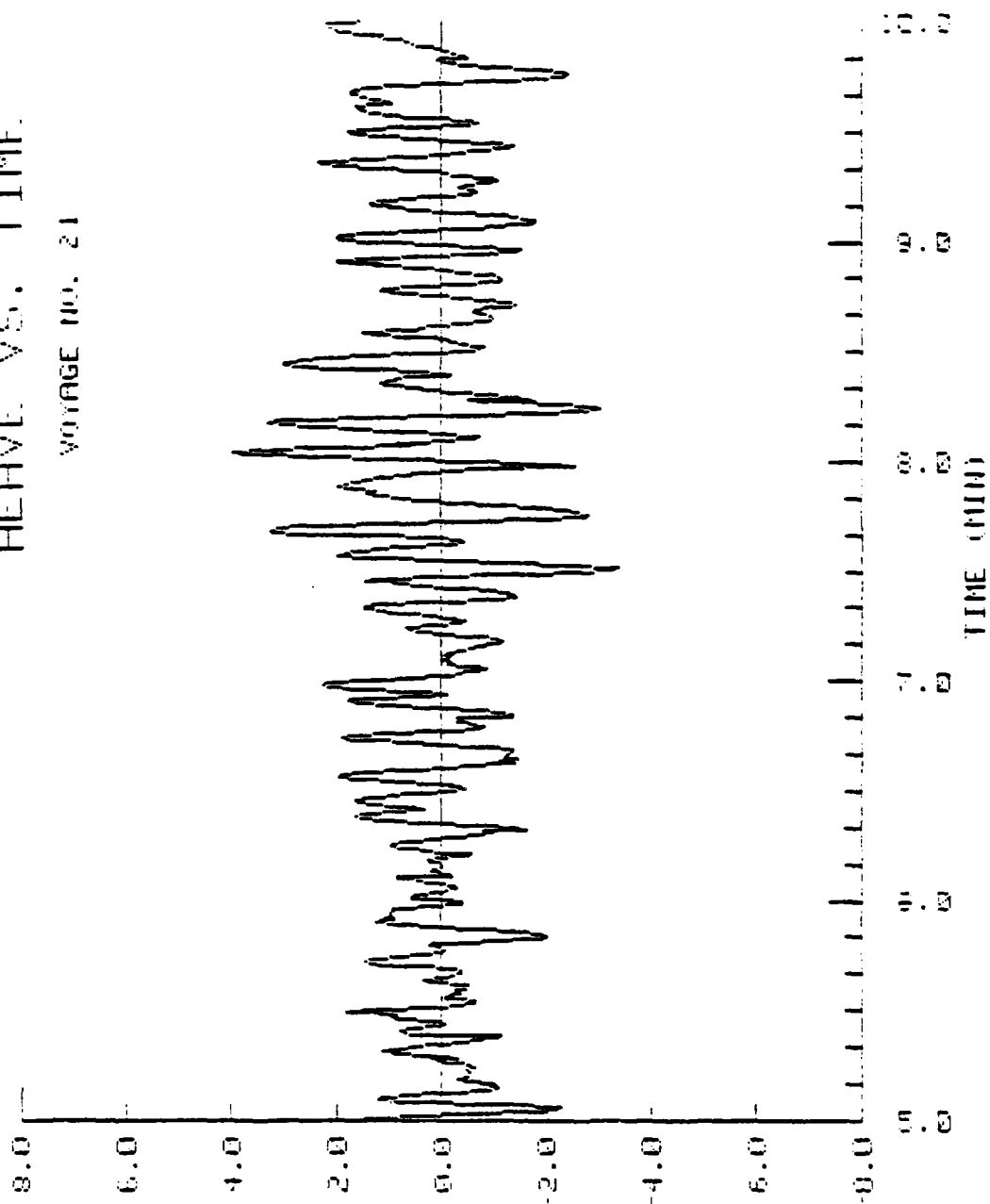
ACC. VS. TIME

VOLUME NO. 21



HEAVE VS. TIME

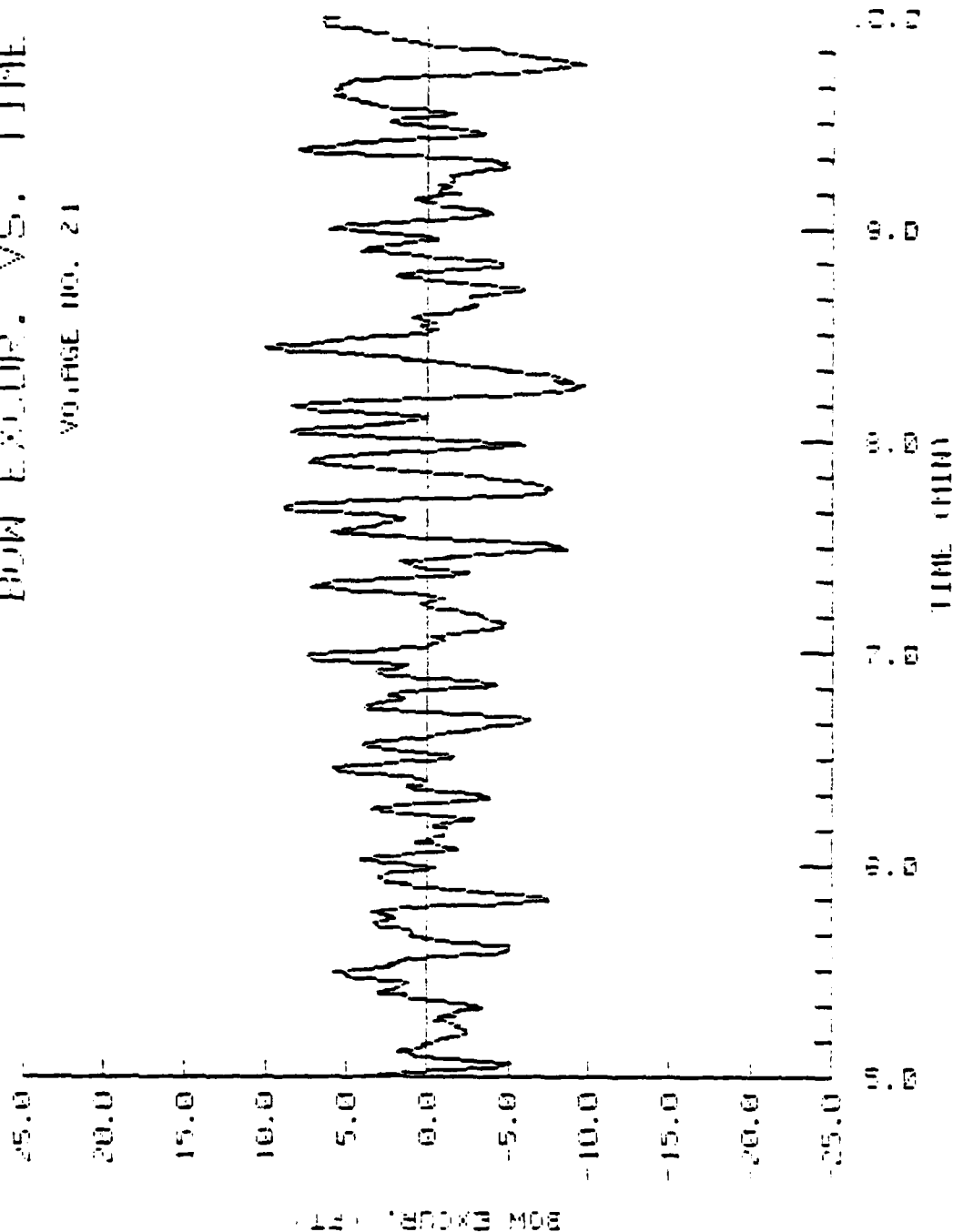
VOYAGE NO. 21



11-30-67

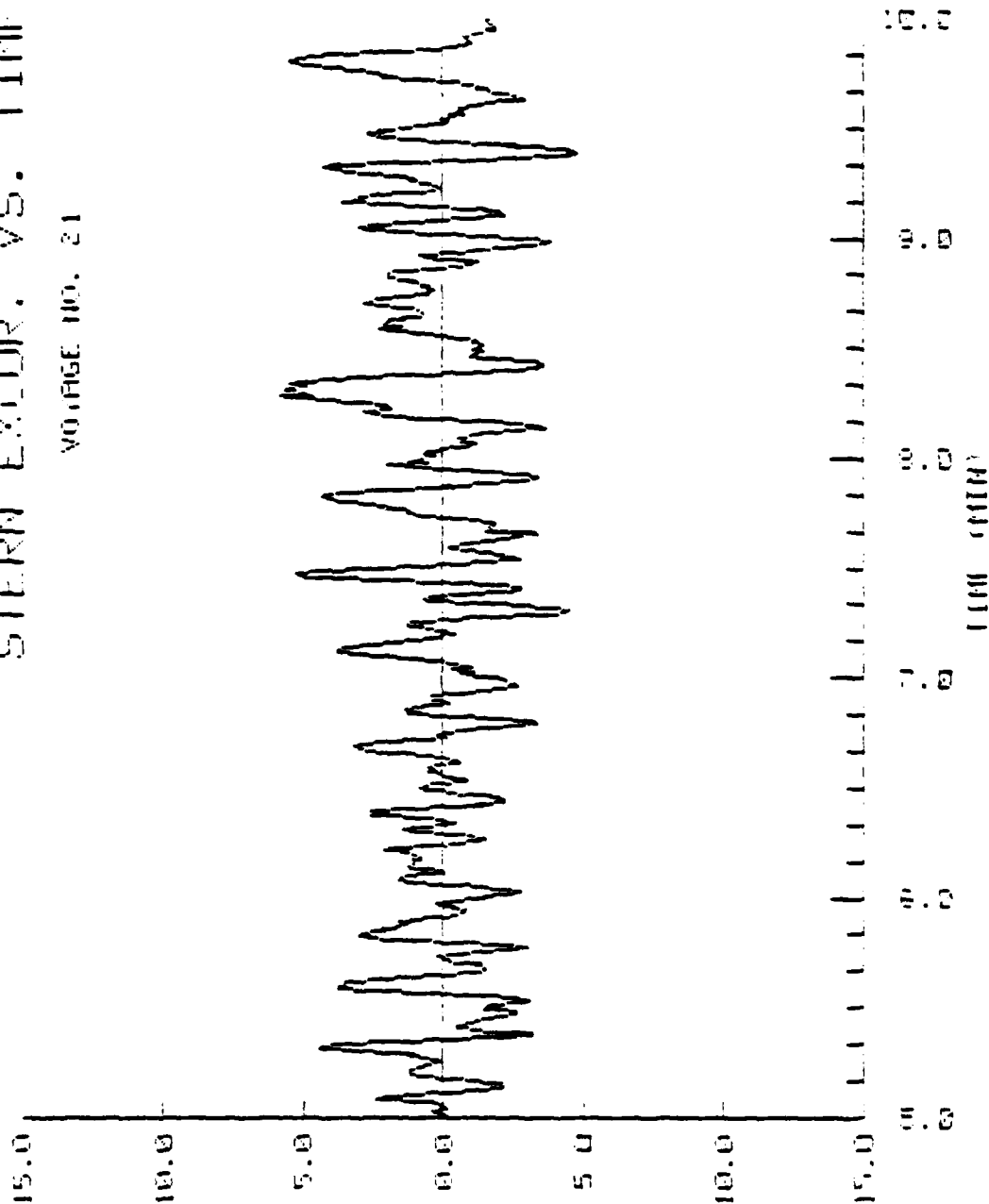
EDW EXCUR. VS. TIME

VOLUME NO. 21



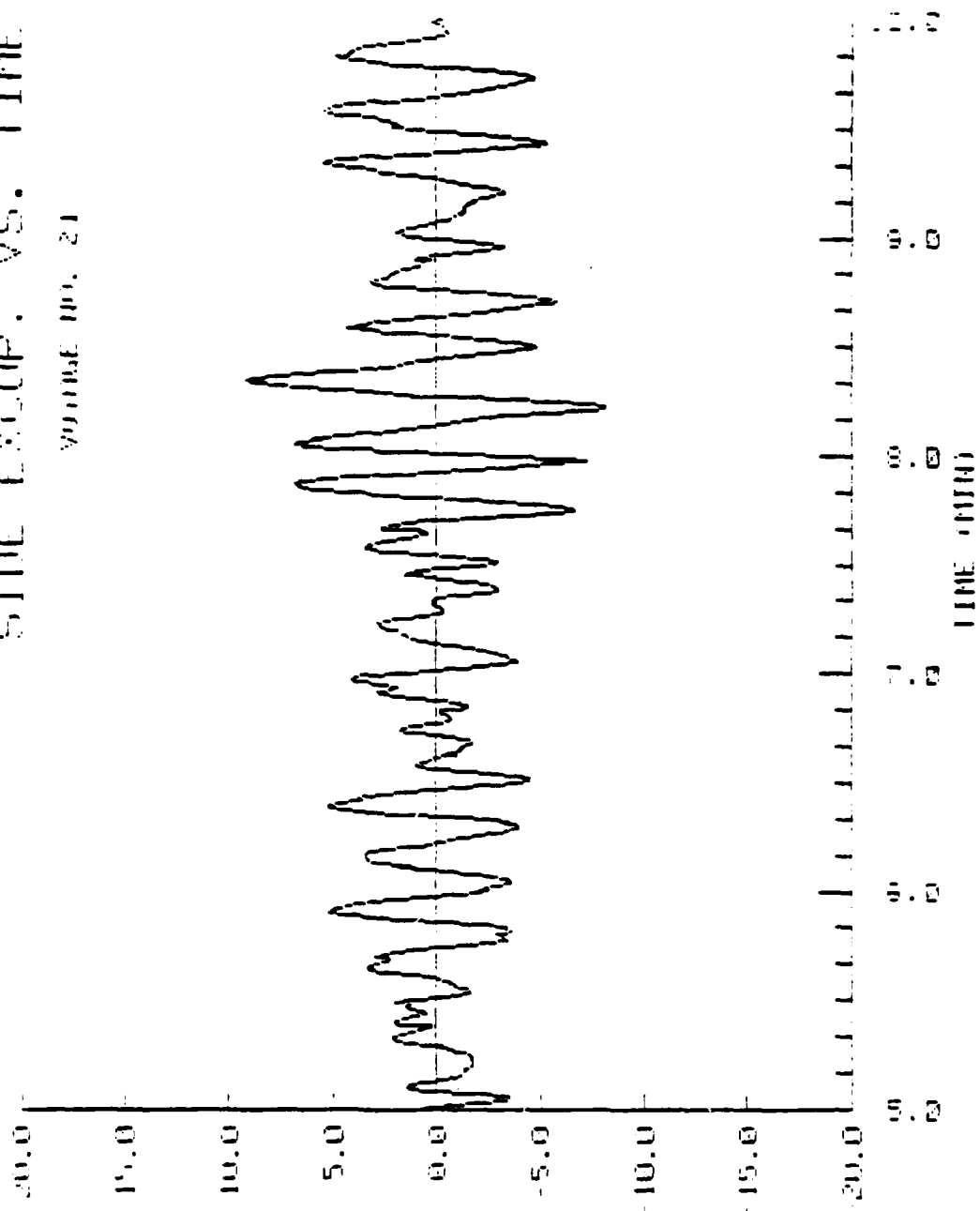
STERN EXCUR. VS. TIME

VOLTAJE NO. 21



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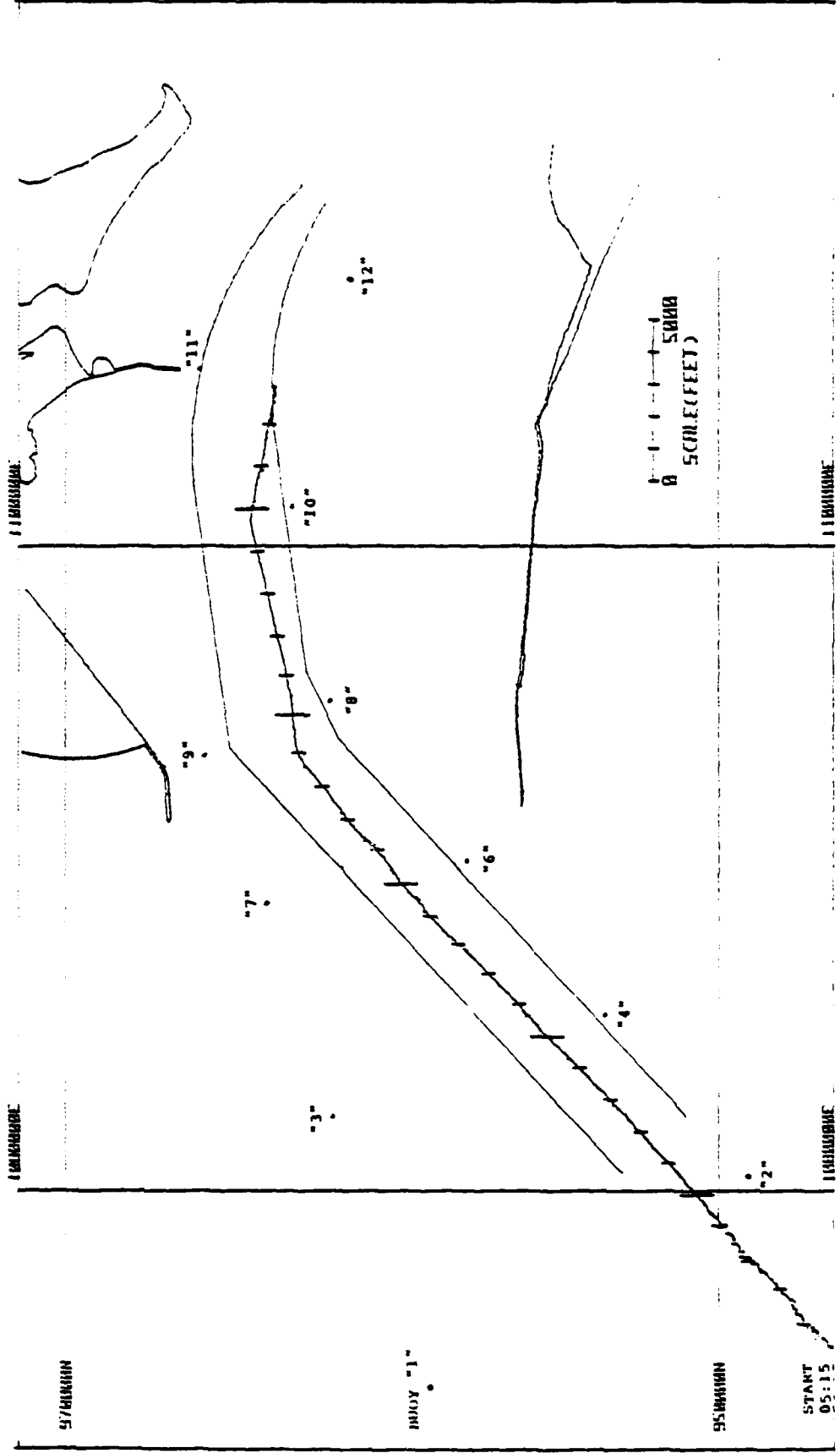
STATISTICAL SUMMARY

VOTAGE NO. 22

	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG.)	.2	1.5	.6	.7
ROLL (DEG.)	1.4	8.1	3.1	3.5
YAW (FT PER SEC)	.1	3.6	1.0	1.2
HEAVE (FT)	.1	3.8	1.2	1.4
ROLL EXCUR. (FT)	.1	11.8	4.2	5.1
YAW EXCUR. (FT)	.1	6.9	2.3	2.7
HEAVE EXCUR. (FT)	.1	7.0	2.9	3.3

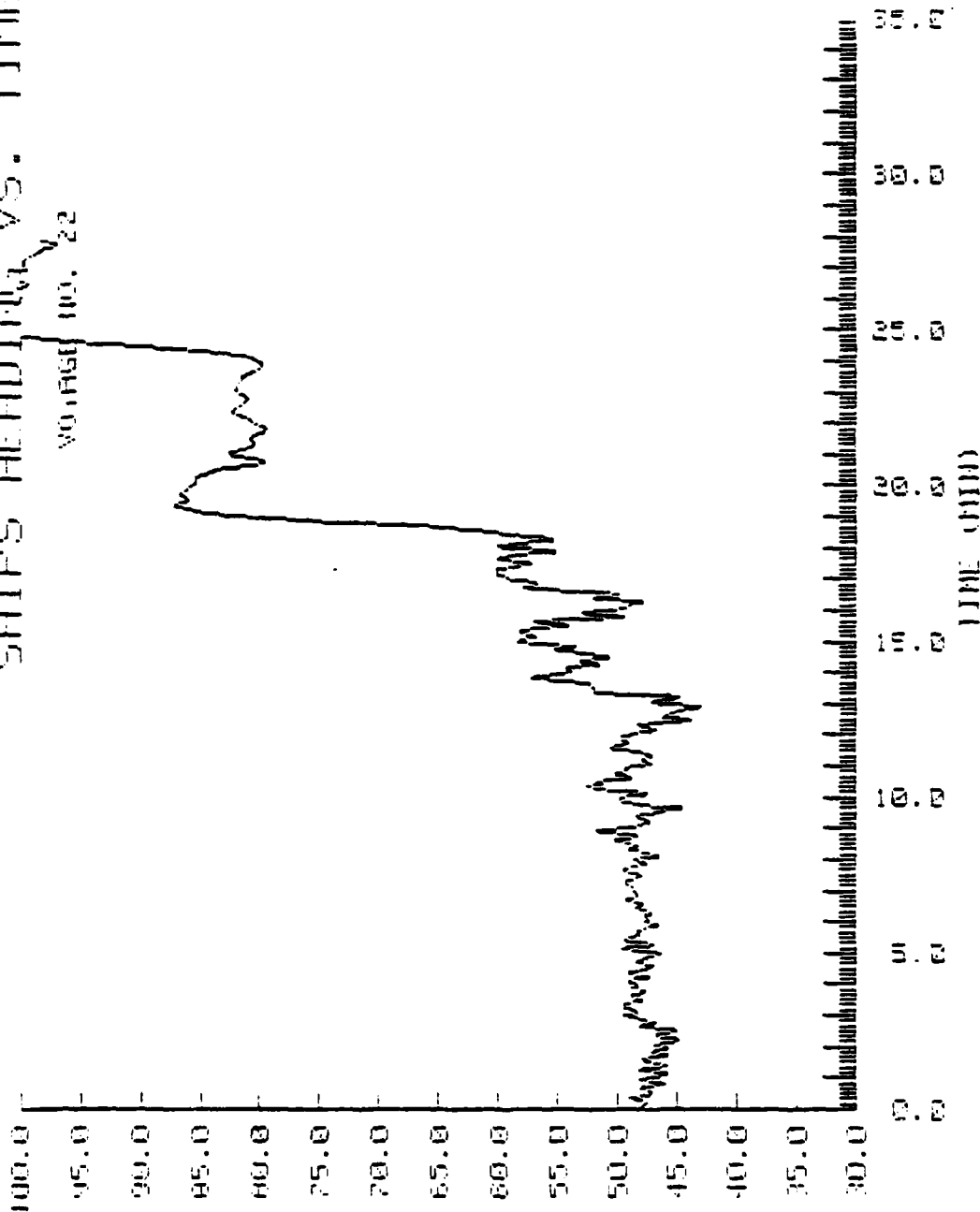
VOYAGE NO. 22 SHIP TRACK

SCALE 1:20000



SHIPS HEADING VS. TIME

VO. 100. 22

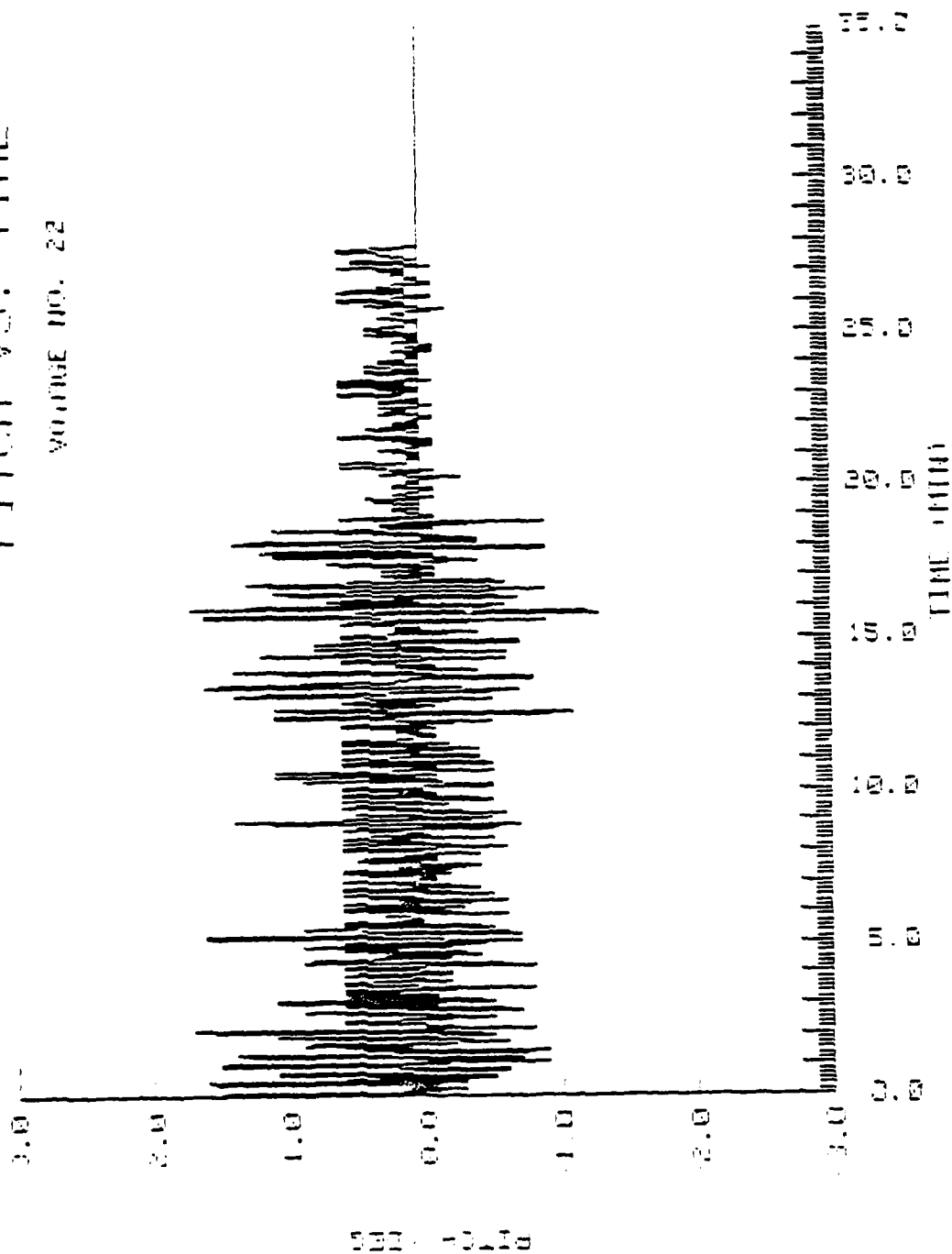


100.0 95.0 90.0 85.0 80.0 75.0 70.0 65.0 60.0 55.0 50.0 45.0 40.0 35.0 30.0

TIME (MIN)

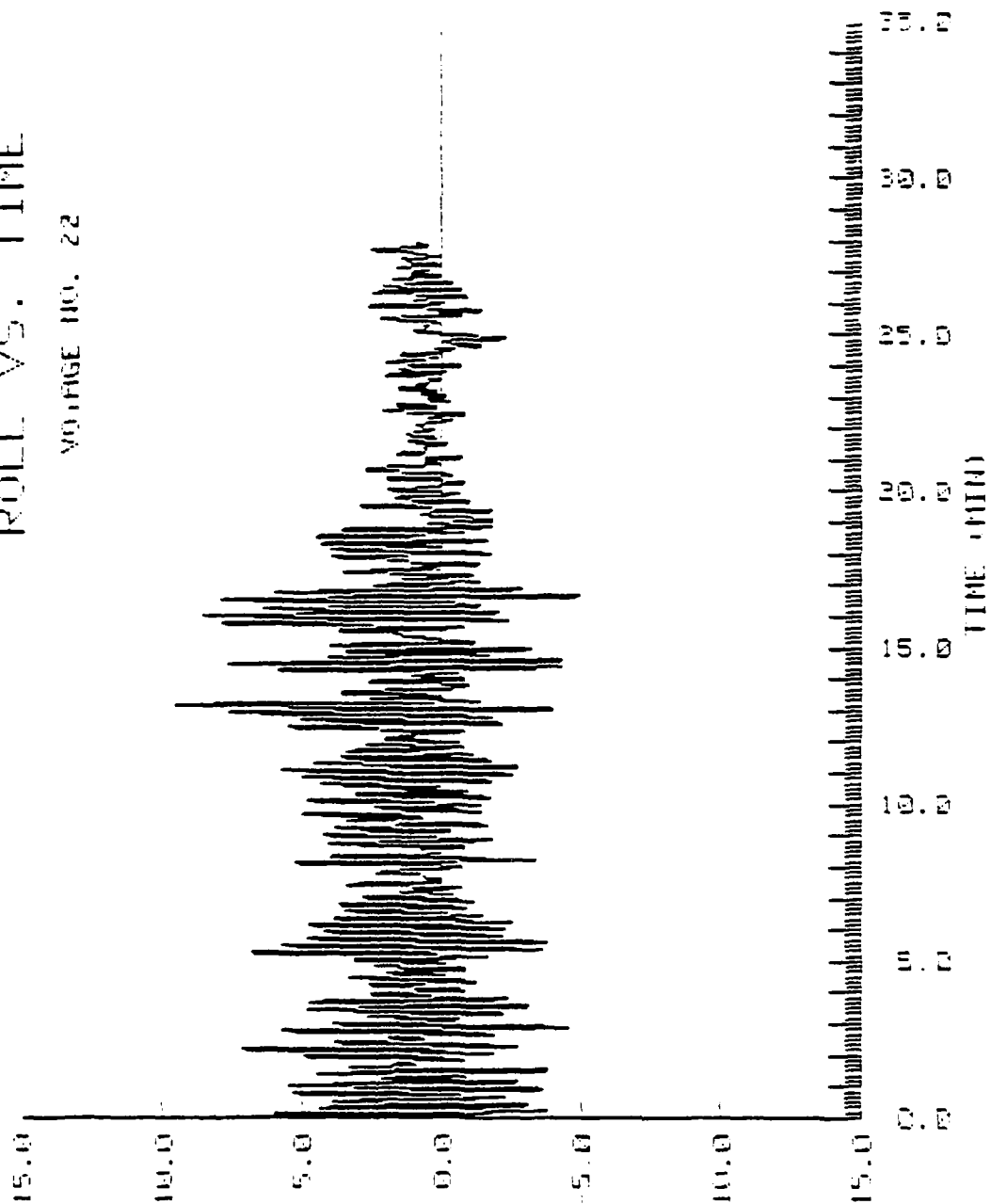
PITCH VS. TIME

VOICE NO. 22



ROLL VS. TIME

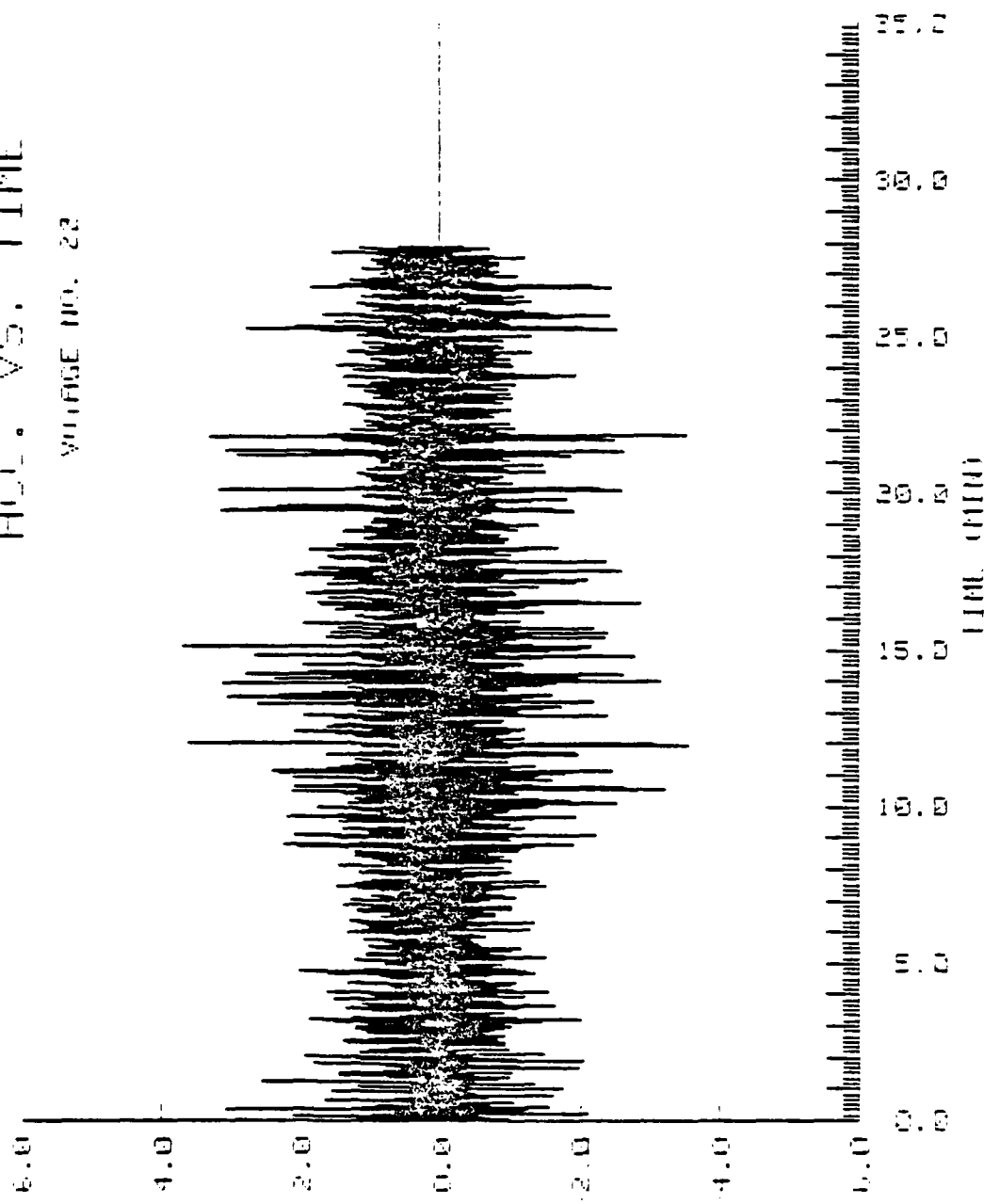
VOLUME NO. 22



1968-1969

ACC. VS. TIME

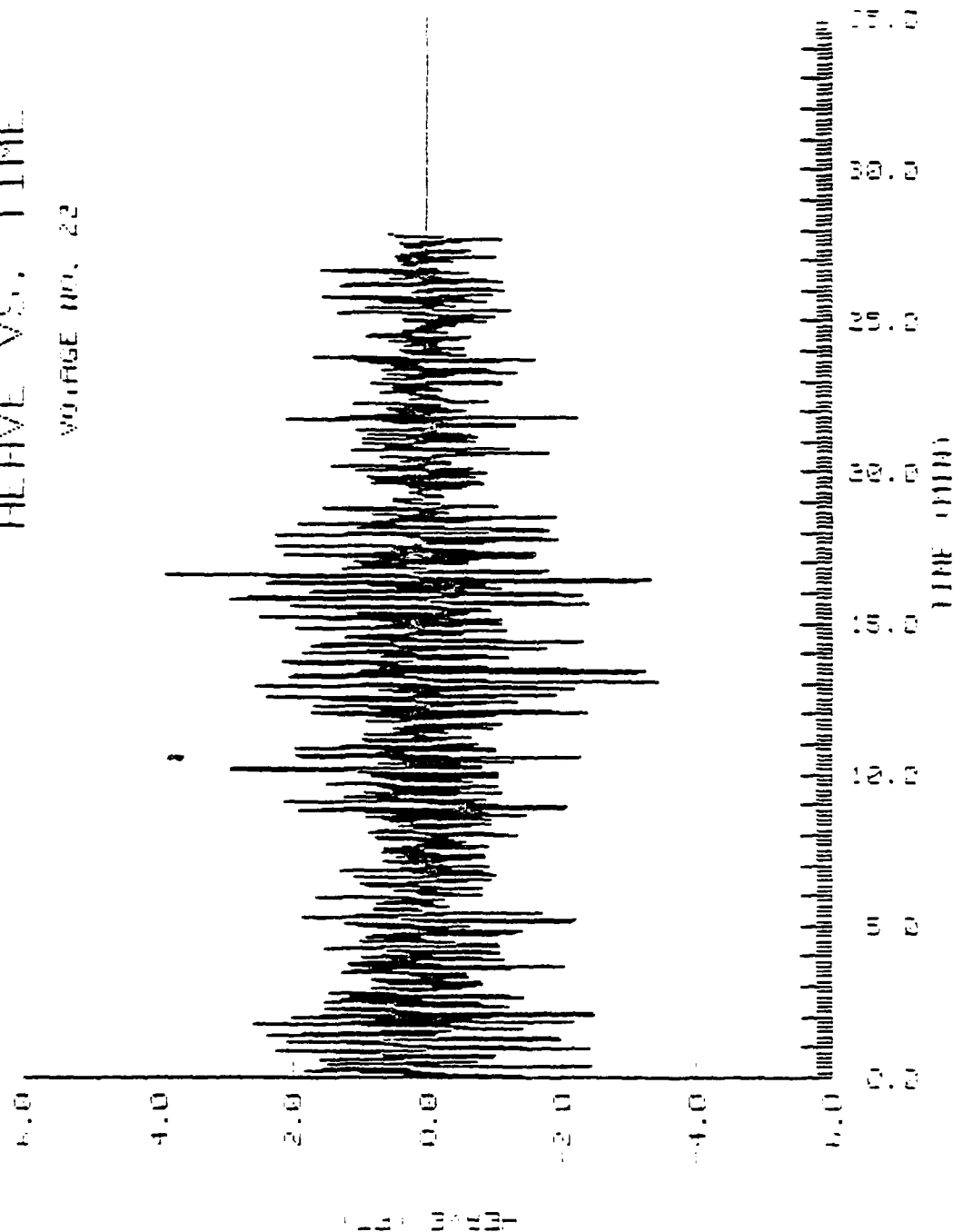
VOL. 100. 22



135. 135. 12 1005

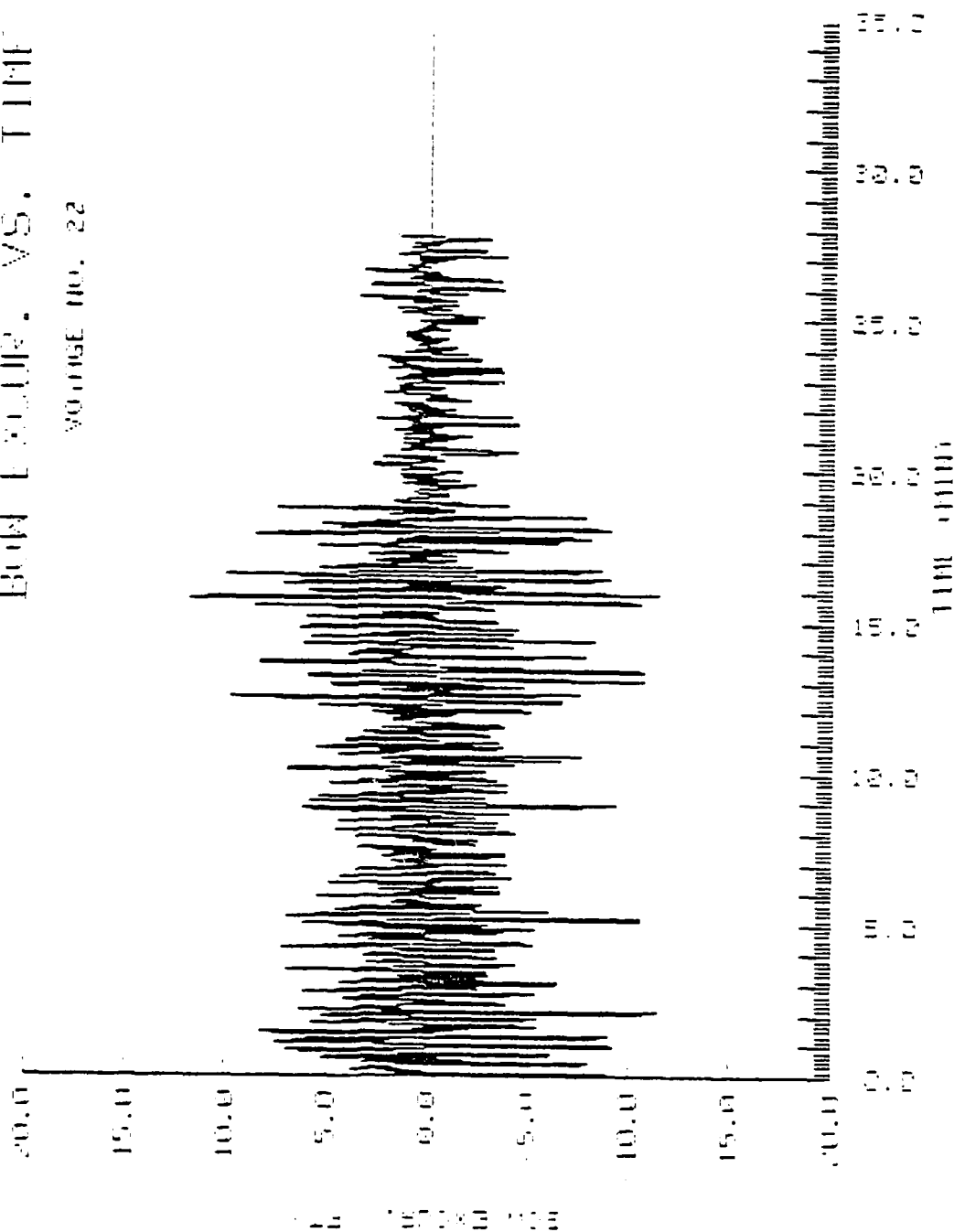
HEAVE VS. TIME

VOLUME NO. 22

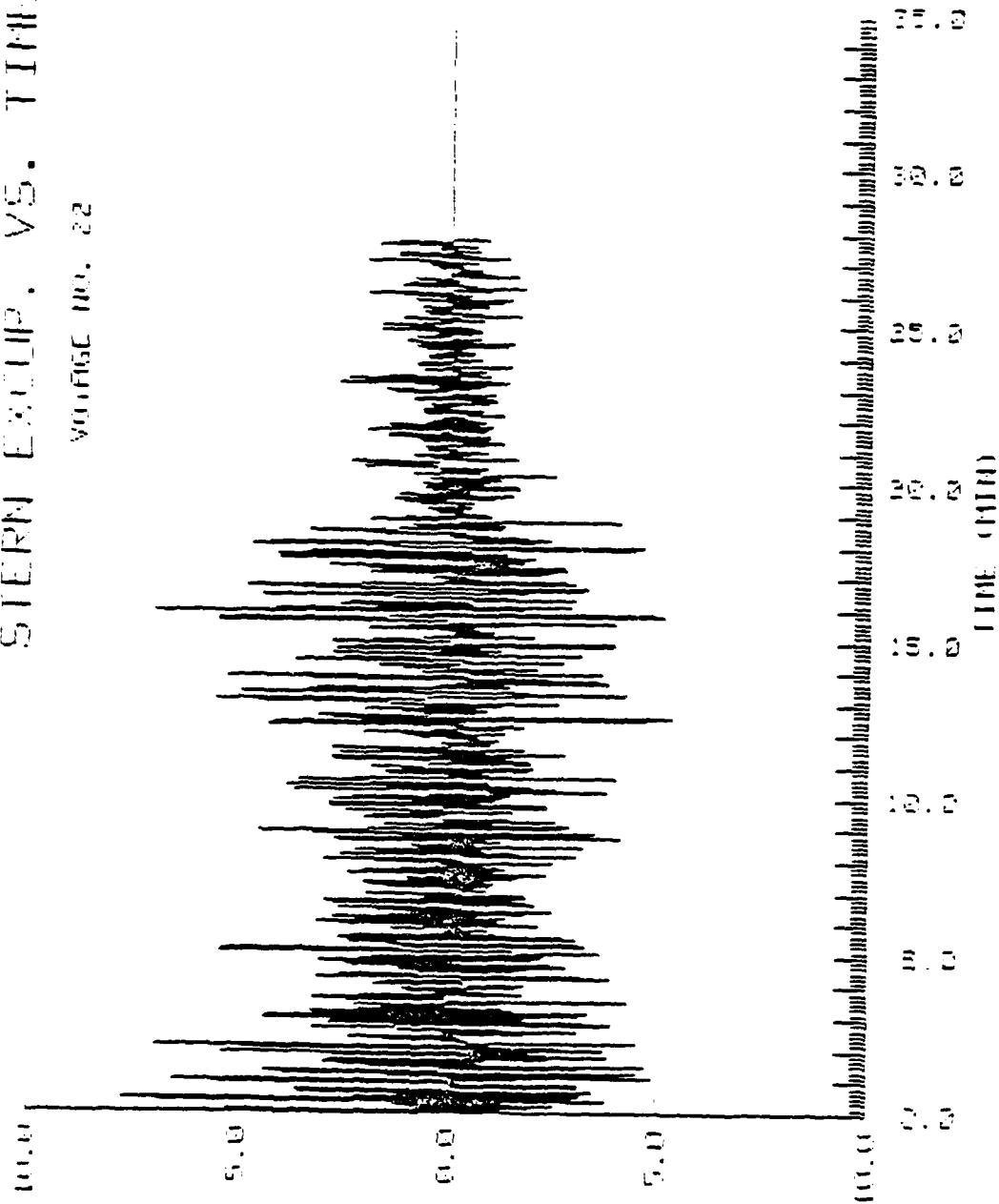


BOW EQUATION VS. TIME

VOLUME NO. 22

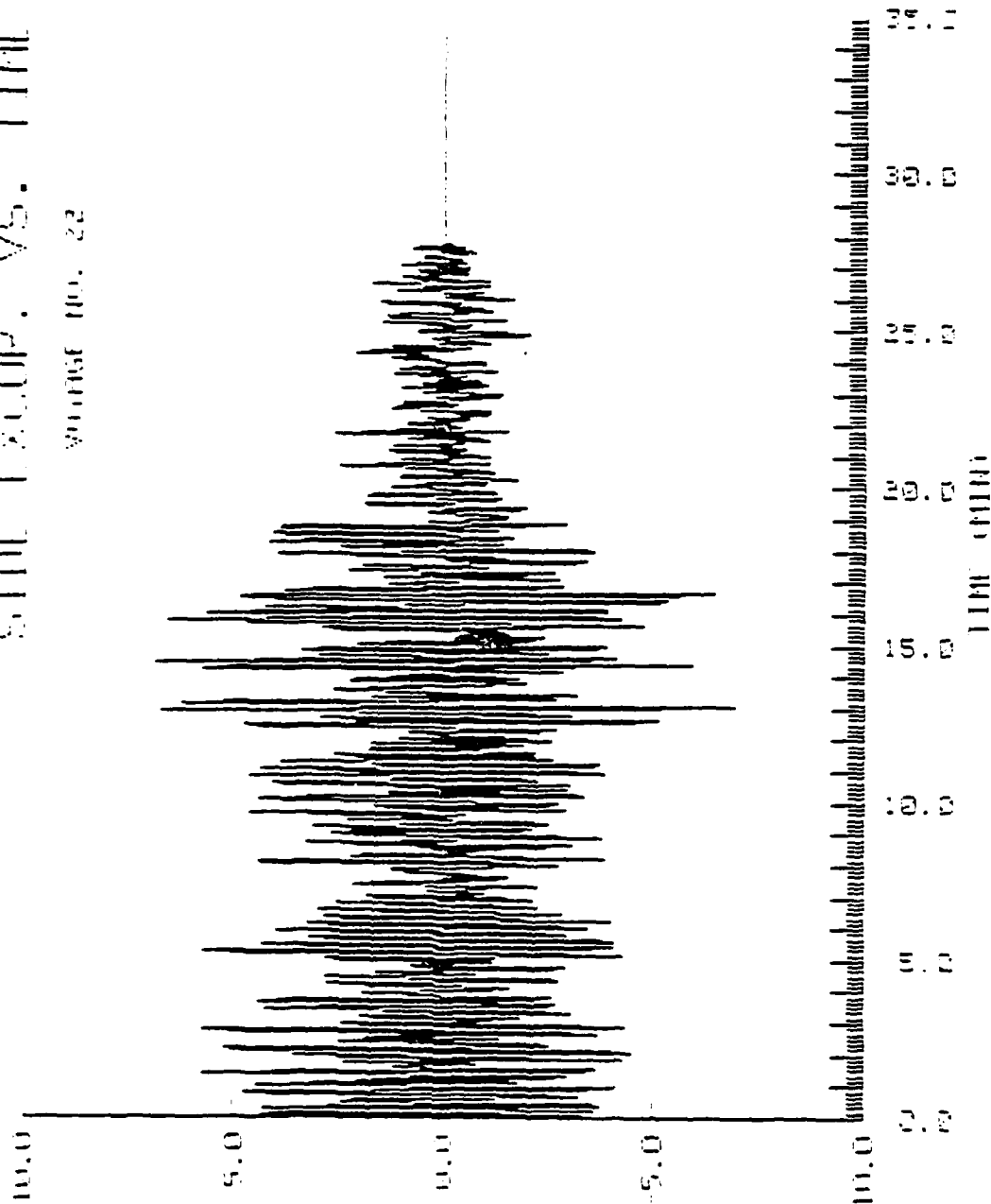


STERN EXCIP. VS. TIME VOLUME NO. 22



SILH GROUP VS. TIME

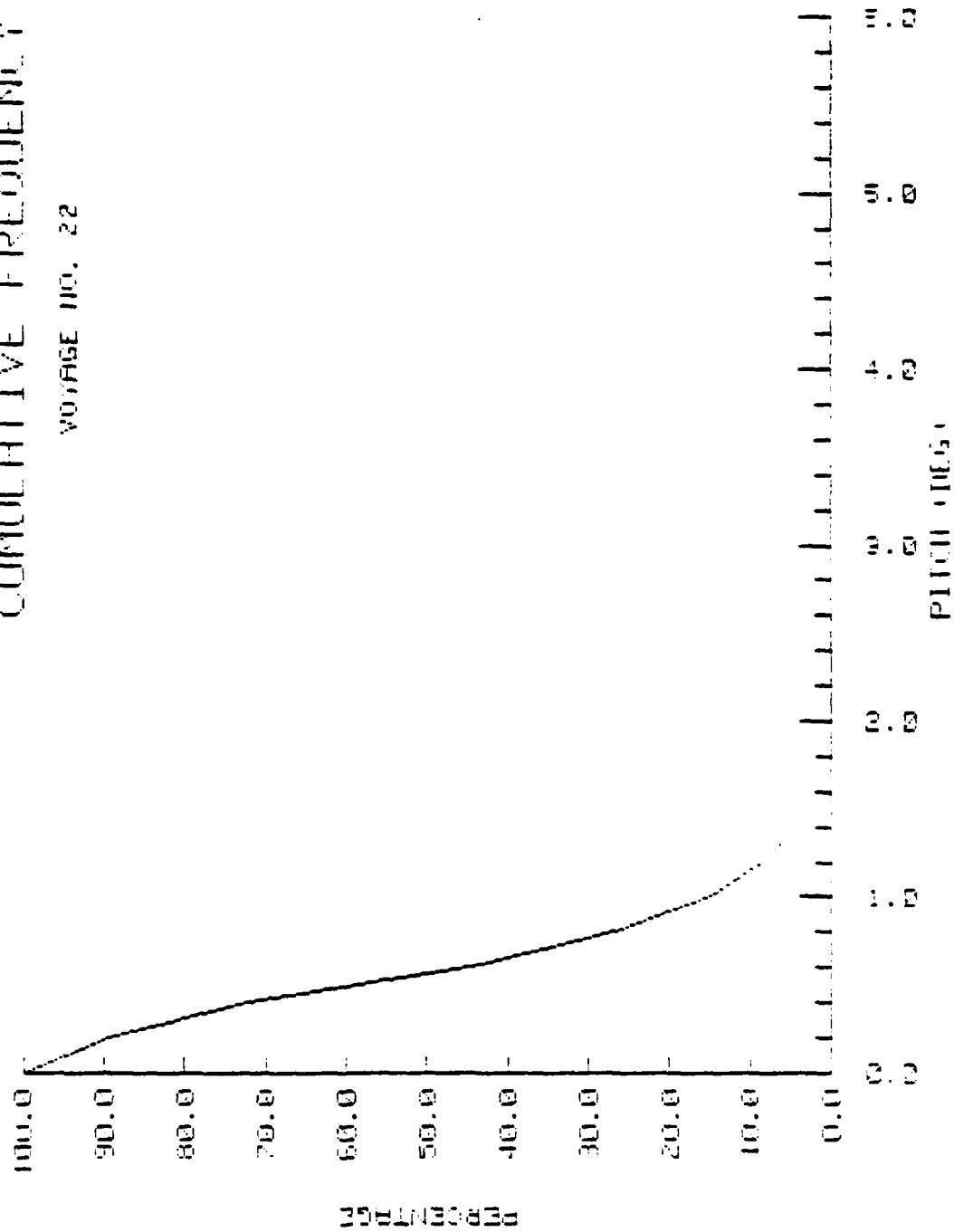
WINDS NO. 22



11 1971 02 0111

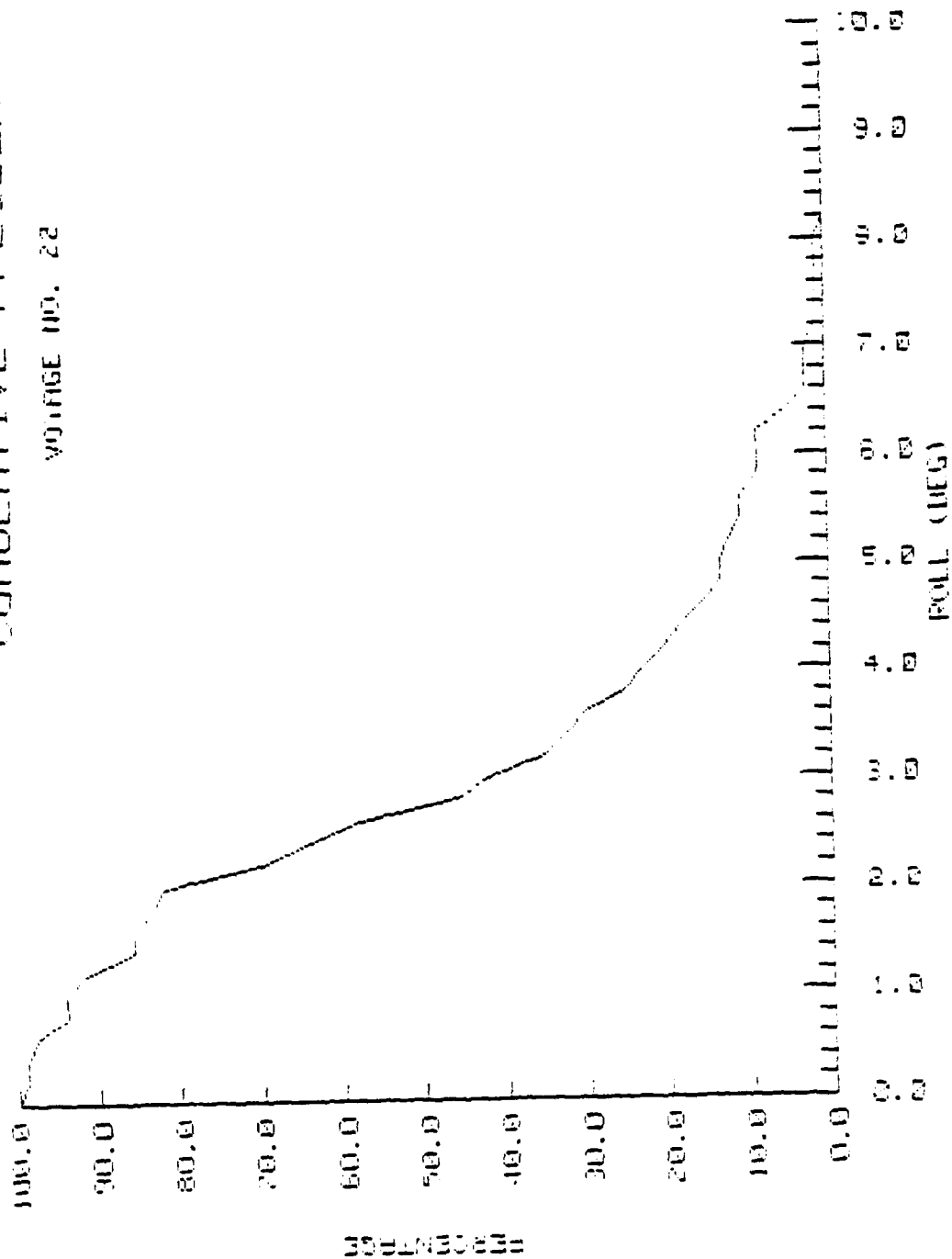
CUMULATIVE FREQUENCY

VOLUME NO. 22



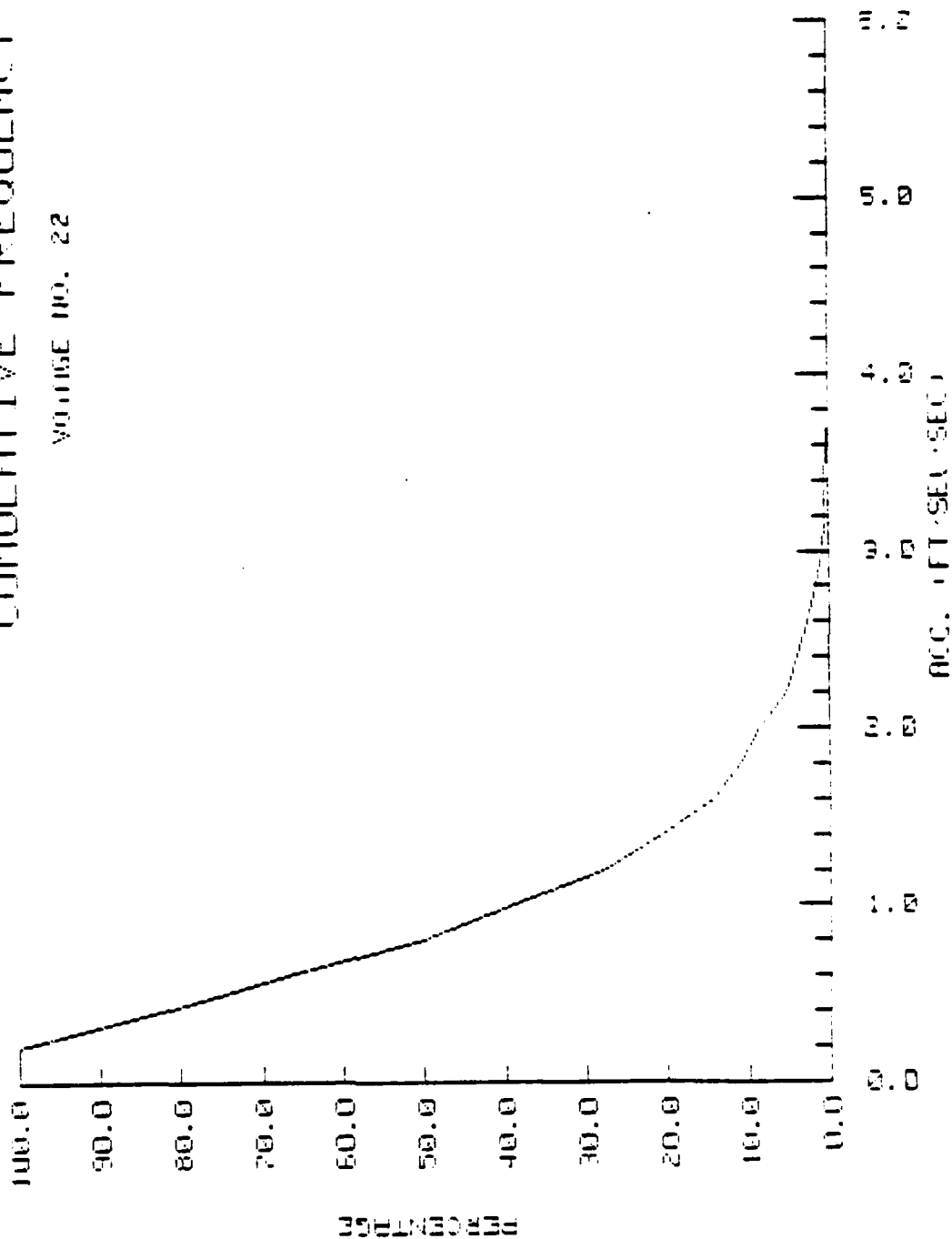
CUMULATIVE FREQUENCY

VOLUME NO. 22



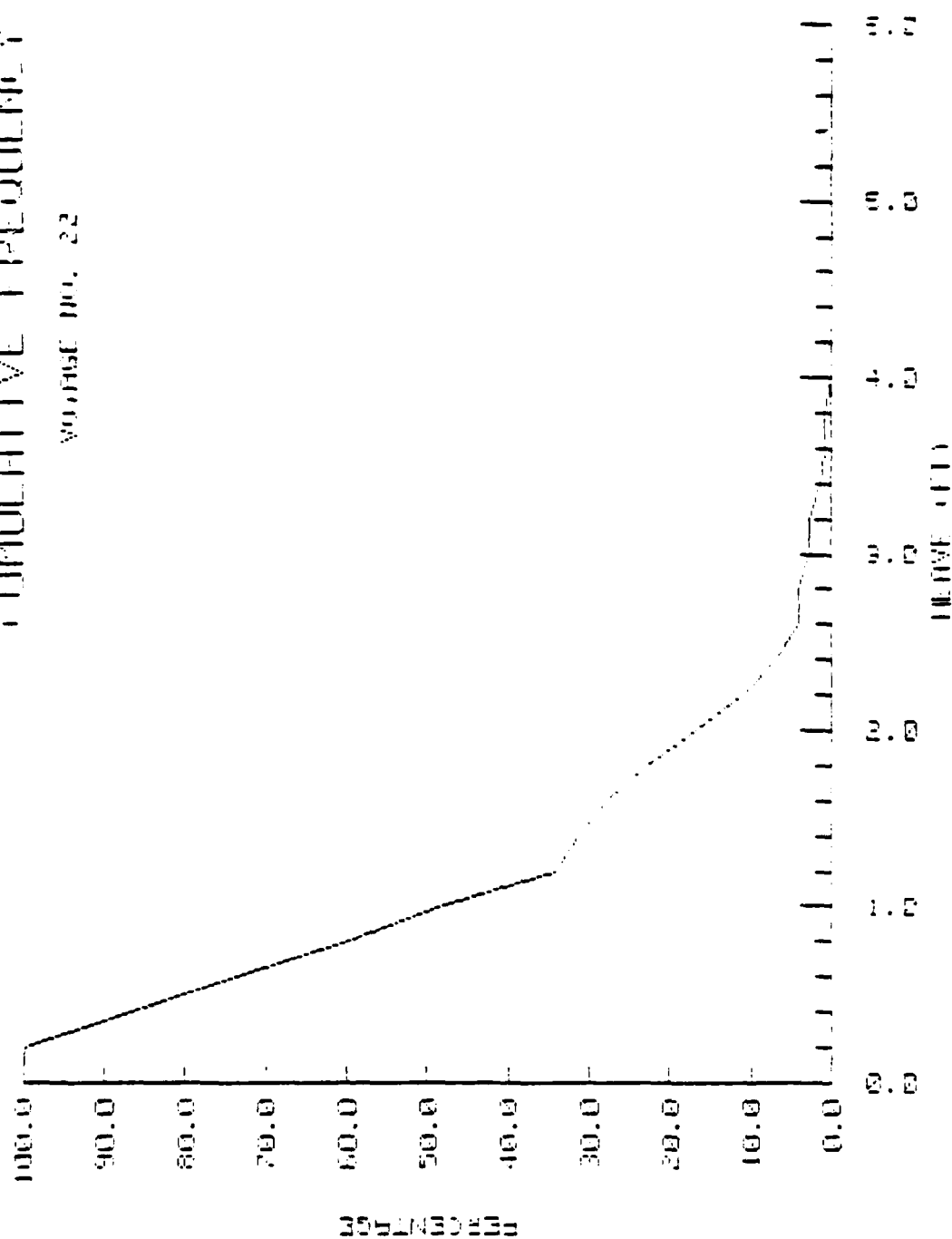
CUMULATIVE FREQUENCY

VOLUME NO. 22



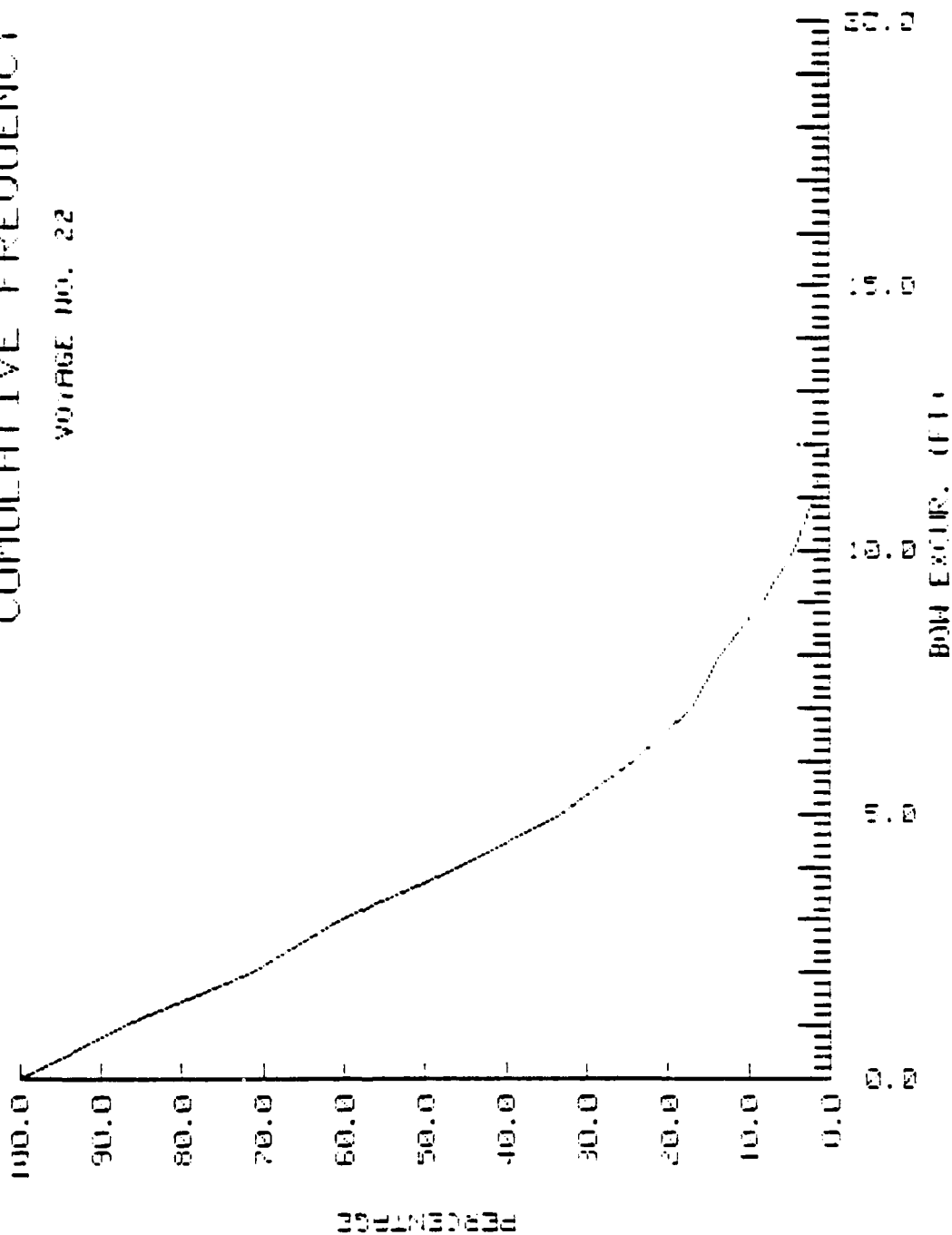
CUMULATIVE FREQUENCY

W0056E 100, 22



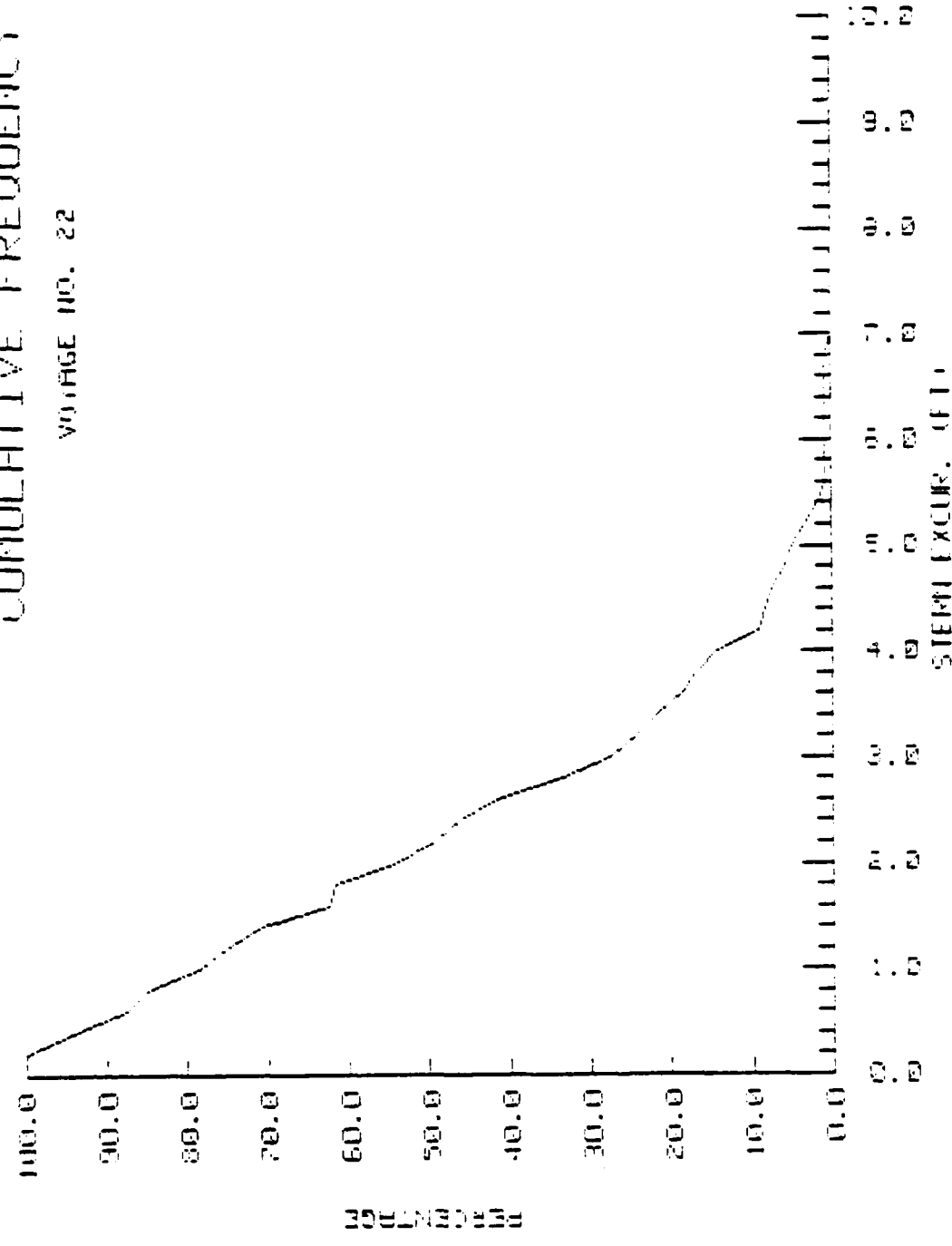
CUMULATIVE FREQUENCY

VOLUME NO. 22



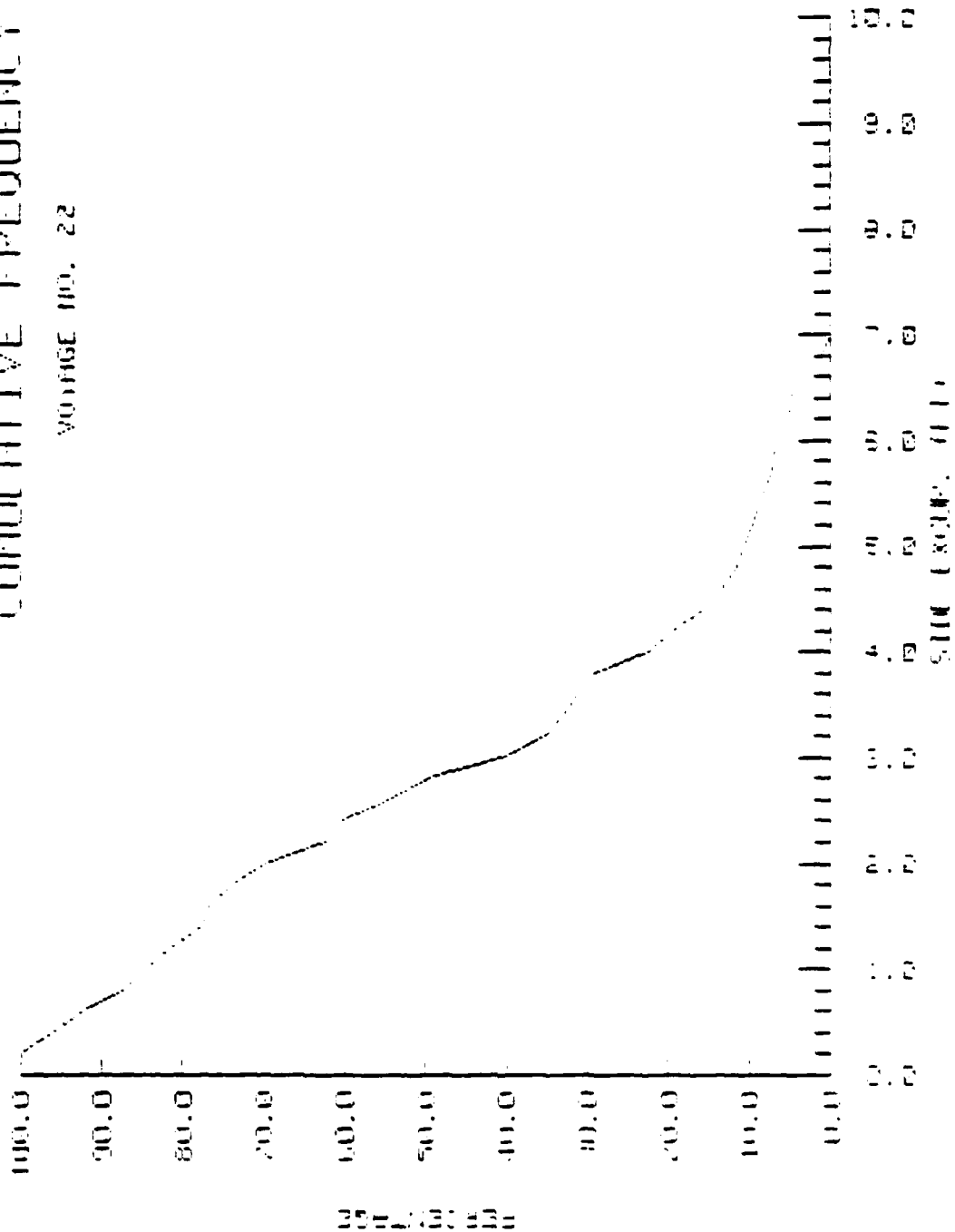
CUMULATIVE FREQUENCY

PAGE NO. 22



CUMULATIVE FREQUENCY

VOLUME NO. 22



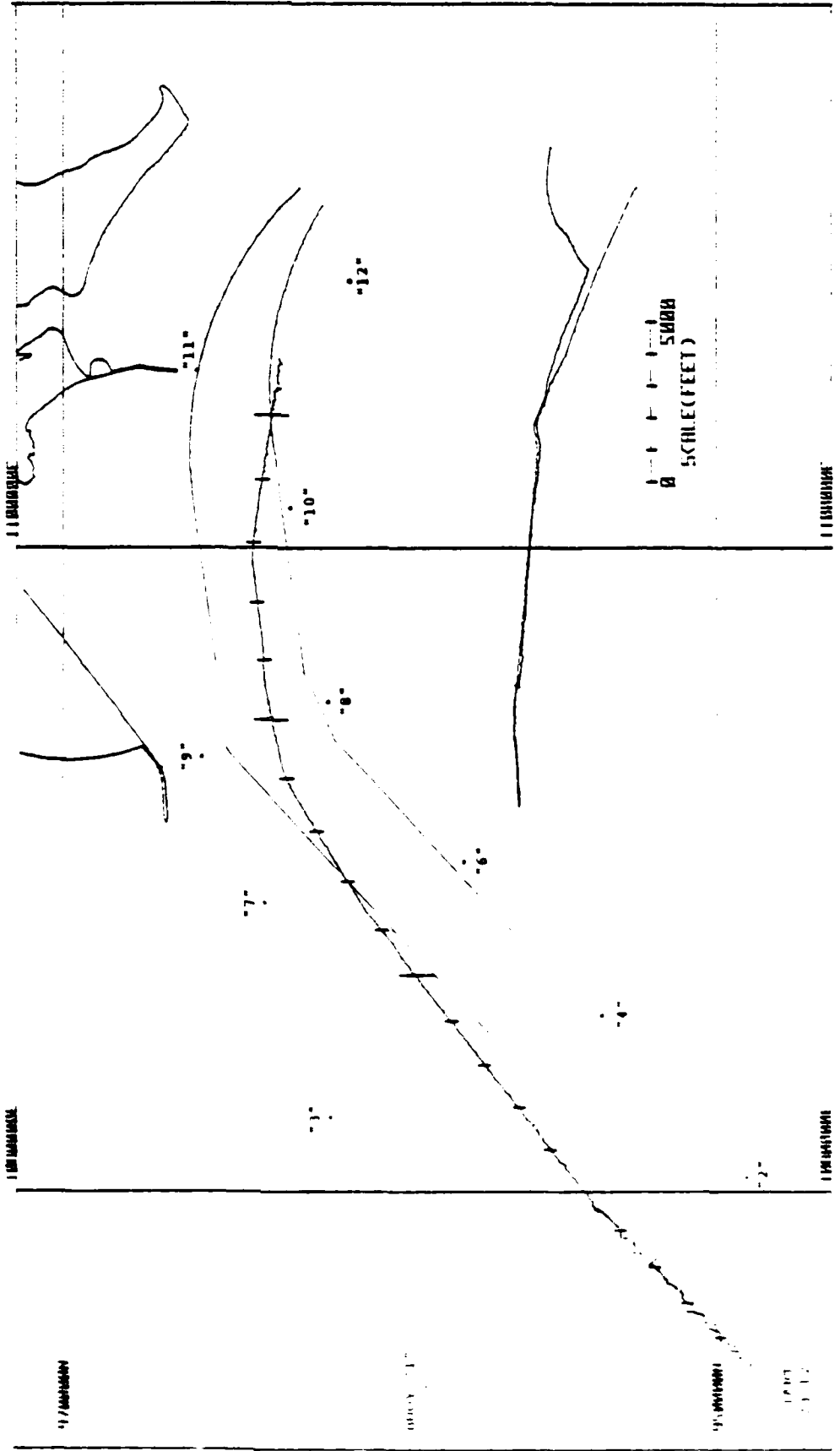
STATISTICAL SUMMARY

VOLUME NO. 23

	MEAN VALUE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
1. 1000 - 1000	.5	1.1	.4	.5
2. 1000 - 1000	.0	9.6	1.7	1.9
3. 1000 - 1000	.0	4.9	.5	.7
4. 1000 - 1000	.0	2.4	.9	1.0
5. 1000 - 1000	.0	8.2	2.9	3.4
6. 1000 - 1000	.0	4.5	1.7	1.9
7. 1000 - 1000	.0	6.0	1.8	2.2

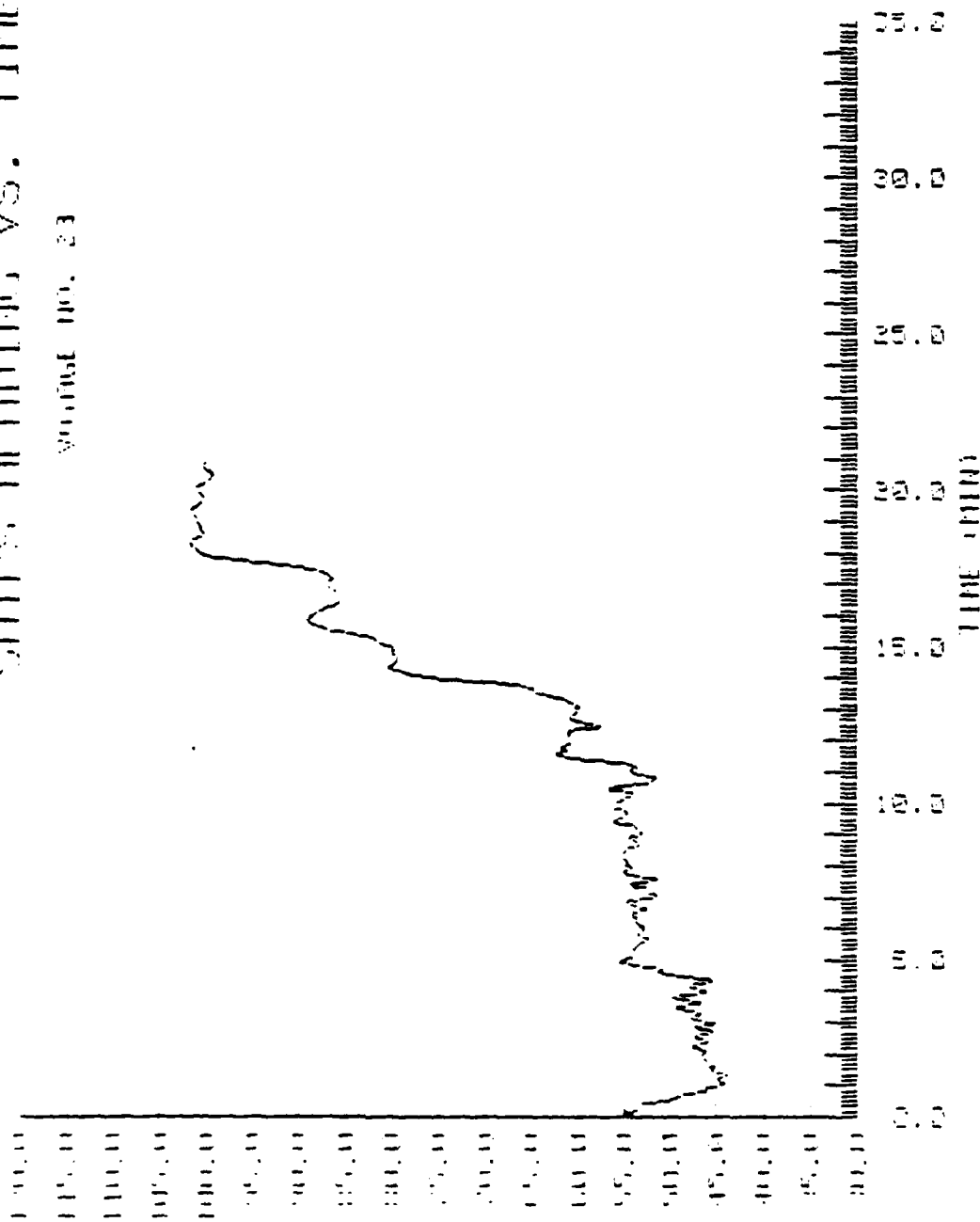
VIEWED NW 24 SHEET TRICK

Scale 1:10000



SOILS HUMIDITY VS. TIME

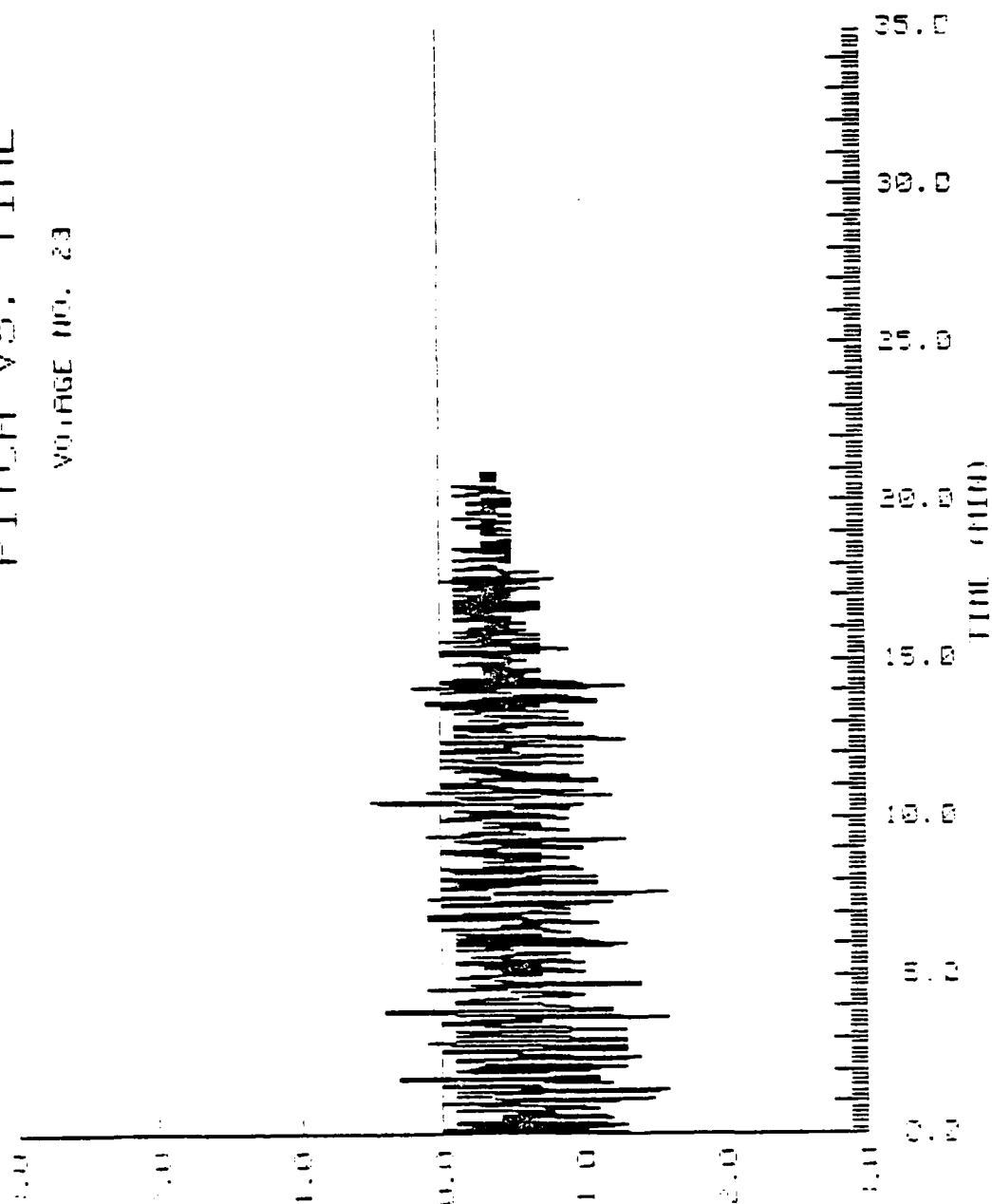
WINDTUN NO. 23



1.00 0.95 0.90 0.85 0.80 0.75 0.70 0.65 0.60 0.55 0.50 0.45 0.40 0.35 0.30 0.25 0.20 0.15 0.10 0.05 0.00

PITCH VS. TIME

VOLUME NO. 23



200 100 0

ROLL VS. TIME

VOYAGE NO. 23

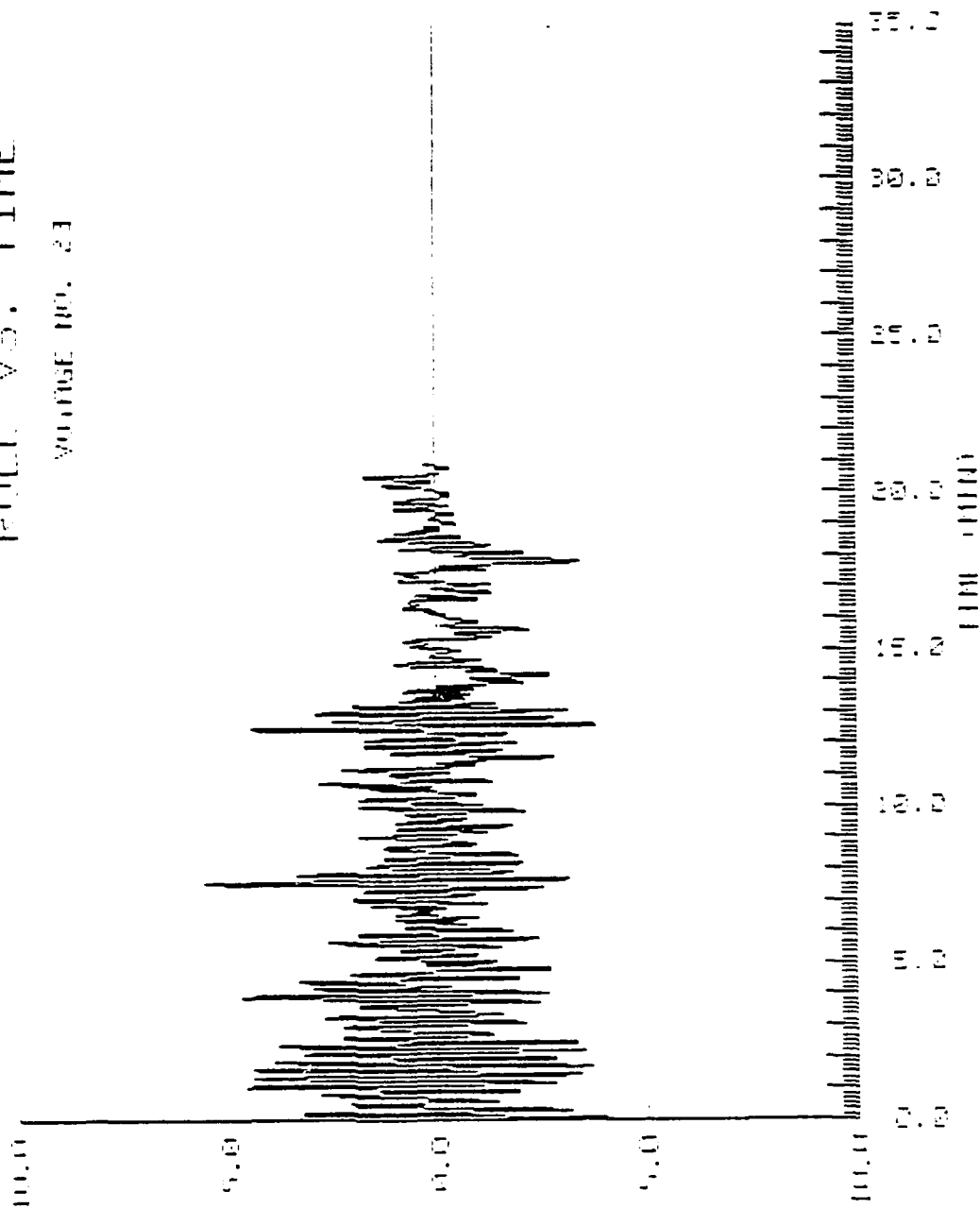
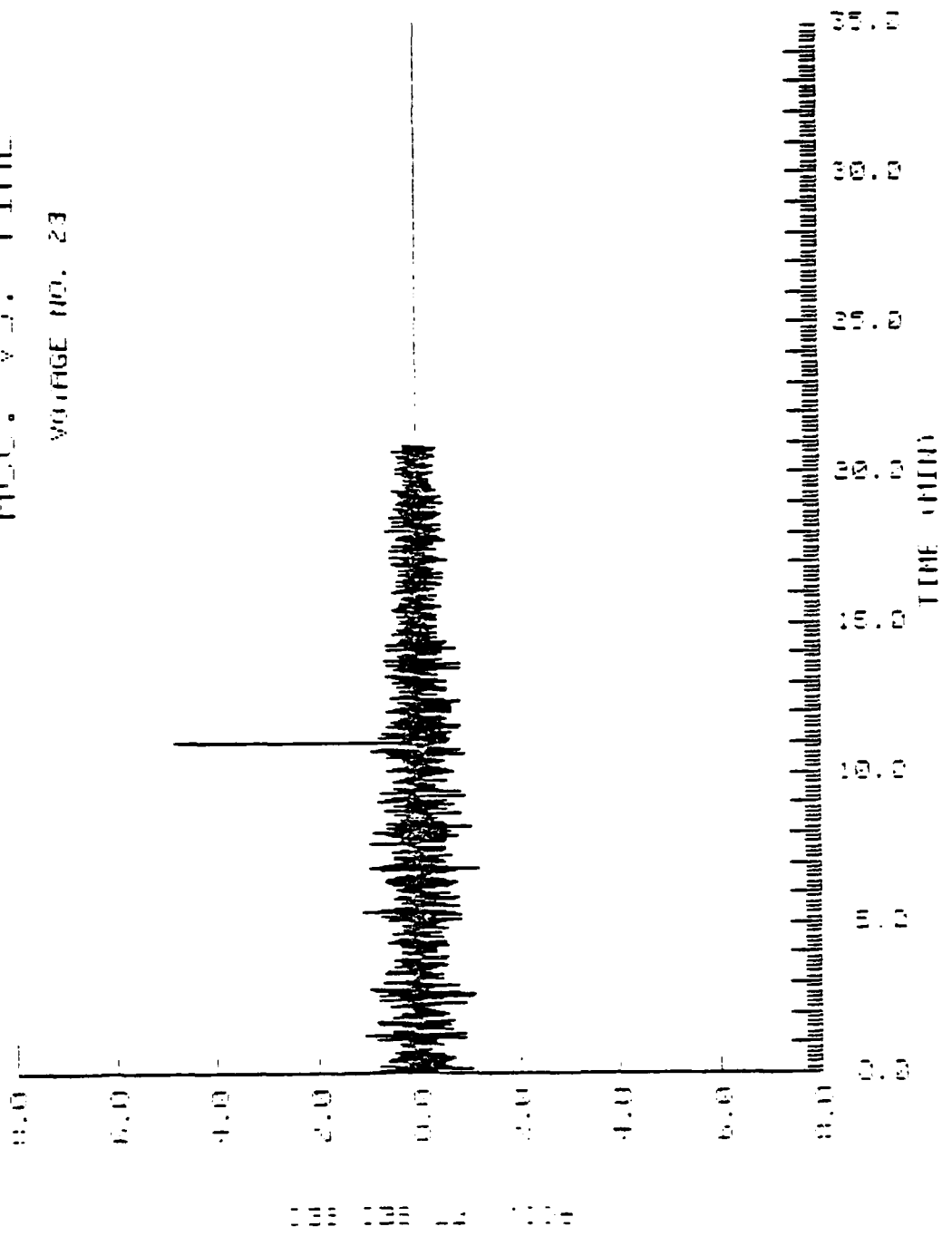


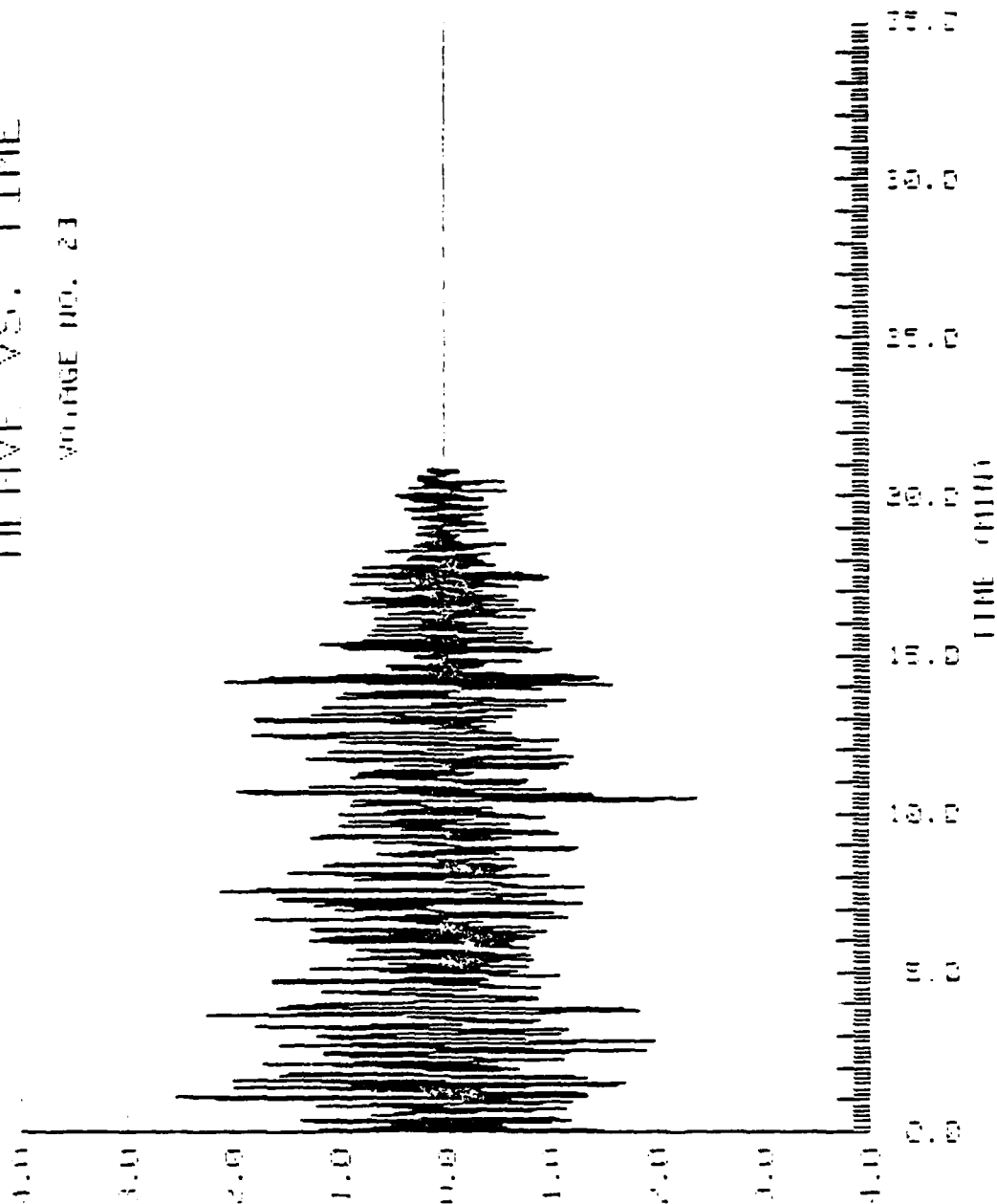
FIG. VS. TIME

VOLUME NO. 23



IMPULSE VS. TIME

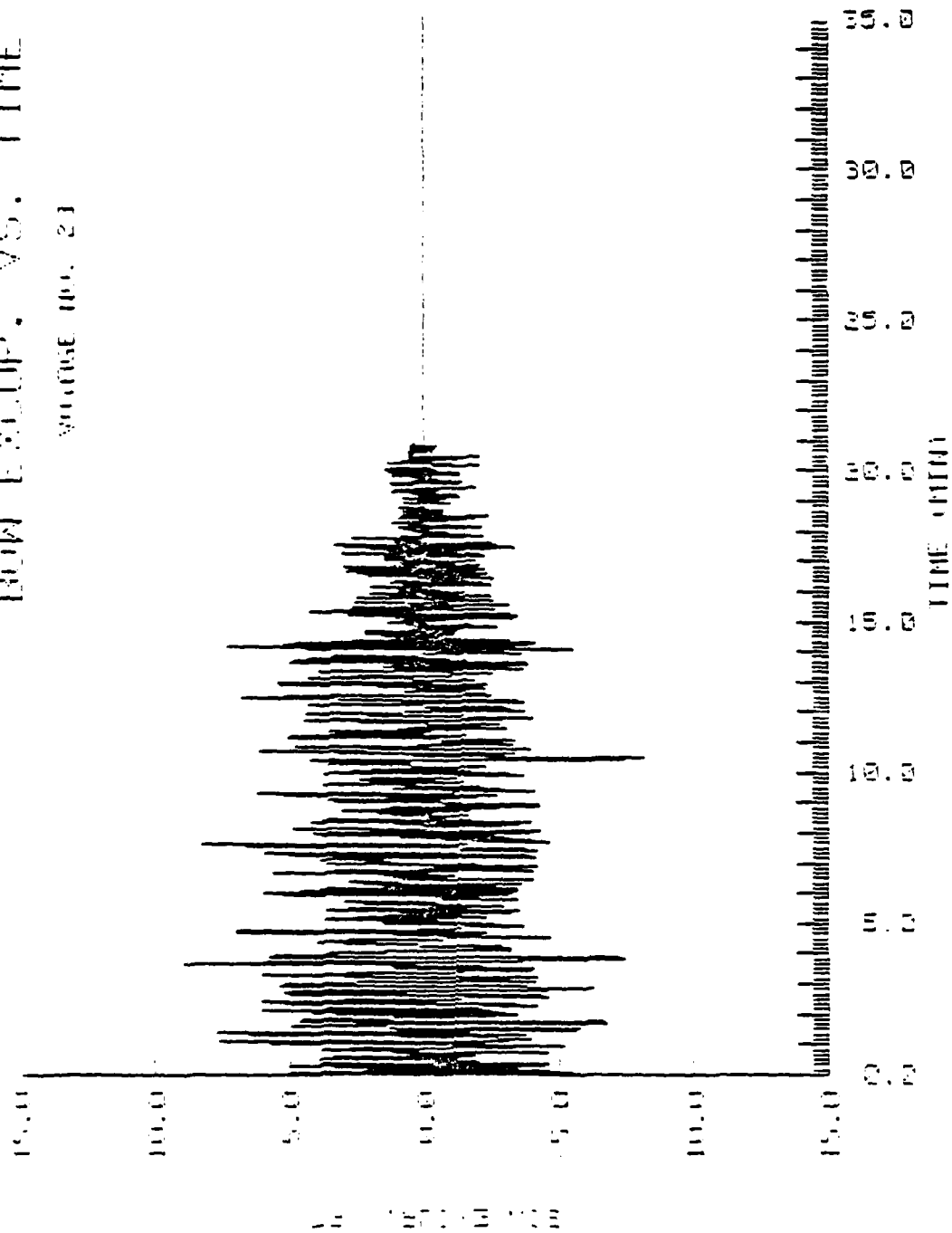
VOLUME NO. 23



11 37134

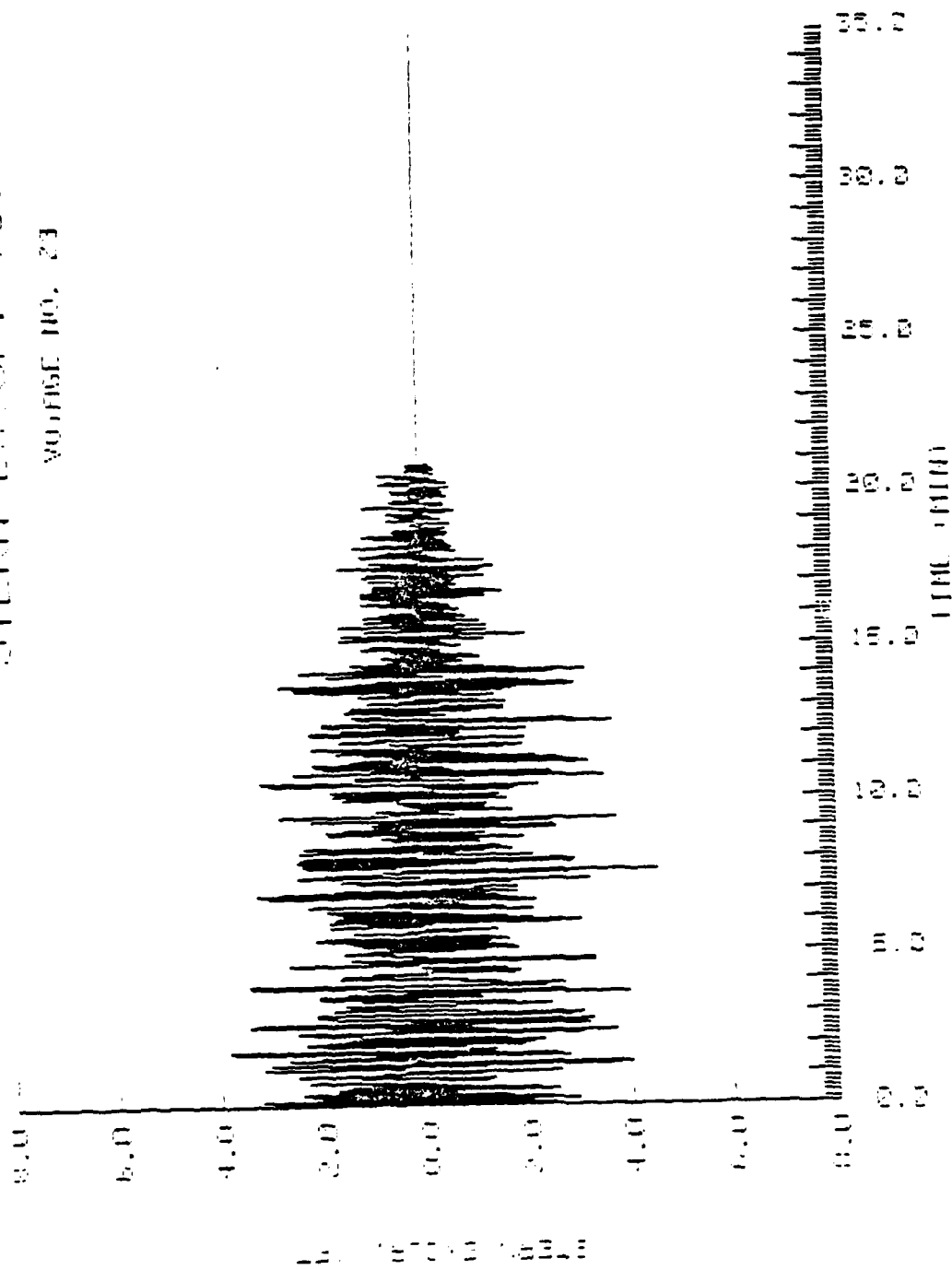
BOW ECLIP. VS. TIME

W0005E 100. 23



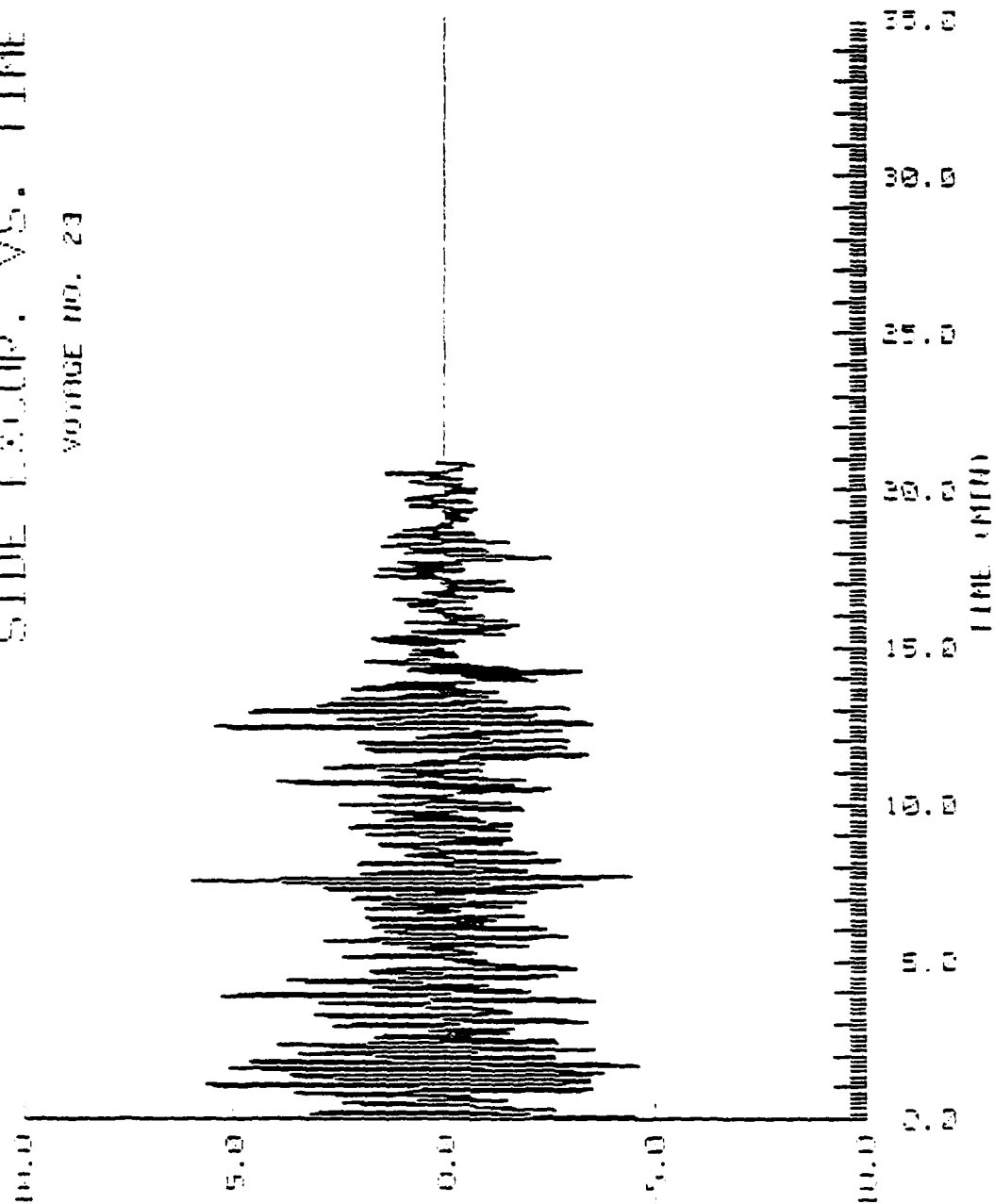
STERN EXTUP. VS. TIME

VOYAGE NO. 23



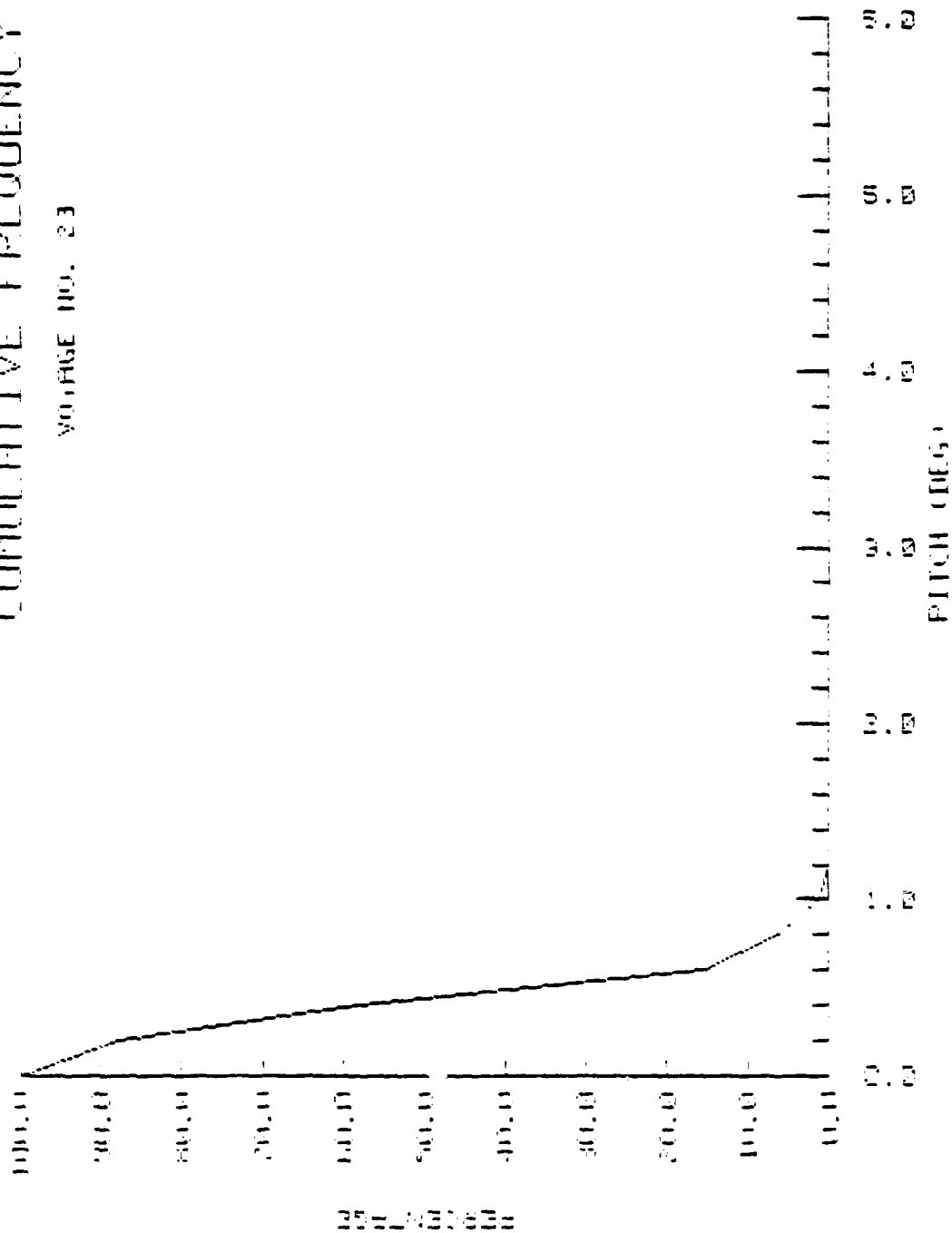
SUE LAPOINTE VS. THE

VOIRGE 107. 23



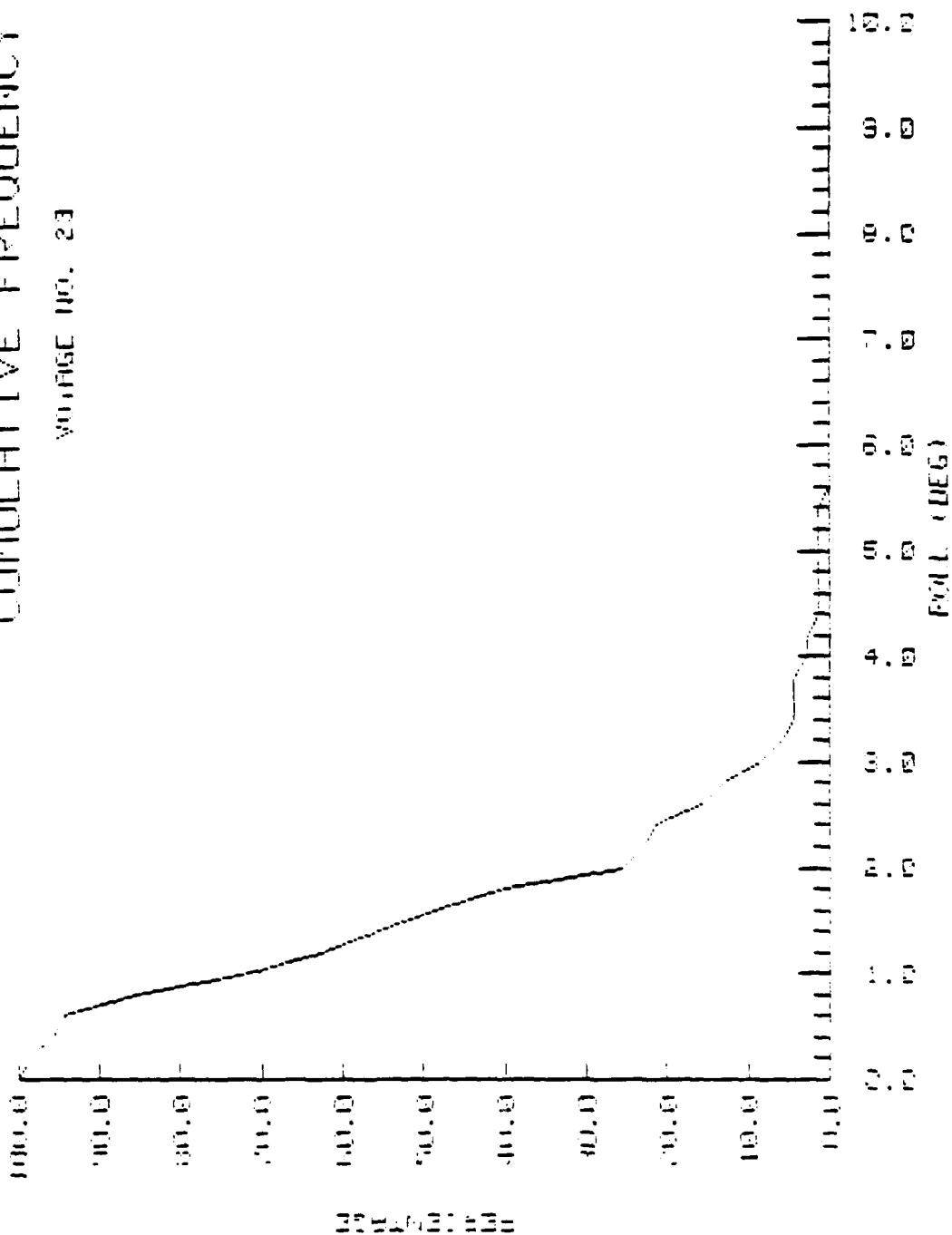
CUMULATIVE FREQUENCY

VOYAGE NO. 23



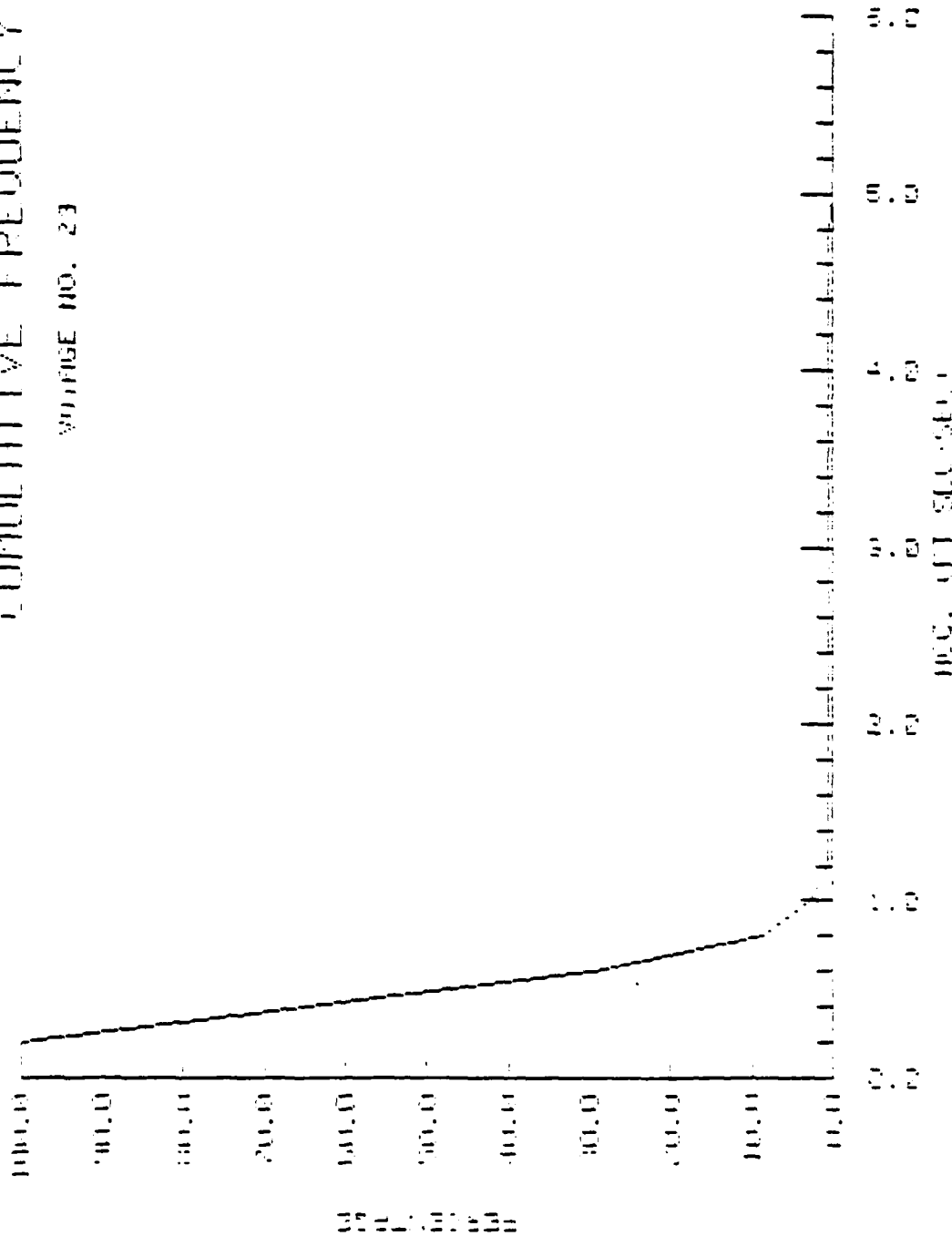
CUMULATIVE FREQUENCY

VOLUME NO. 23



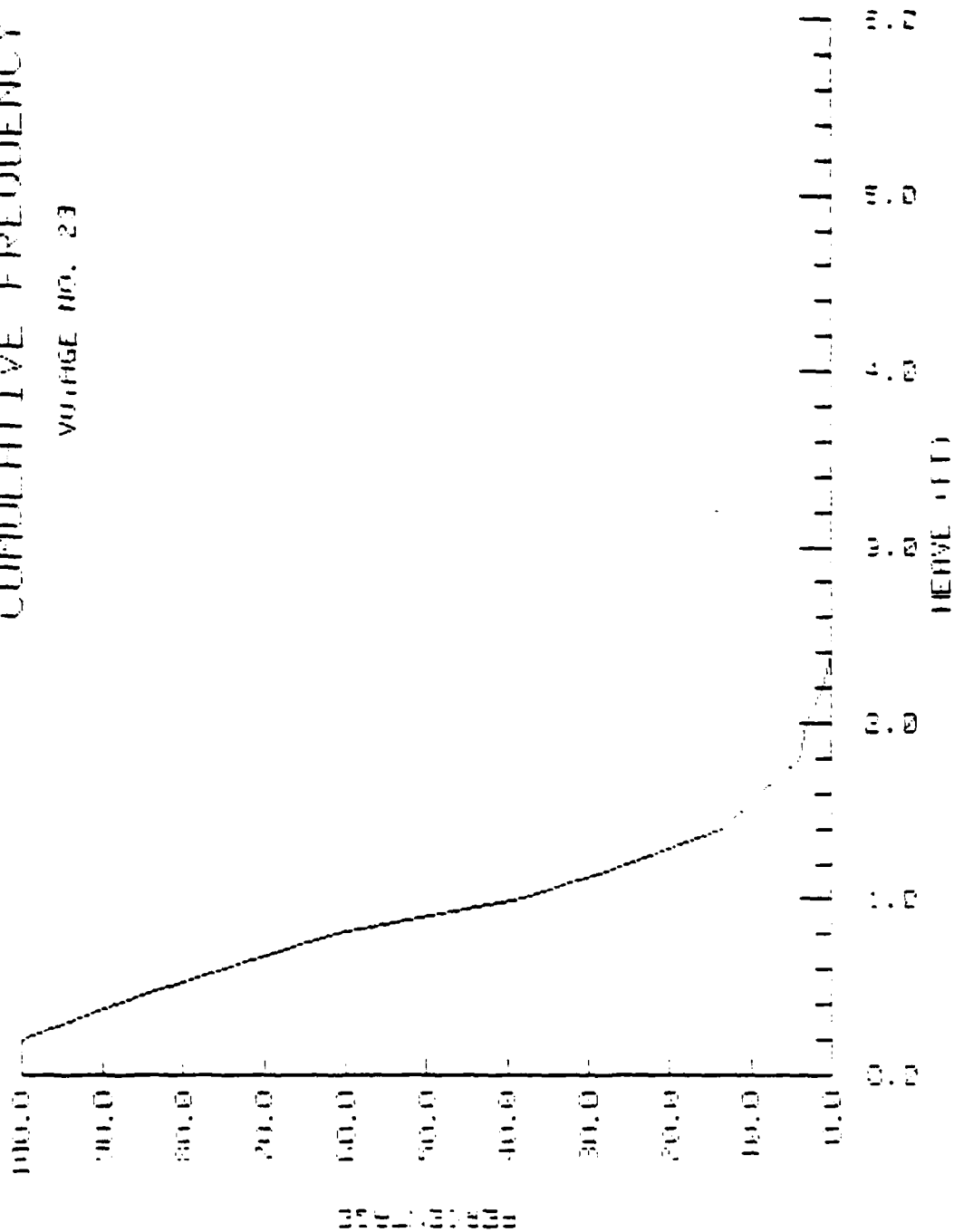
CUMULATIVE FREQUENCY

VOLUME NO. 23



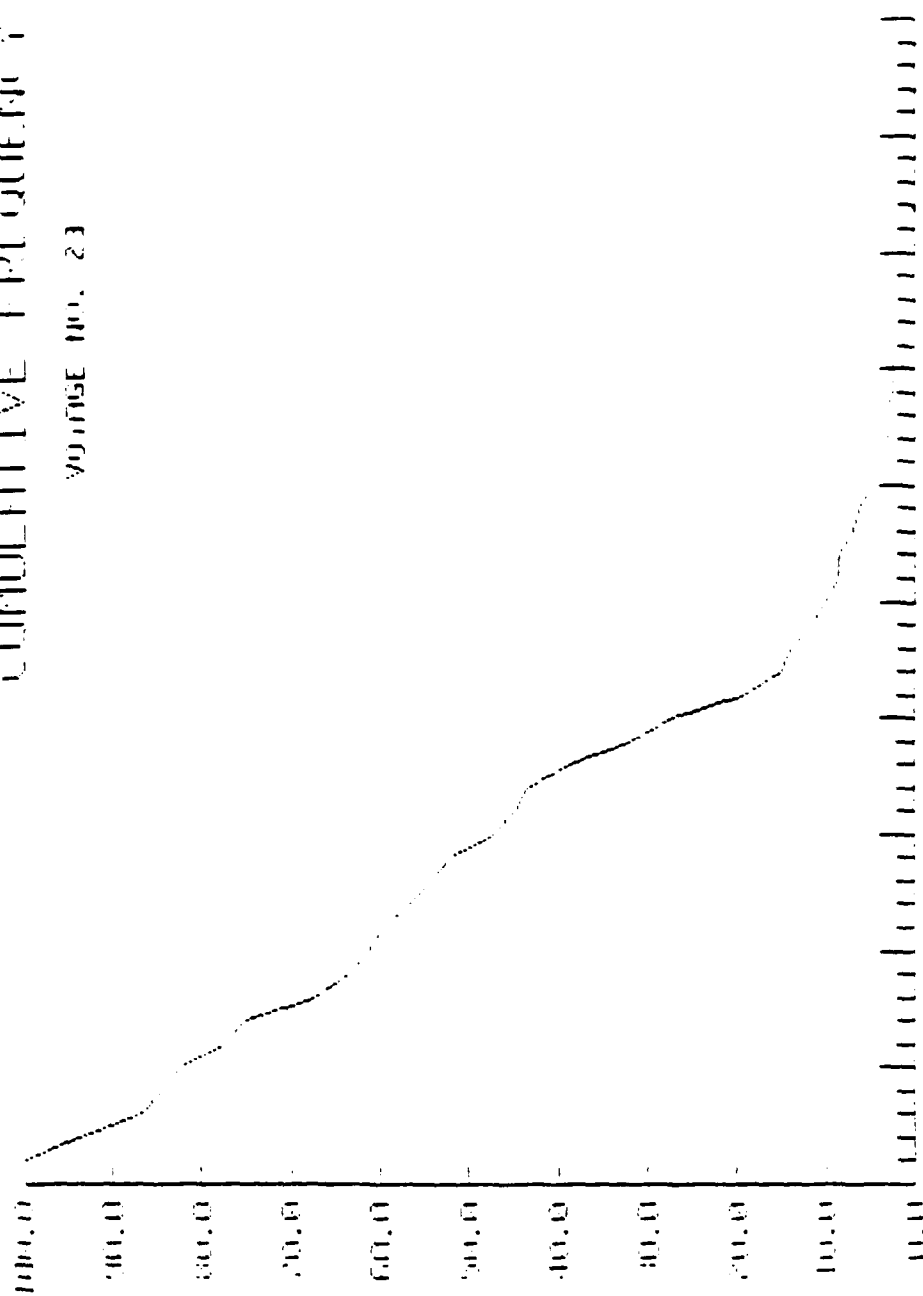
CUMULATIVE FREQUENCY

VOLUME NO. 23



CUMULATIVE FREQUENCY

VOYAGE NO. 23

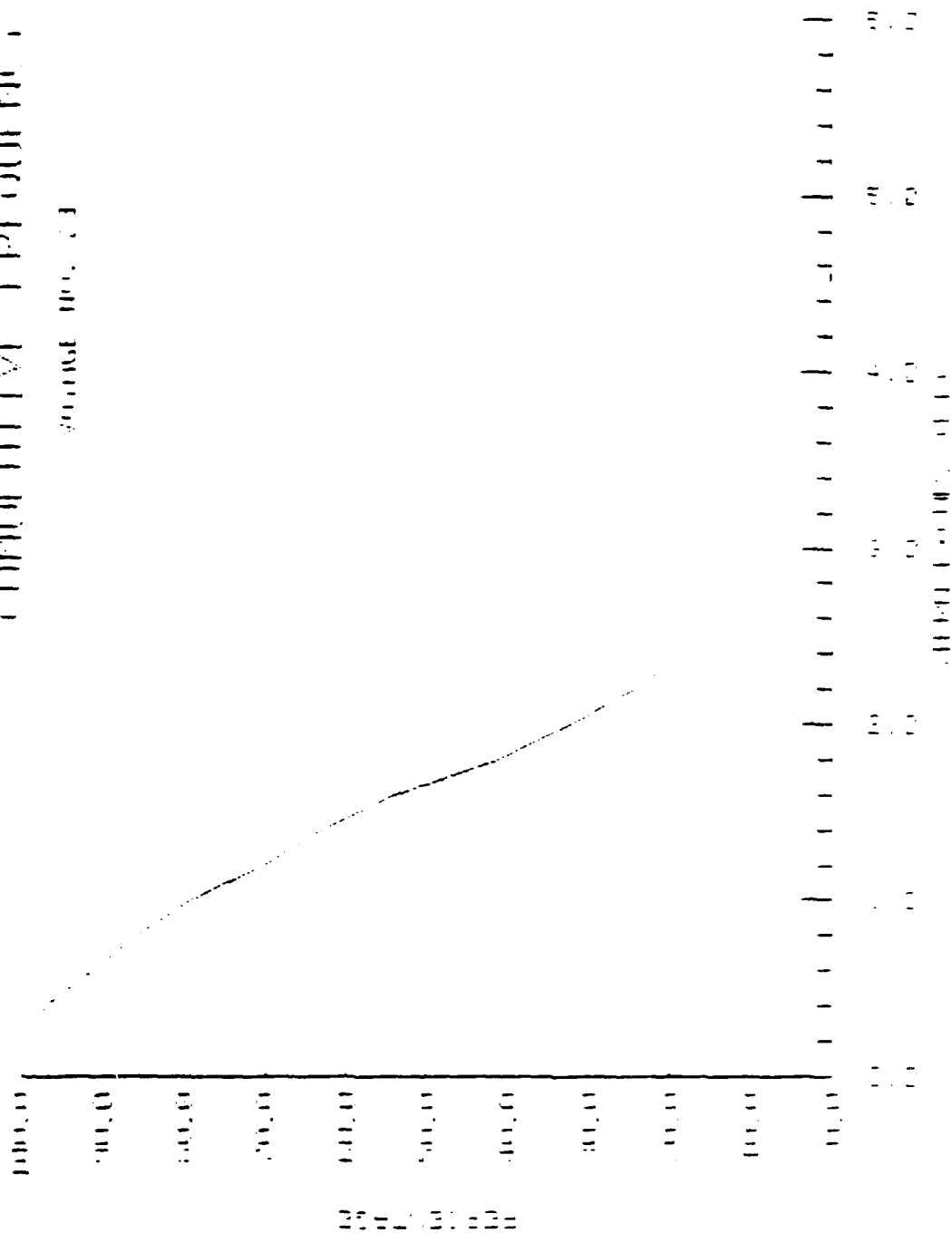


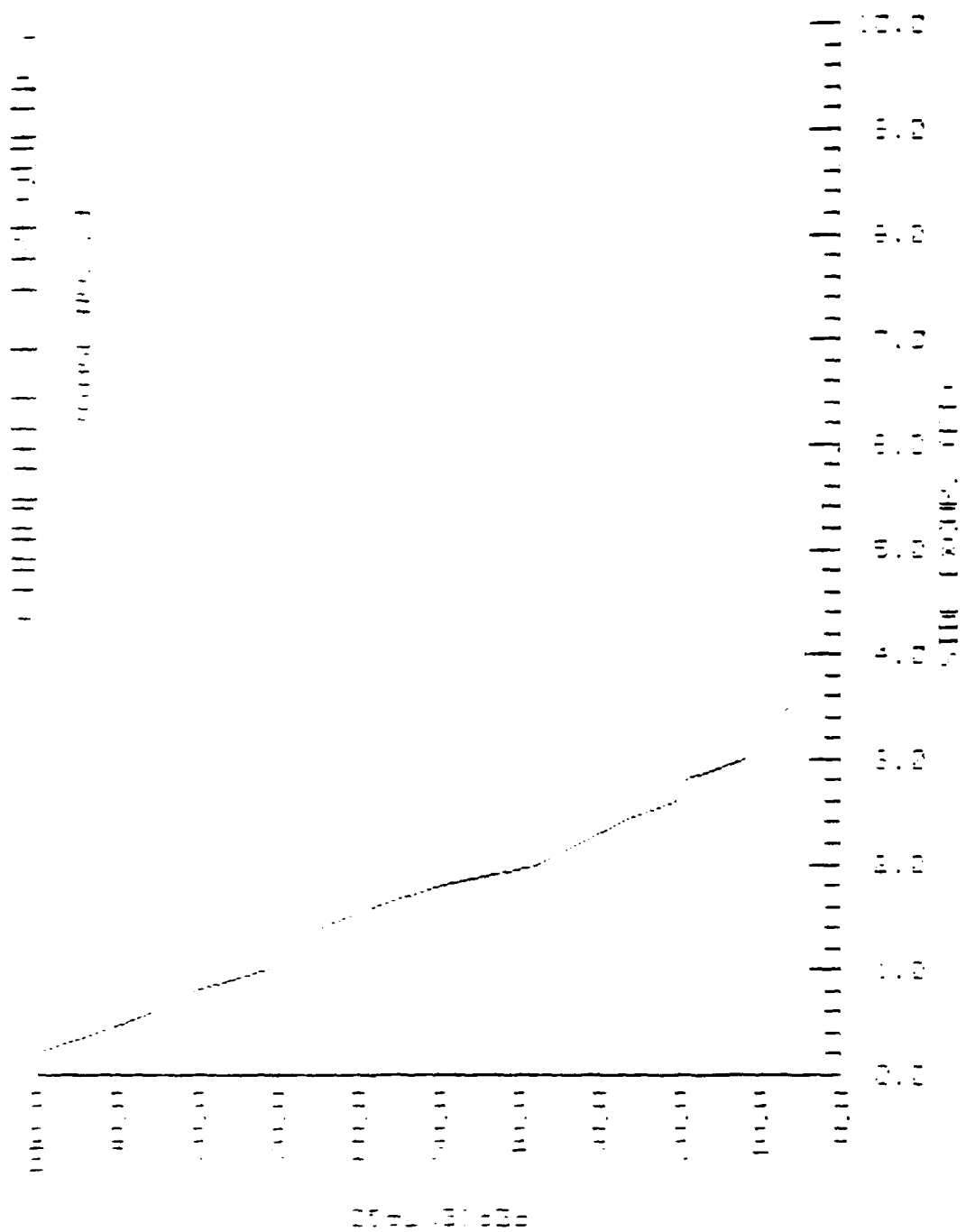
0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0

BOYD (2012). (11)

CUMULATIVE FLOW

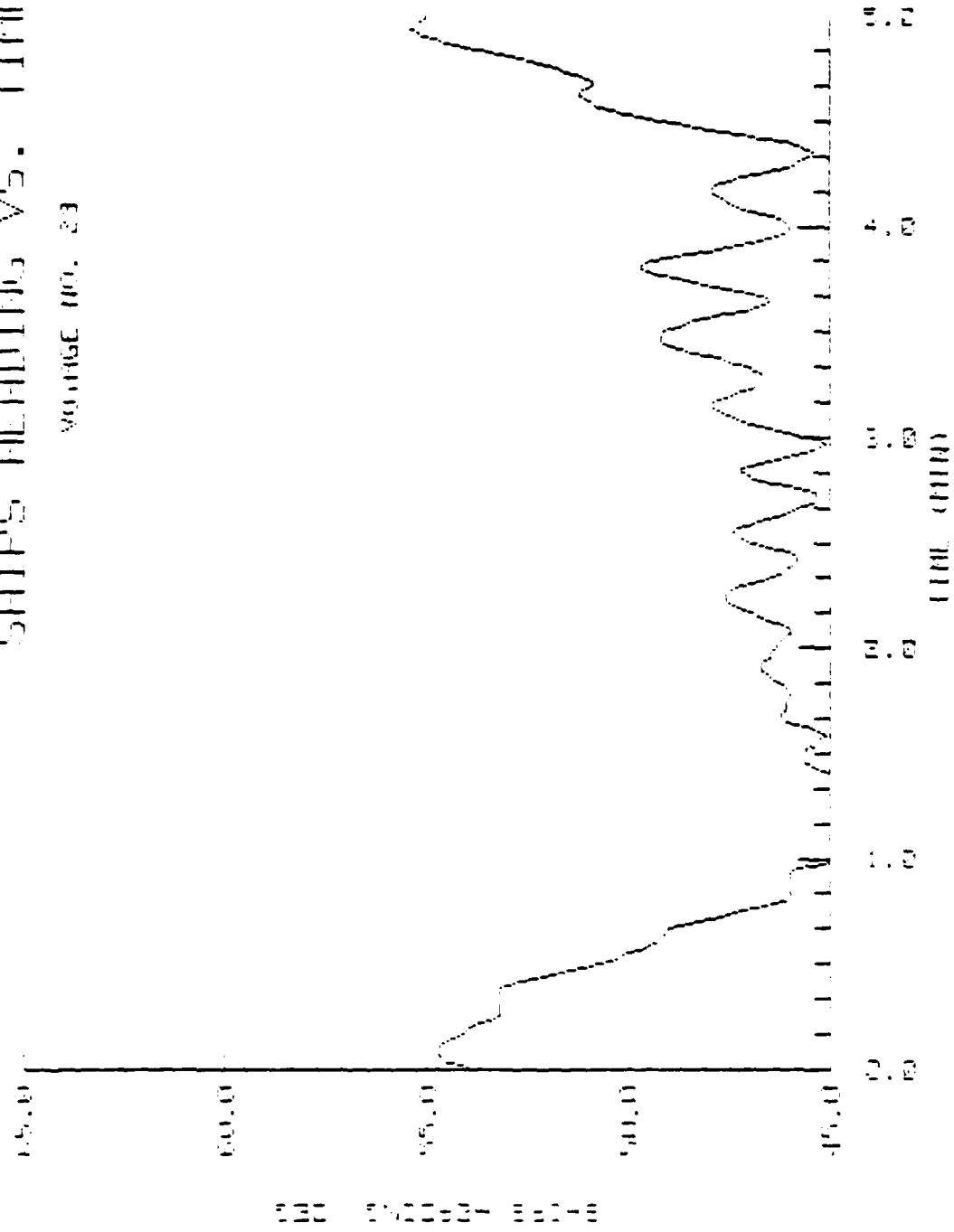
FIGURE NO. 33





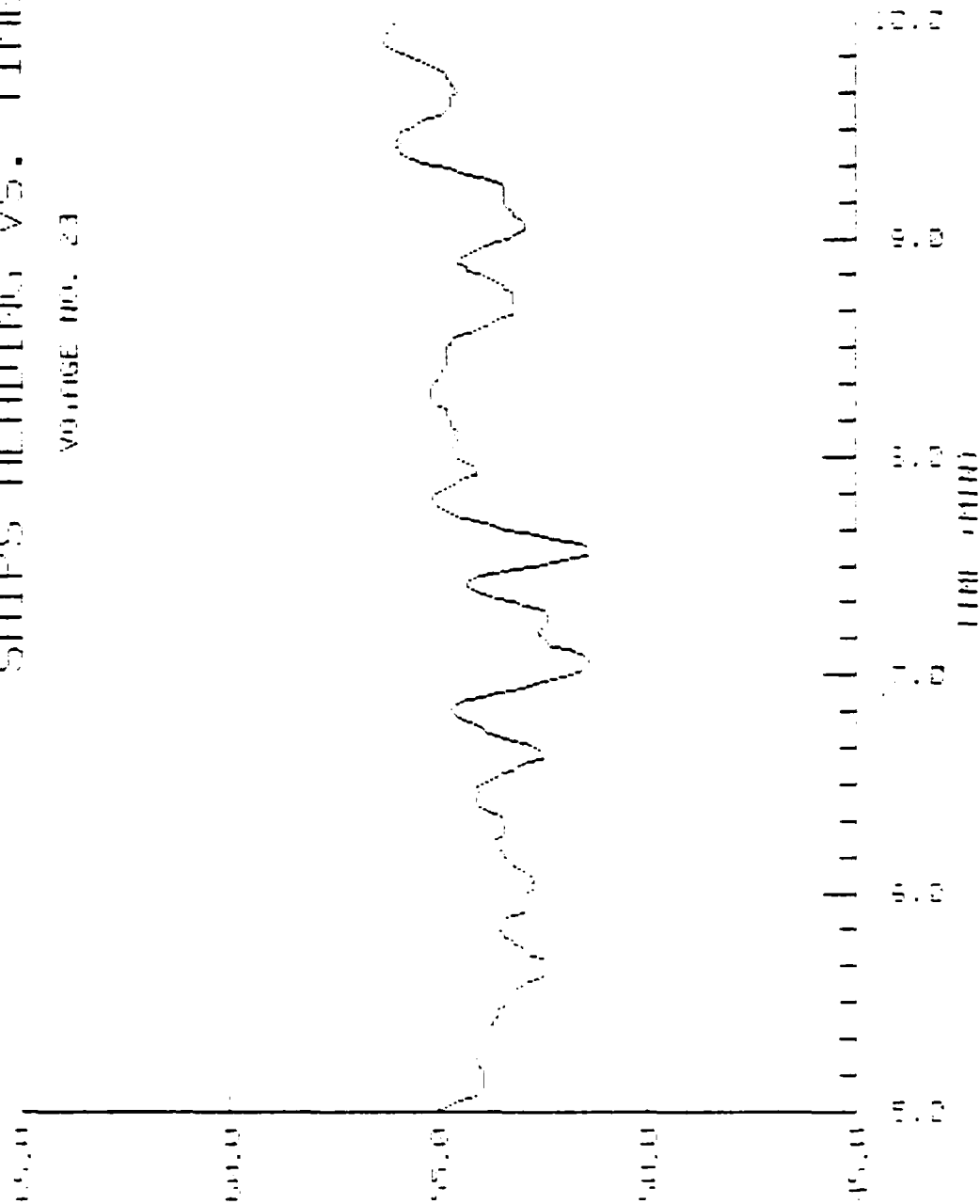
SHIPS HEADING VS. TIME

VOLUME NO. 23



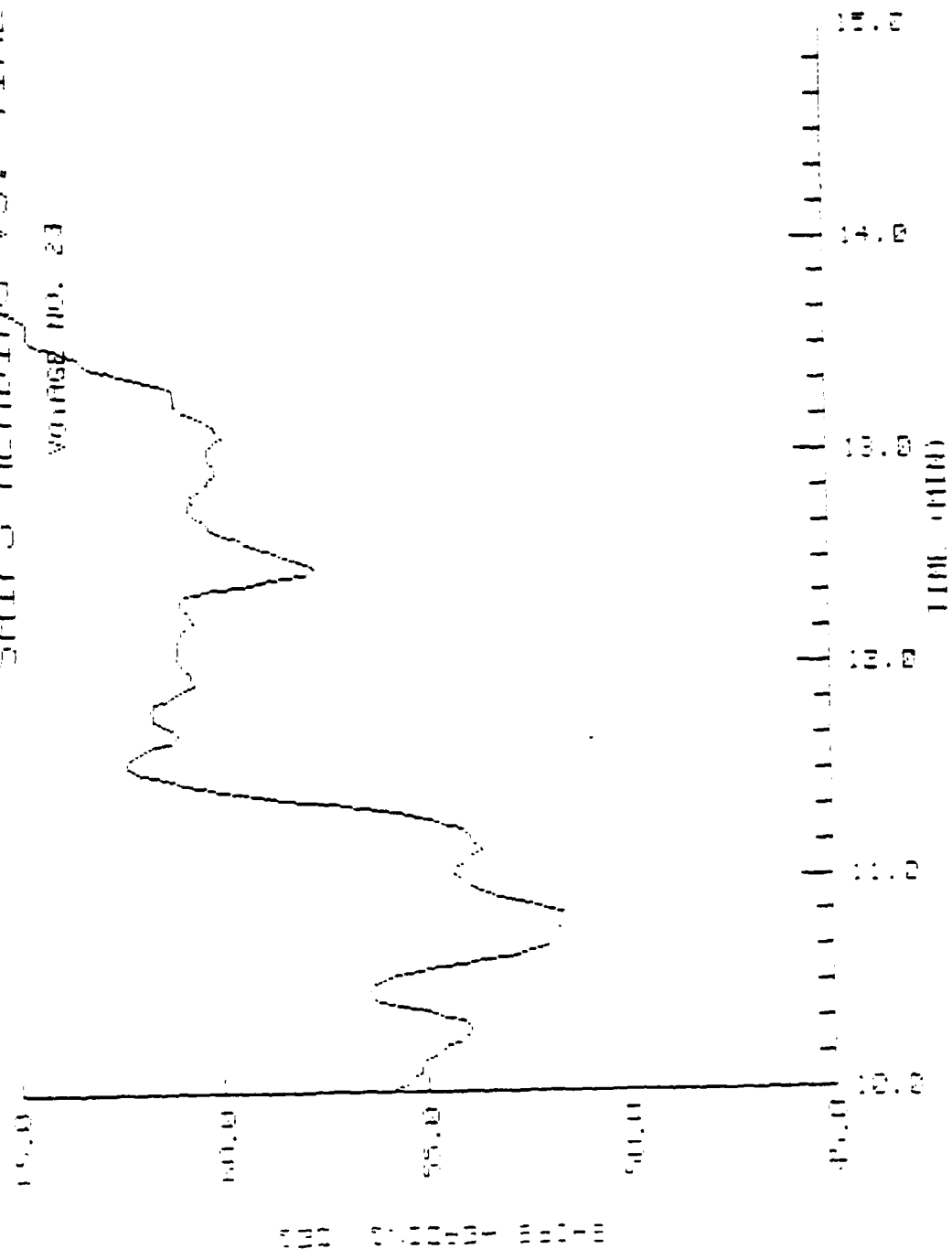
SHIPS BUILDING VS. TIME

VOLUME NO. 23



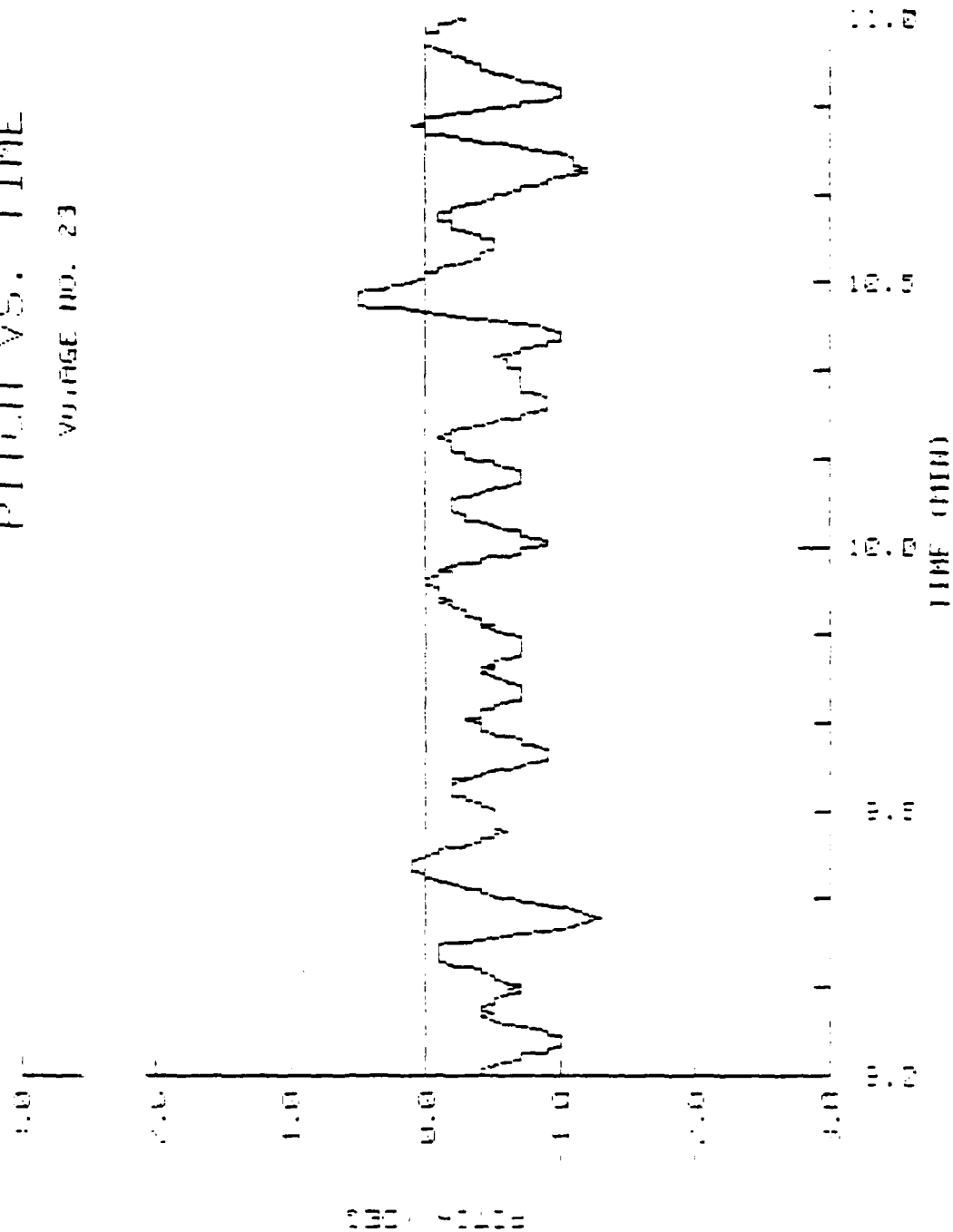
SHIPS HEADING VS. TIME

VOYAGE NO. 23



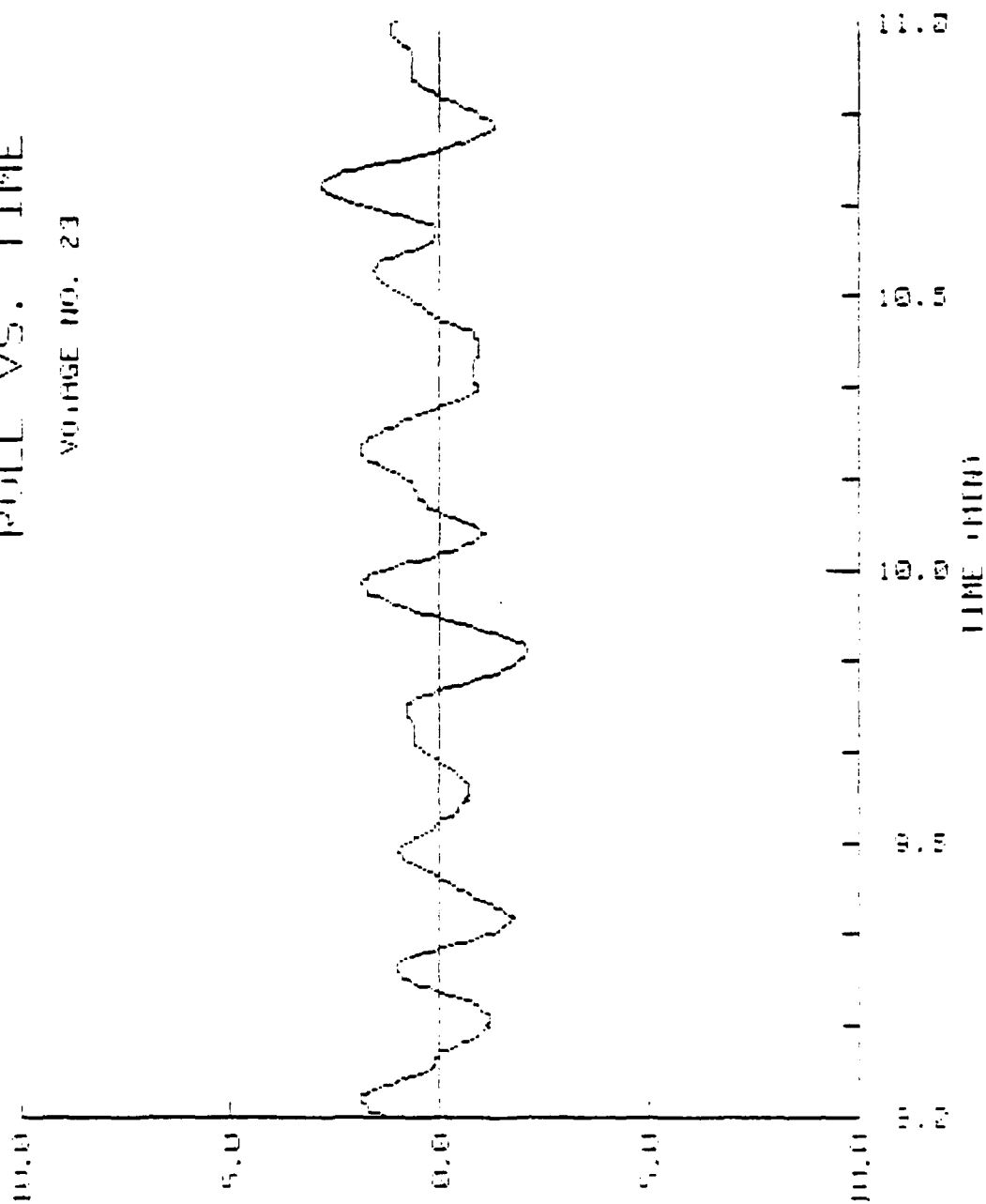
PITCH VS. TIME

VOLUME NO. 23



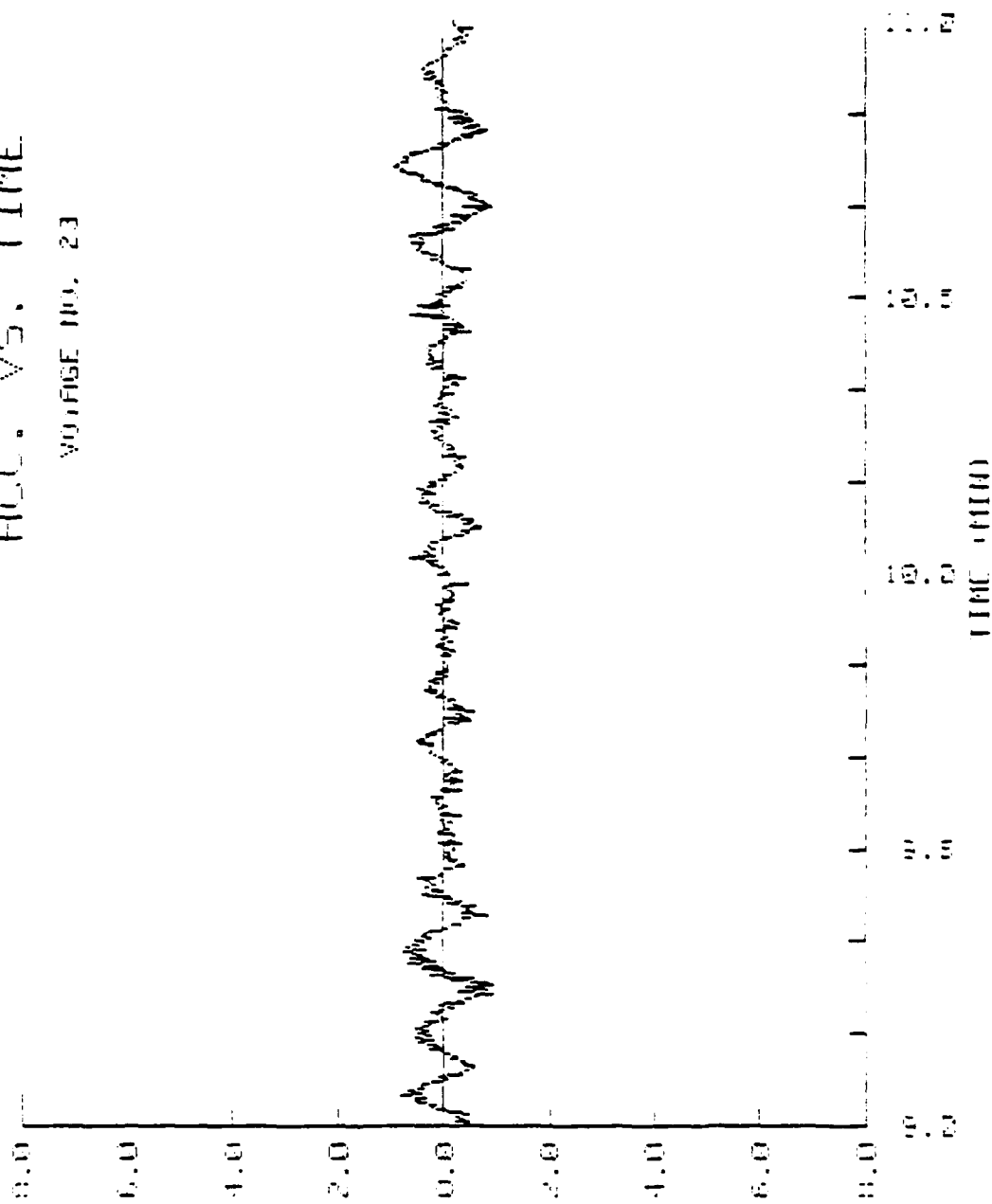
ROLL VS. TIME

VOLUME NO. 23



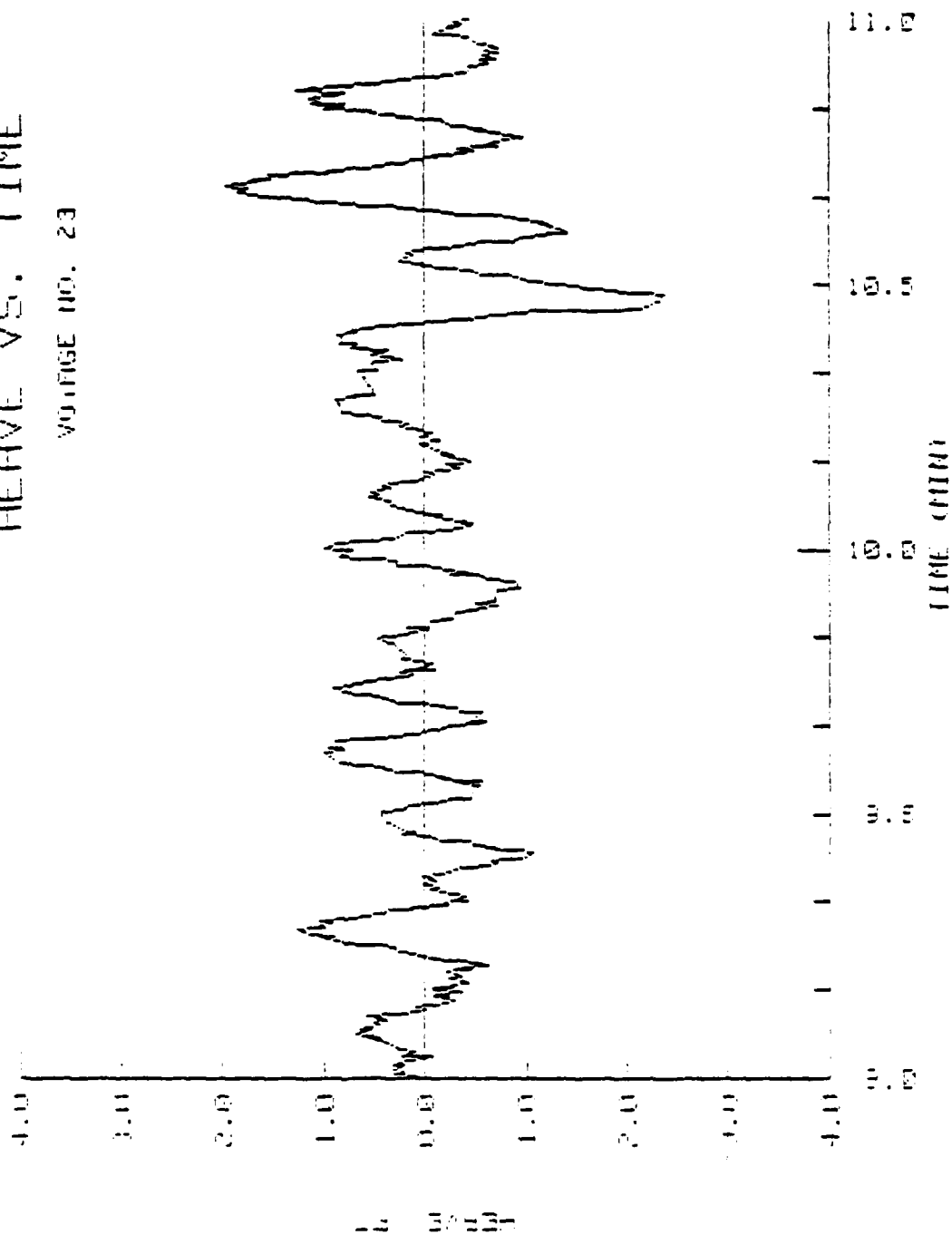
ACC. VS. TIME

VOLUME NO. 23



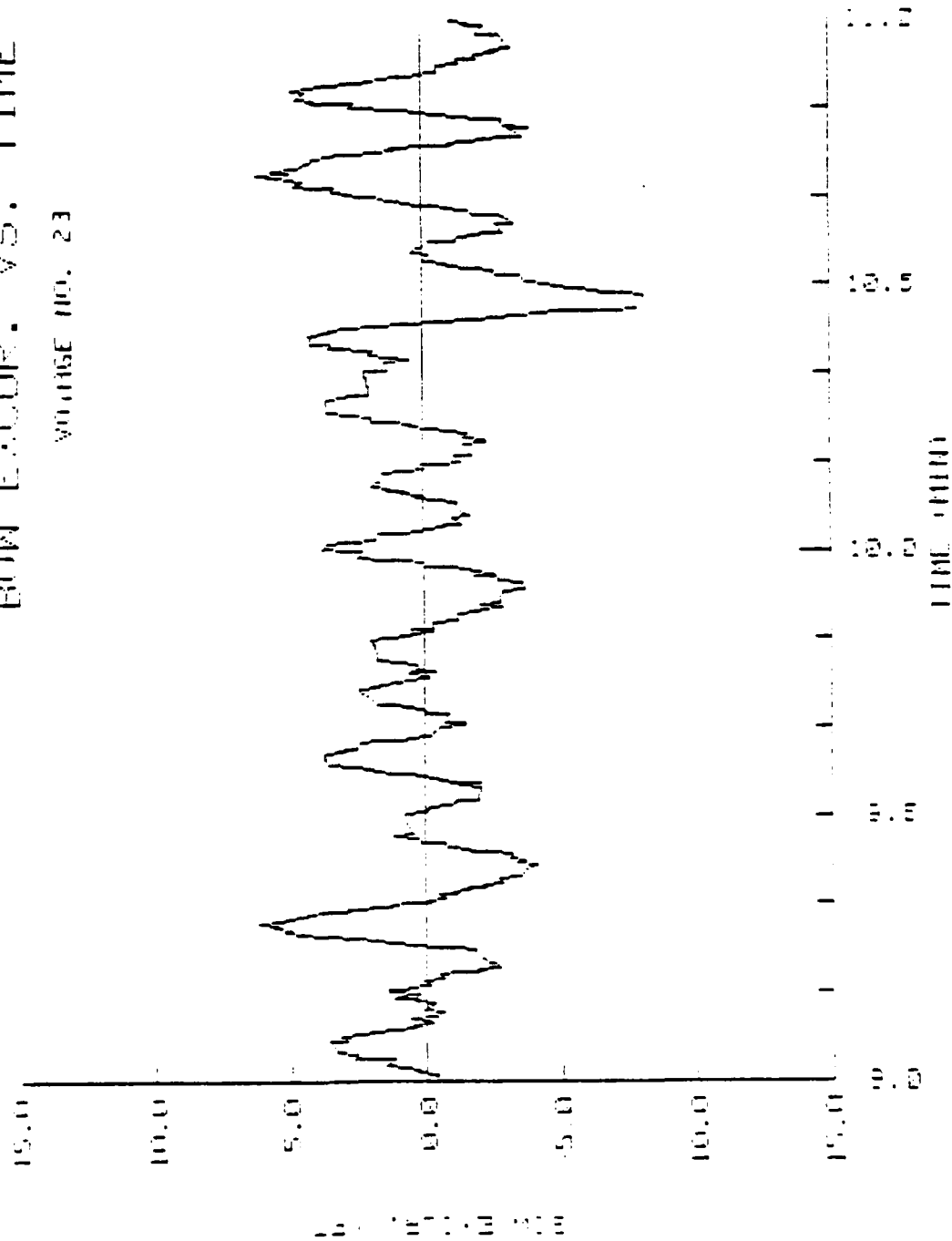
HEAVE VS. TIME

WAVE NO. 23



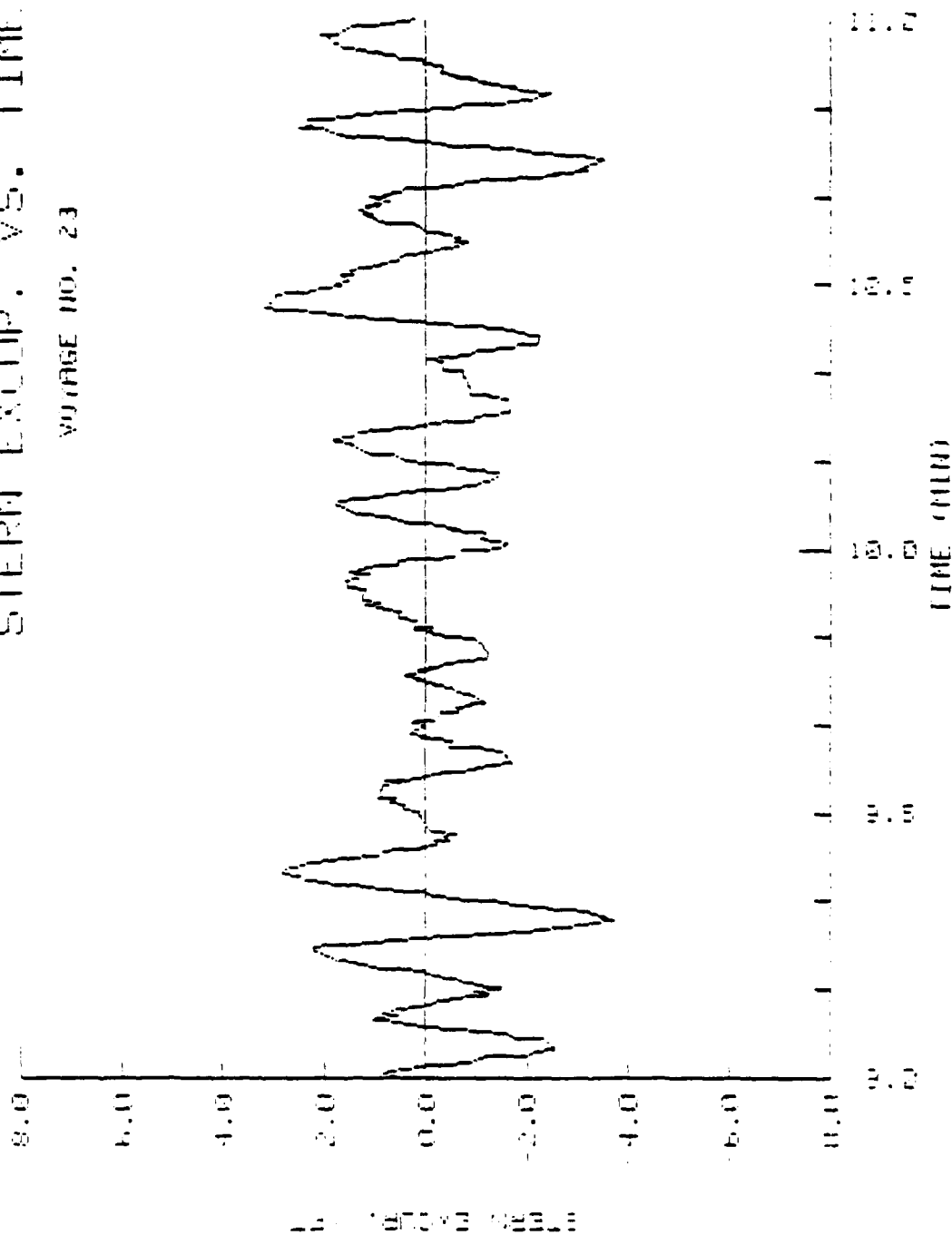
BOW EXCUR. VS. TIME

VOLUME NO. 23



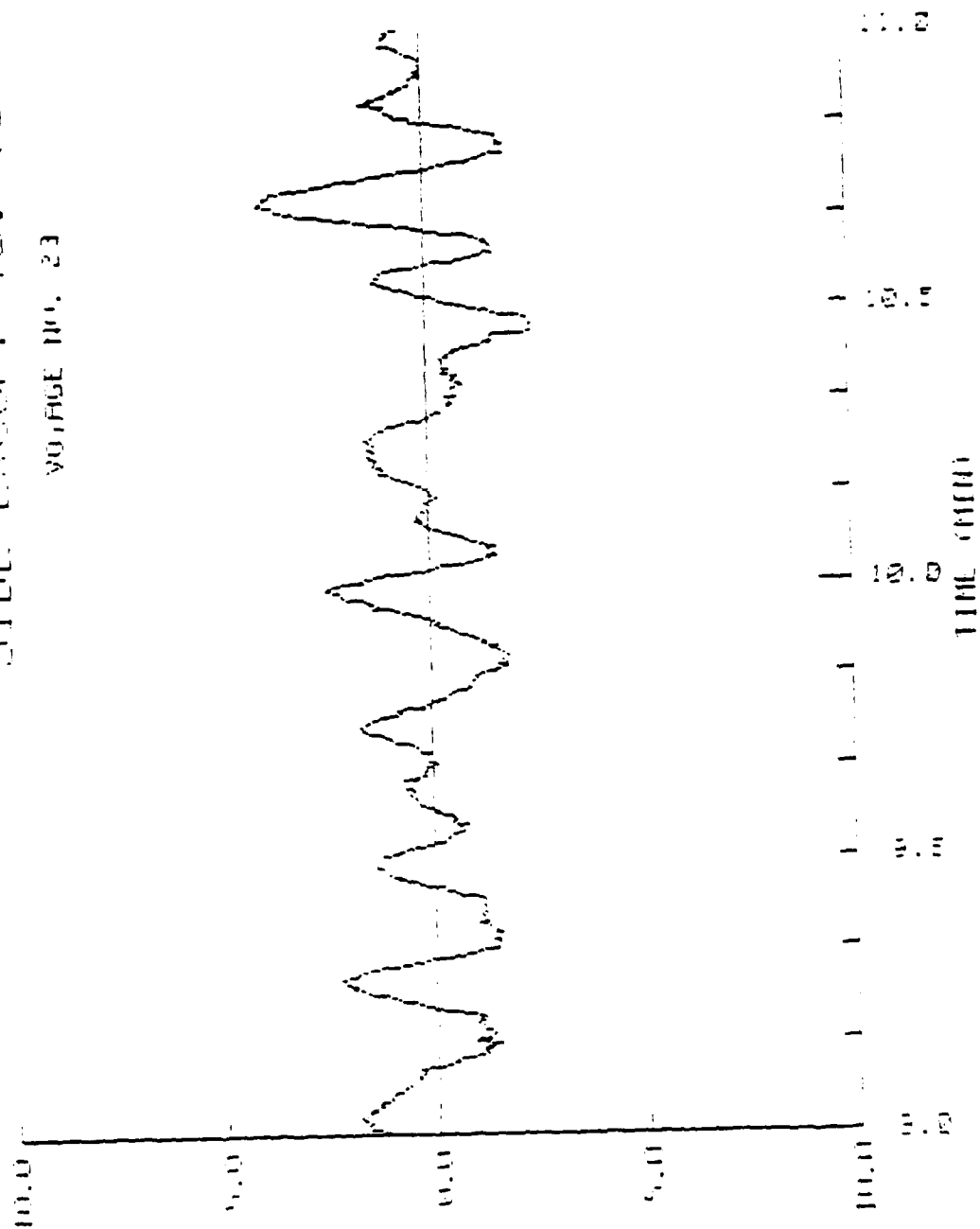
STERN EXCIP. VS. TIME

VOLUME NO. 23



SIDE SCUP. VS. TIME

VOLUME NO. 23



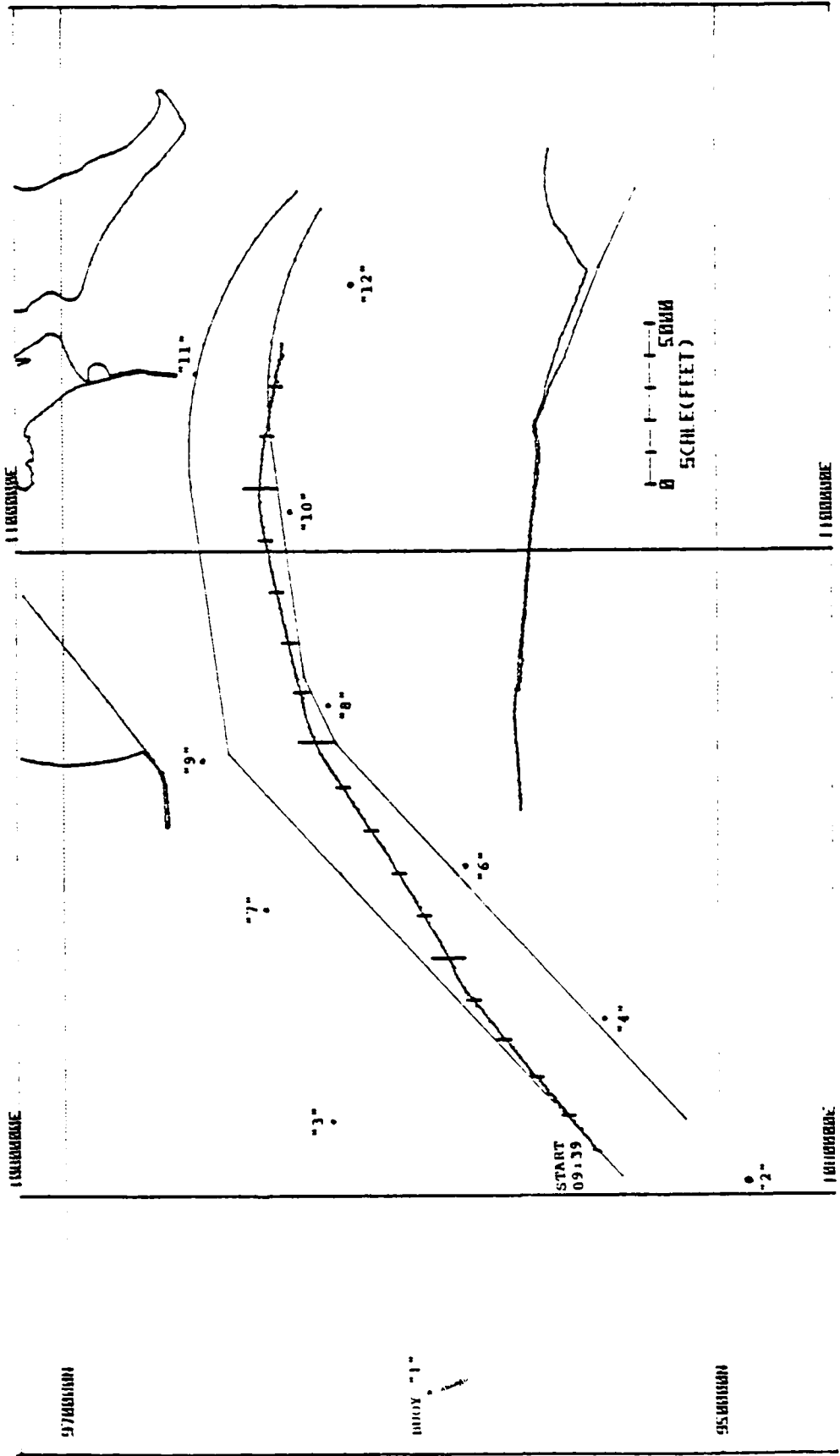
STATISTICAL SUMMARY

VOYAGE NO. 24

	HEMM LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	PNS
PITCH (DEG)	-.4	.8	.3	.3
ROLL (DEG)	-.0	4.3	1.7	2.0
HEAVE (FT SEC/SEC)	.1	1.4	.6	.7
HEAVE (FT)	.0	1.4	.6	.7
ROLL EXCUR. (FT)	.0	5.8	1.8	2.2
ROLL EXCUR. (FT)	.0	3.3	1.2	1.4
ROLL EXCUR. (FT)	.0	3.7	1.7	1.9

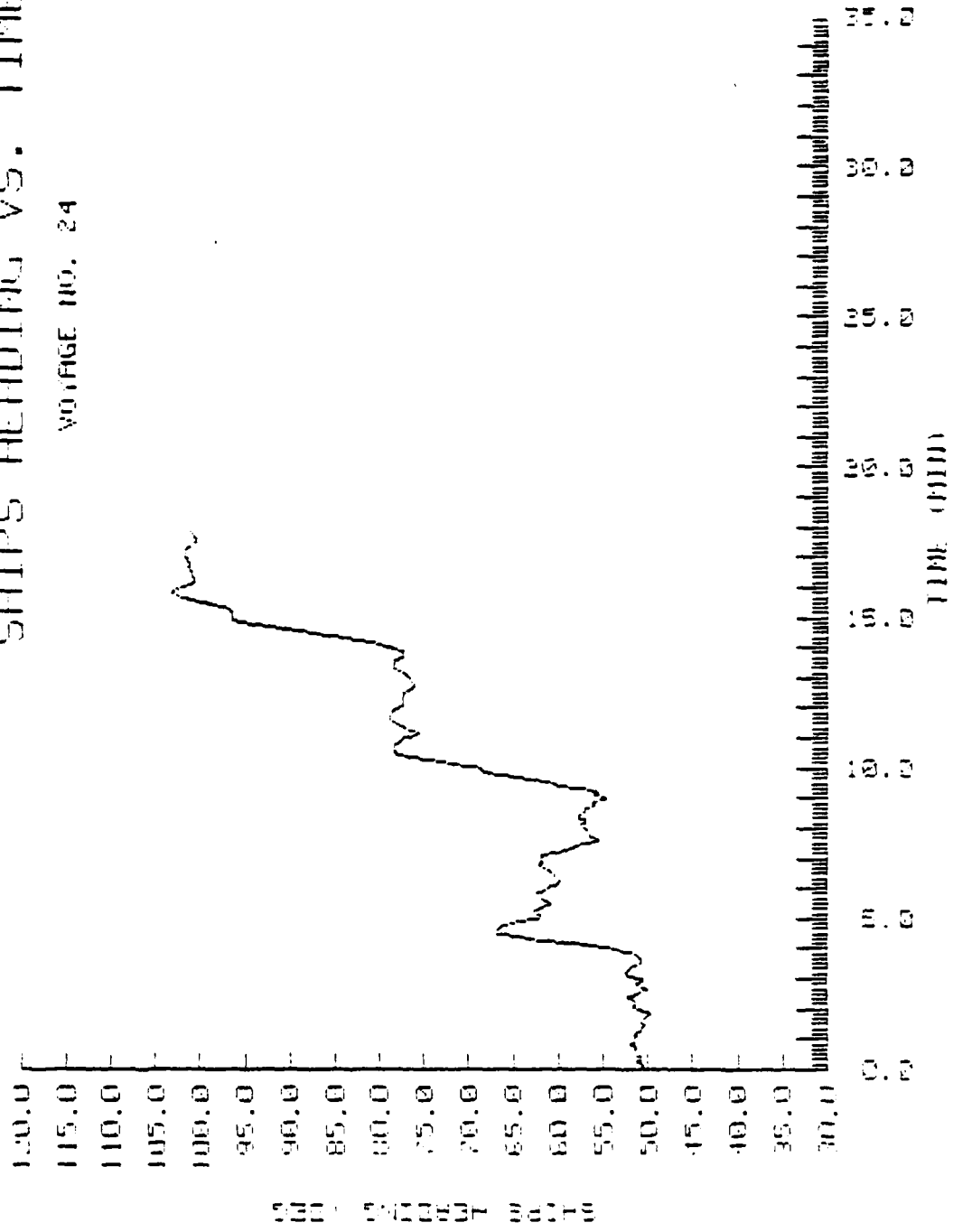
VIIYUKE NO. 24 SHIP TRACK

SCALE 1: 20000



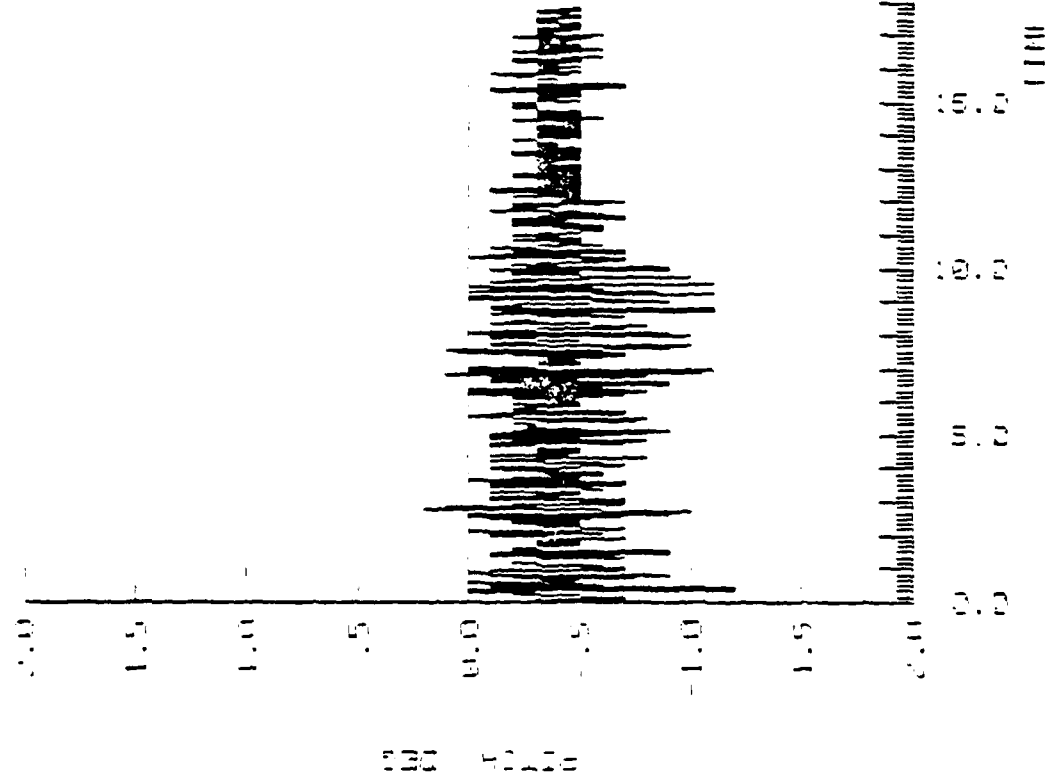
SHIPS HEADING VS. TIME

VOLTAIR 110. 24



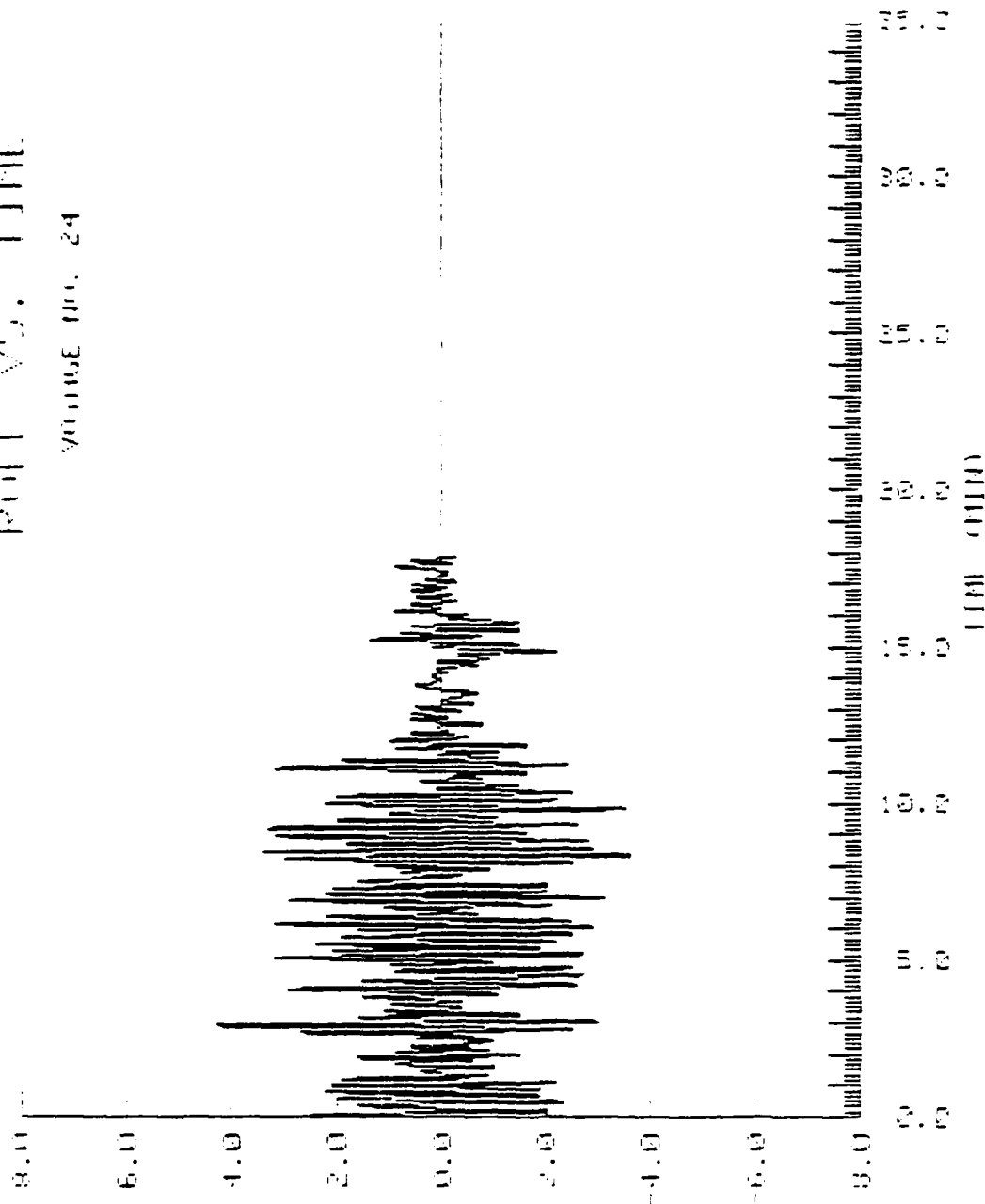
PITCH VOLT. TIME

VOLUME NO. 24



POLL VS. TIME

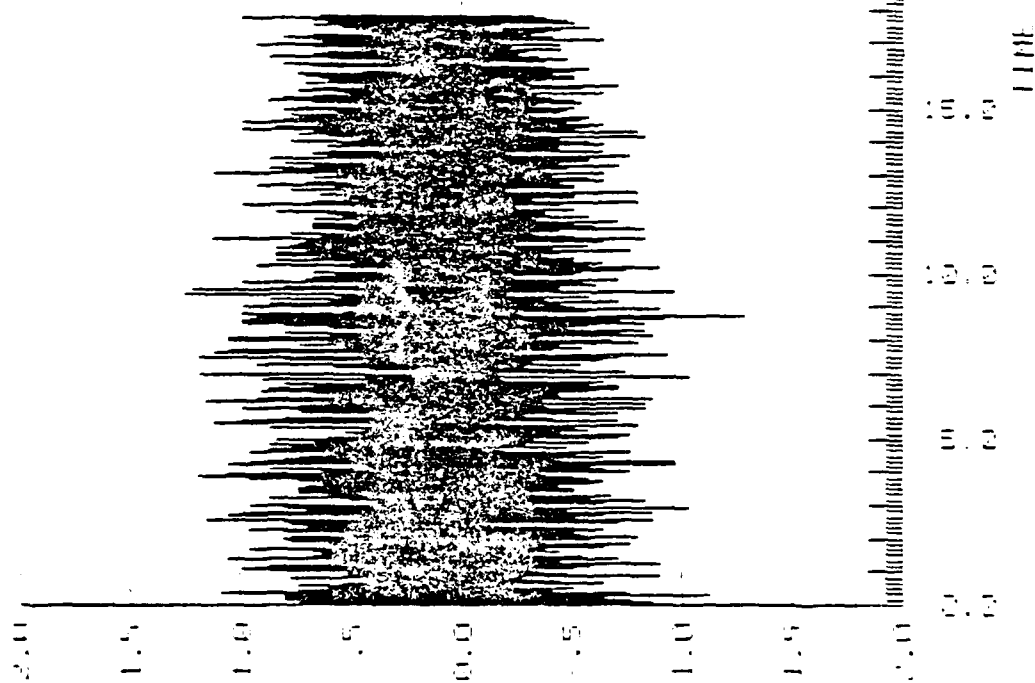
WINDMILL NO. 24



100 1000

1000. V₂. FILM

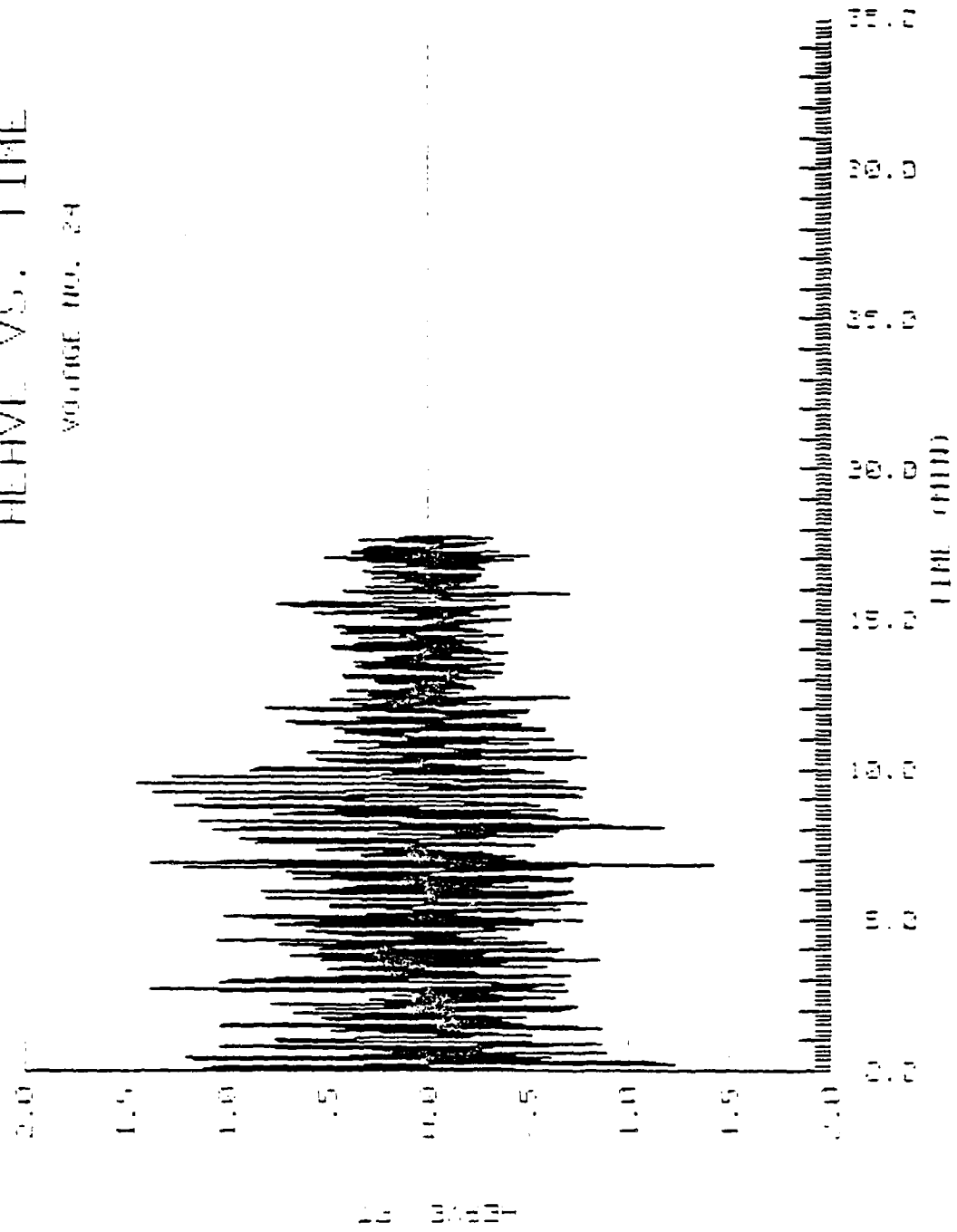
VOLUME NO. 24



1000. V₂. FILM

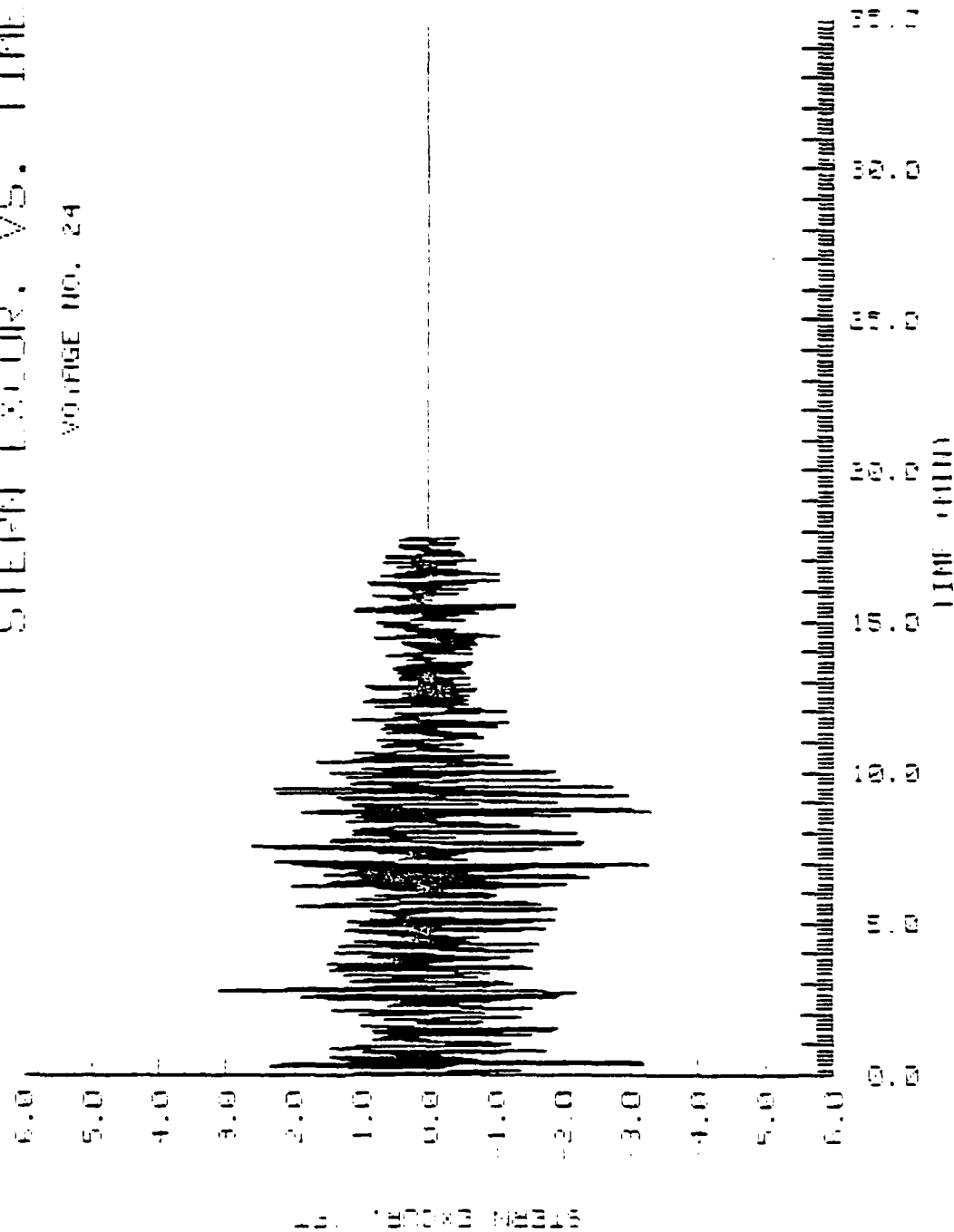
HEAVE VS. TIME

VOLUME 100. 24



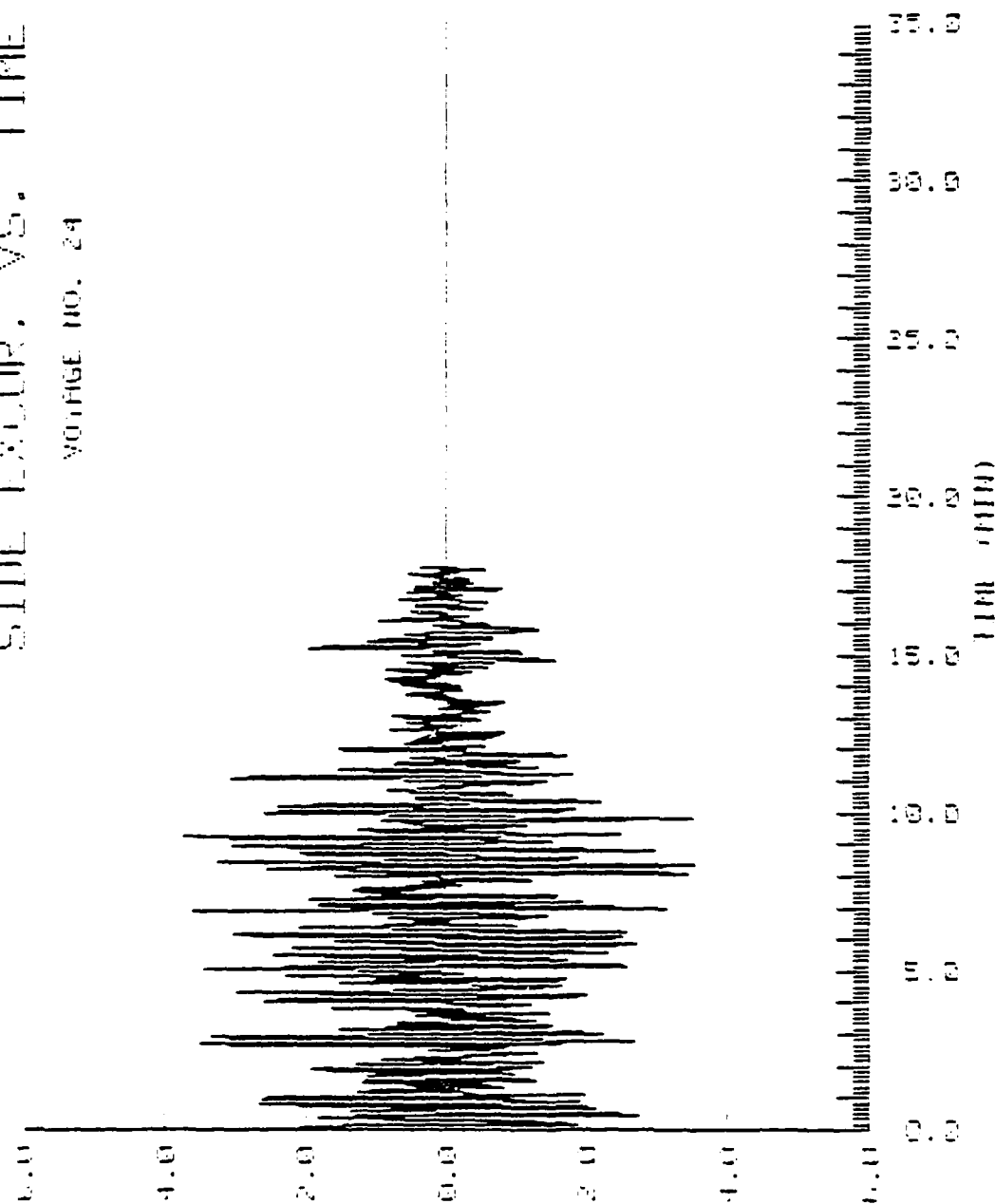
STEPH COLLIER, VS. TIME

VOLUME NO. 24



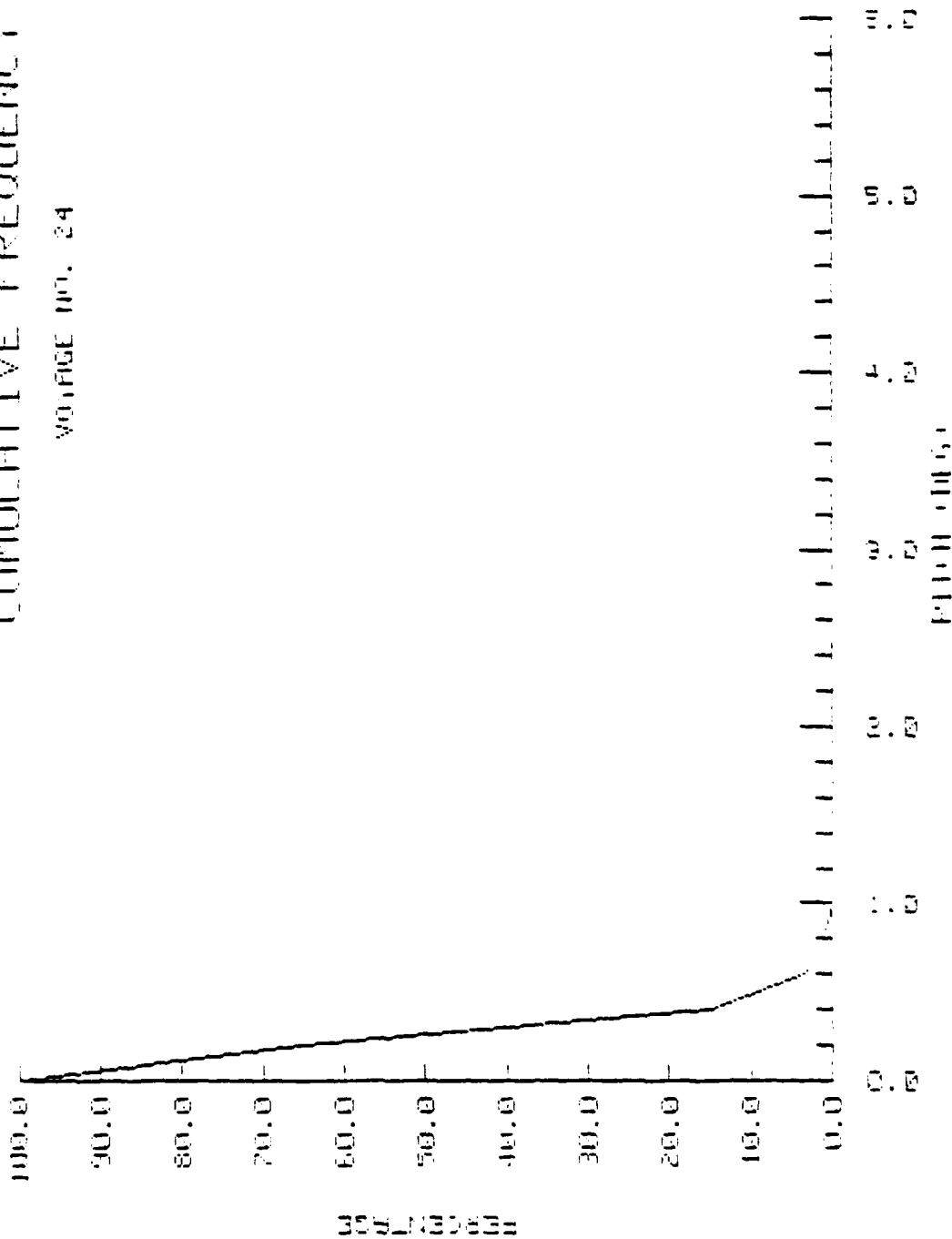
SIDE EXCUSE VS. LINE

VOLUME NO. 29



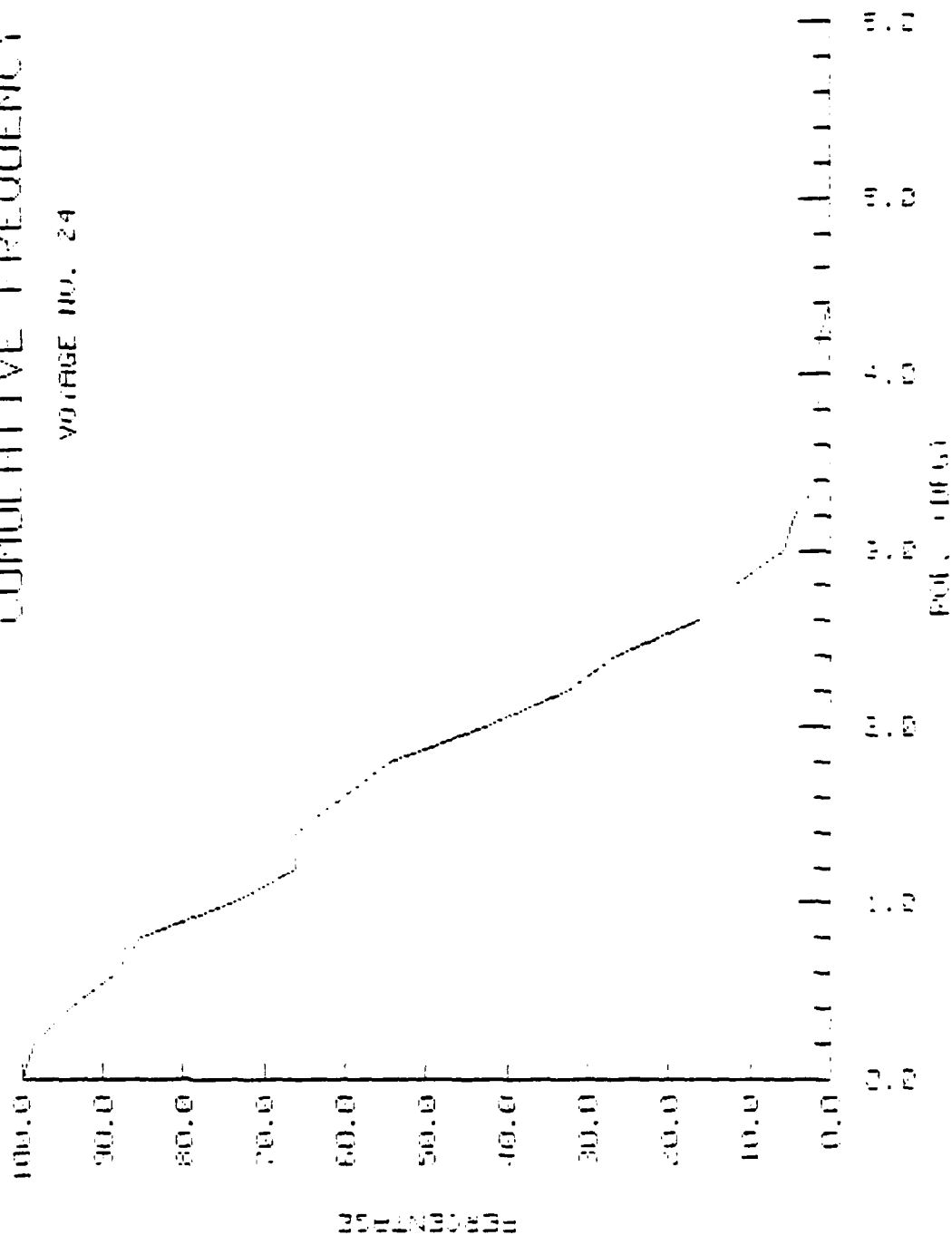
CUMULATIVE FREQUENCY

VOLAGE NO. 24



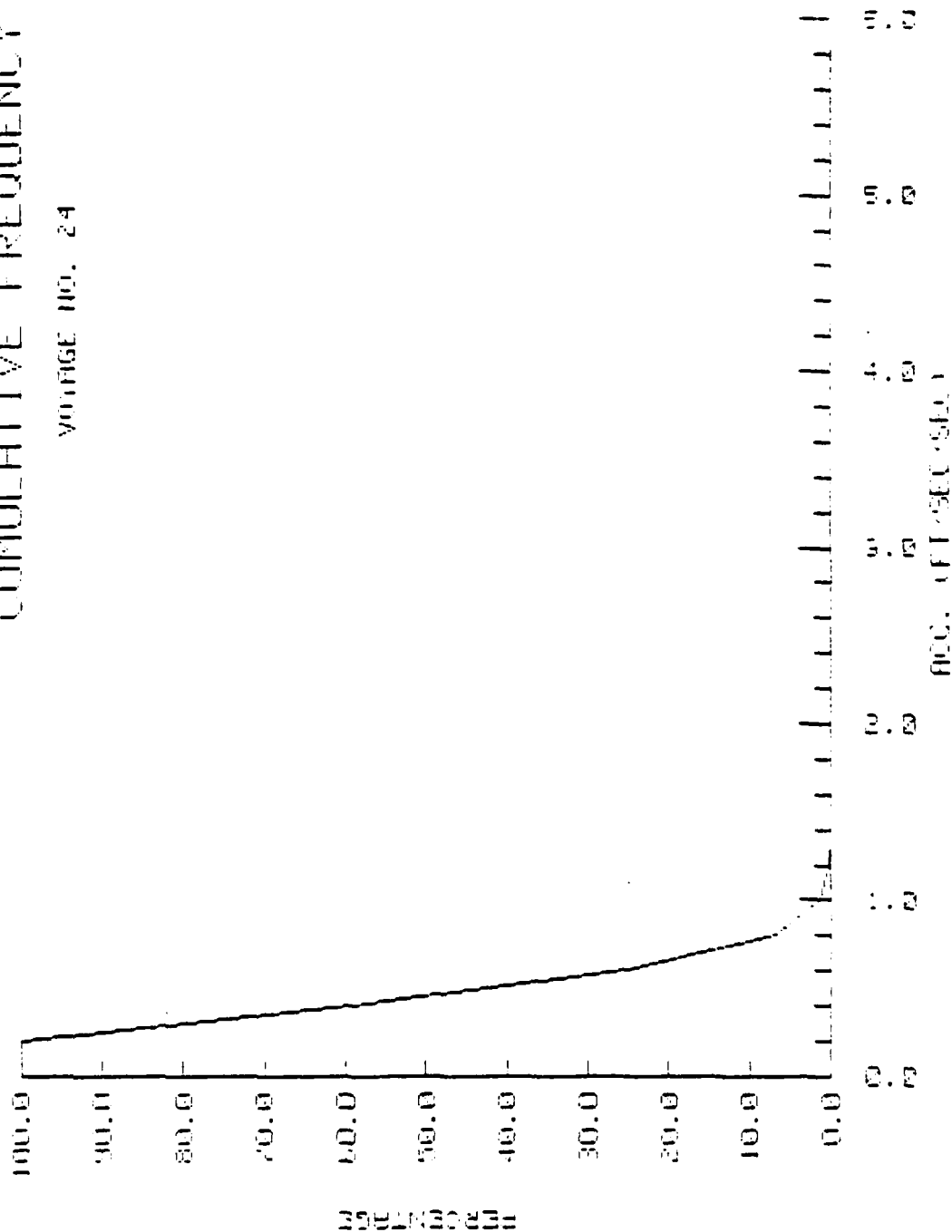
CUMULATIVE FREQUENCY

VOLUME NO. 24



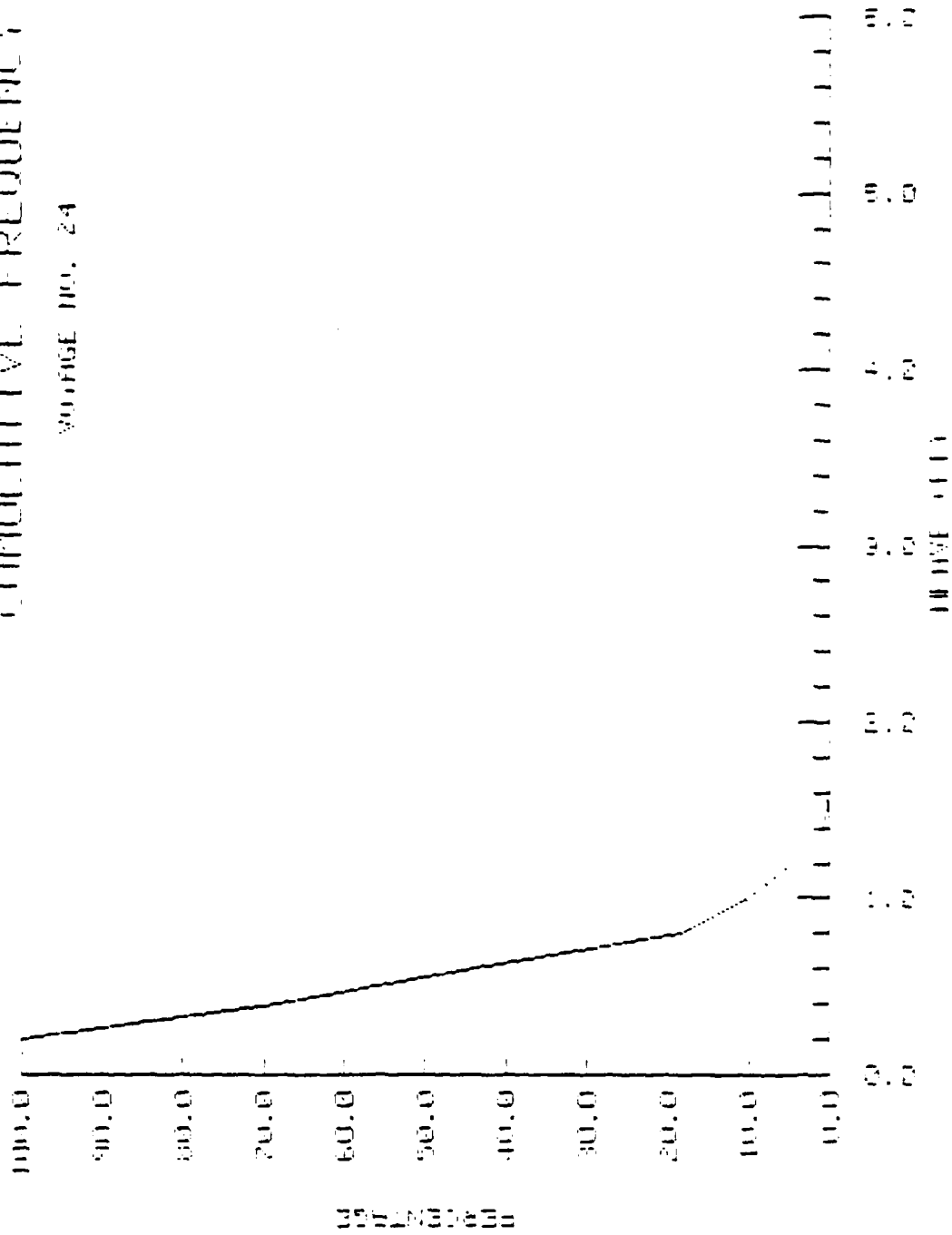
CUMULATIVE FREQUENCY

VOLUME NO. 24



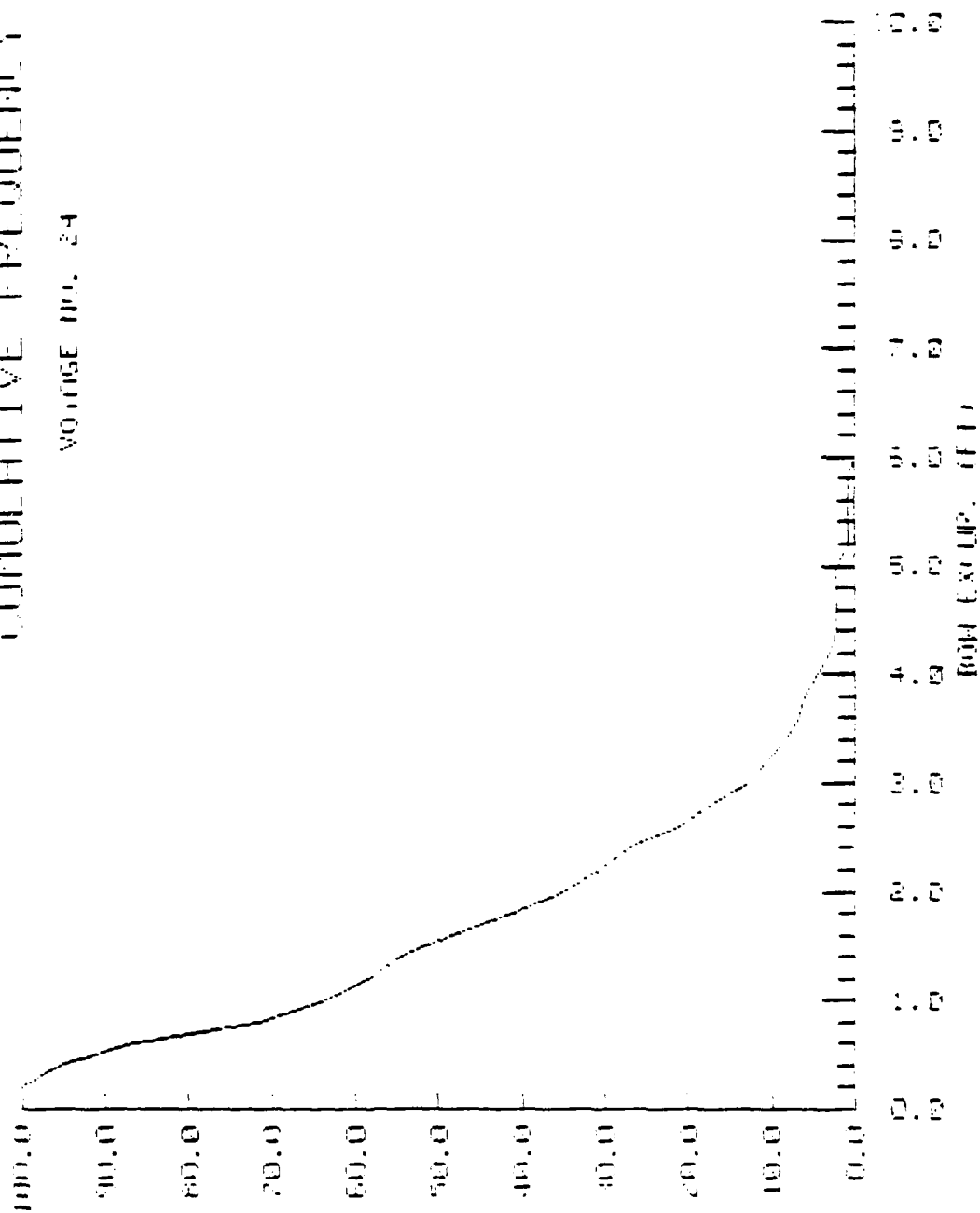
CUMULATIVE FREQUENCY

VOYAGE NO. 24



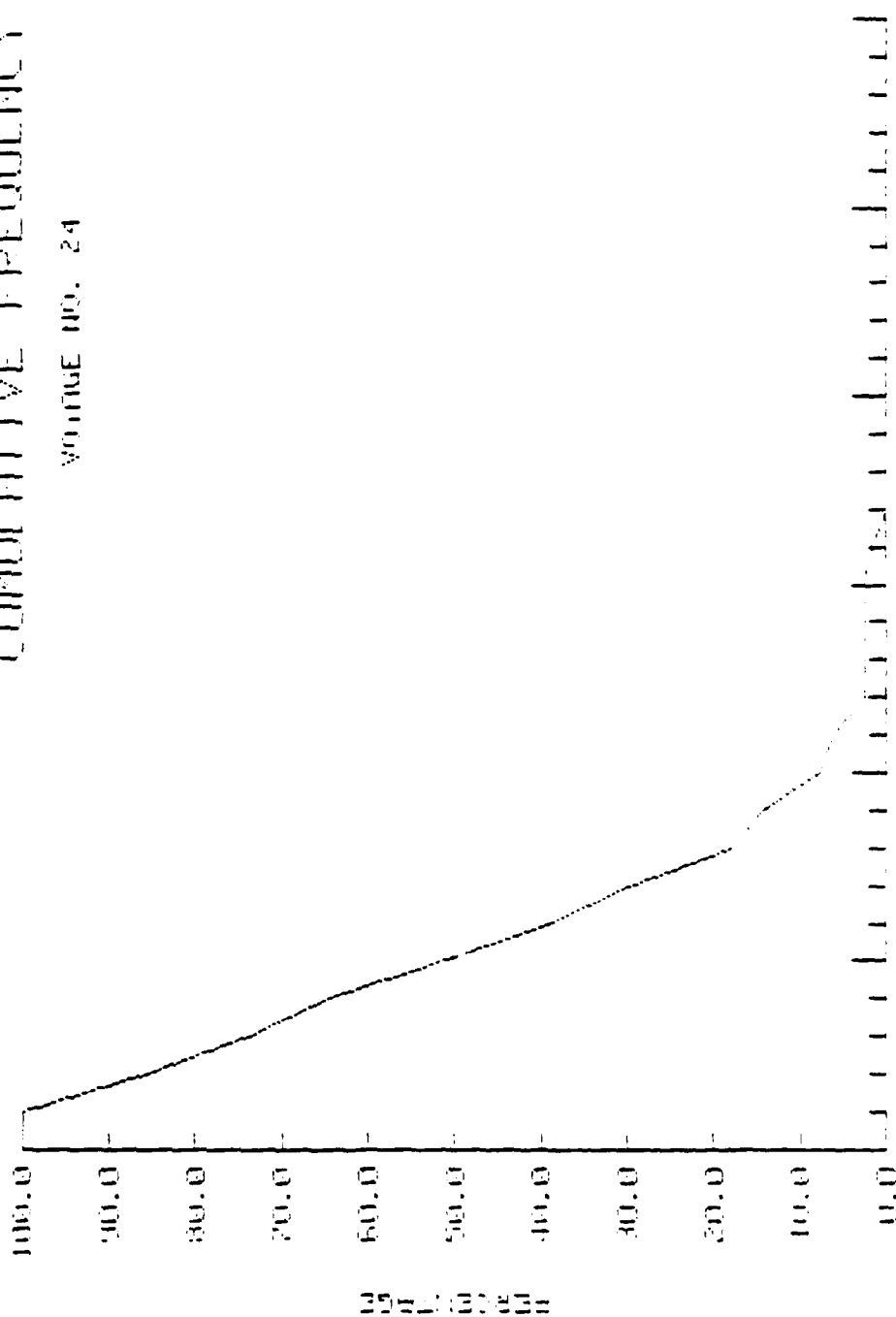
COMPULSIVE FREQUENCY

VOYAGE III. 24



CUMULATIVE FREQUENCY

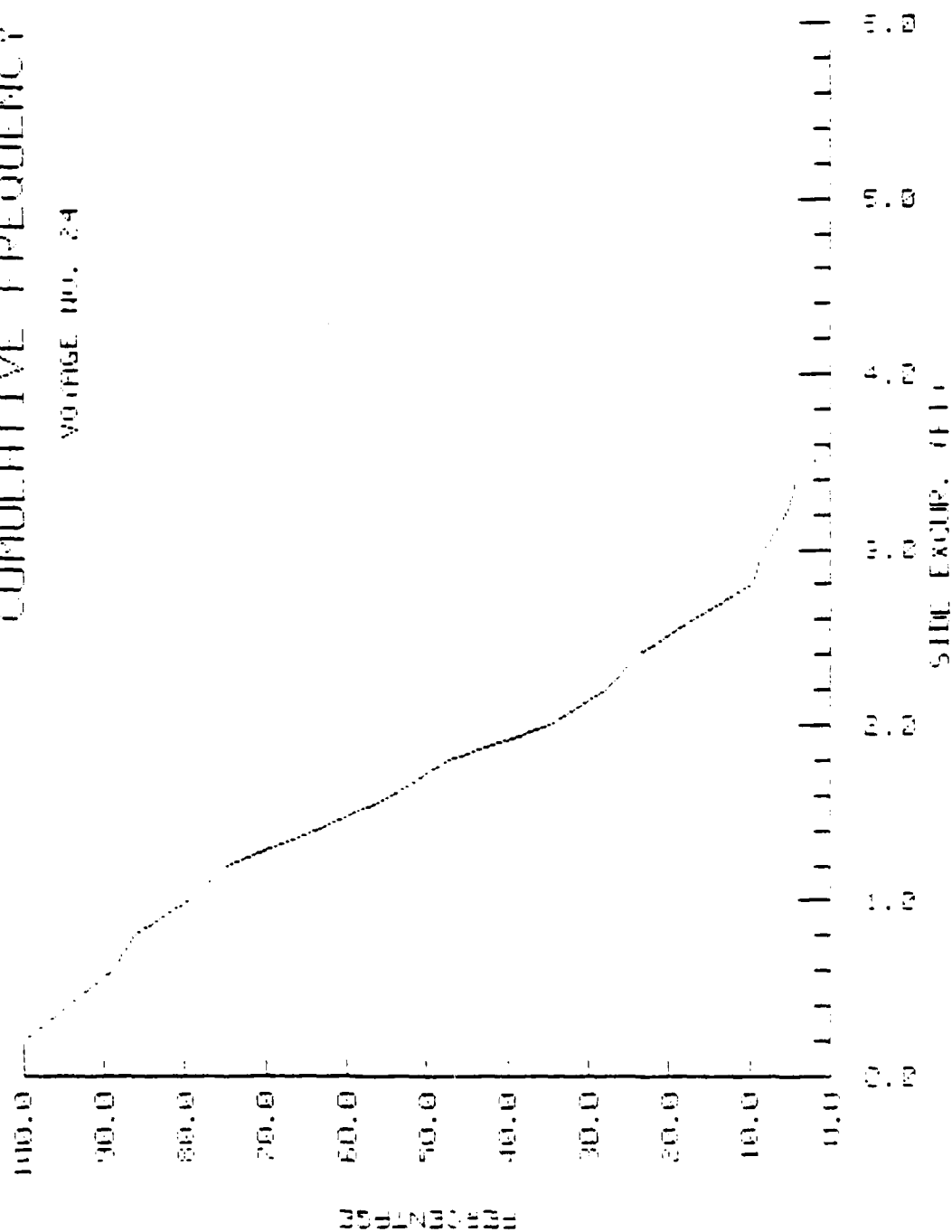
VOLUME NO. 24



STEP (SEC. 0.1)

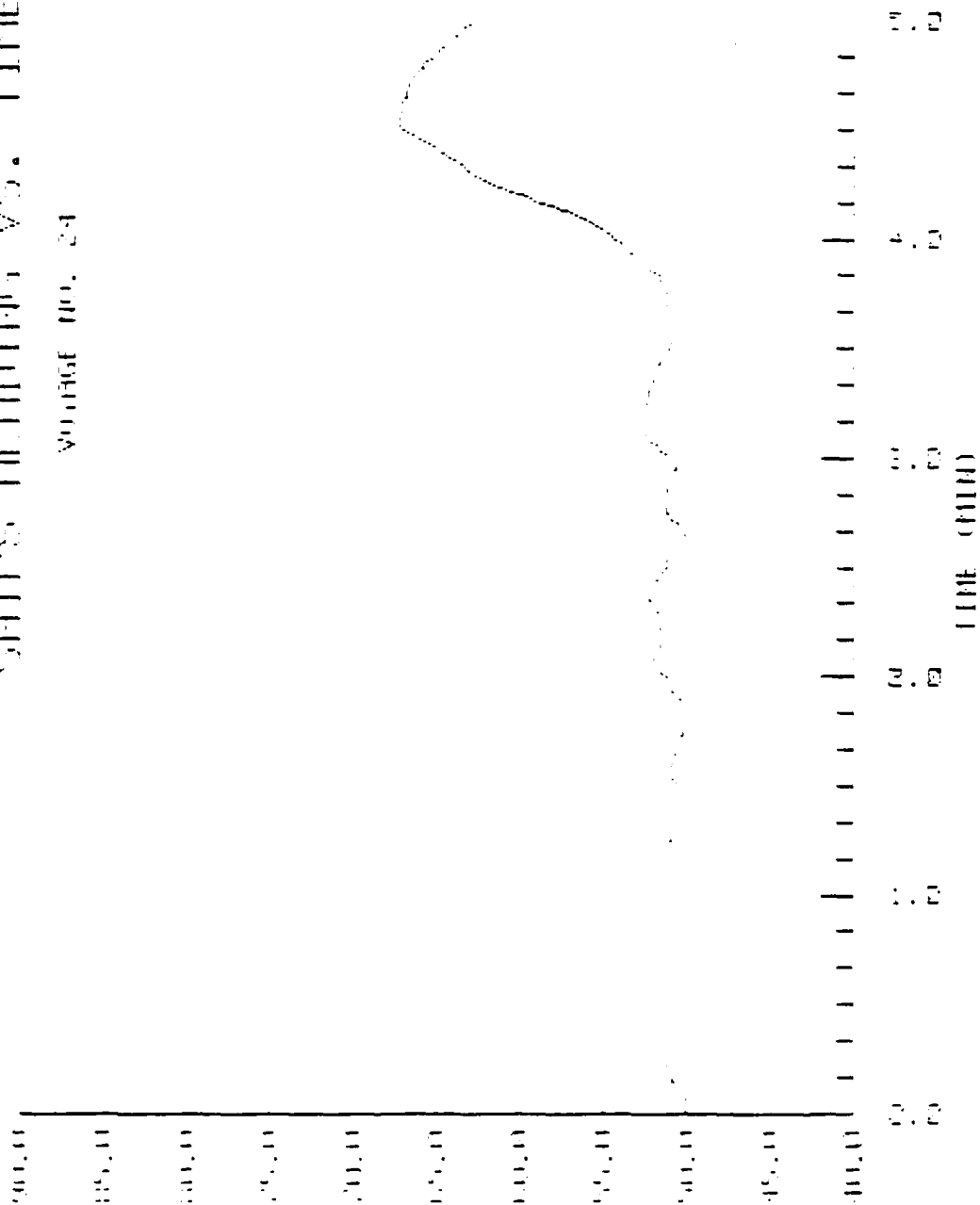
CUMULATIVE FREQUENCY

VOYAGE NO. 24



SHIPS HULLING V% TIME

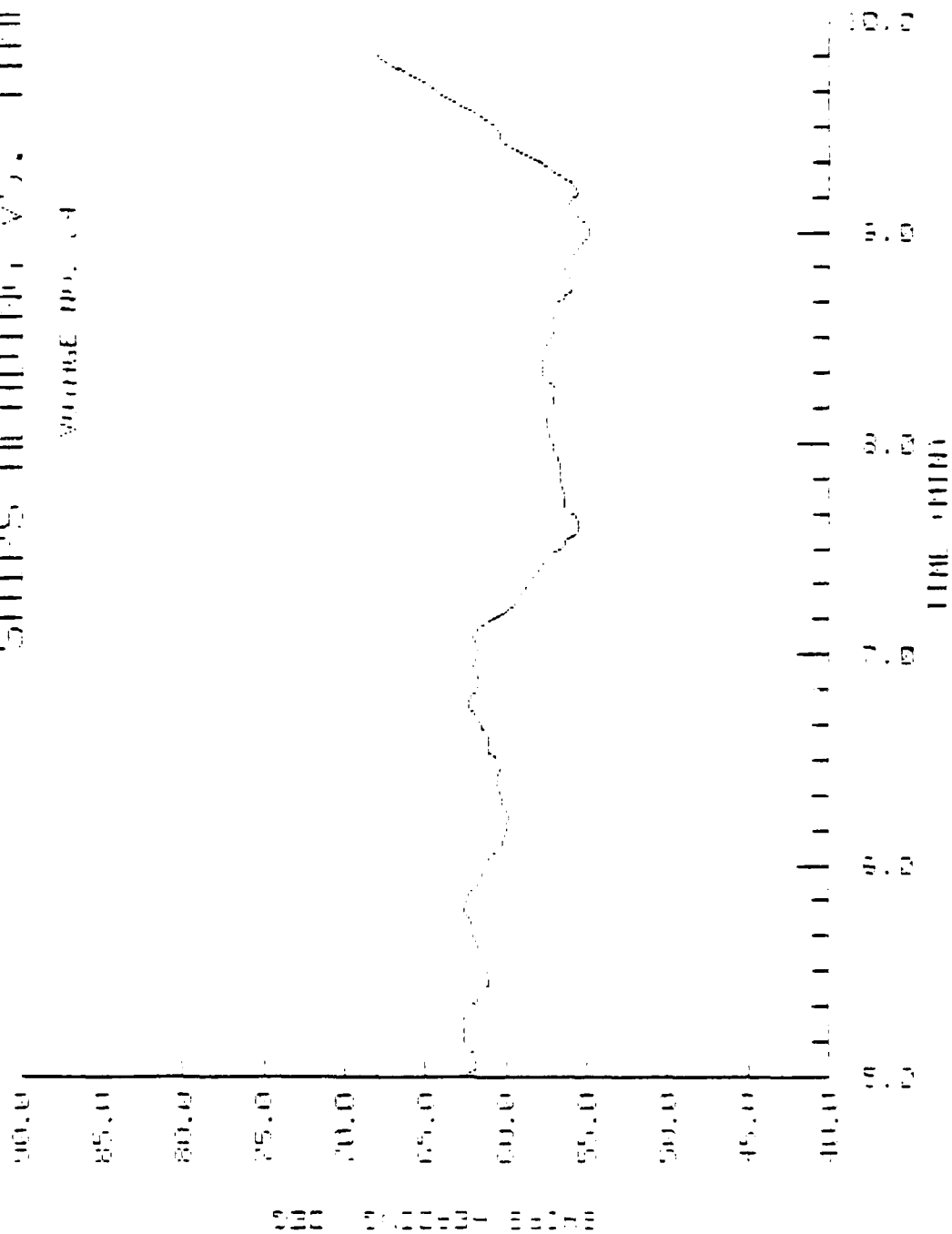
VOLUME NO. 24



100 1000000-1000000

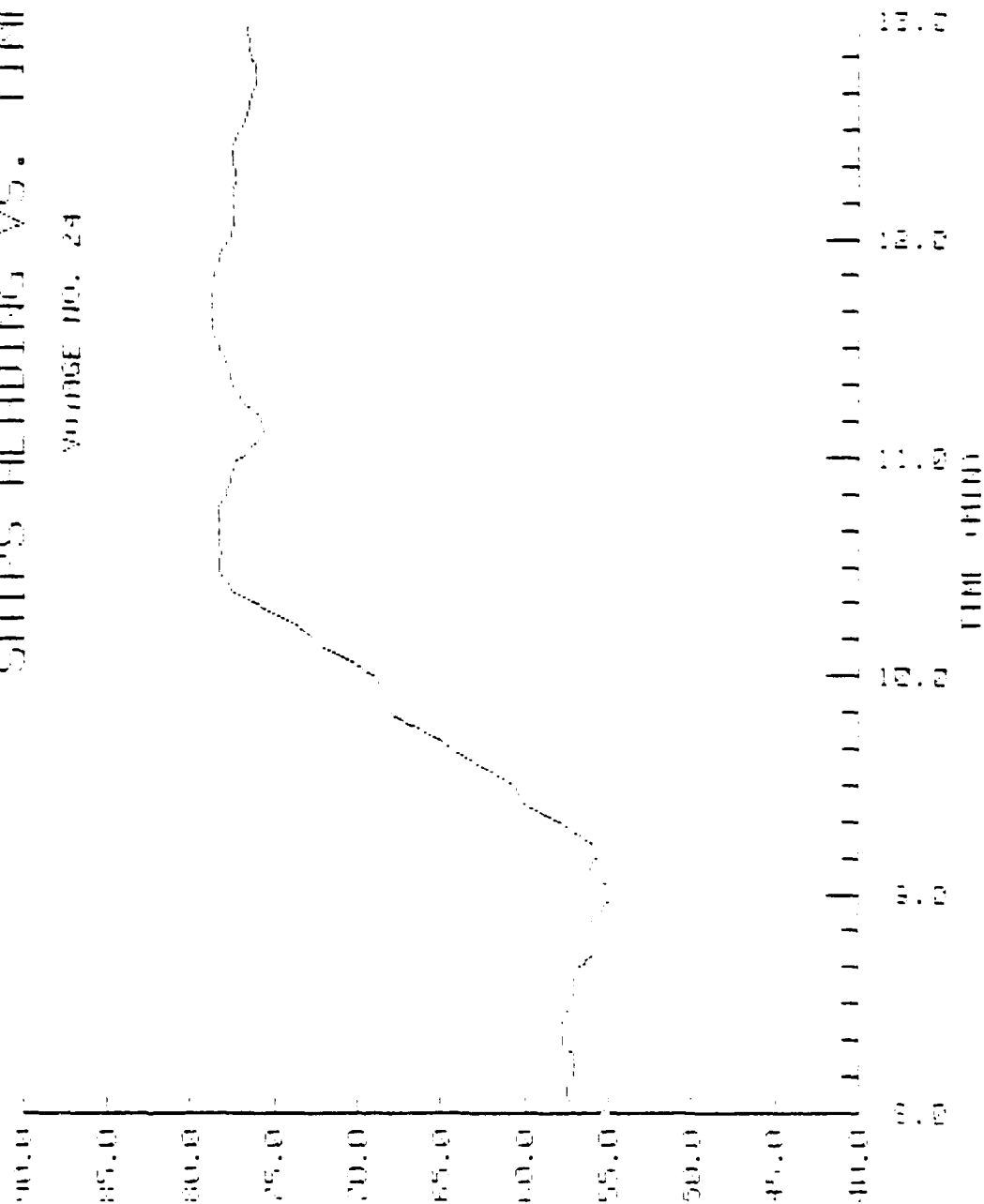
SHIPS IN HULL, V's. III

WAVE NO. 14



SHIPS HEADING VS. TIME

VOYAGE NO. 24



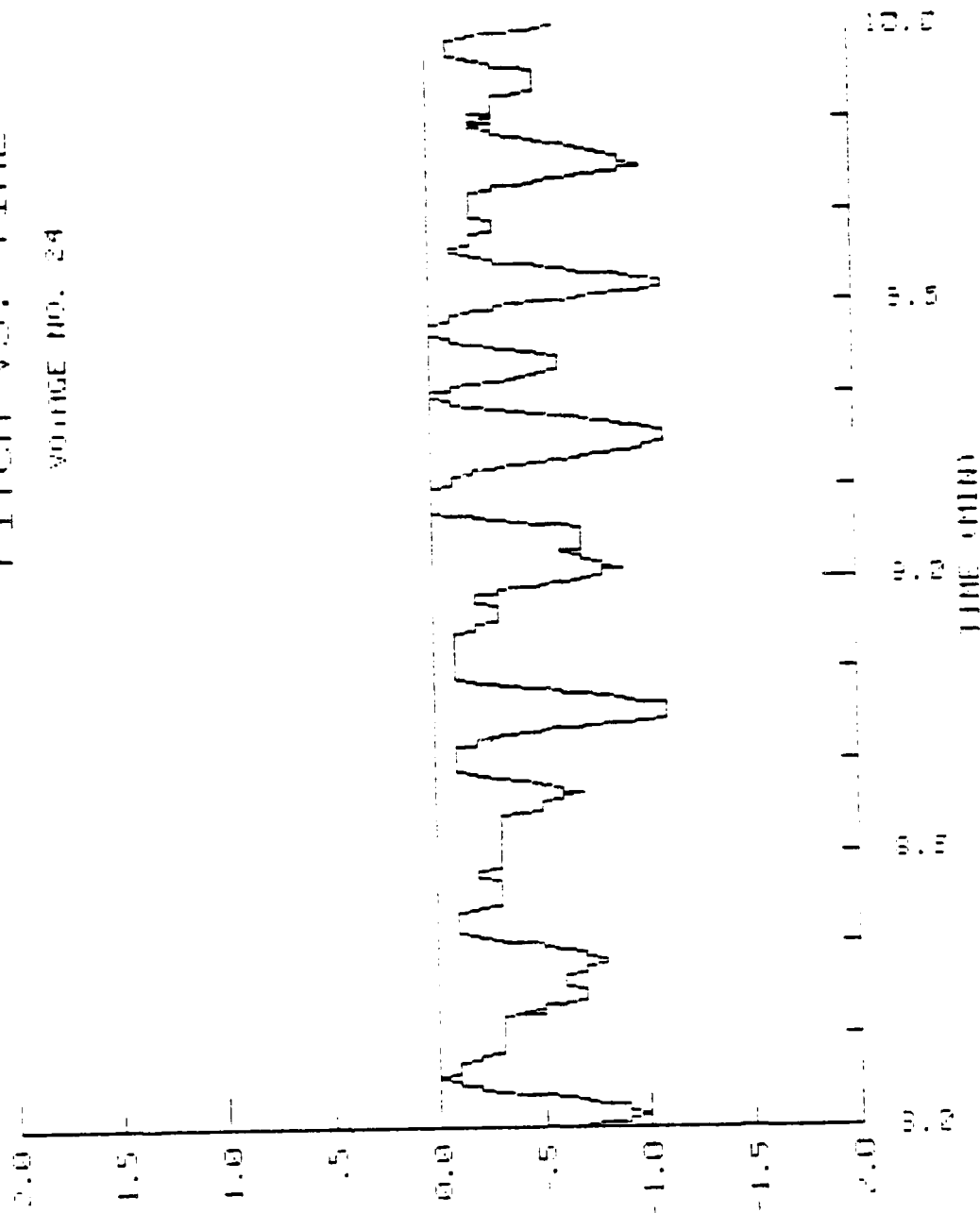
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

TIME (min)

PITCH VS. TIME

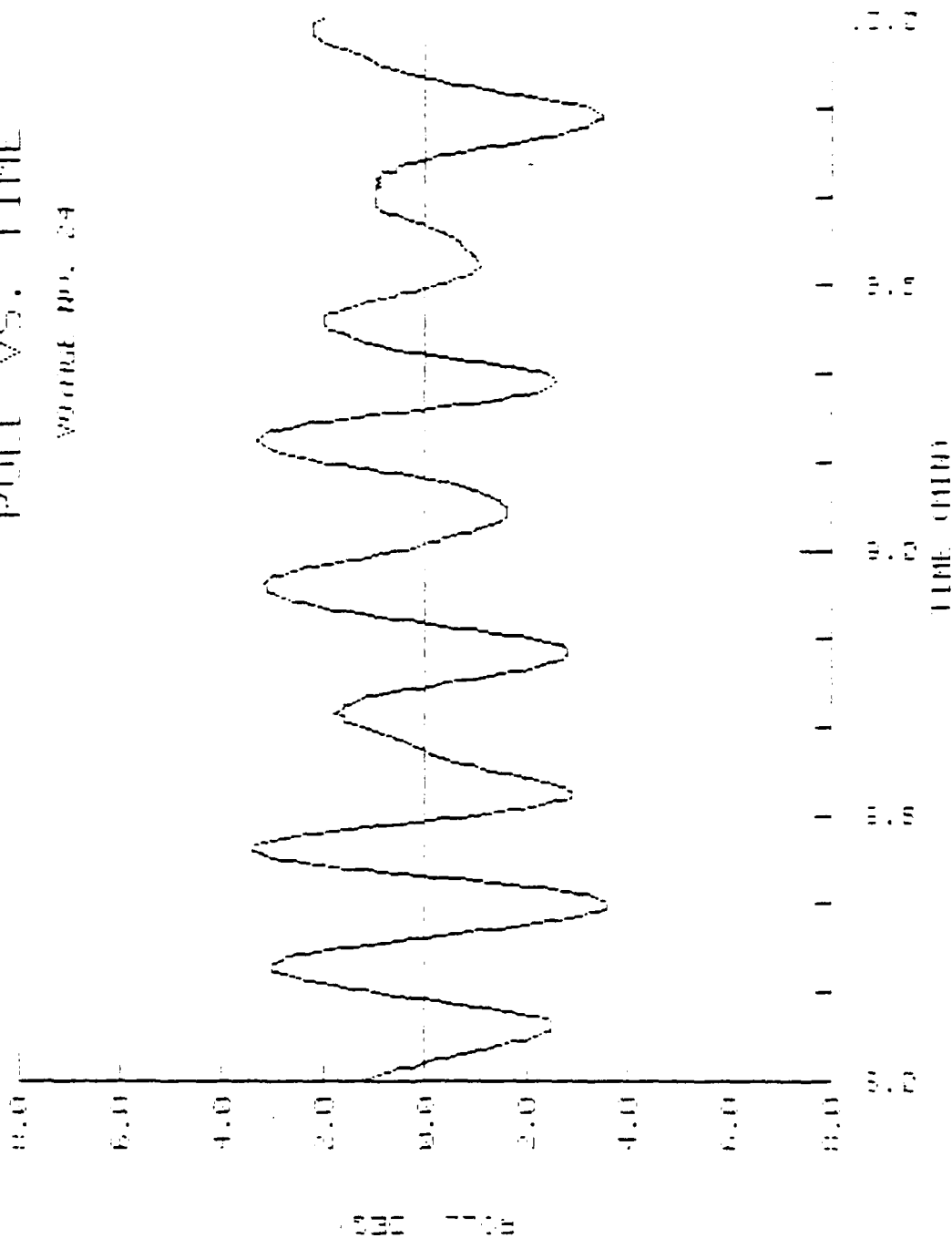
VOLUME NO. 24



333 11111

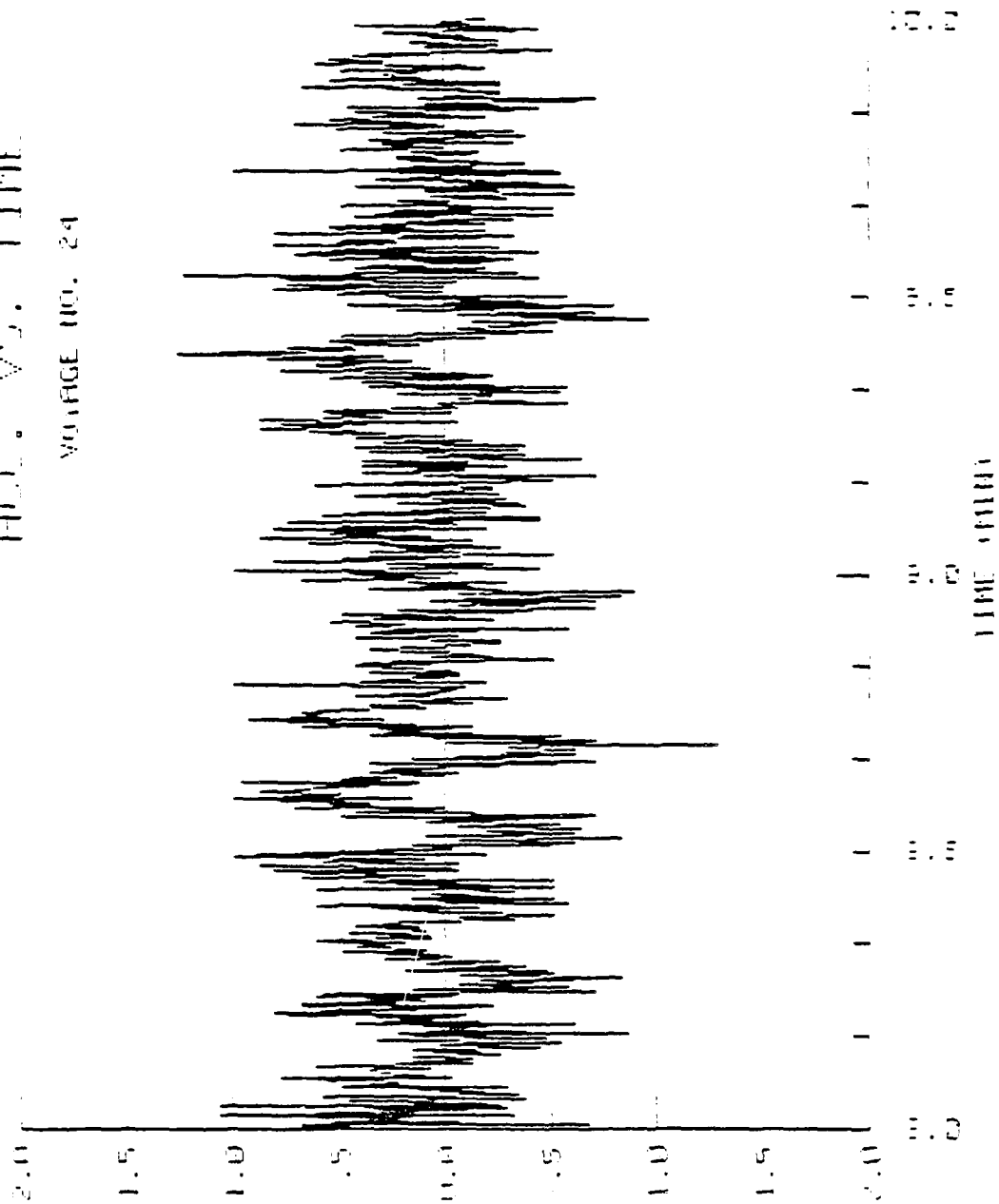
POLL VS. TIME

WIND NO. 24



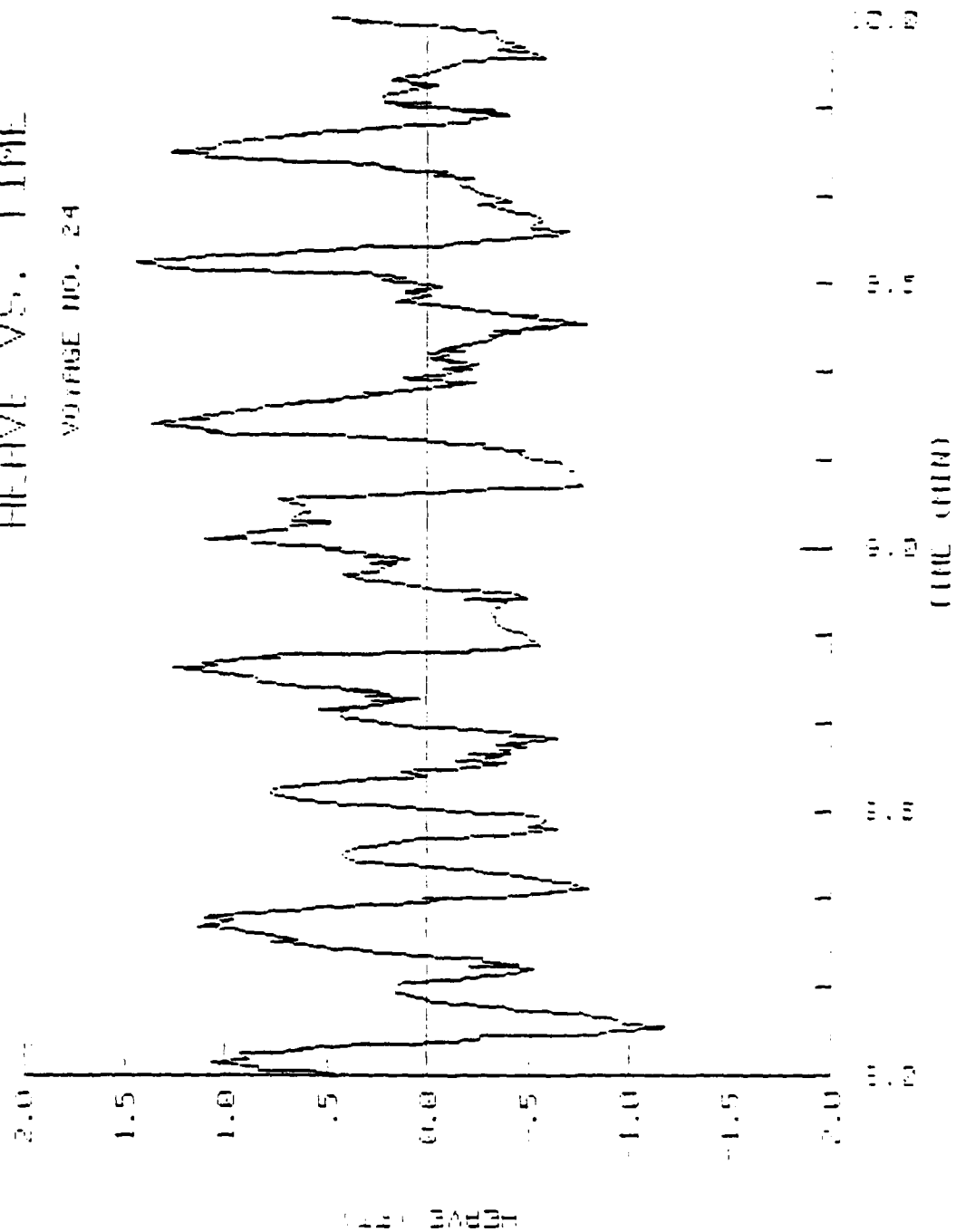
HCL. VS. TIME

VOLUME NO. 24



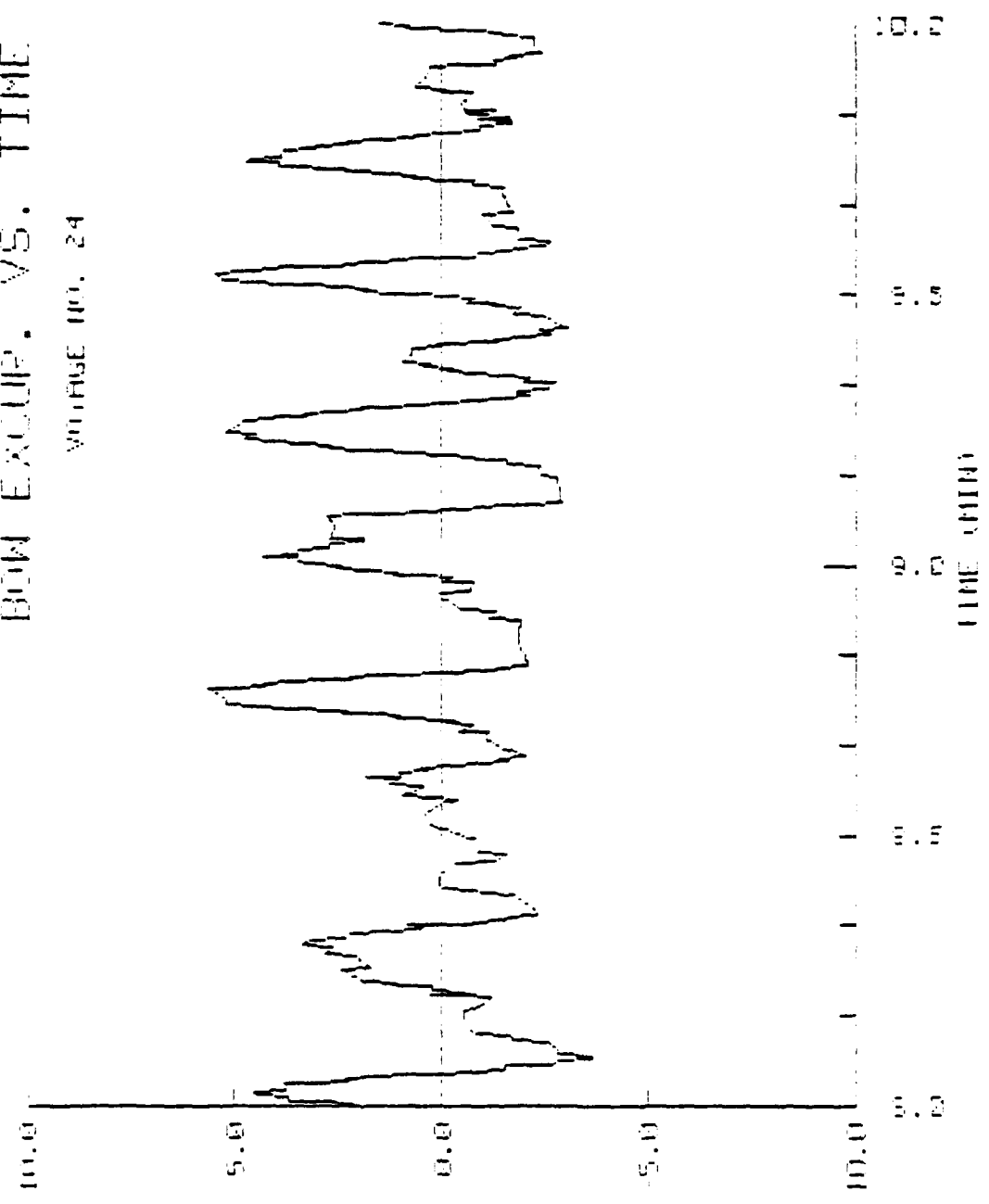
HEAVE VS. TIME

VOYAGE NO. 24



BOW EXCUR. VS. TIME

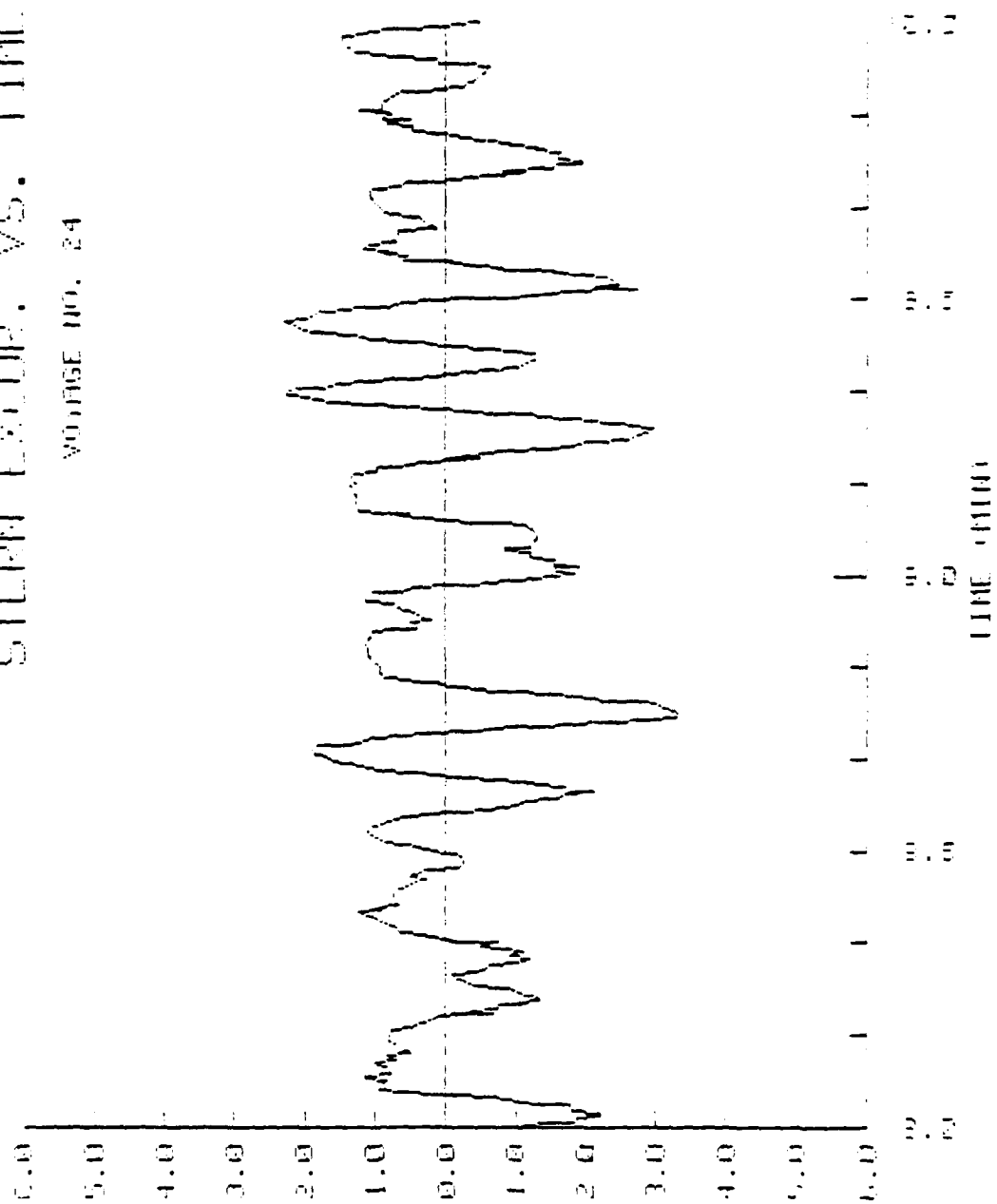
WAVE NO. 24



BOW EXCUR. FE

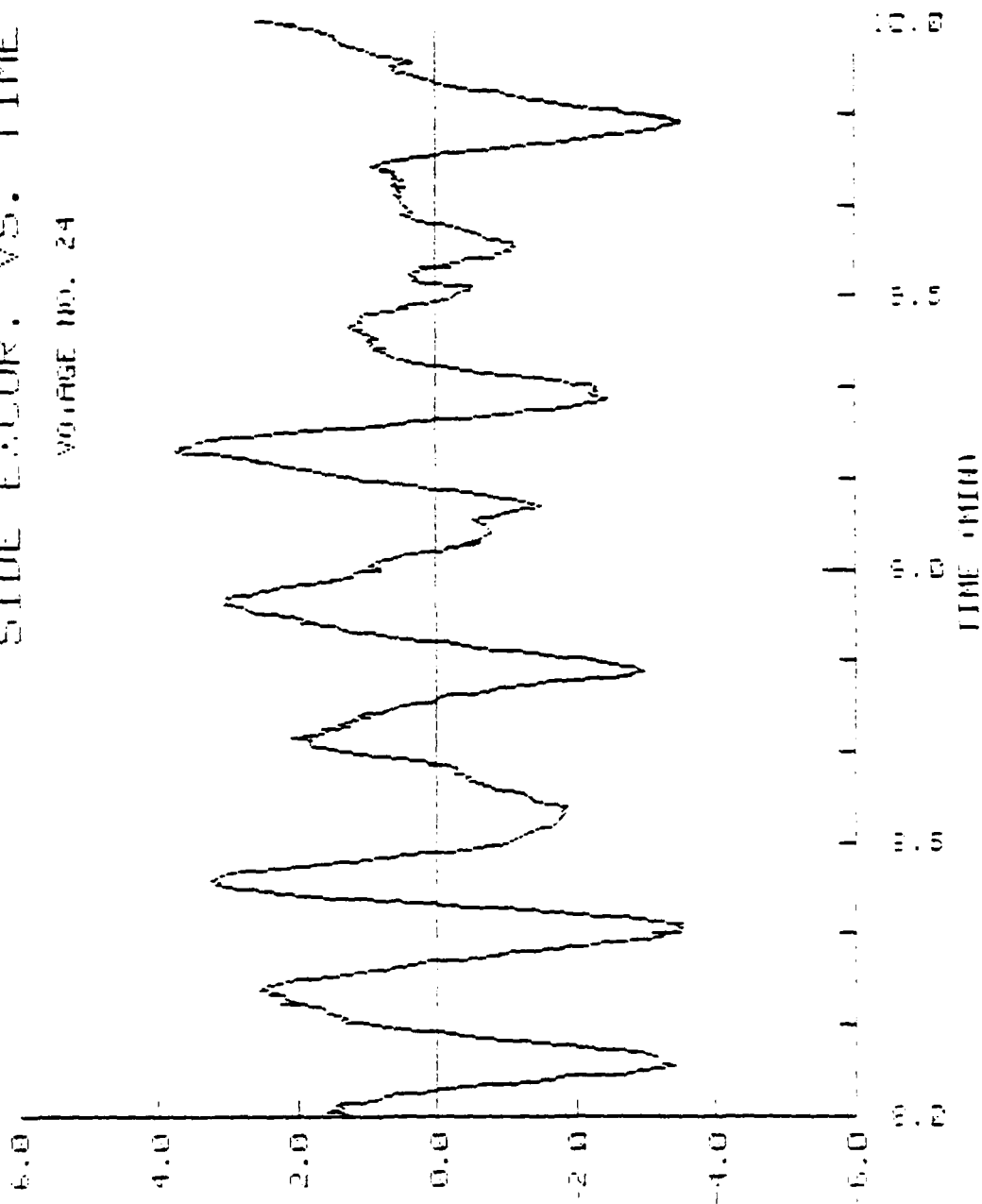
STEPH EXCUR. VS. TIME

VOLUME NO. 24



SIDE EXCUR. VS. TIME

VOLUME NO. 24



14-00000-00000

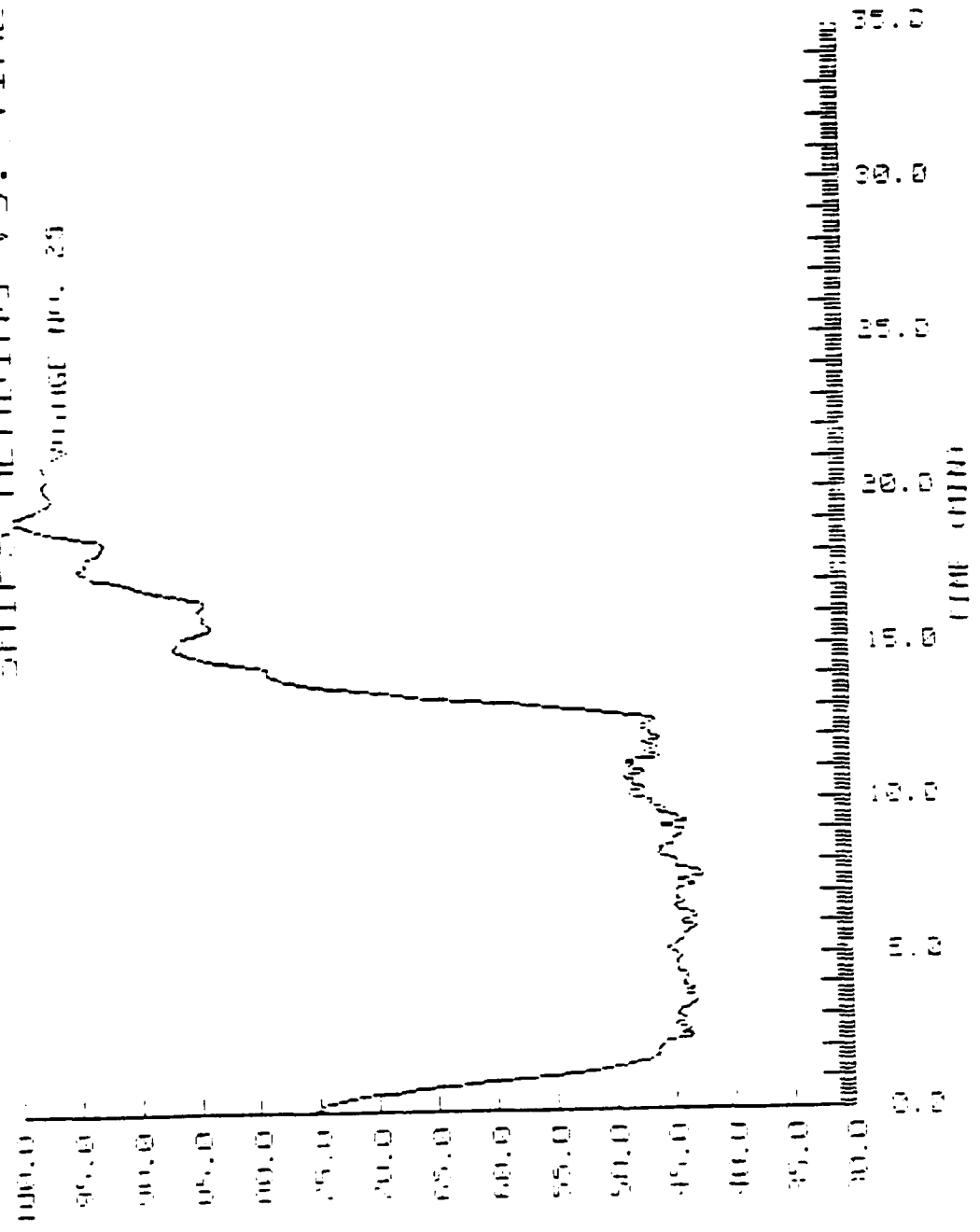
STATISTICAL SUMMARY

VOYAGE NO. 25

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG.)	-.4	.9	.4	.4
ROLL (DEG.)	-1.0	6.0	2.7	3.0
HEAVE (FT. SEC. SEC.)	.0	1.8	.7	.7
HEAVE (FT.)	.1	1.8	.7	.8
ROLL (COUP. (FT.)	.1	5.9	2.1	2.5
HEAVE (COUP. (FT.)	.1	3.0	1.3	1.4
ROLL (COUP. (FT.)	.1	5.2	2.1	2.4

SHIPS HEADING VS. TIME

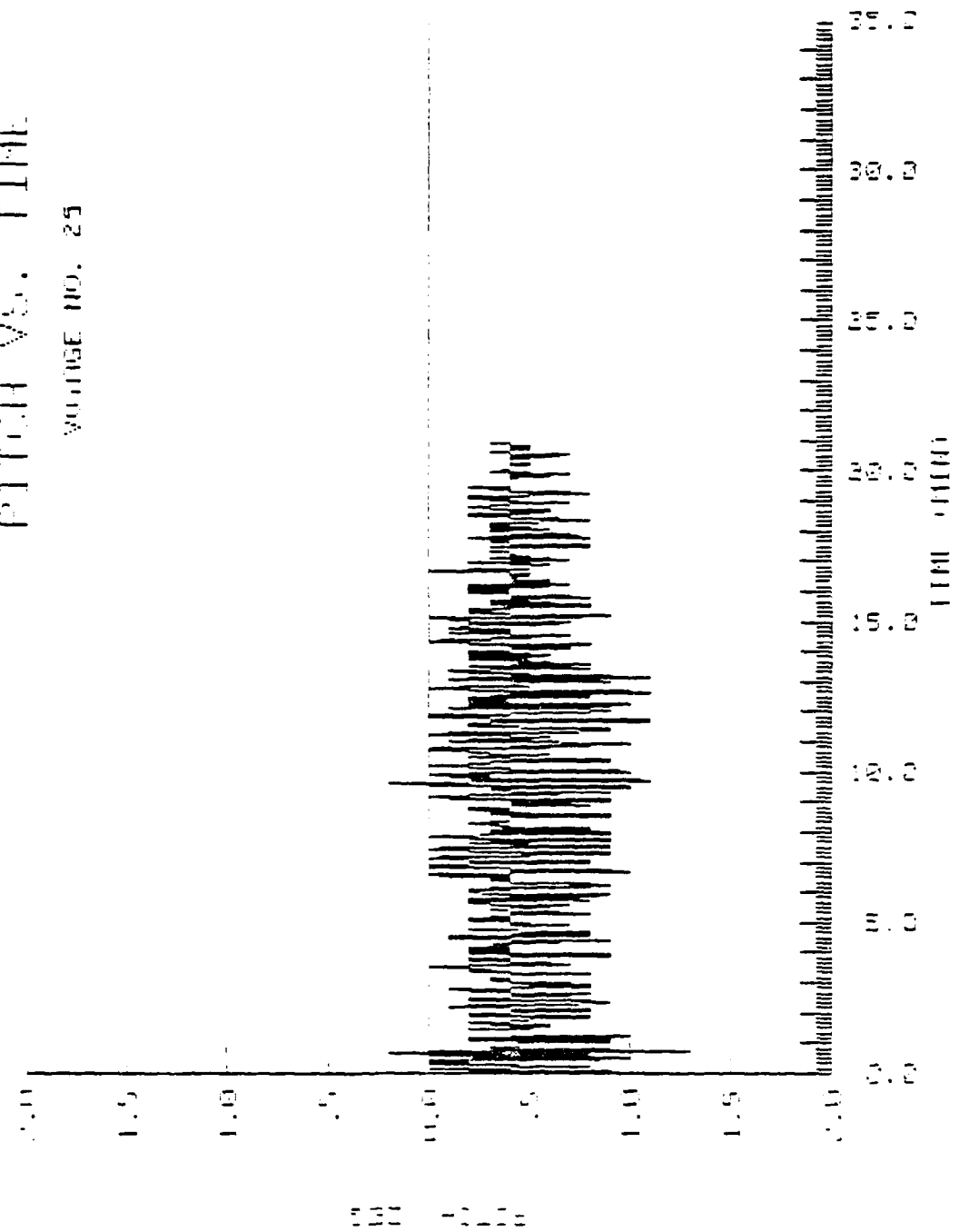
WAVE NO. 29



SHIPS HEADING VS. TIME

PITCH VS. TIME

VOLUME NO. 25



ROLL VS. TIME

VOLUME NO. 25

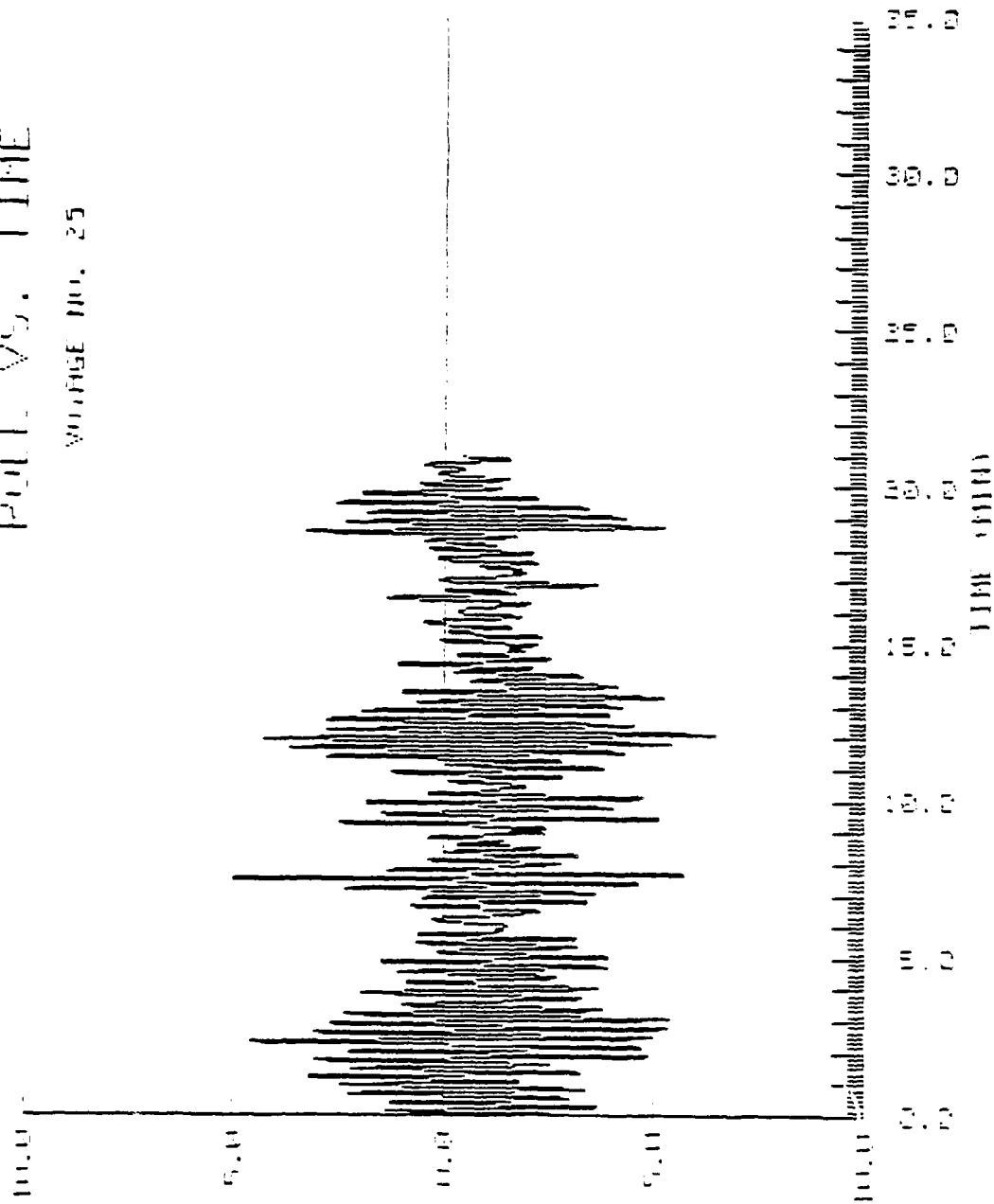
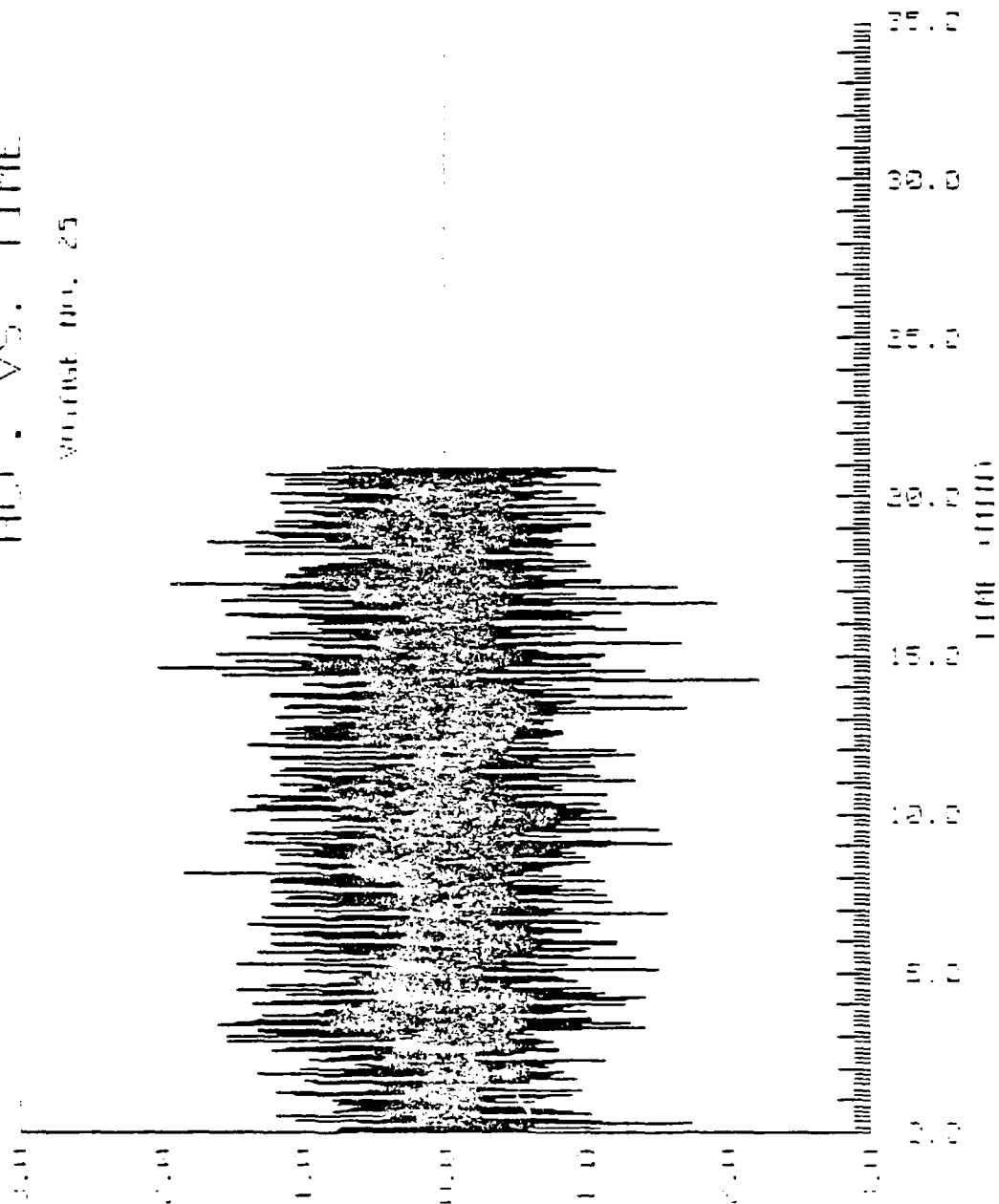
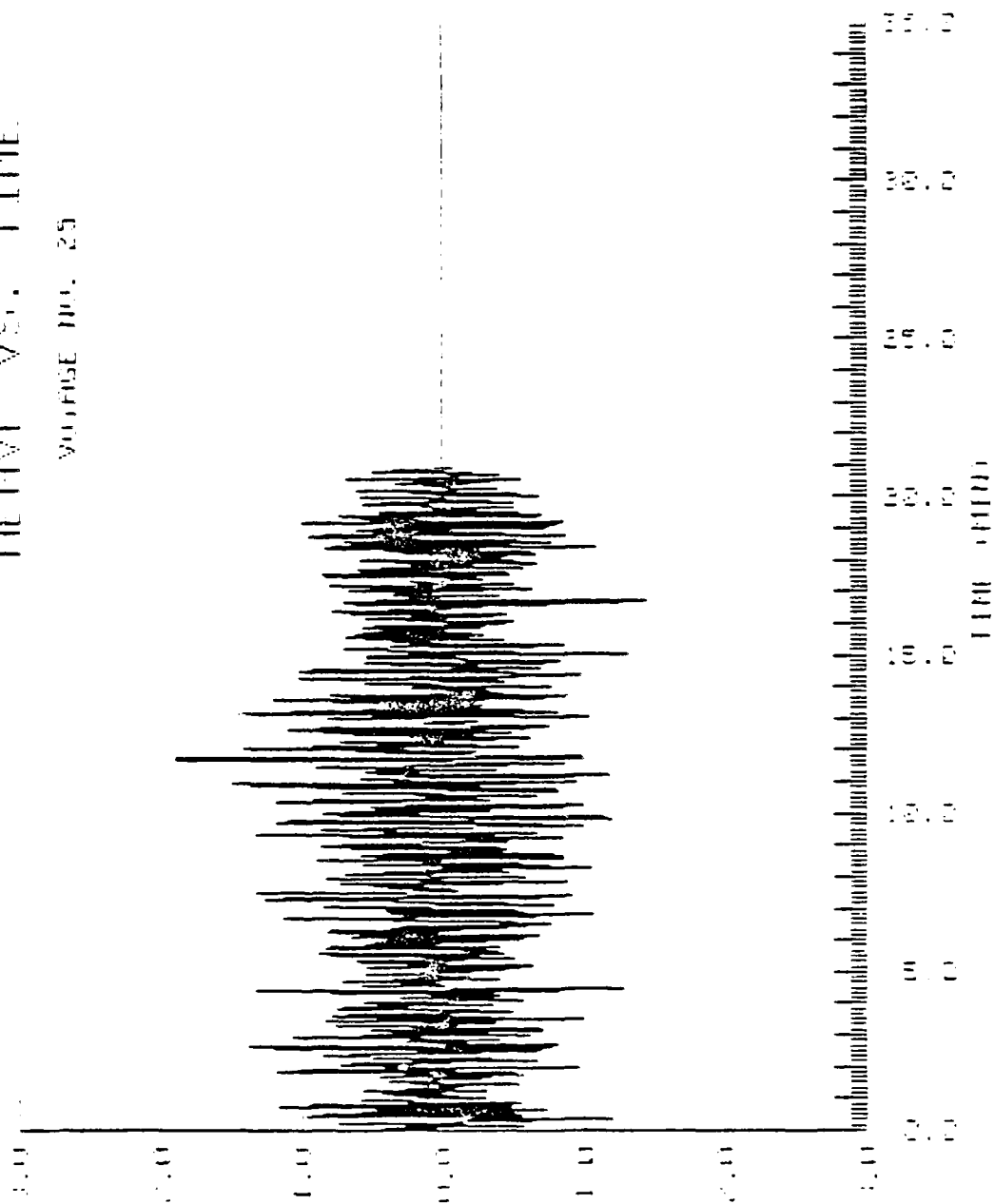


FIG. 1. VS. TIME
 VOLUME NO. 25



HELM VEG. TIME

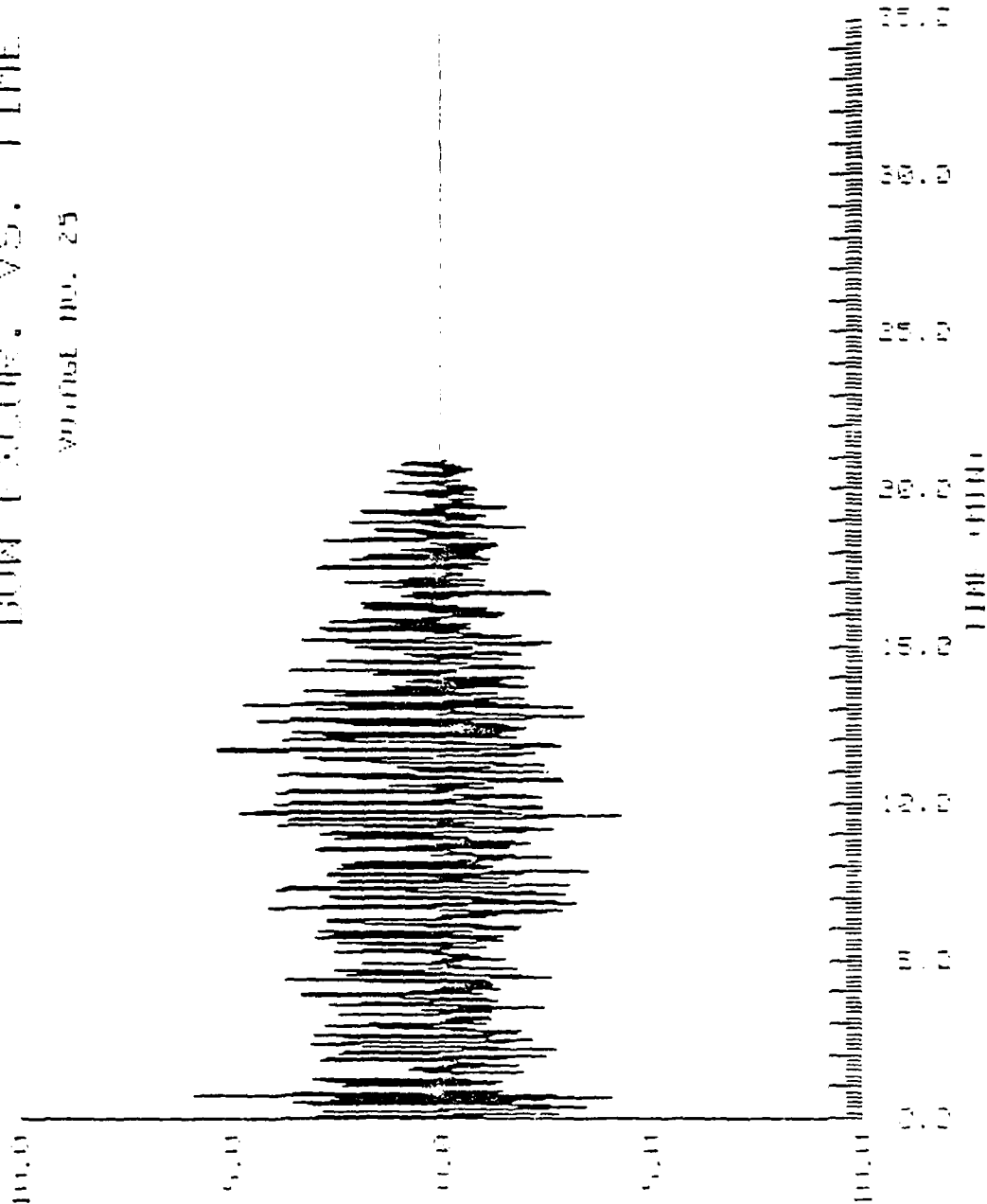
VOYAGE NO. 25



11-11-11

BOB F. SCULP. VS. TIME

Volume No. 25



AD-A098 984

TETRA TECH INC PASADENA CA

F/G 13/10

COLUMBIA RIVER ENTRANCE CHANNEL DEEP-DRAFT VESSEL MOTION STUDY.--ETC(U)

SEP 80 S WANG, M KIMBLE, C BUTCHER, G D COX

DACW57-78-C-0028

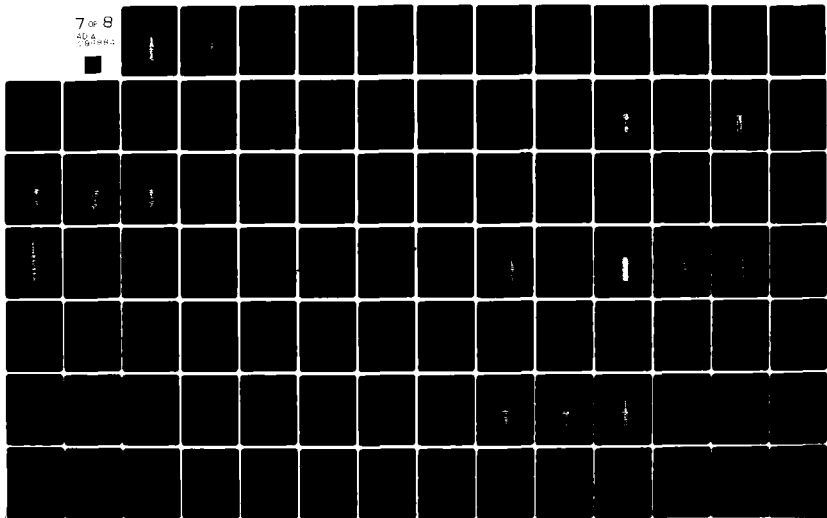
UNCLASSIFIED

TETRA-T-3925-APP-A(1)

NL

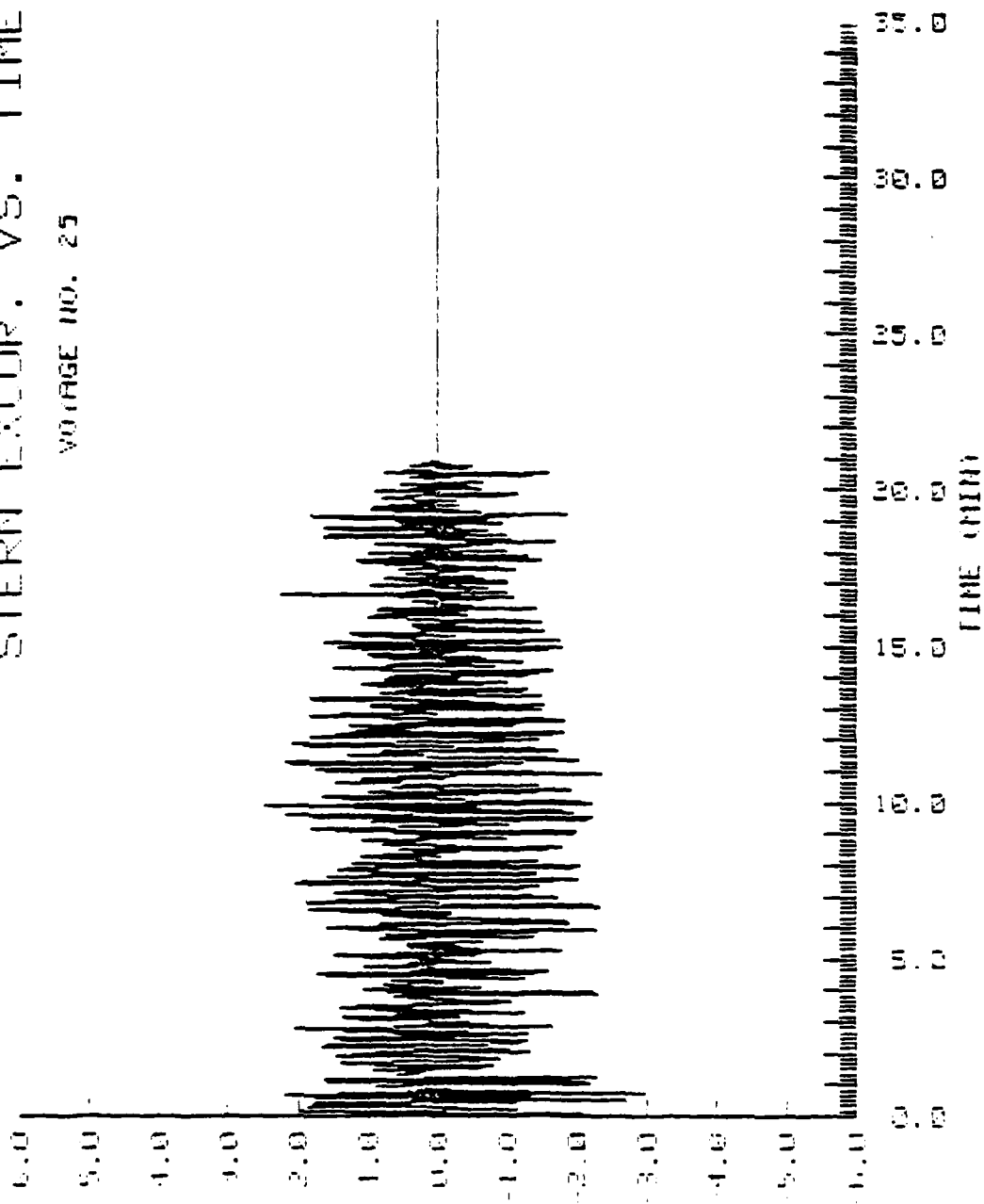
7 of 8

404
CUBH-1



STERN EXCUR. VS. TIME

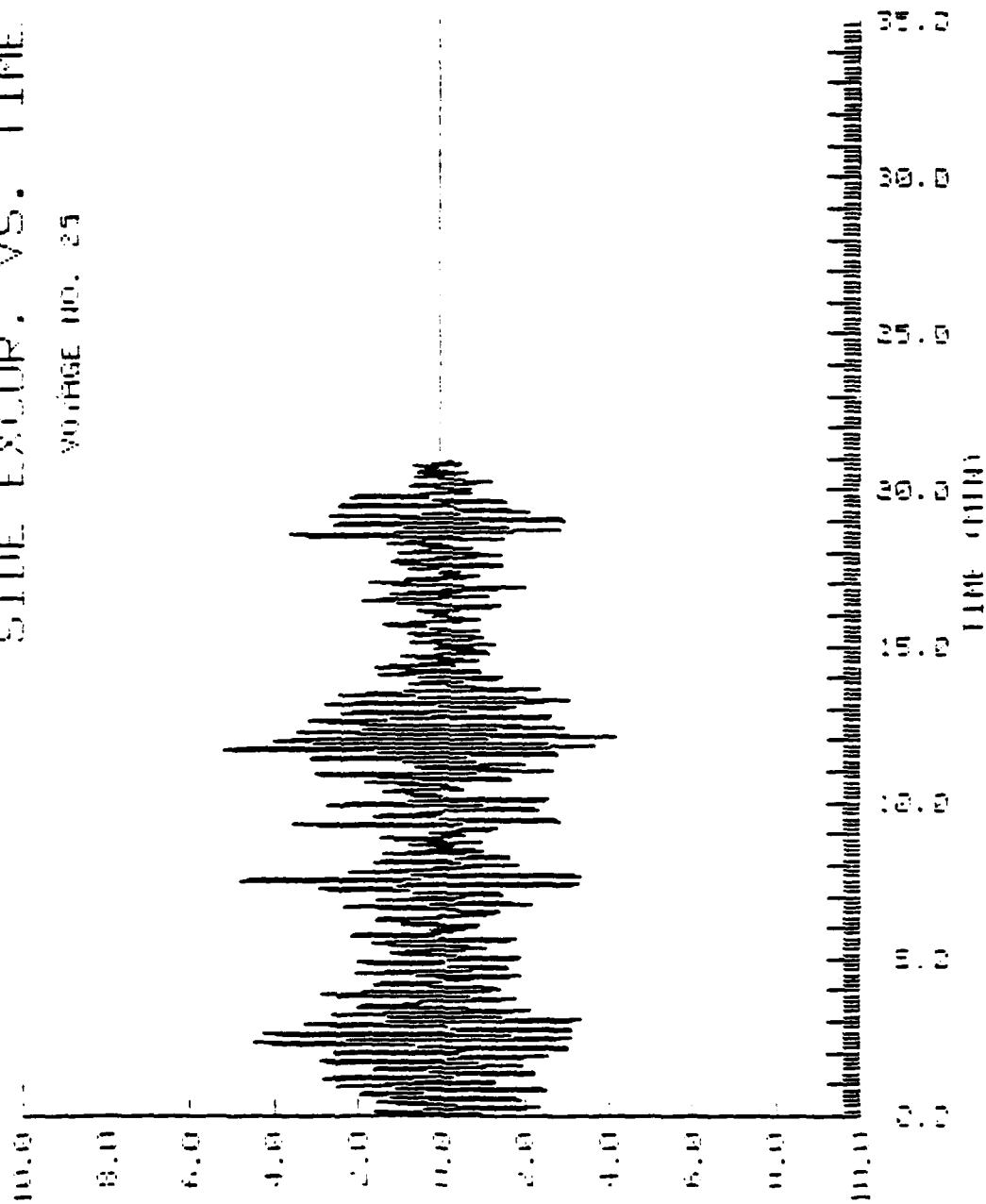
VOLTAGE NO. 25



11 0711.3 00013

SIDE EXCUR. VS. TIME

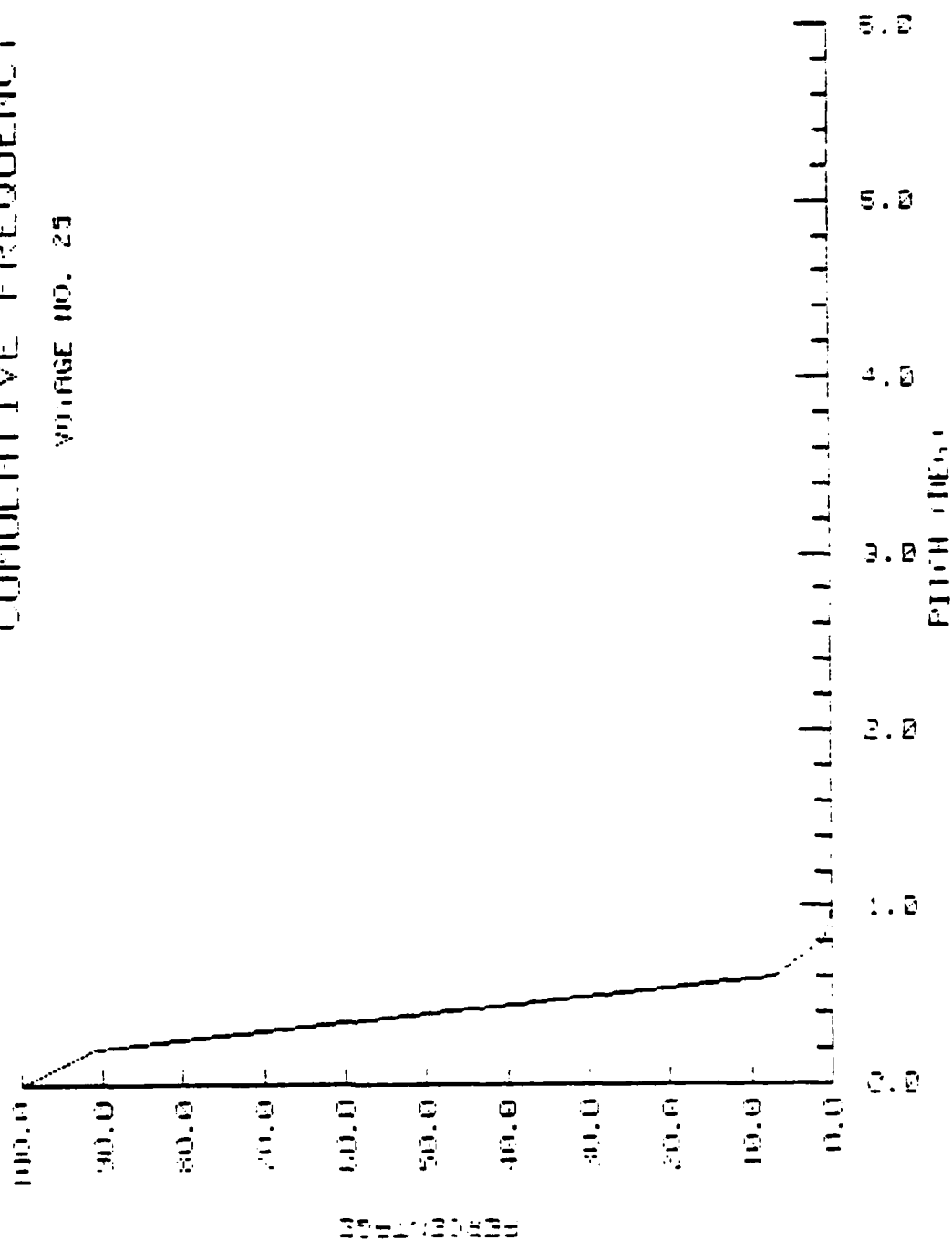
WAVE NO. 25



10 10 10 10 10

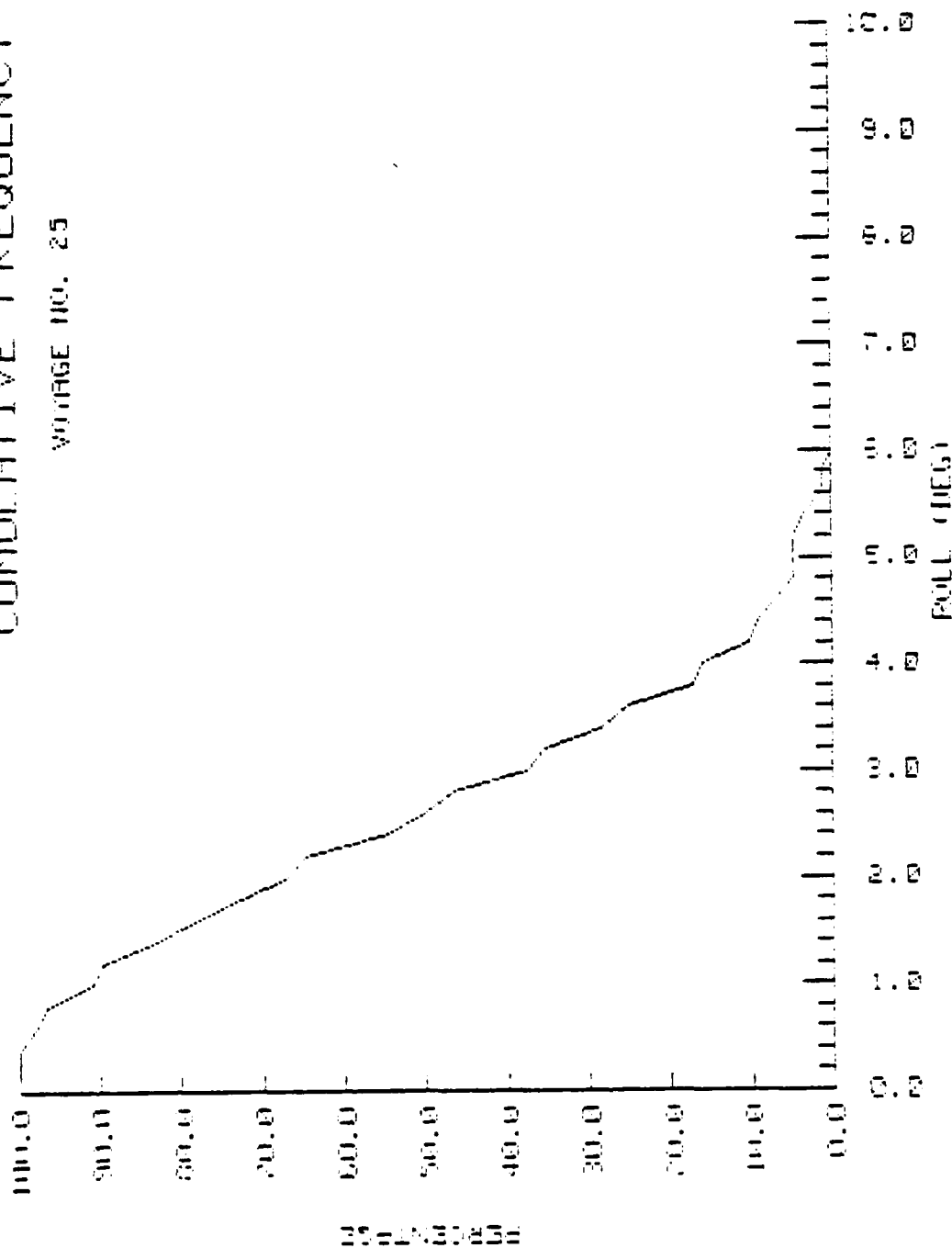
CUMULATIVE FREQUENCY

VOLAGE NO. 25



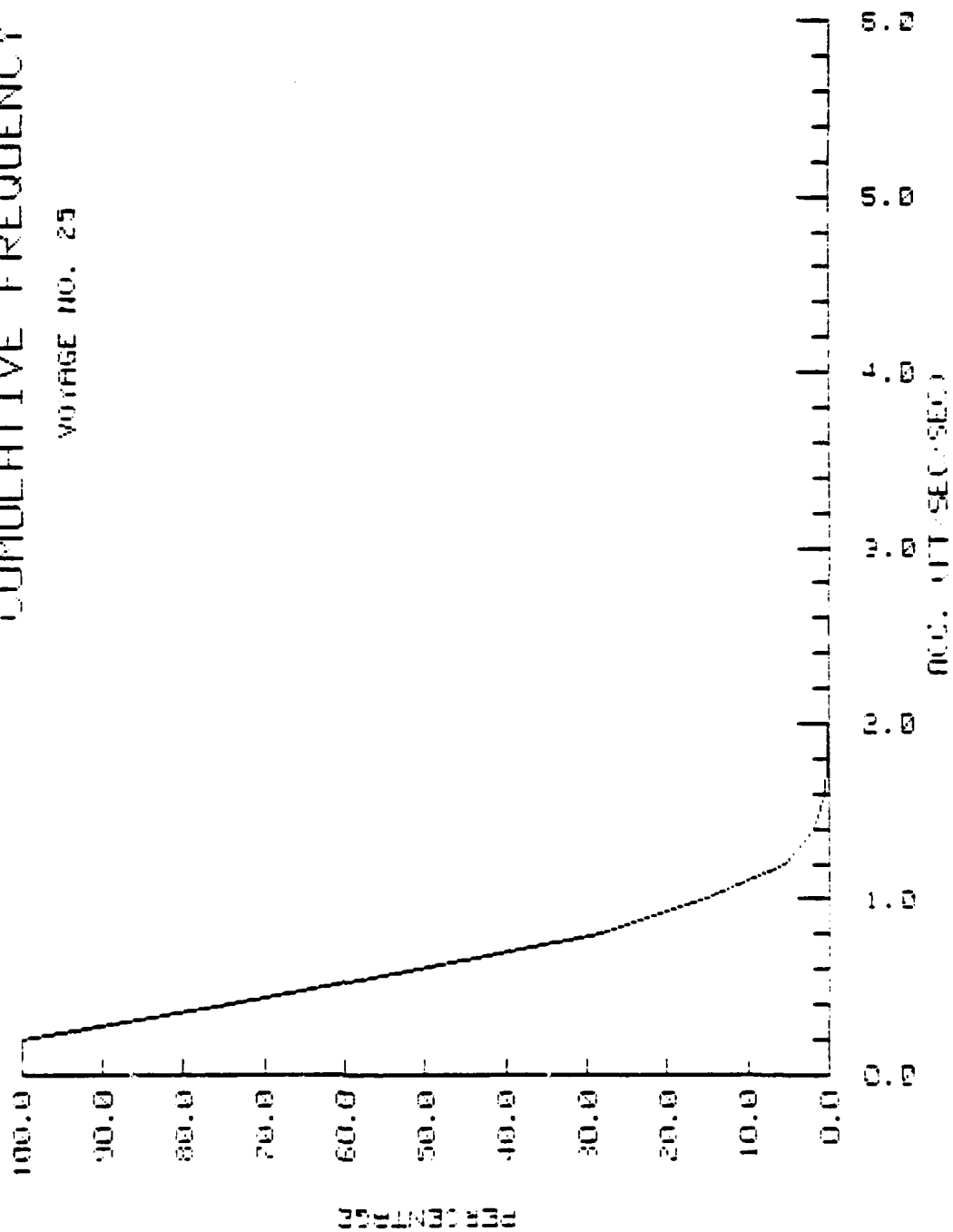
CUMULATIVE FREQUENCY

VOLUME NO. 25



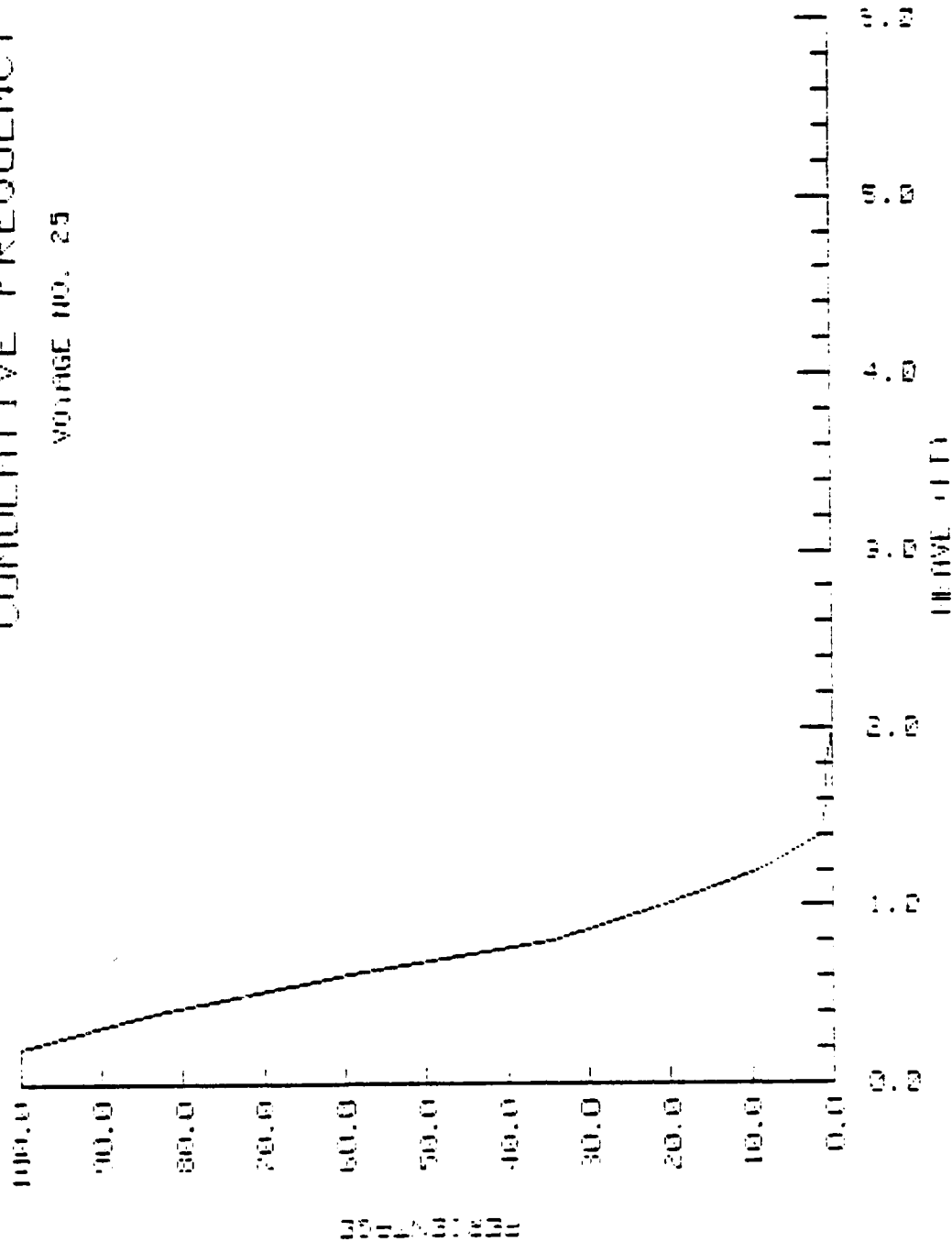
CUMULATIVE FREQUENCY

VOLTAGE NO. 25



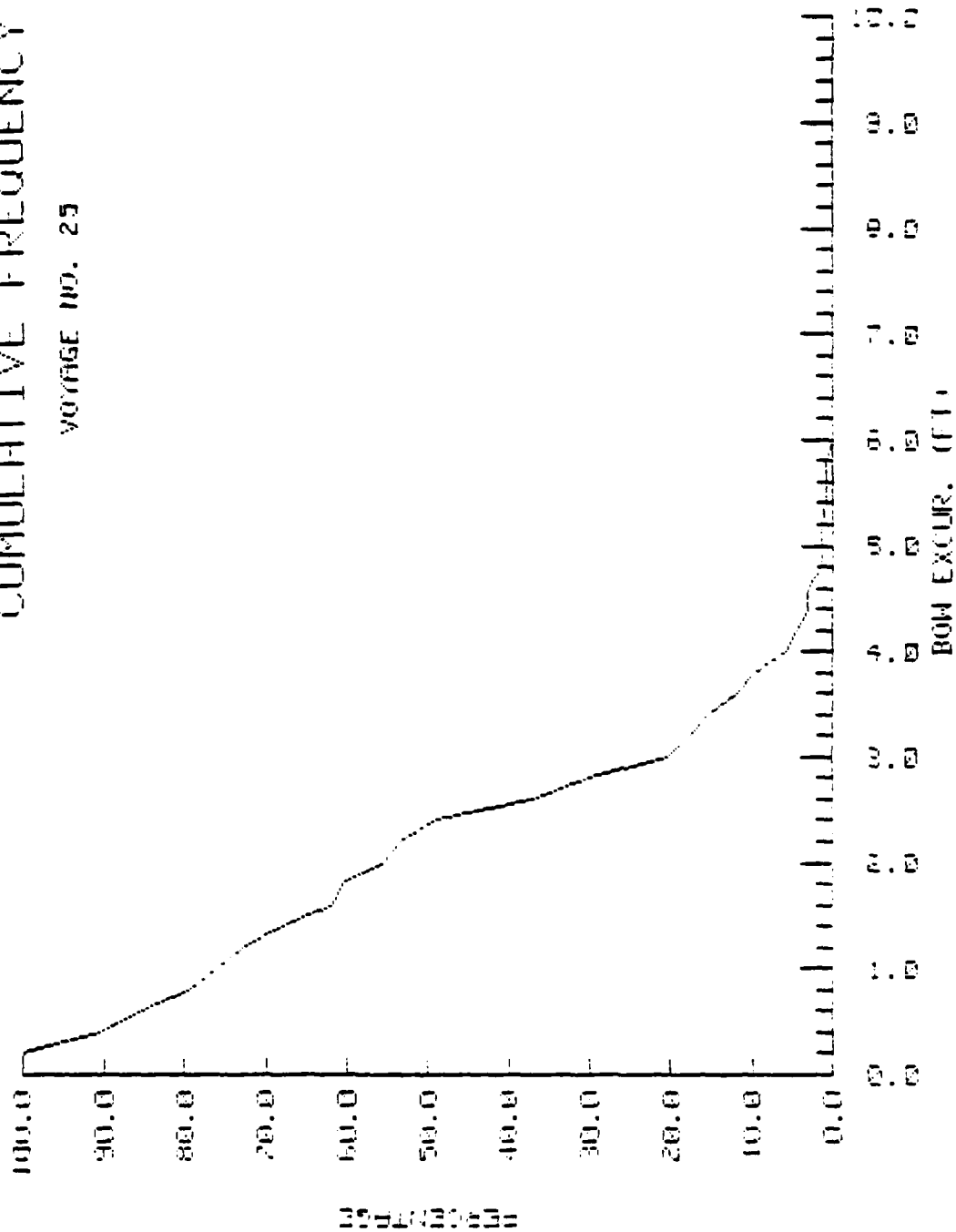
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VOLUME NO. 25



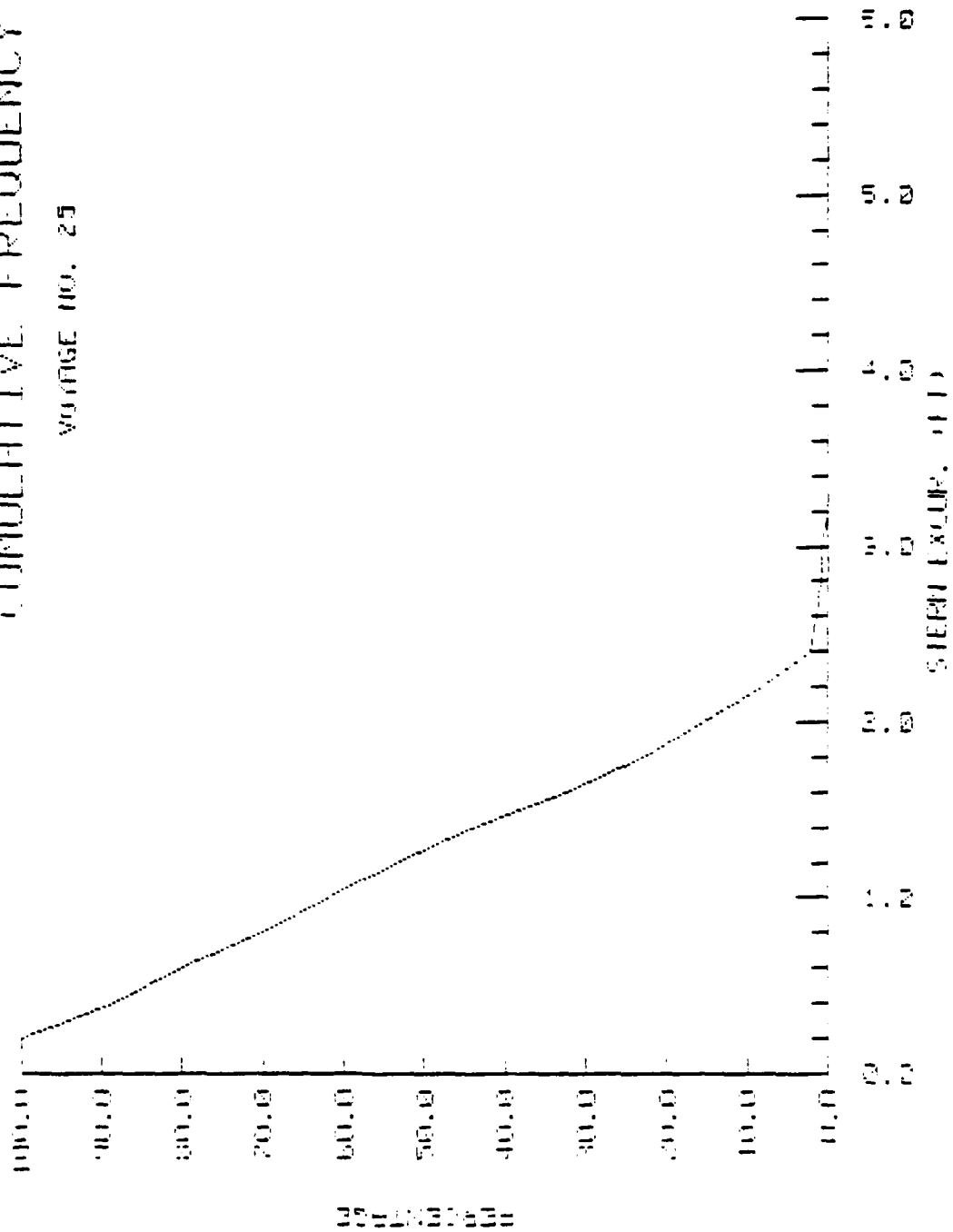
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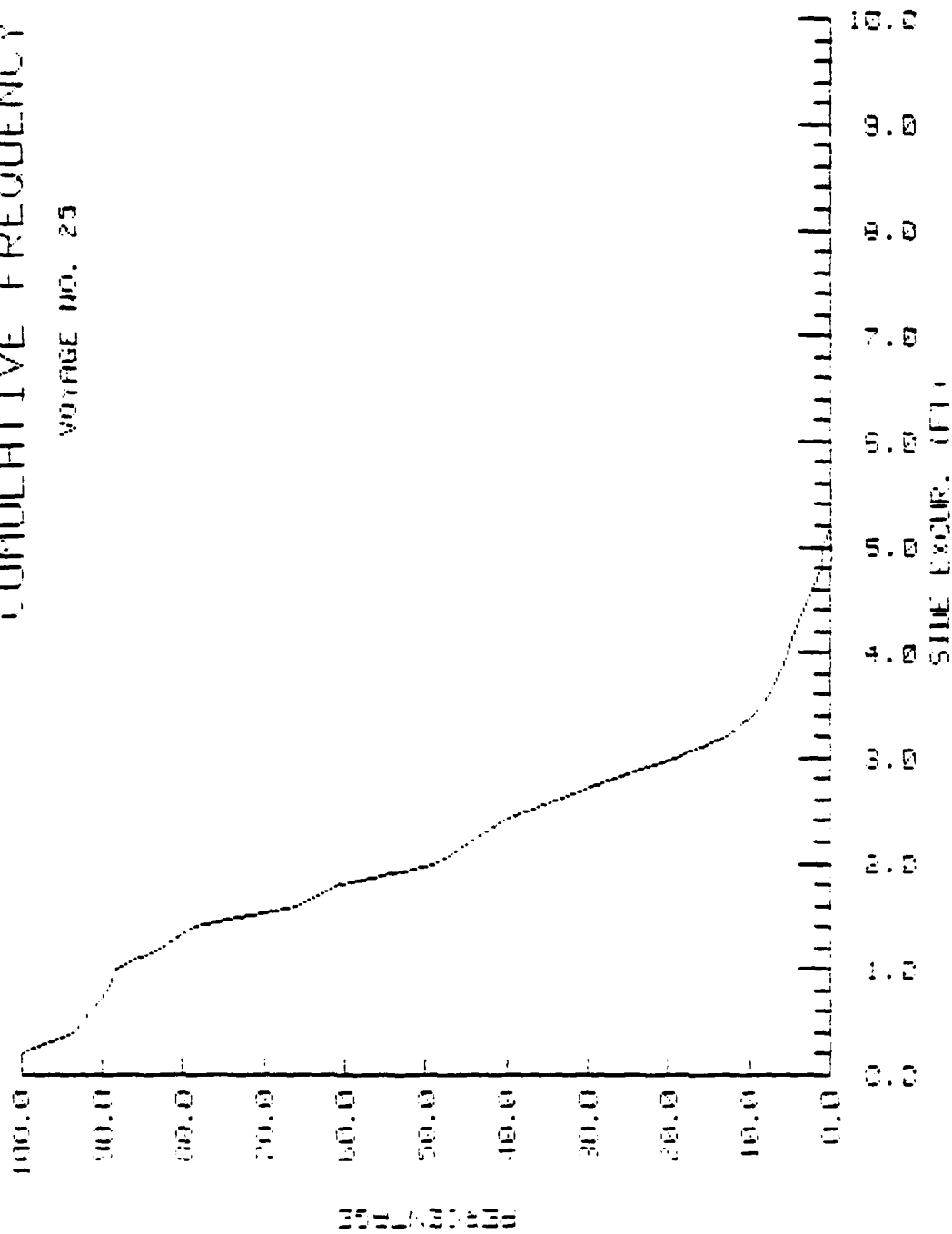
CUMULATIVE FREQUENCY

VOLUME NO. 25



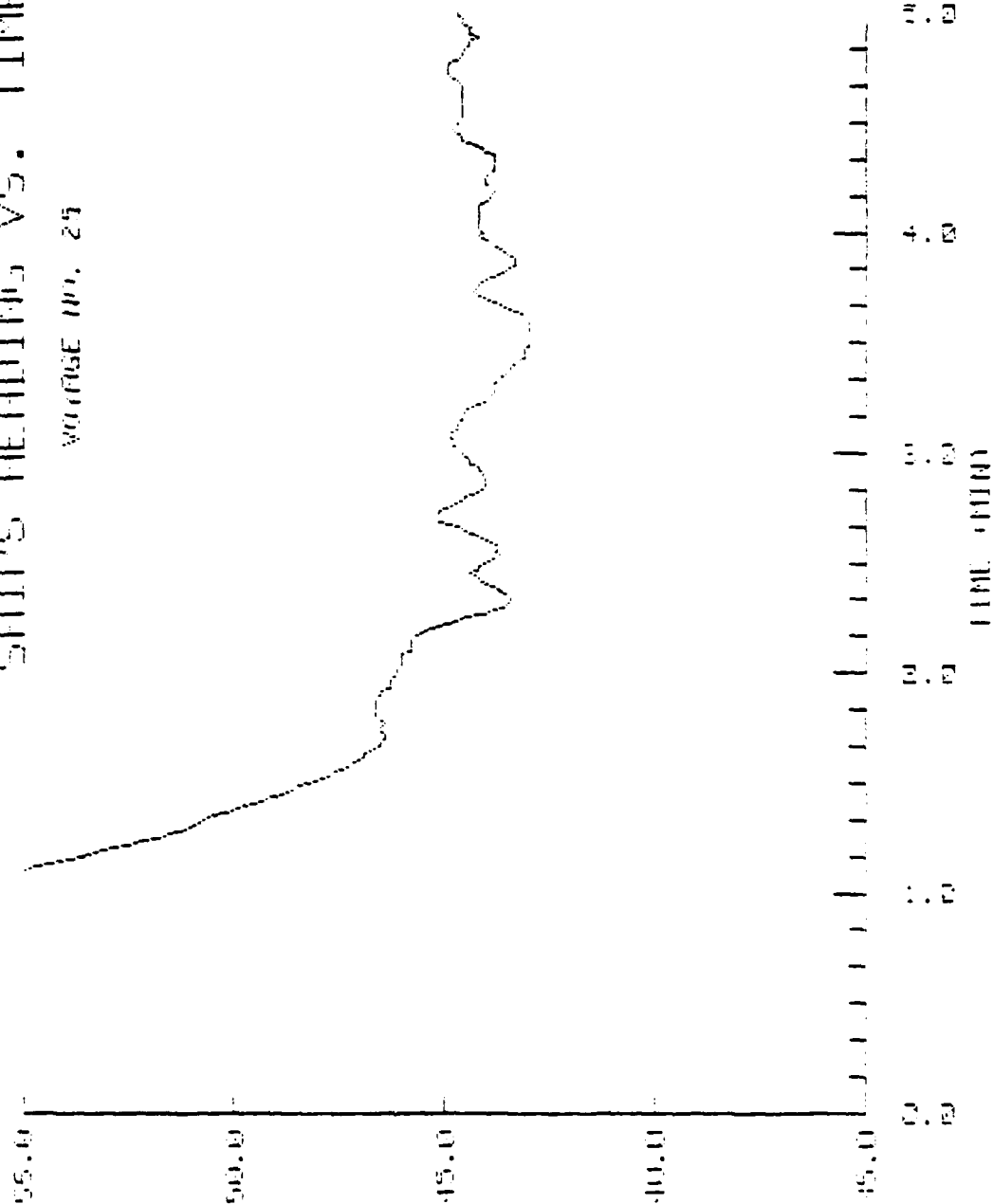
CUMULATIVE FREQUENCY

VOYAGE NO. 25



SHIP'S HEADING VS. TIME

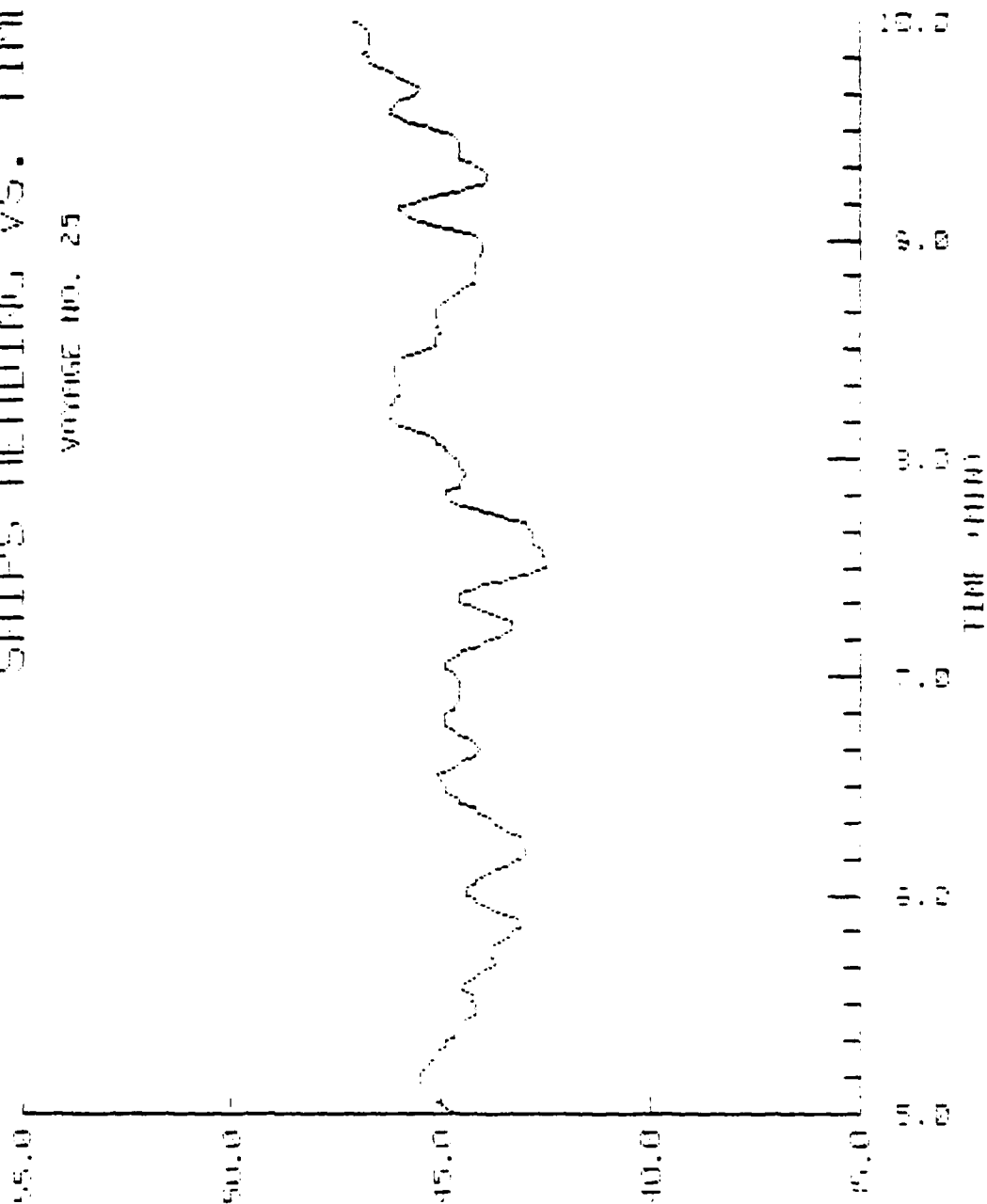
VOYAGE NO. 27



SHIP'S HEADING VS. TIME

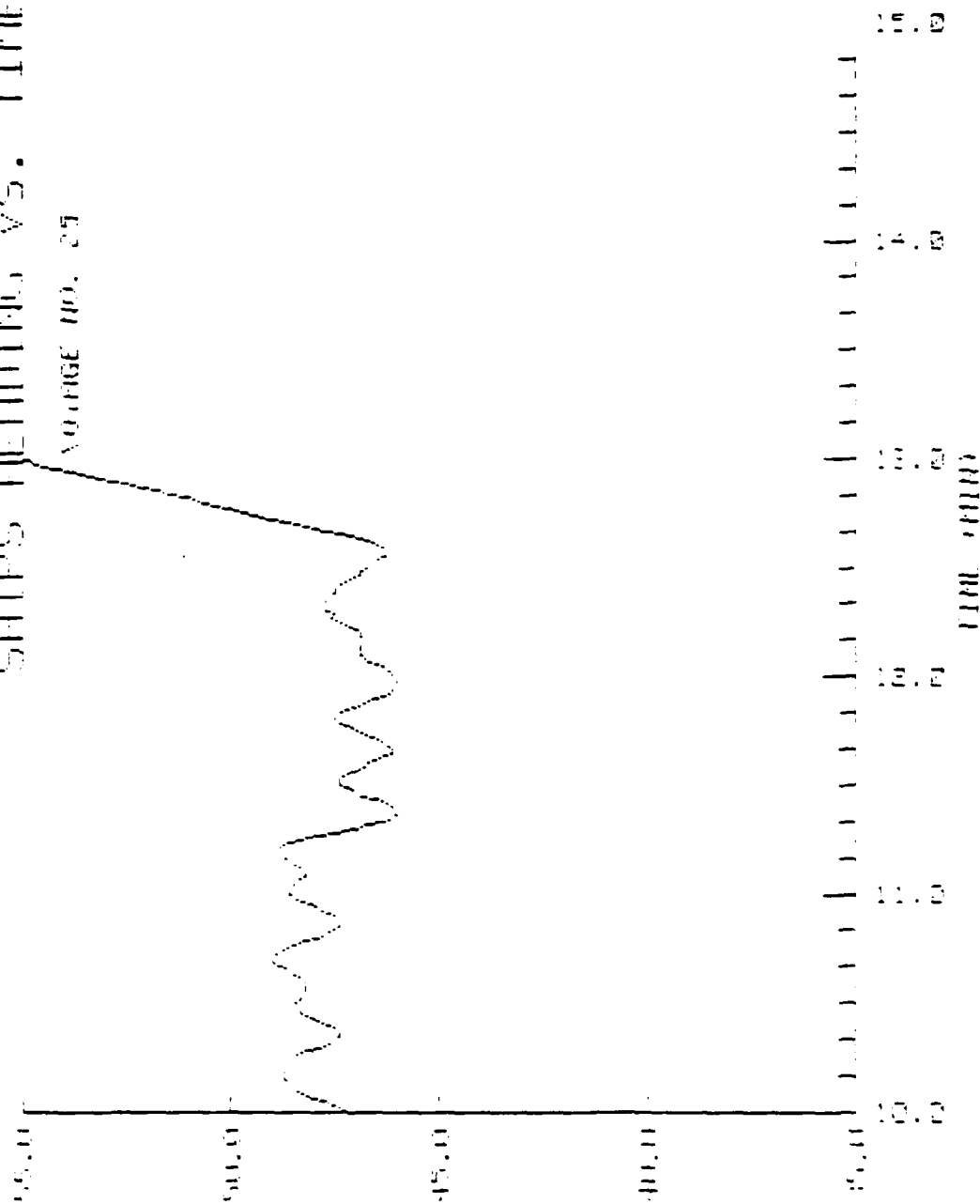
SHIPS BEHIND VS. THE

page 10, 25



SHIPS HEADING VS. TIME

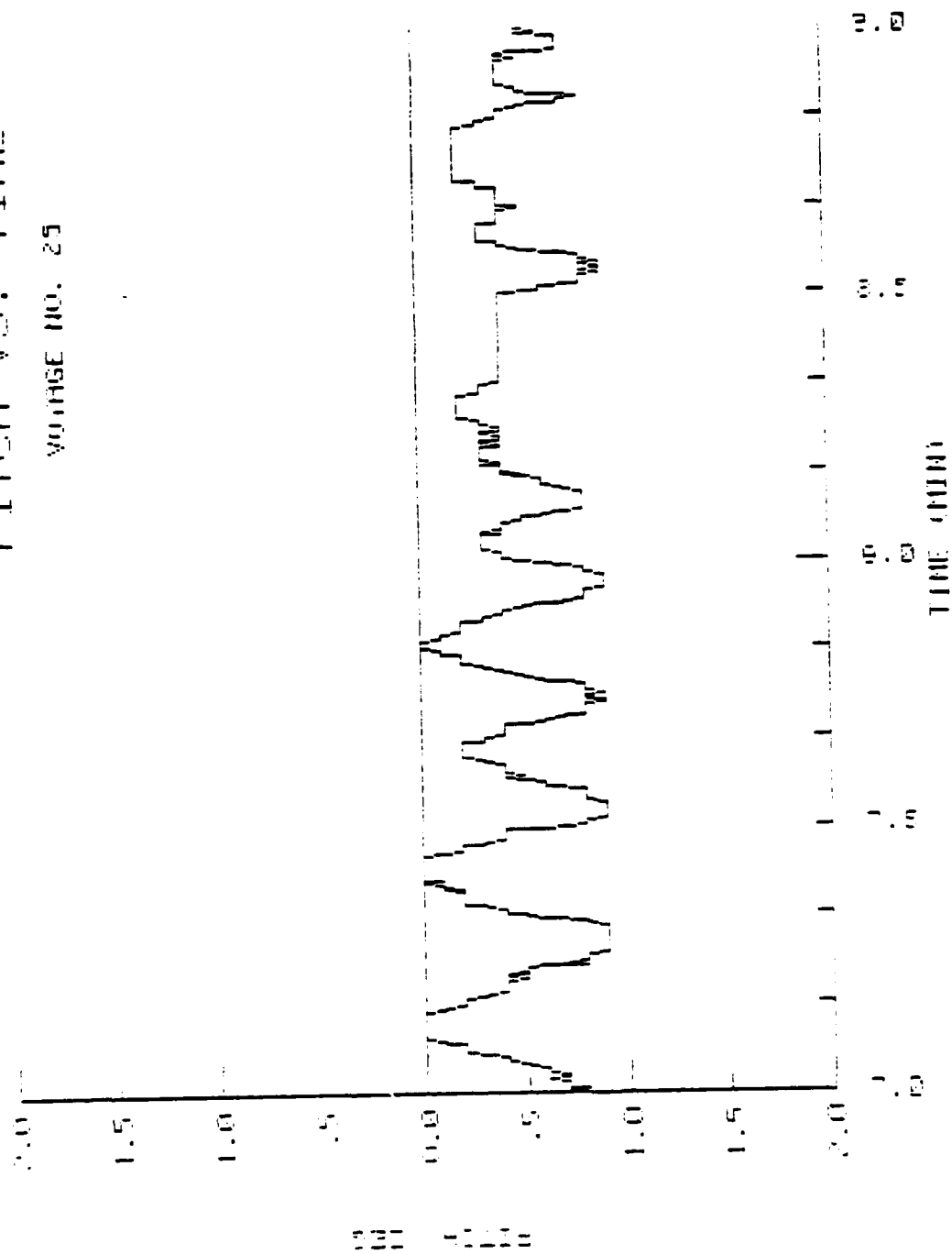
VOYAGE NO. 27



100-5000-3-33-1E

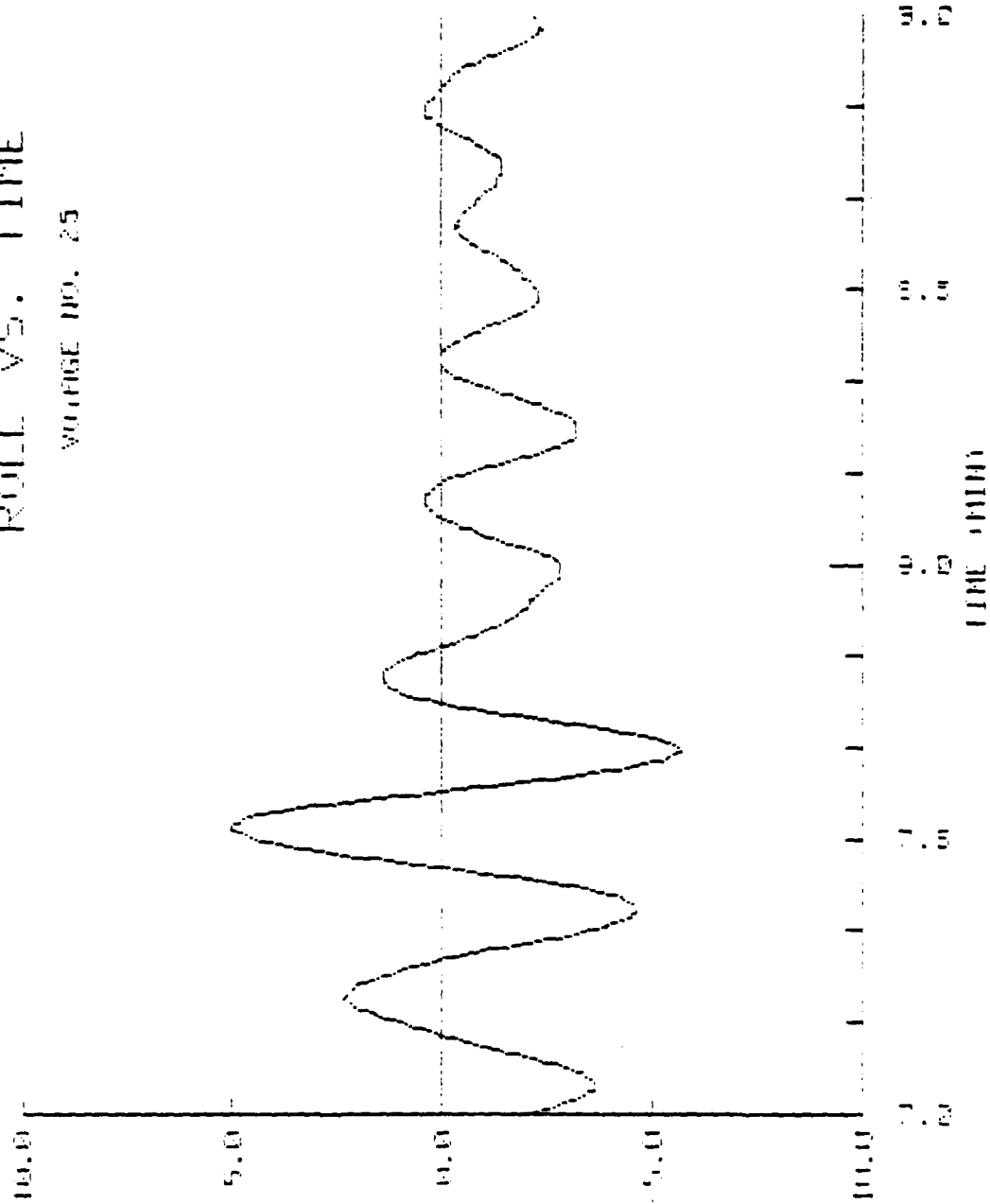
PITCH VS. TIME

VOYAGE NO. 25



ROLL VS. TIME

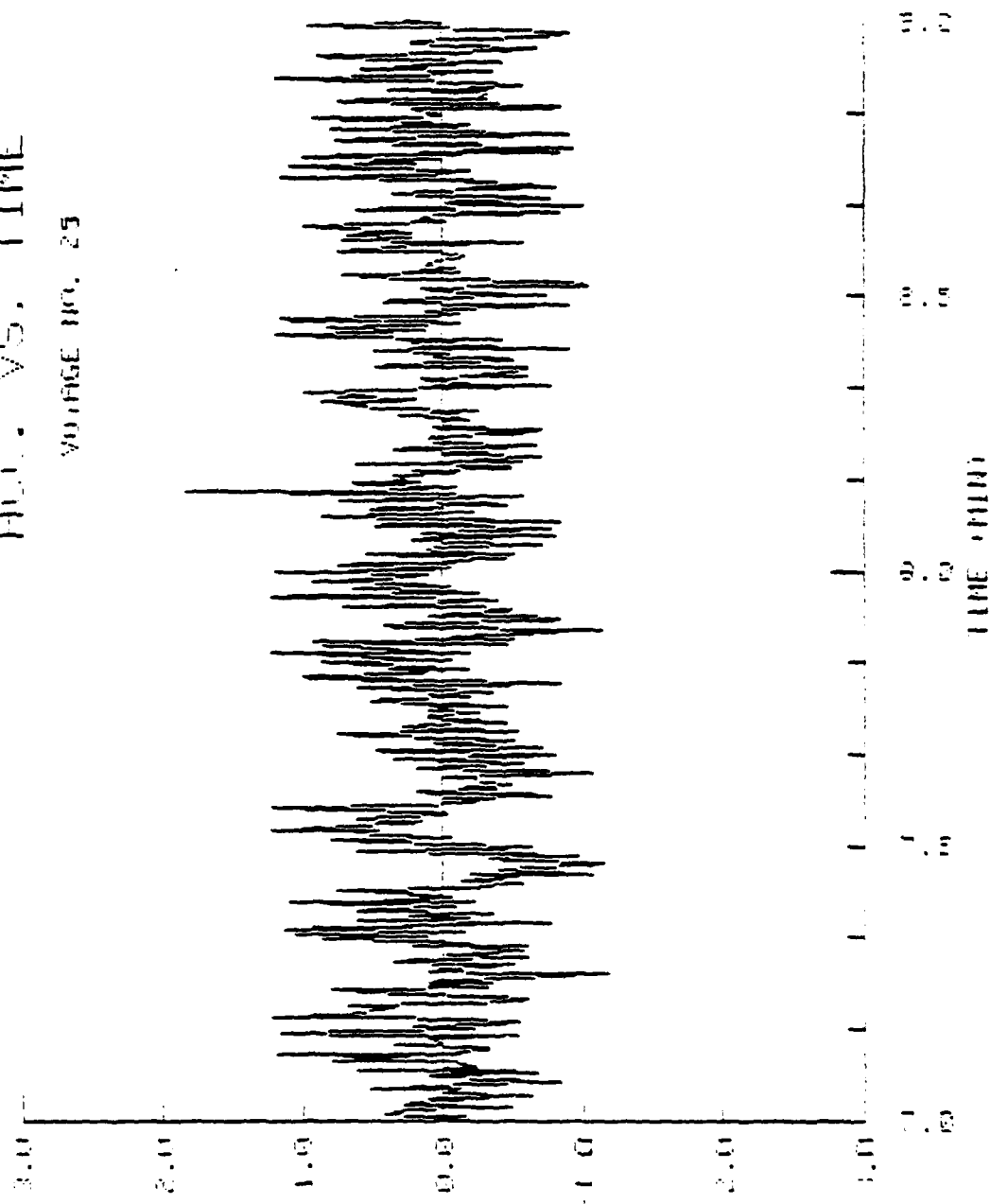
VOLUME NO. 25



1961 7706

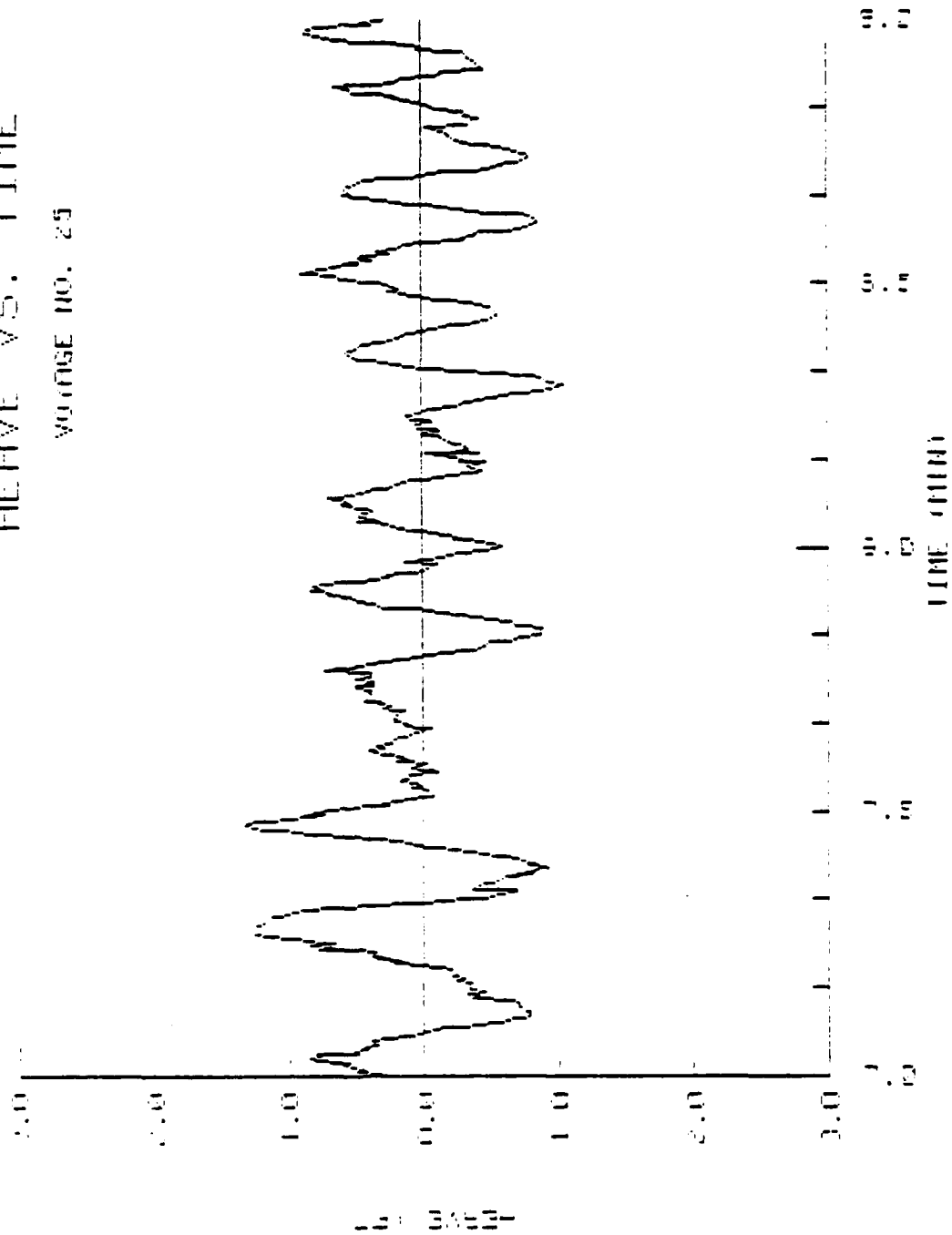
ALU. VS. TIME

VOLUME NO. 25



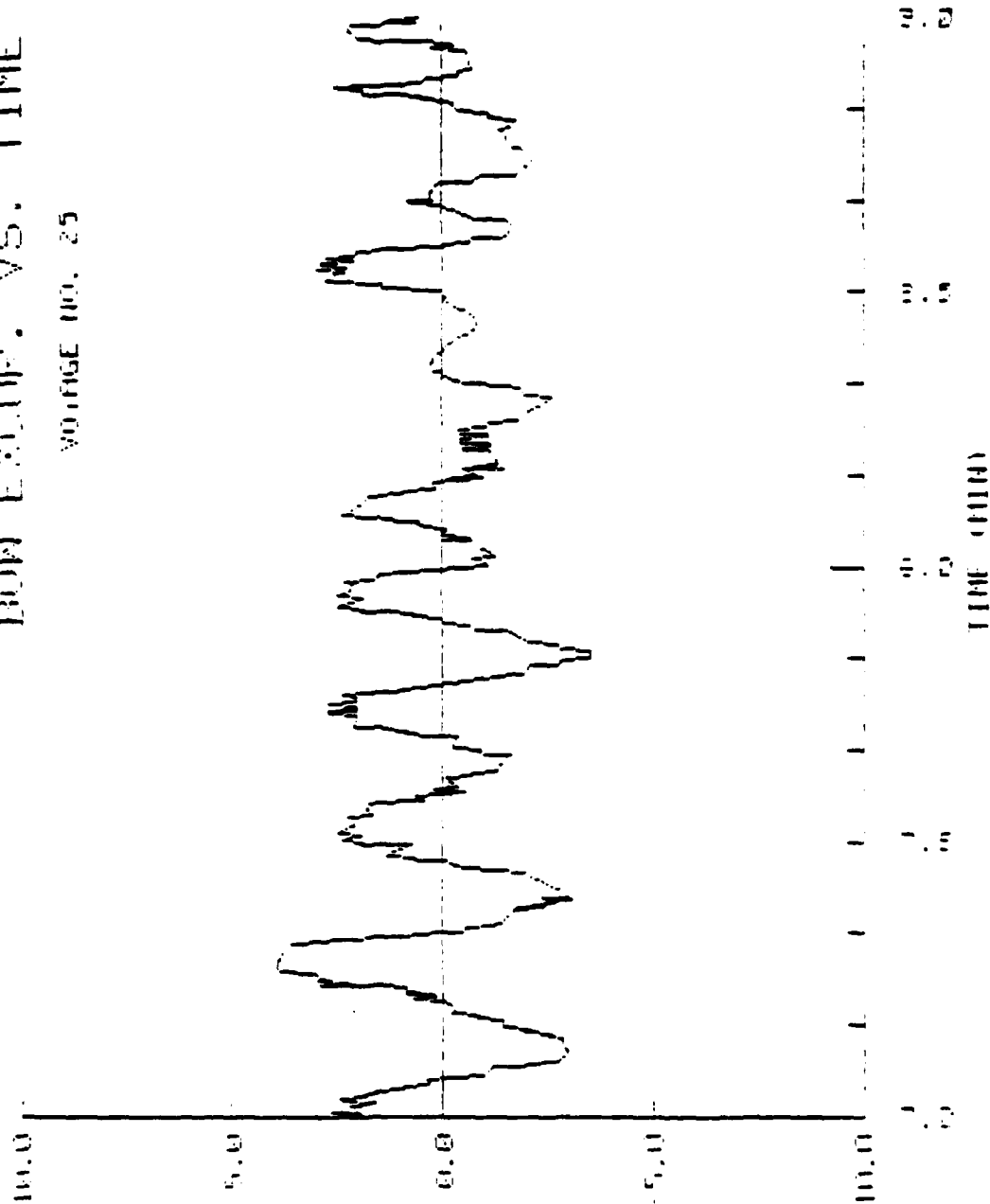
HEAVE VS. TIME

VOYAGE NO. 25



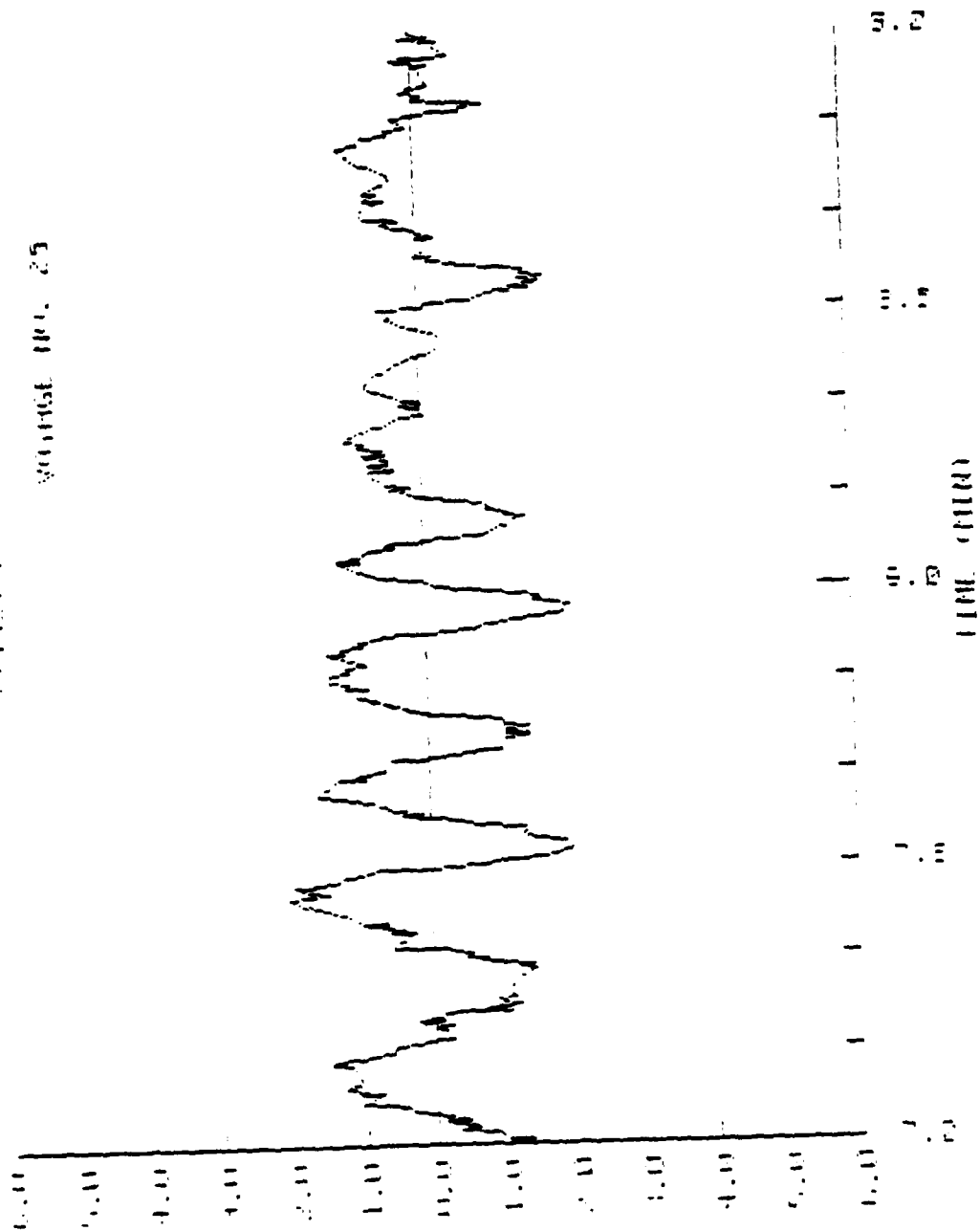
BOH EXCUR. VS. TIME

VOLUME NO. 25



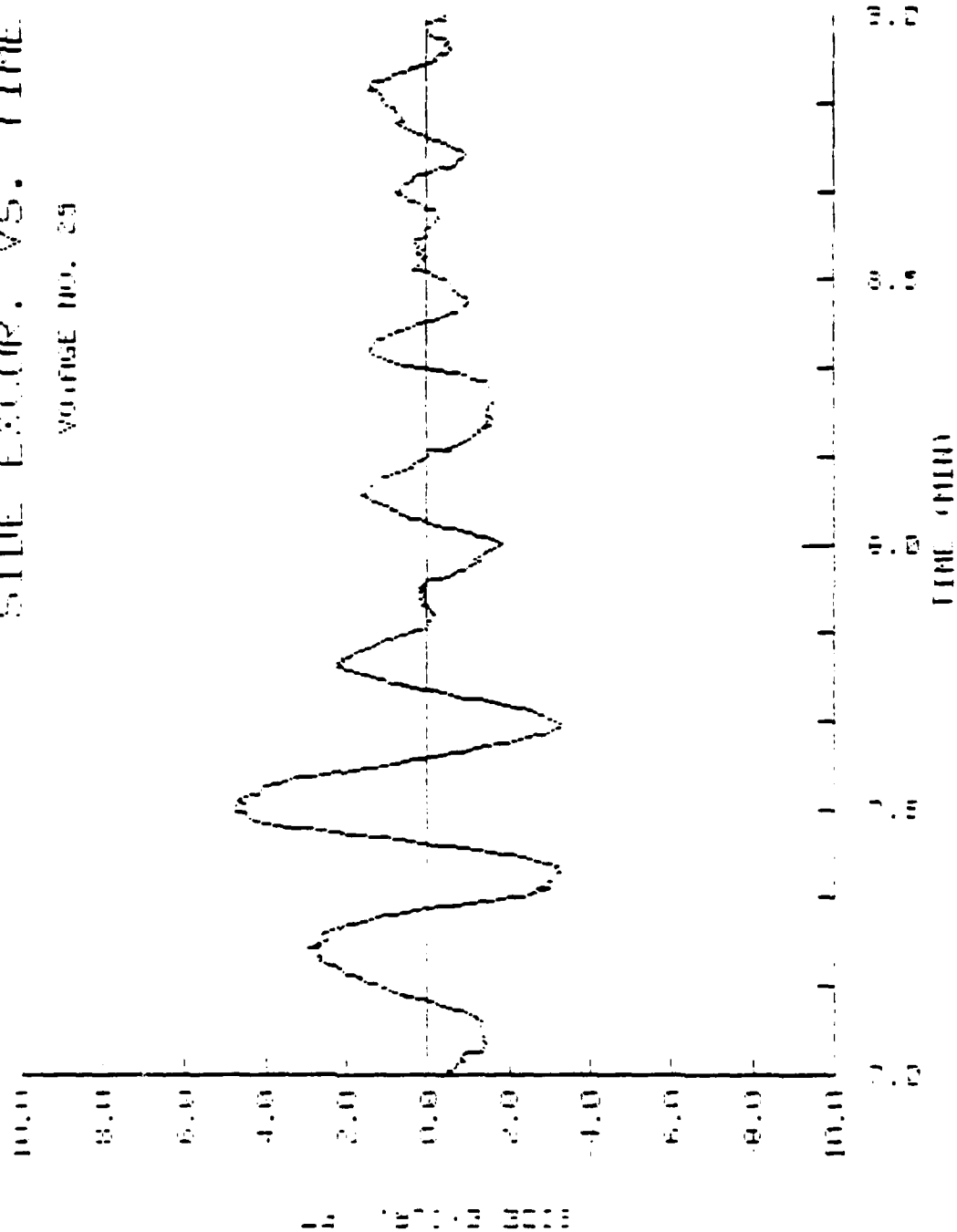
5.1EPP1300P. VS. TIME

W0005E 000.25



SIDE EXCUR. VS. TIME

VOLUME NO. 25



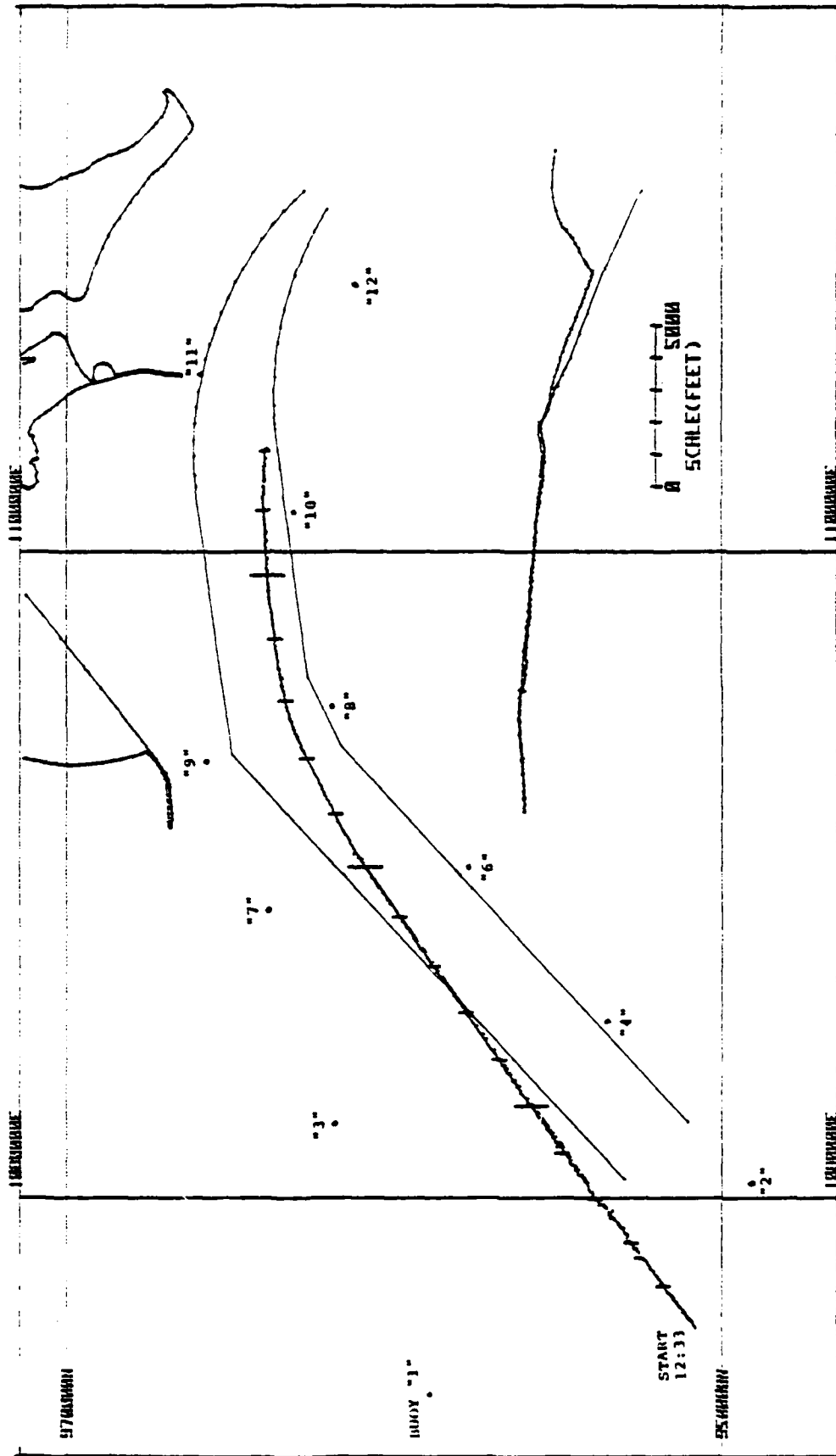
STATISTICAL SUMMARY

VOYAGE NO. 26

	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
FLUTTER (DEG)	-.1	.5	.3	.3
ROLL (DEG)	.1	2.8	1.3	1.5
HEAVE (FT)	.1	2.3	.8	.9
ROLL EXCUR. (FT)	.0	1.4	.6	.6
ROLL EXCUR. (FT)	.0	3.4	1.6	1.8
ROLL EXCUR. (FT)	.0	1.8	.9	1.0
ROLL EXCUR. (FT)	.0	2.5	1.3	1.5

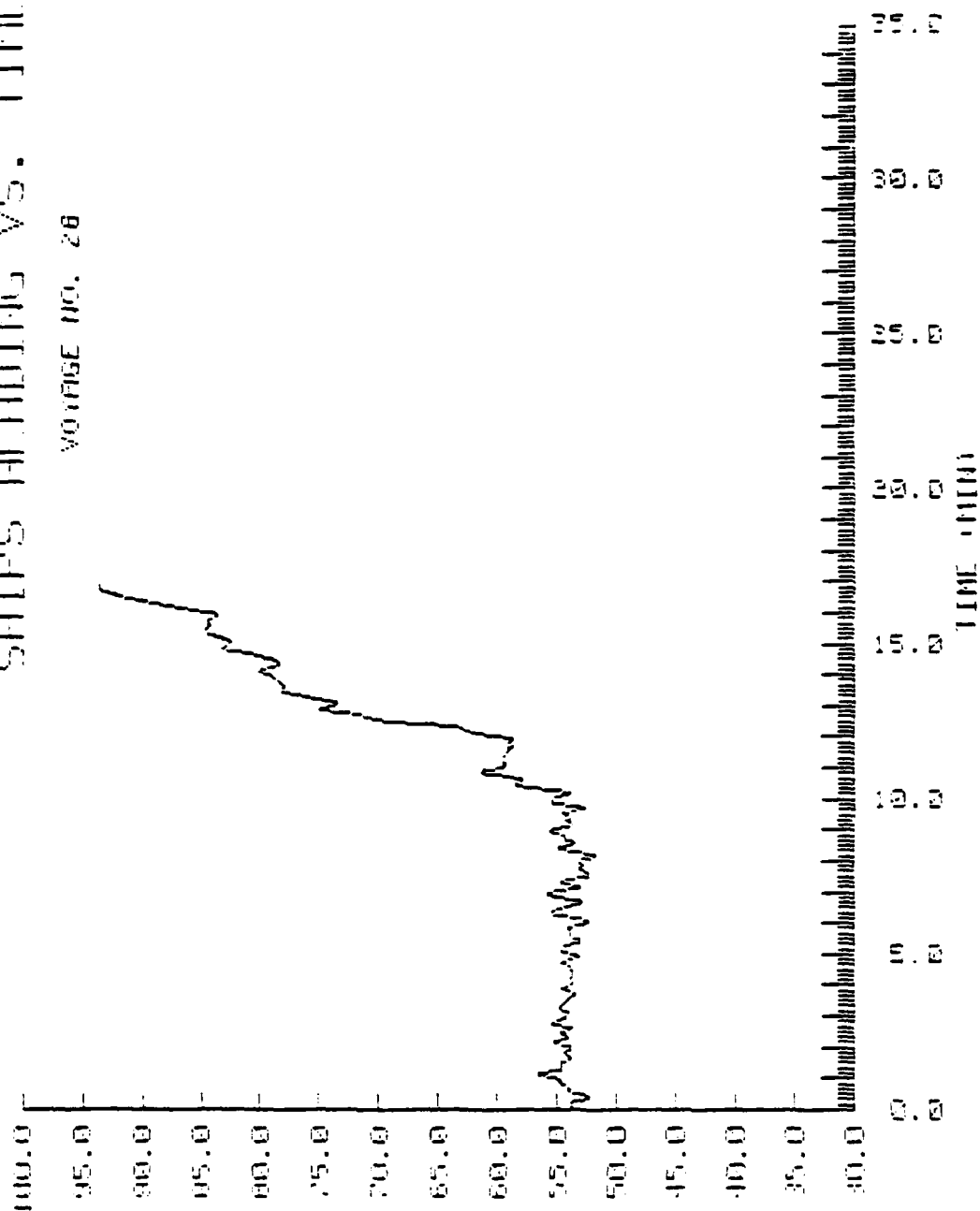
VOYAGE NO. 26 SHIP TRACK

SCHE 1: 30000



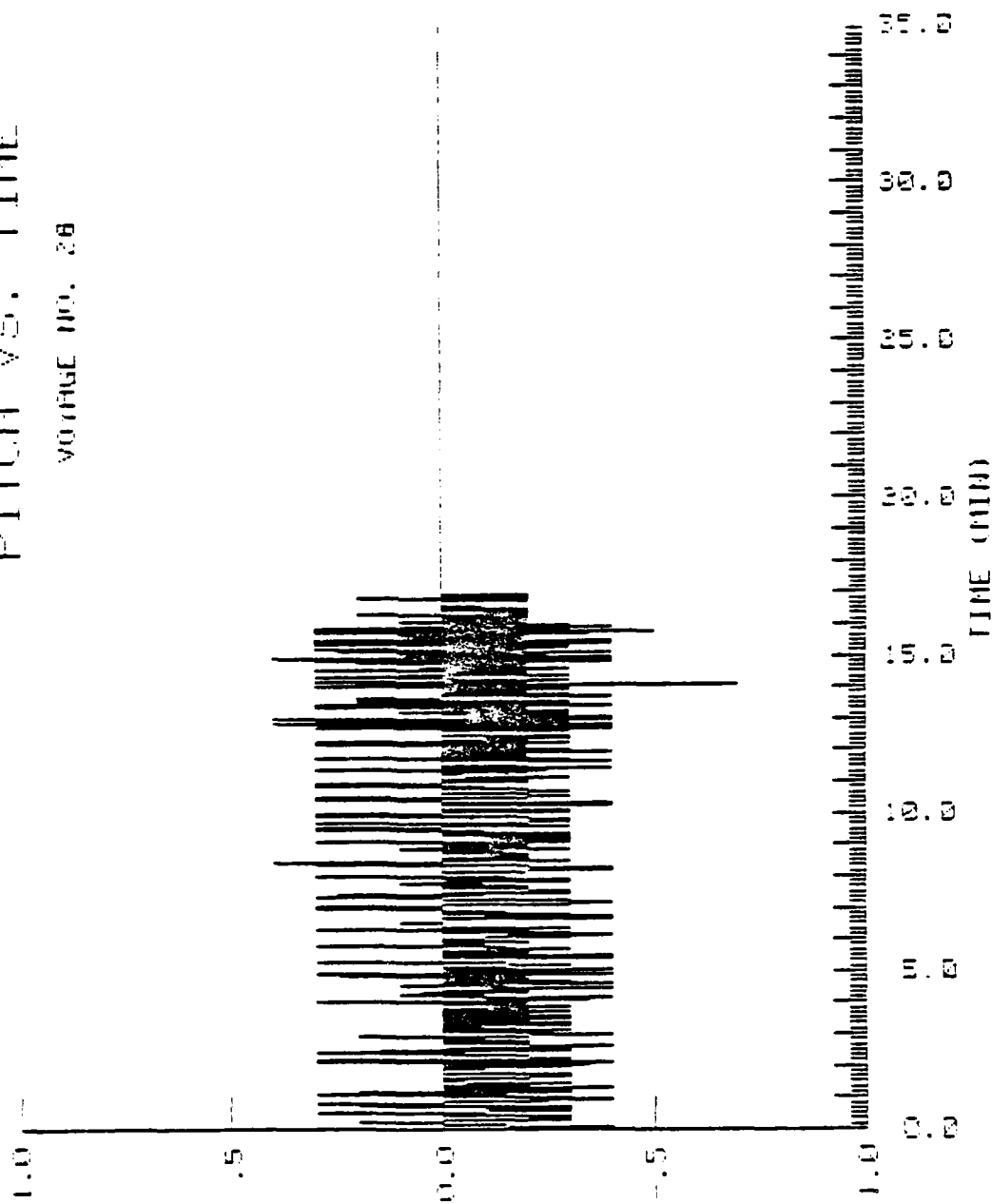
SHIPS HEADING VS. TIME

VOYAGE NO. 28



PITCH VS. TIME

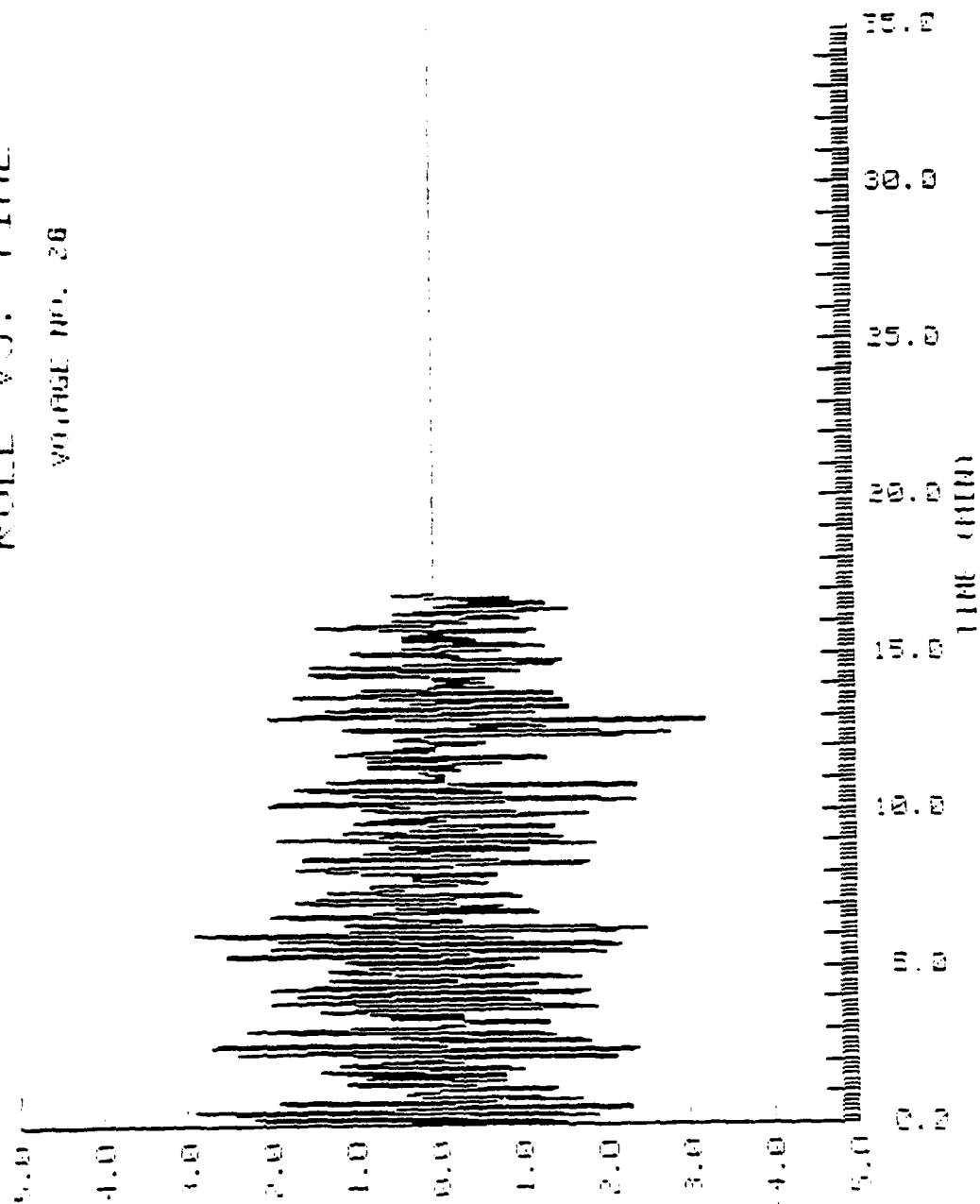
VOLUME NO. 28



1961-12-11

ROLL VS. TIME

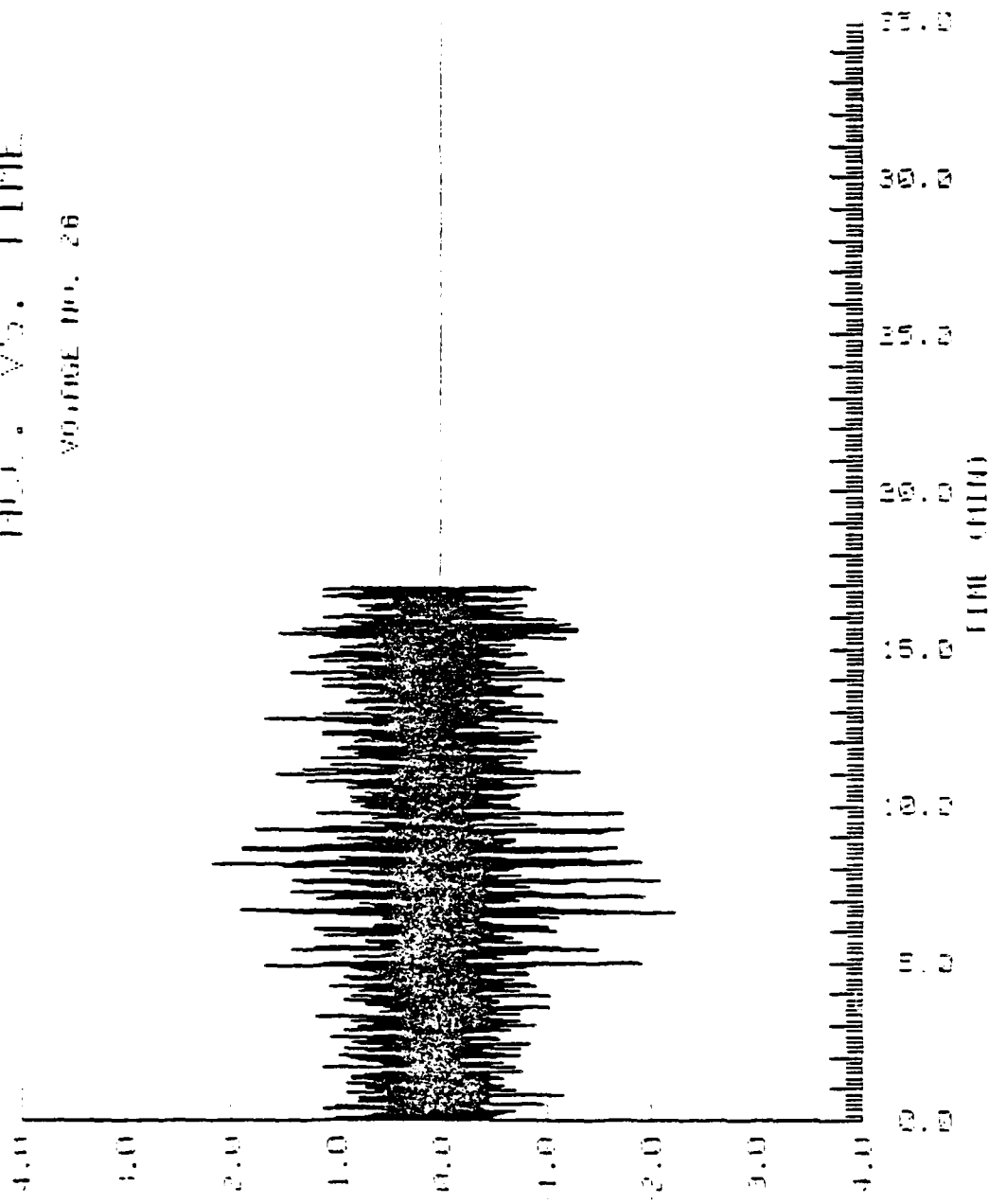
VORAGE NO. 26



0001 1116

NOISE VS. TIME

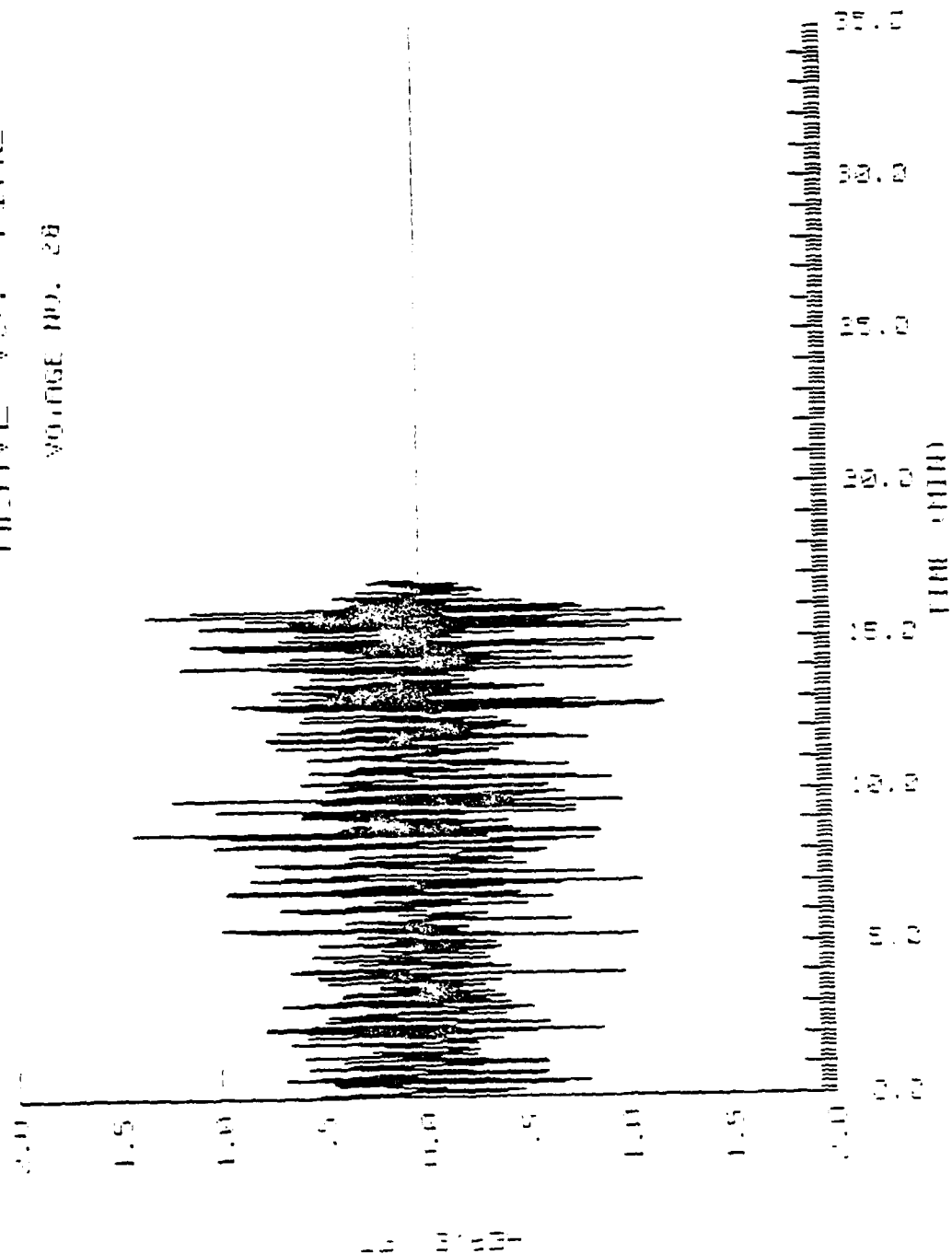
VOLUME 100, 26



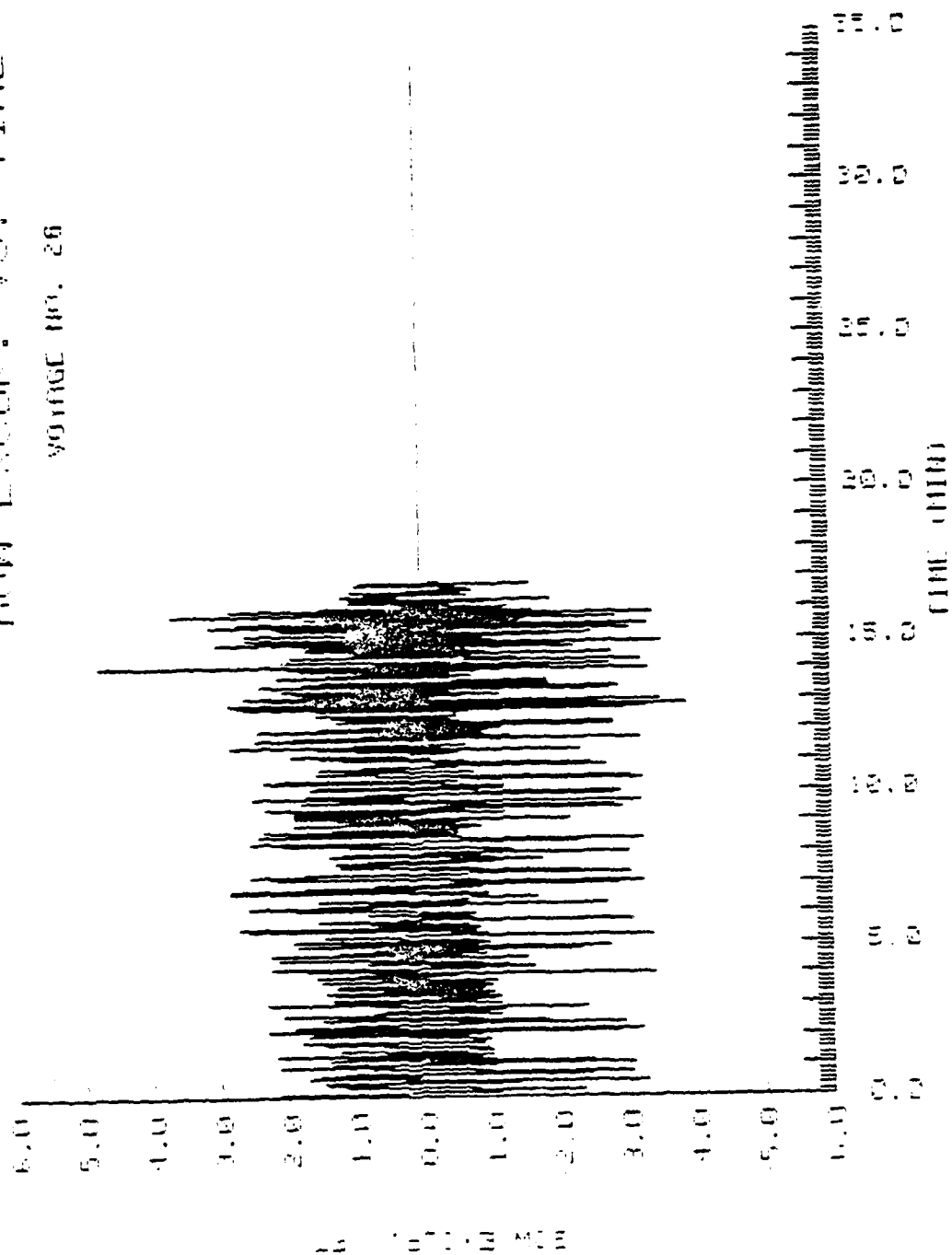
NOISE VS. TIME

HEAVE VS. TIME

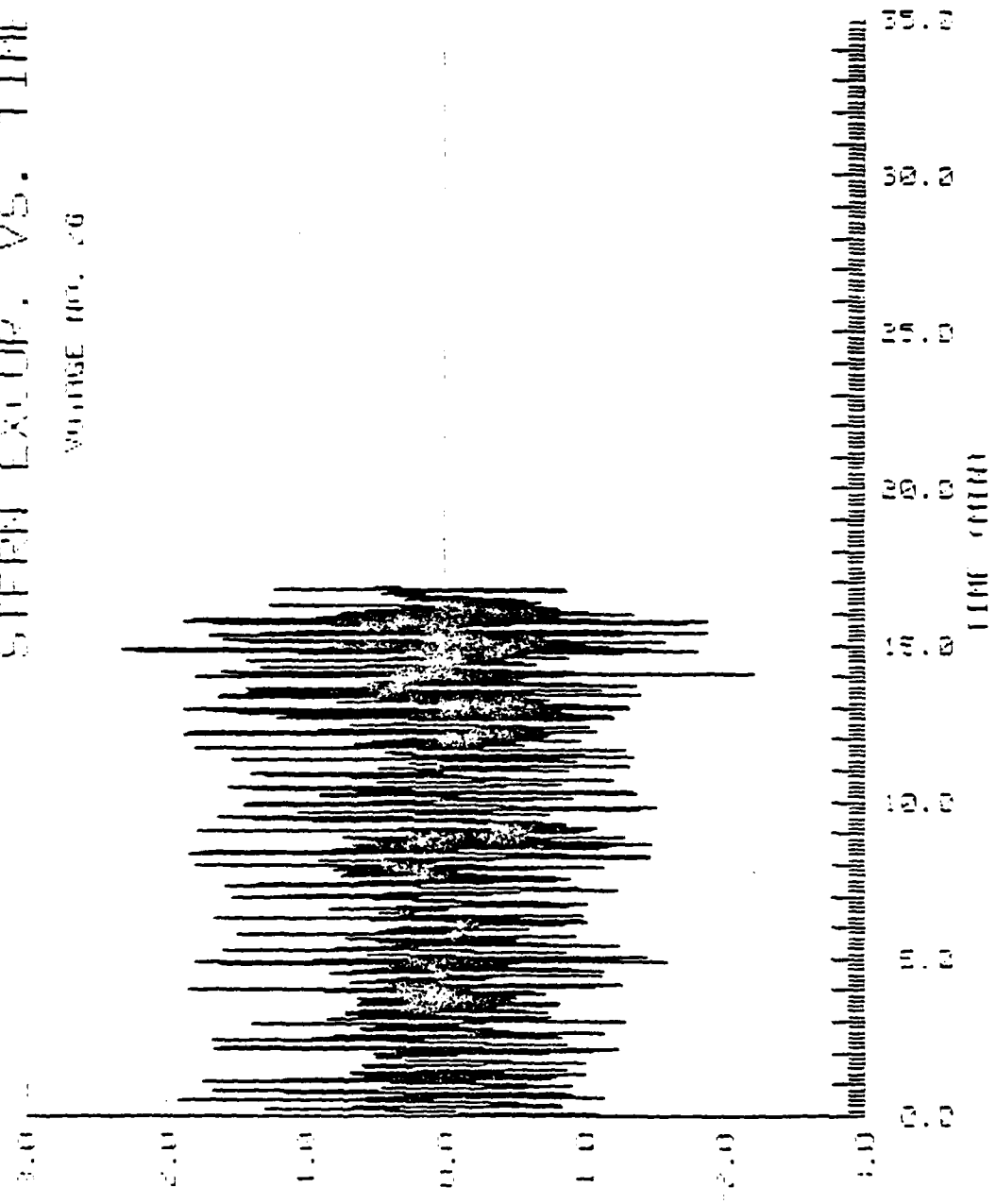
VOYAGE NO. 28



FROM EXCUR. VS. TIME YOUNG NO. 26



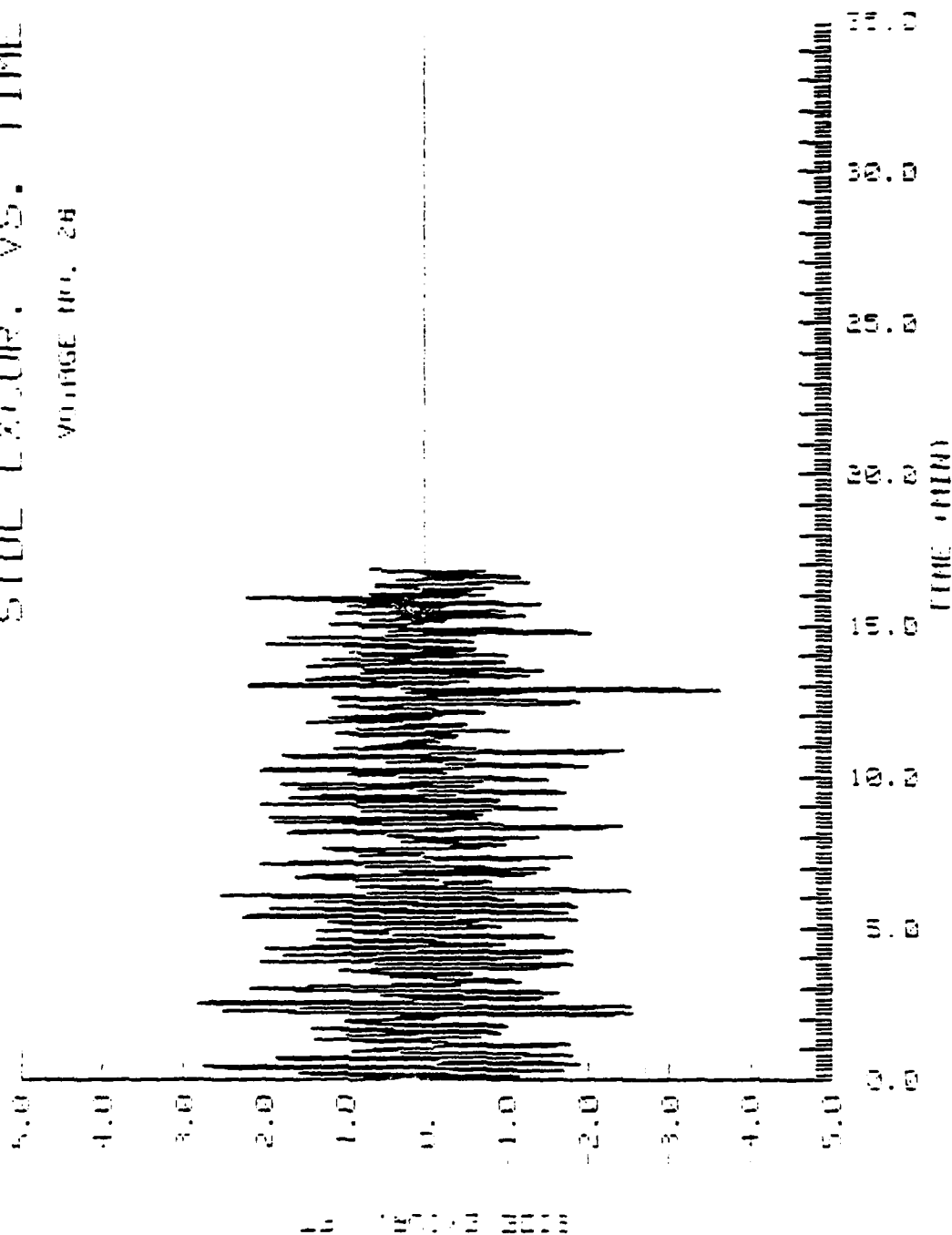
SUPERN EXCUR. VS. TIME
VOLTAGE 100, 20



14-00000-100000

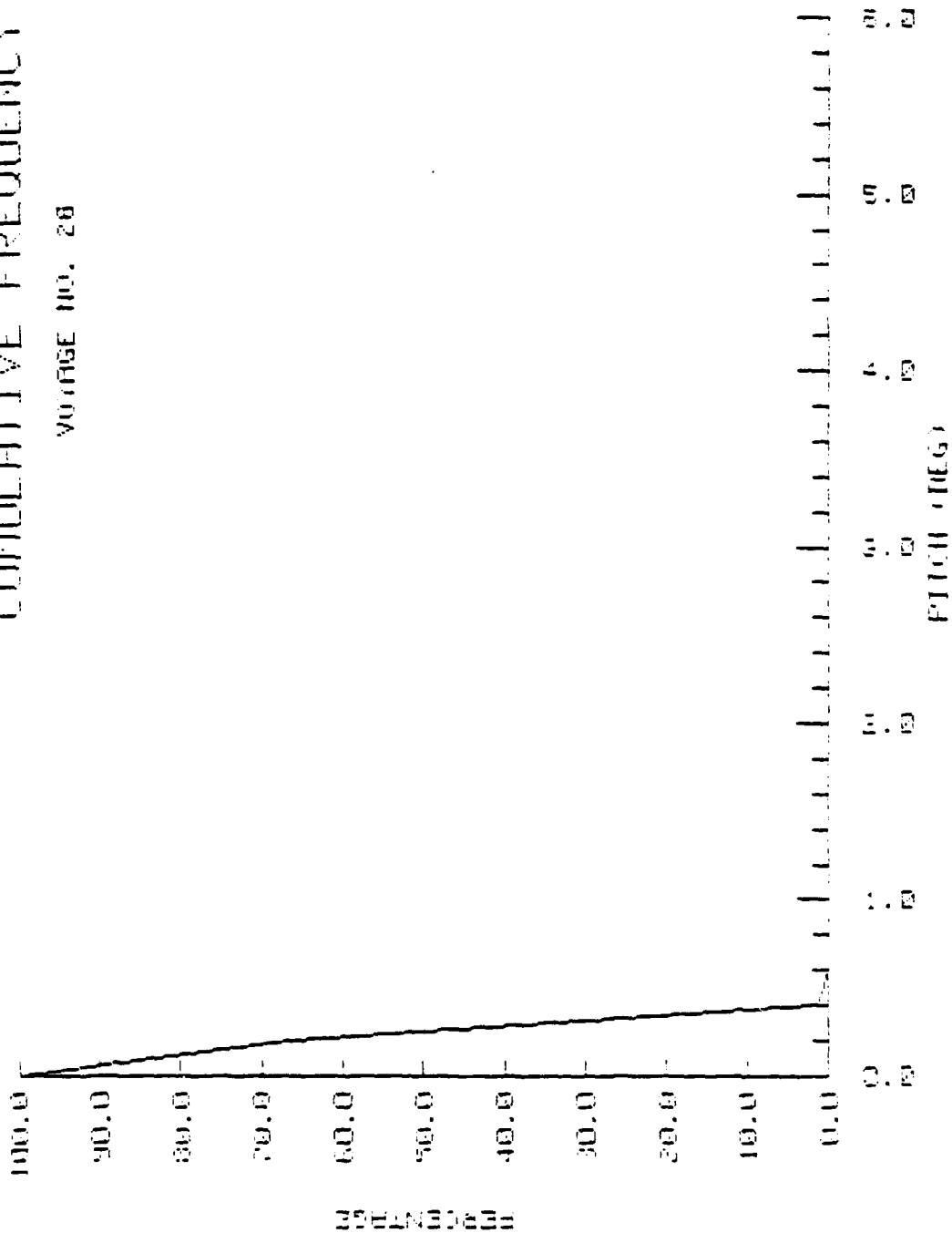
SIDE LACUR. VS. TIME

VOLUME 100, 20



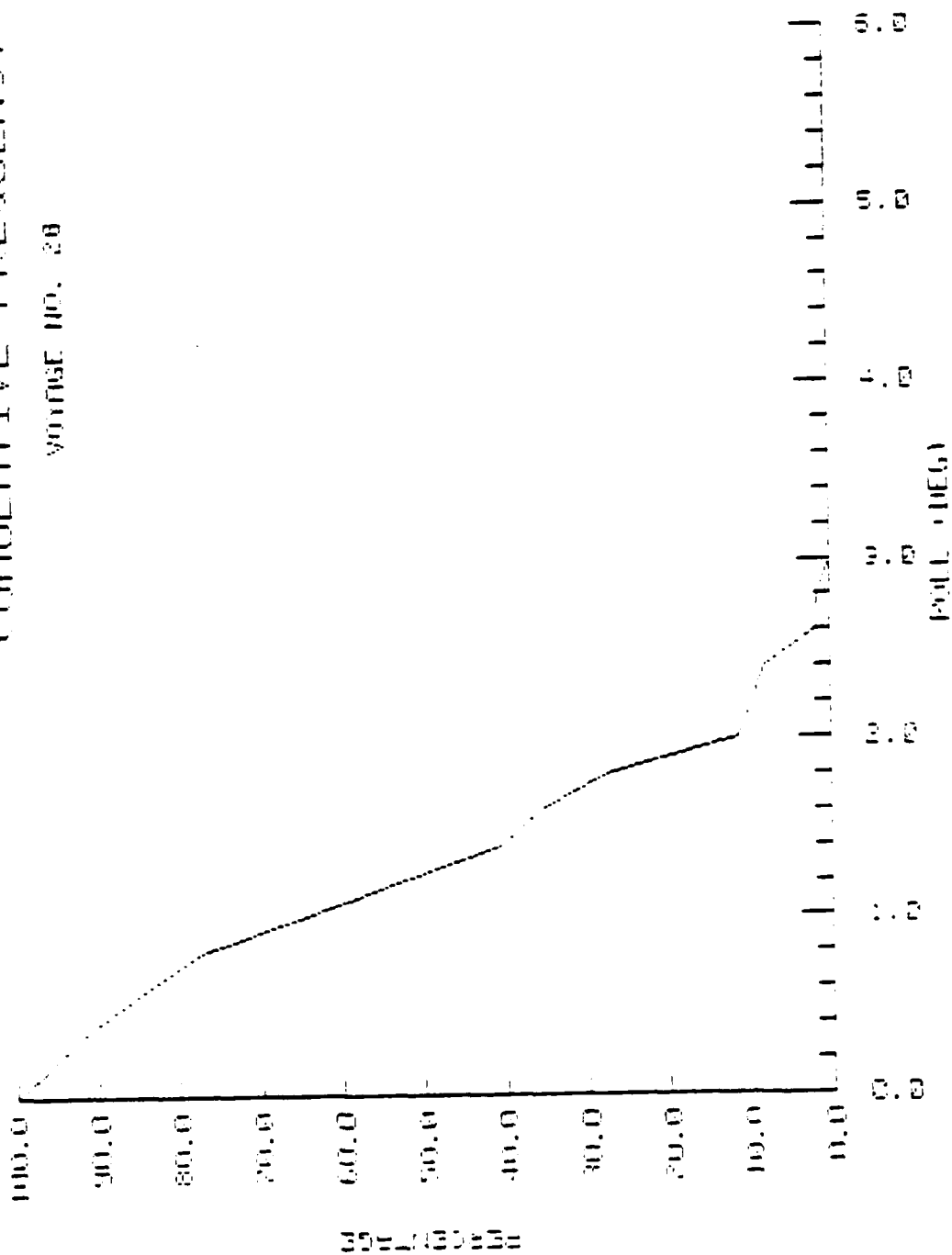
CUMULATIVE FREQUENCY

VOLUME NO. 28



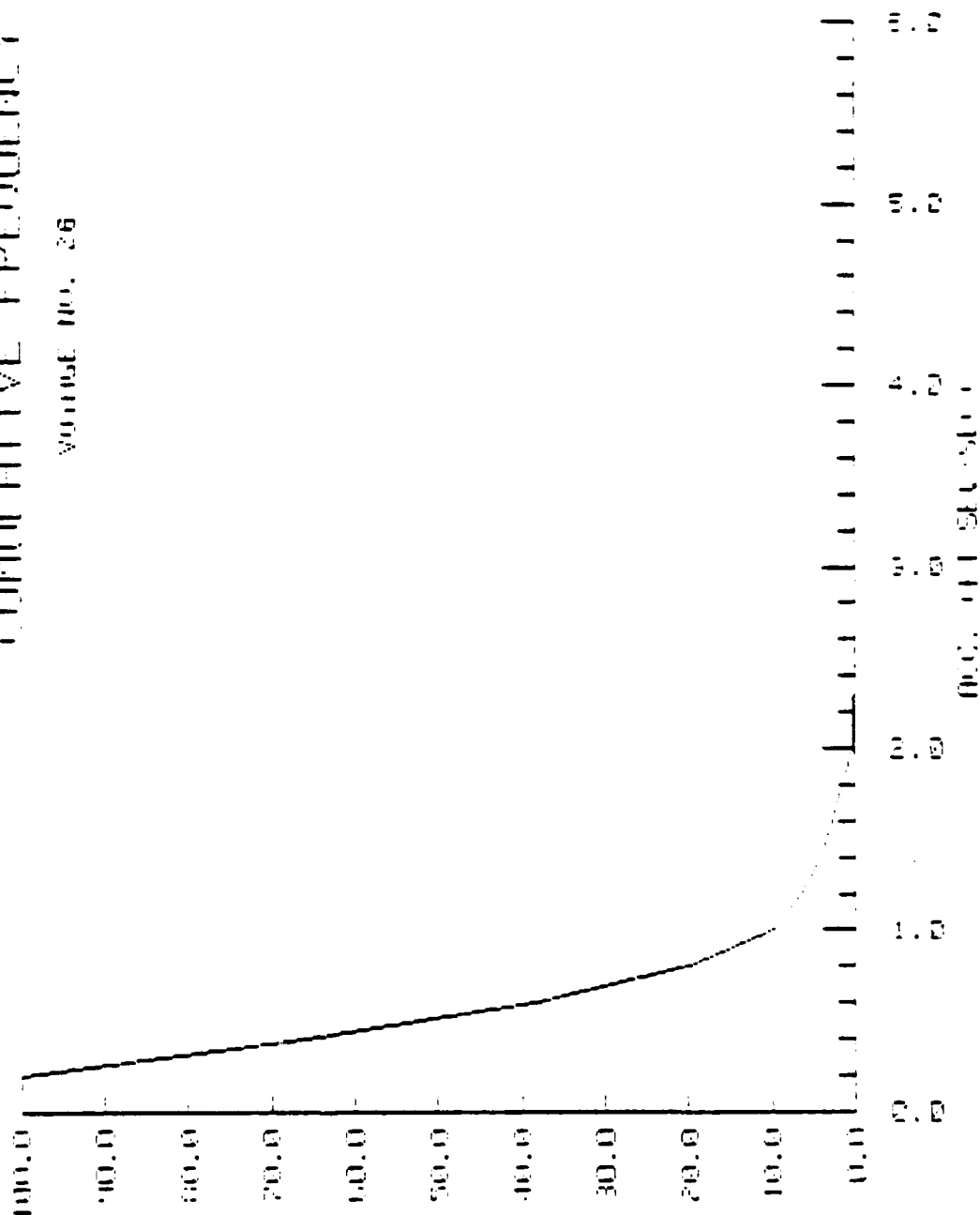
CUMULATIVE FREQUENCY

YOUNG NO. 20



CUMULATIVE FREQUENCY

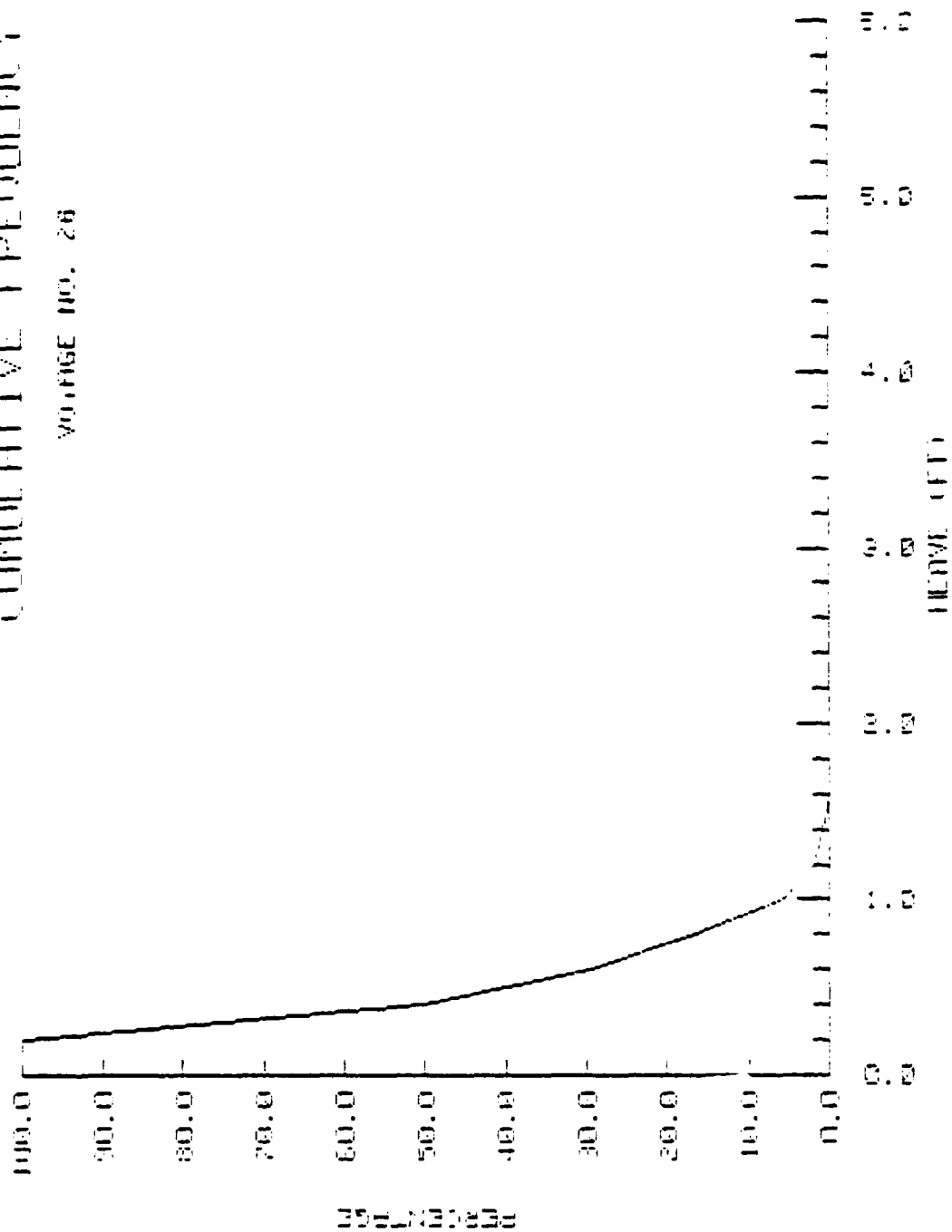
TABLE NO. 26



300-14037-630

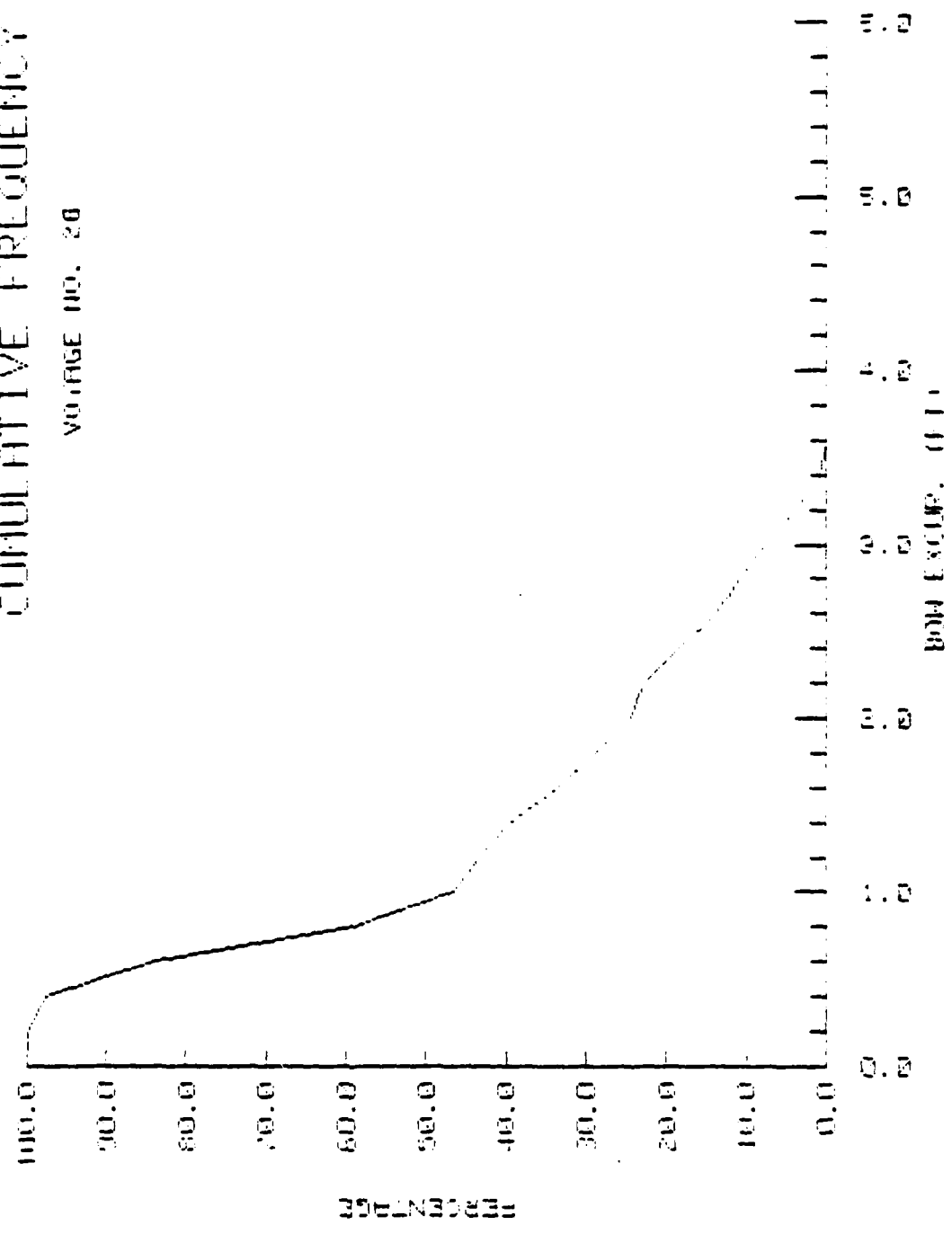
CUMULATIVE FREQUENCY

VOYAGE NO. 26



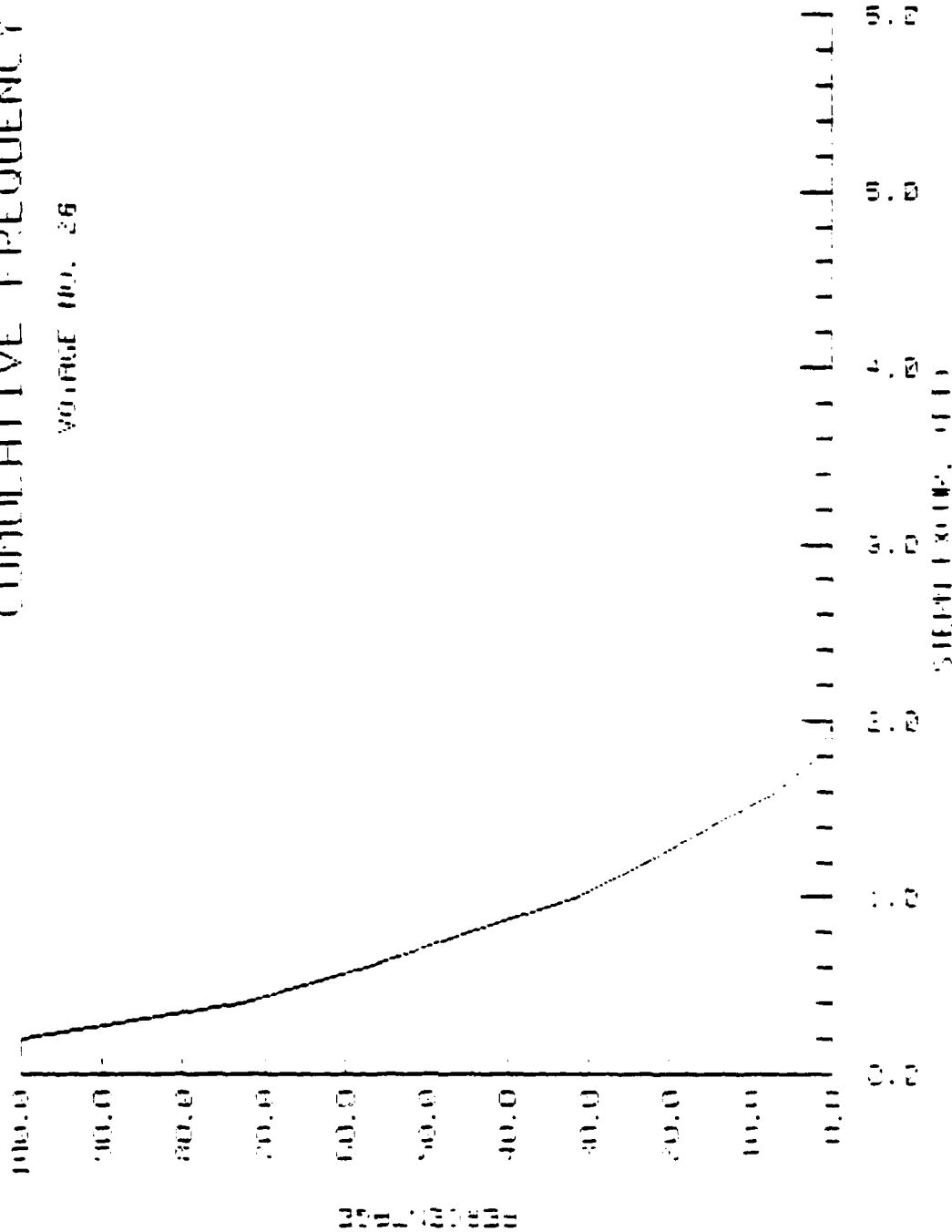
CUMULATIVE FREQUENCY

VOLAGE NO. 20



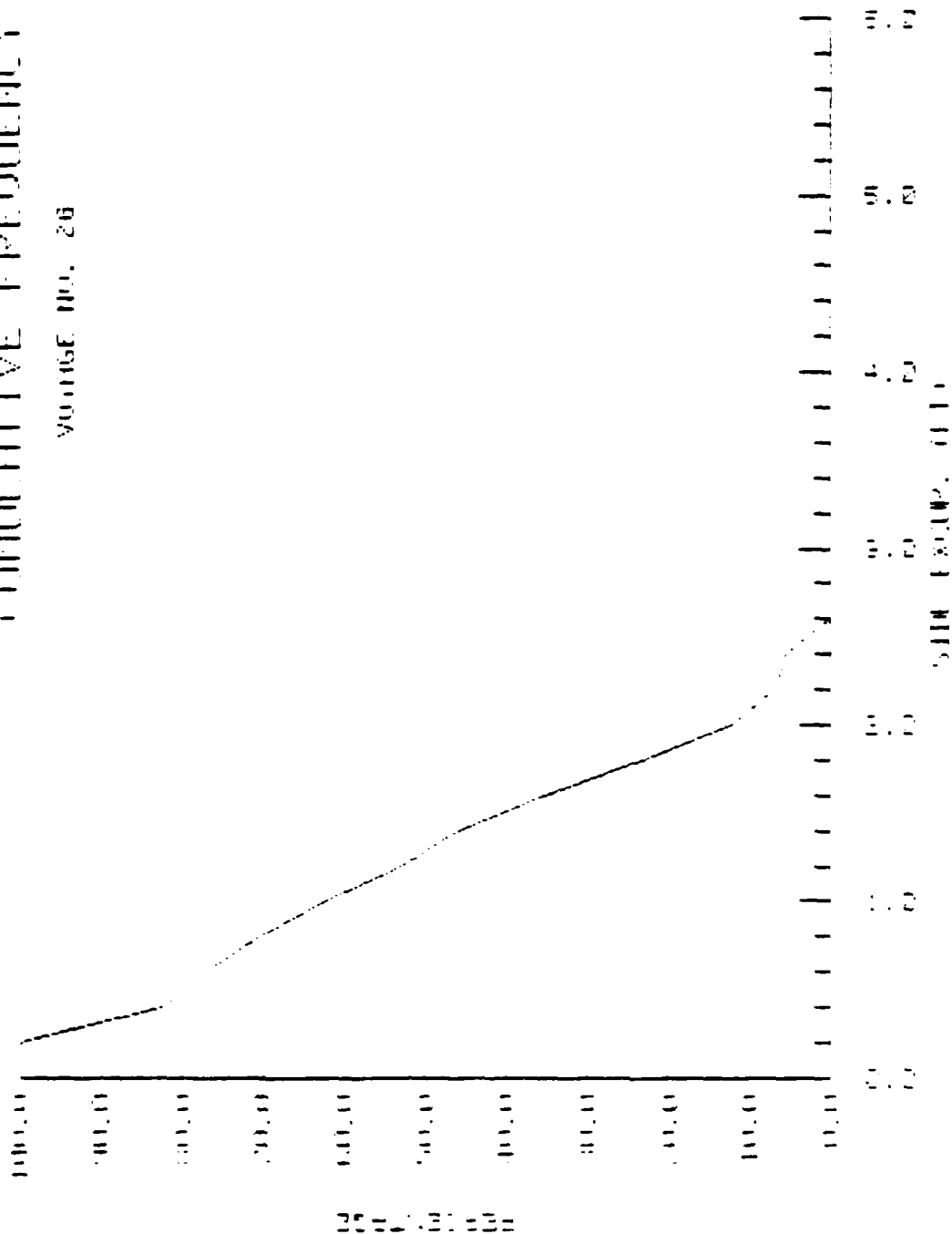
CUMULATIVE FREQUENCY

VOLUME NO. 26



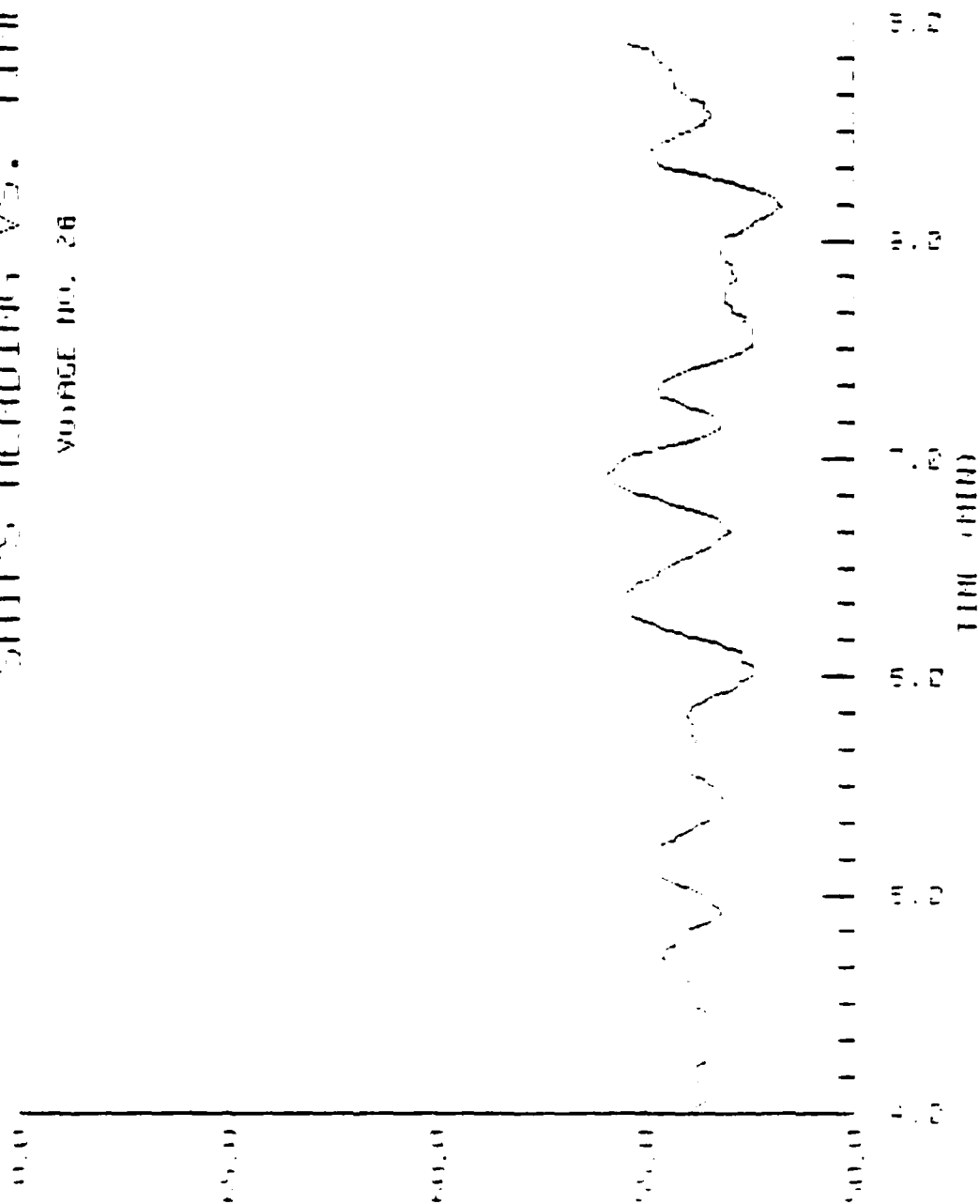
CUMULATIVE FREQUENCY

YOUNG NO. 26



SHIPS HOLDING VS. TIME

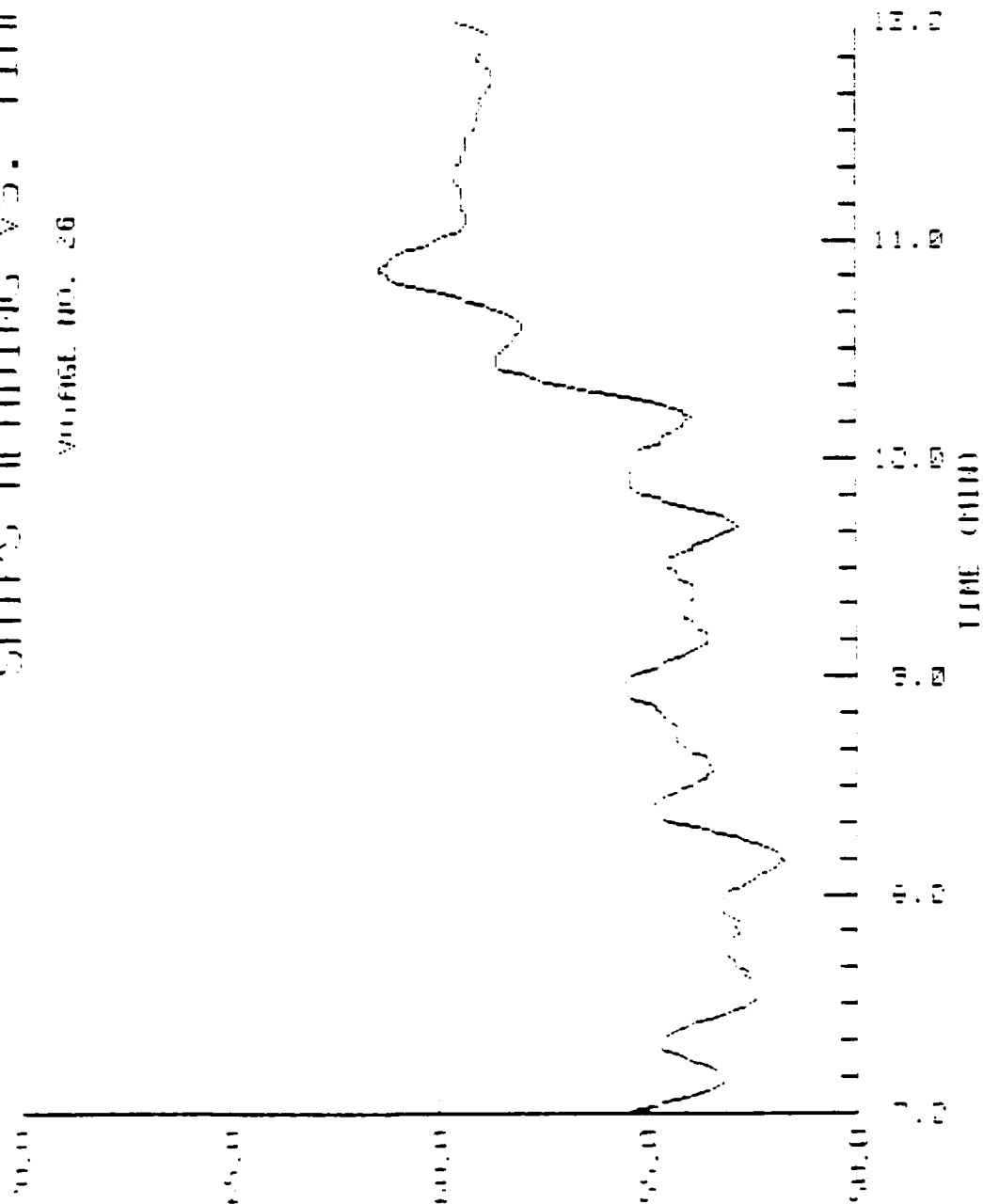
VOLUME NO. 26



130 0.00-0.01 0.01-0.02

SAMPLES INCLUDING VS. TIME

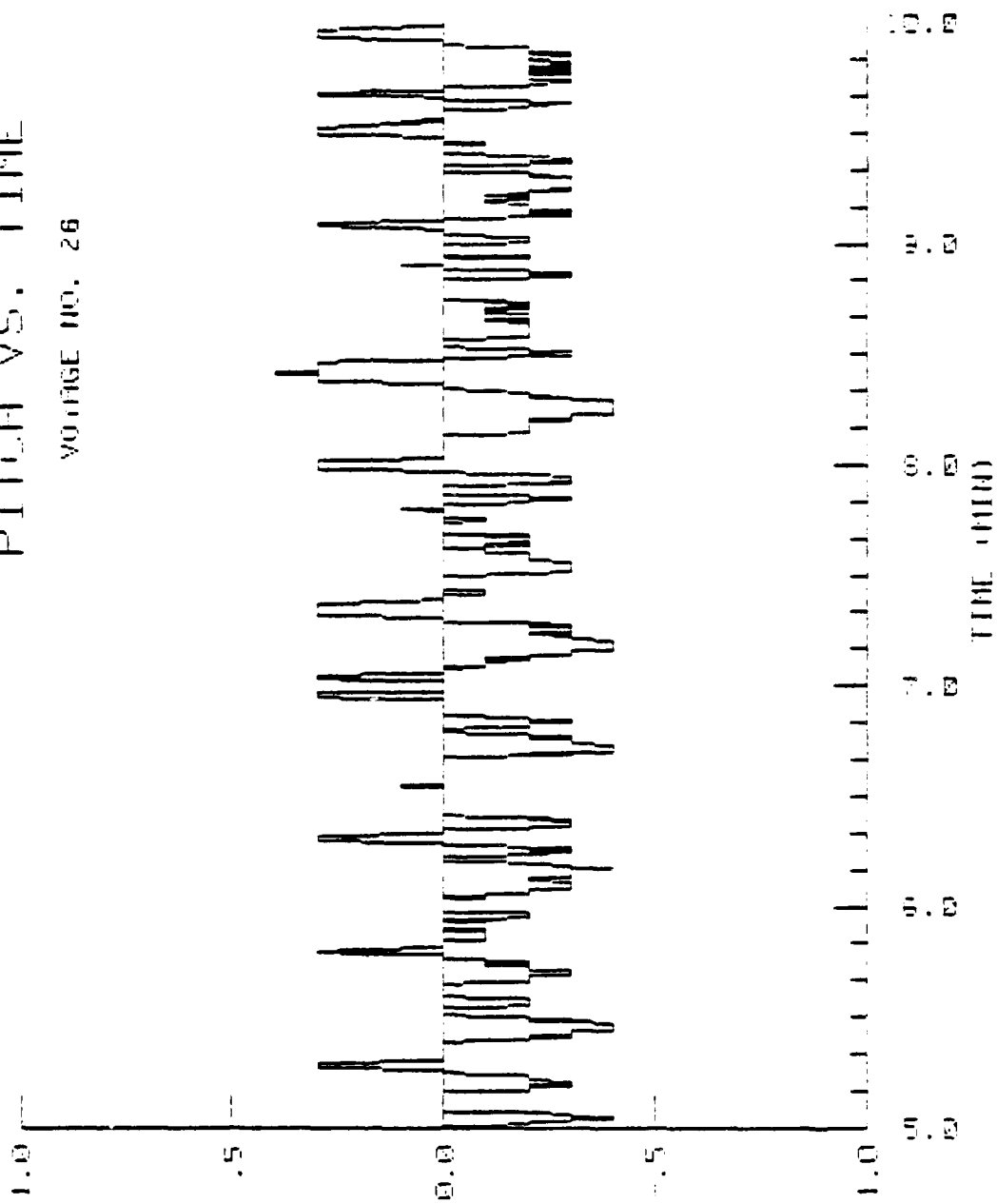
VOLUME NO. 26



100 0.00000-0.00000

PITCH VS. TIME

VOICE NO. 26



PITCH (DEG)

POLL. VS. TIME

VOLUME 100, 20

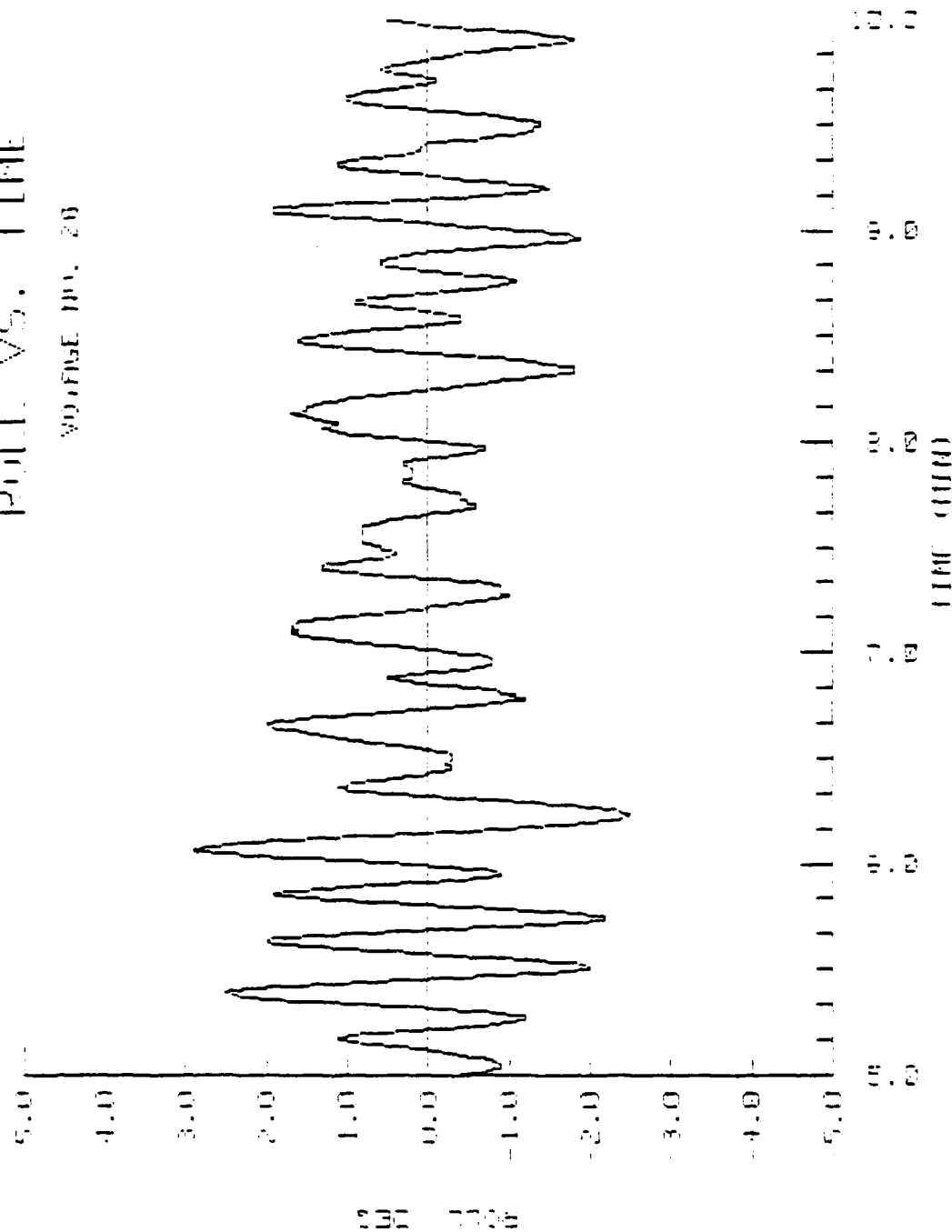
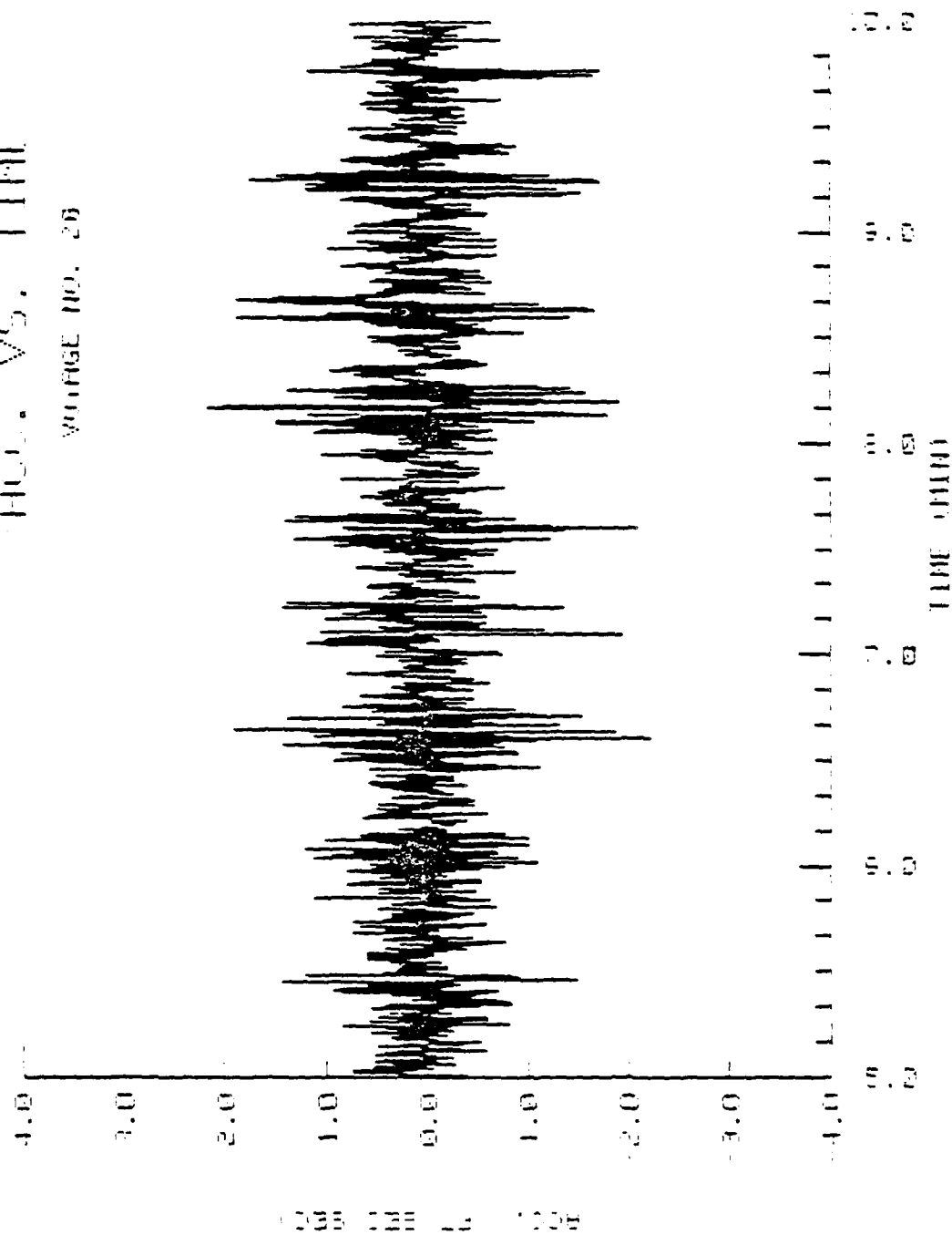


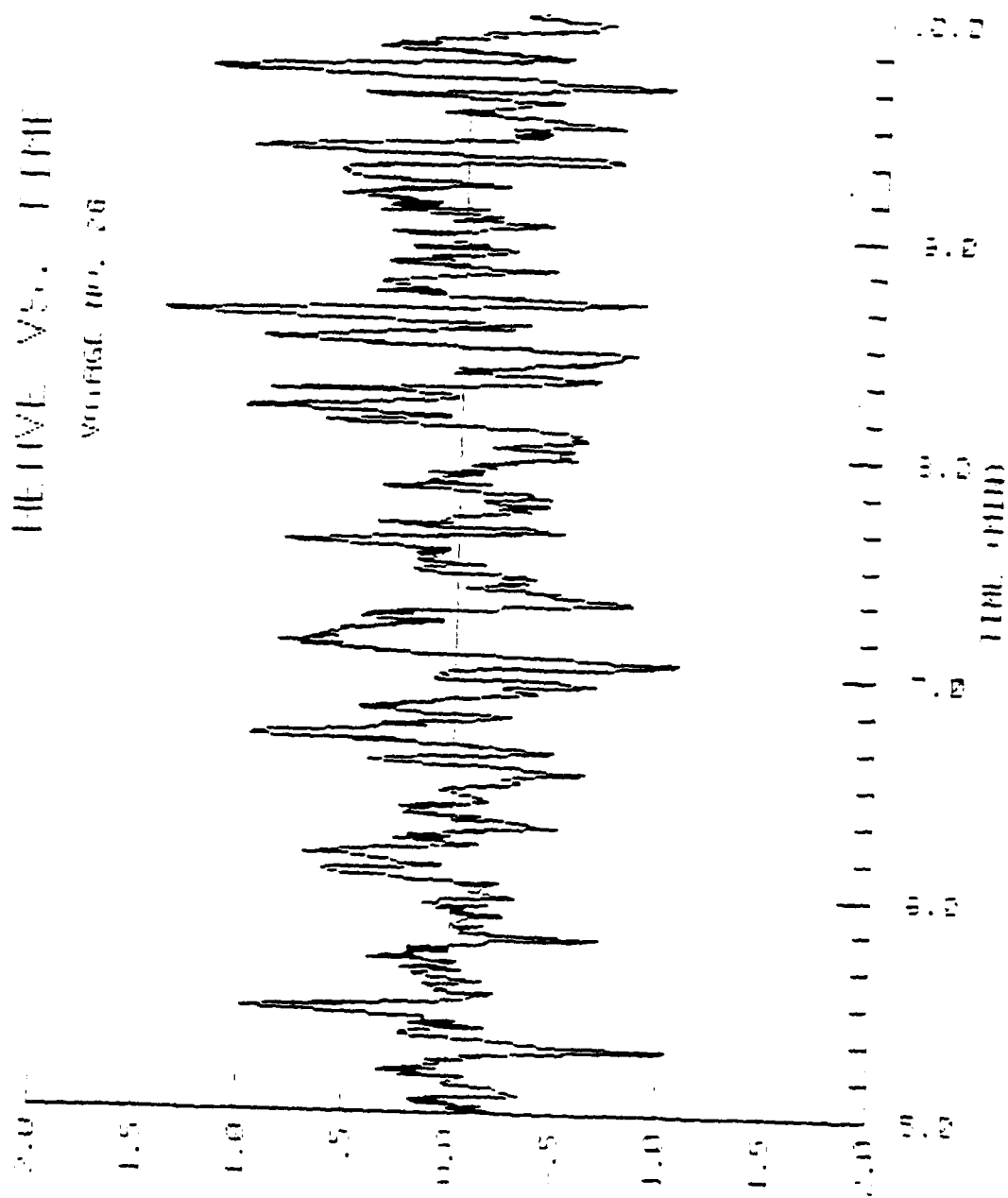
FIG. VS. TIME

VOLUME NO. 25



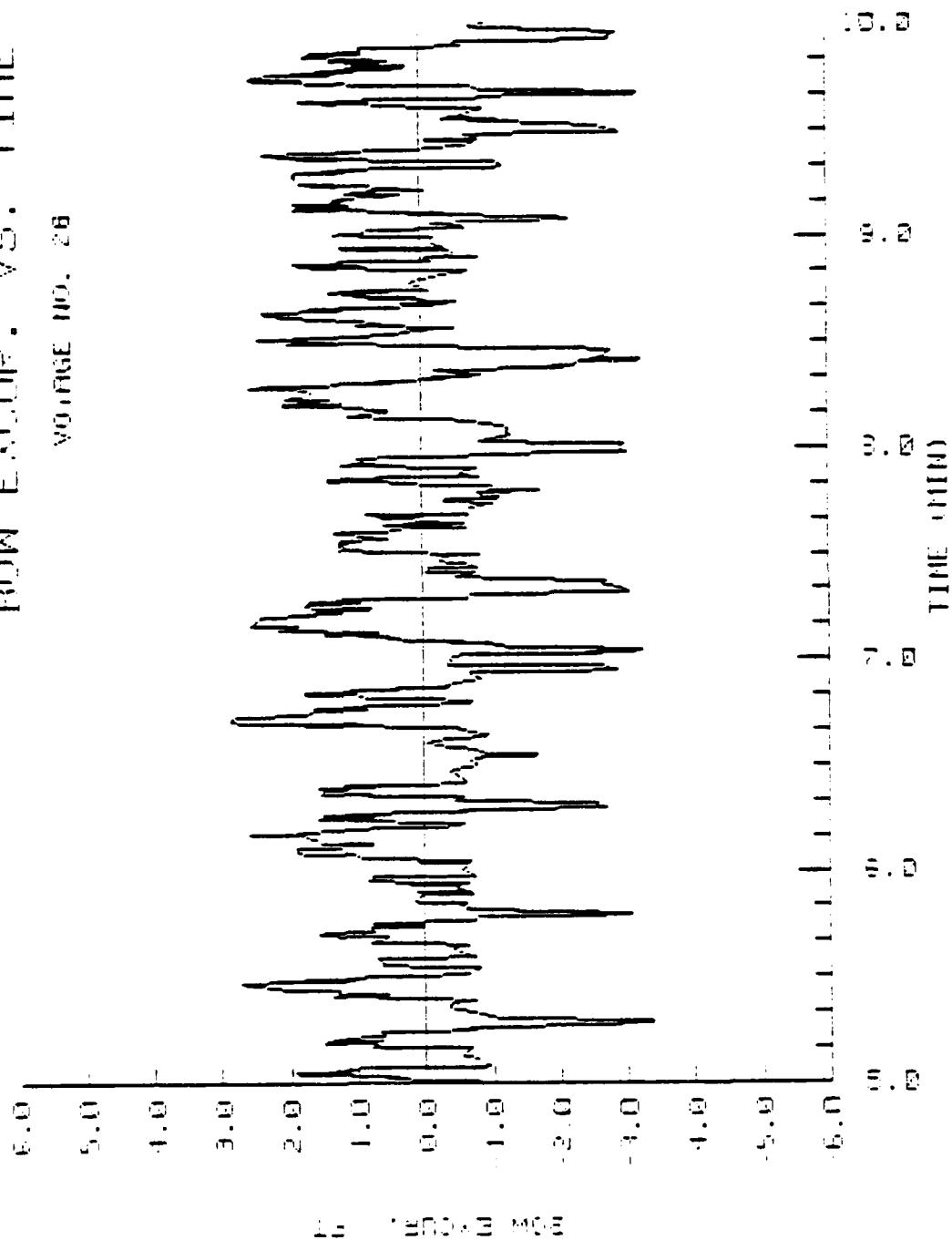
HEIWE V5. 1111

YOUNG 100. 20

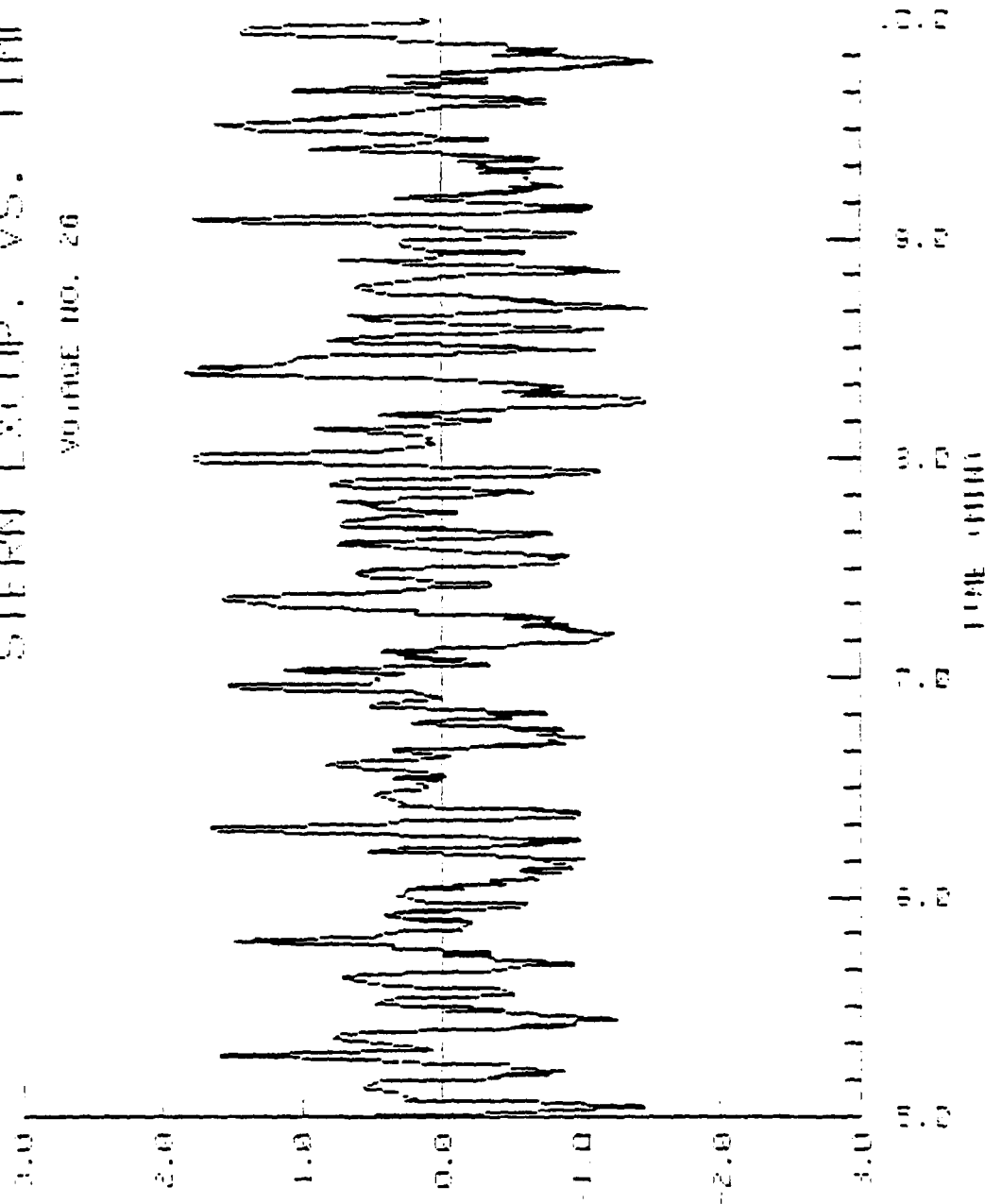


ROW EXCUR. VS. TIME

VOLUME NO. 28



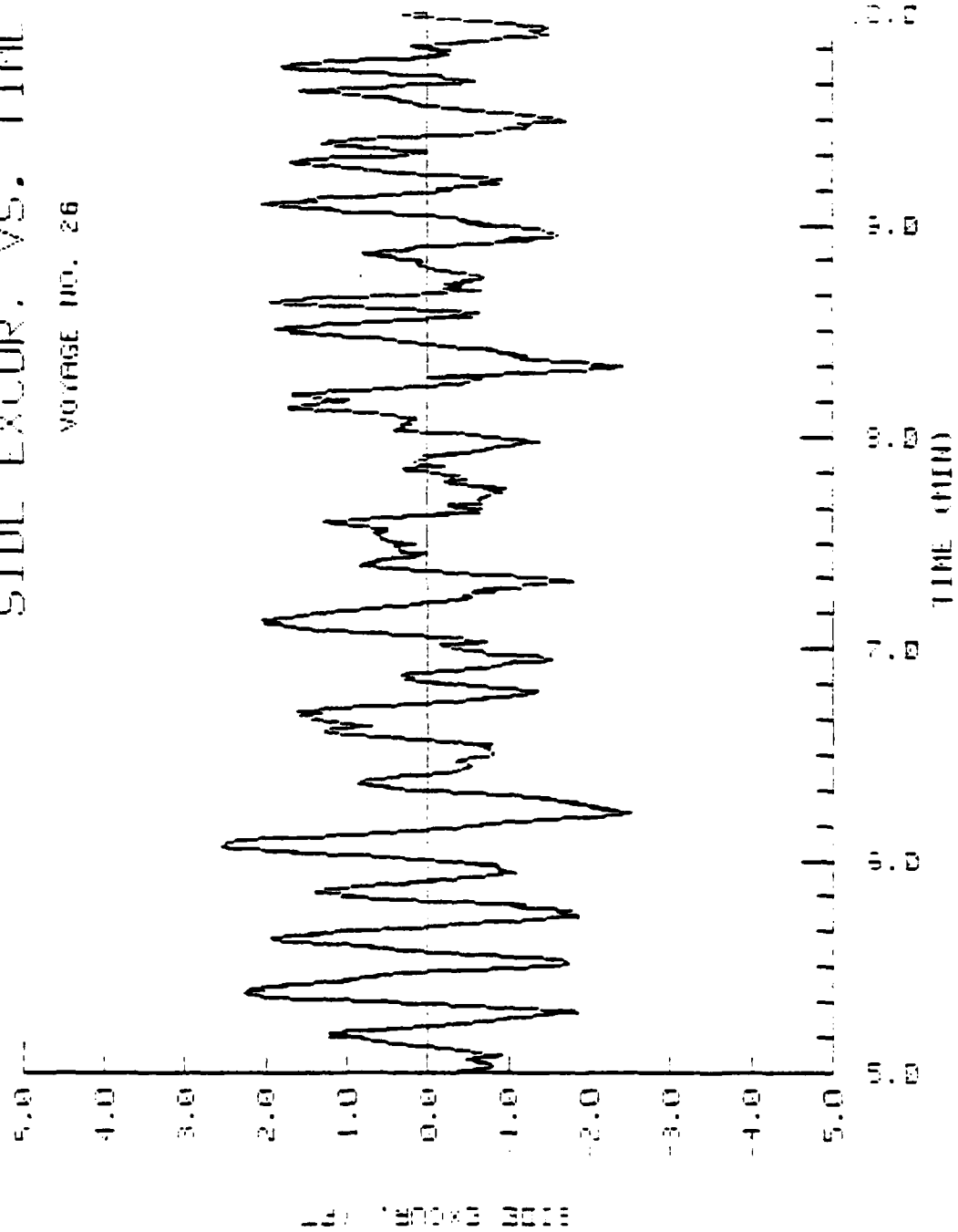
STERN EXCIP. VS. TIME VOYAGE NO. 26



STERN EXCIP. VS. TIME

SIDE EXCUR. VS. TIME

VOYAGE NO. 26



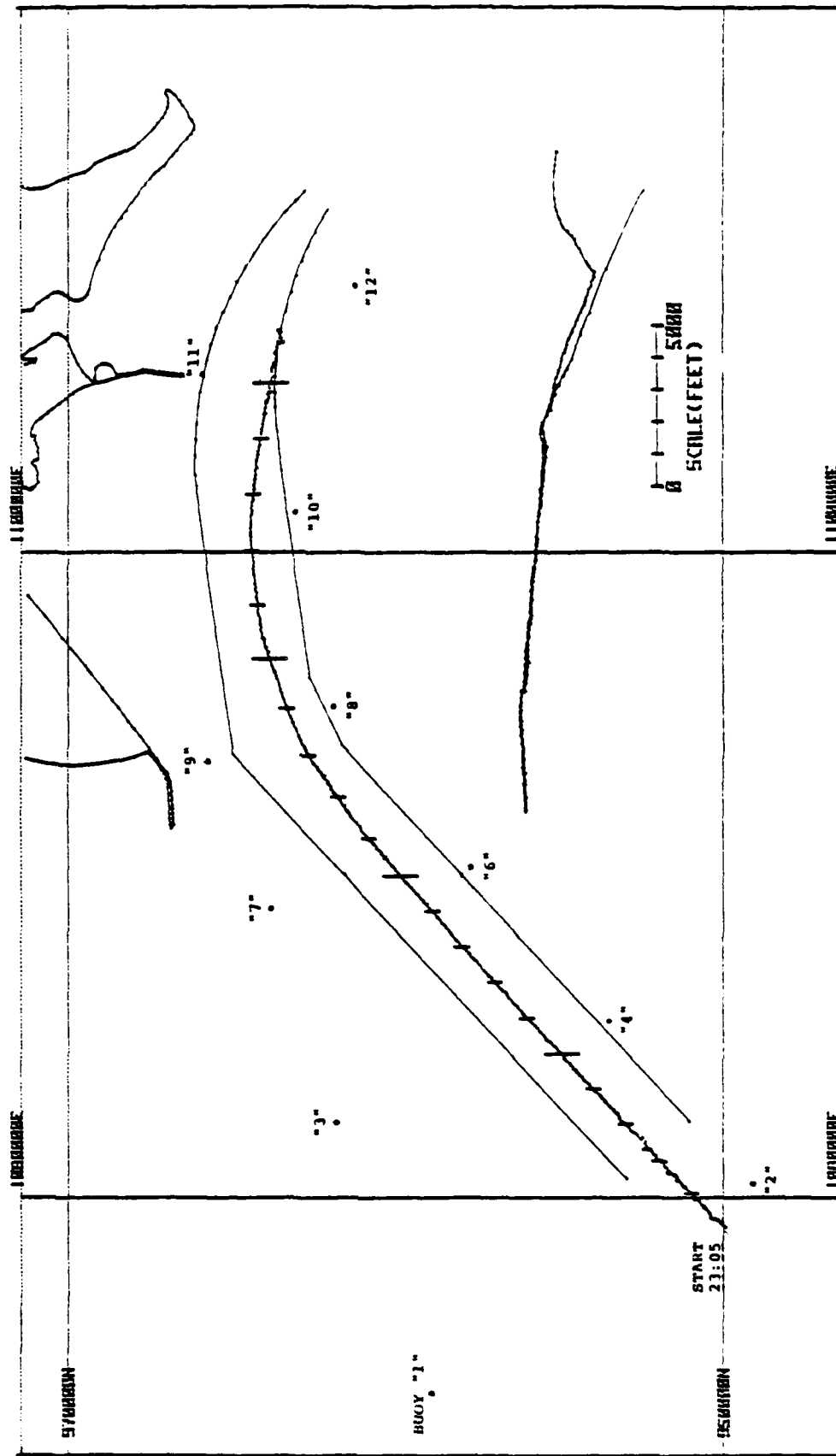
STATISTICAL SUMMARY

VOTAGE NO. 27

	HEAD LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	-1.9	.9	.5	.5
ROLL (DEG)	-1.1	5.4	2.2	2.5
YOC (FT/SEC/SEC)	.0	1.6	.6	.7
HEAVE (FT)	.0	1.9	.9	1.0
ROLL EXCUR. (FT)	.0	7.2	3.0	3.5
SHIP EXCUR. (FT)	.1	3.7	1.6	1.8
SIDE EXCUR (FT)	.0	5.8	2.0	2.3

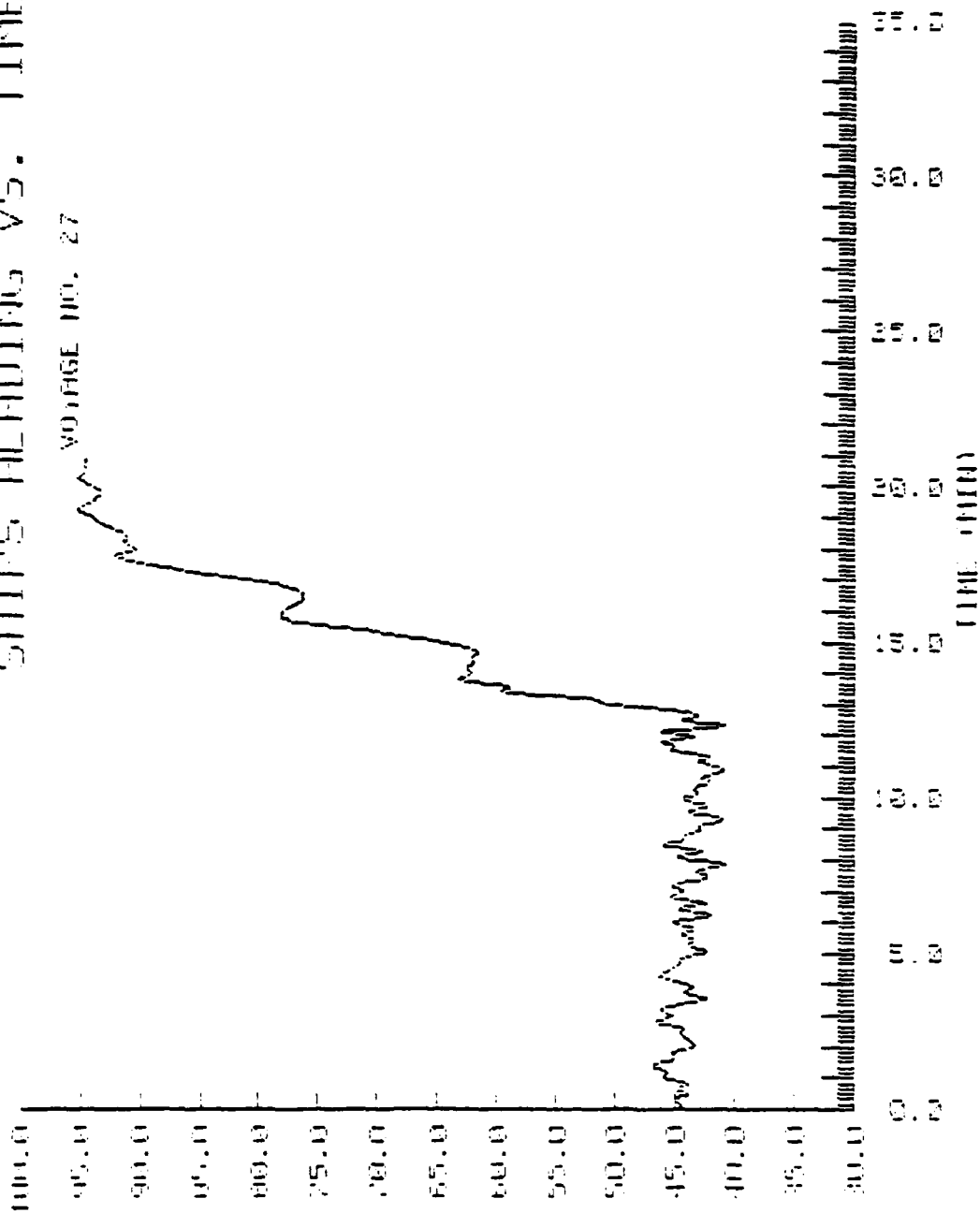
VOYAGE NO. 27 SHIP TRACK

SCALE 1" = 3000'



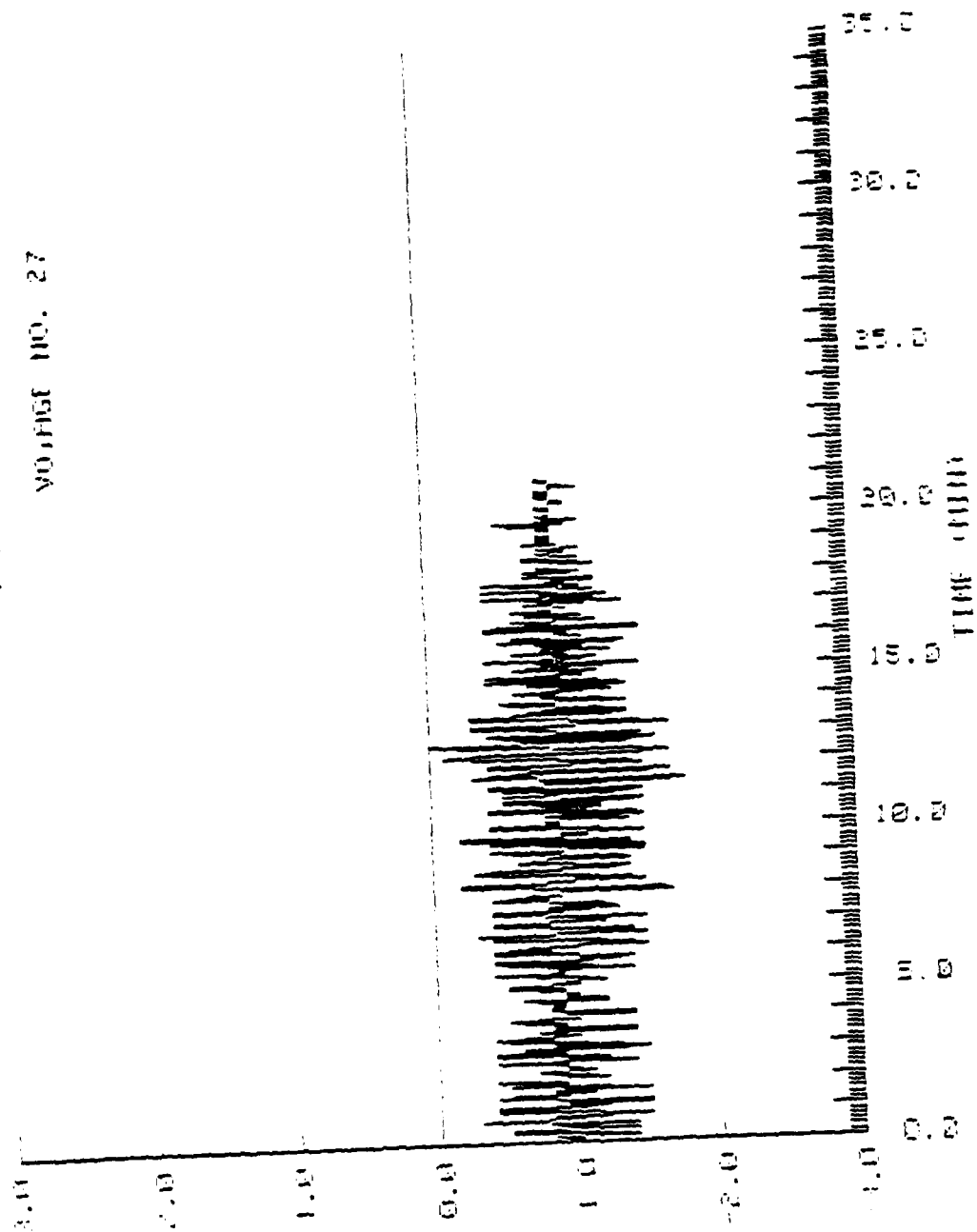
SHIPS HEADING VS. TIME

VOLUME NO. 27



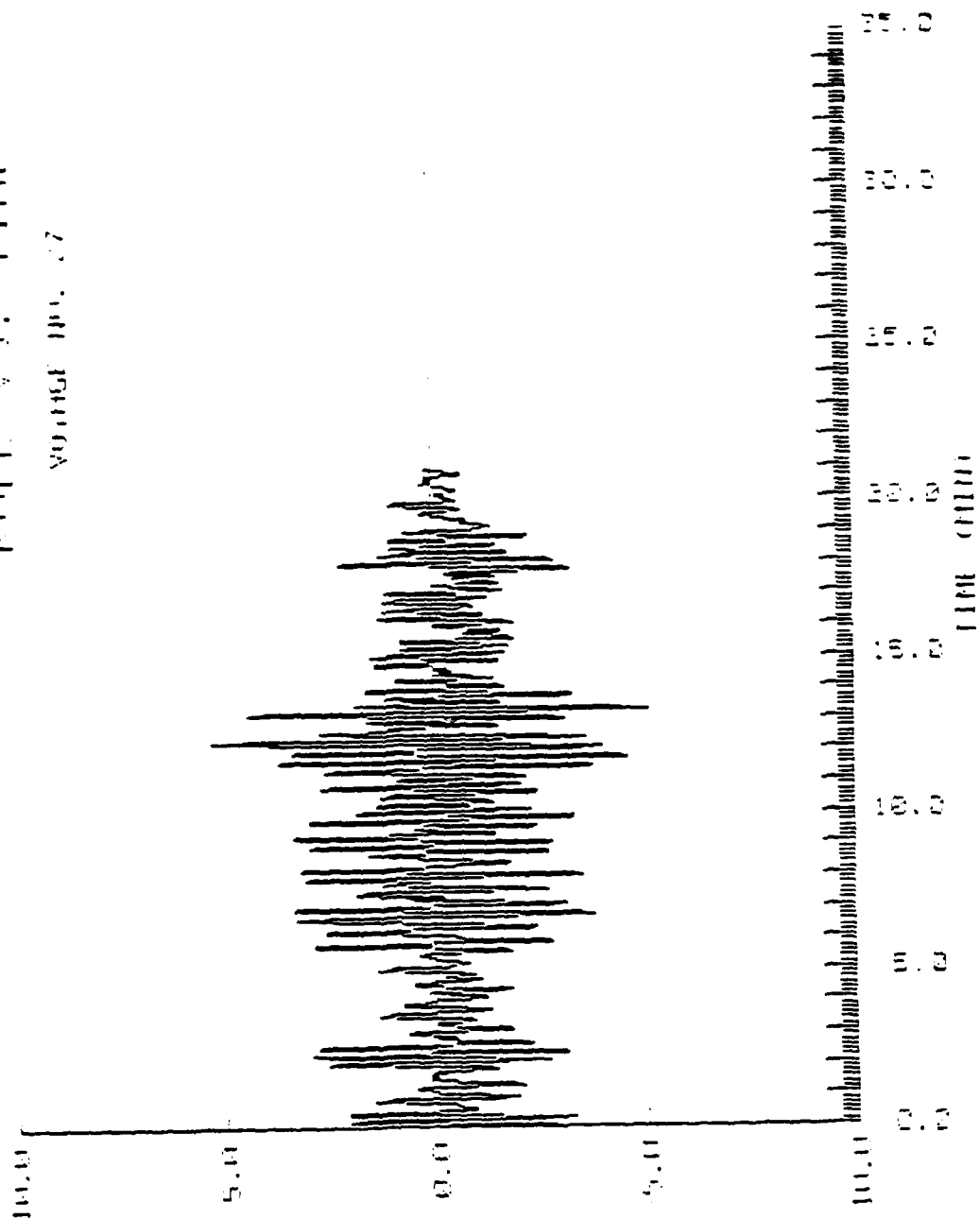
PITCH VS. TIME

VOICED NO. 27



POLY. V. 1111

VOLUME 100. 27



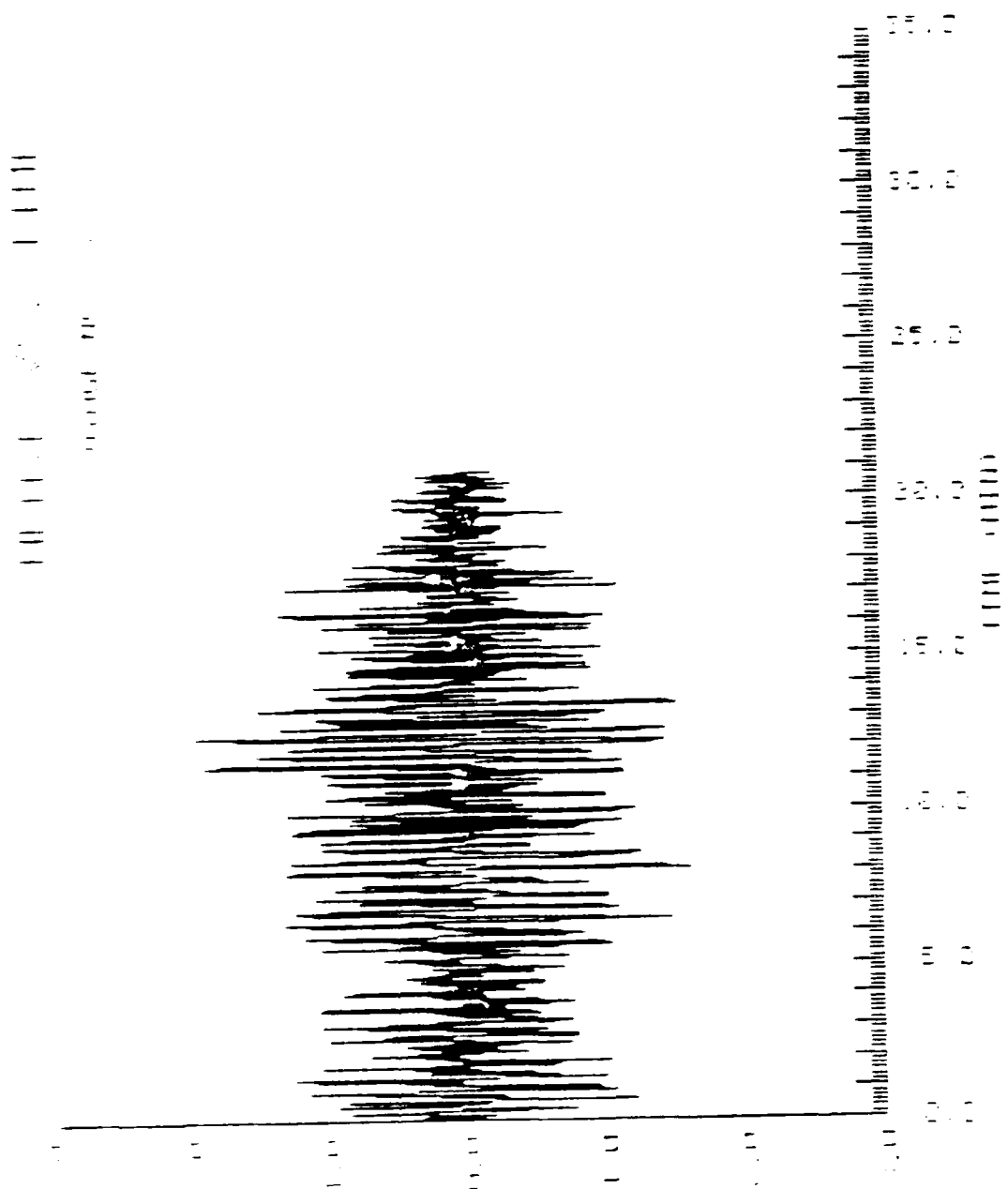
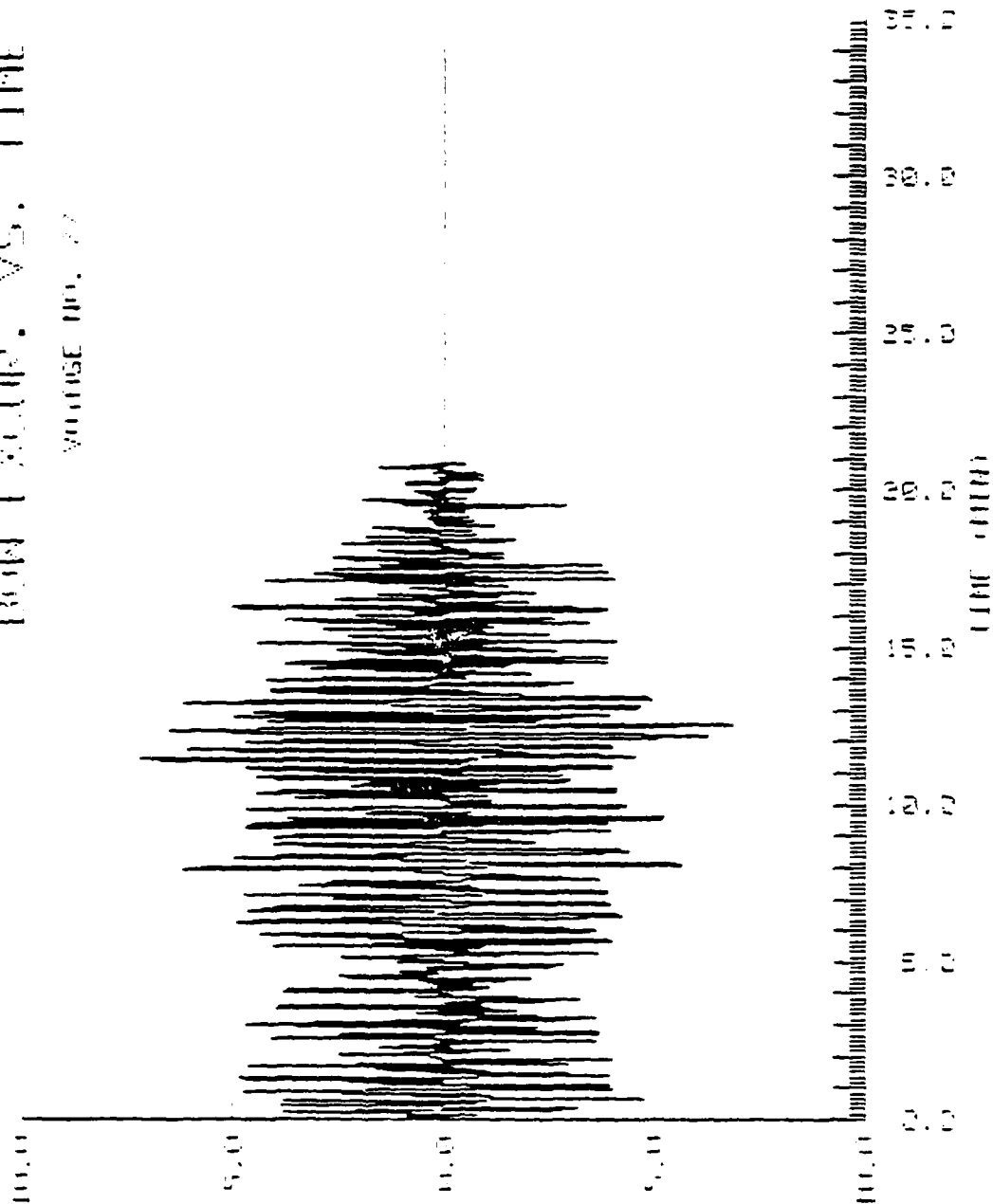


Figure 1. Schematic representation of the experimental design. The subjects were divided into two groups: the control group (n = 10) and the experimental group (n = 10). The control group received a placebo (P) and the experimental group received a 100 mg dose of the active ingredient (A). The subjects were then divided into two subgroups: the control subgroup (n = 5) and the experimental subgroup (n = 5). The control subgroup received a placebo (P) and the experimental subgroup received a 100 mg dose of the active ingredient (A). The subjects were then divided into two subgroups: the control subgroup (n = 5) and the experimental subgroup (n = 5). The control subgroup received a placebo (P) and the experimental subgroup received a 100 mg dose of the active ingredient (A).

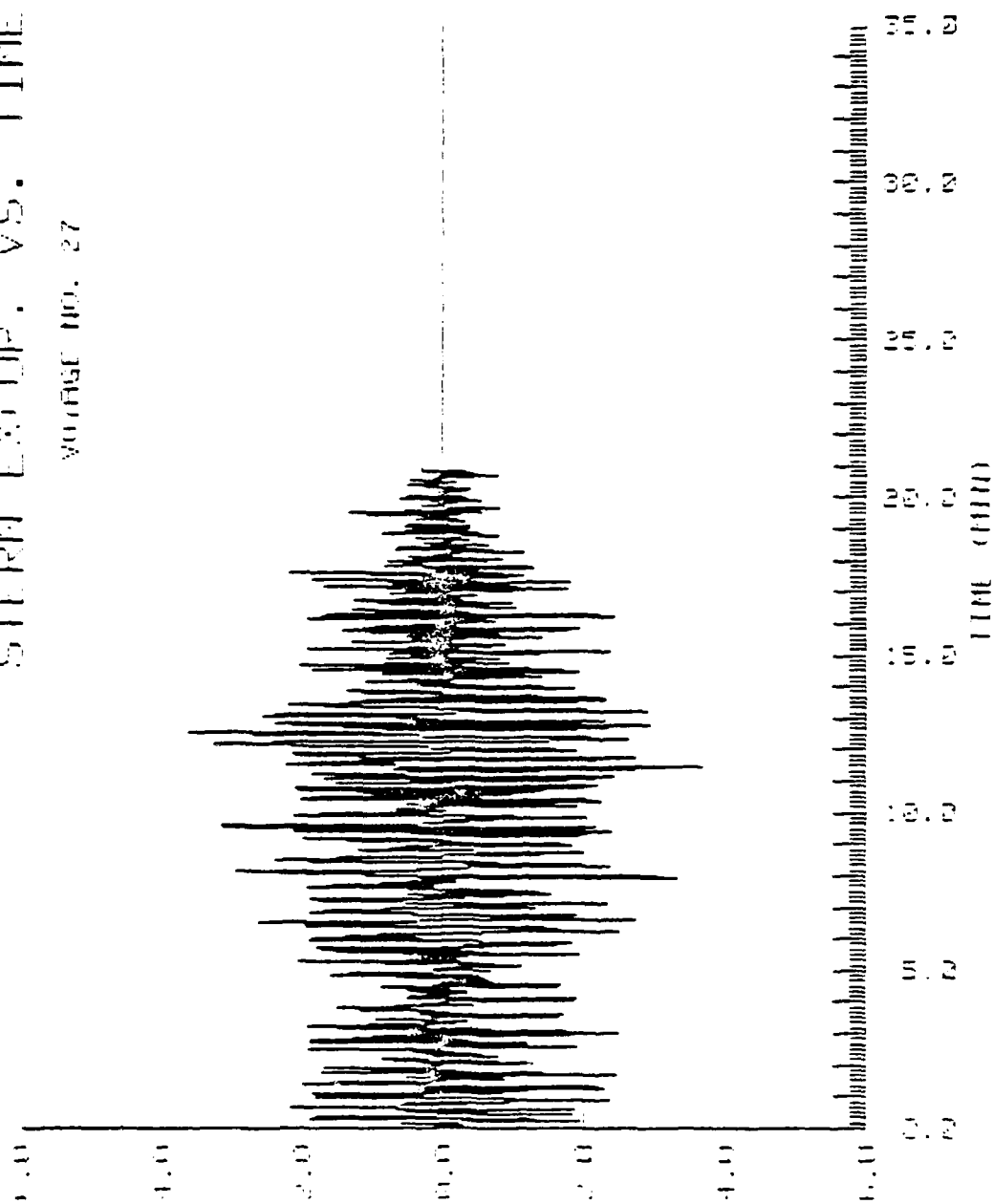
1304 P. 800 P. VS. TIME

WINDSPEED 100.0



STERN EXDIP. VS. TIME

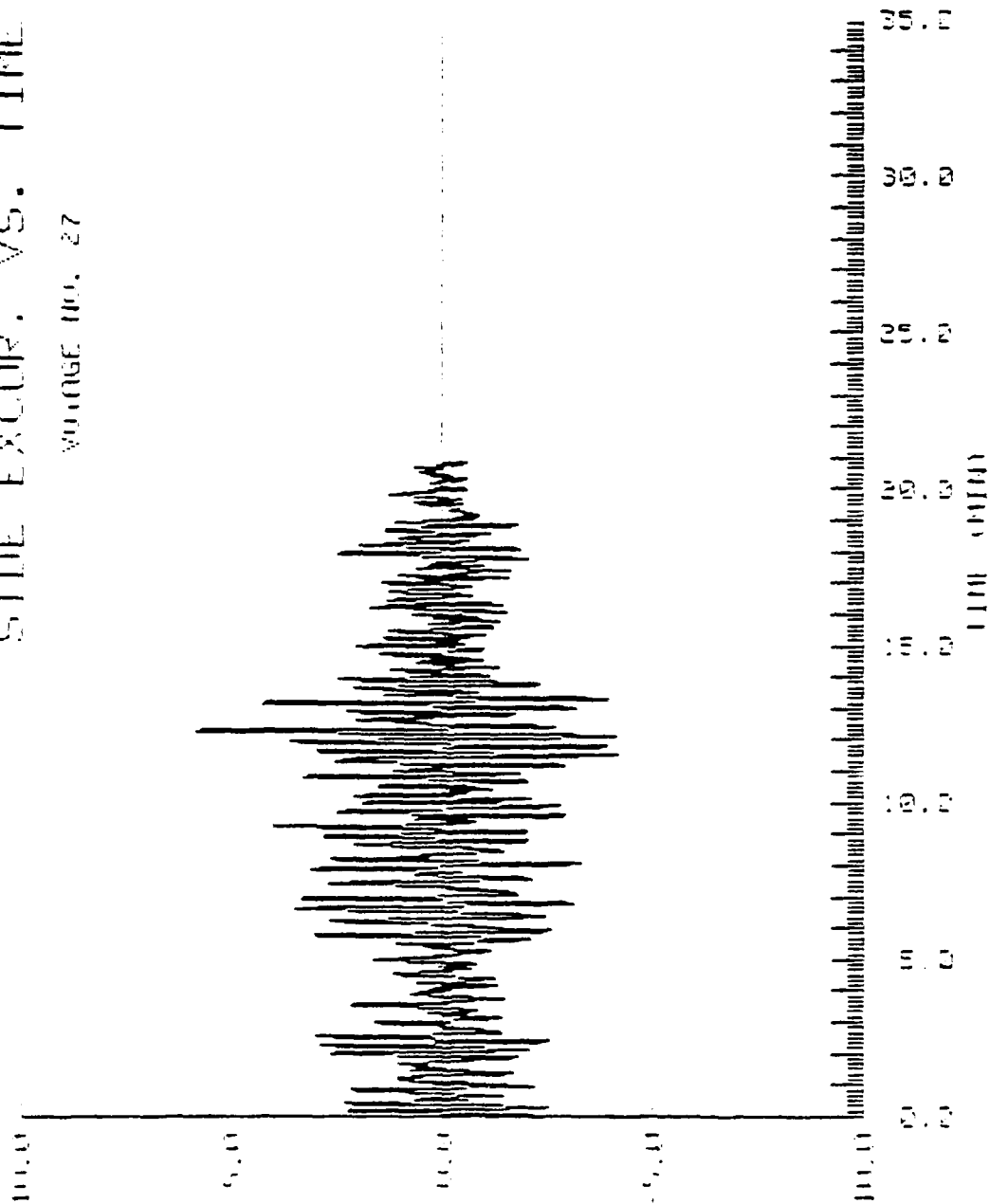
VOLUME NO. 27



11-18-1963

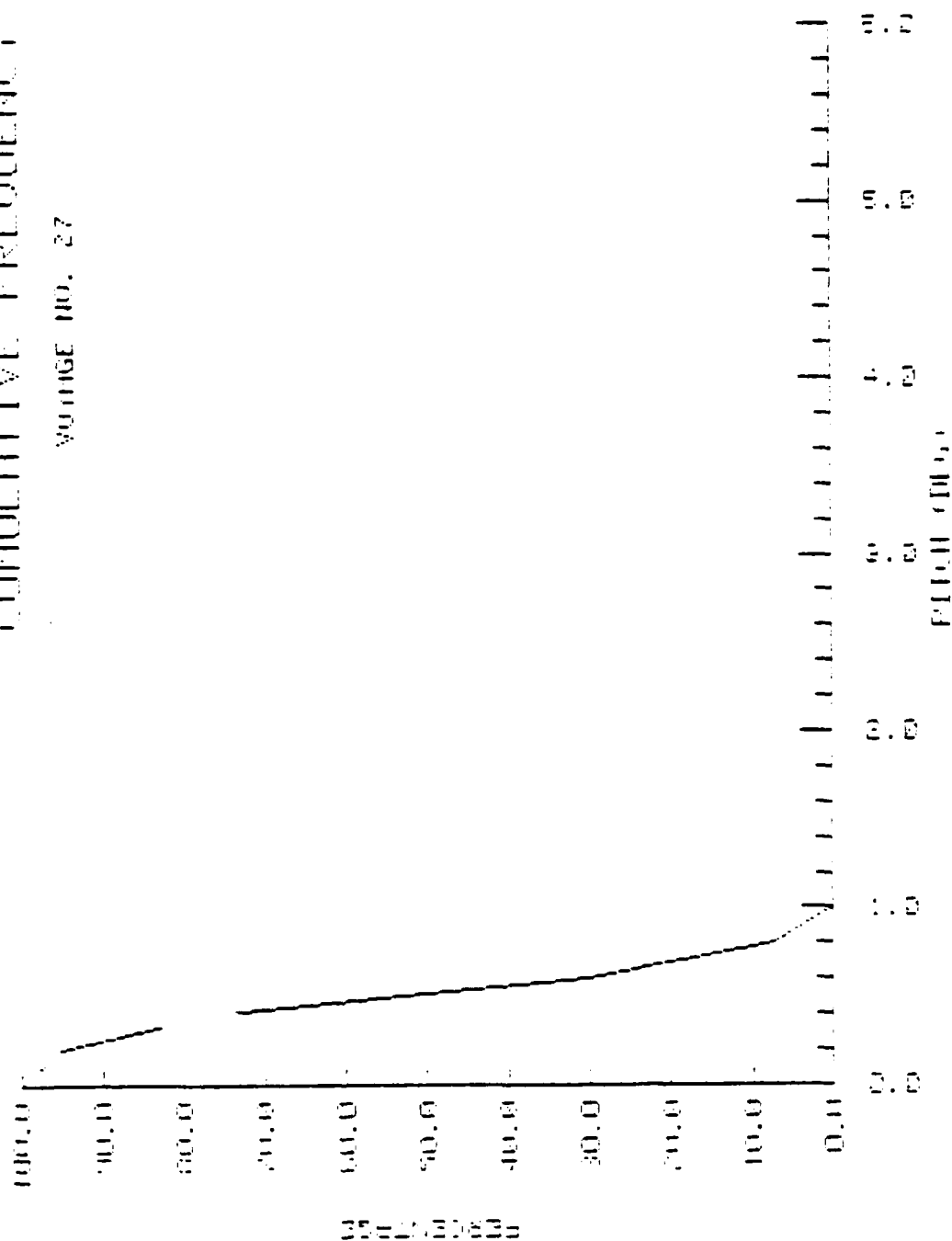
SIDE EXCUR. VS. TIME

VOLUME NO. 27



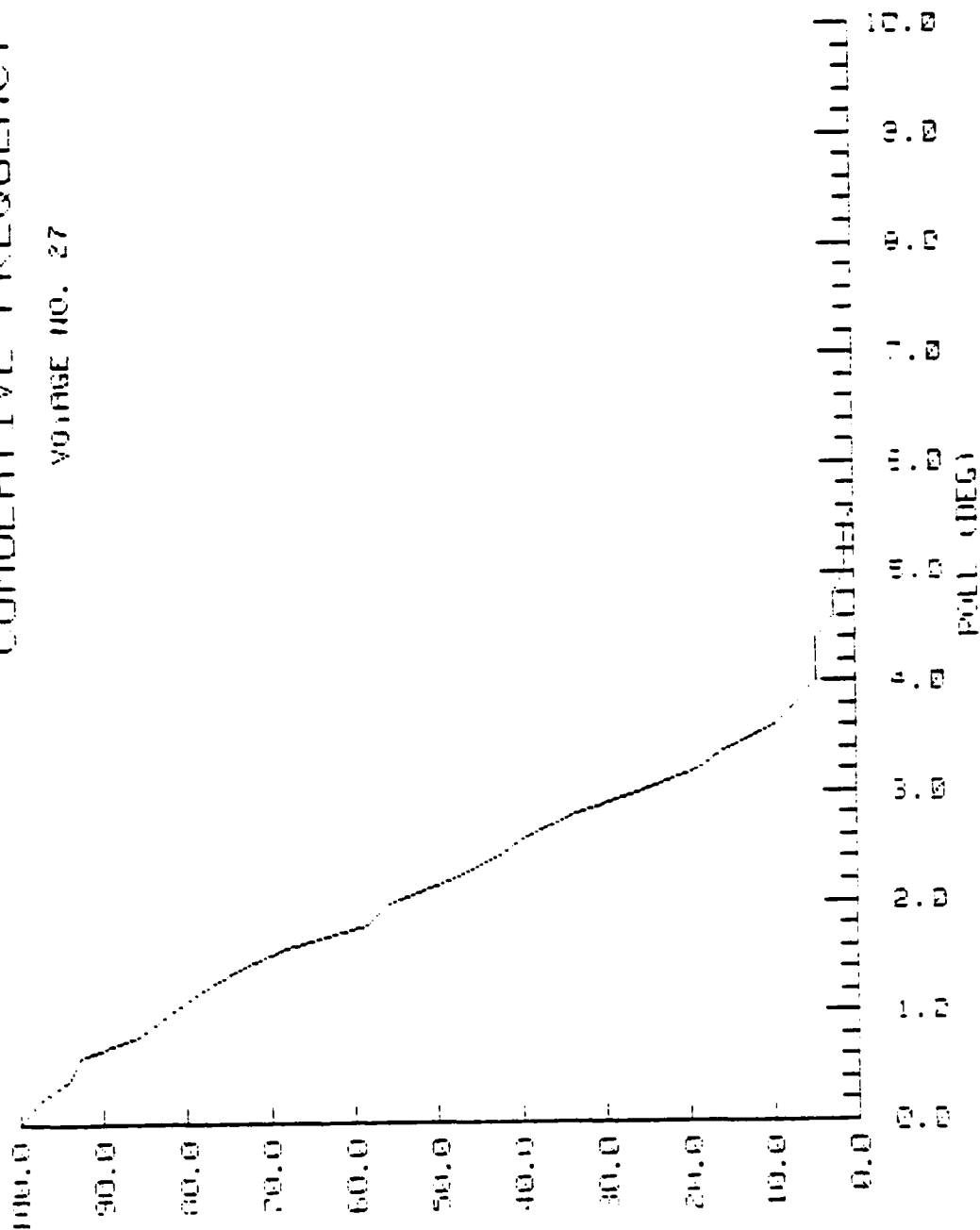
CUMULATIVE FREQUENCY

WING NO. 27



CUMULATIVE FREQUENCY

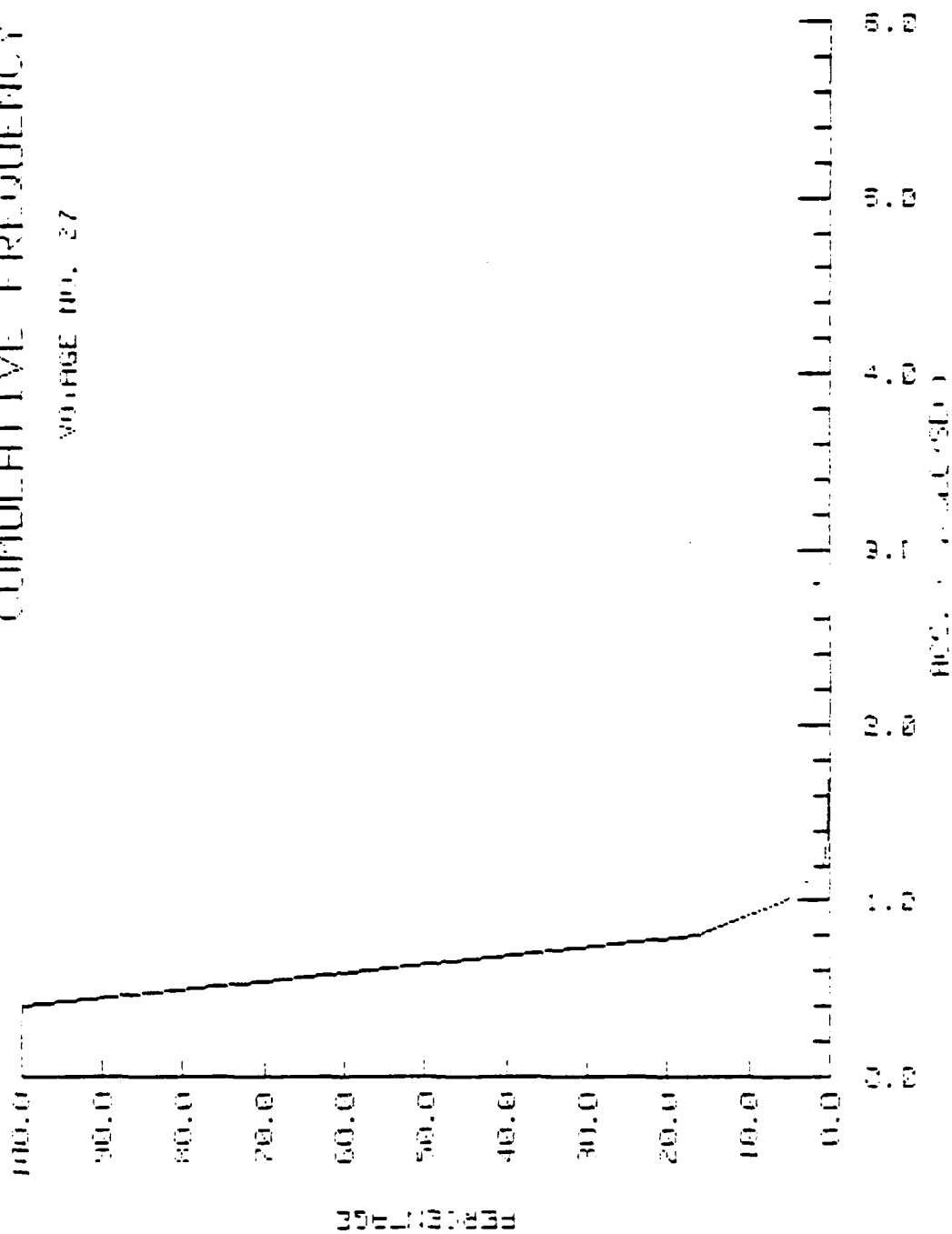
VOLUME NO. 27



352-NB0858

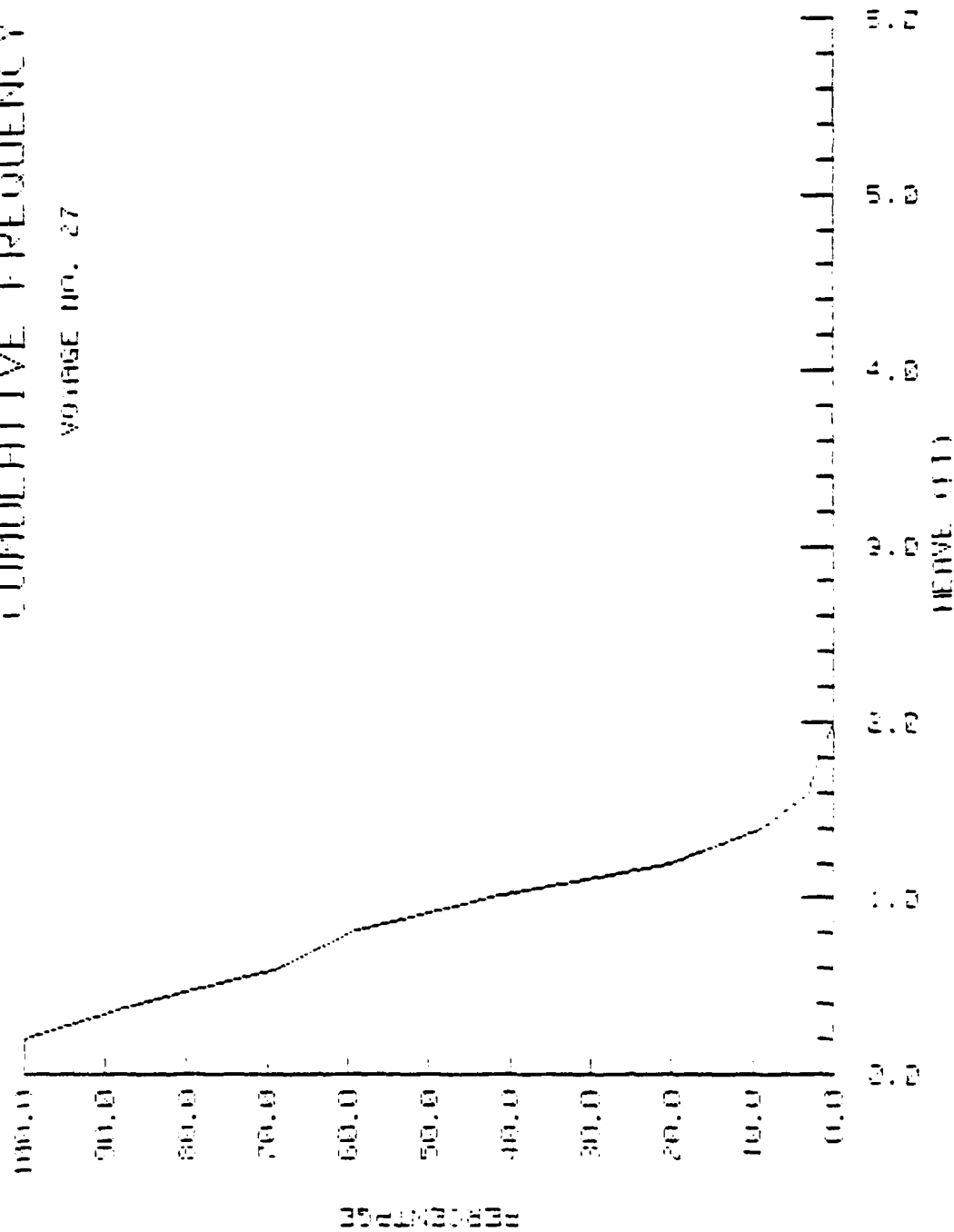
CUMULATIVE FREQUENCY

VOLUME NO. 27



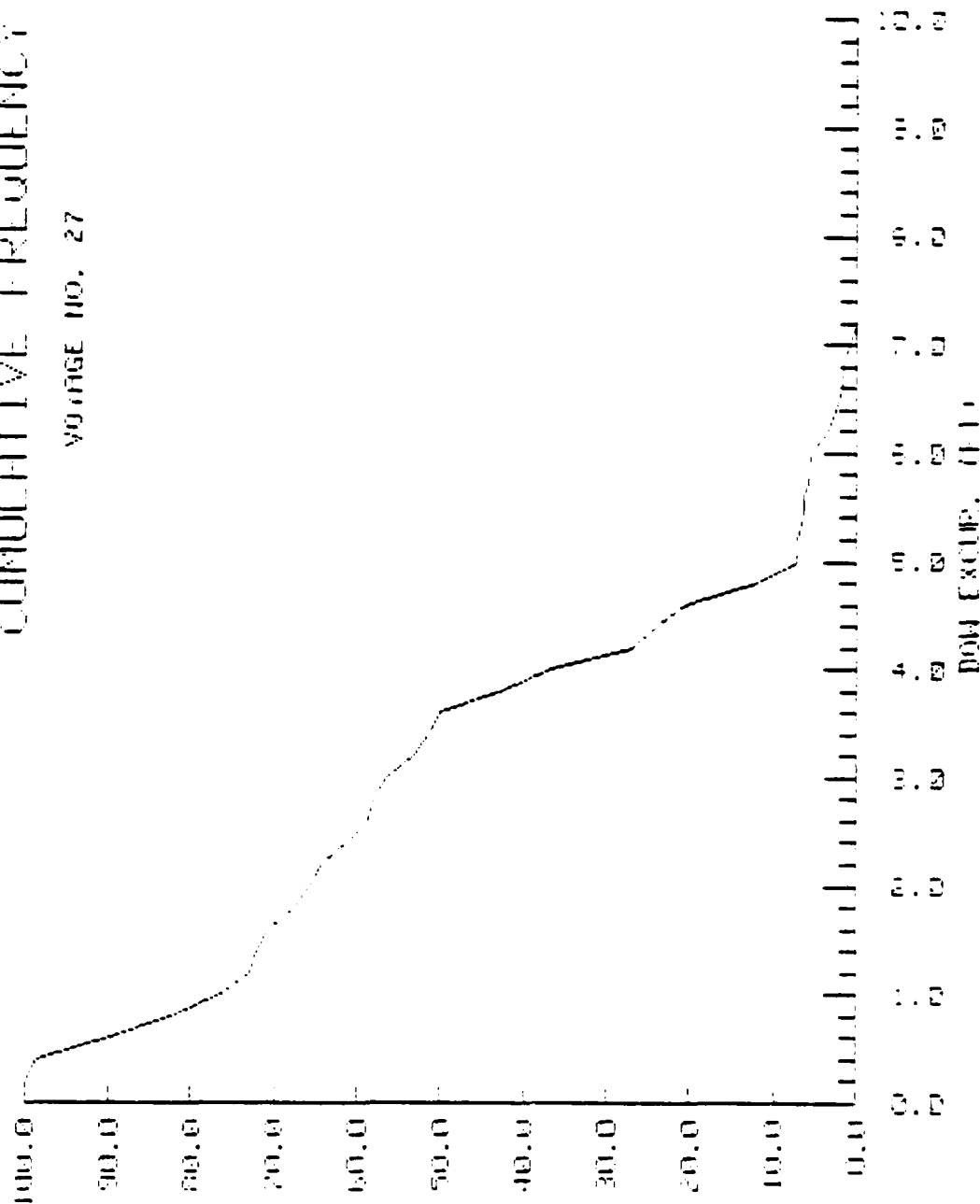
CUMULATIVE FREQUENCY

VOLAGE NO. 27



CUMULATIVE FREQUENCY

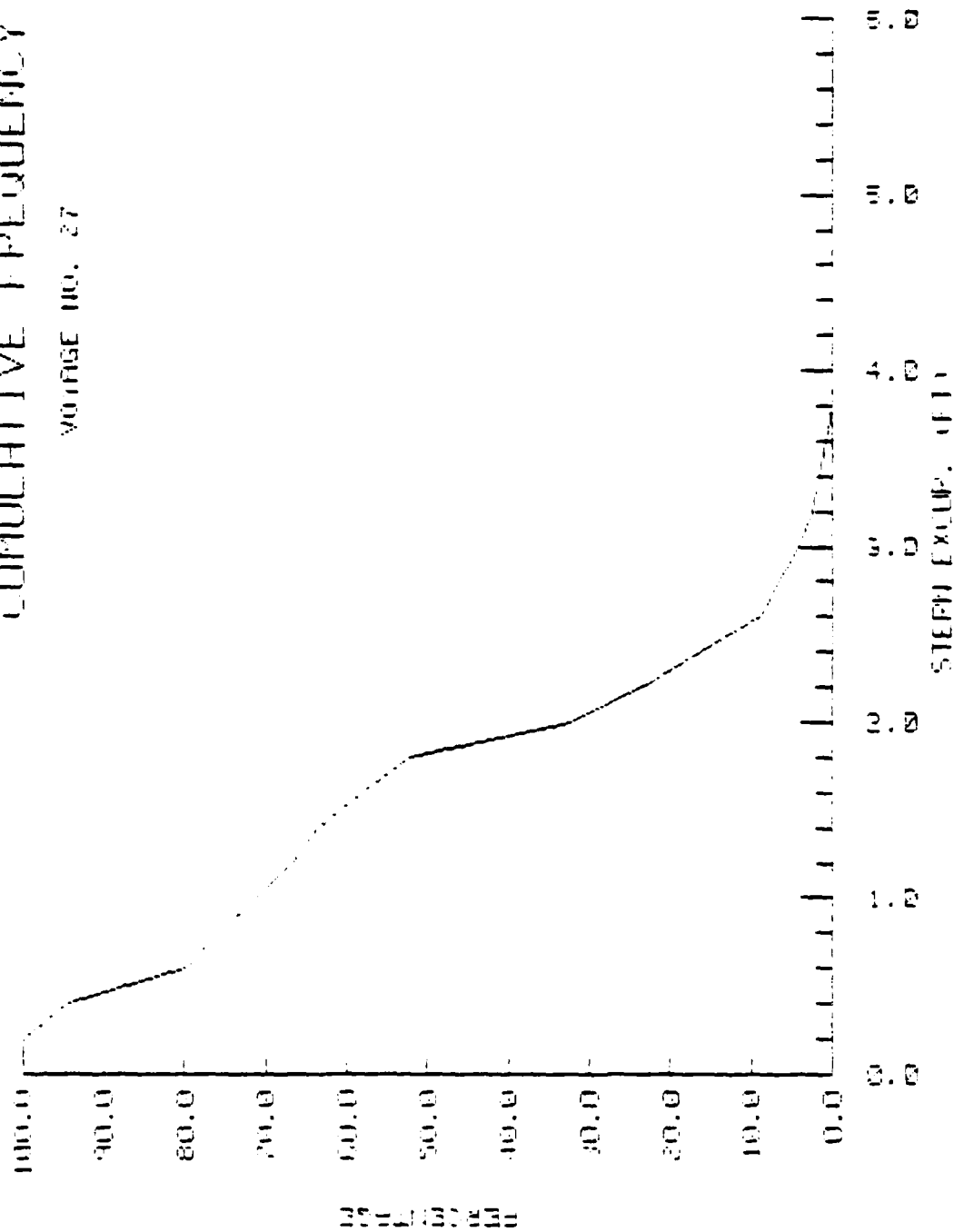
VOLUME NO. 27



25-12-20-10

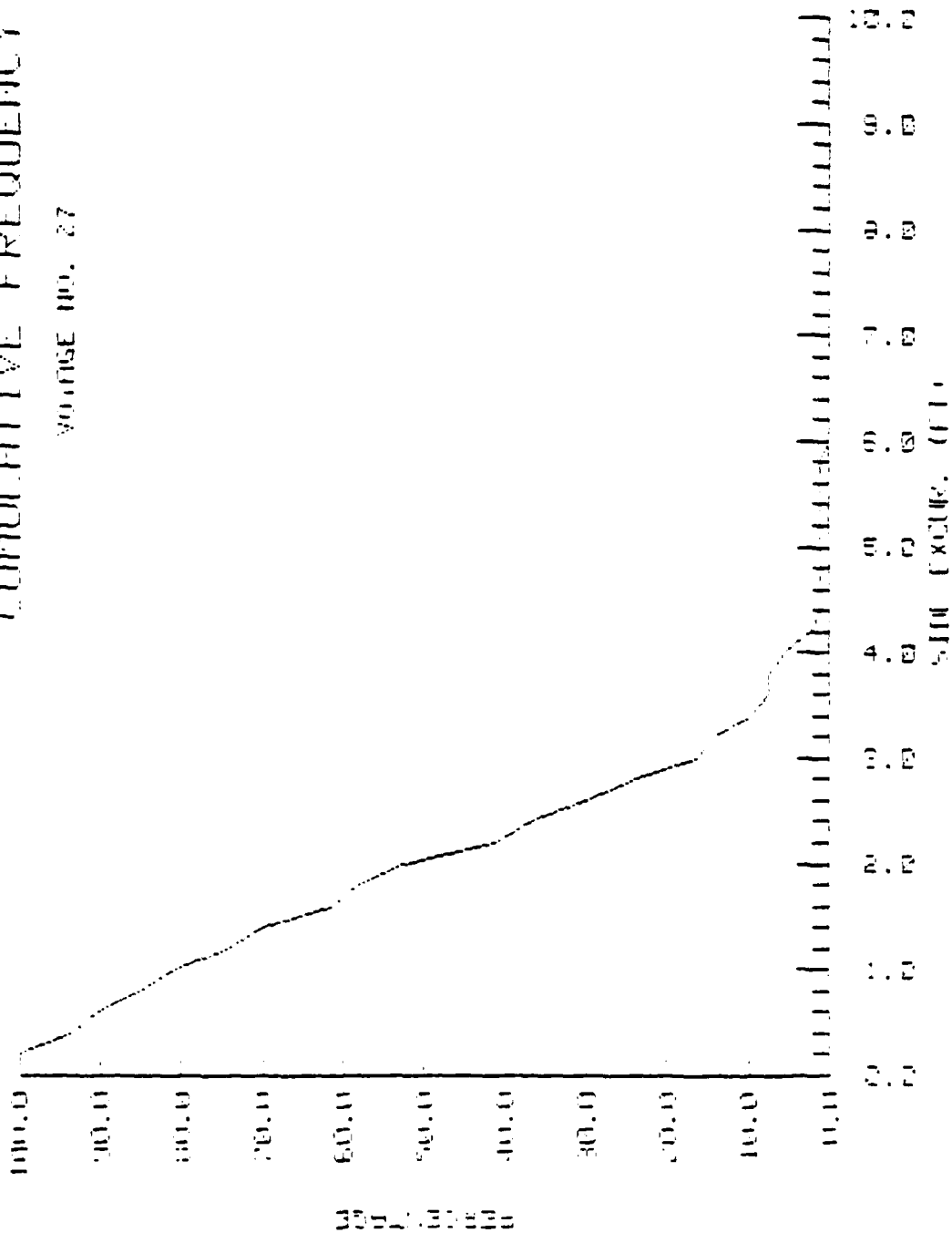
CUMULATIVE FREQUENCY

VOLUME NO. 27



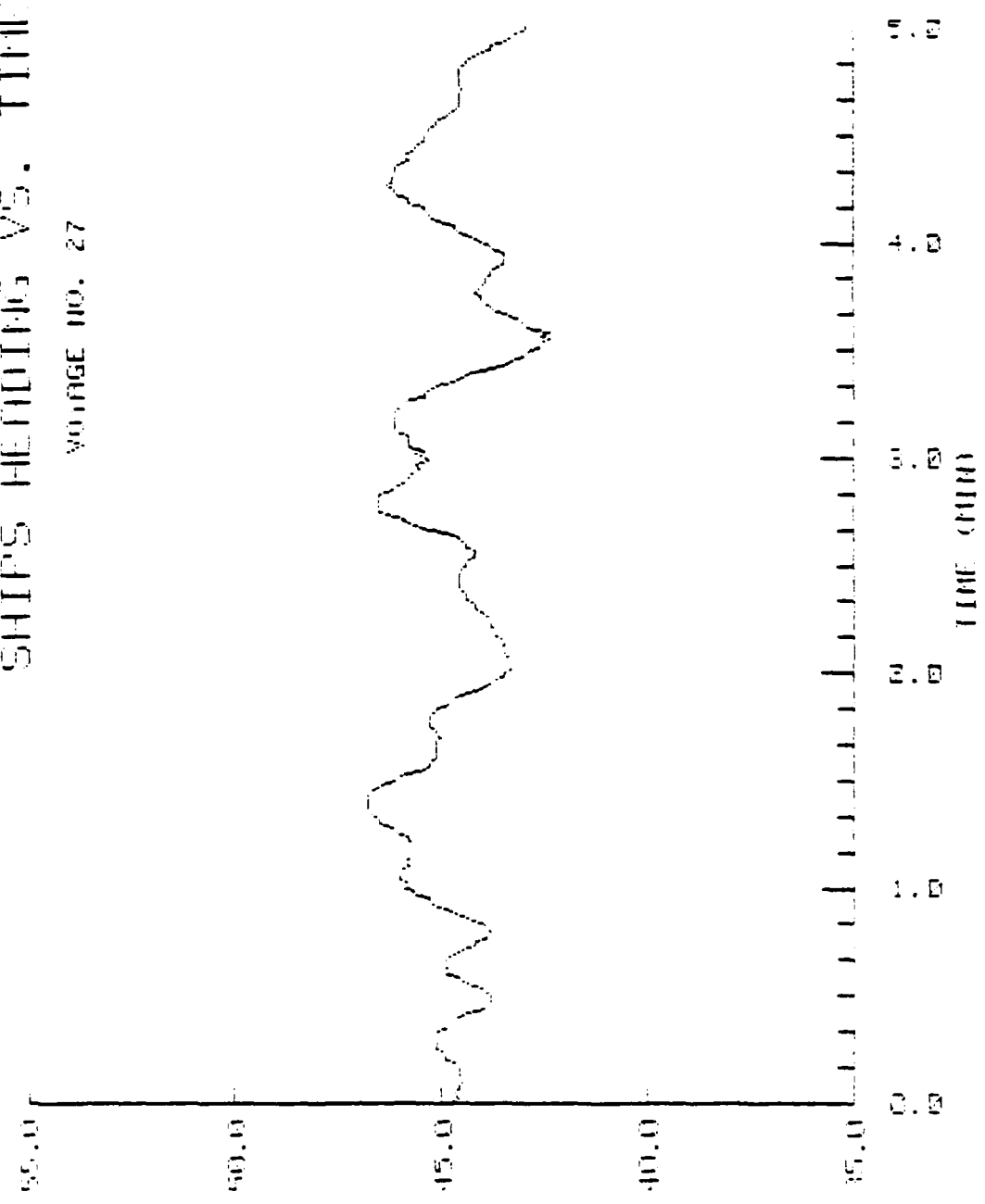
CUMULATIVE FREQUENCY

VOICE NO. 27



SHIPS HEADING VS. TIME

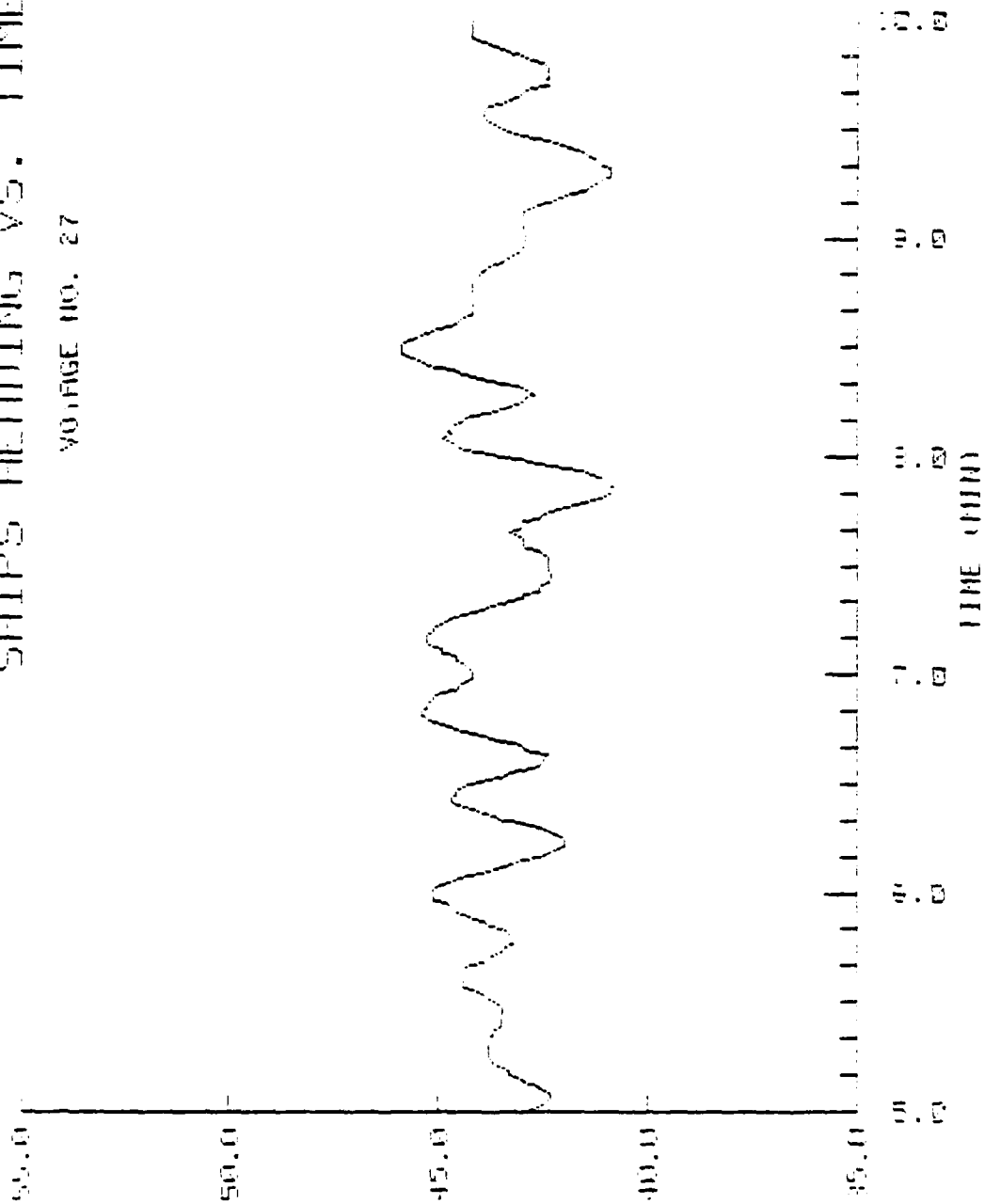
VOLUME NO. 27



0000 54440000 000000

SHIPS HEADING VS. TIME

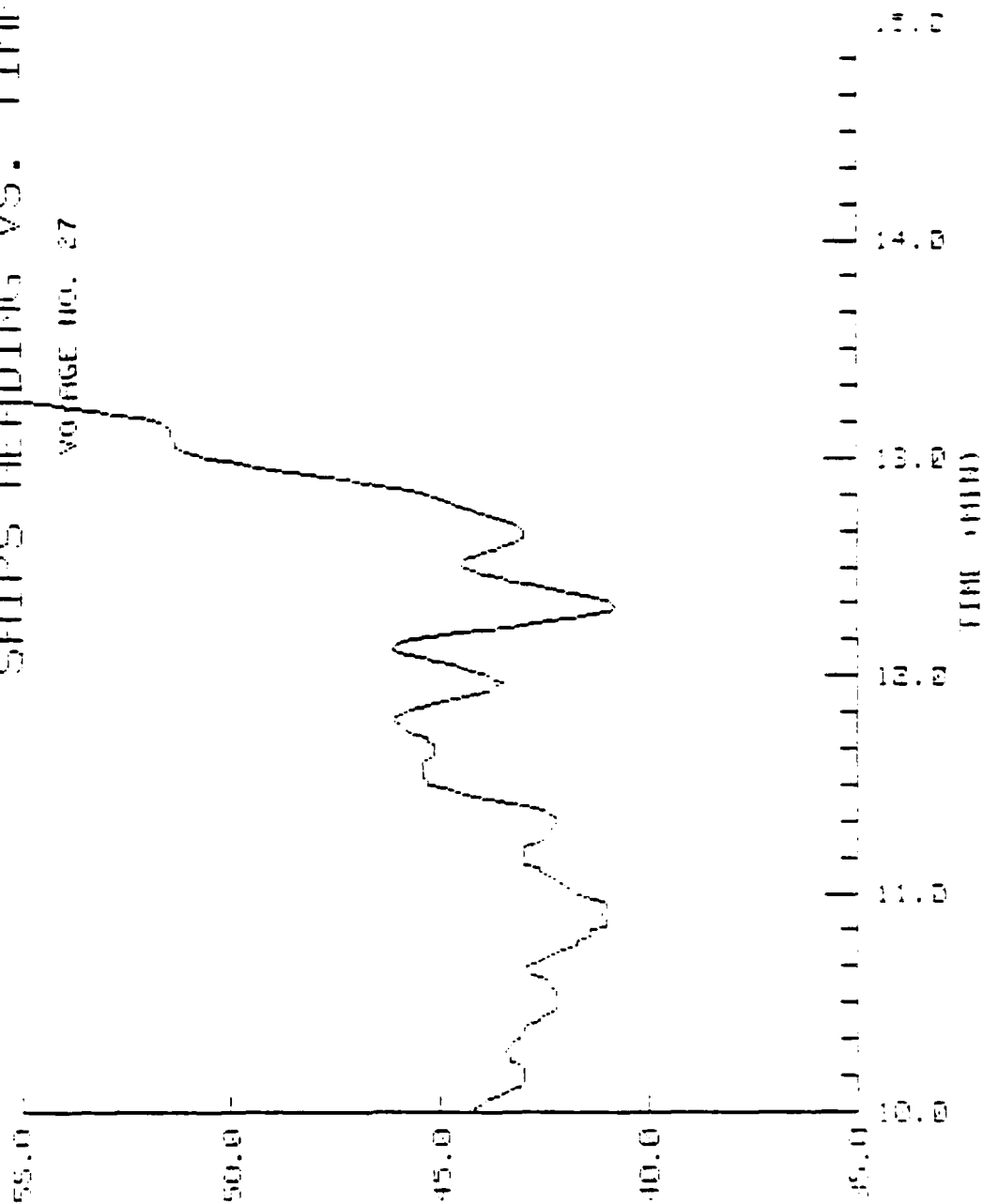
VOLUME NO. 27



1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400

SHIPS HEADING VS. TIME

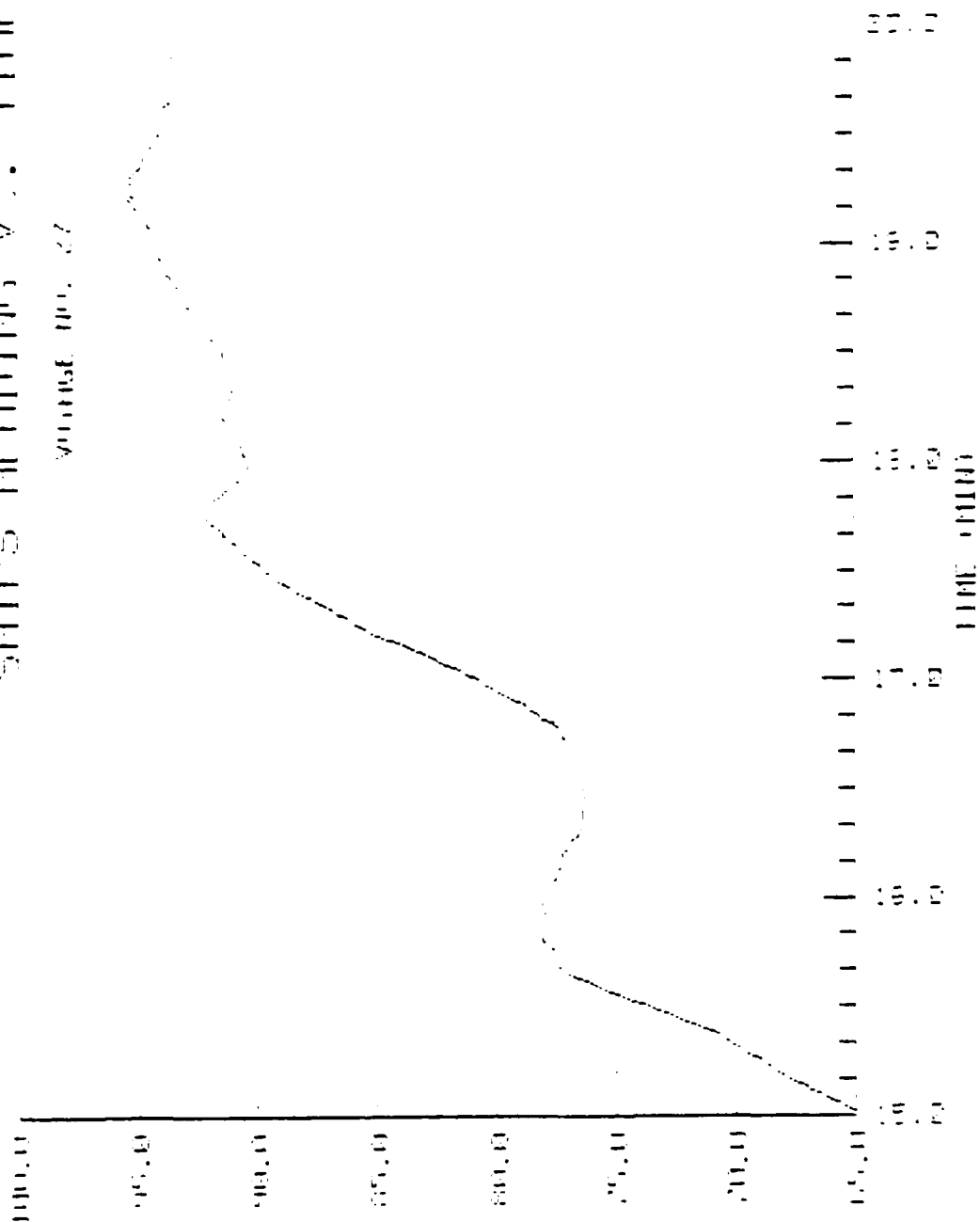
VOLUME NO. 27



100 : 2400000 000000

SHIPS HULLING V.S. TIME

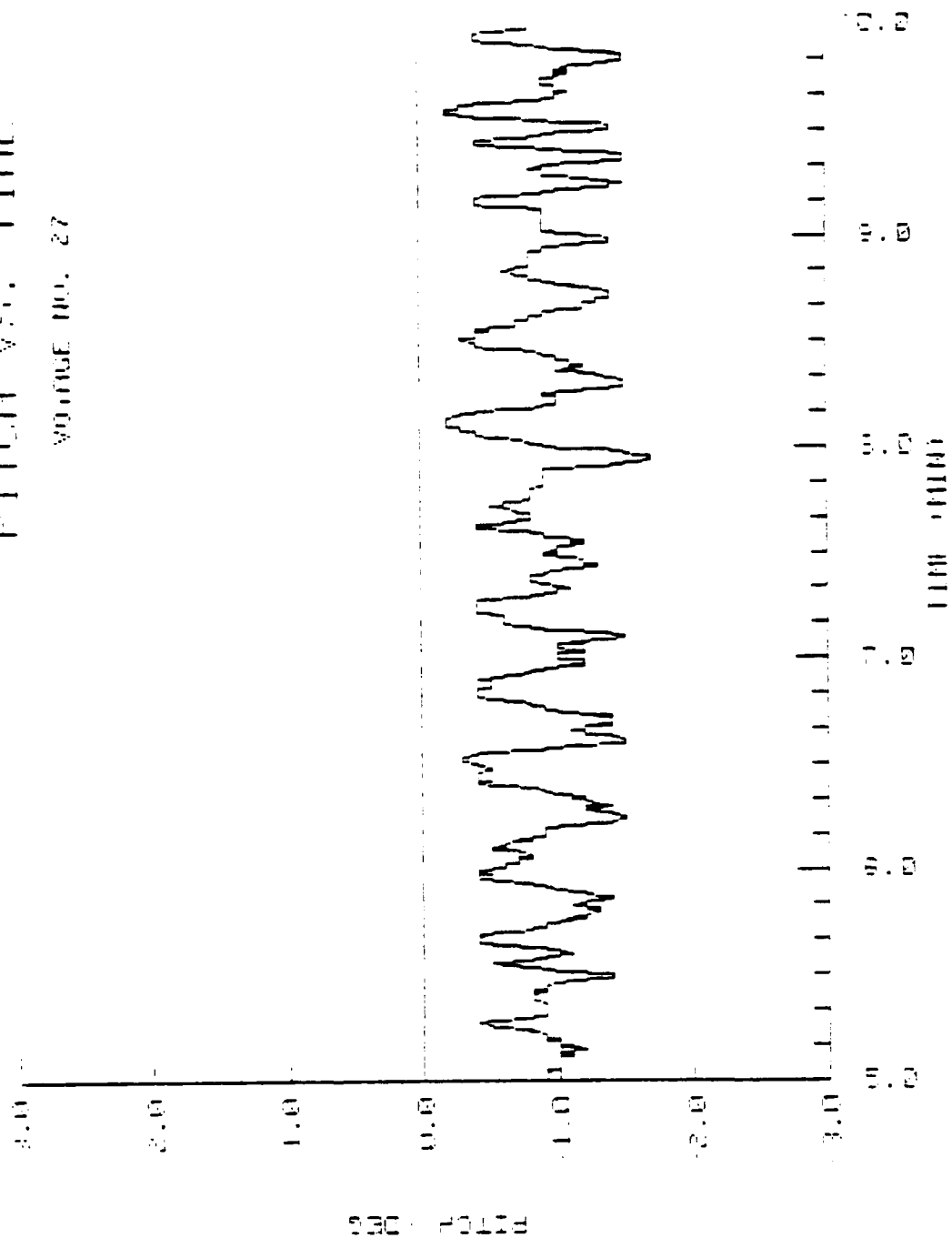
WINDAGE NO. 27



100.00 95.00 90.00 85.00 80.00 75.00 70.00 65.00 60.00 55.00 50.00 45.00 40.00 35.00 30.00 25.00 20.00 15.00 10.00 5.00 0.00

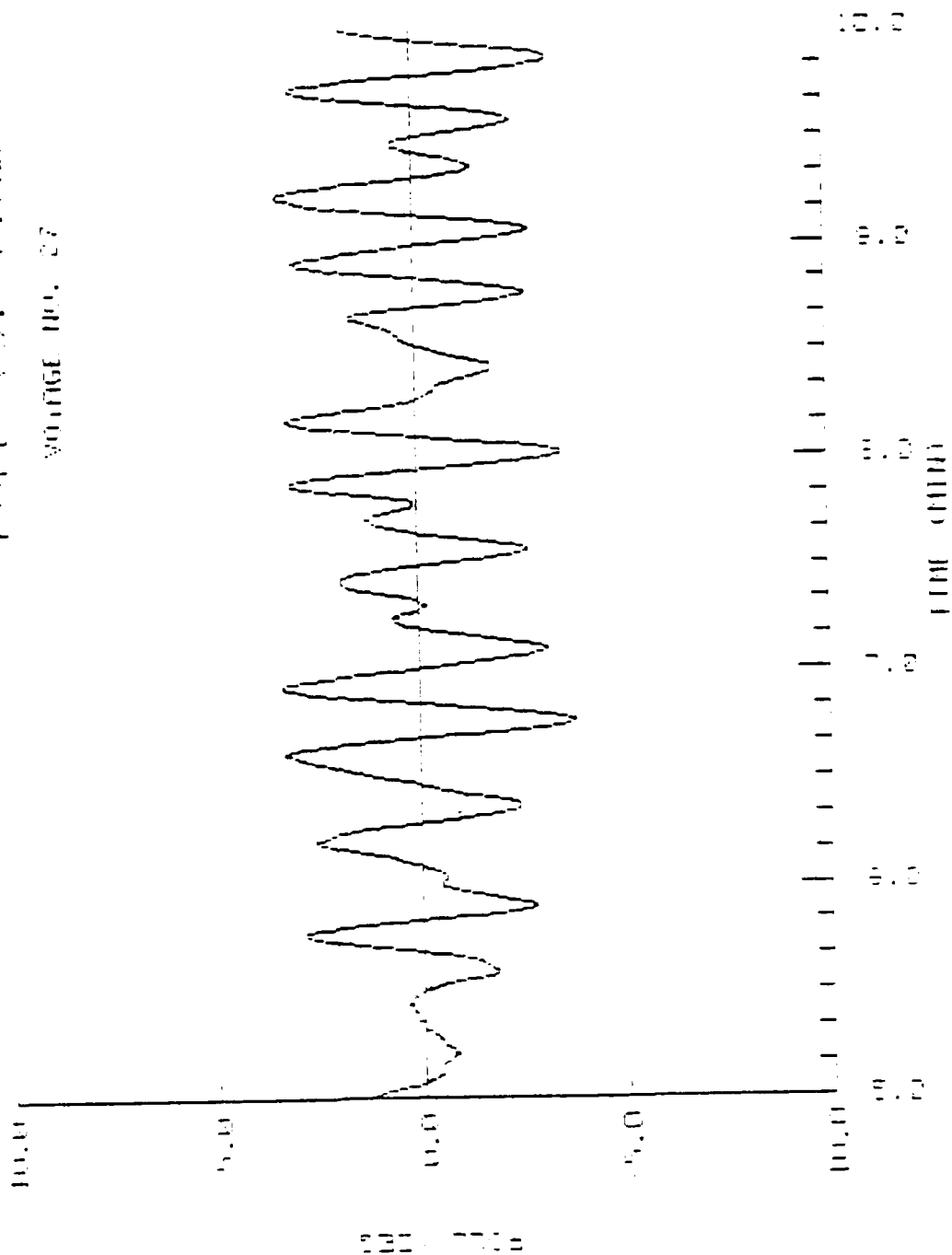
PITCH VS. TIME

VOLUME NO. 27



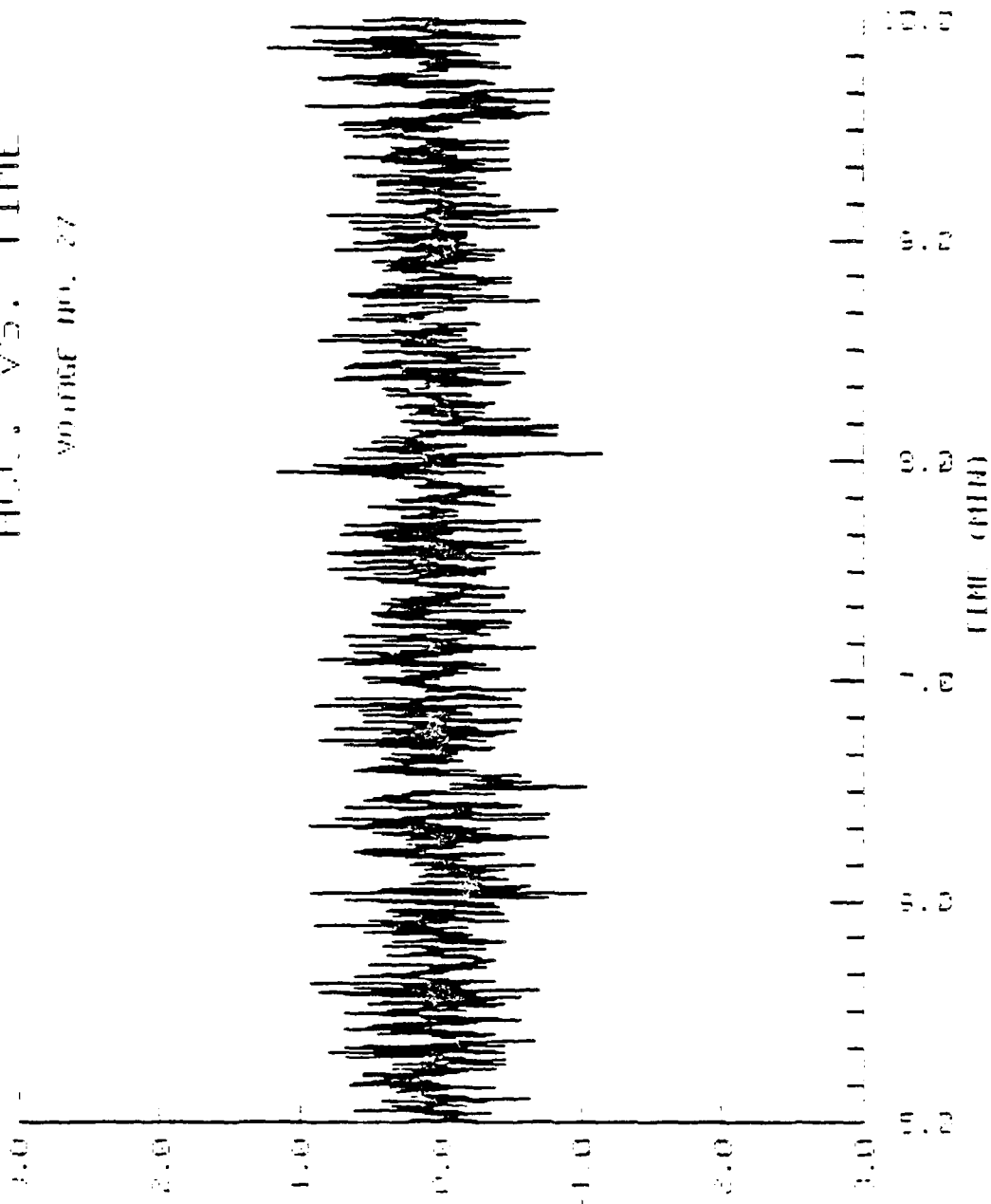
Potential vs. Time

Y-axis: Volts



HCC. VS. TIME

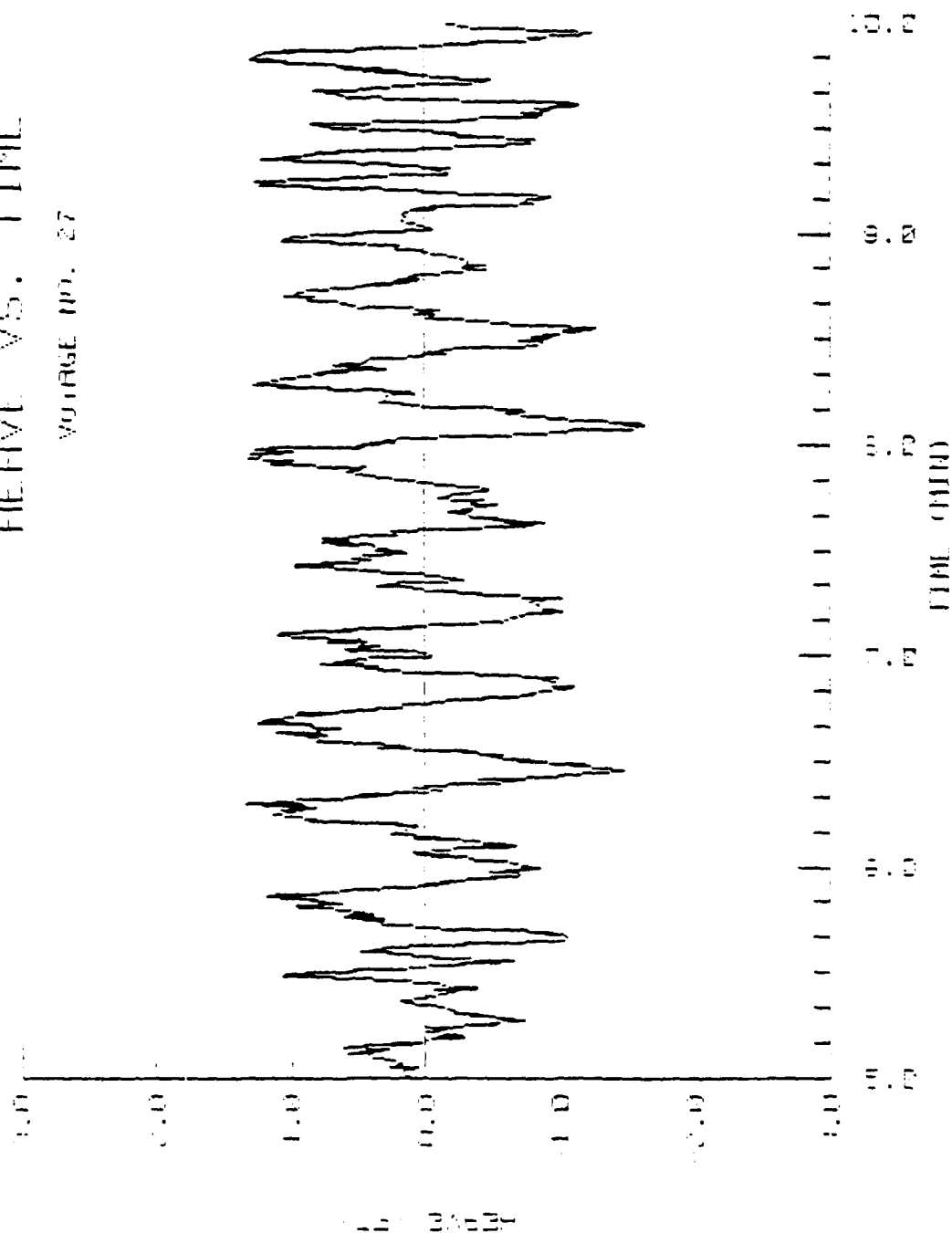
YOUNG NO. 27



038 038 11 1007

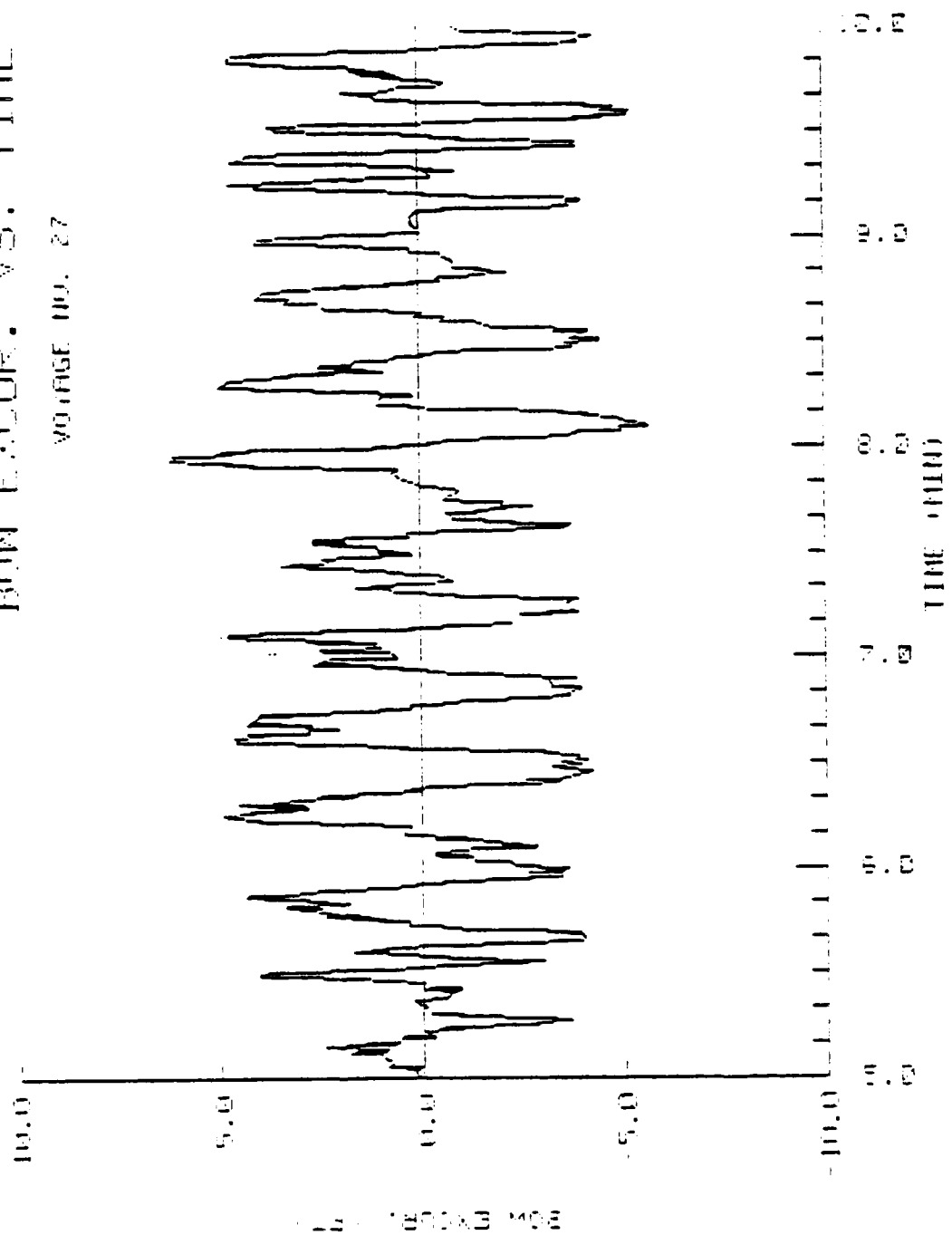
HEFIVE VS. TIME

VOLUME NO. 27



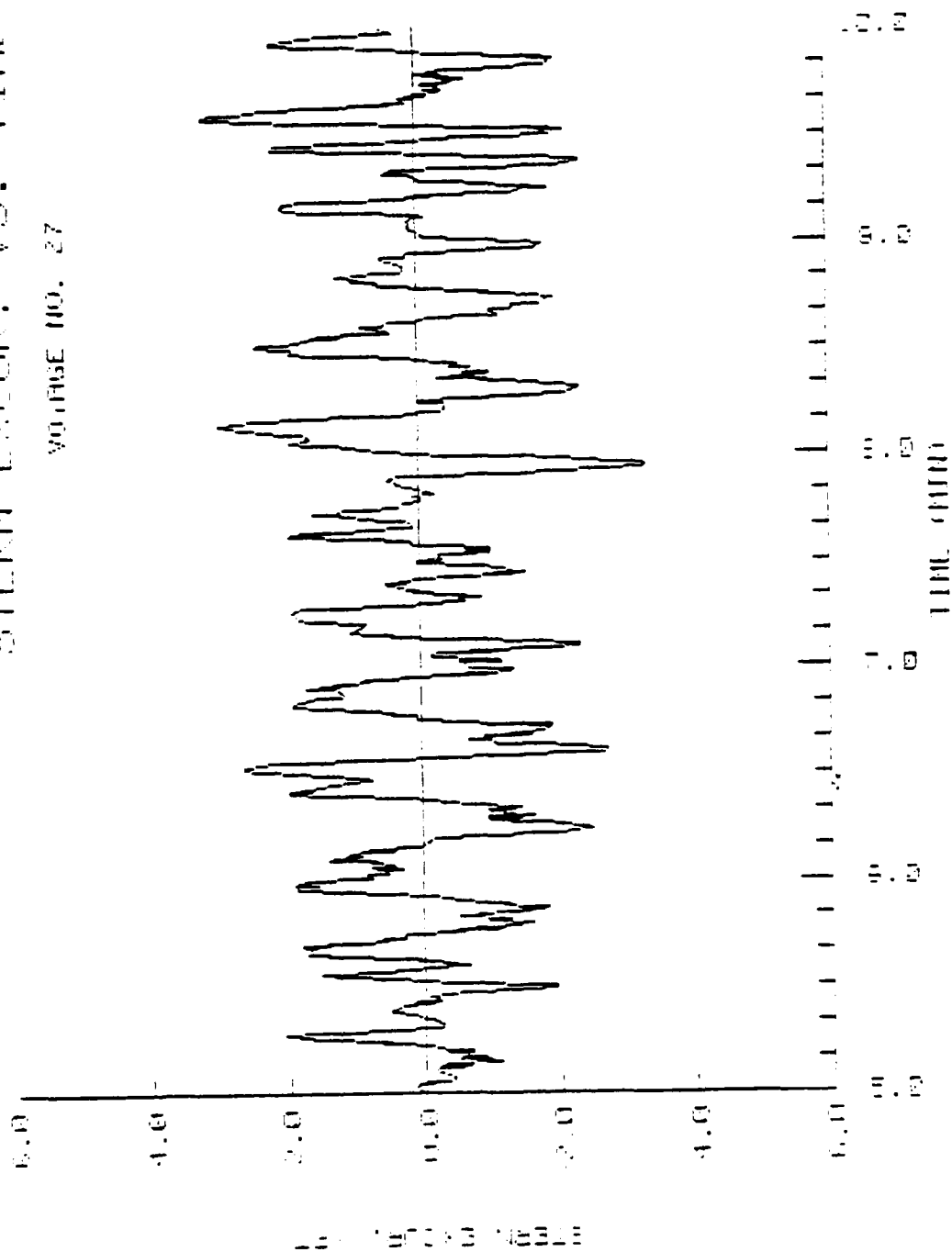
BOM EXCUR. VS. TIME

VOLUME NO. 27



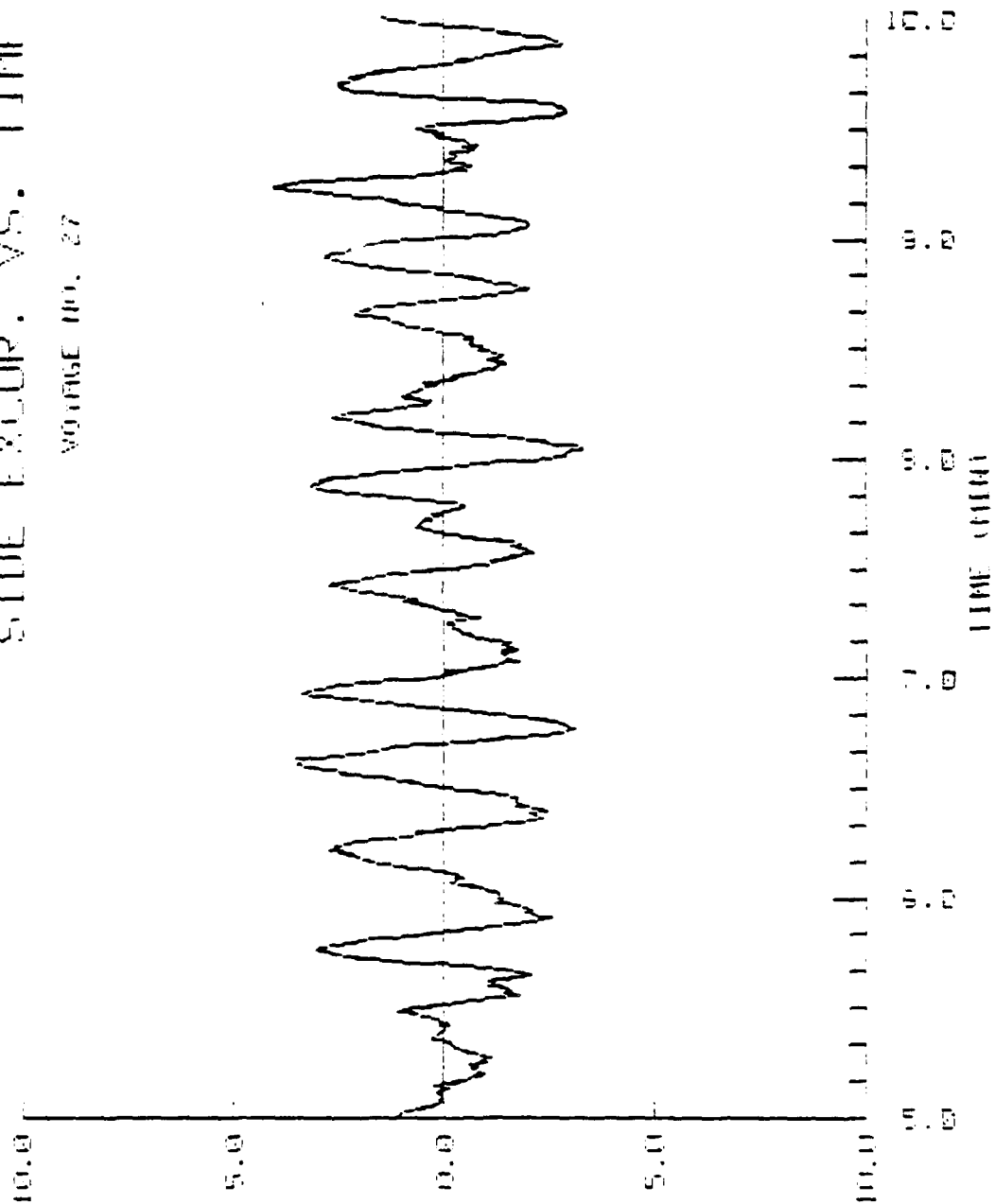
STERN EXCUR. VS. TIME

VOLUME NO. 27



SIDE EXCUR. VS. TIME

VOLUME NO. 27

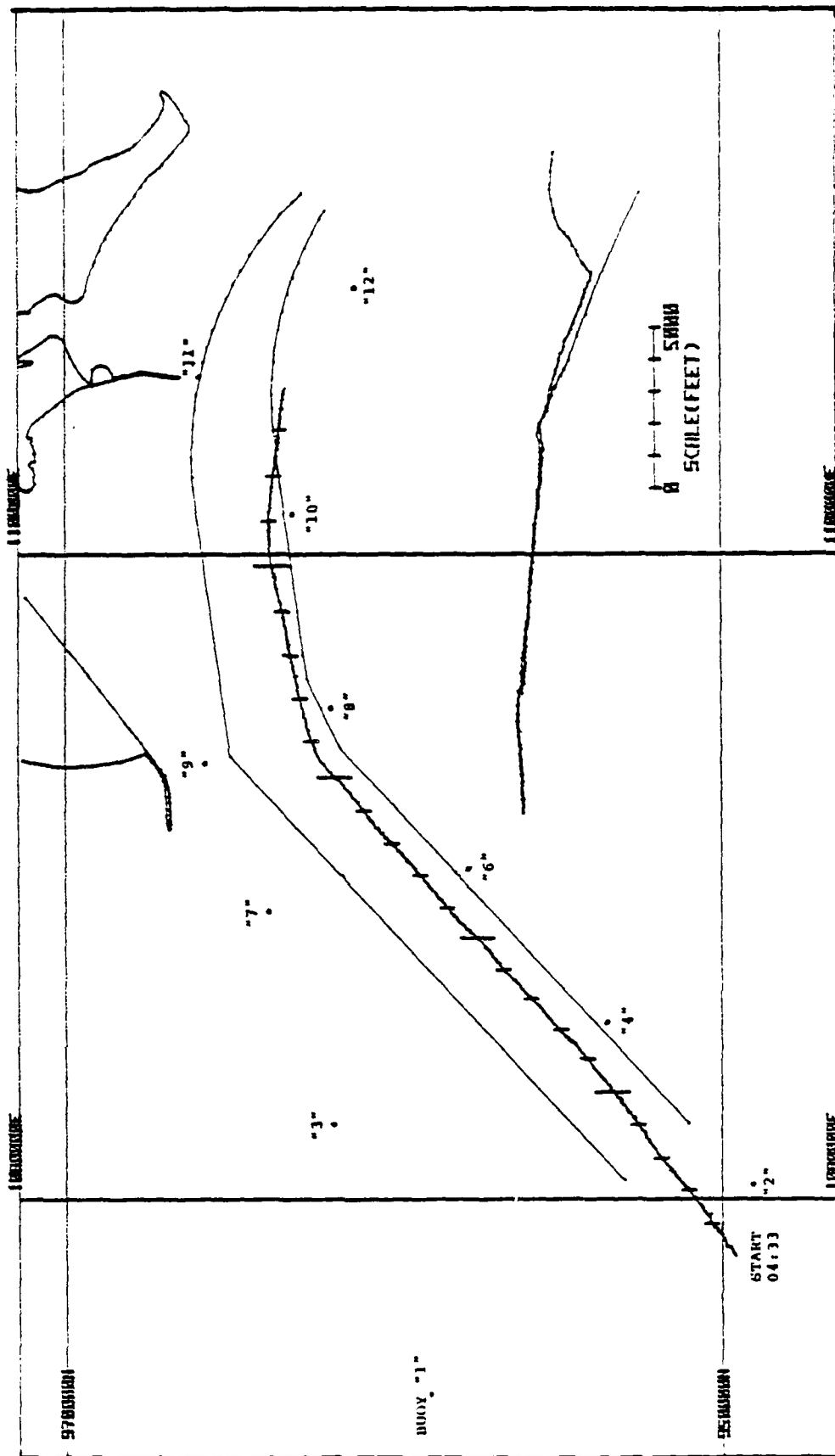


STATISTICAL SUMMARY

VOYAGE NO. 28

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH - DEG.	.3	1.6	.6	.7
ROLL - DEG.	.3	3.6	1.4	1.7
HEAVE - FT.	-0	1.9	.7	.8
SWAY - FT.	-0	6.1	1.8	2.2
YAW - DEG.	-0	14.6	4.3	5.2
SHIP EXCUP. - FT.	.0	5.6	1.9	2.1
STIFF EXCUP. - FT.	-0	7.1	2.3	2.7

BIRTH : 1 3 1925



SHIPS HEADING VS. TIME

VOLUME 100, 20

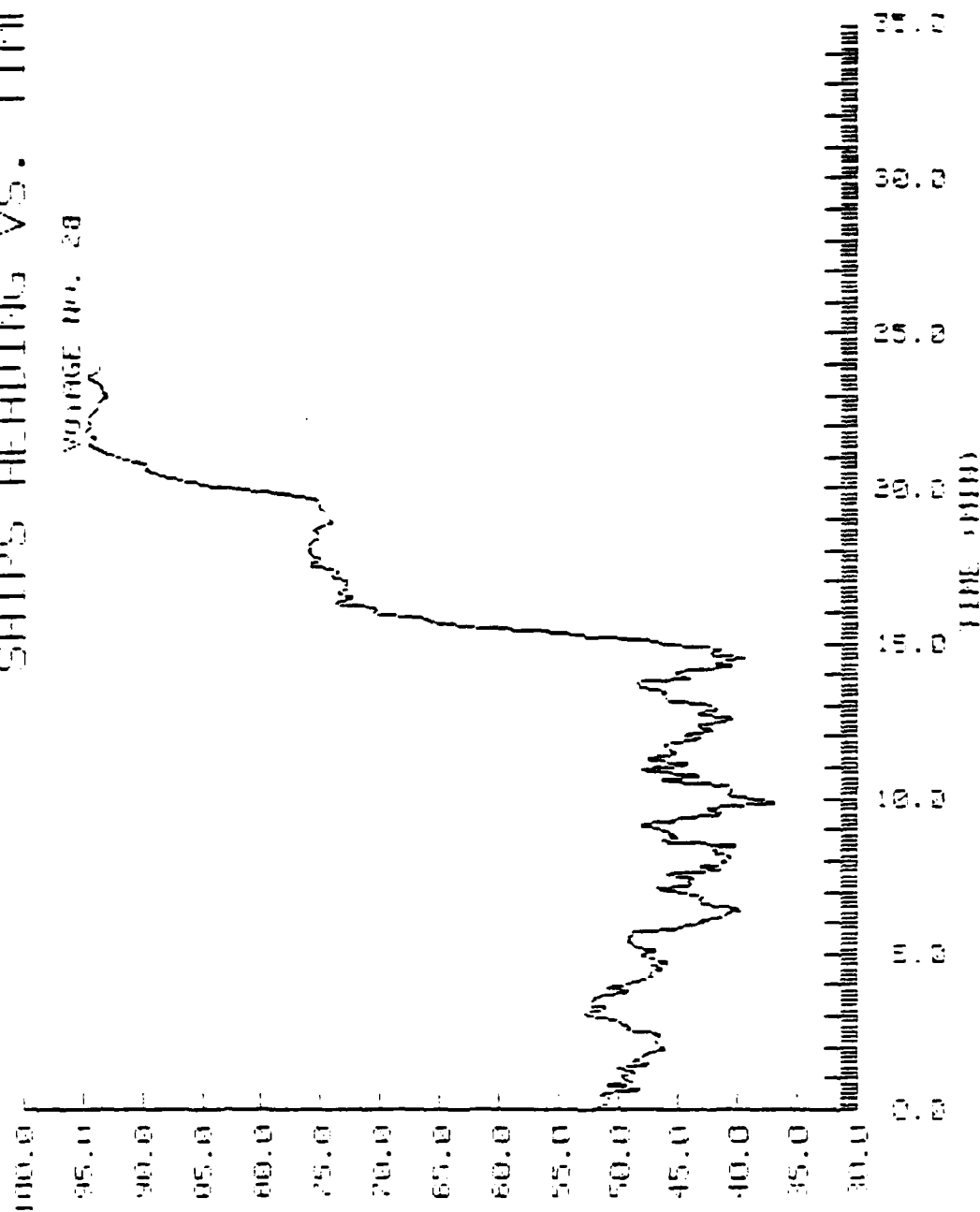
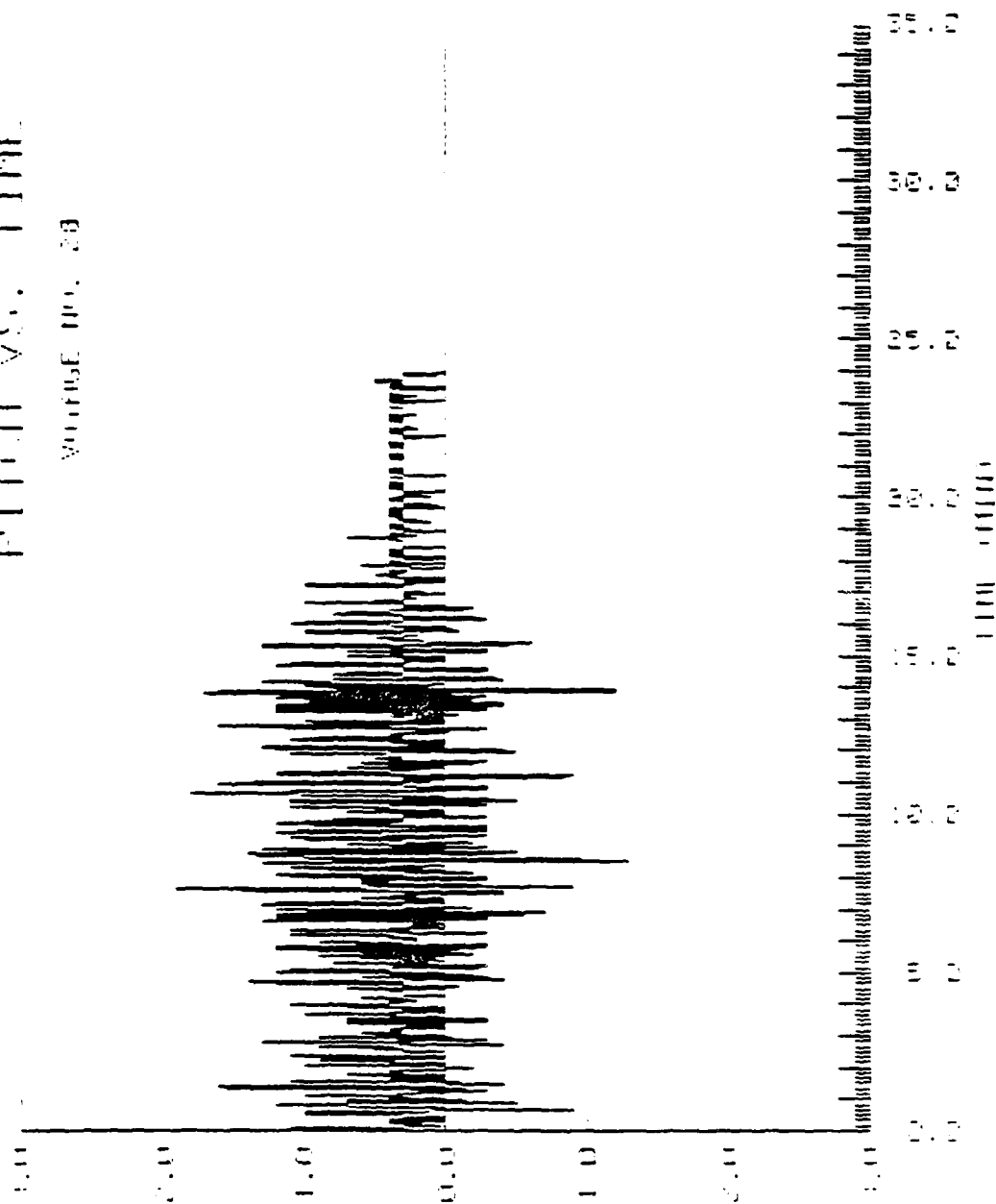


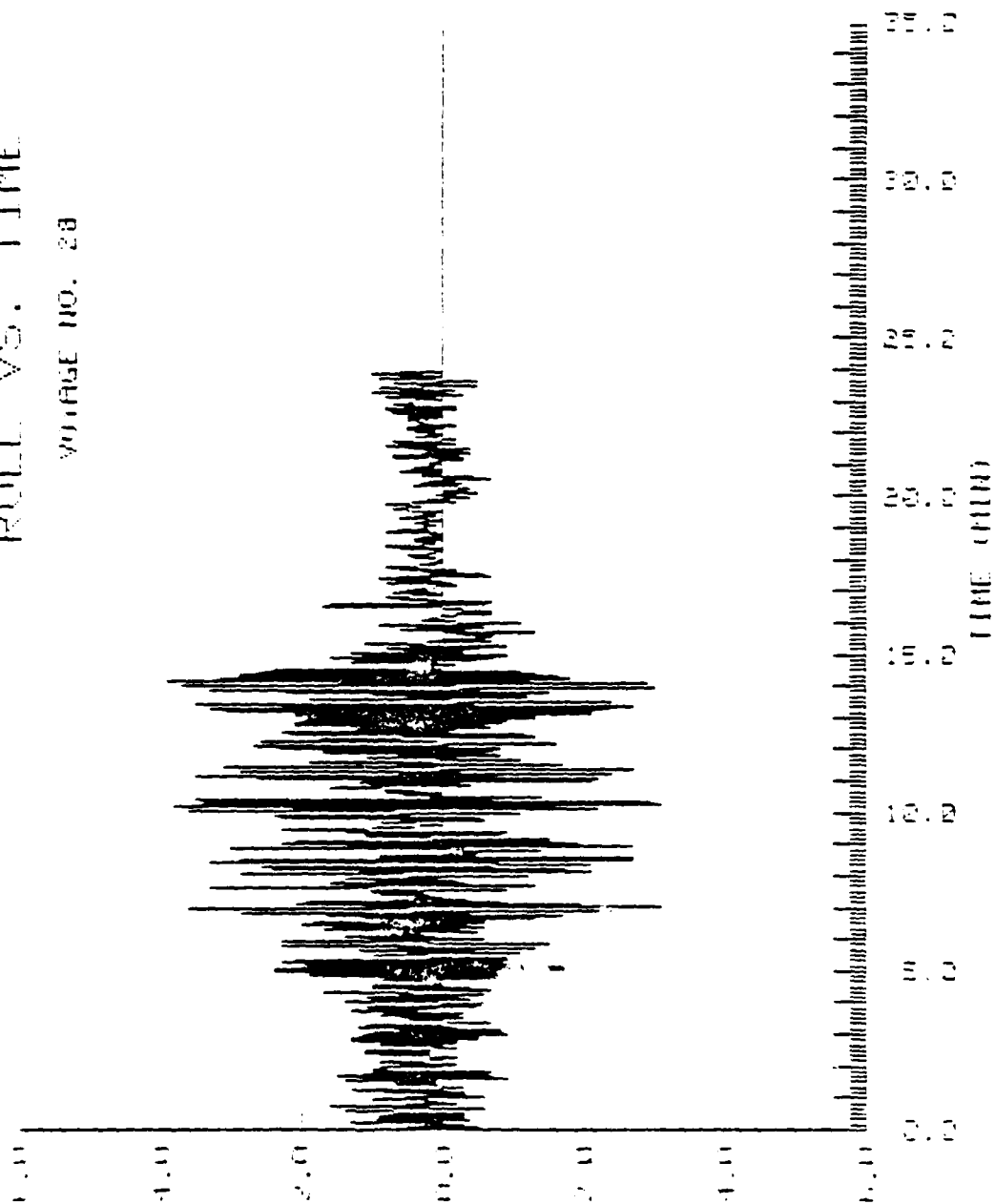
PLATE VS. TIME

VOLUME 100, 28



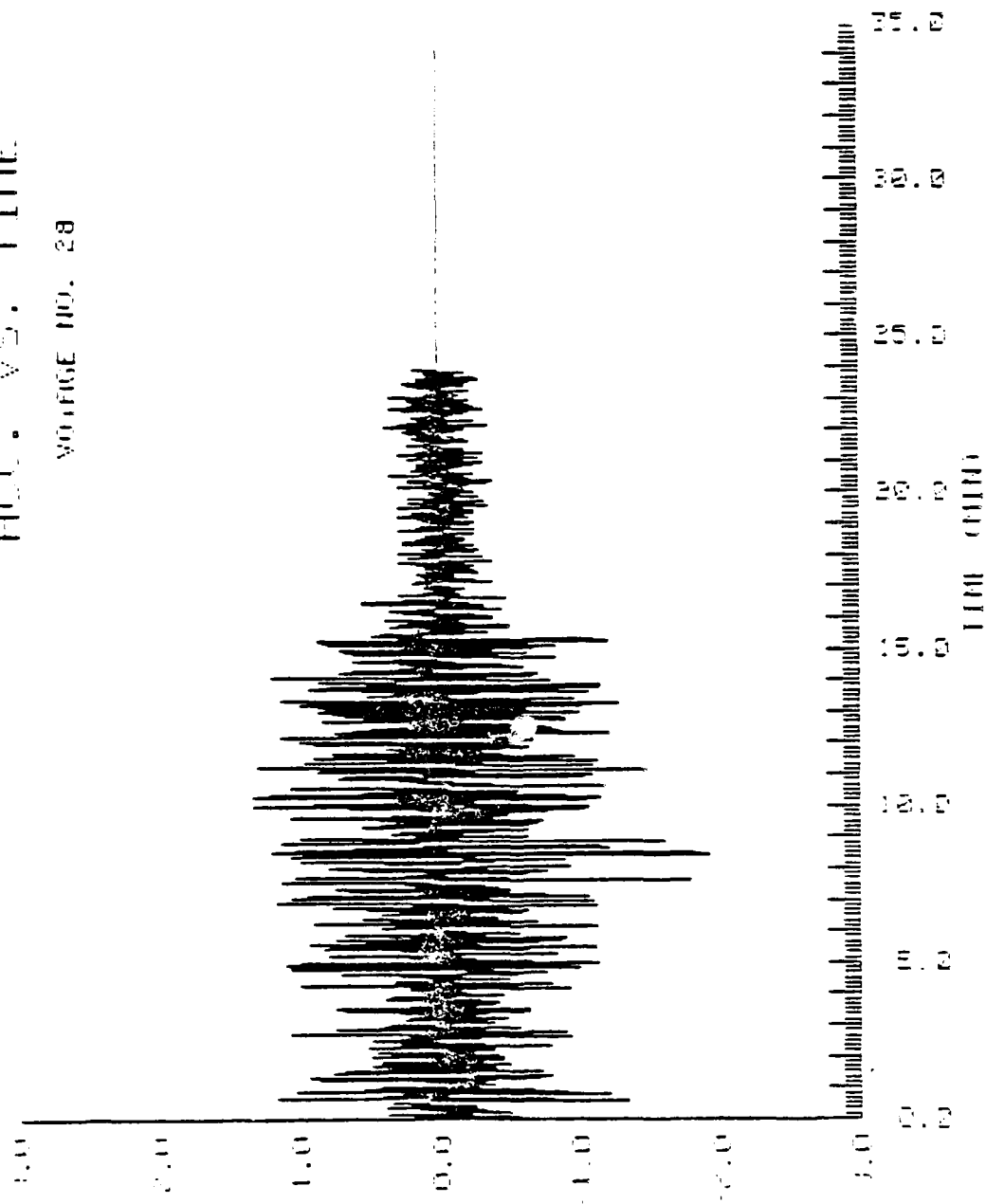
ROLL VS. TIME

VOLUME NO. 28



ACC. VS. TIME

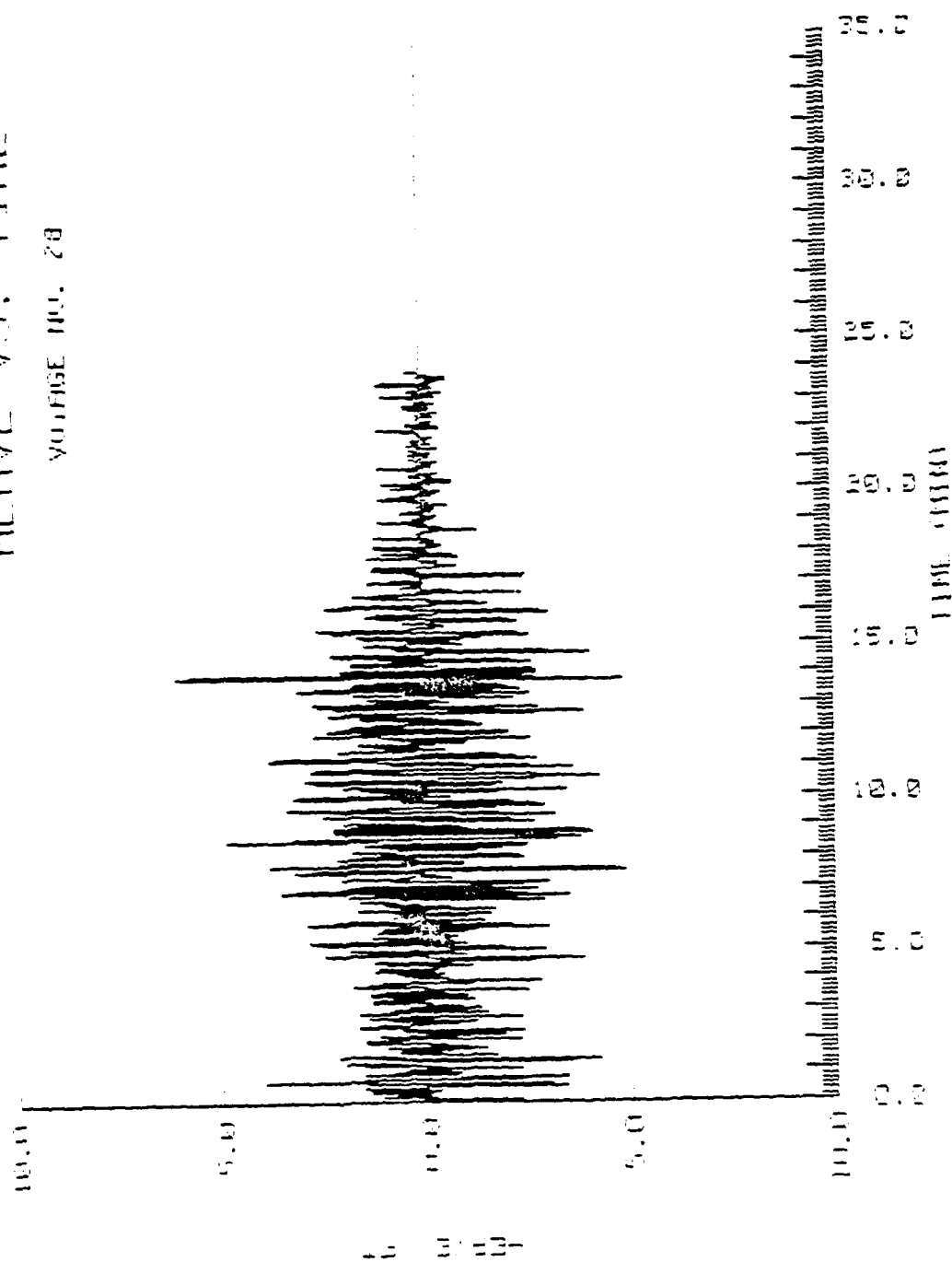
VOLUME NO. 28



133 133 133 133

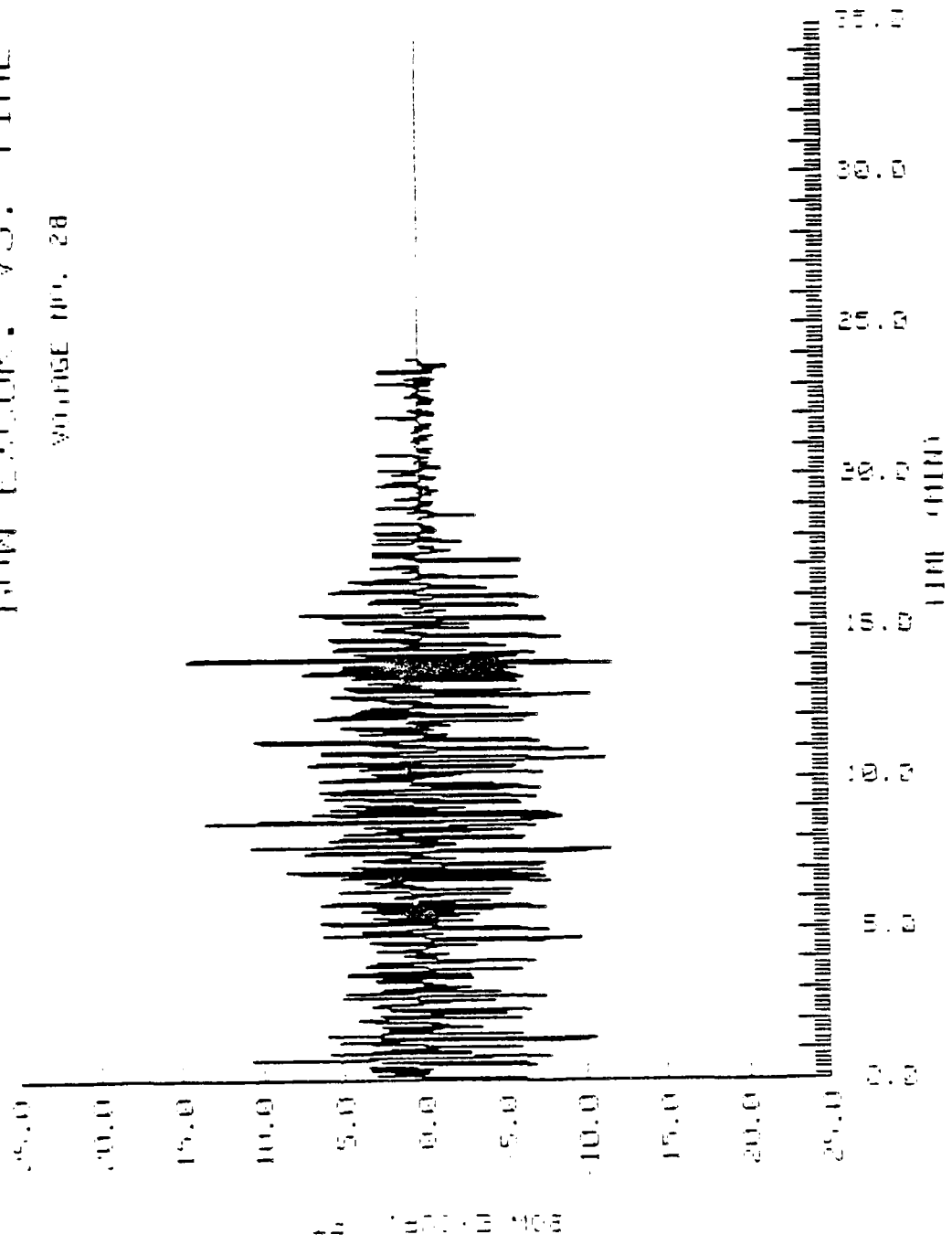
RELATIVE VS. TIME

VOLUME NO. 28



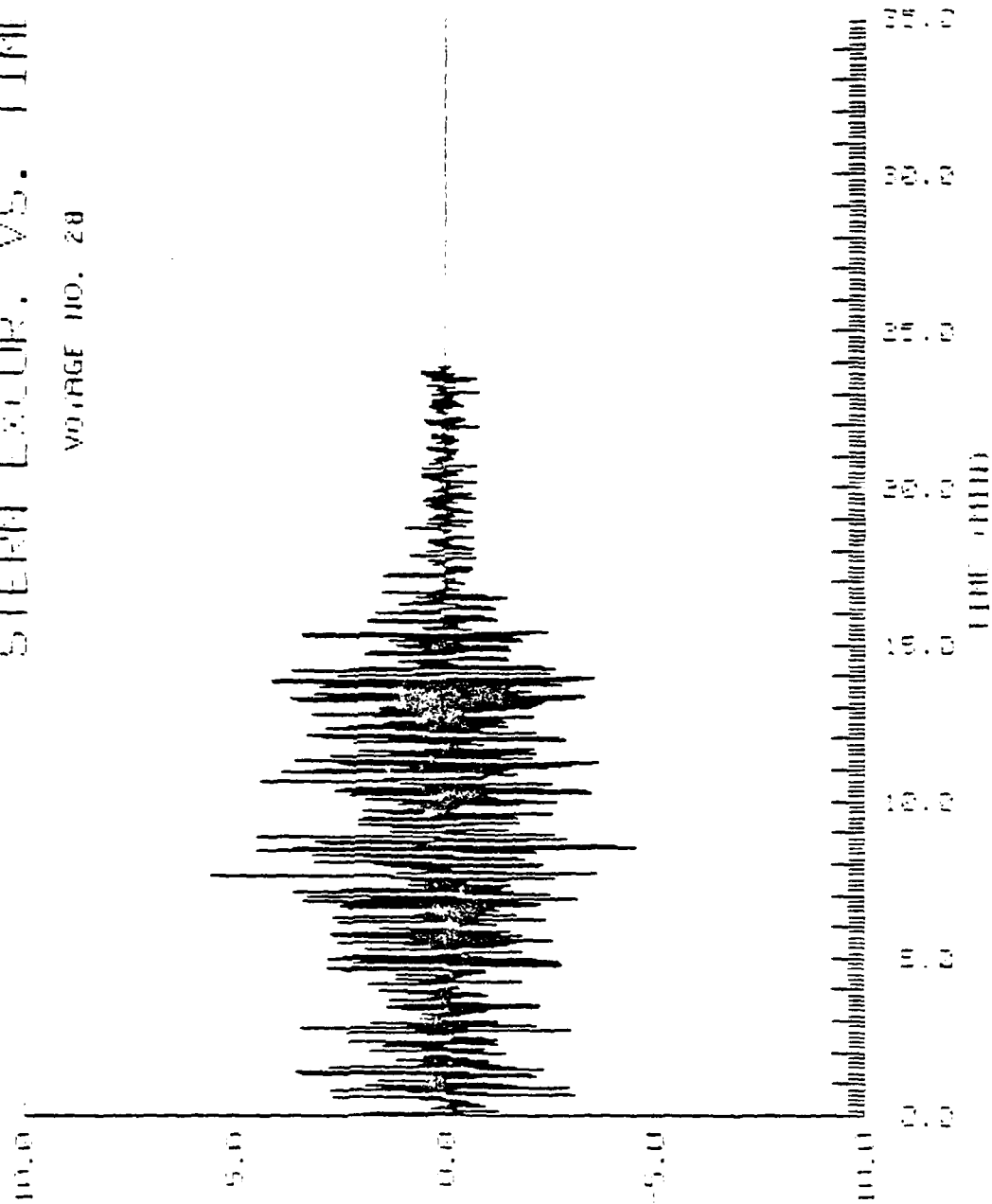
POWER SPECTRUM VS. TIME

VOLUME NO. 28



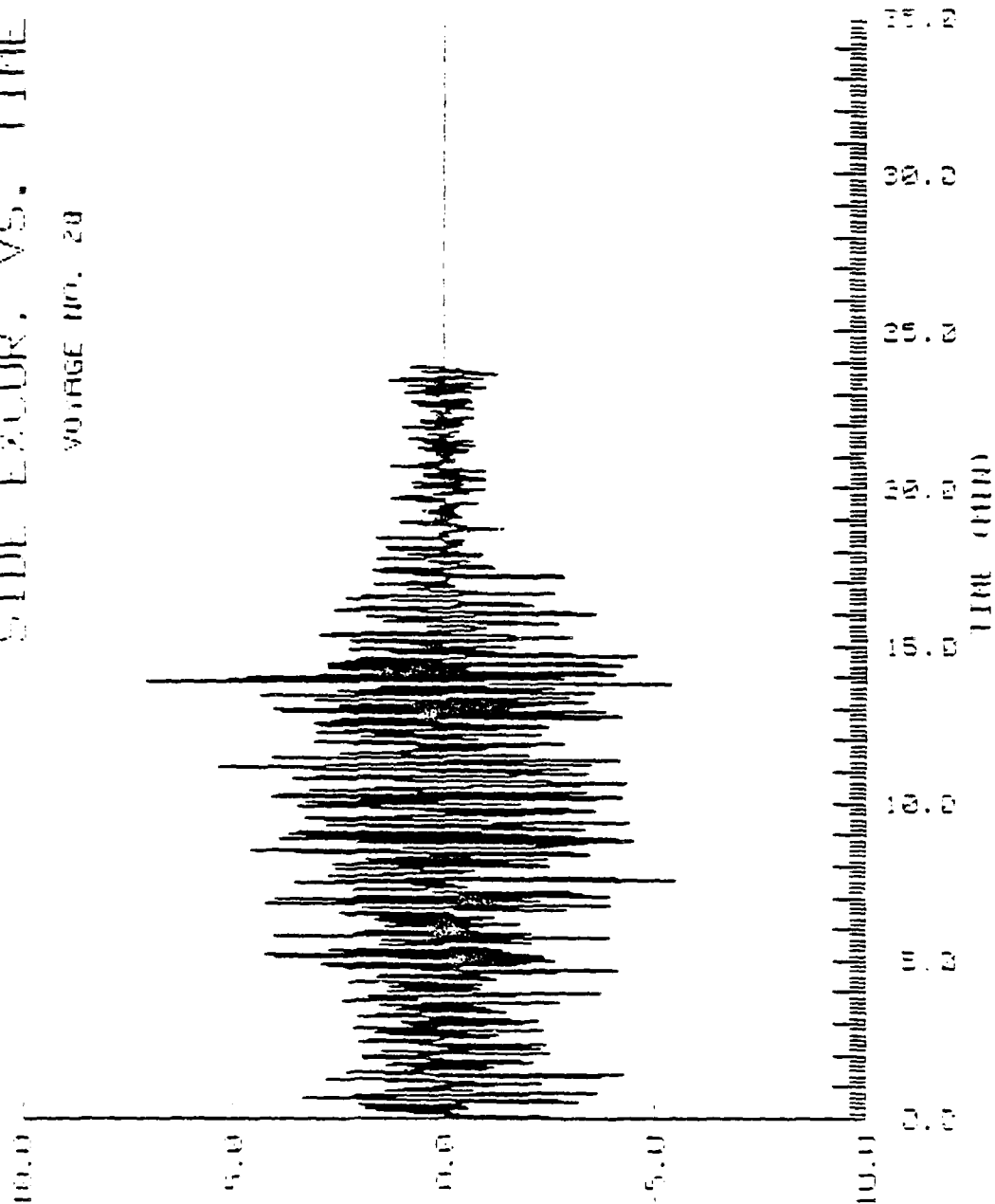
STERN EXCUR. VS. TIME

VOLTAGE 110. 28



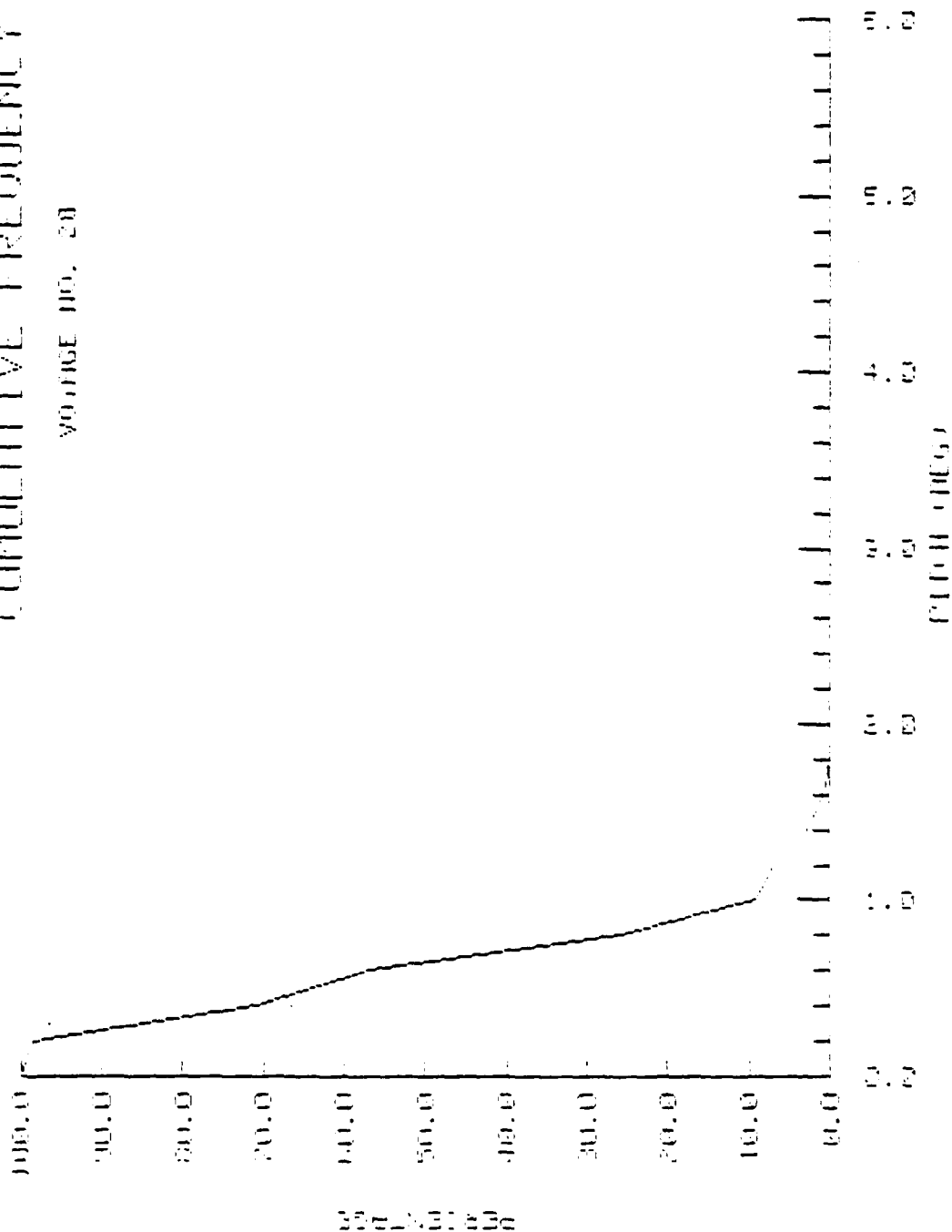
SIDE EXCUR. VS. TIME

VOLUME NO. 20



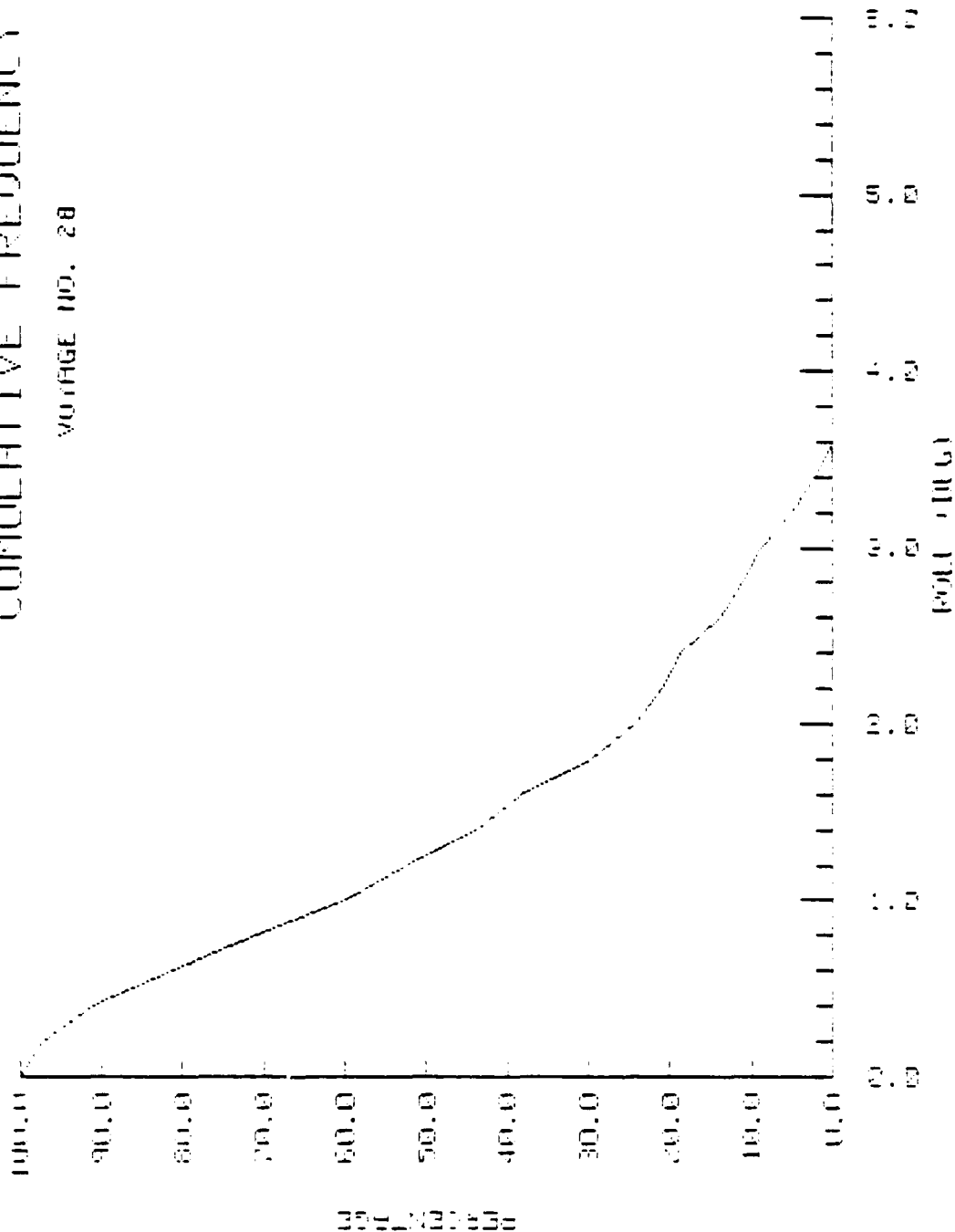
CUMULATIVE FREQUENCY

VOLUME NO. 20



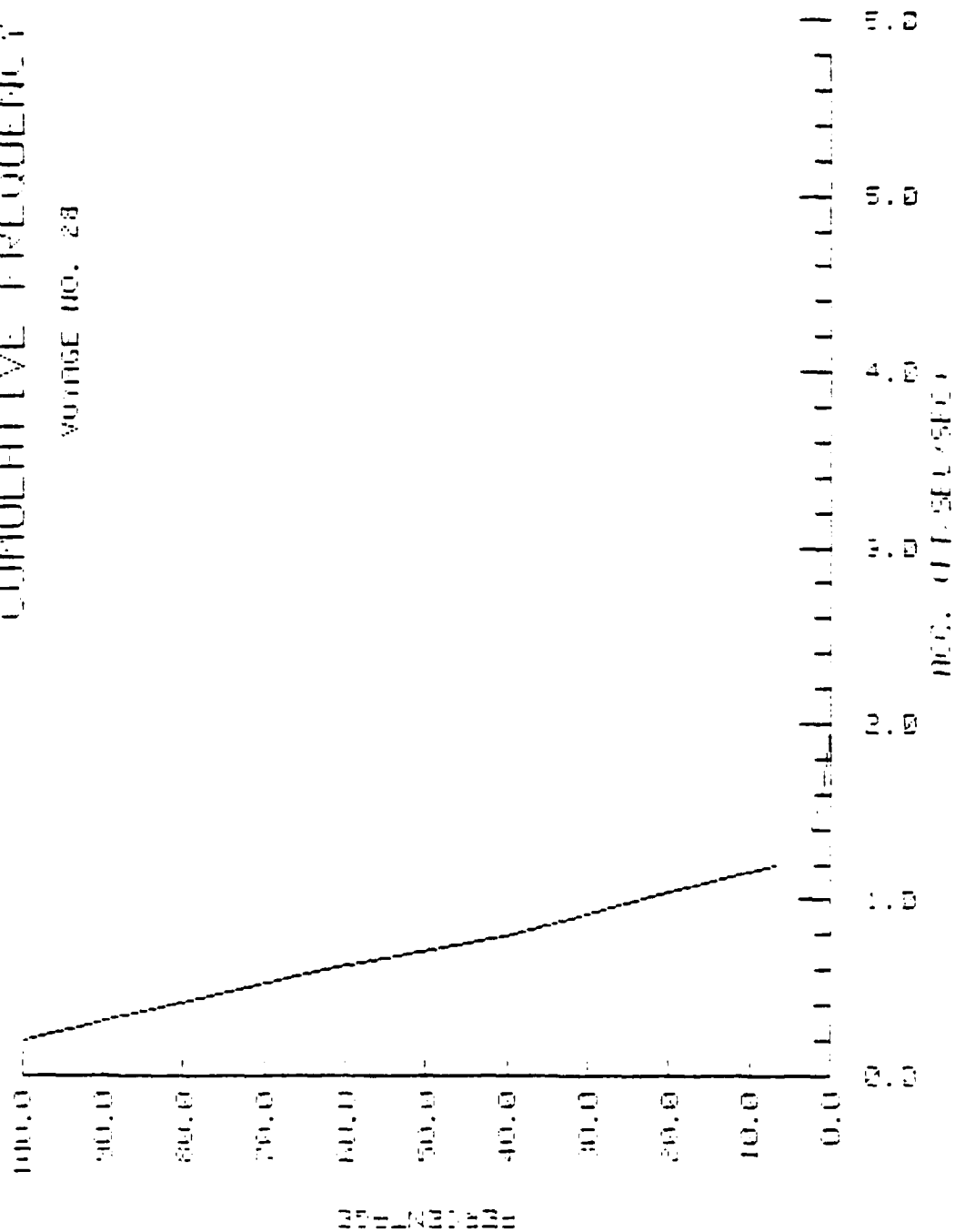
CUMULATIVE FREQUENCY

VOLUME NO. 28



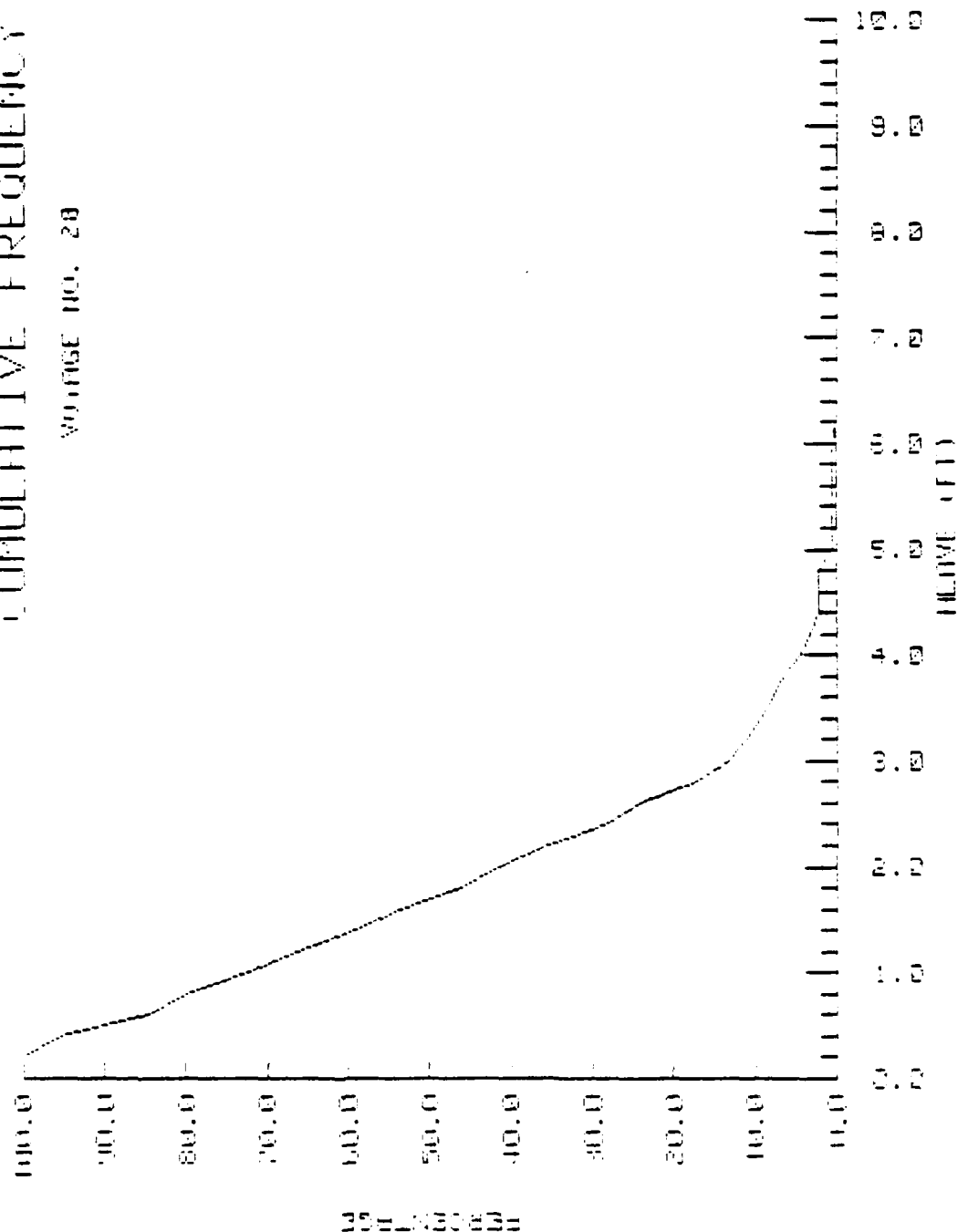
CUMULATIVE FREQUENCY

VOLUME NO. 28



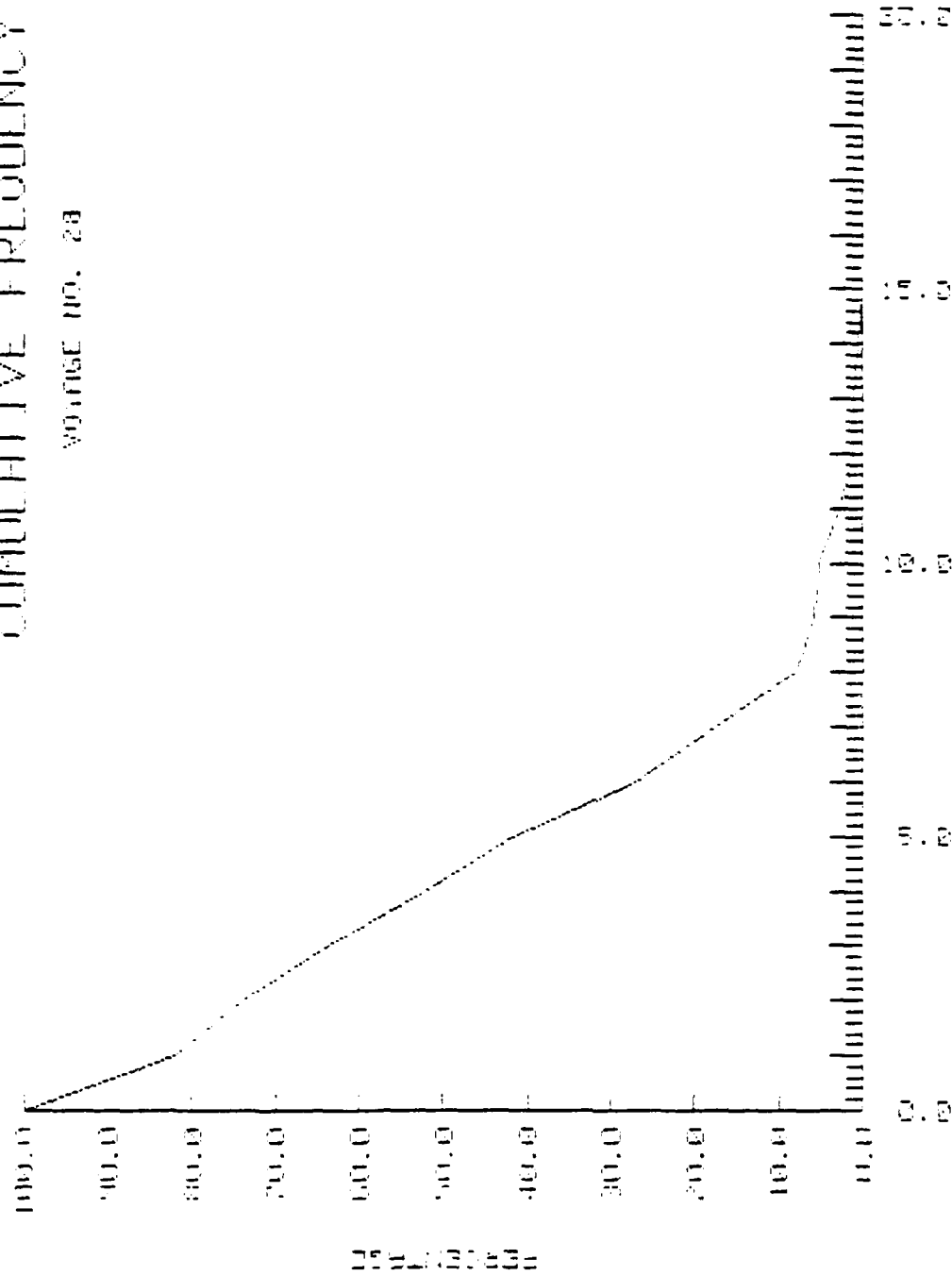
CUMULATIVE FREQUENCY

VOLUME NO. 28



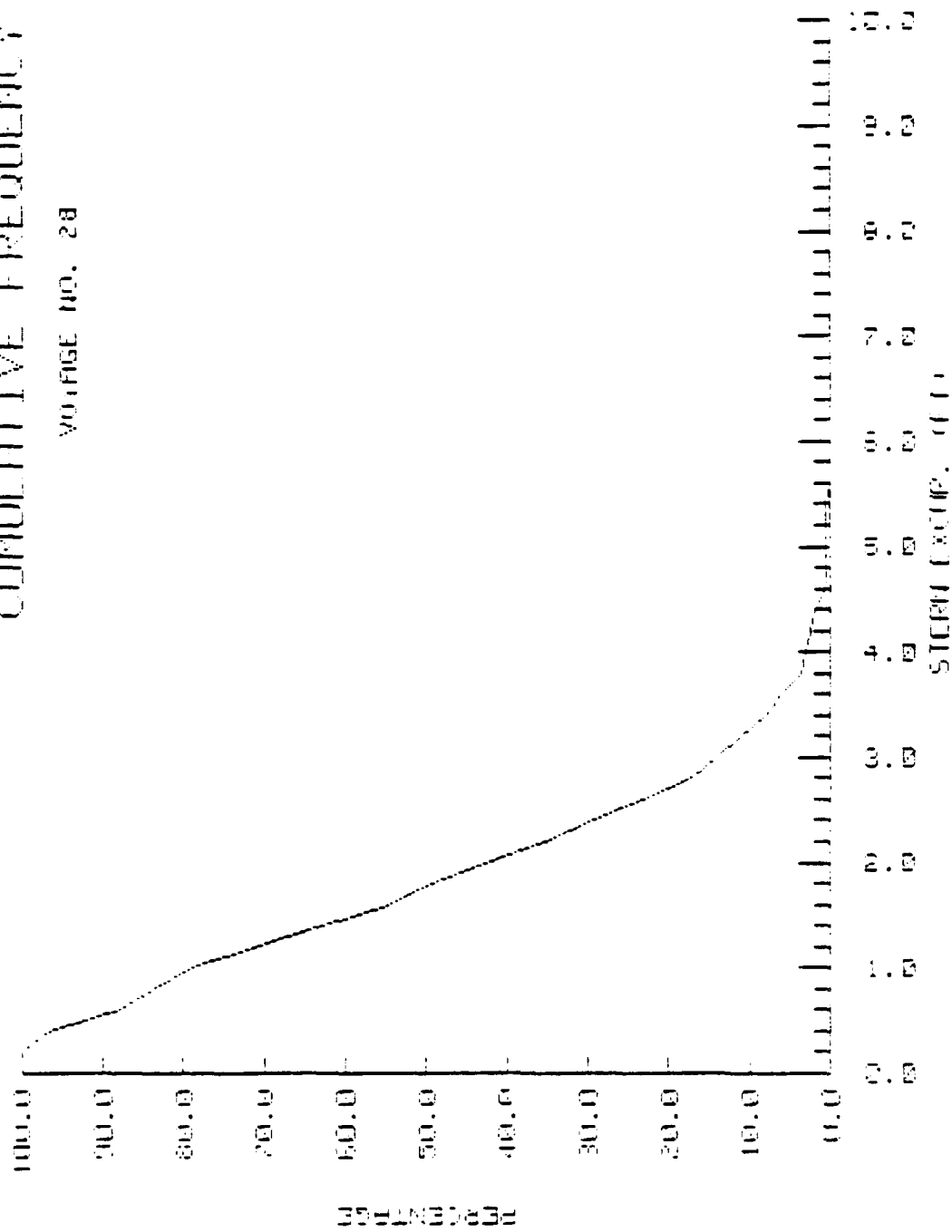
CUMULATIVE FREQUENCY

VOICE NO. 28



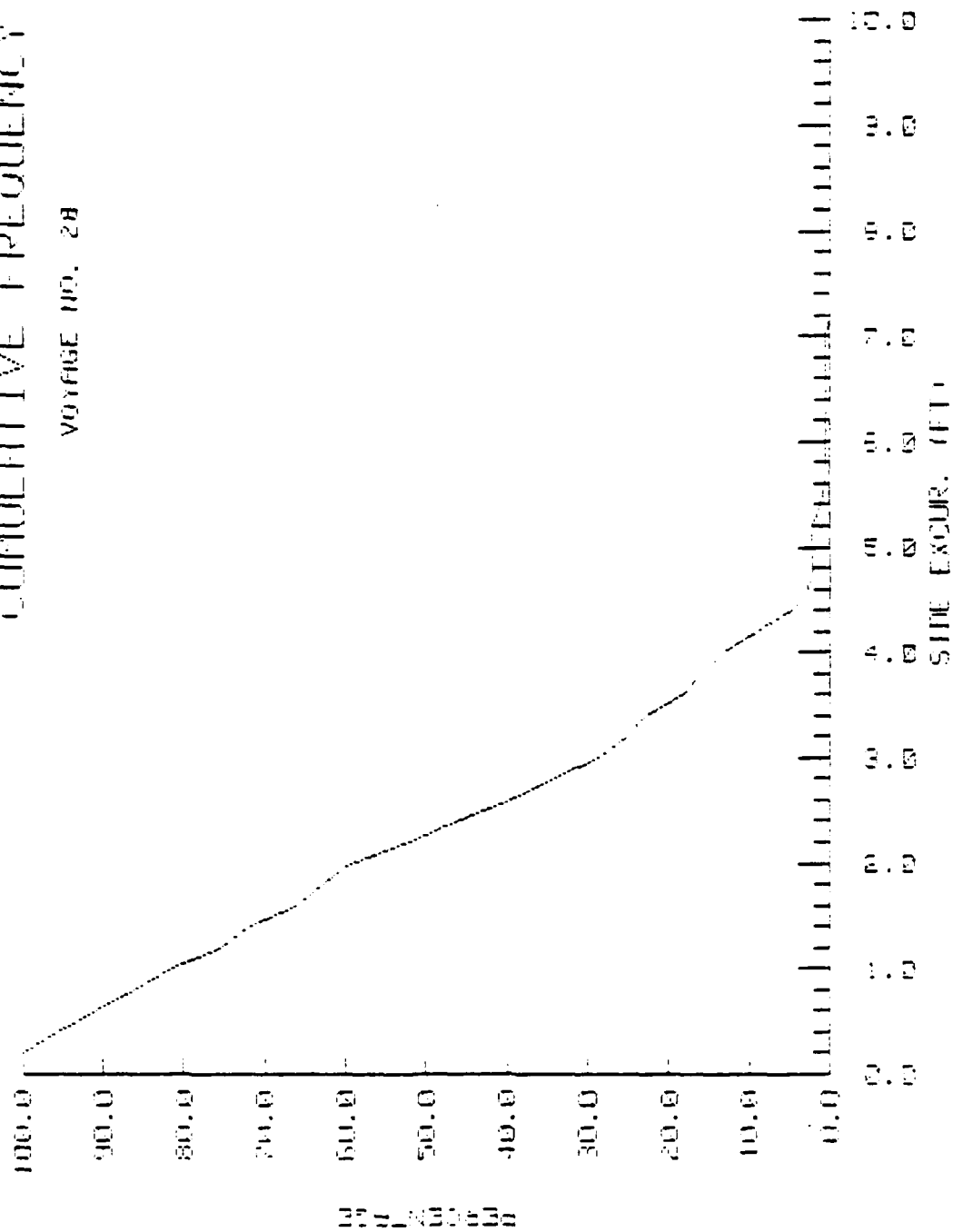
CUMULATIVE FREQUENCY

VOLUME NO. 28



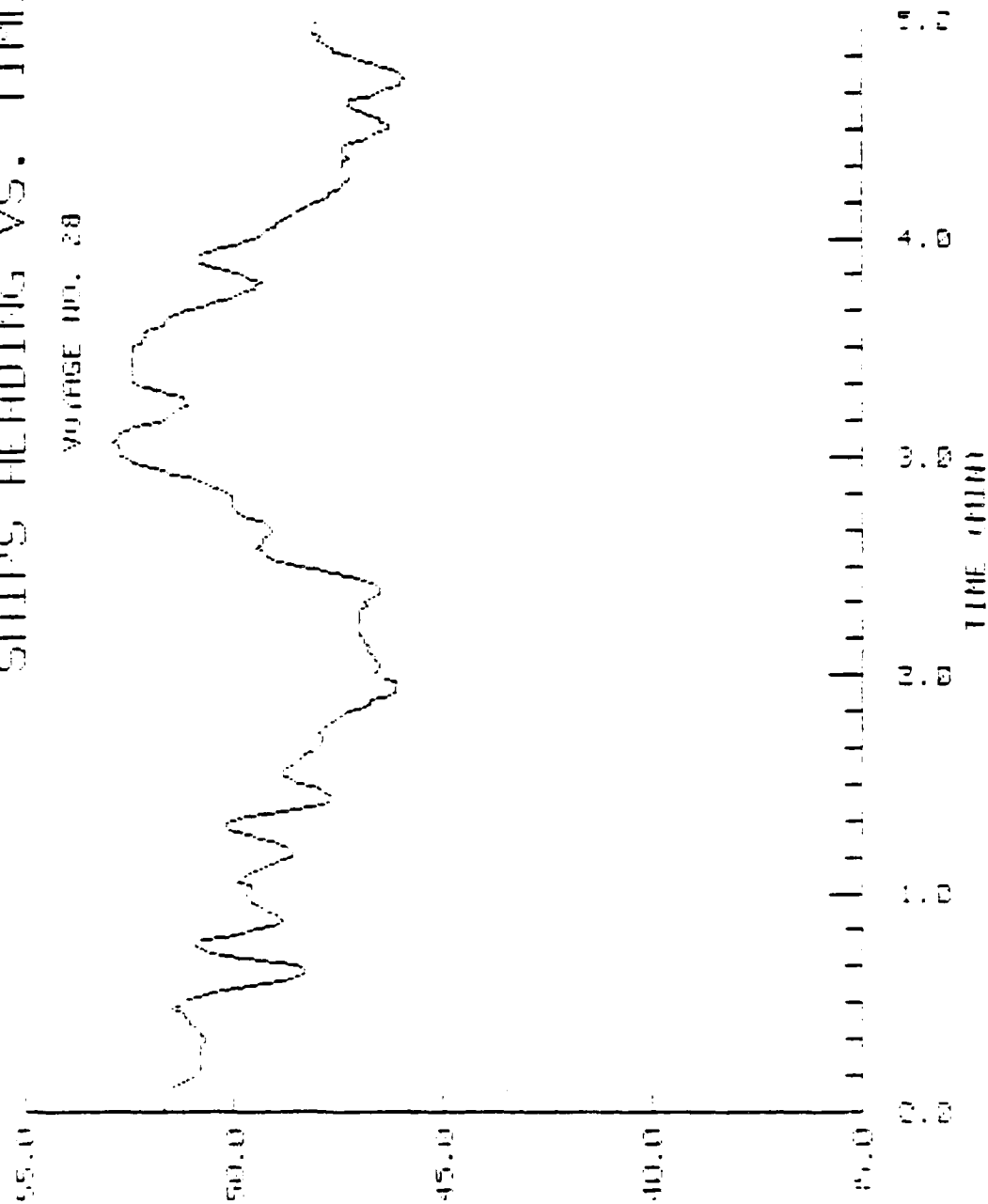
CUMULATIVE FREQUENCY

VOYAGE NO. 28



SHIPS HEADING VS. TIME

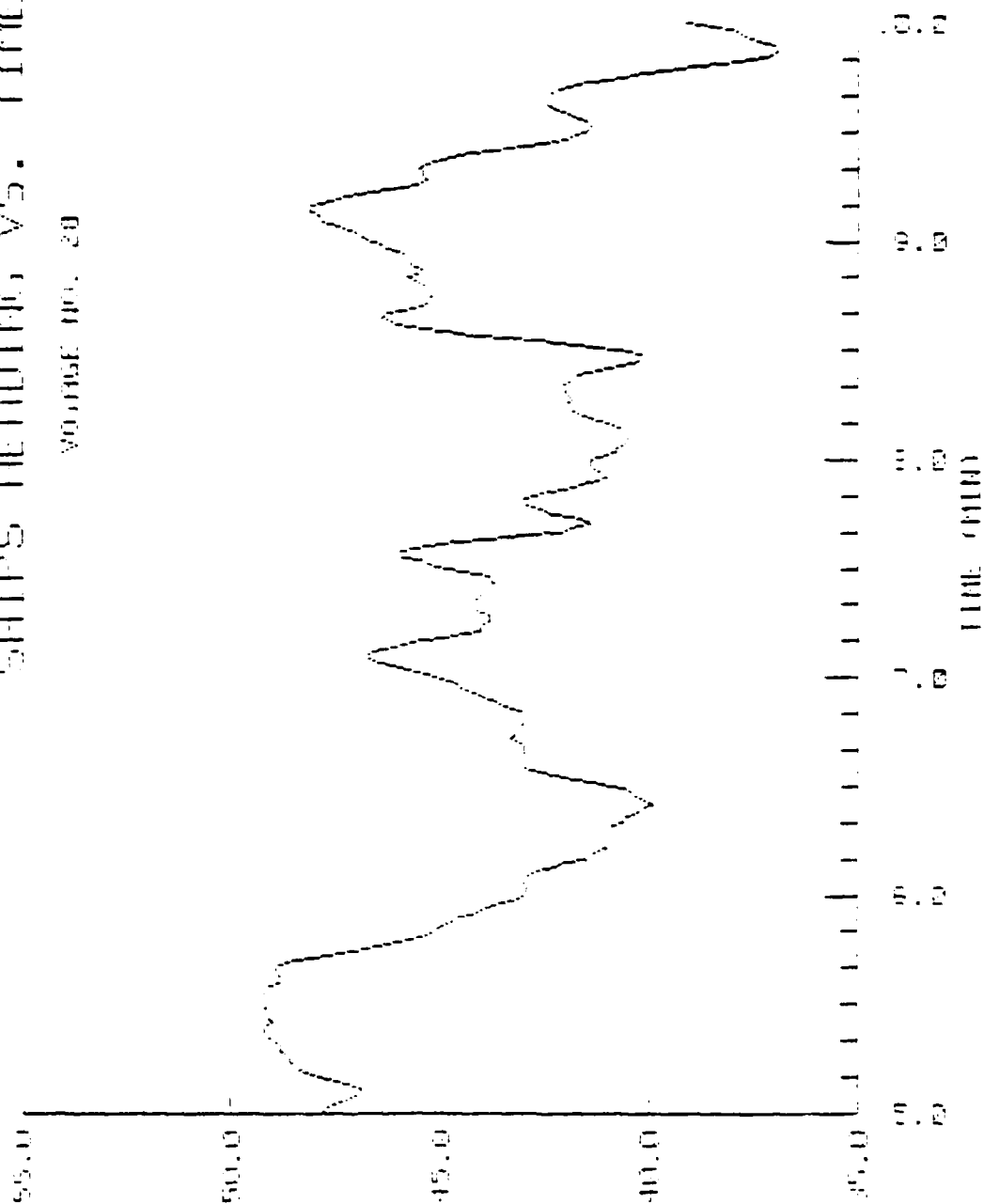
VORAGE NO. 28



50.0 45.0 40.0 35.0 30.0

SHIP'S HEADING VS. TIME

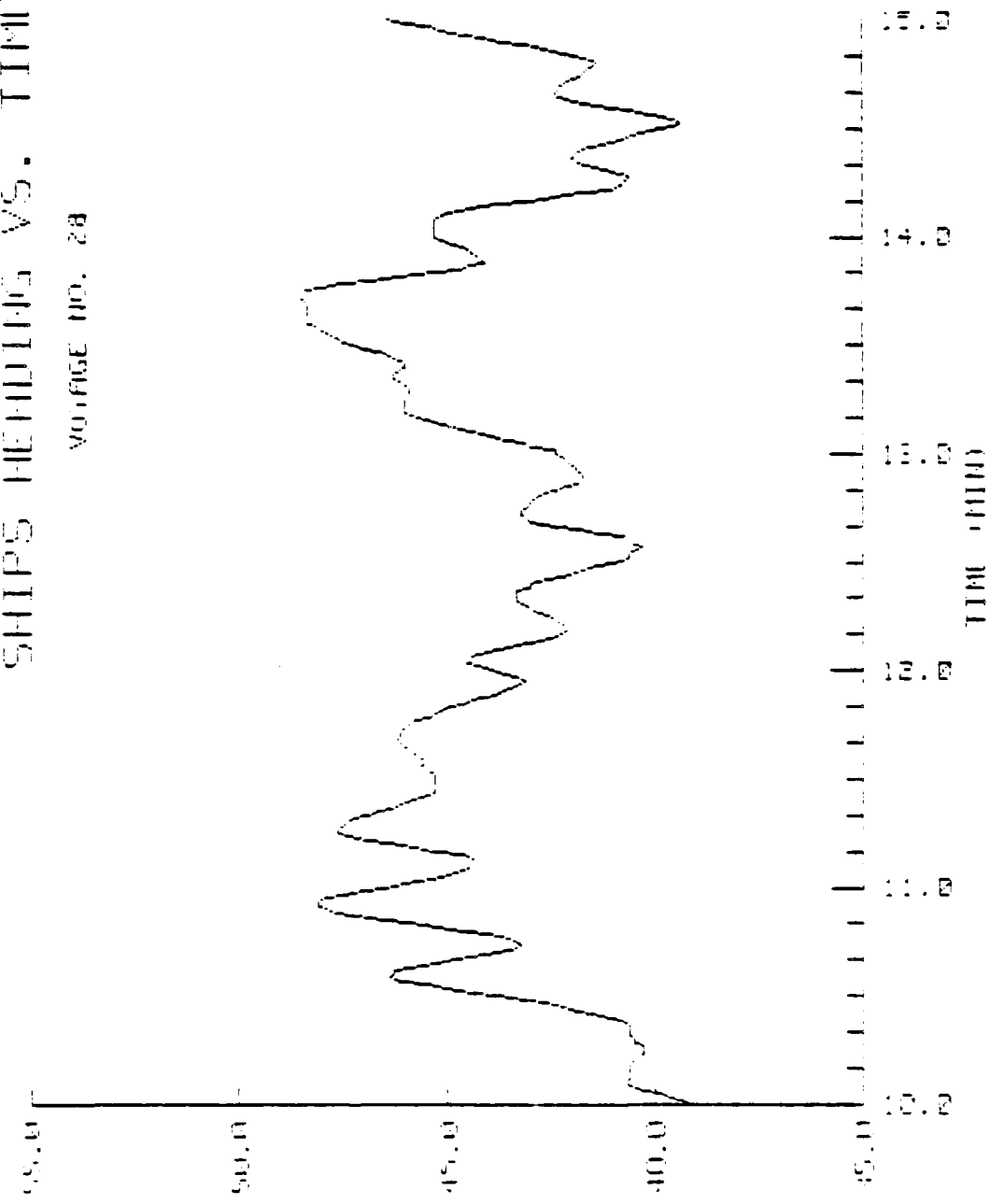
VOLUME 100, 20



100 - 10010-01- 0011-0

SHIPS HEADING VS. TIME

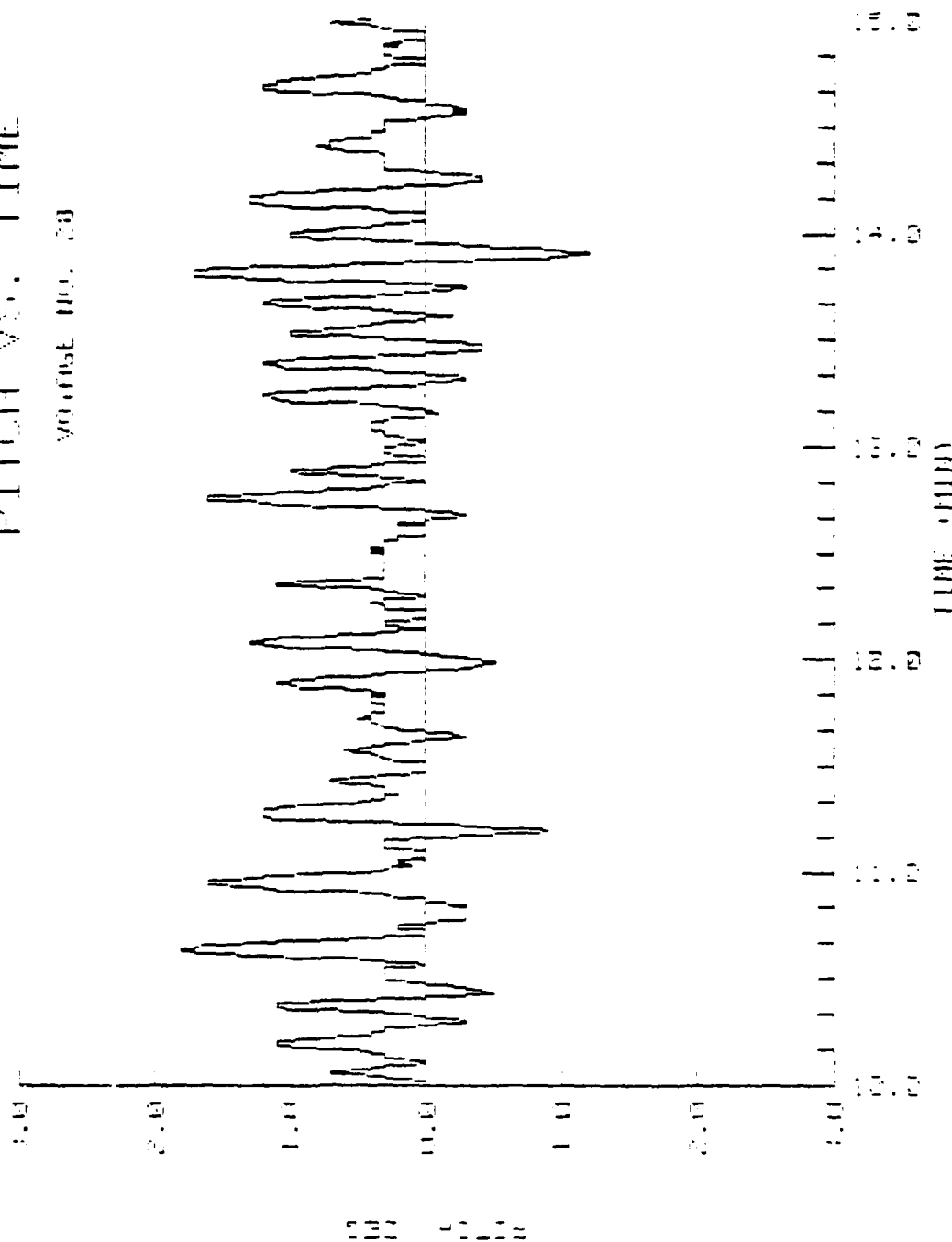
VOLUME NO. 28



1000 2000 3000 4000 5000 6000 7000 8000 9000

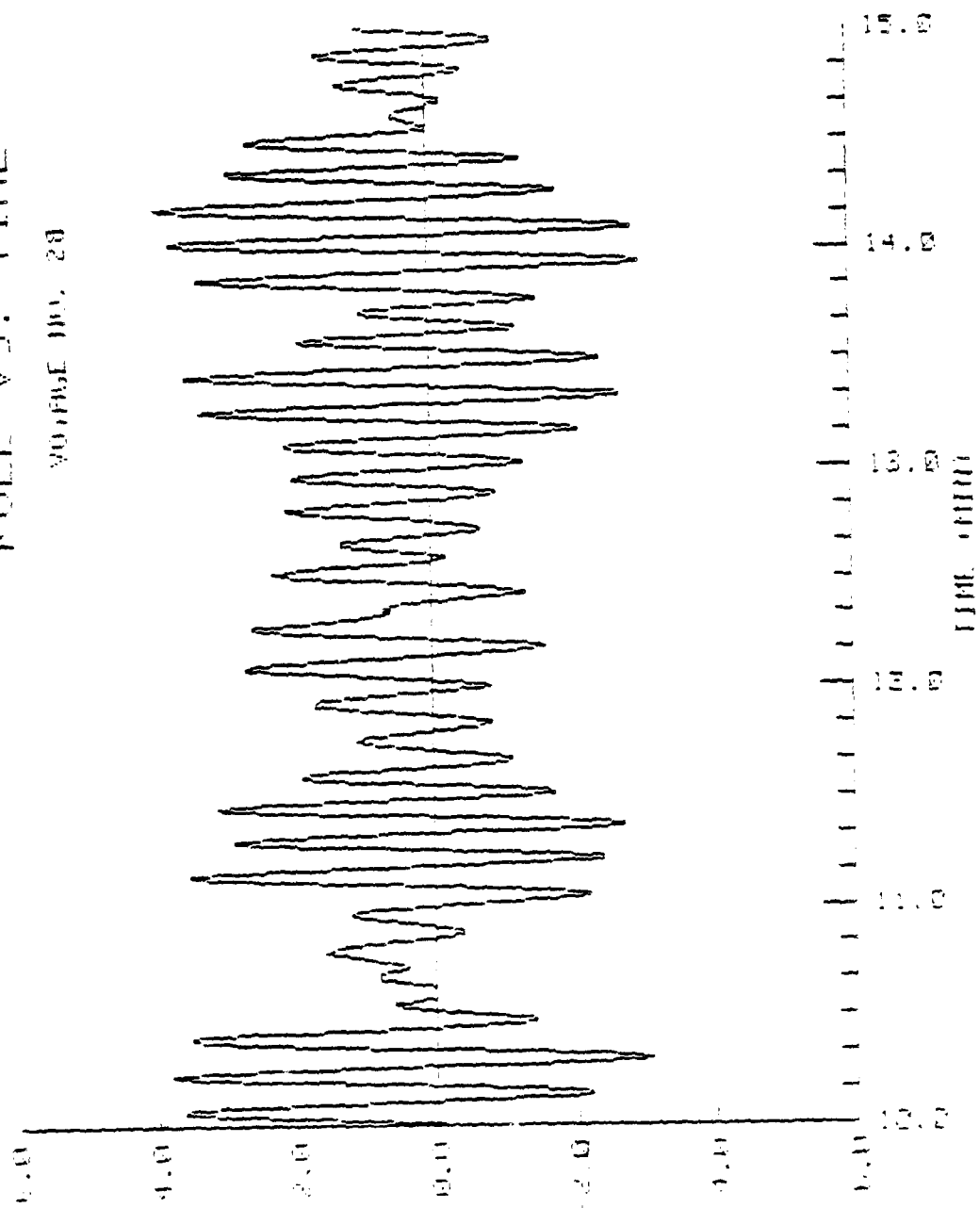
PITCH VS. TIME

VOICE NO. 28



POLL VS. TIME

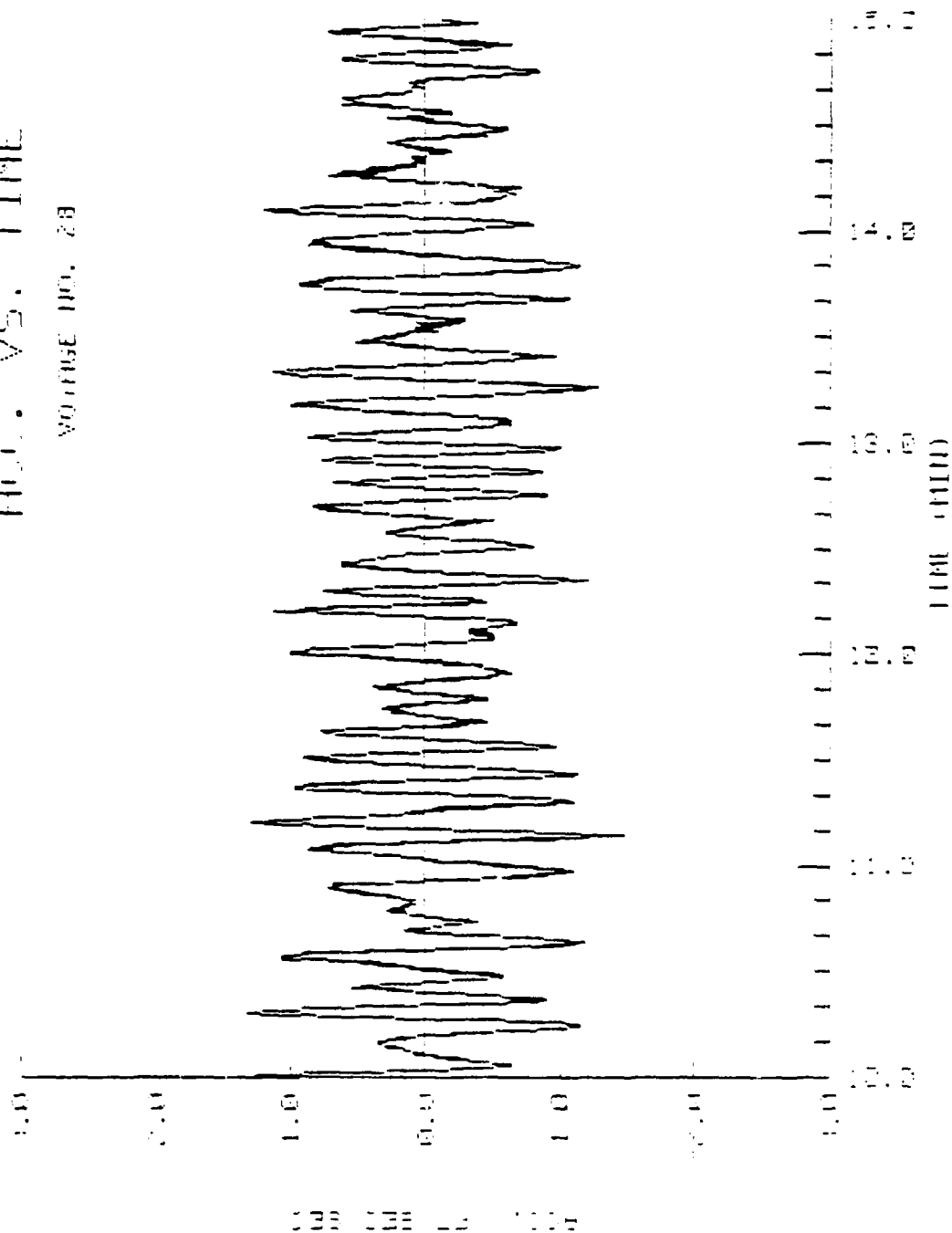
VOLUME NO. 28



131-1706

FOC. VS. TIME

VOLUME NO. 28



AD-A098 984

TETRA TECH INC PASADENA CA

F/G 13/10

COLUMBIA RIVER ENTRANCE CHANNEL DEEP-DRAFT VESSEL MOTION STUDY.--ETC(U)

SEP 80 S WANG, M KIMBLE, C BUTCHER, G D COX

DACW57-78-C-0028

UNCLASSIFIED

TETRAT-TC-3925-APP-A(1)

NL

8 of 8

AD-A098 984

■

END

DATE

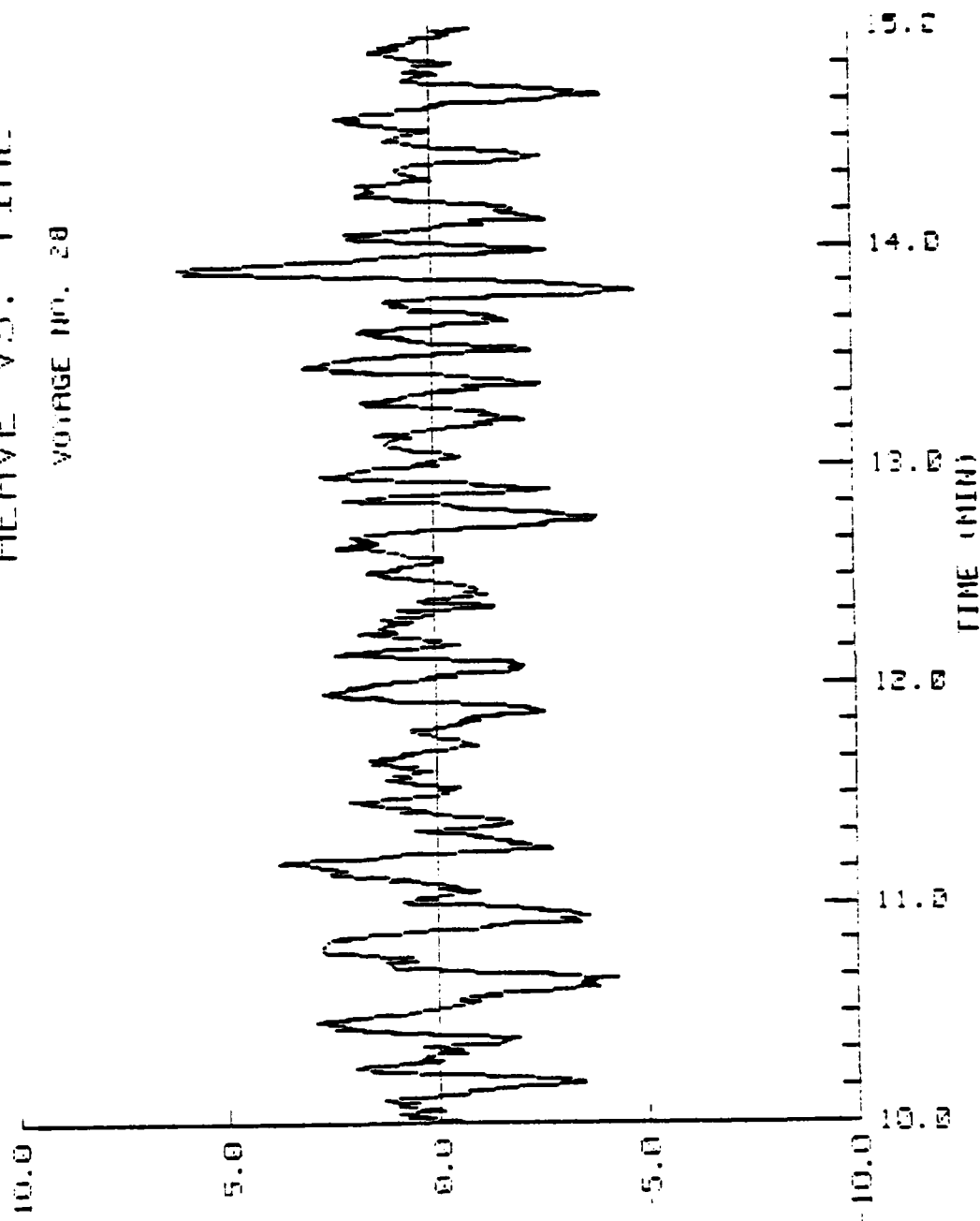
ENRWD

6-81

DTIC

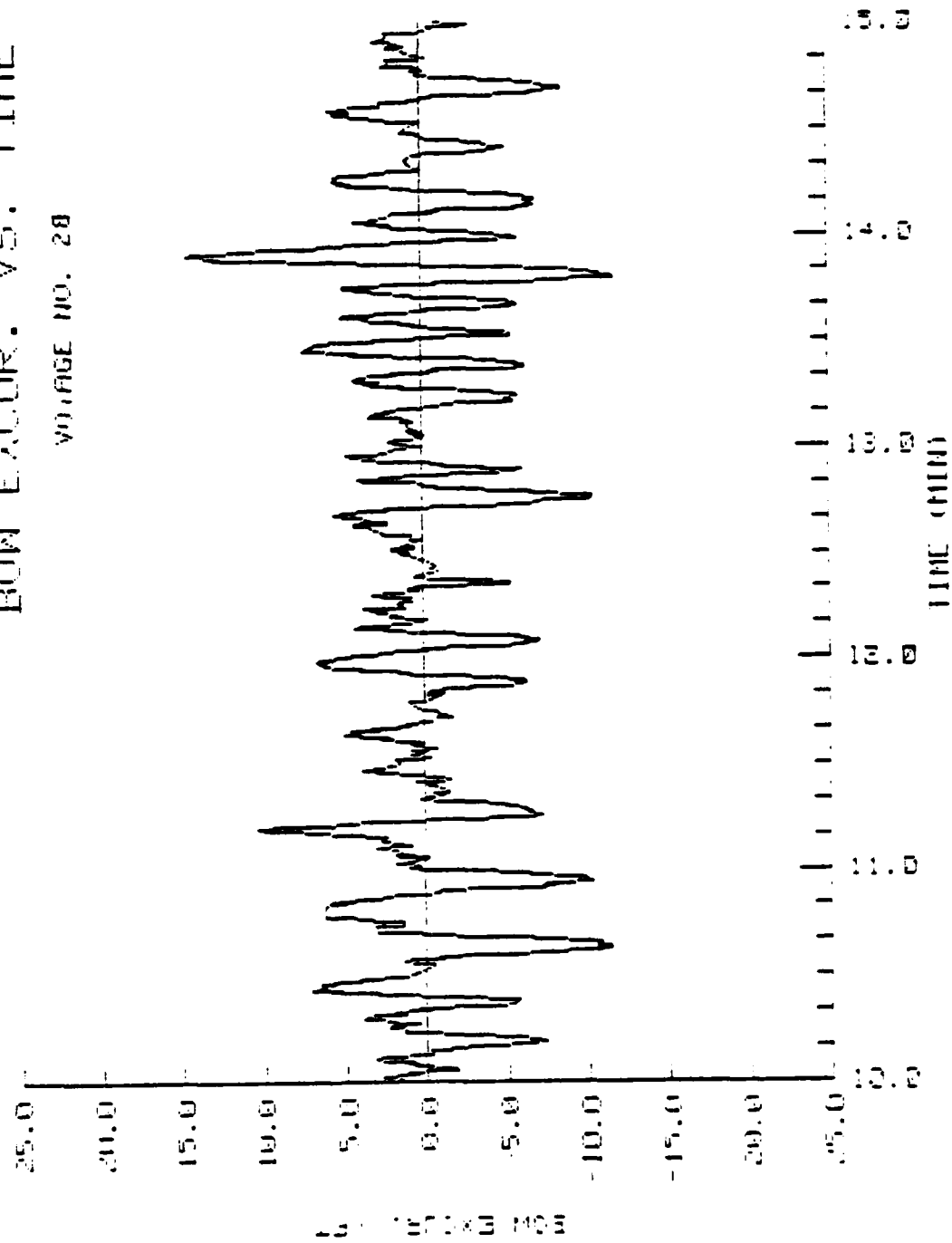
HEAVE VS. TIME

VOLUME NO. 20



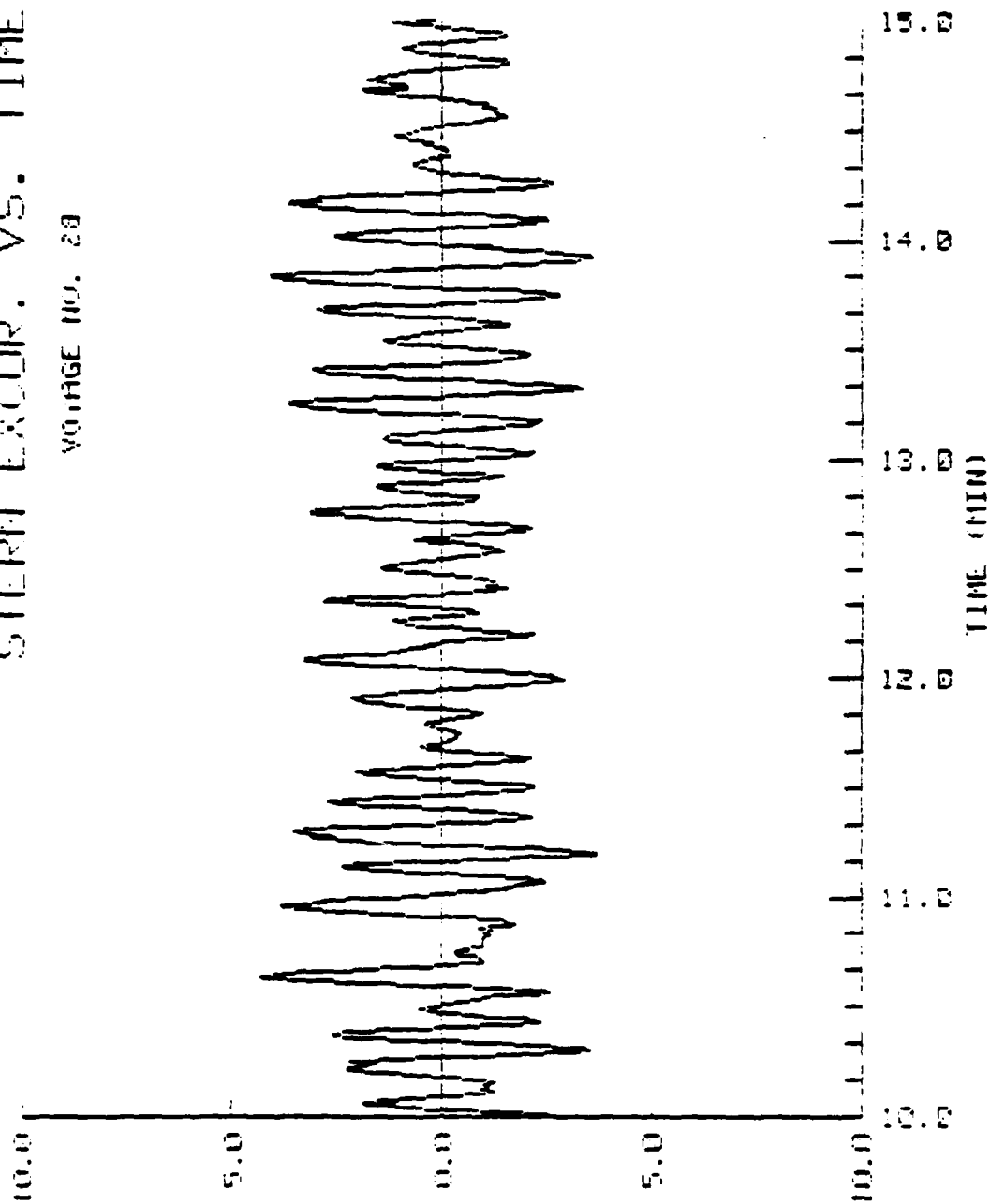
ROM EXCUR. VS. TIME

VOLAGE NO. 28



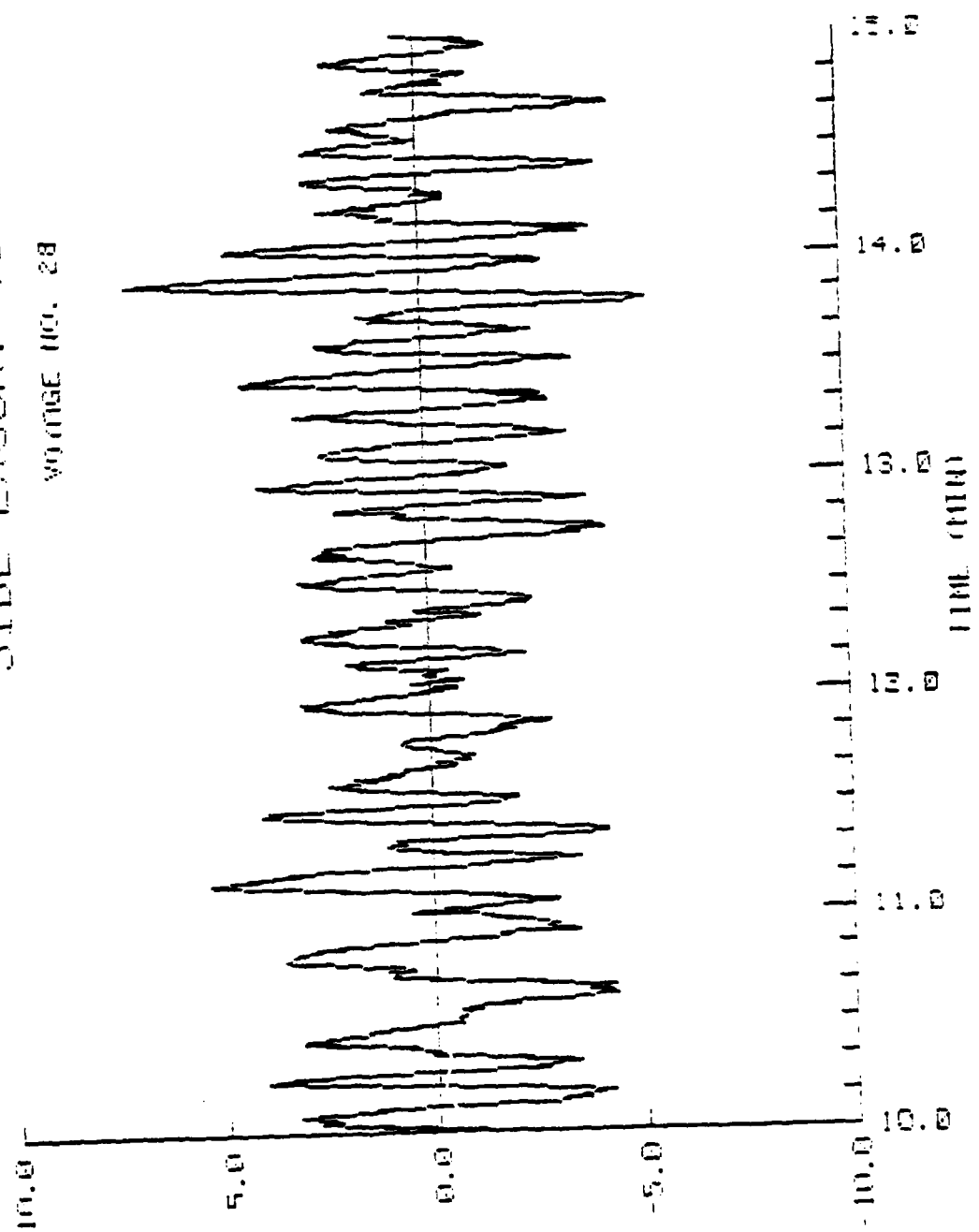
STERN EXCUR. VS. TIME

VOLUME NO. 28



SIDE EXCUR. VS. TIME

VOLUME NO. 28



11-1970X3 2013

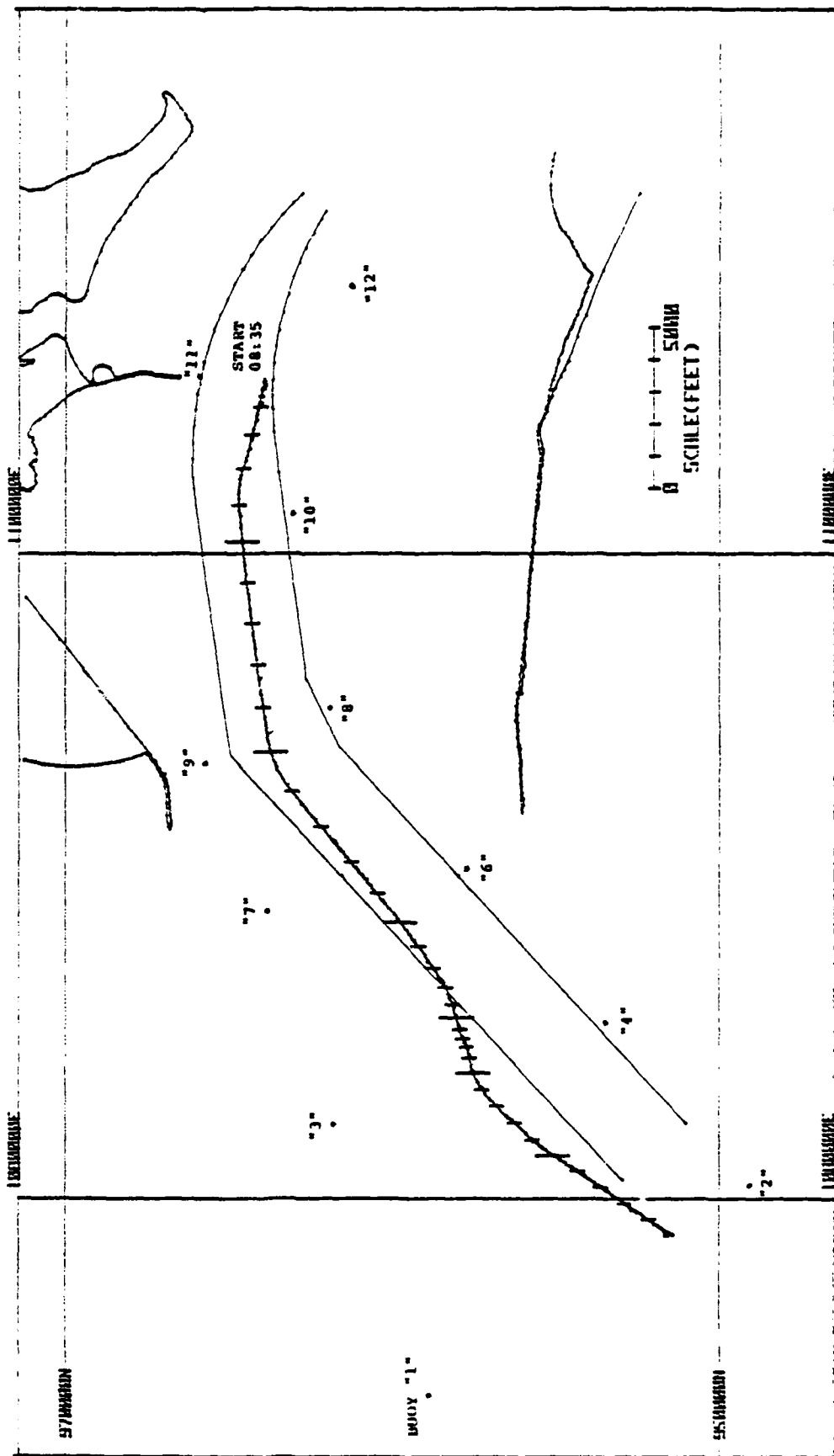
STATISTICAL SUMMARY

VOYAGE NO. 29

	MEAN LINE DEVIATION FROM ZERO	MAXIMUM AMPLITUDE	AVERAGE AMPLITUDE	RMS
PITCH (DEG)	.1	1.8	.7	.8
ROLL (DEG)	.2	3.7	1.0	1.2
NO. (FT/SEC/SEC)	-.0	2.5	.8	.9
HEAVE (FT)	.0	5.5	1.9	2.2
BOW EXCUR. (FT)	.0	15.2	5.1	6.0
STERN EXCUR. (FT)	.0	6.5	2.1	2.4
SIDE EXCUR (FT)	.0	4.8	2.0	2.2

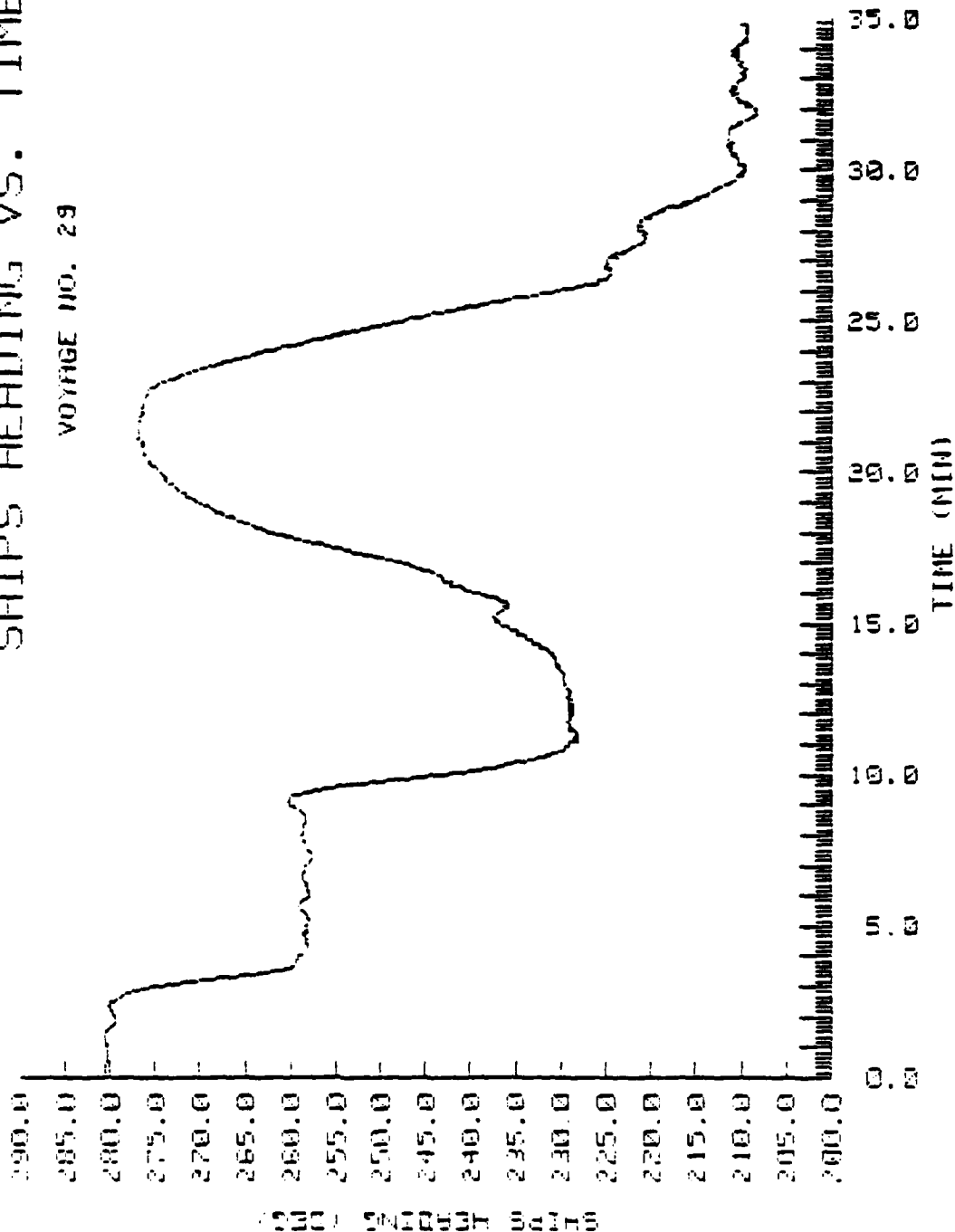
VOYAGE NO. 29 SHIP TRACK

DATE: 1 JUL 55



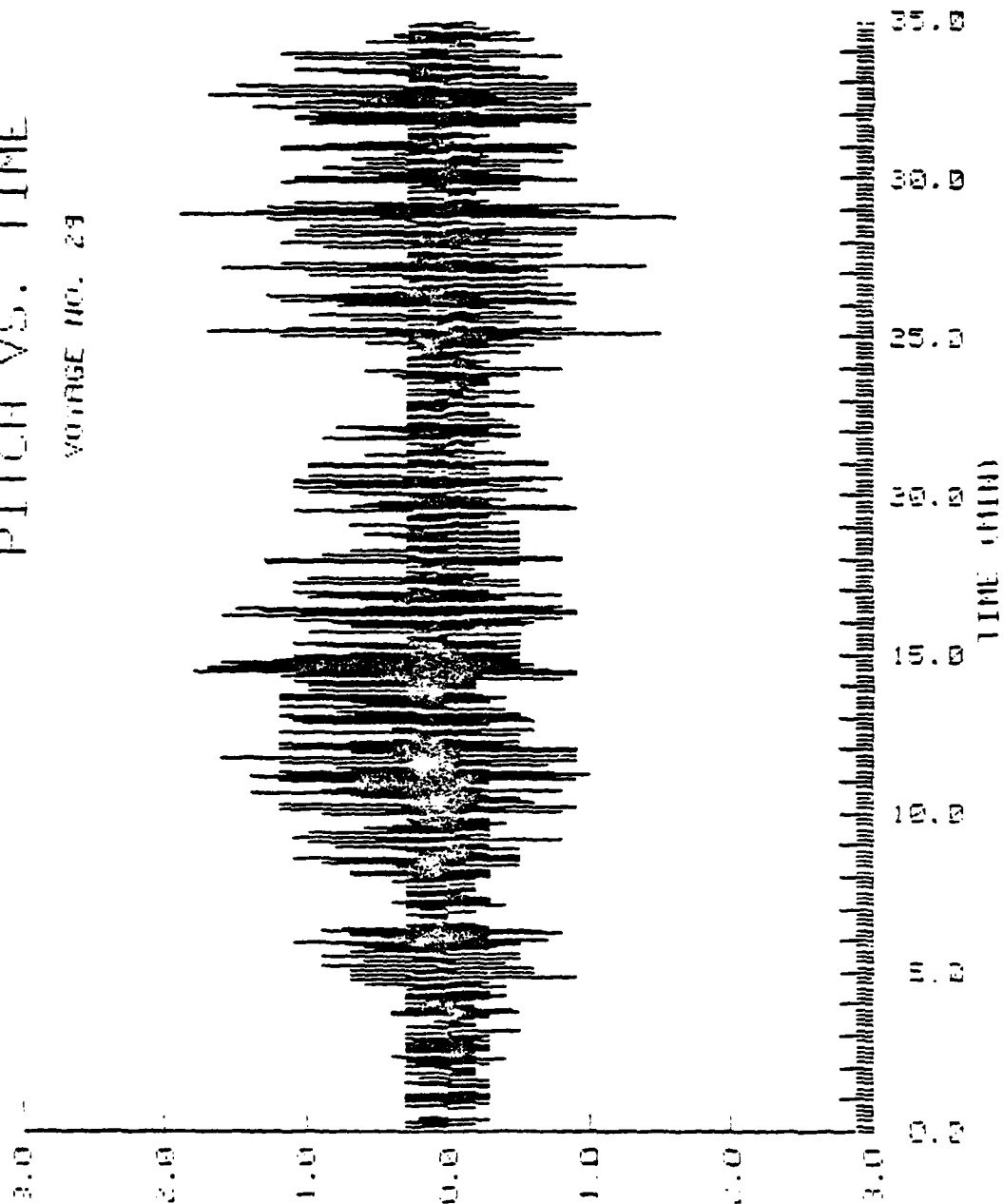
SHIPS HEADING VS. TIME

VOYAGE NO. 29



PITCH VS. TIME

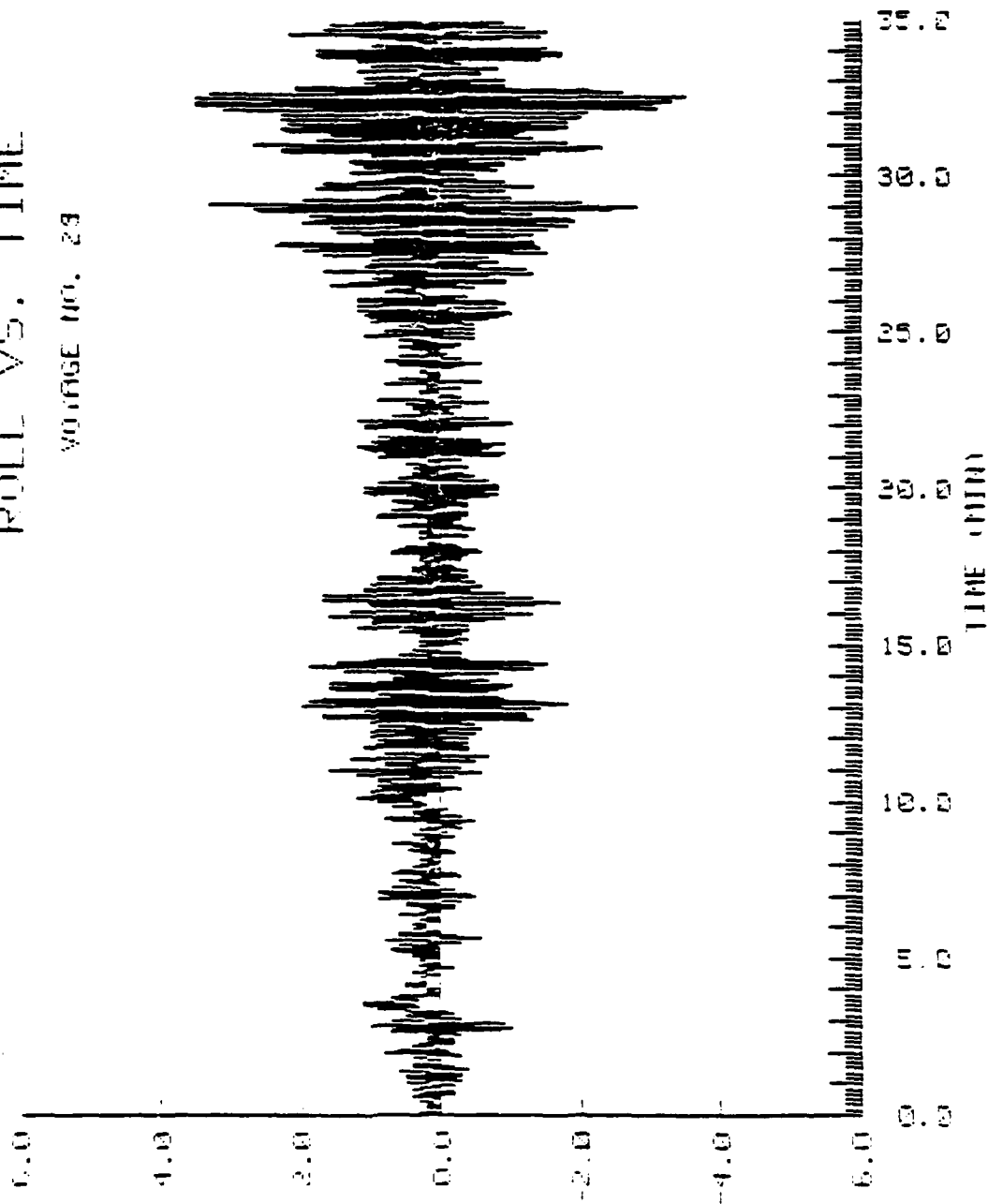
VOLUME NO. 29



1000 1000

ROLL VS. TIME

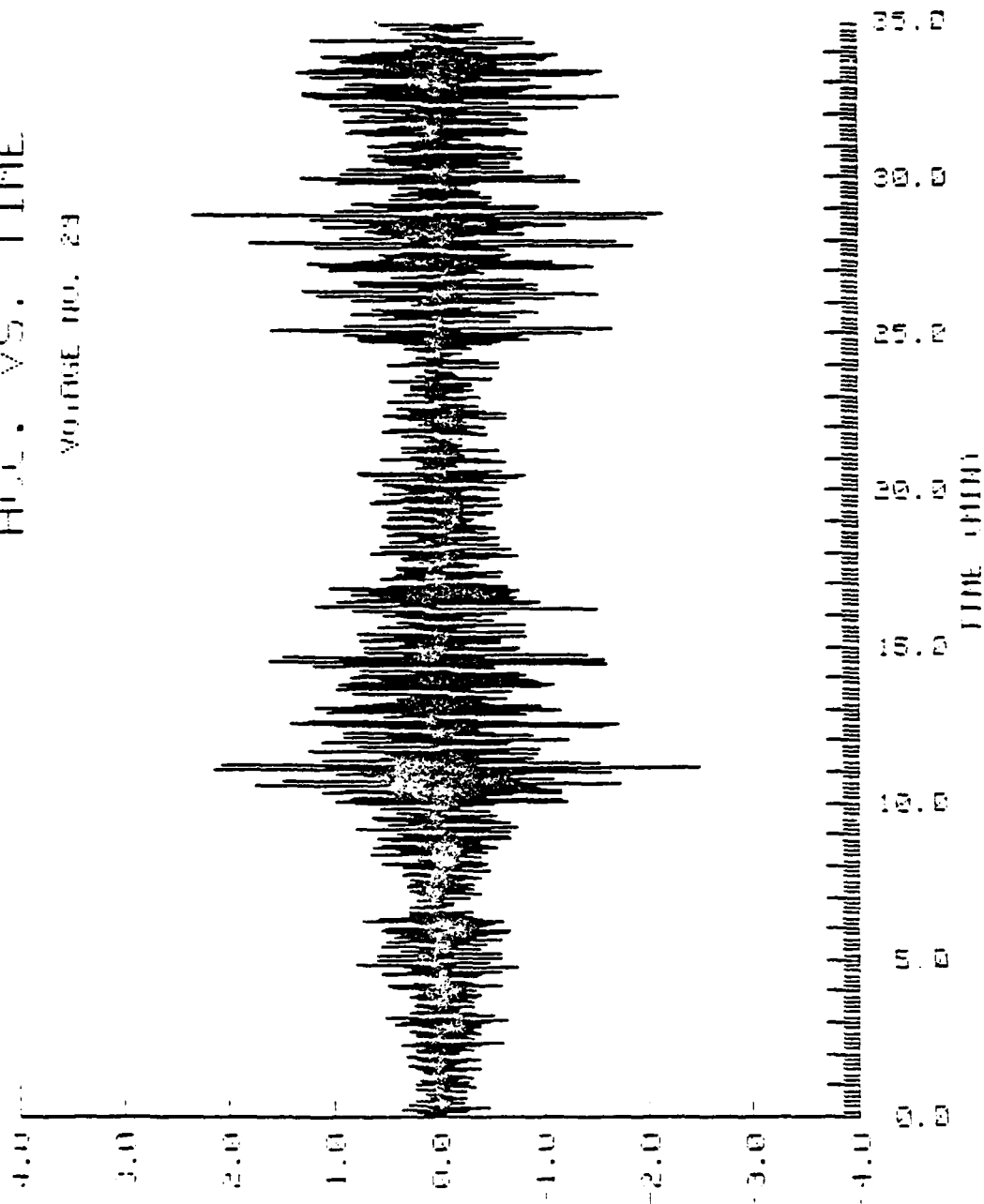
VOLUME NO. 23



ROLL (DEG)

REC. VS. TIME

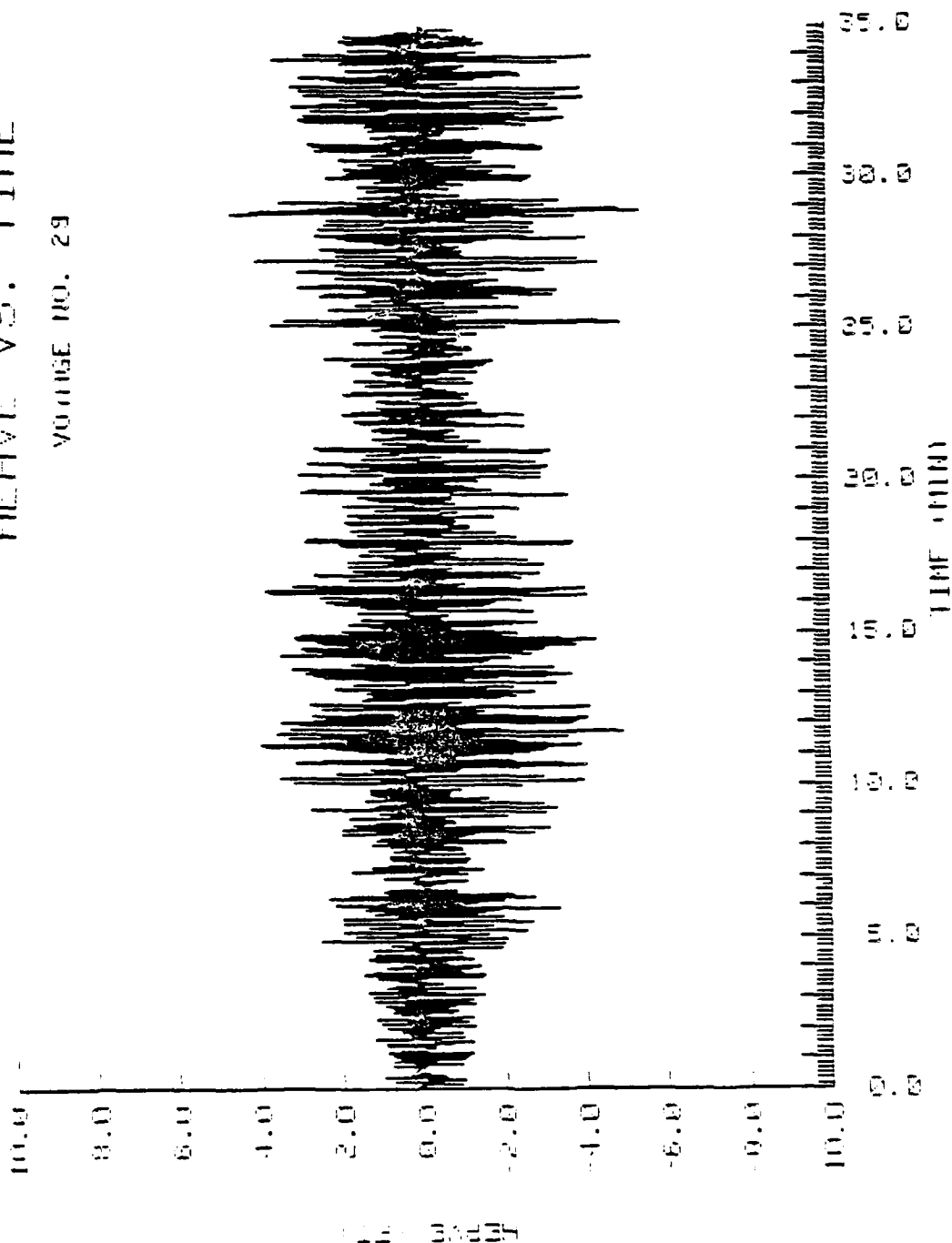
VOLUME NO. 23



REC. VS. TIME

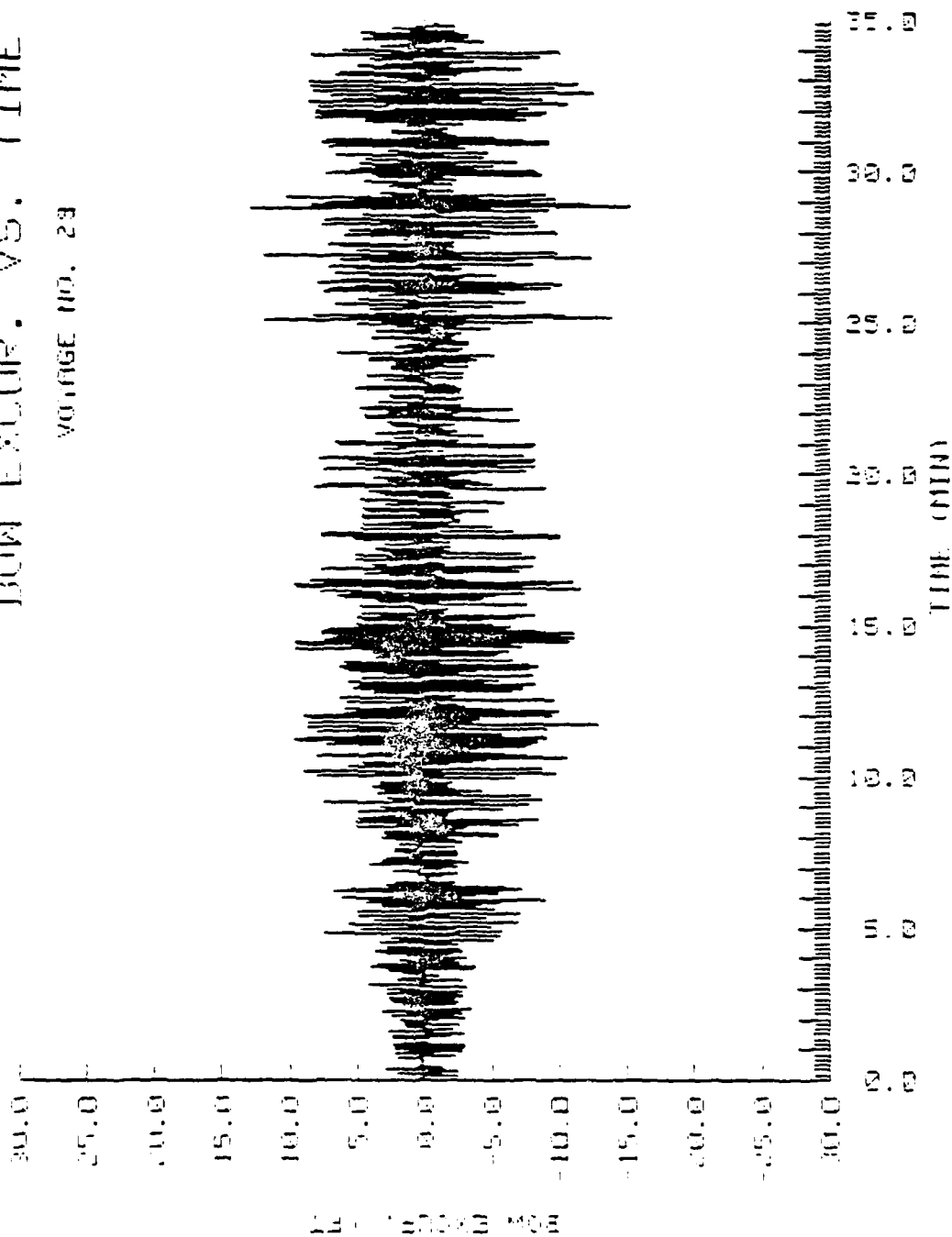
HEAVE VS. TIME

VOYAGE NO. 29



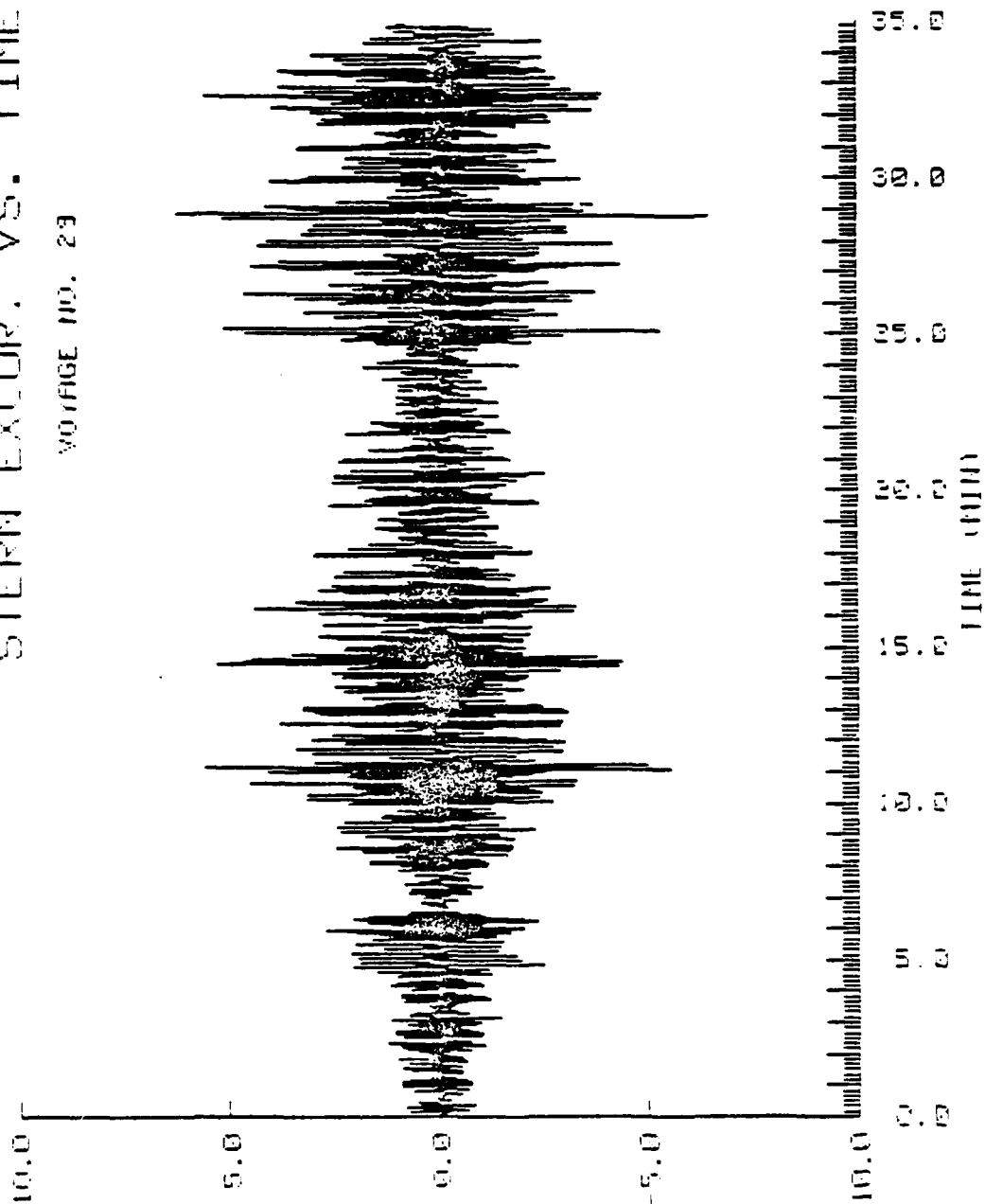
BOH EXCUR. VS. TIME

VOLUME NO. 23



STERN EXCUR. VS. TIME

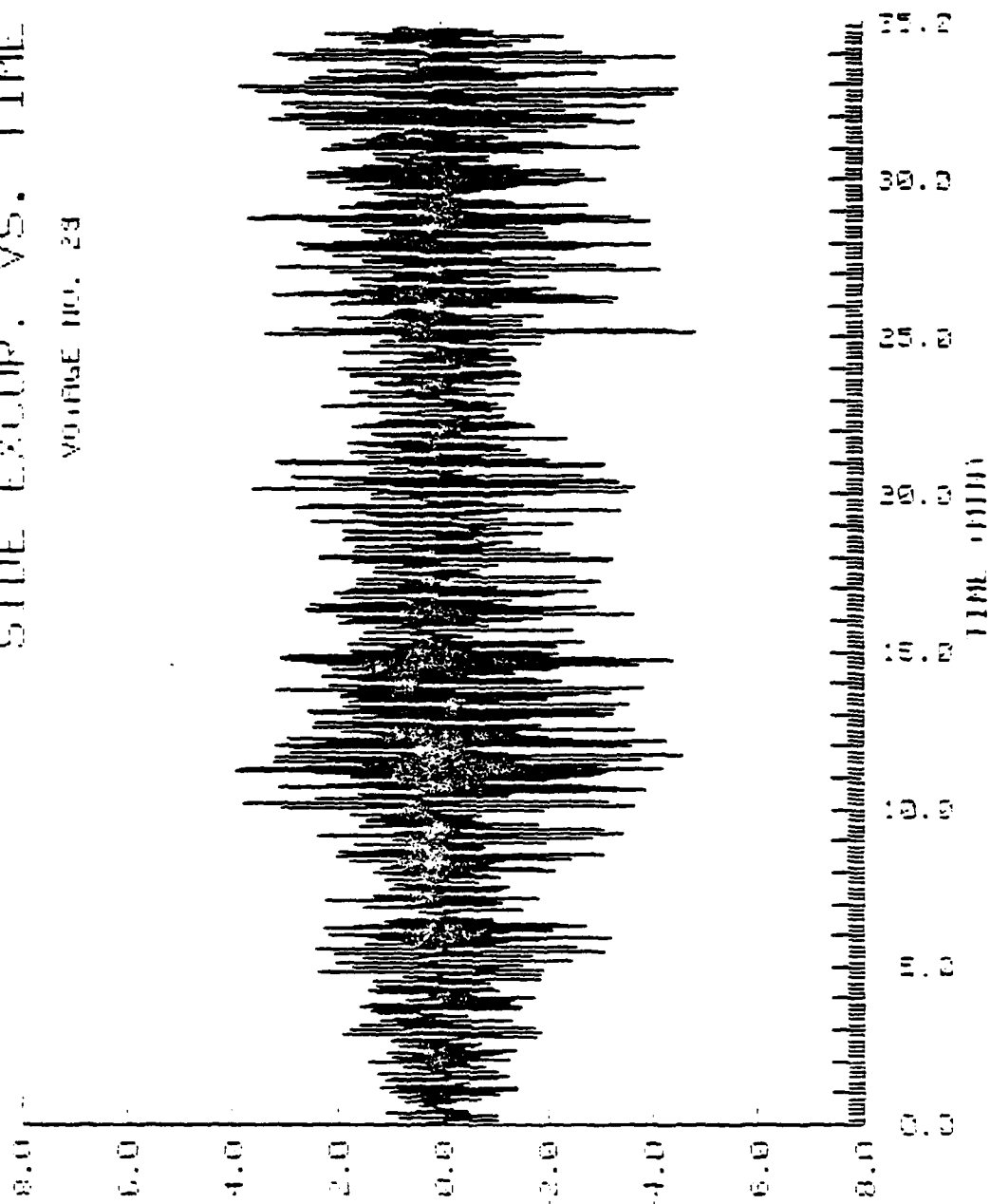
VOLUME NO. 23



STERN EXCUR. (V)

SIDE EXCUR. VS. TIME

VOLUME NO. 23

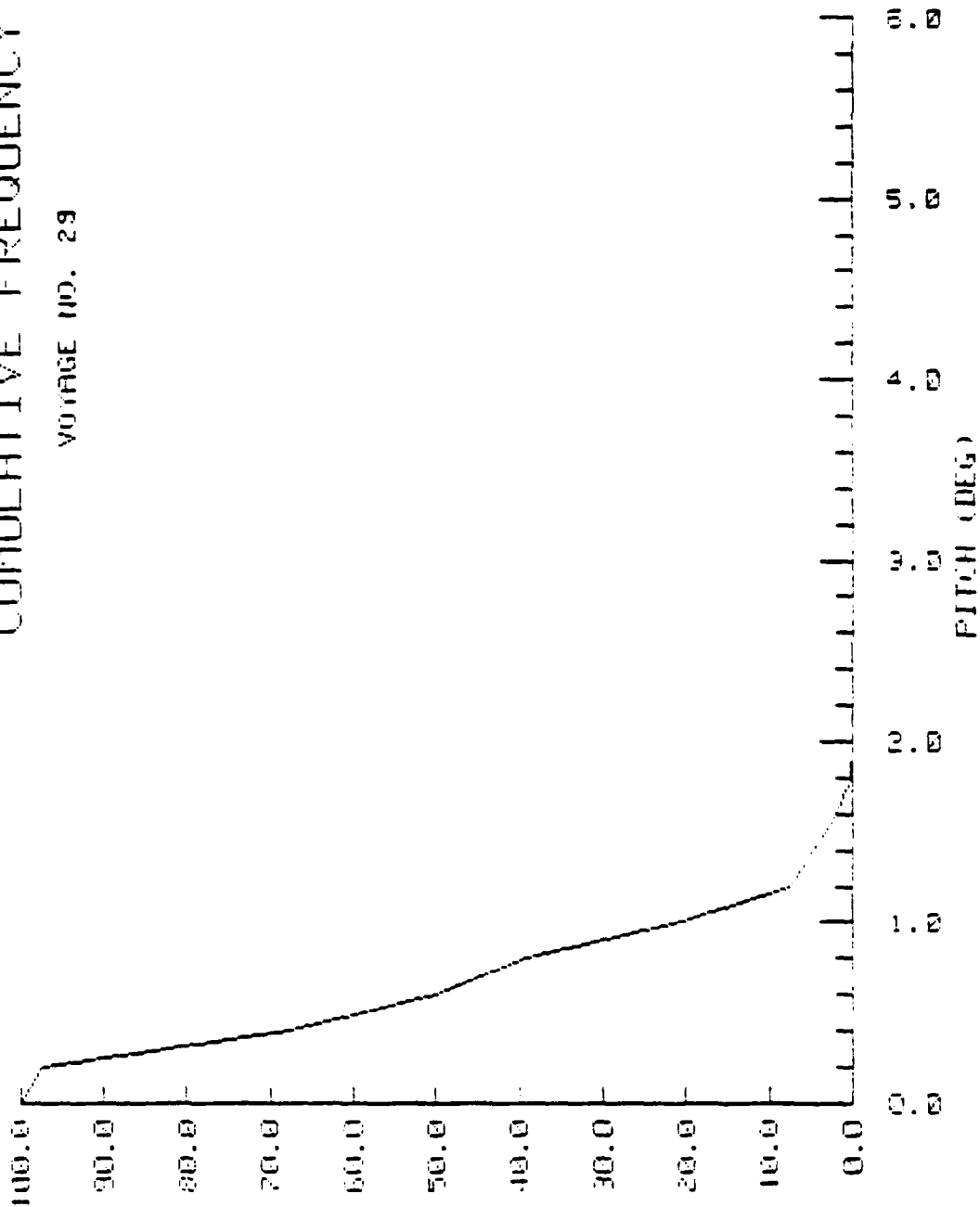


SIDE EXCUR. (FT)

TIME (MIN)

CUMULATIVE FREQUENCY

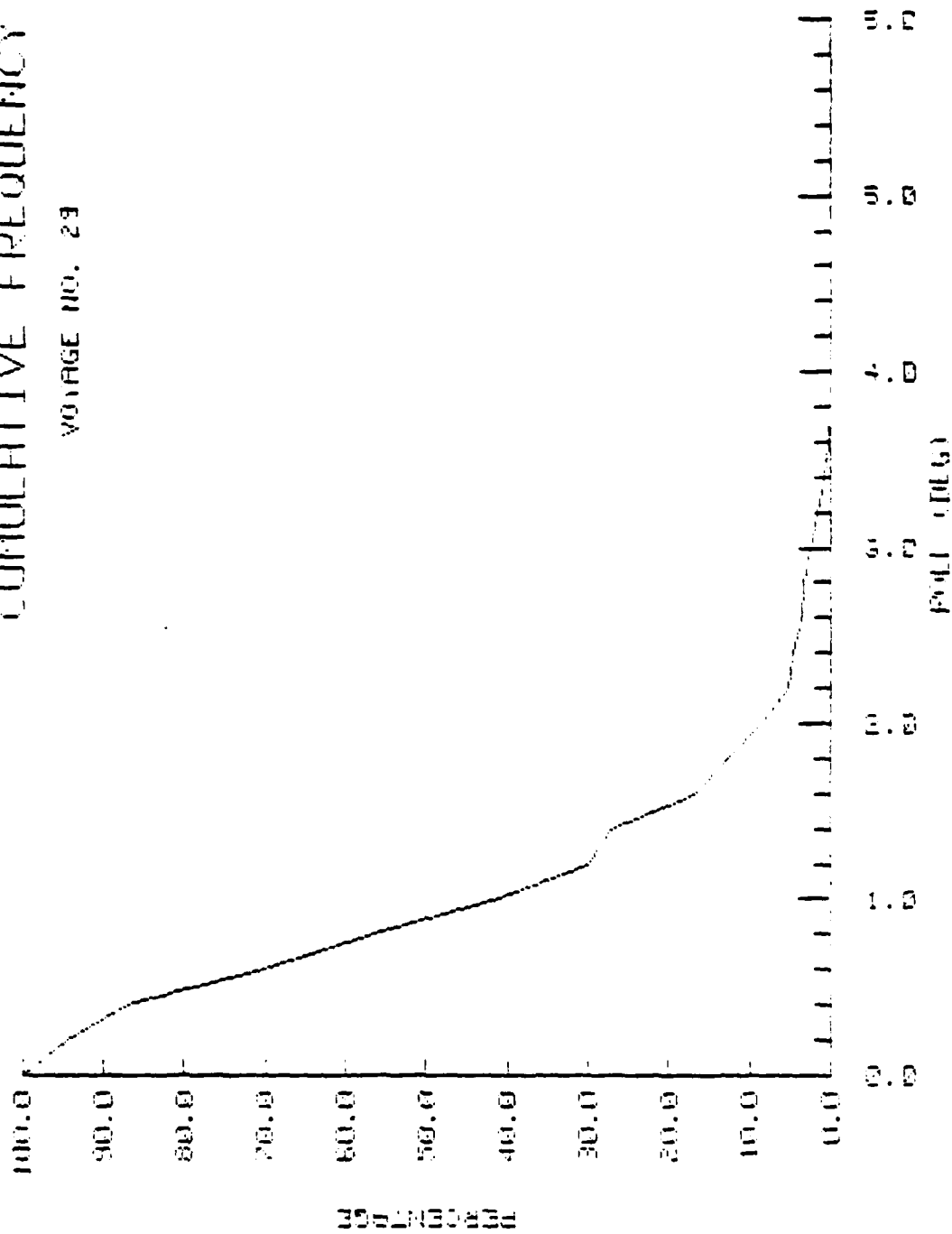
VOTAGE NO. 29



355112133230

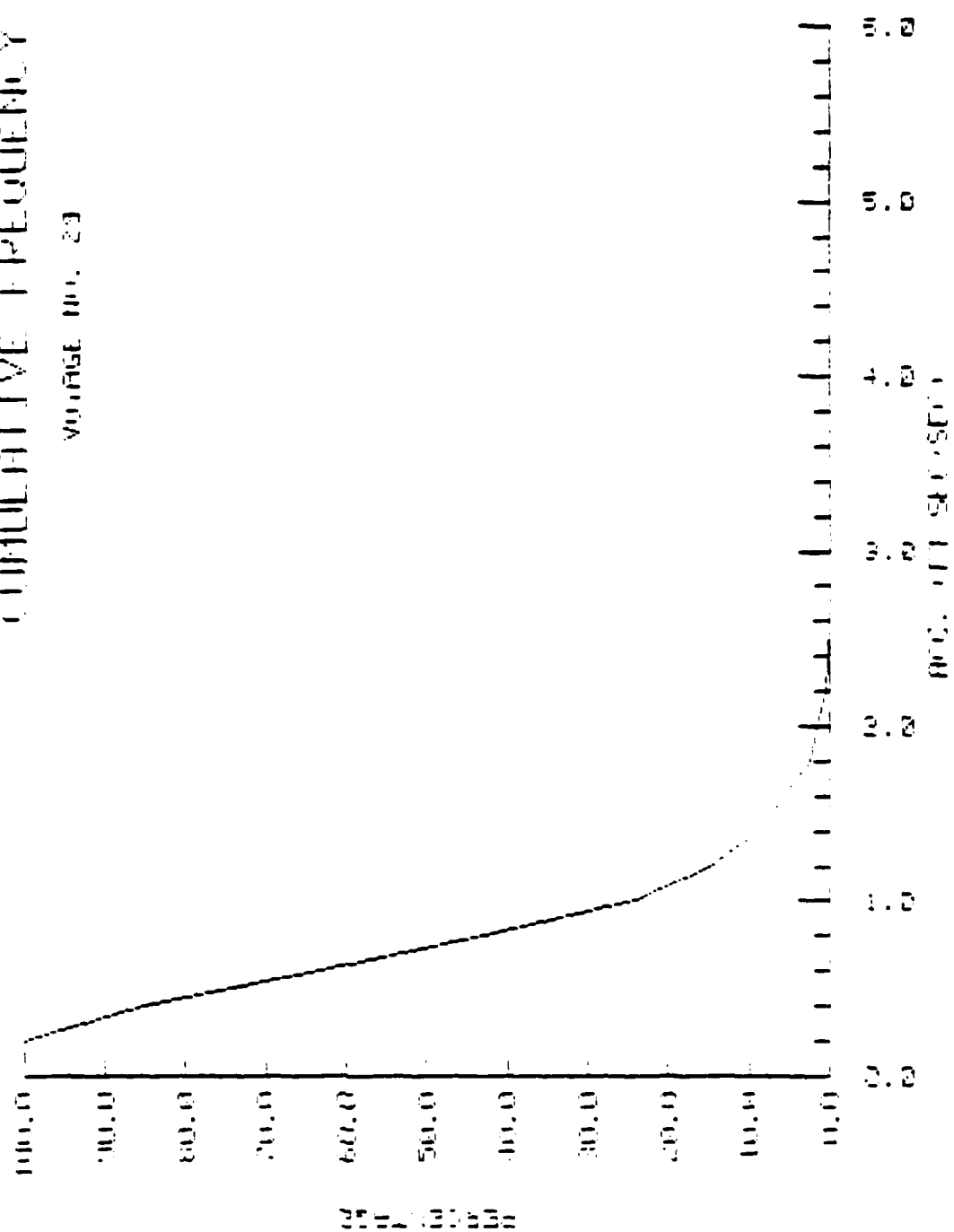
CUMULATIVE FREQUENCY

VOLUME NO. 29



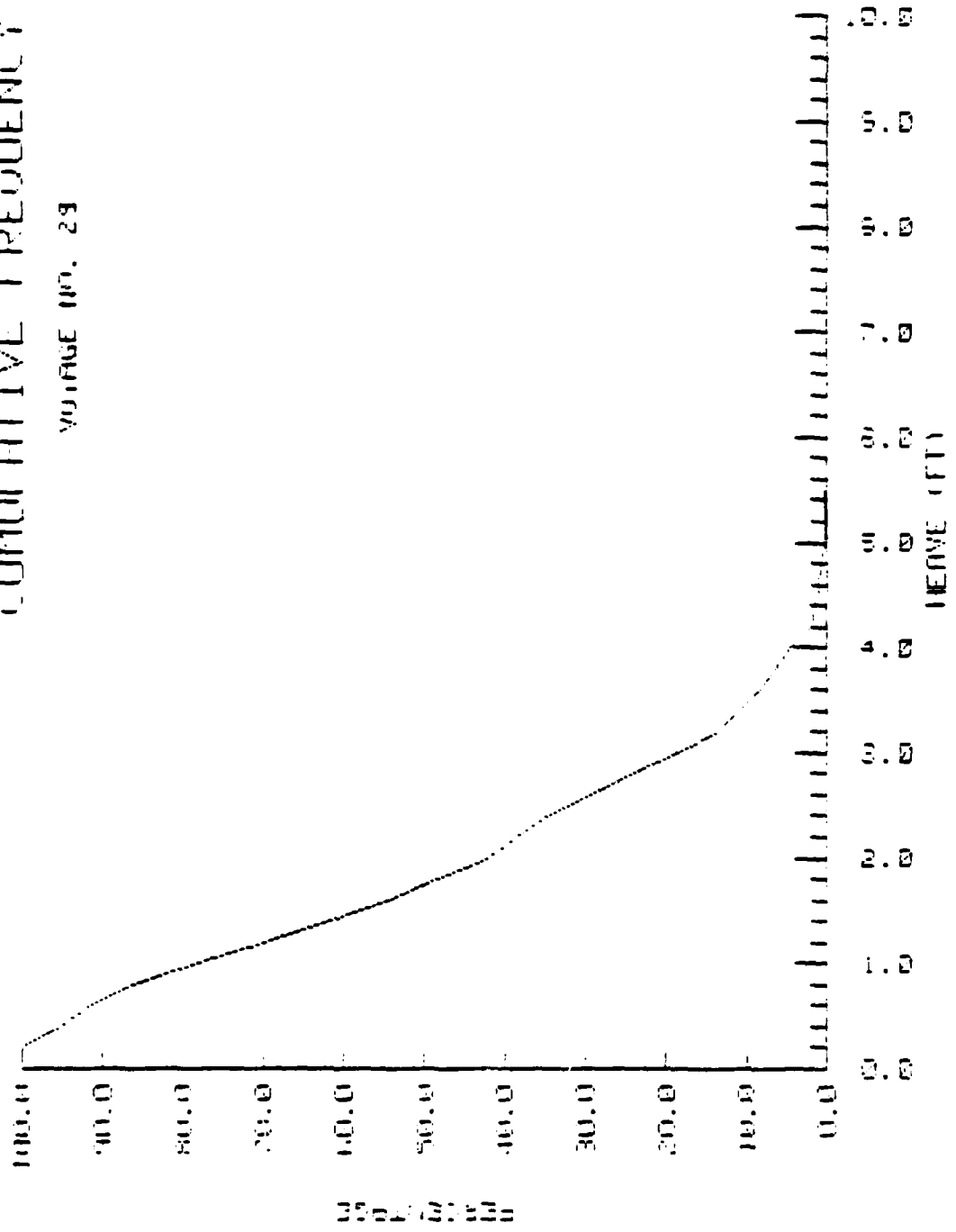
CUMULATIVE FREQUENCY

VOLUME NO. 20



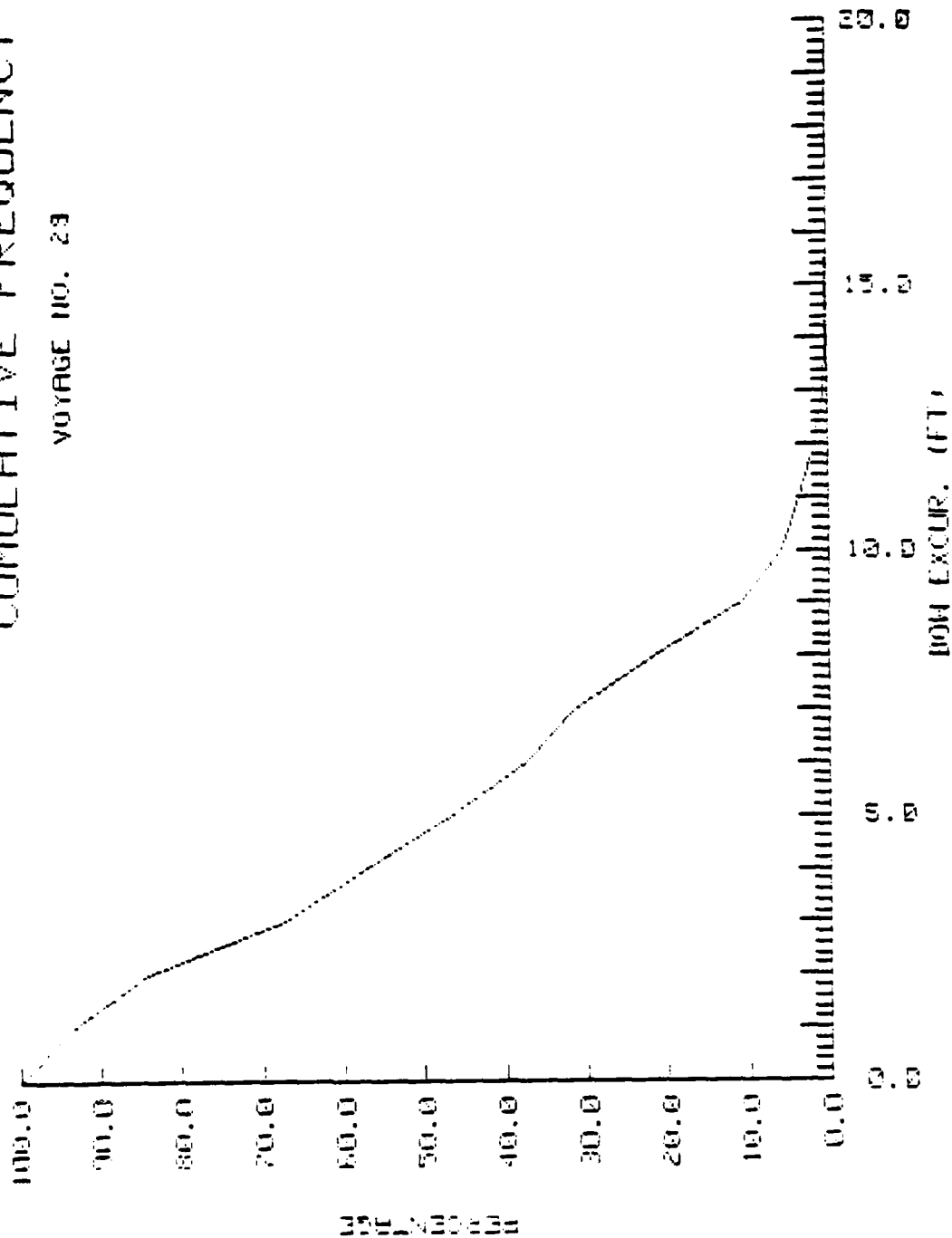
CUMULATIVE FREQUENCY

VOLUME NO. 29



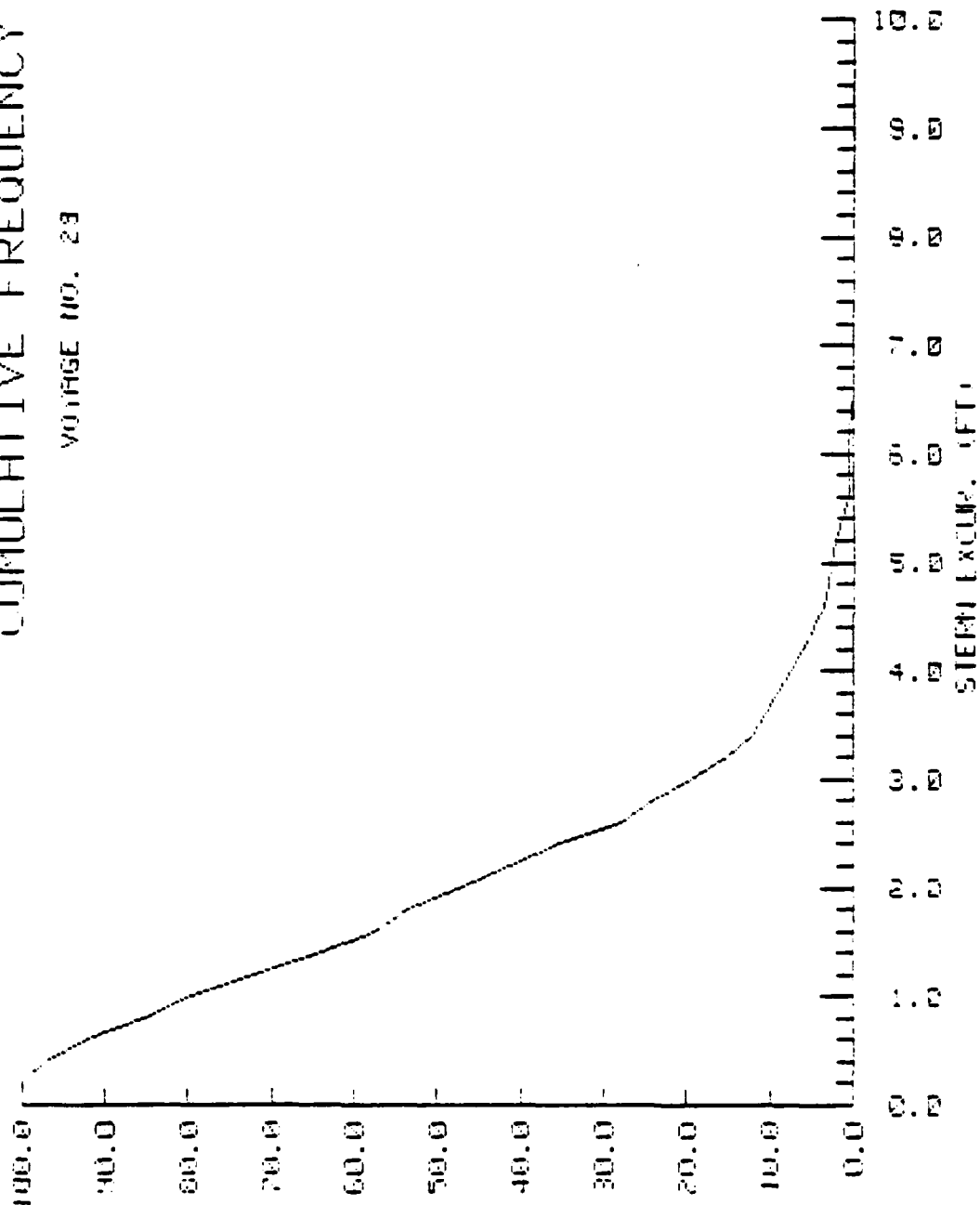
CUMULATIVE FREQUENCY

VOYAGE NO. 23



CUMULATIVE FREQUENCY

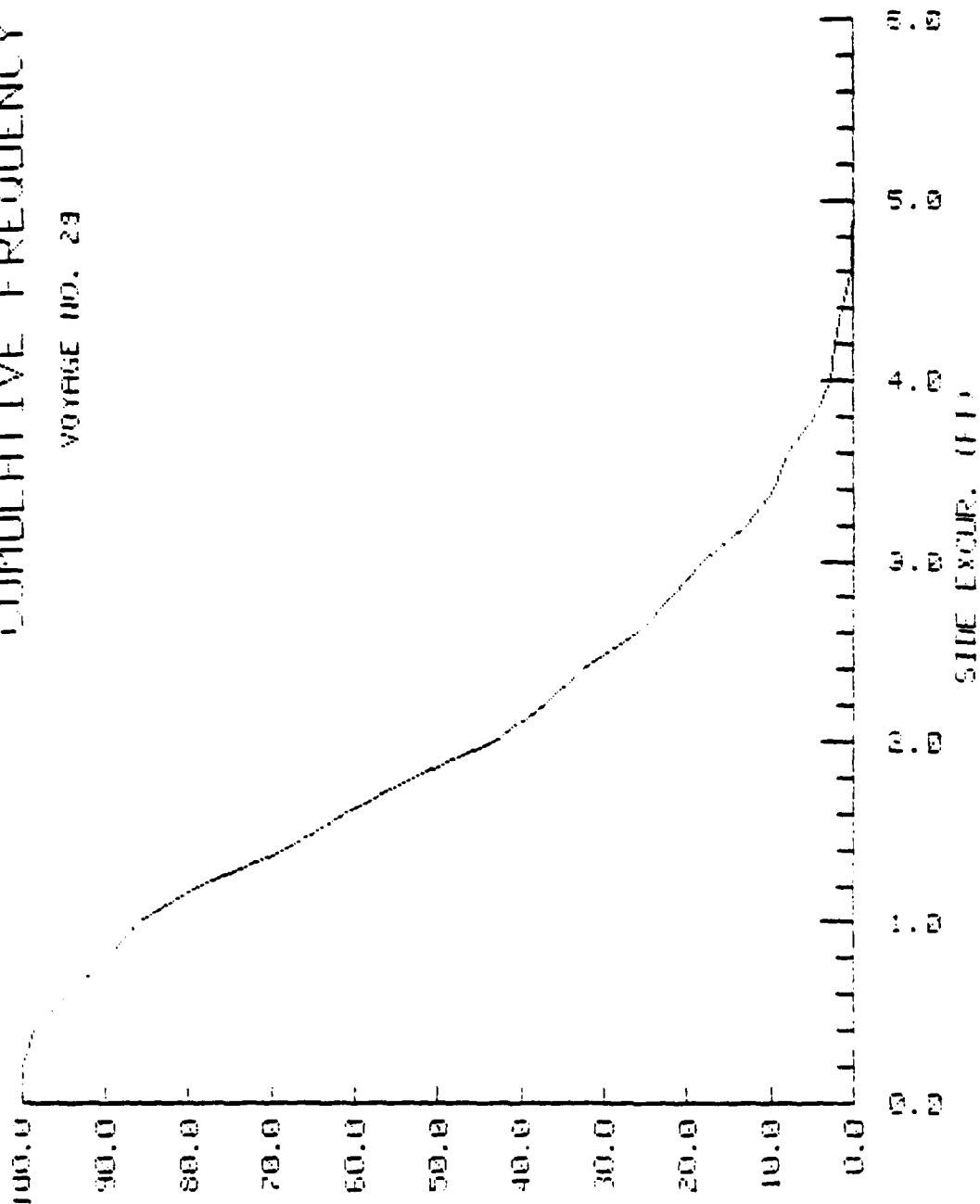
VOLUME NO. 23



25-17-1308551

CUMULATIVE FREQUENCY

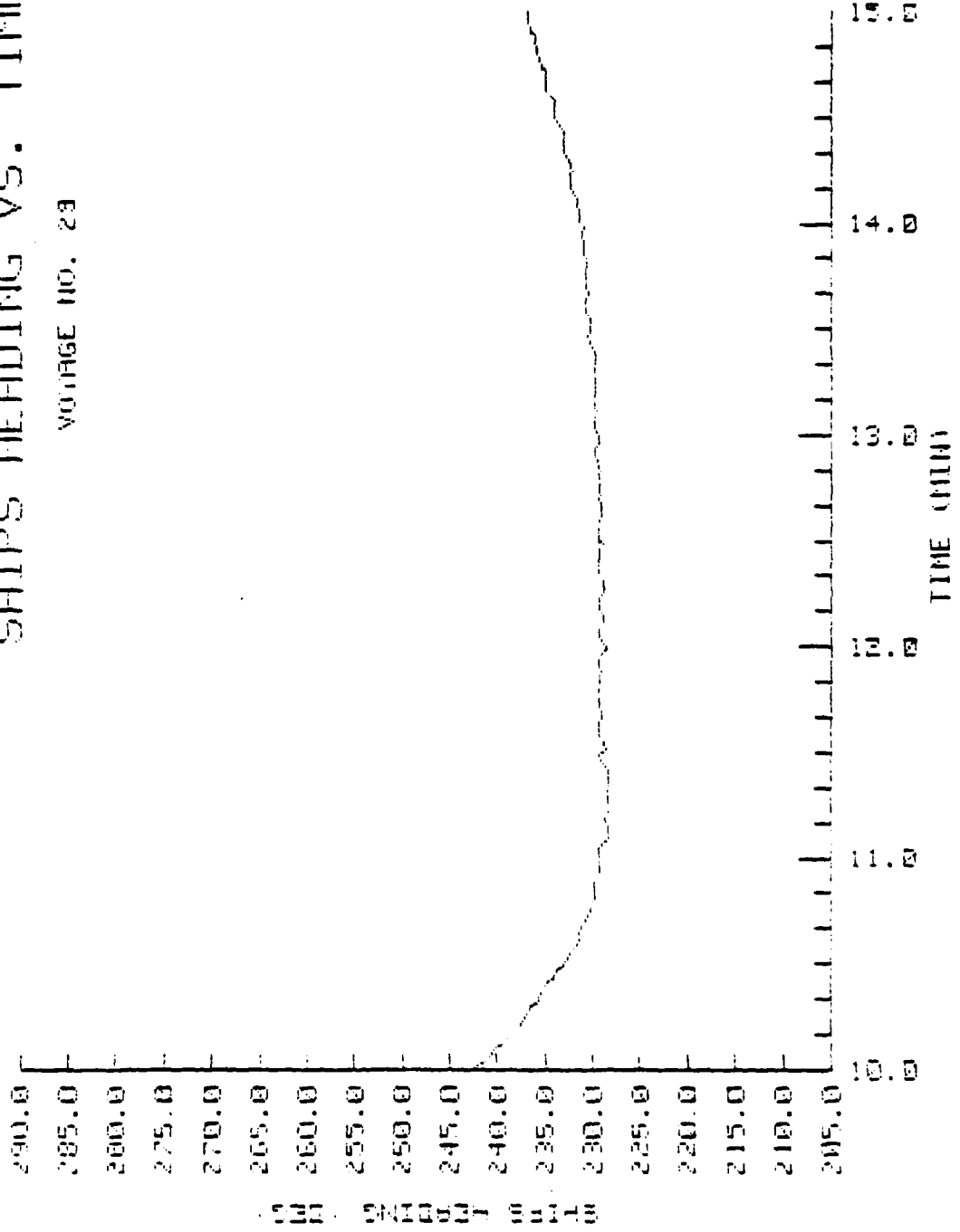
VOYAGE NO. 23



3501250621

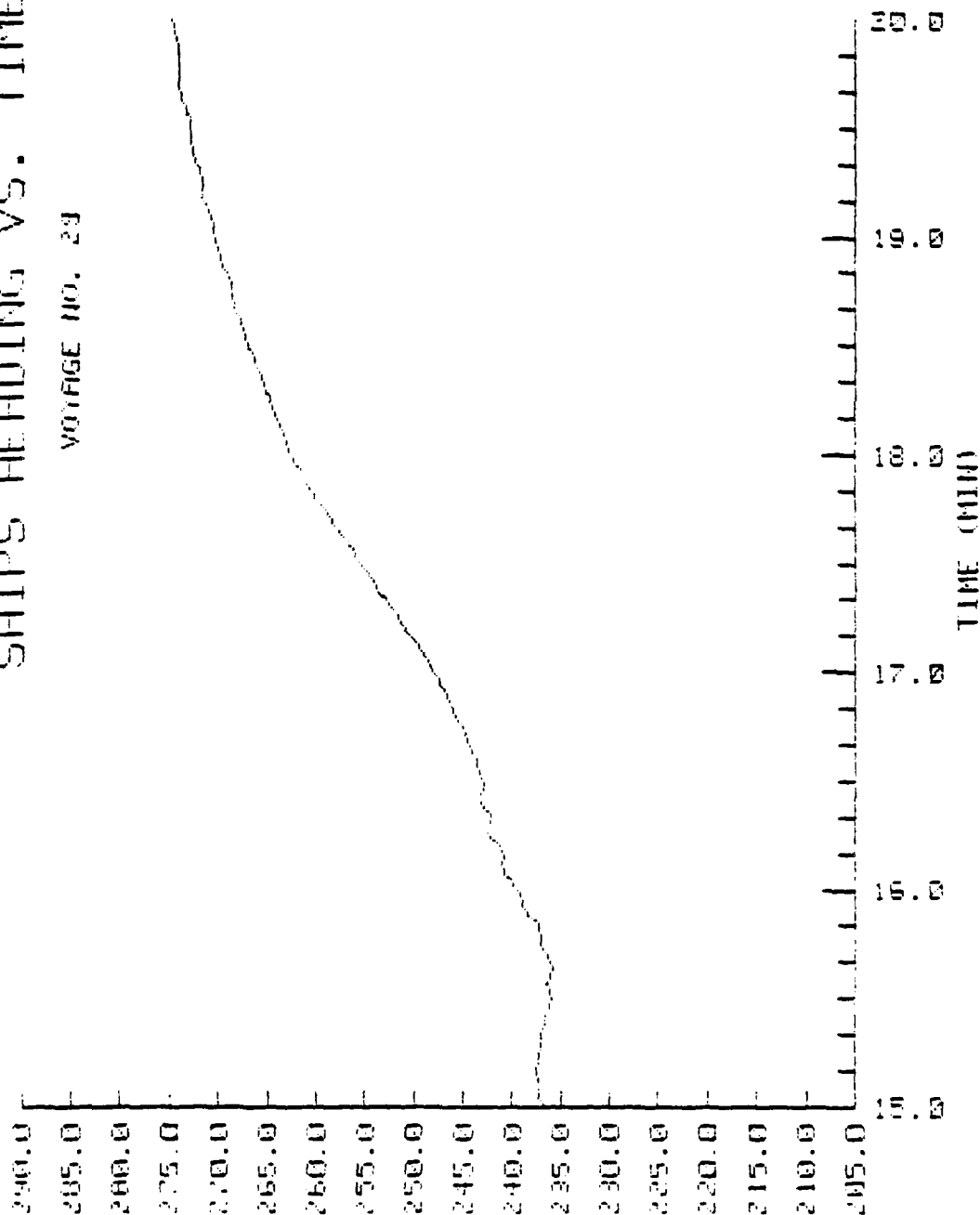
SHIPS HEADING VS. TIME

VOTAGE NO. 23

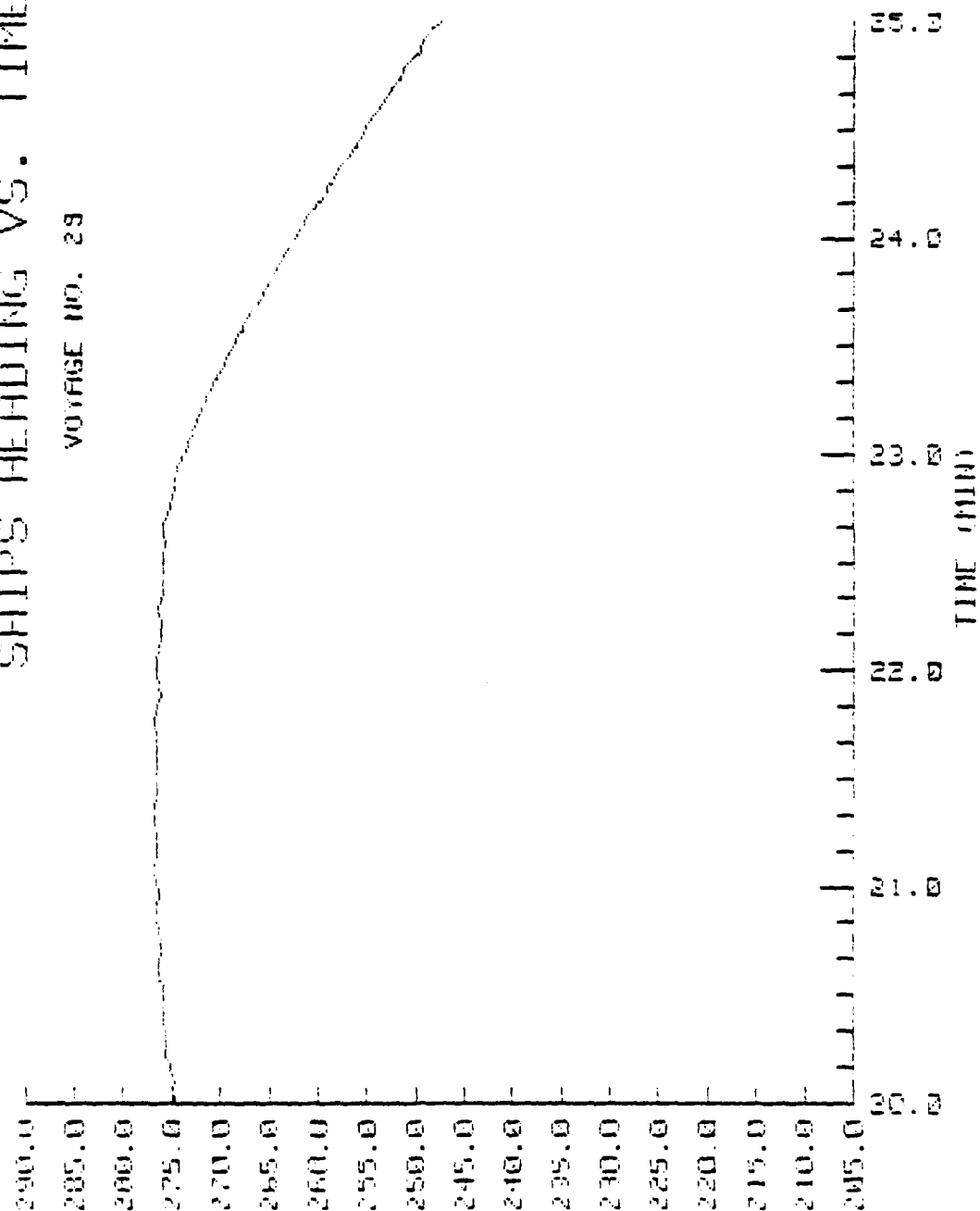


SHIPS HEADING VS. TIME

Voyage No. 29

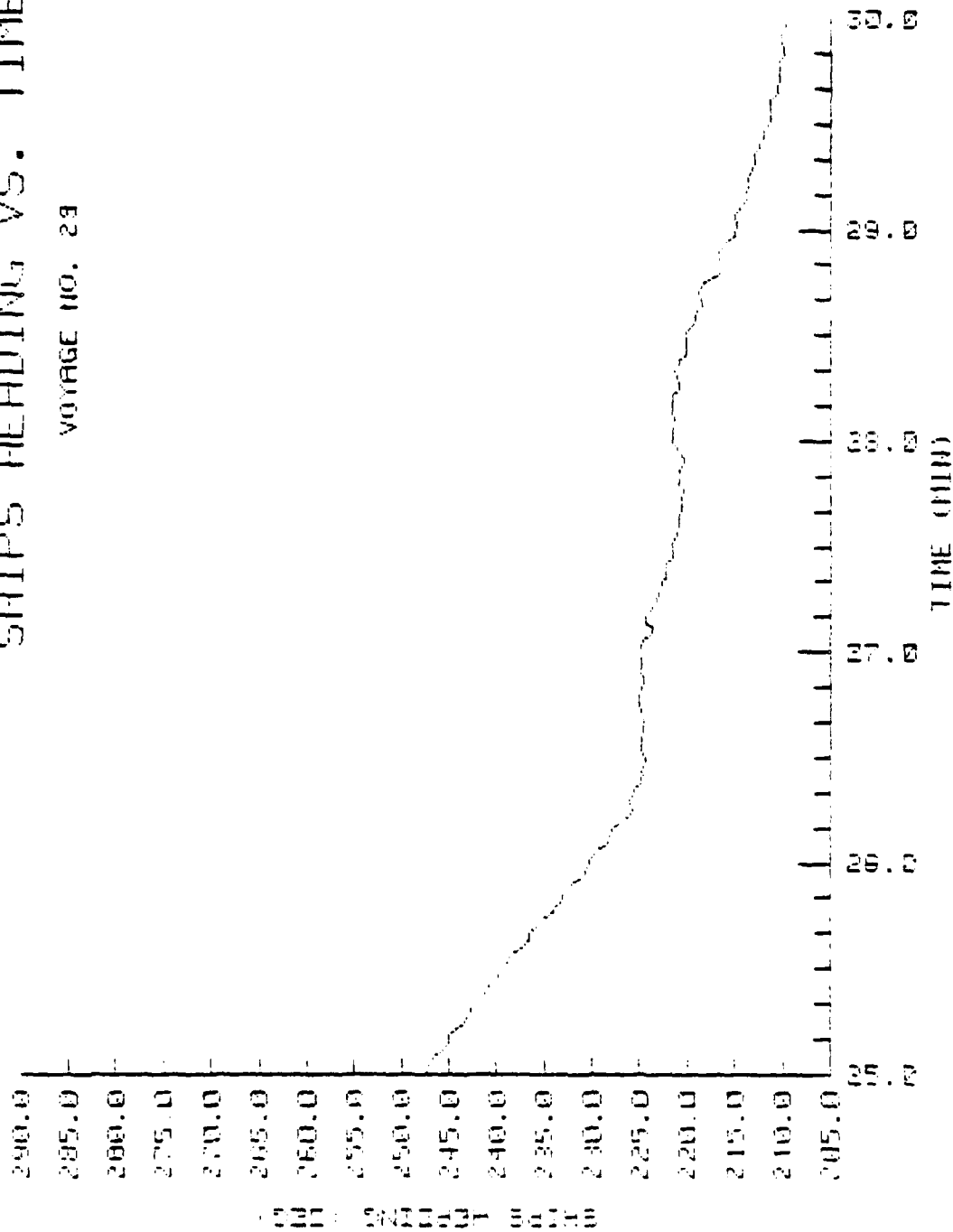


VORFALL NO. 29



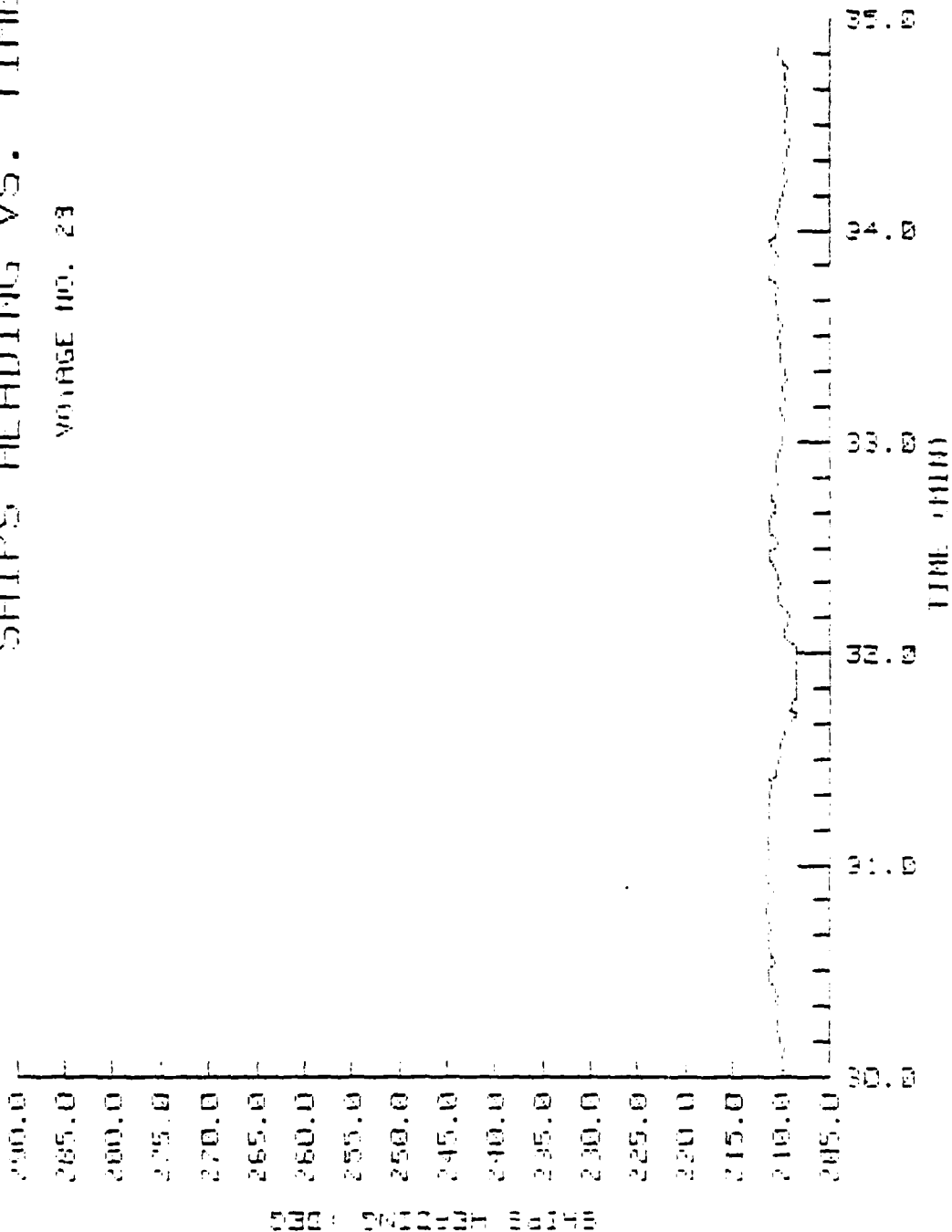
SHIPS HEADING VS. TIME

VOYAGE NO. 29



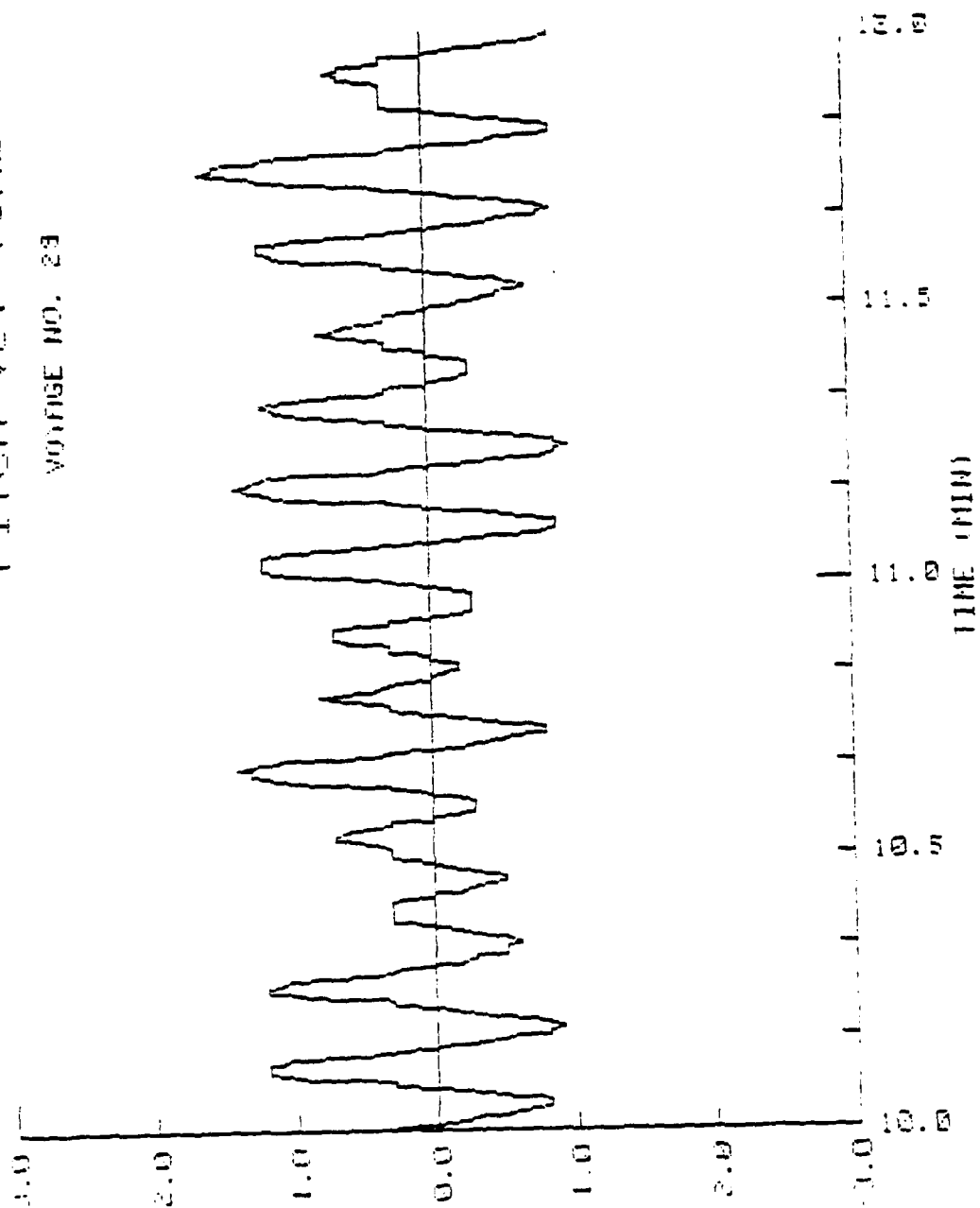
SHIPS HEADING VS. TIME

VOYAGE NO. 23



PITCH VS. TIME

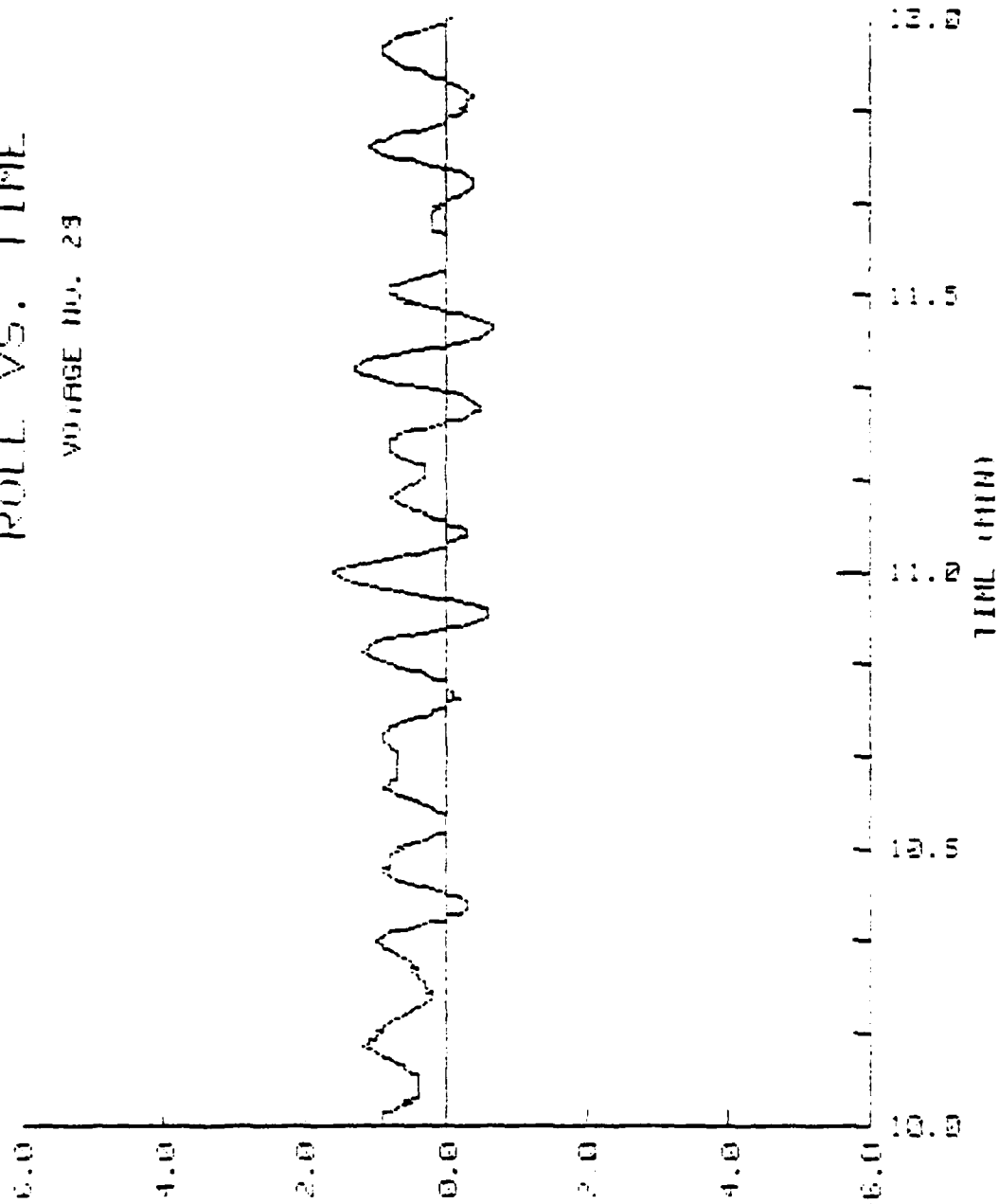
VOLUME NO. 23



1000 10000

ROLL VS. TIME

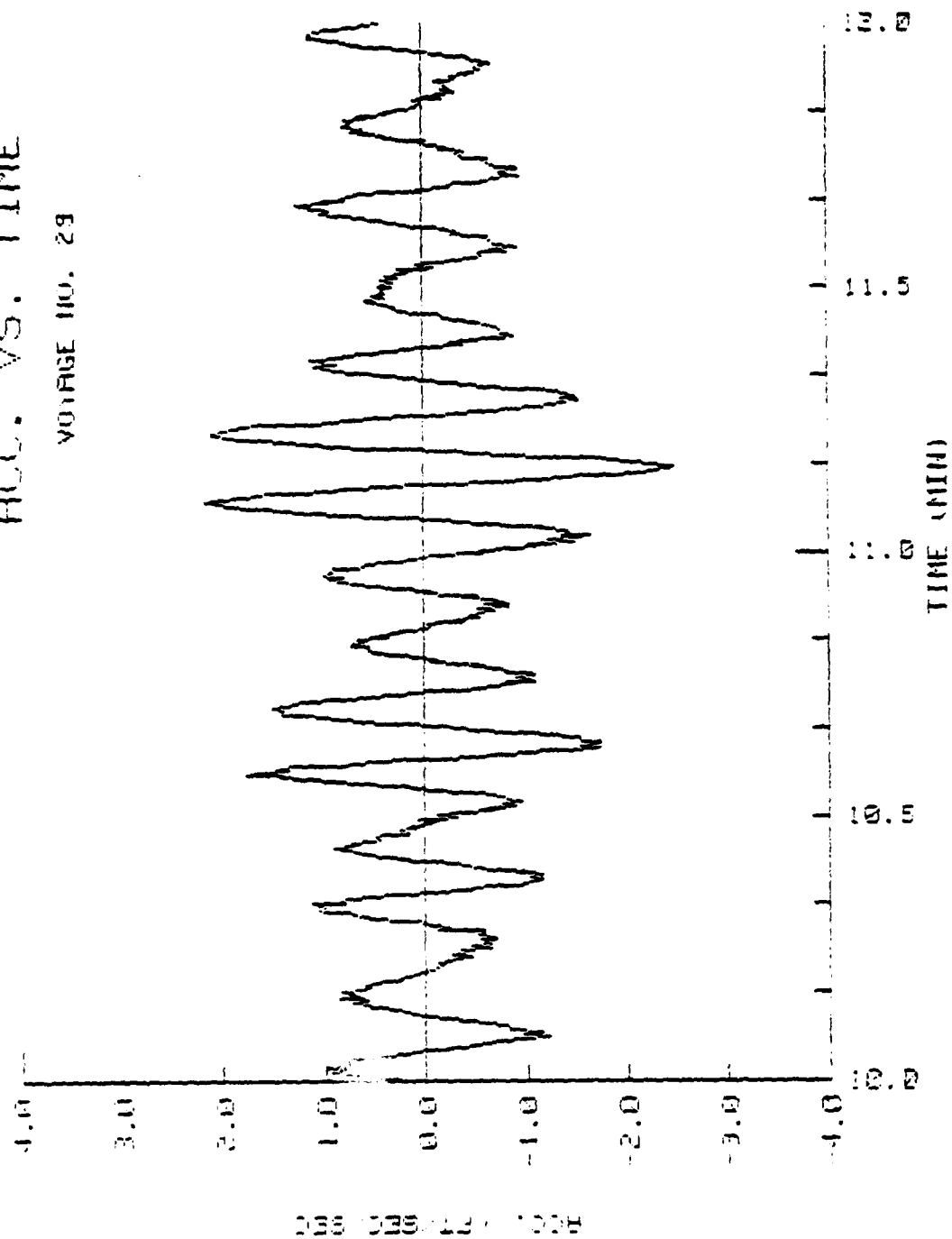
VORAGE NO. 23



ROLL (DEG)

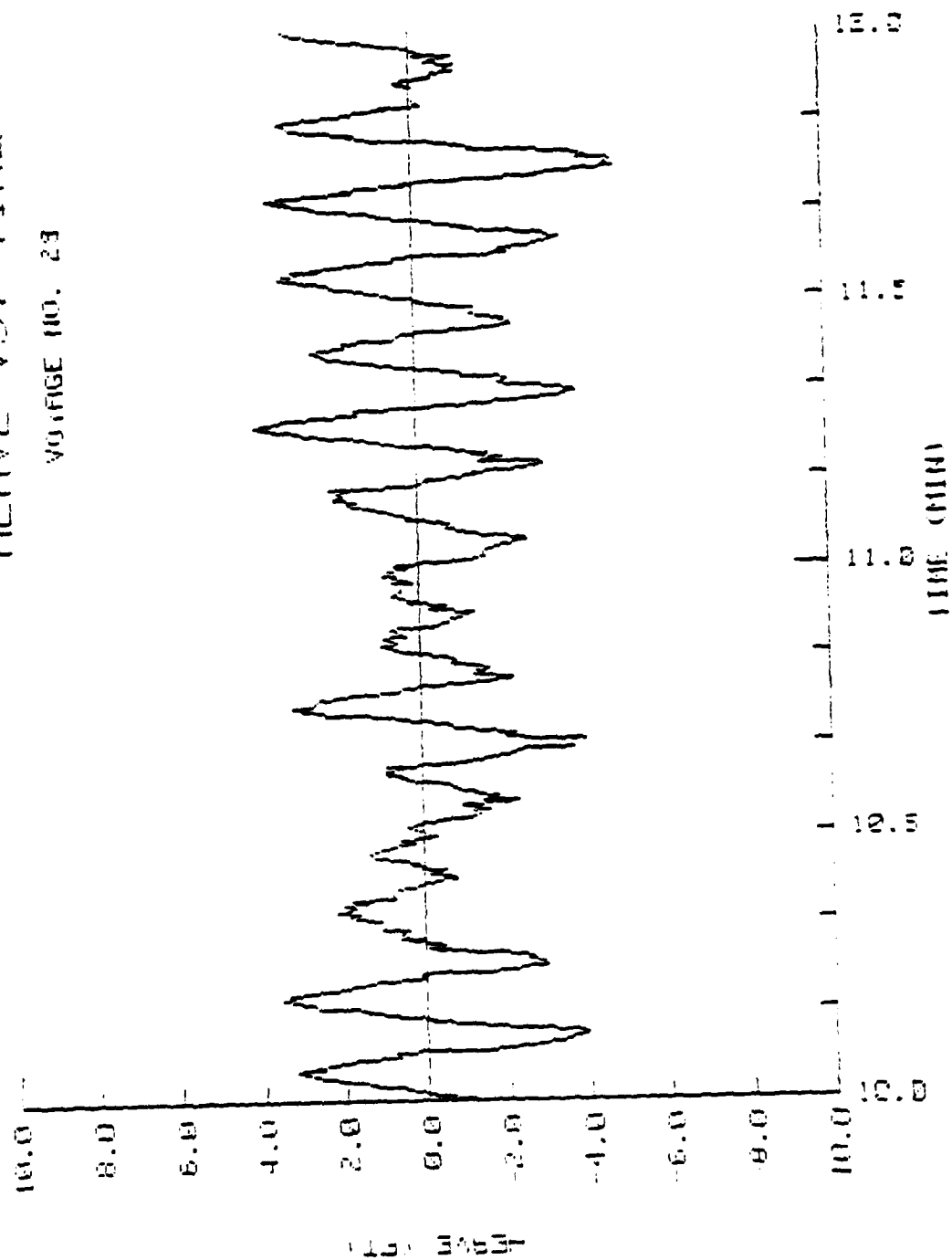
ACC. VS. TIME

VOLUME NO. 29



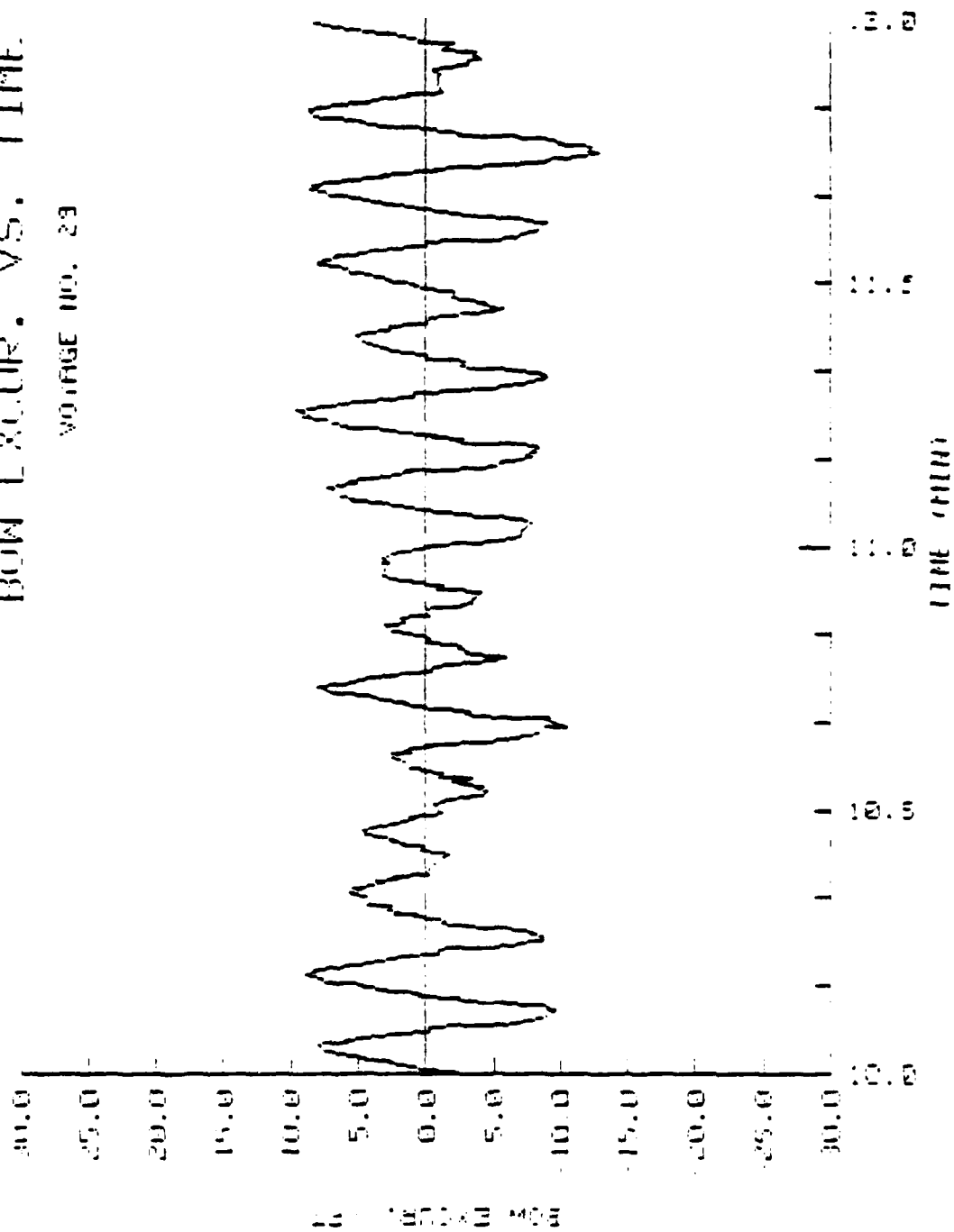
HEAVE VS. TIME

VOL. NO. 23



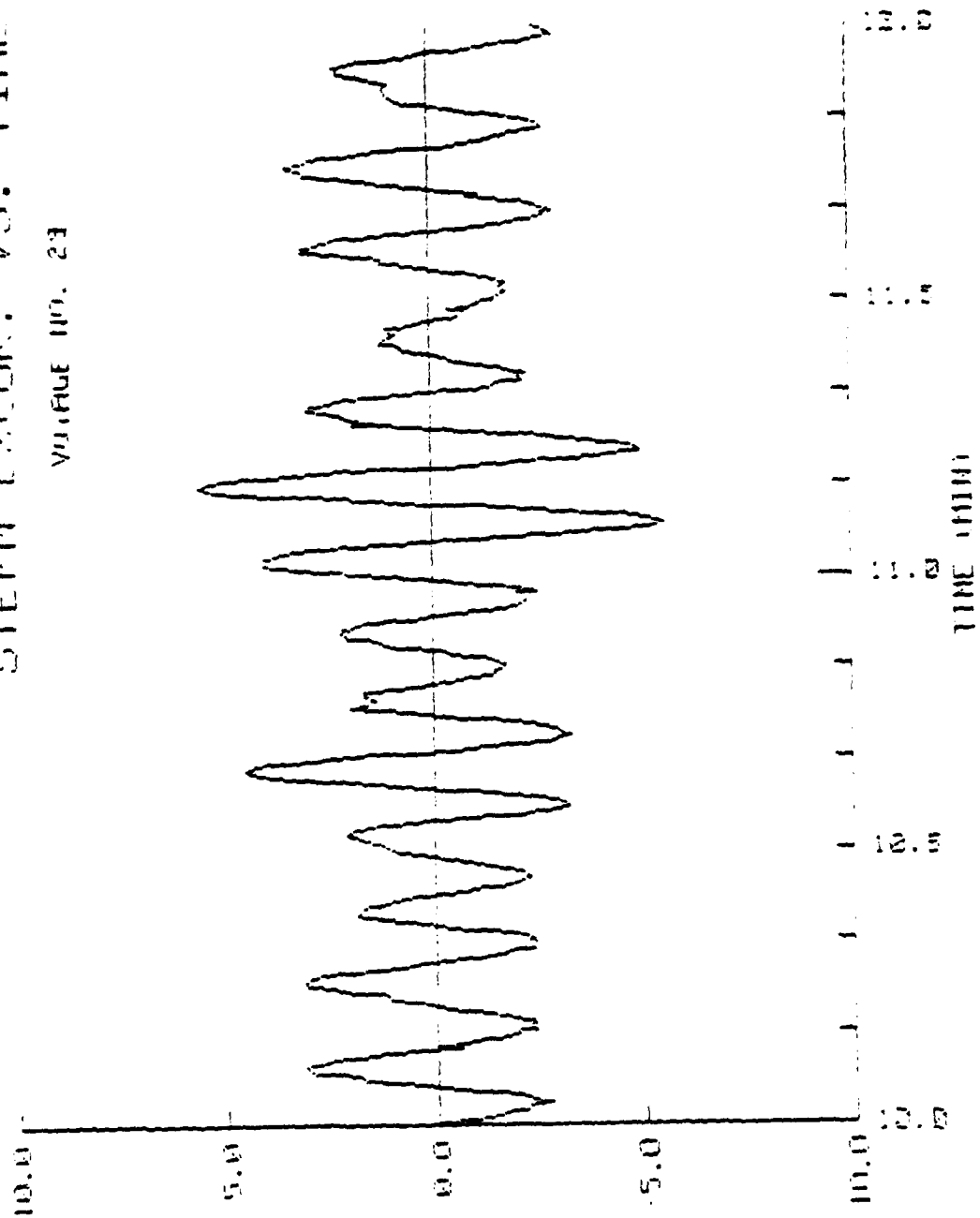
BOM EXCUR. VS. TIME

VOLTAJE NO. 29



STEPH LECUR. VS. TIME

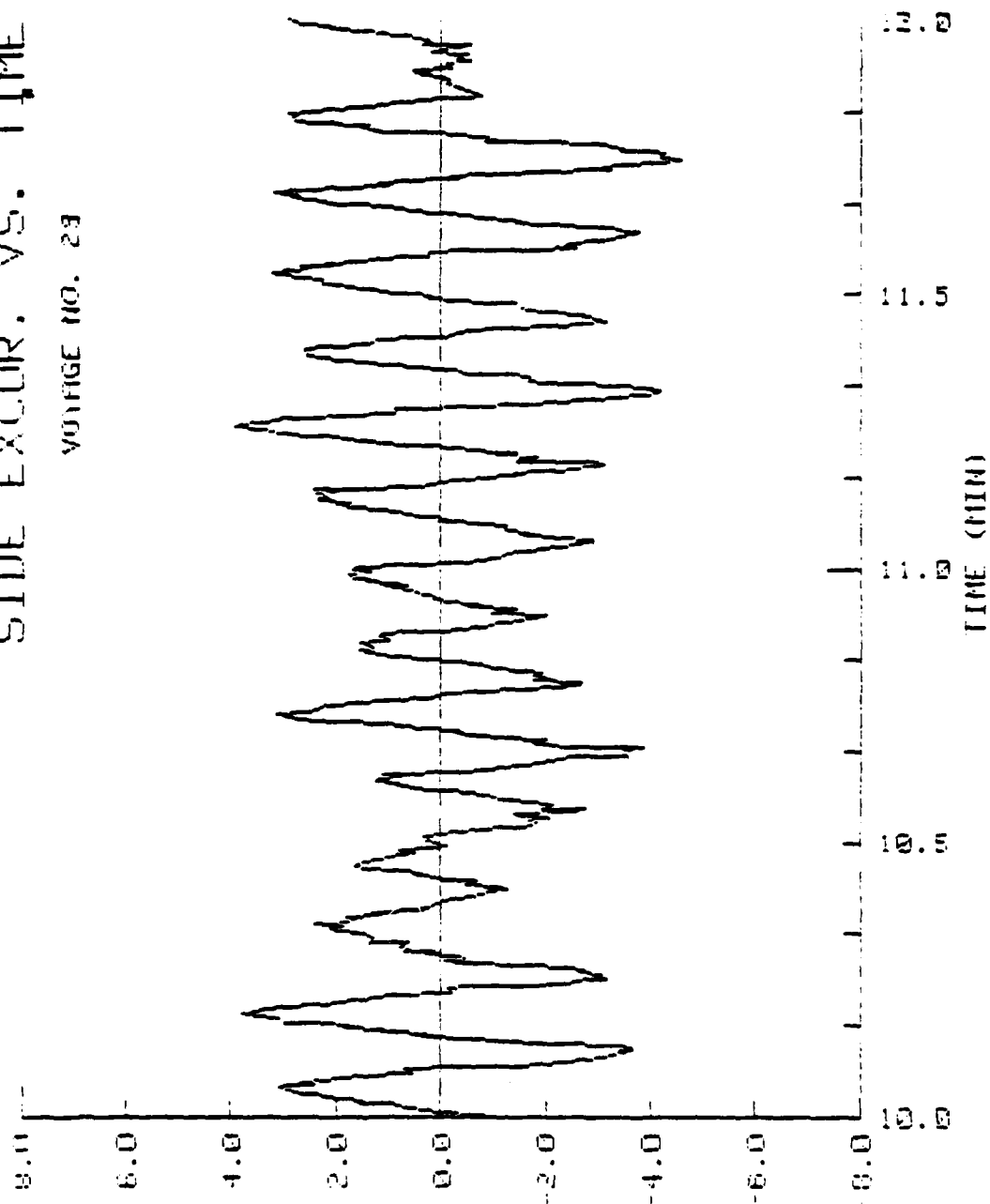
VOLUME 110. 23



STEPH LECUR. VS. TIME

SIDE EXCUR. VS. TIME

VOLUME NO. 23



SIDE EXCUR. (V)

DATE
FILME