

DIFFERENTIAL LORAN-C FOR BUOY POSITION CHECKING

Volume 2 Data Plots

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March 1983



**TECHNICAL REPORT
NO. 99**

PREFACE

In order to make our extensive series of technical reports more readily available, we have scanned the old master copies and produced electronic versions in Portable Document Format. The quality of the images varies depending on the quality of the originals. The images have not been converted to searchable text.

DIFFERENTIAL LORAN-C
FOR
BUOY POSITION CHECKING

by

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VOLUME TWO

Data Plots

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Technical Report No. 99

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PREFACE

This report contains data plots associated with the final report of work performed under a contract "Data Reduction Analysis--Differential LORAN-C for Buoy Position Checking" funded by the Telecommunications and Electronics Branch of the Canadian Coast Guard. The Scientific Authority for this contract was J.C. Rennie.

Part of this work was funded by a strategic research grant from the Natural Sciences and Engineering Research Council of Canada, entitled "Marine Geodesy".

The main report is available as Technical Report No. 99 of the Department of Surveying Engineering, University of New Brunswick. In order to place these data plots in context, the Executive Summary and six figures from the main report have been reproduced here to form an introduction.

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INTRODUCTION

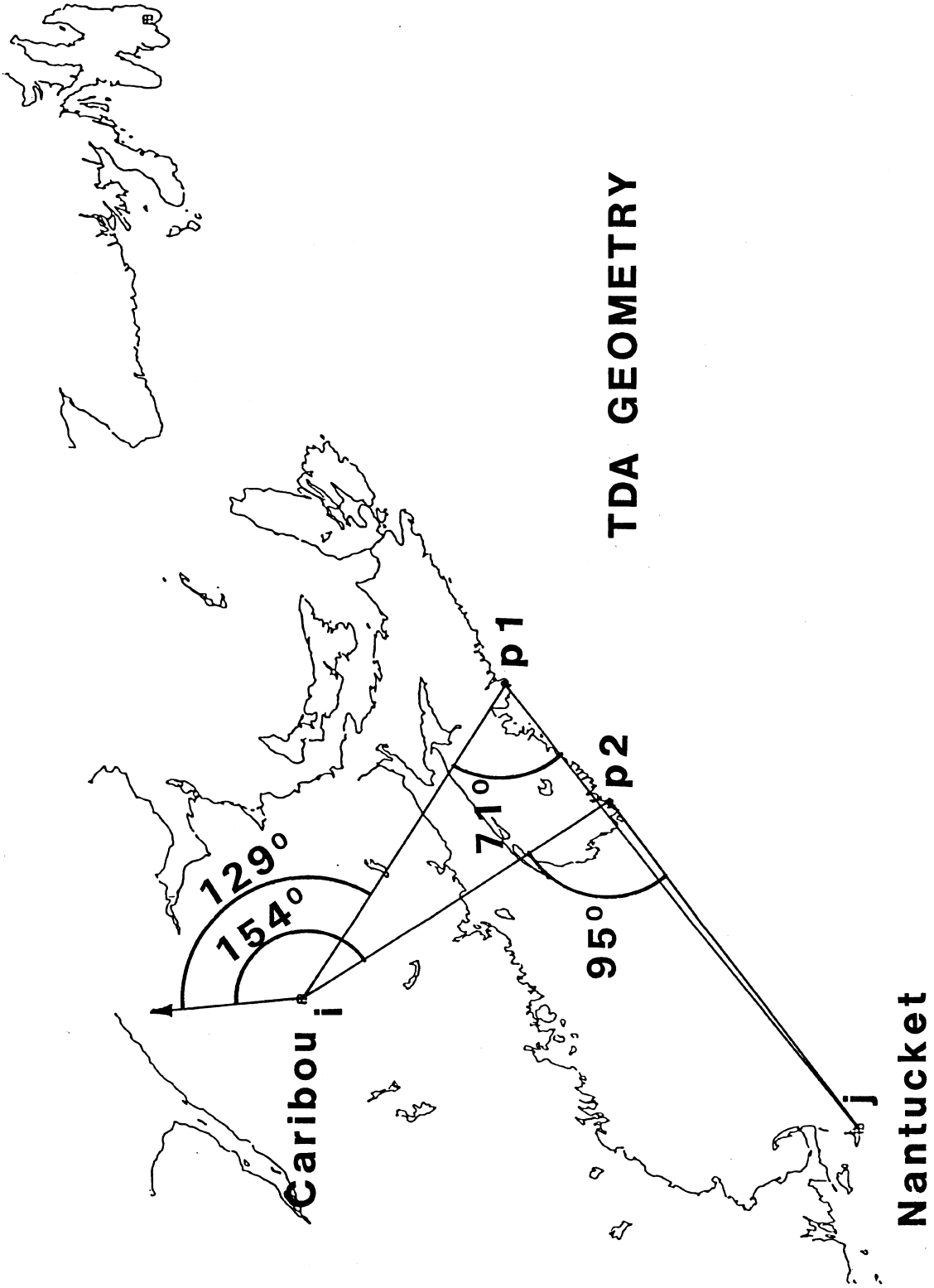
A first experiment to evaluate the usefulness of differential LORAN-C for buoy position checking was held along the Nova Scotia south shore between August and September 1982, by the Telecommunications and Electronics Branch of the Canadian Coast Guard. The criterion for buoy position checking is that buoy movements as small as 15 metres should be detectable. Time difference (TD) measurements were made simultaneously at a monitor site, and at 23 remote sites occupied repeatedly by either van or helicopter. The remote sites consist of 10 van sites, 8 helicopter landing sites, and 5 actual buoys over which the helicopter hovered. A total of 32,858 TD measurements were obtained. This report presents an analysis of this data.

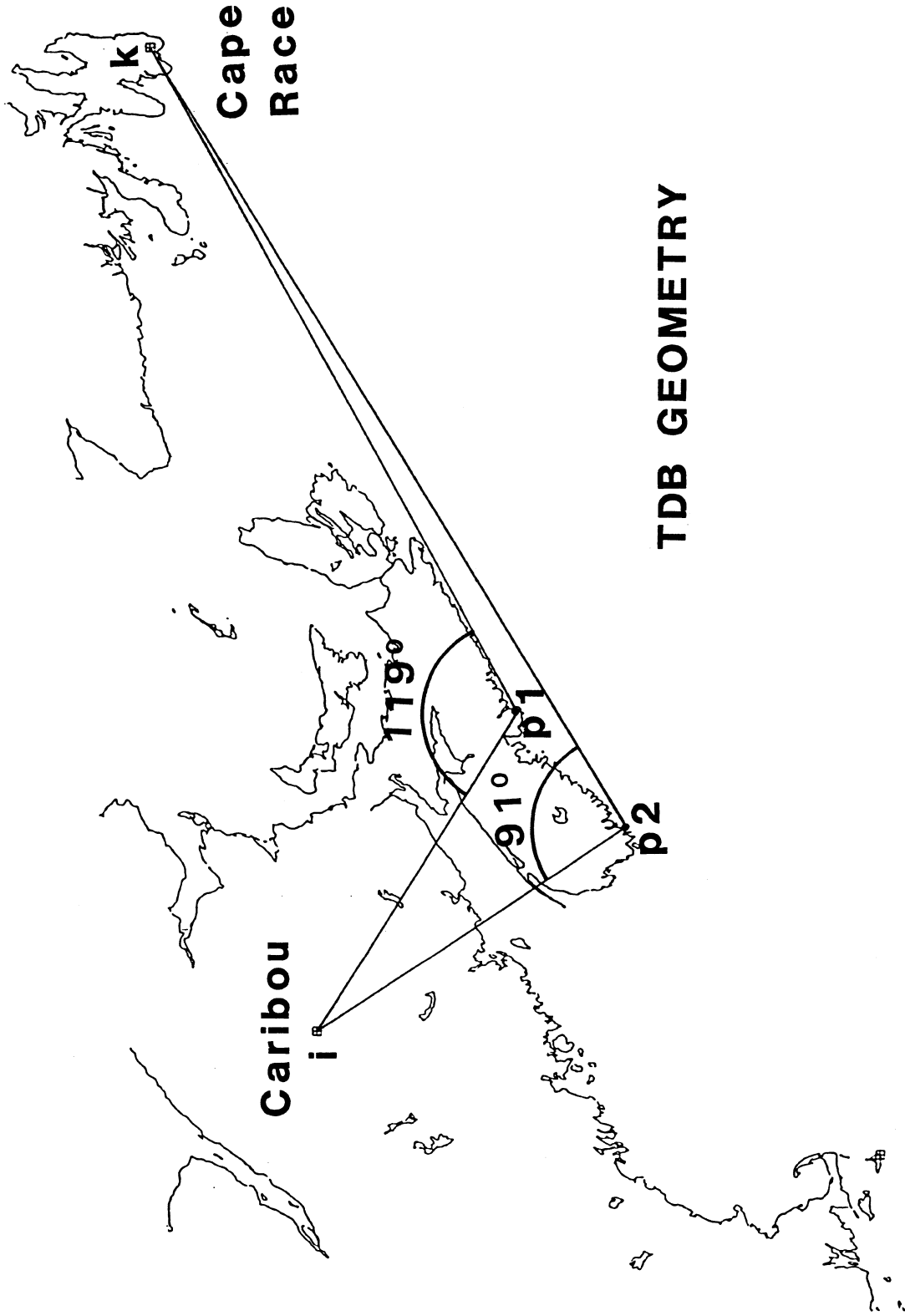
All the raw TD measurements, and the (remote-monitor) TD differences were statistically analysed and graphically plotted, and the results are contained in the appendices to this report. The repeatability of the differential TD measurements was determined by comparing the values for each visit to each site against the mean for all visits to that site. These TD repeatability results were converted to position determination repeatability results, using a simple conversion procedure developed in this report. Differential LORAN-C positioning repeatability (at the 95% confidence level) was found to be

- 1) approximately 12 metres for the van sites (averaging 2 hours of TD observations per visit)
- 2) approximately 14 metres for the helicopter landing sites (averaging 7 minutes of data per visit).

The helicopter buoy hovering results demonstrated that a better method of positioning the helicopter relative to the buoy must be found. The single pair of visits using a flypast technique showed promise and should be further

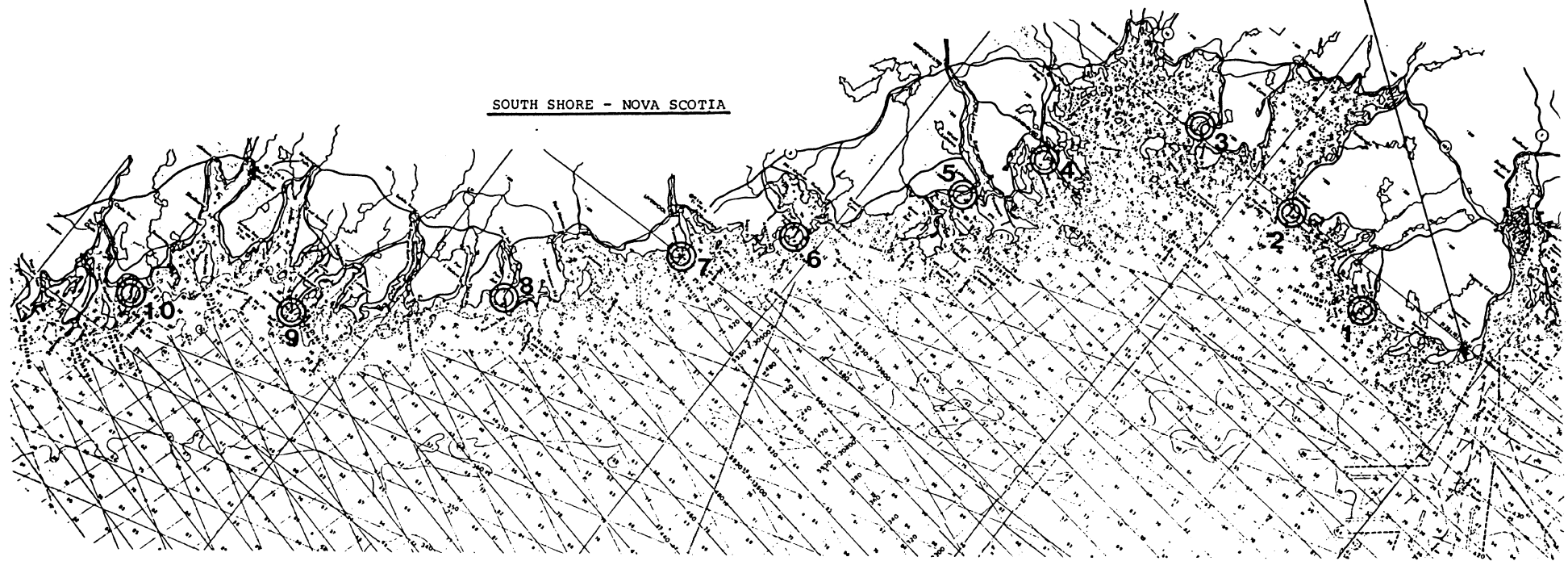
pursued. Questions about LORAN signal and receiver stability, effective range of the technique, and data recording and processing procedures remain to be answered before the technique will be a practical operational tool. Twelve specific recommendations for future tests are presented.





C.G.R.S.
KETCH HARBOUR
LORAN-C SHORE-BASED
MONITOR

SOUTH SHORE - NOVA SCOTIA

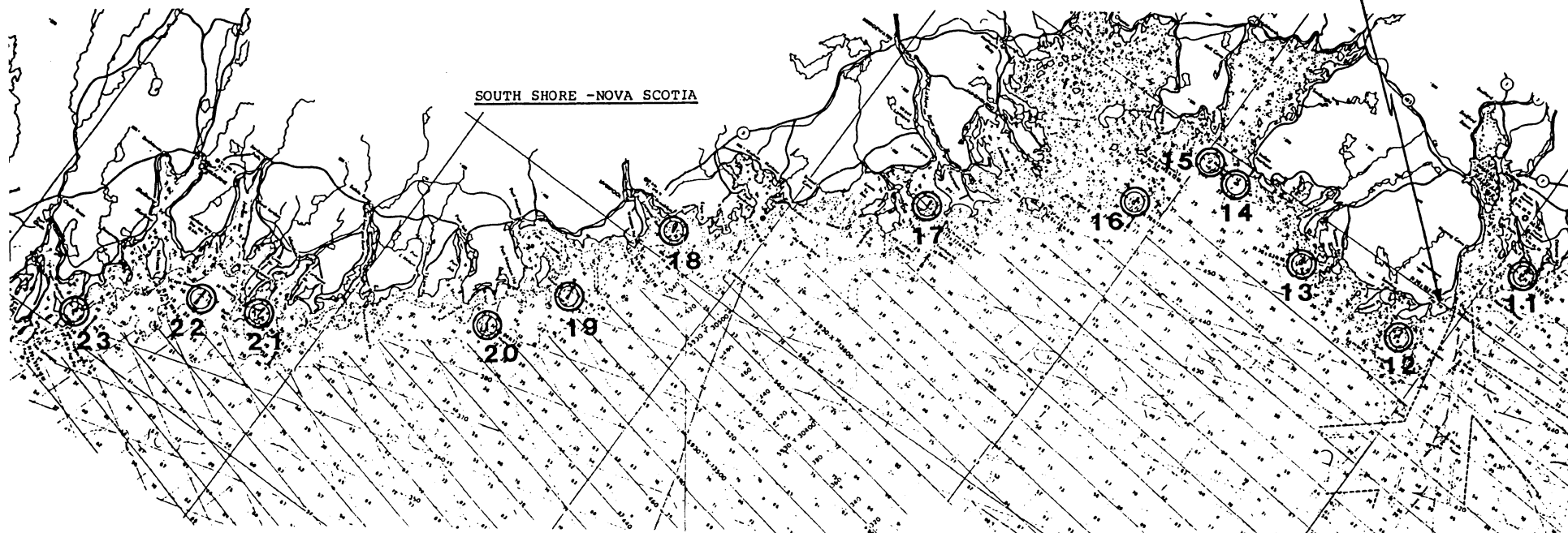


VAN TEST SITES

- | | |
|--------------------------------|-----------------------------------|
| 1. LOWER PROSPECT (GOVT WHARF) | 6. MEDWAY HEAD |
| 2. PEGGY'S COVE | 7. WESTERN HEAD (LIVERPOOL) |
| 3. BLANDFORD (MAHONE BAY) | 8. PORT JOLI HARBOUR (GOVT WHARF) |
| 4. BATTERY POINT | 9. WESTERN HEAD (LOCKEPORT) |
| 5. DUBLIN SHORE (GOVT WHARF) | 10. INGOMAR CEMETERY |

Van Site Locations

C.G.R.S.
KETCH HARBOUR
LORAN-C SHORE-BASED
MONITOR



HELICOPTER TEST SITES

- | | | |
|-----------------------------|------------------------------|----------------------------------|
| 11. Devils Island Light (L) | 15. Horseshoe Ledge Buoy (H) | 19. White Point Rock Buoy (H) |
| 12. Sambro Island Light (L) | 16. Pearl Island Light (L) | 20. Little Hope Island Light (L) |
| 13. Betty Island Light (L) | 17. Mosher Island Light (L) | 21. Gull Rock Island Light (L) |
| 14. Peggys Point Buoy (H) | 18. Coffin Island Light (L) | 22. Jig Rock Buoy (H) |
| | | 23. Budget Rock Buoy (H) |

(L) Helicopter landing. (H) Helicopter Hovering

Helicopter Site Locations

Calendar of Remote Site Data

AUGUST 1982 AOÛT													
SUN	DIM	MON	LUN	TUES	MAR	WED	MER	THURS	JEU	FRI	VEN	SAT	SAM
1 213		2 214		3 215		4 216		5 217		6 218		7 219	
8 220		9 221		10 222		11 223		12 224		13 225		14 226	
15 227		16 228		17 229		18 230		19 231		20 232		21 233	
22 234		23 235		24 236		25 237		26 238		27 239		28 240	
29 241		30 242		31 243									
SEPTEMBER SEPTEMBRE													
SUN	DIM	MON	LUN	TUES	MAR	WED	MER	THURS	JEU	FRI	VEN	SAT	SAM
						1 244		2 245		3 246		4 247	
5 248		6 249		7 250		8 251		9 252		10 253		11 254	
12 255		13 256		14 257		15 258		16 259		17 260		18 261	
19 262		20 263		21 264		22 265		23 266		24 267		25 268	
26 269		27 270		28 271		29 272		30 273					
OCTOBER OCTOBRE													
SUN	DIM	MON	LUN	TUES	MAR	WED	MER	THURS	JEU	FRI	VEN	SAT	SAM
										1 274		2 275	
3 276		4 277		5 278		6 279		7 280		8 281		9 282	
10 283		11 284		12 285		13 286		14 287		15 288		16 289	
17 290		18 291		19 292		20 293		21 294		22 295		23 296	
24 297	31 304	25 298		26 299		27 300		28 301		29 302		30 303	

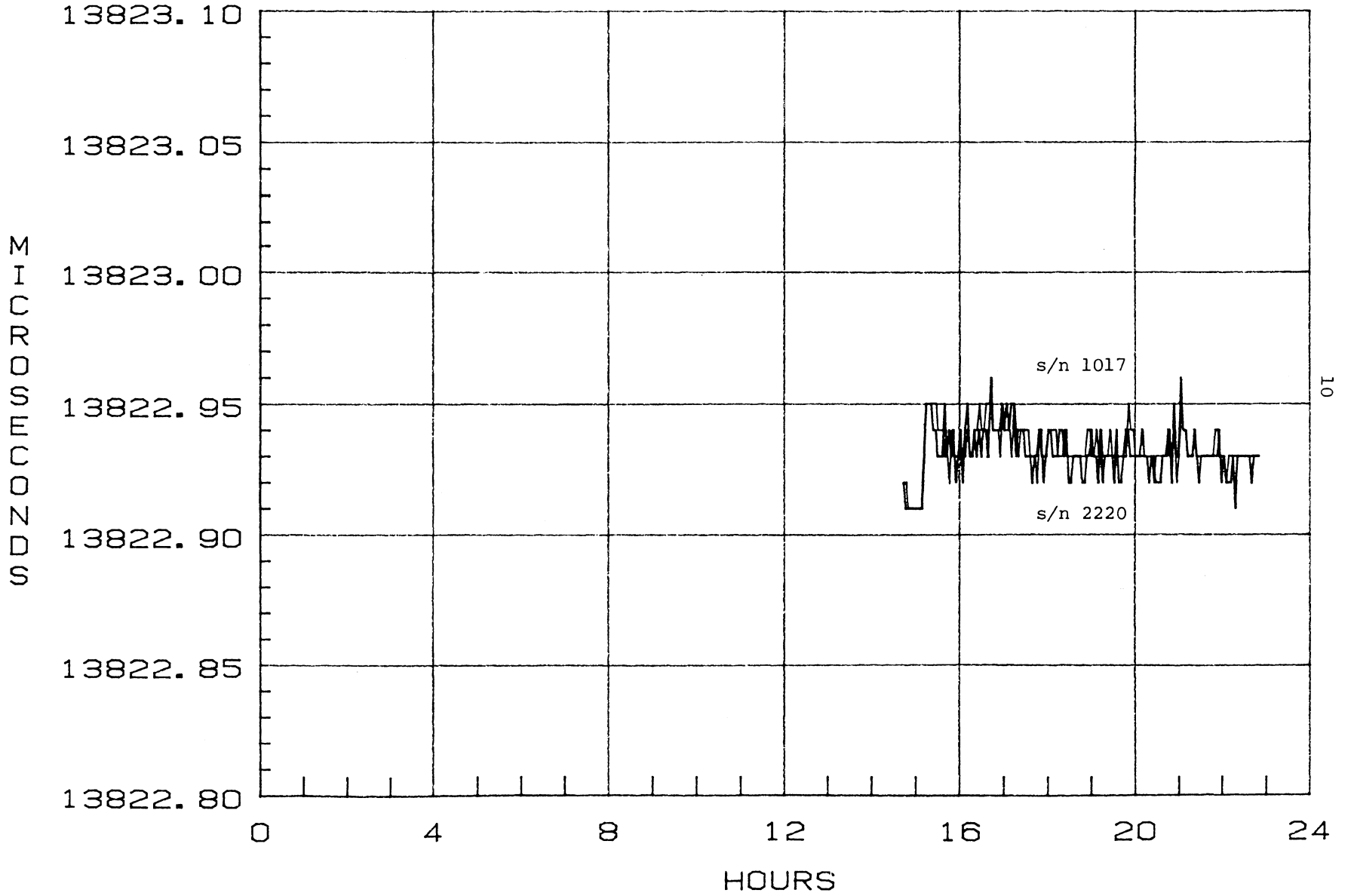
 = Helicopter Data

APPENDIX V

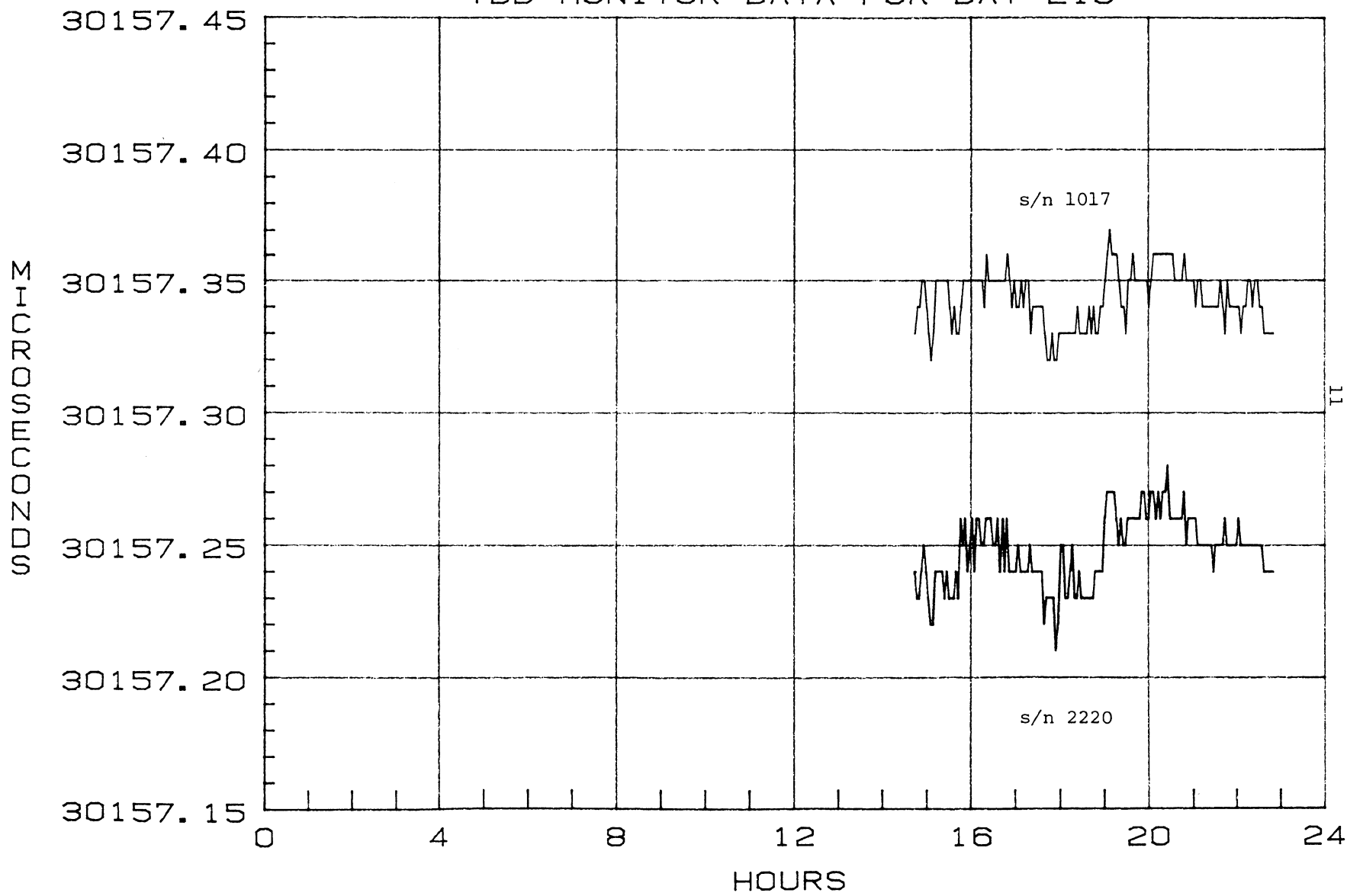
MONITOR STATION PLOTS

The monitor site for this experiment was located at Ketch Harbour. Two Internav 404 receivers were operated at this site (serial numbers 1017 and 2220). This appendix contains daily plots of the LORAN-C time difference (TD) measurements made at this site during the experiment. Two plots are included for each day: TDA (LORAN chain 5930 Caribou-Nantucket time difference), and TDB (LORAN chain 5930 Caribou-Cape Race time difference).

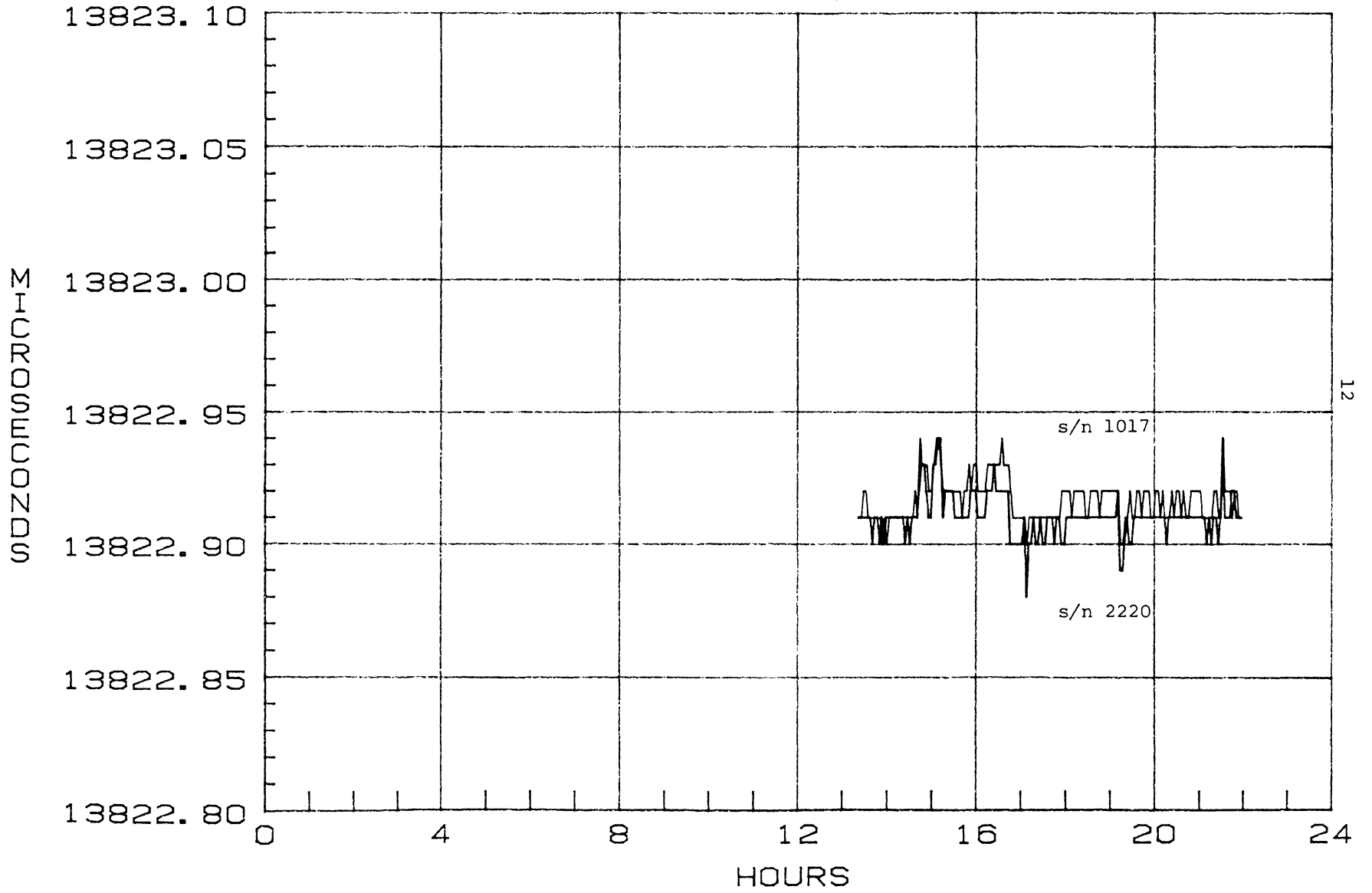
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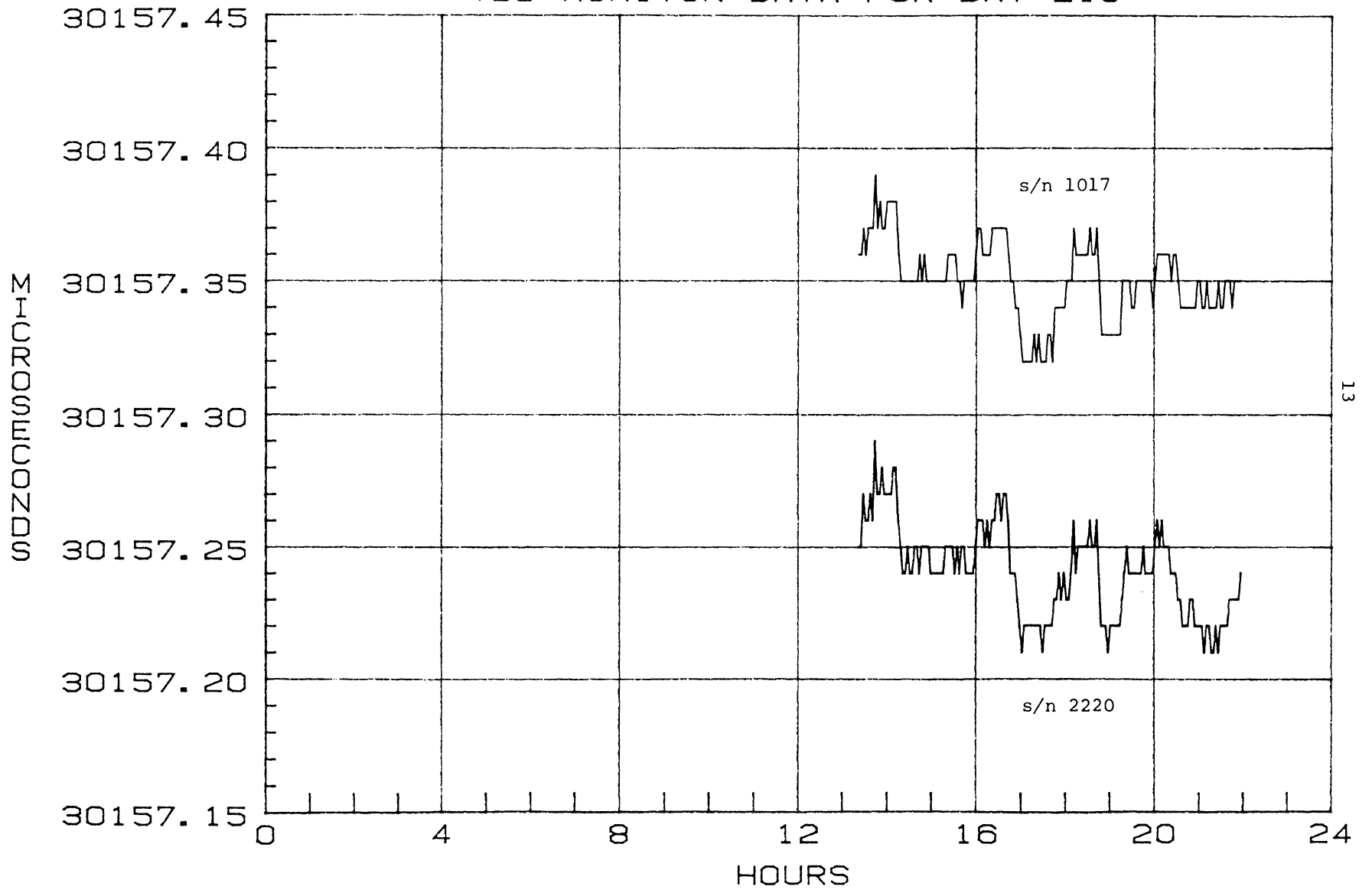
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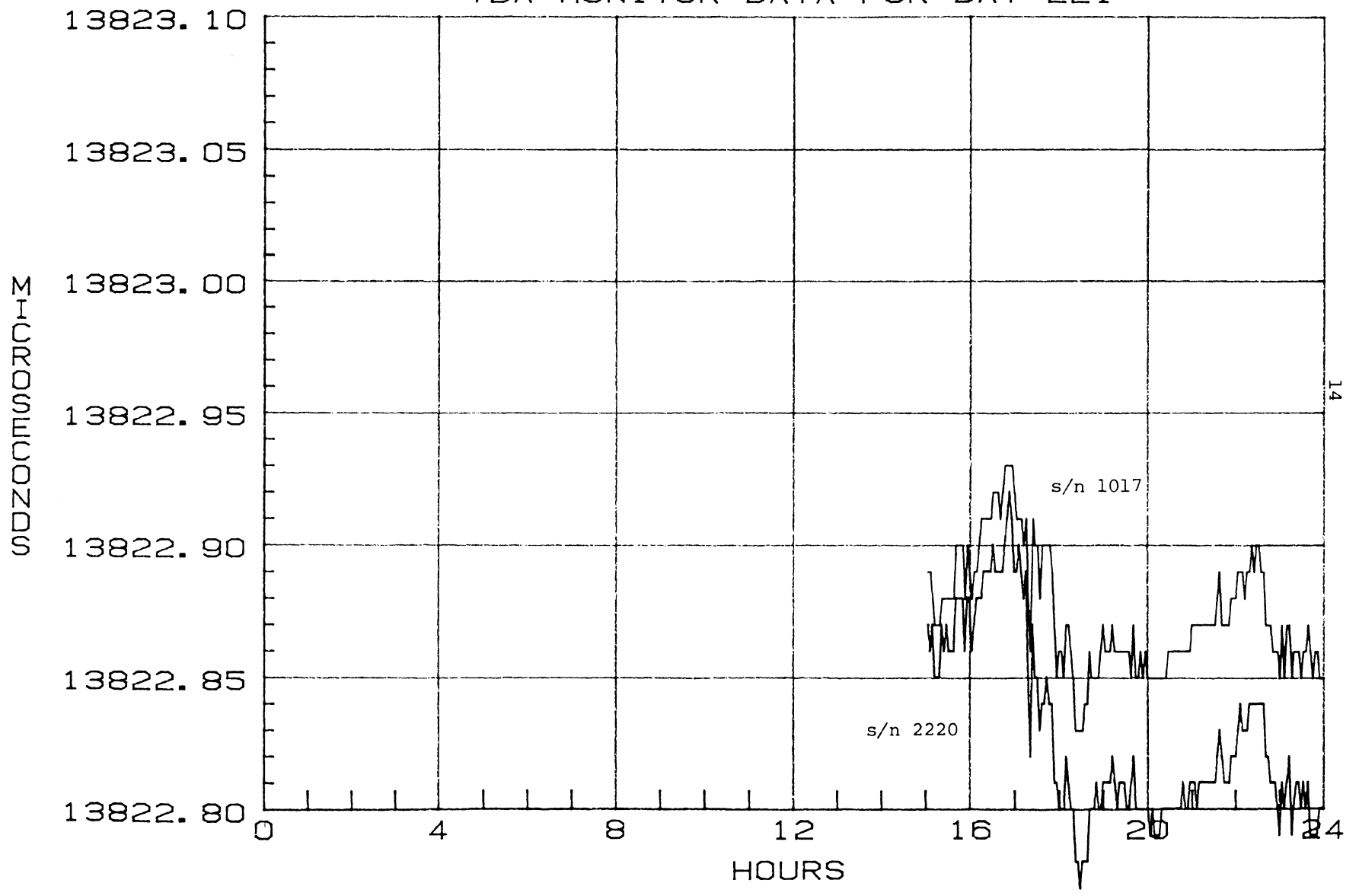
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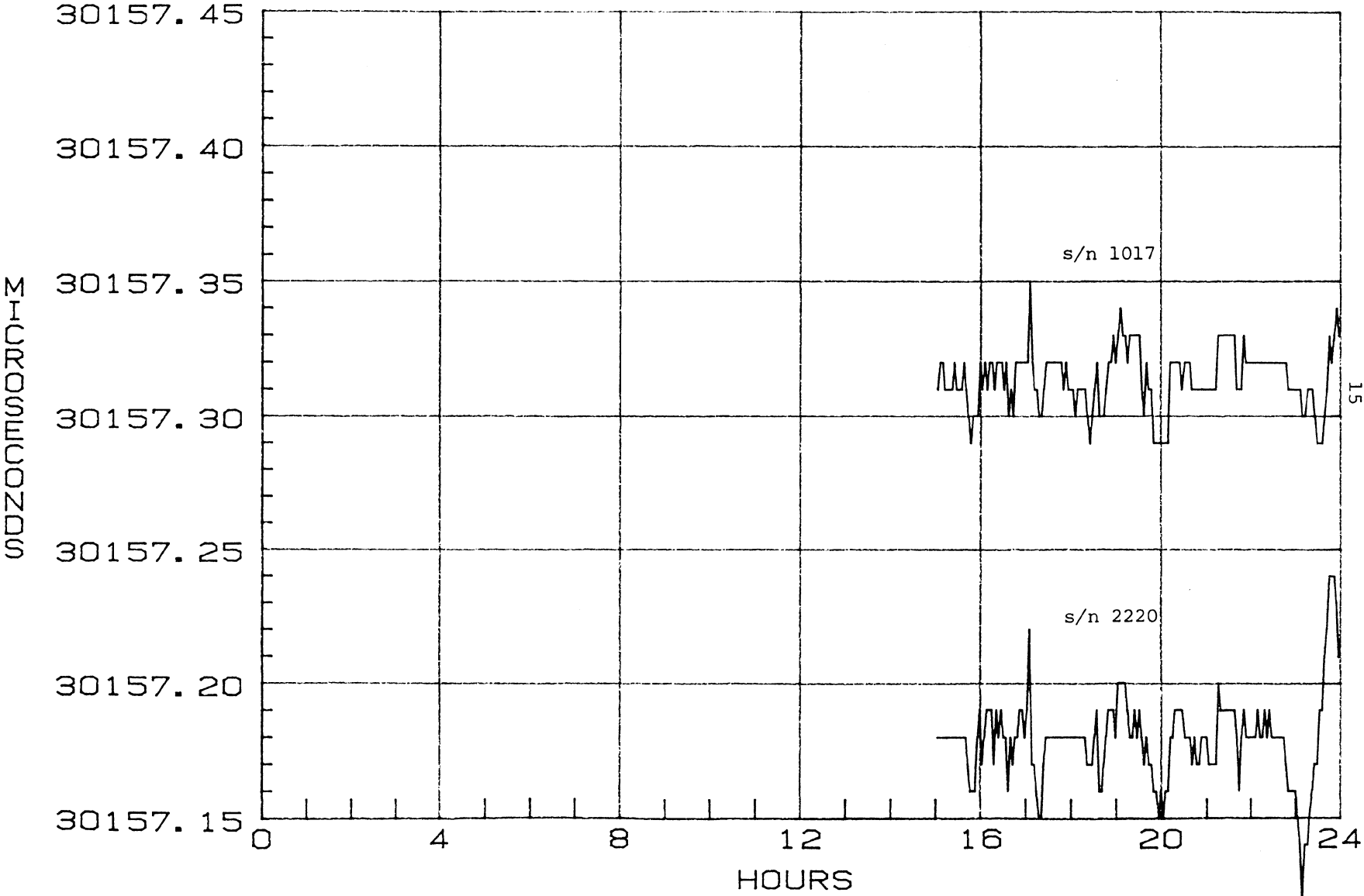
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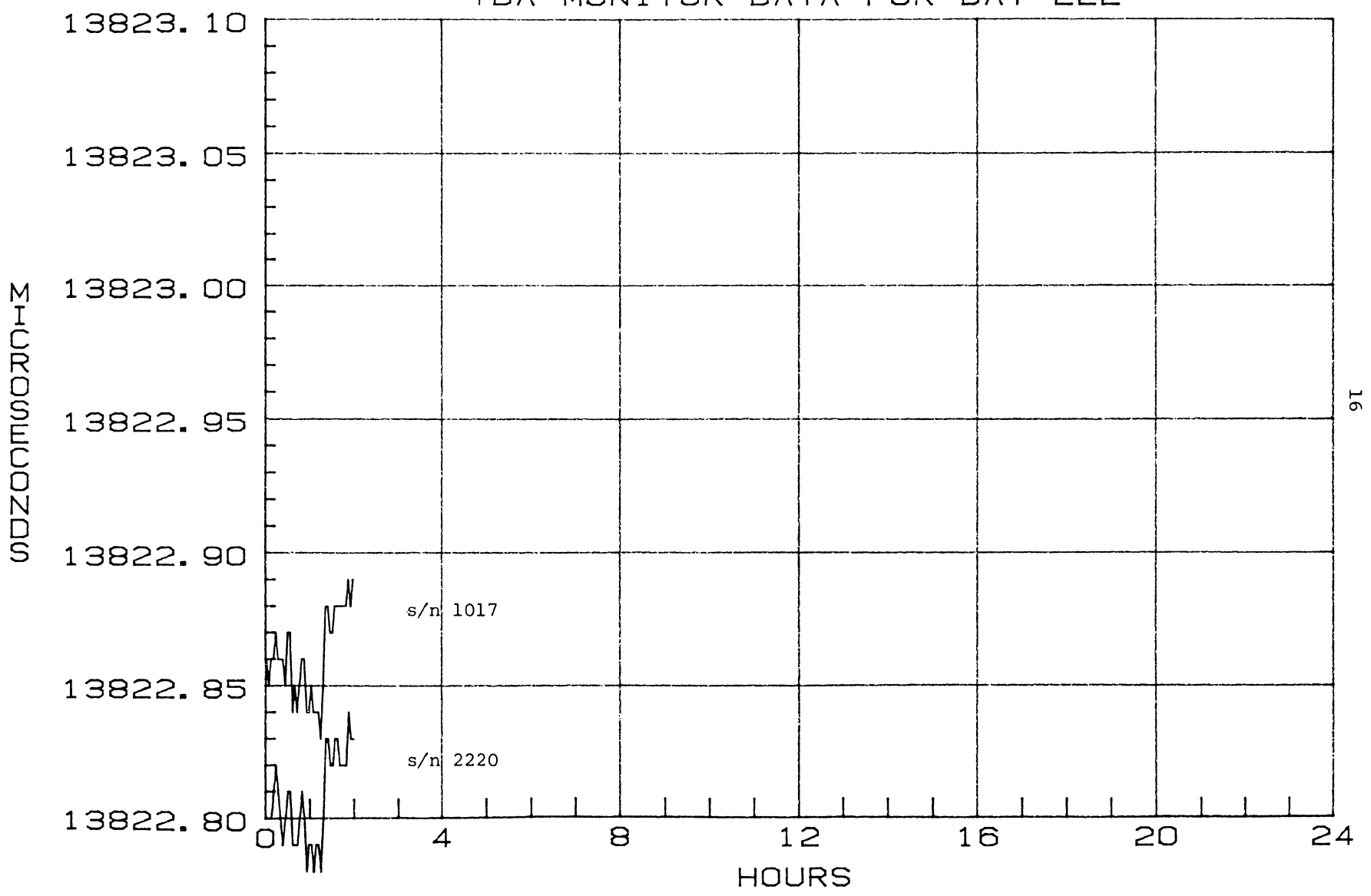
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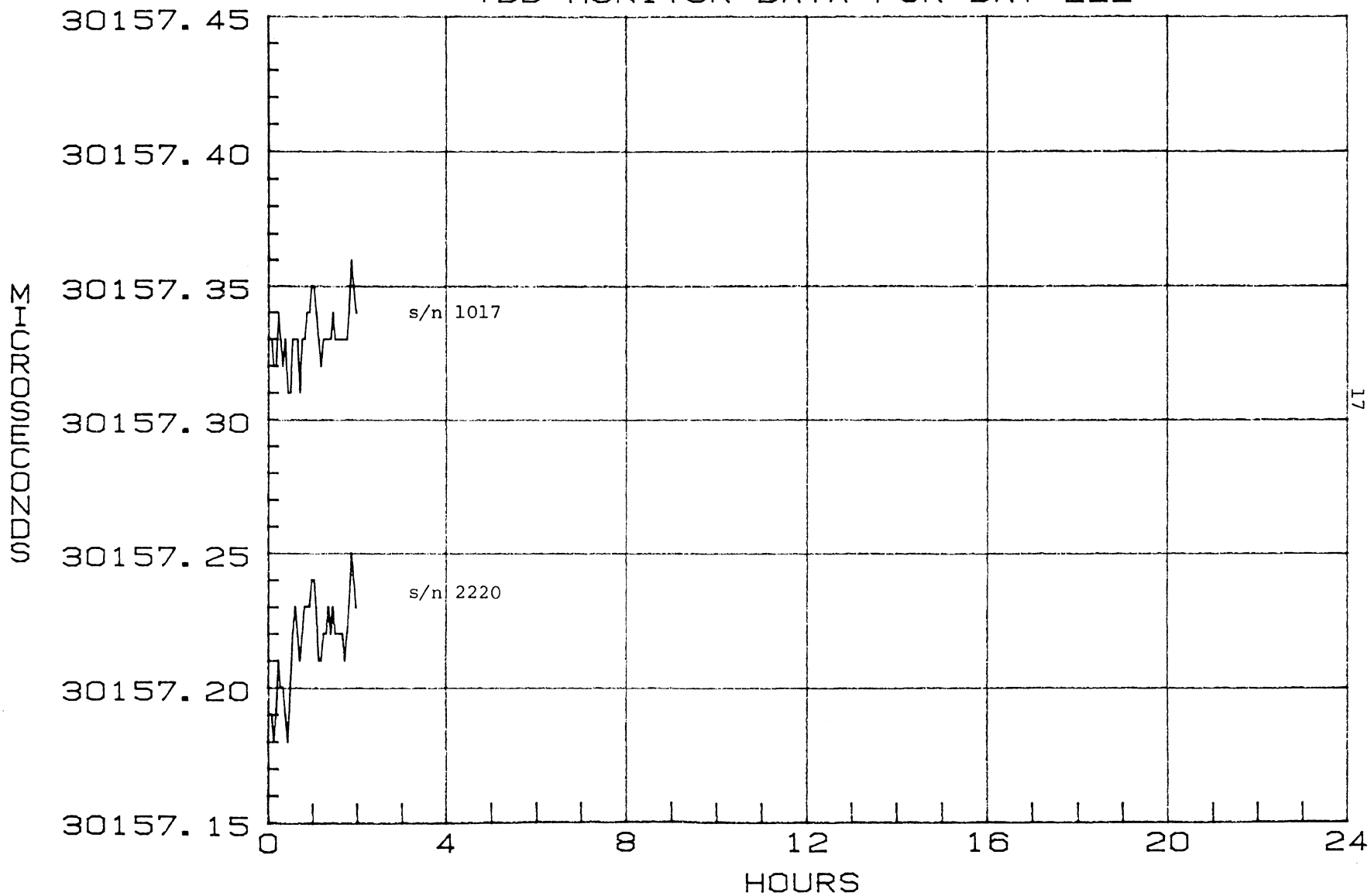
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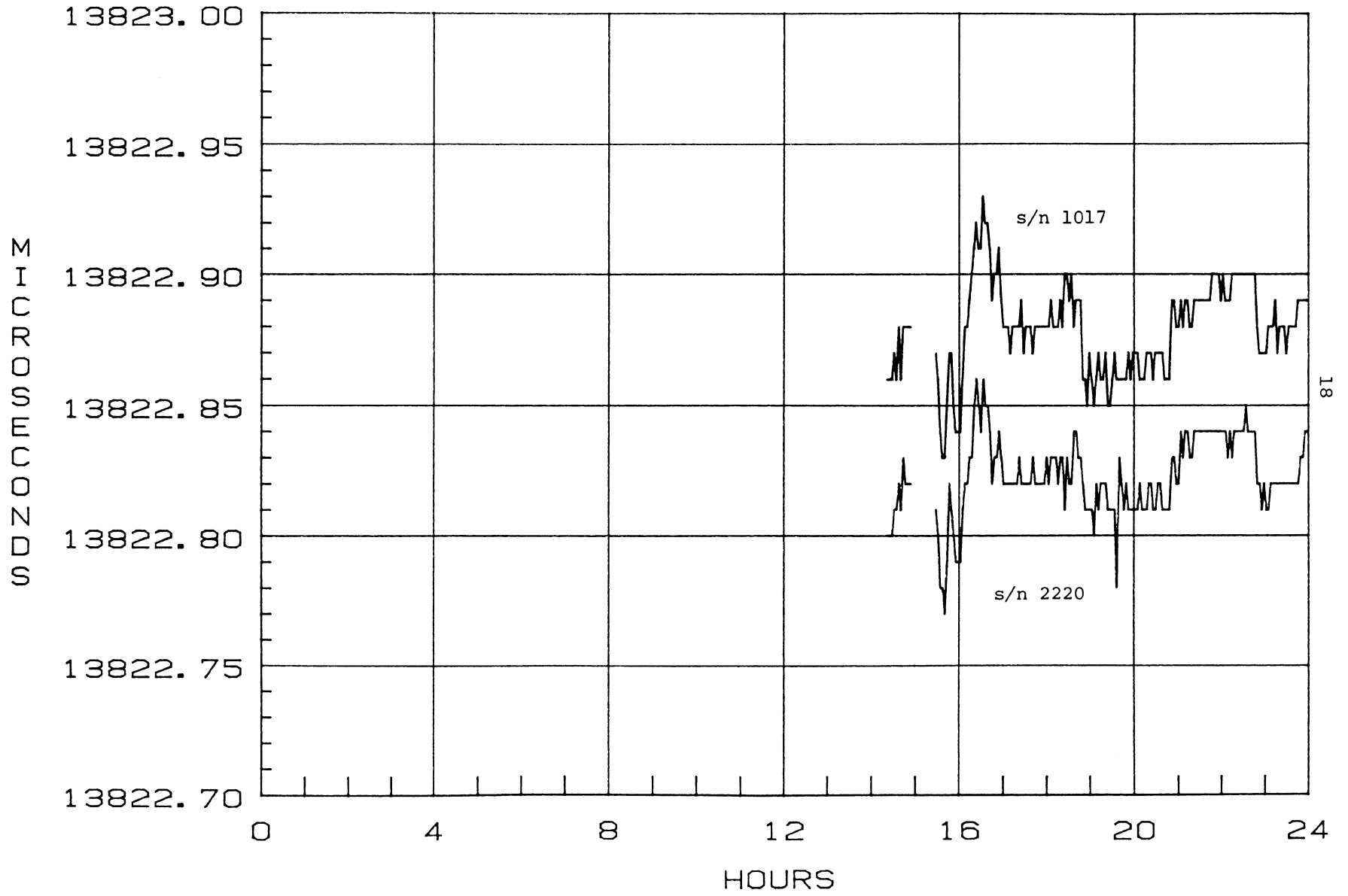
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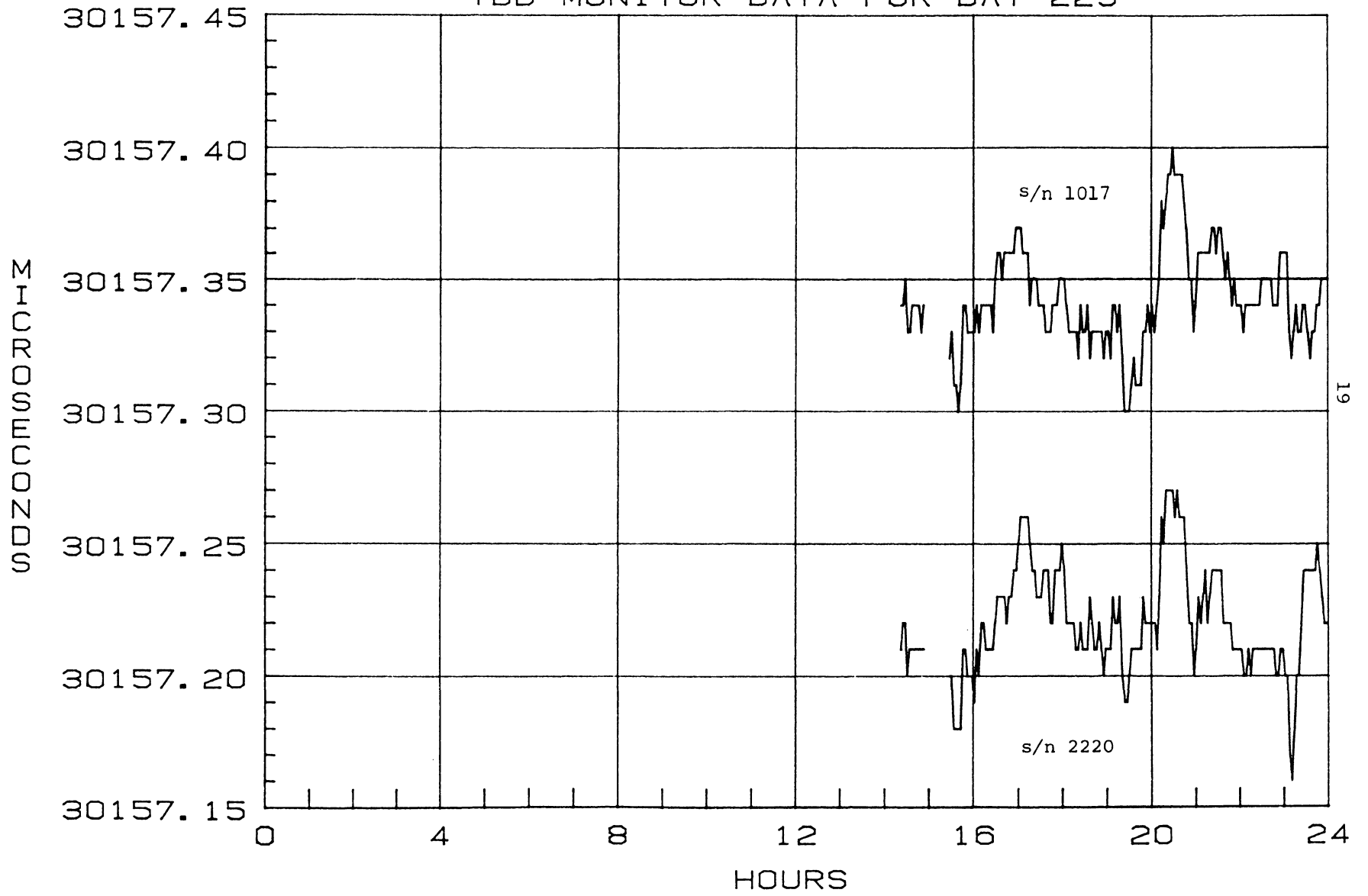
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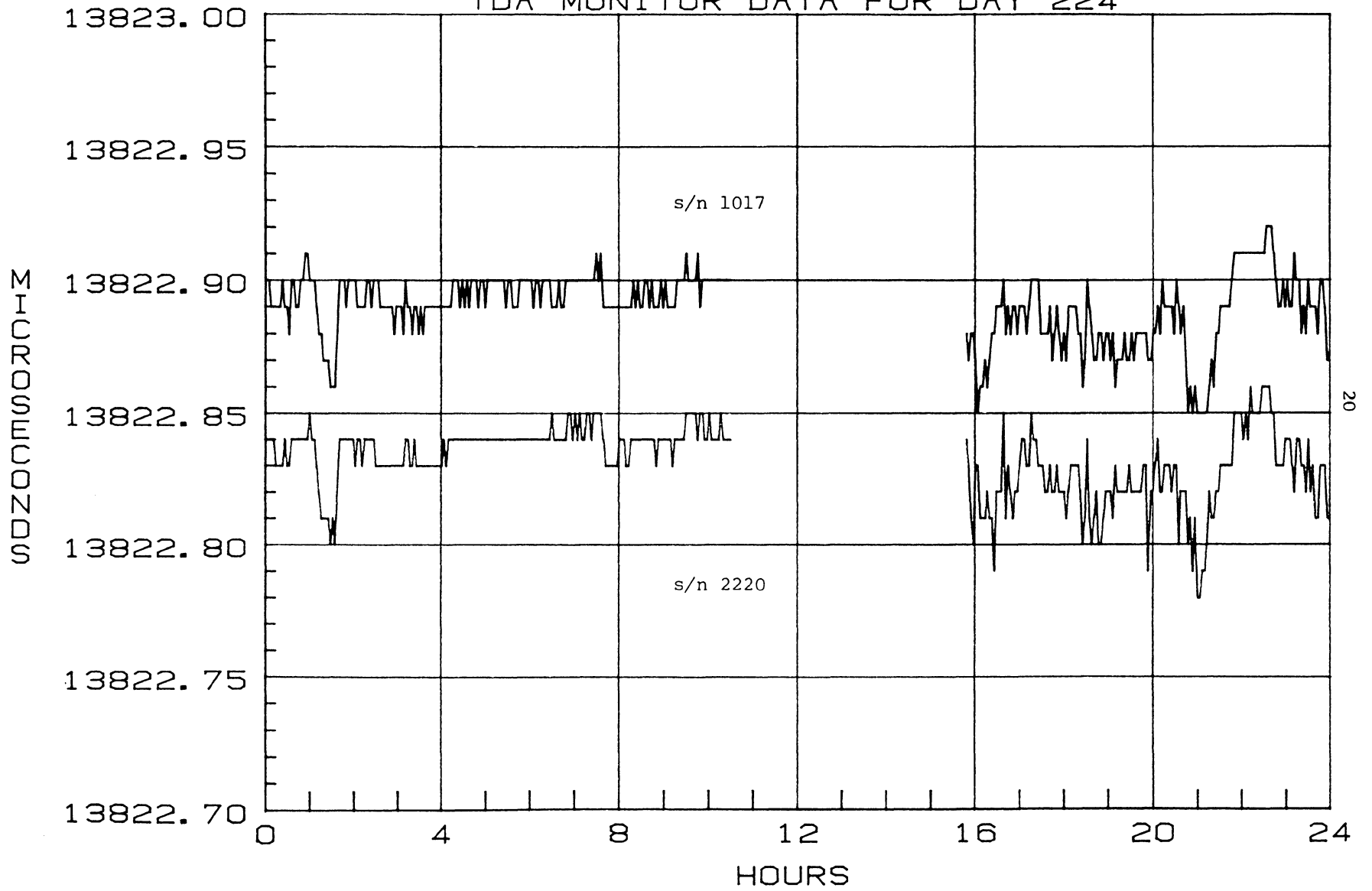
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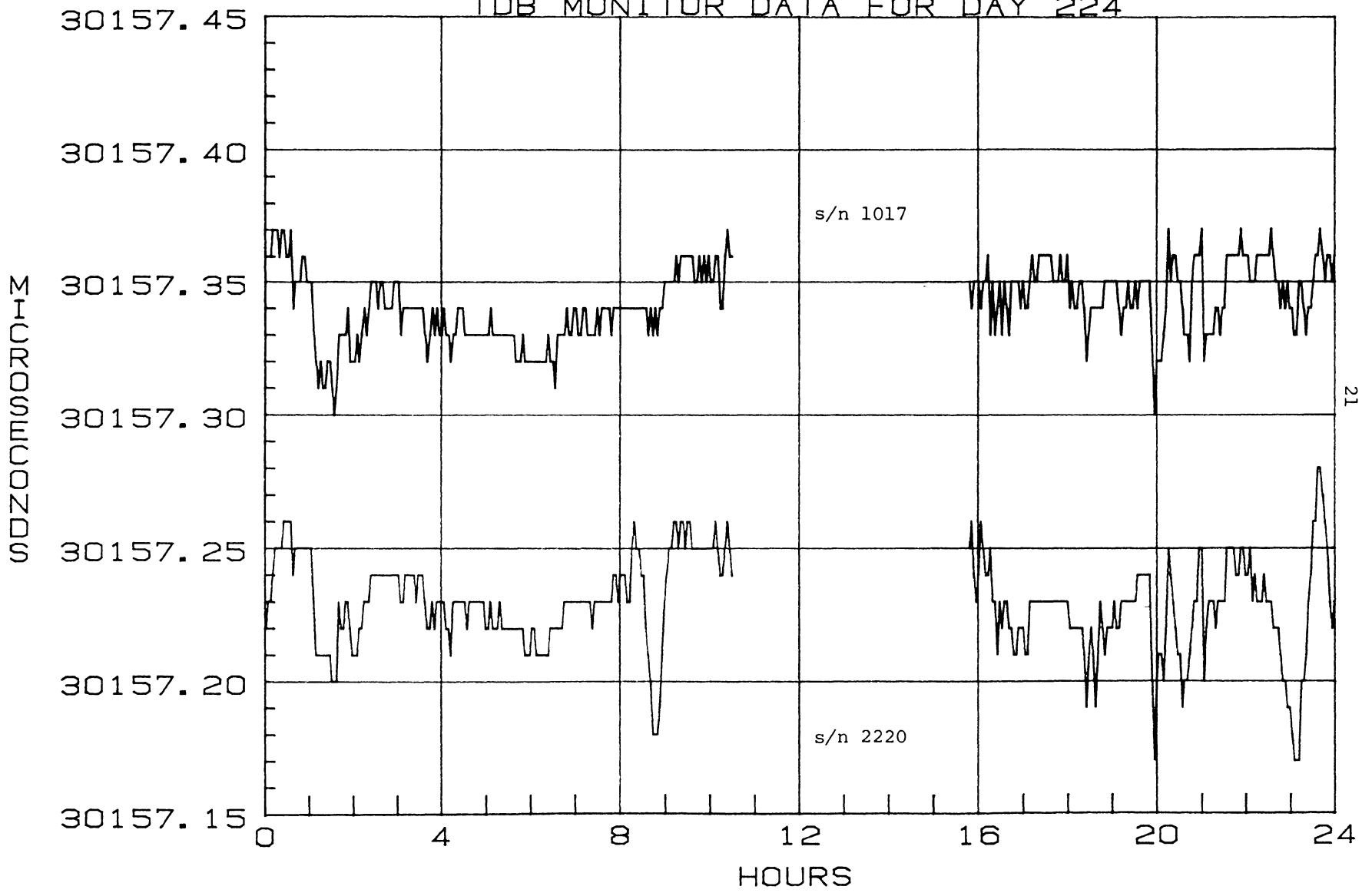
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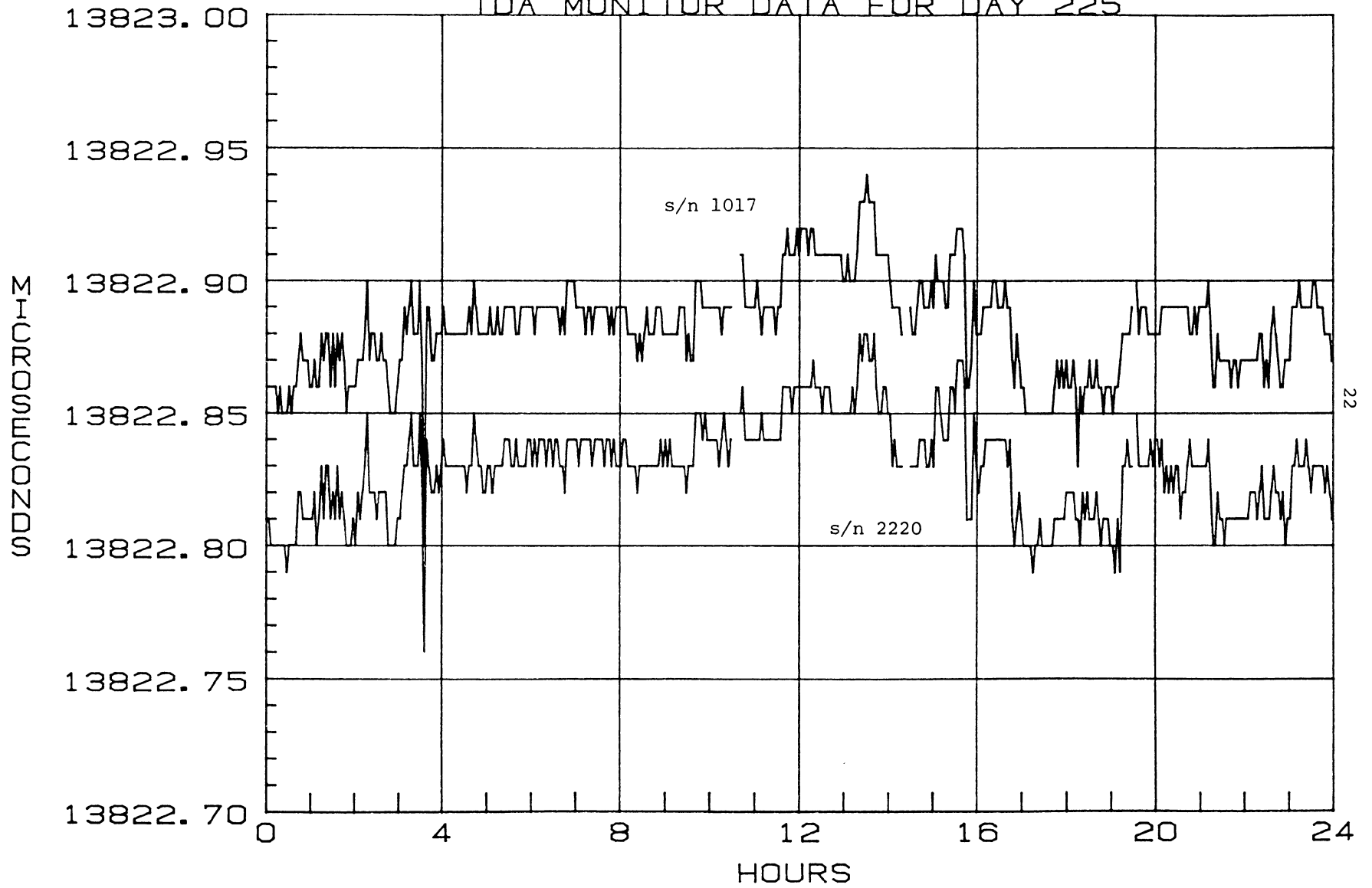
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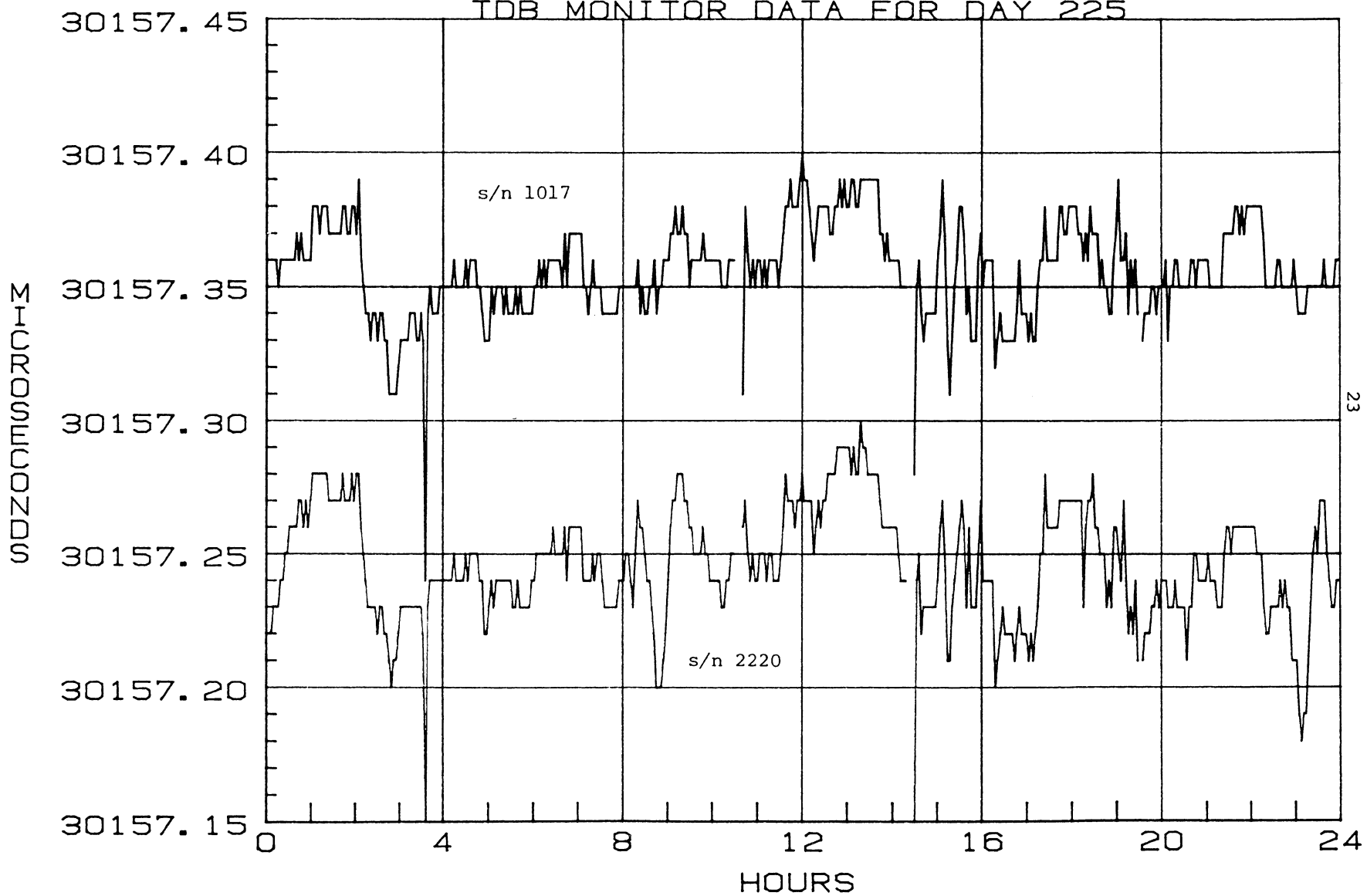
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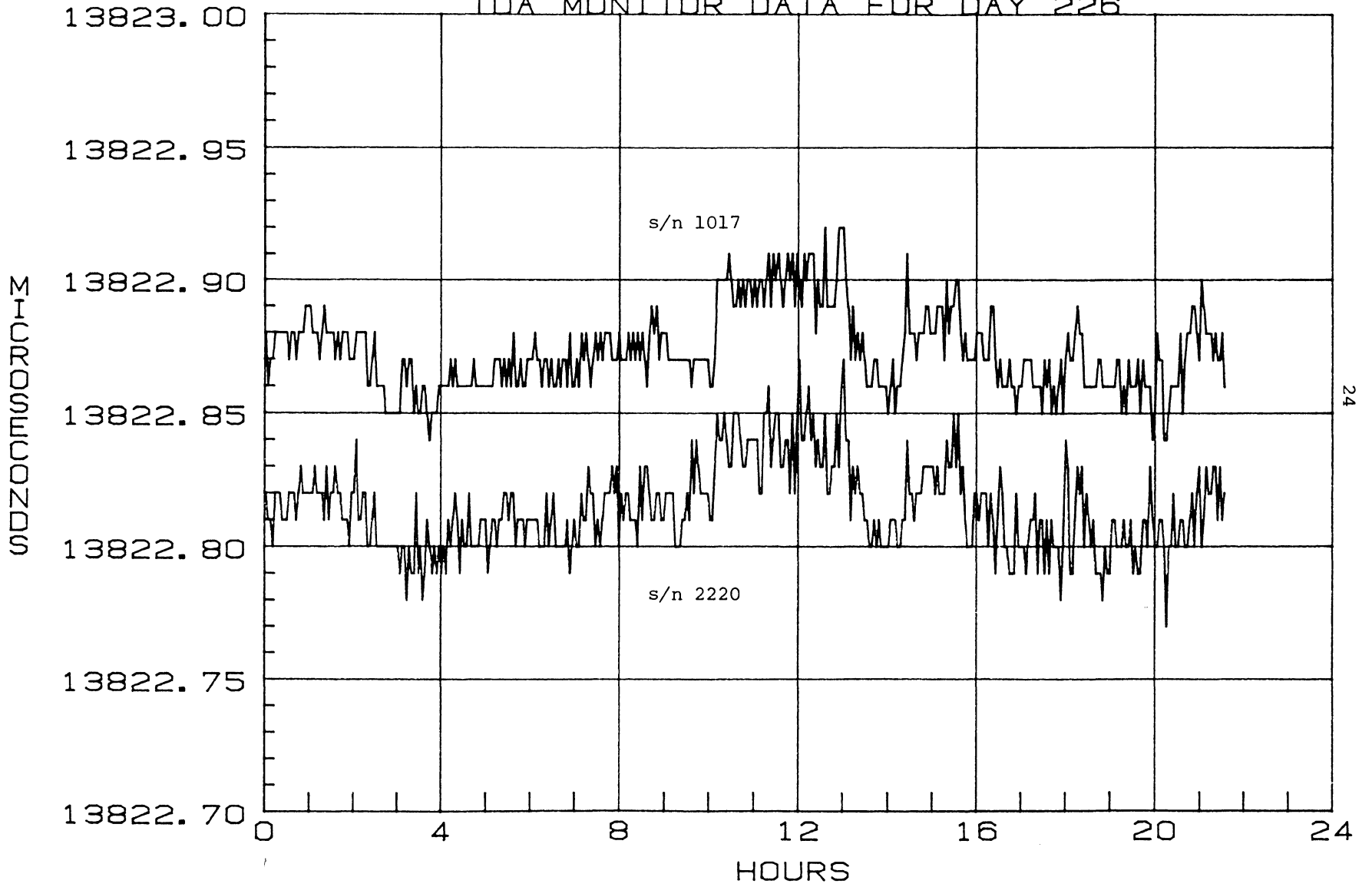
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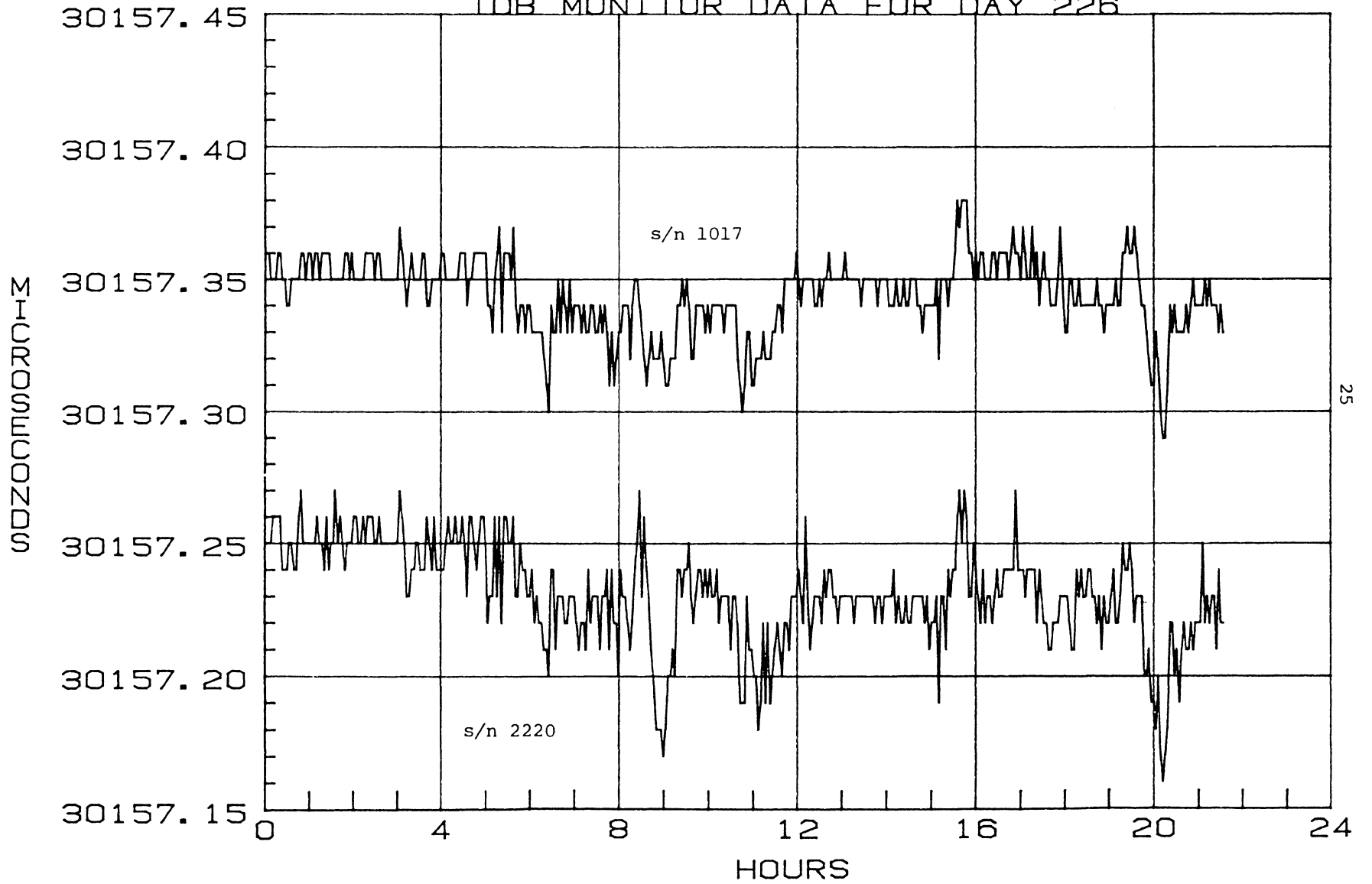
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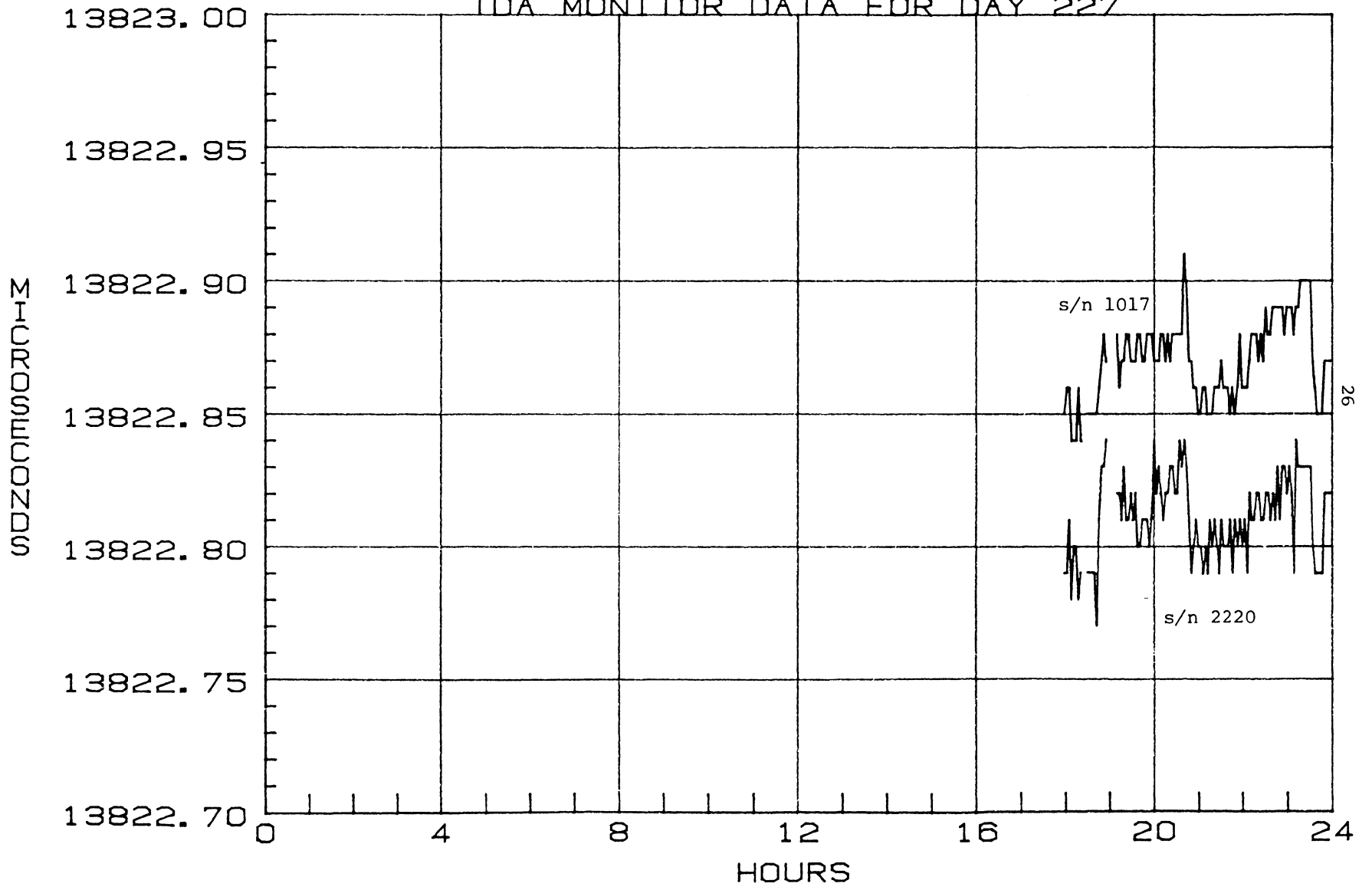
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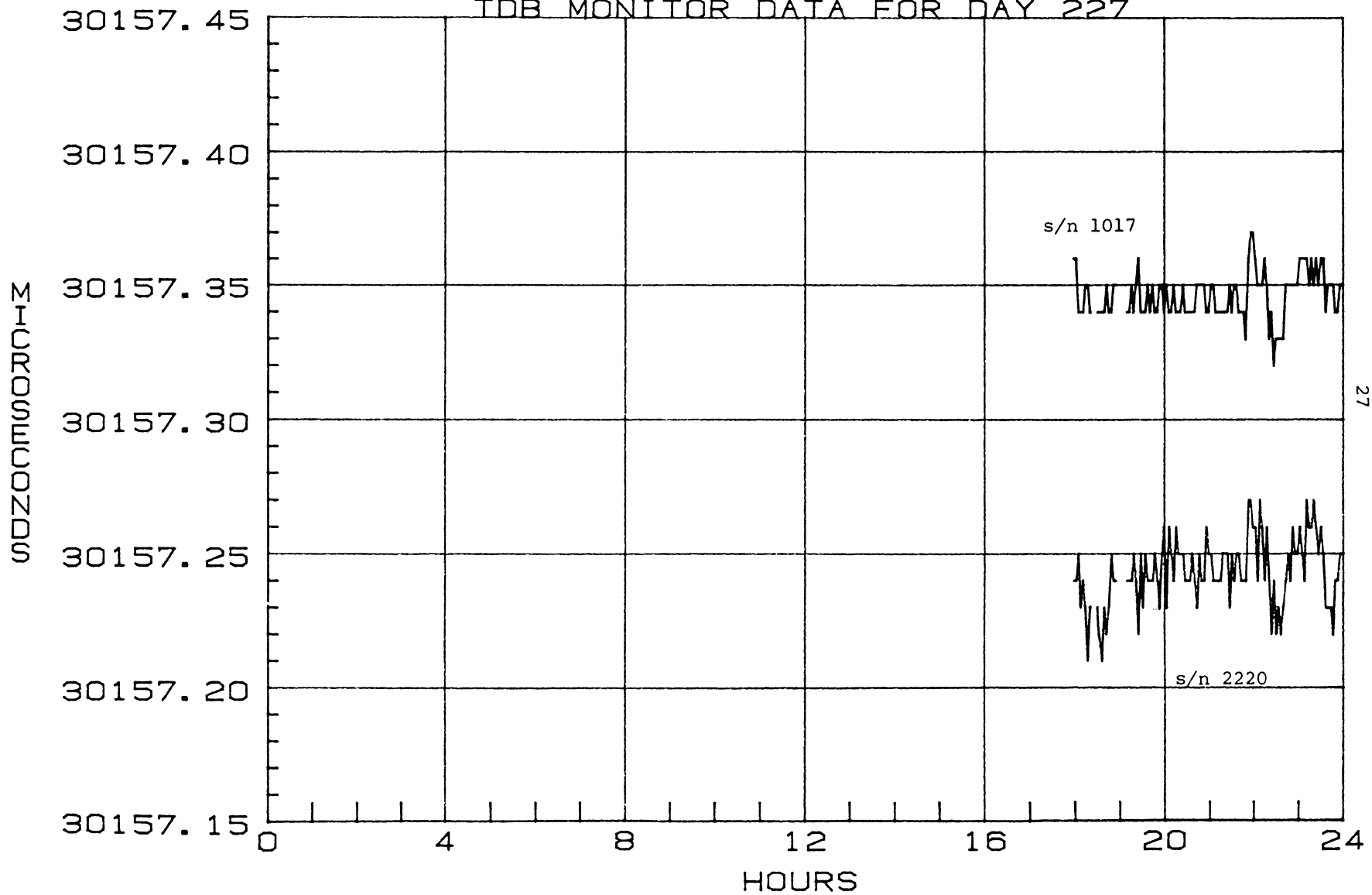
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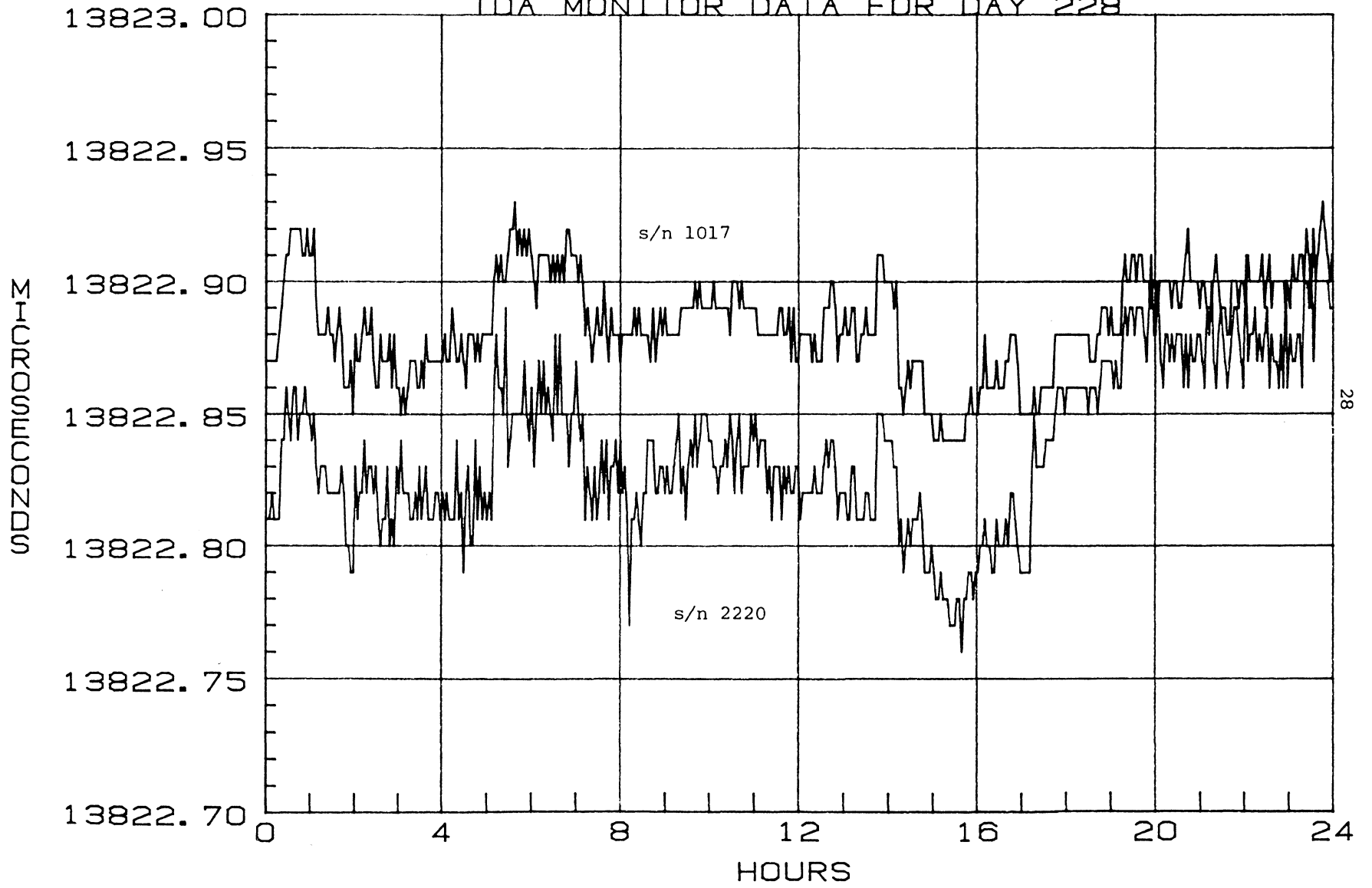
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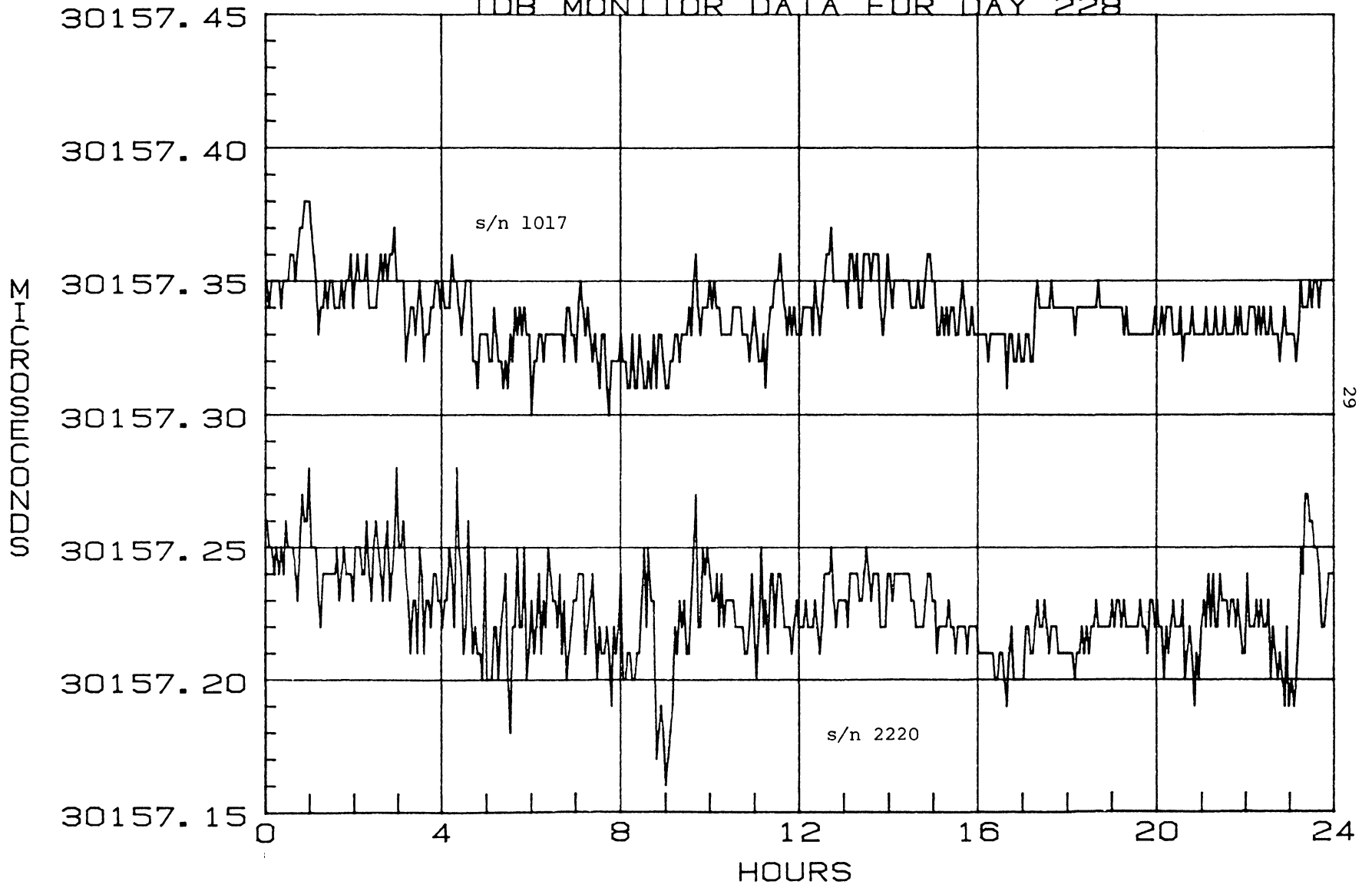
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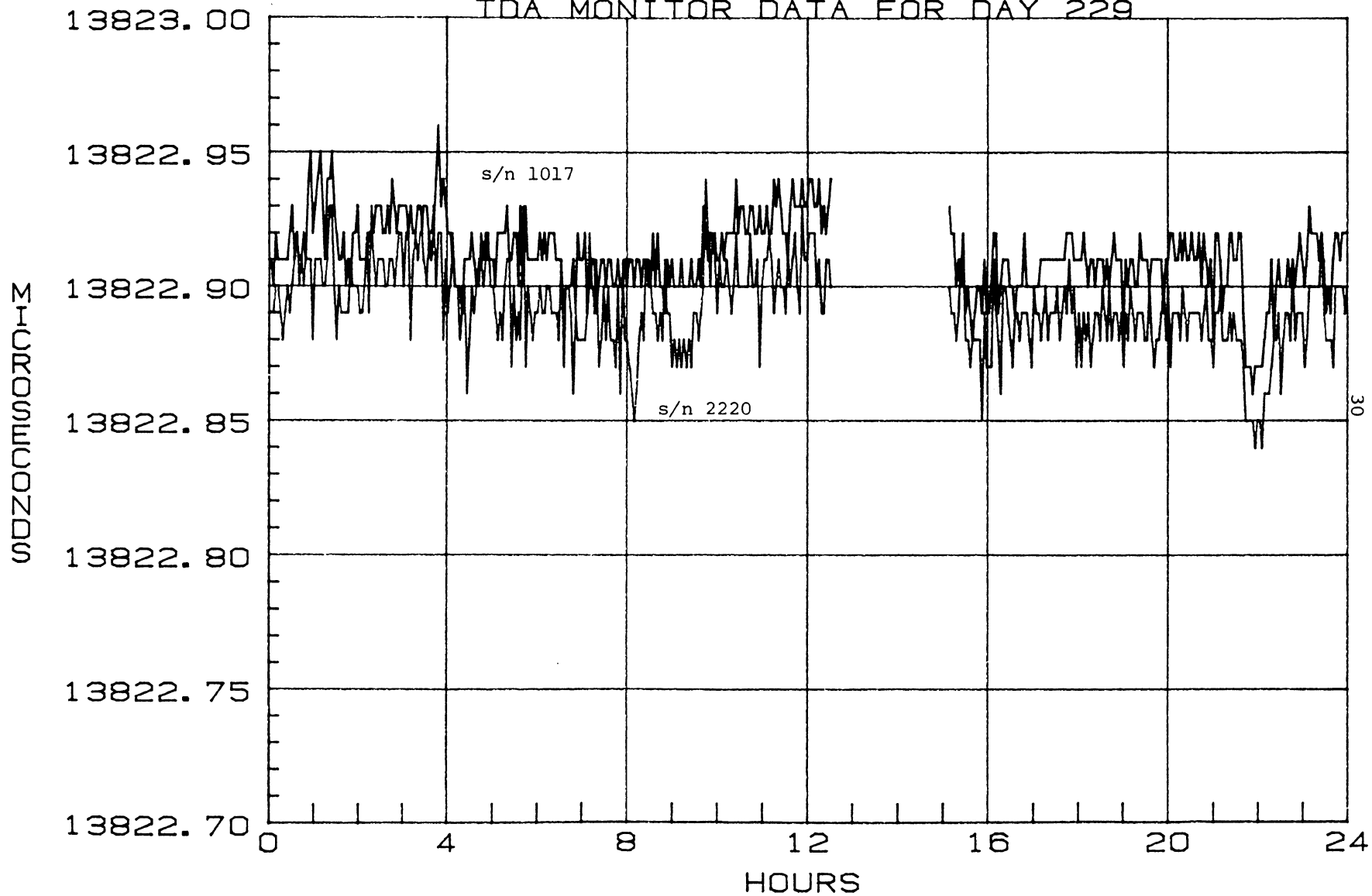
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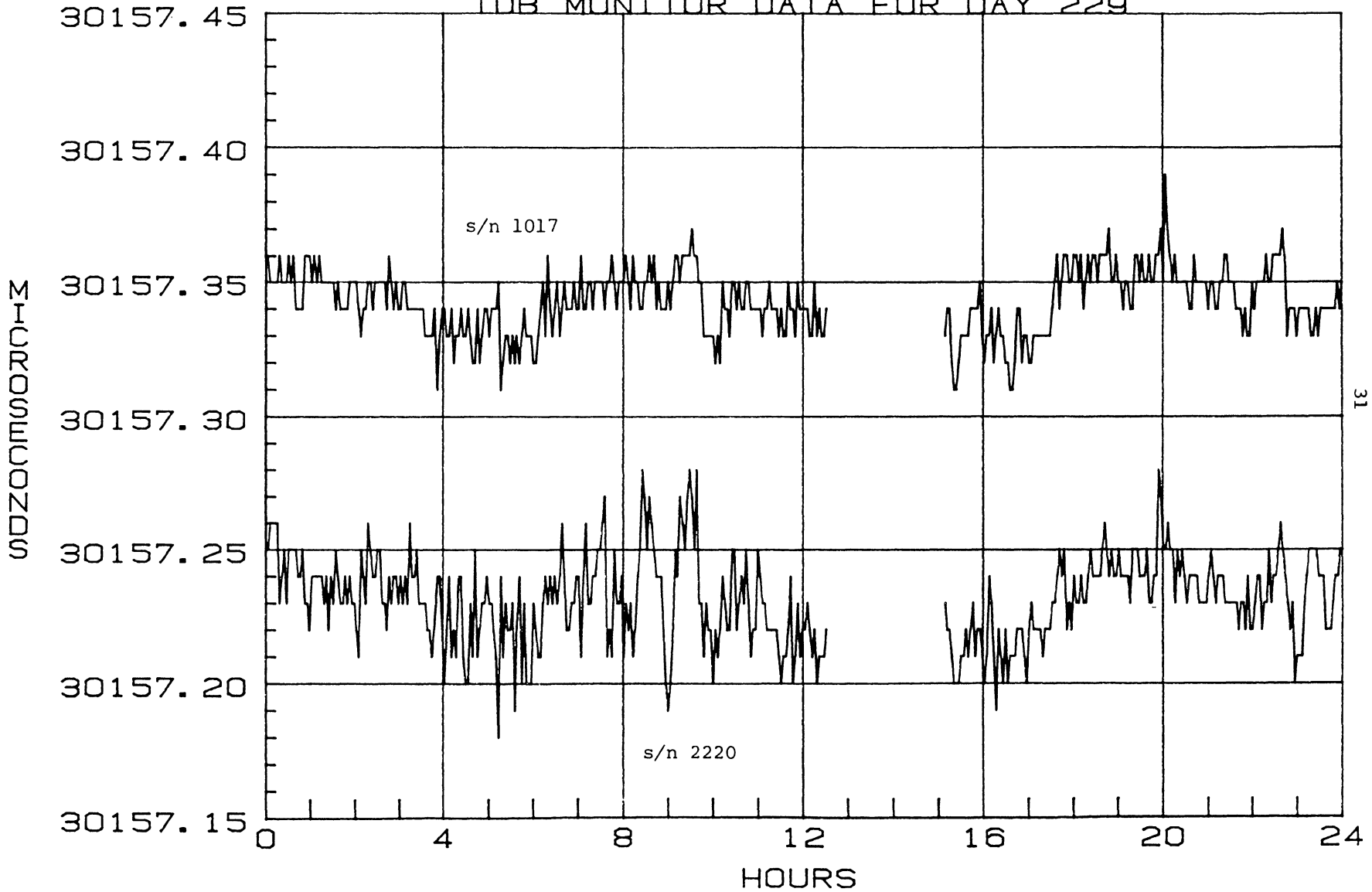
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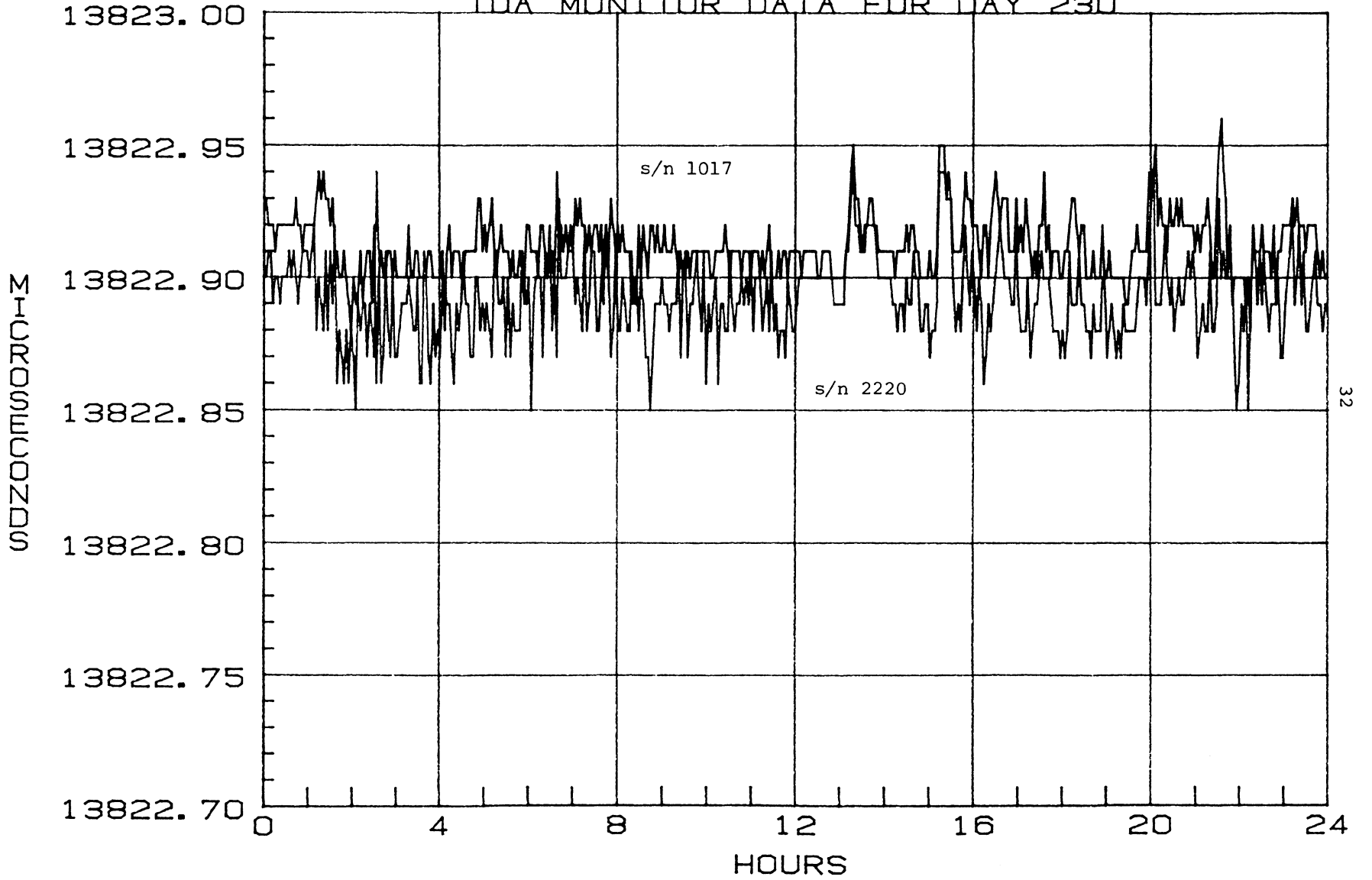
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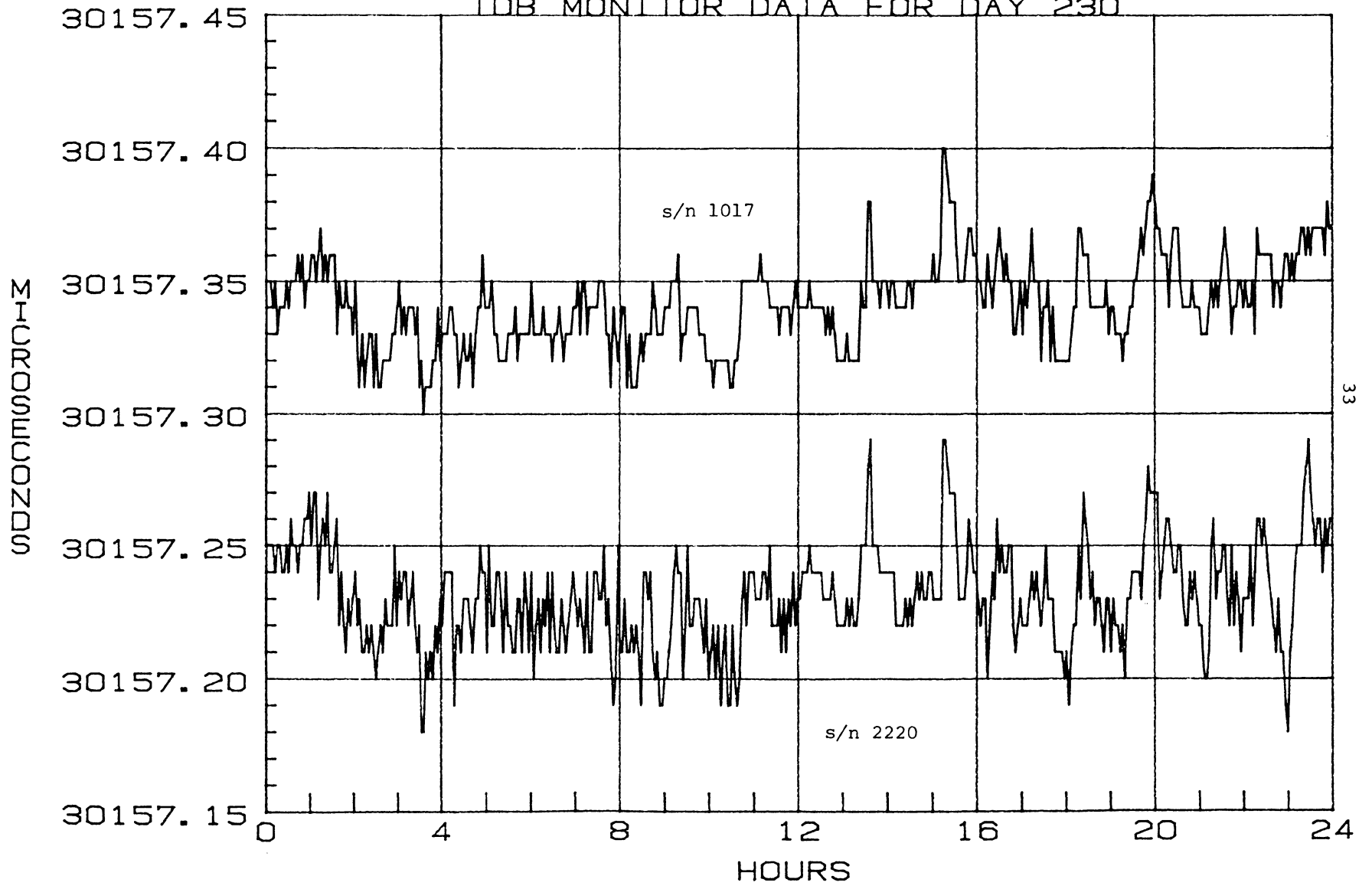
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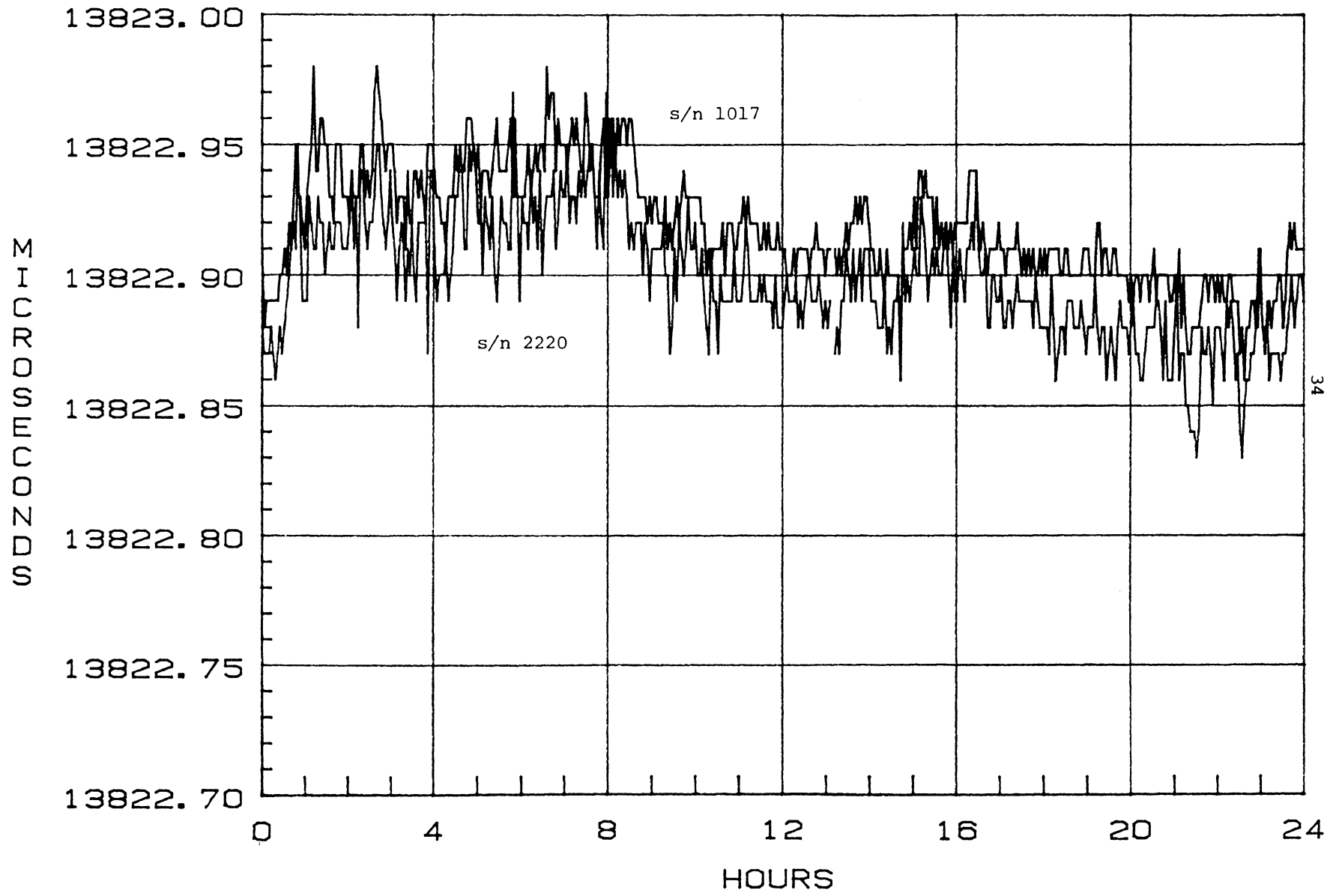
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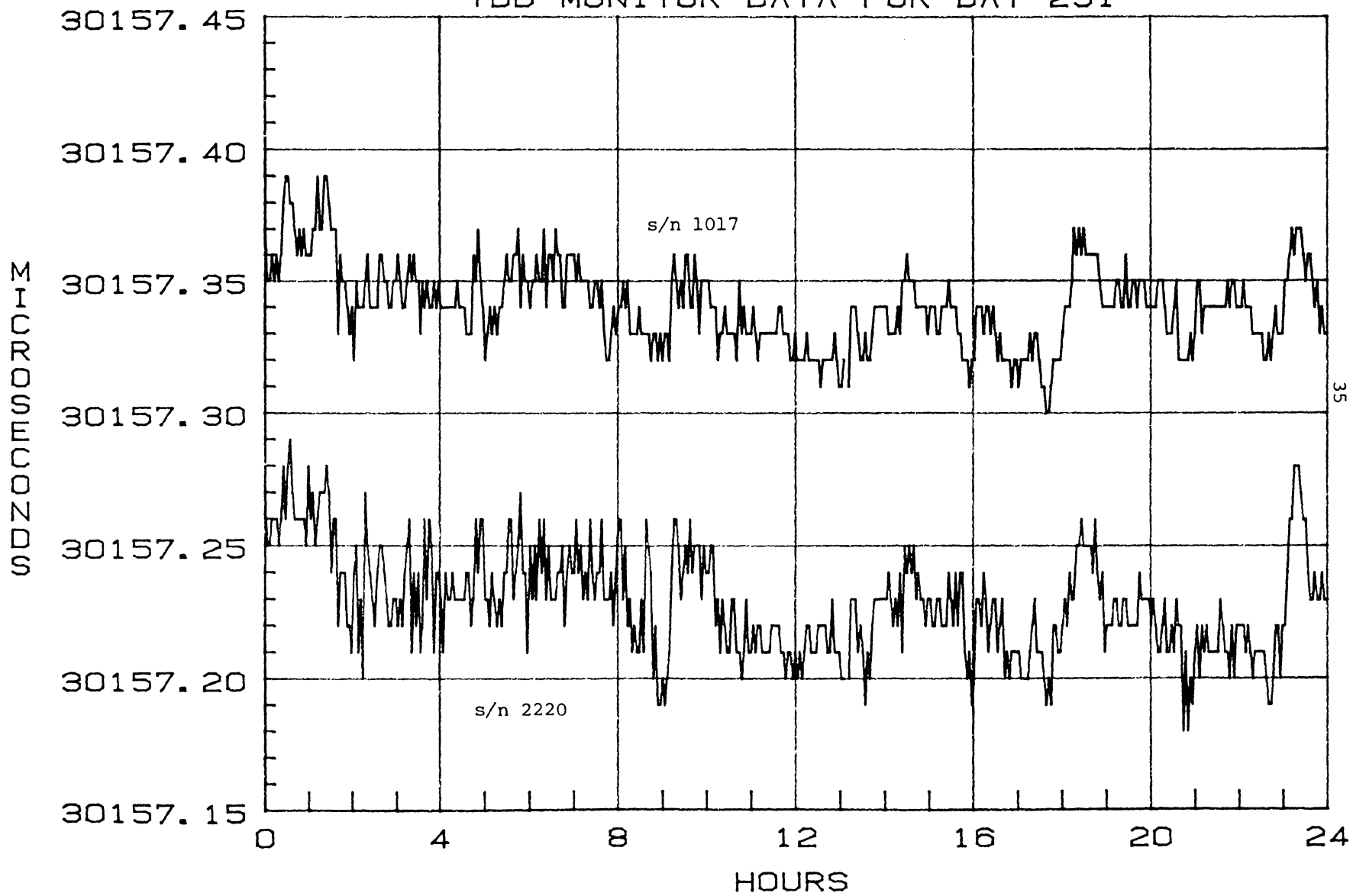
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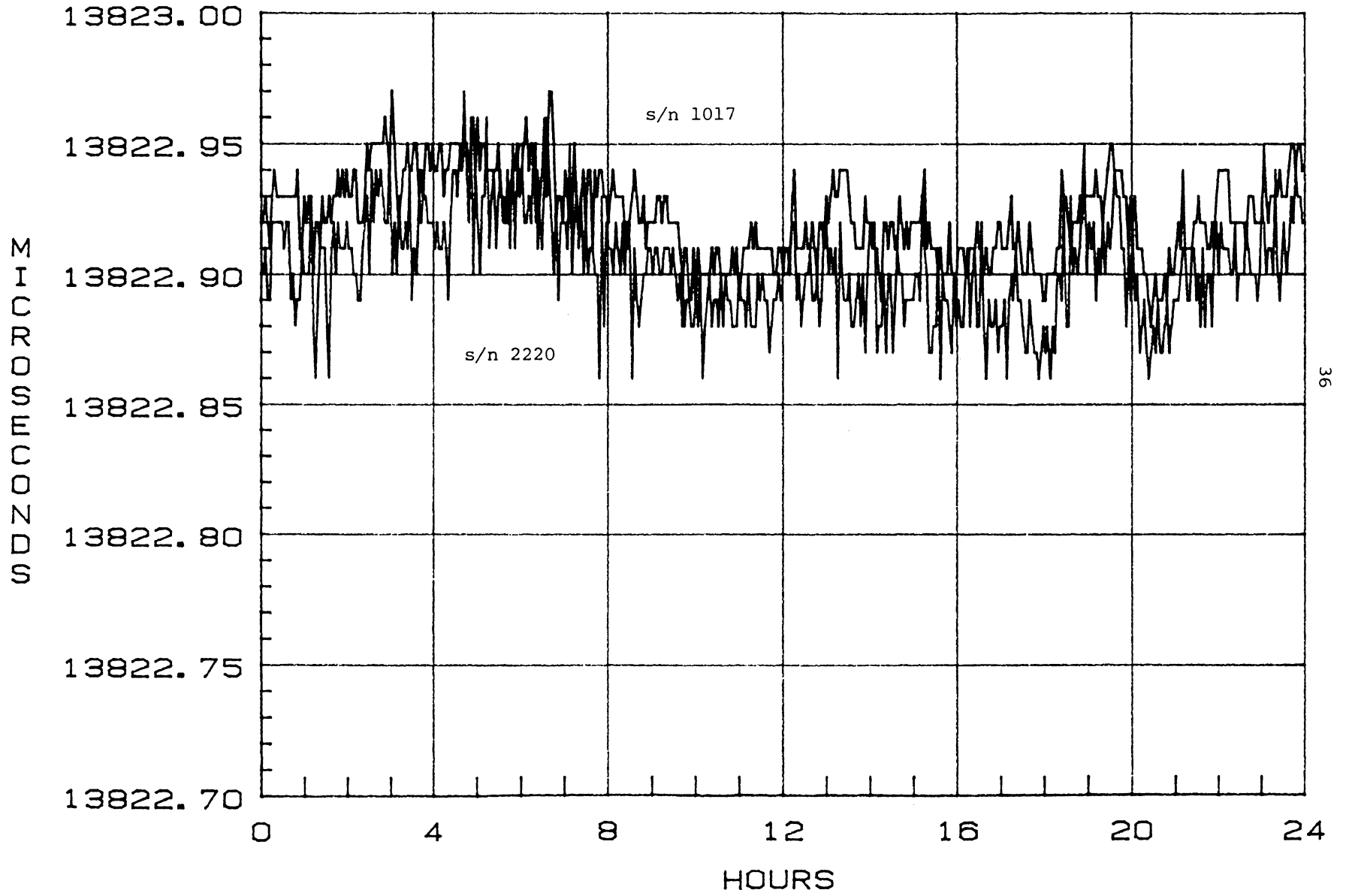
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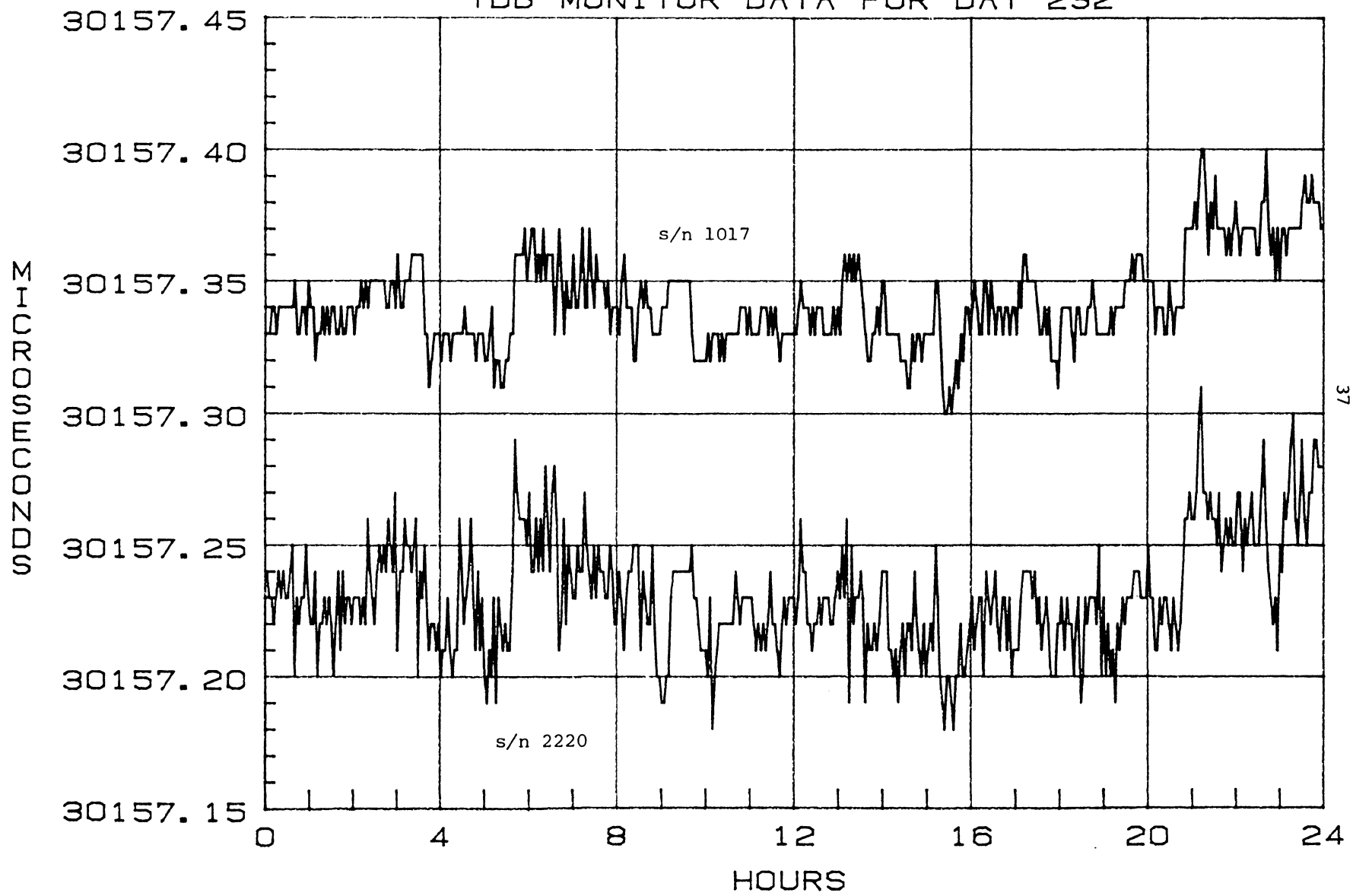
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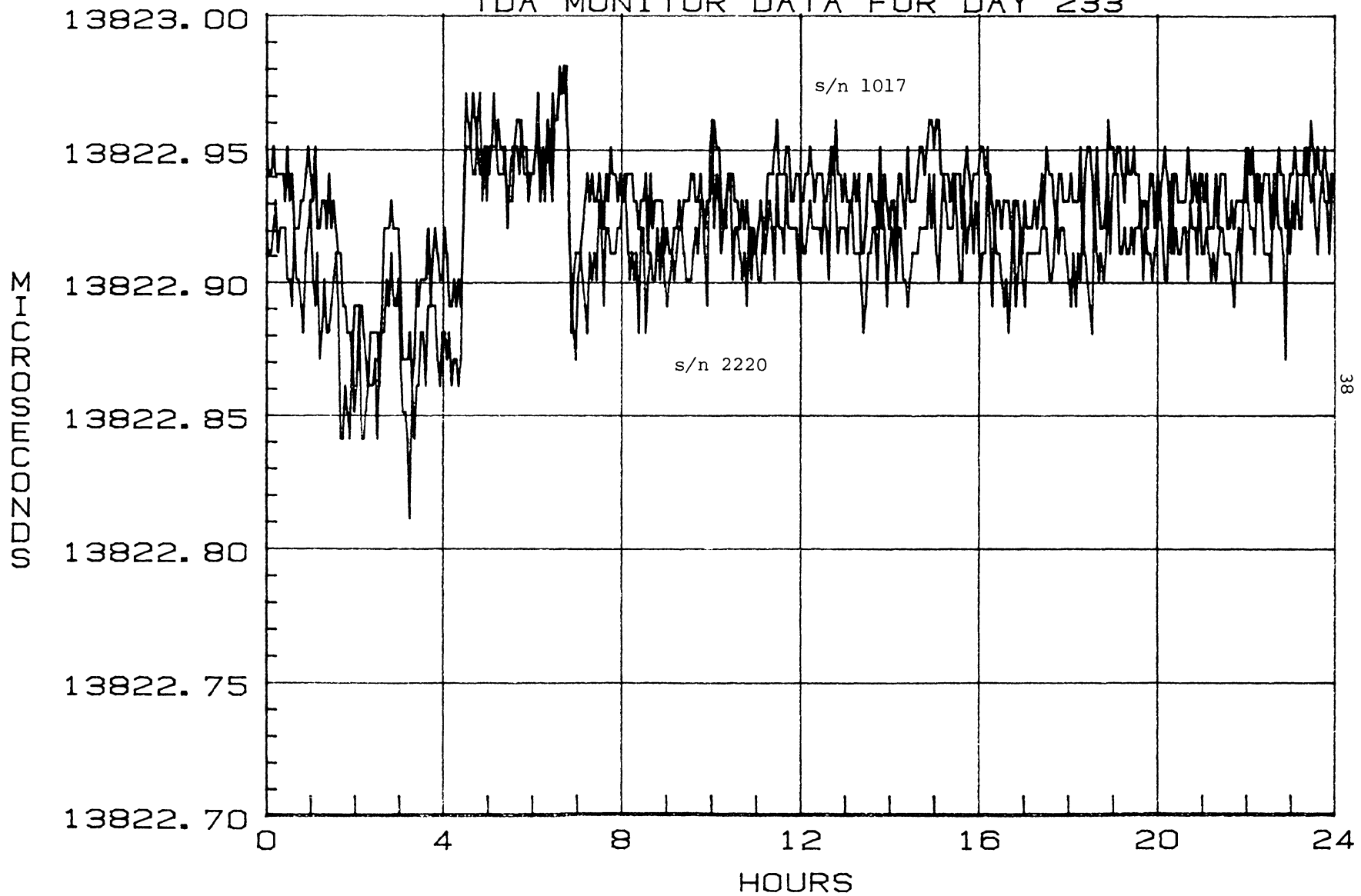
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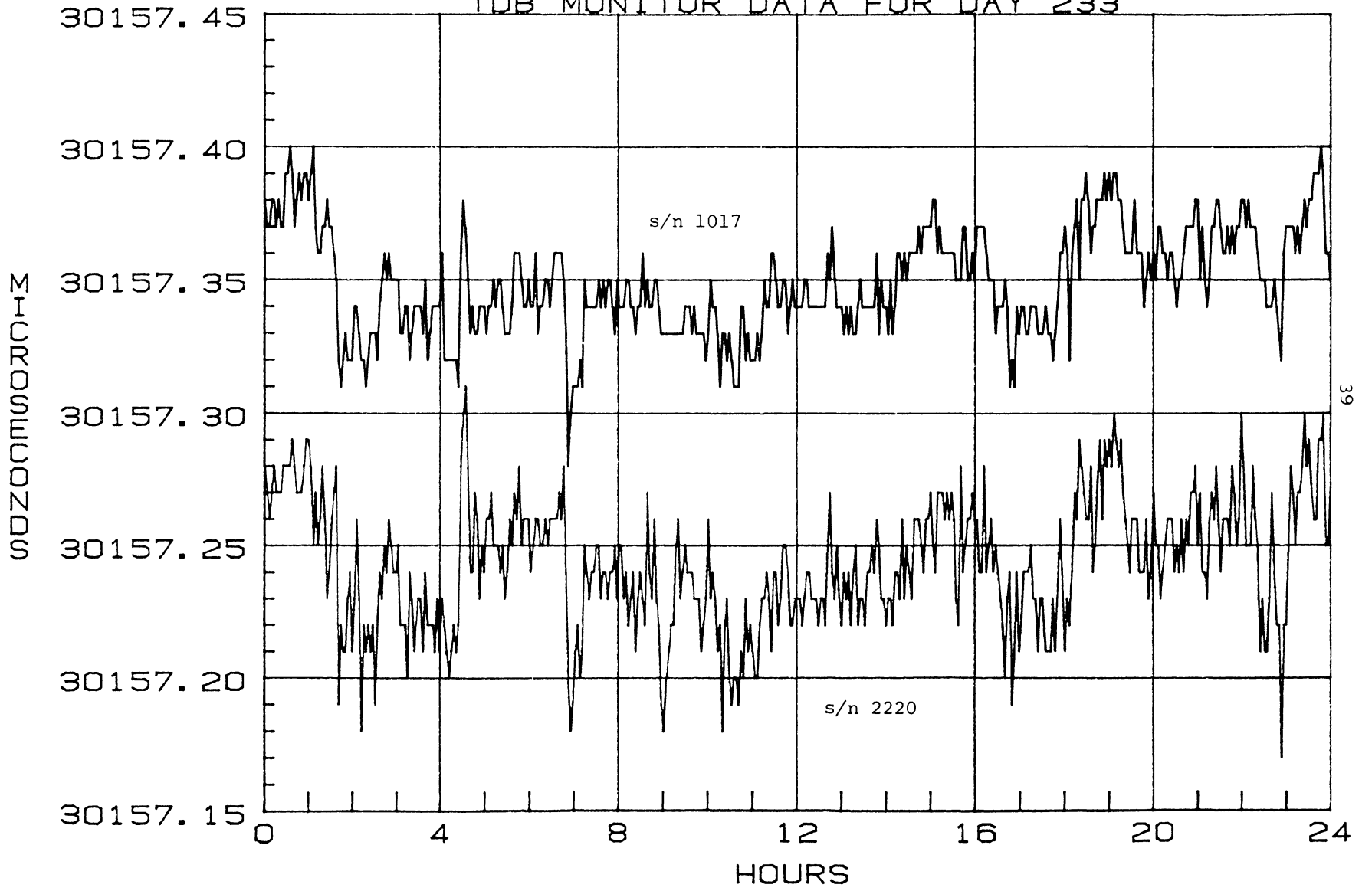
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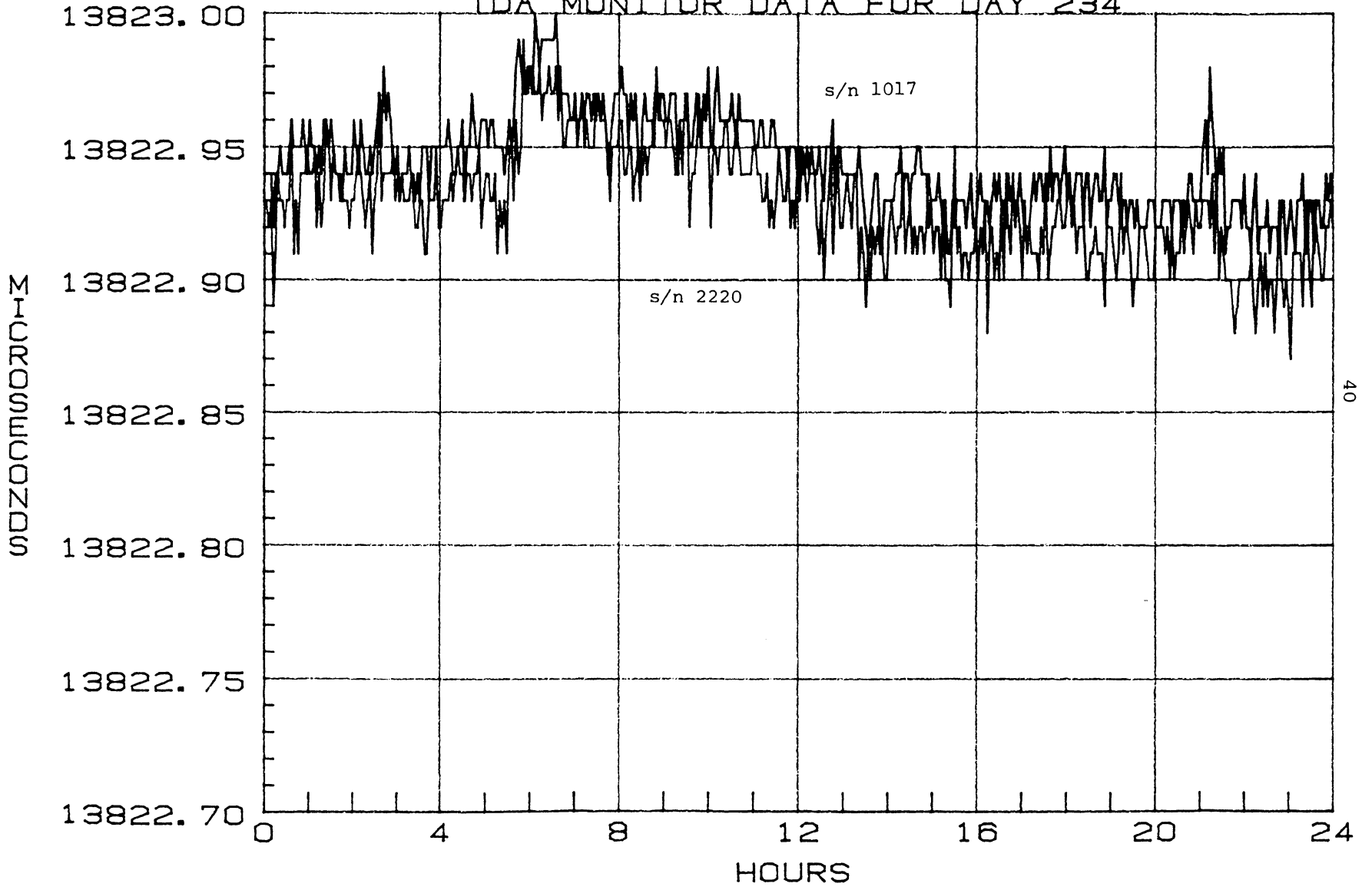
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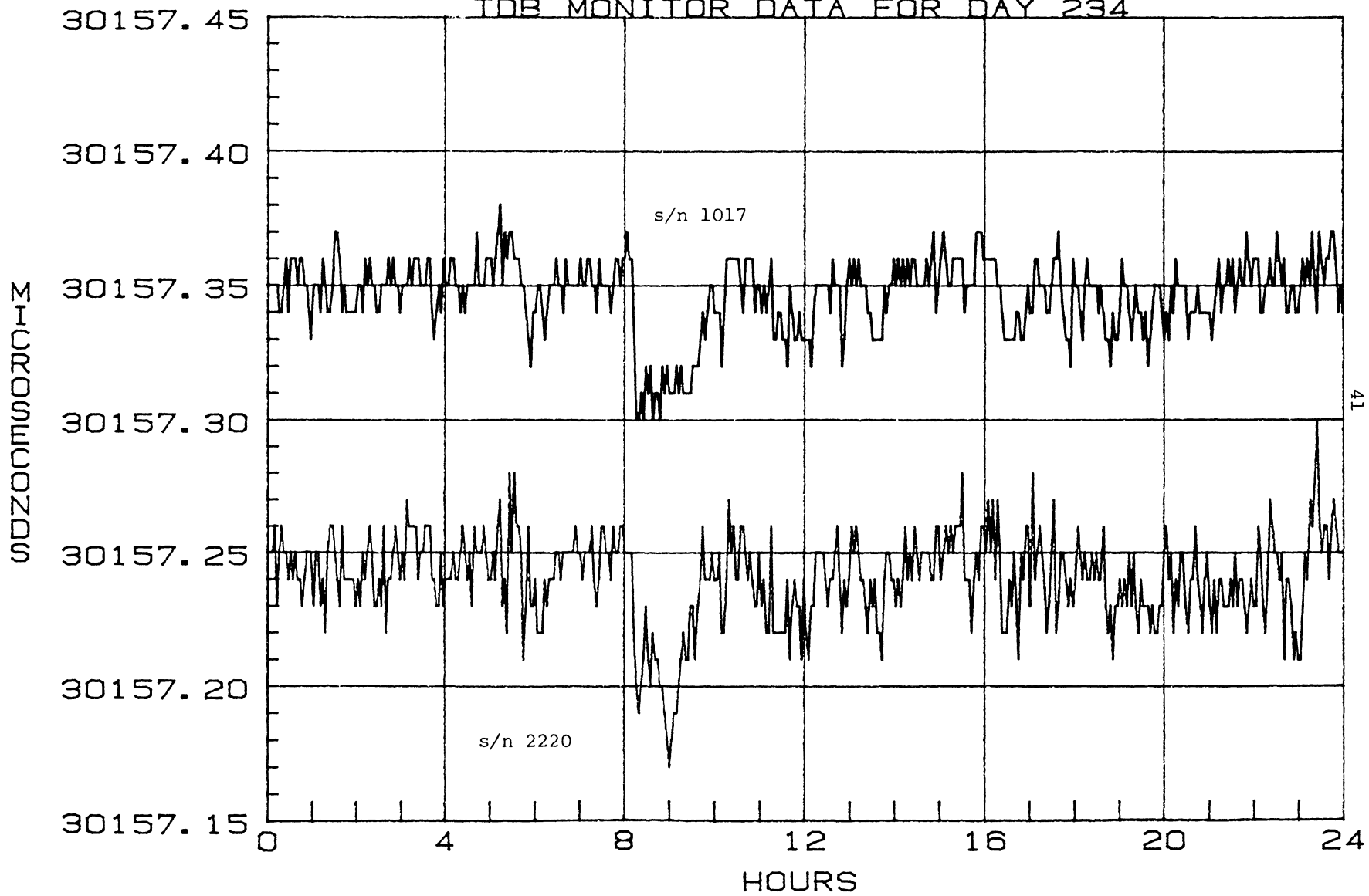
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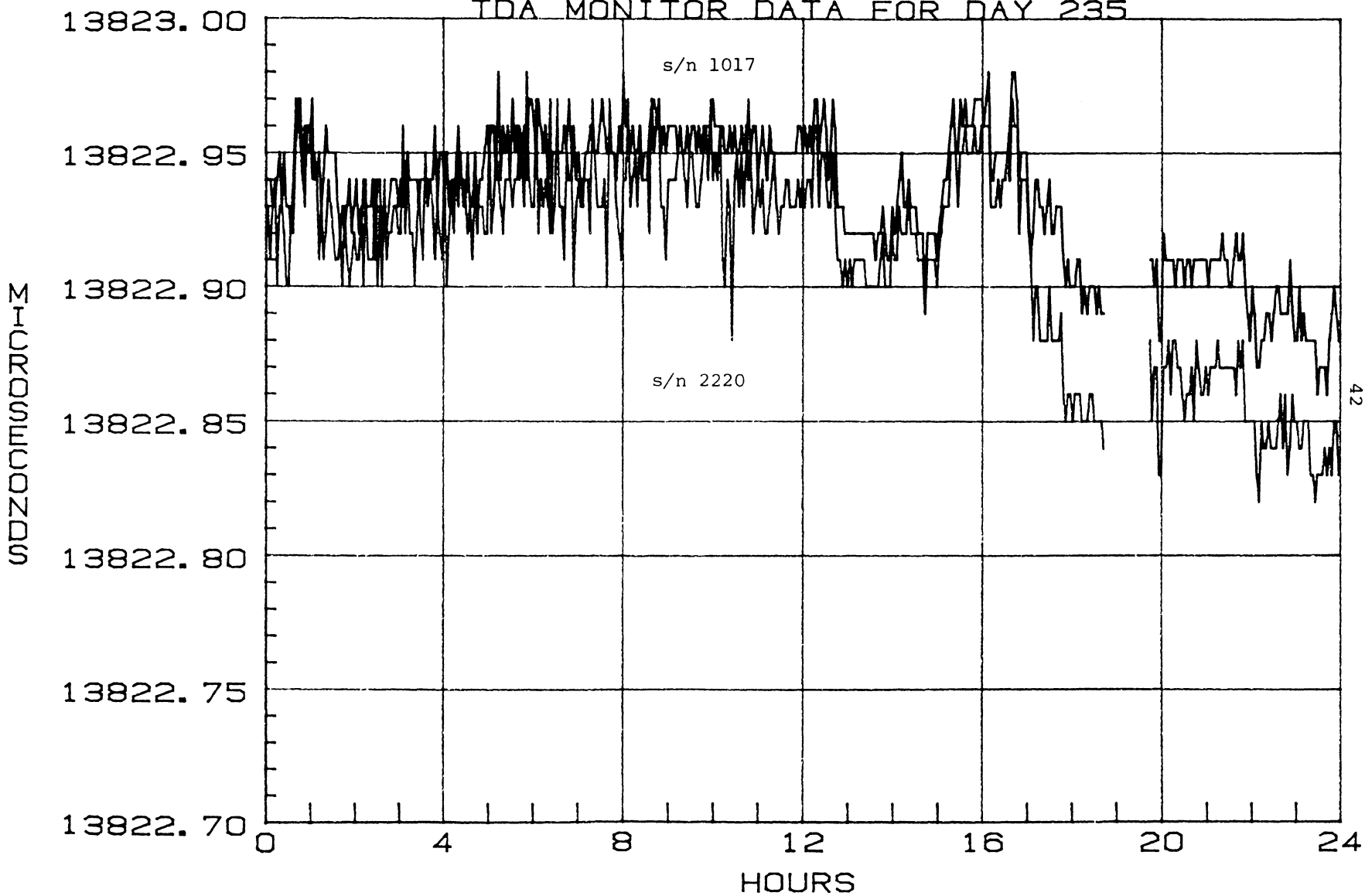
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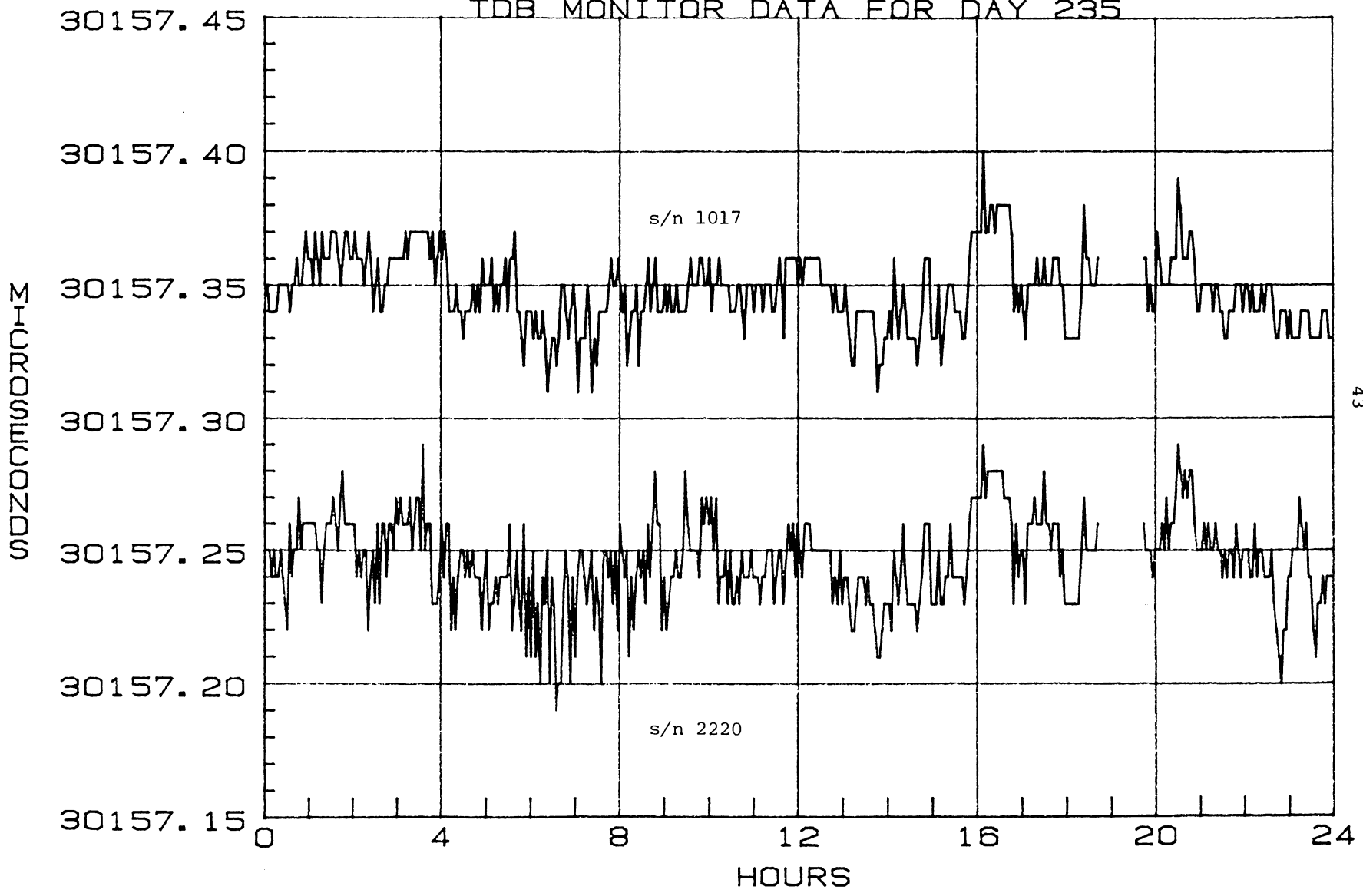
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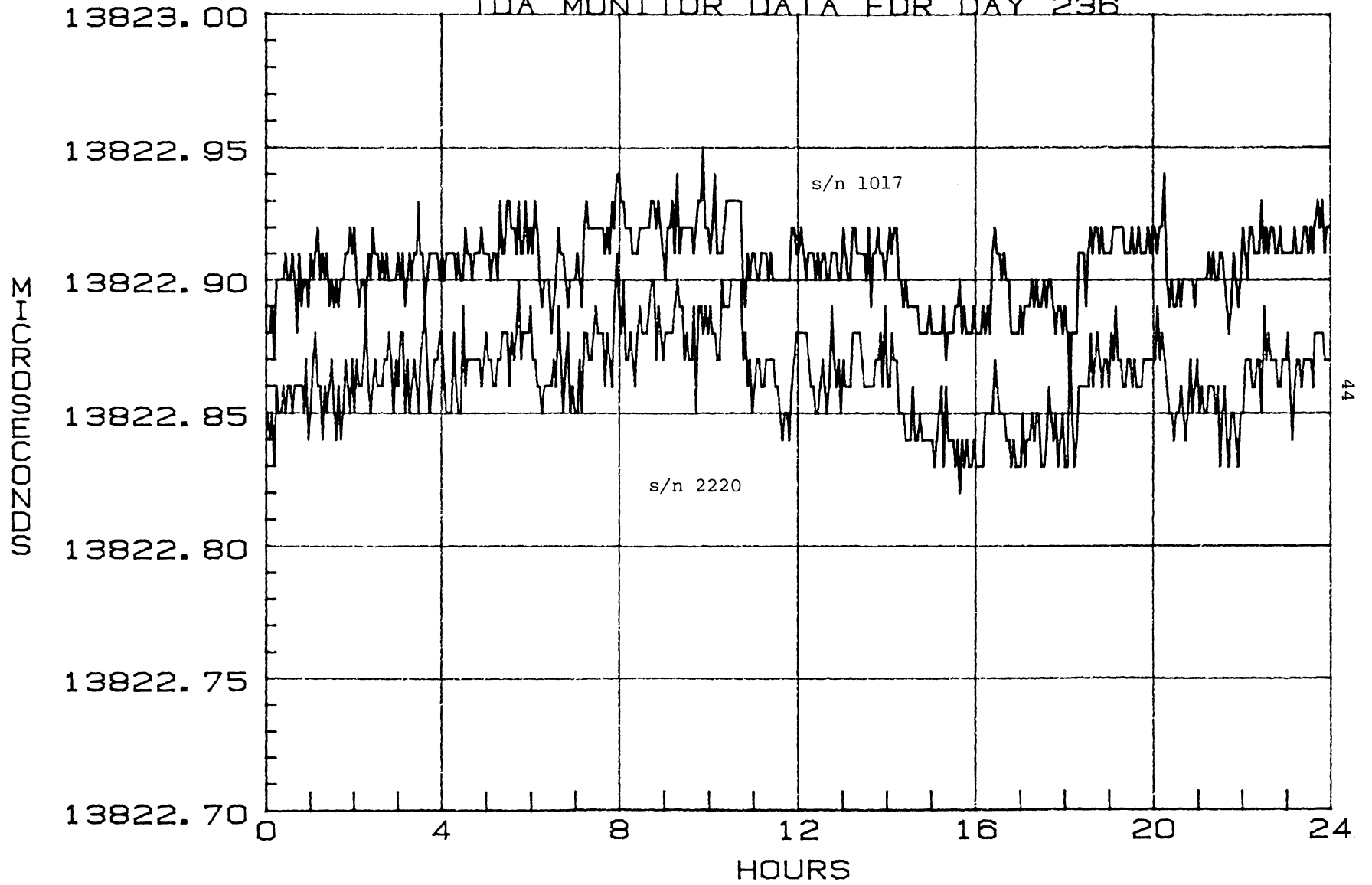


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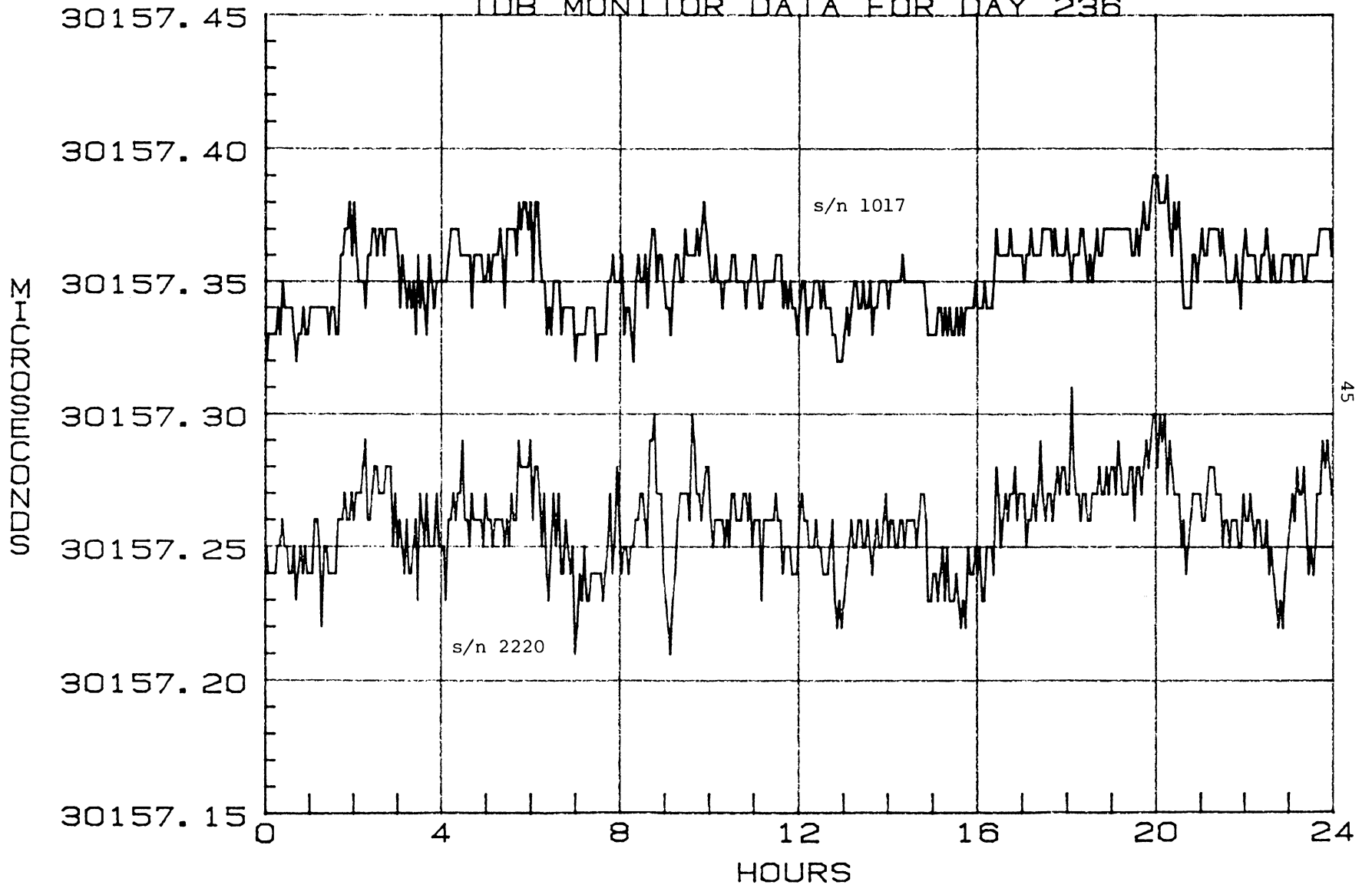


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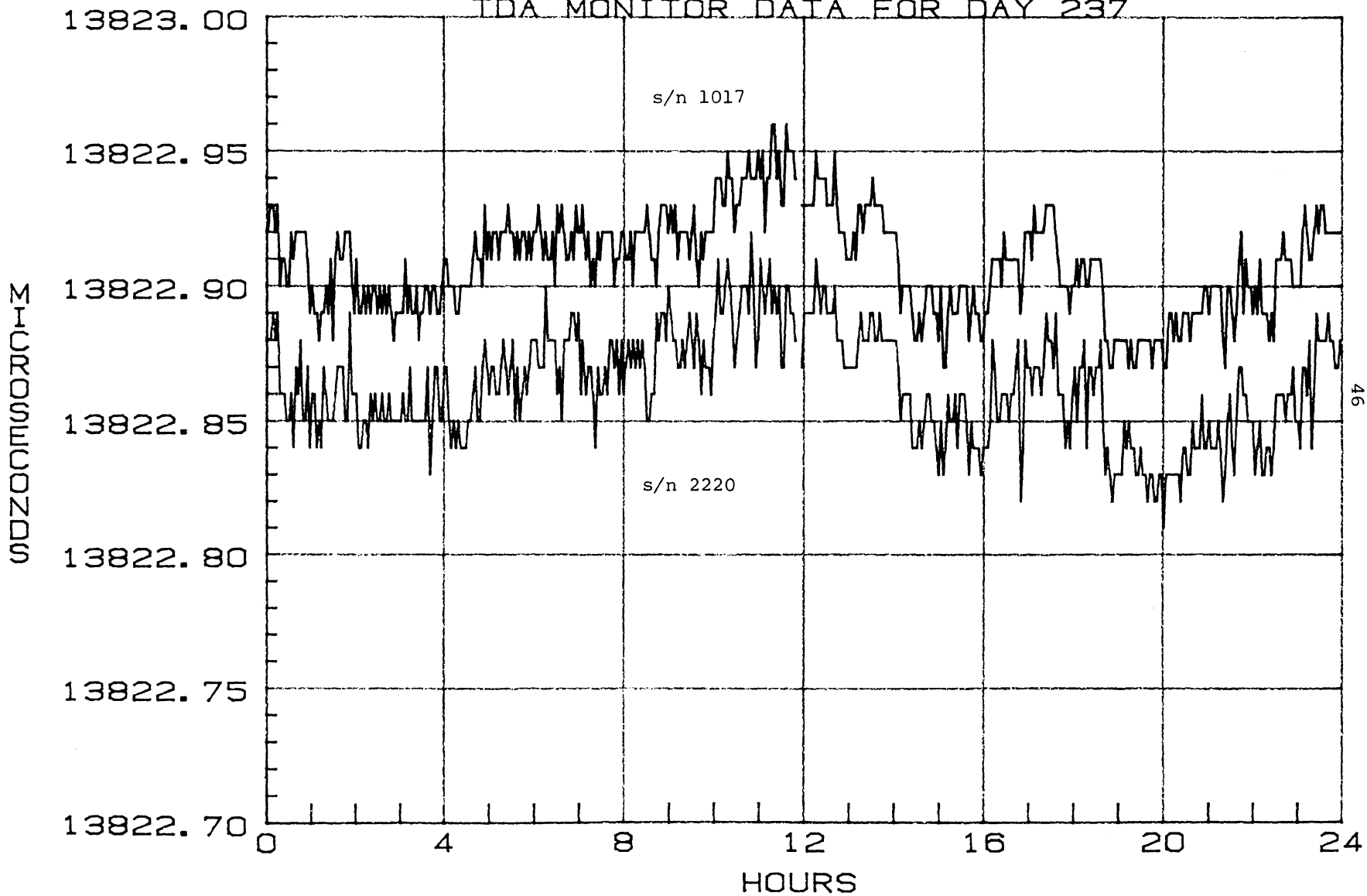
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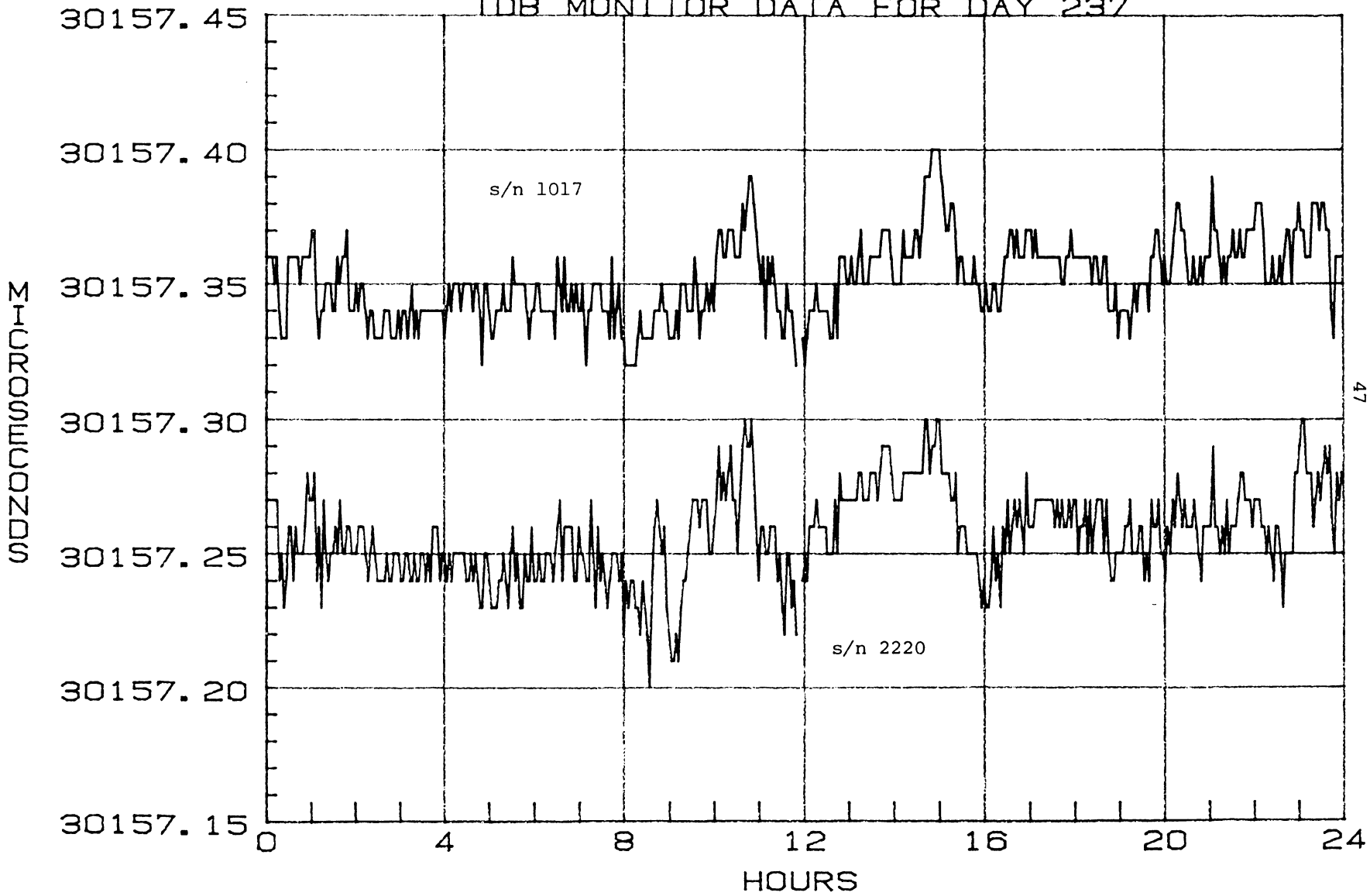
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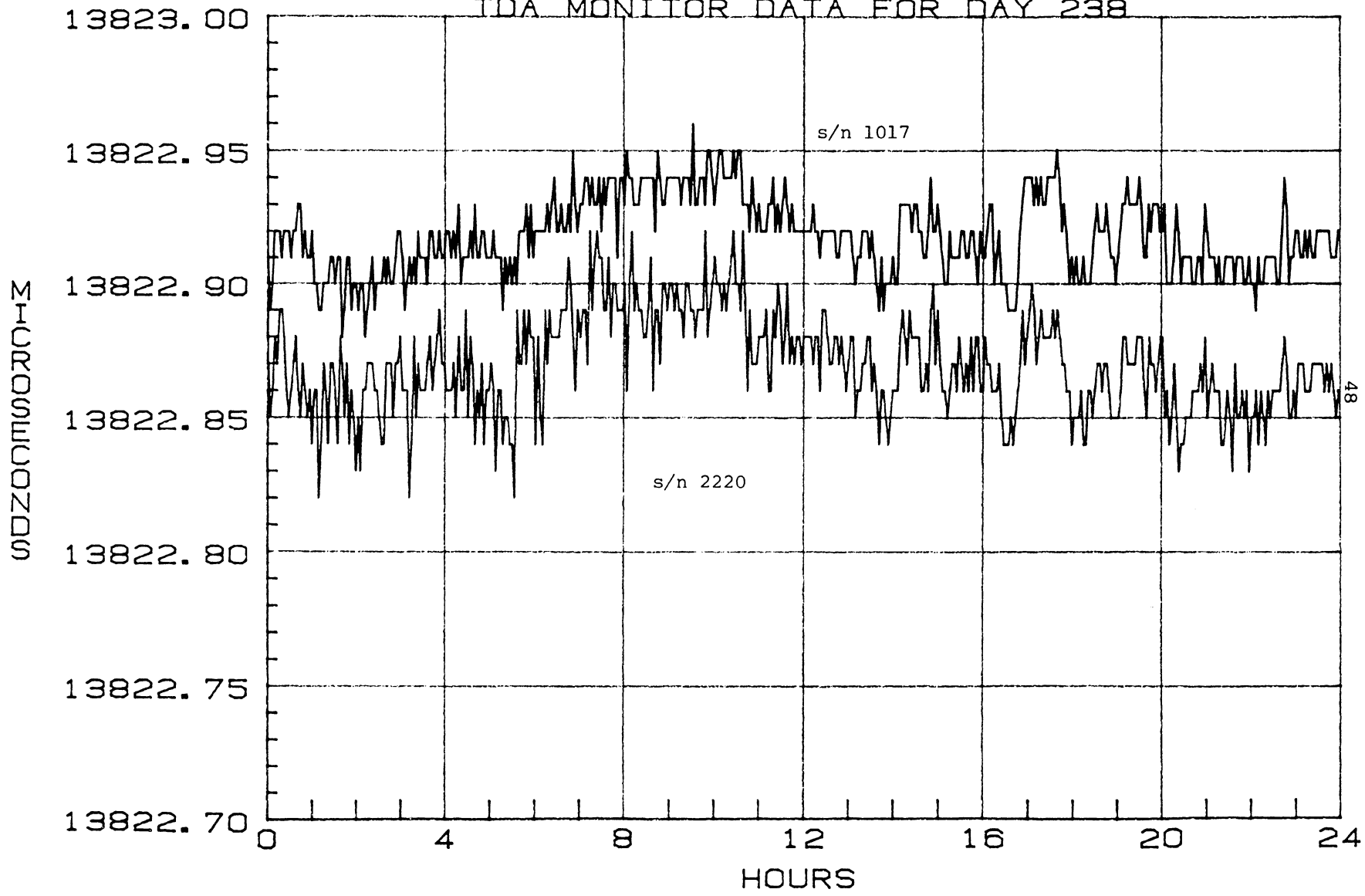
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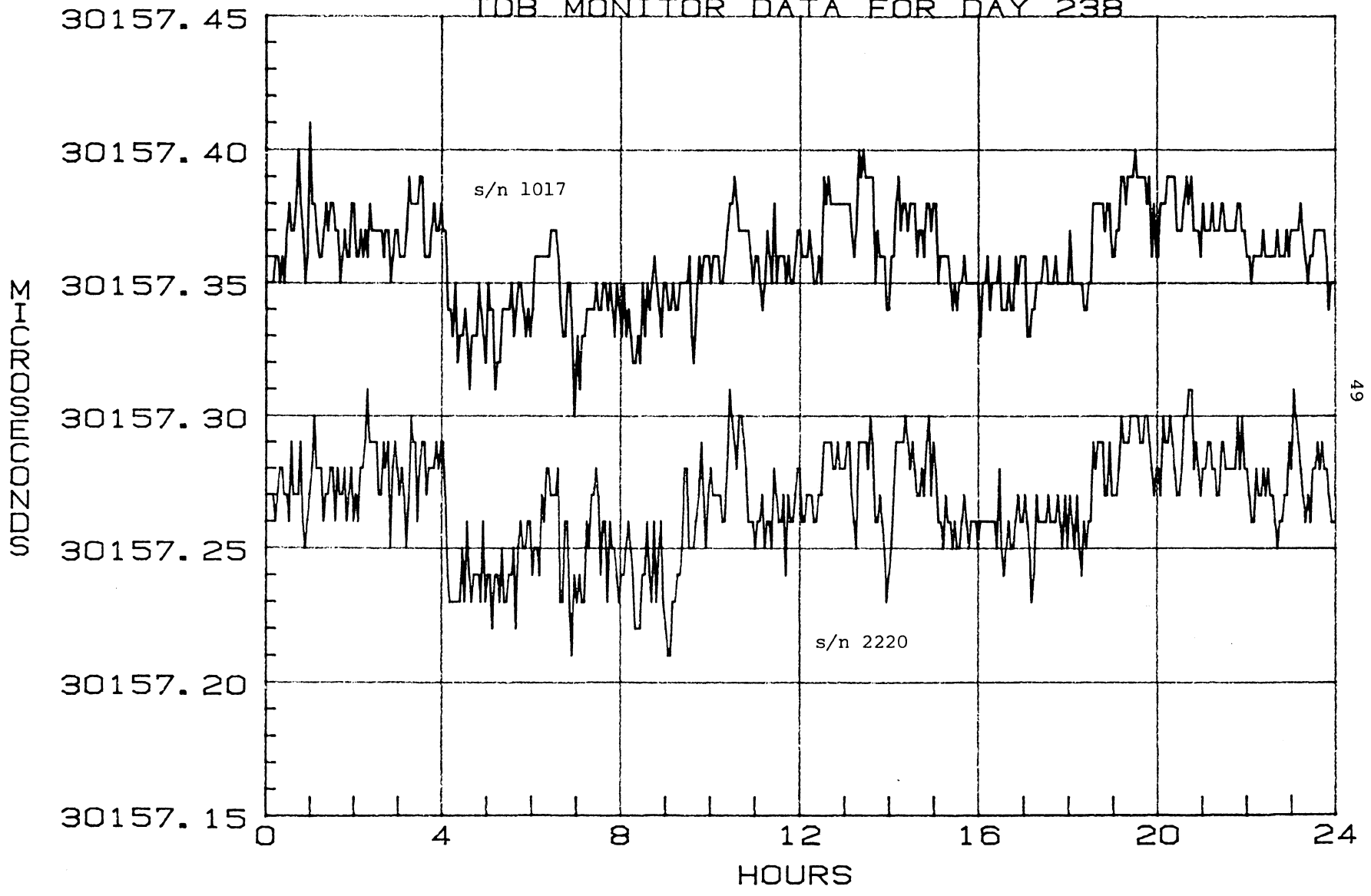
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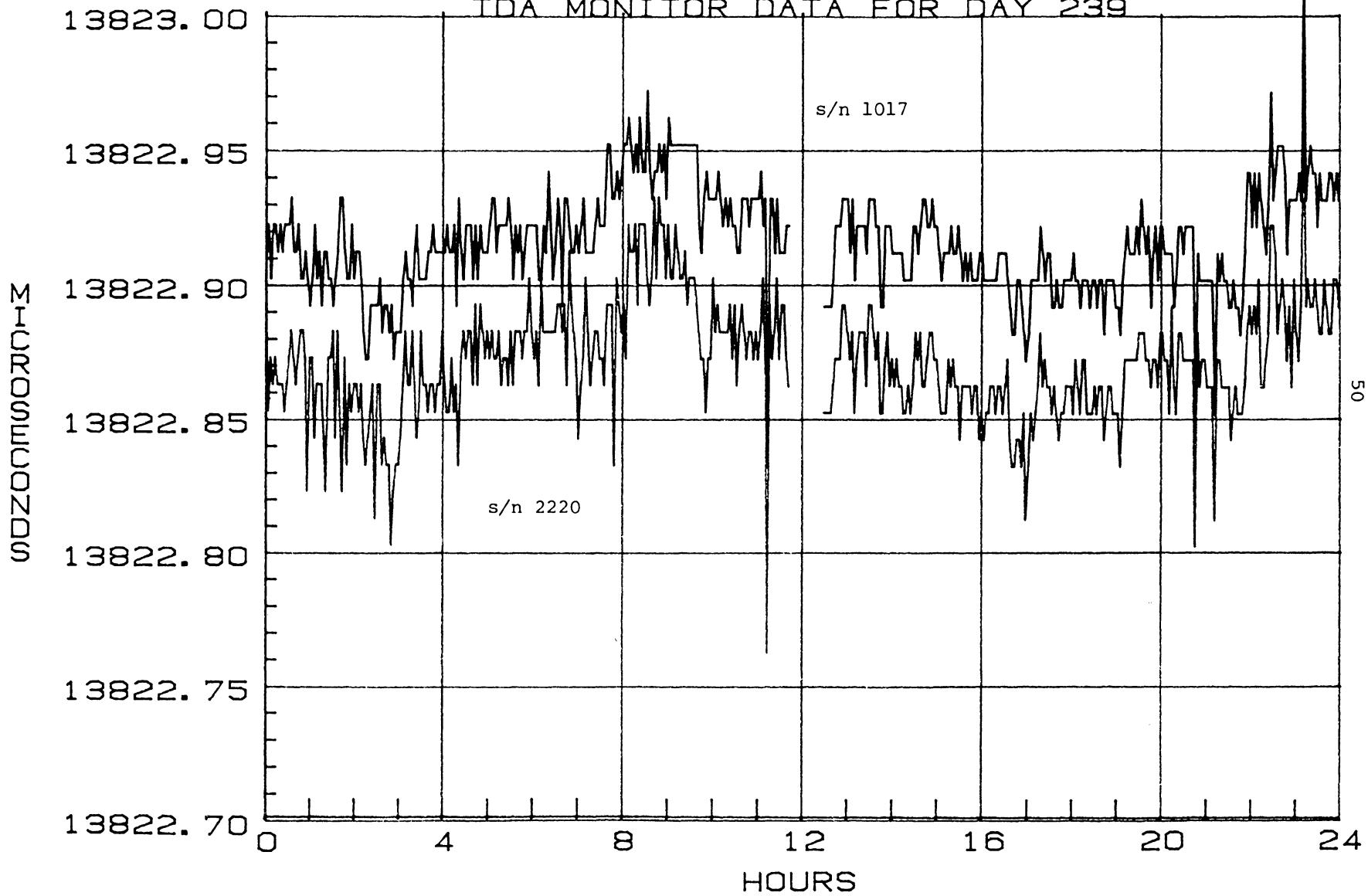
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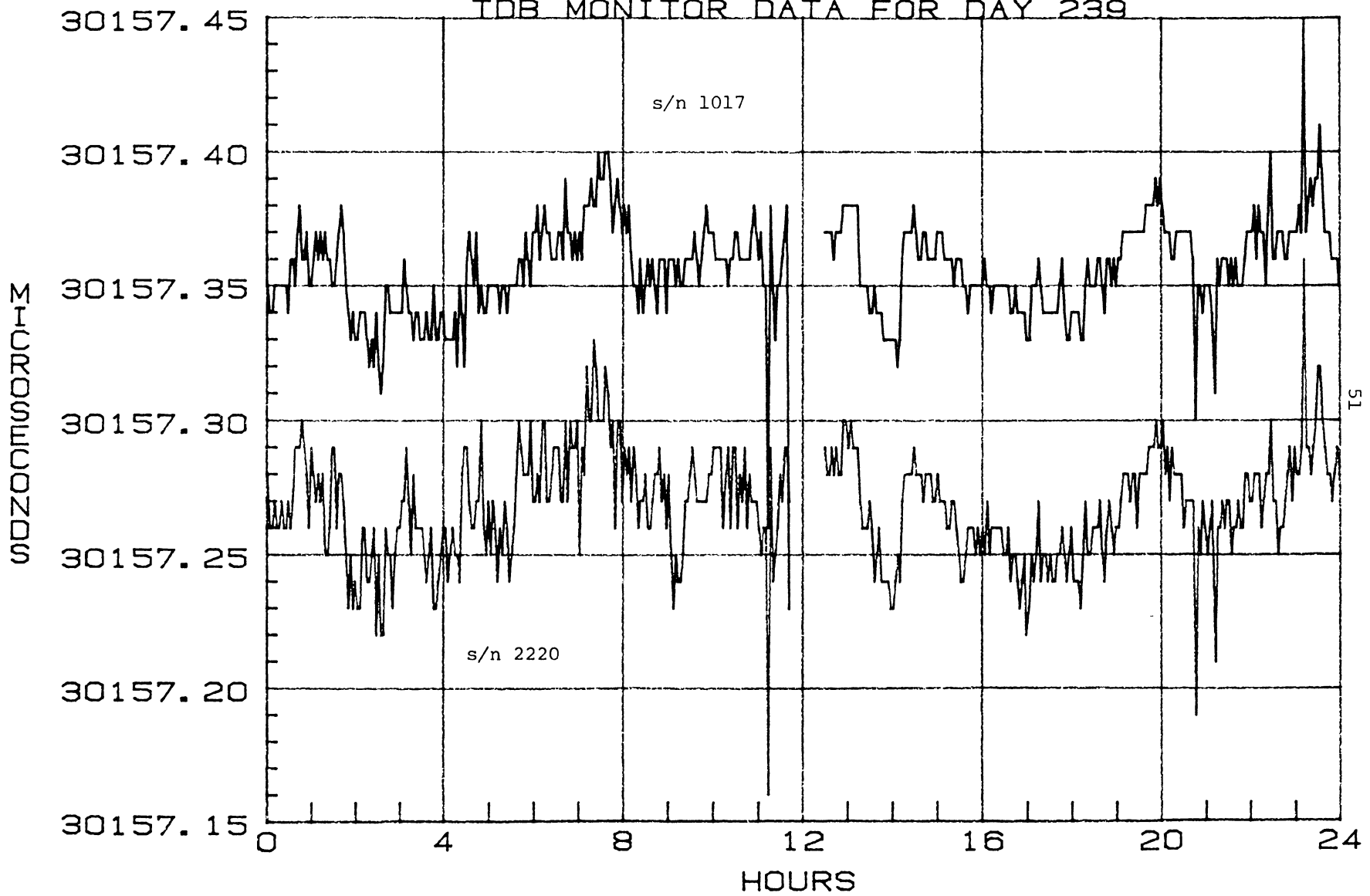
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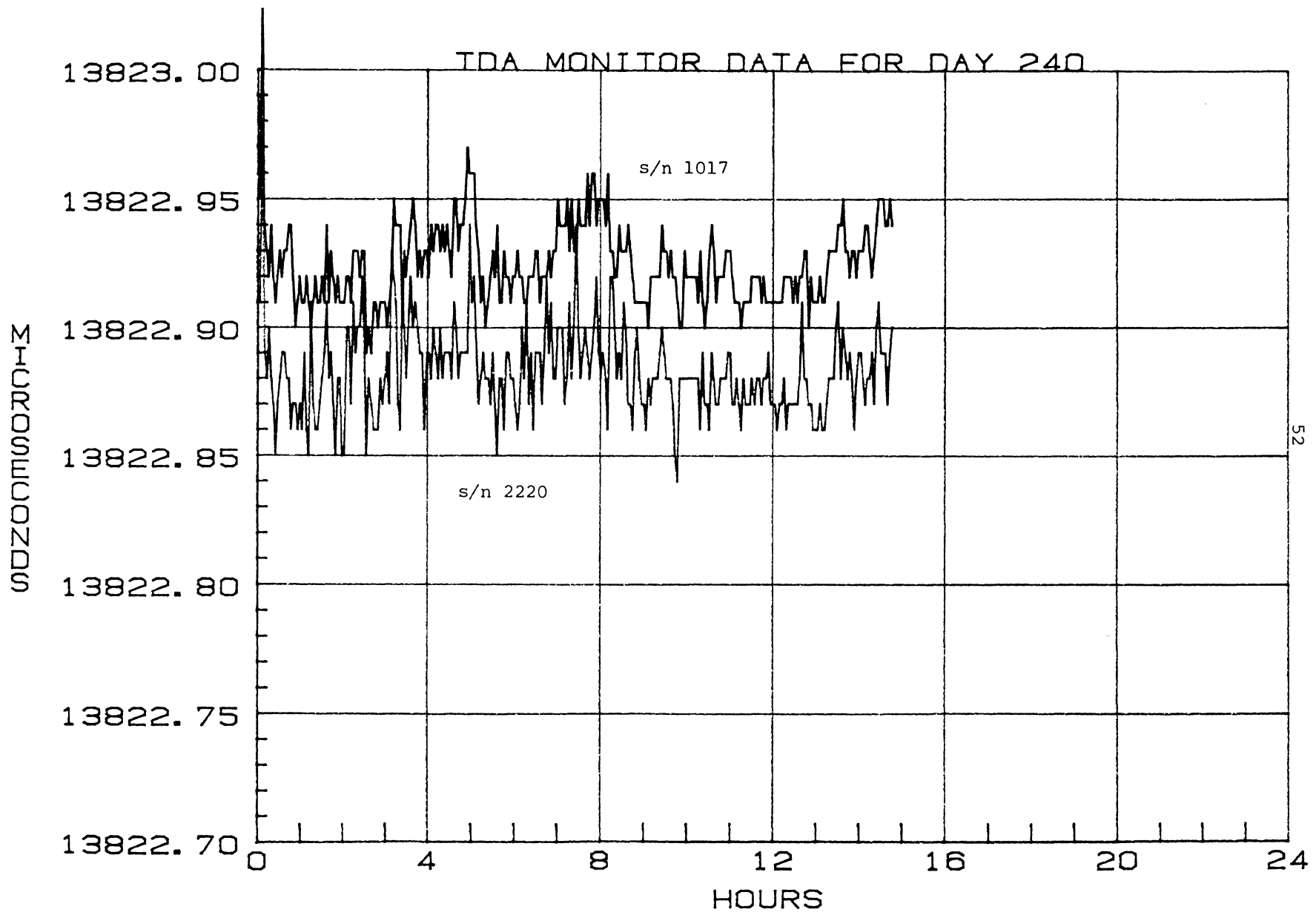


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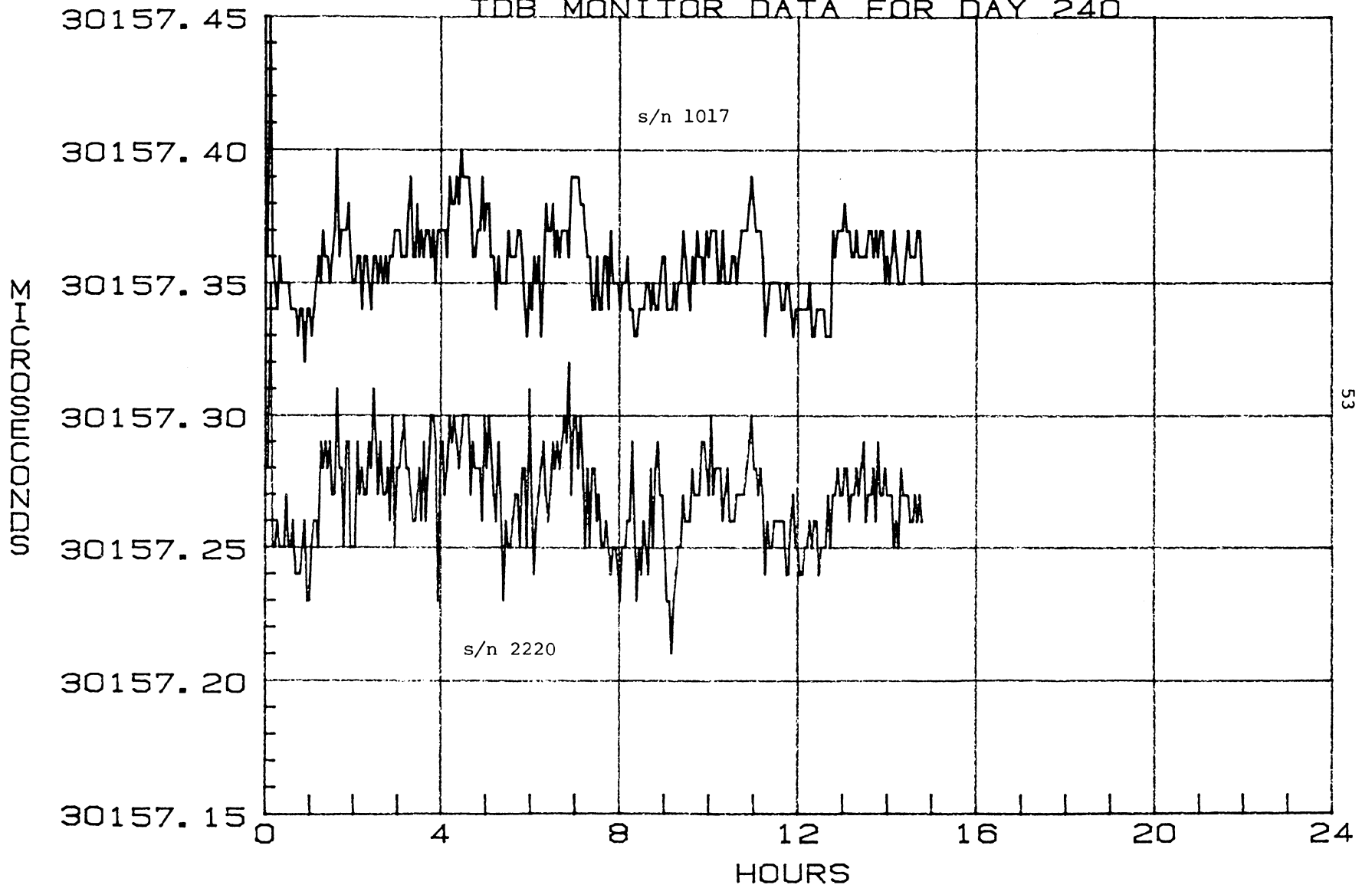


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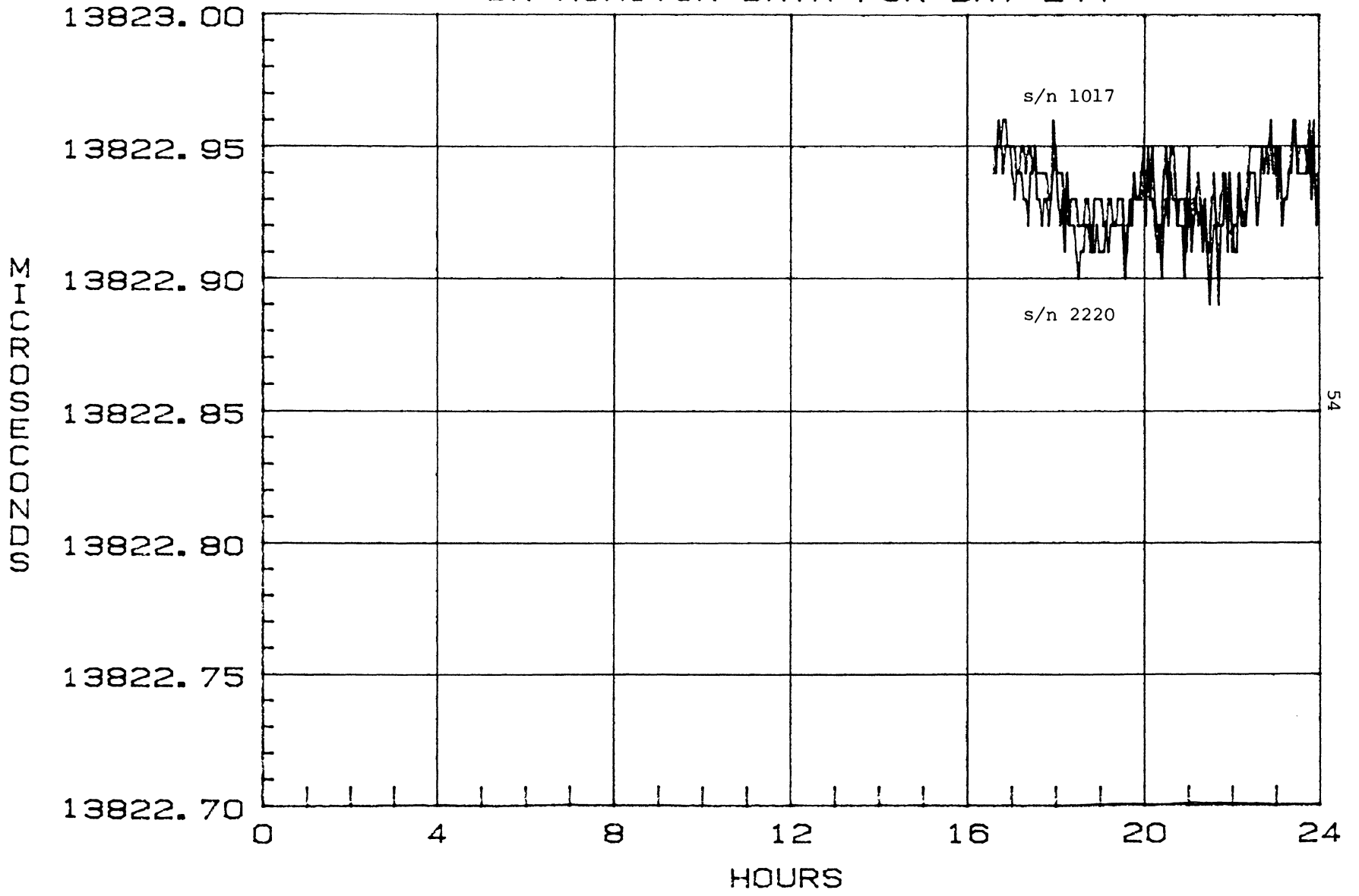




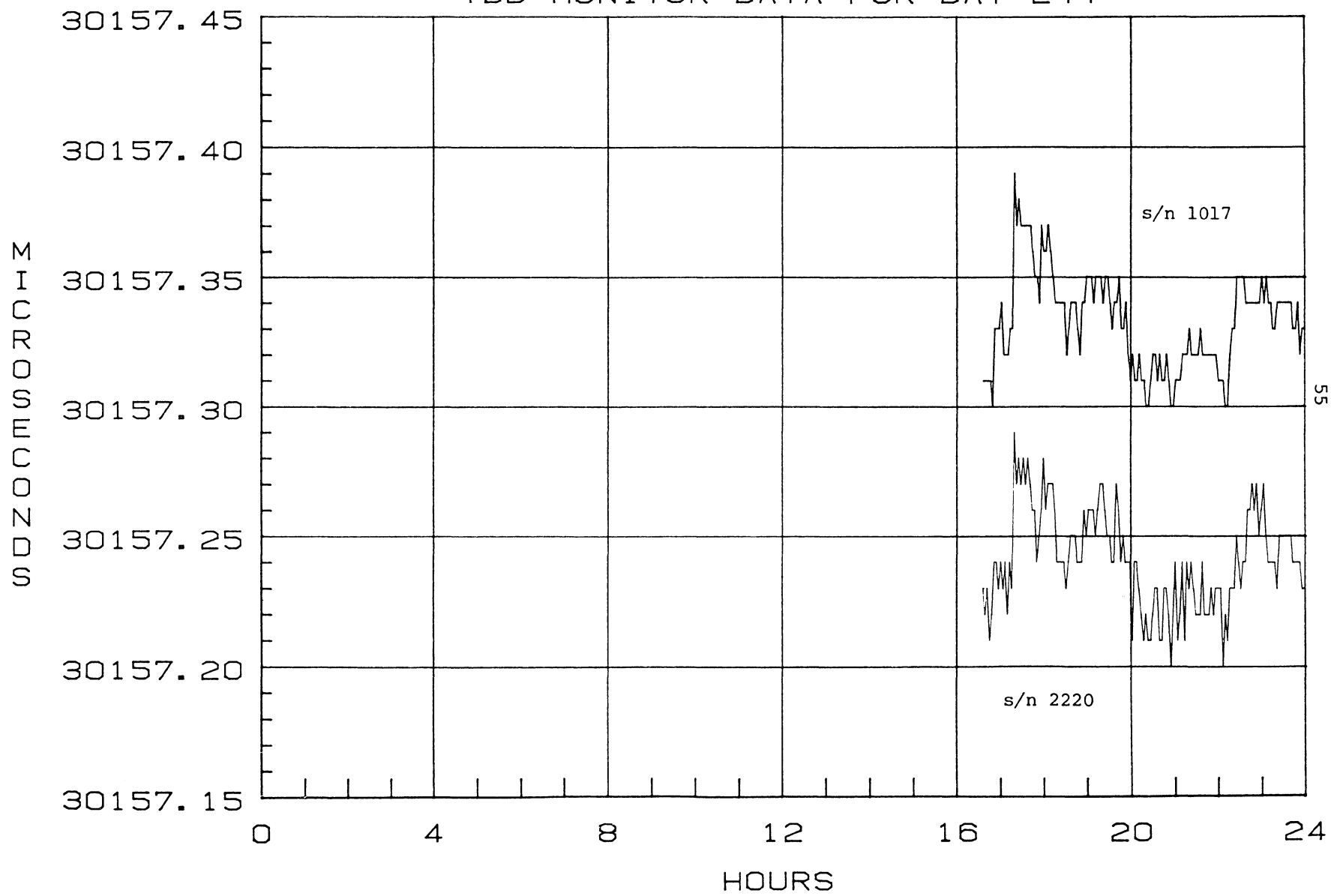
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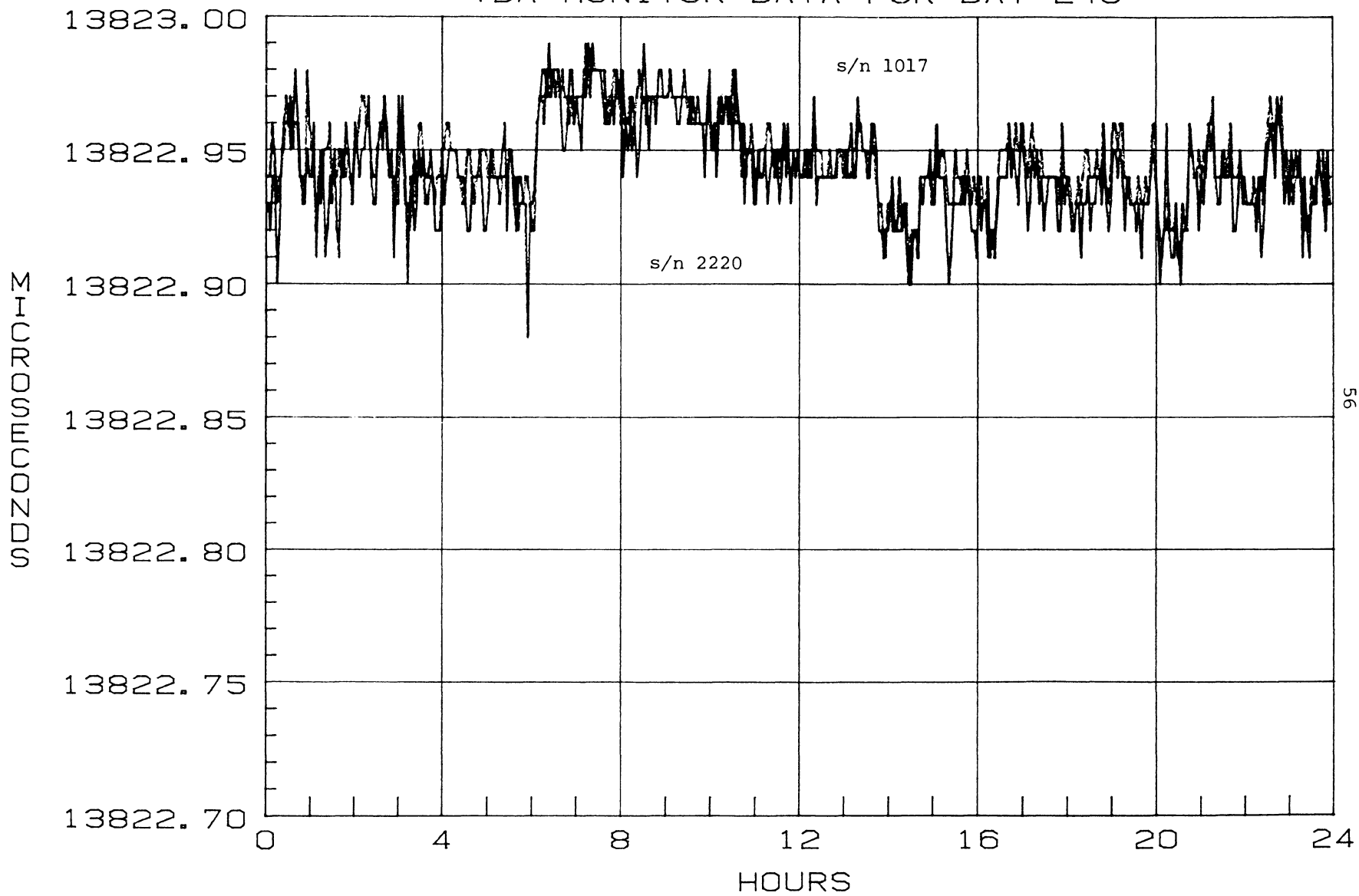
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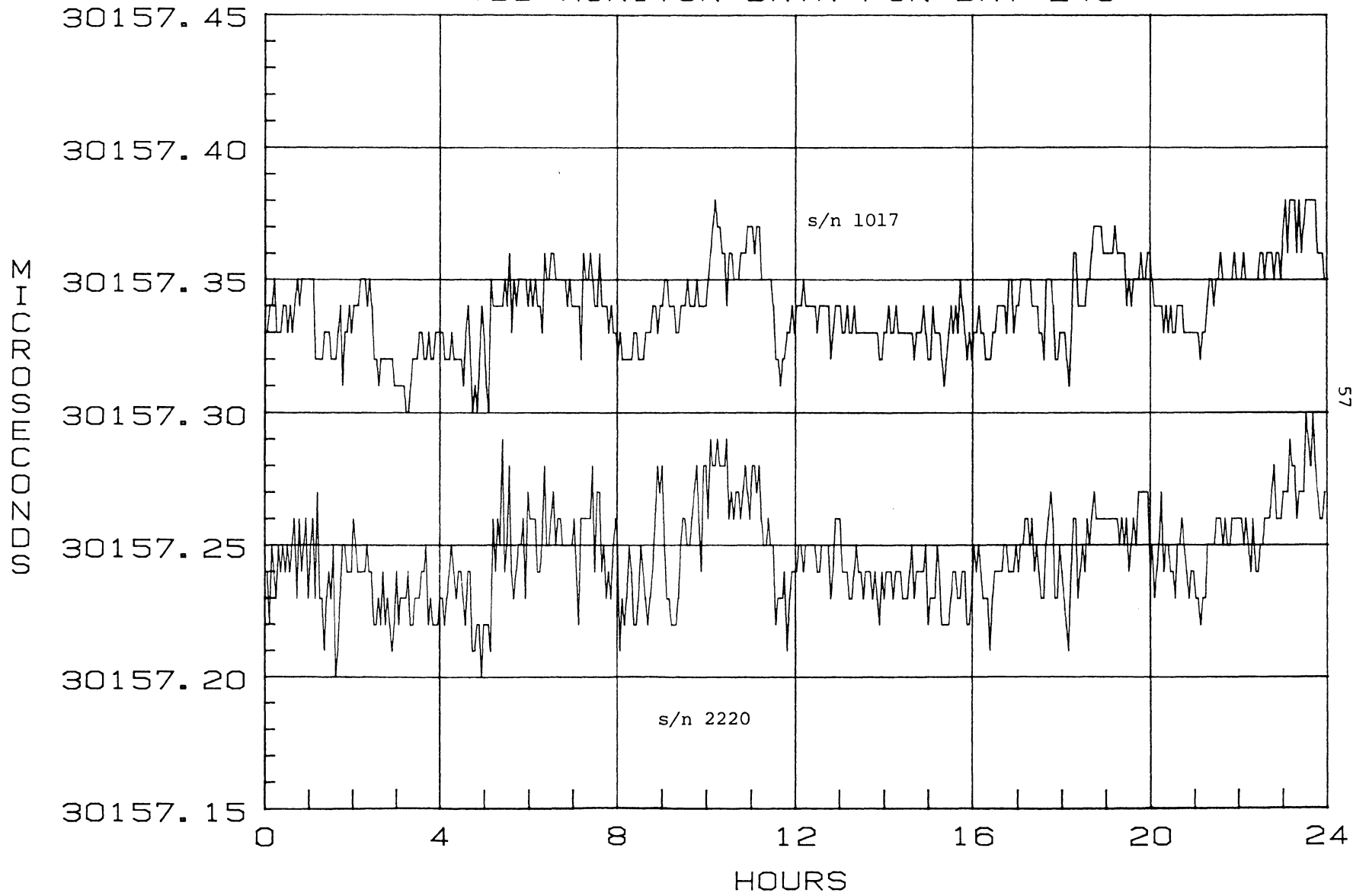
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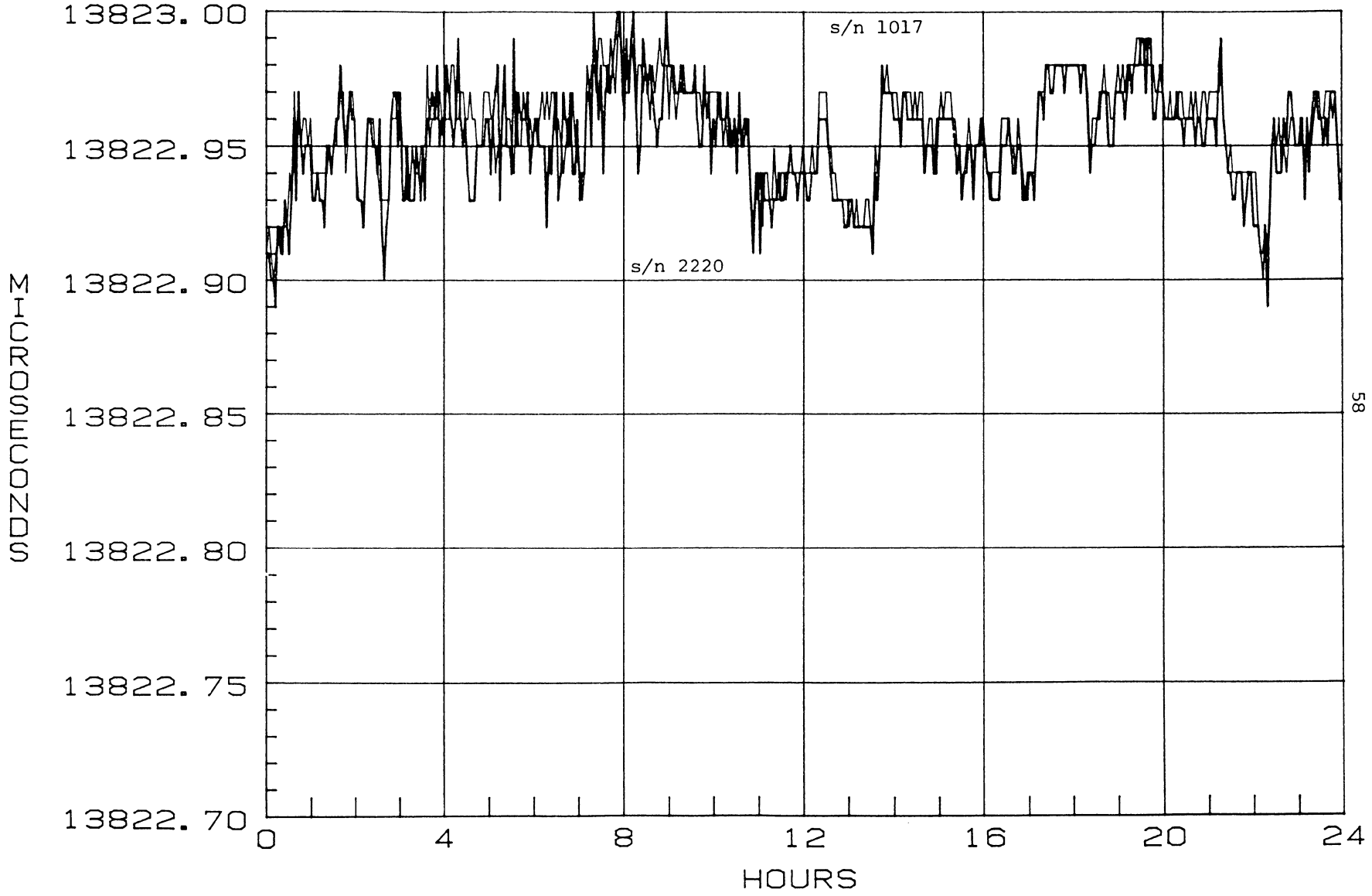
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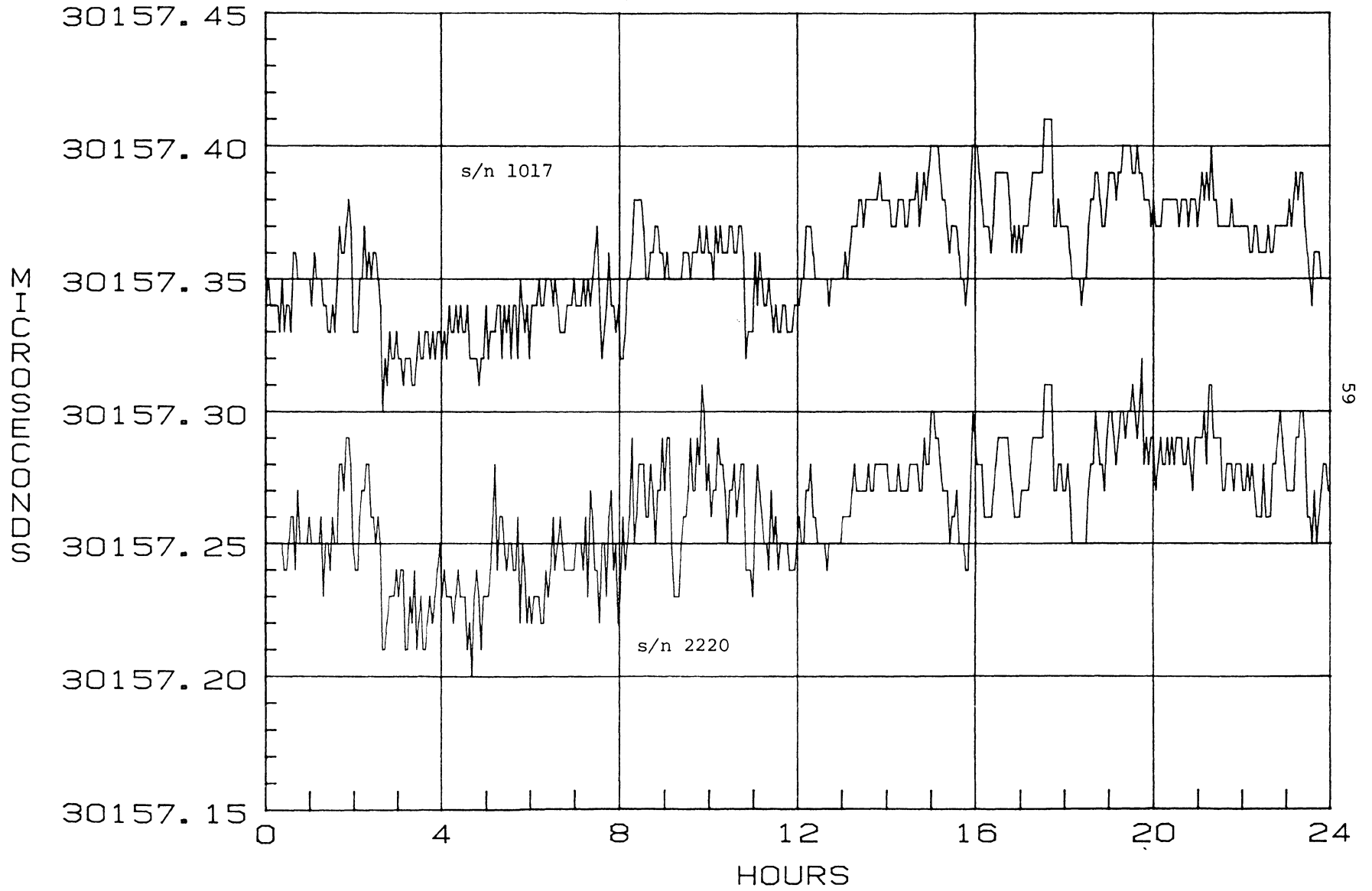
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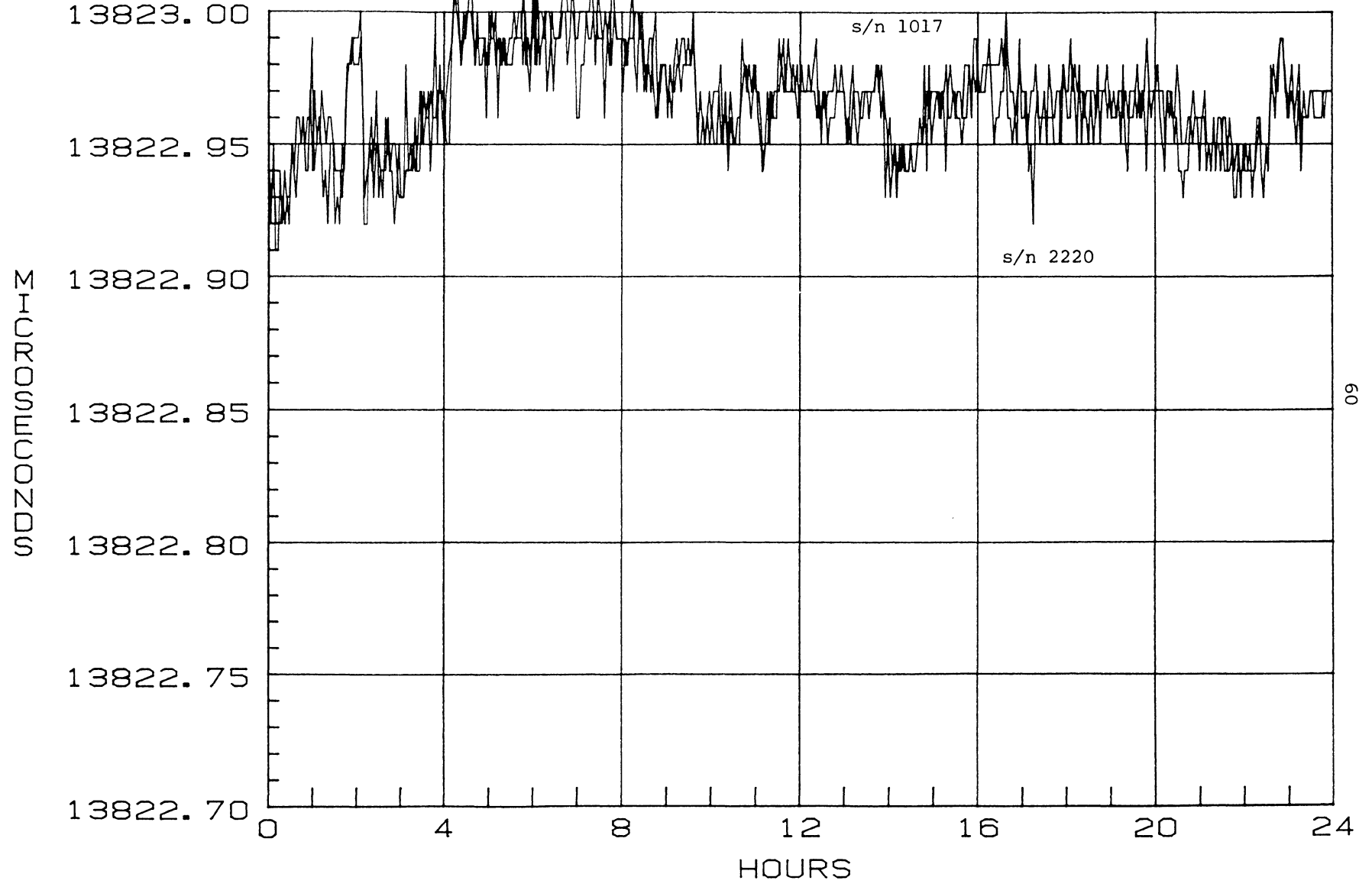
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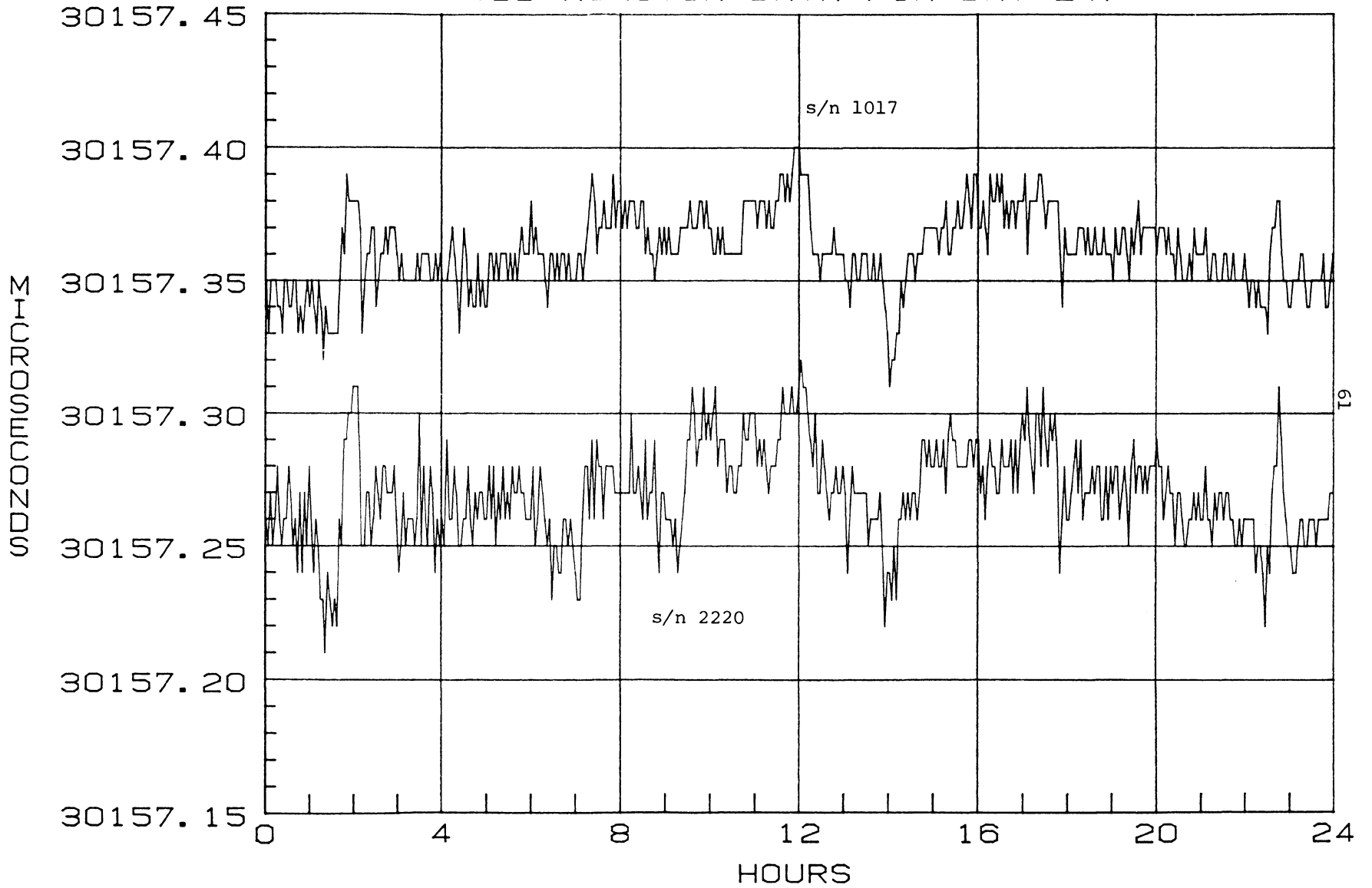
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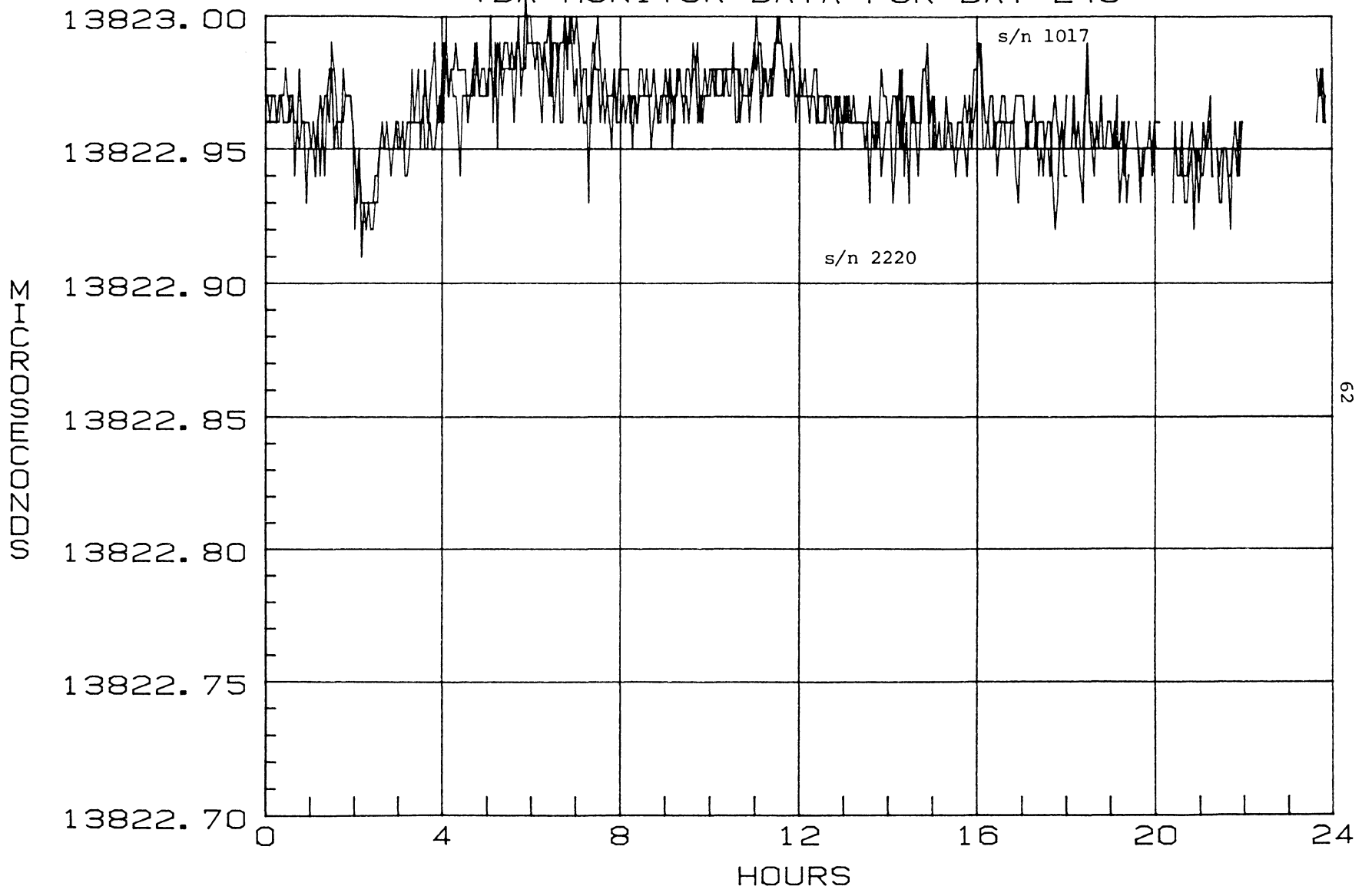
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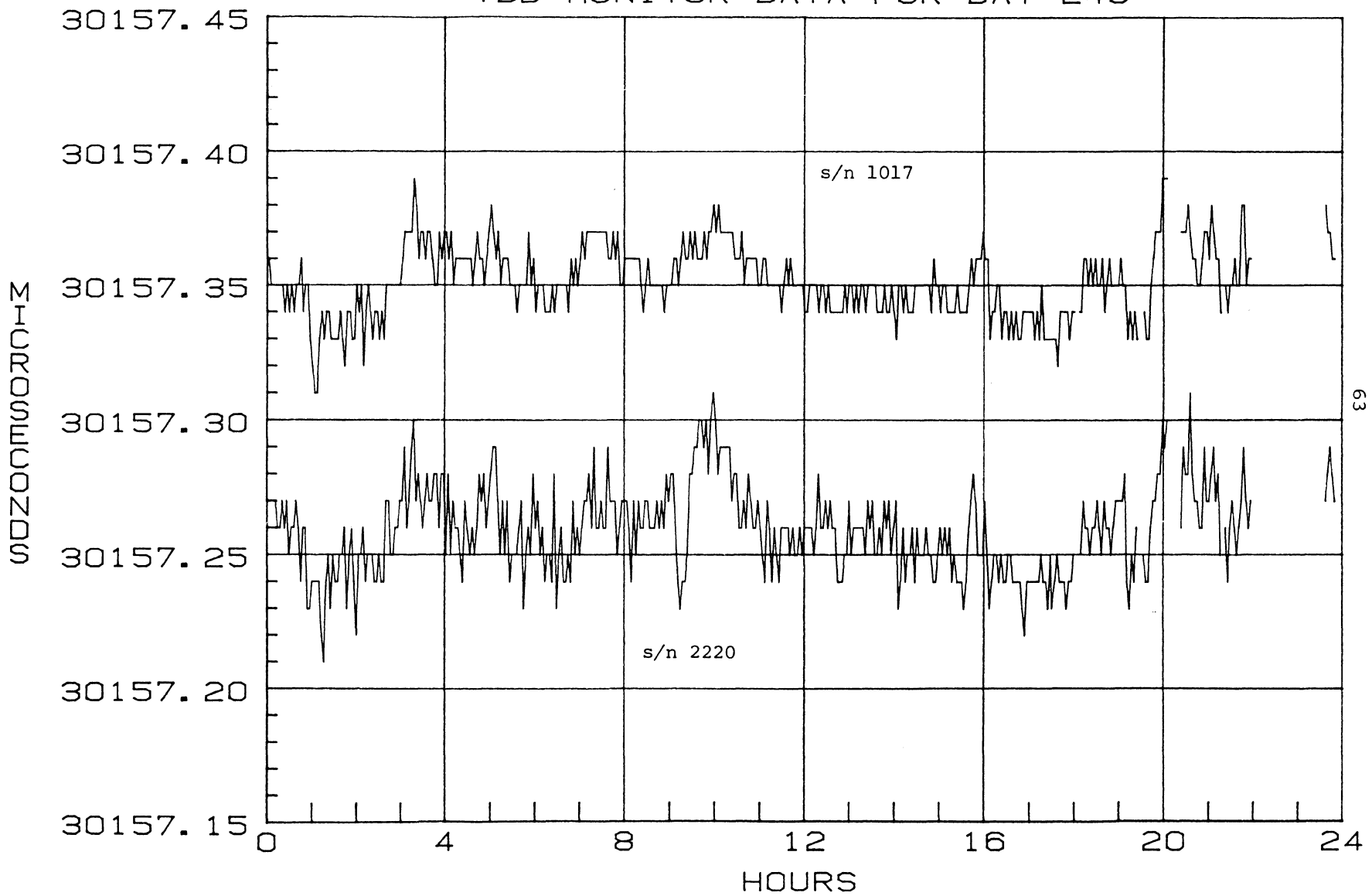
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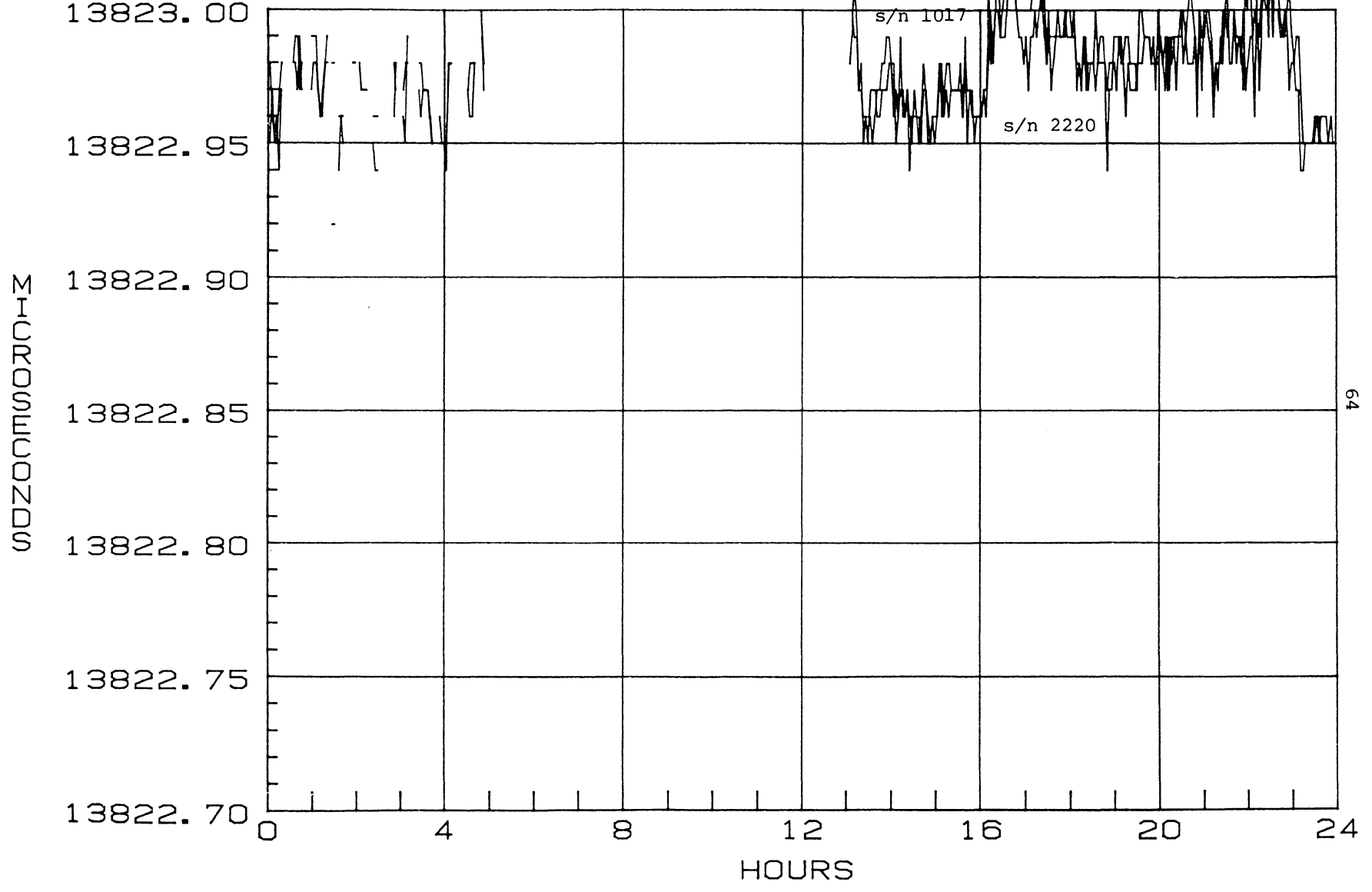
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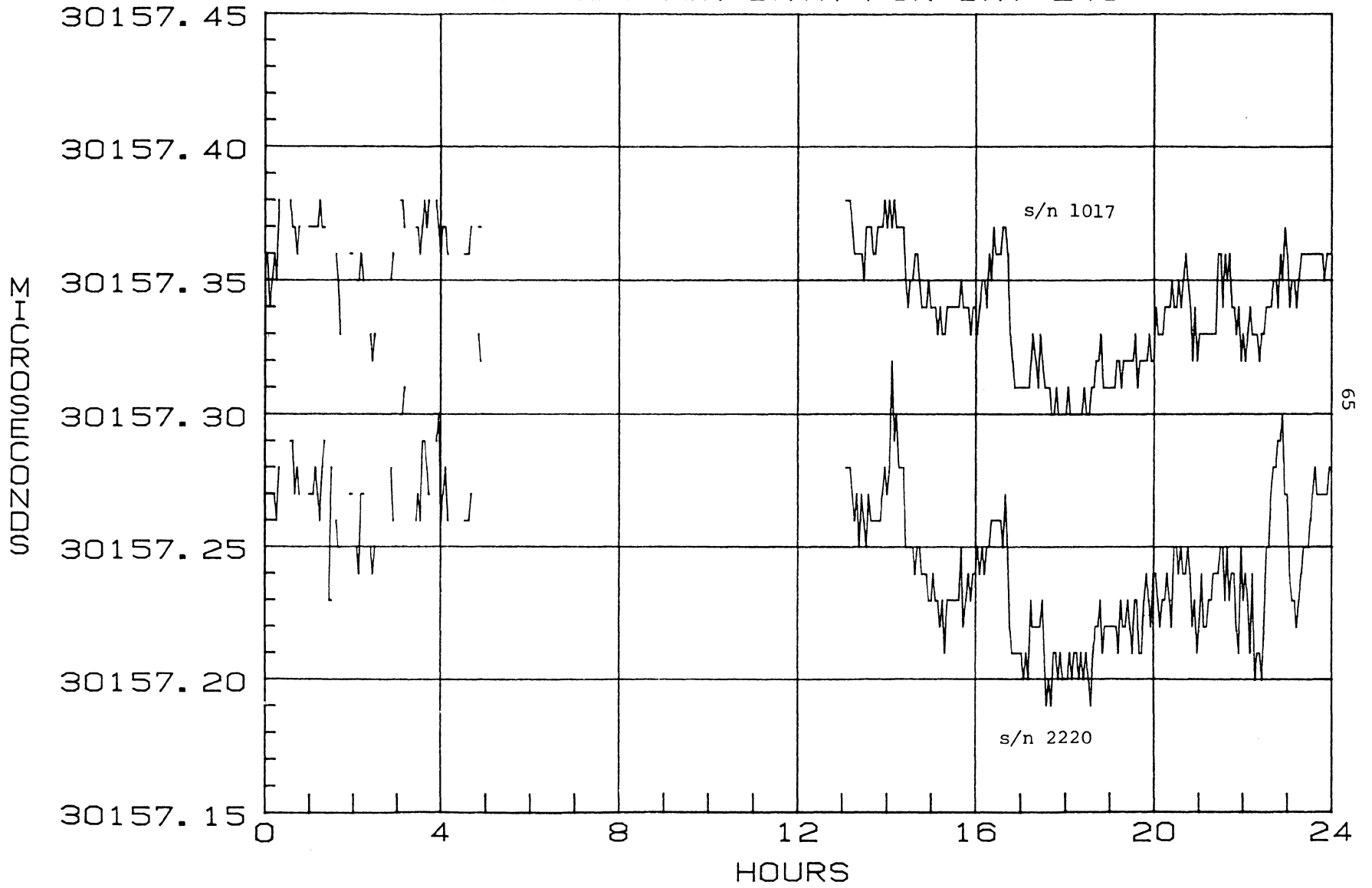
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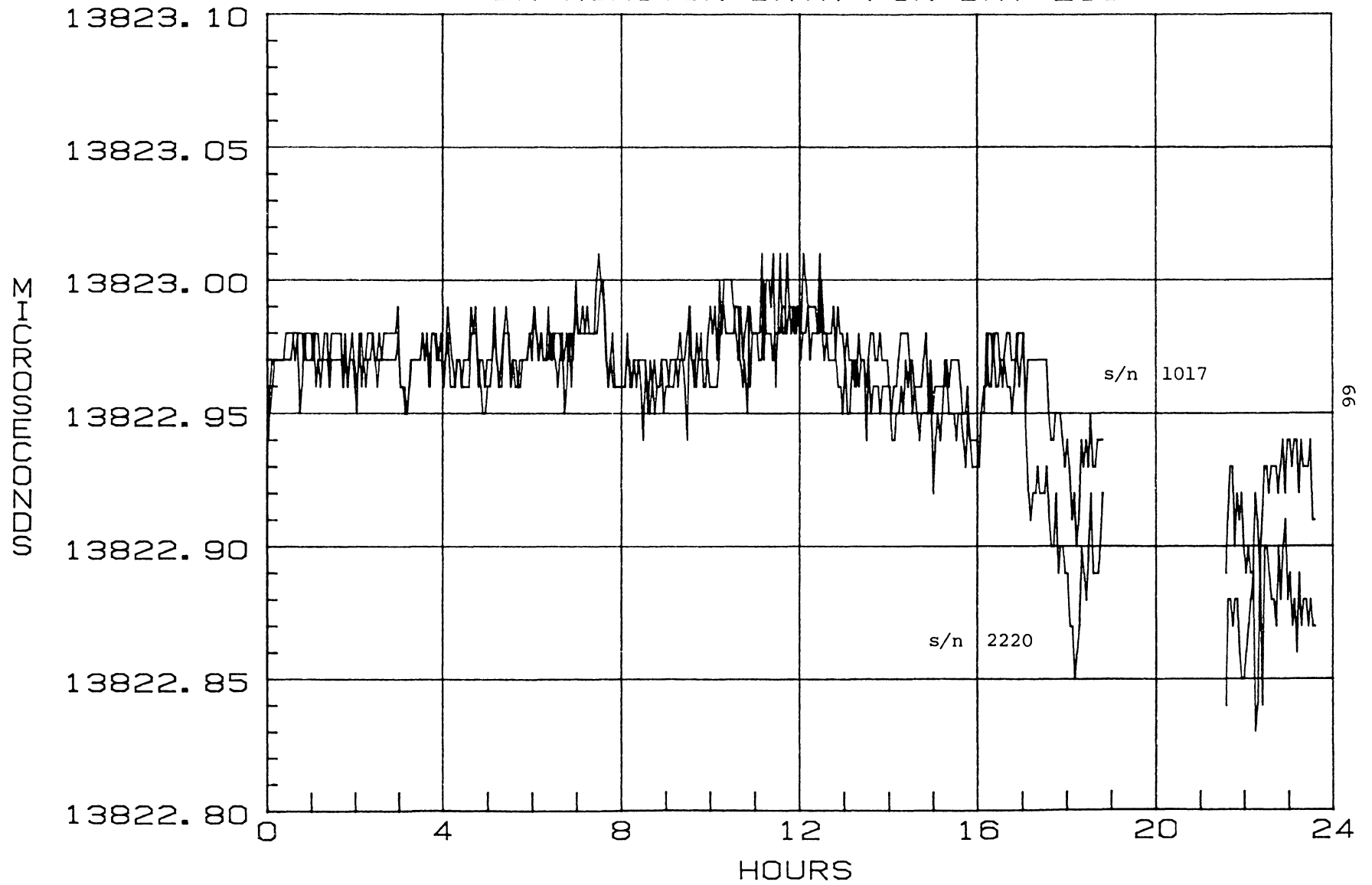
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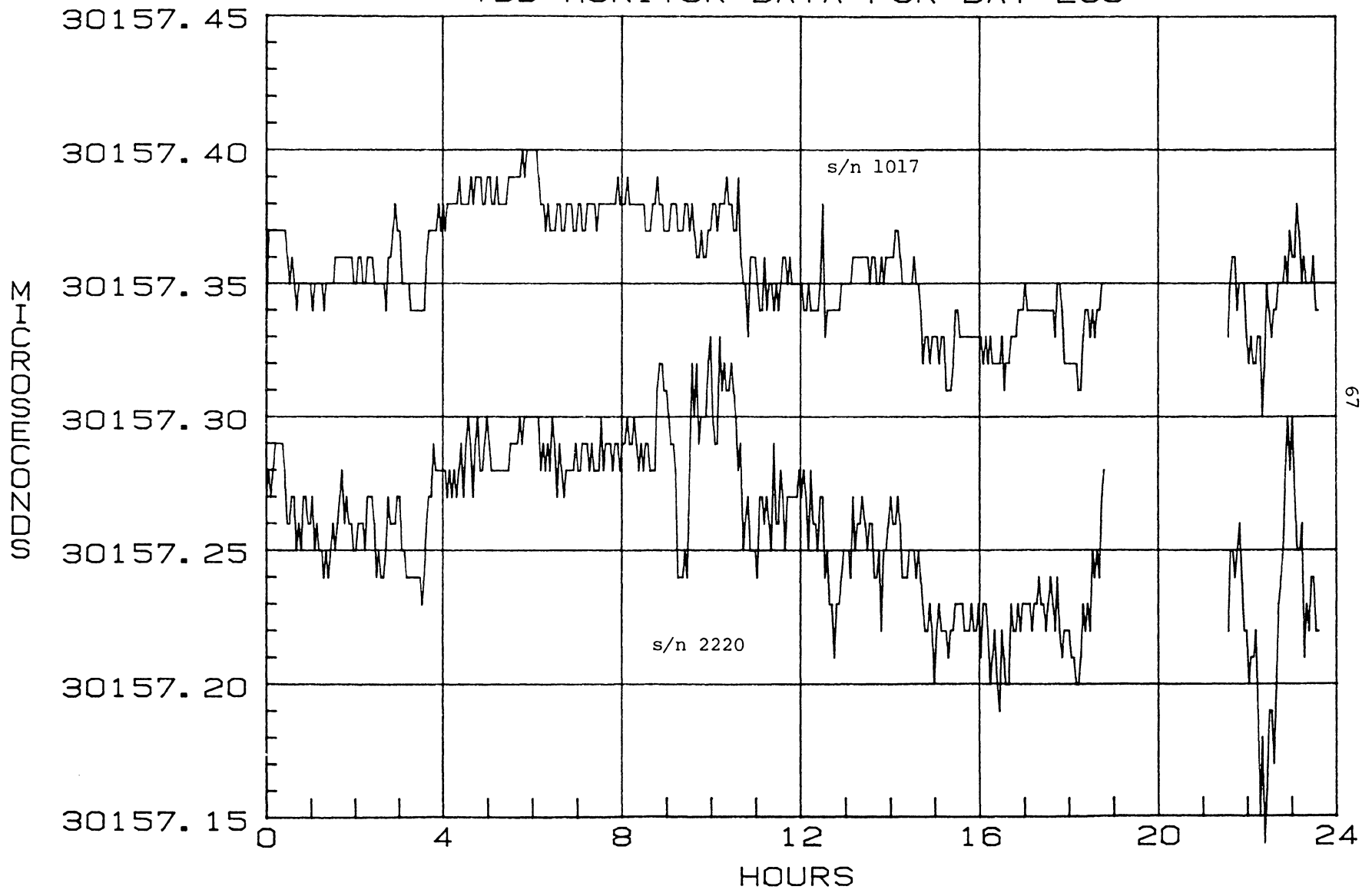
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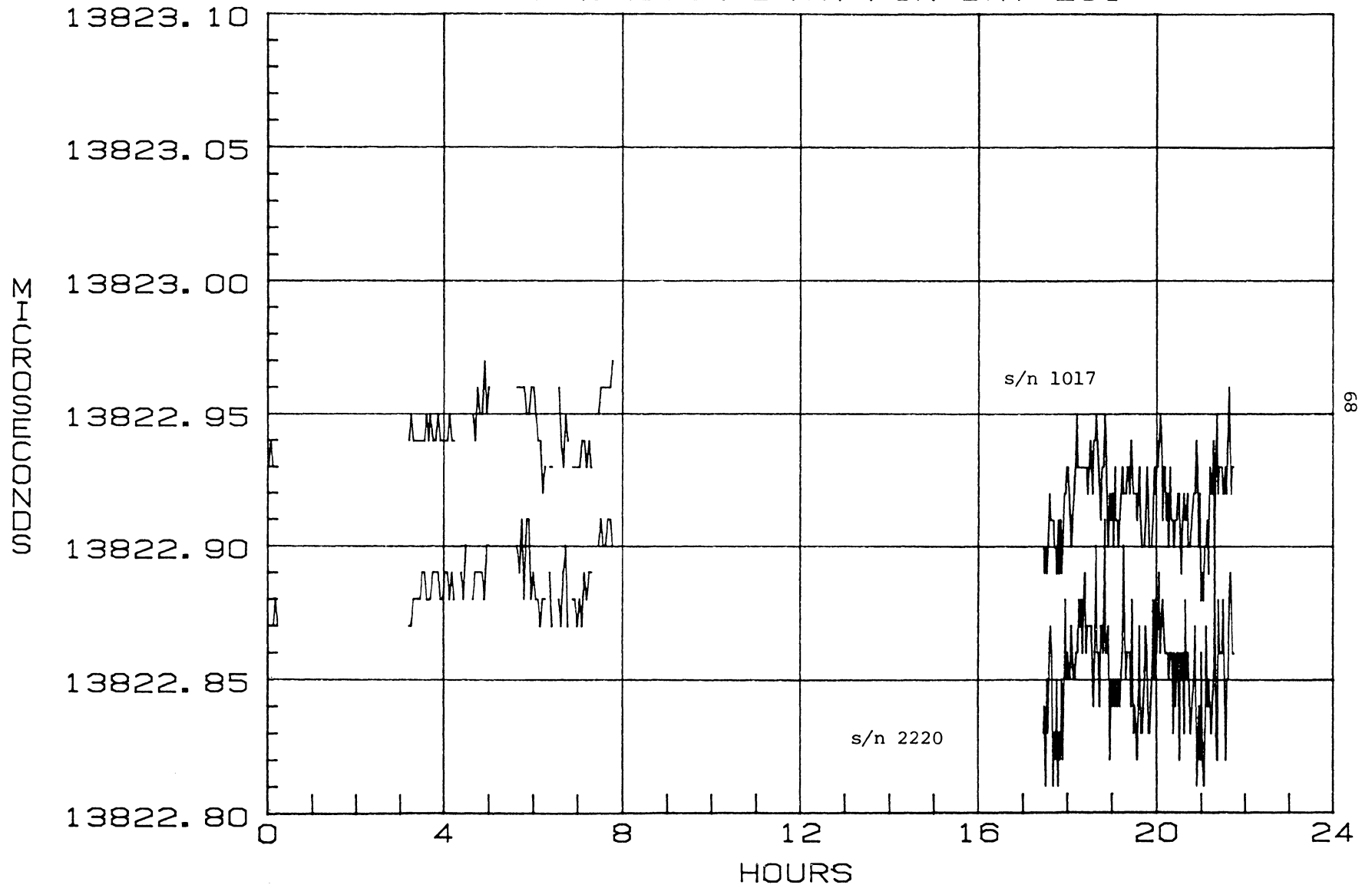


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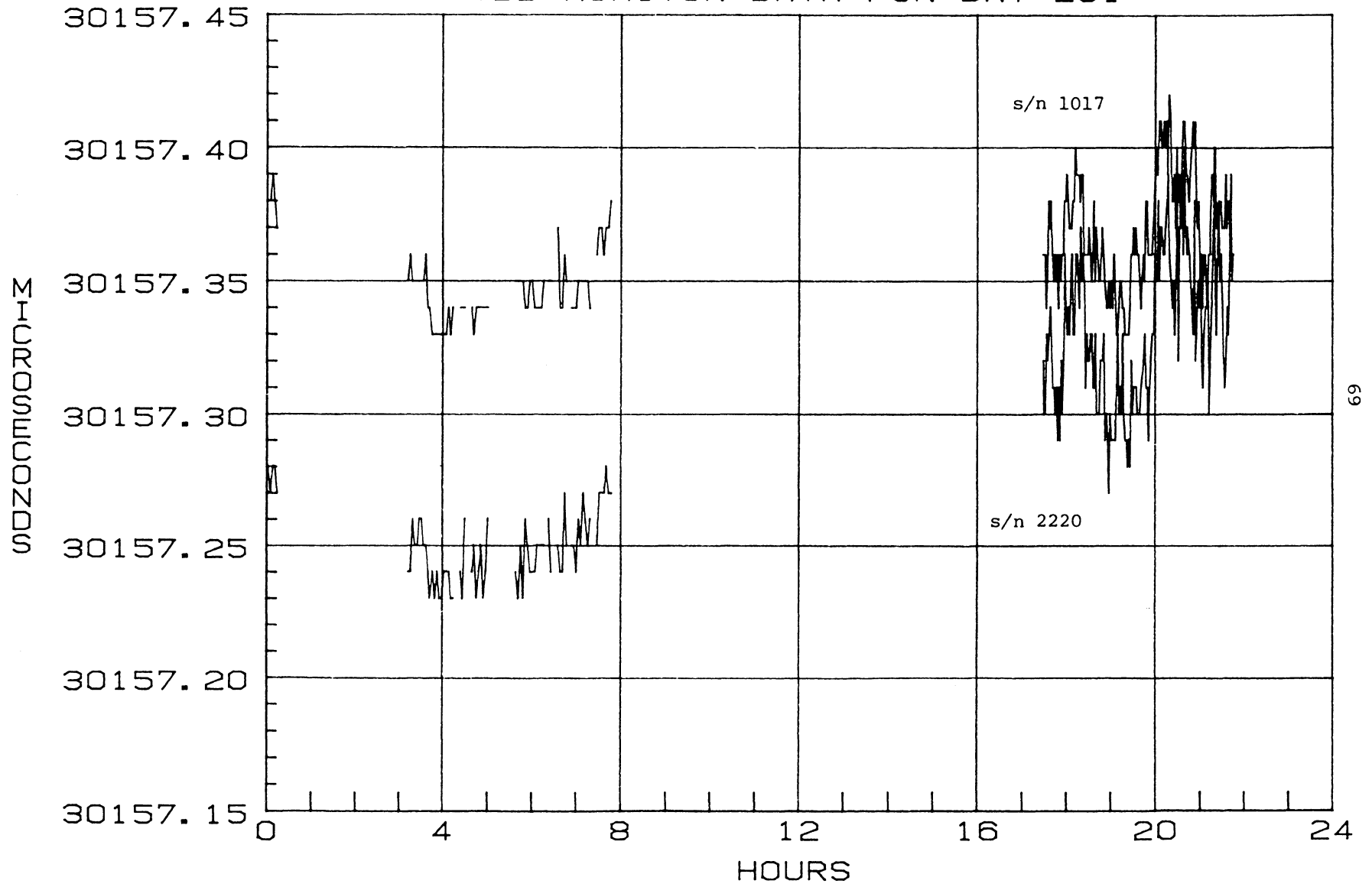


67

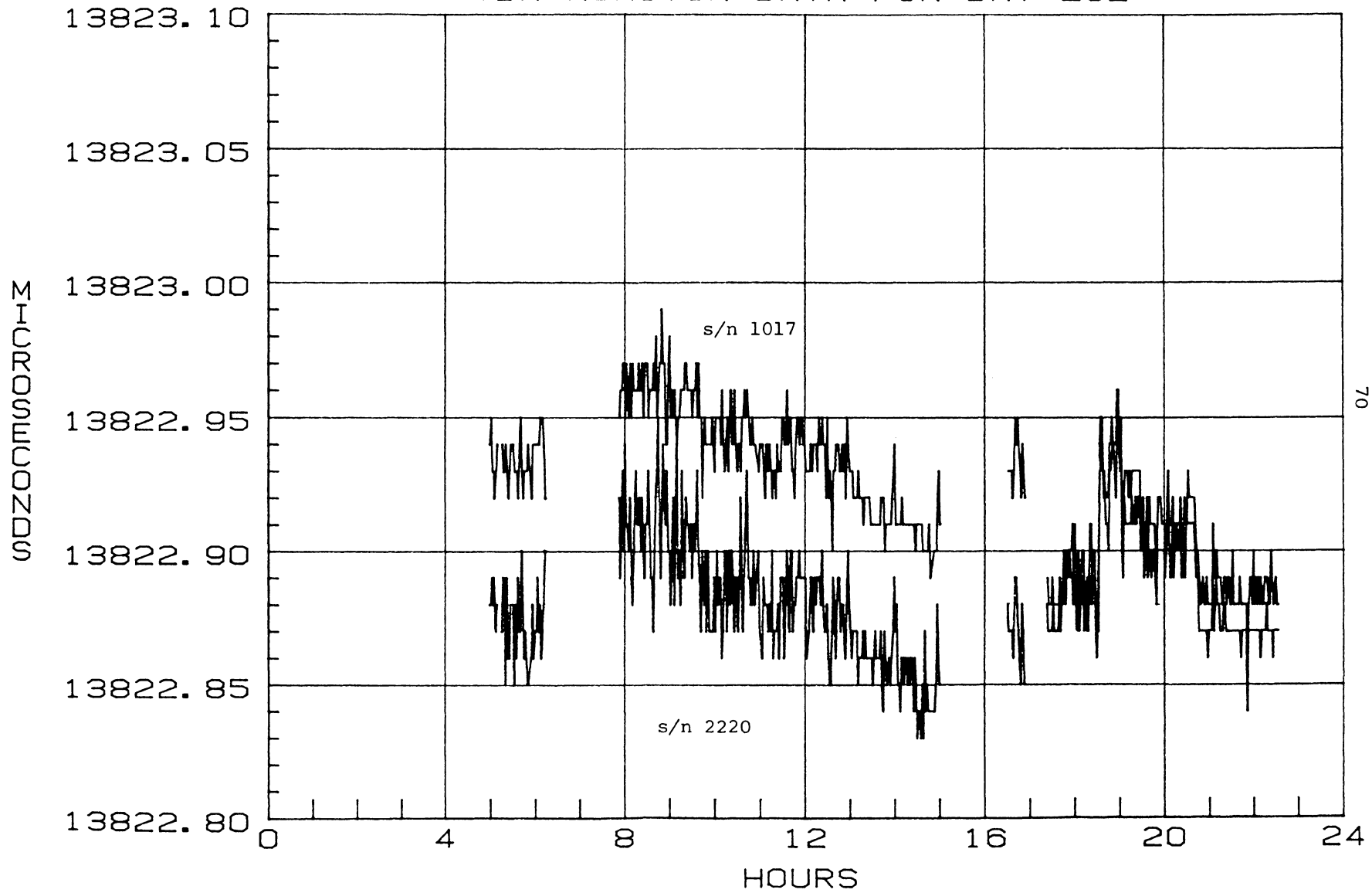
TDA MONITOR DATA FOR DAY 251



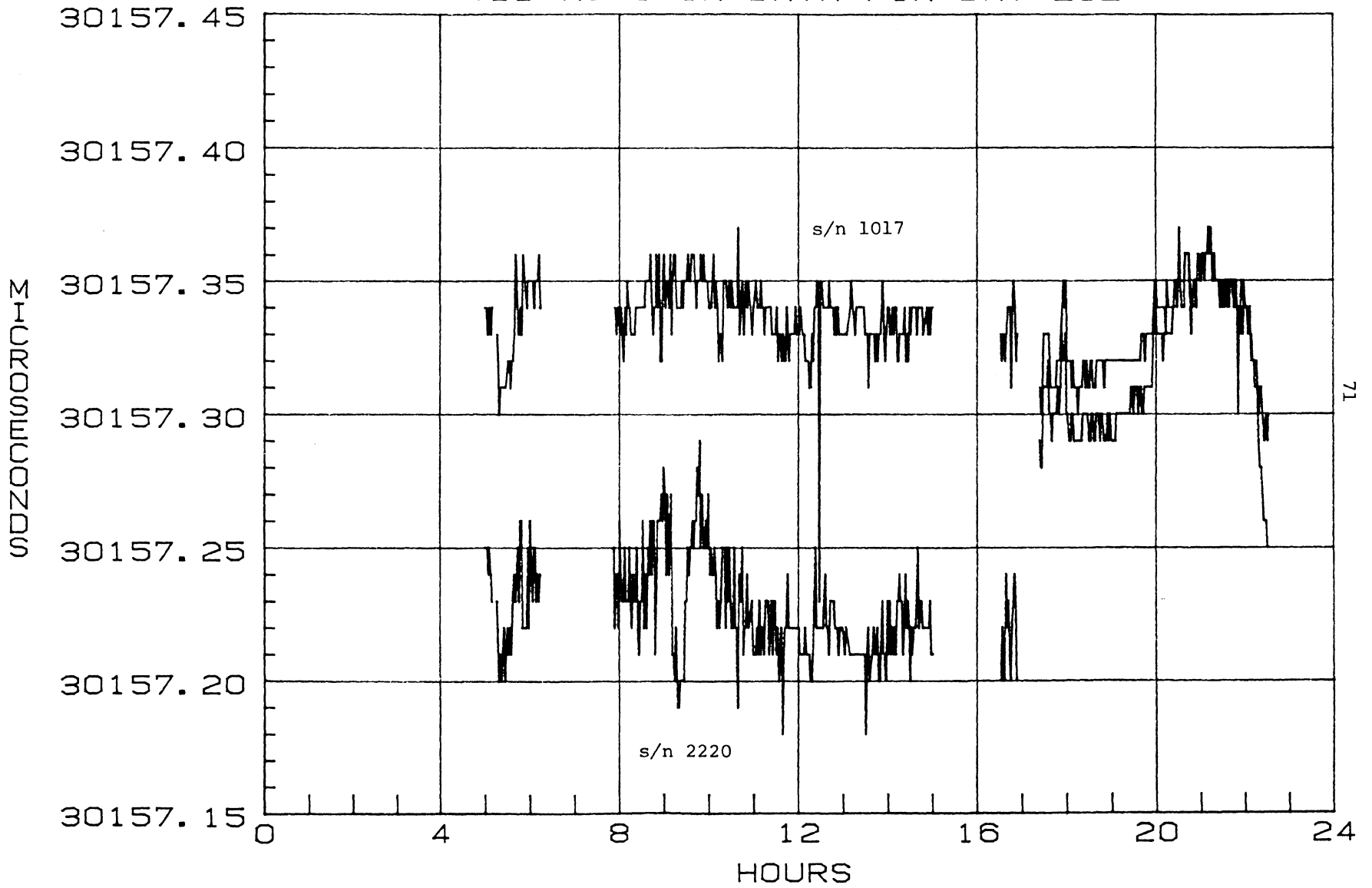
TDB MONITOR DATA FOR DAY 251



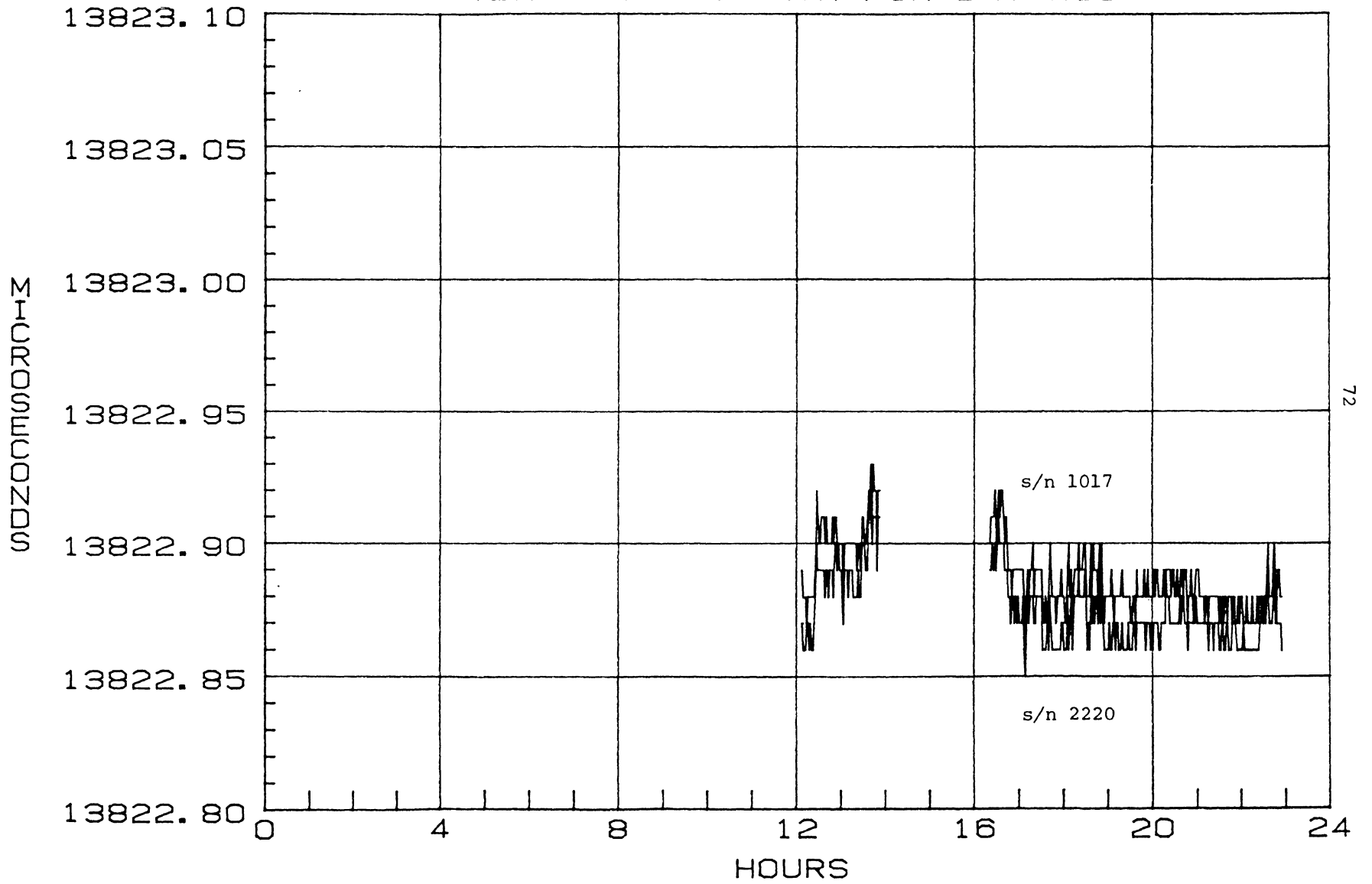
TDA MONITOR DATA FOR DAY 252



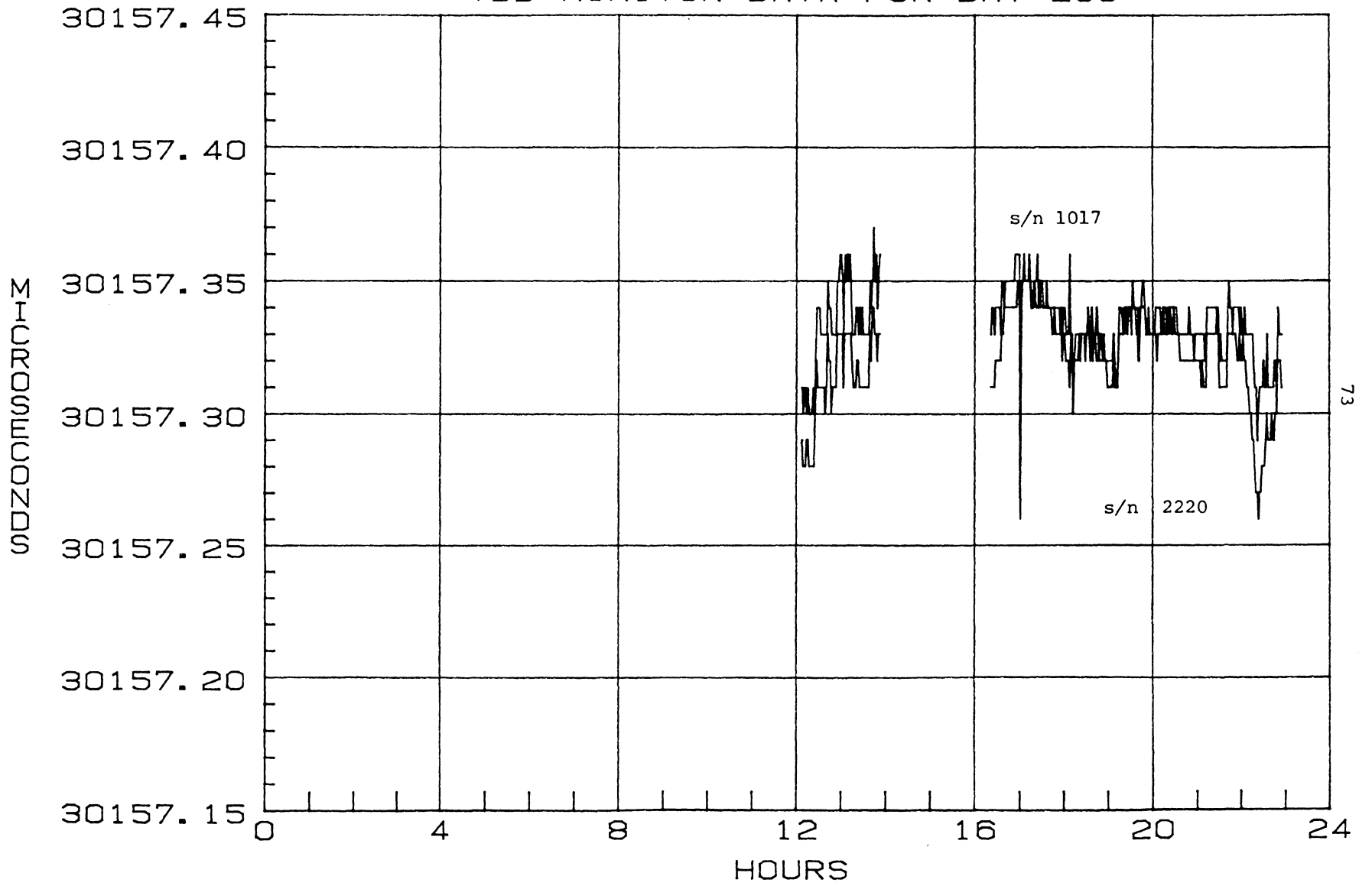
TDB MONITOR DATA FOR DAY 252



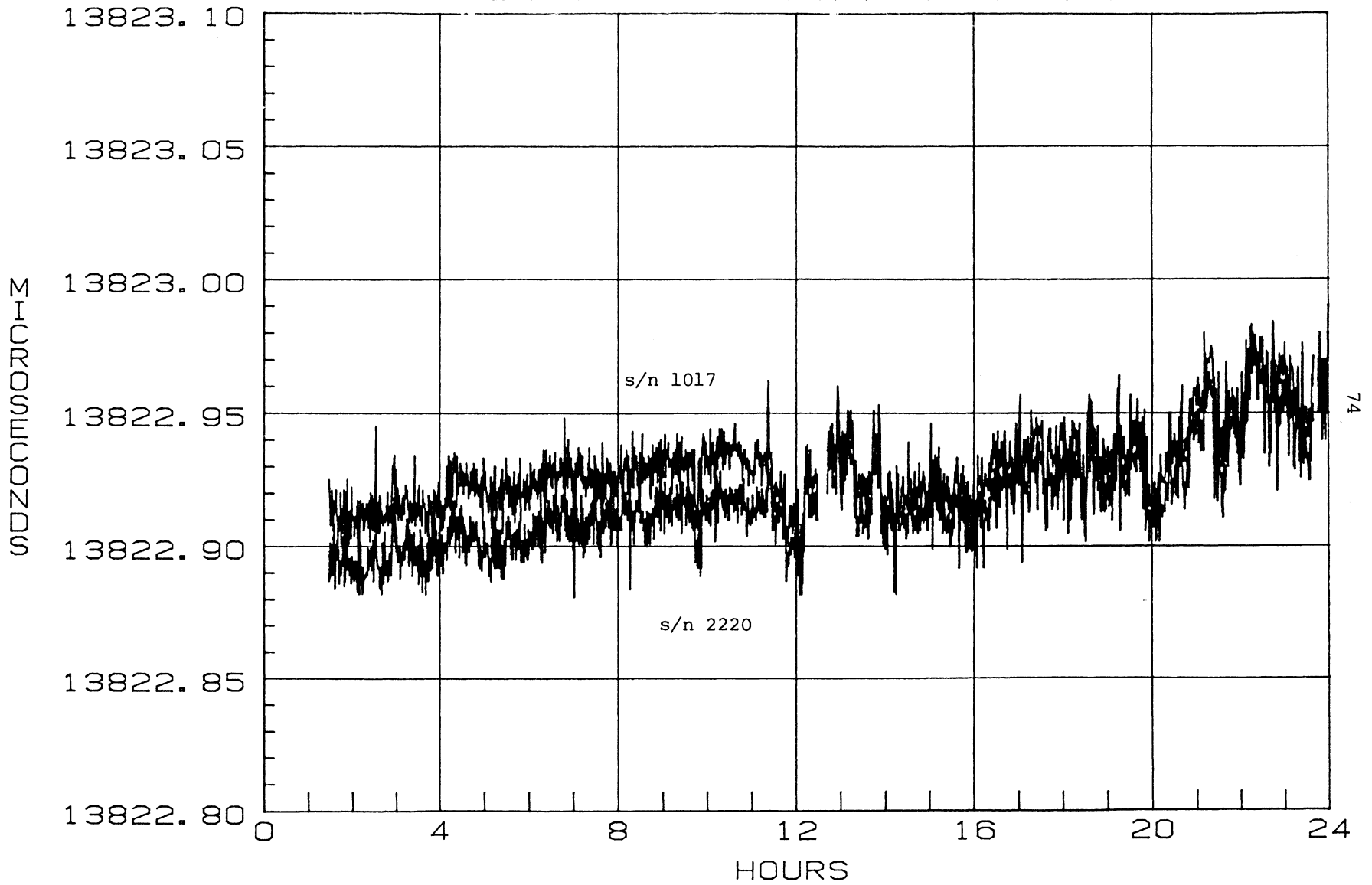
TDA MONITOR DATA FOR DAY 253



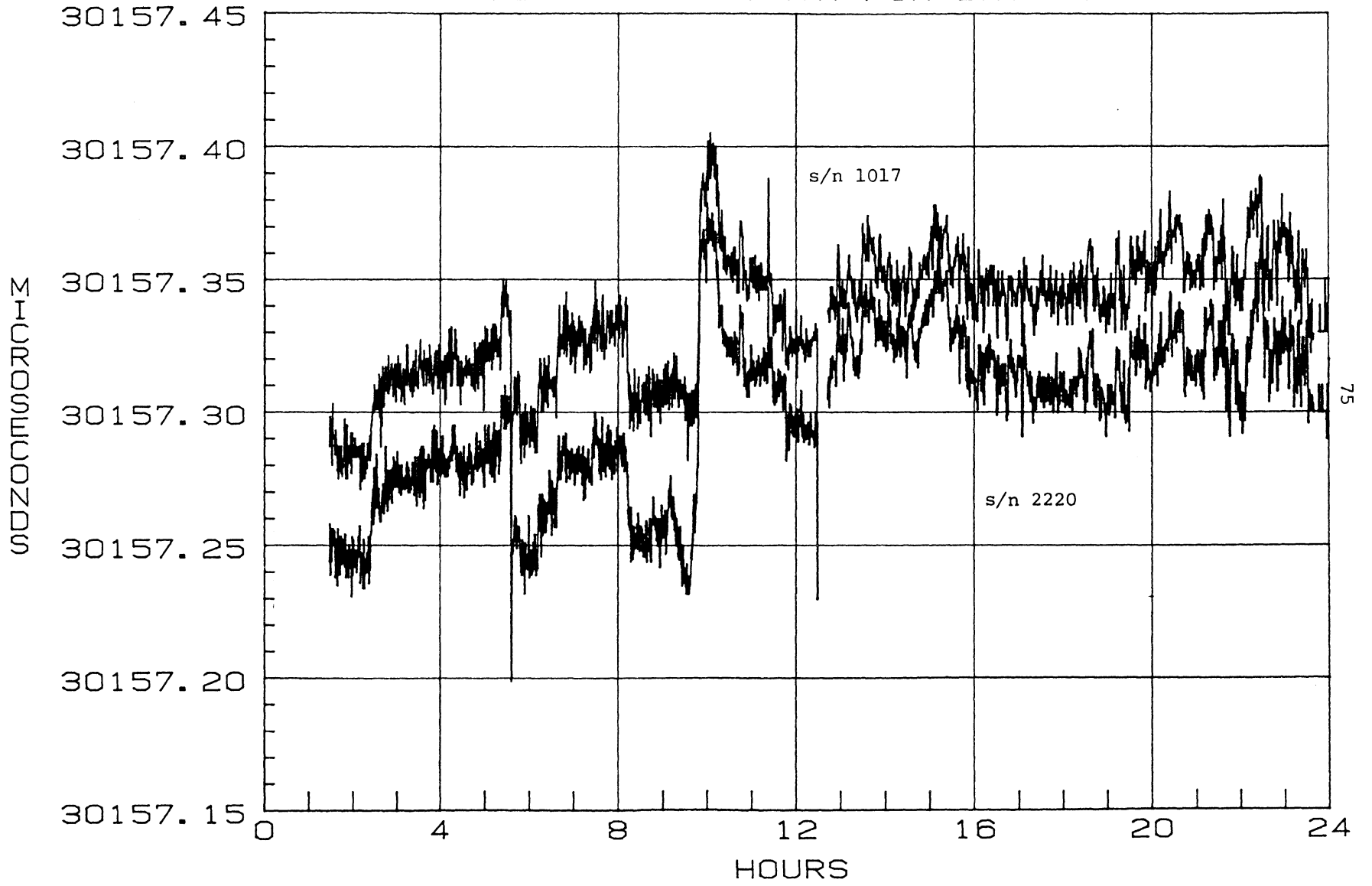
TDB MONITOR DATA FOR DAY 253



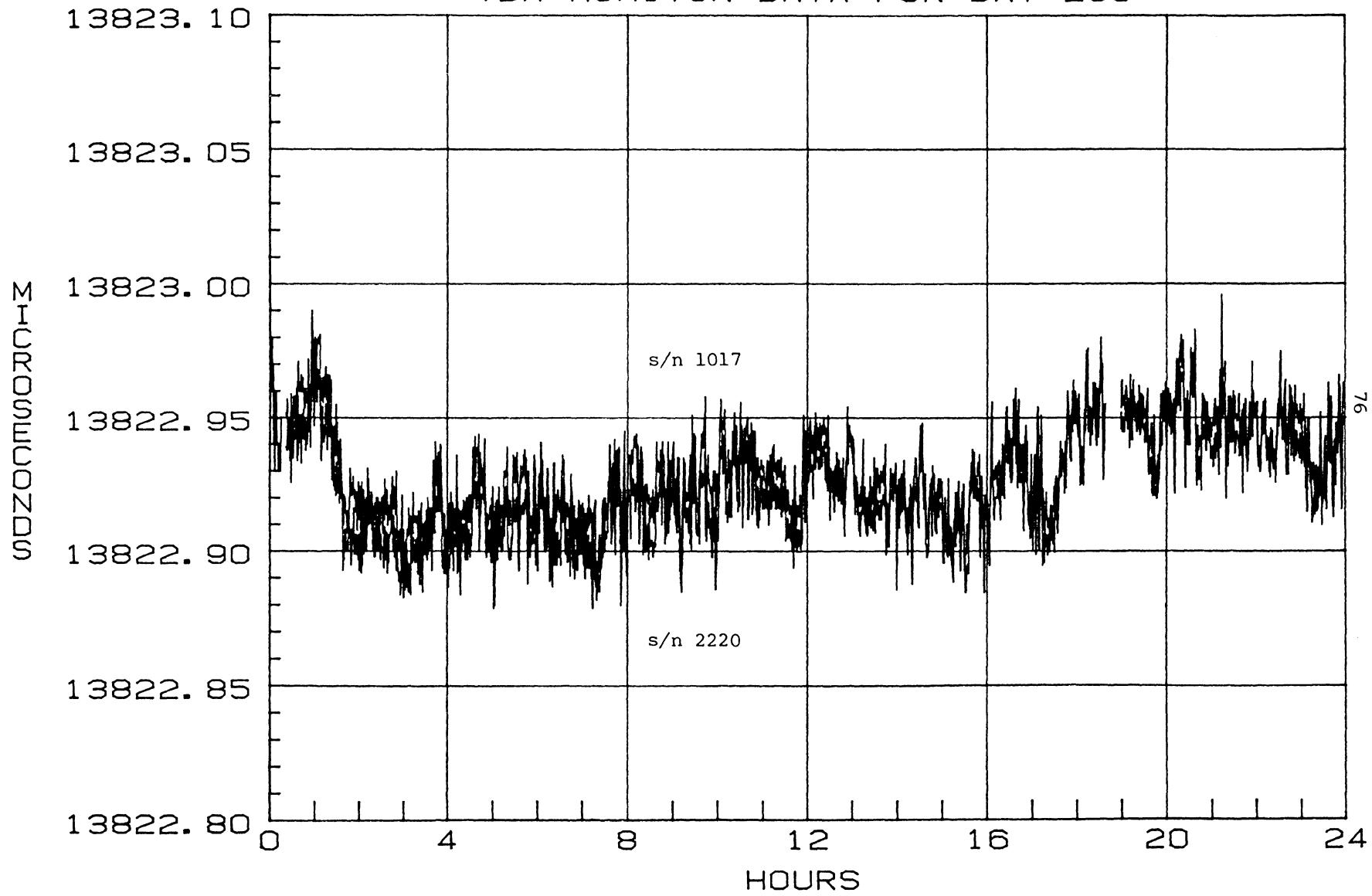
TDA MONITOR DATA FOR DAY 264



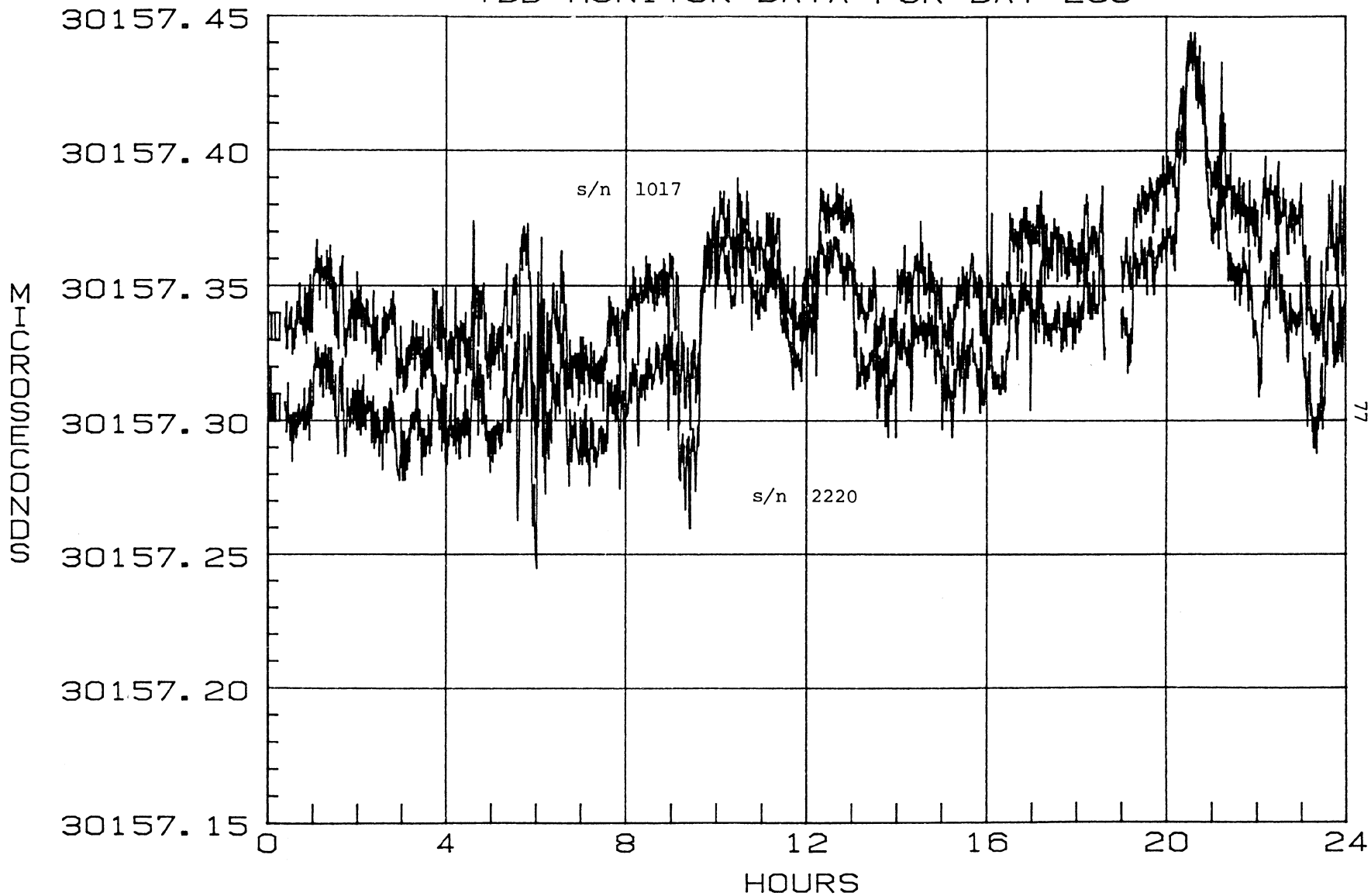
TDB MONITOR DATA FOR DAY 264



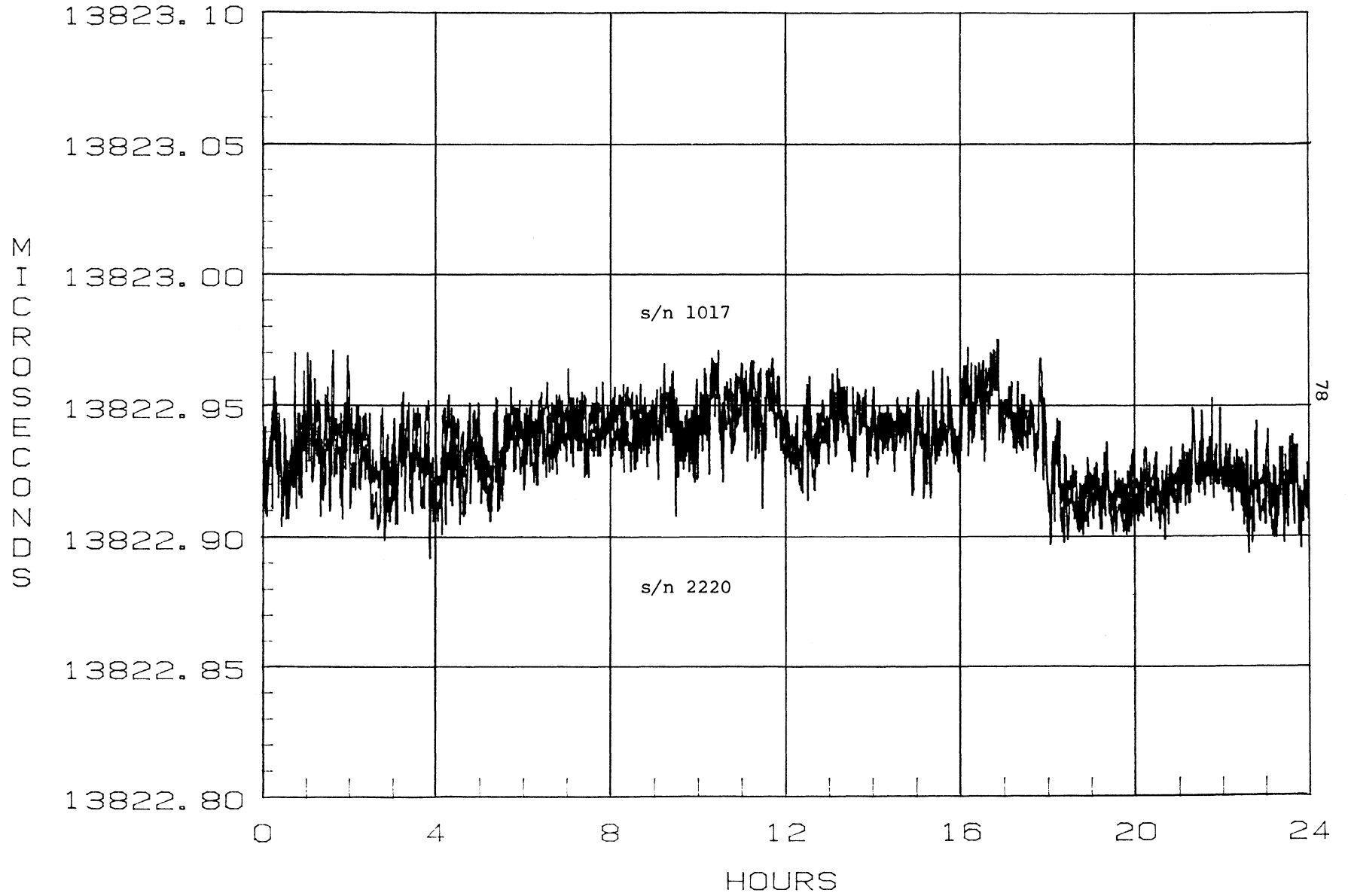
TDA MONITOR DATA FOR DAY 265



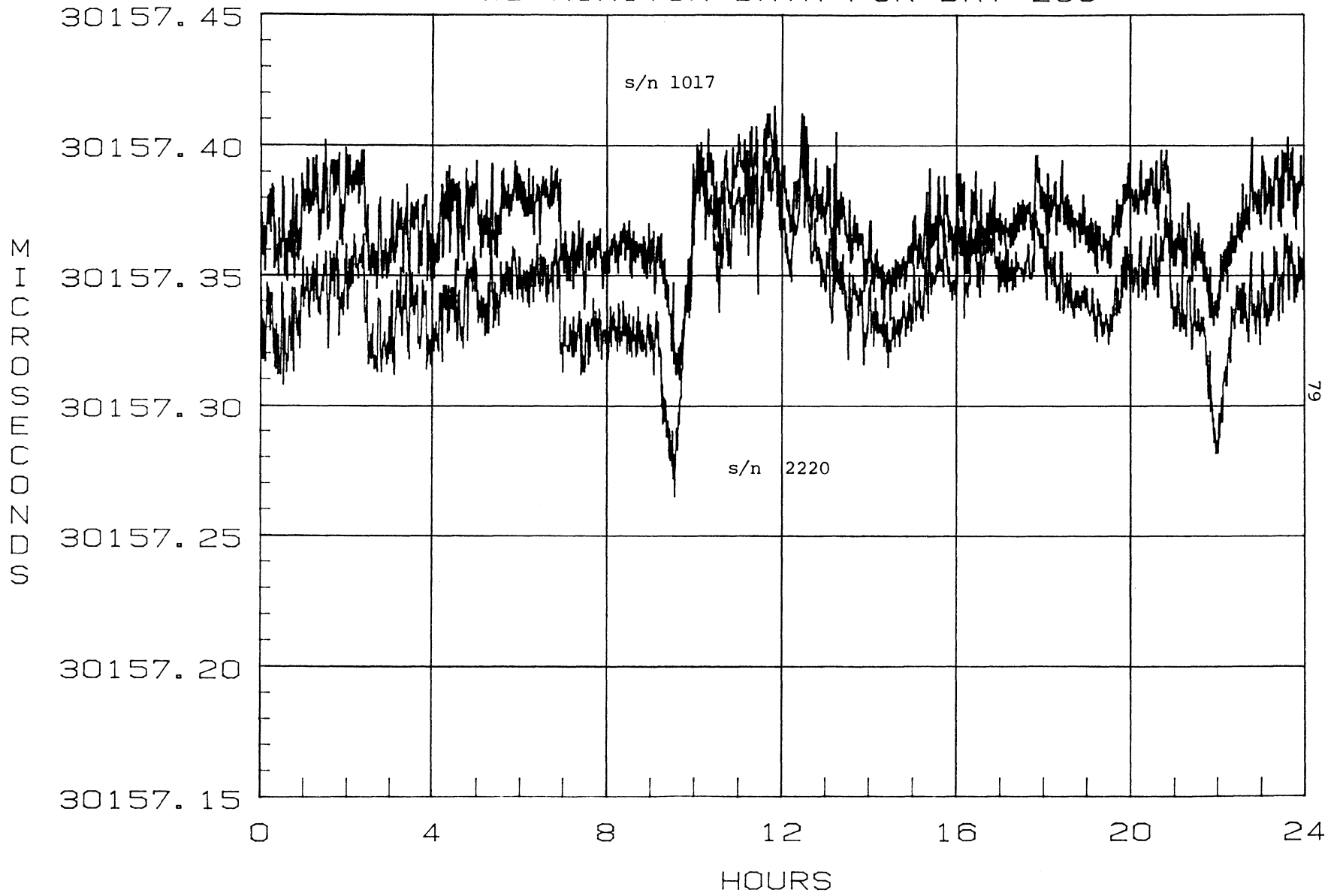
TDB MONITOR DATA FOR DAY 265



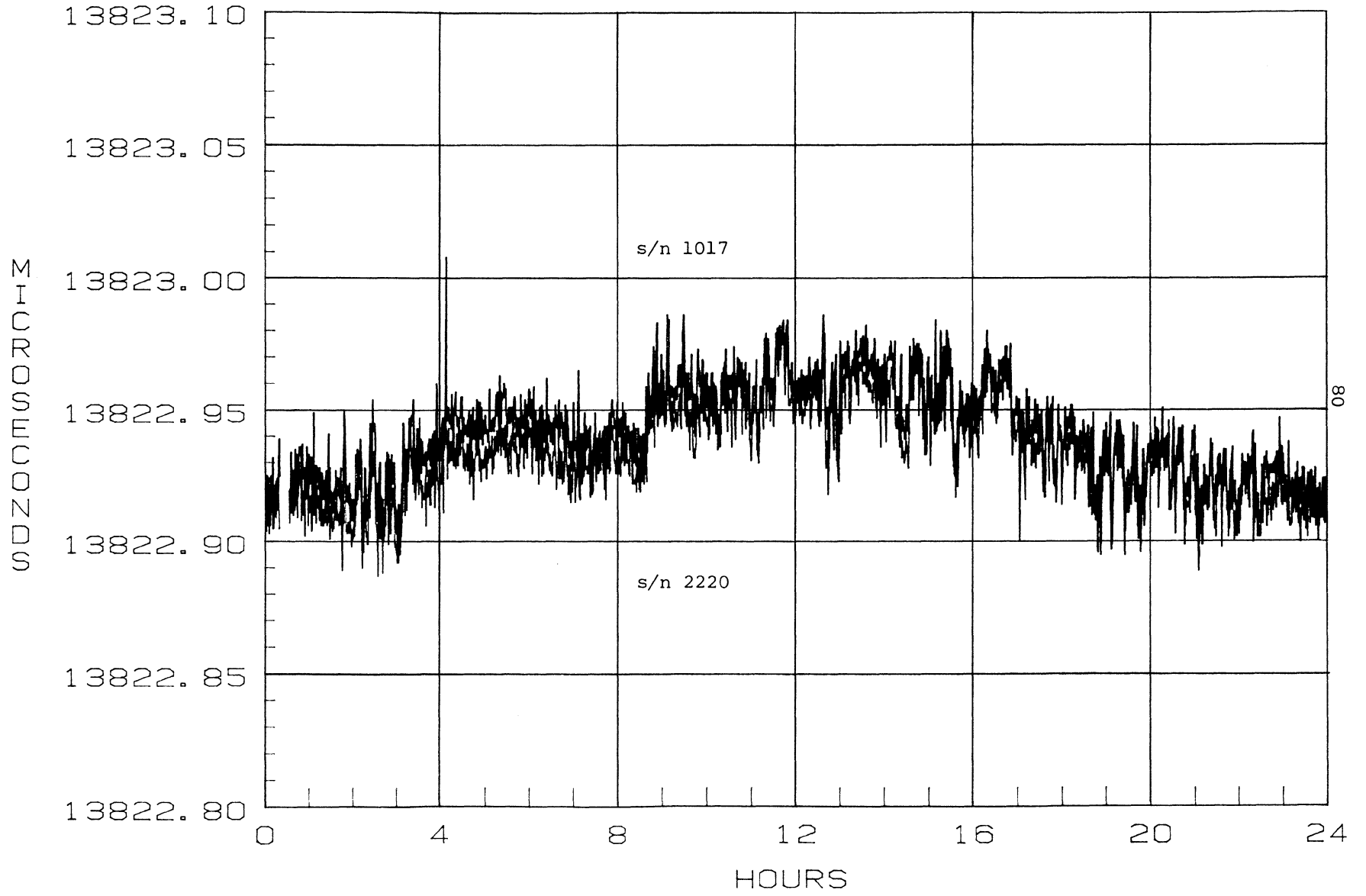
TDA MONITOR DATA FOR DAY 266



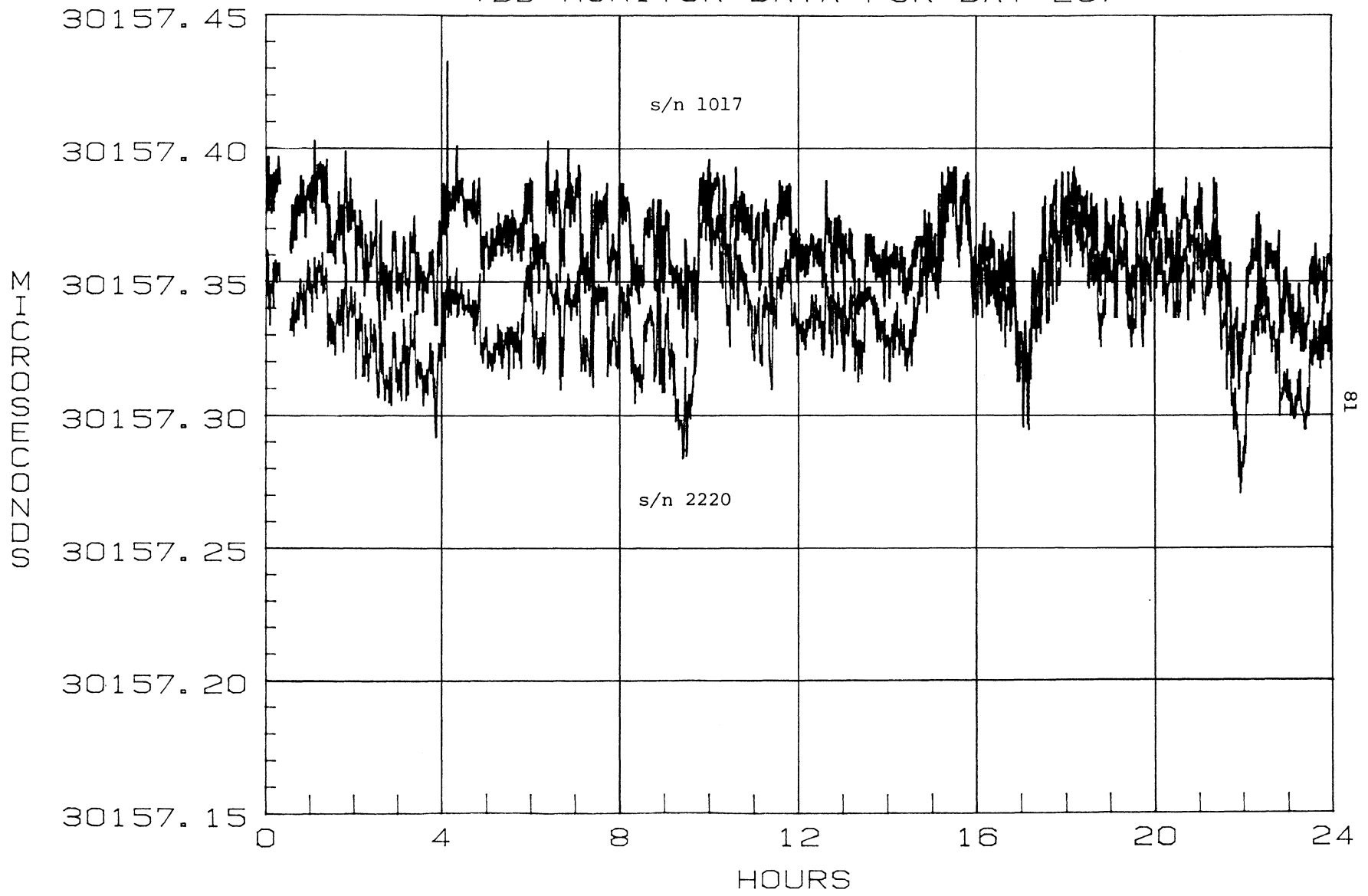
TDB MONITOR DATA FOR DAY 266



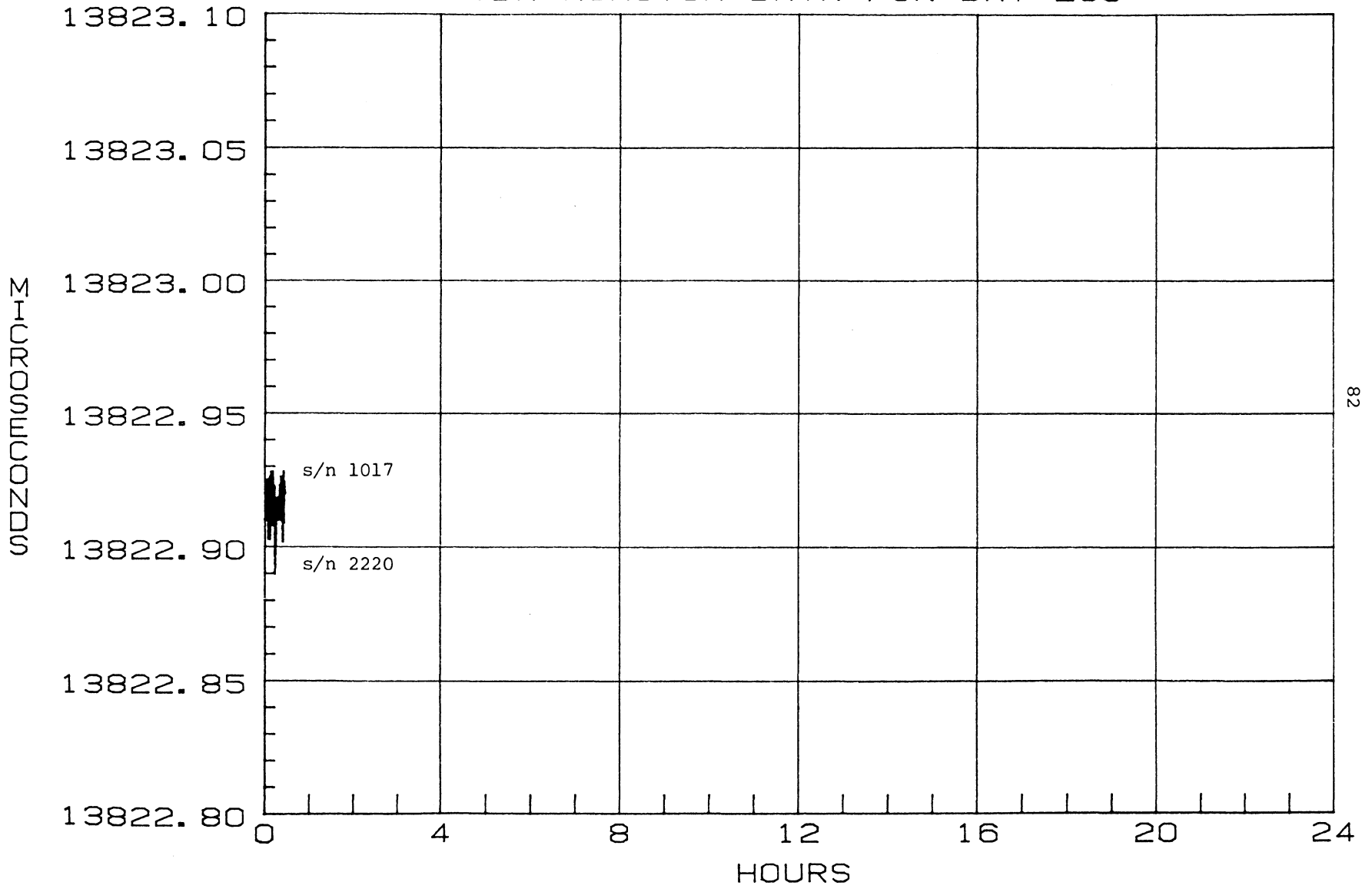
TDA MONITOR DATA FOR DAY 267



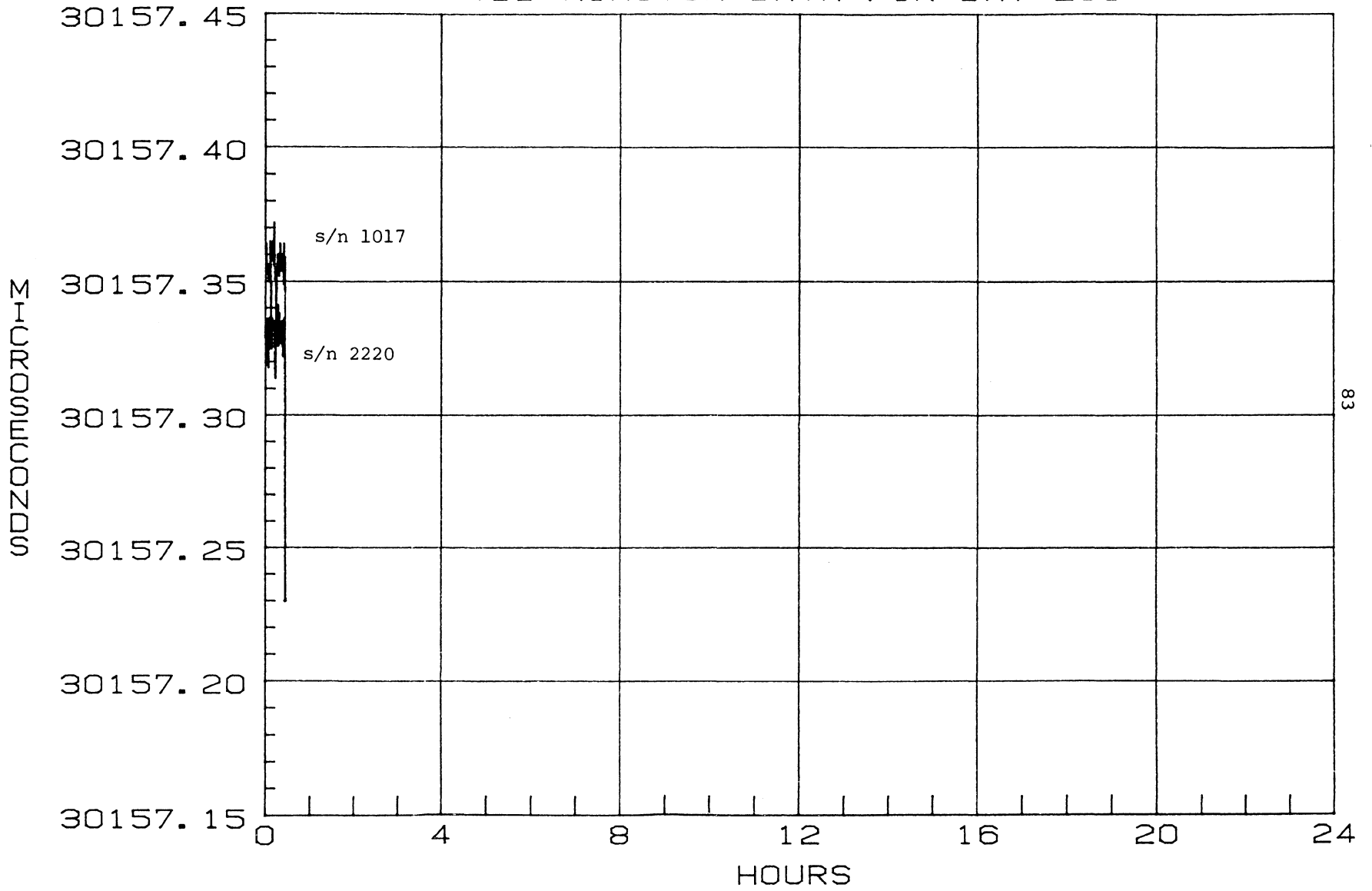
TDB MONITOR DATA FOR DAY 267



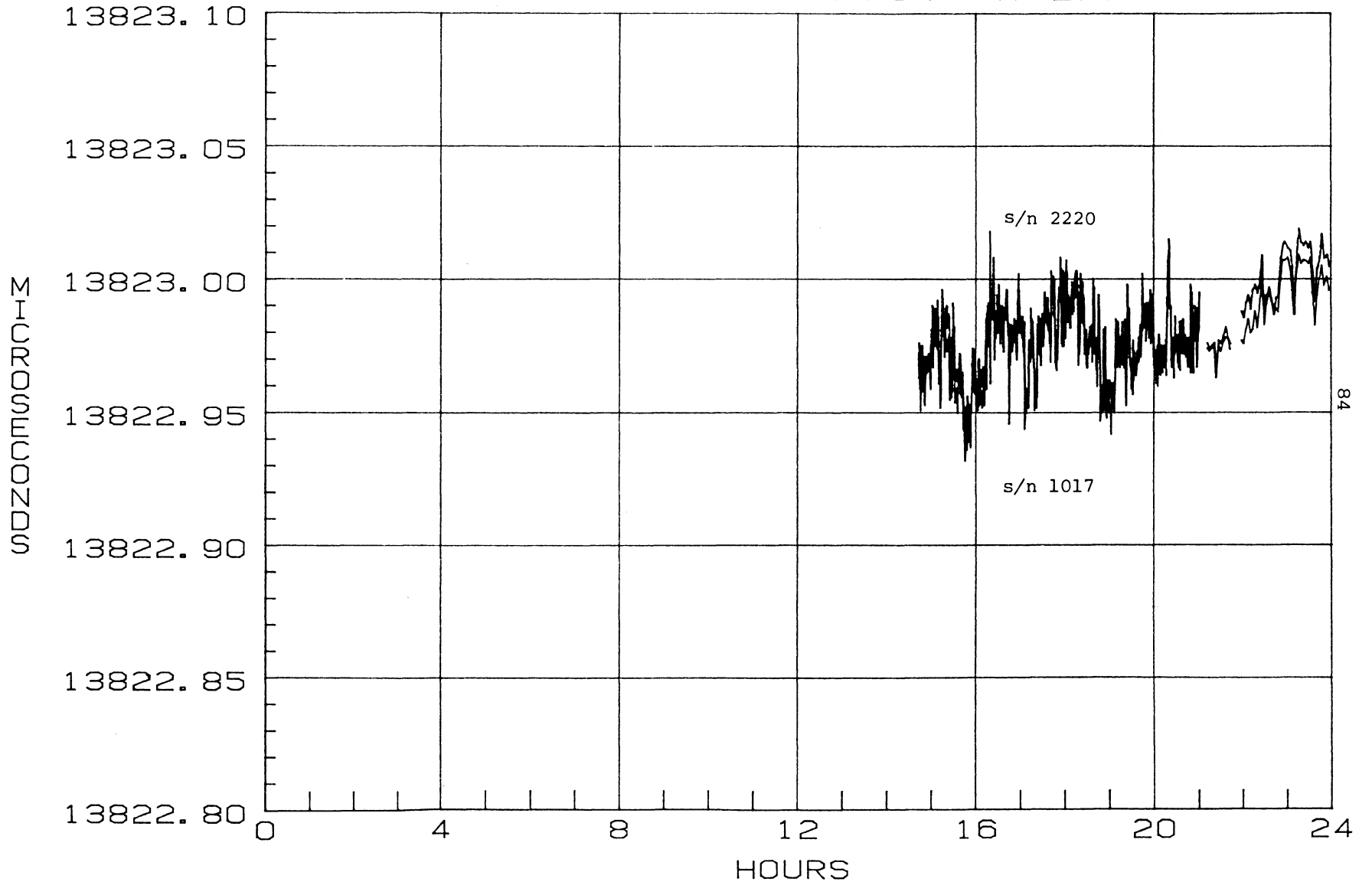
TDA MONITOR DATA FOR DAY 268



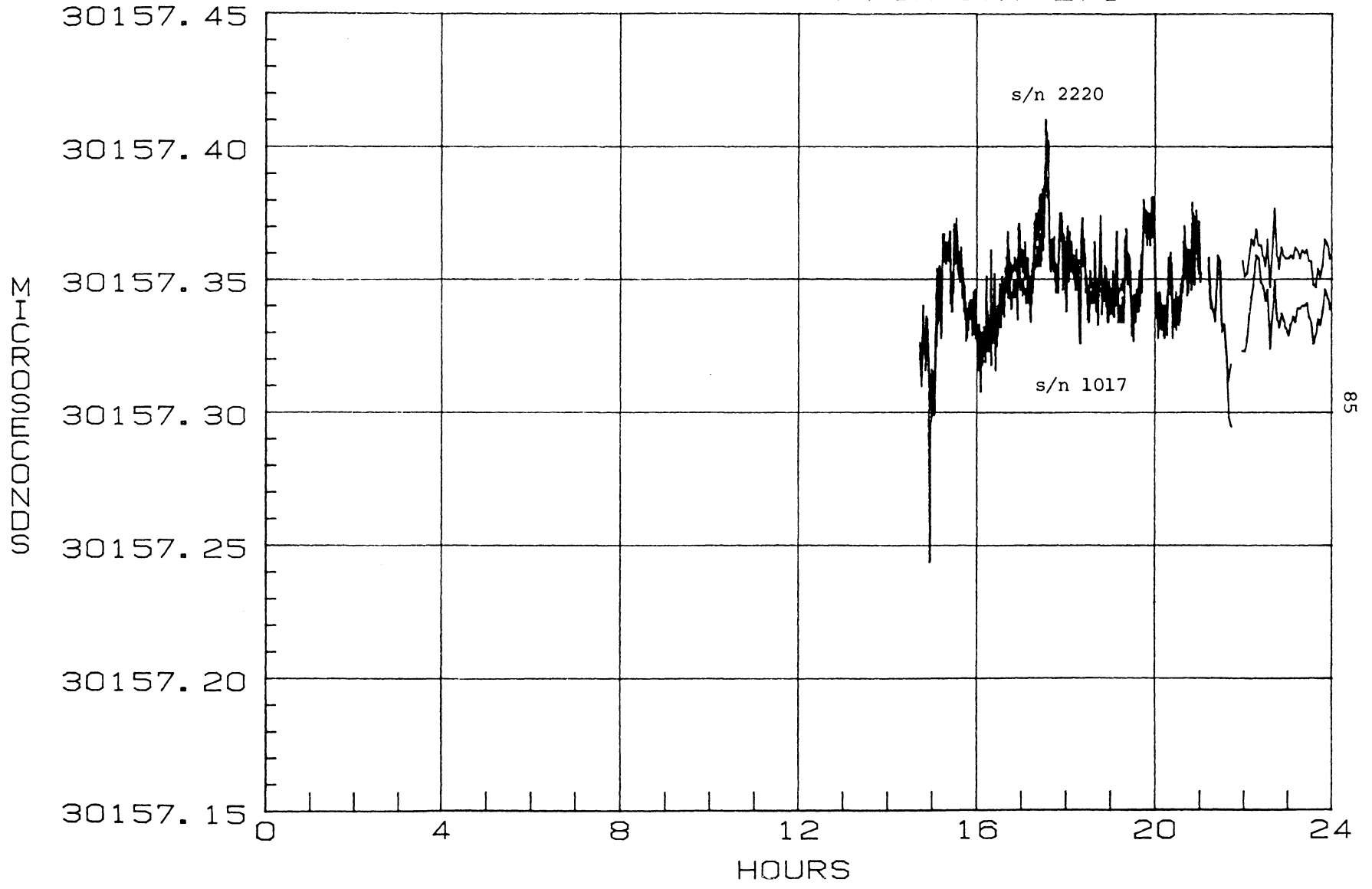
TDB MONITOR DATA FOR DAY 268



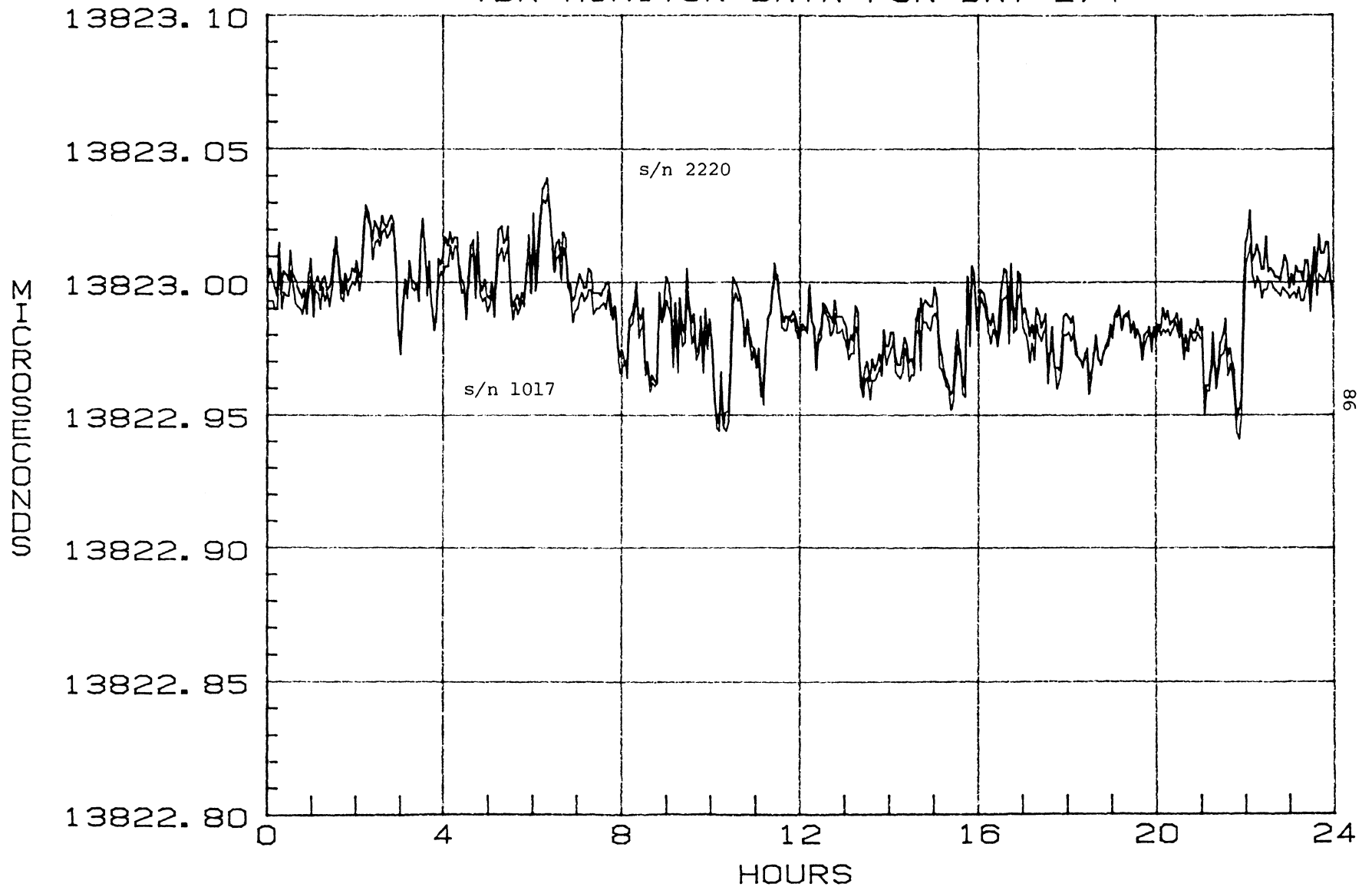
TDA MONITOR DATA FOR DAY 273



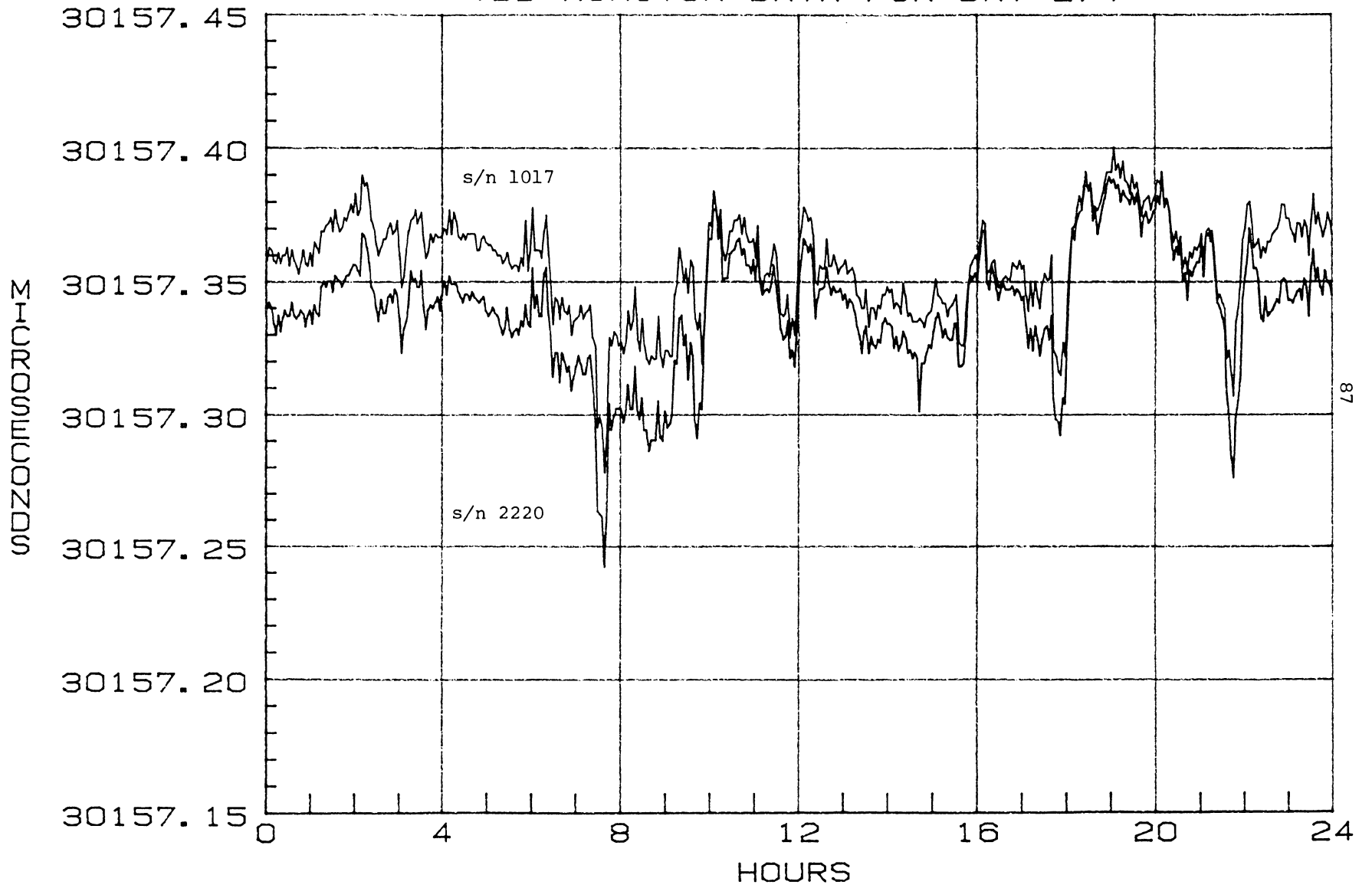
TDB MONITOR DATA FOR DAY 273



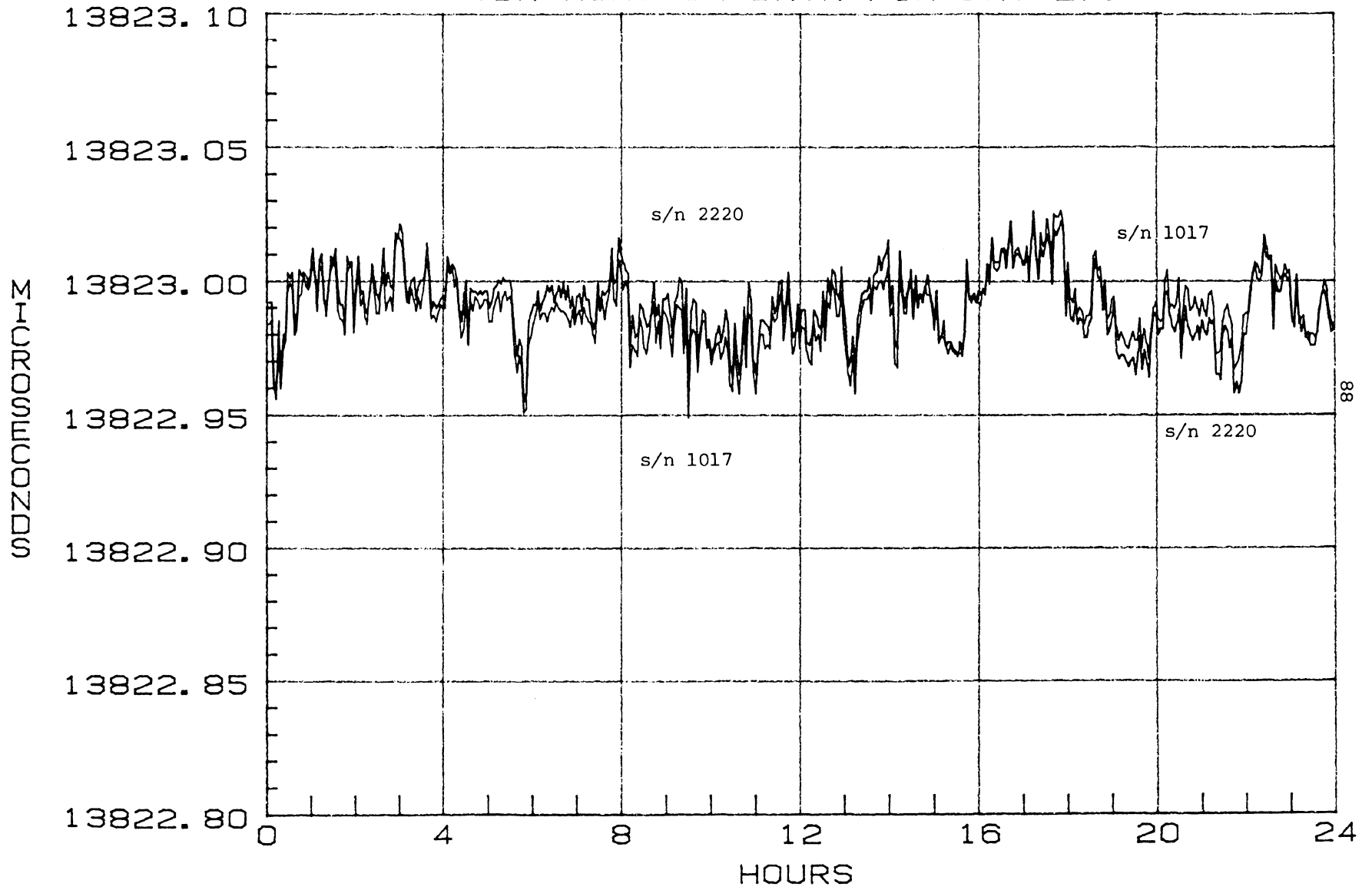
TDA MONITOR DATA FOR DAY 274



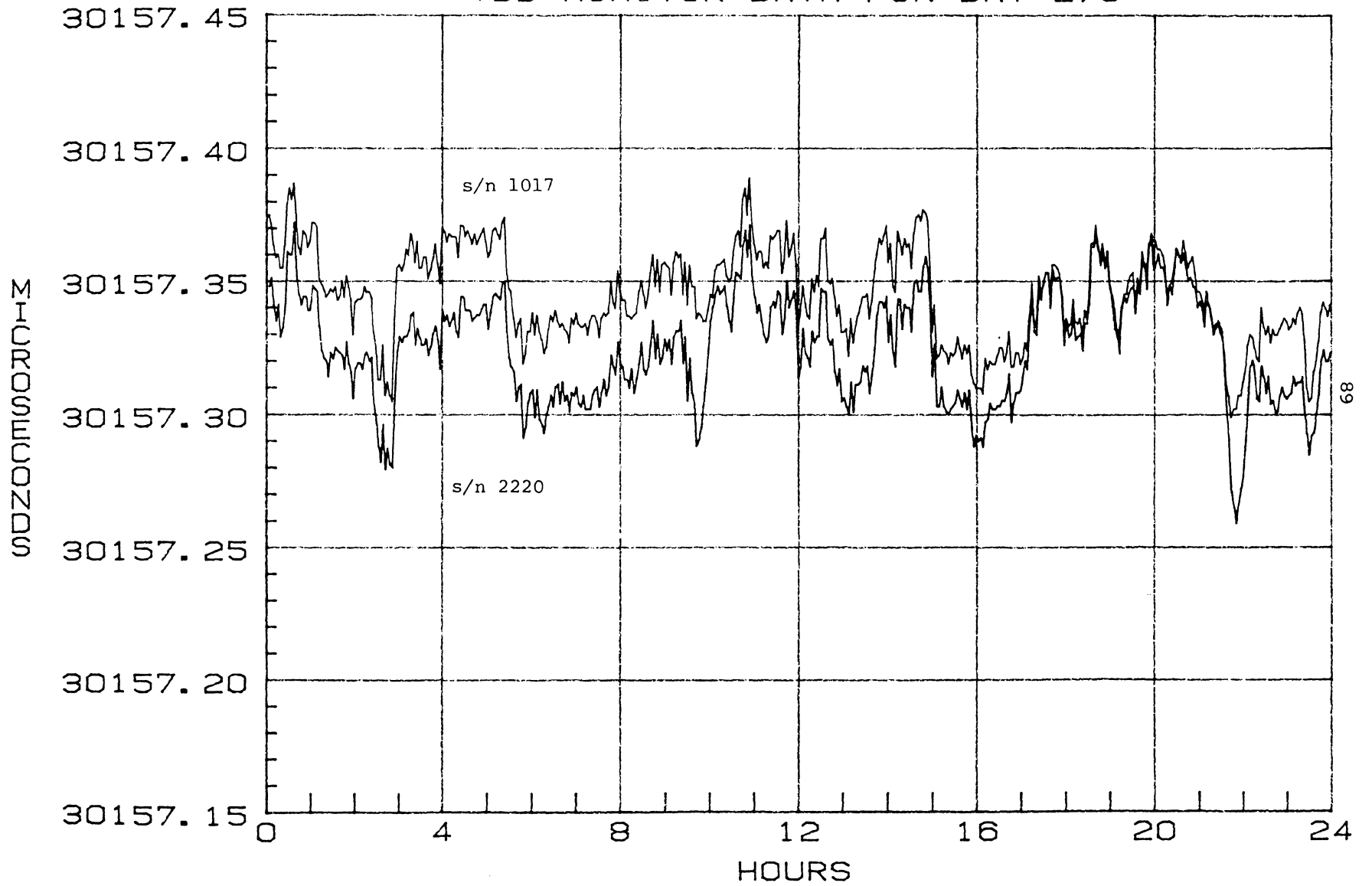
TDB MONITOR DATA FOR DAY 274



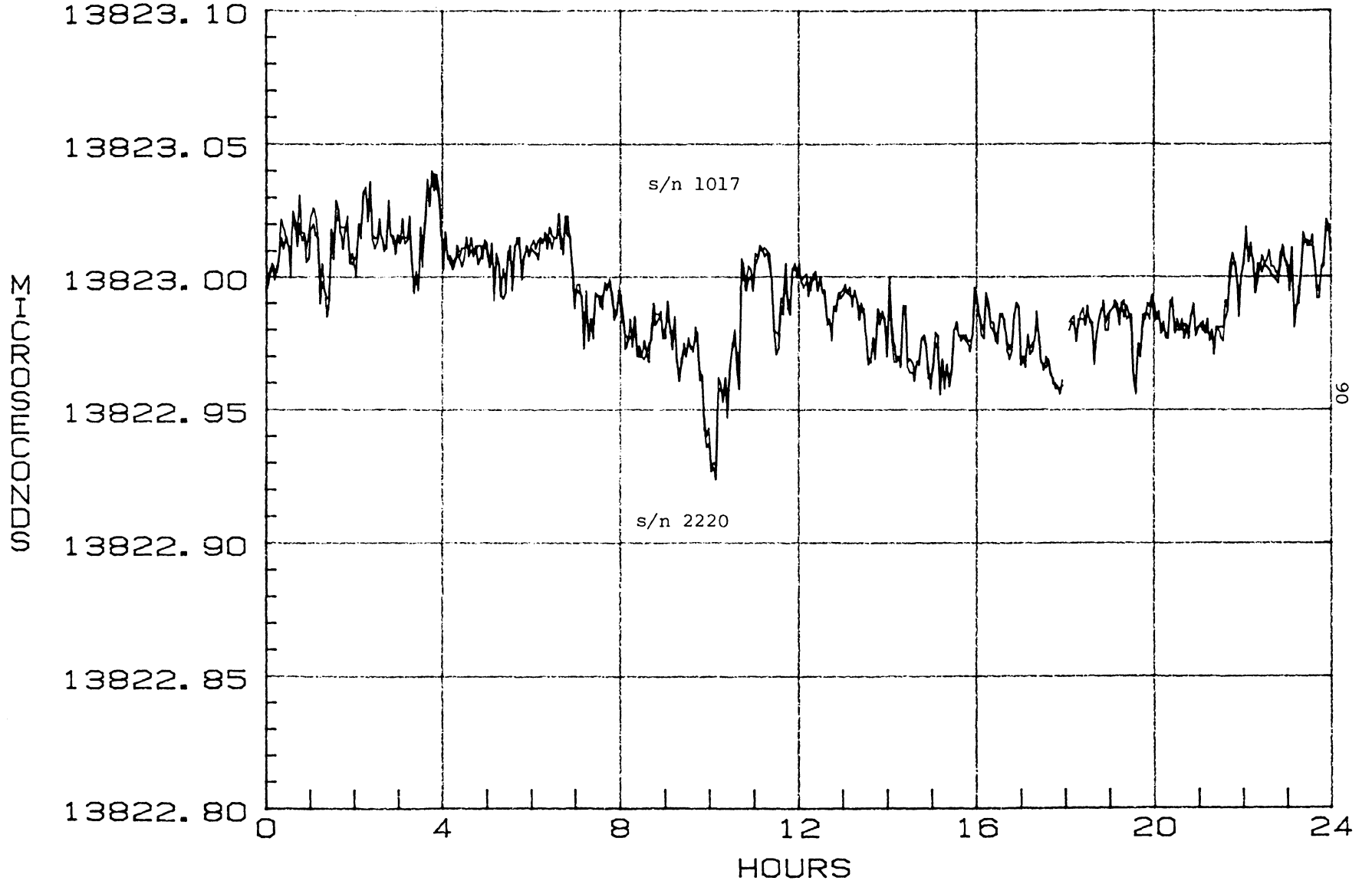
TDA MONITOR DATA FOR DAY 275



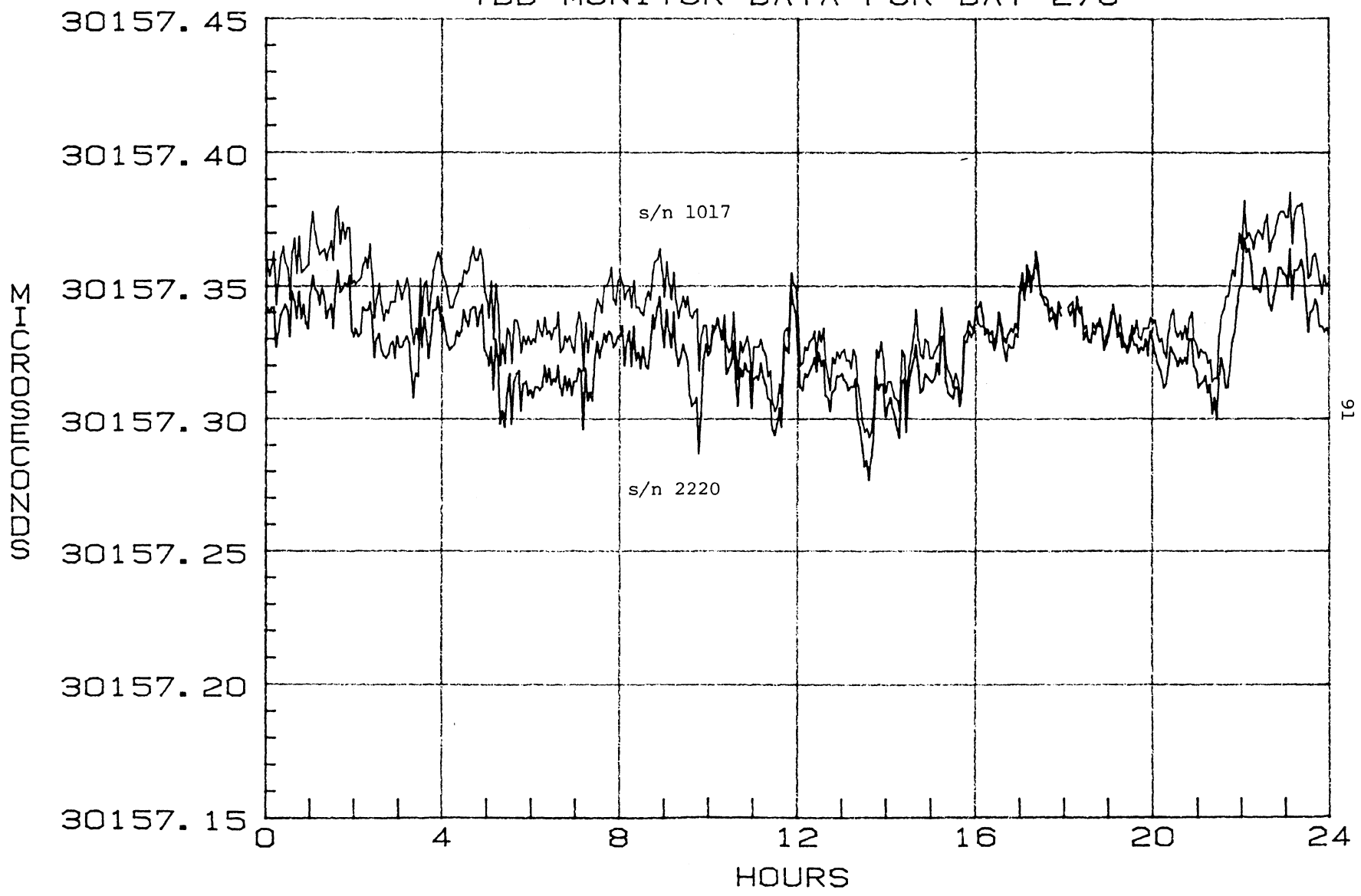
TDB MONITOR DATA FOR DAY 275



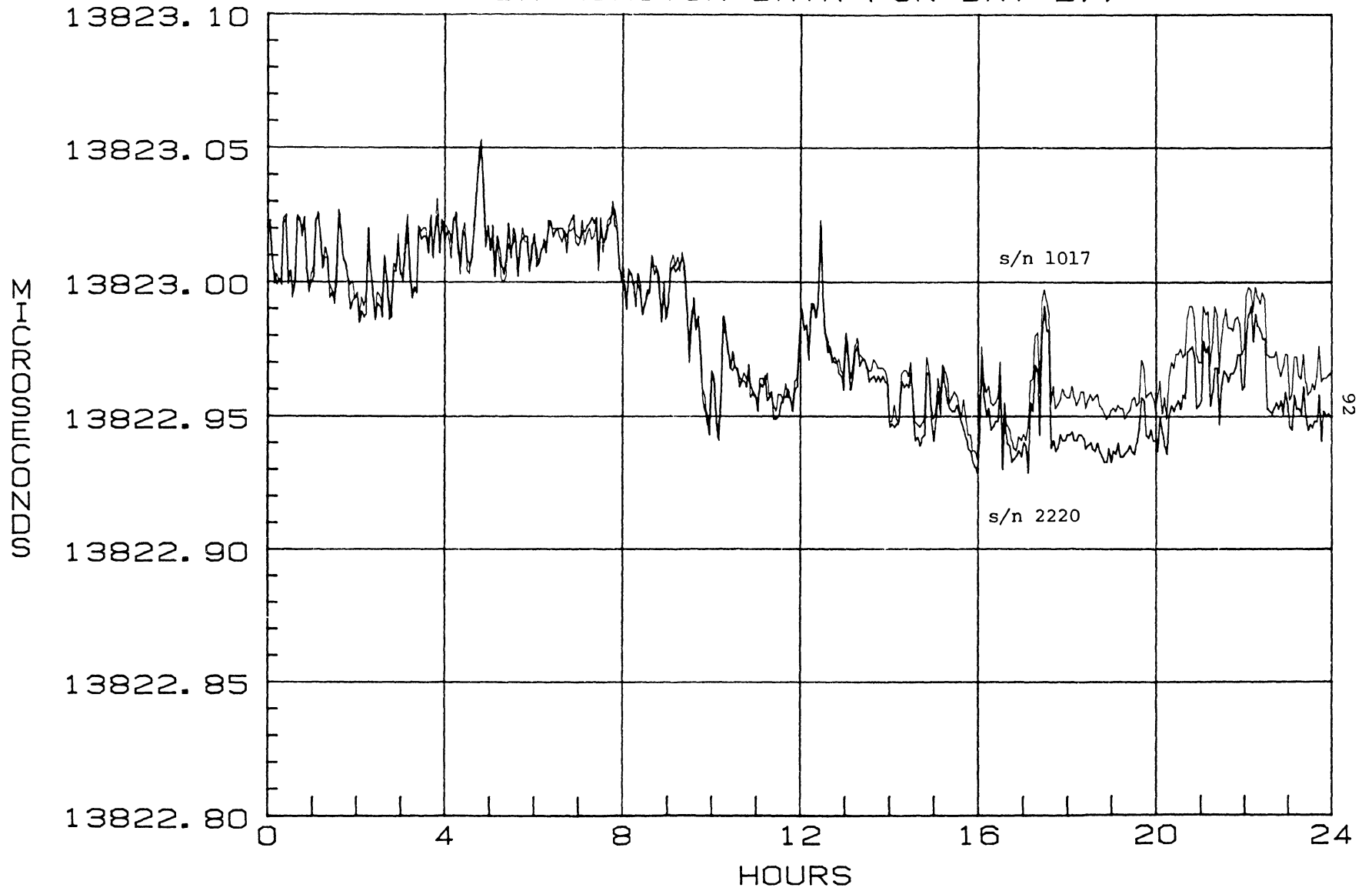
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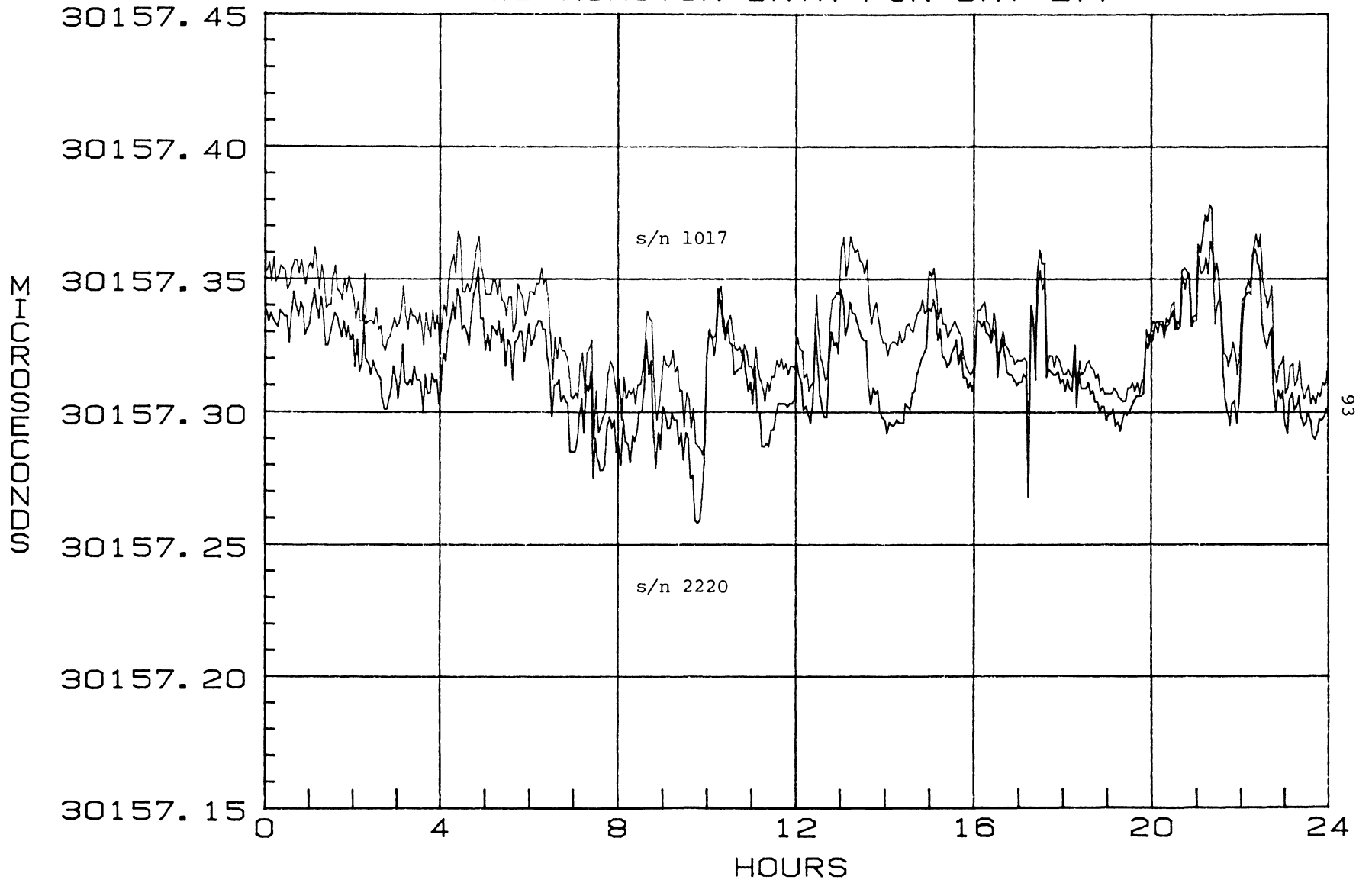
TDB MONITOR DATA FOR DAY 276



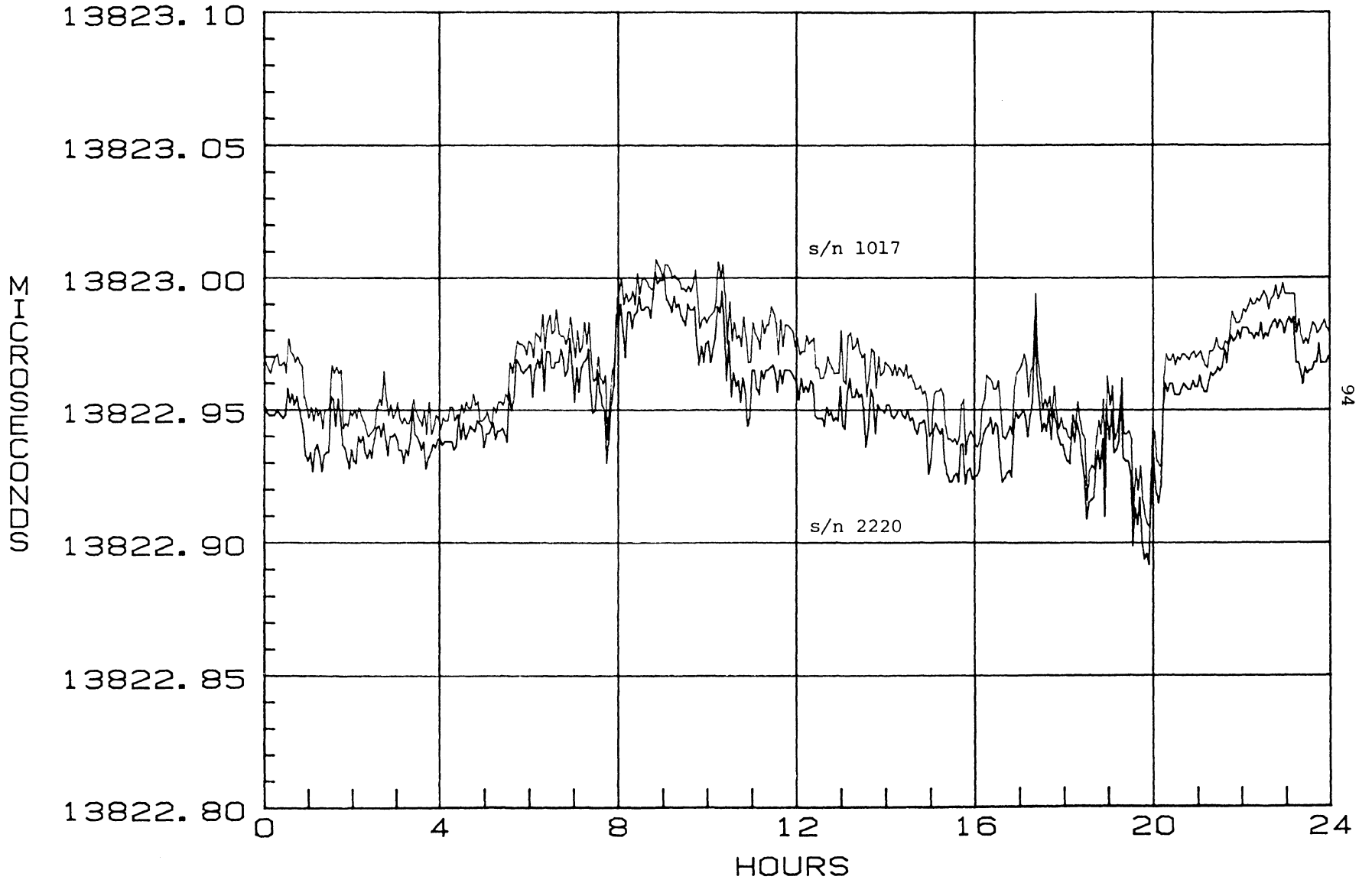
TDA MONITOR DATA FOR DAY 277



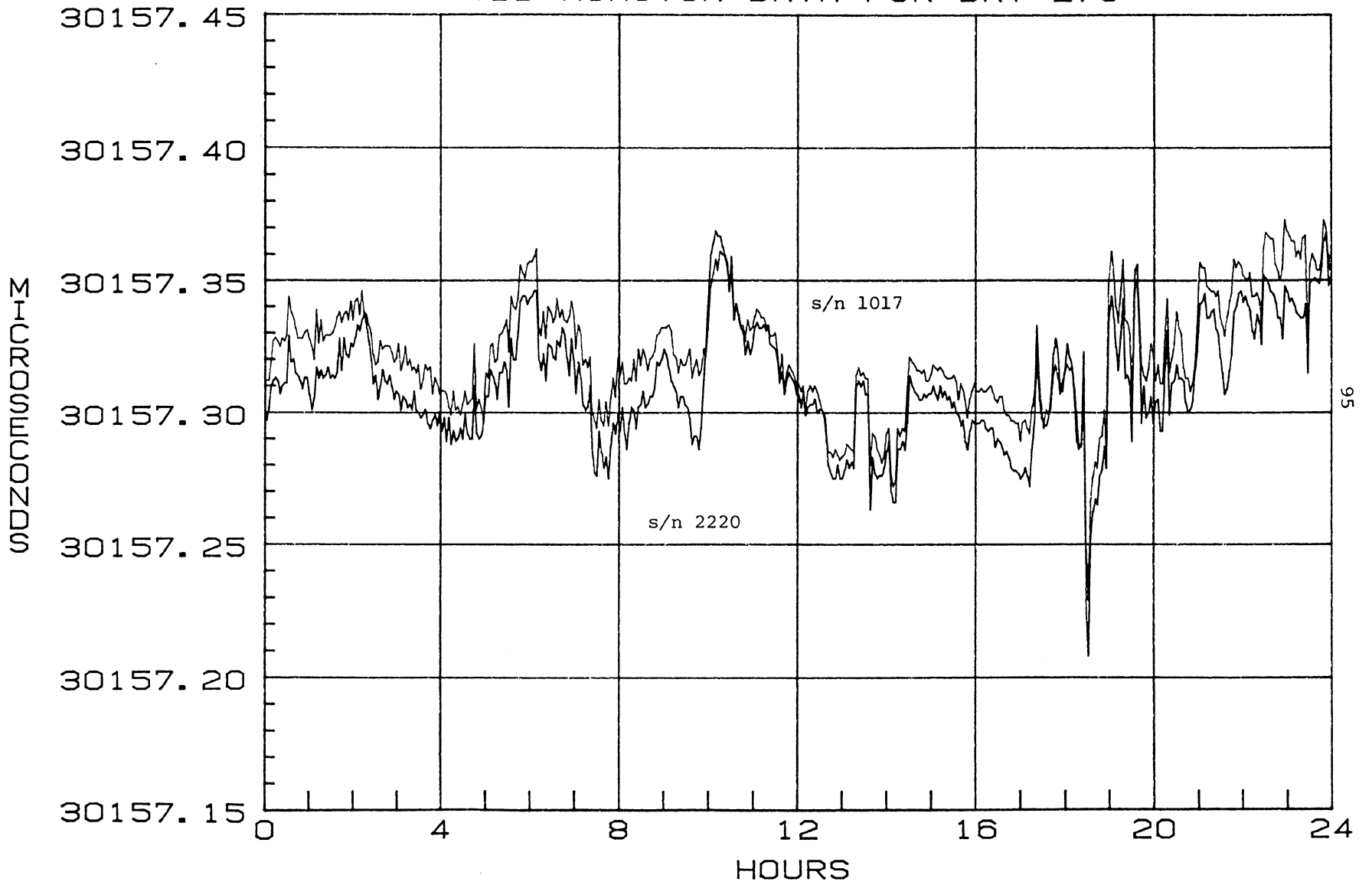
TDB MONITOR DATA FOR DAY 277



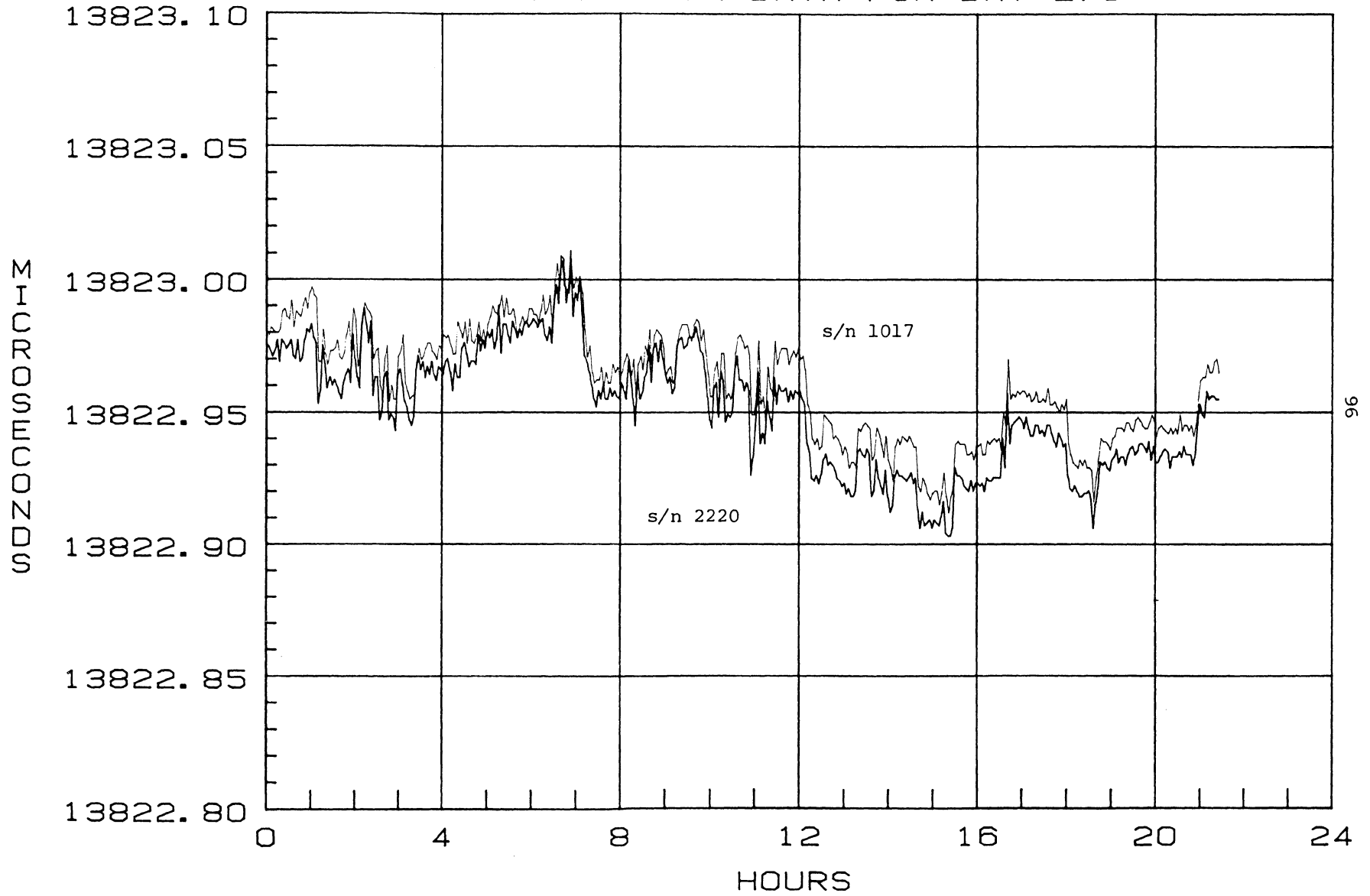
TDA MONITOR DATA FOR DAY 278



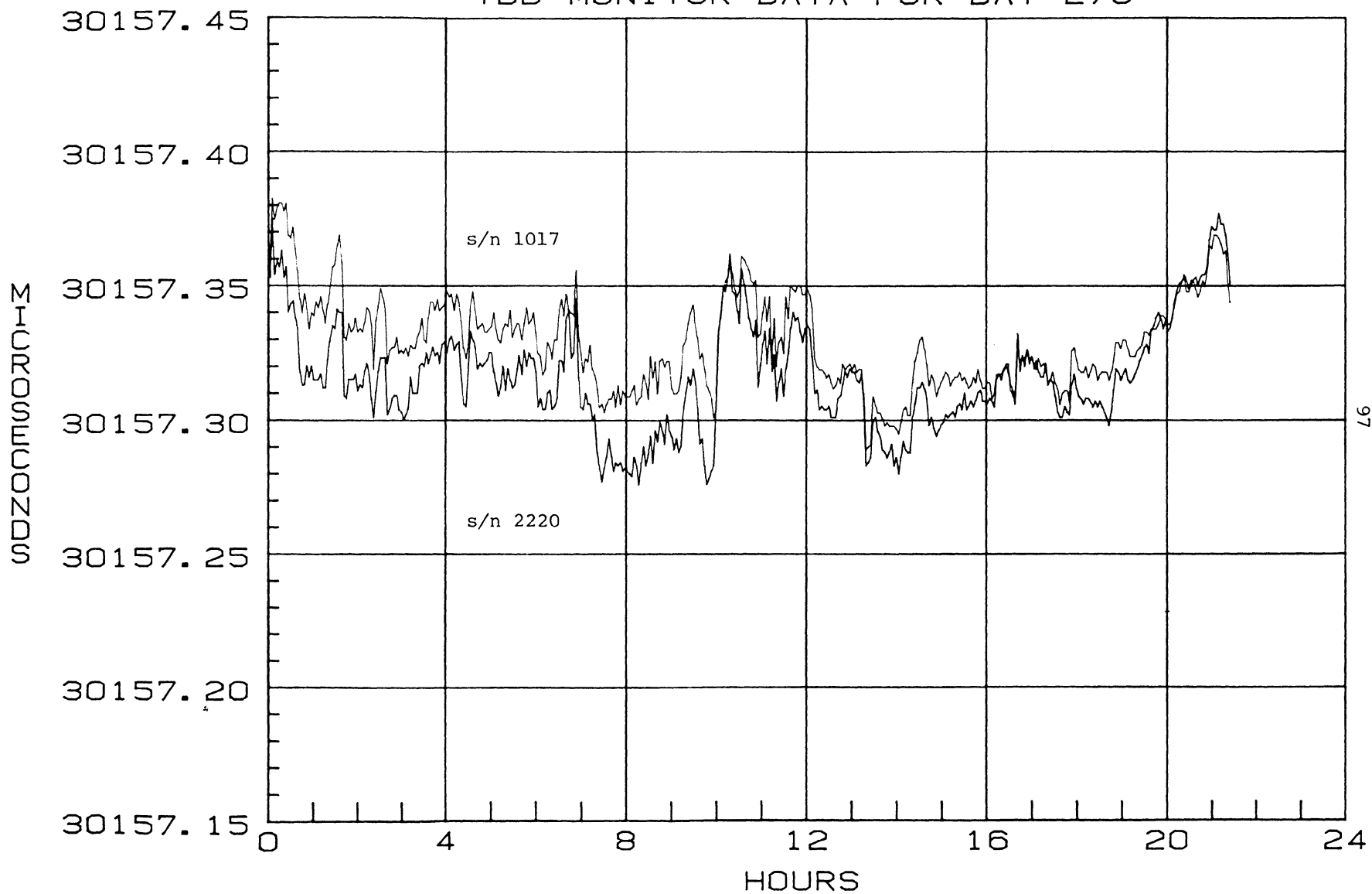
TDB MONITOR DATA FOR DAY 278



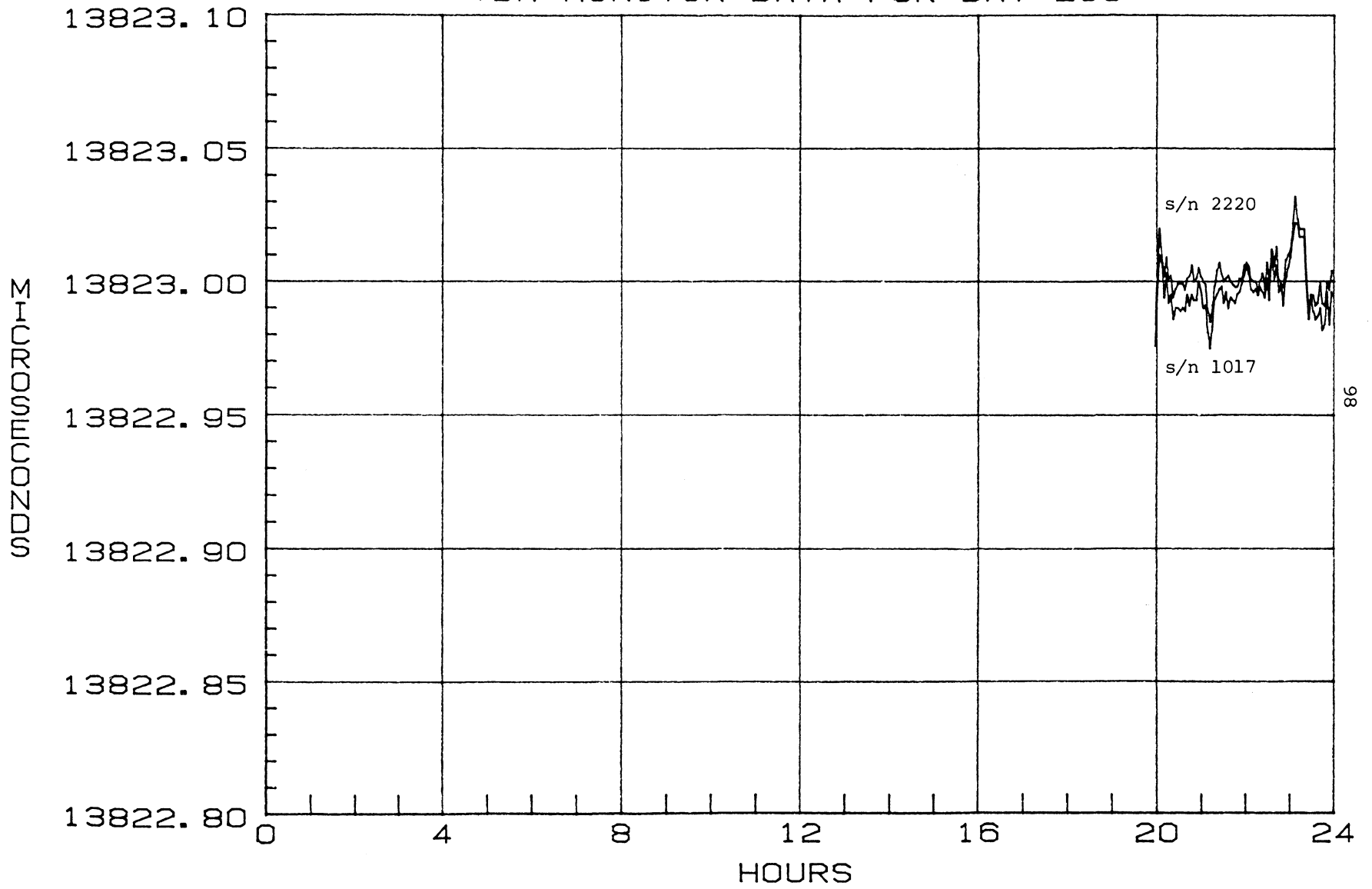
TDA MONITOR DATA FOR DAY 279



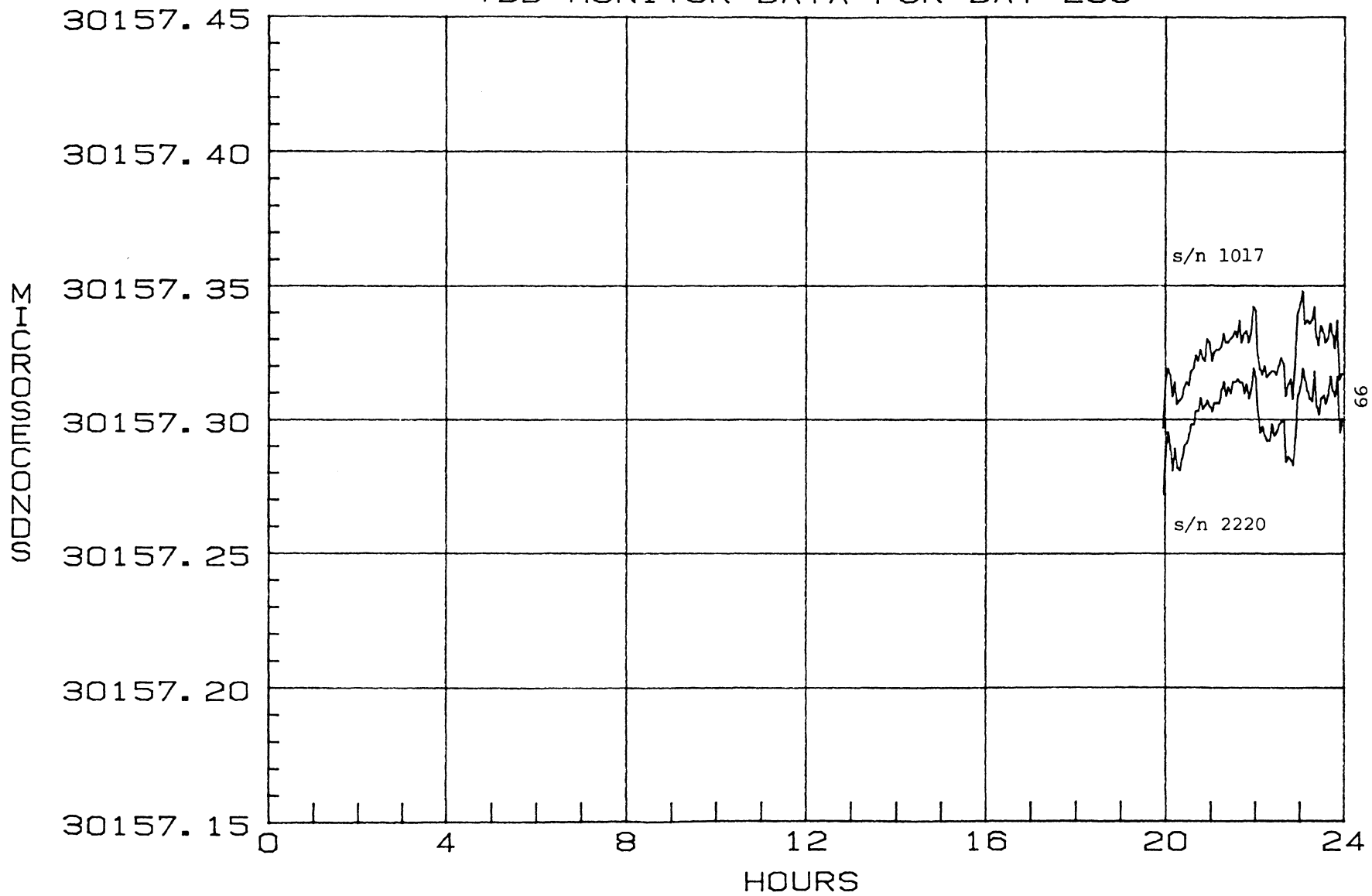
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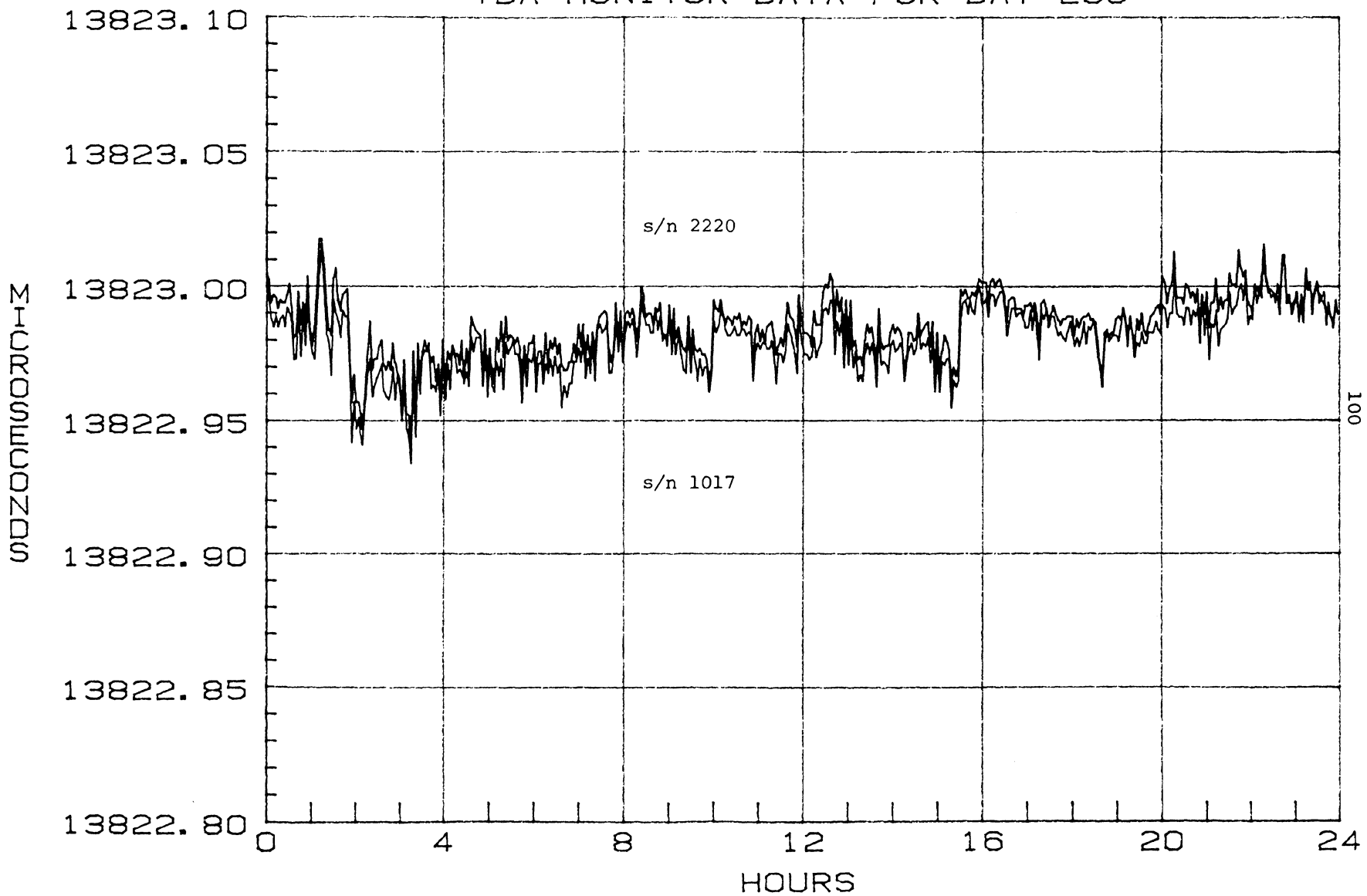
TDA MONITOR DATA FOR DAY 288



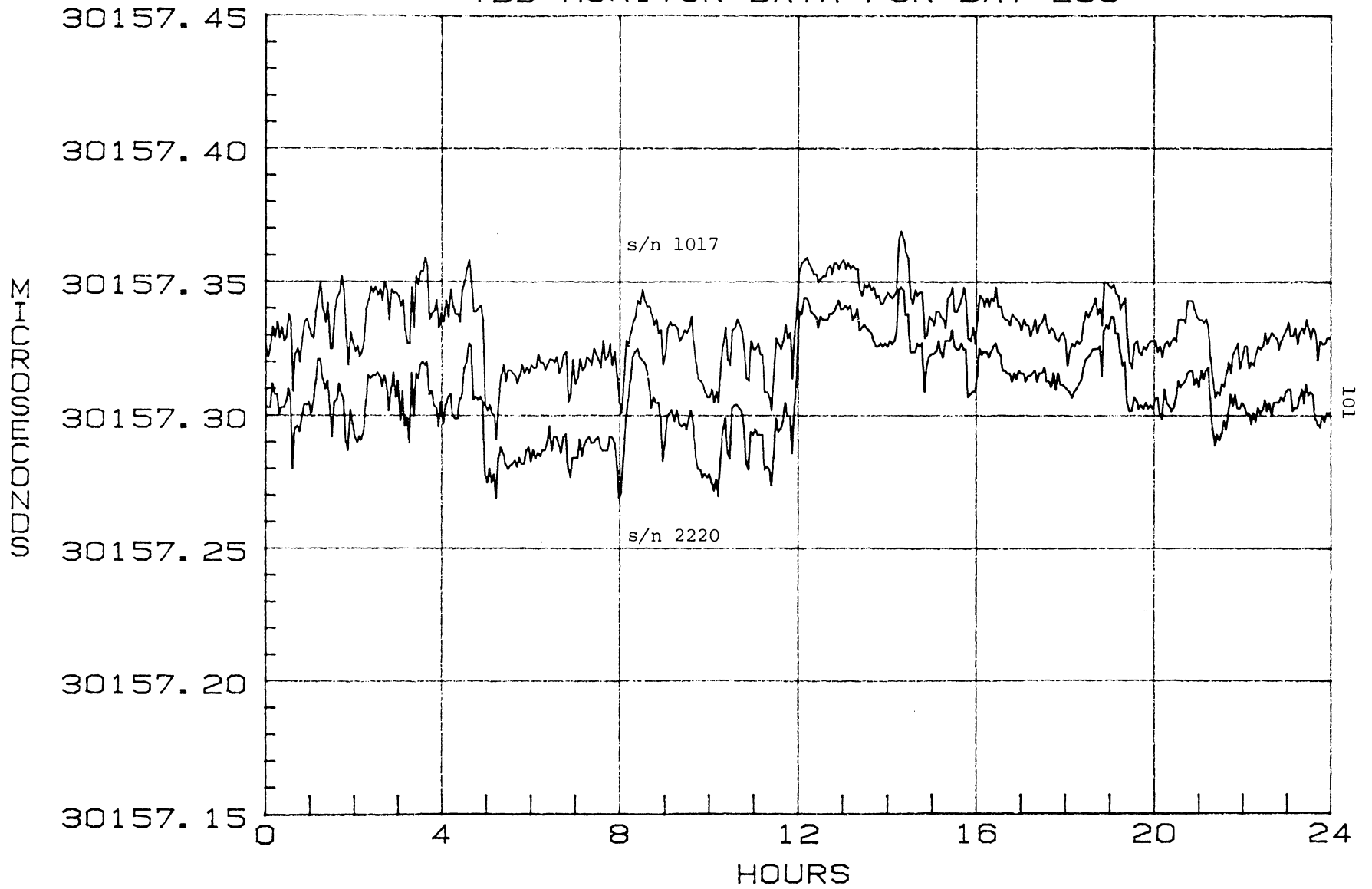
TDB MONITOR DATA FOR DAY 288



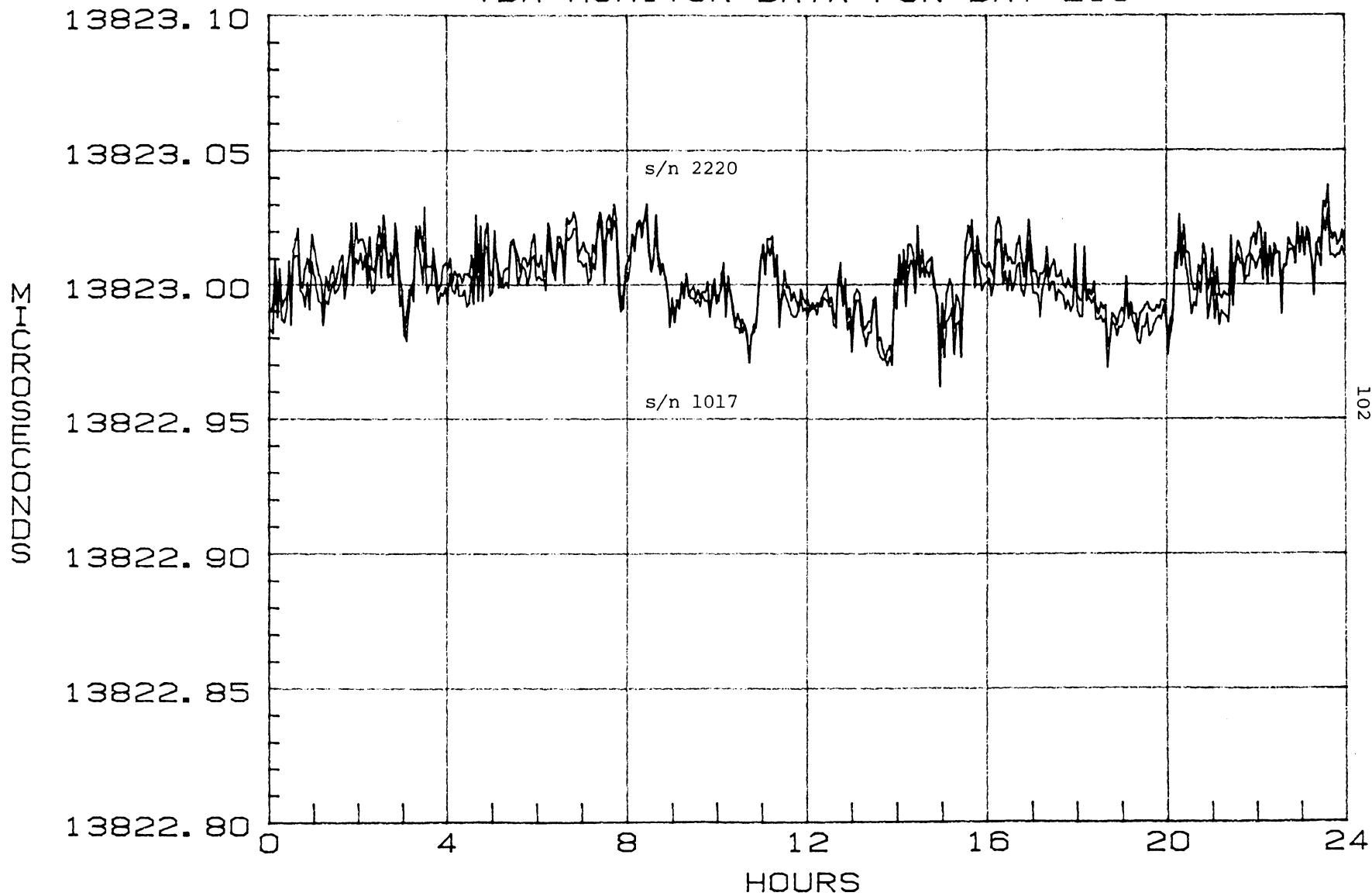
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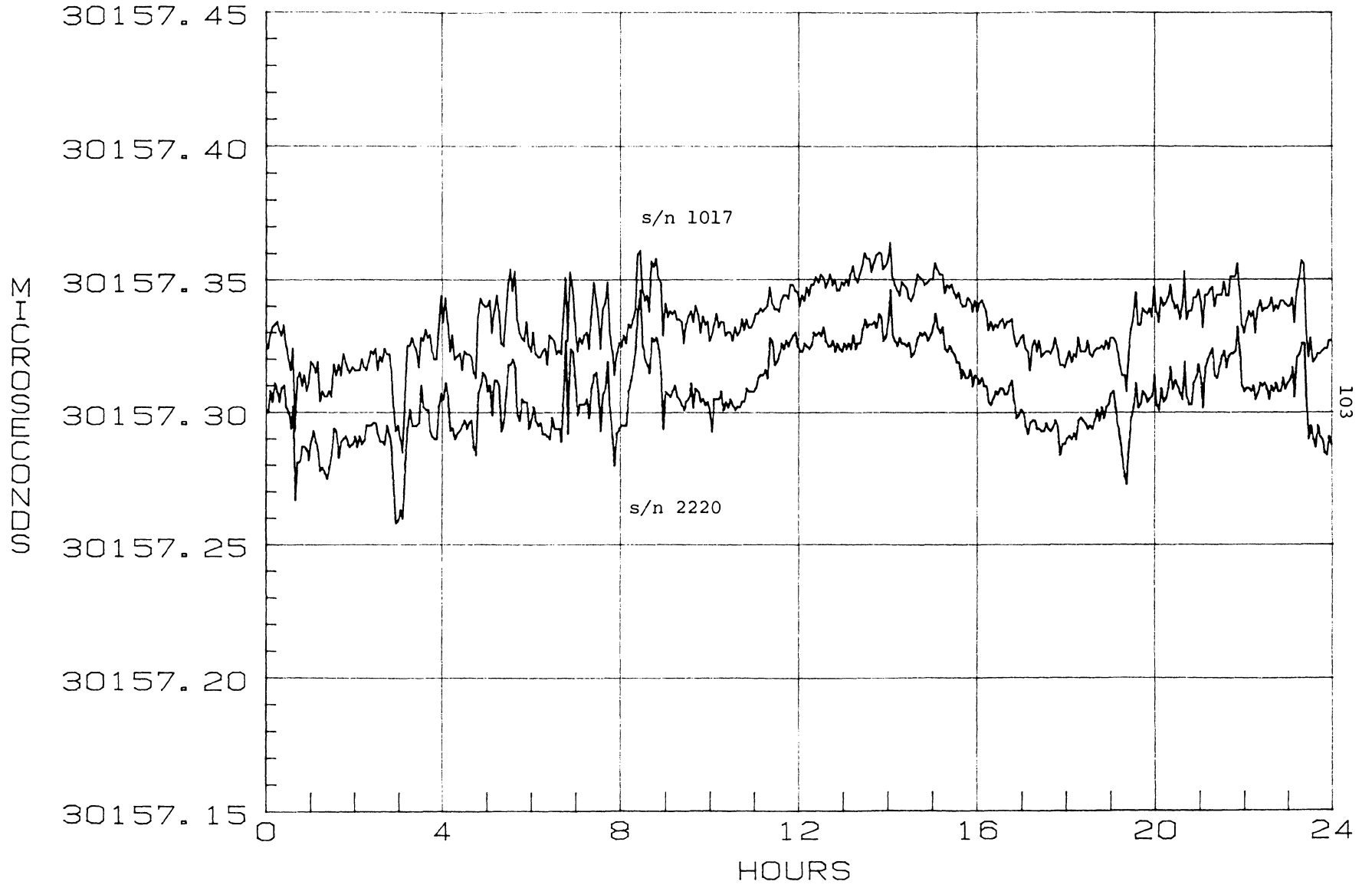
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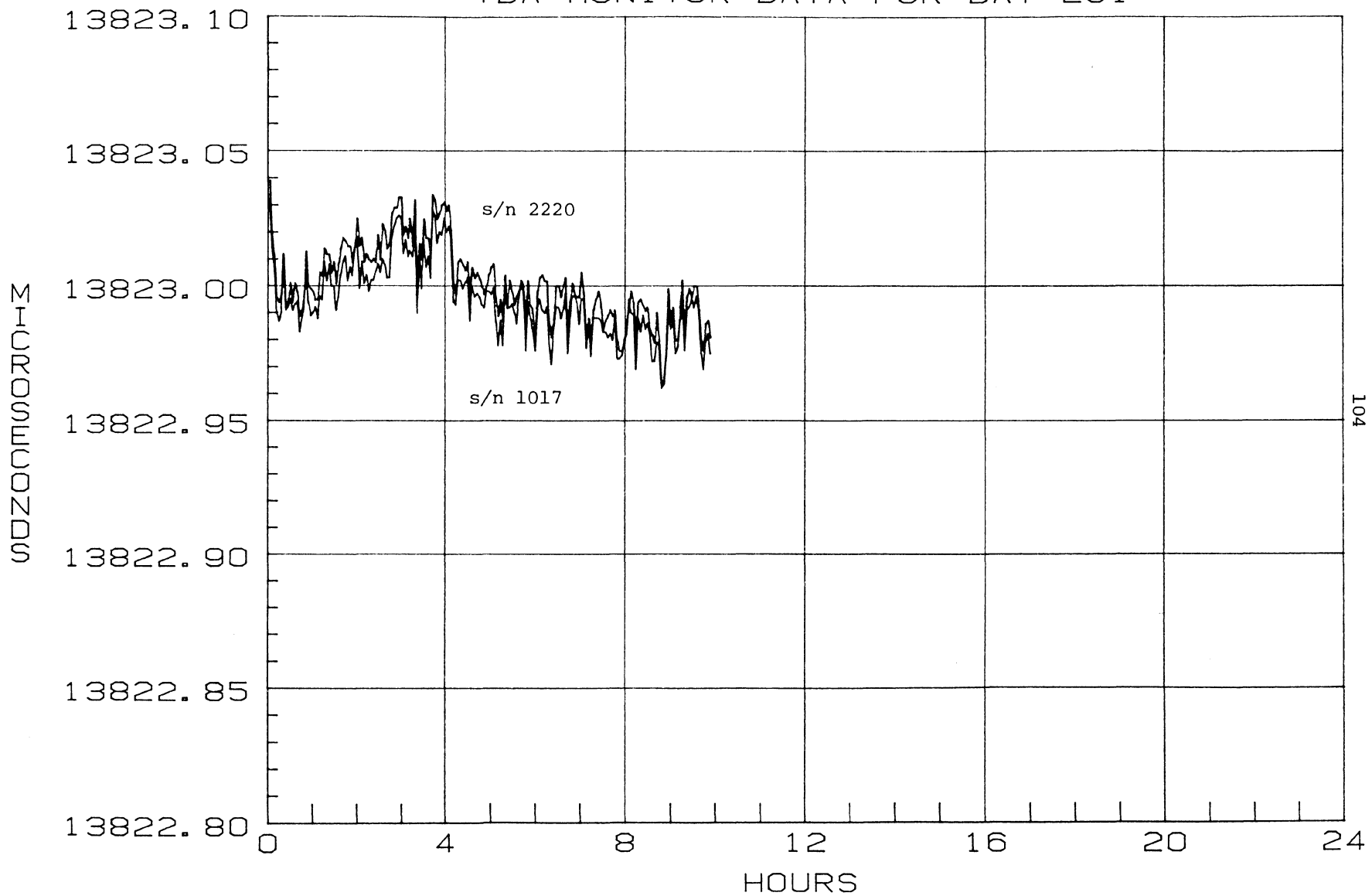
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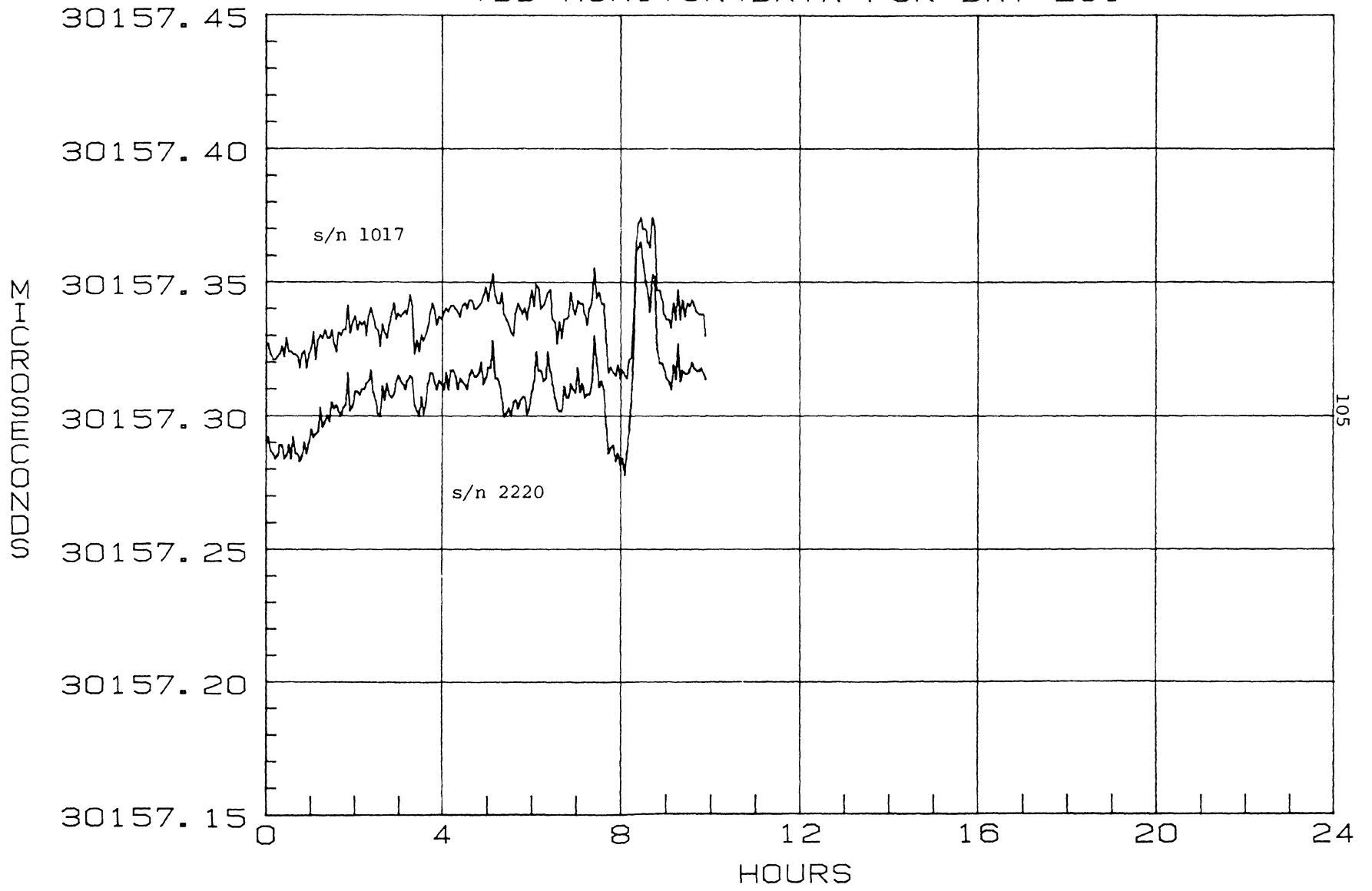
TDB MONITOR DATA FOR DAY 290



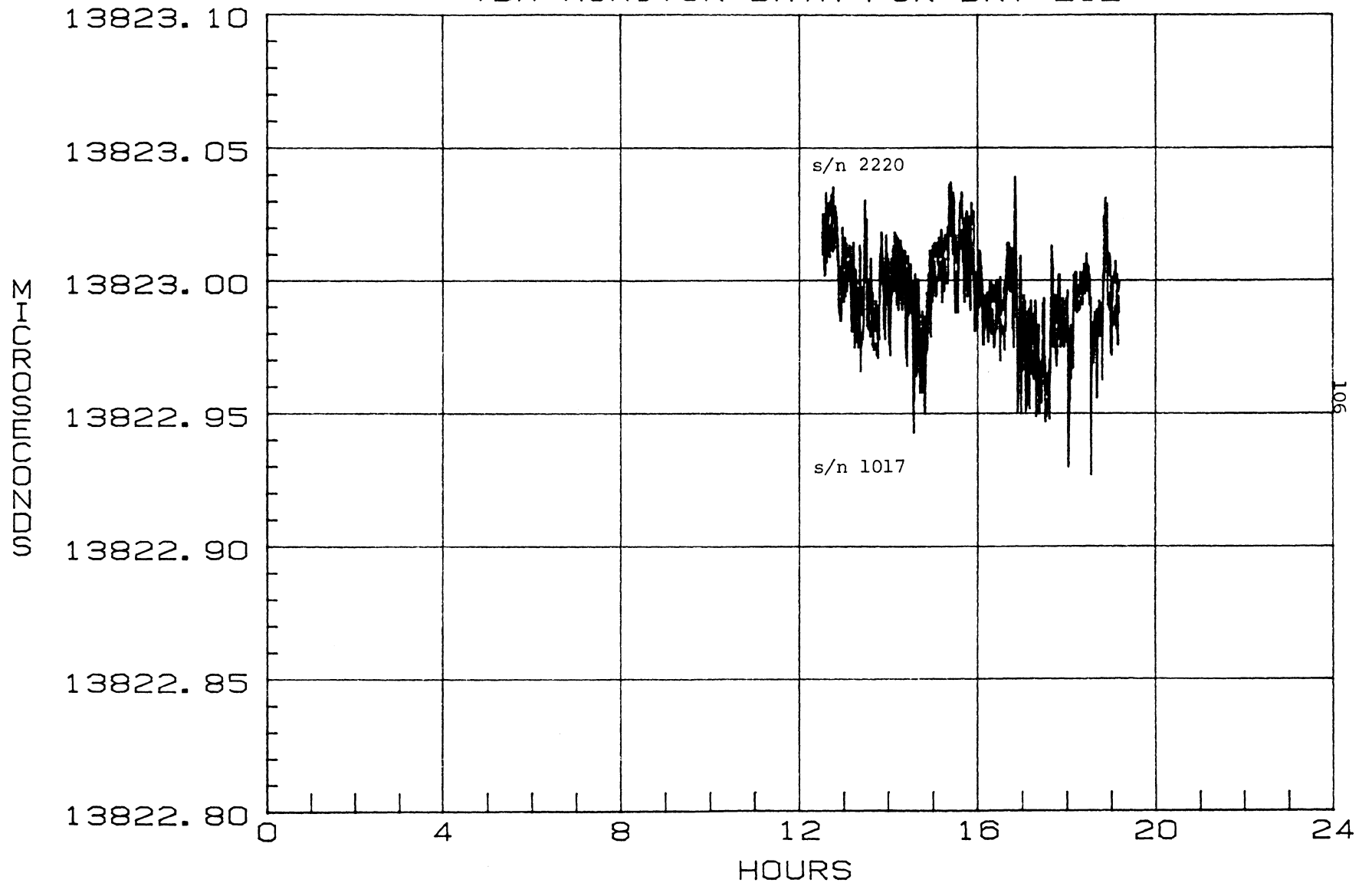
TDA MONITOR DATA FOR DAY 291



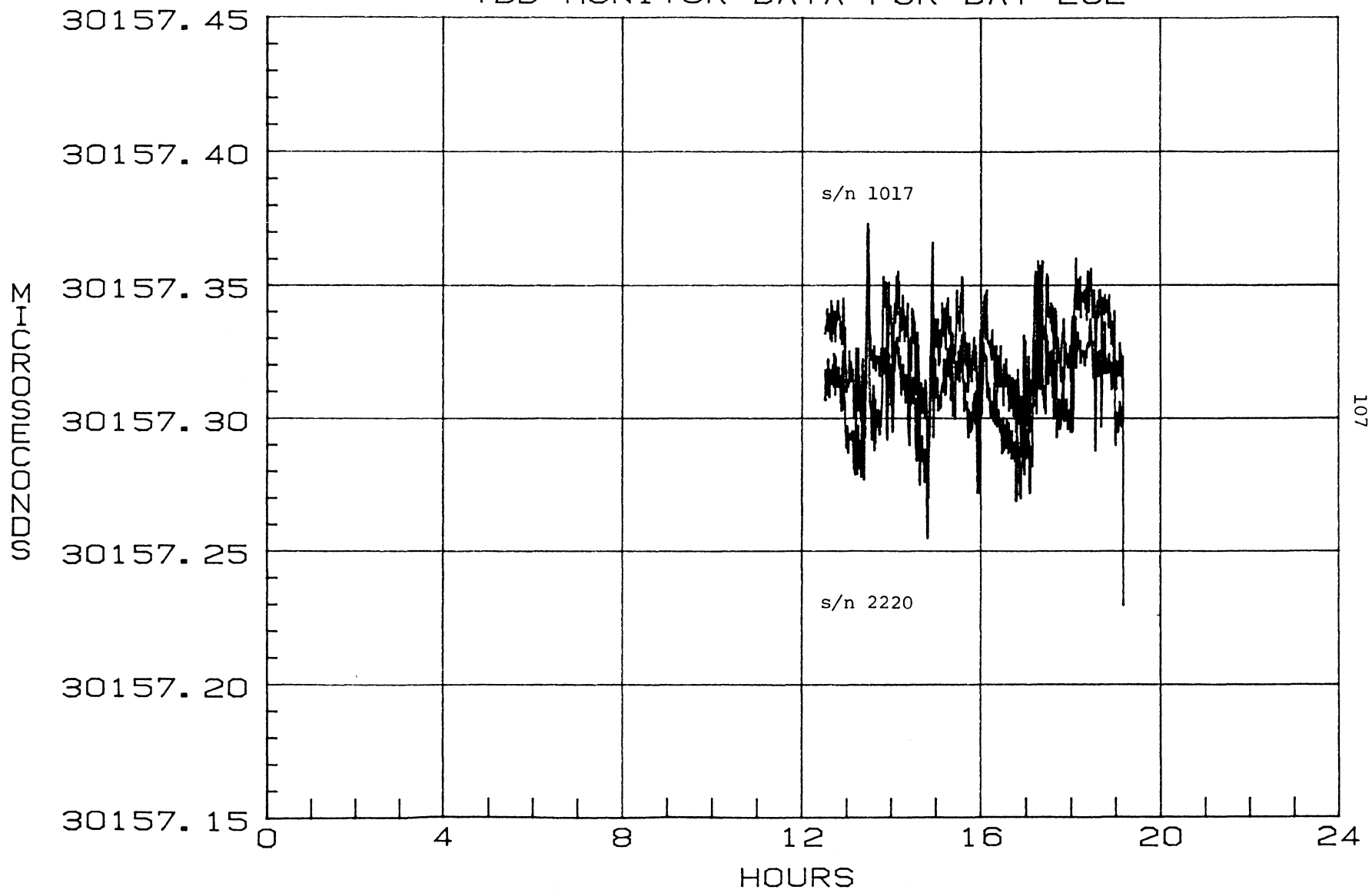
TDB MONITOR DATA FOR DAY 291



TDA MONITOR DATA FOR DAY 292



TDB MONITOR DATA FOR DAY 292



APPENDIX VI

VAN SITE PLOTS

For this experiment, the BIO calibration van, carrying an Internav 404 LORAN-C receiver, occupied ten sites, each of which was visited up to four times. Plots of all data for each site are presented together in the following subsections of this appendix:

- VI.1 Lower Prospect
- VI.2 Peggy's Cove
- VI.3 Blandford
- VI.4 Battery Point
- VI.5 Dublin Shore
- VI.6 Medway Head
- VI.7 Western Head Liverpool
- VI.8 Port Joli
- VI.9 Western Head Lockport
- VI.10 Ingomar

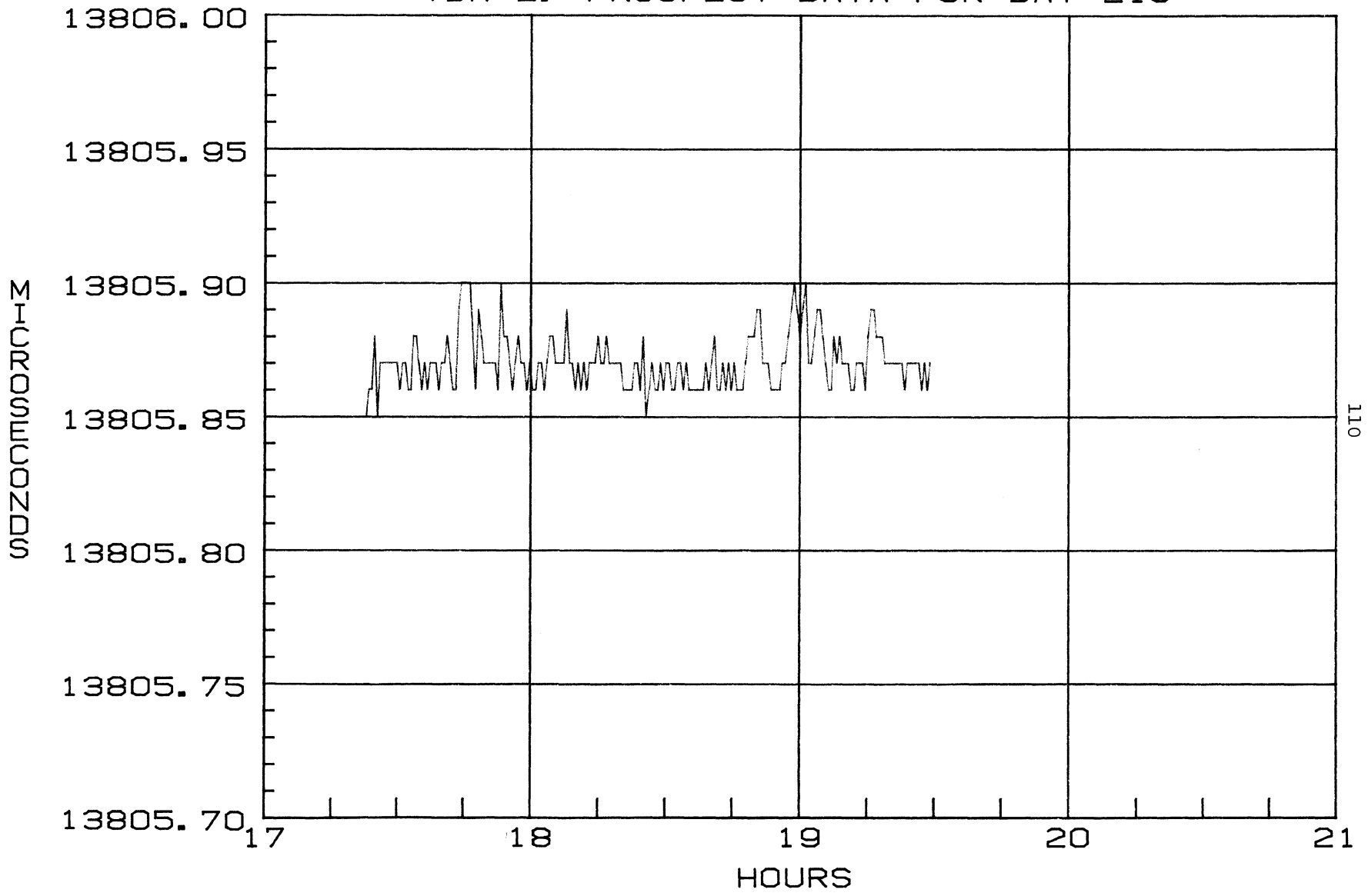
With each subsection, plots of the data from each visit are presented together. For each visit four plots are given:

- TDA raw data (LORAN chain 5930 Caribou-Nantucket time difference)
- TDB raw data (LORAN chain 5930 Caribou-Cape Race time difference)
- TDA differences (van site - monitor)
- TDB differences (van site - monitor).

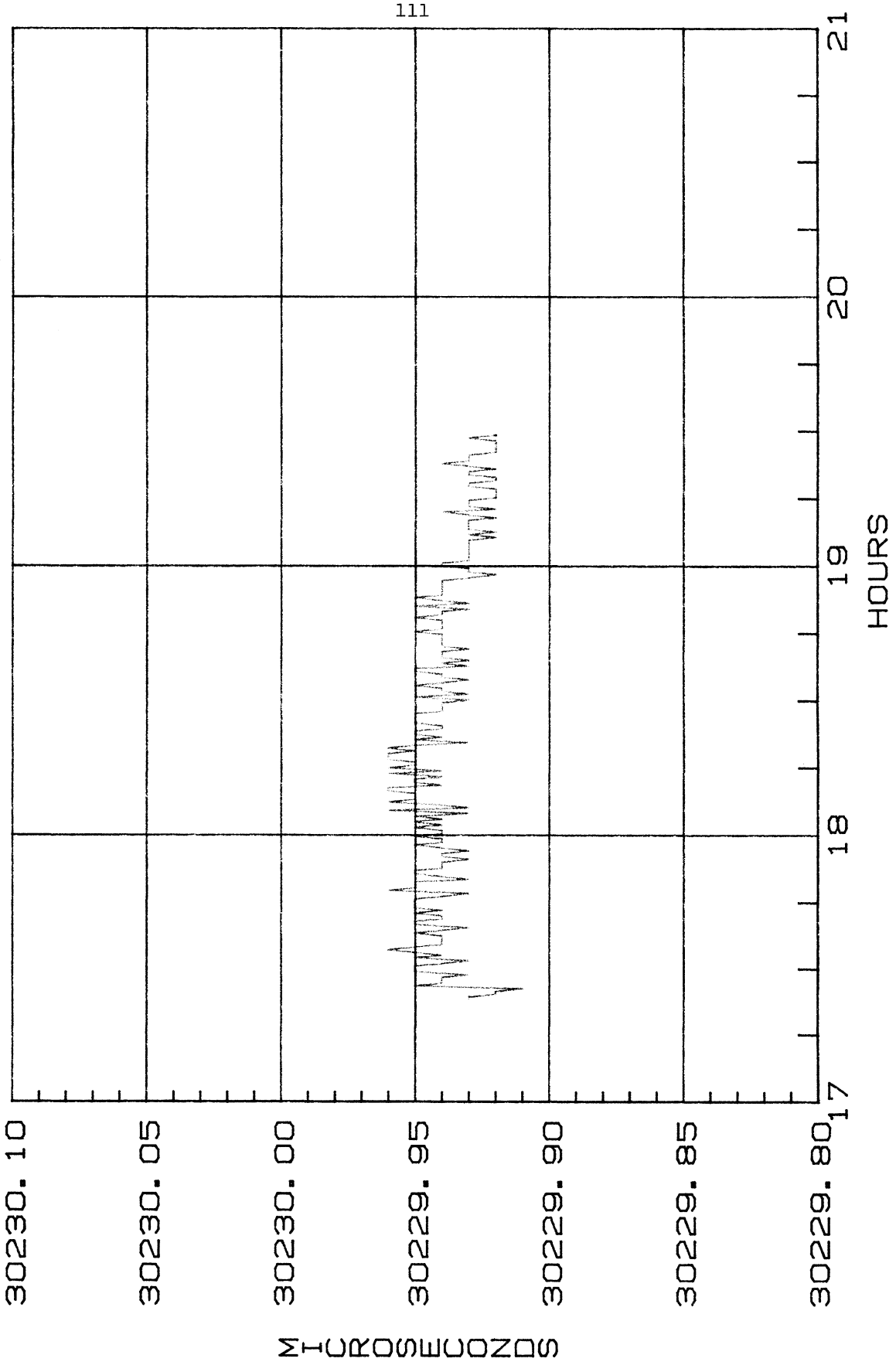
APPENDIX VI.1

LOWER PROSPECT

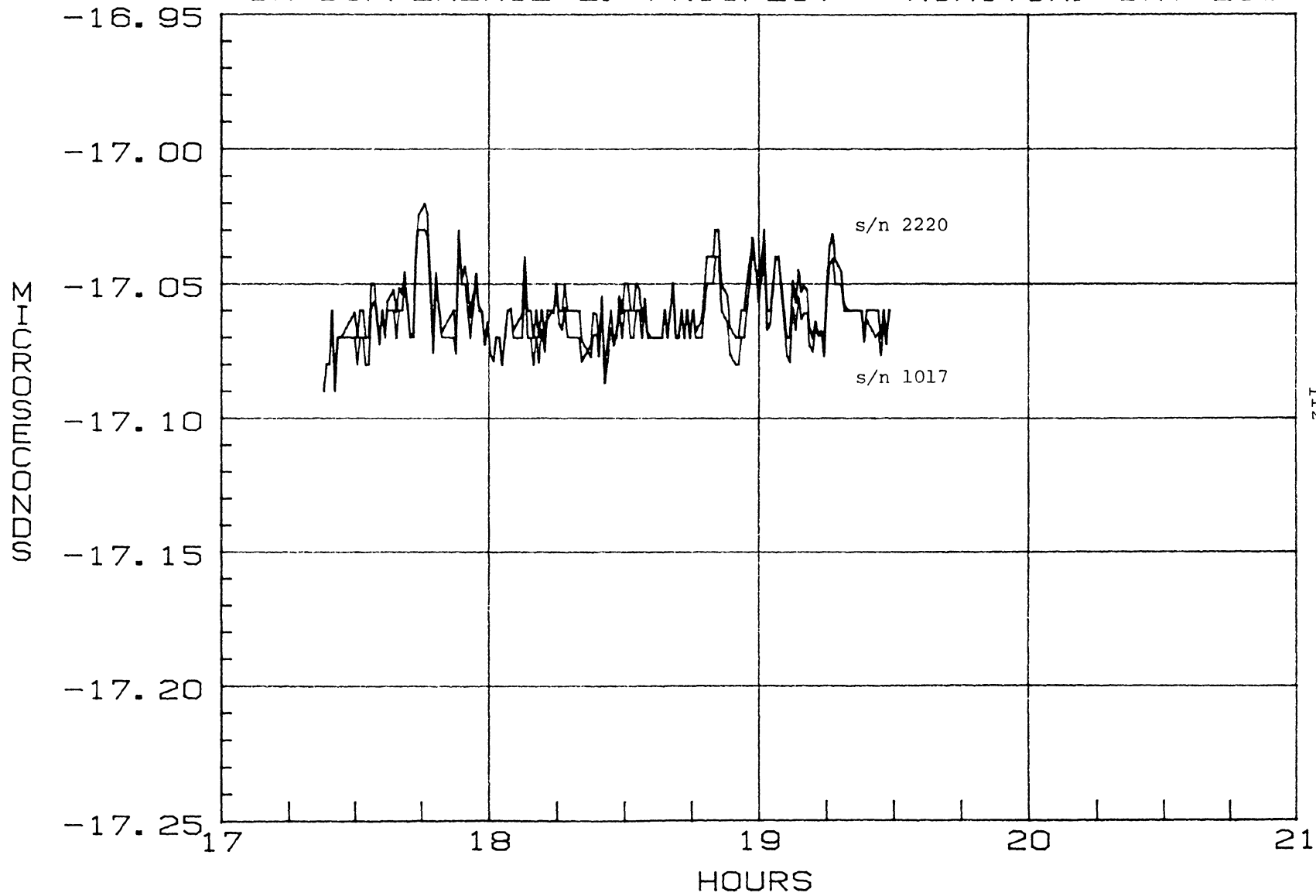
TDA L. PROSPECT DATA FOR DAY 218



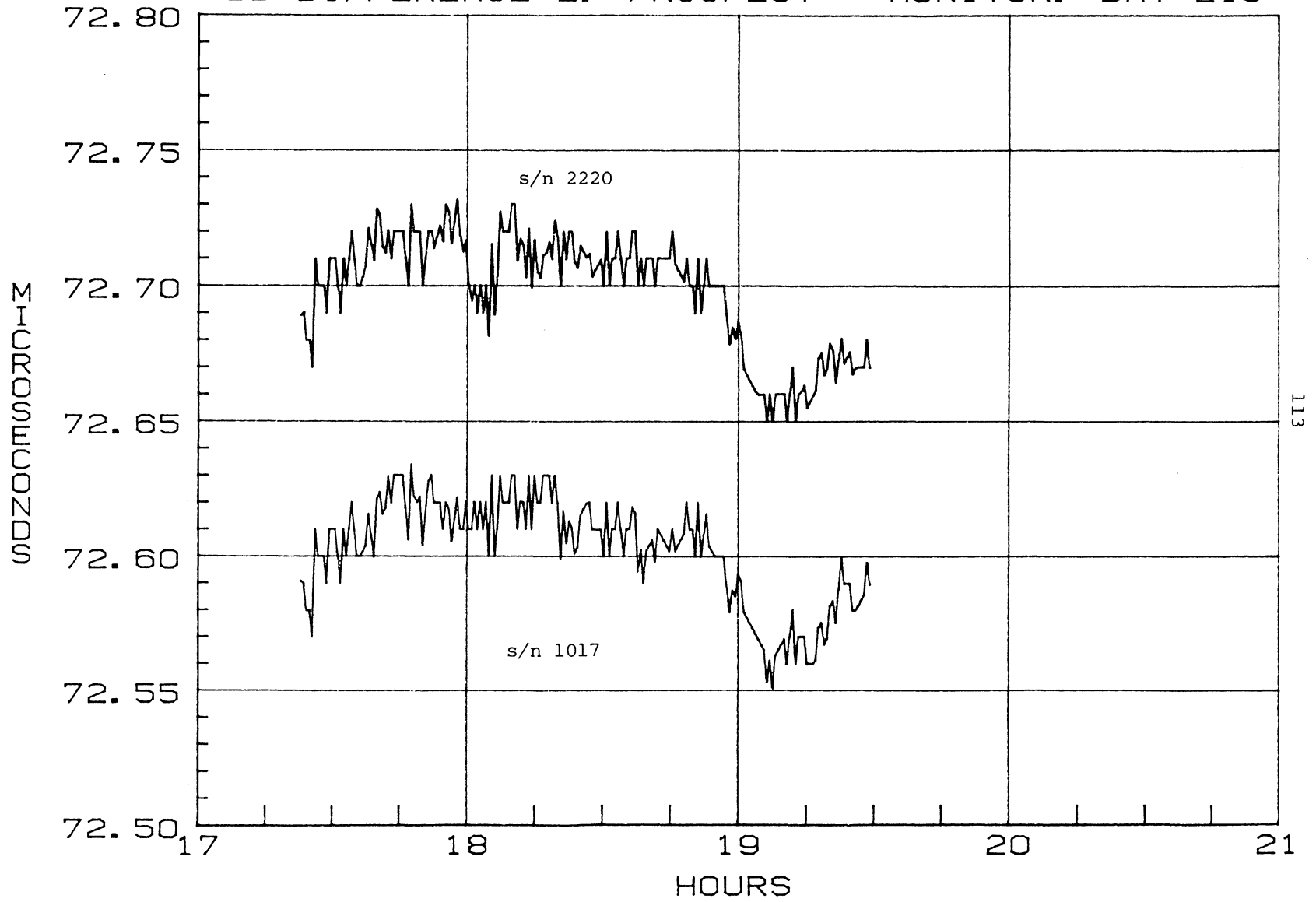
TDB L. PROSPECT DATA FOR DAY 218



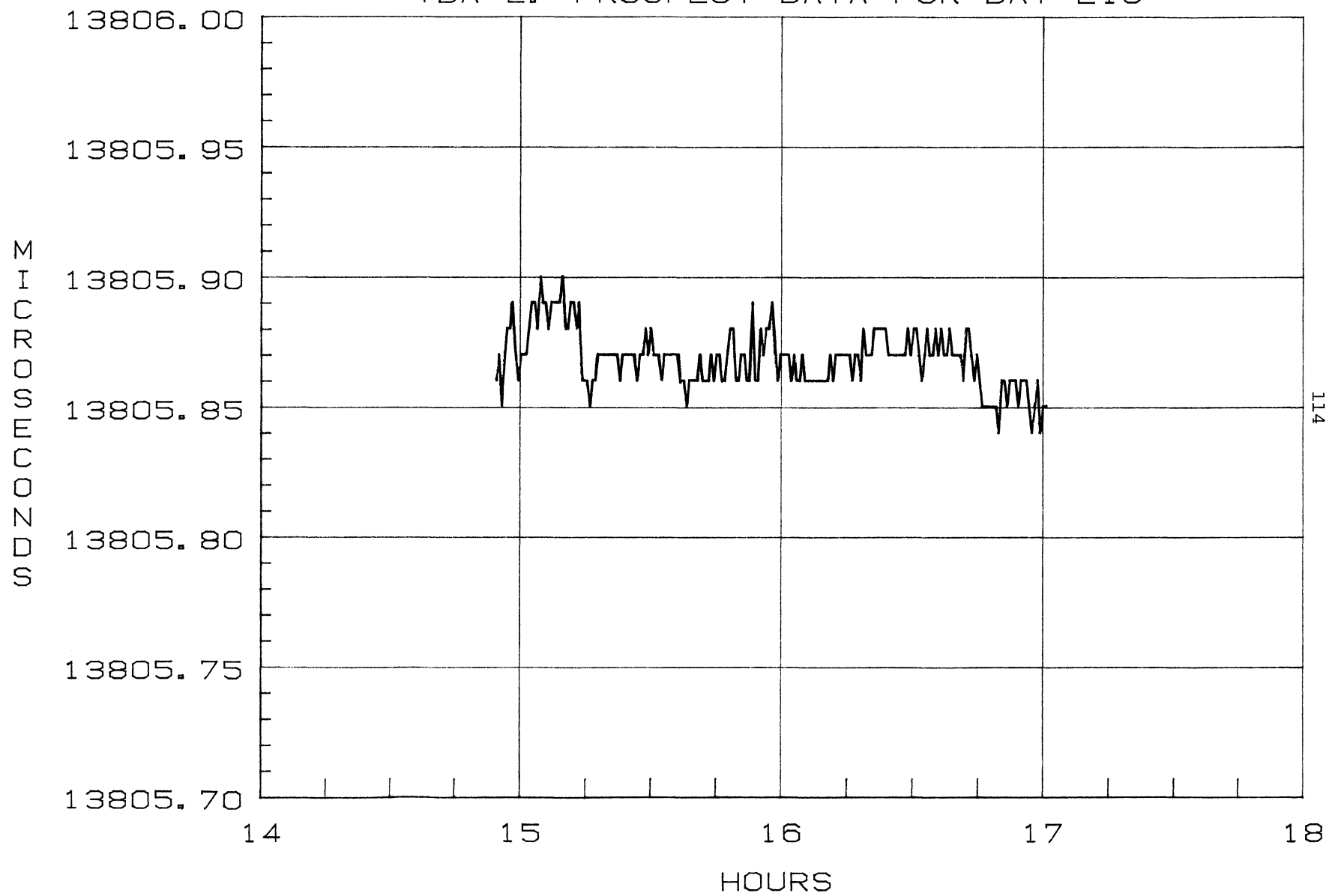
TDA DIFFERENCE L. PROSPECT - MONITOR. DAY 218



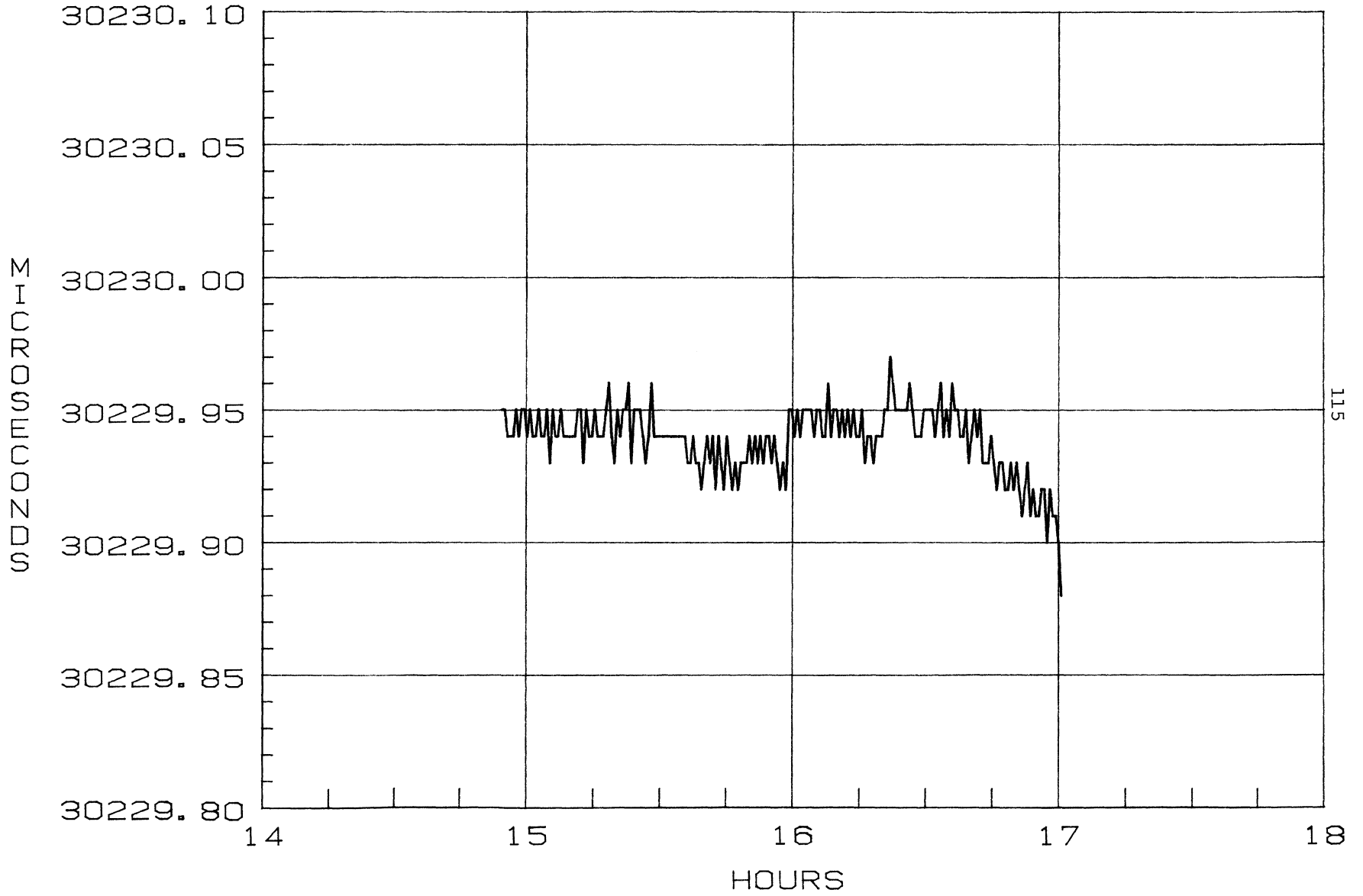
TDB DIFFERENCE L. PROSPECT - MONITOR. DAY 218



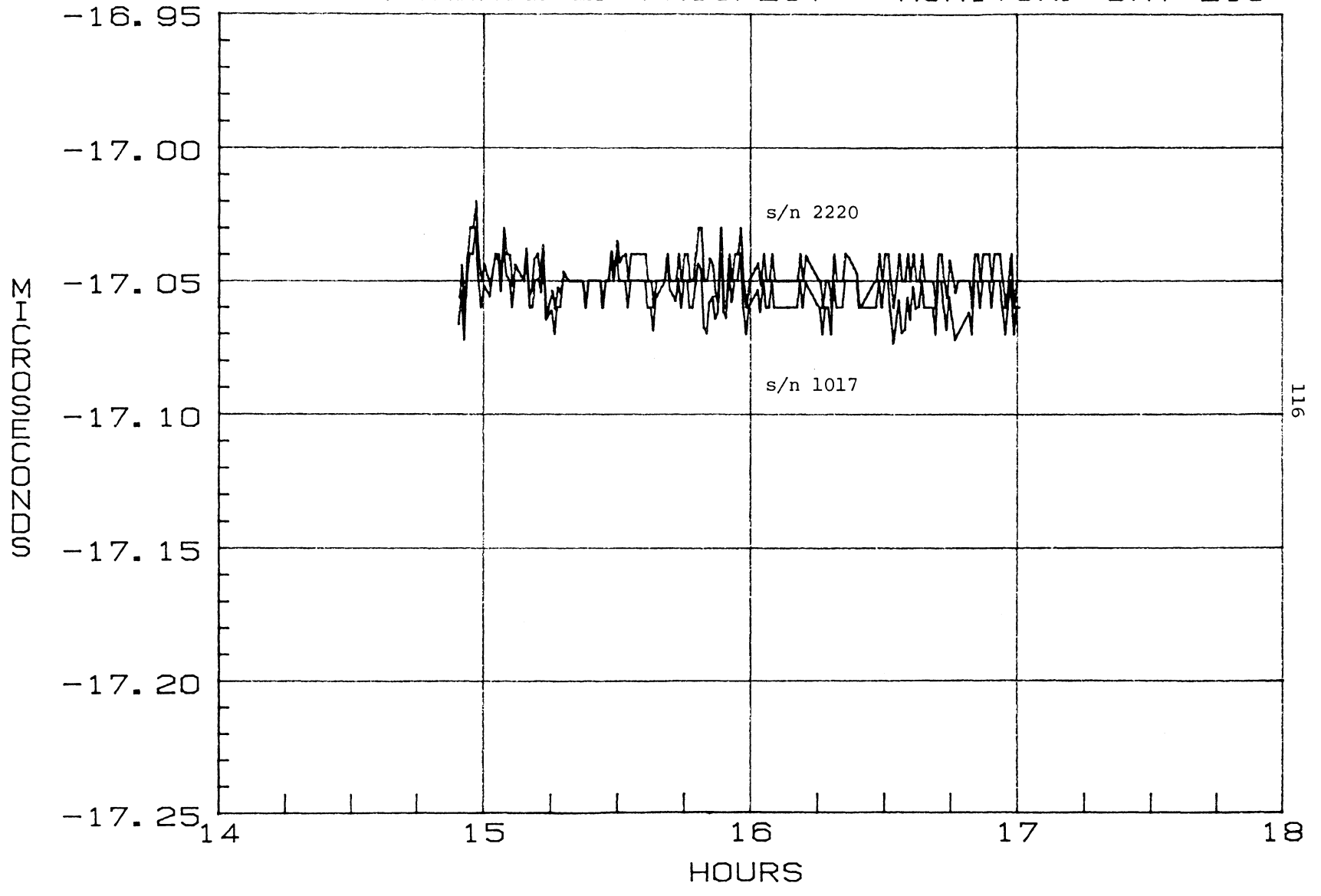
TDA L. PROSPECT DATA FOR DAY 219



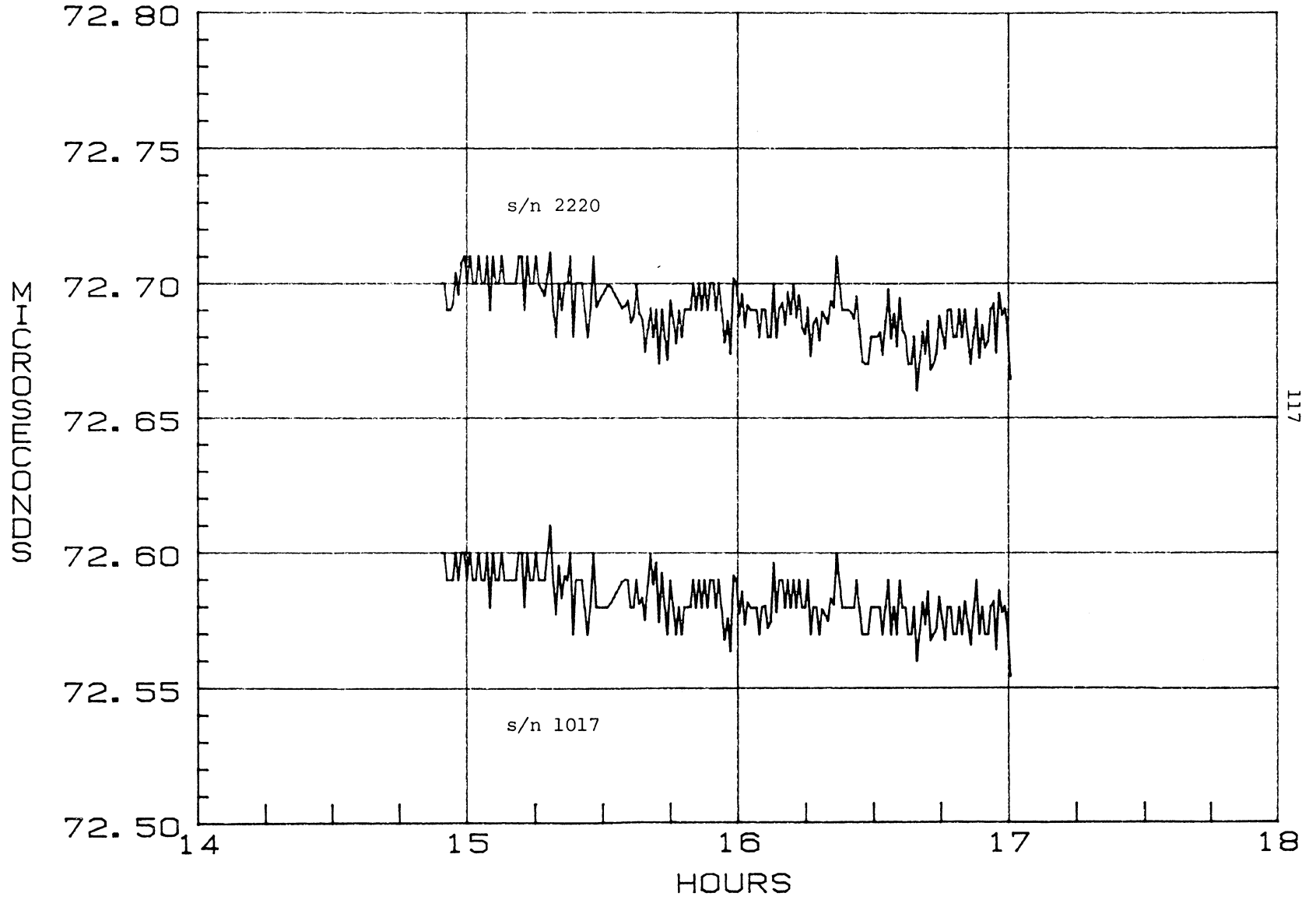
TDB L. PROSPECT DATA FOR DAY 219



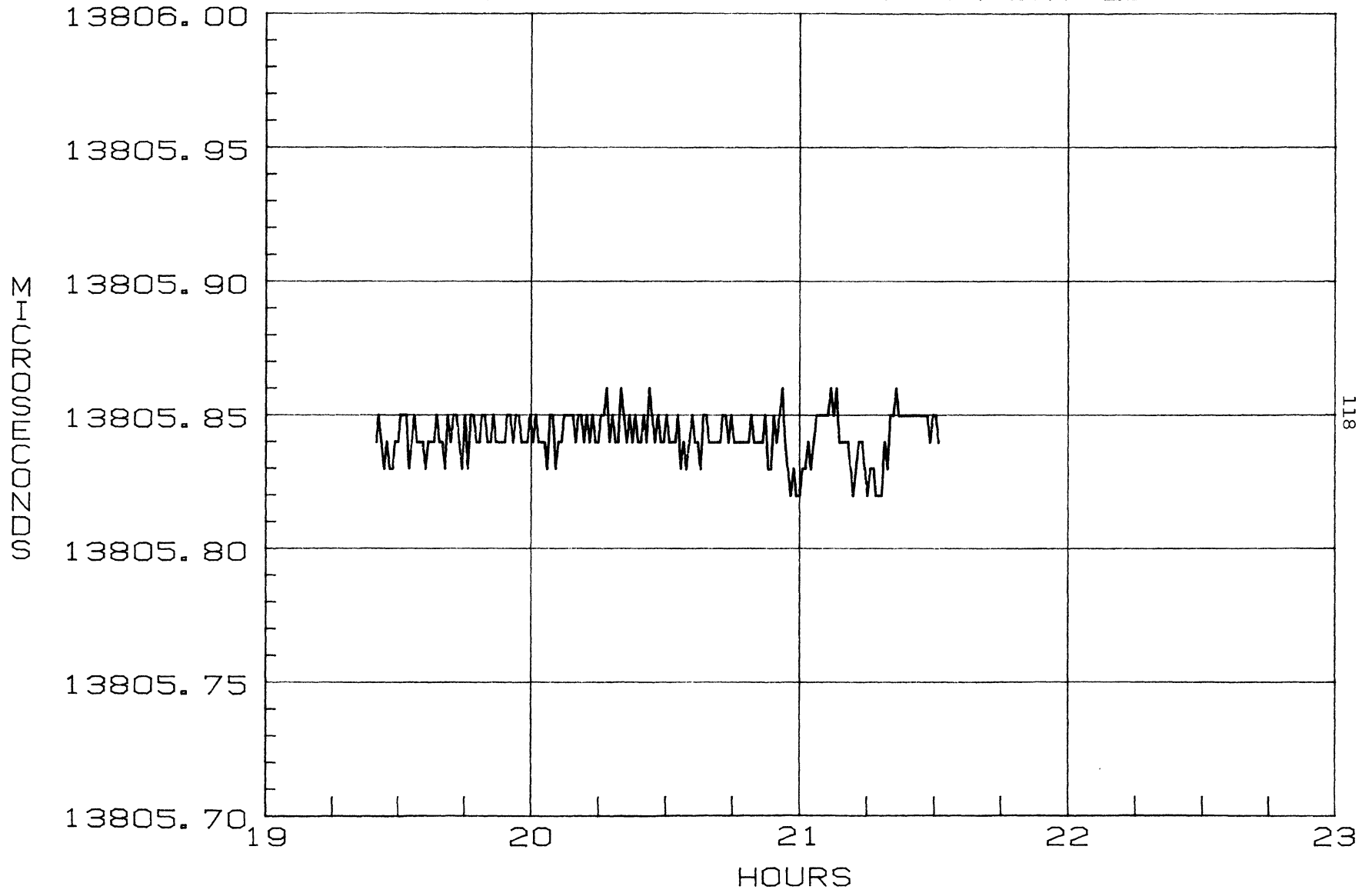
TDA DIFFERENCE L. PROSPECT - MONITOR. DAY 219



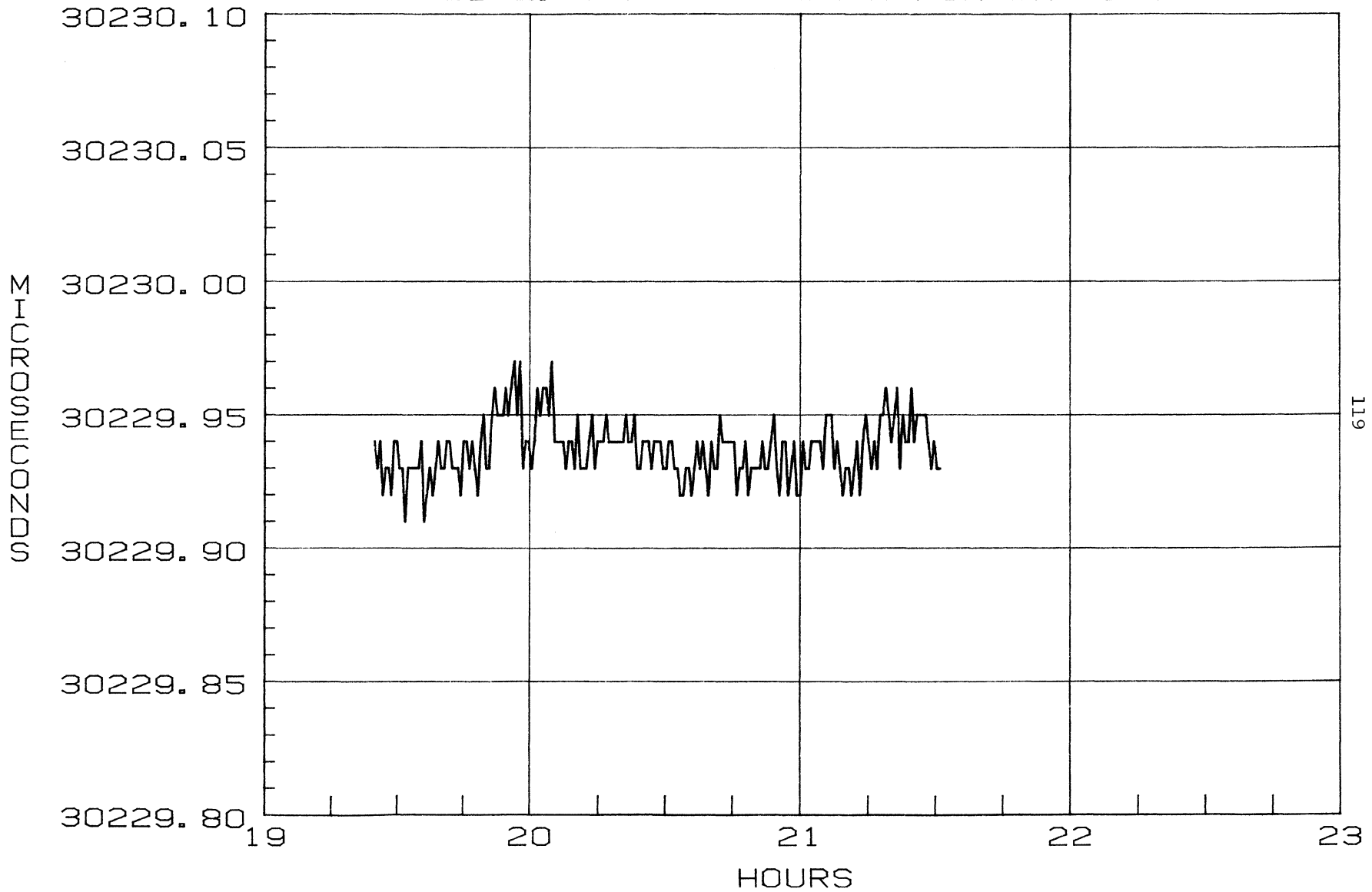
TDB DIFFERENCE L. PROSPECT - MONITOR. DAY 219



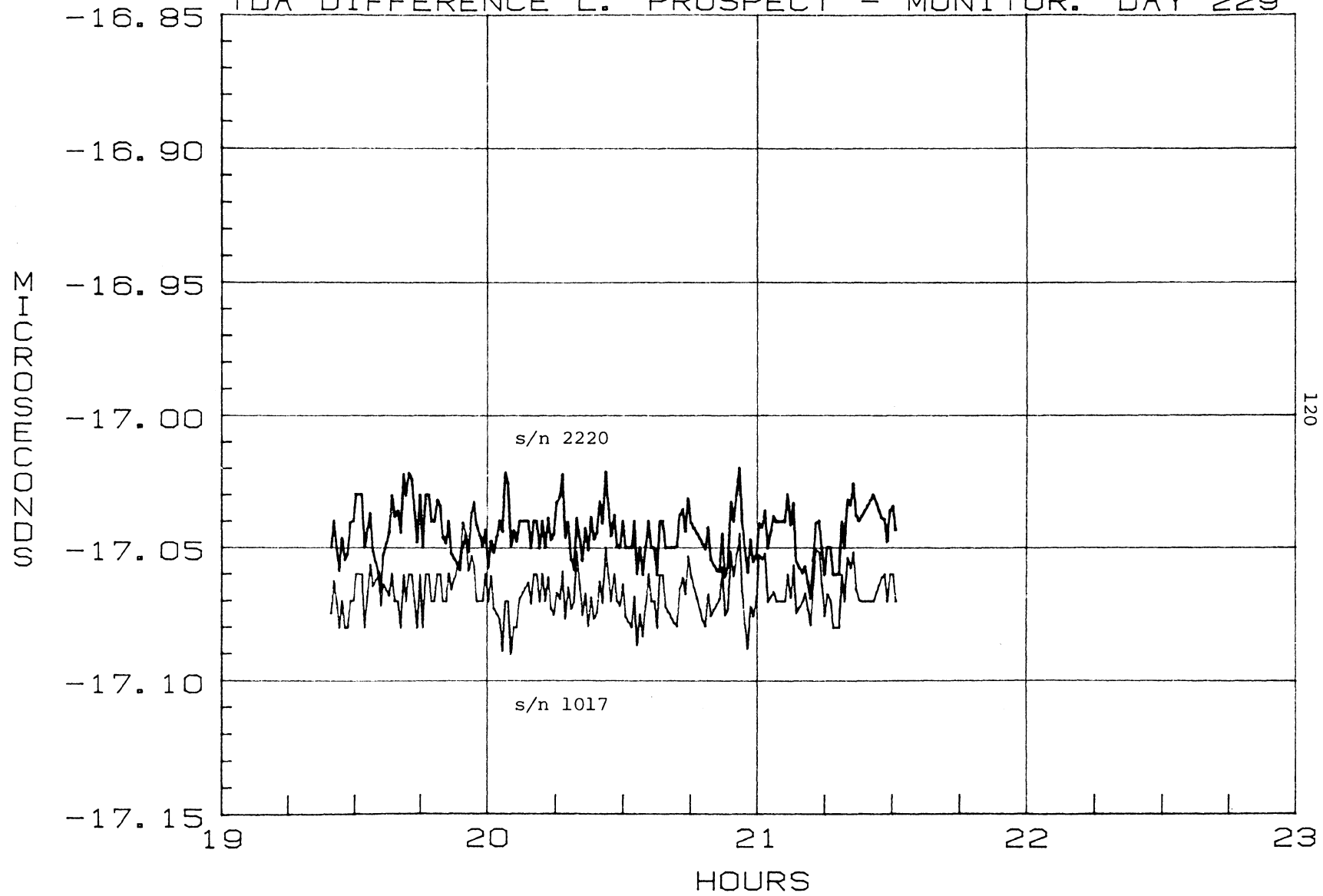
TDA L. PROSPECT DATA FOR DAY 229



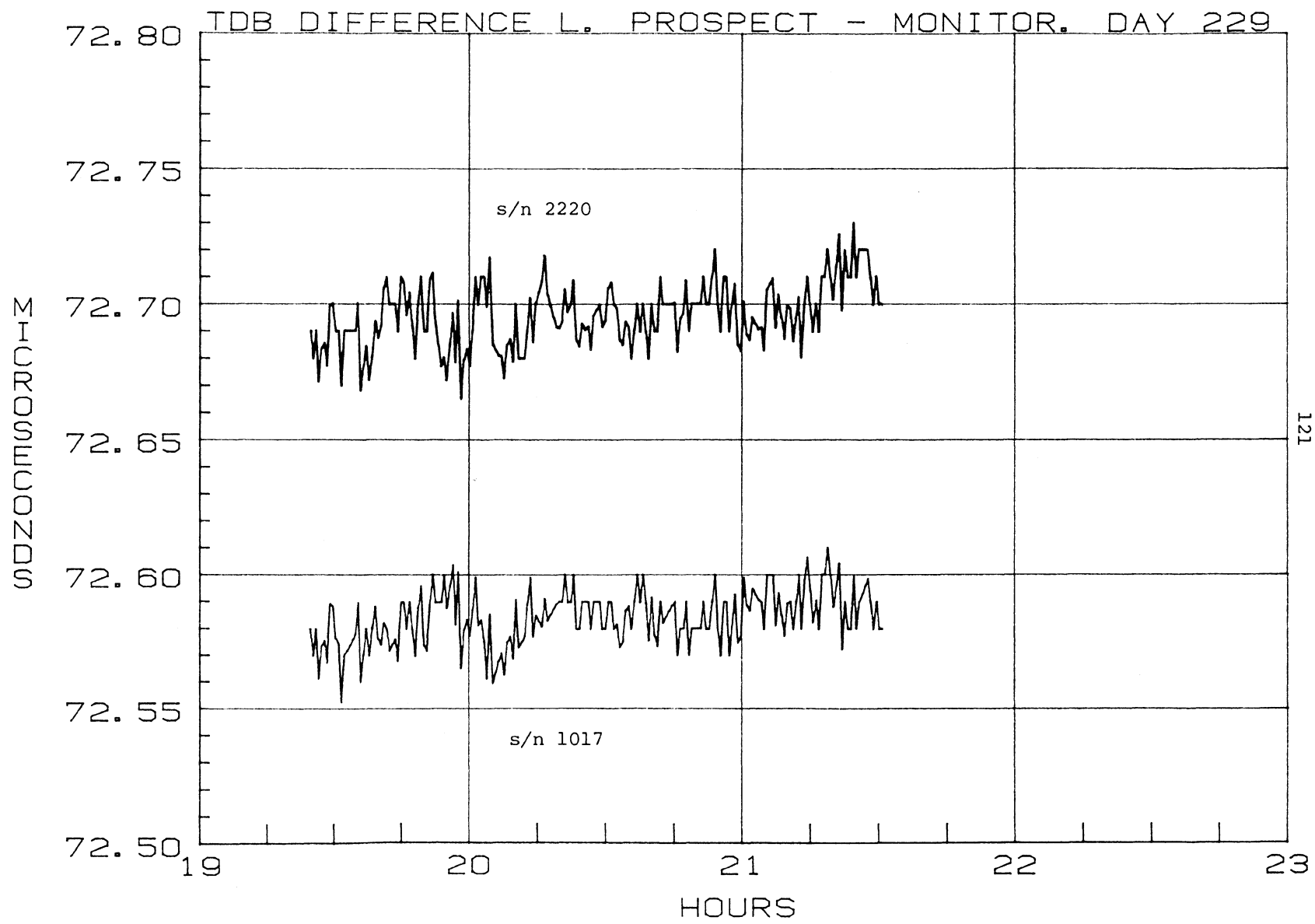
TDB L. PROSPECT DATA FOR DAY 229



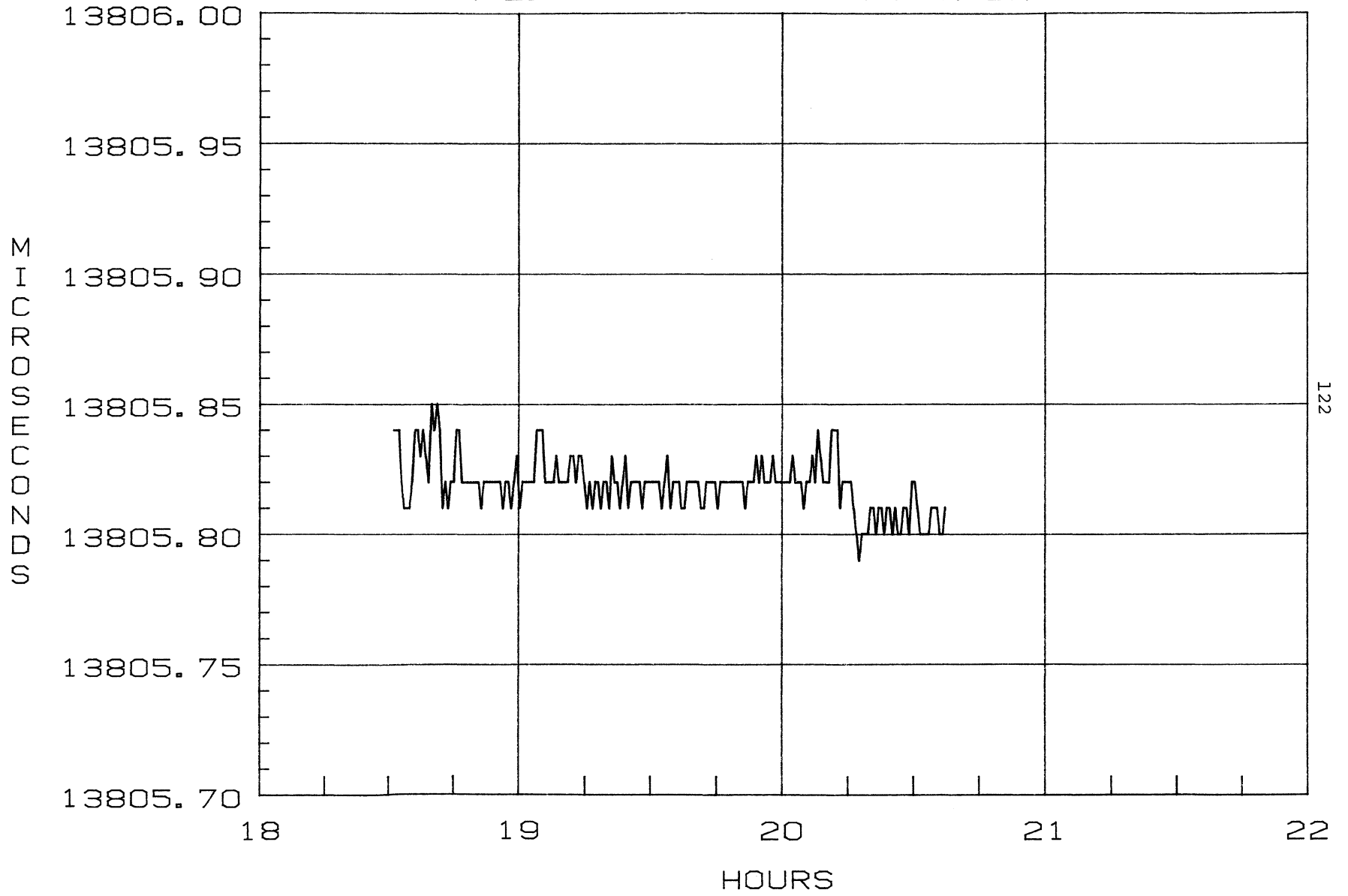
TDA DIFFERENCE L. PROSPECT - MONITOR. DAY 229



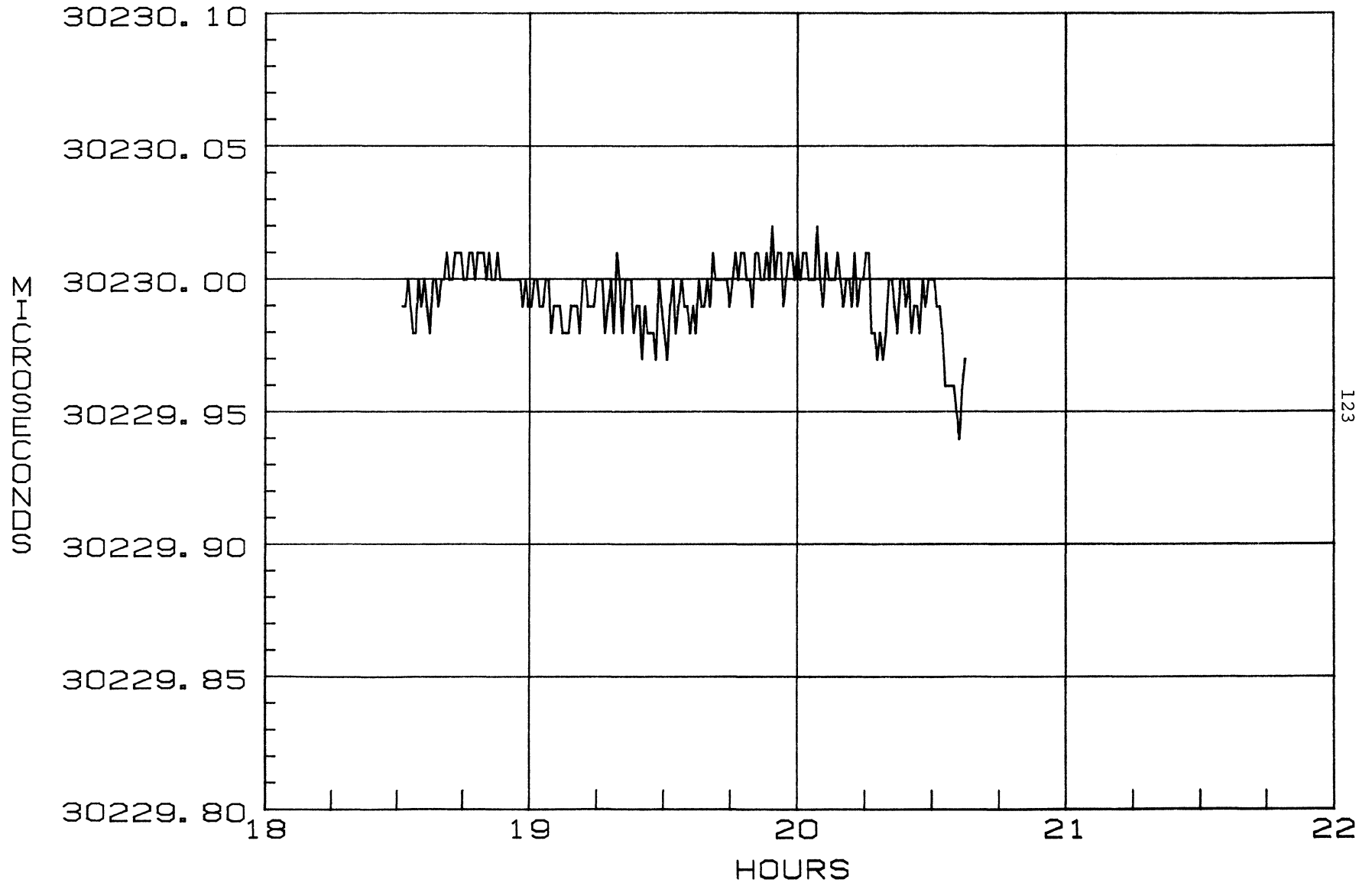
120



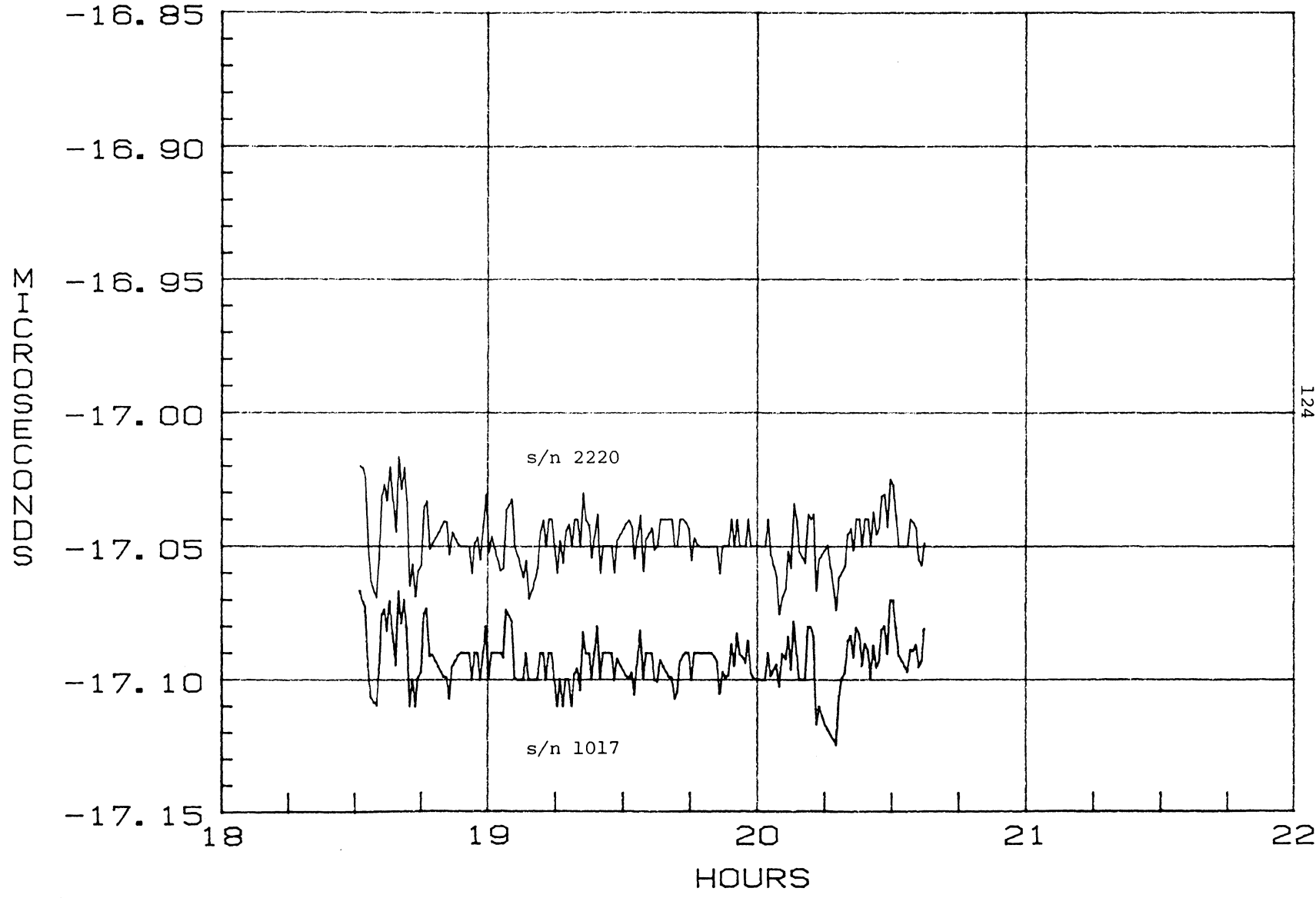
TDA L. PROSPECT DATA FOR DAY 236



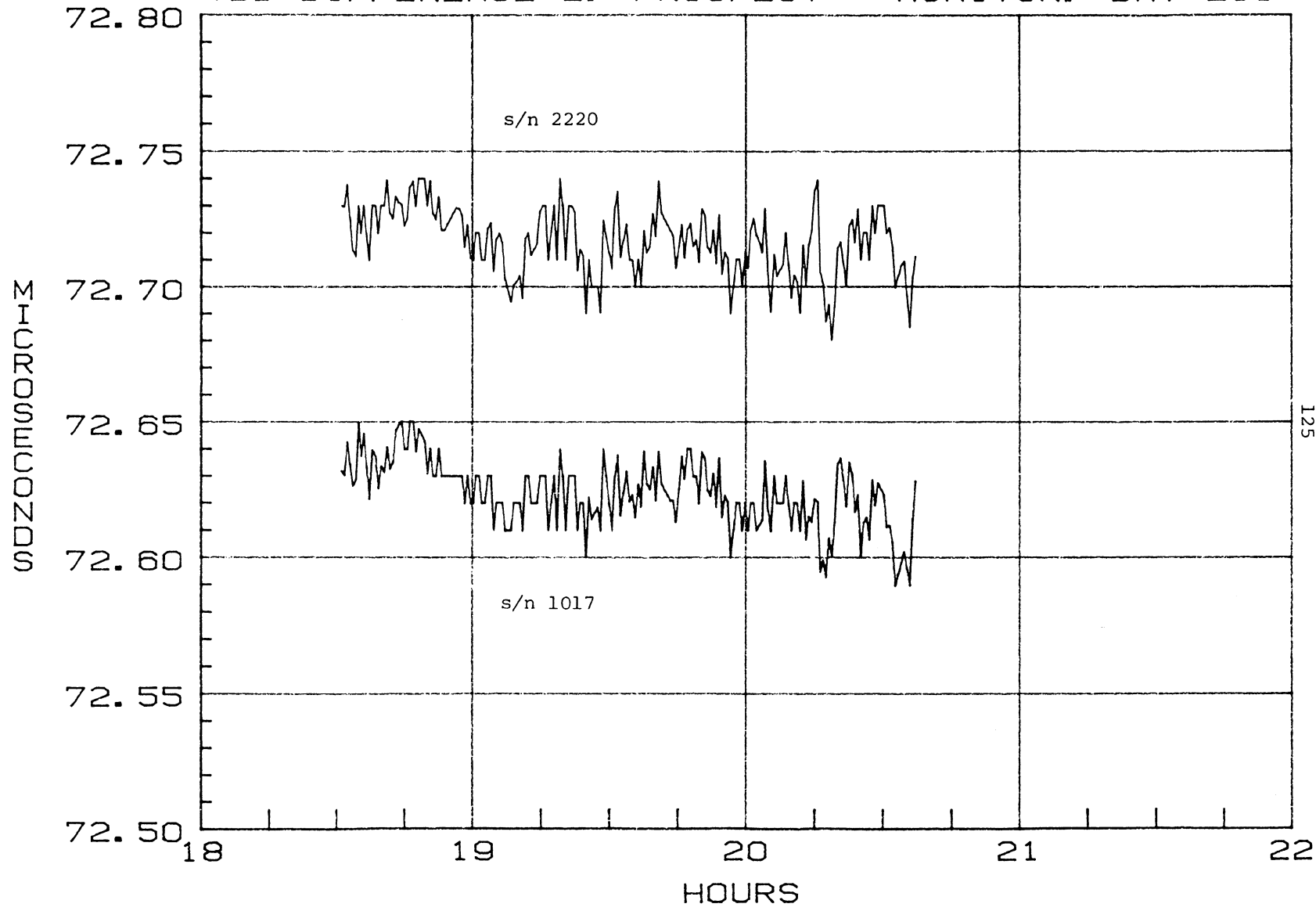
TDB L. PROSPECT DATA FOR DAY 236



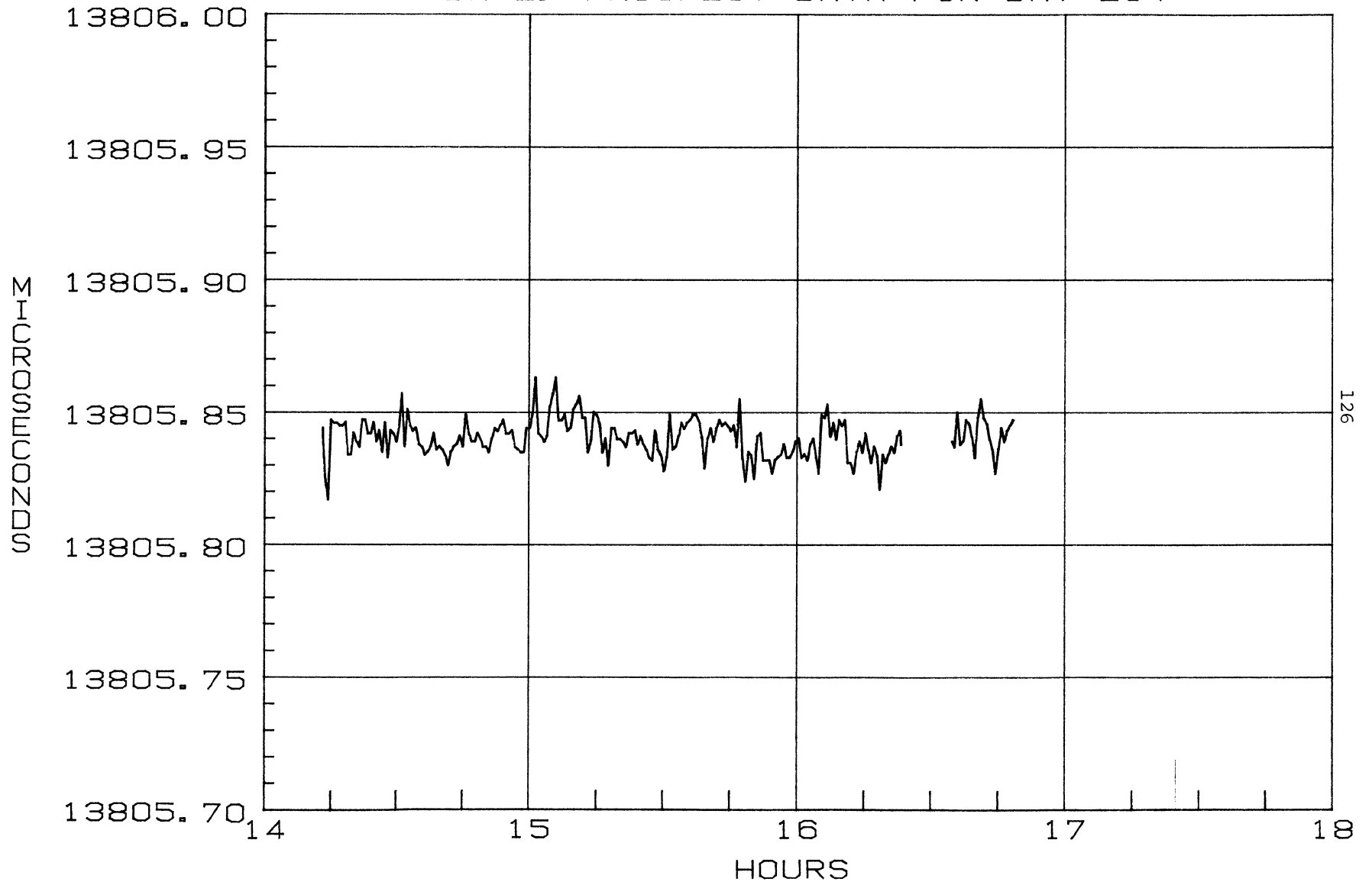
TDA DIFFERENCE L. PROSPECT - MONITOR. DAY 236



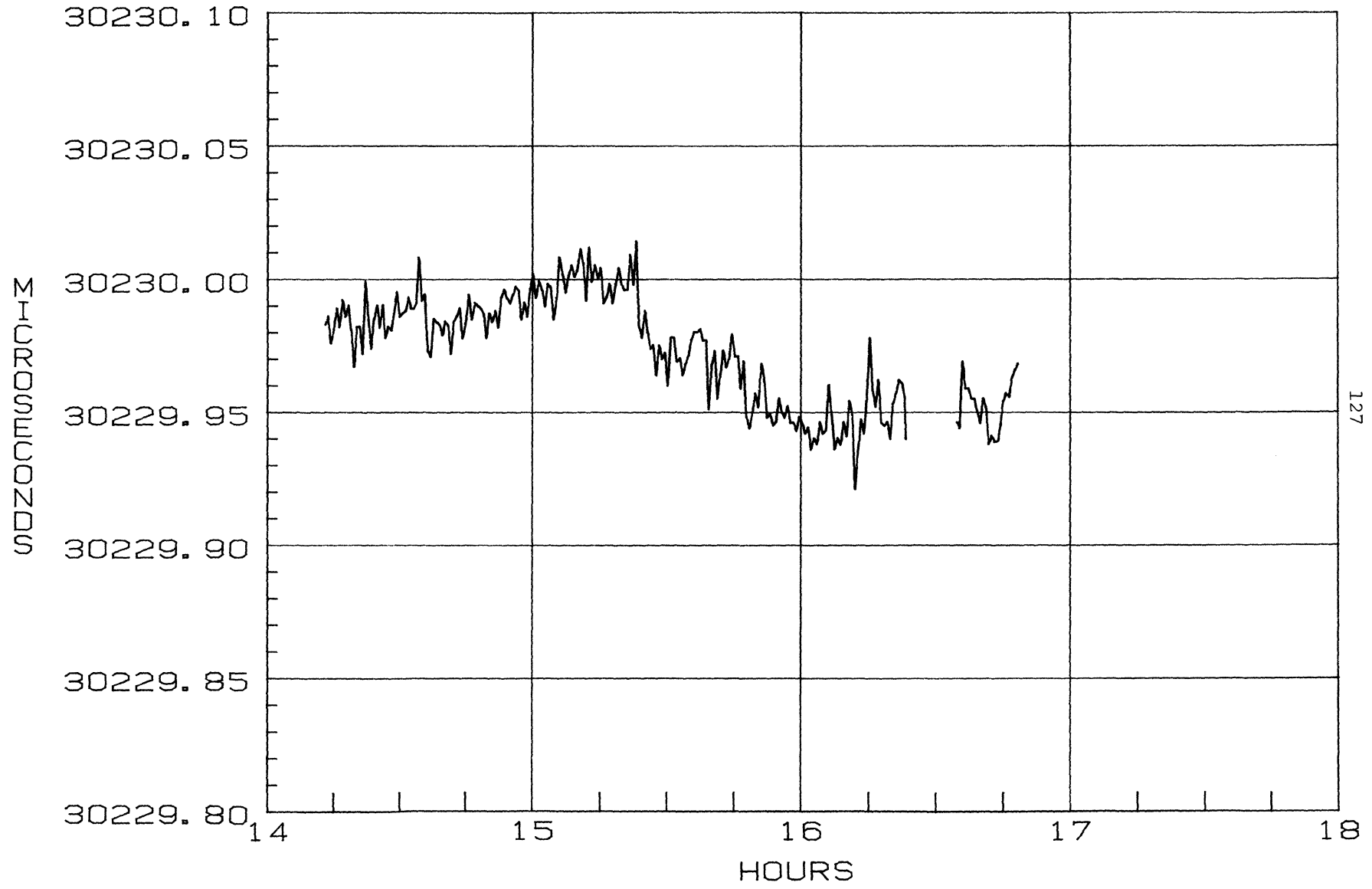
TDB DIFFERENCE L. PROSPECT - MONITOR. DAY 236

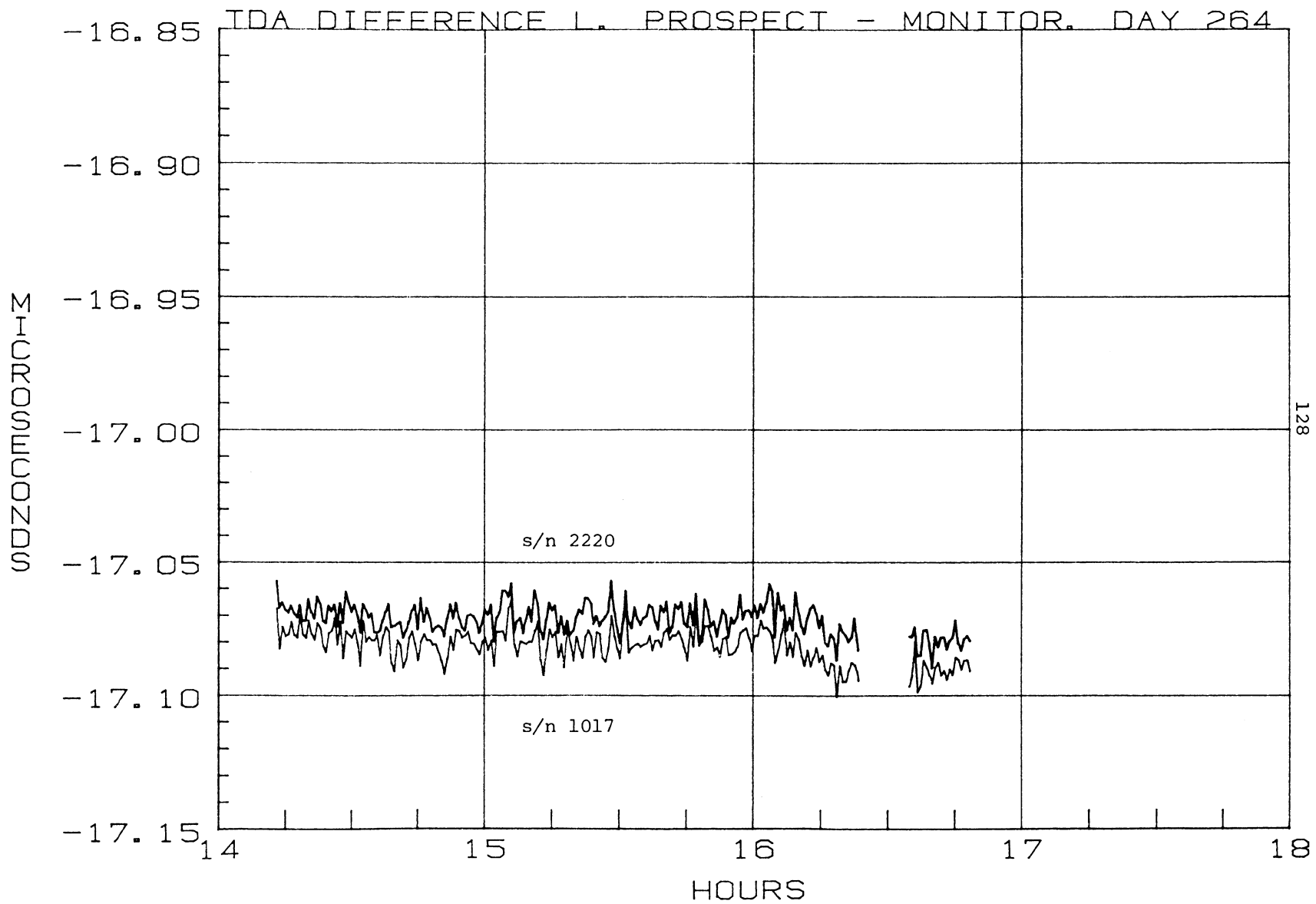


TDA L. PROSPECT DATA FOR DAY 264

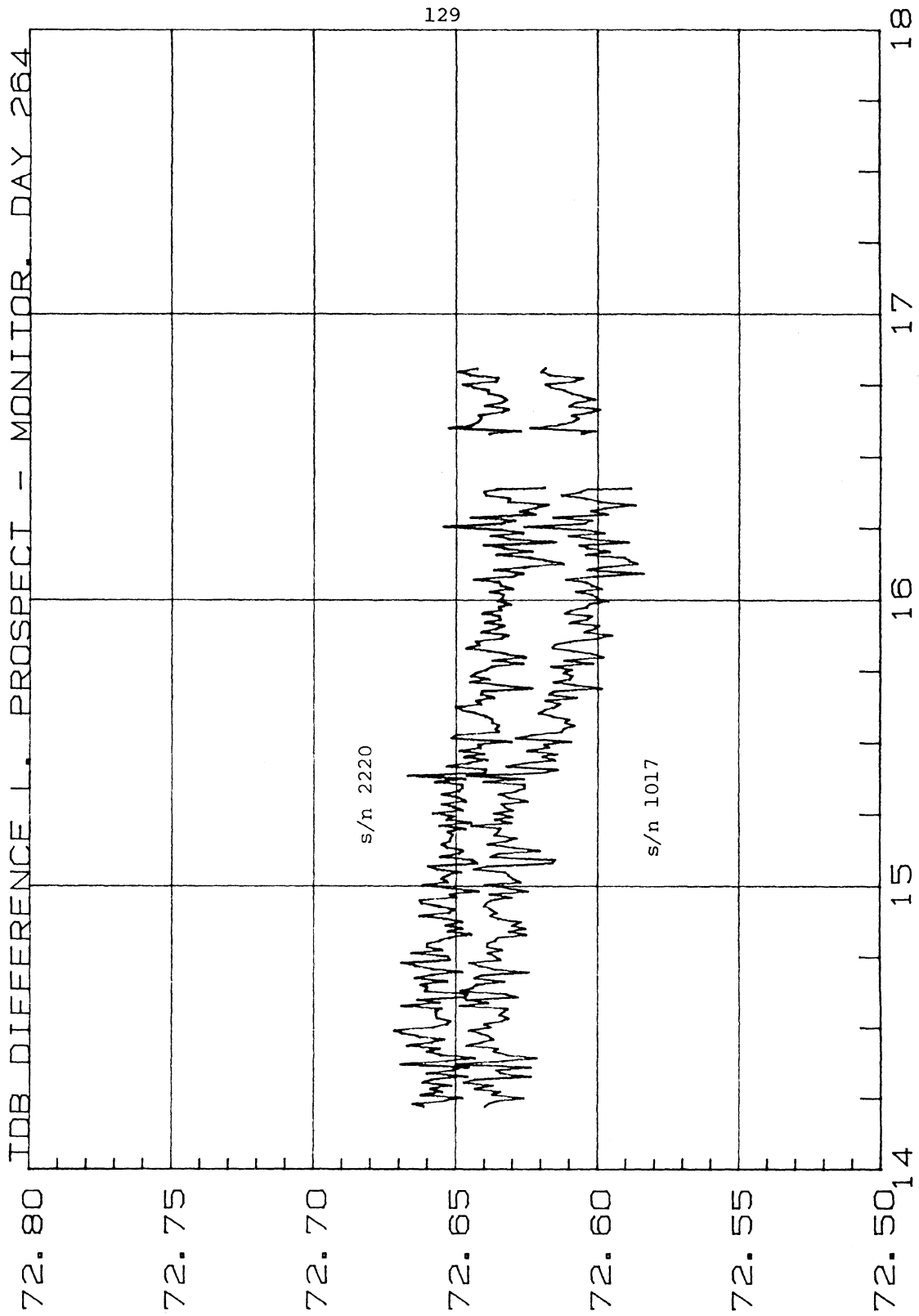


TDB L. PROSPECT DATA FOR DAY 264





TDB DIFFERENCE L. PROSPECT - MONITOR. DAY 264

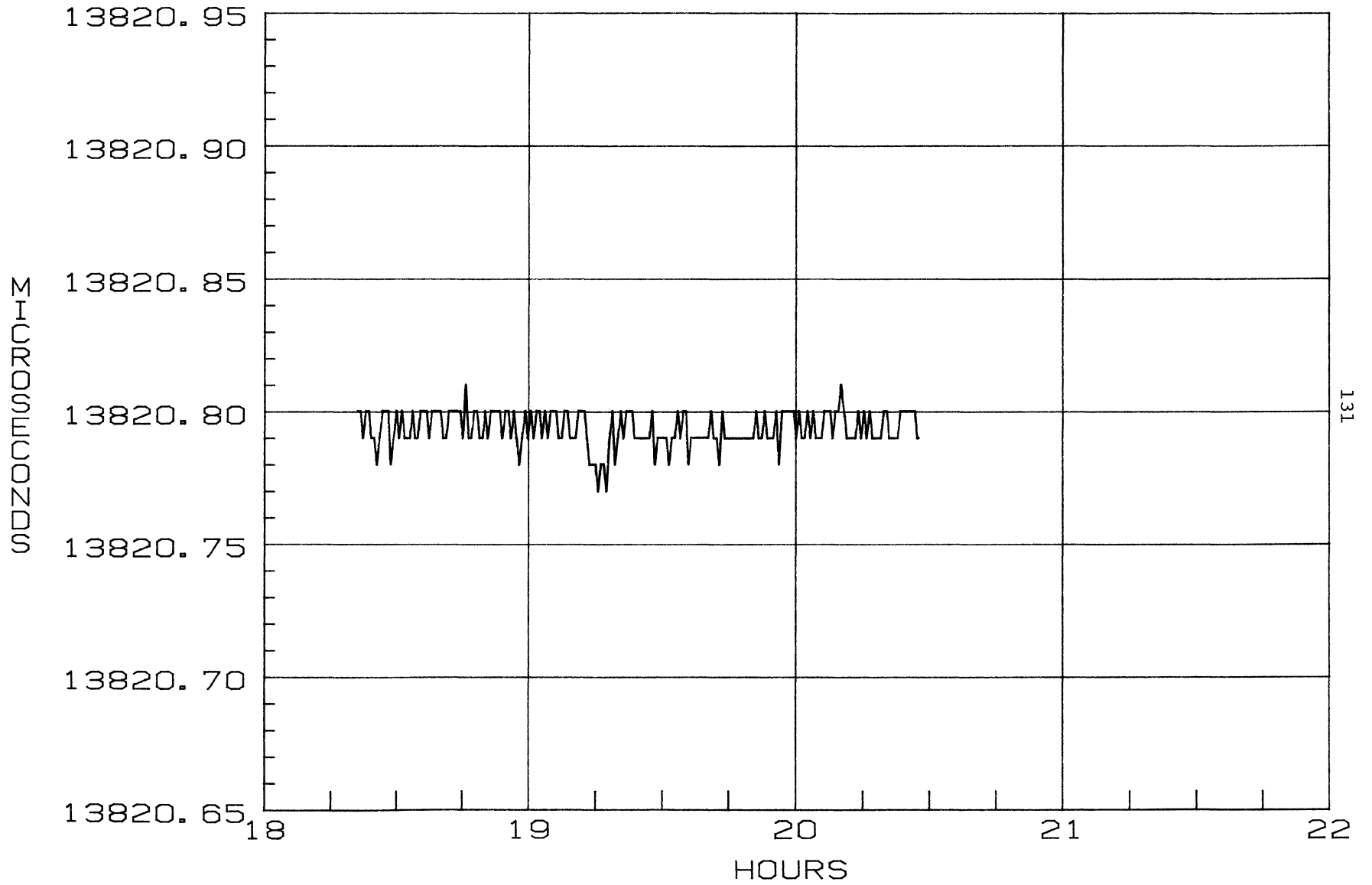


MONOSUOZOS

APPENDIX VI.2

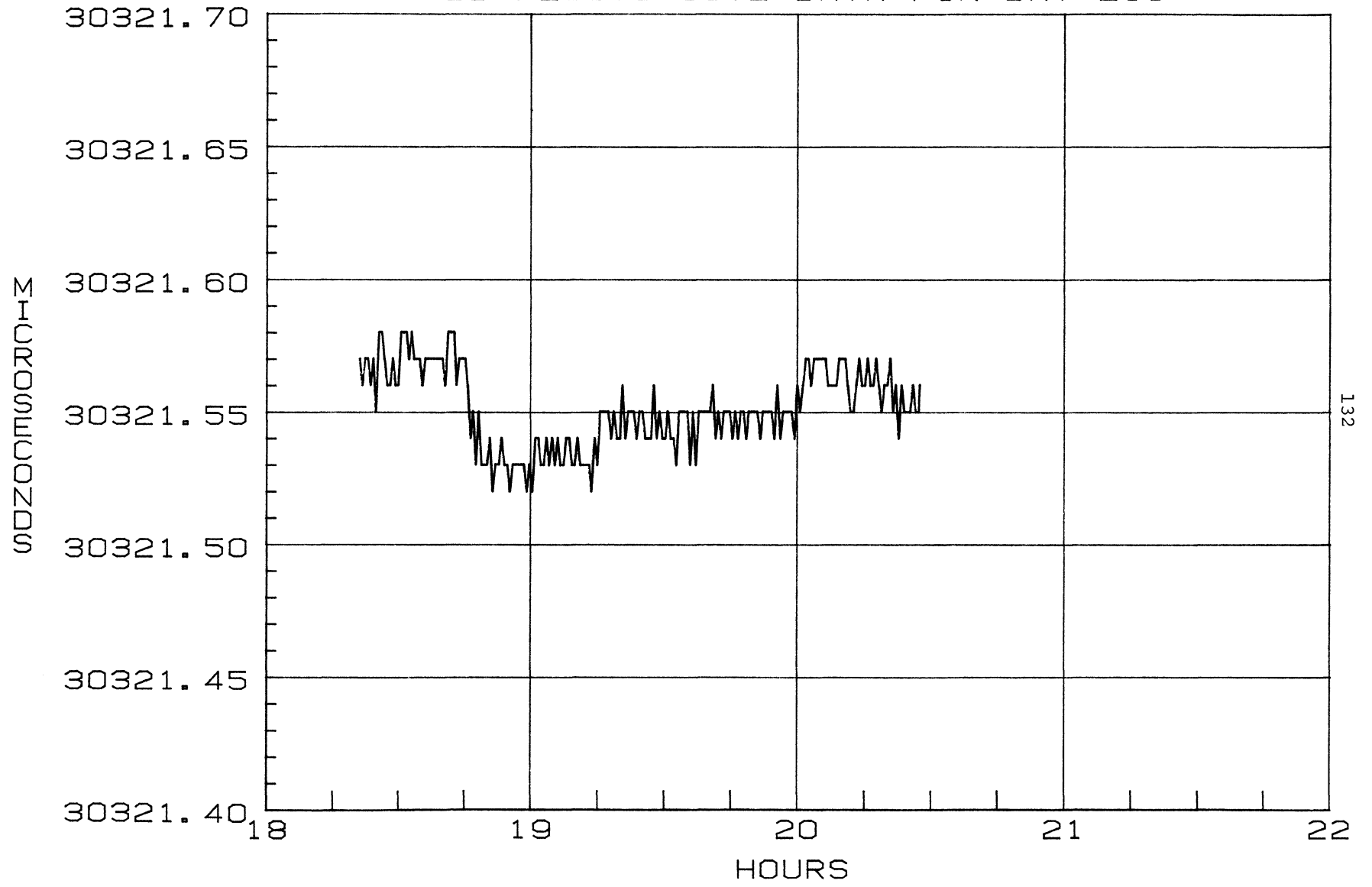
PEGGY'S COVE

TDA PEGGYS COVE DATA FOR DAY 219

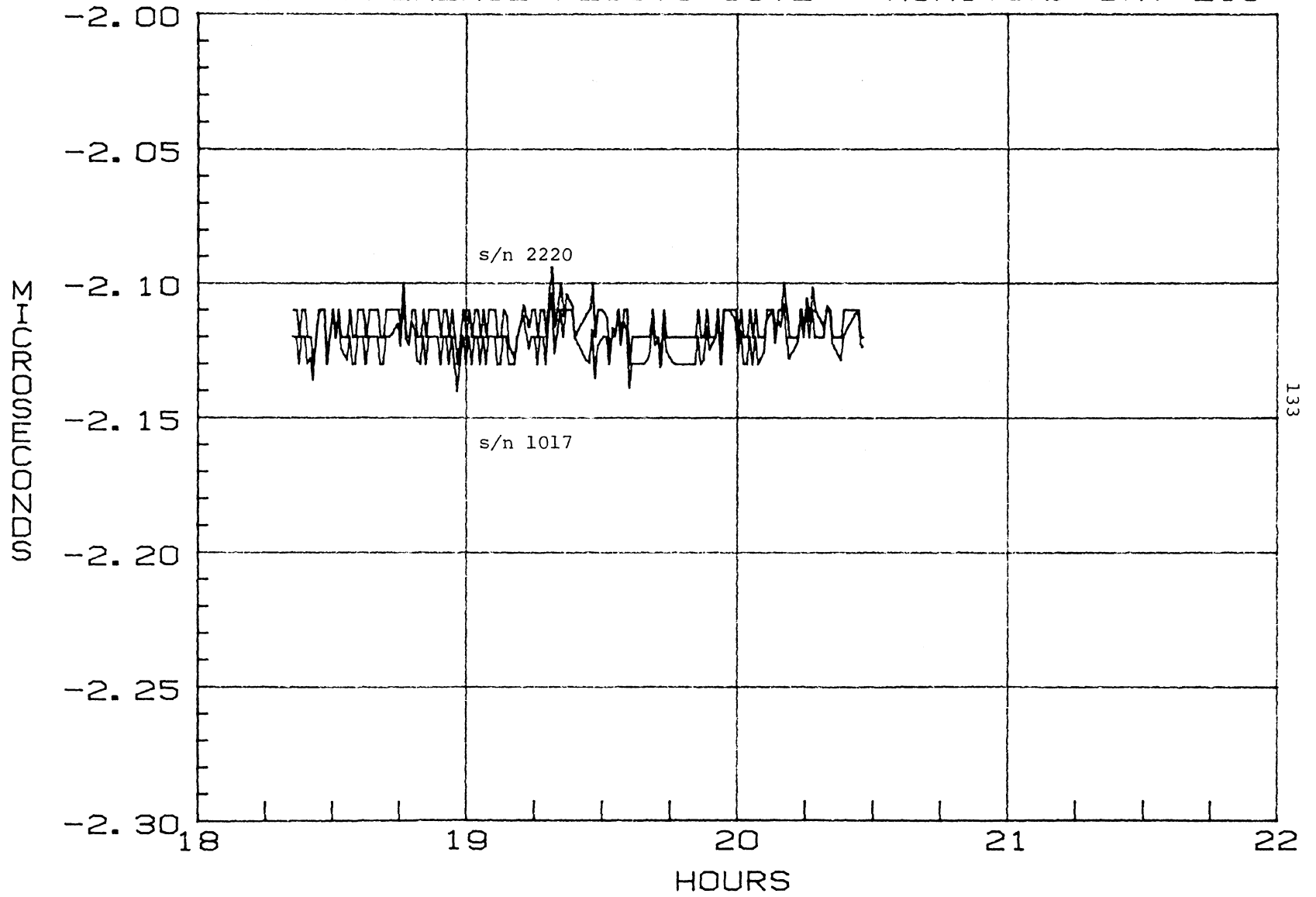


131

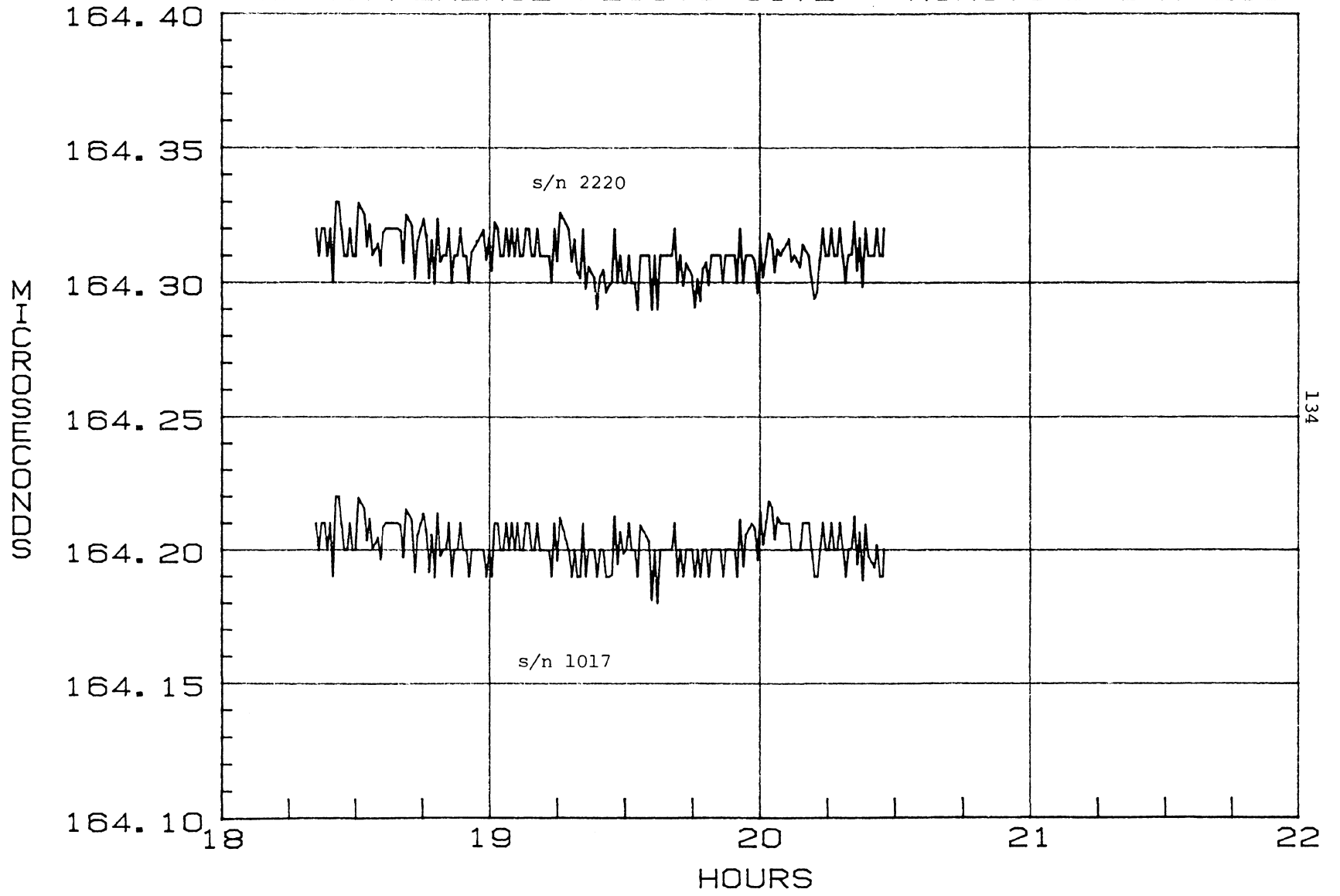
TDB PEGGYS COVE DATA FOR DAY 219



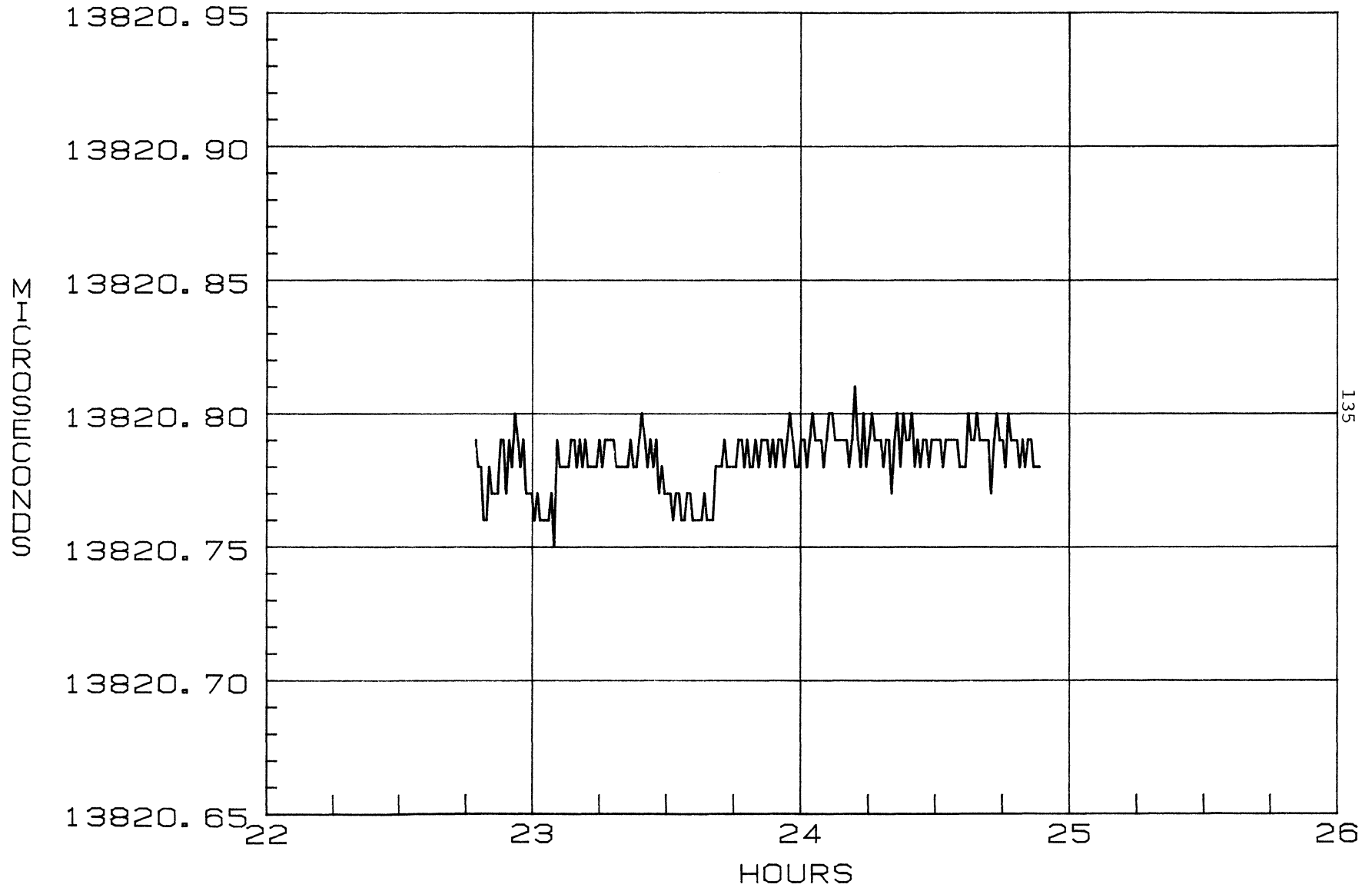
TDA DIFFERENCE PEGGYS COVE - MONITOR. DAY 219



TDB DIFFERENCE PEGGYS COVE - MONITOR. DAY 219

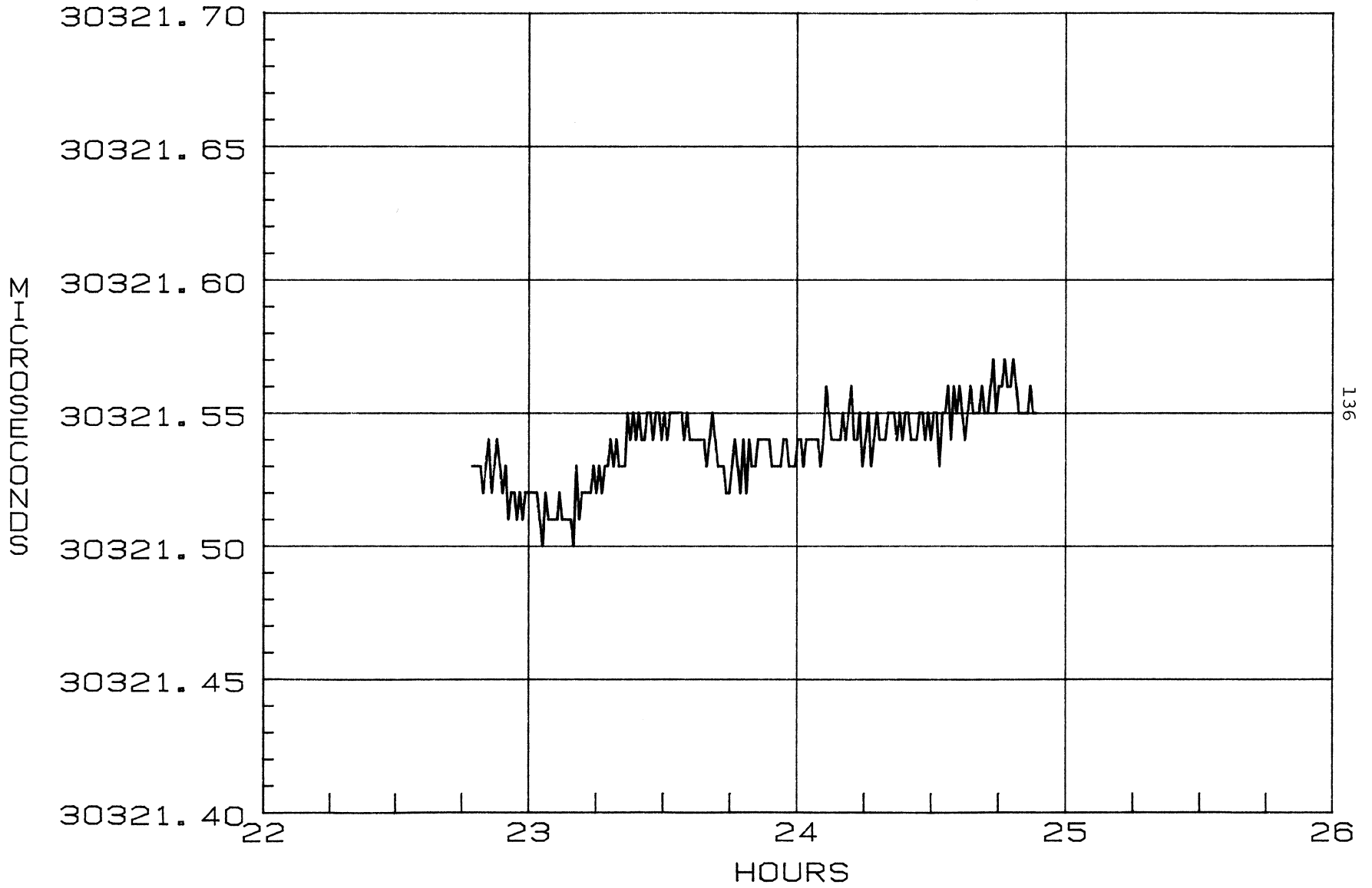


TDA PEGGYS COVE DATA FOR DAY 229

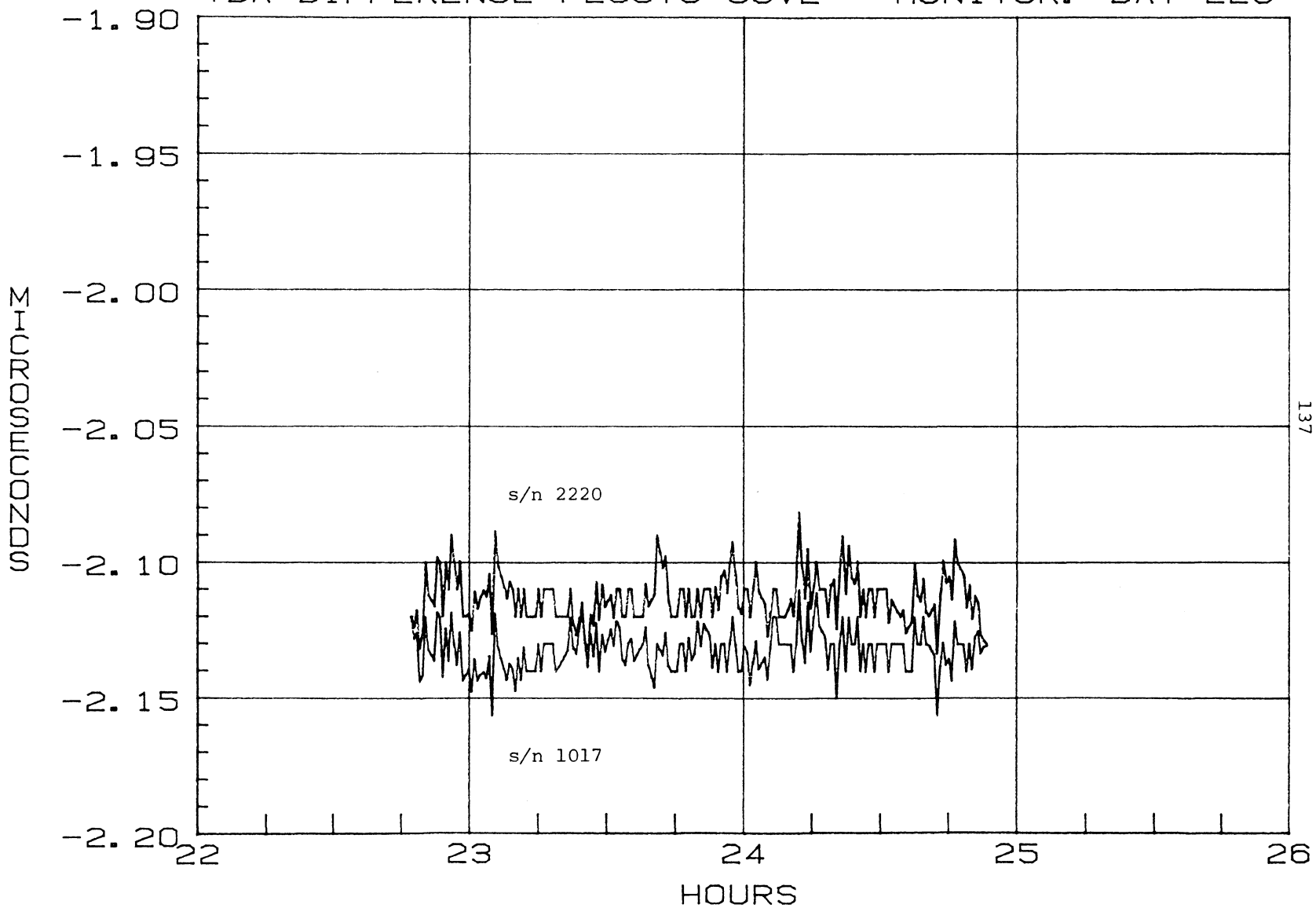


135

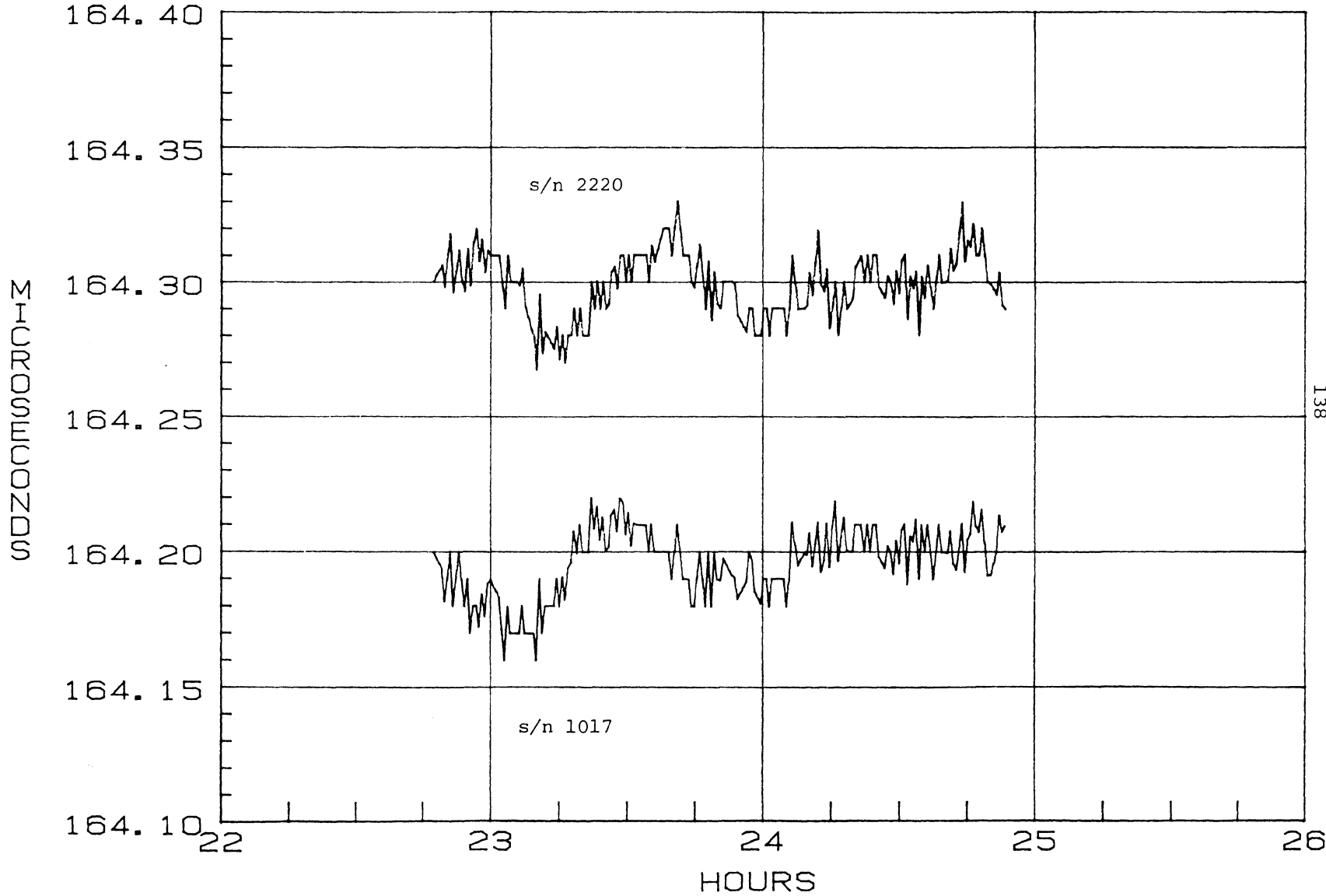
TDB PEGGYS COVE DATA FOR DAY 229



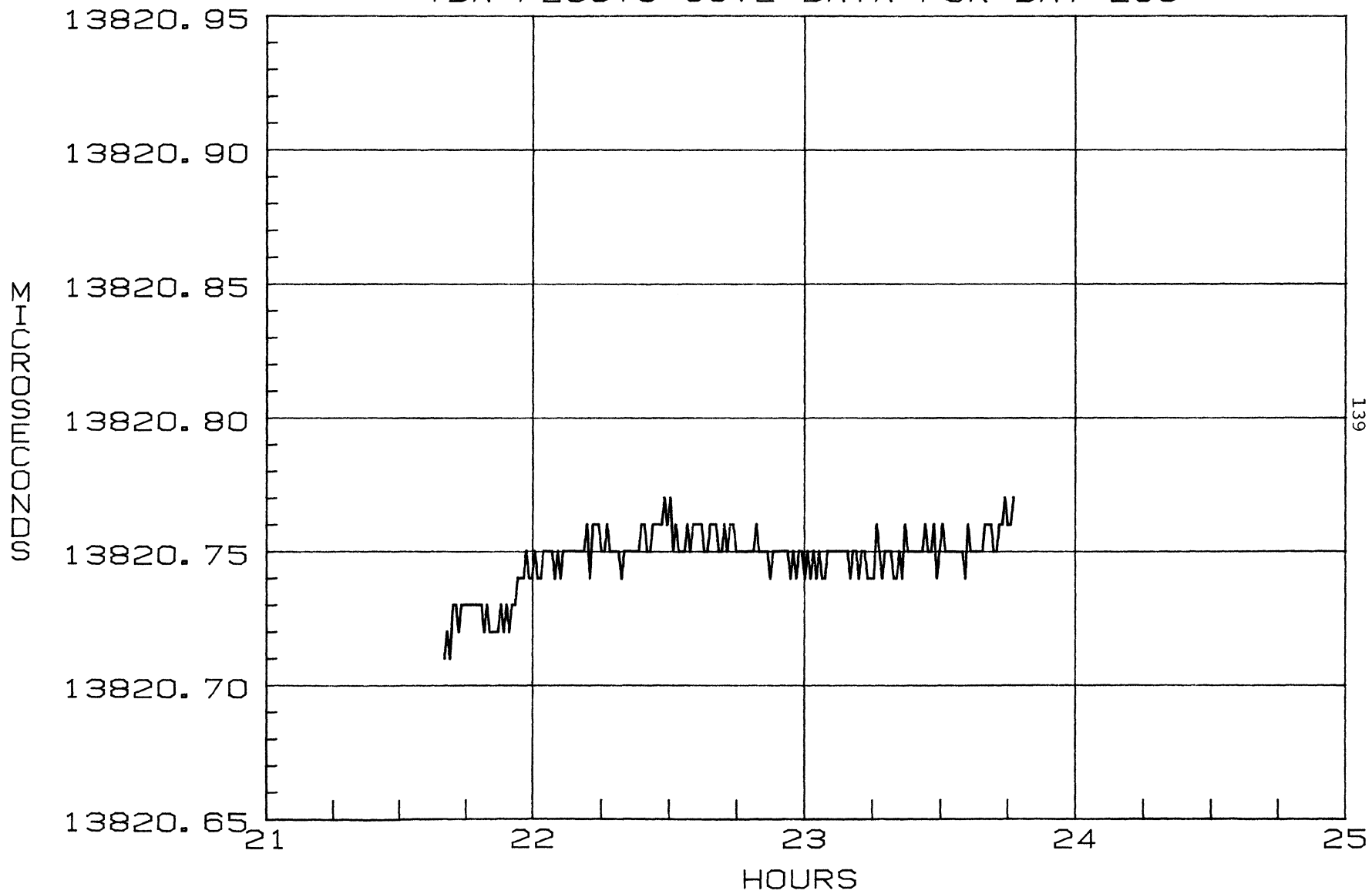
TDA DIFFERENCE PEGGYS COVE - MONITOR. DAY 229



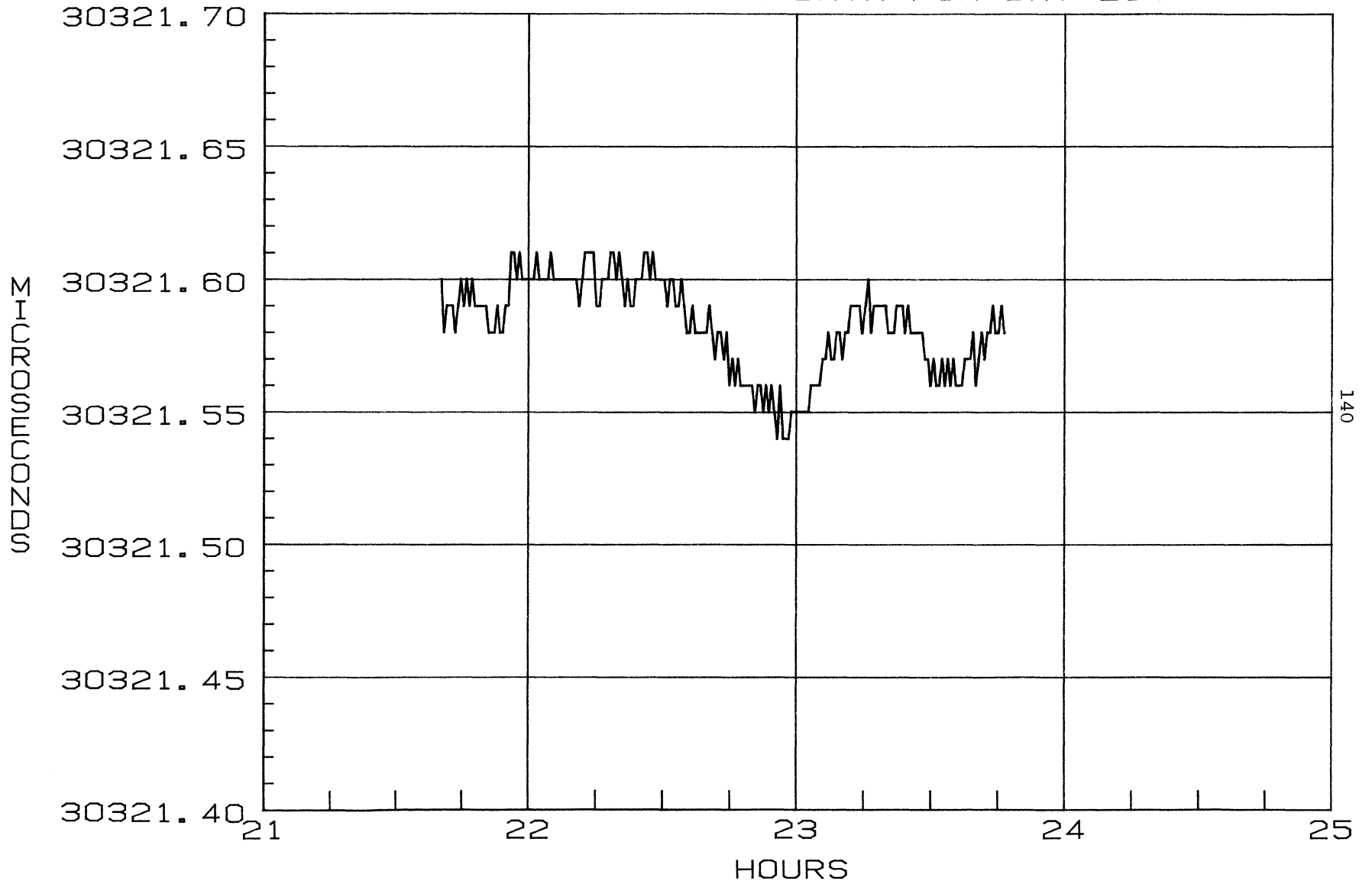
TDB DIFFERENCE PEGGYS COVE - MONITOR. DAY 229



TDA PEGGYS COVE DATA FOR DAY 236

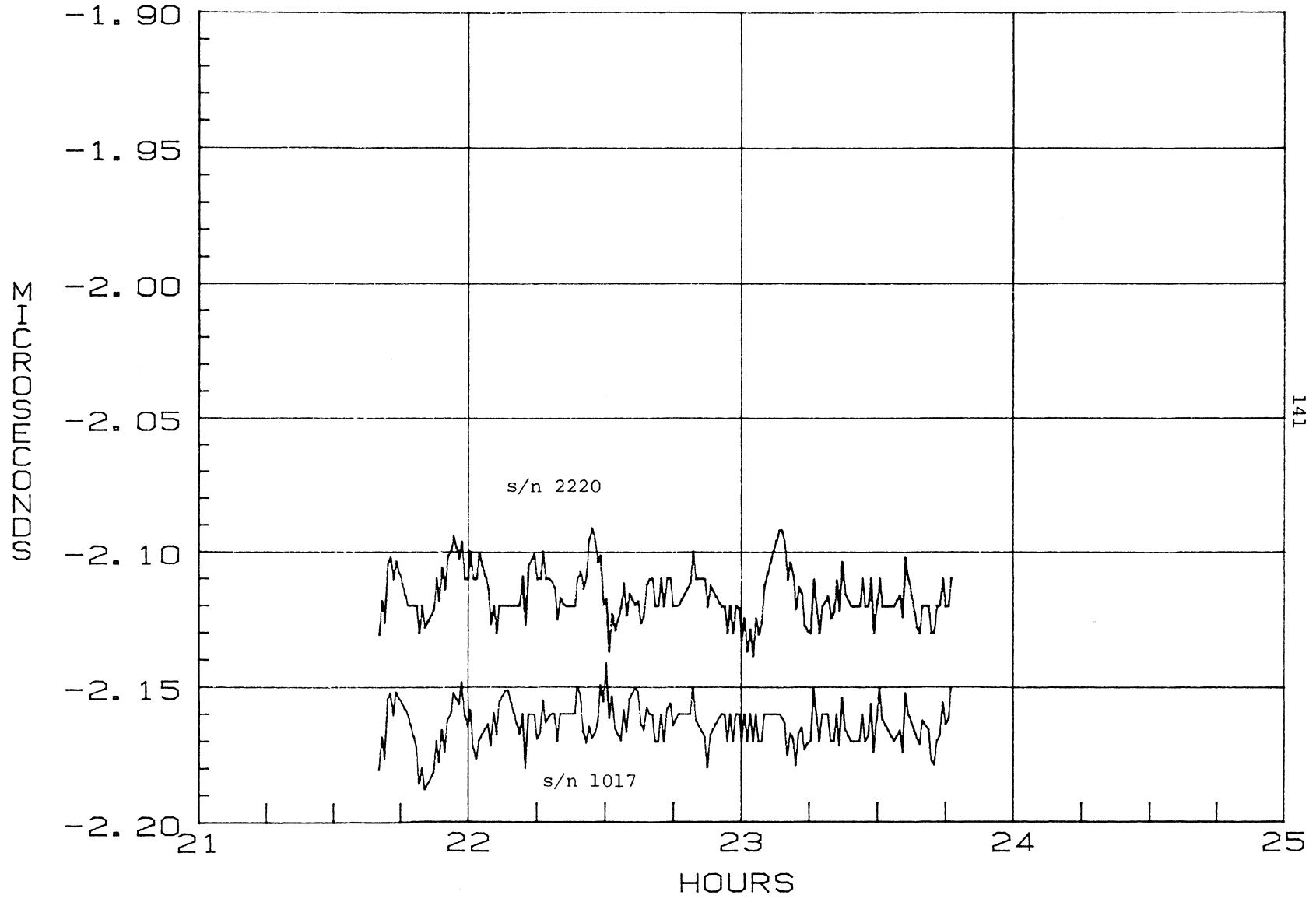


TDB PEGGYS COVE DATA FOR DAY 236

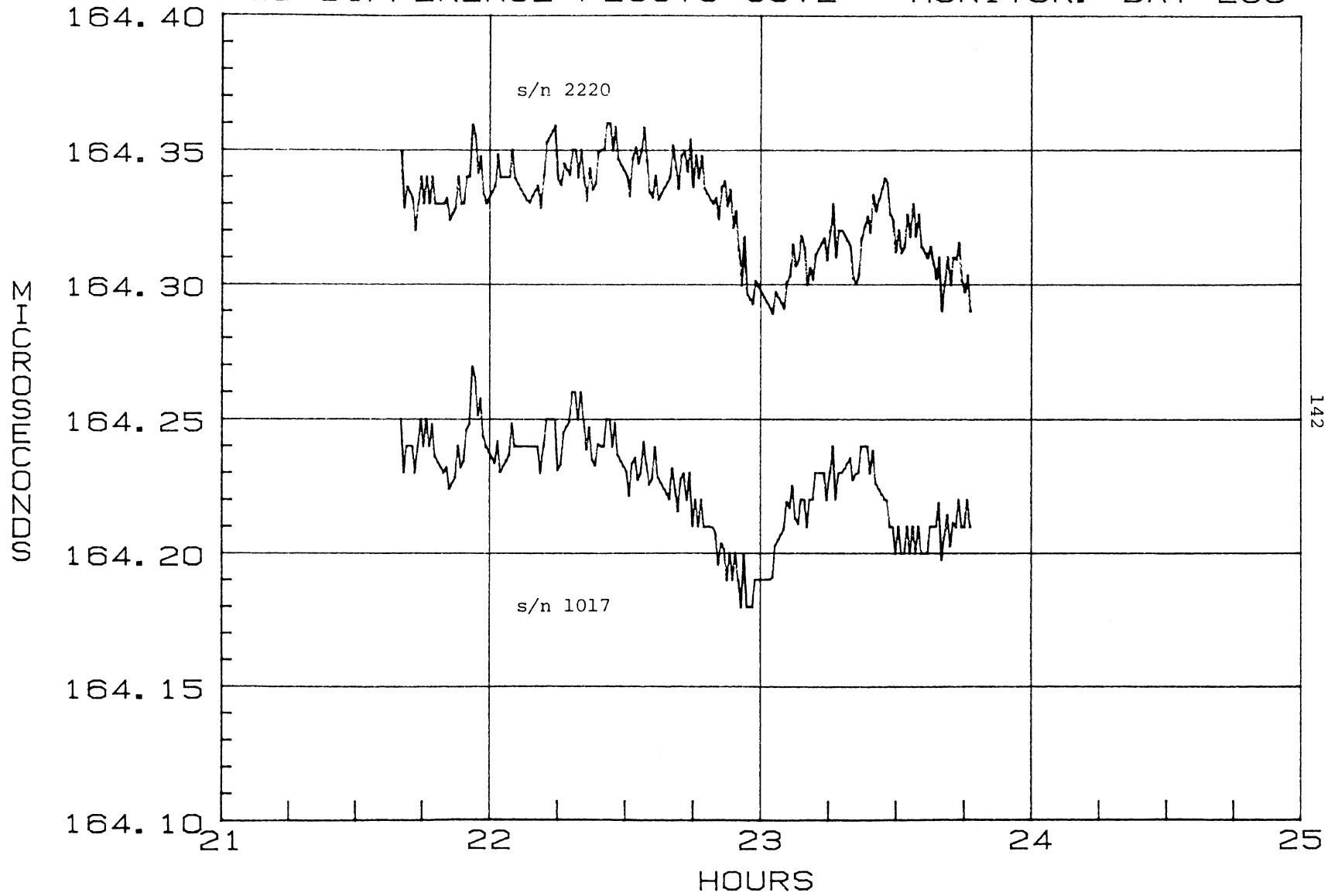


140

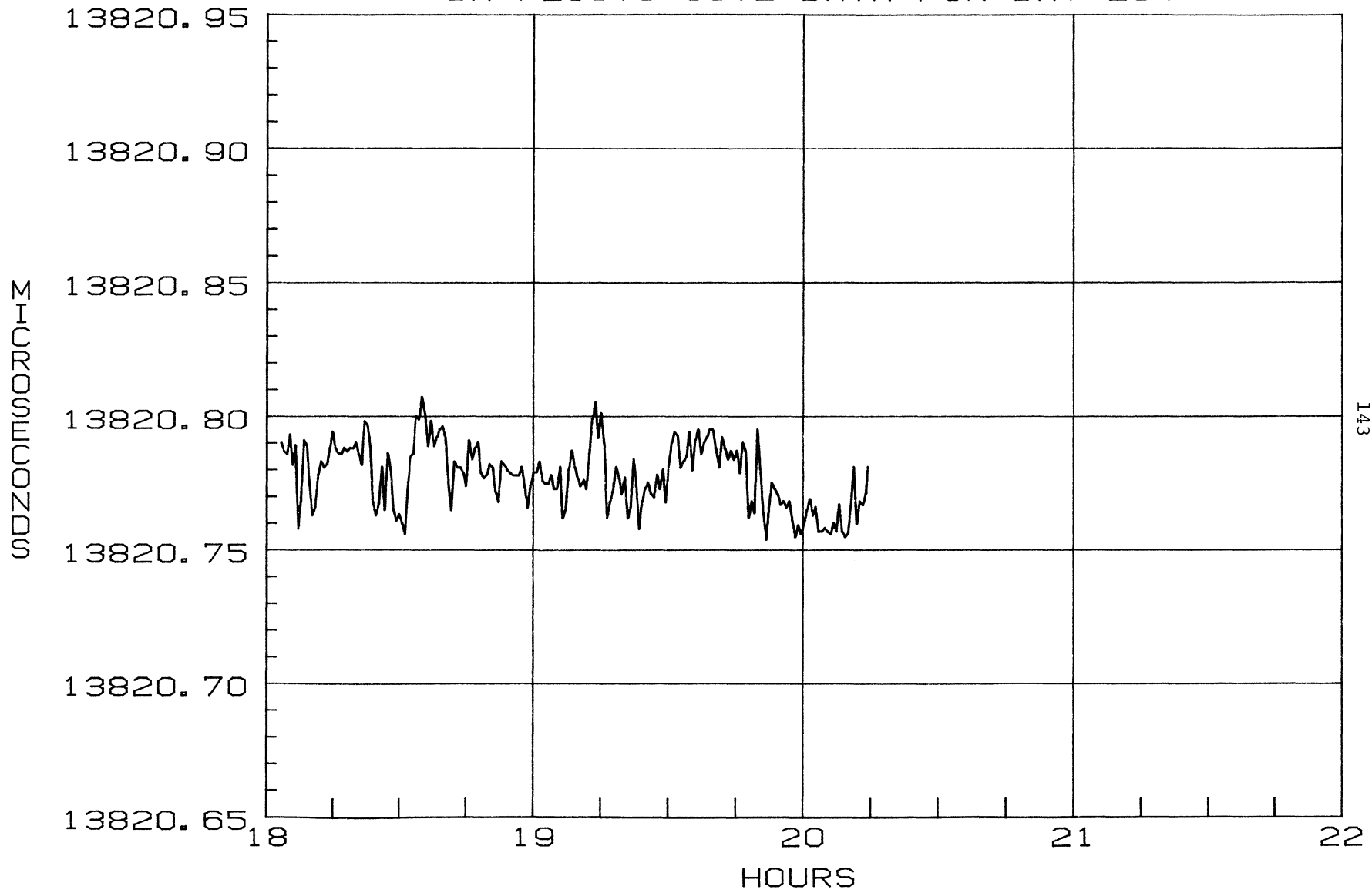
TDA DIFFERENCE PEGGYS COVE - MONITOR. DAY 236



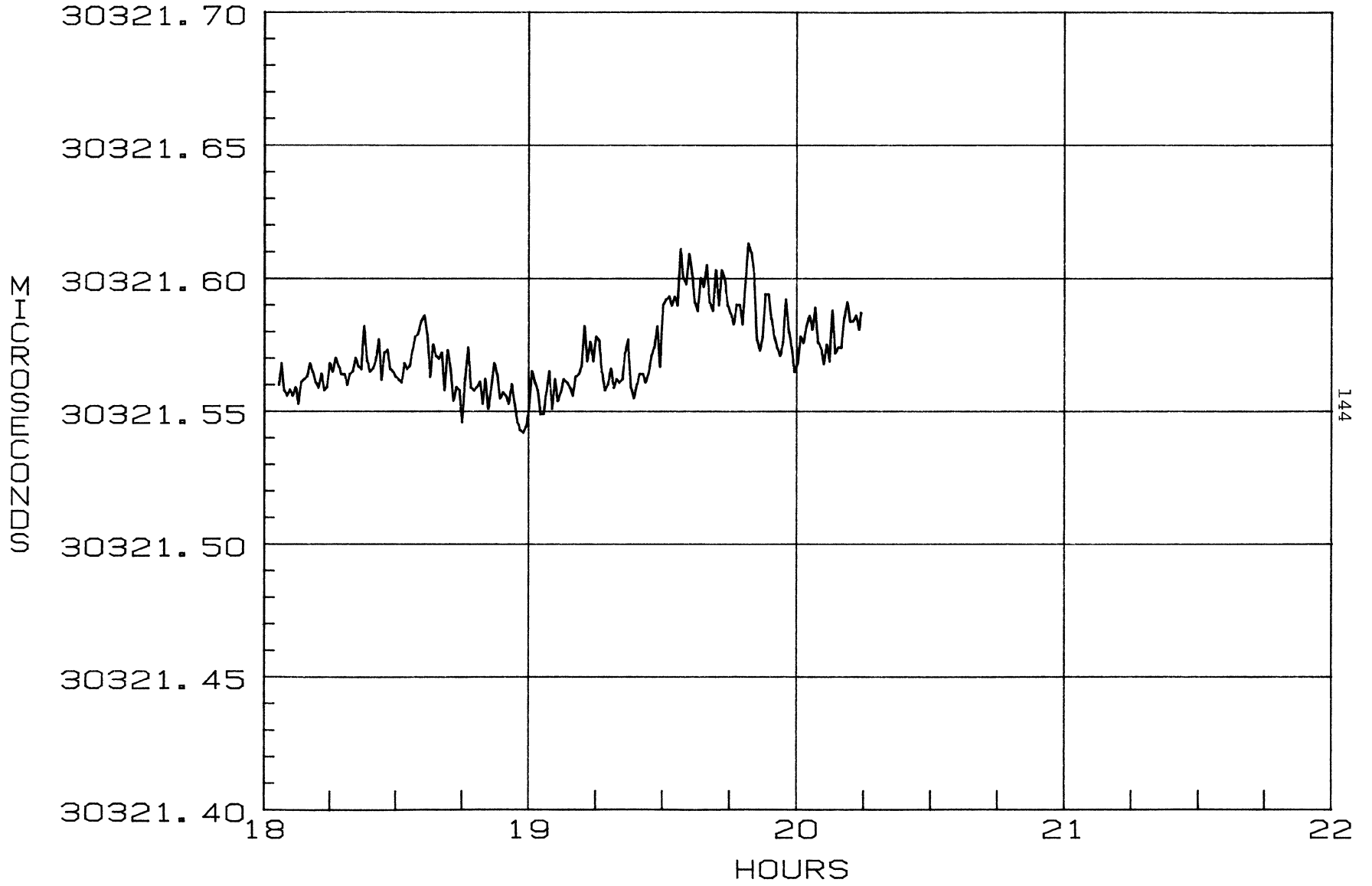
TDB DIFFERENCE PEGGYS COVE - MONITOR. DAY 236



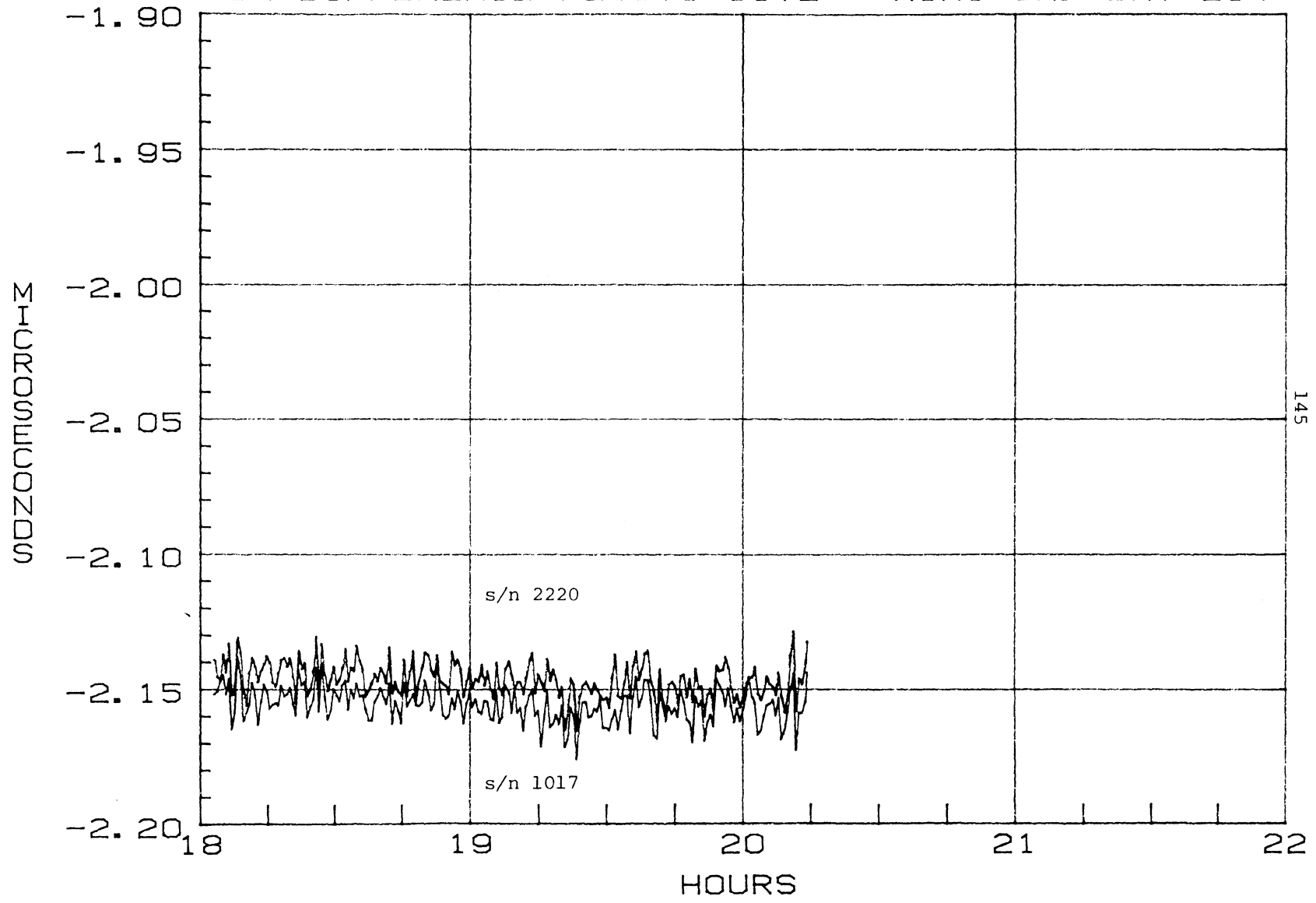
TDA PEGGYS COVE DATA FOR DAY 264



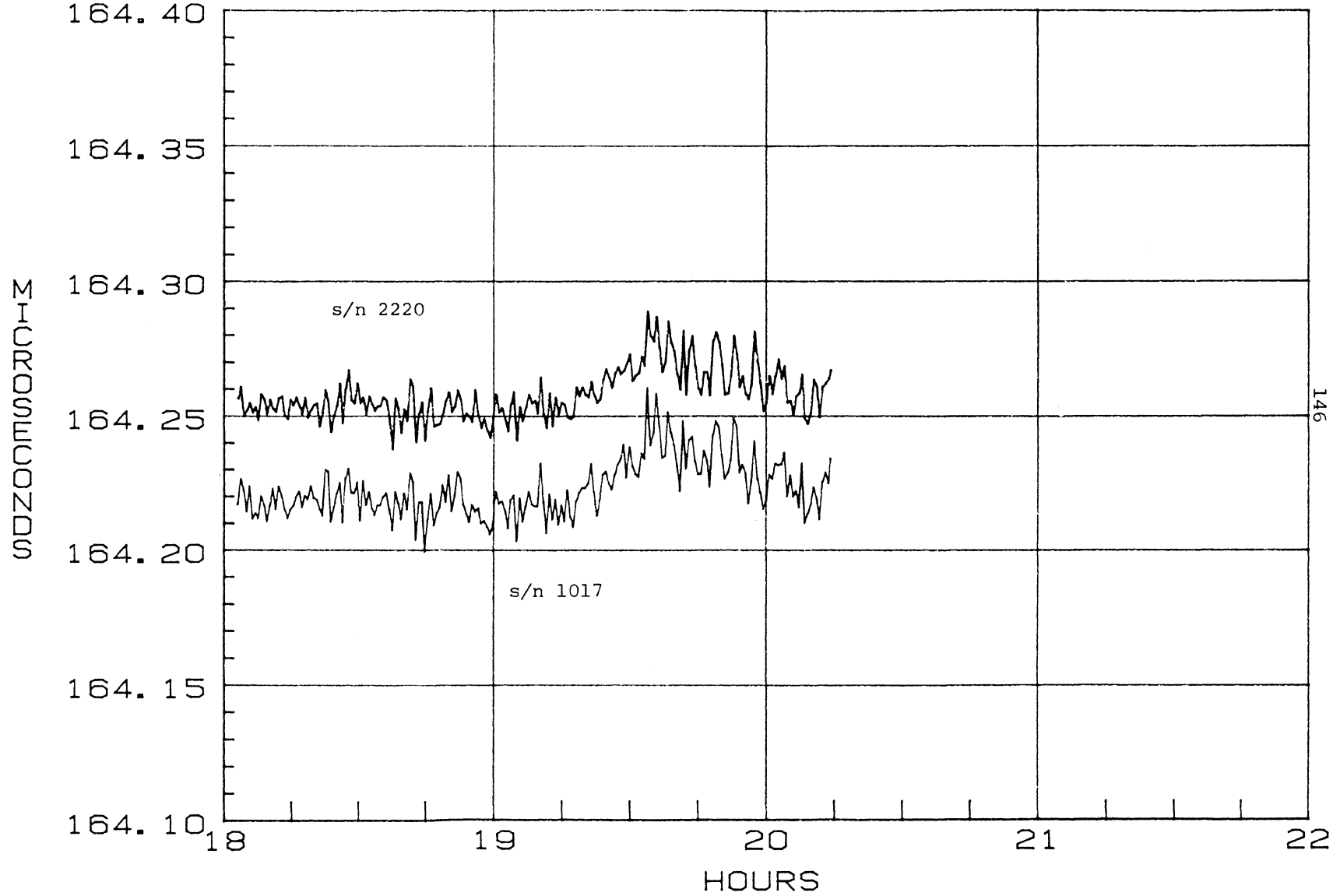
TDB PEGGYS COVE DATA FOR DAY 264



TDA DIFFERENCE PEGGYS COVE - MONITOR. DAY 264



TDB DIFFERENCE PEGGYS COVE - MONITOR. DAY 264

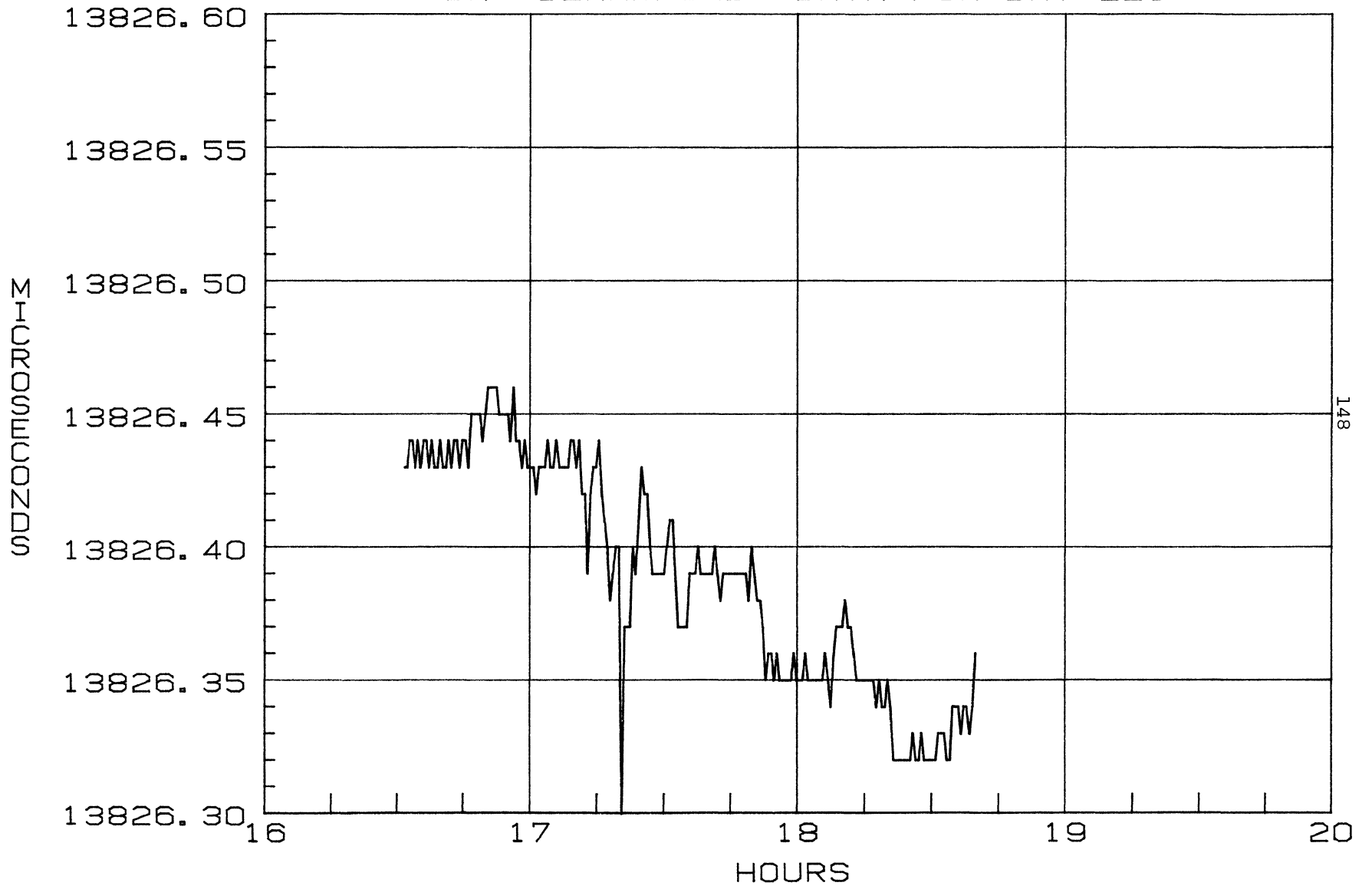


146

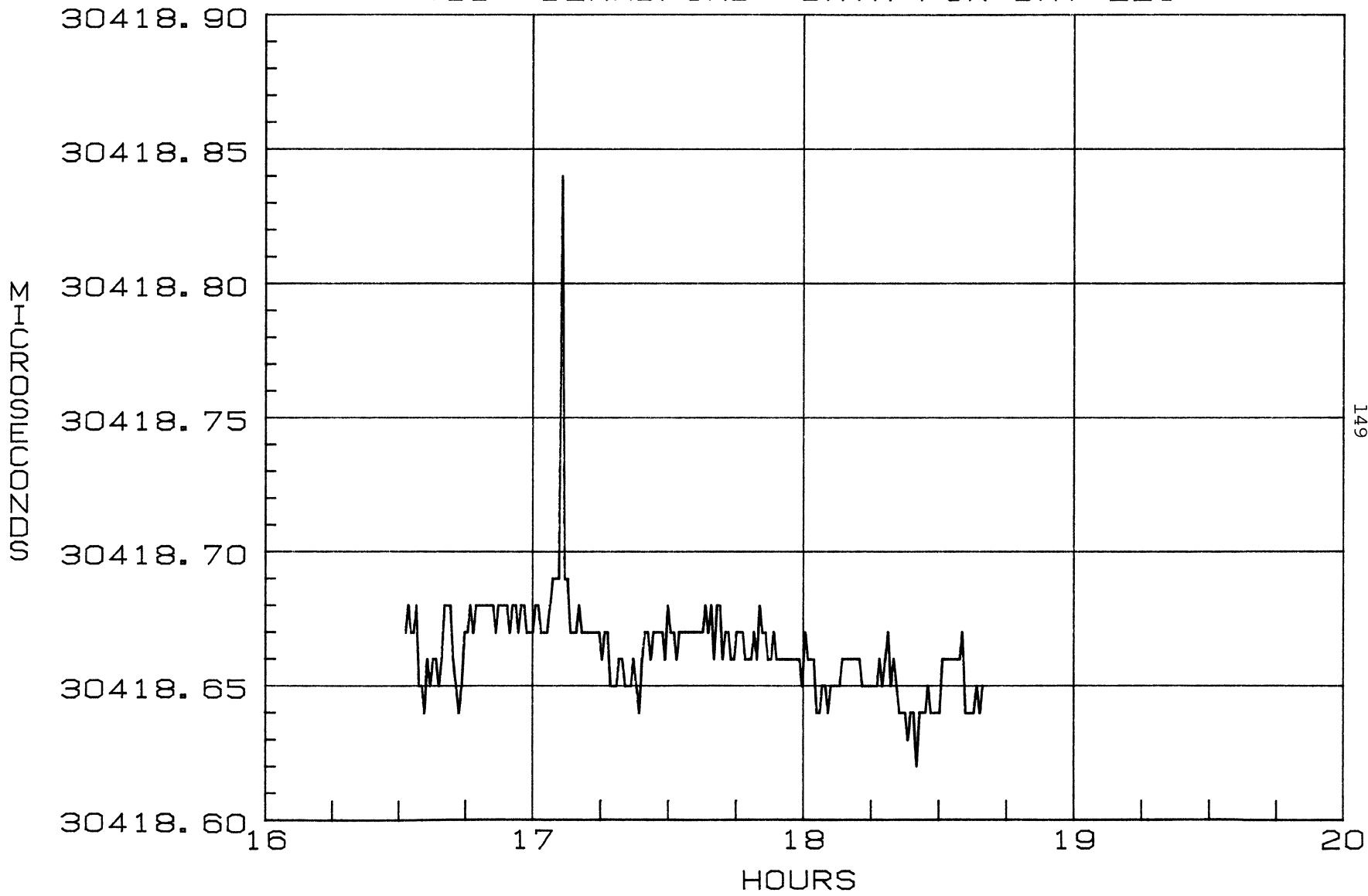
APPENDIX VI.3

BLANDFORD

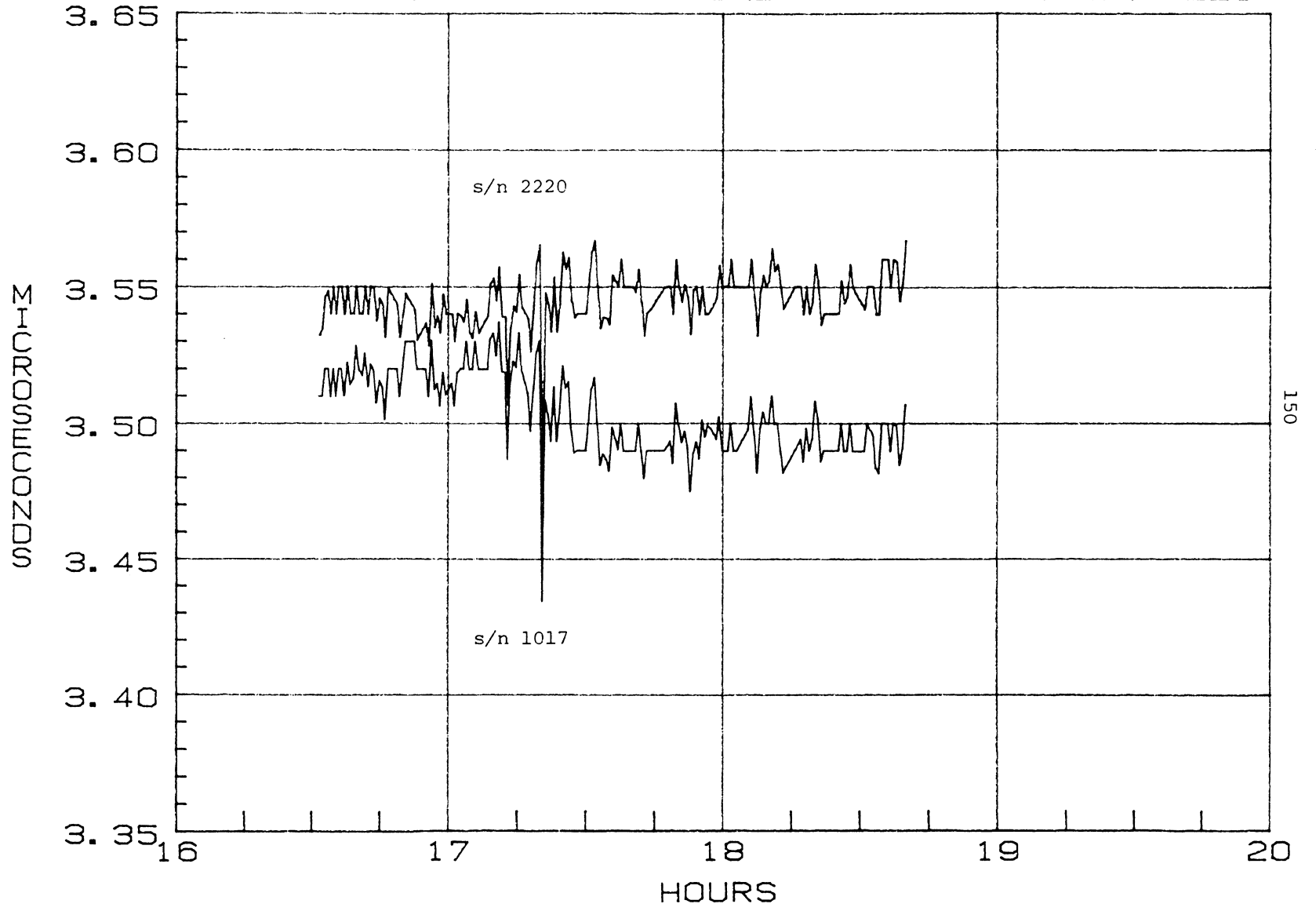
TDA BLANDFORD DATA FOR DAY 221

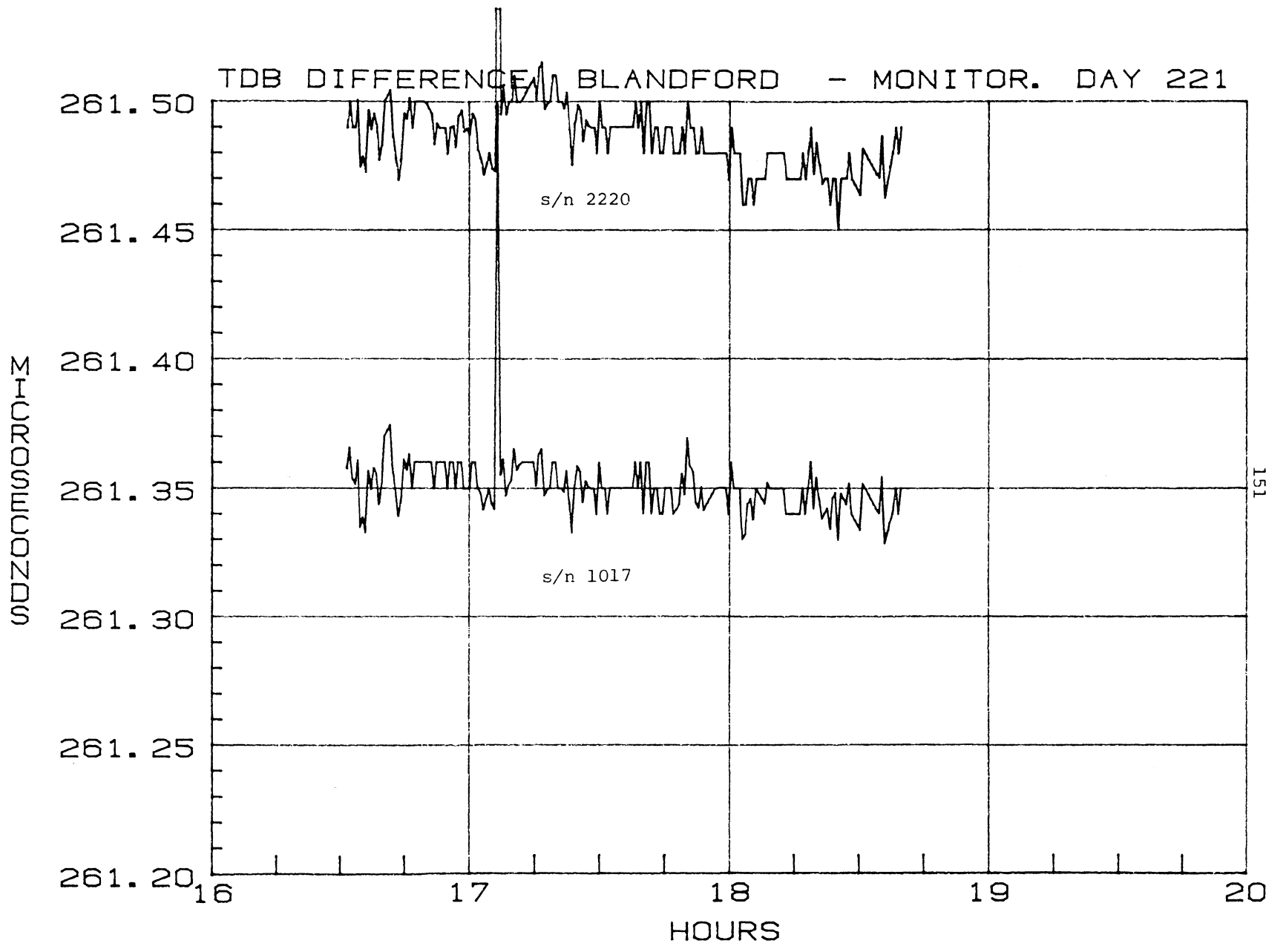


TDB BLANDFORD DATA FOR DAY 221

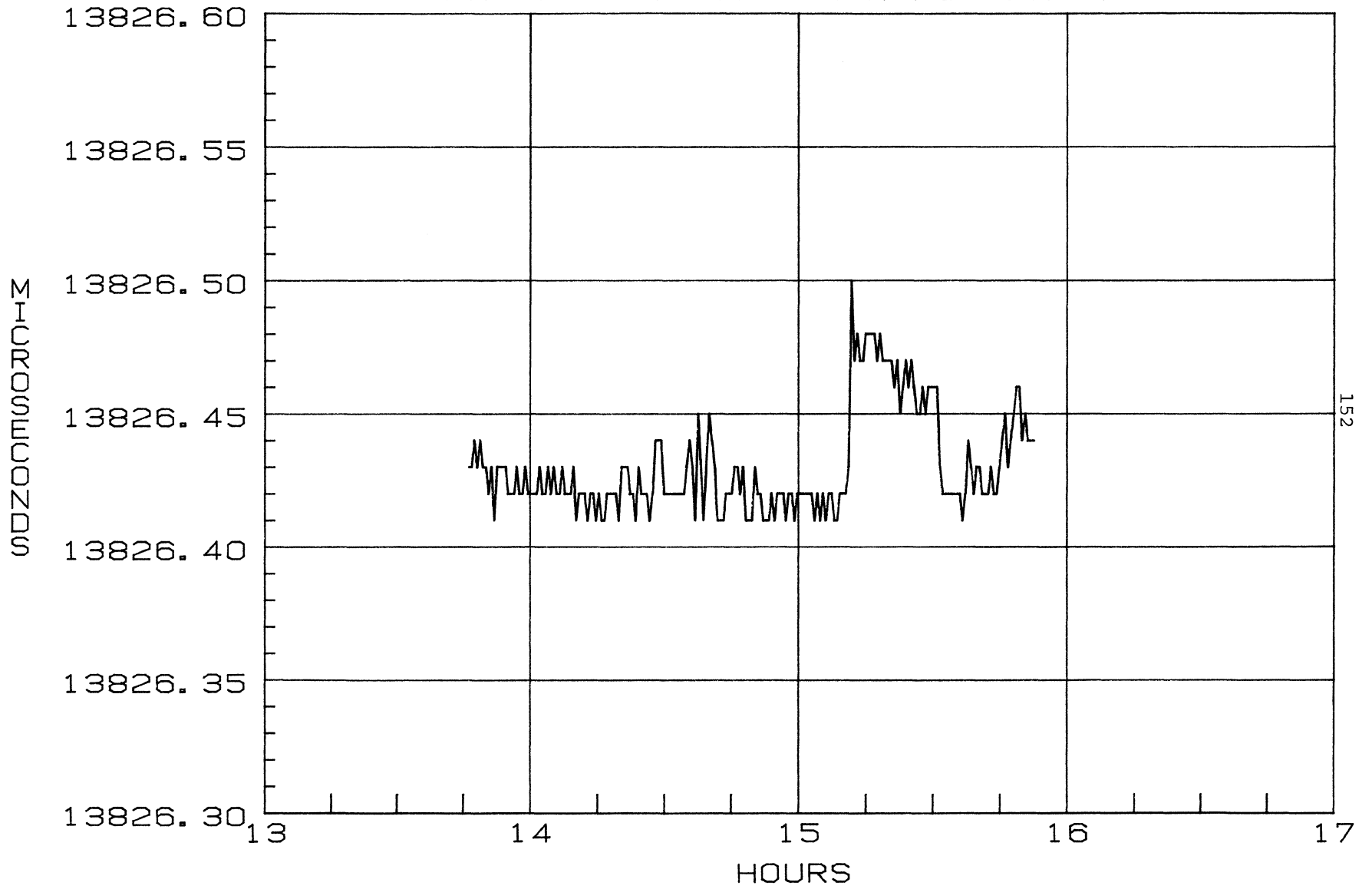


TDA DIFFERENCE BLANDFORD - MONITOR. DAY 221



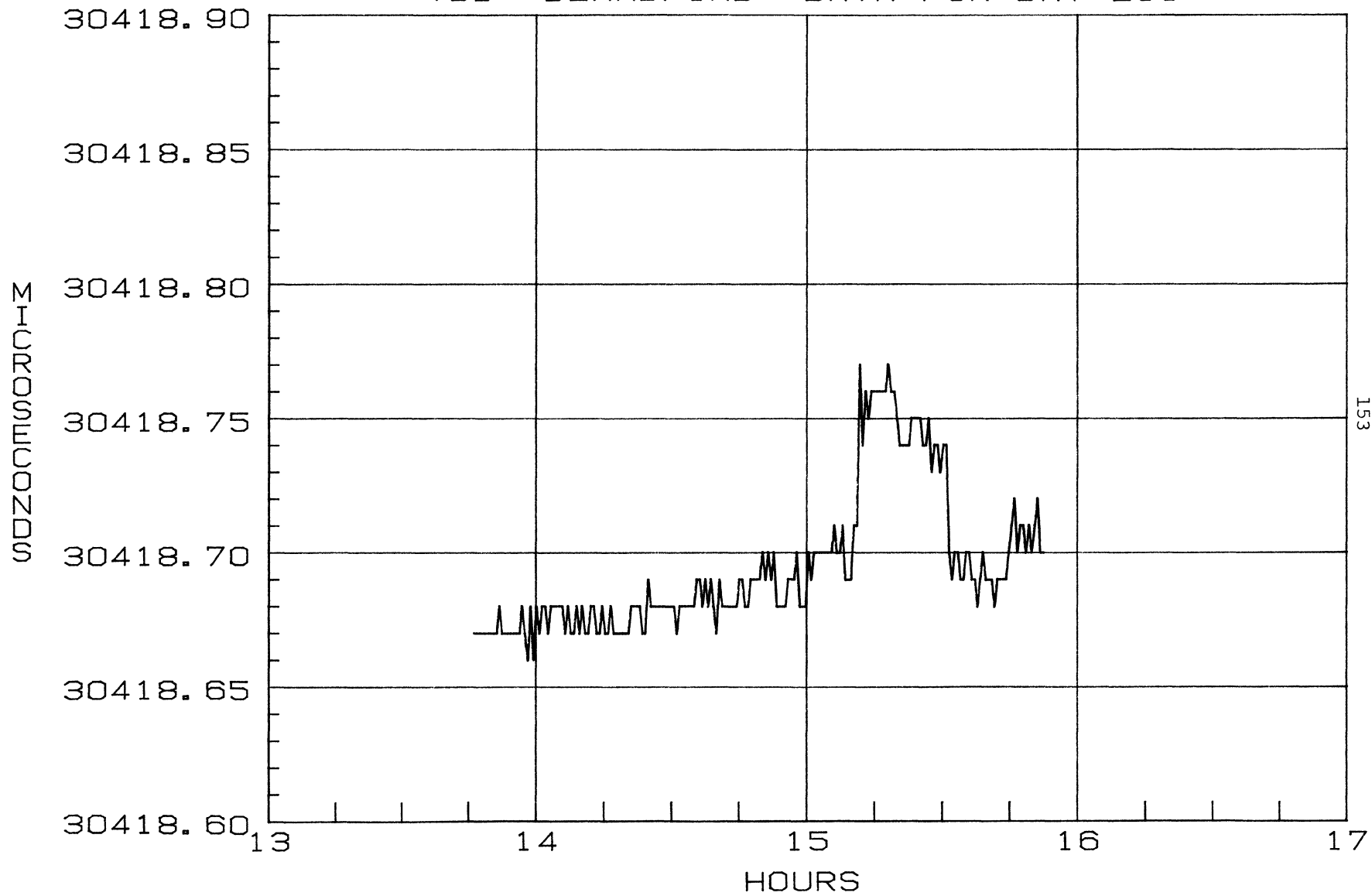


TDA BLANDFORD DATA FOR DAY 230

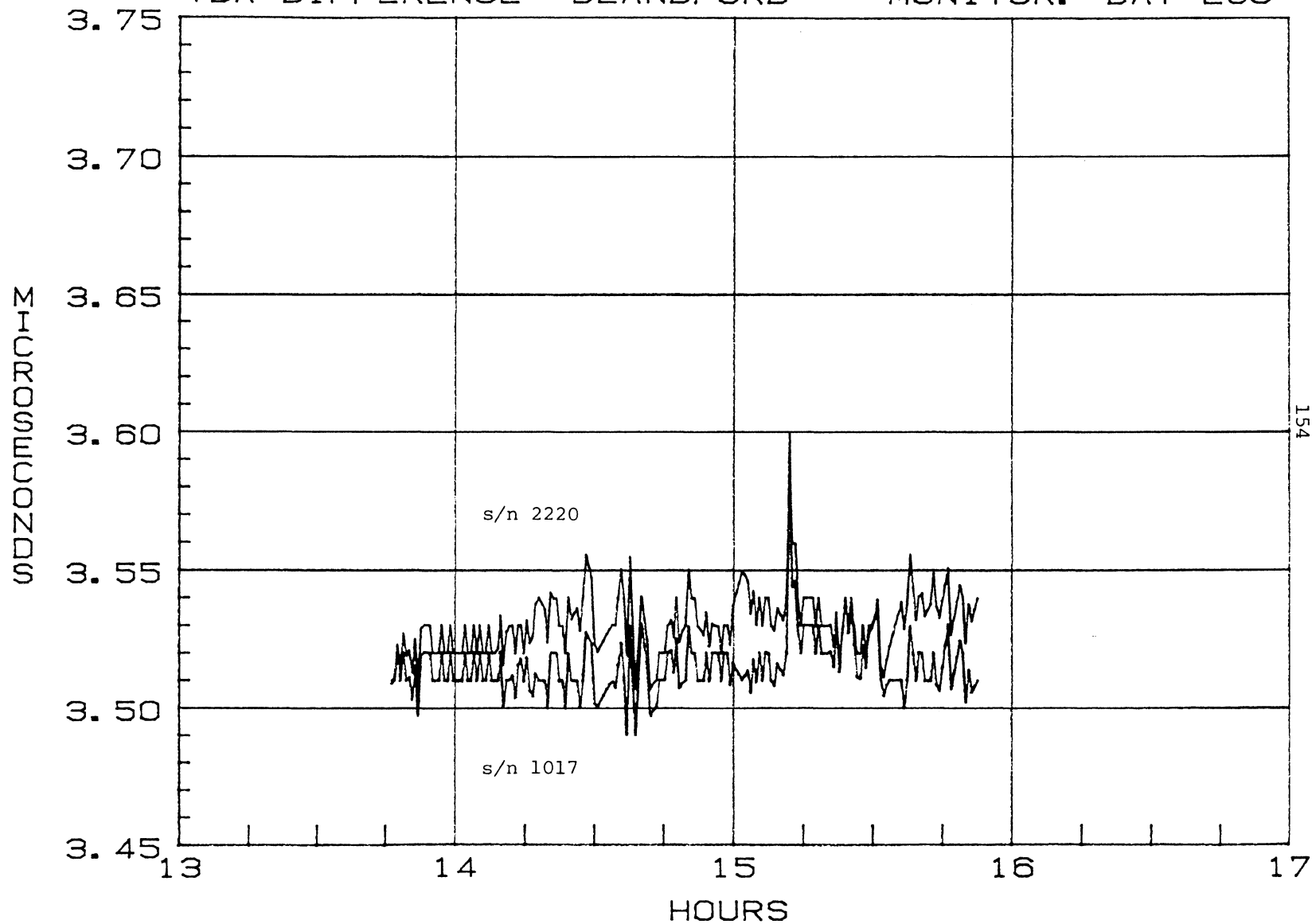


152

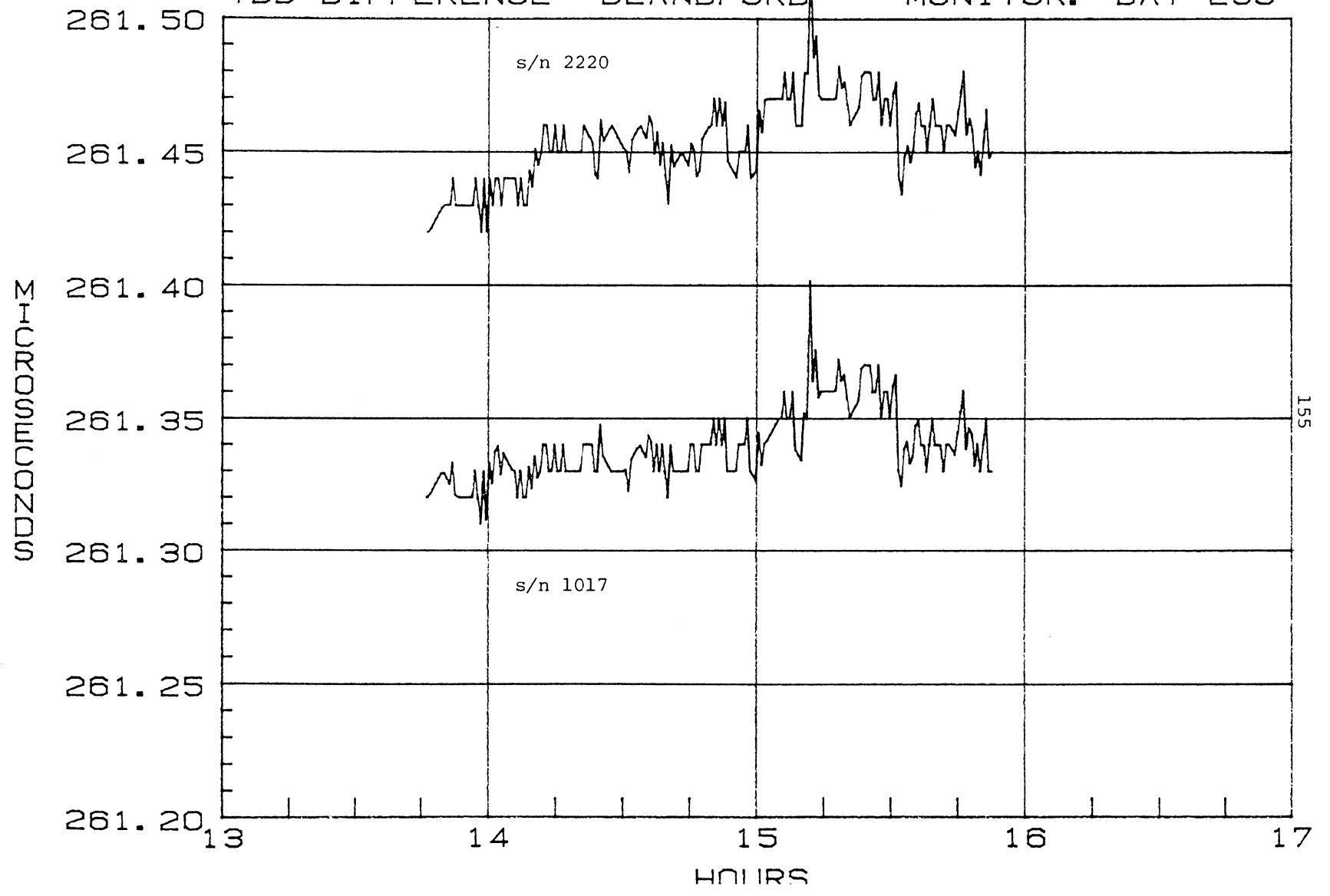
TDB BLANDFORD DATA FOR DAY 230



TDA DIFFERENCE BLANDFORD - MONITOR. DAY 230

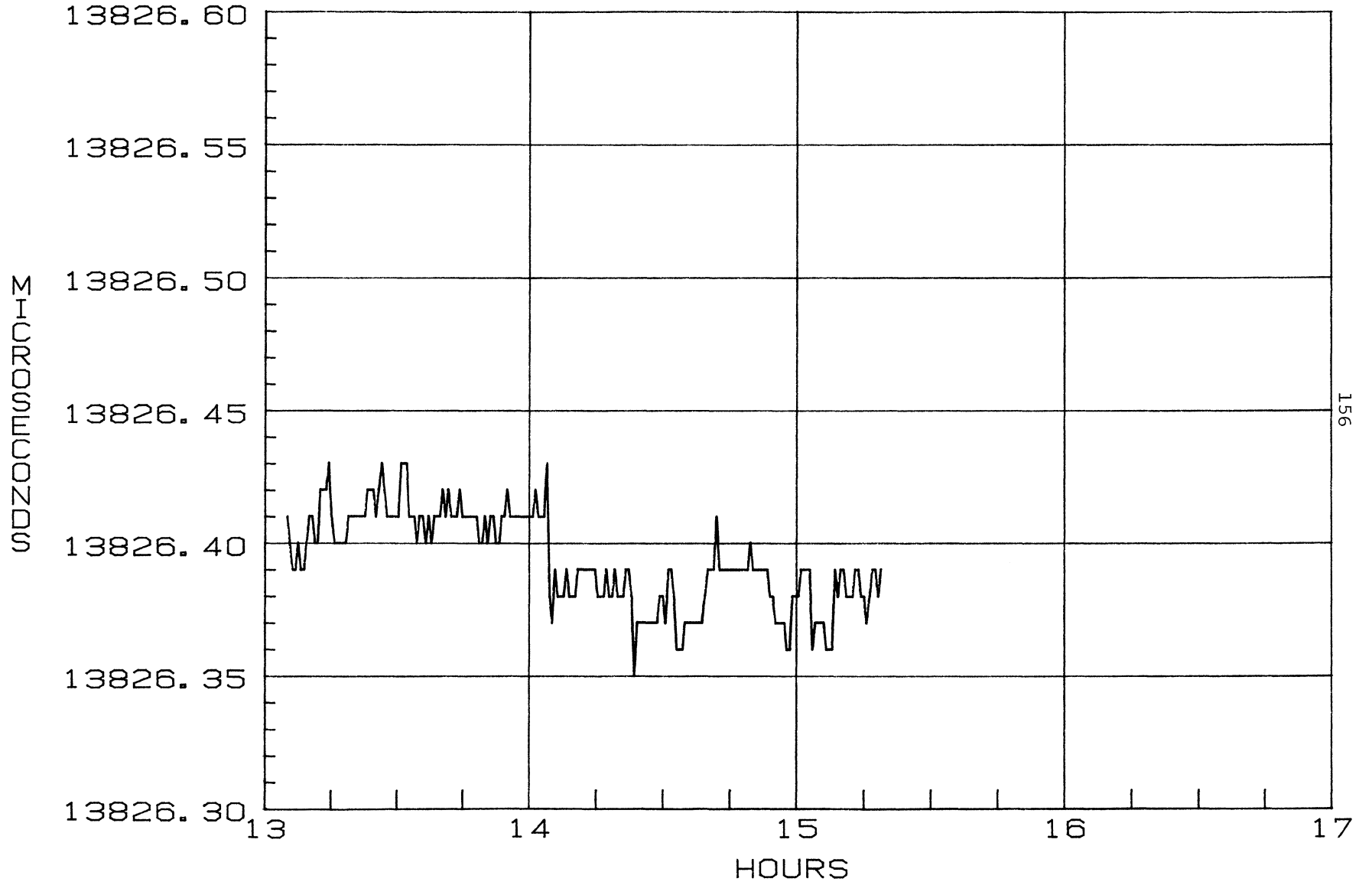


TDB DIFFERENCE BLANDFORD - MONITOR. DAY 230

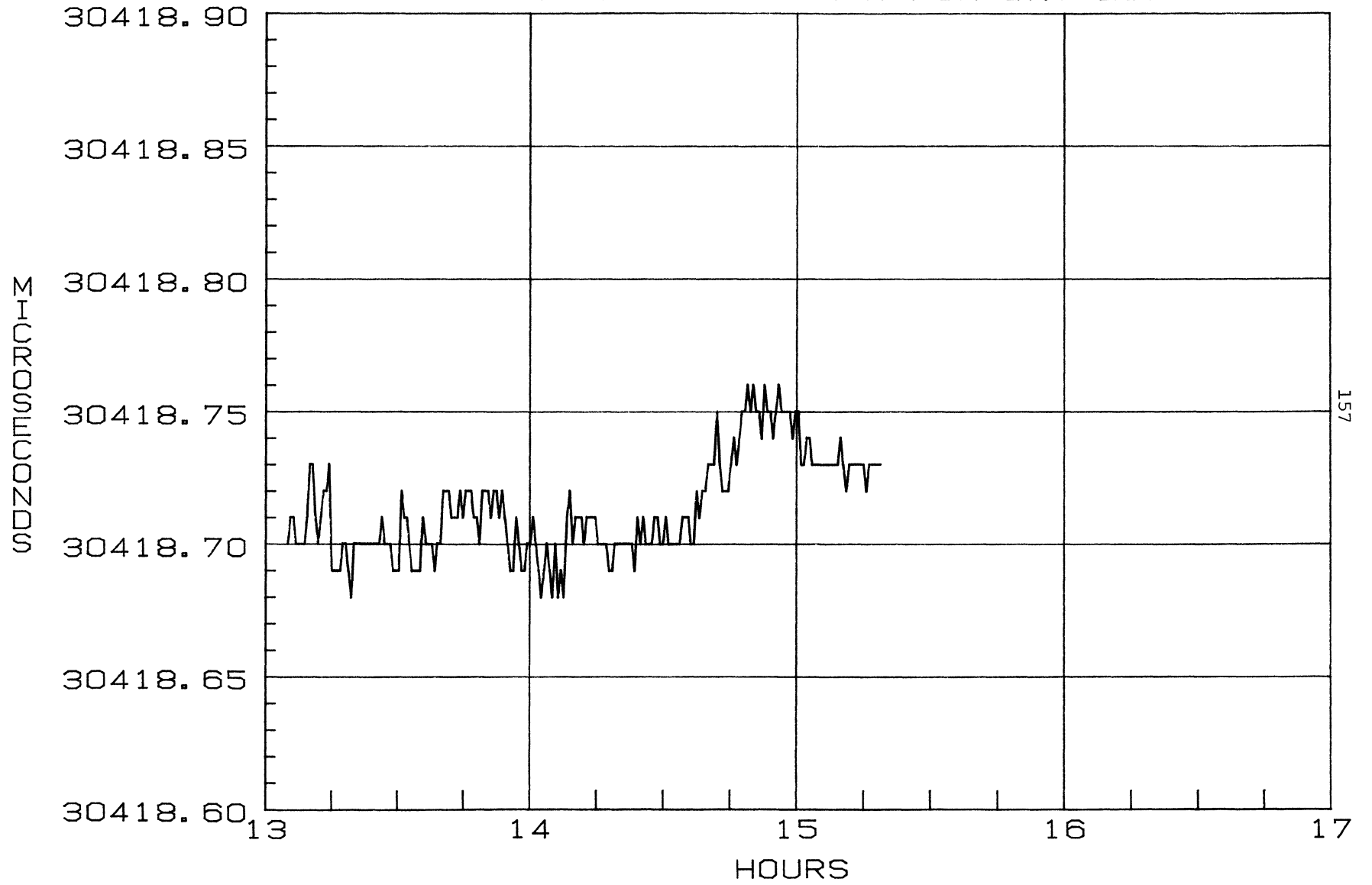


155

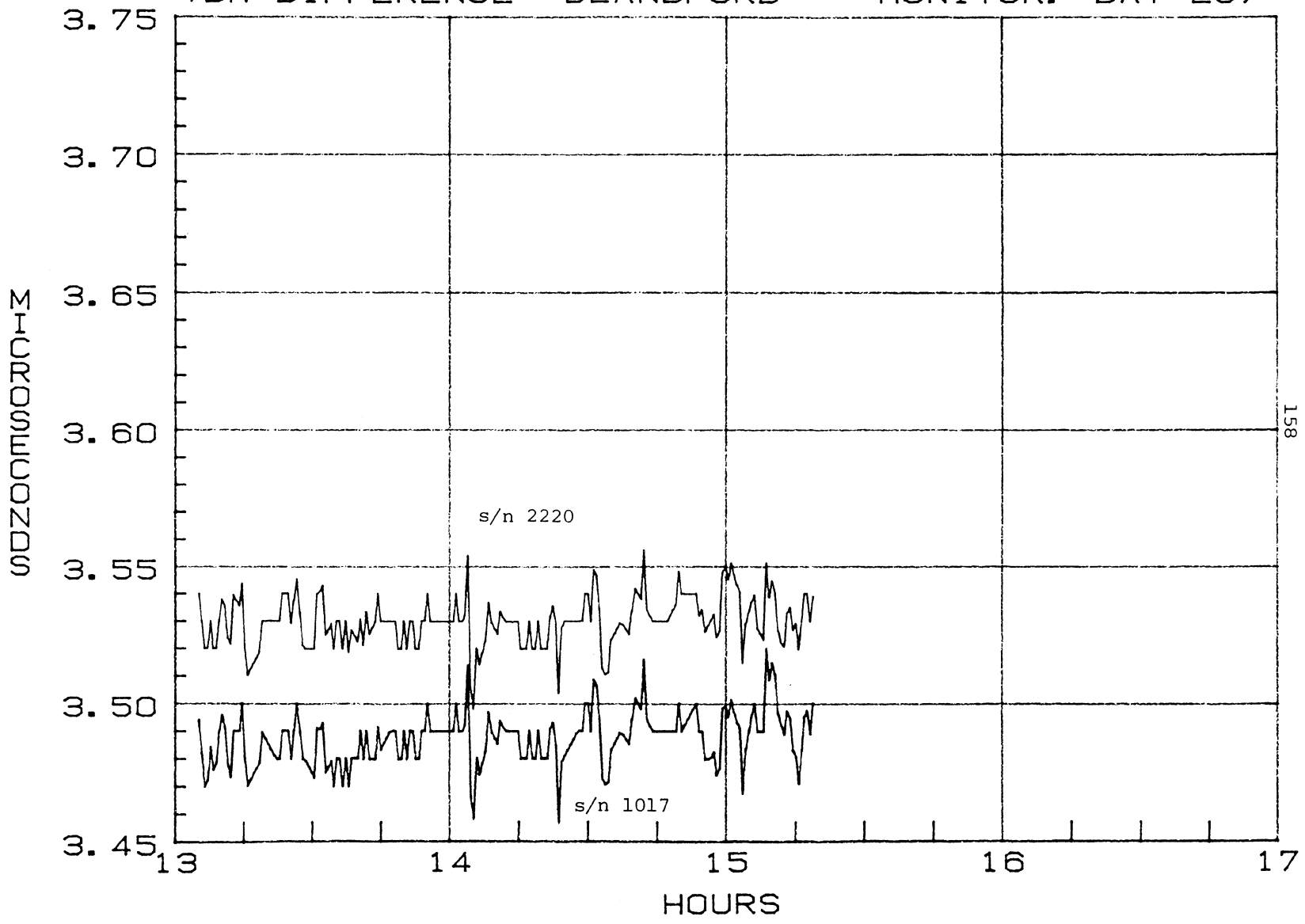
TDA BLANDFORD DATA FOR DAY 237



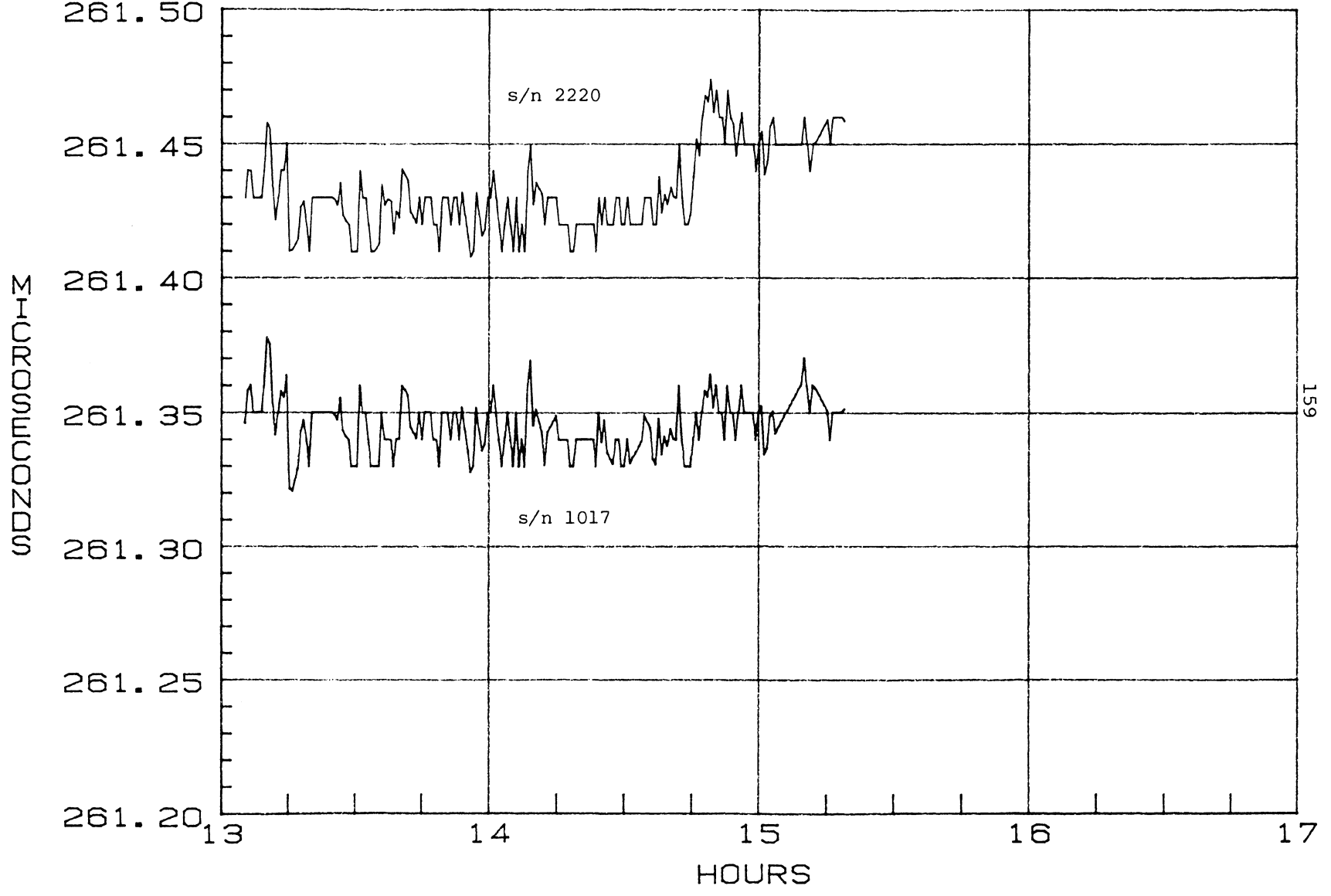
TDB BLANDFORD DATA FOR DAY 237



TDA DIFFERENCE BLANDFORD - MONITOR. DAY 237

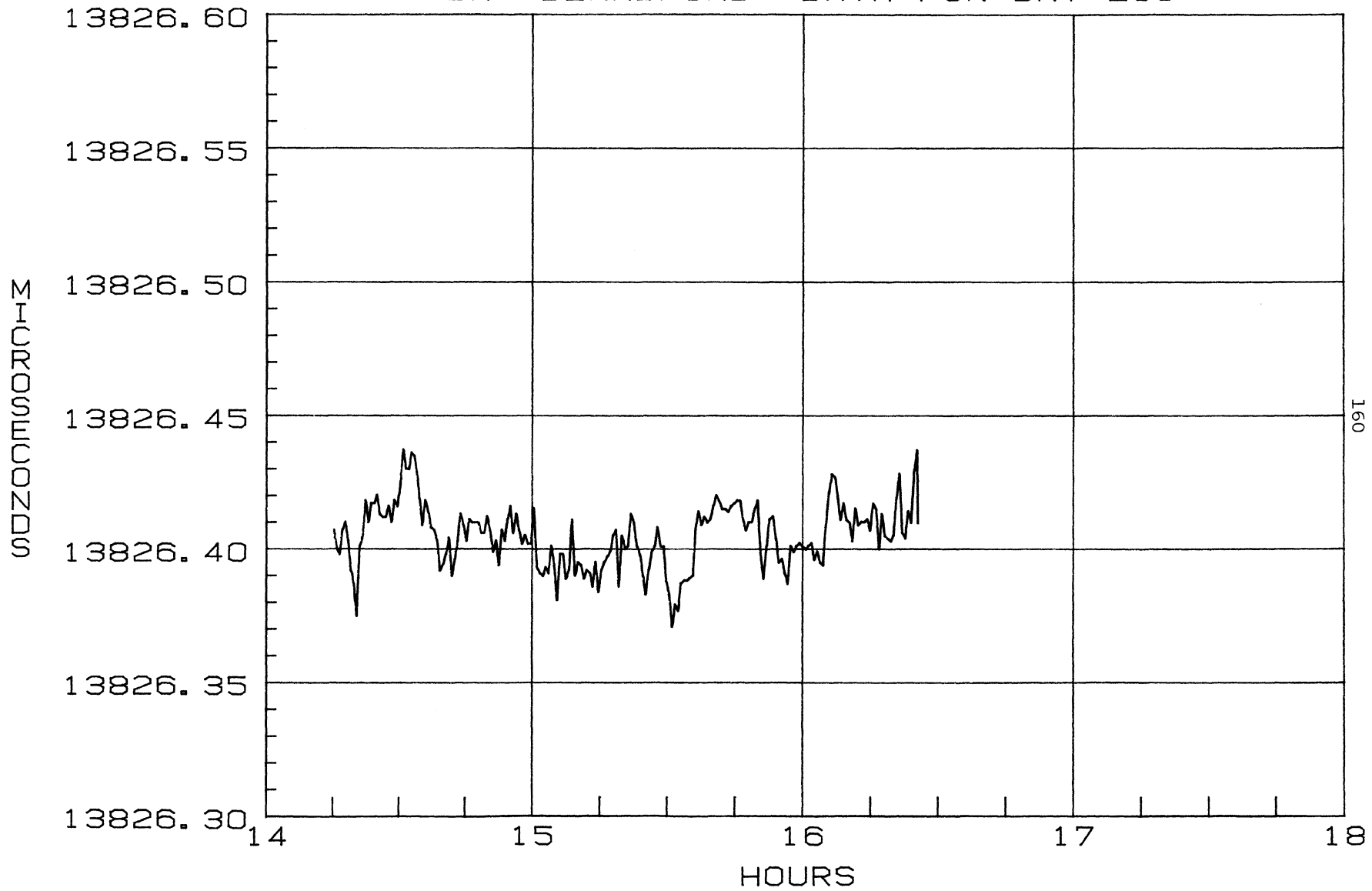


TDB DIFFERENCE BLANDFORD - MONITOR. DAY 237

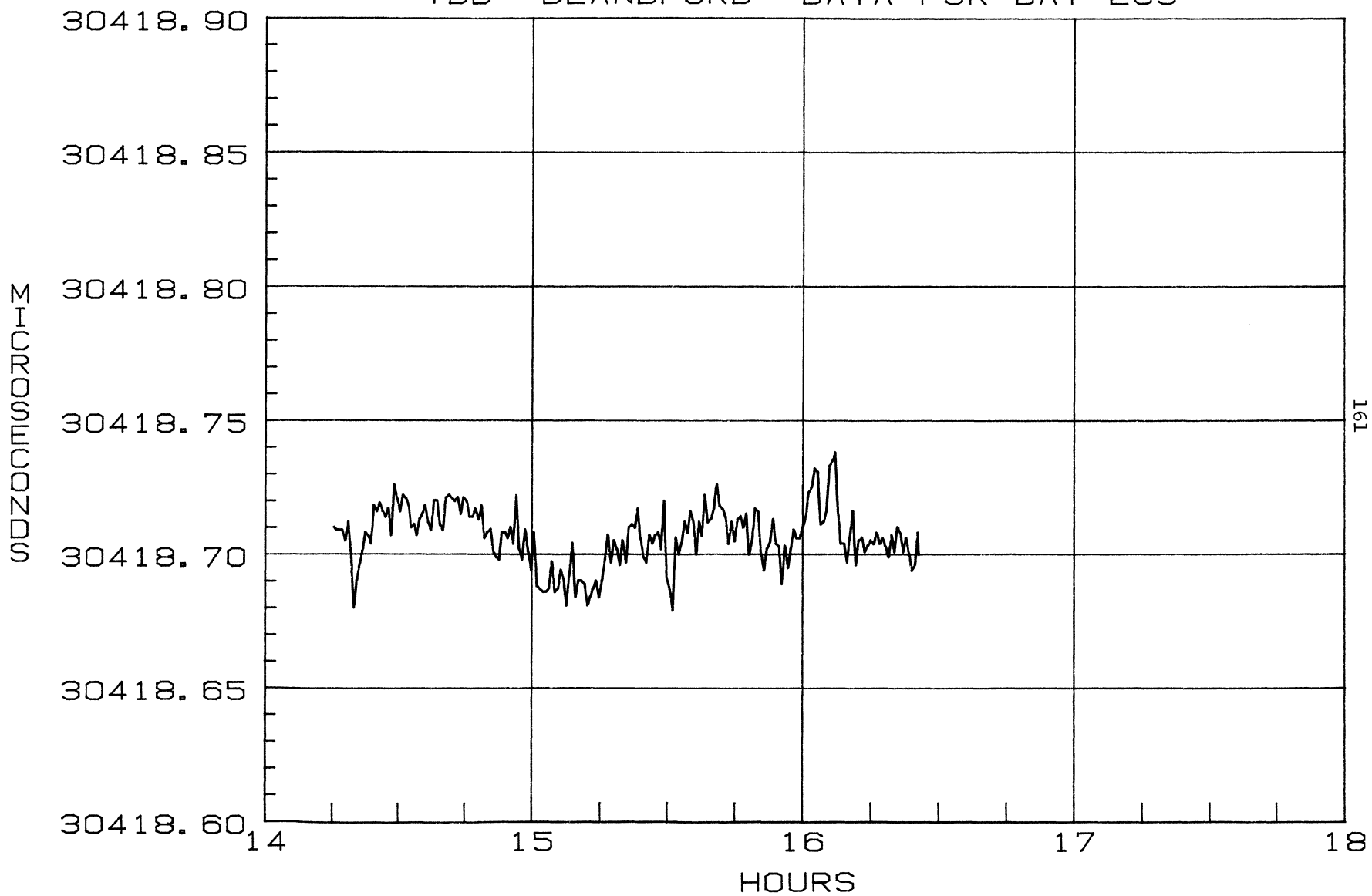


159

TDA BLANDFORD DATA FOR DAY 265

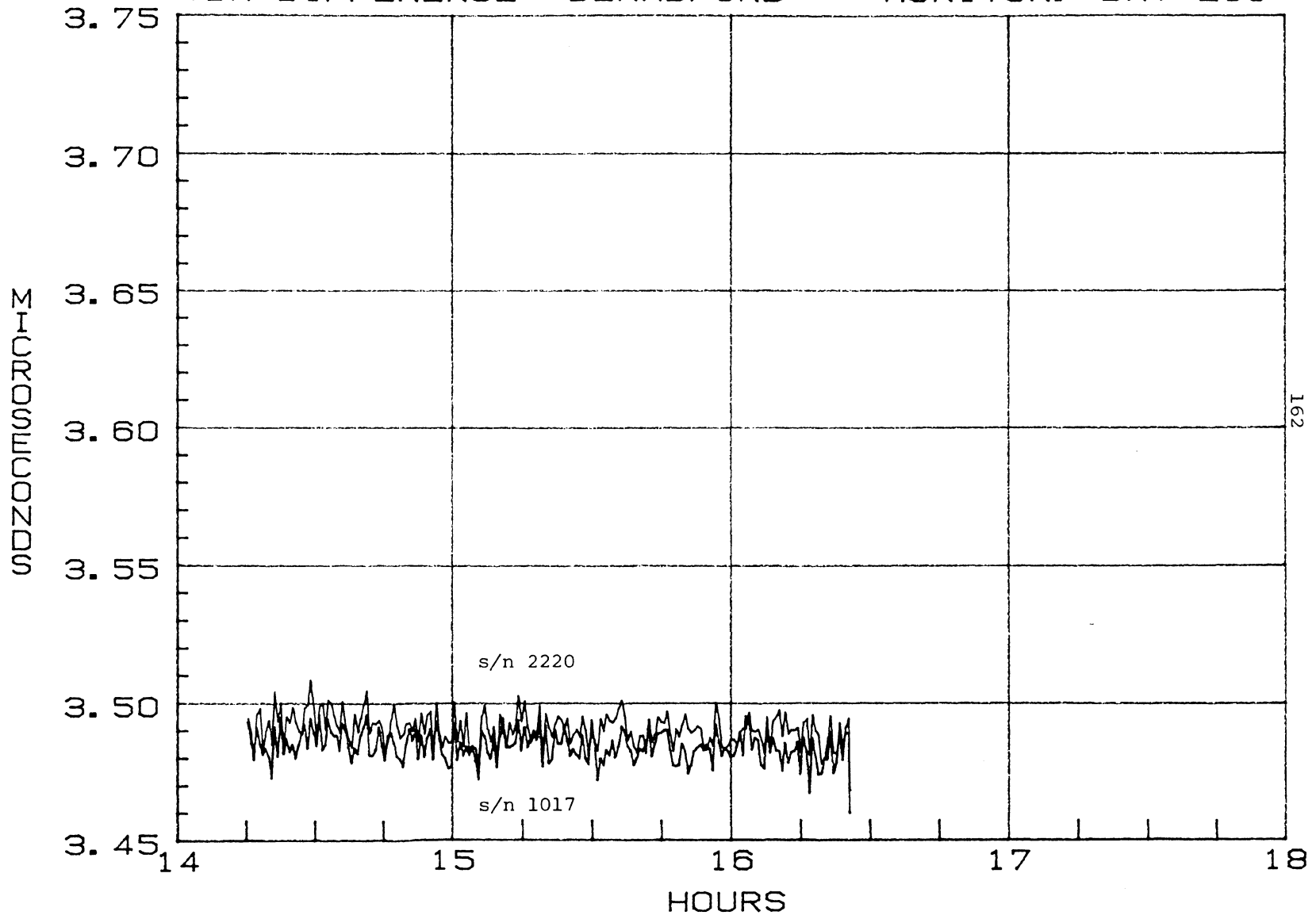


TDB BLANDFORD DATA FOR DAY 265

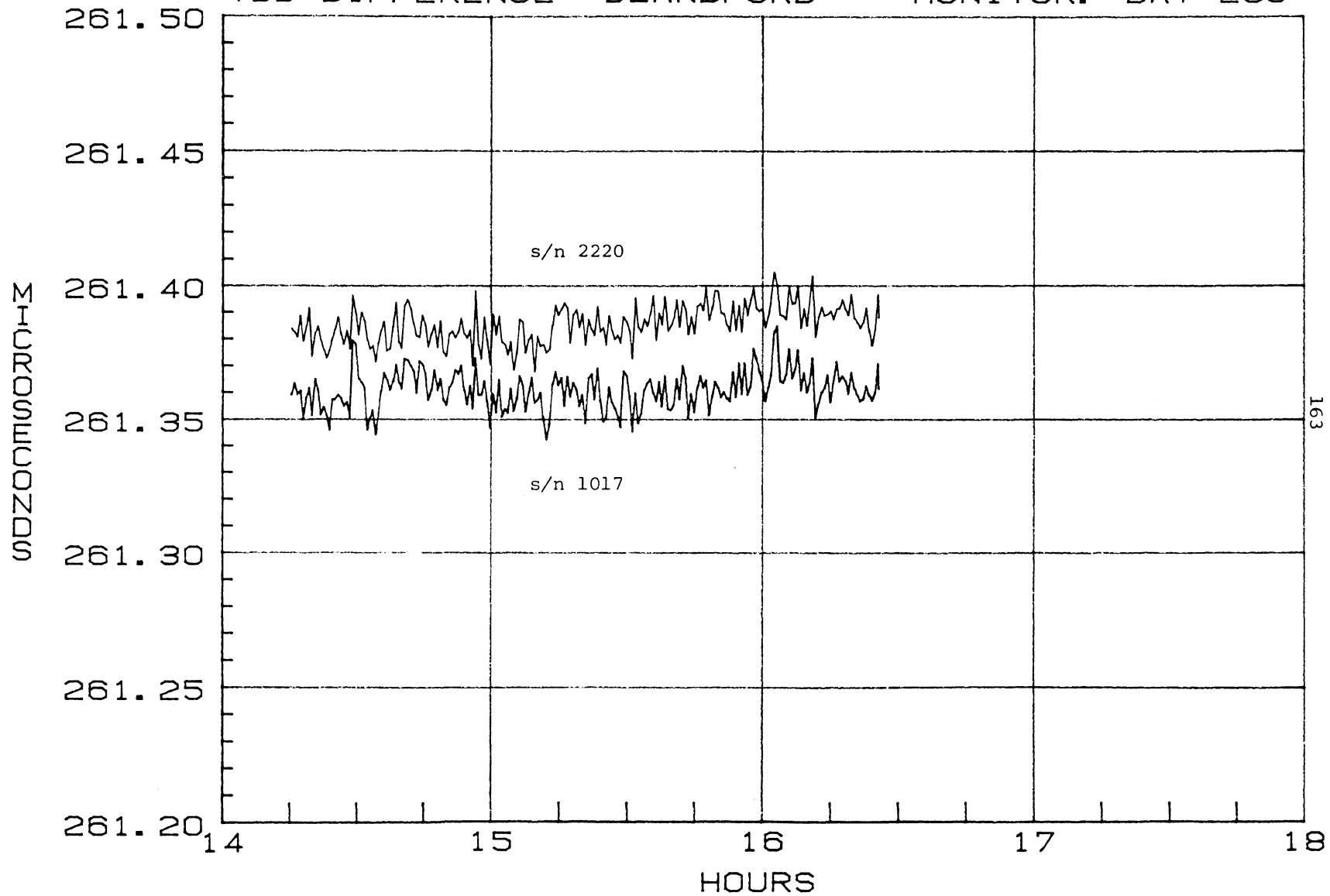


161

TDA DIFFERENCE BLANDFORD - MONITOR. DAY 265



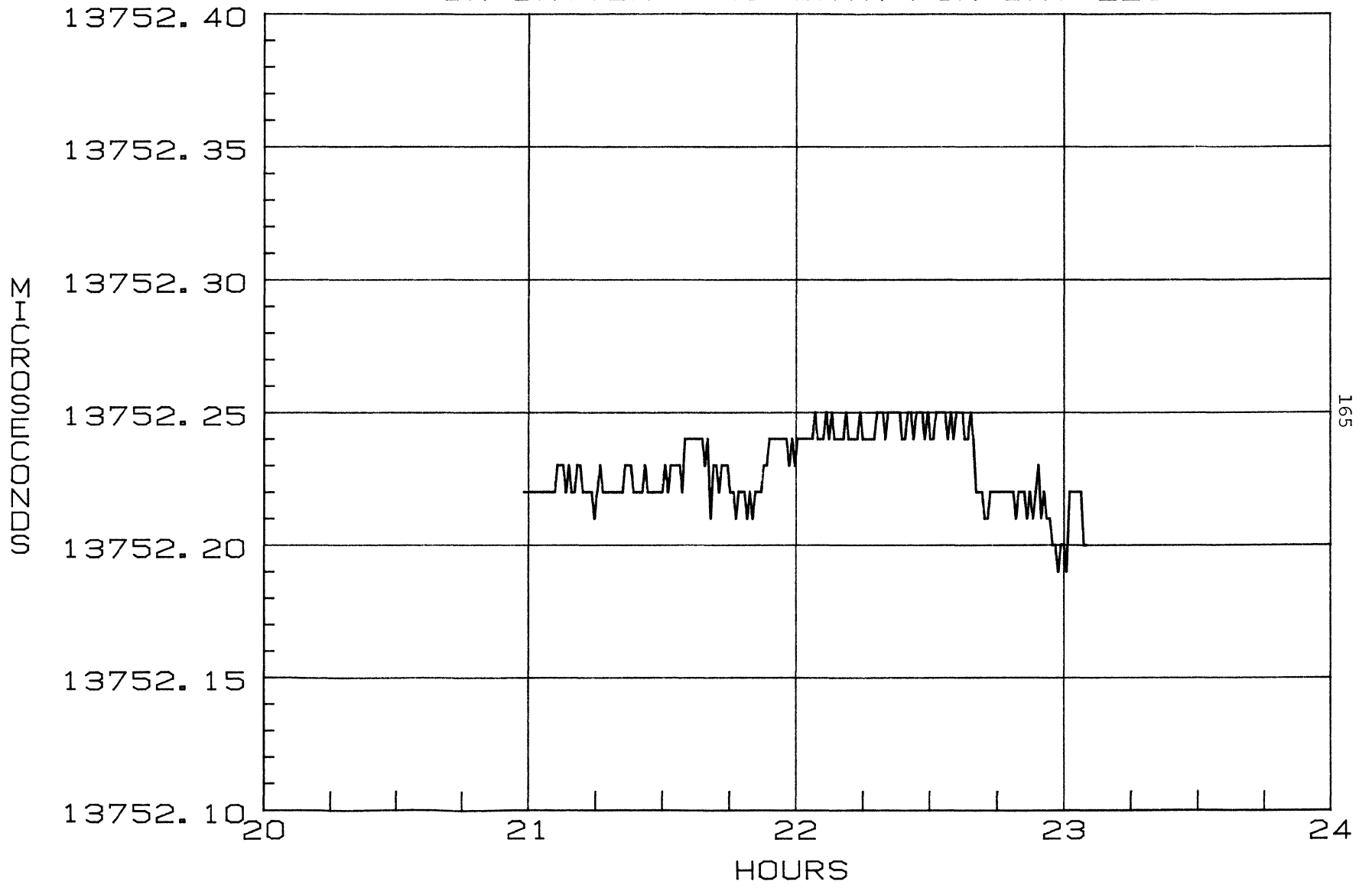
TDB DIFFERENCE BLANDFORD - MONITOR. DAY 265



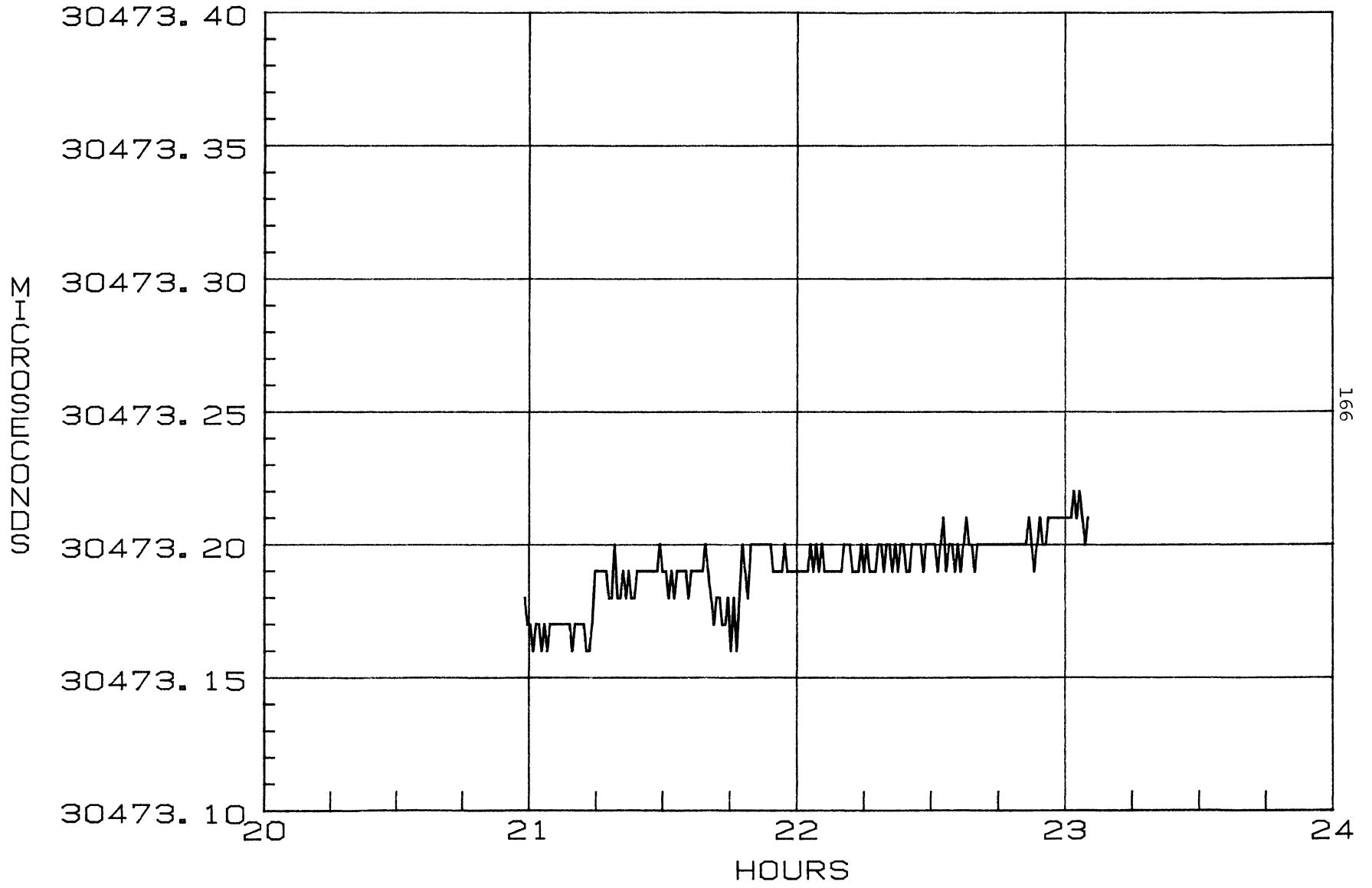
APPENDIX VI.4

BATTERY POINT

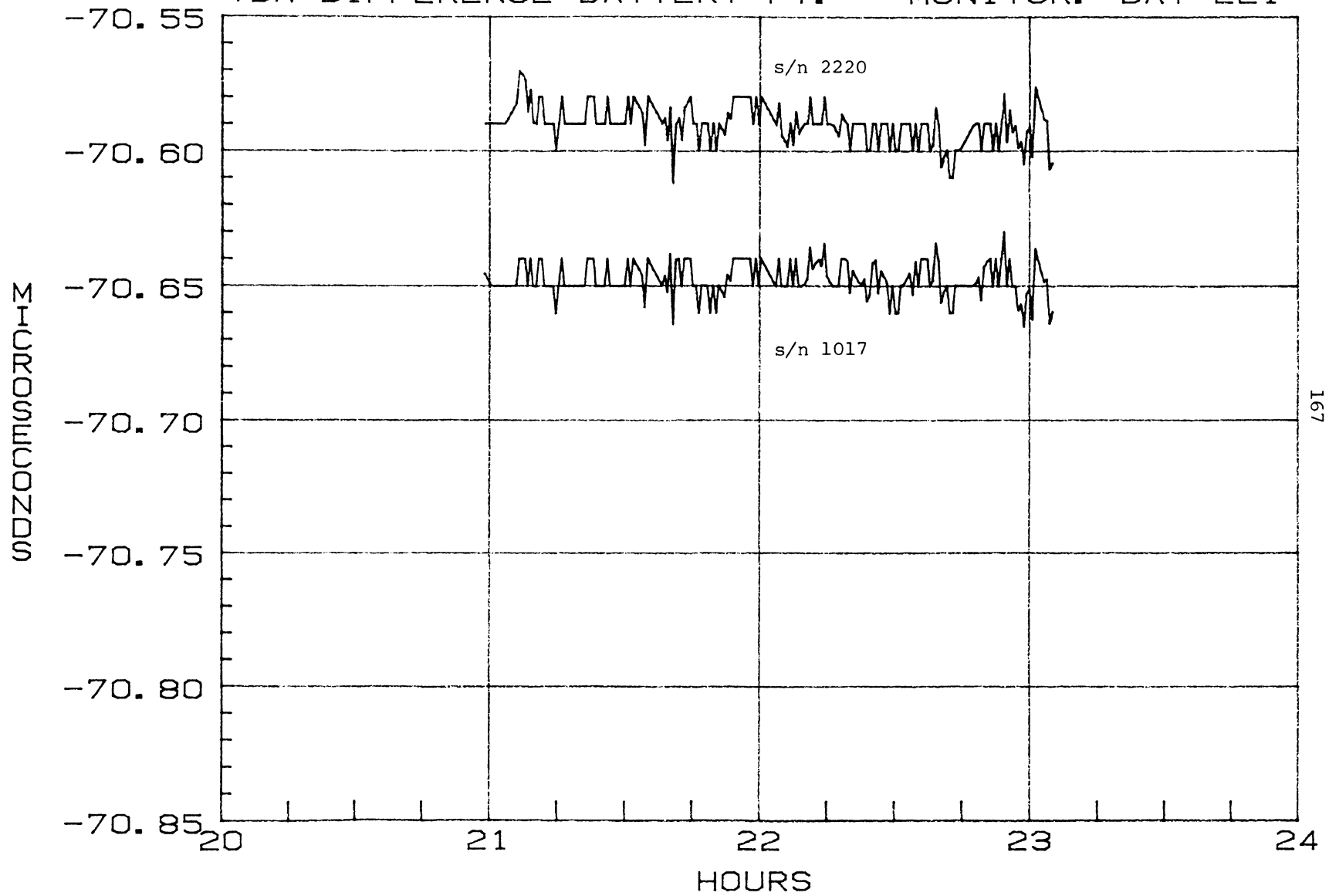
TDA BATTERY PT. DATA FOR DAY 221



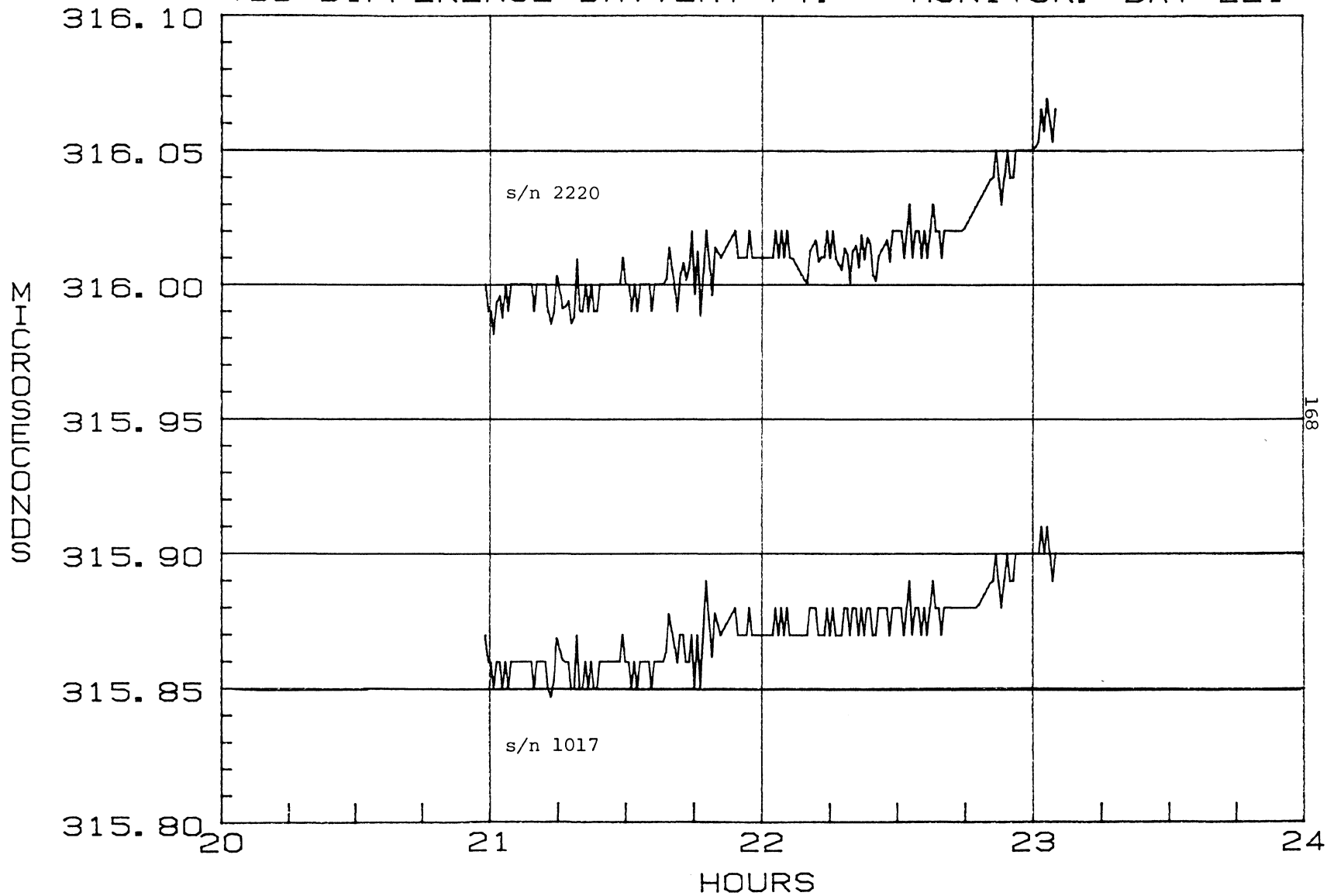
TDB BATTERY PT. DATA FOR DAY 221



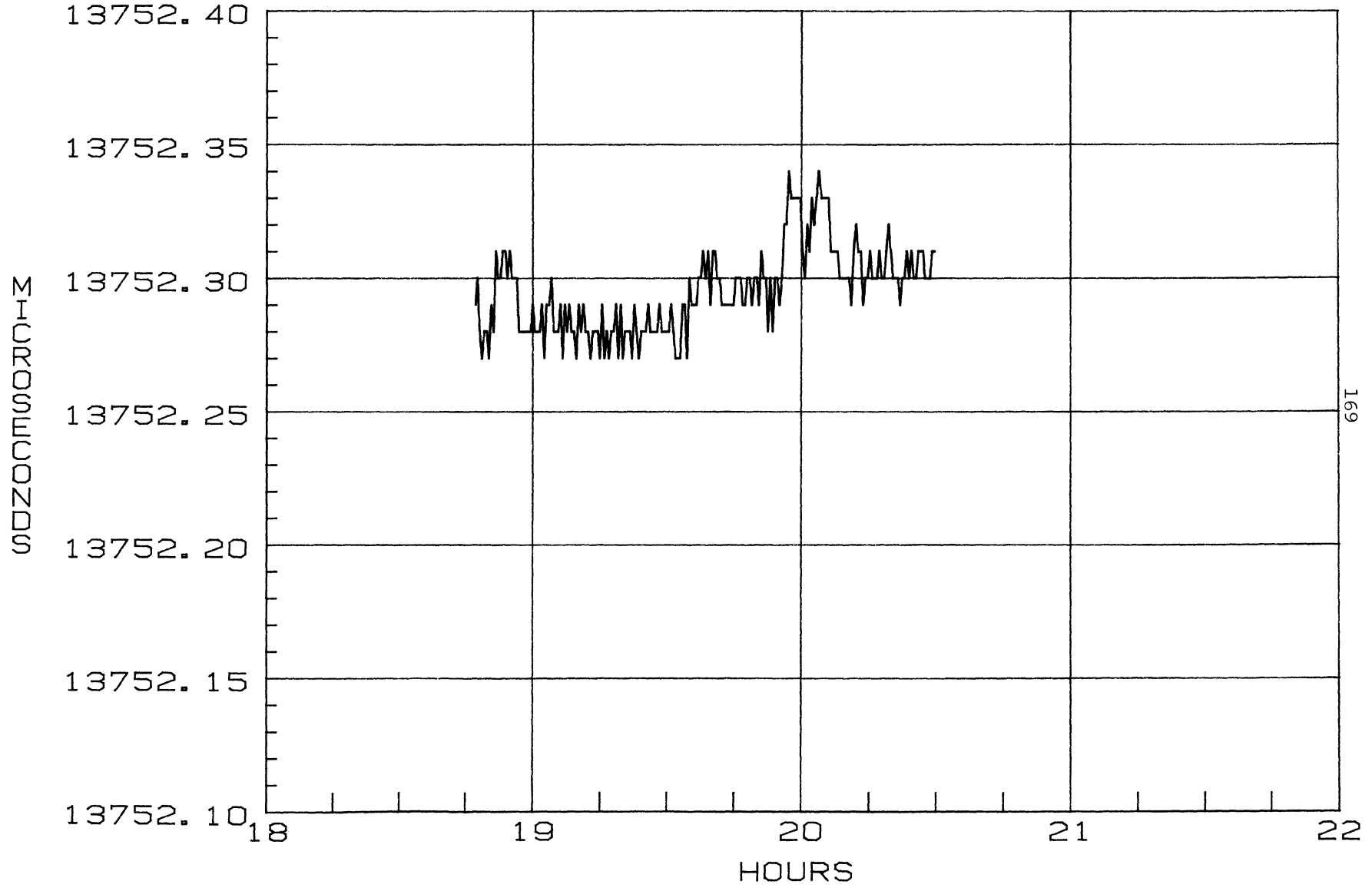
TDA DIFFERENCE BATTERY PT. - MONITOR. DAY 221



TDB DIFFERENCE BATTERY PT. - MONITOR. DAY 221

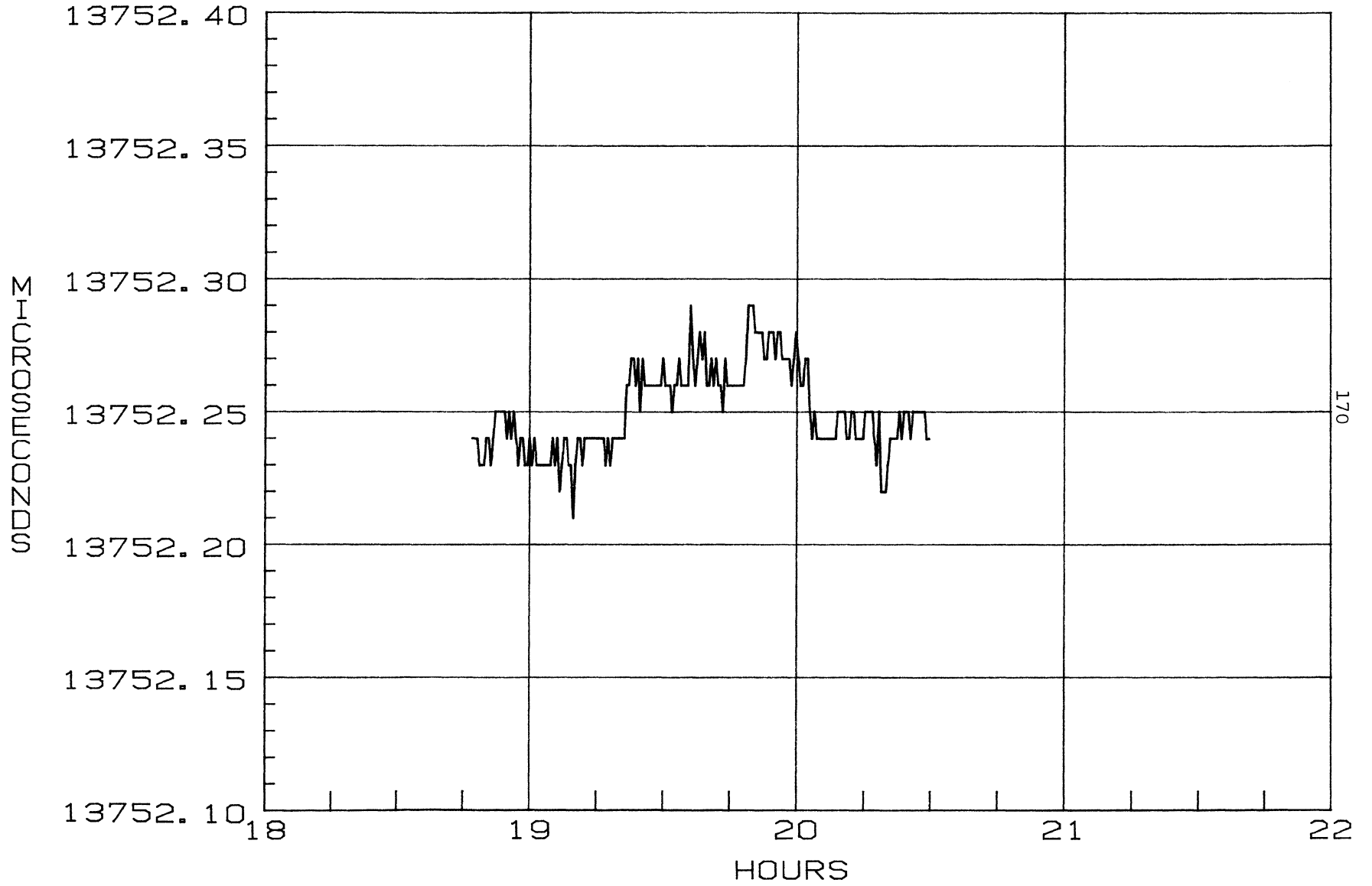


TDA BATTERY PT. DATA FOR DAY 230

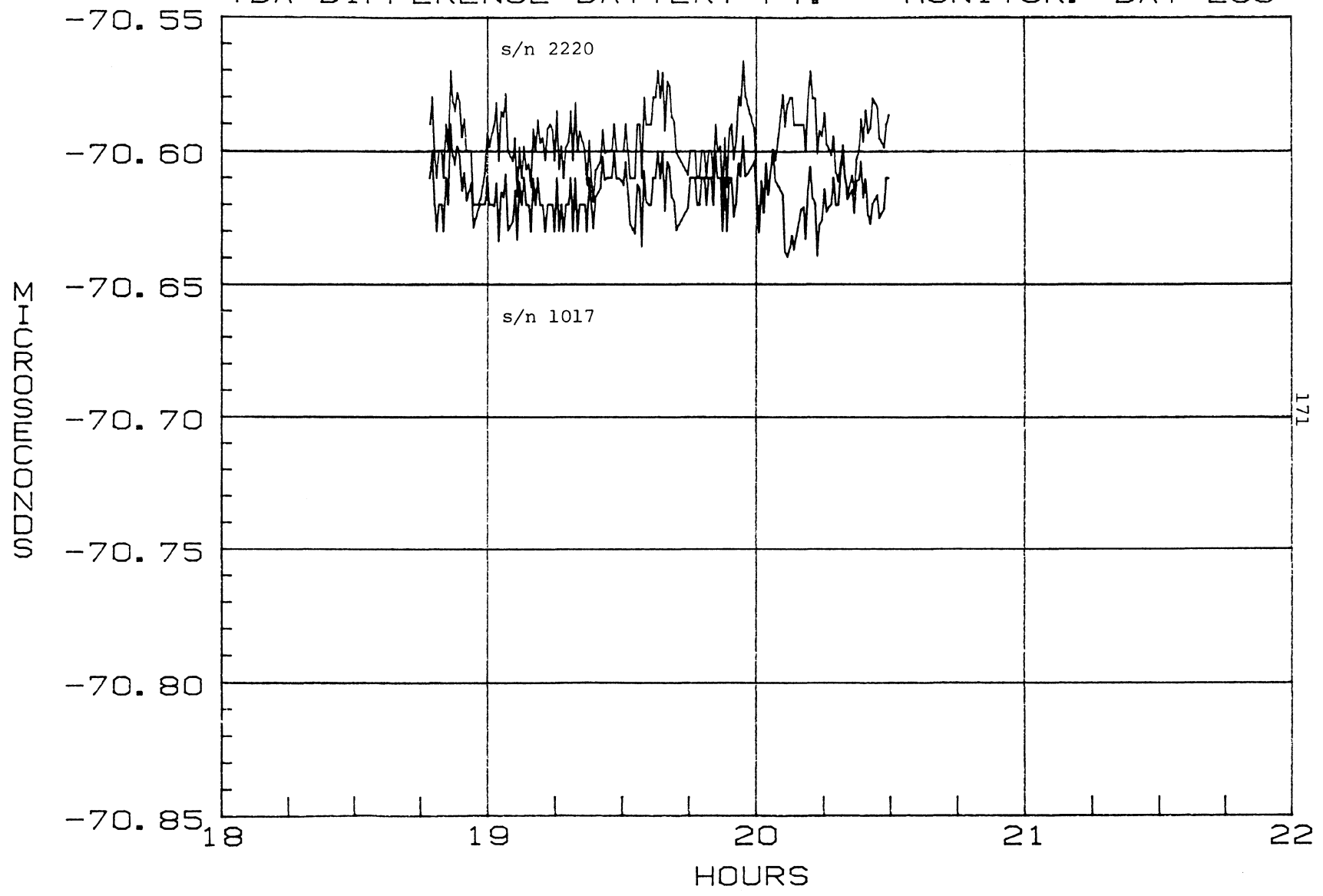


169

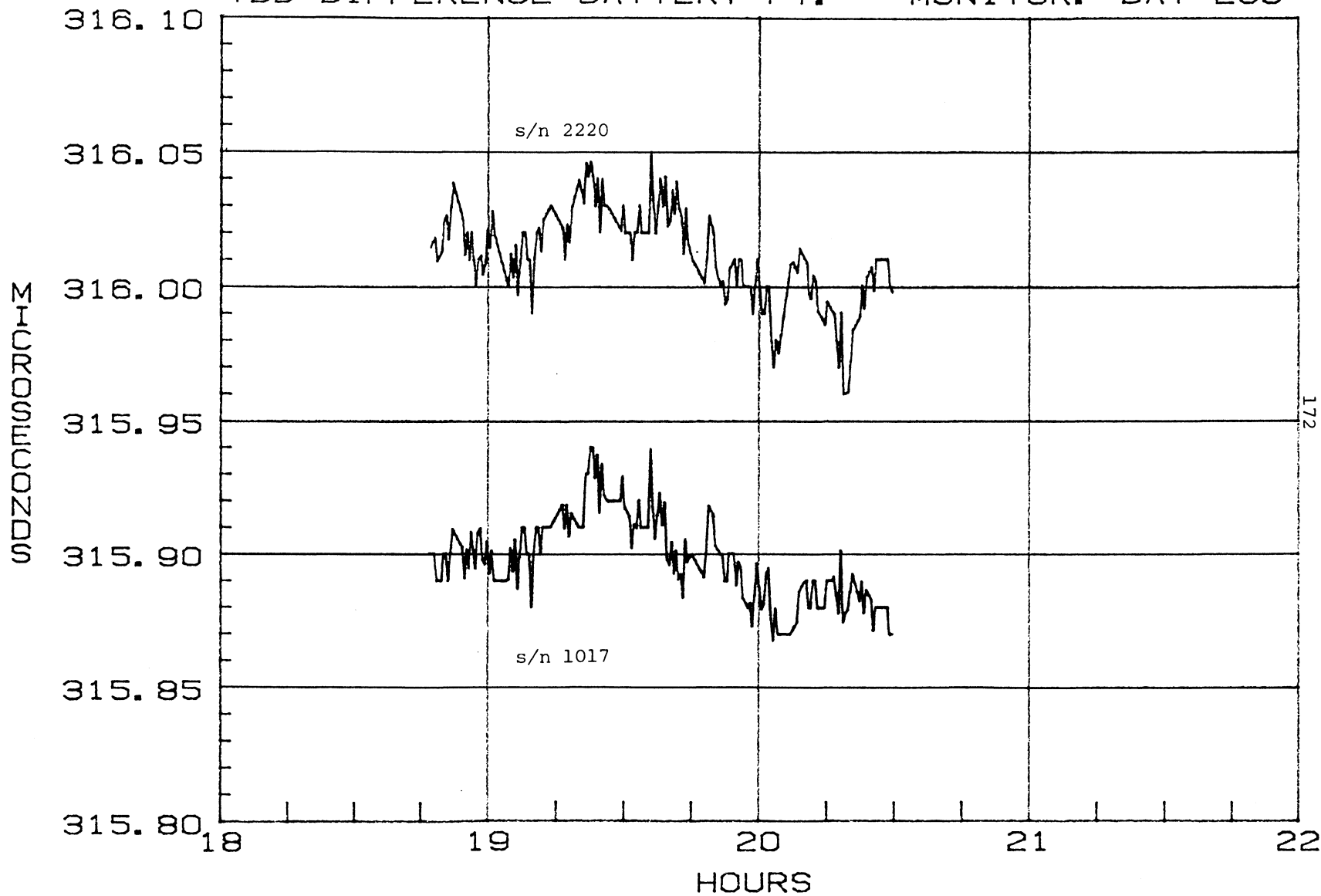
TDB BATTERY PT. DATA FOR DAY 230



TDA DIFFERENCE BATTERY PT. - MONITOR. DAY 230

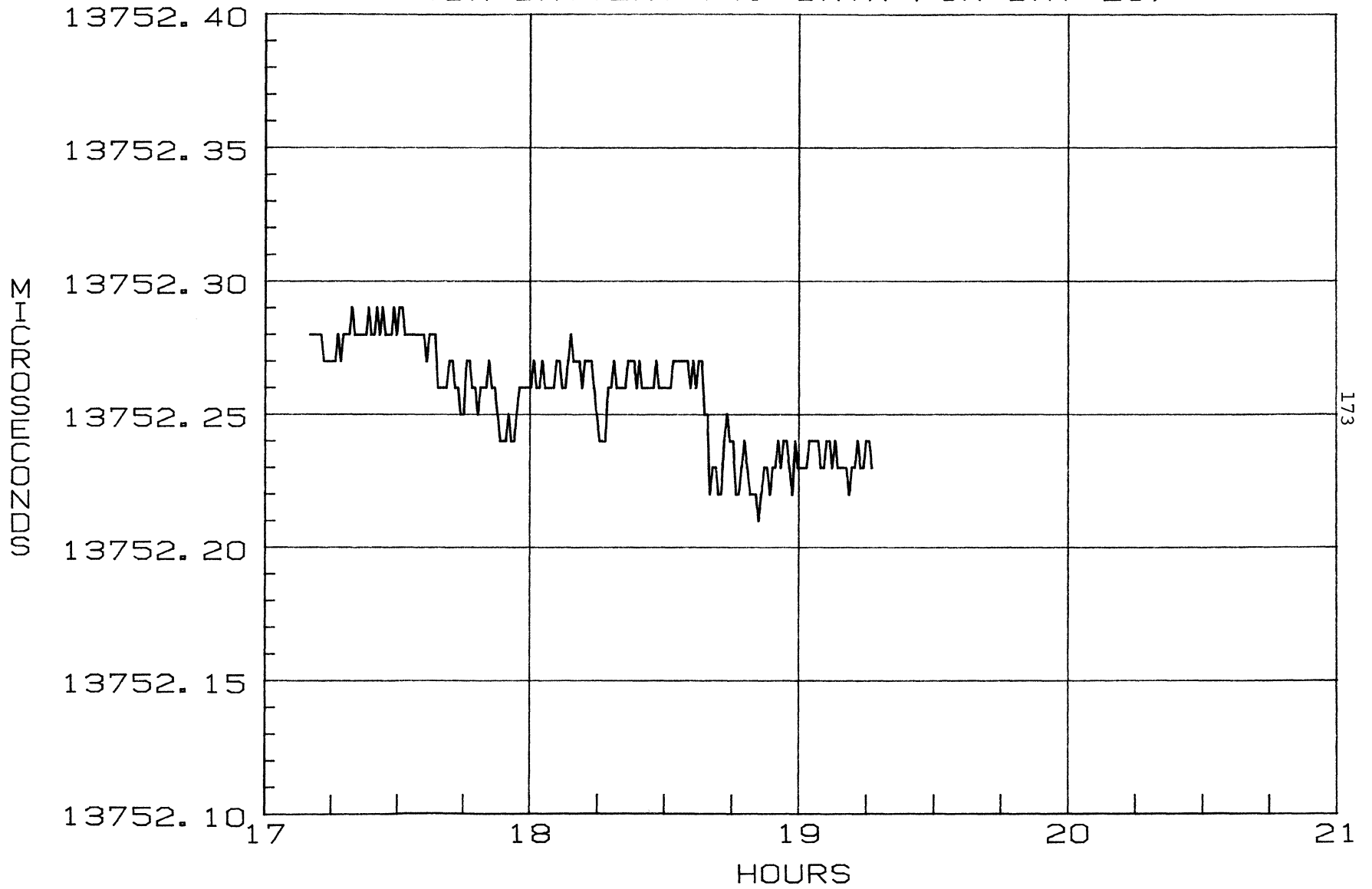


TDB DIFFERENCE BATTERY PT. - MONITOR. DAY 230

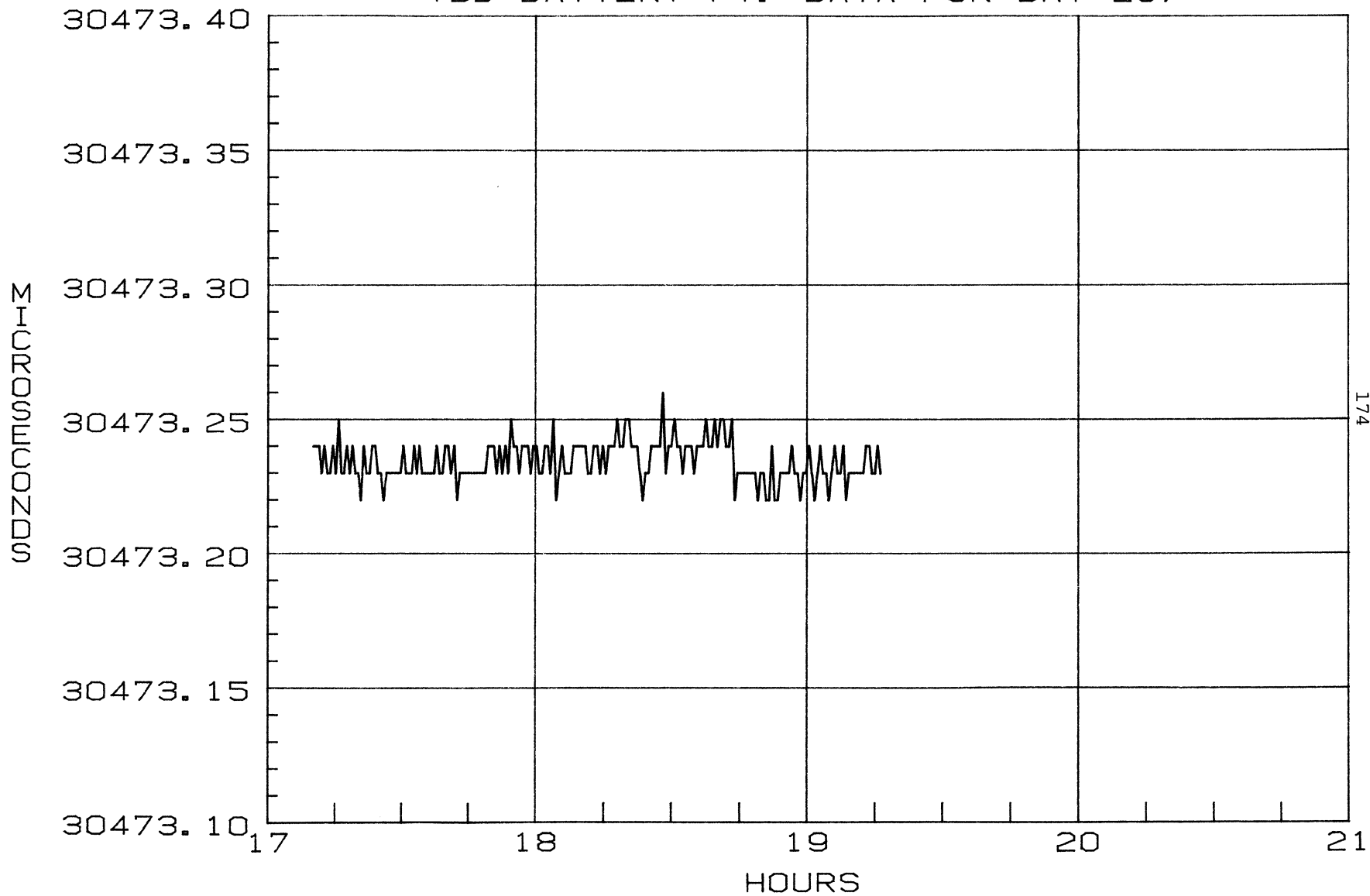


172

TDA BATTERY PT. DATA FOR DAY 237

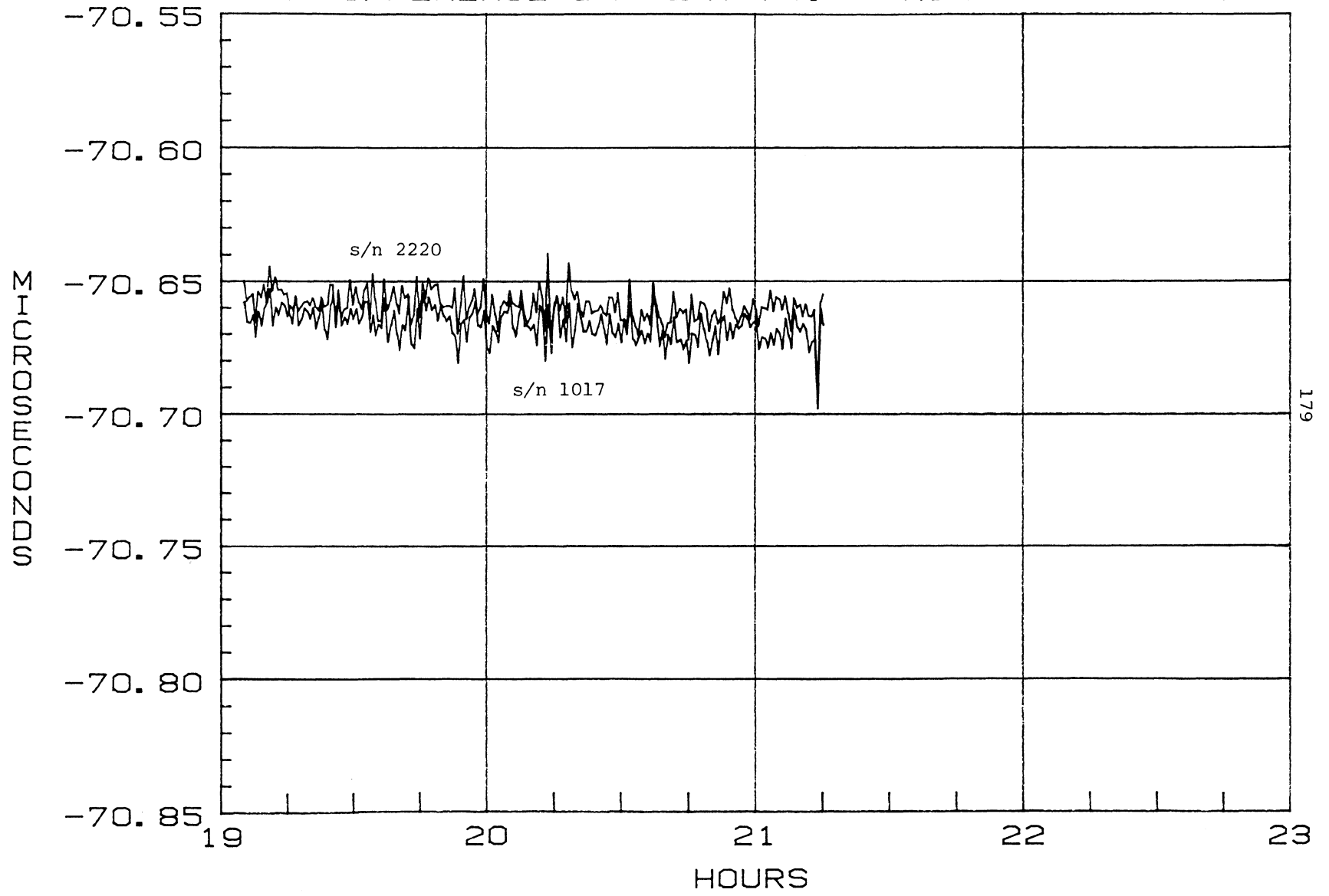


TDB BATTERY PT. DATA FOR DAY 237

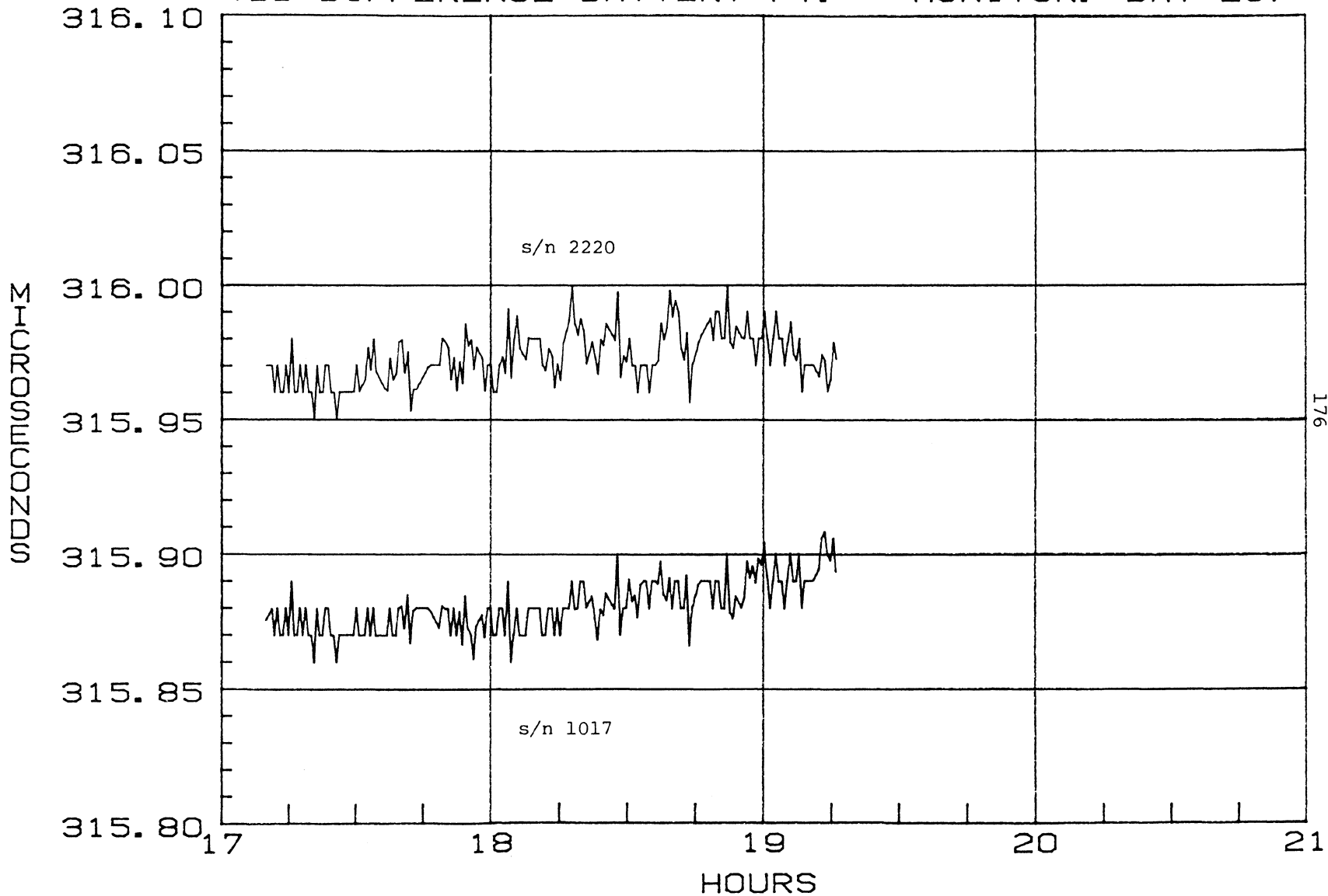


174

TDA DIFFERENCE BATTERY PT. - MONITOR. DAY 265

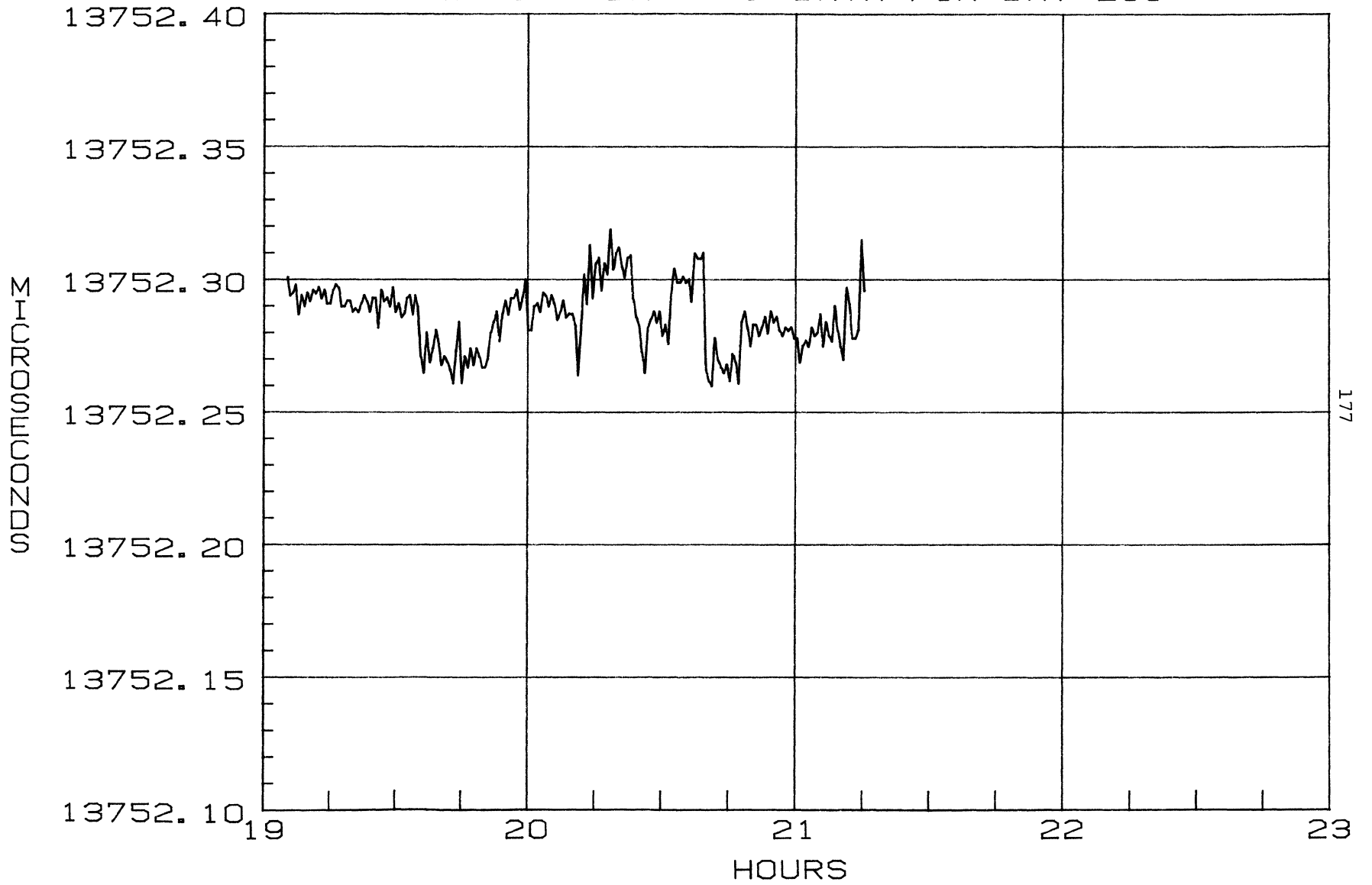


TDB DIFFERENCE BATTERY PT. - MONITOR. DAY 237

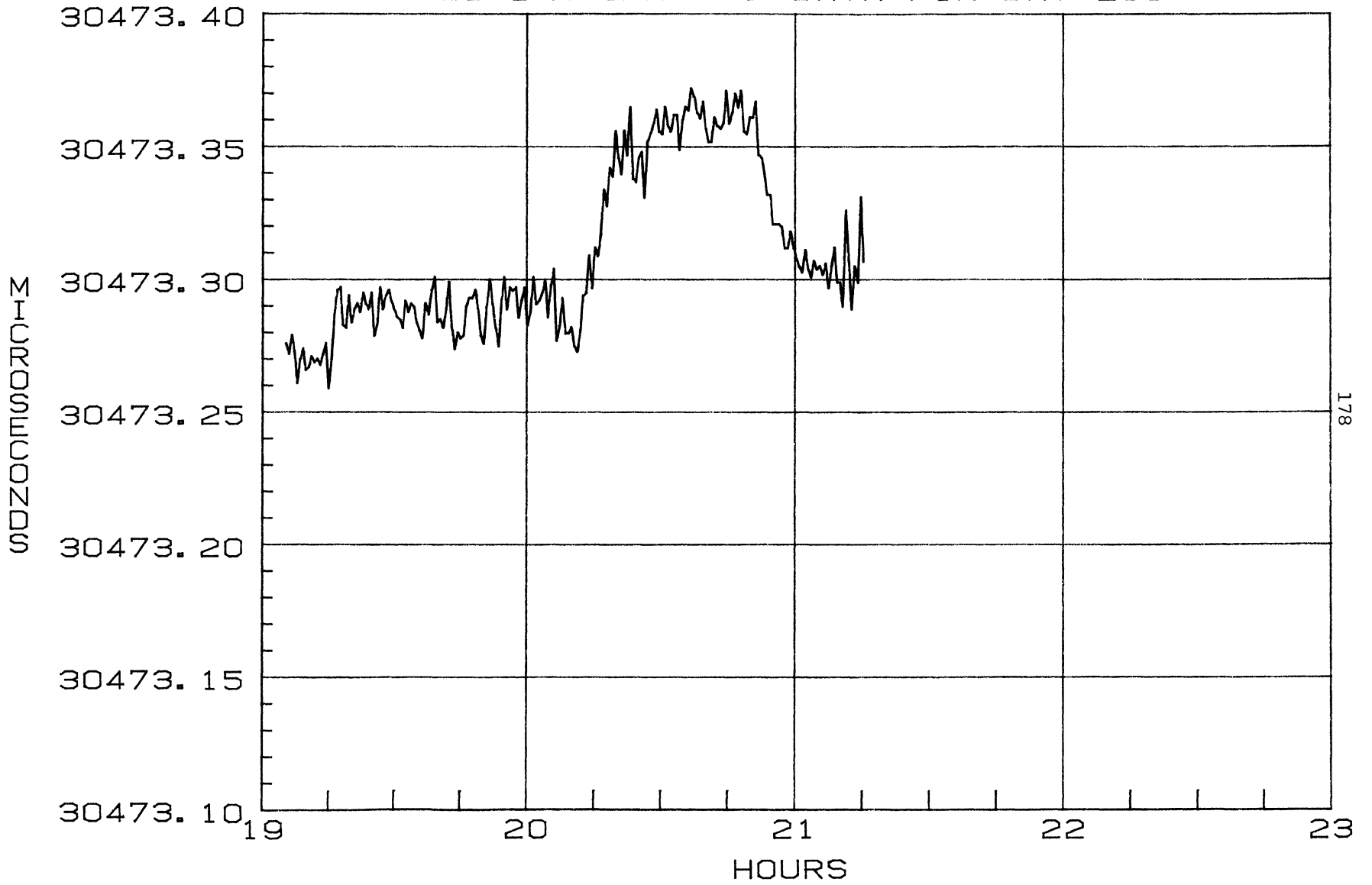


176

TDA BATTERY PT. DATA FOR DAY 265

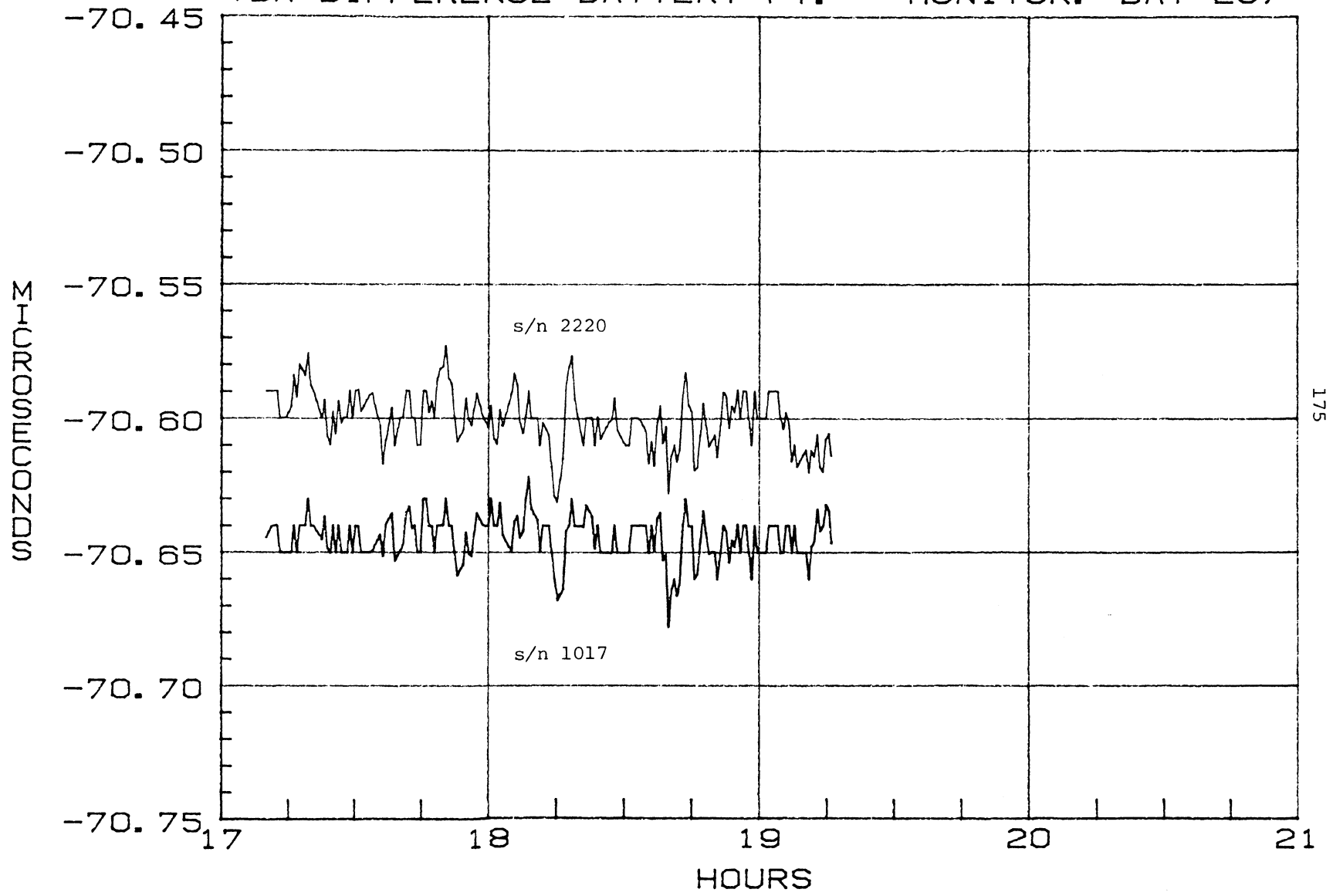


TDB BATTERY PT. DATA FOR DAY 265

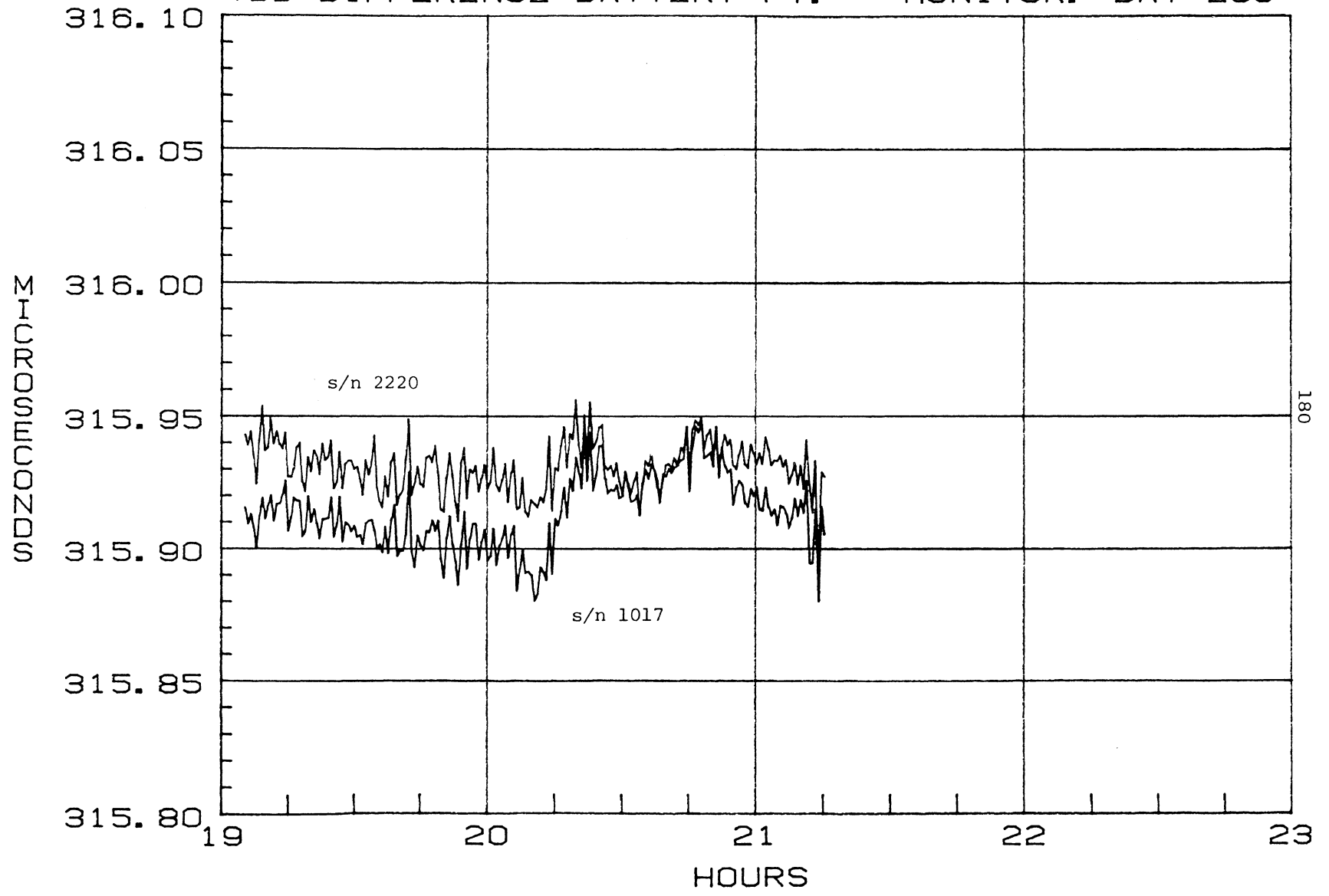


178

TDA DIFFERENCE BATTERY PT. - MONITOR. DAY 237



TDB DIFFERENCE BATTERY PT. - MONITOR. DAY 265

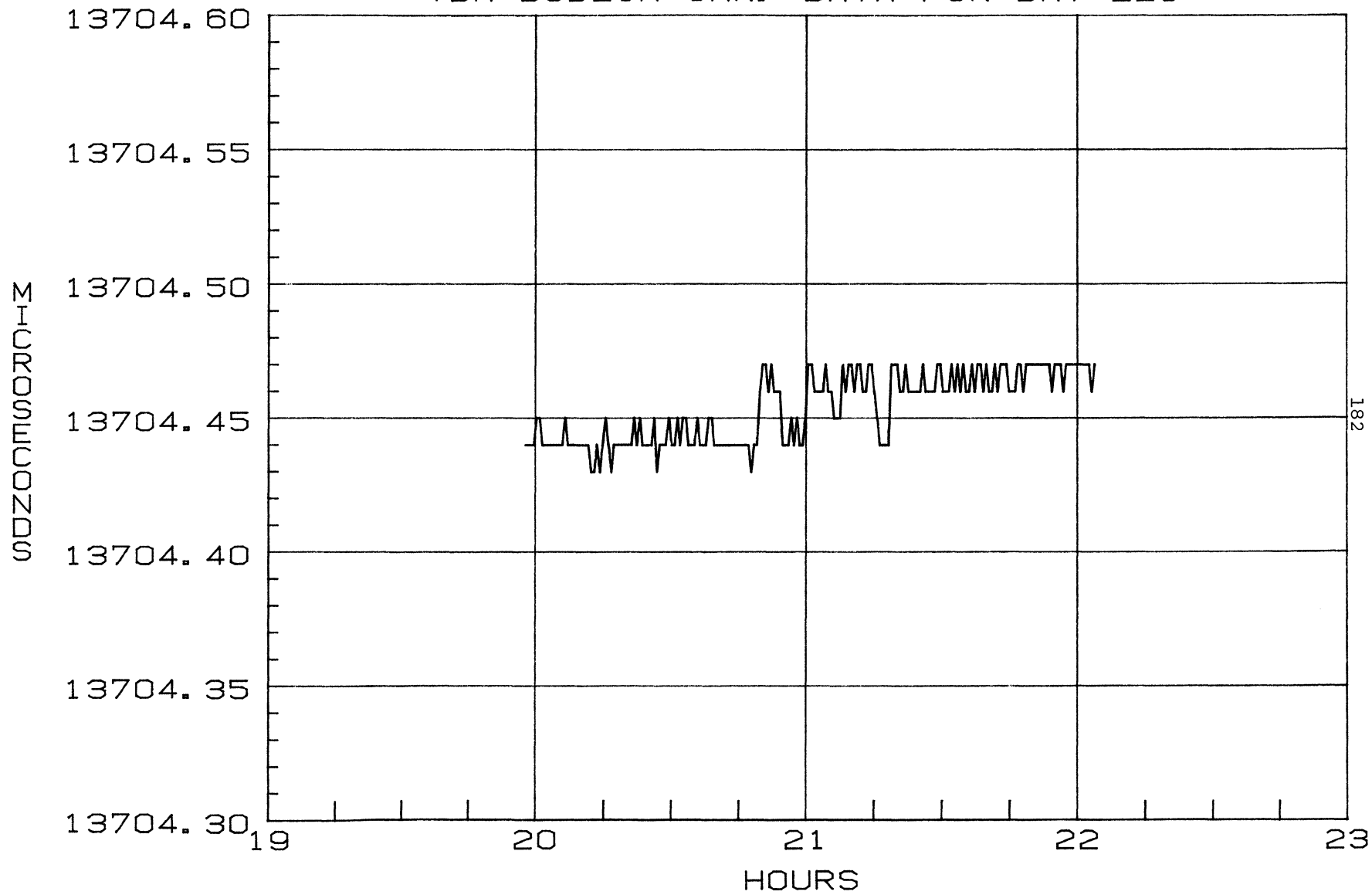


180

APPENDIX VI.5

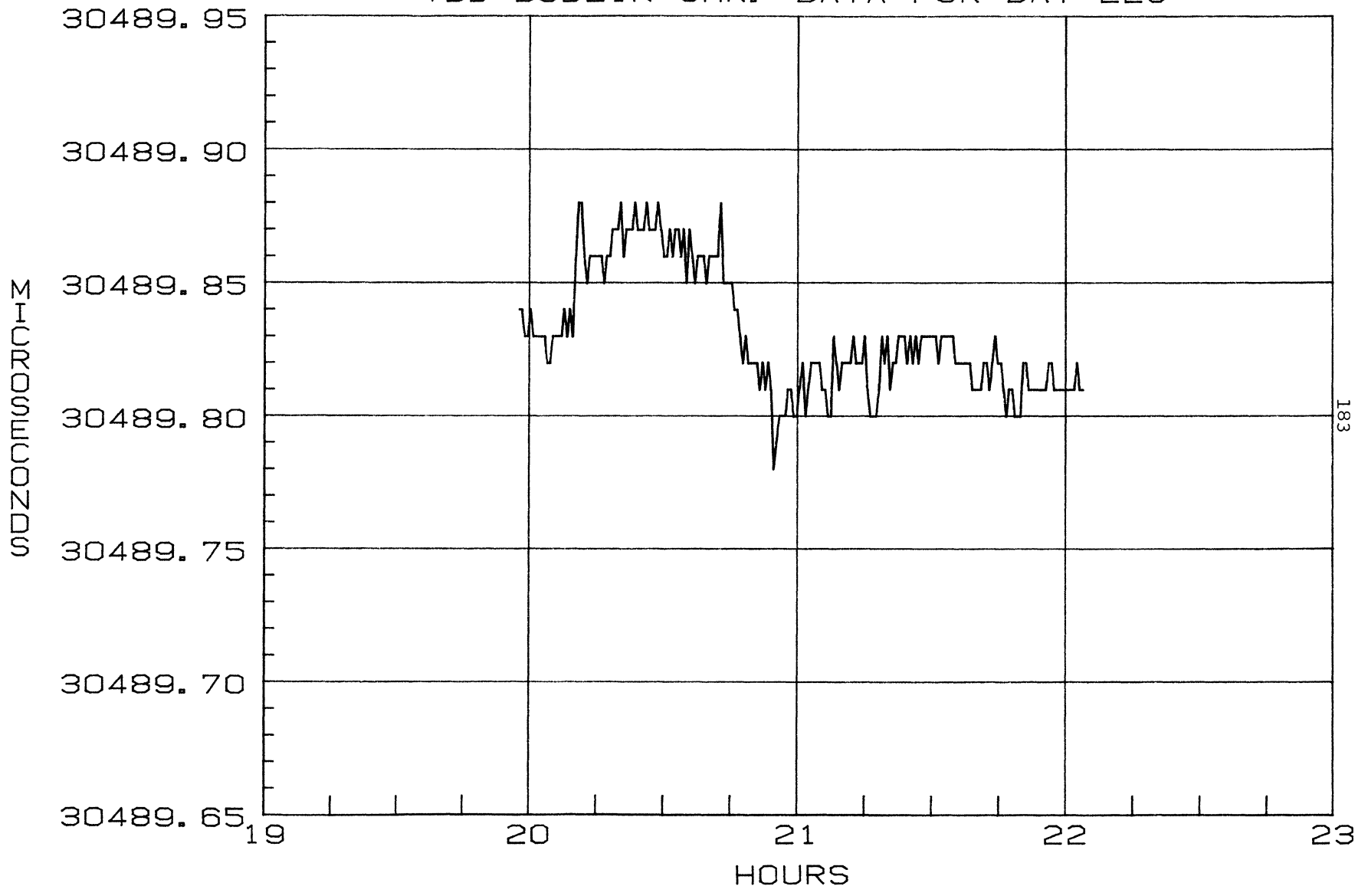
DUBLIN SHORE

TDA DUBLIN SHR. DATA FOR DAY 223

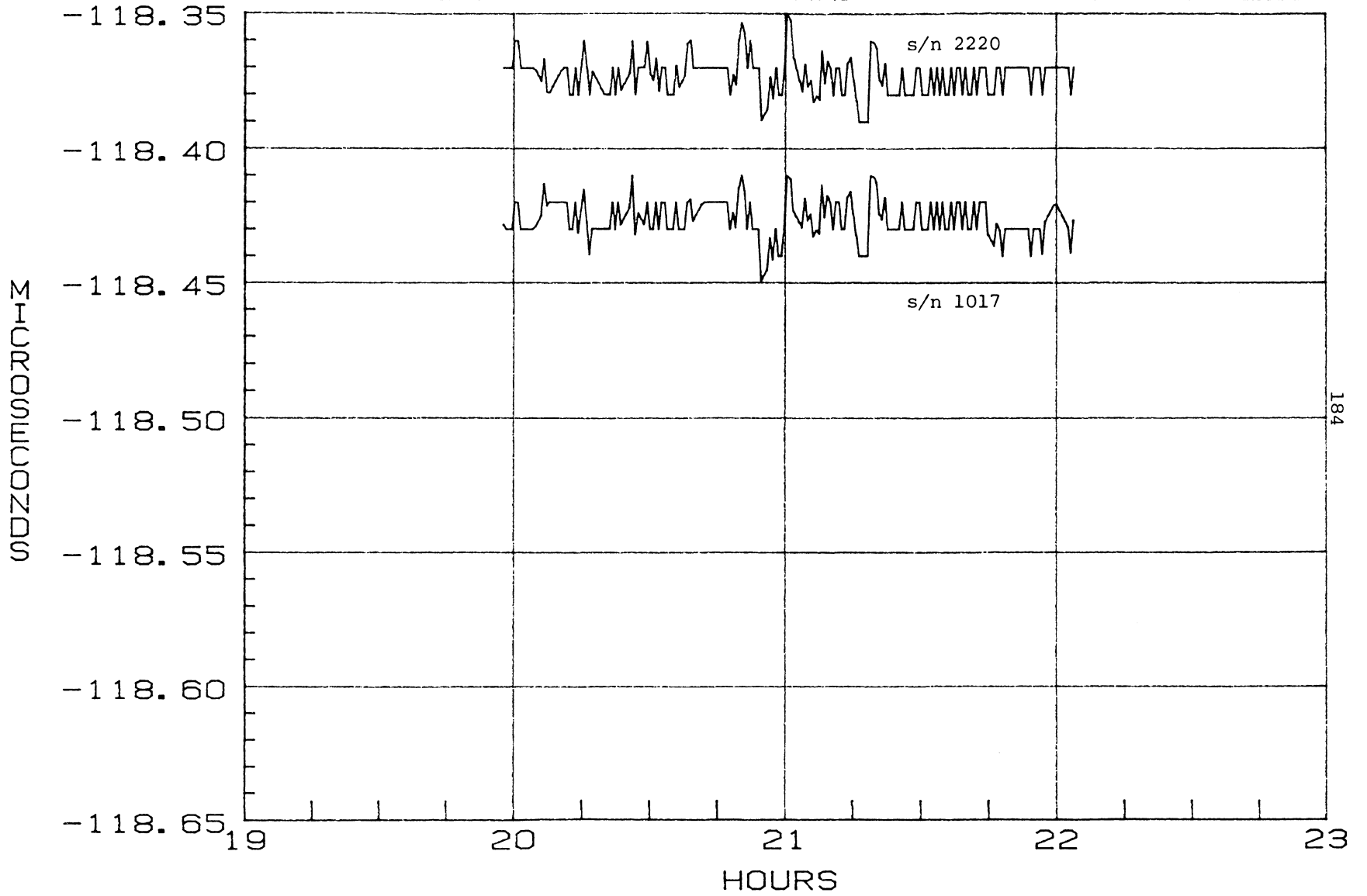


182

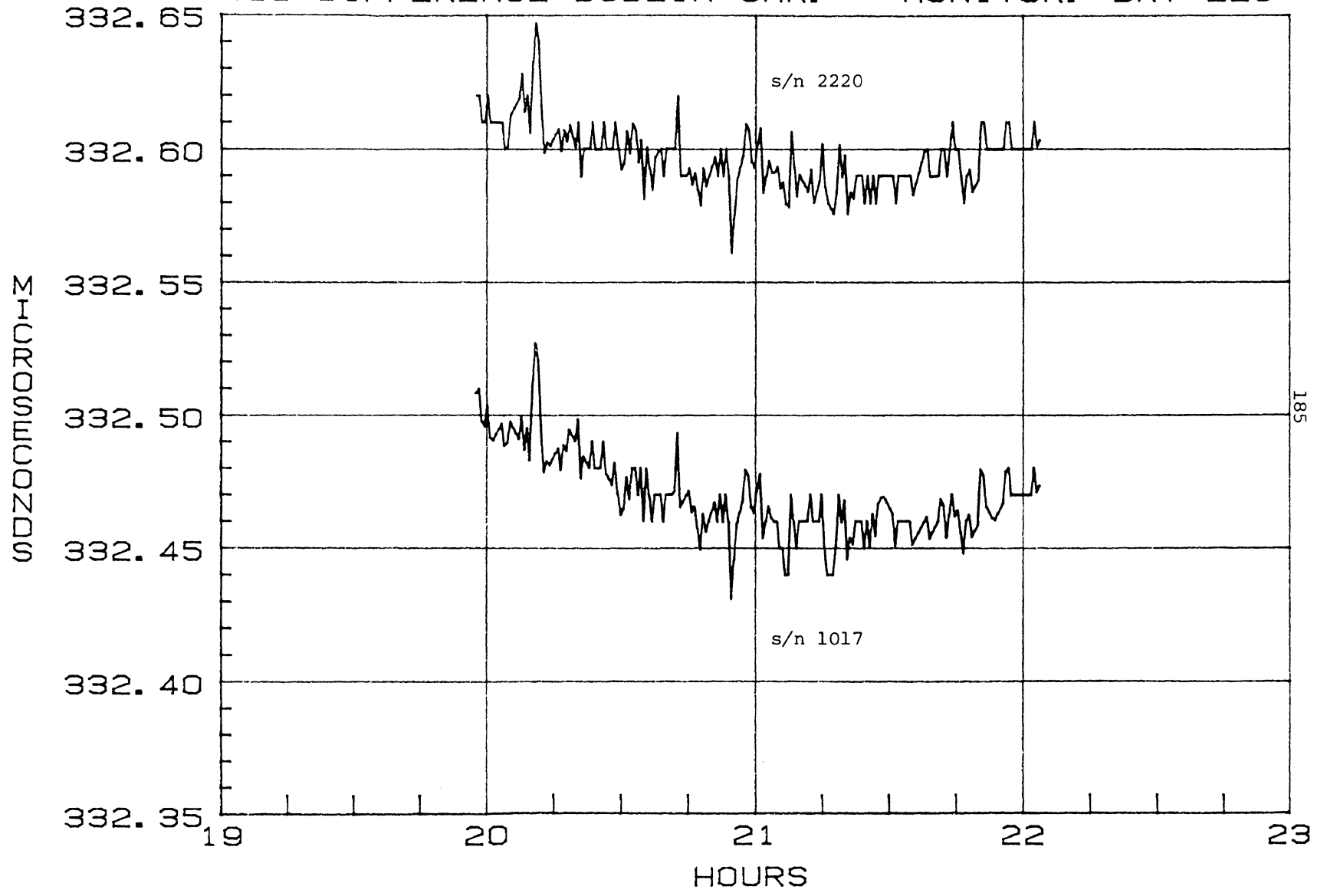
TDB DUBLIN SHR. DATA FOR DAY 223



TDA DIFFERENCE DUBLIN SHR. - MONITOR. DAY 223

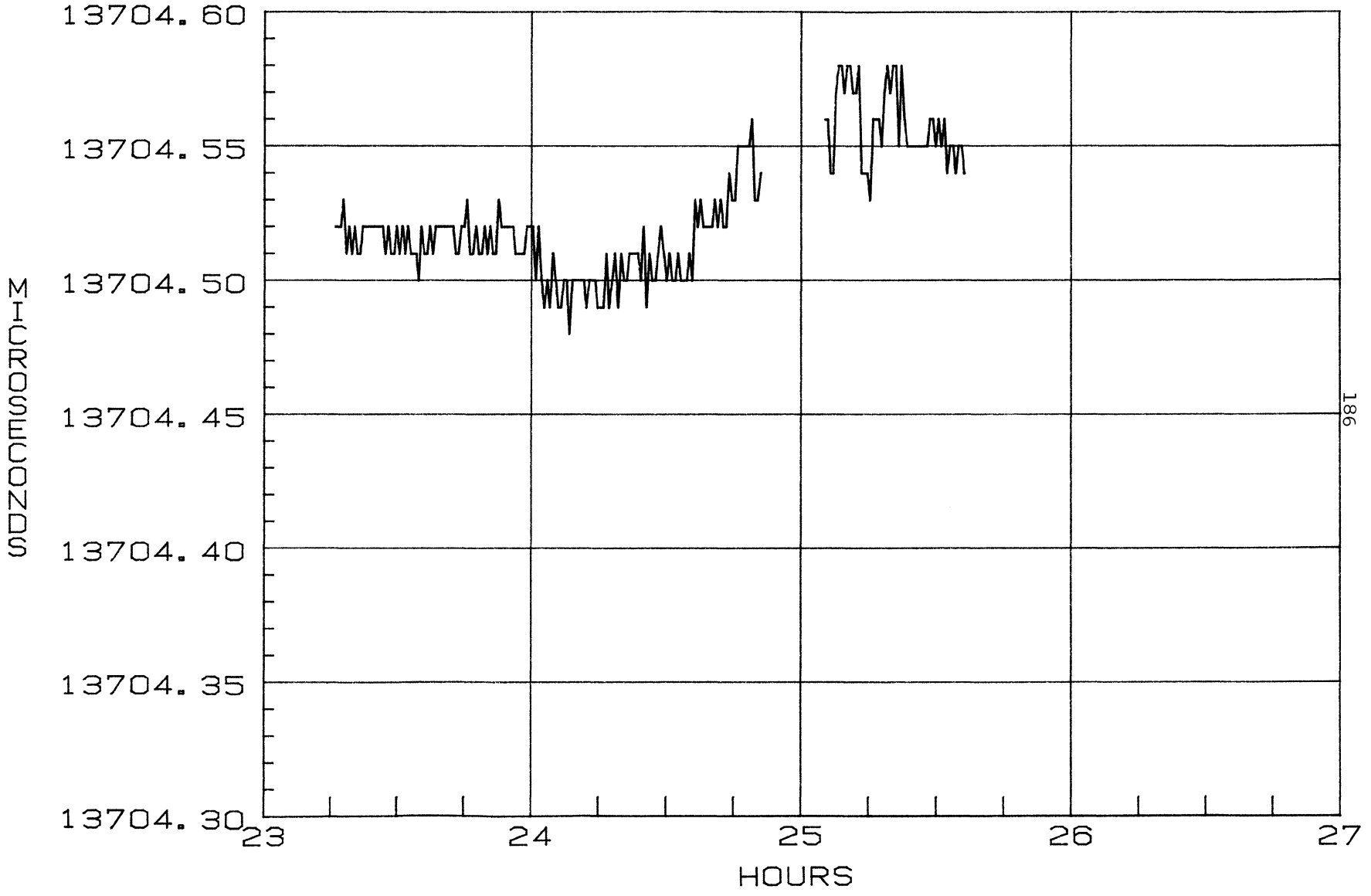


TDB DIFFERENCE DUBLIN SHR. - MONITOR. DAY 223



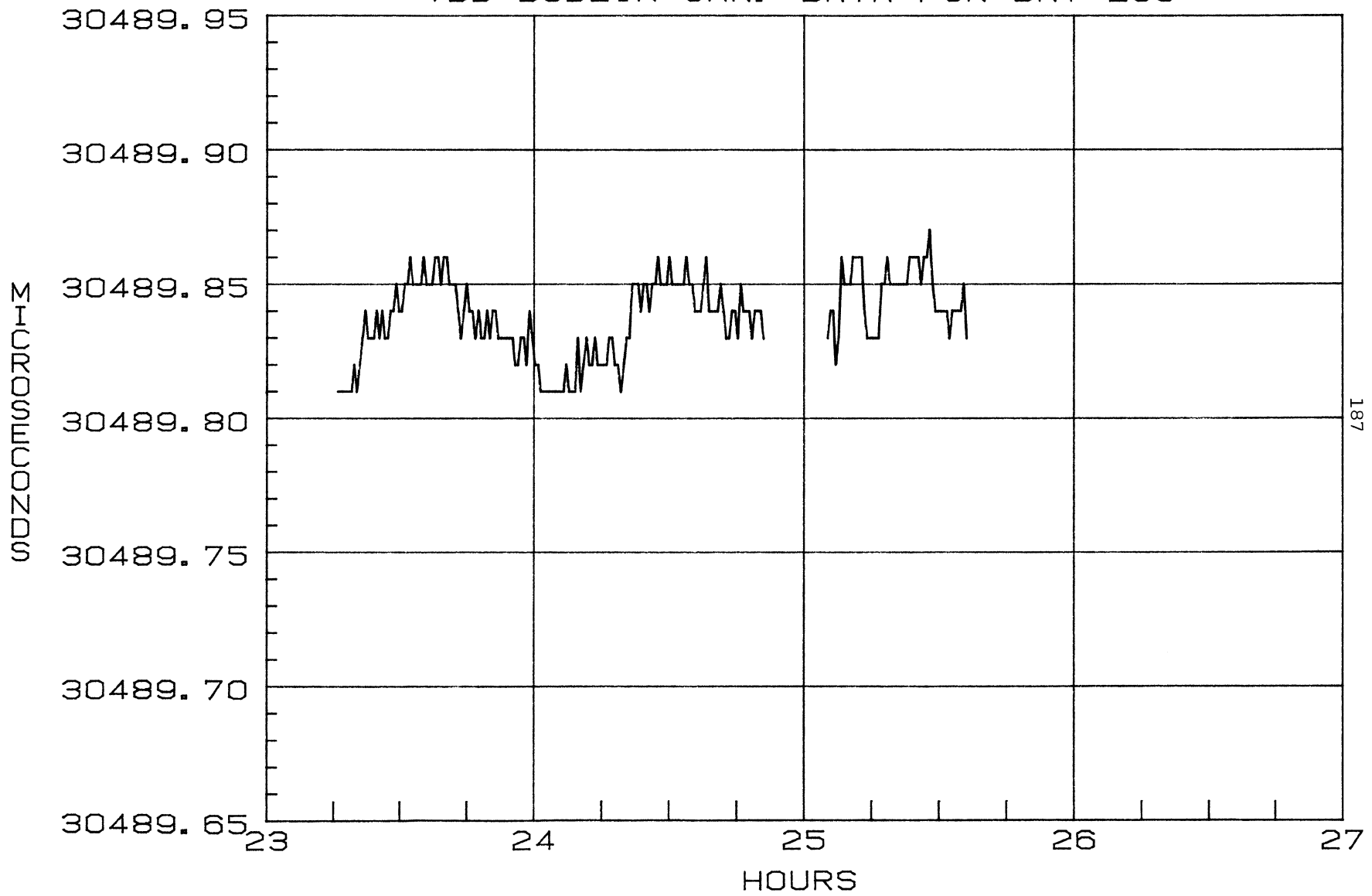
185

TDA DUBLIN SHR. DATA FOR DAY 230

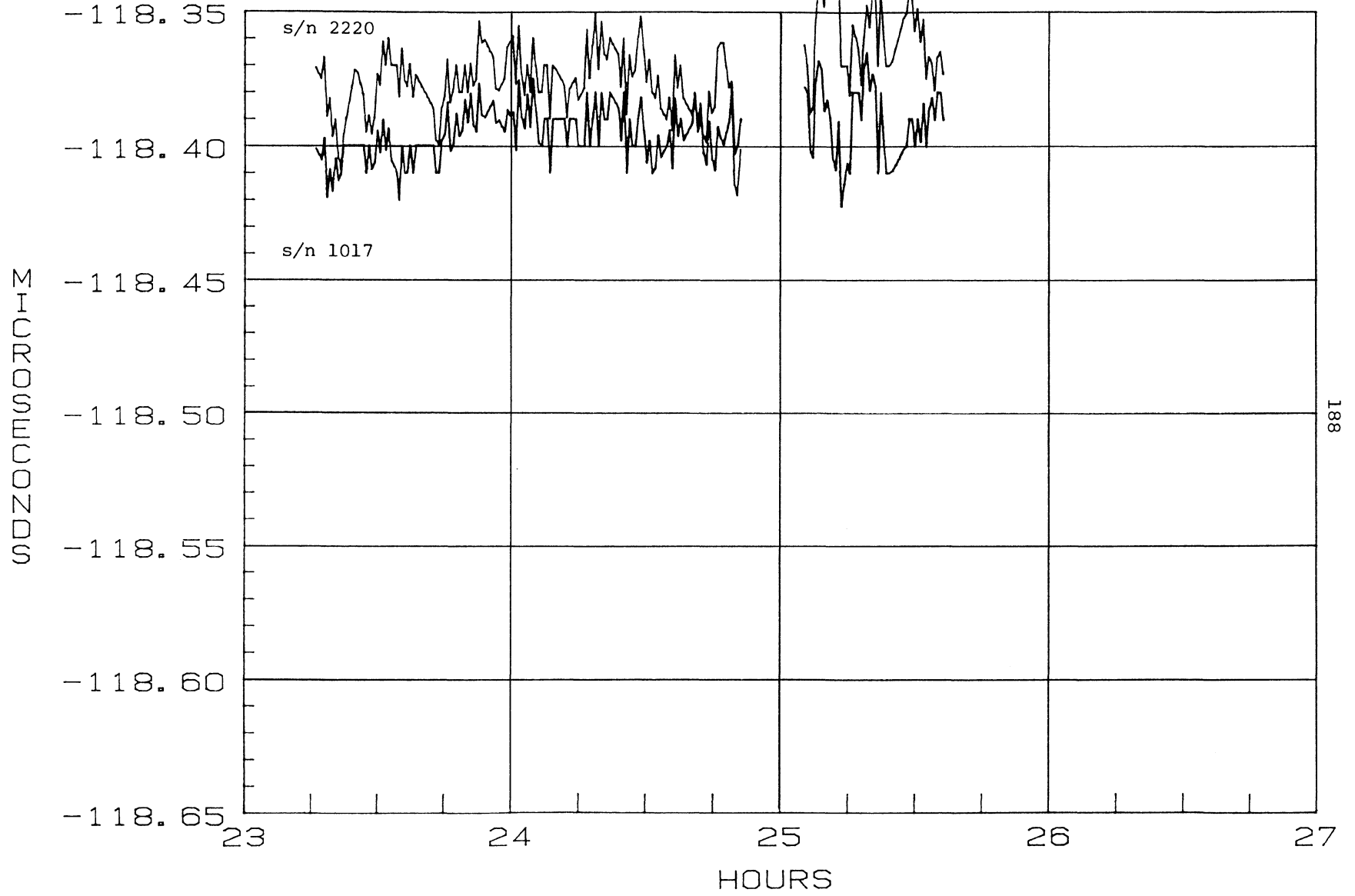


186

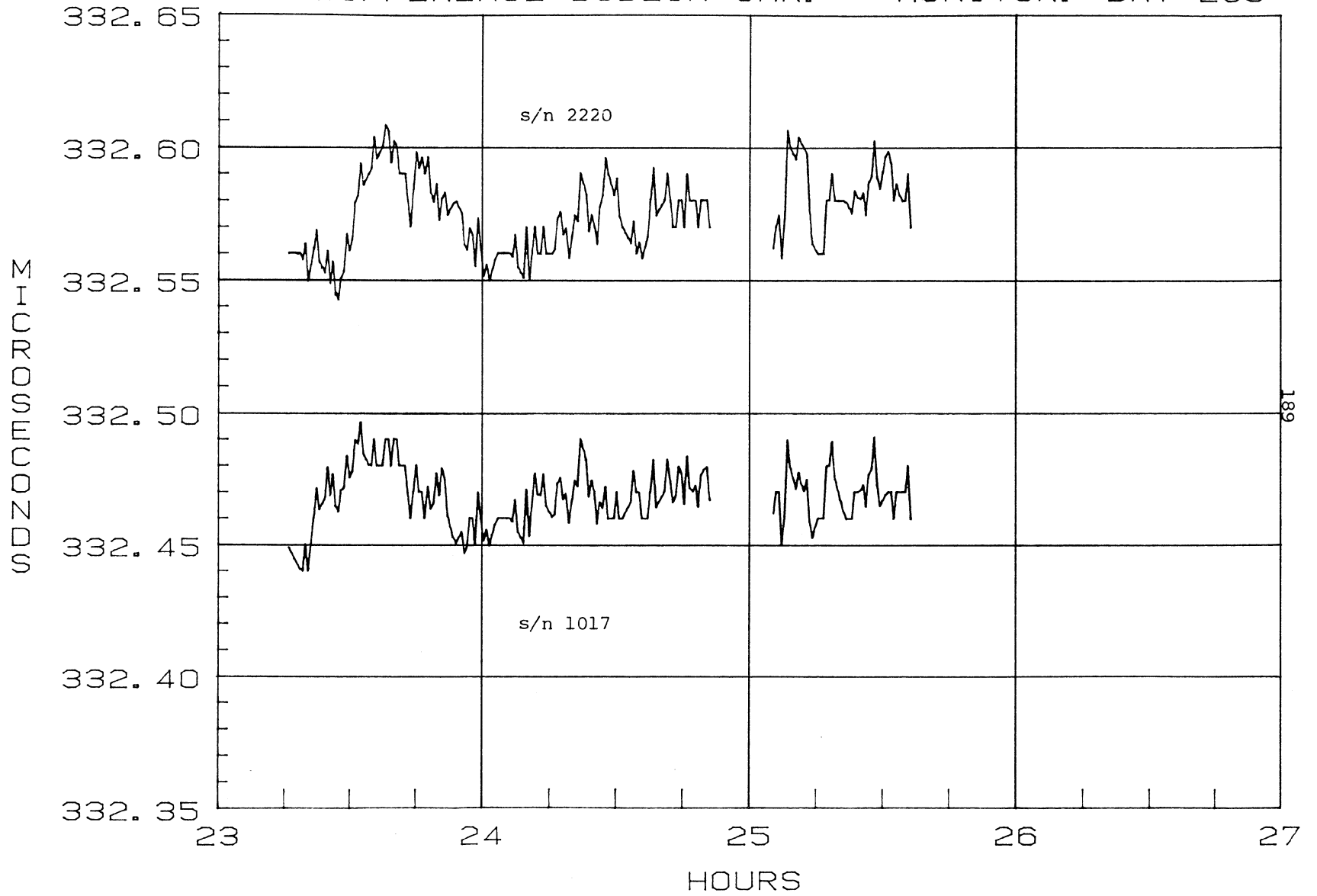
TDB DUBLIN SHR. DATA FOR DAY 230



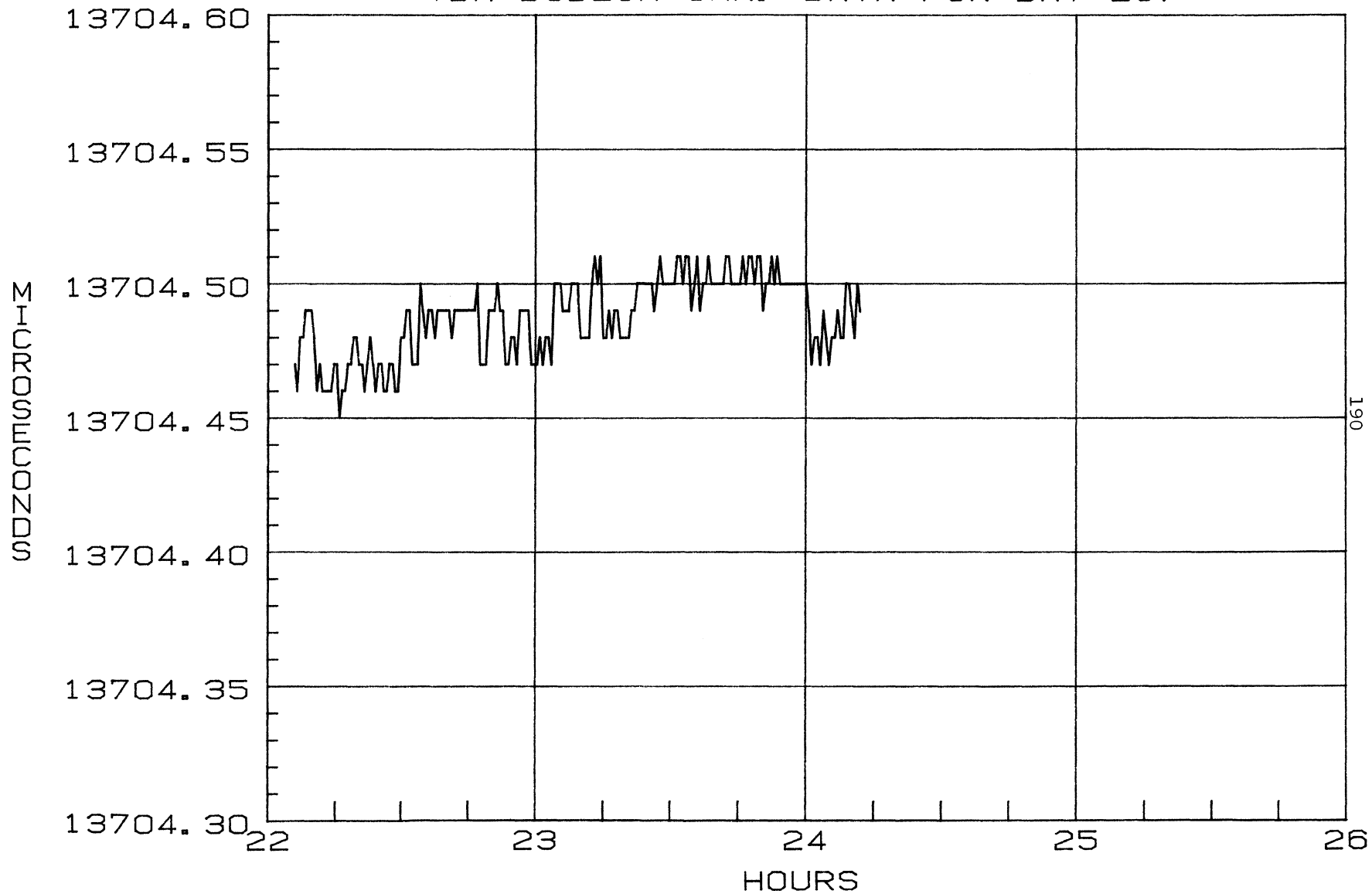
TDA DIFFERENCE DUBLIN SHIP - MONITOR. DAY 230



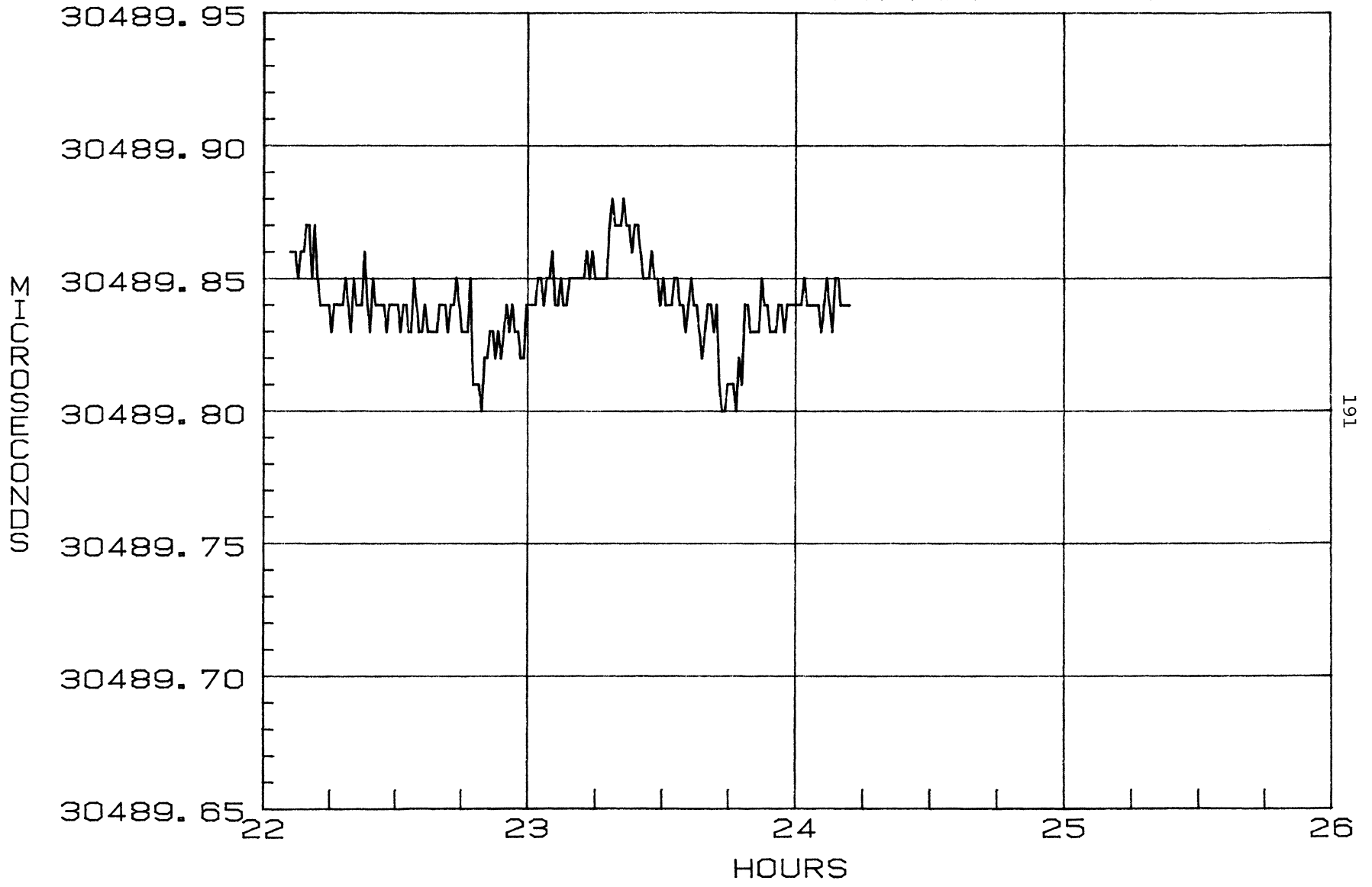
TDB DIFFERENCE DUBLIN SHR. - MONITOR. DAY 230



TDA DUBLIN SHR. DATA FOR DAY 237

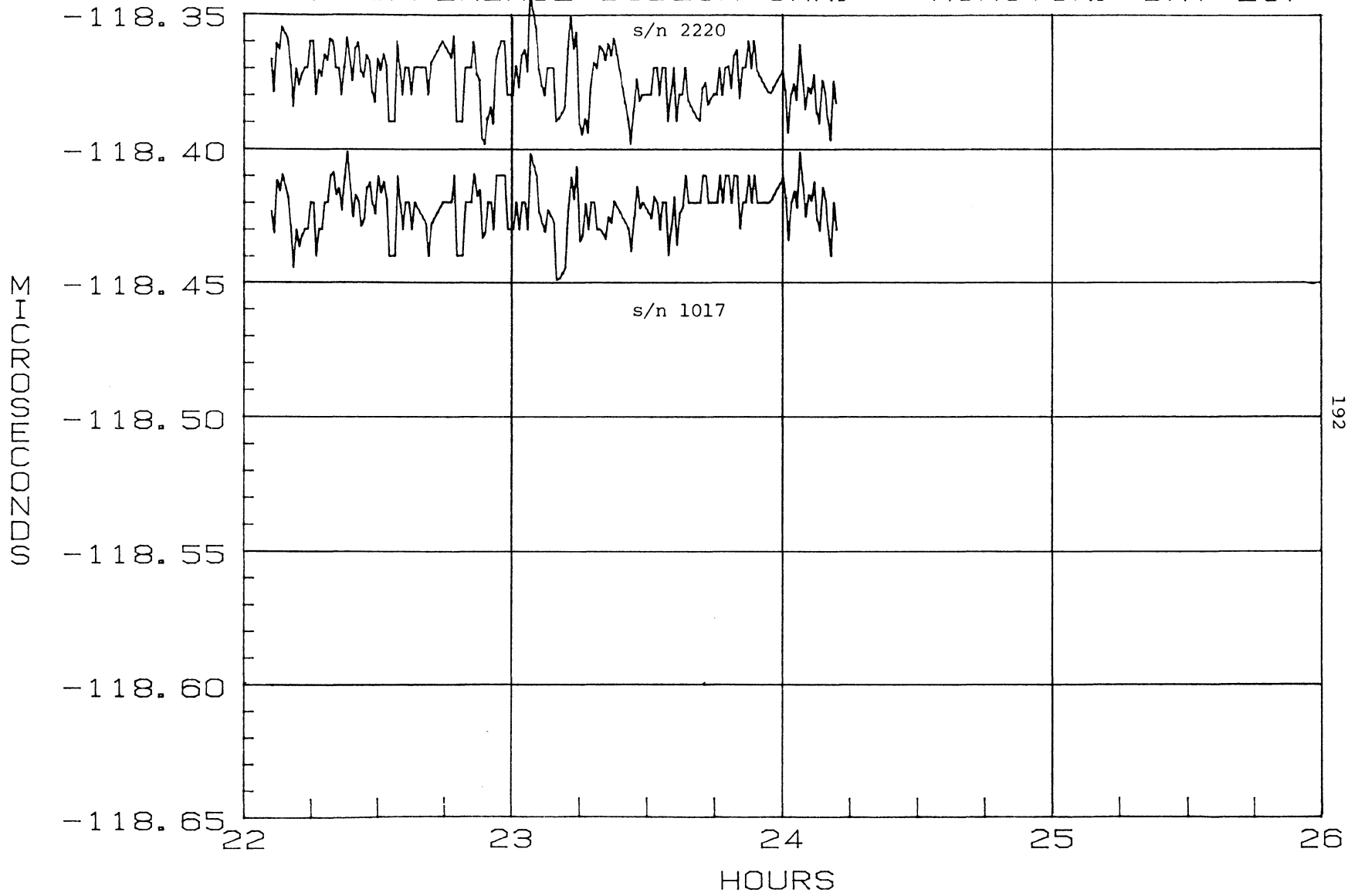


TDB DUBLIN SHR. DATA FOR DAY 237

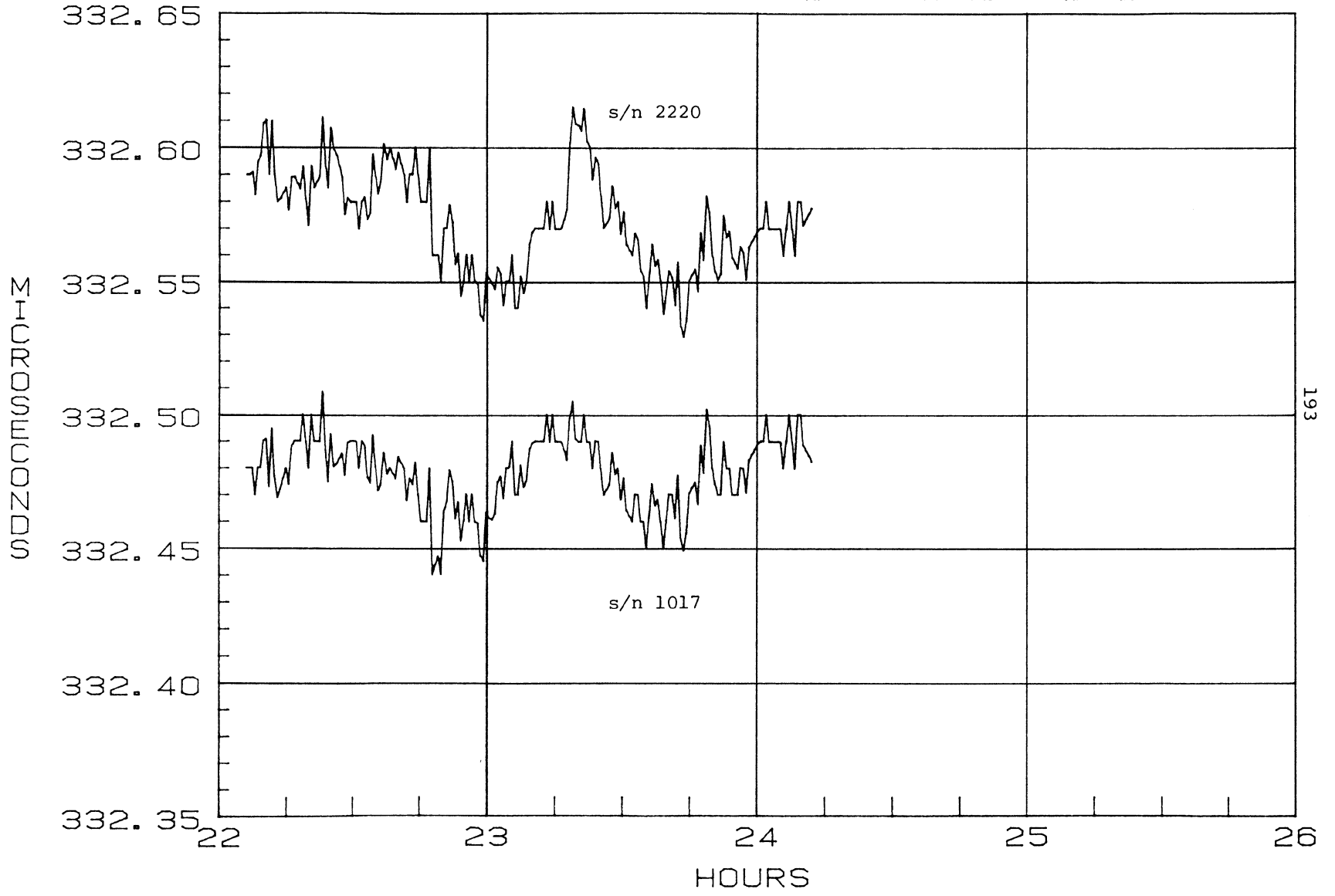


T6T

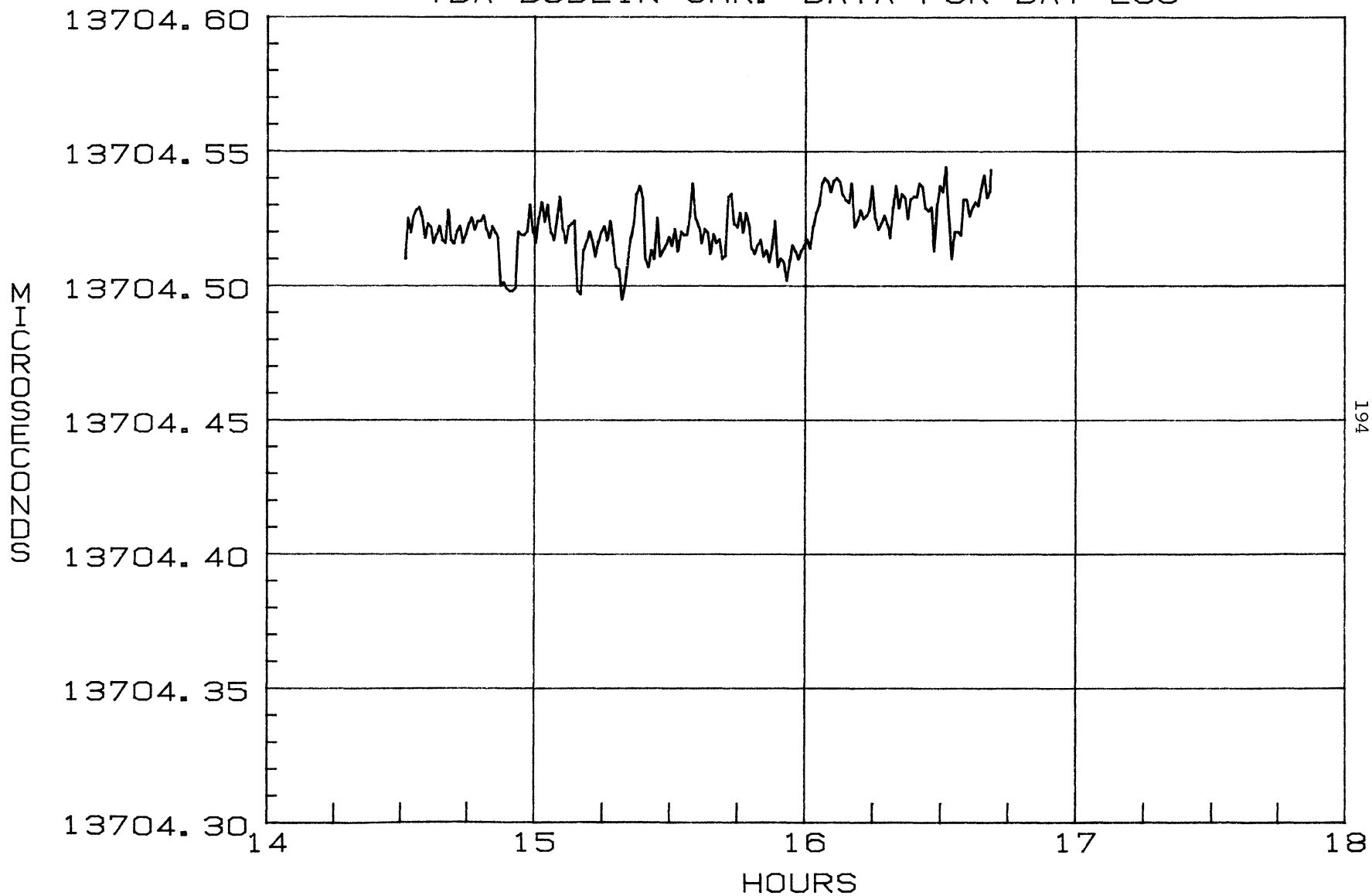
TDA DIFFERENCE DUBLIN SHR. - MONITOR. DAY 237



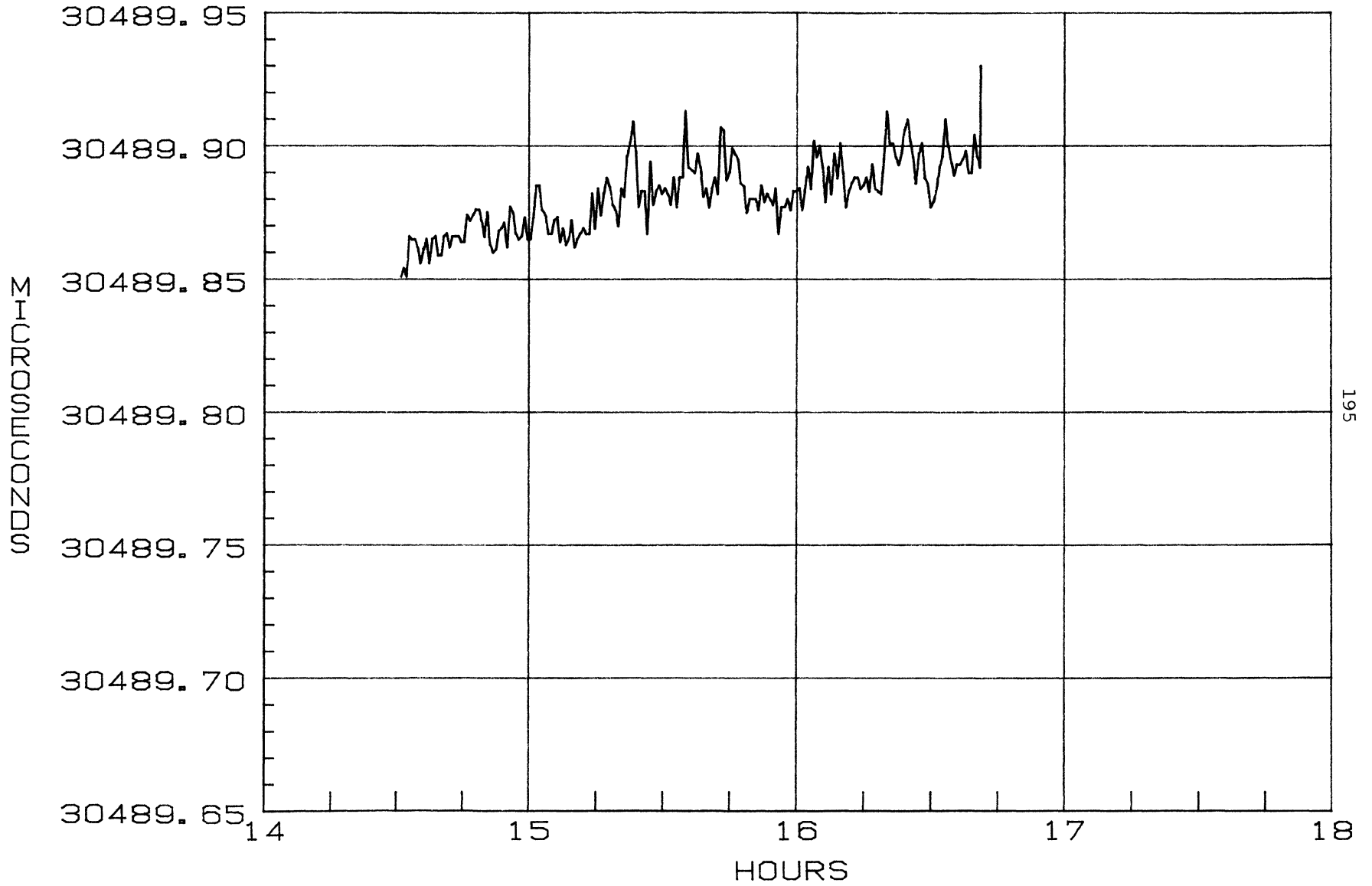
TDB DIFFERENCE DUBLIN SHR. - MONITOR. DAY 237



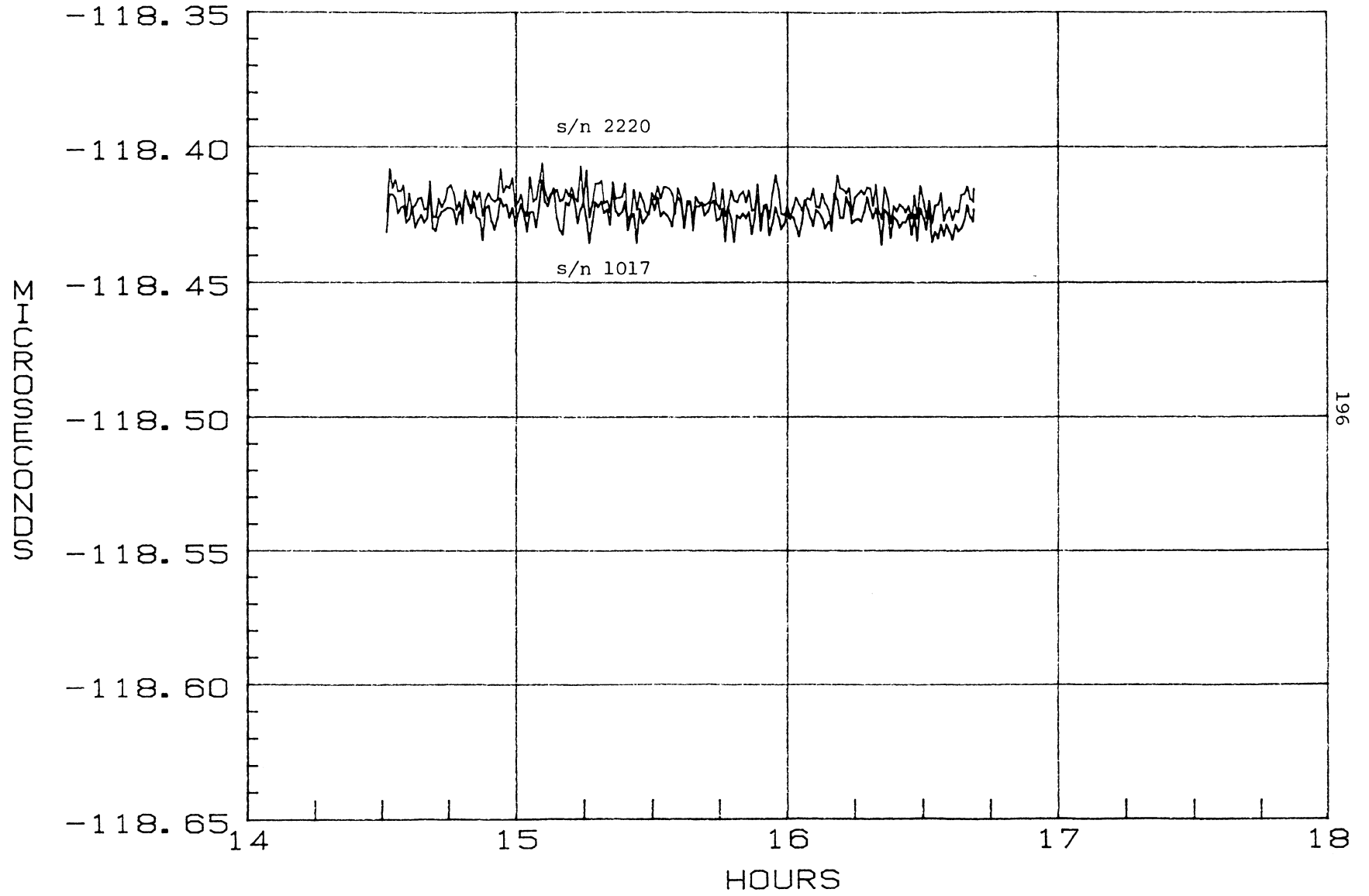
TDA DUBLIN SHR. DATA FOR DAY 266



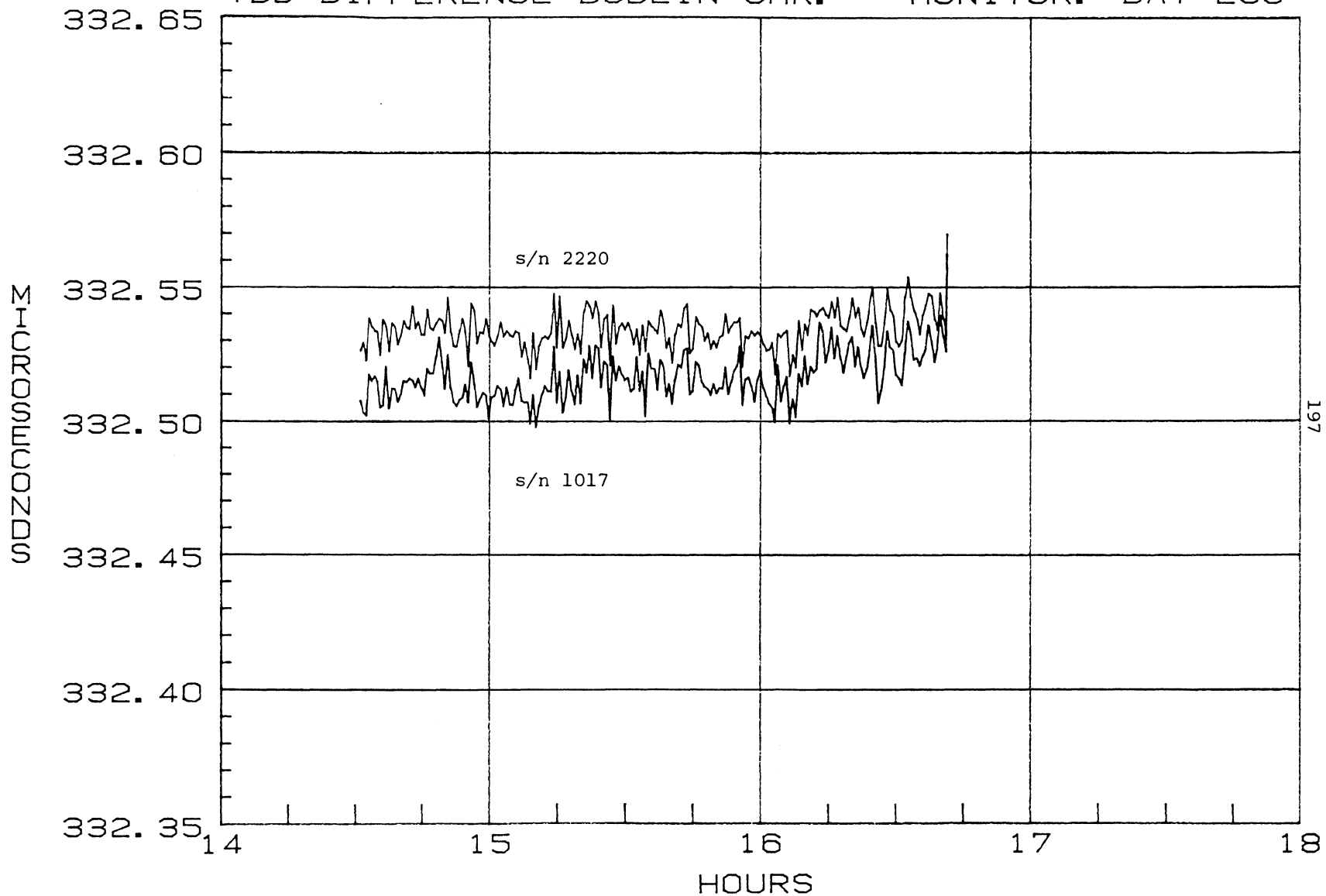
TDB DUBLIN SHR. DATA FOR DAY 266



TDA DIFFERENCE DUBLIN SHR. - MONITOR. DAY 266



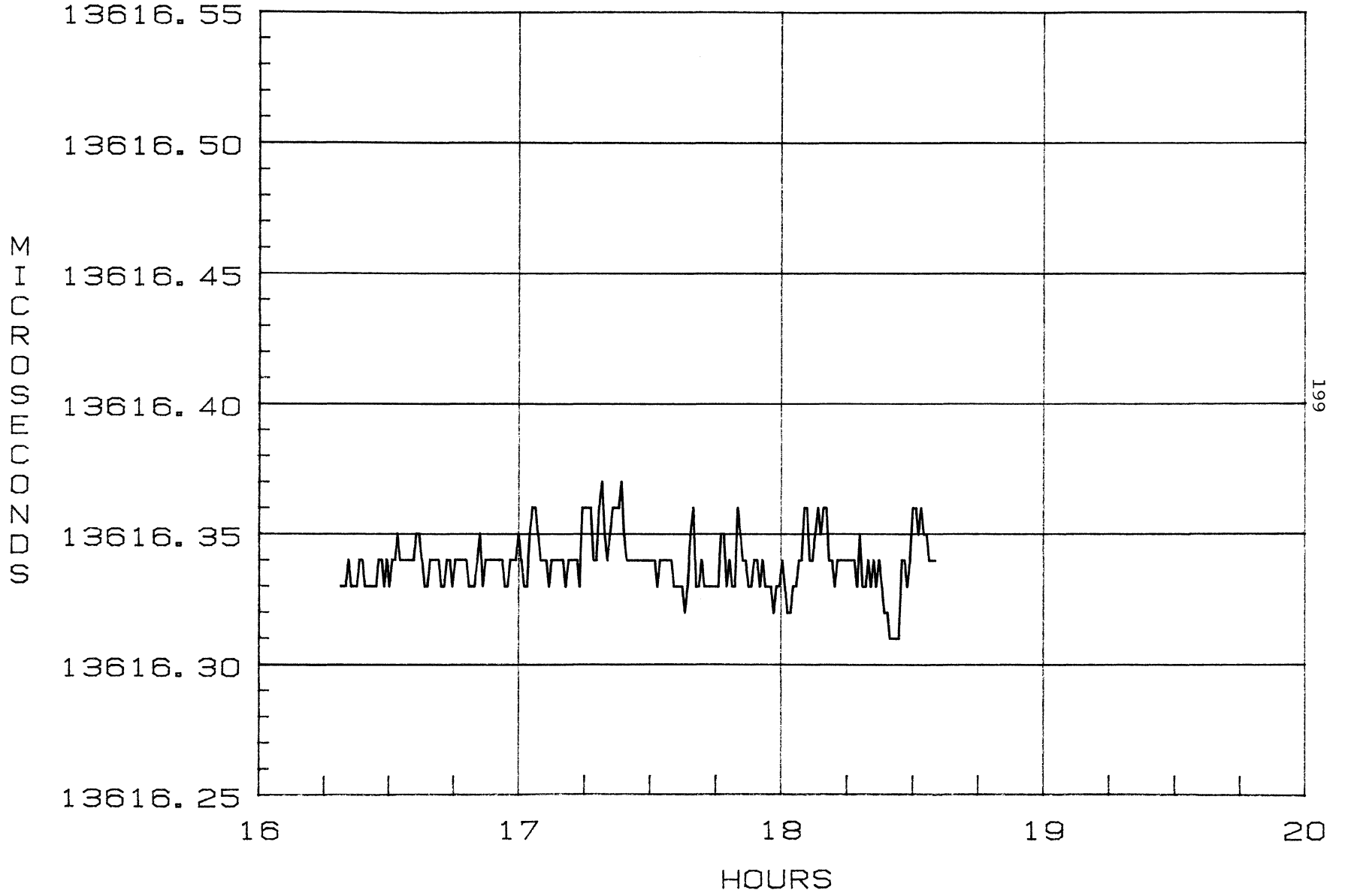
TDB DIFFERENCE DUBLIN SHR. - MONITOR. DAY 266



APPENDIX VI.6

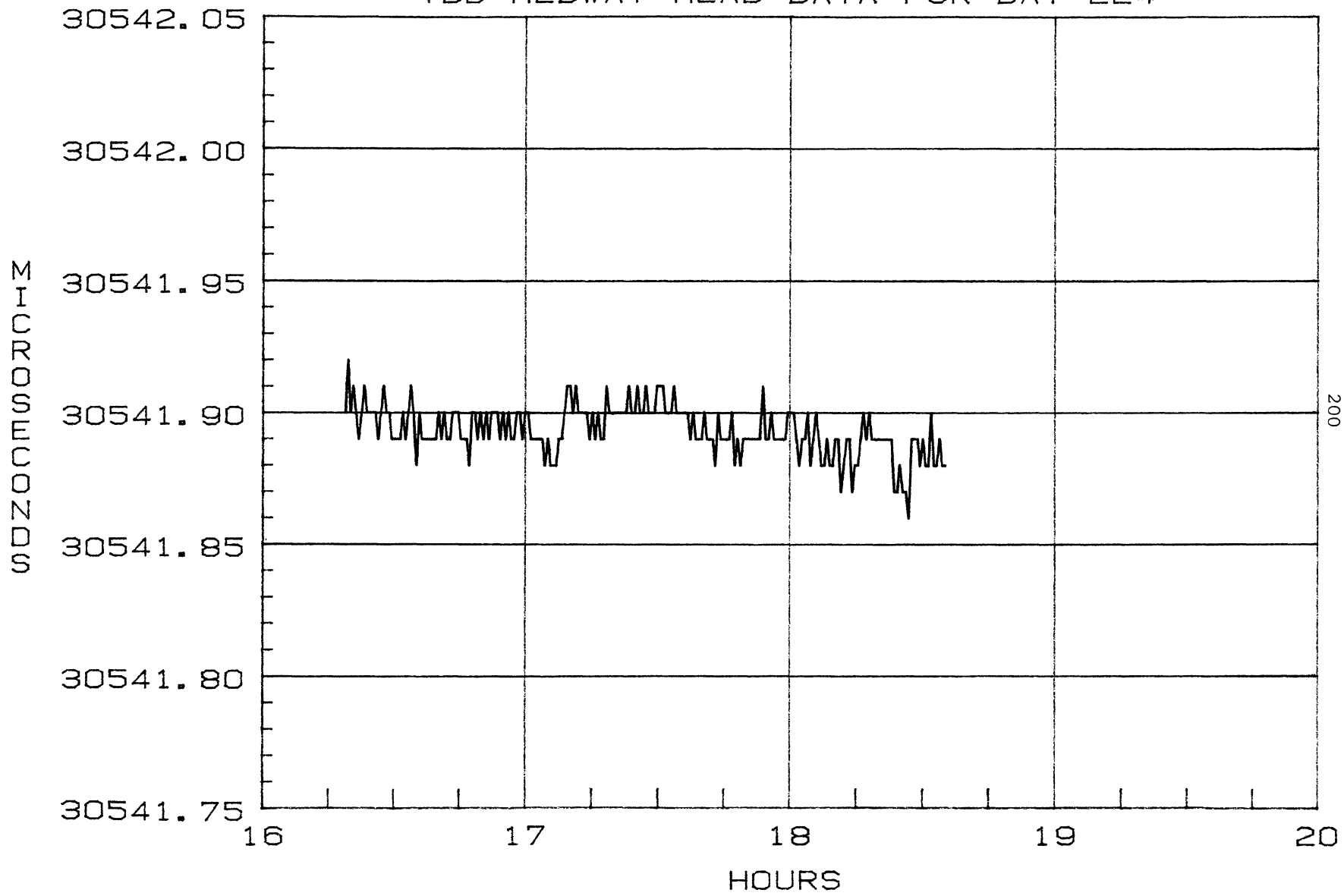
MEDWAY HEAD

TDA MEDWAY HEAD DATA FOR DAY 224

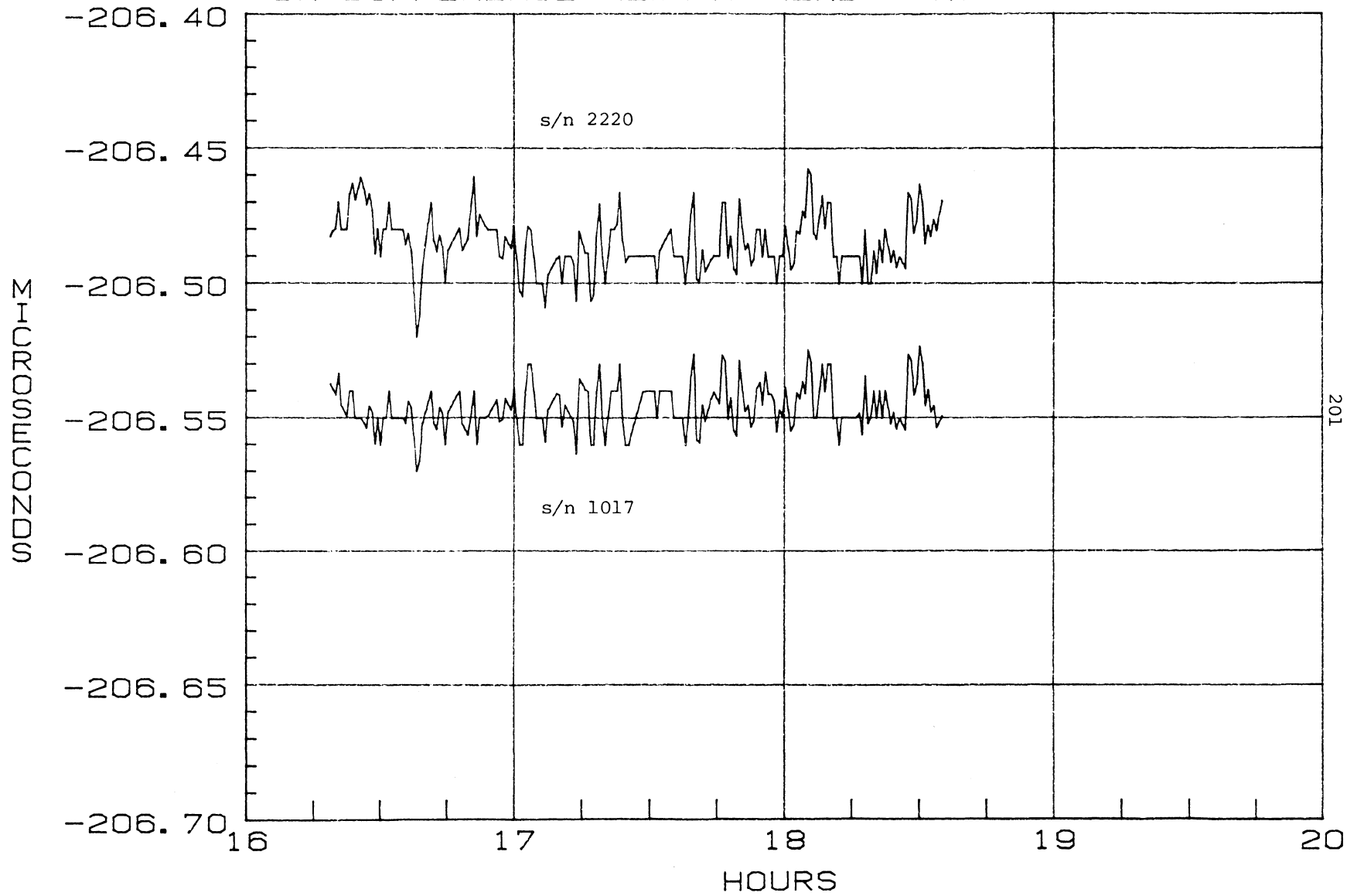


199

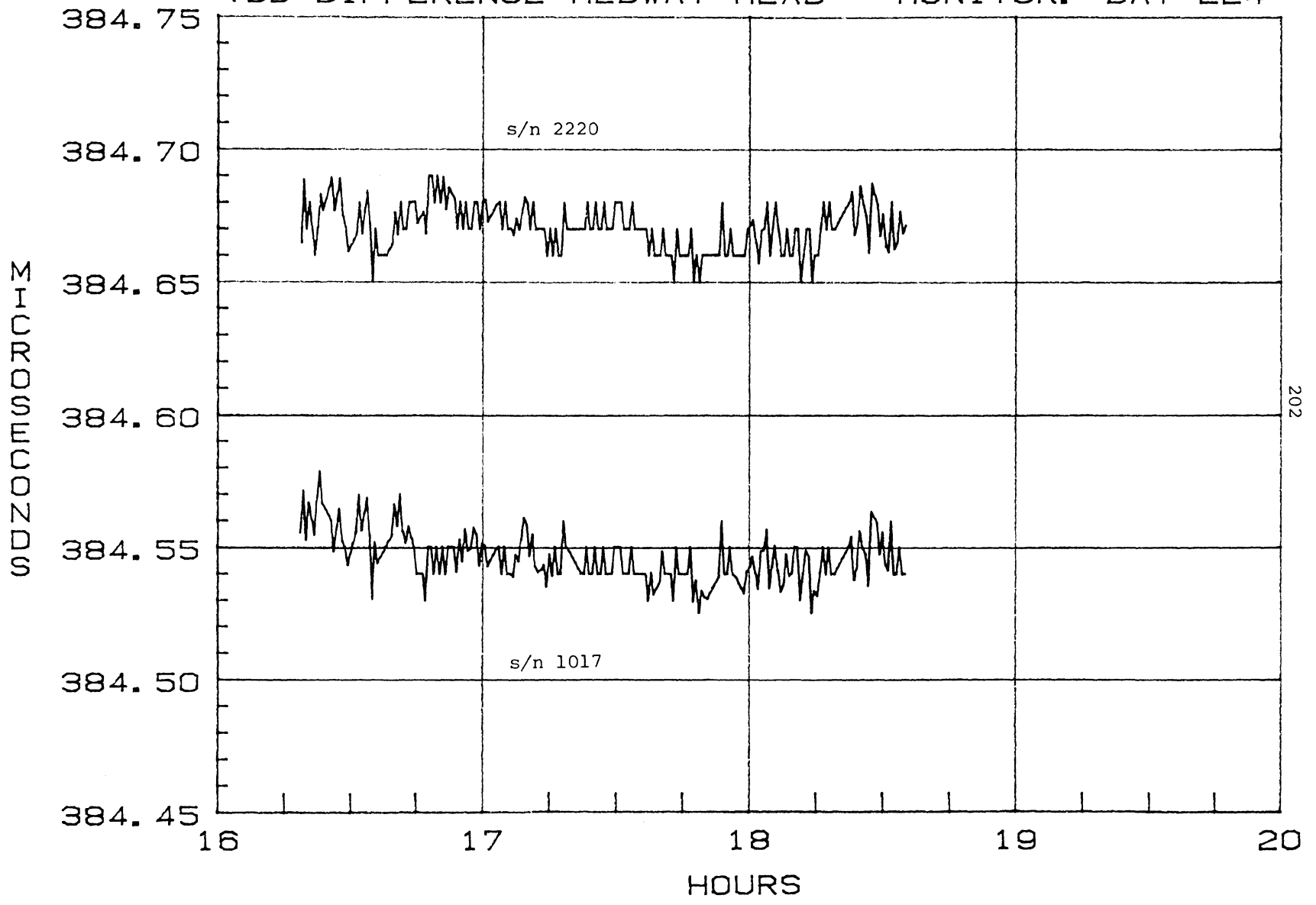
TDB MEDWAY HEAD DATA FOR DAY 224



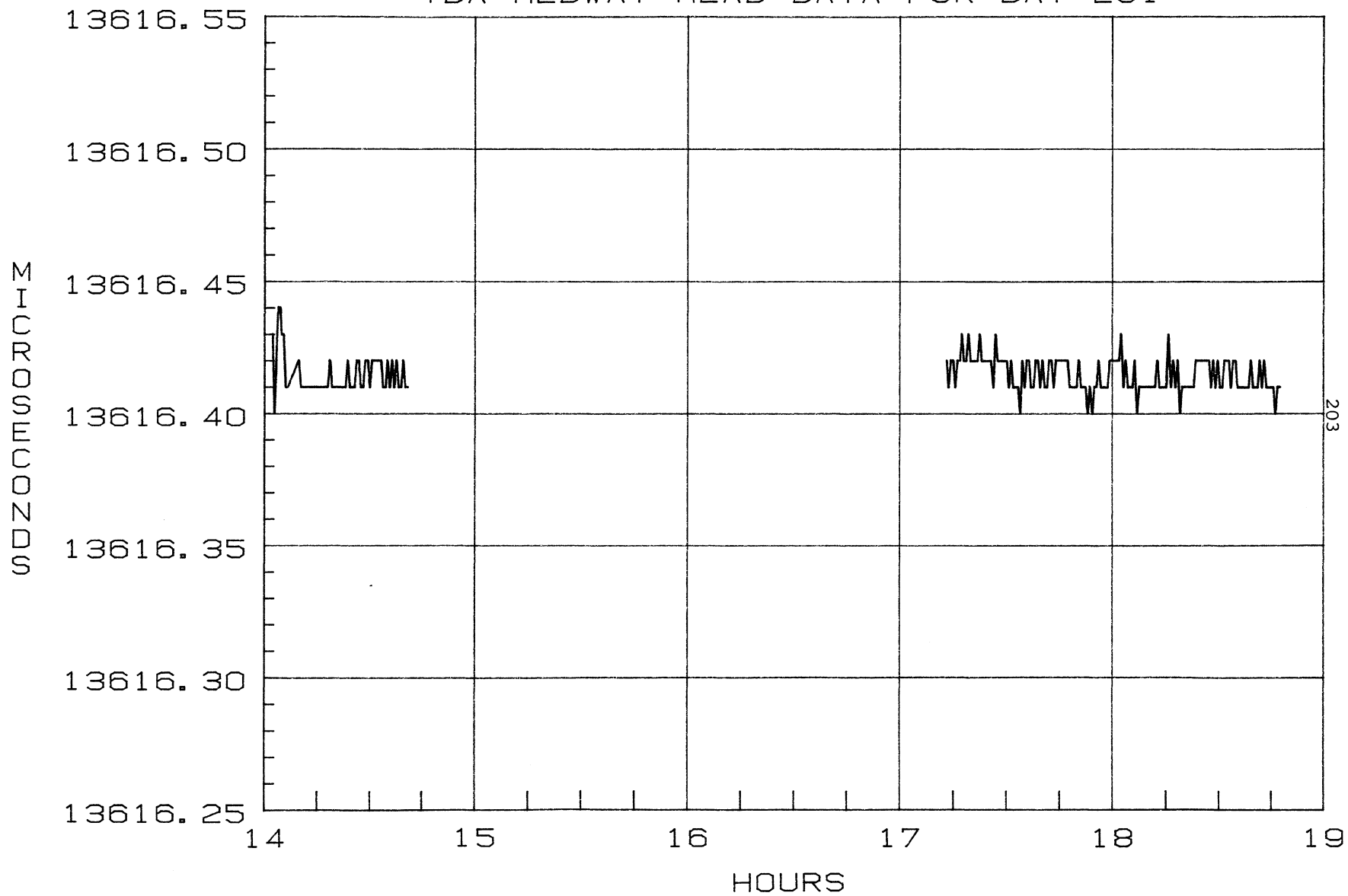
TDA DIFFERENCE MEDWAY HEAD - MONITOR. DAY 224



TDB DIFFERENCE MEDWAY HEAD - MONITOR. DAY 224

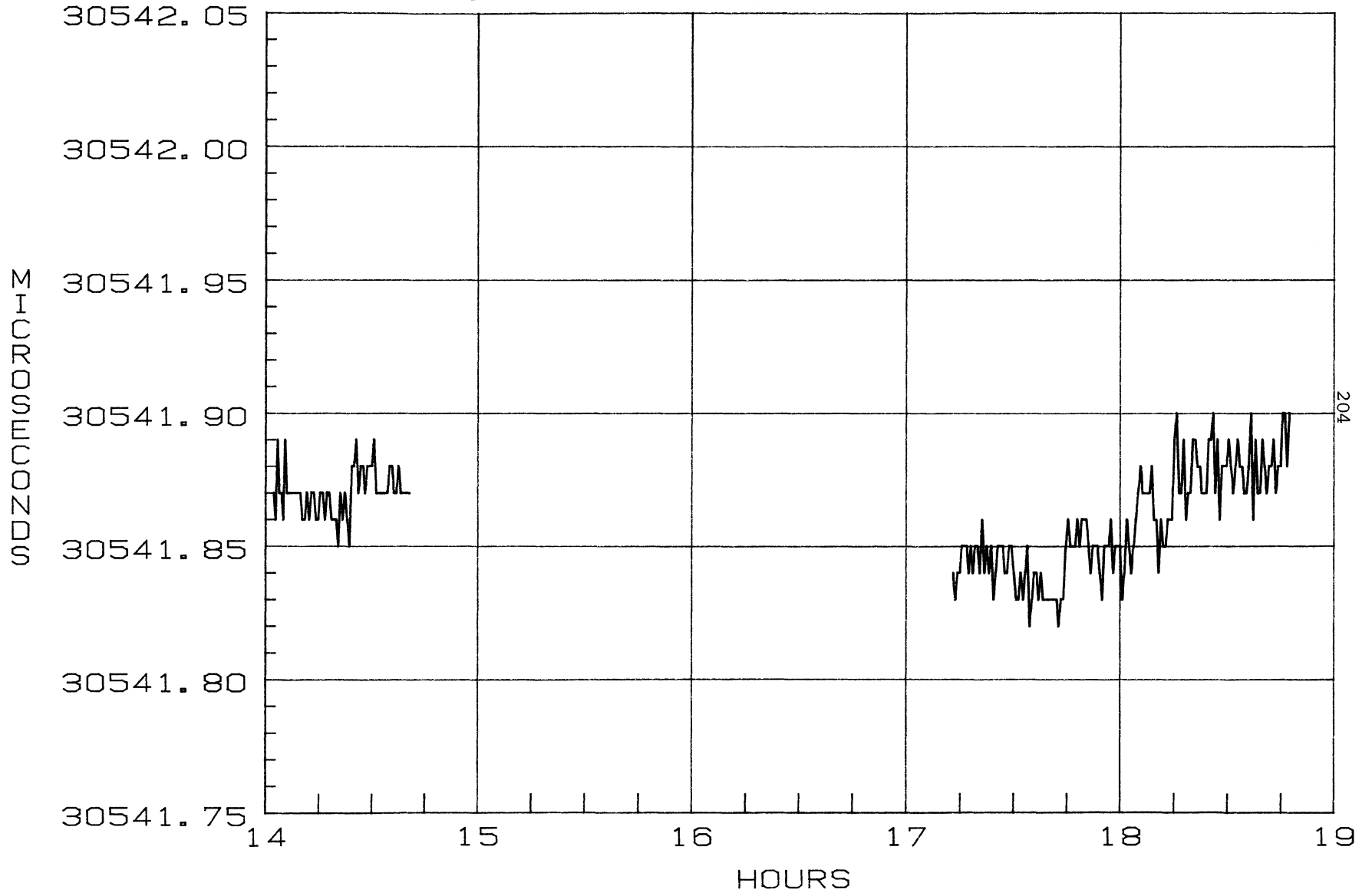


TDA MEDWAY HEAD DATA FOR DAY 231

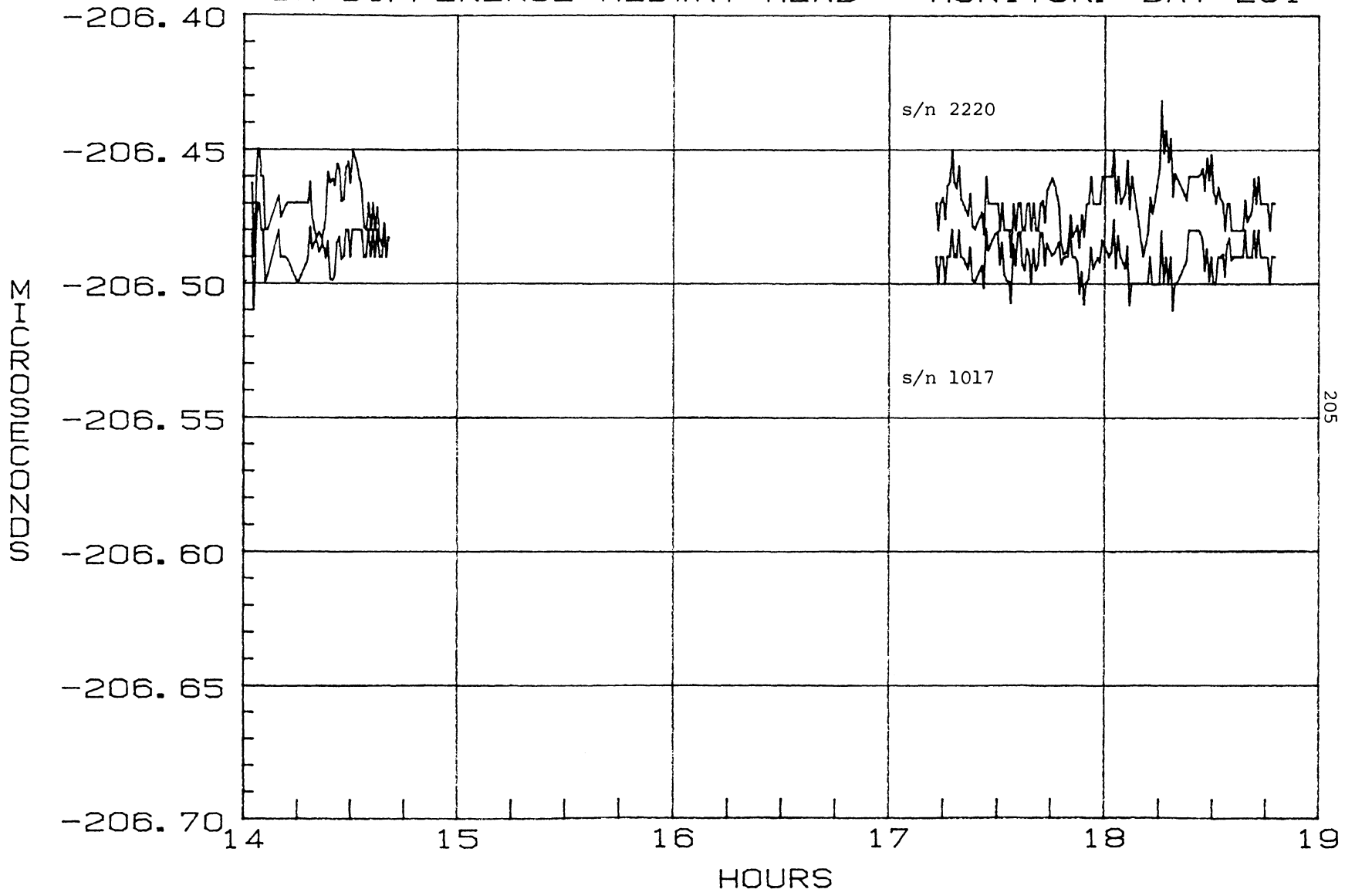


203

TDB MEDWAY HEAD DATA FOR DAY 231

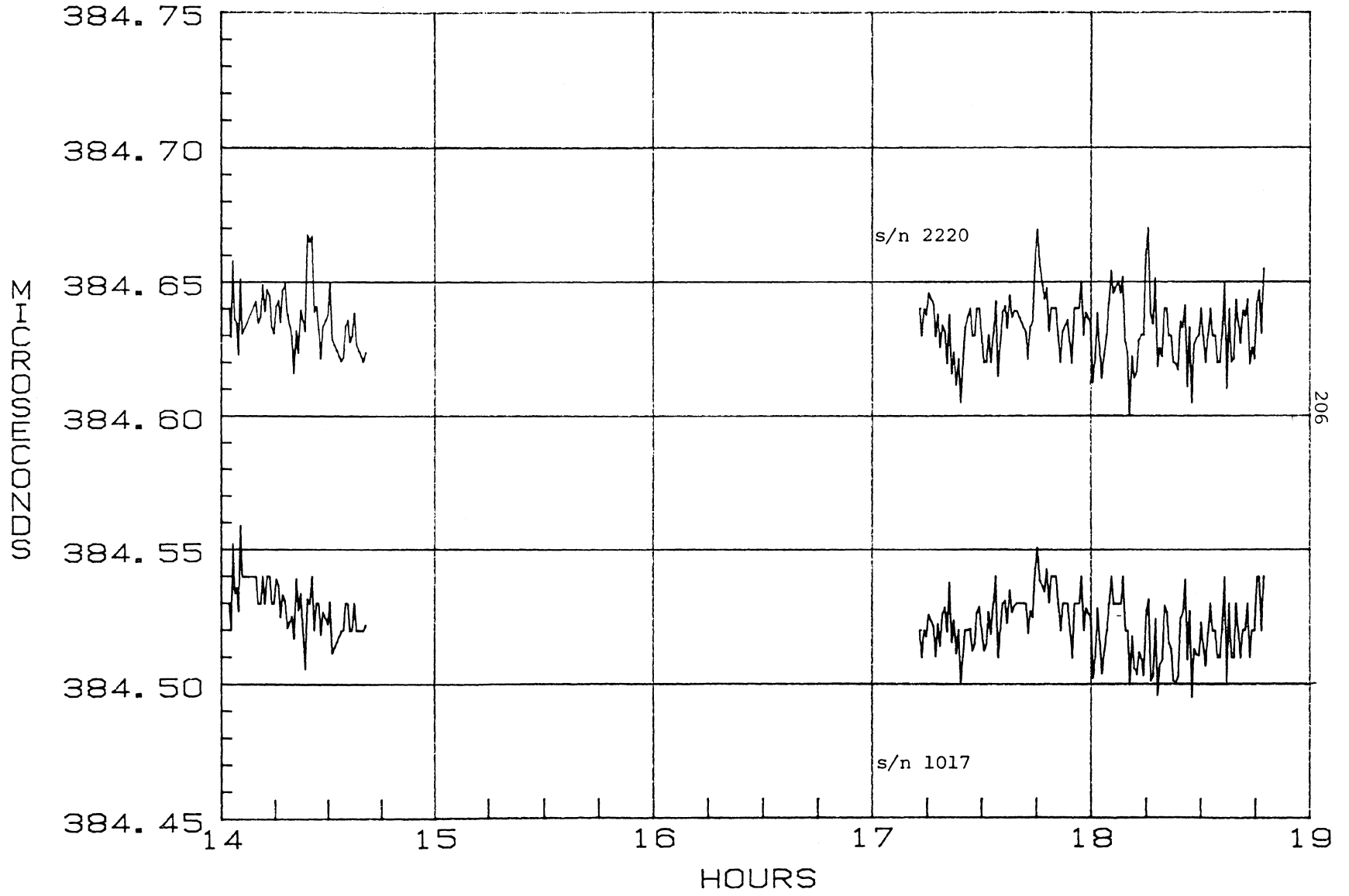


TDA DIFFERENCE MEDWAY HEAD - MONITOR. DAY 231

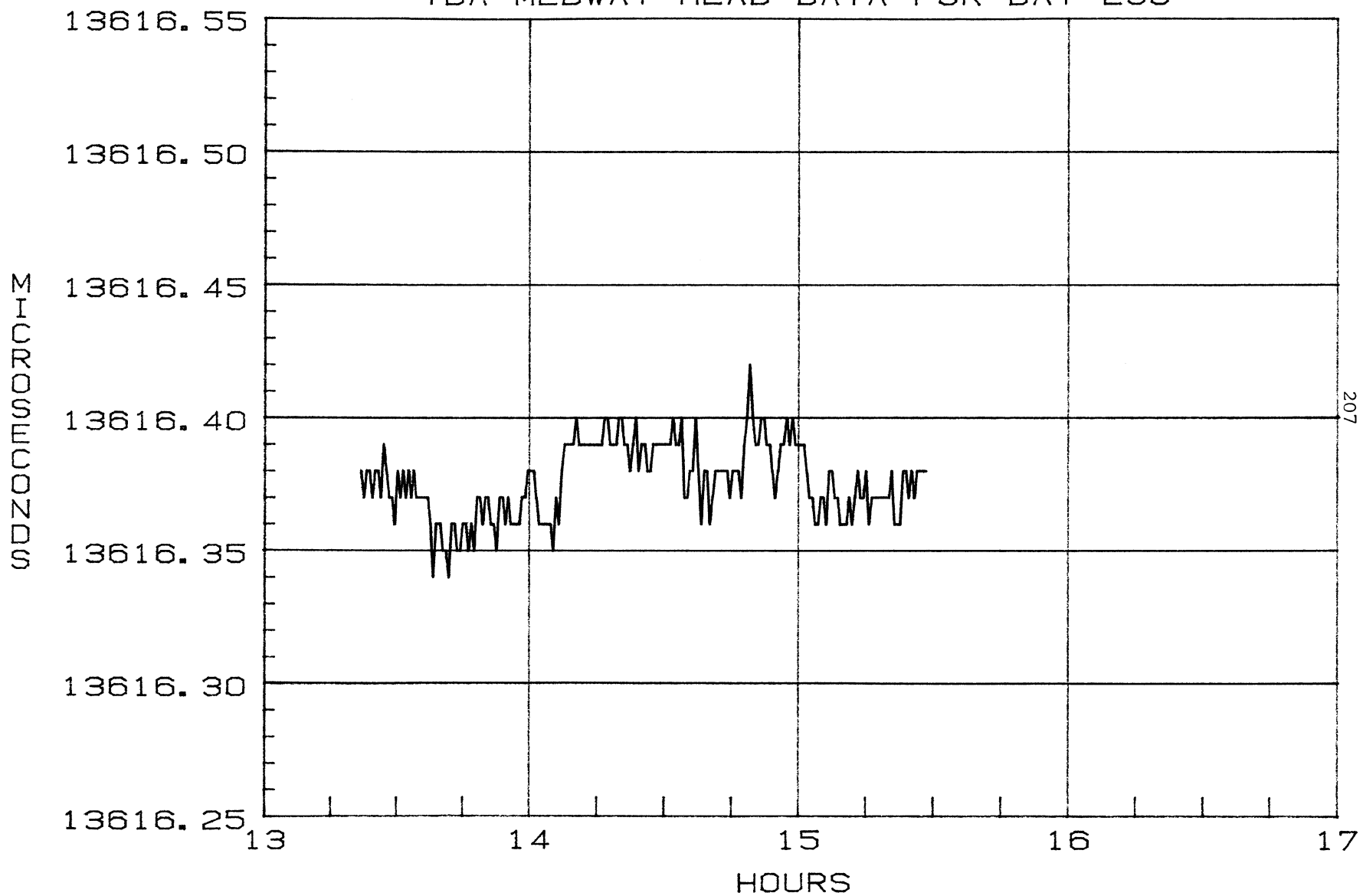


205

TDB DIFFERENCE MEDWAY HEAD - MONITOR. DAY 231

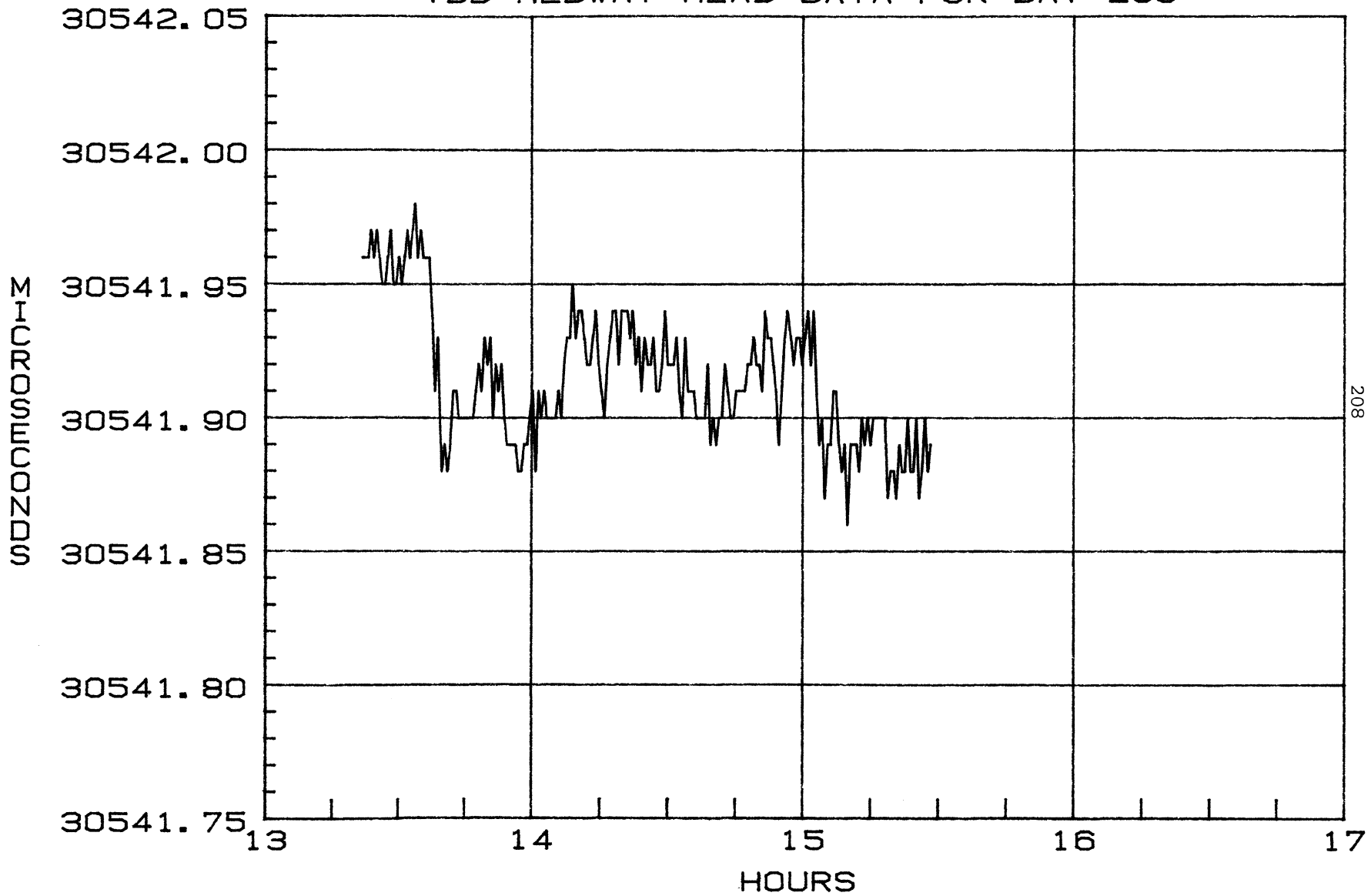


TDA MEDWAY HEAD DATA FOR DAY 238

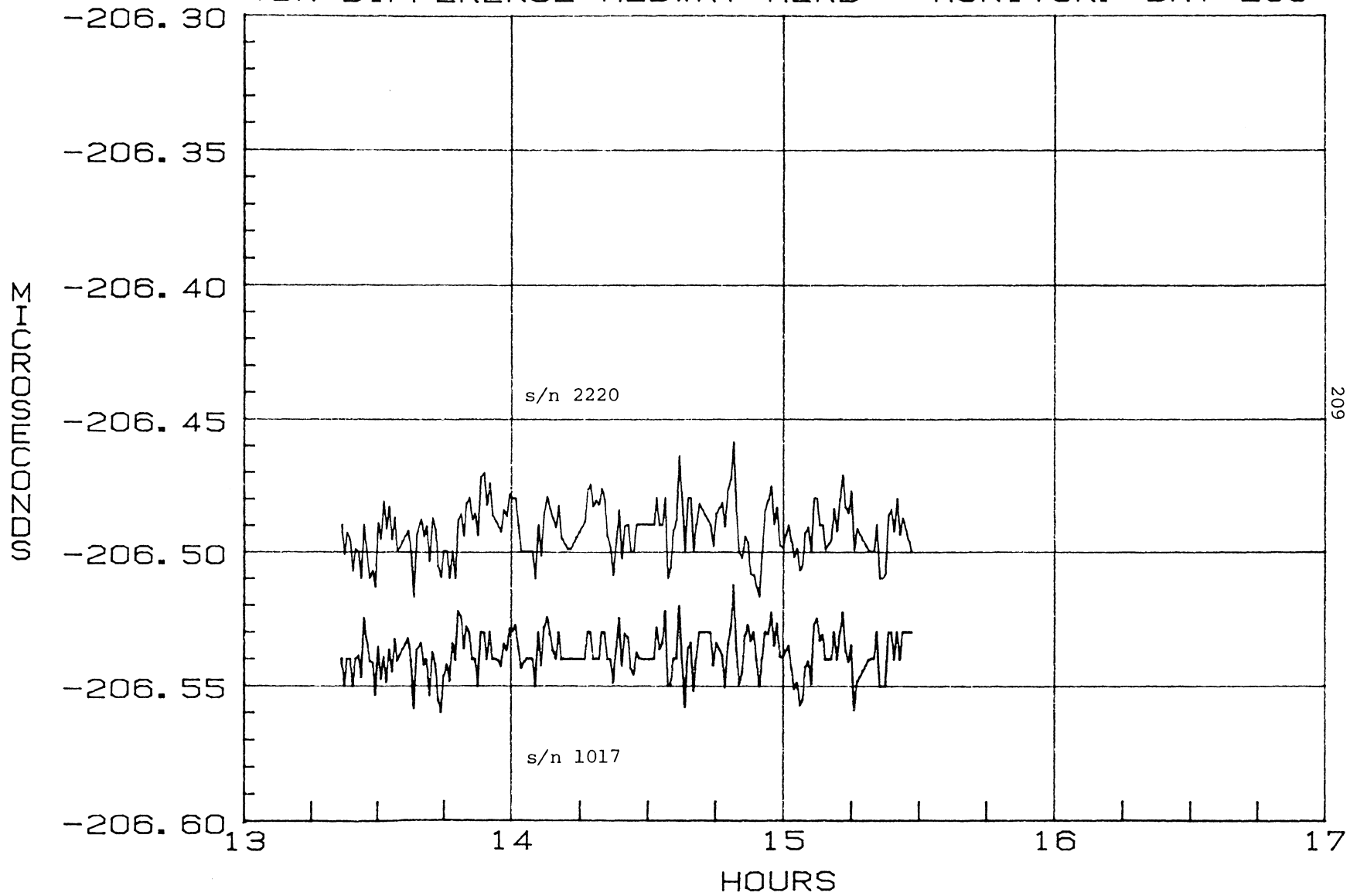


207

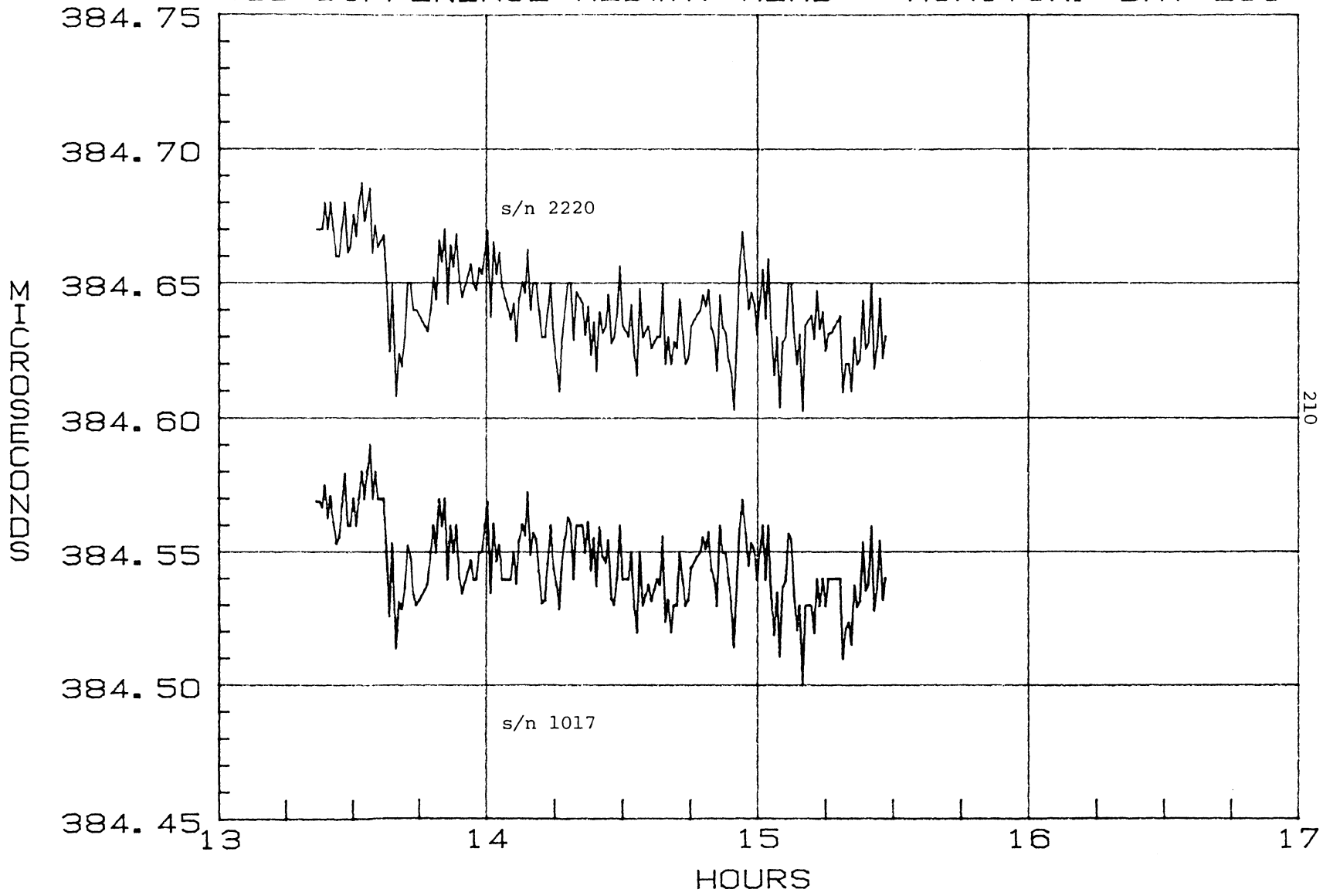
TDB MEDWAY HEAD DATA FOR DAY 238



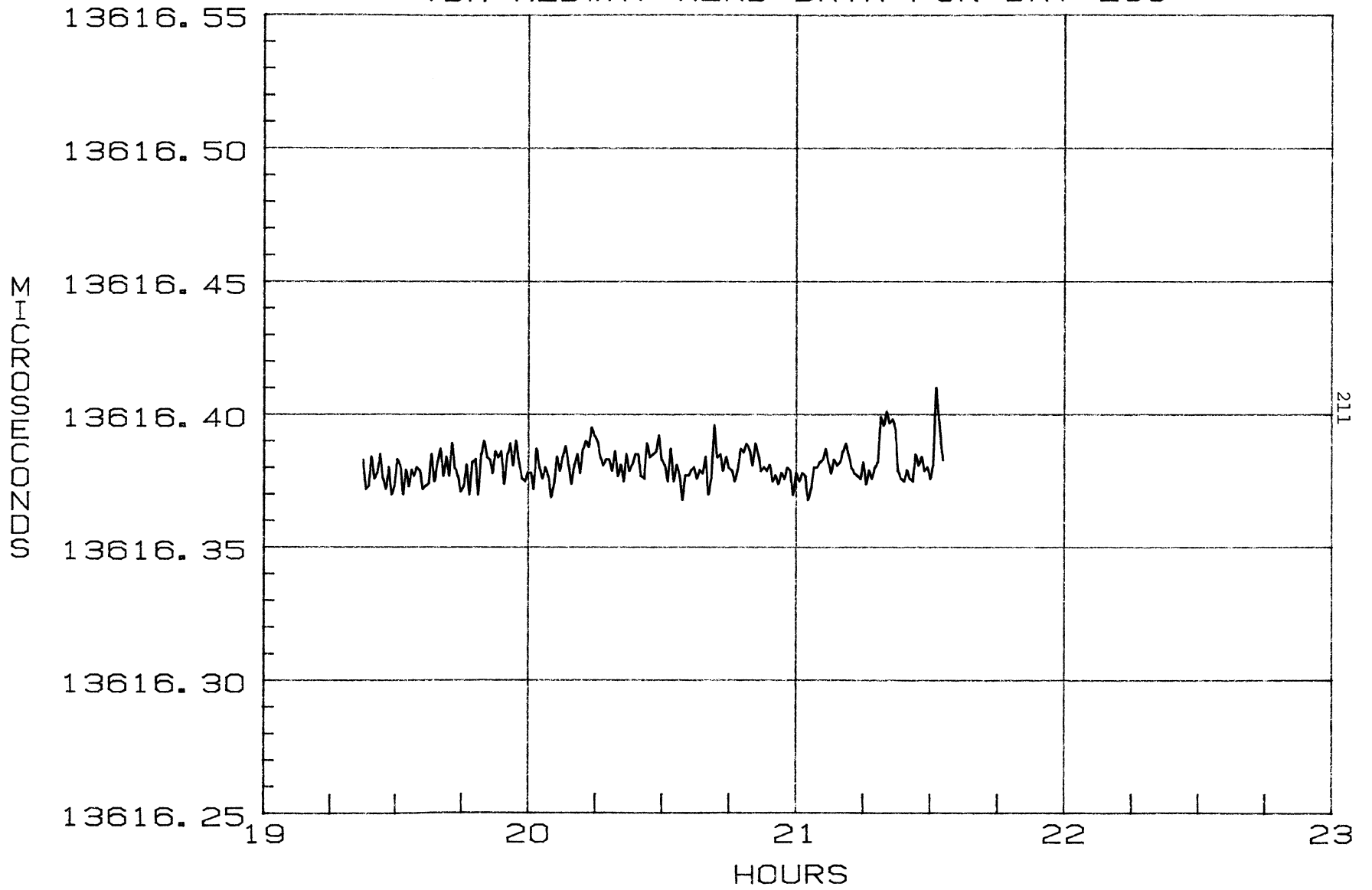
TDA DIFFERENCE MEDWAY HEAD - MONITOR. DAY 238



TDB DIFFERENCE MEDWAY HEAD - MONITOR. DAY 238

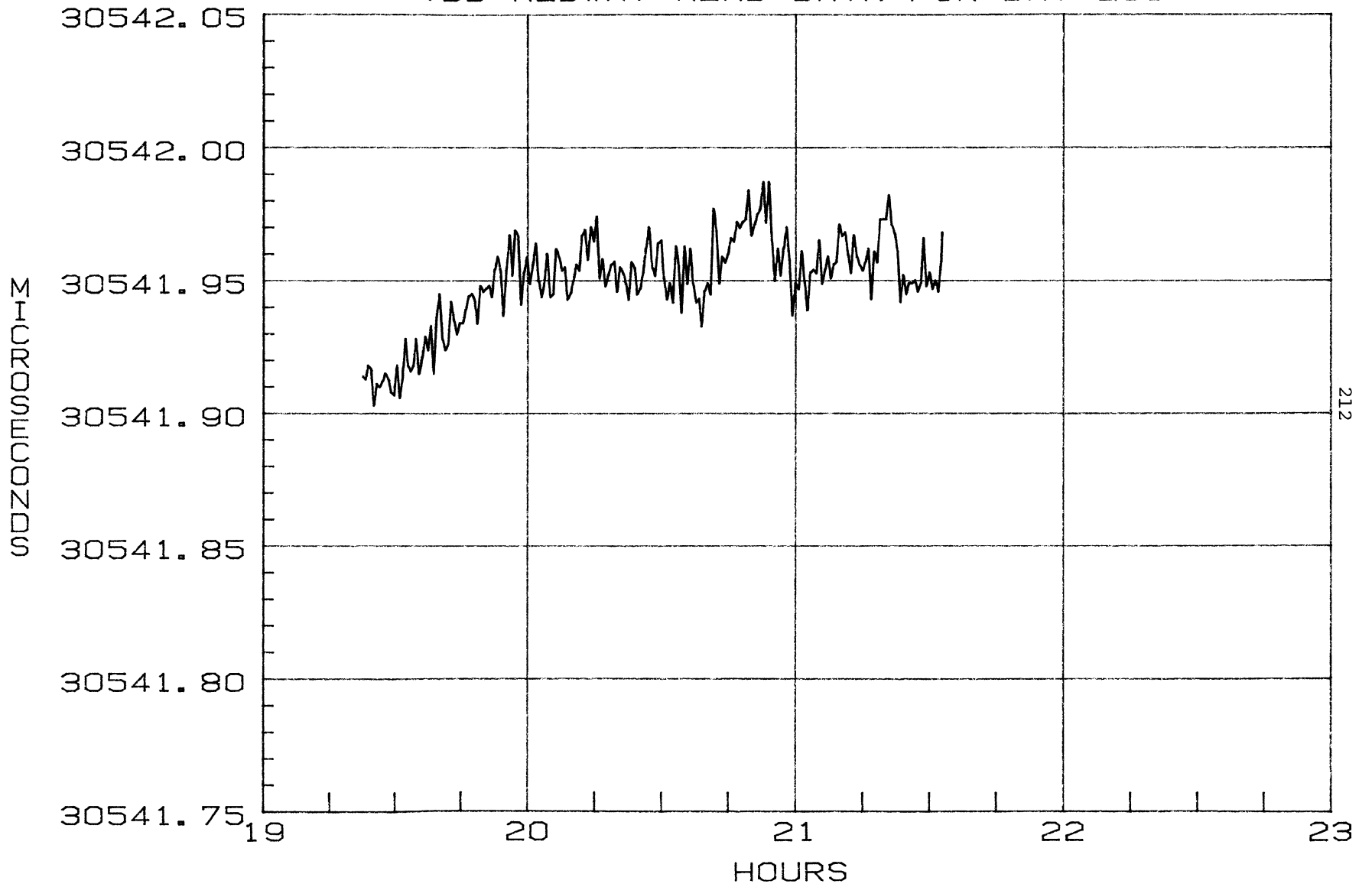


TDA MEDWAY HEAD DATA FOR DAY 266



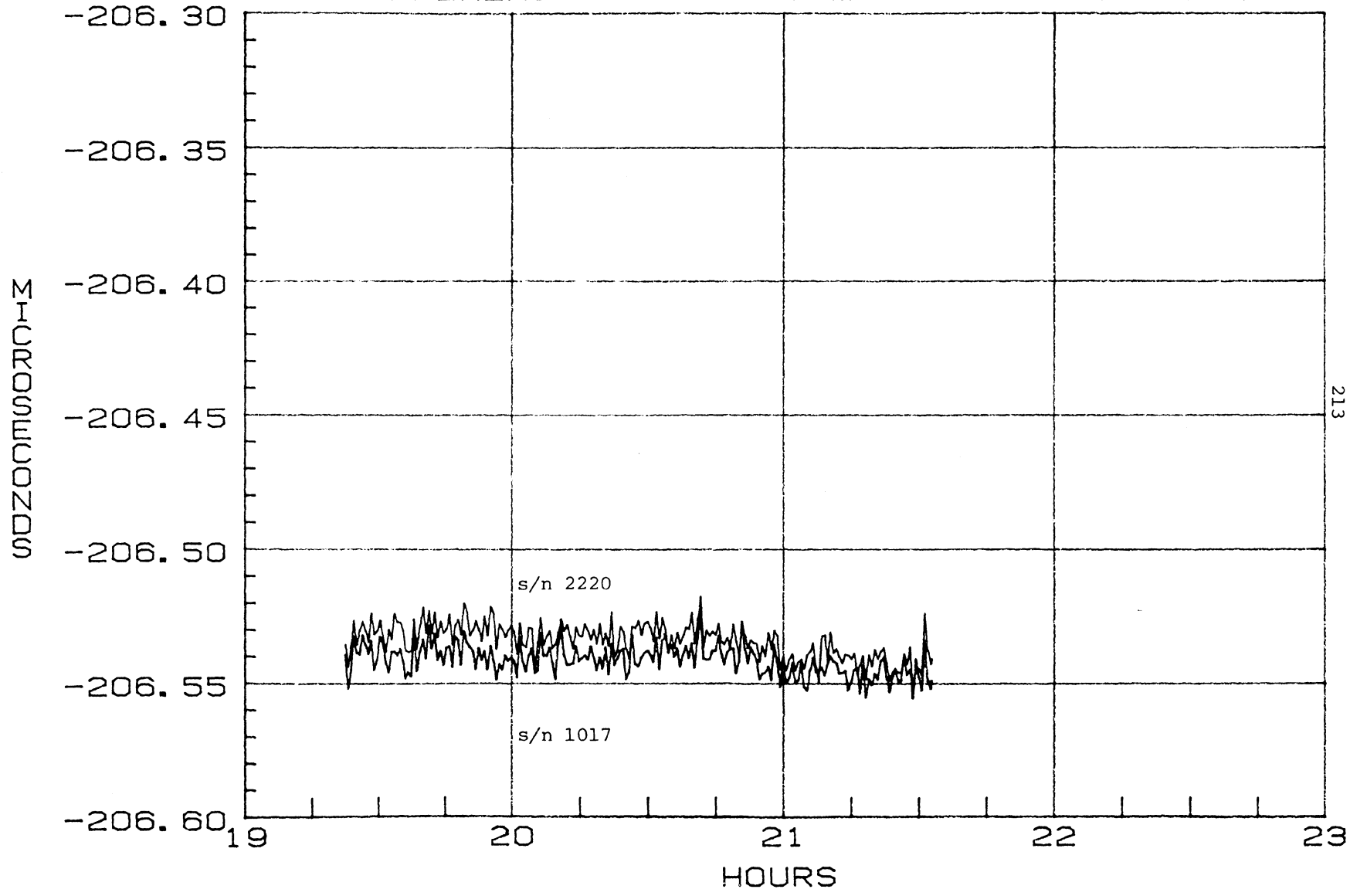
211

TDB MEDWAY HEAD DATA FOR DAY 266

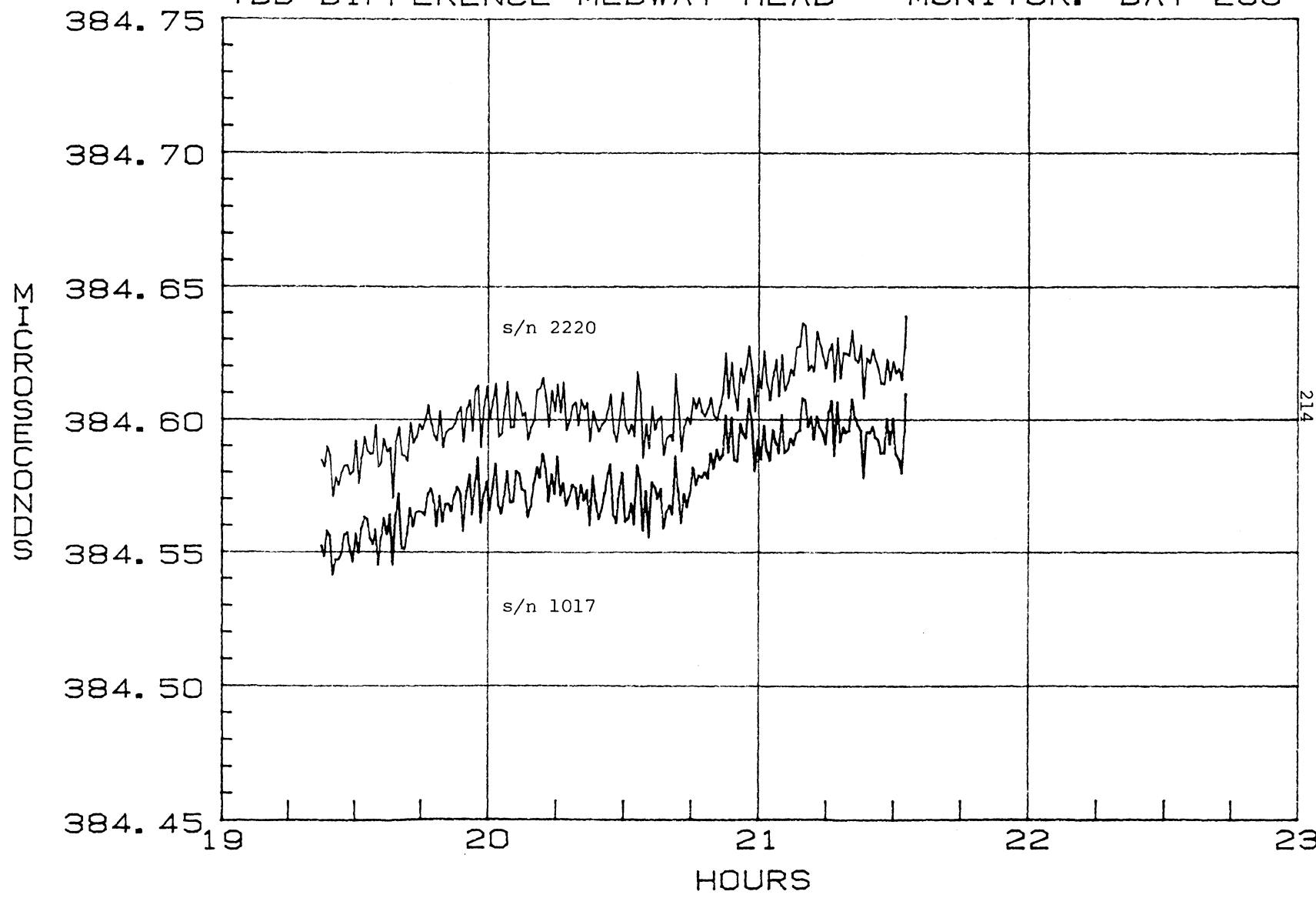


212

TDA DIFFERENCE MEDWAY HEAD - MONITOR. DAY 266



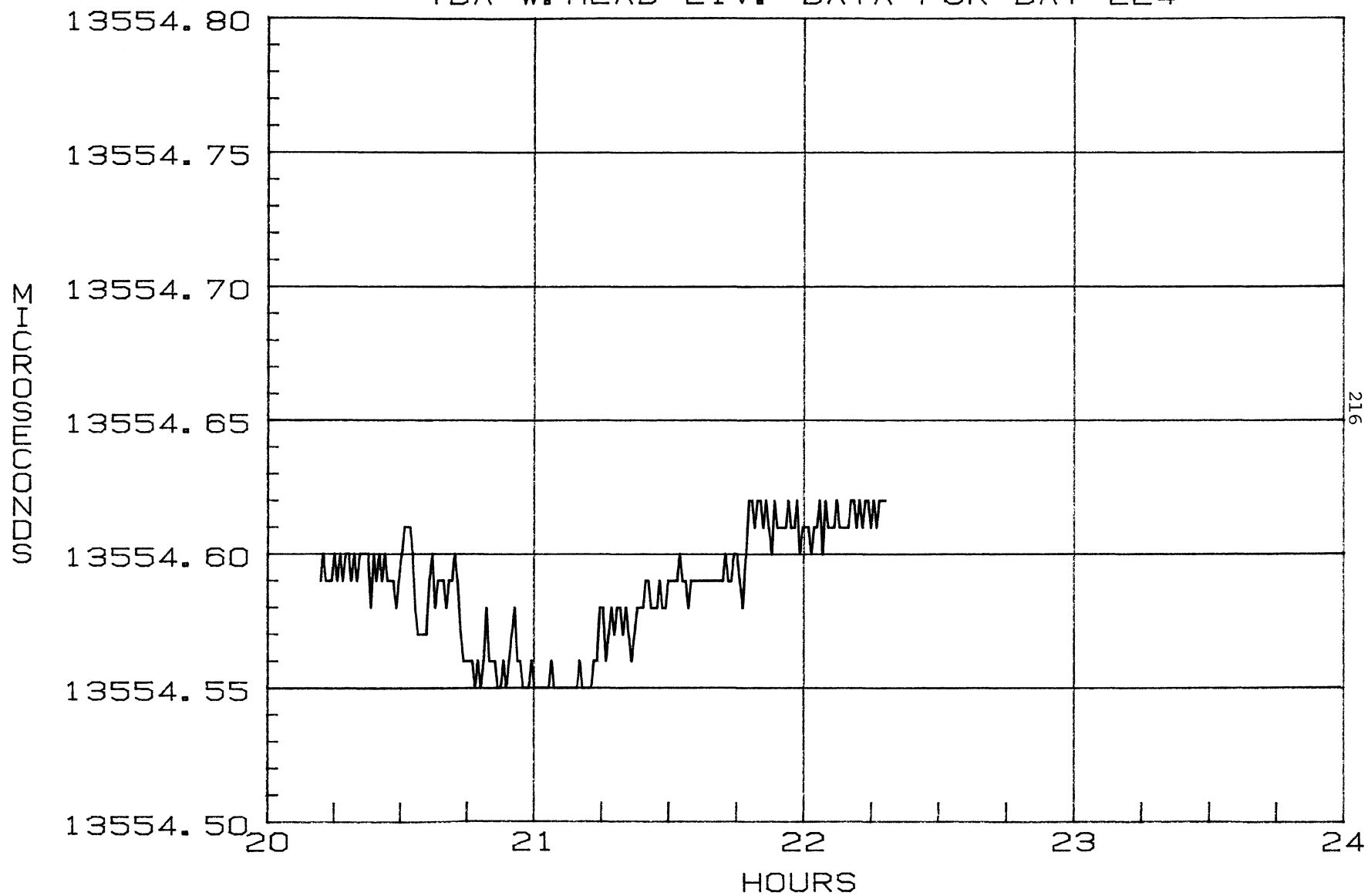
TDB DIFFERENCE MEDWAY HEAD - MONITOR. DAY 266



APPENDIX VI.7

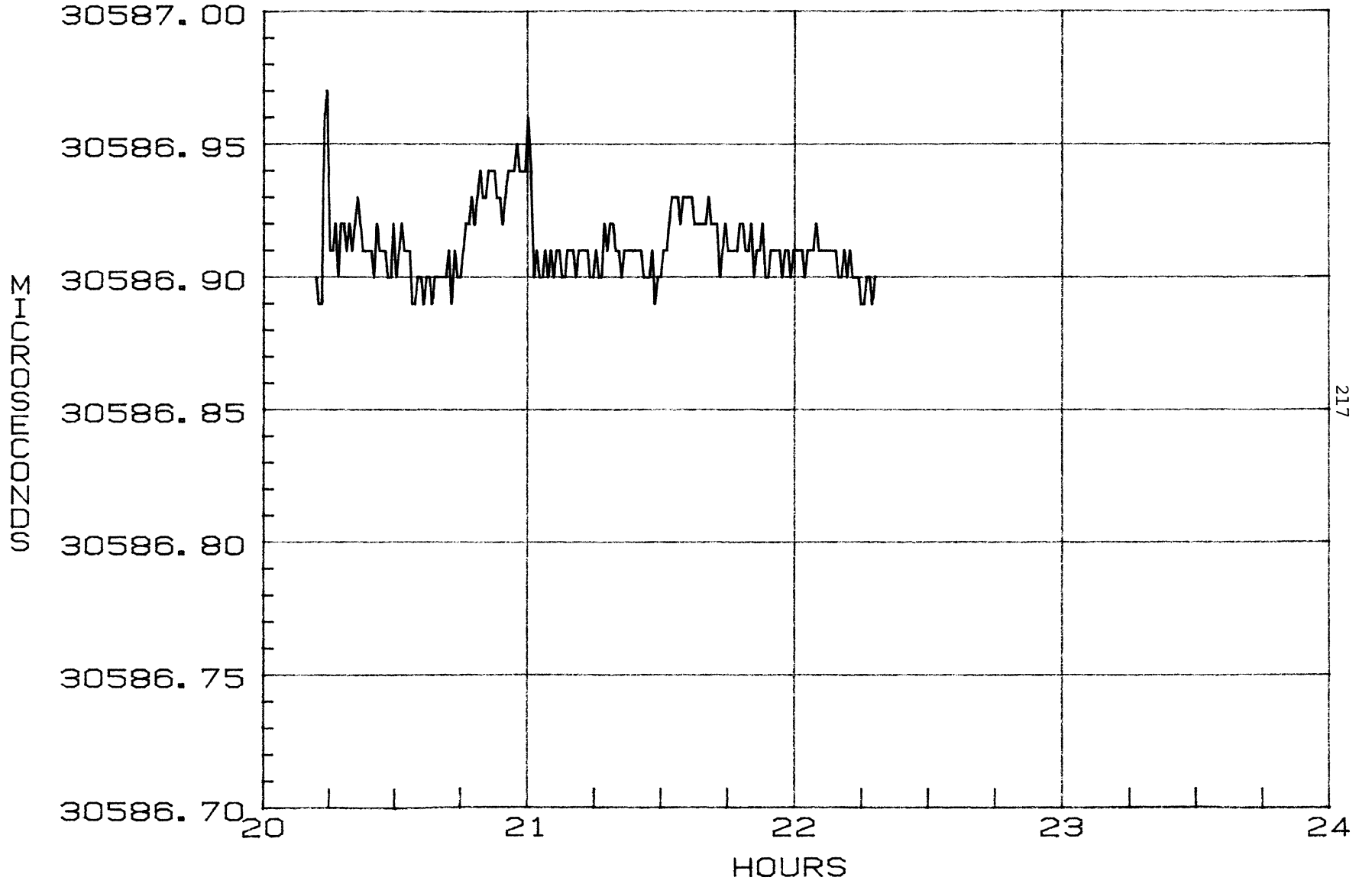
WESTERN HEAD LIVERPOOL

TDA W. HEAD LIV. DATA FOR DAY 224

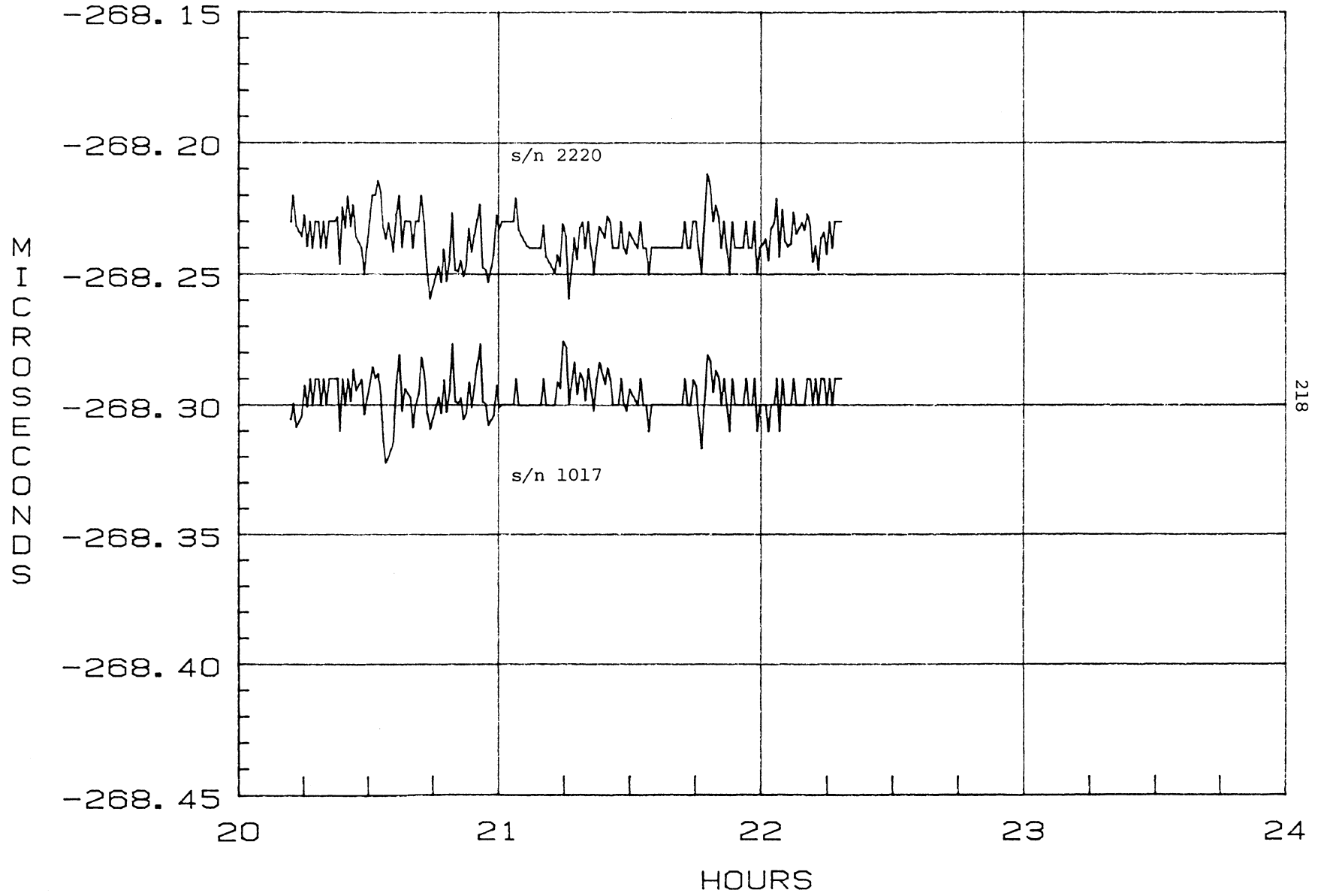


216

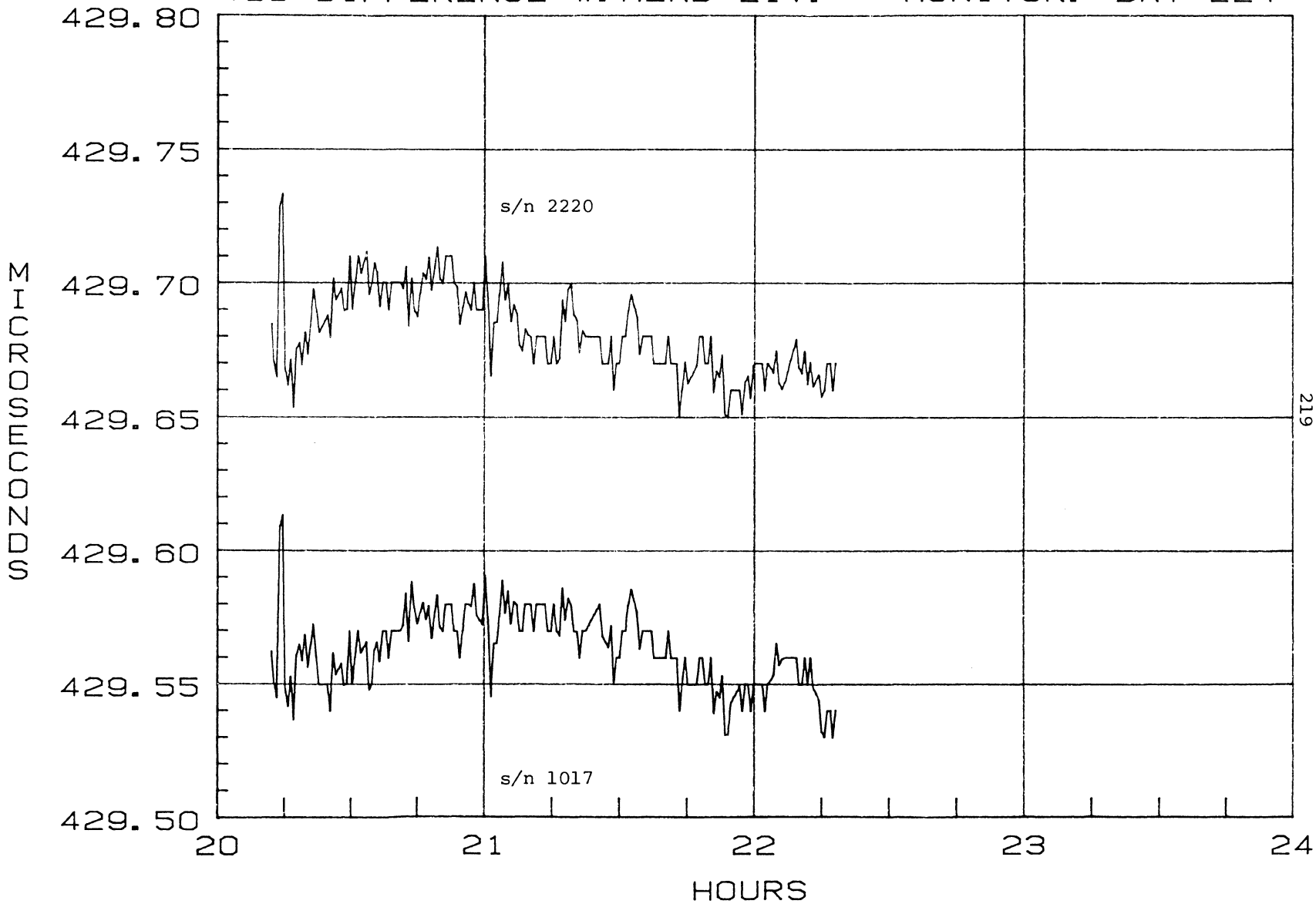
TDB W. HEAD LIV. DATA FOR DAY 224



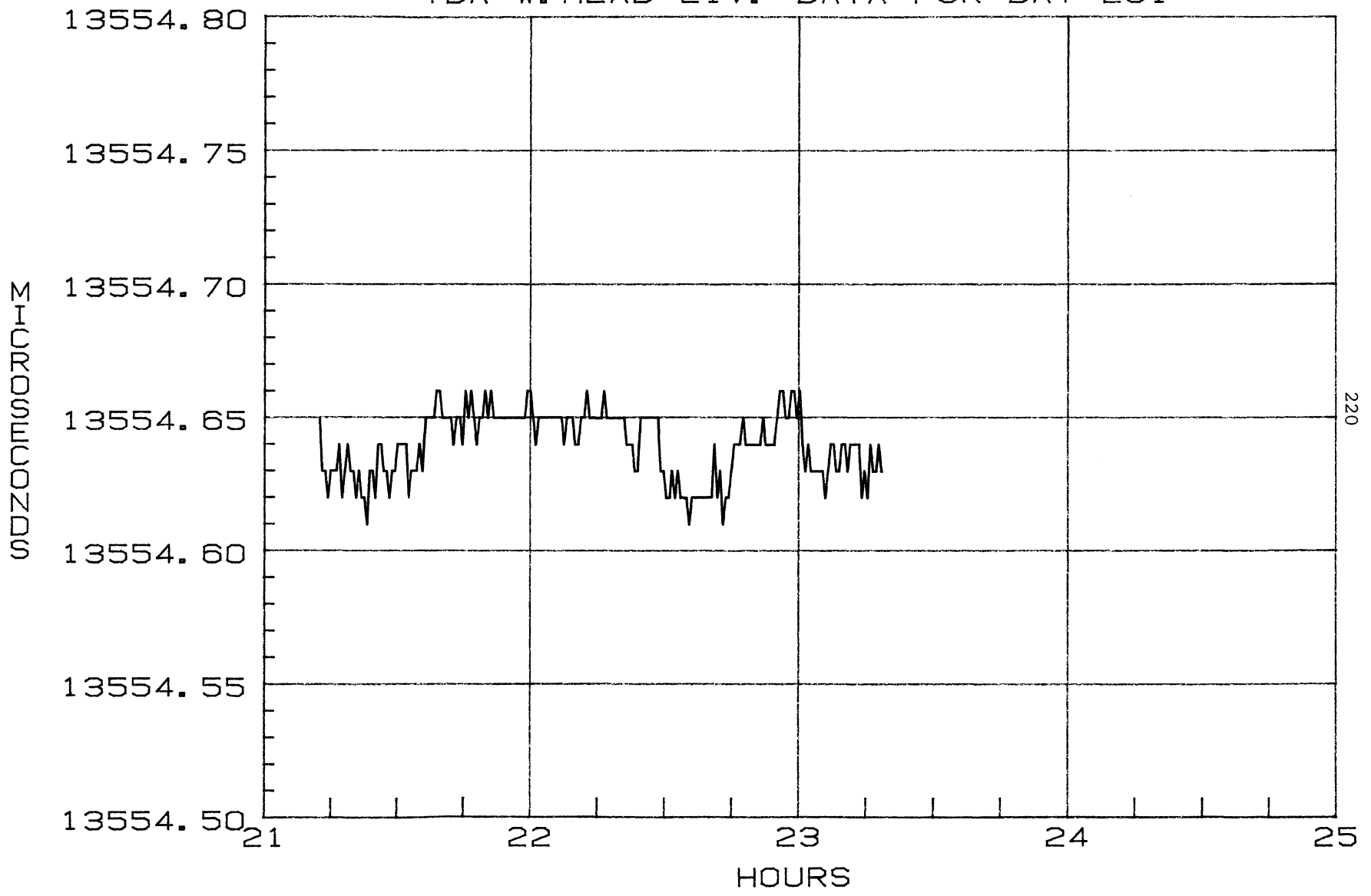
TDA DIFFERENCE W. HEAD LIV. - MONITOR. DAY 224



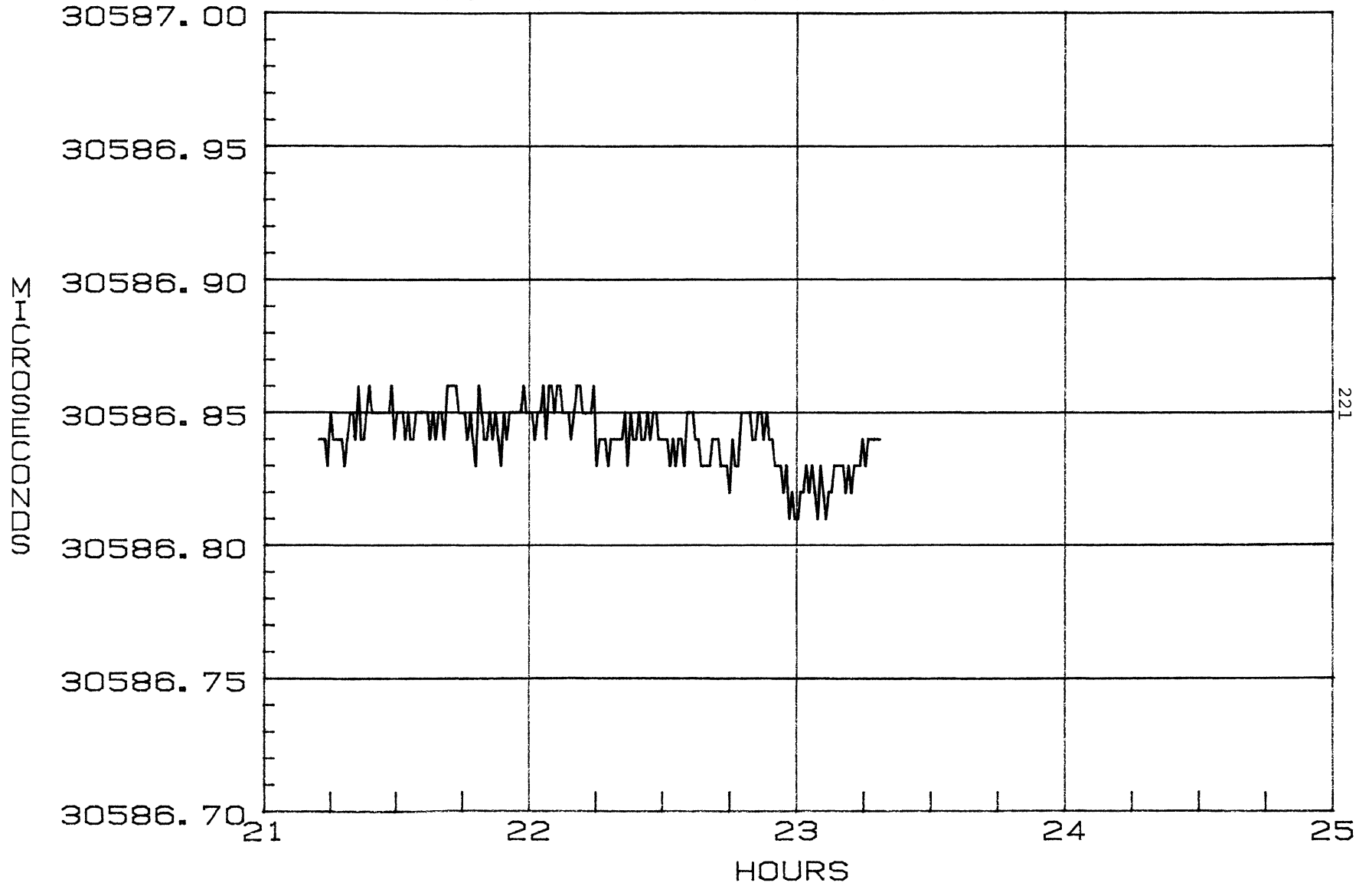
TDB DIFFERENCE W. HEAD LIV. - MONITOR. DAY 224



TDA W. HEAD LIV. DATA FOR DAY 231

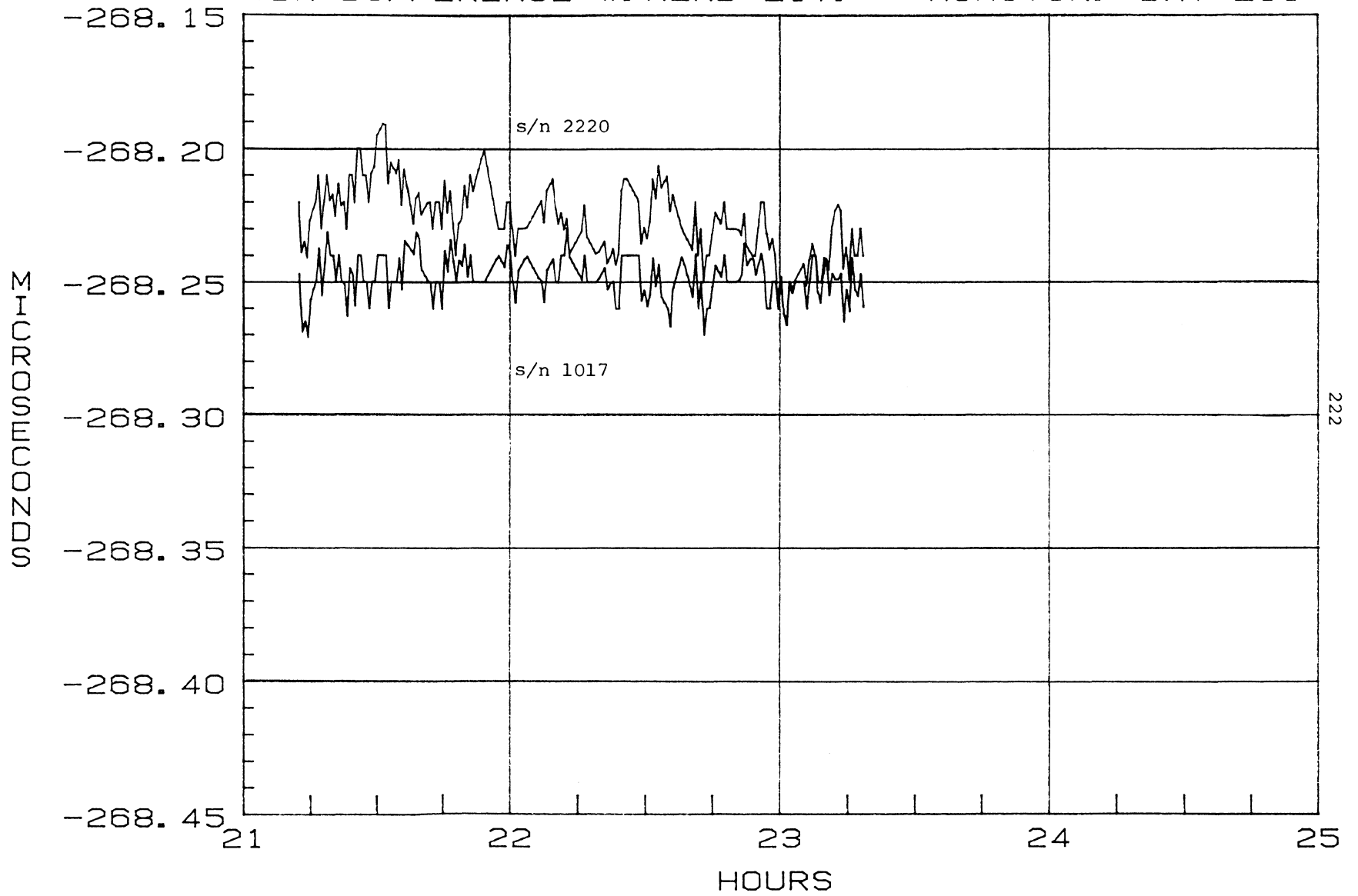


TDB W. HEAD LIV. DATA FOR DAY 231

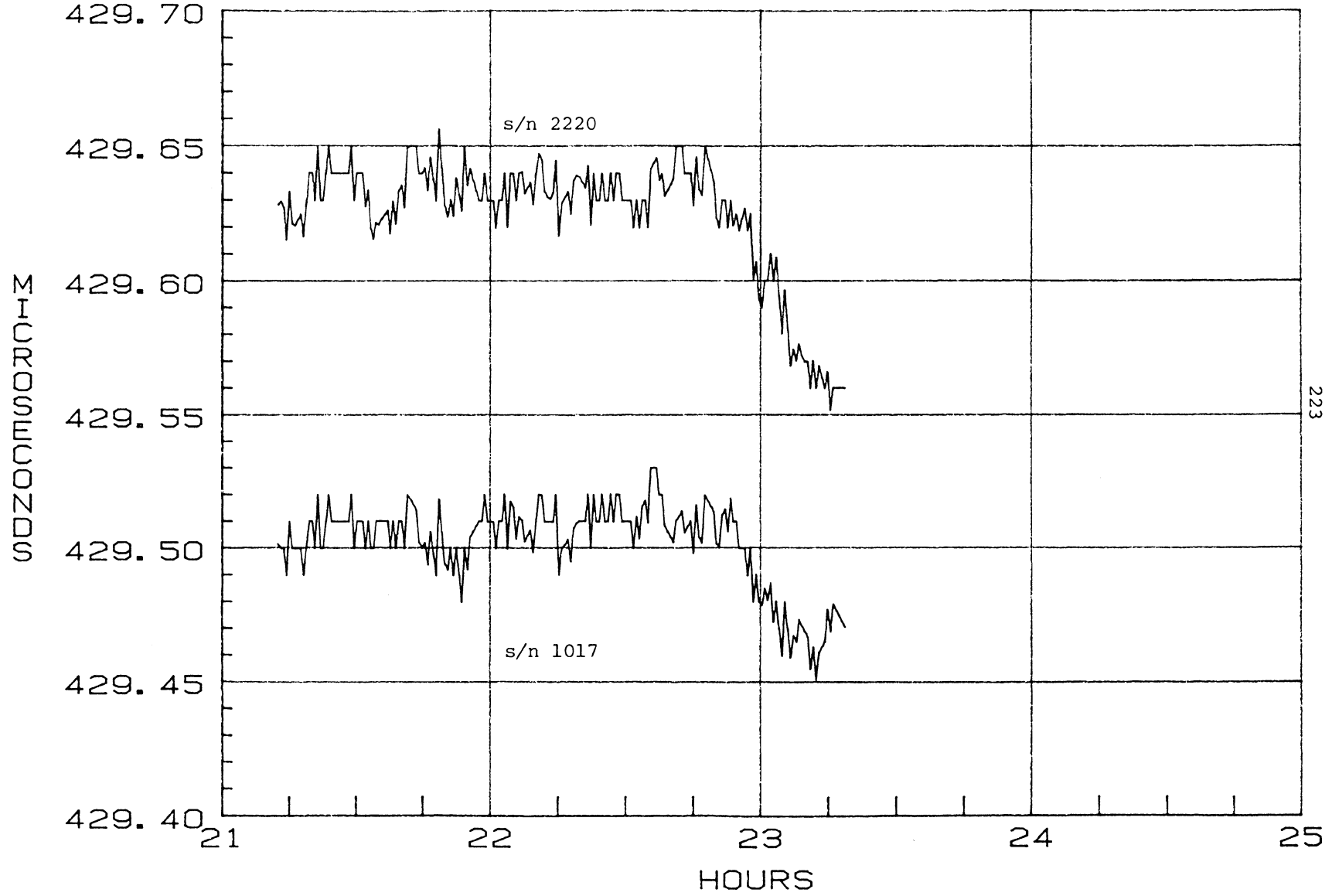


221

TDA DIFFERENCE W. HEAD LIV. - MONITOR. DAY 231

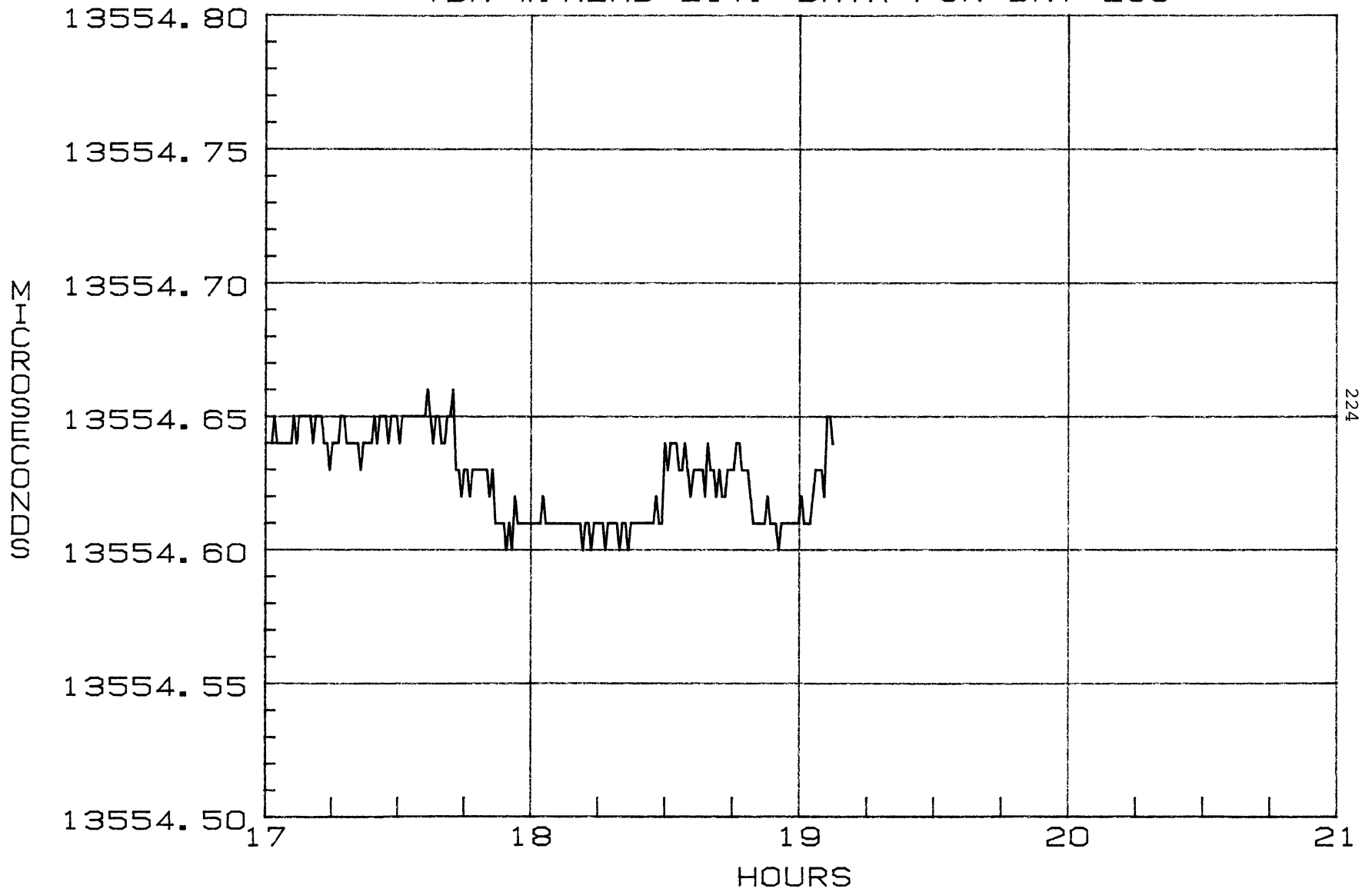


TDB DIFFERENCE W. HEAD LIV. - MONITOR. DAY 231

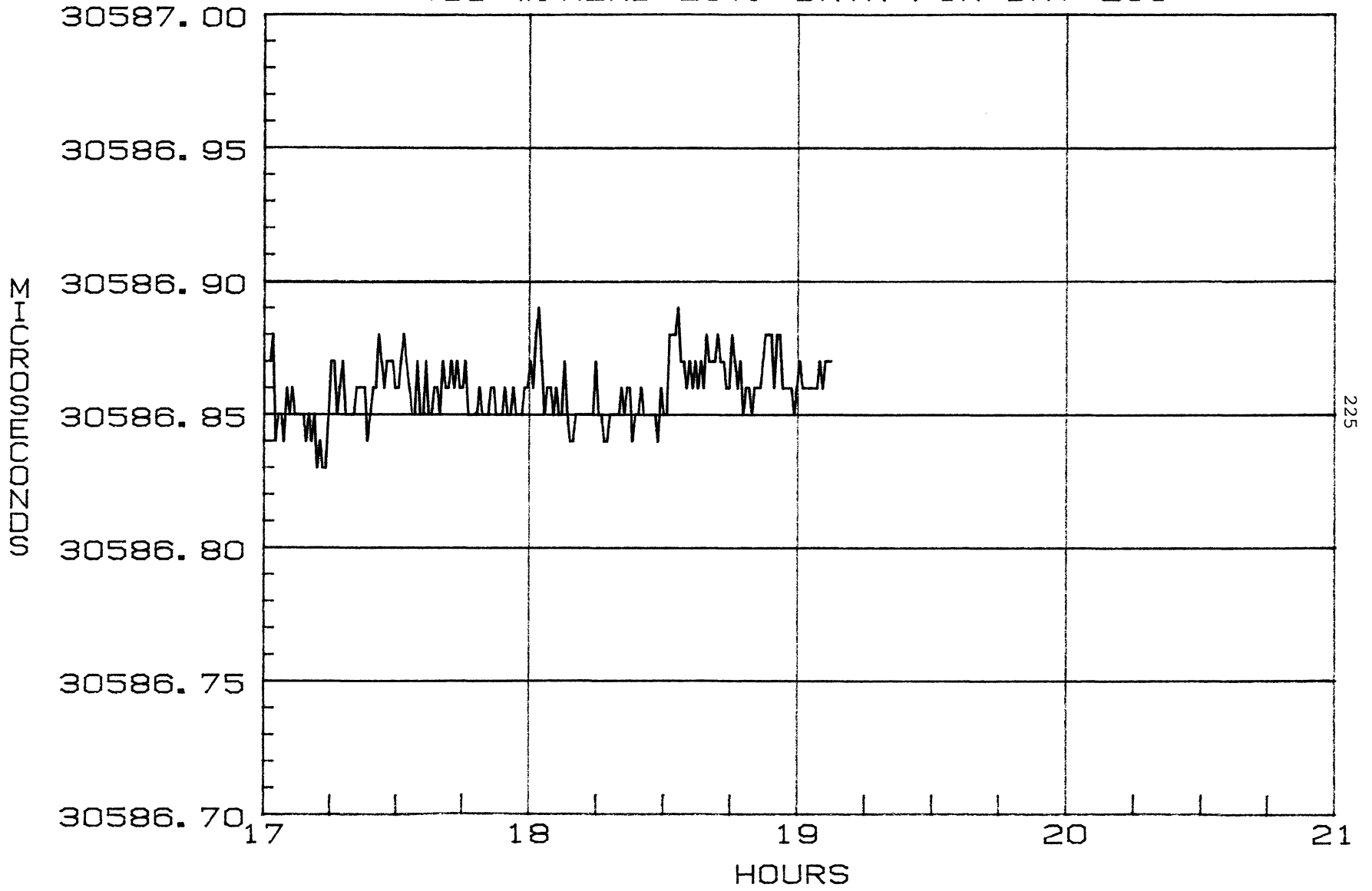


223

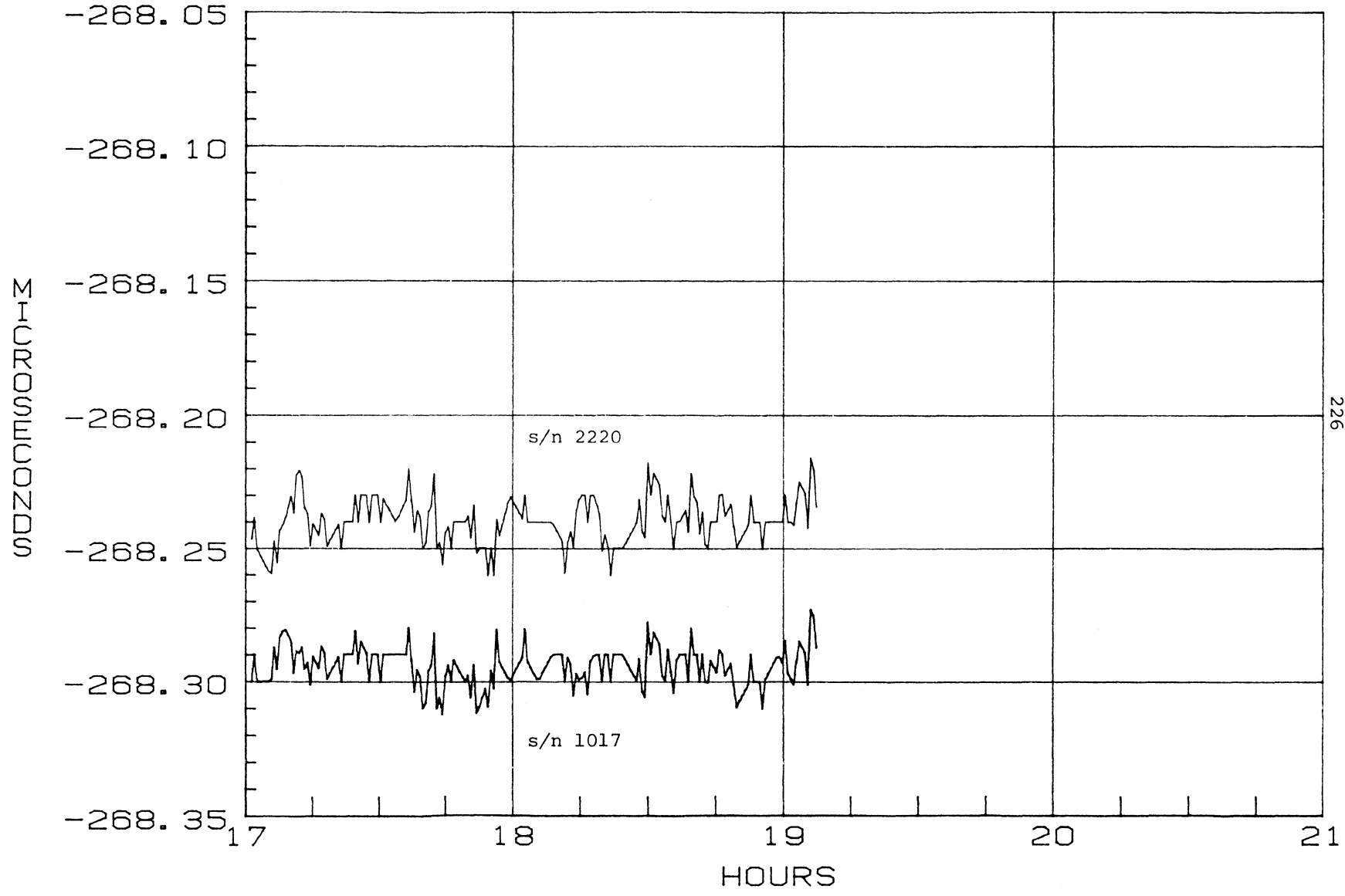
TDA W. HEAD LIV. DATA FOR DAY 238



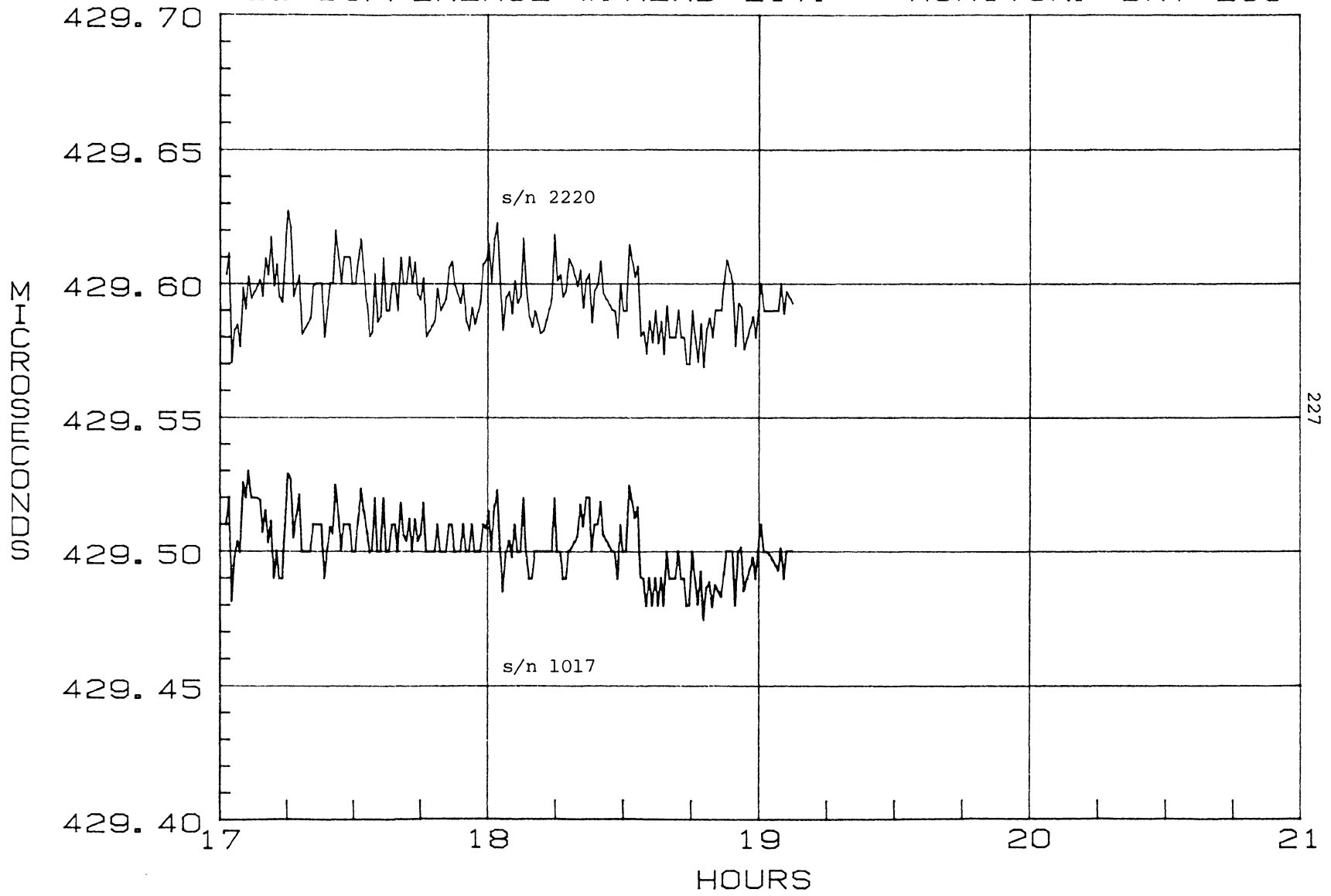
TDB W. HEAD LIV. DATA FOR DAY 238



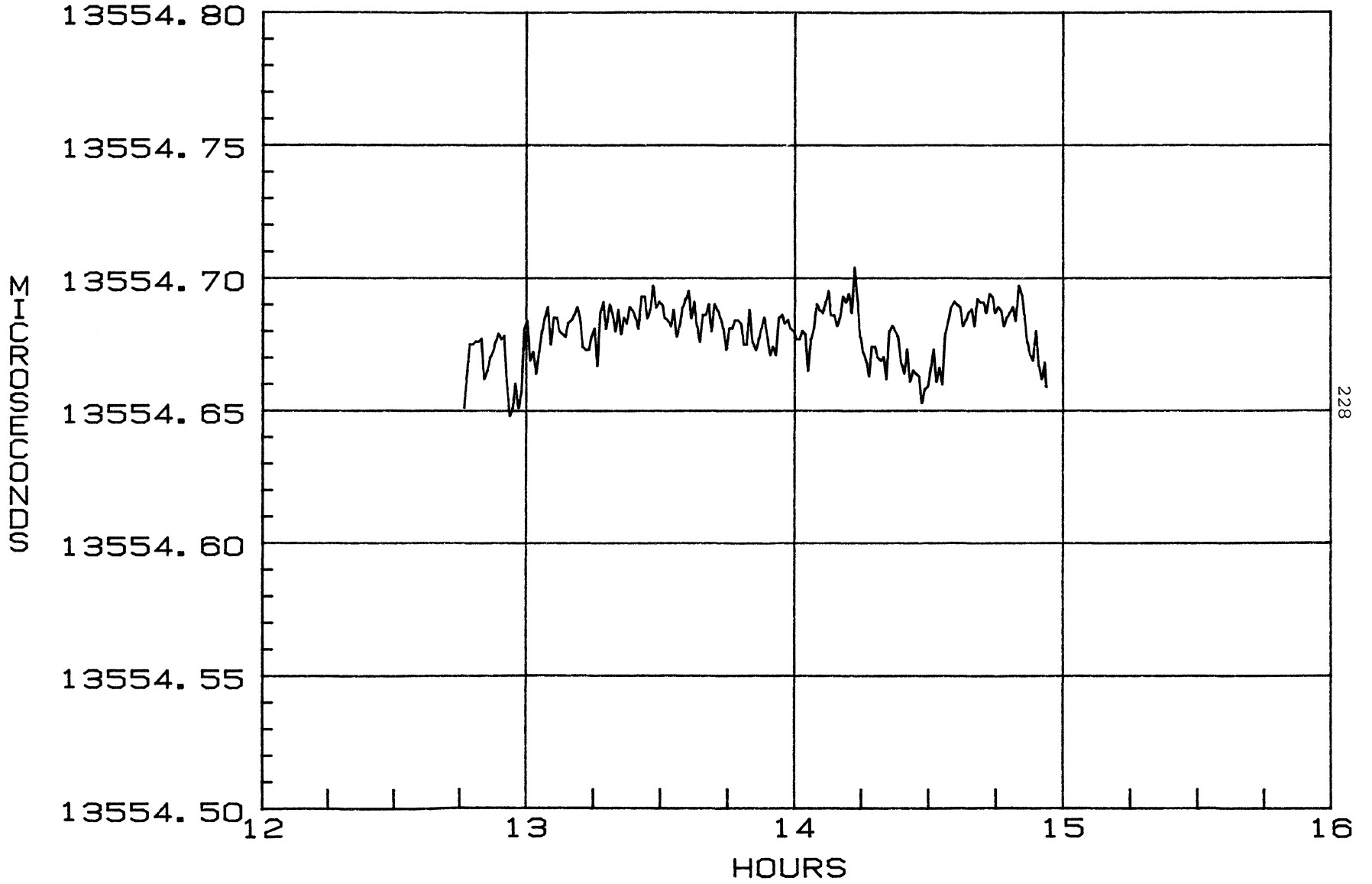
TDA DIFFERENCE W. HEAD LIV. - MONITOR. DAY 238



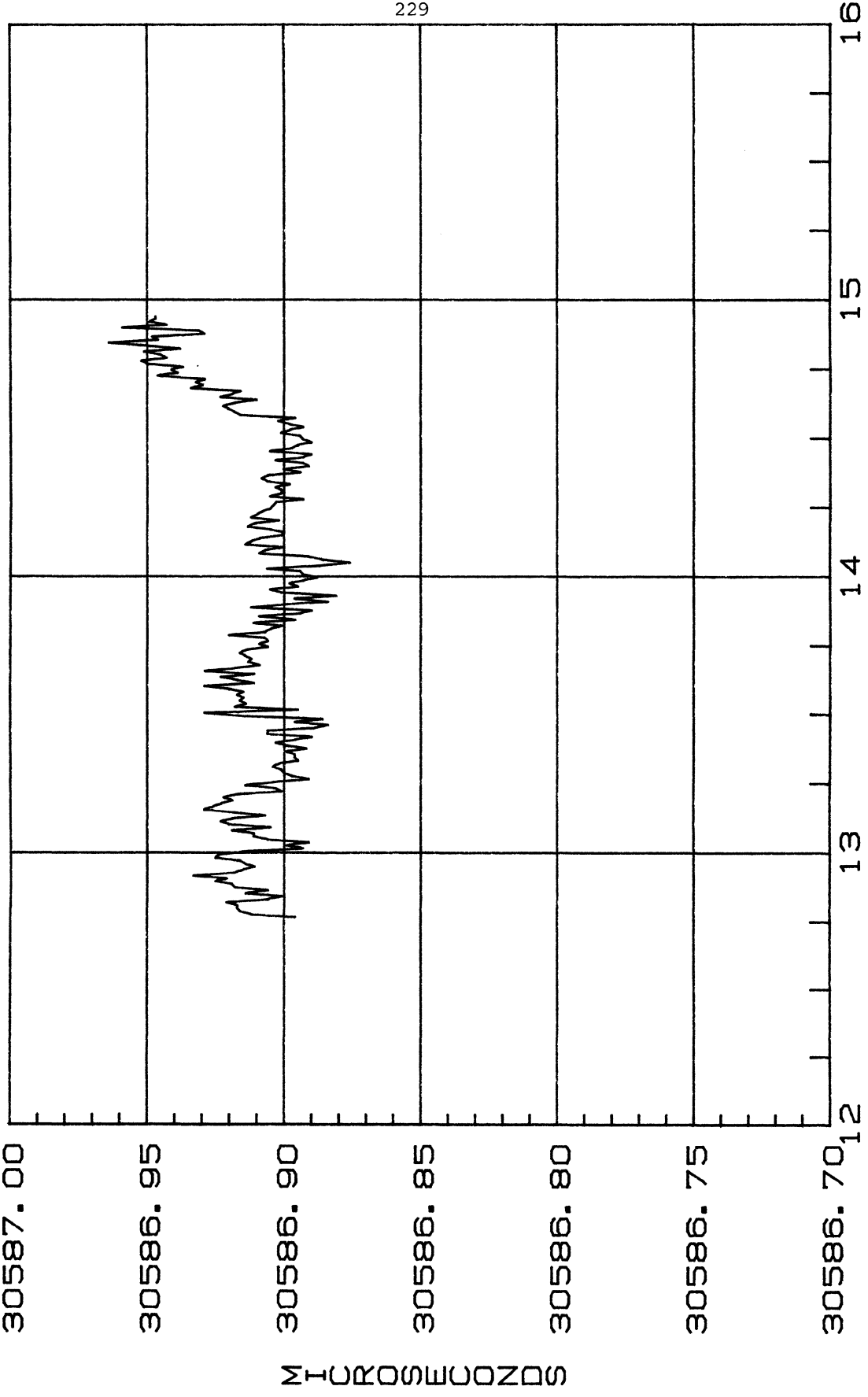
TDB DIFFERENCE W. HEAD LIV. - MONITOR. DAY 238



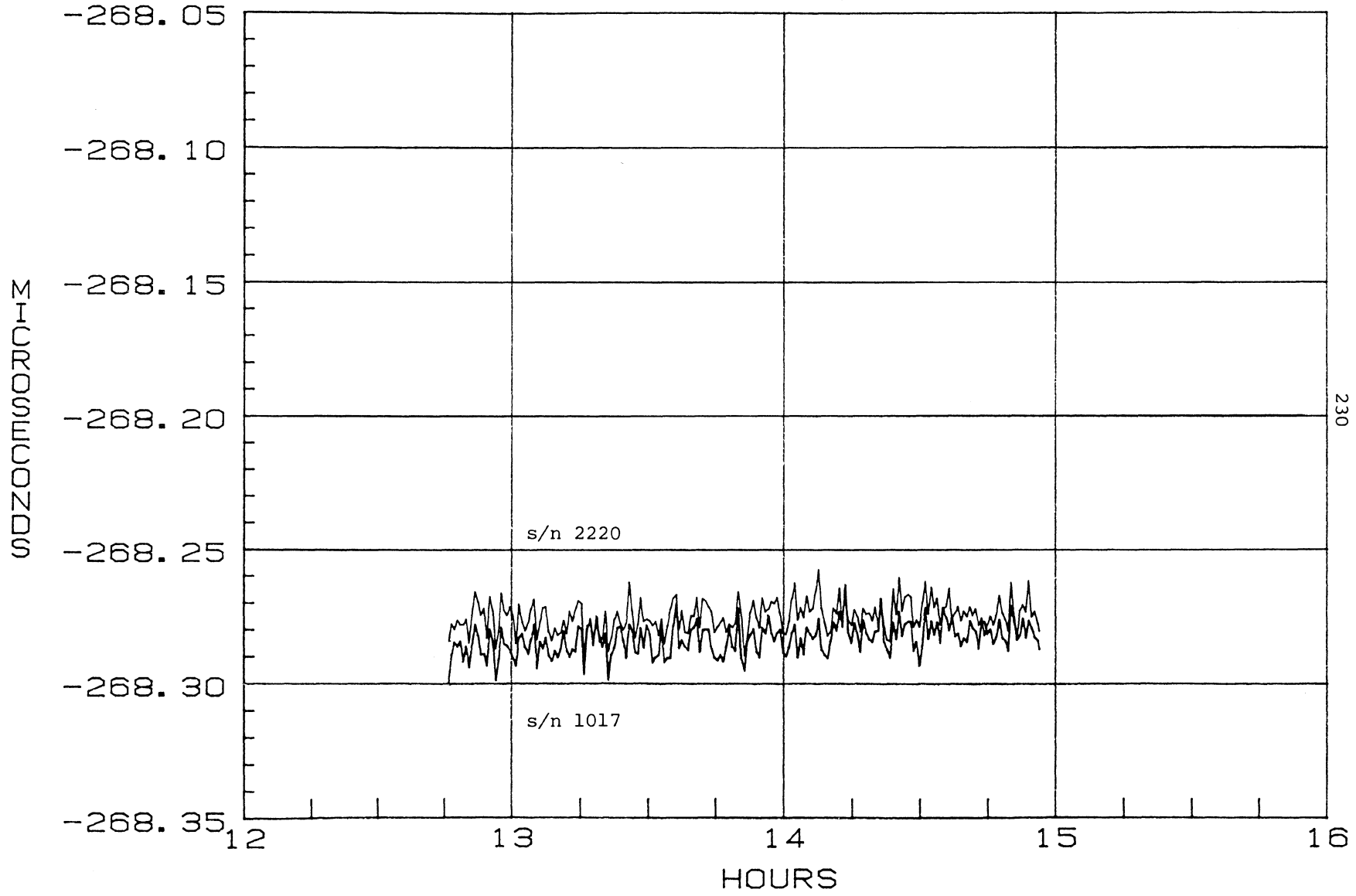
TDA W. HEAD LIV. DATA FOR DAY 267



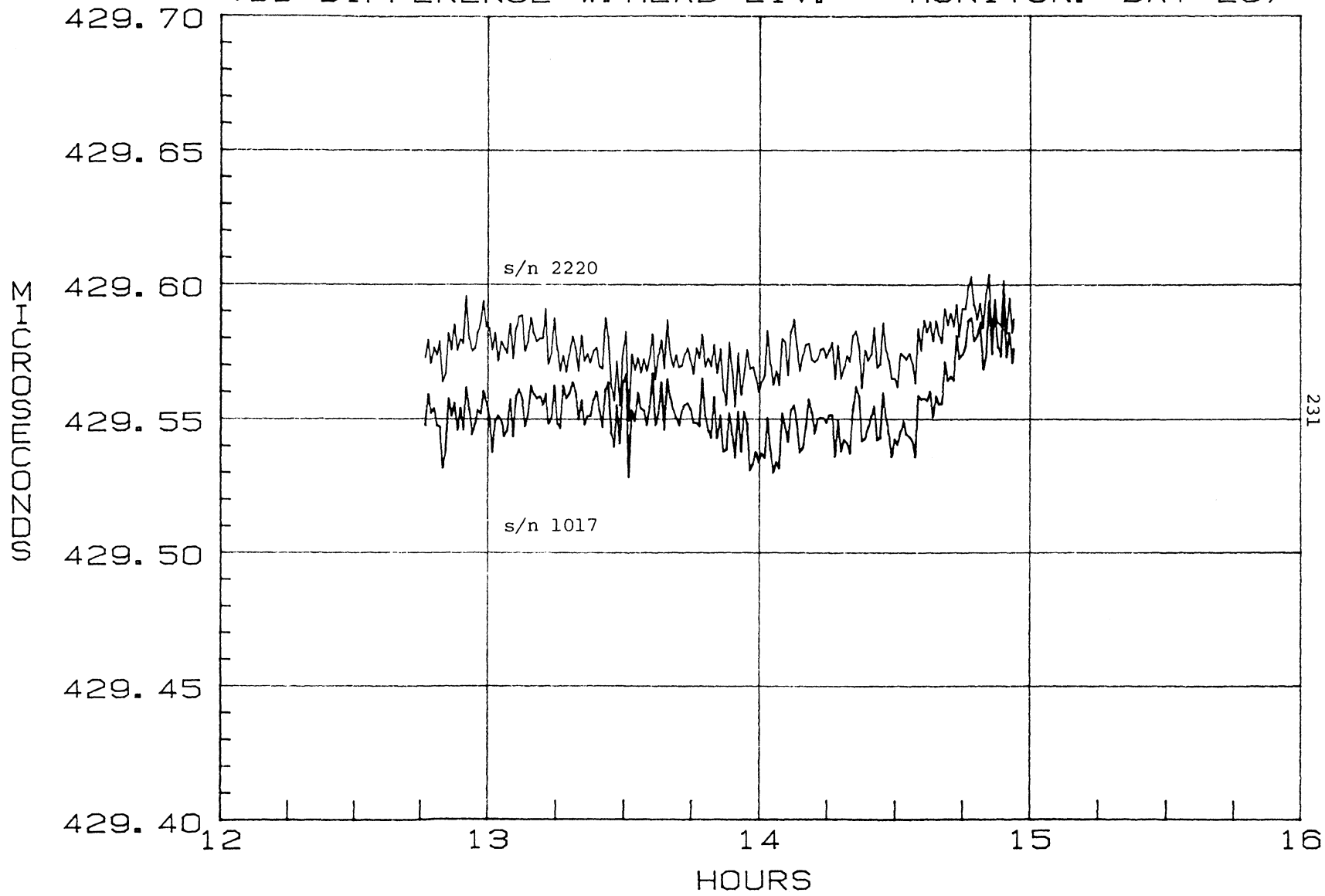
TDB W. HEAD LIV. DATA FOR DAY 267



TDA DIFFERENCE W. HEAD LIV. - MONITOR. DAY 267



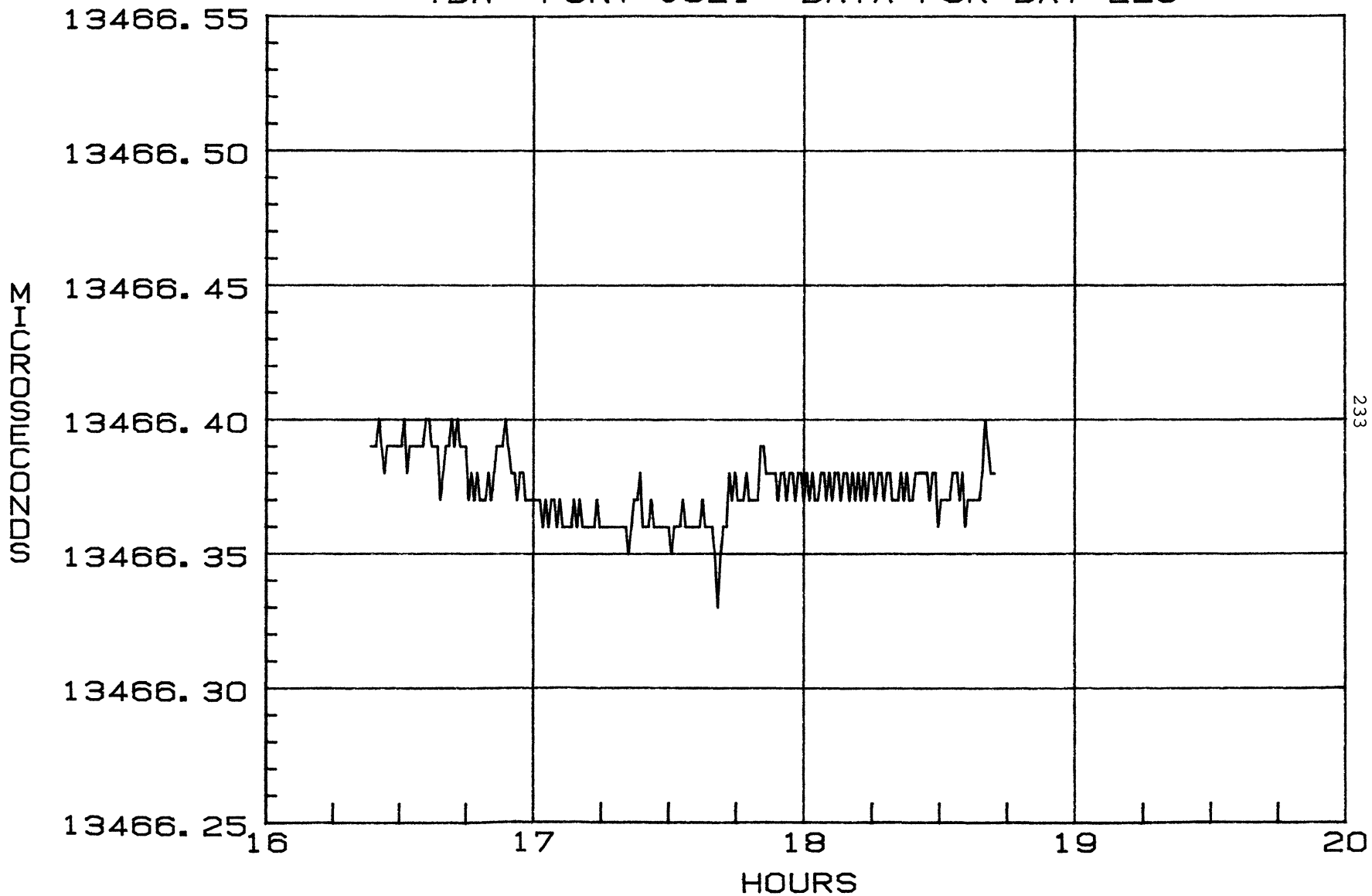
TDB DIFFERENCE W. HEAD LIV. - MONITOR. DAY 267



APPENDIX VI.8

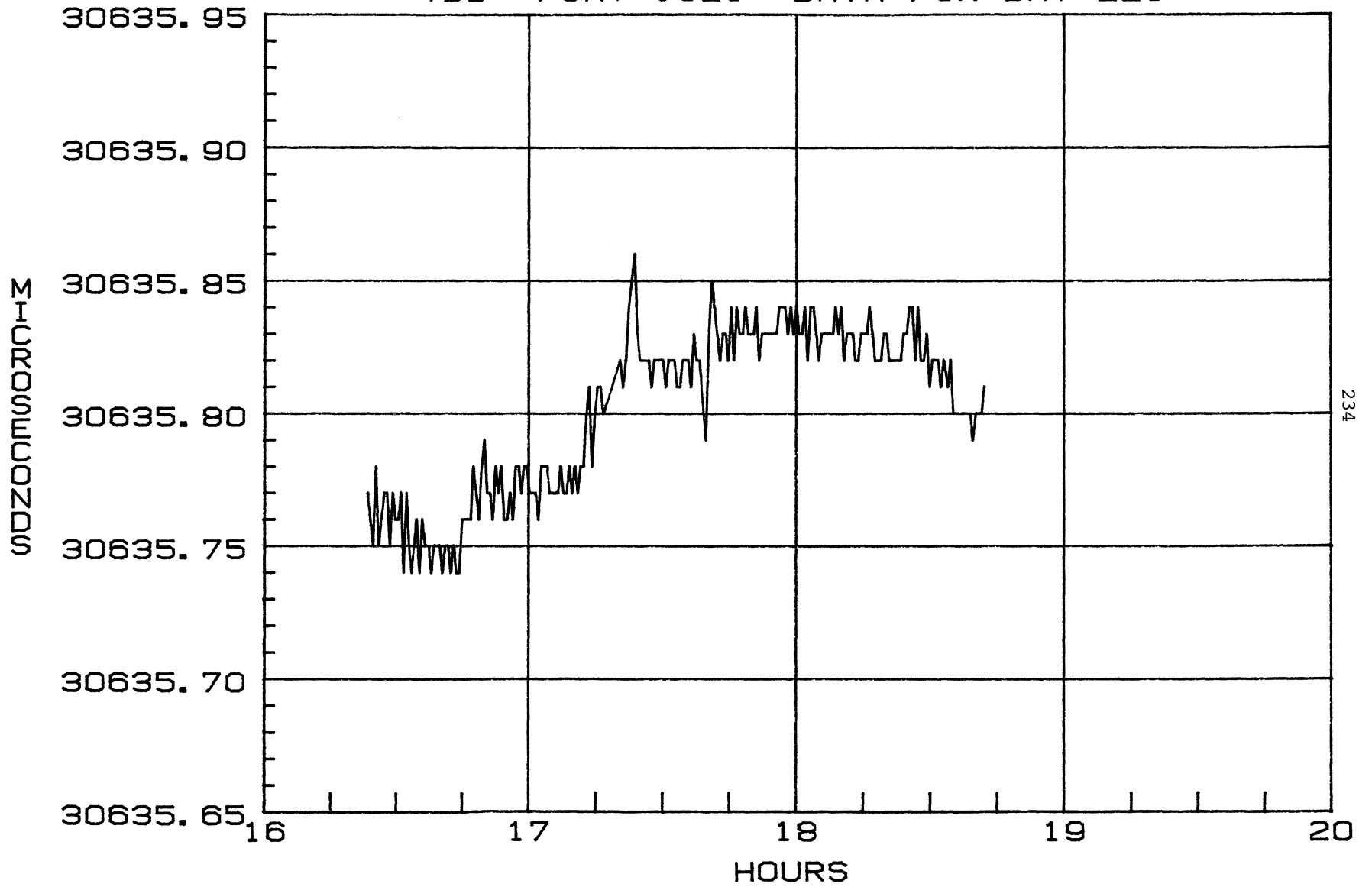
PORT JOLI

TDA PORT JOLI DATA FOR DAY 225

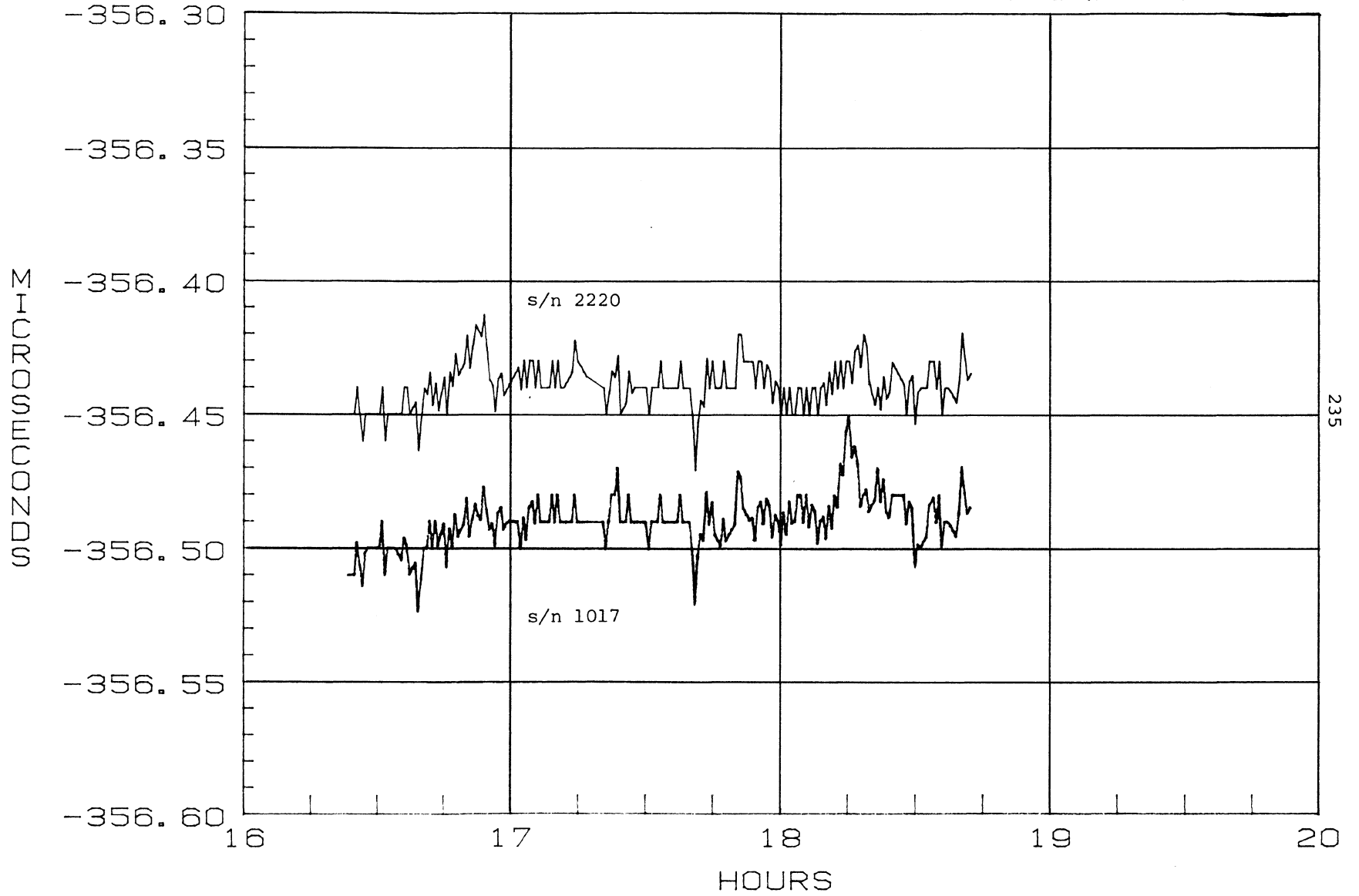


233

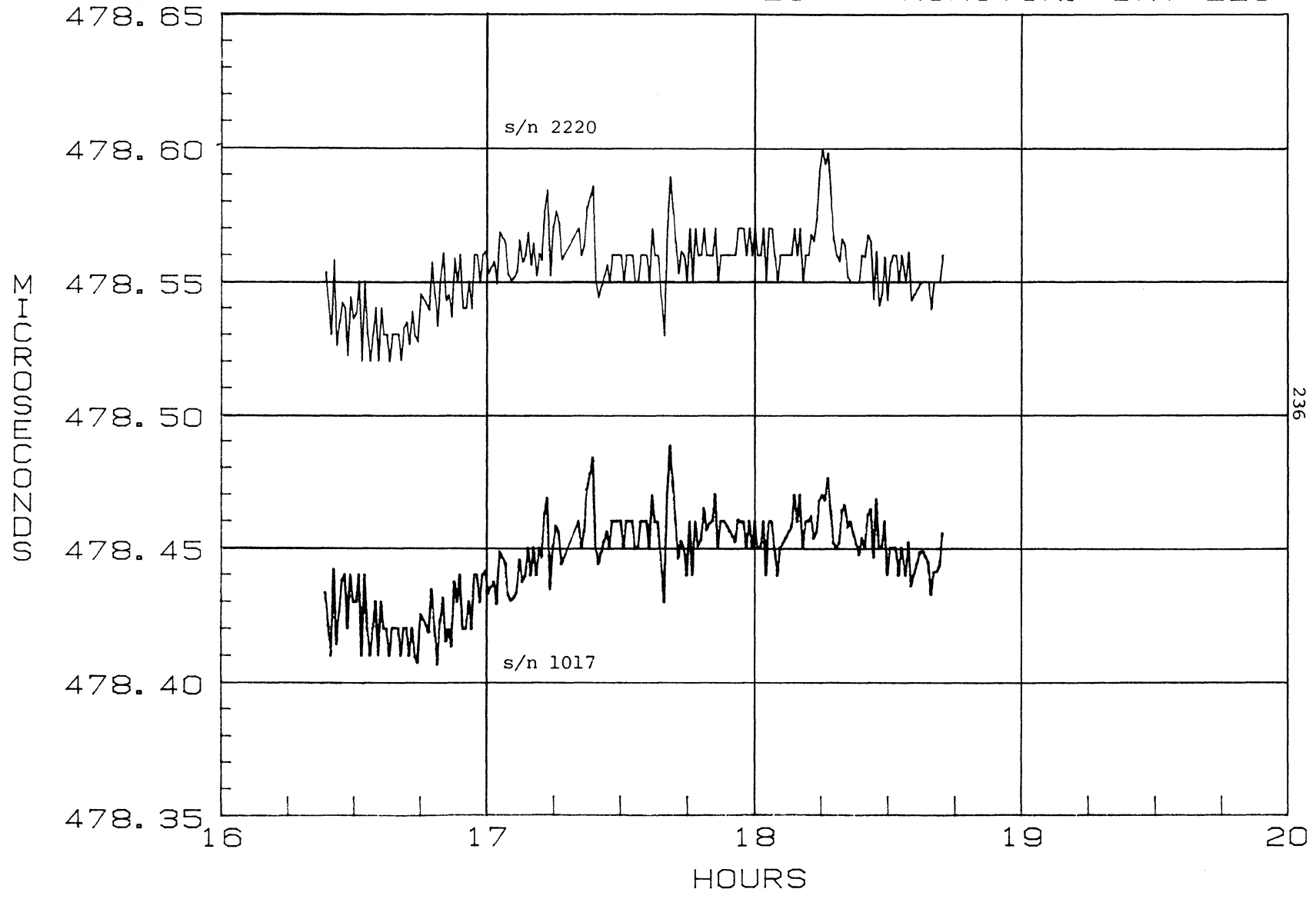
TDB PORT JOLI DATA FOR DAY 225



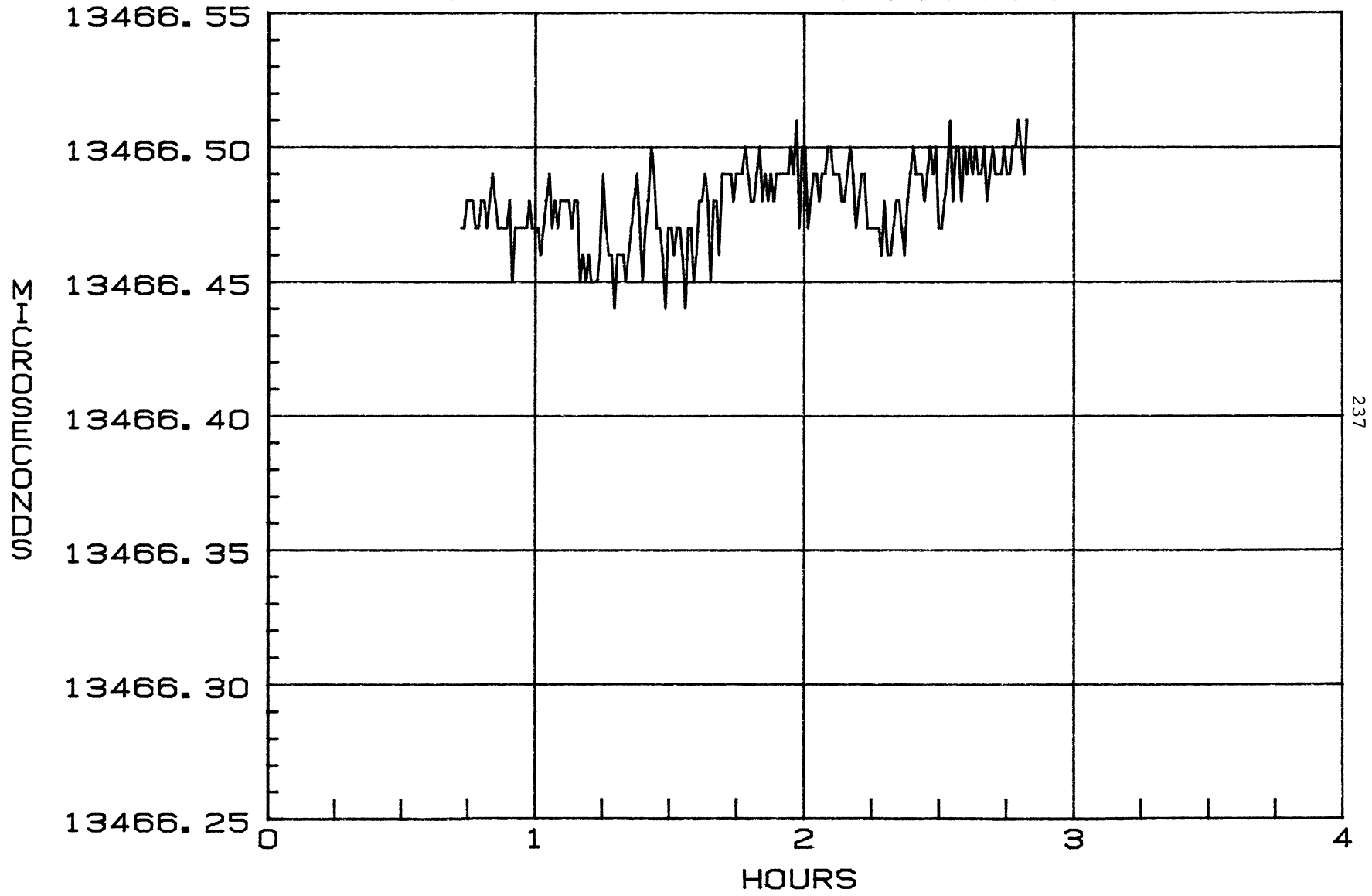
TDA DIFFERENCE PORT JOLI - MONITOR. DAY 225



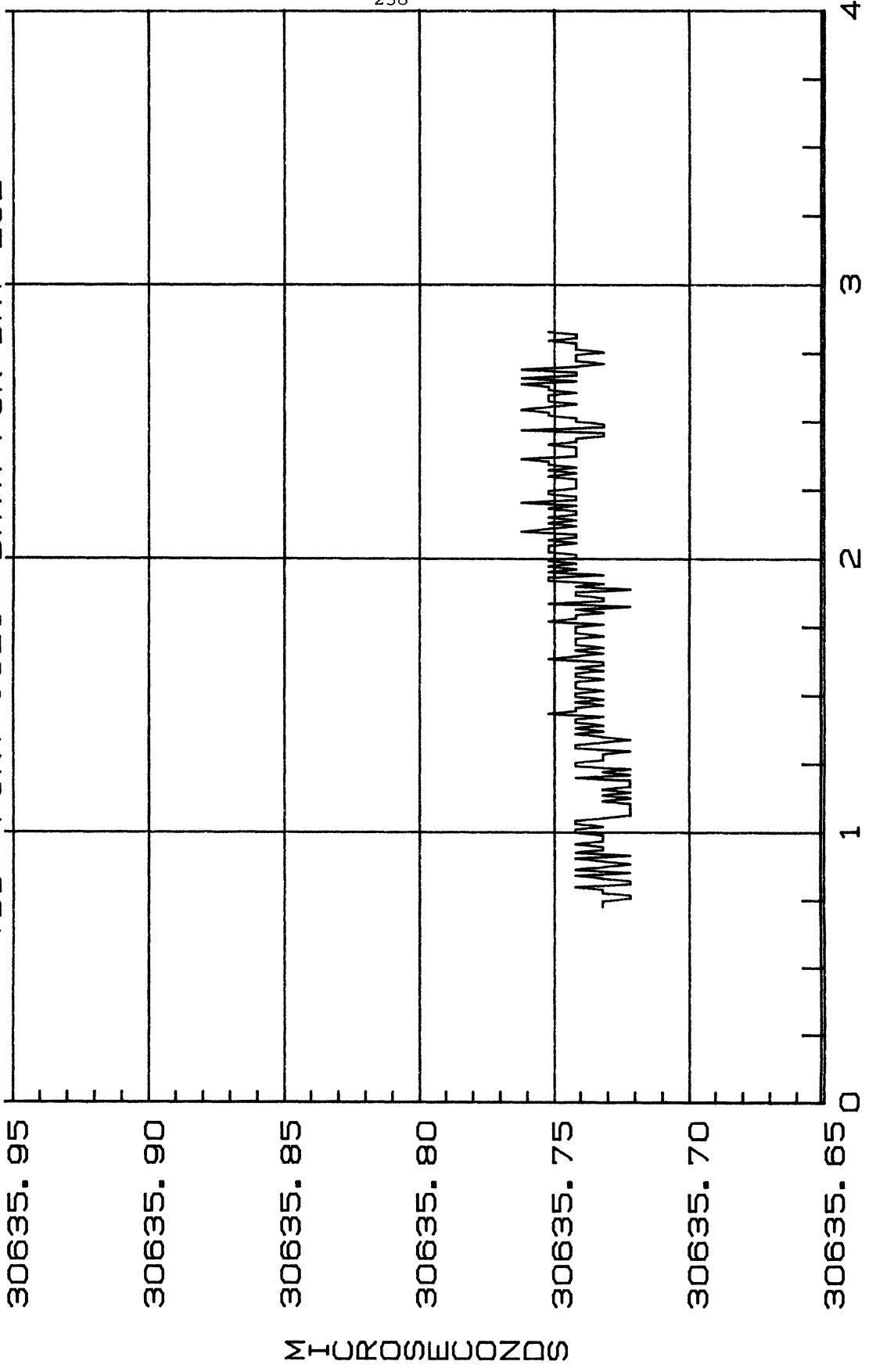
TDB DIFFERENCE PORT JOLI - MONITOR. DAY 225



TDA PORT JOLI DATA FOR DAY 232



TDB PORT JOLI DATA FOR DAY 232



30635.95

30635.90

30635.85

30635.80

30635.75

30635.70

30635.65 0

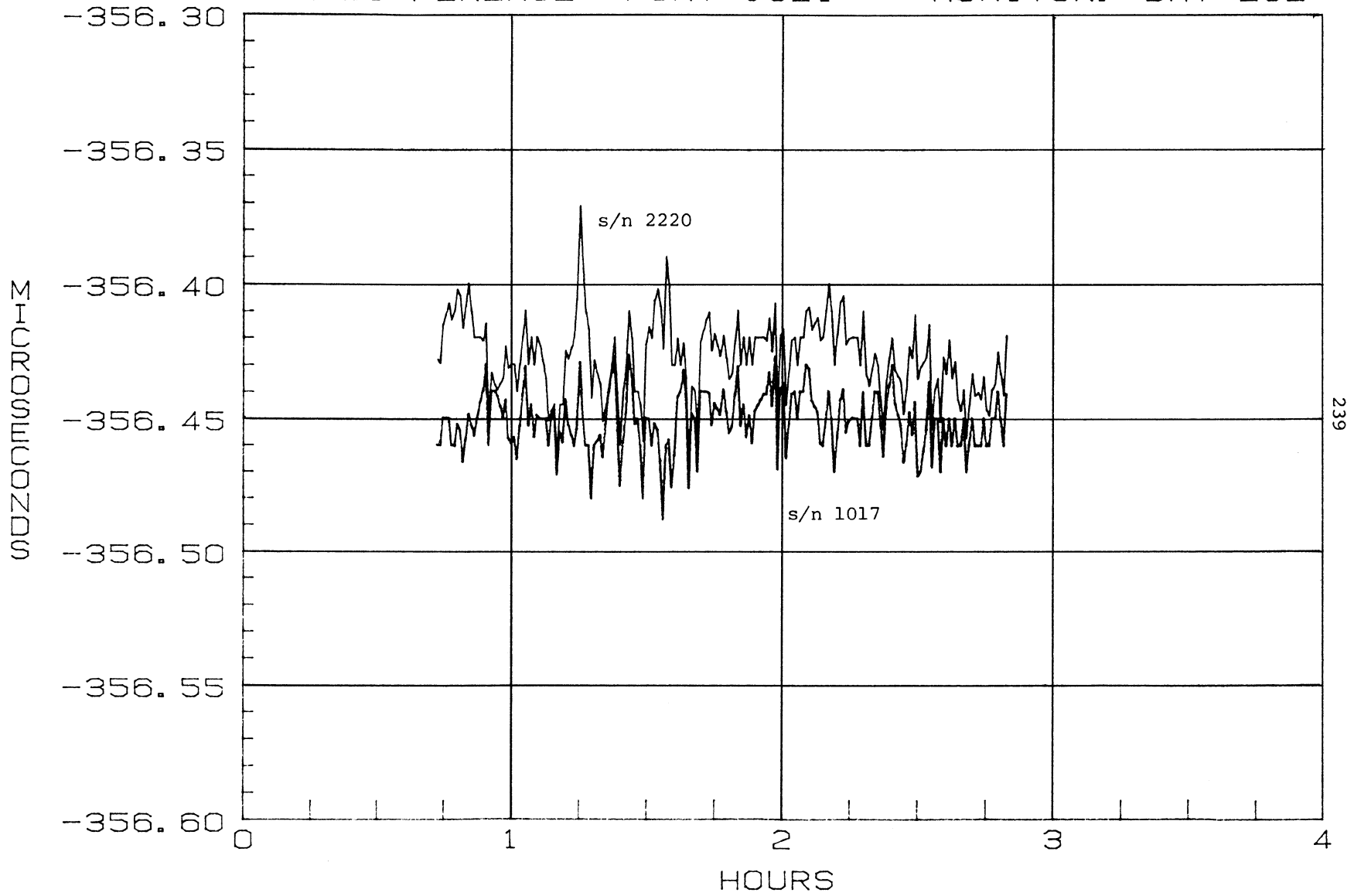
1

2

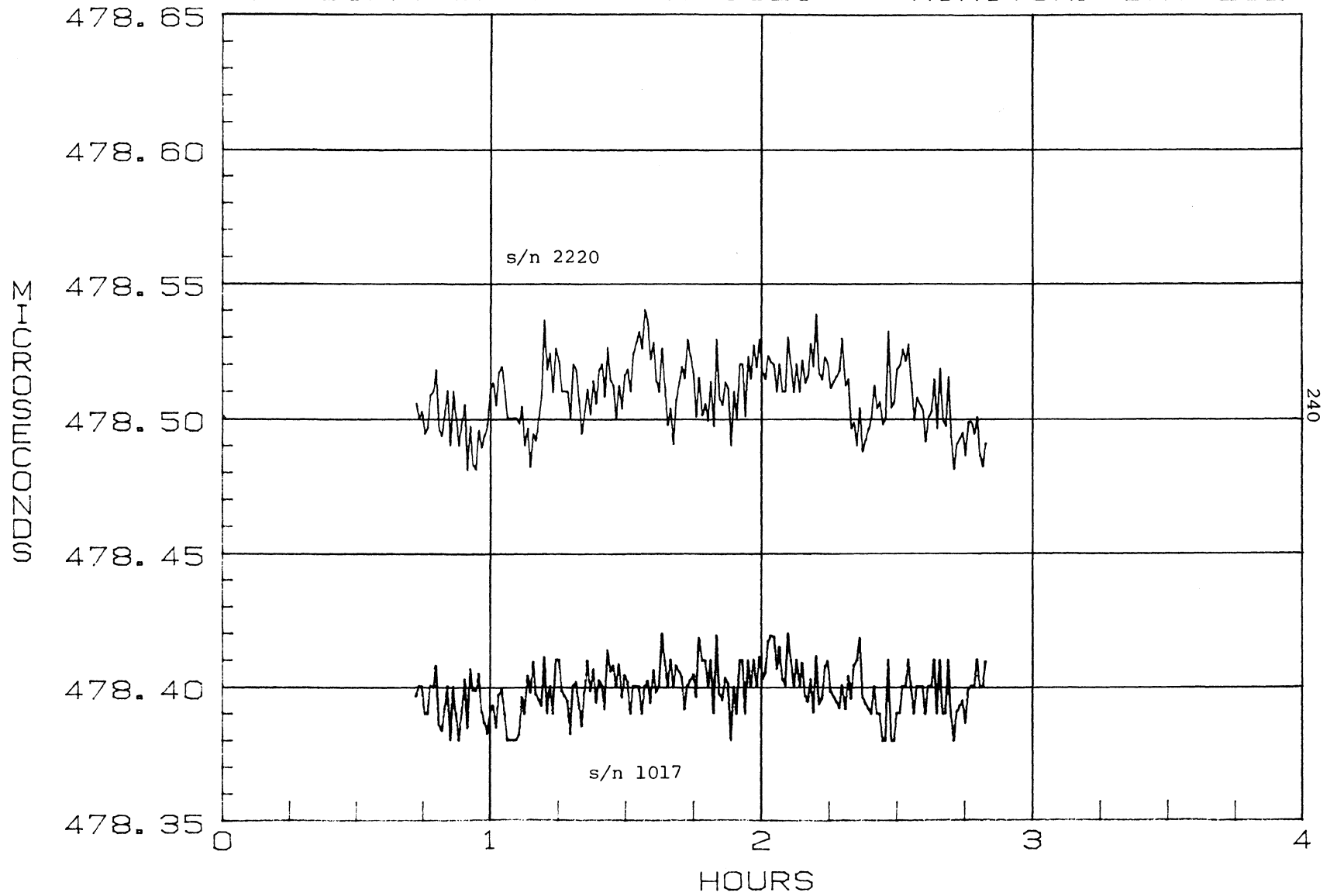
3

4

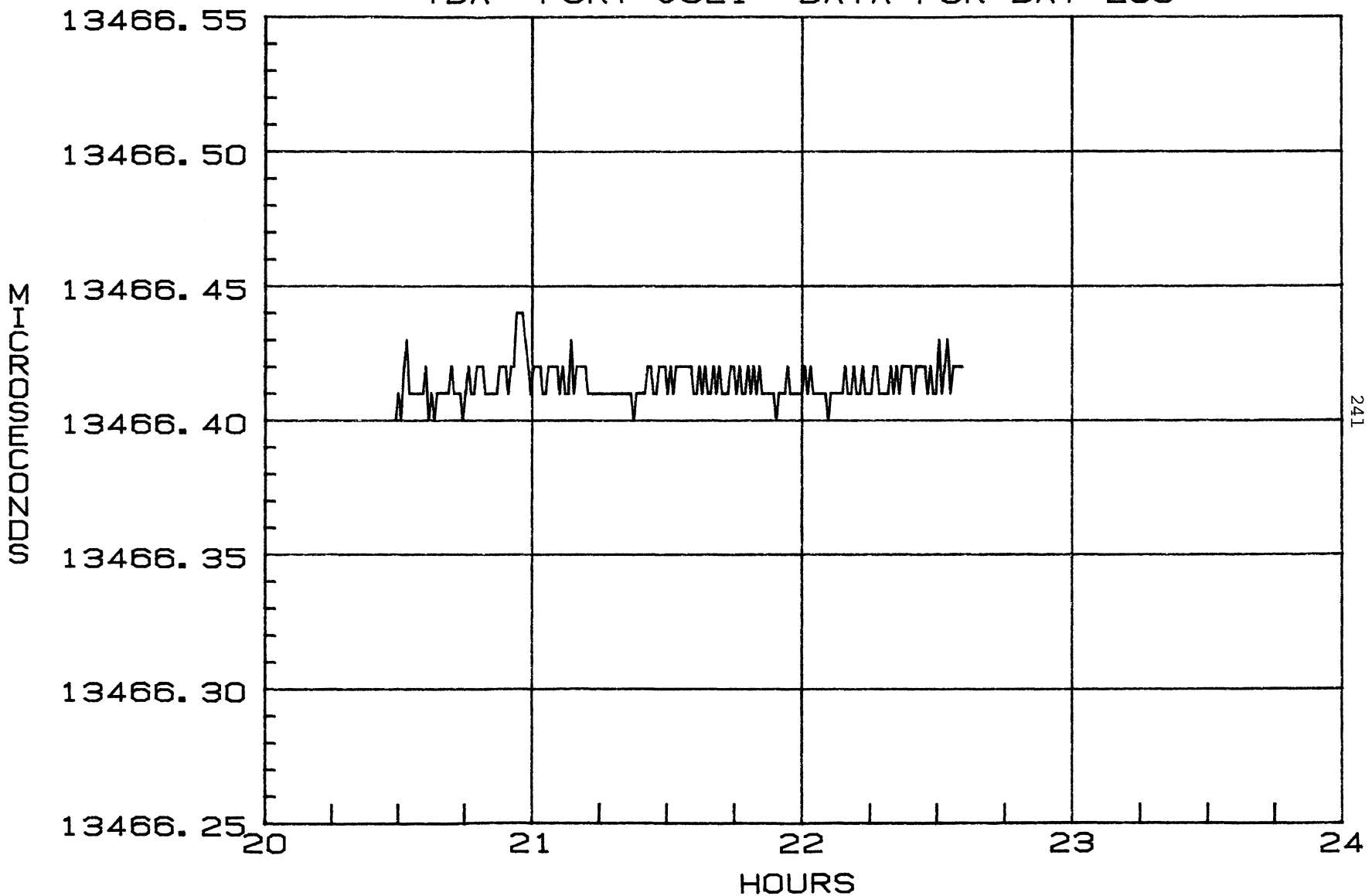
TDA DIFFERENCE PORT JOLI - MONITOR. DAY 232



TDB DIFFERENCE PORT JOLI - MONITOR. DAY 232

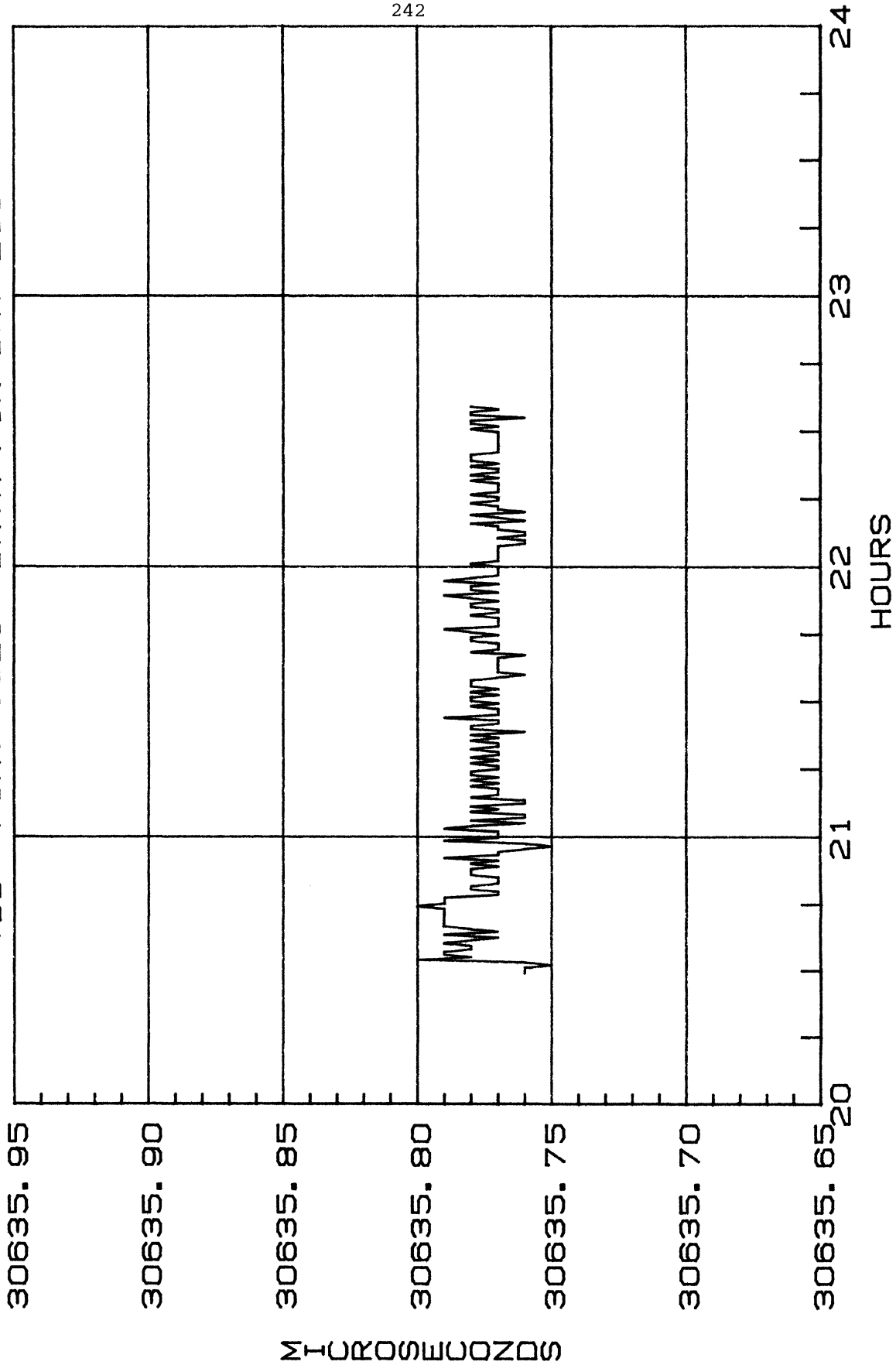


TDA PORT JOLI DATA FOR DAY 238

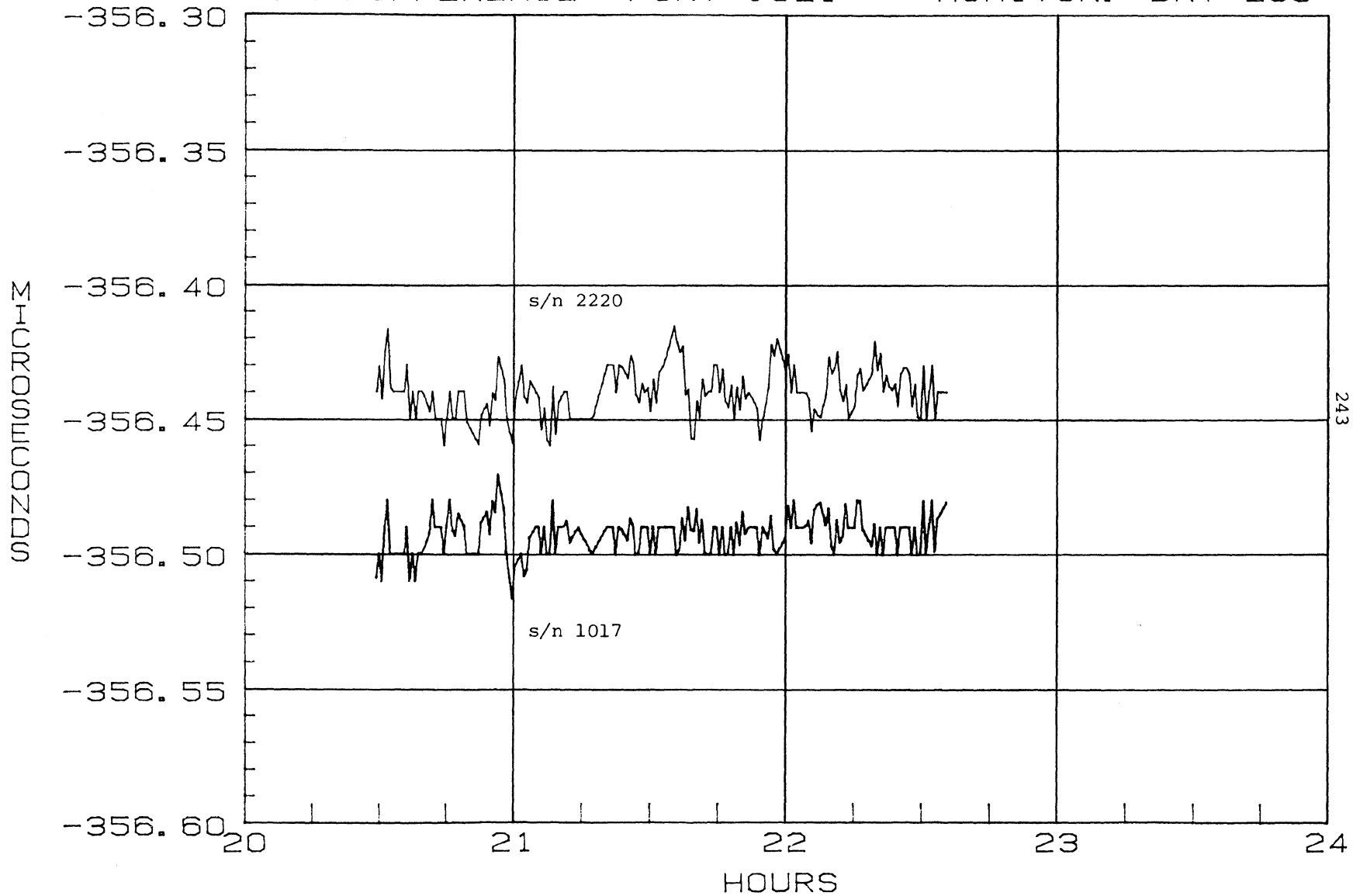


241

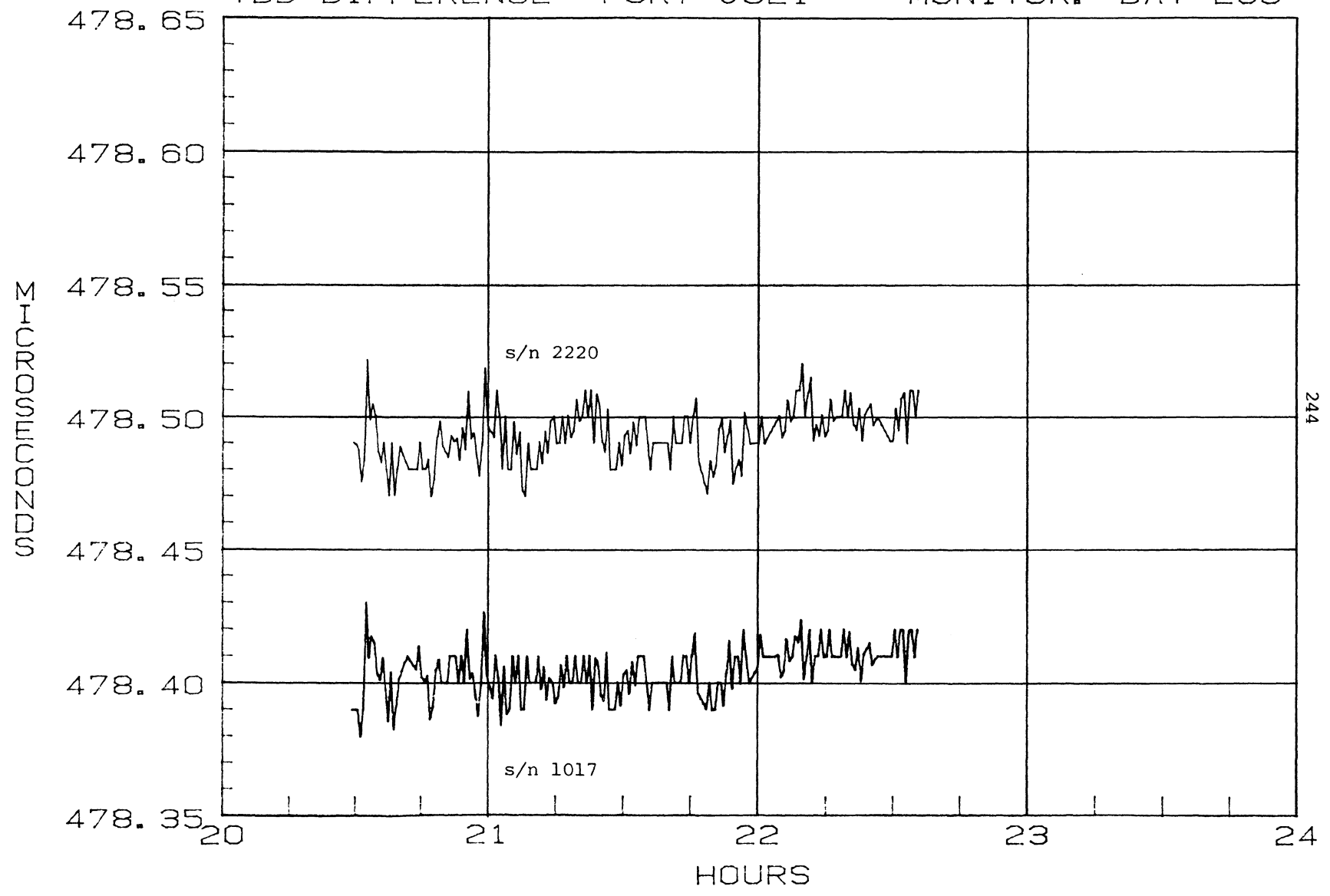
TDB PORT JOLI DATA FOR DAY 238



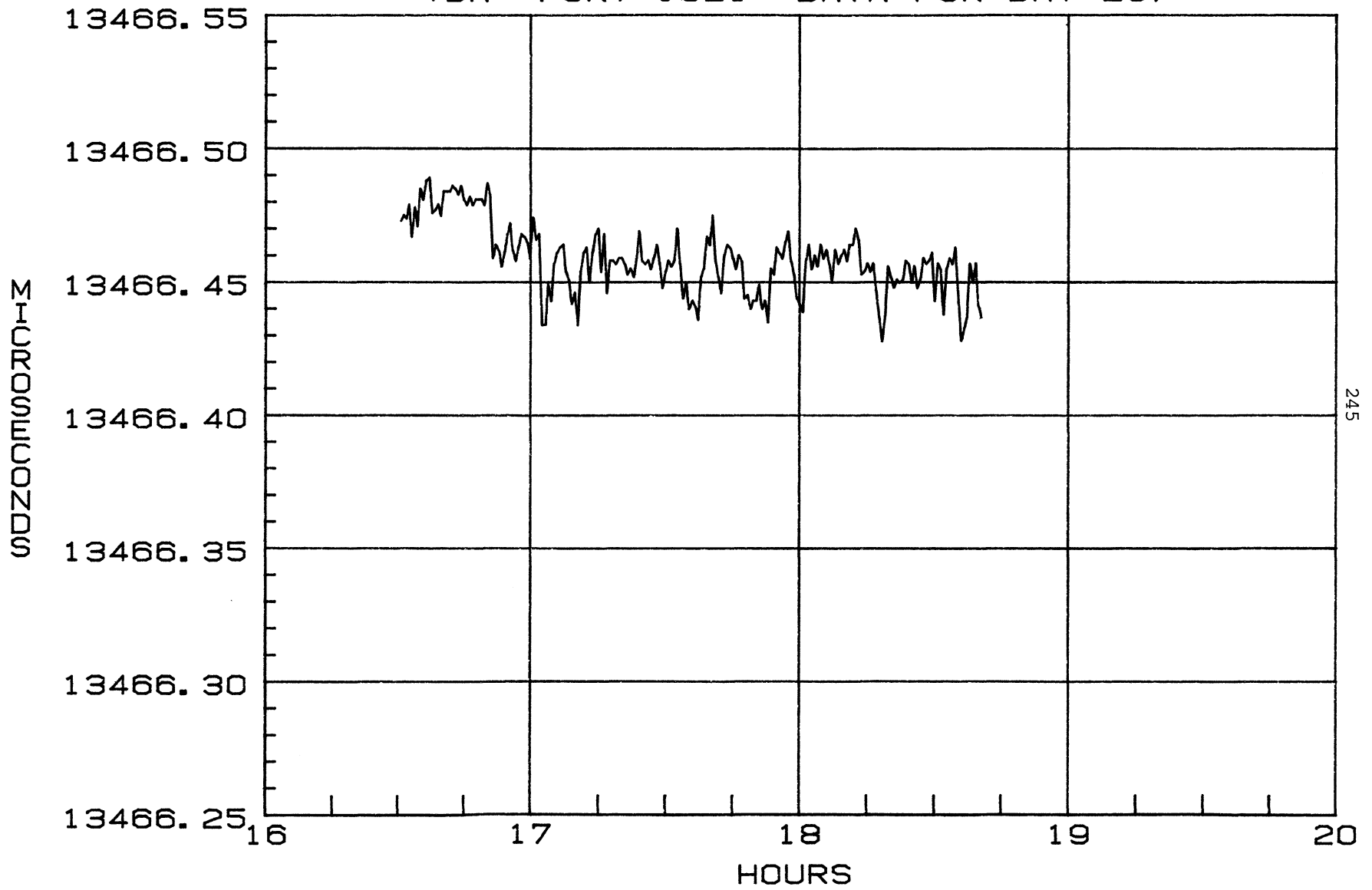
TDA DIFFERENCE PORT JOLI - MONITOR. DAY 238



TDB DIFFERENCE PORT JOLI - MONITOR. DAY 238

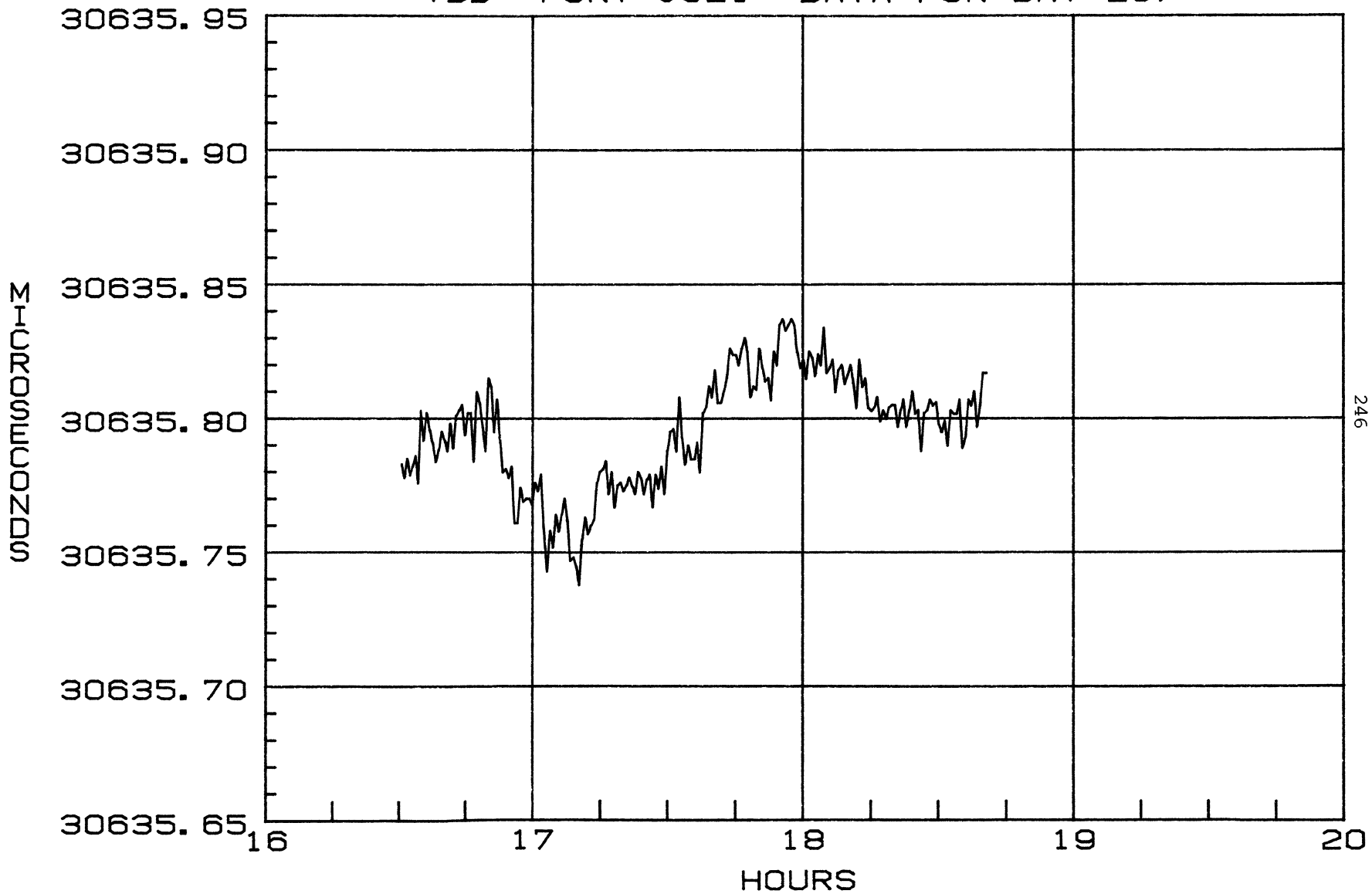


TDA PORT JOLI DATA FOR DAY 267

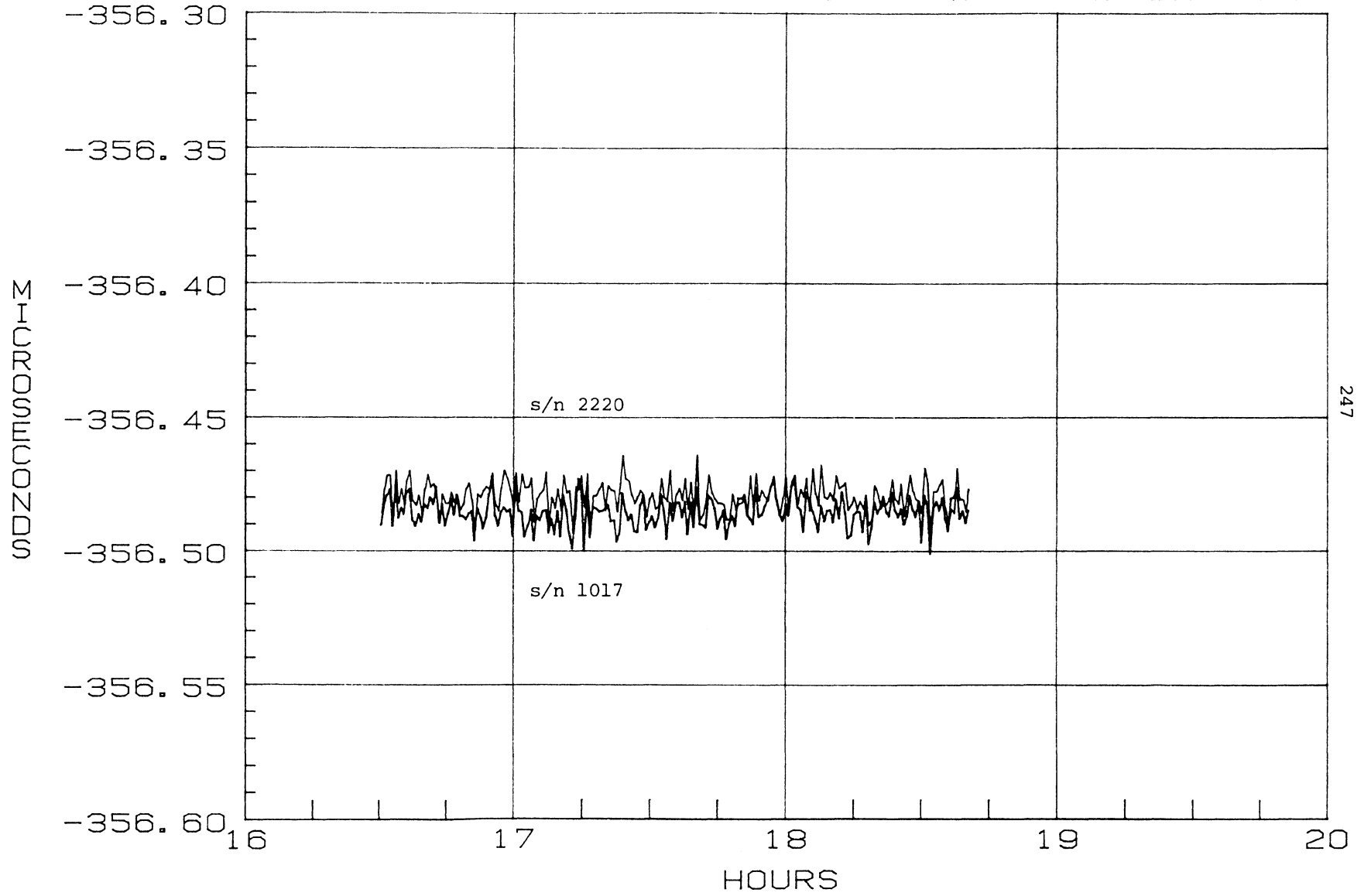


245

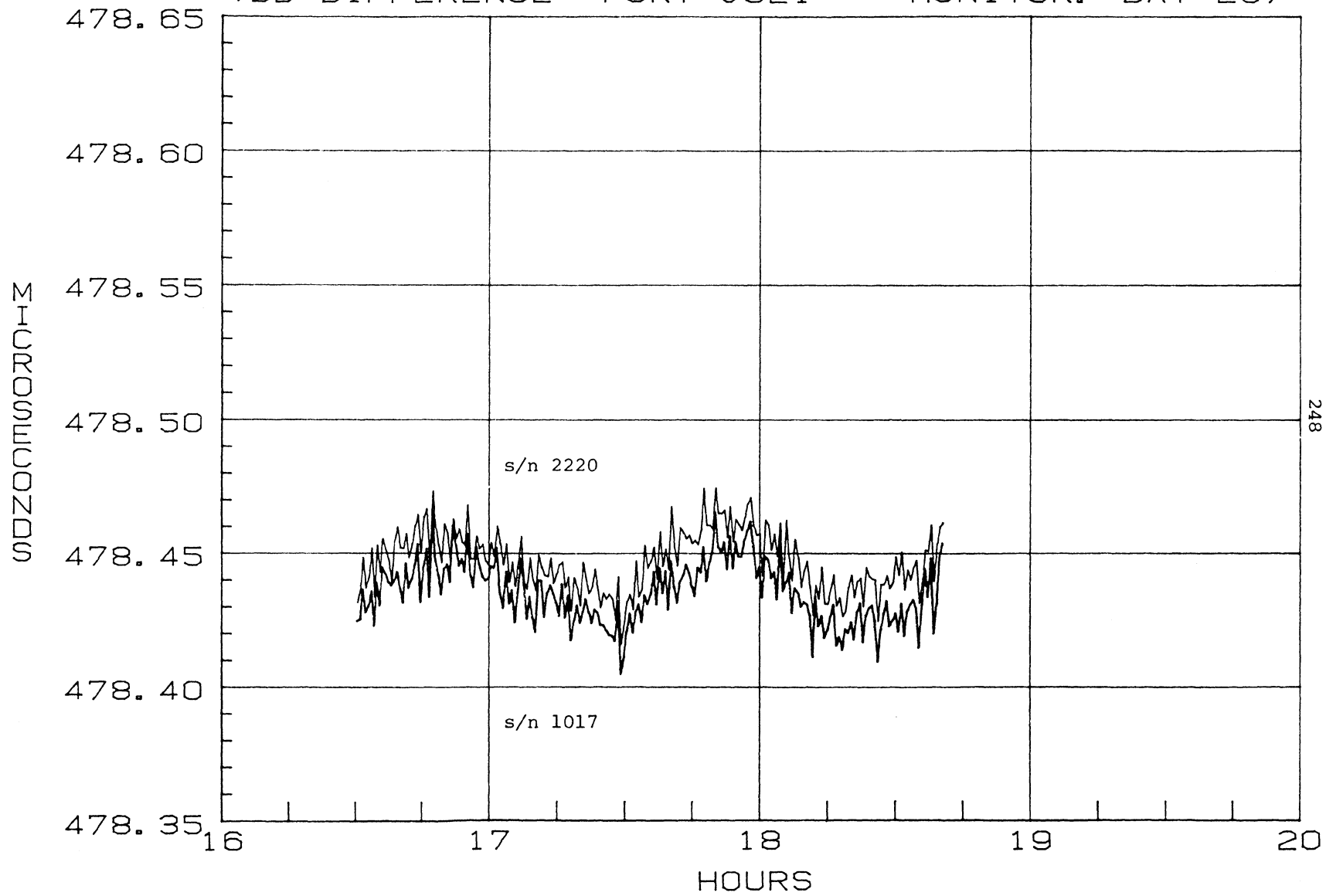
TDB PORT JOLI DATA FOR DAY 267



TDA DIFFERENCE PORT JOLI - MONITOR. DAY 267



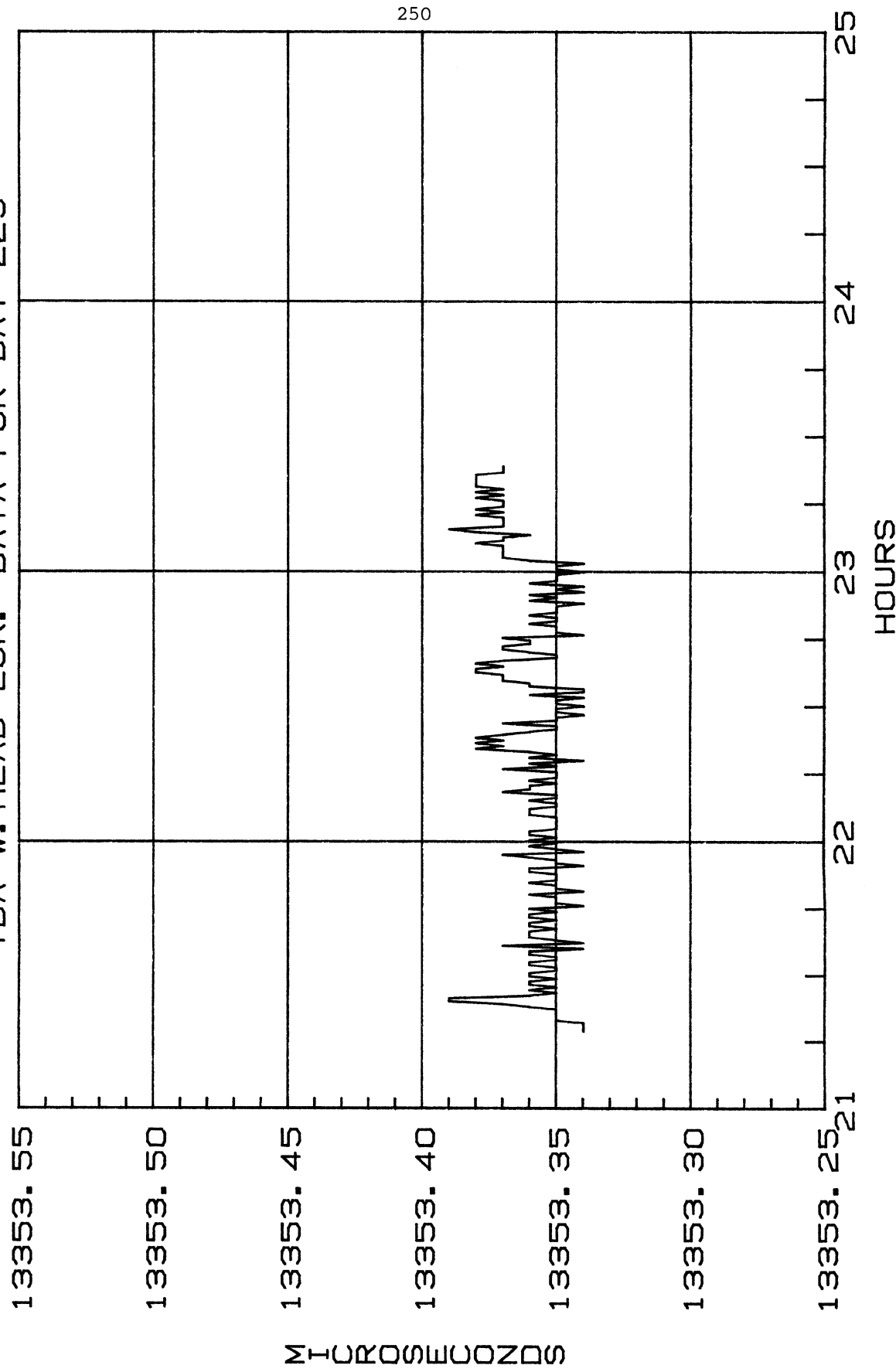
TDB DIFFERENCE PORT JOLI - MONITOR. DAY 267



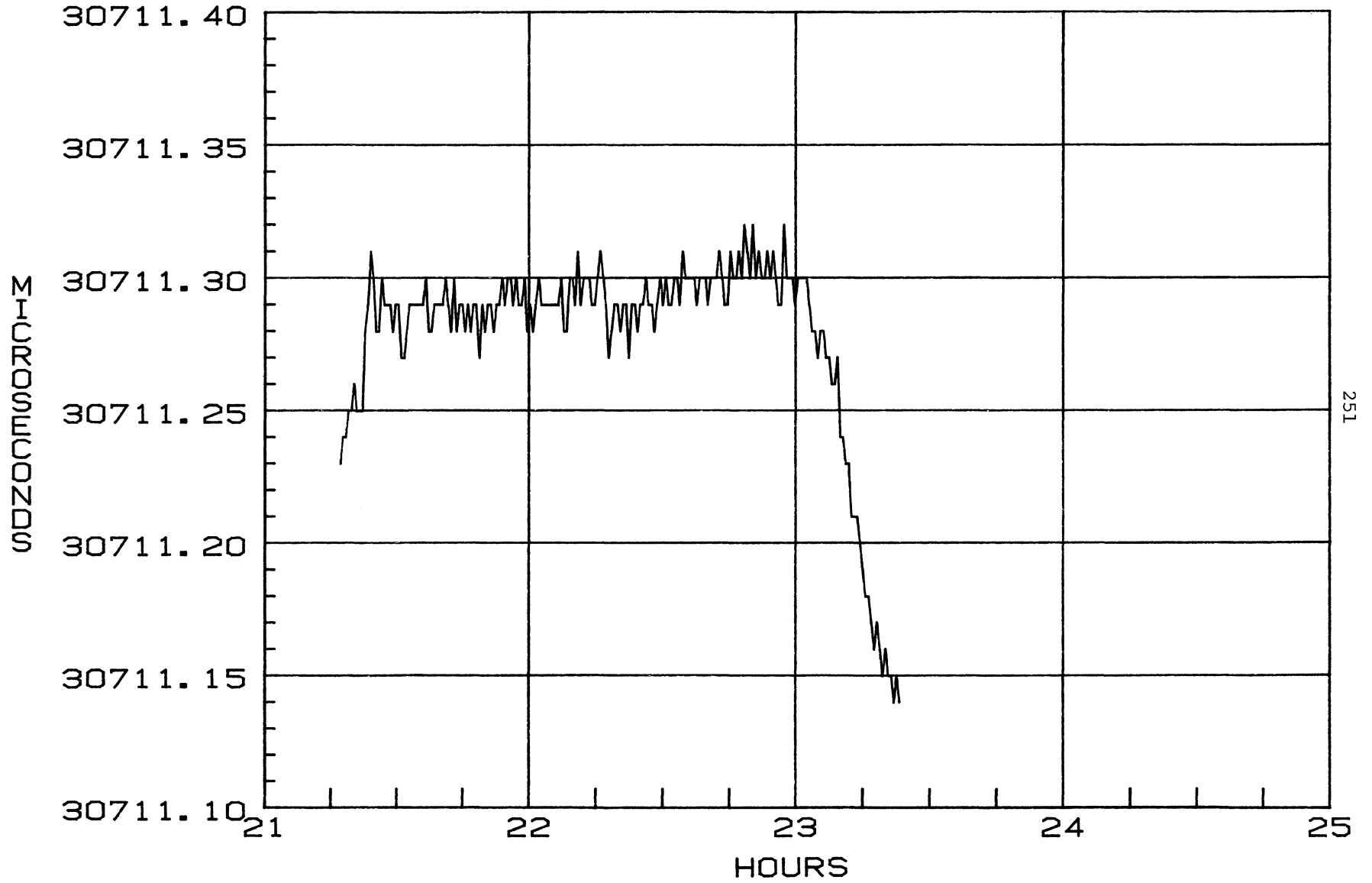
APPENDIX VI.9

WESTERN HEAD LOCKPORT

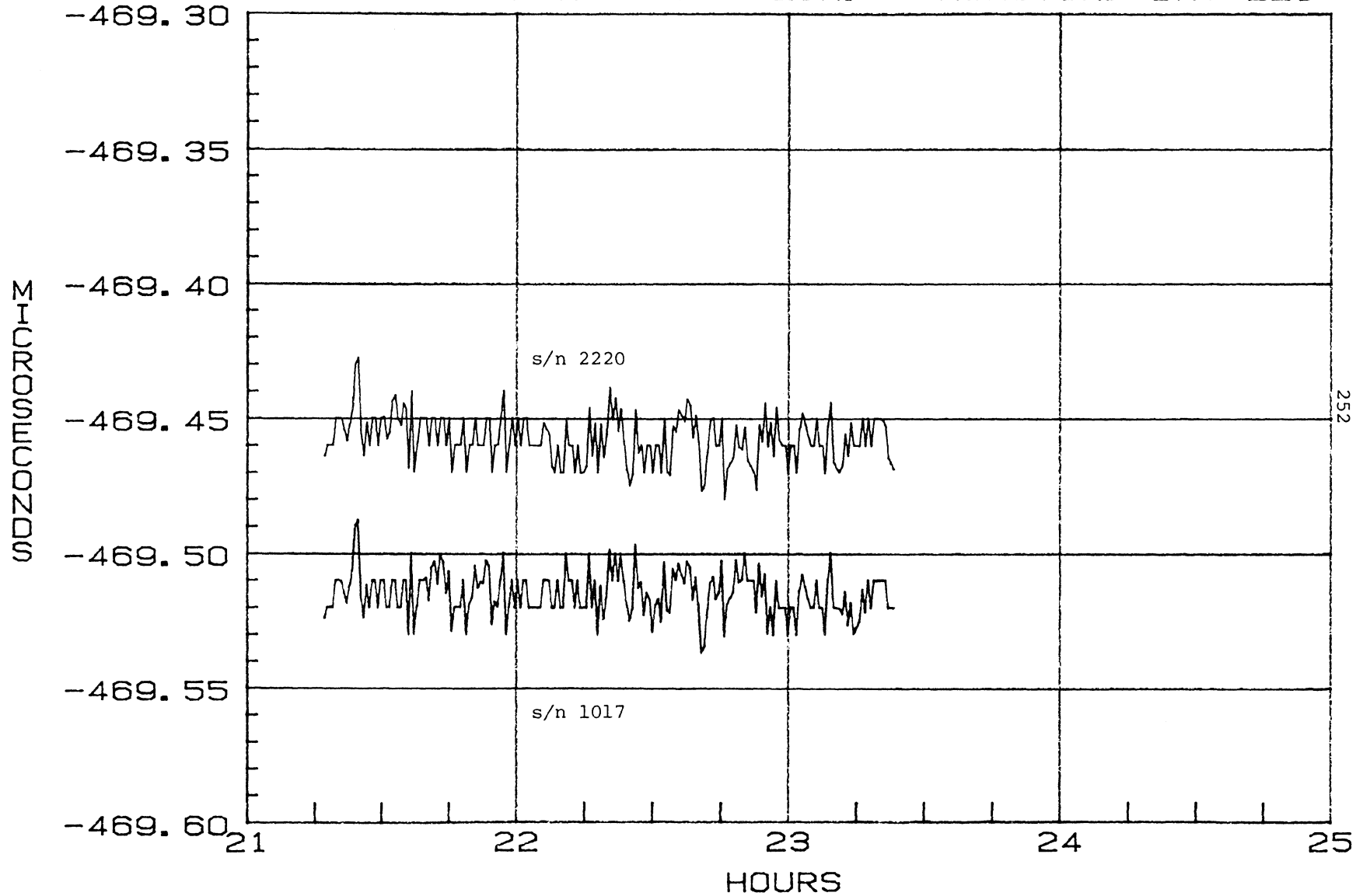
TDA W. HEAD LOK. DATA FOR DAY 225



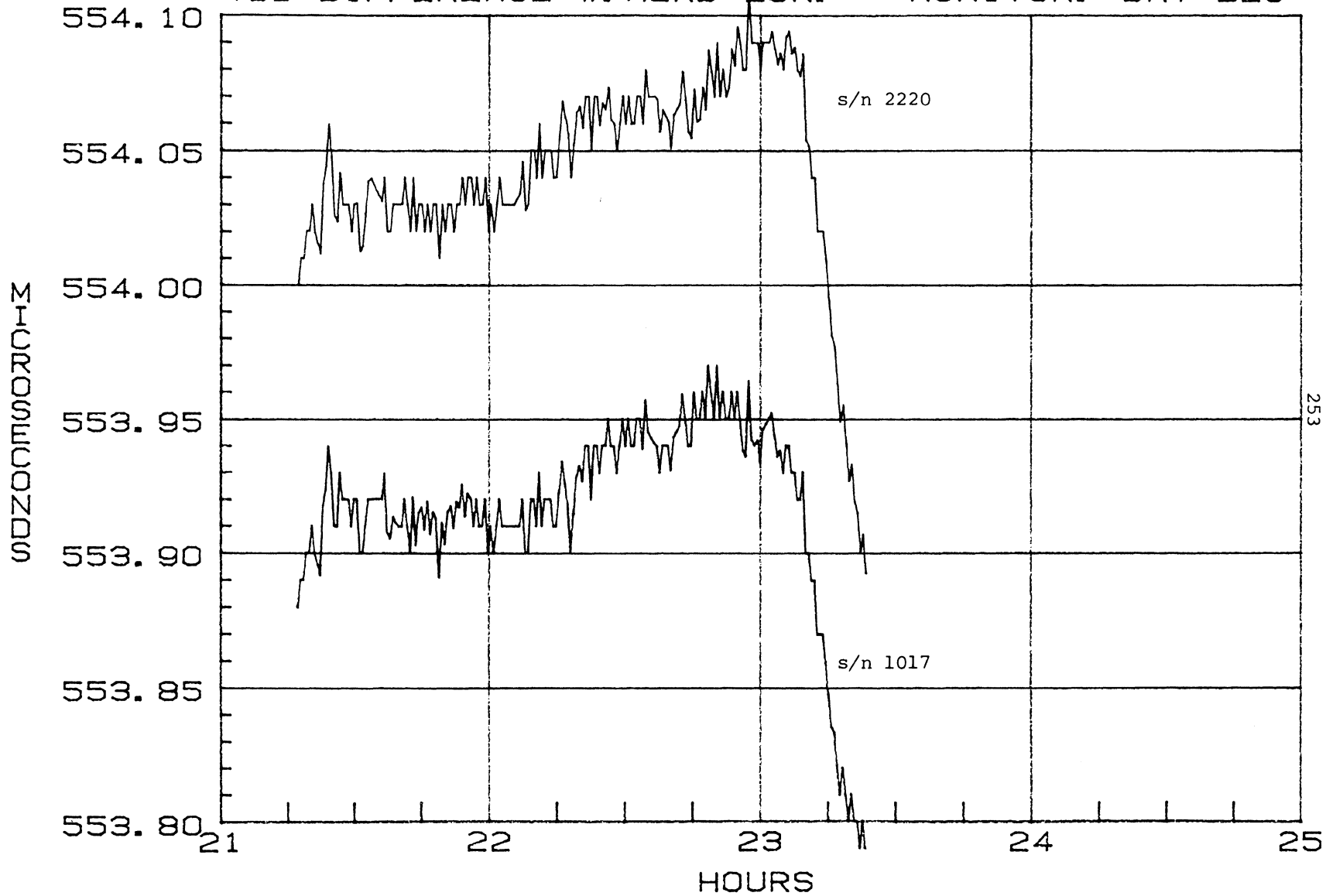
TDB W. HEAD LOK. DATA FOR DAY 225



TDA DIFFERENCE W. HEAD LOK. - MONITOR. DAY 225

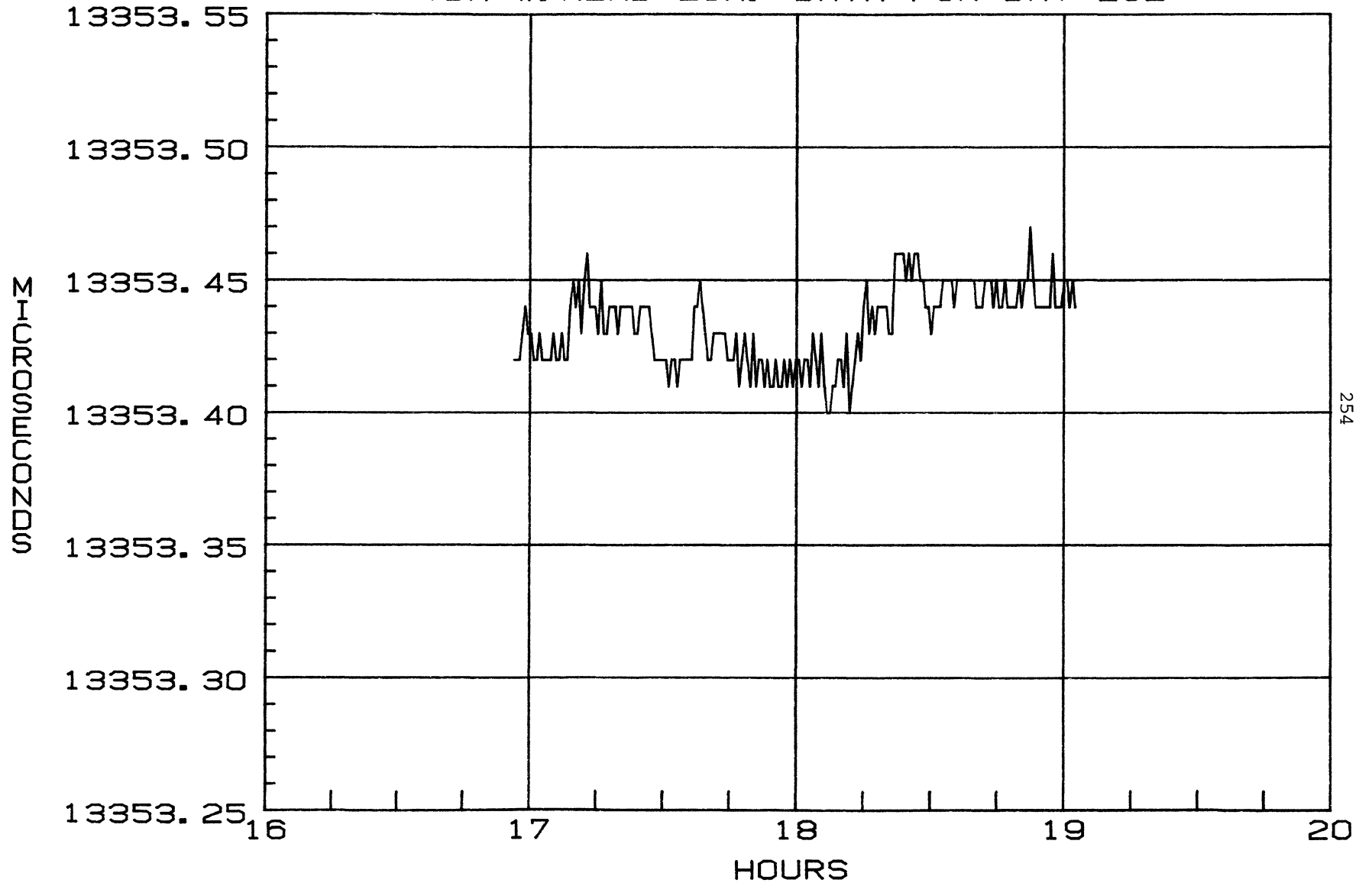


TDB DIFFERENCE W. HEAD LOK. - MONITOR. DAY 225

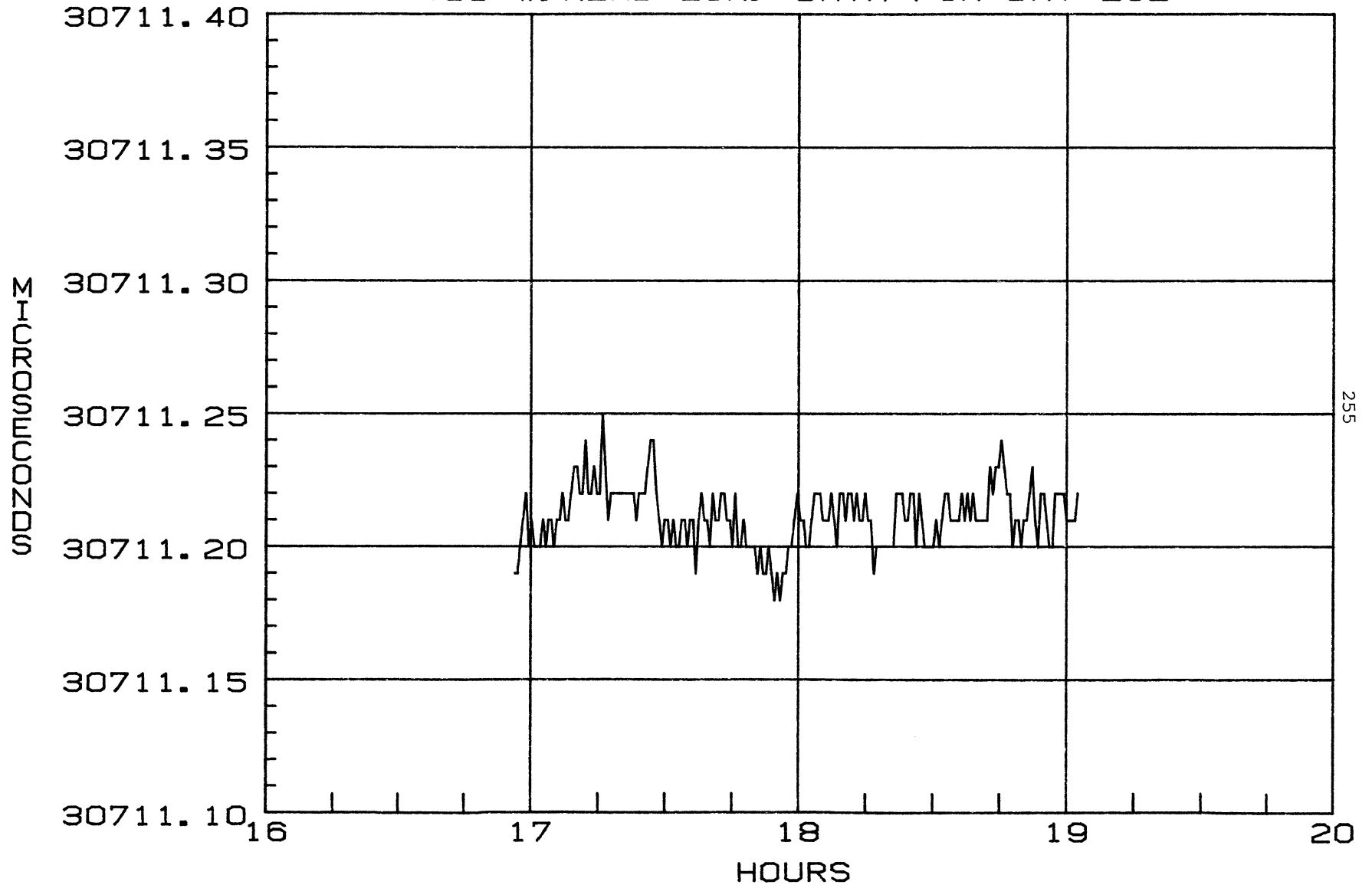


253

TDA W. HEAD LOK. DATA FOR DAY 232

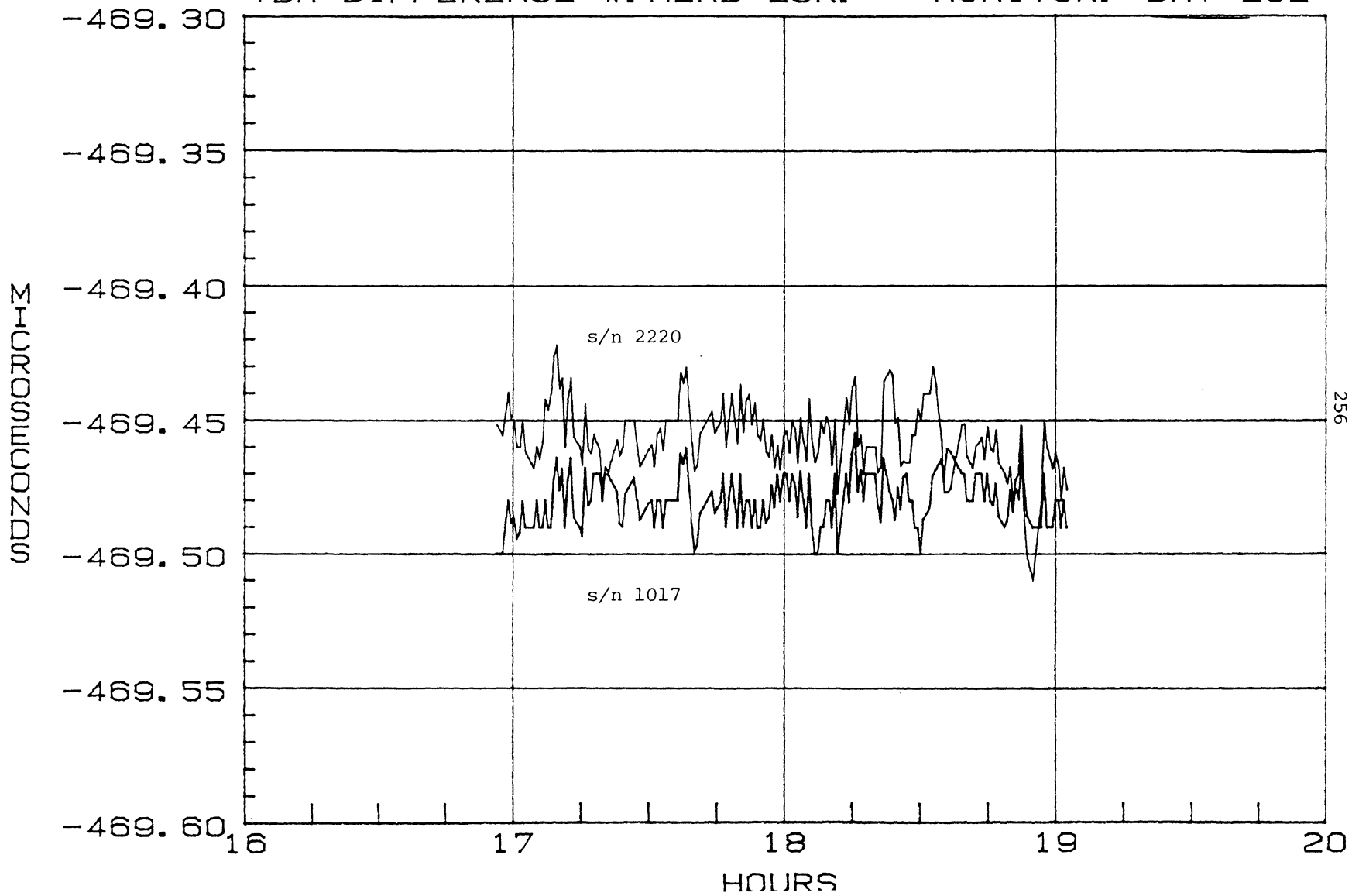


TDB W. HEAD LOK. DATA FOR DAY 232

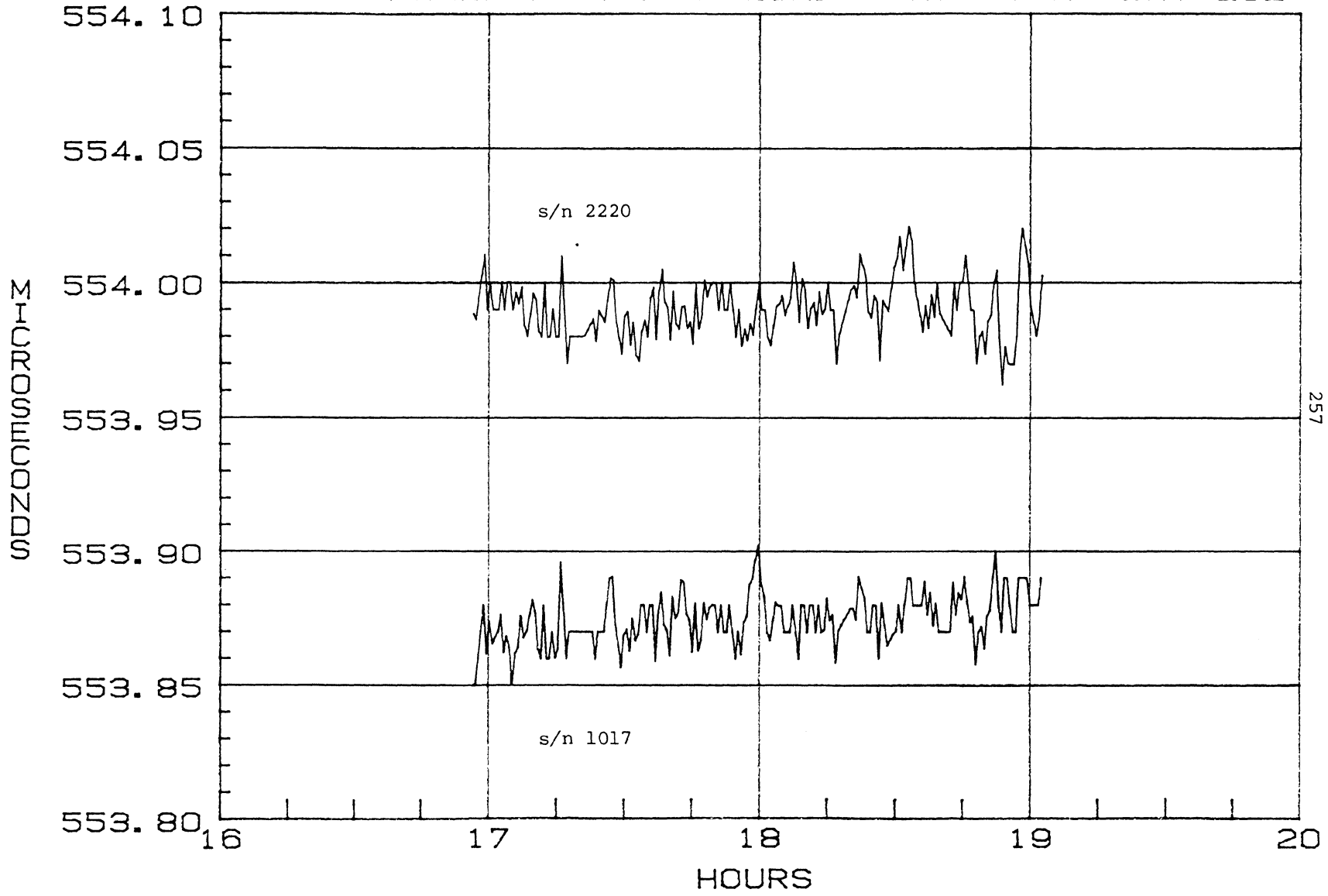


255

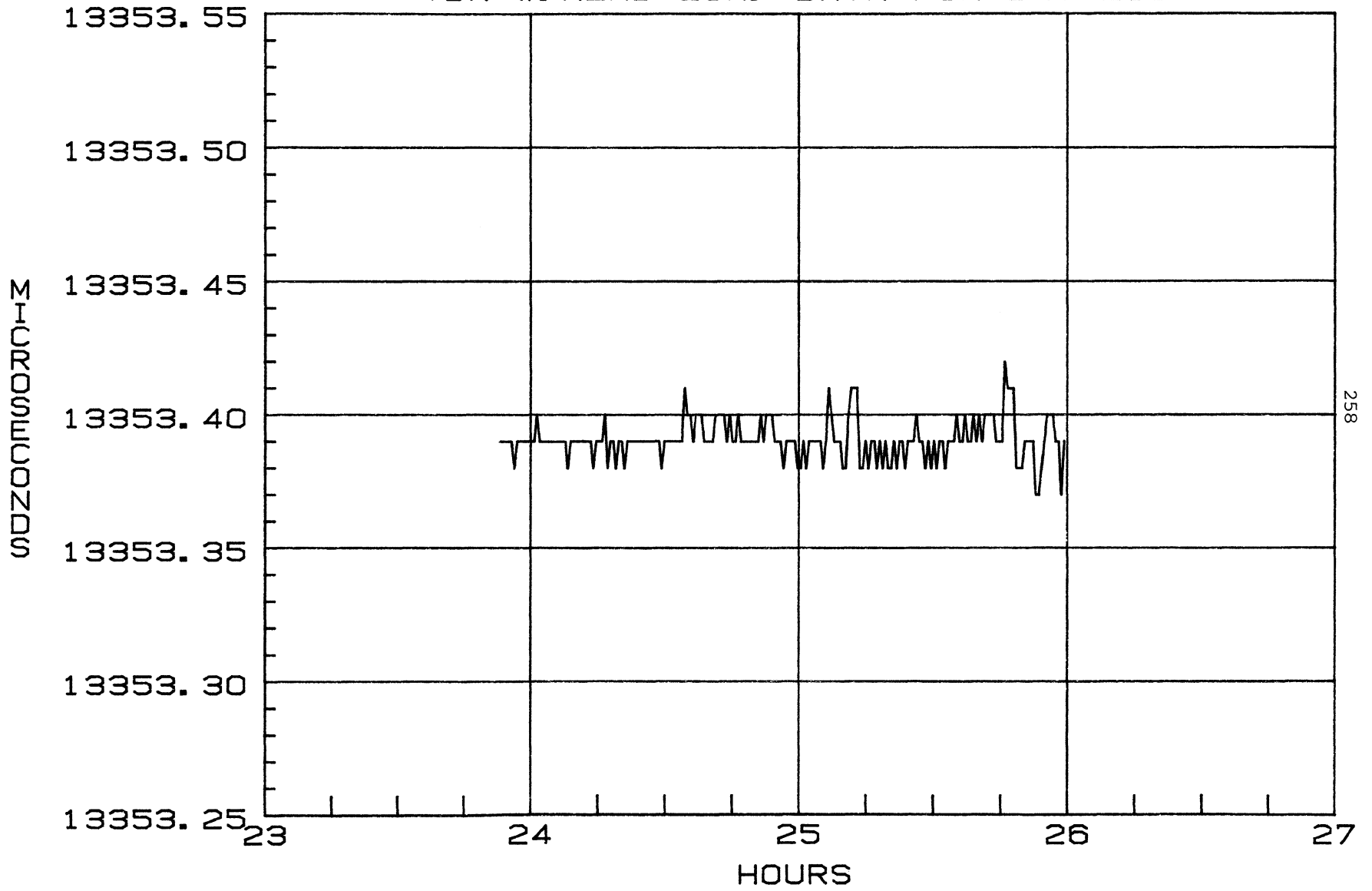
TDA DIFFERENCE W. HEAD LOK. - MONITOR. DAY 232



TDB DIFFERENCE W. HEAD LOK. - MONITOR. DAY 232

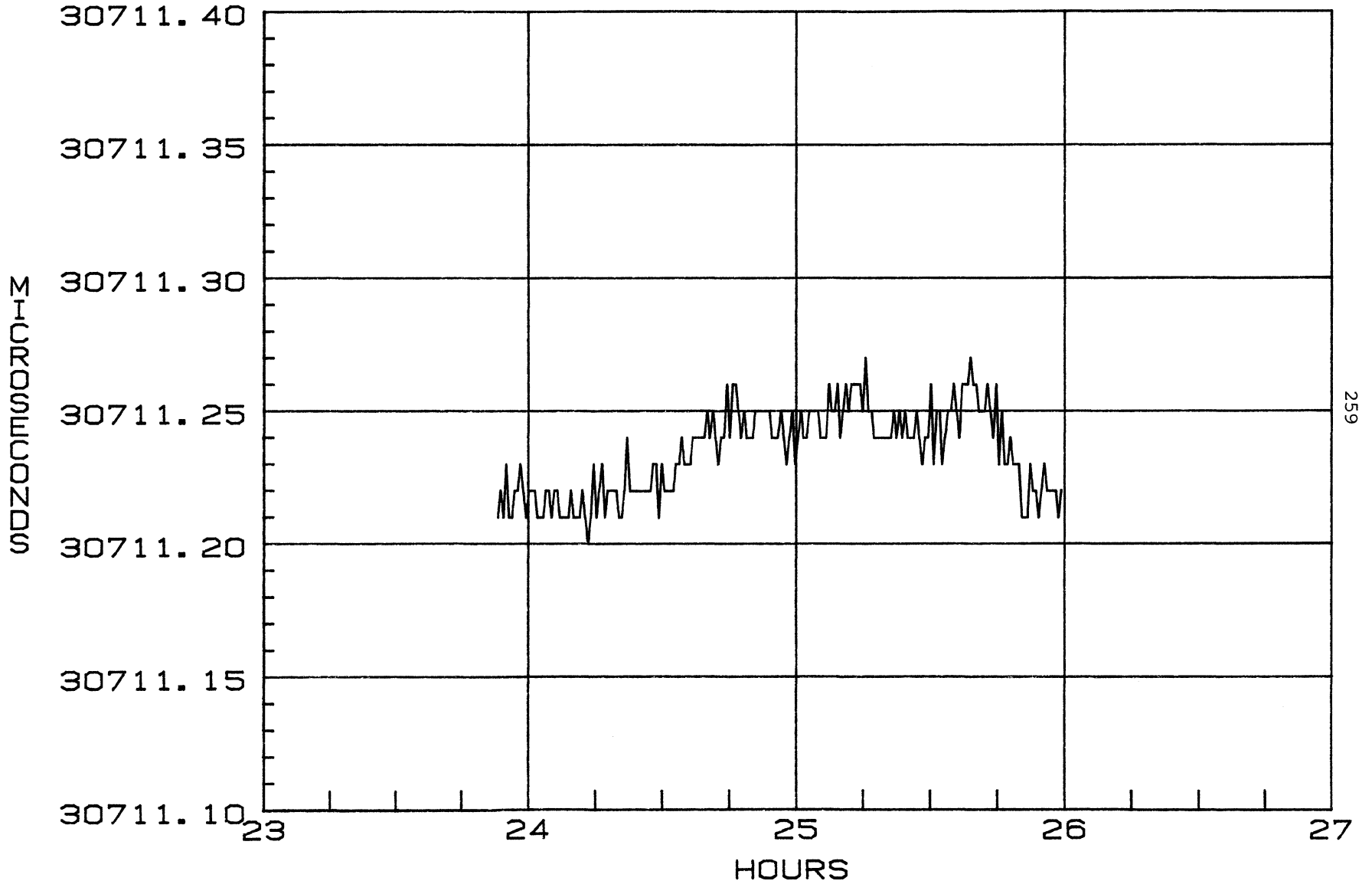


TDA W. HEAD LOK. DATA FOR DAY 238

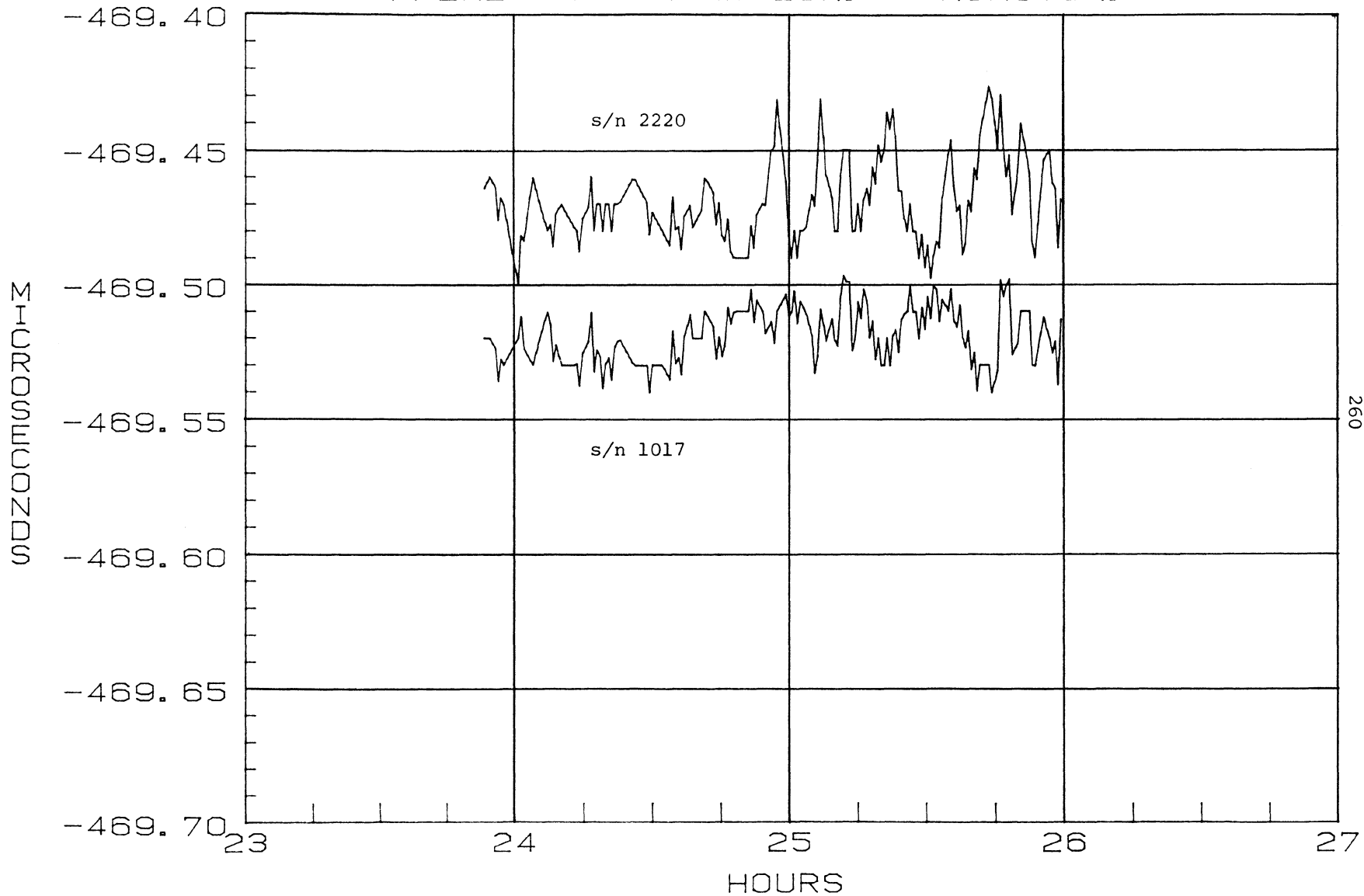


258

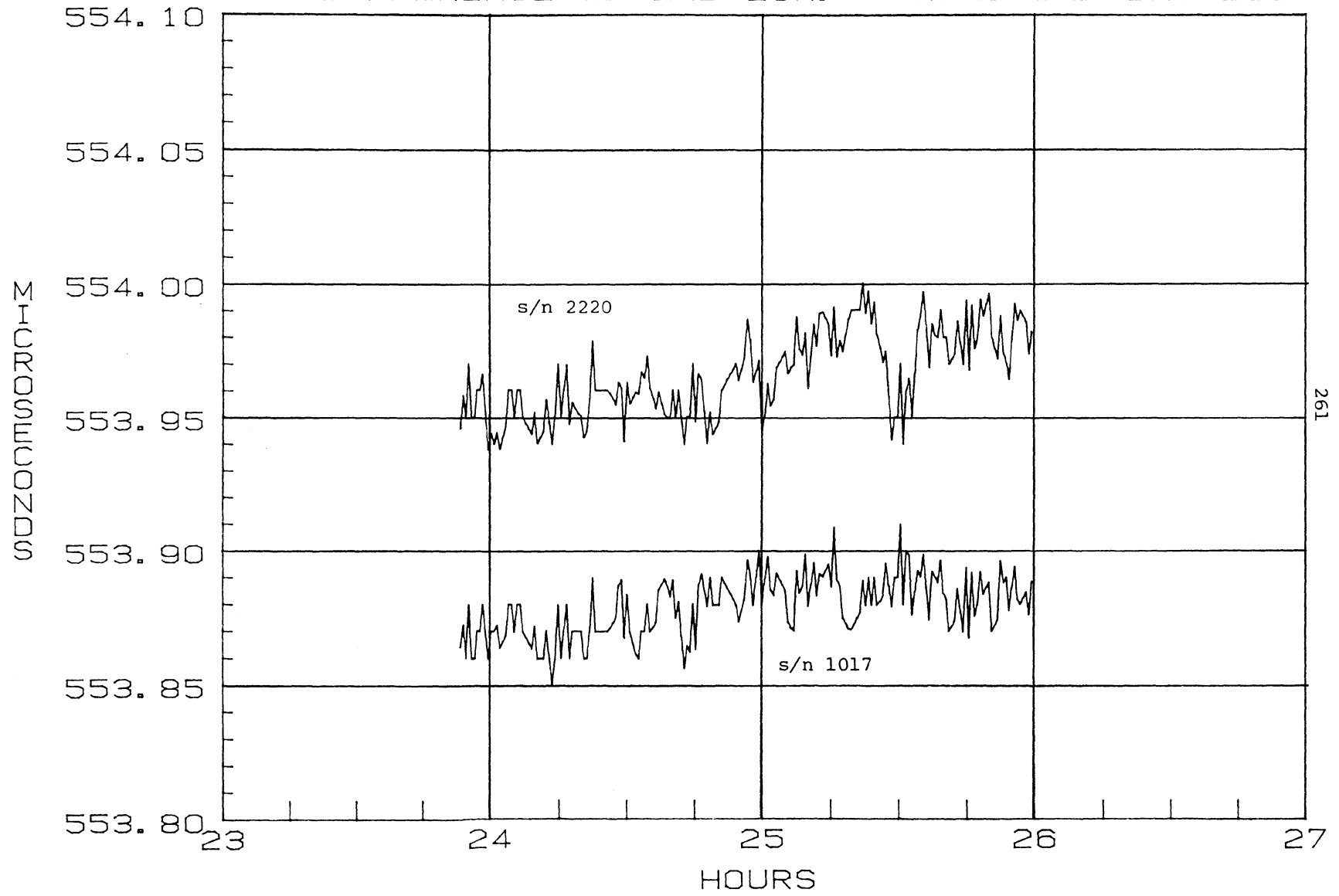
TDB W. HEAD LOK. DATA FOR DAY 238



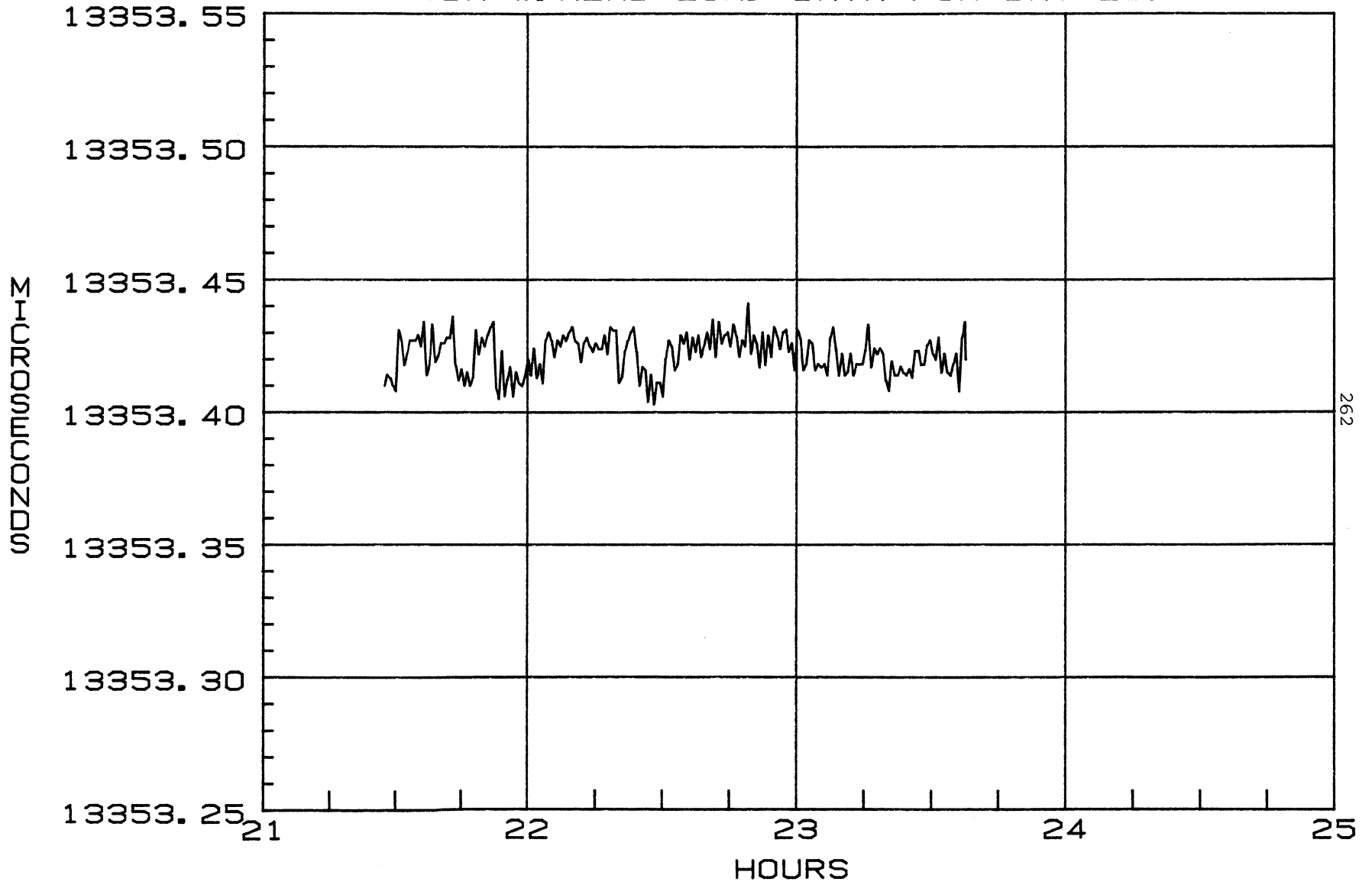
TDA DIFFERENCE W. HEAD LOK. - MONITOR. DAY 238



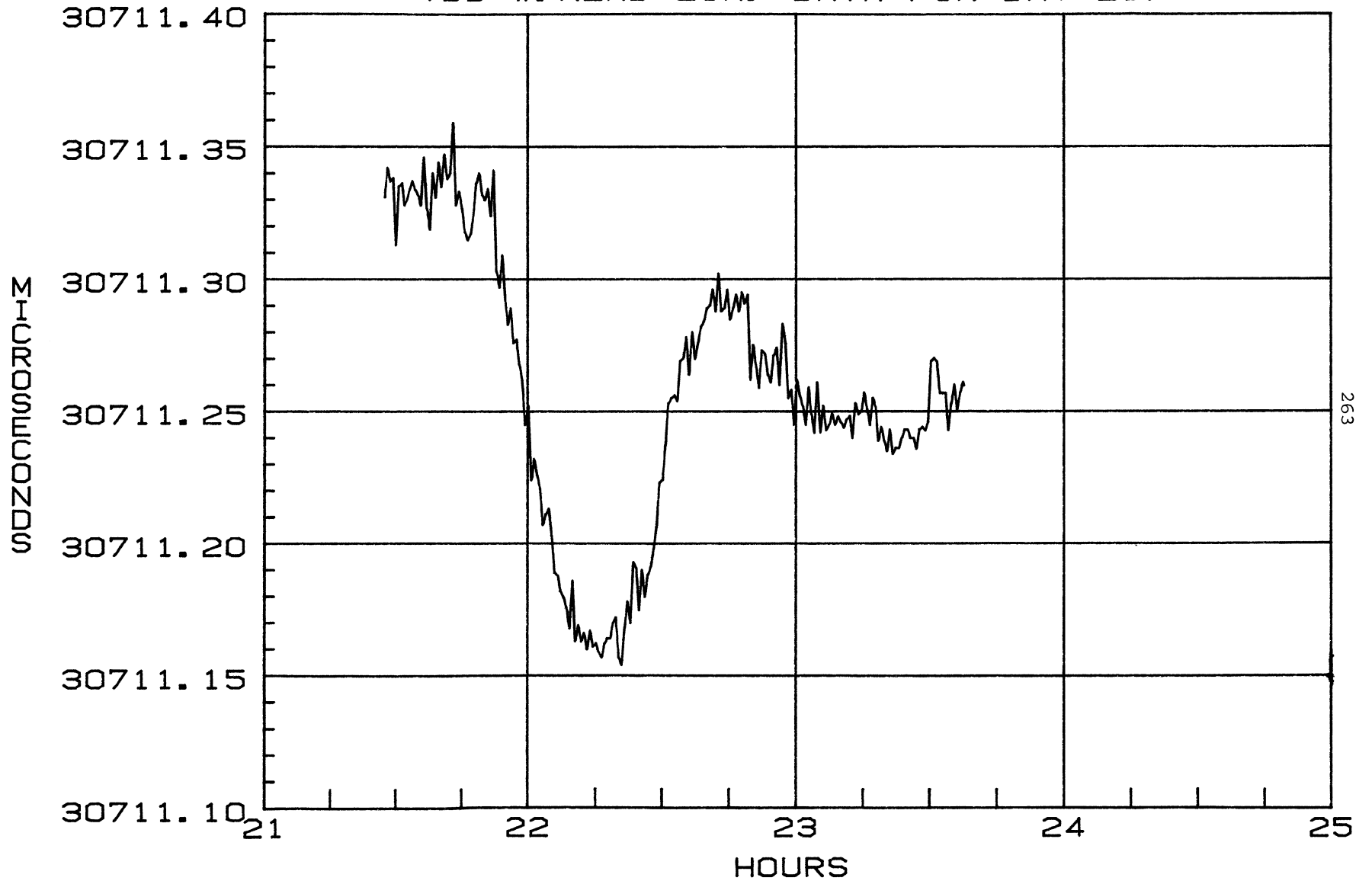
TDB DIFFERENCE W. HEAD LOK. - MONITOR. DAY 238



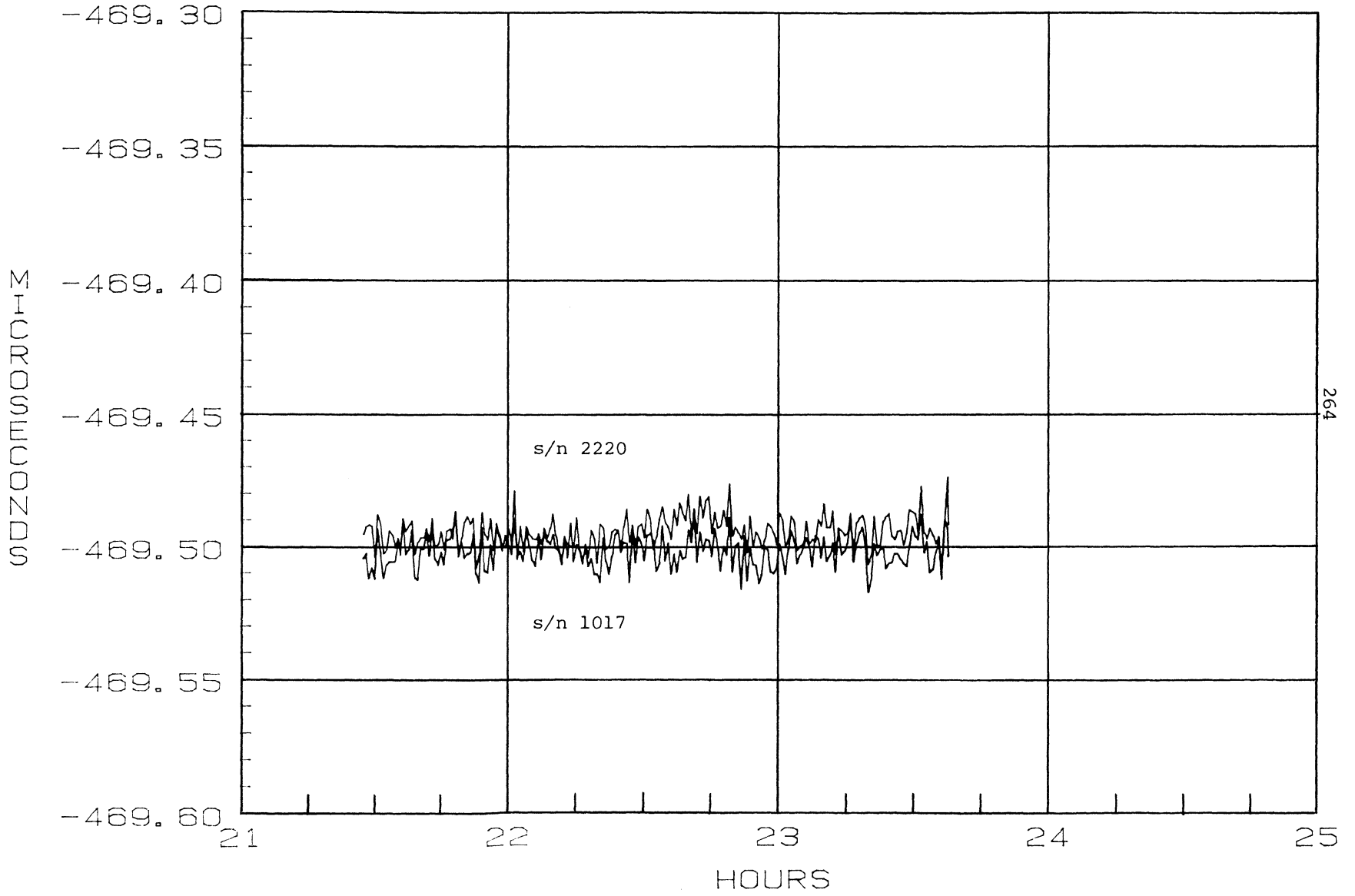
TDA W. HEAD LOK. DATA FOR DAY 267



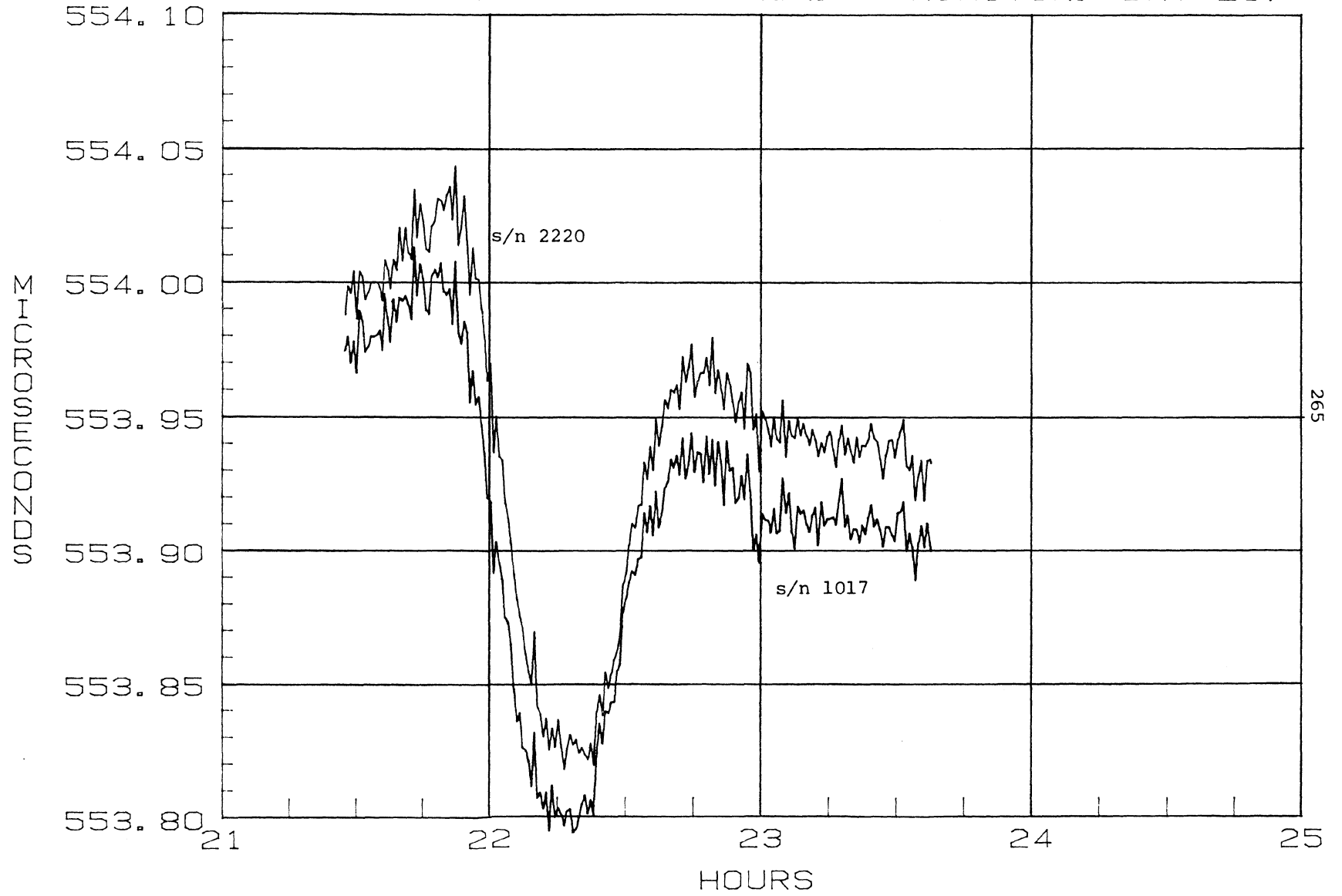
TDB W. HEAD LOK. DATA FOR DAY 267



TDA DIFFERENCE W. HEAD LOK. - MONITOR. DAY 267



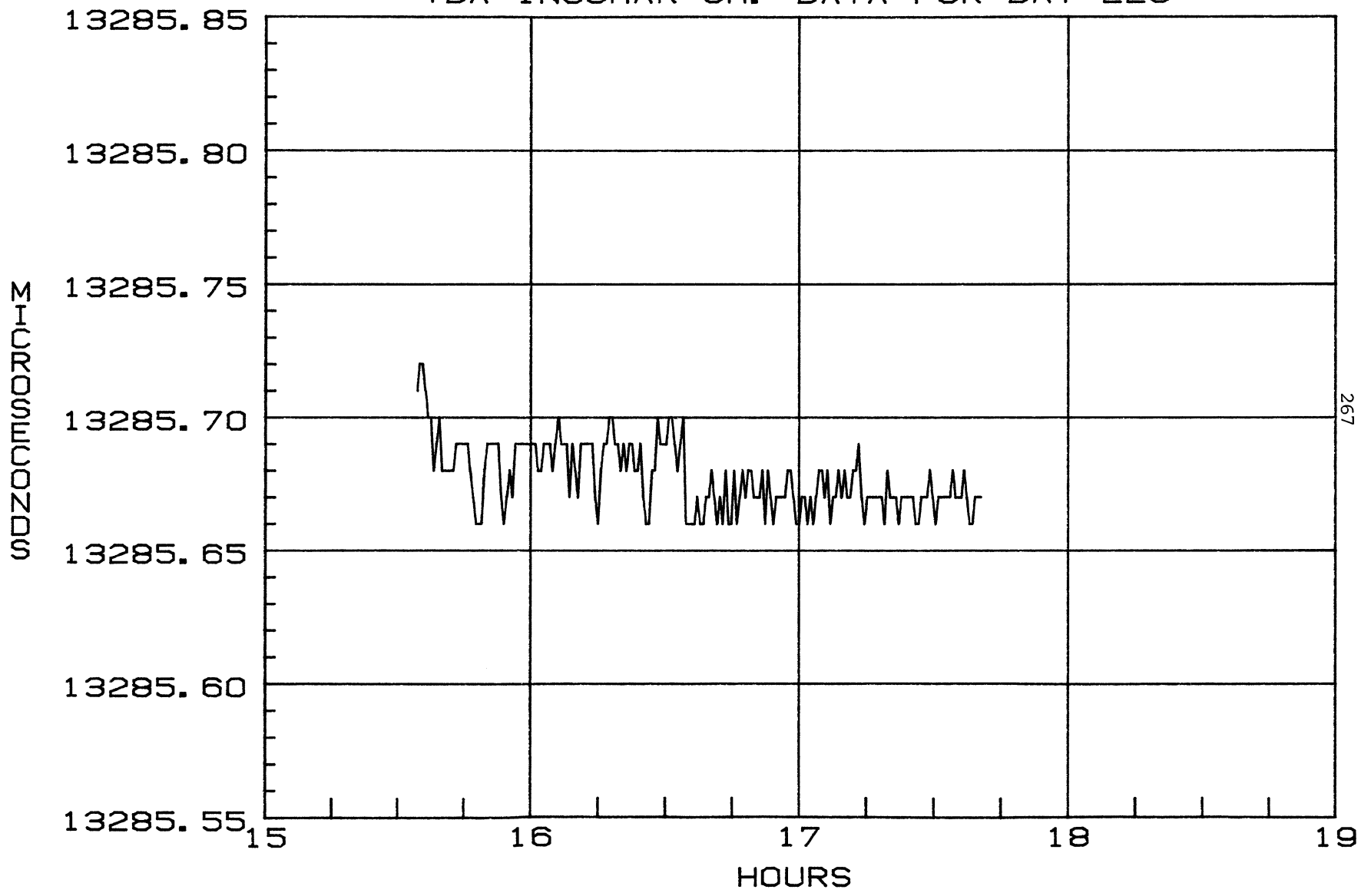
TDB DIFFERENCE W. HEAD LOK. - MONITOR. DAY 267



APPENDIX VI.10

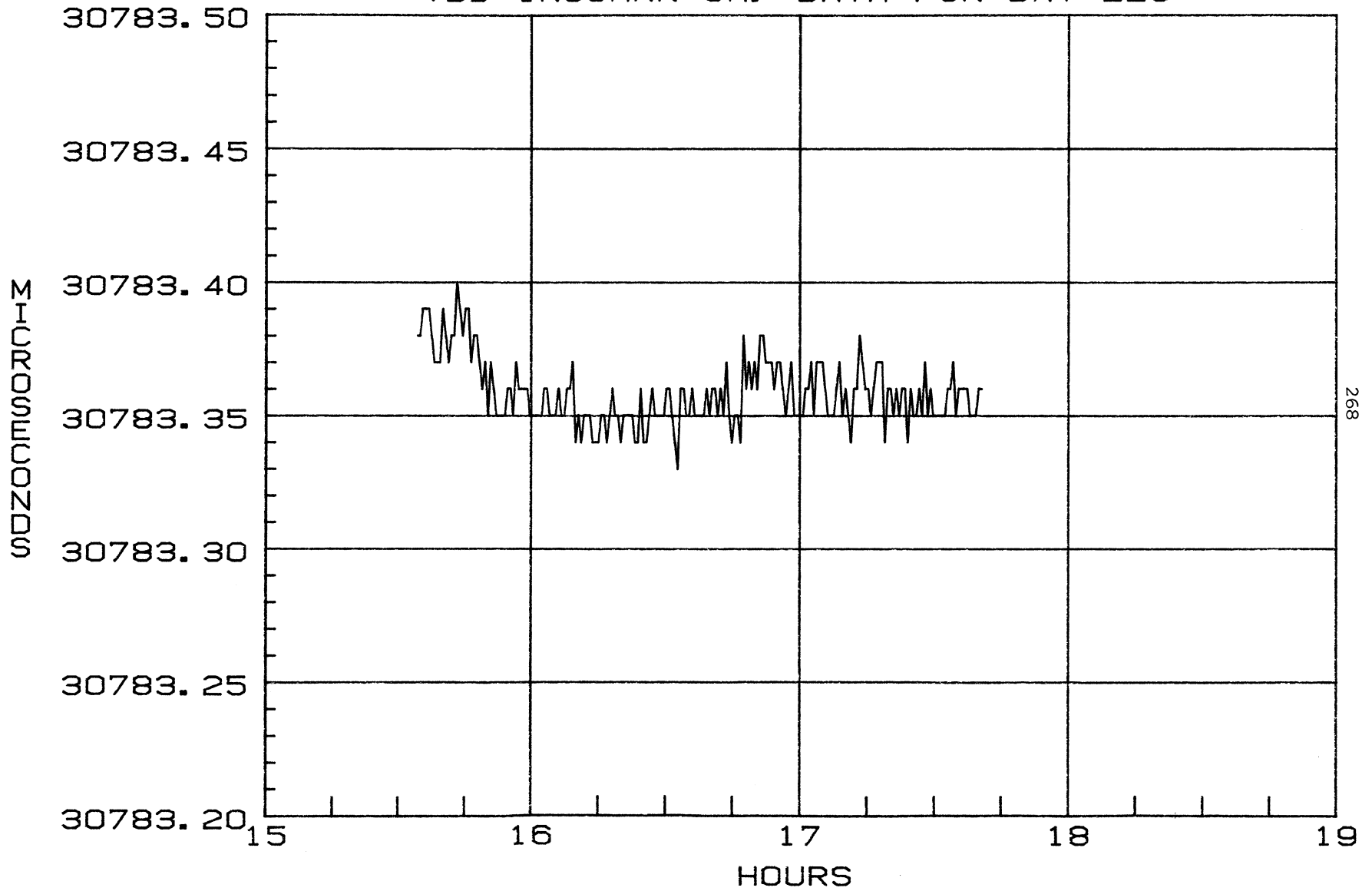
INGOMAR

TDA INGOMAR CM. DATA FOR DAY 226

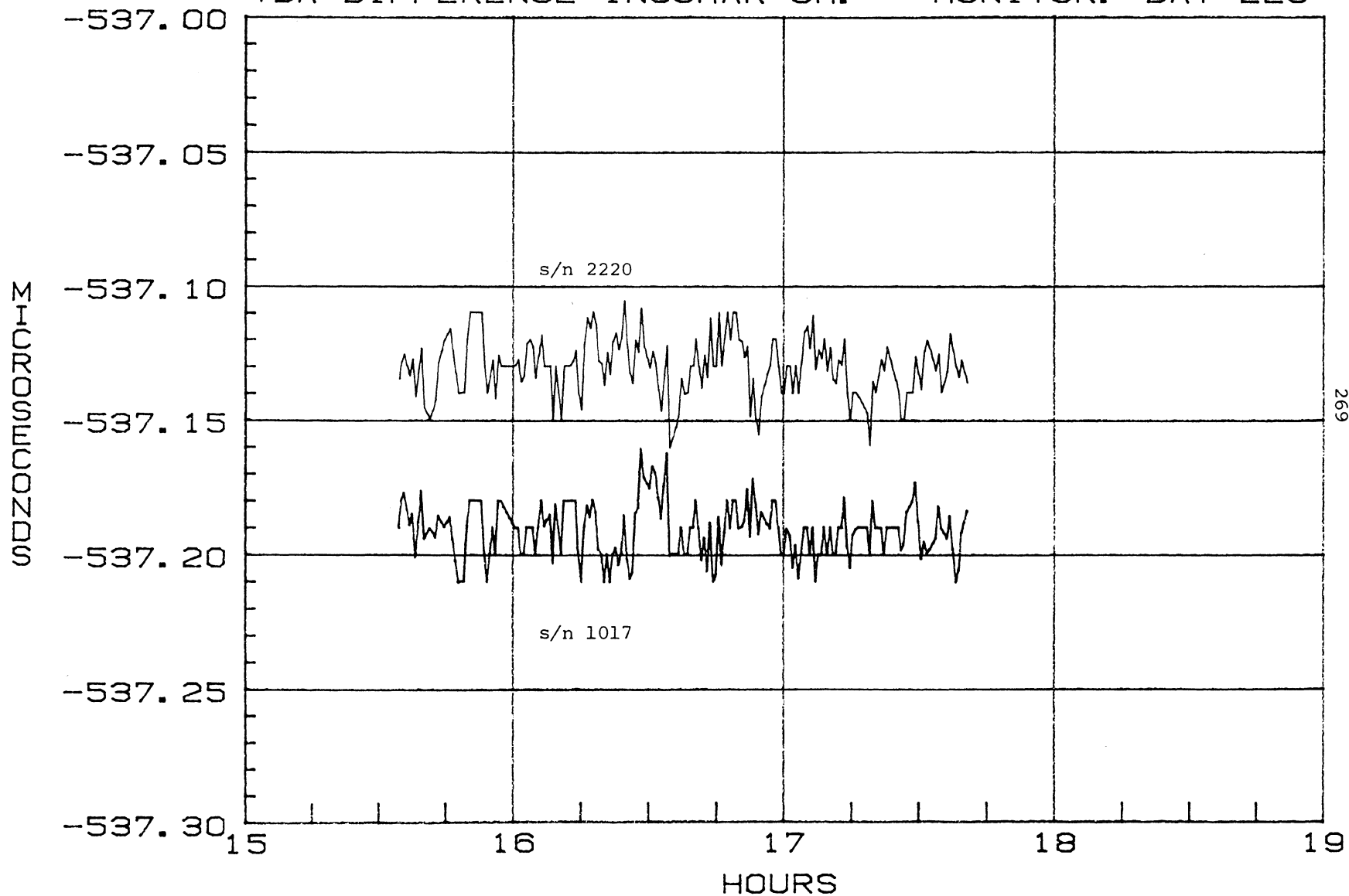


267

TDB INGOMAR CM. DATA FOR DAY 226

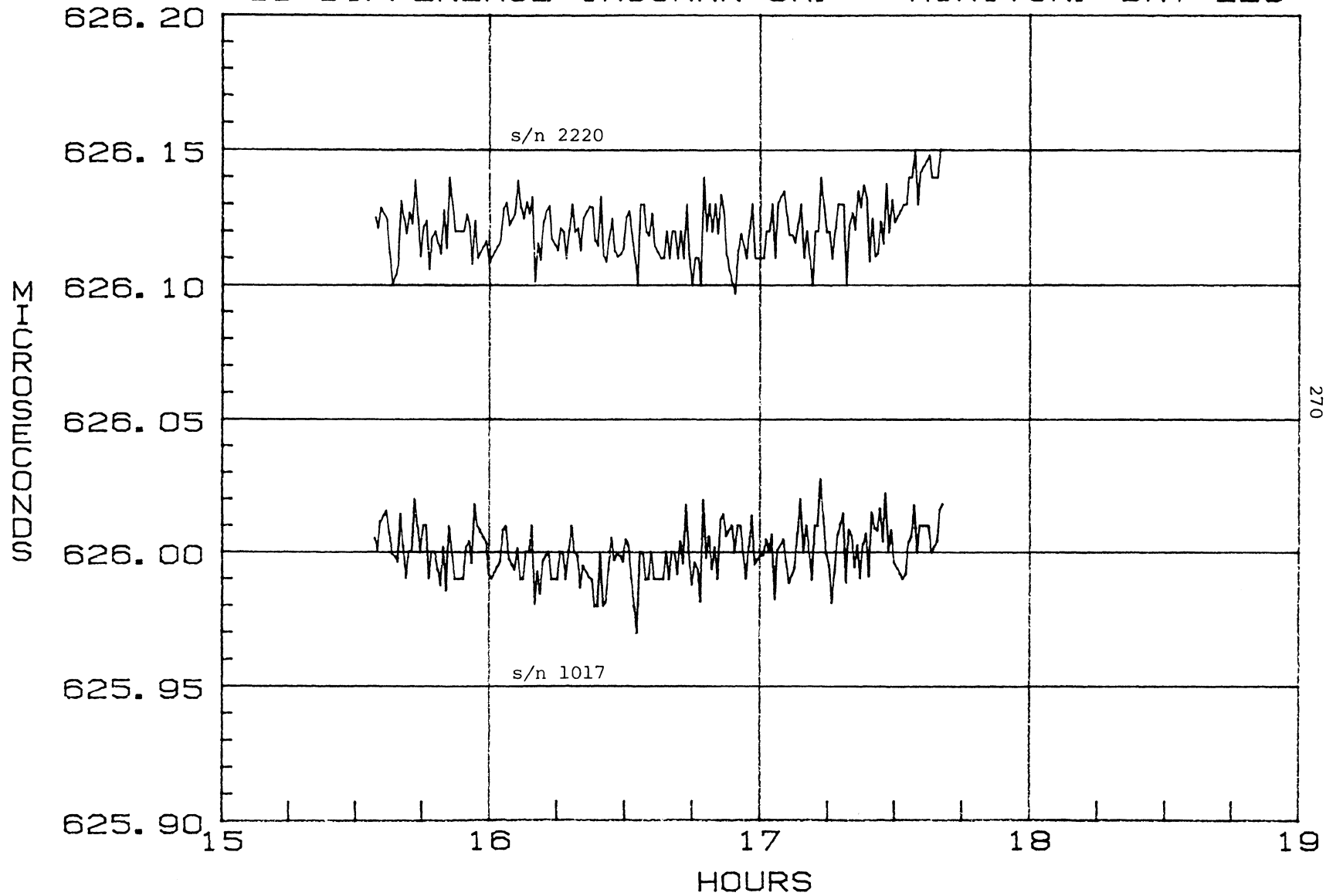


TDA DIFFERENCE INGOMAR CM. - MONITOR. DAY 226

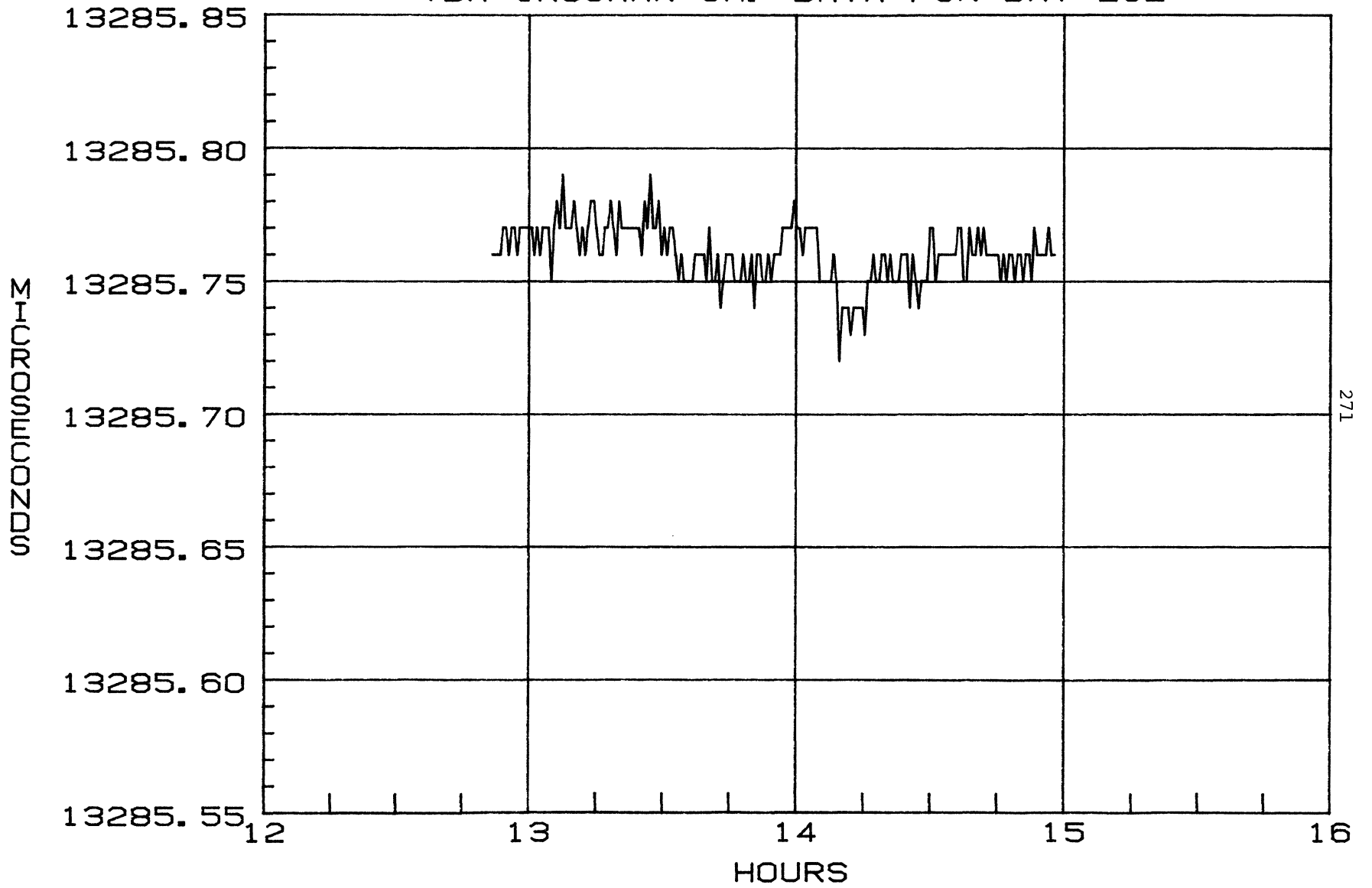


269

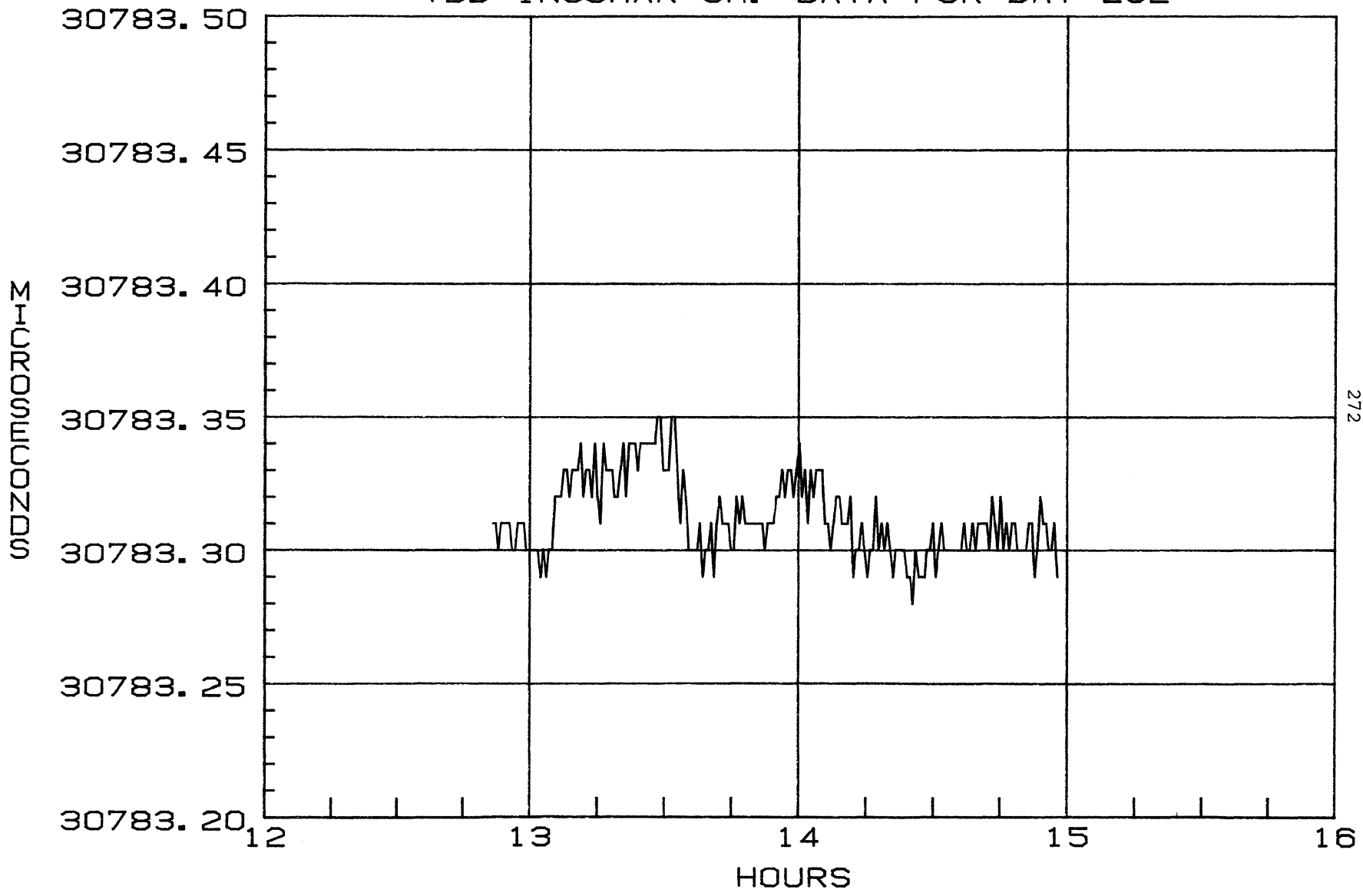
TDB DIFFERENCE INGOMAR CM. - MONITOR. DAY 226



TDA INGOMAR CM. DATA FOR DAY 232

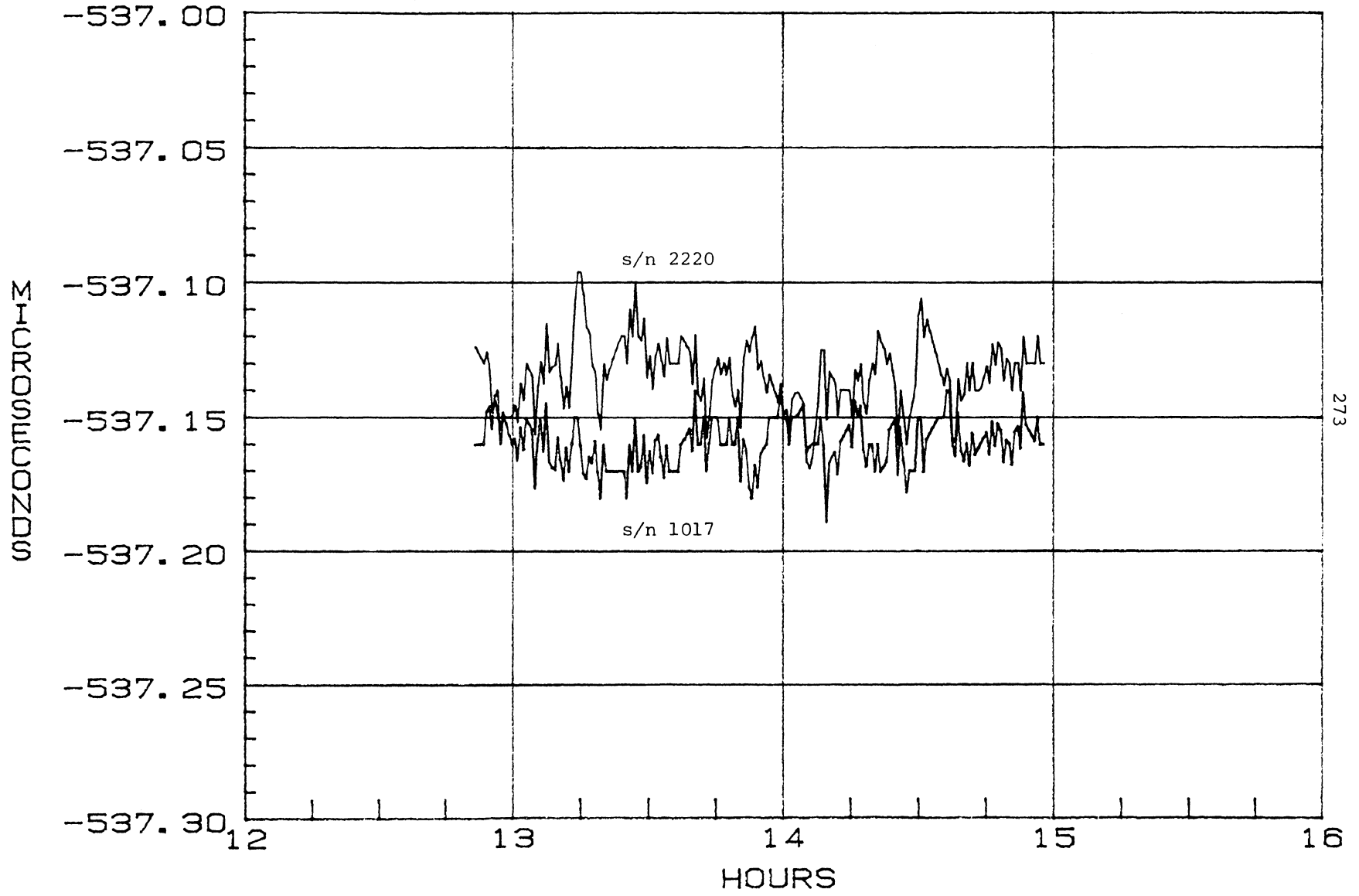


TDB INGOMAR CM. DATA FOR DAY 232

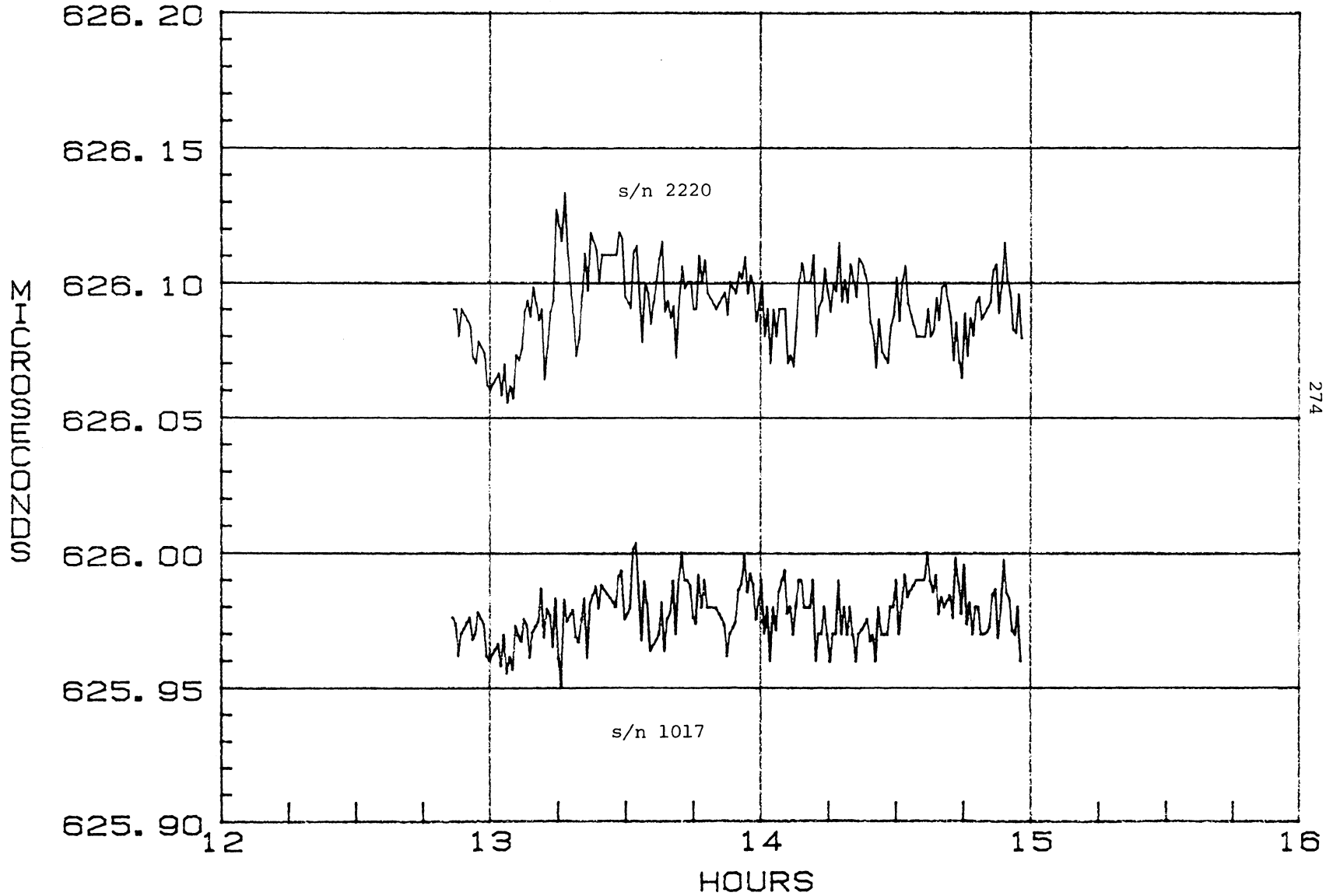


272

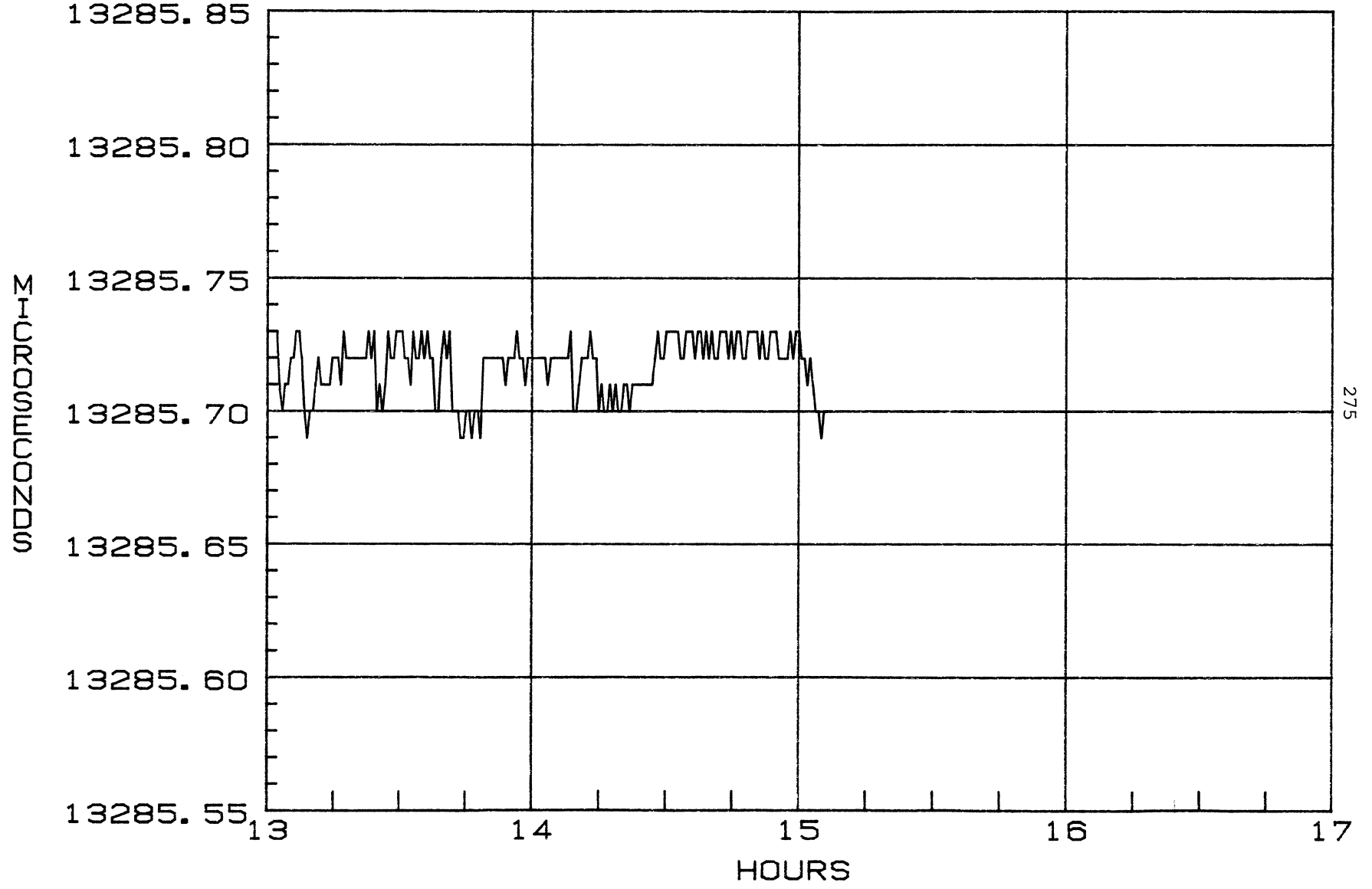
TDA DIFFERENCE INGOMAR CM. - MONITOR. DAY 232



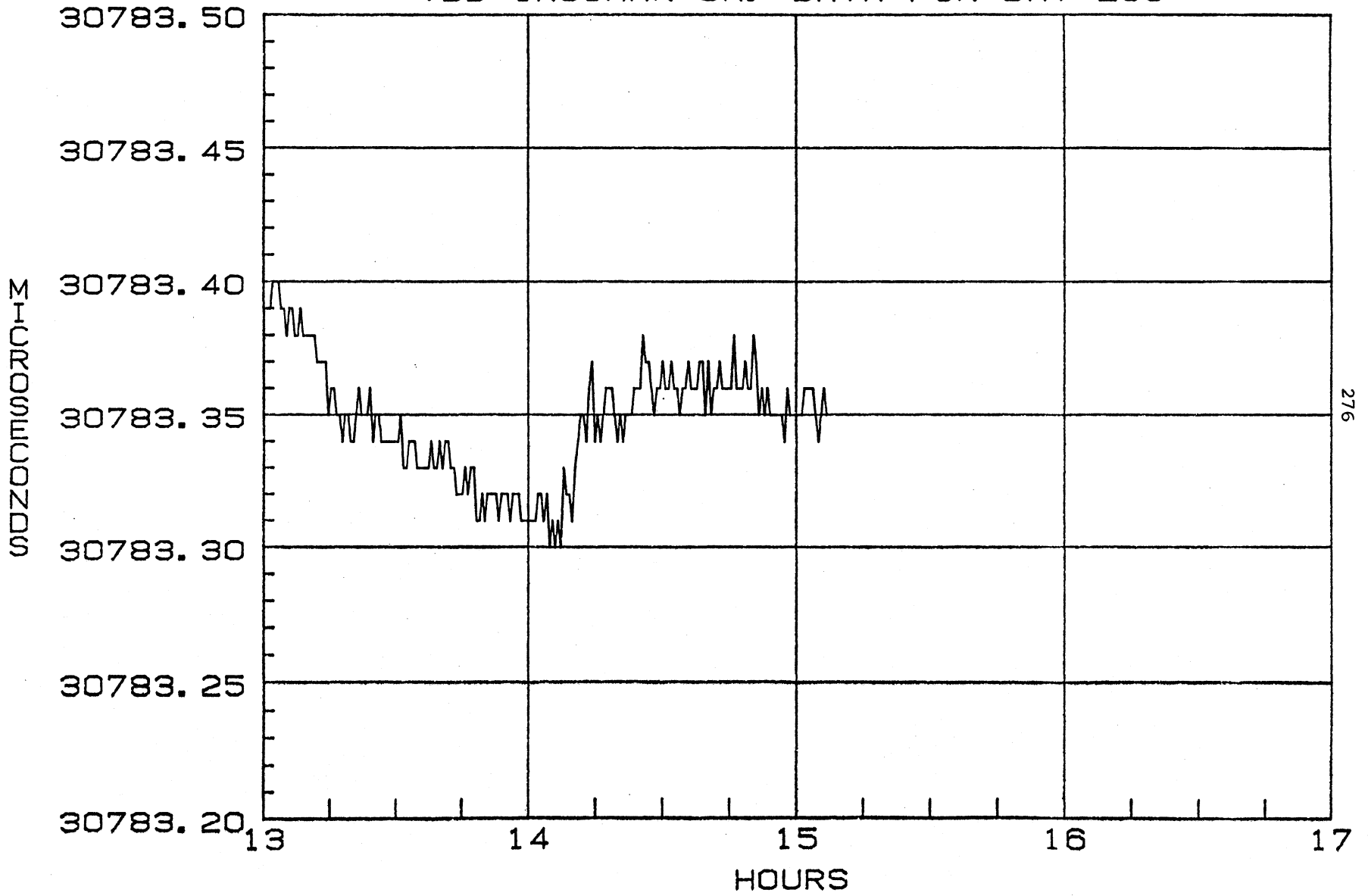
TDB DIFFERENCE INGOMAR CM. - MONITOR. DAY 232



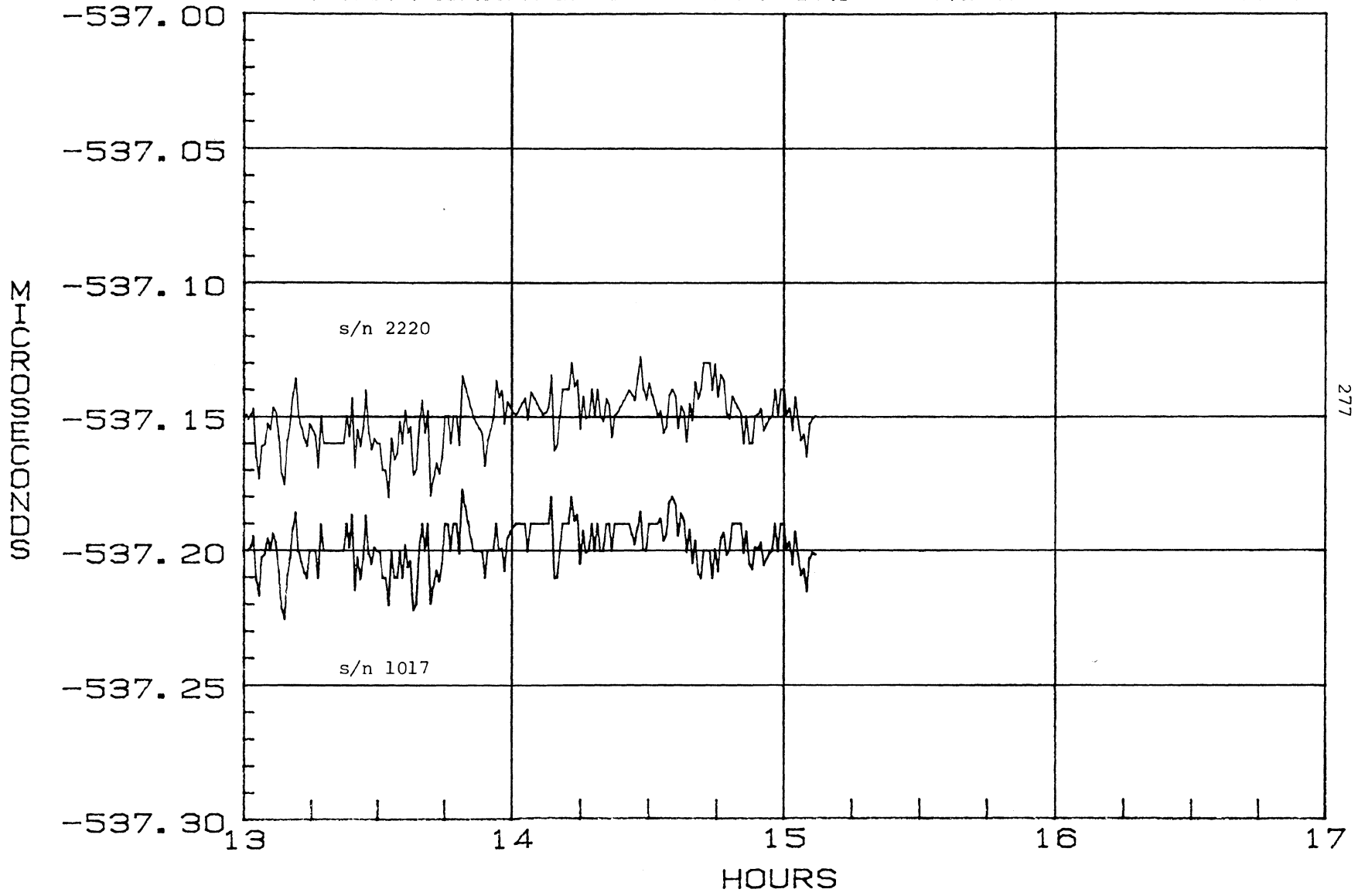
TDA INGOMAR CM. DATA FOR DAY 239



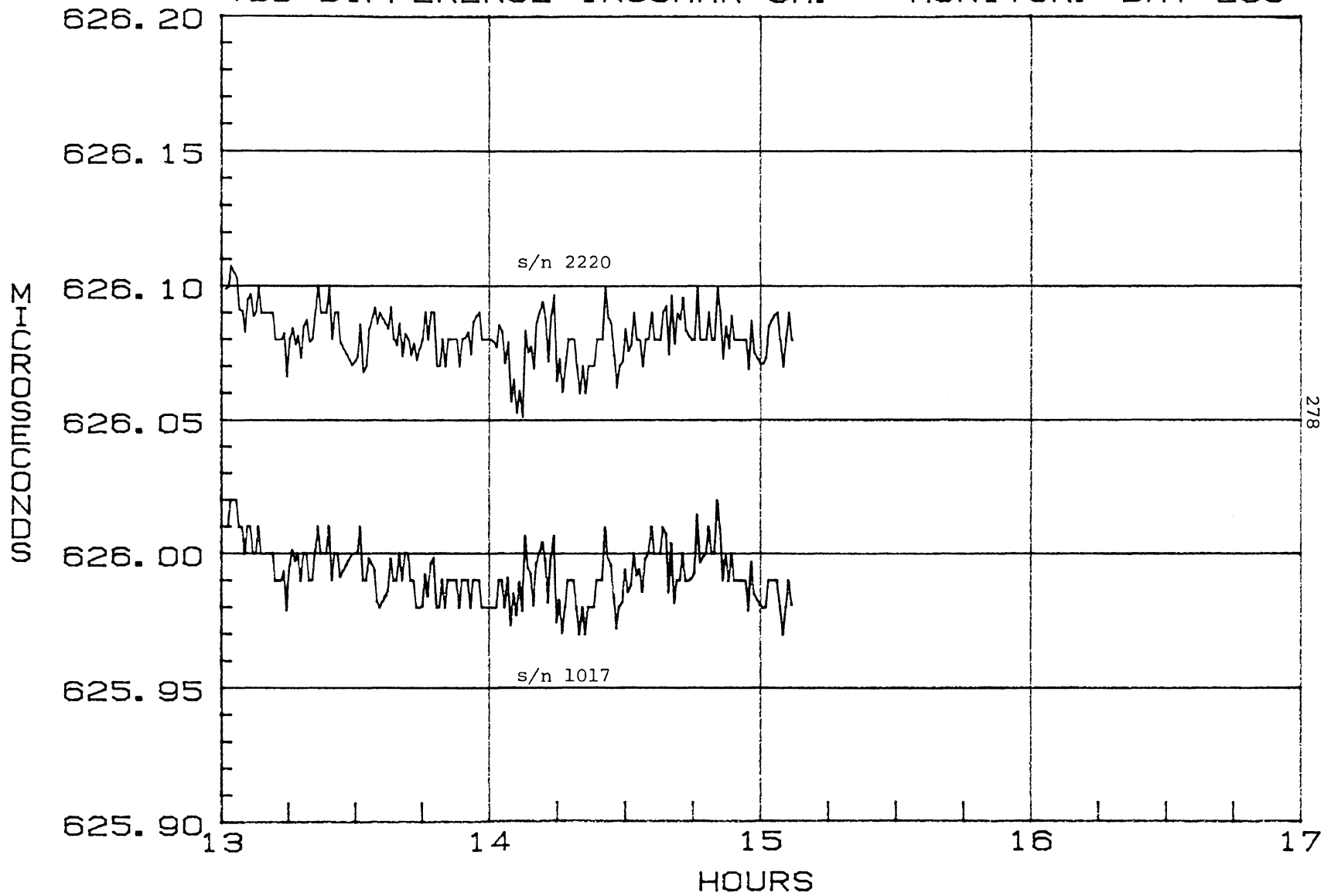
TDB INGOMAR CM. DATA FOR DAY 239



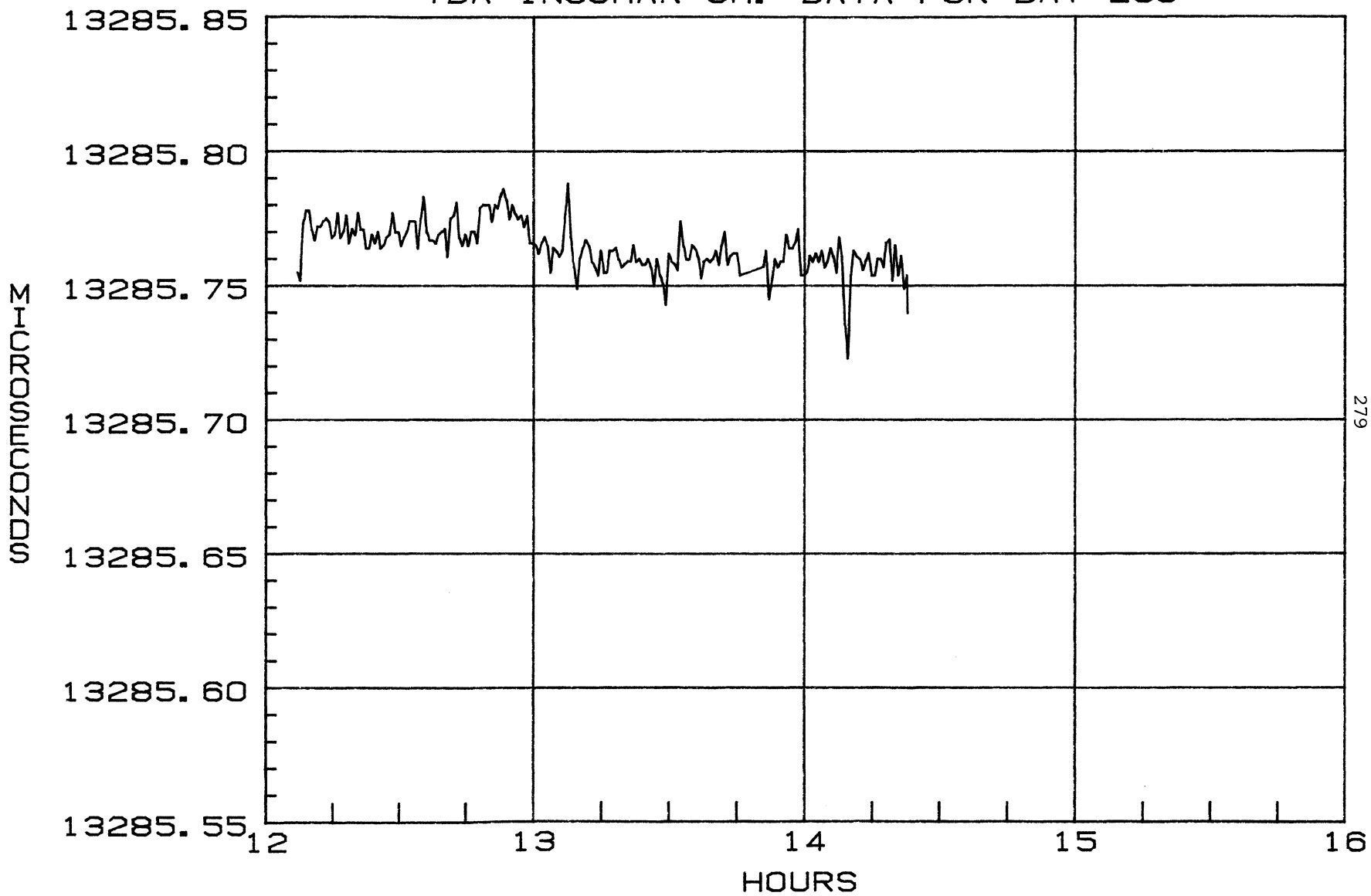
TDA DIFFERENCE INGOMAR CM. - MONITOR. DAY 239



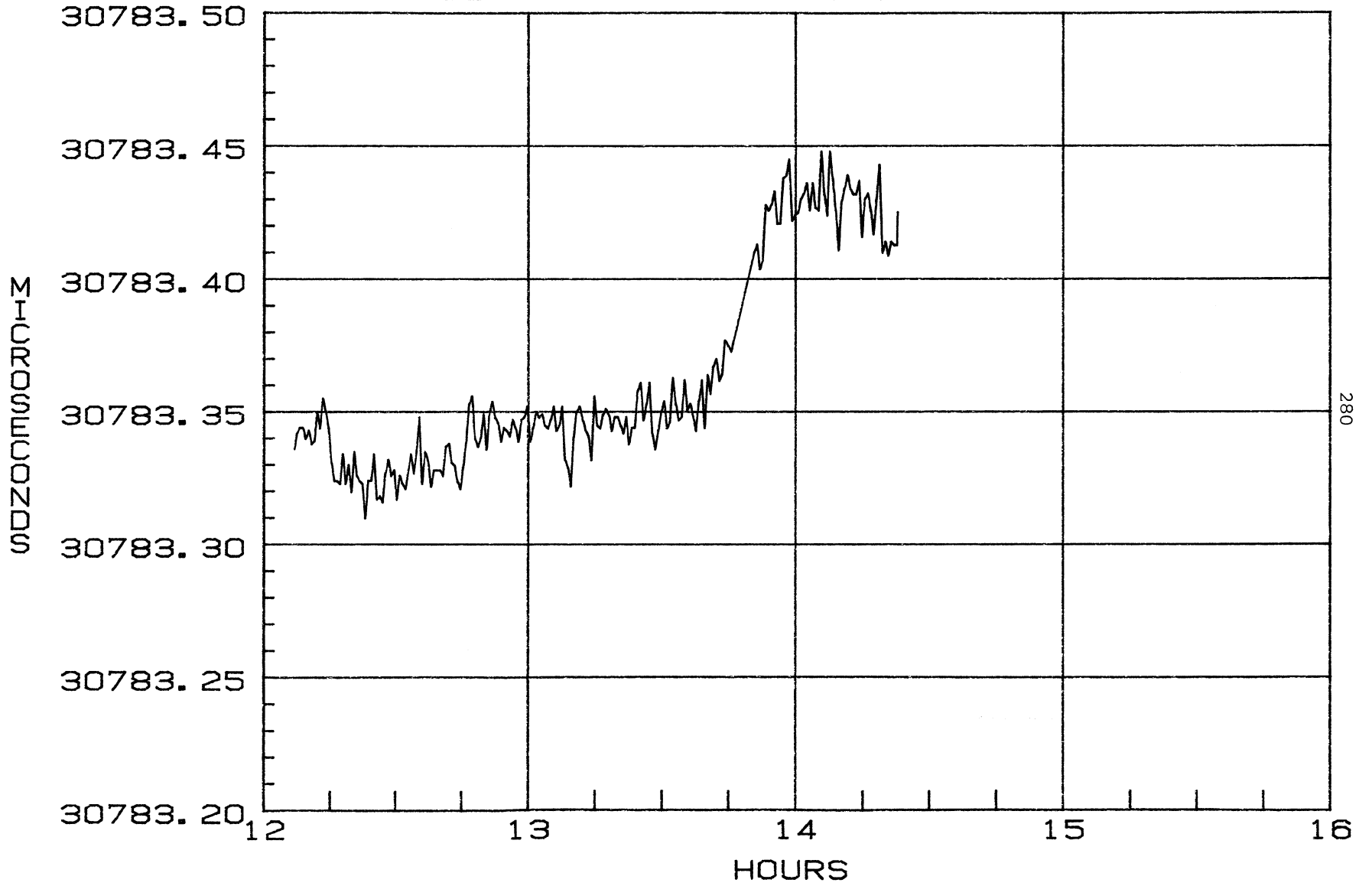
TDB DIFFERENCE INGOMAR CM. - MONITOR. DAY 239



TDA INGOMAR CM. DATA FOR DAY 268



TDB INGOMAR CM. DATA FOR DAY 268



APPENDIX VII

HELICOPTER SITE PLOTS

For this experiment, a helicopter carrying an Internav 404 LORAN-C receiver, occupied thirteen sites, each of which was visited up to five times. Eight of these sites were lighthouses at which the helicopter landed. The other five were buoys, at which the helicopter hovered. Plots of all data for each site are presented together in the following subsections of this appendix:

- VII.11 Devils Island Light
- VII.12 Sambro Island Light
- VII.13 Betty Island Light
- VII.14 Peggy's Point Buoy
- VII.15 Horseshoe Ledge Buoy
- VII.16 Pearl Island Light
- VII.17 Mosher Island Light
- VII.18 Coffin Island Light
- VII.19 White Point Rock Buoy
- VII.20 Little Hope Island Light
- VII.21 Gull Rock Island Light
- VII.22 Jig Rock Buoy
- VII.23 Budget Rock Buoy

Within each subsection, four plots are given:

TDA raw data for all visits (LORAN chain 5930 Caribou-Nantucket time differences)

TDB raw data for all visits (LORAN chain 5930 Caribou-Cape Race time differences)

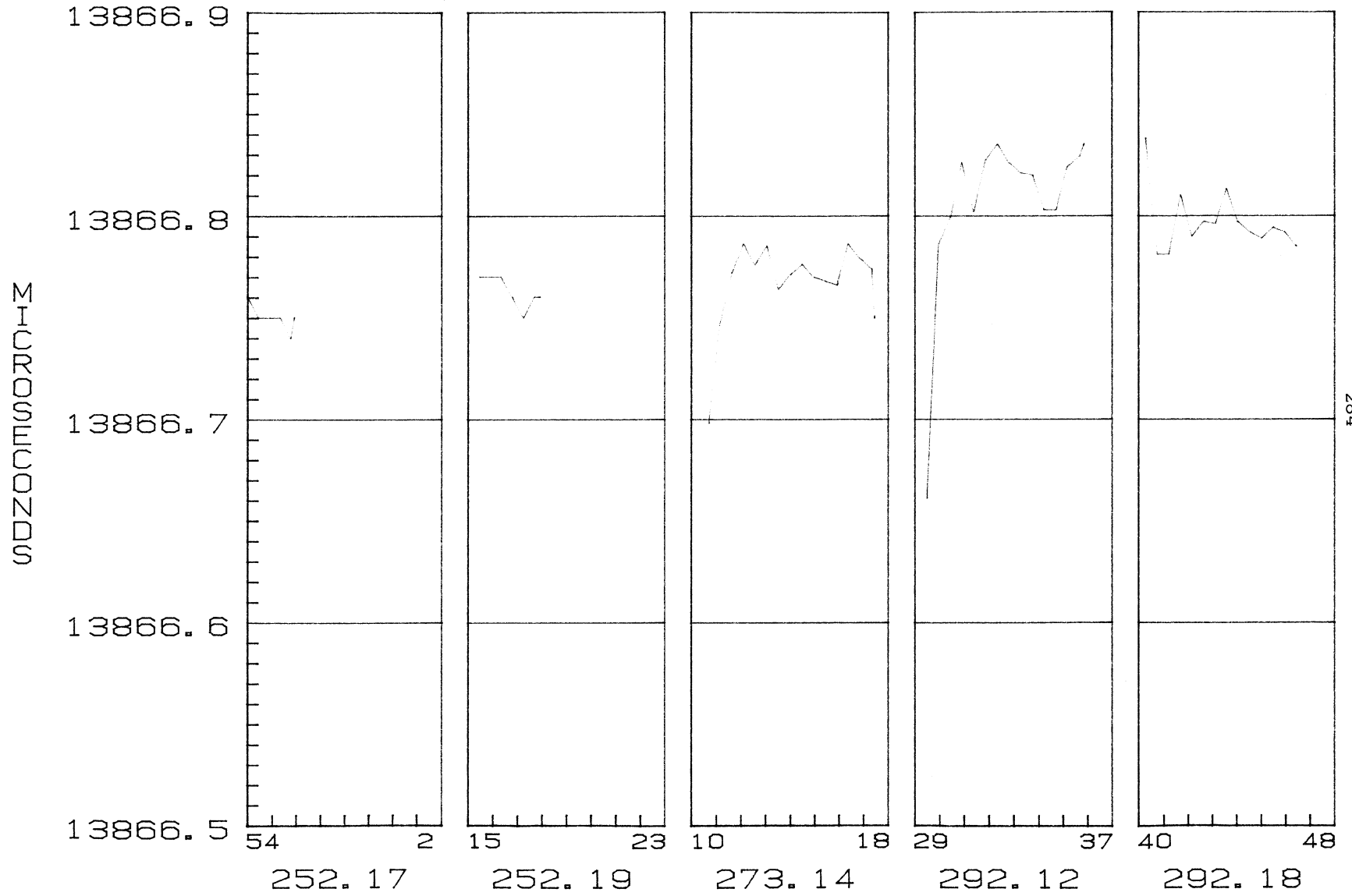
TDA differences for all visits (helicopter site - monitor)

TDB differences for all visits (helicopter site - monitor).

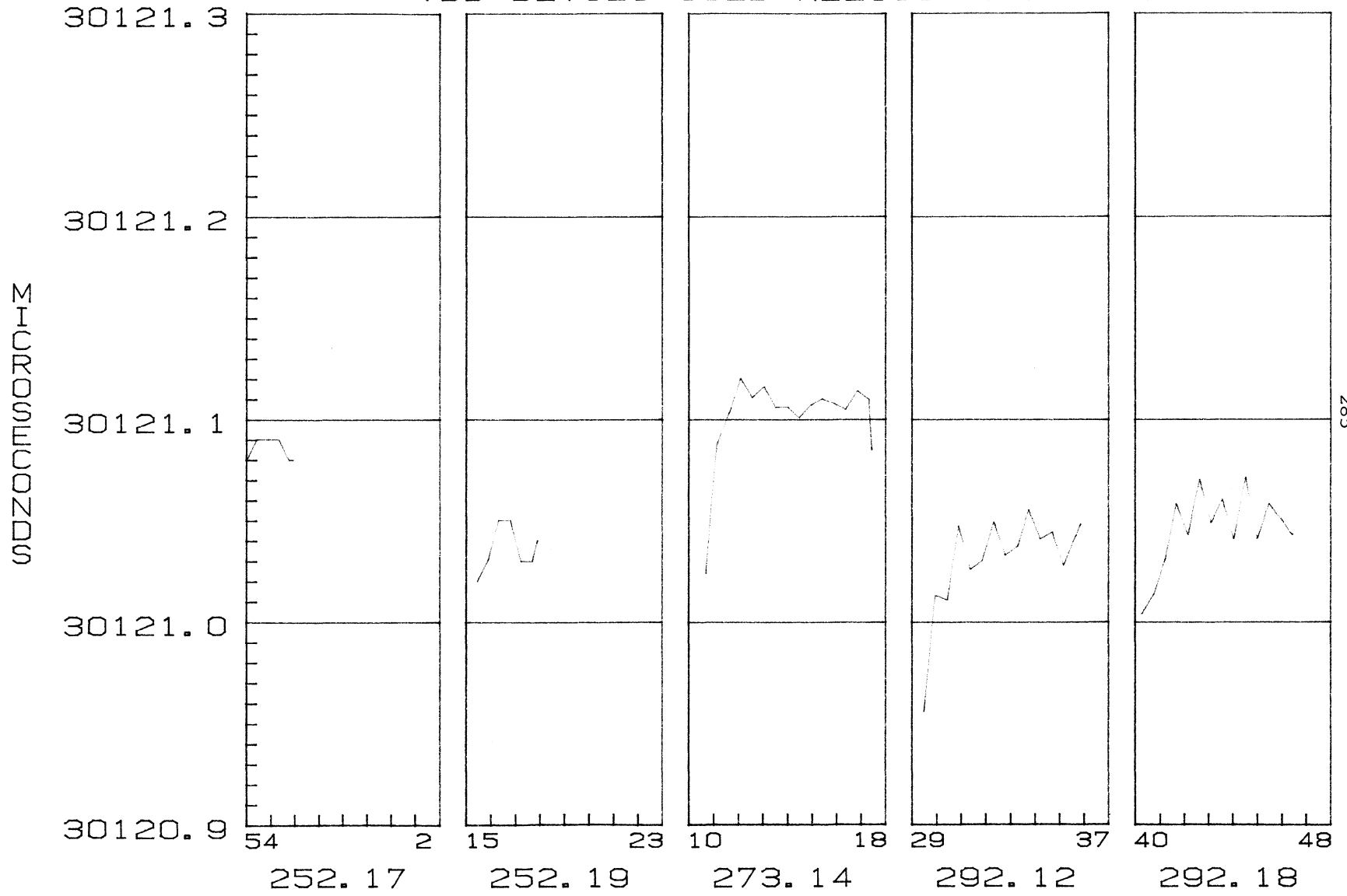
APPENDIX VII.11

DEVILS ISLAND LIGHT

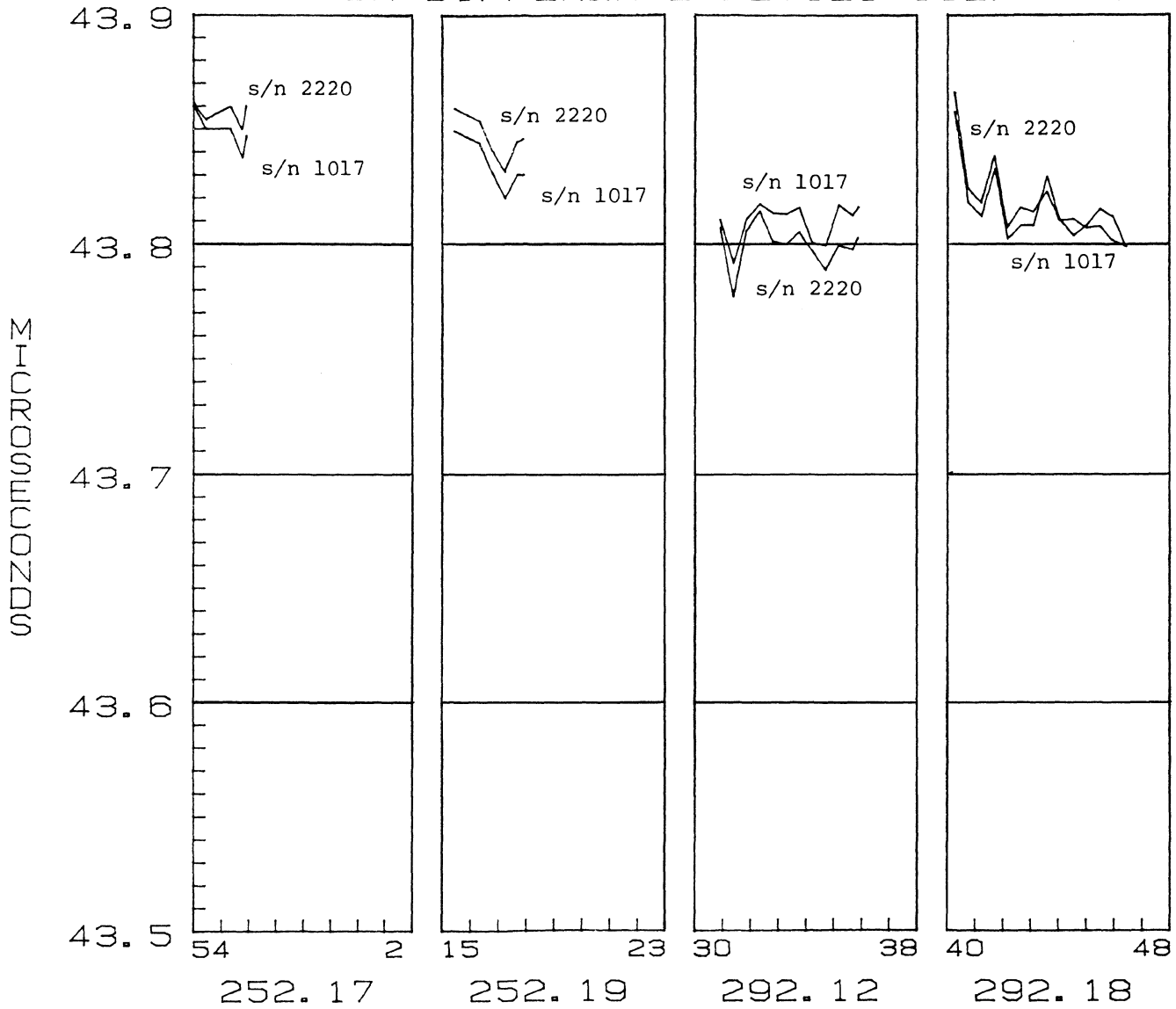
TDA DEVILS ISLD HELICOPTER DATA



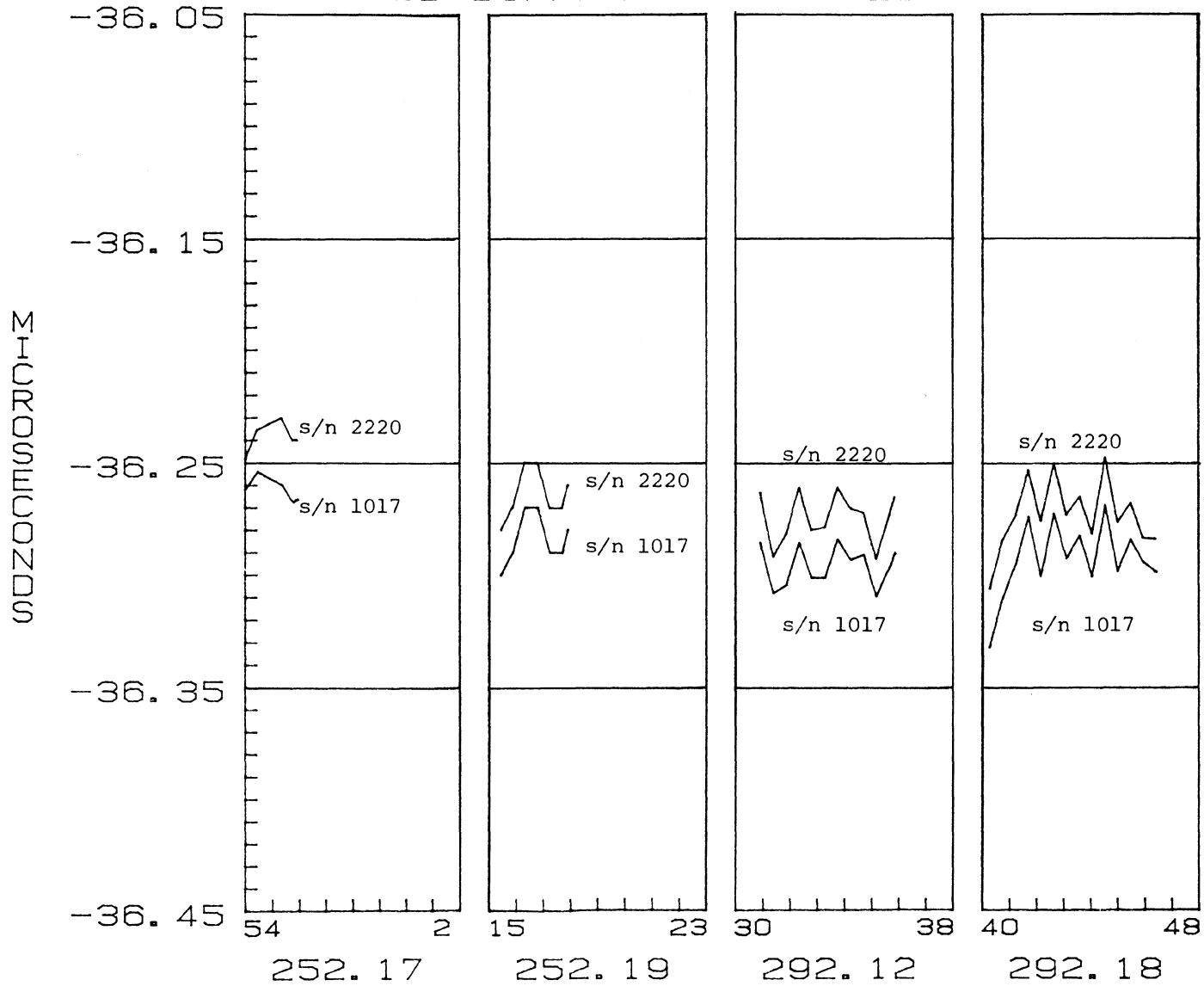
TDB DEVILS ISLD HELICOPTER DATA



TDA DIFFERENCE DEVILS ISLD - MONITOR



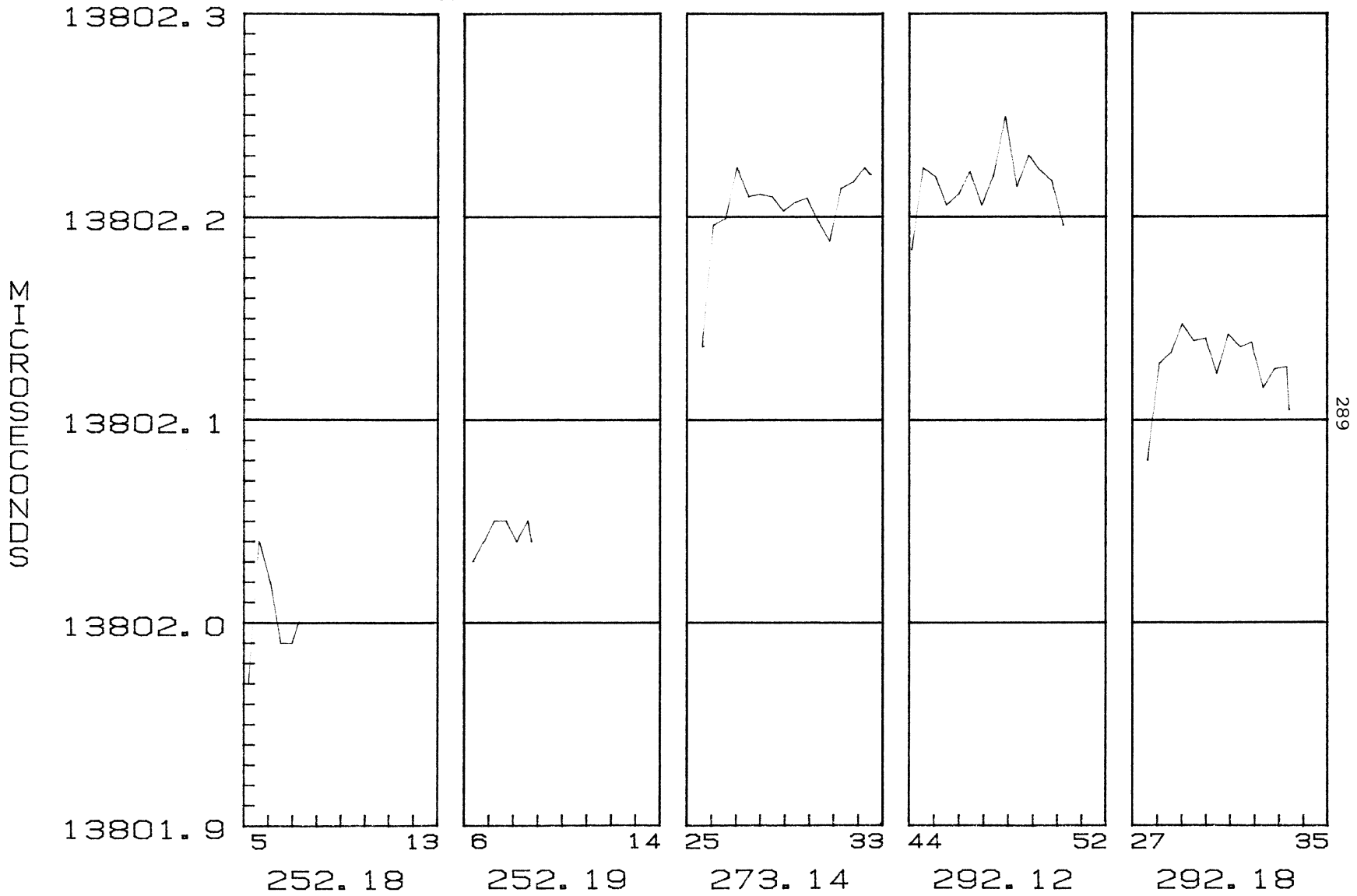
TDB DIFFERENCE DEVILS ISLD - MONITOR



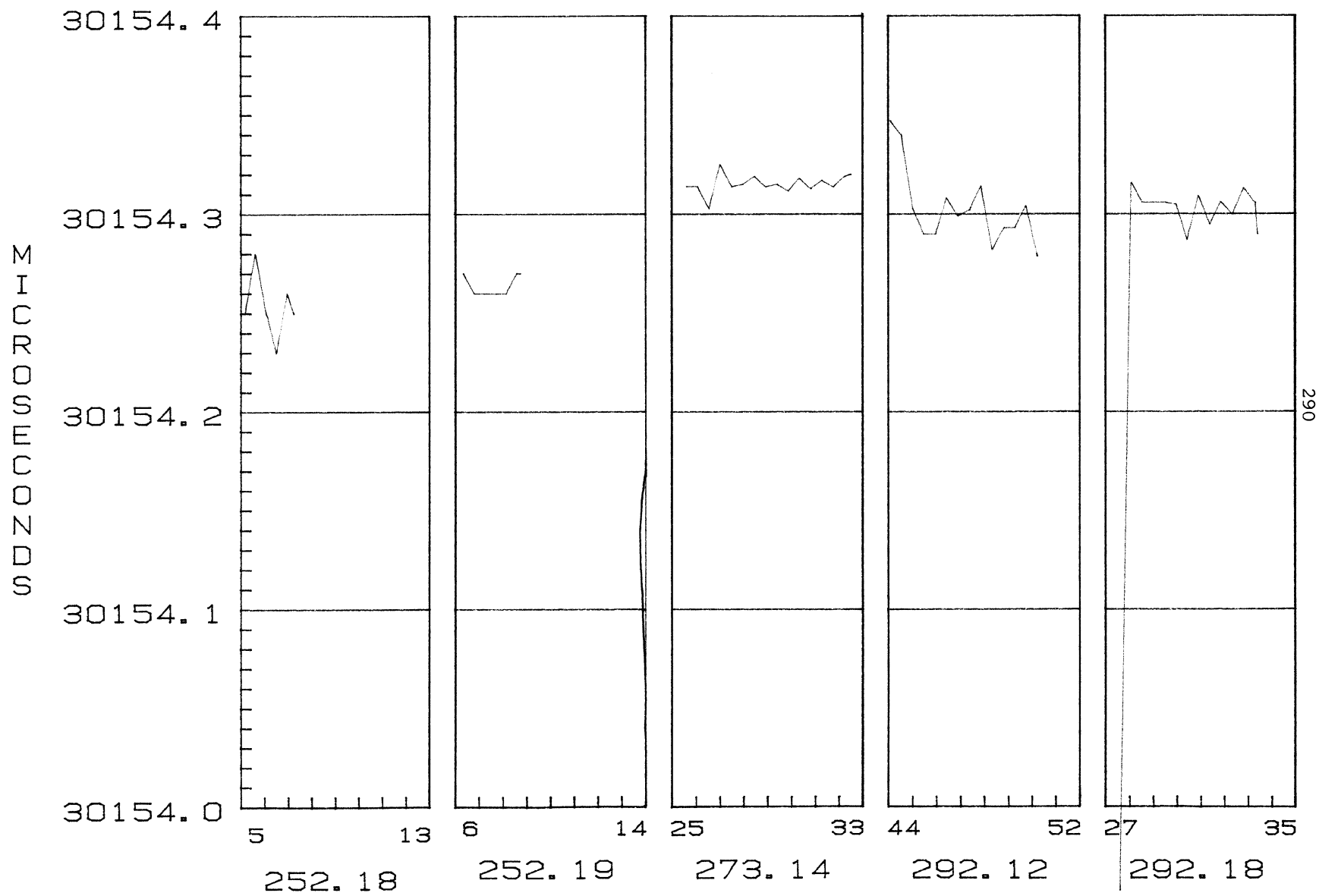
APPENDIX VII.12

SAMBRO ISLAND LIGHT

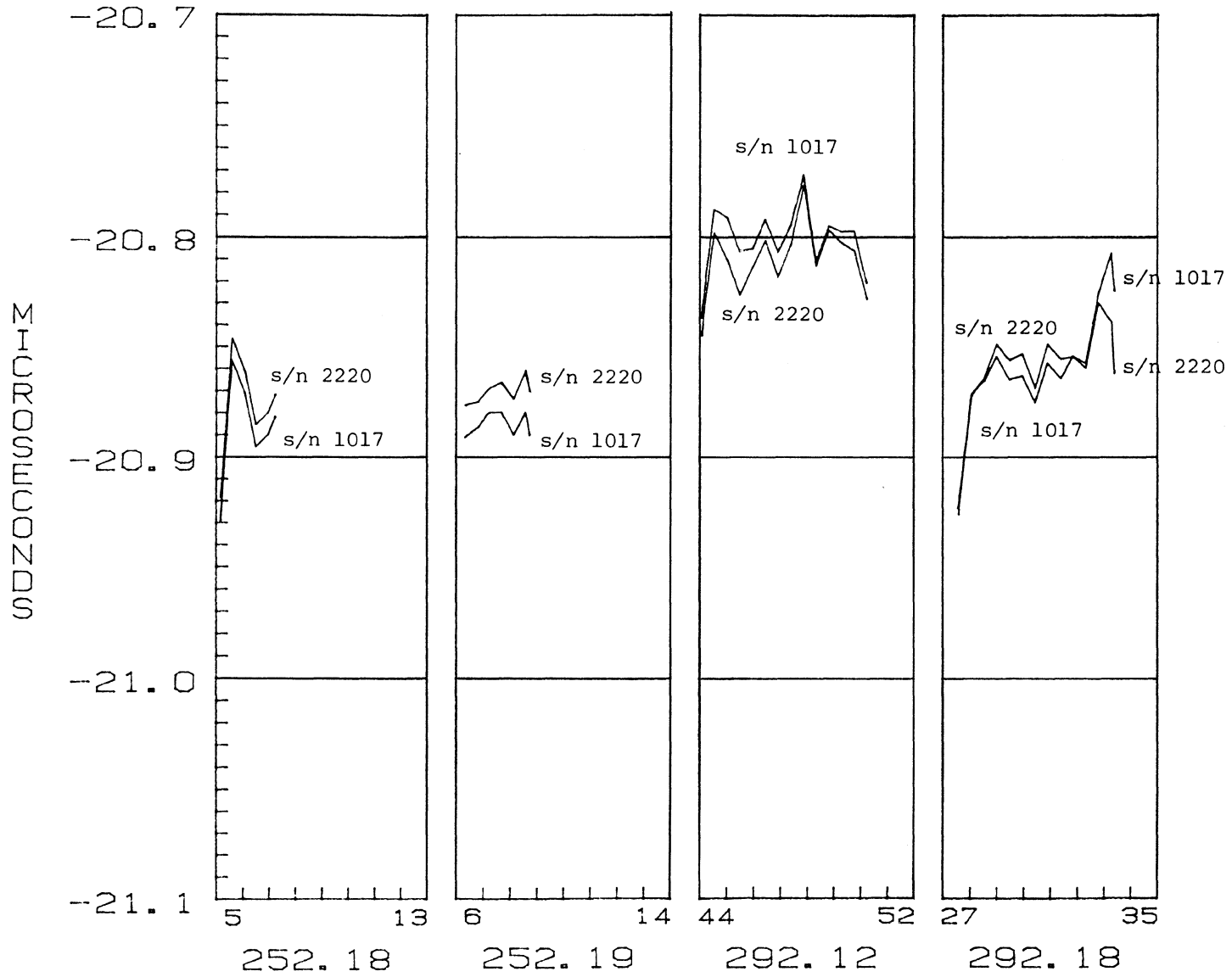
TDA SAMBRO ISLD HELICOPTER DATA



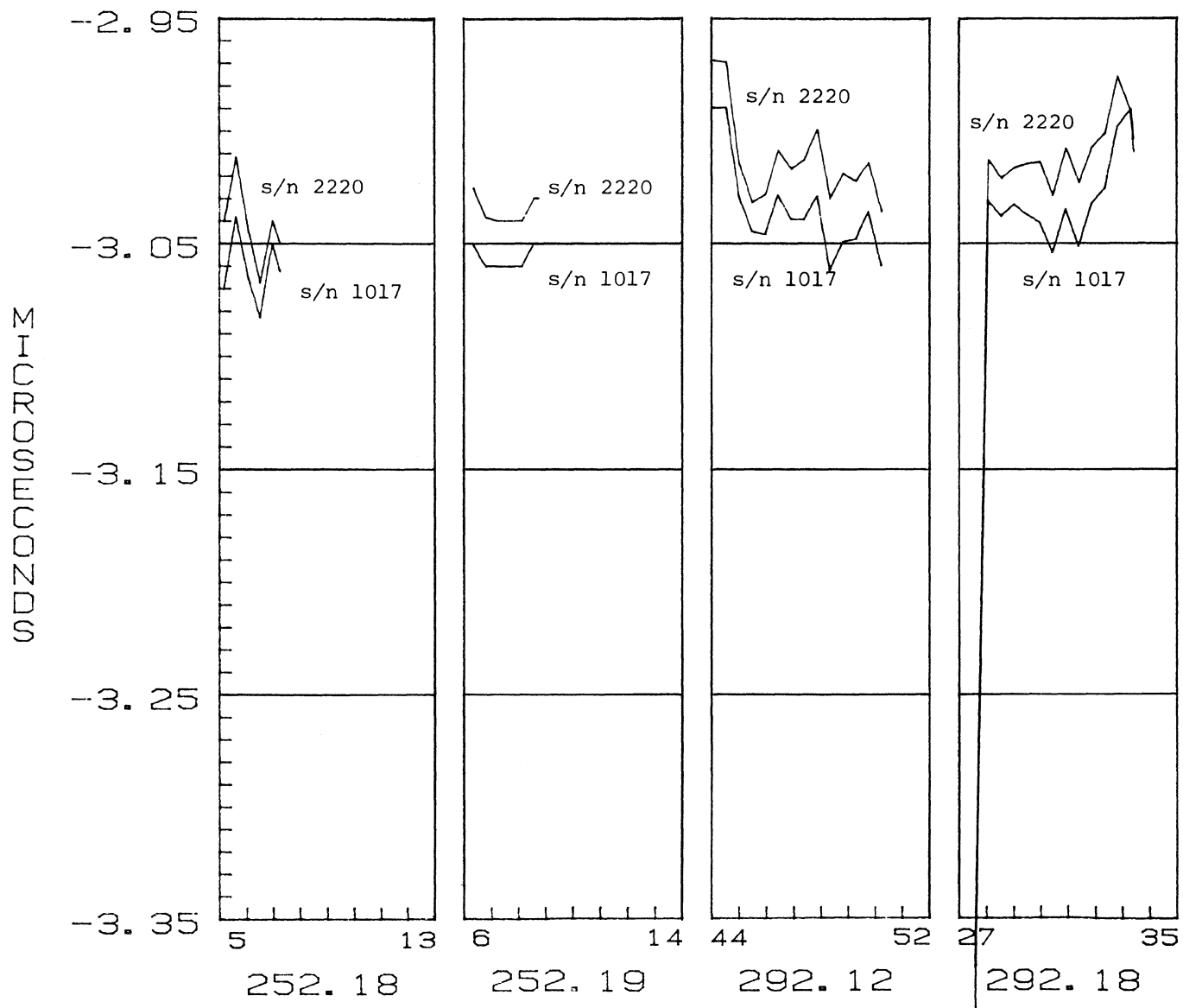
TDB SAMBRO ISLD HELICOPTER DATA



TDA DIFFERENCE SAMBRO ISLD - MONITOR



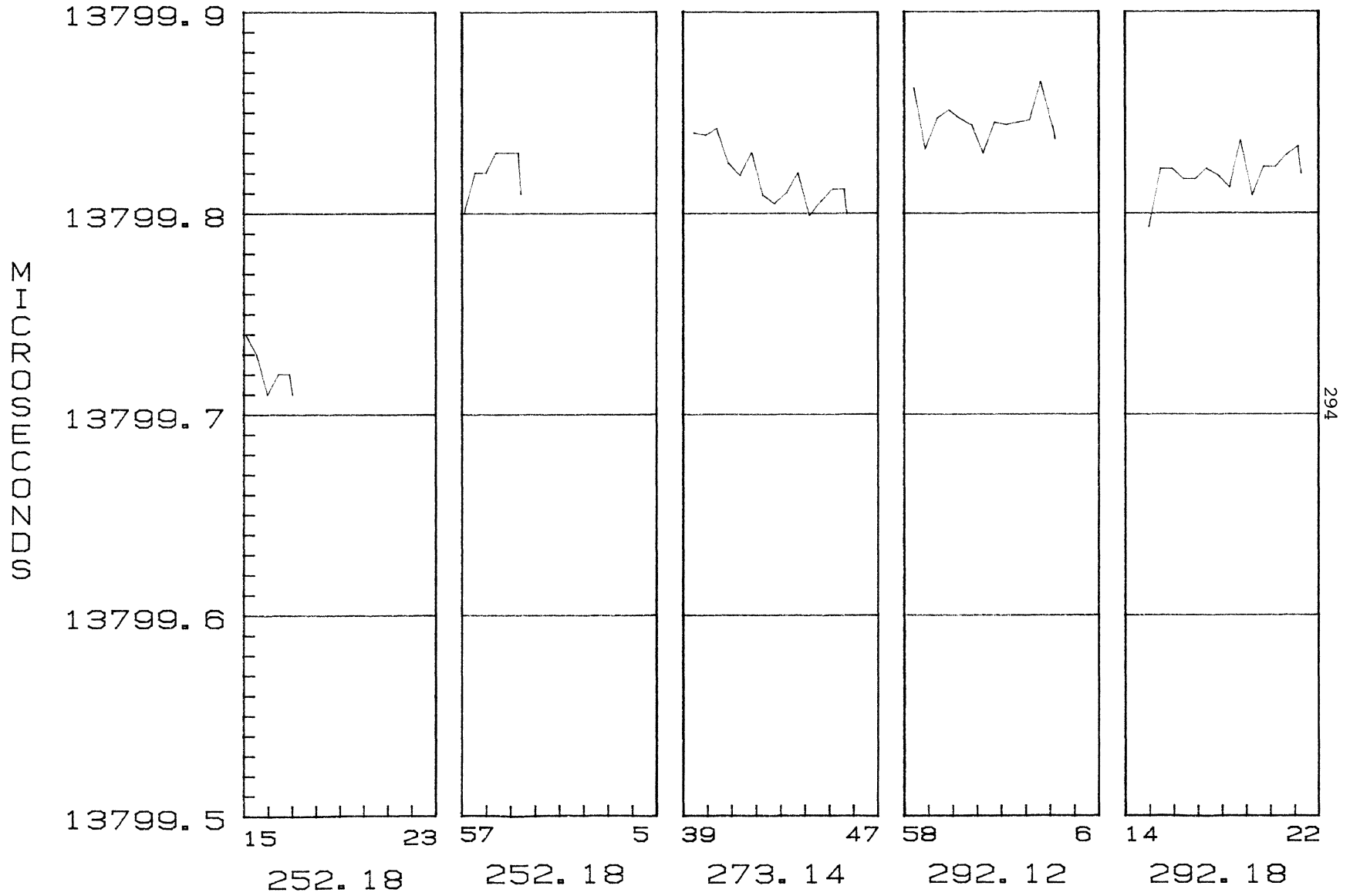
TDB DIFFERENCE SAMBRO ISLD - MONITOR



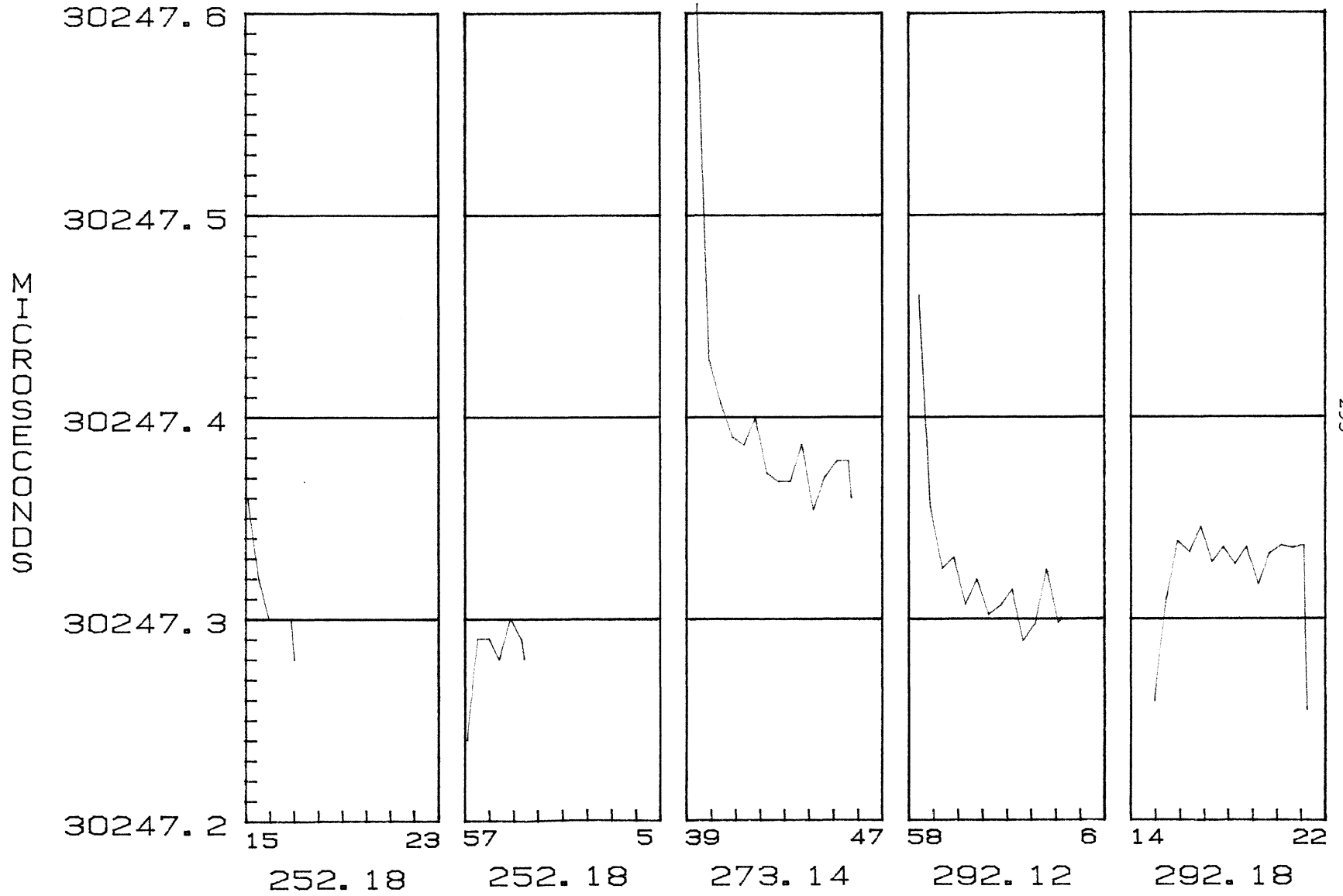
APPENDIX VII.13

BETTY ISLAND LIGHT

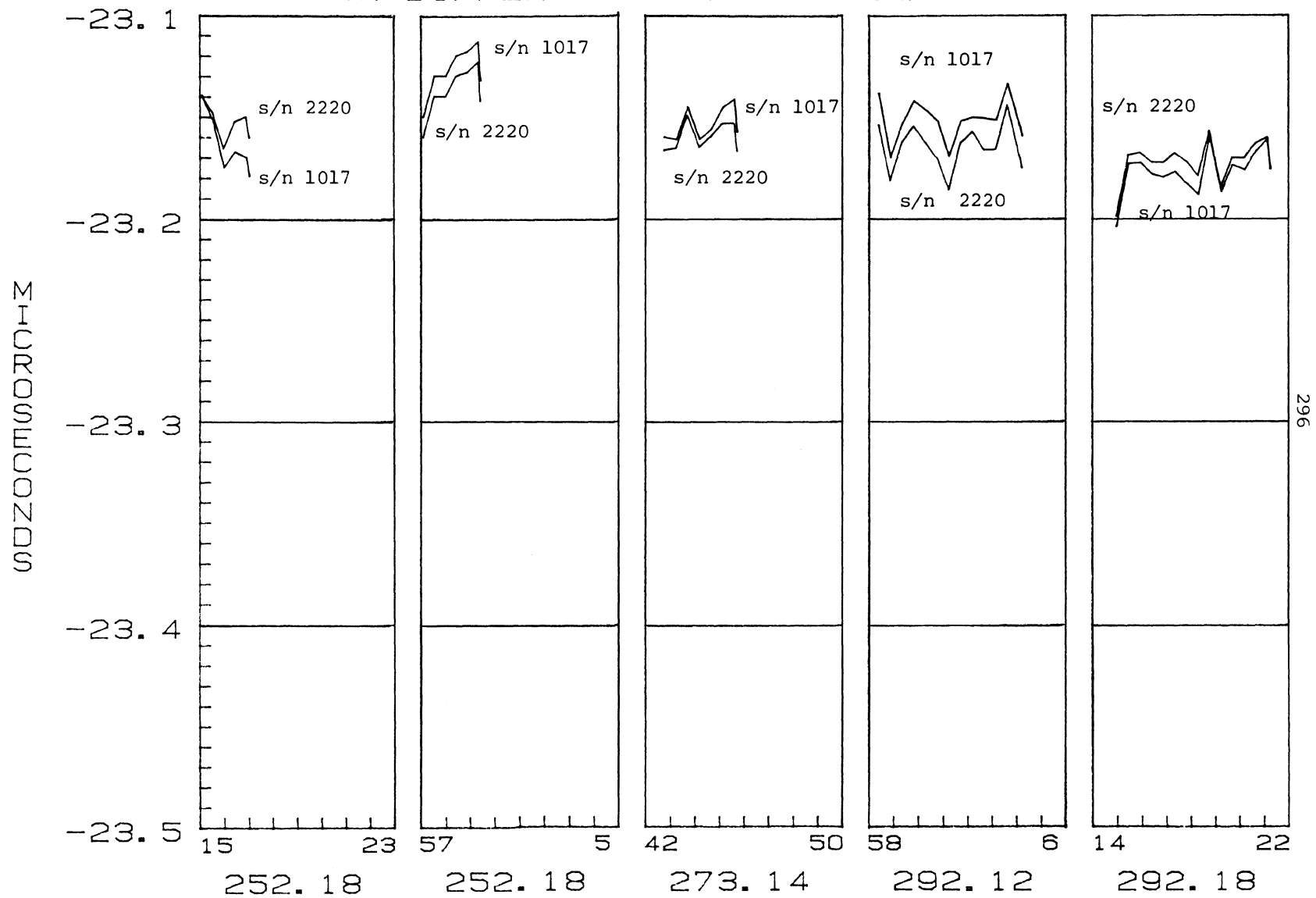
TDA BETTY ISLND HELICOPTER DATA



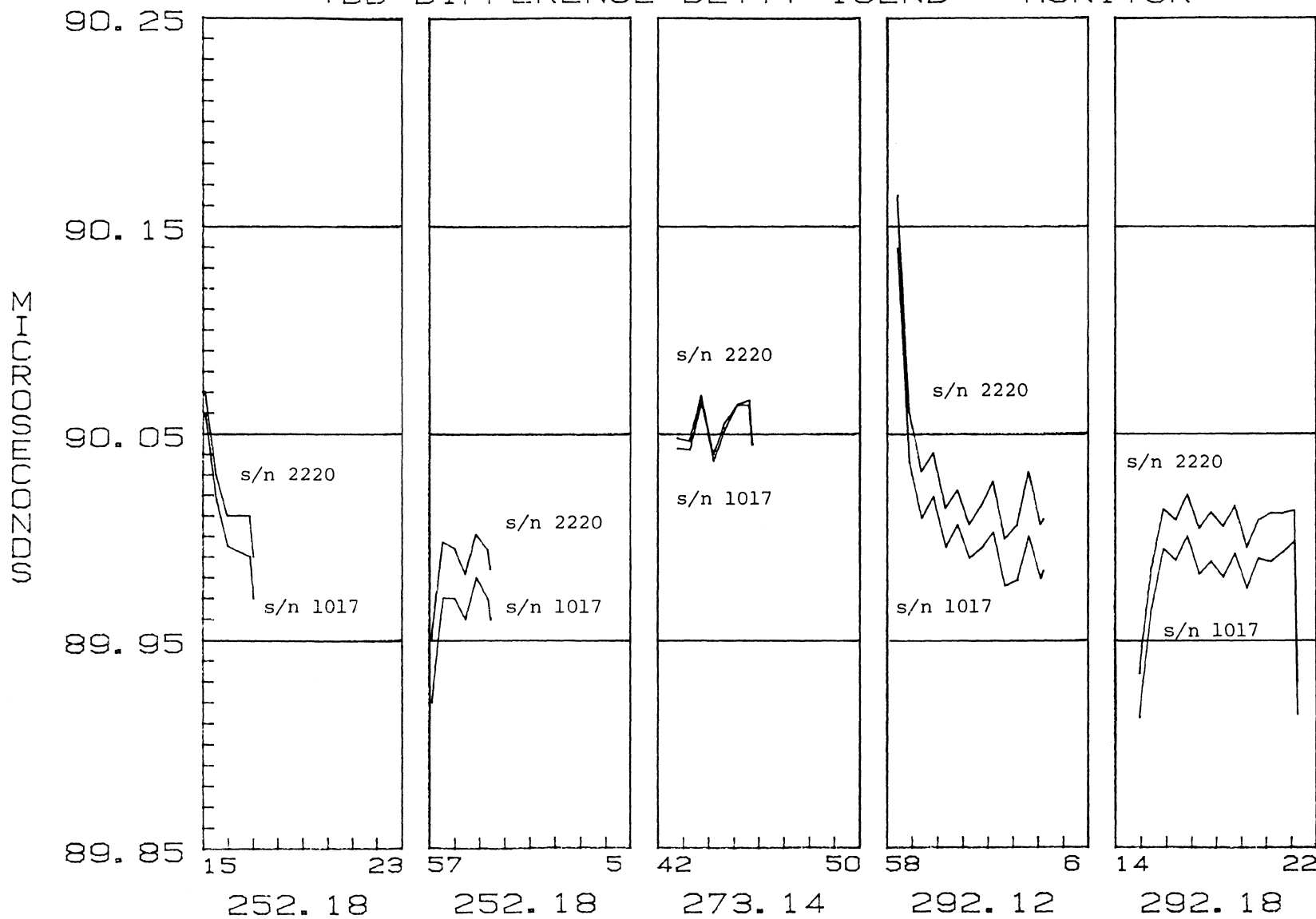
TDB BETTY ISLND HELICOPTER DATA



TDA DIFFERENCE BETTY ISLND - MONITOR



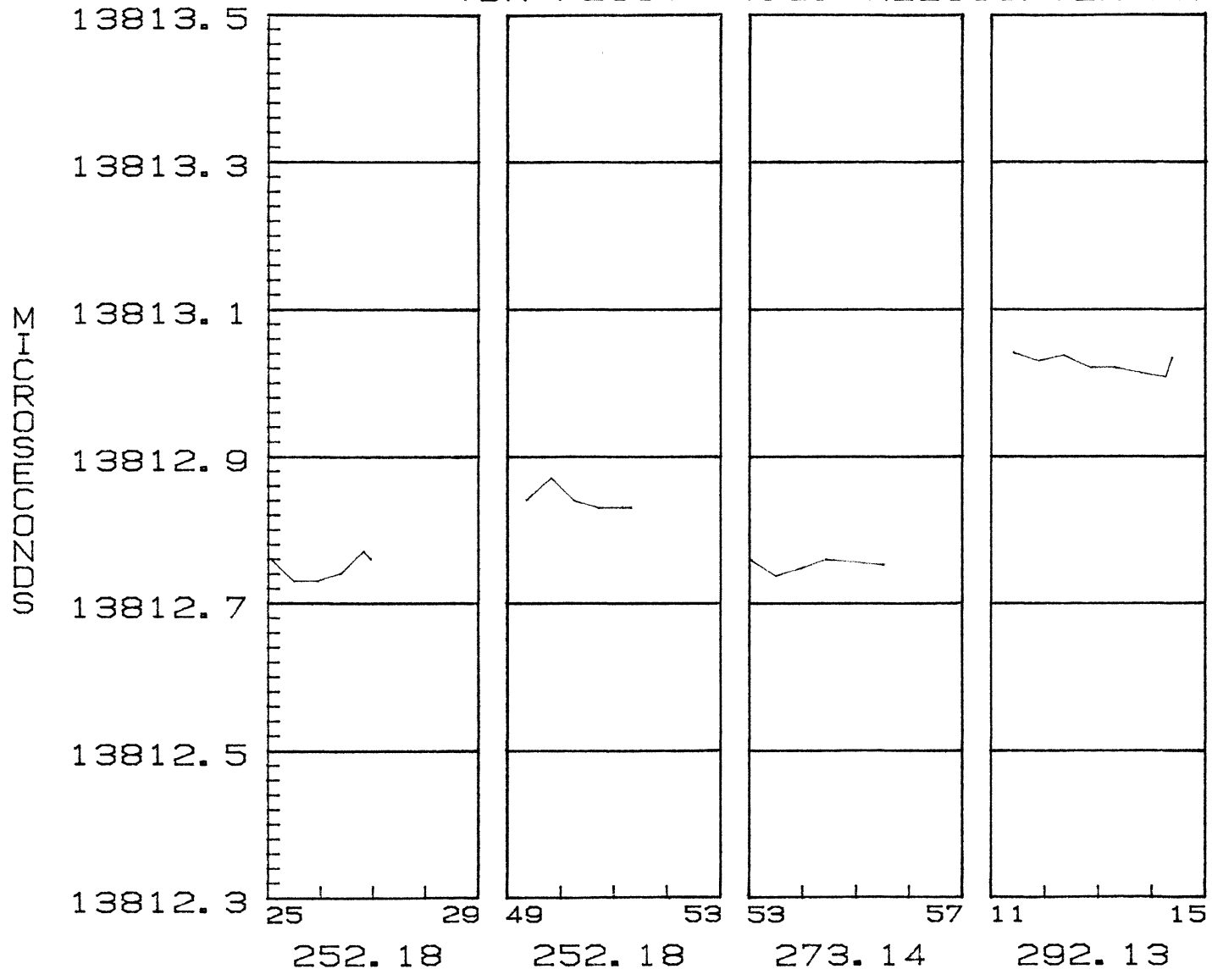
TDB DIFFERENCE BETTY ISLND - MONITOR



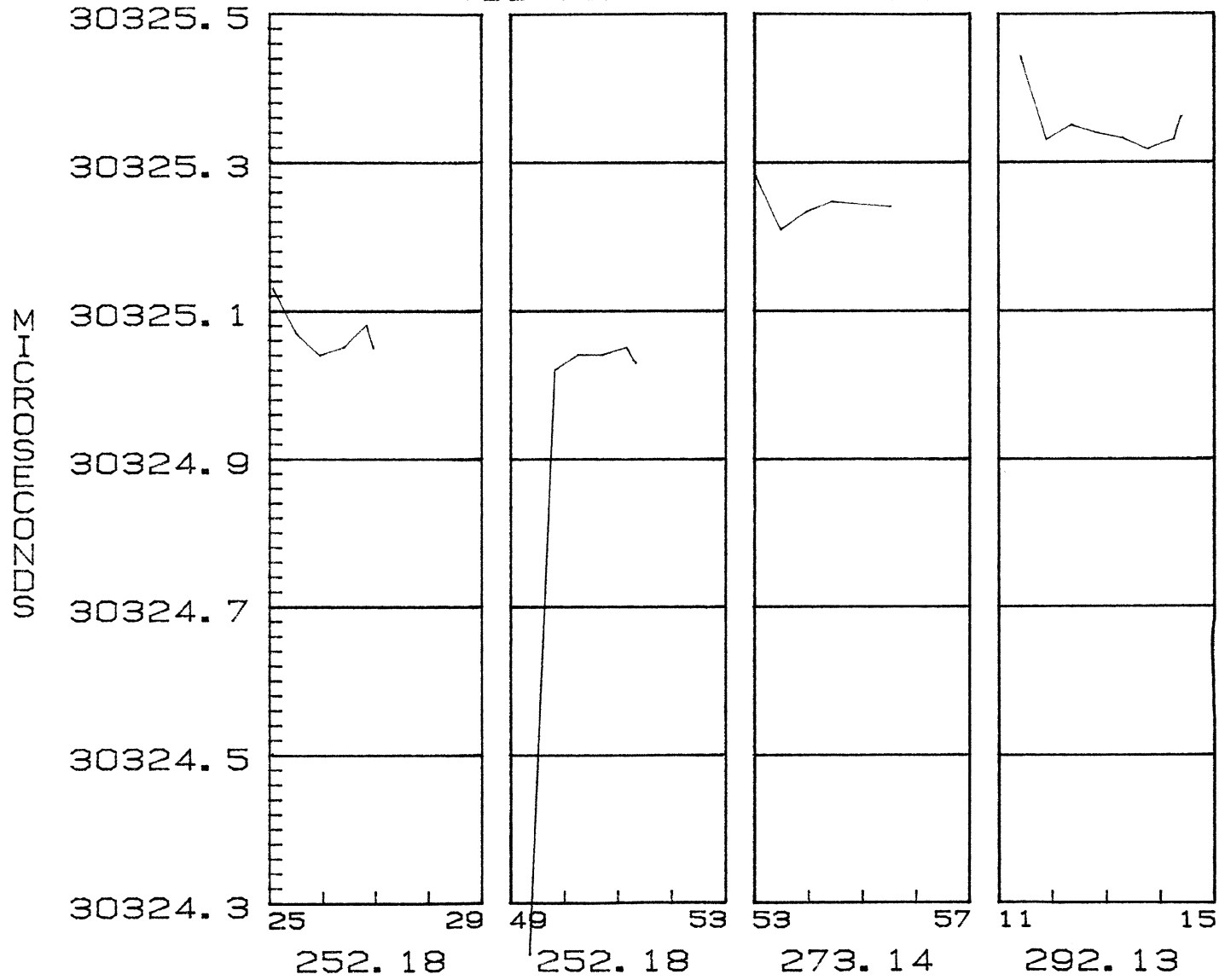
APPENDIX VII.14

PEGGY'S POINT BUOY

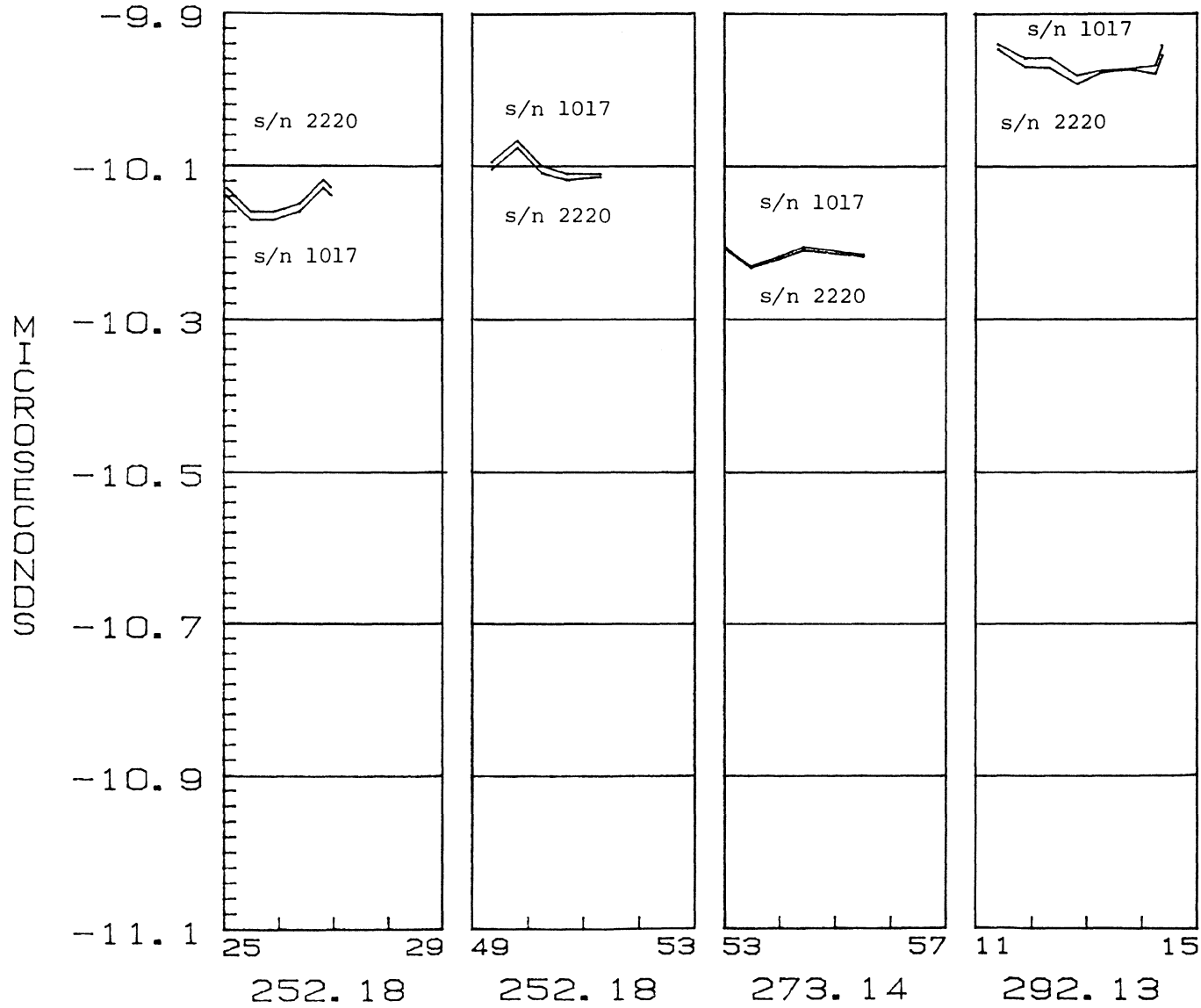
TDA PEGGY PT. B. HELICOPTER DATA



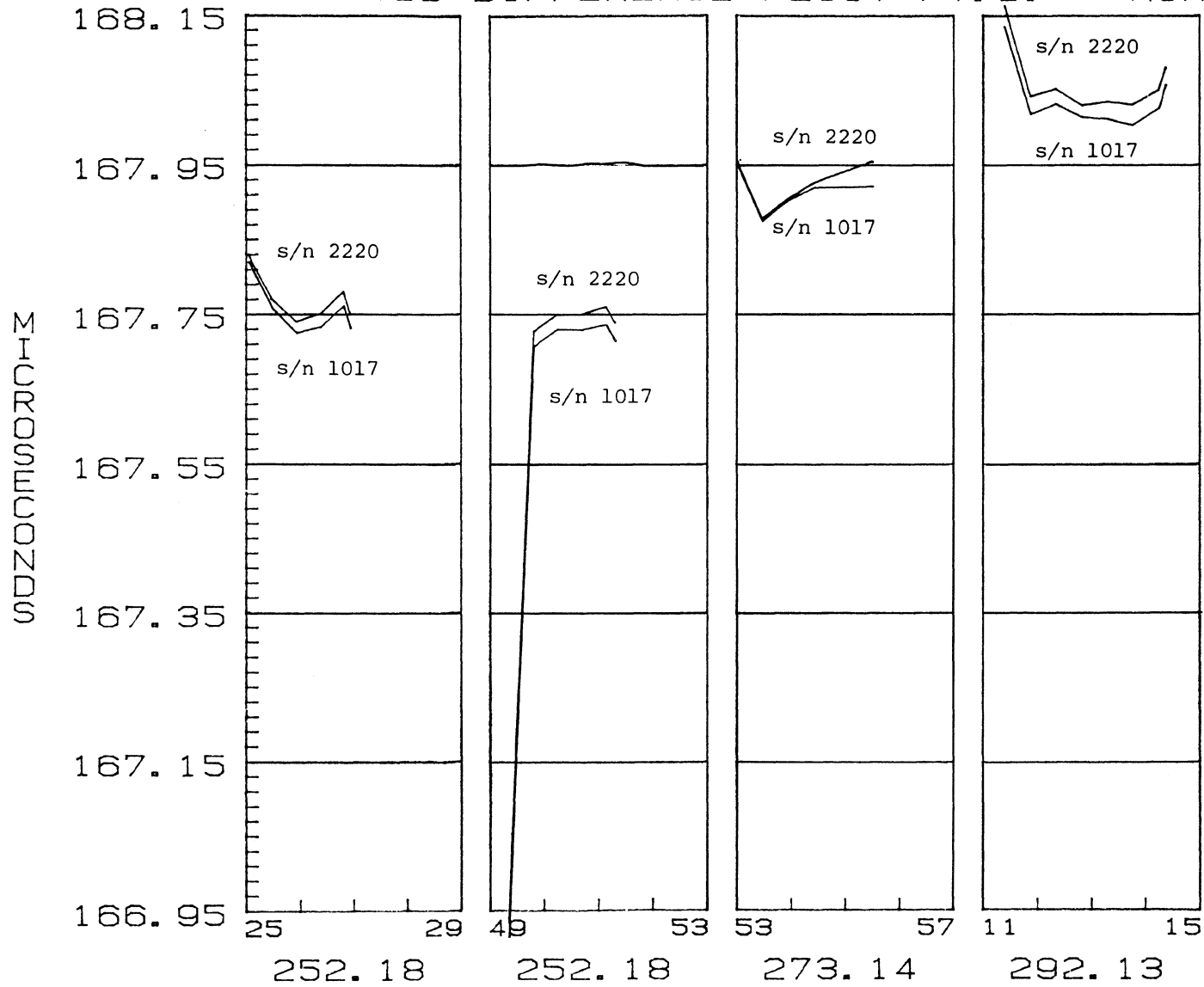
TDB PEGGY PT. B. HELICOPTER DATA



TDA DIFFERENCE PEGGY PT. B. - MONITOR



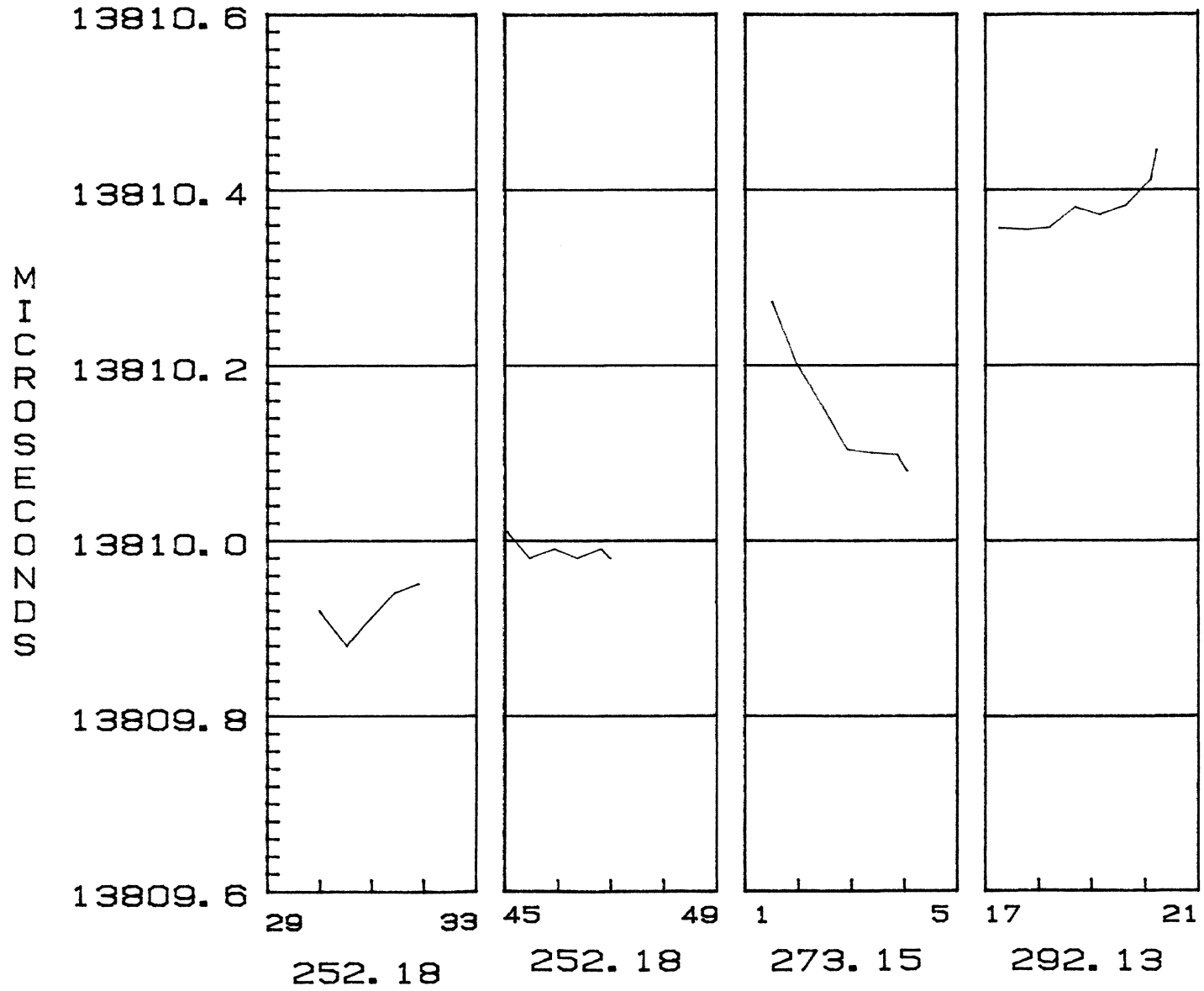
TDB DIFFERENCE PEGGY PT. B. - MONITOR



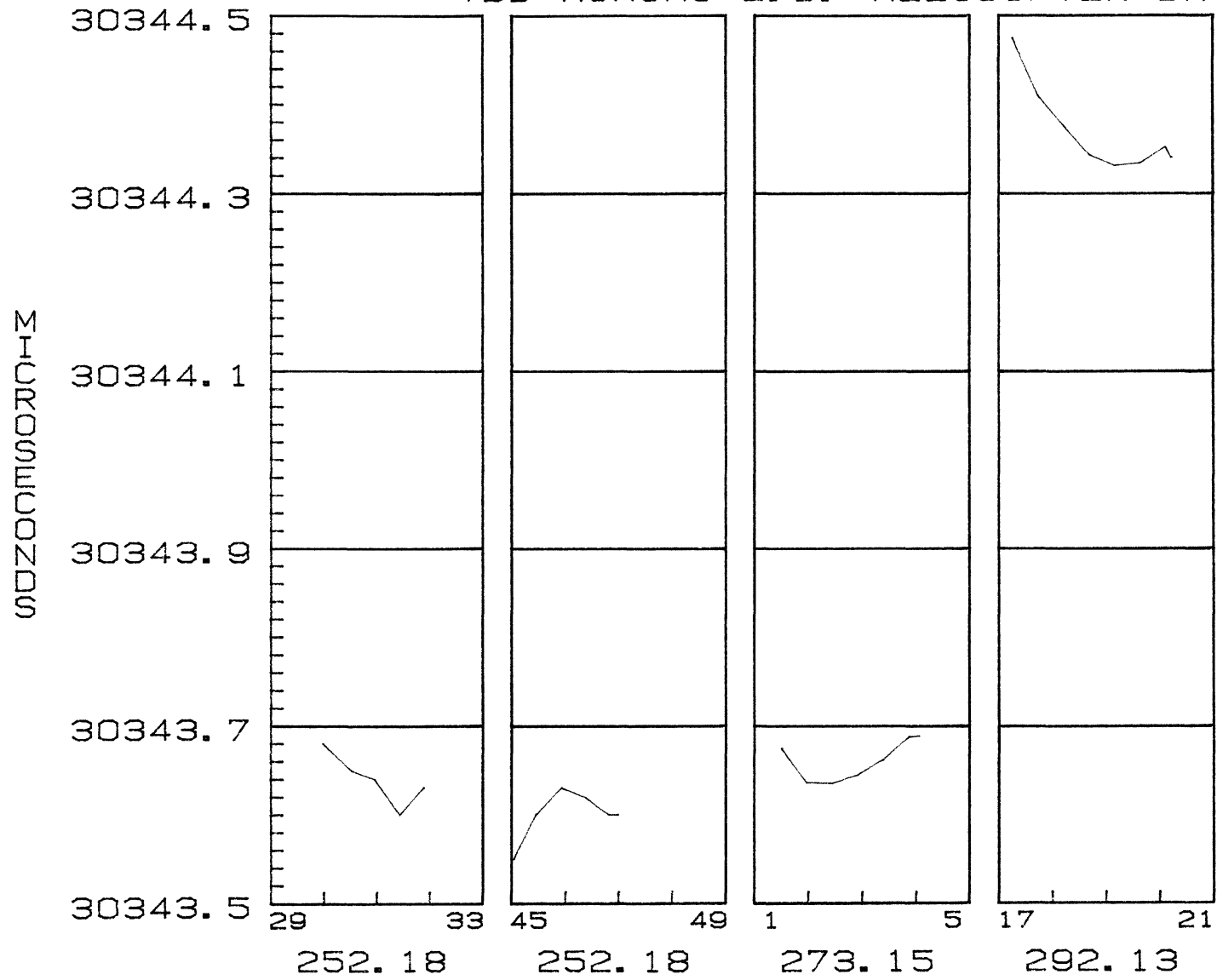
APPENDIX VII.15

HORSESHOE LEDGE BUOY

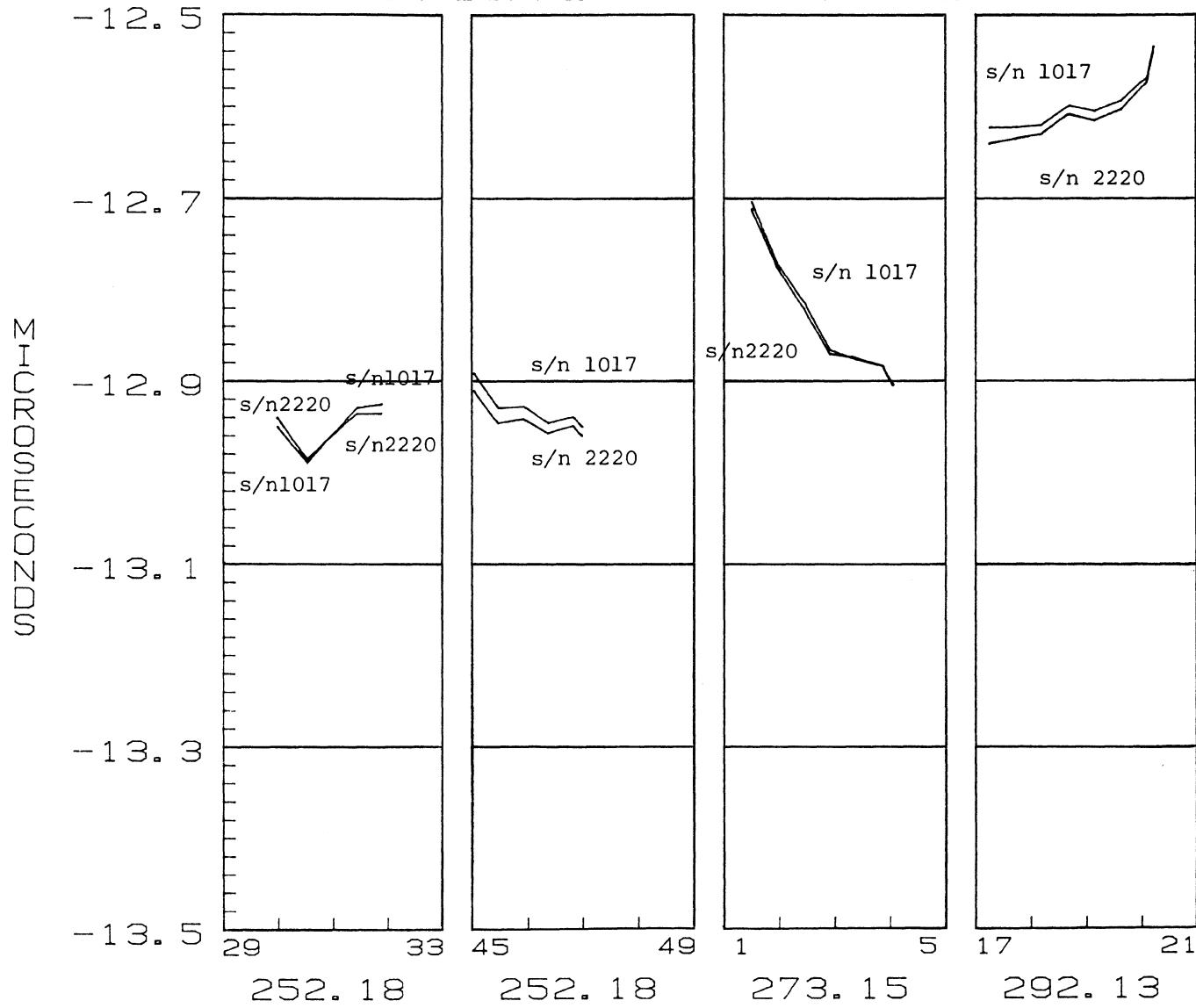
TDA HORSHO L. B. HELICOPTER DATA



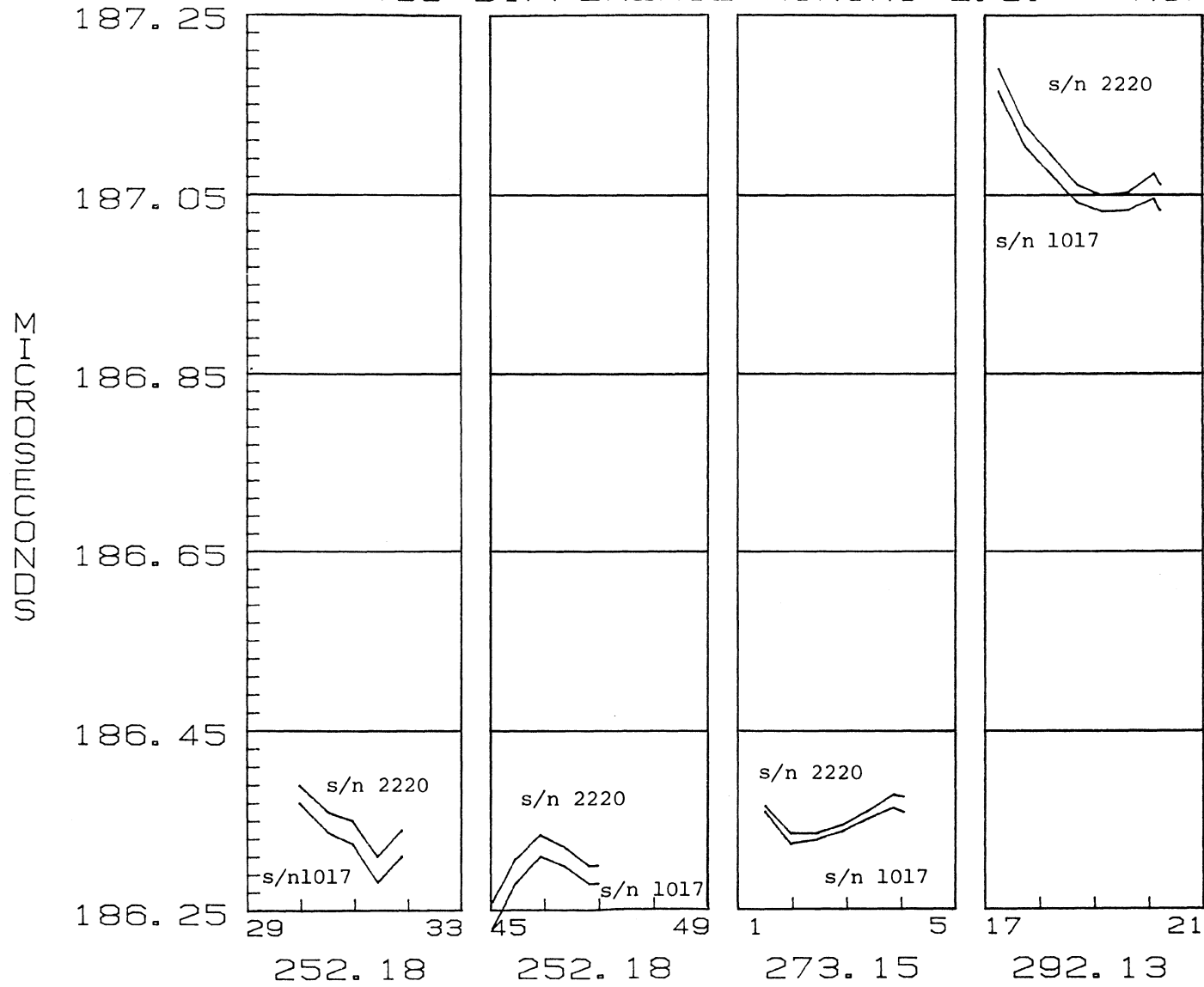
TDB HORSHO L. B. HELICOPTER DATA



TDA DIFFERENCE HORSHO L. B. - MONITOR



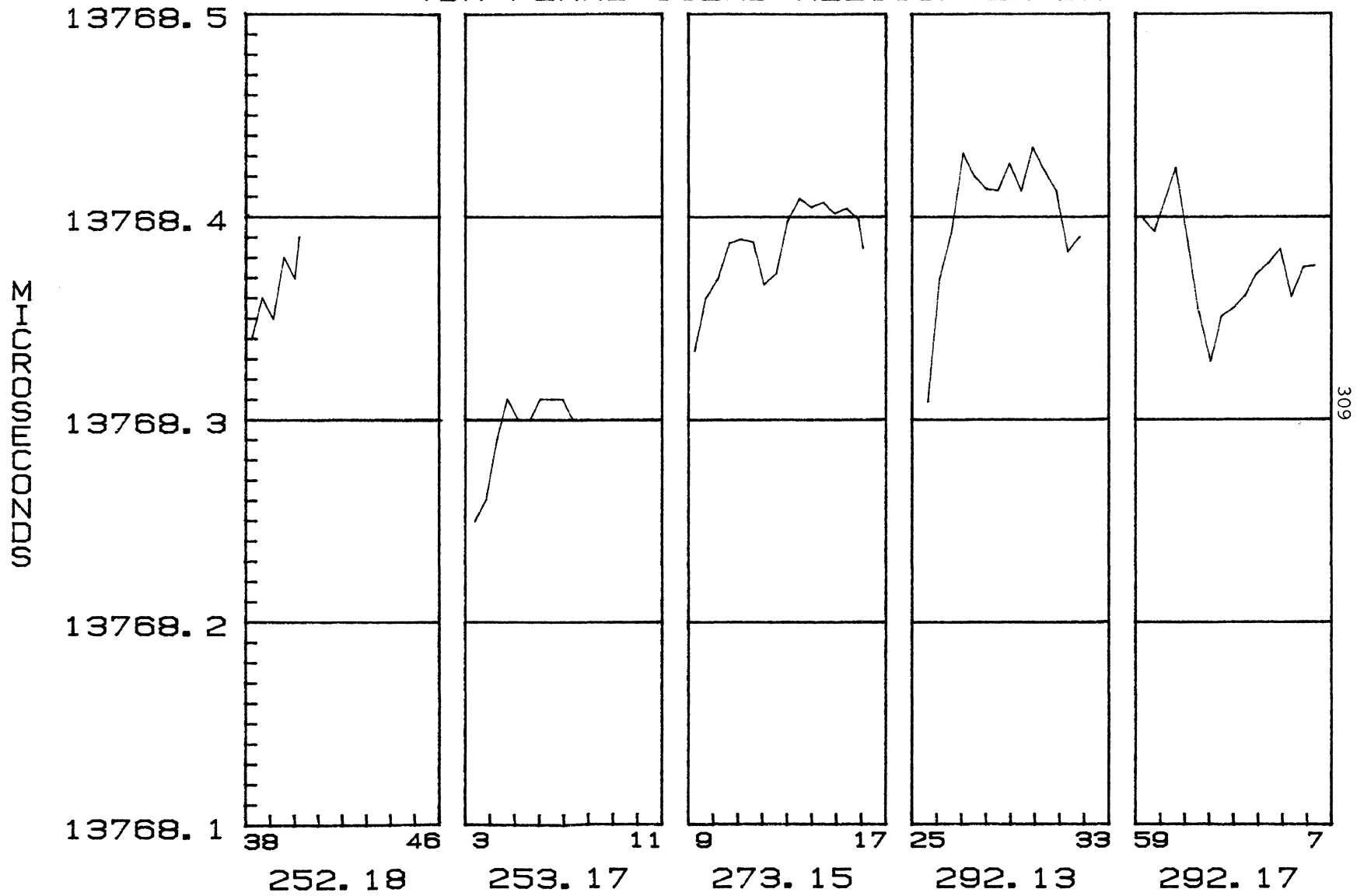
TDB DIFFERENCE HORSHO L. B. - MONITOR



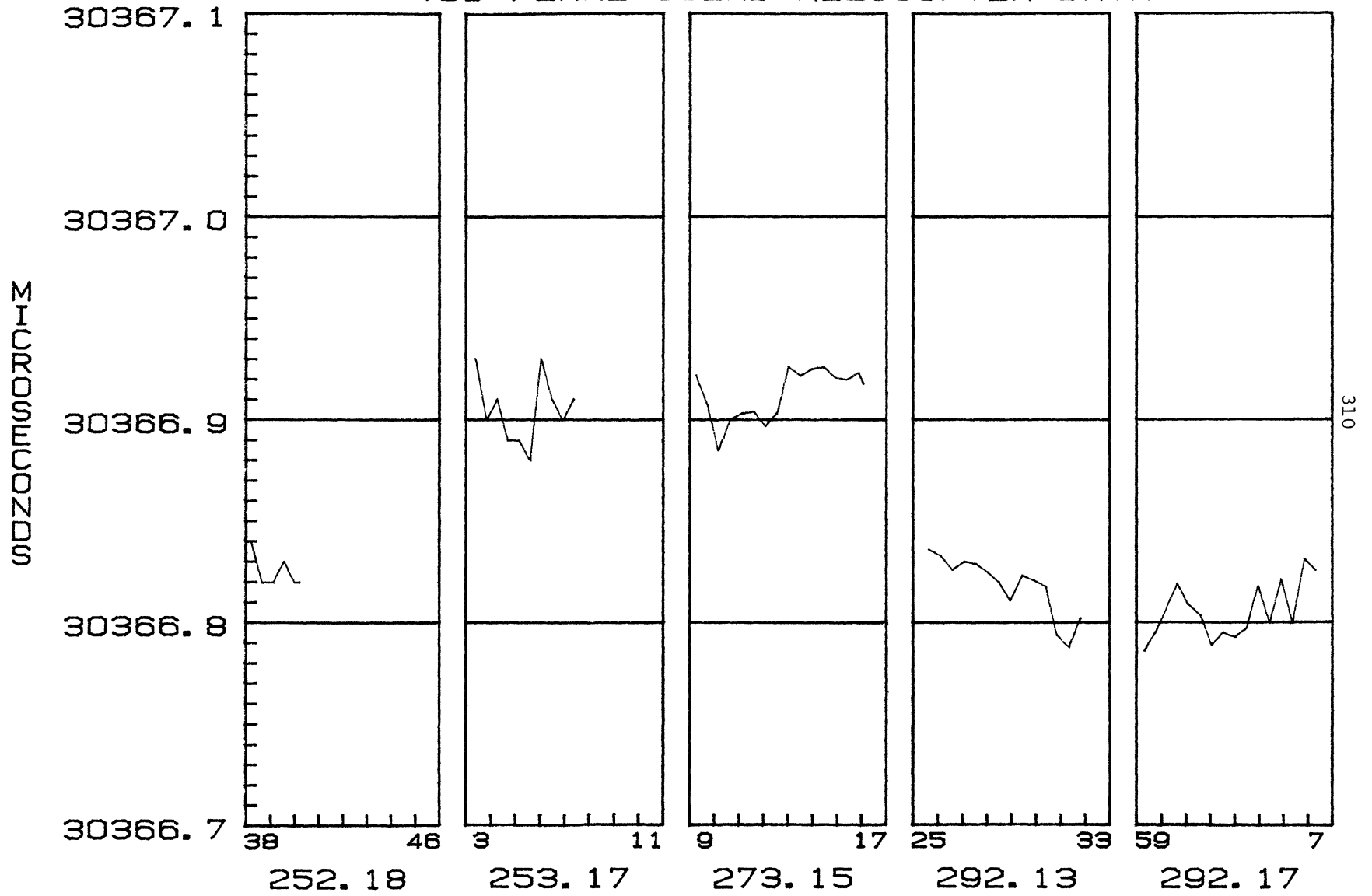
APPENDIX VII.16

PEARL ISLAND LIGHT

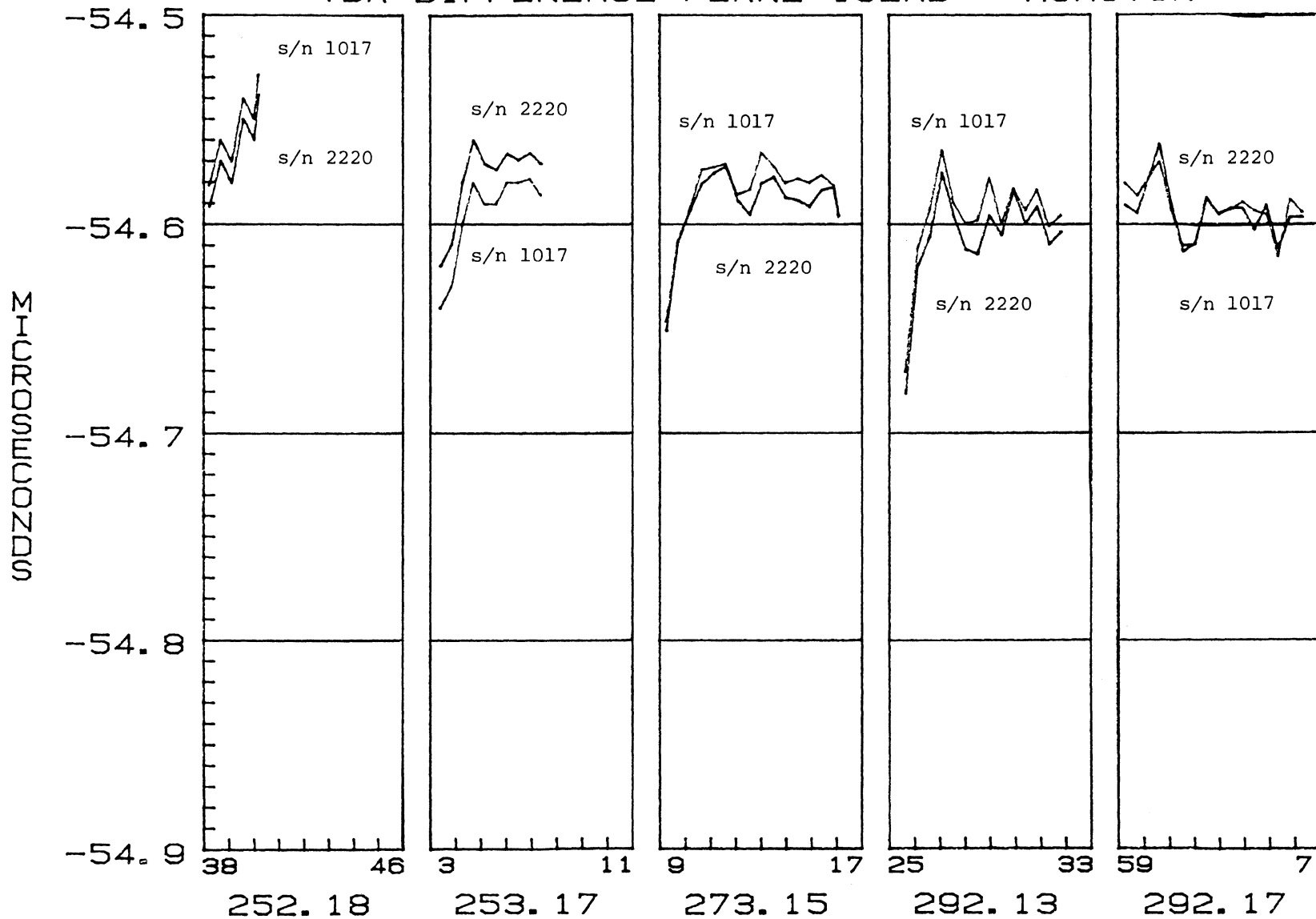
TDA PEARL ISLND HELICOPTER DATA



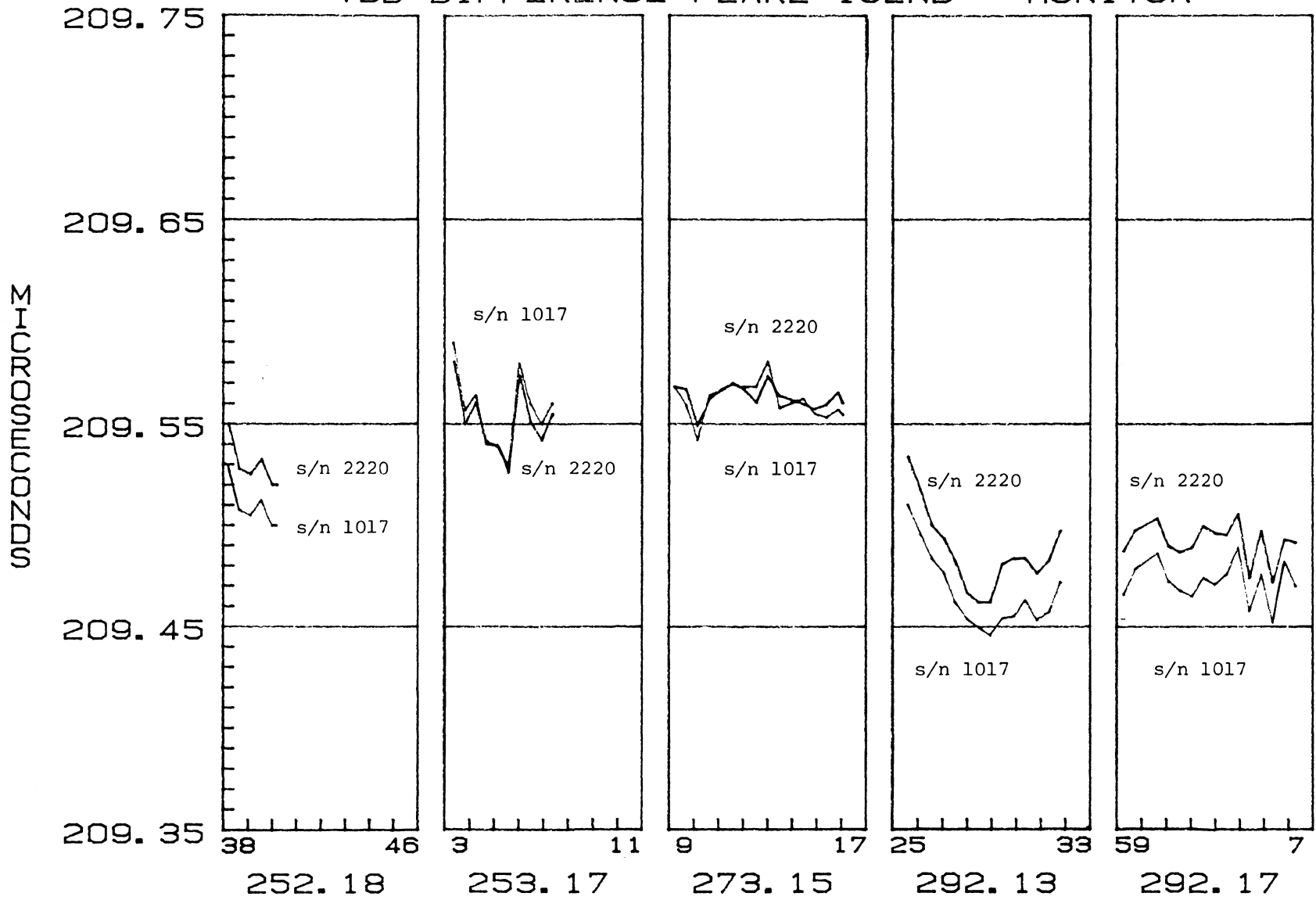
TDB PEARL ISLND HELICOPTER DATA



TDA DIFFERENCE PEARL ISLND - MONITOR



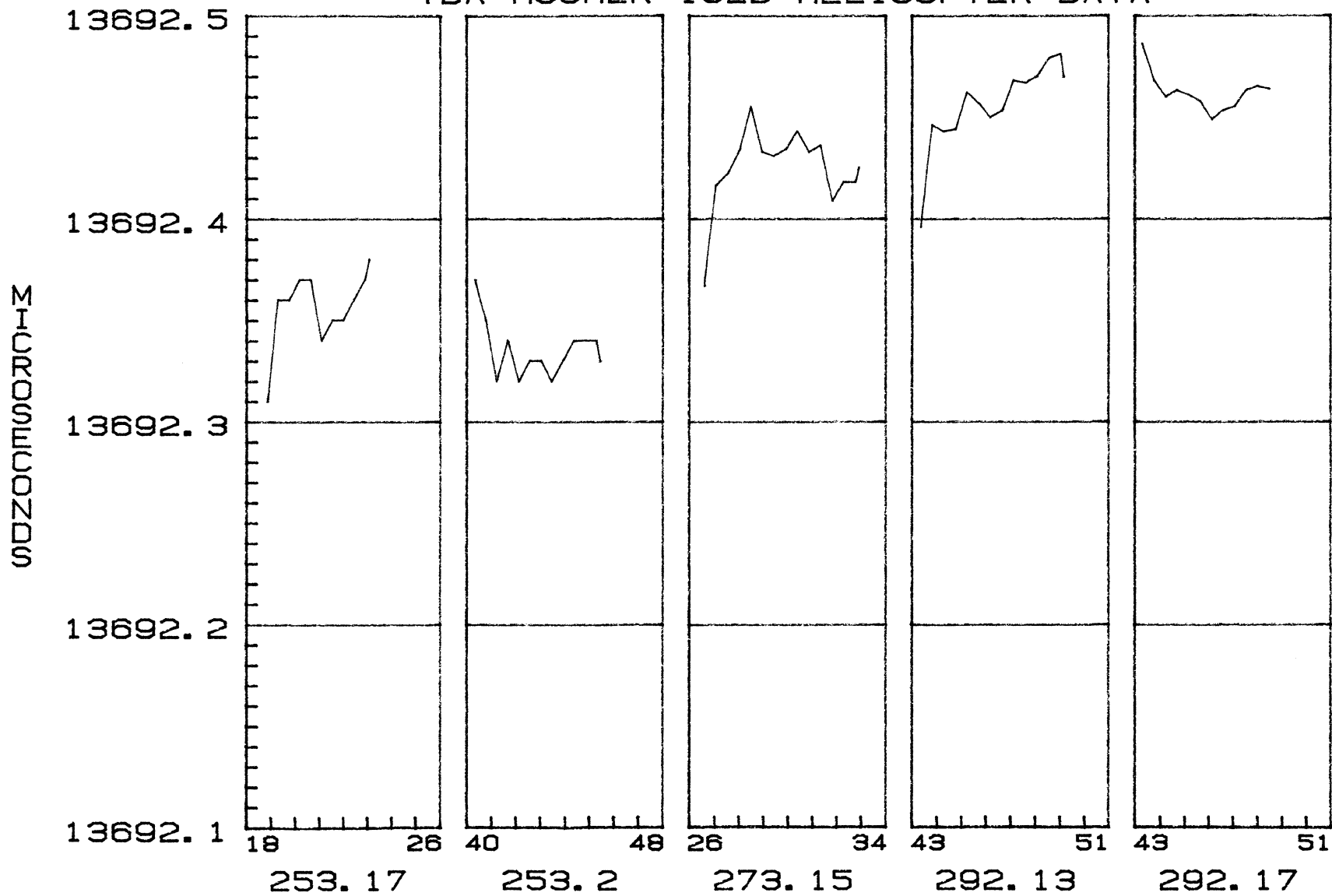
TDB DIFFERENCE PEARL ISLAND - MONITOR



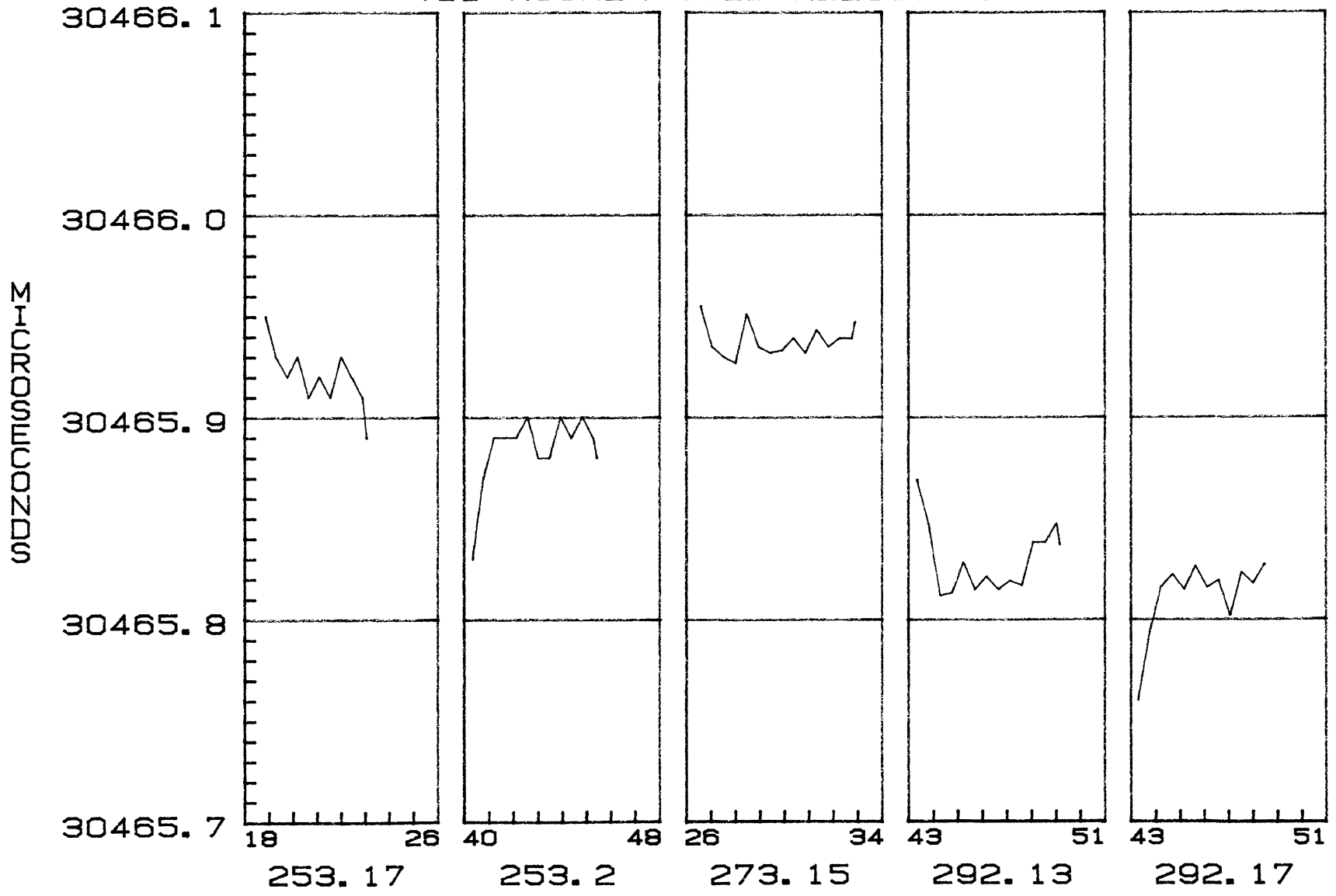
APPENDIX VII.17

MOSHER ISLAND LIGHT

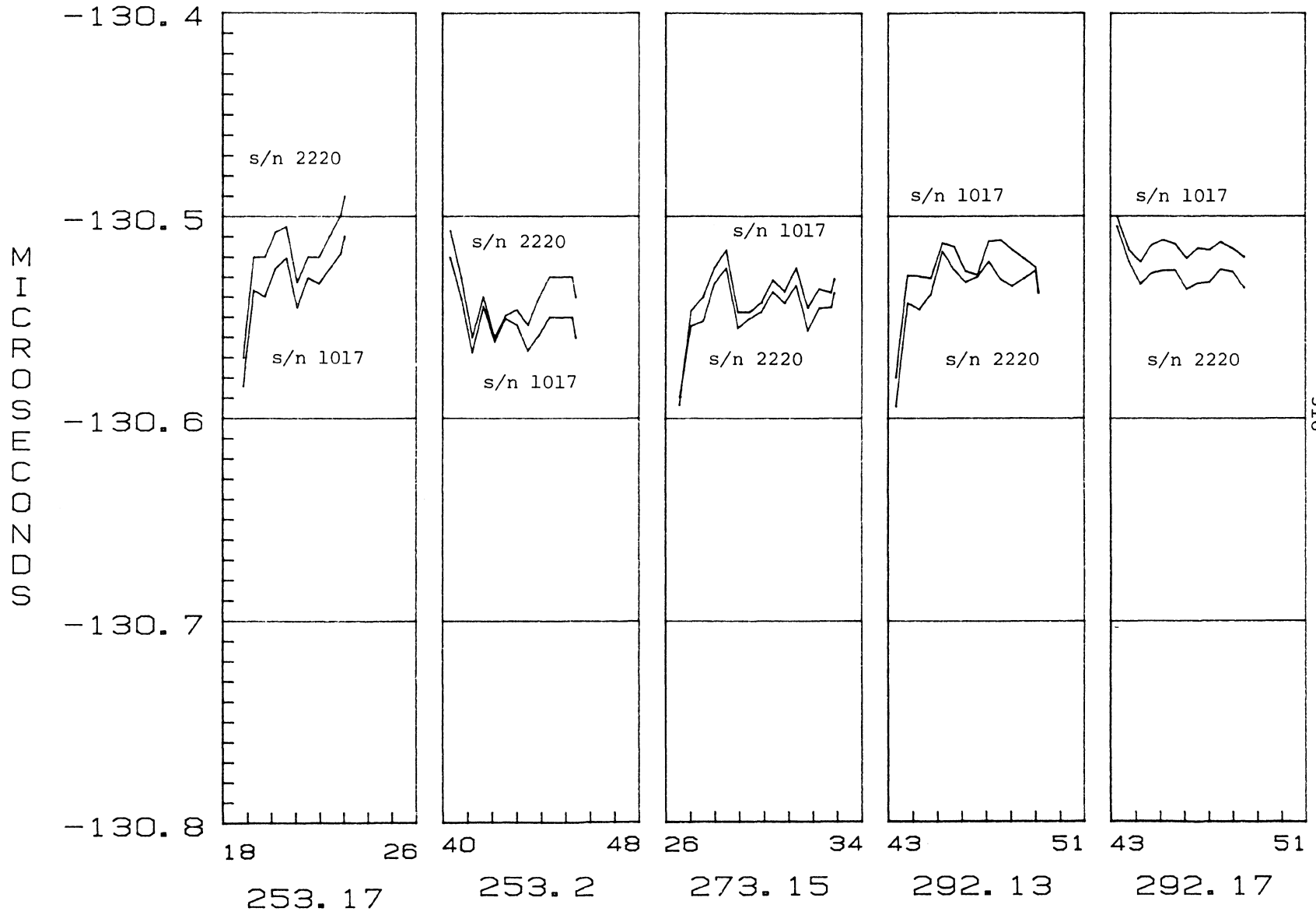
TDA MOSHER ISLD HELICOPTER DATA



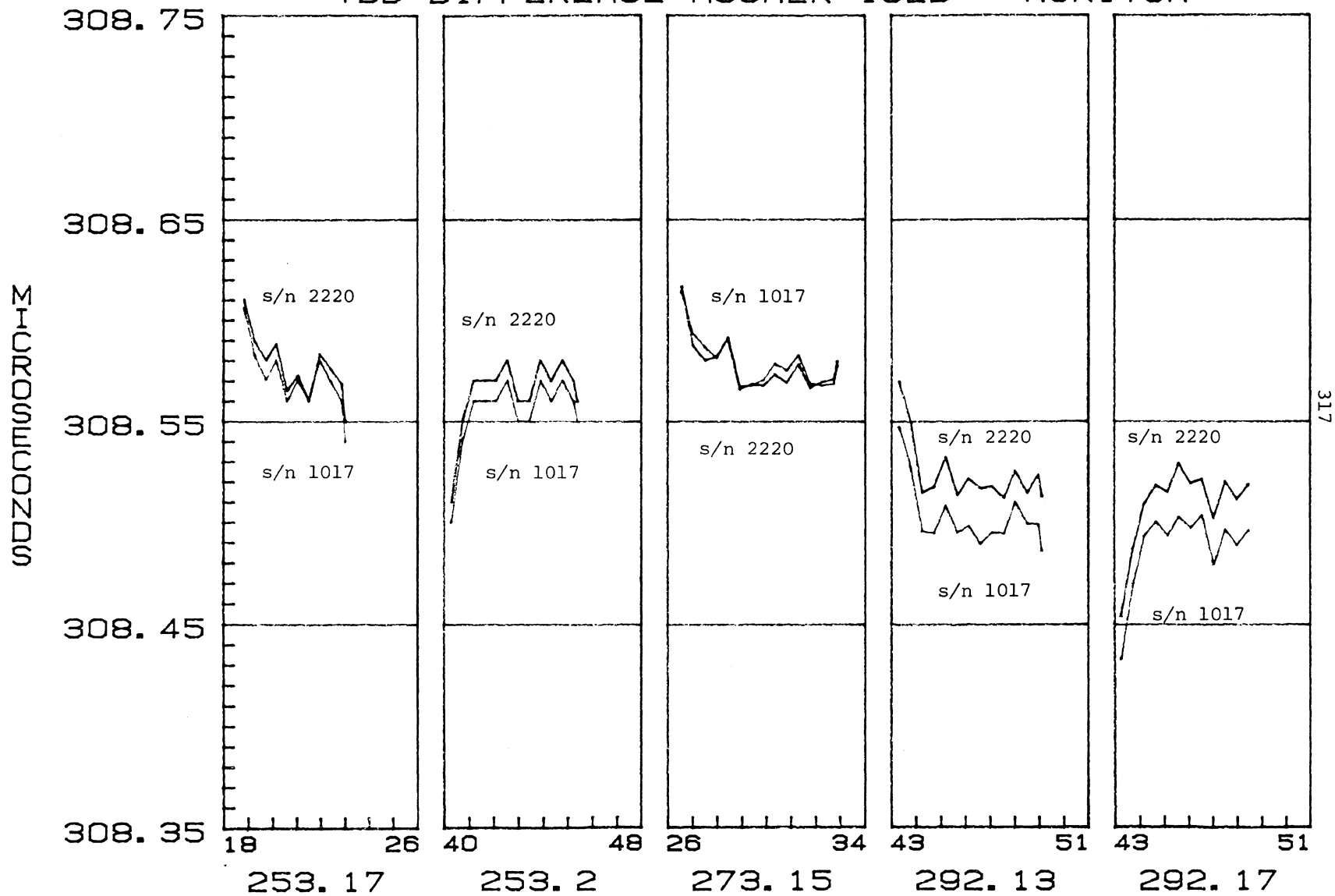
TDB MOSHER ISLD HELICOPTER DATA



TDA DIFFERENCE MOSHER ISLD - MONITOR



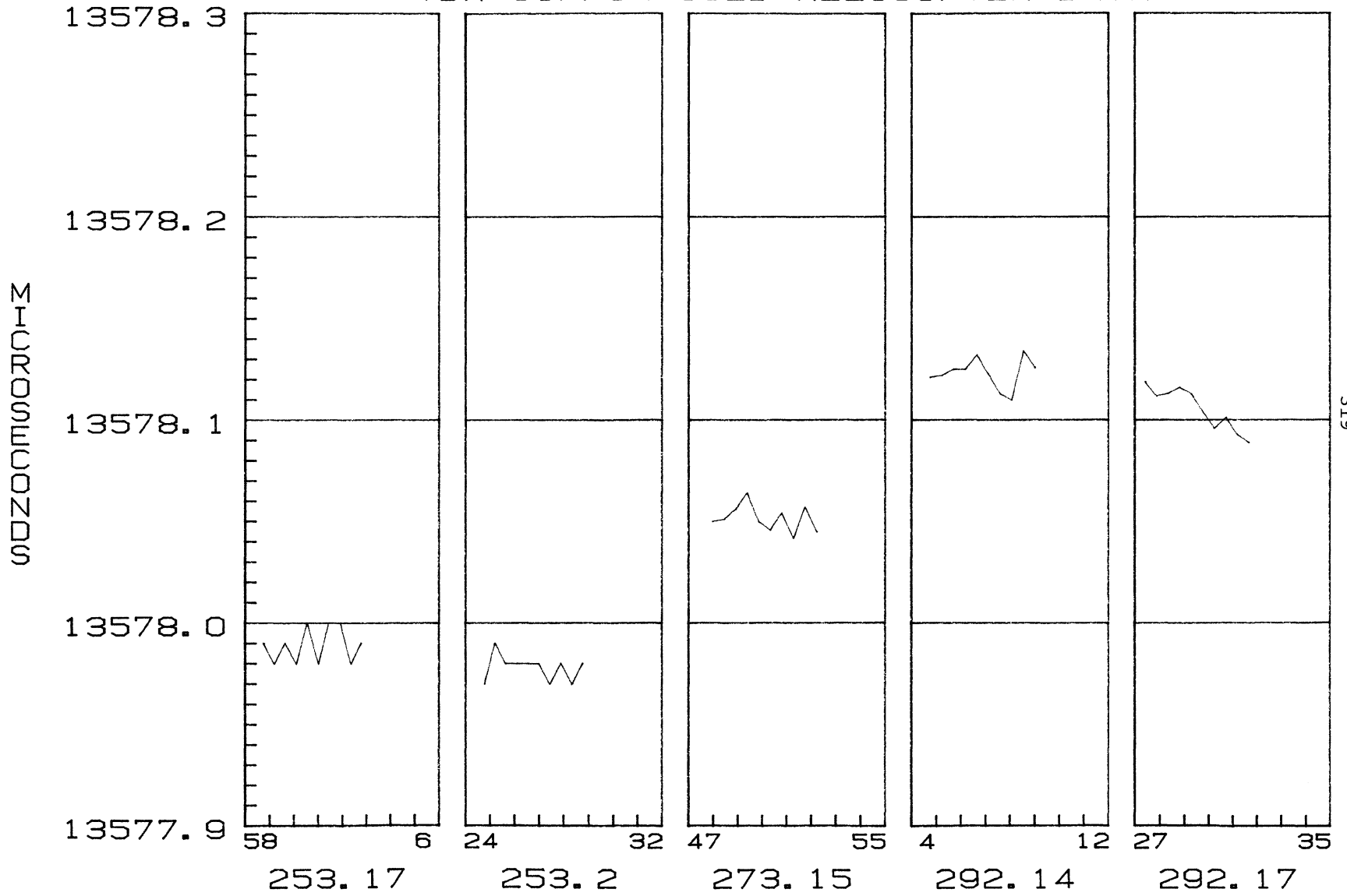
TDB DIFFERENCE MOSHER ISLD - MONITOR



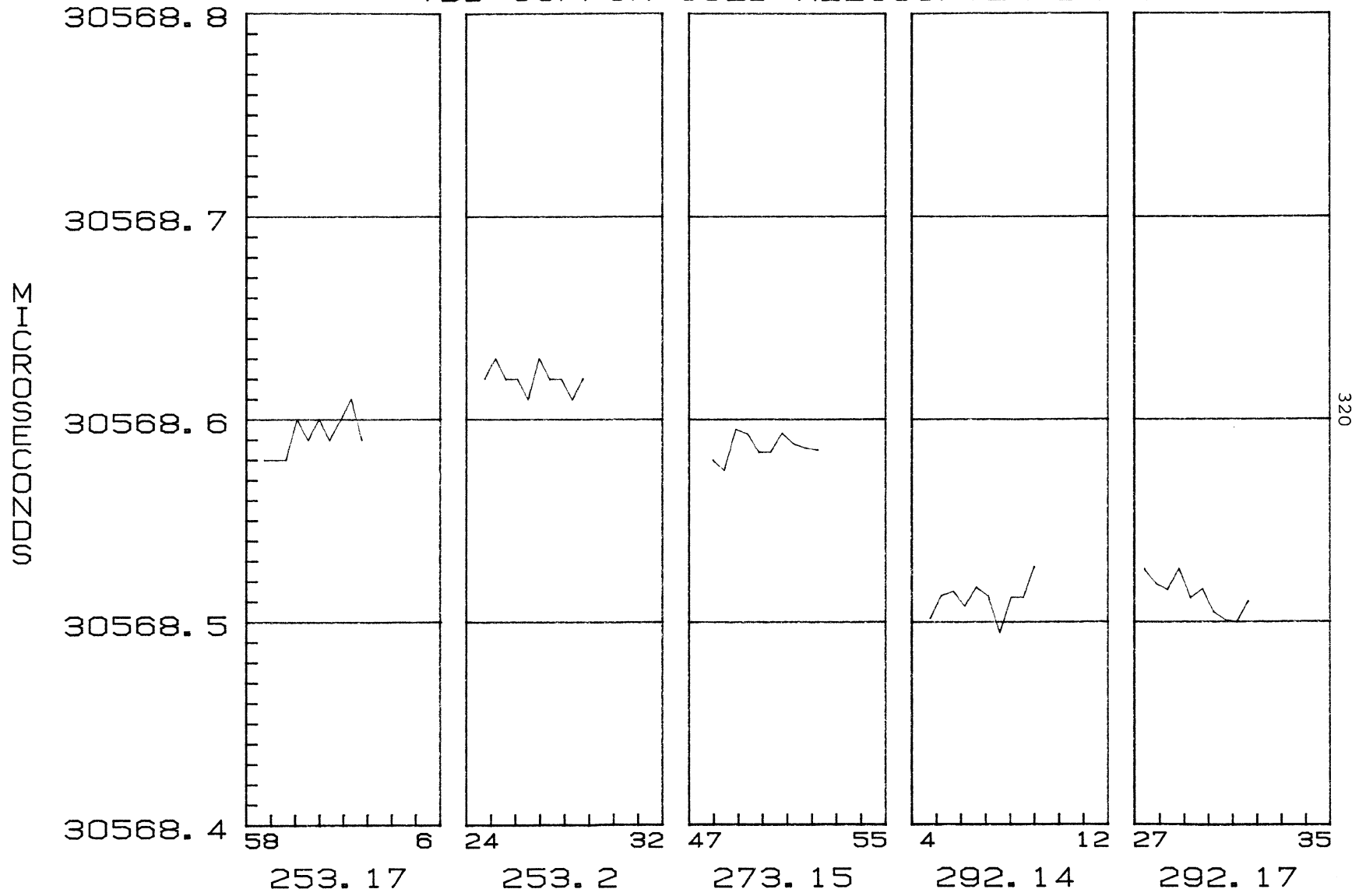
APPENDIX VII.18

COFFIN ISLAND LIGHT

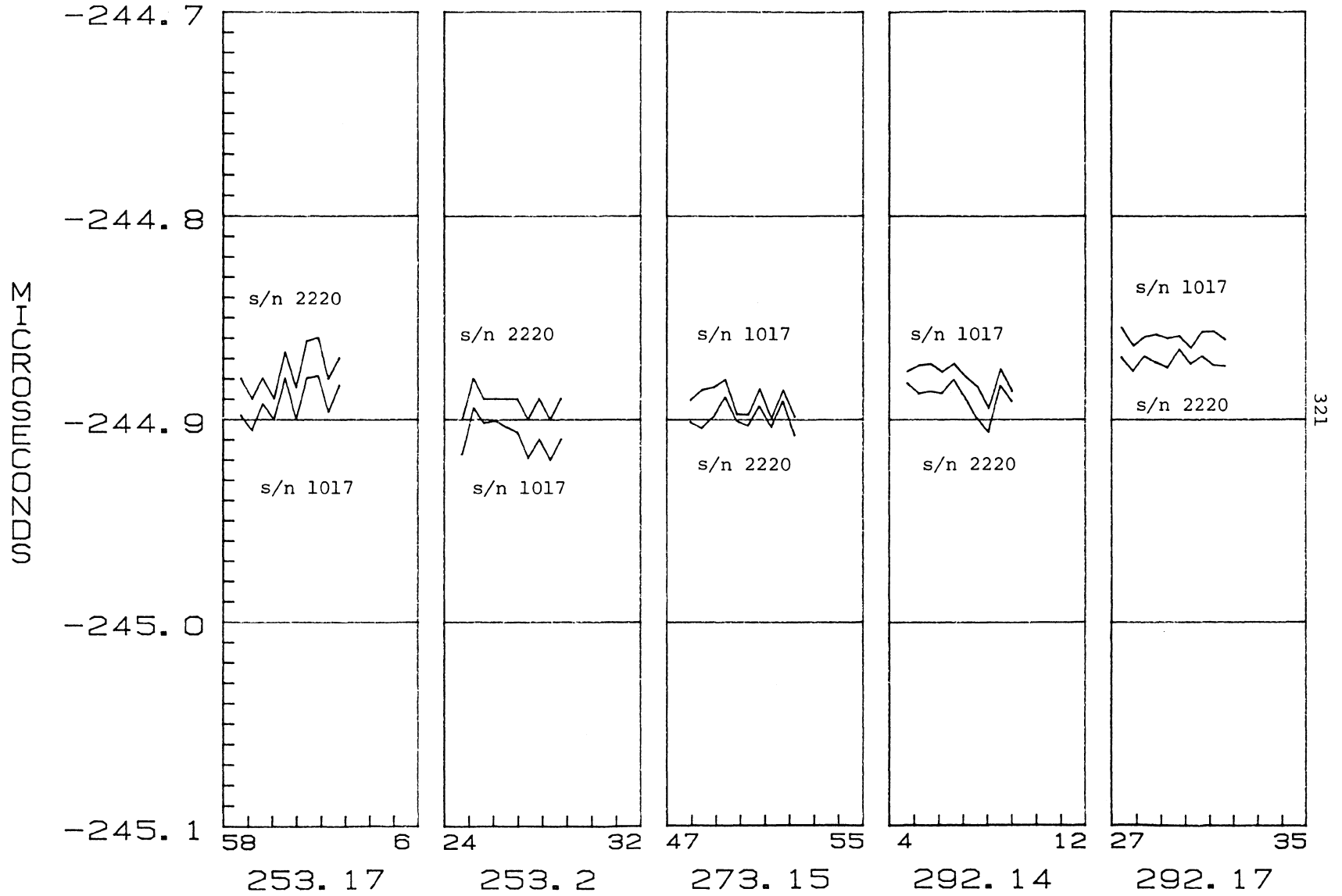
TDA COFFIN ISLD HELICOPTER DATA



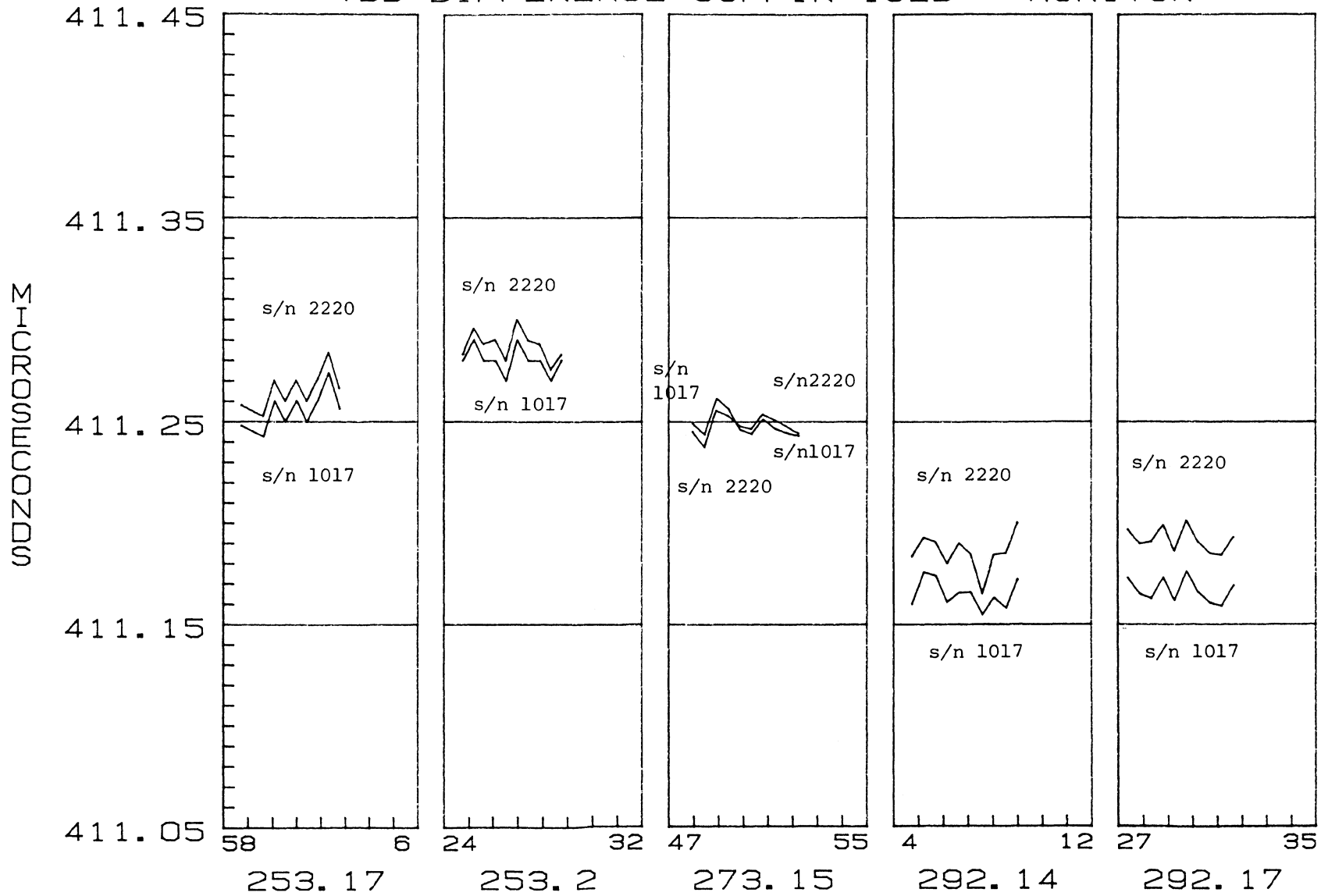
TDB COFFIN ISLD HELICOPTER DATA



TDA DIFFERENCE COFFIN ISLD - MONITOR



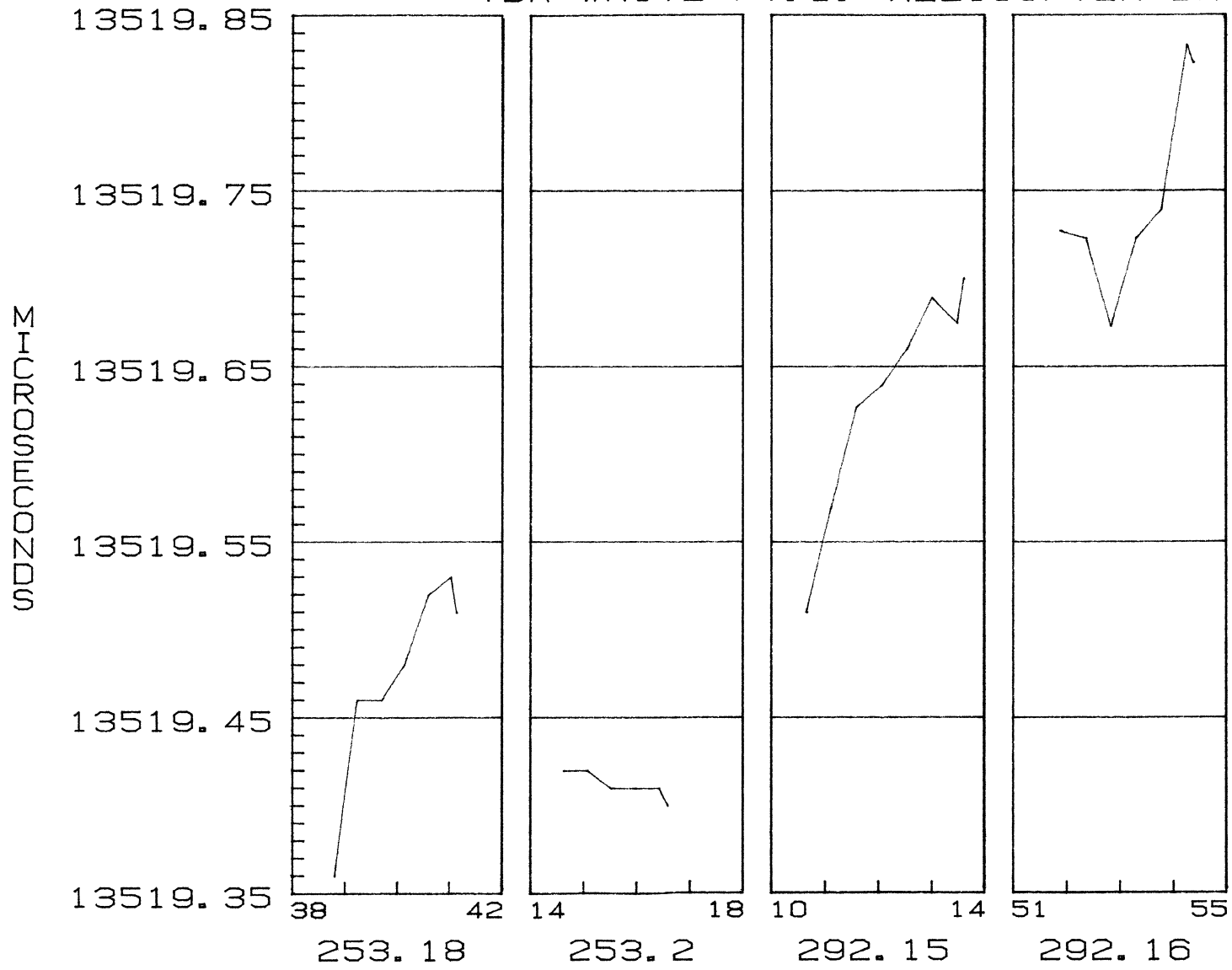
TDB DIFFERENCE COFFIN ISLD - MONITOR



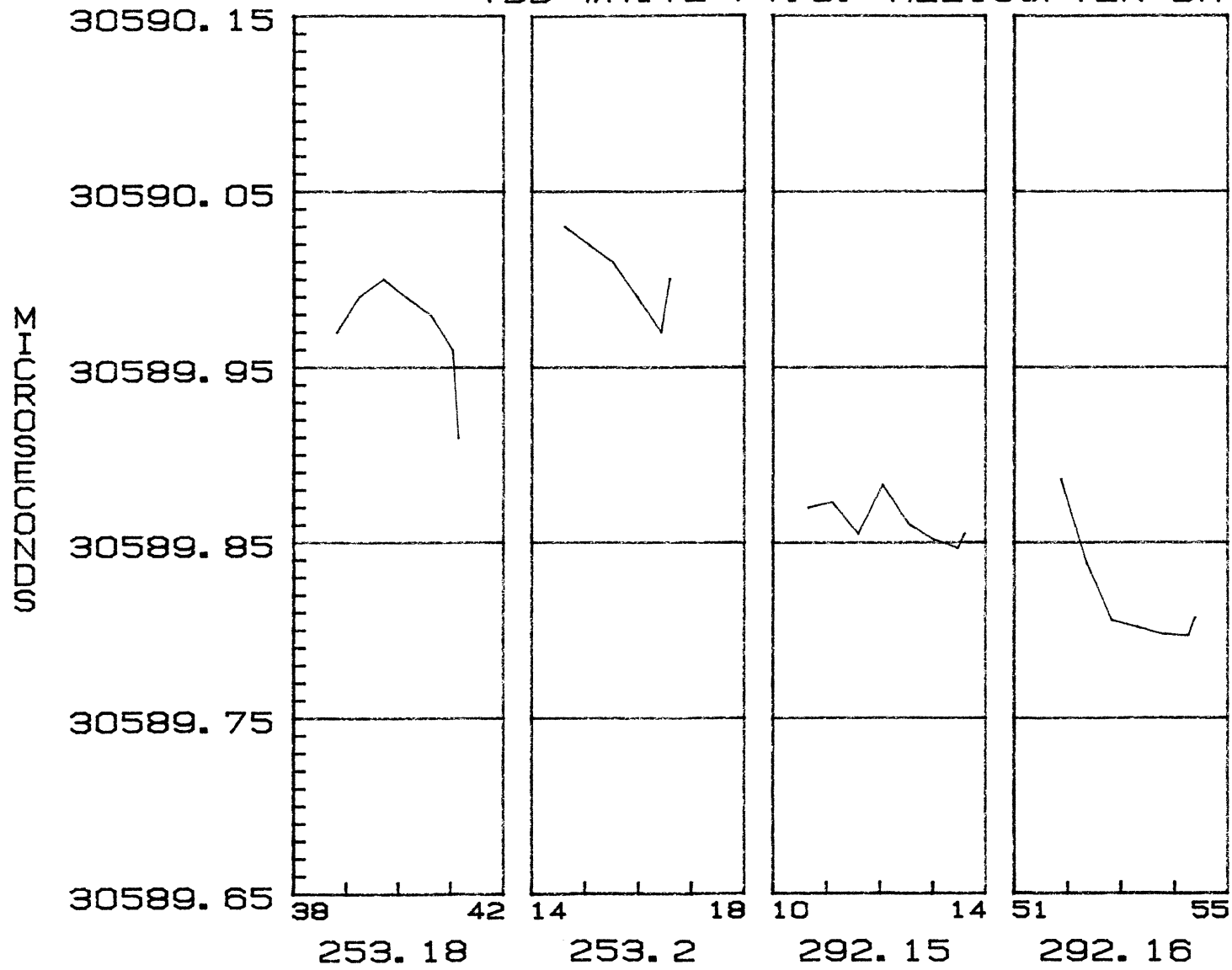
APPENDIX VII.19

WHITE POINT ROCK BUOY

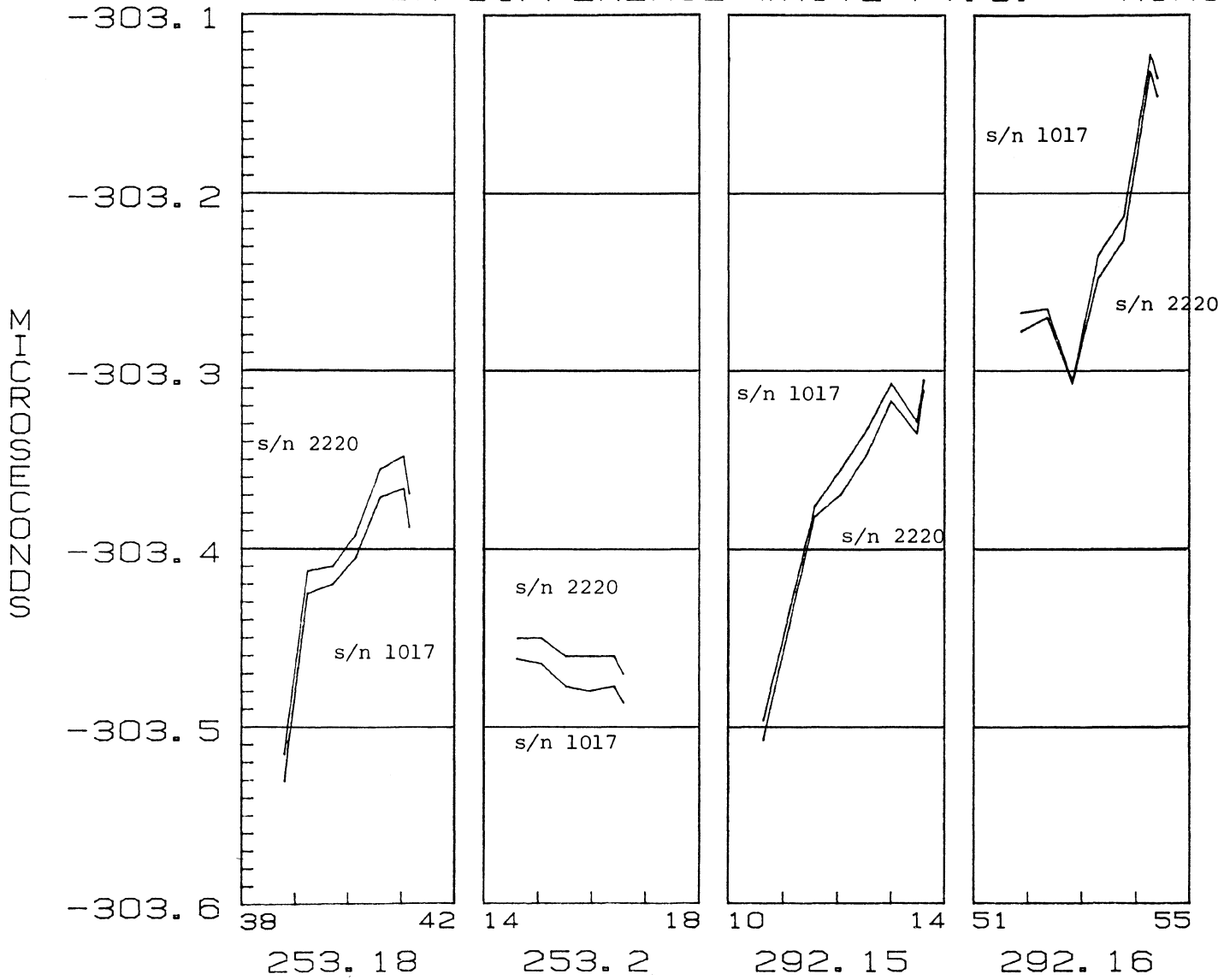
TDA WHITE PT. B. HELICOPTER DATA



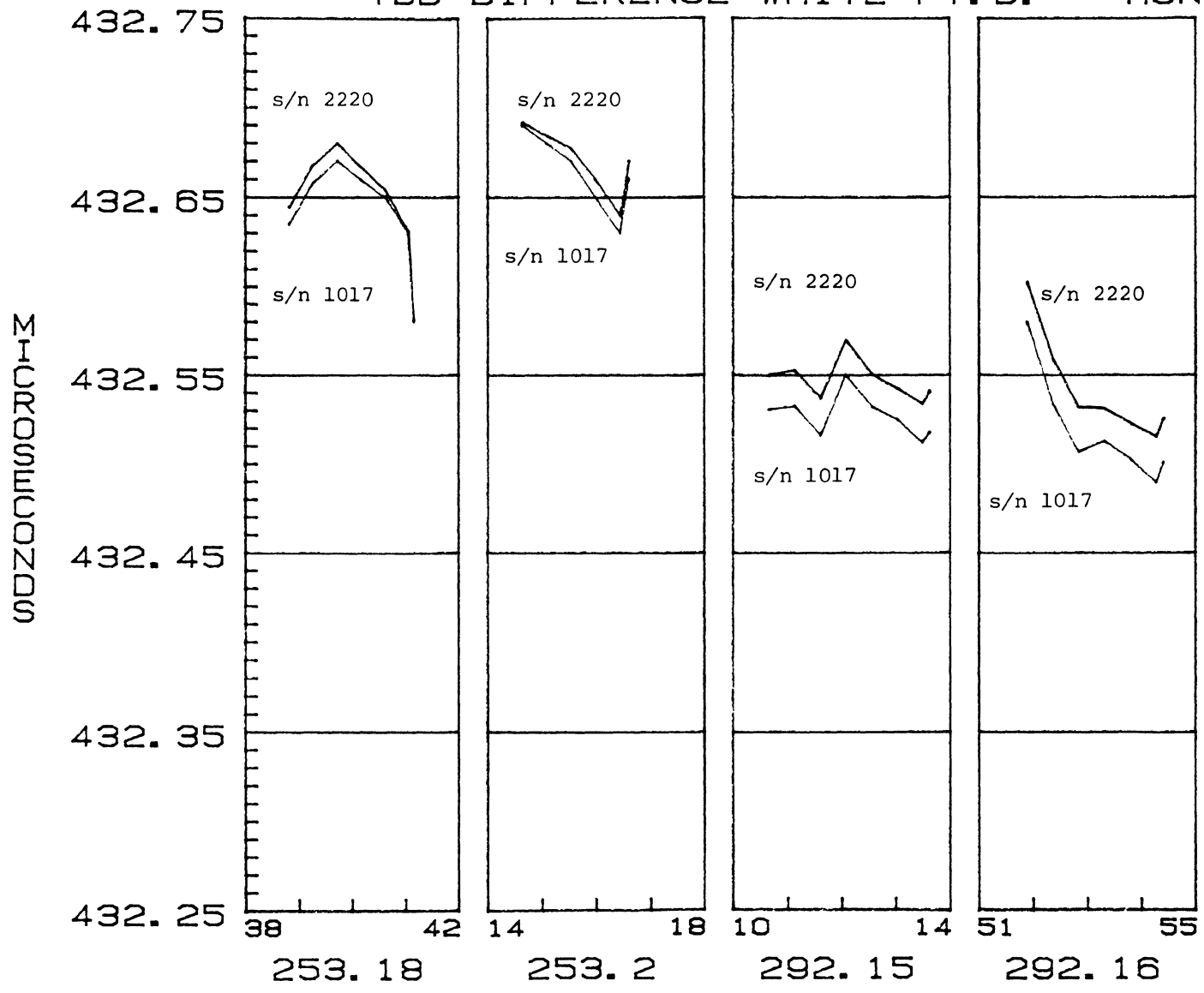
TDB WHITE PT. B. HELICOPTER DATA



TDA DIFFERENCE WHITE PT. B. - MONITOR



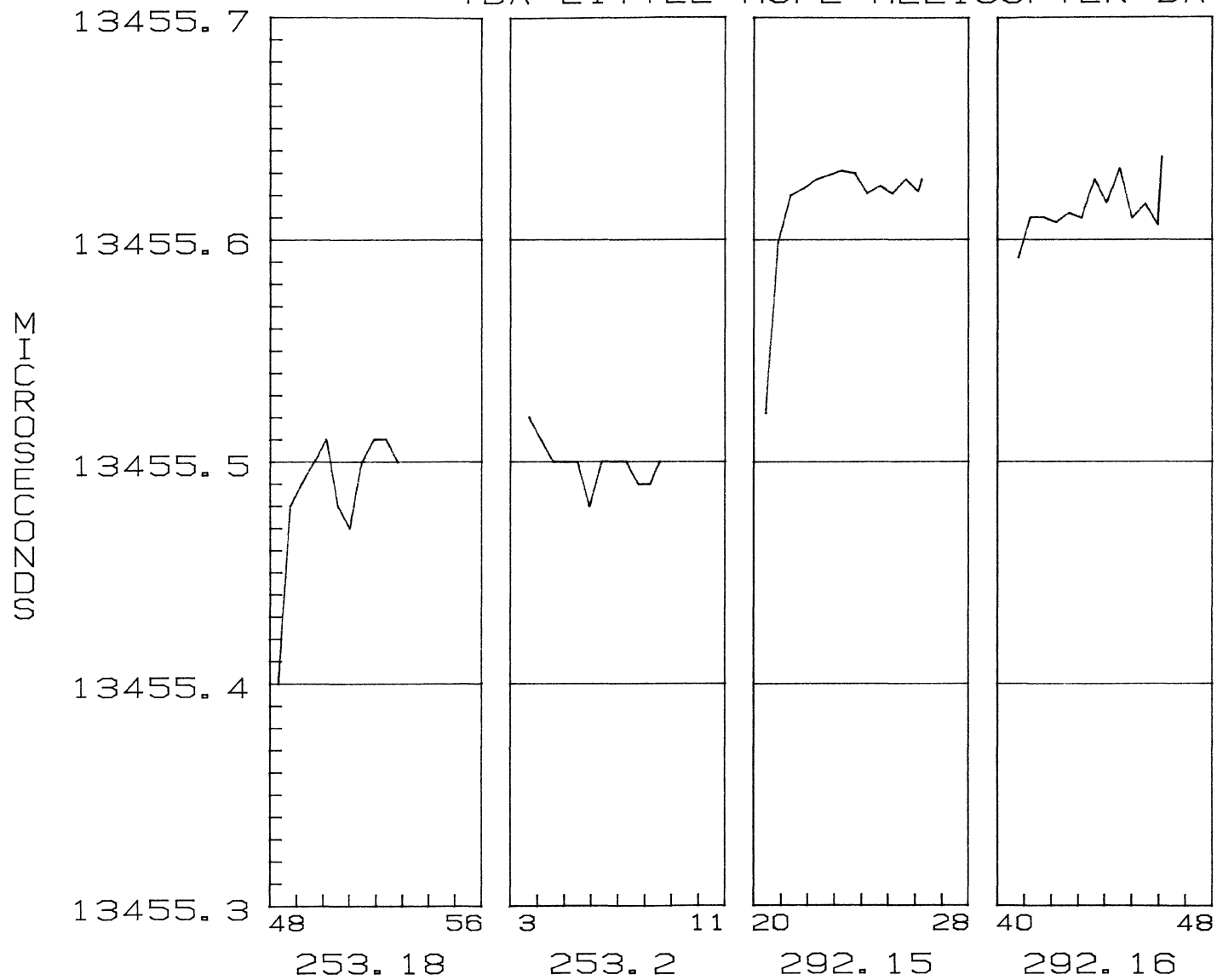
TDB DIFFERENCE WHITE PT. B. - MONITOR



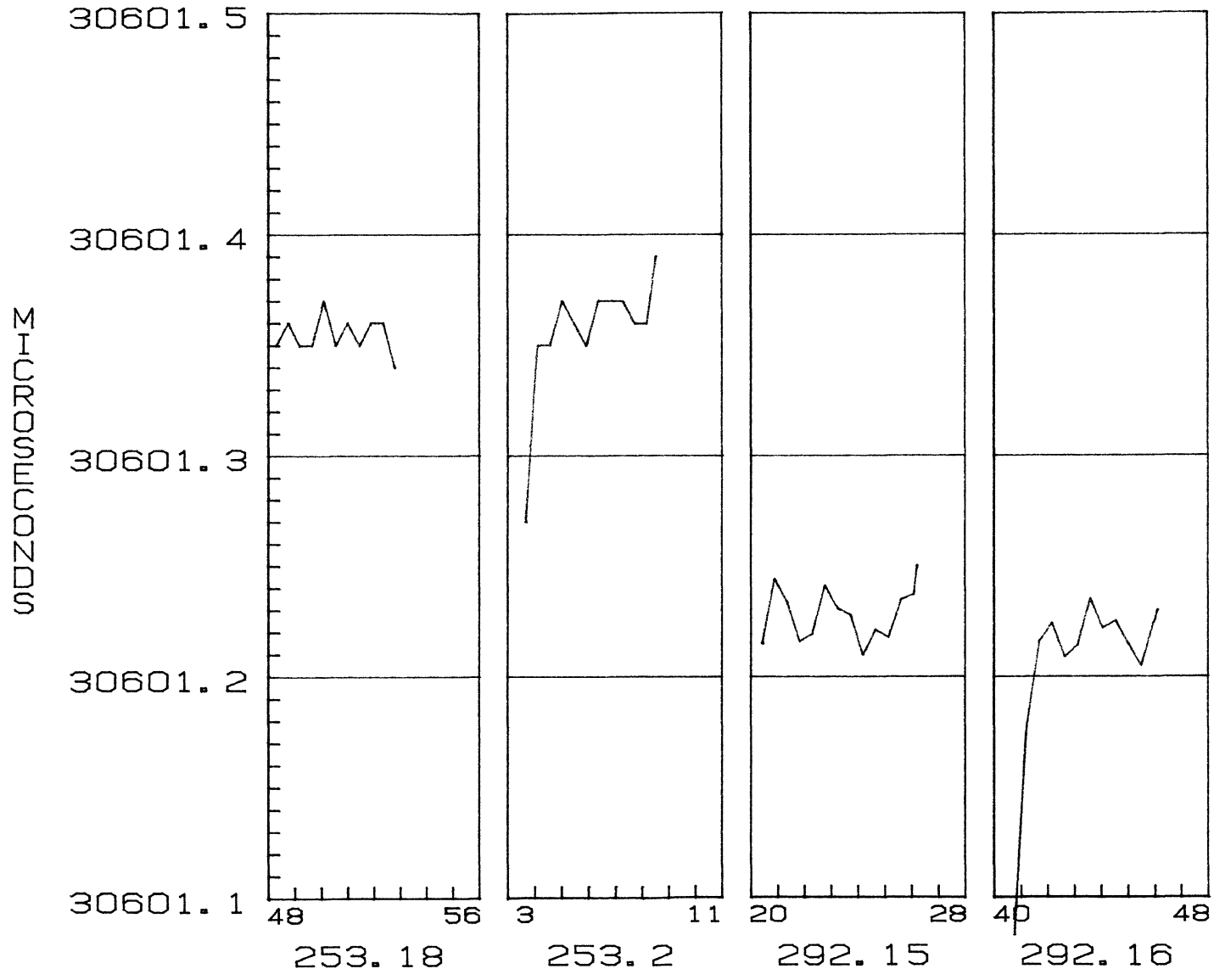
APPENDIX VII.20

LITTLE HOPE ISLAND LIGHT

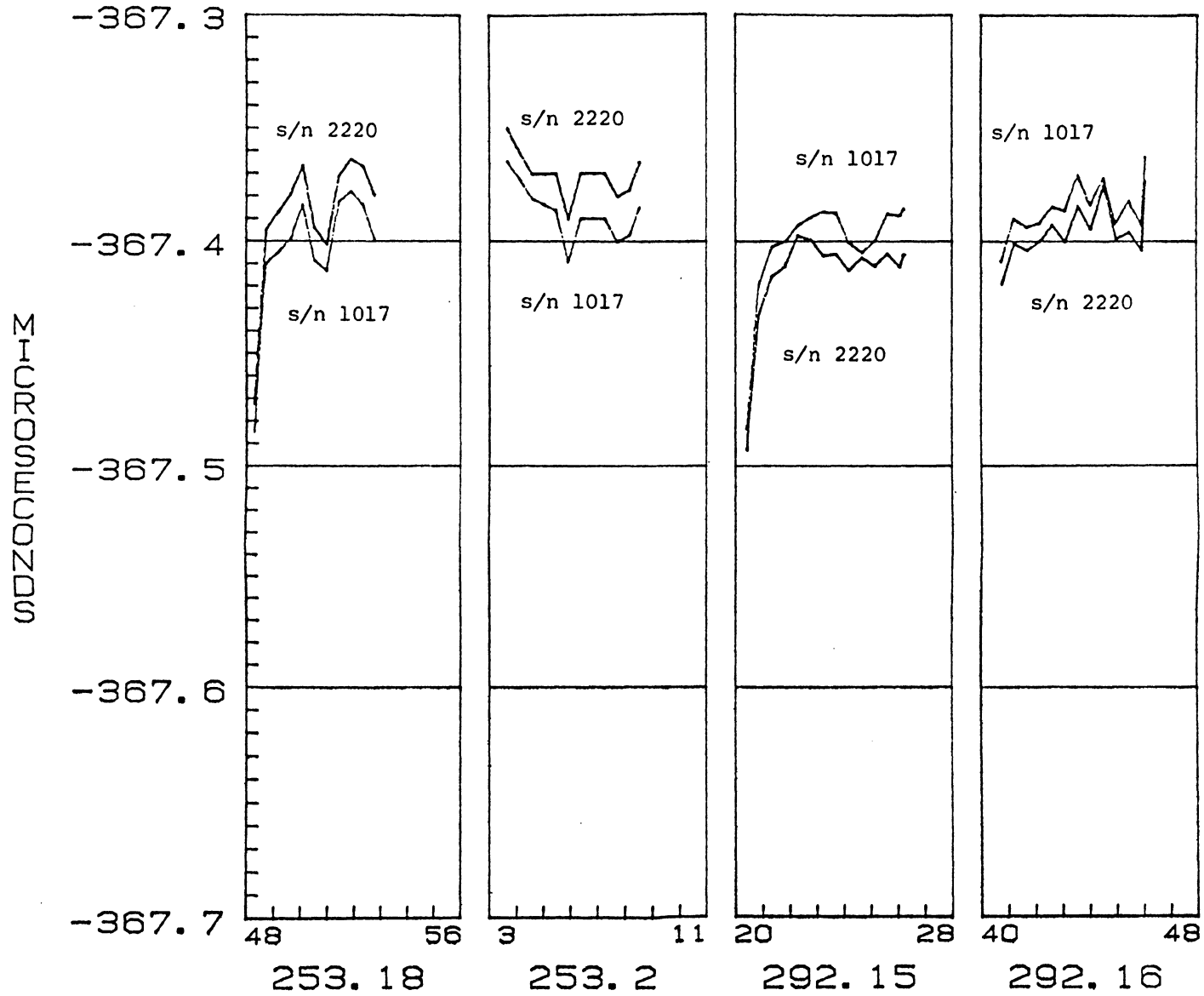
TDA LITTLE HOPE HELICOPTER DATA



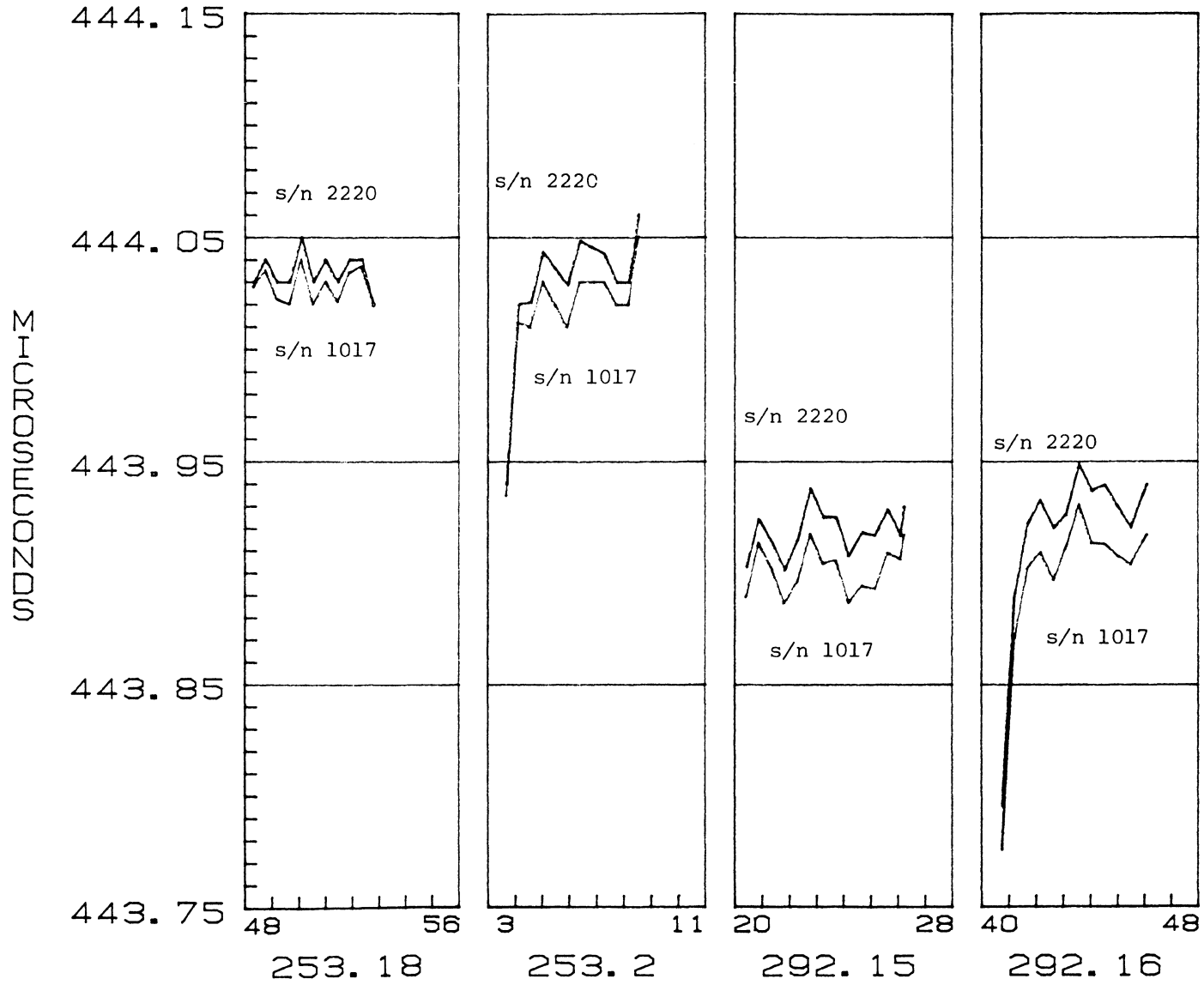
TDB LITTLE HOPE HELICOPTER DATA



TDA DIFFERENCE LITTLE HOPE - MONITOR



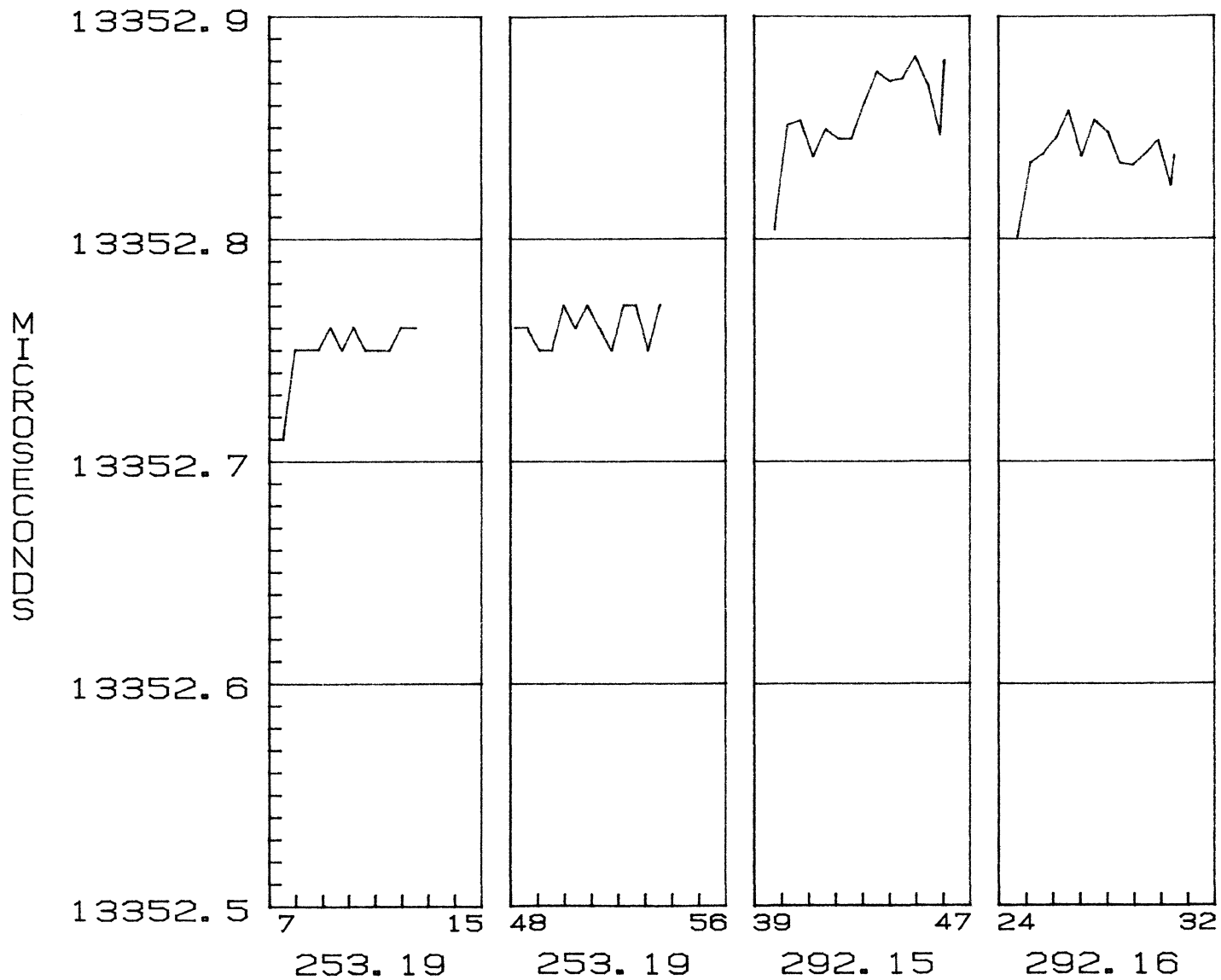
TDB DIFFERENCE LITTLE HOPE - MONITOR



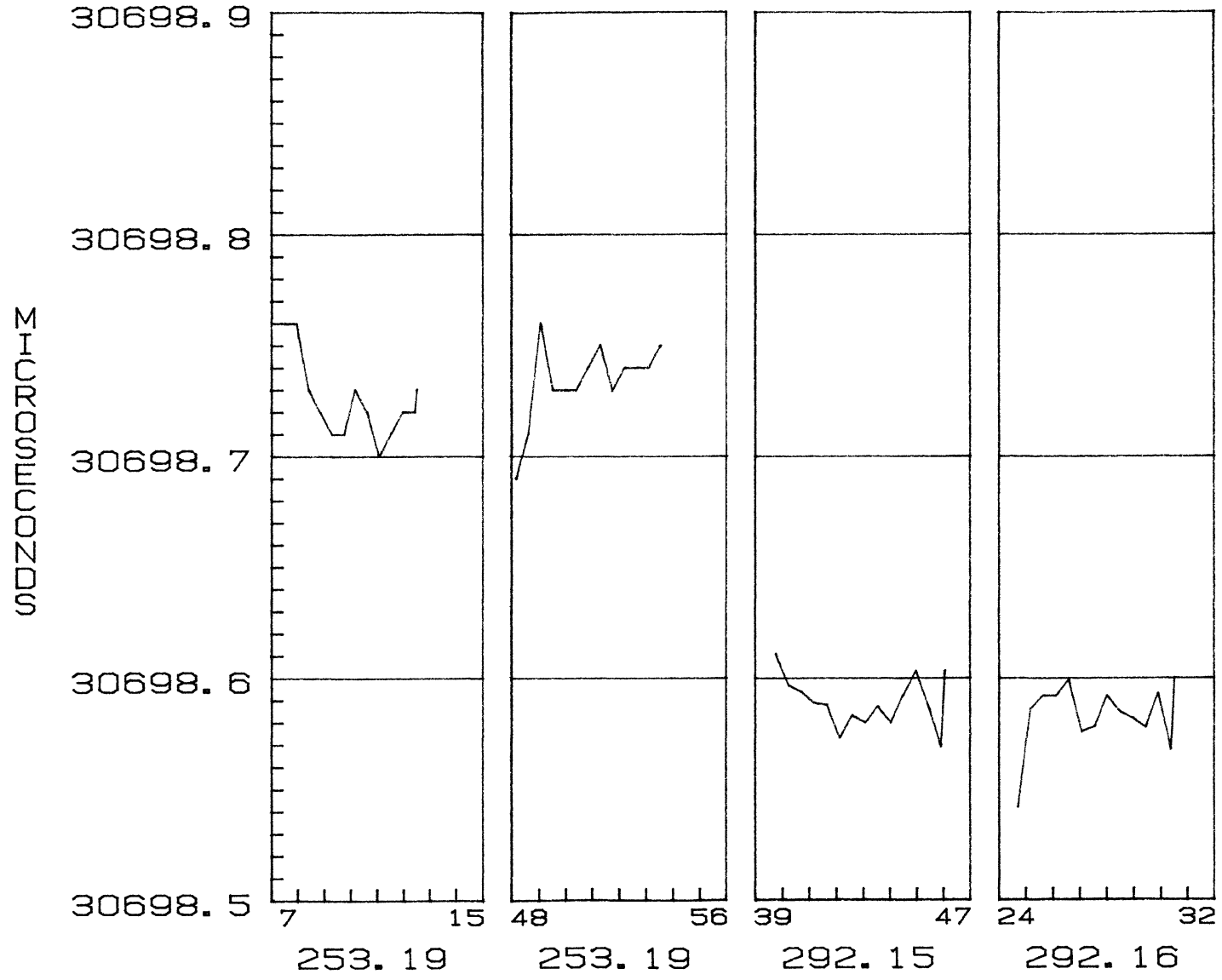
APPENDIX VII.21

GULL ROCK ISLAND LIGHT

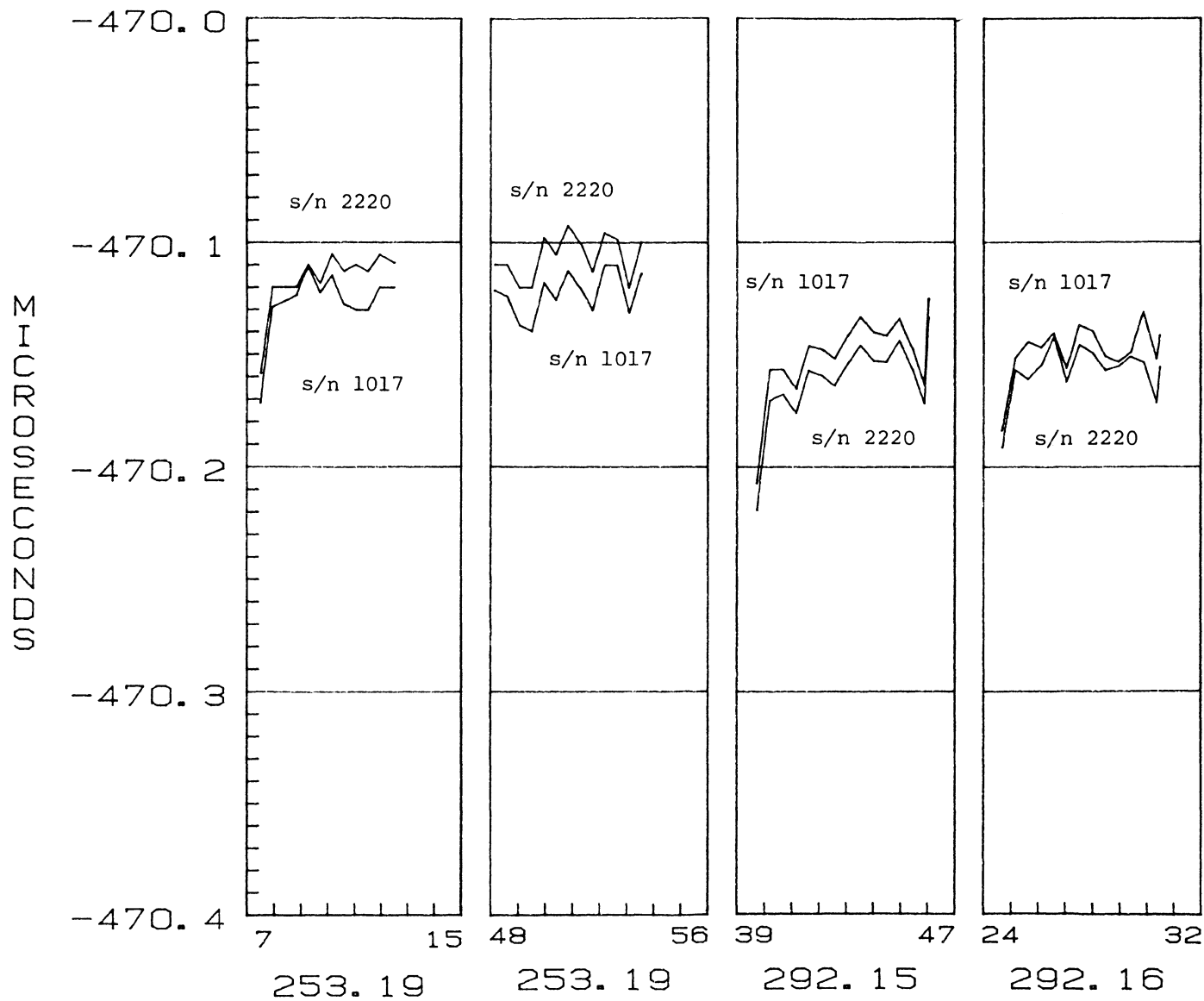
TDA GULL ROCK HELICOPTER DATA



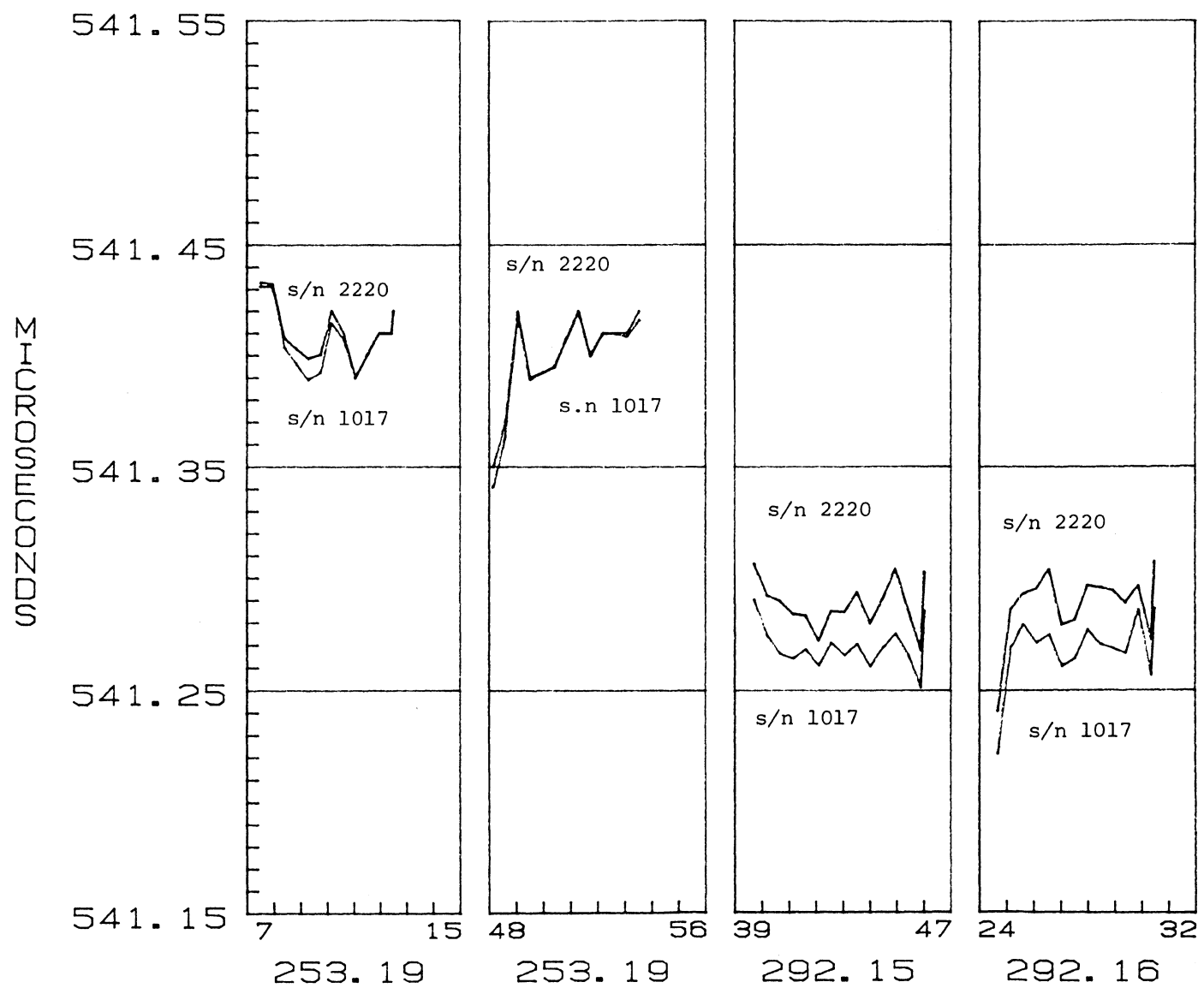
TDB GULL ROCK HELICOPTER DATA



TDA DIFFERENCE GULL ROCK - MONITOR



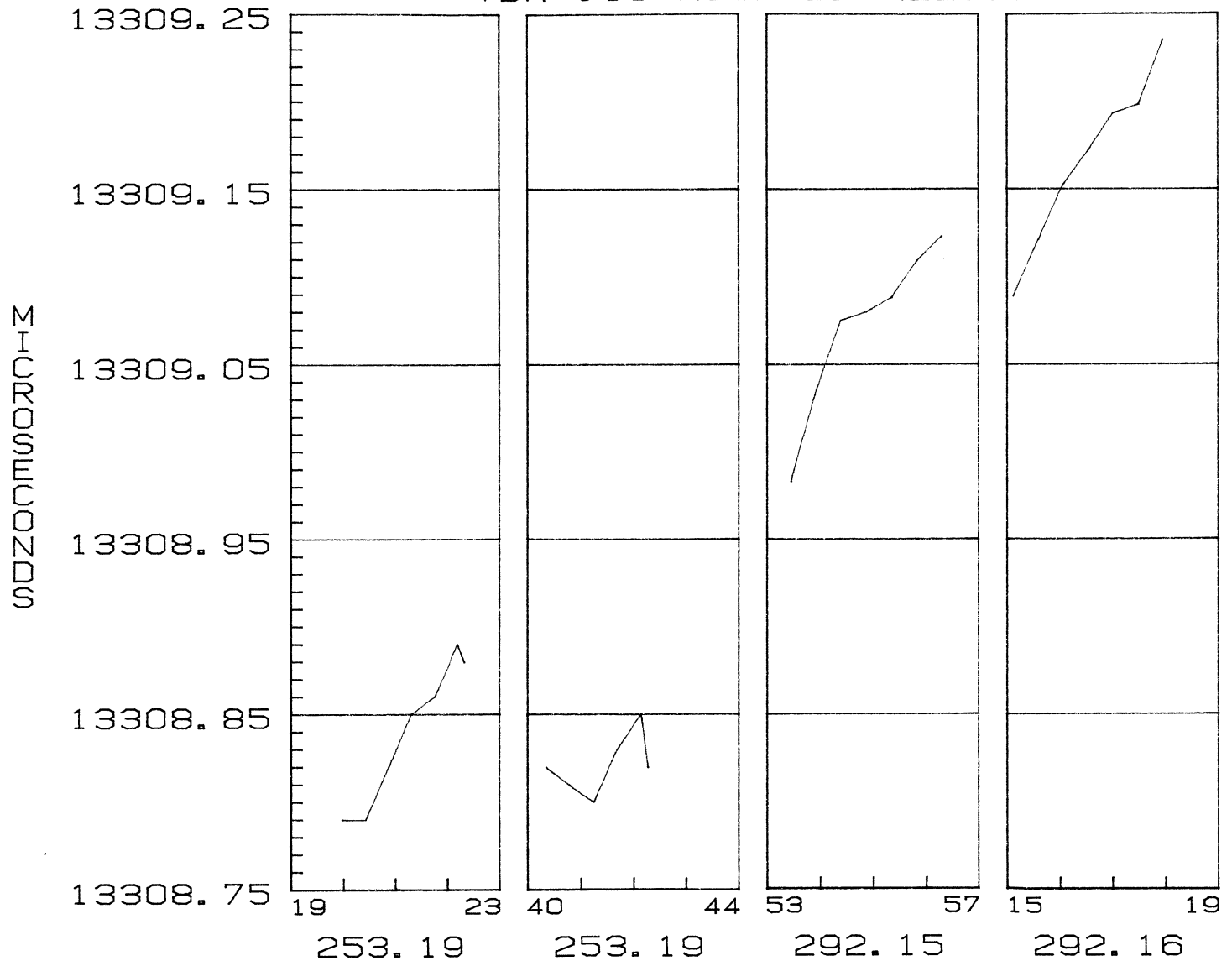
TDB DIFFERENCE GULL ROCK - MONITOR



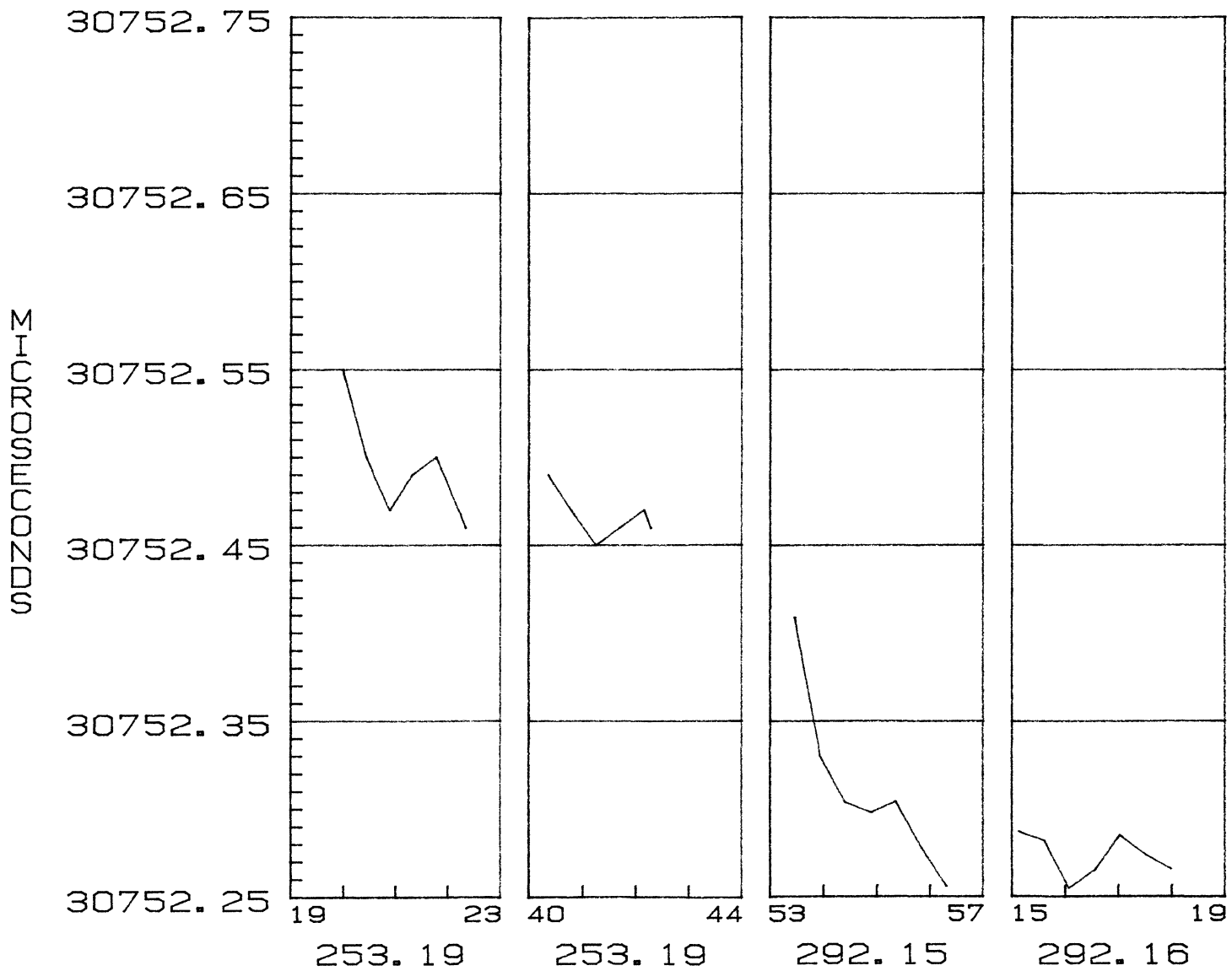
APPENDIX VII.22

JIG ROCK BUOY

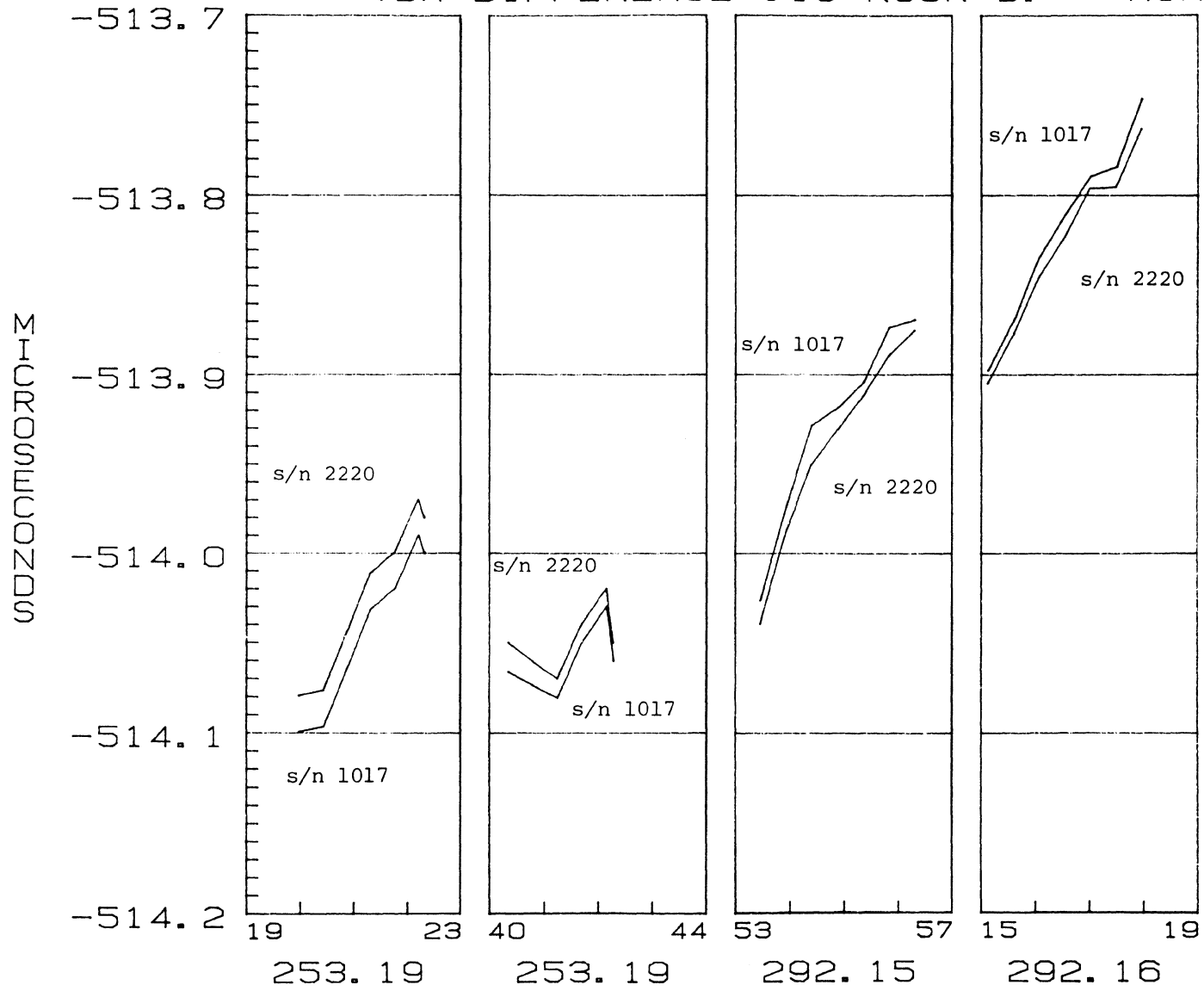
TDA JIG ROCK B. HELICOPTER DATA



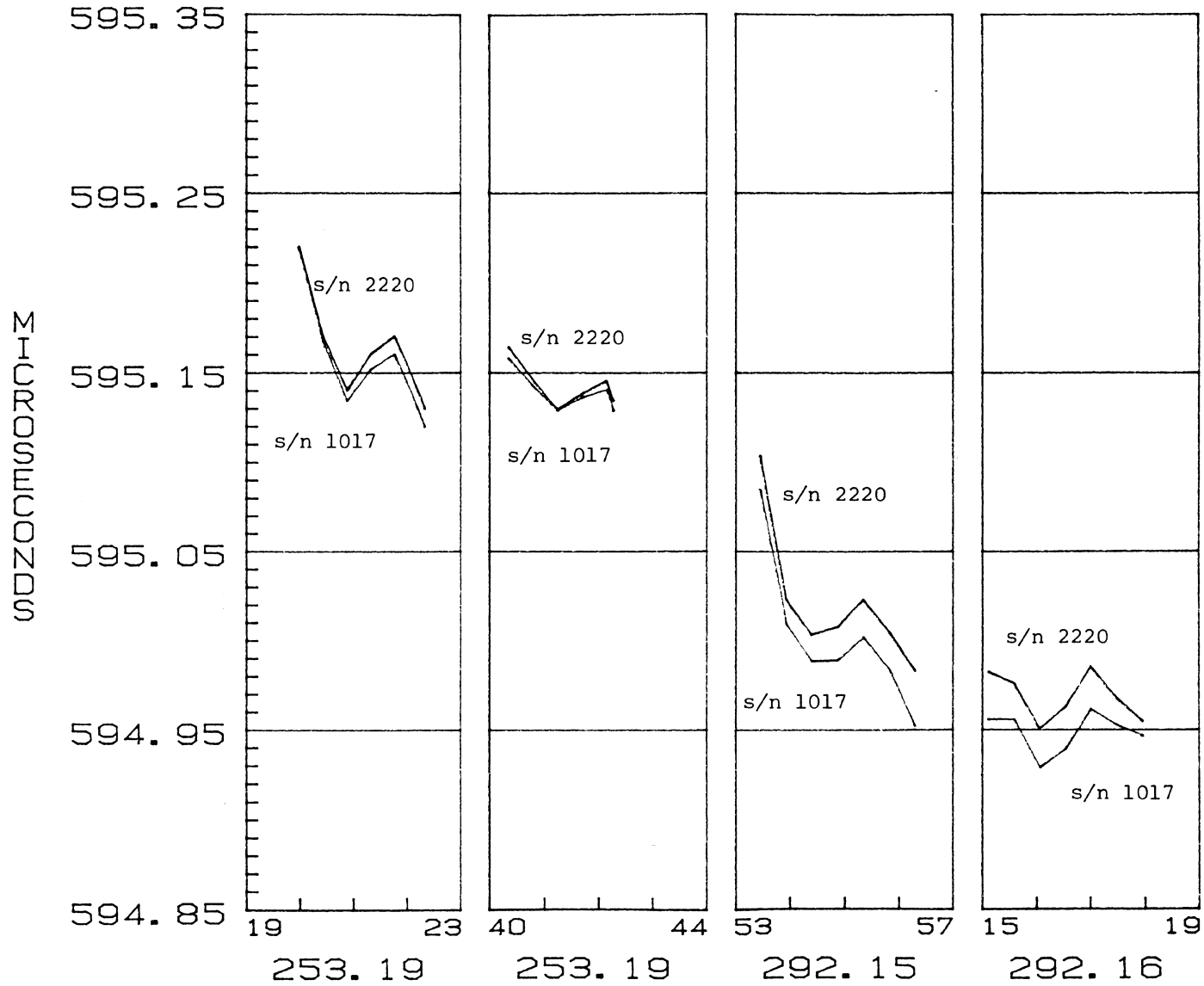
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TDA DIFFERENCE JIG ROCK B. - MONITOR



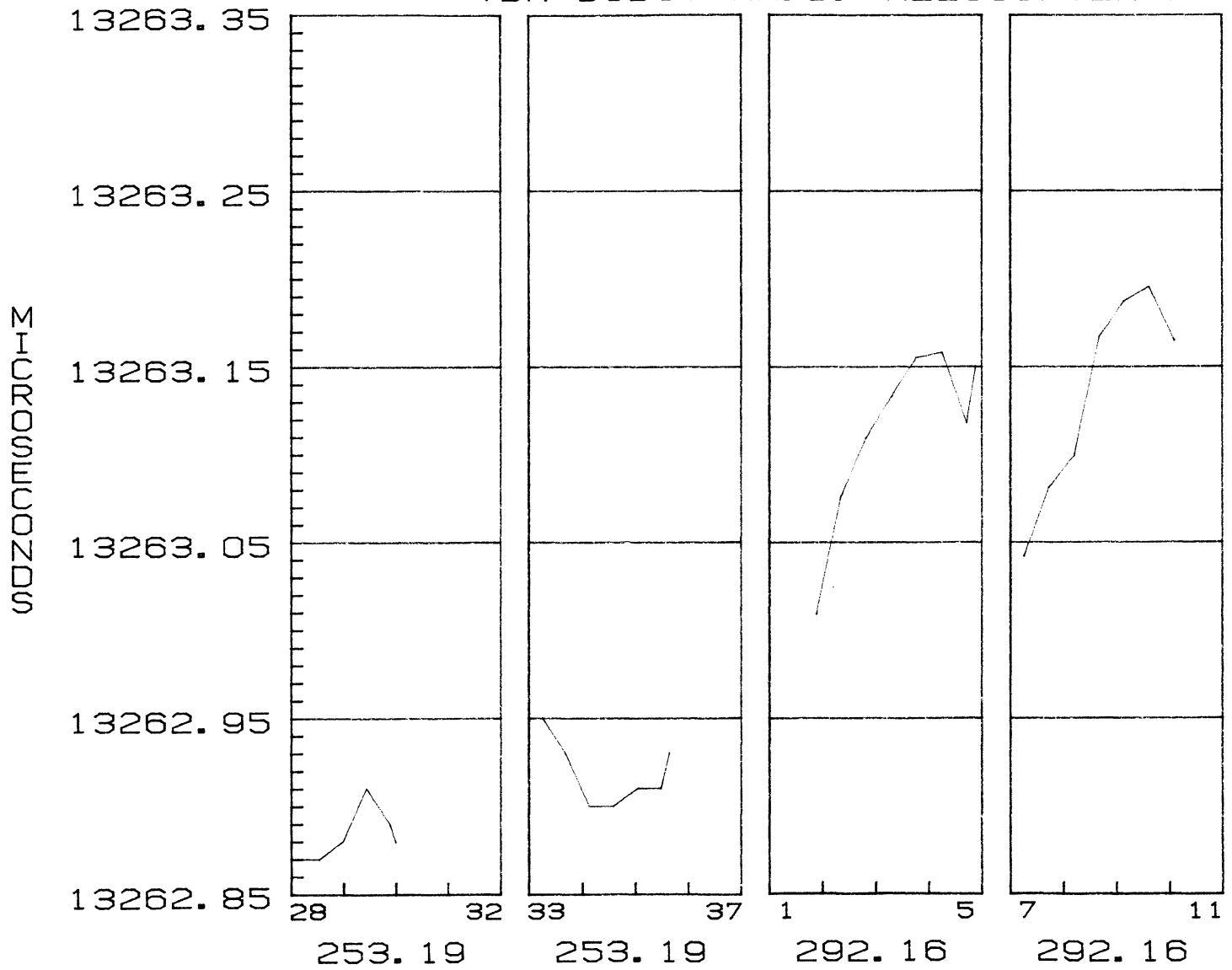
TDB DIFFERENCE JIG ROCK B. - MONITOR



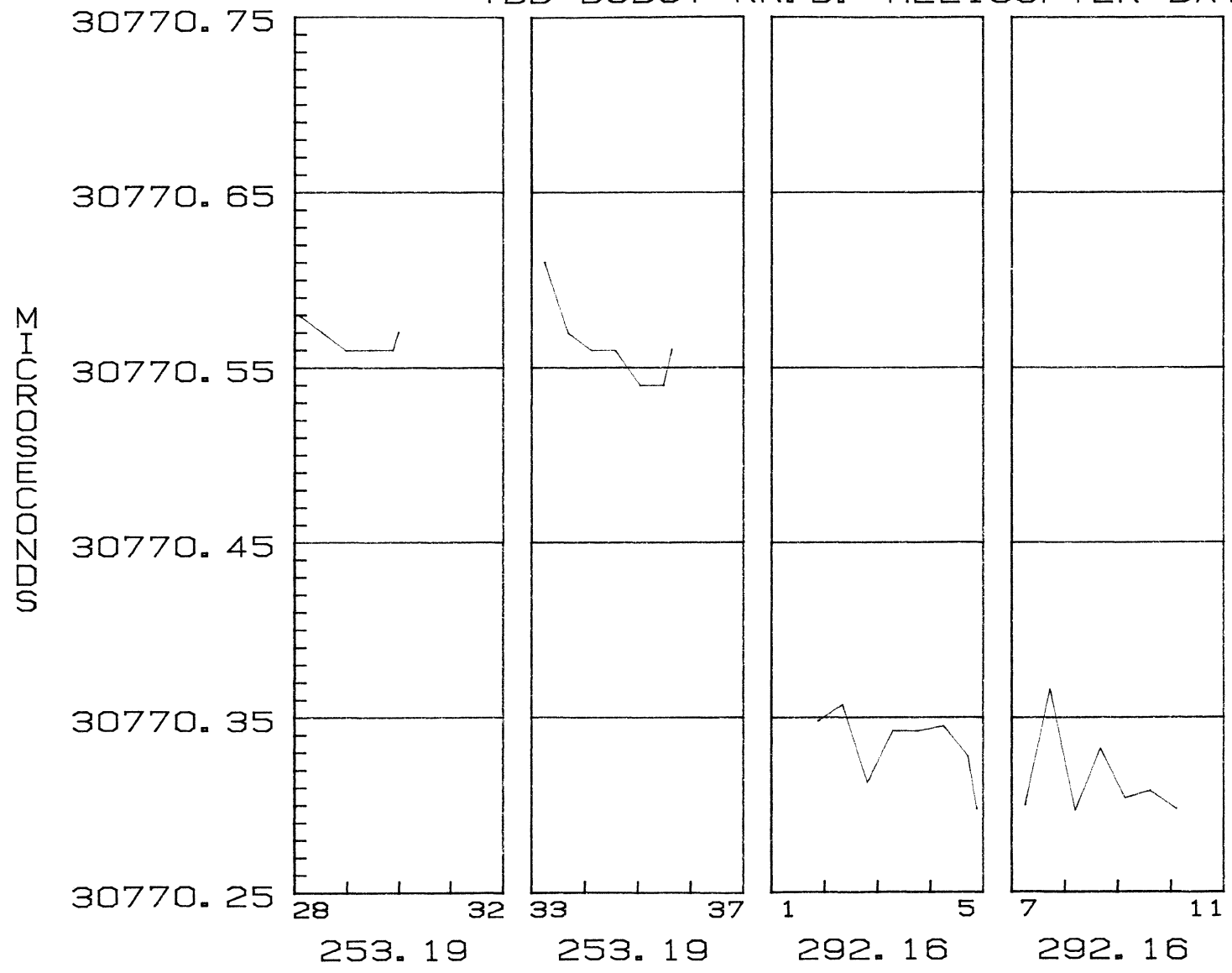
APPENDIX VII.23

BUDGET ROCK BUOY

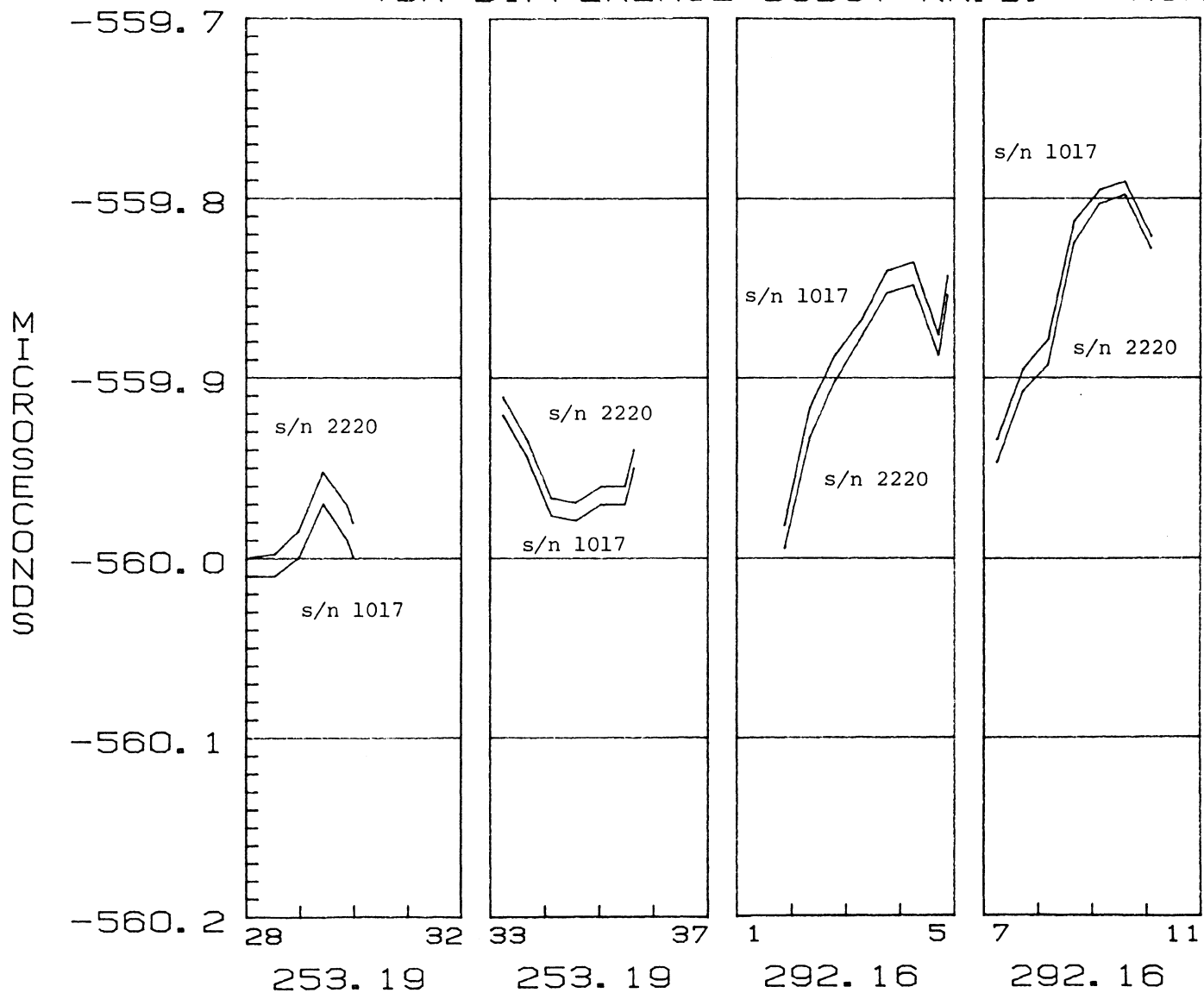
TDA BUDGT RK. B. HELICOPTER DATA



TDB BUDGT RK. B. HELICOPTER DATA



TDA DIFFERENCE BUDGT RK. B. - MONITOR



TDB DIFFERENCE BUDGT RK. B. - MONITOR

