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RP-1-OC-71
Northeast Pacific Geophysical Survey

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BOULDER, COLO.
January 1972

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RP-1-OC-71 NORTHEAST PACIFIC GEOPHYSICAL SURVEY

H. R. Stevens, Jr.

This report summarizes the work undertaken by scientific personnel aboard the NOAA Ship OCEANOGRAPHER in the spring of 1971. Over 17,000 nautical miles of bathymetry, magnetic, and gravity data were recorded during the cruise. From this data a profile of magnetic and gravity anomalies with related bathymetry has been produced. A major part of the work involved continuous seismic profiling. From this record and the other geophysical measurements additional information pertaining to the oceanic crust in the Northeast Pacific Ocean has been acquired. Four separate regions were investigated. They were a region of abyssal hills between the Murray and Mendocino fracture zones, the Chinook trough, the northern Gulf of Alaska, and the Queen Charlotte Islands fracture zone.

1. INTRODUCTION

During the months of March-June 1971 a scientific party from the NOAA Pacific Oceanographic Laboratories conducted a geophysical survey while aboard the National Ocean Survey Ship OCEANOGRAPHER. The fundamental purpose of this project (RP-1-OC-71) was to obtain geophysical data that bears on the origin and development of the oceanic crust in this region. A generally accepted theory of plate tectonics holds that the northeast Pacific basin is part of a large rigid crustal plate presently moving in a northwesterly direction and underthrusting the eastern Aleutian arc and Alaska continental margin (see figs. 1-5).

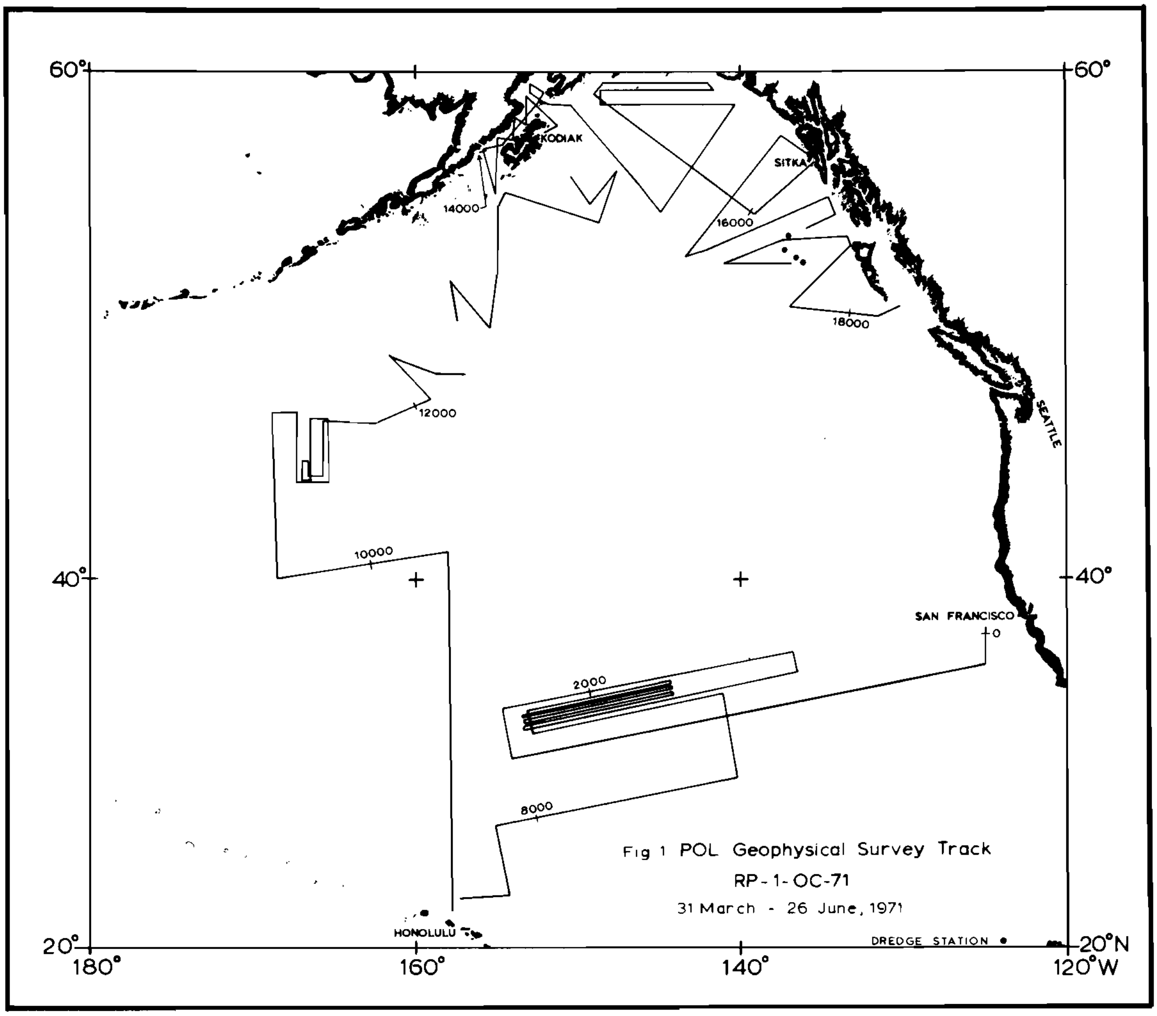

Figure 1. POL Geophysical Survey Track

The four survey areas were selected with specific objectives in mind. That for Leg I was to examine a region of abyssal hills between the Murray and Mendocino fracture zones northeast of the Hawaiian Islands. This was an attempt to delineate the topographic grain in an area where linear magnetic anomalies, of the type associated with sea floor spreading, exists and also within an area void of magnetic lineations.

The Chinook trough appears to mark the southern limit of an ancient small crustal plate that broke away in a northerly direction from the main Pacific plate. The objectives of Leg II were to locate precisely the termination of the Chinook trough and also to delineate the volcanic structure beneath the abyssal Aleutian plain. An examination of local turbidite phenomena was accomplished concurrently.

The investigation of fracture zones, magnetic anomalies, and sedimentary strata in the northern Gulf of Alaska was the major objective of work done on Leg III. Of special interest was the oceanic crustal structure along the continental margin. A special two-day gravity survey in Shelikof Strait and lower Cook Inlet was conducted during this phase of the work.

A seismic reflection survey of the Queen Charlotte Island fracture zone and the bathymetric development and dredging of four seamounts to the west comprised the work done on Leg IV.

Several additional projects, summarized in Appendix B, were a part of the overall scientific program conducted aboard ship.

2. CHRONOLOGY

The cruise was divided into four Legs:

I.	Seattle to Honolulu	- 31 March to 28 April
II.	Honolulu to Kodiak	- 4 May to 27 May
III.	Kodiak to Sitka	- 1 June to 12 June
IV.	Sitka to Seattle	- 13 June to 26 June

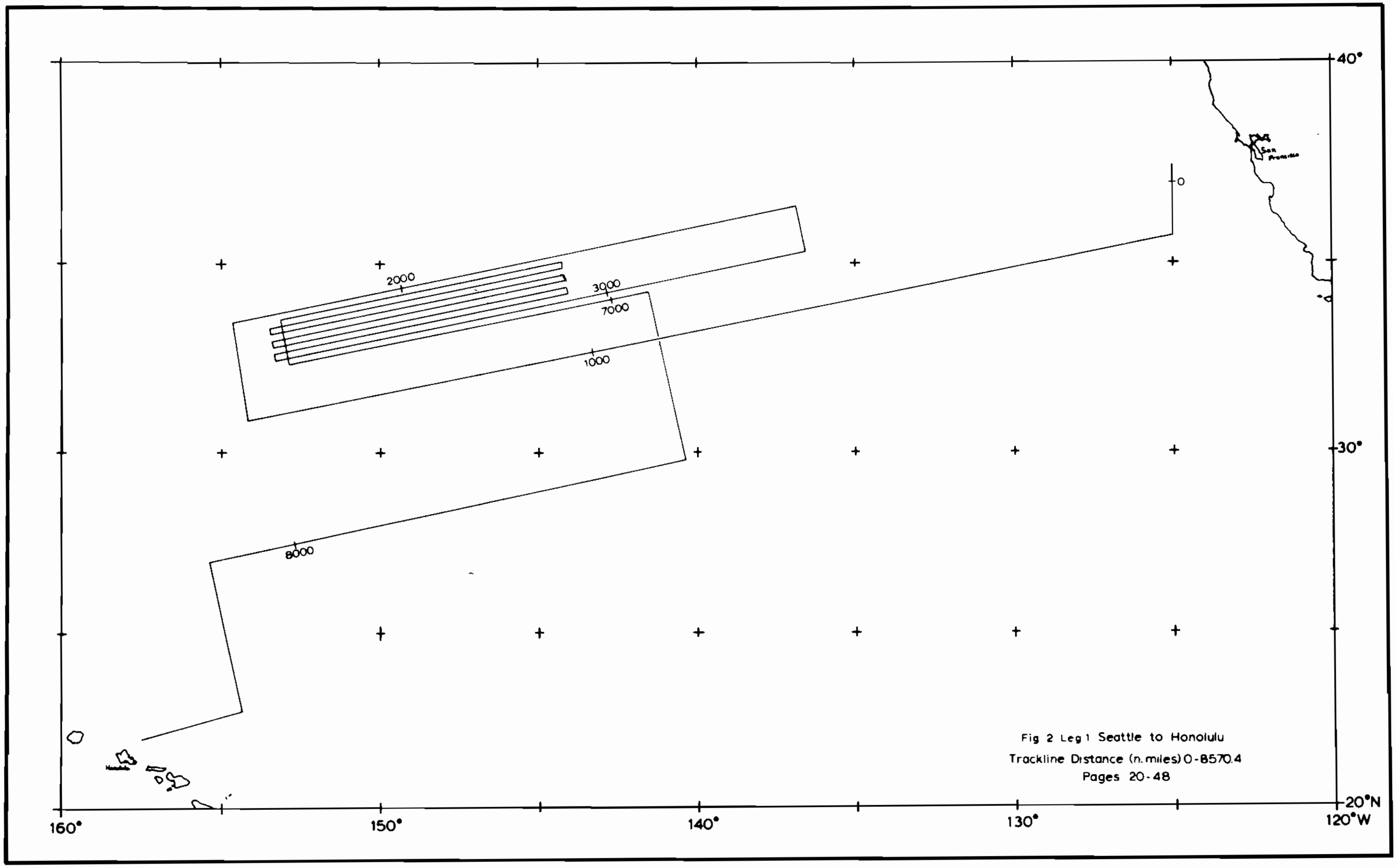

Figure 2. Leg I Seattle - Honolulu

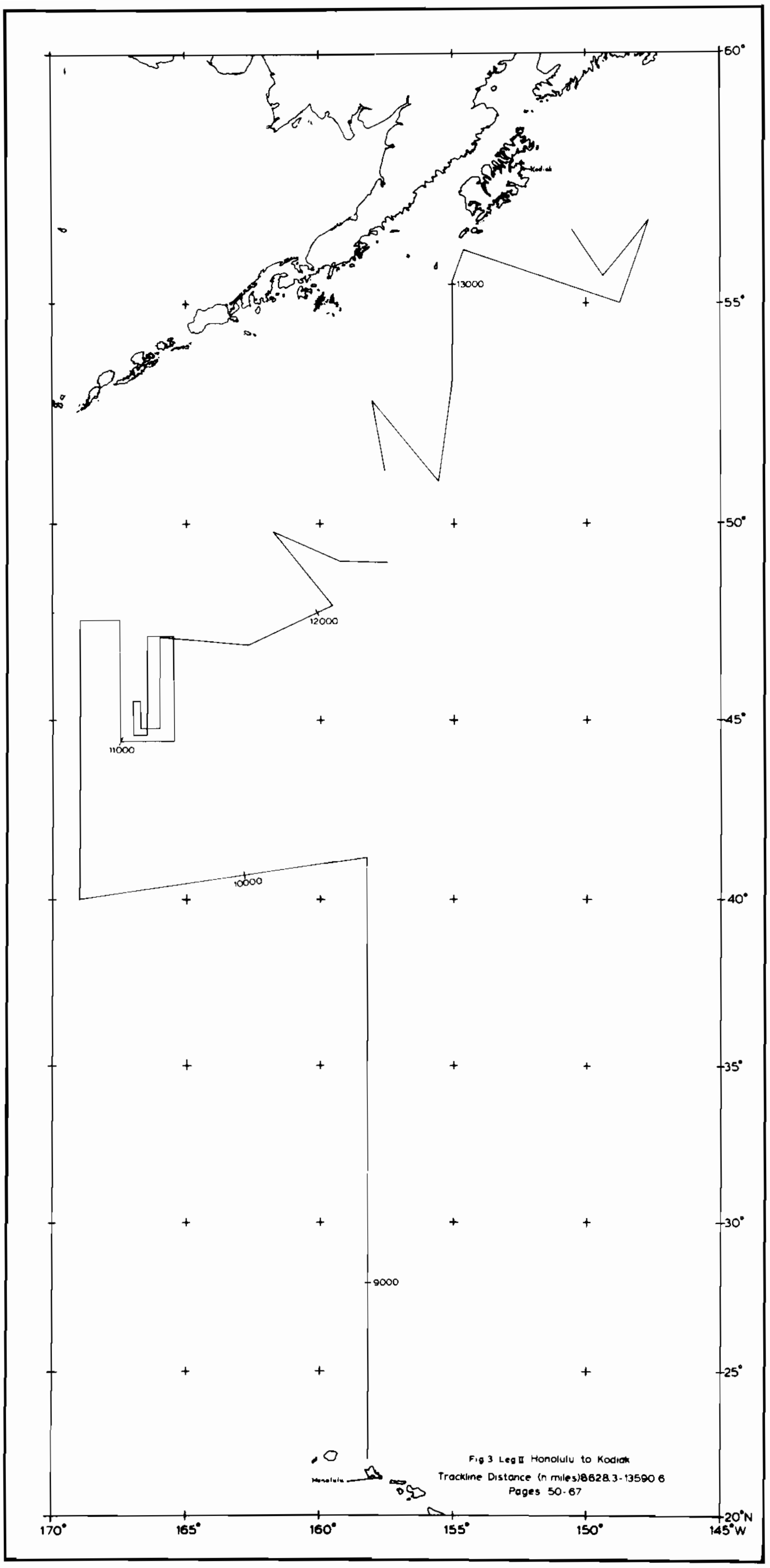

Figure 3. Leg II Honolulu - Kodiak

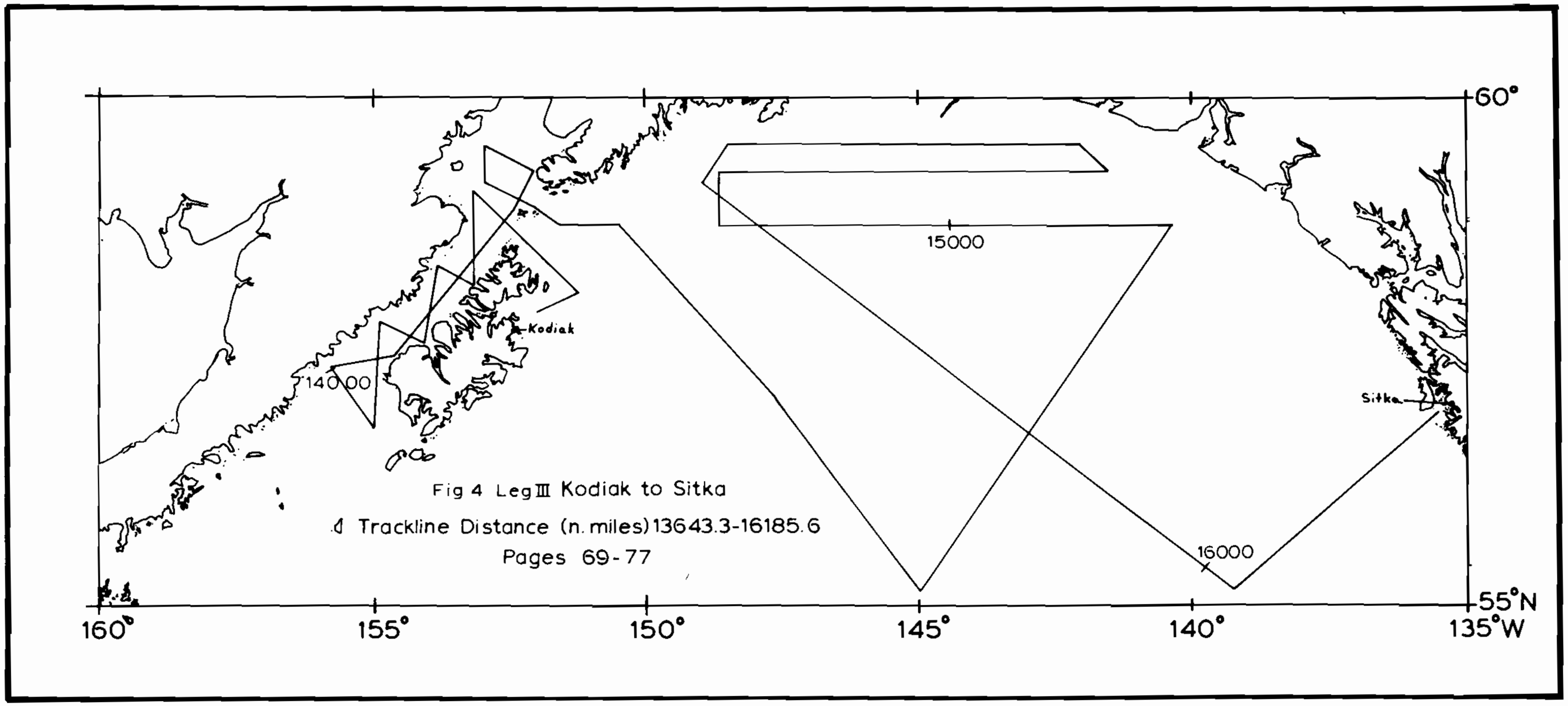

Figure 4. Leg III Kodiak - Sitka

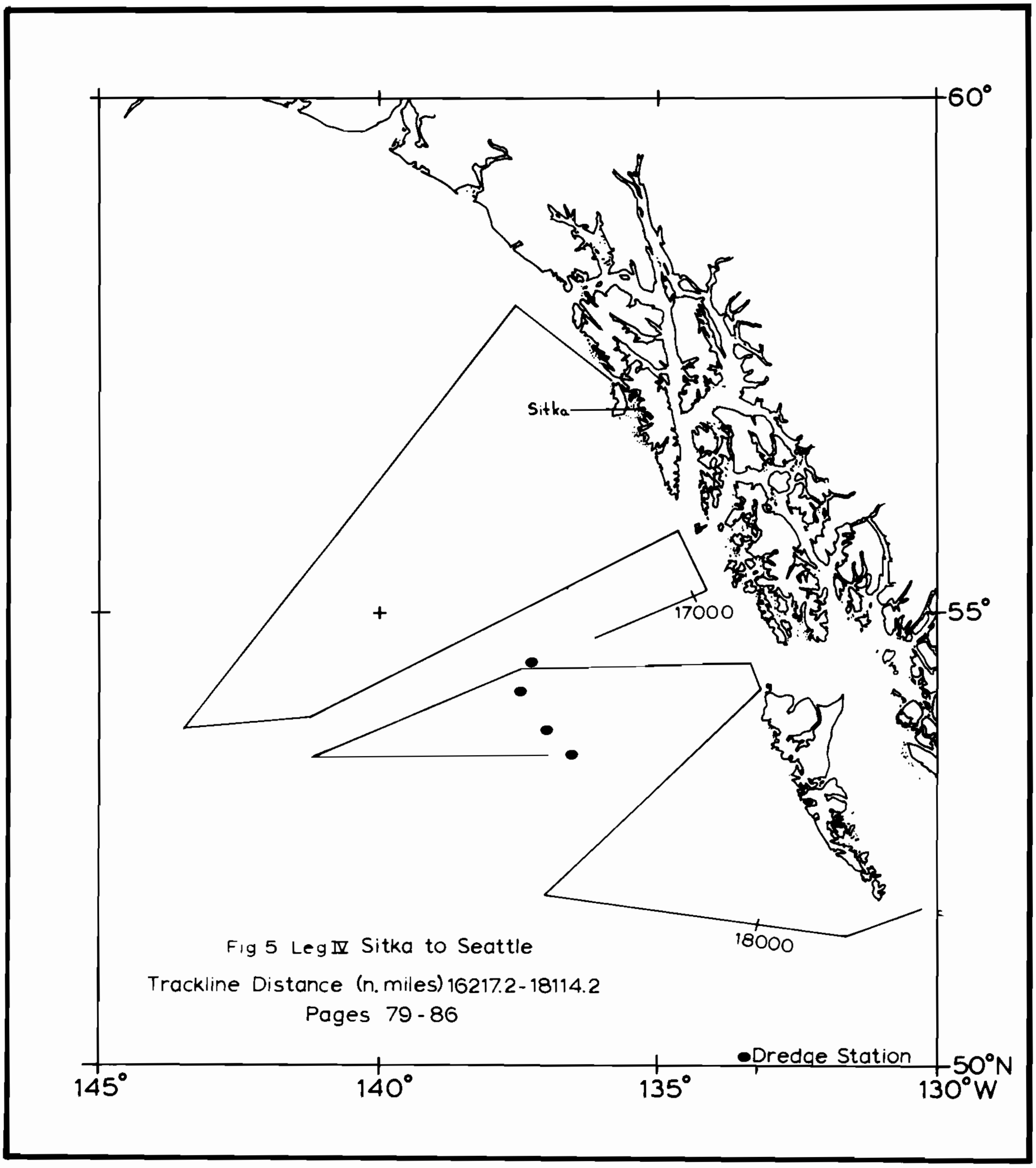

Figure 5. Leg IV Sitka - Seattle

3. NAVIGATION CONTROL

Except when operating close to shore where radar and visual fixes were used, most of the trackline was controlled by an AN/SR-9 Satellite System which was supplemented by Loran A and C.

The Cape Flattery gravity range was run prior to start of the Leg I trackline and again after completion of Leg IV. A Decca Seafix system was used for position control during the first run of the gravity range and Satellite Navigation used on the last run.

Refinement of navigational data is discussed in section 5. DATA ACQUISITION AND PROCESSING.

4. INSTRUMENTATION/EQUIPMENT

4.1 Sounding Equipment

Three transceivers and two depth recorders were used to obtain 12 kilohertz bathymetric data. The transceivers were two Edo Model 248A units and a Raytheon PTR Model 105. Sounding traces were recorded on Edo Model 33A Precision Bottom Recorders.

4.2 Magnetics

A Varian V4937 Proton Precession Magnetometer was towed at a cable length of 700 feet. Total field magnetic intensities were continually recorded on analog tape at six inches per hour and were also logged on punch paper tape at five minute intervals.

It will be noted that the profiled magnetic values are indicated as being negative throughout Leg I and part of Leg II. As the ship progressed northward from about 41°N Latitude and 159°W Longitude positive values appear on the profile with increasing frequency. Magnetic values obtained on Legs III and IV are almost entirely positive. The apparent gradual shift of the profile's zero reference line is due to the inexact fit of the IGRF standard with the actual regional field.

4.3 Gravity

The gravity meter used aboard the OCEANOGRAPHER was an Askania GSS2, number 22. The gravity data were recorded continuously by analog trace and at five minute intervals on punch paper tape.

Cross-coupling error is basically the product of both horizontal and vertical accelerations, caused by ship motion, acting upon a beam type gravimeter. In order to avert the effects of these large vertical accelerations the beam of the Askania meter is first magnetically dampened. Any deflection of the beam from the horizontal position is then detected by photocell sensors and signals are then sent through a series of RC filters to a servo mechanism. This motor makes the necessary screw adjustments that control spring tension and the beam is restored to the horizontal position. Because there is a delay in readjustment the beam is out of horizontal position during the period of wave motion and deflections occur when horizontal accelerations act on it to produce a resultant vertical acceleration which is indistinguishable from that of gravity. This is known as cross-coupling error. The problem is to remove this induced error from the gravimeter record.

Although cross-coupling meters are commercially available budgetary considerations precluded the purchase of one for project RP-1-OC-71. For this reason an instrument was developed by two members of the NOAA Commissioned Corps to detect the cross-coupling effect and compute the correction values to be used in data reduction. Cost of materials for this instrument was approximately $250. The ship's gravity officer, LTJG Carl A. Pearson defined the general performance requirements of the instrument. The circuit design and construction of the cross-coupling computer is credited to LTJG Thomas E. Brown, electronics officer of the OCEANOGRAPHER. A Texas Instrument Analog Recorder was used in conjunction with the computer.

4.4 Seismic Profiling

Except for the Aquadyne hydrophone streamer and the sparker equipment belonging to POL the other instrumentation was on loan from the University of Washington. Equipment used is listed below:

Bolt 40 cubic inch air gun

Rix K-44 air compressor

Sparker array (POL manufacture)

Del sparker power unit (105 - 3 kjoule)

2 LM hydrophone streamers (Univ. of Wash. manufacture)

Aquadyne hydrophone streamer

Edo PBR Recorder Model 333-II

Del Norte Technology Inc. amplifier, Model 501

The Bolt air gun produces acoustic energy by the sudden release of air at a pressure of 2000 psi. The reflected signals from the sea floor are picked up by the hydrophone streamer and amplified and filtered between 35-70 Hz before being recorded on the Edo unit at a 4 second sweep.

The sparker produces acoustic energy by discharging a capacitor bank through multiple electrodes. Signal returns were generally filtered between 60 and 600 Hz and recorded at a 1 second sweep. The air gun generally was used when operating in depths exceeding 400 fathoms and the sparker for shoaler depths. The hydrophone streamer was towed at a distance of approximately 400 feet. At speeds over 9.5 knots excessive stress was produced on the towed equipment and the air gun towing behavior tended to be erratic when certain combinations of speed and sea state were encountered.

5. DATA ACQUISITION AND PROCESSING

Processing of acquired data was done aboard ship and ashore. The reduction of raw data to finalized forms required a number of distinct processing operations, data checks, and corrective procedures.

5.1 Shipboard Data Processing

Three primary output products resulted from shipboard data reduction. Two were punched paper tapes, the Edited Data Tape and the Control Tape. These tapes were processed together to produce the Geophysical Report which is a final listing of the processed data.

The Edited Data Tape contains corrected time, depth, magnetic, and gravity values. Preparation of the Edited Data Tape requires that underway time, depth, magnetics, and gravity data be recorded on punch paper tape at selected time intervals by a Raw Data logger. RDL tape is translated to a Raw Data Tape on which time sequences are rearranged to account for the inherent five minute delay in gravity values and manual depth entries. The printout of this tape is checked against fathograms and analog records for any error or omission and a Correction Tape is prepared. Two other tapes are employed to make up the Edited Data Tape. The Shaft Tape records gravimeter shaft encoder corrections and the cross-coupling corrections. The Status Tape logs periods when the gravimeter is not in operation. These tapes are processed together with the Raw Data Tape and the Correction Tape to produce the Edited Data Tape.

The Control Tape contains time, course, speed, and position data with the computed values of the International Geomagnetic Reference Field (IGRF). Preparation of the Control Tape is the result of several processing procedures. Information from the smooth plotted Boat Sheet is recorded on a Position Tape. From this tape a listing is produced of ship course and speed between positions. Detected errors are corrected and the Control Tape is made from the revised listing.

5.2 POL Data Processing

Data processing is not finalized aboard ship but is completed at the Pacific Oceanographic Laboratories and at the University of Washington Computer Center.

POL uses an IBM 1620 to transfer to cards the information which is on the Edited Data Tape and the Control Tape. After listing, the cards are checked for time sequence and the navigation data is reviewed. If all is in order the deck is then programmed to place card data on a magnetic tape. This transfer is made at the University of Washington using the CDC 6400 system. Information on the magnetic tape is then programmed to produce a profile of magnetic and gravity anomalies, bathymetry, and positioning. A visual inspection of this profile indicates final corrections which are made directly on the magnetic tape.

6. DISCUSSION OF PRELIMINARY RESULTS

6.1 Leg I

The abyssal hills in this survey area were shown to be lineated in a direction parallel to the linear magnetic anomalies. This alignment suggests that the topographic grain remains as initially formed by crustal generation. A portion of the survey area also extended into the magnetic quiet zone, a region where the crust is believed to have been generated during a period when the earth's magnetic field did not reverse polarity. Here, also, the abyssal hills were lineated in a direction consistent with an origin due to sea floor spreading, that is, at right angles to the nearby fracture zones.

The abyssal hills exhibit a degree of banding based on variations in the topographic relief. Relief banding paralleling linear magnetic anomalies occurs in an abyssal hill region of similar age south of the Aleutian trench. The relief characteristics of these bands, however, cannot be related on an anomaly to anomaly basis from one region to the other. This suggests that the banding is a local phenomenon.

6.2 Leg II

The eastern termination of the Chinook trough was located at approximately 45°N and 165°W. This position is within 15 miles of that predicted by plate theory. The subbottom topographic expression of the magnetic bight was evidenced only in a reorientation of the abyssal hills with no obvious evidence of fracturing found associated with it. This reorientation of the abyssal hills was used to locate the bight at one location within the quiet zone.

6.3 Leg III

The gravity readings in Shelikof Strait and immediately to the north and northeast of Kodiak Island are of special interest. The Free Air and Bouguer anomalies are noticeably different from those found elsewhere along the entire trackline. See the Profile of Leg 3, figure 4, pages 69 to 71. Crustal irregularities beneath the thick sedimentary deposits are reflected in the Free Air anomalies which range in this region from -45 mgals to 66 mgals. The profile of the Bouguer values, -29 mgals to +56 mgals, presents a unique pattern because these values closely parallel the Free Air profile. The low positive and negative Bouguer values are attributed to the relatively shallow shelf depth which is generally well under 200 meters.

The CSP system was operated over two of the lines in the Strait and showed two different sedimentary units separated by an angular unconformity.

The upper unit is underformed and mostly flat-lying with few internal reflectors. The lower unit is well-stratified and shows evidence of structural deformation followed by erosion. In places the acoustic basement is at or near the sea floor with very little sediment cover.

On the continental shelf at the northern end of the Gulf of Alaska, numerous truncated and folded reflectors are evident in a relatively thick sedimentary section. An apparent fault scarp is exposed at the sea floor near Middleton Island, perhaps related to the 1964 Alaskan earthquake.

CSP lines were run in the Gulf of Alaska basin during both Legs III and IV. The great thickness of stratified sediments obscured the basement, making it difficult to arrive at any conclusions regarding the fracture zone locations without additional interpretation of the CSP records. Disturbed turbidites overlain by flat lying turbidites suggests that a period of deformation, perhaps in Late Tertiary, was followed by a second period of quiescence throughout the Gulf of Alaska.

6.4 Leg IV

On the continental shelf near Sitka the CSP data show that sedimentary structure near shore dip steeply seaward. A broad syncline is present between the shore and the outer edge of the shelf. The sediments are very thick and appear to be ponded behind a damming ridge at the shelf break. North and south of Sitka, the sediments are very stratified with some faulting and appear to dip seaward with little evidence of any tectonic dam. Because of the complexity of the sedimentary structure additional interpretation of the data is necessary before any conclusions regarding the Queen Charlotte Fracture Zone are attempted.

7. PRESENTATION OF THE PROFILE

A profile and a print-out are the finalized forms of POL geophysical data reduction and processing. The profile, a product of a CalComp plotter is presented with this report.

The chief advantage of a profile is that it permits a rapid inspection of the processed data and ready recognition of geophysical relationships and anomalies. In short, a profile is an aid in evaluating the results of the work undertaken. Its features may also suggest that further development of a given area is warranted.

Other RP-1-OC-71 data which may be of special interest can be obtained by writing to:

National Oceanic and Atmospheric Administration
Environmental Data Service
National Geophysical Data Center
Chief, Marine Geophysics Group
Gramax Building, 8060 13th Street
Silver Spring, Maryland 20910

In descending order on each page are the profiles of the Magnetic Anomaly, Free Air Anomaly, Bathymetry, and Bouguer Anomaly. Appropriate scales are found at frequent intervals throughout the profile sections. The CalComp plotter has also printed, in conjunction with the four profiles, the distance traveled in nautical miles, course changes, and the ship's position. Latitude and longitude are indicated at the half-tic marks and the full tic marks denote position fixes.

Positions or areas of interest on the trackline charts (figures 1-5) may be quickly located in the four profile sections with the aid of the four Location Indices.

FIGURE 6

LOCATION INDEX

Leg I SEATTLE - HONOLULU (See Figure 2)

Distance in n miles along track			Degrees Lat - Long		Degrees Lat - Long	Pages
0	to	500.1	36.91 - 125.03	to	34.35 - 133.64	20 - 21
500.1	to	1000.1	34.35 - 133.64	to	32.75 - 143.45	21 - 23
1000.1	to	1500.6	32.75 - 143.45	to	31.08 - 153.08	23 - 25
1500.6	to	2000.4	31.08 - 153.08	to	34.45 - 149.16	25 - 26
2000.4	to	2500.3	34.45 - 149.16	to	36.14 - 139.16	26 - 28
2500.3	to	3000.0	36.14 - 139.16	to	34.29 - 142.79	28 - 29
3000.0	to	3500.6	34.29 - 142.79	to	32.65 - 152.60	29 - 31
3500.6	to	3999.9	32.65 - 152.60	to	34.22 - 144.40	31 - 32
3999.9	to	4499.9	34.22 - 144.40	to	32.86 - 153.38	32 - 34
4499.9	to	4999.6	32.86 - 153.38	to	34.74 - 144.30	34 - 35
4999.6	to	5501.1	34.74 - 144.30	to	33.45 - 152.94	35 - 39
5501.1	to	6000.3	33.45 - 152.94	to	34.93 - 145.13	39 - 40
6000.3	to	6500.1	34.93 - 145.13	to	32.54 - 152.39	40 - 42
6500.1	to	6999.4	32.54 - 152.39	to	34.18 - 142.62	42 - 43
6999.4	to	7499.4	34.18 - 142.62	to	29.24 - 143.46	43 - 45
7499.4	to	8000.4	29.24 - 143.46	to	27.54 - 152.75	45 - 46
8000.5	to	8570.4	27.54 - 152.75	to	22.03 - 157.23	46 - 48

Developed Area: Abyssal Hills

1715.1	to	6999.4	33.48 - 154.75	to	34.18 - 142.62	25 - 43

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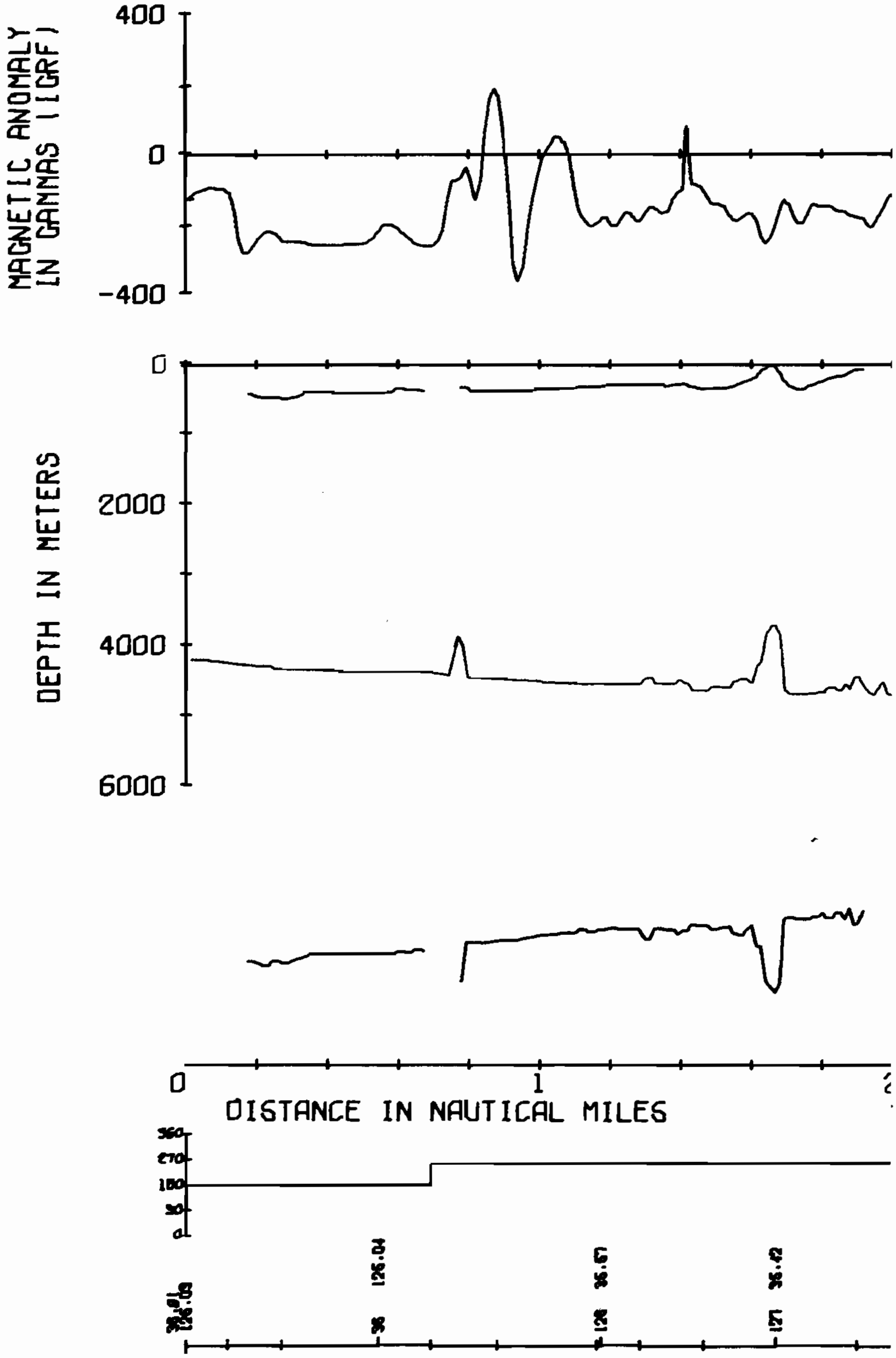
Fig. 6



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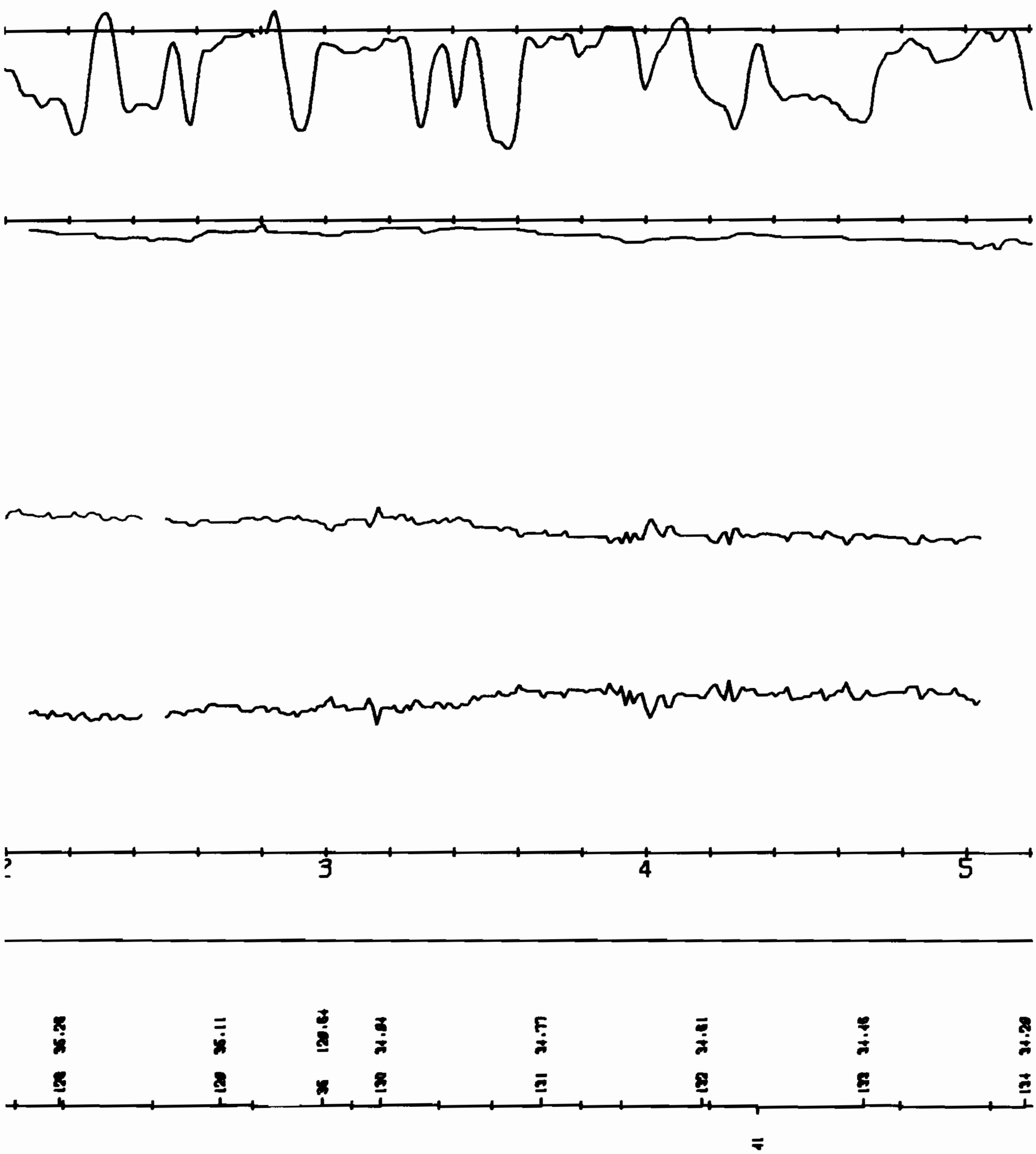

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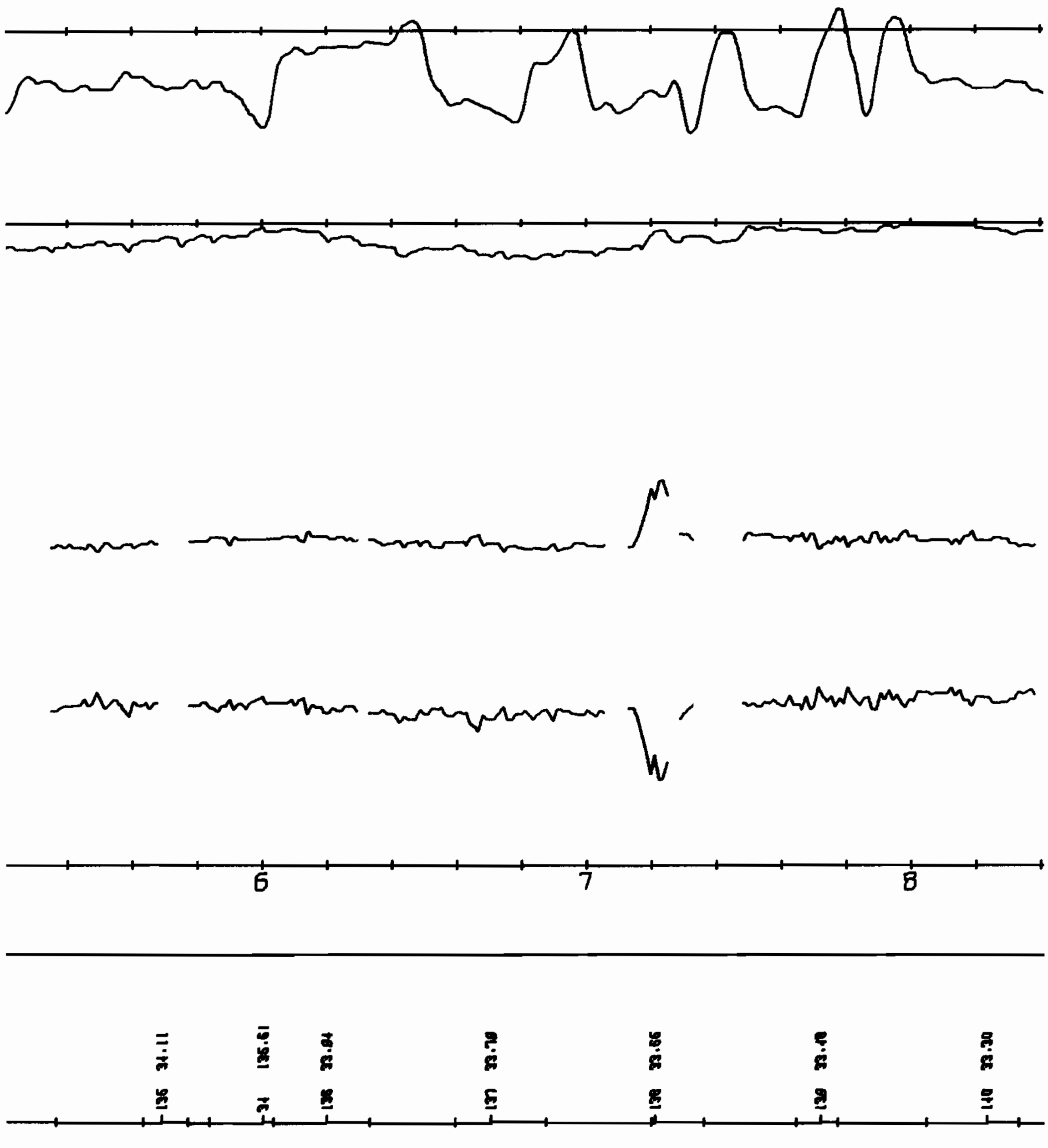

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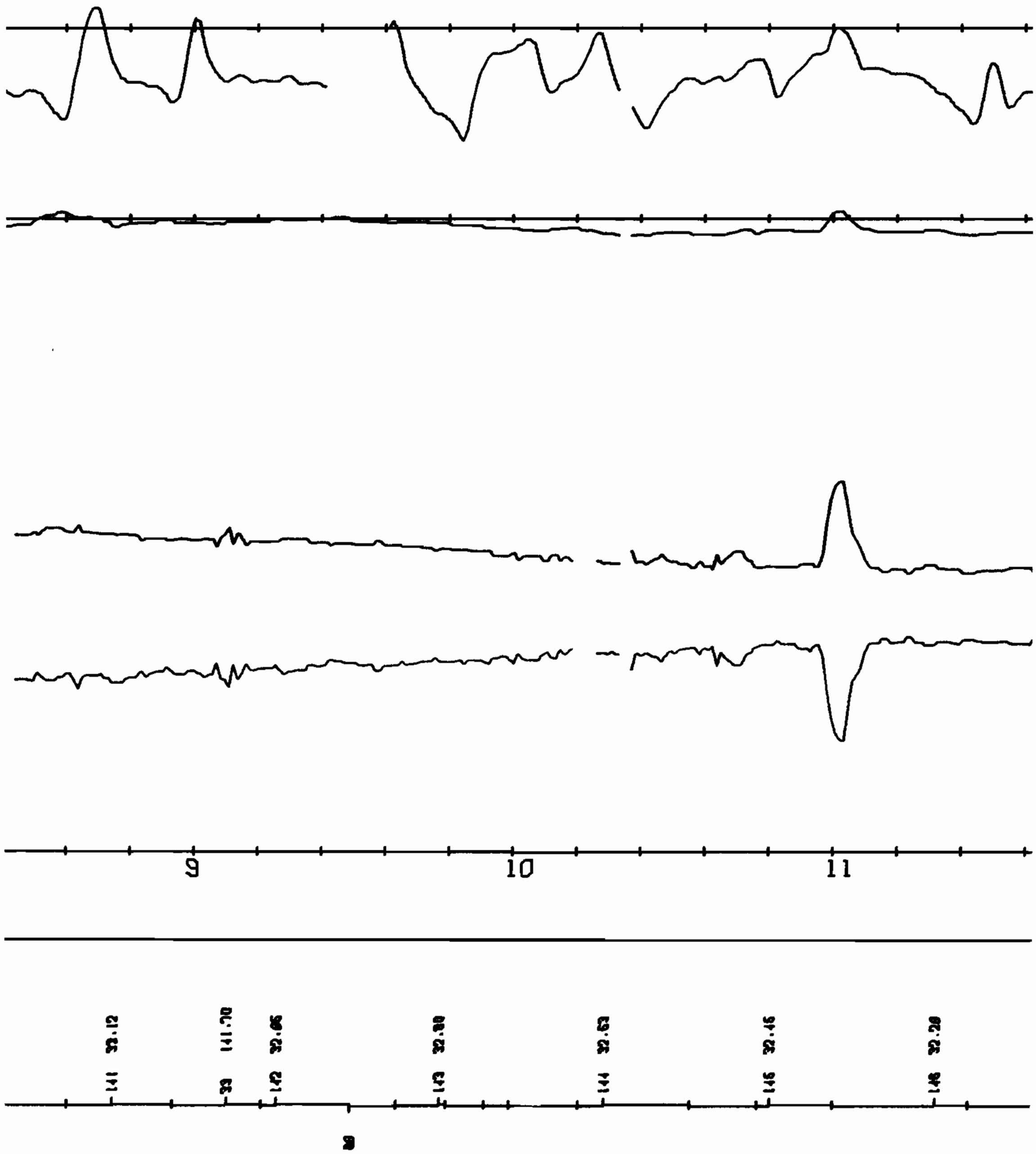

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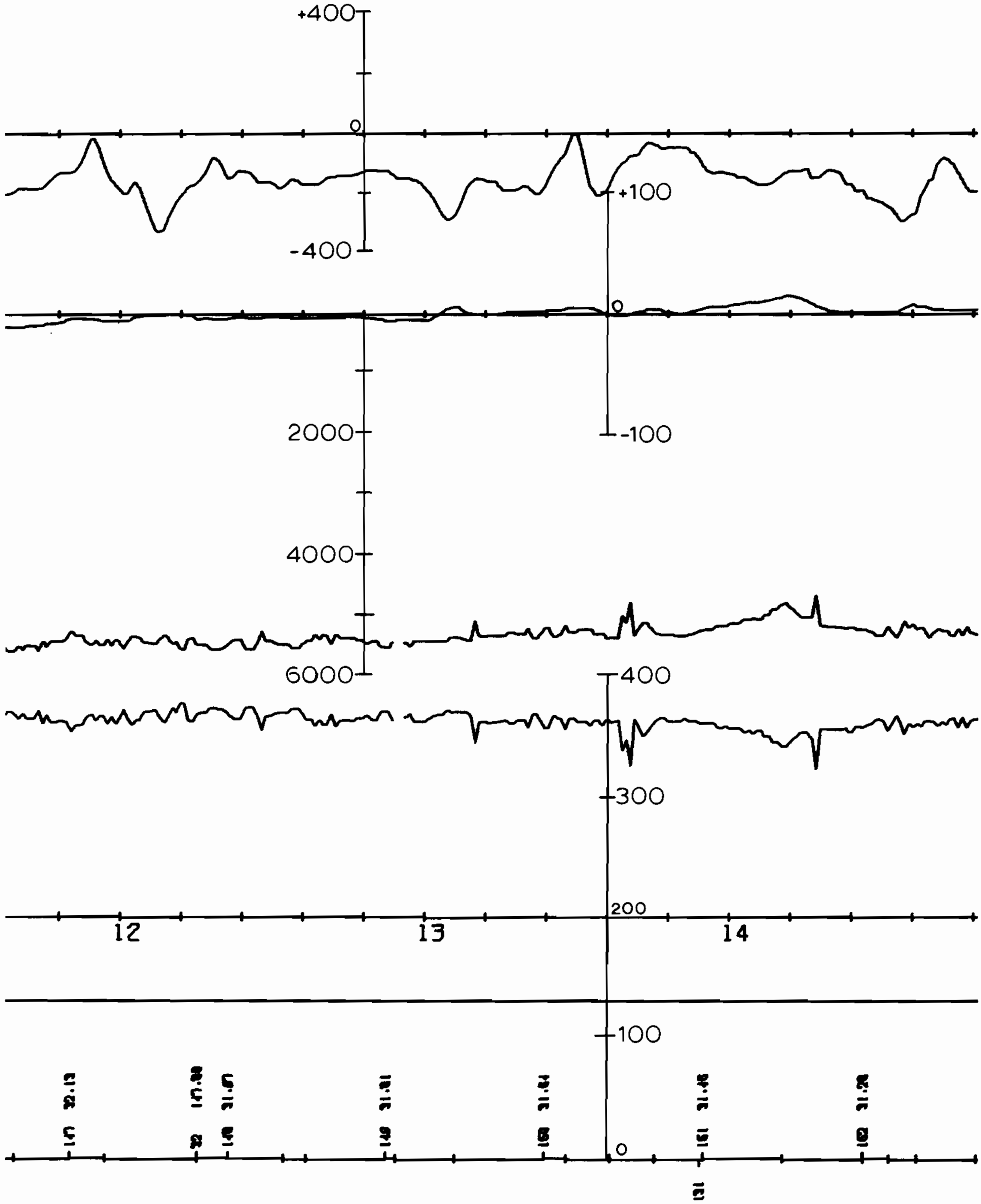

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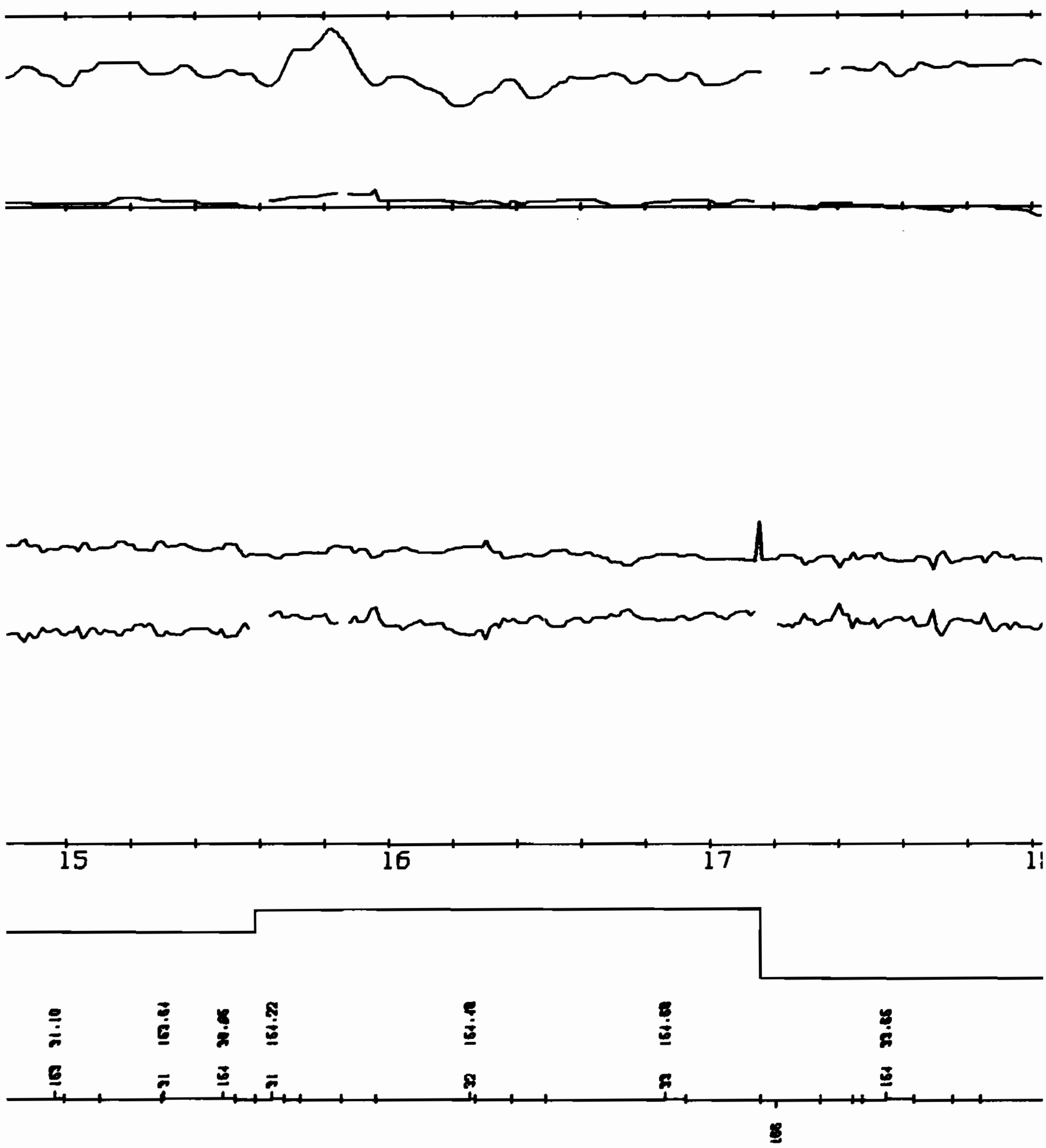

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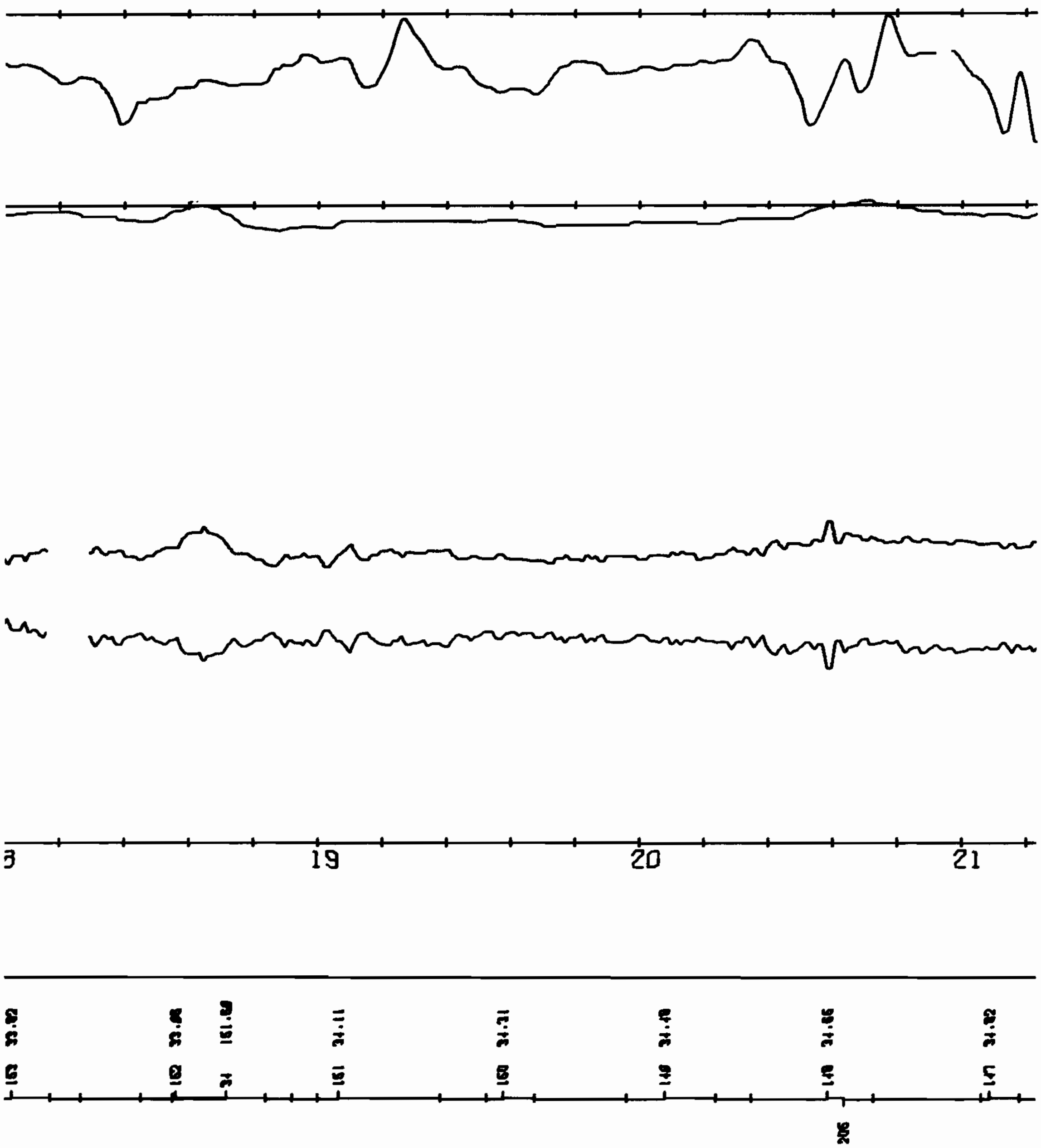

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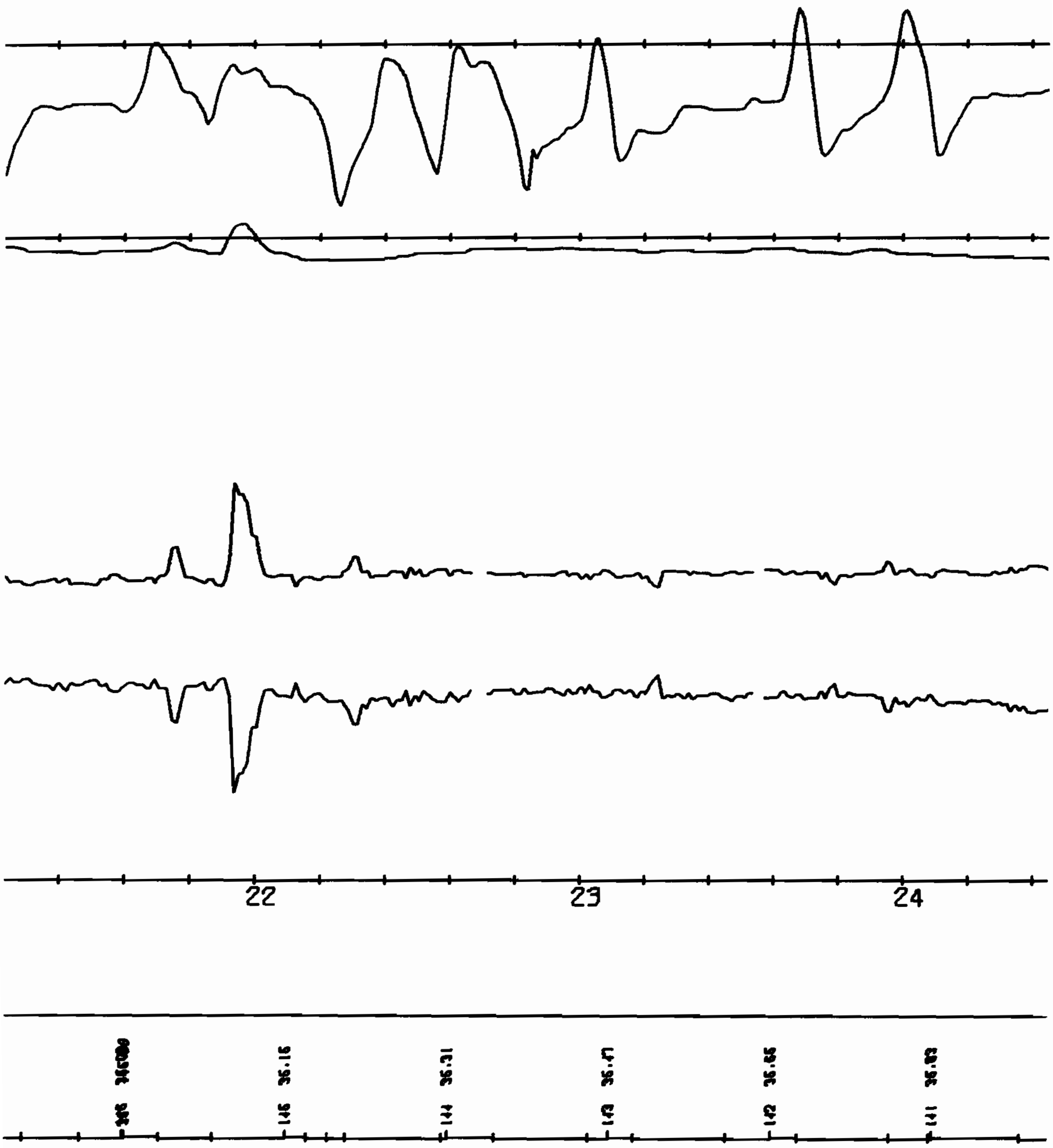

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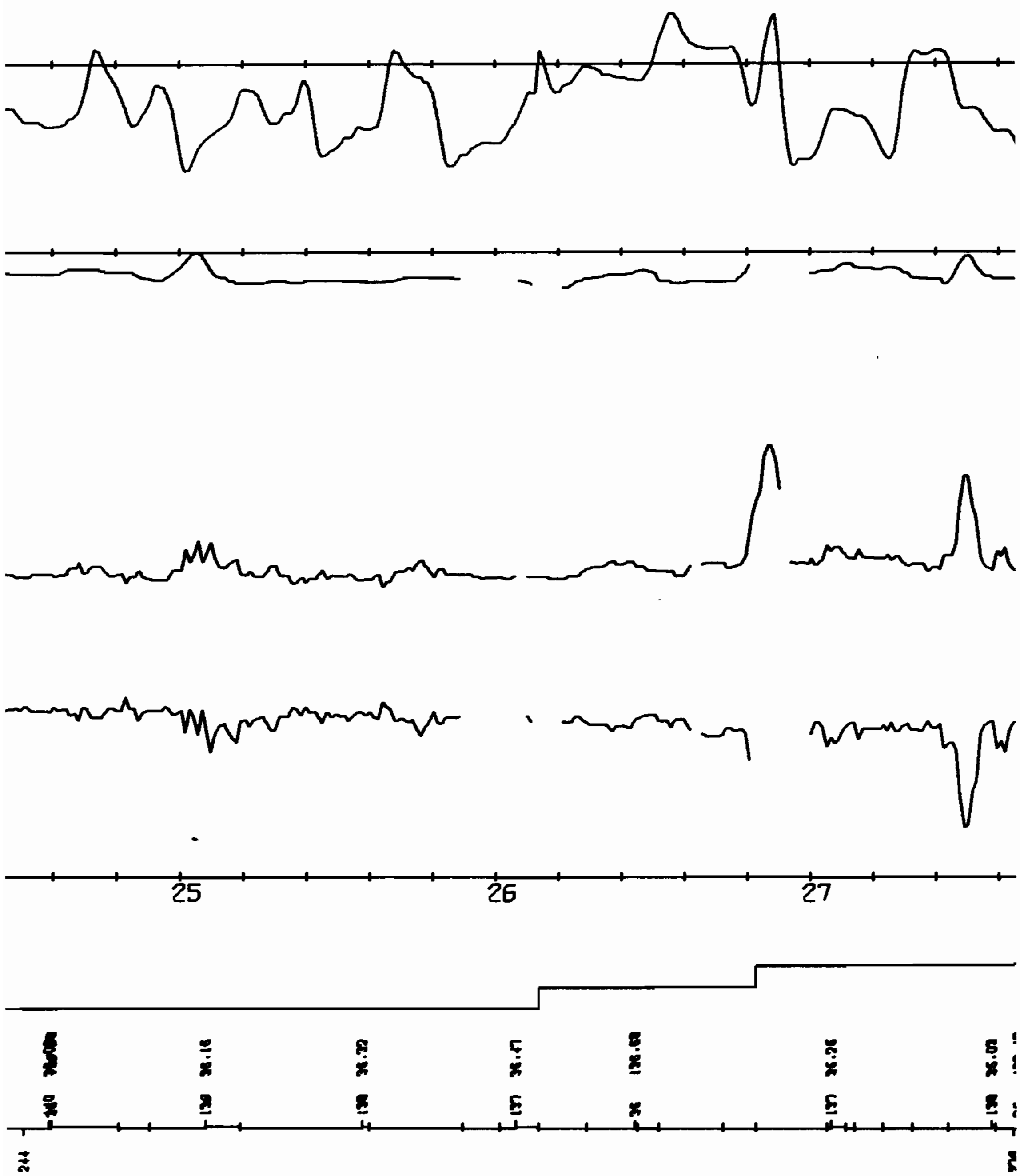

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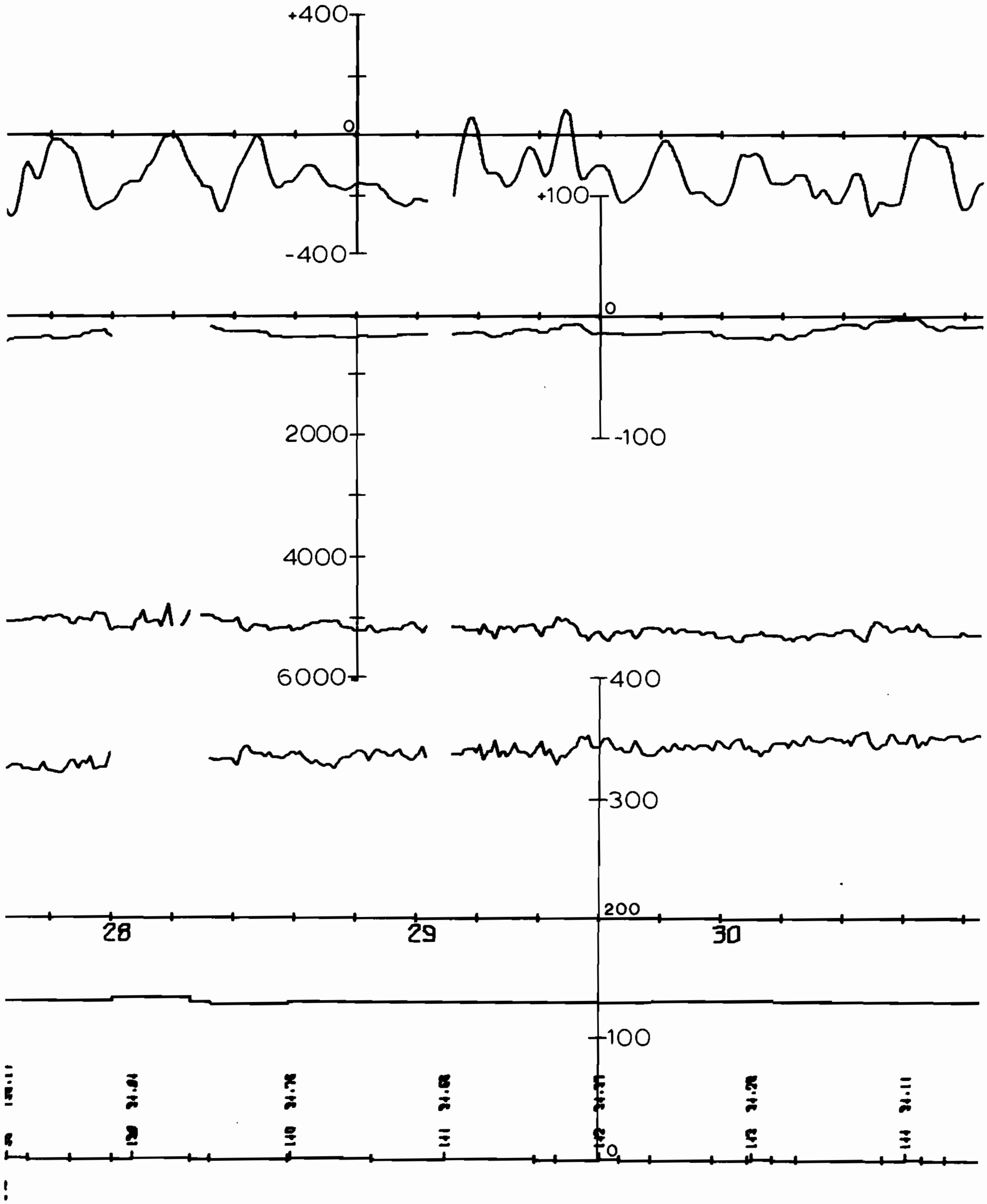

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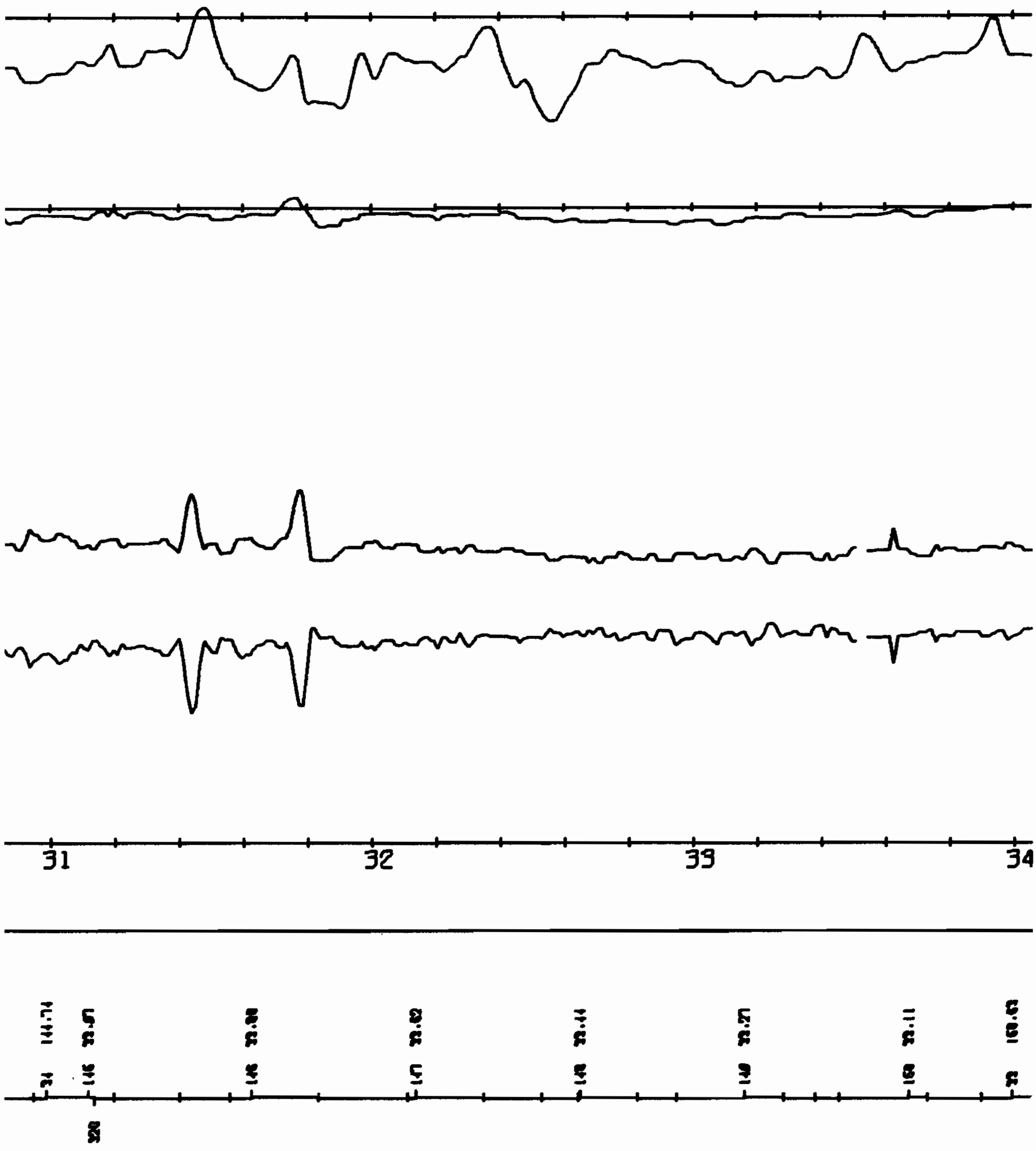

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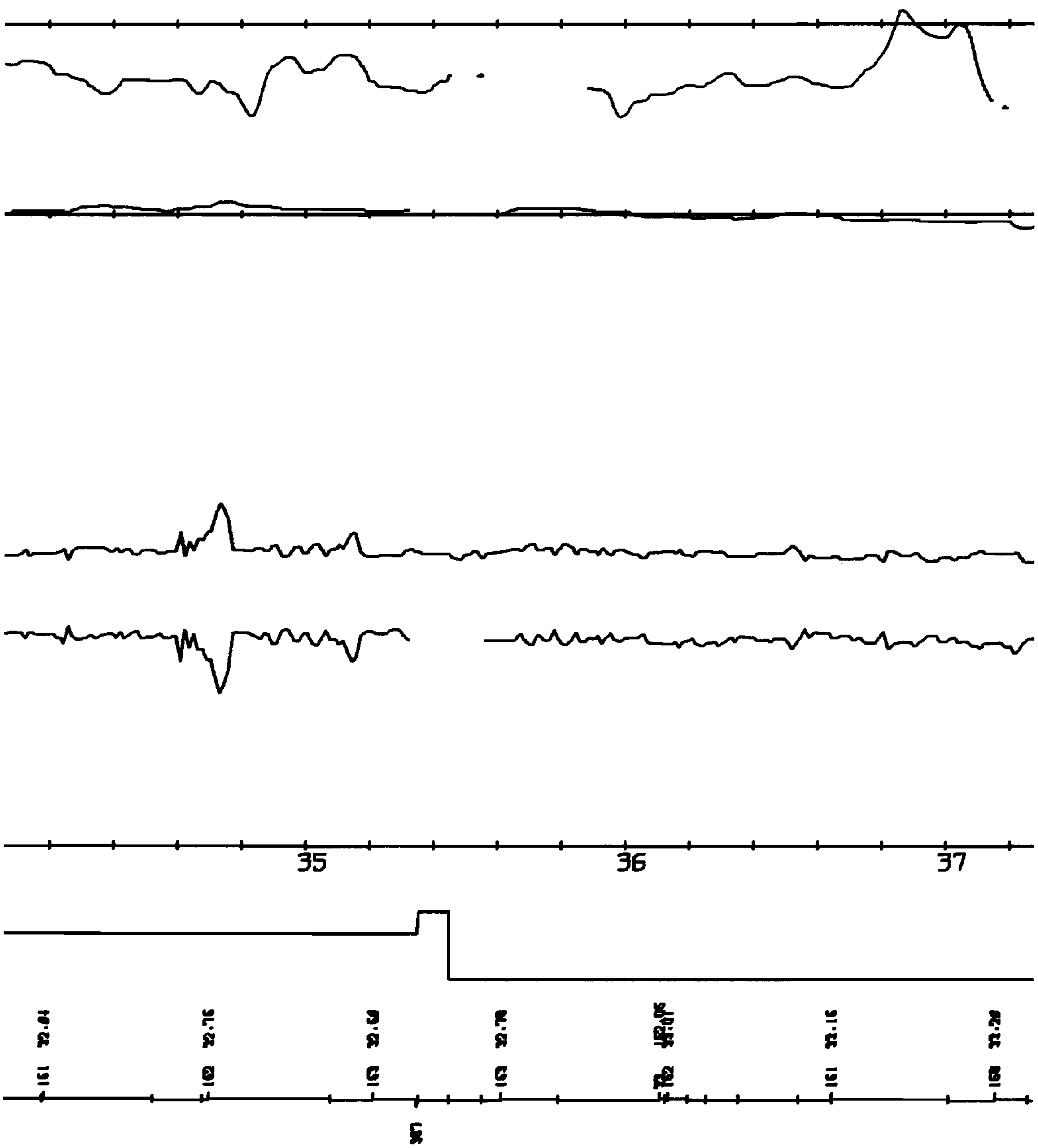

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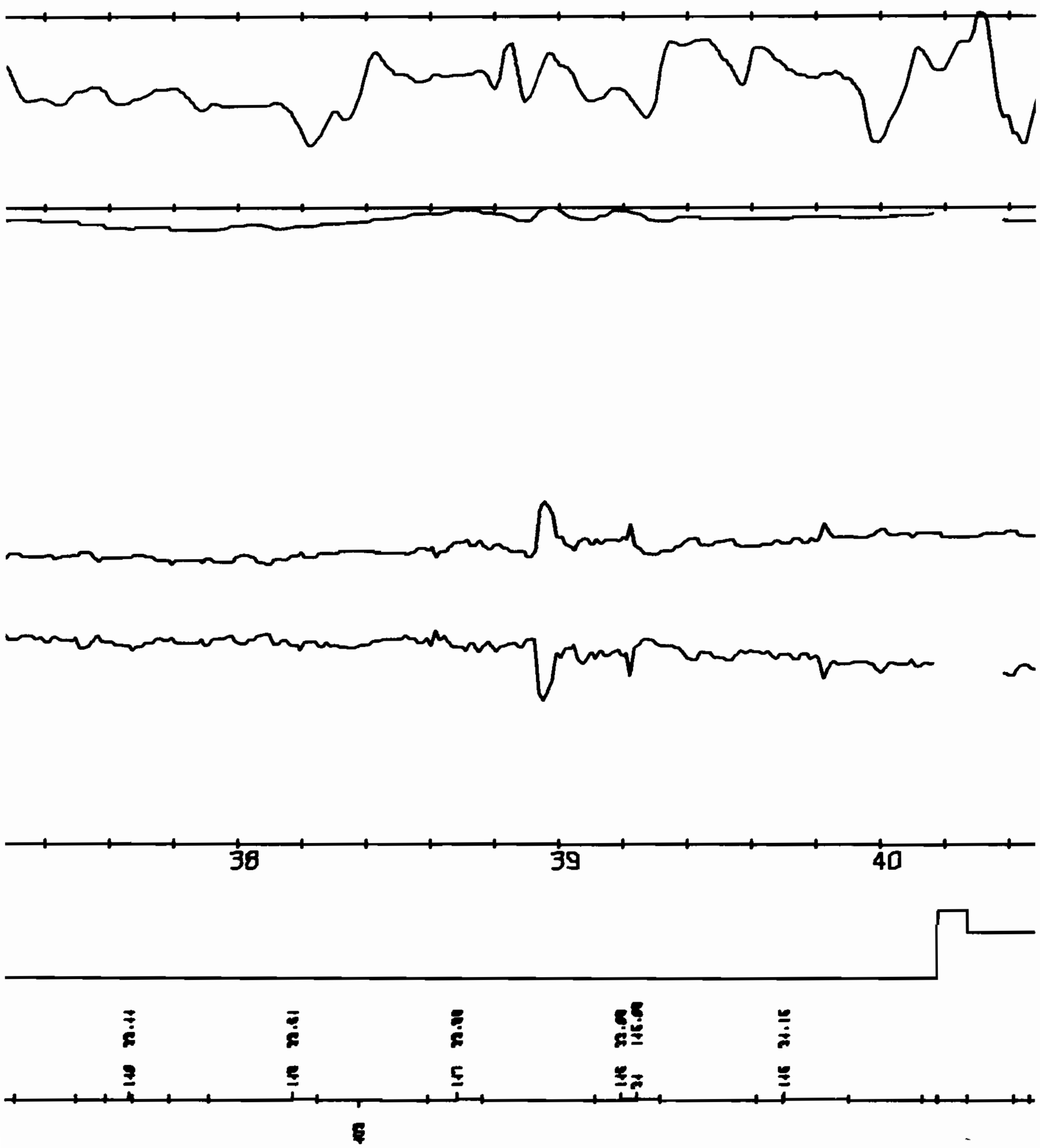

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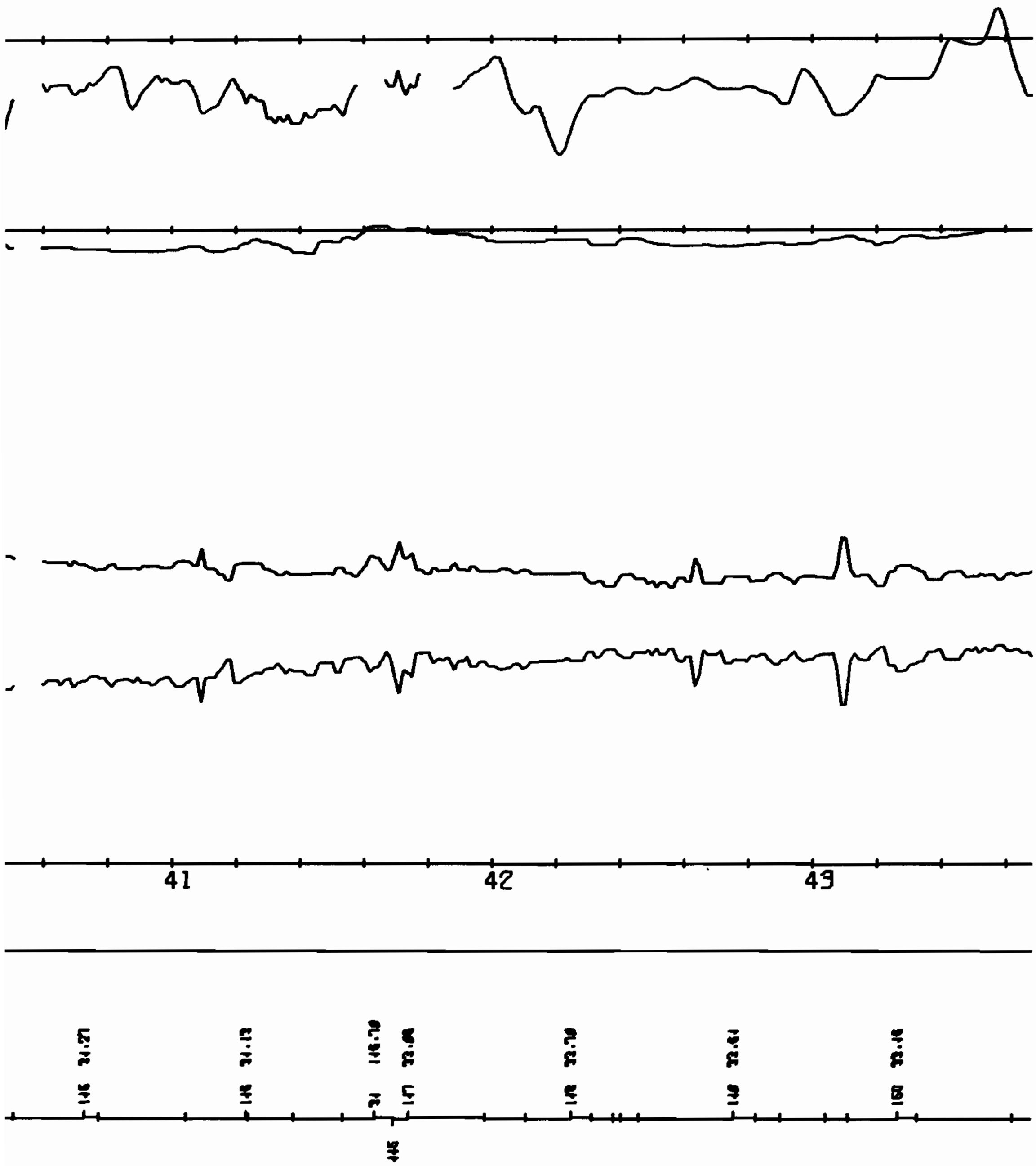

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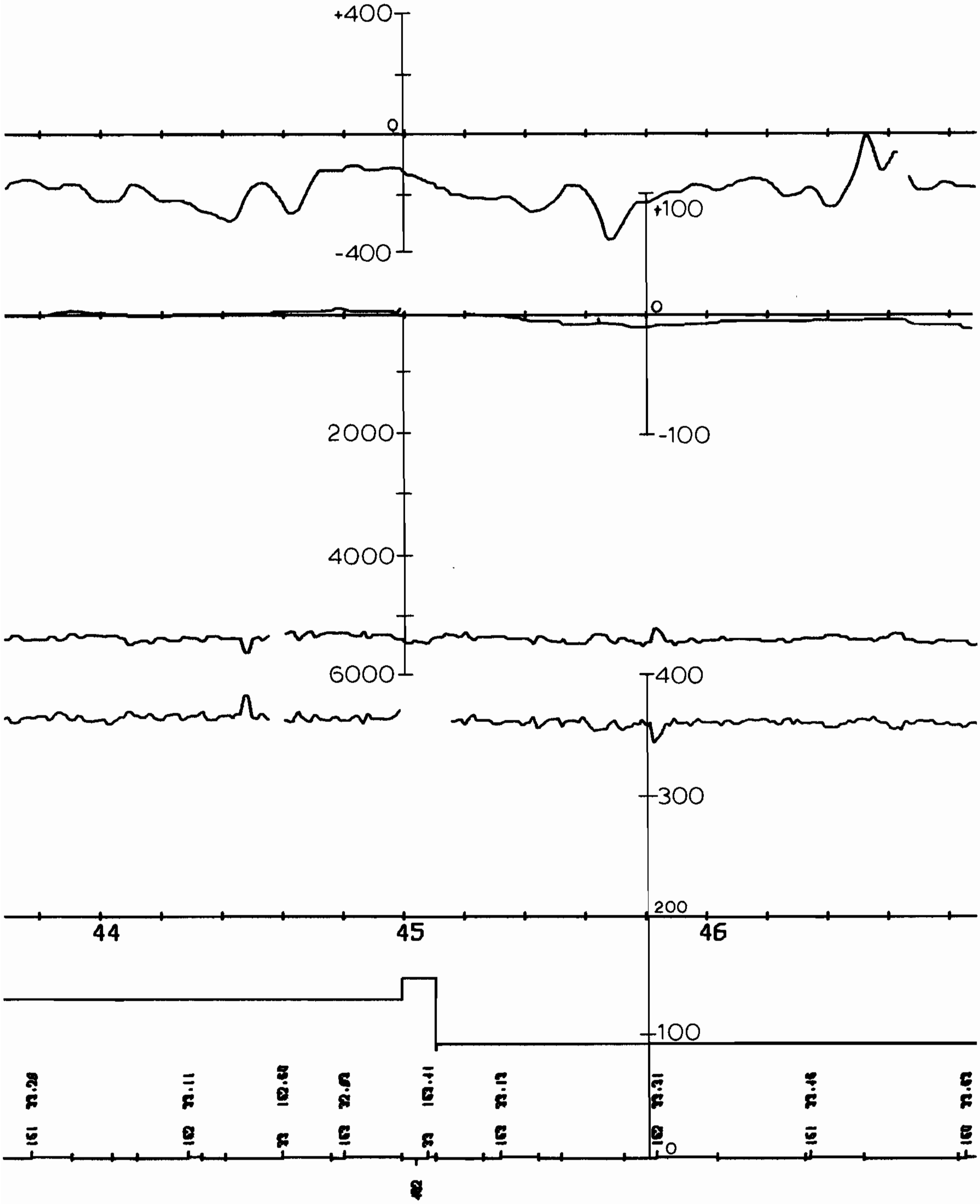

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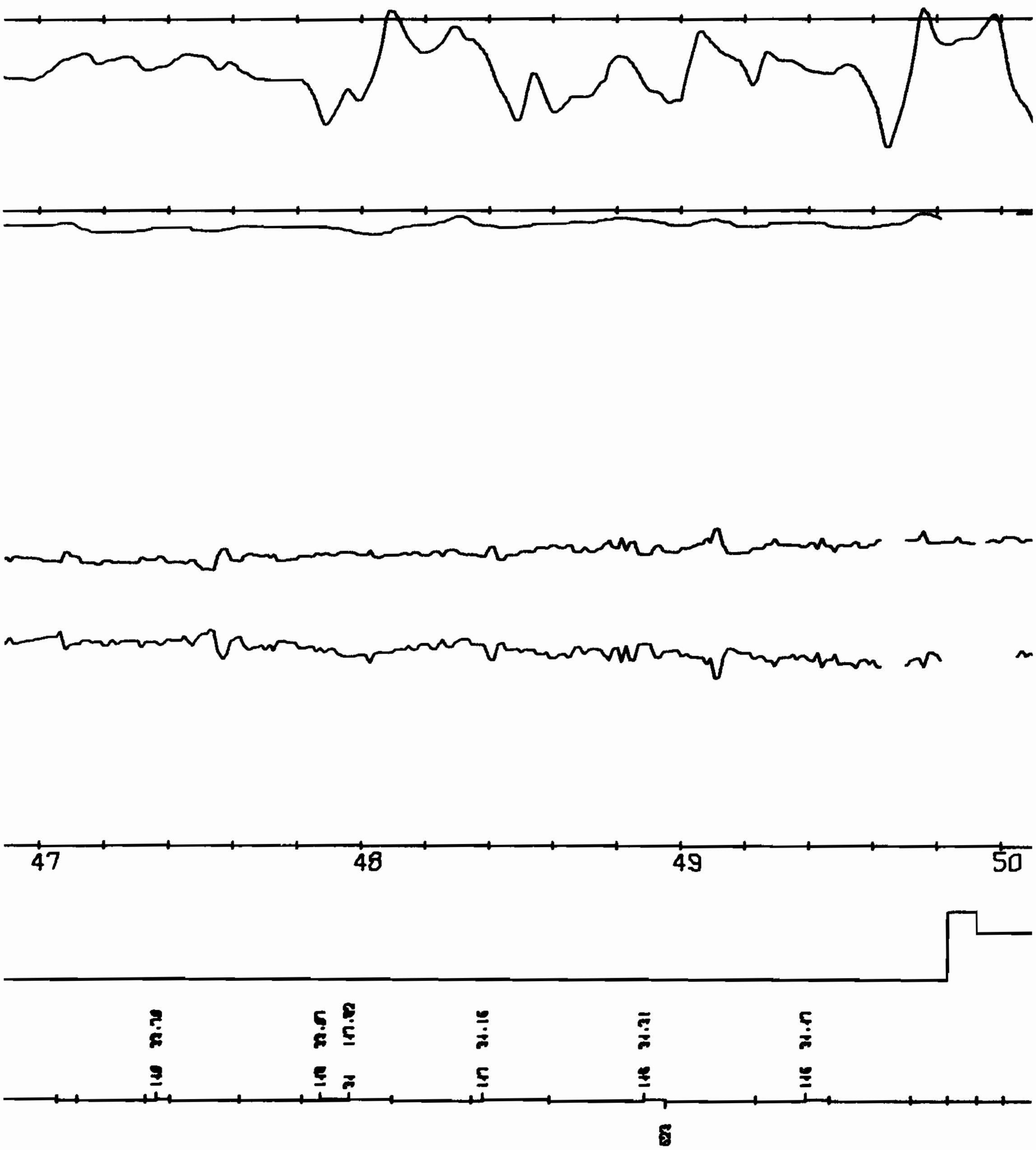

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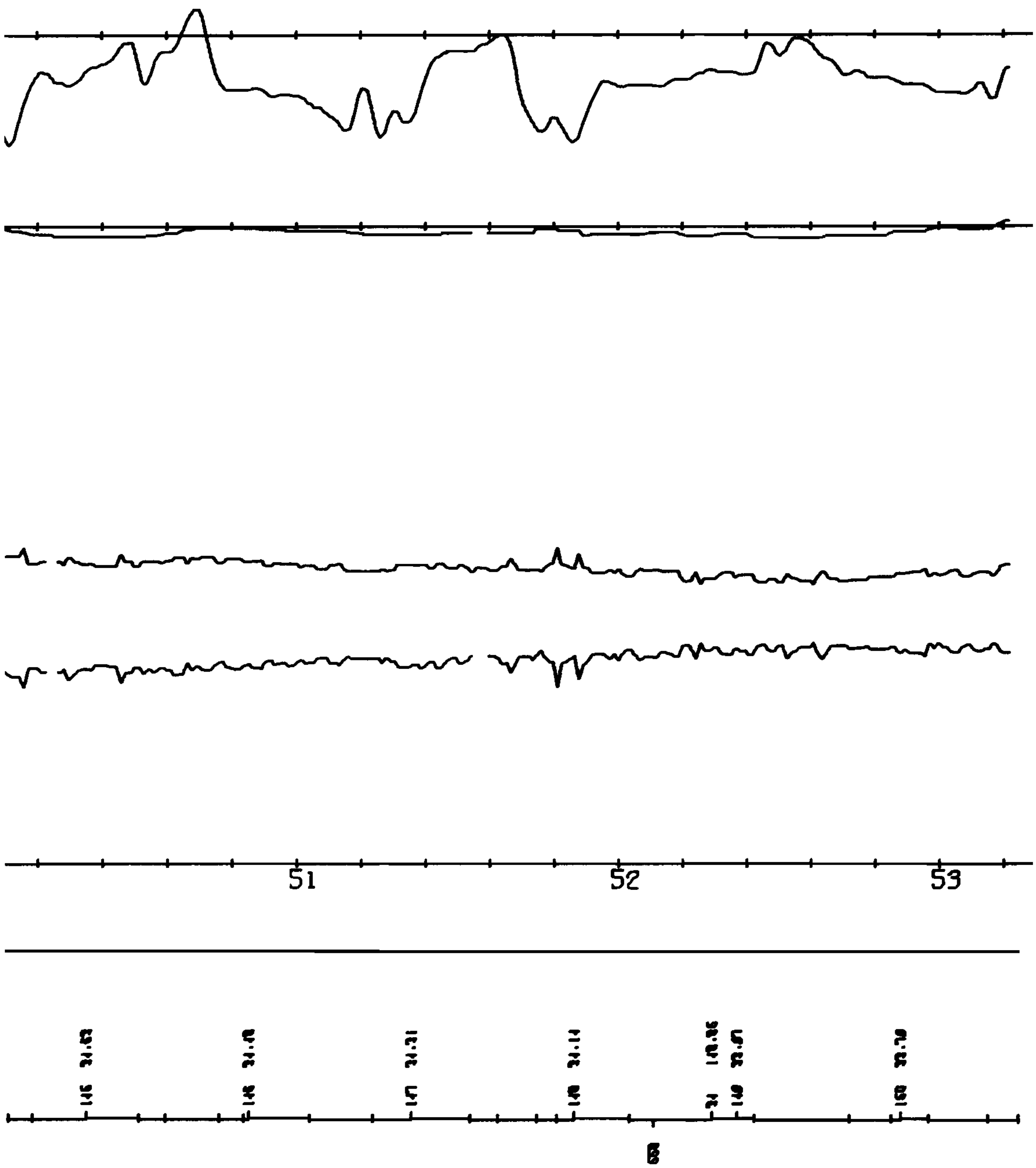

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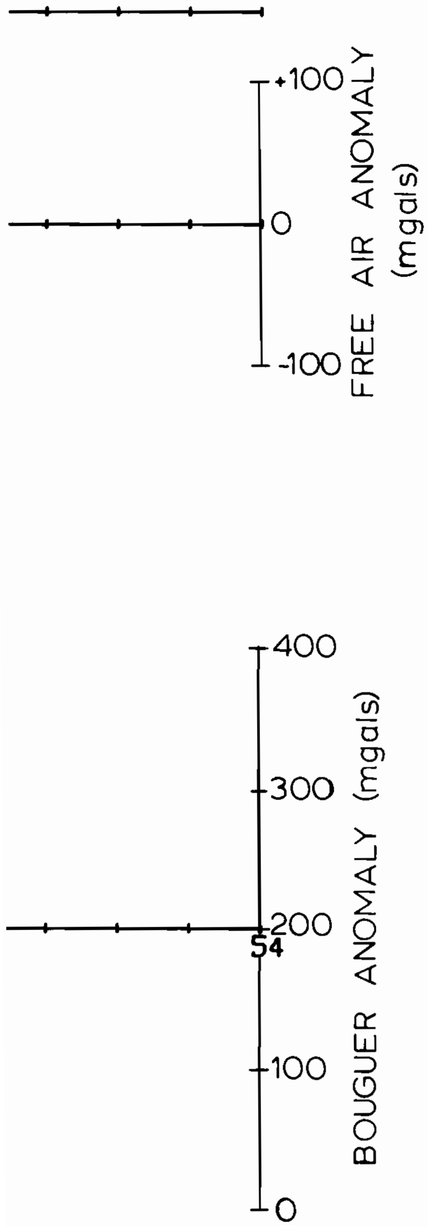

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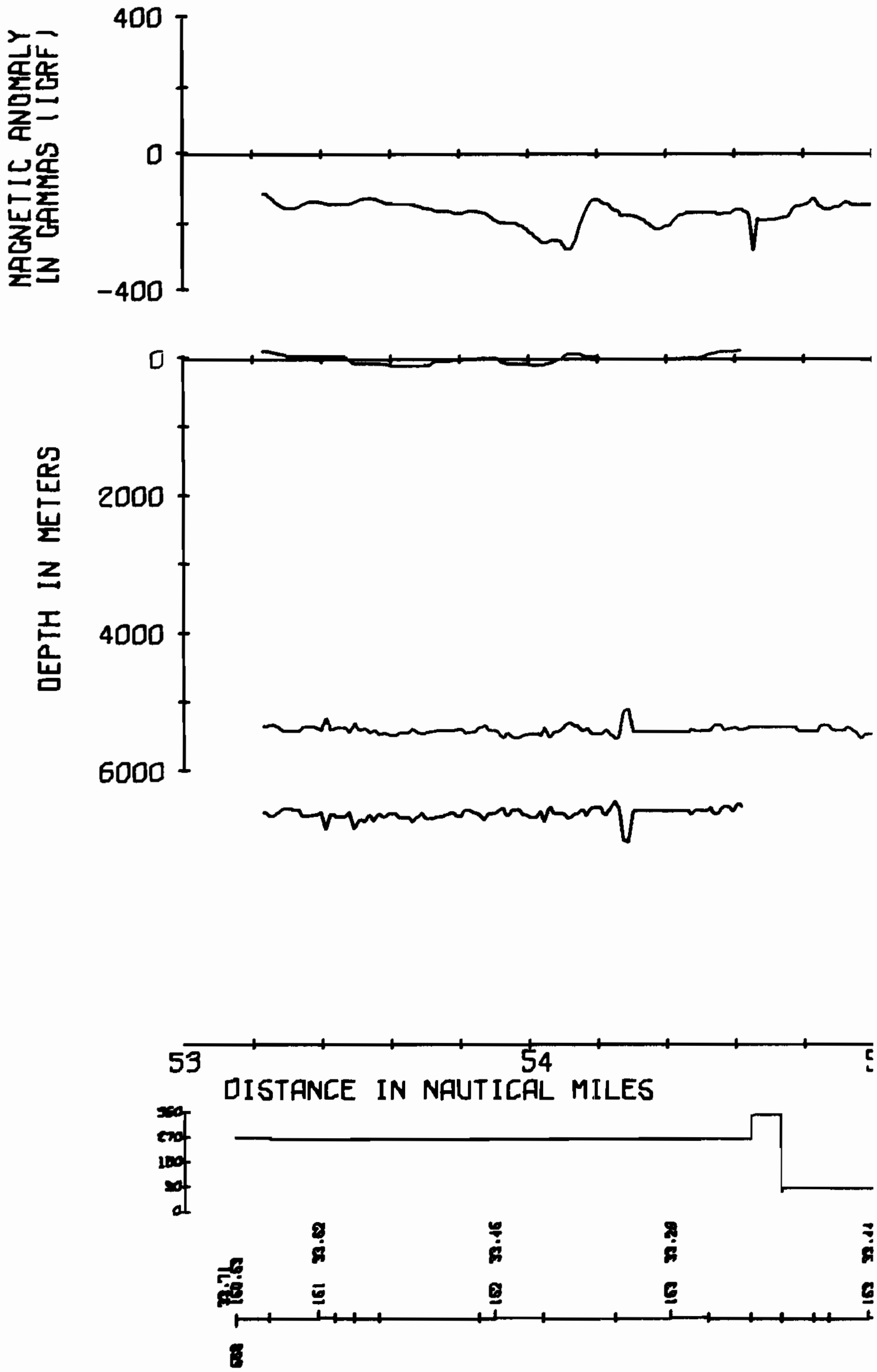
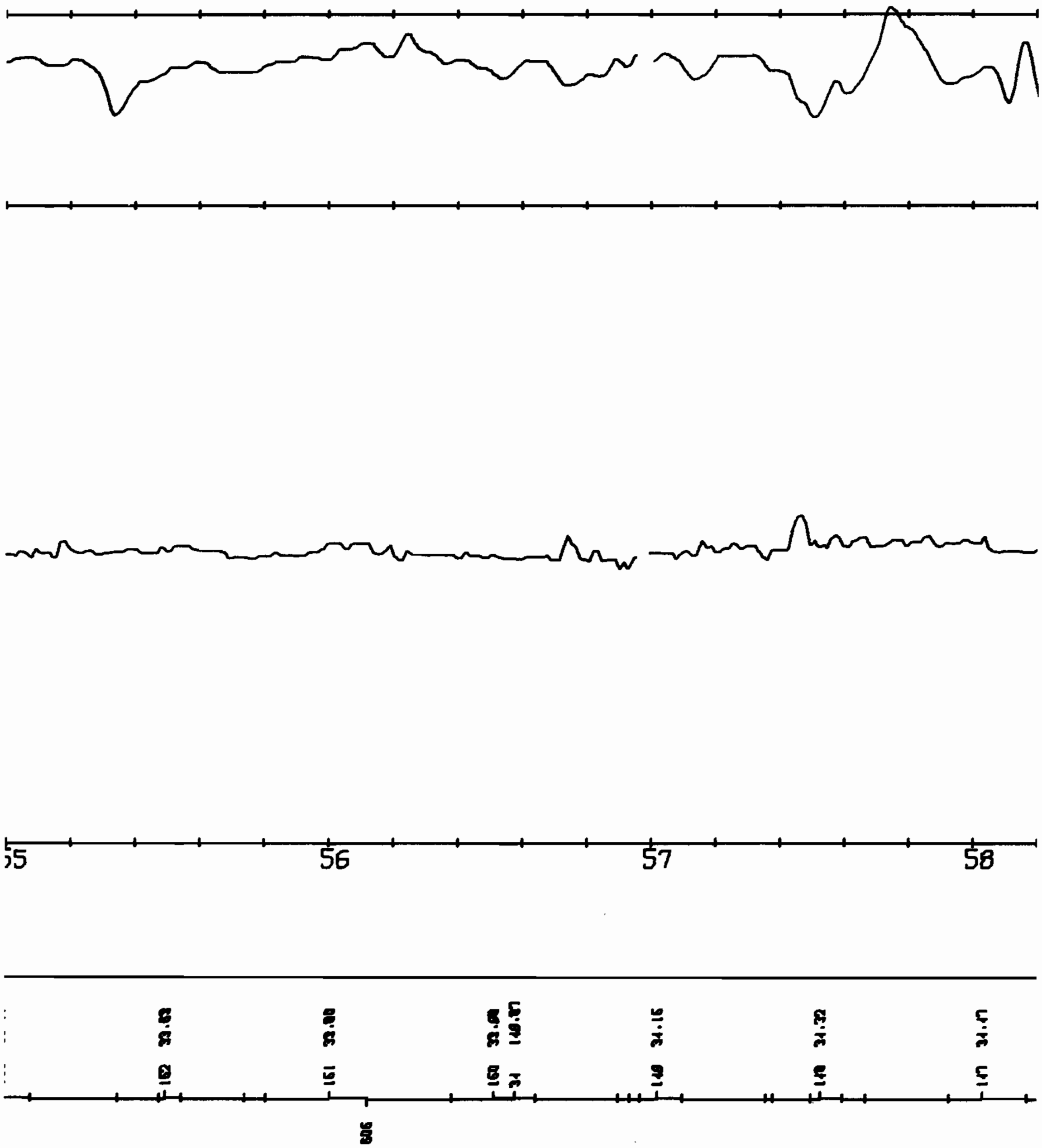

MAGNETIC ANOMALY
IN GAMMAS (IGRF)
400
0
-400
0
DEPTH IN METERS
2000
4000
6000
53
54
DISTANCE IN NAUTICAL MILES

RP-1-OC-71
Fig. 6



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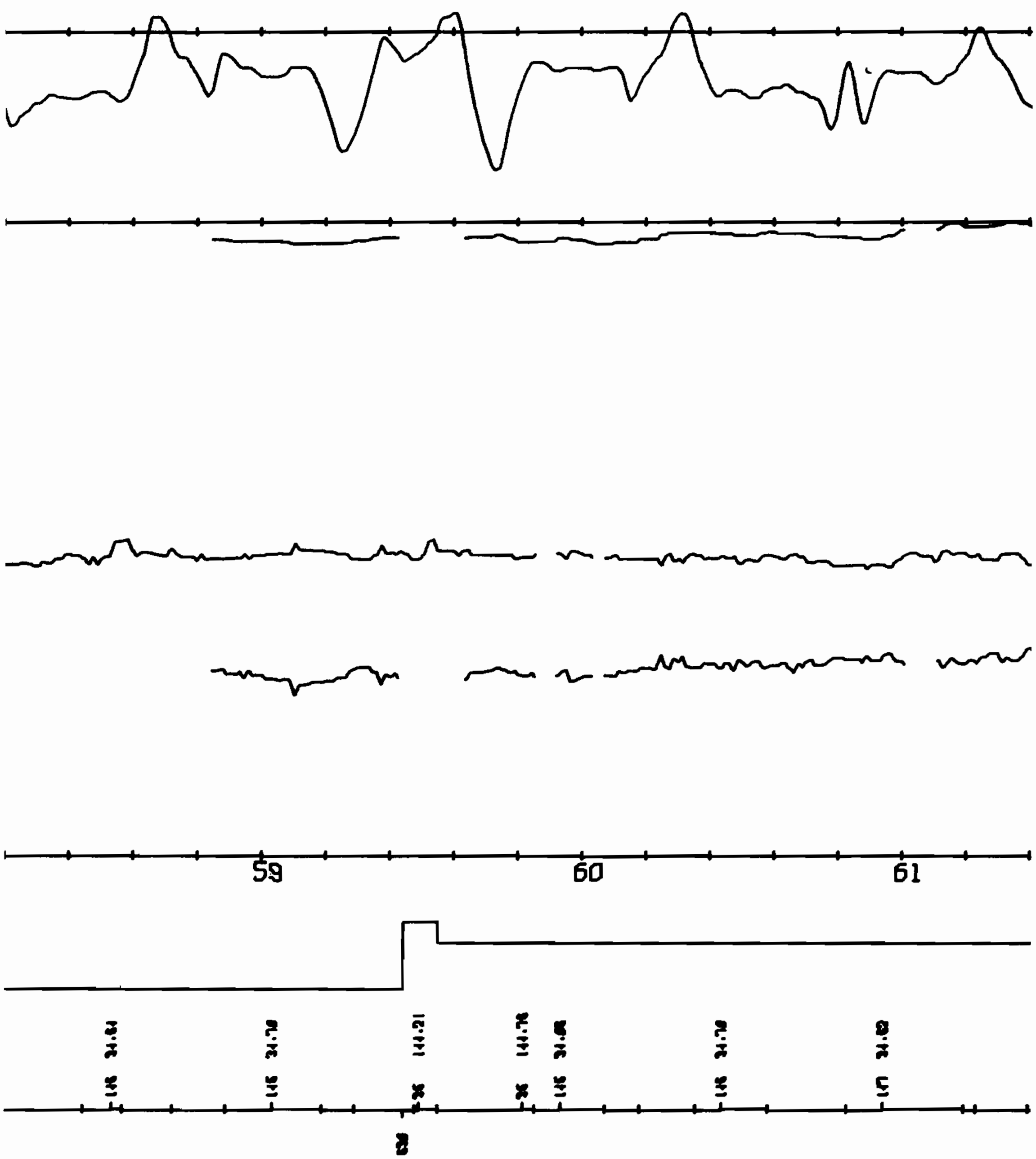

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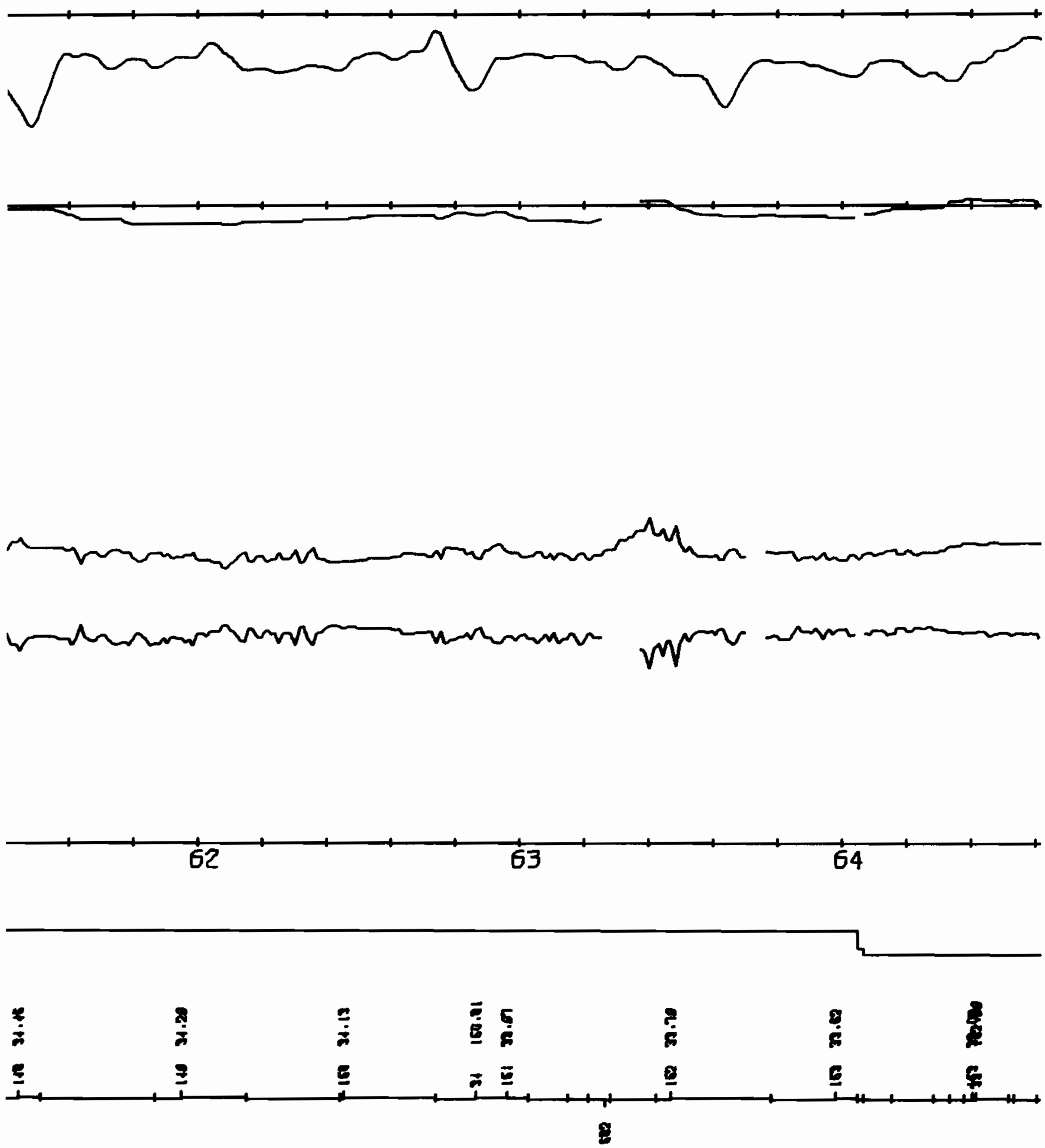

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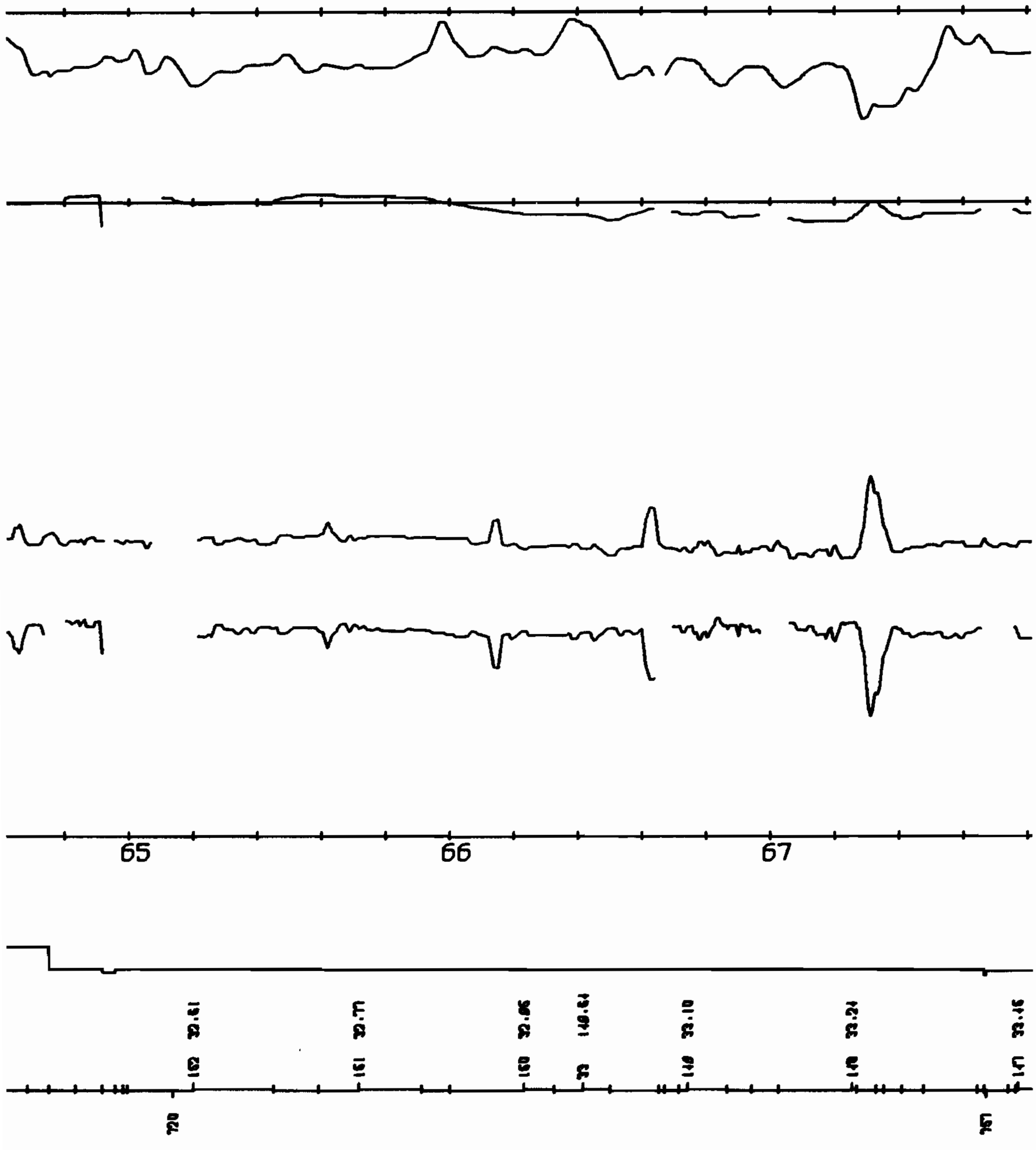

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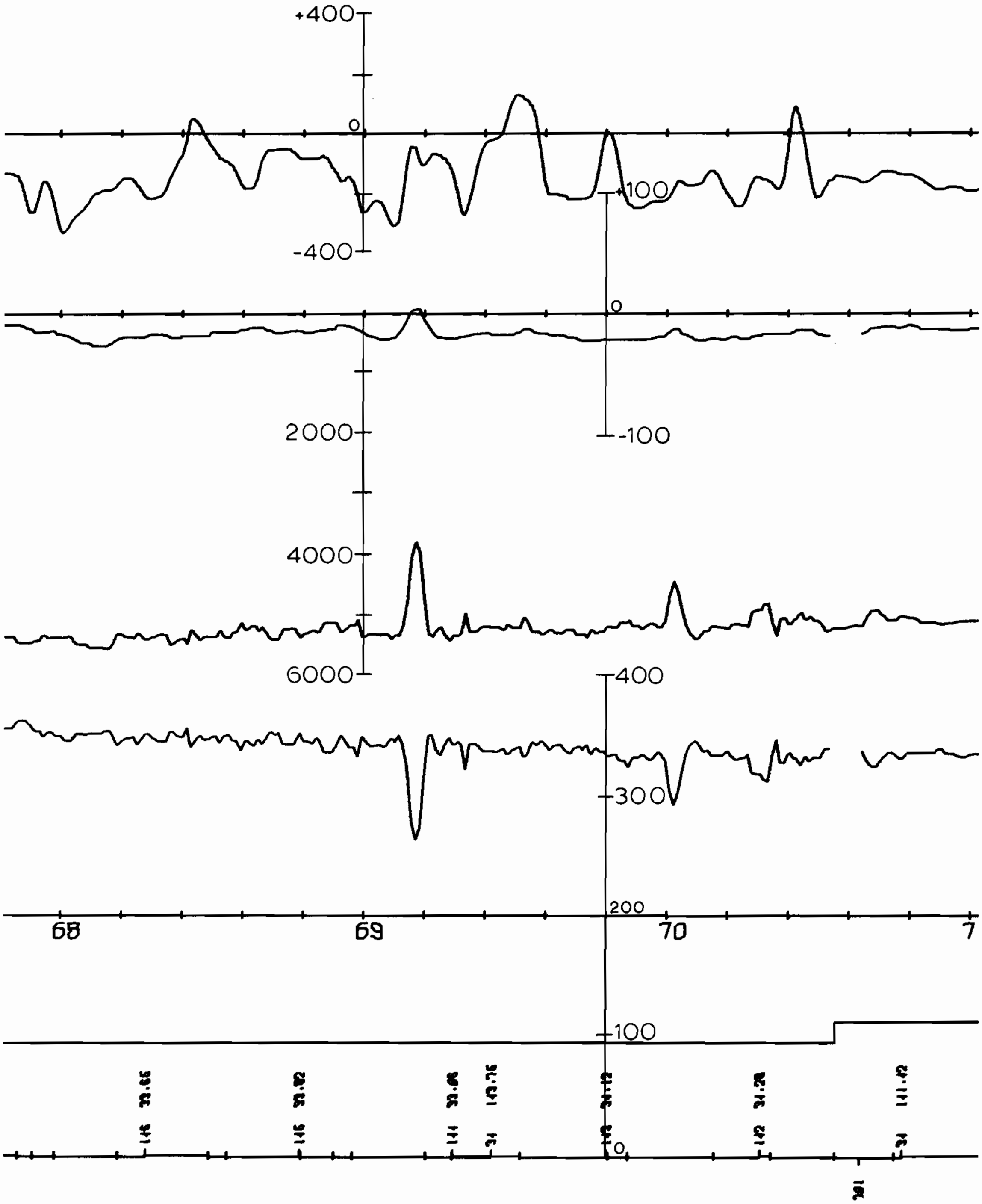

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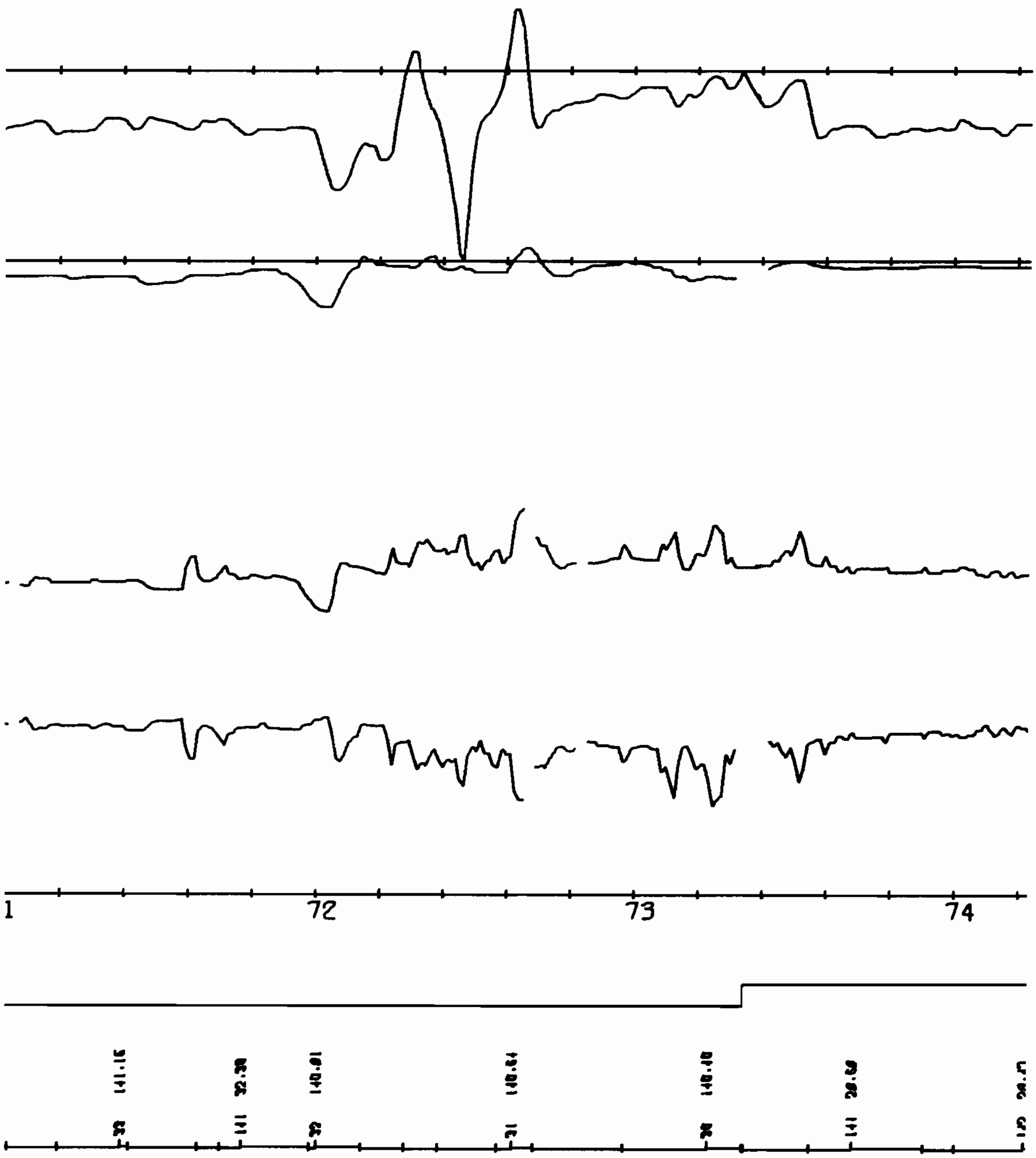

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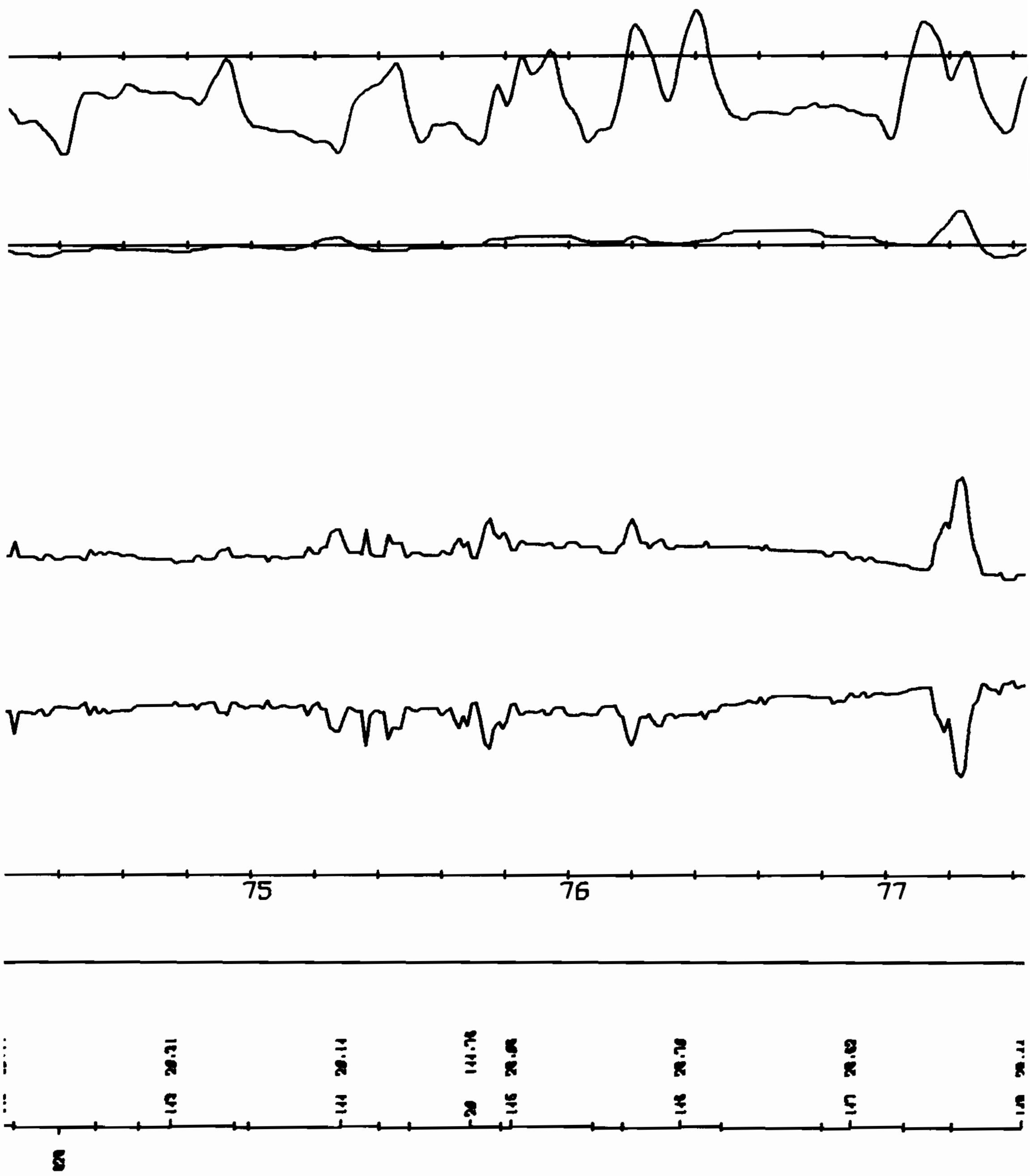
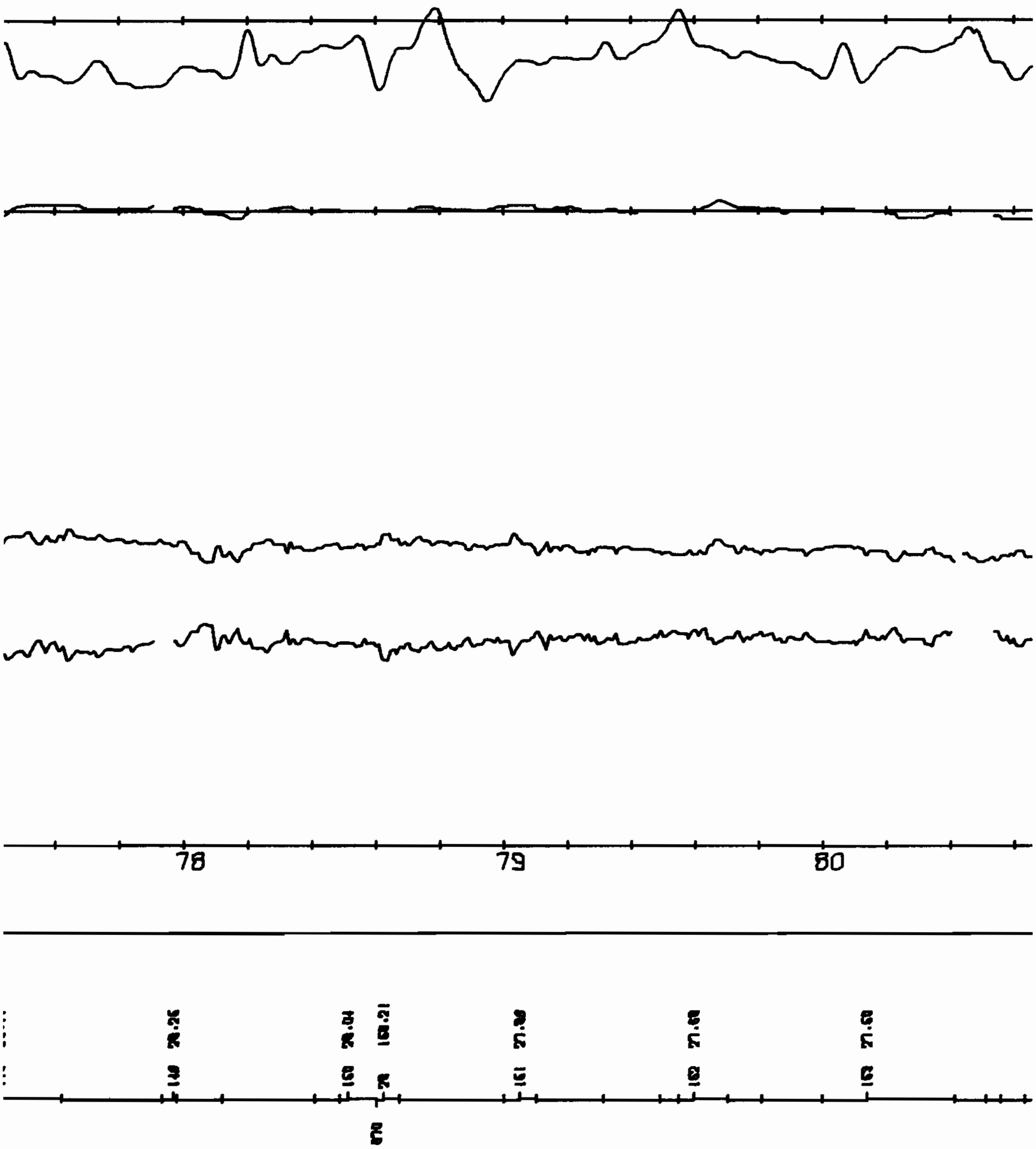
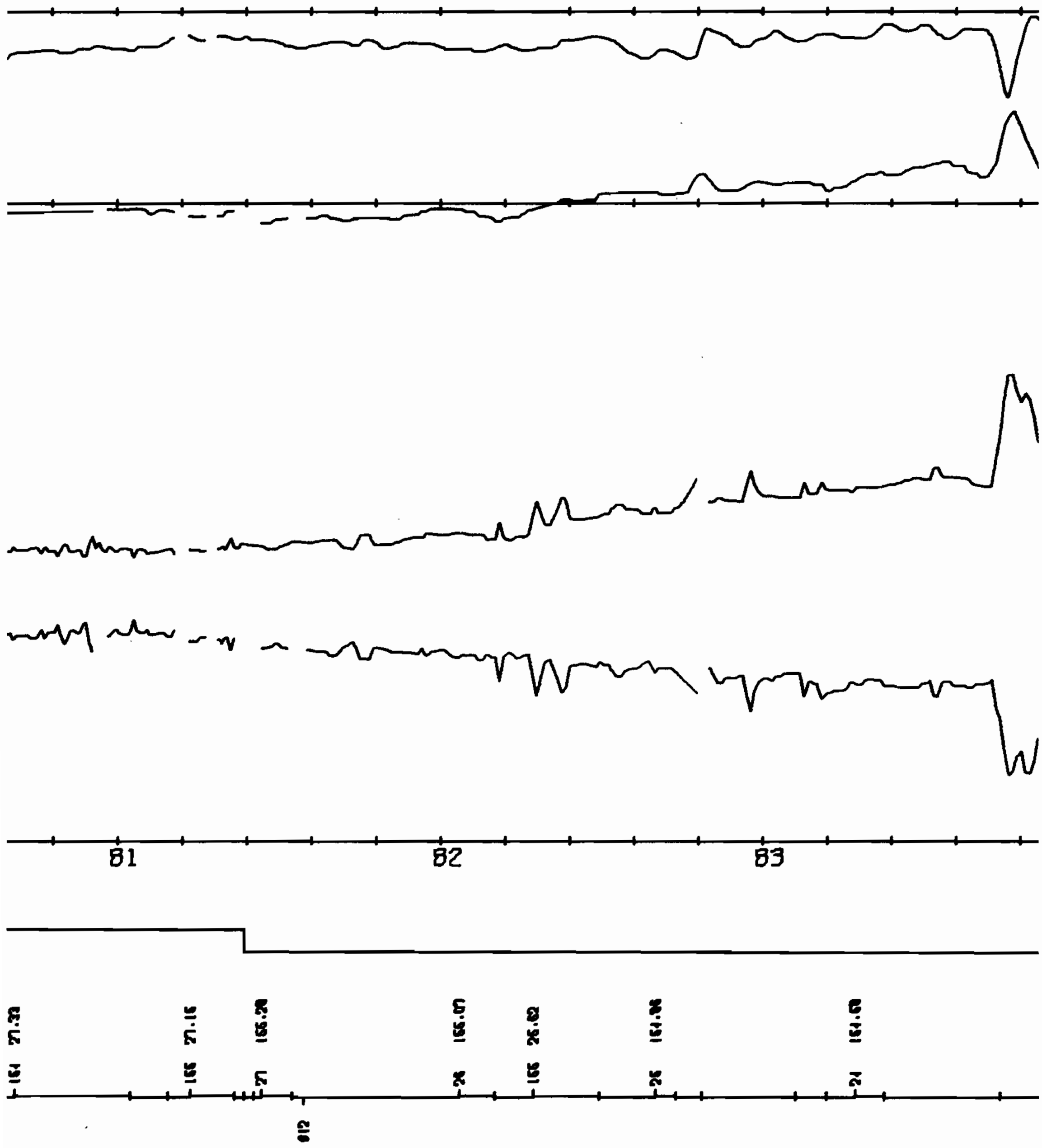


RP-1-OC-71
Fig. 6



RP-1-OC-71
Fig. 6



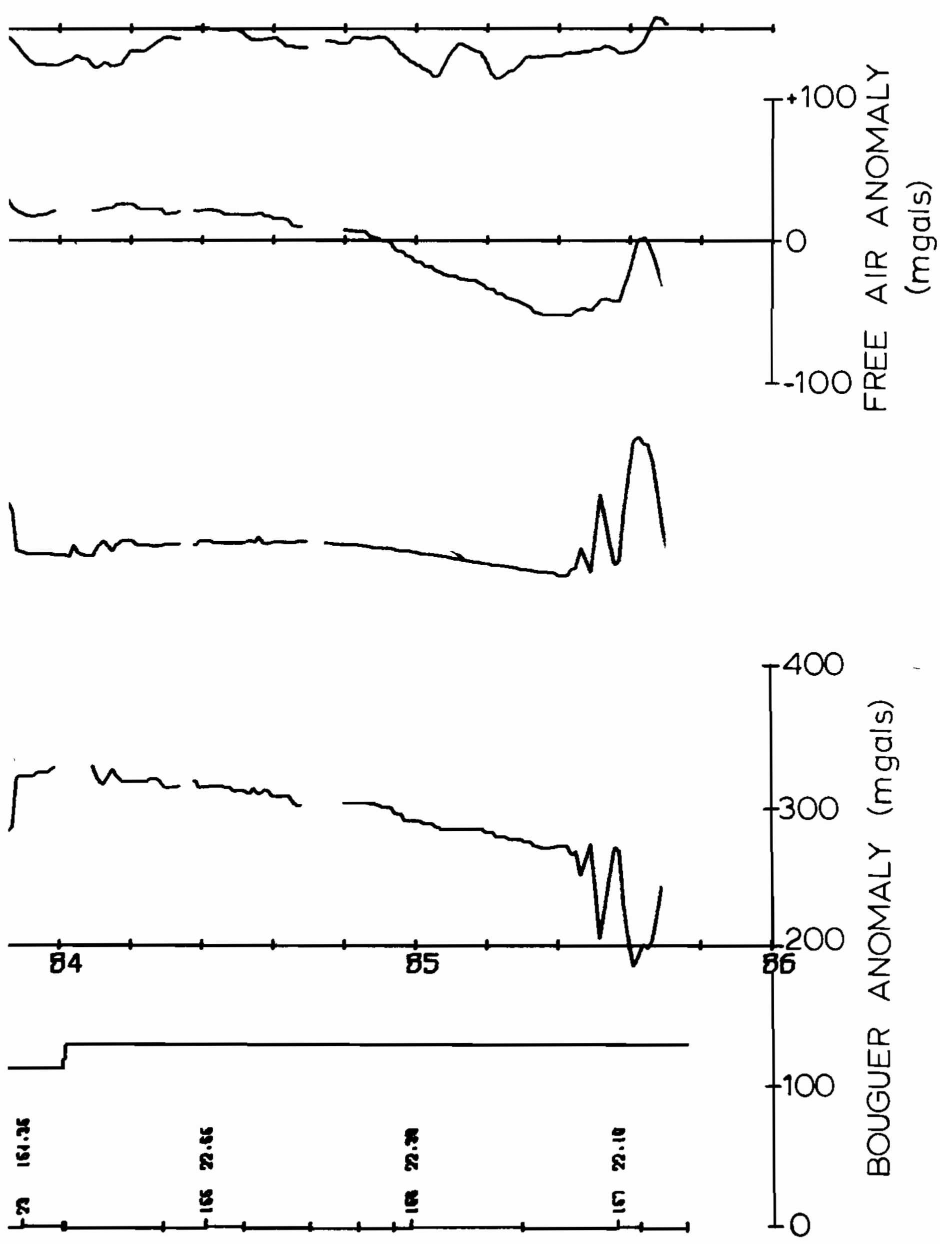

+100
0
-100
FREE AIR ANOMALY
(mgals)
400
300
200
100
0
BOUGUER ANOMALY (mgals)
84
85
86

FIGURE 7

LOCATION INDEX

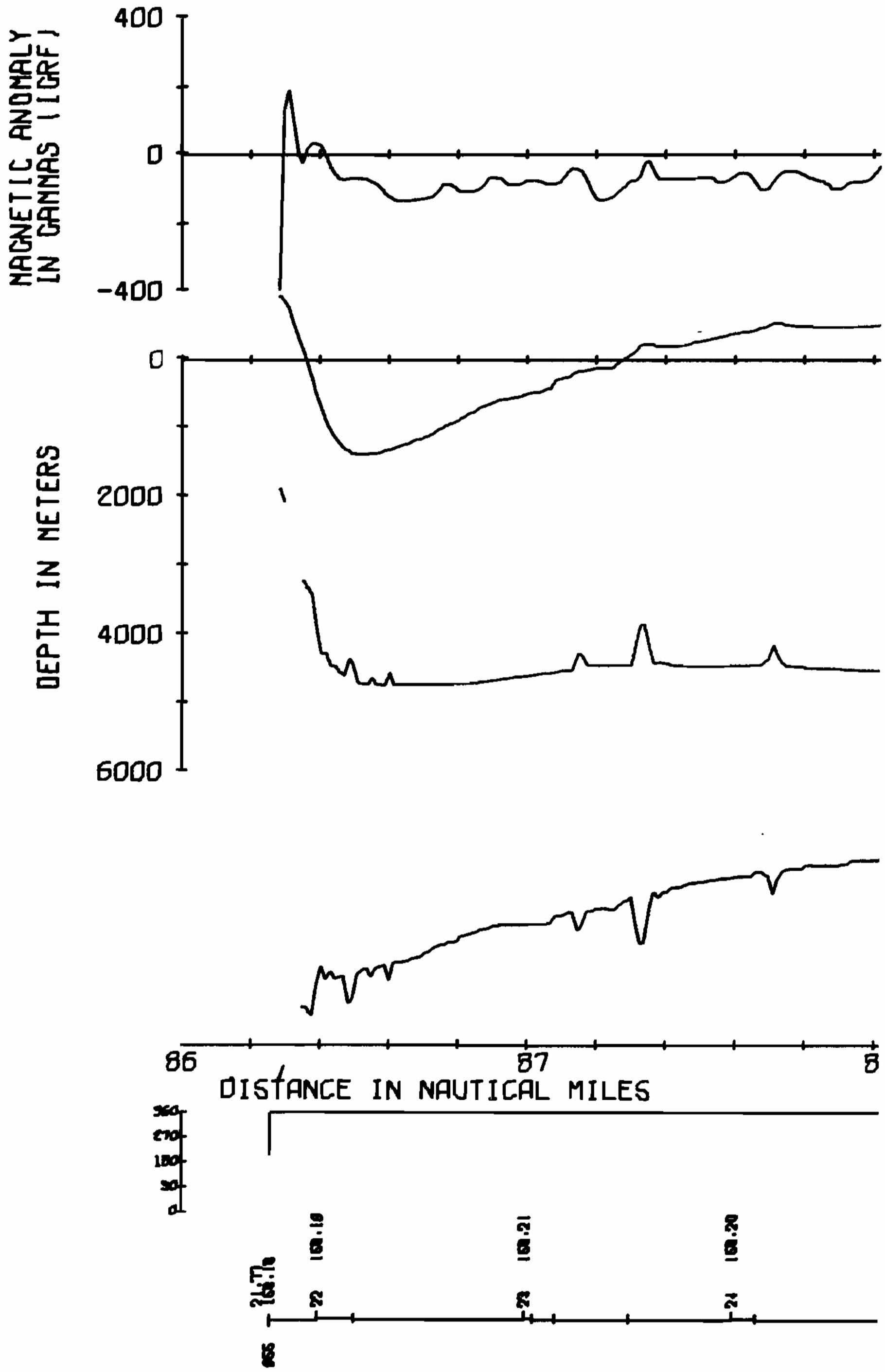
Leg II HONOLULU - KODIAK (See Figure 3)

Distance in n miles along track			Degrees Lat - Long		Degrees Lat - Long	Pages
8628.3	to	9099.7	21.81 - 158.18	to	29.67 - 158.16	50 - 51
9099.7	to	9599.3	29.67 - 158.16	to	38.00 - 158.18	51 - 53
9599.3	to	10100.3	38.00 - 158.18	to	40.40 - 164.93	53 - 55
10100.3	to	10600.5	40.40 - 164.93	to	45.11 - 168.98	55 - 56
10600.5	to	11099.9	45.11 - 168.98	to	44.71 - 165.50	56 - 58
11099.9	to	11600.0	44.71 - 165.50	to	44.78 - 166.21	58 - 59
11600.0	to	12100.3	44.78 - 166.21	to	48.84 - 160.57	59 - 61
12100.3	to	12600.2	48.84 - 160.57	to	52.82 - 157.79	61 - 63
12600.2	to	13100.0	52.82 - 157.79	to	55.94 - 153.36	63 - 65
13100.0	to	13590.6	55.94 - 153.36	to	57.21 - 151.40	65 - 67

Developed Area: Chinook Trough

10807.7	to	11795.6	47.59 - 167.51	to	47.10 - 165.01	57 - 60

RP-1-OC-71
Fig. 7



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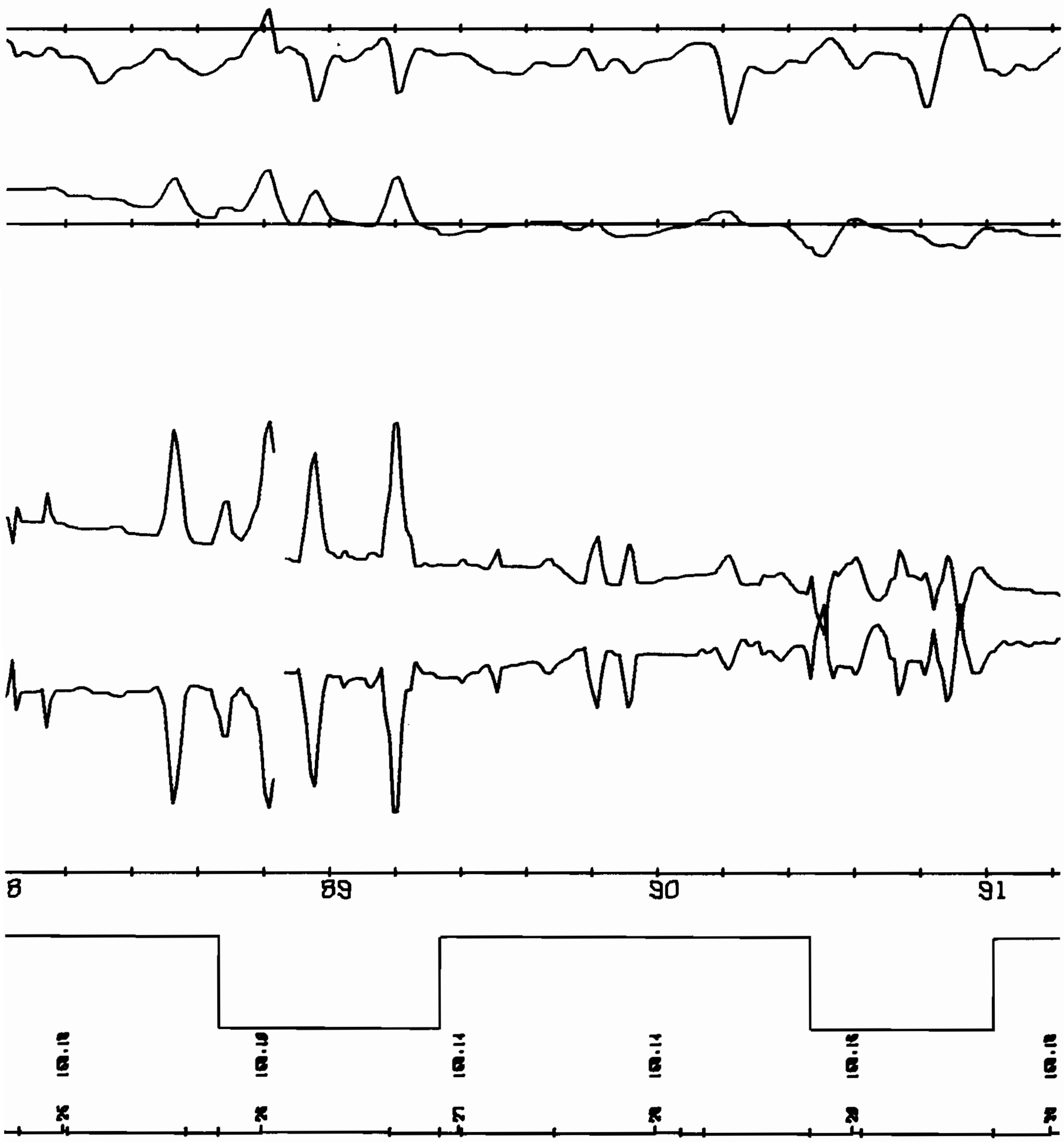
RP-1-OC-71
Fig. 7



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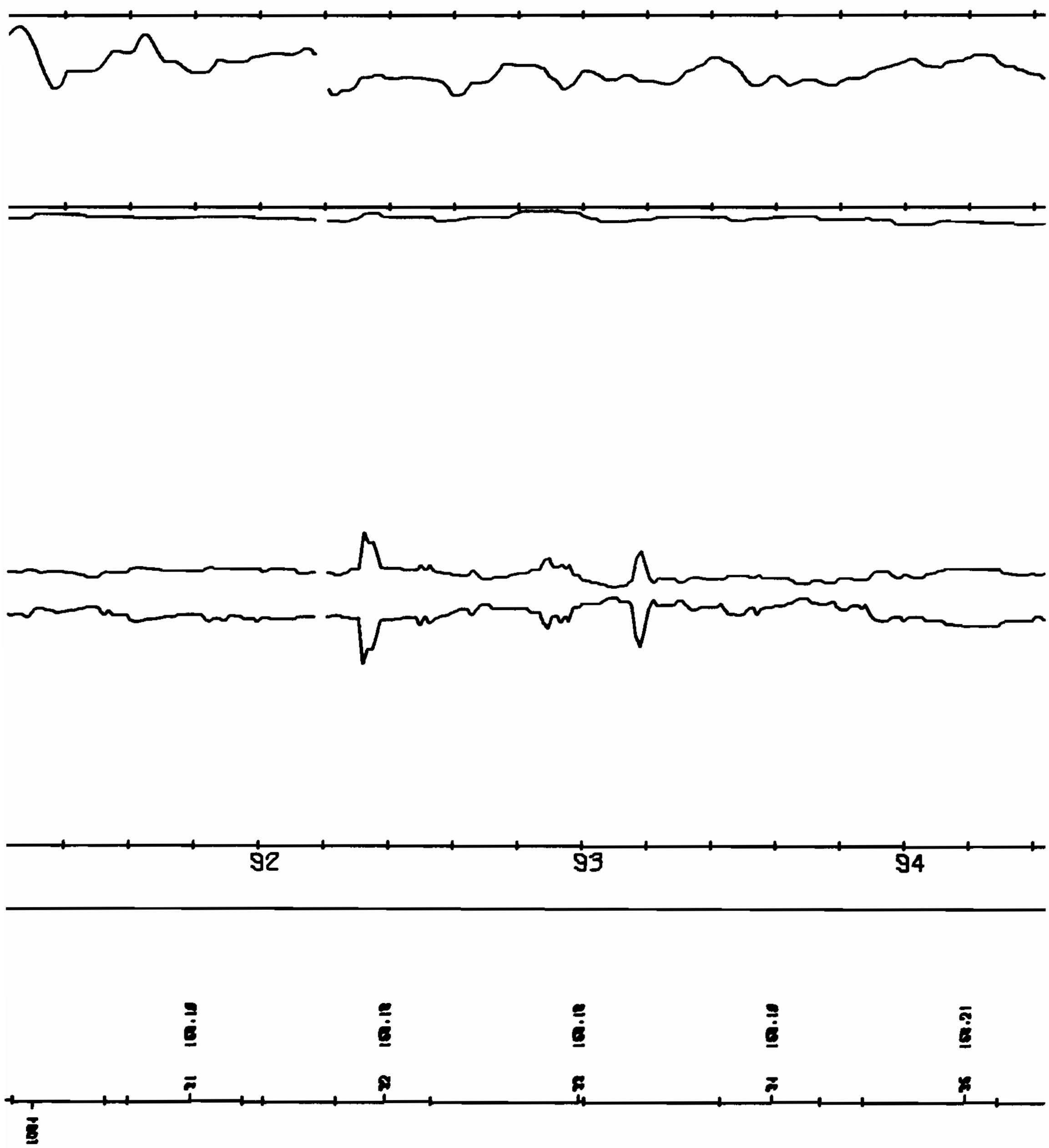

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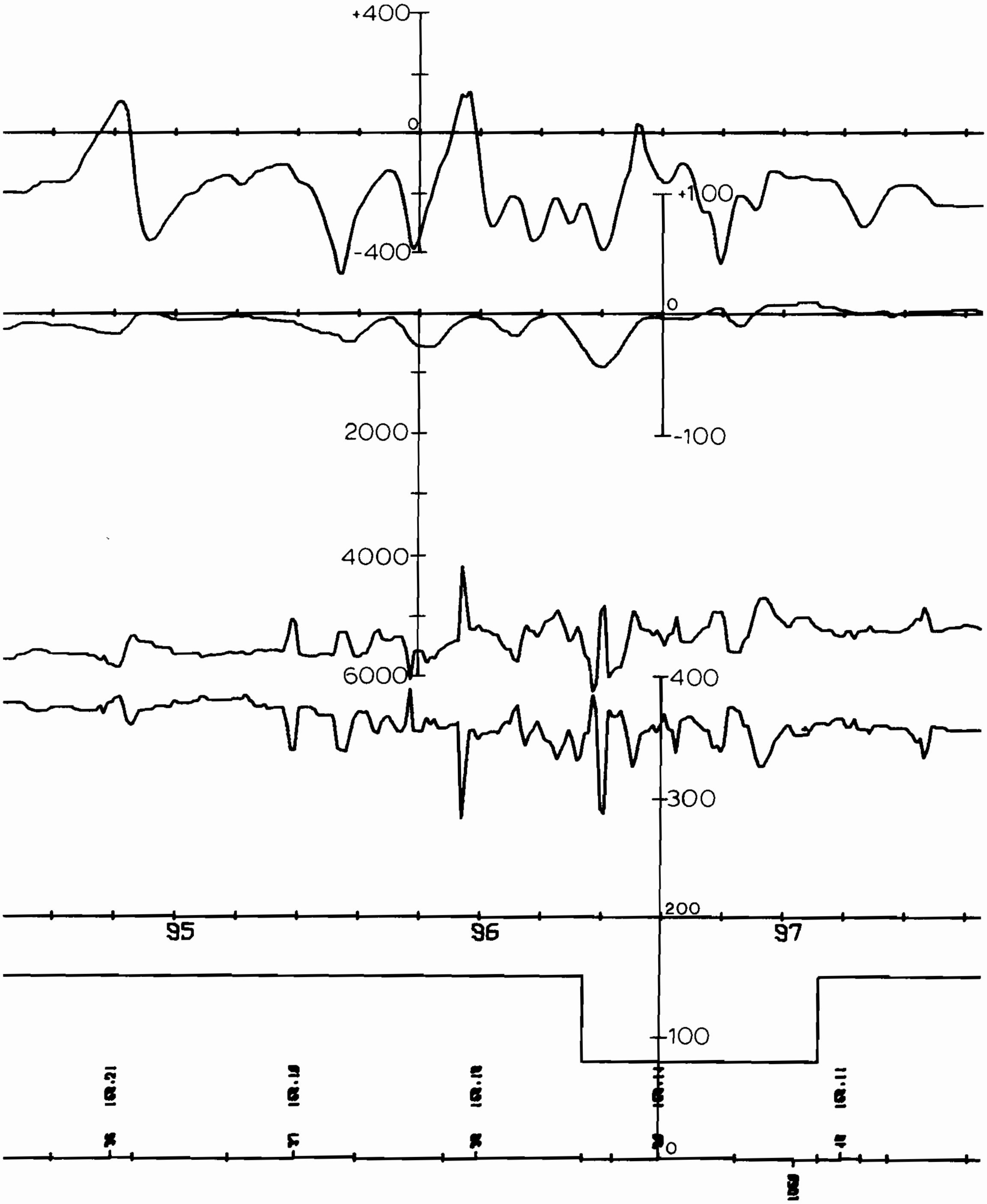
Fig 7



RP-1-OC -71
Fig. 7

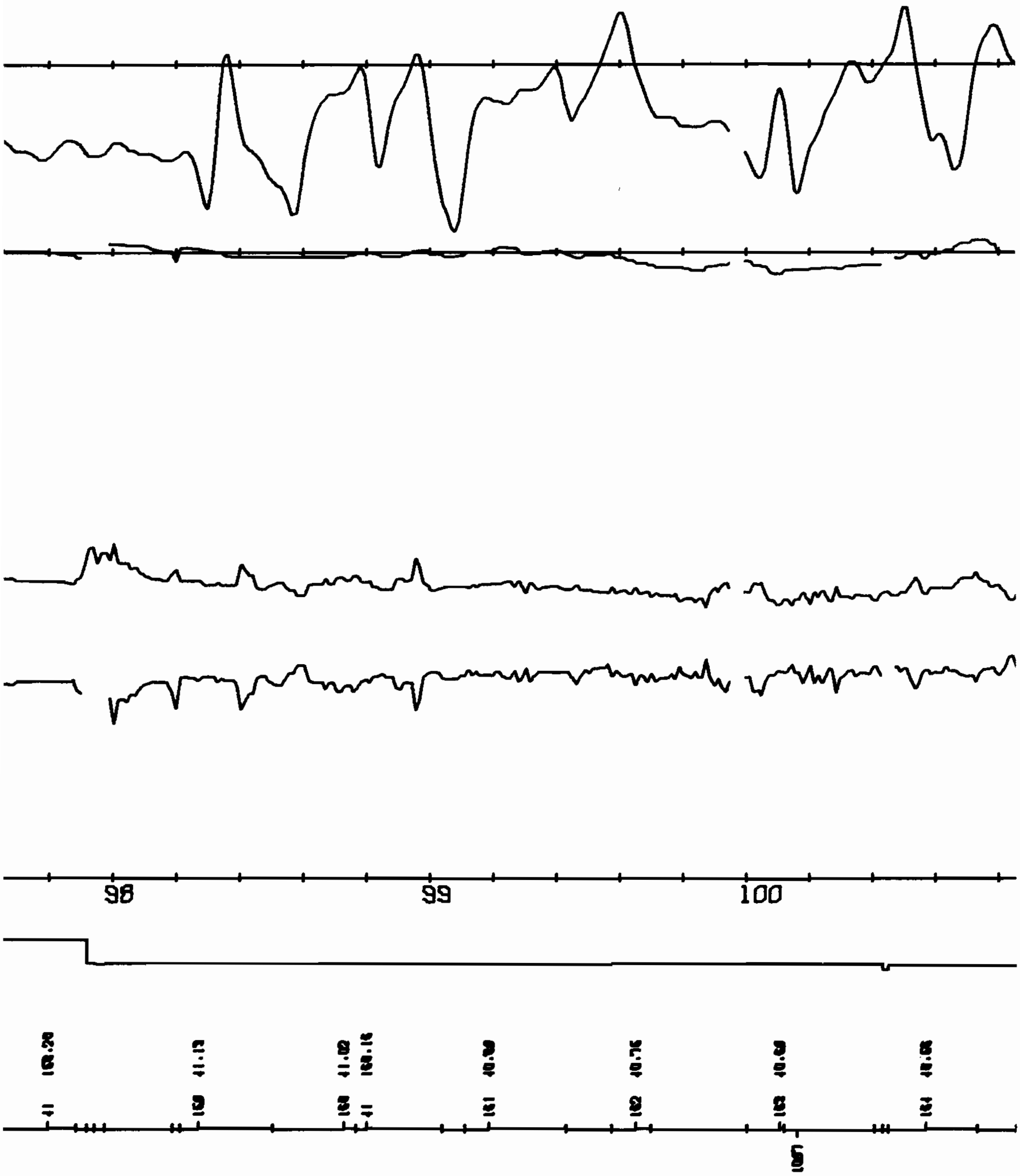


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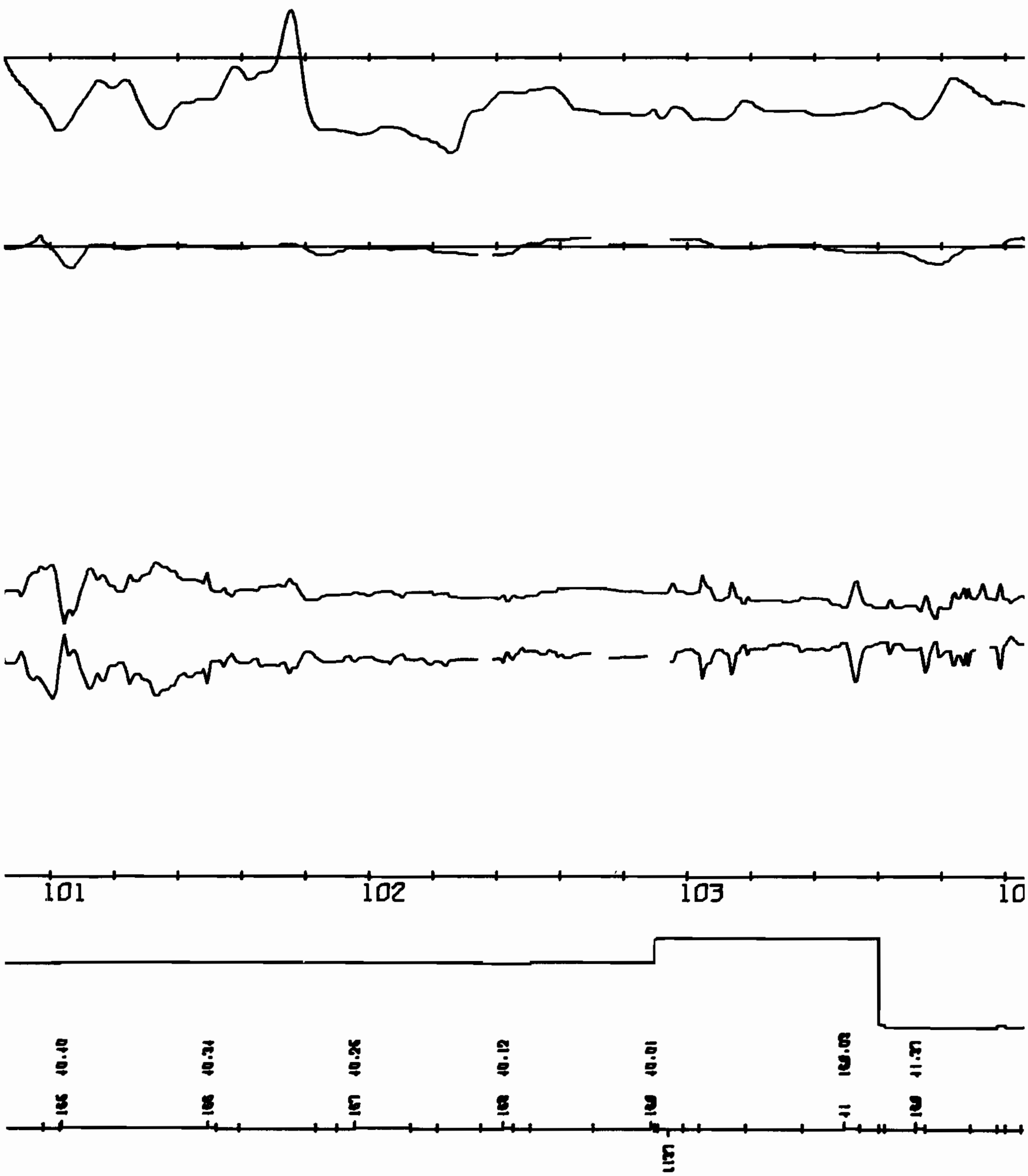
Fig. 7



RP-1-OC-71
Fig 7

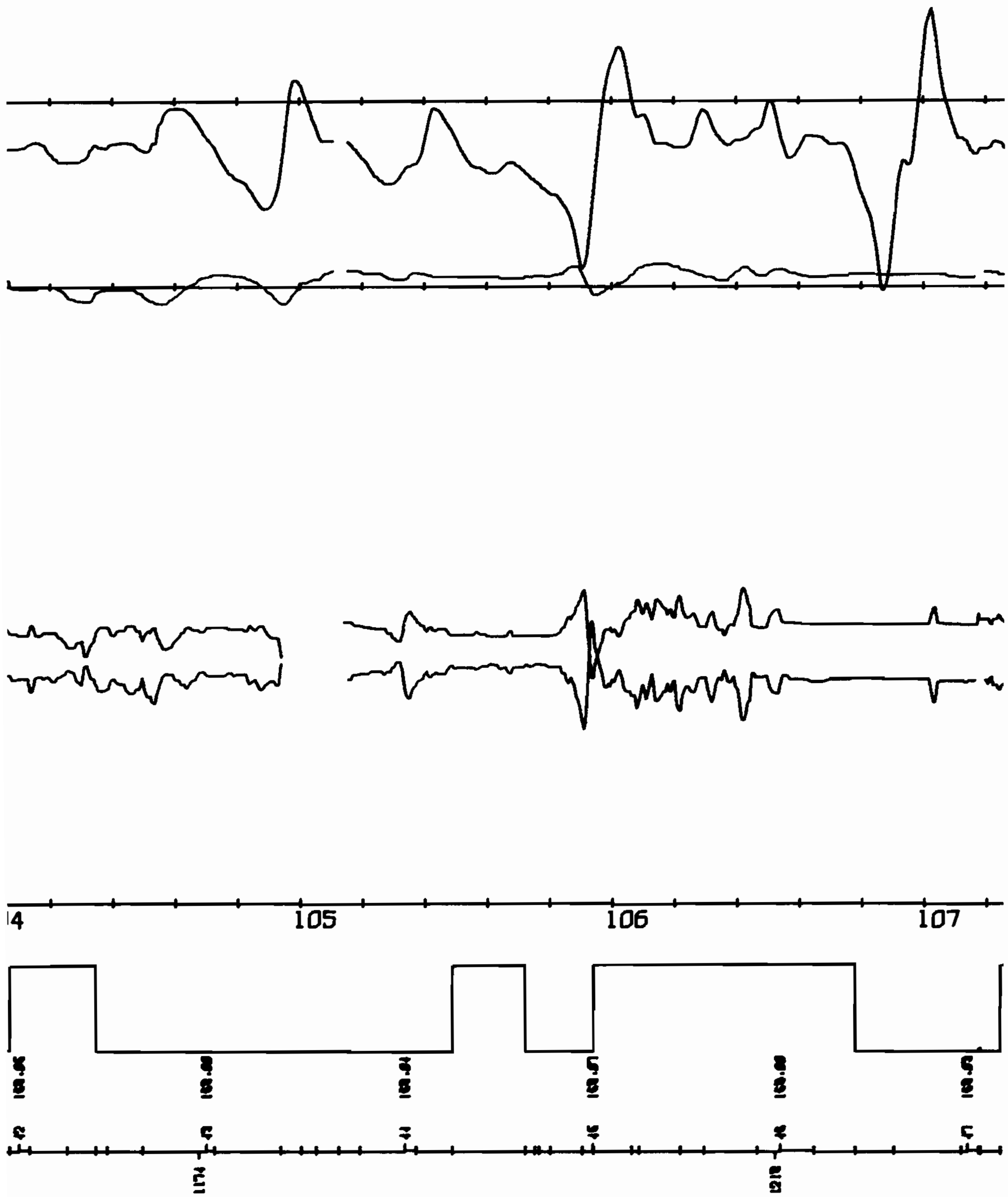


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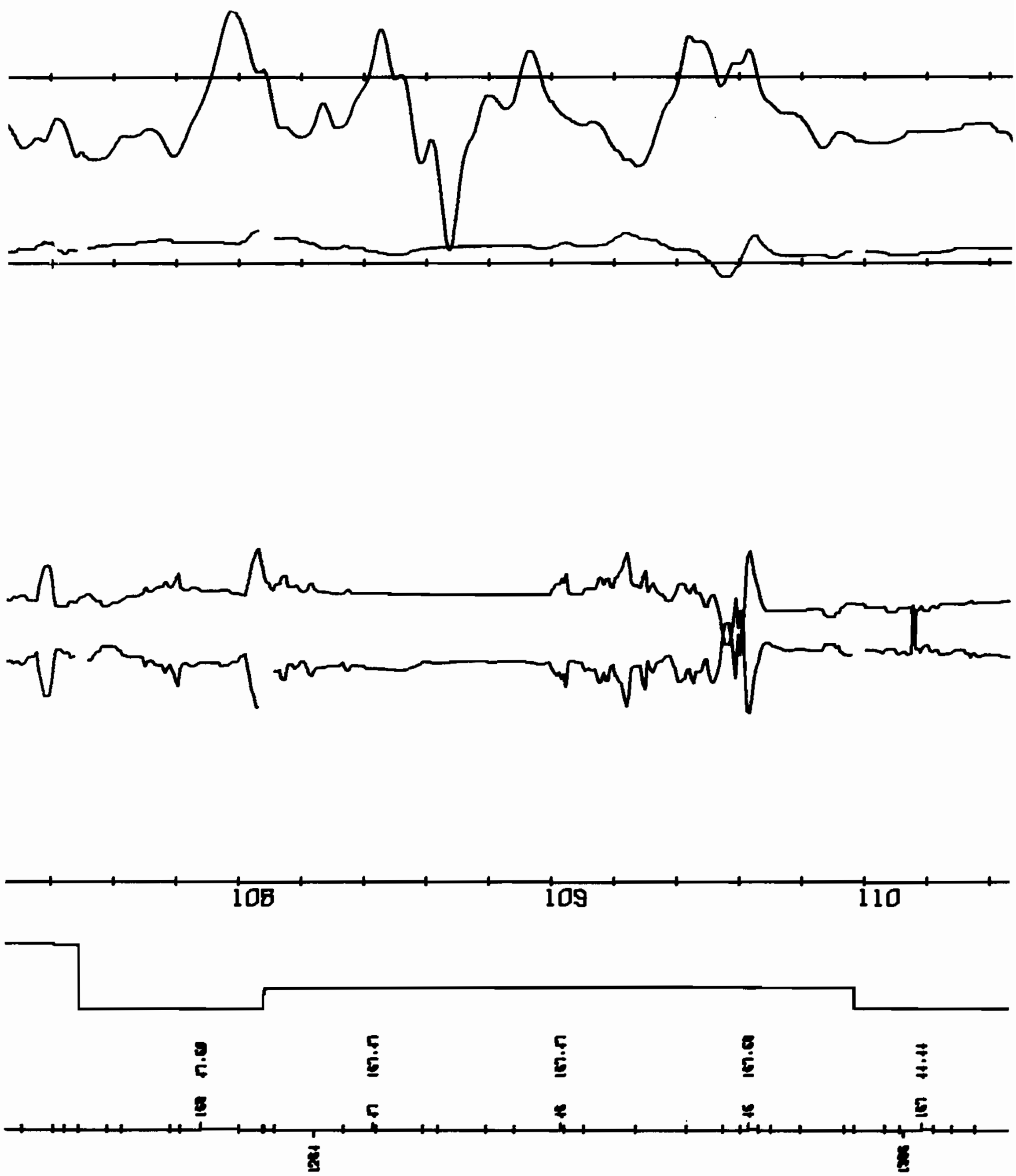
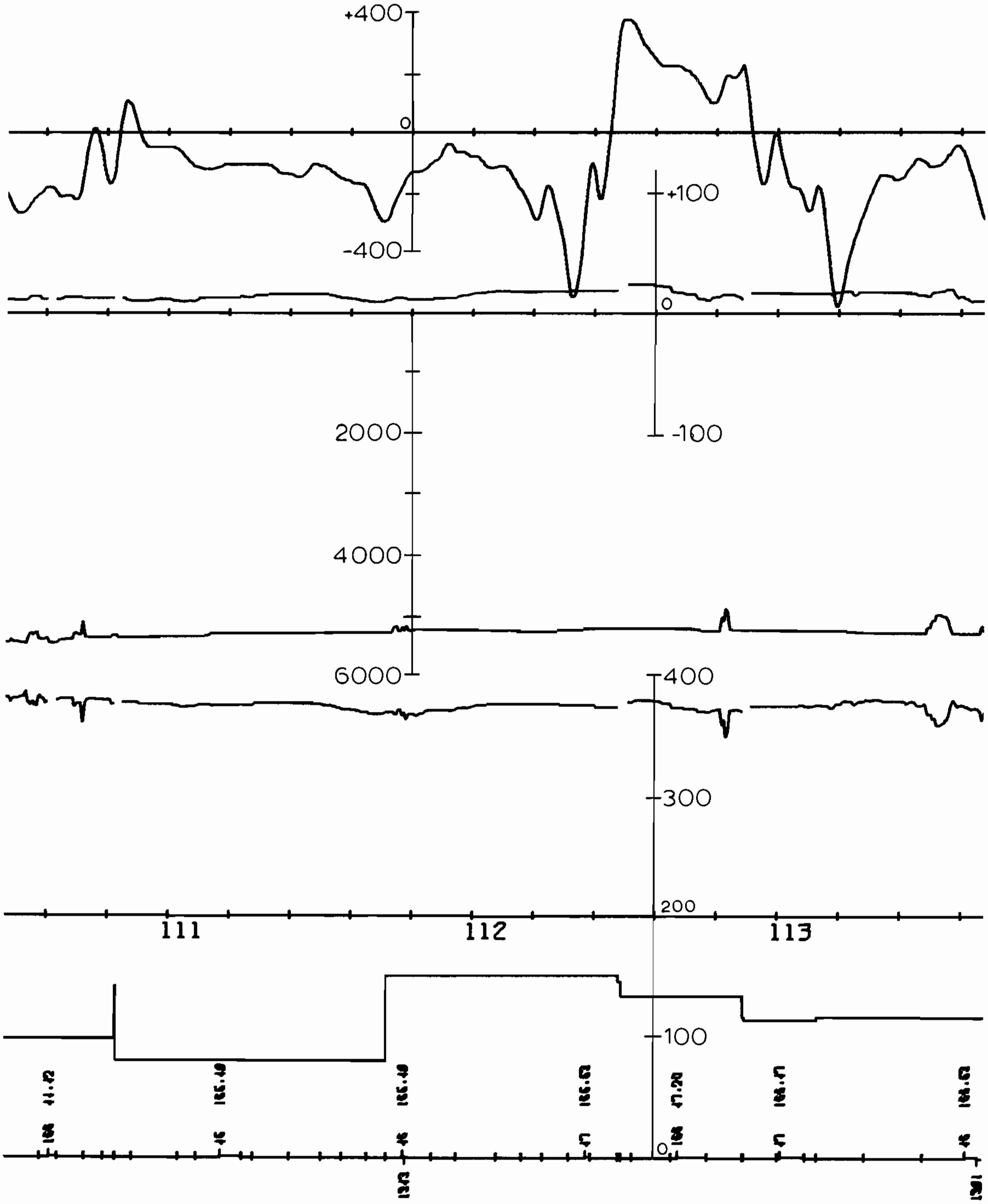
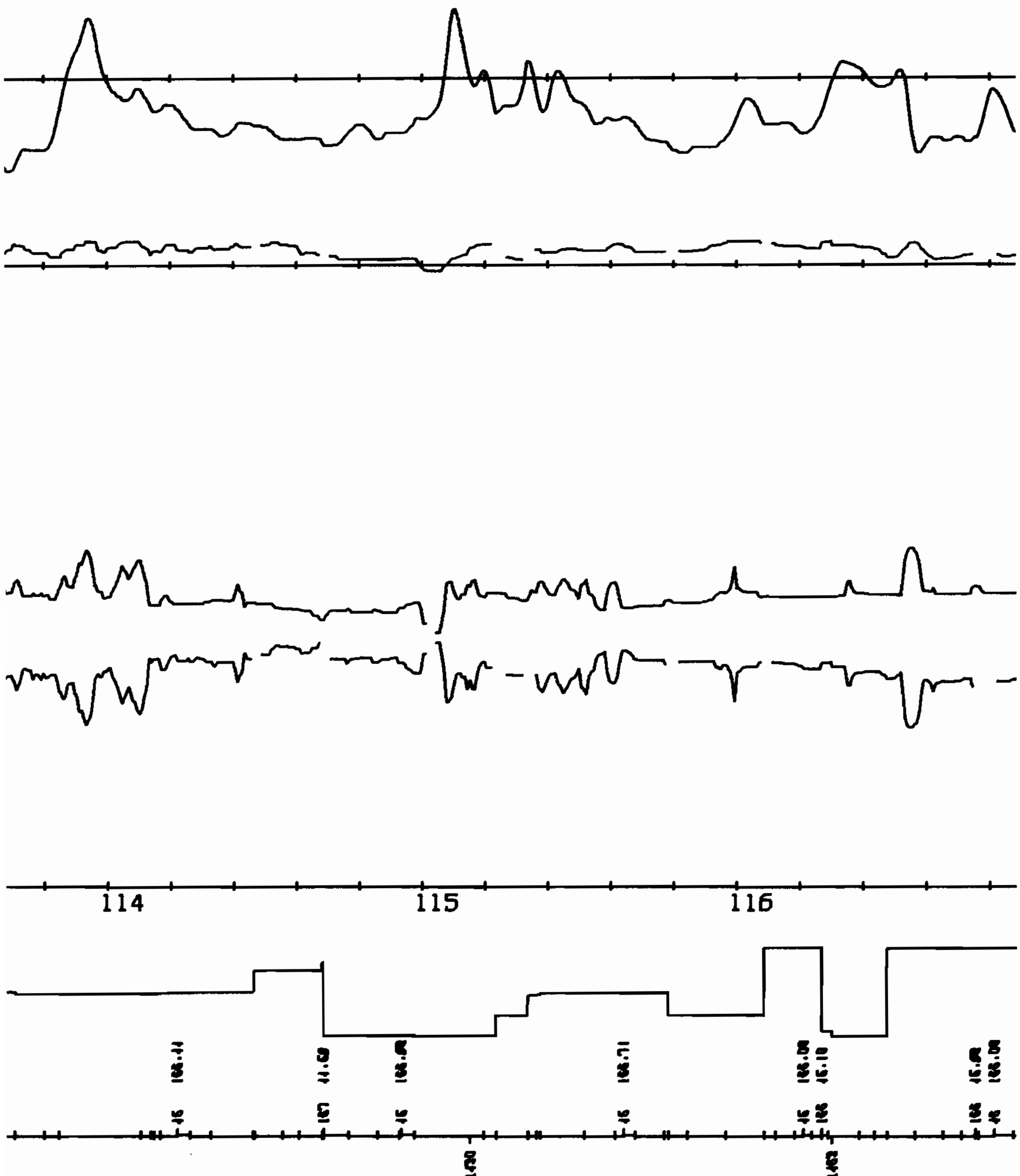
Fig. 7



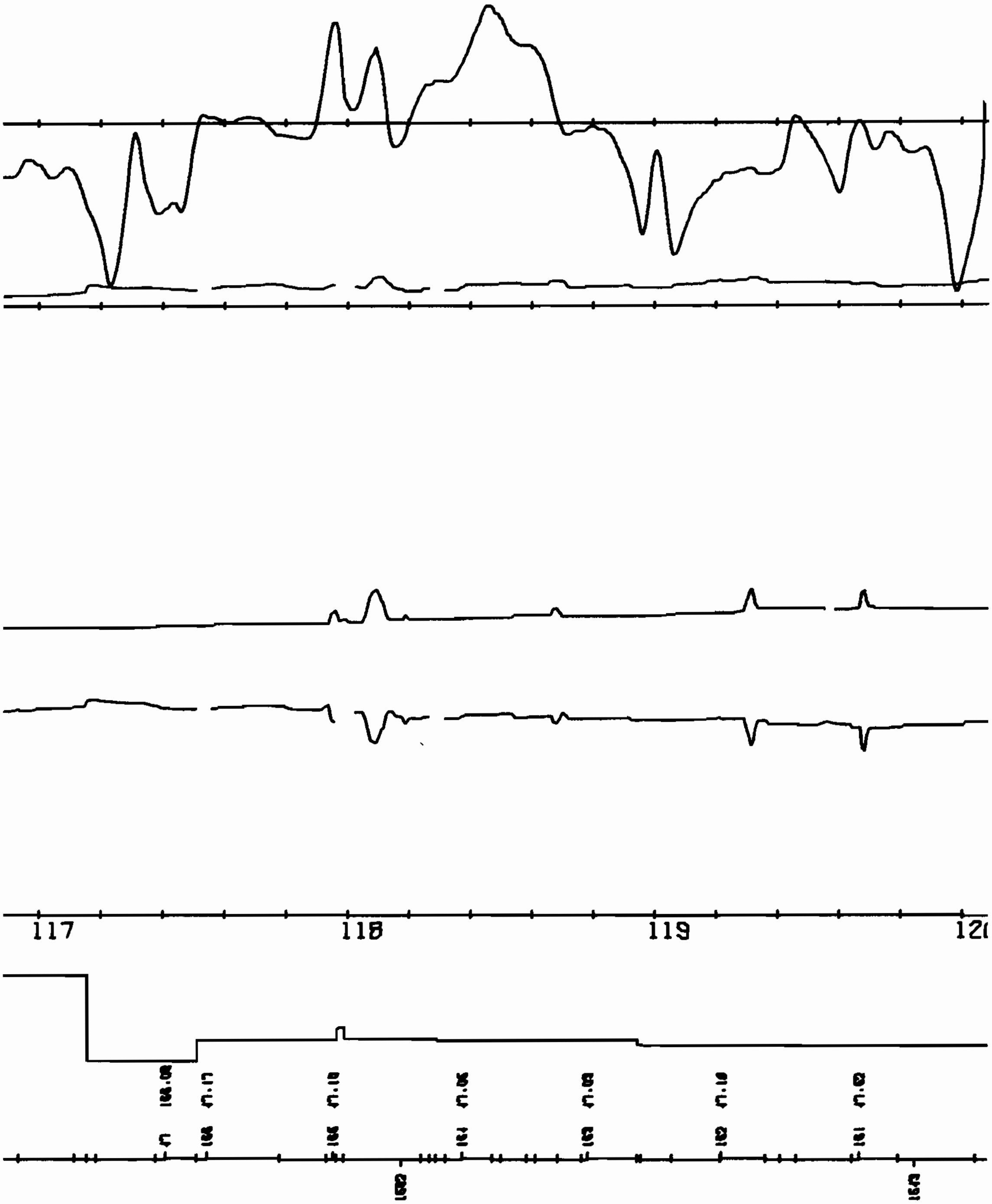
RP-1-OC-71
Fig. 7

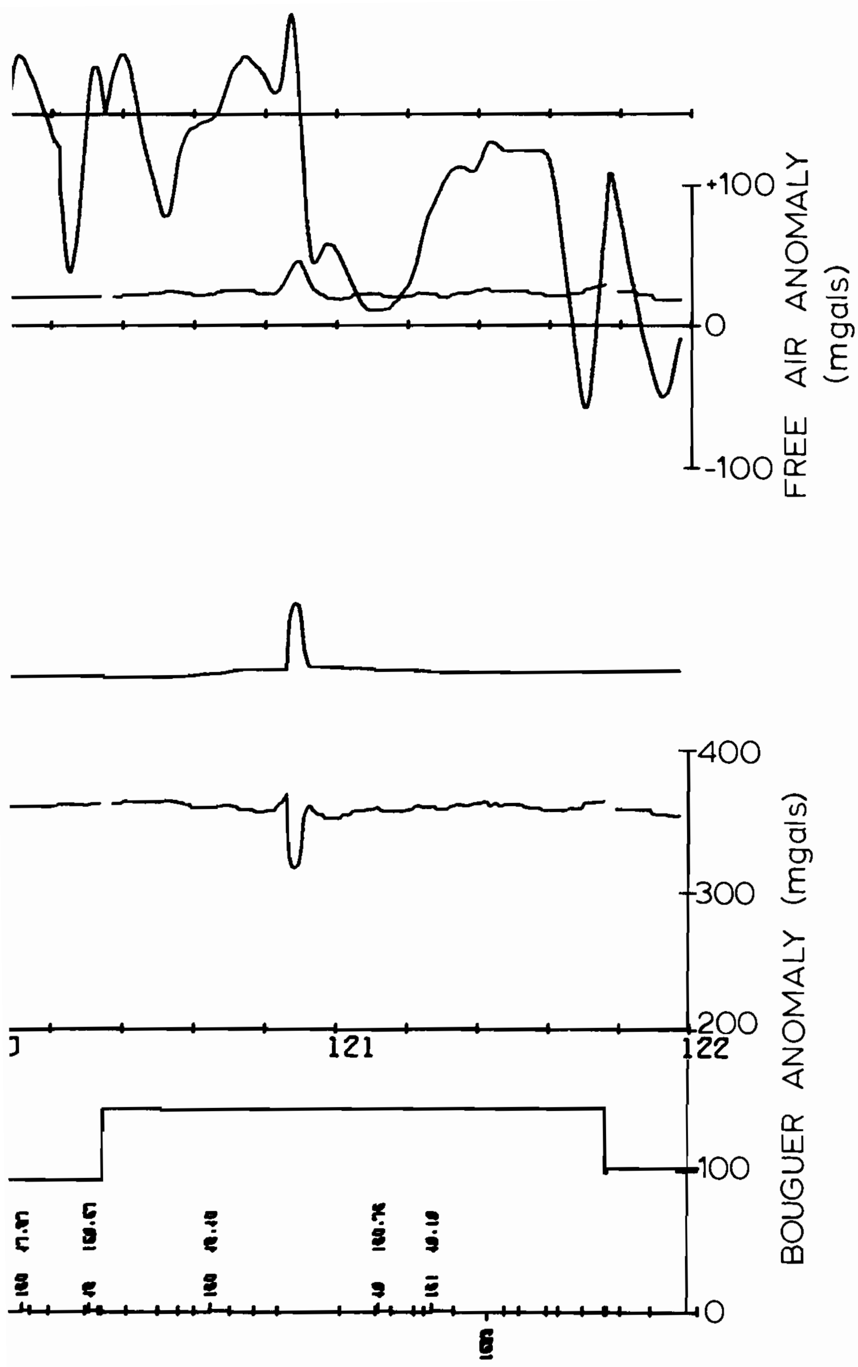


RP-1-OC-71
Fig. 7



RP-1-OC-71
Fig. 7





FREE AIR ANOMALY
(mgals)
+100
0
-100
BOUGUER ANOMALY (mgals)
400
300
200
100
0
121
122

RP-1-OC-71
Fig. 7

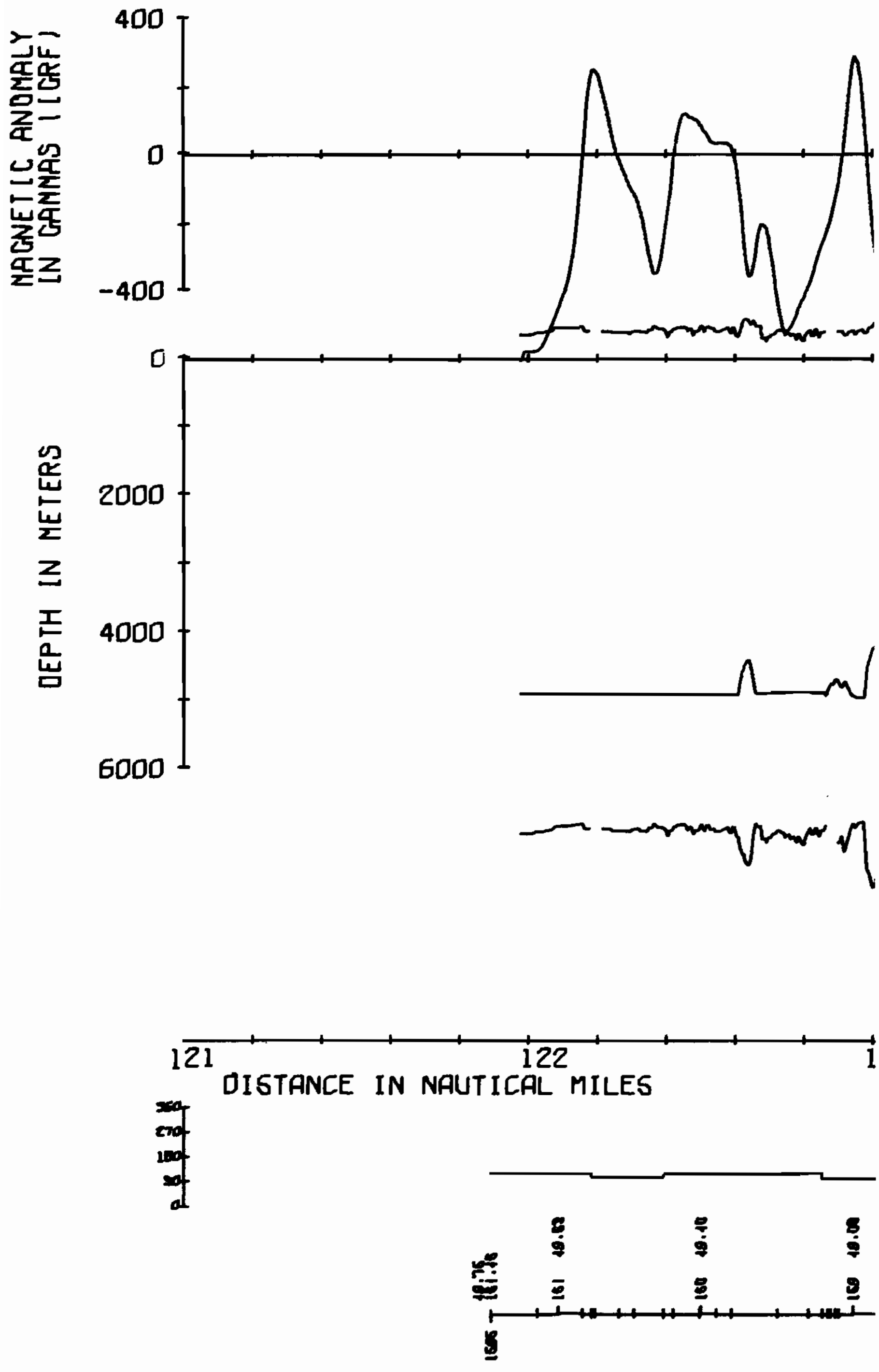


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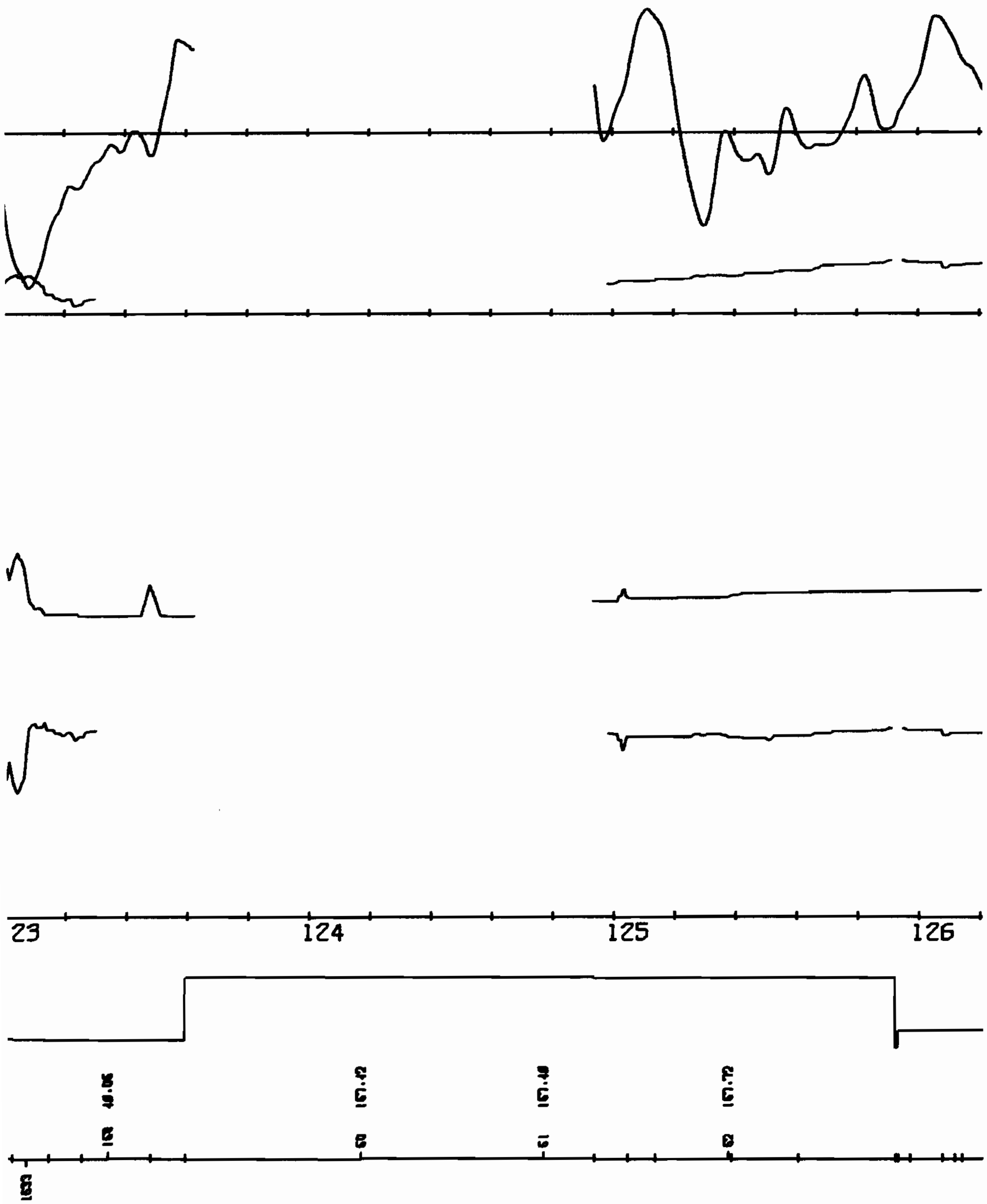
Fig 7



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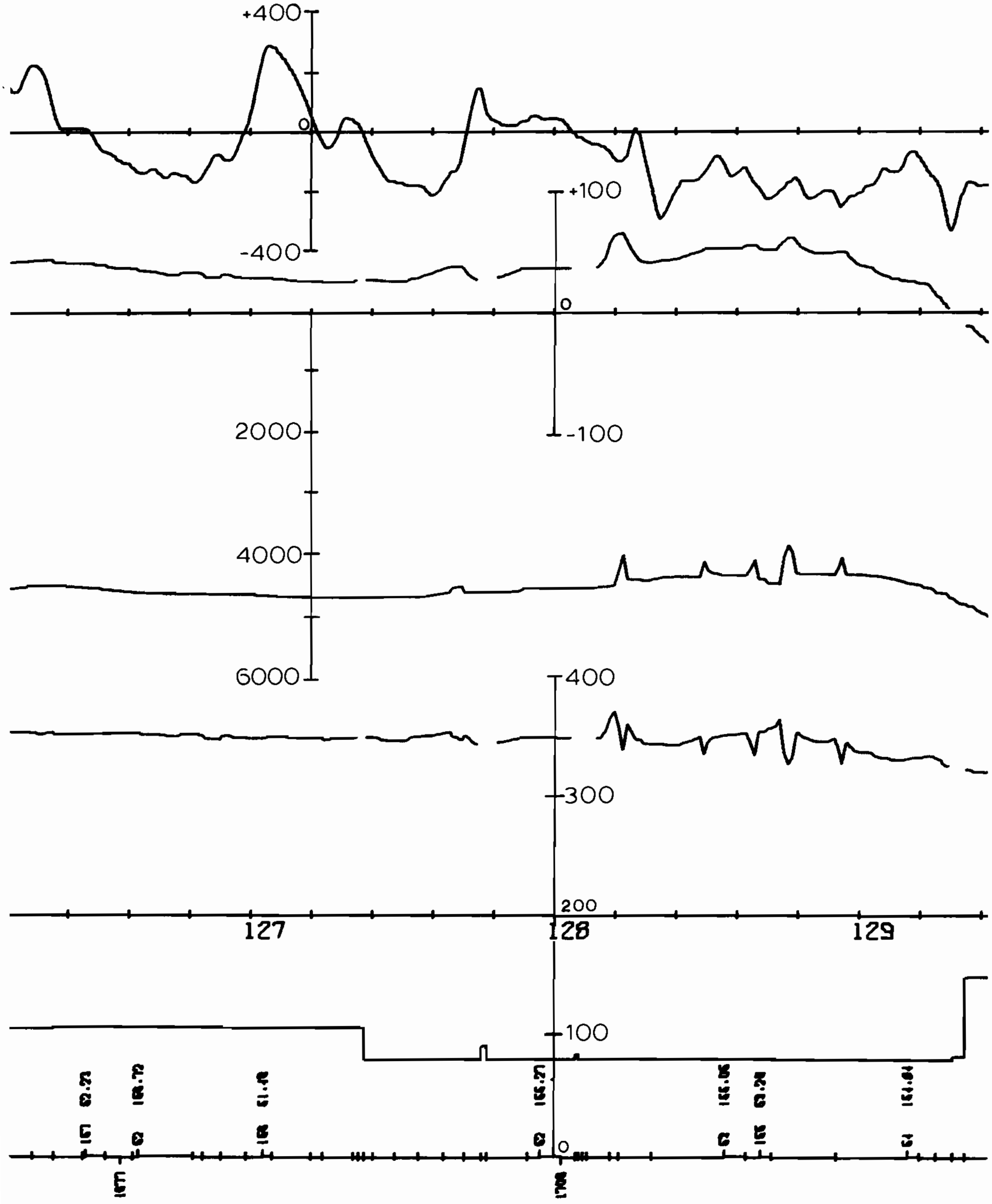

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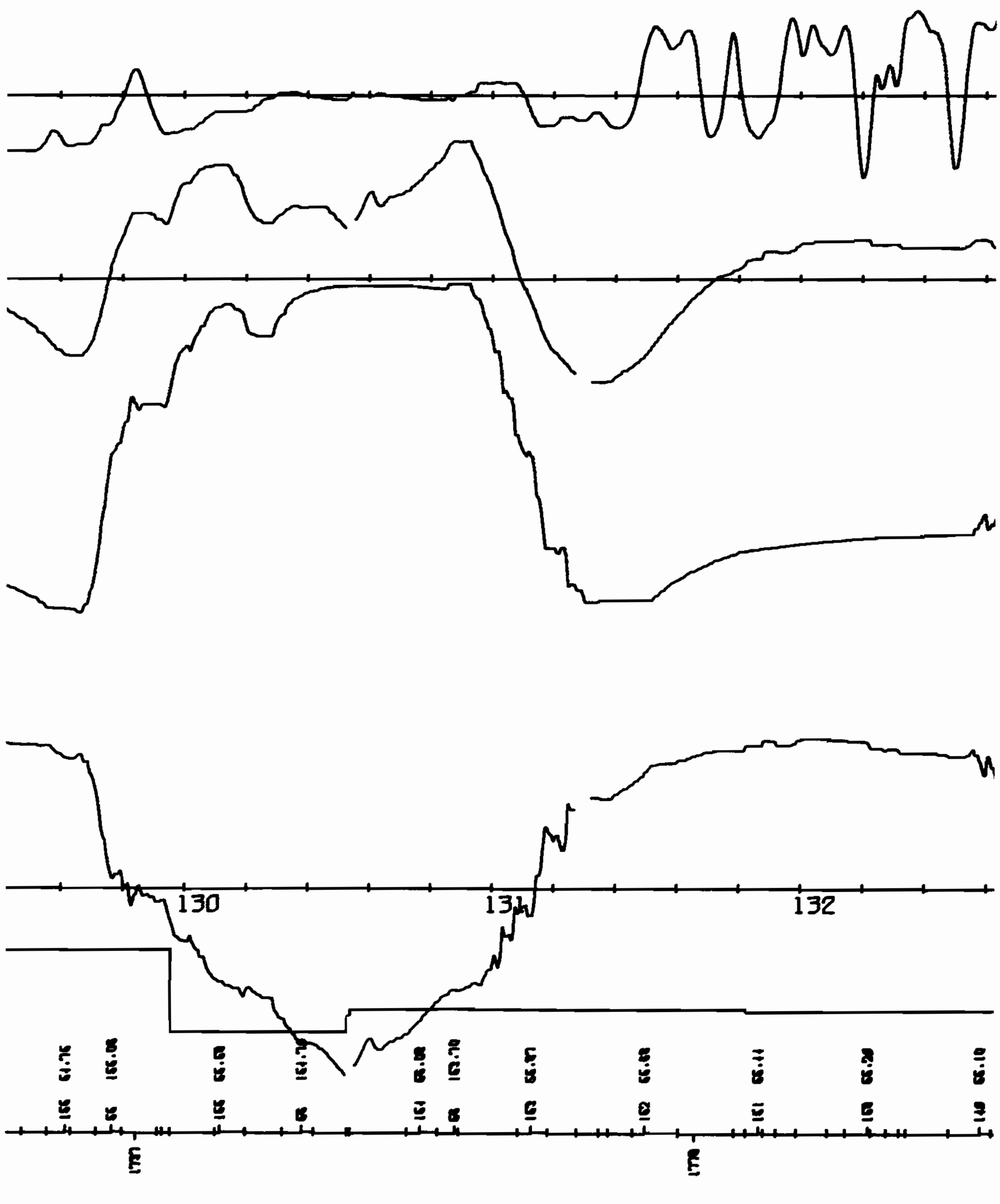
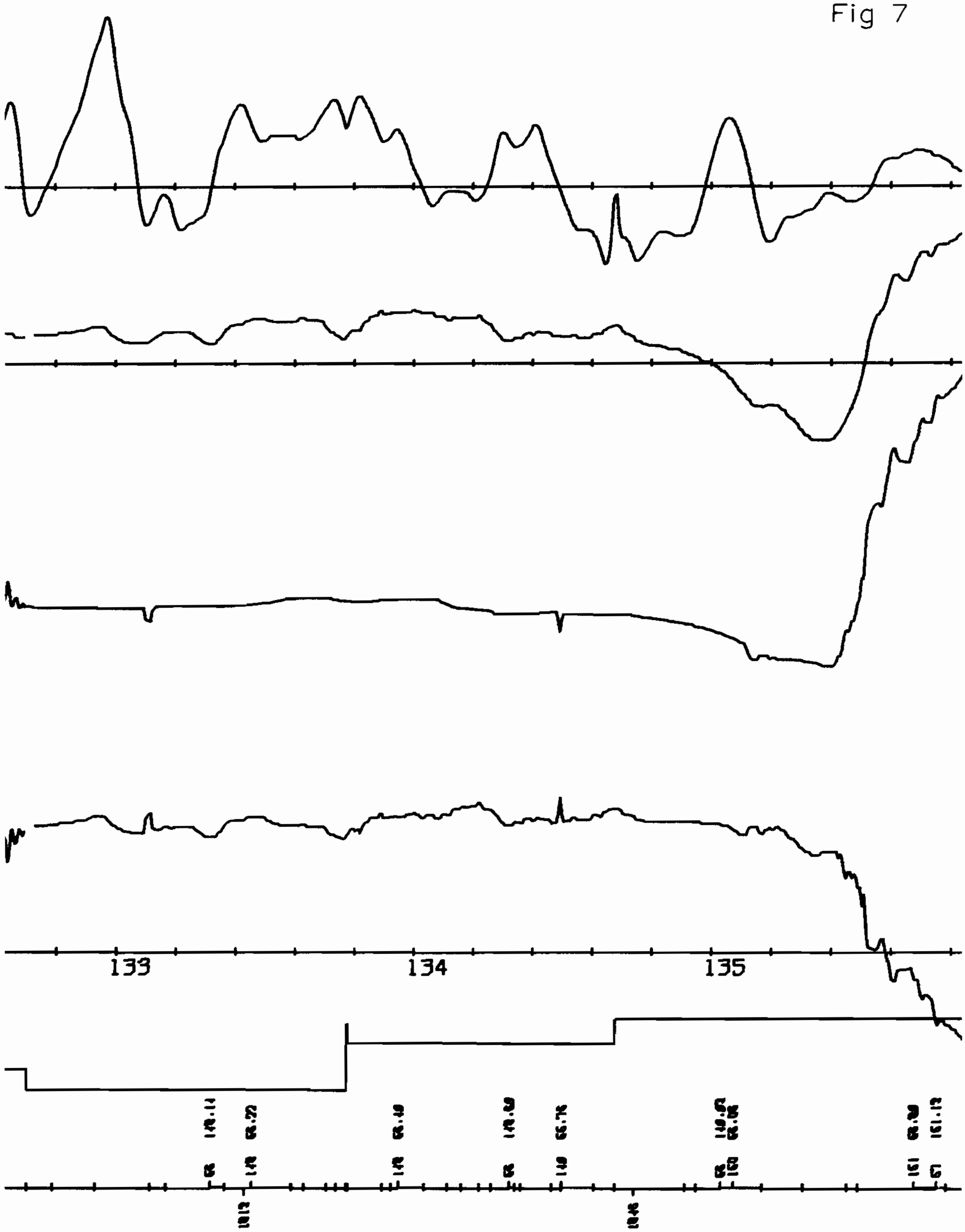
Fig 7



RP-1-OC-71
Fig 7



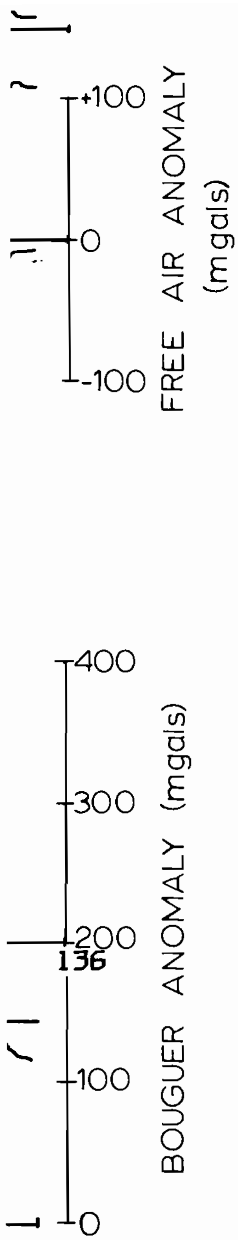

+100
0
-100
FREE AIR ANOMALY
(mgals)
400
300
200
136
100
0
BOUGUER ANOMALY (mgals)

FIGURE 8

LOCATION INDEX

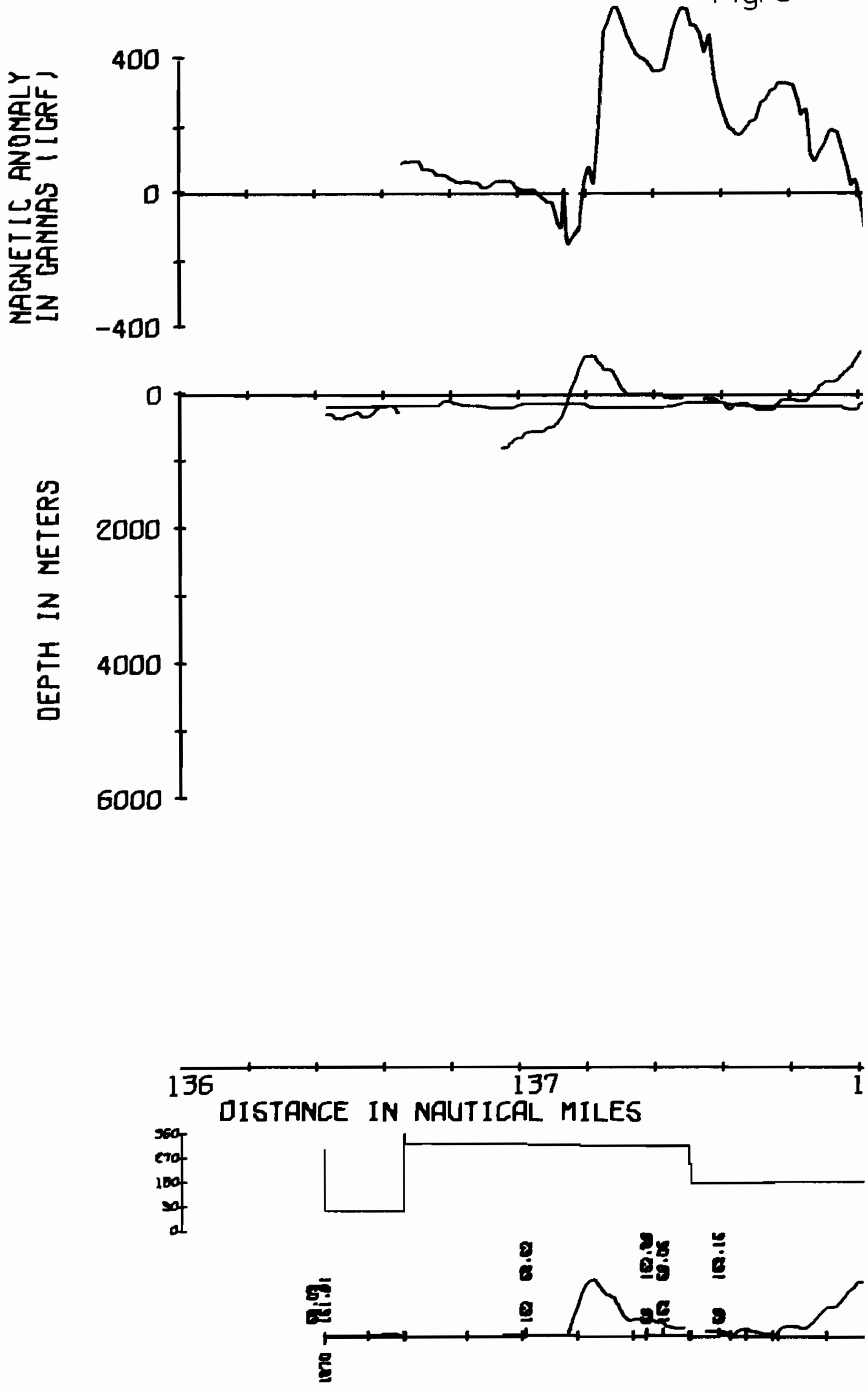
Leg III KODIAK - SITKA (See Figure 4)

Distance in n miles along track			Degrees Lat - Long		Degrees Lat - Long	Pages
13643.3	to	13999.9	58.04 - 151.88	to	57.39 - 155.73	69 - 70
13999.9	to	14600.3	57.39 - 155.73	to	55.24 - 145.10	70 - 72
14600.3	to	15099.8	55.24 - 145.10	to	58.80 - 147.61	72 - 73
15099.8	to	15600.2	58.80 - 147.61	to	59.62 - 148.52	73 - 75
15600.2	to	16185.6	59.62 - 148.52	to	56.93 - 135.64	75 - 77

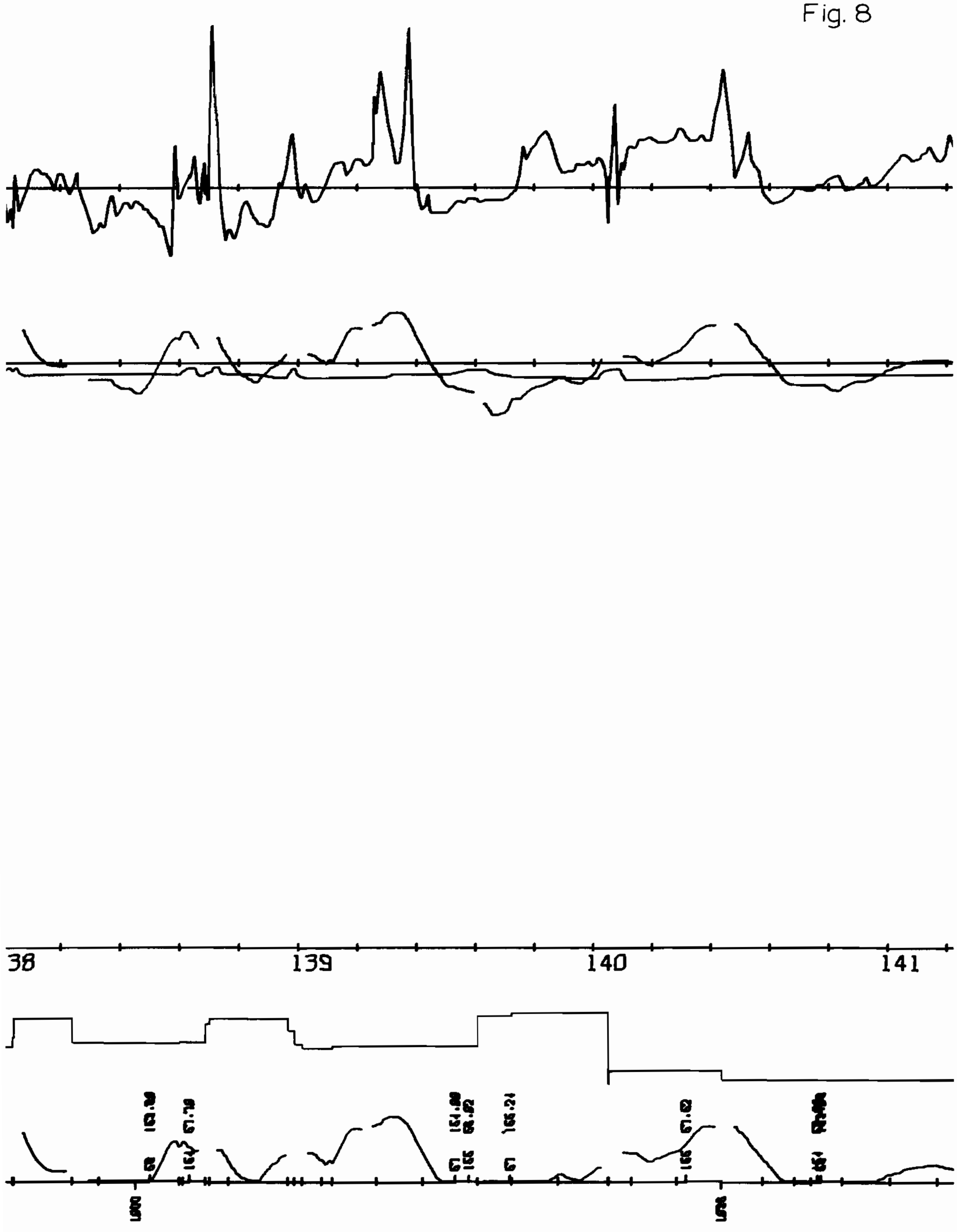
Developed Area: Shelikof Strait

13684.3	to	14274.3	58.41 - 151.62	to	58.84 - 151.61	69 - 71

RP-1-OC-71
Fig. 8



RP-1-OC-71
Fig. 8



RP-1-OC -71
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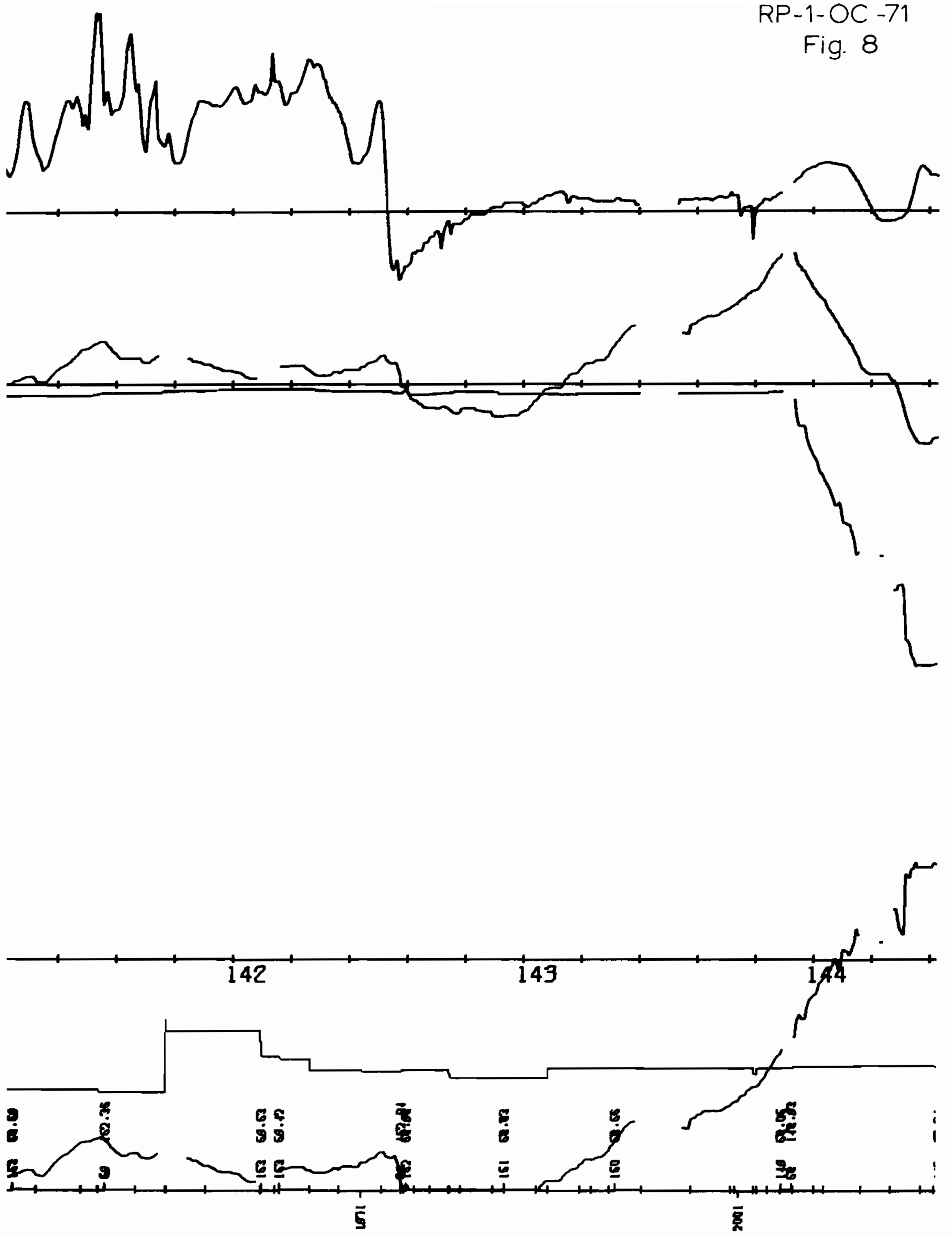

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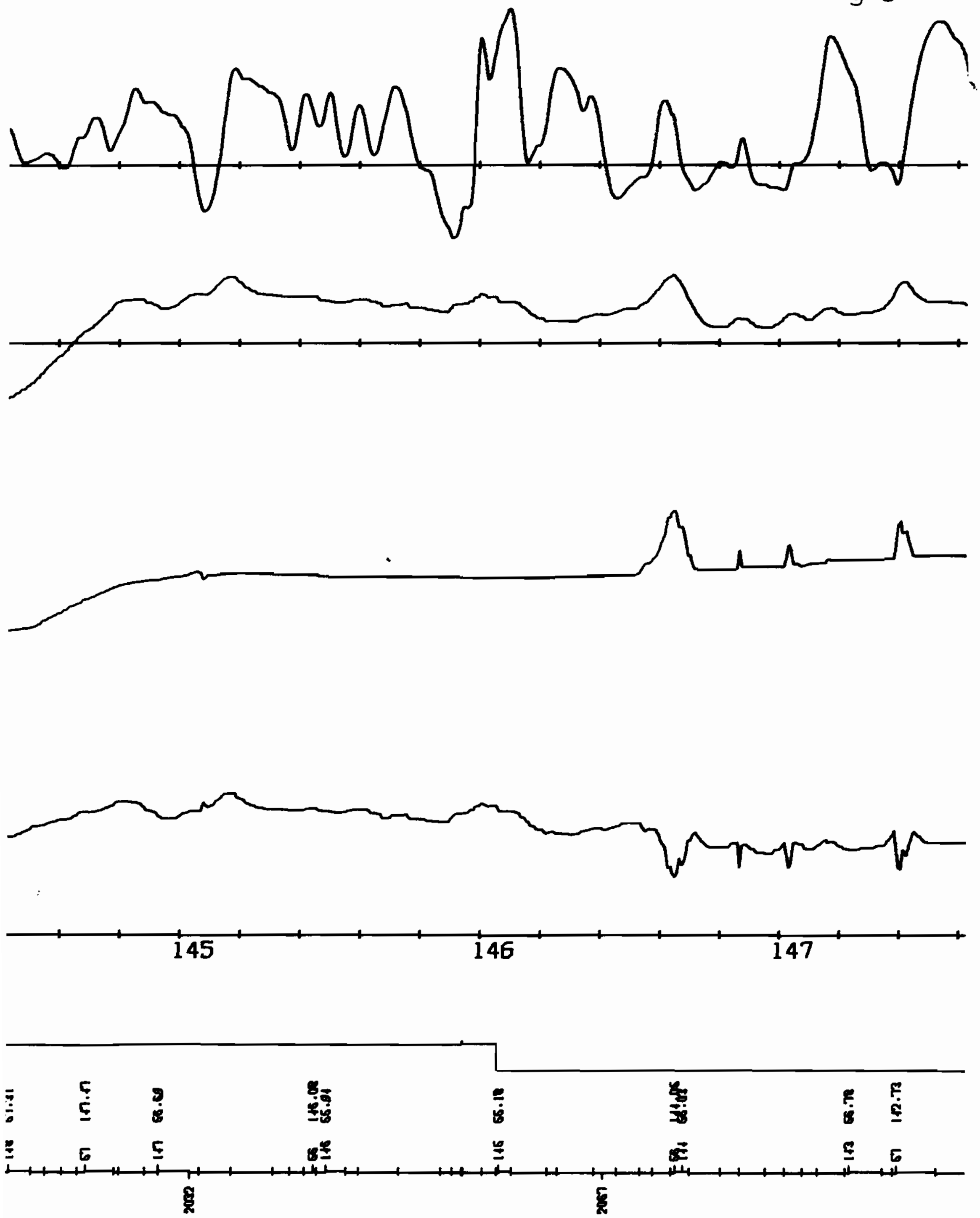
Fig. 8



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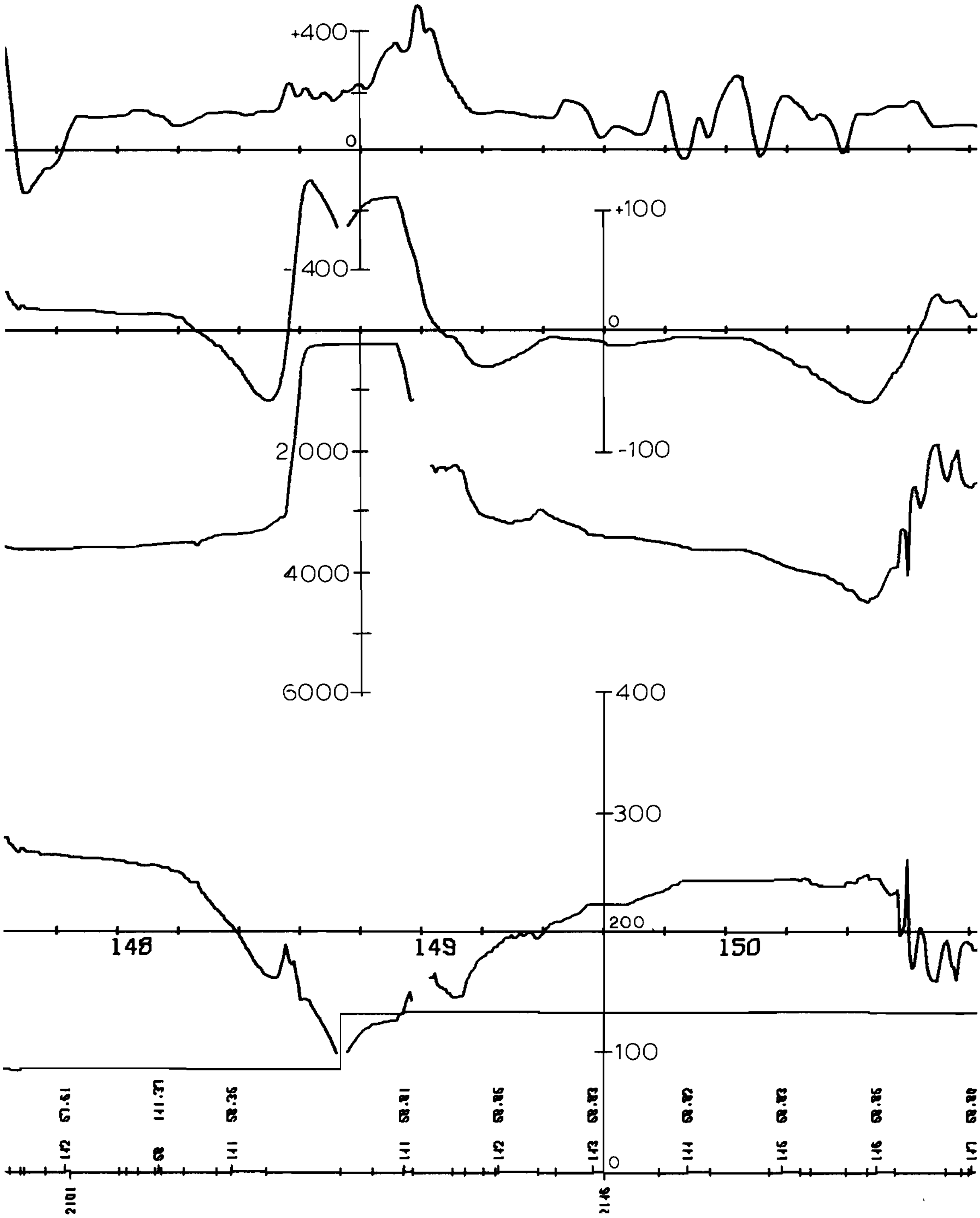

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Fig 8

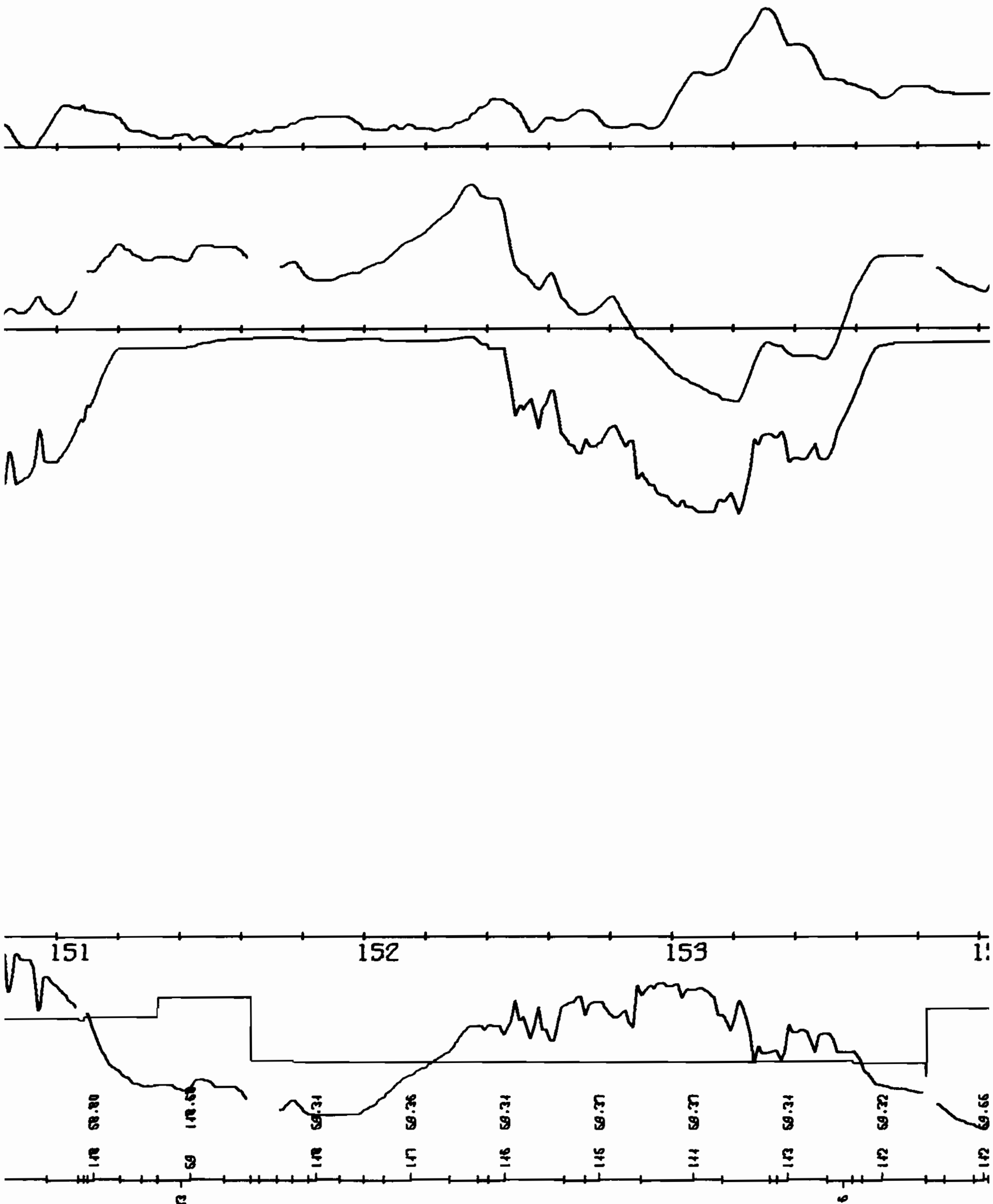

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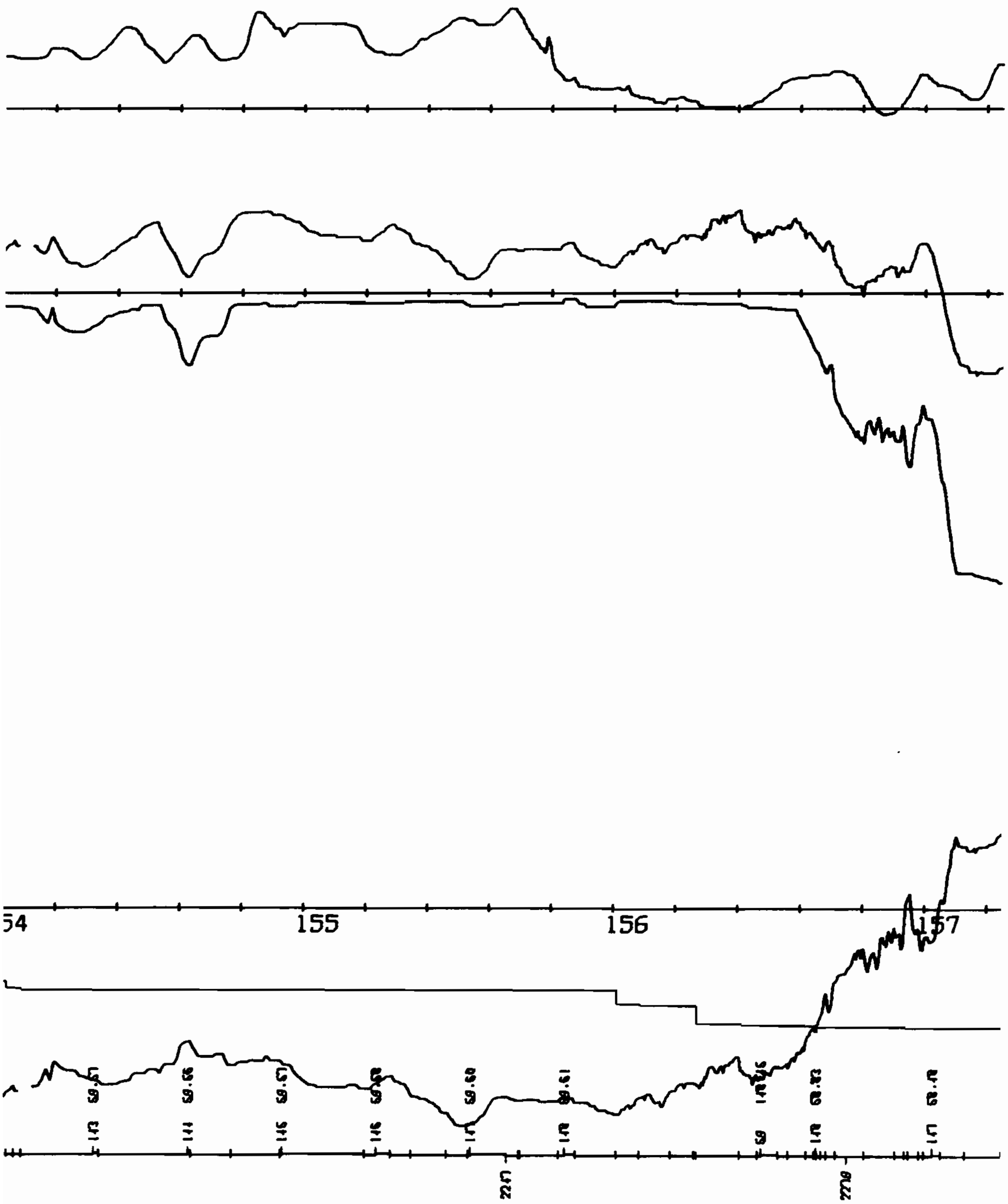
Fig. 8



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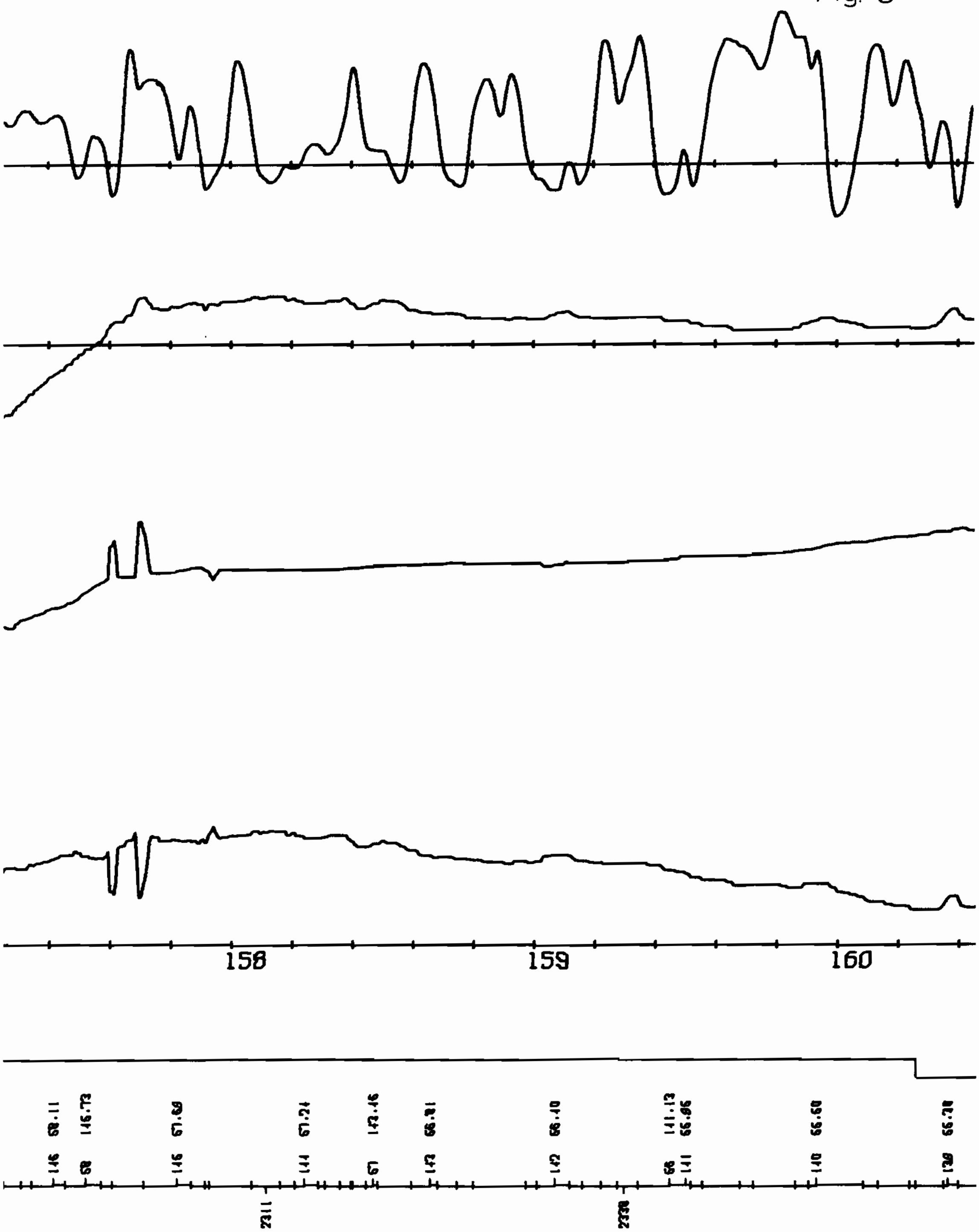


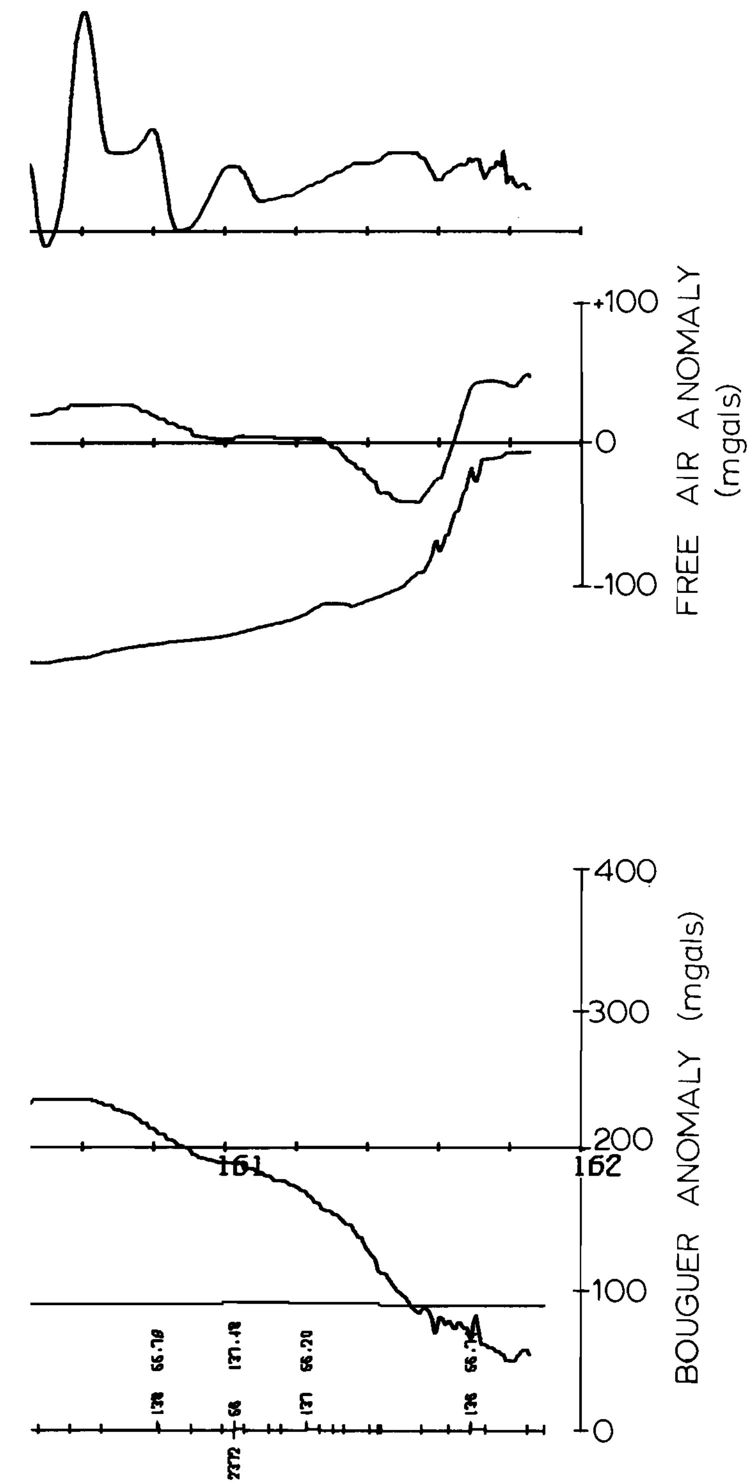

+100
0
-100
FREE AIR ANOMALY
(mgals)
400
300
200
100
0
161
162
BOUGUER ANOMALY (mgals)

FIGURE 9

LOCATION INDEX

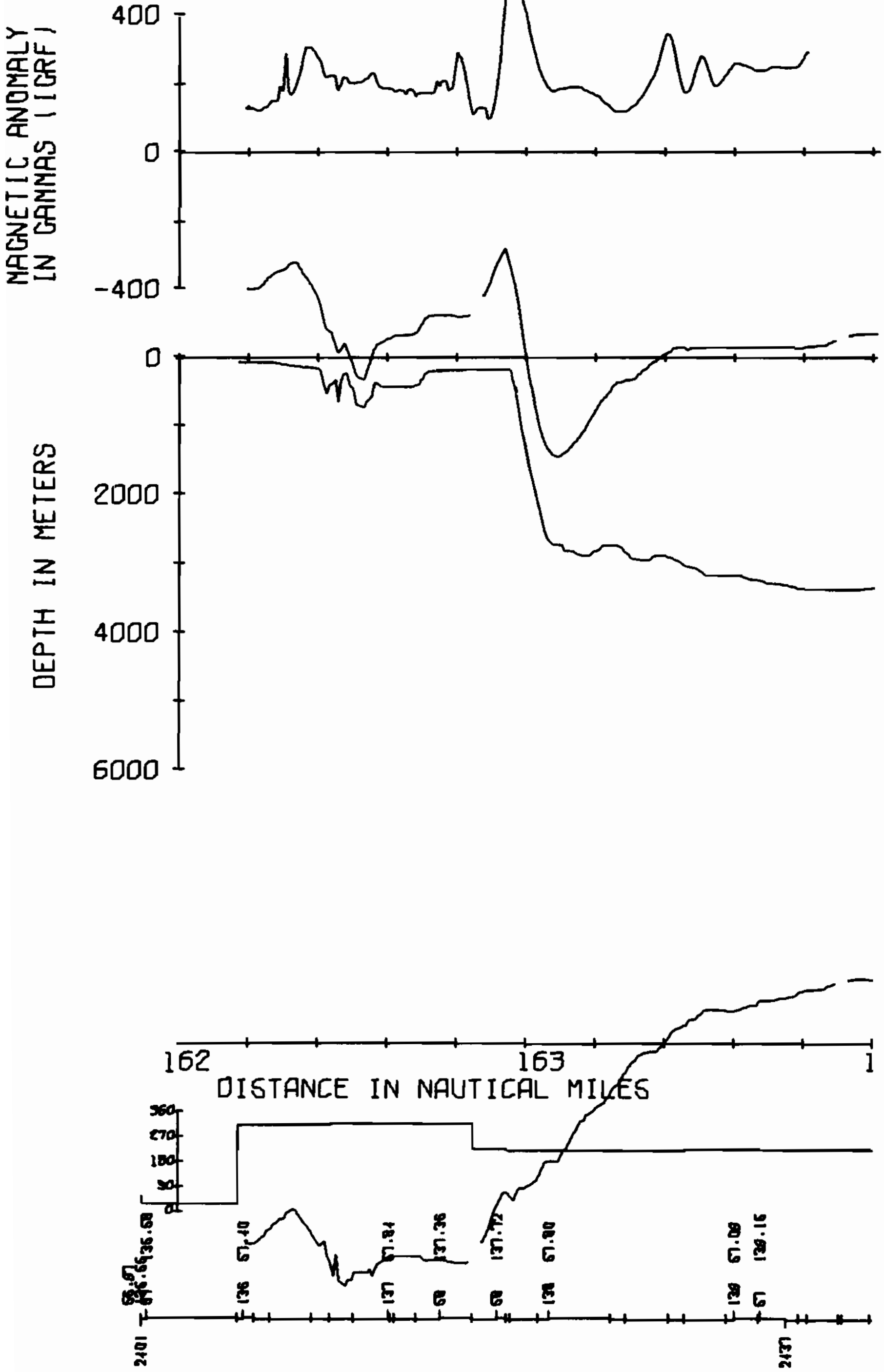
Leg IV SITKA - SEATTLE (See Figure 5)

Distance in n miles along track			Degrees Lat - Long		Degrees Lat - Long	Pages
16217.2	to	16699.9	57.38 - 135.96	to	53.98 - 141.08	79 - 80
16699.9	to	17199.9	53.98 - 141.08	to	53.48 - 136.78	80 - 83
17199.9	to	17700.4	53.48 - 136.78	to	53.87 - 133.75	83 - 85
17700.4	to	18114.2	53.87 - 133.75	to	51.84 - 130.29	85 - 86

Developed Area: Seamounts

17174.3	to	17860.7	53.48 - 136.06	to	52.01 - 136.93	83 - 85

RP-1-OC-71
Fig 9



RP-1-OC-71
Fig 9

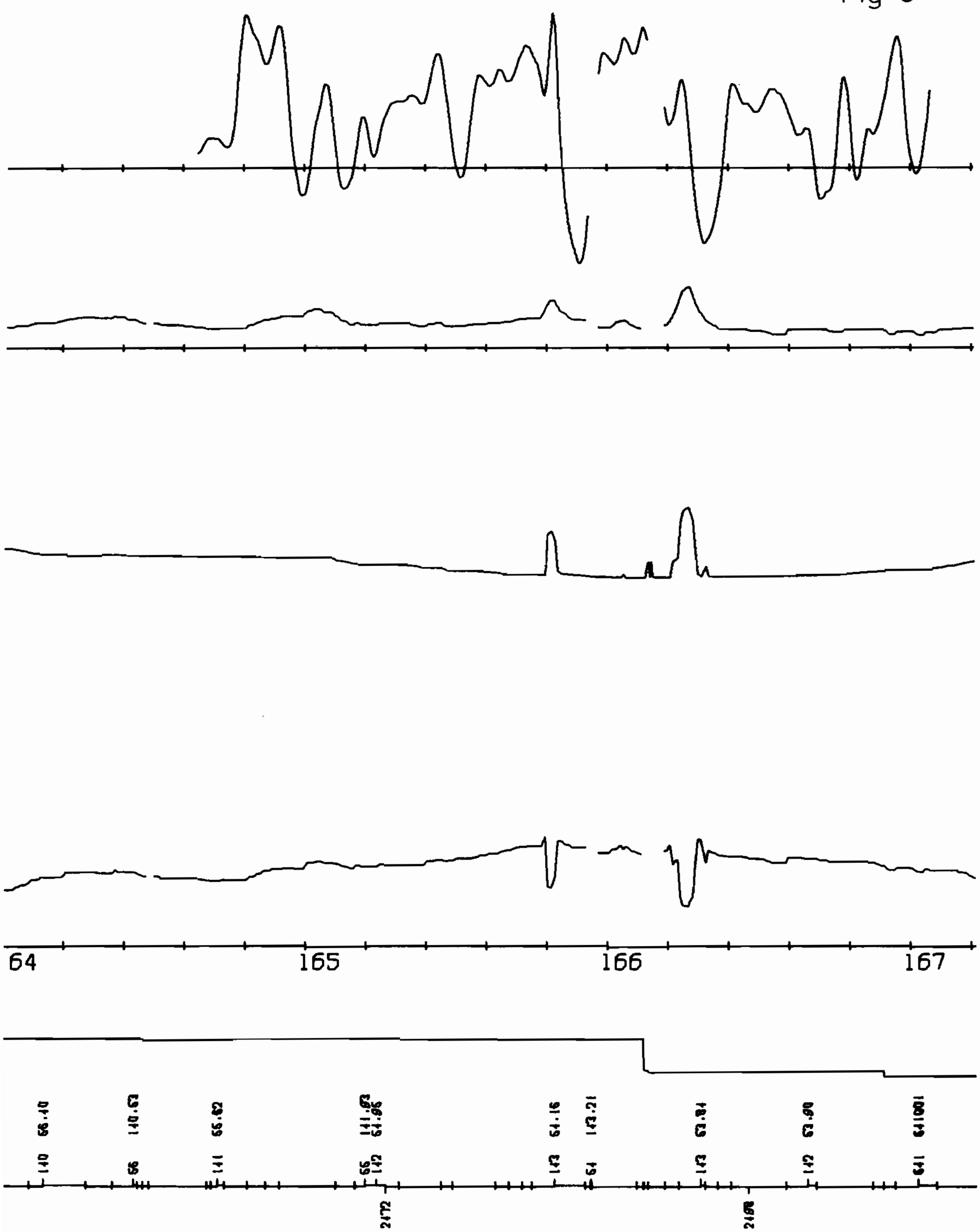


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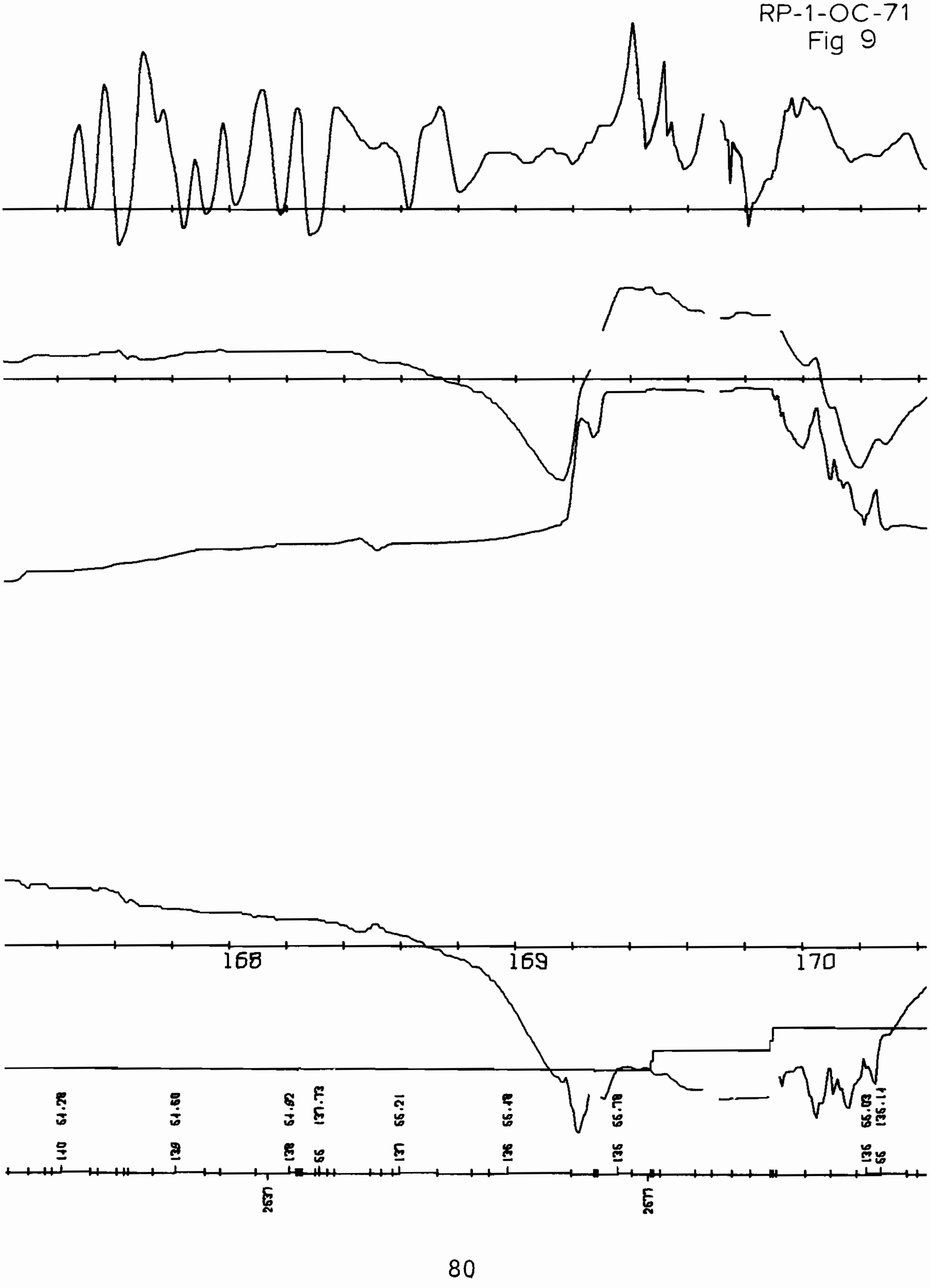
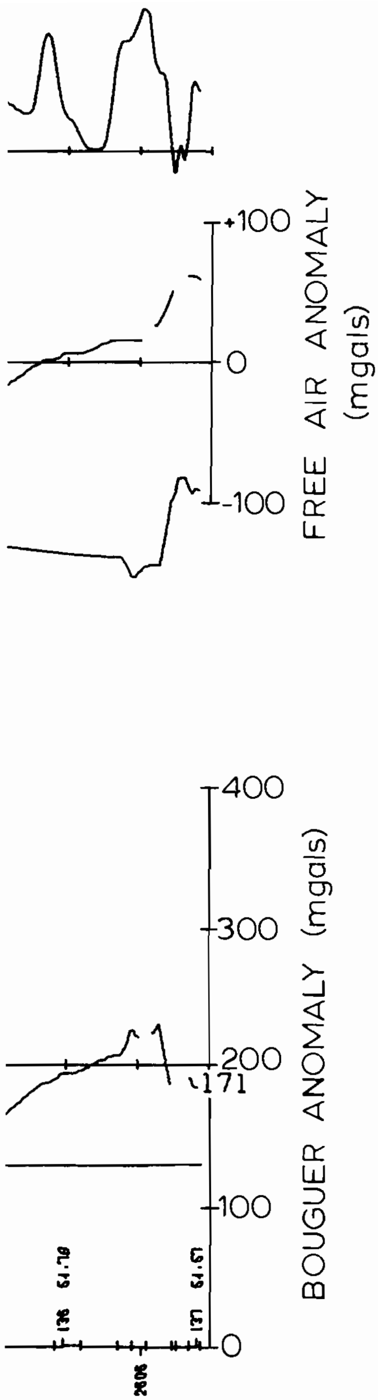
Fig 9




+100
0
-100
FREE AIR ANOMALY
(mgals)
400
300
200
171
100
0
BOUGUER ANOMALY (mgals)

RP-1-OC-71
Fig 9

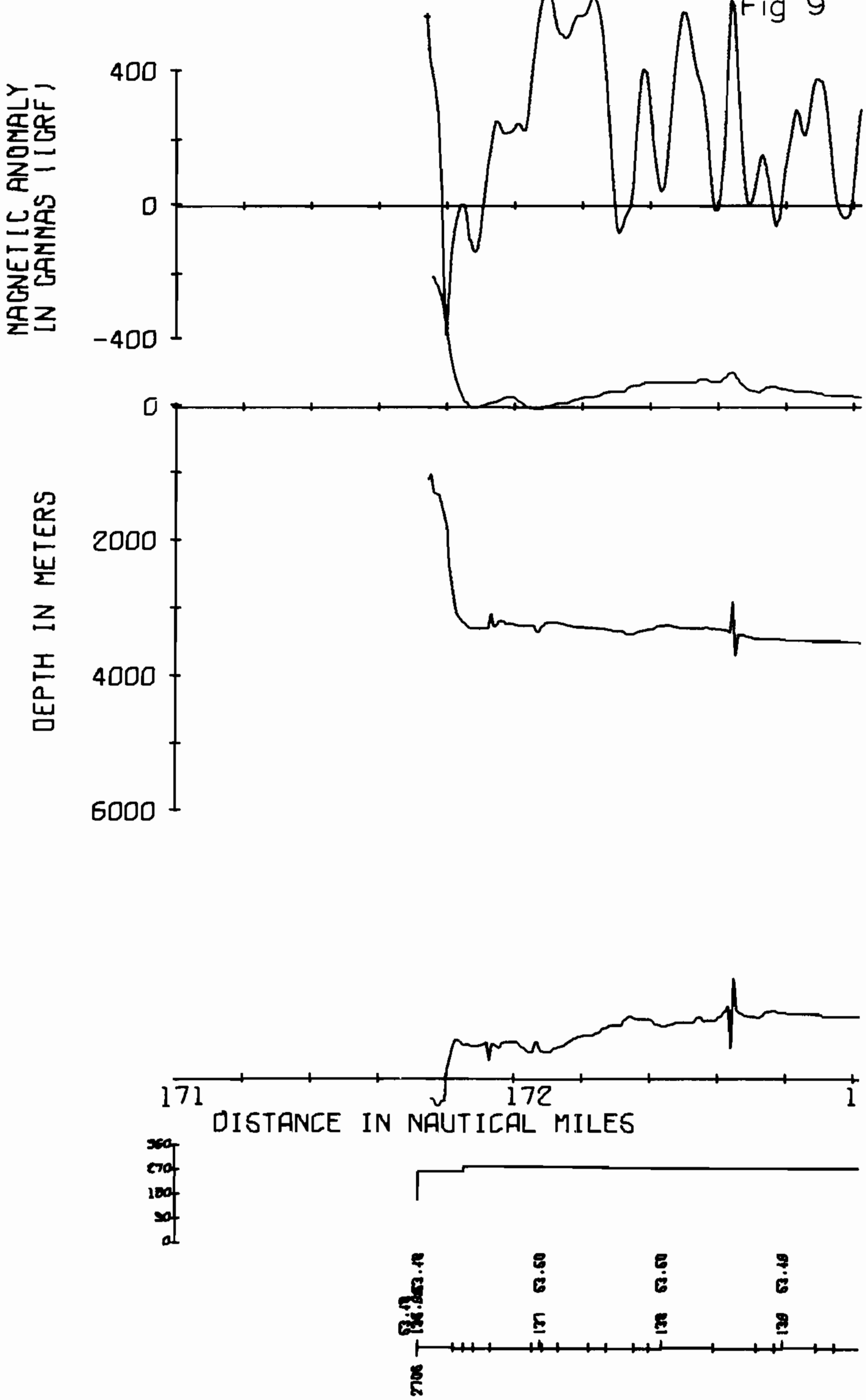


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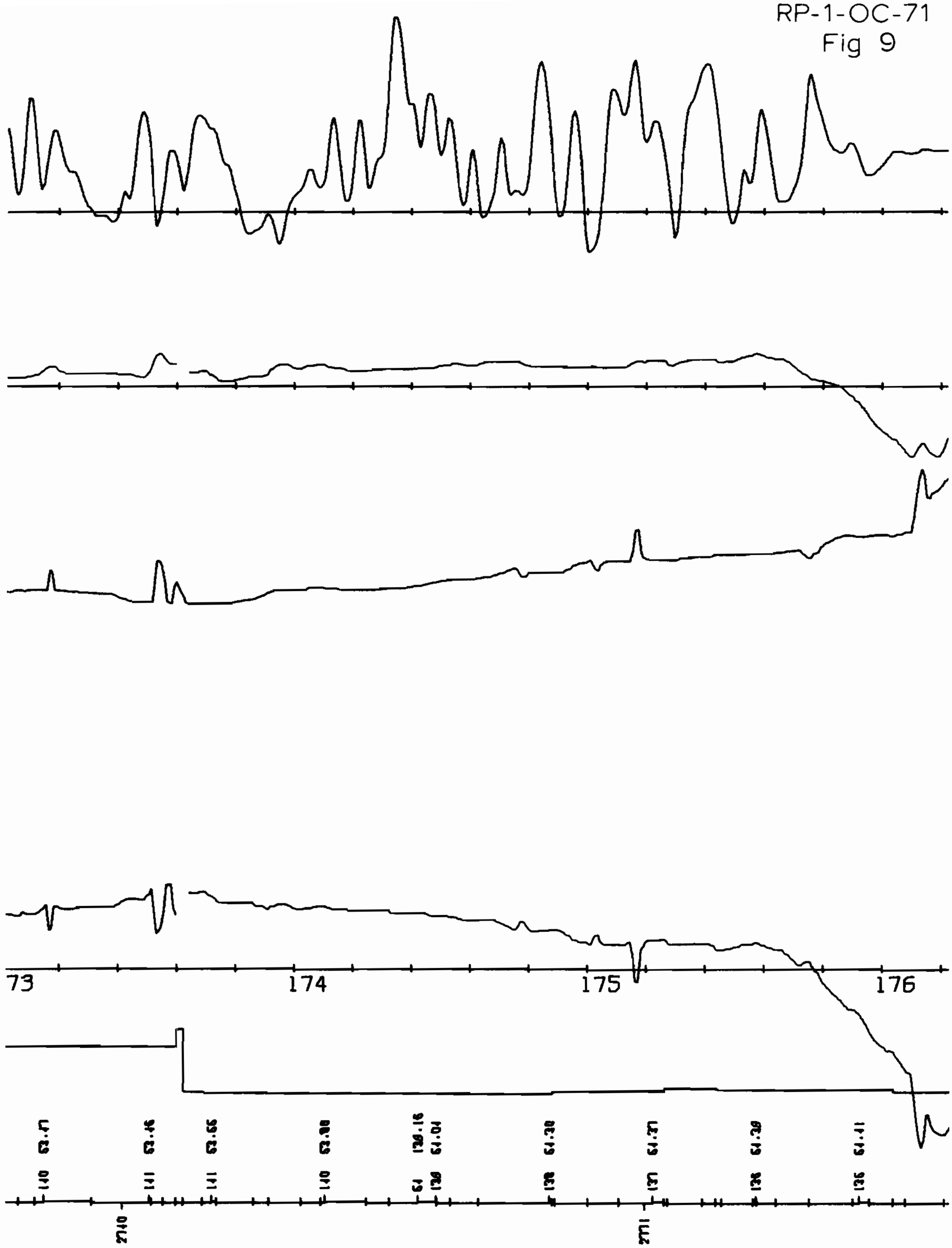
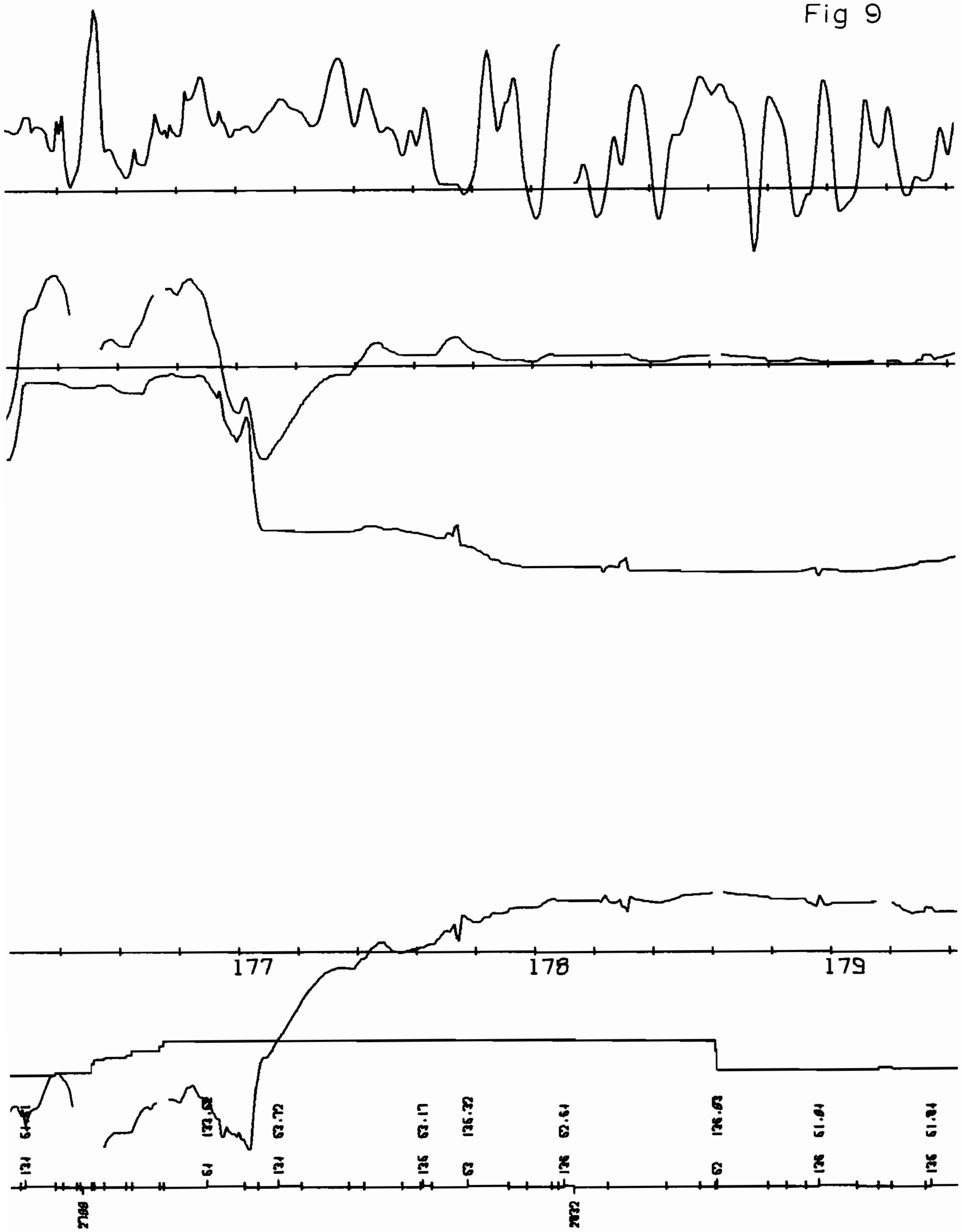
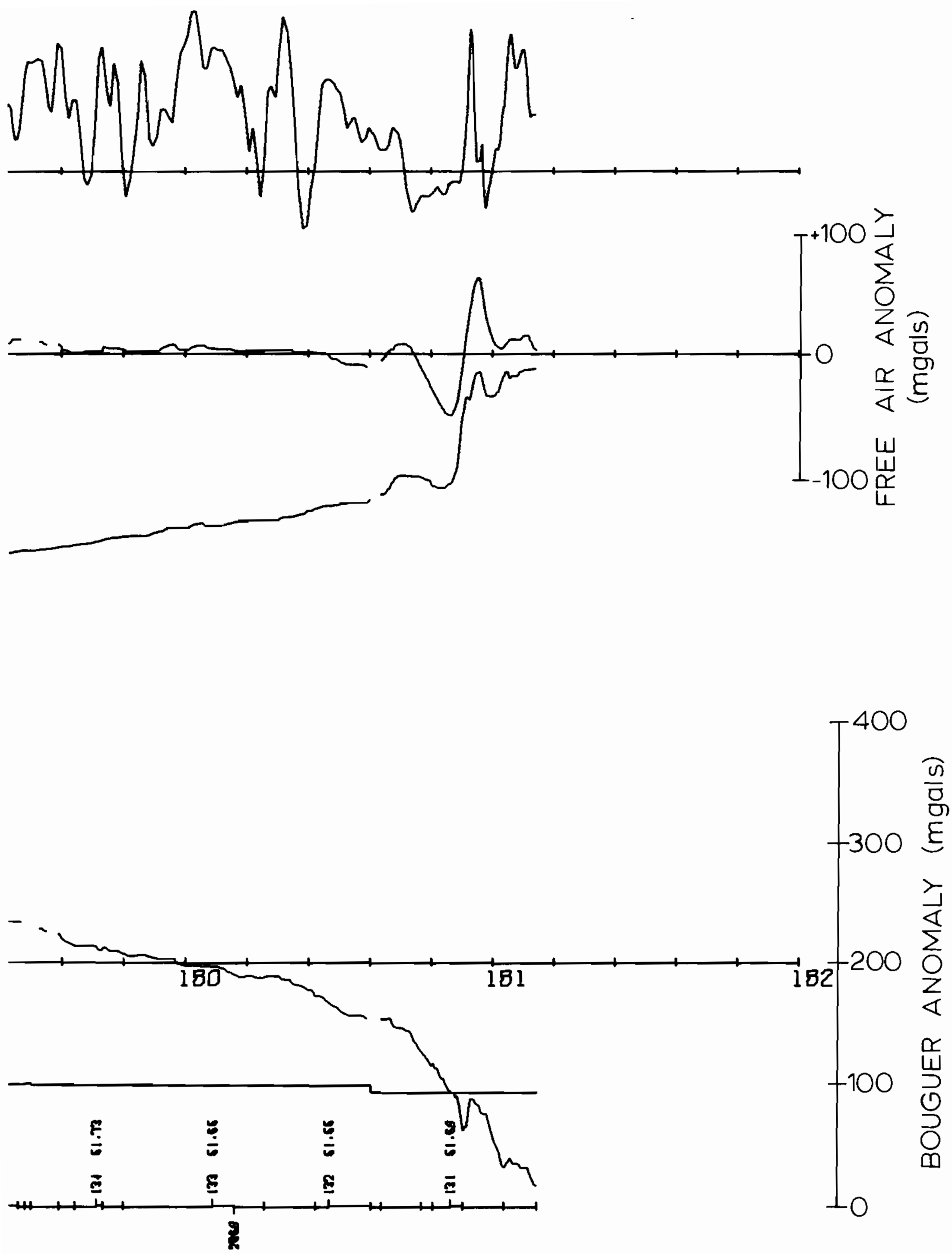
Fig 9



RP-1-OC-71
Fig 9





+100
0
-100
FREE AIR ANOMALY
(mgals)
400
300
200
100
0
BOUGUER ANOMALY (mgals)
180
181
182

8. ACKNOWLEDGEMENTS

I thank F. P. Naugler and J. M. Wageman for providing information and helpful suggestions used in the preparation of this report. They, along with R. E. Burns, read the manuscript and offered constructive criticisms. LTJG G. Holloway of the NOAA Commissioned Corps was responsible for producing the geophysical profile. S. P. Perry assisted him with the data preparation. R. R. Uhlhorn did the drafting. Mrs. Kim Hamasaki typed the manuscript.

A special acknowledgement is due the officers and crew of the OCEANOGRAPHER. Their efforts contributed to the success of RP-1-OC-71.

9. REFERENCES

Erickson, B. H., D. K. Rea, and F. P. Naugler (1969), "Chinook Trough: A probable consequence of north-south sea floor spreading," abstract: Trans. Am. Geophys. Union, 50, 633.

Holloway, Gregory (1970), "Programs for Data Acquisition and Processing Aboard the NOAA Ship OCEANOGRAPHER," POL Manual.

Naugler, F. P., and D. K. Rea (1970), "Abyssal hills and sea floor spreading in the central north Pacific," Geological Society of America Bulletin, 81, 3123-3128.

APPENDIX A

Scientific Personnel

Name	Affiliation	Dates
Robert E. Burns	NOAA - POL	31 March - 2 April
Frans Vandekop	Odum Offshore Survey Co.	31 March - 2 April
Frederic P. Naugler*	NOAA - POL	31 March - 12 June
Richard Sylwester	NOAA - POL	31 March - 26 June
Richard R. Uhlhorn	NOAA - POL	31 March - 26 June
John M. Wageman**	NOAA - POL	4 May - 26 June
Jurgen Kienle	U of Alaska	1 June - 12 June
David Stone	U of Alaska	1 June - 12 June
Robert E. Stevenson	U of So. Dakota	12 June - 26 June
John T. Kummer	U of Washington	12 June - 26 June

Weather Observers

Robert A. Hadler	Nat. Weather Service	31 March - 28 April
Edward I. Fogman	Nat. Weather Service	31 March - 28 April
Carlos Rodrigues	Nat. Weather Service	31 March - 28 April
Ramon A. Choffee	Nat. Weather Service	4 May - 26 June
Ercell R. Iverson	Nat. Weather Service	4 May - 26 June

* Chief Scientist on Legs I and II.

** Chief Scientist on Legs III and IV.

APPENDIX B

Summary of Special Projects

Bathythermographs

Expendable bathythermograph (XBT) observations were at 0000, 0600, 1200, and 1800 GMT except when the seismic profiler was operating. BT data was transmitted to Navy Fleet Weather Central in Honolulu and copies were also sent to the National Oceanographic Data Center.

Dredging

As part of a project to investigate several northeast Pacific seamounts, dredging operations were conducted in an area about 140 miles west of the Queen Charlotte Islands. John T. Kummer, a graduate student at the University of Washington, was on board for this phase of the work. Four seamounts, Dickens, Denson, Davidson, and Hodgkins were sampled with chain bag and pipe dredges. Sixteen of the twenty-four attempted hauls were successful with the exception of some ice rafted boulders found in a few hauls the dredged samples consisted of weathered basalt. A bathymetric and magnetic survey was made of each seamount prior to dredging.

Meteorology

National Weather Service personnel made surface and upper air meteorological observations daily throughout the cruise. Surface observations were made at 0000, 0600, 1200, and 1800 GMT. Radiosonde information was obtained at 0000 and 1200 GMT. Facsimile weather charts, transmitted from Fleet Weather Central, Honolulu, aided the ship's meteorology officer in setting up the weather forecasts for shipboard use.

Large Volume Water Sampling

At the request of Wyatt Silker of Battelle-Northwest in Richland, Washington, large volume water sampling was carried out aboard ship. Water filter, flow meter, and other supplies were provided Battelle. Twenty-nine samples were taken during the field operations, and forwarded to Battelle from Honolulu, Kodiak, and Seattle.

Summary of Underway Operations

Trackline gravity	17,516 lin. naut. miles
Trackline magnetics	17,671 lin. naut. miles
Trackline soundings	18,147 lin. naut. miles
Sub-bottom profile (CSP)	5,901 lin. naut. miles

BT lowerings - all depths	124
Bottom sample, dredge hauls	
- less than 1000 m	2
- more than 1000 m	22
Meteorological radiosonde	126
Radionuclide water samples	29

APPENDIX D

Base Tie Summary

Place	Date	Meter	Sea-Level Grav. (gals)	Zero Meter Grav.	Drift (mgal)
PMC	31 March	38.080	980.7427	976.8738	---
Honolulu	28 April	20.270	979.9413	976.8819	+8.1
Honolulu	1 May	20.267	978.9426	976.8835	+1.6
Kodiak	28 May	47.840	981.7486	976.8881	+4.6
Kodiak	1 June	47.820	981.7480	976.8895	+1.4
Sitka	12 June	47.360	981.6992	976.8874	-2.1
PMC	28 June	37.925	980.7425	976.8893	+1.9

GPO 841-726

ERRATA

"RP-1-OC-71 Northeast Pacific Geophysical Survey," H. R. Stevens, Jr., NOAA Tech. Rept. ERL 232-POL 10, January 1972.

Note page number changes.

FIGURE 6

LOCATION INDEX

Leg I SEATTLE - HONOLULU (See Figure 2)

Distance in n miles along track	Degrees Lat	Long		Degrees Lat	Long	Pages
0 to 500.1	36.91 -	125.03	to	34.35 -	133.64	18 - 19
500.1 to 1000.1	34.35 -	133.64	to	32.75 -	143.45	19 - 21
1000.1 to 1500.6	32.75 -	143.45	to	31.08 -	153.08	21 - 23
1500.6 to 2000.4	31.08 -	153.08	to	34.45 -	149.16	23 - 24
2000.4 to 2500.3	34.45 -	149.16	to	36.14 -	139.16	24 - 26
2500.3 to 3000.0	36.14 -	139.16	to	34.29 -	142.79	26 - 27
3000.0 to 3500.6	34.29 -	142.79	to	32.65 -	152.60	27 - 29
3500.6 to 3999.9	32.65 -	152.60	to	34.22 -	144.40	29 - 30
3999.9 to 4499.9	34.22 -	144.40	to	32.86 -	153.38	30 - 32
4499.9 to 4999.6	32.86 -	153.38	to	34.74 -	144.30	32 - 33
4999.6 to 5501.1	34.74 -	144.30	to	33.45 -	152.94	33 - 37
5501.1 to 6000.3	33.45 -	152.94	to	34.93 -	145.13	37 - 38
6000.3 to 6500.1	34.93 -	145.13	to	32.54 -	152.39	38 - 40
6500.1 to 6999.4	32.54 -	152.39	to	34.18 -	142.62	40 - 41
6999.4 to 7499.4	34.18 -	142.62	to	29.24 -	143.46	41 - 43
7499.4 to 8000.4	29.24 -	143.46	to	27.54 -	152.75	43 - 44
8000.5 to 8570.4	27.54 -	152.75	to	22.03 -	157.23	44 - 46

Developed Area: Abyssal Hills

1715.1 to 6999.4	33.48 -	154.75	to	34.18 -	142.62	23 - 41

ERRATA

"RP-1-OC-71 Northeast Pacific Geophysical Survey," H. R. Stevens, Jr., NOAA Tech. Rept. ERL 232-POL 10, January 1972.

Note page number changes.

FIGURE 7

LOCATION INDEX

Leg II HONOLULU - KODIAK (See Figure 3)

Distance in n miles along track	Degrees Lat	Long		Degrees Lat	Long	Pages
8628.3 to 9099.7	21.81 -	158.18	to	29.67 -	158.16	48 - 49
9099.7 to 9599.3	29.67 -	158.16	to	38.00 -	158.18	49 - 51
9599.3 to 10100.3	38.00 -	158.18	to	40.40 -	164.93	51 - 53
10100.3 to 10600.5	40.40 -	164.93	to	45.11 -	168.98	53 - 54
10600.5 to 11099.9	45.11 -	168.98	to	44.71 -	165.50	54 - 56
11099.9 to 11600.0	44.71 -	165.50	to	44.78 -	166.21	56 - 57
11600.0 to 12100.3	44.78 -	166.21	to	48.84 -	160.57	57 - 59
12100.3 to 12600.2	48.84 -	160.57	to	52.82 -	157.79	59 - 61
12600.2 to 13100.0	52.82 -	157.79	to	55.94 -	153.36	61 - 63
13100.0 to 13590.6	55.94 -	153.36	to	57.21 -	151.40	63 - 65

Developed Area: Chinook Trough

10807.7 to 11795.6	47.59 -	167.51	to	47.10 -	165.01	55 - 58

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Note page number changes.

FIGURE 8

LOCATION INDEX

Leg III KODIAK - SITKA (See Figure 4)

Distance in n miles along track	Degrees Lat	Long		Degrees Lat	Long	Pages
13643.3 to 13999.9	58.04	- 151.88	to	57.39	- 155.73	68 - 69
13999.9 to 14600.3	57.39	- 155.73	to	55.24	- 145.10	69 - 71
14600.3 to 15099.8	55.24	- 145.10	to	58.80	- 147.61	71 - 73
15099.8 to 15600.2	58.80	- 147.61	to	59.62	- 148.52	73 - 74
15600.2 to 16185.6	59.62	- 148.52	to	56.93	- 135.64	74 - 76

Developed Area: Shelikof Strait

13684.3 to 14274.3	58.41	- 151.62	to	58.84	- 151.61	68 - 70

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Note page number changes.

FIGURE 9

LOCATION INDEX

Leg IV SITKA - SEATTLE (See Figure 5)

Distance in n miles along track	Degrees Lat	Degrees Long		Degrees Lat	Degrees Long	Pages
16217.2 to 16699.9	57.38 -	135.96	to	53.98 -	141.08	78 - 79
16699.9 to 17199.9	53.98 -	141.08	to	53.48 -	136.78	79 - 82
17199.9 to 17700.4	53.48 -	136.78	to	53.87 -	133.75	82 - 84
17700.4 to 18114.2	53.87 -	133.75	to	51.84 -	130.29	84 - 85

Developed Area: Seamounts

17174.3 to 17860.7	53.48 -	136.06	to	52.01 -	136.93	82 - 84