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Received Answered				15 JUL 1982
DEPT. OF MINES				E & I
REF. No. 5716/82				

CRA EXPLORATION PTY. LIMITED.

RAILTON EL 4/74 FINAL REPORT

ON 1982 DRILLING

**OPEN FILE**

Author: I.M.Clementson

Date: 1st April, 1982.

Submitted to: T.W.Dickson

Accepted by: *[Signature]*

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## 1. SUMMARY

CRA Exploration has completed a total of 5051 metres of open hole and diamond drilling to assess the Tasmanite oil shale resources of EL 4/74. This programme has fulfilled the exploration commitment in the joint venture agreement between CRA Exploration and Endeavour Resources, holders of EL 4/74.

The results have indicated a total of 42 million tonnes of Tasmanite oil shale, in several separate occurrences in the Railton-Latrobe area within EL 4/74. Approximately 6 million tonnes of this total indicated resource occurs at depths of less than 20 metres.

There exists abundant potential to increase the total Tasmanite resource, possibly by a further 20 million tonnes, however, the potential to increase the shallow Tasmanite resource is much more restricted.

Before expenditure on further exploration is warranted, it is recommended that the economic viability of bitumen production from Tasmanite be carefully examined.

## 2. INTRODUCTION

EL 4/74 (Railton), for coal and oil shale, has been held by Endeavour Resources since 1974. In September 1981 CRA Exploration entered into an agreement with Endeavour whereby CRA Exploration could earn a majority interest in the Tasmanite oil shale prospects by conducting 5000 metres of exploration drilling within EL 4/74 plus technical investigations into bitumen production from Tasmanite.

During 1981 CRA Exploration completed 2345 metres of drilling and followed this in 1982 with 2706 metres of drilling to evaluate the Tasmanite potential of EL 4/74.

This report details the results of the 1982 drilling programme and summarises the findings of the total programme. It should be studied in conjunction with CRAE Report 11047 which covers the background to the investigation and the results of the 1981 drilling programme.

### 3. CONCLUSIONS

1. Recent drilling by CRAE and previous investigations have indicated a Tasmanite resource of approximately 42 million tonnes. This is located in some separate blocks, several of which have not been fully delineated.
2. The potential open-cut resource (to depths of 20 metres) is approximately 6 million tonnes of Tasmanite. This occurs in a number of separate areas, the largest of which is North China Flat (Area V) which hosts about 2 million tonnes of Tasmanite.
3. Extensive potential exists to increase the Tasmanite resource, primarily at depths in excess of 100 metres. This potential exists adjacent to several areas recently drilled and elsewhere within the EL.
4. The potential to increase the shallow (less than 20 metres) Tasmanite resource appears to be limited. Further drilling in prospective areas could only hope to locate a further 3 million tonnes or so of shallow Tasmanite.
5. The limited open-cut potential will require that future development of the Tasmanite oil shale will be by underground mining. Because of the relatively high cost factors involved, it is essential that the economics of the beneficiation of bitumen production from Tasmanite be established to determine if further investigations are warranted.

#### 4. RECOMMENDATIONS

1. Prior to any further exploration, the economics of bitumen production from Tasmanite have to be evaluated and a conclusion reached as to the desirability of continuing investigations.
2. Potential shallow Tasmanite occurrences to the south of Area V, to the east of Area VI, to the north west of Railton and Area X are the only areas worthy of further exploration drilling.

#### 5. GEOLOGY AND PREVIOUS WORK

Refer to CRAE Report 11047: Railton EL 4/74 Interim Report on 1981 Drilling.

*D.O.M. 82-1707.*

#### 6. CRAE DRILLING - 1982

##### 6.1 General

A total of 2681 metres of open hole drilling and 25.2 metres of diamond drilling was completed in 70 drill holes at 60 sites within EL 4/74. Tasmanite was intersected at 30 of the sites drilled.

The drilling broadly followed recommendations based on the results of the 1981 drilling programme. Emphasis was placed on attempting to locate and delineate areas of Tasmanite at shallow depth although several deeper holes, both exploratory and proving, were drilled. Plan TASH 678 shows the location of all the CRAE holes drilled (1981 - 1982); a summary of the 1982 drilling and the drill logs are given in Appendices 1 and 2 respectively.

Drilling was carried out by Exploration Drilling using an Ingersoll Rand Cyclone TH60 Rig. Geophysical logging of open holes was conducted by Murdoch Geophysics using an SIE system.

## 6.2 Results

### 6.2.1. Area I

Endeavour Resources located shallow Tasmanite in a line of holes drilled to the west of Saggars Hill. To further evaluate the open-cut potential CRAE drilled 19 holes (RD82 MR67 - RD82 MR86) at 14 sites in this area. The resulting grid of holes indicates that whilst the strike length of shallow Tasmanite is quite extensive (approximately 1.8 kilometres), the topography and the dip of the seam restrict the area of shallow (<20 metres) Tasmanite to a narrow belt parallel to strike. The dip appears to be fairly uniform at 5° - 8° towards 065° True, although minor local variations are indicated by structural contouring. Minor faulting probably explains the slight structural complication in the north of the grid around hole 30 of Endeavours 1975 drilling programme. Average seam thickness is 1.43 metres and one or two thin, low spore content partings are generally present.

To the east of Saggars Hill two holes, RD82 MR101 and RD82 MR105, were drilled to test if the Tasmanite persisted down dip from the outcrop area west of Saggars Hill. RD82 MR101 intersected the Tasmanite at 160.5 metres whilst RD82 MR105 had to be abandoned at 161 metres but was believed to be within 20 metres of the Tasmanite seam. This indicates that the Tasmanite seam probably dips quite uniformly from the outcrop to the west, beneath the basalts capping Saggars Hill, and that it may extend still further east and north-east of these drill holes. There is therefore quite a large area of Tasmanite at depth, in this central eastern portion of Area I, with potential to expand the resource, albeit at significant depths. The southern extent of this occurrence is delineated by Endeavours 1975 drilling (holes 21-25) and RD82 MR104 all of which were collared stratigraphically below the Tasmanite horizon. The proximity of these holes to an indicated Tasmanite occurrence in RD82 MR105 at great depth suggests that the southerly extent of Area I is, in part, fault controlled.

In the north of Area I, three holes were drilled to confirm the presence of the Tasmanite seam at depth. RD82 MR 87, RD82 MR89 and RD82 MR103 intersected the seam at 57.3, 145.3 and 80.7 metres respectively. RD82 MR102 had to be abandoned above the Tasmanite horizon.

The northerly extent of the seam in this area is not known. RD82 MR88 was stopped in basalts due to the difficult drilling, so the continuity between the intersections in the north of Area I and those in Cherry Hill area (RD82 MR134 and RD82 MR135) has not been tested.

The Cherry Hill area was drilled in anticipation of locating shallow Tasmanite close to the unconformity mapped between the Pre Cambrian and the basal Permian in that locality. The Tasmanite intersections in RD82 MR134 and RD82 MR135 were at 83.0 and 93.5 metres respectively, indicating that the area east of the unconformity is prospective for Tasmanite at depth but that the potential for shallow Tasmanite is minimal.

#### 6.2.2. Area II

Because of the lack of open-cut Tasmanite potential, only one hole was drilled in this area. RD82 MR116 was sited north east of holes drilled by CRAE in 1981 (RD81 MR30/60, RD81 MR29/61) to test the persistence, at greater depth, of the seam down dip from the previous intersections. Due to drilling problems the hole had to be abandoned at 124 metres whilst still above the Tasmanite horizon.

#### 6.2.3. Area III

The limited open cut potential in the south-east of Area III indicated by drilling carried out in the 1920's was followed up by 7 drill holes. The results generally confirmed the accuracy of the previous work and proved that the shallow Tasmanite occurrence is very restricted.

The failure of RD82 MR120 to intersect the seam, whilst apparently collared above it, suggests some faulting within the area.

In the south of Area III, RD82 MR123 was collared in basalt whilst RD82 MR124 and RD82 MR125 were both collared stratigraphically below the Tasmanite horizon. The southern extent of the Area III Tasmanite occurrence therefore lies north of these holes and is probably fault-bounded.

The south west portion of Area III was tested by 5 drill holes. The most western holes, RD82 MR130 and RD82 MR131, were collared too high in the Permian succession to have reached the Tasmanite with the drill rods available (180 metres) and were therefore abandoned. RD82 MR129 successfully intersected the seam at 39.6 metres, whilst RD82 MR 126 and RD82 MR132 both had to be abandoned due to drilling difficulties before intersecting the seam. Although the Tasmanite potential in this area has not been satisfactorily tested, the indications are that the only potential is for Tasmanite at depth and that the area is not structurally simple.

Area III, although not exhaustively tested, appears to have a fairly large Tasmanite resource, the vast majority of which is below 20 metres depth. Whilst the drilling has not fully delimited or described the resource (it is still open to the north and west), the information available does indicate that the area is relatively complex structurally. At best (from a mining viewpoint) there is broad, low amplitude folding with some faulting, at worst there is extensive faulting.

#### 6.2.4. Area IV

RD82 MR122 proved to be collared stratigraphically below the Tasmanite horizon. Because of the lack of potential in this area, no further exploration was attempted.

#### 6.2.5. Area V

The 1981 CRAE and 1975 Endeavour drilling having satisfactorily described the potential of the North and South China Flat areas, no further drilling was conducted in the 1982 programme.

South-east of South China Flat 8 holes (RD82 MR106 - RD82 MR114) were drilled to test the extent of Tasmanite in this area. The northern outline of the Tasmanite was adequately tested but access problems prevented drilling to the south, therefore this remains open. Whilst most of the drill holes in the south extension of Area V intersected Tasmanite in excess of 20 metres depth, there is indication of a limited open-cut potential along the west flank of this area. This has not been adequately tested and so any resource estimate can only be tentative.

One hole, RD82 MR115 was drilled well to the south of Area V, distal to any known Tasmanite occurrences. Unfortunately this hole had to be abandoned before a distinctive Permian lithology could be recognised. The Tasmanite potential of the mapped basal Permian in this southern area is therefore totally untested.

#### 6.2.6 Area VI

The Tasmanite intersection in RD81 MR22 suggested that Area V has a resource potential and possibly, some open-cut potential. To investigate this potential, 11 holes (RD82 MR90 - RD82 MR100) were drilled during the 1982 programme.

The results confirm that there is a small Tasmanite occurrence, and that a small proportion may be at shallow depth. However, the results also indicate that there is some structural complication in the area. This may be as simple as a local reversal of the regional dip by folding, or there may be several faults within the area.

The Tasmanite averages 1.25 metres in thickness and has at least one central, low spore content parting. The open-cut potential is a small area in the north-west of the Tasmanite occurrence.

Although drilling to date is sufficient to fully evaluate the potential of the area, the indicated resource, especially for shallow Tasmanite is insufficient to warrant further investigation. The only area which may have some potential worthy of testing lies east of RD82 MR99.

## 7. ANALYSES

After geological logging, Tasmanite core intersections were sawn into equal halves, one half being sent for analysis, the remaining half being stored at CRAE Burnie offices.

The Australian Mineral Development Laboratories (AMDEL) conducted proximate analyses on an "as received" and a moisture - free basis, plus Fischer estimates to determine oil yield. The results of the analyses are given in Appendix 3.

## 8. RESOURCES

Using the average Tasmanite thickness intersected in each area, and taking the average density as 2.0 gm/cc for the overall Tasmanite horizon the geologically indicated resource potential for the areas investigated are shown in Table 1. Tasmanite at depths of less than 20 metres is assumed to be open-cuttable. Plan TASH 719 shows the areas of indicated Tasmanite within that part of EL 4/74 studied.

TABLE 1

Locality	Av. Thickness (metres)	Indicated Open-cut Resource (million tonnes)	Indicated Deep Resource (million tonnes)	Possible Deep Resource (million tonnes)
Area I				
W. of Sagers H.	1.43	0.57	4.96	Nil
Beneath " "	?1.20	Nil	Nil	?1.25
E. of Sagers H.	1.00	Nil	1.00	?4.00
Cherry Hill	1.30	Not tested	0.78	?4.00+
Area II				
South	2.05	?0.25	3.69	Nil
North	1.70	?0.45	7.90	?7.00
Area III				
	1.82	0.73	13.80	?10.00+
Area IV				
Not adequately tested: resource believed to be minimal.				
Area V				
N.China Flat	1.30	2.20	Nil	Nil
S.China Flat	1.30	0.70	Nil	Nil
S.Extension	1.13	?0.56	1.96	?
Area VI				
	1.25	0.55	1.85	?0.9

N.B. These figures are only "order of magnitude", geologically indicated estimates.

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## 9. DISCUSSION

The total indicated Tasmanite resource of approximately 42 million tonnes includes only some 6 million tonnes of Tasmanite at less than 20 metres depth. The potential for increasing the total resource within EL 4/74 is great, however the vast majority of any increase would be of Tasmanite at depths in excess of 100 metres. Localities which offer such potential are to the north and east of Area I, to the north and west of Areas II and III respectively and to the south of Area V. In addition to these areas, which are prospective by virtue of their contiguity with known Tasmanite occurrences, there are several, often large, areas within EL 4/74 which have been mapped as Upper Permian. These areas are potentially Tasmanite bearing, although any Tasmanite present would be at great depth.

For shallow Tasmanite the only prospective areas untested are Area X to the north of Nook, to the south of Area V, to the east of Area VI and a small area north west of Railton. The total potential within these, and possibly a few other very small areas, is not great, probably less than 3 million tonnes of Tasmanite in total.

Some features of the Tasmanite occurrences which may affect exploitation of the resource should be mentioned.

Firstly there is a possibility that faulting which would pose problems for any underground mining operation, may be widespread. Small scale faulting was reported as a major difficulty in the early mining operations in the Latrobe area. In most areas, the drilling to date has been too widely spread to allow estimates of the frequency, preferred orientation or average displacement of such small scale faulting to be made. Major faulting does not present as many problems as it is more easily recognised from wide spaced drilling.

The clast content of the Tasmanite seam may present a problem to continuous mining machinery in an underground operation. However, average clast size is small (approx. 1cm) and the frequency of clasts rarely exceeds 5%, and then only at the margins of the seam. Those clasts within the body of the seam are not very tightly held by the fabric of the oil shale and may be "plucked out" with little damage or increase in wear to mining equipment.

During the 1982 drilling programme, conducted during summer when the regional water table was at a minimum, it was noticed that the siltstones immediately above the Tasmanite act as an aquifer. It appears that the Tasmanite being relatively impermeable, is acting as the base for a perched water table. This may cause problems in an underground mining operation.

10. REFERENCES

- Clementson, I.M. 1981 Railton EL 4/74 Interim Report  
on 1981 Drilling. CRAE Report 11047.
- Bujtor, G.J. and Waldram, J.T.W. 1982 Tasmanite Oil Shale Prospect  
CRA Services Report.

11. LOCATION

- Burnie 1:250 000 Sheet SK 55-3  
Launceston 1:250 000 Sheet SK 55-4

12. KEYWORDS

Tasmanite, oil shale, drilling, borehole geophysics, Permian, proximate analyses.

13. LIST OF PLANS

<u>Plan No.</u>	<u>Title</u>	<u>Scale</u>
TASh 579	EL 4/74 Location Plan and Geology	1:63 360
TASh 679	Exploration Drilling EL 4/74	1:15 000
TASh 719	Indicated Potential Tasmanite Occurrences EL 4/74	1:15 000

14. LIST OF APPENDICES

- Appendix I      Summary - 1982 CRAE Drilling
- II      1982 CRAE Drill Logs
- III     Analyses of Tasmanite Oil Shale
- IV      Geophysical Logging of Tasmanite Oil Shale  
                  Railton, North Tasmania.

APPENDIX I

SUMMARY - 1982 CRAE DRILLING

1982 CRAE DRILLING SUMMARY

TASMANITE INTERSECTION

<u>Hole No.</u>		<u>From (m)</u>	<u>To (m)</u>	<u>Thickness (m)</u>	<u>Total Depth (m)</u>
RD82 MR67	approx.	21	approx. 22	approx. 1	22.0
68		20.80	22.16	1.36	23.5
69	approx.	4	approx. 6	approx. 2	6.0
70		3.50	4.52	1.02	6.5
71	approx.	14	approx. 15	approx. 1	15.0
72		14.10	15.53	1.43	16.5
73	approx.	3	approx. 4	approx. 1	4.0
74		2.46	3.66	1.20	4.0
75		Collared stratigraphically below Tasmanite horizon			15.0
76		Abandoned above Tasmanite because of drilling problems			8.0
77		Collared stratigraphically below Tasmanite horizon			21.0
78		Collared stratigraphically below Tasmanite horizon			21.0
79	approx.	23	approx. 24	approx. 1	26.0
80		23.32	24.88	1.56	25.0
81*		43.05	44.60	1.55	50.0
82	approx.	10	approx. 12	approx. 2	12.0
83	approx.	9.5	approx. 11.0	approx. 1.5	12.0
84		40.40	41.23	0.83	43.0
85		Collared stratigraphically below Tasmanite horizon			12.0
86*		11.40	12.80	1.40	16.0

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<u>Hole No.</u>	<u>From (m)</u>	<u>To (m)</u>	<u>Thickness (m)</u>	<u>Total Depth (m)</u>
RD82 MR87*	57.30	58.50	1.20	65.0
88	Hole abandoned in basalt			23.0
89*	145.3	?147	?	156.0
90*	17.66	18.96	1.30	24.0
91	approx. 7	approx. 8	approx.1	12.0
92	Hole collared in Pre Cambrian basement			4.0
93	Hole collared stratigraphically below Tasmanite horizon			95.0
94*	69.60	70.50	0.90	77.0
95*	28.80	30.70	1.90	36.0
96	Collared stratigraphically below Tasmanite horizon			32.0
97	16.00	16.90	0.90	19.0
98	Collared stratigraphically below Tasmanite horizon			6.0
99	Collared stratigraphically below Tasmanite horizon			14.0
100	Collared in Pre-Cambrian basement			9.0
101*	160.50	161.45	0.95	165.0
102	Abandoned above Tasmanite because of drilling problems			76.0
103*	81.00	82.15	1.15	89.0
104	Collared stratigraphically below Tasmanite horizon			11.0
105	Abandoned above Tasmanite because of drilling problems			161.0
106	24.70	25.56	0.86	31.0
107*	approx. 12.3	approx. 13	approx.0.7	16.0
108	Collared stratigraphically below Tasmanite horizon			15.0

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<u>Hole No.</u>	<u>From (m)</u>	<u>To (m)</u>	<u>Thickness (m)</u>	<u>Total Depth (m)</u>
RD82 MR109				15.0
110				27.0
111*	57.00	58.46	1.46	64.0
112				27.0
113				15.0
114	25.47	26.28	0.81	26.7
115				15.0
116				126.0
117*	57.80	59.61	1.81	64.0
118*	21.00	22.9	1.90	30.0
119*	17.70	18.50	0.80	28.0
120				26.0
121*	32.40	34.50	2.10	40.0
122				6.0
123				6.0
124				57.0
125				24.0
126				46.0
127*	56.53	58.66	2.13	66.0
128				30.0
128A*	68.20	70.10	1.90	77.0
129*	39.50	41.40	1.90	47.0
130				28.0

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<u>Hole No.</u>	<u>From (m)</u>	<u>To (m)</u>	<u>Thickness (m)</u>	<u>Total Depth (m)</u>
RD82 MR131	No Tasmanite intersected			12.0
132	Abandoned above Tasmanite because of drilling problems			94.0
133	Stopped above Tasmanite horizon			22.0
134*	83.20	84.45	1.25	90.00
135*	98.55	99.45	0.90	103.00

\* Determined from geophysical logs.

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APPENDIX II

1982 CRAE DRILL LOGS



C.R.A. EXPLORATION PTY. LIMITED  
DRILL CORE LOG

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SHEET 1 OF 2

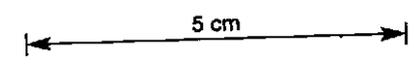
TENEMENT NAME Marssey River JV No. FL 6/74

PLAN - MAP REFERENCE LATE 08 1:25,000

COORDINATES 494000 E 3431440 N DRILLERS Exploration Drilling COMMENCED 12-2-82 DEPTH 23.50m HOLE No RD82MR68

RL COLLAR 80 ASL INCLINATION -90° DRILL TYPE I.R. IMA COMPLETED 12-2-82 CASING LEFT ..... DPO No(s) 20303

DEPTH		Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by <u>AMDEL</u> )			
From (M)	To (M)									Volatiles %	Ash %	Fired C %	Yield L/Tonne
0	3		open hole		<u>WEATHERED ARGILLITE : ochre clays.</u>								
3	18	-	"		<u>MUDSTONE : blue grey Poorly fissile. Soft.</u>								
18	20.8				<u>SILTSTONE : mid grey, poorly sorted. Fairly hard.</u>								
20.8	21.0				<u>TASMANITE OIL SHALE : very low grade.</u>								
21.0	21.10	0.10	HQ		<u>SILTSTONE : mid grey muddy siltstone with a very minor pore content (&lt; 5%). Noticeably micaceous - not usual within the Tasmanite horizon.</u>	987070	21.00	21.10	0.10	84	91.0	0.6	25
21.10	21.30	0.0			<u>PROBABLY highly weathered Tasmanite oil shale. No recovery</u>								
21.30	21.42	0.12			<u>SILTSTONE : mid grey Very low pore content (&lt; 5%). Occasional small (0.3cm) clasts of various lithologies.</u>	987071	21.30	21.42	0.12	9.8	89.4	0.8	38
21.42	21.67	0.25			<u>TASMANITE OIL SHALE : upper 10cms is low grade, below that pore content decreases even further. Poorly laminated at ± 90°. Upper and lower contacts gradational.</u>	987072	21.42	21.67	0.25	16.5	89.9	0.6	97
21.67	21.87	0.20			<u>MUDSTONE : bluish grey. Spores present but probably &lt; 2%. Poorly laminated. Soft.</u>	987073	21.67	21.87	0.20	8.1	91.5	0.4	10
21.87	22.16	0.29			<u>TASMANITE OIL SHALE : low grade. Extremely soft. Contacts gradational.</u>	987074	21.87	22.16	0.29	23.6	78.8	0.6	205











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C.R.A. EXPLORATION PTY. LIMITED  
DRILL CORE LOGSHEET ..... OF .....  
TENEMENT NAME ..... Marsay River JV. ..... No. EL 6/7PLAN - MAP REFERENCE LATSAPF ..... 1:25,000CO-ORDINATES 434005 ..... E 5431340 ..... N ..... DRILLERS Exploration Drilling ..... COMMENCED 13-2-82 ..... DEPTH 16.50 ..... HOLE No. R087 M872  
RL COLLAR 71 ..... ASL ..... INCLINATION -90° ..... DRILL TYPE IR TMR ..... COMPLETED 13-2-82 ..... CASING LEFT ..... DPO No(s) 30303

DEPTH		Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by <u>AMEL</u> )			
From (M)	To (M)									Volatiles %	Ash %	Fixed C %	Yield L/Tonne
0	4	Open hole			<u>WEATHERED ARGILLITES: brown-yellow claye.</u>								
4	13.5				<u>MUDSTONE: bluish grey.</u>								
13.50	14.10	0.60	NP		<u>SILTSTONE: mid grey, fairly 'muddy' clasts near large (i.e. 0.3cm) not common. Traces of pyrite. Poorly laminated at 90°. Sparingly micaceous.</u>	987081	13.50	14.10	0.60	6.3	935	0.2	<5
14.10	14.37	0.27			<u>TASMANITE OIL SHALE: low grade. Typical appearance. Traces of pyrite, usually associated with the infrequent small (0.3cm) clasts present. Upper and lower contacts pre-gradational.</u>	987082	14.10	14.37	0.27	11.7	87.5	0.8	45
14.37	14.54	0.17			<u>SILTSTONE: mid grey. Contains ± 5% Tasmanites spores.</u>	987083	14.37	14.54	0.17	8.9	911	0.0	22
14.54	14.82	0.28			<u>TASMANITE OIL SHALE: low grade. Very soft. Laminated at ± 90°. No clasts.</u>	987084	14.54	14.82	0.28	18.1	81.1	0.8	109
14.82	15.09	0.27			<u>SILTSTONE: mid grey. Approx. 5% spore content.</u>	987085	14.82	15.09	0.27	9.4	90.4	0.2	14
15.09	15.30	0.20			<u>TASMANITE OIL SHALE: moderate grade. Clast (qz, and acid igneous) content is noticeable in upper part - py assoc. with clasts. Lower contact gradational.</u>	987086	15.09	15.30	0.20	20.6	78.7	0.7	116
15.30	15.53	0.14			<u>SILTSTONE: very 'muddy' i.e. argillitic/clay rich. Very low content of Tasmanites spores (5-7%?) Occasional clasts.</u>	987087	15.30	15.53	0.14	9.2	90.5	0.3	19
15.53	15.97	0.43			<u>MUDSTONE: blue grey. Massive. Very soft. Traces spores only.</u>	987088	15.53	15.97	0.43	7.0	92.9	0.5	<5
15.97	16.50	0.53			<u>SILTSTONE: mid grey. Poorly sorted. No Tasmanites spores.</u>	987089	15.97	16.50	0.53	5.8	93.5	0.7	<5



750030

C.R.A. EXPLORATION PTY. LIMITED  
DRILL CORE LOGSHEET 1 OF 2  
TENEMENT NAME Mersey River JV. No. FL 4/7  
PLAN - MAP REFERENCE LA1808E 1:25,000CO-ORDINATES 453940 E 5431215 N DRILLERS Exploration Drilling COMMENCED 13.2.82 DEPTH 4.0m HOLE No. RD82M87  
RL COLLAR 75 ASL INCLINATION -90° DRILL TYPE I.R. IM60 COMPLETED 14.2.82 CASING LEFT DPO No(s) 30303

DEPTH		Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMPA)				
From (M)	To (M)									Volatiles %	Ash %	Fired C. %	Yield L/Tonne	
0	1	Open hole			Soil: ochre clay ex-argillite.									
1.0	1.70	0.70	HQ		MUDSTONE: highly weathered - ochre-brown but blue grey where fresher.									
1.70	2.20	0.50	"		MUDSTONE: blue grey, slightly silty. Fairly massive but traces of lamination at various angles in some cross lamination. Clasts to 1cm, of mica-lens dominantly are present. Contacts gradational.									
2.20	2.46	0.26	"		SILTSTONE: mid grey. Contorted and cross-laminated at 75°-90°. Spores present in trace (= 1-2%) quantities.	987075	2.20	2.46	0.26	6.9	92.8	0.3	8	
2.46	2.66	0.20	"		TASMANITE OIL SHALE: low grade. Occasional igneous (acid) clasts - often very weathered.	987076	2.46	2.66	0.20	12.0	87.6	0.4	55	
2.66	2.85	0.19	"		SILTSTONE with approx. 5% spores. Partly laminated, occasional clasts. Distinct cross-lamination developed.	987077	2.66	2.85	0.19	8.1	91.5	0.4	18	
2.85	3.14	0.29	"		TASMANITE OIL SHALE: moderately high grade. Well laminated - but still traces of cross lamination. Clasts present - up to 3cm dia. Upper and lower contacts sharp.	987078	2.85	3.14	0.29	18.1	80.9	1.0	94	
3.14	3.37	0.23	"		SILTSTONE: mid grey. Approx 5% Tasmanite spores. Clasts present but all small (< 3mm).	987079	3.14	3.37	0.23	18.7	91.1	0.2	9	
3.37	3.66	0.29	"		TASMANITE OIL SHALE: good grade especially at the top. The lower 10cm has interlaminae of baser siltstone. Contacts gradational!	987080	3.37	3.66	0.29	17.4	80.9	1.7	100	













750037

C.R.A. EXPLORATION PTY. LIMITED  
DRILL CORE LOGSHEET 1 OF 1  
TENEMENT NAME Marsy River JV No. EL 6/74  
PLAN - MAP REFERENCE LATROBE 1:25 000  
CO-ORDINATES 454130 E 5430840 N DRILLERS Exploration Drilling COMMENCED 14-2-82 DEPTH 25.00m HOLE No. R082MR80  
RL COLLAR 95 # ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 15-2-82 CASING LEFT ..... DPO No(s) 30303

DEPTH		Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by <u>A. J. DEL</u> )				
From (M)	To (M)									Volatiles %	Ash %	Fired C %	Yield L/Tonne	
0	5		Open hole		<u>WEATHERED MUD/SILTSTONE : yellow clays.</u>									
5	12				<u>SILTSTONES : argillitic, light-midgrey.</u>									
12	24.0				<u>SILTSTONE : mid grey, Poorly sorted, Micaceous</u>									
24.00	23.07	1.07	HQ		<u>SILTSTONE : mid grey, Massive, competent, Fine grained, moderately well sorted but with some large (2cm) rounded-subangular clasts of quartz. Tend to coarsen downwards. Micaceous, Pyritic, especially around clasts</u>									
23.07	23.32	0.25	"		<u>SILTSTONE : as above but with a very low (&lt;5%) spon content.</u>	987092	23.07	23.32	0.25	6.7	92.6	0.7	<5	
23.32	23.56	0.24	"		<u>TASMANITE OIL SHALE : rich, but thin, laminae, separated by very low grade silt laminae. Bedding rather "wavy" around 90°</u>	987093	23.32	23.56	0.24	11.1	89.2	0.7	41	
23.56	23.80	0.24	"		<u>MUDSTONE : rather silty and with approx 5% Teomanites spores. Occasional small (&lt;0.5cm) clasts</u>	987094	23.56	23.80	0.24	9.2	90.3	0.5	32	
23.80	24.07	0.27	"		<u>TASMANITE OIL SHALE : low grade. Typical appearance low spon content. Laminae at approx 90° Upper contact sharp, lower gradational.</u>	987095	23.80	24.07	0.27	20.5	78.6	0.9	142	
24.07	24.32	0.25	"		<u>SILTSTONE : silty mudstone, Mid grey, Low (approx 5%) spon content. Not well sorted, small (0.2-0.4cm) clasts fairly abundant, especially towards base.</u>	987096	24.07	24.32	0.25	9.1	90.6	0.3	10	

750038

C.R.A. EXPLORATION PTY. LIMITED  
DRILL CORE LOGSHEET 1 OF 2  
TENEMENT NAME Mersey River JV. No. E.L. 4/7  
PLAN - MAP REFERENCE LATROBE 1:25,000CO-ORDINATES 454130 E 5430240 N DRILLERS Exploration Drilling COMMENCED 14-2-82 DEPTH 25.00m HOLE No. RD82MR80  
RL COLLAR 95 m ASL INCLINATION -90° DRILL TYPE I.R. TMR COMPLETED 15-2-82 CASING LEFT DPO No(s) 30303

DEPTH		Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by A.M.DEL)				
From (M)	To (M)									Volatiles %	Ash %	Fixed C %	Yield %	
0	5				WEATHERED MUD/SILTSTONE : yellow clay.									
5	12				SILTSTONES : argillitic, light-midgrey.									
12	24.0				SILTSTONE : mid grey Poorly sorted. Micaceous									
22.00	23.07	0.07	HQ		SILTSTONE : mid grey. Massive, competent. Finegrained, moderately well sorted but with some large (2cm) rounded-subangular clasts of quartz. Tend to coarsen downwards. Micaceous. Pyritic, especially around clasts									
23.07	23.32	0.25	"		SILTSTONE : as above but with a very low (<5%) pore content.	987092	23.07	23.32	0.25	6.7	92.6	0.7	<5	
23.32	23.56	0.24	"		TASMANITE OIL SHALE : rich, but thin, laminae, separated by very low grade silt laminae. Bedding rather wavy around 90°	987093	23.32	23.56	0.24	11.1	88.2	0.7	41	
23.56	23.80	0.24	"		MUDSTONE : rather silty and with approx 5% Tasmanites spores. Occasional small (<0.5cm) clasts	987094	23.56	23.80	0.24	9.2	90.3	0.5	32	
23.80	24.07	0.27	"		TASMANITE OIL SHALE : low grade. Typical appearance low clast content. Laminae at approx 90° upper contact sharp, lower gradational.	987095	23.80	24.07	0.27	20.5	78.6	0.9	142	
24.07	24.32	0.25	"		SILTSTONE : silty mudstone. Midgrey. Low (approx 5%) pore content. Not well sorted, small (0.2-0.4cm) clasts fairly abundant, especially towards base.	987096	24.07	24.32	0.25	9.1	90.6	0.3	10	







C.R.A. EXPLORATION PTY. LIMITED  
DRILL CORE LOG

SHEET 1 OF 1  
TENEMENT NAME Mersey River JV. No. EL 6/7  
PLAN - MAP REFERENCE 1:25 000  
DEPTH 1.2m HOLE No. RD 82 08 83  
COMPLETED 15-2-82 CASING LEFT DPO No(s) 30303

750042

CO-ORDINATES 484320 E 5430455 N DRILLERS Exploration Drilling COMMENCED 15-2-82  
RL COLLAR 110 # ASL INCLINATION - 90° DRILL TYPE I.R. TNGR

DEPTH		Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by J.M.P.)			
From (M)	To (M)									Volatiles %	Ash %	Fixed C %	Yield /Tons
0	8		Open hole		WEATHERED MUDSTONES: white-yellow-ochre-pink clays.								
8	9.5				SILTSTONE: soft Midgrey Micaceous, poorly sorted.								
7.50	12.00	1.02	HQ		TASMANITE OIL SHALE: (NB poor core recovery. Only the Tasmanite was recovered - is 1.02m. The core being very broken no realistic subdivision was possible. The water and varying lithologies were lost. Probable that most of the Tasmanite was recovered) Low-moderate grade. Few clasts. Very soft but still relatively competent. Sample represent all the Tasmanite horizon and is probably close to the true thickness.	987099	?	?	1.02	19.7	79.4	1.9	141































750058

C.R.A. EXPLORATION PTY. LIMITED  
DRILL CORE LOGSHEET 1 OF 2  
TENEMENT NAME Mersey River JV No. EL 4/7  
PLAN - MAP REFERENCE RAILTON 1:25 000  
COORDINATES 454870 E 5428060 N DRILLERS Exploration Drilling COMMENCED 24.2.82 DEPTH 19m HOLE No RD82MR97  
RL COLLAR 107 # ASL INCLINATION -90° DRILL TYPE I.R. TMR COMPLETED 24.2.82 CASING LEFT DPO No(s) 30303

DEPTH		Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMPEL)			
From (M)	To (M)									Volatiles %	Ash %	Fired L %	Yield L/Tonne
0	2		Open hole		WEATHERED ARGILLITE: brown clays								
2	14				MUDSTONE: mid grey - grey blue soft mudstone. Fairly well sorted, very few clasts. Sparingly pyritic								
14	16				SILTSTONE: light - mid grey Quite well sorted, no large clasts observed. Micaceous								
16.00	16.13	0.13	HP		SILTSTONE: mid grey, well laminated. Contains < 10% Tasmanites spores Pyritic	987106	16.00	16.13	0.13	5.5	94.1	0.4	65
16.13	16.20	0			CORE LOSS: only quartz pebbles recovered, rounded, up to 1cm								
16.20	16.44	0.24			TASMANITE OIL SHALE: high spore content. Unusually pyritic, especially around the clasts present and also on irregular joint planes. Upper "contact" is marked by large (1cm), rounded clasts of quartz and phyllite. These do not persist down. Lower contact is gradational through decreasing spore content.	987107	16.20	16.44	0.24	23.6	74.0	2.4	166
16.44	16.67	0.23			SILTSTONE: mid grey, low spore content. Very occasional clasts - all small. Traces of pyrite	987108	16.44	16.67	0.23	5.8	94.0	0.2	65
16.67	16.80	0.13			TASMANITE OIL SHALE: moderate to good grade. Very few clasts, often with pyrite. Also pyrite on joint planes. Upper and lower contacts gradational.	987109	16.67	16.80	0.13	14.3	84.0	1.7	90
16.80	16.90	0.10			SILTSTONE: mid grey, not very well sorted. Low spore content. Common slightly & becomes less well sorted with	987110	16.80	16.90	0.10	4.6	95.1	0.3	9





































750077

C.R.A. EXPLORATION PTY. LIMITED  
DRILL CORE LOG

SHEET 1 OF 2  
TENEMENT NAME Marsy River JV No. EL 4/7  
PLAN - MAP REFERENCE RAILTON 1:25,000  
DEPTH 26.7m HOLE No. RD82MR11  
COMPLETED 8-3-82 CASING LEFT ..... DPO No(s) 30303

CO-ORDINATES 454250 E 5423710 N. DRILLERS Exploration Drilling COMMENCED 8-3-82  
RL COLLAR SS # ASL INCLINATION -90° DRILL TYPE I.R. TMA COMPLETED 8-3-82

DEPTH		Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by <u>AMP&amp;L</u> )			
From (M)	To (M)									Volatiles %	Ash %	Fines %	Yield L/Tonne
0	4				SOIL: red-brown clay rich soil.								
4	8				WEATHERED ARGILLITE buff-brown clays								
8	20				MUDSTONE: mid-grey silty mudstone plus occasional qz clasts.								
20	24				SILTSTONE: mid grey hard siltstone with clasts.								
24.00	25.47	1.30	HQ		SILTSTONE: m. J grey. Massive slightly micaceous. Matrix fairly well sorted but occasional large (up to 5mm dia.) clasts of quartz and grey quartzites, all fairly well rounded, are present. Hard traces of pyrite. Sorting decreases downwards, the lowermost 10cm are more of a gritty siltstone with abundant (15%) clasts. Strongly pyritic at the base. Soft sediment deformation at contact into the underlying Tasmanite horizon.	987111	25.47	26.10	0.63	30.1	67.6	2.3	137
25.47	26.10	0.63	HQ		TASMANITE OIL SHALE: high opone content. Typical bronze-green colour and lustre. Upper contact has load casts of silt from the overlying horizon. Foliation (lamination?) is at $\pm 90^\circ$ . Clasts are present but are infrequent, pyrite nodules (to 1cm) are also present. Grade is uniform (or fairly so) throughout. Clast frequency increases slightly with depth, but only noticeable in lowest 5cm.								
26.10	26.28	0.18	HQ		CONGLOMERATE: gritty siltstone matrix with abundant	987112	26.10	26.28	0.18	94	90.3	0.3	8

















































APPENDIX III

ANALYSES OF TASMANITE OIL SHALE

SUMMARY OF TASMANITE INTERSECTIONS, PROXIMATE ANALYSES, OIL YIELDS AND  
COMPOSITE OIL YIELDS

<u>HOLE#</u>	<u>SAMPLE#</u>	<u>FROM(M)</u>	<u>TO(M)</u>	<u>LENGTH(M)</u>	<u>VOLATILES</u>	<u>FIXED C</u>	<u>ASH</u>	<u>OIL YIELD L/TONNE</u>	<u>COMPOSITE OIL YIELD</u>		
MR68	987070	21.00	21.10	0.10	8.4	0.6	91.0	25	1.16m @ 79 L/tonne 0.74m @ 115 L/tonne		
	71	21.30	21.42	0.12	9.8	0.8	89.4	38			
	72	21.42	21.67	0.25	16.5	0.6	82.9	97			
	73	21.67	21.87	0.20	8.1	0.4	91.5	10			
	74	21.87	22.16	0.29	23.6	0.6	75.8	205			
	987090	3.50	4.10	0.60	11.1	1.0	87.9	85		1.02m @ 87 L/tonne	
91	4.10	4.52	0.42	13.9	0.8	85.3	90				
MR72	987081	13.50	14.10	0.60	6.3	0.2	93.5	< 5	1.43m @ 61 L/tonne 0.85m @ 81 L/tonne		
	82	14.10	14.37	0.27	11.7	0.8	87.5	45			
	83	14.37	14.54	0.17	8.9	0.0	91.1	22			
	84	14.54	14.82	0.28	18.1	0.8	81.1	109			
	85	14.82	15.09	0.27	9.4	0.2	90.4	14			
	86	15.09	15.39	0.30	20.6	0.7	78.7	116			
	87	15.39	15.53	0.14	9.2	0.3	90.5	19			
	88	15.53	15.97	0.44	7.0	0.5	92.9	< 5			
	89	15.97	16.50	0.53	5.8	0.7	93.5	< 5			
	MR74	987075	2.20	2.46	0.26	6.9	0.3	92.8		8	12m @ 60 L/tonne
		76	2.46	2.66	0.20	12.0	0.4	87.6		55	
77		2.66	2.85	0.19	8.1	0.4	91.5	18			
78		2.85	3.14	0.29	18.1	1.0	80.9	94			
79		3.14	3.37	0.23	8.7	0.2	91.1	9			
80		3.37	3.66	0.29	17.4	1.7	80.9	100			
MR80		987092	23.07	23.32	0.25	6.7	0.7	92.6	< 5		
	93	23.32	23.56	0.24	11.1	0.7	88.2	41			

750103

<u>HOLE#</u>	<u>SAMPLE#</u>	<u>FROM(M)</u>	<u>TO(M)</u>	<u>LENGTH(M)</u>	<u>VOLATILES</u>	<u>FIXED C</u>	<u>ASH</u>	<u>OIL YIELD L/TONNE</u>	<u>COMPOSITE OIL YIELD</u>
MR80	987094	23.56	23.80	0.24	9.2	0.5	90.3	32	1.34m @ 77 L/tonne 0.86m @ 99 L/tonne
	95	23.80	24.07	0.27	20.5	0.9	78.6	142	
	96	24.07	24.32	0.25	9.1	0.3	90.6	10	
	97	23.32	24.66	0.34	21.0	1.6	77.4	131	
	98	24.66	24.88	0.22	8.0	0.5	91.5	8	
MR83	987099	From Interval 9.50 - 12.00		1.02	18.7	1.9	79.4	141	1.02m @ 141 L/tonne
MR84	987100	40.40	40.60	0.20	19.2	1.1	79.7	137	1.45m @ 109 L/tonne
	101	40.60	40.77	0.17	9.2	0.4	90.4	38	
	102	40.77	41.04	0.27	20.1	1.0	78.9	151	
	103	41.04	41.23	0.19	9.2	0.4	90.4	24	
	104	41.23	41.85	0.62	19.9	0.9	79.2	127	
	105	41.85	42.00	0.15	5.9	0.4	93.7	< 5	
MR97	987106	16.00	16.13	0.13	5.5	0.4	94.1	< 5	0.60m @ 87 L/tonne
	107	16.20	16.44	0.24	23.6	2.4	74.0	166	
	108	16.44	16.67	0.23	5.8	0.2	94.0	< 5	
	109	16.67	16.80	0.13	14.3	1.7	84.0	90	
	110	16.80	16.90	0.10	4.6	0.3	95.1	9	
MR114	987111	25.47	26.10	0.63	30.1	2.3	67.6	137	0.63m @ 137 L/tonne
	112	26.10	26.28	0.18	9.4	0.3	90.3	8	

750104



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14 May 1982

# amdel

## NATA CERTIFICATE

Mr. T.W. Dickson,  
CRA Exploration Pty. Ltd.  
P.O. Box 138,  
BELLERIVE TASMANIA 7018

REPORT AC 5574/82

YOUR REFERENCE:

DPO Number: 30303

IDENTIFICATION:

As listed

DATE RECEIVED:

20 April 1982

D.K. Rowley  
Manager  
Analytical Chemistry Division

*S.B. Bowditch*  
for Norton Jackson  
Managing Director

cc The Manager,  
CRA Exploration Pty. Ltd.,  
G.P.O. Box 384D,  
MELBOURNE VIC. 3001

cc Mr. C. Glow,  
CRA Exploration Pty. Ltd.,  
P.O. Box 93,  
NORTHLAND CENTRE VIC. 3072

cc The Administration Officer,  
CRA Exploration Pty. Ltd.,  
P.O. Box 138,  
BELLERIVE TASMANIA 7018

(Invoice)

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Flemington Street, Frewville  
South Australia 5063,  
Telephone (08) 79 1662  
Telex: Amdel AA82520  
Pilot Plant:  
Osman Place  
Thebarton, S.A.  
Telephone (08) 43 8053  
Branch Laboratories:  
Melbourne, Vic.  
Telephone (03) 645 3093  
Perth, W.A.  
Telephone (09) 325 7311  
Townsville  
Queensland 4814  
Telephone (077) 75 1377

*NOTE:*

1. *Sample 987074 was received very wet. This is evident by the very high moisture value obtained.*
2. *Samples 987074, 987088, 987090 and 987099 were quite different from the other 39 samples of this submission.*

*The 39 were of fairly hard, dry material whereas these four (4) were soft and wet and special preparation techniques were necessary.*

*The sample preparation on these four samples has been charged on a time basis.*

ANALYSIS  
%

SAMPLE MARK	TOTAL MOISTURE		VOLATILE	ASH	FIXED CARBON
	As	Received			
987070	1.4		8.4	91.0	0.6
71	1.8		9.8	89.4	0.8
72	3.8		16.5	82.9	0.6
73	2.0		8.1	91.5	0.4
74	31.0		23.6	75.8	0.6
75	1.9		6.9	92.8	0.3
76	1.9		12.0	87.6	0.4
77	2.0		8.1	91.5	0.4
78	1.8		18.1	80.9	1.0
79	1.9		8.7	91.1	0.2
80	2.3		17.4	80.9	1.7
81	2.0		6.3	93.5	0.2
82	2.0		11.7	87.5	0.8
83	2.3		8.9	91.1	0.0
84	1.9		18.1	81.1	0.8
85	2.0		9.4	90.4	0.2
86	1.9		20.6	78.7	0.7
87	2.2		9.2	90.5	0.3
88	7.3		7.0	92.9	0.5
987089	2.2		5.8	93.5	0.7

## ANALYSIS

SAMPLE MARK	TOTAL MOISTURE As Received	VOLATILE -----	-----Dry Basis-----	
			ASH	FIXED CARBON
987090	10.2	11.1	87.9	1.0
91	2.4	13.9	85.3	0.8
92	1.8	6.7	92.6	0.7
93	2.1	11.1	88.2	0.7
94	2.3	9.2	90.3	0.5
95	2.1	20.5	78.6	0.9
96	2.2	9.1	90.6	0.3
97	1.9	21.0	77.4	1.6
98	1.9	8.0	91.5	0.5
99	13.1	18.7	79.4	1.9
100	1.6	19.2	79.7	1.1
101	2.2	9.2	90.4	0.4
102	1.8	20.1	78.9	1.0
103	2.0	9.2	90.4	0.4
104	1.9	19.9	79.2	0.9
105	1.6	5.9	93.7	0.4
106	5.7	5.5	94.1	0.4
107	4.2	23.6	74.0	2.4
108	6.3	5.8	94.0	0.2
109	5.5	14.3	84.0	1.7
987110	6.1	4.6	95.1	0.3
111	2.0	30.1	67.6	2.3
987112	2.3	9.4	90.3	0.3

Method: S1



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750109  
**amdel**

31 May, 1982.

AC 3/1/6/0

CRA Exploration,  
P.O. Box 138,  
BELLERIVE, TAS. 7018

ATTENTION: T.W. Dickson.

REPORT AC T504/82  
AD. 5574/82

YOUR REFERENCE: D.P.O. No. 30303.  
MATERIAL: 43 Samples.  
IDENTIFICATION: As Listed.  
WORK REQUIRED: Fischer Distillation Oil Yield Analysis.  
DATE RECEIVED: 20th April, 1982.

Enquiries quoting AC T504/82 to Chief Chemist: Bob Harris.  
Manager, Townsville Branch: Barry Dillon.

*B. Dillon*

for Norton Jackson,  
Managing Director.

cc. C.Glow.  
CRA Exploration,  
P.O. Box 93,  
NORTHLAND CENTRE. VIC. 3072

CRA Exploration,  
G.P.O. Box 384D,  
MELBOURNE, VIC. 3001

Head Office:  
Brimington Street, Frewville  
South Australia 5063,  
Telephone (08) 79 1662  
Telex: Amdel AAB2520  
Pilot Plant:  
Osman Place  
Thebarton, S.A.  
Telephone (08) 43 8053  
Branch Laboratories:  
Melbourne, Vic.  
Telephone (03) 645 3093  
Perth, W.A.  
Telephone (09) 325 7311

Form 38

REPORT AC T504/82

## ANALYSIS

Sample No	Oil Yield Ltr/Tne	Sample No	Oil Yield Ltr/Tne
987070	25	987095	142
987071	38	987096	10
987072	97	987097	131
987073	10	987098	8
987074	205	987099	141
987075	8	987100	137
987076	55	987101	38
987077	18	987102	151
987078	94	987103	24
987079	9	987104	127
987080	100	987105	<5
987081	< 5	987106	<5
987082	45	987107	166
987083	22	987108	<5
987084	109	987109	90
987085	14	987110	9
987086	116	987111	137
987087	19	987112	8
987088	< 5		
987089	< 5		
987090	85		
987091	90		
987092	< 5		
987093	41		
987094	32		

METHOD:

R6

R6

N.B. Results are reported on a dry basis.

APPENDIX IV

GEOPHYSICAL LOGGING OF TASMANITE OIL SHALE

RAILTON, NORTH TASMANIA



## CRA EXPLORATION PTY. LIMITED

(INC. IN N.S.W.)

LEVEL 4, BELLERIVE QUAY,  
CAMBRIDGE ROAD, BELLERIVE, 7018, TASMANIA, AUSTRALIAP.O. BOX 138  
BELLERIVE 7018  
TELEGRAMS: CRAEX  
TELEX: AA57144  
TELEPHONE: 44 3533  
AREA CODE: (002)

IN REPLY PLEASE QUOTE

6th July, 1982.

Memorandum To: I.M.CLEMENTSON

Copy: T.W.DICKSON

From: M.FLIS

GEOPHYSICAL LOGGING OF TASMANITE OIL SHALE  
RAILTON, NORTH TASMANIA.INTRODUCTION

A second phase of exploratory and delineatory drilling for Tasmanite oil shales was carried out in the Railton area, North Tasmania (E.L. 4/74). Fifty-eight of the sixty sites drilled were geophysically logged to assist in the identification and limits of any intersections.

Logging was conducted by Murdoch Geophysics (Aust.) using a portable S.I.E. T450 logging unit. Holes were logged for Resistivity, Self-potential, Neutron-Neutron, Gamma-Gamma density and Caliper. A short note on equipment specifications together with computer plots of the logs are attached.

DISCUSSION

From the first phase of drilling, concluded in 1981, it was apparent that Tasmanite oil shale was readily identifiable on geophysical logs (See Appendix I of Report No.11047 by Clementson). Resistivity, Neutron-Neutron and Gamma-Gamma density reflected the occurrence of the Tasmanite, although the density log failed to do so in a limited number of cases.

To defray logging costs it was decided to use a portable logging unit rather than the truck - mounted Century Geophysical Corporation (C.G.C.) unit used in the first phase.

In general, there appears to be a degradation of the response when using the S.I.E. unit. This is mainly due to the fact that:

- 1) S.I.E. equipment only supplies a single point resistivity log whilst the C.G.C. unit has both focussed resistance and resistivity log. The resultant increase in definition is marked,
- 2) specifications in the gamma-gamma density tool vary widely between the two units: S.I.E. has a 7.1 cu,cm crystal with a 10 milli Curie Cesium source whilst C.G.S. has a 73.3 cu.cm crystal with a 100 milli Curie Cesium source. Once again, the increase in definition on the C.G.C. logs is marked,
- 3) specifications for the neutron-neutron tools were identical except for source-detector spacing. The spacing was greater on the S.I.E. unit by approximately 3 inches.

Tasmanite was always detectable on the neutron-neutron log. The resistivity and gamma-gamma density logs usually detected the seams, but occasionally they did not due either to the grade of Tasmanite or hole condition.

#### CONCLUSION AND RECOMMENDATION

Tasmanite is, in general, easily detected by geophysical logs. Provided these logs are chosen carefully the method provides a cheap alternative for the identification of Tasmanite, in lieu of diamond drilling.

Logs to be used in any future programme should consist of neutron-neutron, focussed resistance, and gamma-gamma density. Tests into the effects of source-detector spacings must be carried out to ascertain the optimum configuration before full reliance is placed on the method.



MARCUS FLIS

750114

BOREHOLE LOGS MR77 TO MR 135

RAILTON, TASMANIA

LOGGED FOR C.R.A.

By: Murdoch Geophysics (Australia)  
21 Parker Street,  
Maroochydore Q. 4558

Phone: (071) 433922 •

March 1982.



INTRODUCTION

The borehole data included herein are for holes MR77 to MR135, logged in the Railton/Latrobe districts of Northern Tasmania, from 25/2/82 to 16/3/82 for C.R.A.

The holes were logged by Mr. S. Morgan of Murdoch Geophysics (Australia). The holes were logged for Resistivity, S.P., Neutron, Gamma Gamma Density (side wall) and Caliper.

The specification of the tools used is included. At the surface, the data was recorded on an SIE T450 recorder interfaced to an HP85 recorder via a Murdoch Geophysics (Australia) CAL interface. An analogue record of each log was obtained from the SIE surface recorder. The data was digitised by the CAL interface and recorded on data cartridge on the HP85 desk top computer.

The data presented herein has been replayed onto a HP7225B A4 size plotter. The logging scales used are:-

Neutron:  $7\frac{1}{2}$  centrimetres = 10,000 counts per second

Density: 1 centimetre: 500 counts per second

and 1 centimetre: 50 counts per second

Caliper: 1 centimetre: 2 inches

SP/Resistivity Scales: See individual logs.

Logging Speeds used: 6 metres per minute.

The logs are now presented side by side in A4 format, with 25 metres of hole per page (1:100). Other types of format on vertical or horizontal scales are available, and can be provided upon request. Individual parts of each log can also be re-plotted at different scales when required.

MURDOCH GEOPHYSICS - INFORMATION ON LOGGING TOOLS(A) Single Point Resistivity/SP Tools (Single Pass)

Company of Manufacture - S.I.E. Brisbane.

Ranges Available: Resistivity (ohms) :- 25, 50 100, 250,  
500, 1000.

: SP :- Positive or negative deflection.

Maximum deflections(mV) :- 25, 50, 100,  
250, 500, 1000.

Detection Method (Resistivity):- Surface  
voltage pick-up with constant current  
output from tool.

Diameter :- 3.3 cm.

Length :- 0.34 metres.

(B) Gamma Gamma Density (Side Wall) (Single Pass)

Company of Manufacture - S.I.E. Brisbane

Ranges Available :- 25, 50, 100, 250, 500, 1000, 2500,  
5000, 10000, 25000, 50000, CPS.

Time Constants Available - 0.5, 1, 2, 5, 10 sec.

Detection Method - Scintillation method consisting of  
Sodium Iodide crystal coupled with a  
photomultiplier.

Crystal size - 1.9 cm diameter x 2.5 cm long (7.1 cm<sup>3</sup>)

Source - Collimated Cesium (Cs) 137.

Source Strengths Available - 10 millicurie & 50 millicurie.

Source-Detector Spacings Available - 20 cm (BRD), 30 cm,  
35 cm, 45 cm.

Diameter - 3.5 cm (no spring); 6.0 cm (with spring).

Length (BRD Spacing) - 1.26 metres.

(C) Caliper Tool (Single Pass)

Company of Manufacture - S.I.E. Brisbane

Ranges Available - Variable according to clients wishes.

Normally run at 0" - 10". Full scale  
deflection (to correspond with vertical  
divisions on chart paper).

Minimum diameter hole - 4.5 cm.

Maximum diameter hole - 36 cm.



Detection Method - 3-Arm caliper system with arms mechanically interlocked. Borehole diameter transmitted via linear displacement transducer in tool.

Diameter - 4.4cm.

Length - 1.055 metres.

(D) Neutron Tool

Company of Manufacture - S.I.E. Brisbane

Ranges Available :- 25, 50, 100, 250, 500, 1000, 2500, 5000, 10000, 25000, 50000, CPS.

Time Constants Available :- 0.5, 1, 2, 5, 10 seconds.

Detection Method - Helium tube (3 atmospheres).

Crystal size - 15.24 cms x 2.54 cm diameter.

Source - Americium - 241/Beryllium

Source Strength - 3 curie.

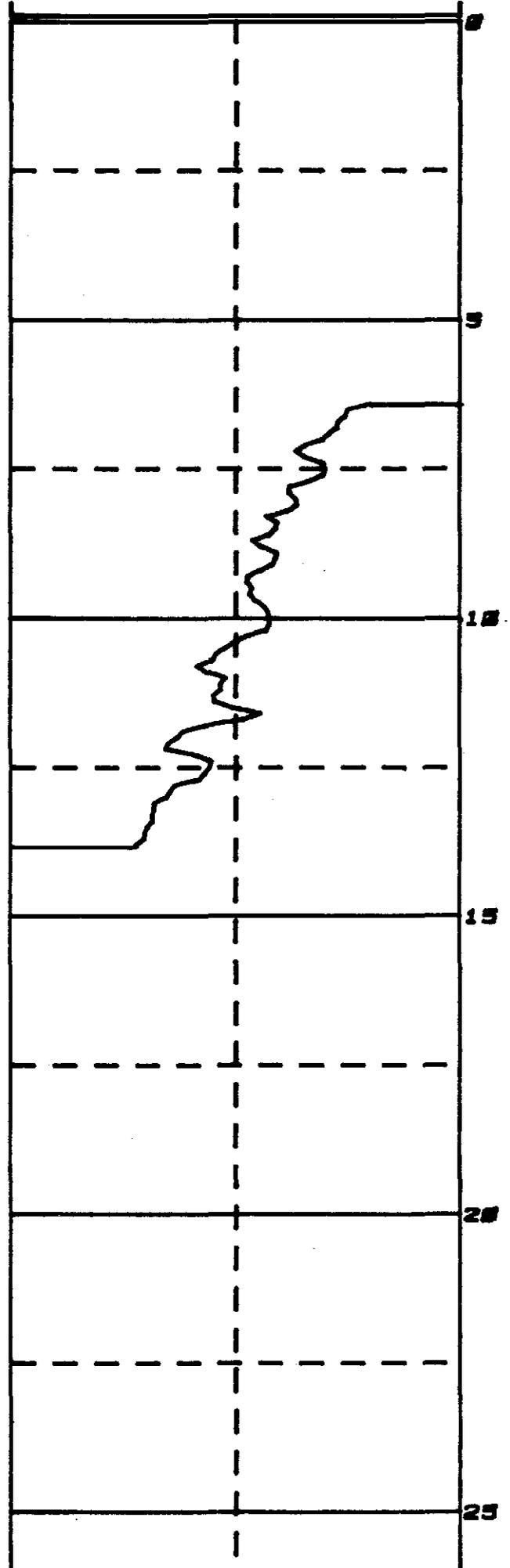
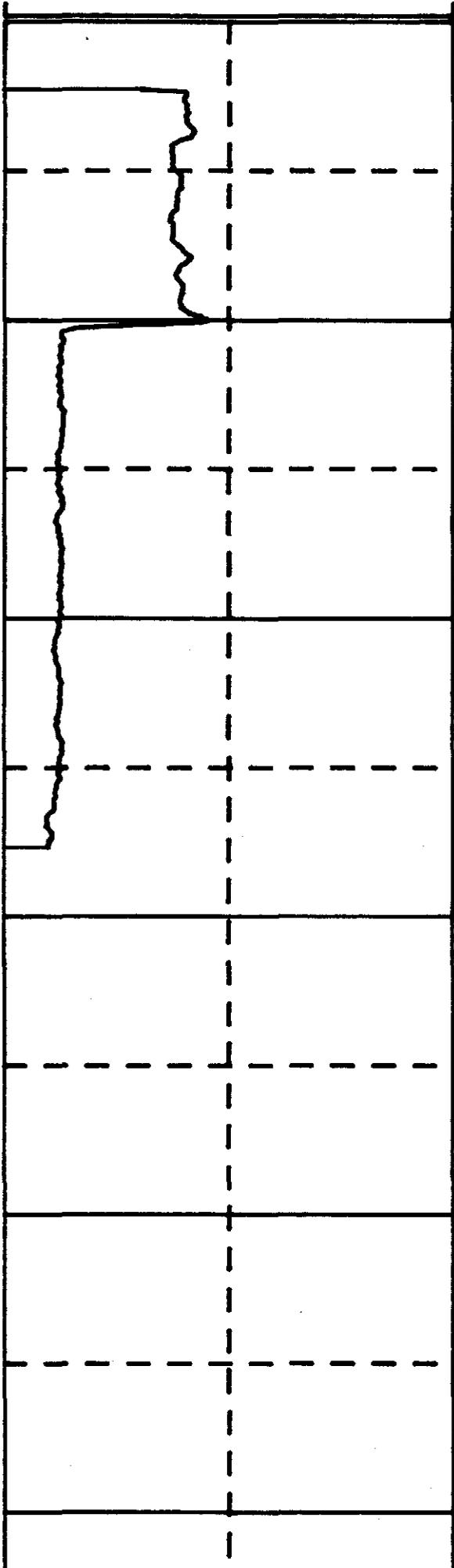
Diameter - 3.4 cm.

Length (including Space and Source) - 146 cm.



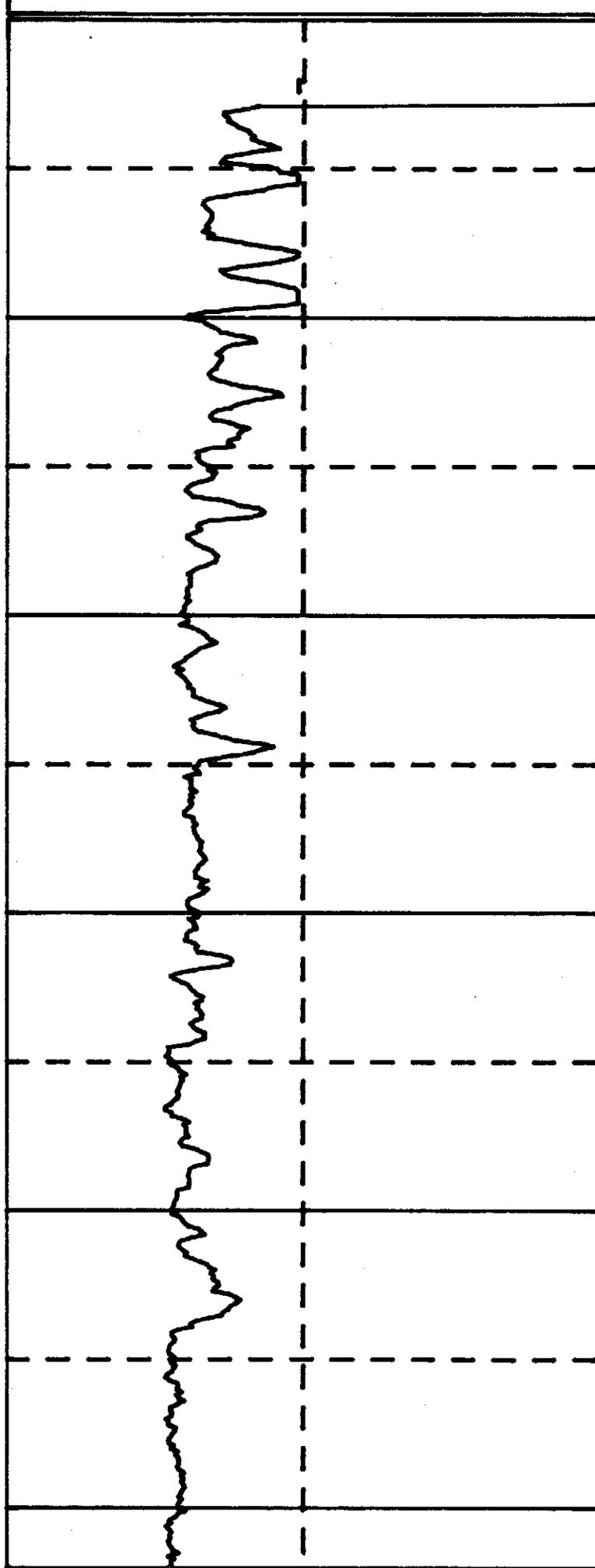
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RESISTIVITY (700-950 OHMS)

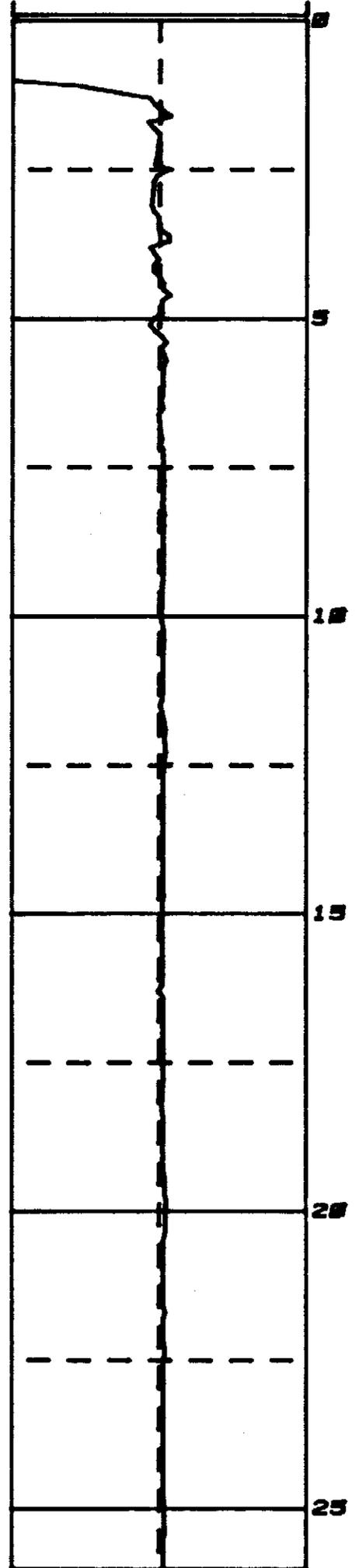


750119

L. S. DENSITY (8-1000 C. P. S.)

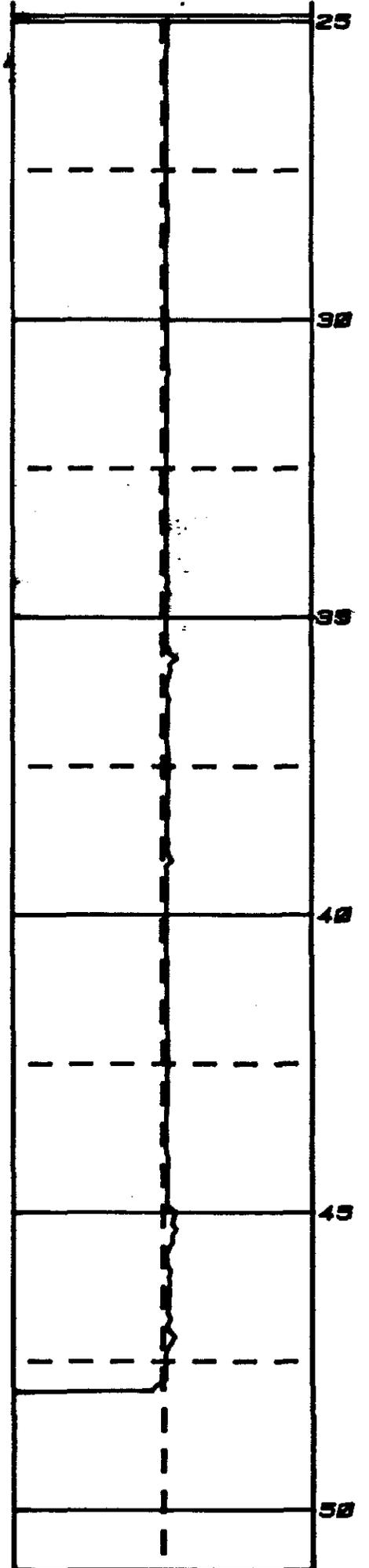
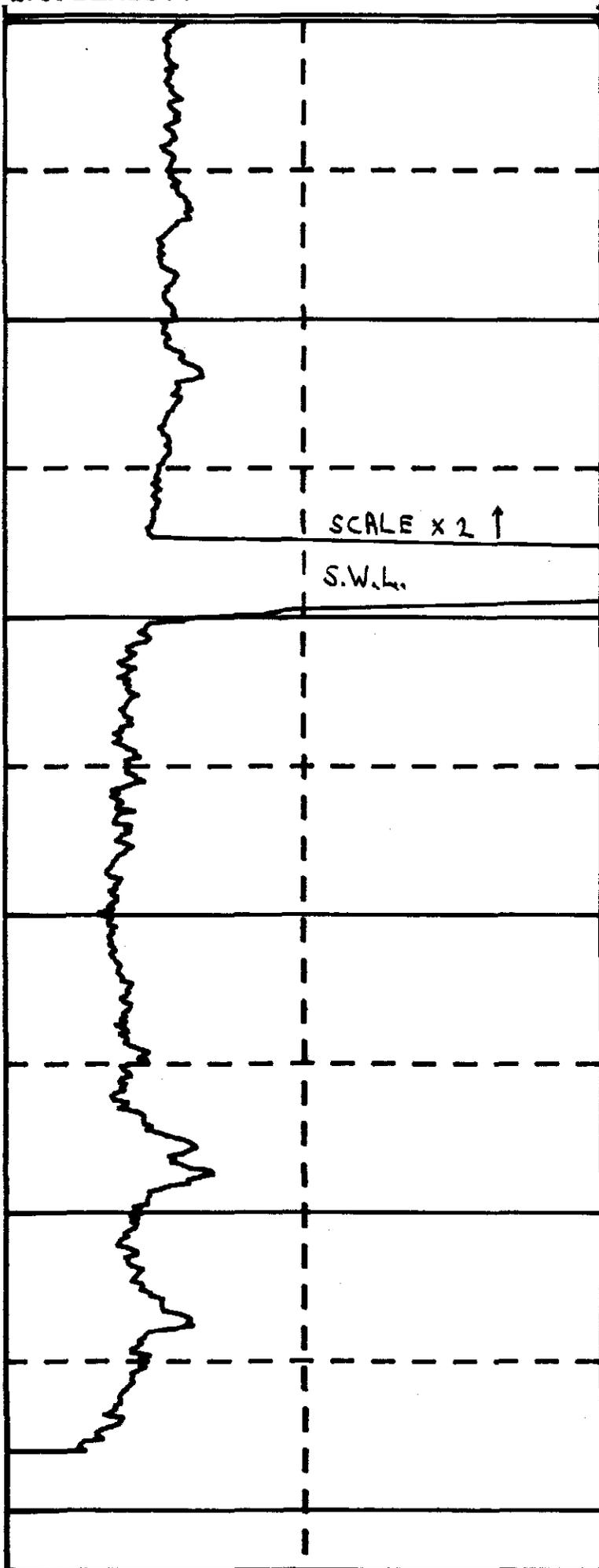


CALIPER (8-10 In.)



L.S. DENSITY (8-500 C.P.S.)

CALIPER (8-18 In.)

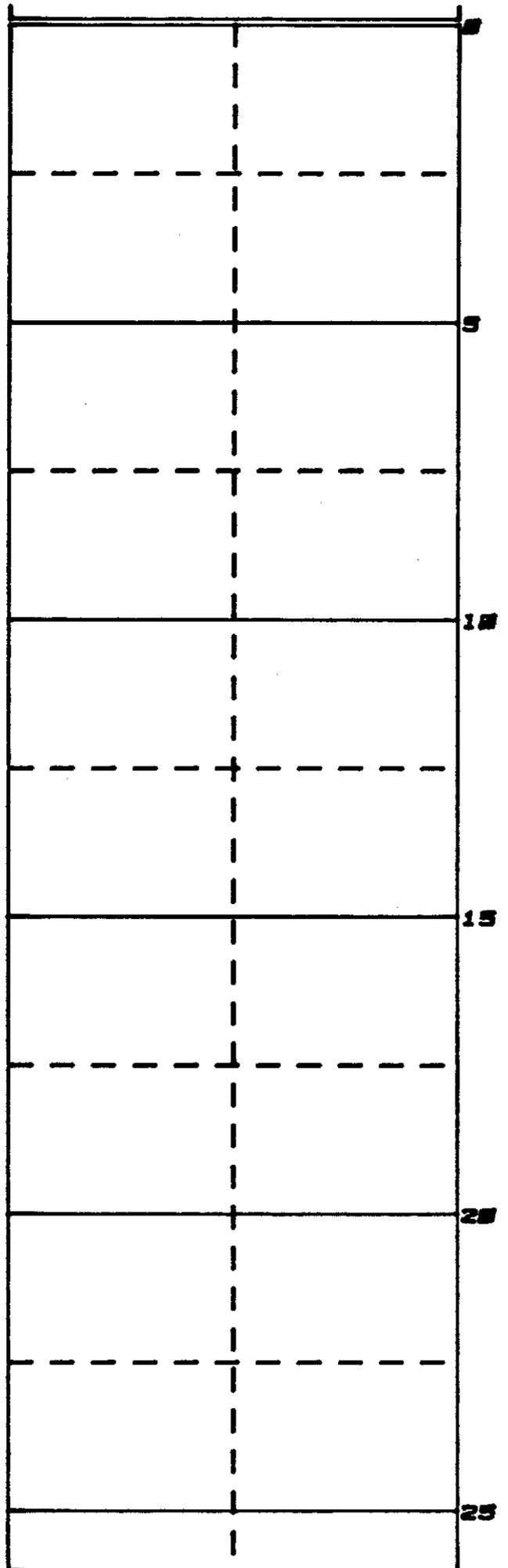
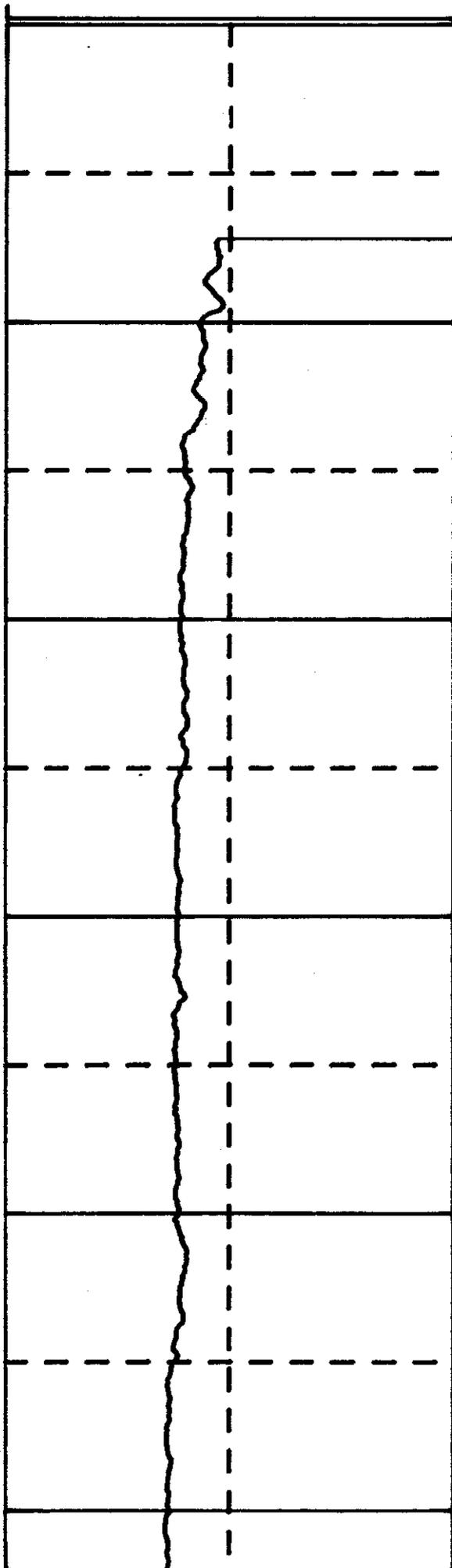


CRA EXPLORATION PTY. LTD.  
RAILTON J. V. EL 4/74

RO82MR81

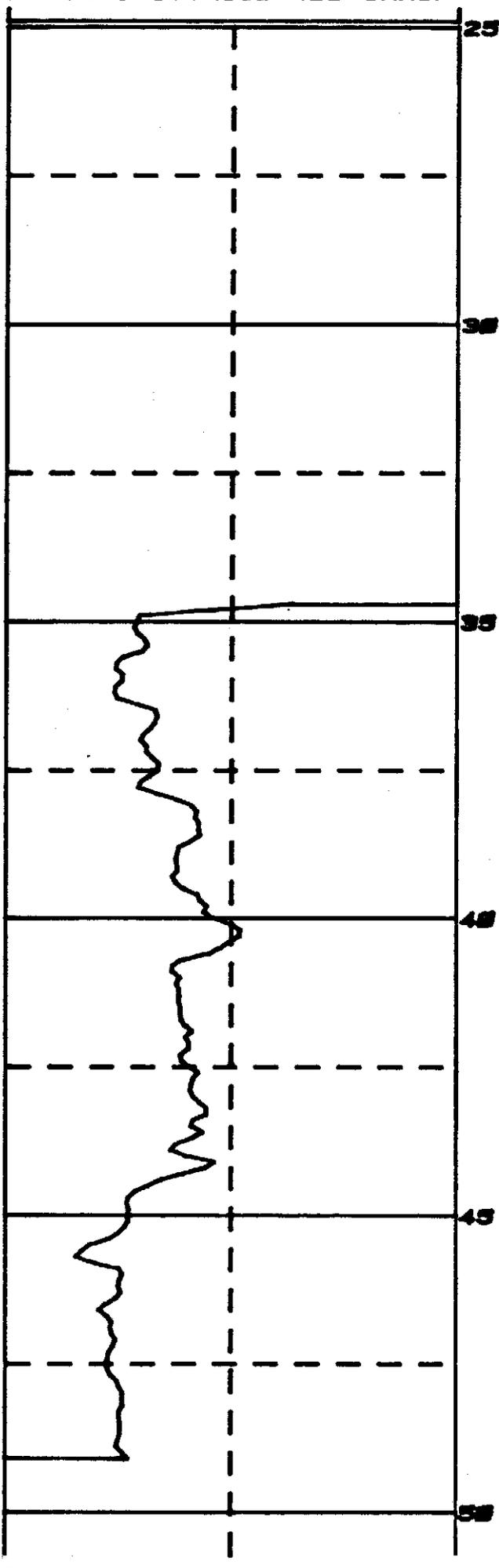
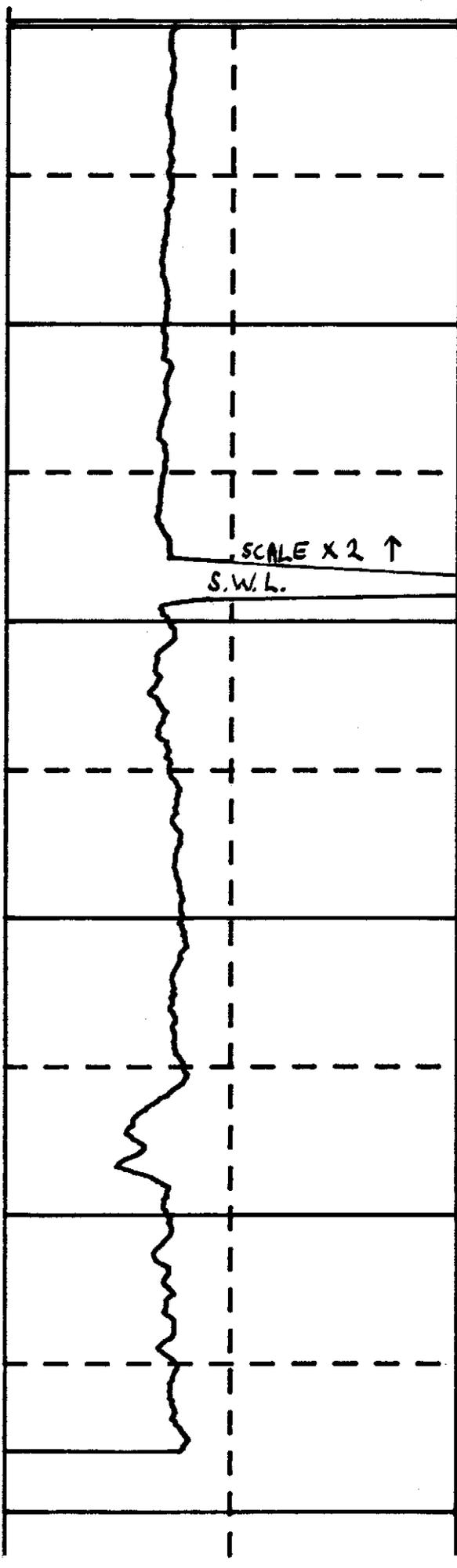
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750121  
S. W. L. -94.0 METRES



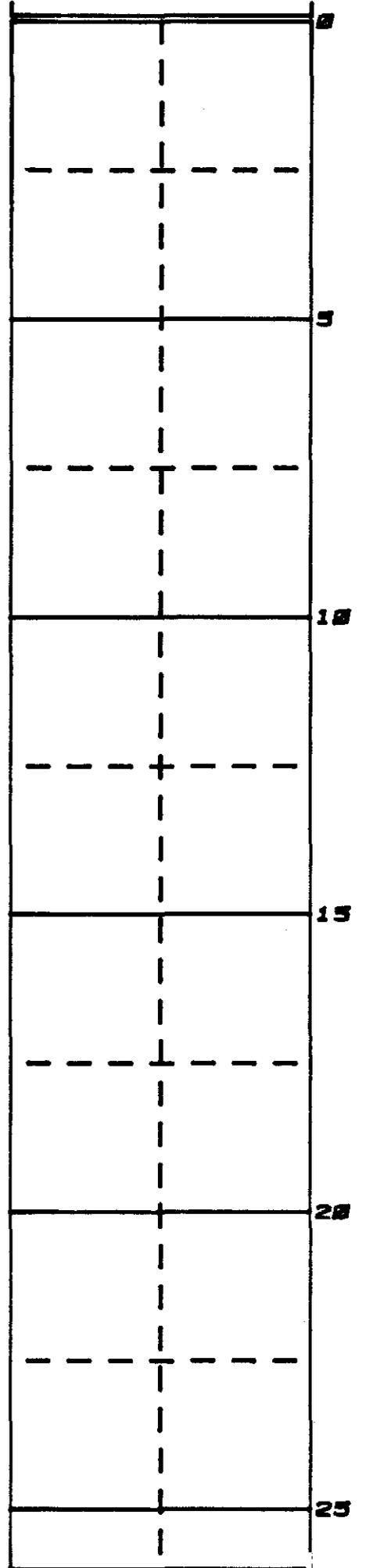
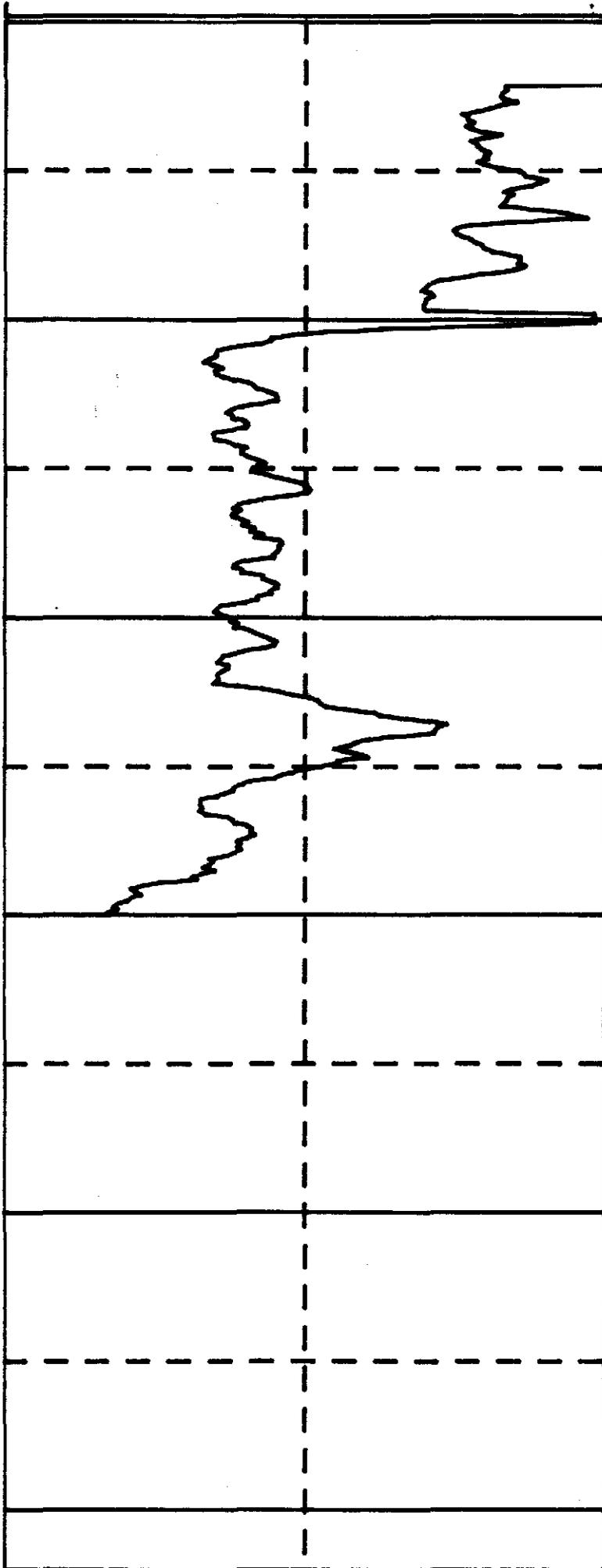
NEUTRON (5-10000 C. P. S.)

RESISTIVITY (150-400 OHMS)



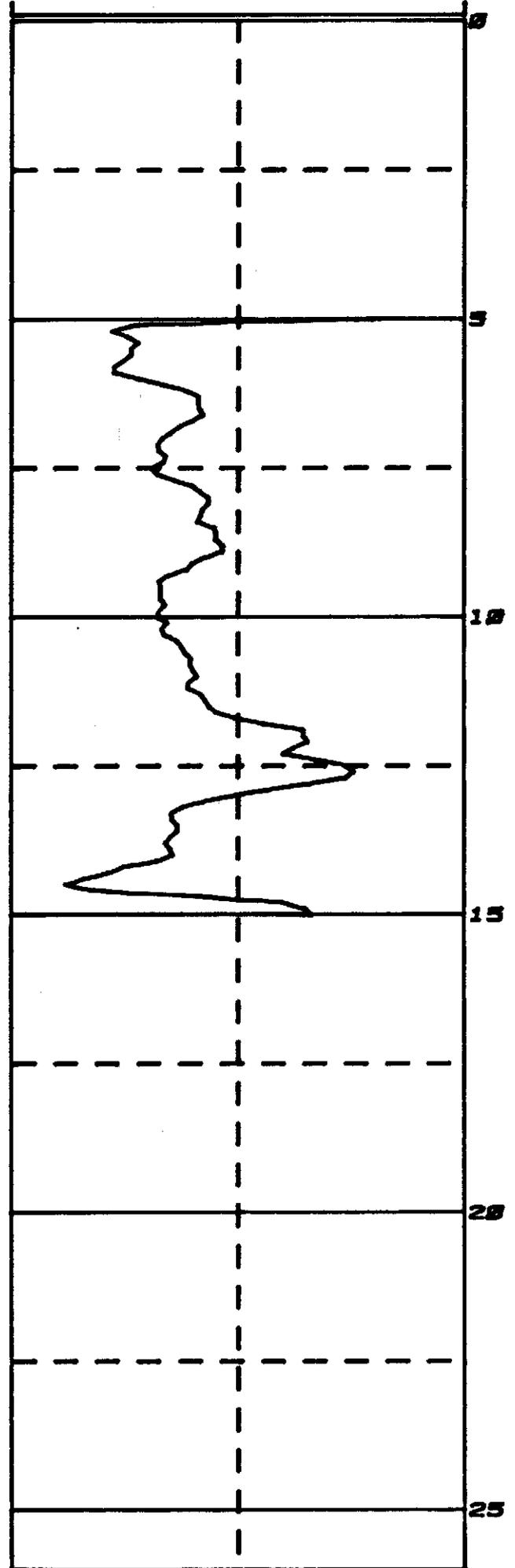
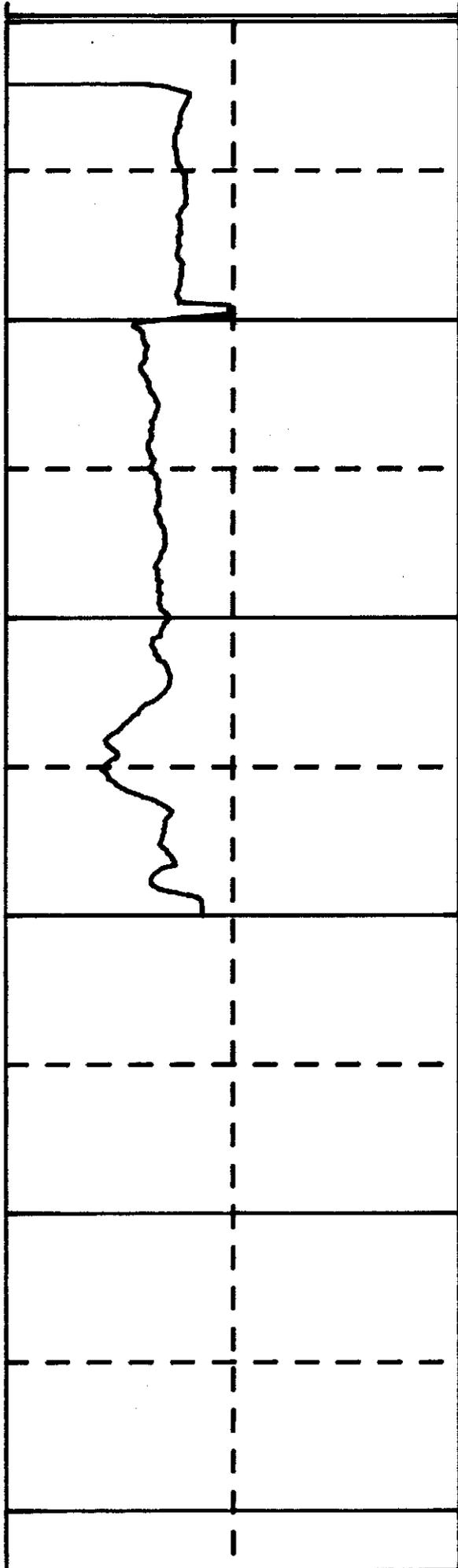
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NO CALIPER



NEUTRON (0-10000 C.P.S.)

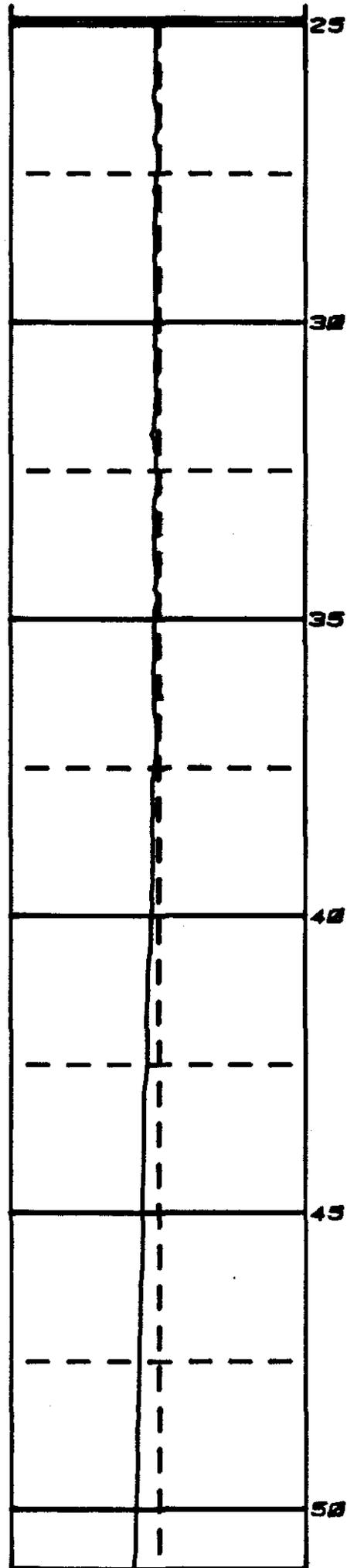
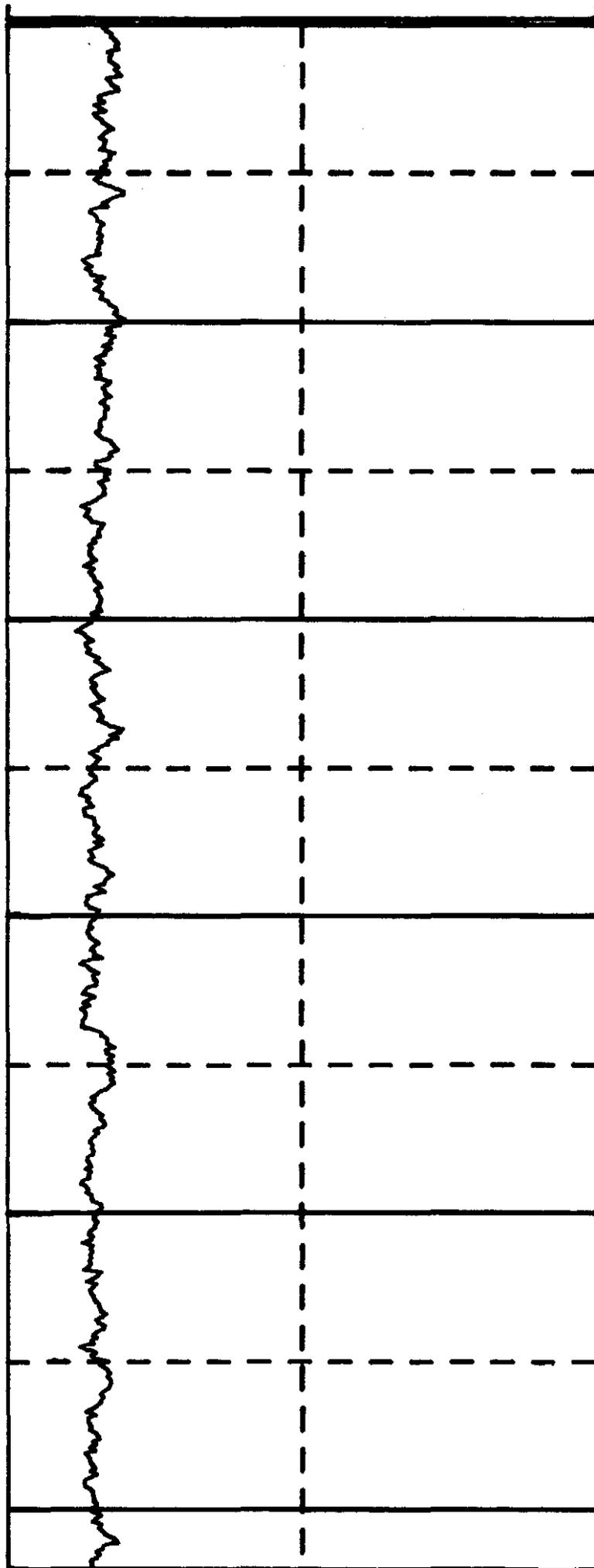
RESISTIVITY (300-400 OHMS)





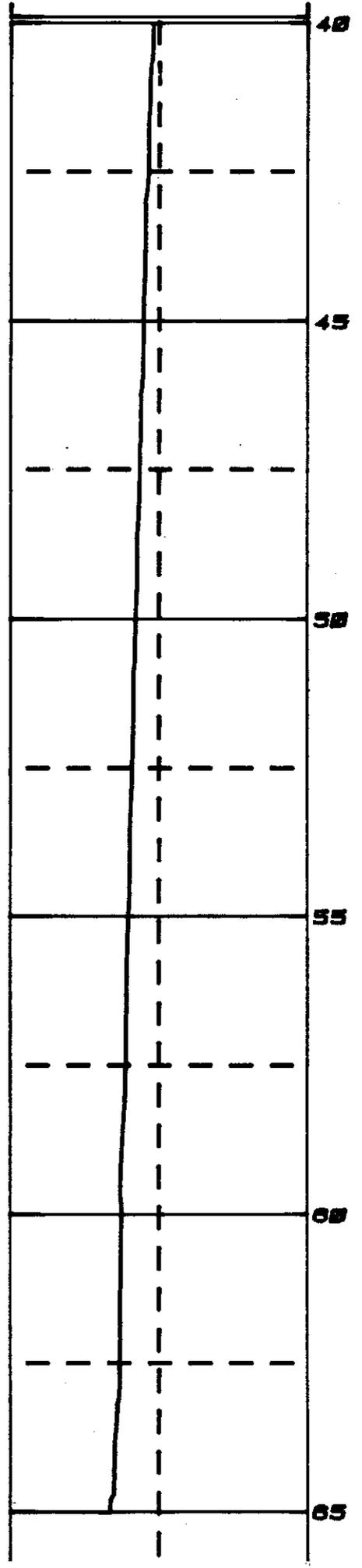
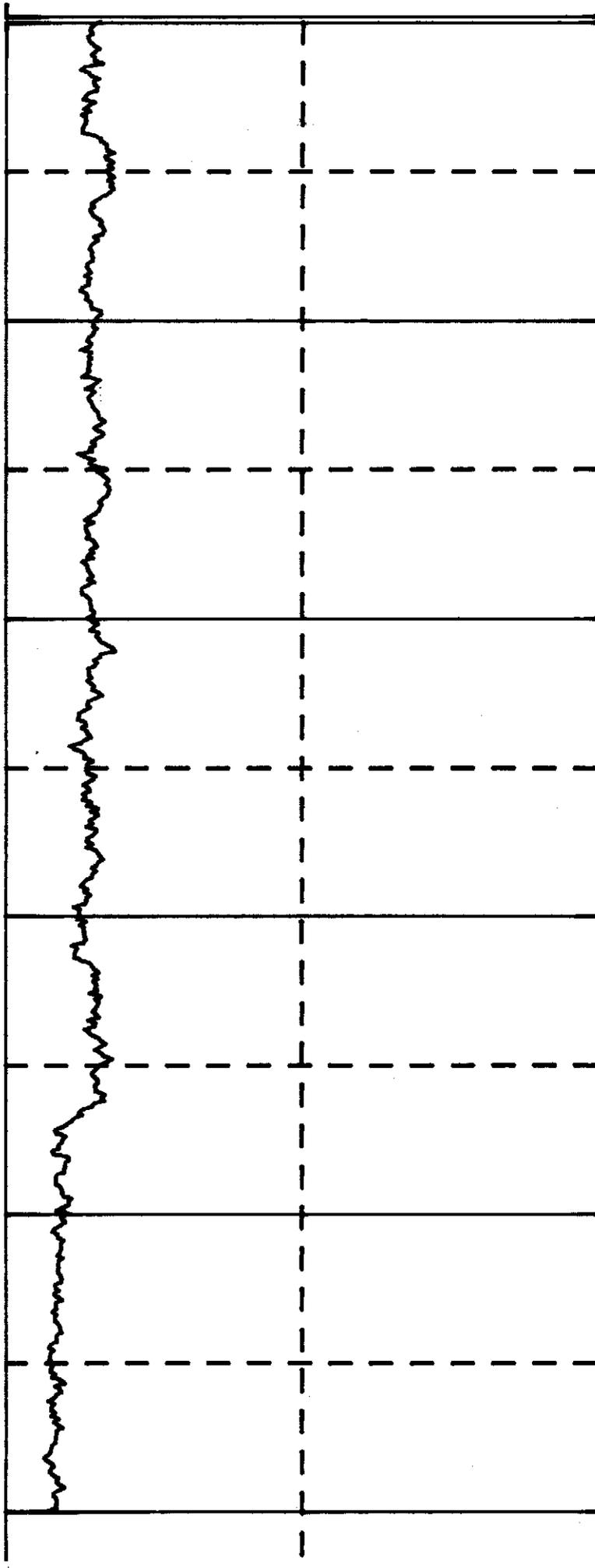
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CALIPER (8-10 In.)



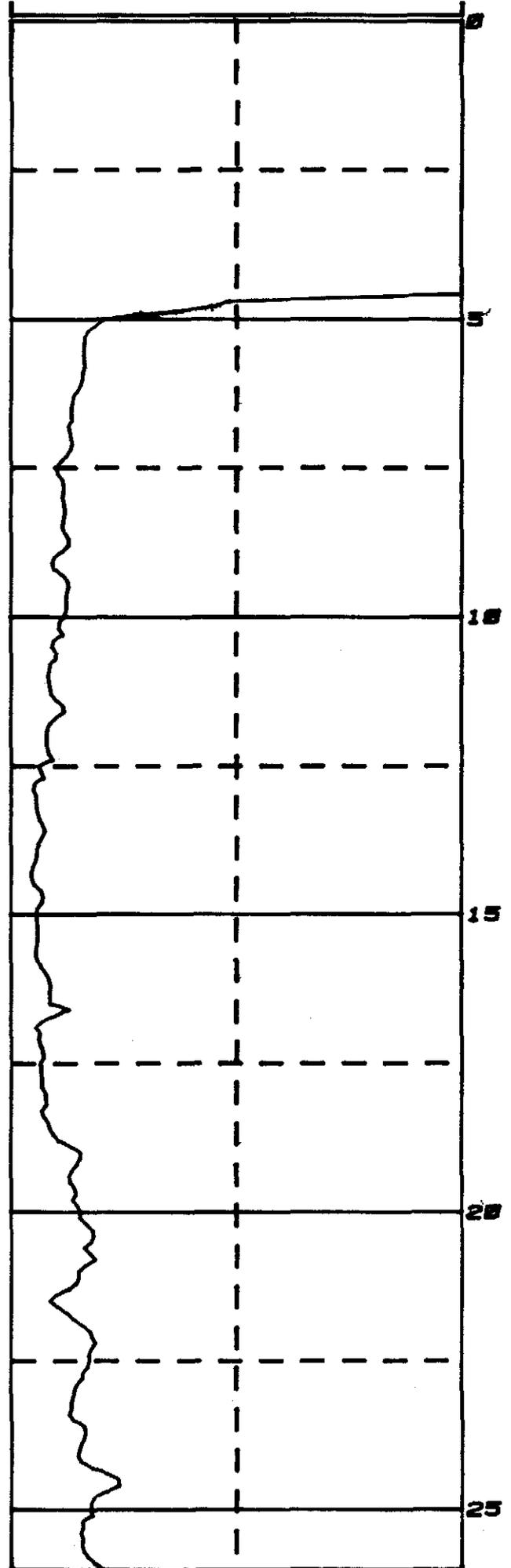
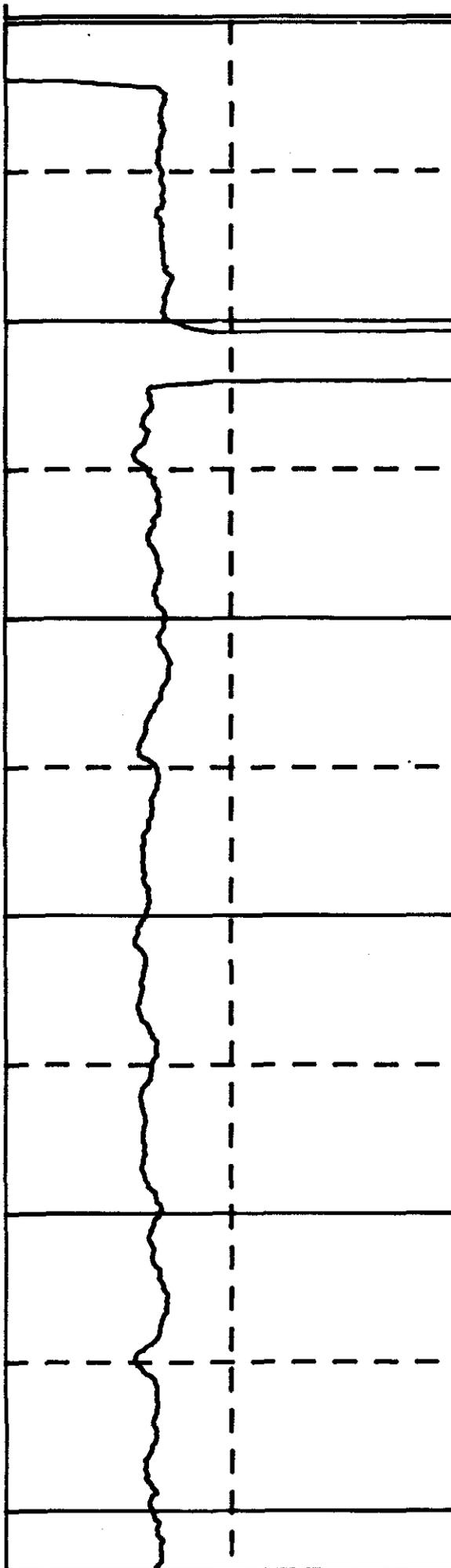
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CALIPER (2-10 In.)



NEUTRON (8-10000 C. P. S.)

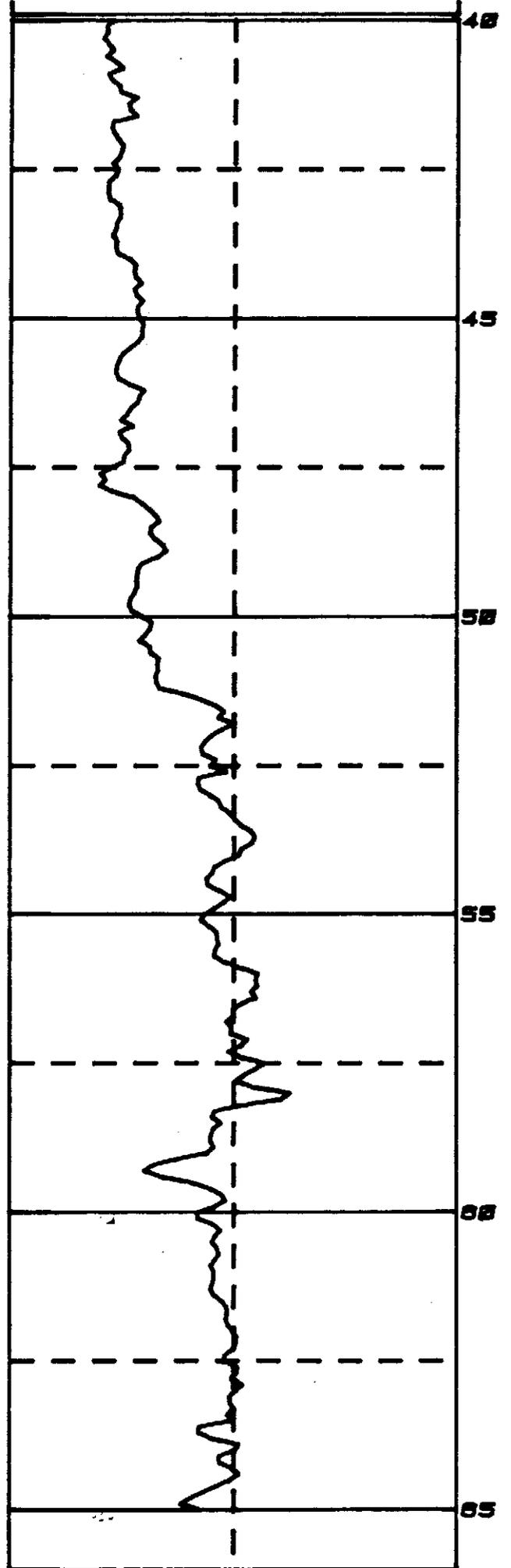
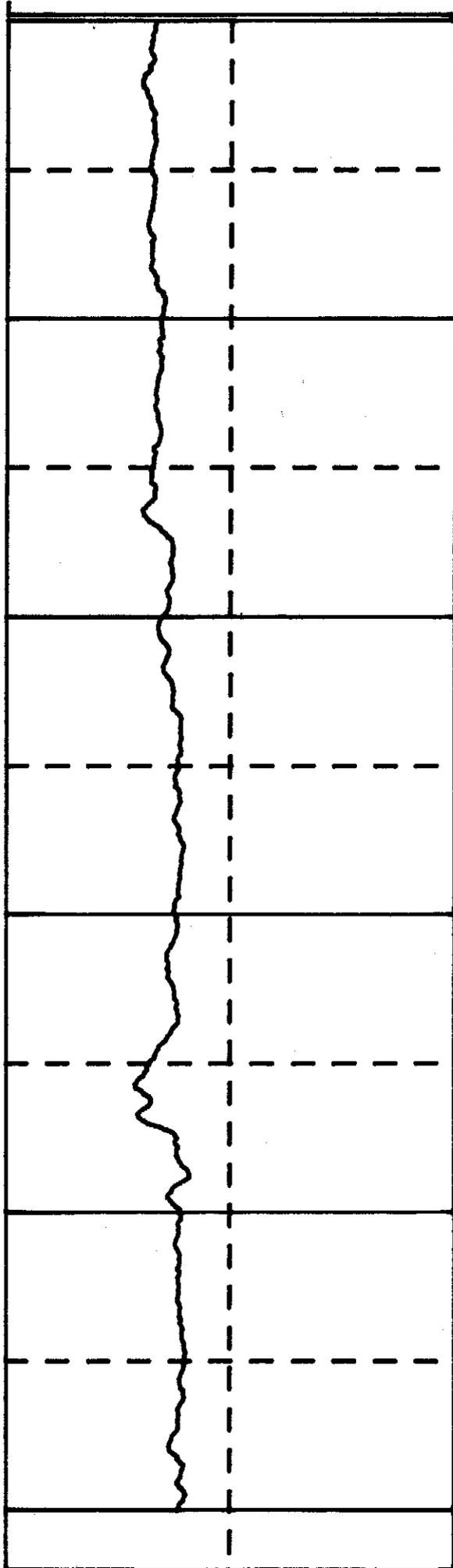
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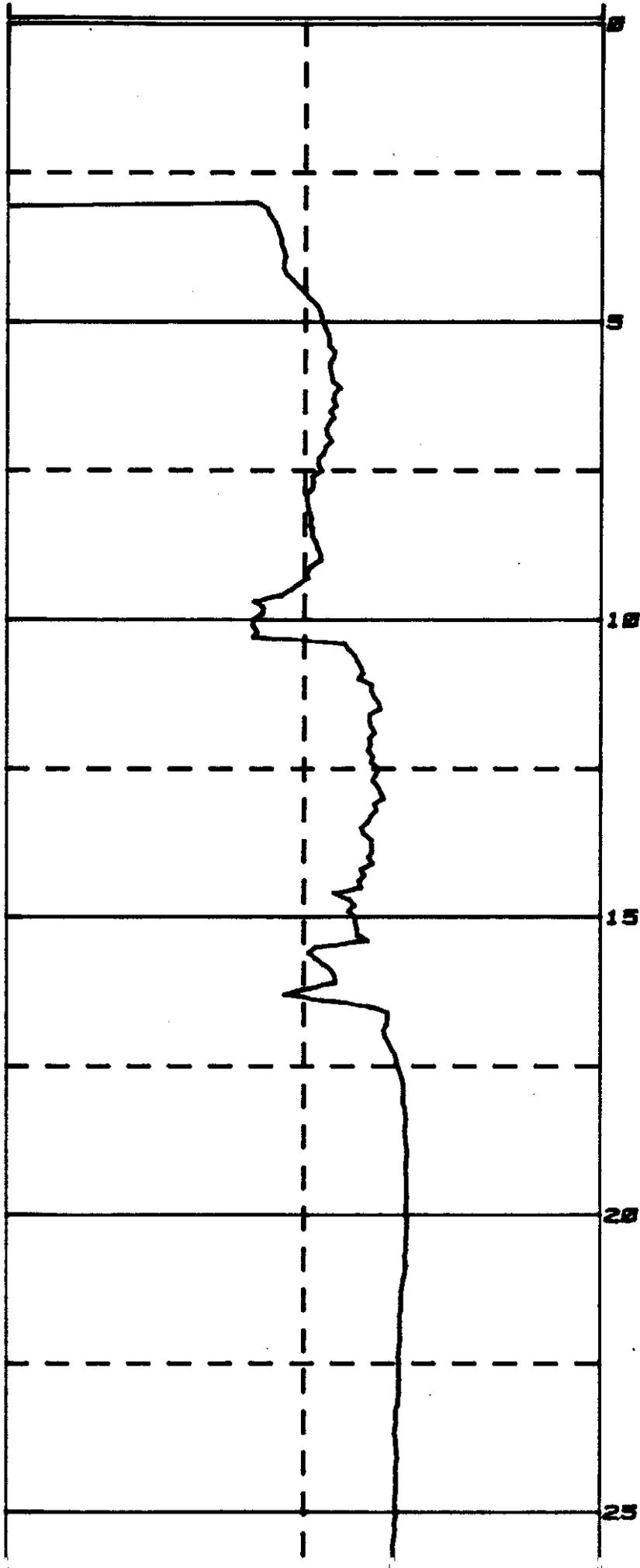


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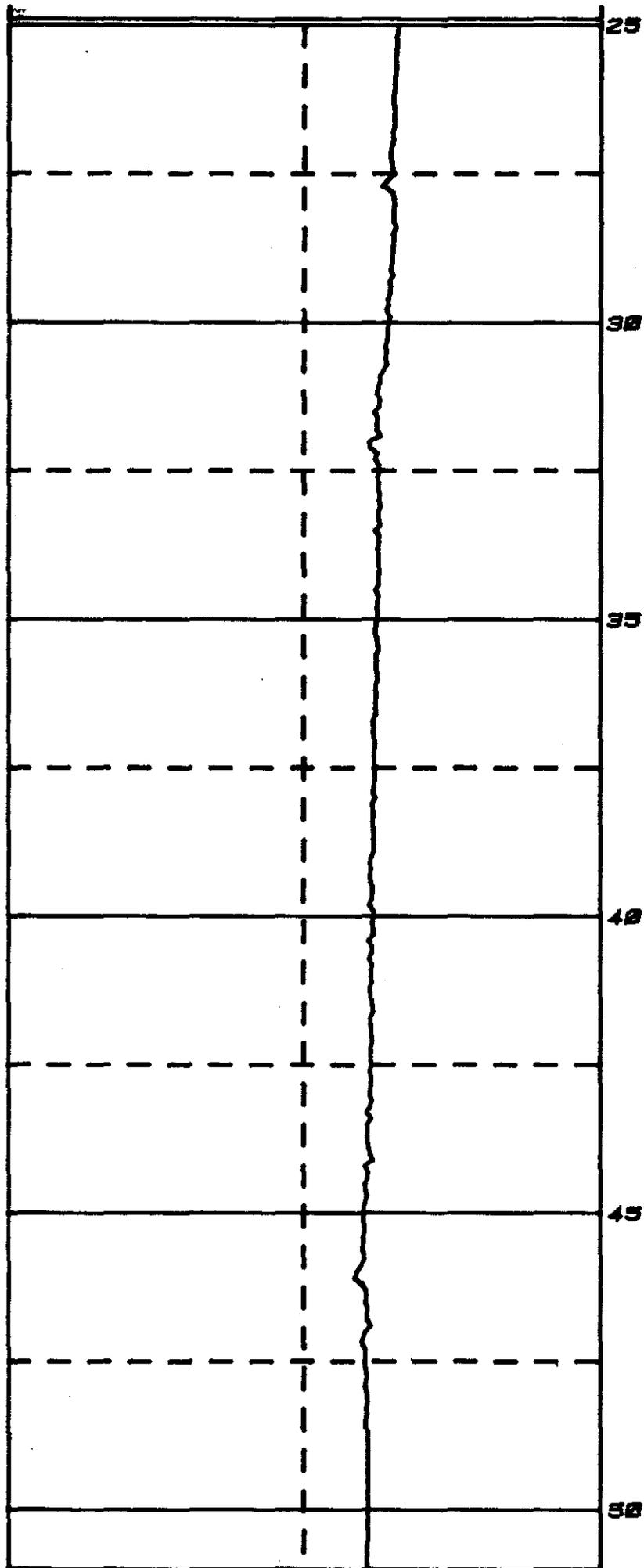
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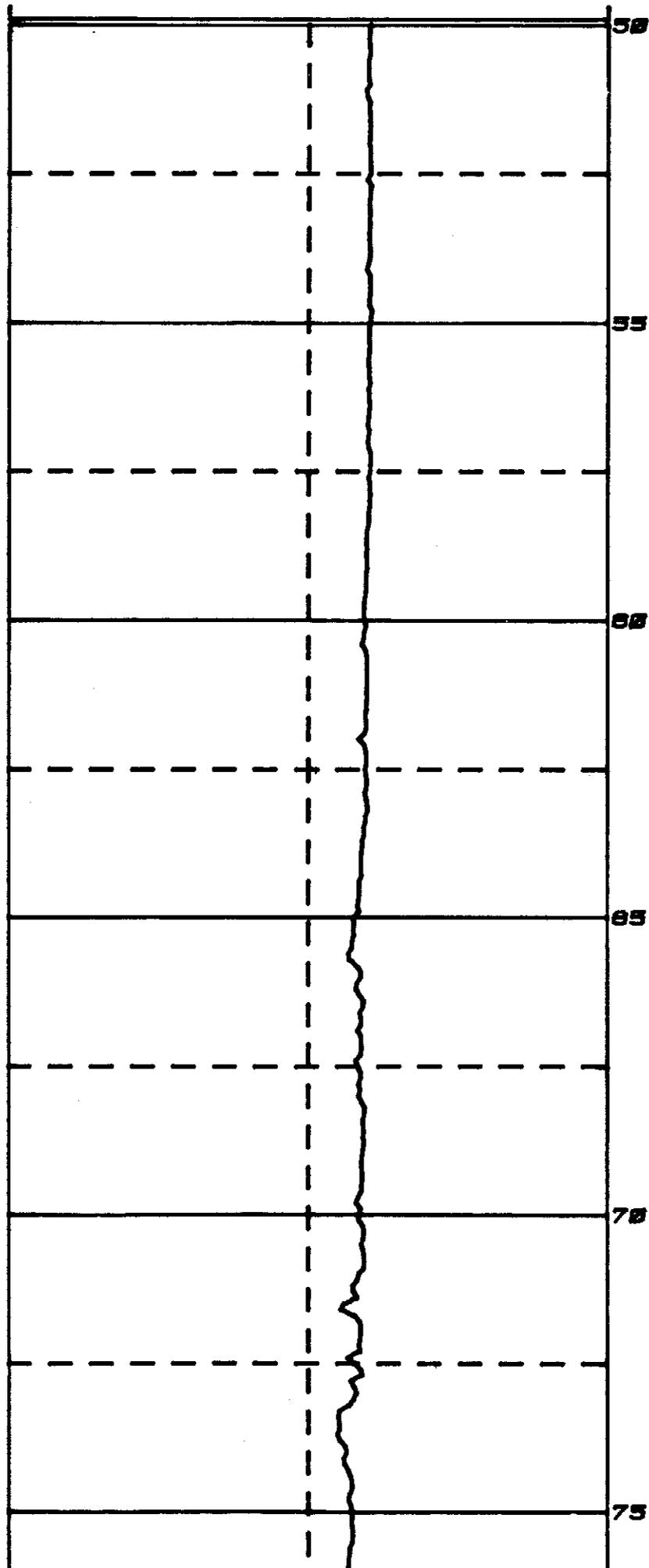
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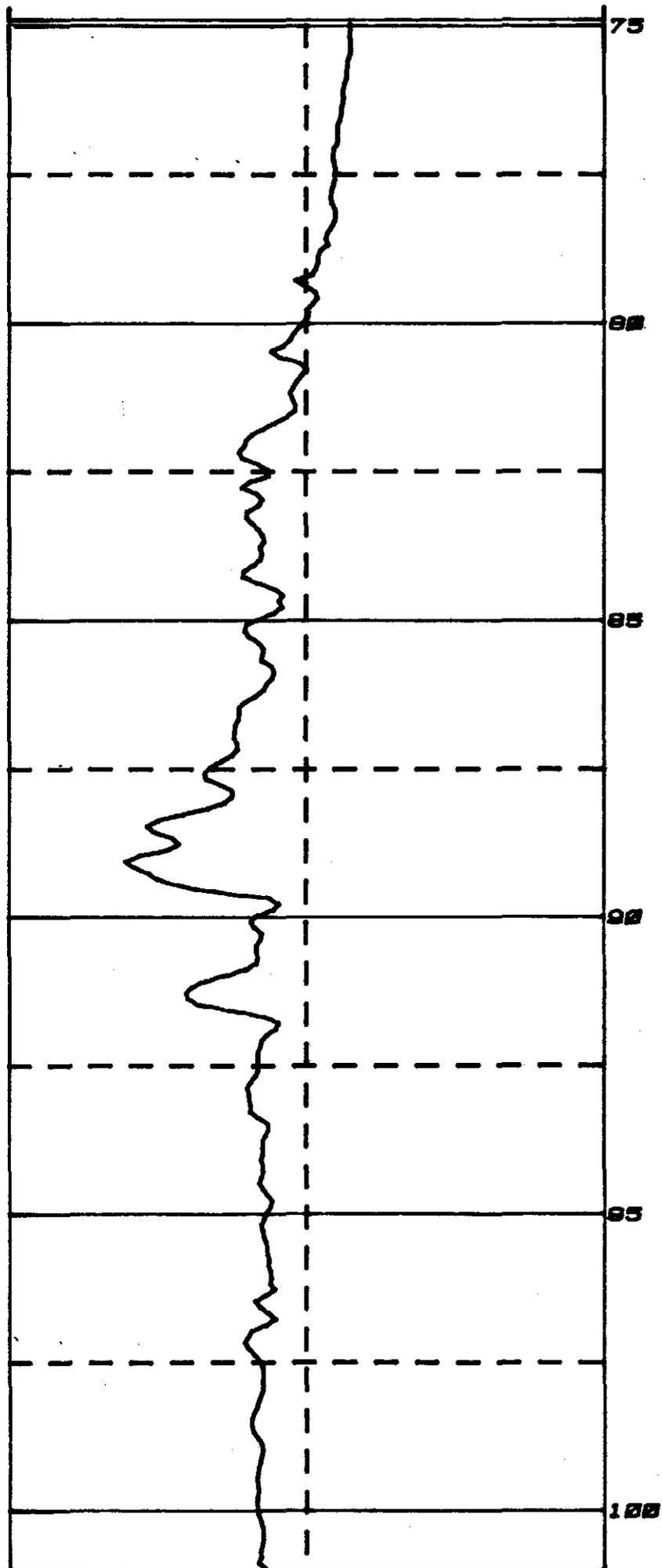
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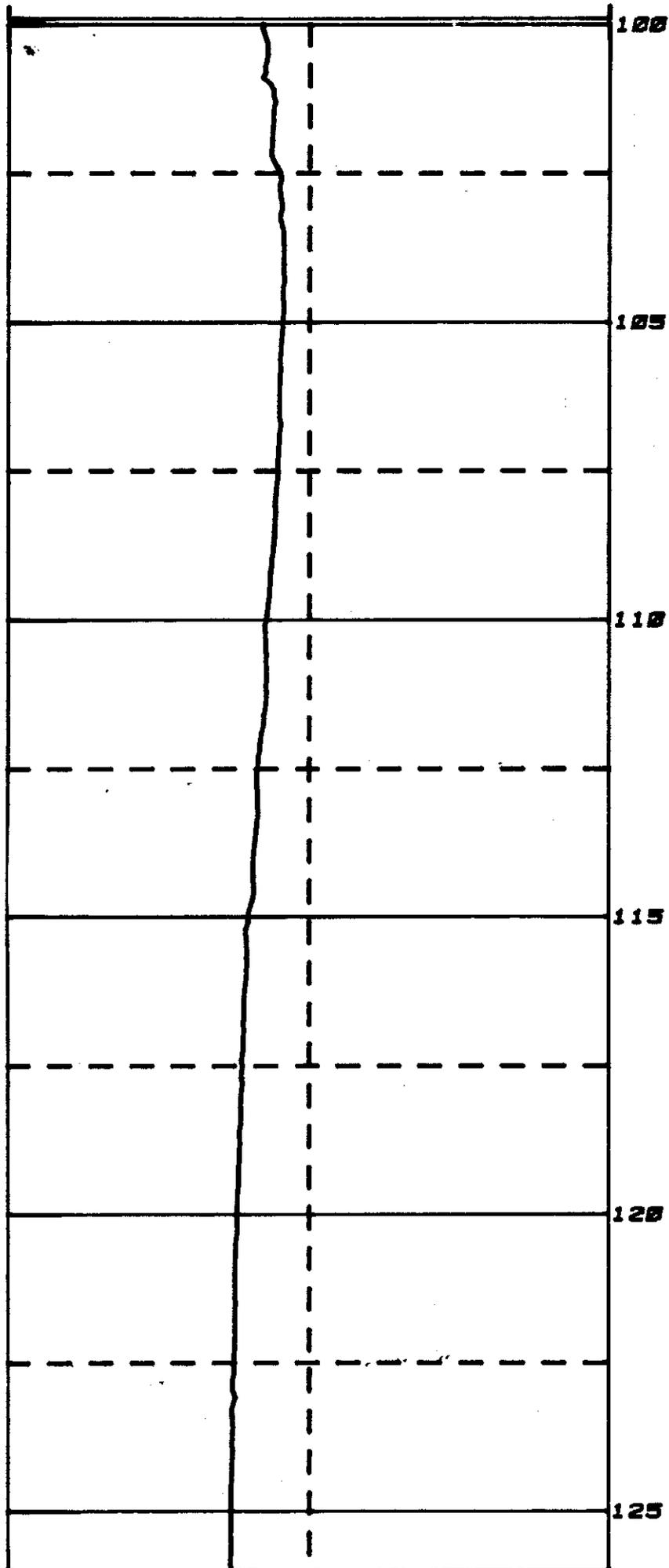
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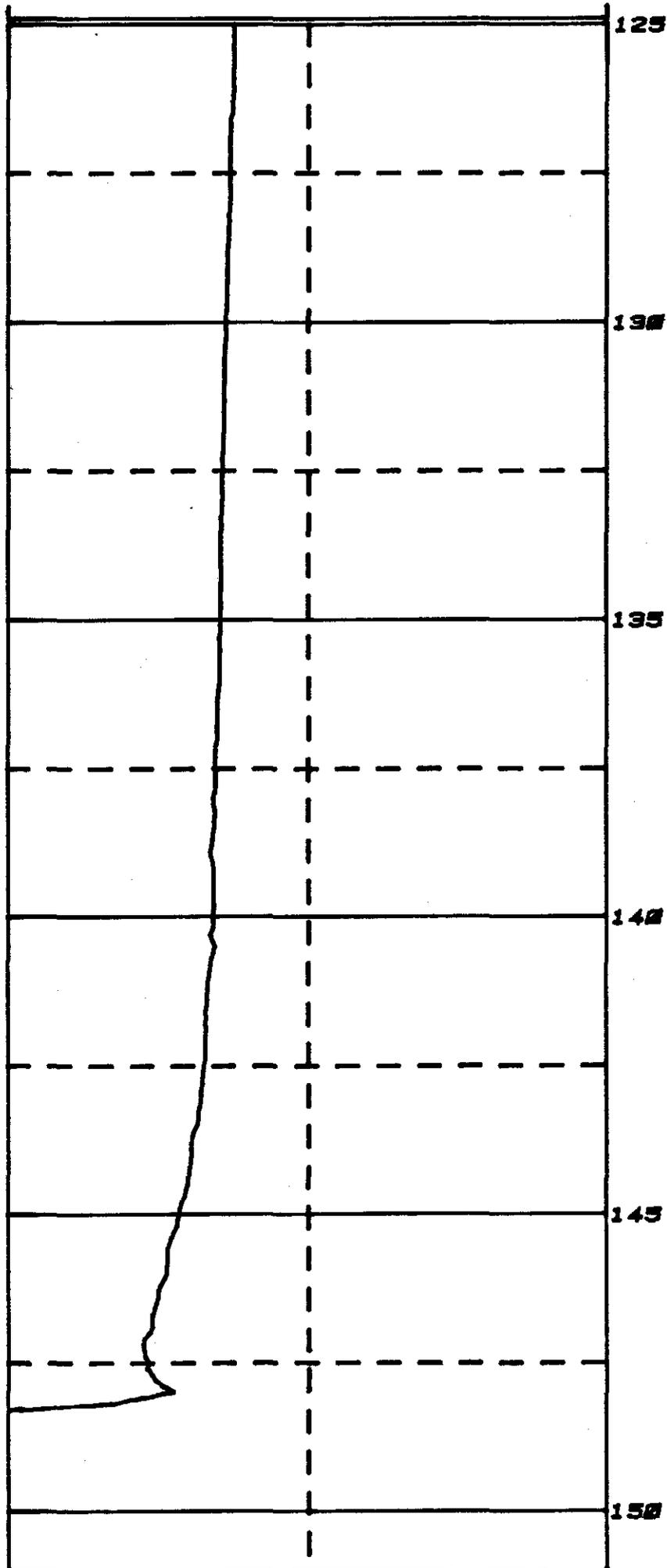
SELF POTENTIAL (-95 to -70 mV.)



SELF POTENTIAL (-95 to -70 mV.)

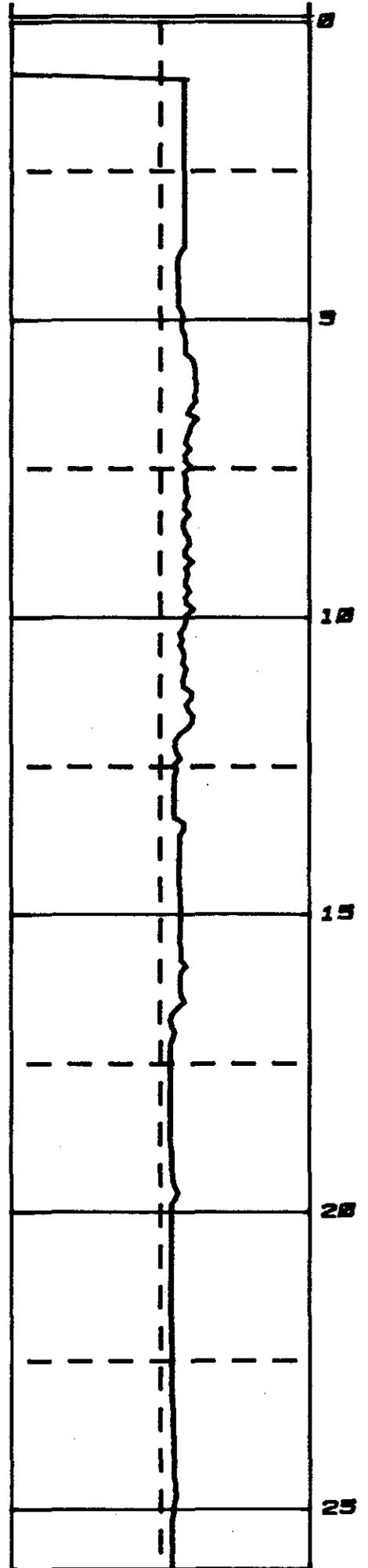
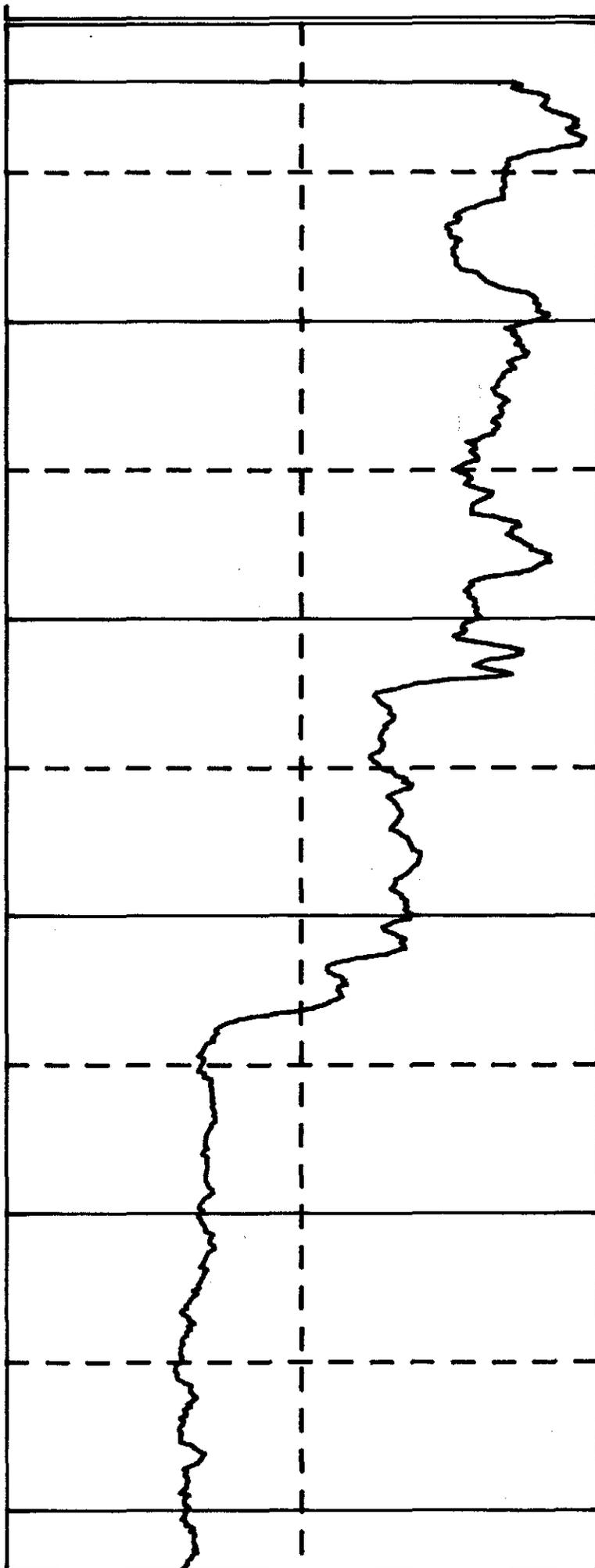


SELF POTENTIAL (-95 to -70 mV.)

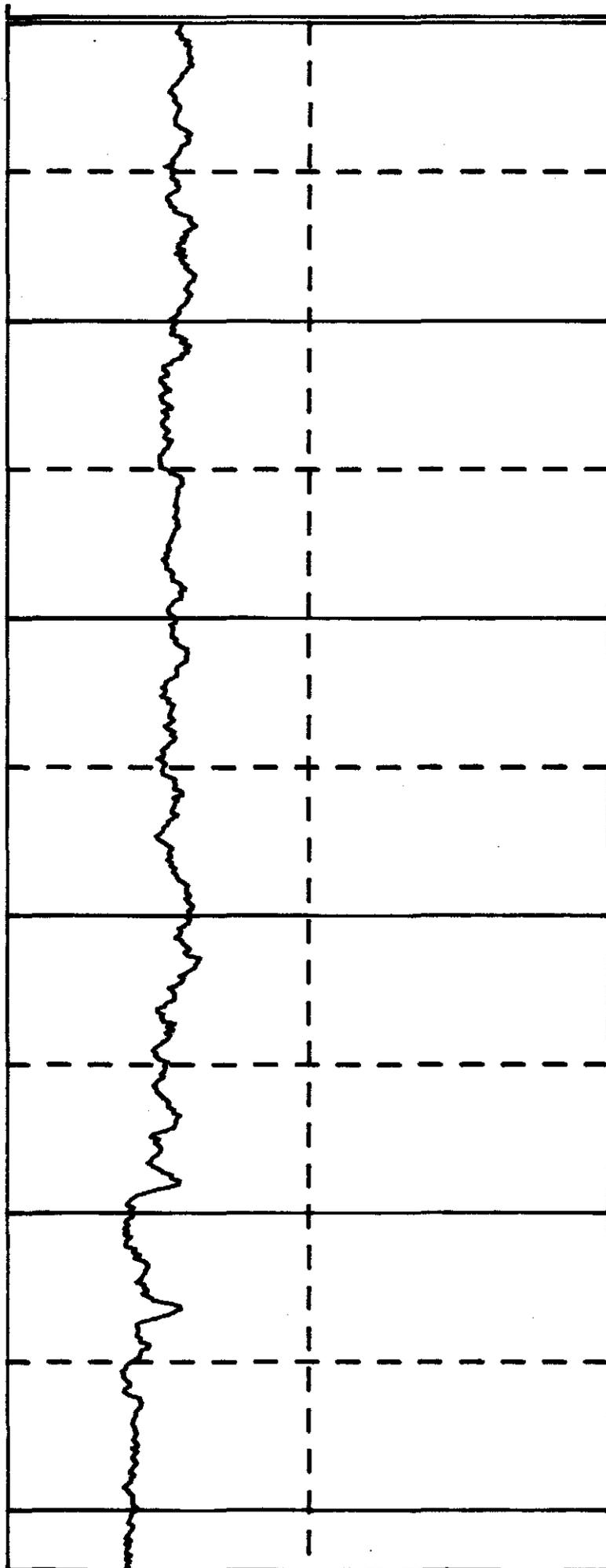


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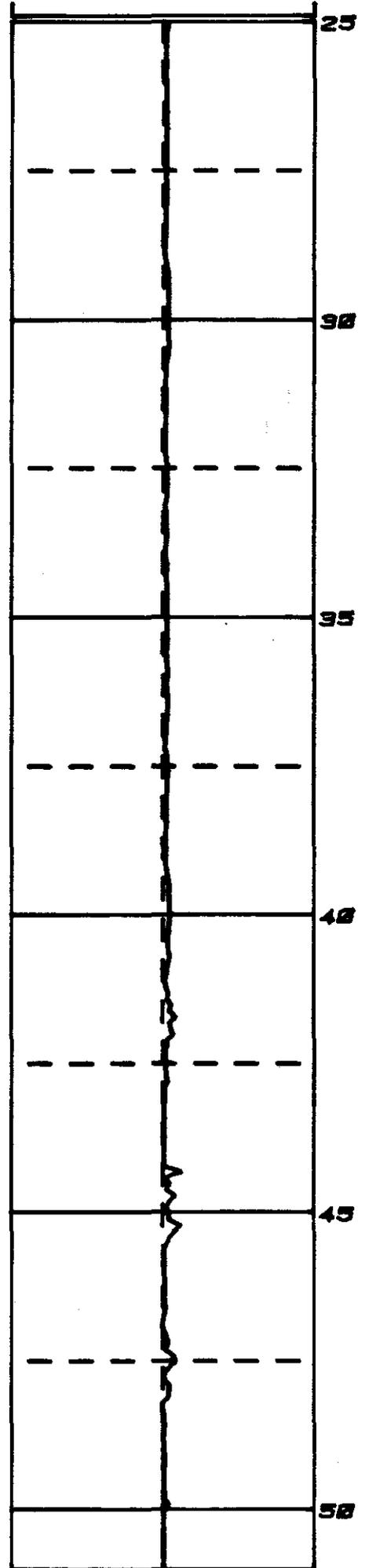
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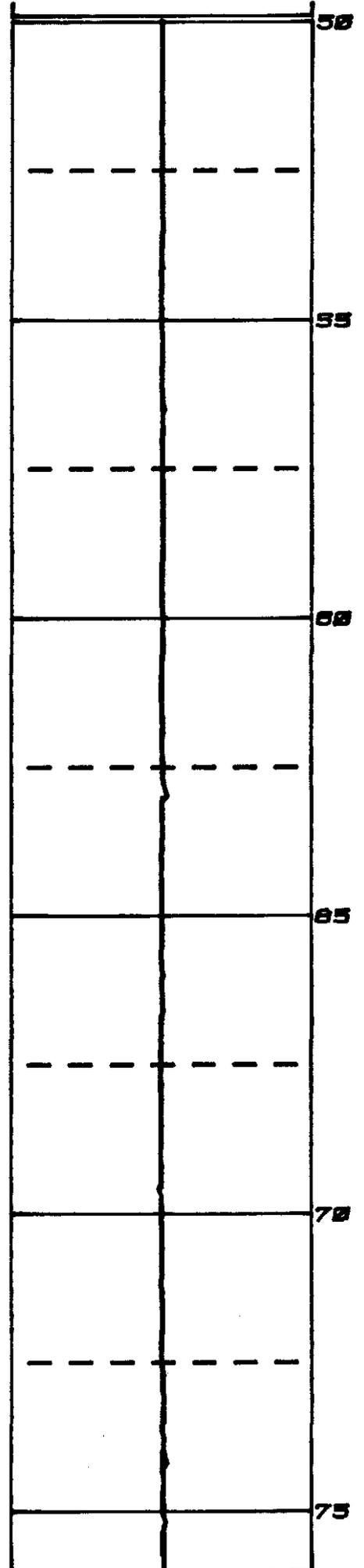
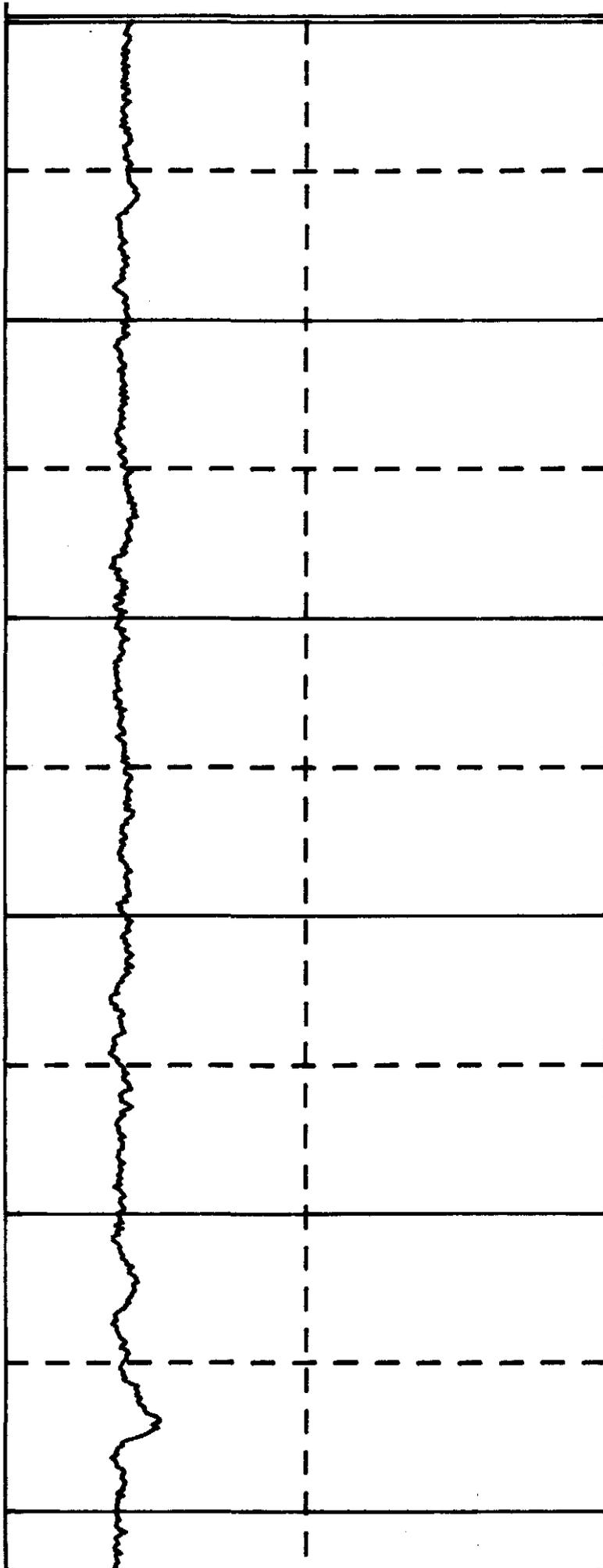


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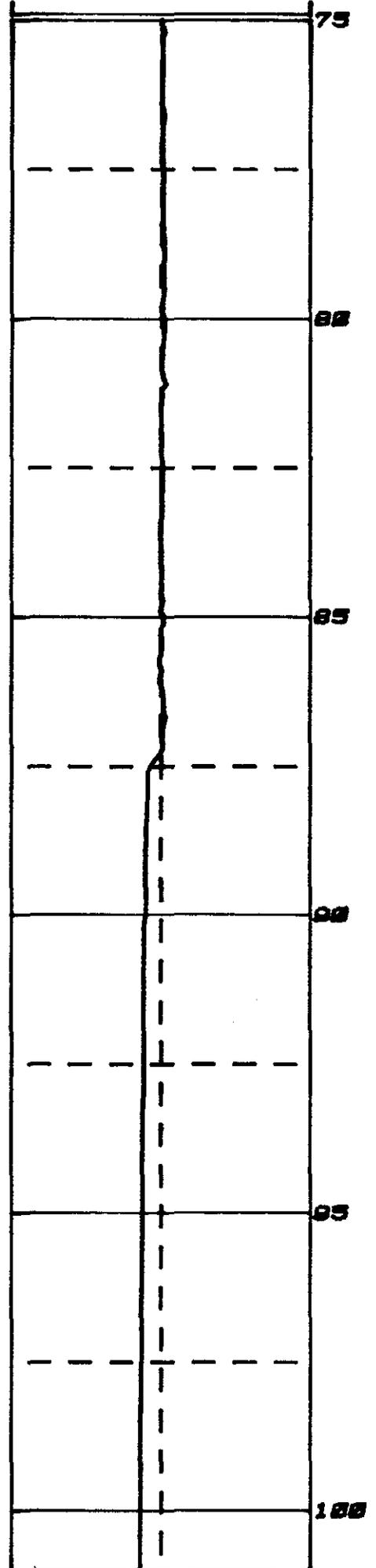
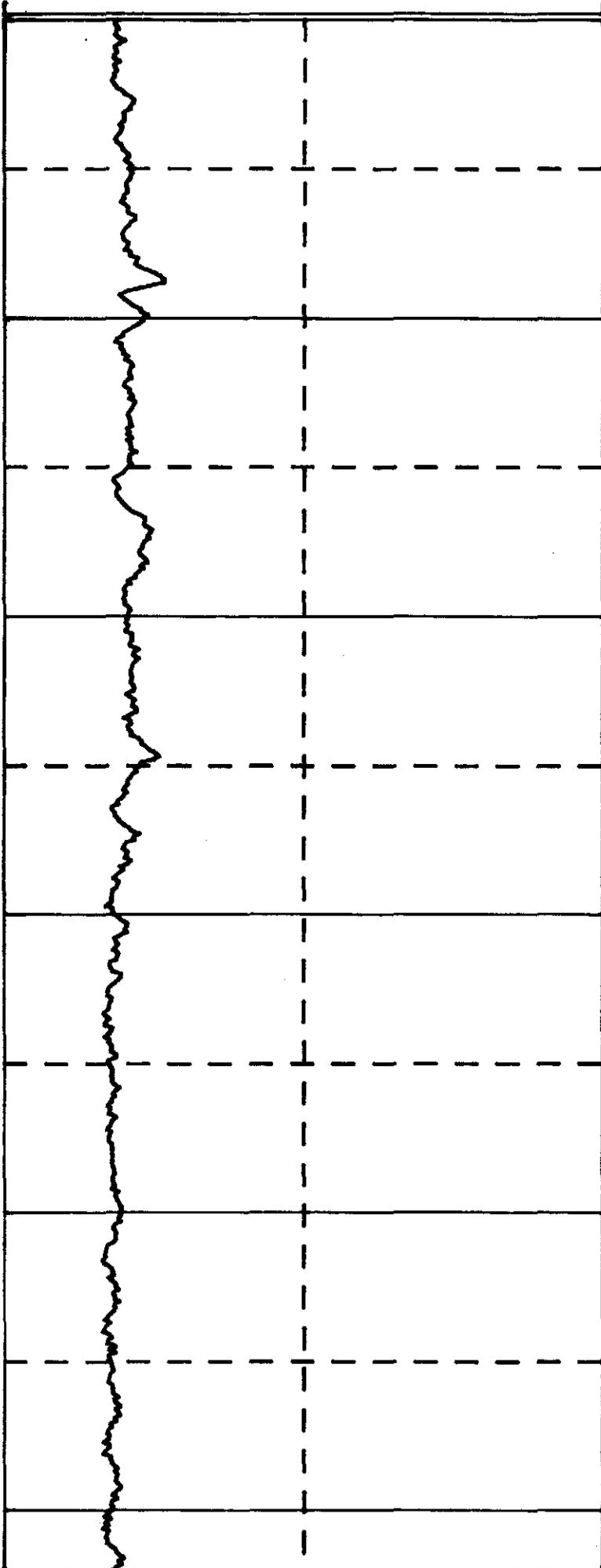
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CALIPER (0-10 In.)



DENSITY (G-5000 C. P. S.)

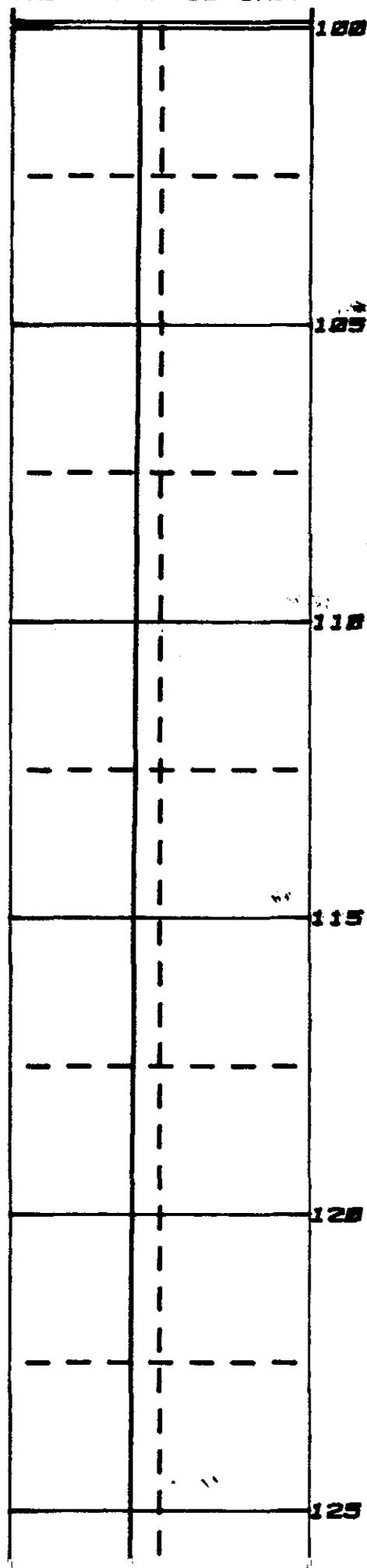
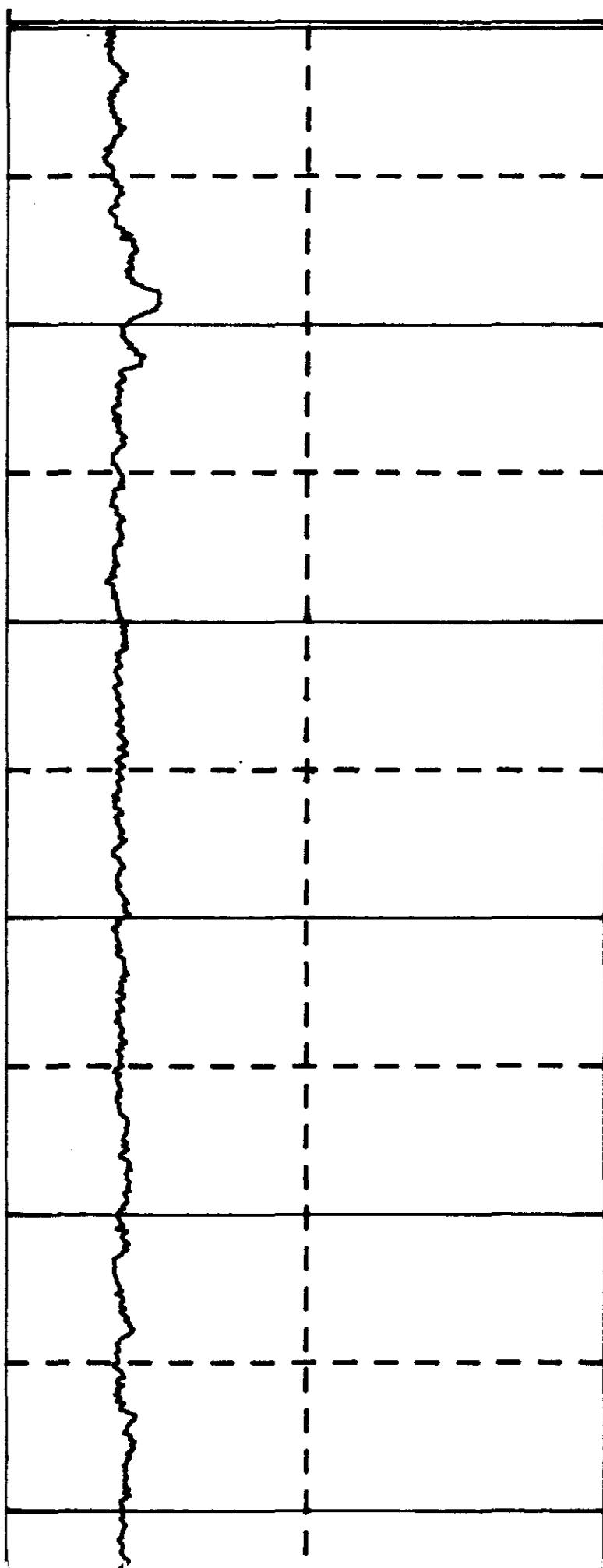
CALIPER (8-10 In.)



750141

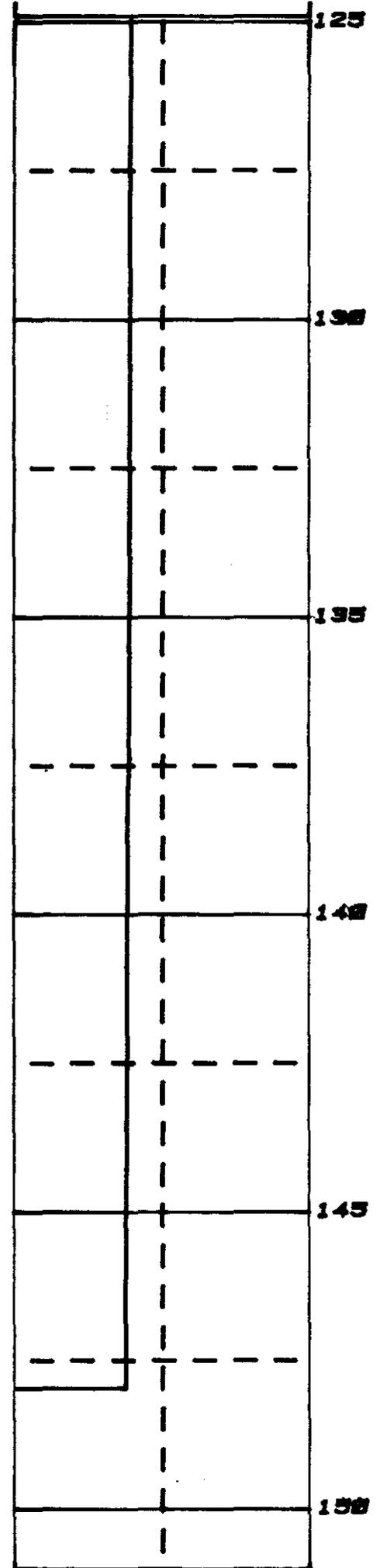
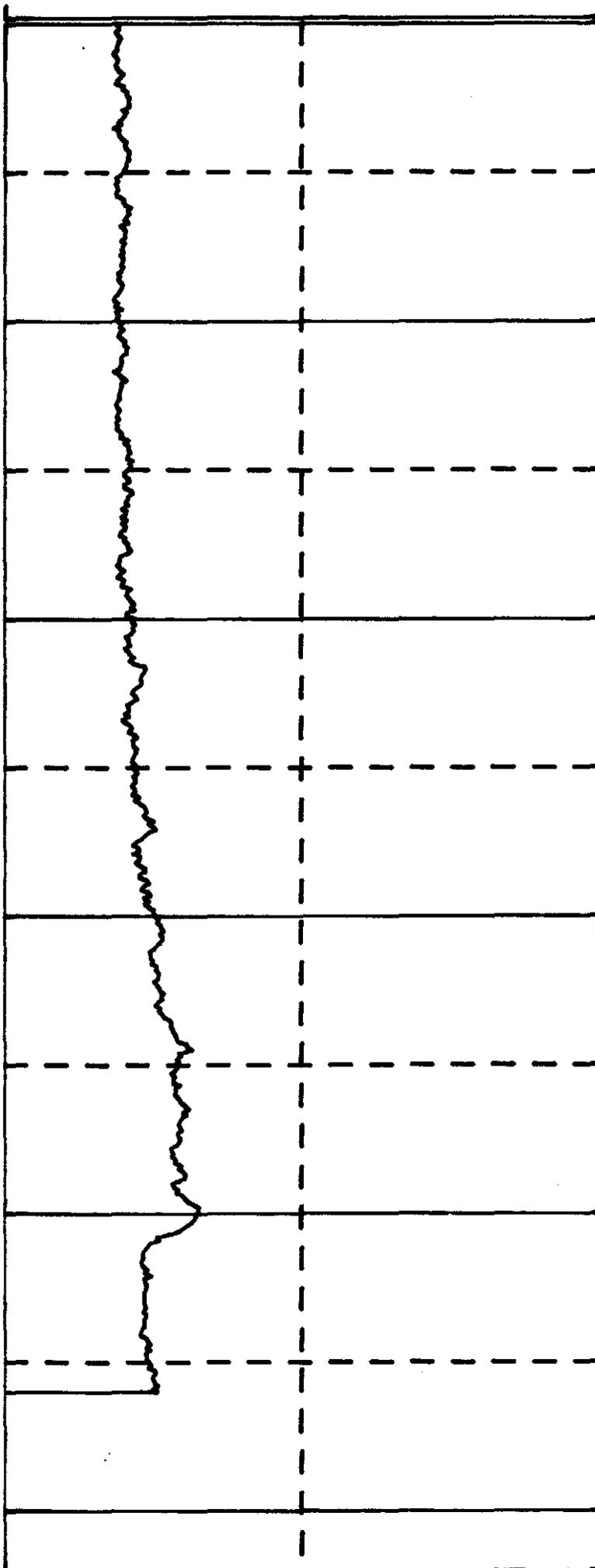
DENSITY (G-5000 C. P. S.)

CALIPER (G-10 In.)



DENSITY (S-5000 C. P. S.)

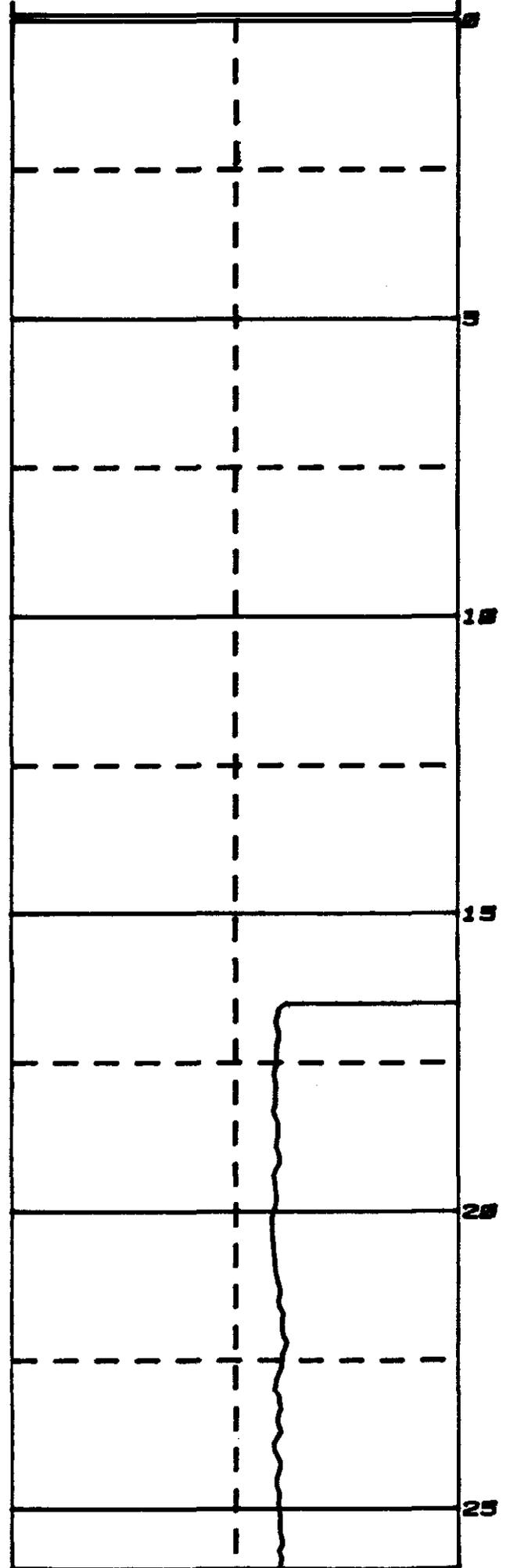
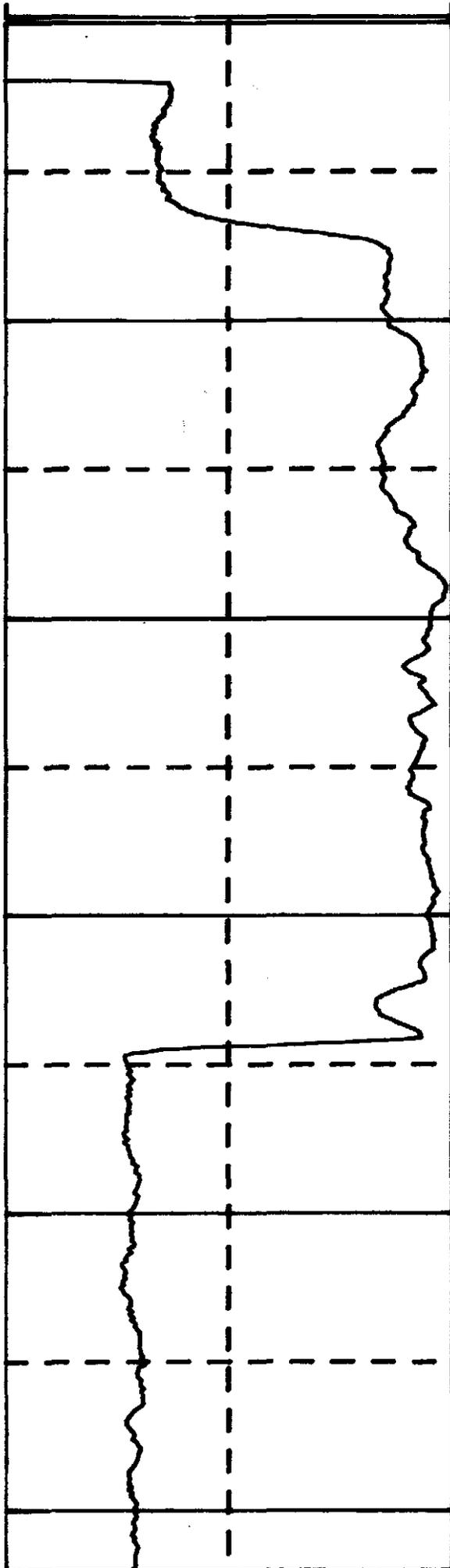
CALIPER (S-10 In.)



125  
130  
135  
140  
145  
150

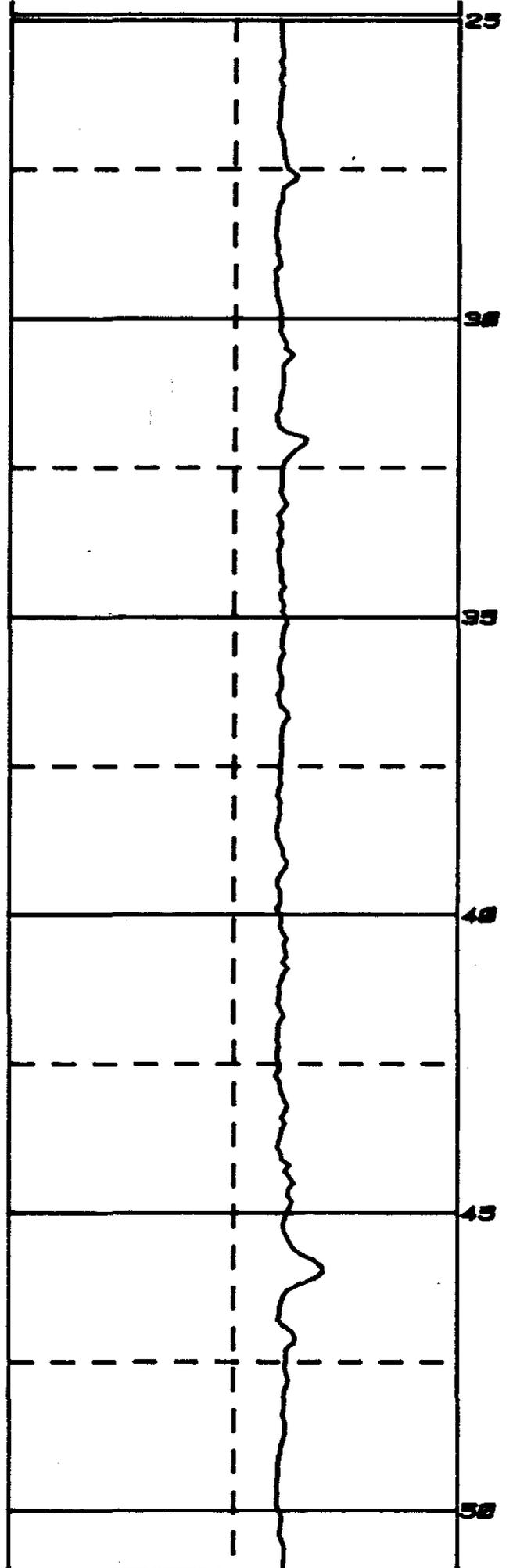
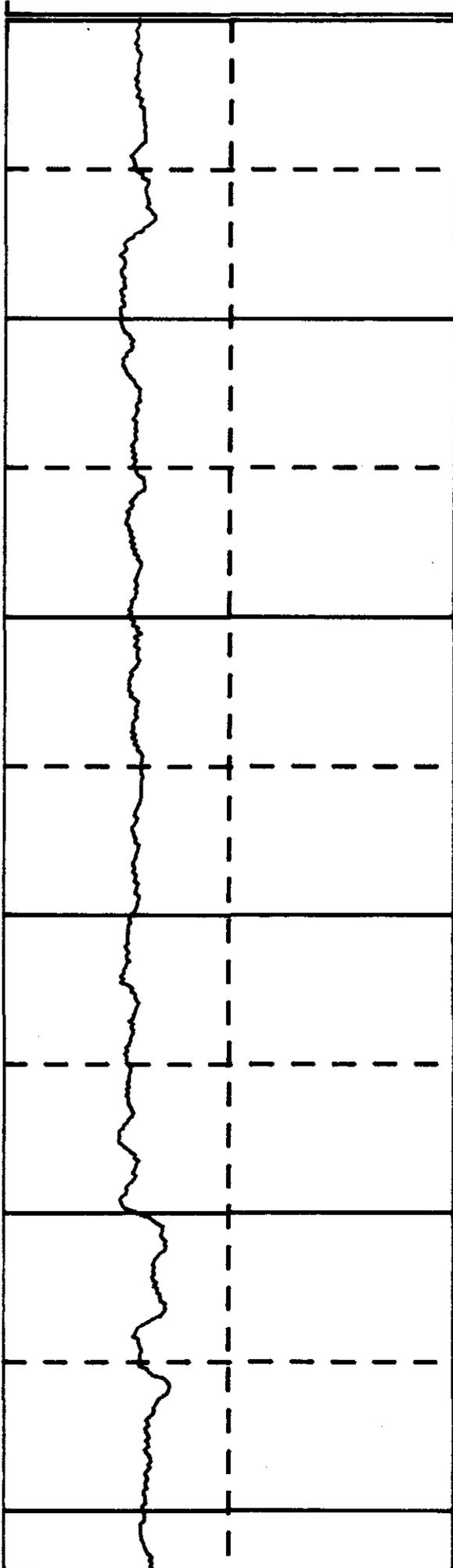
NEUTRON (8-10000 C. P. S.)

RESISTIVITY (200-700 OHMS)



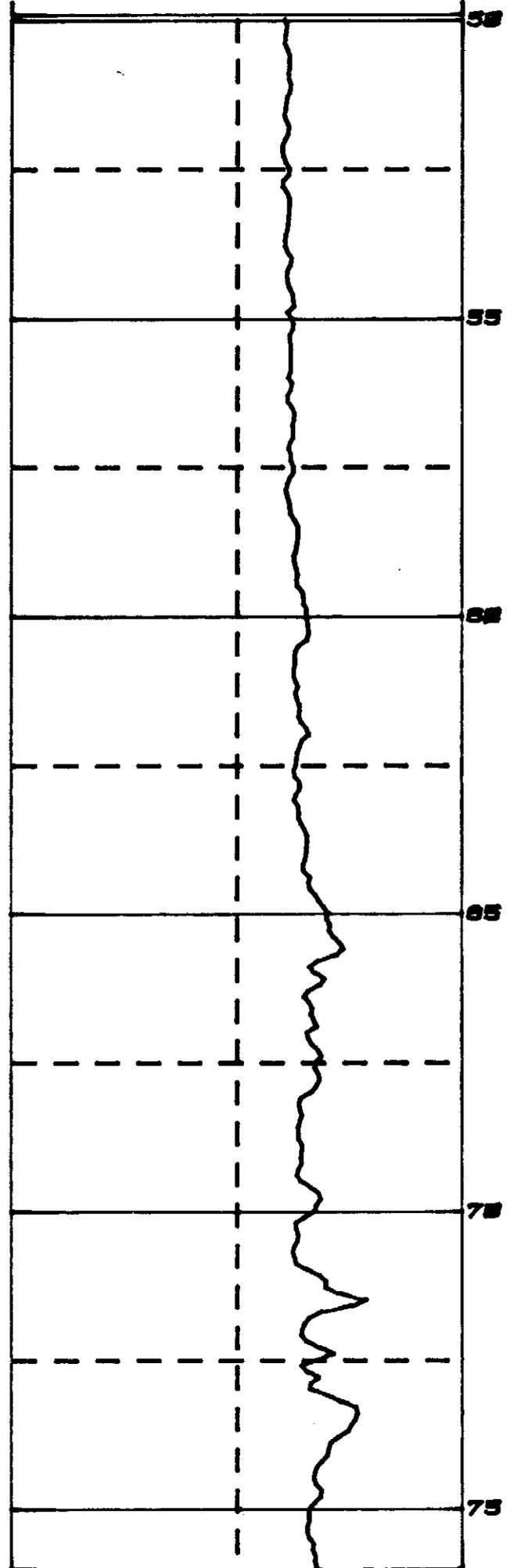
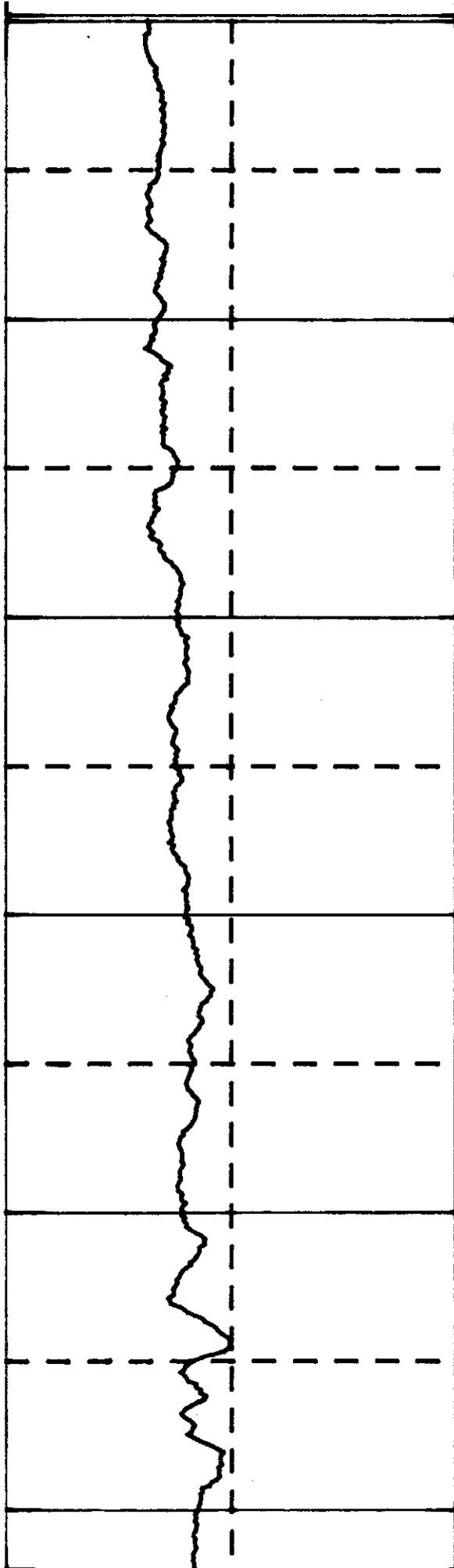
NEUTRON (0-10000 C.P.S.)

RESISTIVITY (200-700 OHMS)



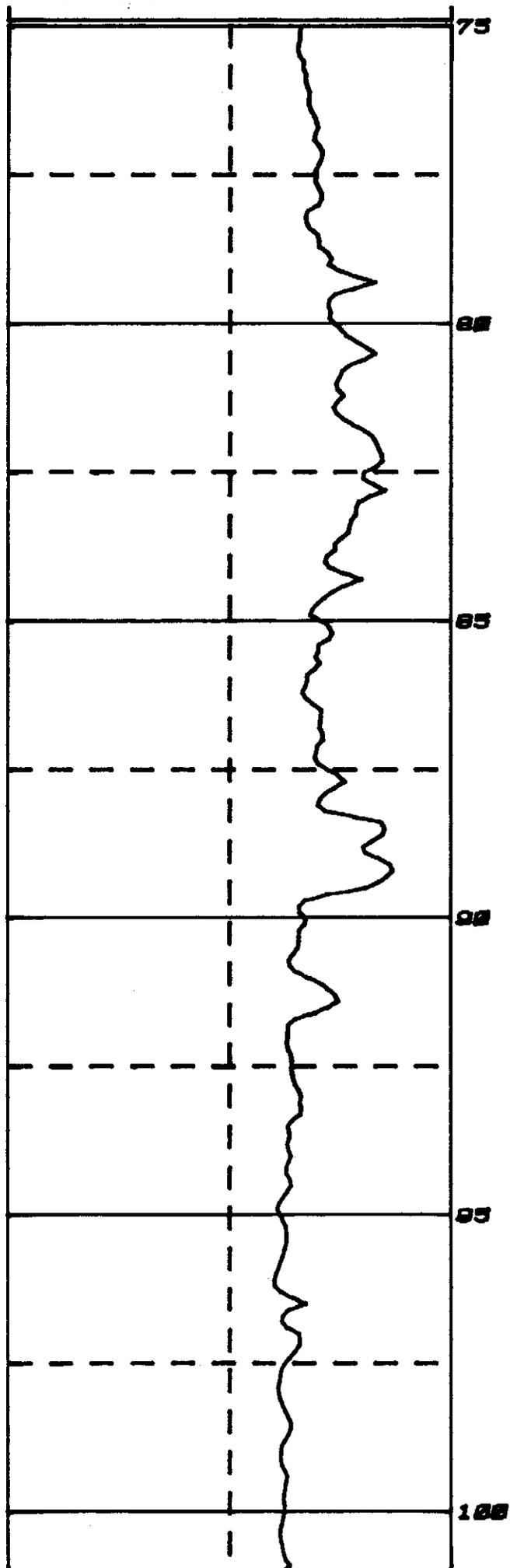
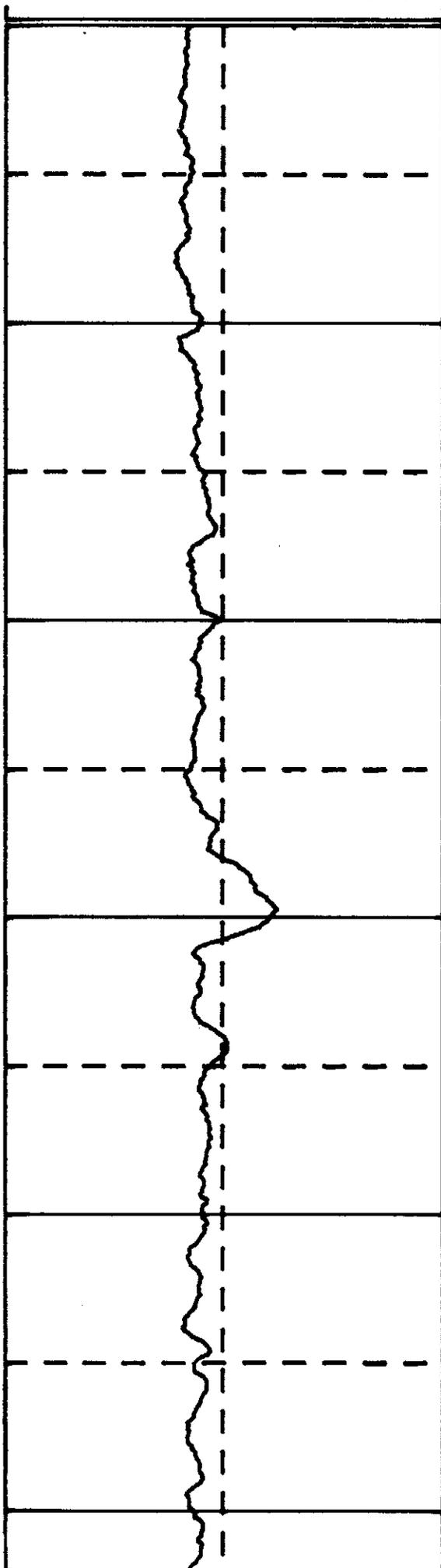
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (200-700 OHMS)



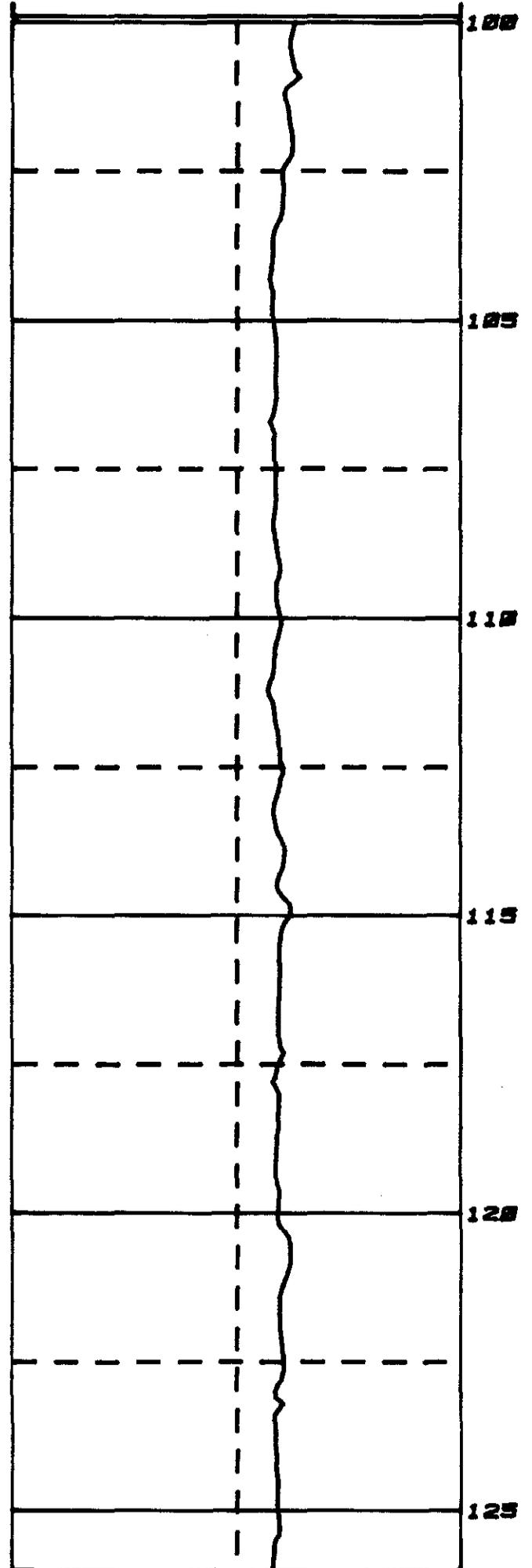
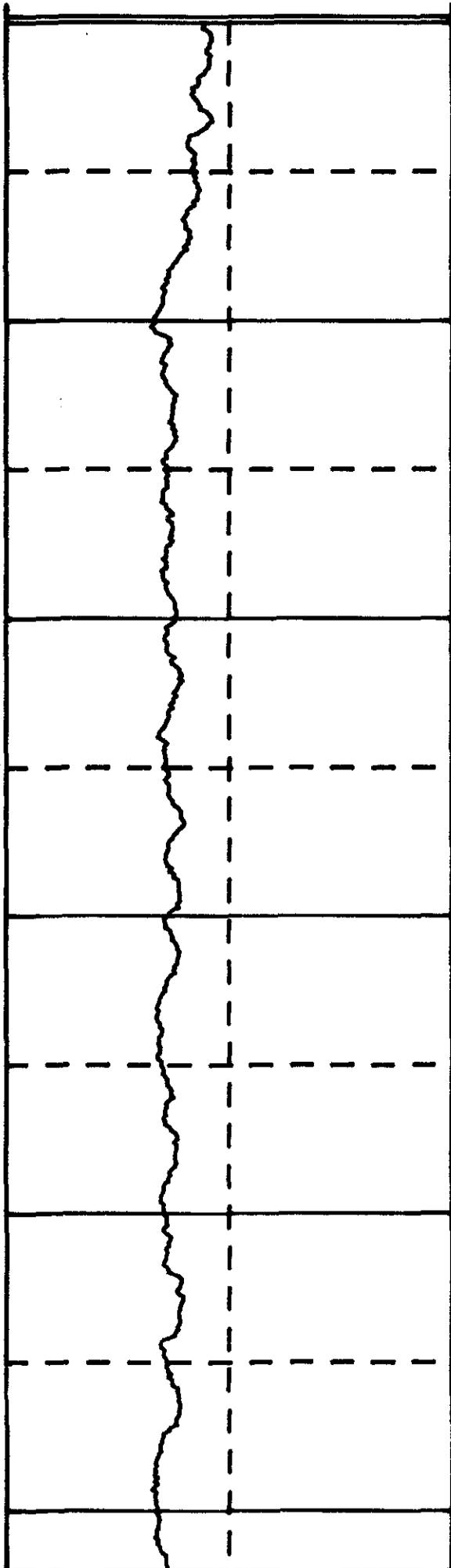
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (200-700 OHMS)



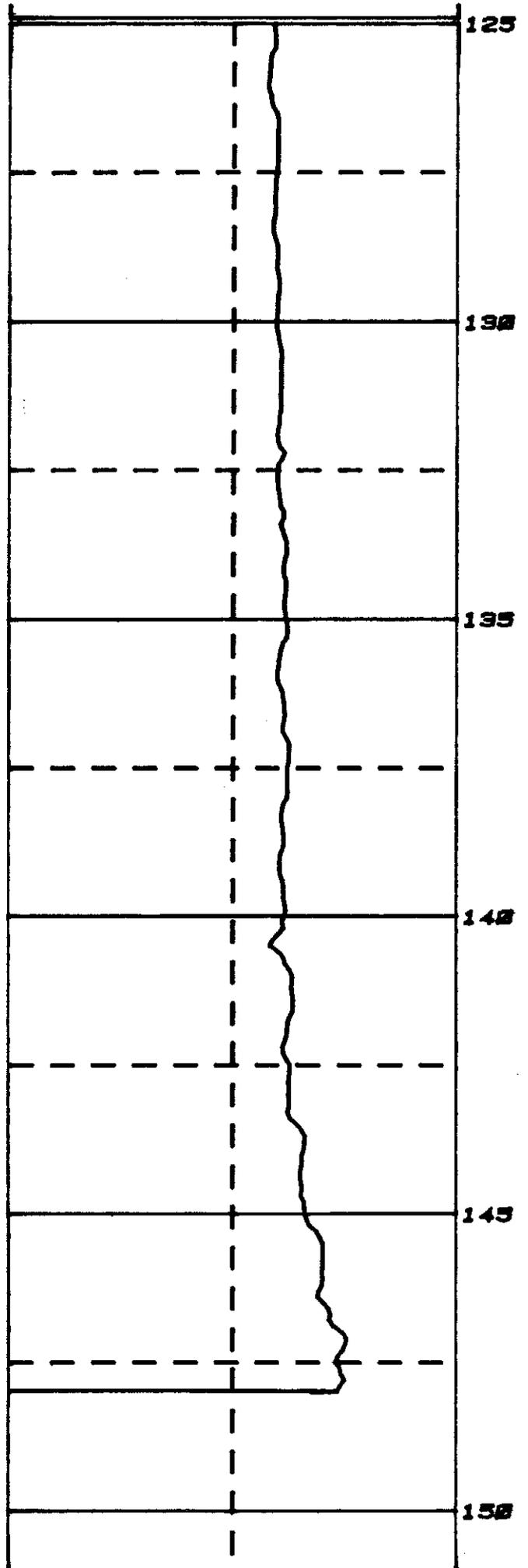
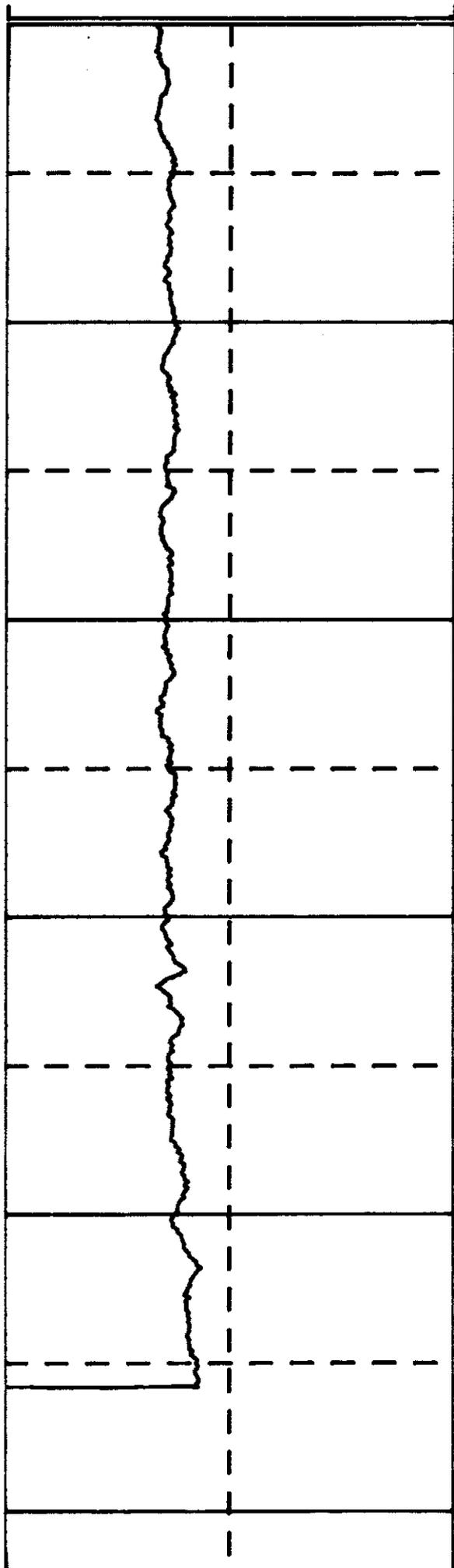
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (200-700 OHMS)

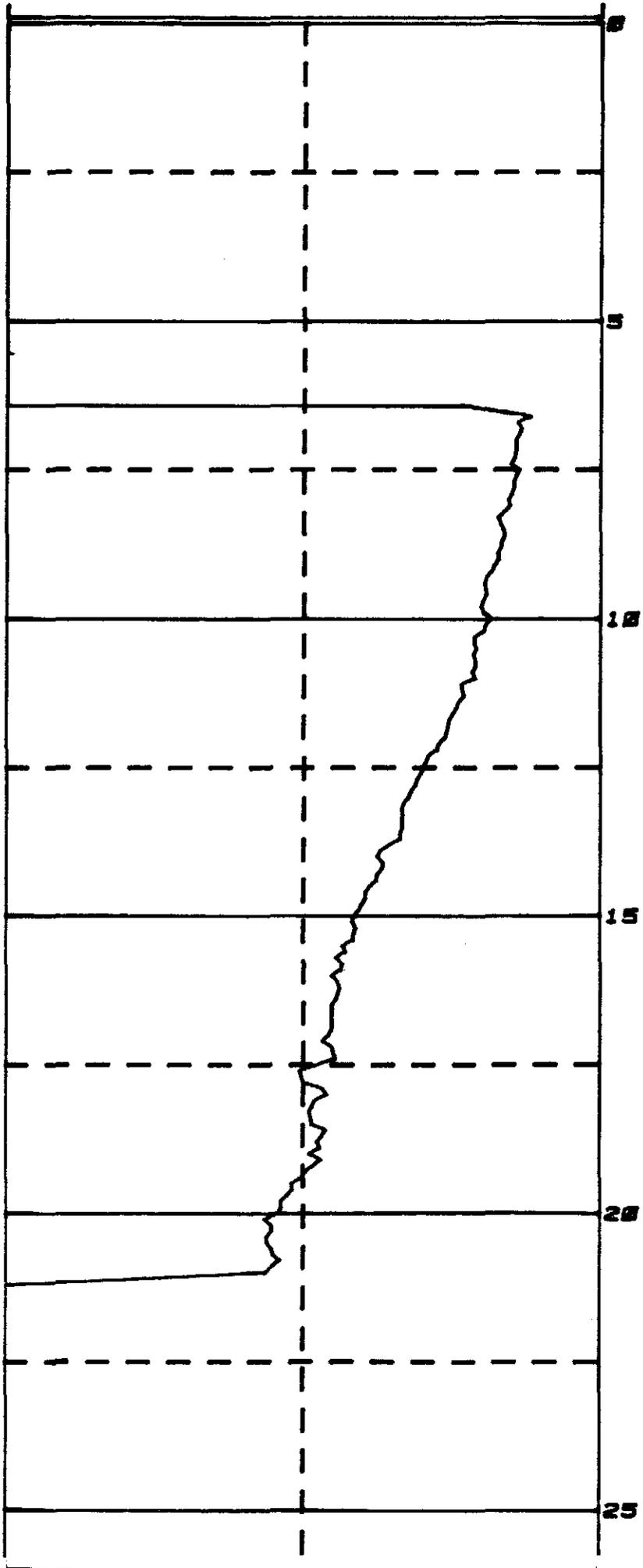


NEUTRON (0-1000 C. P. S.)

RESISTIVITY (200-700 OHMS)



SELF POTENTIAL ( 10 to +35 mV. )

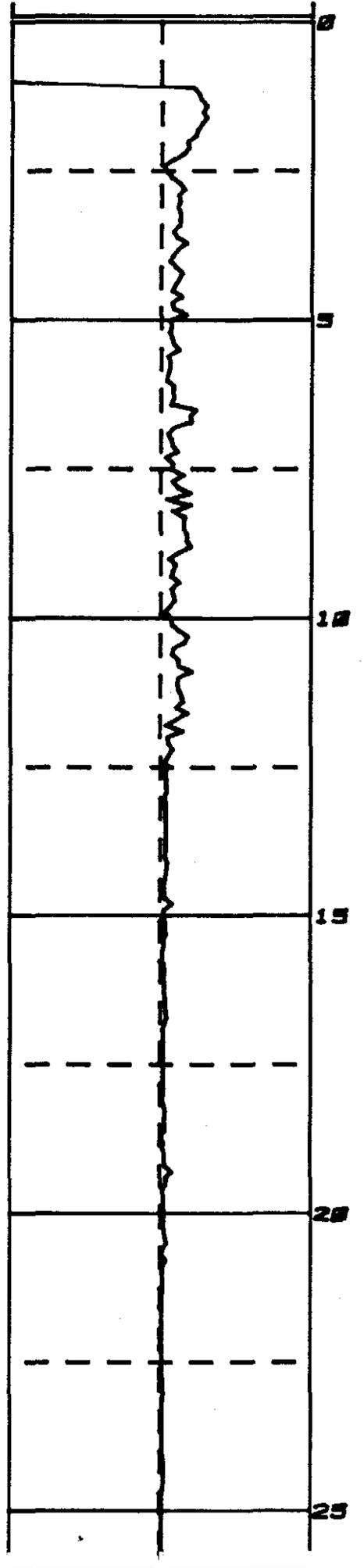
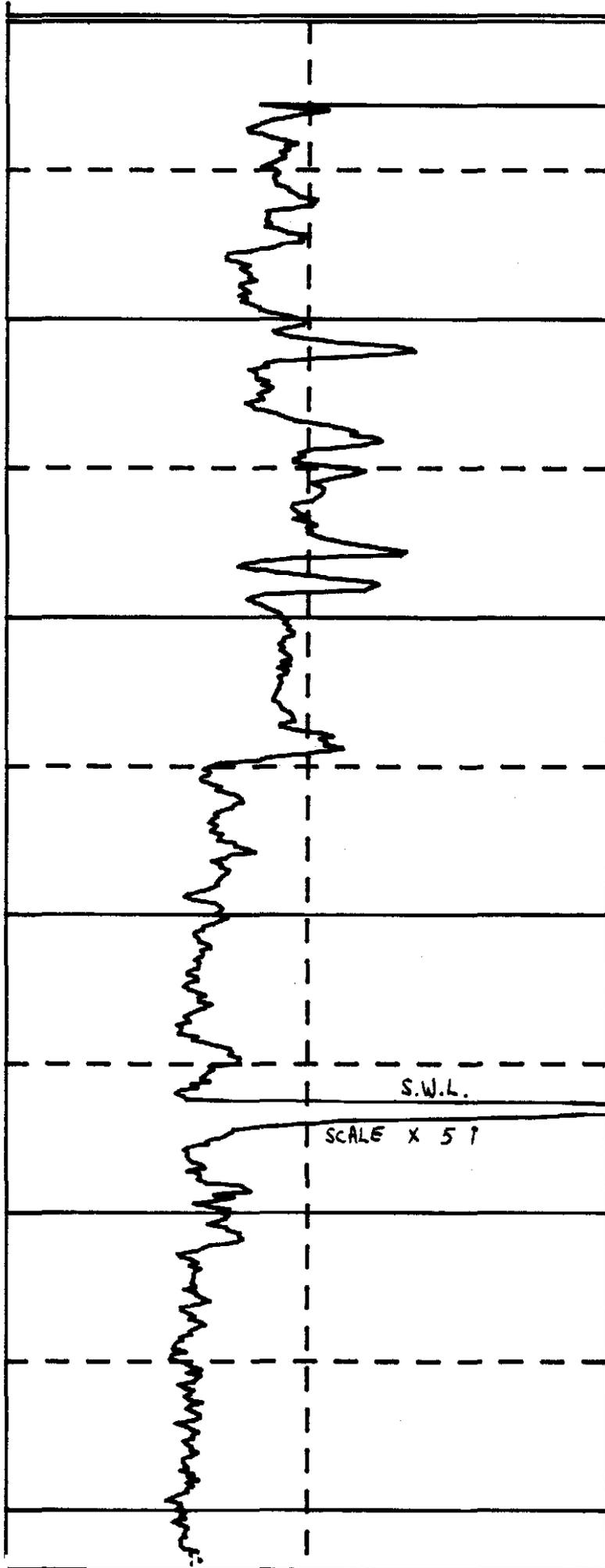






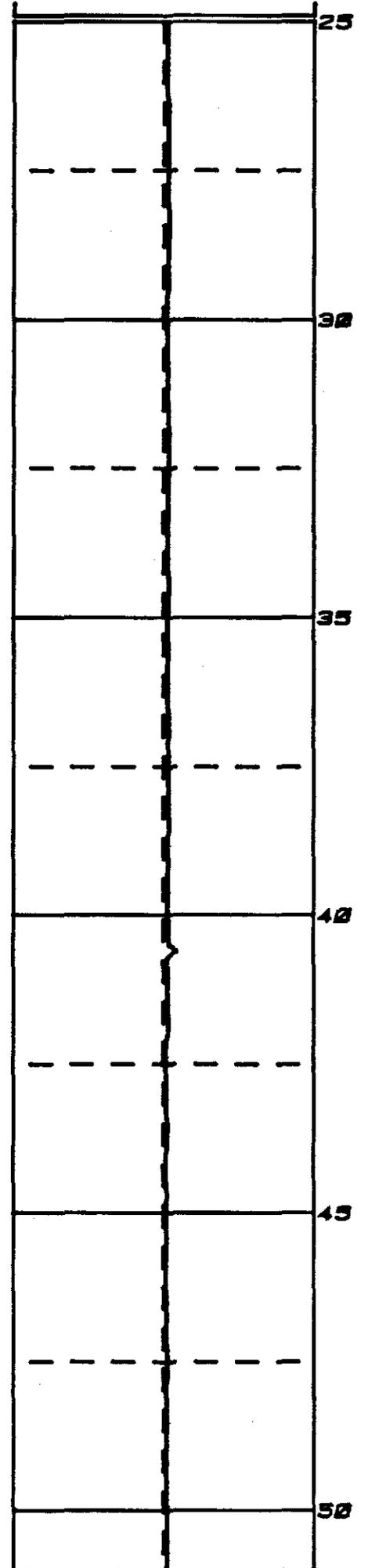
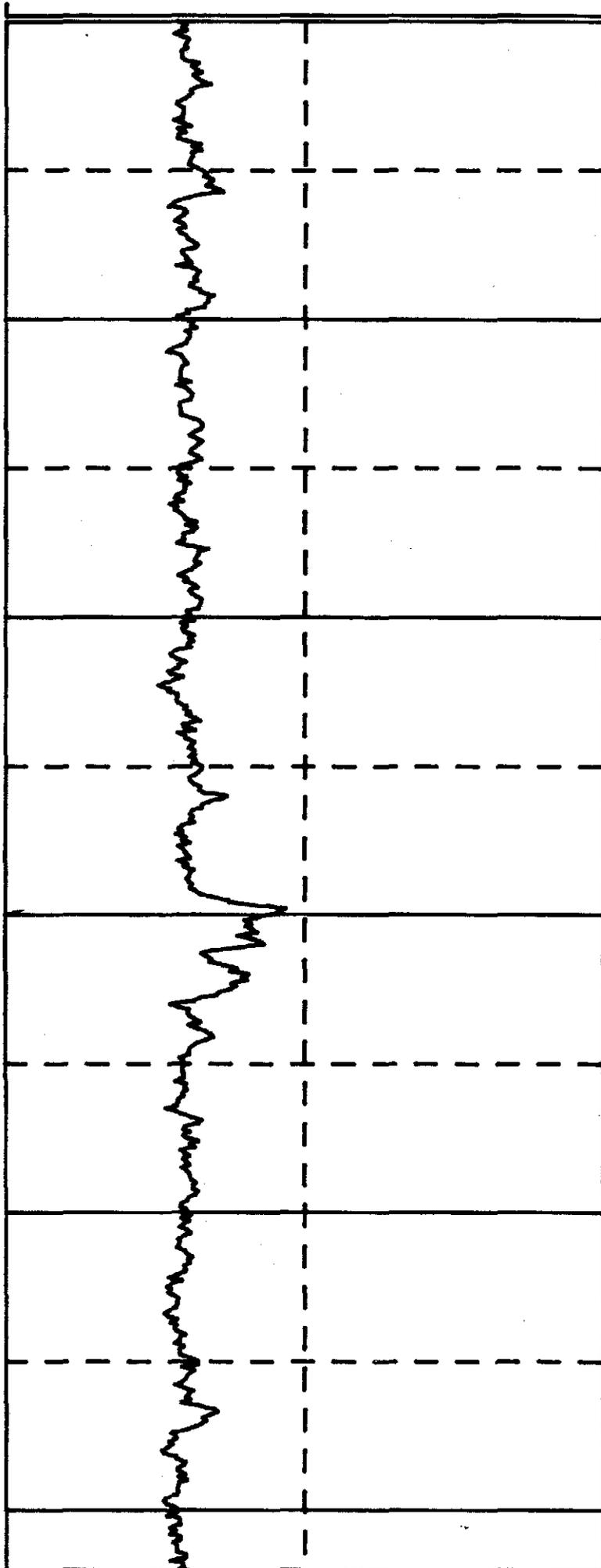
L. S. DENSITY (0-500 C. P. S.)

CALIPER (0-10 In.)



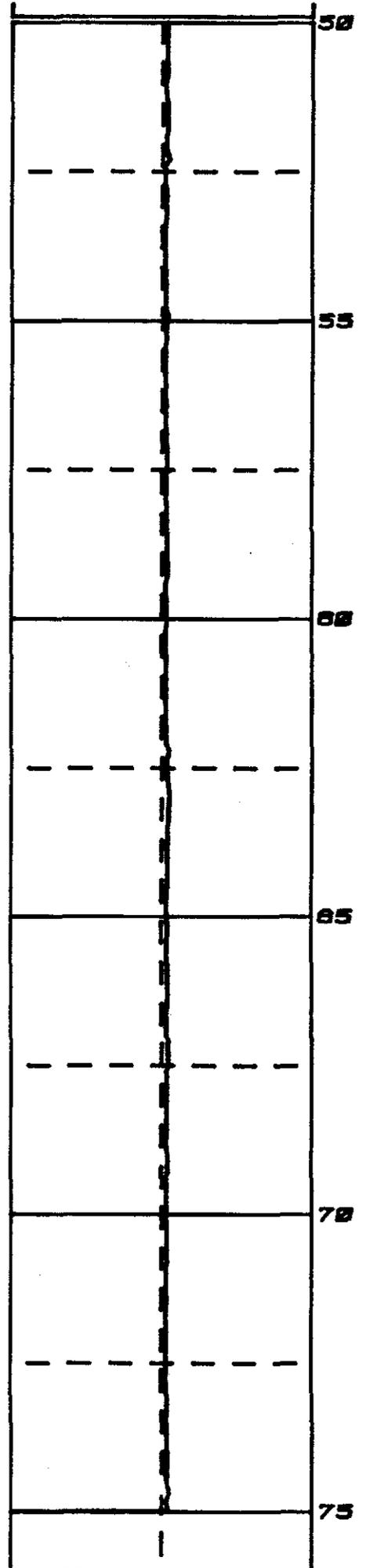
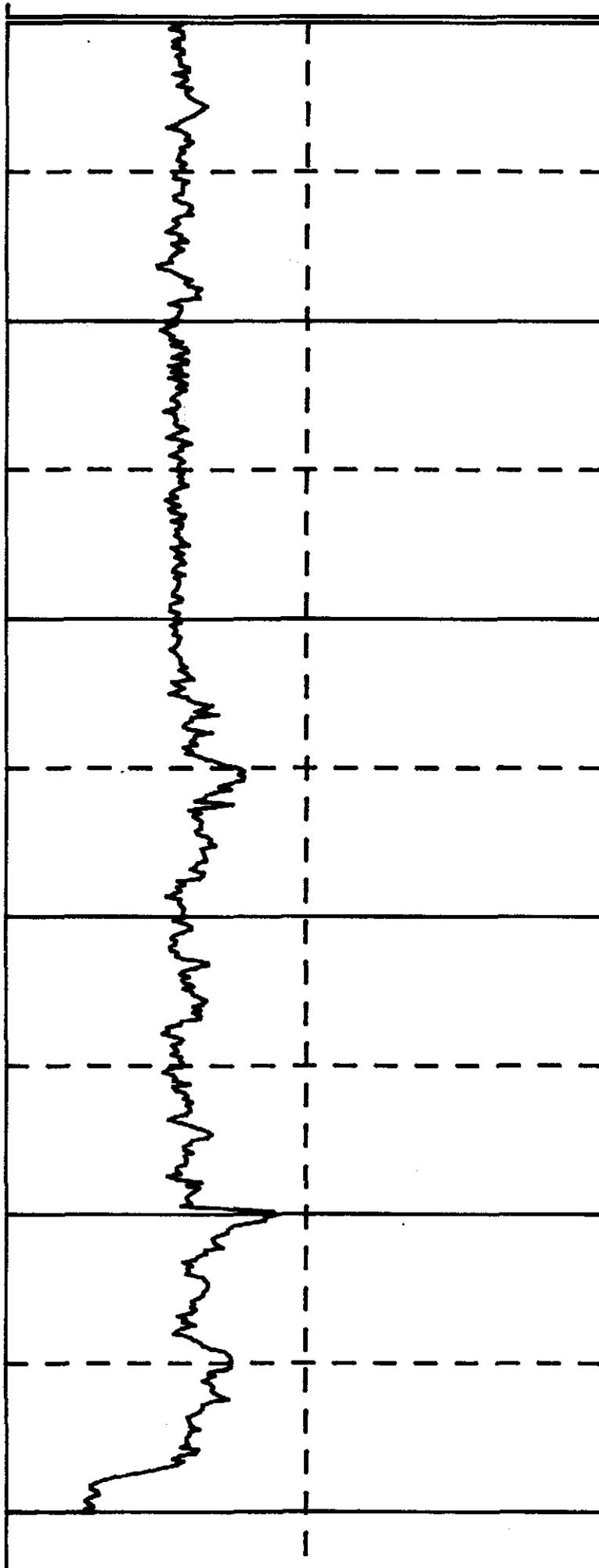
L. S. DENSITY (0-500 C. P. S.)

CALIPER (0-10 In.)



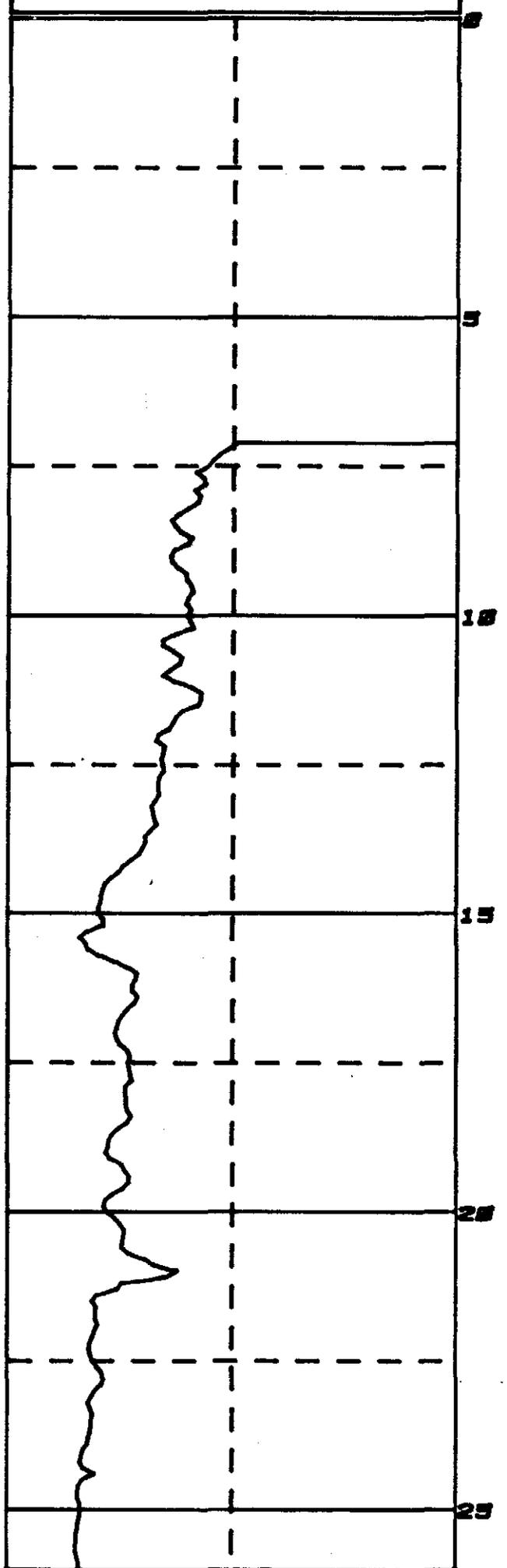
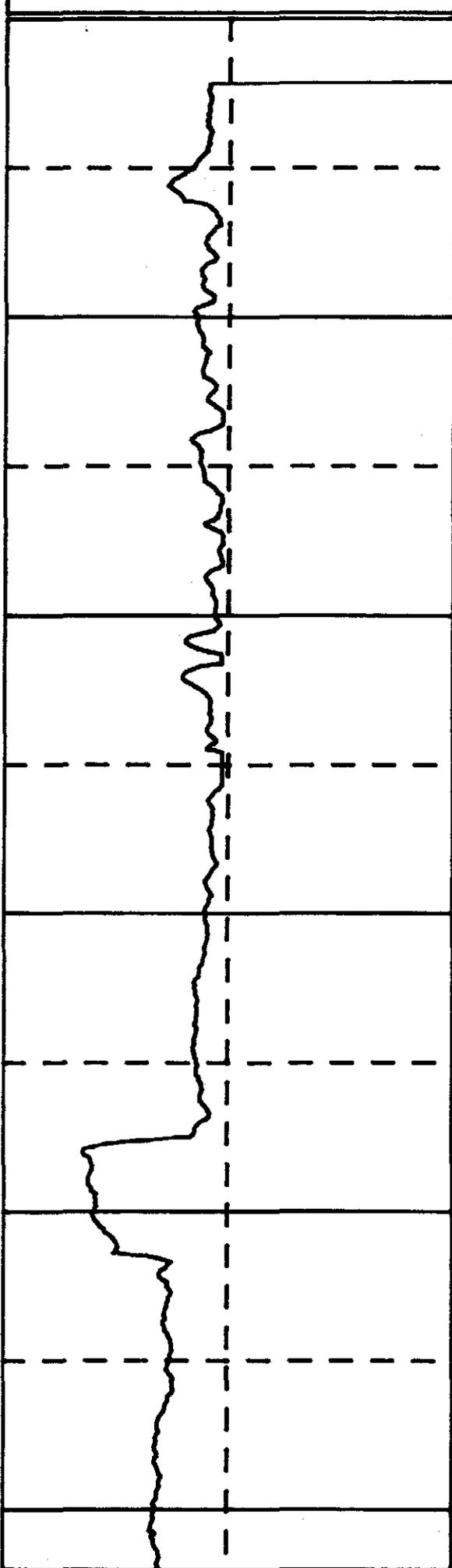
L. S. DENSITY (0-500 C. P. S.)

CALIPER (0-10 OHMS)



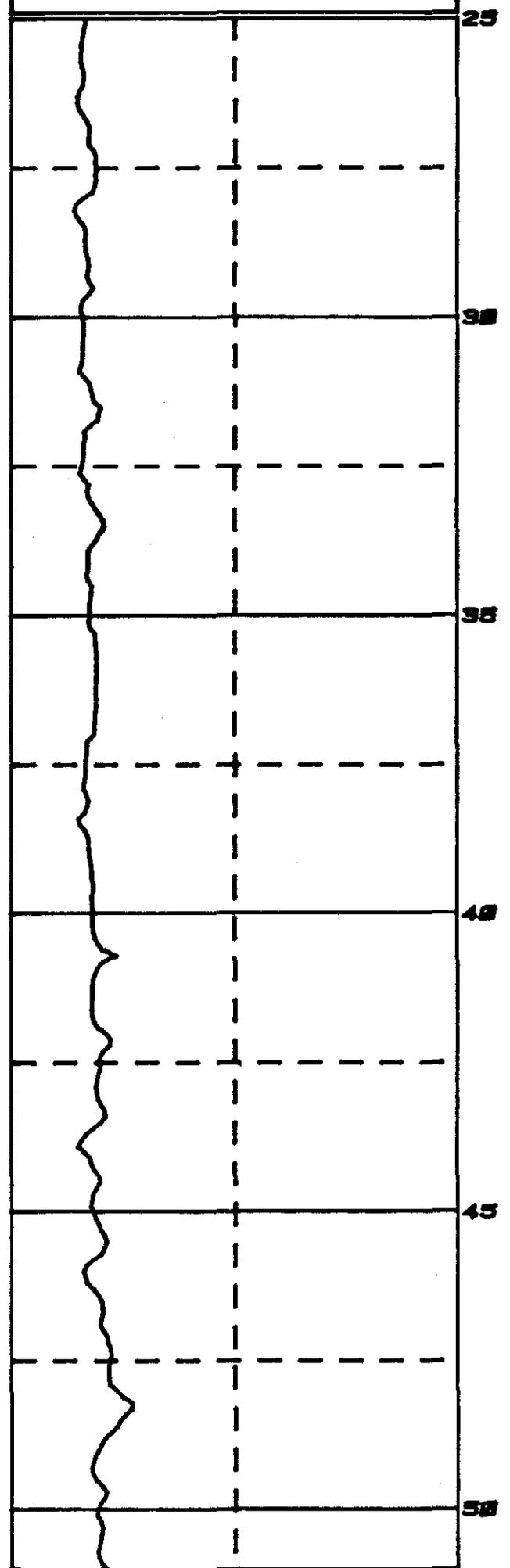
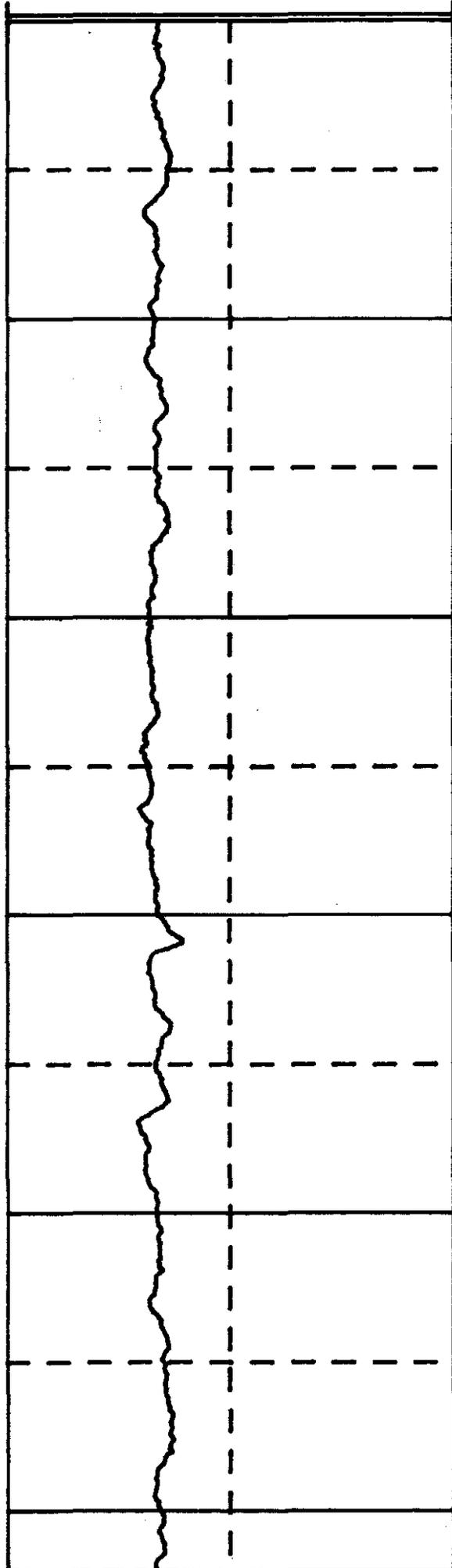
NEUTRON (8-10000 C. P. S.)

RESISTIVITY (150-400 OHMS)



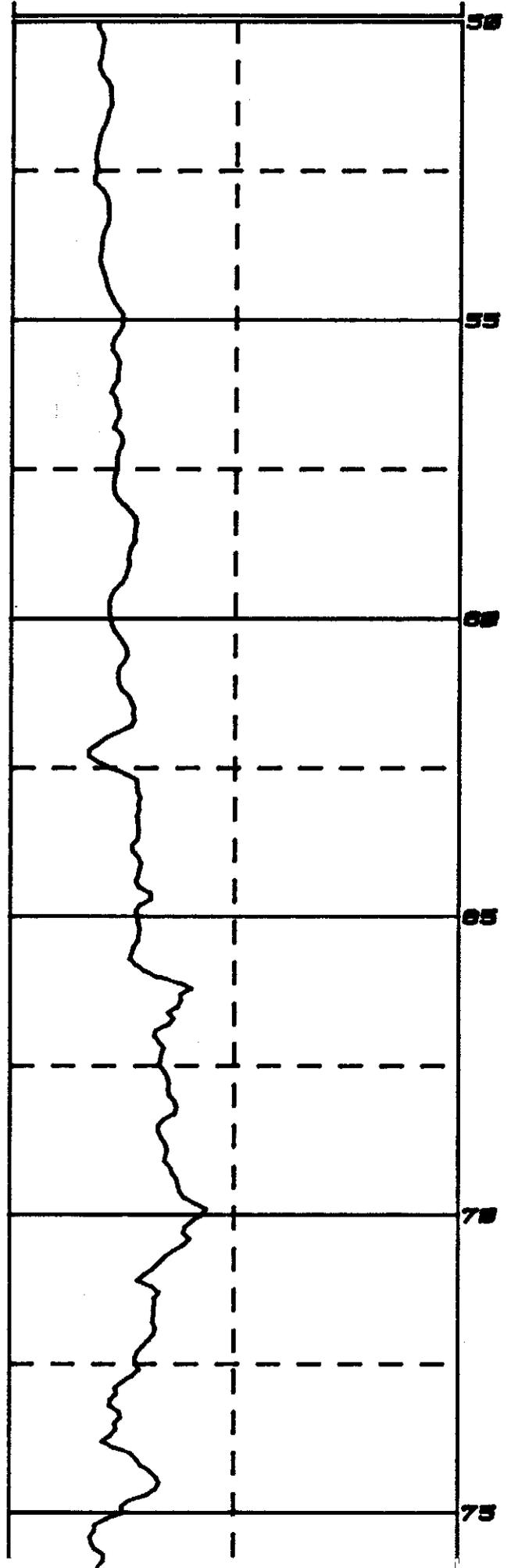
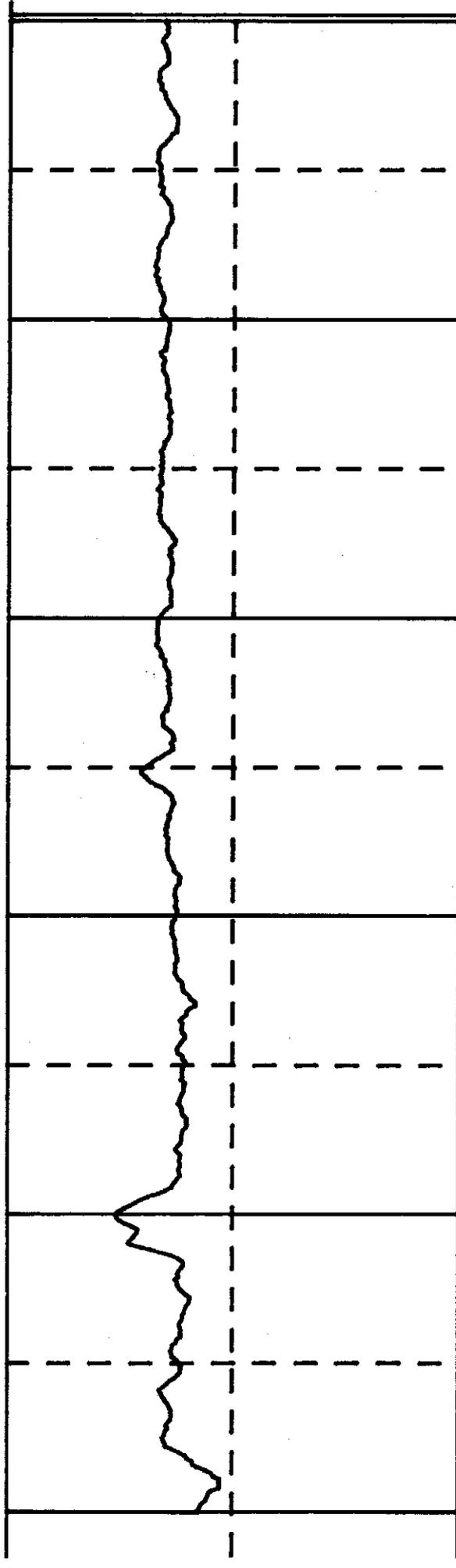
NEUTRON (8-10000 C. P. S.)

RESISTIVITY (150-400 OHMS)



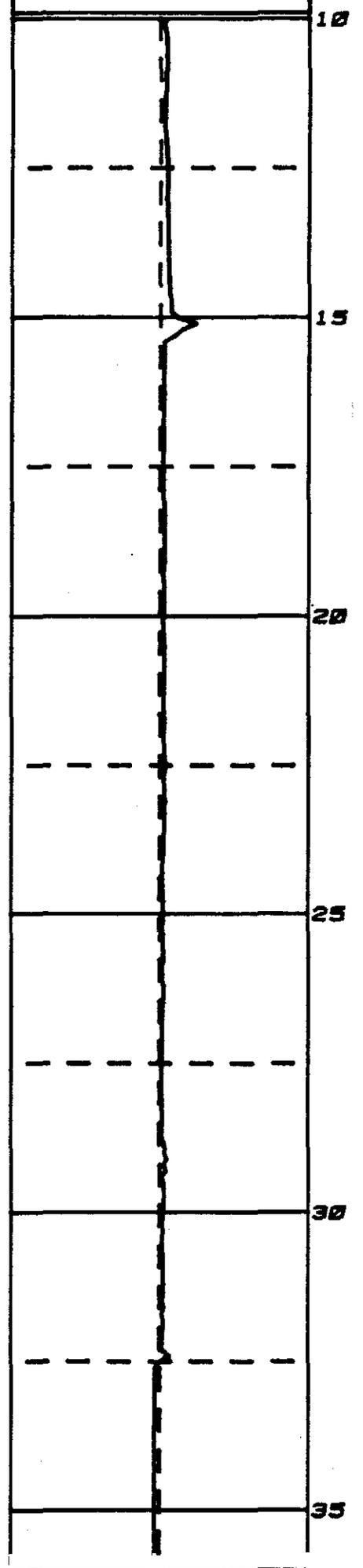
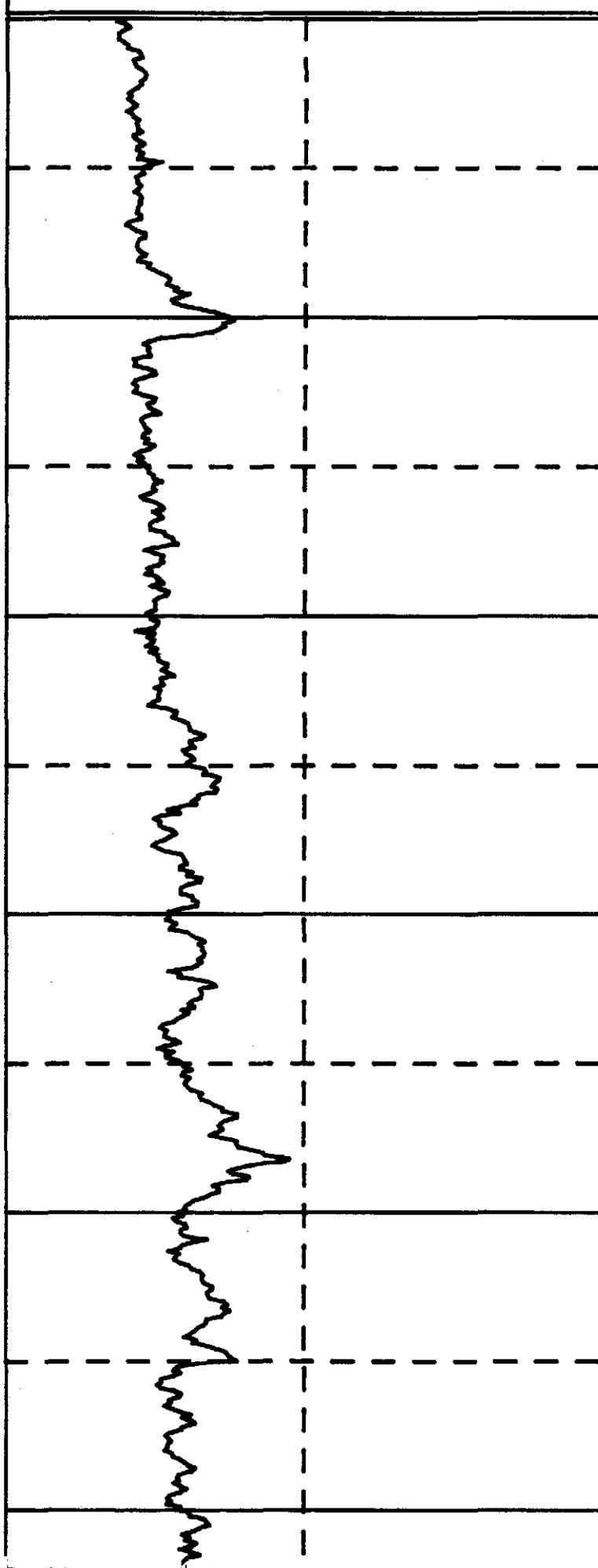
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (150-400 OHMS)



L. S. DENSITY (0-500 C. P. S.)

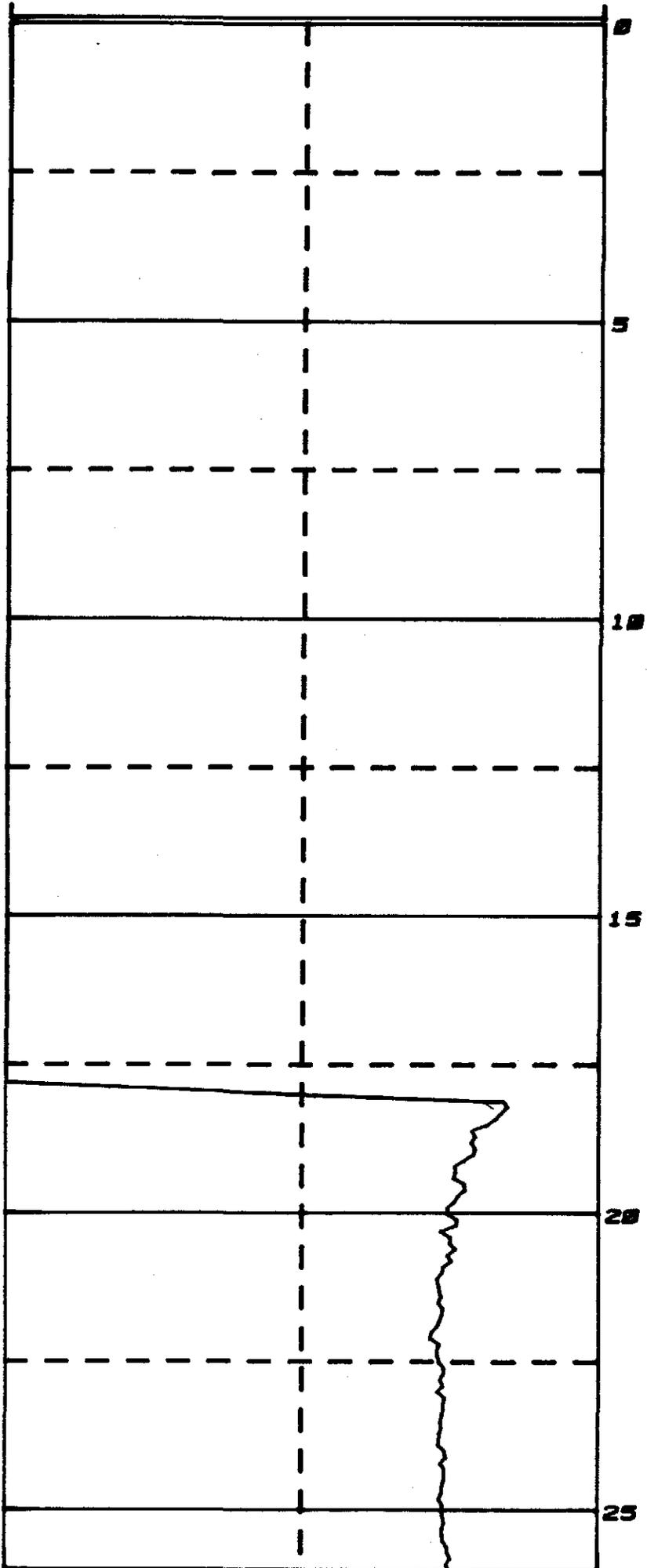
CALIPER (0-10 In.)



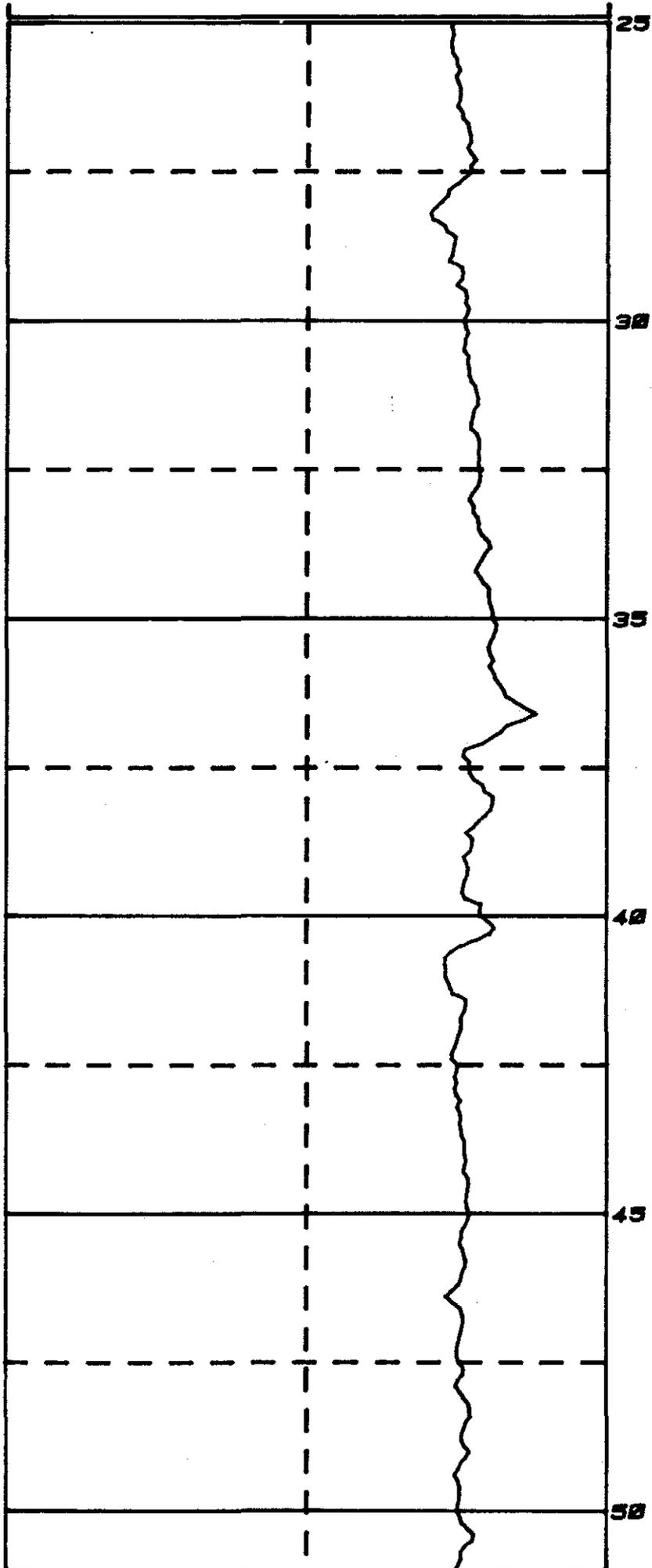


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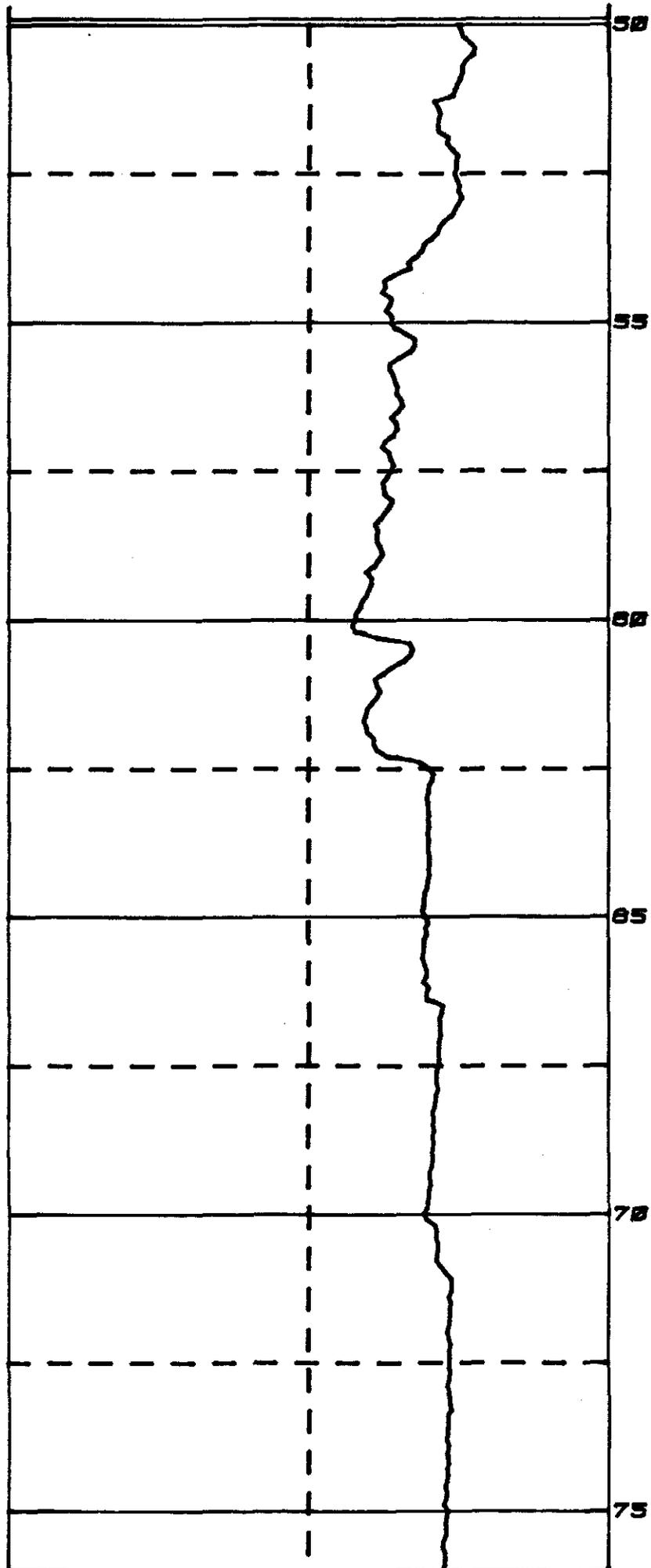
SELF POTENTIAL (-95 to -78 mV.)



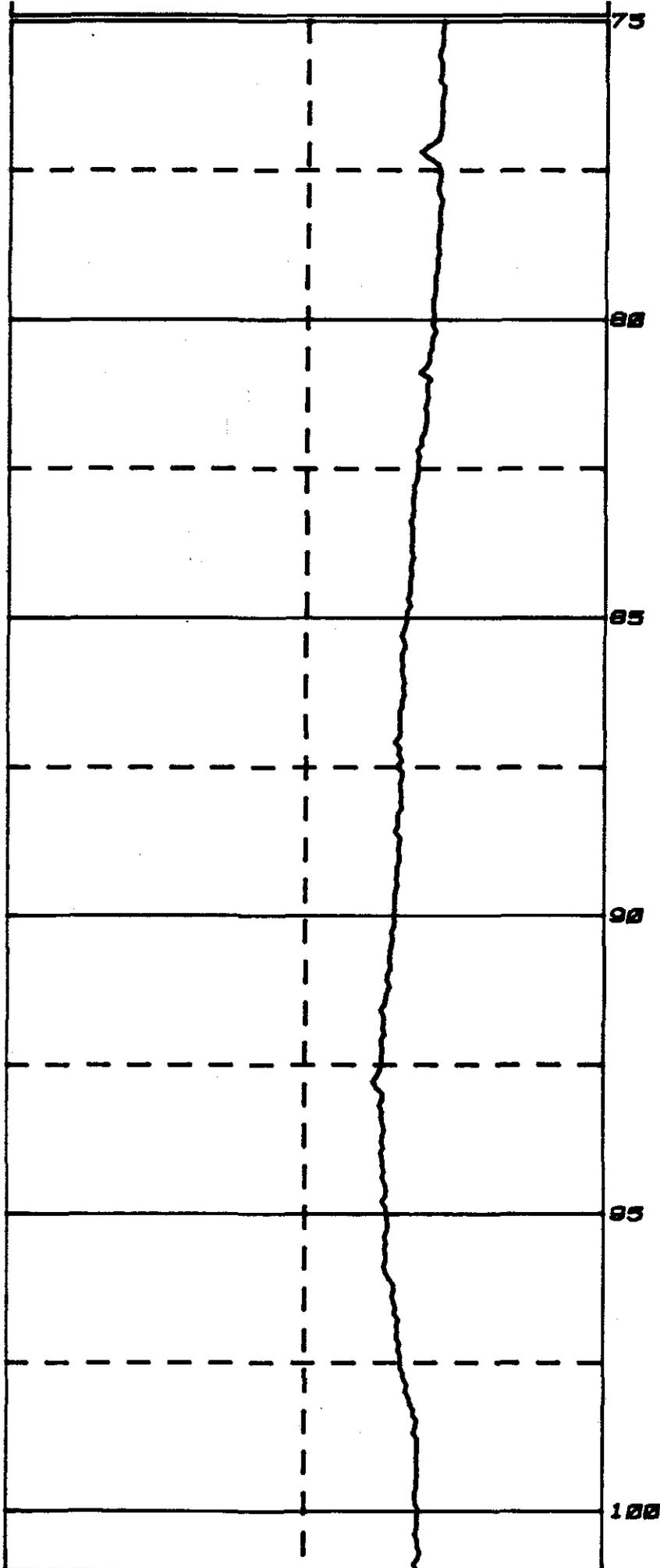
SELF POTENTIAL (-95 to -70 mV.)



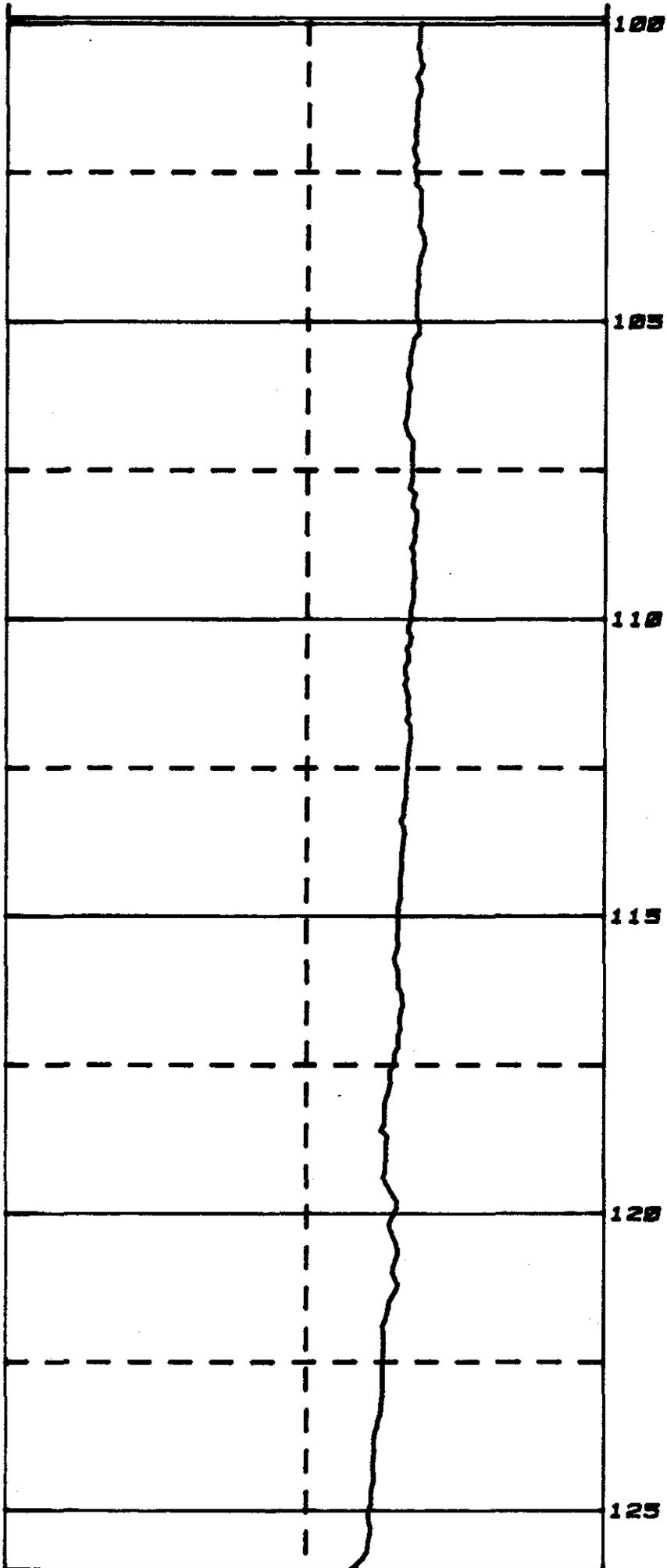
SELF POTENTIAL (-95 to -70 mV.)



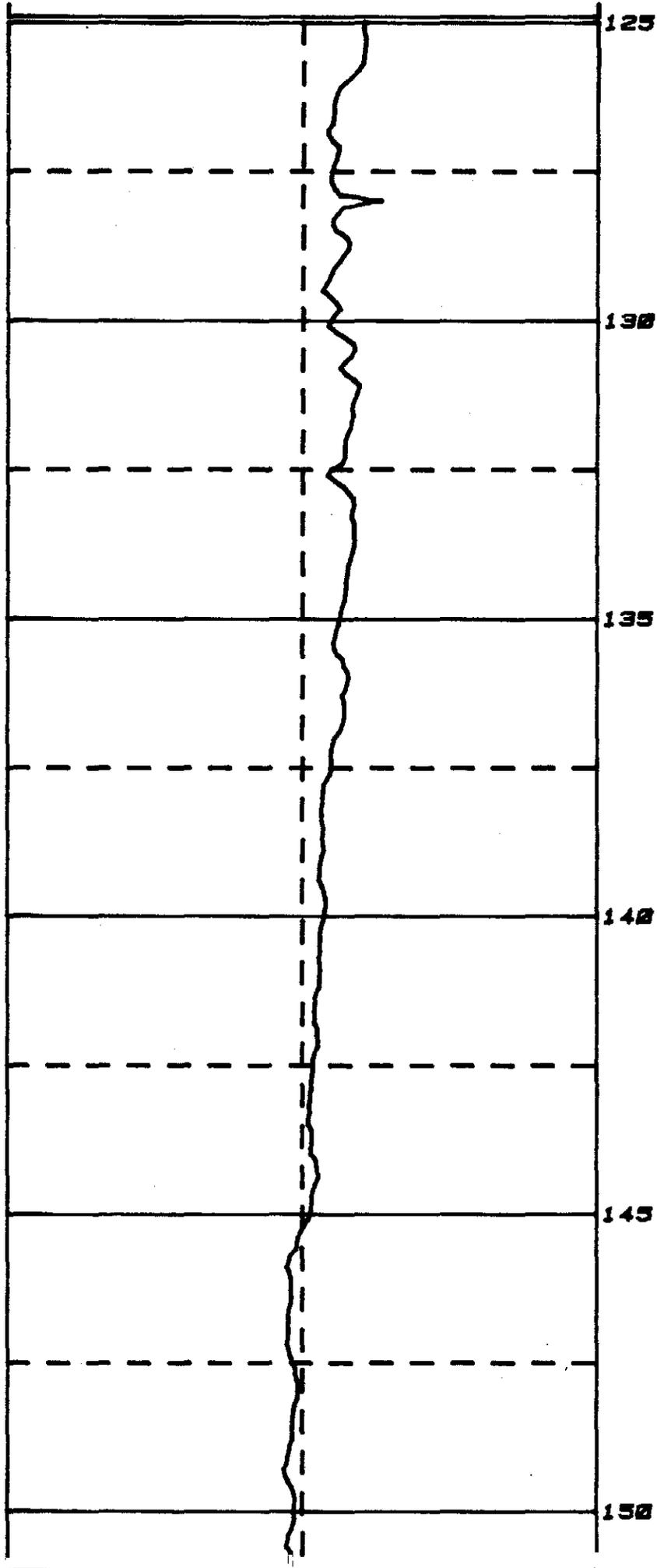
SELF POTENTIAL (-95 to -70 mV.)



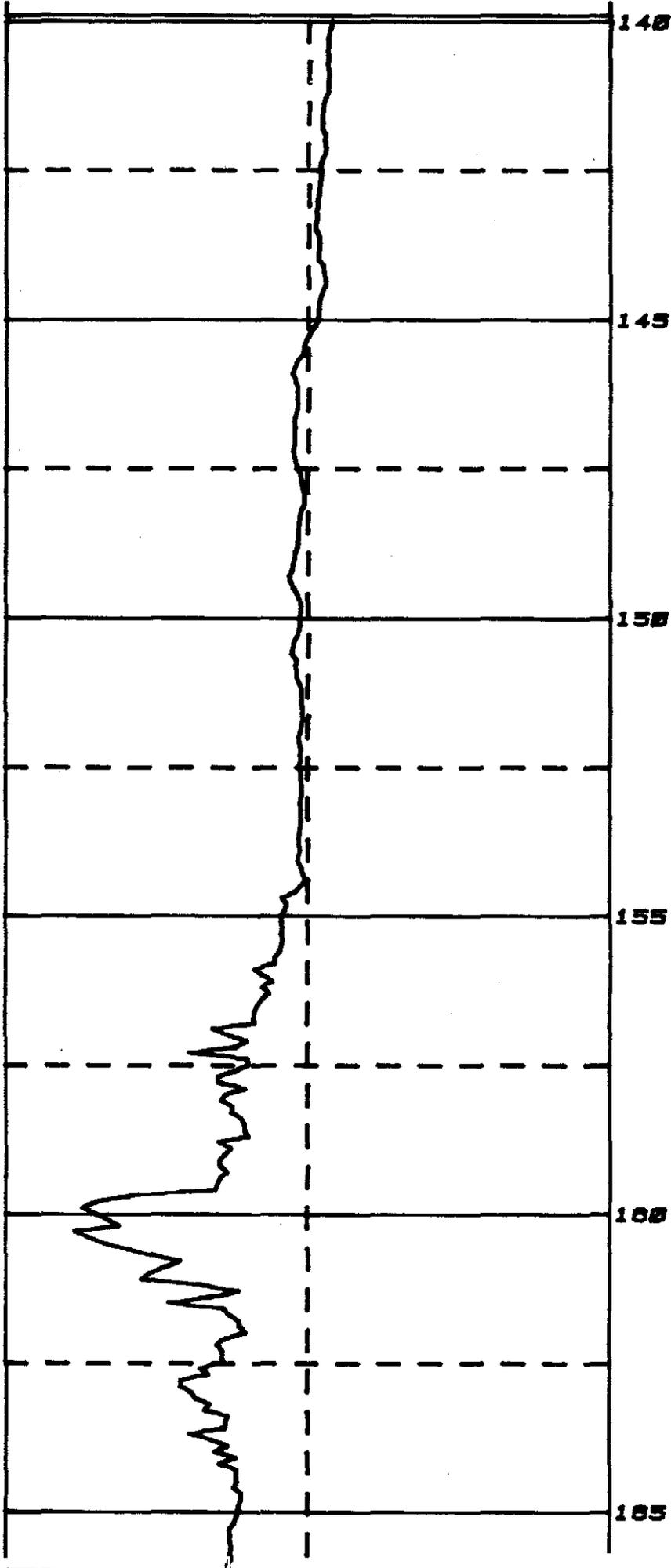
SELF POTENTIAL (-95 to -70 mV.)



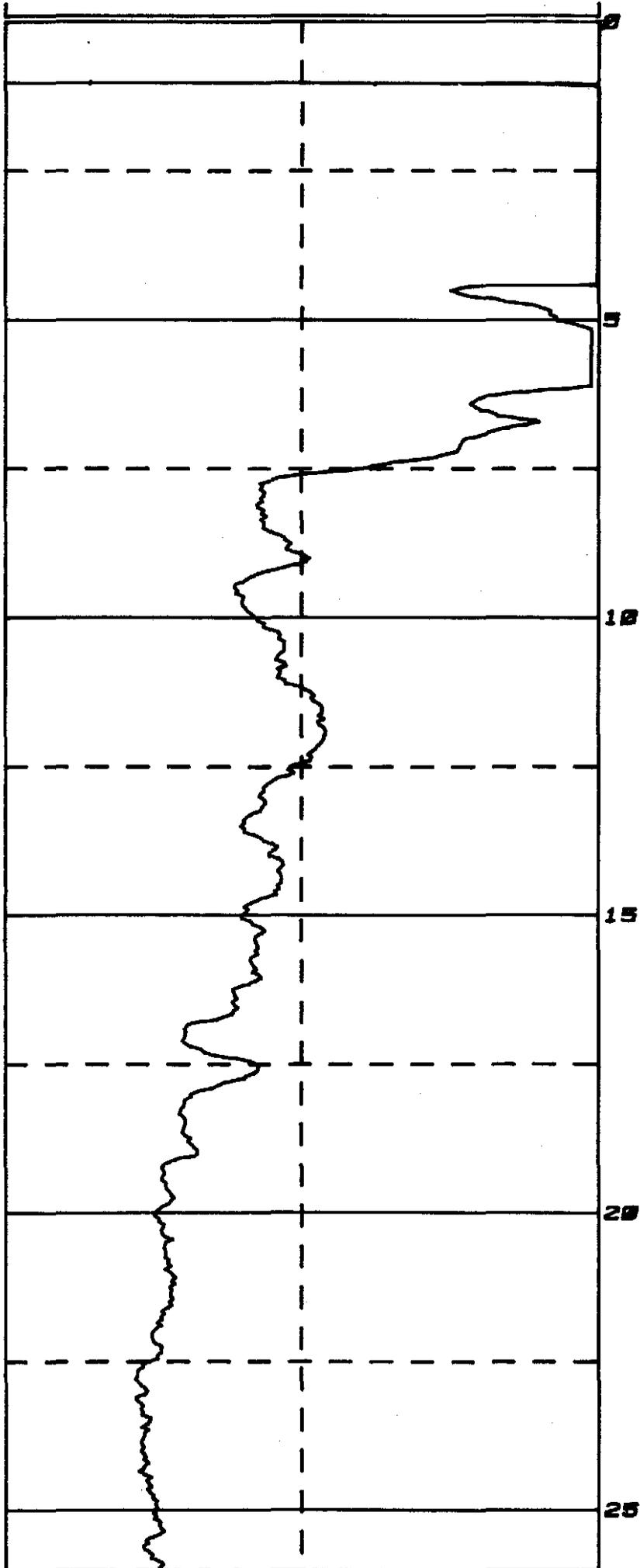
SELF POTENTIAL (-95 to -70 mV.)



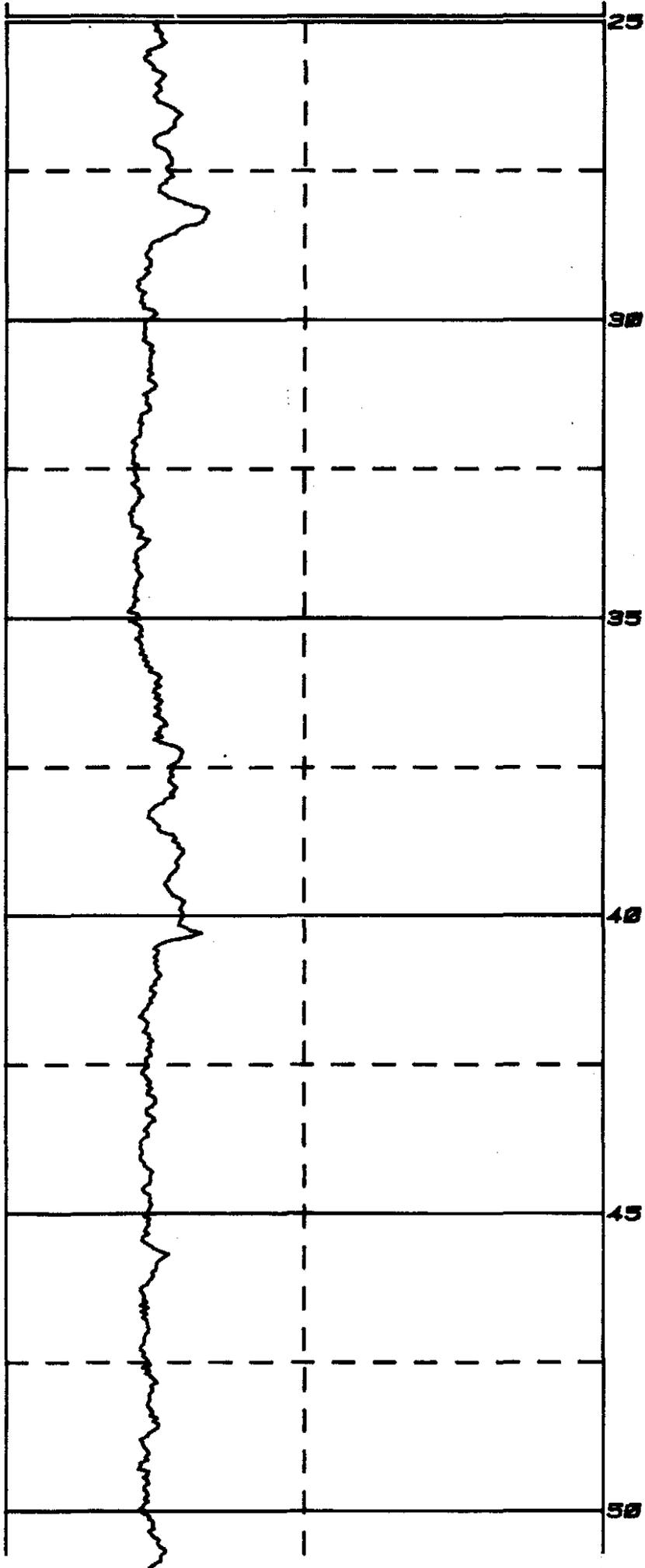
SELF POTENTIAL (-95 to -70 mV.)



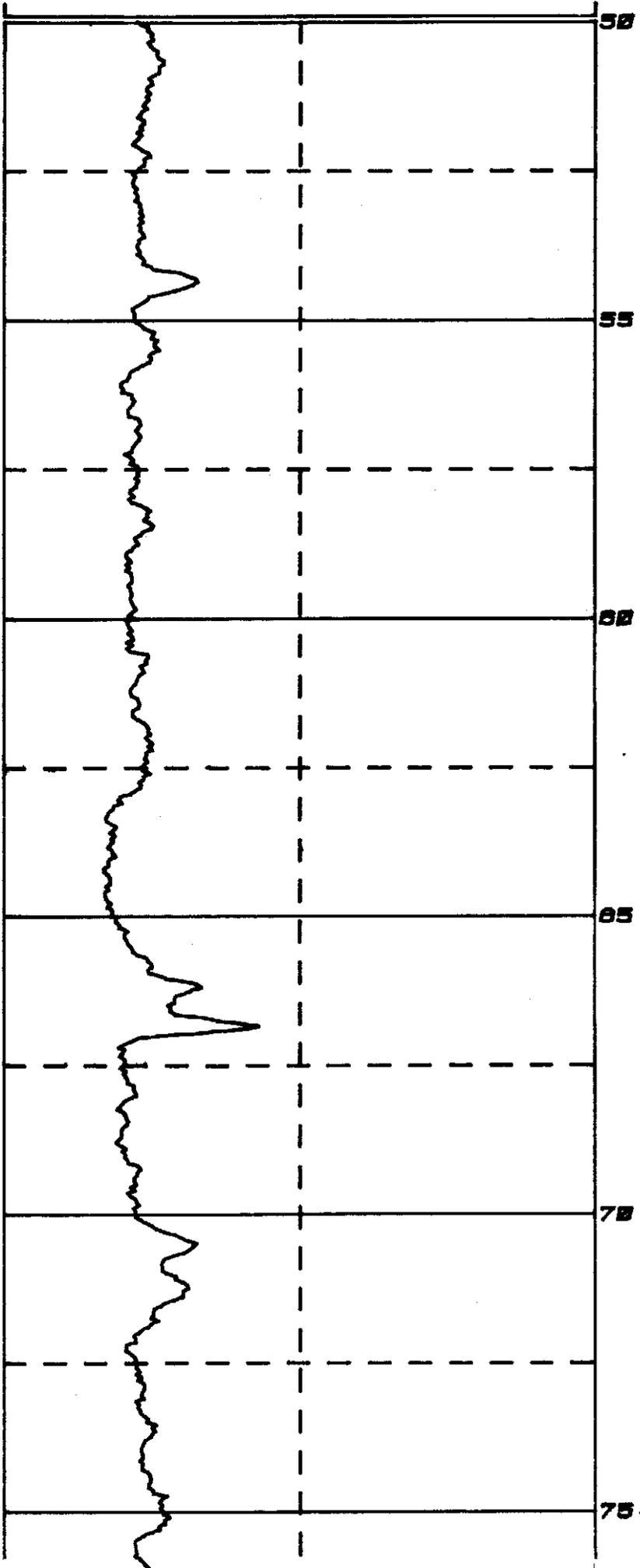
DENSITY (G-5000 C. P. S.)



DENSITY (0-5000 C. P. S.)

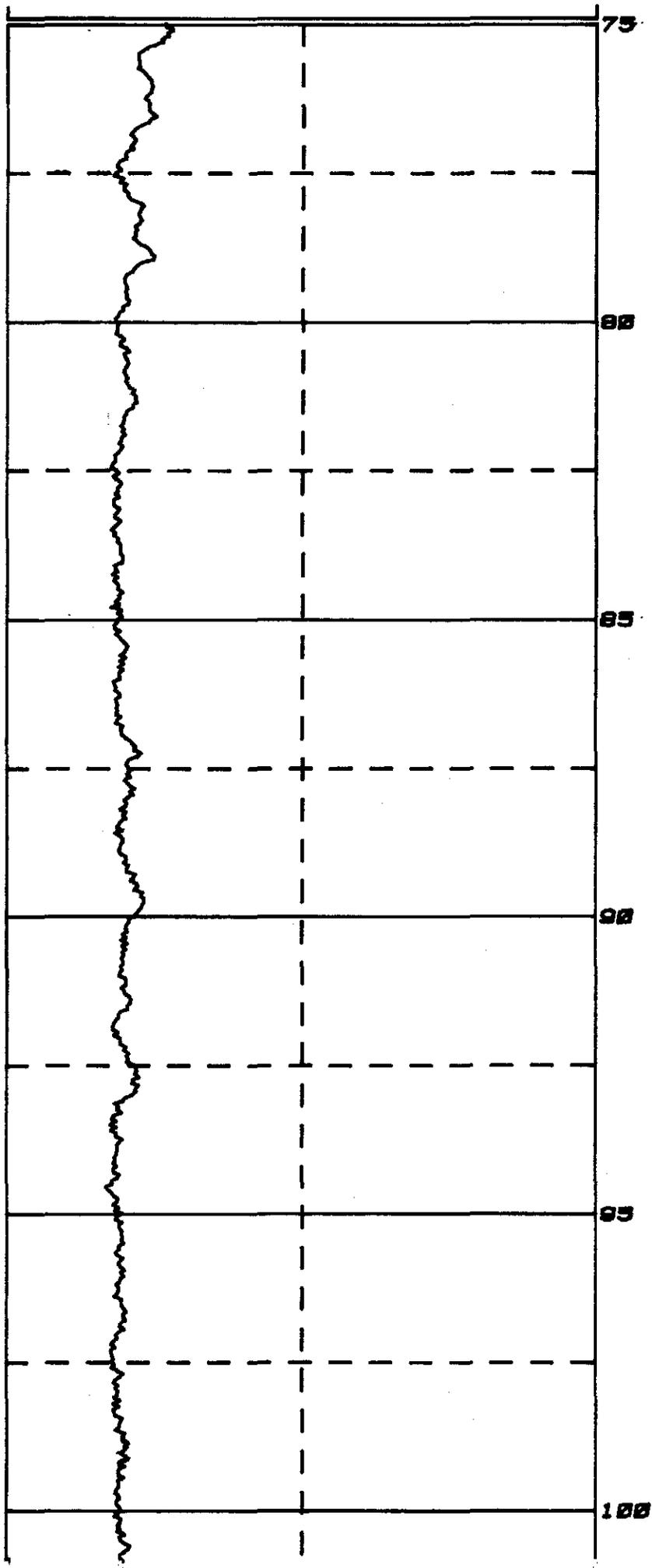


DENSITY (0-5000 C. P. S.)

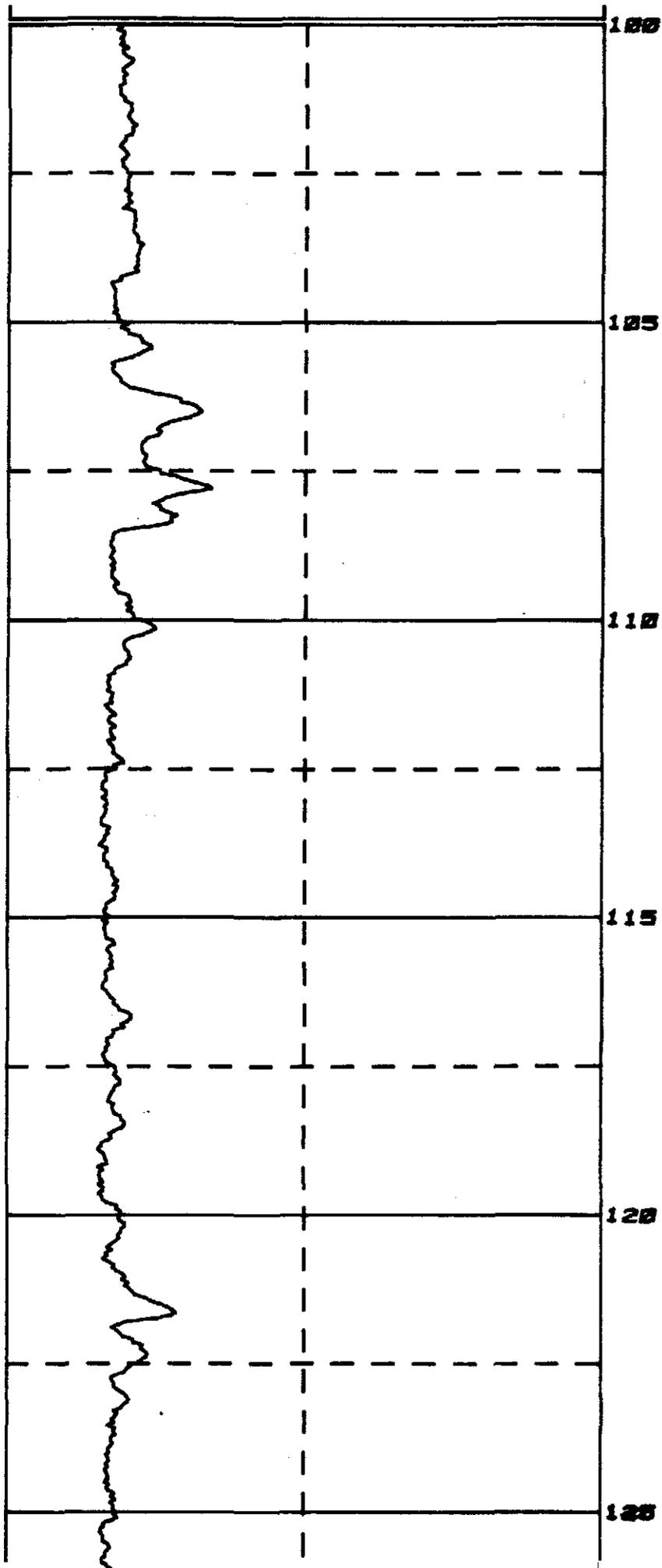


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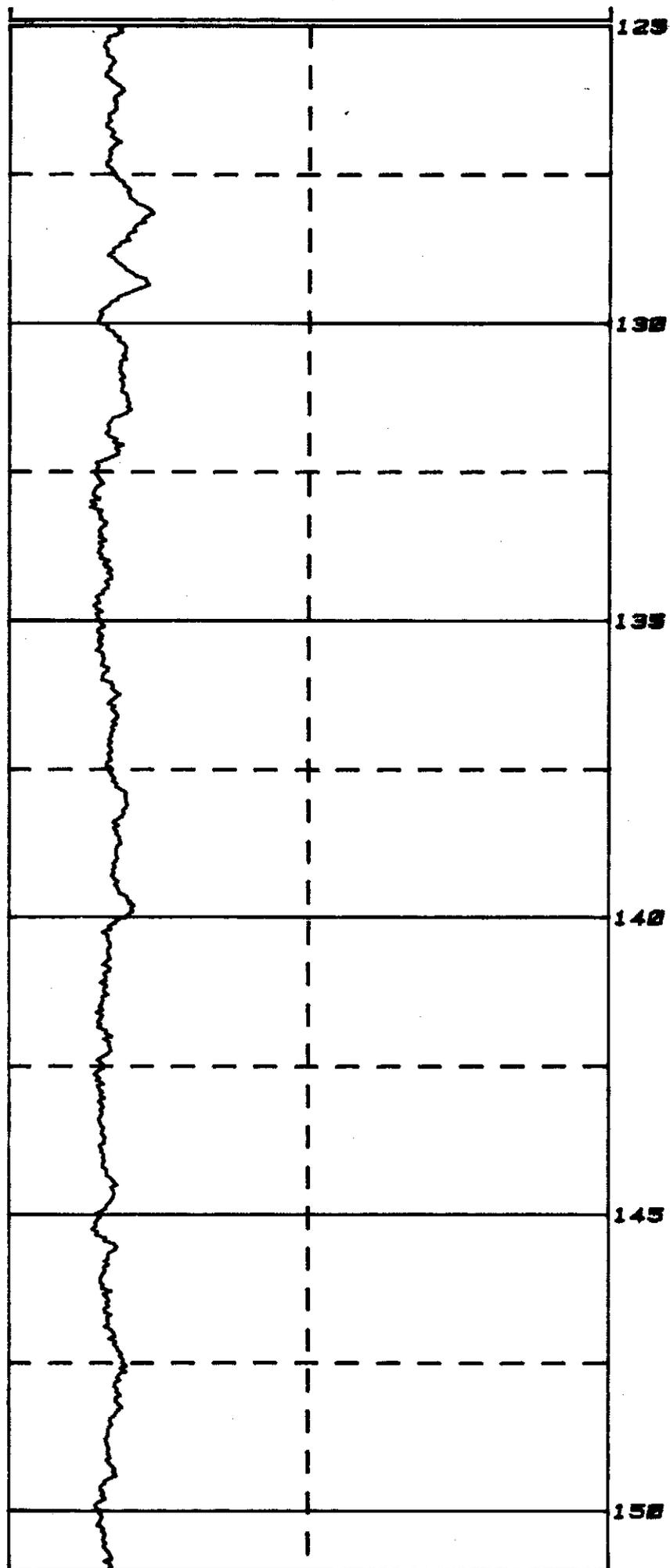
DENSITY (0-5000 C.P.S.)



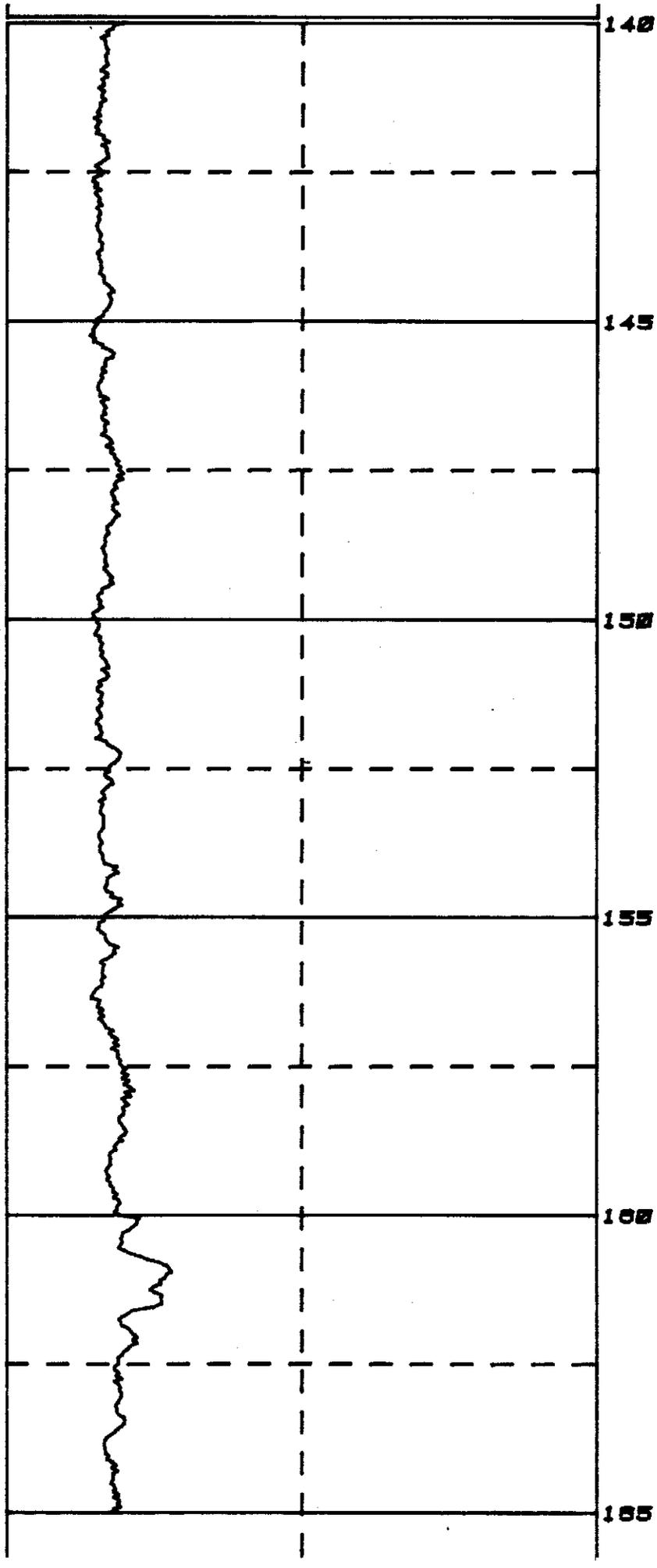
DENSITY (0-5000 C. P. S.)



DENSITY (0-5000 C. P. S.)

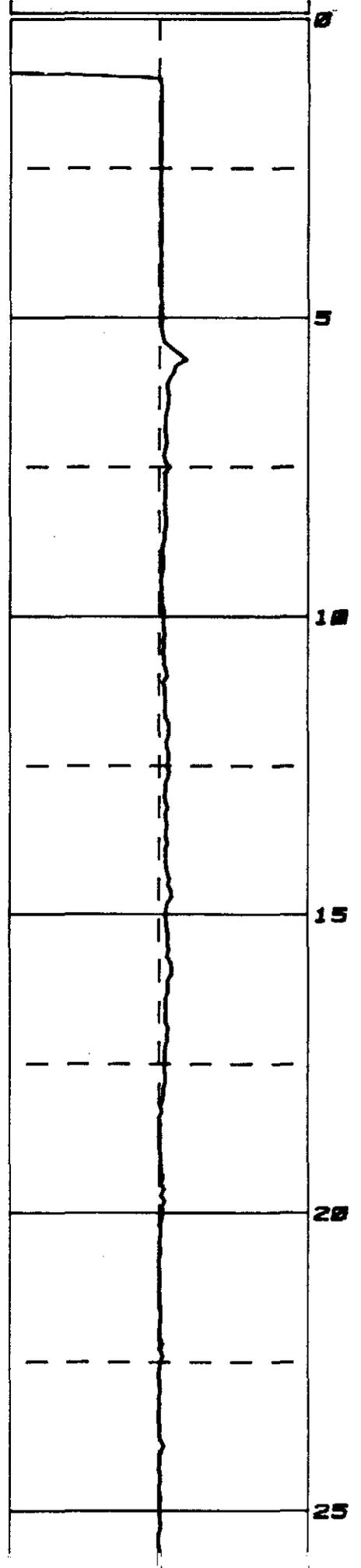
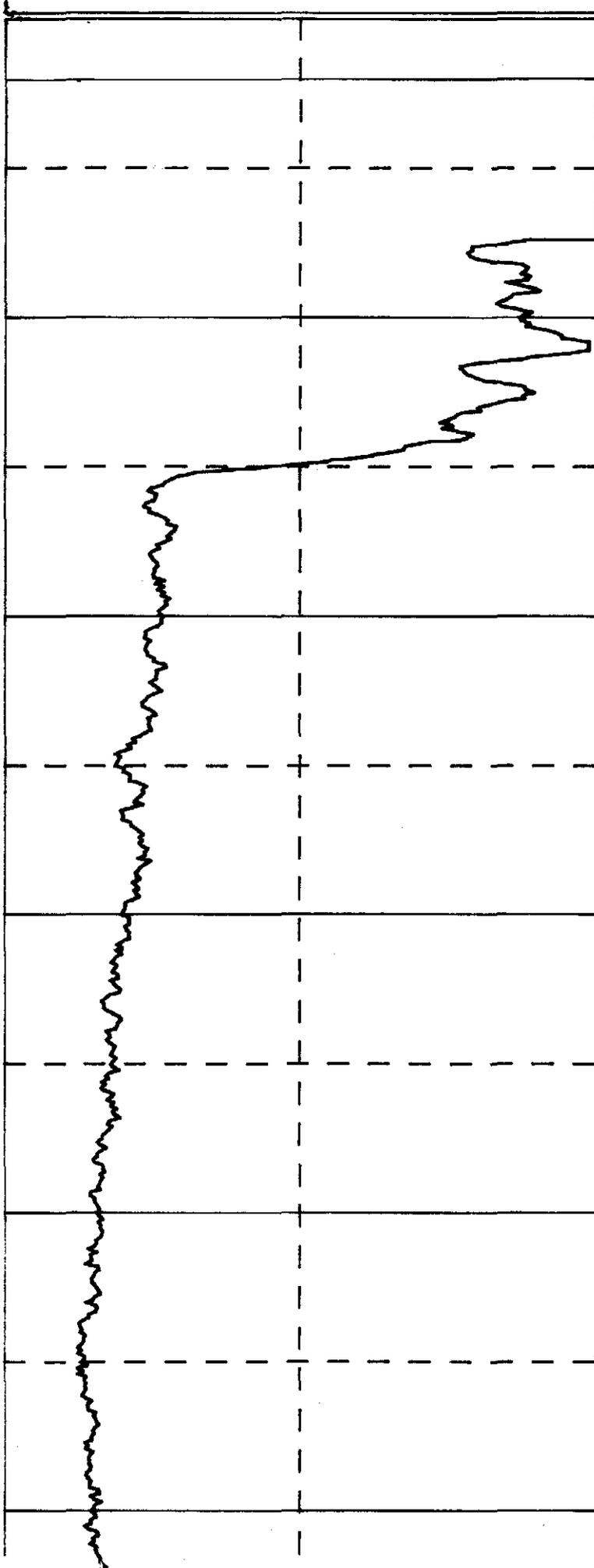


DENSITY (0-5000 C. P. S.)



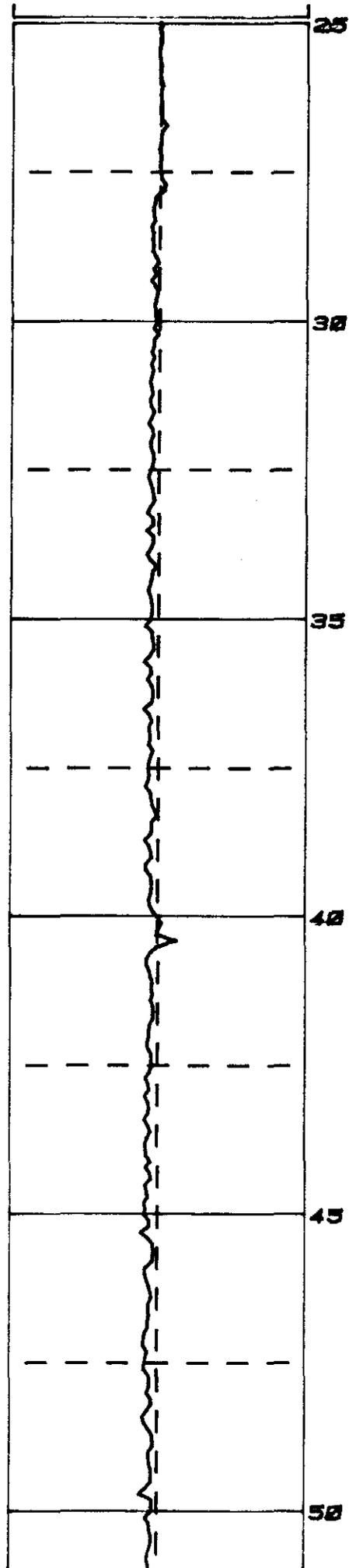
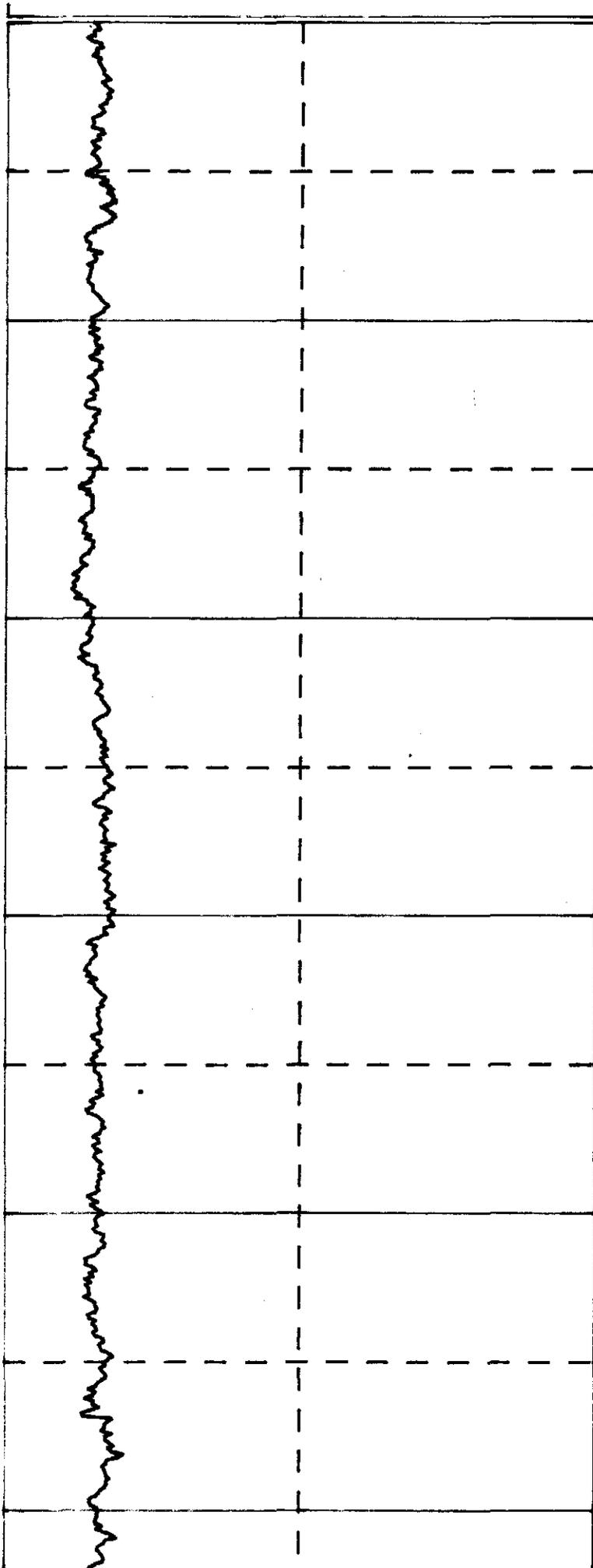
L. S. DENSITY (8-500 C. P. S.)

CALIPER (8-18 In.)



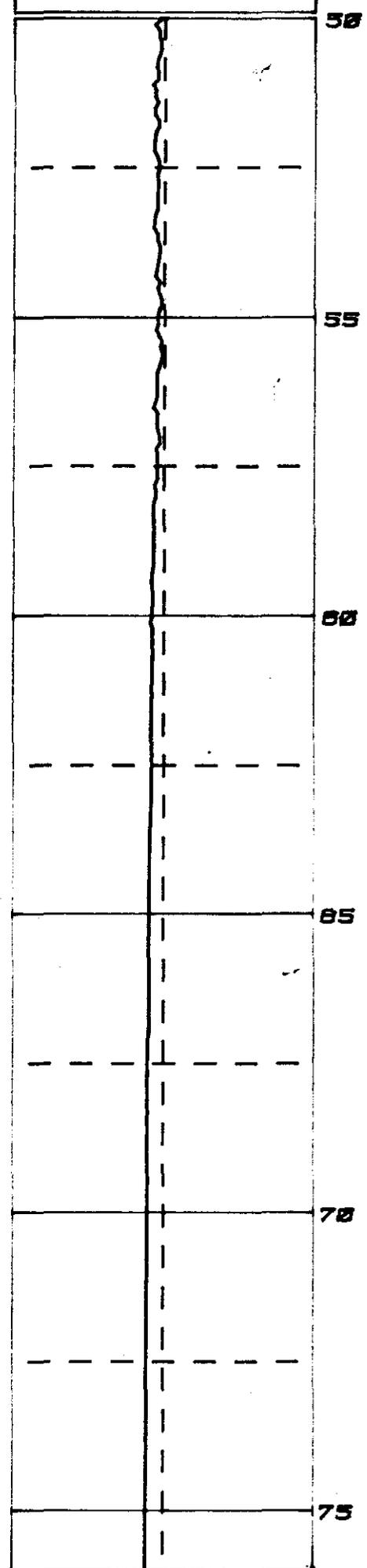
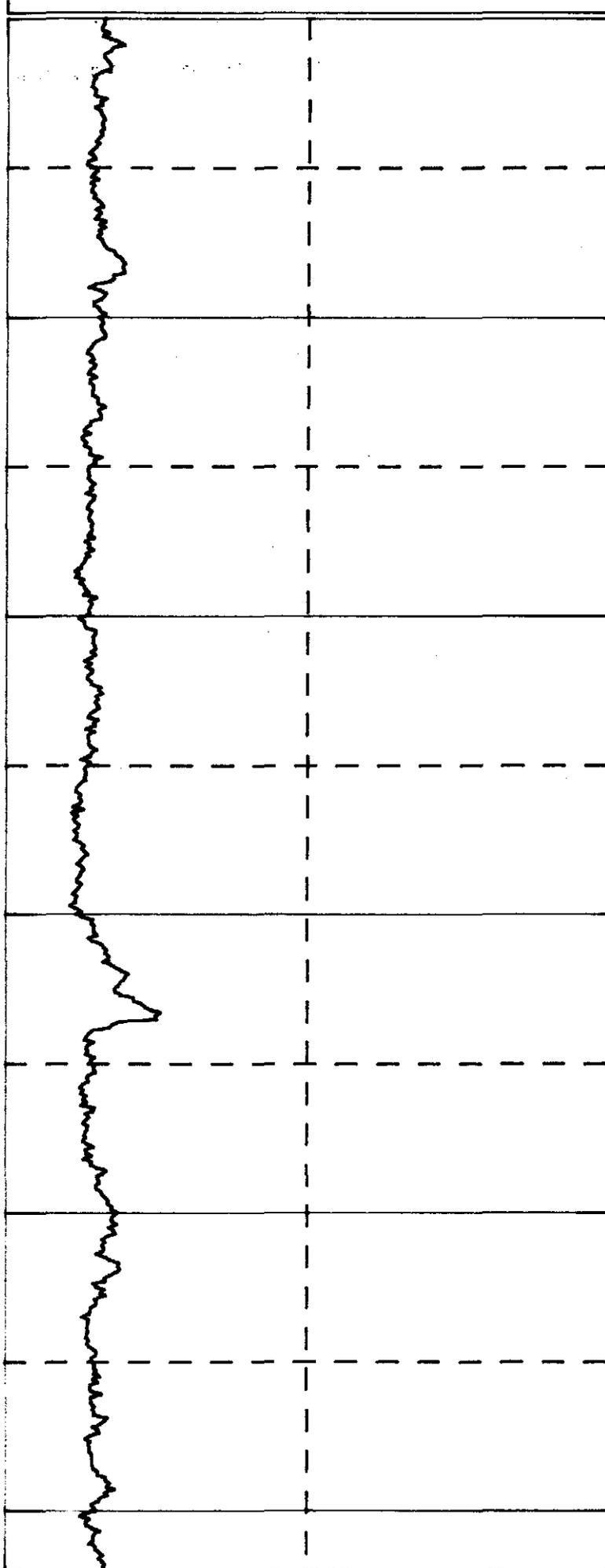
L. S. DENSITY (0-500 C. P. S.)

CALIPER (0-10 In.)



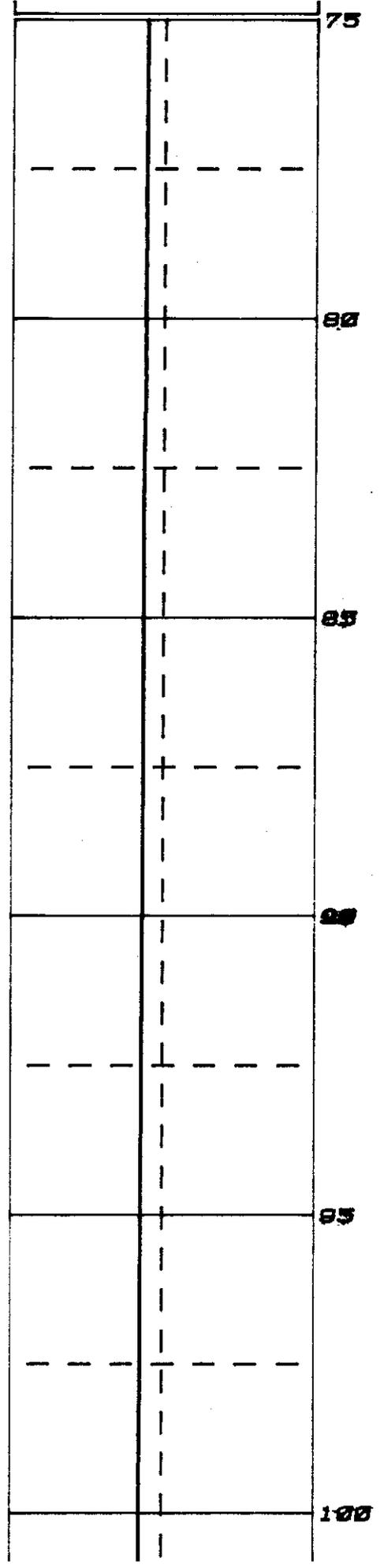
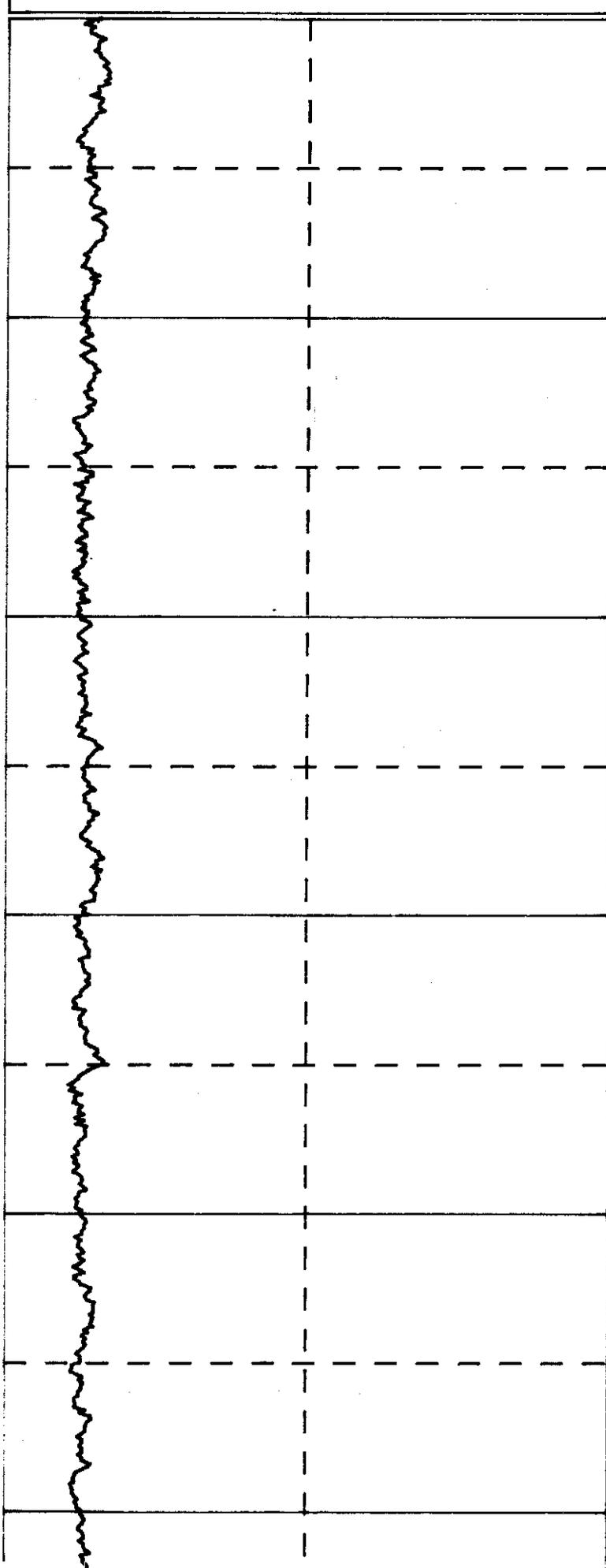
L. S. DENSITY (Ø-500 C. P. S.)

CALIPER (Ø-10 In.)



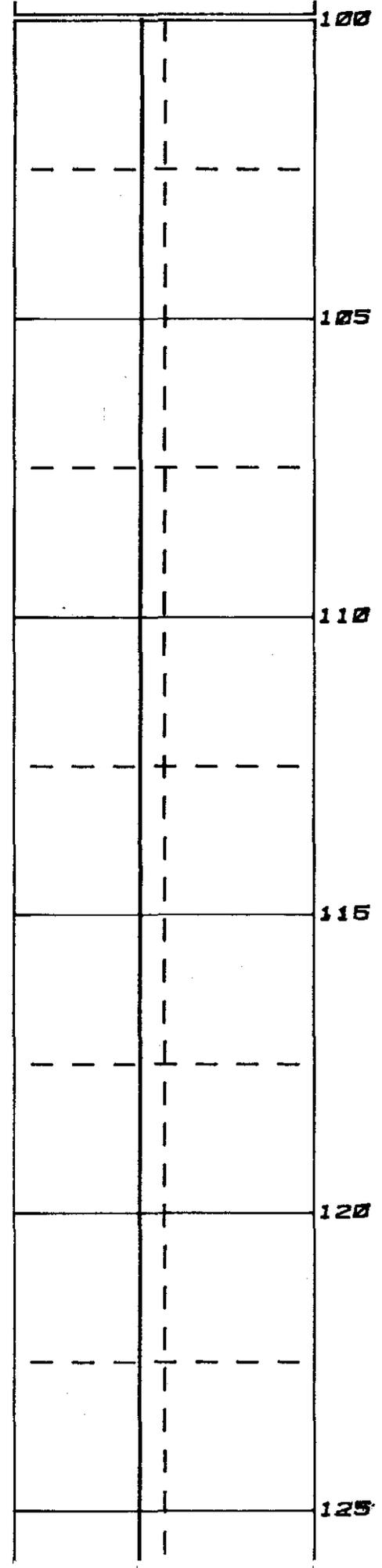
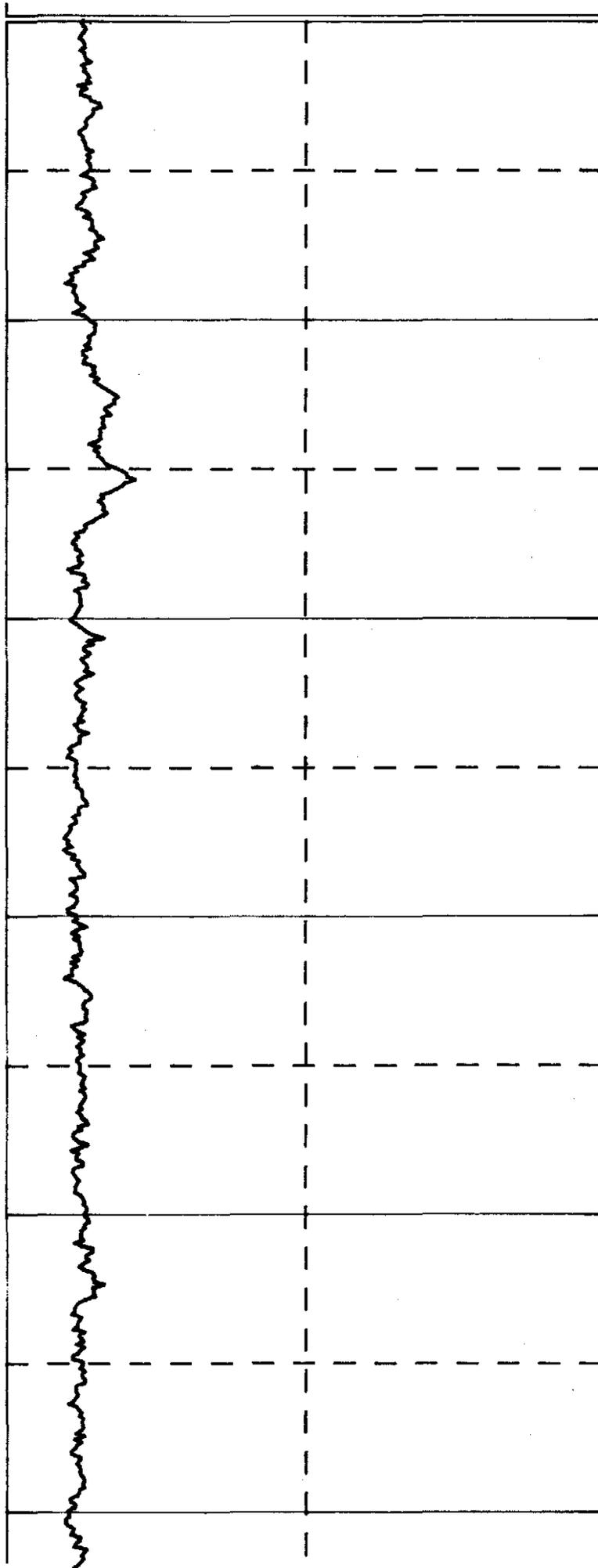
L. S. DENSITY (0-500 C. P. S.)

CALIPER (0-10 In.)



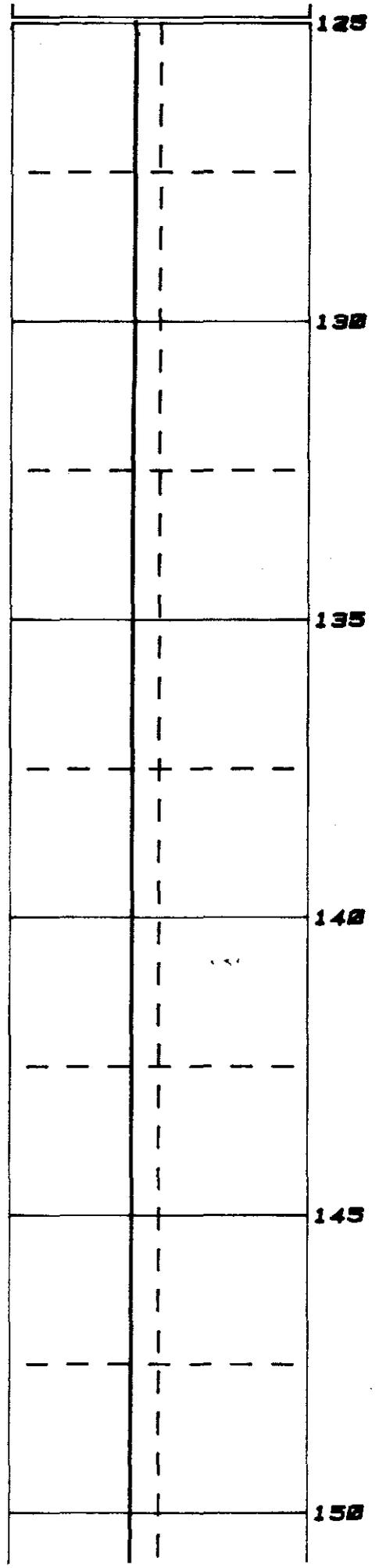
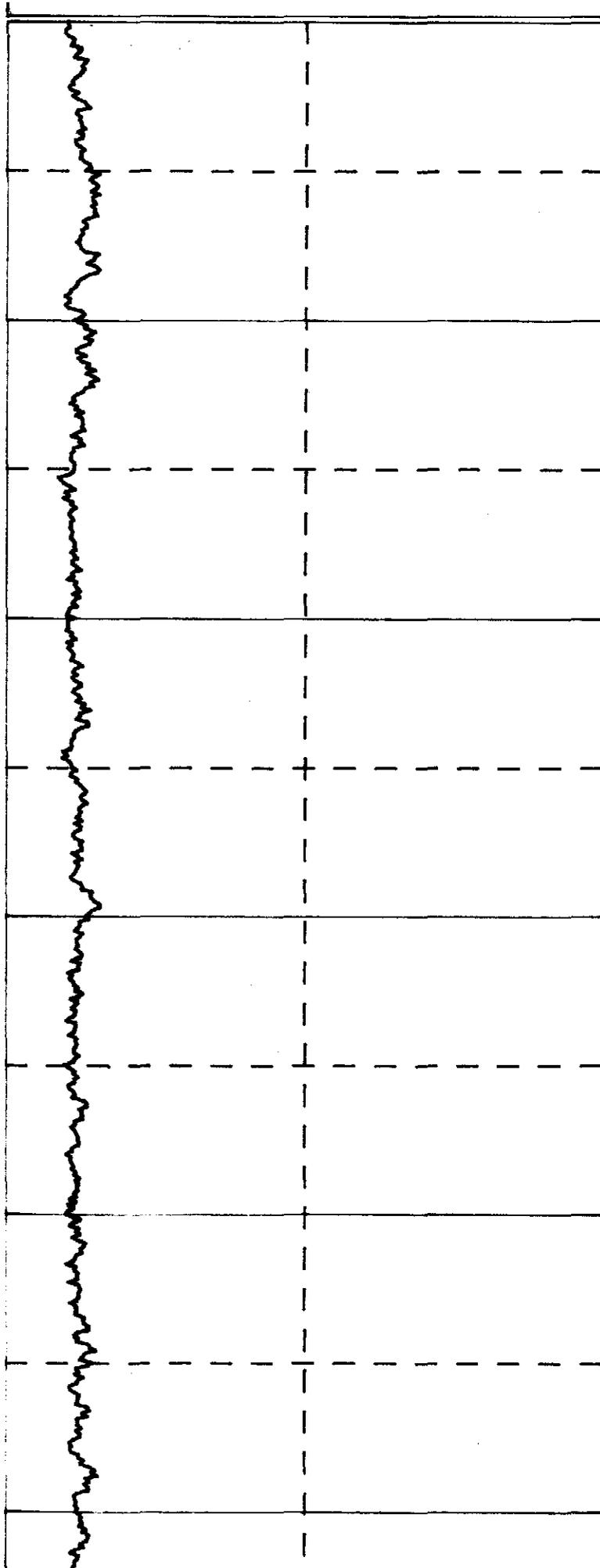
L. S. DENSITY (0-500 C. P. S.)

CALIPER (0-10 In.)



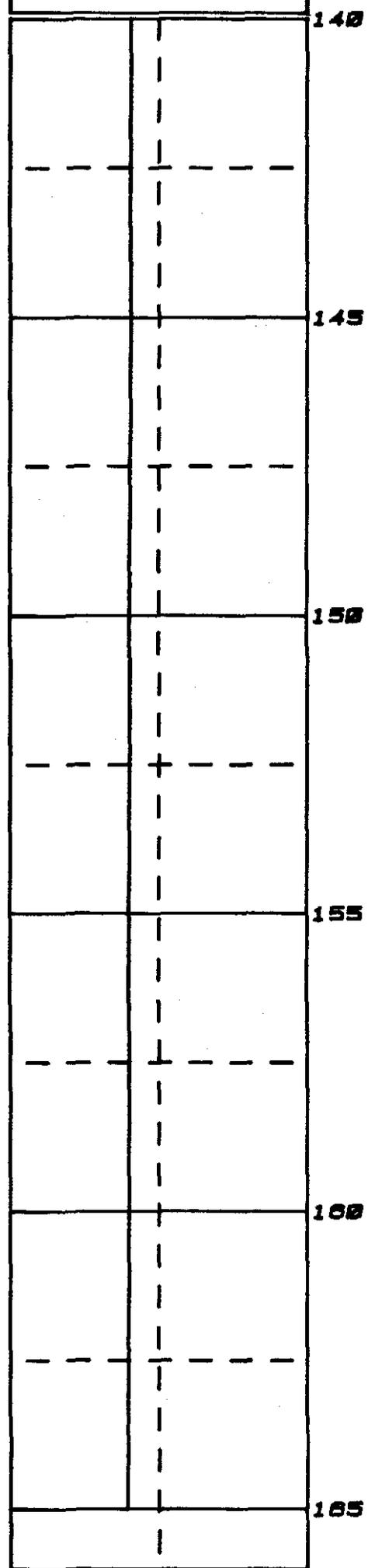
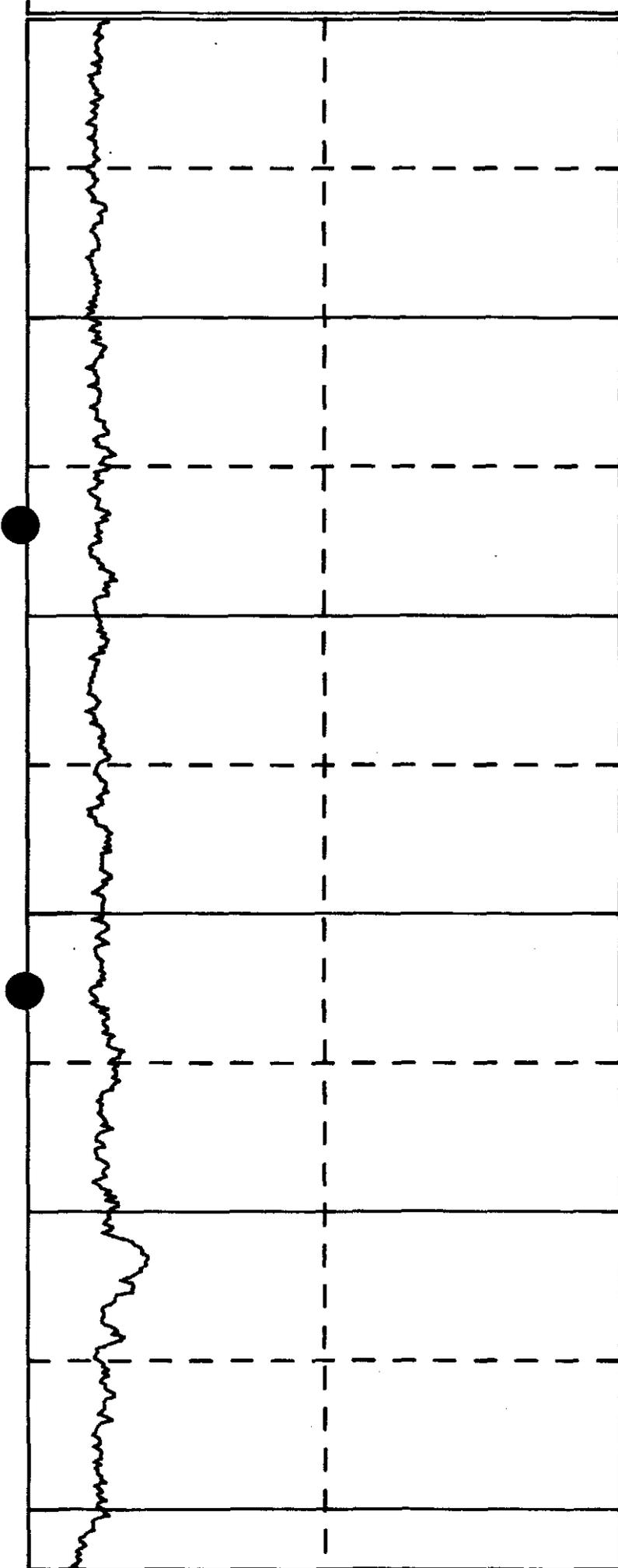
L. S. DENSITY (G-500 C. P. S.)

CALIPER (8-18 In.)



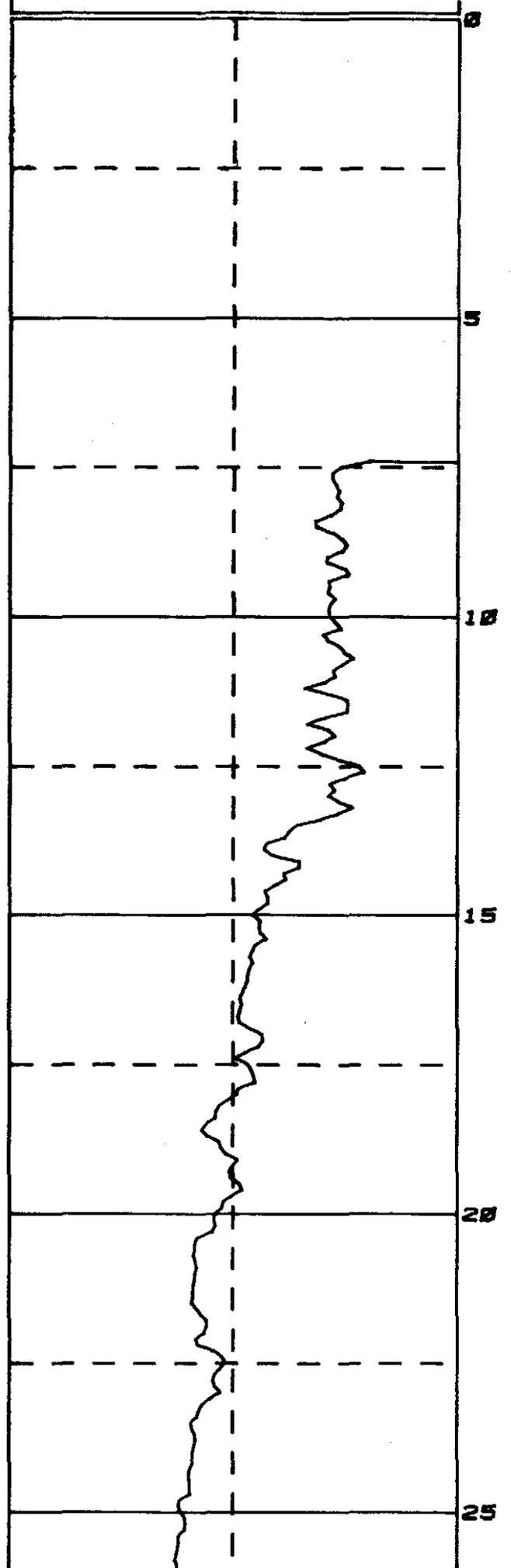
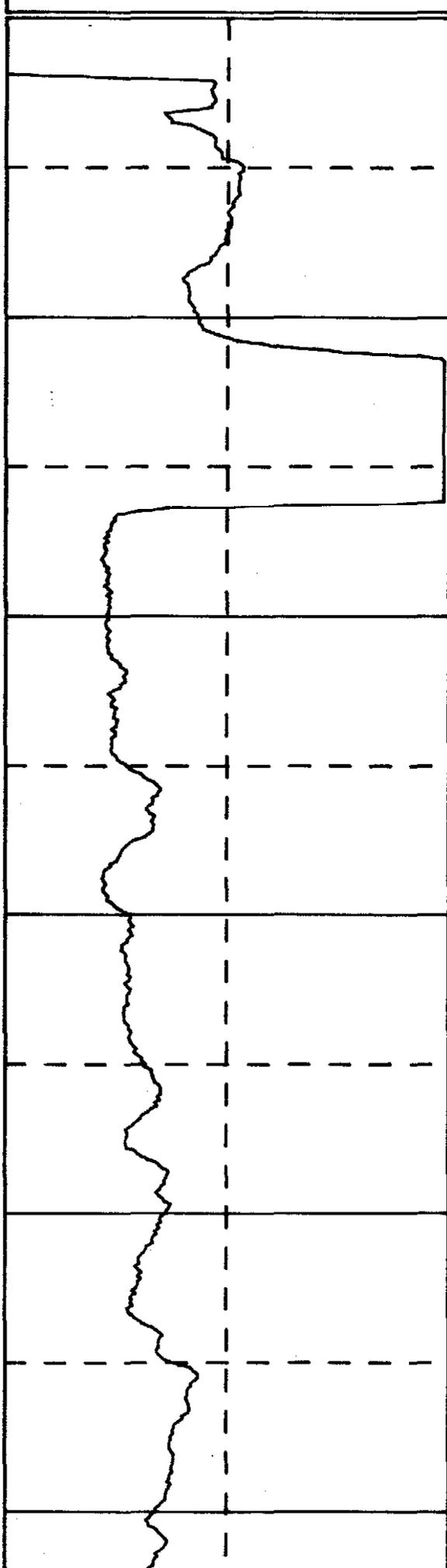
L. S. DENSITY (0-500 C. P. S.)

CALIPER (0-10 In.)



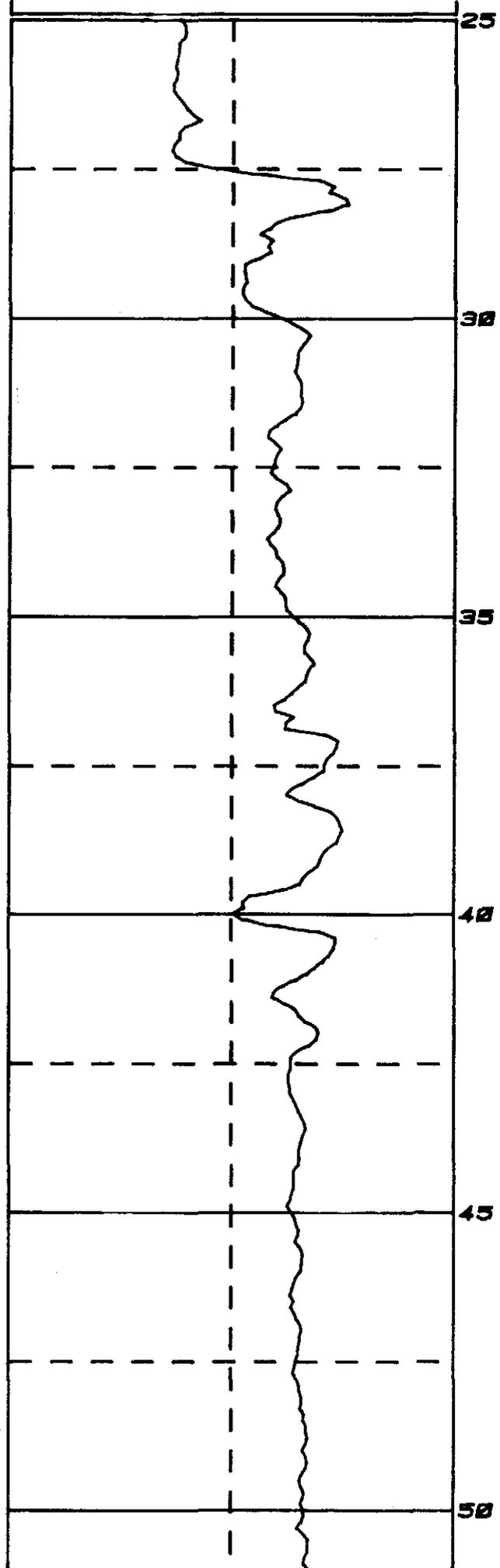
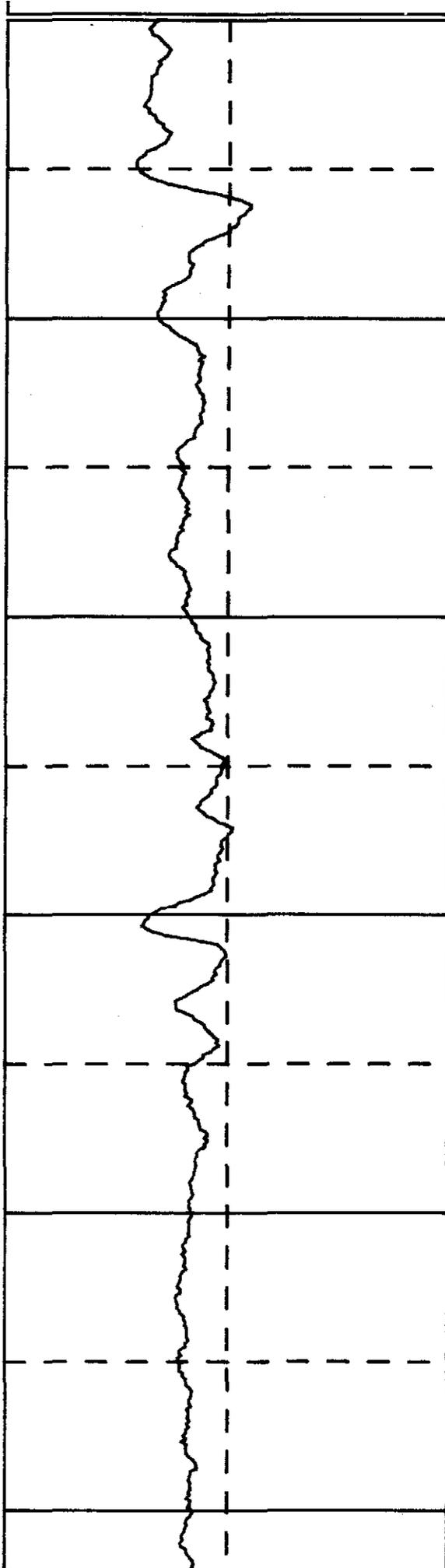
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (150-400 OHMS)



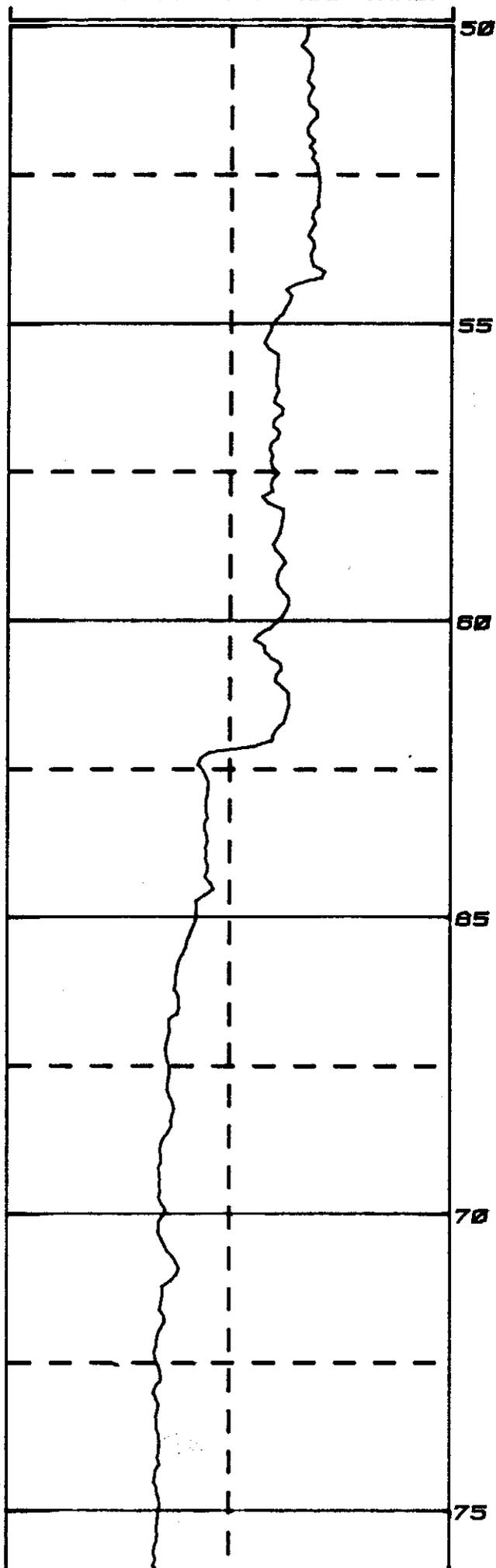
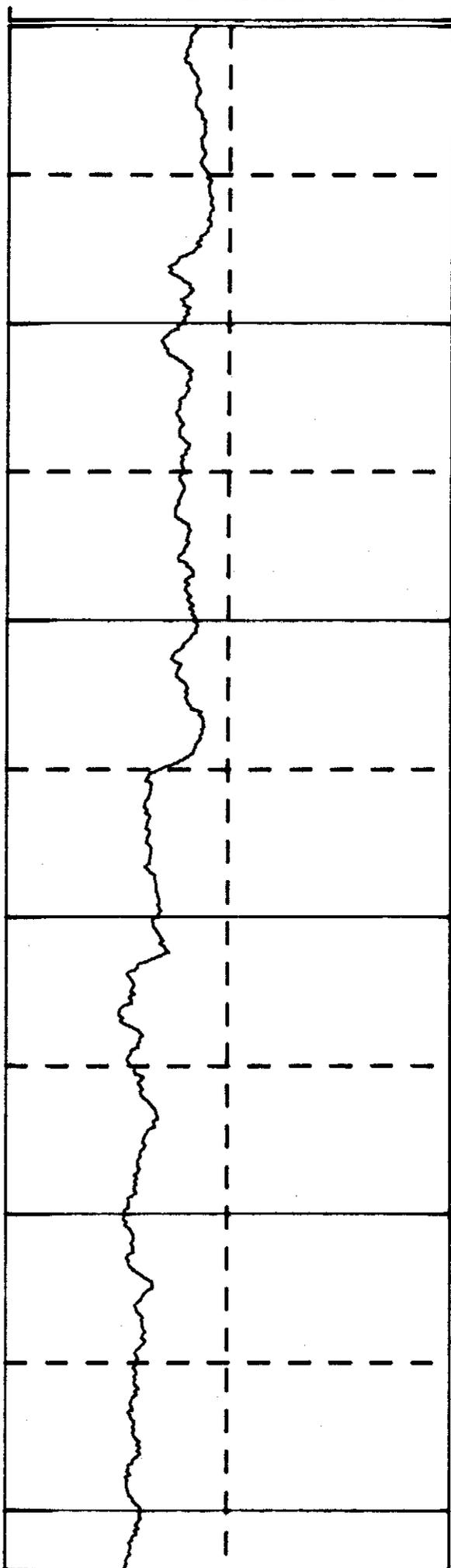
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (150-400 OHMS)



NEUTRON (0-10000 C. P. S.)

RESISTIVITY (150-400 OHMS)

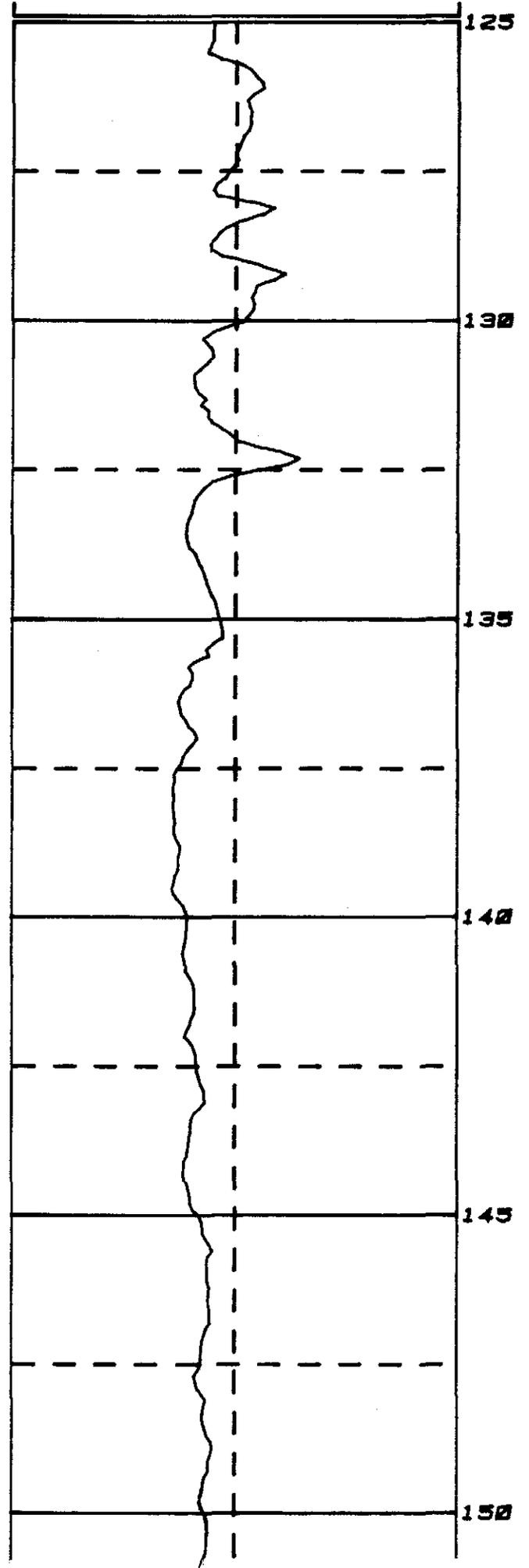
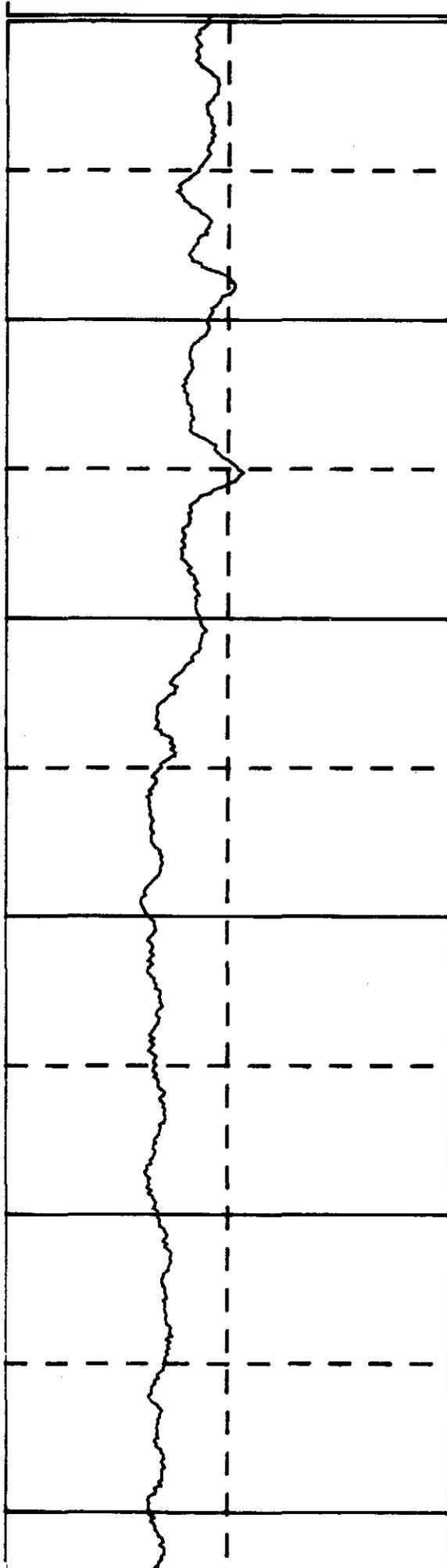






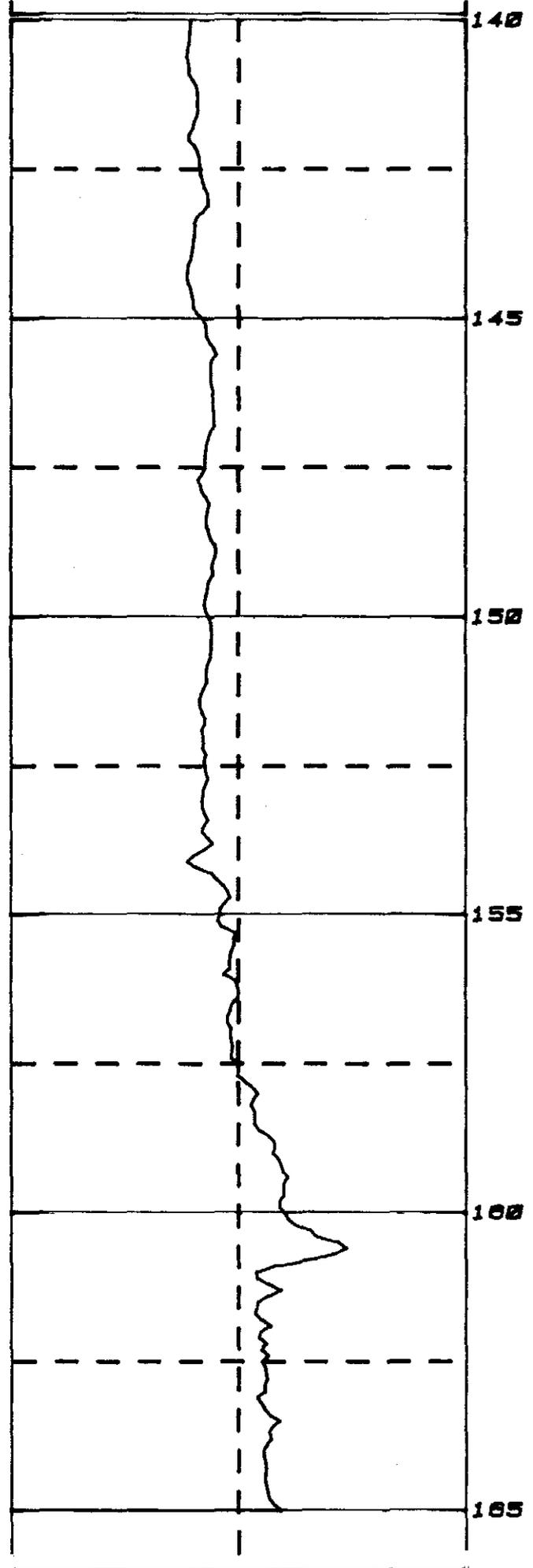
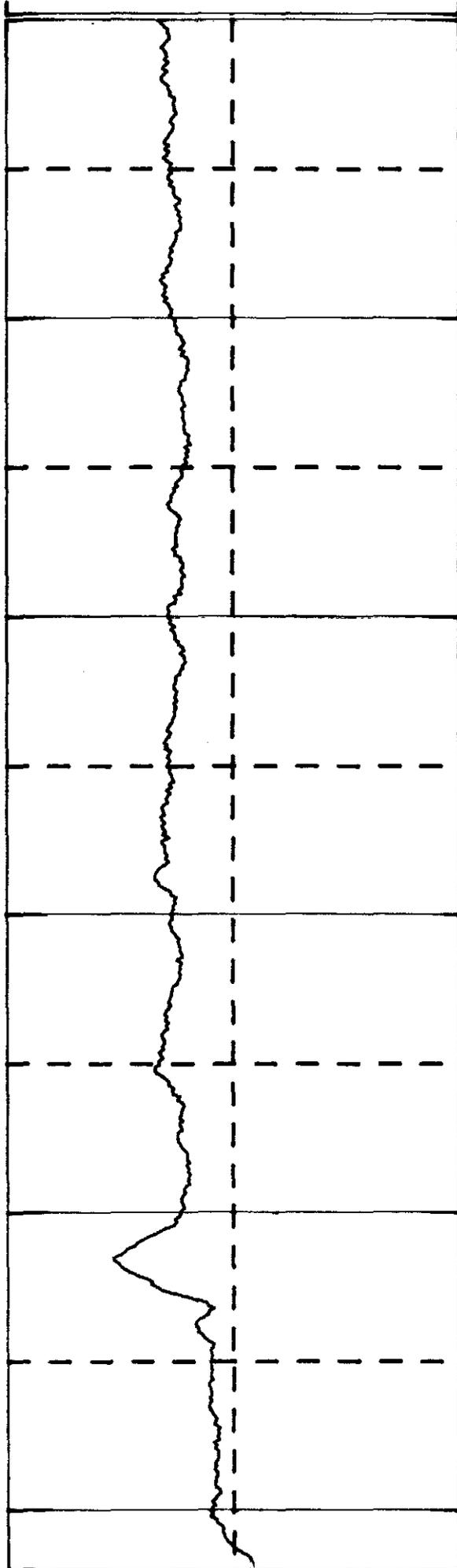
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (150-400 OHMS)

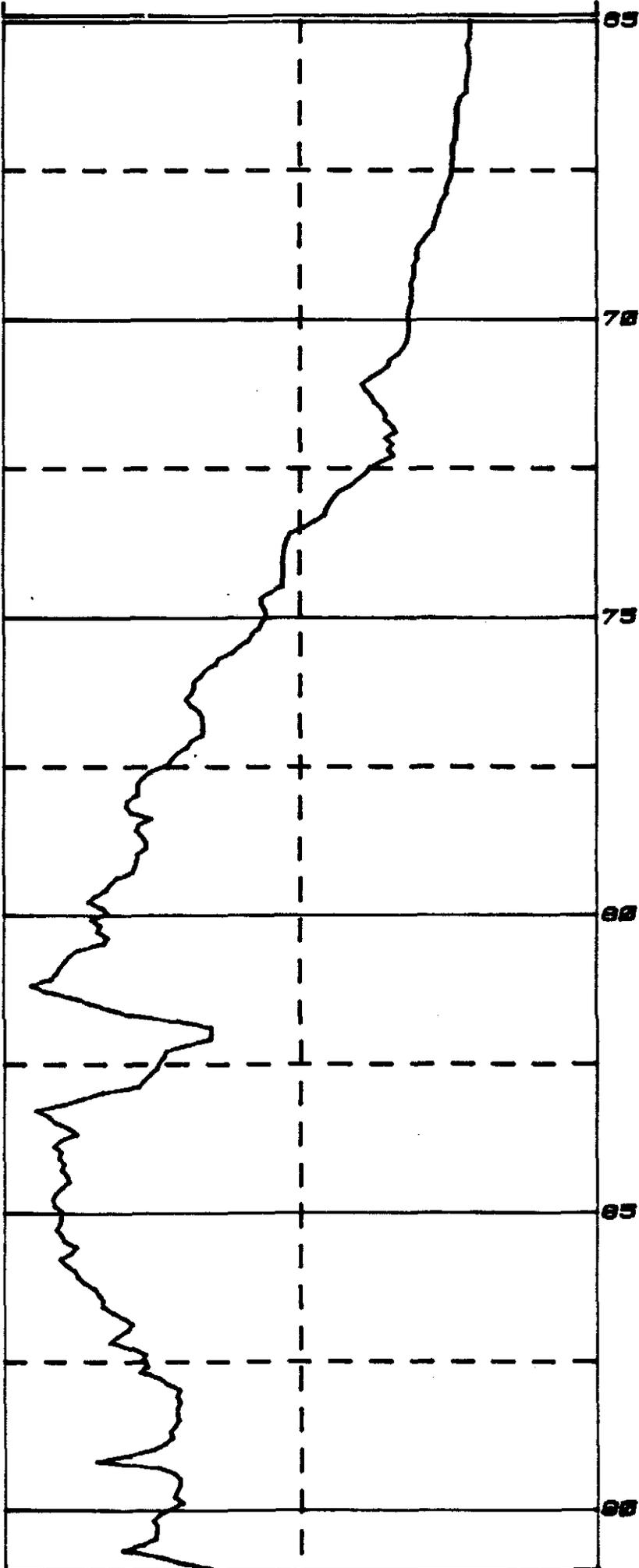


NEUTRON (2-10000 C. P. S.)

RESISTIVITY (150-400 OHMS)

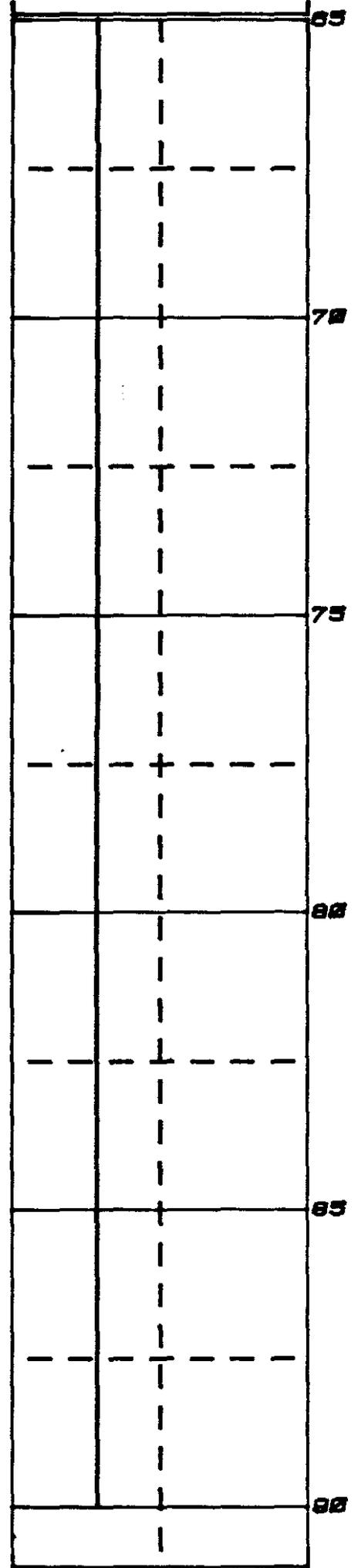
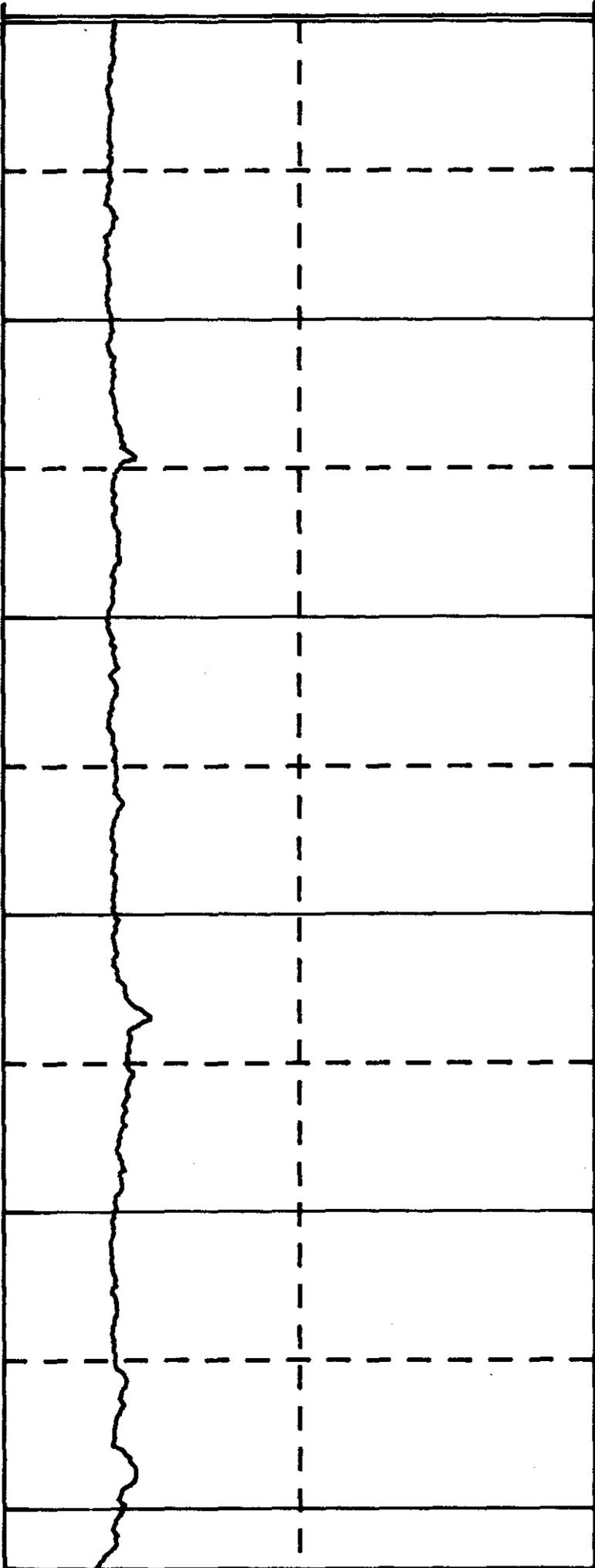


SELF POTENTIAL (-95 to -70 mV.)



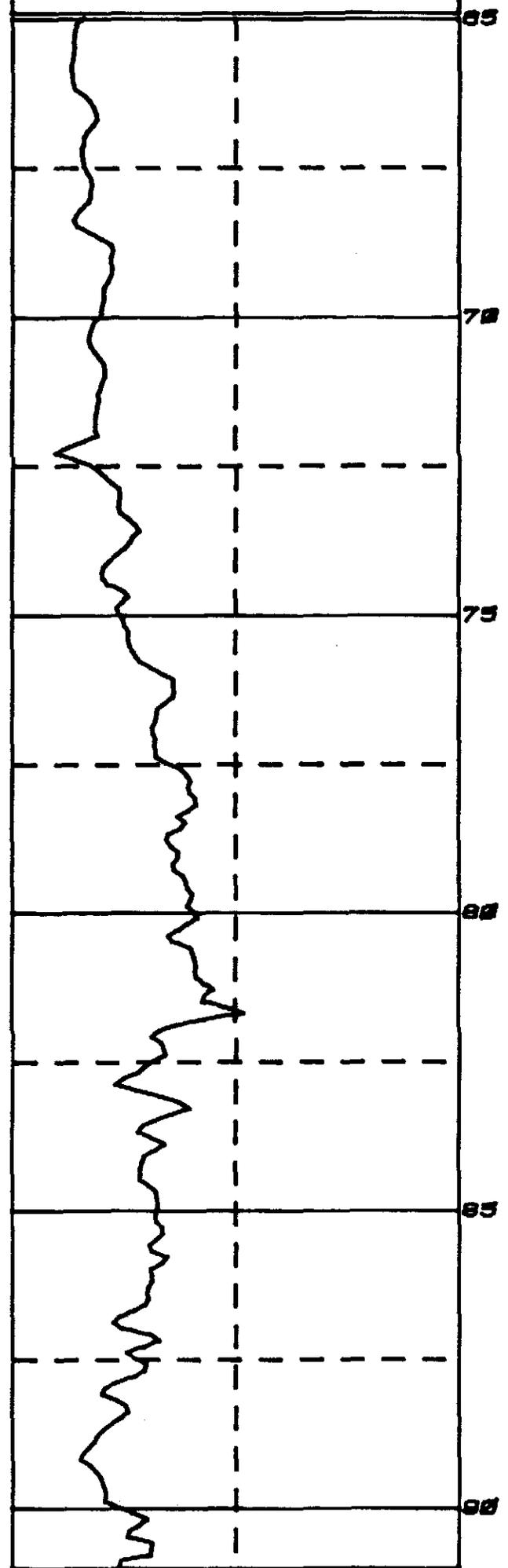
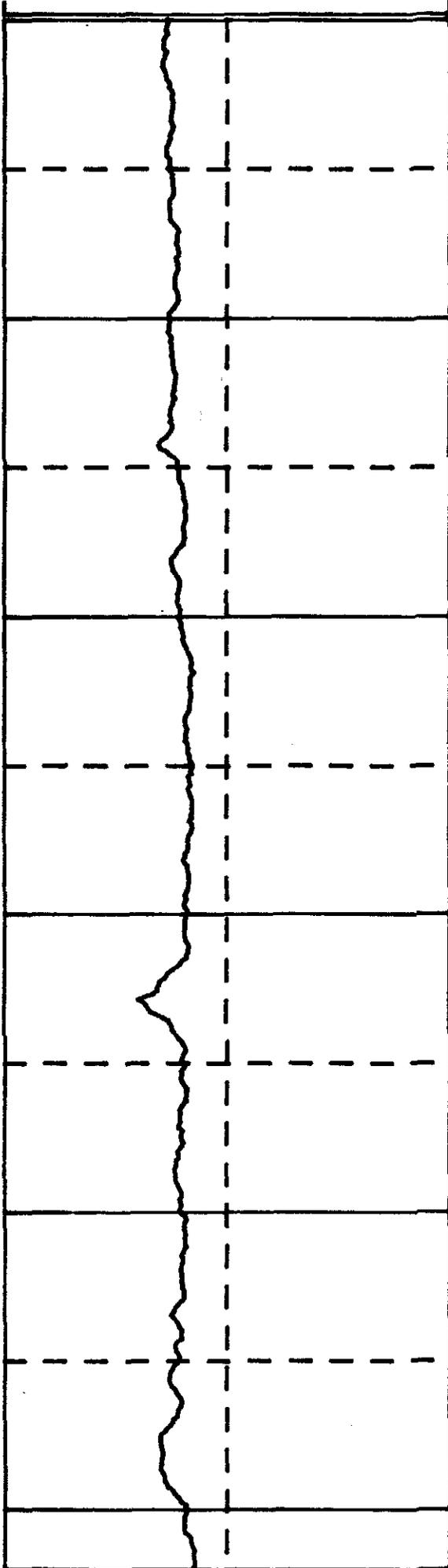
DENSITY (0-5000 C.P.S.)

CALIPER (0-10 In.)

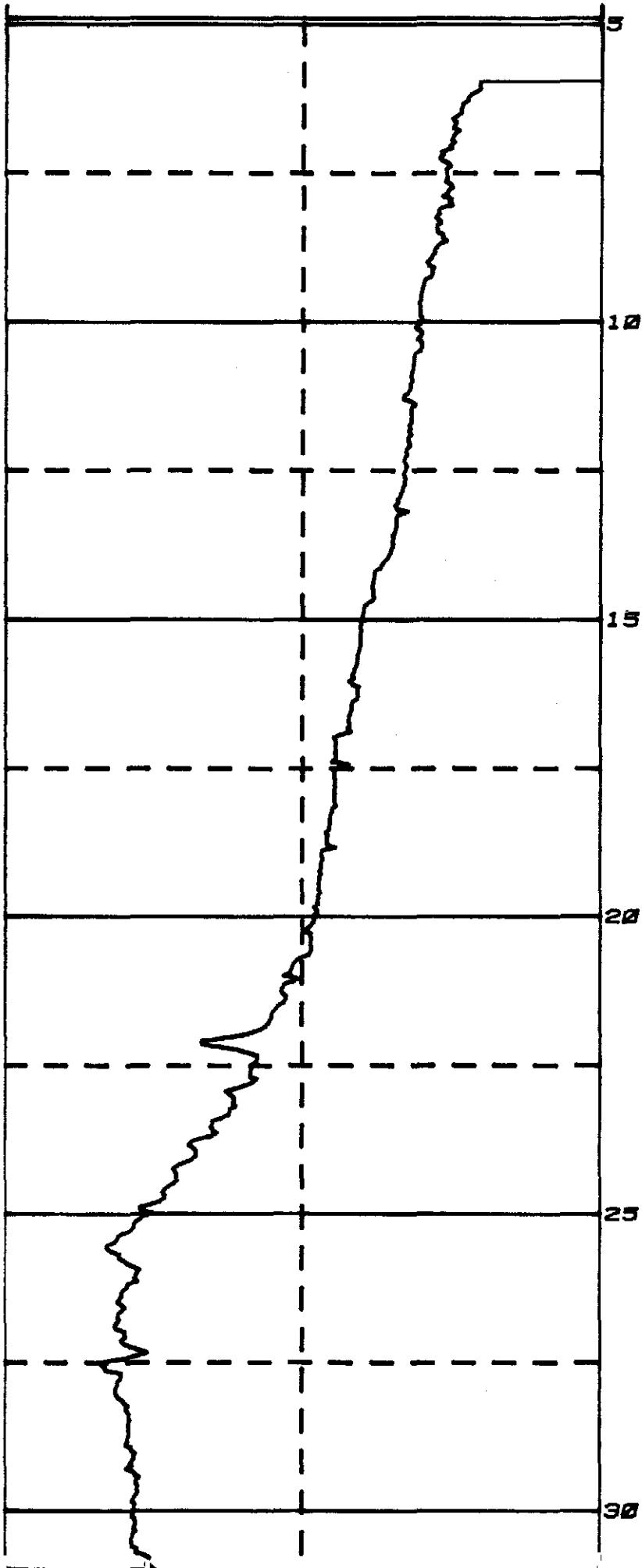


NEUTRON (0-10000 C. P. S.)

RESISTIVITY (150-400 OHMS)

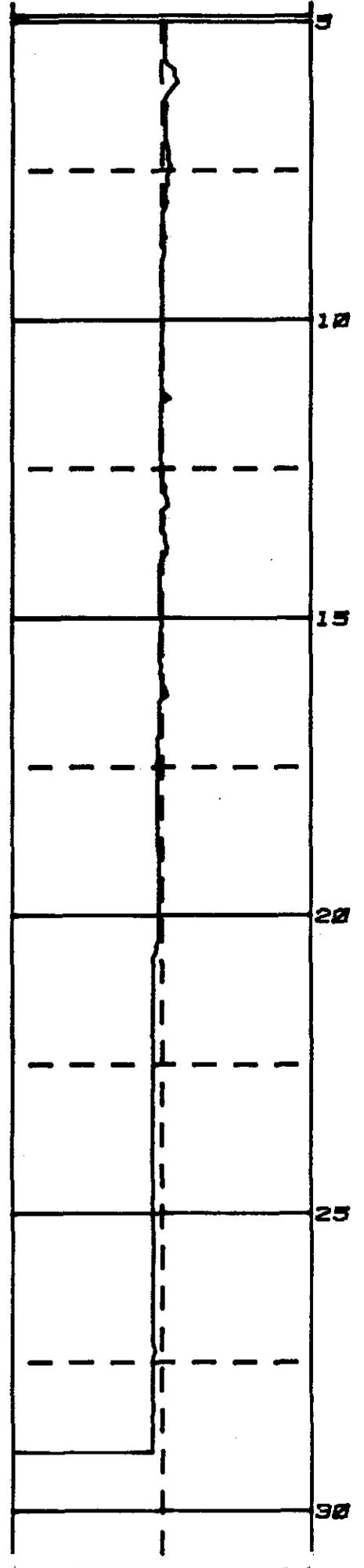
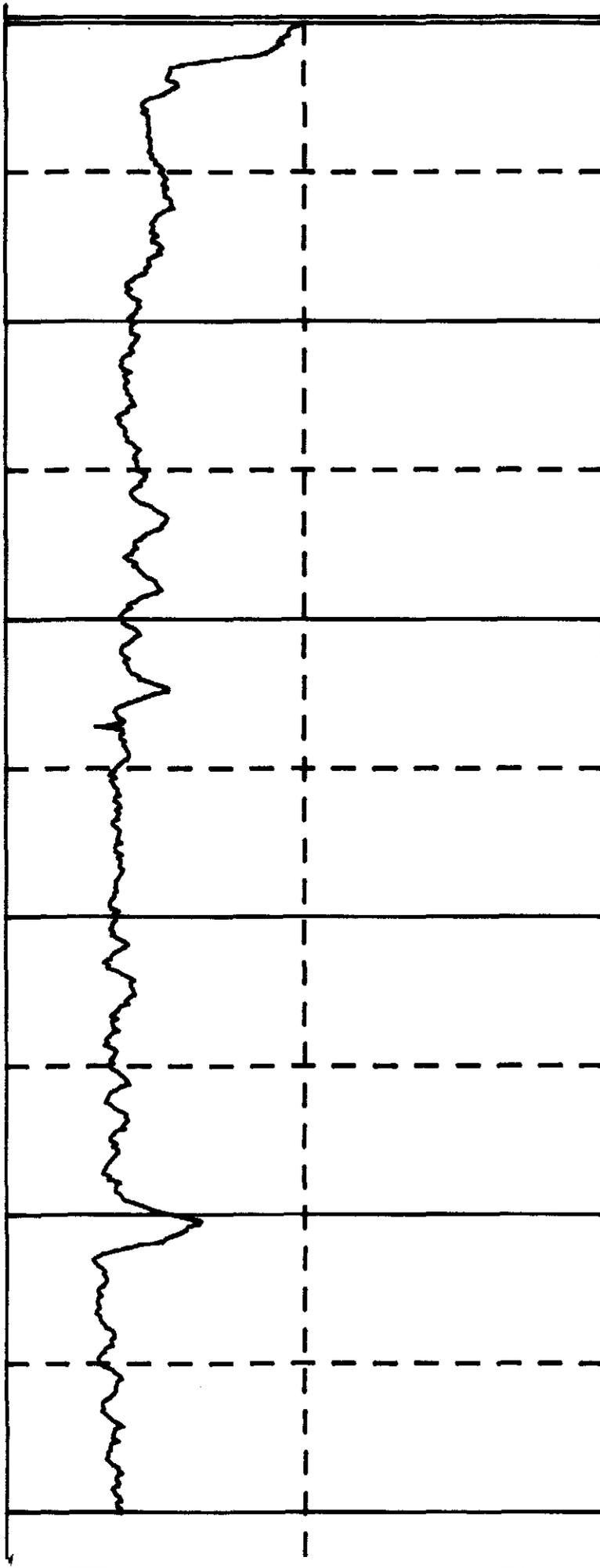


SELF POTENTIAL (-70 to +30 mV.)



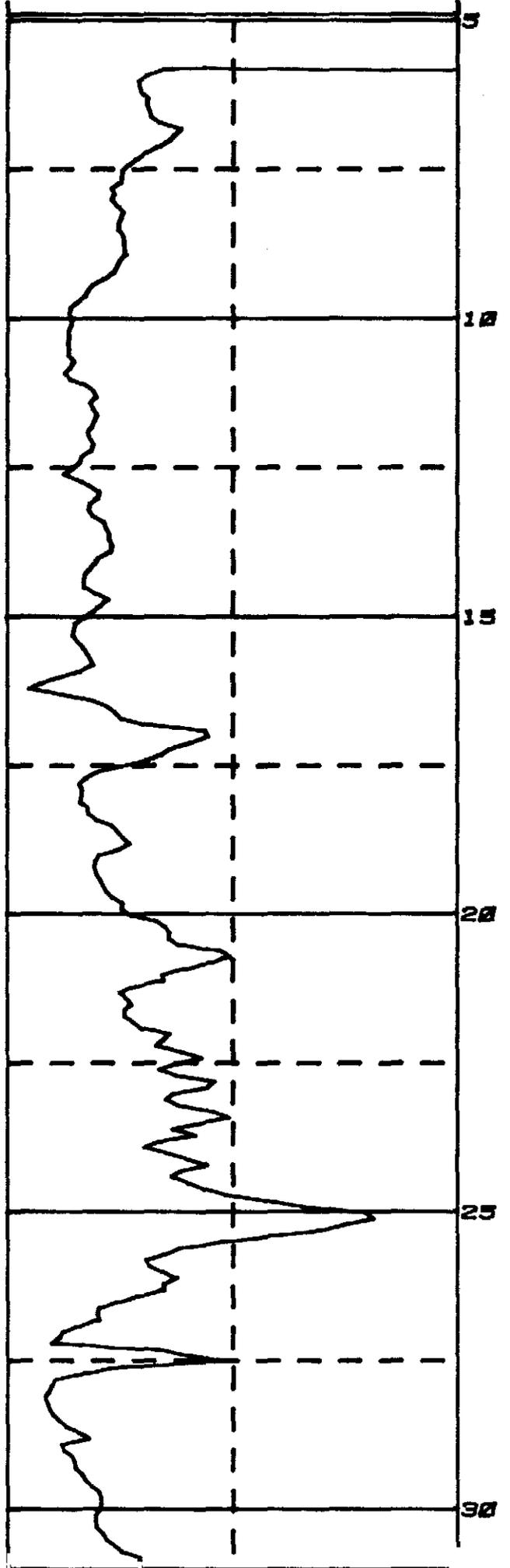
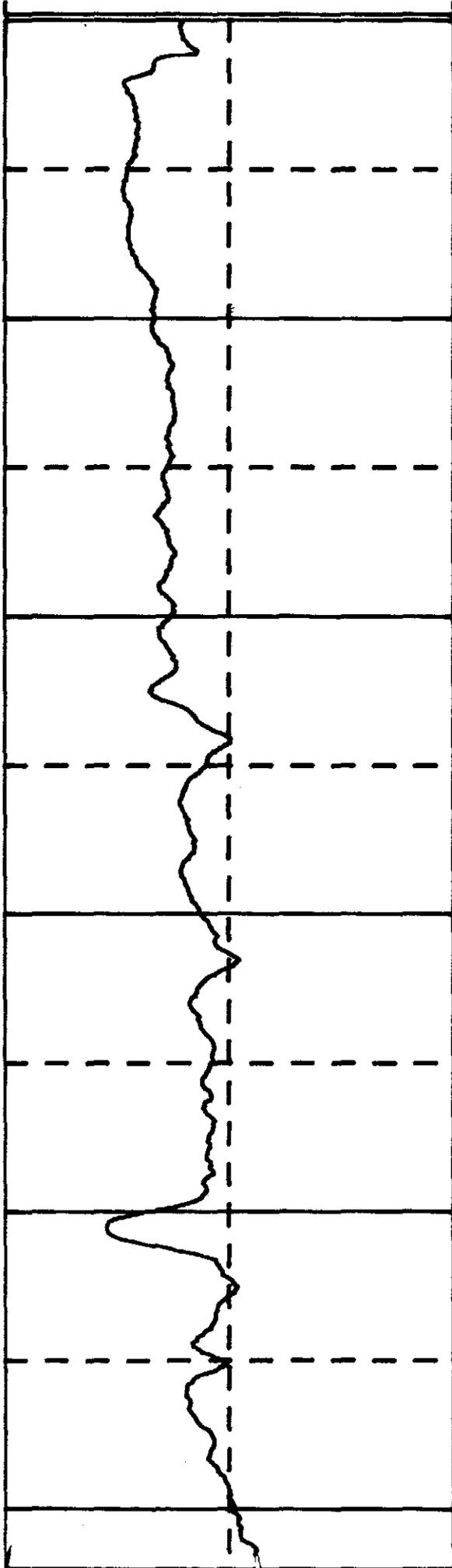
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)

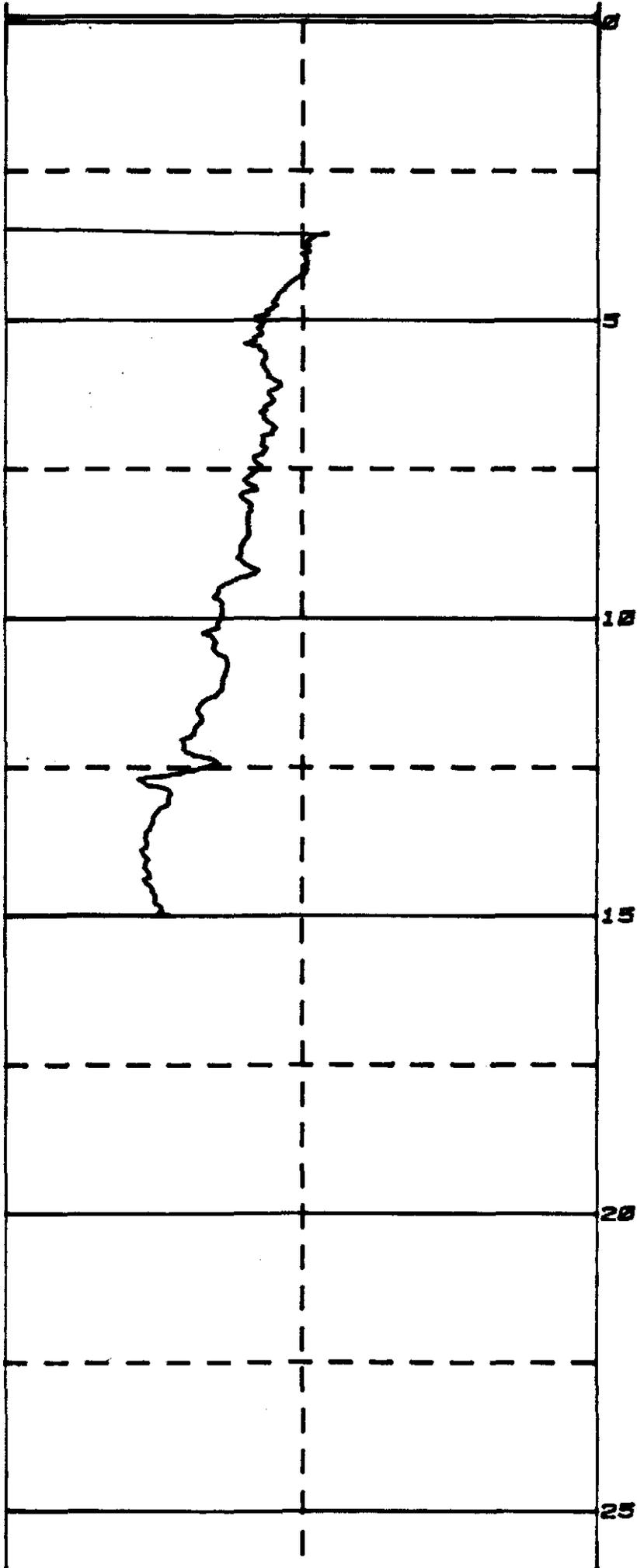


NEUTRON (0-10000 C.P.S.)

RESISTIVITY (300-550 OHMS)



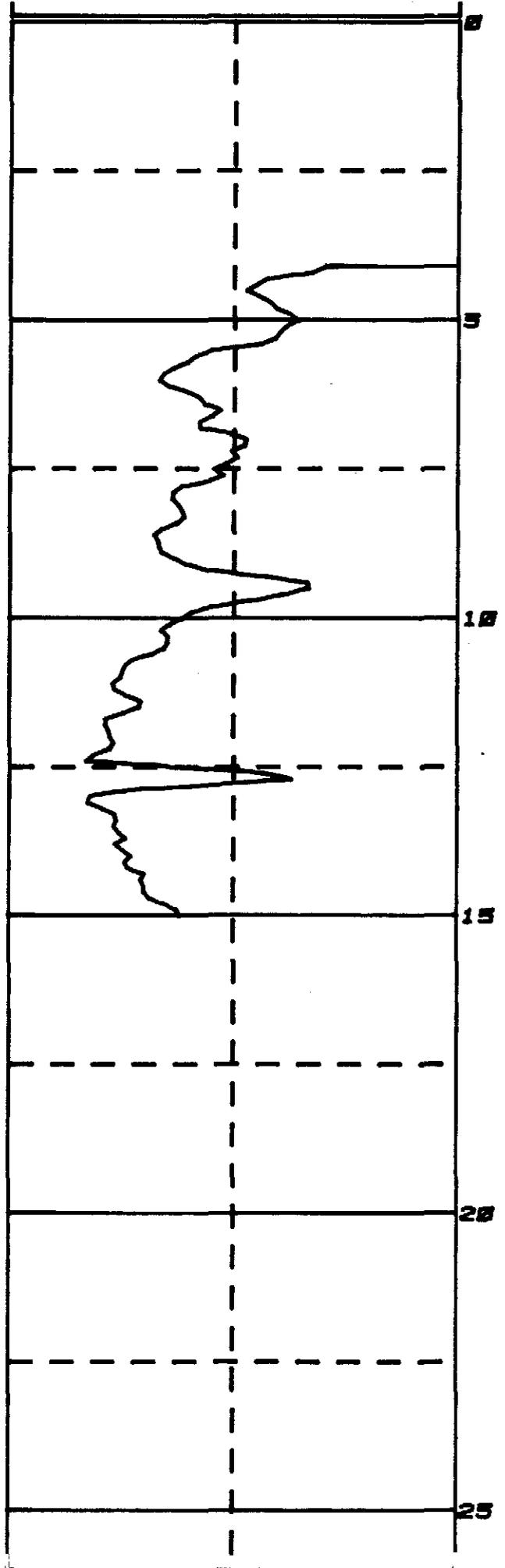
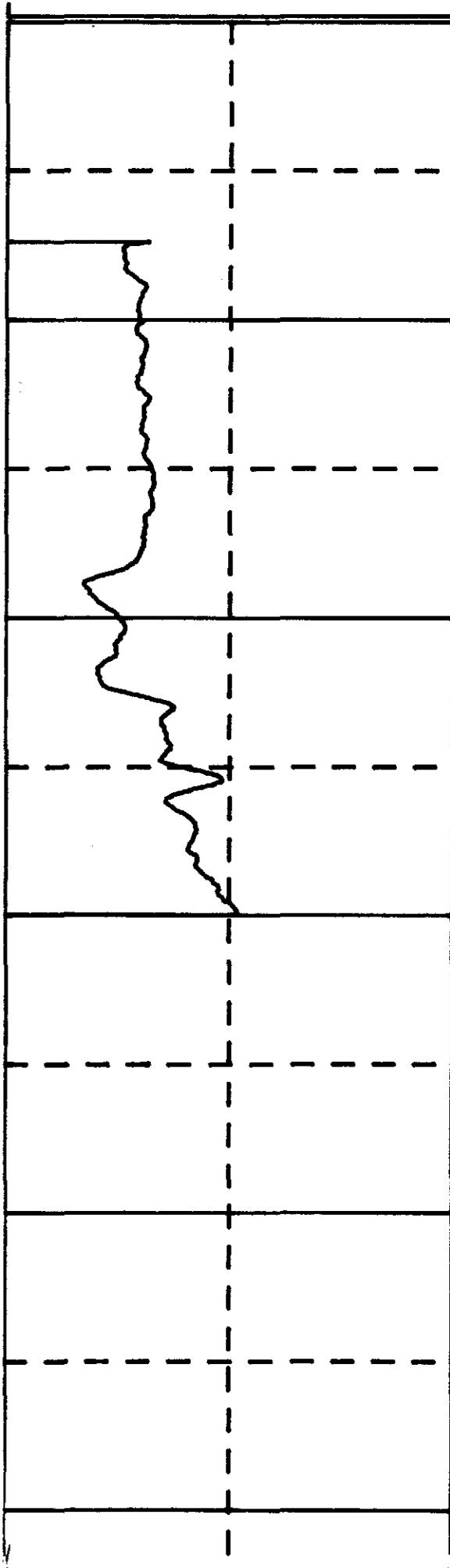
SELF POTENTIAL ( 25 to +125 mV. )



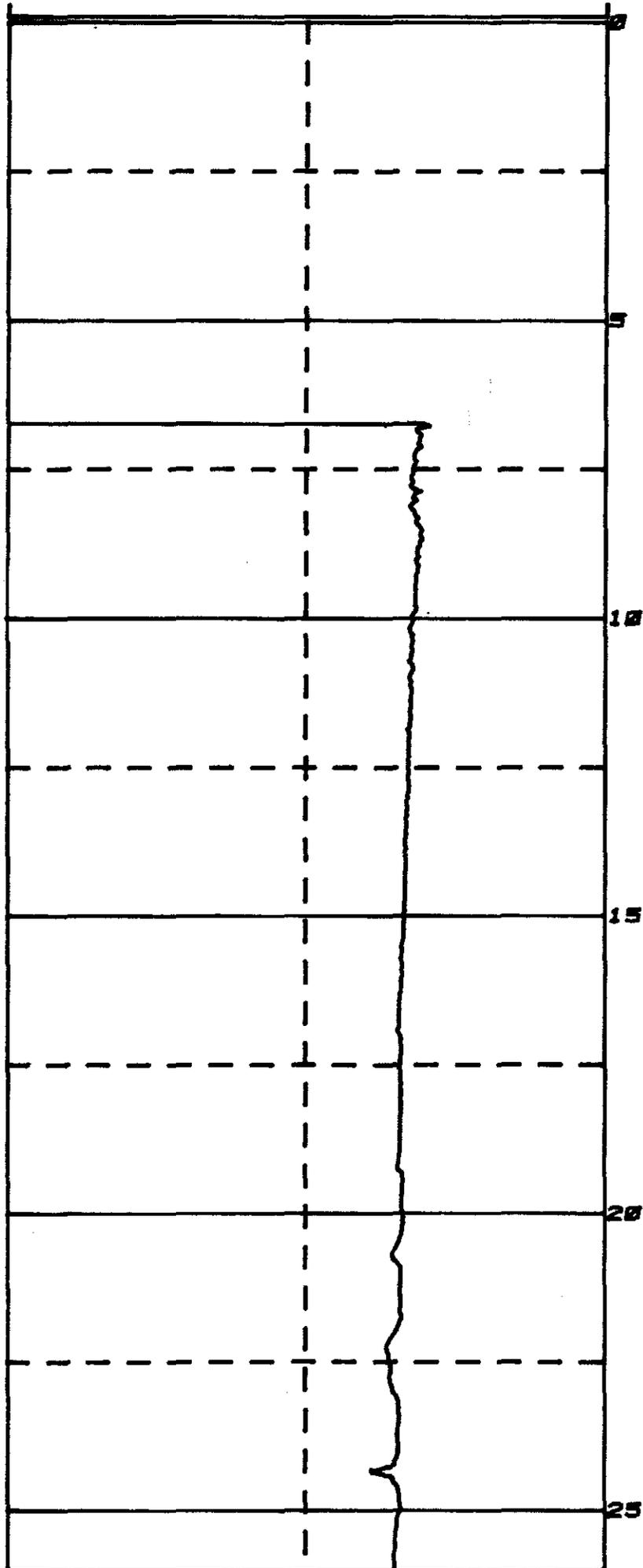


NEUTRON (0-10000 C.P.S.)

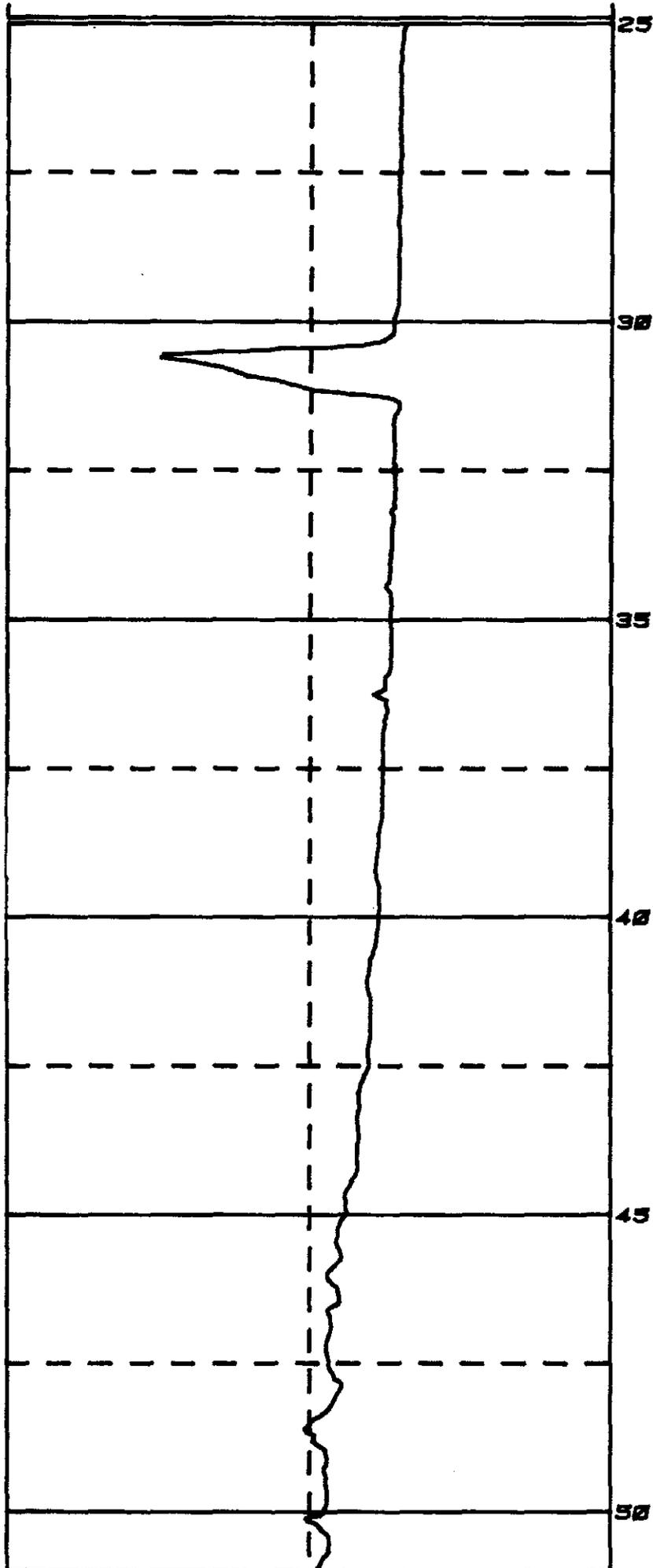
RESISTIVITY (400-800 OHMS)



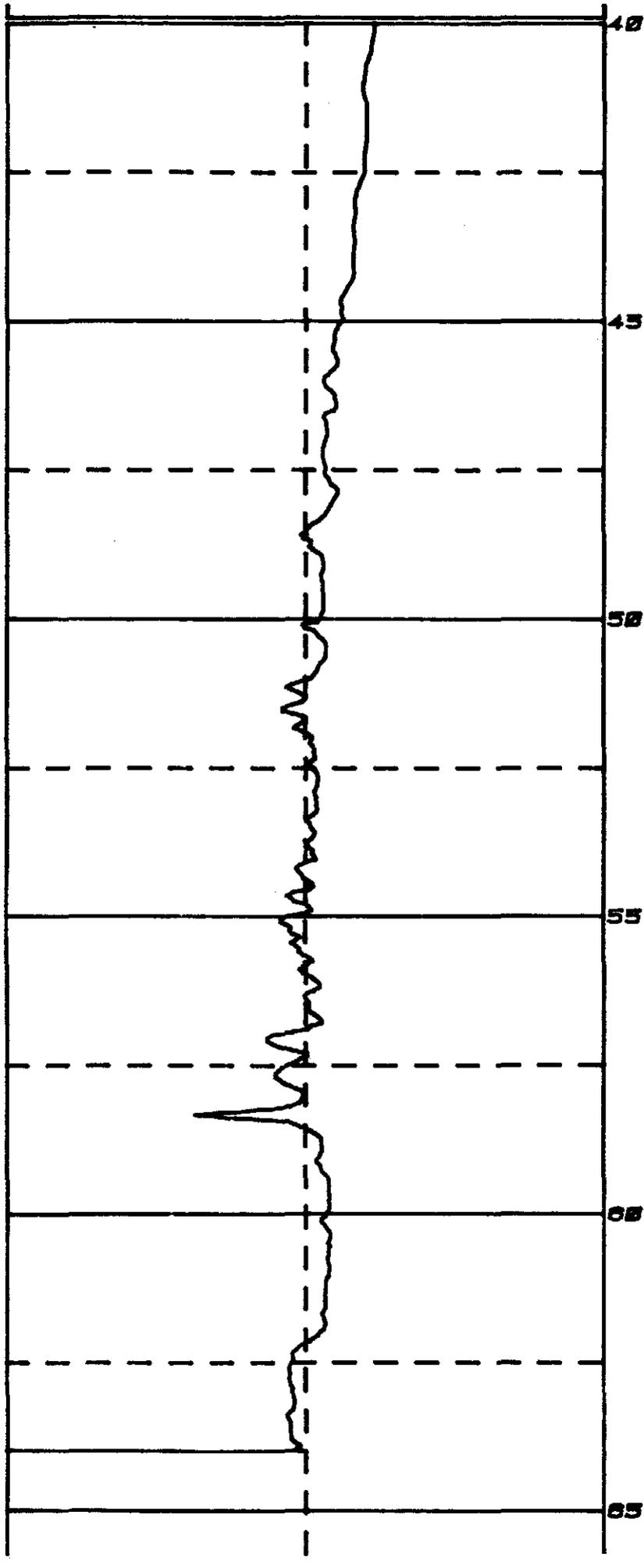
SELF POTENTIAL (-200 to +50 mV.)



SELF POTENTIAL (-200 to +50 mV.)

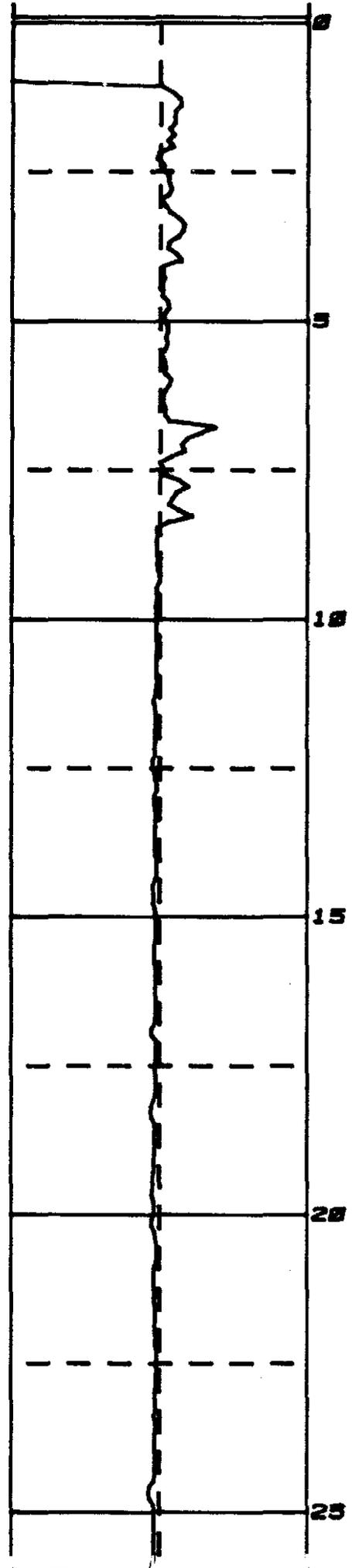
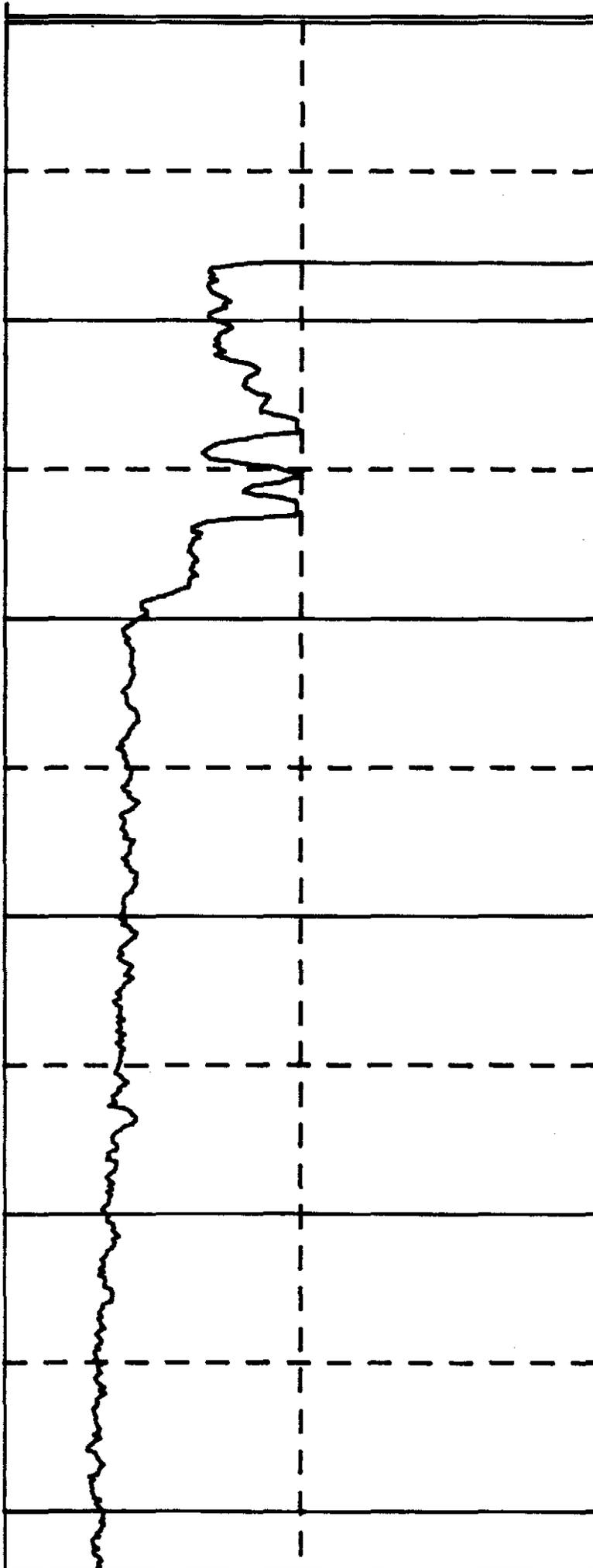


SELF POTENTIAL (-200 to +50 mV.)



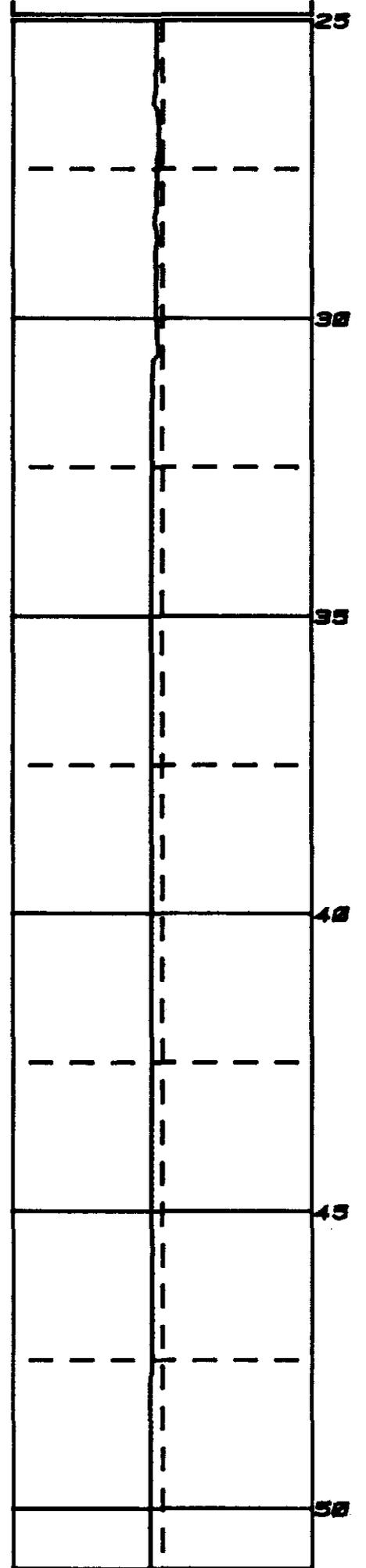
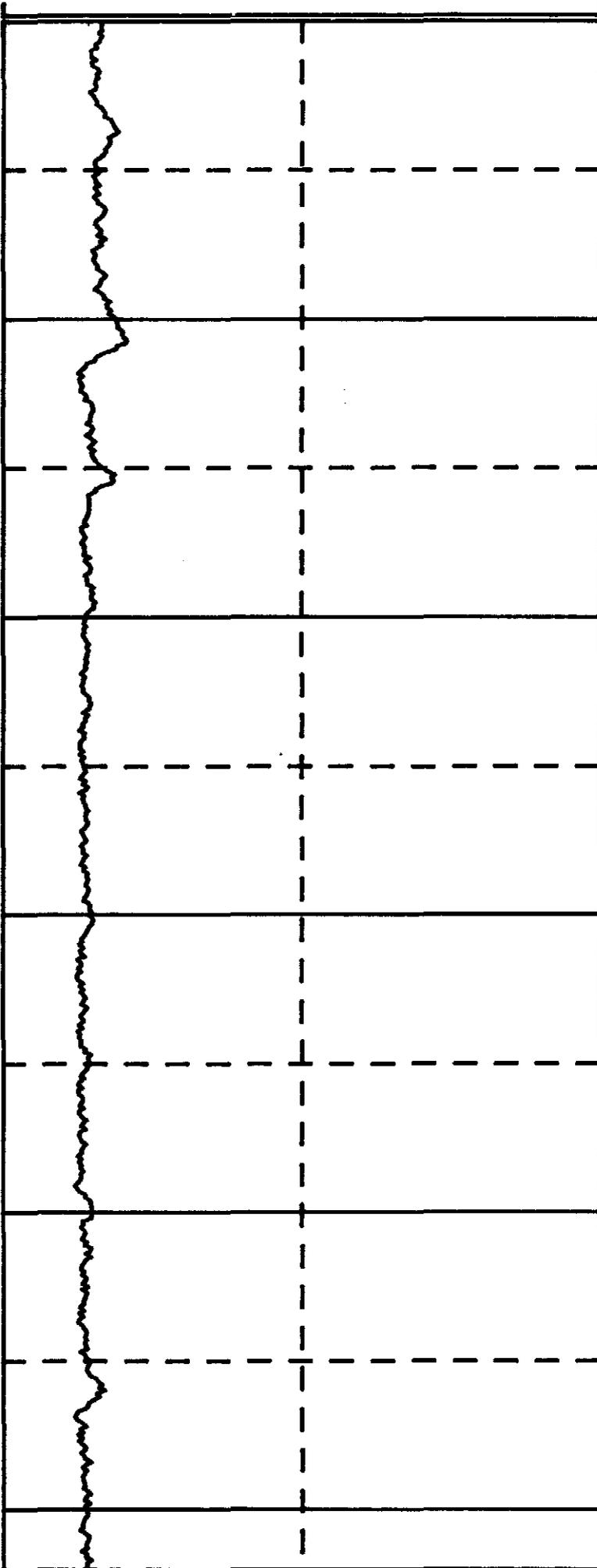
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)



DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)

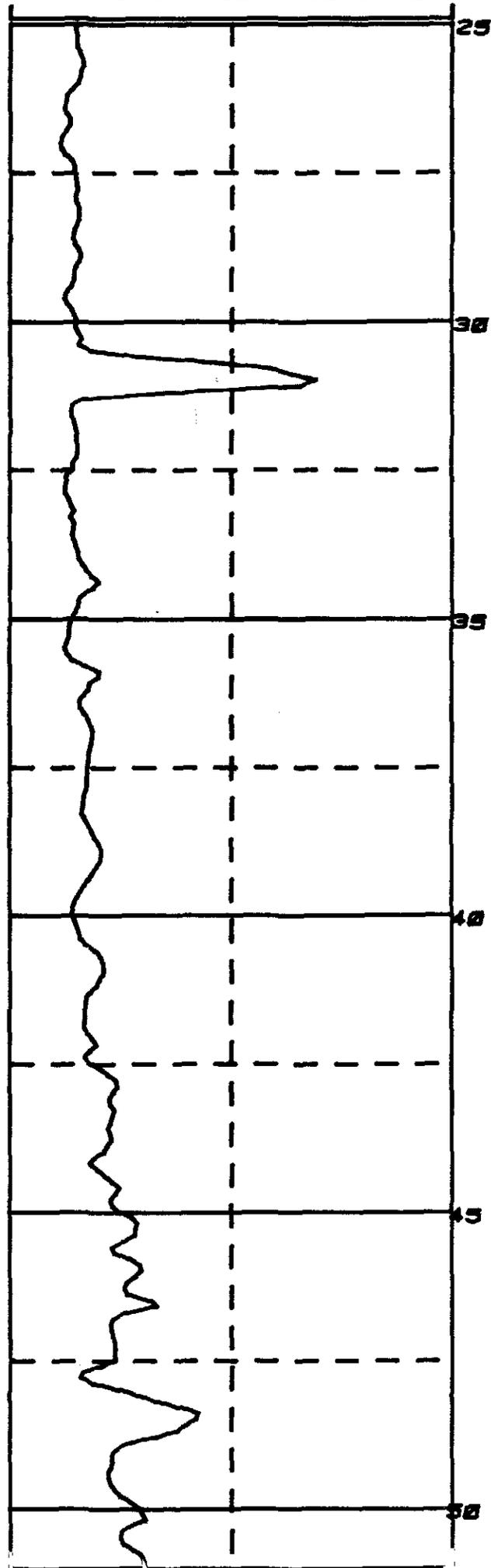
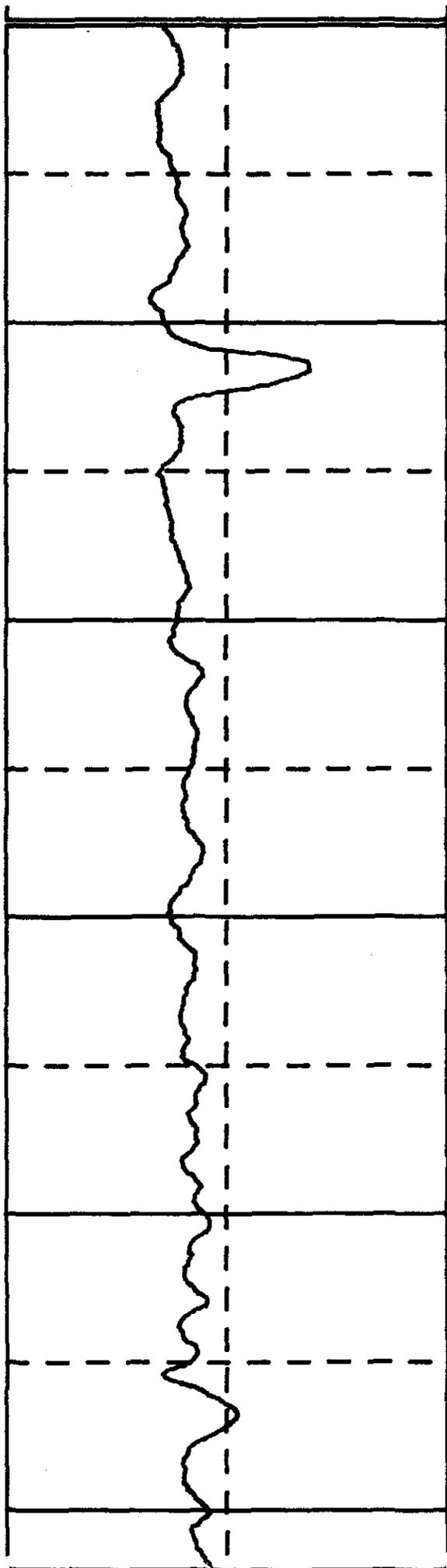






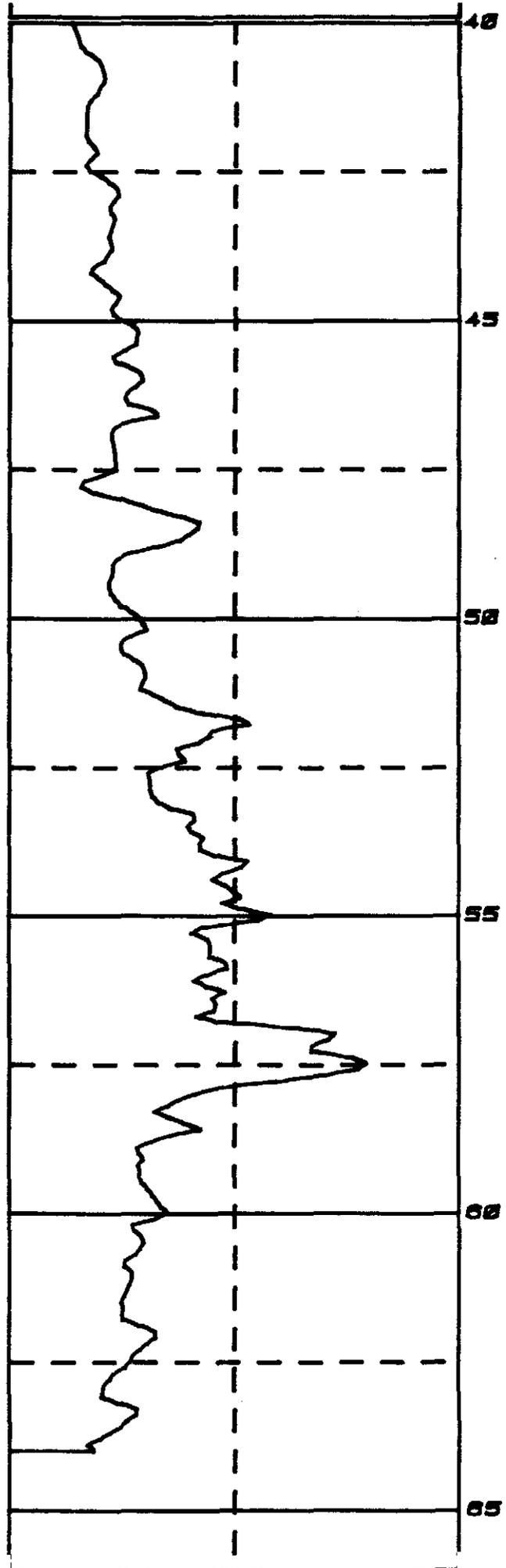
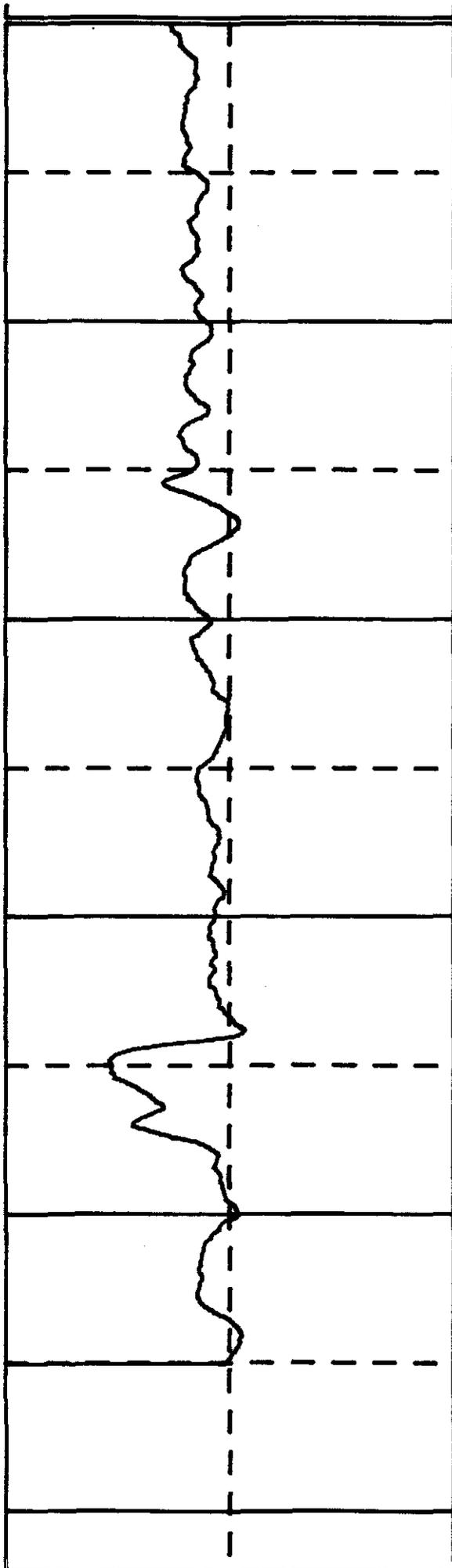
NEUTRON (2-10000 C. P. S.)

RESISTIVITY (200-700 OHMS)

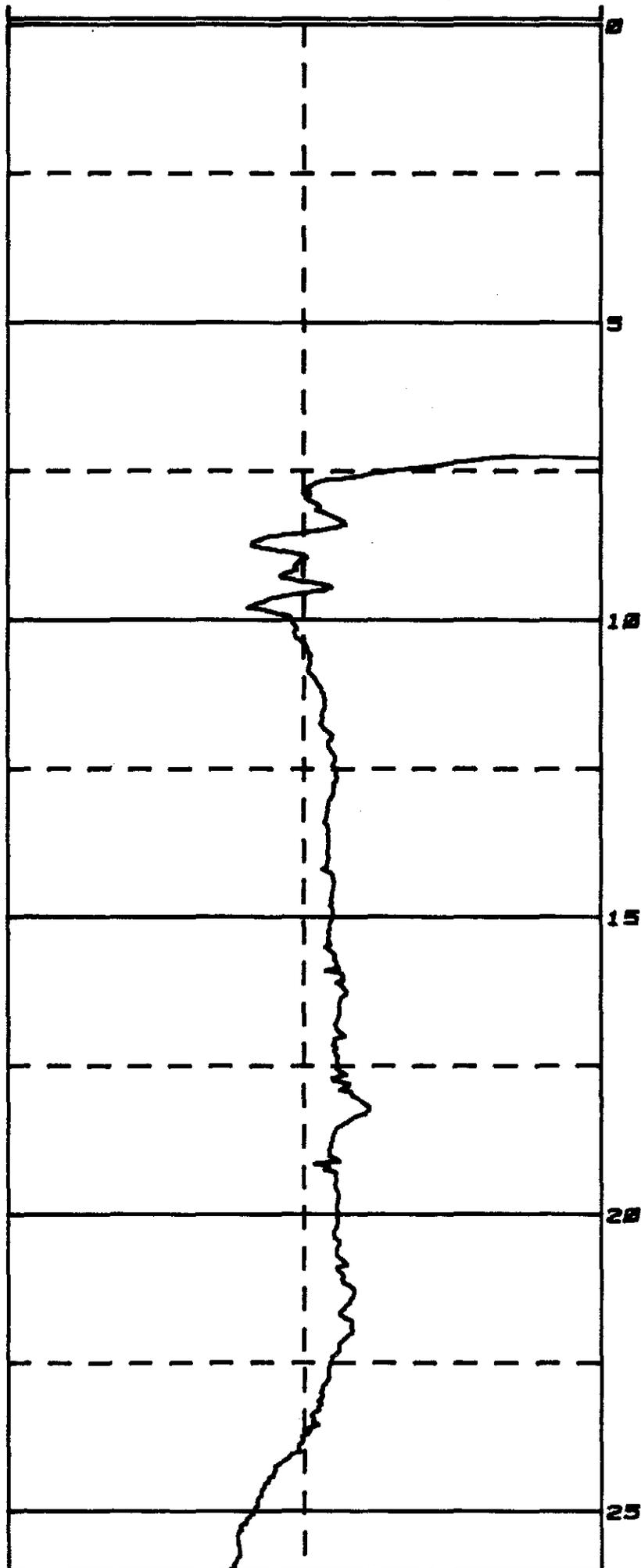


NEUTRON (0-10000 C. P. S.)

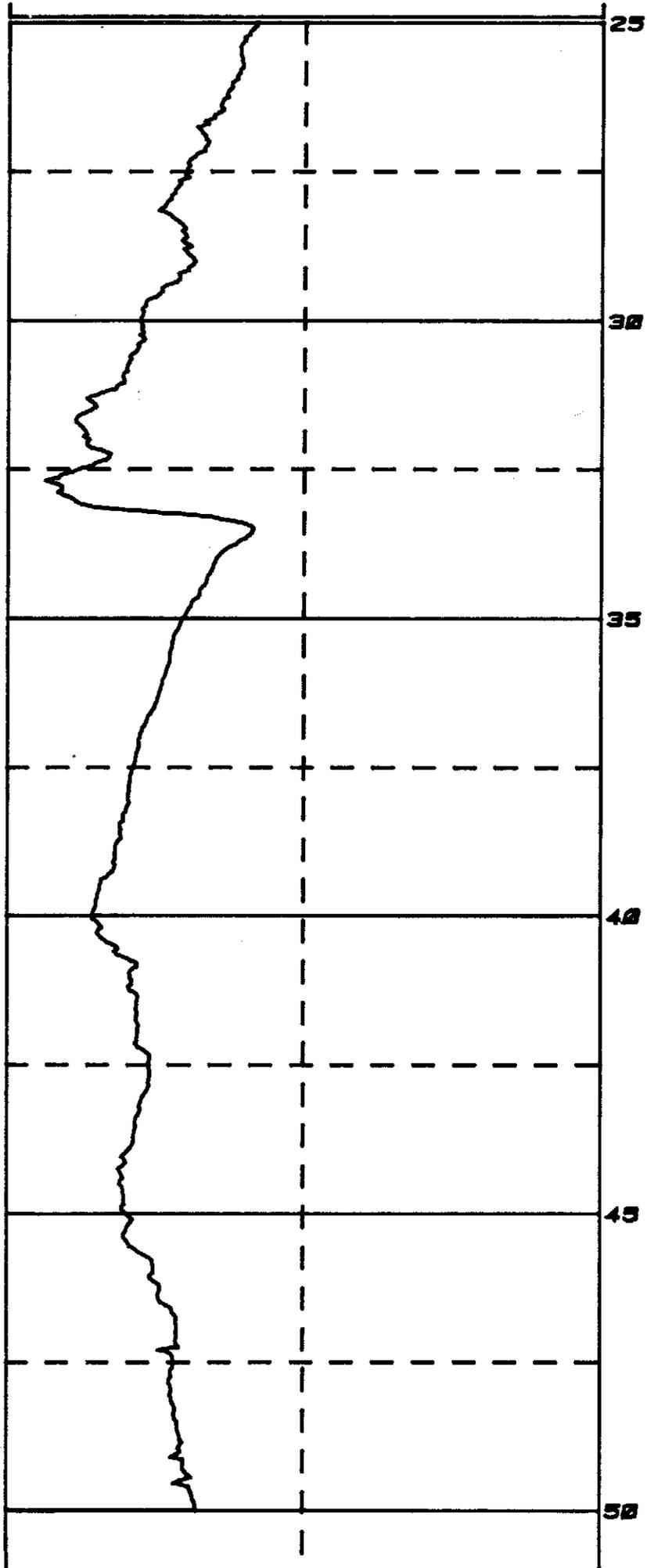
RESISTIVITY (200-700 OHMS)



SELF POTENTIAL (0--+50 mV.)

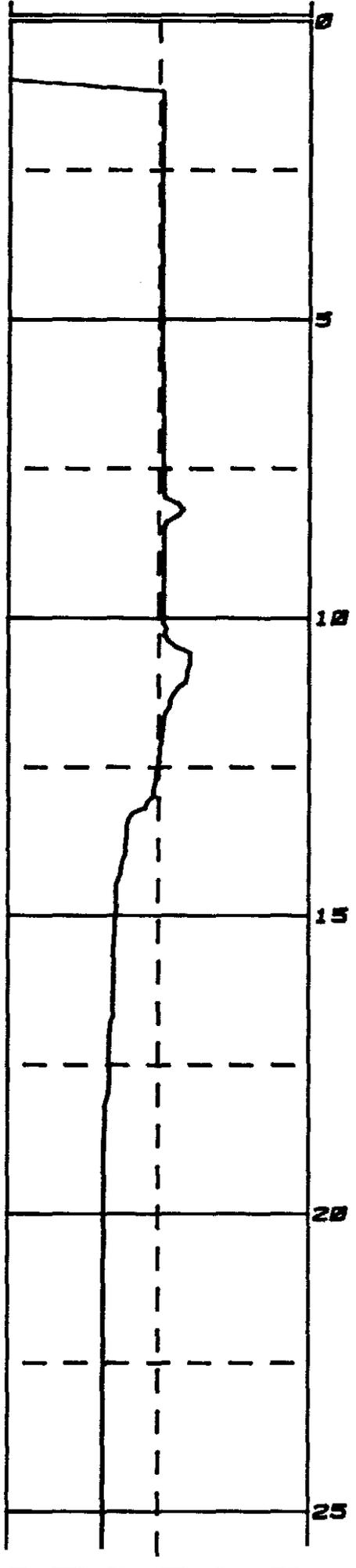
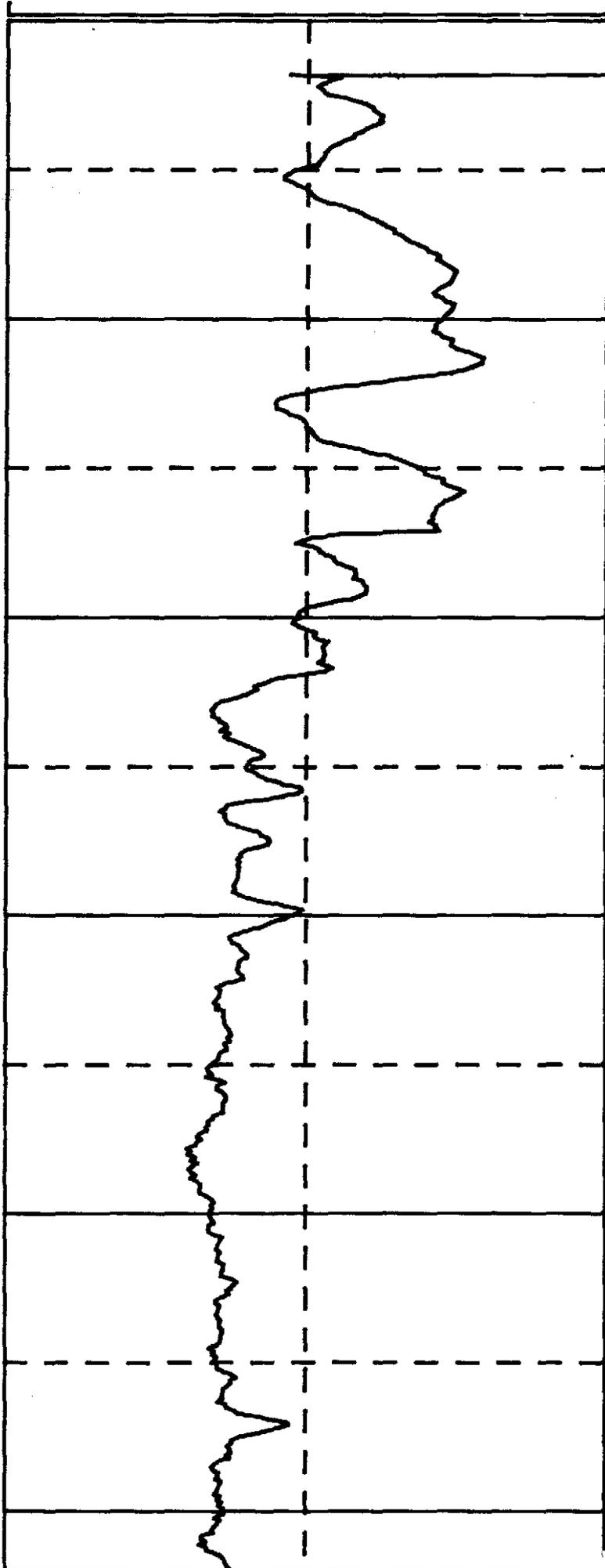


SELF POTENTIAL (0--+50 mV.)



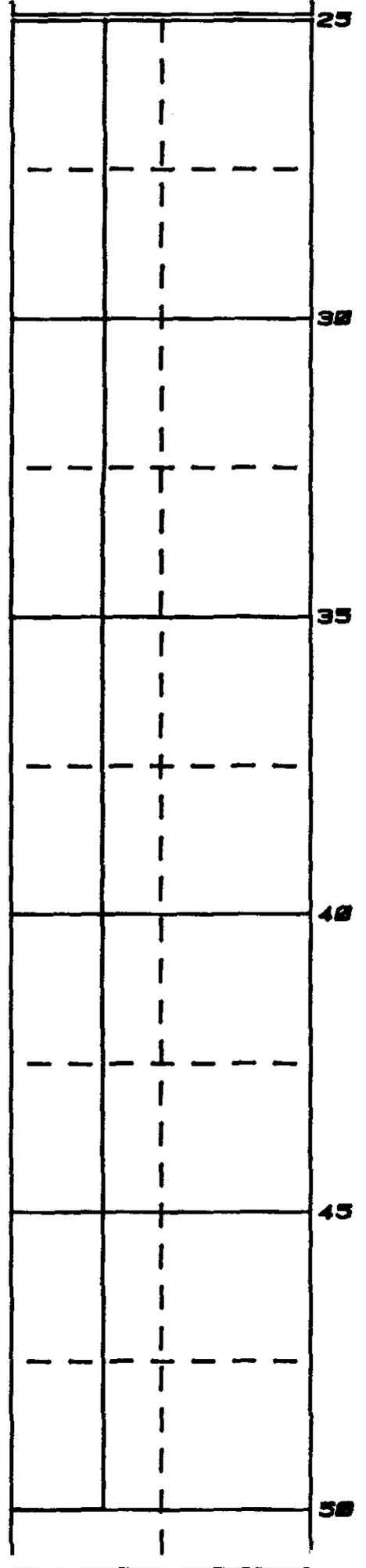
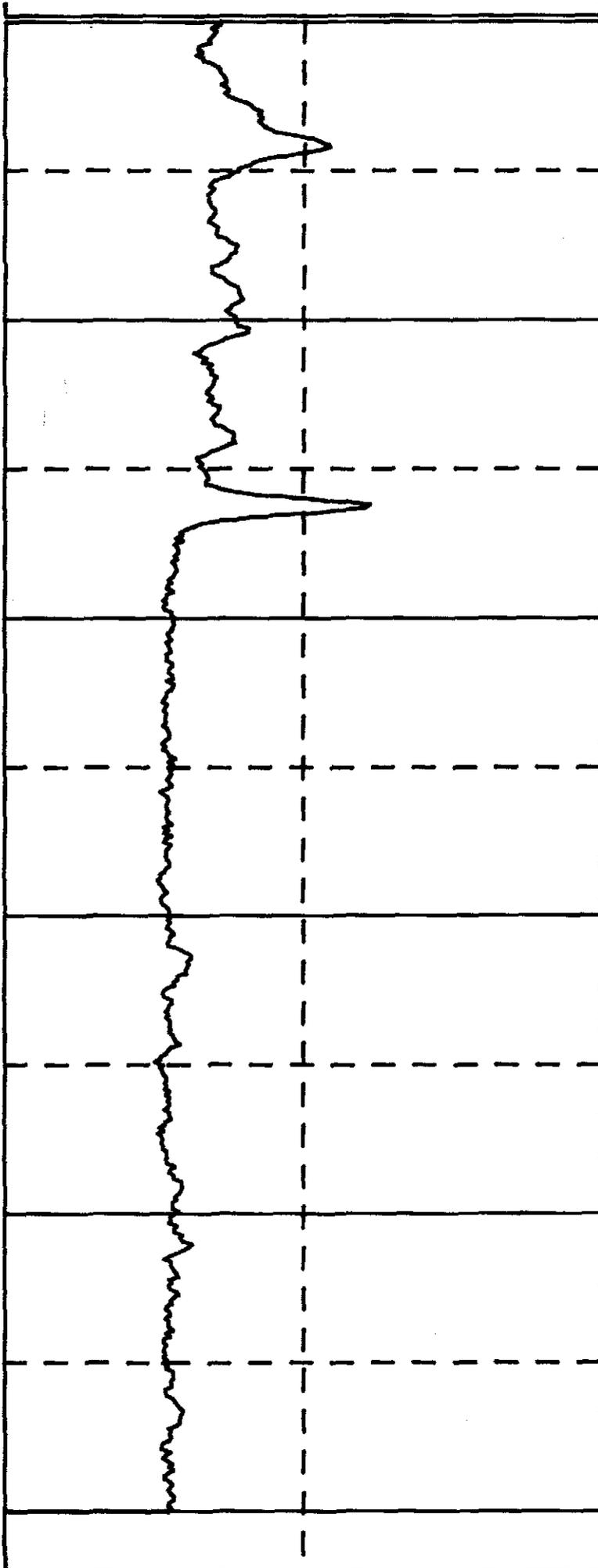
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)



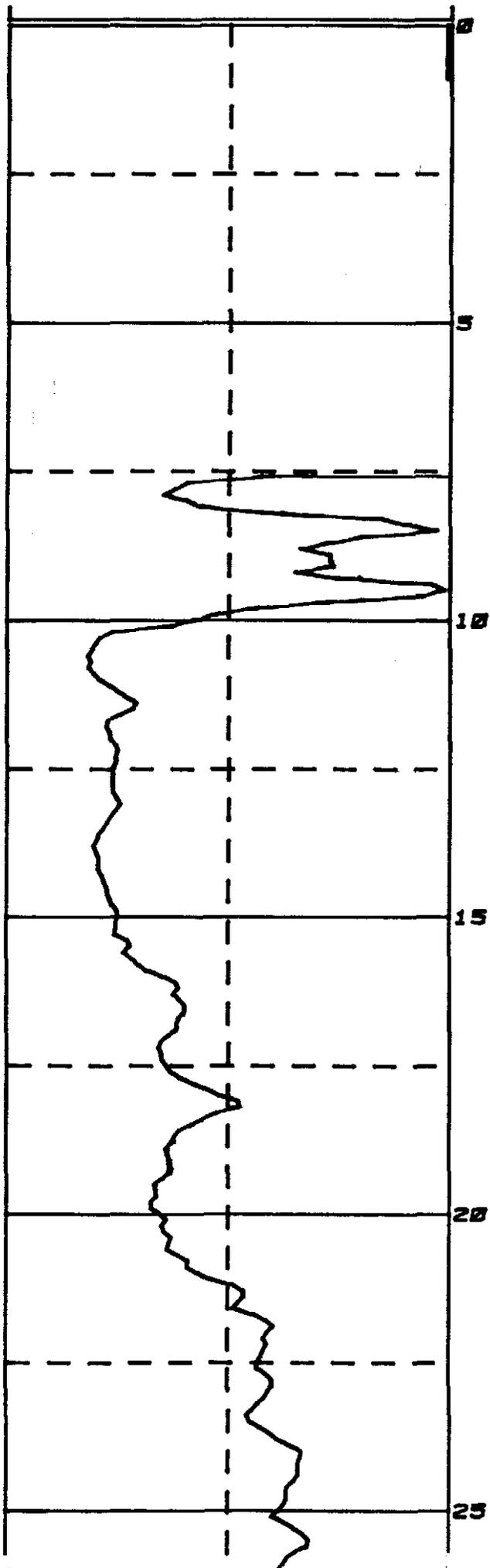
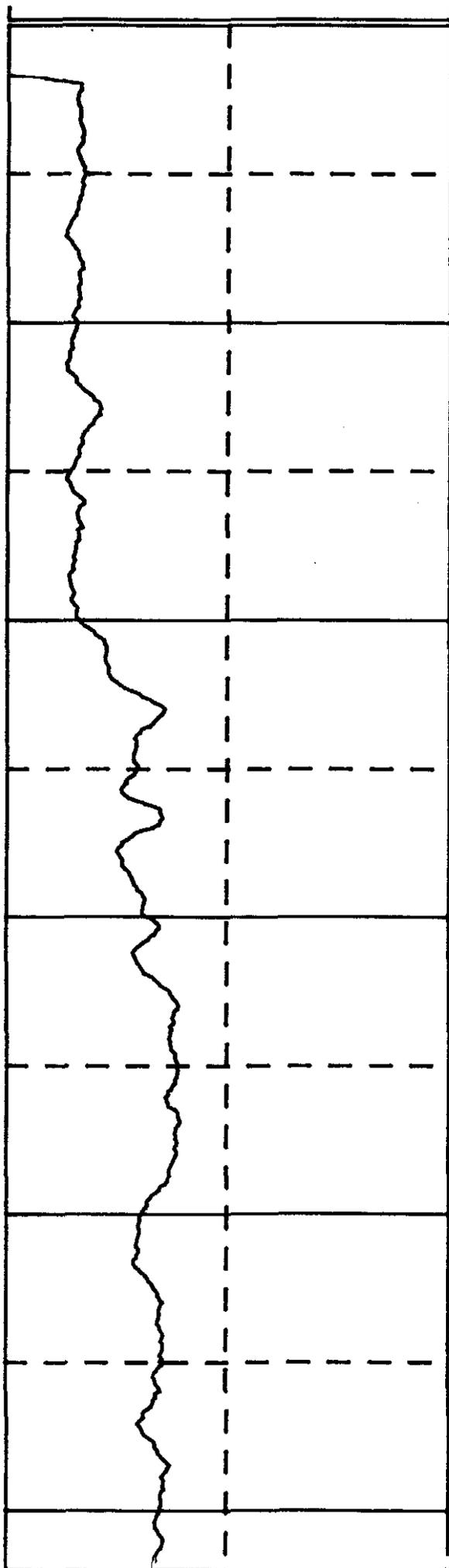
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)



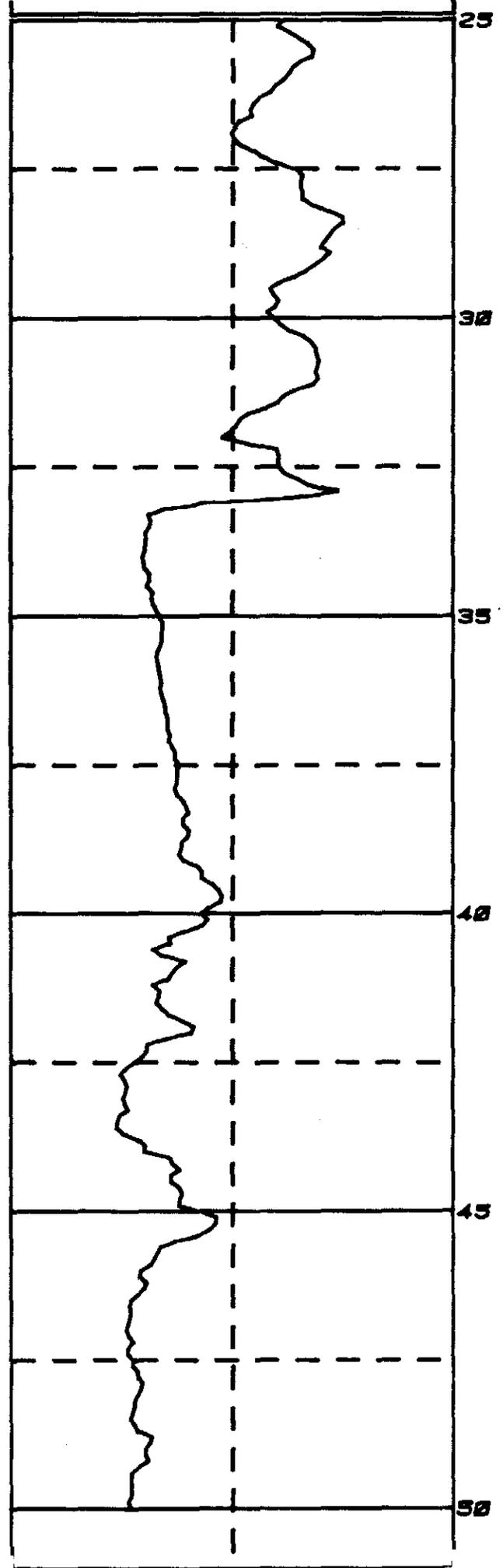
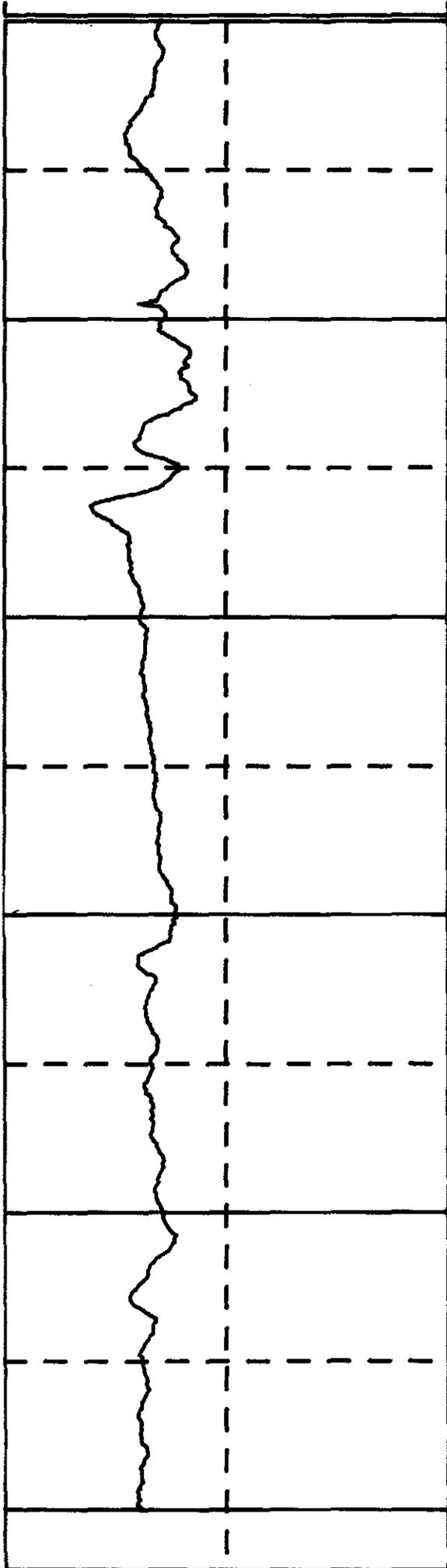
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (50-300 OHMS)

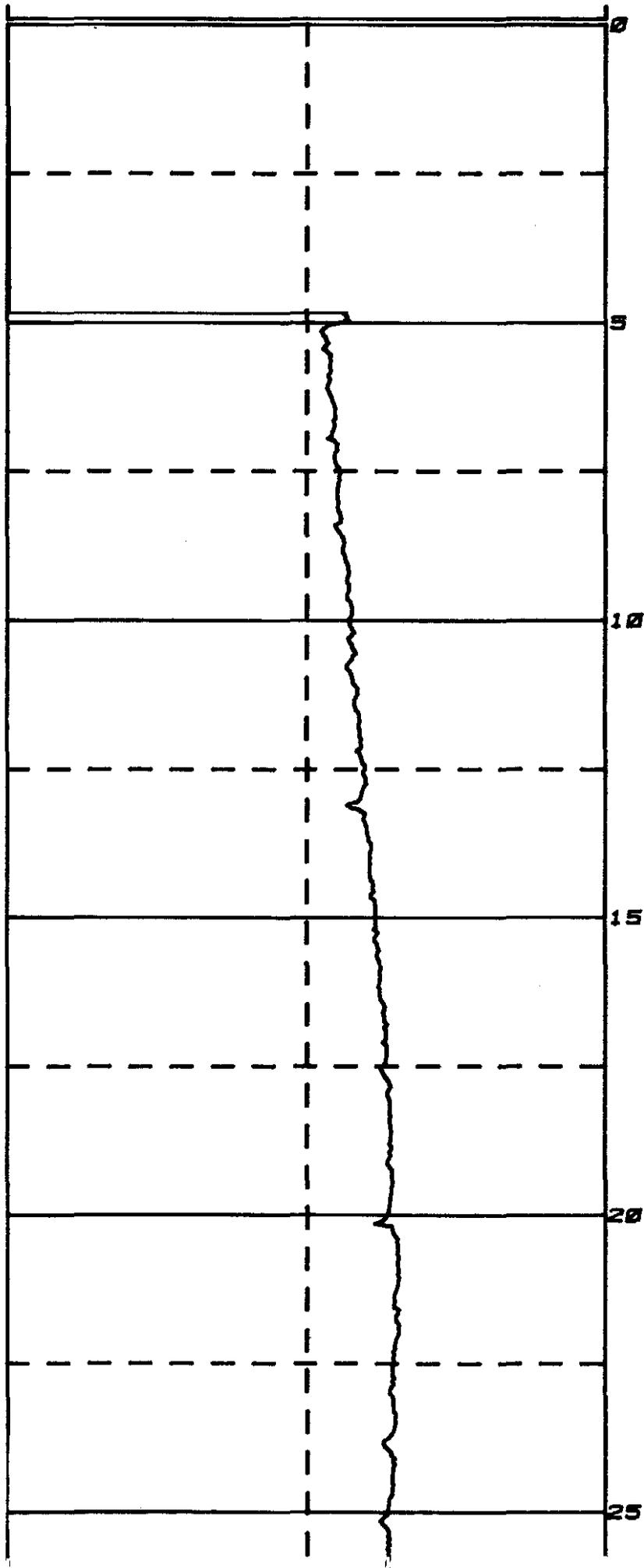


NEUTRON (0-10000 C. P. S.)

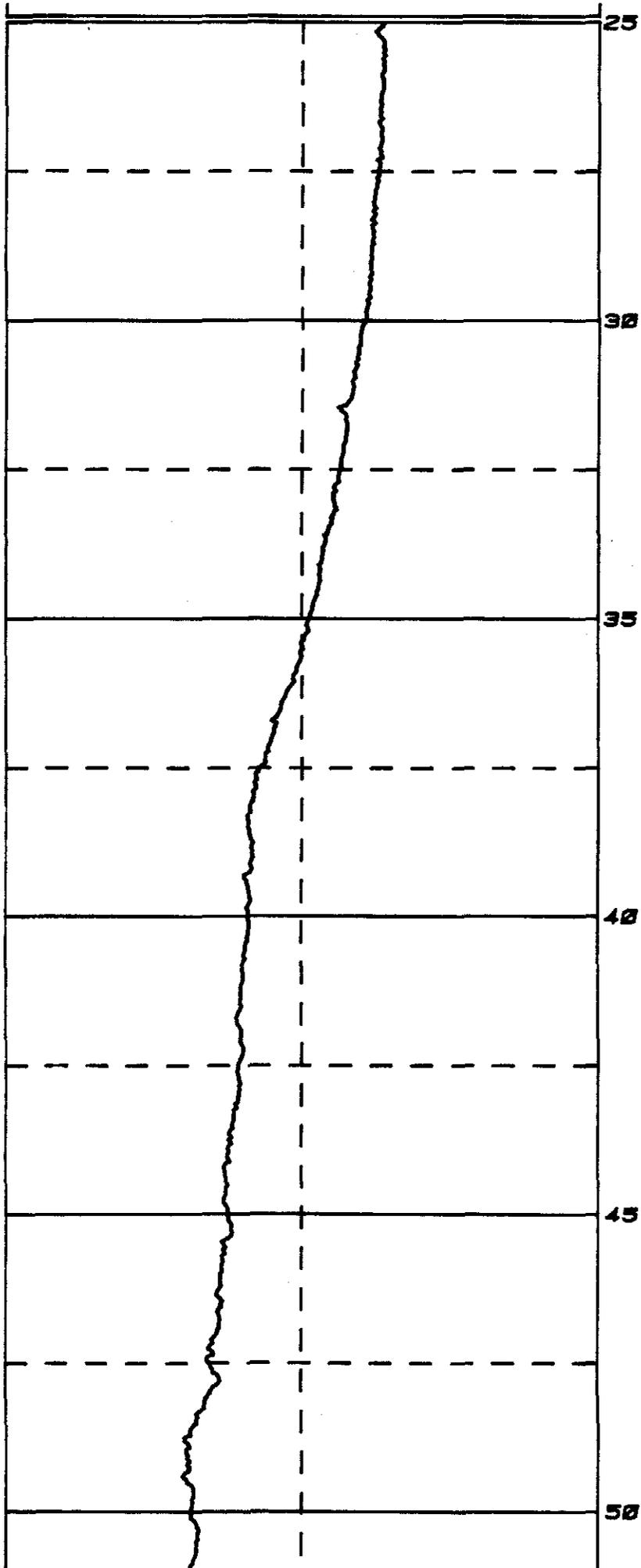
RESISTIVITY (50-300 OHMS)



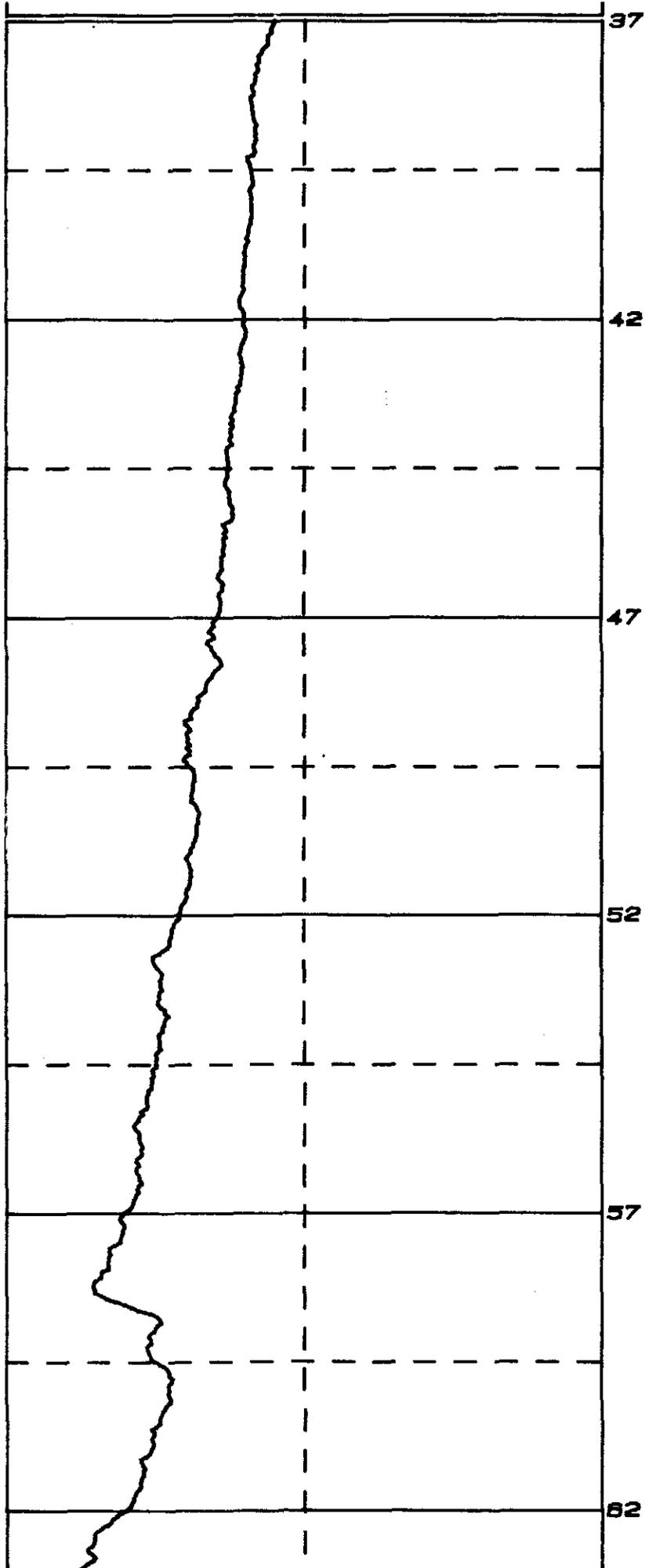
SELF POTENTIAL (-80 to +40 mV.)



SELF POTENTIAL (-80 to +40 mV.)

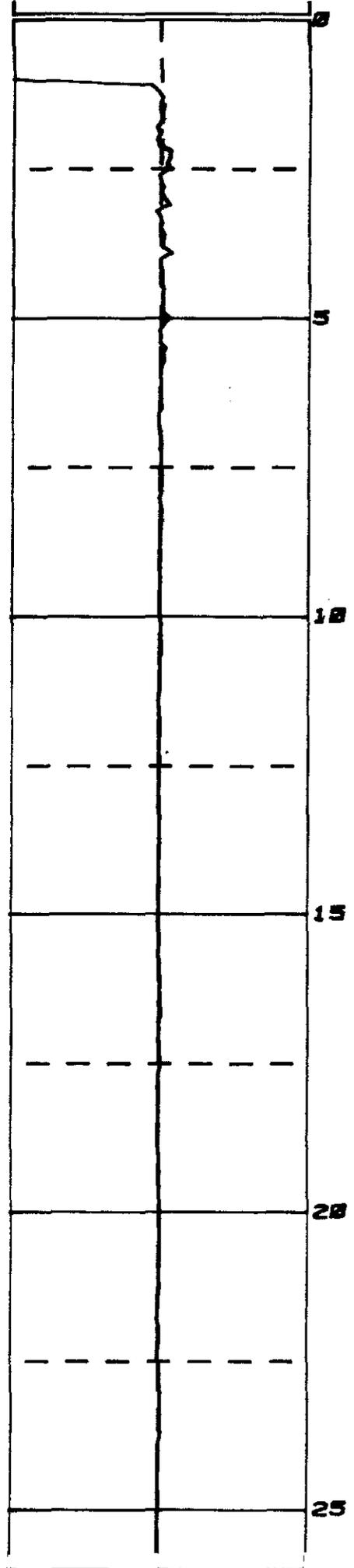
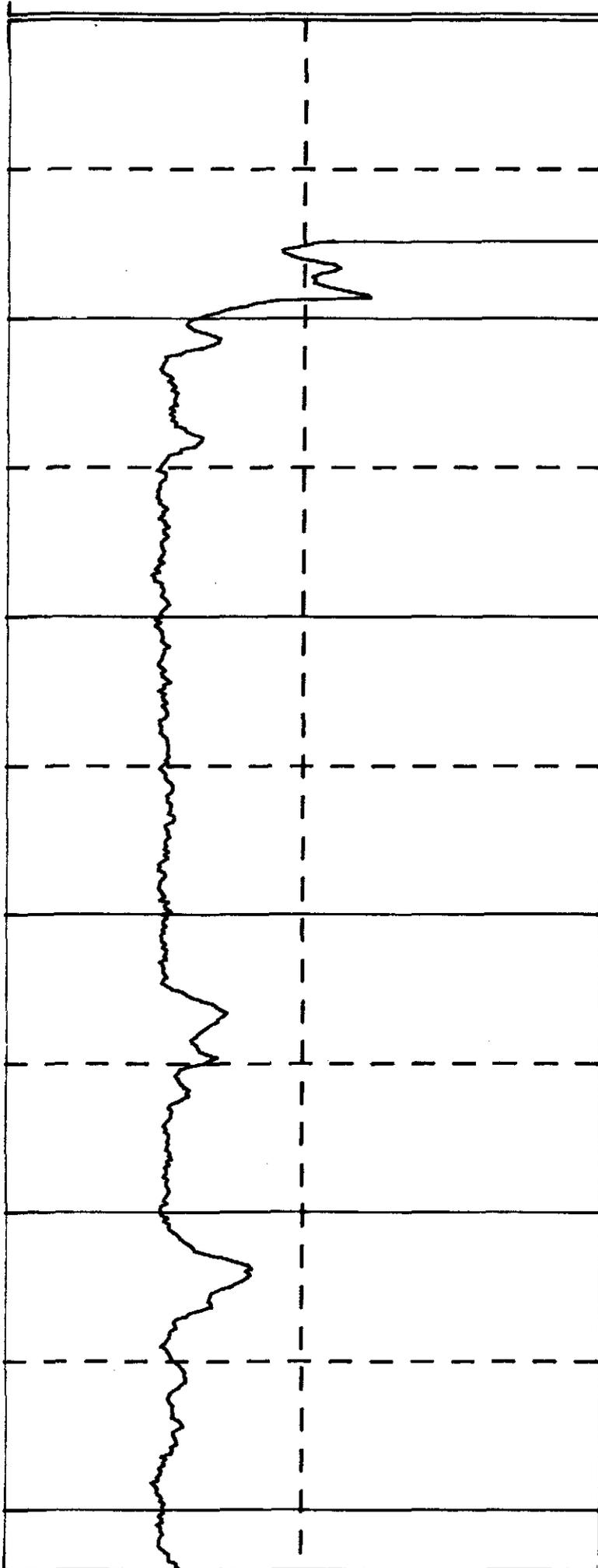


SELF POTENTIAL (-80 to +40 mV.)

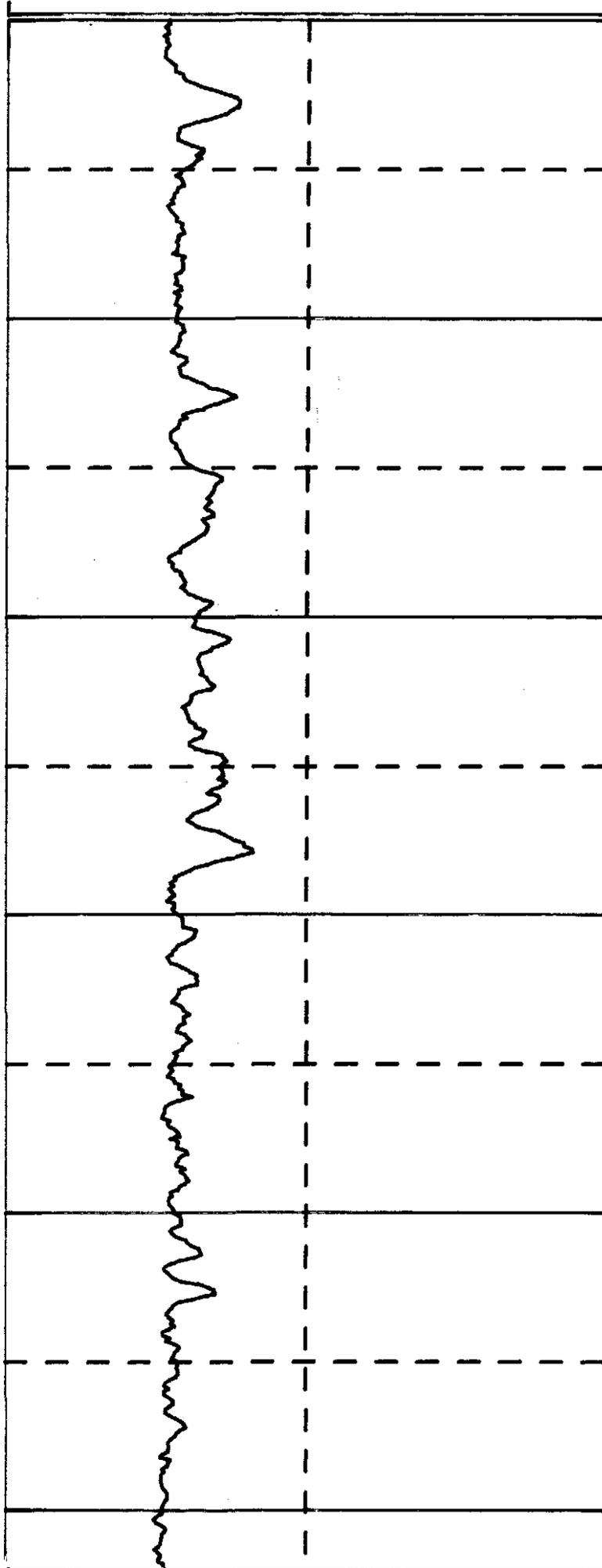


DENSITY (0-5000 C. P. S.)

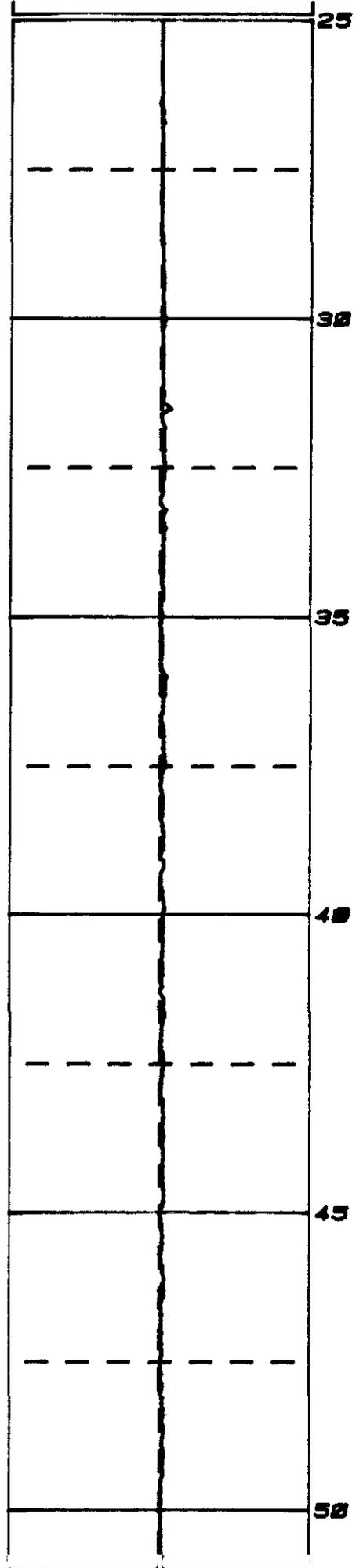
CALIPER (0-10 In.)



DENSITY (Ø-5000 C. P. S.)

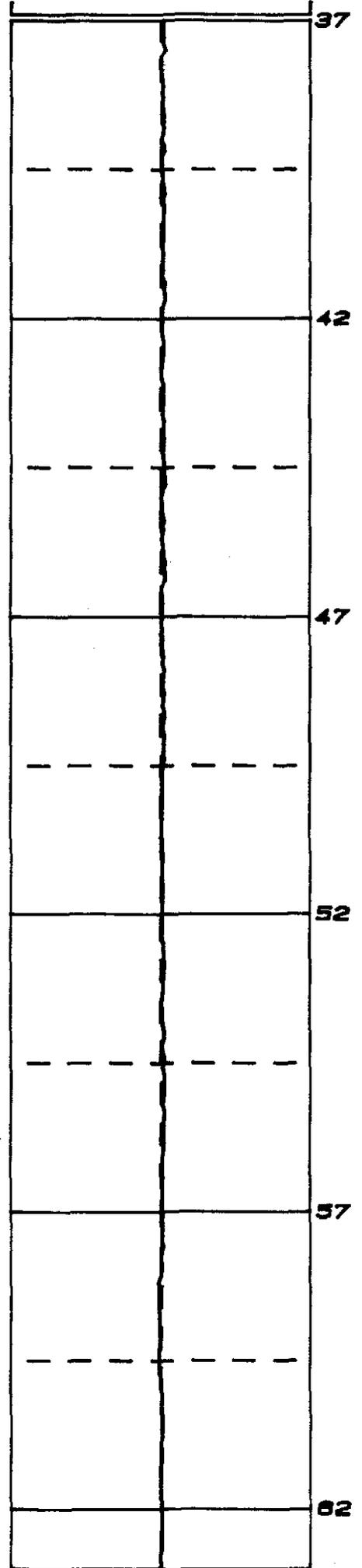
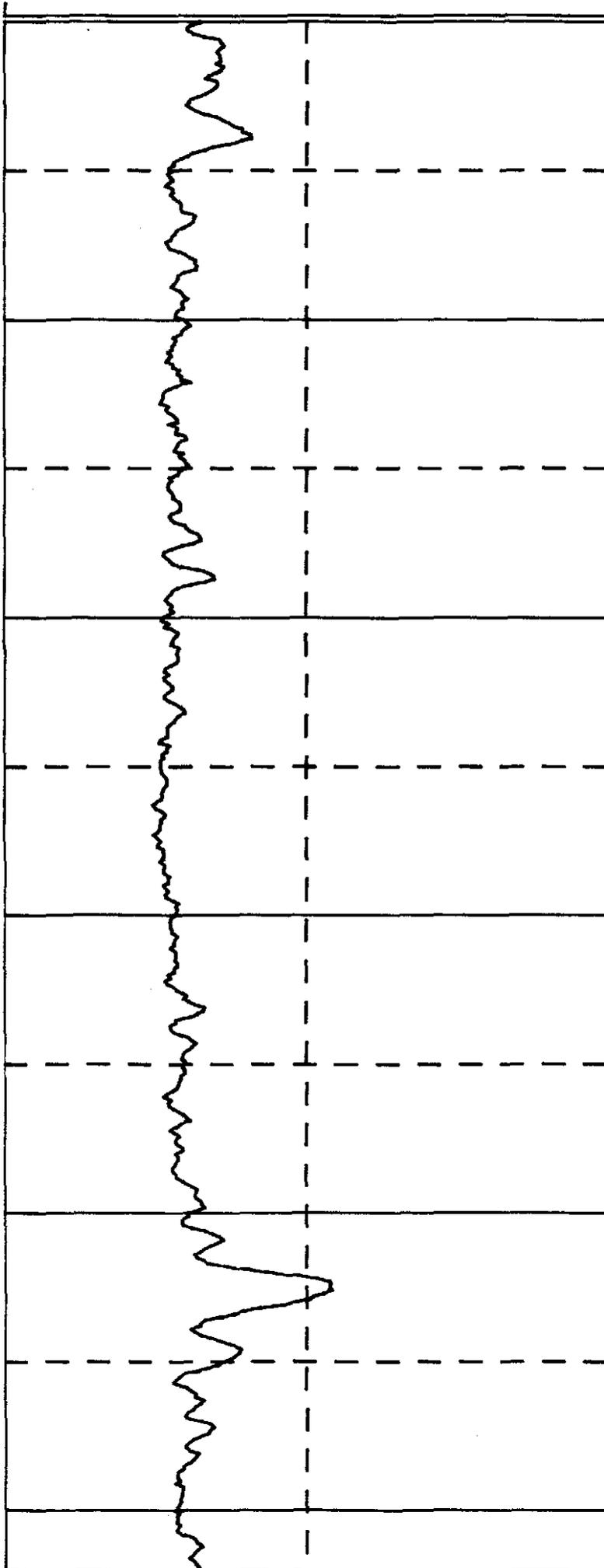


CALIPER (Ø-10 In.)



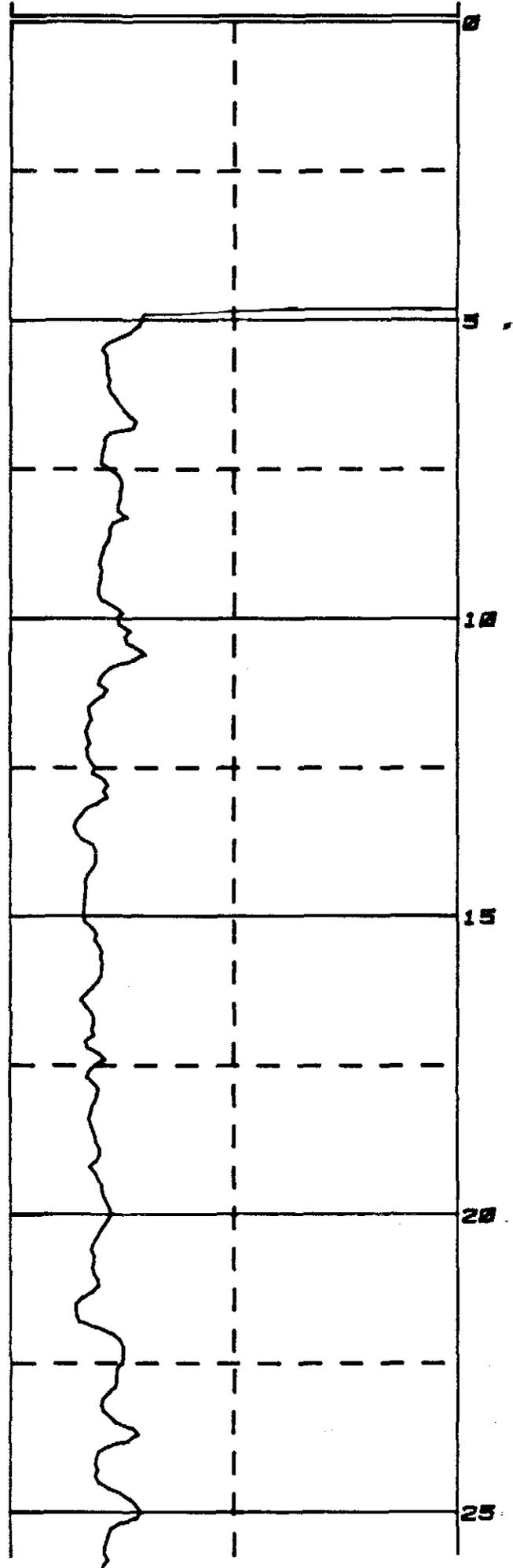
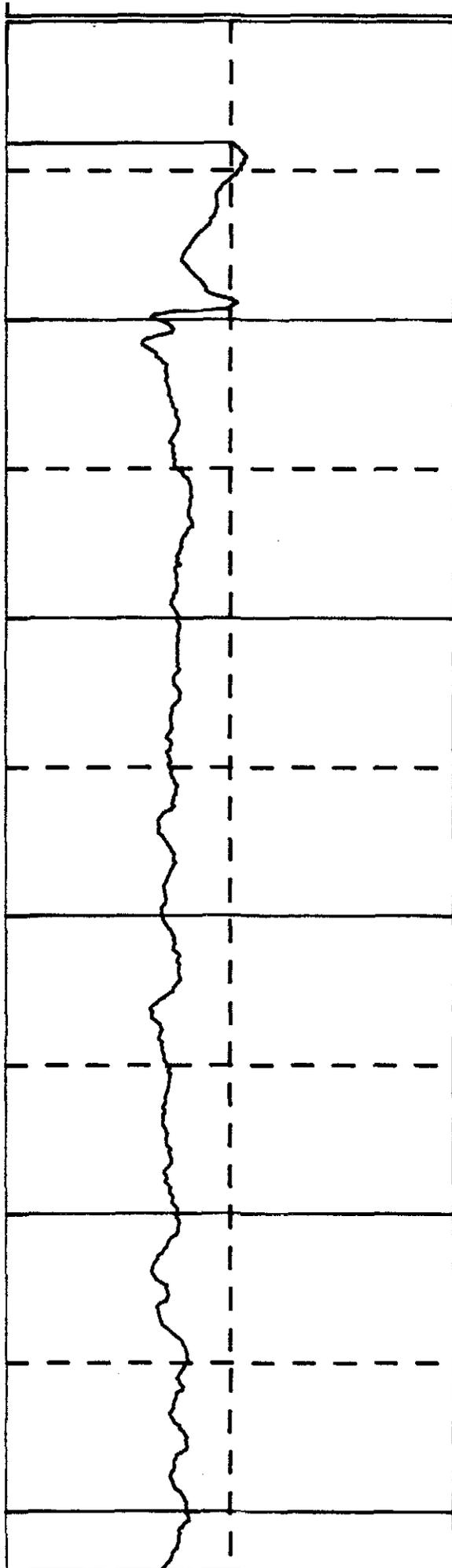
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)



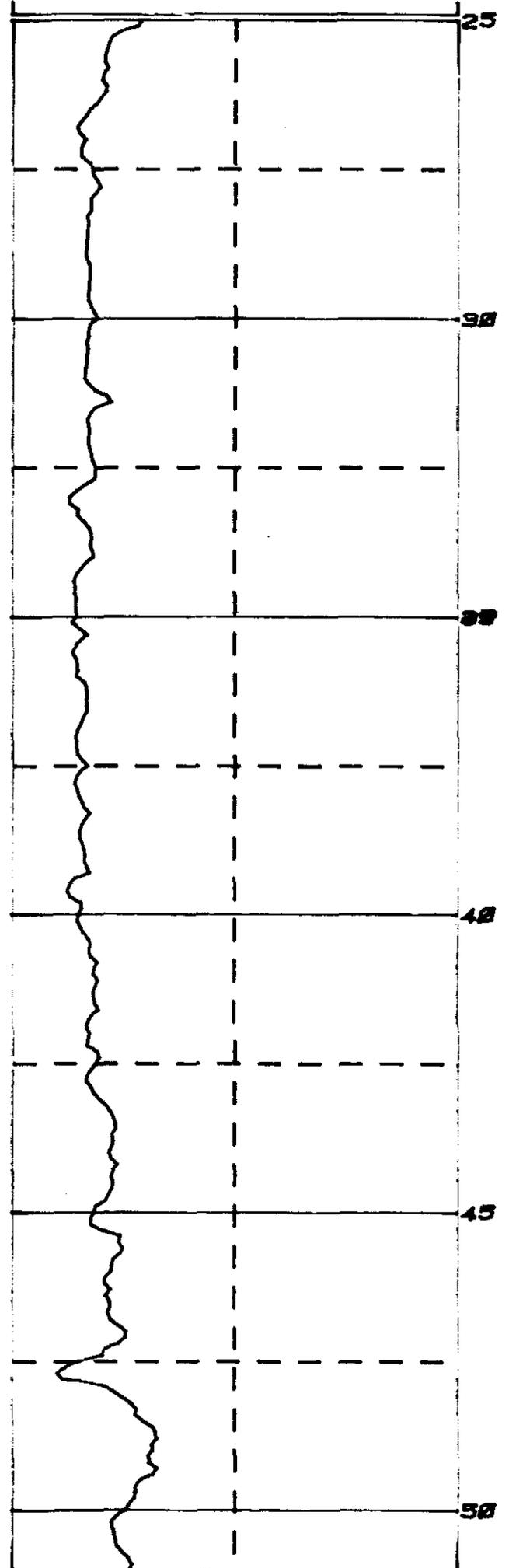
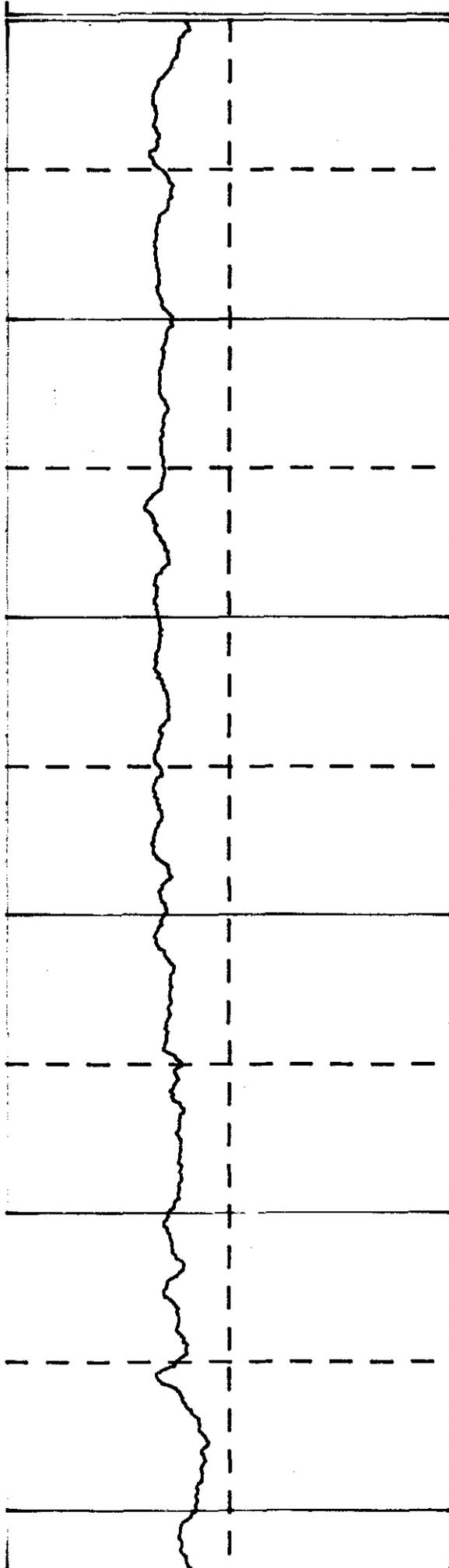
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (400-650 OHMS)



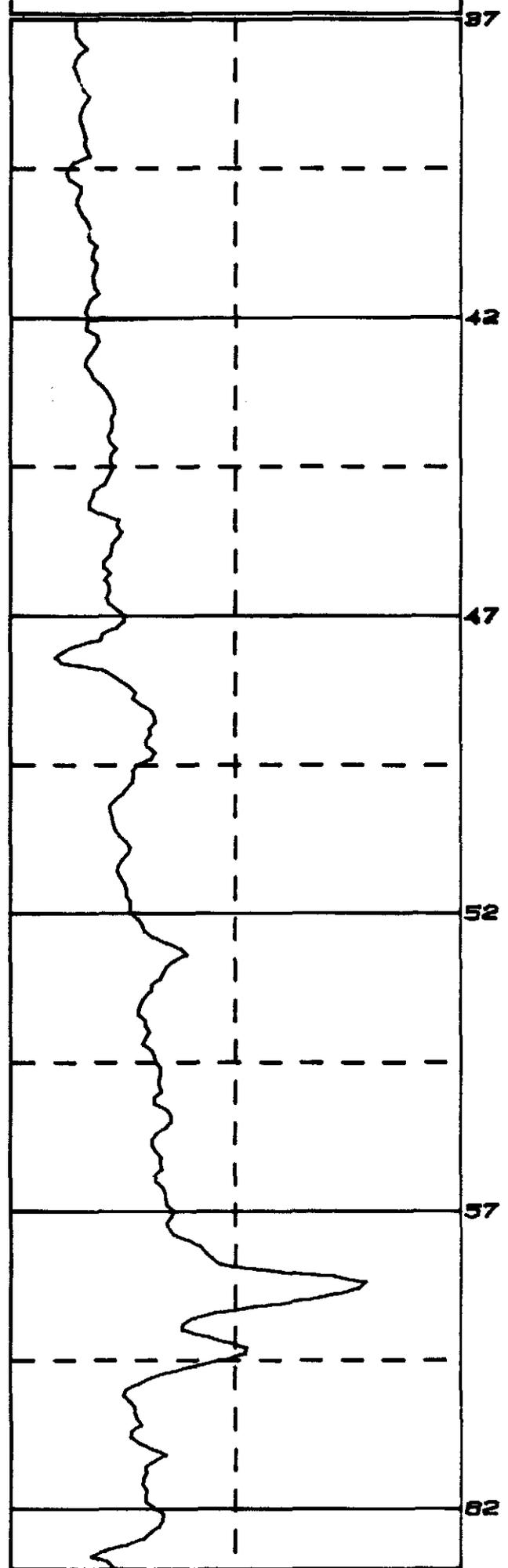
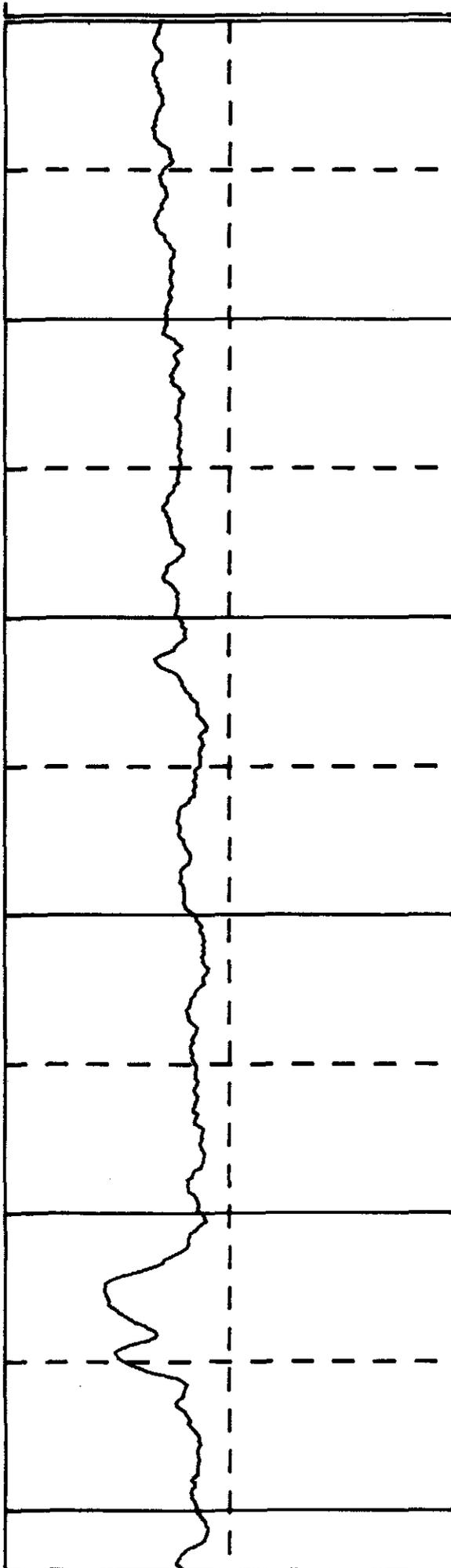
NEUTRON (0-1000 C. P. S.)

RESISTIVITY (400-850 OHMS)

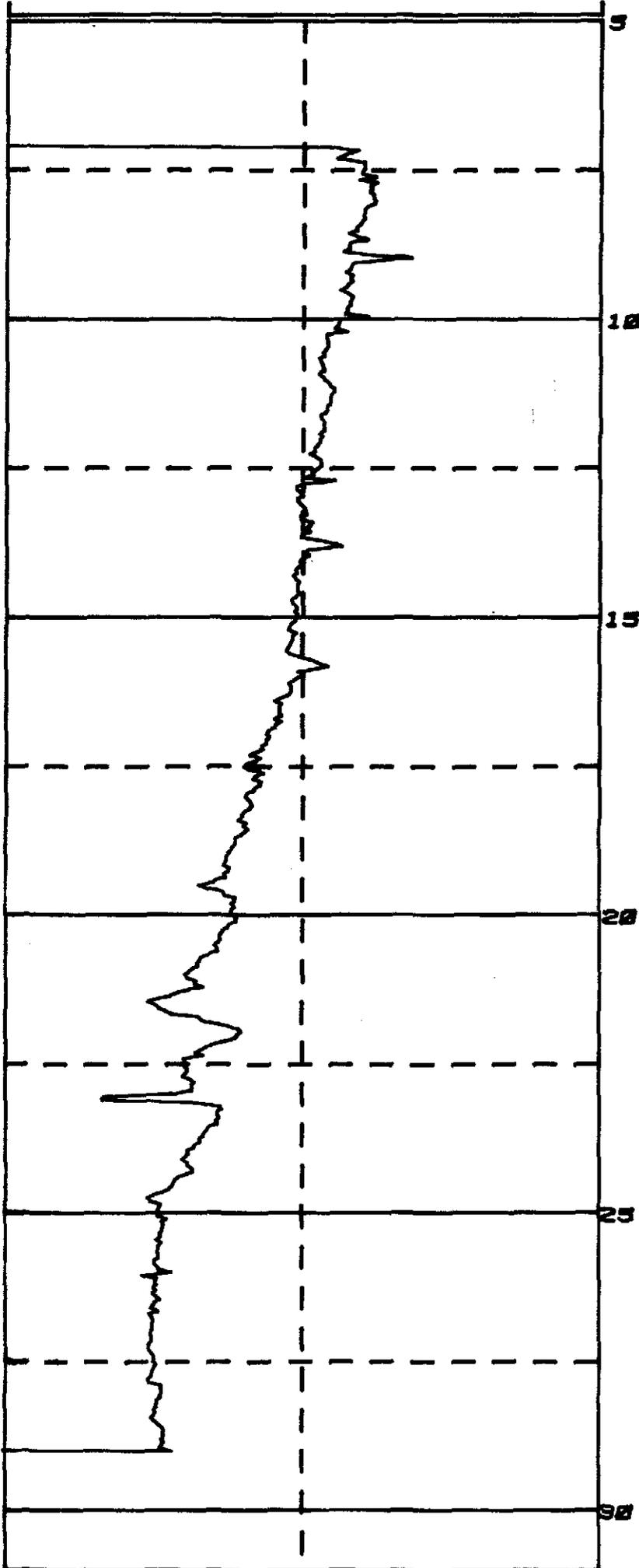


NEUTRON (0-10000 C. P. S.)

RESISTIVITY (400-850 OHMS)

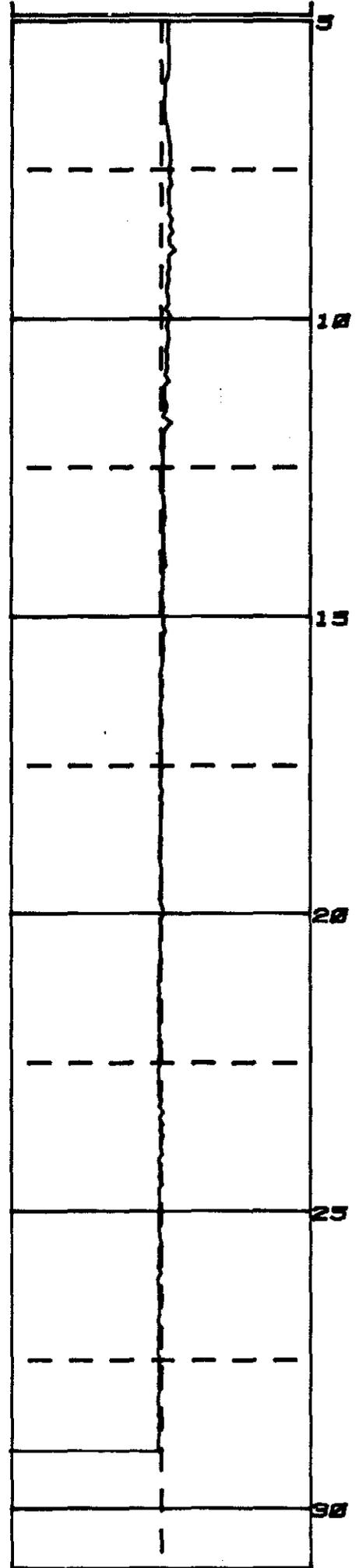
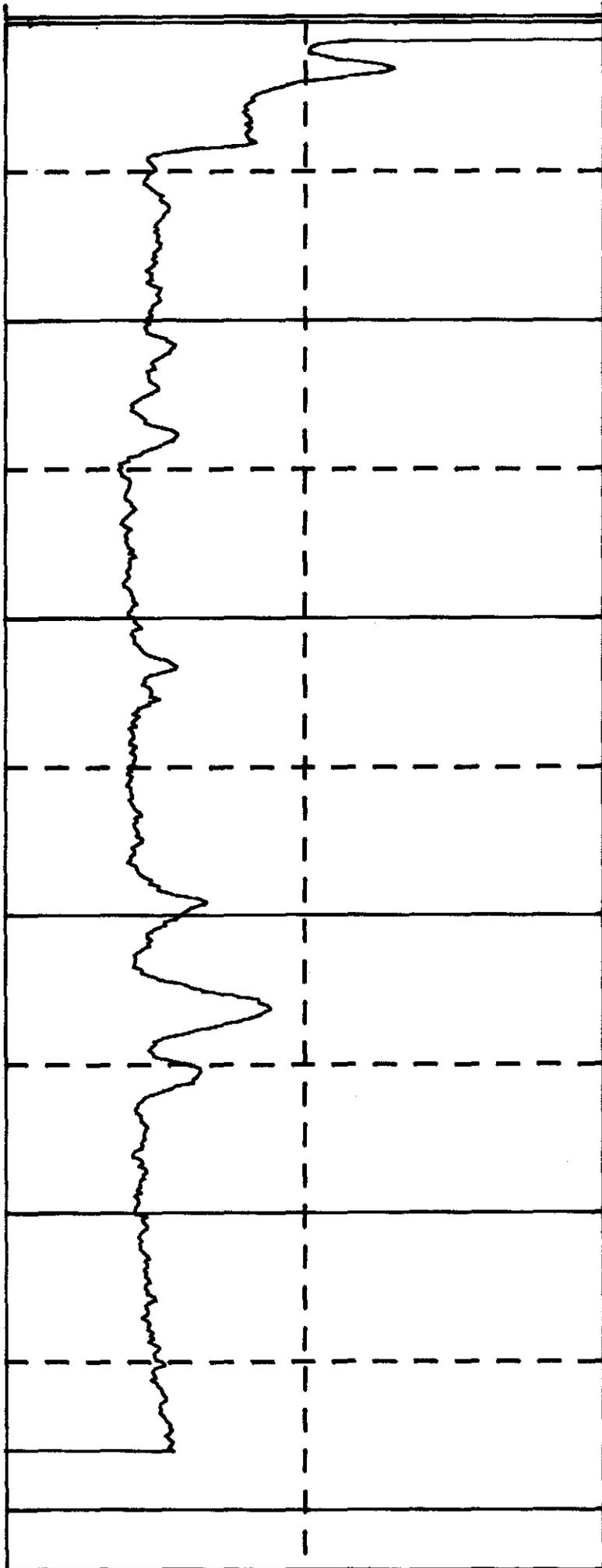


SELF POTENTIAL (-25 to +25 mV.)



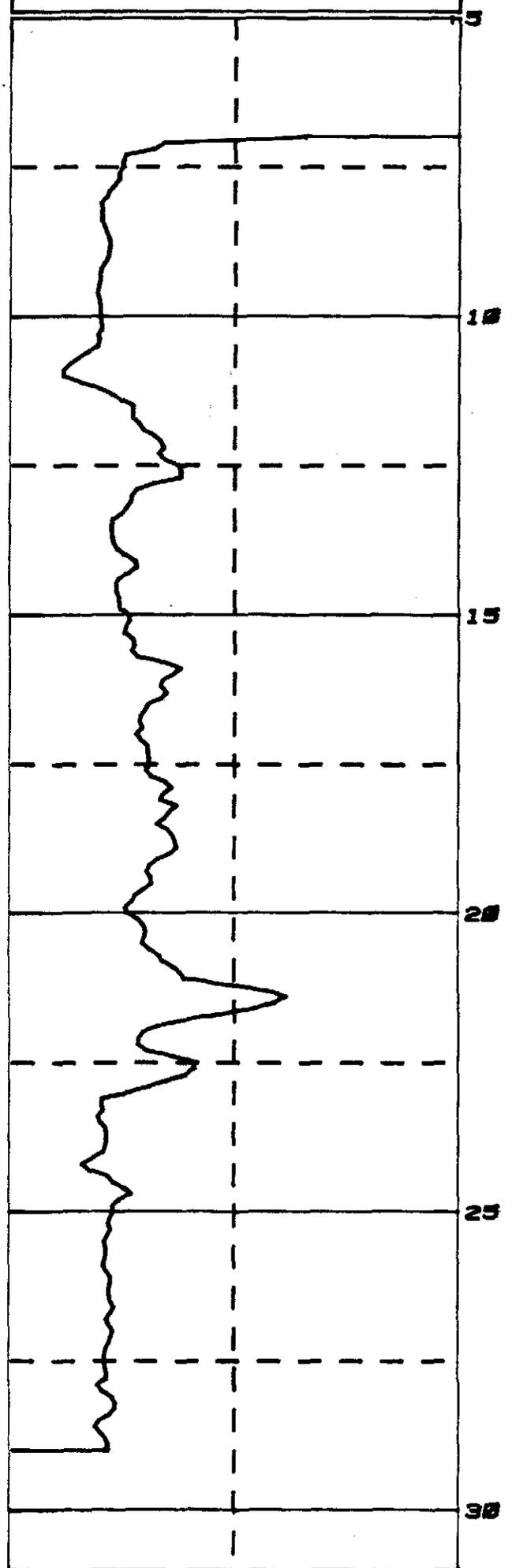
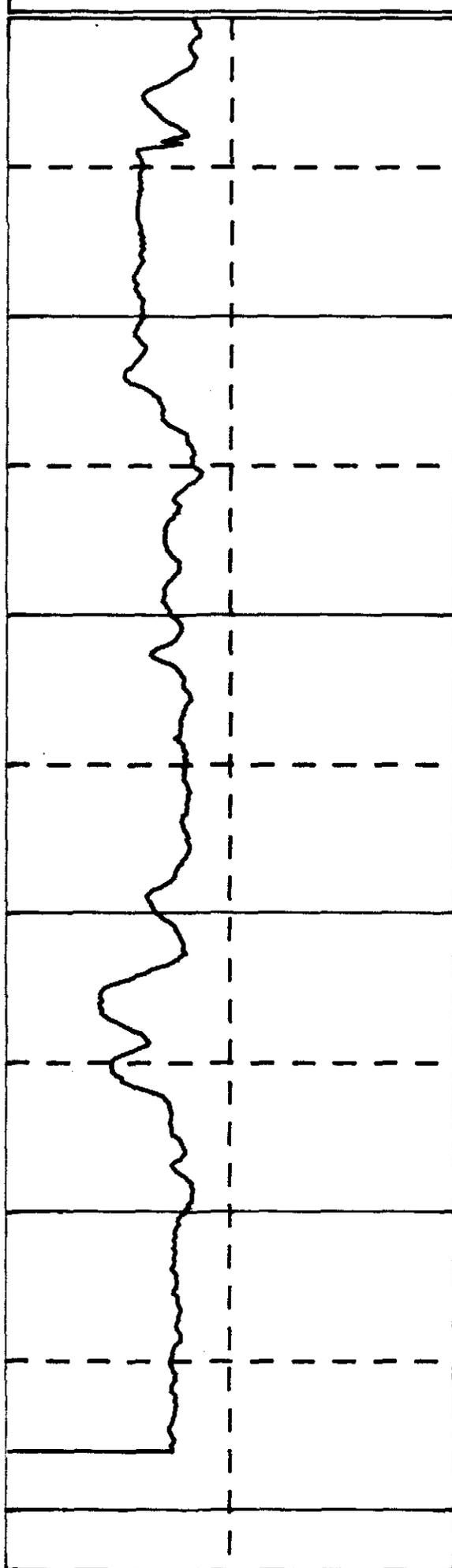
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)

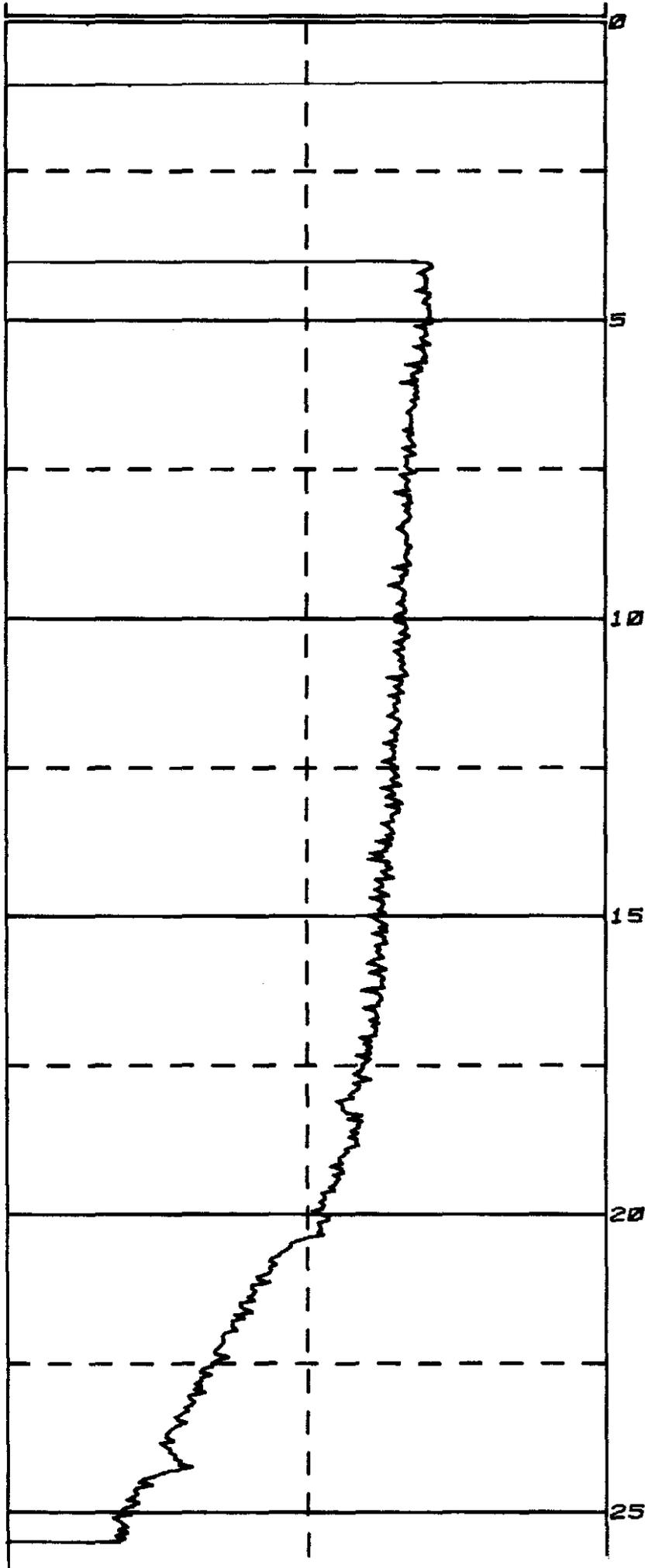


NEUTRON (0-10000 C. P. S.)

RESISTIVITY (350-600 OHMS)



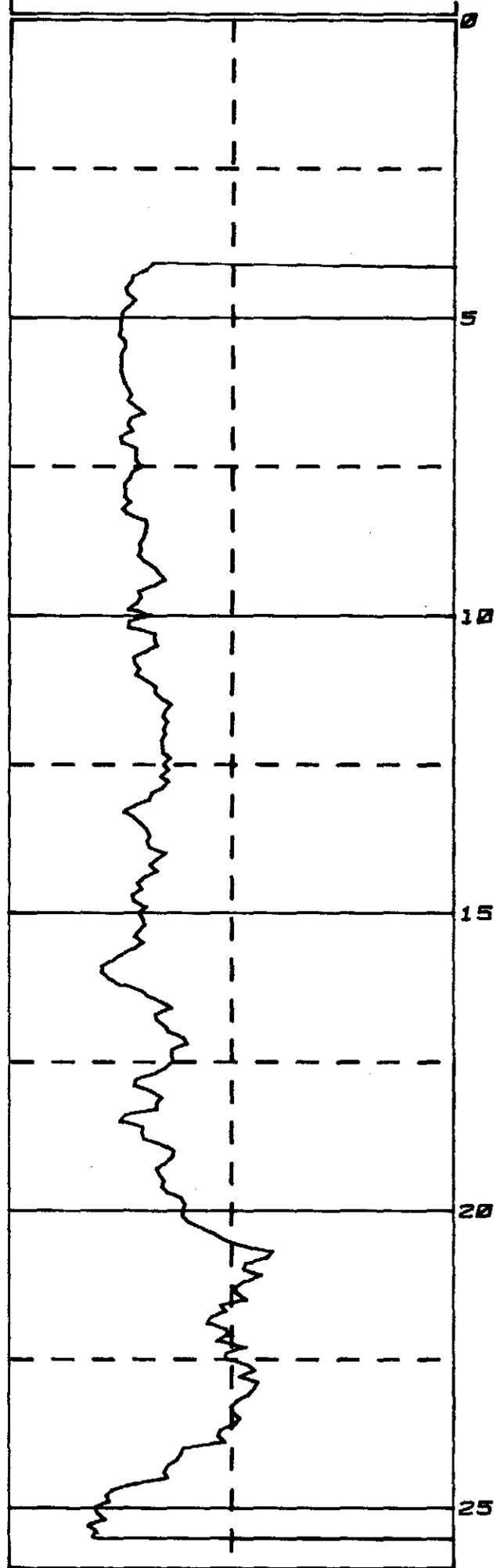
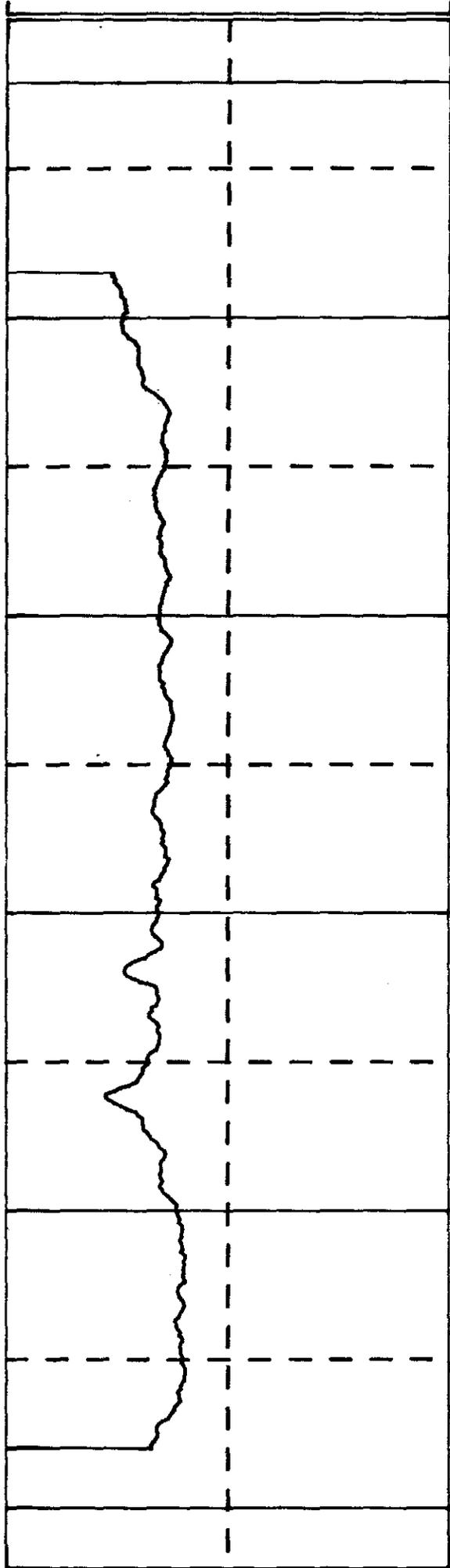
SELF POTENTIAL (-50 to 50 mV.)



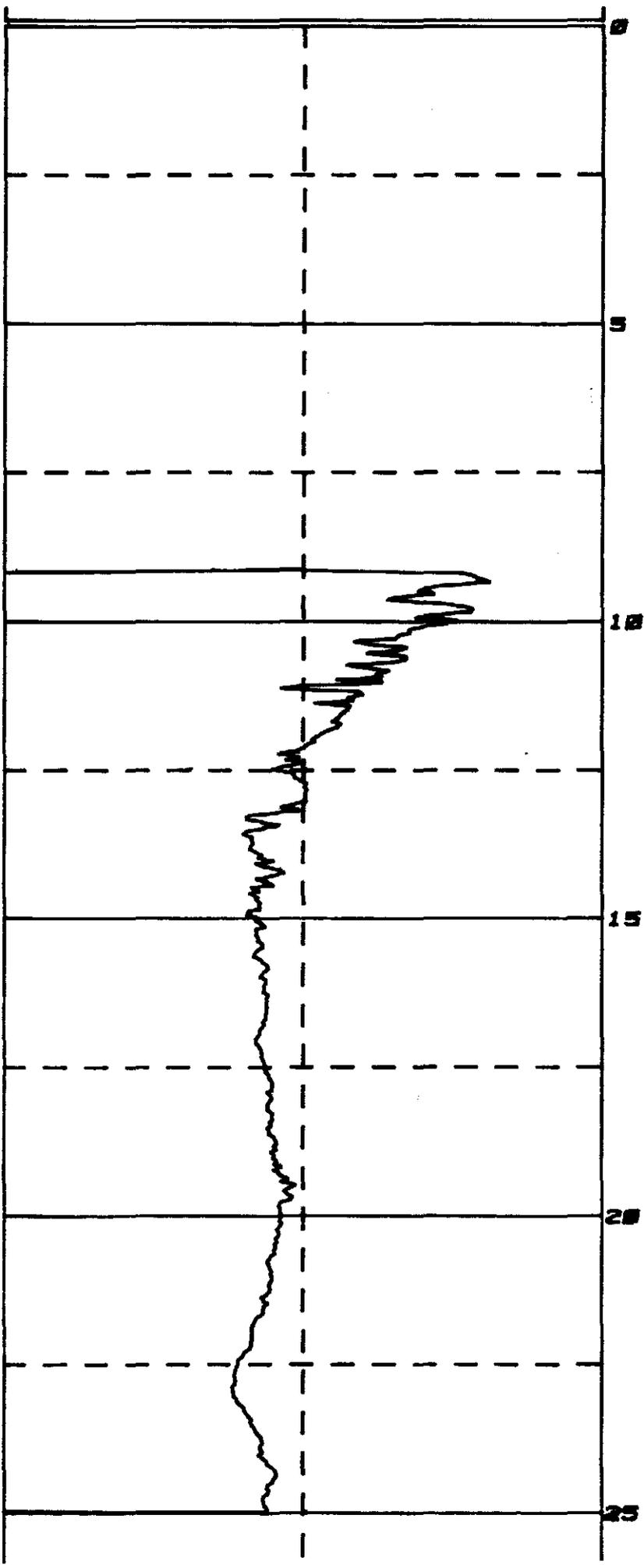


NEUTRON (0-10000 C. P. S.)

RESISTIVITY (250-500 OHMS)

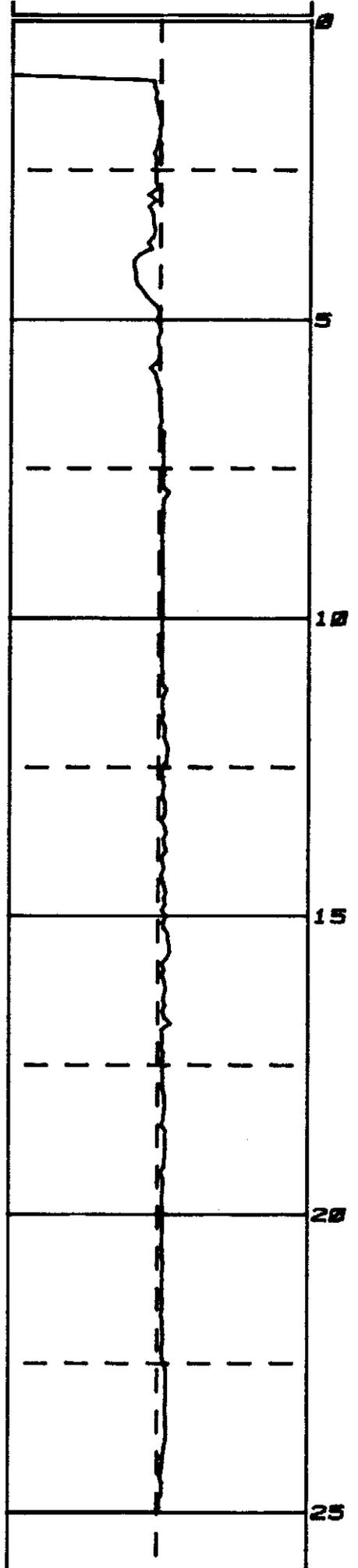
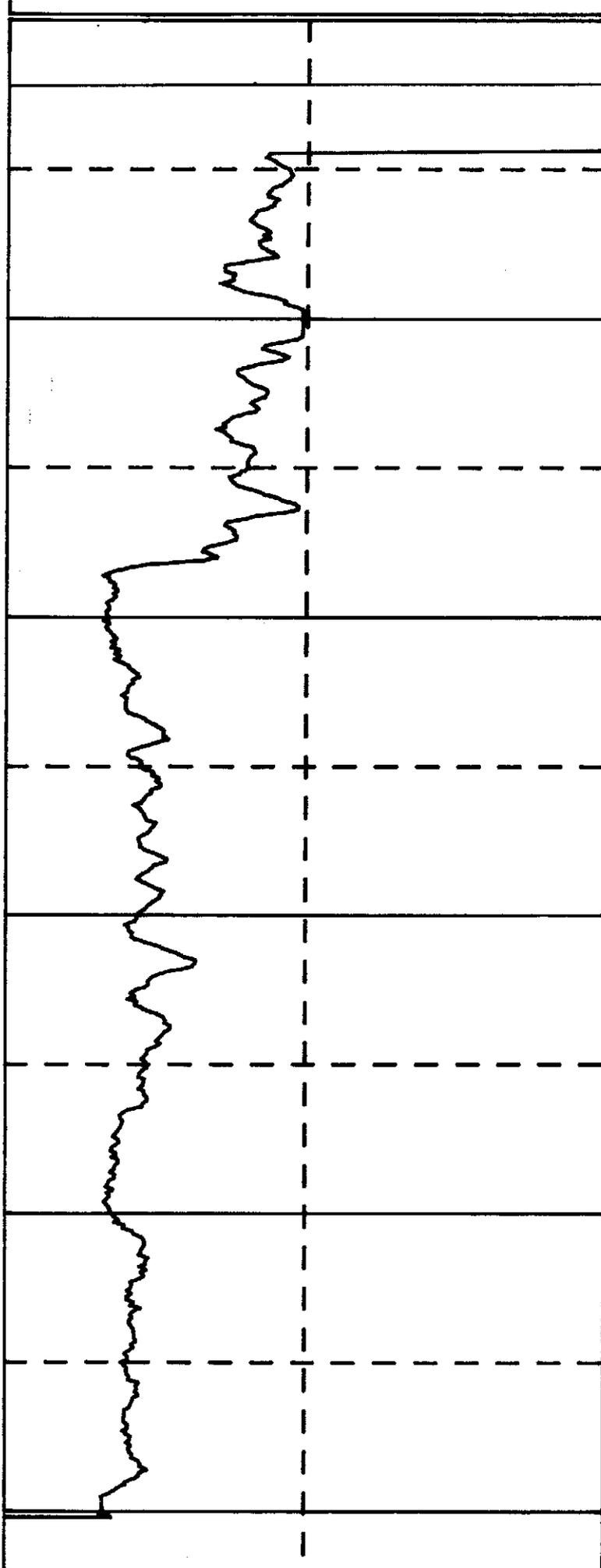


SELF POTENTIAL (-10 to 40 mV.)



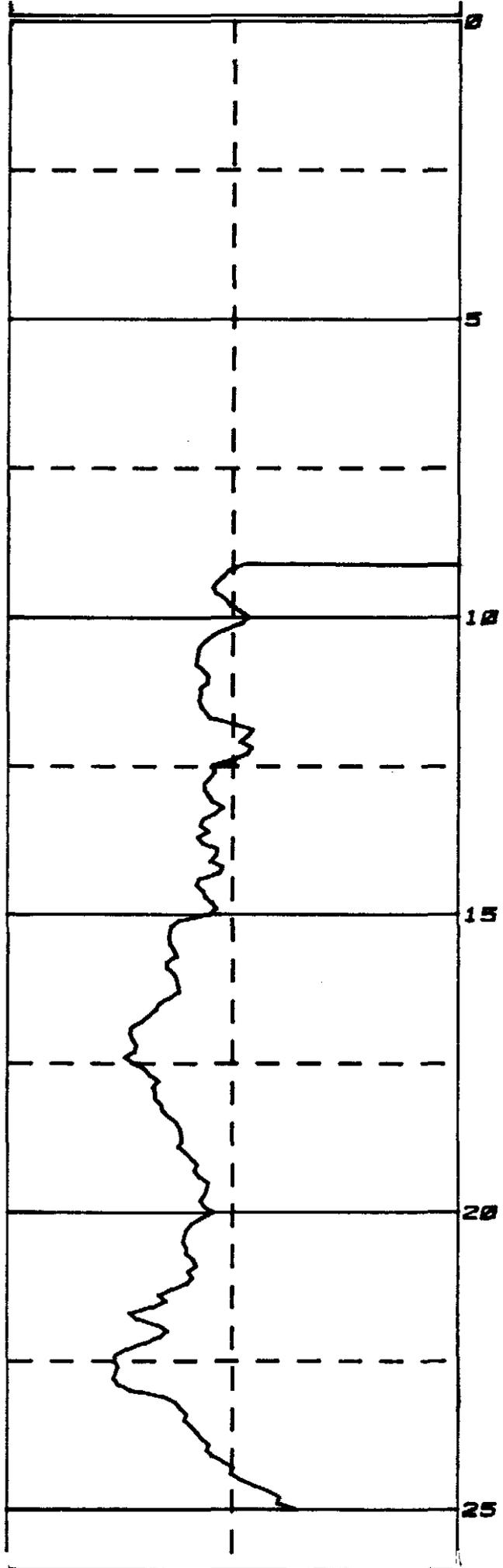
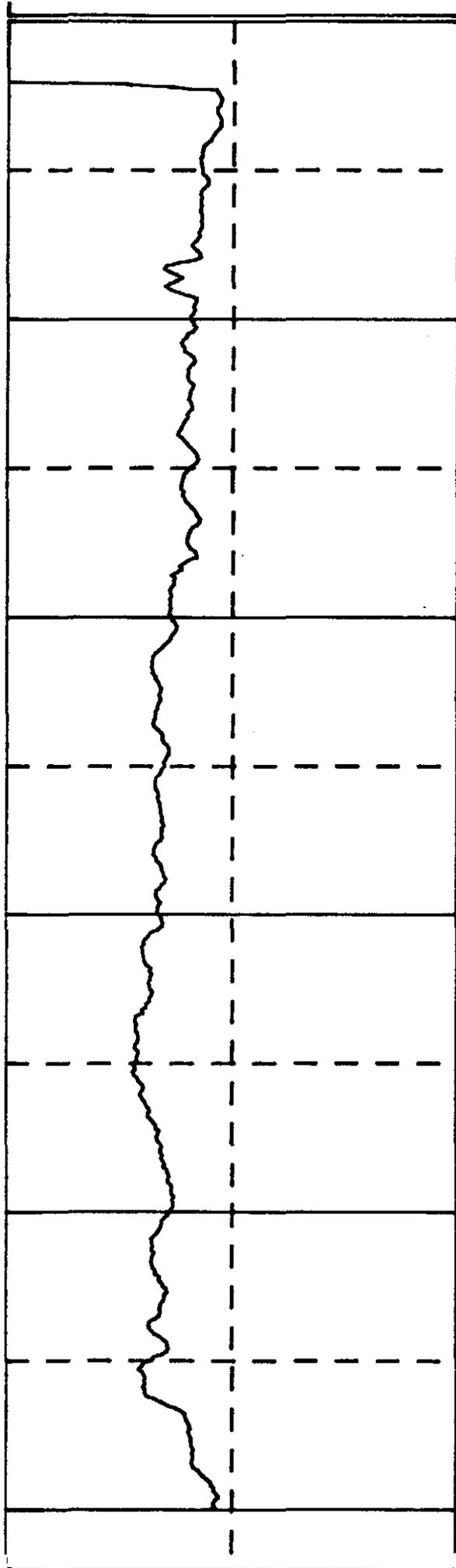
DENSITY (Ø-5000 C. P. S.)

CALIPER (Ø-10 In.)

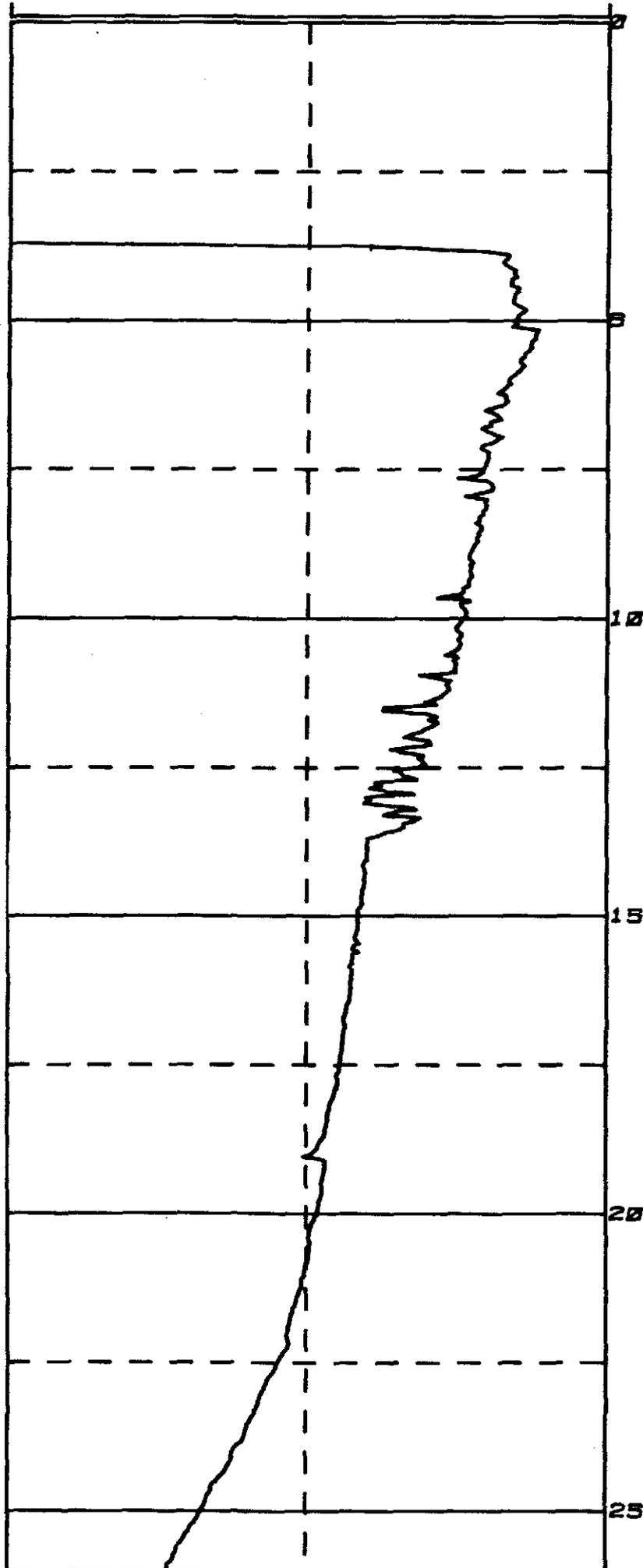


NEUTRON (0-10000 C. P. S.)

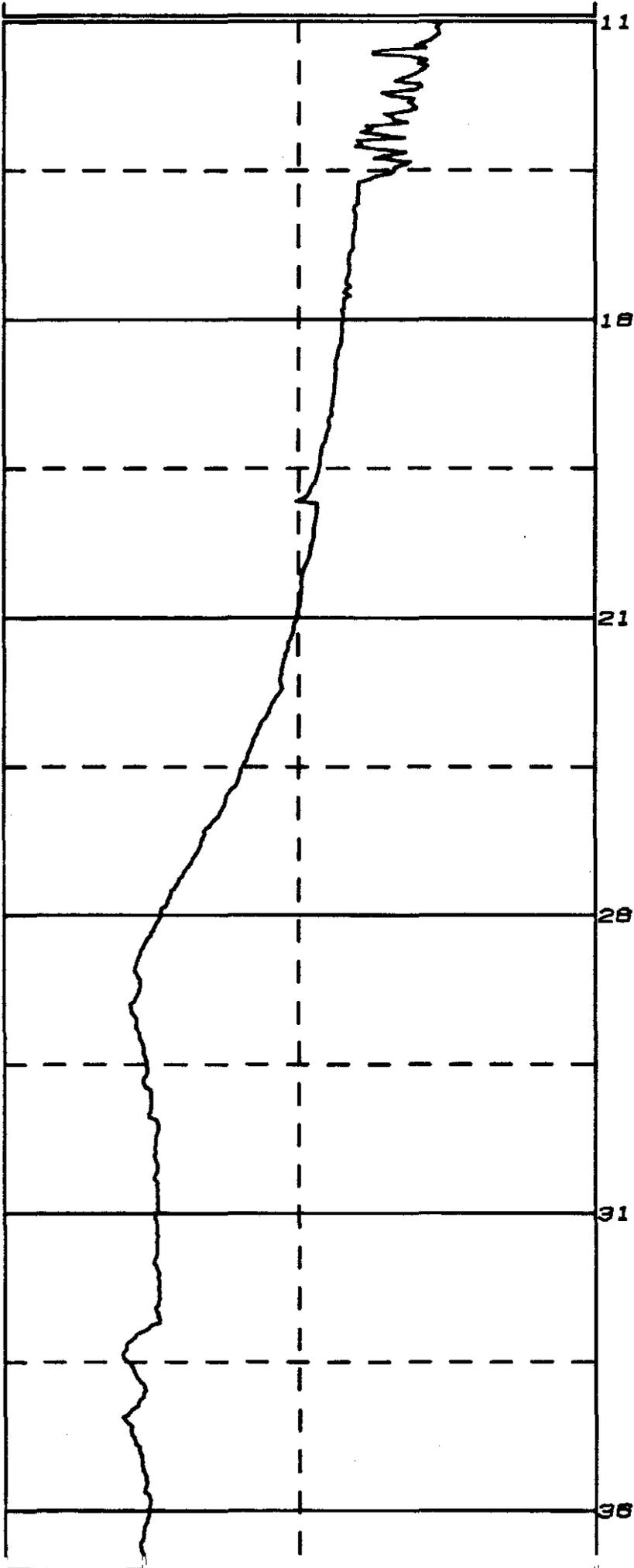
RESISTIVITY (150-250 OHMS)



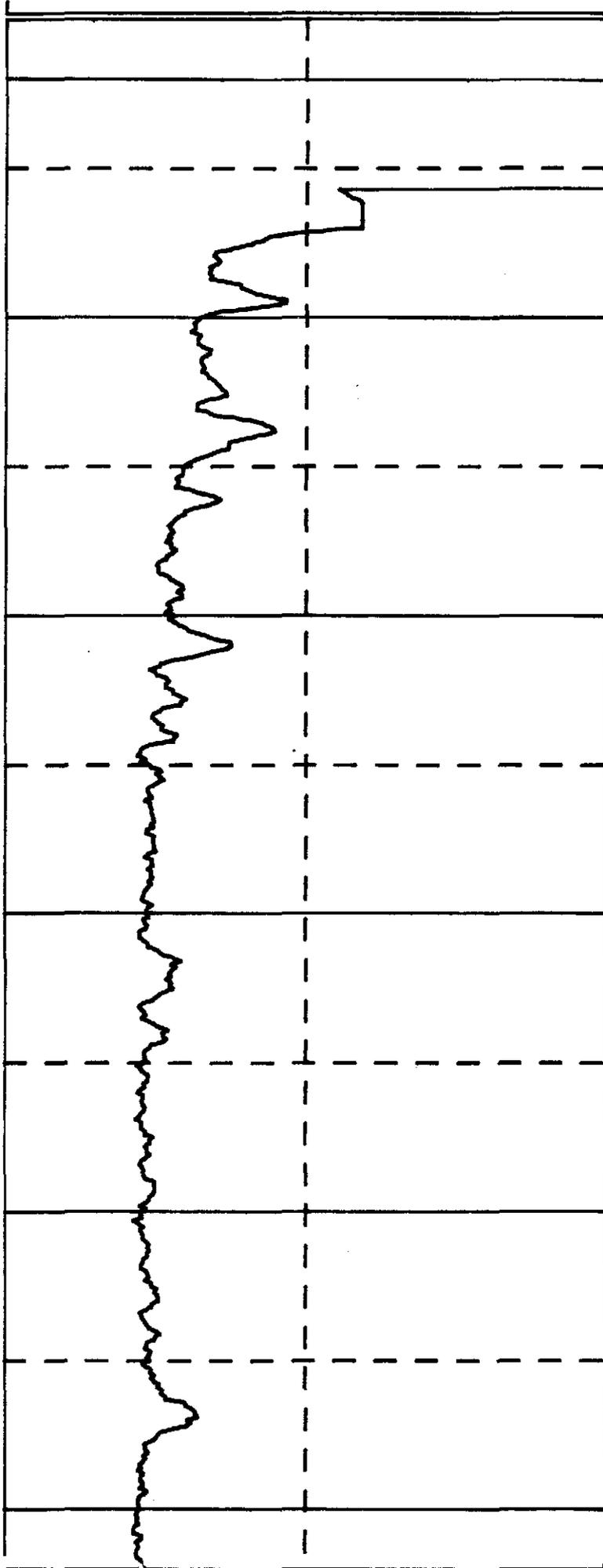
SELF POTENTIAL ( 50 to +150 mV. )



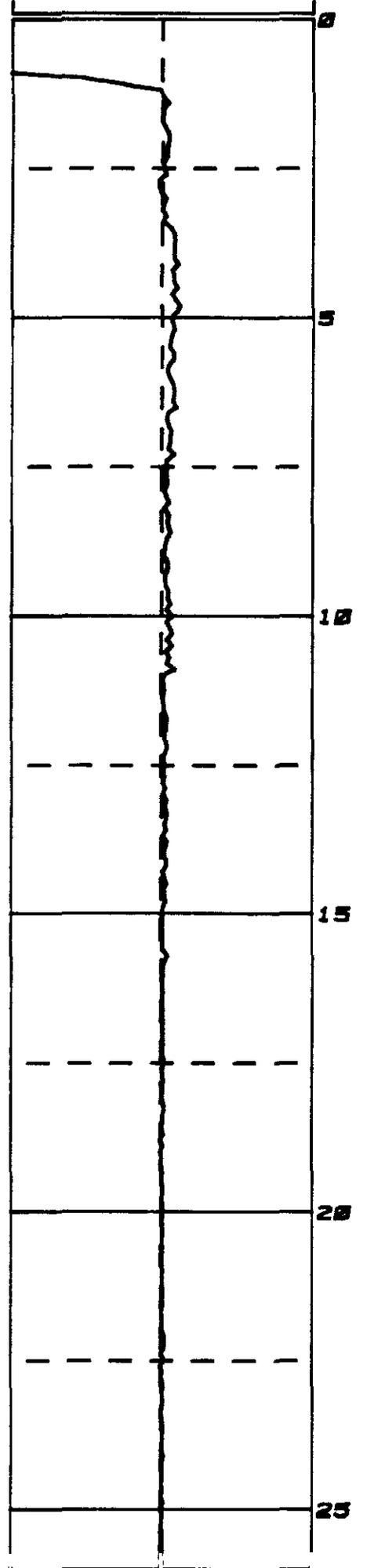
SELF POTENTIAL ( 50 to 150 mV. )



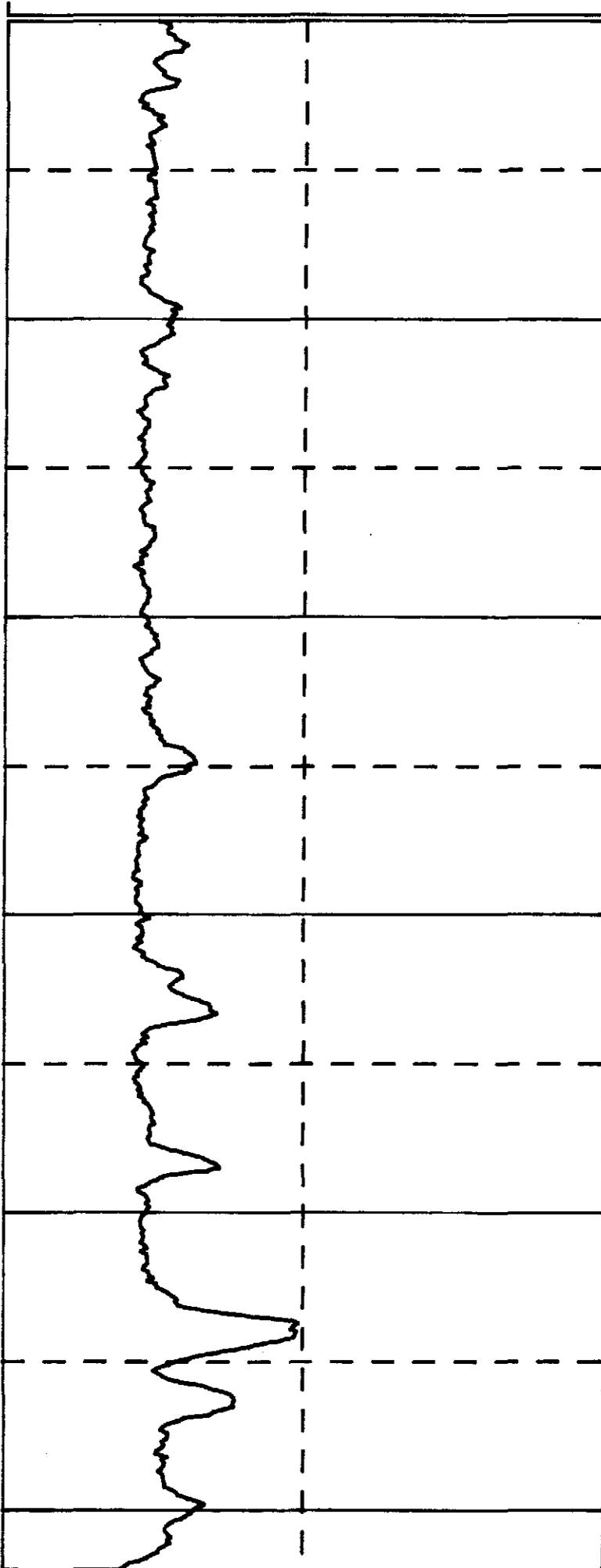
DENSITY (0-5000 C. P. S.)



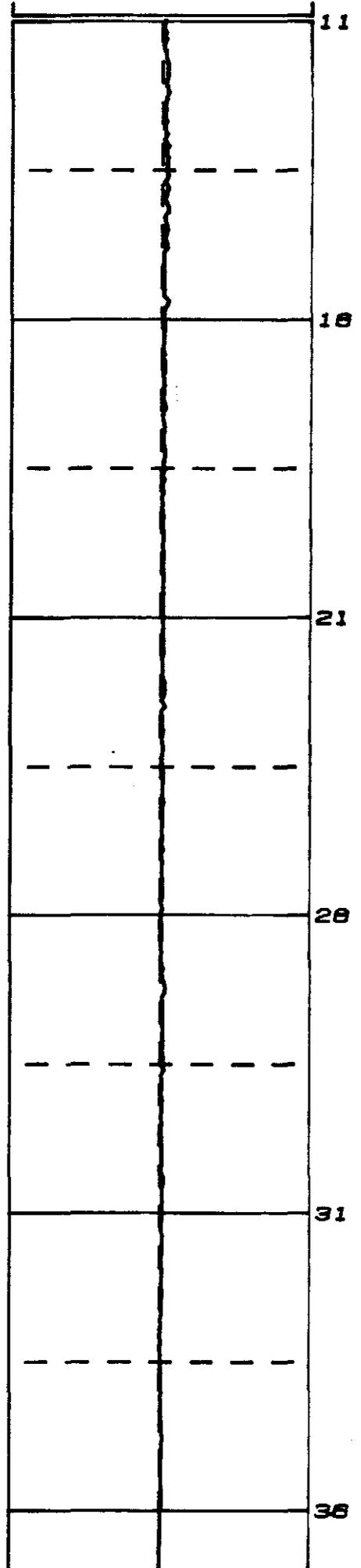
CALIPER (0-10 In.)



DENSITY (0-5000 C. P. S.)



CALIPER (0-10 In.)

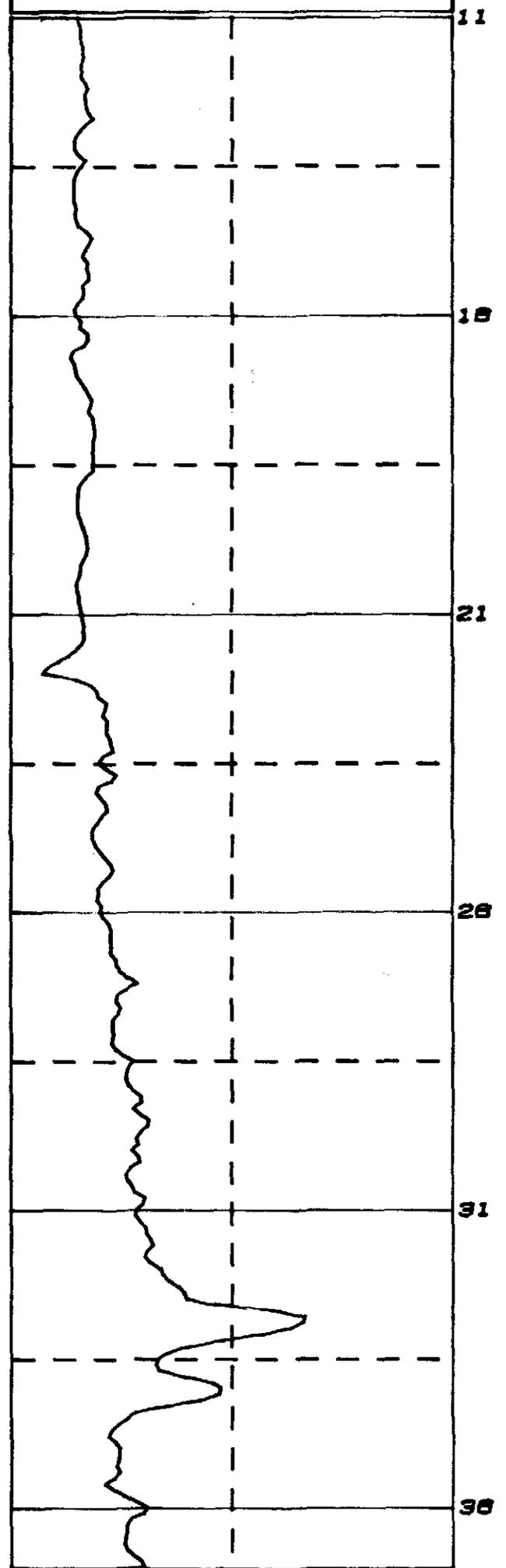
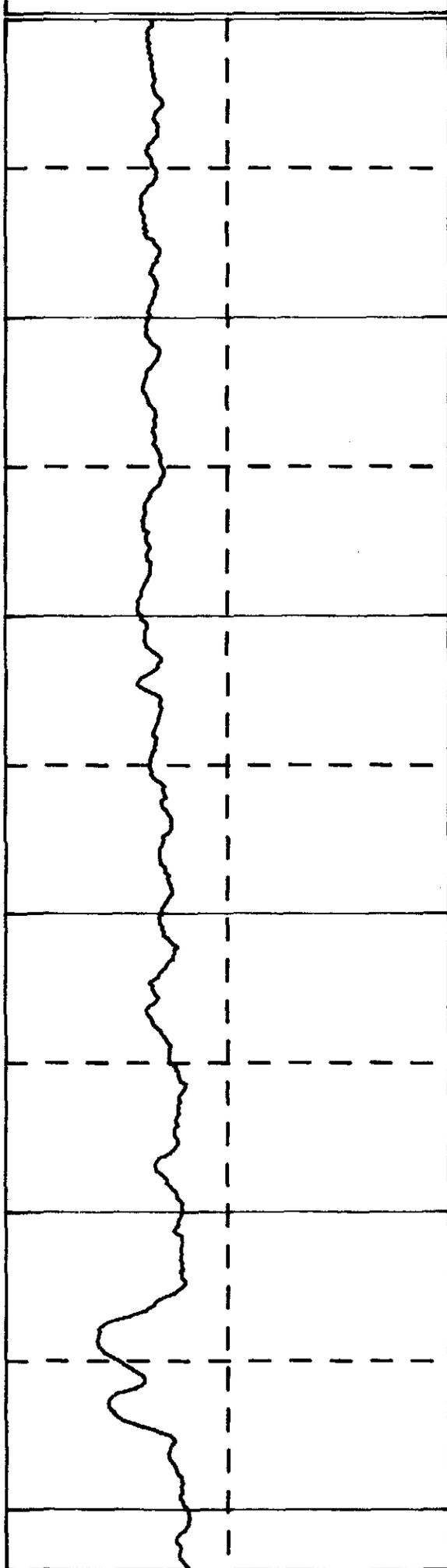


11  
18  
21  
28  
31  
38

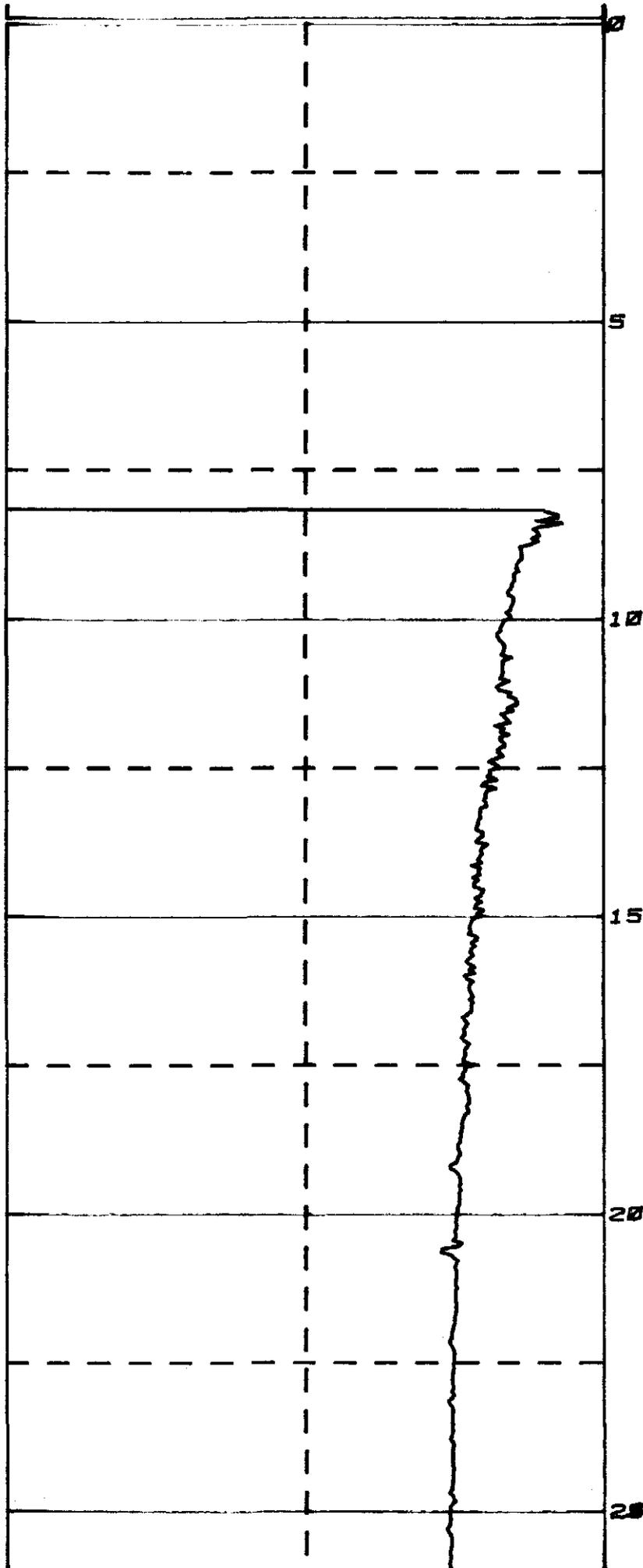


NEUTRON (0-10000 C. P. S.)

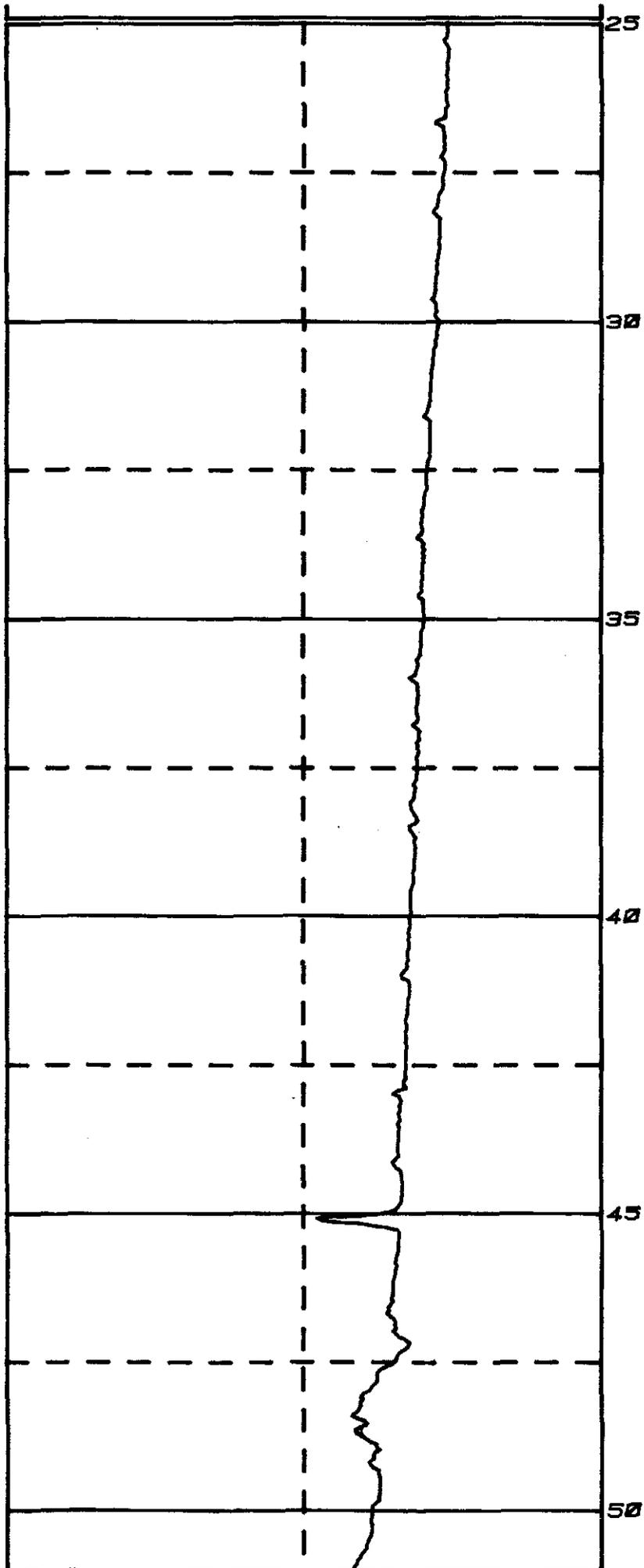
RESISTIVITY (100-350 OHMS)



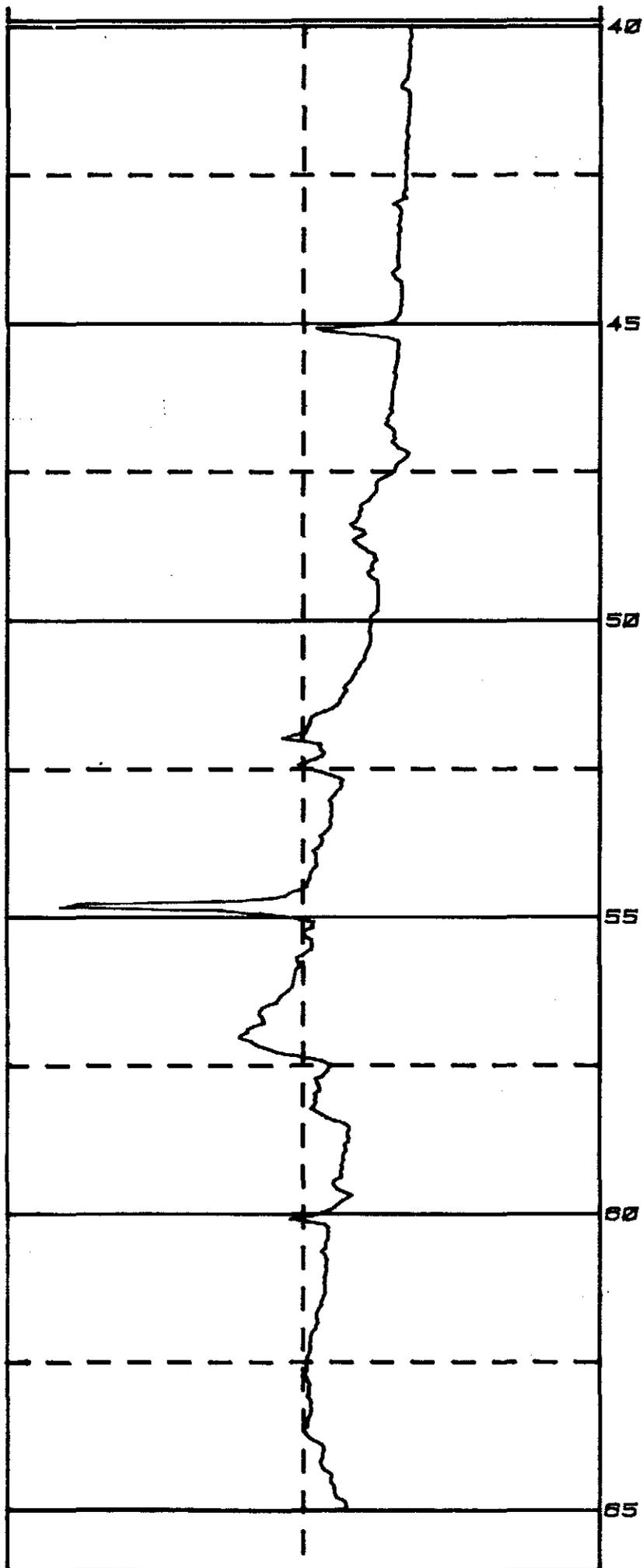
SELF POTENTIAL (-70 to +30 mV.)



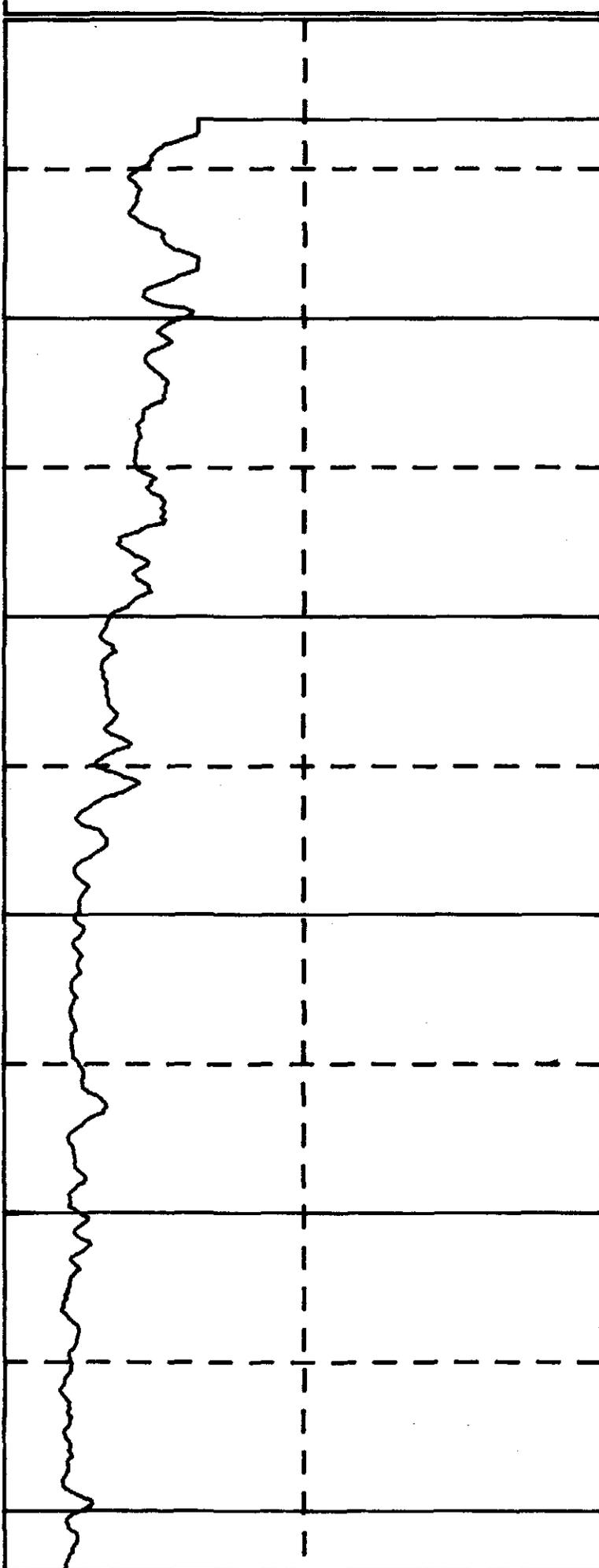
SELF POTENTIAL (-70 to +30 mV.)



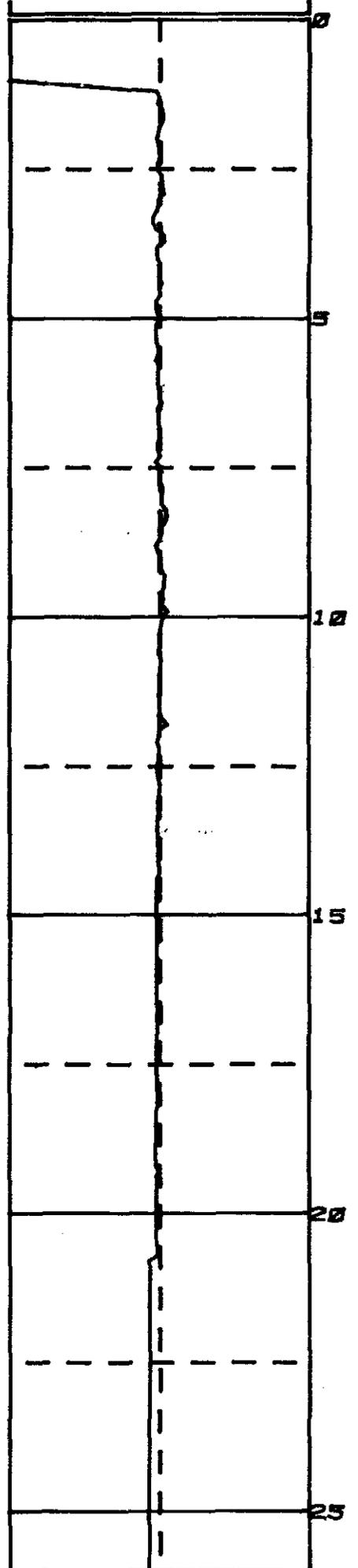
SELF POTENTIAL (-70 to +30 mV.)



DENSITY (0-5000 C. P. S.)

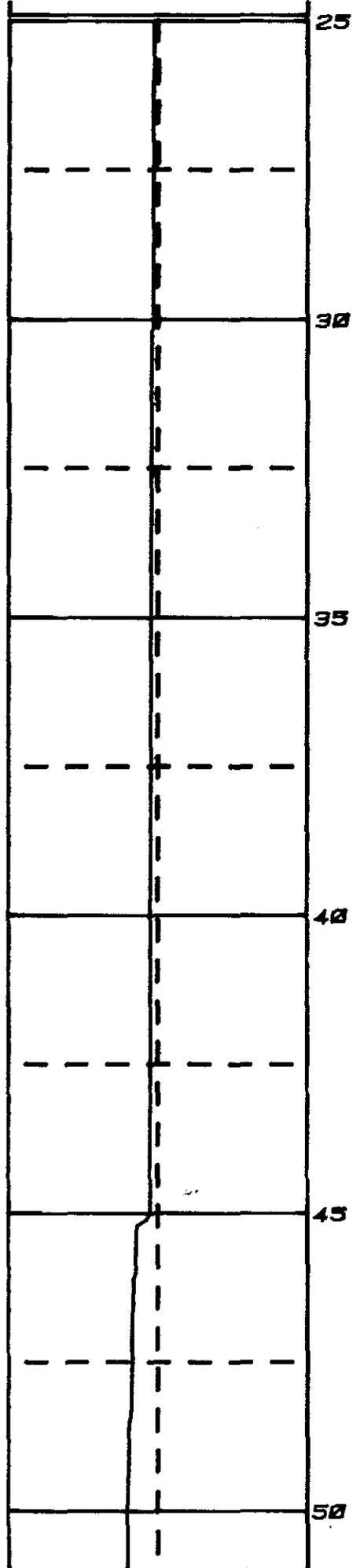
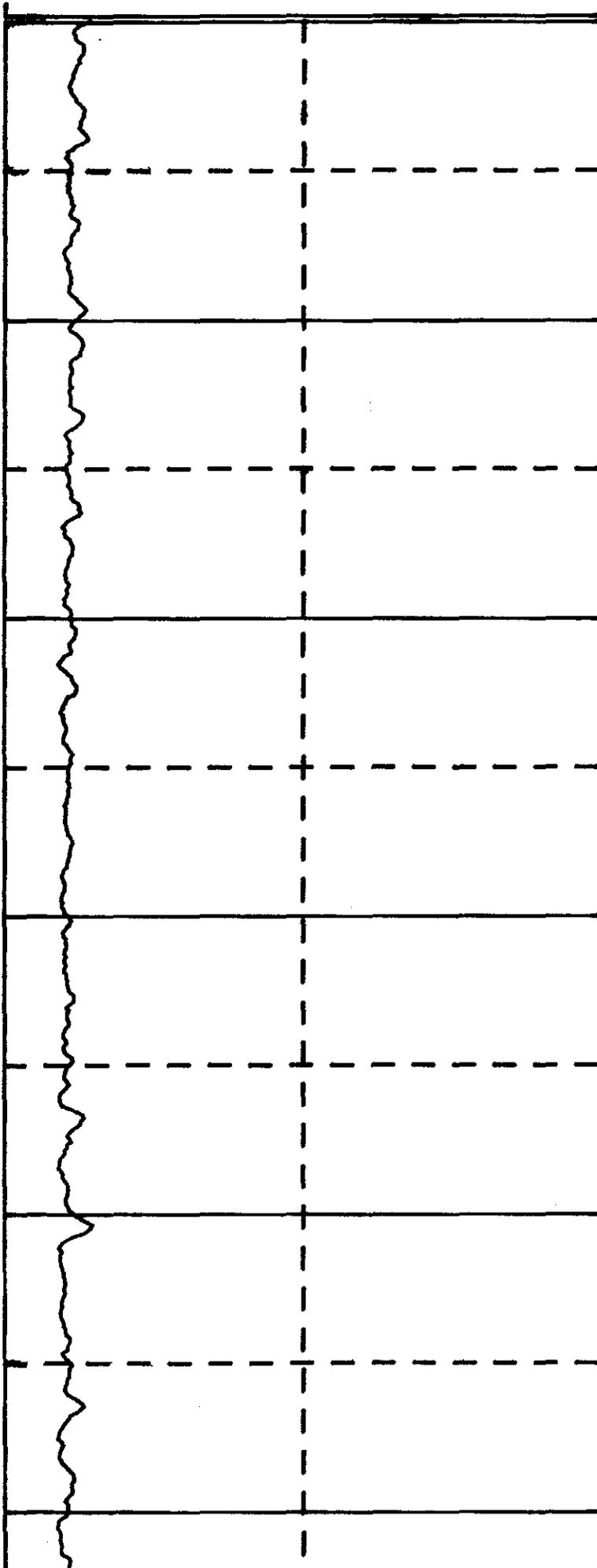


CALIPER (0-10 In.)



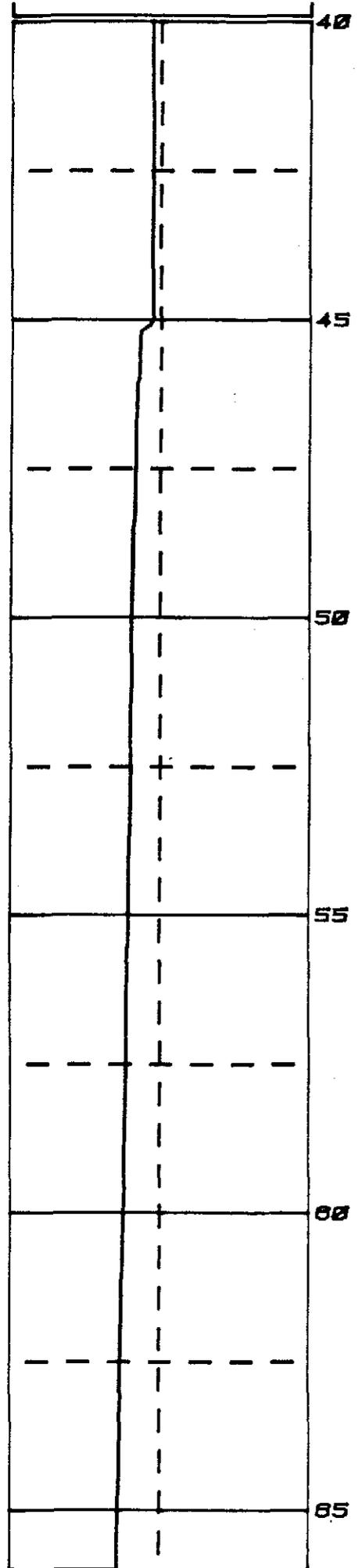
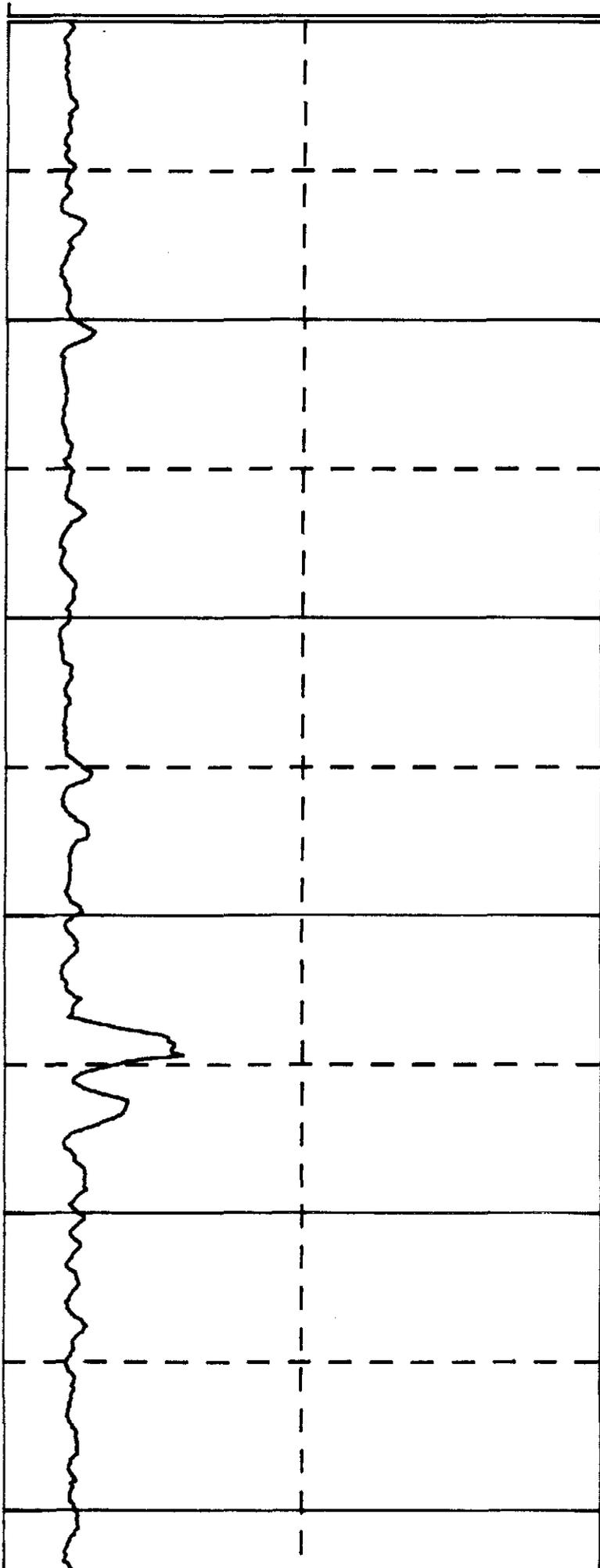
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)



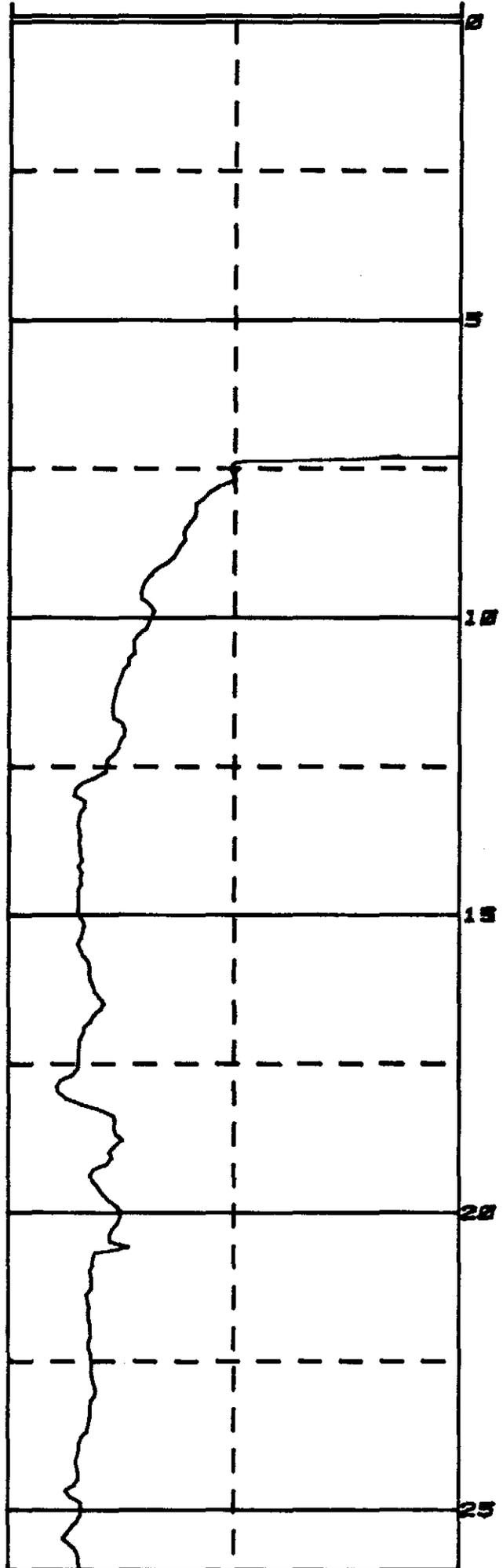
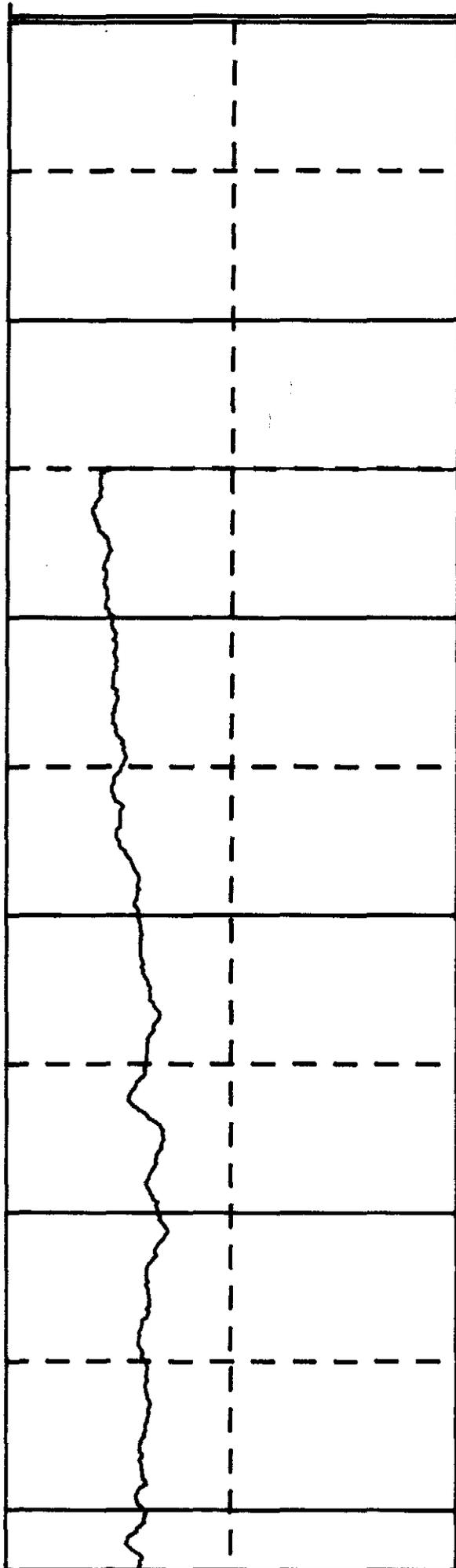
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)



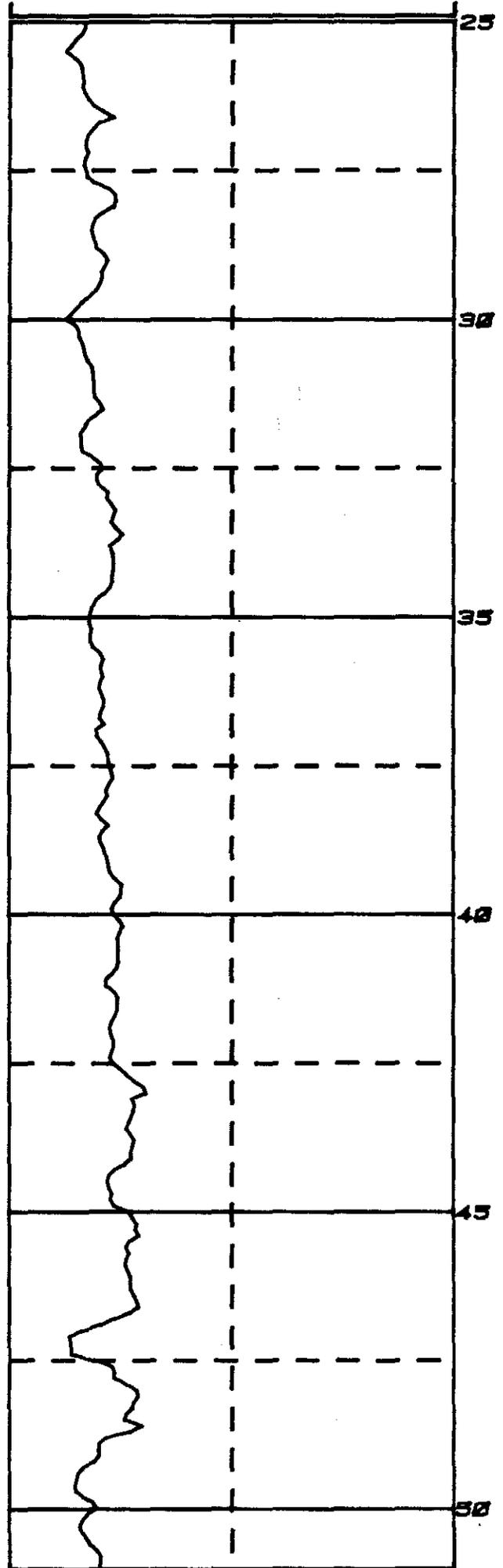
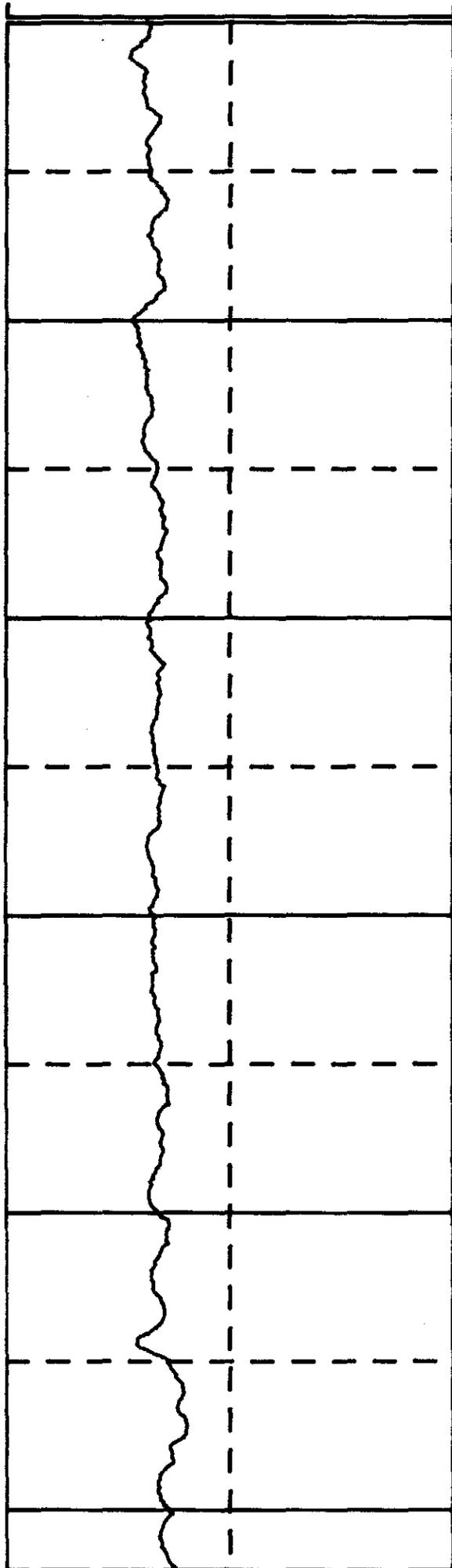
NEUTRON (0-10000 C.P.S.)

RESISTIVITY (900-1150 OHMS)



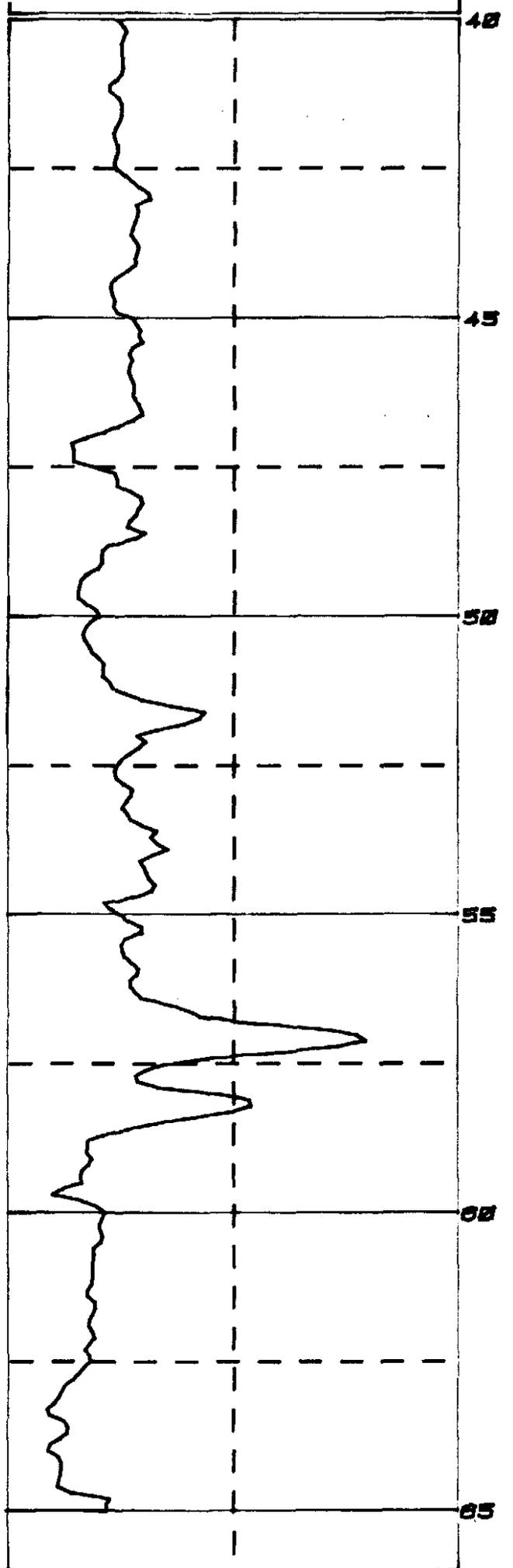
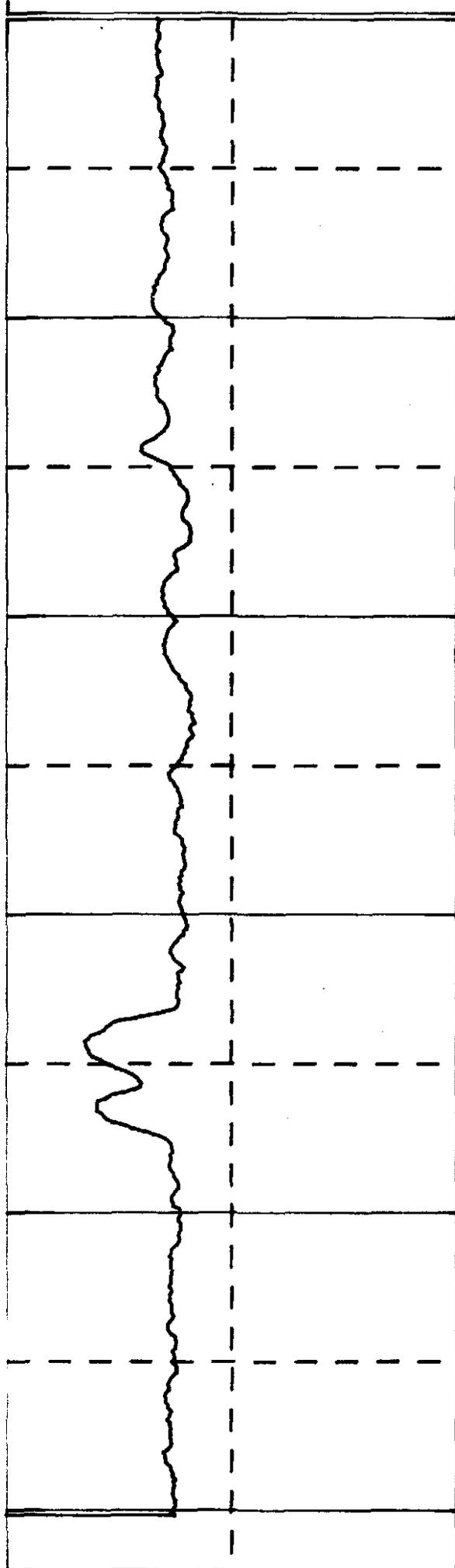
NEUTRON (0-10000 C.P.S.)

RESISTIVITY (000-1150 OHMS)

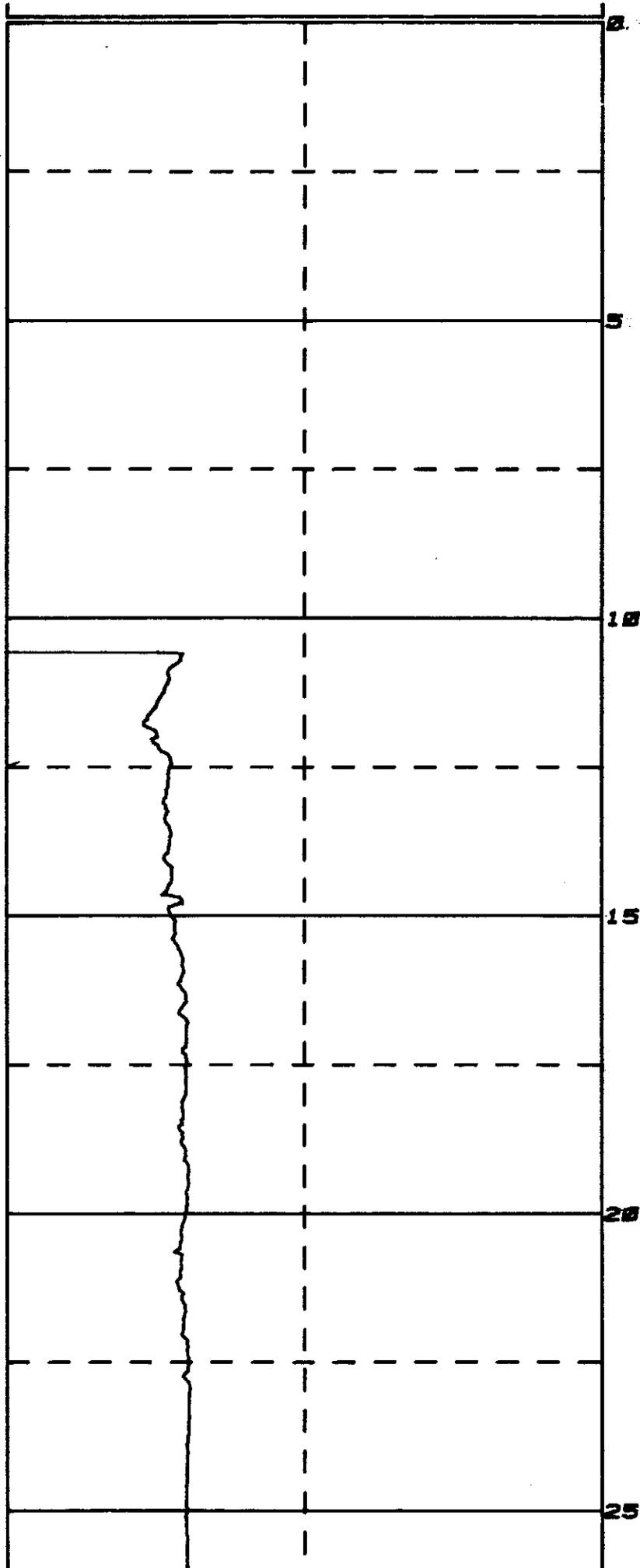


NEUTRON (0-10000 C. P. S.)

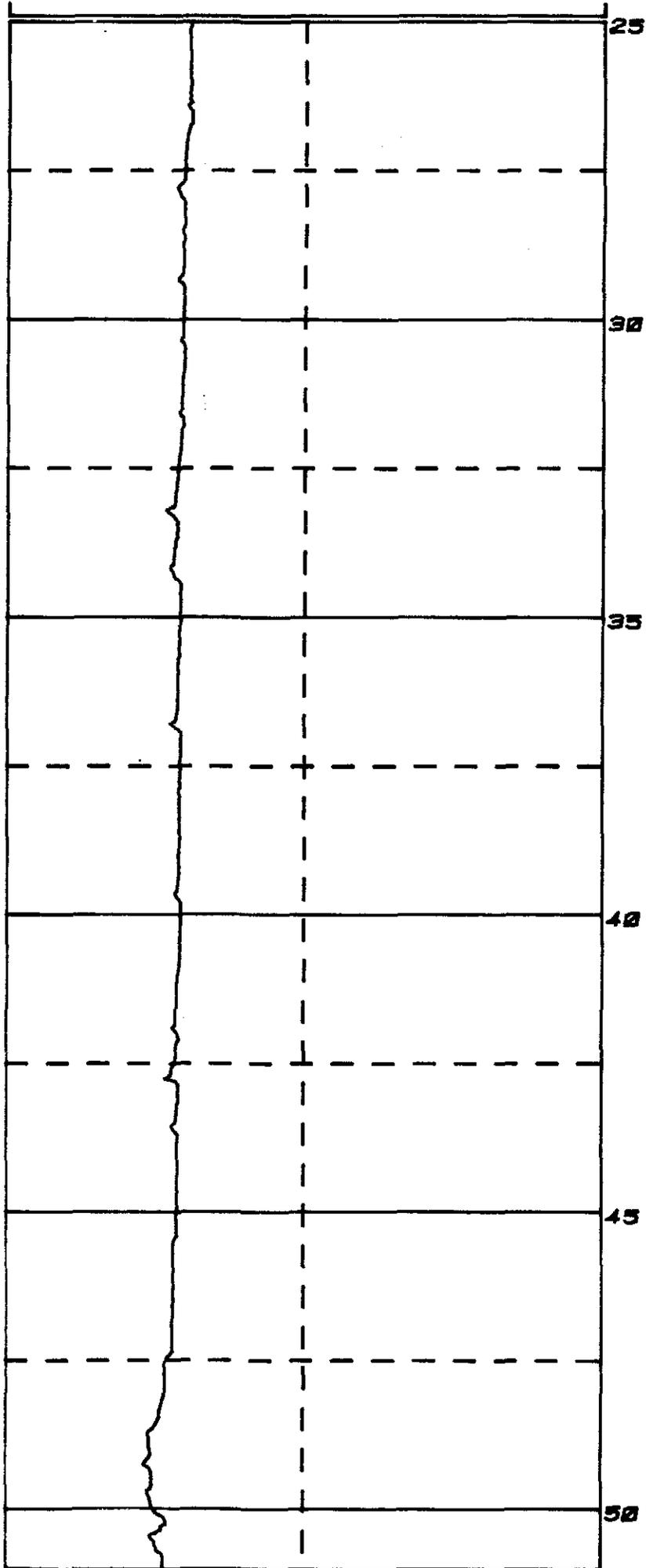
RESISTIVITY (900-1150 OHMS)



SELF POTENTIAL (-25 to +75 mV.)

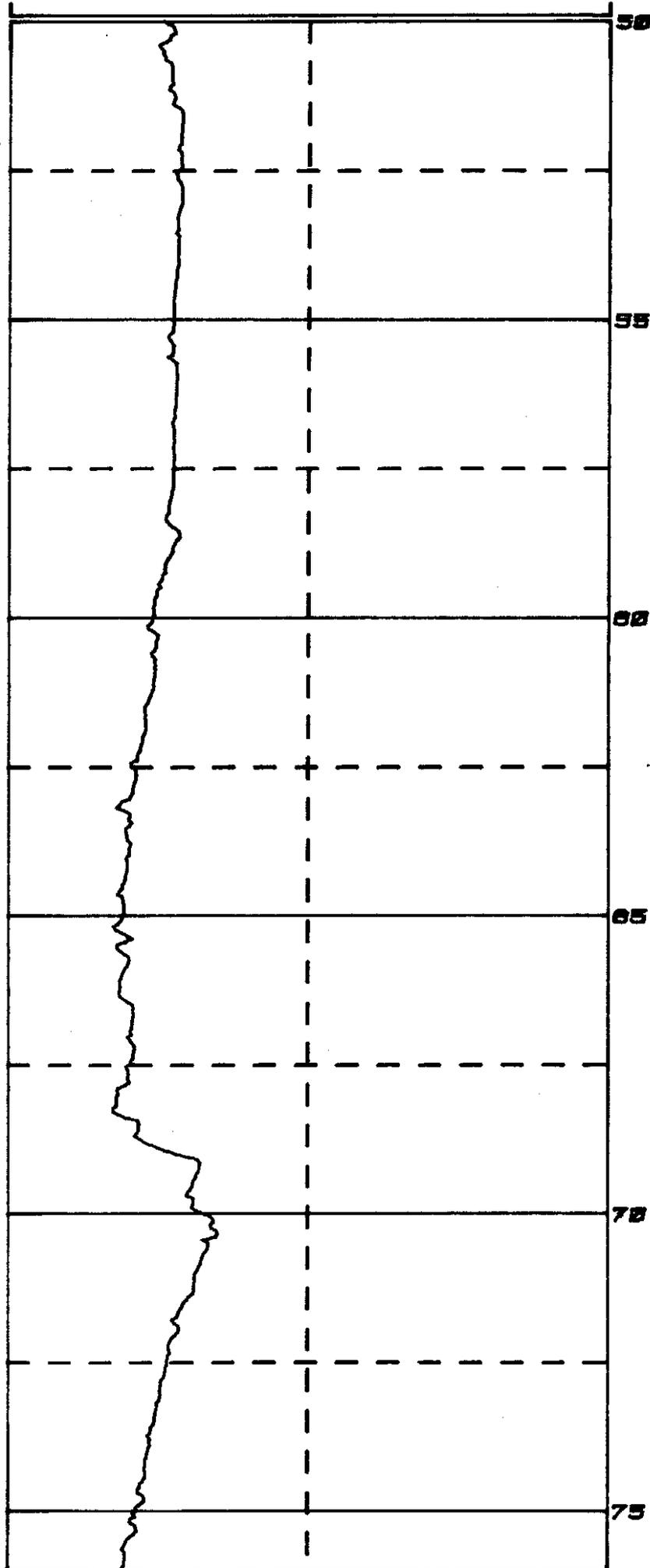


SELF POTENTIAL (-25 to 75 mV.)



SELF POTENTIAL (-25 to 75 mV.)

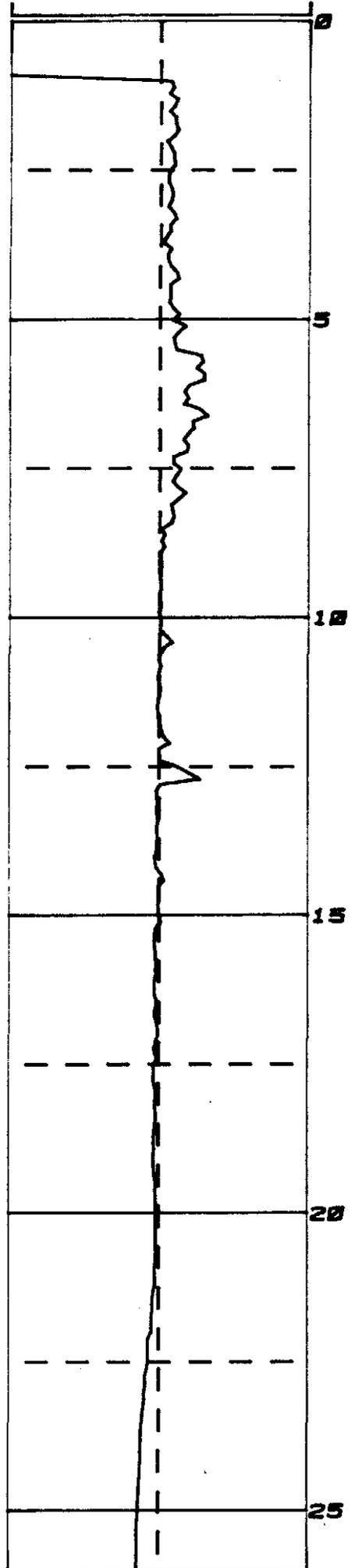
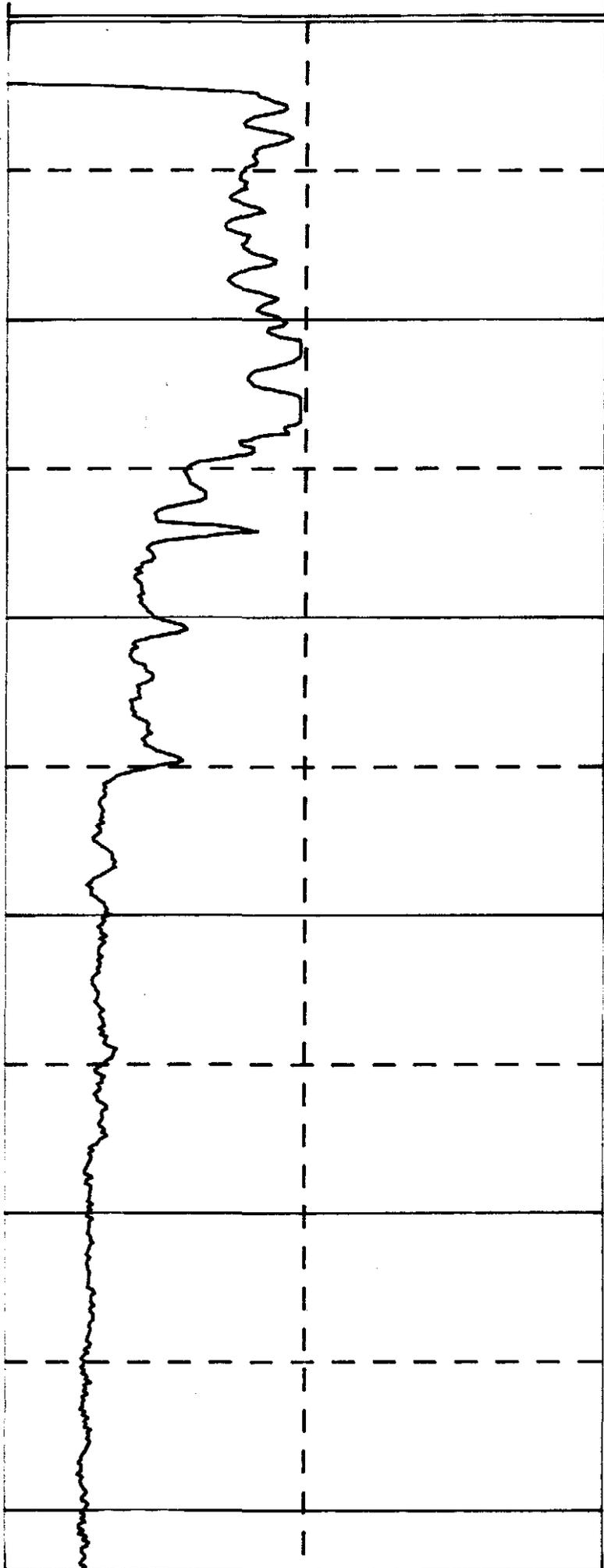
750247



750248

DENSITY (0-5000 C. P. S.)

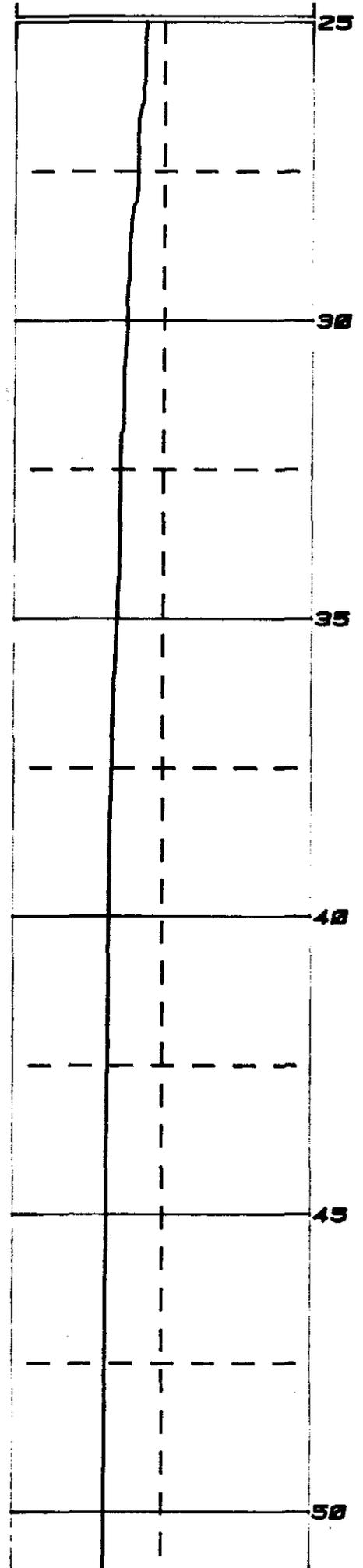
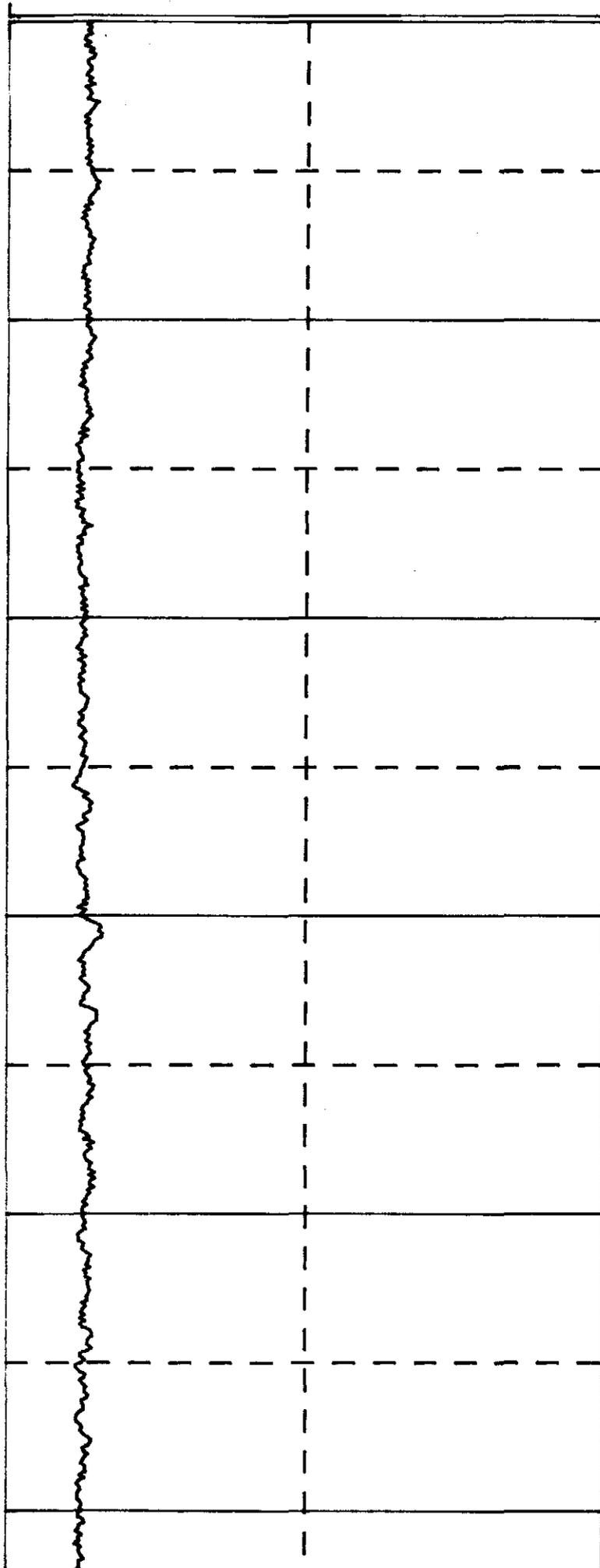
CALIPER (0-10 In.)



750249

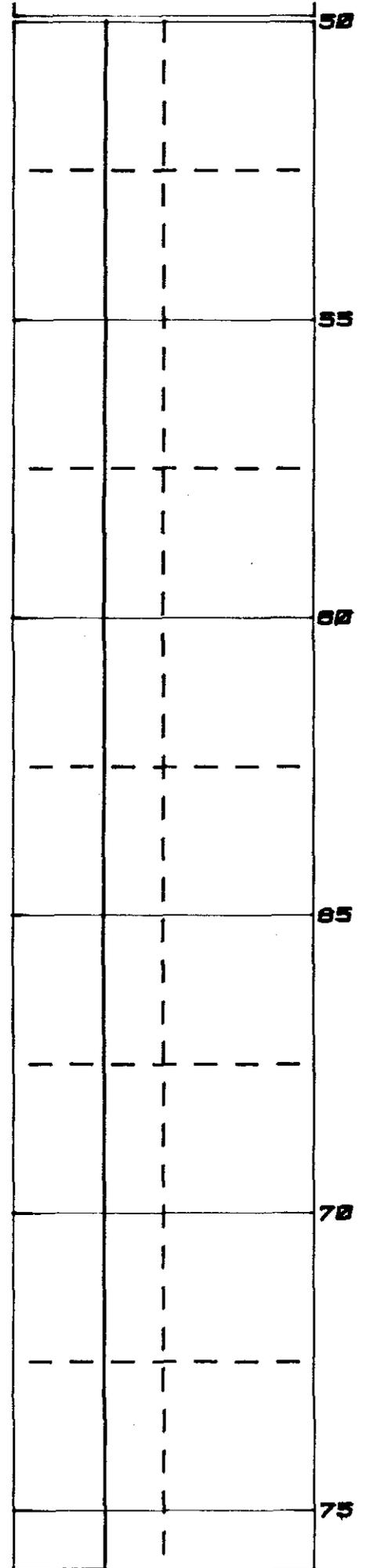
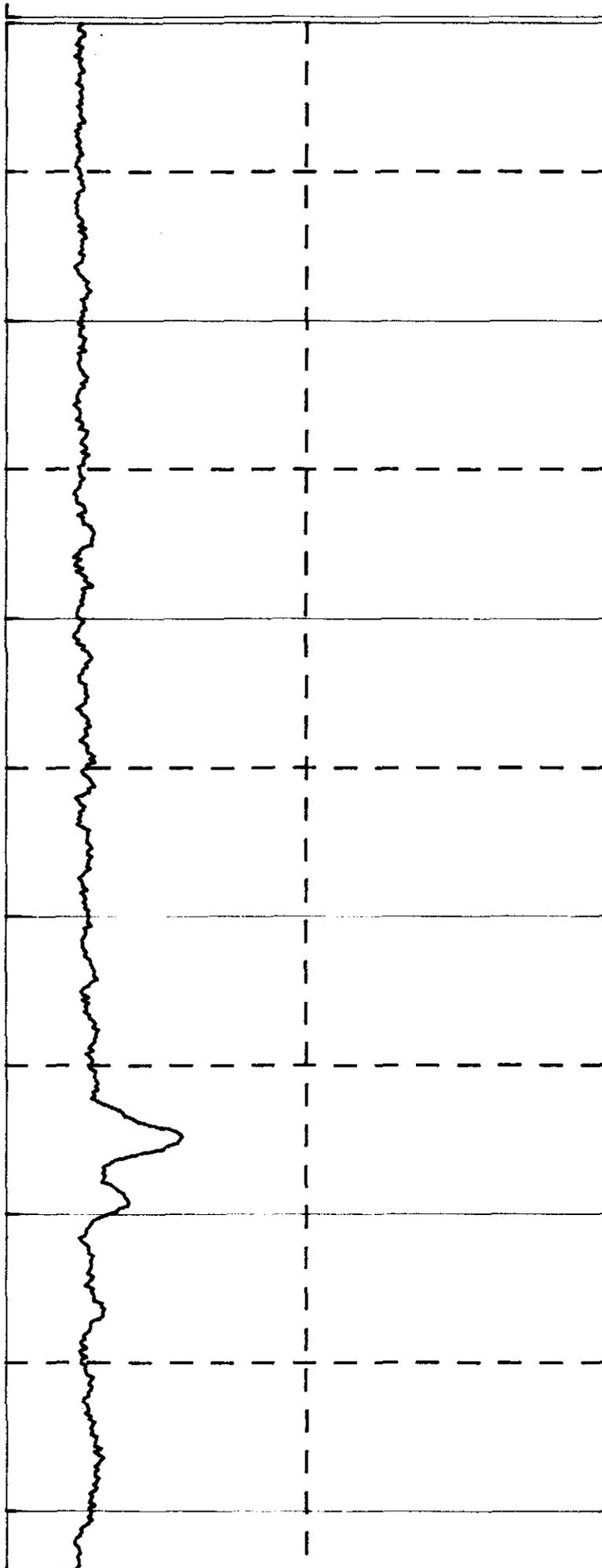
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)



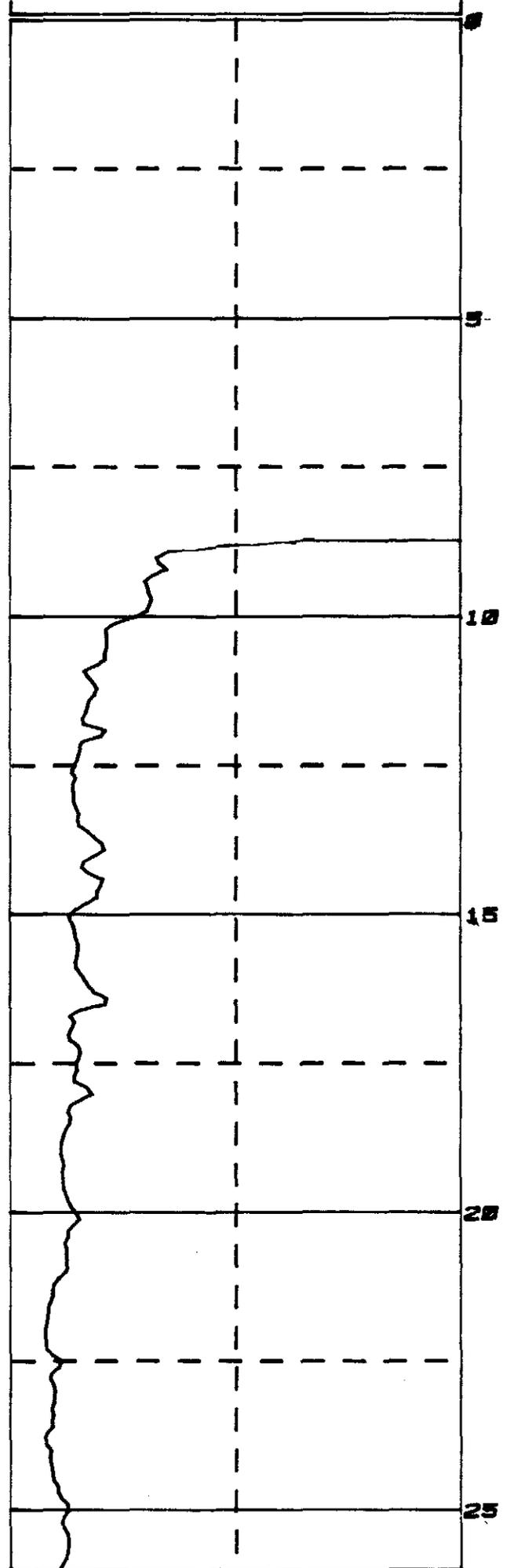
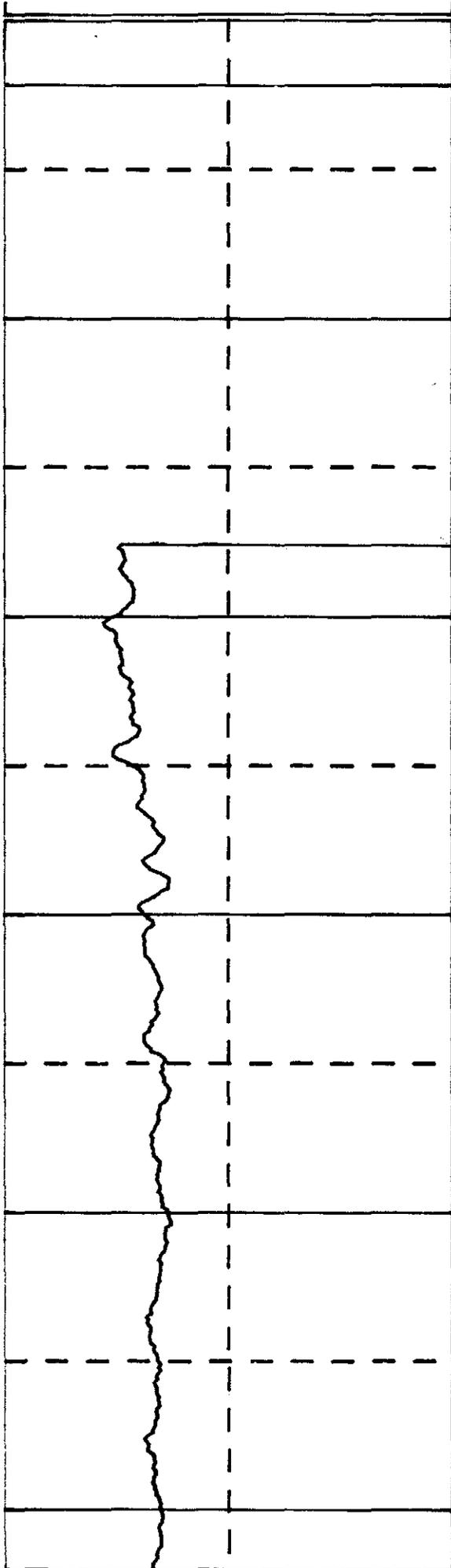
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)



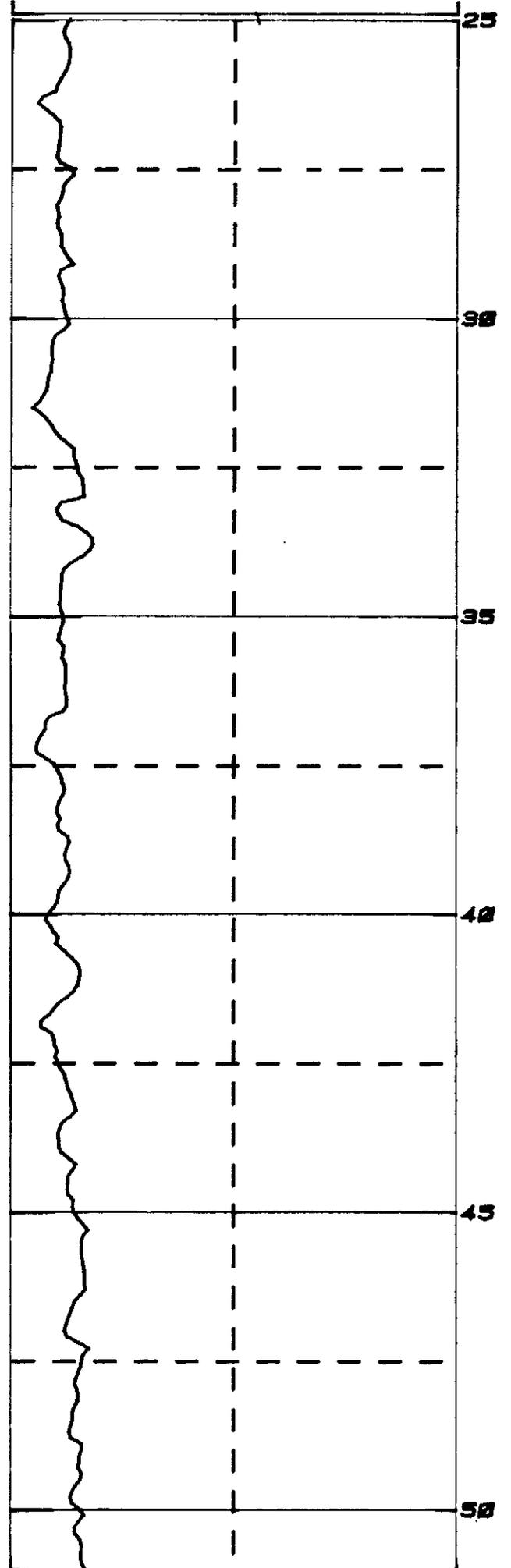
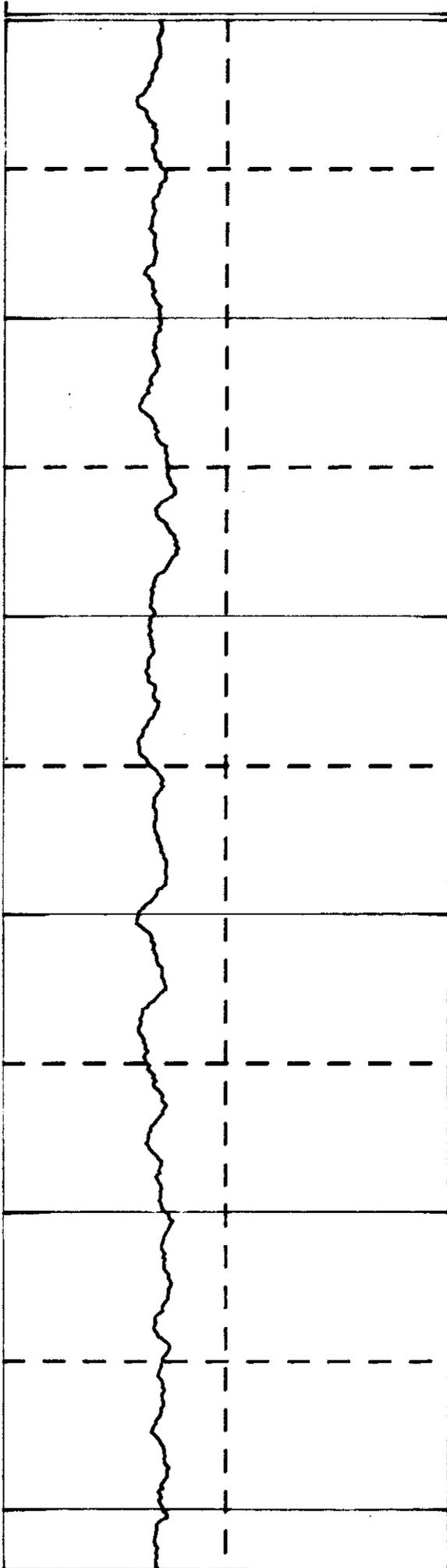
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (400-850 OHMS)



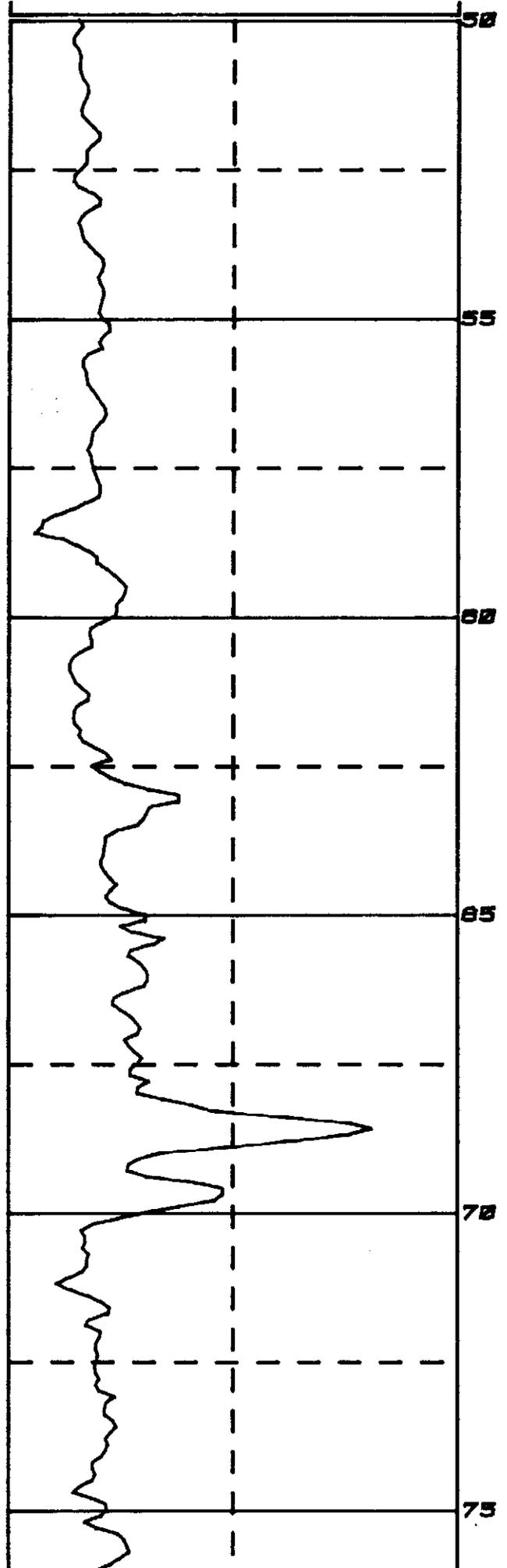
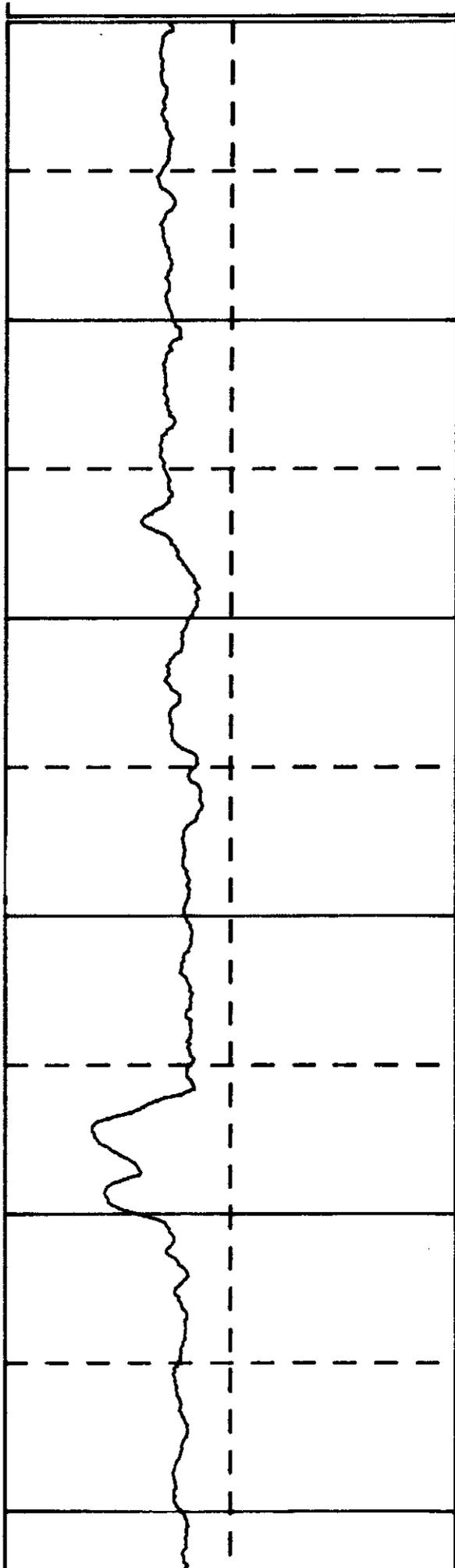
NEUTRON (0-10000 C. P. S.)

RESISTIVITY (400-850 OHMS)

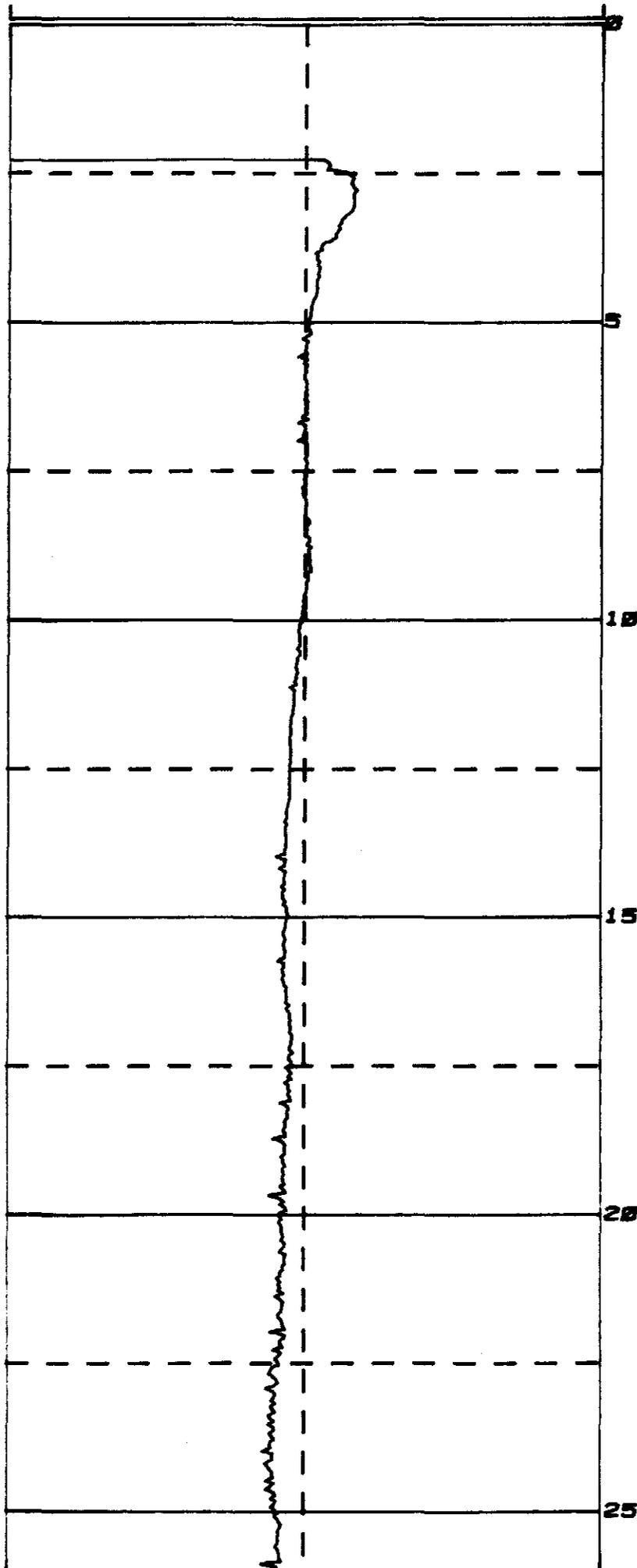


NEUTRON (0-10000 C.P.S.)

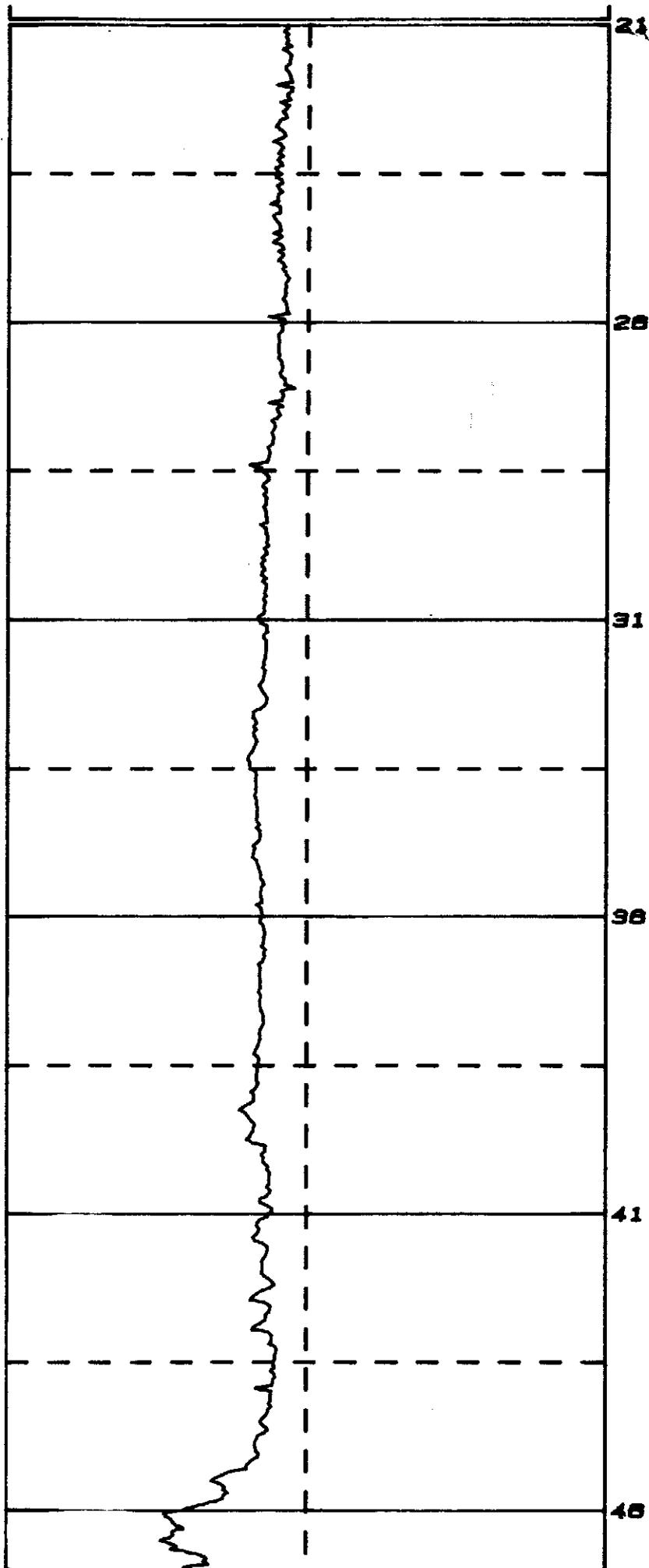
RESISTIVITY (400-850 OHMS)



SELF POTENTIAL ( 50 to 150 mV. )

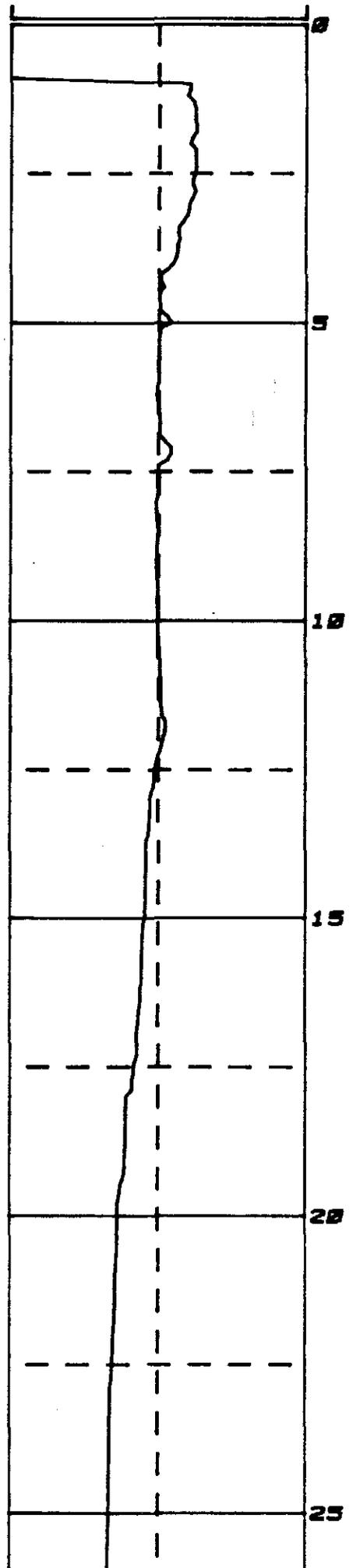
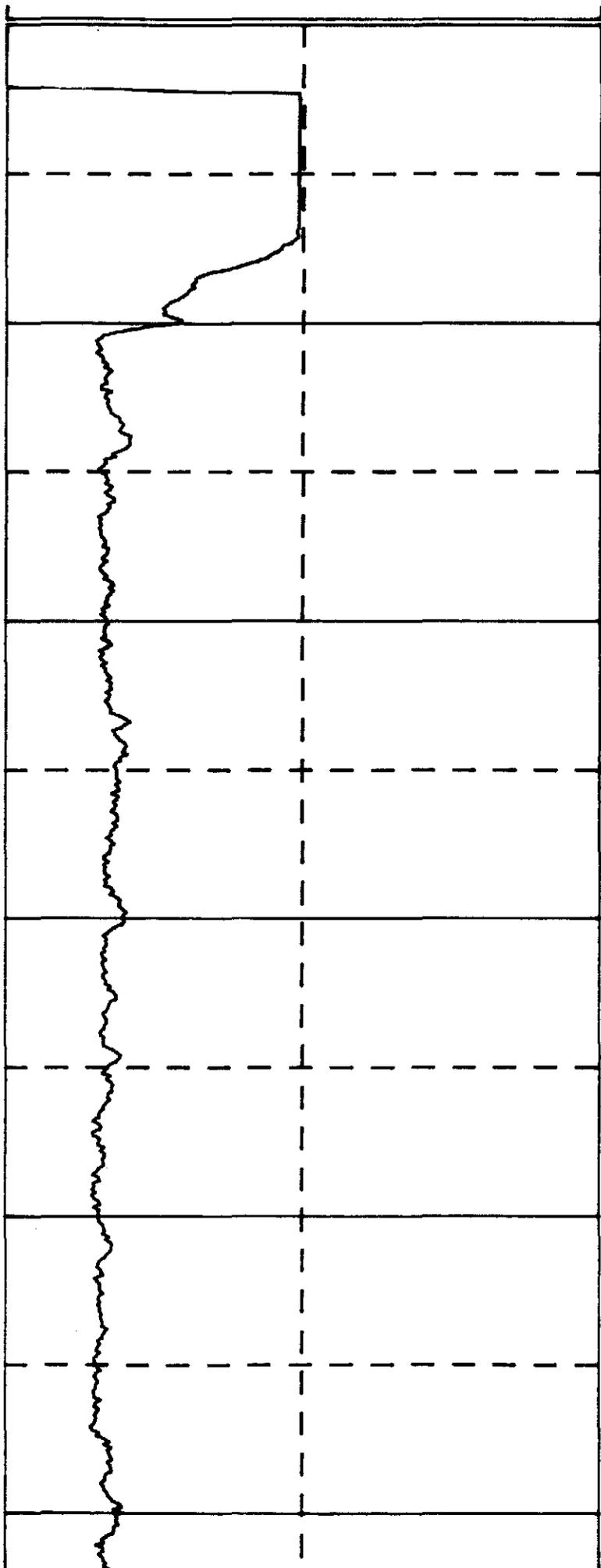


SELF POTENTIAL ( 50 to 150 mV. )



DENSITY (8-5000 C. P. S.)

CALIPER (8-10 In.)



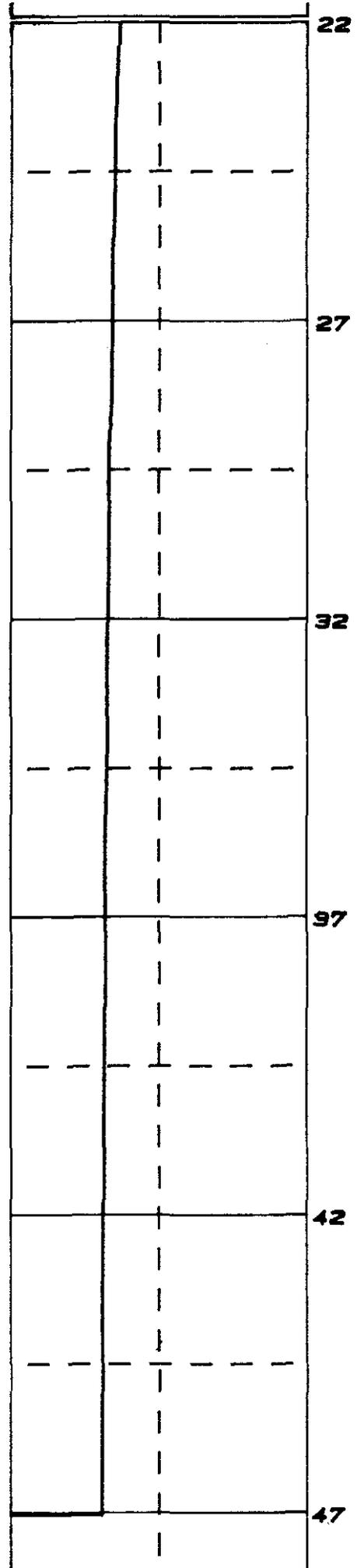
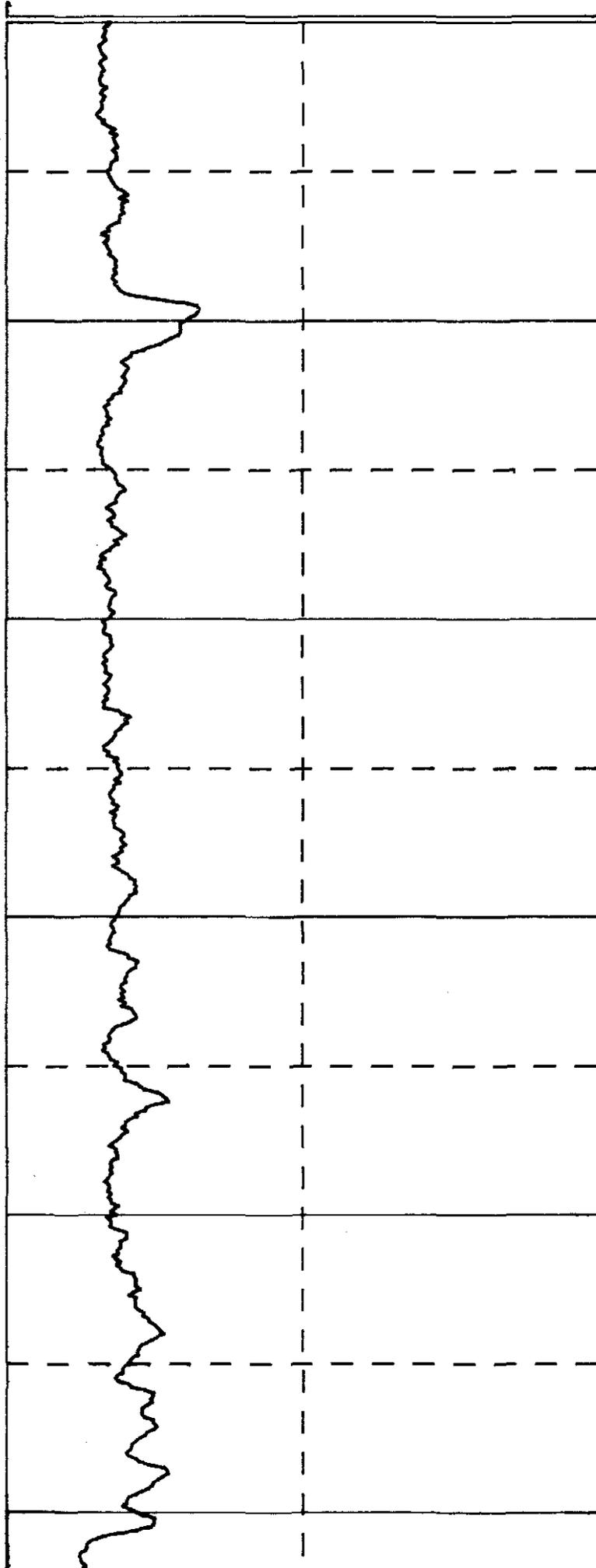
CRA EXPLORATION PTY. LTD.  
RAILTON J. V. EL 4/74

750257

RD82MR128

DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)



22

27

32

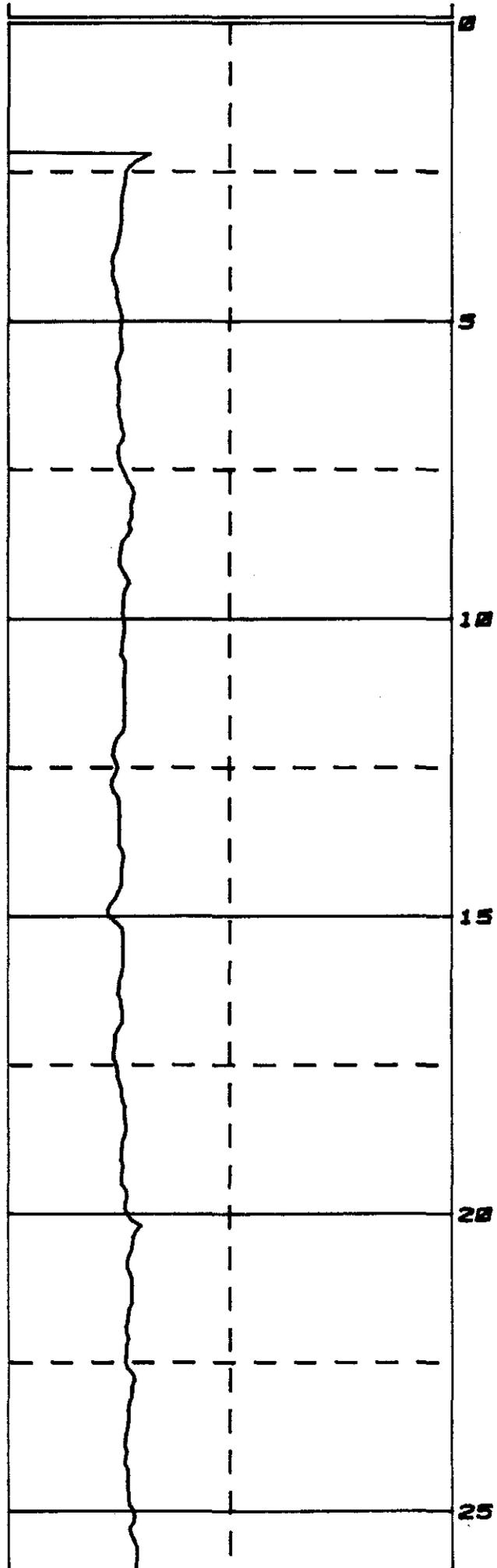
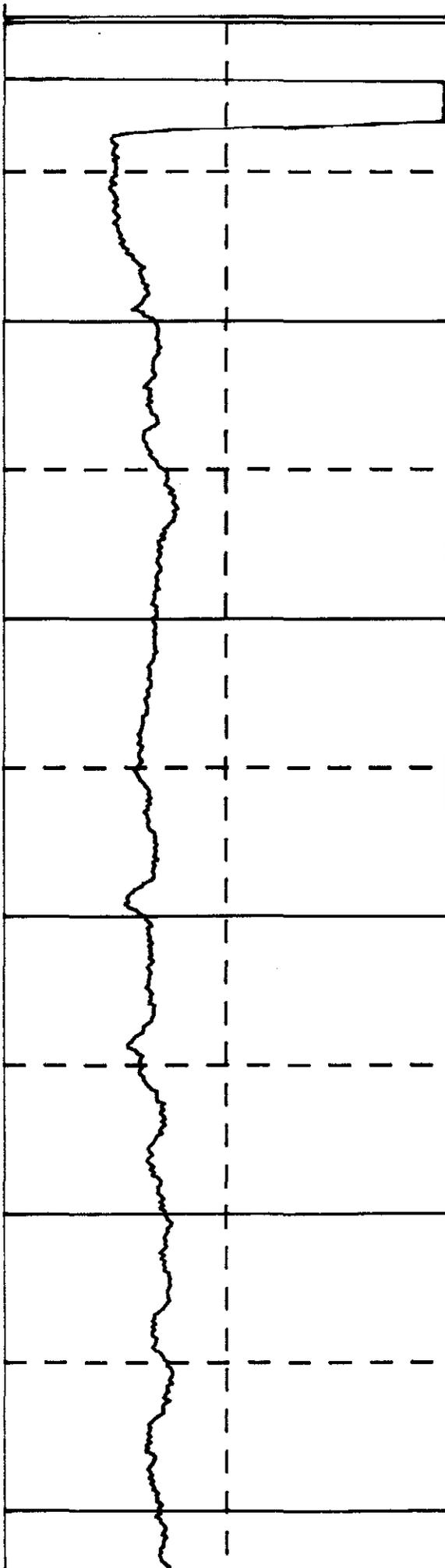
37

42

47

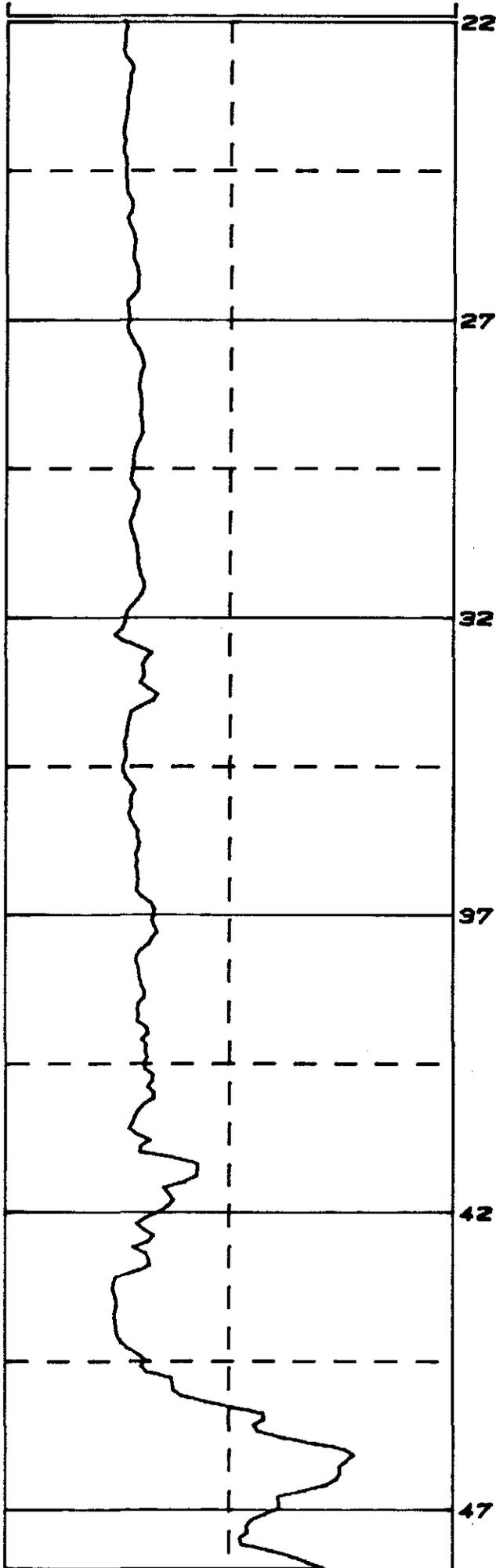
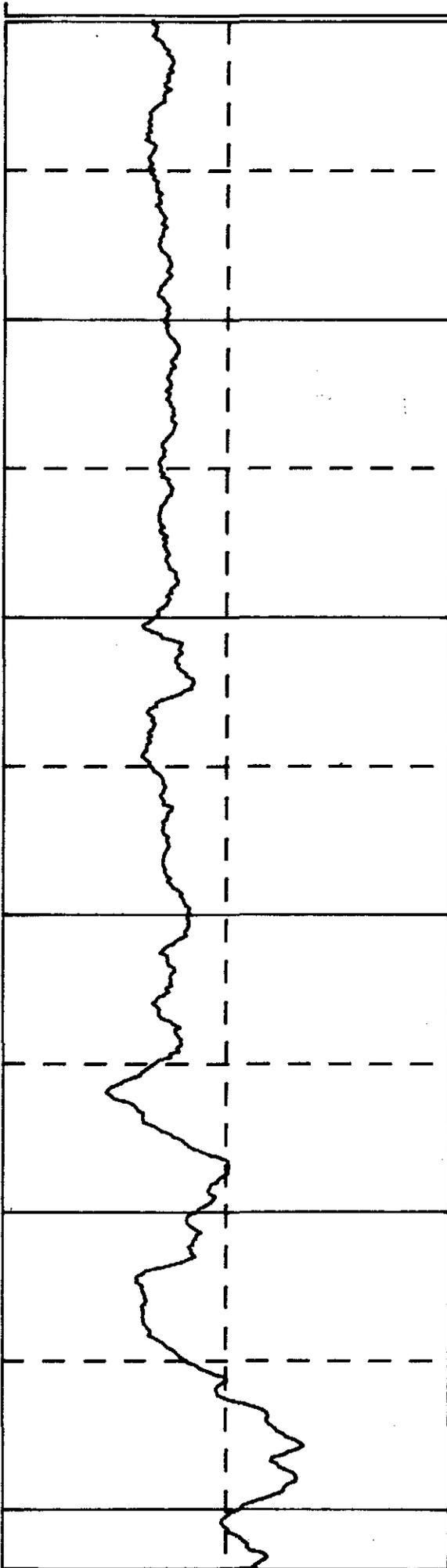
NEUTRON (8-10000 C. P. S.)

RESISTIVITY (200-700 OHMS)

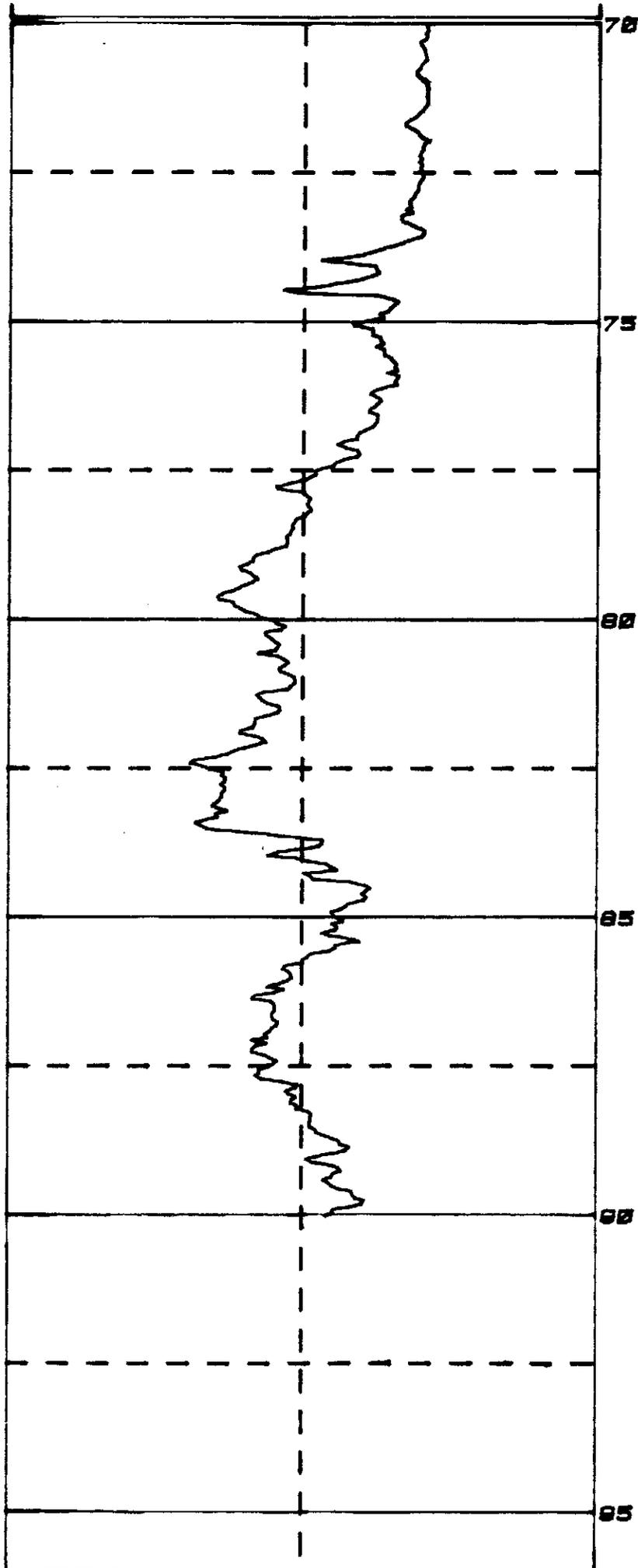


NEUTRON (0-10000 C. P. S.)

RESISTIVITY (200-700 OHMS)



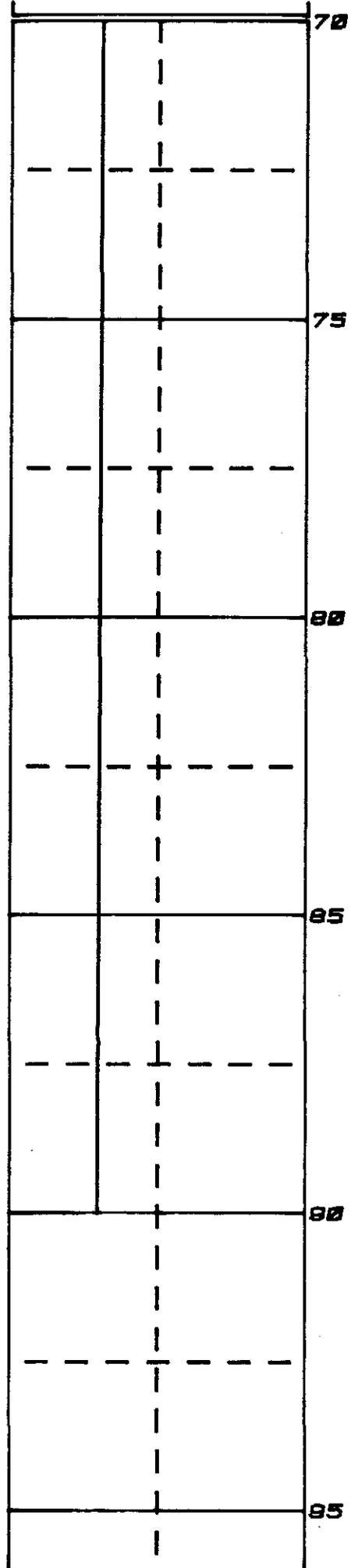
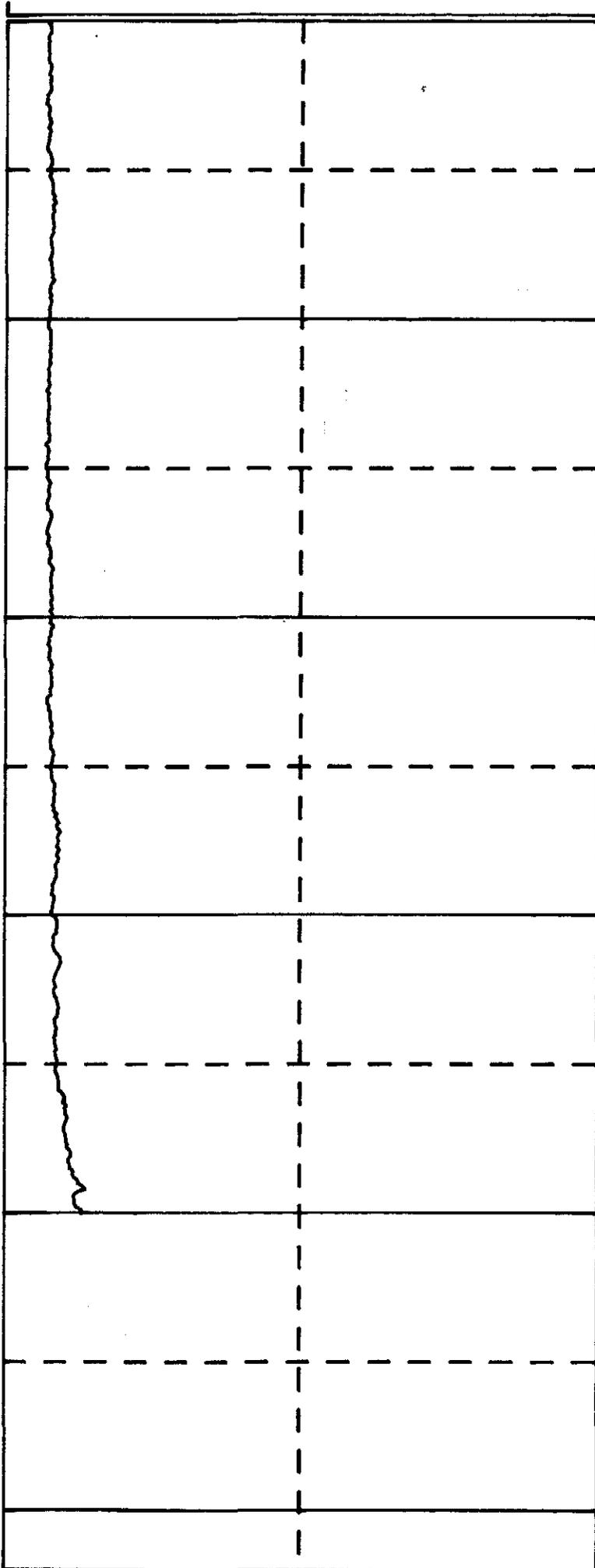
SELF POTENTIAL ( 100 to 125 mV. )



750261

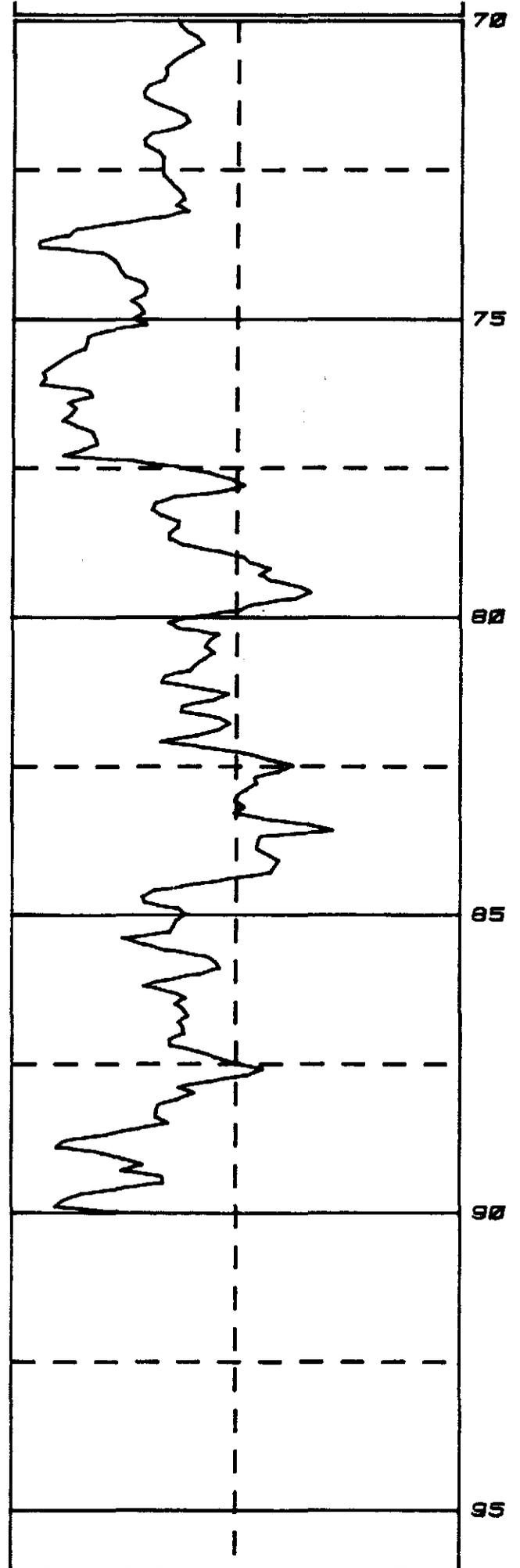
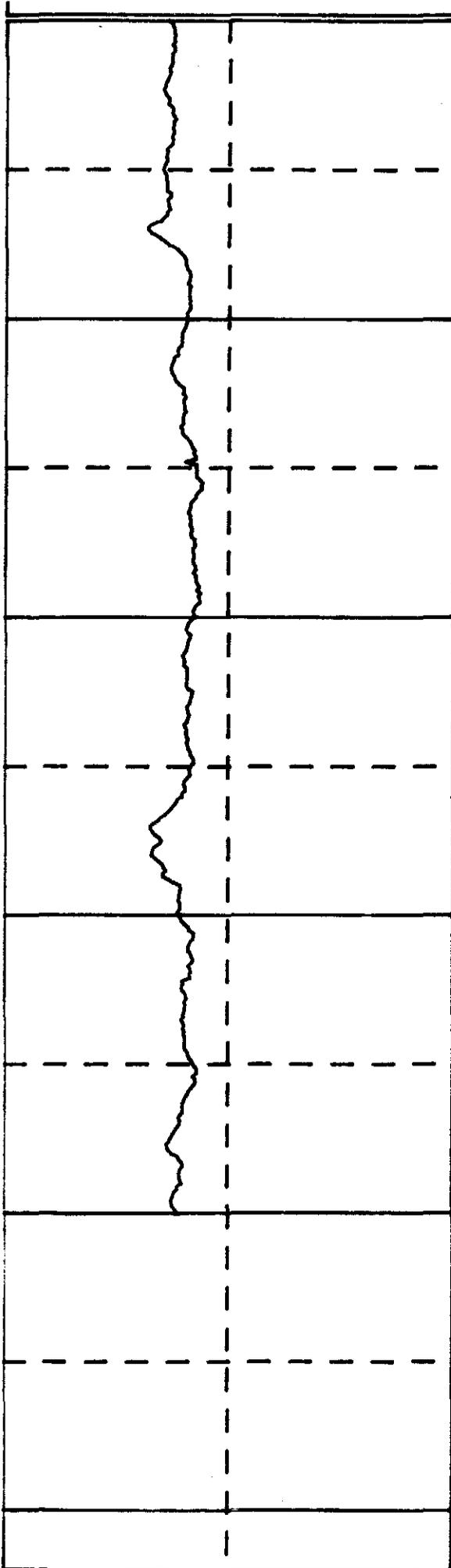
DENSITY (0-5000 C. P. S.)

CALIPER (0-10 In.)

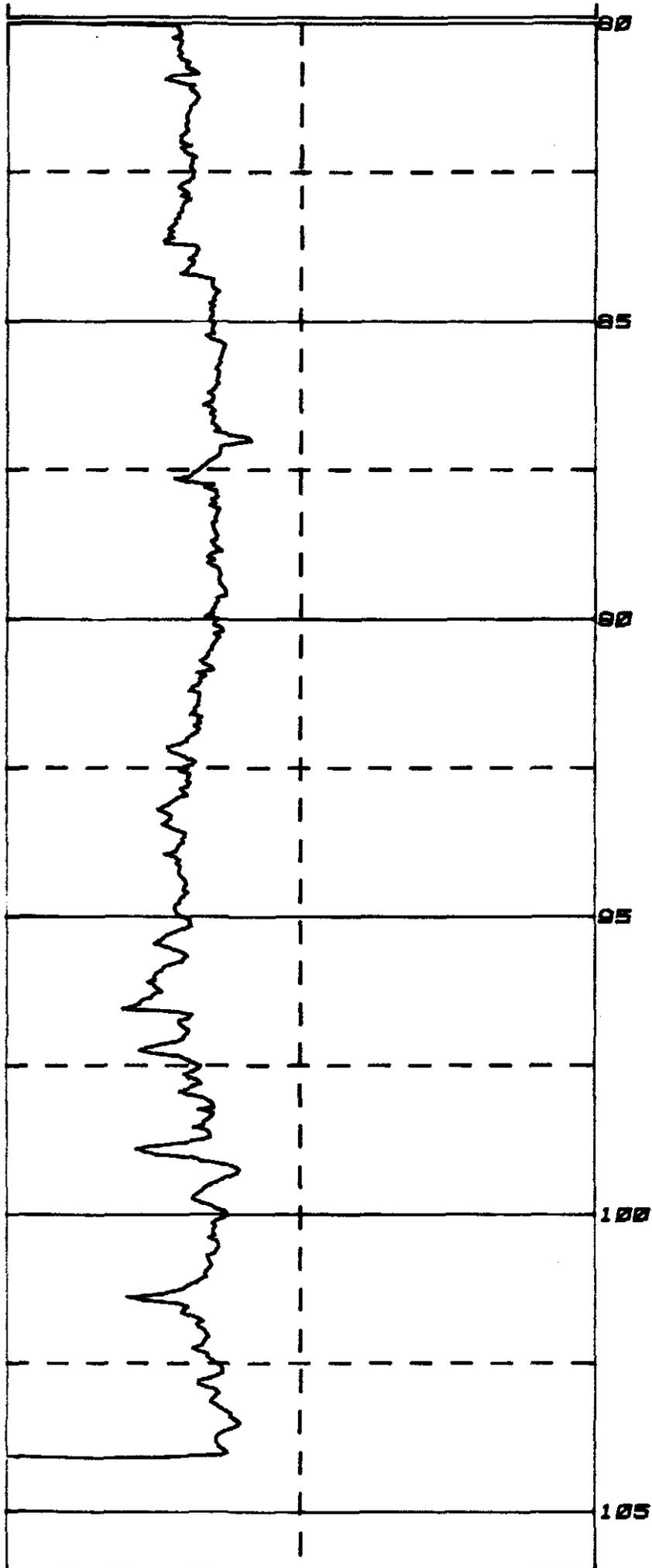


NEUTRON (0-10000 C. P. S.)

RESISTIVITY (300-400 OHMS)



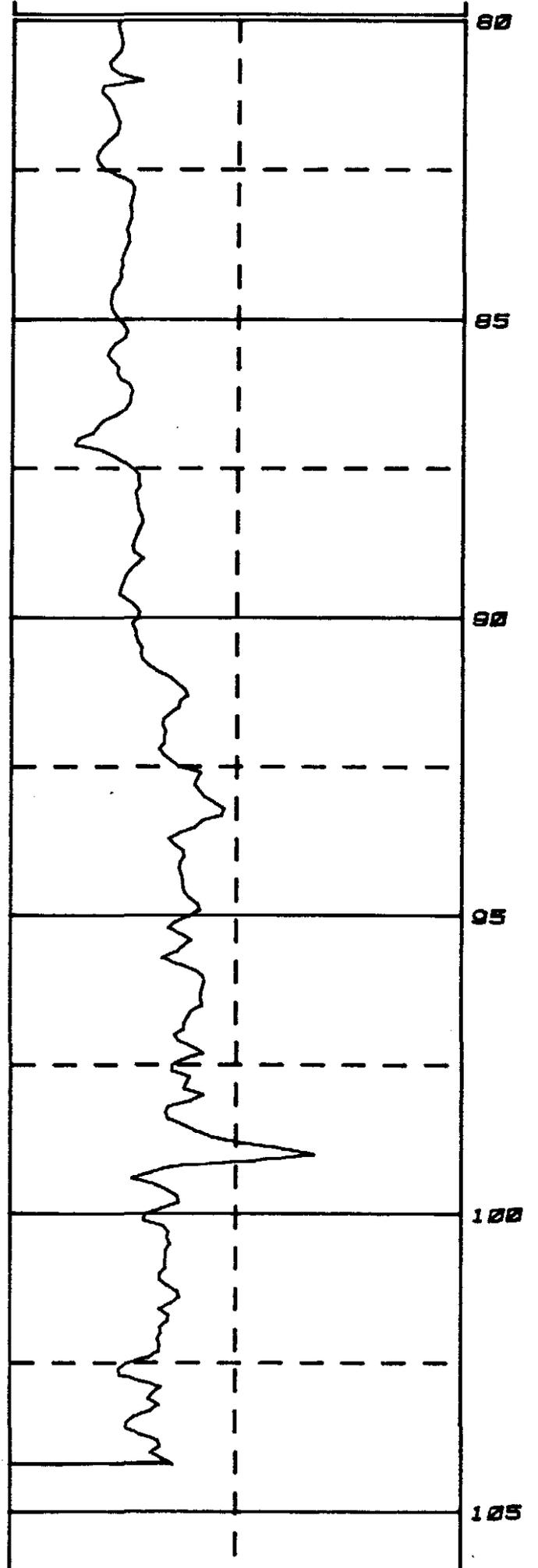
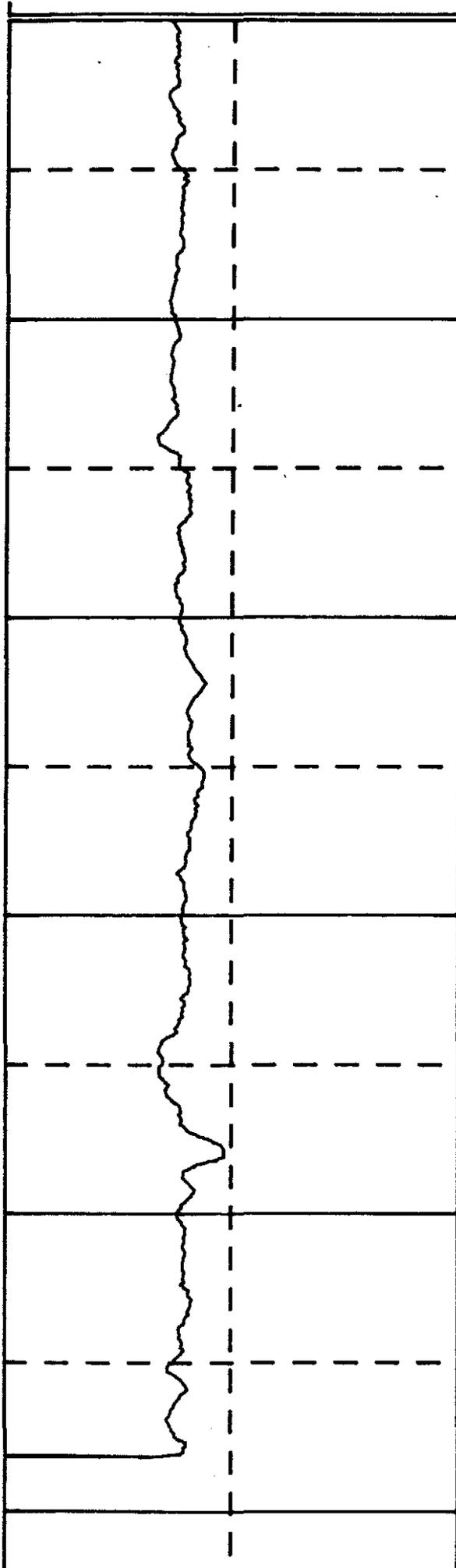
SELF POTENTIAL ( 25 to +55 mV. )

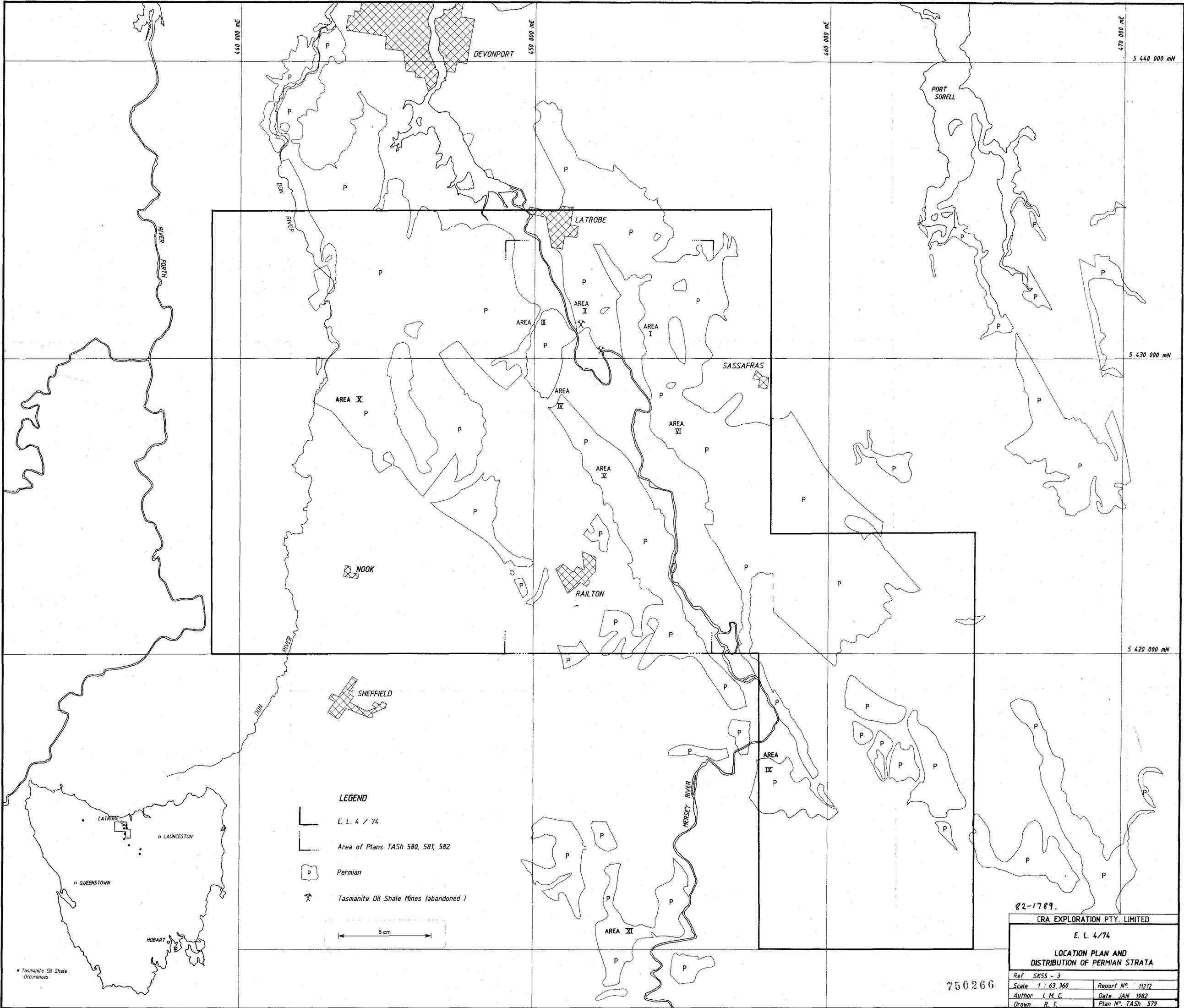




NEUTRON (<0-10000 C. P. S.>

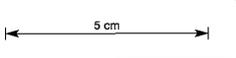
RESISTIVITY (<100-350 OHMS>





**LEGEND**

-  E. L. 4 / 74
-  Area of Plans TASH 580, 581, 582.
-  Permian
-  Tasmanite Oil Shale Mines (abandoned)

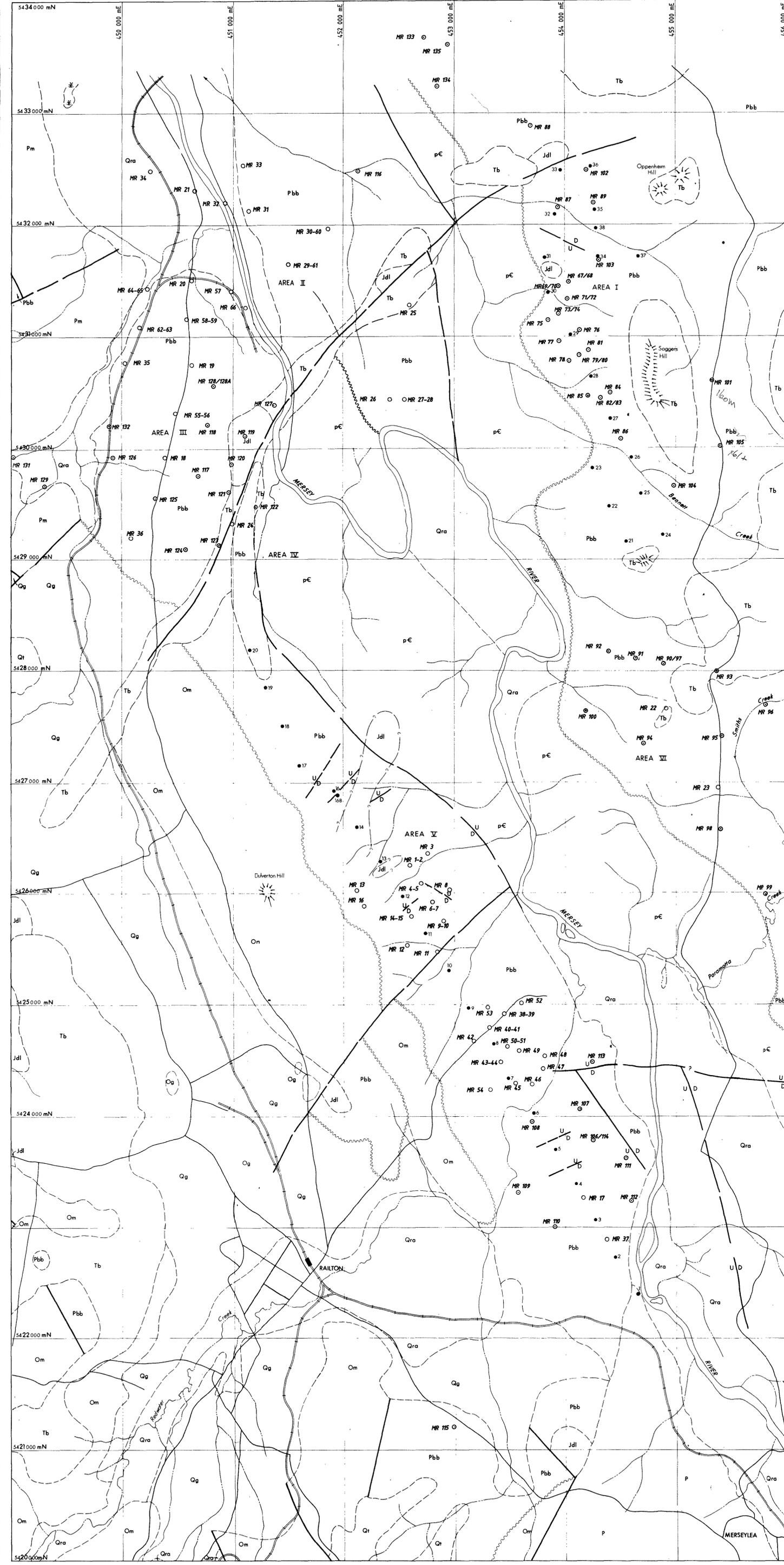


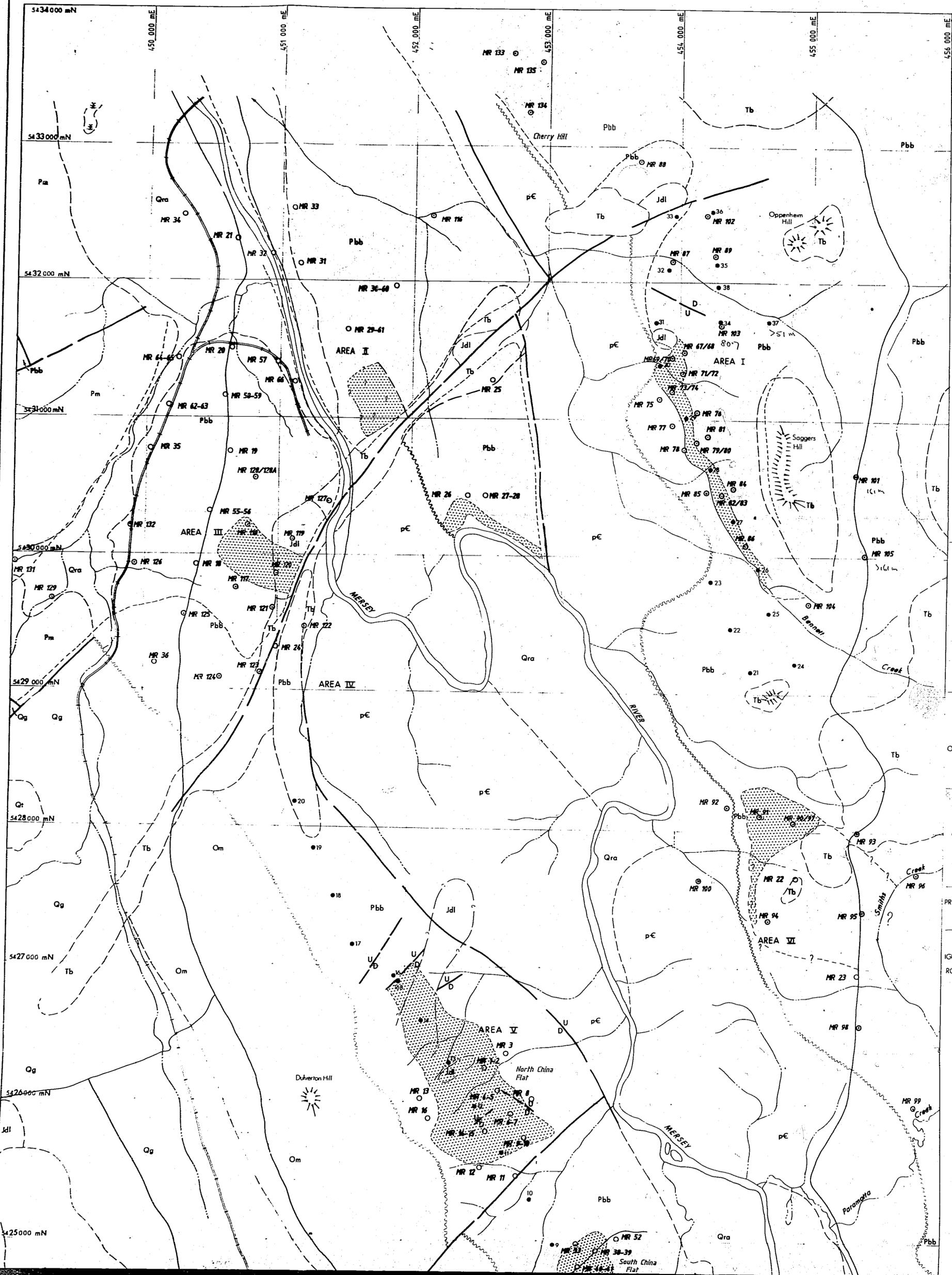
82-1789.

CRA EXPLORATION PTY. LIMITED	
E. L. 4/74	
LOCATION PLAN AND DISTRIBUTION OF PERMIAN STRATA	
Ref SK55 - 3	Report No 11212
Scale 1 : 63 360	Date JAN 1982
Author I. M. C.	Plan No TASH 579
Drawn R. T.	

750266

Tasmanite Oil Shale Occurrences





REFERENCE

QUATERNARY	Qra	Recent alluvium
	Qt	Basalt dolerite quartzite and conglomerate talus
	Qg	Sands clays and residual gravels
PERMIAN	Pf	Fernree group
	Pw	Woodbridge group
	Pm	Mersey coal measures
	Pbb	Basal beds including Tasmanite oil shale member
	P	
ORDOVICIAN	Og	Skarn and Gordon limestone
	Om	Moina sandstone including Caroline Creek beds
	Od	Roland and dial conglomerates
CAMBRIAN	Egg	Gog Range greywacke
	Eb	Balt conglomerate
	Est	Sprent Formation
	Em	Motton Spilite
PRE-CAMBRIAN	pE	Undifferentiated
IGNEOUS ROCKS	Tb	Tertiary Basalt
	Jdl	Jurassic Dolerite

LEGEND

—	Fault
~~~~~	Unconformity
- - - - -	Geological boundary indefinite
- · - · -	approximate
—	River, creek, watercourse
—	Railway line
—	Road, track
●	Borehole locations
3 ●	Endeavour - 1975
MR 48 ○	CRAE - 1981
MR 99 ○	CRAE - 1982

