

HALLIBURTON

HIGH RESOLUTION INDUCTION

COMPANY		WINDY HILLS GAS STORAGE	
WELL		WINDY HILL #7-17S	
FIELD		UNNAMED	
COUNTY		MORGAN	
STATE		CO	
Permanent Datum Log measured from		GL KB	Elev. 4499.0 ft
Drilling measured from		KB KB	18.5 ft above perm. Datum
Date	04-Apr-07 22:12:29		
Run No.	2		
Depth - Driller	5520.0 ft		
Depth - Logger	5517.0 ft		
Bottom - Logged Interval	5508		
Top - Logged Interval	478		
Casing - Driller	20,000 in @ 465.0 ft		@
Casing - Logger	478.0 ft		
Bit Size	12.250 in	17.500 in @ 1741.00 ft	@
Type Fluid in Hole	WATER BASED MUD		
Density	9.2 pp9	50.00 s/qt	
PH	9.00 pH	7 cph	
Source of Sample			
Rm @ Meas. Temperature	0.60 ohmm @ 61.00 degF		@
Rmf @ Meas. Temperature	0.40 ohmm @ 75.00 degF		@
Rmc @ Meas. Temperature	0.49 ohmm @ 75.00 degF		@
Source Rmf	CHART	CHART	
Rm @ BHT	0.29 ohmm @ 132.0 degF		@
Time Since Circulation	6.0 hr		
Time on Bottom	04-Apr-07 20:47:19		
Max. Rec. Temperature	132.0 degF @ 5617.0 ft		@
Equipment	Location	10549597	CASPER, WY
Recorded By	EDWARD KOON		
Witnessed By	JIM BROWNING		

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API No.	05087081460000
Location	1748.00 ft FNL and 2622.00 ft FWL of the NE/SW
Sect.	17
Twp.	3N
Rge.	56W
Other Services:	RWCH/GR SDL/DSN BCS CSNG

Fold here

Service Ticket No.: 4957392		API Serial No.: 05087081460000		PGM Version: WL INSITE R1.8 (Build 5)				
CHANGE IN MUD TYPE OR ADDITIONAL SAMPLE				RESISTIVITY SCALE CHANGES				
Date	Sample No.			Type Log	Depth	Scale Up Hole	Scale Down Hole	
Depth-Driller								
Type Fluid in Hole								
Density	Viscosity							
Ph	Fluid Loss							
Source of Sample				RESISTIVITY EQUIPMENT DATA				
Rm @ Meas. Temp	@	@		Run No.	Tool Type & No.	Pad Type	Tool Pos.	Other
Rmf @ Meas. Temp.	@	@		TWO	HRID #AB287	N/A	1.5" S.O.	N/A
Rmc @ Meas. Temp.	@	@						
Source Rmf	Rmc							
Rm @ BHT	@	@						
Rmf @ BHT	@	@						
Rmc @ BHT	@	@						
EQUIPMENT DATA								
GAMMA		ACOUSTIC		DENSITY		NEUTRON		
Run No.	TWO	Run No.	TWO	Run No.	TWO	Run No.	TWO	
Serial No.	108646	Serial No.	350	Serial No.	A046	Serial No.	108722	
Model No.	NGRT	Model No.	BCSD	Model No.	SDL-DC	Model No.	DSN-II	
Diameter	3.625	No. of Cent.	2	Diameter	4.5	Diameter	3.625	
Detector Model No.	102A	Spacing	2'	Log Type	GAM-GAM	Log Type	NEU-NEU	
Type	SCINT			Source Type	Cs137	Source Type	Am241Be	
Length	4"	Length	154.14/M1	Serial No.	2370GW	Serial No.	DSN-83	

Distance to Source	N/A		FWDA [Y/N]				Strength		1.5 Ci		Strength		18.5 Ci		
LOGGING DATA															
GENERAL				GAMMA		ACOUSTIC			DENSITY			NEUTRON			
Run	Depth		Speed	Scale		Scale		Matrix	Scale		Matrix	Scale		Matrix	
No.	From	To	ft/min	L	R	L	R		L	R		L	R		
TWO	5517	478	REC	0	150	60	0	55.5	60	0	2.65	60	0	SAND	
DIRECTIONAL INFORMATION															
Maximum Deviation							@	KOP							@
Remarks: PRESENTATION AS PER CUSTOMER REQUEST.															
AHV CALCULATED USING 8 5/8 PRODUCTION CASING.															
LARGE HOLE SIZE AND HOLE RUGOSITY AFFECTS TOOL RESPONSE.															
RWCH/NGRT/DSN/SDL/HRI RUN IN COMBINATION.															
LATITUDE: 40.217 DEGREES NORTH & LONGITUDE: 103.550 DEGREES WEST.															
CHLORIDES: 9000 PPM															
YOUR HES CREW TODAY: BRIAN SHORT, GABE BREED, AND ABRAHAM HENNEMAN RIG: UNIT #134															
THANK YOU FOR USING HALLIBURTON ENERGY SERVICES. CASPER, WY (307) 473-8200															
HALLIBURTON DOES NOT GUARANTEE THE ACCURACY OF ANY INTERPRETATION OF THE LOG DATA, CONVERSION OF LOG DATA TO PHYSICAL ROCK PARAMETERS OR RECOMMENDATIONS WHICH MAY BE GIVEN BY HALLIBURTON PERSONNEL OR WHICH APPEAR ON THE LOG OR IN ANY OTHER FORM. ANY USER OF SUCH DATA, INTERPRETATIONS, CONVERSIONS, OR RECOMMENDATIONS AGREES THAT HALLIBURTON IS NOT RESPONSIBLE EXCEPT WHERE DUE TO GROSS NEGLIGENCE OR WILLFUL MISCONDUCT, FOR ANY LOSS, DAMAGES, OR EXPENSES RESULTING FROM THE USE THEREOF.															
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PARAMETERS REPORT

Depth (ft)	Tool Name	Mnemonic	Description	Value	Units
TOP					
	SHARED	BS	Bit Size	17.500	in
1741.00					
	SHARED	BS	Bit Size	12.250	in
	SHARED	UBS	Use Bit Size instead of Caliper for all applications.	No	
	SHARED	MDWT	Borehole Fluid Weight	9.200	ppg
	SHARED	RMUD	Mud Resistivity	2.000	ohmm
	SHARED	TRM	Temperature of Mud	75.0	degF
	SHARED	OBM	Oil Based Mud System?	No	
	SHARED	ICOD	AHV Casing OD	8.625	in
	SHARED	CSD	Logging Interval is Cased?	No	
	SHARED	CSOD	Casing OD size	8.625	in
	SHARED	CSWT	Casing Weight	17.00	lbpf
	SHARED	ST	Surface Temperature	75.0	degF
	SHARED	TD	Total Well Depth	5600.00	ft
	SHARED	BHT	Bottom Hole Temperature	140.0	degF
	SHARED	CSOD	Outer Casing OD size	20.000	in
	SHARED	CSWT	Outer Casing Weight	17.00	lbpf
	Rwa / CrossPlot	XPOK	Process Crossplot?	Yes	

Rwa / CrossPlot	FCHO	Select Source of F	Automatic	
Rwa / CrossPlot	AFAC	Archie A factor	0.6200	
Rwa / CrossPlot	MFAC	Archie M factor	2.1500	
Rwa / CrossPlot	RMFR	Rmf Reference	0.10	ohmm
Rwa / CrossPlot	TMFR	Rmf Ref Temp	75.00	degF
NGRT	GROK	Process Gamma Ray?	Yes	
NGRT	GRSO	Gamma Tool Standoff	0.000	in
NGRT	GEOK	Process Gamma Ray EVR?	No	
DSN_II	DNOK	Process DSN?	Yes	
DSN_II	DEOK	Process DSN EVR?	No	
DSN_II	BHOL	Use DSN Bad Hole Correction?	No	
DSN_II	NLIT	Neutron Lithology	Sandstone	
DSN_II	DNSO	DSNTool Standoff	0.000	in
DSN_II	TMPC	Temperature Correction Type	None	
DSN_II	DPRS	DSN Pressure Correction Type	None	
SDL_DC	DNOK	Process Density?	Yes	
SDL_DC	DNOK	Process Density EVR?	No	
SDL_DC	AD	Is Hole Air Drilled?	No	
SDL_DC	CB	Use Calibration Blocks?	No	
SDL_DC	SPVT	SDLT Pad Temperature Valid?	Yes	
SDL_DC	MDTP	Weighted Mud Correction Type?	None	
SDL_DC	DMA	Formation Density Matrix	2.650	g/cc
SDL_DC	DFL	Formation Density Fluid	1.000	g/cc
SDL_DC	CLOK	Process Caliper Outputs?	Yes	
HRID-SP	HRE	Do HRI Induction Calculation?	Yes	
HRID-SP	DFLE	Do DFL Calculation?	Yes	
HRID-SP	PYRI	Pyrite Switch	Off	
HRID-SP	CSDP	Casing Depth	0.0	ft
HRID-SP	HDSP	Spike Reduction Filter Type	DELTA	
HRID-SP	HRTC	Temperature Correction Source	None	
HRID-SP	MMRS	Hrimap Minimum Resistivity	0.20	
HRID-SP	MXRS	Hrimap Maximum Resistivity	200.00	

BOTTOM

Data: WINDY_7_17S_RN210001 TRIPLEIDLE

Date: 04-Apr-07 23:48:05

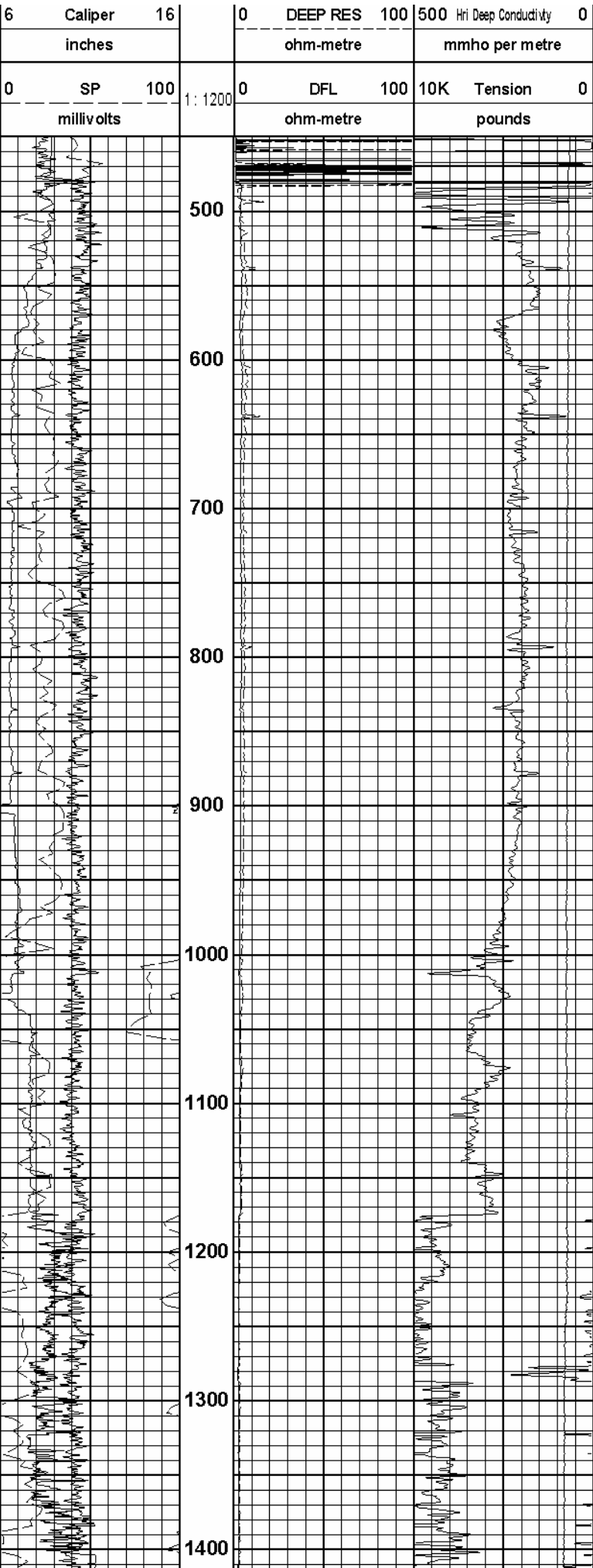
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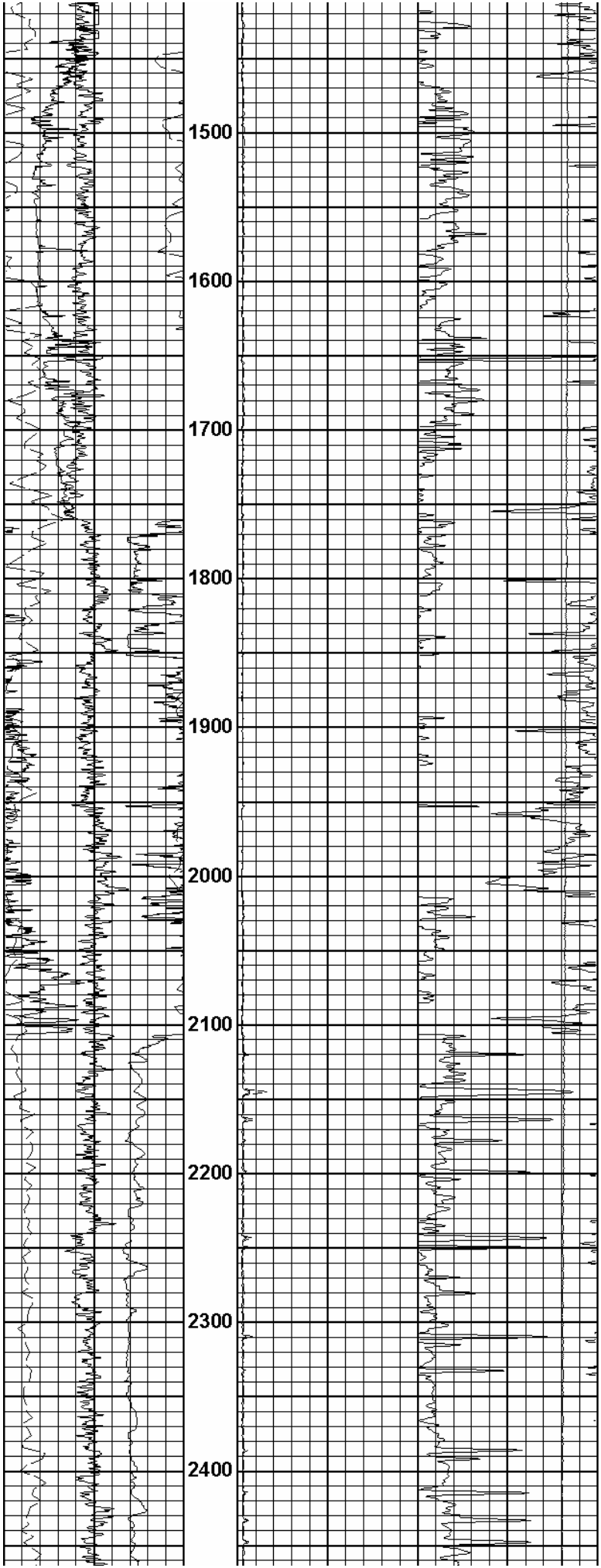
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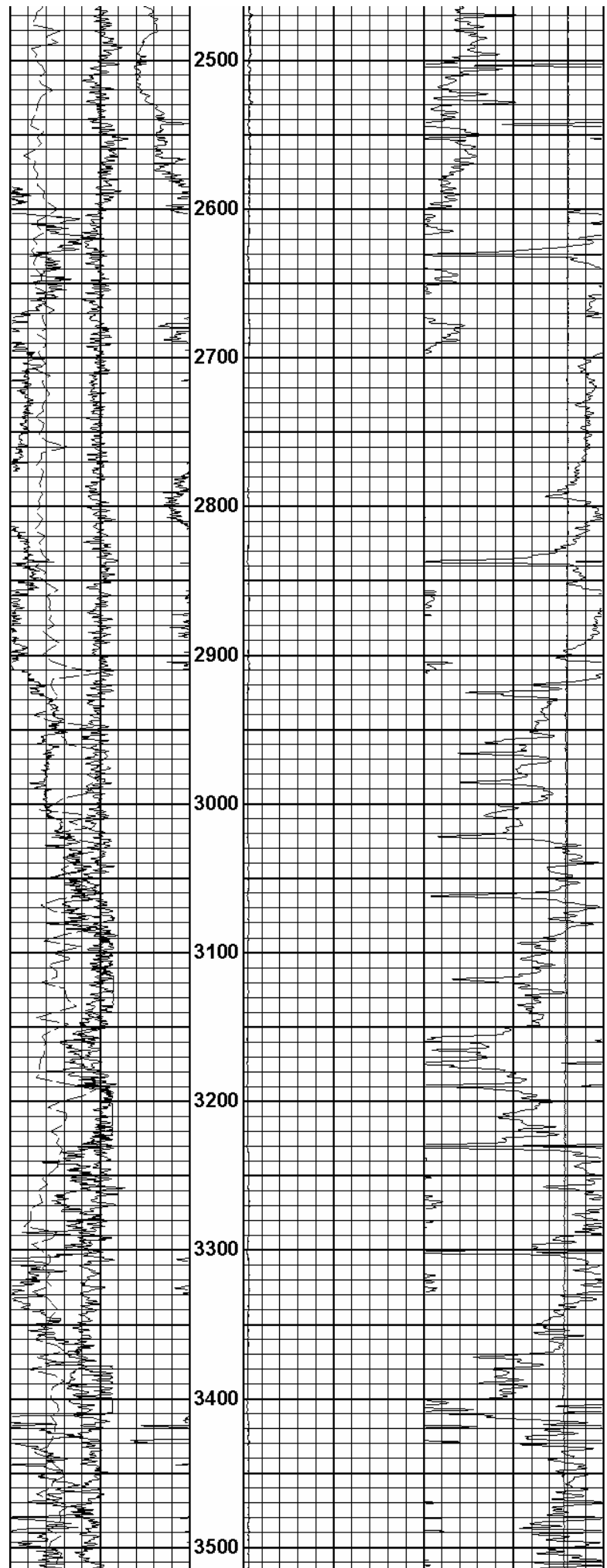
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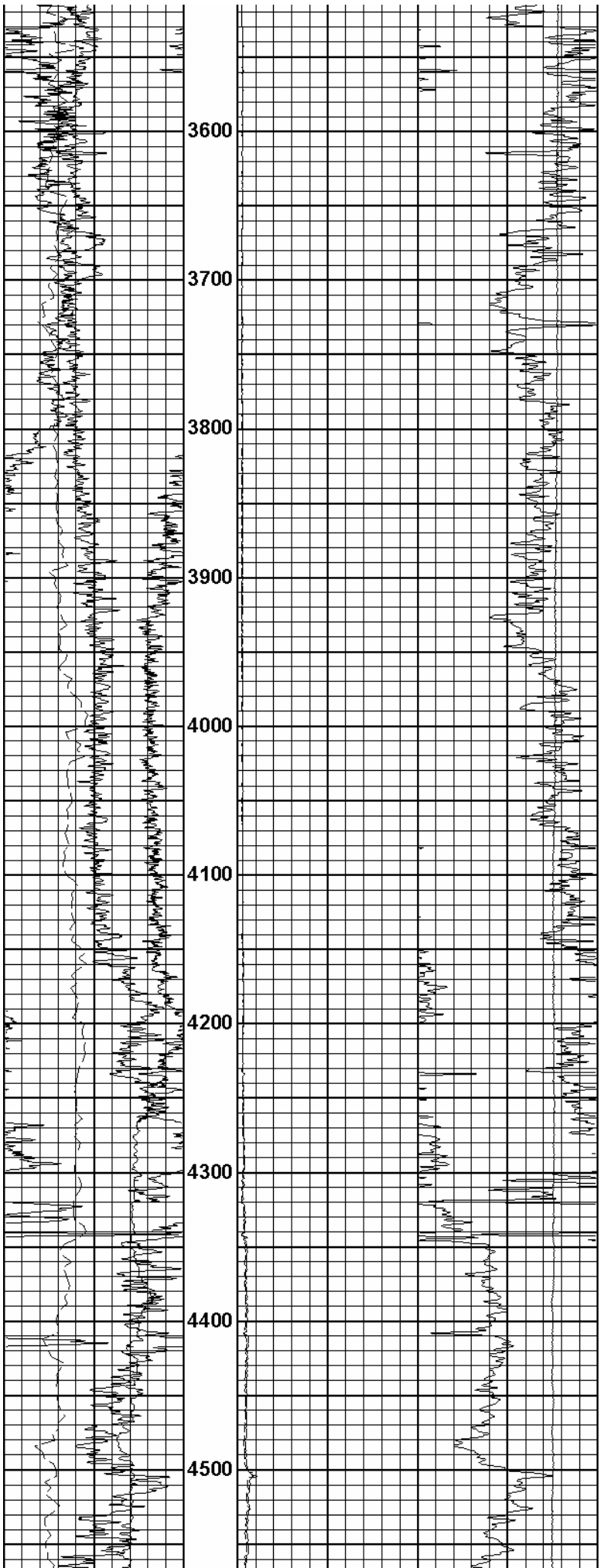
0 Gamma API 150

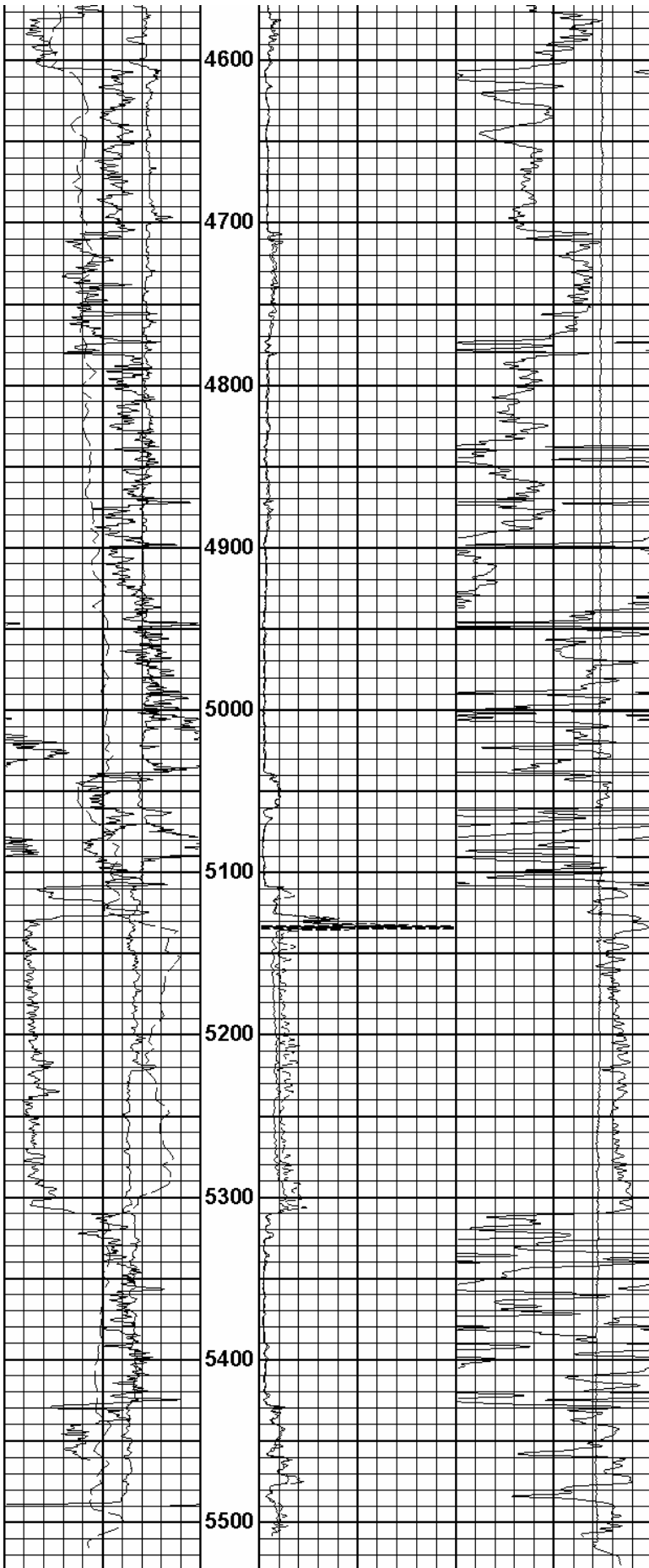
api











0	SP	100	1: 1200	0	DFL	100	10K	Tension	0
	millivolts				ohm-metre			pounds	
6	Caliper	16		0	DEEP RES	100	500	Hri Deep Conductivity	0

inches

0Gamma API 150

api

ohm-metre

mmho per metre

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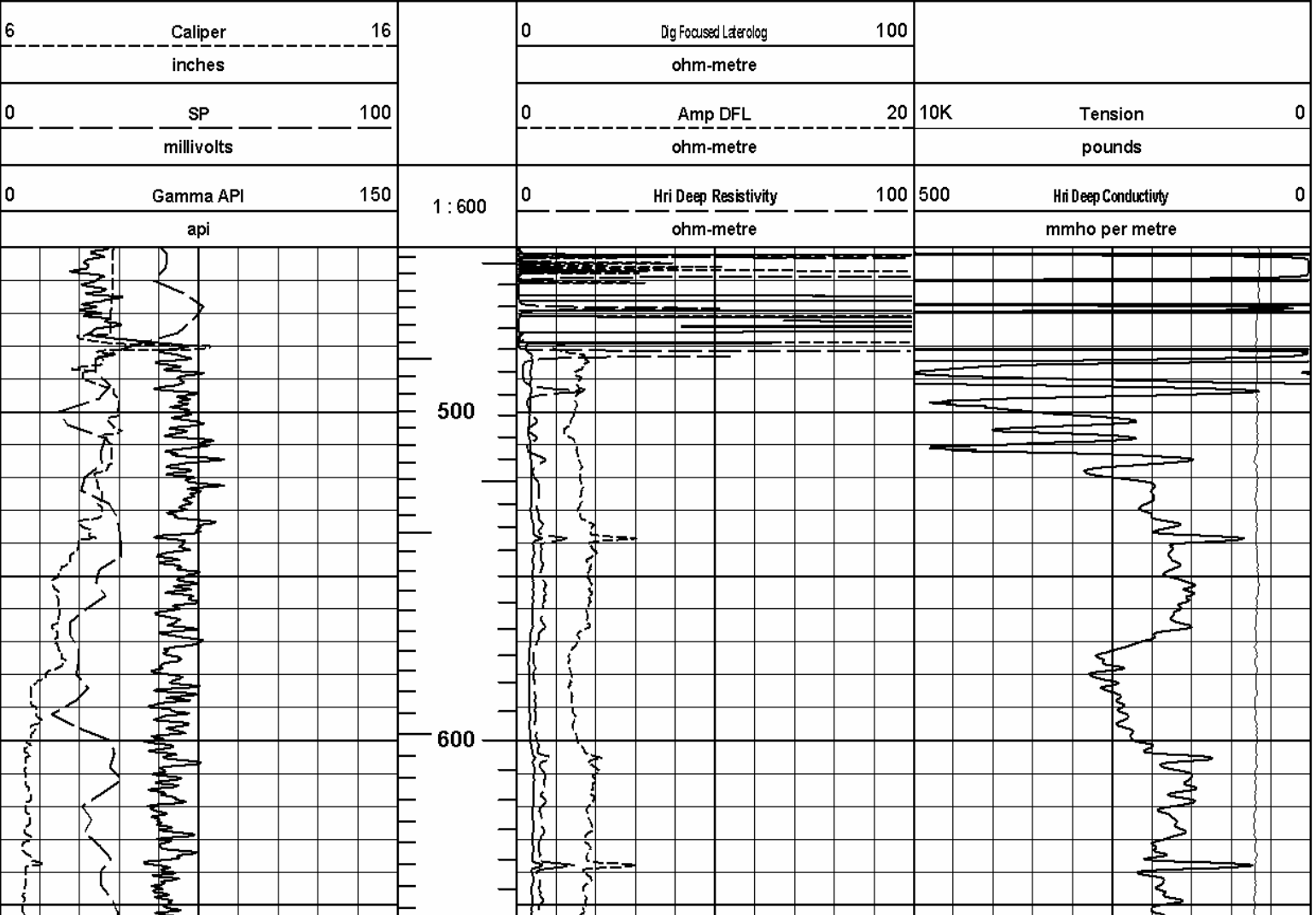
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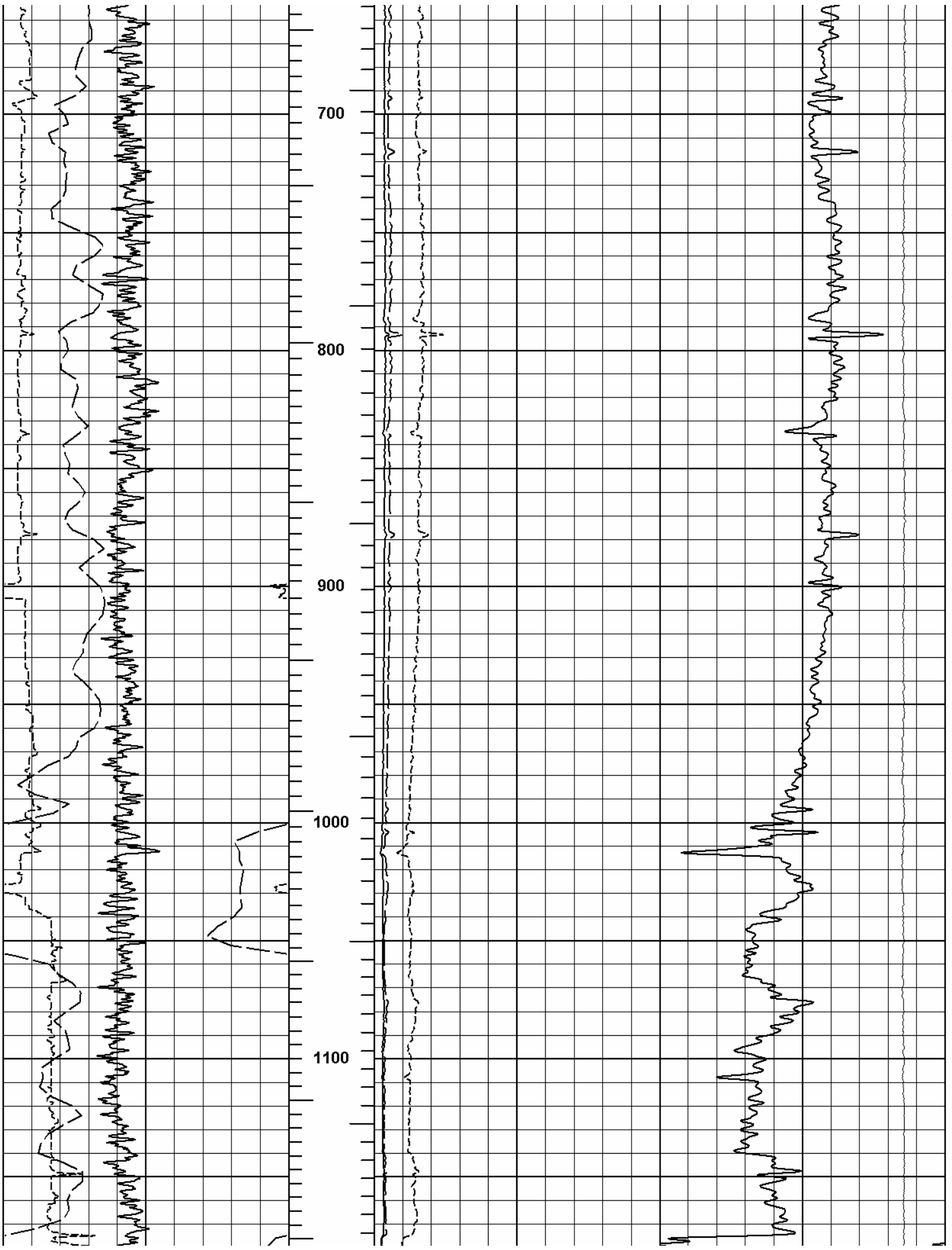
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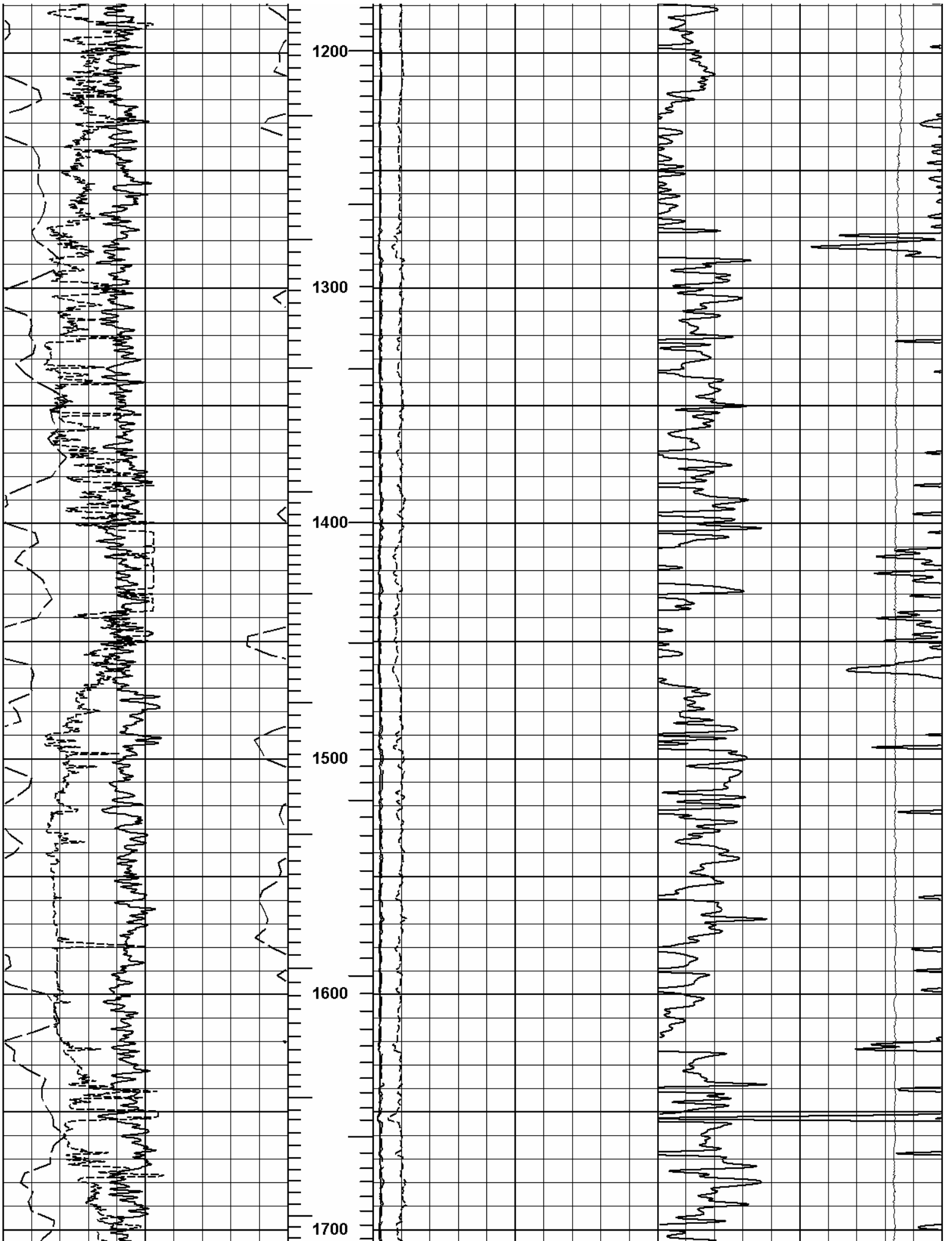
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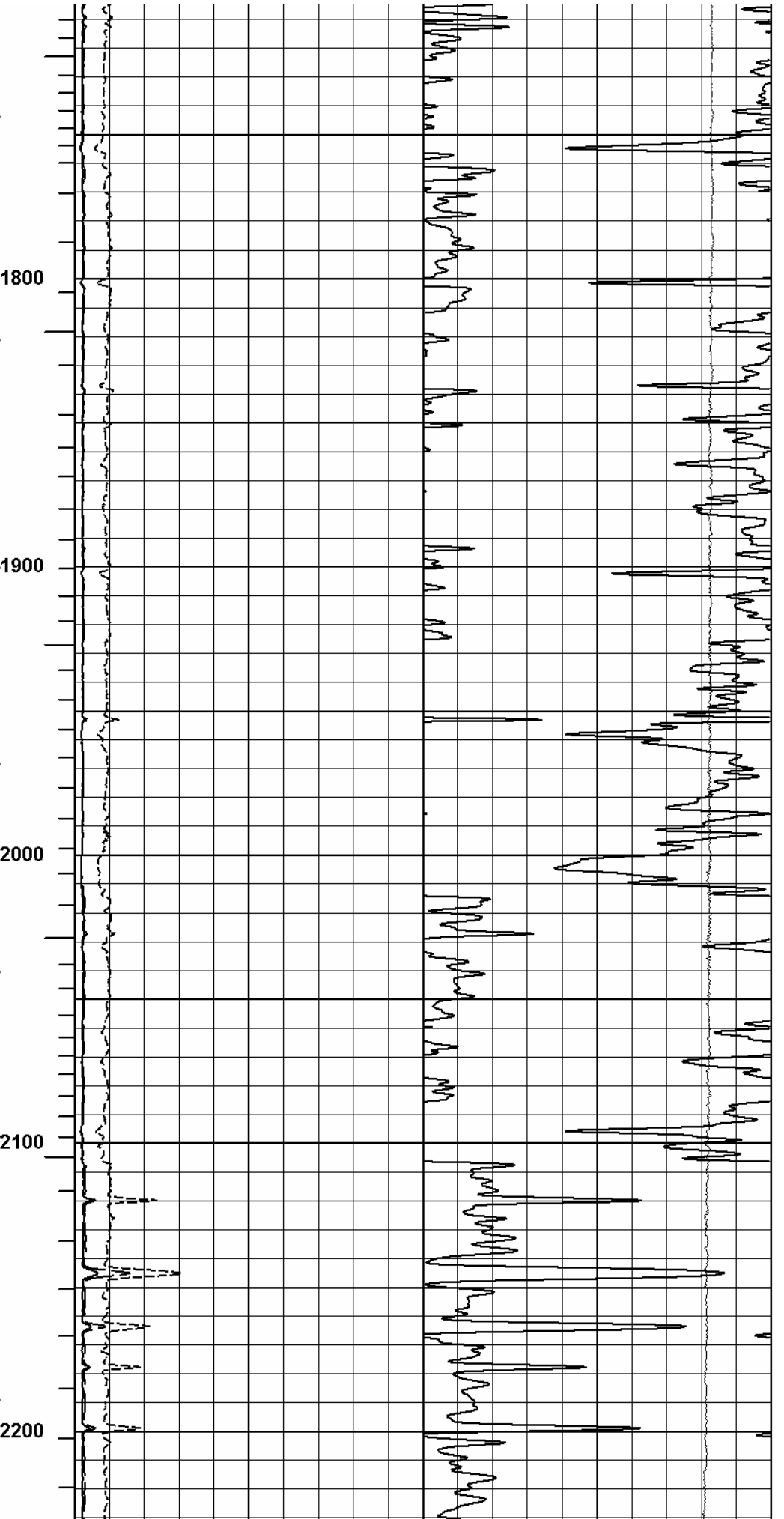
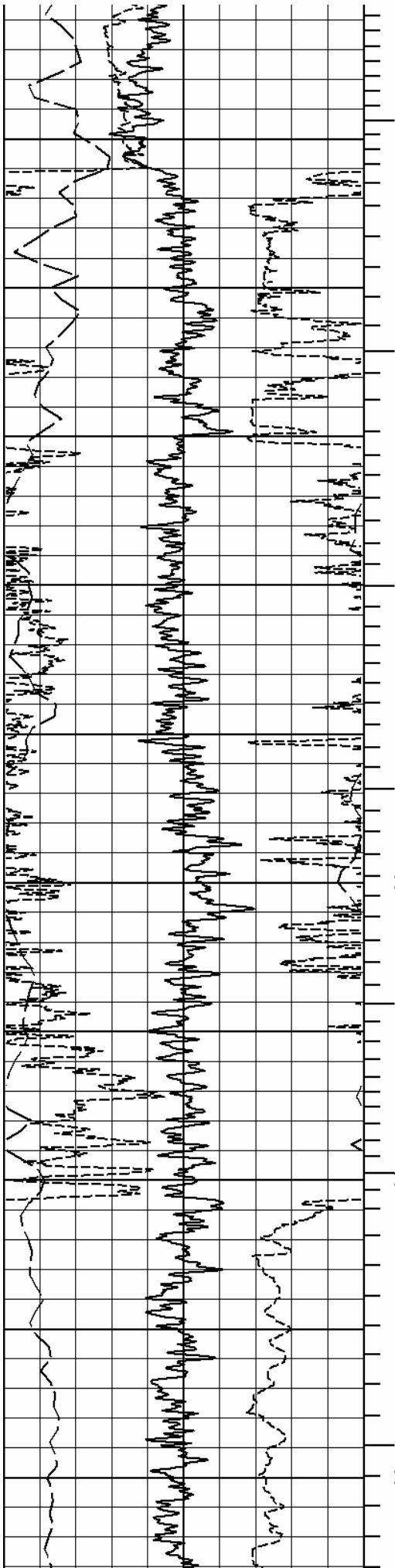
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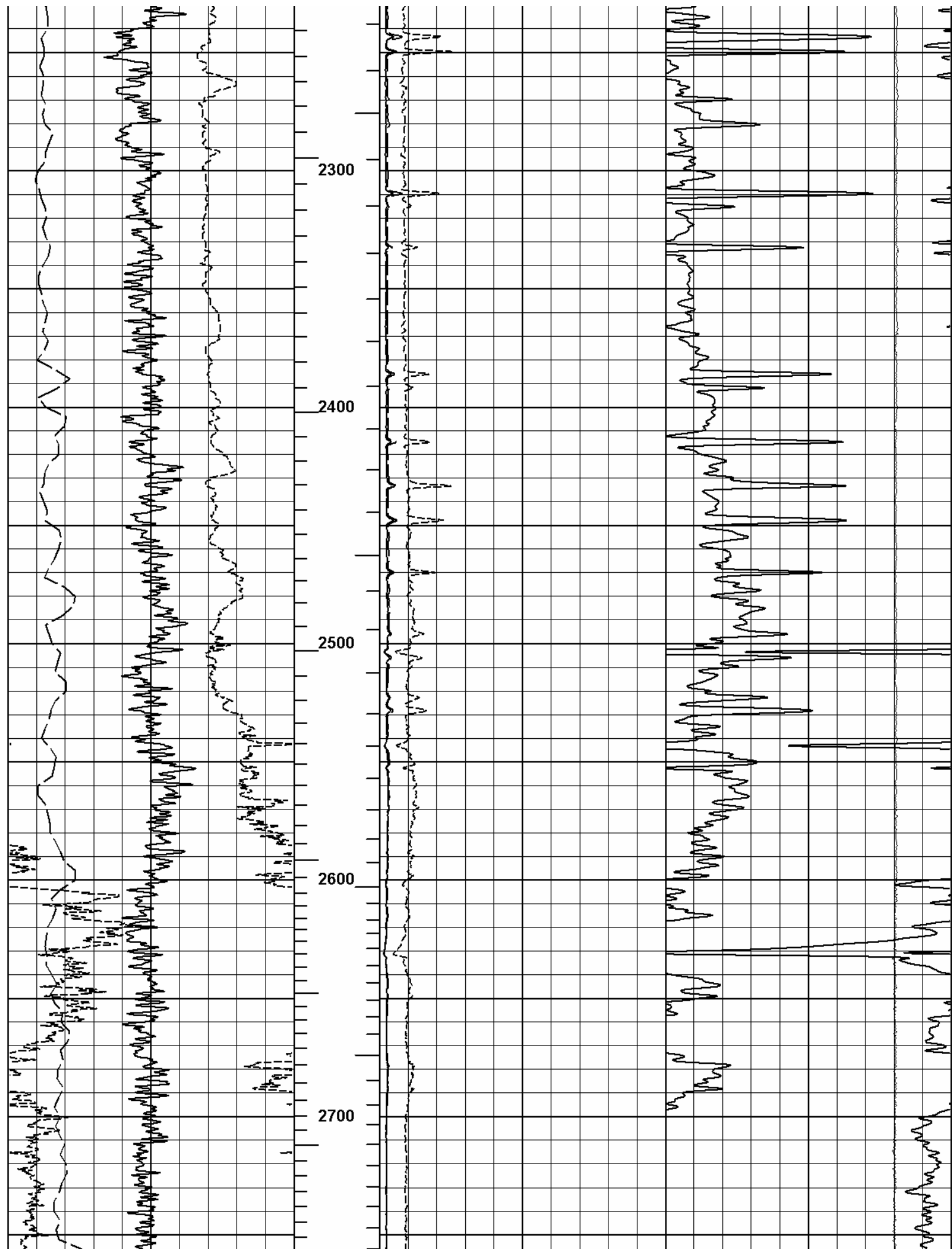
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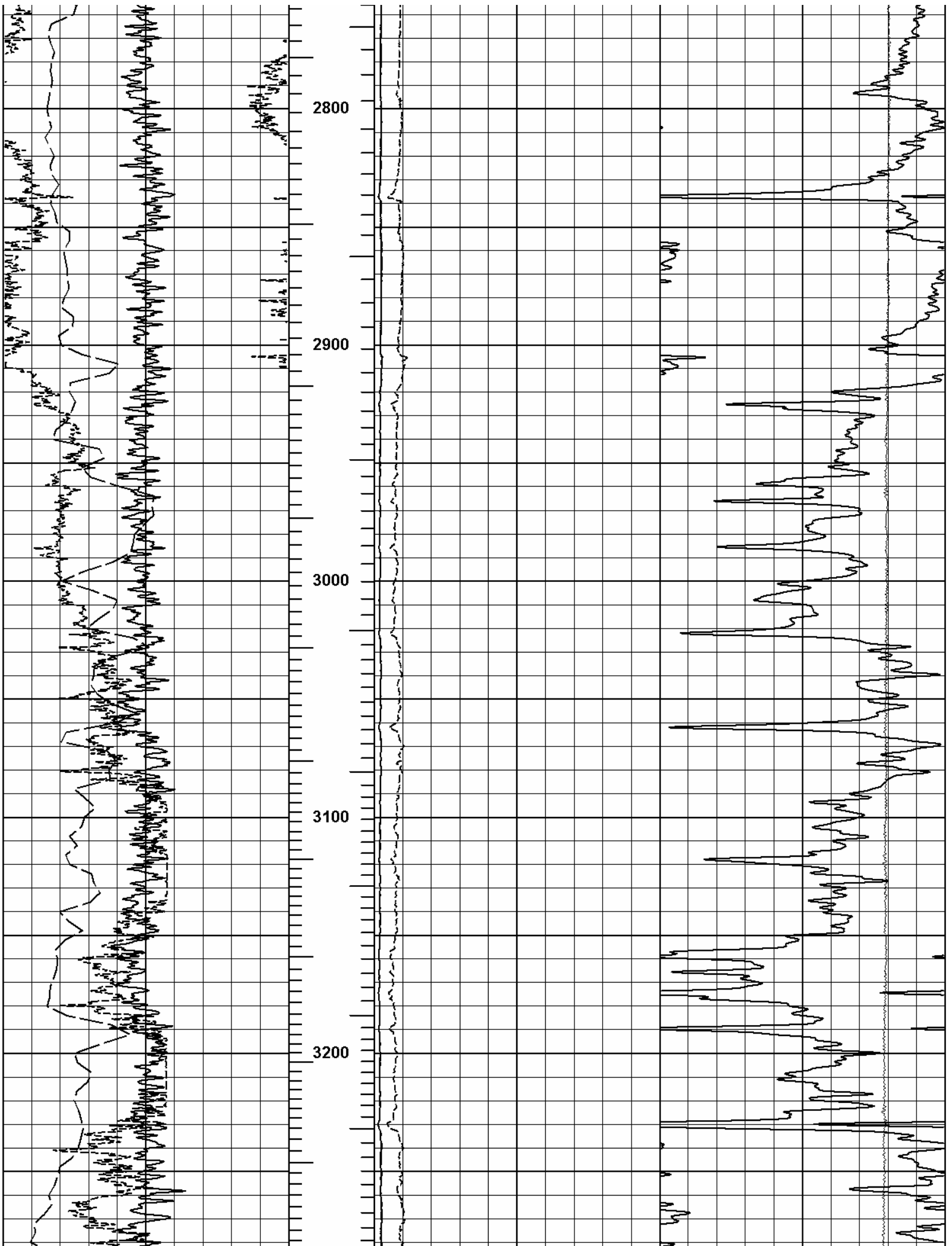


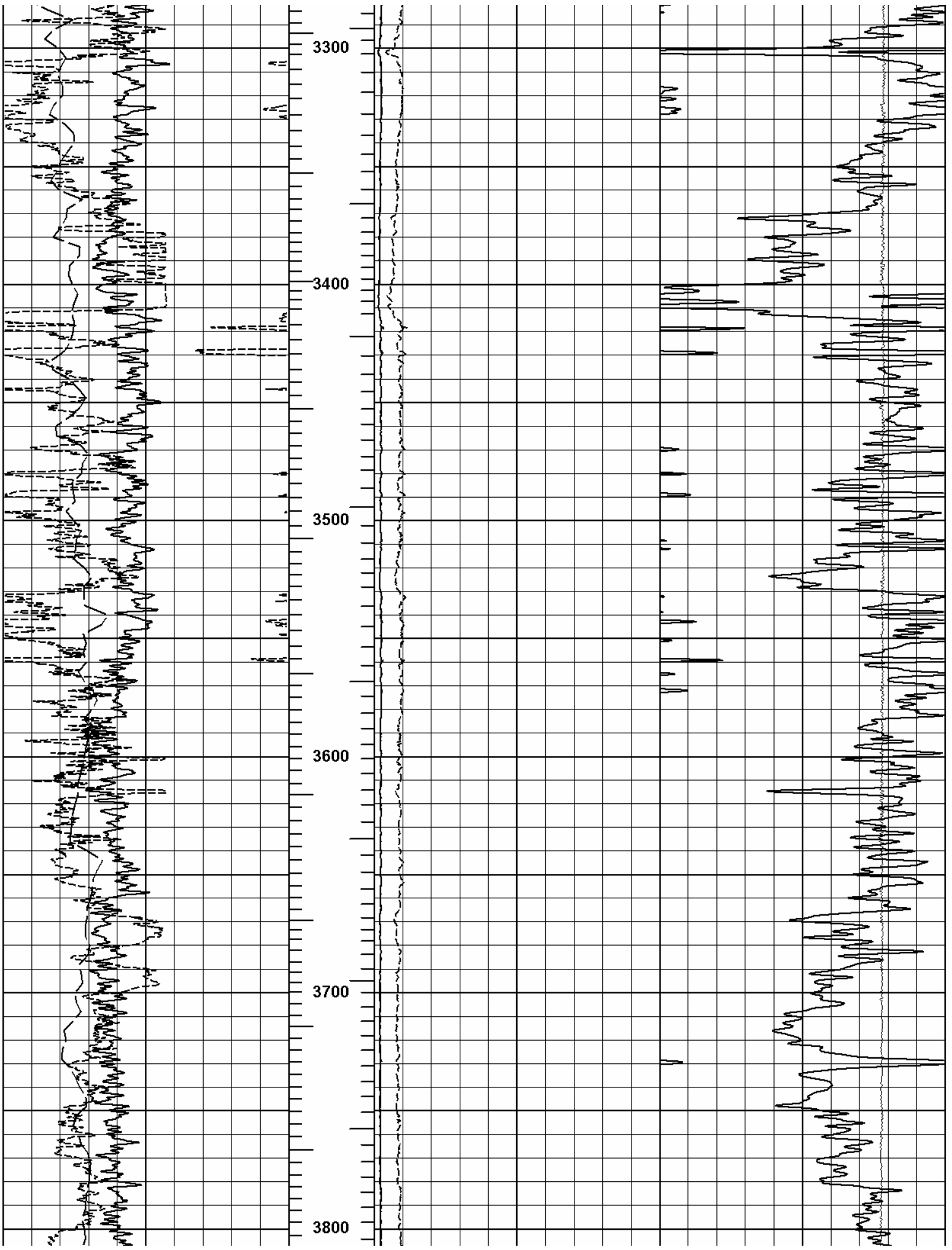


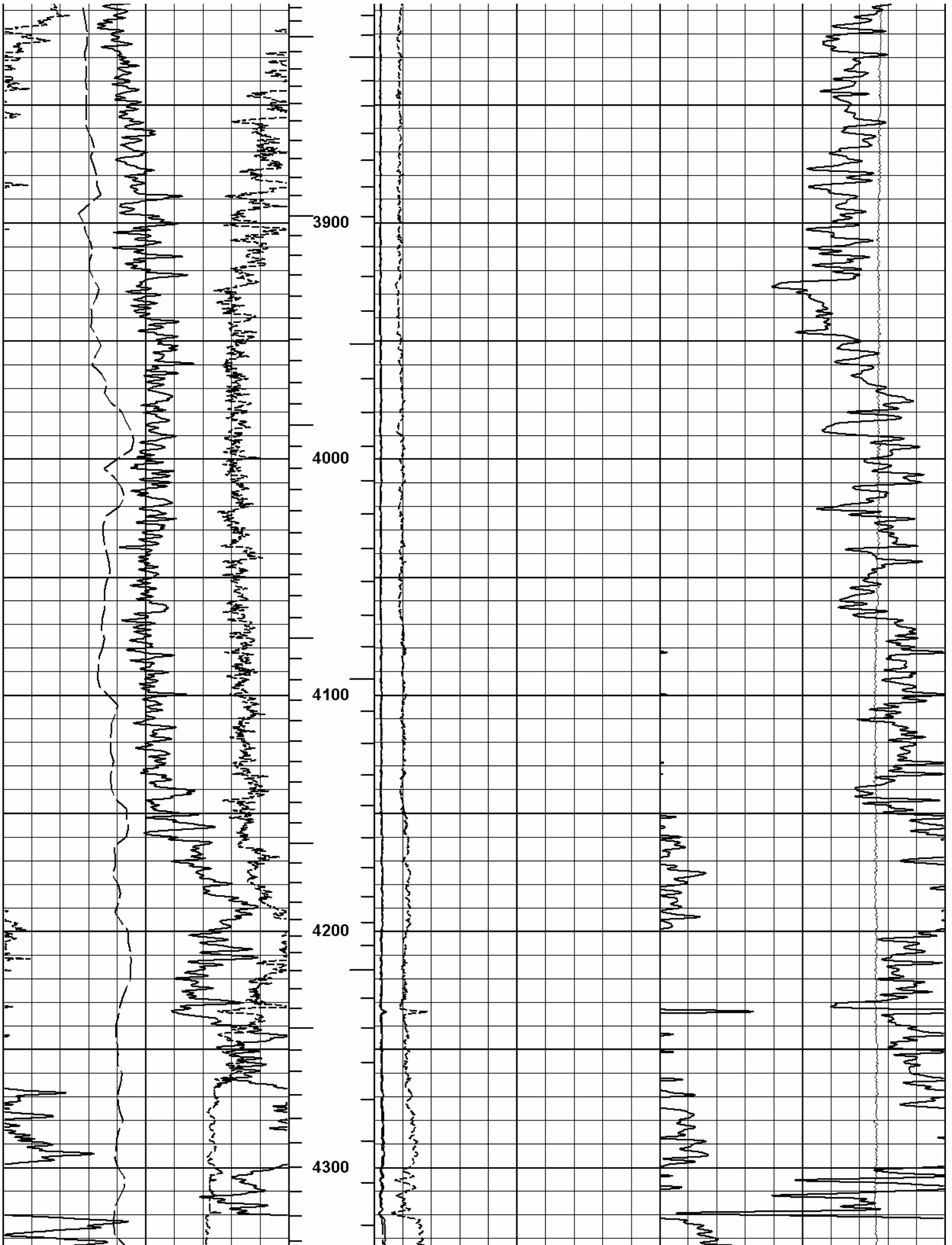


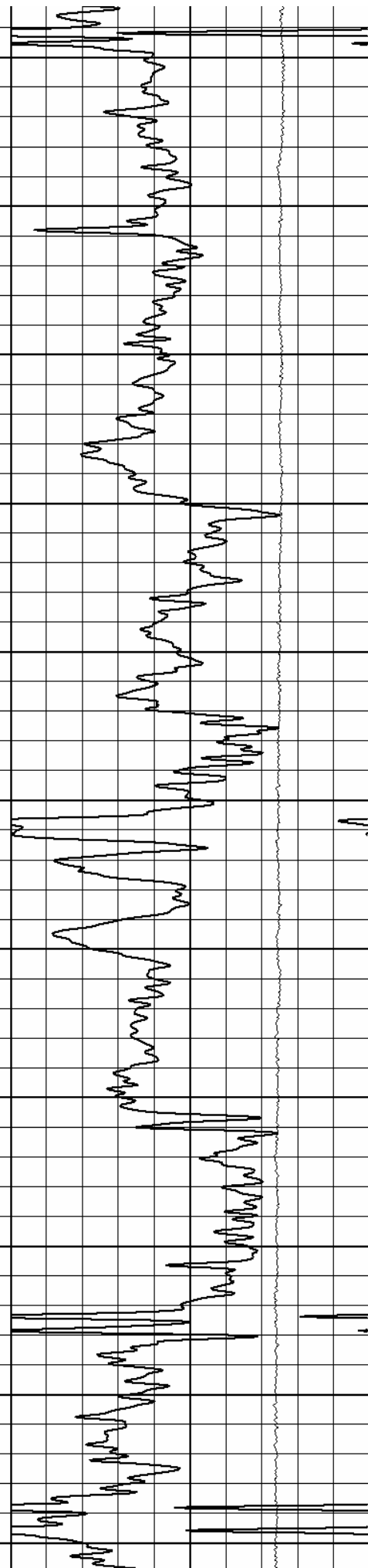
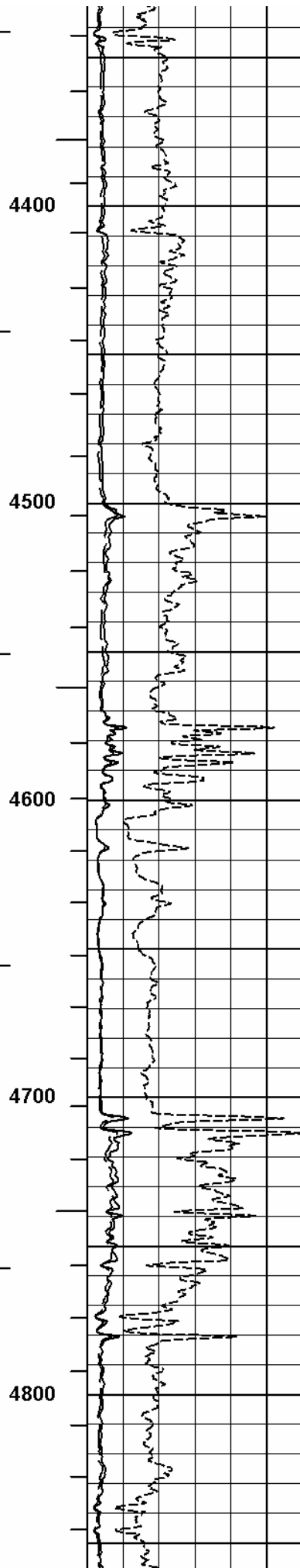
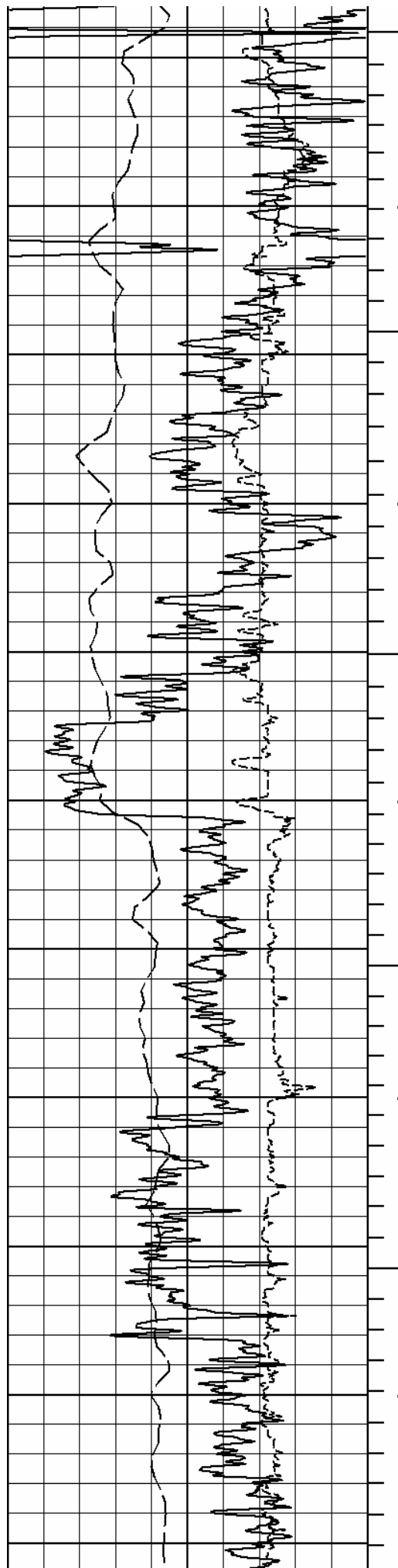


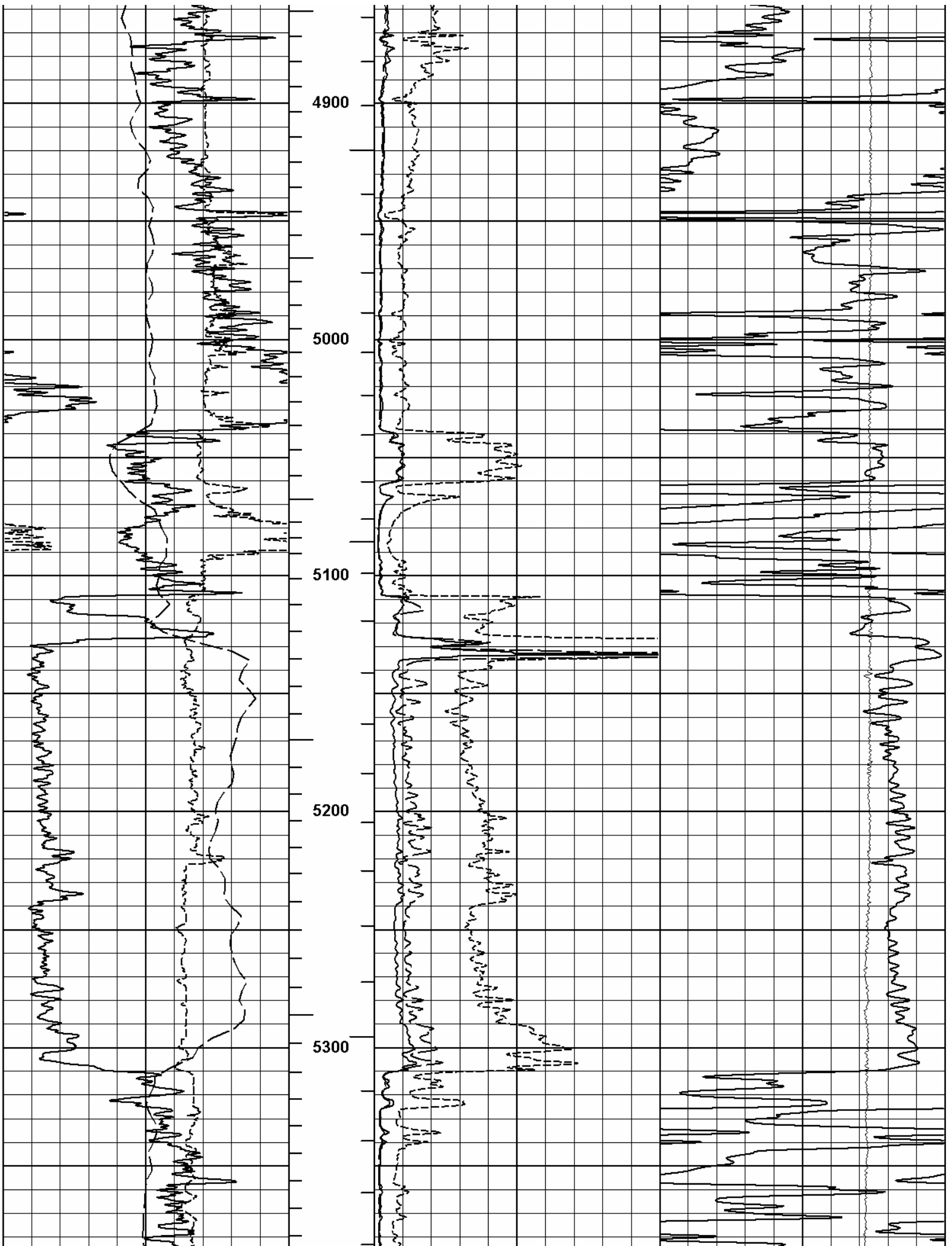


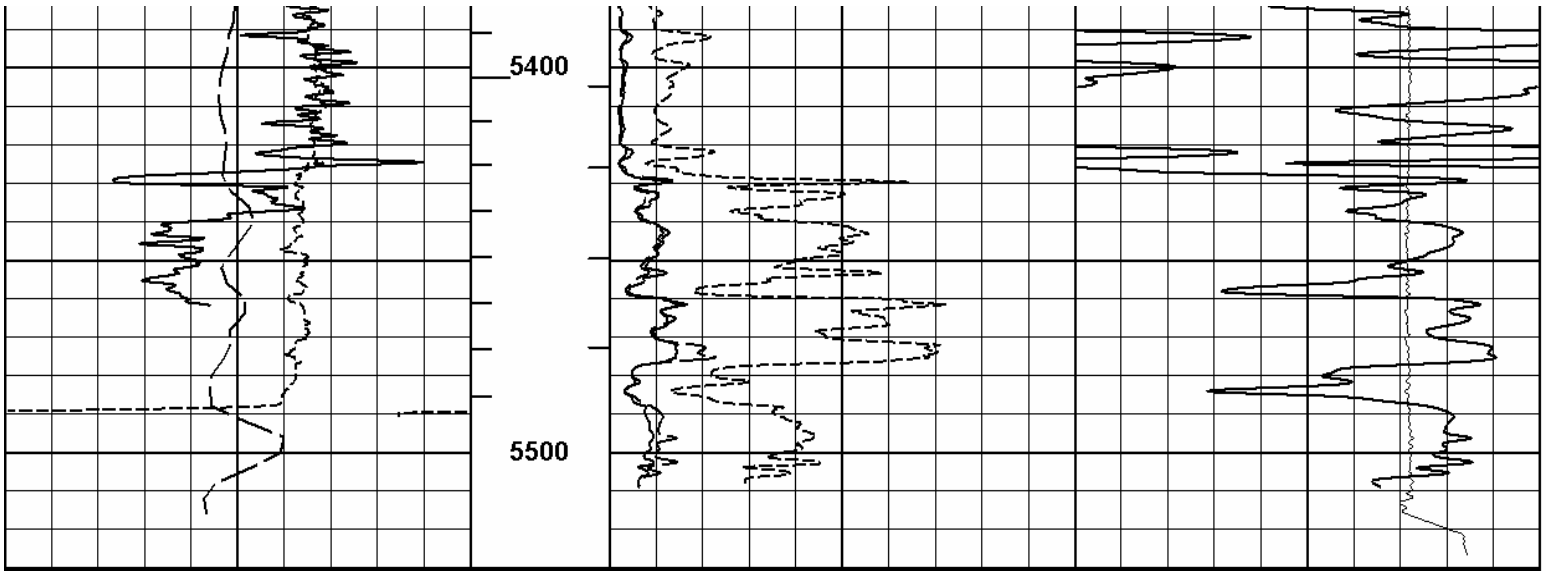












0	Gamma API	150	1 : 600	0	Hri Deep Resistivity	100	500	Hri Deep Conductivity	0
	api				ohm-metre			mmho per metre	
0	SP	100		0	Amp DFL	20	10K	Tension	0
	millivolts				ohm-metre			pounds	
6	Caliper	16		0	Dig Focused Laterolog	100			
	inches				ohm-metre				

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Plot Time: 04-Apr-07 23:55:47
Plot Range: 450 ft to 5530 ft
Data: {ActiveWell}-Well Based-DAQ Current-
Plot File: \\(not saved)\\2IN_HRI

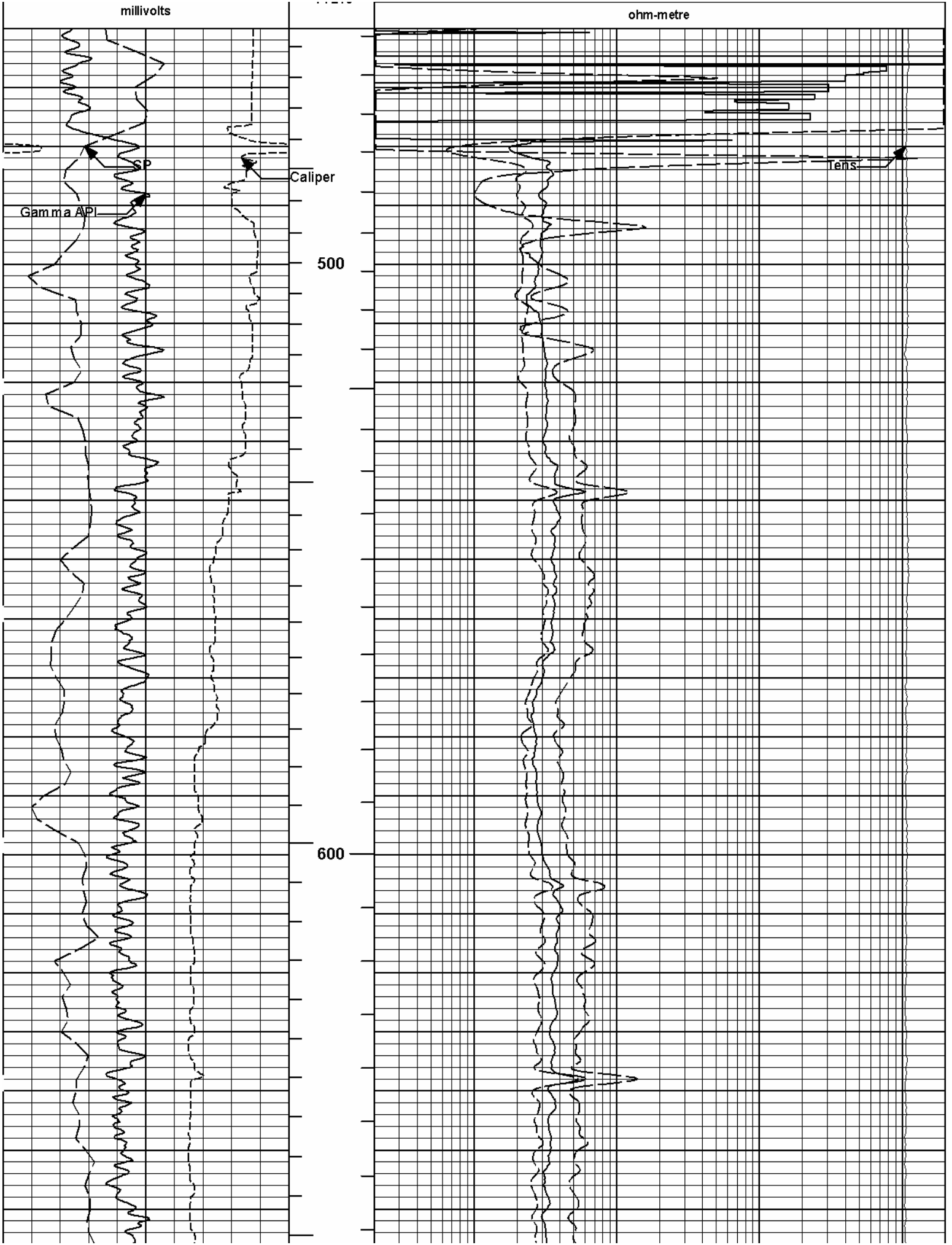
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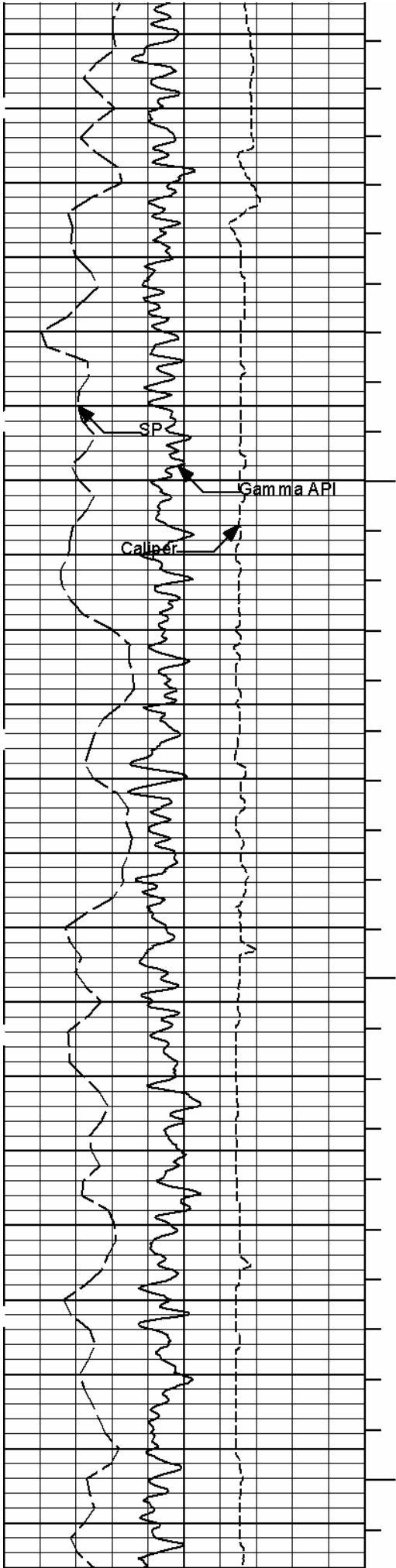
HALLIBURTON

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Plot File: \\(not saved)\\5IN_HRI

MAIN PASS 5"=100'

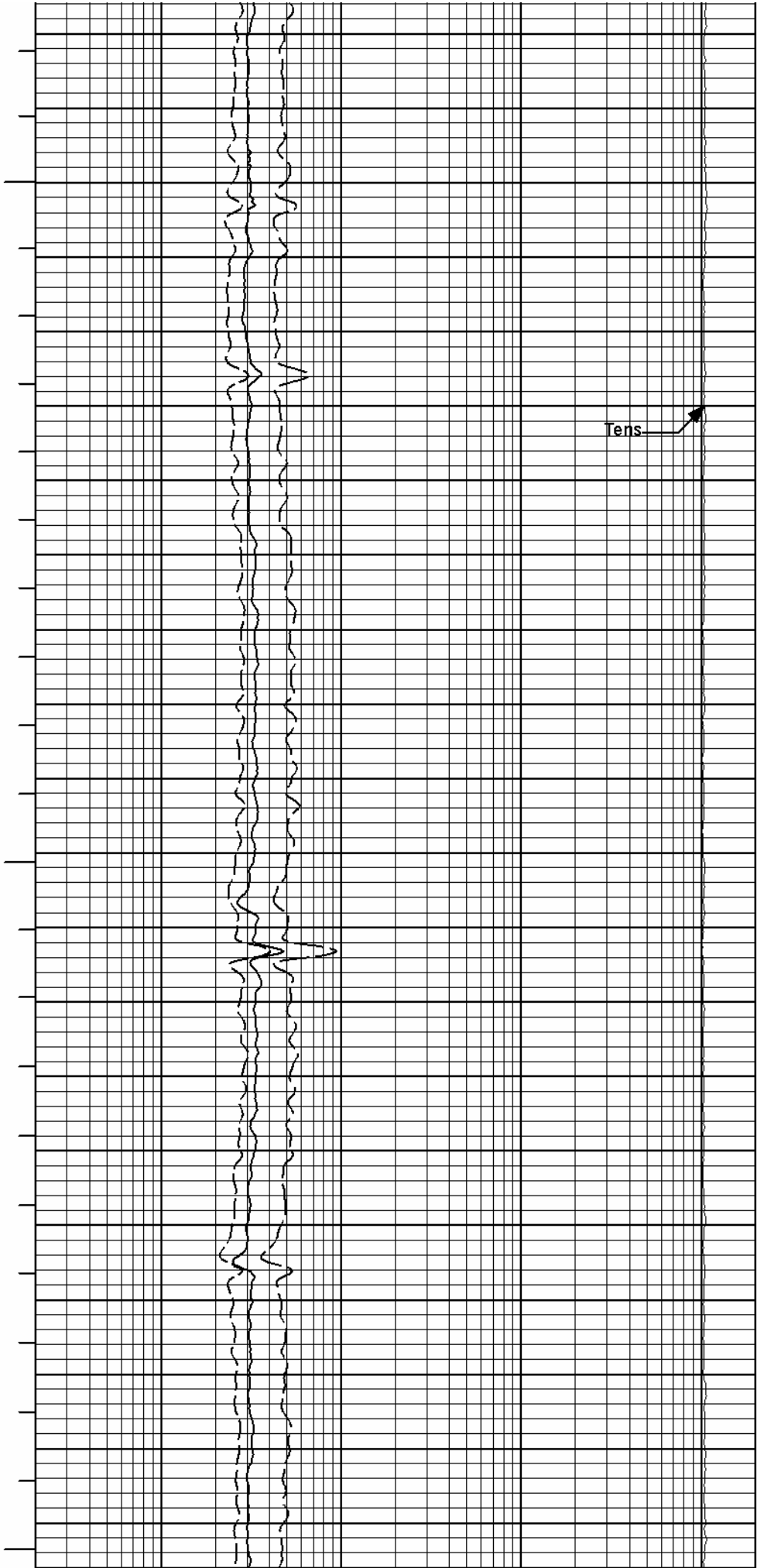
				10K	Tens	0
				pounds		
10	Caliper	20	AHV	0.2	Hri Deep Resistivity	2K
	inches				ohm-metre	
0	Gamma API	150	BHV	0.2	Hri Medium Resistivity	2K
	api				ohm-metre	
0	SP	100	1 : 240	0.2	Dig Focused Laterolog	2K



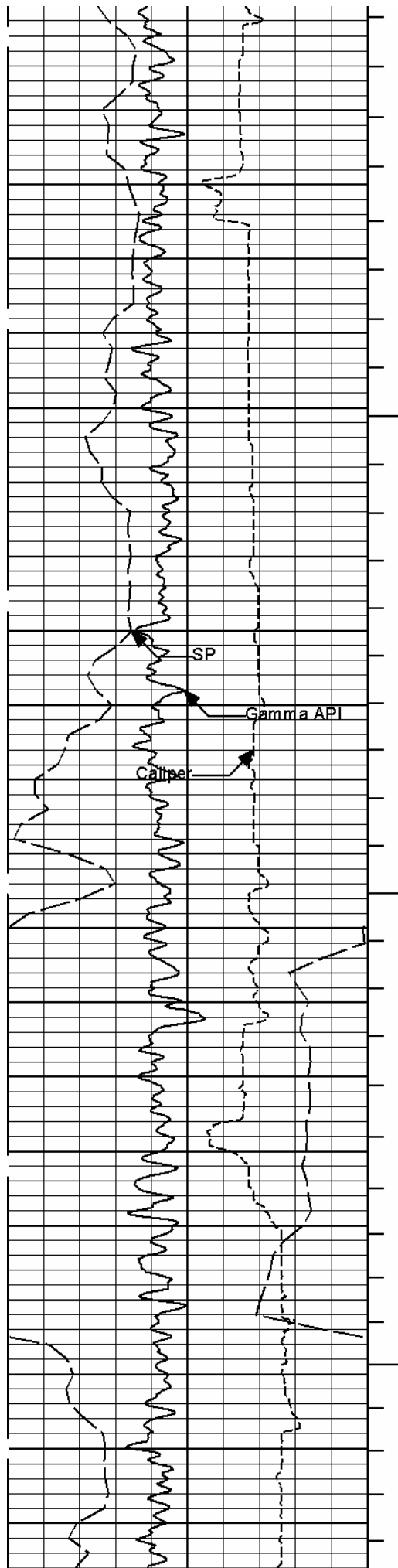


700

800

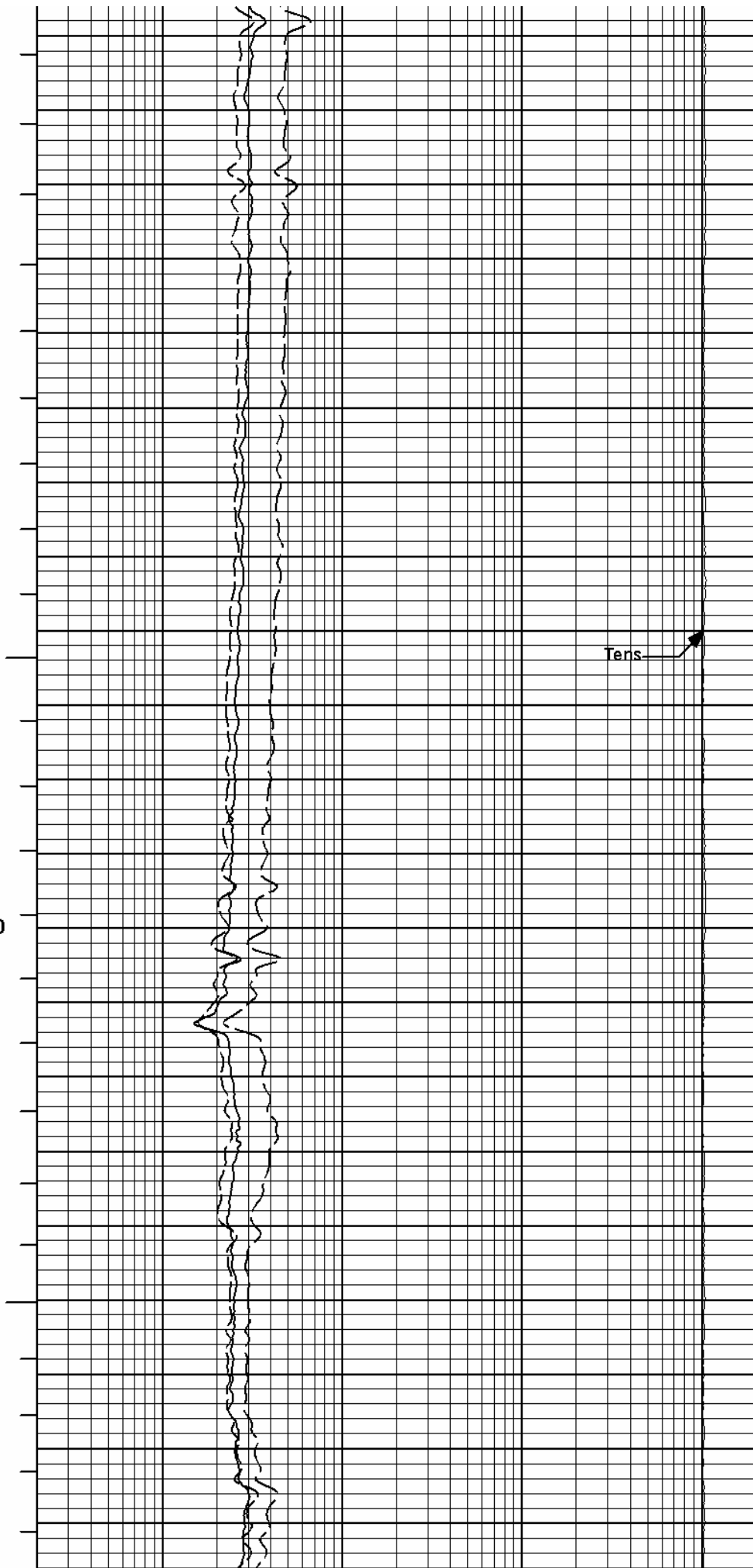


Tens

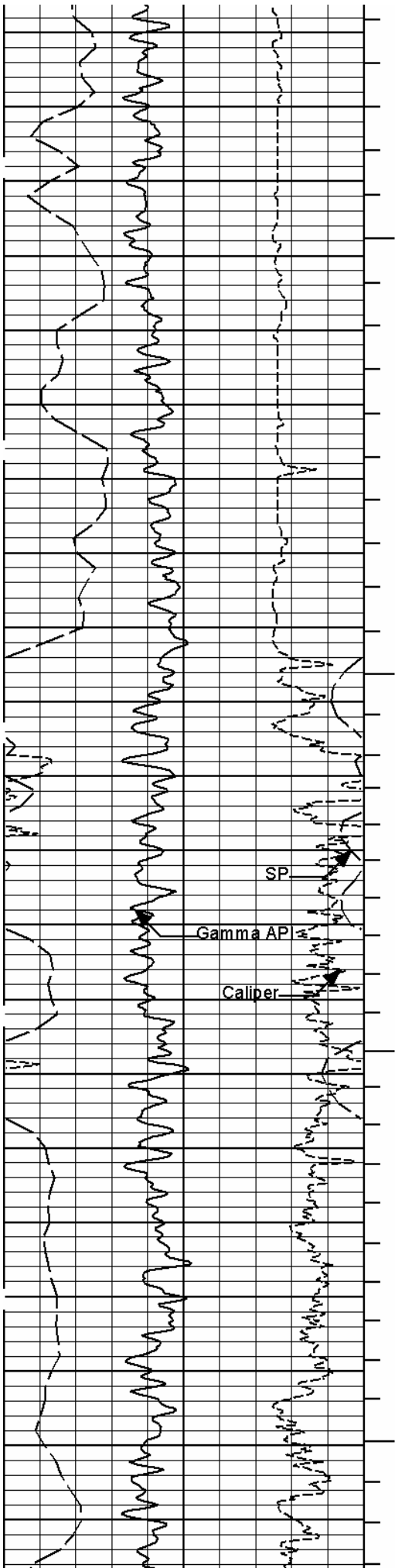


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1000

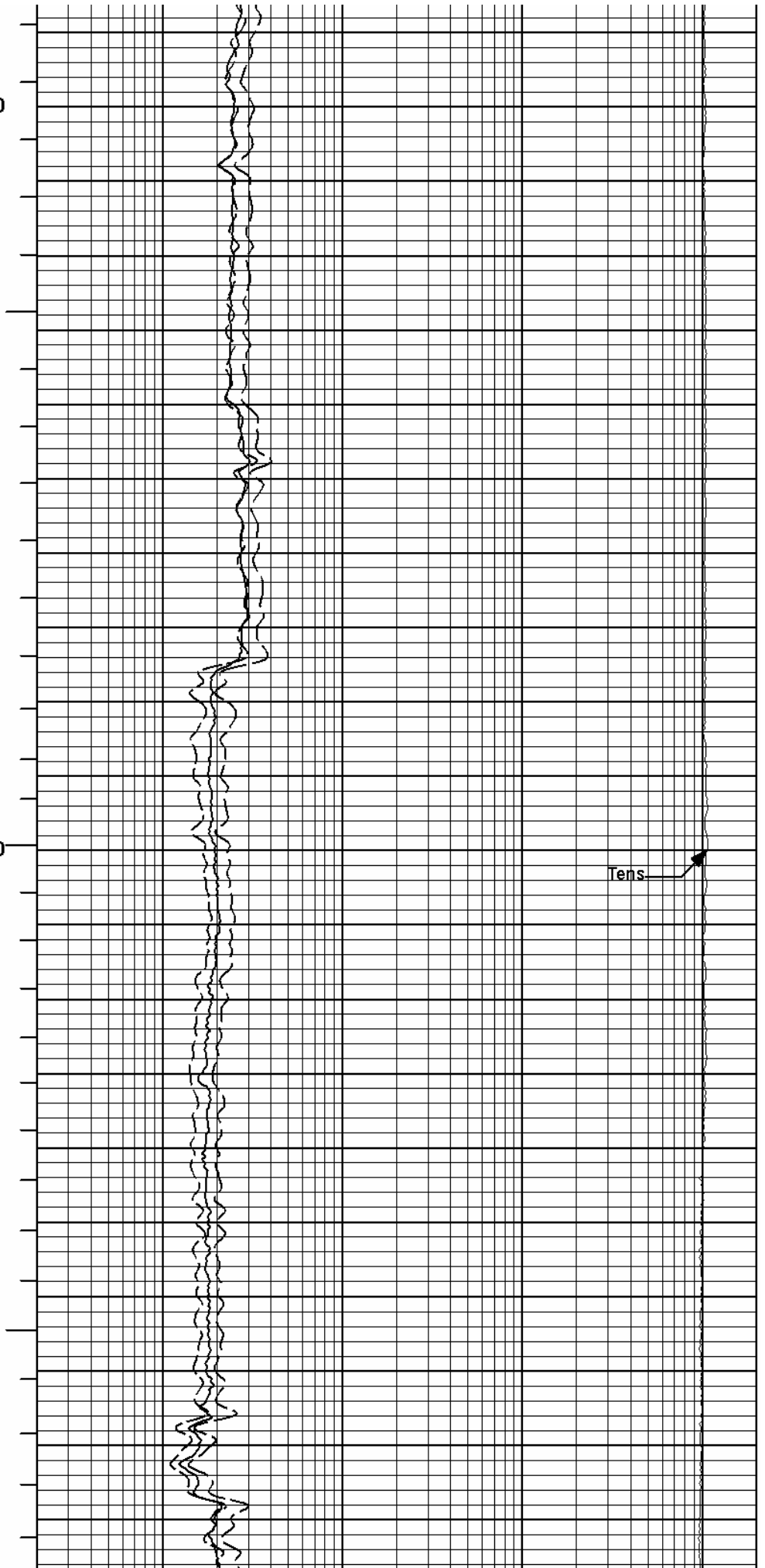


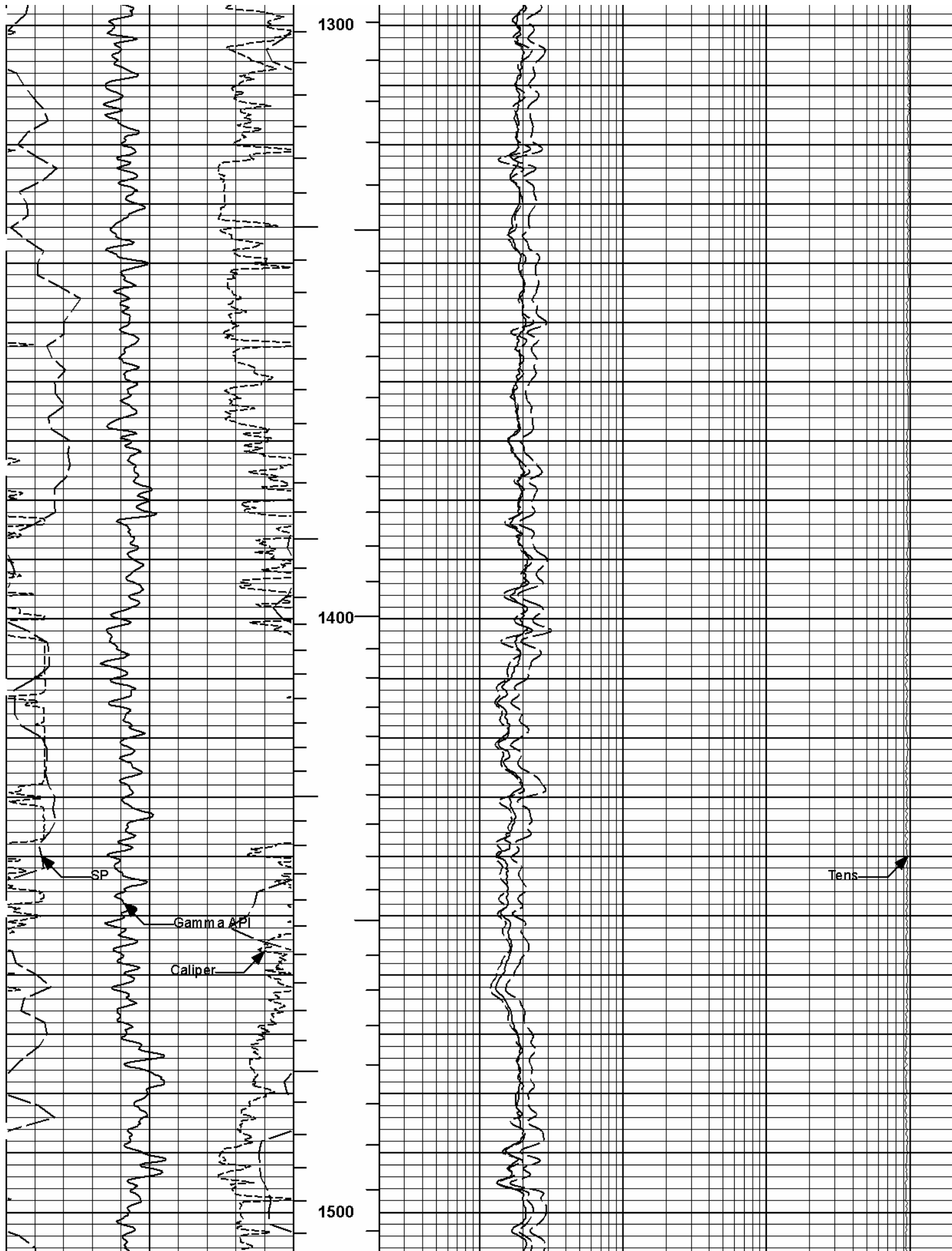
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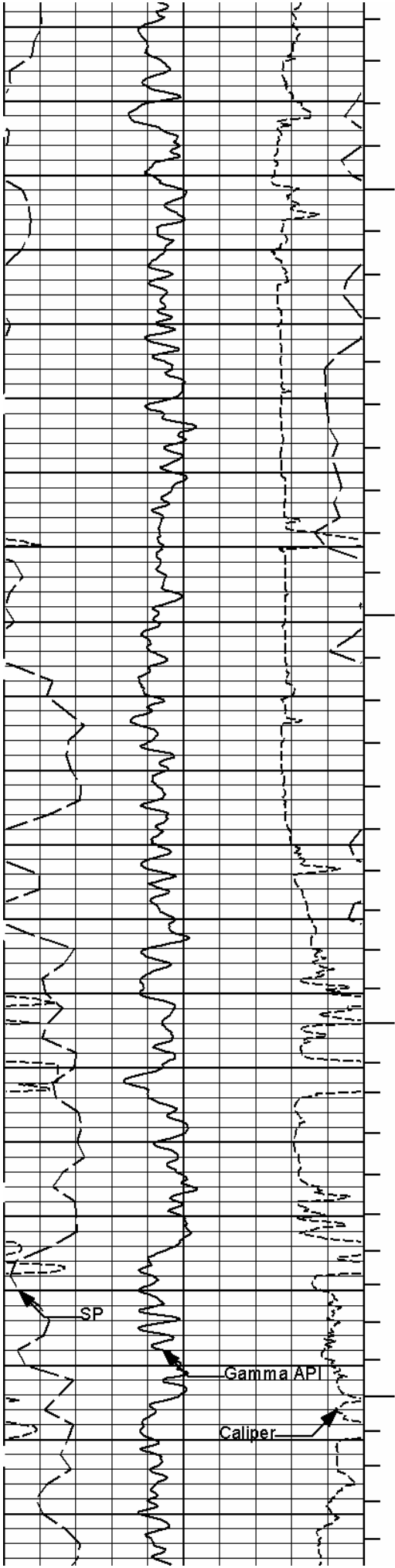


1100

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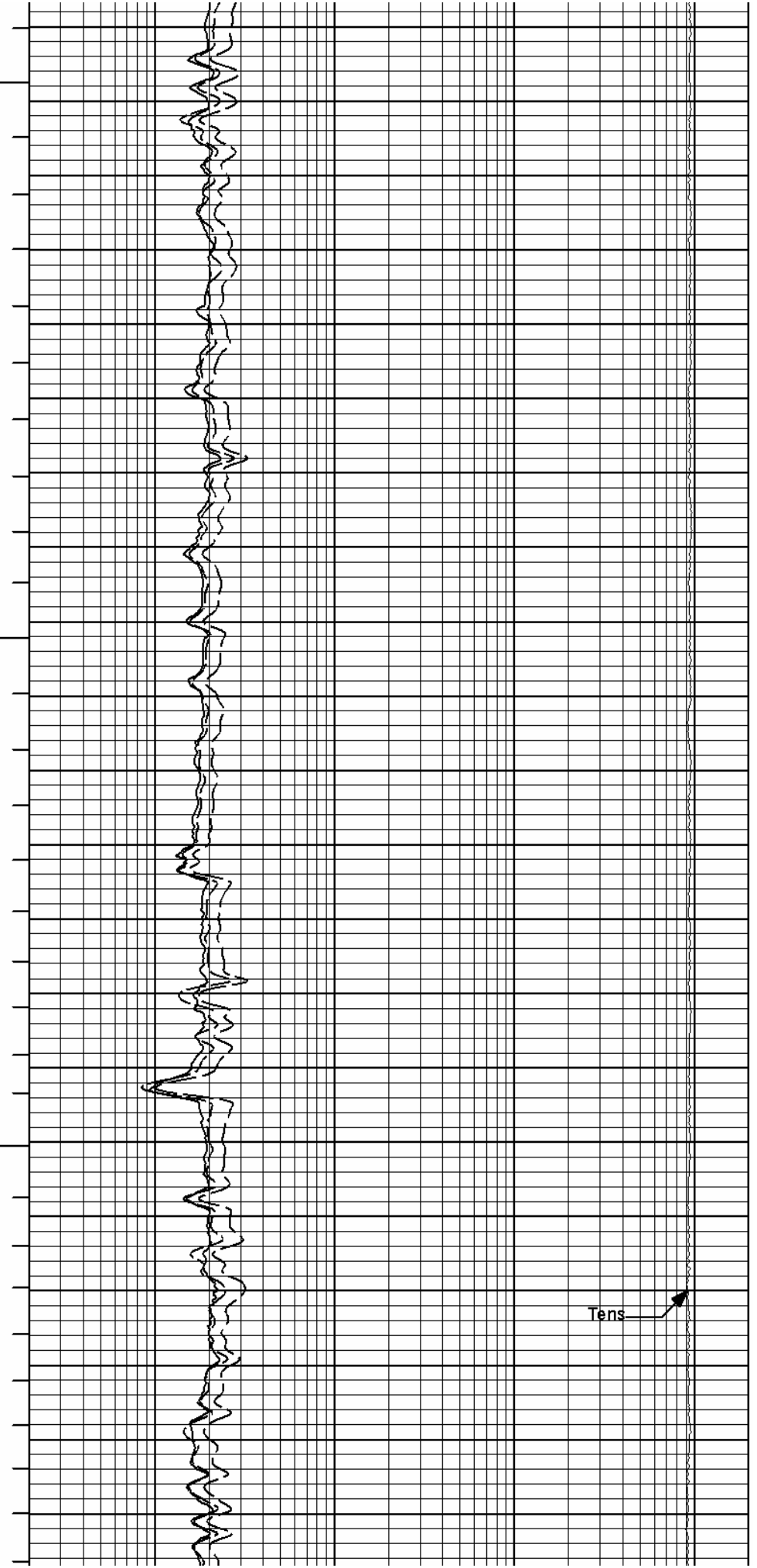




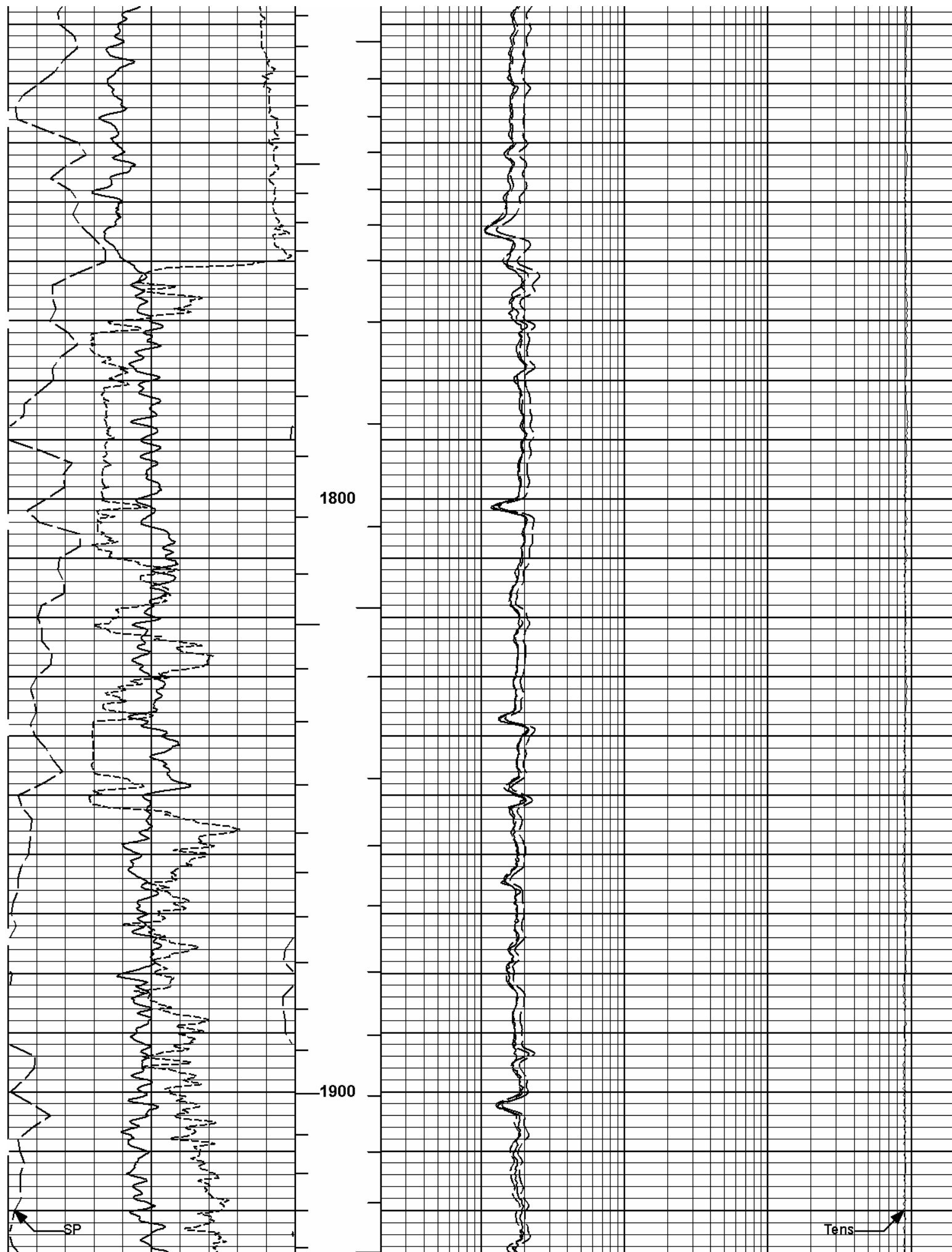


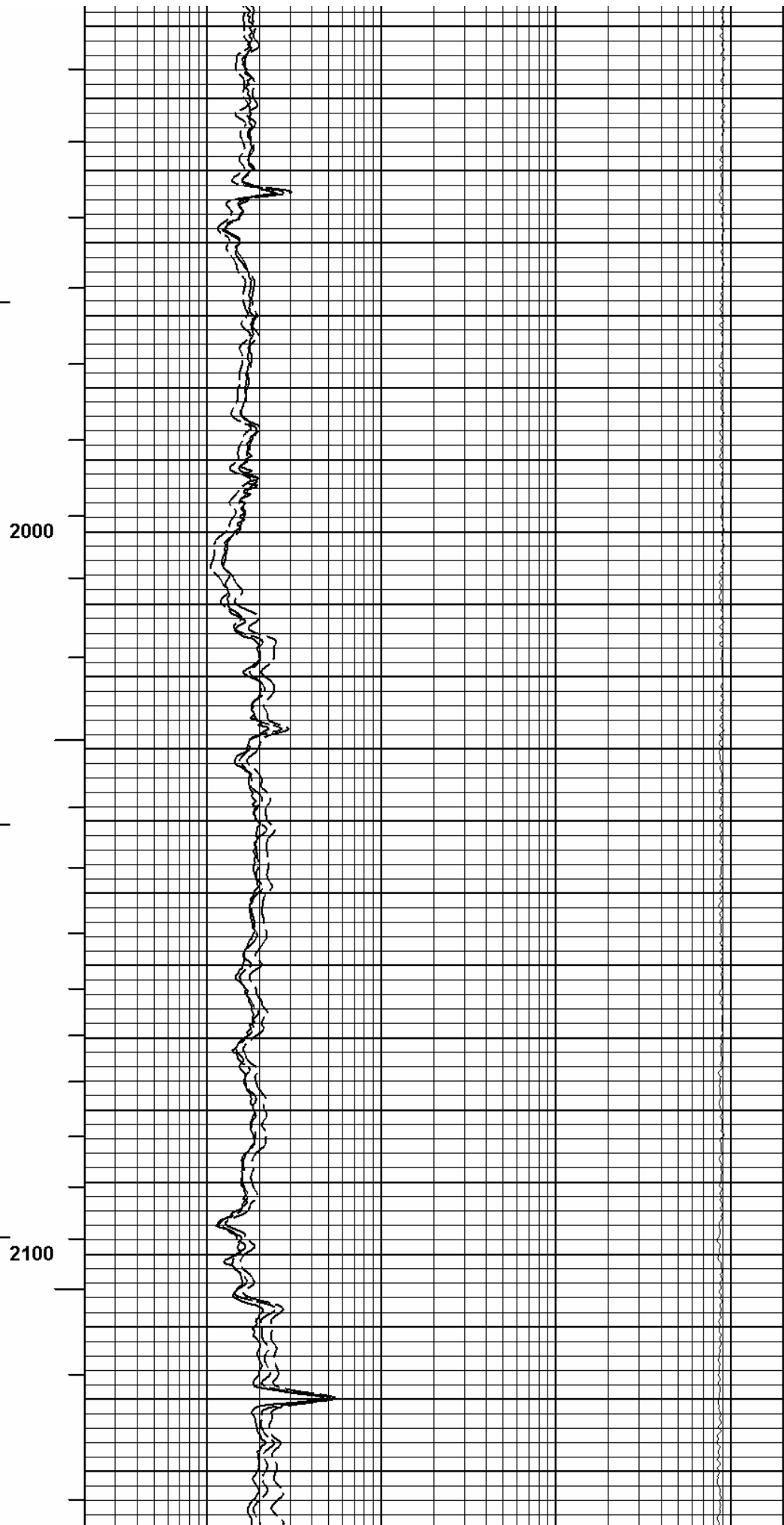
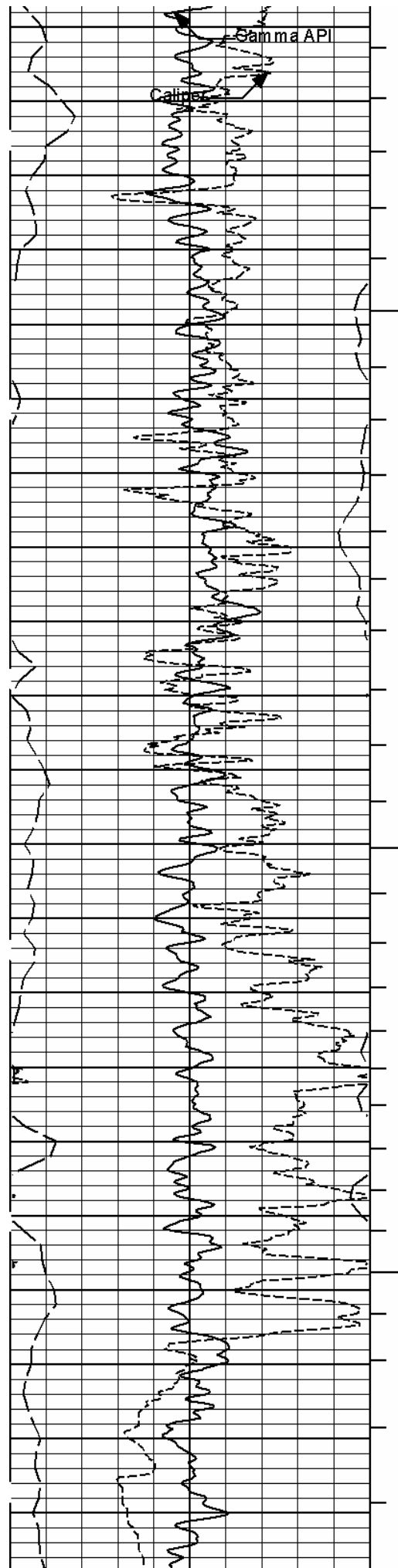
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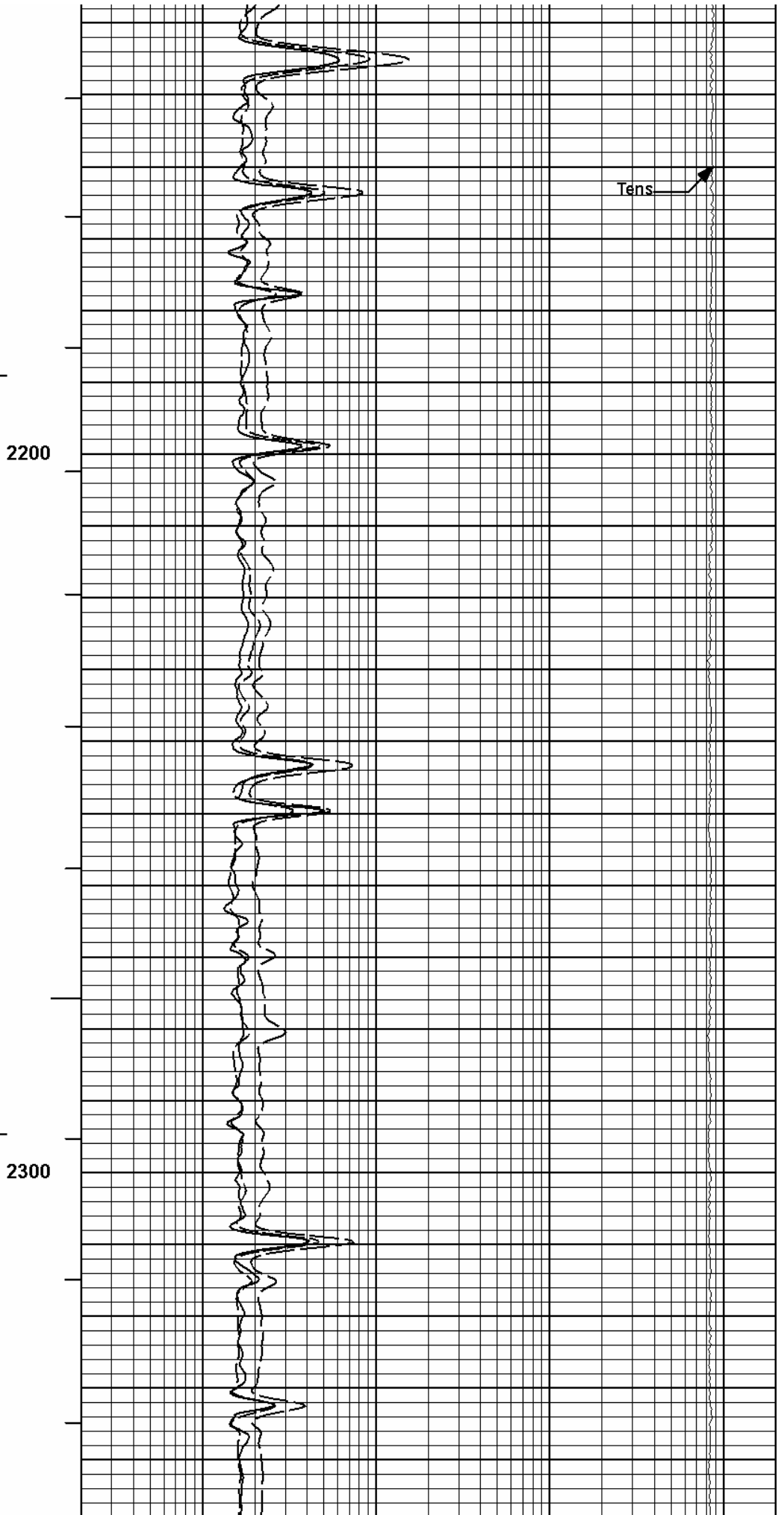
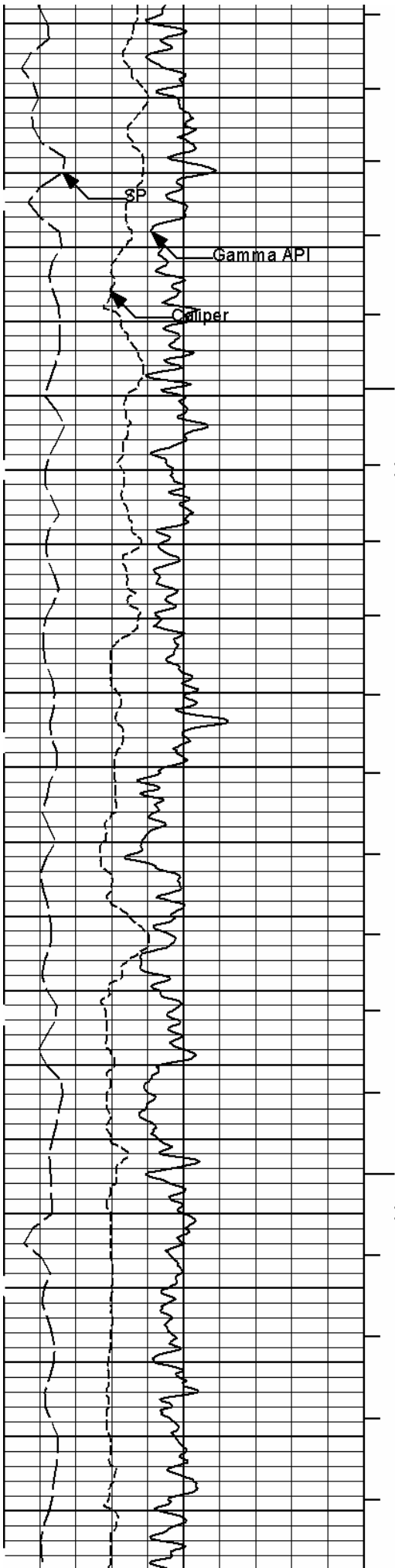
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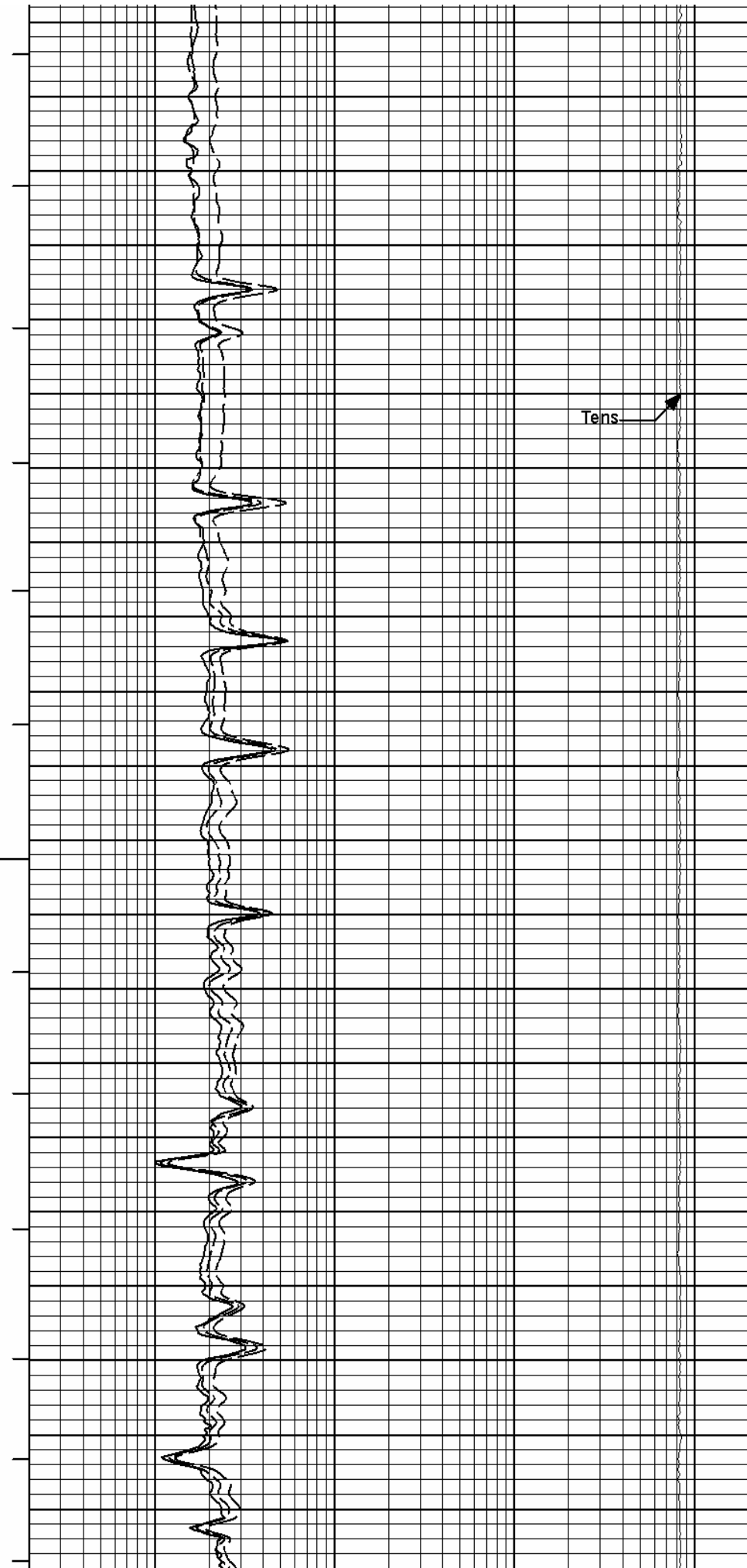
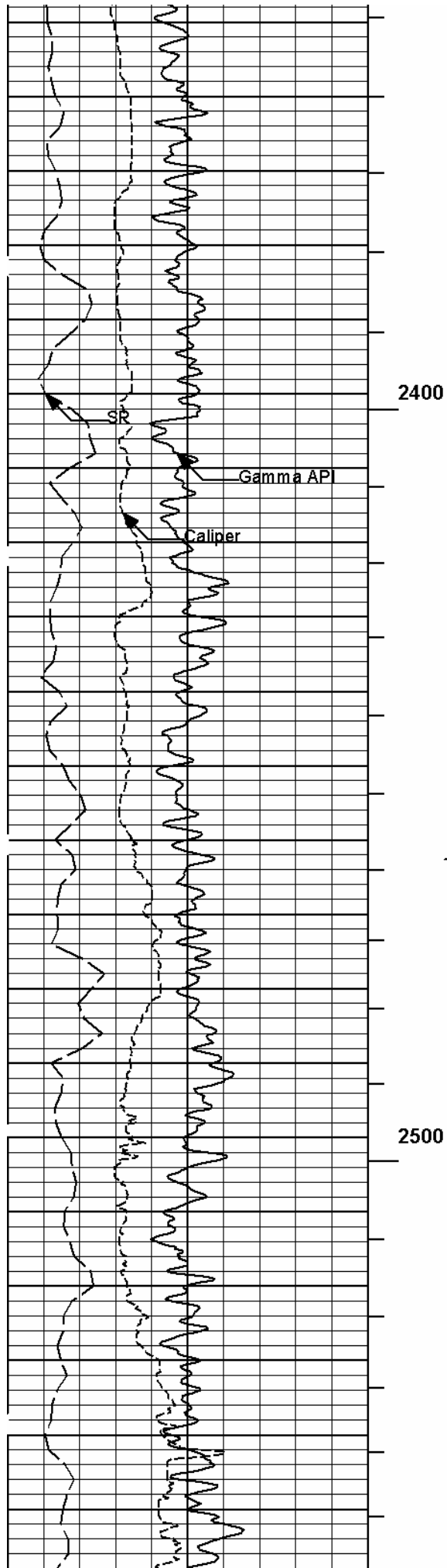


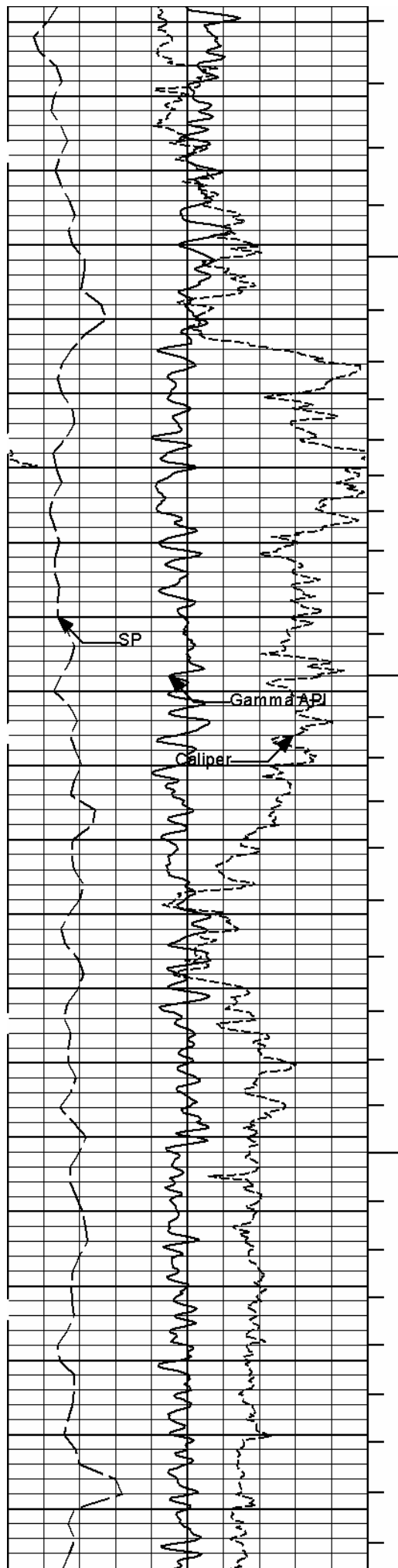
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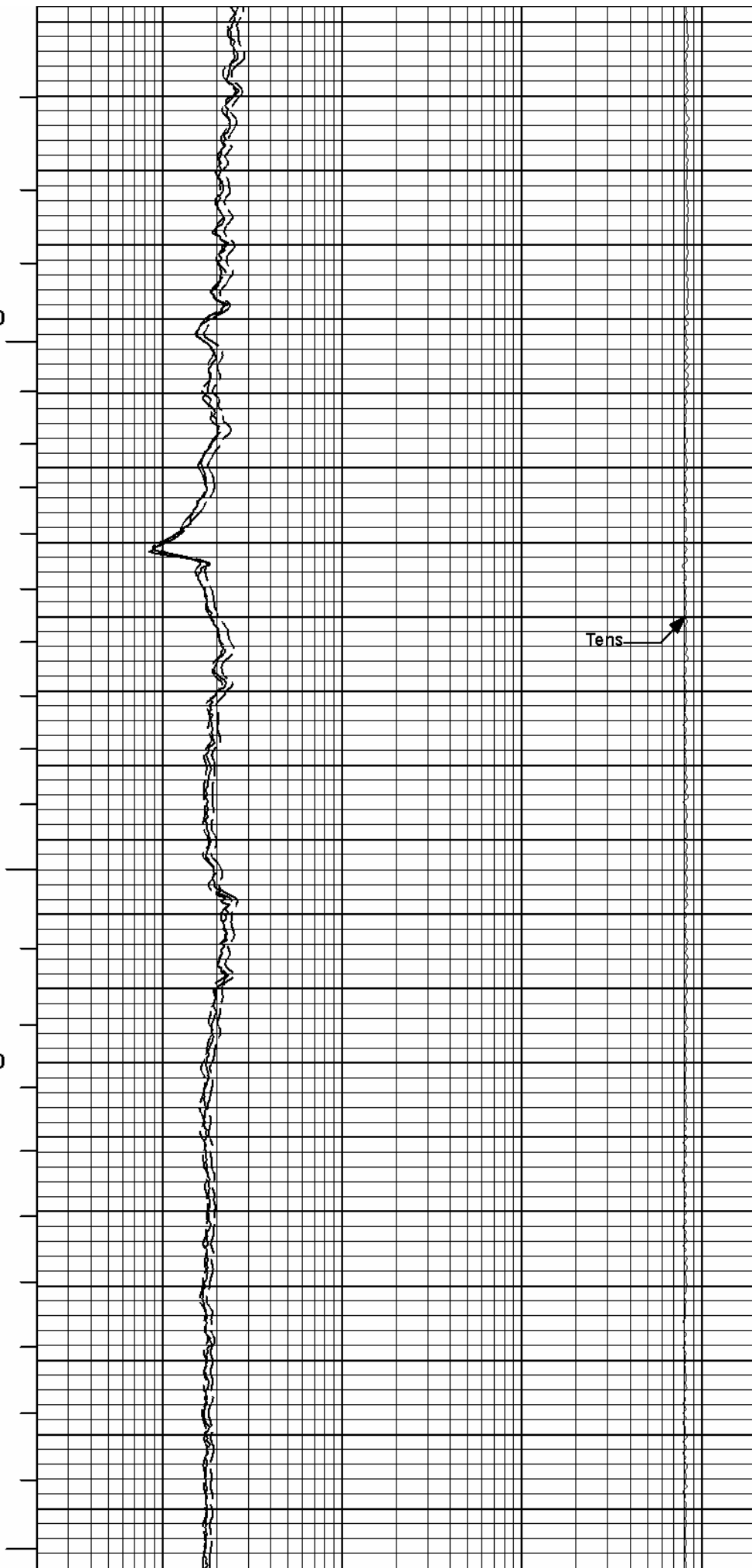




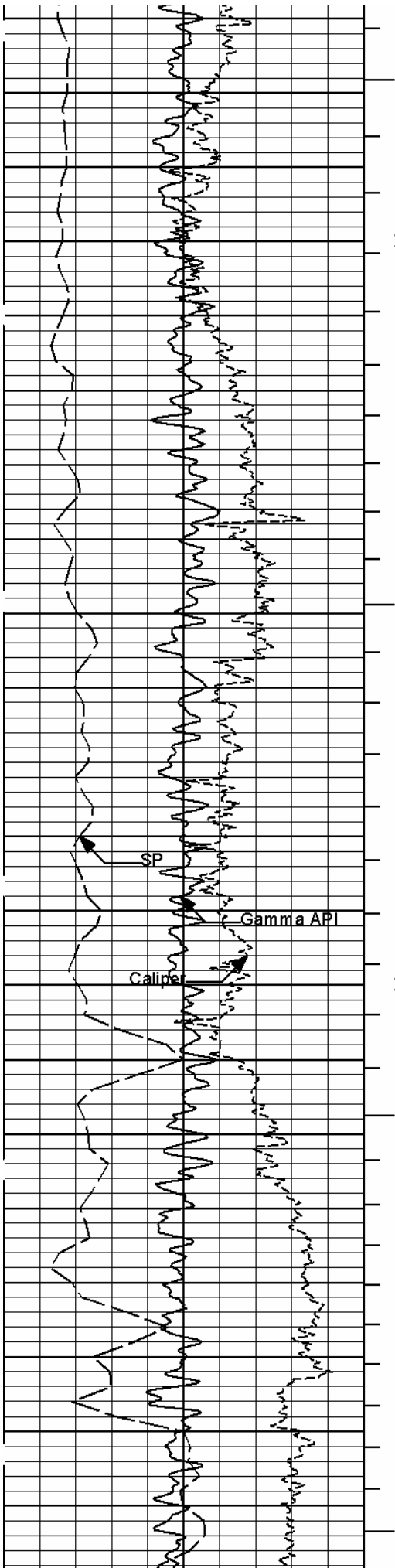


2600

2700



Tens



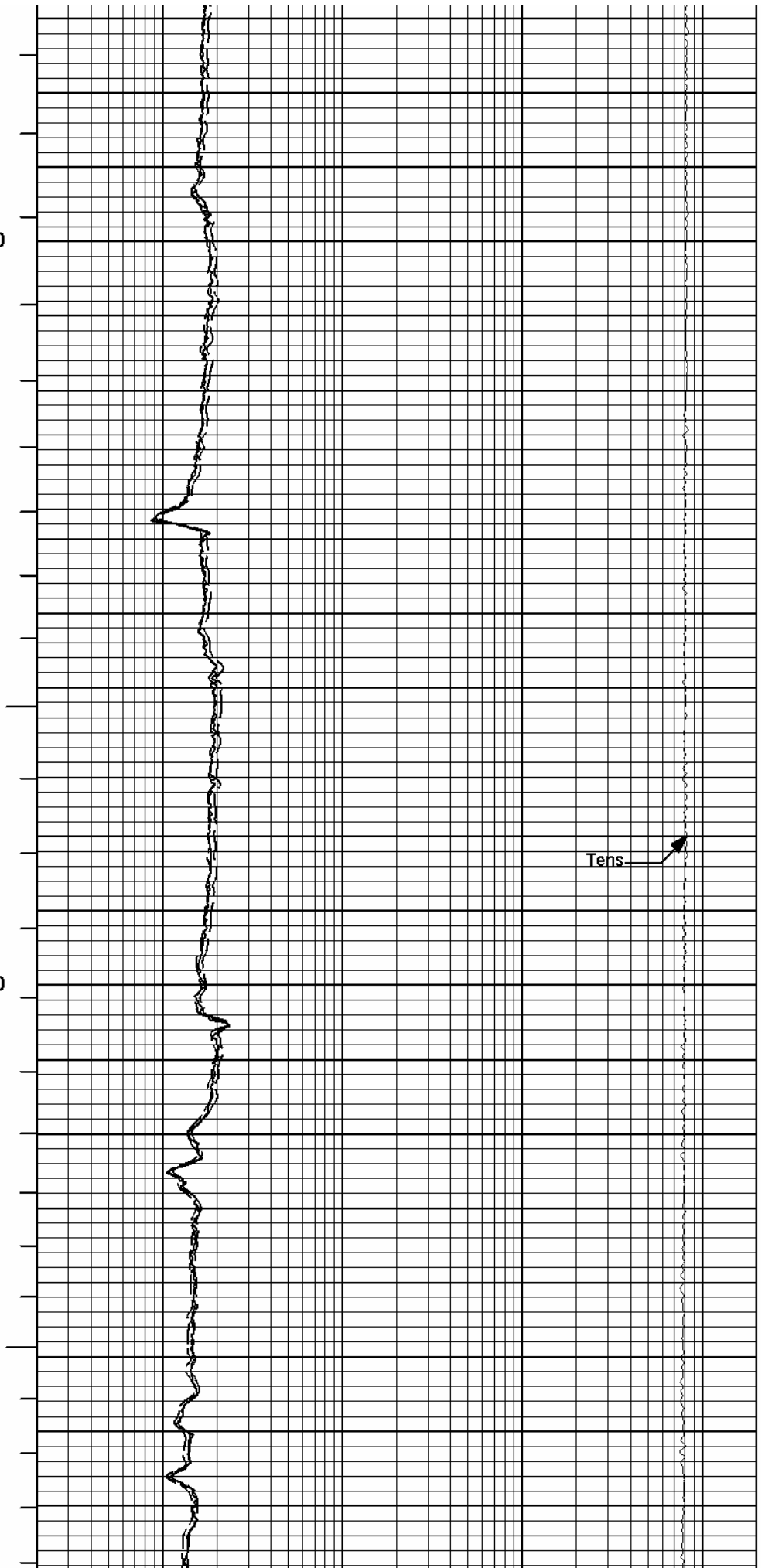
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Gamma API

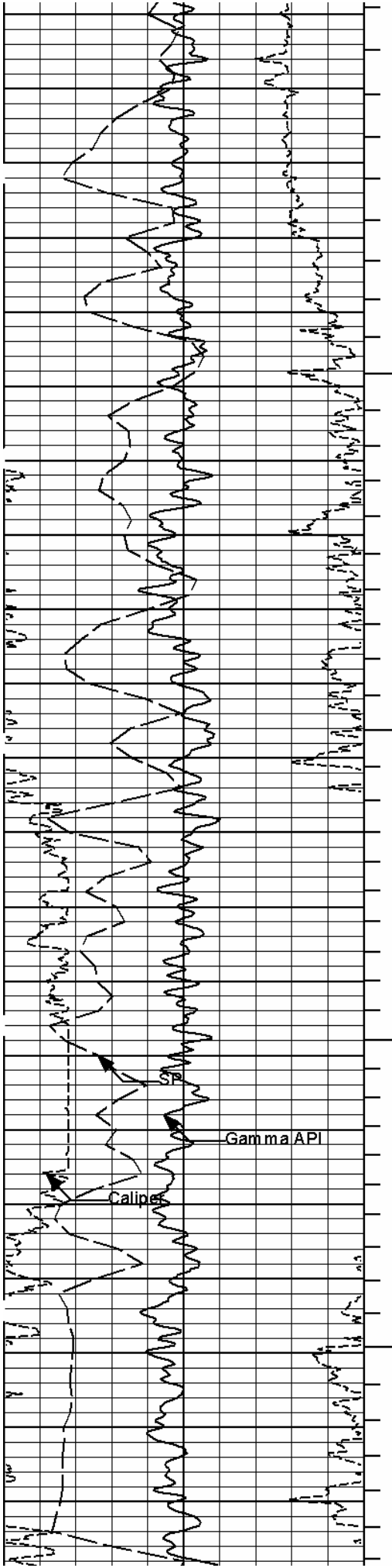
Caliper

SP

2900

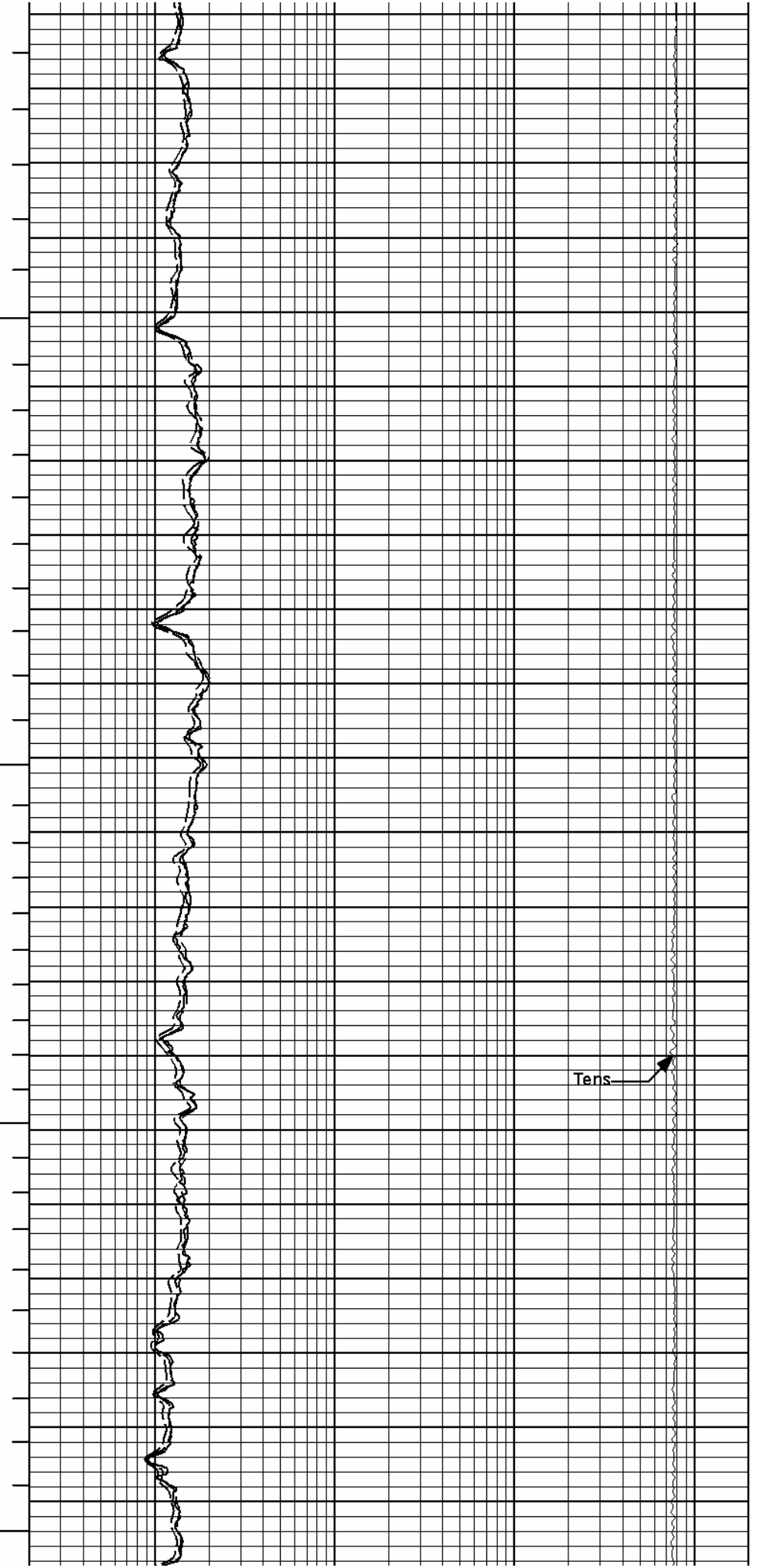


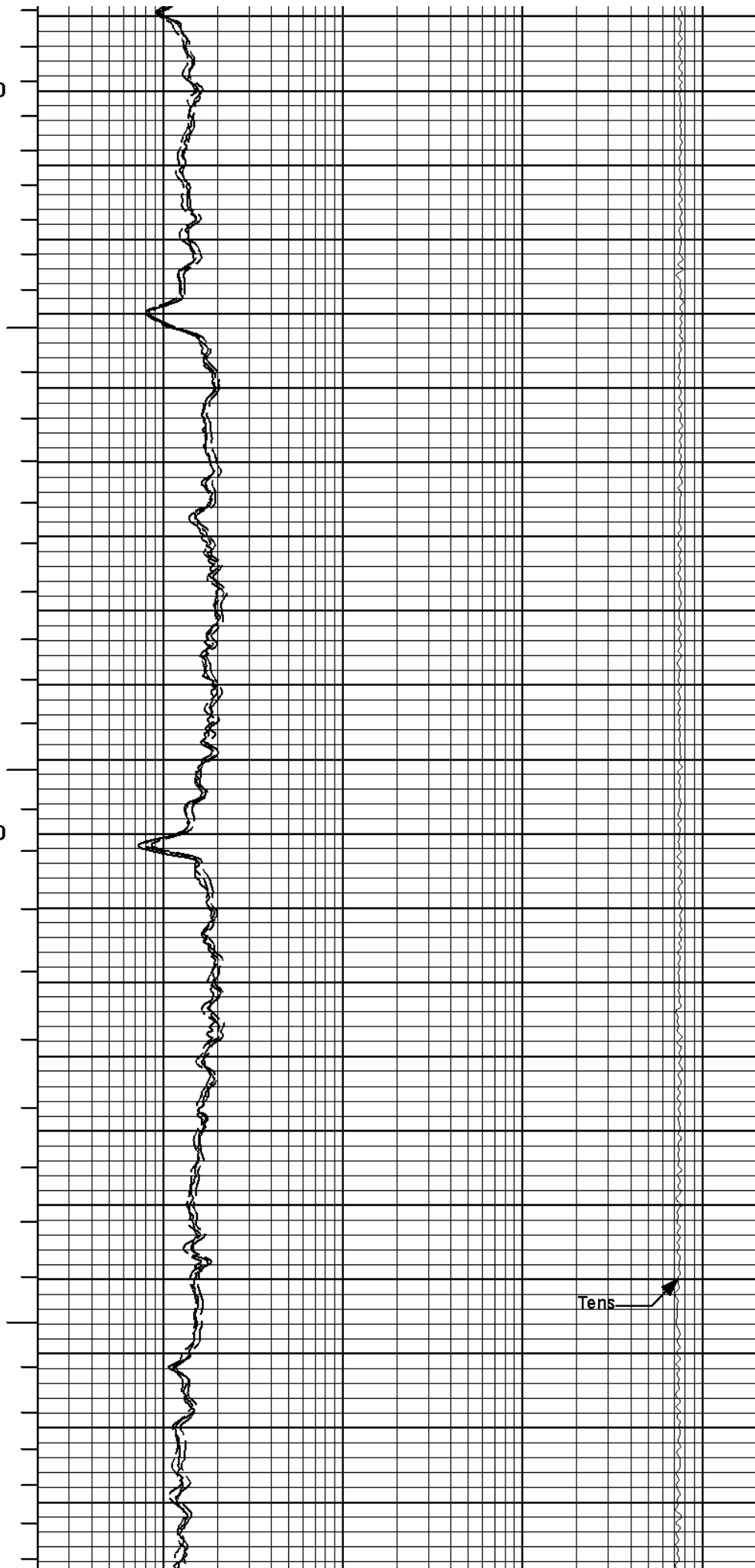
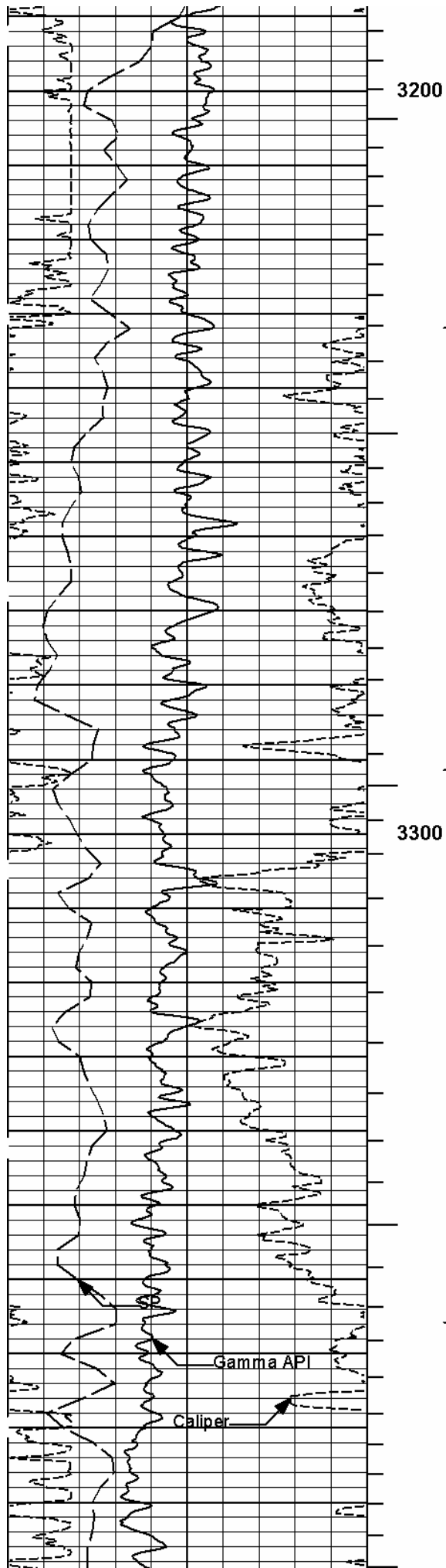
Tens

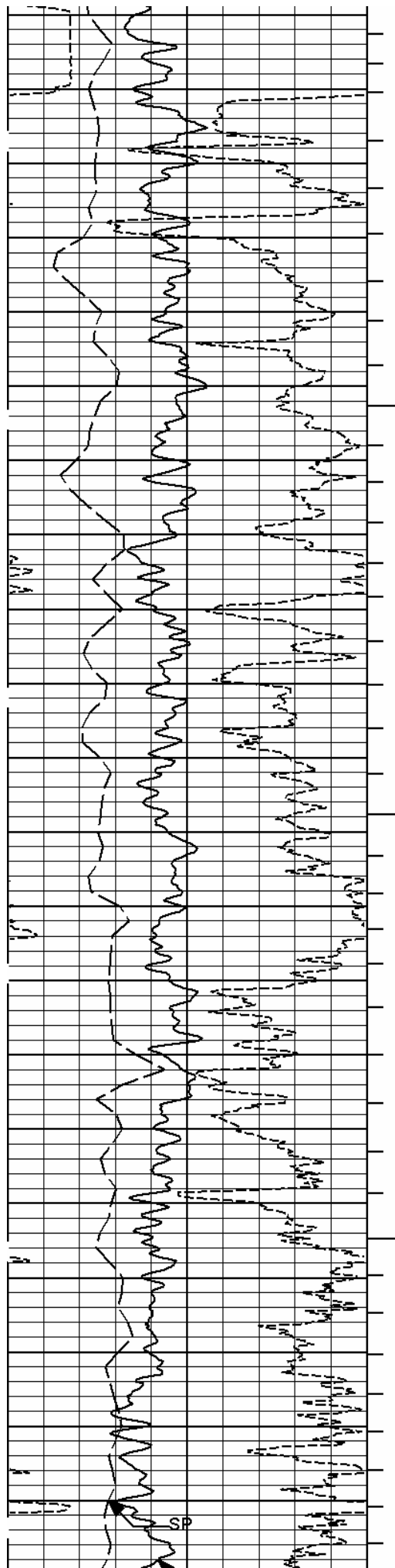


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3100



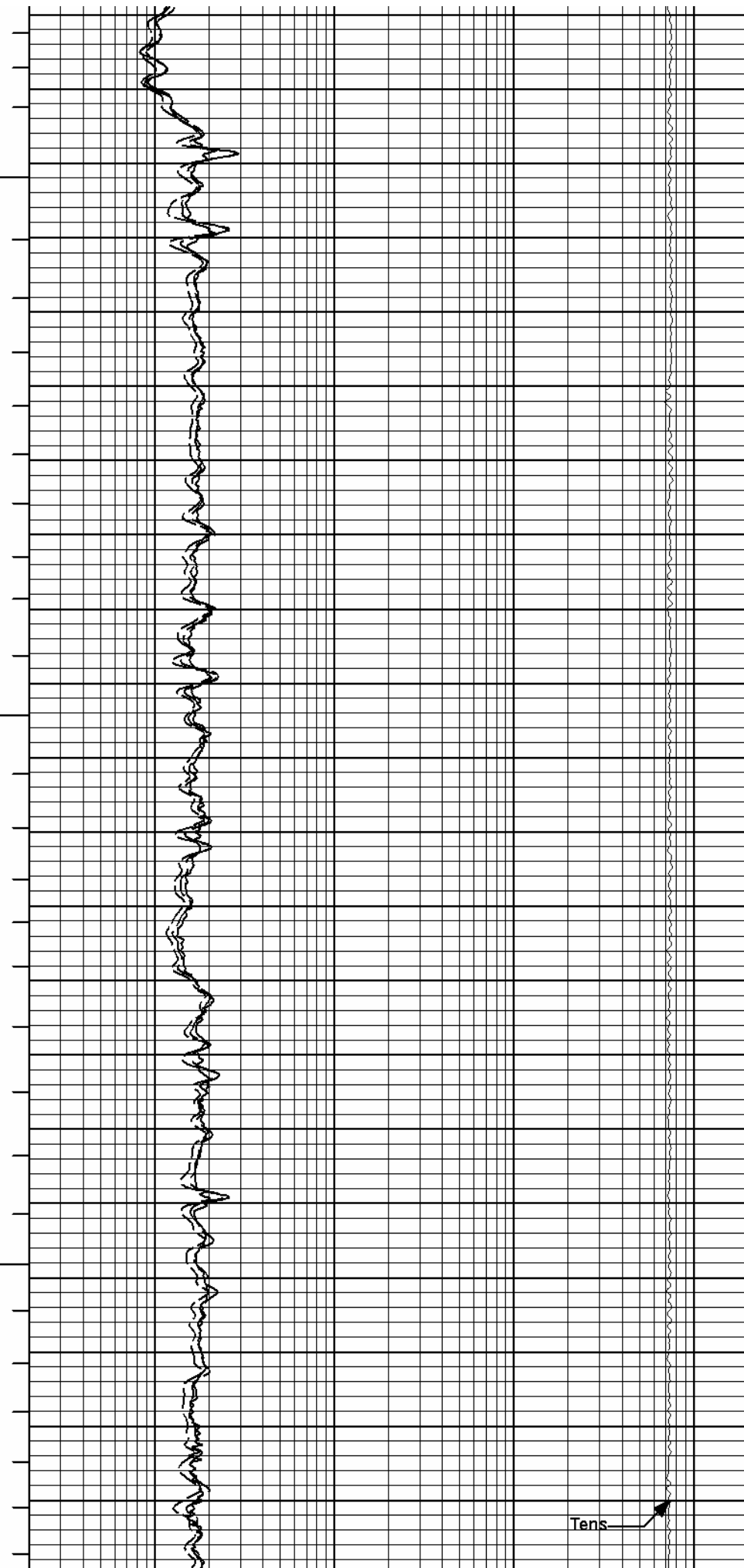




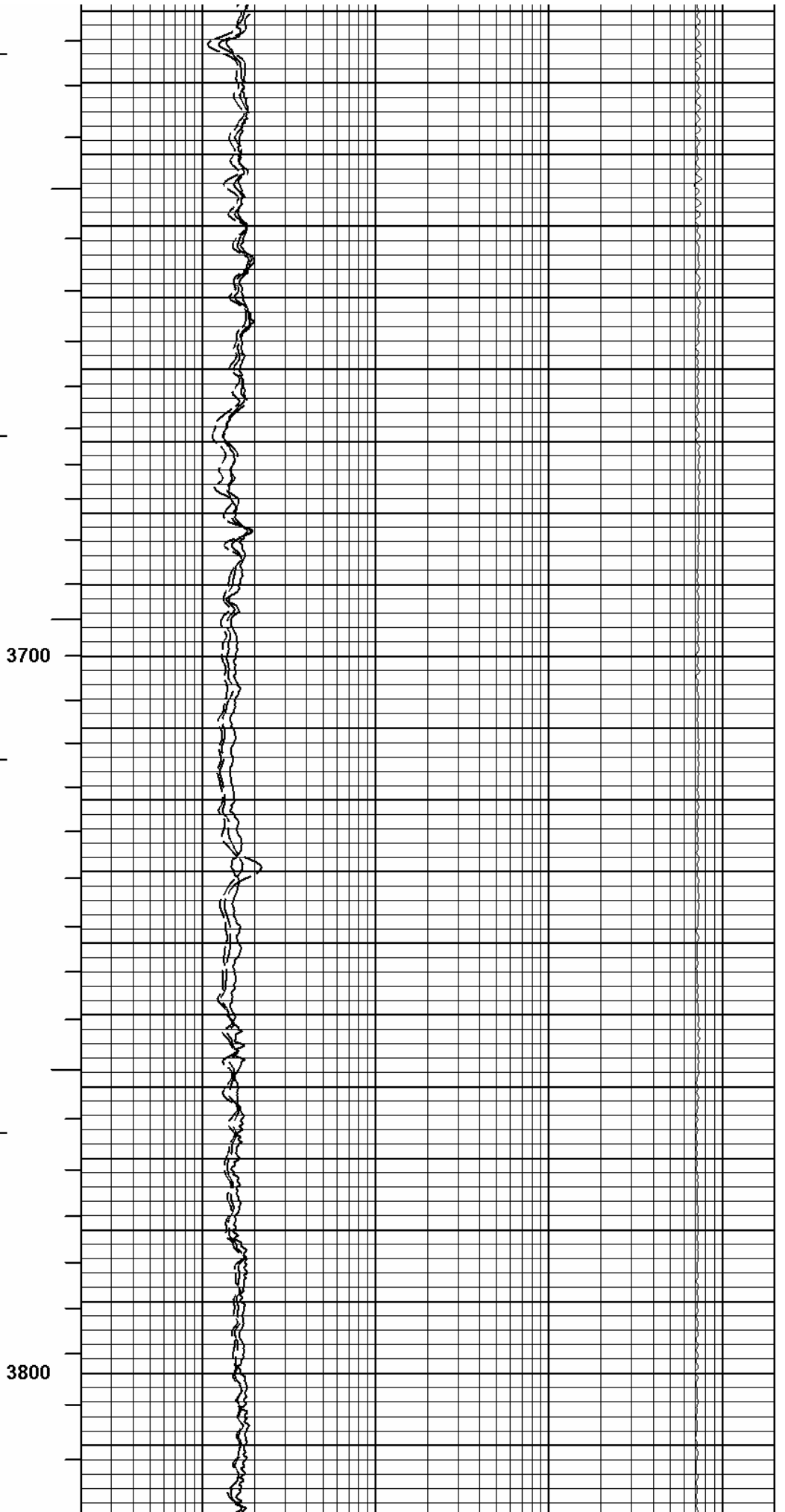
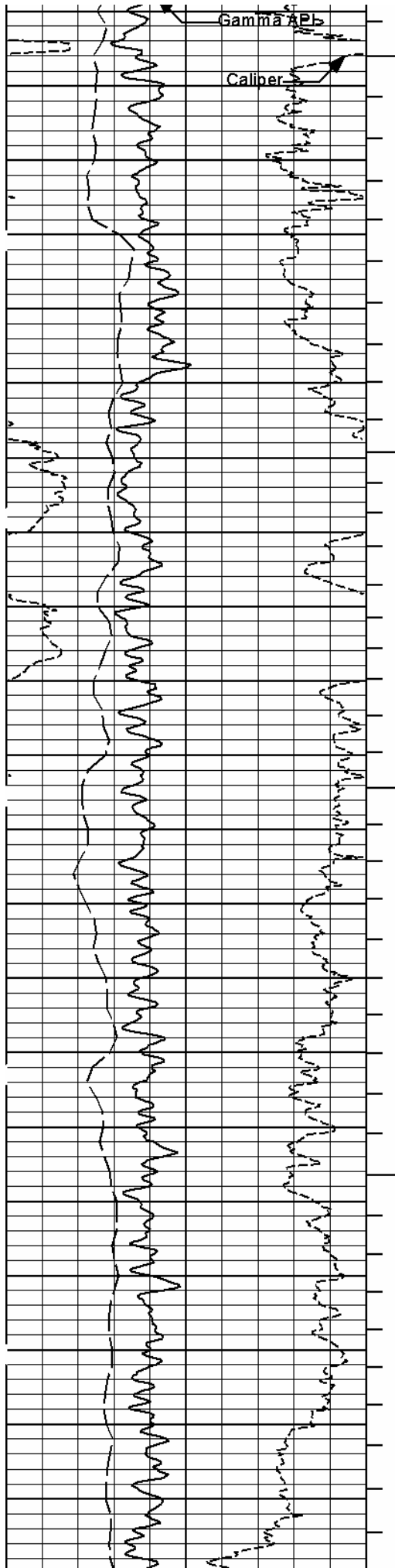
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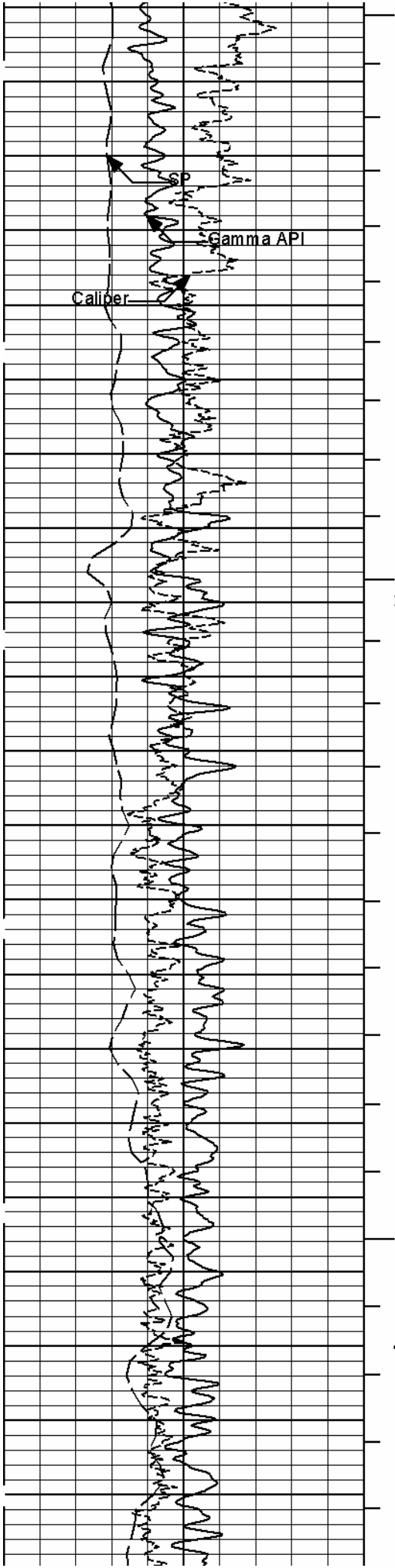
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3600



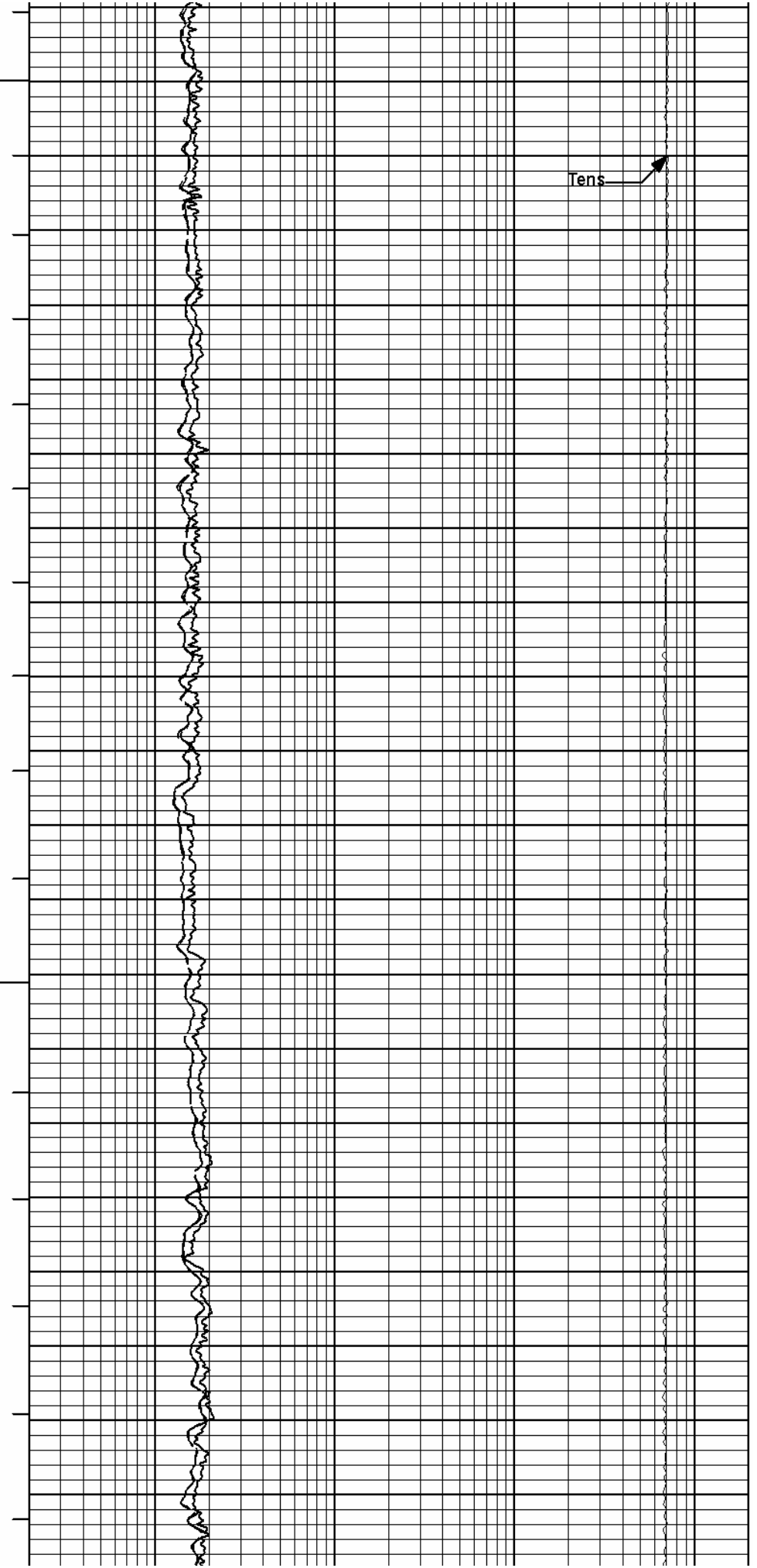
Tens

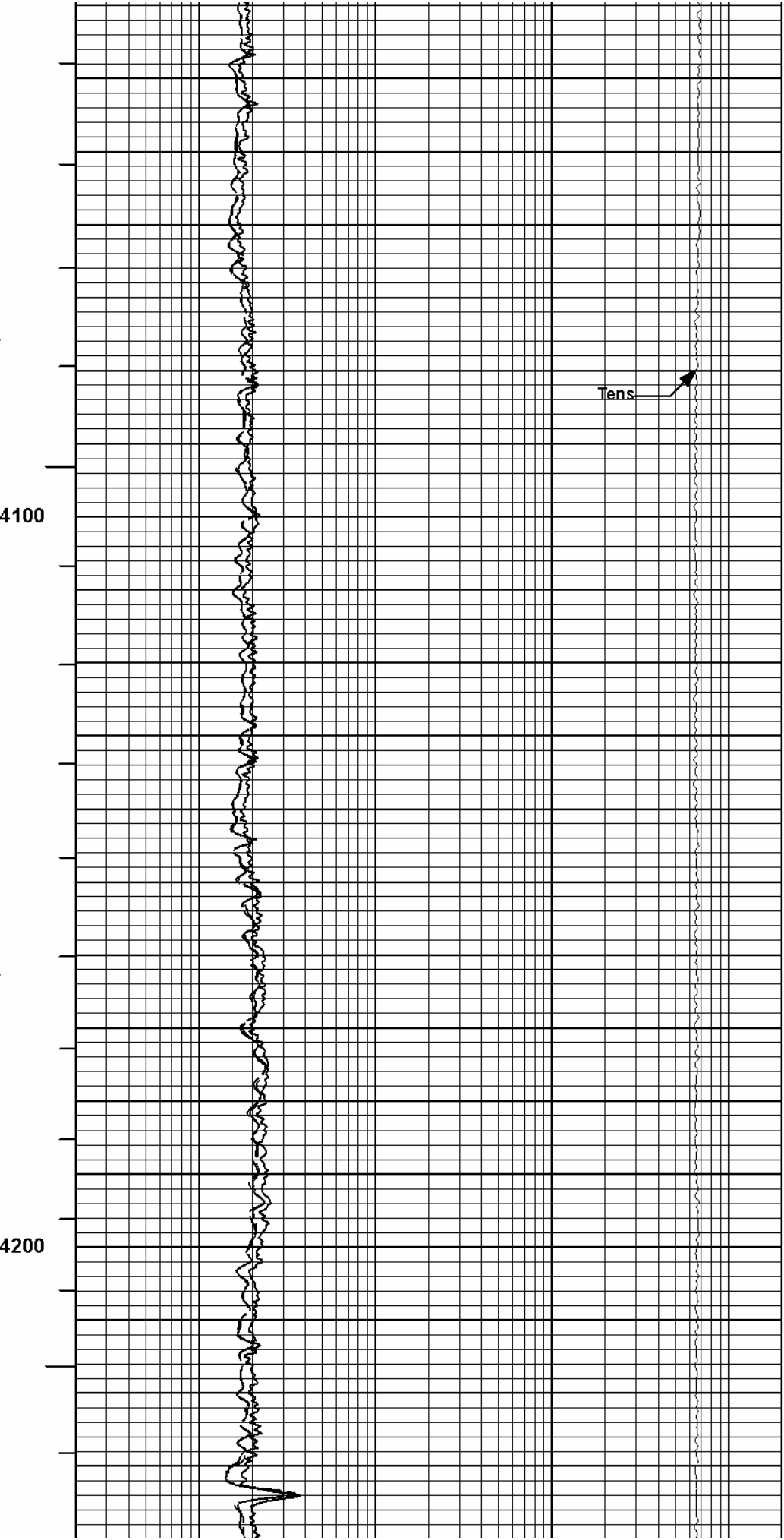
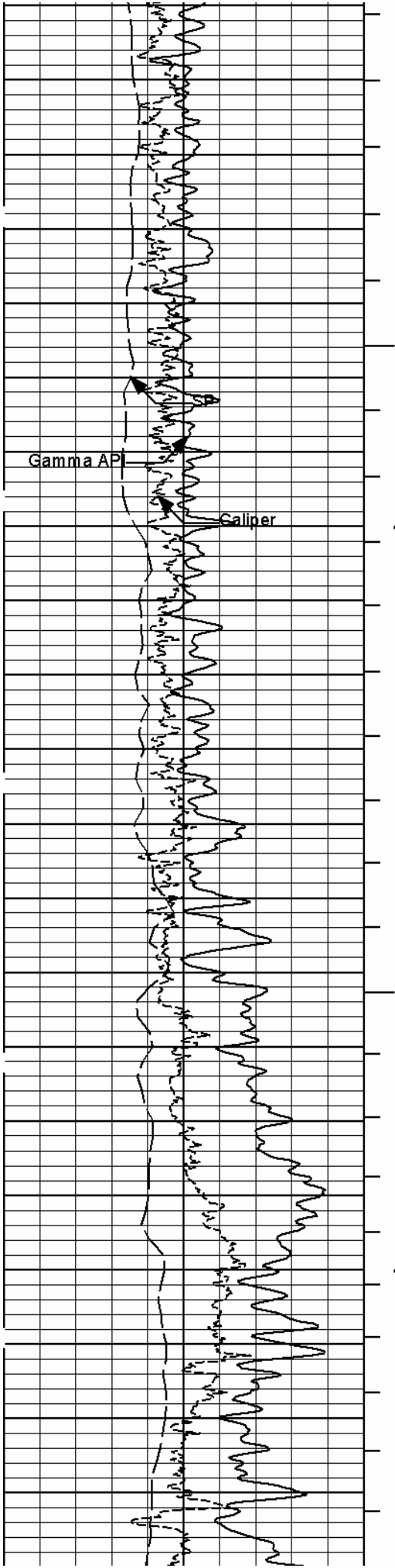


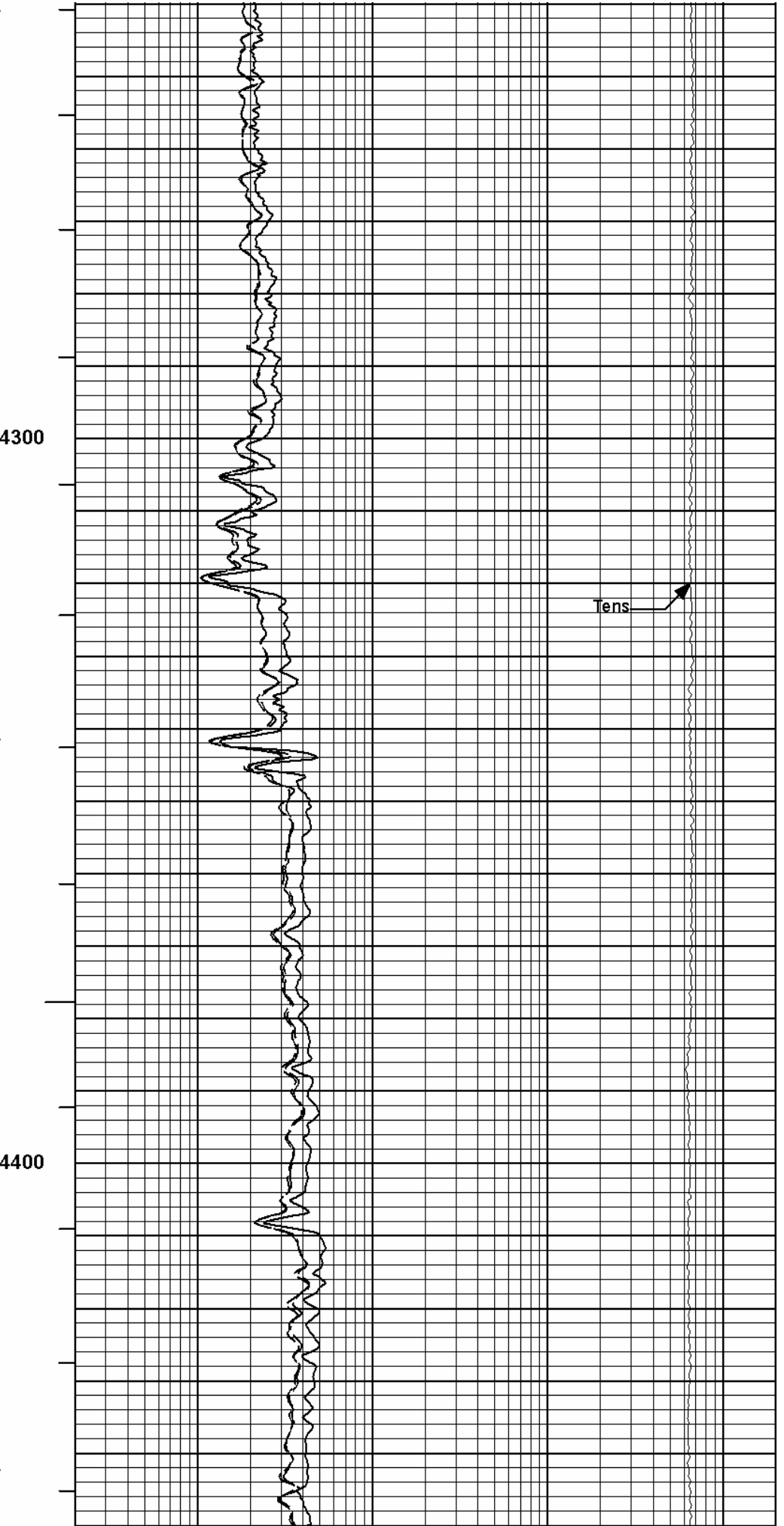
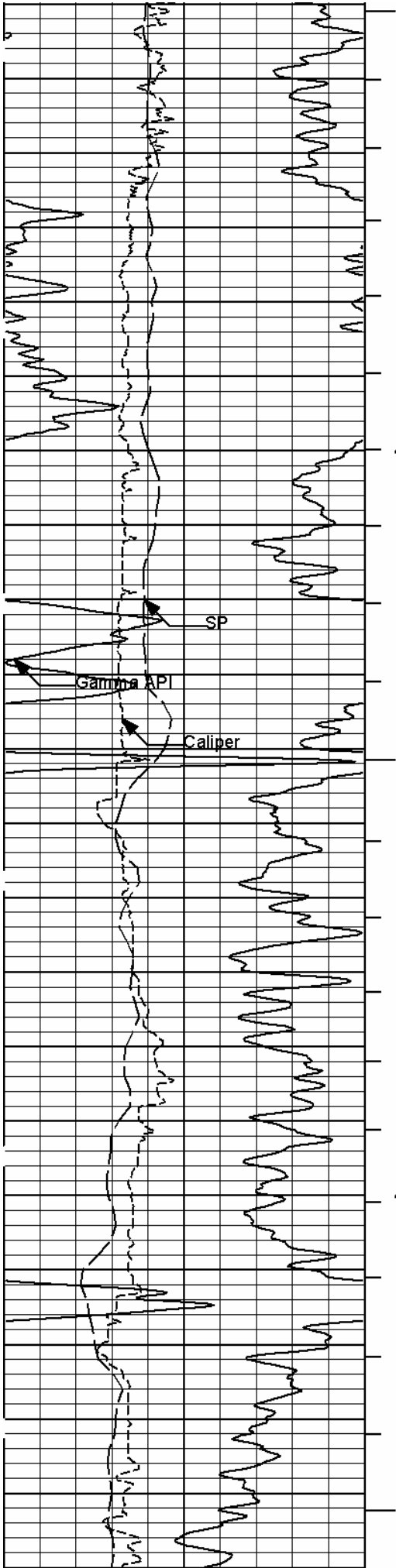


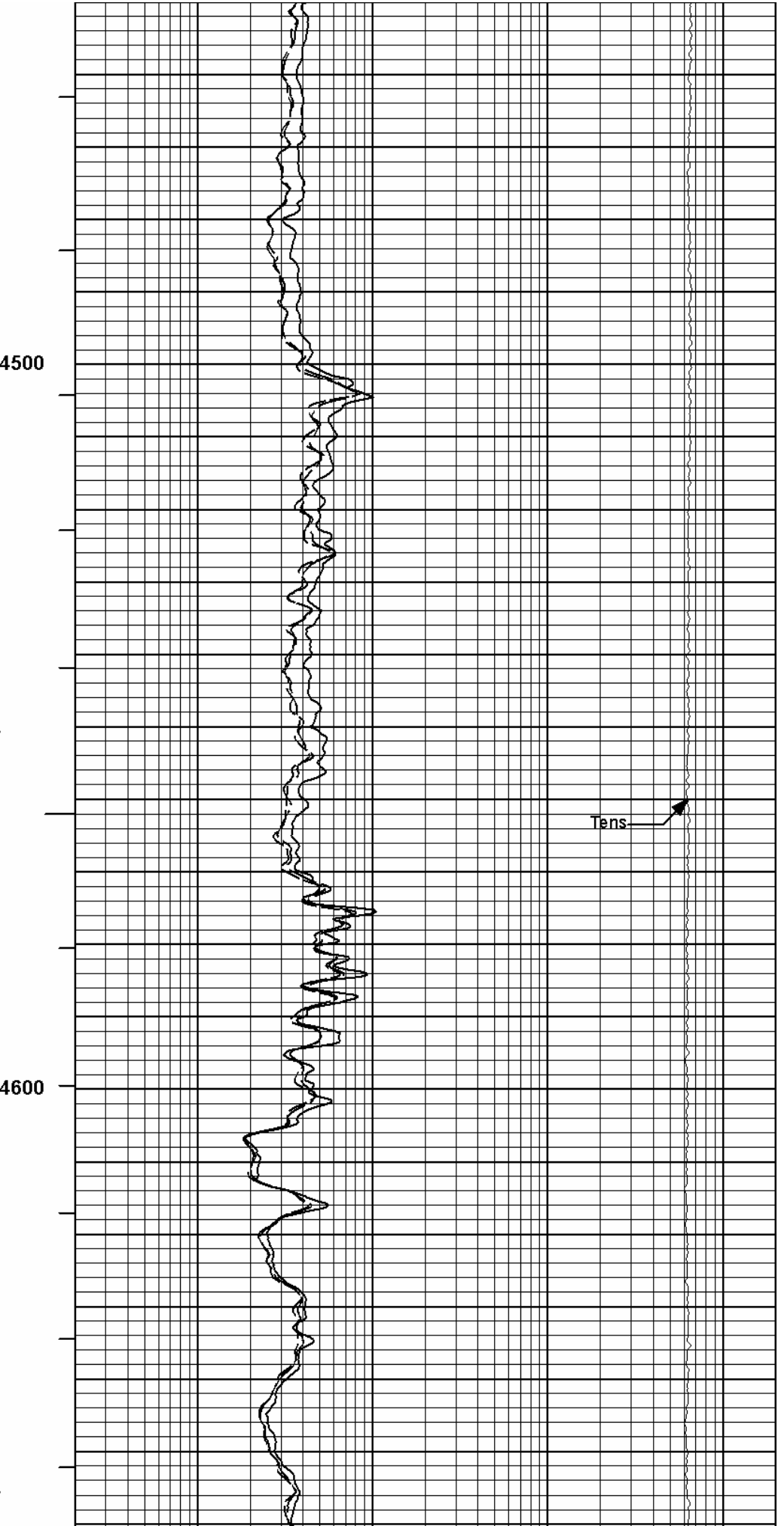
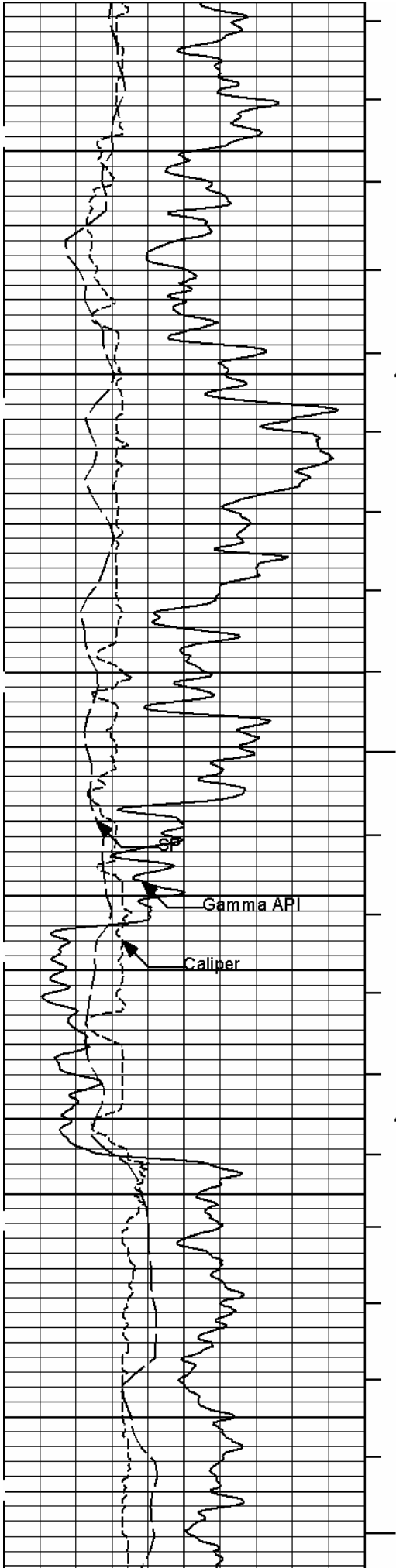
3900

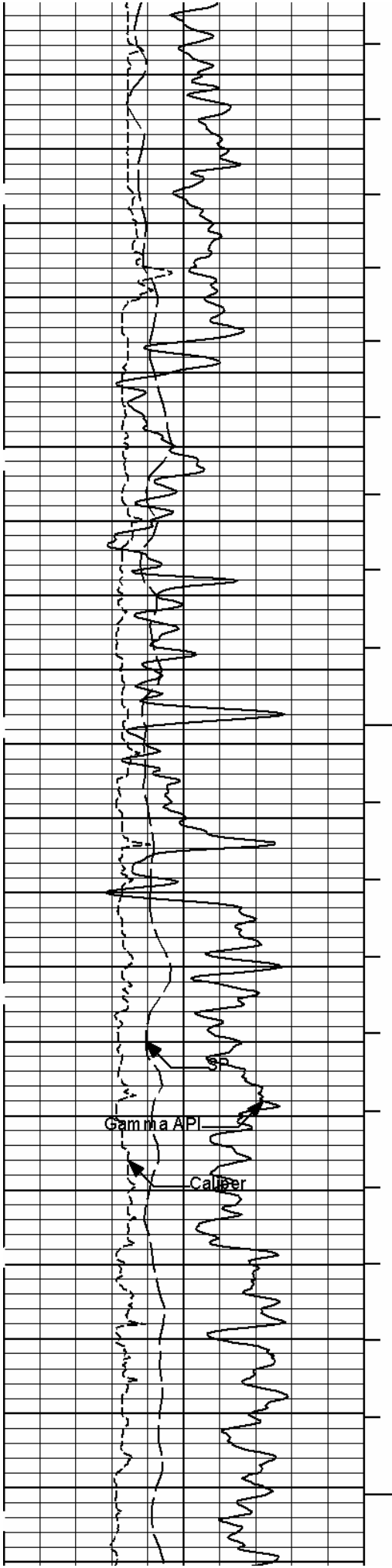
4000









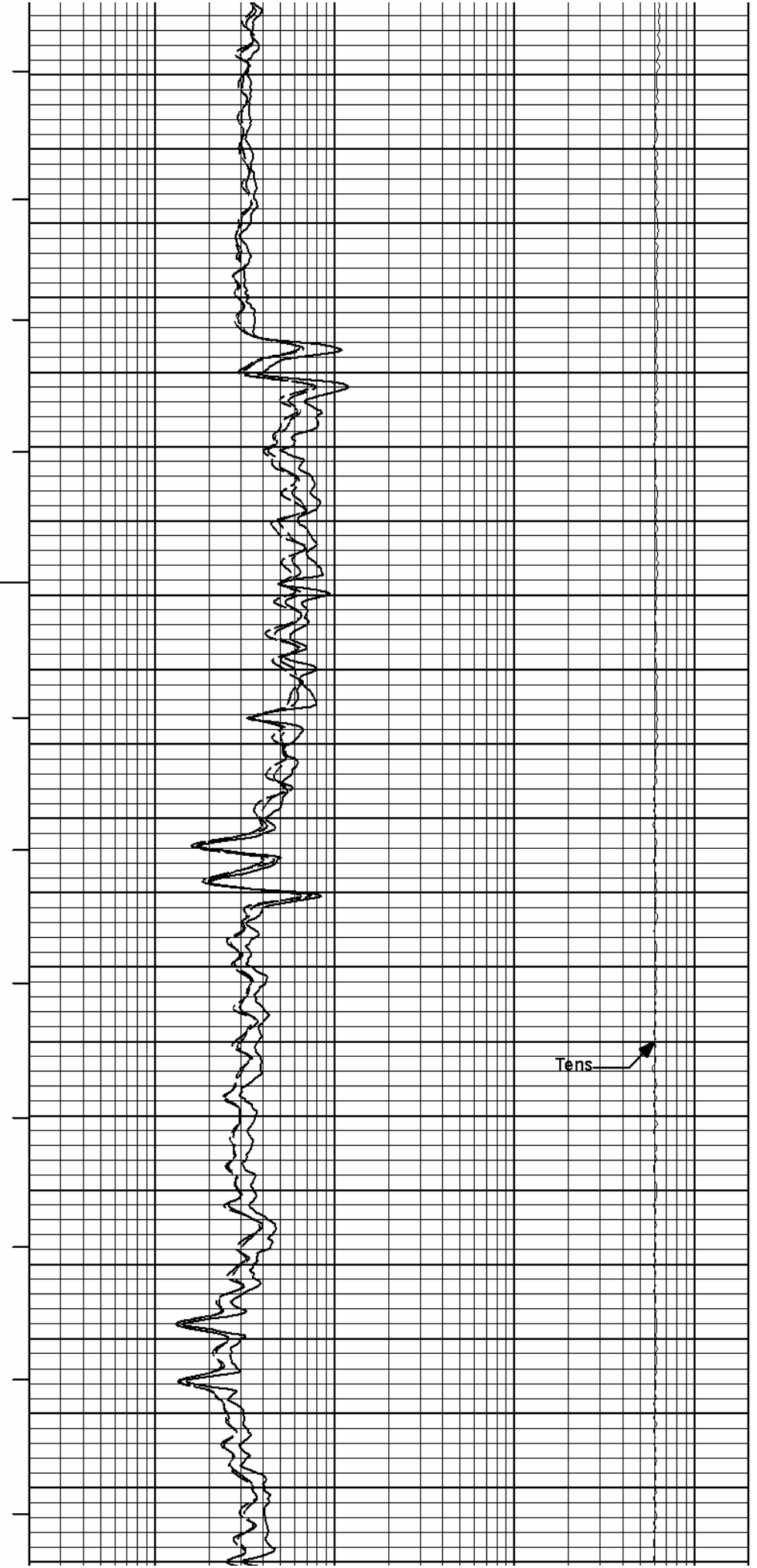


4700

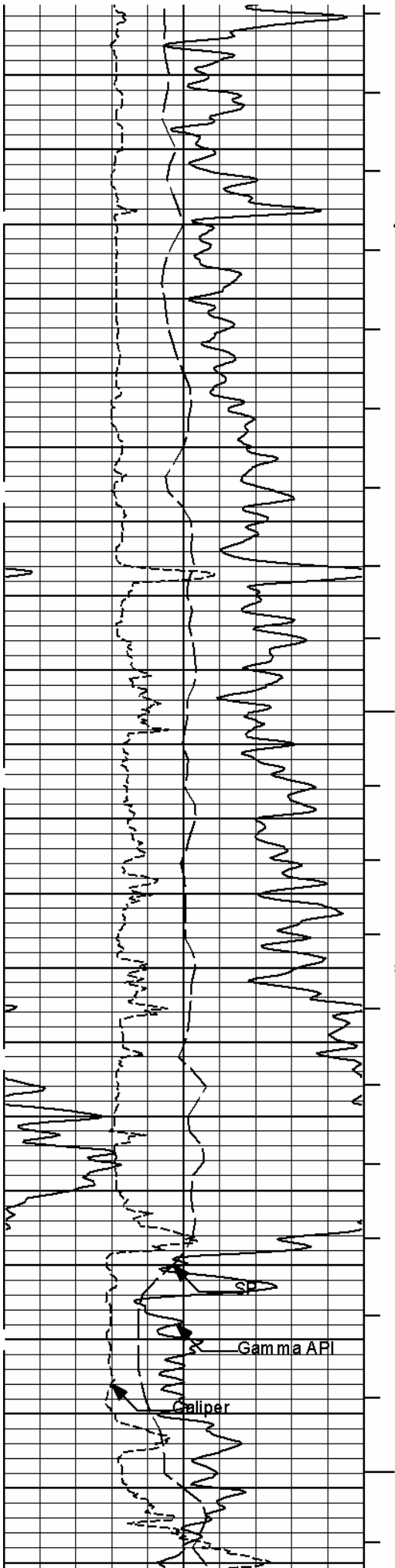
4800

Gamma API

Caliper



Tens

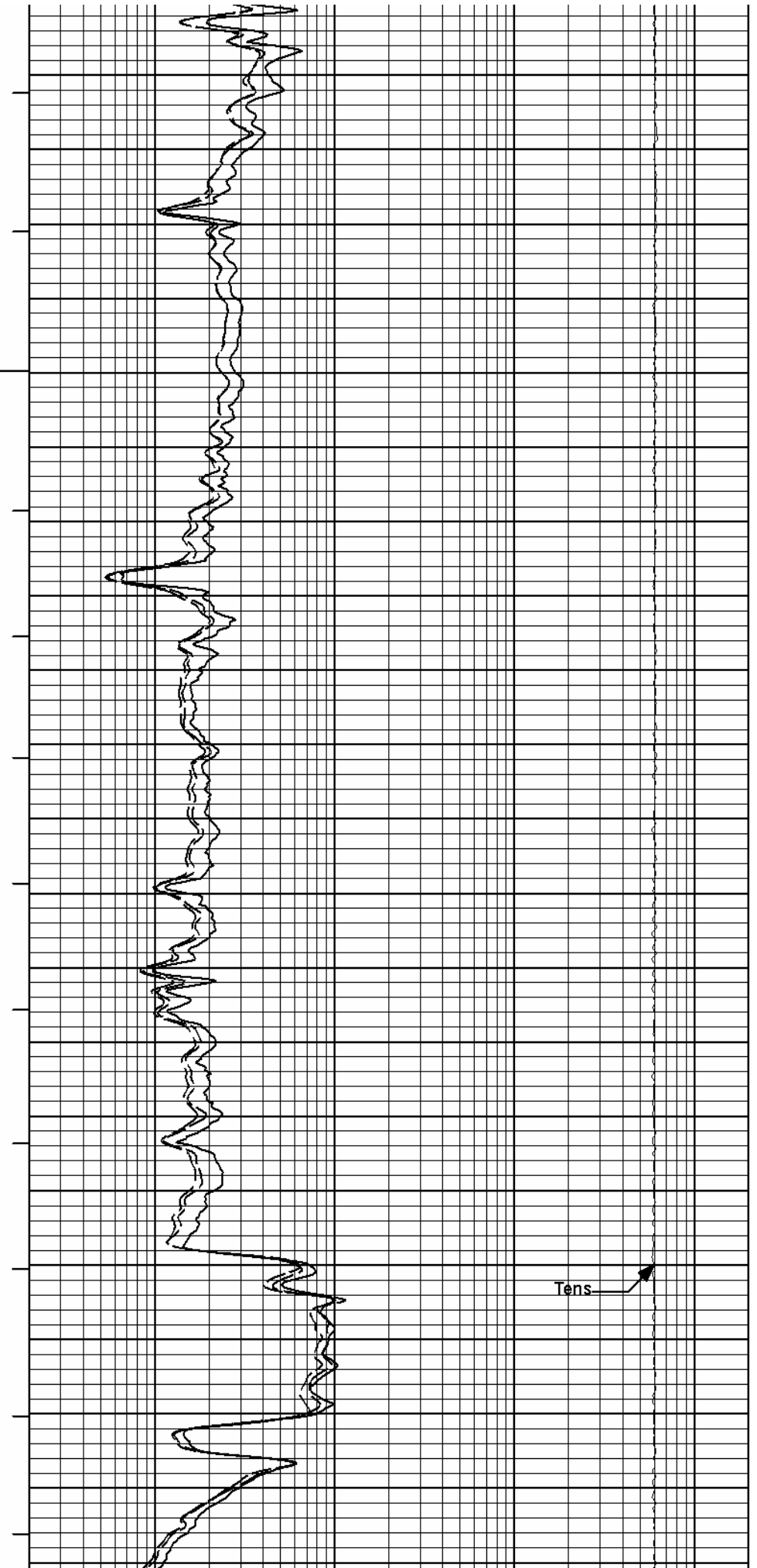


4900

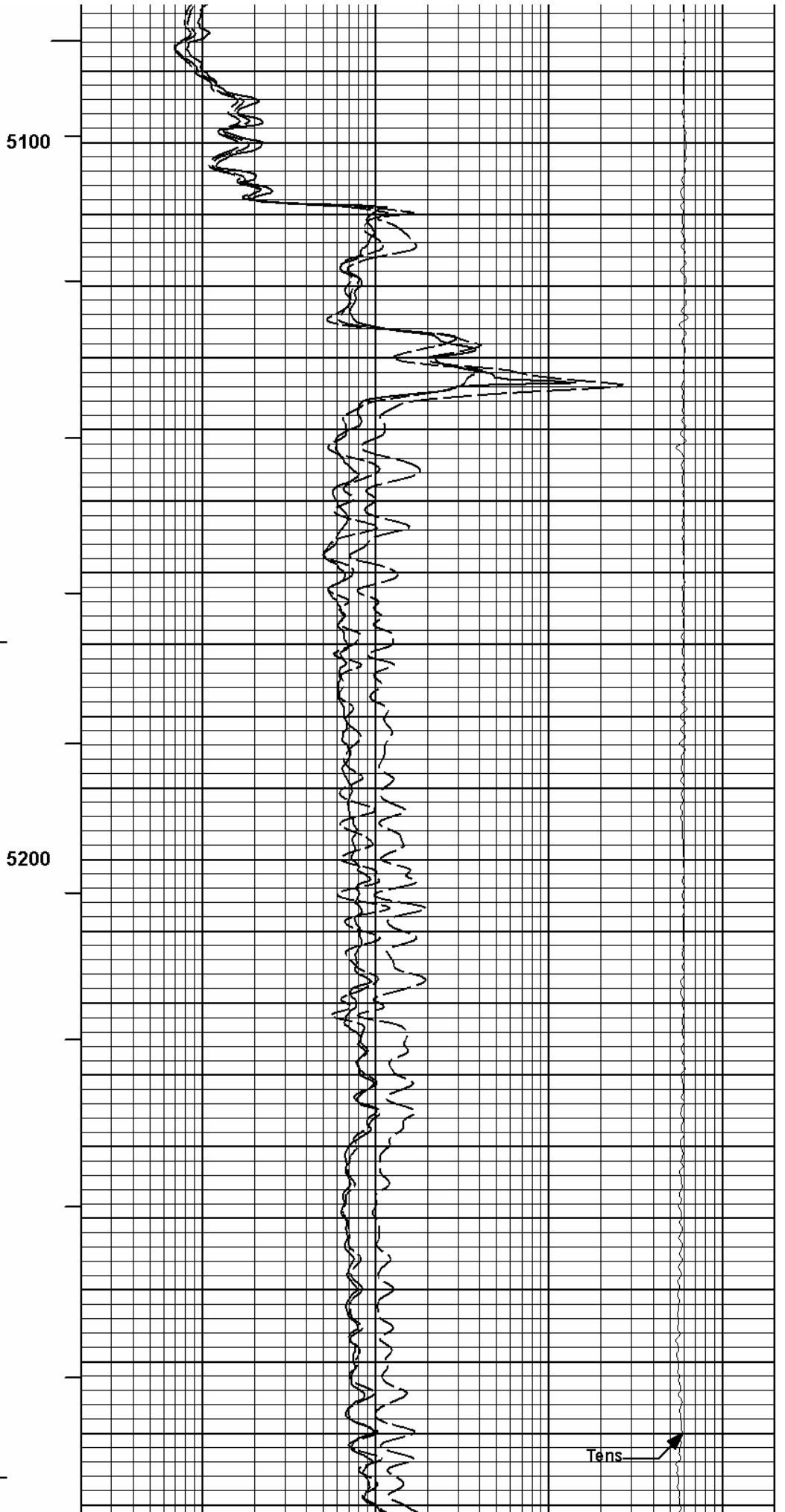
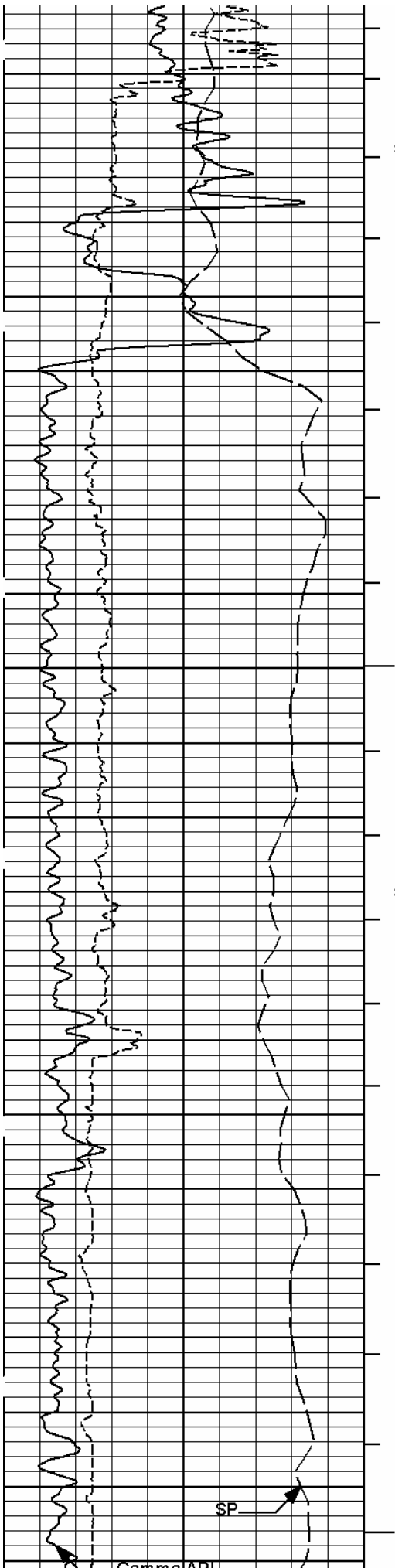
5000

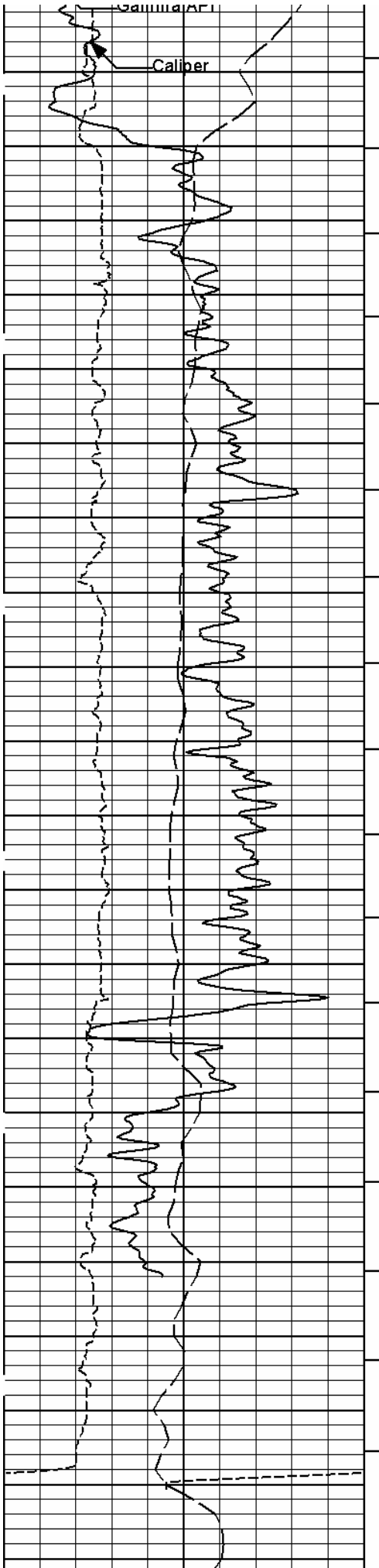
Gamma API

Caliper



Tens

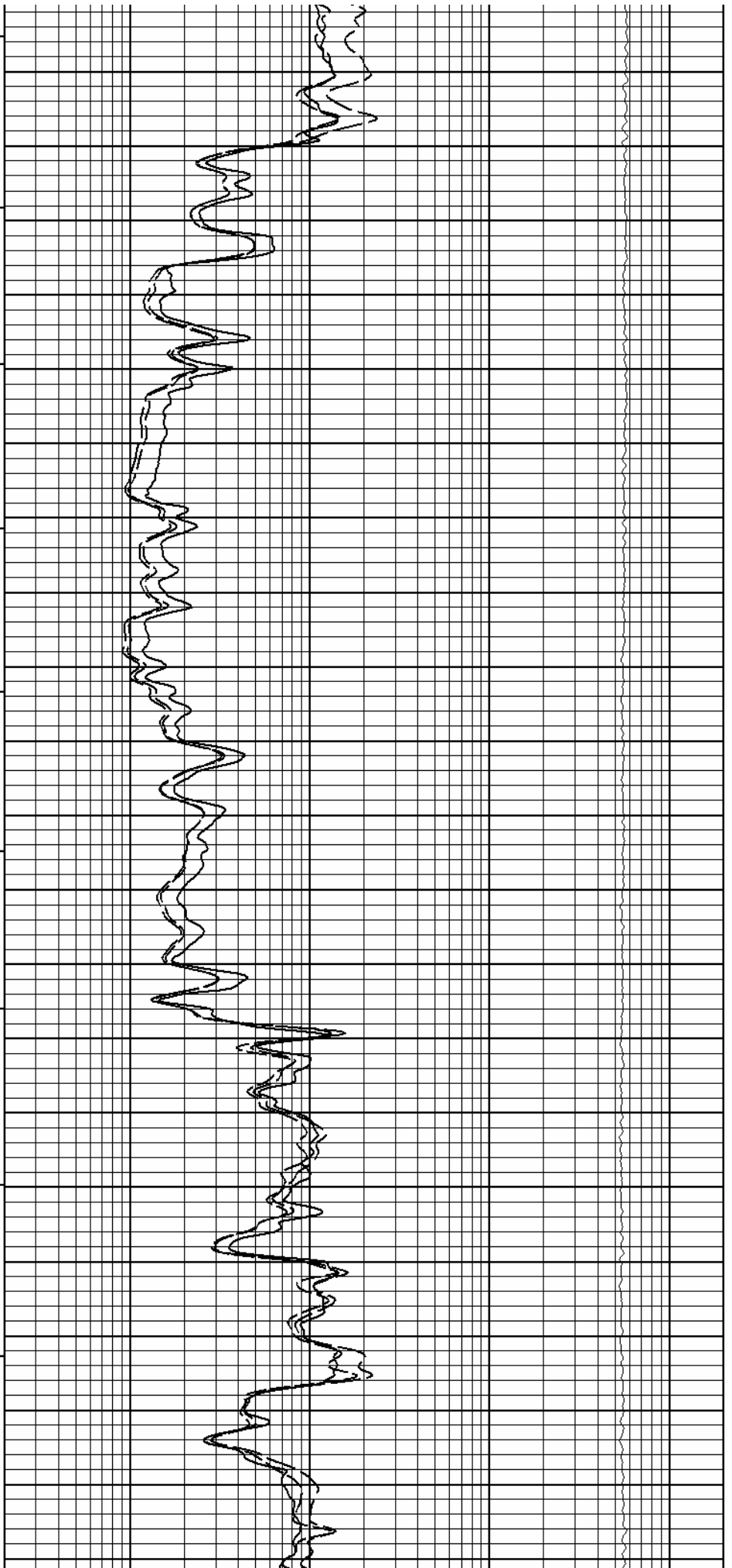


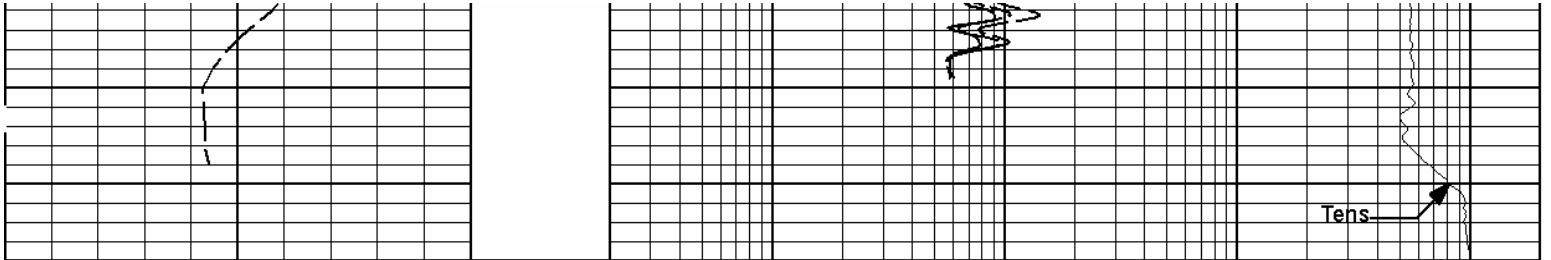


5300

5400

5500





0	SP	100	1 : 240	0.2	Dig Focused Laterolog	2K
	millivolts				ohm-metre	
0	Gamma API	150	BHV	0.2	Hri Medium Resistivity	2K
	api				ohm-metre	
10	Caliper	20	AHV	0.2	Hri Deep Resistivity	2K
	inches				ohm-metre	
					10K	Tens 0
						pounds

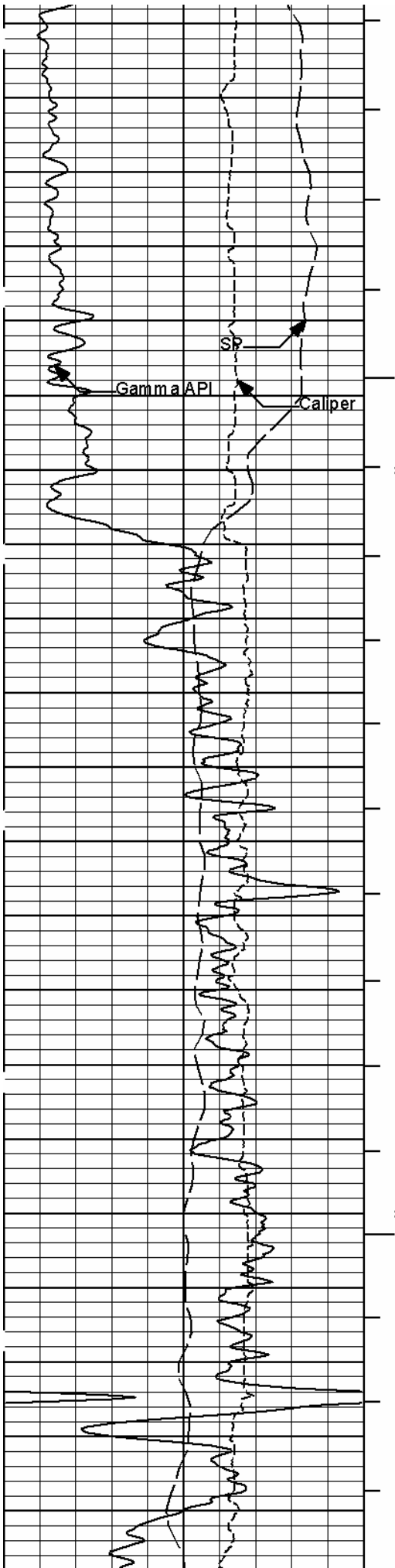
HALLIBURTON Plot Time: 04-Apr-07 23:55:51
Plot Range: 460 ft to 5528 ft
Data: {ActiveWell}-Well Based-DAQ Current-
Plot File: \\(not saved)\\5IN_HRI

MAIN PASS 5"=100'

HALLIBURTON Plot Time: 04-Apr-07 23:55:52
Plot Range: 5220 ft to 5526 ft
Data: {ActiveWell}-Well Based-DAQ-0001-003-
Plot File: \\(not saved)\\5IN_HRI_REPEAT

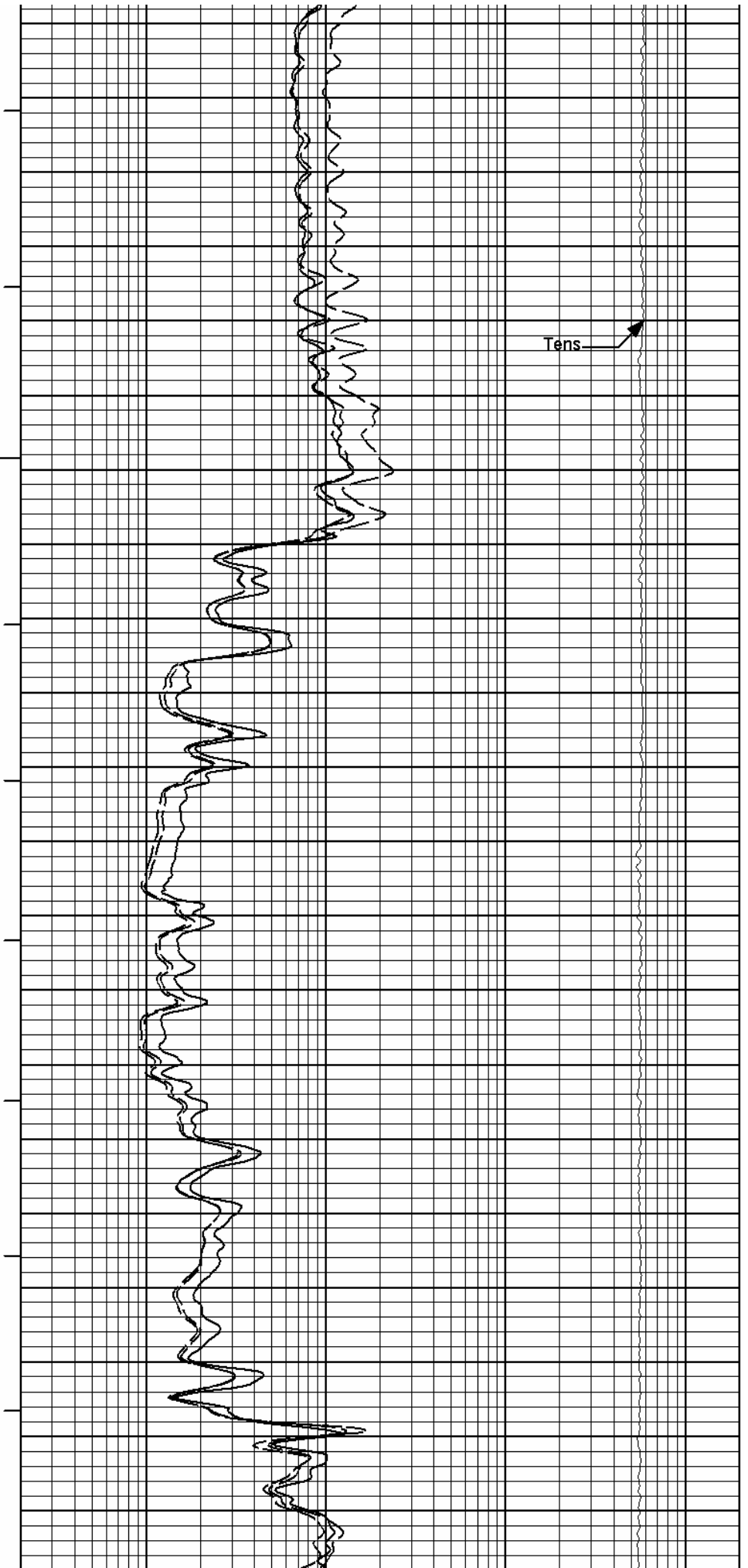
REPEAT PASS 5"=100'

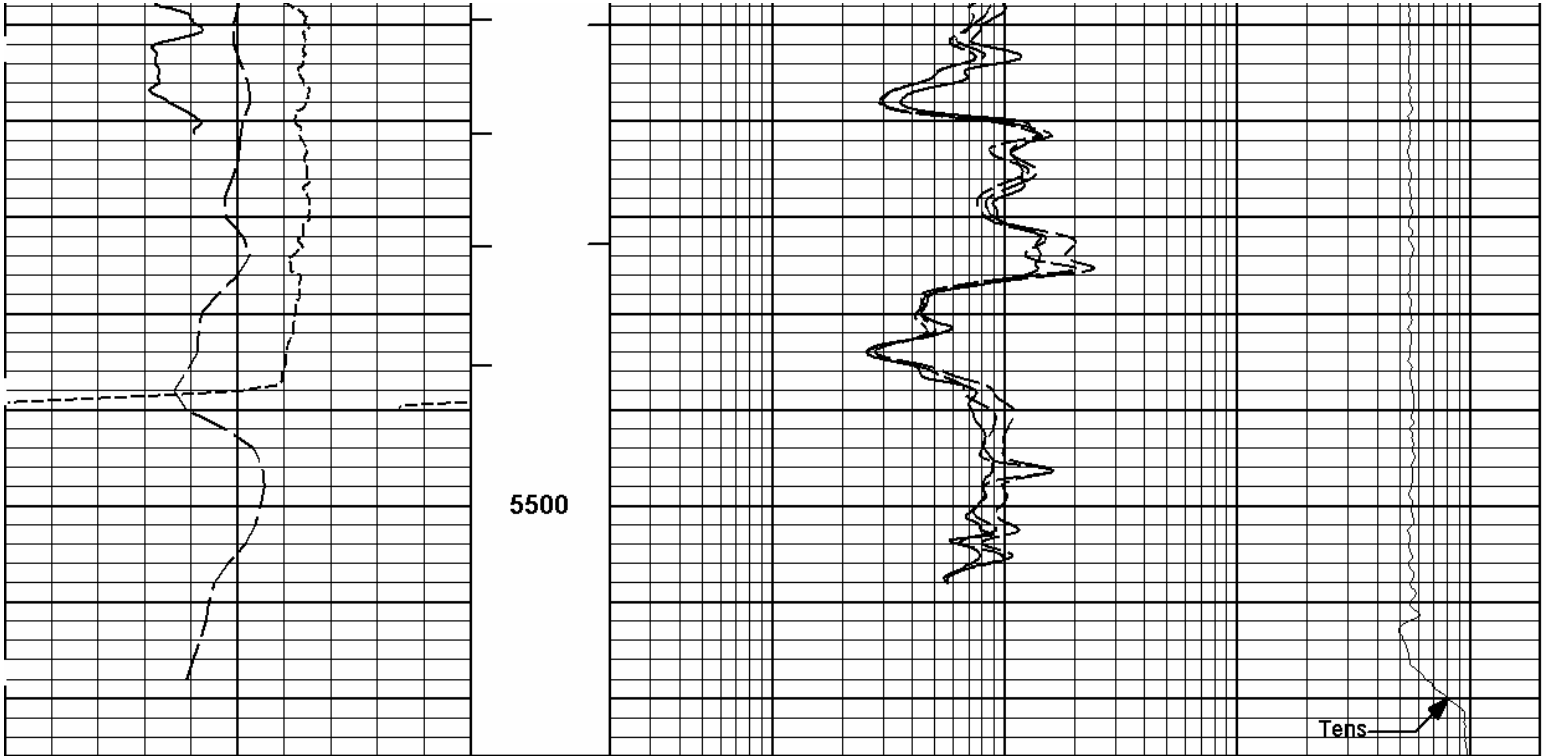
					10K	Tens 0
						pounds
6	Caliper	16	AHV	0.2	Hri Deep Resistivity	2K
	inches				ohm-metre	
0	Gamma API	150	BHV	0.2	Hri Medium Resistivity	2K
	api				ohm-metre	
0	SP	100	1 : 240	0.2	Dig Focused Laterolog	2K
	millivolts				ohm-metre	



5300

5400





0	SP	100	1 : 240	0.2	Dig Focused Laterolog	2K
	millivolts				ohm-metre	
0	Gamma API	150	BHV	0.2	Hri Medium Resistivity	2K
	api				ohm-metre	
6	Caliper	16	AHV	0.2	Hri Deep Resistivity	2K
	inches				ohm-metre	
					10K	Tens
						pounds
						0

HALLIBURTON

Plot Time: 04-Apr-07 23:55:53
Plot Range: 5220 ft to 5526 ft
Data: {ActiveWell}-Well Based-DAQ-0001-003-
Plot File: \\(not saved)\\5IN_HRI_REPEAT

REPEAT PASS 5"=100'

HALLIBURTON

CALIBRATION REPORT

NATURAL GAMMA RAY TOOL SHOP CALIBRATION

Previous Calibration Date: 04-Mar-07 14:39:45

Tool Name: NGRT - 108646

Calibration Date: 25-Mar-07 21:20:21

Calibrator Source S/N: 290
Calibrator API Reference:230.00 api

Measurement	Measured	Calibrated	Units
Background	68.4	63.5	api

Background + Calibrator		316.2	293.5	api
Calibrator		225.1	230.0	api
NATURAL GAMMA RAY TOOL FIELD CALIBRATION				
Reference Calibration Date: 25-Mar-07 21:20:21				
Tool Name: NGRT - 108646			Calibration Date: 04-Apr-07 17:37:28	
Calibrator Source S/N: 290				
Calibrator API Reference:230.00 api				
Field Verification		Shop	Field	Units
Background		63.5	39.8	api
Background + Calibrator		293.5	271.0	api
Calibrator		230.0	231.2	api
Shop		Field	Difference	Tolerance
230.0		231.2	-1.2	+/- 9.0
CALIPER SHOP CALIBRATION				
Previous Calibration Date: 23-Mar-07 09:59:16				
Tool Name: SDL_DC - A046			Calibration Date: 23-Mar-07 10:01:33	
MEASURED CALIPER RINGS				
Measurement	Current Reading (Previous Coeff.)		Calibrated (New Coeff.)	Change
RING DIAMETER:				
Ring #1 (in)	6.06		6.00	0.06
Ring #2 (in)	16.00		16.00	0.00
CALIPER FIELD CALIBRATION				
Reference Calibration Date: 23-Mar-07 10:01:33				
Tool Name: SDL_DC - A046			Calibration Date: 04-Apr-07 17:40:25	
MEASURED CALIPER RINGS				
Measurement	Shop	Field	Change	Control Limit On New Value
Ring #1 (in)	6.06	5.89	-0.17	+/- 0.50
PASS/FAIL SUMMARY				
Ring #1 Check:			Passed	
HIGH RESOLUTION INDUCTION SHOP CALIBRATION				
Previous Calibration Date: 20-Jul-06 09:41:22				
Tool Name: HRID-SP - AB287			Calibration Date: 28-Feb-07 09:28:07	
HIGH RESOLUTION INDUCTION SHOP CALIBRATION SUMMARY				
TEST LOOP RESPONSE				
1 - Test Loop Closed		Measured Signal		Nominal
		R	X	R
				X
HRD		1976	1972	1976
HRM		2838	2832	2838
2 - Test Loop Off(Sonde Error)		Measured Signal		Nominal
		R	X	R
				X
				Units
				MMHOS
				MMHOS

HRD	-5	9	+/- 15	+/- 100	MMHOS
HRM	-10	-15	+/- 15	+50/-150	MMHOS

ELECTRONICS RELATIVE GAIN

	Set		Nominal	
	Magnitude	Phase	Magnitude	Phase
HRD	1.03	-0.14	1. +/- .1	0. +/- 5
HRM	1.03	-0.04	1. +/- .1	0. +/- 5
Temperature at time of calibration:		49.5	degF	

NOTICE
 THE HIGH RESOLUTION INDUCTION TOOL (HRID) IS A CONTINUAL SELF-CALIBRATING TOOL. DURING LOGGING, THE TOOL CONSTANTLY SELF-UPDATES ITS COEFFICIENTS. THE SHOP CALIBRATION IS PERFORMED UNDER VERY STRINGENT CONDITIONS. SINCE THE TOOL IS SELF-CALIBRATING DURING LOGGING, FIELD AND POST CALIBRATIONS ARE NOT AVAILABLE OR NECESSARY FOR THE HRID TOOL.

Data: WINDY_7_17S_RN2\0001 TRIPLE\IDLE

Date: 04-Apr-07 23:54:37

HALLIBURTON

CUSTOMER EVENT LOG


Event Type	Time & Date	Depth (ft)	Event Description
	04-Apr-07 19:56:59	691.50	Logging 001 04-Apr-07 19:56 Up @691.5f
	04-Apr-07 20:05:15	409.08	Halting 001 04-Apr-07 19:56 Up @691.5f
	04-Apr-07 20:06:52	320.25	Logging 002 04-Apr-07 20:06 Dn @320.3f
	04-Apr-07 20:32:22	5491.75	Halting 002 04-Apr-07 20:06 Dn @320.3f
	04-Apr-07 20:33:48	5526.75	Logging 003 04-Apr-07 20:33 Up @5526.8f
	04-Apr-07 20:43:44	5216.83	Halting 003 04-Apr-07 20:33 Up @5526.8f
	04-Apr-07 20:47:16	5527.50	Logging 004 04-Apr-07 20:47 Up @5527.5f
	04-Apr-07 23:05:34	395.53	Halting 004 04-Apr-07 20:47 Up @5527.5f

Data: WINDY_7_17S_RN2\0001 TRIPLE\HWI0608

Date: 04-Apr-07 23:48:31

HALLIBURTON

TOOL STRING DIAGRAM REPORT

Description	OD/Sensors	Diagram	Sensors	Tool Length	Accumulated Length
RWCH-B097 135.00 lbs	O.D. = 3.63 in		Load Cell @ 80.08 ft	6.25 ft	83.76 ft
D4TS-11548 100.00 lbs	O.D. = 3.63 in		BH Temperature @ 79.51 ft	77.51 ft	77.51 ft
				6.50 ft	71.01 ft

NGRT-108646
176.00 lbs

O.D. = 3.63 in

8.00 ft

← GammaRay @ 64.34 ft

↕ 63.01 ft

DSN_II-108722
195.80 lbs

O.D. = 3.63 in

10.25 ft

← Neutron Porosity @ 54.66 ft

↕ 52.76 ft

SDLD-A046
420.00 lbs

O.D. = 4.50 in

19.43 ft

↙ SDL Caliper @ 35.83 ft

↙ SDL @ 35.37 ft

↕ 33.33 ft

