Weatherford®

COMPACT PHOTO DENSITY COMPENSATED NEUTRON MICRORESISTIVITY LOG

COMPANY	M&M EXPLORATION INC.
WELL	Z-BAR #26-11
FIELD	AETNA GAS AREA
PROVINCE/COUNTY	BARBER
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	2200' FSL & 2200' FWL SW/4

SEC	TWP	RGE	Other Services
26	33S	15W	MAI/MFE

API Number 15-007-23912
Permit Number

Permanent Datum G.L., Elevation 1786 feet
Log Measured From KB
Drilling Measured From K.B. @ 12 FEET

Elevations:	feet
KB	1798.00
DF	1796.00
GL	1786.00

Date	05-AUG-2012			
Run Number	ONE			
Depth Driller	5150.00	feet		
Depth Logger	5150.00	feet		
First Reading	5131.00	feet		
Last Reading	4000.00	feet		
Casing Driller	300.00	feet		
Casing Logger	295.00	feet		
Bit Size	7.875	inches		
Hole Fluid Type	CHEMICAL			
Density / Viscosity	1.12 g/c3	43.00 CP		
PH / Fluid Loss	10.00	12.00 ml/30Min		
Sample Source	FLOWLINE			
Rm @ Measured Temp	0.95 @ 89.0	ohm-m		
Rmf @ Measured Temp	0.76 @ 89.0	ohm-m		
Rmc @ Measured Temp	1.14 @ 89.0	ohm-m		
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	0.67 @126.0	ohm-m		
Time Since Circulation	4 HOURS			
Max Recorded Temp	126.00	deg F		
Equipment Name	COMPACT			
Equipment / Base	13057	LIB		
Recorded By	R.HOFFMAN			
Witnessed By	BETH BROCK			
S.O. # / JOB #	3534568		LB12-202	

BOREHOLE RECORD

Last Edited: 05-AUG-2012 05:46

Bit Size inches	Depth From feet	Depth To feet
7.875	295.00	5150.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	13.375	0.00	295.00	48.00

REMARKS

Tools Ran: MCG, MML, MDN, MPD, MFE, MAI.
Hardware Used: MDN Dual Eccentralizer used. MPD 8 inch profile plate used. MFE and MAI 0.5 inch standoffs used.
2.71 g/cc Limestone Density Matrix used to calculate porosity.
All intervals logged and scaled per customer's request.
Tight pulls, washouts and borehole rugosity will affect data quality.
Total hole volume from TD to Surface casing = 2411 cu. ft.
Annular volume with 4.5 inch production casing TD to 4000ft = 328 cu. ft.
Service order: #3534568
Rig: Southwind Drilling Rig #70
Engineer: R. Hoffman
Operator(s): B. Reeves

5 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 05-AUG-2012 06:59
Filename: C:\Minimus 13.02.6600\Data\M&M Z-Bar #26-11\M&M Z-Bar #26-11 Main spooled section.dta
Recorded on 05-AUG-2012 05:38
System Versions: Logged with 13.02.6600 Plotted with 13.02.6600

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Density Caliper
inches
6 11 16

Bit Size
inches
6 11 16

DST Uphole Tension
pounds
5000 0

Depth in Feet

Borehole Temp in deg F

HVI every 10 cu ft

Annular Integral every 10 cu ft

Replay Scale 1:240

Limestone Neutron Por.
percent
30 20 10 0 -10

Limestone Density Por.
percent
30 20 10 0 -10

PE
barns/electron
0 5 10

Density Correction
grams/cc
-0.25 0 0.25

Micro-normal
ohm metres
0 20

Micro-inverse
ohm metres
0 20

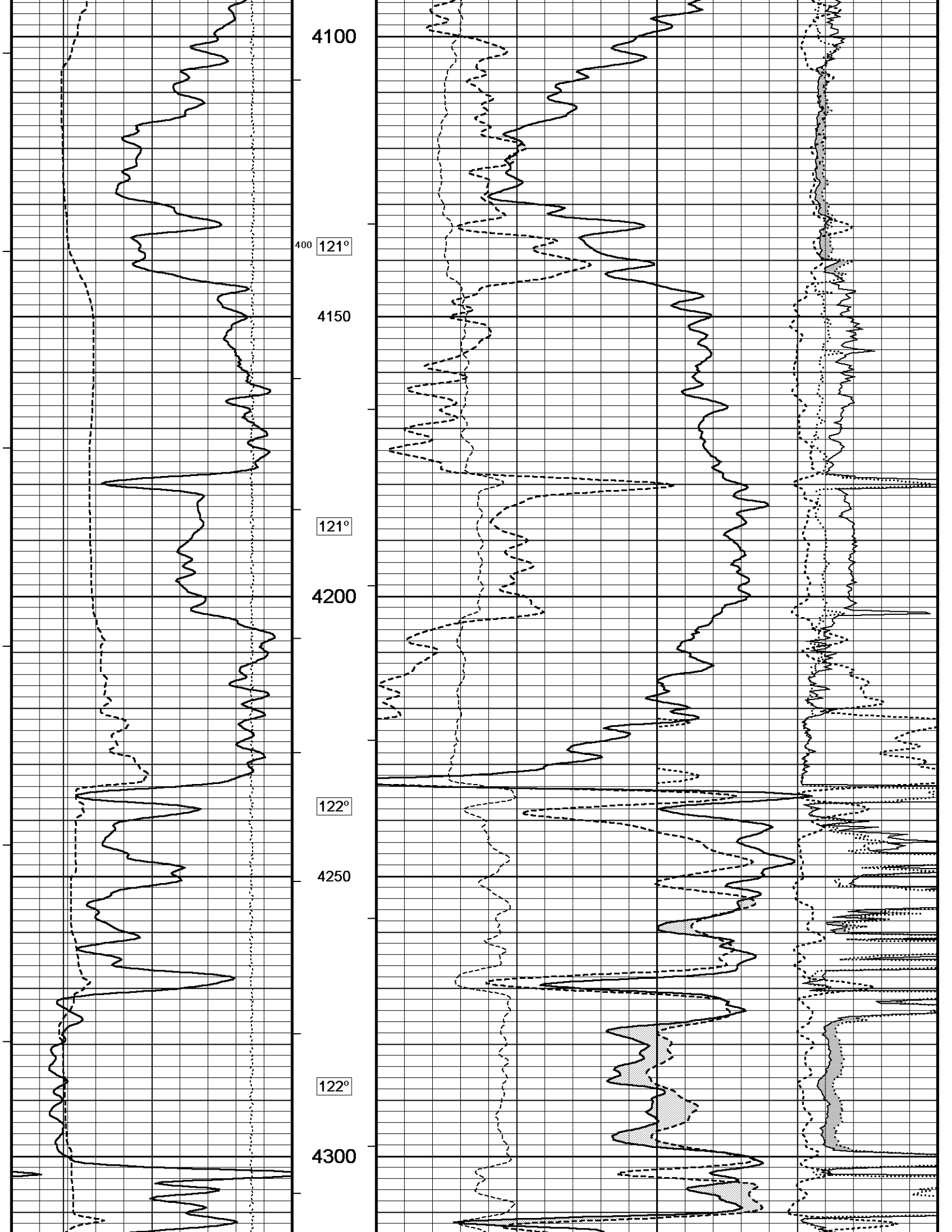
4000

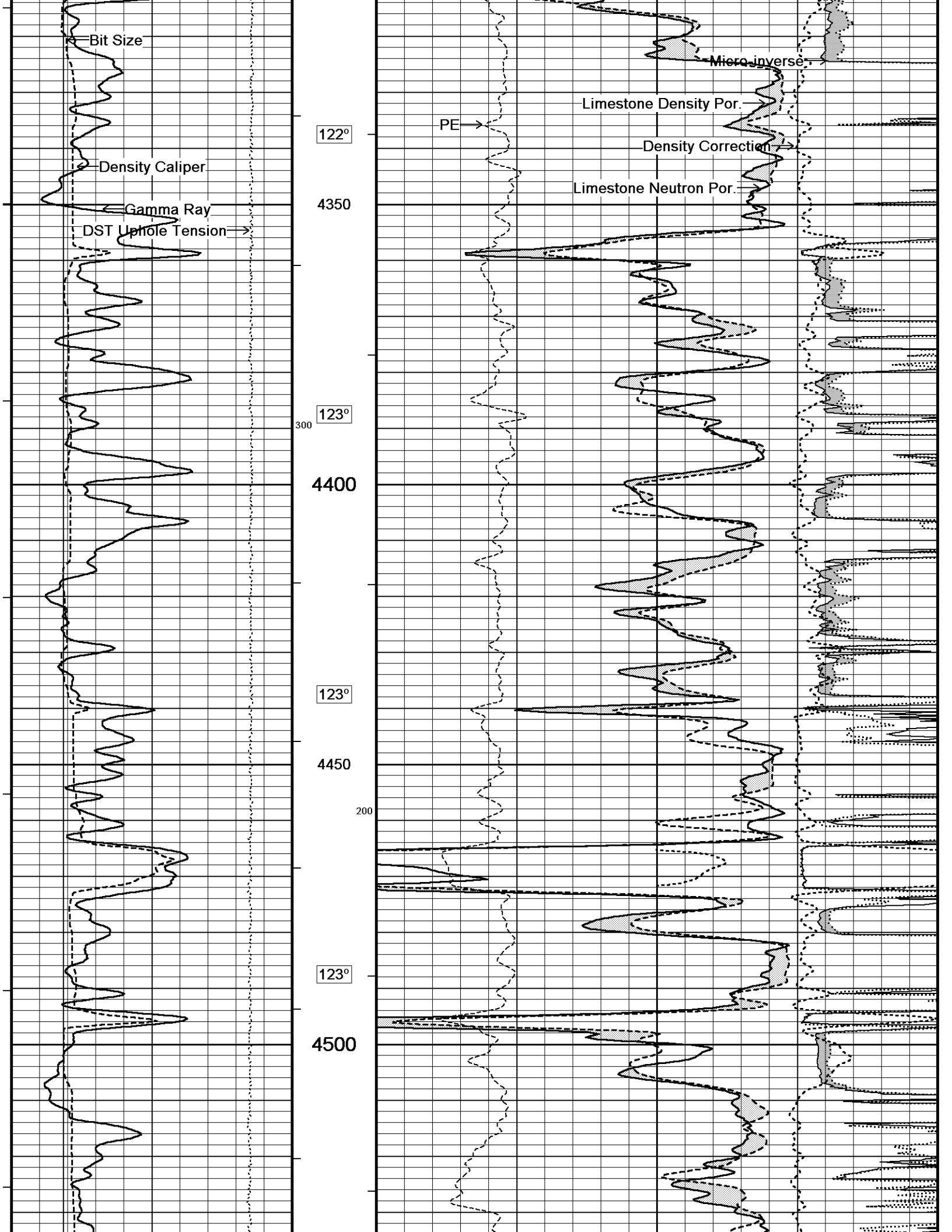
120°

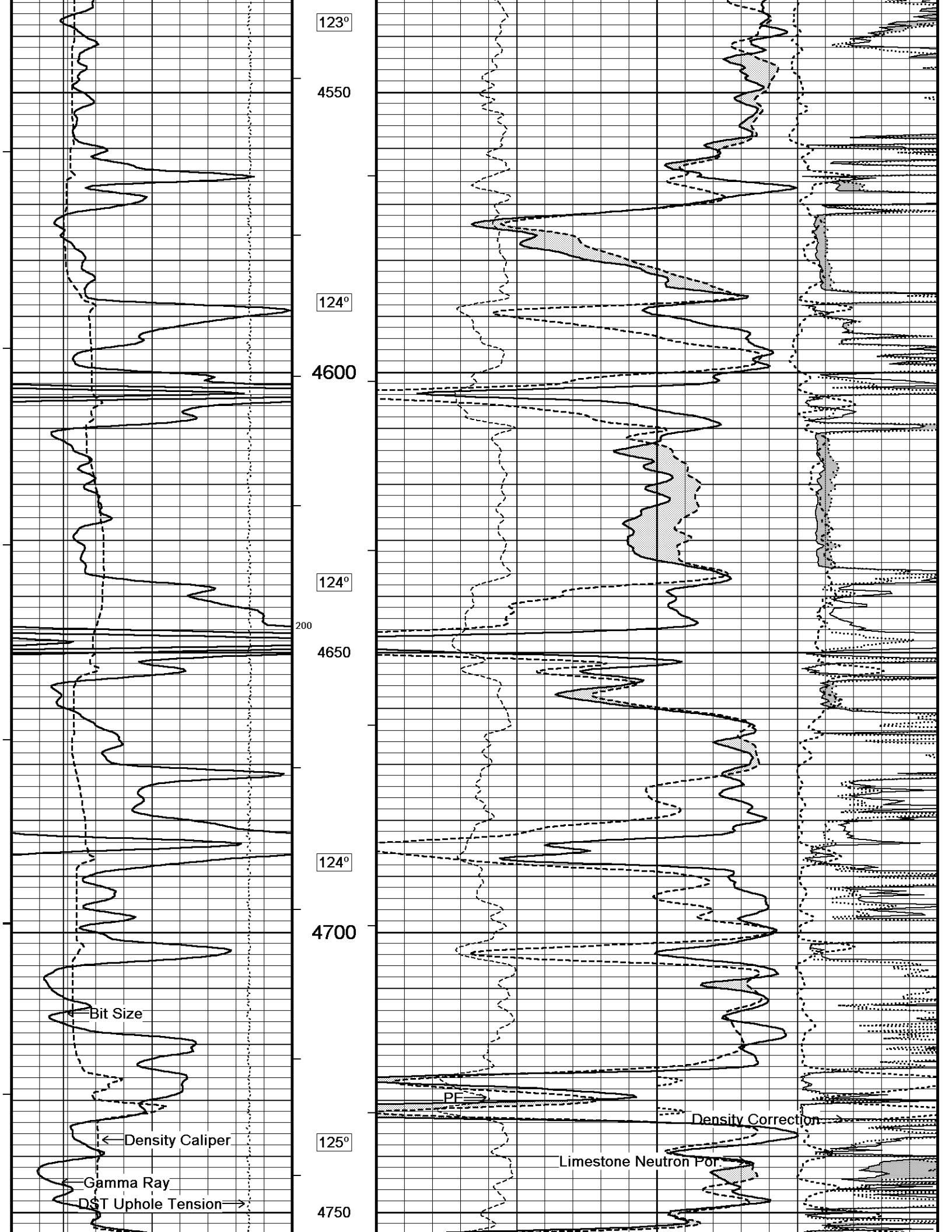
4050

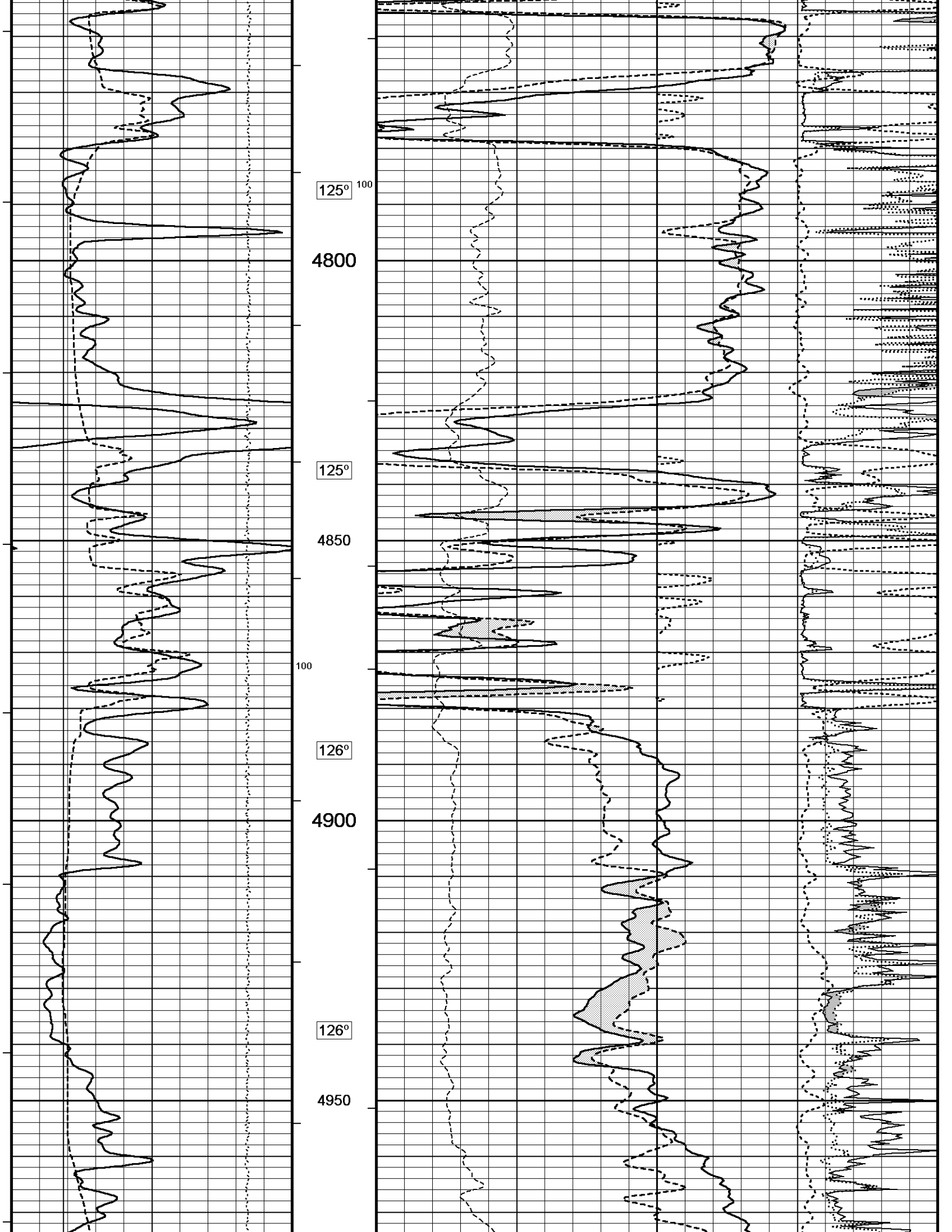
121°

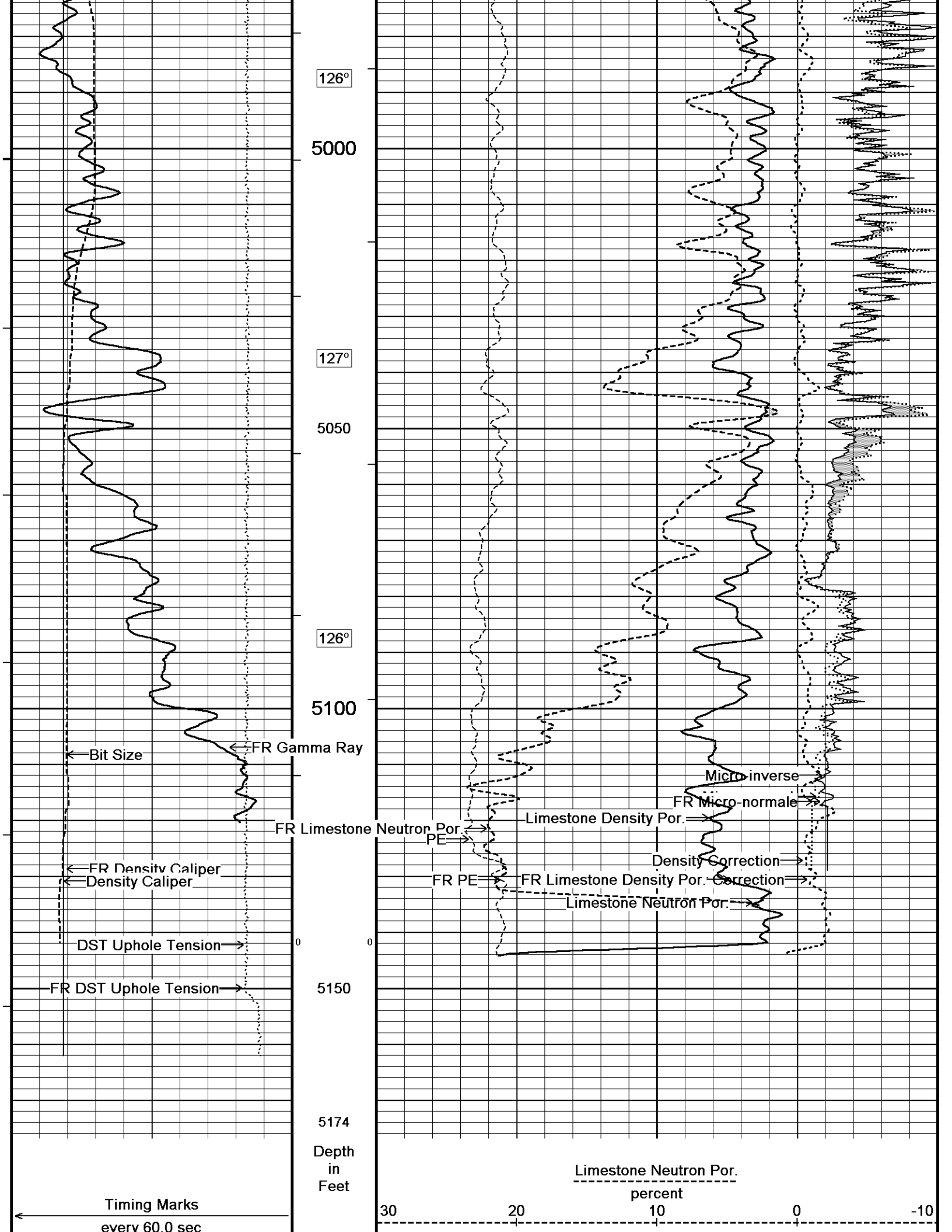
300

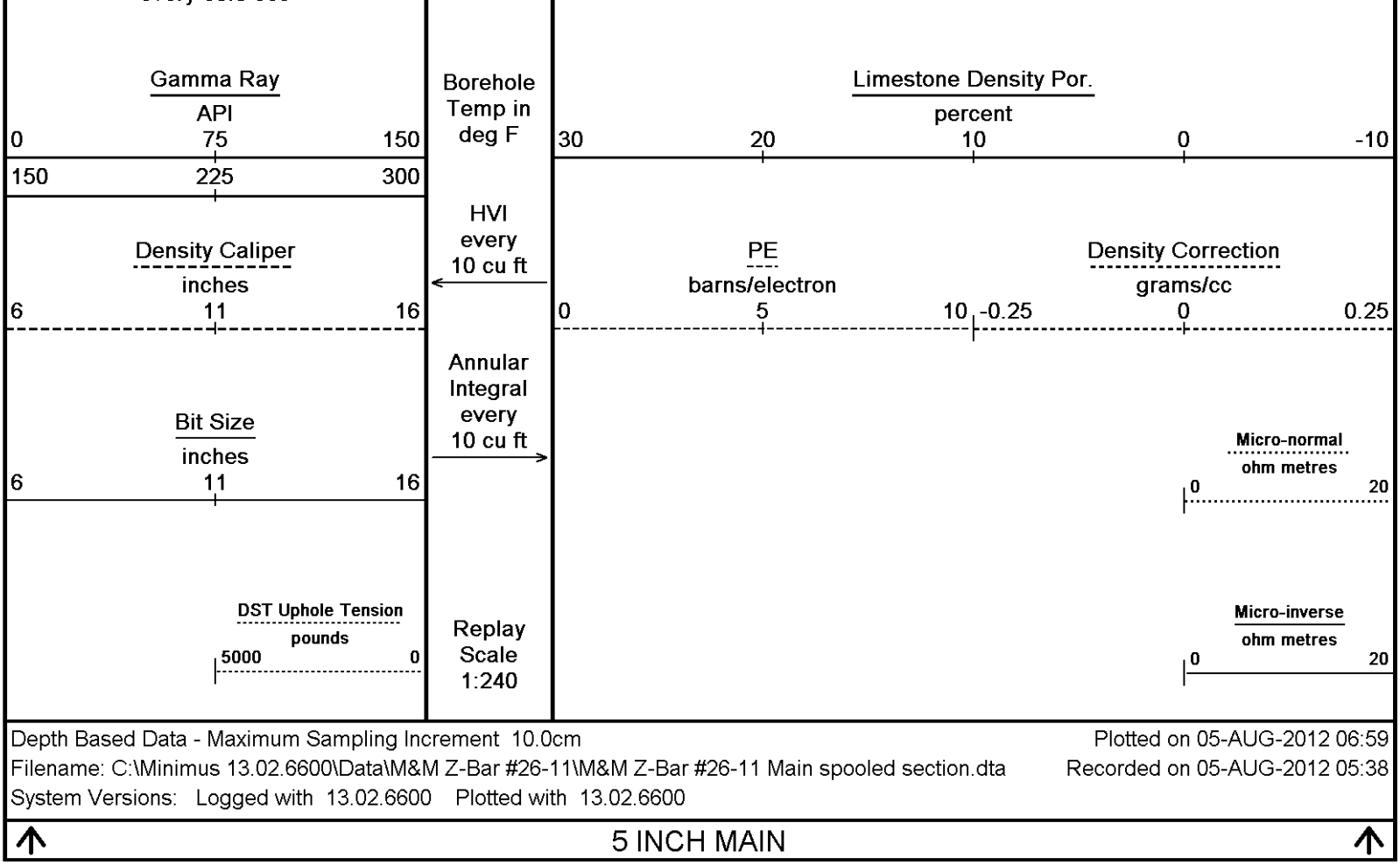

4100
400
121°
4150
121°
4200
122°
4250
122°
4300

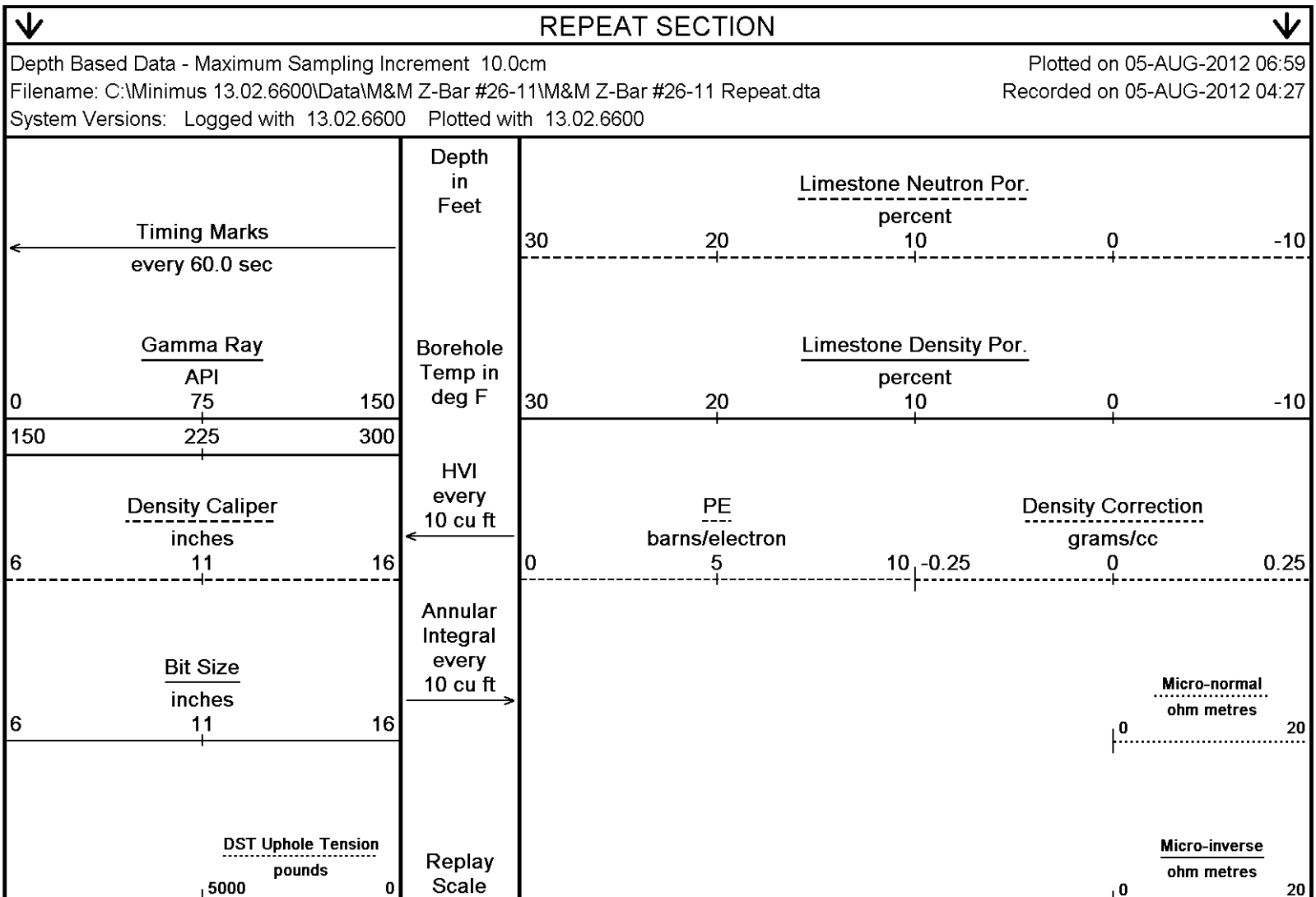

Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
122°
4350
123°
300
4400
123°
4450
200
123°
4500
PE
Micro-inverse
Limestone Density Por.
Density Correction
Limestone Neutron Por.

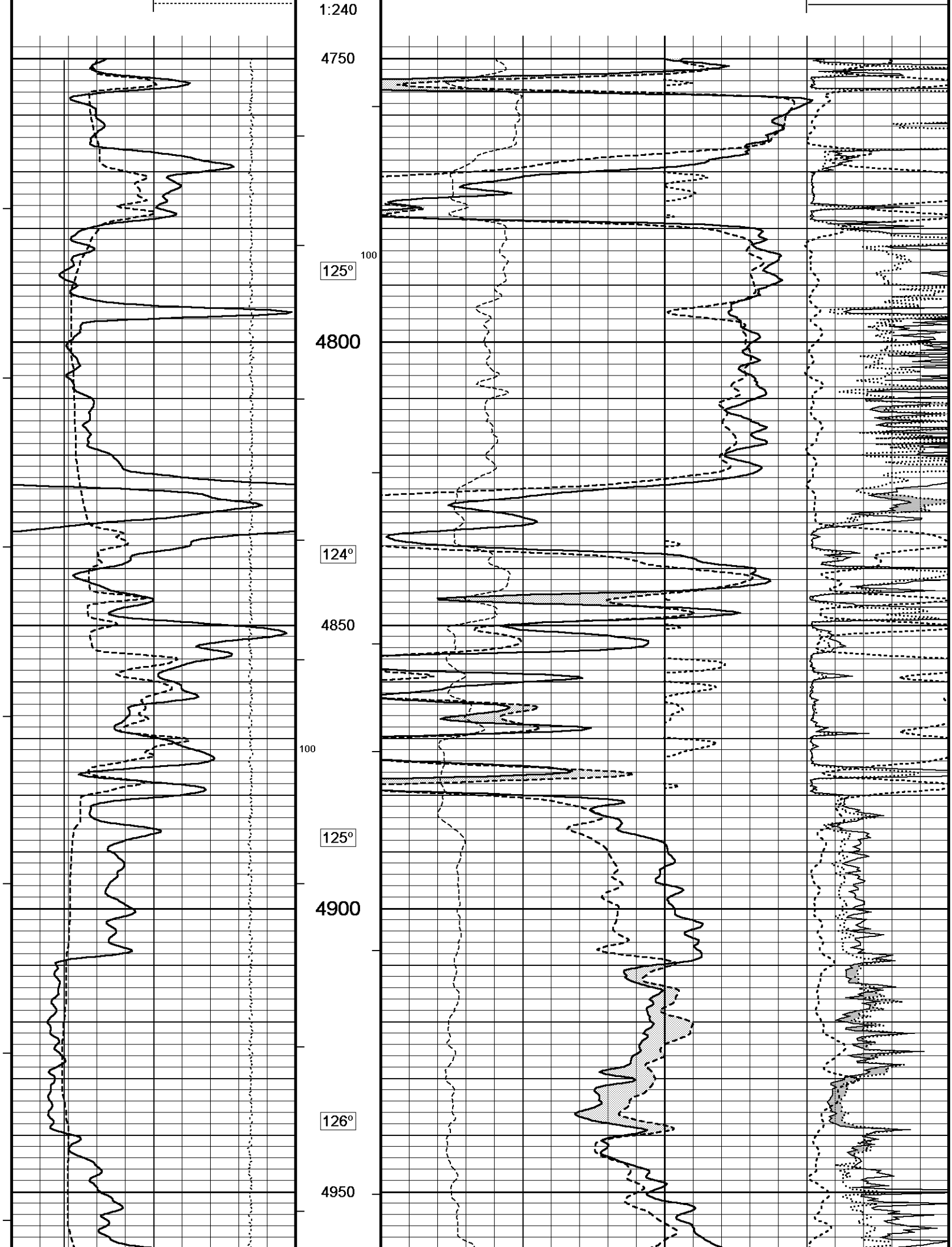

123°
4550
124°
4600
124°
200
4650
124°
4700
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
125°
4750
PE
Density Correction
Limestone Neutron Por.

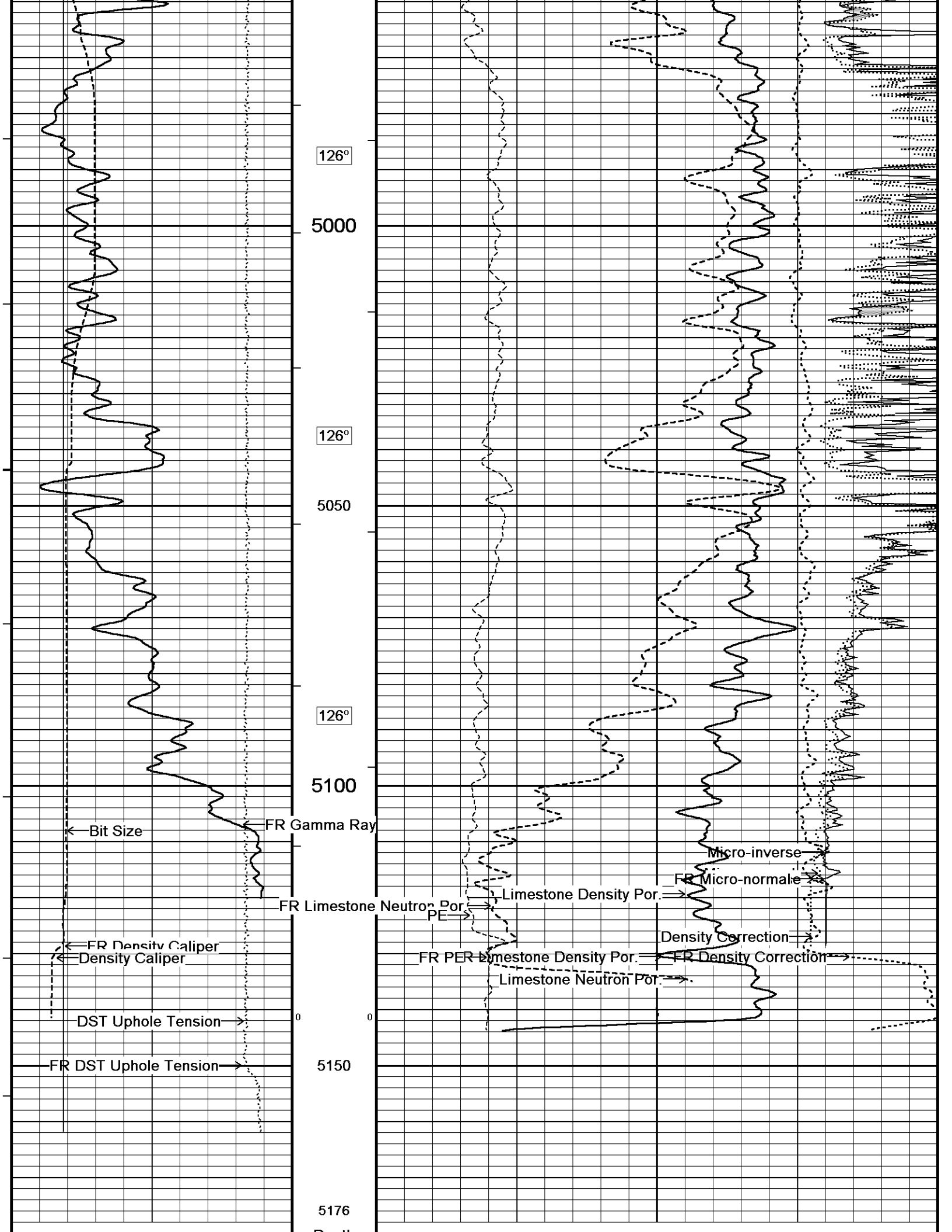

125°
100
4800
125°
4850
100
126°
4900
126°
4950

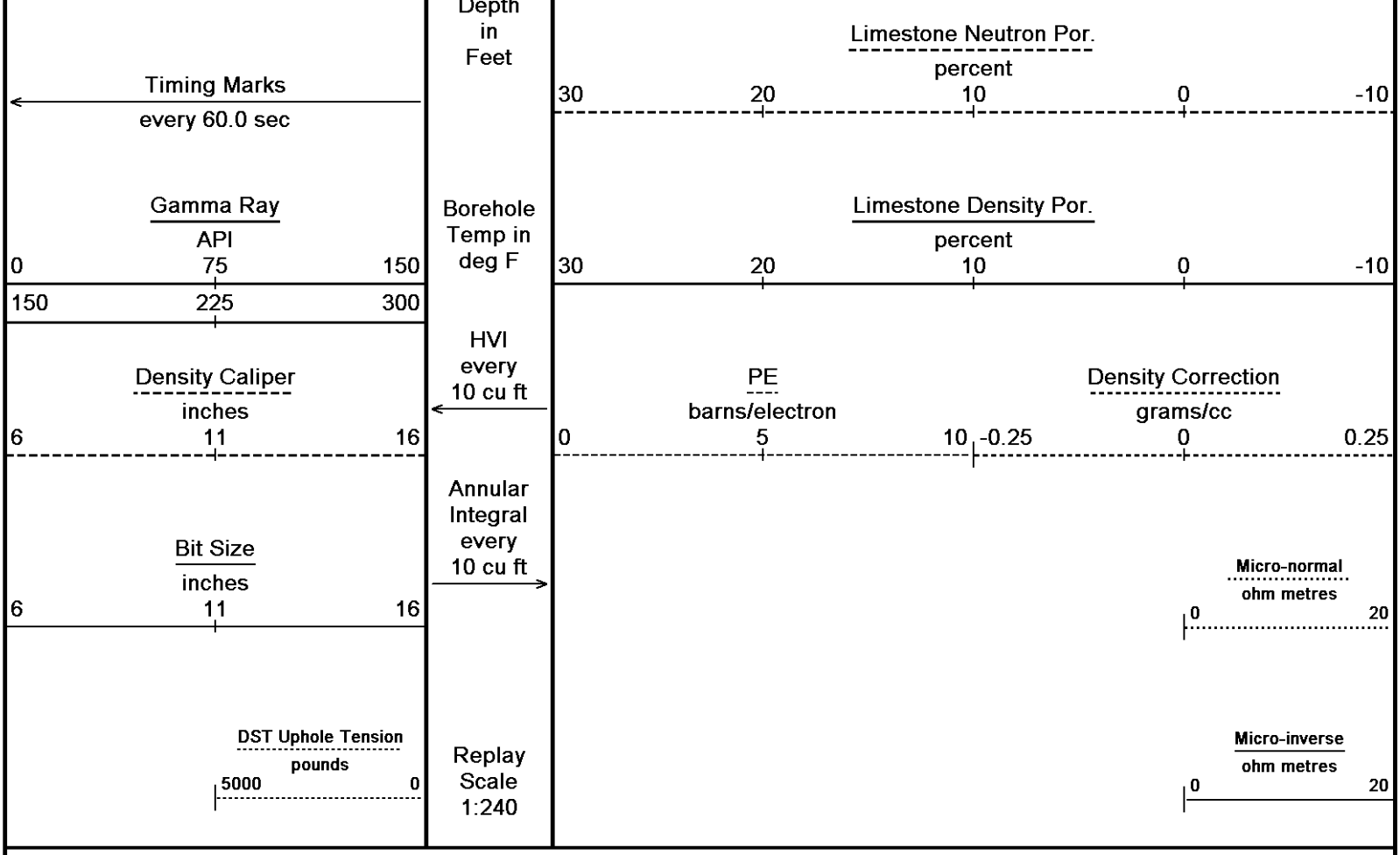

126°
5000
127°
5050
126°
5100
Bit Size
FR Gamma Ray
FR Density Caliper
Density Caliper
DST Uphole Tension
FR DST Uphole Tension
0
0
5150
5174
Depth
in
Feet
Timing Marks
every 60.0 sec
FR Limestone Neutron Por.
PE
FR PE
Micro-inverse
FR Micro-normale
Limestone Density Por.
Density Correction
FR Limestone Density Por. Correction
Limestone Neutron Por.
Limestone Neutron Por.
percent
30
20
10
0
-10


Gamma Ray
API
0
75
150
150
225
300
Density Caliper
inches
6
11
16
Bit Size
inches
6
11
16
DST Uphole Tension
pounds
5000
0
Borehole Temp in deg F
HVI every 10 cu ft
Annular Integral every 10 cu ft
Replay Scale 1:240
Limestone Density Por.
percent
30
20
10
0
-10
PE
barns/electron
0
5
10
Density Correction
grams/cc
-0.25
0
0.25
Micro-normal
ohm metres
0
20
Micro-inverse
ohm metres
0
20
Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 05-AUG-2012 06:59
Filename: C:\Minimus 13.02.6600\Data\M&M Z-Bar #26-11\M&M Z-Bar #26-11 Main spooled section.dta
Recorded on 05-AUG-2012 05:38
System Versions: Logged with 13.02.6600 Plotted with 13.02.6600
5 INCH MAIN


REPEAT SECTION
Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 05-AUG-2012 06:59
Filename: C:\Minimus 13.02.6600\Data\M&M Z-Bar #26-11\M&M Z-Bar #26-11 Repeat.dta
Recorded on 05-AUG-2012 04:27
System Versions: Logged with 13.02.6600 Plotted with 13.02.6600
Timing Marks
every 60.0 sec
Depth in Feet
Limestone Neutron Por.
percent
30
20
10
0
-10
Gamma Ray
API
0
75
150
150
225
300
Density Caliper
inches
6
11
16
Bit Size
inches
6
11
16
DST Uphole Tension
pounds
5000
0
Borehole Temp in deg F
HVI every 10 cu ft
Annular Integral every 10 cu ft
Replay Scale
Limestone Density Por.
percent
30
20
10
0
-10
PE
barns/electron
0
5
10
Density Correction
grams/cc
-0.25
0
0.25
Micro-normal
ohm metres
0
20
Micro-inverse
ohm metres
0
20


1:240
4750
100
125°
4800
124°
4850
100
125°
4900
126°
4950


126°
5000
126°
5050
126°
5100
Bit Size
FR Gamma Ray
FR Limestone Neutron Por.
PE
FR Density Caliper
Density Caliper
DST Uphole Tension
FR DST Uphole Tension
0
0
5150
5176
Micro-inverse
FR Micro-normale
Limestone Density Por.
Density Correction
FR PER Limestone Density Por.
FR Density Correction
Limestone Neutron Por.



Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 05-AUG-2012 06:59
Filename: C:\Minimus 13.02.6600\Data\M&M Z-Bar #26-11\M&M Z-Bar #26-11 Repeat.dta — Recorded on 05-AUG-2012 04:27
System Versions: Logged with 13.02.6600 Plotted with 13.02.6600

REPEAT SECTION

5 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 05-AUG-2012 06:59
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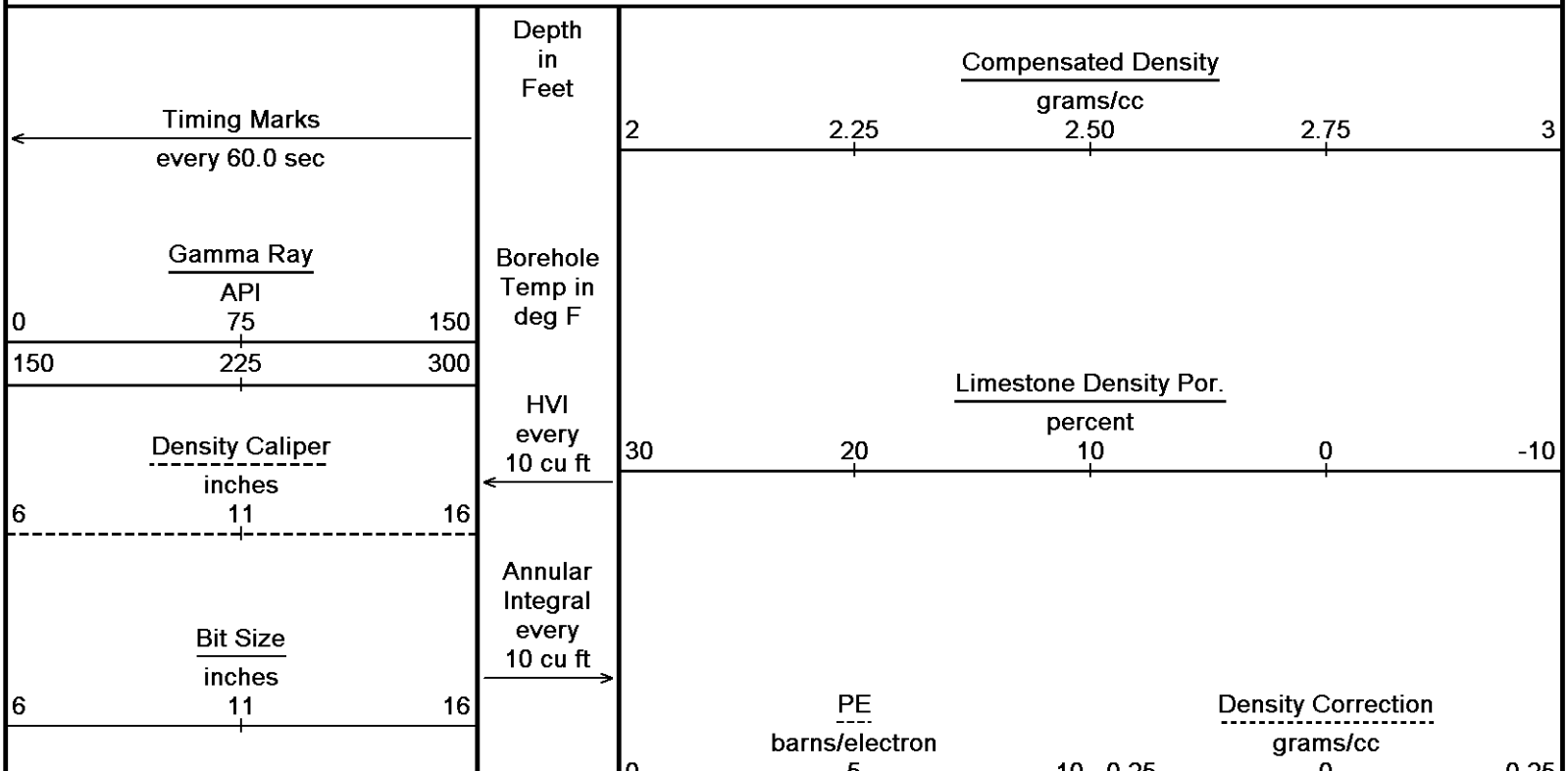
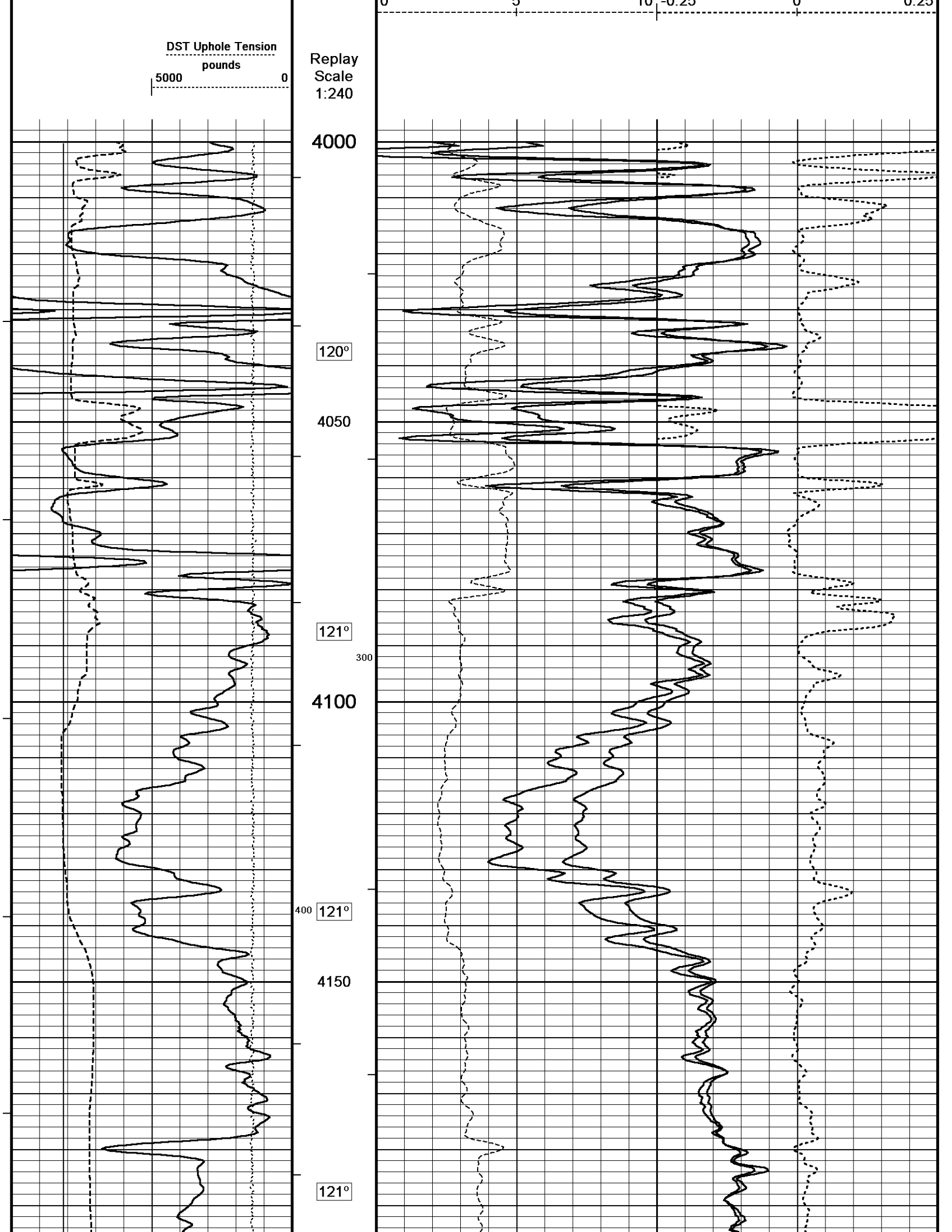
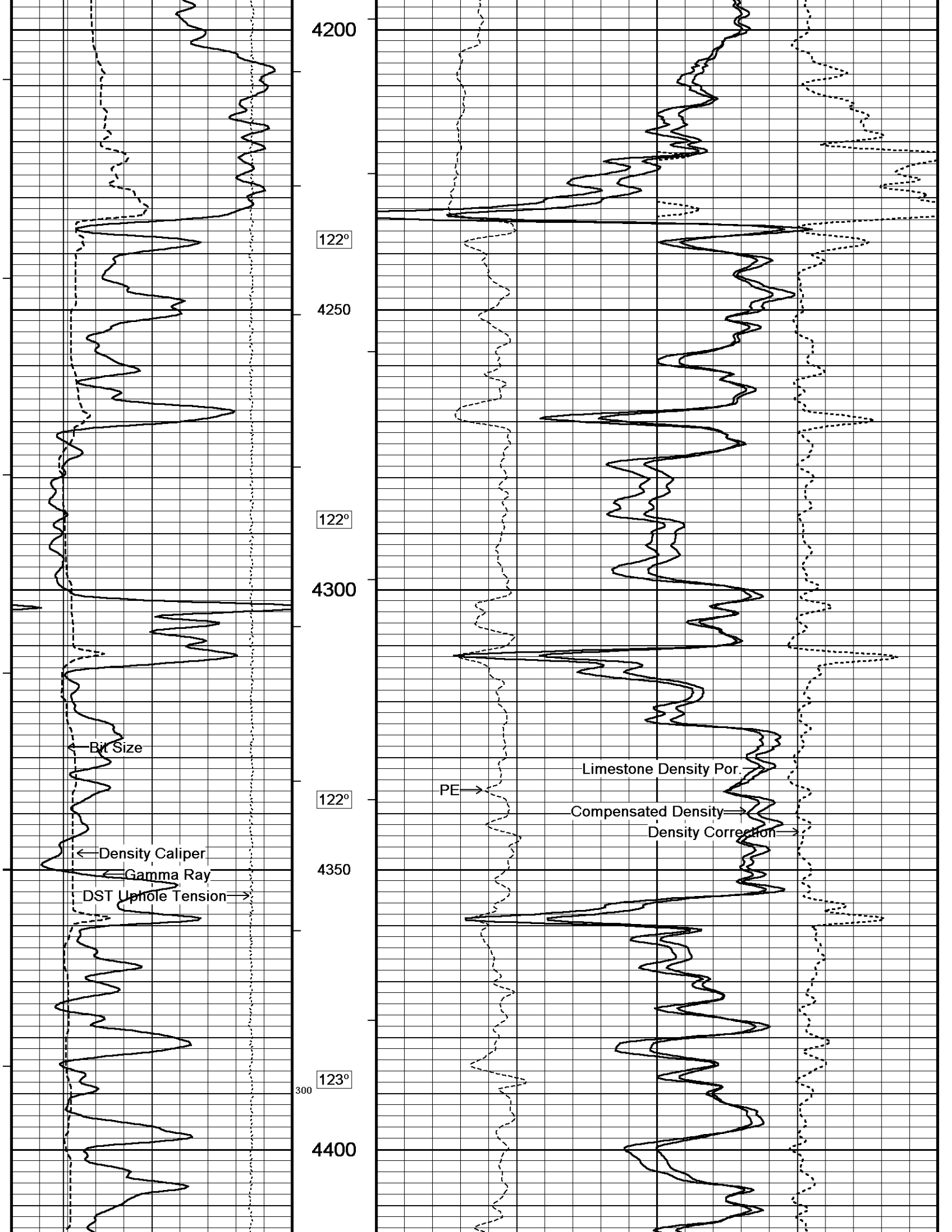
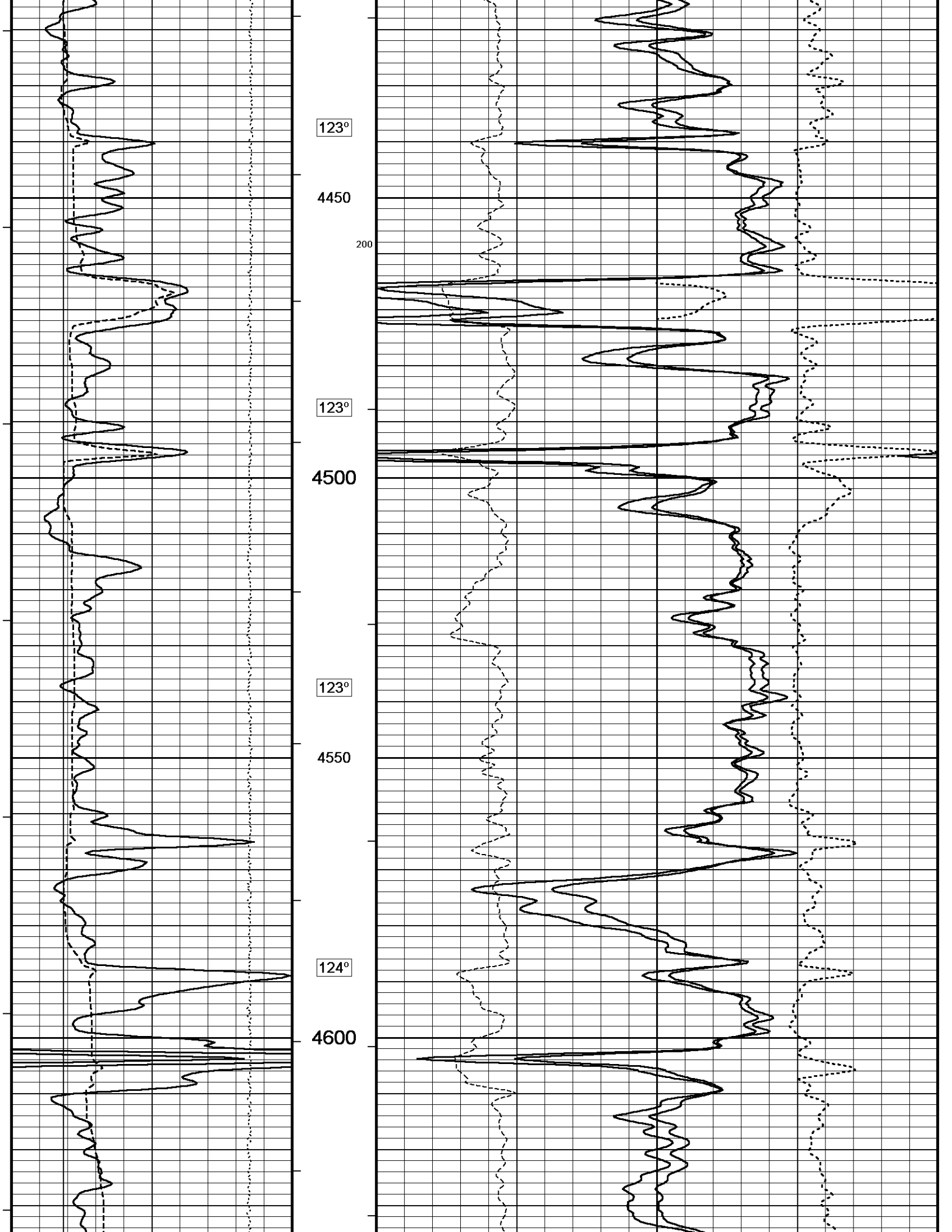
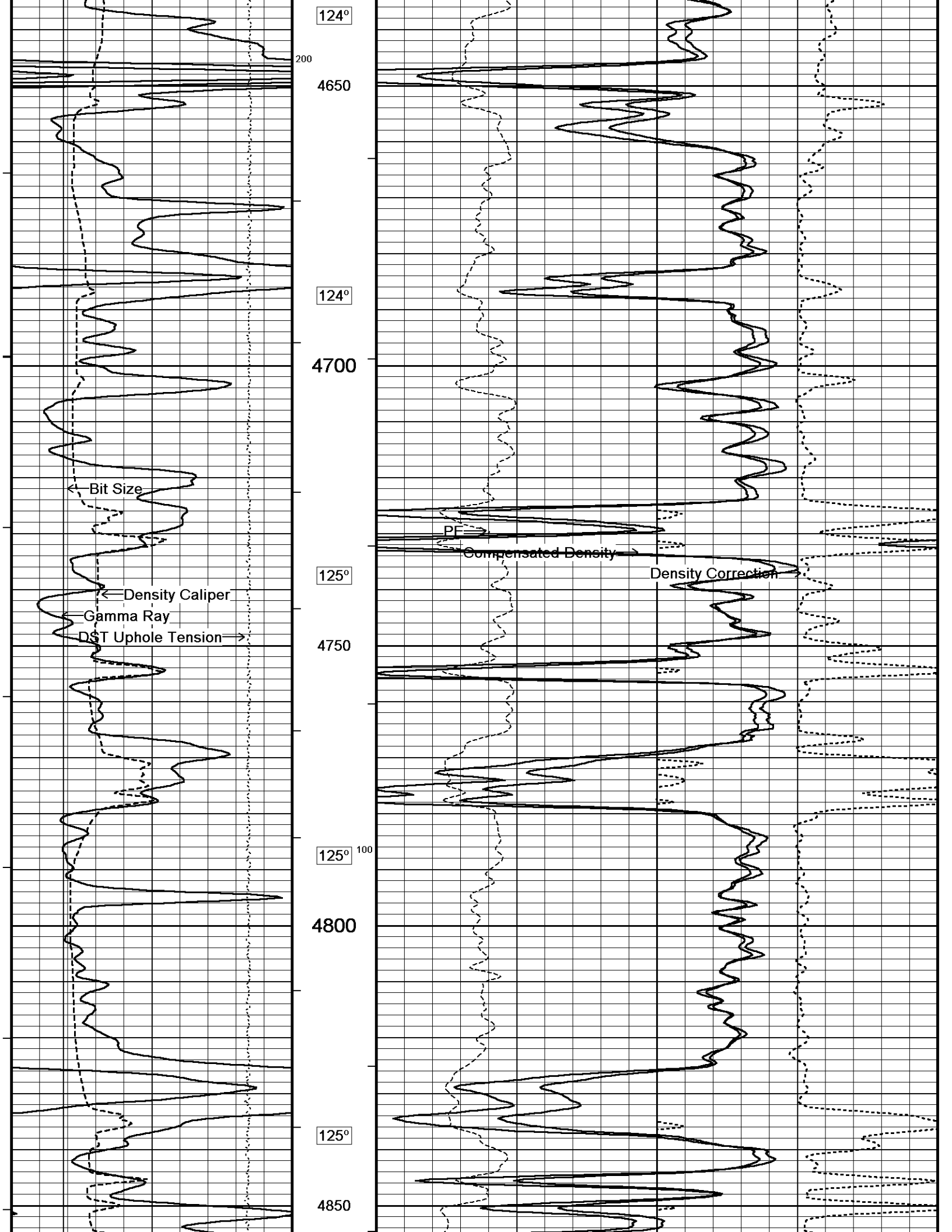
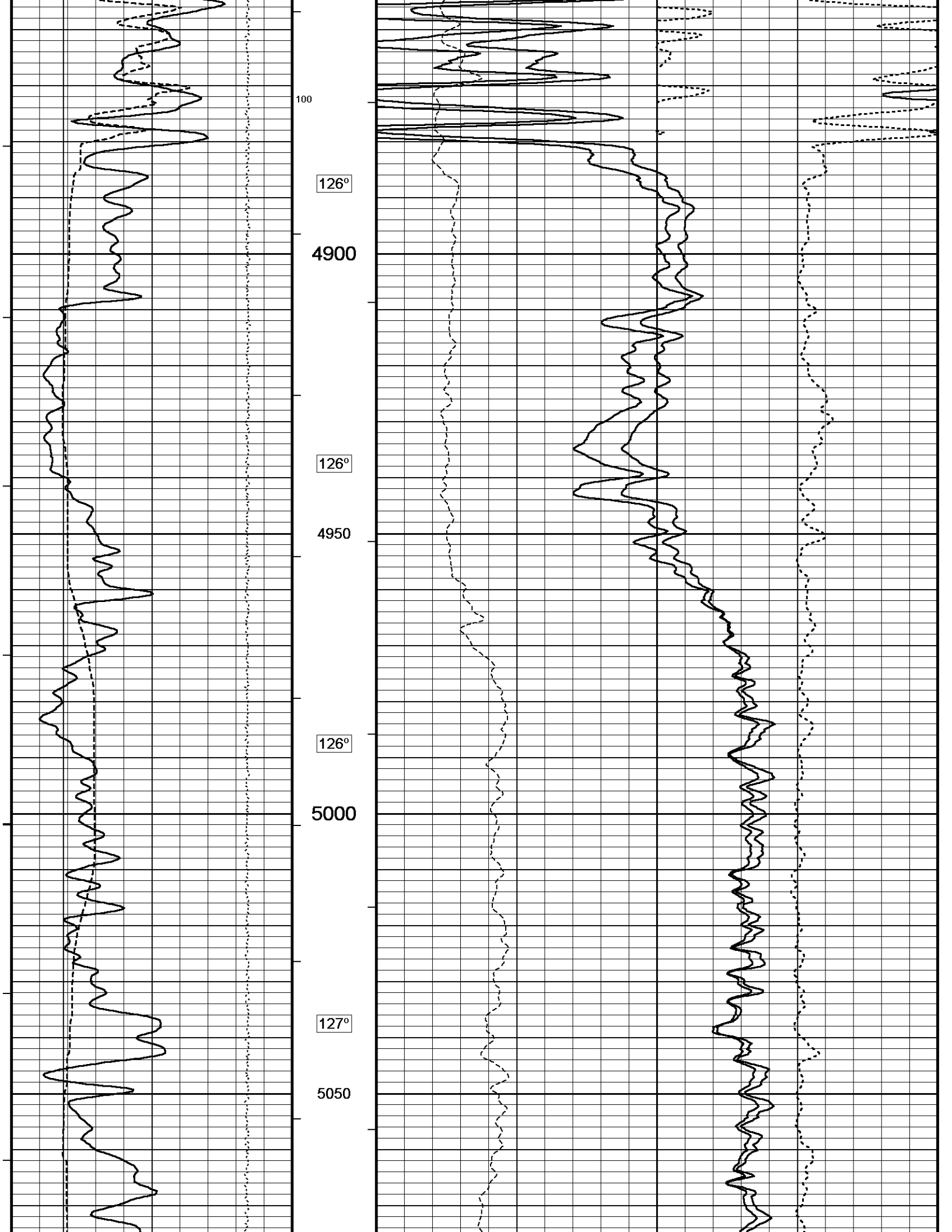


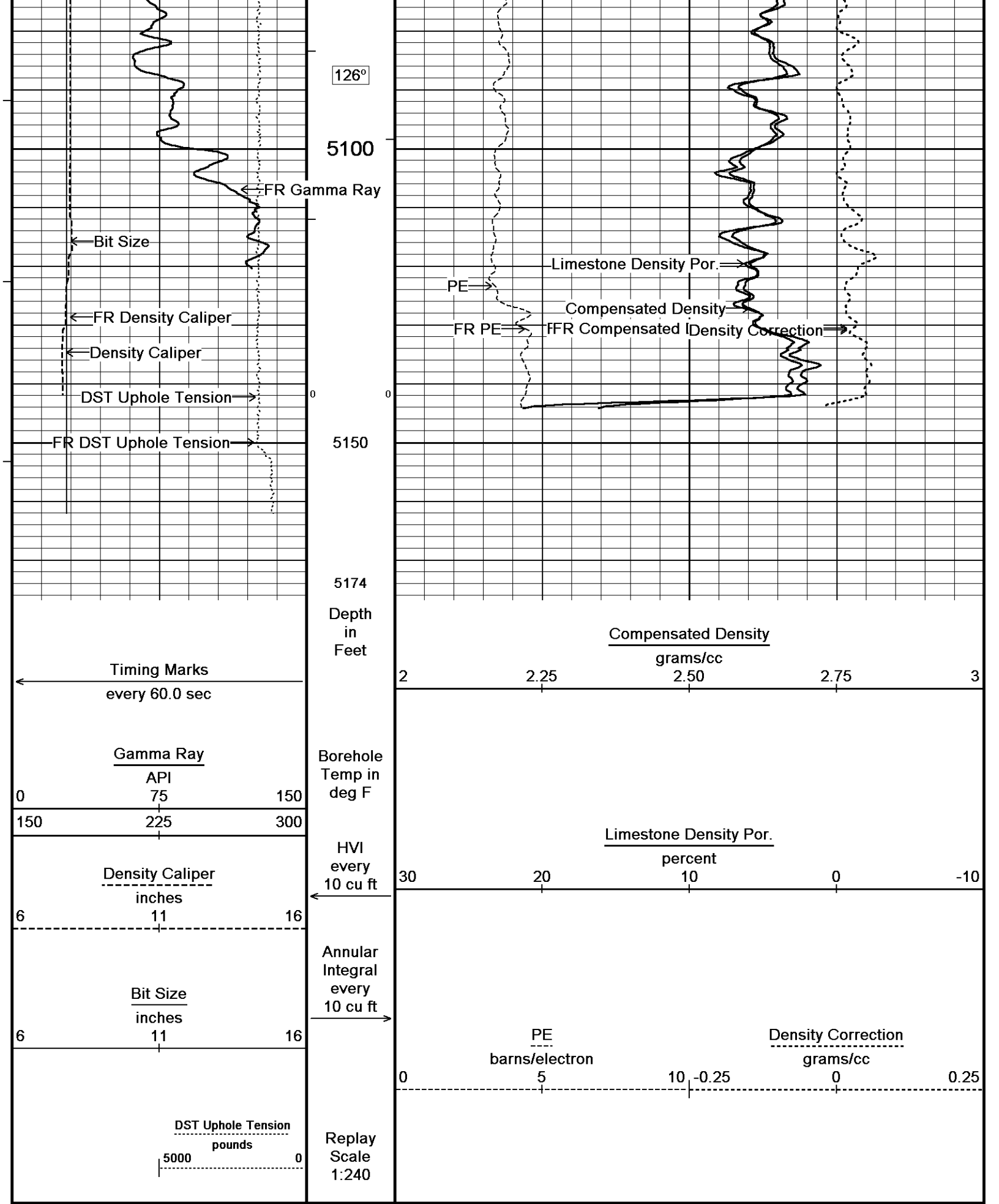

DST Uphole Tension
pounds
5000
0
Replay
Scale
1:240
4000
120°
4050
121°
300
4100
400
121°
4150
121°
0
5
10
-0.25
0
0.25


4200
122°
4250
122°
4300
122°
4350
123°
300
4400
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
PE
Limestone Density Por.
Compensated Density
Density Correction


123°
4450
200
123°
4500
123°
4550
124°
4600


124°
200
4650
124°
4700
Bit Size
PE
Compensated Density
Density Correction
125°
Density Caliper
Gamma Ray
DST Uphole Tension
4750
125°
100
4800
125°
4850


100
126°
4900
126°
4950
126°
5000
127°
5050



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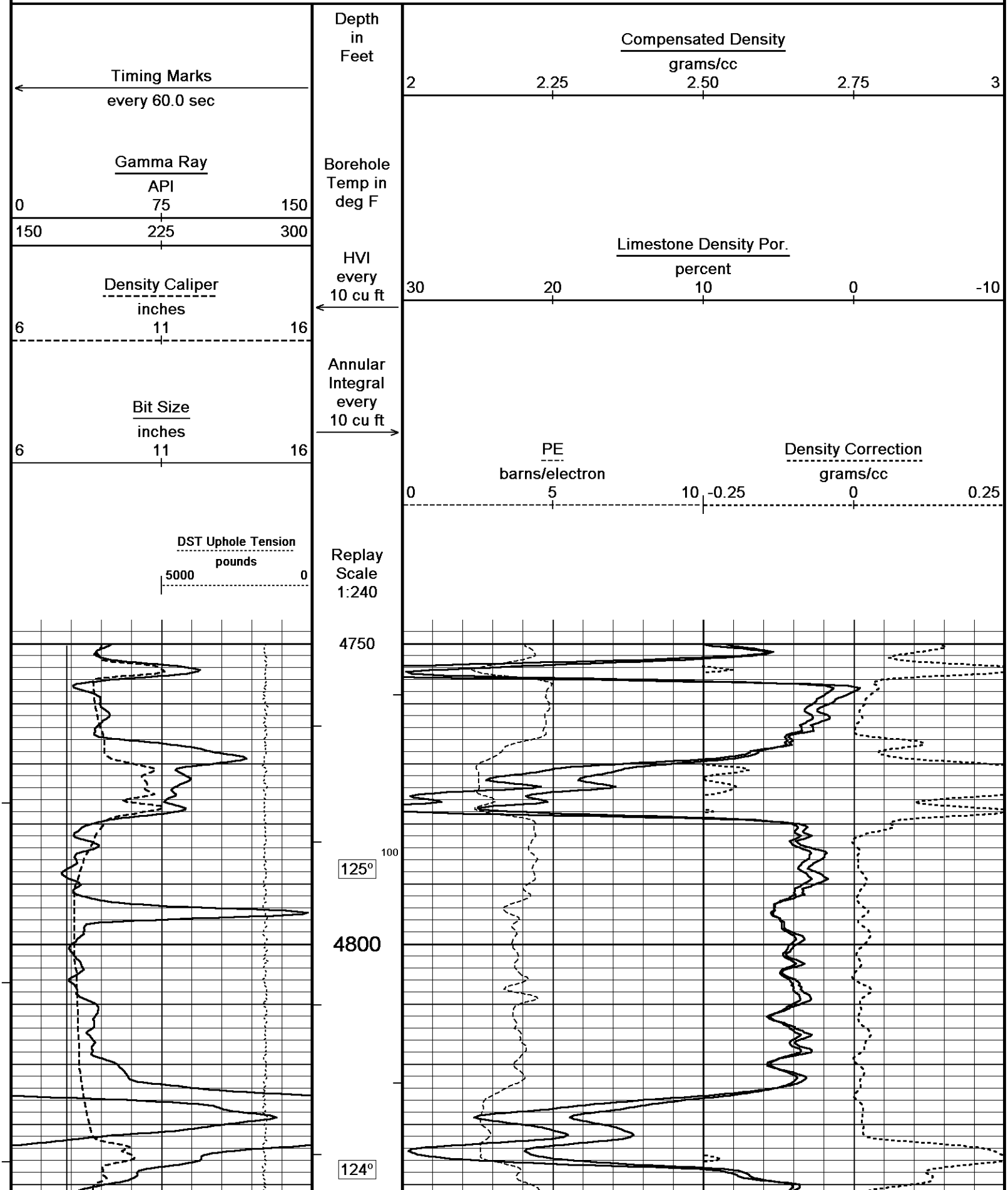
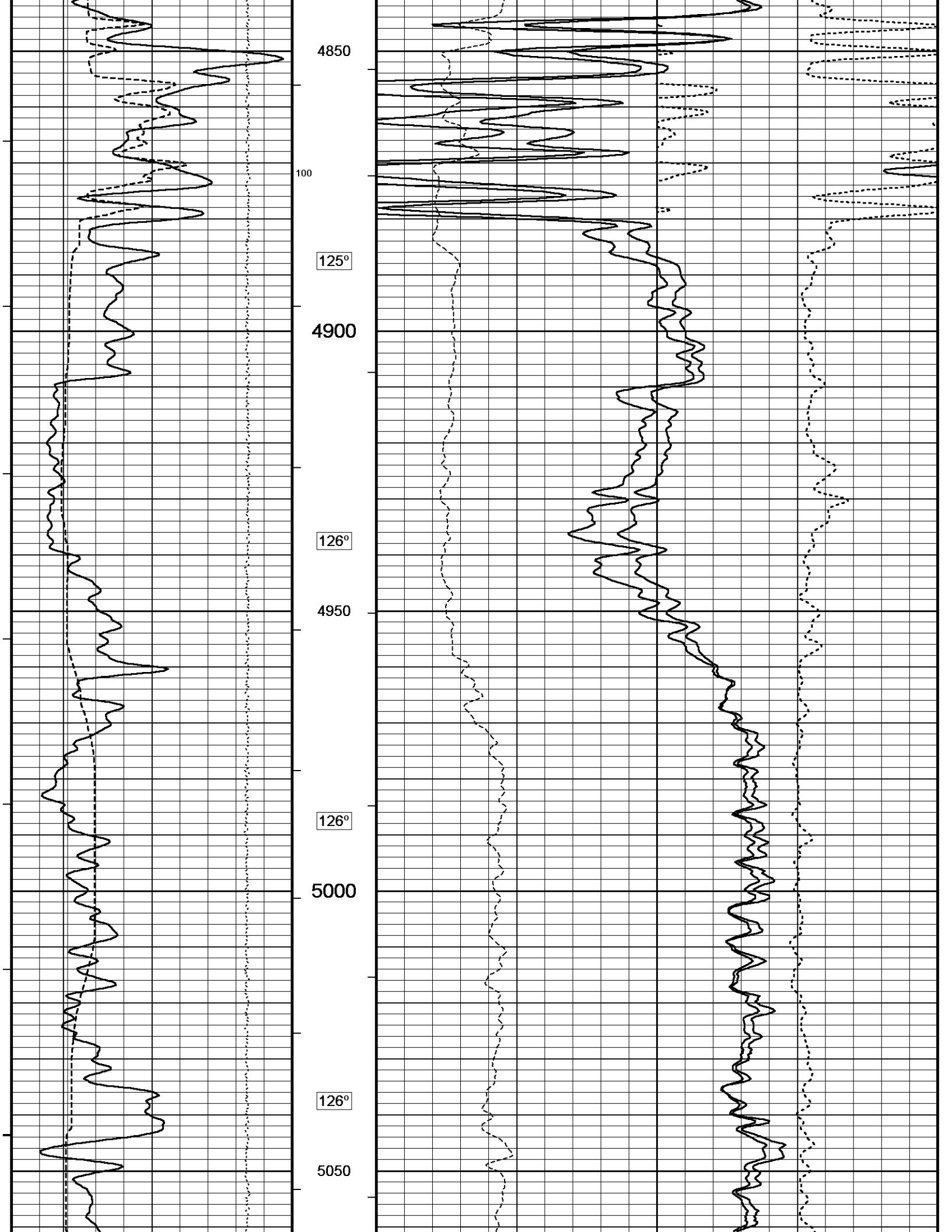
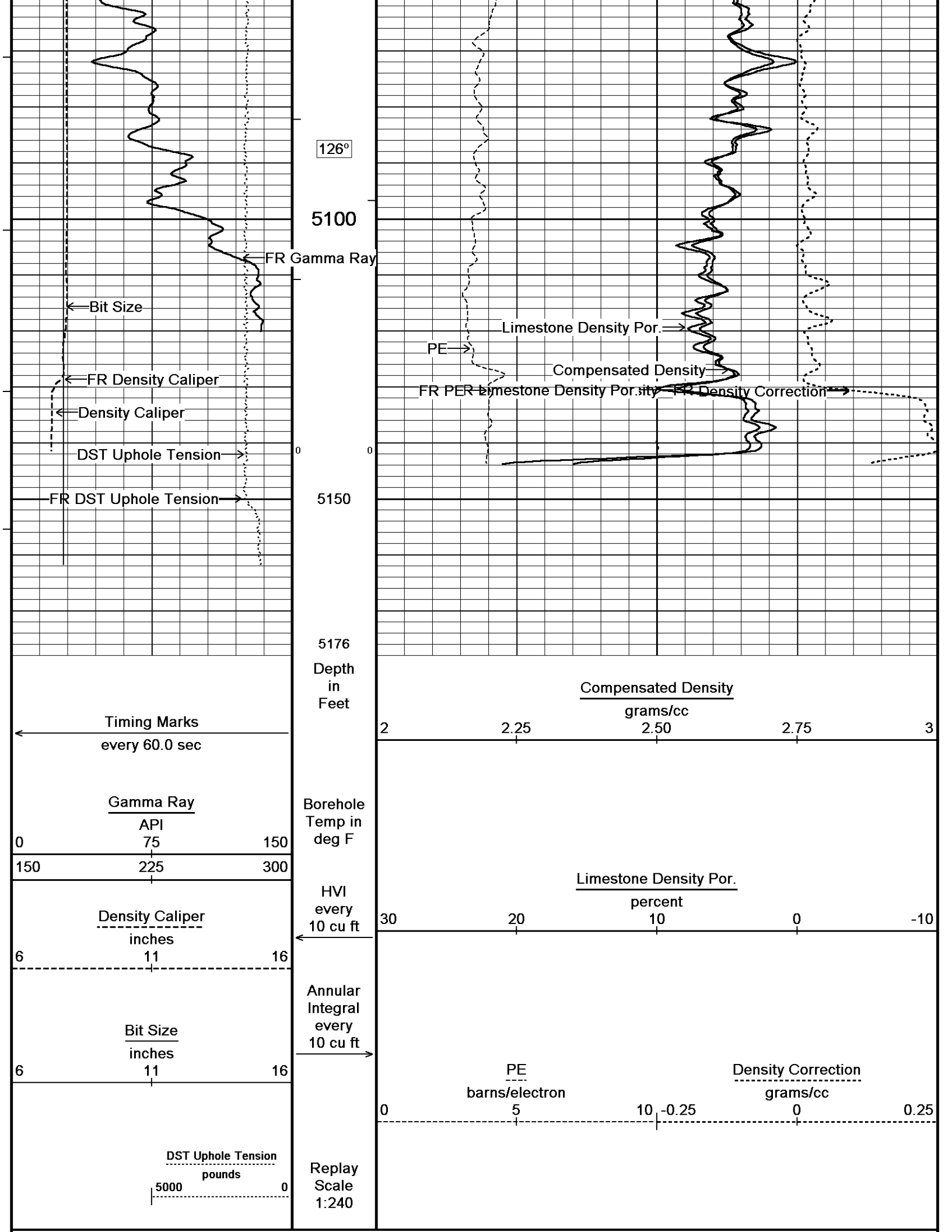
5 INCH MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 05-AUG-2012 06:59
Filename: C:\Minimus 13.02.6600\Data\M&M Z-Bar #26-11\M&M Z-Bar #26-11 Repeat.dta
Recorded on 05-AUG-2012 04:27
System Versions: Logged with 13.02.6600 Plotted with 13.02.6600




4850
100
125°
4900
126°
4950
126°
5000
126°
5050


126°
5100
FR Gamma Ray
Bit Size
FR Density Caliper
Density Caliper
DST Uphole Tension
FR DST Uphole Tension
0
0
5150
5176
Depth in Feet
Limestone Density Por.
PE
Compensated Density
FR PER Limestone Density Porosity
FR Density Correction
Compensated Density
grams/cc
2
2.25
2.50
2.75
3
Timing Marks
every 60.0 sec
Gamma Ray
API
0
75
150
150
225
300
Borehole Temp in deg F
HVI every 10 cu ft
Limestone Density Por.
percent
30
20
10
0
-10
Density Caliper
inches
6
11
16
Annular Integral every 10 cu ft
Bit Size
inches
6
11
16
PE
barns/electron
0
5
10
Density Correction
grams/cc
-0.25
0
0.25
DST Uphole Tension
pounds
5000
0
Replay Scale 1:240

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 05-AUG-2012 06:59
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REPEAT SECTION

BEFORE SURVEY CALIBRATION

C:\Minimus 13.02.6600\Data\M&M Z-Bar #26-11\M&M Z-Bar #26-11 Main spooled section.dta

General Constants All 000

Last Edited on 04-AUG-2012,23:41

General Parameters		
Mud Resistivity	0.950	ohm-metres
Mud Resistivity Temperature	89.000	degrees F
Water Level	0.000	feet
Density/Neutron Processing	Wet Hole	
Hole/Annular Volume and Differential Caliper Parameters		
HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	4.500	inches
Caliper for Differential Caliper	None	
Rwa Parameters		
Porosity used	Base Density Porosity	
Resistivity used	Array Ind. Four Res Rt	
RWA Constant A	0.610	
RWA Constant M	2.150	

Down-hole Tension Calibration SMS 0

Field Calibration on 05-AUG-2012 03:51

Reading No	Measured	Calibrated (lbs)
1	15948.01	0.00
2	16538.30	399.00

Gamma Calibration MCG-C 208

Field Calibration on 03-AUG-2012 22:27

	Measured	Calibrated (API)
Background	79	54
Calibrator (Gross)	1135	779
Calibrator (Net)	1056	725

Gamma Constants MCG-C 208

Last Edited on 04-AUG-2012,23:27

Gamma Calibrator Number	GR38	
Mud Density	1.12	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl	0.00	kppm

SP Calibration MCG-C 208

Field Calibration on 03-AUG-2012 22:37

	Measured	Calibrated (mV)
Reference 1	100.2	101.0
Reference 2	-101.3	-101.0

High Resolution Temperature Calibration MCG-C 208

Field Calibration on 03-AUG-2012,16:18

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	75.00	75.00

High Resolution Temperature Constants MCG-C 208

Last Edited on

Pre-filter Length	11

Micro Normal and Micro Inverse Calibration MML-A 4

Base Calibration on 24-JUL-2012 08:59
Field Check on 03-AUG-2012 22:21

Base Calibration

Channel	Measured Resistor 1	Measured Resistor 2	Calibrated (ohm-m) Resistor 1	Calibrated (ohm-m) Resistor 2

Micro Normal	12.2	60.2	5.0	25.0
Micro Inverse	15.7	78.4	5.0	25.0

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	62.9	62.9
Micro Inverse	48.2	48.2

Micro Normal and Micro Inverse Constants MML-A 4

Last Edited on 02-AUG-2012,09:13

Pad Type	8-12 in Soft Rubber Inflatable 006-9011-159	
Micro Normal K Factor	1.0000	
Micro Inverse K Factor	1.0000	
Standoff Offset	N/A	inches

Caliper Calibration MML-A 4

Base Calibration on 24-JUL-2012 08:53
Field Calibration on 03-AUG-2012 22:21

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	15504	5.98
2	18771	7.97
3	22124	9.86
4	25894	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
5.93	5.98

Neutron Calibration MDN-A.B 65

Base Calibration on 26-JUL-2012 11:25
Field Check on 03-AUG-2012 22:33

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
	3179	99	3714	110
Ratio	32.263		33.764	

Field Calibrator at Base	Calibrated (cps)	
	1621	2347
Ratio	0.691	

Field Check	Calibrated (cps)	
	1614	2231
Ratio	0.723	

Neutron Constants MDN-A.B 65

Last Edited on 02-AUG-2012,09:24

Neutron Source Id	PN-521	
Neutron Jig Number	5824NE	
Epithermal Neutron	No	
Caliper Source for Processing	Density Caliper	
Stand-off	0.00	inches
Mud Density	1.00	gm/cc
Limestone Sigma	7.10	cu
Sandstone Sigma	4.26	cu
Dolomite Sigma	4.70	cu
Formation Pressure Source	Constant Value	
Formation Pressure	0.00	kpsi
Temperature Source	Constant Value	
Temperature	68.00	degrees F
Mud Salinity	0.00	kppm
Salinity Correction	Not Applied	
Formation Fluid Salinity Source	Constant Value	
Formation Fluid Salinity	0.00	kppm
Barite Mud Correction	Not Applied	

FE Calibration MFE-A.A 55

Base Calibration on 24-JUL-2012 09:23
Field Check on 03-AUG-2012 22:12

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	968.0	126.8

Base Check	276.7
Field Check	276.7

FE Constants MFE-A.A 55

Last Edited on 04-AUG-2012,23:27

Running Mode	No Sleeve	
MFE K Factor	0.1268	
Caliper Source for FE correction	Density Caliper	
Caliper Value for FE correction	N/A	inches
Rm Source for FE correction	Temperature Corr	
Temp. for Rm Corr.	MCG External Temperature	
Stand-off	0.5	inches

Induction Calibration MAI-A.A 45

Base Calibration on 26-JUL-2012,09:22
Field Check on 03-AUG-2012 22:11

Base Calibration

Test Loop Calibration

Channel	Measured Low	Measured High	Calibrated (mmho/m) Low	Calibrated (mmho/m) High
1	14.4	472.6	9.3	966.2
2	5.7	374.0	7.6	821.4
3	3.4	261.2	5.2	566.0
4	2.5	133.9	2.6	279.2

Array Temperature 78.4 Deg F

Channel	Base Check (mmho/m) Low	Base Check (mmho/m) High	Field Check (mmho/m) Low	Field Check (mmho/m) High
1	0.0	0.0	19.8	3852.9
2	0.0	0.0	32.0	3630.1
3	0.0	0.0	28.8	3050.0
4	0.0	0.0	18.4	2079.5
Deep	0.0	0.0	16.2	1911.6
Medium	0.0	0.0	42.6	4061.3
Shallow	0.0	0.0	50.1	5484.3
Array Temperature	0.0		82.4	Deg F

Induction Constants MAI-A.A 45

Last Edited on 04-AUG-2012,23:27

Induction Model	RtAP-WBM	
Caliper for Borehole Corr.	Density Caliper	
Hole Size for Borehole Correction	N/A	inches
Tool Centred	No	
Stand-off Type	Fins	
Stand-off	0.50	inches
Number of Fins on Stand-off	8.0000	
Stand-off Fin Angle	45.00	degrees
Stand-off Fin Width	0.5000	inches
Borehole Corr. Rm Source	Temperature Corr	
Temp. for Rm Corr.	MCG External Temperature	
Squasher Start	0.0020	mhos/metre
Squasher Offset	N/A	mhos/metre

Borehole Normalisation

DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
SRM2	0.0000	SRC2	0.0000

Calibration Site Corrections

Channel 1	0.00	mmhos/metre
Channel 2	0.00	mmhos/metre
Channel 3	0.00	mmhos/metre
Channel 4	0.00	mmhos/metre

Apparent Porosity and Water Saturation Constants

Archie Constant (A)	1.00
Cementation Exponent (M)	2.00

Saturation Exponent (N)	2.00	
Saturation of Water for Apor	100.00	percent
Resistivity of Water for Apor and Sw	0.05	ohm-m
Resistivity of Mud Filtrate for Sw	0.00	ohm-m
Source for Rt	0.00	
Source for Rxo	0.00	

High Resolution Temperature Calibration MAI-A.A 45

Field Calibration on 26-JUL-2012,09:09

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	75.00	75.00

High Resolution Temperature Constants MAI-A.A 45

Last Edited on

Pre-filter Length	11

Caliper Calibration MPD-B 31

Base Calibration on 26-JUL-2012 09:16
Field Calibration on 03-AUG-2012 22:14

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	17567	3.99
2	26416	5.98
3	35056	7.97
4	43488	9.86
5	52816	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
5.97	5.98

Photo Density Calibration MPD-B 31

Base Calibration on 26-JUL-2012 10:02
Field Check on 03-AUG-2012 22:20

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	48085	24200	59556	30836
Reference 2	19674	1989	24941	2541

Field Check at Base

692.2	849.9

Field Check

691.9	854.9

PE Calibration

Base Calibration	Measured			Calibrated
	WS	WH	Ratio	Ratio
Background	127	608		
Reference 1	19234	47953	0.404	0.371
Reference 2	5695	19580	0.293	0.272

Field Check at Base

126.7	608.3

Field Check

126.9	606.5

Density Constants MPD-B 31

Last Edited on 04-AUG-2012,23:27

Density Source Id	254	
Nylon Calibrator Number	DNCE695	
Aluminium Calibrator Number	DACD698	
Density Shoe Profile	8 inch	
Caliper Source for Processing	Density Caliper	
PE Correction to Density	Not Applied	
Mud Density	1.12	gm/cc
Mud Density Z/A Multiplier	1.13	
Mud Filtrate Density	1.00	gm/cc
Dry Hole Mud Filtrate Density	1.00	gm/cc
DNCT	0.00	gm/cc
CRCT	0.00	gm/cc

CRCT	0.00	gm/cc
Density Z/A Correction	Hybrid	

Matrix density (gm/cc)	Depth (m)
2.71	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00

DOWNHOLE EQUIPMENT

C:\Minimus 13.02.6600\Data\M&M Z-Bar #26-11\M&M Z-Bar #26-11 Main spooled section.dta

Compact Comms Gamma
MCG-C 208 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-log
MML-A 4 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

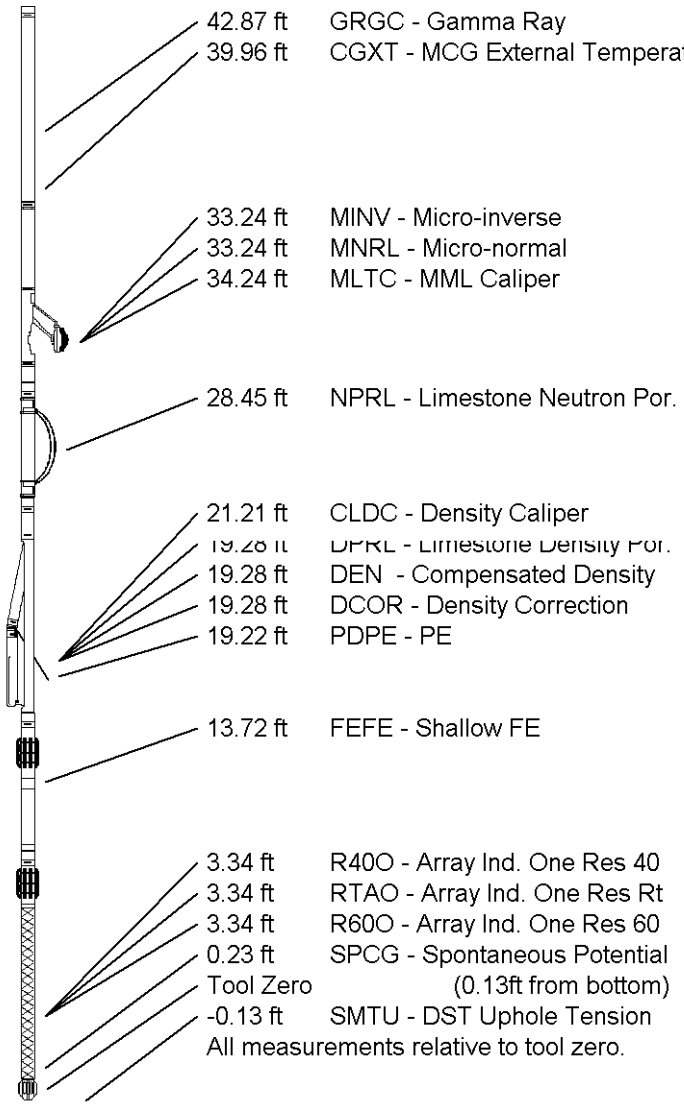
Compact Neutron
MDN-A.B 65 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper
MPD-B 31 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric
MFE-A.A 55 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction
MAI-A.A 45 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 48.16 ft Weight: 383.6 lb



42.87 ft	GRGC - Gamma Ray
39.96 ft	CGXT - MCG External Temperature
33.24 ft	MINV - Micro-inverse
33.24 ft	MNRL - Micro-normal
34.24 ft	MLTC - MML Caliper
28.45 ft	NPRL - Limestone Neutron Por.
21.21 ft	CLDC - Density Caliper
19.28 ft	DPRL - Limestone Density Por.
19.28 ft	DEN - Compensated Density
19.28 ft	DCOR - Density Correction
19.22 ft	PDPE - PE
13.72 ft	FEFE - Shallow FE
3.34 ft	R40O - Array Ind. One Res 40
3.34 ft	RTAO - Array Ind. One Res Rt
3.34 ft	R60O - Array Ind. One Res 60
0.23 ft	SPCG - Spontaneous Potential
Tool Zero	(0.13ft from bottom)
-0.13 ft	SMTU - DST Uphole Tension

All measurements relative to tool zero.

COMPANY	M&M EXPLORATION INC.
WELL	Z-BAR #26-11
FIELD	AETNA GAS AREA
PROVINCE/COUNTY	BARBER
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	1798.00	feet	First Reading	5131.00	feet
Elevation Drill Floor	1796.00	feet	Depth Driller	5150.00	feet
Elevation Ground Level	1786.00	feet	Depth Logger	5150.00	feet

Weatherford®

COMPACT PHOTO DENSITY
COMPENSATED NEUTRON
MICRORESISTIVITY LOG