

**Weatherford****CALIPER
LOG**

COMPANY				EAST CHEYENNE GAS STORAGE LLC				
WELL				ECGS NO 6-16 WPD009-2				
FIELD				PEETZ WEST				
PROVINCE/COUNTY				LOGAN				
COUNTRY/STATE				USA/COLORADO				
LOCATION				SHL: 1646' FNL & 2199' FWL				
SEC	TWP	RGE	Other Services		CMI			
6	11N	52W	MAI					
API Number		WPD009-2		MPD/MDN				
Permit Number		05-075-09402						
Permanent Datum G.L., Elevation 4555 feet						Elevations: KB 4567.00 DF 4566.00 GL 4555.00		
Log Measured From KB								
Drilling Measured From KB@ 12								
Date	23-SEP-2012							
Run Number	1							
Depth Driller	5260.00					feet		
Depth Logger	5260.00					feet		
First Reading	5206.00					feet		
Last Reading	1223.00					feet		
Casing Driller	1234.00					feet		
Casing Logger	1223.00					feet		
Bit Size	8.750					inches		
Hole Fluid Type	WBM							
Density / Viscosity	9.70 g/c3		51.00 CP					
PH / Fluid Loss	9.00		17.00 ml/10min					
Sample Source	FLOWLINE							
Rm @ Measured Temp	3.46 @ 87.3					ohm-m		
Rmf @ Measured Temp	2.77 @ 87.3					ohm-m		
Rmc @ Measured Temp	4.15 @ 87.3					ohm-m		
Source Rmf / Rmc	CALC		CALC					
Rm @ BHT	2.12 @144.0		ohm-m					
Time Since Circulation	4 HOURS							
Max Recorded Temp	144.00		deg F					
Equipment Name	COMPACT							
Equipment / Base	13144		RK SPR					
Recorded By	J.LIU					T.BENICH		
Witnessed By	J.ASHBY							

BOREHOLE RECORD

Last Edited: 23-SEP-2012 09:50

Bit Size inches	Depth From feet	Depth To feet
8.750	1234.00	5260.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	9.625	0.00	1234.00	36.00

REMARKS

SOFTWARE VERSION 13.03.7779
TOOLS RUN: SHA, MCG, MDN, MPD, MIS-D, SKJ, MIS-E, SKJ, MIM, MIE, SKJ, MFE, MAI RUN IN COMBINATION.

HARDWARE: MPD: 8" PROFILE PLATE USED.
MAI: TWO 1 INCH STANDOFFS USED.
MFE: ONE 1 INCH STANDOFF USED.
MDN: DUAL BOWSPRING USED.
MIM: ONE NONMETALIC CENTRALIZING BASKET USED.
MIE: ONE 1 INCH STANDOFF USED

2.65 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY.

TIGHT PULLS, BOREHOLE SIZE AND RUGOSITY WILL AFFECT REPEATABILITY AND DATA QUALITY.

ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

DENSITY CALIPER UNDERGAUGED. REPROCESSED WITH BIT SIZE

TIGHT PULL AT 3995 FT. CLOSED CALIPERS TO PULL THROUGH. MAX TENSION AT 2000 LBS

TOTAL HOLE VOLUME FROM TD TO SURFACE CASING =1700 CUBIC FEET

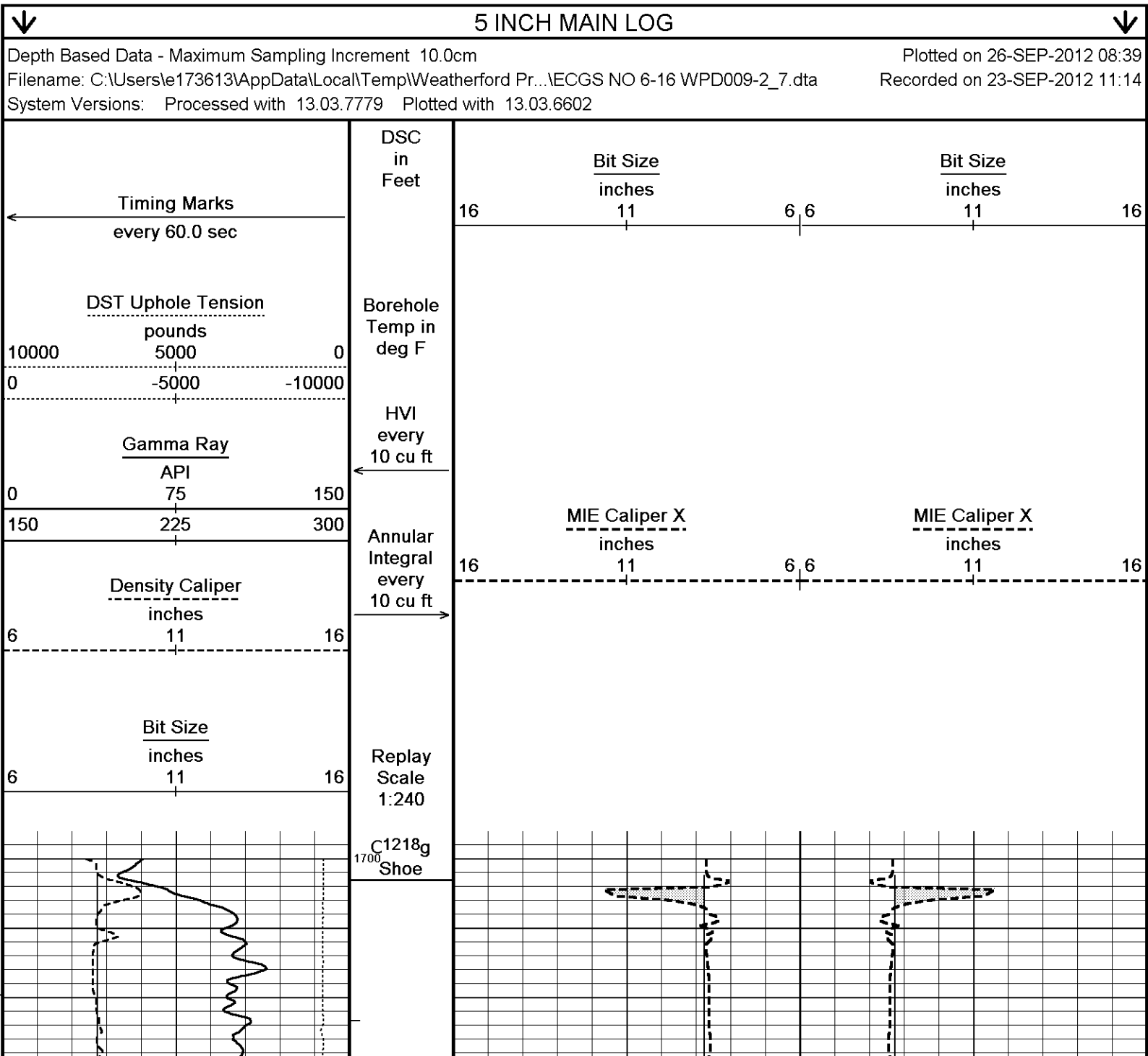
ANNULAR VOLUME WITH 7 INCH PRODUCTION CASING FROM TD TO SURFACE CASING = 620 CUBIC FEET

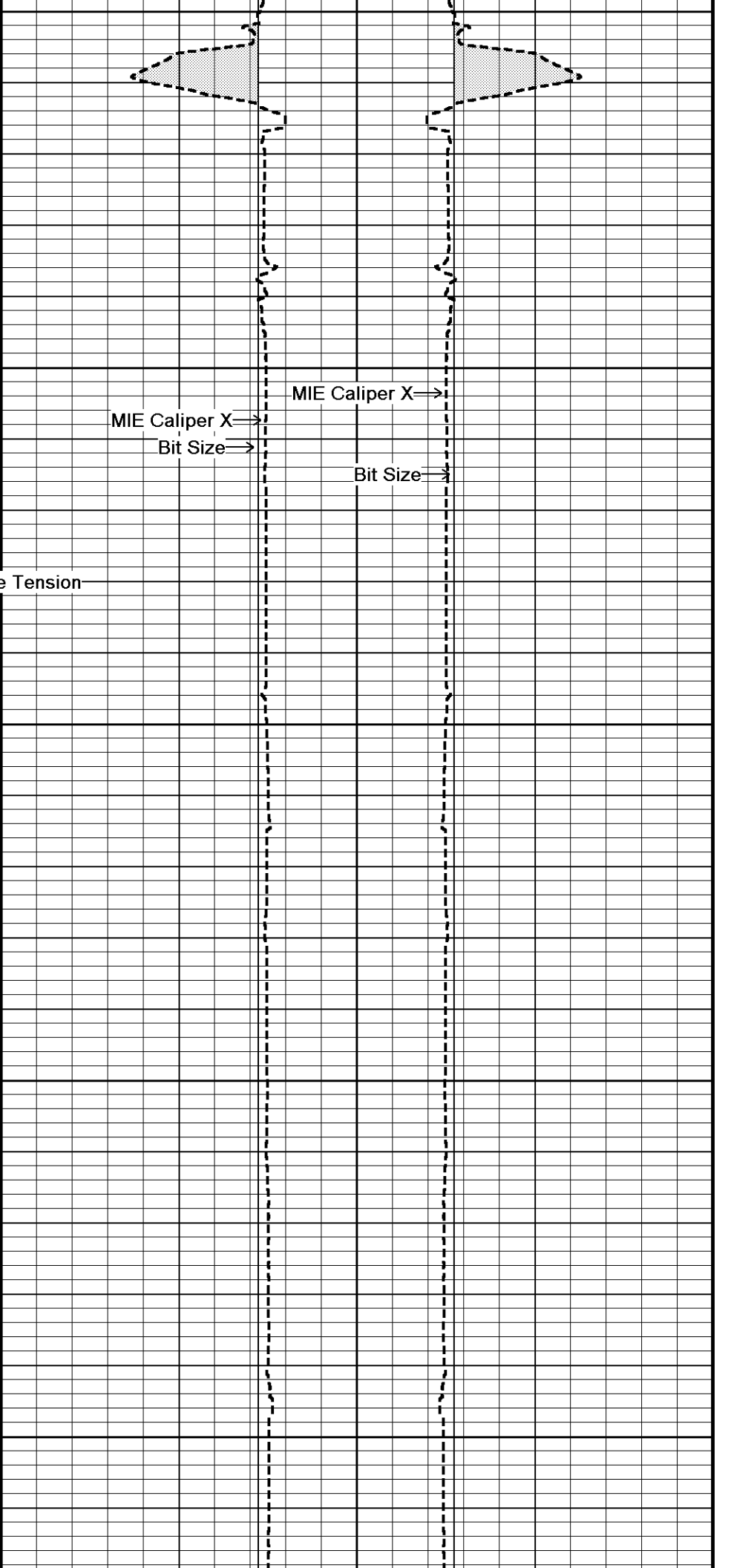
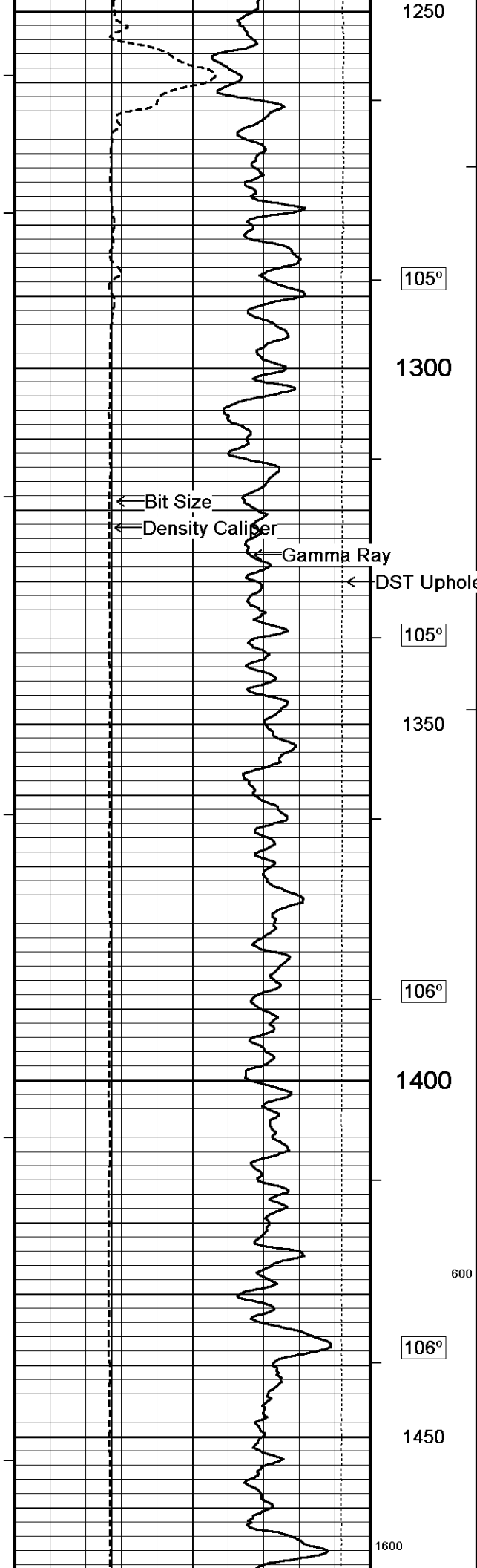
SERVICE ORDER: #3535291

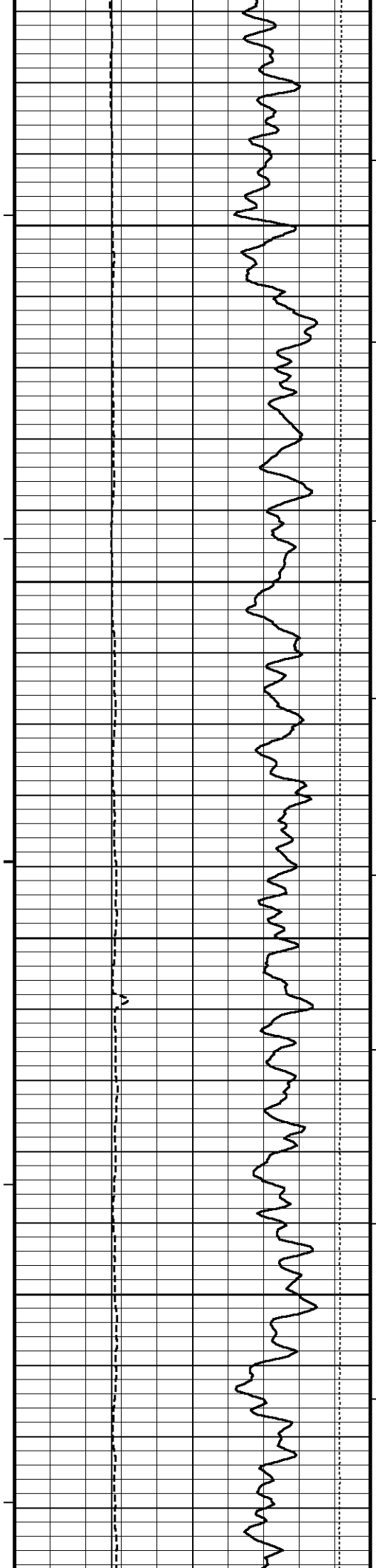
OPERATOR: B.PECK
S.ELMORE
J.BARTZ

RIG: CADE 22

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions in our price schedule.







107°

1500

107°

1550

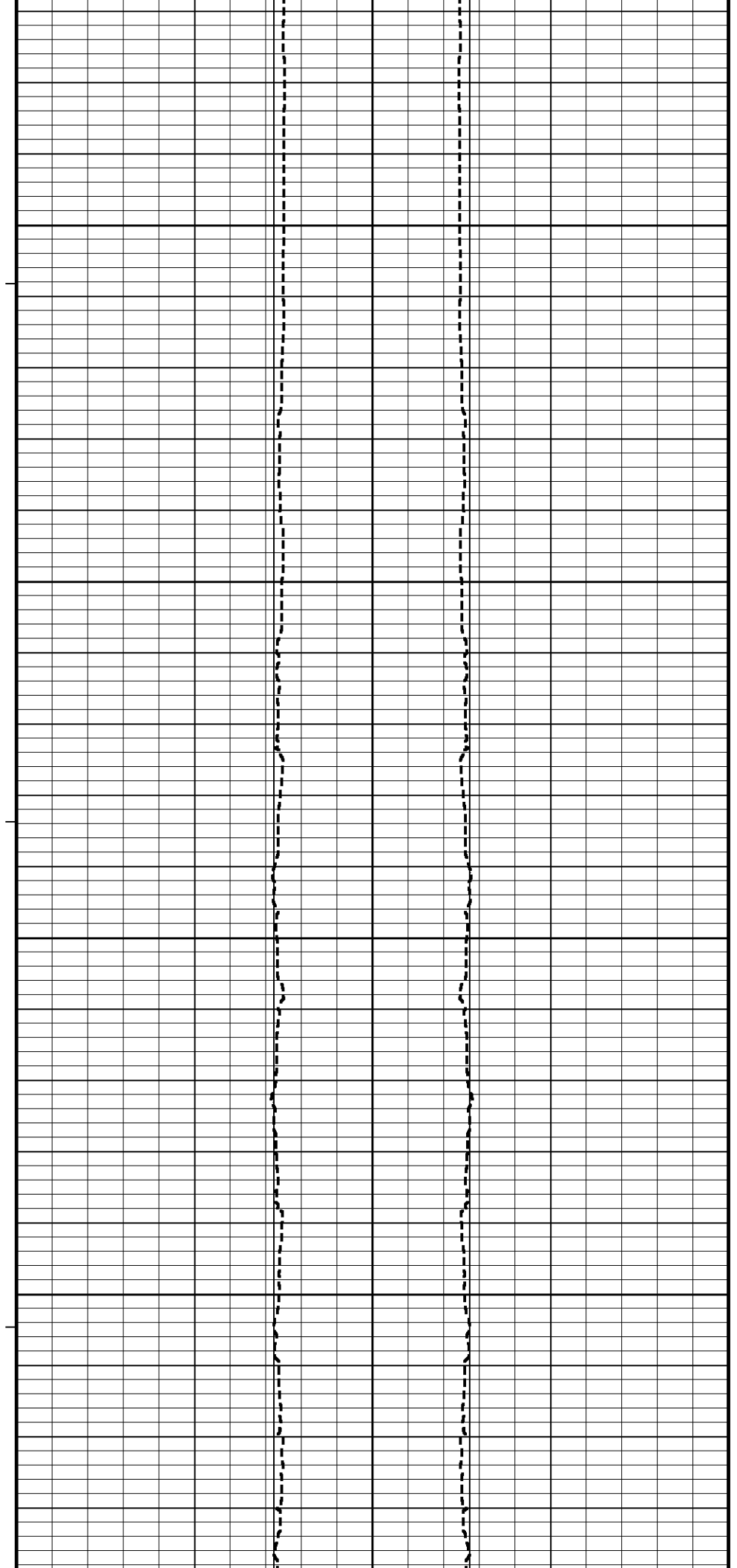
108°

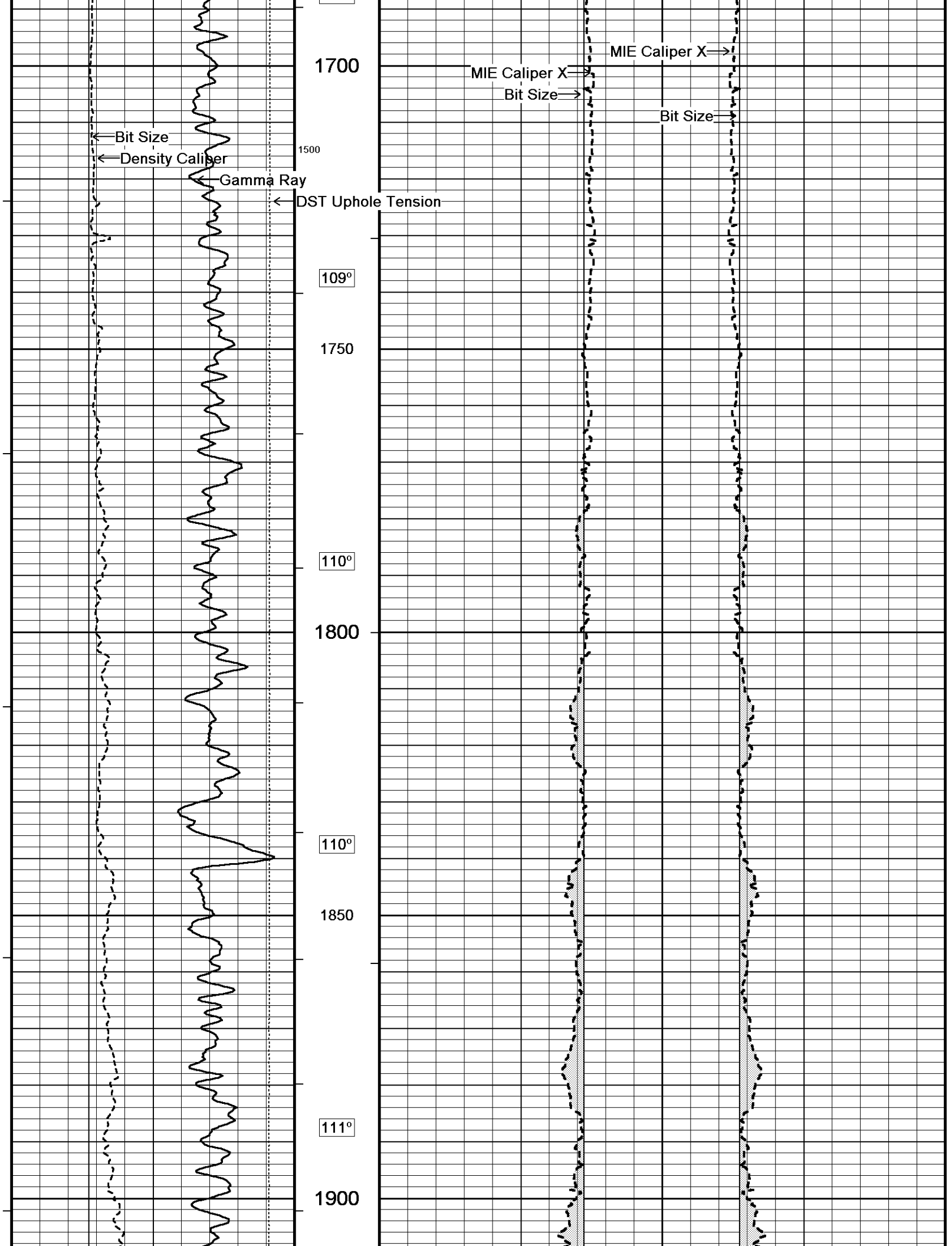
1600

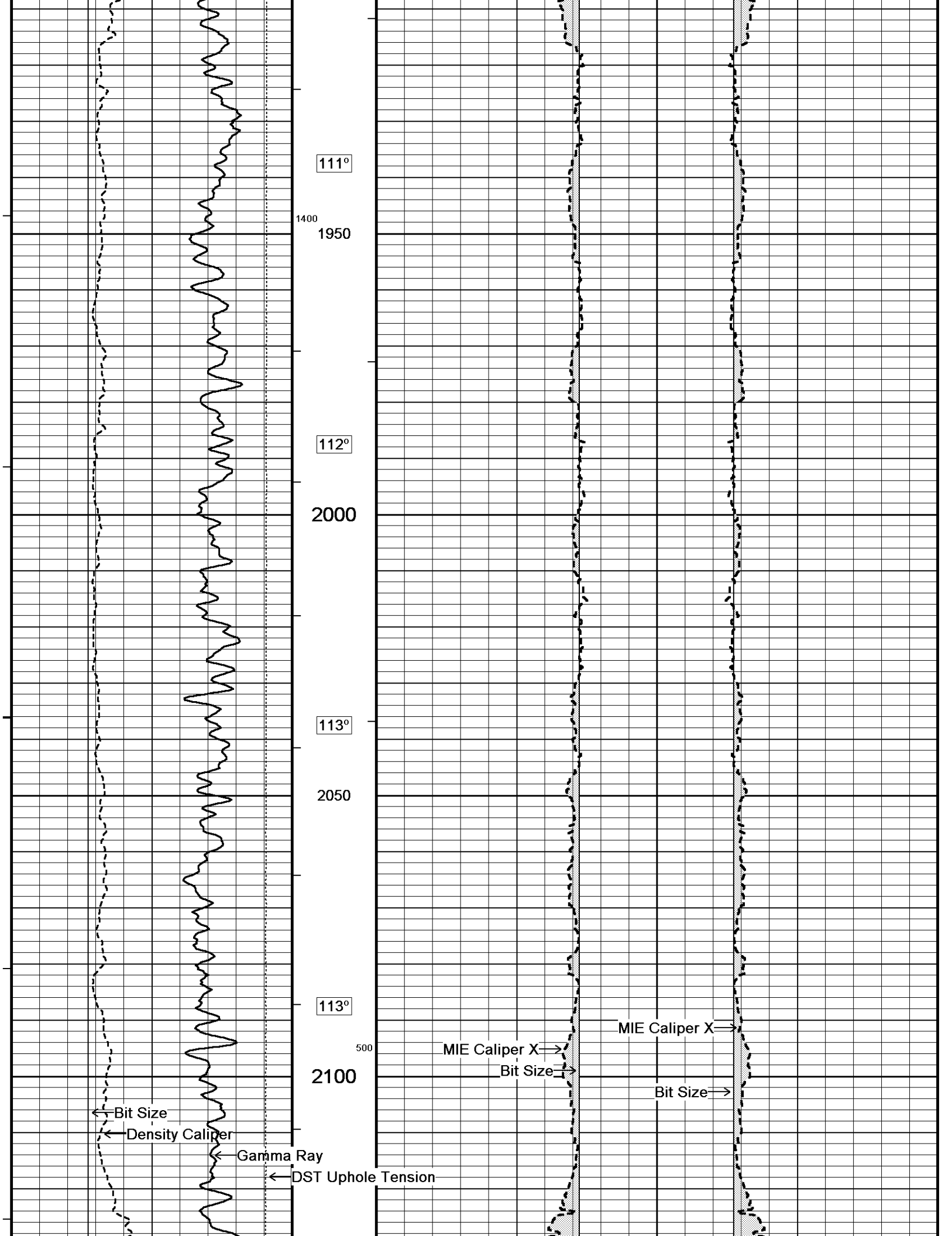
108°

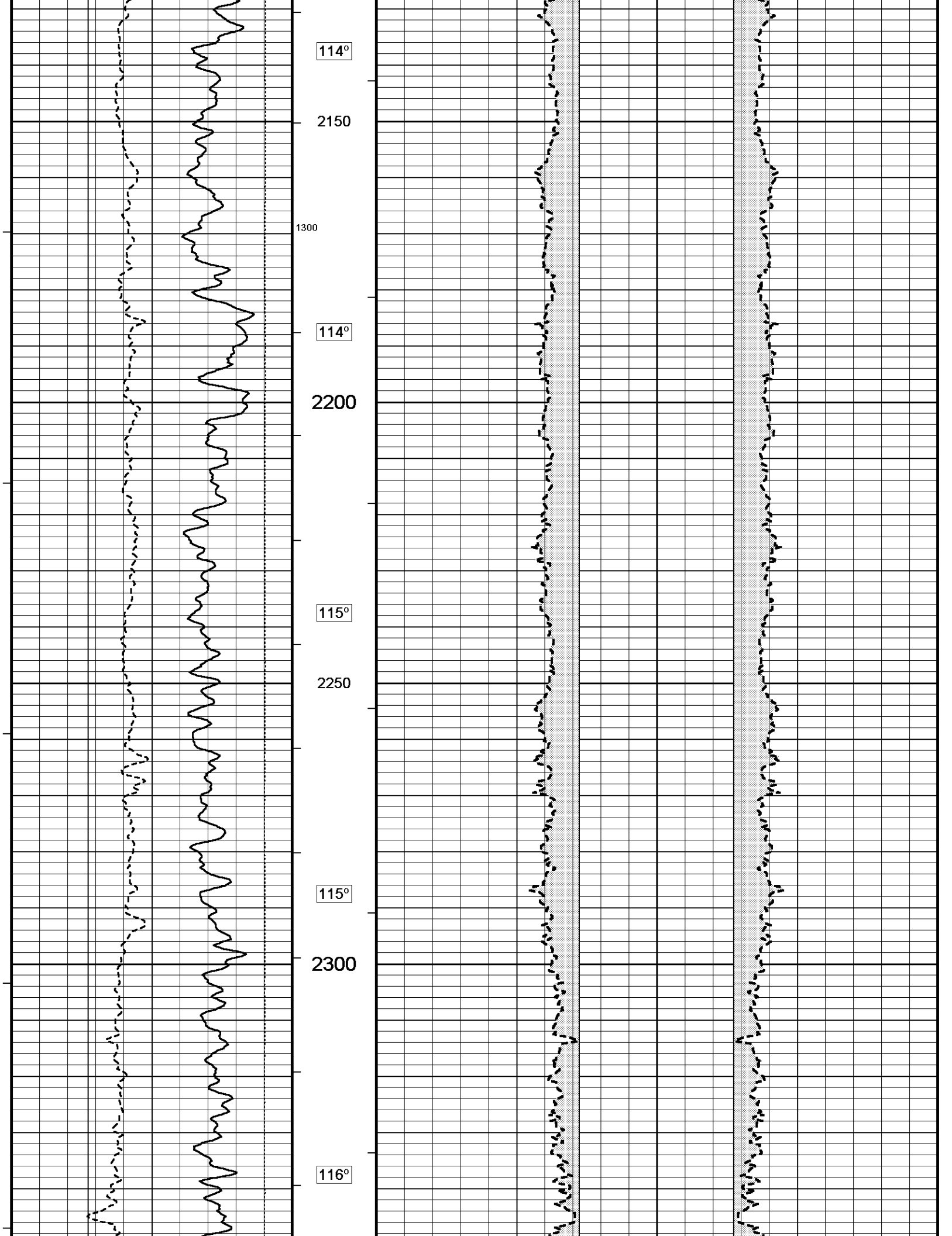
1650

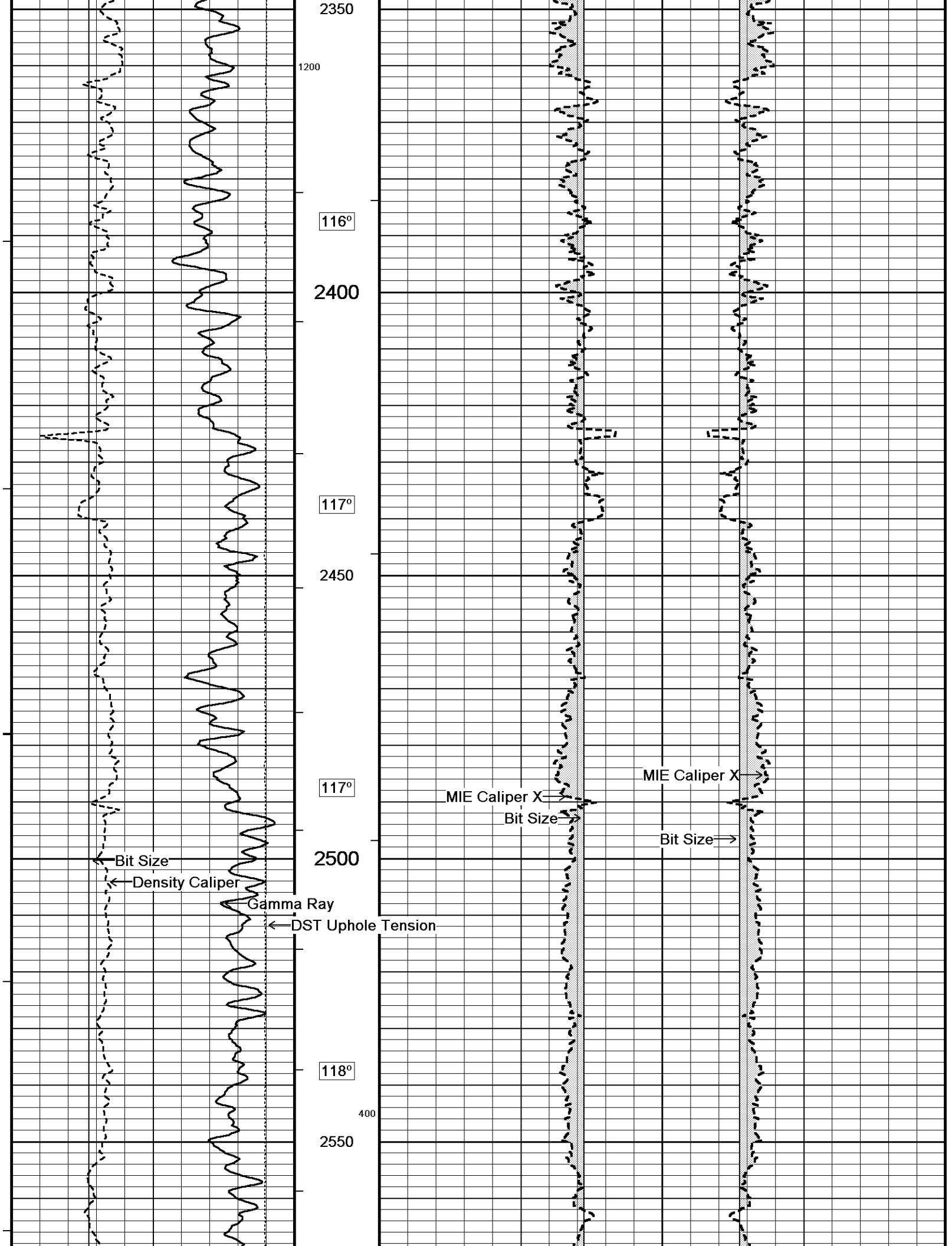
109°

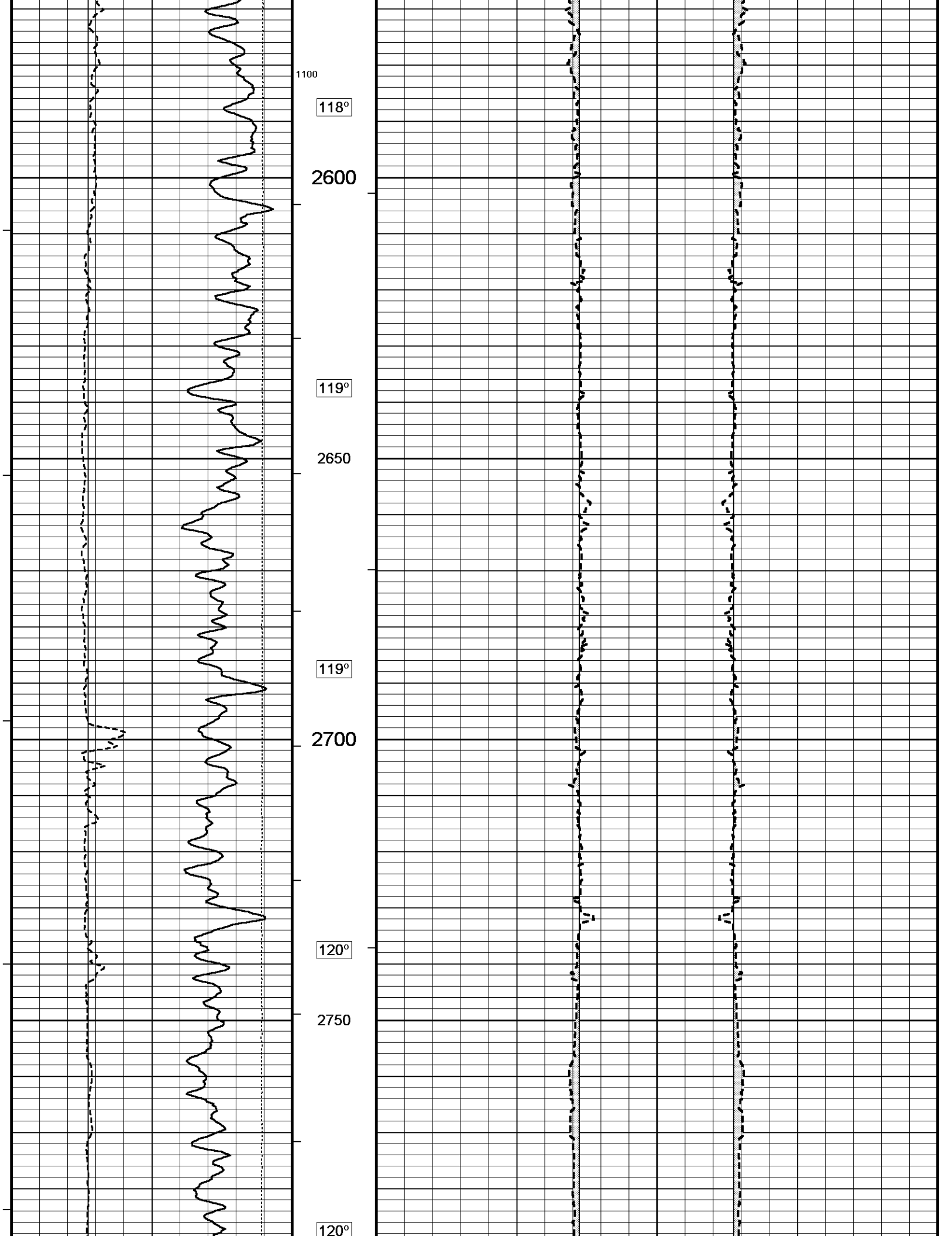


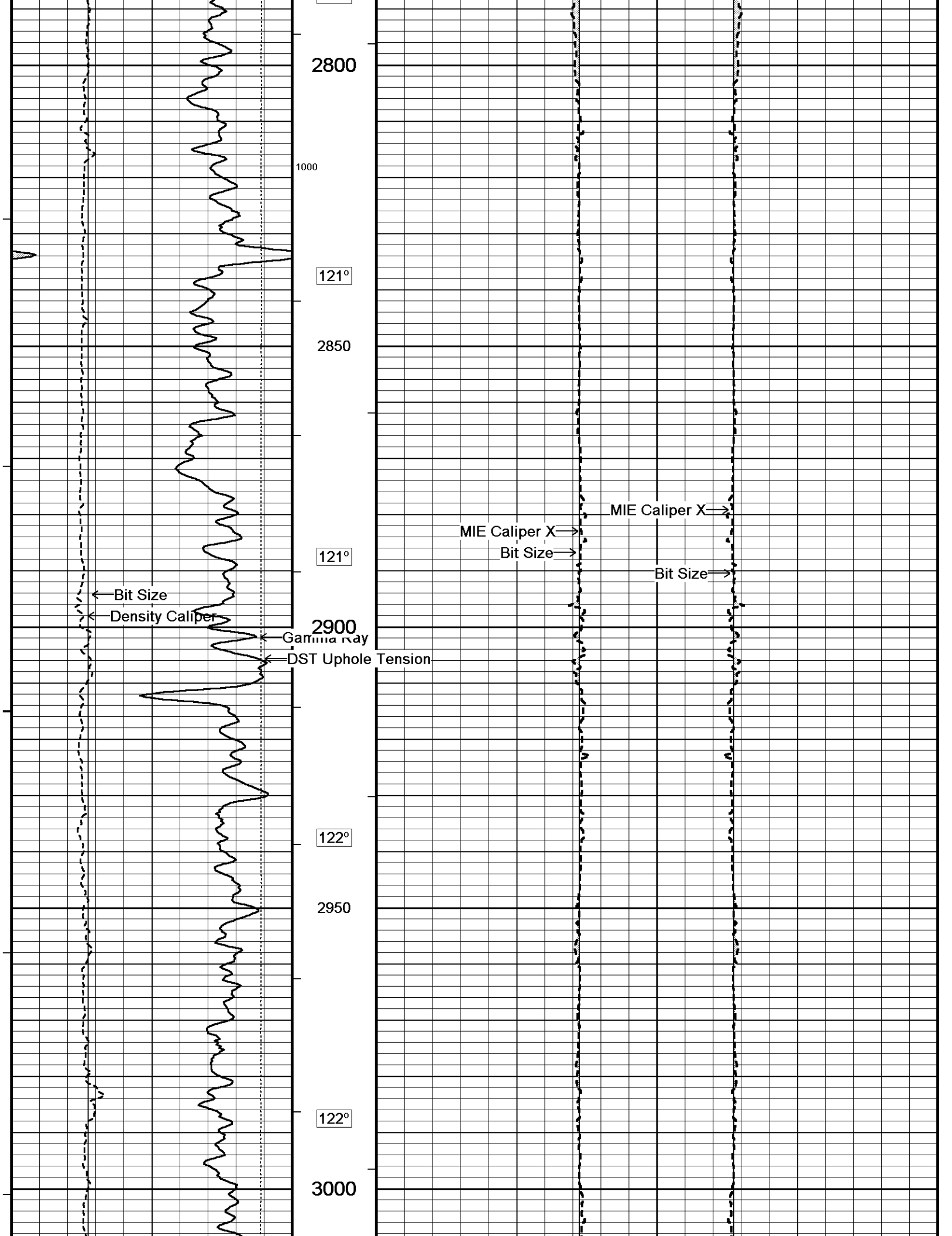


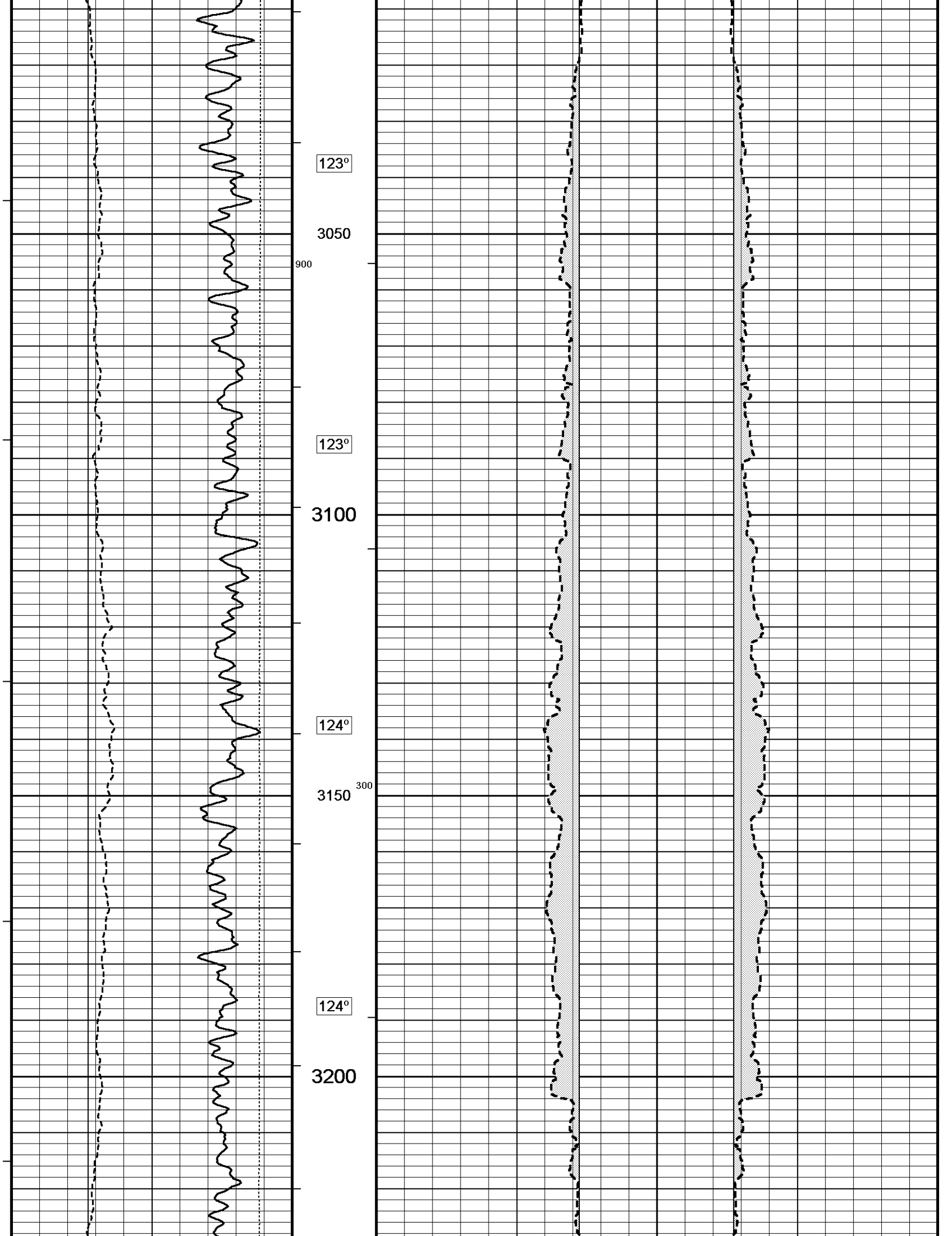


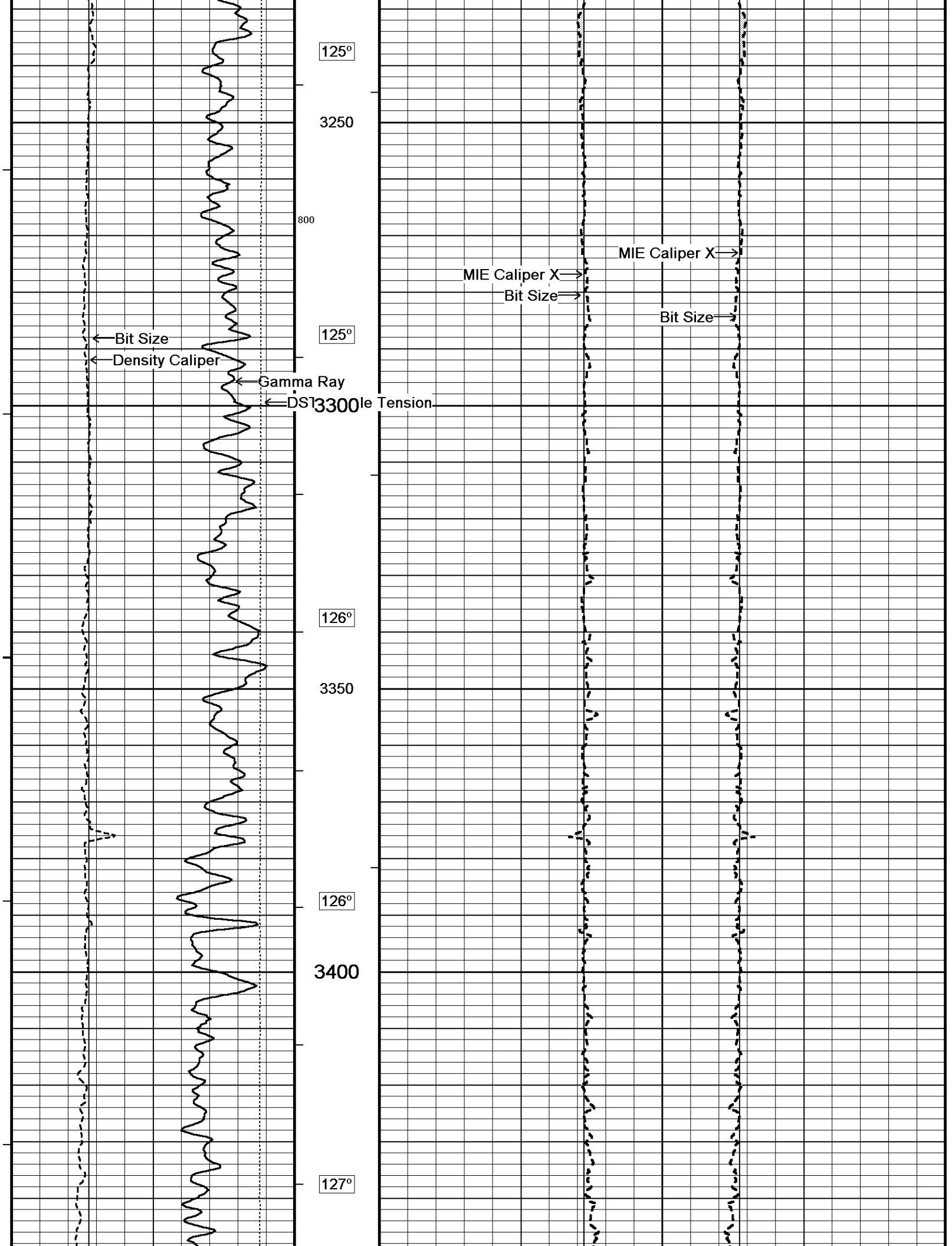


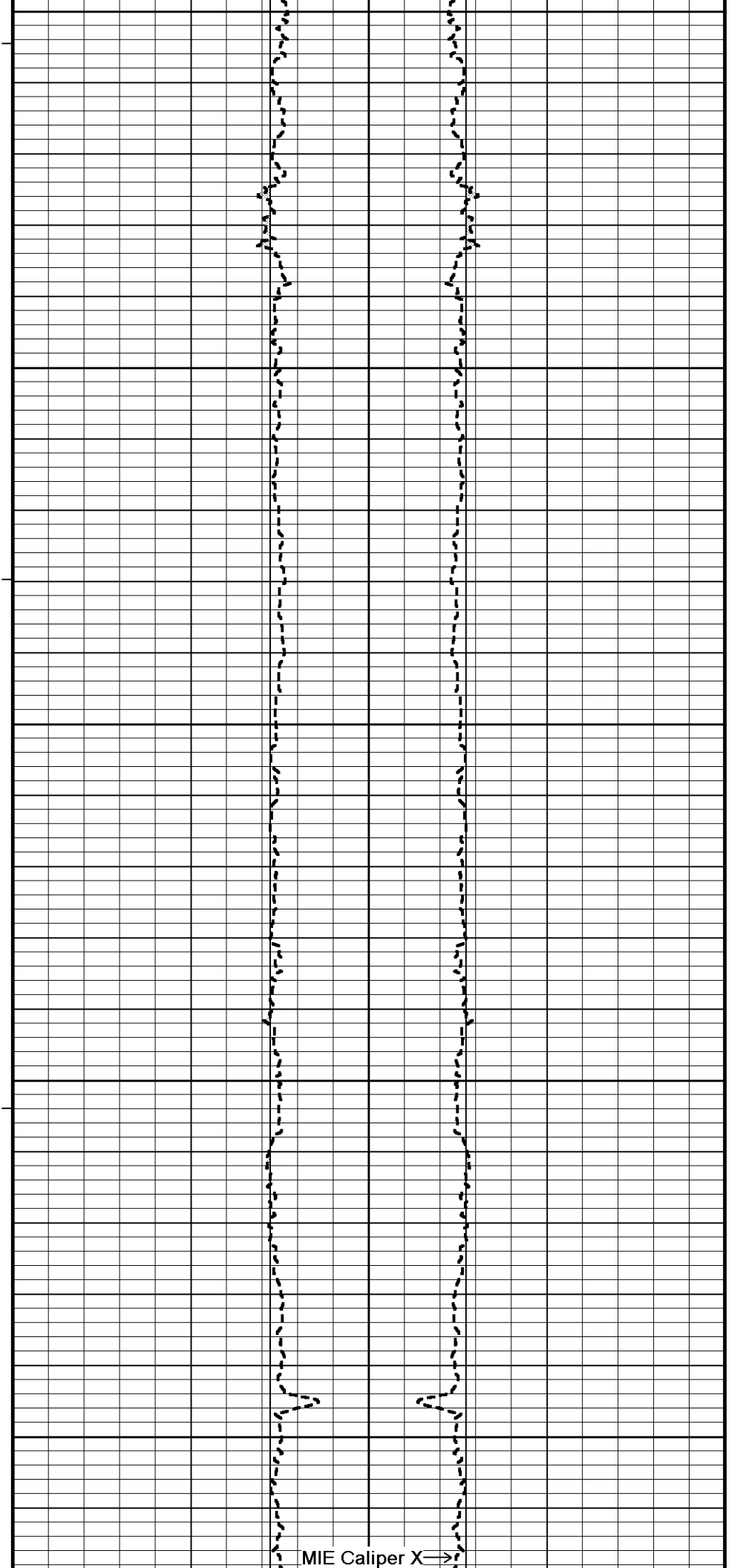
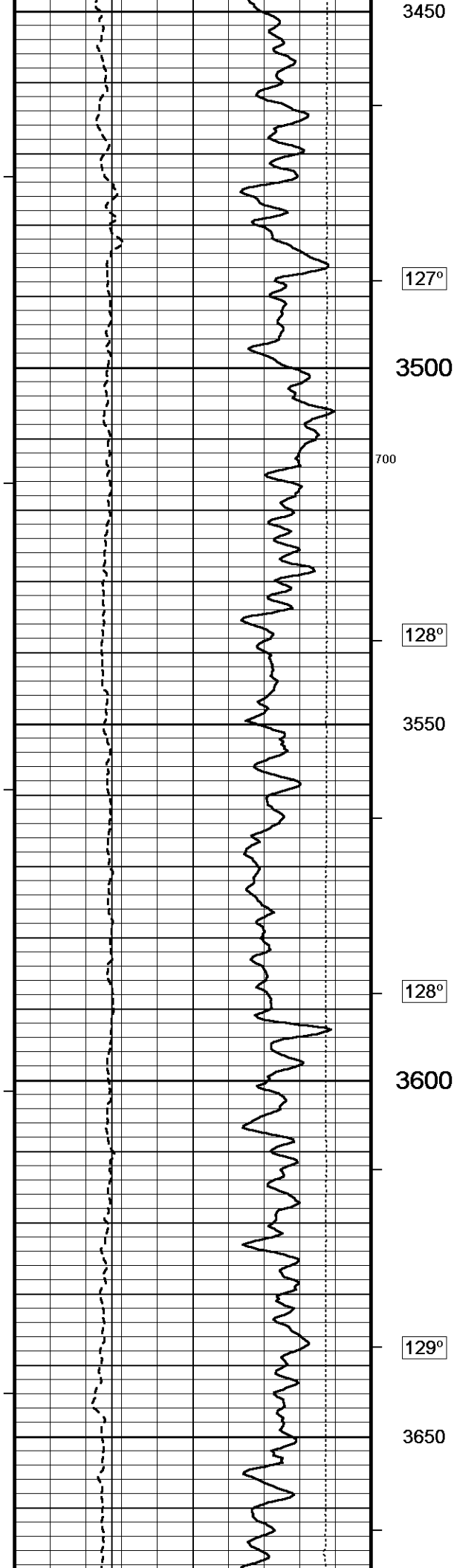


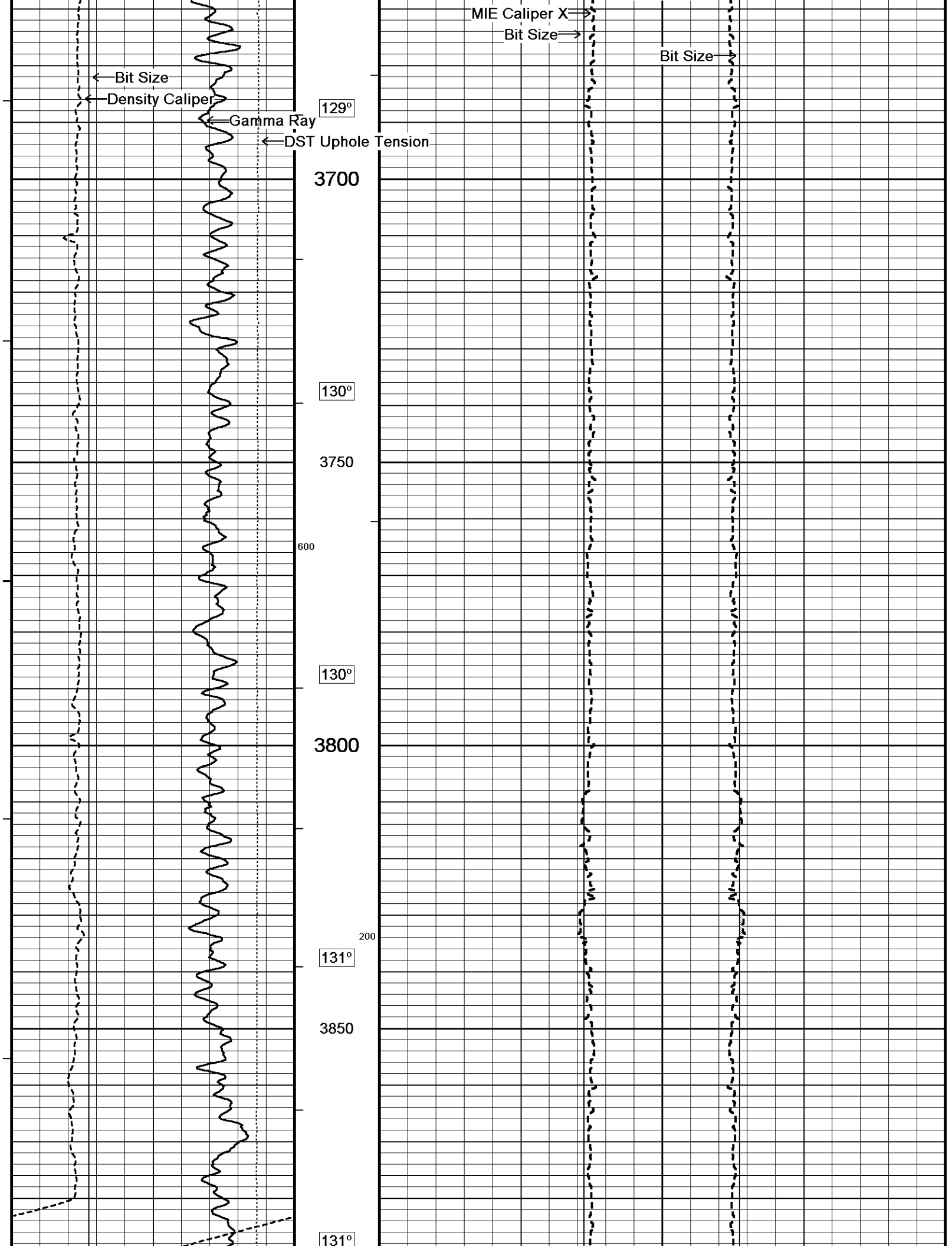


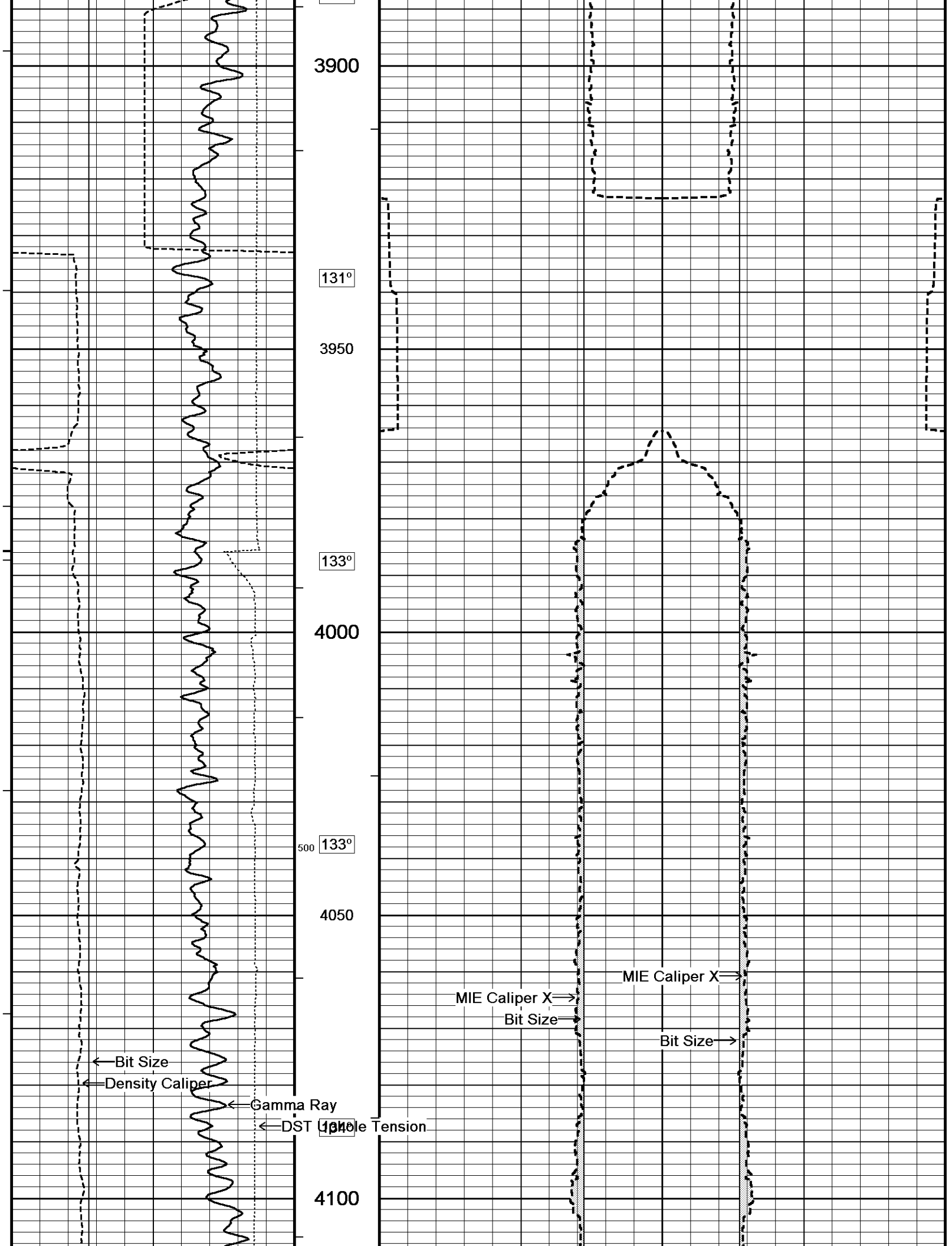


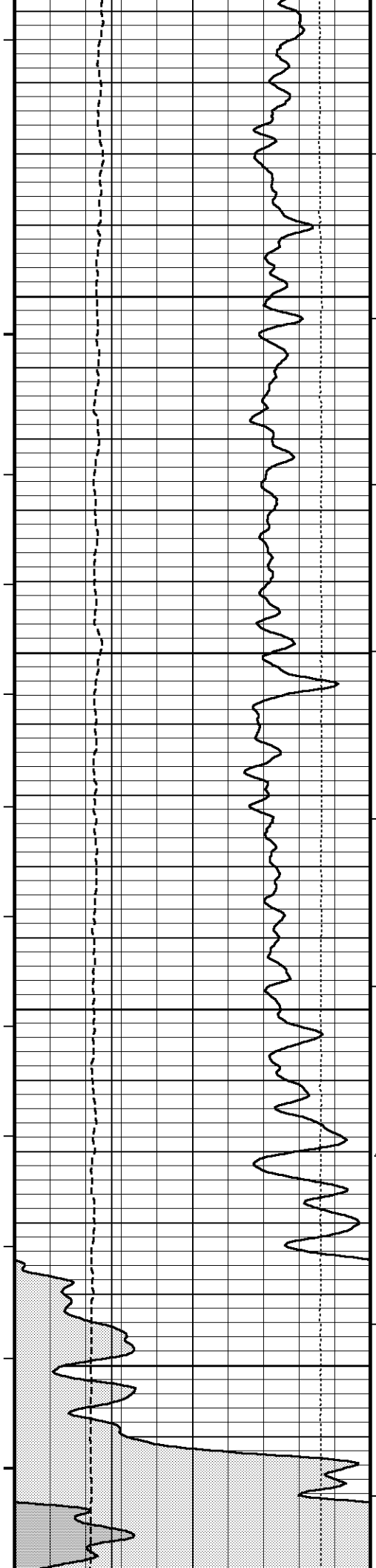












134°

4150

134°

4200

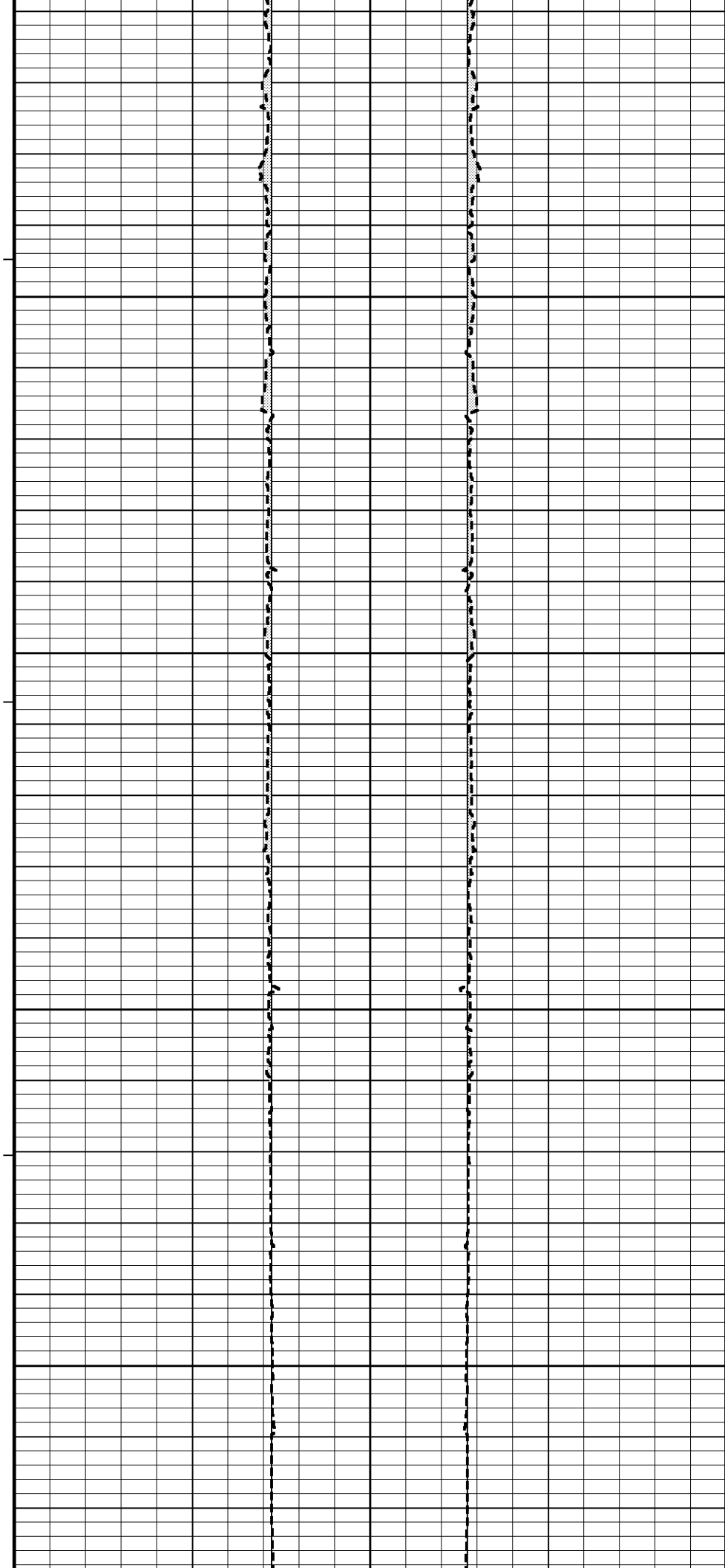
134°

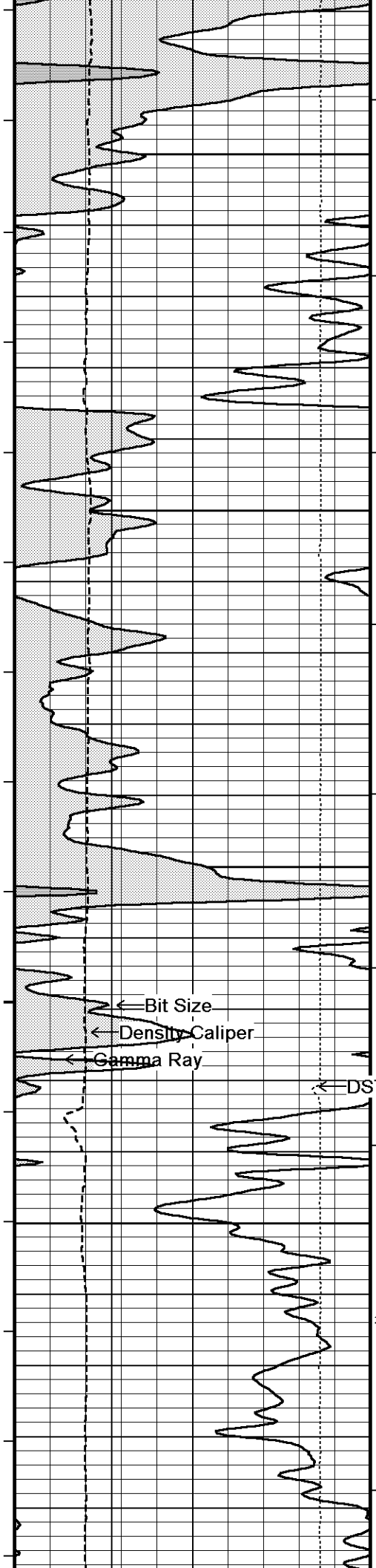
4250

400

135°

4300





135°

4350

135°

4400

135°

4450

MIE Caliper X

Bit Size

MIE Caliper X

Bit Size

DST Uphole Tension

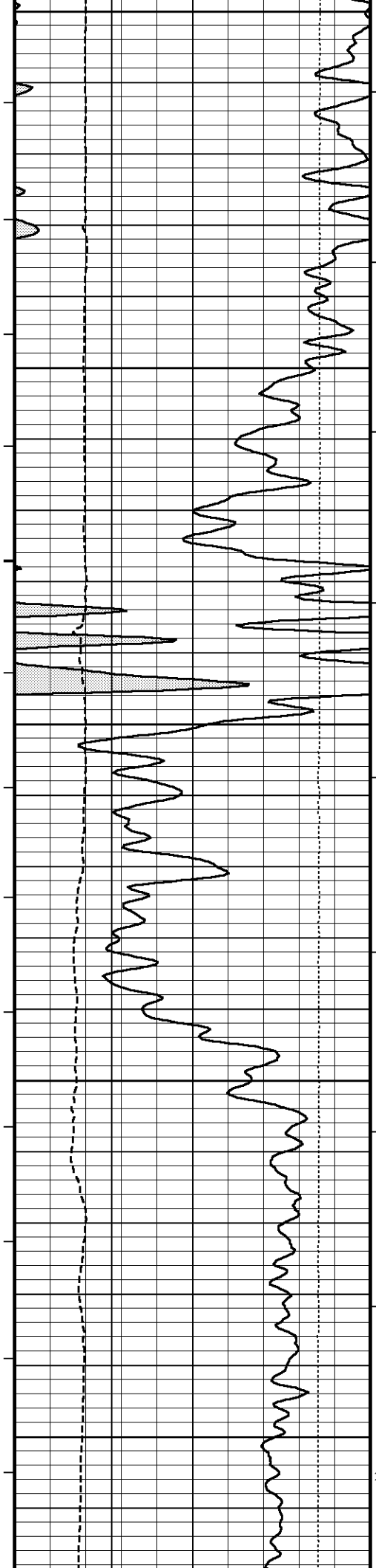
135°

4500

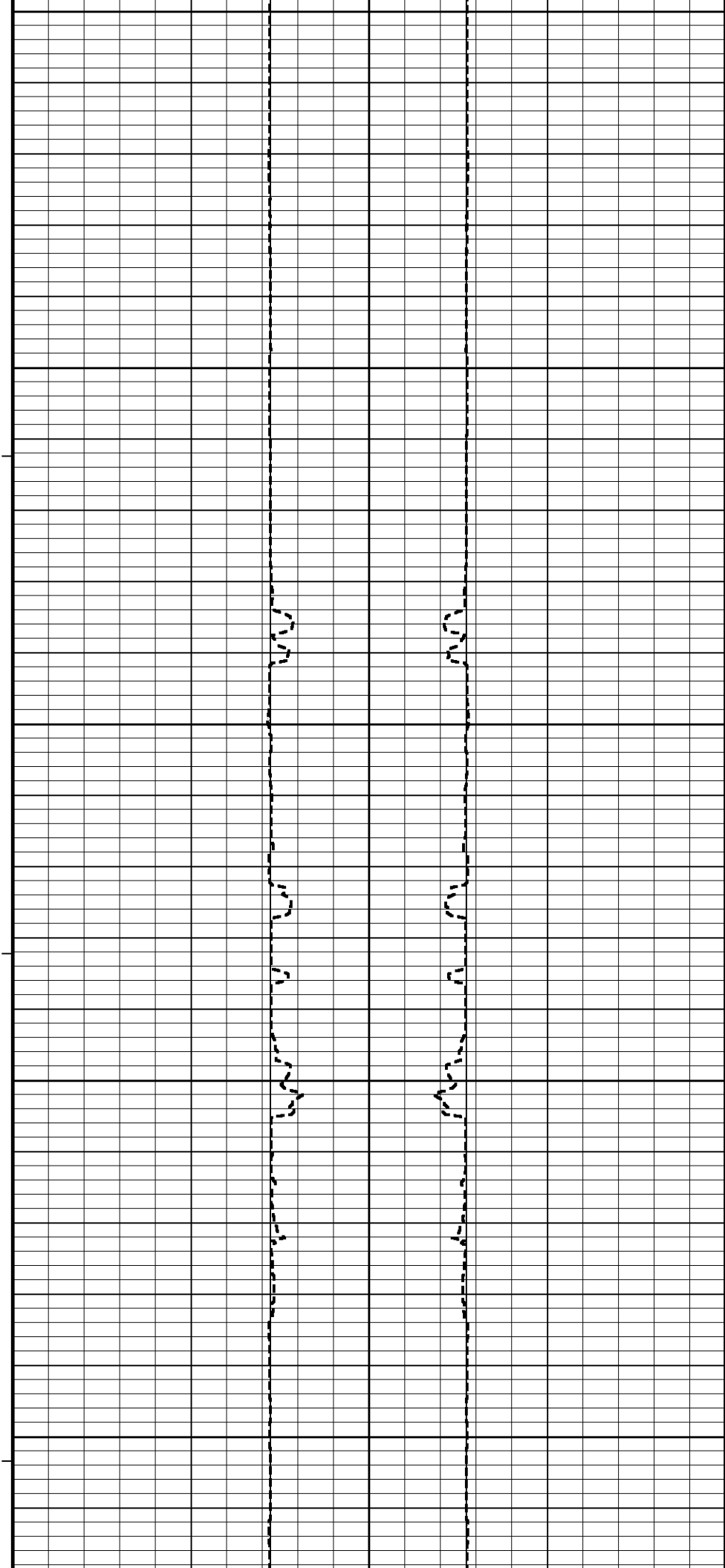
300

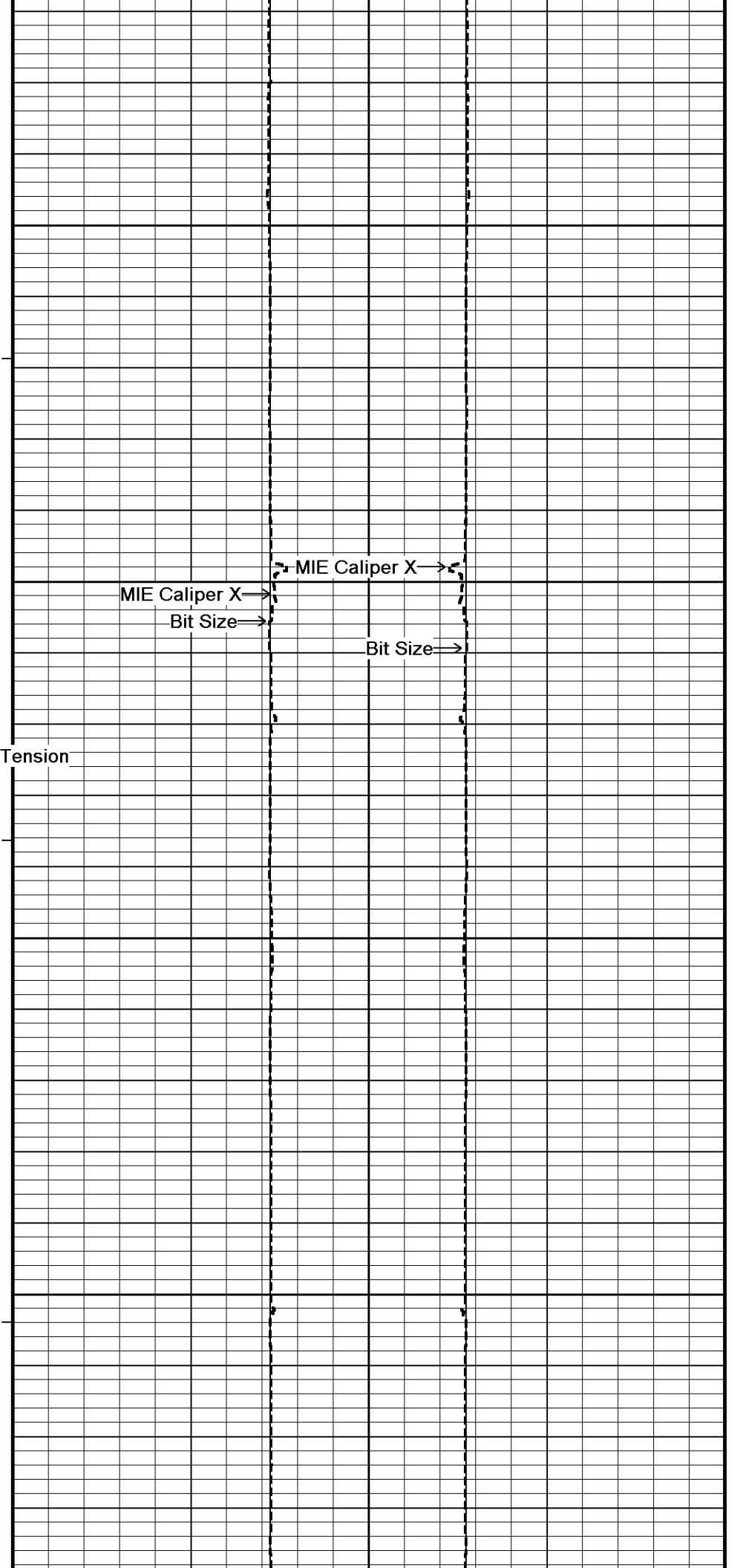
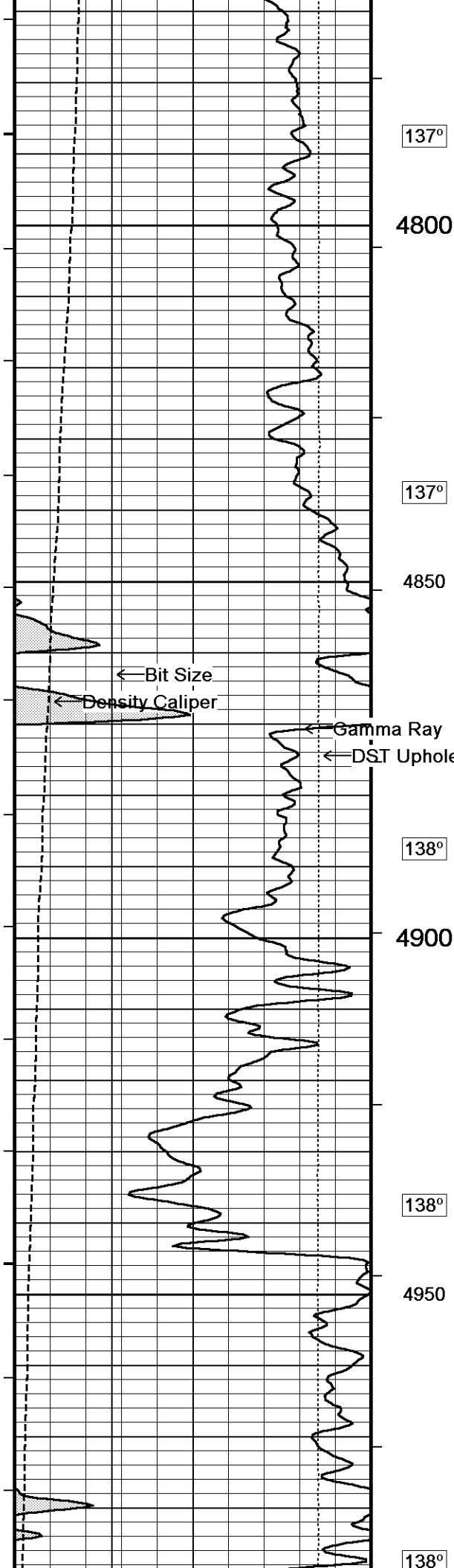
136°

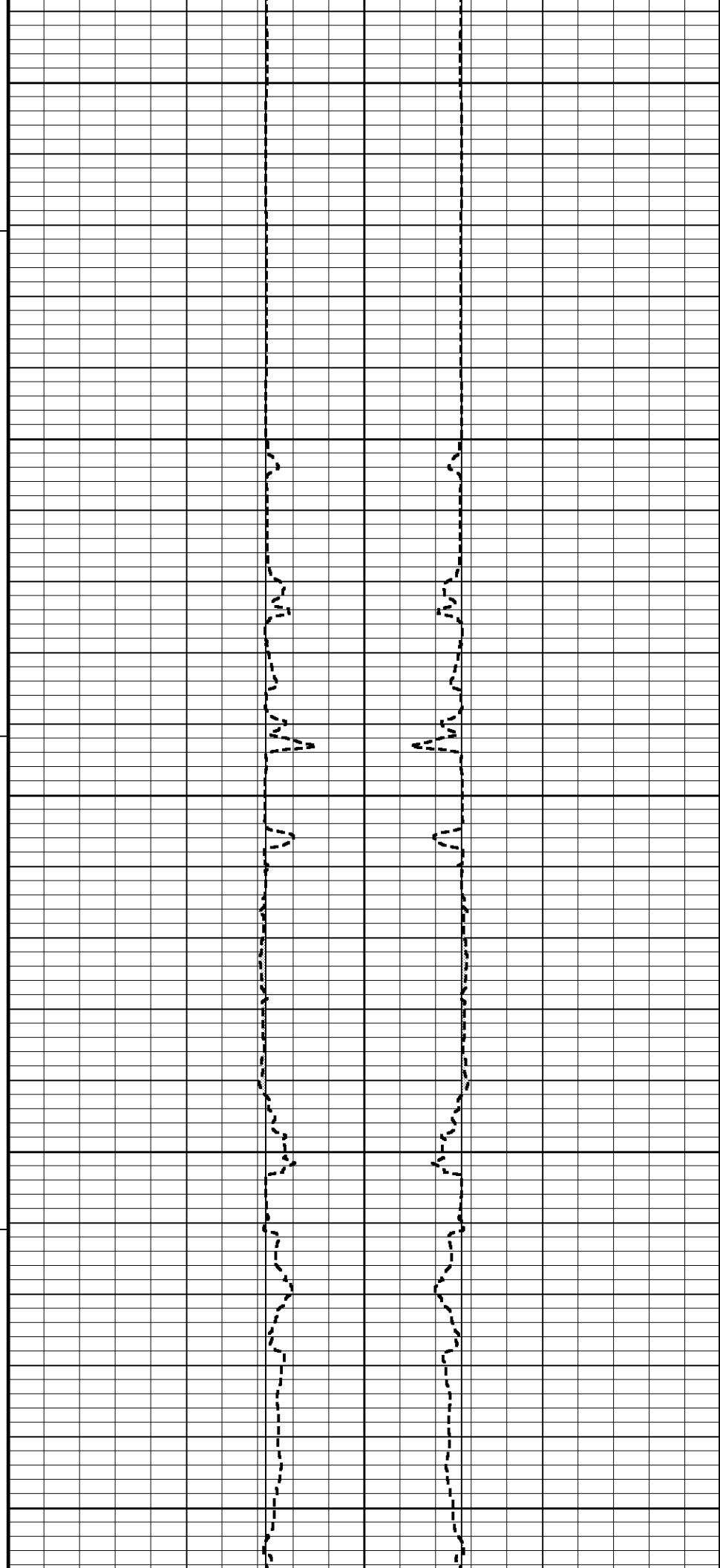
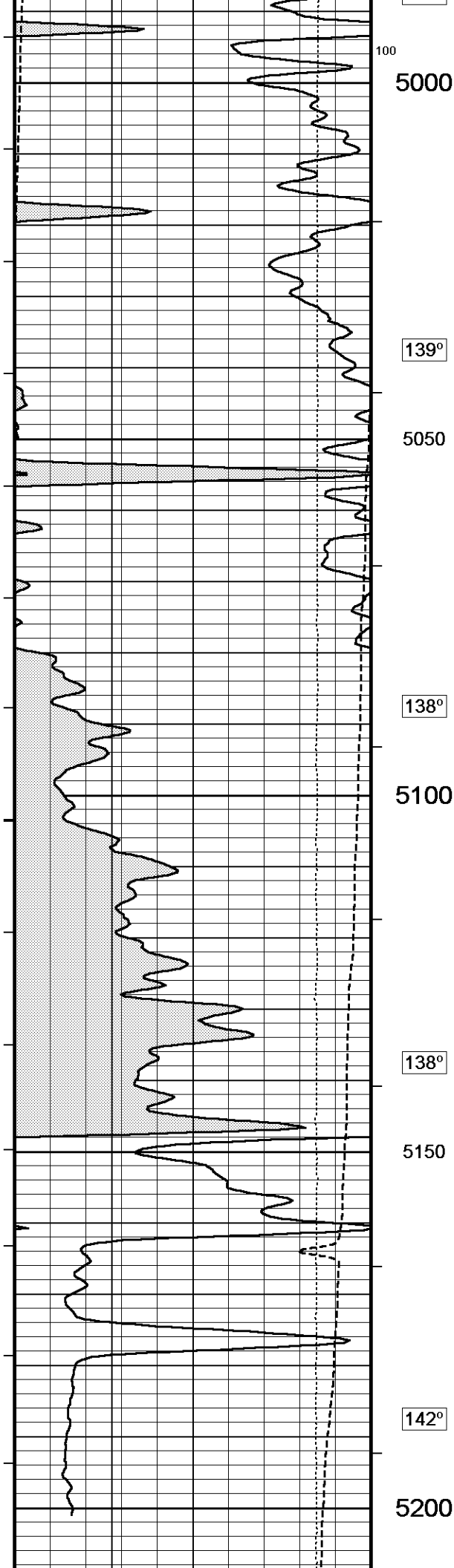
100



4550
136°
4600
137°
4650
137°
4700
137°
4750
200







Reading No	Measured	0
1	15659.85	0.00
2	15734.68	370.00

General Constants All 000			Last Edited on 23-SEP-2012,13:52		
General Parameters					
Mud Resistivity	3.460		ohm-metres		
Mud Resistivity Temperature	87.300		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	MIE Caliper X				
HVOL Caliper 2	N/A				
Annular Volume Diameter	7.000		inches		
Caliper for Differential Caliper	None				
Rwa Parameters					
Porosity used	Base Density Porosity				
Resistivity used	Deep Induction				
RWA Constant A	0.610				
RWA Constant M	2.150				

Down-hole Tension Calibration SMS 0		Field Calibration on 23-SEP-2012 09:39	
Reading No	Measured	Calibrated (lbs)	
1	15638.44	0.00	
2	16772.04	490.00	

Gamma Calibration MCG-D.K 483		Field Calibration on 22-SEP-2012 22:34	
	Measured	Calibrated (API)	
Background	124	85	
Calibrator (Gross)	885	604	
Calibrator (Net)	761	519	

Gamma Constants MCG-D.K 483		Last Edited on 25-SEP-2012,16:17	
Gamma Calibrator Number	GRCC119		
Mud Density	1.00	gm/cc	
Caliper Source for Processing	Bit Size		
Tool Position	Eccentred		
Concentration of KCl	0.00	kppm	

SP Calibration MCG-D.K 483		Field Calibration on 23-SEP-2012,10:15	
	Measured	Calibrated (mV)	
Reference 1	100.0	100.0	
Reference 2	-100.0	-100.0	

High Resolution Temperature Constants MCG-D.K 483		Last Edited on 23-SEP-2012,10:16	
Pre-filter Length	11		

Neutron Calibration MDN-B.J 372				Base Calibration on 11-SEP-2012 10:37	
				Field Check on 19-SEP-2012 08:56	
Base Calibration					
		Measured		Calibrated (cps)	
	Near	Far		Near	Far
	2935	90		3714	110
Ratio	32.738			33.764	
Field Calibrator at Base				Calibrated (cps)	
				2265	3365
Ratio				0.673	
Field Check				Calibrated (cps)	
				2282	3344
Ratio				0.000	

Neutron Constants MDN-B.J 372		Last Edited on 25-SEP-2012,16:16	
-------------------------------	--	----------------------------------	--

Neutron Source Id	P31115B	
Neutron Jig Number	NJ5299	
Epithermal Neutron	No	
Caliper Source for Processing	Bit Size	
Stand-off	0.00	inches
Mud Density	1.00	gm/cc
Limestone Sigma	7.10	cu
Sandstone Sigma	7.00	cu
Dolomite Sigma	4.70	cu
Formation Pressure Source	None	
Formation Pressure	N/A	kpsi
Temperature Source	MCG External Temperature	
Temperature	N/A	degrees F
Mud Salinity	0.00	kppm
Salinity Correction	Not Applied	
Formation Fluid Salinity Source	None	
Formation Fluid Salinity	N/A	kppm
Barite Mud Correction	Not Applied	

Imager Pad Check MIE-A.A 173 Field Check on 12-SEP-2012 09:28

Pad 1	20/20 Buttons Verified	Pad 5	20/20 Buttons Verified
Pad 2	24/24 Buttons Verified	Pad 6	24/24 Buttons Verified
Pad 3	20/20 Buttons Verified	Pad 7	20/20 Buttons Verified
Pad 4	24/24 Buttons Verified	Pad 8	24/24 Buttons Verified

Compact Micro Imager Constants MIE-A.A 173 Last Edited on 22-SEP-2012,23:06

Sonde Configuration	Imager Mode	degrees
Arm-Pad Kit	Normal Pads (12.25 in)	
Centre Pad 1 Rotational Offset	0.00	
Image/Borehole Ovality Reference	Azimuth of Pad 1	degrees
Non Active Buttons	Omit	feet
Search Angle	0.00	feet
Correlation Interval	3.28	mAmp
Correlation Step	1.64	mAmp
Current Offset	0.0000	
Squasher Start	N/A	
Image Processing	Enabled	

Navigation Constants MIE-A.A 173 Last Edited on 22-SEP-2012,23:05

Magnetic Declination	7.15	degrees	East
----------------------	------	---------	------

Magnetometer Parameters MIE-A.A 173

Date Of Last Magnetometer Calibration	23-AUG-2012,08:58		
	X Magnetometer	Y Magnetometer	Z Magnetometer
Slope	-1.000000	-1.010964	-0.998834
Offset	0.014865	-0.019075	0.015130

Magnetometer Constants MIE-A.A 173 Last Edited on

Magnetometer Calibrator Number	000
--------------------------------	-----

Accelerometer Parameters MIE-A.A 173

Date Of Last Accelerometer Calibration	8-AUG-2012,14:18		
	X Accelerometer	Y Accelerometer	Z Accelerometer
Slope	-1.112478	-1.107188	-1.099214
Offset	0.008132	0.004011	0.006751

Accelerometer Constants MIE-A.A 173 Last Edited on 05-SEP-2012,16:48

Accelerometer Calibrator Number	000
---------------------------------	-----

Accelerometer Temperature Characterisation

X Accelerometer				
Serial Number	228			
Calibration Date	10-Jul-2007			
	B0	B1	B2	B3
Bias(α)	0.00000e+000	3.38745e-005	-9.26831e-009	1.17995e-010

Scale Factor(mA/g)	3.00000e+000	2.71979e-004	6.20757e-007	-4.67664e-010
Y Accelerometer				
Serial Number	229			
Calibration Date	10-Jul-2007			
	B0	B1	B2	B3
Bias(g)	0.00000e+000	1.46083e-005	5.28186e-009	2.04363e-010
	SF0	SF1	SF2	SF3
Scale Factor(mA/g)	3.00000e+000	2.68135e-004	7.37732e-007	-8.65499e-010
Z Accelerometer				
Serial Number	212			
Calibration Date	10-Jul-2007			
	B0	B1	B2	B3
Bias(g)	0.00000e+000	2.92968e-005	-2.00645e-008	1.96637e-010
	SF0	SF1	SF2	SF3
Scale Factor(mA/g)	3.00000e+000	2.56822e-004	5.65937e-007	1.73081e-011

Caliper Calibration MIE-A.A 173				Base Calibration on 22-SEP-2012 23:13	
				Field Calibration on 22-SEP-2012 23:16	
Base Calibration					
Reading No	Pads 1-5 Meas.	Pads 3-7 Meas.	Calibrator Size (in)		
1	24690	25434	5.97		
2	34724	35775	7.96		
3	44567	45459	9.87		
4	56108	57251	11.92		
5	0	0	0.00		
Reading No	Pad 2 Meas.	Pad 4 Meas.	Pad 6 Meas.	Pad 8 Meas.	Calibrator Size (in)
1	25363	26152	25925	25306	5.97
2	33861	34843	34504	33588	7.96
3	42302	43083	42709	41981	9.87
4	51973	52931	52879	51641	11.92
5	0	0	0	0	0.00
Field Calibration					
	Measured	Measured	Actual		
	Pads 1-5 Caliper(in)	Pads 3-7 Caliper(in)	Caliper(in)		
	7.93	7.83	7.96		
	Measured	Measured	Measured	Measured	Actual
	Pad 2 Caliper(in)	Pad 4 Caliper(in)	Pad 6 Caliper(in)	Pad 8 Caliper(in)	Caliper(in)
	3.81	3.79	4.05	4.06	7.96

Caliper Constants MIE-A.A 173			Last Edited on 29-APR-2012 09:20		
Caliper Difference for BRKT		0.120	inches		

FE Calibration MFE-A.A 76			Base Calibration on 10-SEP-2012 11:36	
			Field Check on 19-SEP-2012 08:38	
Base Calibration				
	Measured		Calibrated (ohm-m)	
Reference 1	0.0		0.0	
Reference 2	964.4		126.8	
Base Check			279.9	
Field Check			280.1	

FE Constants MFE-A.A 76				Last Edited on 25-SEP-2012,16:16	
Running Mode		No Sleeve			
MFE K Factor		0.1268			
Caliper Source for FE correction		Bit Size			
Caliper Value for FE correction		N/A		inches	
Rm Source for FE correction		Temperature Corr			
Temp. for Rm Corr.		MCG External Temperature			
Stand-off		1.0		inches	

High Resolution Temperature Calibration MAI-B.A 219			Field Calibration on 10-AUG-2011,00:10
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	

Upper

75.00

75.00

High Resolution Temperature Constants MAI-B.A 219

Last Edited on 10-SEP-2012,10:18

Pre-filter Length

11

Induction Calibration MAI-B.A 219

Base Calibration on 08-MAY-2012,15:56

Field Check on 19-SEP-2012 08:29

Base Calibration

Test Loop Calibration

Measured

Calibrated (mmho/m)

Channel	Low	High	Low	High
1	17.4	478.1	9.3	966.2
2	5.8	380.3	7.6	821.4
3	3.5	258.5	5.2	566.0
4	1.9	136.0	2.6	279.2

Array Temperature

77.2

Deg F

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1	0.0	0.0	12.2	3791.7
2	0.0	0.0	30.9	3535.9
3	0.0	0.0	28.6	3055.1
4	0.0	0.0	19.3	2027.9
Deep	0.0	0.0	16.5	1948.3
Medium	0.0	0.0	42.7	4087.3
Shallow	0.0	0.0	47.5	5281.3

Array Temperature

0.0

64.9

Deg F

Induction Constants MAI-B.A 219

Last Edited on 25-SEP-2012,16:16

Induction Model

RtAP-WBM

Caliper for Borehole Corr.

Bit Size

Hole Size for Borehole Correction

N/A

inches

Tool Centred

No

Stand-off Type

Fins

Stand-off

1.00

inches

Number of Fins on Stand-off

6.0000

Stand-off Fin Angle

60.00

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	

Caliper Calibration MPD-C.A 196

Base Calibration on 11-SEP-2012 13:59

Field Calibration on 19-SEP-2012 08:45

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	15672	3.99
2	24368	5.97
3	32940	7.96
4	41136	9.87
5	50464	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.91	7.96

Photo Density Calibration MPD-C.A 196

Base Calibration on 11-SEP-2012 15:19

Field Check on 19-SEP-2012 08:44

Density Calibration

Base Calibration

	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	37007	13951	52994	19128
Reference 2	17051	1942	25185	2558

Field Check at Base

601.7 931.8

Field Check

598.3 935.0

PE Calibration

Base Calibration

	WS	Measured		Calibrated
		WH	Ratio	Ratio
Background	110	536		
Reference 1	11578	36914	0.315	0.309
Reference 2	4580	16980	0.272	0.274

Field Check at Base

110.3 536.4

Field Check

111.2 540.3

Density Constants MPD-C.A 196

Last Edited on 25-SEP-2012,16:16

Density Source Id	P15771B
Nylon Calibrator Number	DNC-D-527
Aluminium Calibrator Number	DAC-D-527
Density Shoe Profile	8 inch
Caliper Source for Processing	Density Caliper
PE Correction to Density	Not Applied
Mud Density	1.16 gm/cc
Mud Density Z/A Multiplier	1.11
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
Density Z/A Correction	Hybrid

Matrix Density (gm/cc)

Depth (ft)

2.65	5208.00
2.68	5060.00
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:\Users\le173613\AppData\Local\Temp\Weatherford PreView\0\ECGS 6-16 WPD009-2_INITIAL6.dta

3/8" Triple Cone Cable Head (MCB C A)
MCB-C.A 5 LG: 1.58 ft WT: 15.4 lb OD: 2.24 in

SHA-H Compact Swivel Head Adaptor
SHA-H 142 LG: 2.30 ft WT: 22.0 lb OD: 2.24 in

Compact Comms Gamma
MCG-D.K 483 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Neutron
MDN-B.J 372 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper
MPD-C.A 196 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

MIS-A.A Compact Inline Bowspring sub
MIS-A.A 70 LG: 5.70 ft WT: 33.1 lb OD: 2.24 in

SKJ-E.B Compact Knuckle Joint
SKJ-E.B 585 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

MIS-E.A Compact Inline Standoff sub
MIS-E.A 334 LG: 2.14 ft WT: 15.4 lb OD: 2.24 in

SKJ-D.A Compact Knuckle Joint
SKJ-D.A 112 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

Compact MMI Memory Section
MIM-A.A 173 LG: 4.65 ft WT: 26.5 lb OD: 2.24 in

Compact MMI Electrode Section
MIE-A.A 173 LG: 13.96 ft WT: 99.2 lb OD: 4.09 in

SKJ-D.A Compact Knuckle Joint
SKJ-D.A 143 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

Compact Focussed Electric
MFE-A.A 76 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction
MAI-B.A 219 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 77.00 ft Weight: 586.4 lb



Tool Zero (0.13ft from bottom)
All measurements relative to tool zero.

COMPANY	EAST CHEYENNE GAS STORAGE LLC
WELL	ECGS NO 6-16 WPD009-2
FIELD	PEETZ WEST
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA/COLORADO

Elevation Kelly Bushing	4567.00	feet	First Reading	5206.00	feet
Elevation Drill Floor	4566.00	feet	Depth Driller	5260.00	feet
Elevation Ground Level	4555.00	feet	Depth Logger	5260.00	feet



CALIPER
LOG

Weatherford®

