



**Weatherford®**

**ARRAY INDUCTION LOG  
GAMMA RAY LOG**

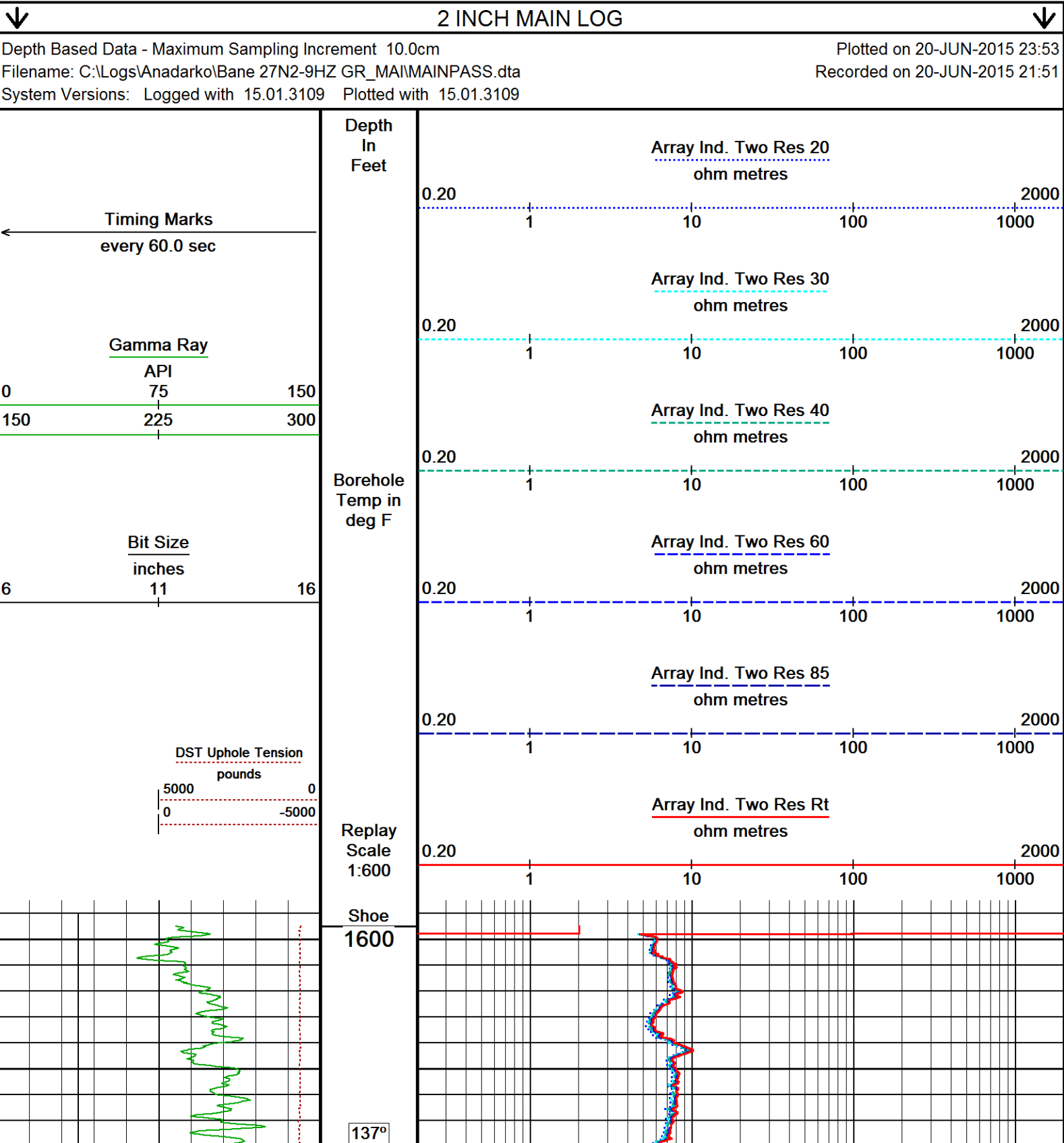
COMPANY				ANADARKO PETROLEUM			
WELL				BANE 27N2-9HZ			
FIELD				WATTENBERG			
PROVINCE/COUNTY				WELD			
COUNTRY/STATE				USA/COLORADO			
LOCATION				SHL: 620' FSL & 1440' FEL			
SEC 9	TWP 1N	RGE 6SW	Other Services				
Latitude		40.060443					
Longitude		-104.664736					
API Number		0512341304					
Permanent Datum GL, Elevation 4966 feet							
Log Measured From KB							
Drilling Measured From KB @ 25 FT							
Date	20-JUN-2015			Elevations:			
Run Number	ONE			KB	4991.00		
Service Order	1746-122031571			DF	4991.00		
Depth Driller	6591.00			GL	4966.00		
Depth Logger	6611.00						
First Reading	6611.00						
Last Reading	1595.00						
Casing Driller	1595.00						
Casing Logger	1595.00						
Bit Size	8.500						
Hole Fluid Type	OBM						
Density / Viscosity	9.50	lb/USg	61.00	sec/Ct			
PH / Fluid Loss	---		14.00	ml/30Min			
Sample Source	---						
Rm @ Measured Temp	---						
Rmf @ Measured Temp	---						
Rmc @ Measured Temp	---						
Source Rmf / Rmc	---		---				
Rm @ BHT	---						
Time Since Circulation	8 HRS						
Max Recorded Temp	200.00			deg F			
Equipment / Base	13173		CASPER				
Recorded By	MAXIM FILIMONOV						
Witnessed By	KALIB FORD						

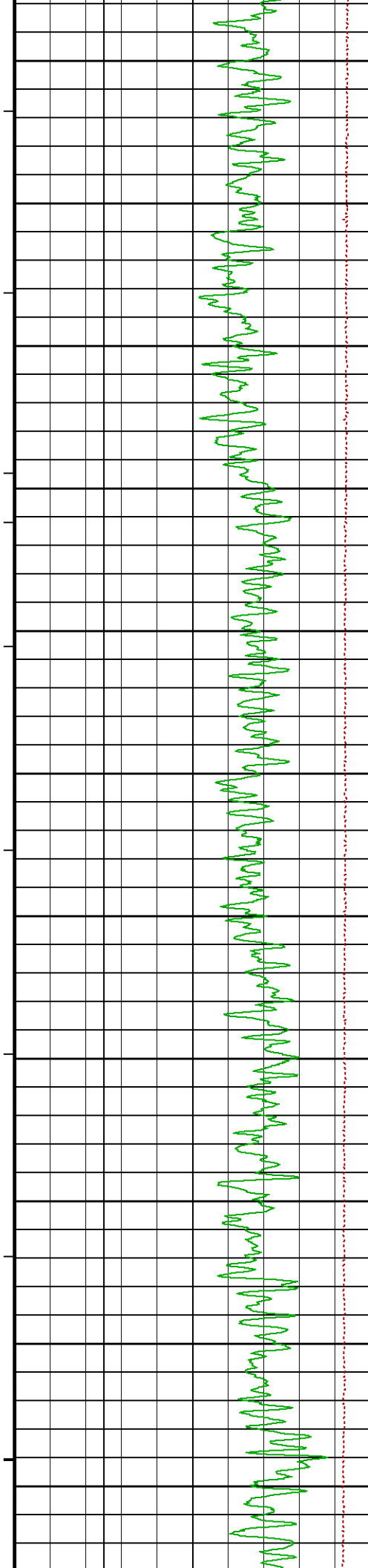
BOREHOLE RECORD					Last Edited: 20-JUN-2015 18:56
Bit Size inches		Depth From feet		Depth To feet	
8.500		1595.00		6591.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	9.625	0.00	1595.00	40.00	

REMARKS
SOFTWARE: 15.01.3109
DEPTH CONTROL: CALIBRATED MEASURE WHEEL METHOD.
TOOLS: MAI, MFE, SKJ, MCG, SHA, MLK RUN IN COMBINATION.
HARDWARE: MAI: 2 x 0.5" STANDOFFS
ALL INTERVALS LOGGED AND SCALED PER CLIENT REQUEST FROM KOP DEPTH (6591 FT) TO SURFACE CASING SHOE.
BARITE ADDED TO MUD MAY AFFECT POROSITY MEASUREMENTS.
MAXIMUM DEVIATION ADVISED: APPROX 15 DEG.
RIG: HP 307

In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data,

type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.





1700

138°

1800

141°

1900

142°

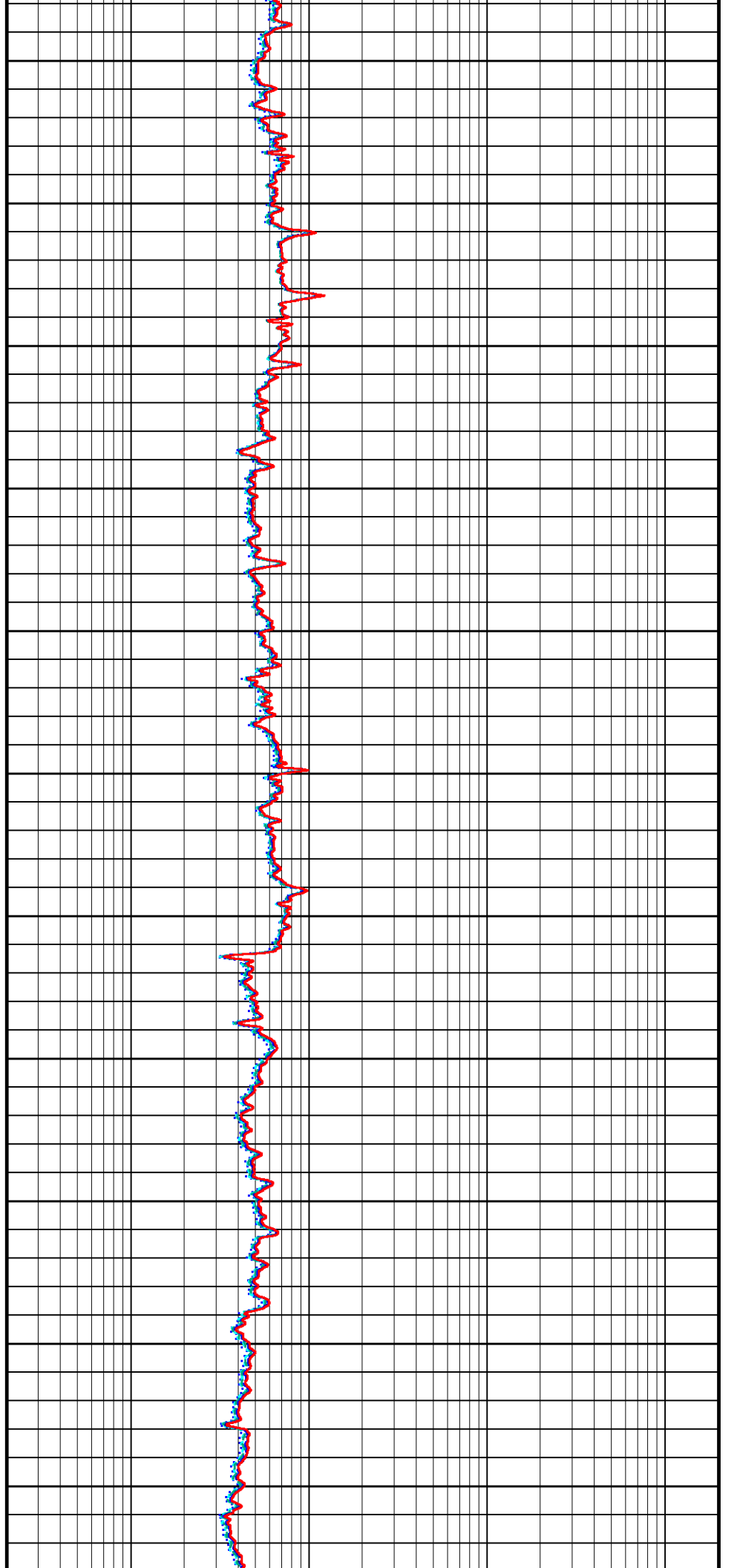
2000

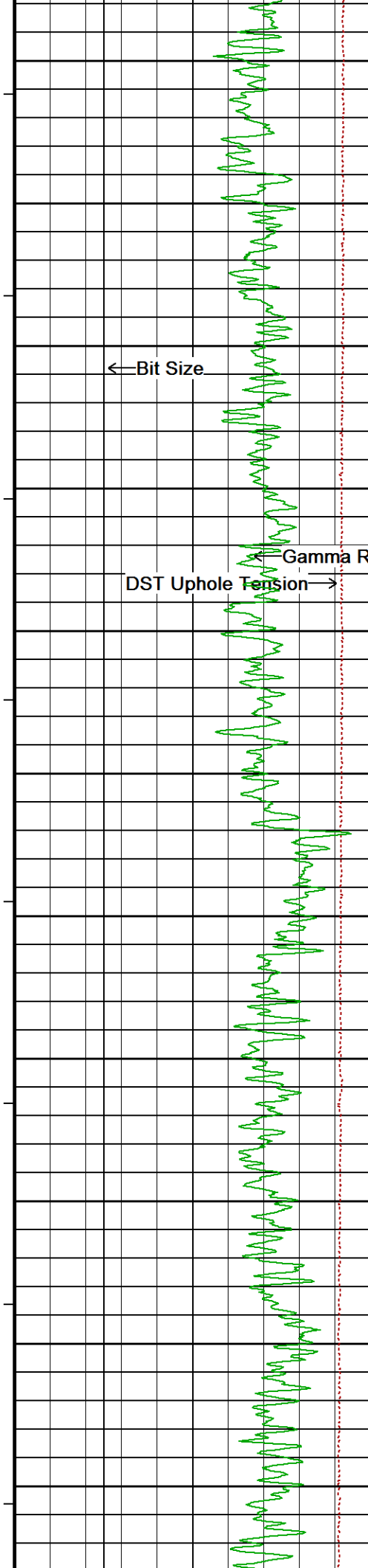
143°

2100

145°

2200





146°

2300

148°

2400

149°

2500

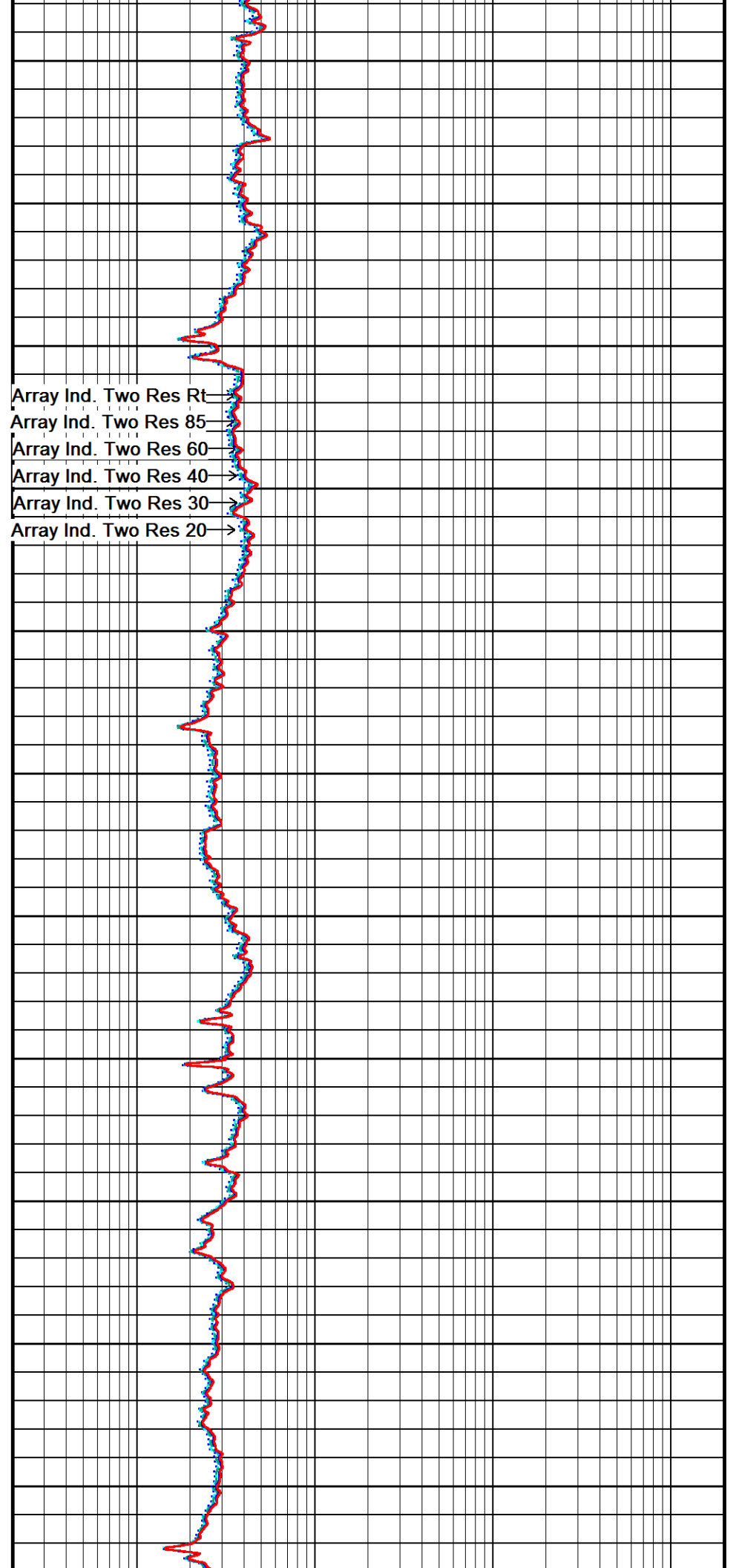
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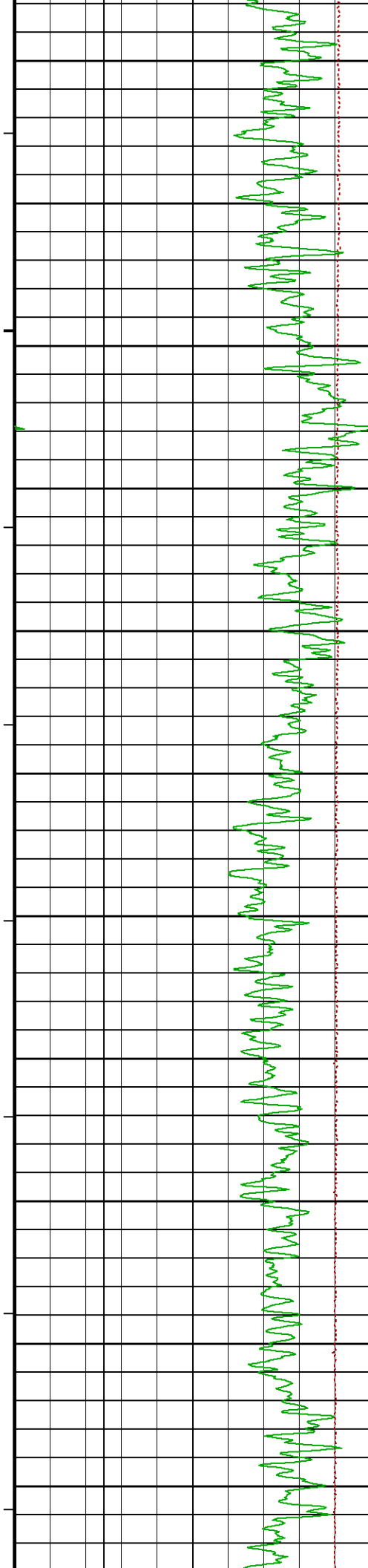
2600

153°

2700

154°





2800

155°

2900

156°

3000

158°

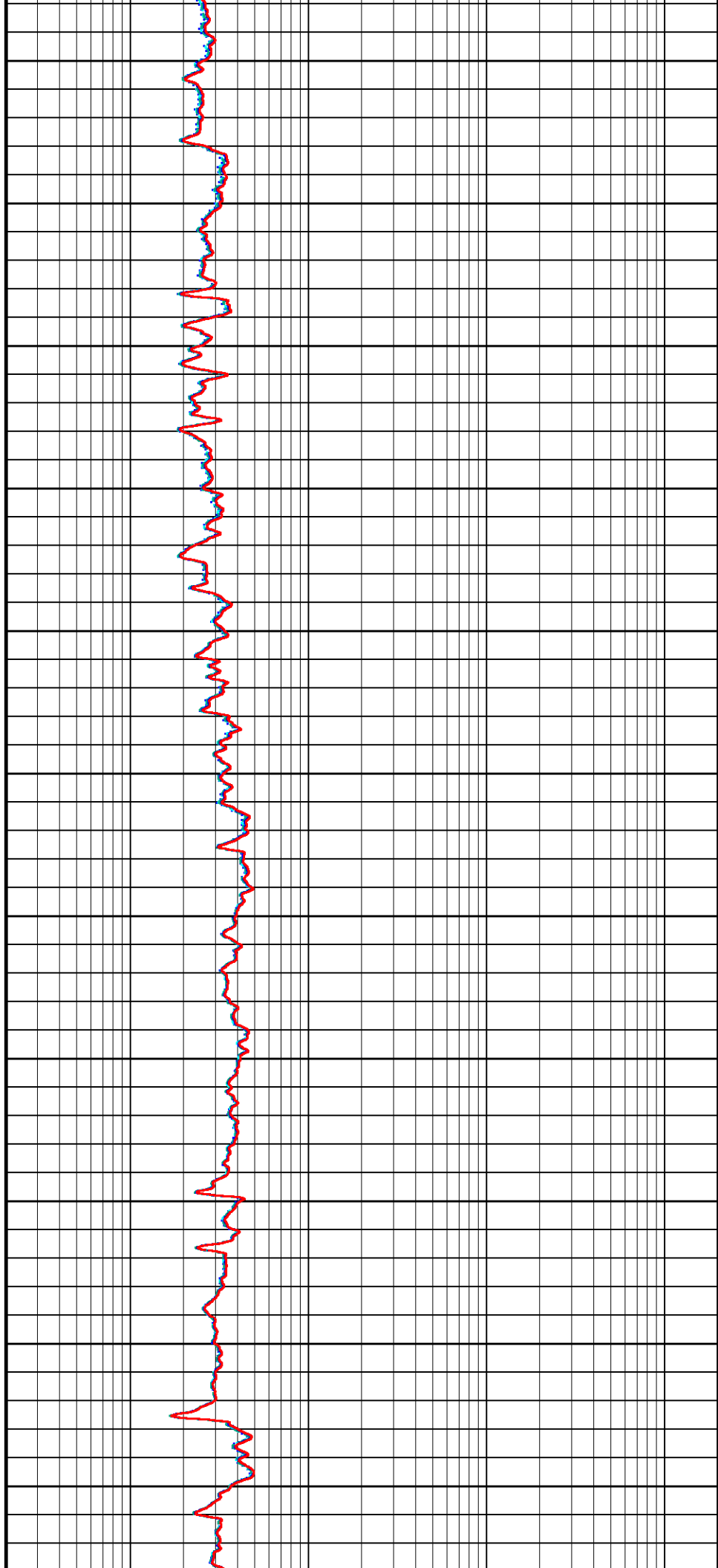
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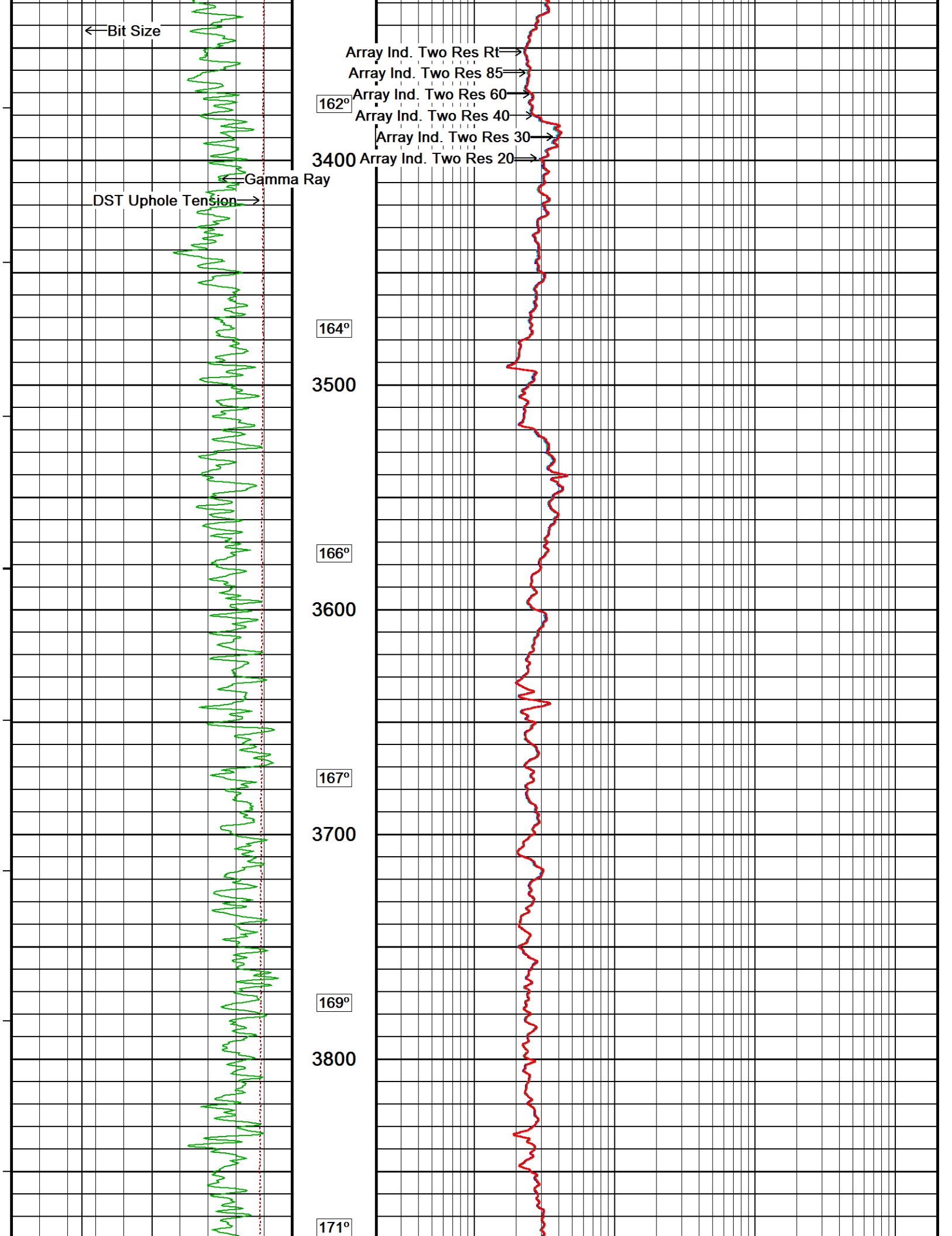
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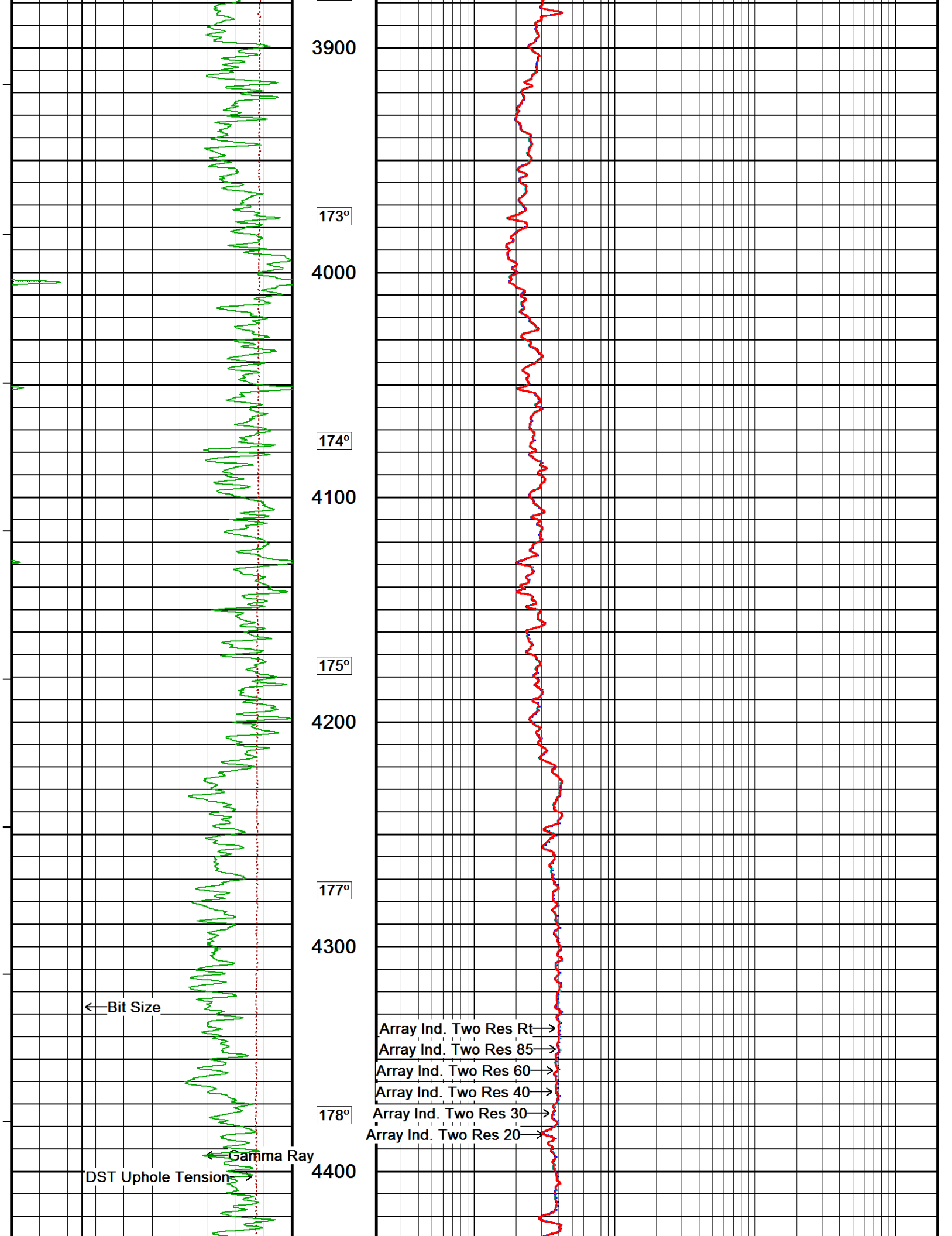
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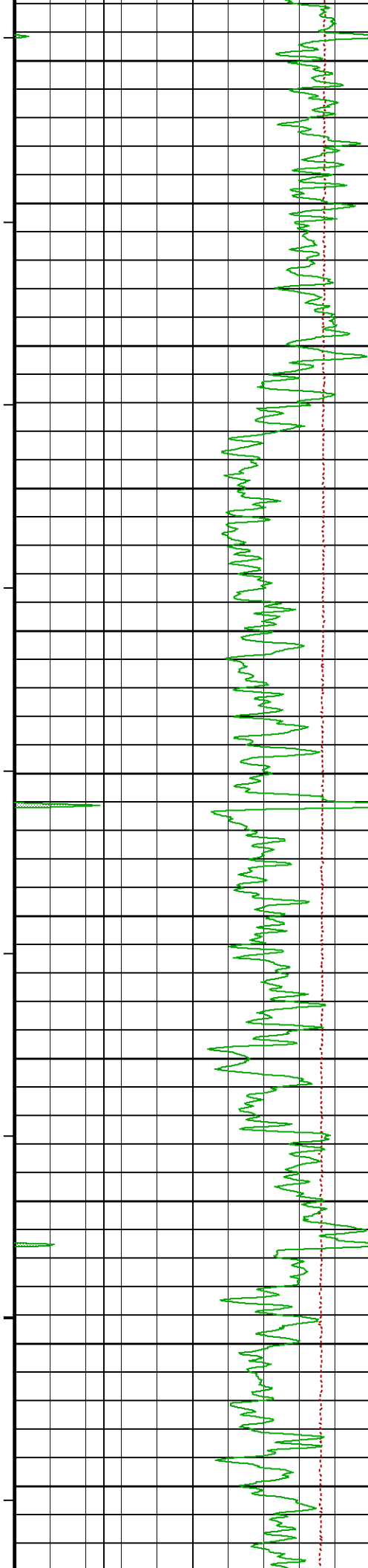
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3300









179°

4500

181°

4600

182°

4700

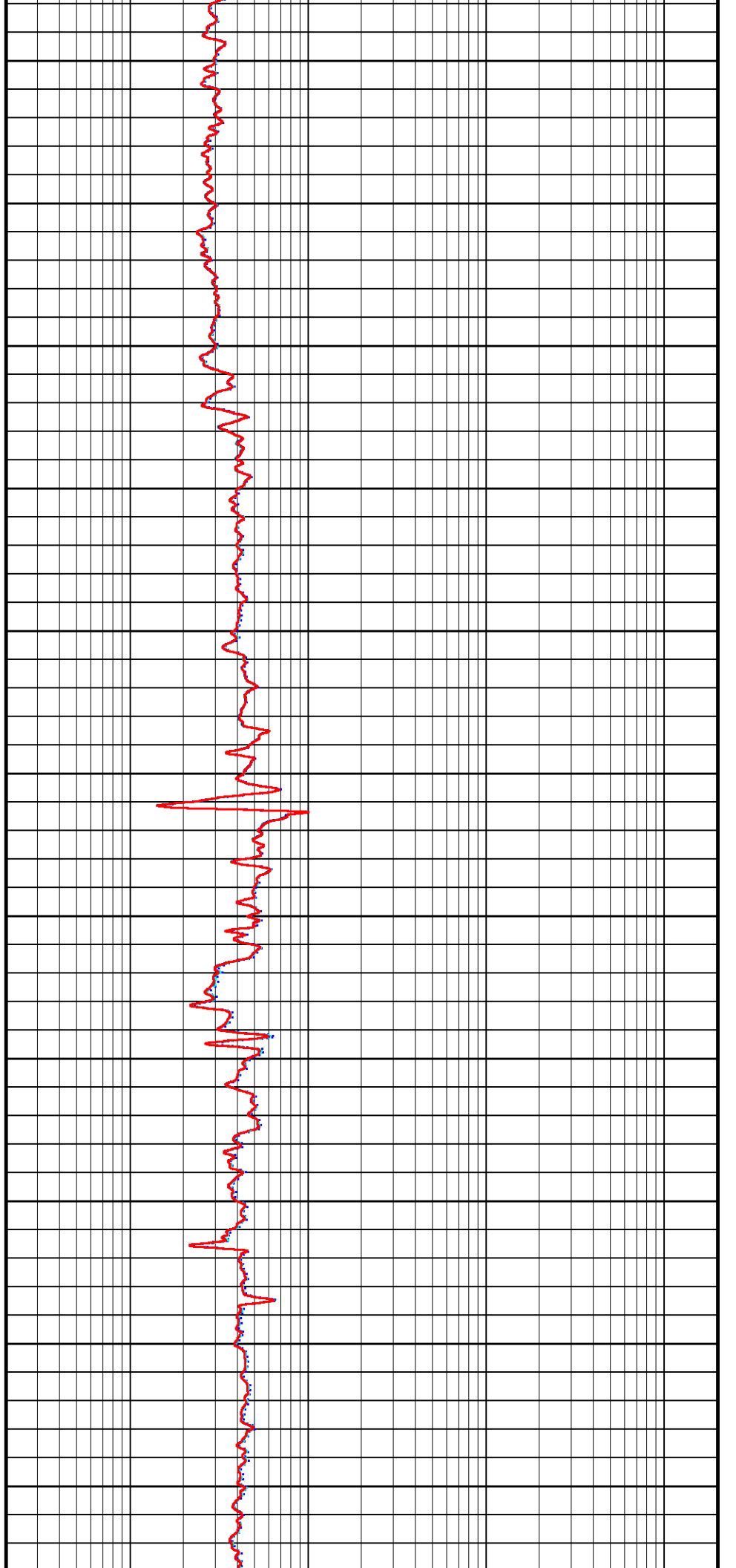
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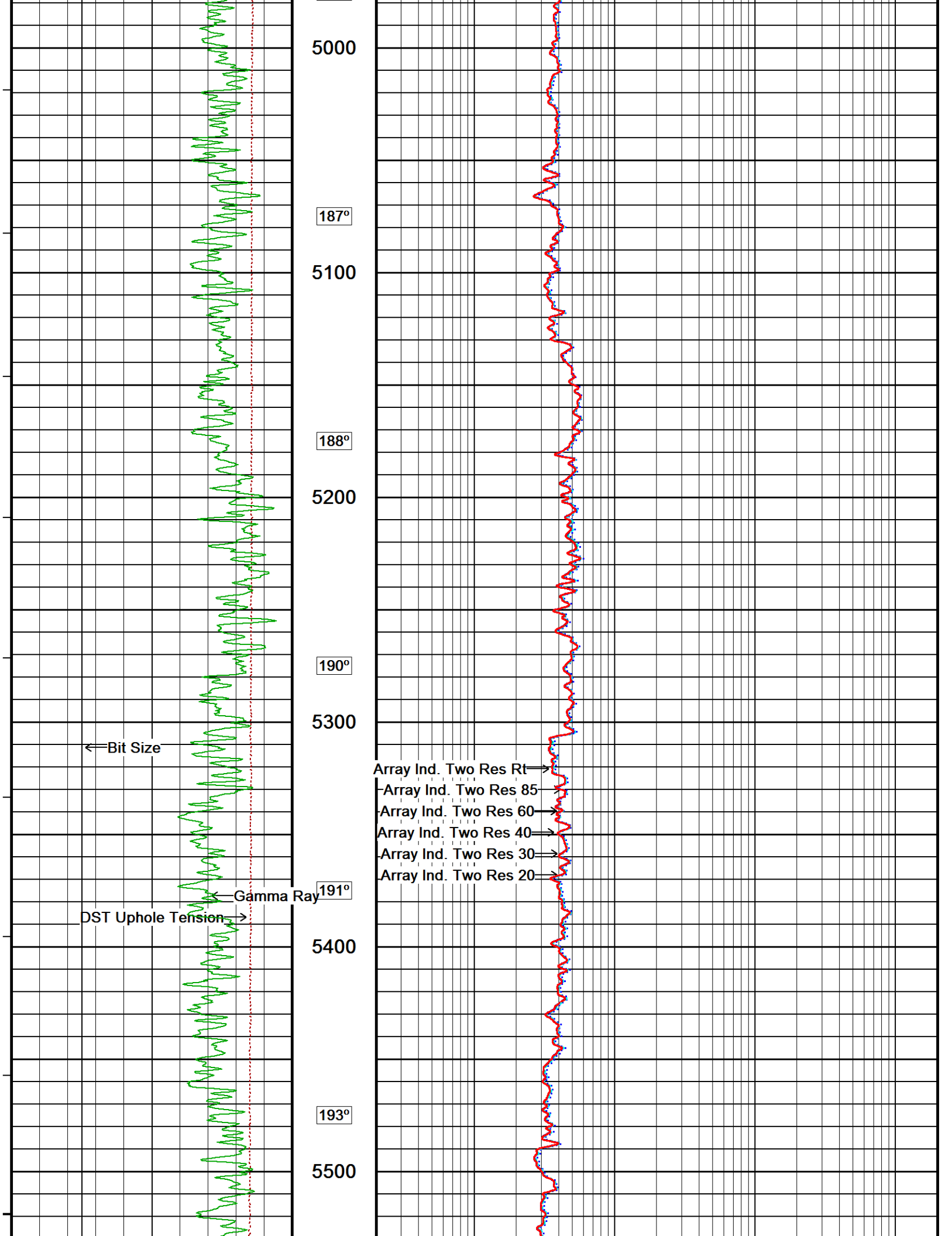
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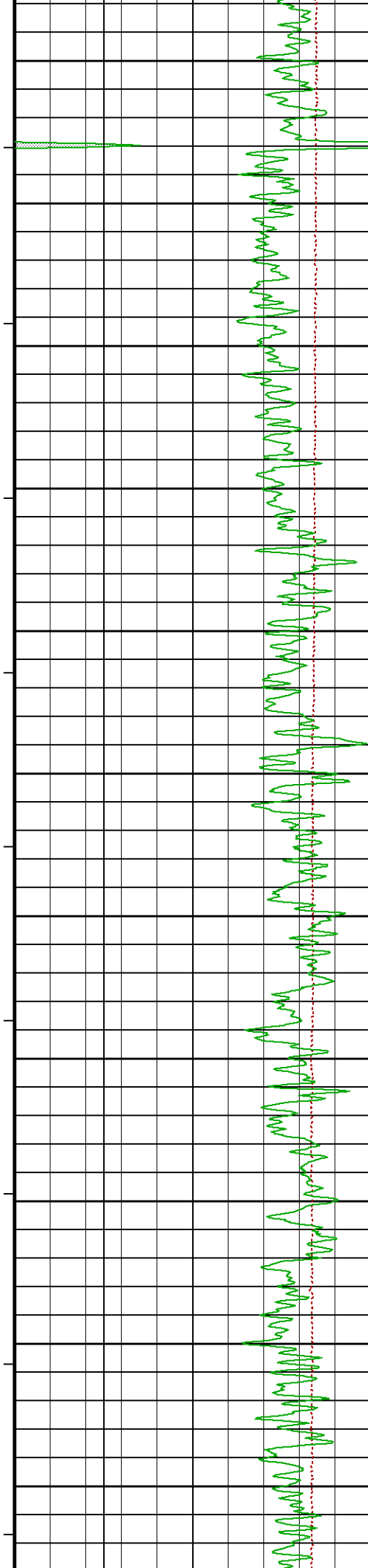
185°

4900

186°







194°

5600

195°

5700

197°

5800

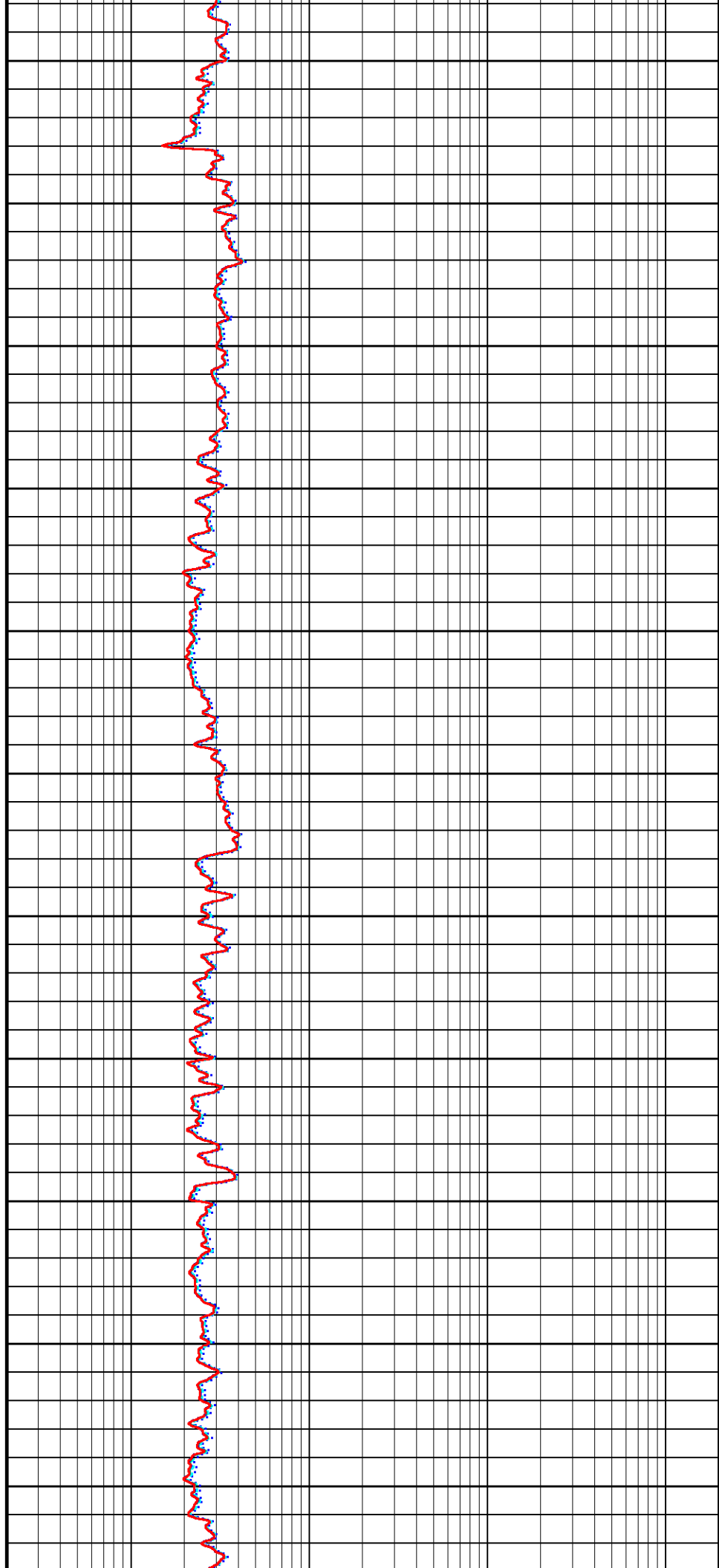
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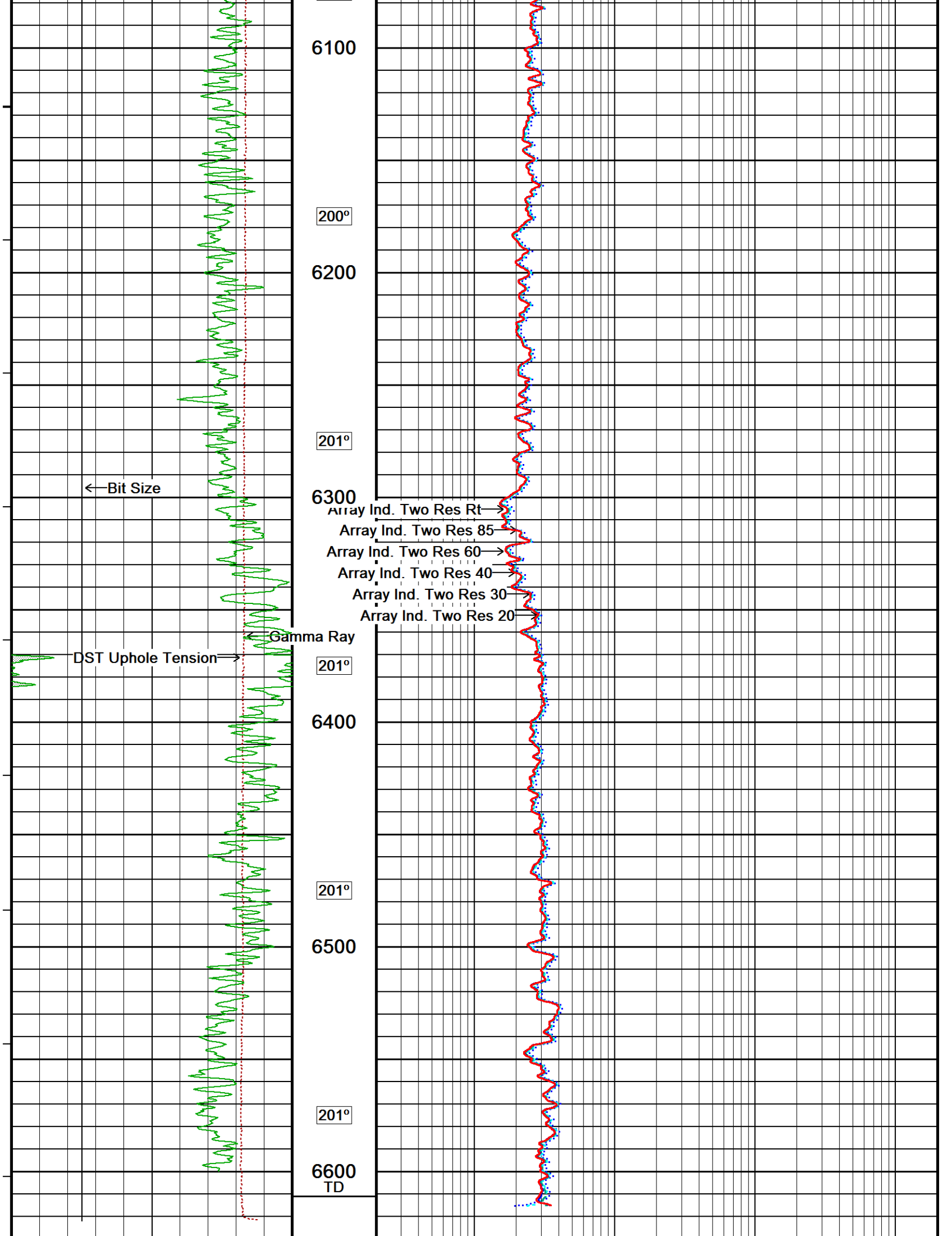
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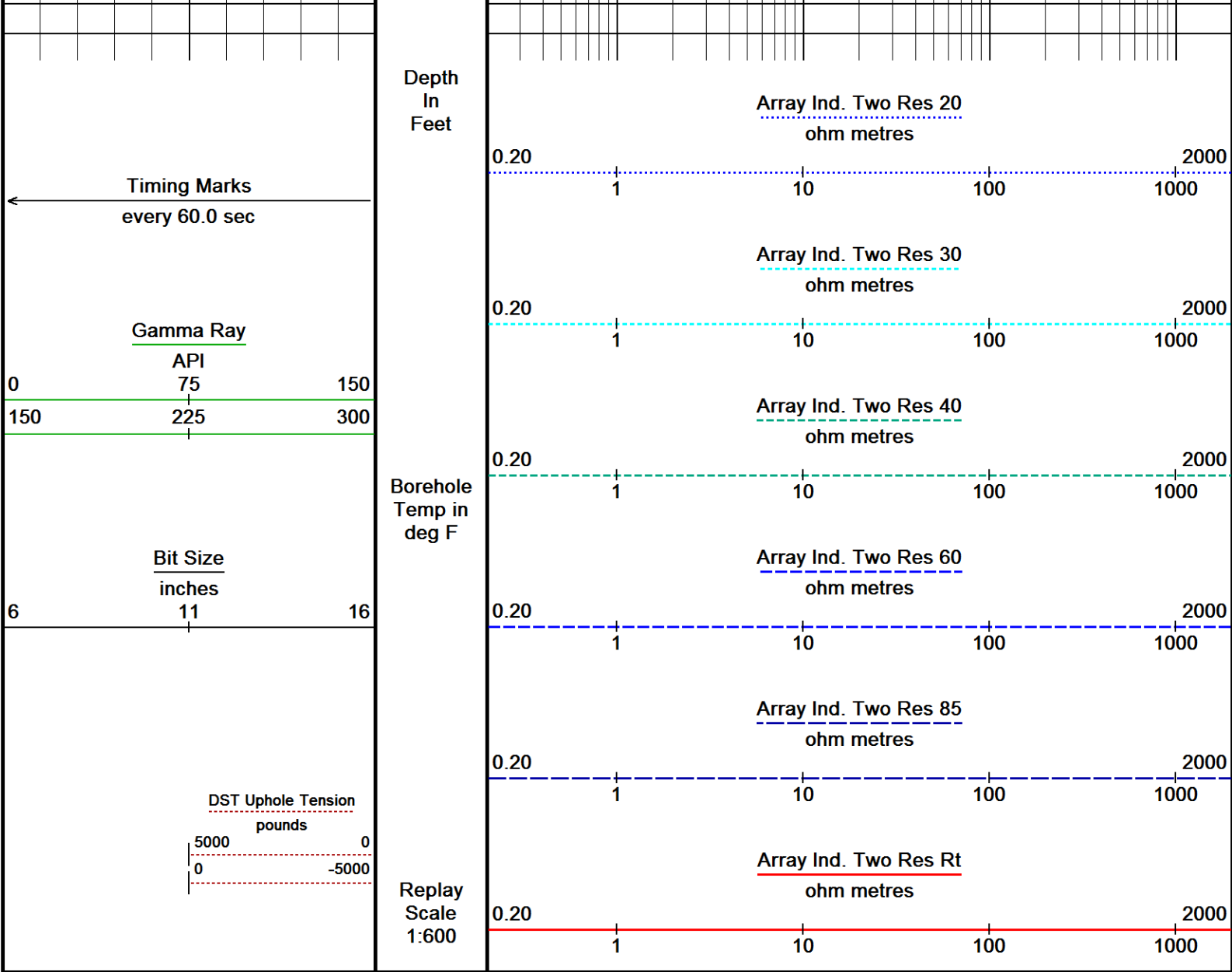
199°

6000

200°







Depth Based Data - Maximum Sampling Increment 10.0cm Filename: C:\Logs\Anadarko\Bane 27N2-9HZ GR_MAI\MAINPASS.dta System Versions: Logged with 15.01.3109 Plotted with 15.01.3109	Plotted on 20-JUN-2015 23:53 Recorded on 20-JUN-2015 21:51
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↑

2 INCH MAIN LOG

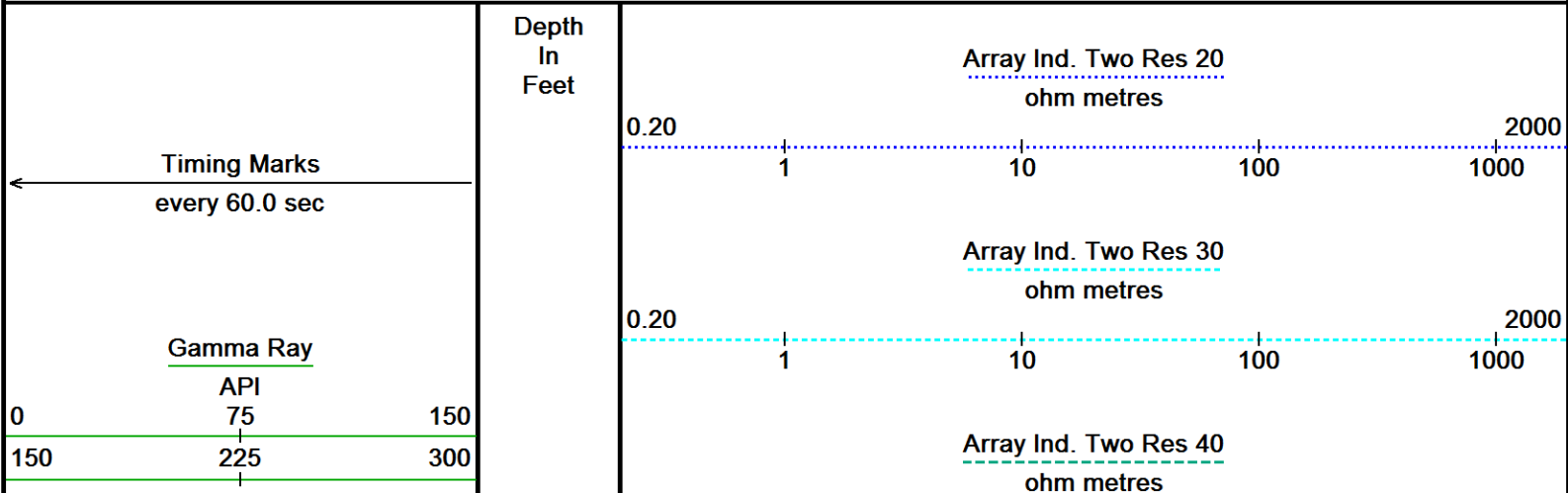
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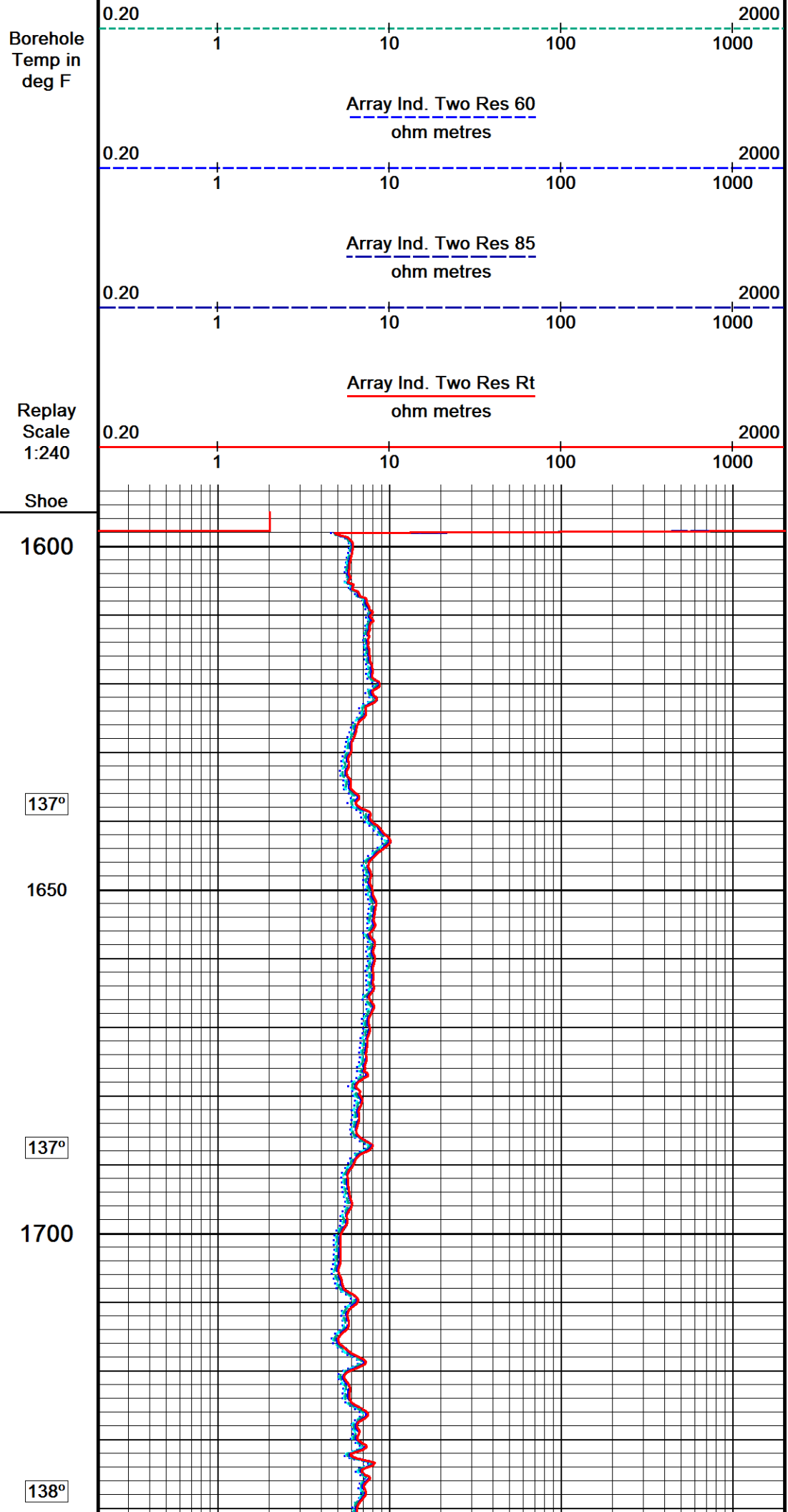
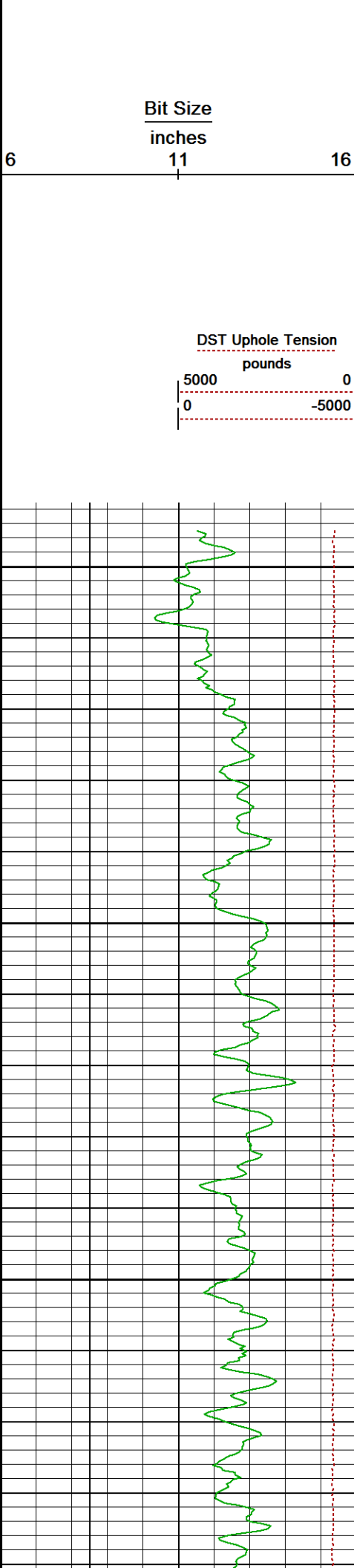
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5 INCH MAIN LOG

↓

Depth Based Data - Maximum Sampling Increment 10.0cm Filename: C:\Logs\Anadarko\Bane 27N2-9HZ GR_MAI\MAINPASS.dta System Versions: Logged with 15.01.3109 Plotted with 15.01.3109	Plotted on 20-JUN-2015 23:53 Recorded on 20-JUN-2015 21:51
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← Bit Size

← Gamma Ray  
DST Uphole Tension →

1750

139°

1800

139°

1850

141°

1900

142°

1950

Array Ind. Two Res Rt →

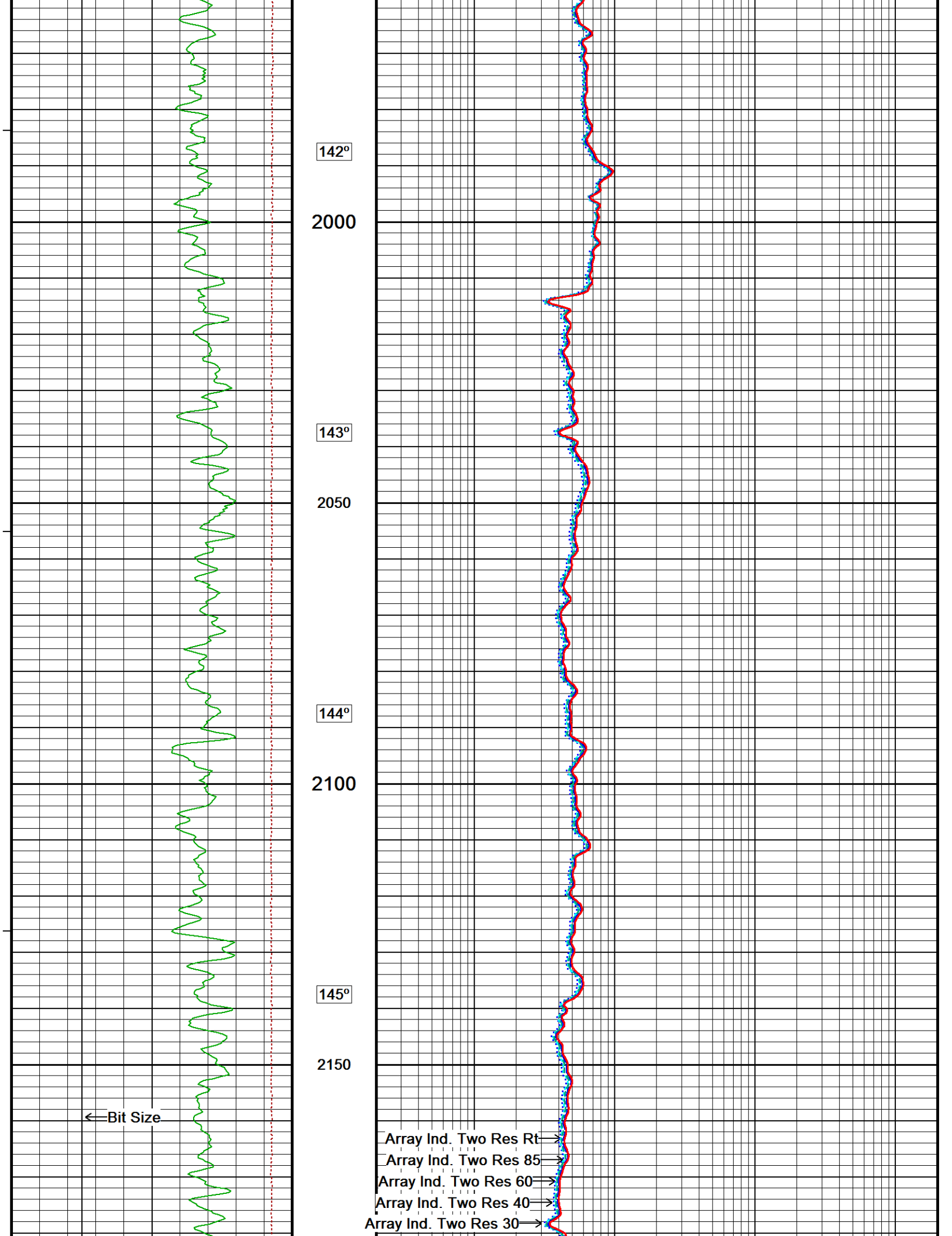
Array Ind. Two Res 85 →

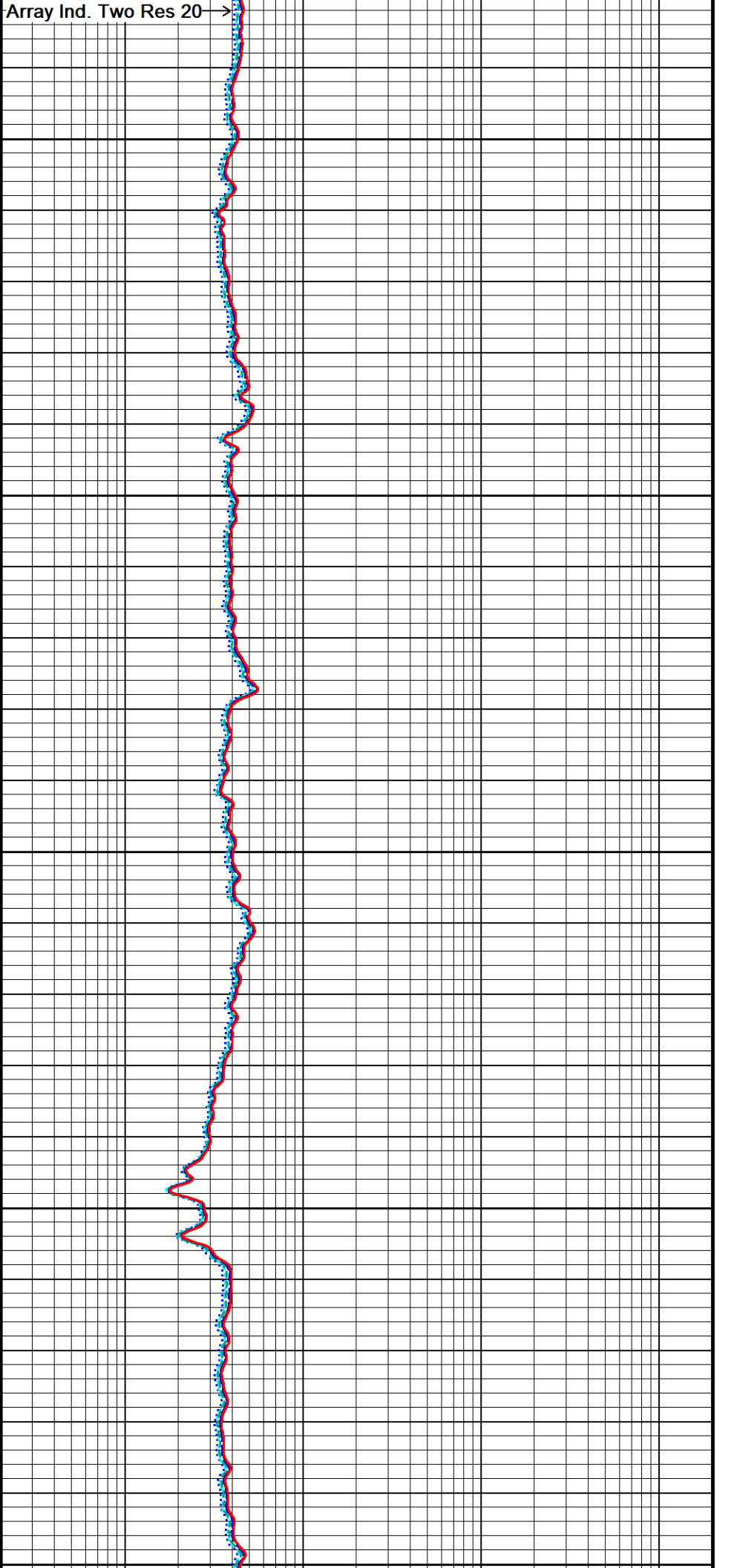
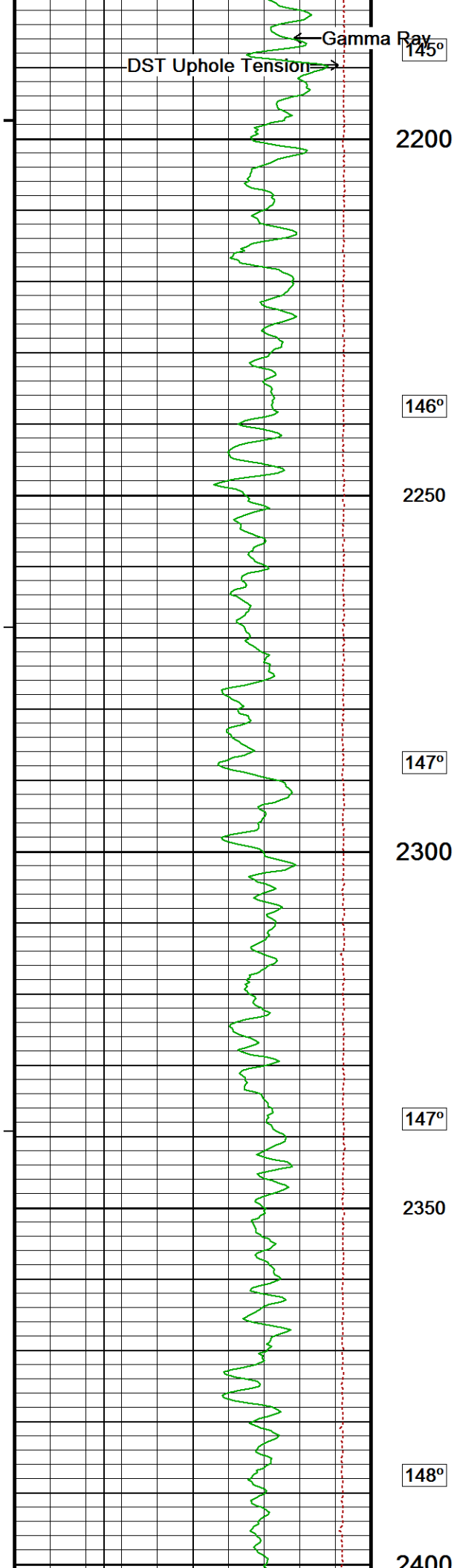
Array Ind. Two Res 60 →

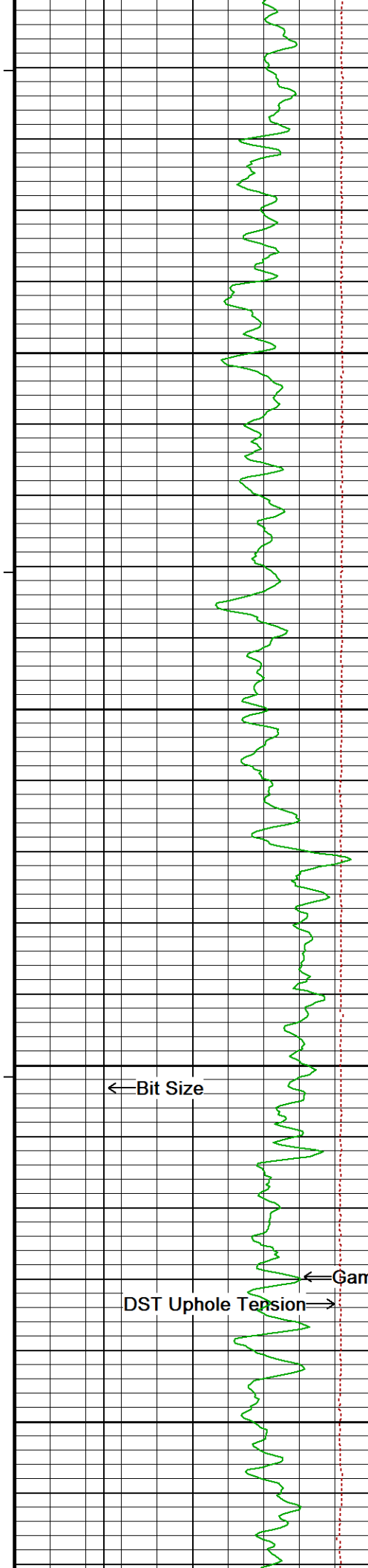
Array Ind. Two Res 40 →

Array Ind. Two Res 30 →

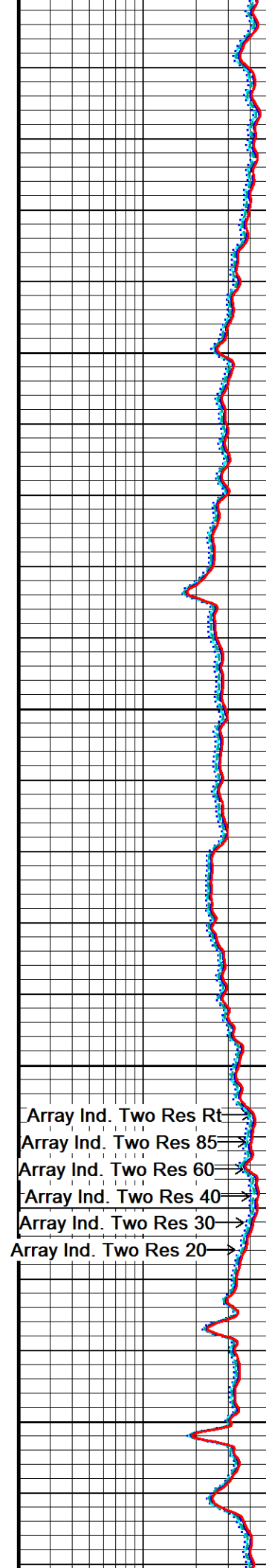
Array Ind. Two Res 20 →







2400  
149°  
2450  
149°  
2500  
150°  
2550  
151°  
2600

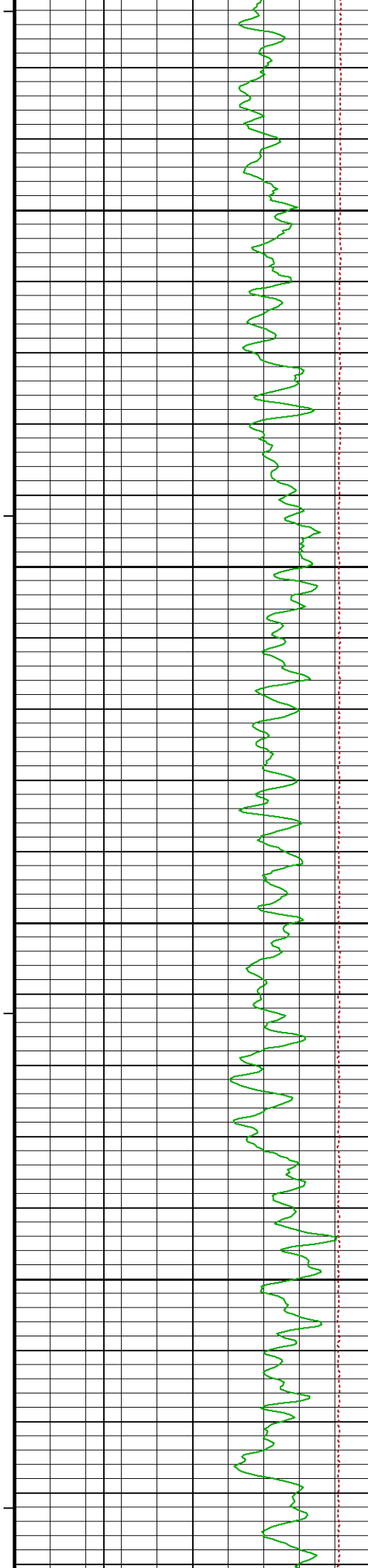


← Bit Size

← Gamma Ray

DST Uphole Tension →

Array Ind. Two Res Rt  
Array Ind. Two Res 85  
Array Ind. Two Res 60  
Array Ind. Two Res 40  
Array Ind. Two Res 30  
Array Ind. Two Res 20



152°

2650

153°

2700

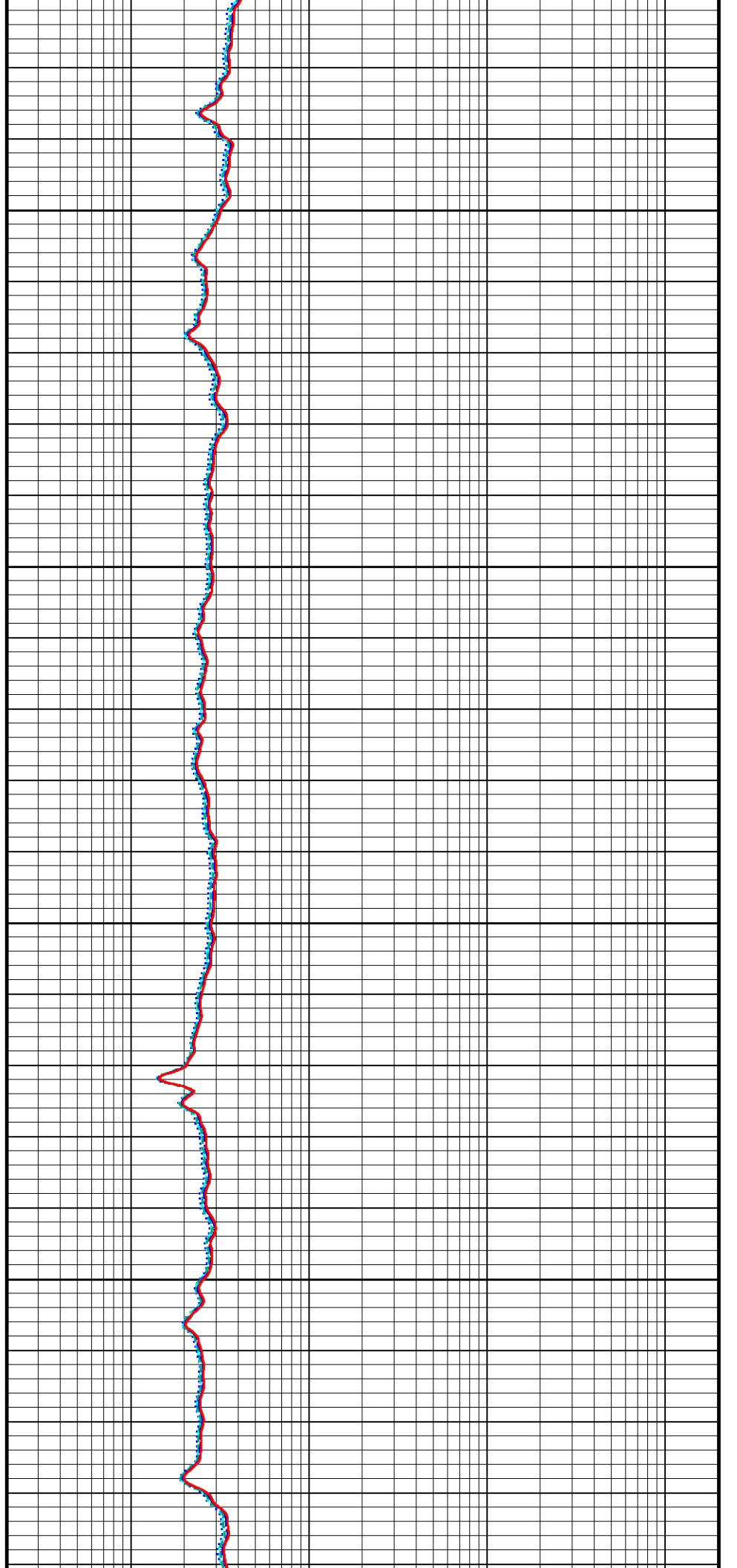
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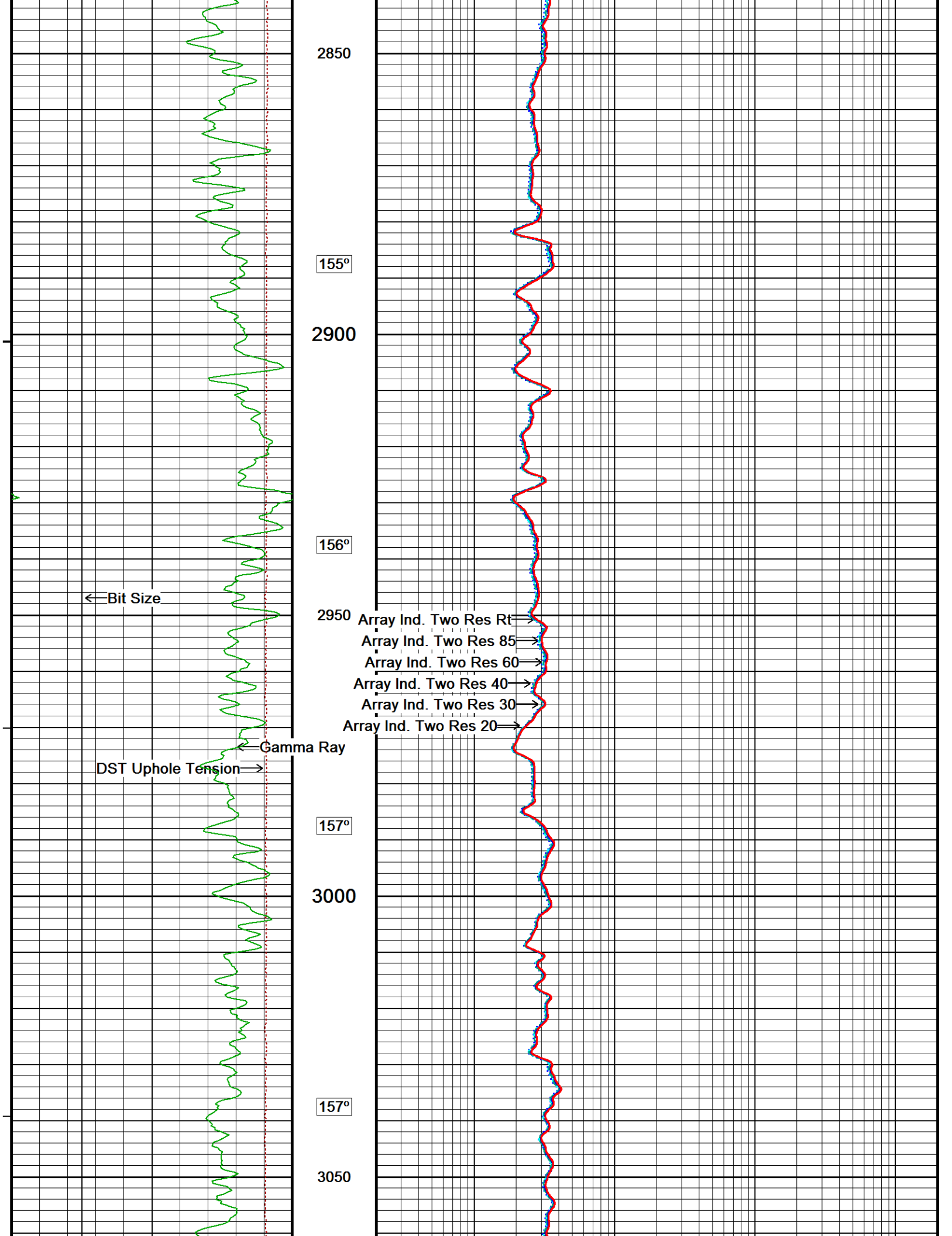
2750

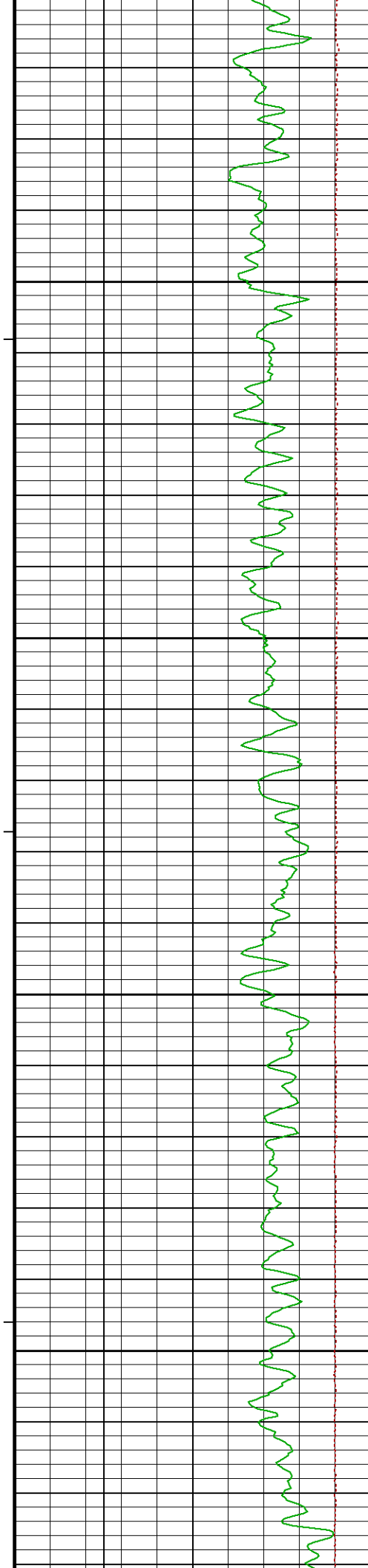
154°

2800

155°







158°

3100

159°

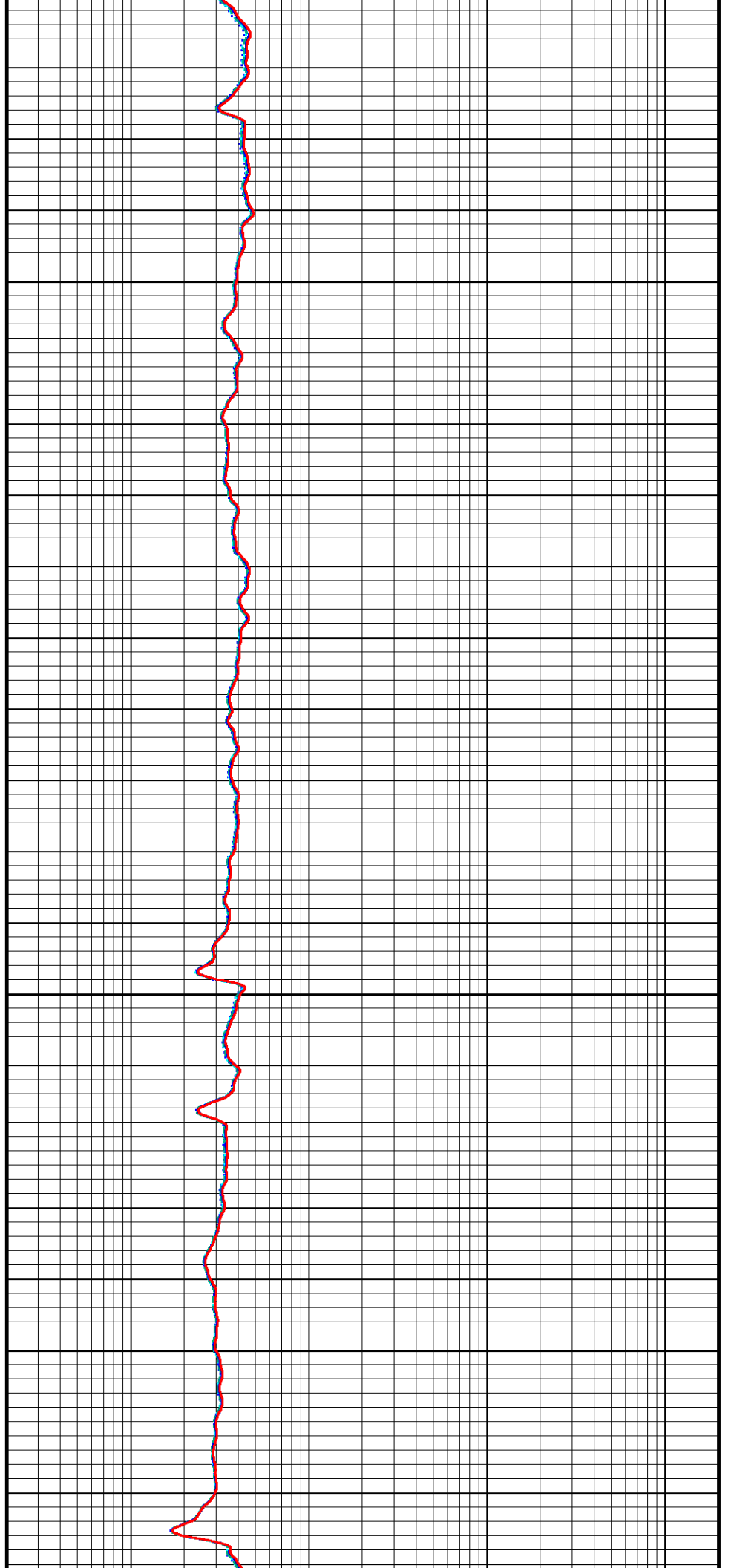
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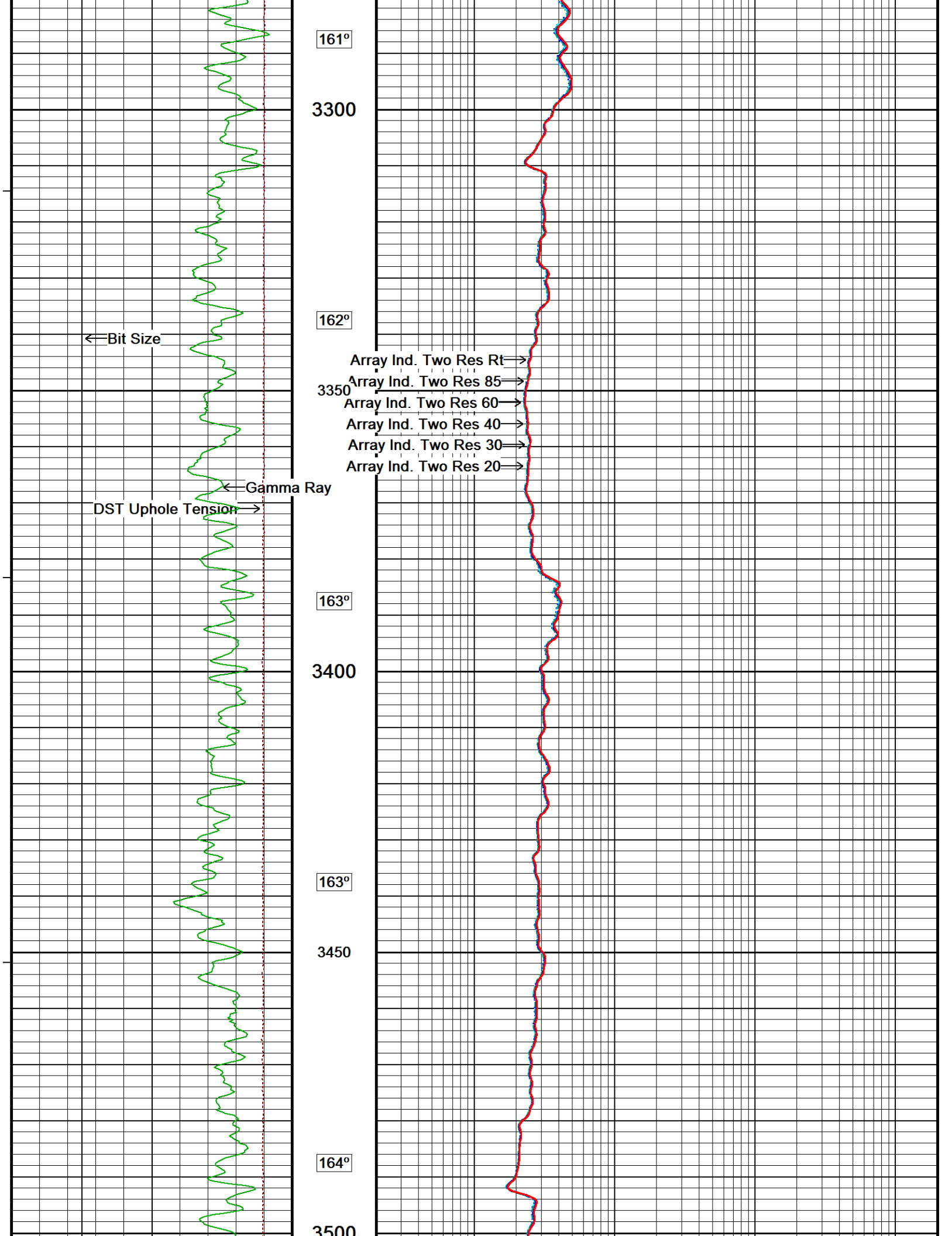
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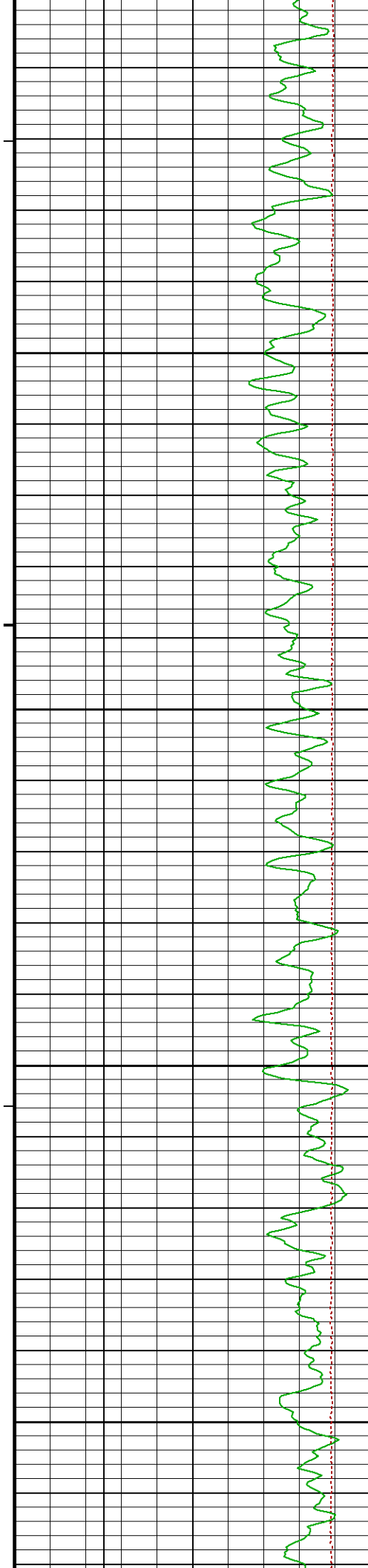
3200

160°

3250







165°

3550

166°

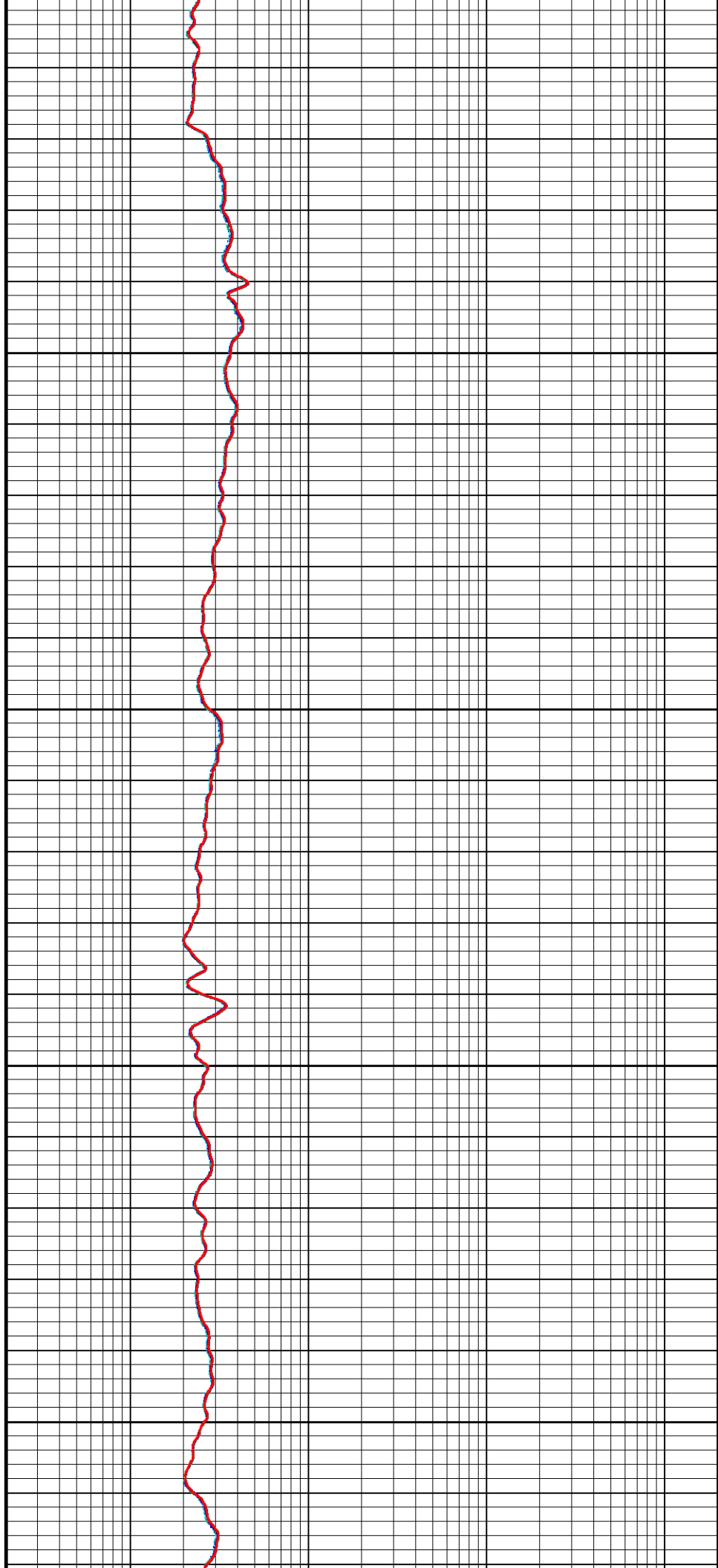
3600

167°

3650

168°

3700



← Bit Size

DST Uphole Tension →

← Gamma Ray

1690

Array Ind. Two Res Rt →

Array Ind. Two Res 85 →

Array Ind. Two Res 60 →

3750ray Ind. Two Res 40 →

Array Ind. Two Res 30 →

Array Ind. Two Res 20 →

170°

3800

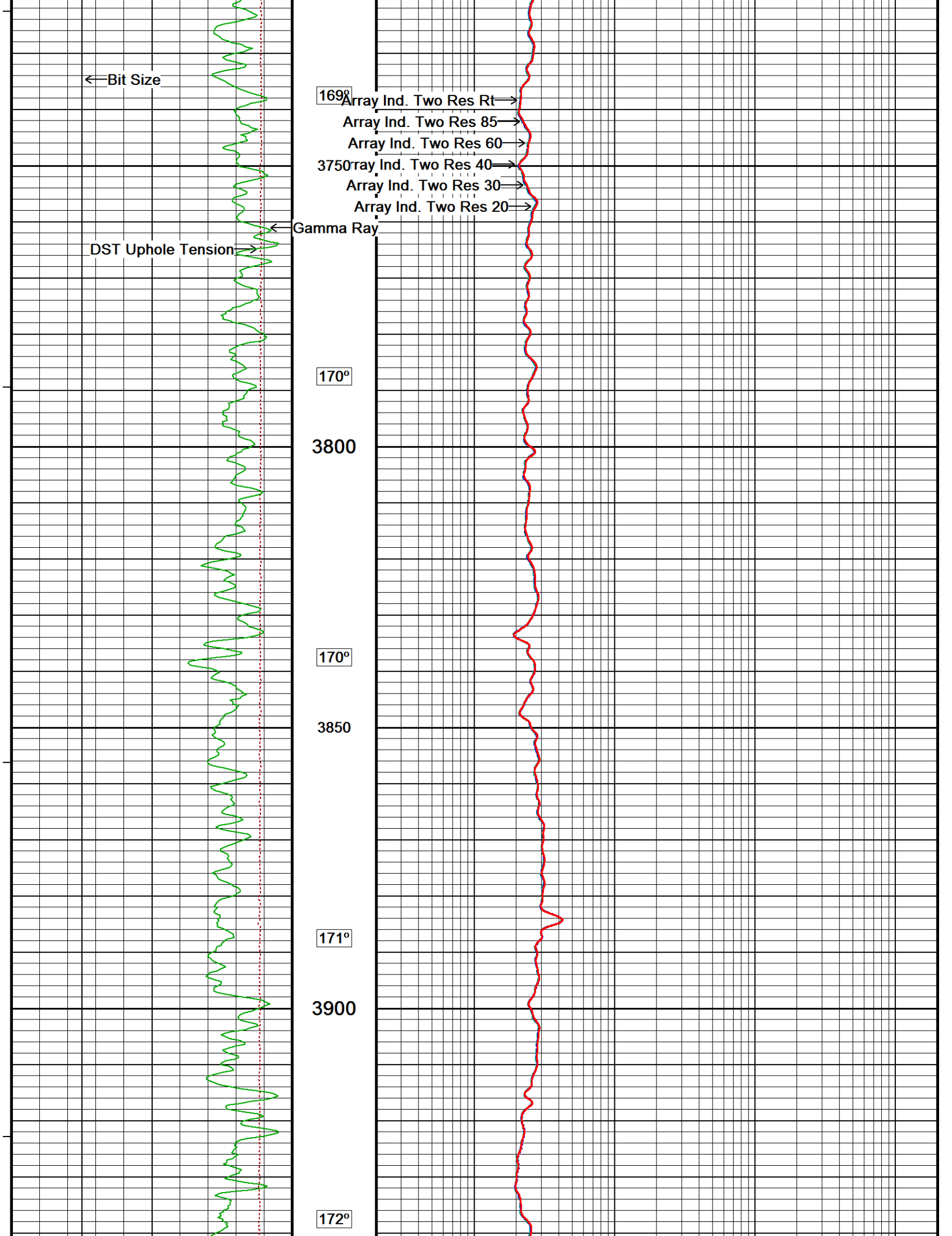
170°

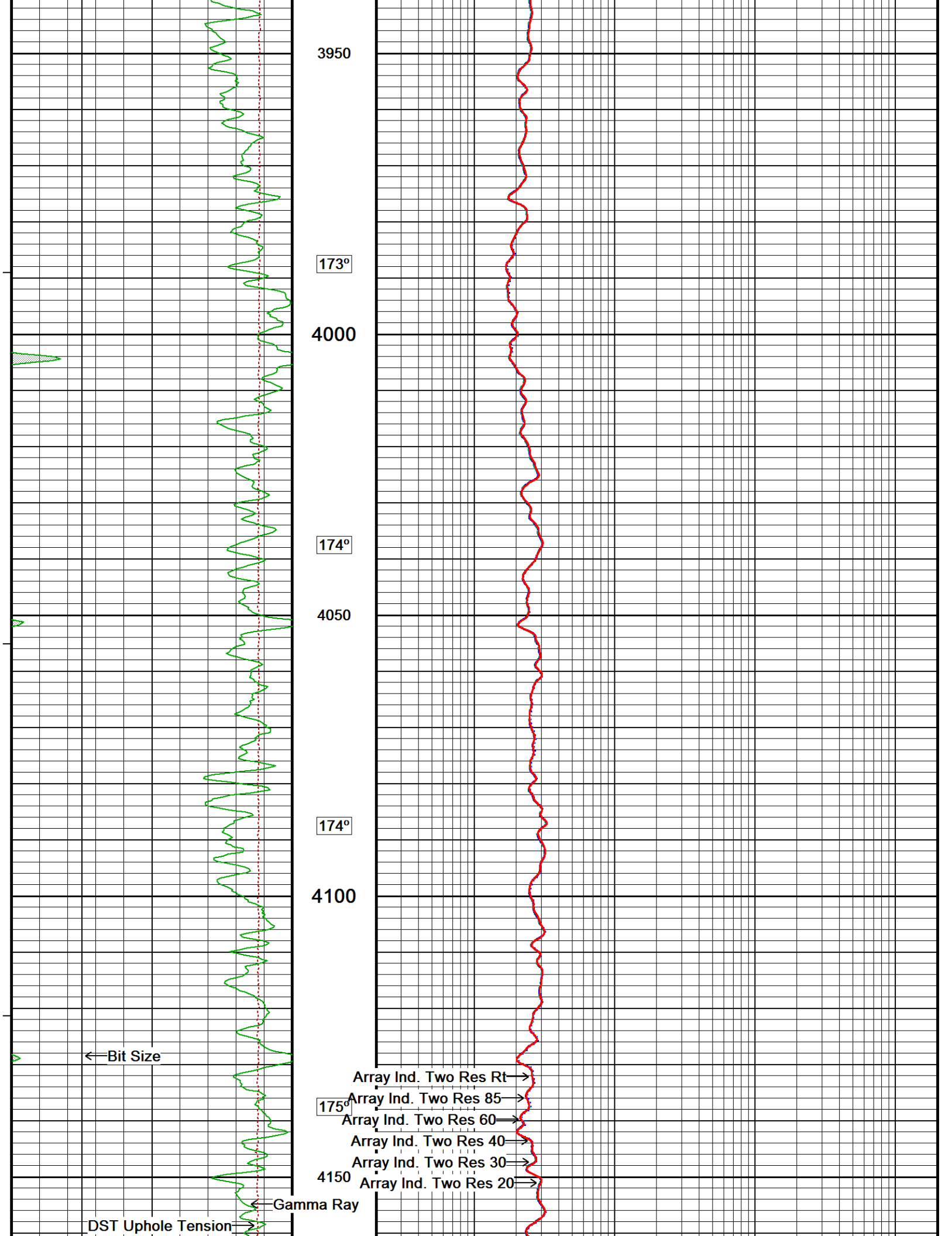
3850

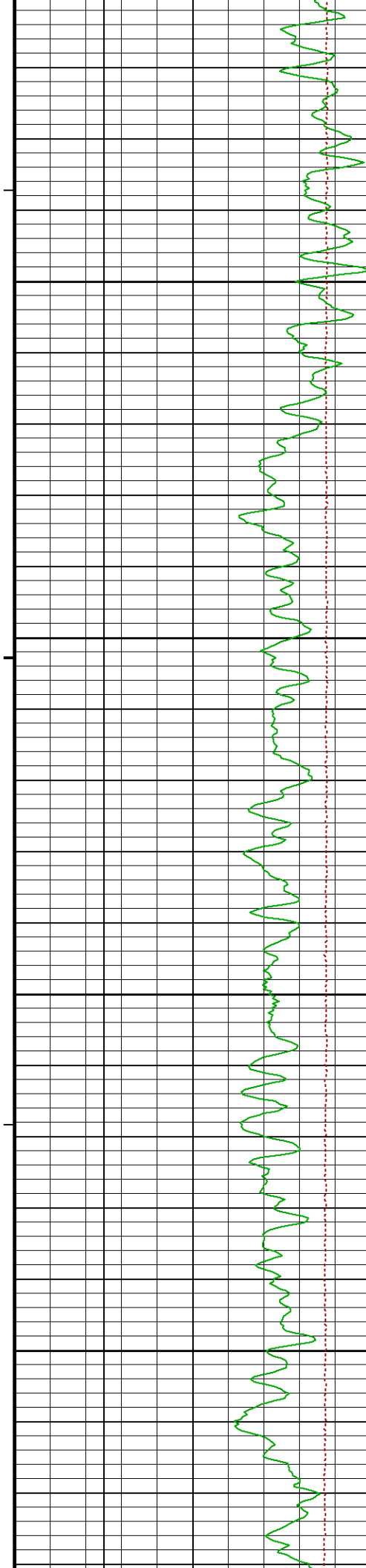
171°

3900

172°







176°

4200

176°

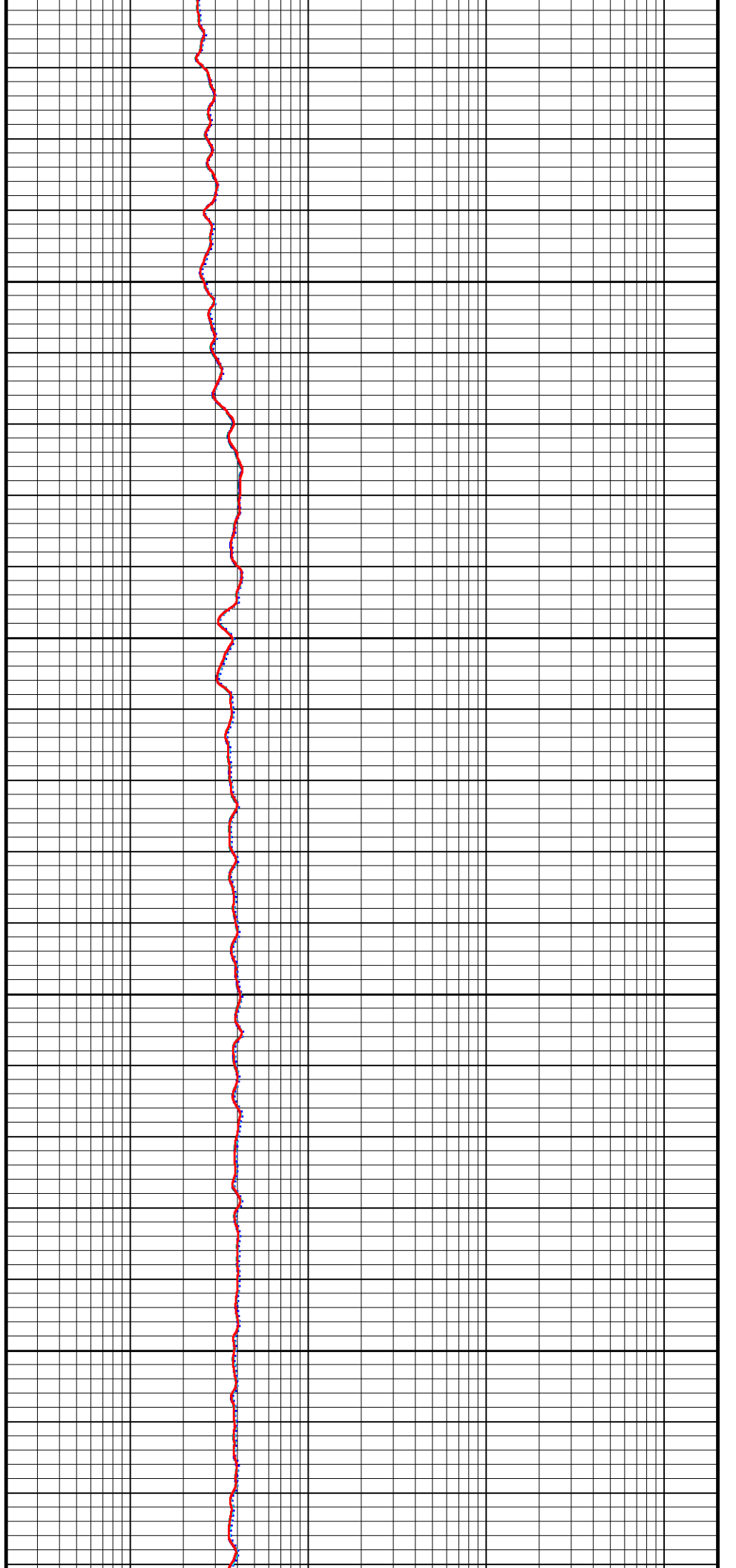
4250

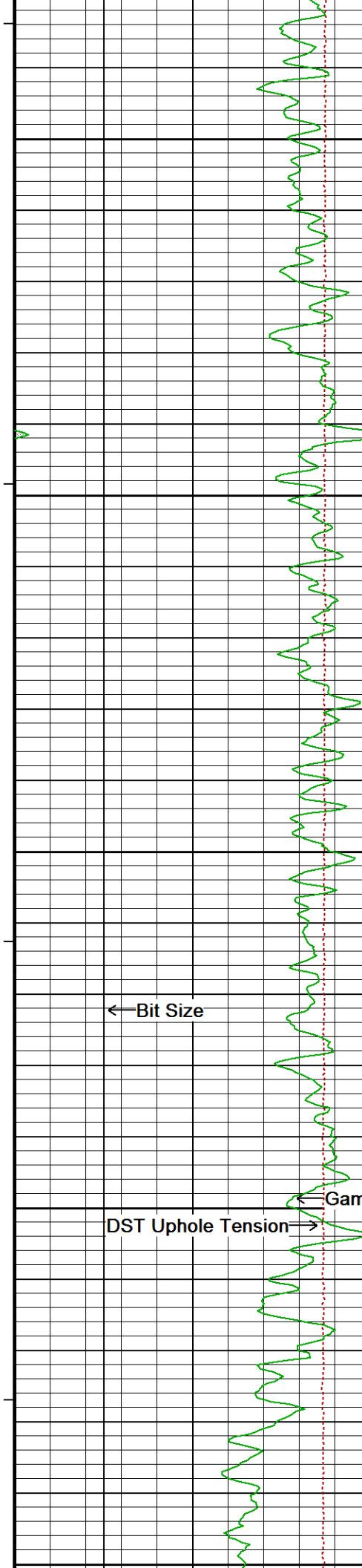
177°

4300

177°

4350





178°

4400

179°

4450

180°

4500

← Bit Size

180°

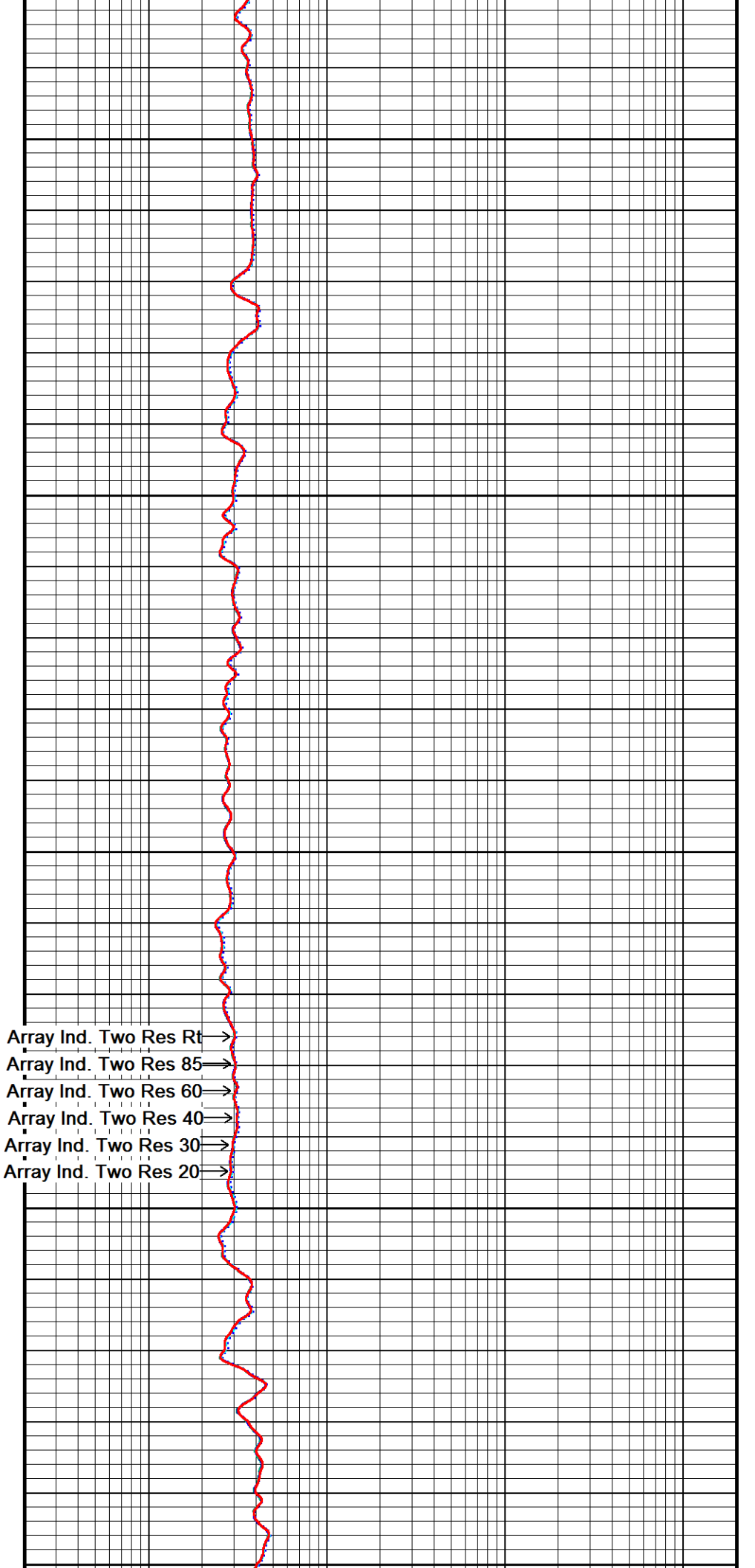
4550

DST Uphole Tension →

← Gamma

181°

4600



Array Ind. Two Res Rt →

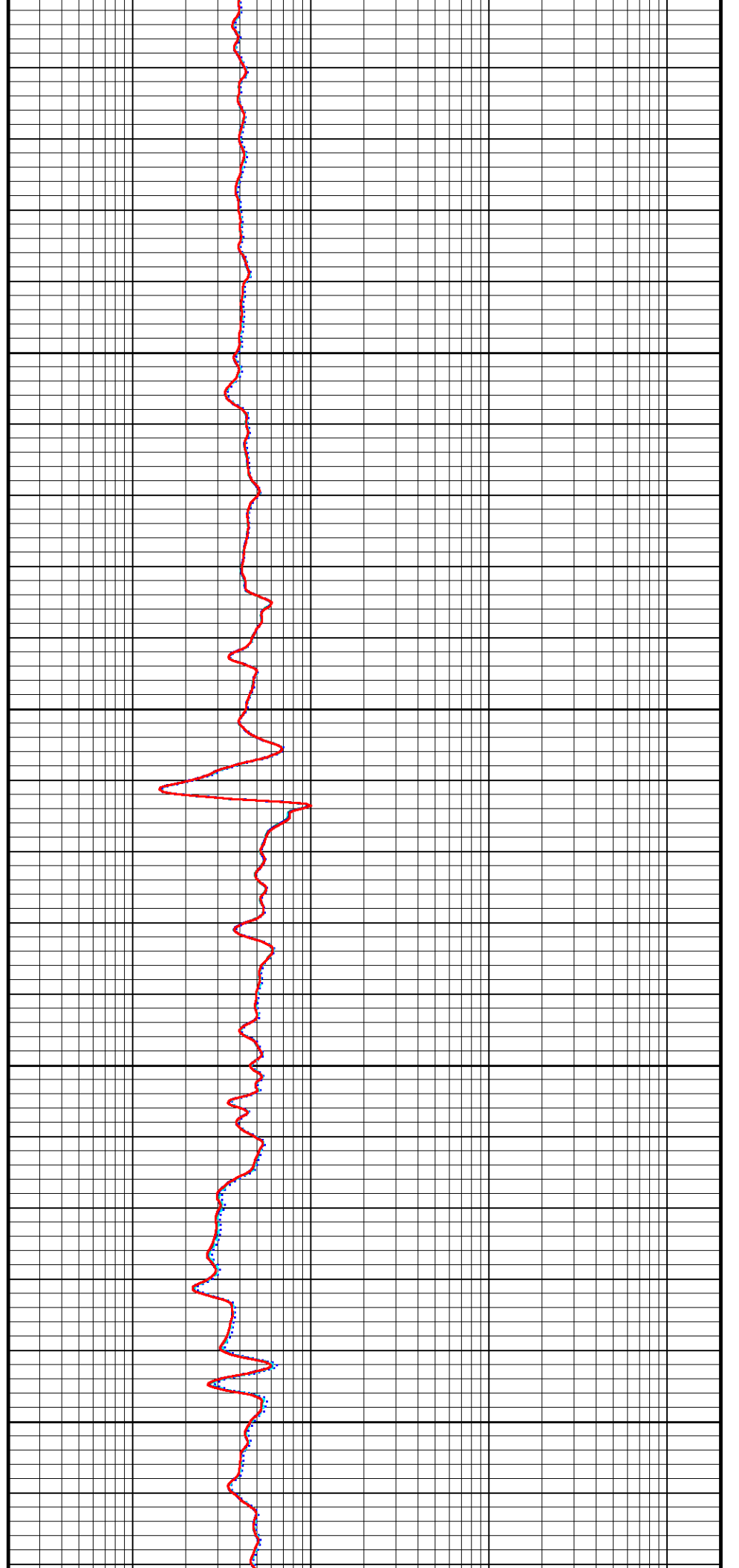
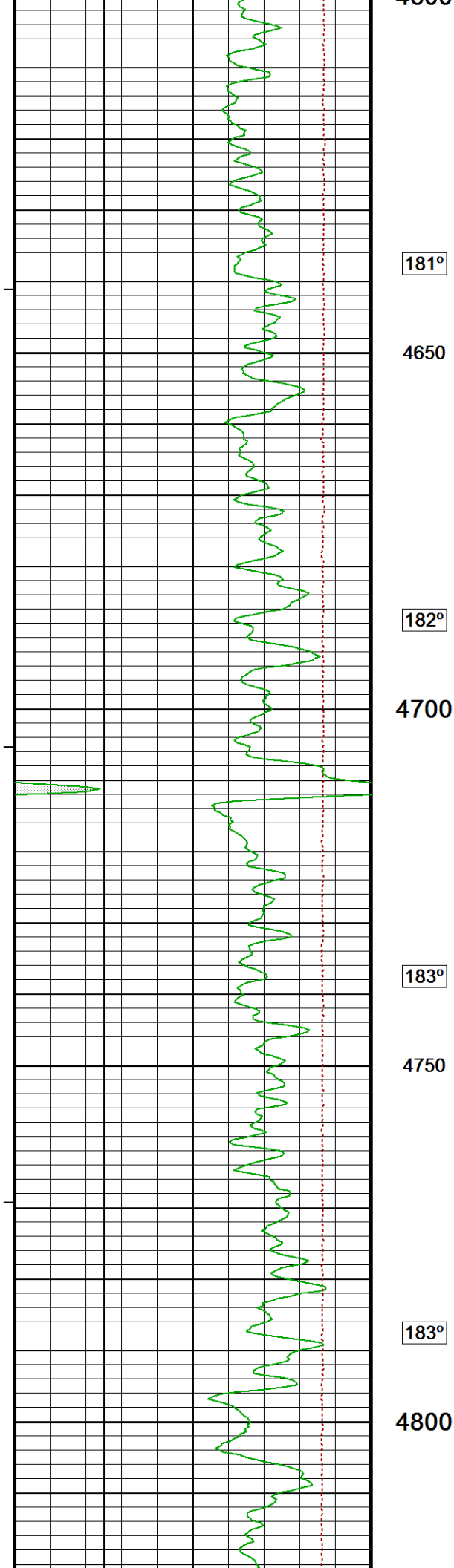
Array Ind. Two Res 85 →

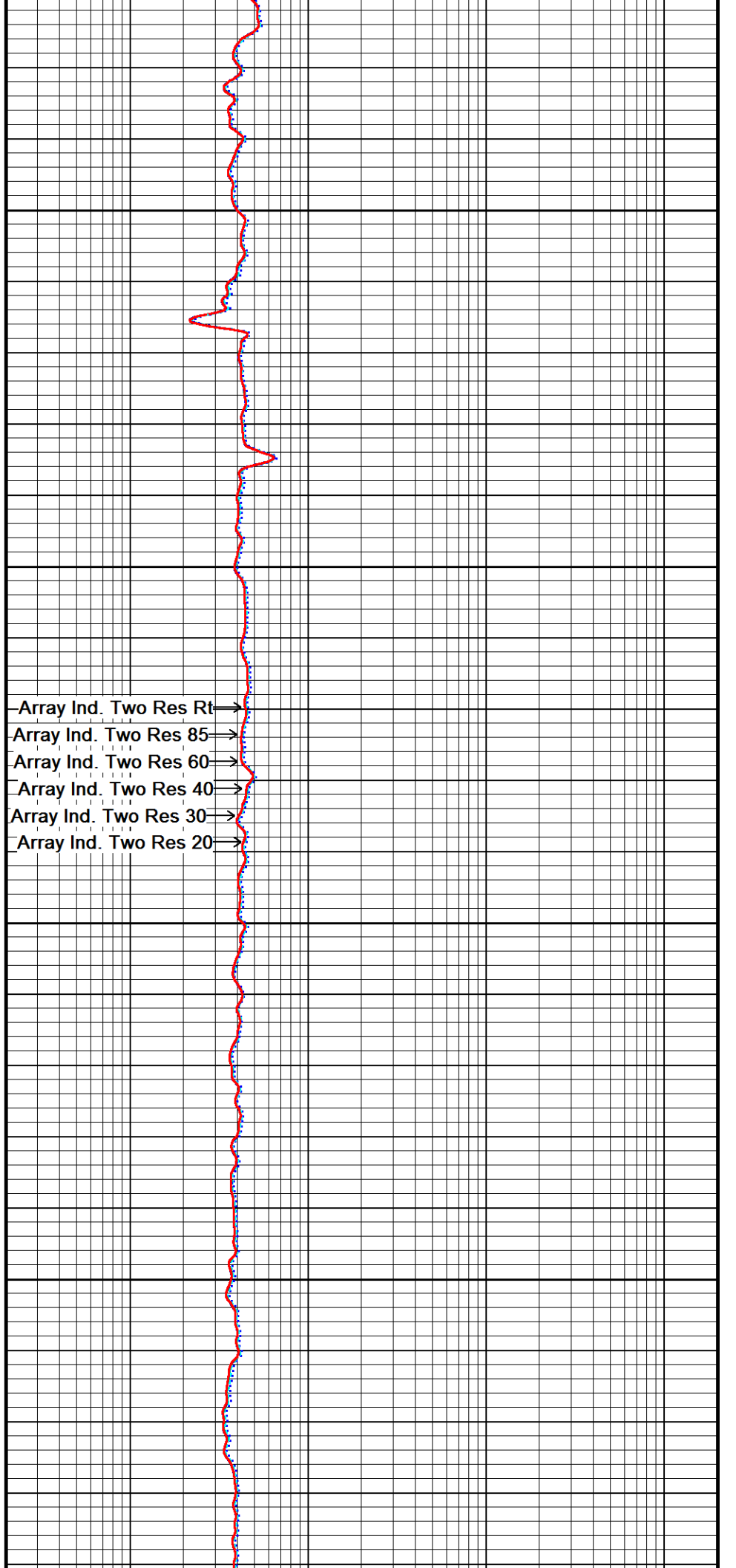
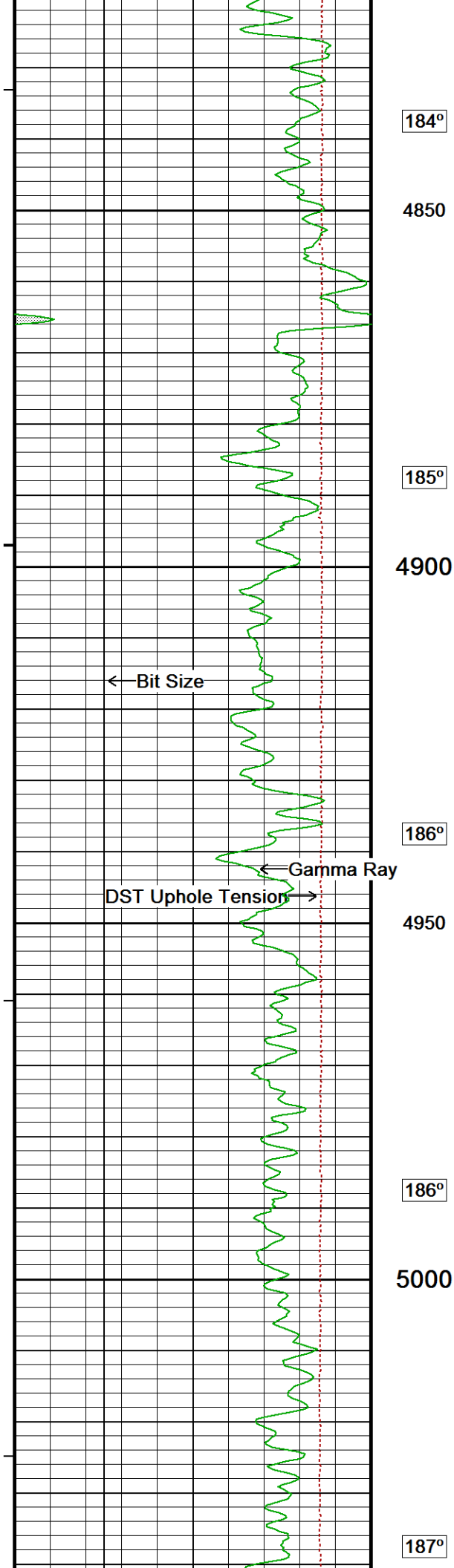
Array Ind. Two Res 60 →

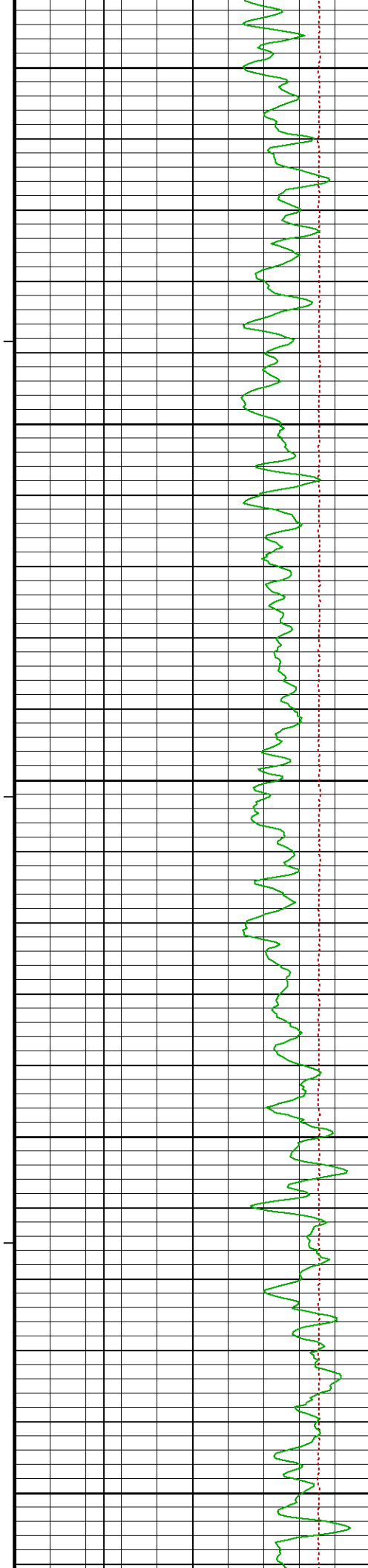
Array Ind. Two Res 40 →

Array Ind. Two Res 30 →

Array Ind. Two Res 20 →







5050

187°

5100

188°

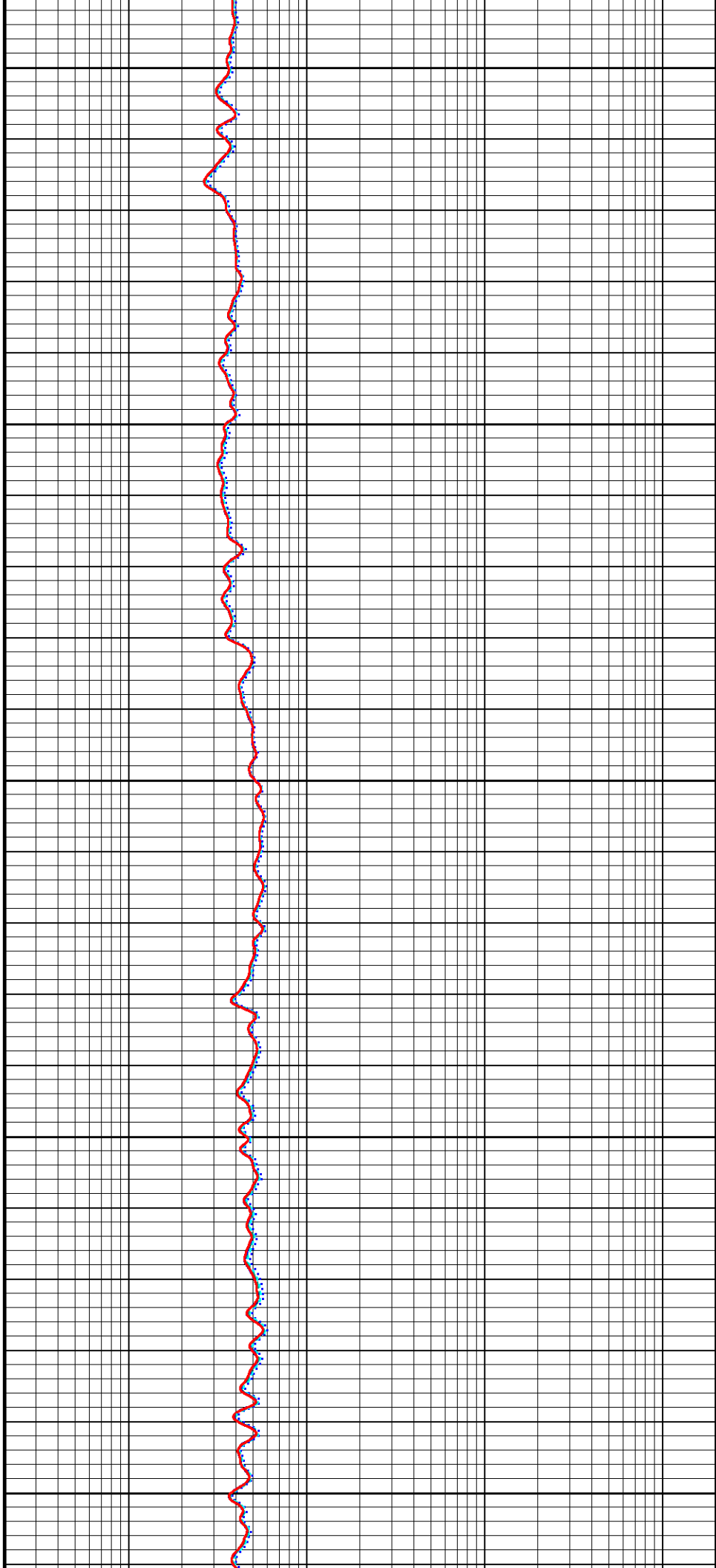
5150

188°

5200

189°

5250



← Bit Size

DST Uphole Tension →

← Gamma Ray

190°

5300

190°

5350

191°

5400

192°

5450

Array Ind. Two Res Rt →

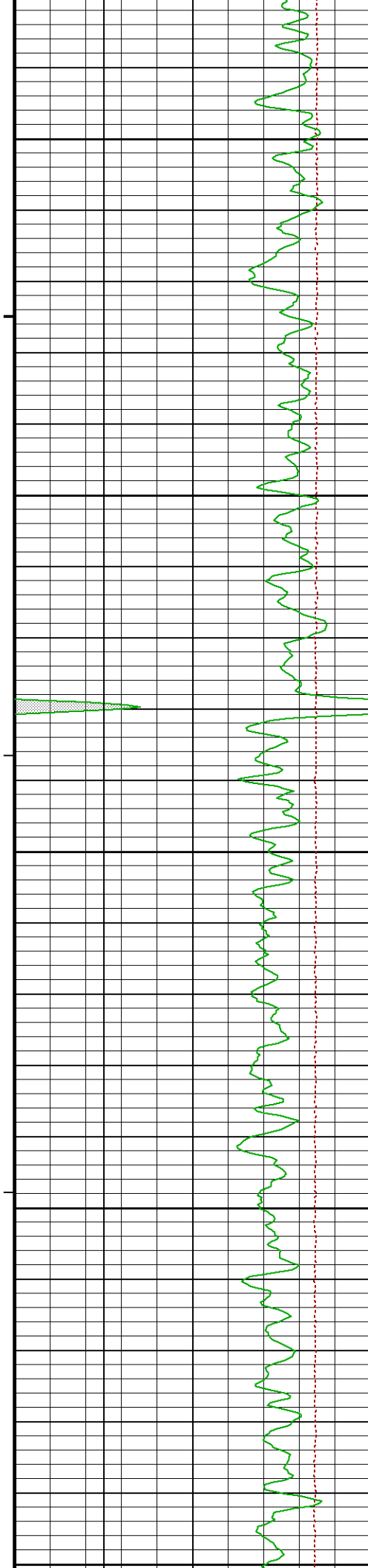
Array Ind. Two Res 85 →

Array Ind. Two Res 60 →

Array Ind. Two Res 40 →

Array Ind. Two Res 30 →

Array Ind. Two Res 20 →



193°

5500

193°

5550

194°

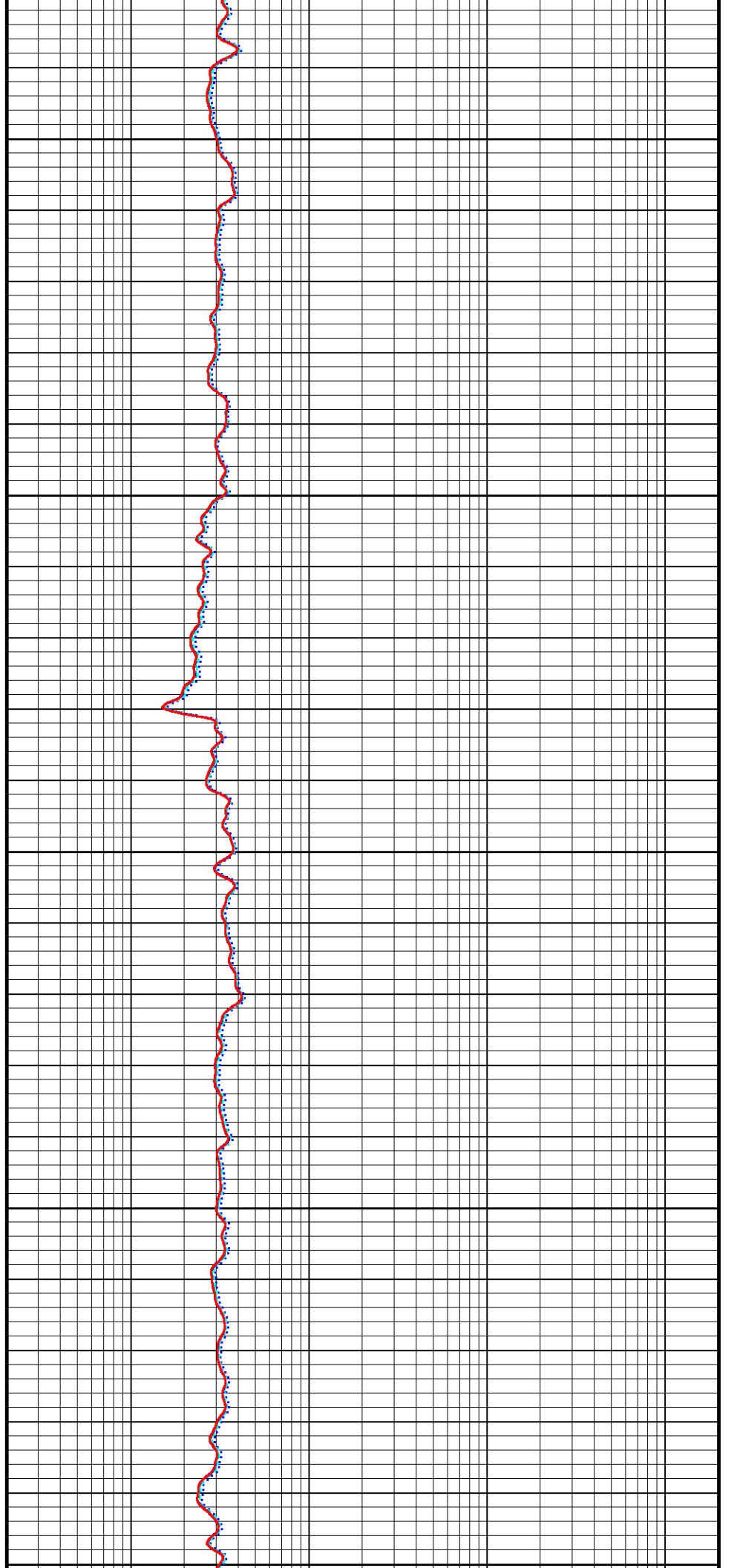
5600

195°

5650

196°

5700



← Bit Size

DST Uphole Tension

Gamma Ray

Array Ind. Two Res Rt

Array Ind. Two Res 85

Array Ind. Two Res 60

Array Ind. Two Res 40

Array Ind. Two Res 30

Array Ind. Two Res 20

196°

5750

197°

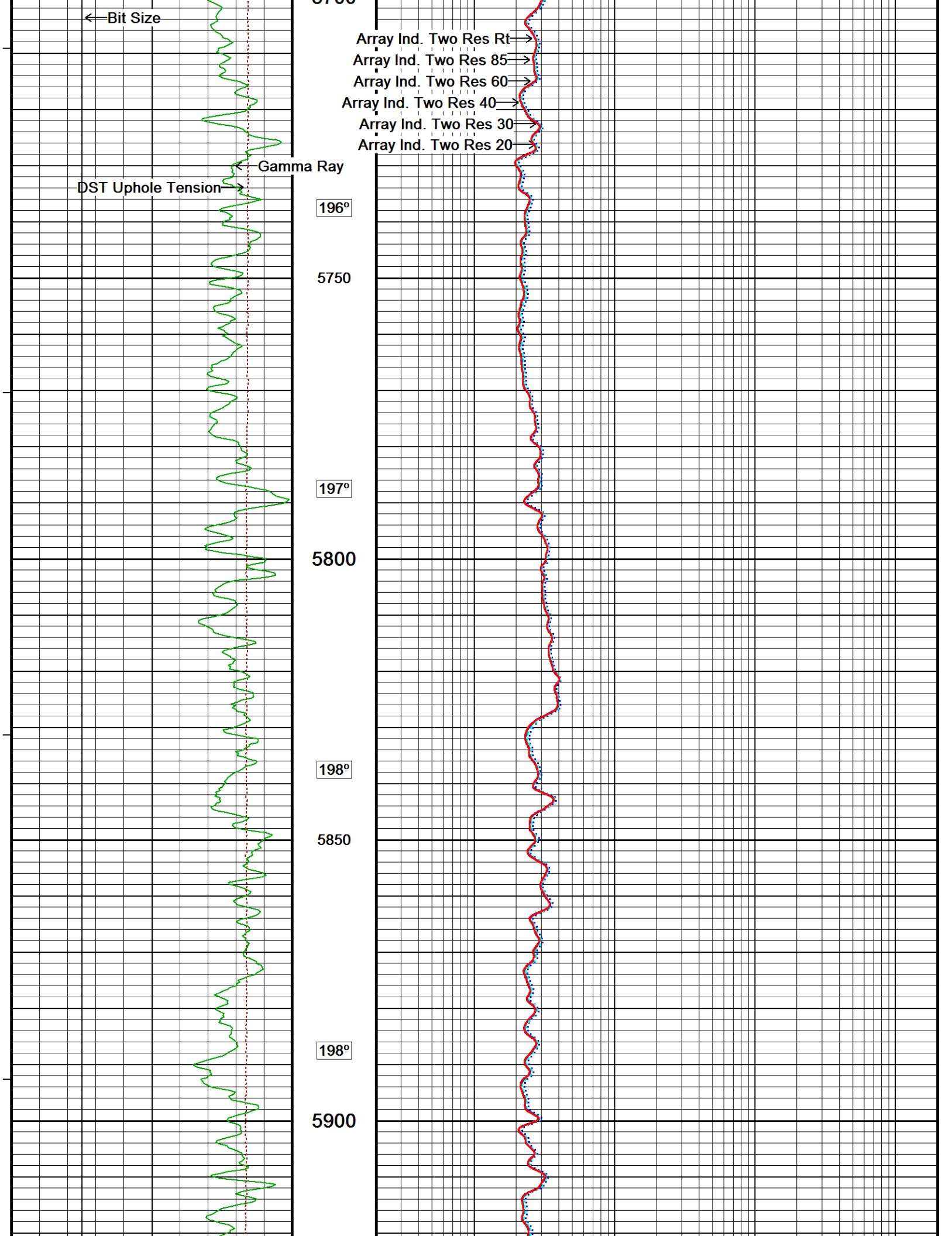
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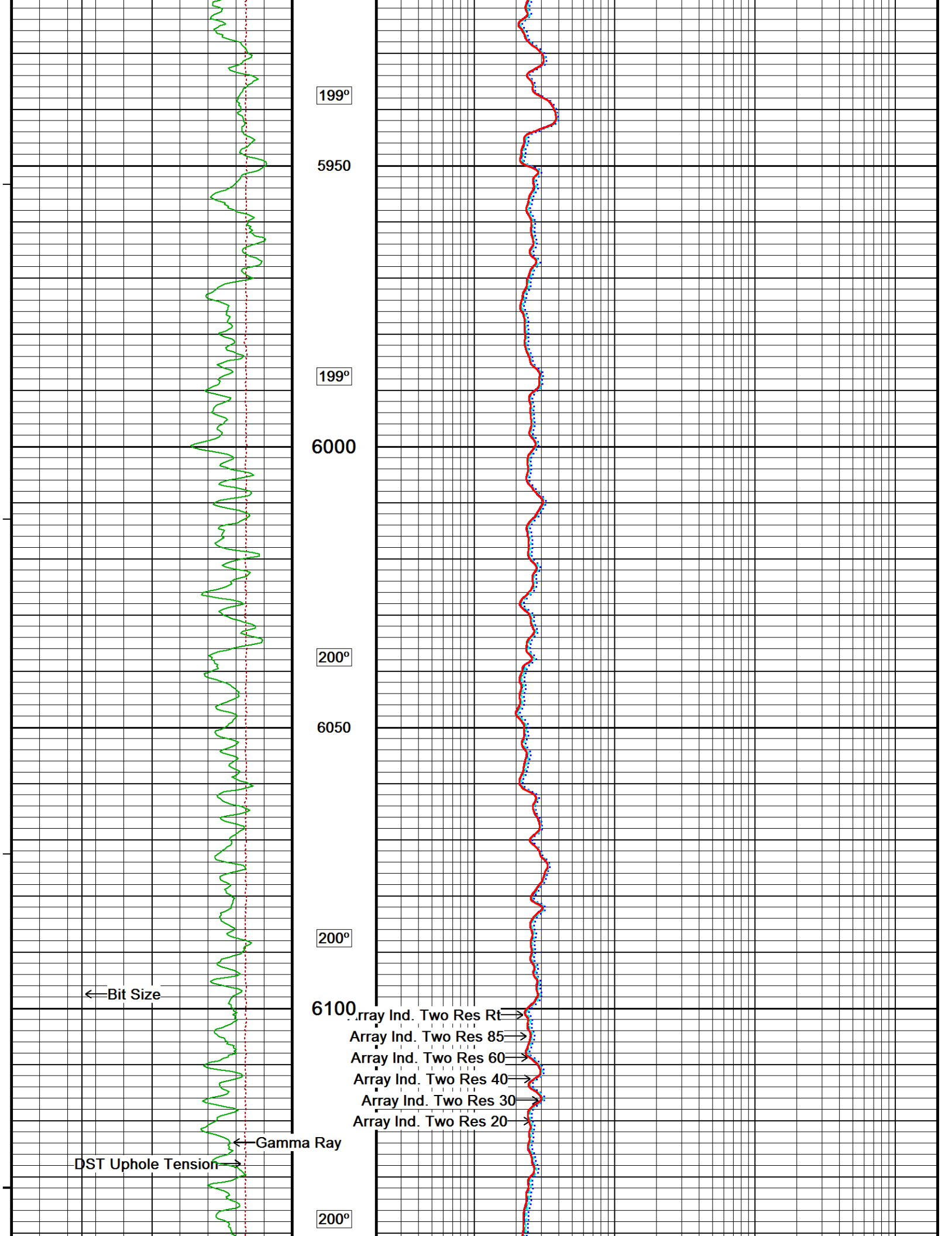
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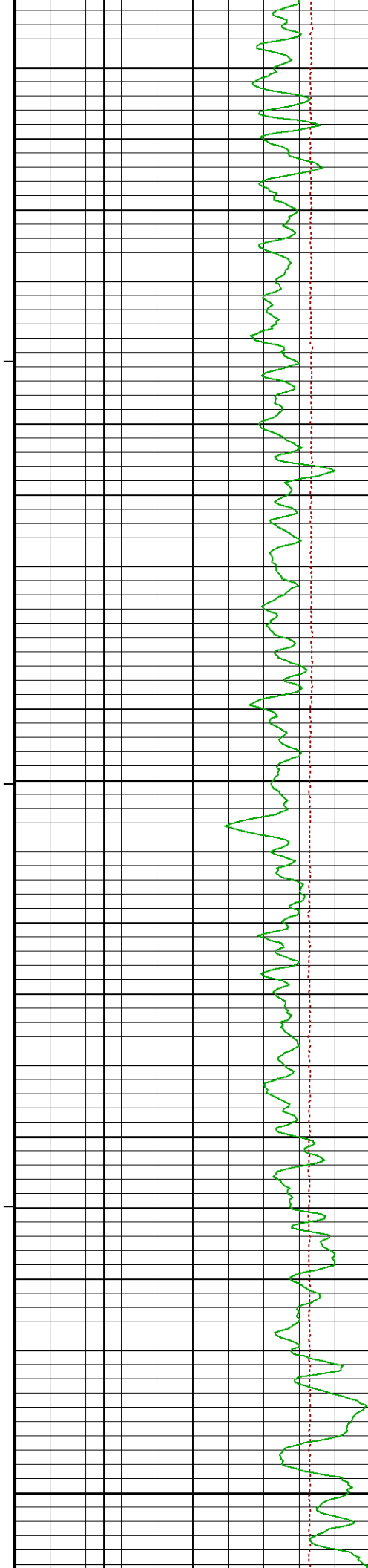
5850

198°

5900







6150

201°

6200

201°

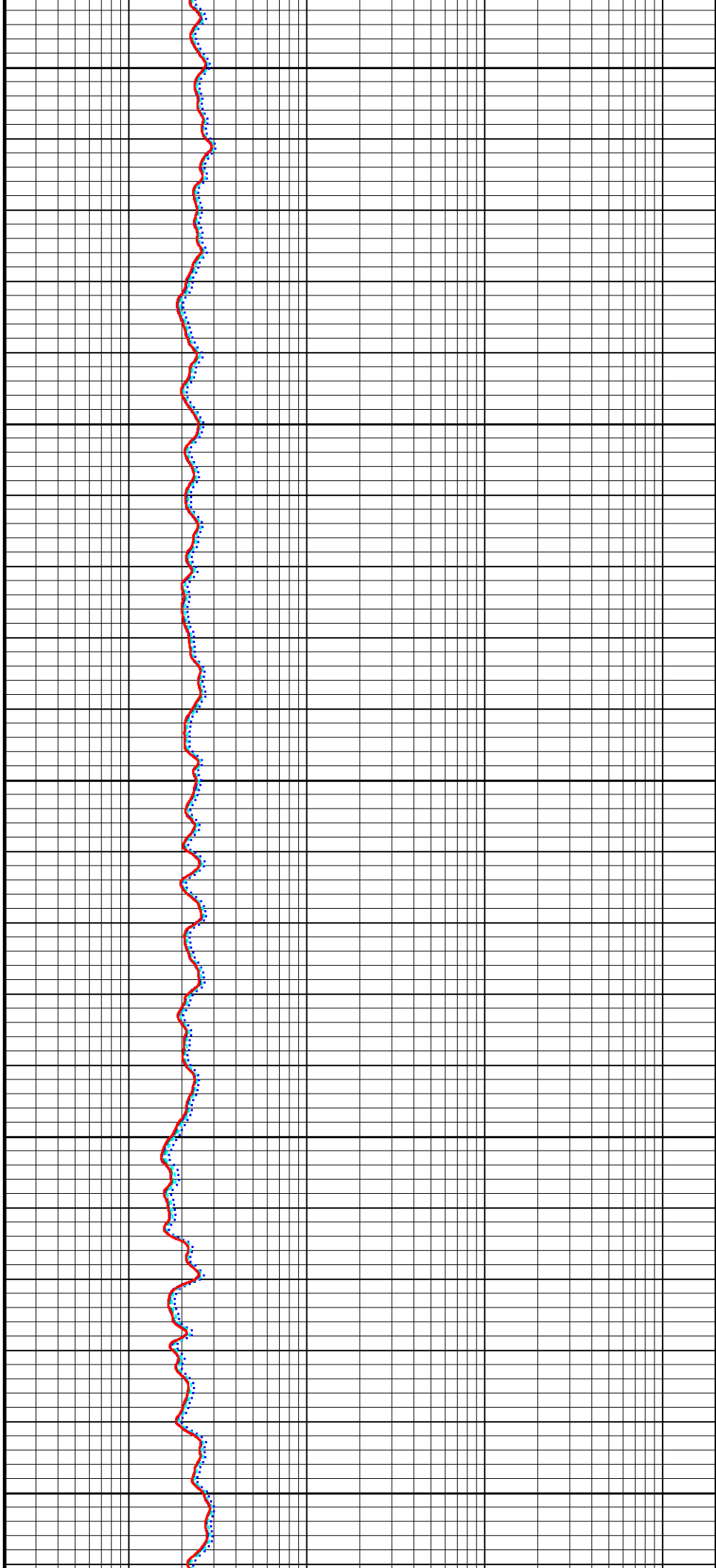
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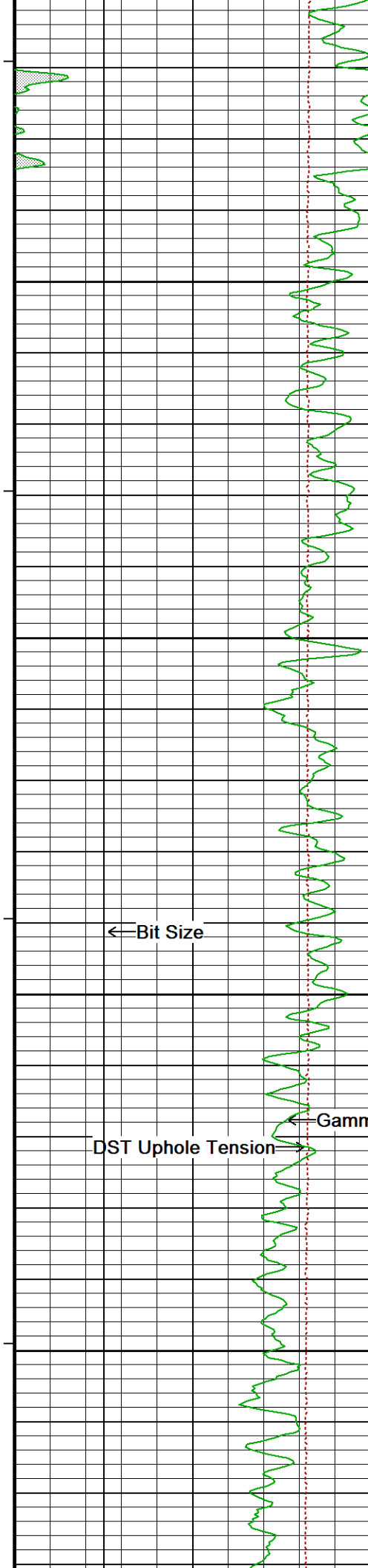
201°

6300

201°

6350





201°

6400

201°

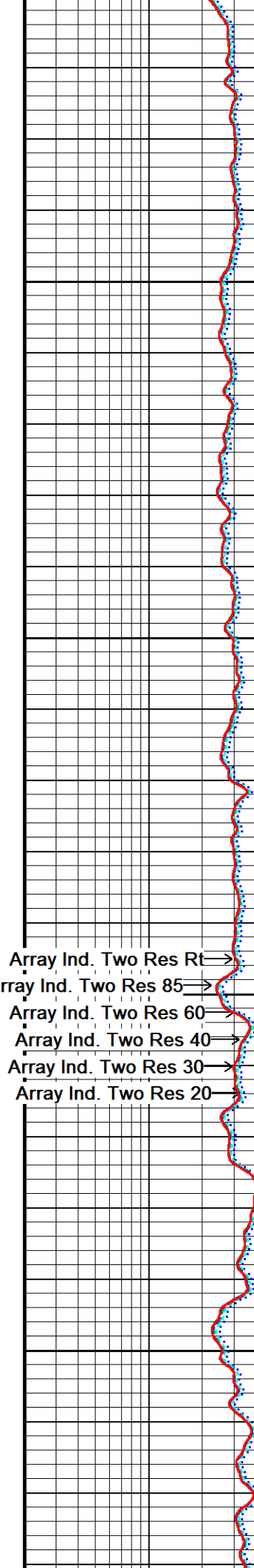
6450

201°

6500

201°

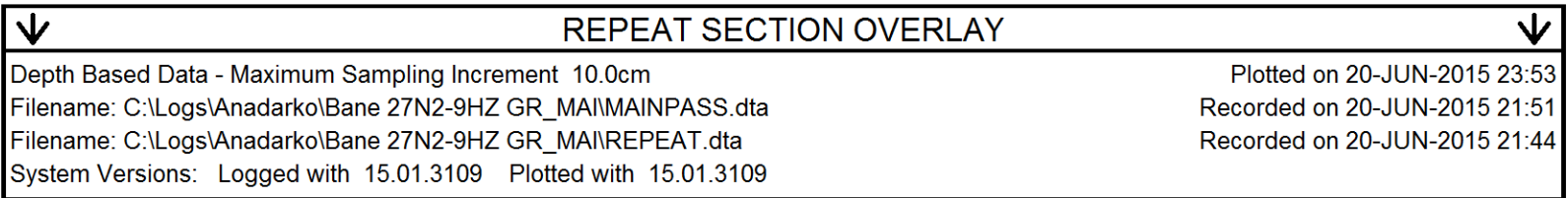
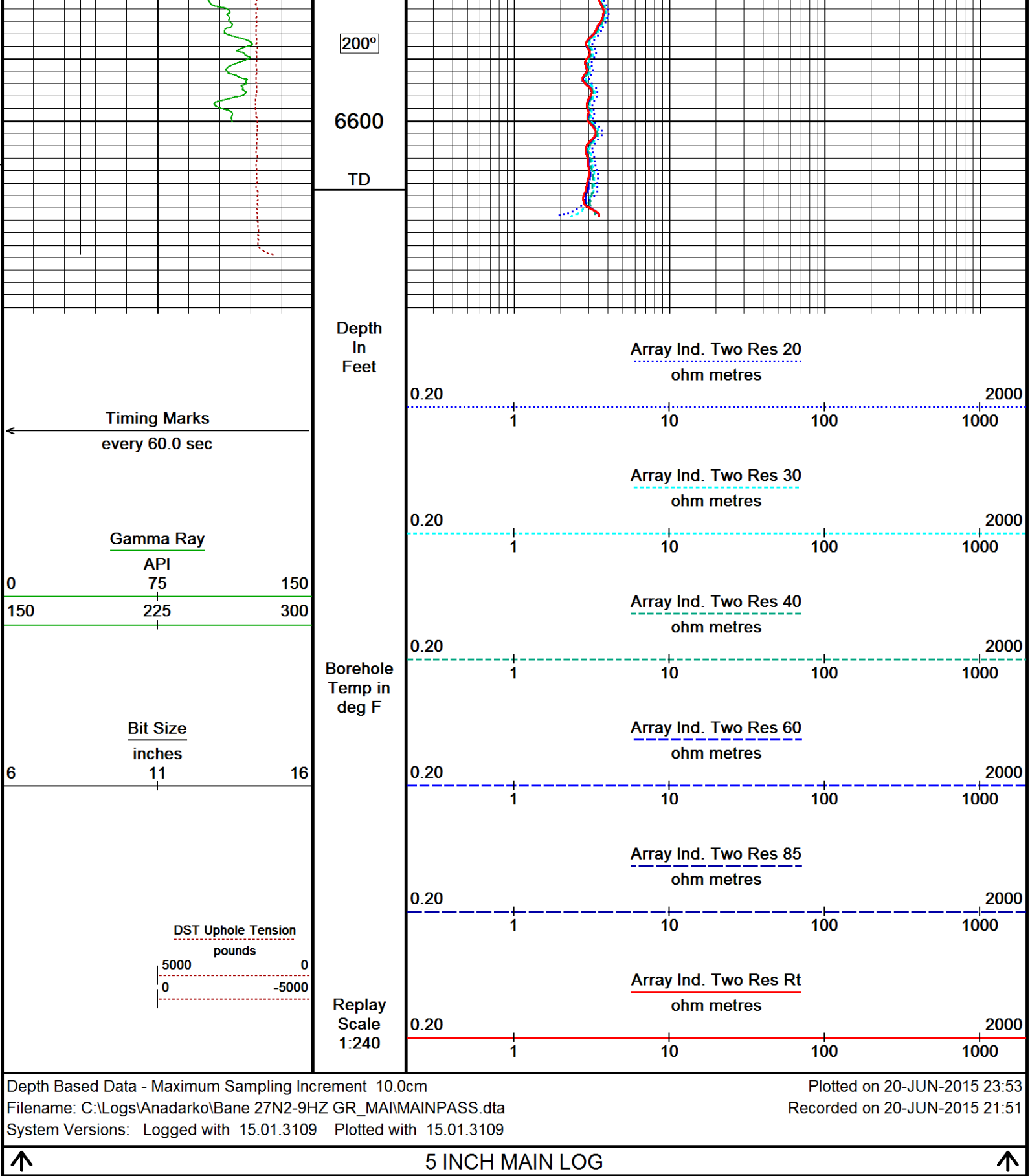
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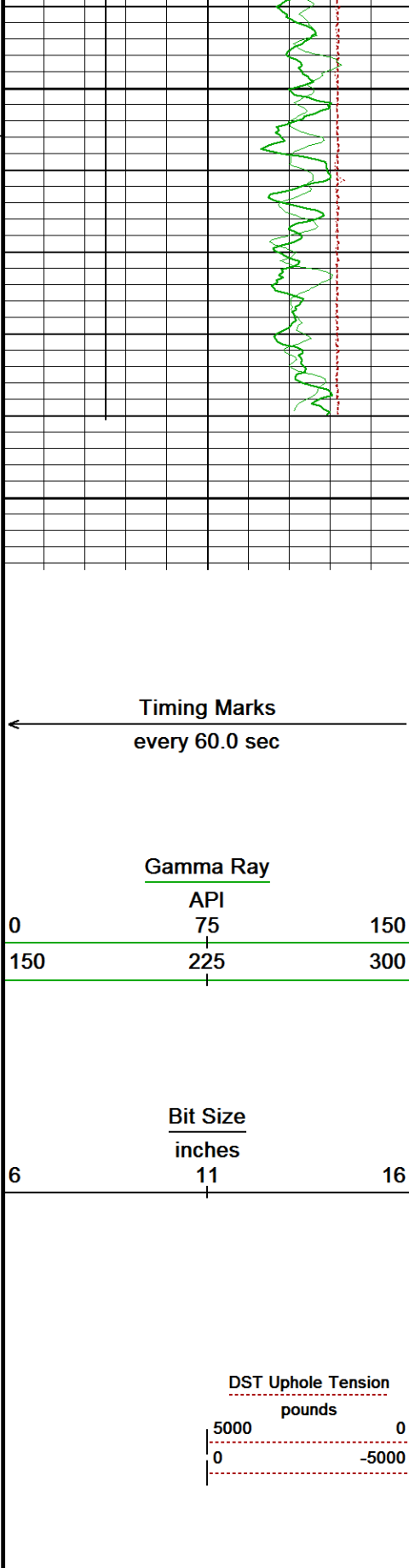
Array Ind. Two Res Rt  
Array Ind. Two Res 85  
Array Ind. Two Res 60  
Array Ind. Two Res 40  
Array Ind. Two Res 30  
Array Ind. Two Res 20

← Bit Size

DST Uphole Tension  
← Gamma Ray







6550

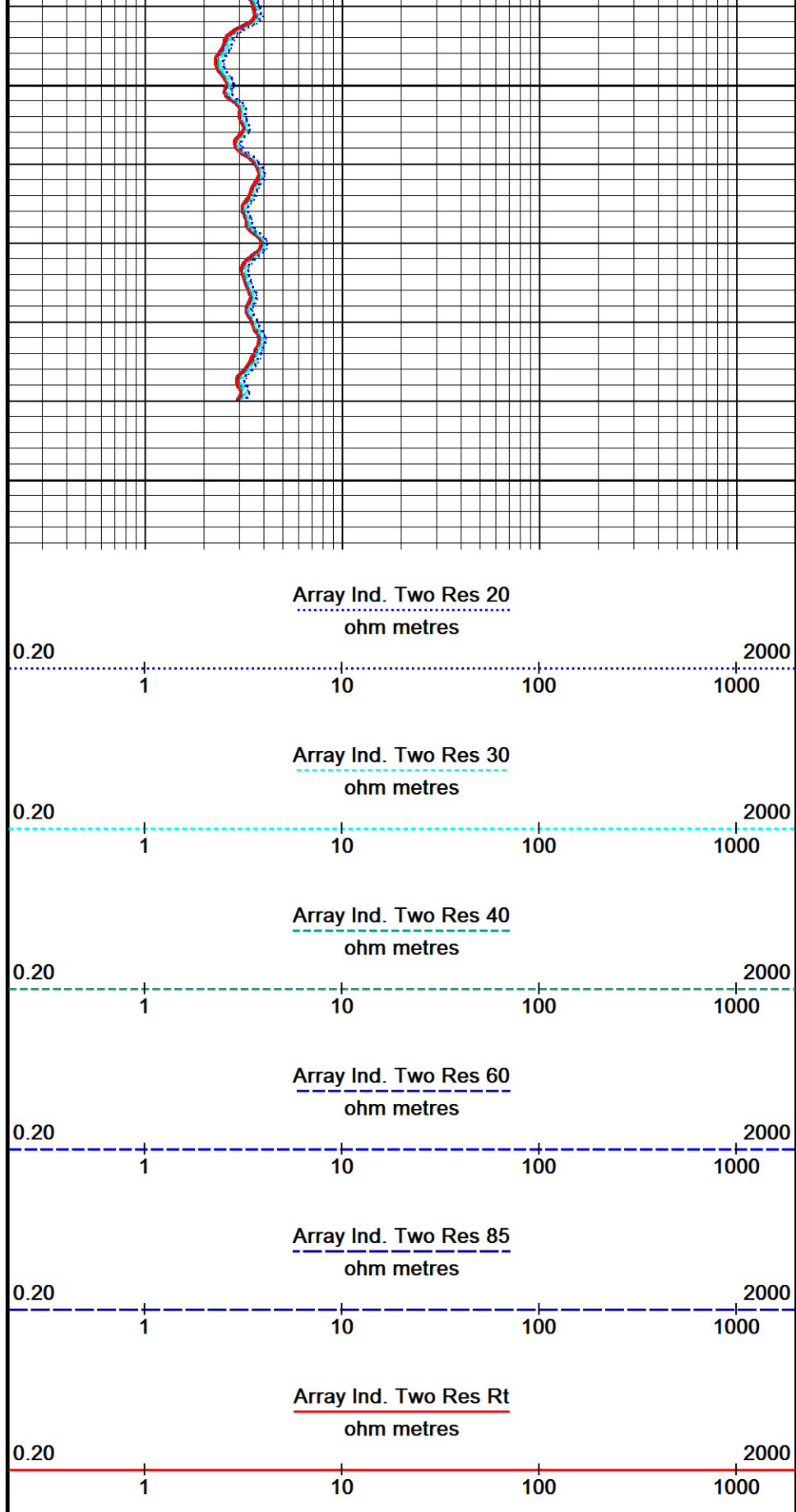
200°

6600

Depth  
In  
Feet

Borehole  
Temp in  
deg F

Replay  
Scale  
1:240



Depth Based Data - Maximum Sampling Increment 10.0cm  
Filename: C:\Logs\Anadarko\Bane 27N2-9HZ GR\_MAI\MAINPASS.dta  
Filename: C:\Logs\Anadarko\Bane 27N2-9HZ GR\_MAI\REPEAT.dta  
System Versions: Logged with 15.01.3109 Plotted with 15.01.3109

Plotted on 20-JUN-2015 23:53  
Recorded on 20-JUN-2015 21:51  
Recorded on 20-JUN-2015 21:44

↑ REPEAT SECTION OVERLAY ↑

BEFORE SURVEY CALIBRATION

## Down-hole Tension Calibration All 000

Field Calibration on 24-OCT-2010 03:34

Reading No	Measured	
1	15659.85	0.00
2	15734.68	370.00

## General Constants All 000

Last Edited on 20-JUN-2015,18:21

## General Parameters

Mud Resistivity	1000.000	ohm-metres
Mud Resistivity Temperature	83.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	

## Hole/Annular Volume and Differential Caliper Parameters

HVOL Method	Single Caliper	
HVOL Caliper 1	None	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	None	

## Rwa Parameters

Porosity used	N/A
Resistivity used	N/A
RWA Constant A	N/A
RWA Constant M	N/A
SW/APOR Tool Source	0.000

## Down-hole Tension Calibration SMS 0

Field Calibration on 20-JUN-2015 20:55

Reading No	Measured	Calibrated (lbs)
1	16362.40	0.00
2	16509.49	280.00

## High Resolution Temperature Calibration MCG-D.K 482

Field Calibration on 03-JUN-2015,23:54

	Measured	Calibrated(Deg F)
Lower	10.00	10.00
Upper	100.00	100.00

## High Resolution Temperature Constants MCG-D.K 482

Last Edited on 03-APR-2014,07:59

Pre-filter Length	11
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## SP Calibration MCG-D.K 482

Field Calibration on 03-JUN-2015,23:53

	Measured	Calibrated (mV)
Reference 1	102.0	100.0
Reference 2	-98.0	-100.0

## Gamma Calibration MCG-D.K 482

Field Calibration on 20-JUN-2015 17:21

	Measured	Calibrated (API)
Background	117	79
Calibrator (Gross)	1458	991
Calibrator (Net)	1341	912

## Gamma Calibration Tolerances MCG-D.K 482

Ratio	1.470	<div><div>1.40</div><div>1.475</div><div>1.55</div></div>	Counts/API
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## Gamma Constants MCG-D.K 482

Last Edited on 20-JUN-2015,18:20

Gamma Calibrator Number	GRC.C.072	
GRC-M Calibrator Jig in Use?	NO	
Inactive Background Jig in Use?	NO	
Mud Density	1.14	gm/cc
Caliper Source for Processing	Bit Size	
Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

# FE Calibration MFE-C.A 400

Base Calibration on 11-JUN-2015 09:36  
Field Check on 20-JUN-2015 17:10

## Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	964.6	126.8
Base Check		280.7
Field Check		281.0

## FE Calibration Tolerances MFE-C.A 400

Reference 2	964.6	<div><div></div><div></div><div></div><div></div><div></div></div> <div>-3% 960.0 +3%</div>	ohm
Base Check	280.7	<div><div></div><div></div><div></div><div></div><div></div></div> <div>-2% 277.0 +2%</div>	ohm-m
Field Check	281.0	<div><div></div><div></div><div></div><div></div><div></div></div> <div>-2% 280.7 +2%</div>	ohm-m

## FE Constants MFE-C.A 400

Last Edited on 20-JUN-2015,18:21

Running Mode	No Sleeve
MFE K Factor	0.1268
Borehole Correction Constants	
Sonde Position	0.5 inches
Hole Size Source	Bit Size
Hole Size Constant Value	N/A inches
Rm Source	Global Value: Temperature Corrected
Temp. for Rm Corr.	MCG External Temperature

## High Resolution Temperature Calibration MAI-B.J 374

Field Calibration on 11-MAR-2013,14:43

	Measured	Calibrated(Deg C)
Lower	10.00	10.00
Upper	100.00	100.00

## High Resolution Temperature Constants MAI-B.J 374

Last Edited on 11-MAR-2013,14:43

Pre-filter Length	11
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## Induction Calibration MAI-B.J 374

Base Calibration on 11-MAR-2013,14:44  
Field Check on 20-JUN-2015 17:08

### Base Calibration

Test Loop Calibration	Measured	Calibrated (mmho/m)
Channel	Low High	Low High
1	16.0 476.0	9.3 966.2
2	5.4 382.2	7.6 821.4
3	3.7 260.5	5.2 566.0
4	1.8 133.4	2.6 279.2

Array Temperature	71.2	Deg F
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Test Loop Calibration Verified	11-JUN-2015 14:09
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Channel	Base Check (mmho/m)	Field Check (mmho/m)
	Low High	Low High
1	14.4 3784.2	16.1 3784.5
2	31.4 3500.4	31.7 3498.9
3	27.8 3021.4	28.0 3020.1
4	19.8 2056.6	19.8 2055.9
Deep	16.1 1969.8	16.3 1969.5
Medium	40.6 3986.7	40.6 3984.5
Shallow	48.5 5174.8	48.7 5172.1

Array Temperature	57.4	83.1	Deg F
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## Induction Calibration Tolerances MAI-B.J 374

Low Conductivity 1	16.0	<div><div></div><div></div><div></div><div></div><div></div></div> <div>13.0 17.0 21.0</div>	mmho/m	High Conductivity 1	476.0	<div><div></div><div></div><div></div><div></div><div></div></div> <div>430.0 475.0 520.0</div>	mmho/m
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Low Conductivity 2	5.4		mmho/m High Conductivity 2	382.2		mmho/m
Low Conductivity 3	3.7		mmho/m High Conductivity 3	260.5		mmho/m
Low Conductivity 4	1.8		mmho/m High Conductivity 4	133.4		mmho/m
Background Vx 1	0.0		mmho/m Phase Check Loop 1	0.0		%
Background Vx 2	0.0		mmho/m Phase Check Loop 2	0.0		%
Background Vx 3	0.0		mmho/m Phase Check Loop 3	0.0		%
Background Vx 4	0.0		mmho/m Phase Check Loop 4	0.0		%

Induction Constants MAI-B.J 374

Last Edited on 20-JUN-2015,17:01

Induction Model		RtAP-NC	
Borehole Correction Constants			
Tool Centred		No	
Hole Size Source		Bit Size	
Hole Size Constant Value		N/A	inches
Stand-off Type		Fins	
Stand-off		0.50	inches
Number of Fins on Stand-off		6.0000	
Stand-off Fin Angle		60.00	degrees
Stand-off Fin Width		0.5000	inches
Rm Source	Global Value: Temperature Corrected		
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	

## DOWNHOLE EQUIPMENT

C:\Logs\Anadarko\Bane 27N2-9HZ GR\_MAI\MAINPASS.dta

CBH-C, Cablehead, 11 pin  
 CBH-C 0 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Linker  
 MLK-D.A 104 LG: 4.87 ft WT: 70.5 lb OD: 2.240 in

SHA-J.B Compact Swivel Head Adaptor  
 SHA-J.B 509 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in



22.44 ft GRGC - MCG Gamma Ray

19.53 ft CGXT - MCG External Temperature

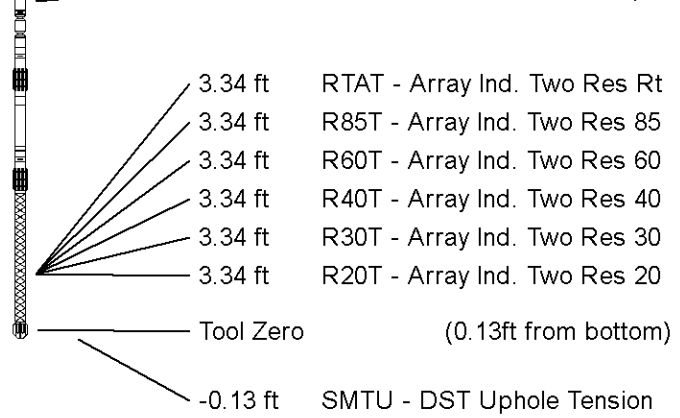
Compact Comms Gamma  
MCG-D.K 482 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

SKJ-D Compact Knuckle Joint  
SKJ-D 29 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Focussed Electric  
MFE-C.A 400 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction  
MAI-B.J 374 LG: 10.81 ft WT: 48.5 lb OD: 2.240 in

Total Length: 37.29 ft Weight: 302.0 lb



All measurements relative to tool zero.

COMPANY ANADARKO PETROLEUM  
WELL BANE 27N2-9HZ  
FIELD WATTENBERG  
PROVINCE/COUNTY WELD  
COUNTRY/STATE USA/COLORADO

Elevation Kelly Bushing	4991.00	feet	First Reading	6611.00	feet
Elevation Drill Floor	4991.00	feet	Depth Driller	6591.00	feet
Elevation Ground Level	4966.00	feet	Depth Logger	6611.00	feet



**Weatherford®**

ARRAY INDUCTION LOG  
GAMMA RAY LOG