



Weatherford

ARRAY INDUCTION
LOG

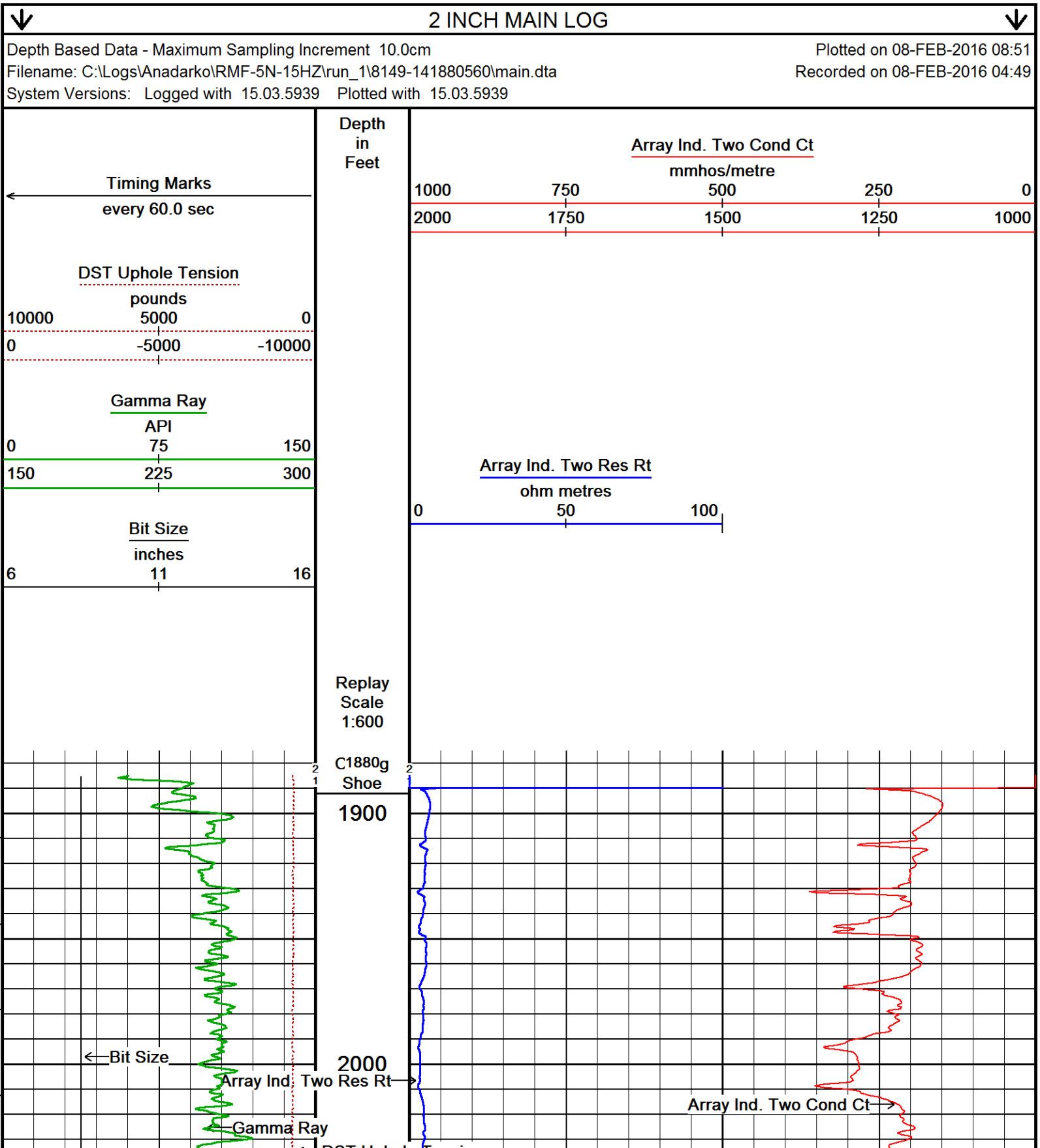
COMPANY			ANADARKO PETROLEUM CORP (ROCKY MOUNTAIN)		
WELL			RMF-5N-15HZ		
FIELD			WATTENBERG		
PROVINCE/COUNTY			WELD		
COUNTRY/STATE			U.S.A. / COLORADO		
LOCATION			SHL: 1210' FSL & 496' FEL		
SEC 26	TWP 4N	RGE 68W	Other Services		
API Number		051233920400			
Permanent Datum G.L., Elevation 4968 feet				Elevations:	
Log Measured From KB				KB 4988.00	
Drilling Measured From KB @ 20 FT				DF 4988.00	
				GL 4968.00	
Date	08-FEB-2016				
Run Number	ONE				
Service Order	8149-171880560				
Depth Driller	---				
Depth Logger	7200.00		feet		
First Reading	7195.00		feet		
Last Reading	10.00		feet		
Casing Driller	1893.00		feet		
Casing Logger	1892.00		feet		
Bit Size	8.500		inches		
Hole Fluid Type	OBM				
Density / Viscosity	9.70	lb/USg	70.00	sec/qt	
PH / Fluid Loss	---		3.20	ml/30Min	
Sample Source	---				
Rm @ Measured Temp	---				
Rmf @ Measured Temp	---				
Rmc @ Measured Temp	---				
Source Rmf / Rmc	CALC		CALC		
Rm @ BHT	---				
Time Since Circulation	12 HOURS				
Max Recorded Temp	94.00		deg F		
Equipment / Base	131763		CASPER		
Recorded By	D. BEANS				
Witnessed By	J. G.				

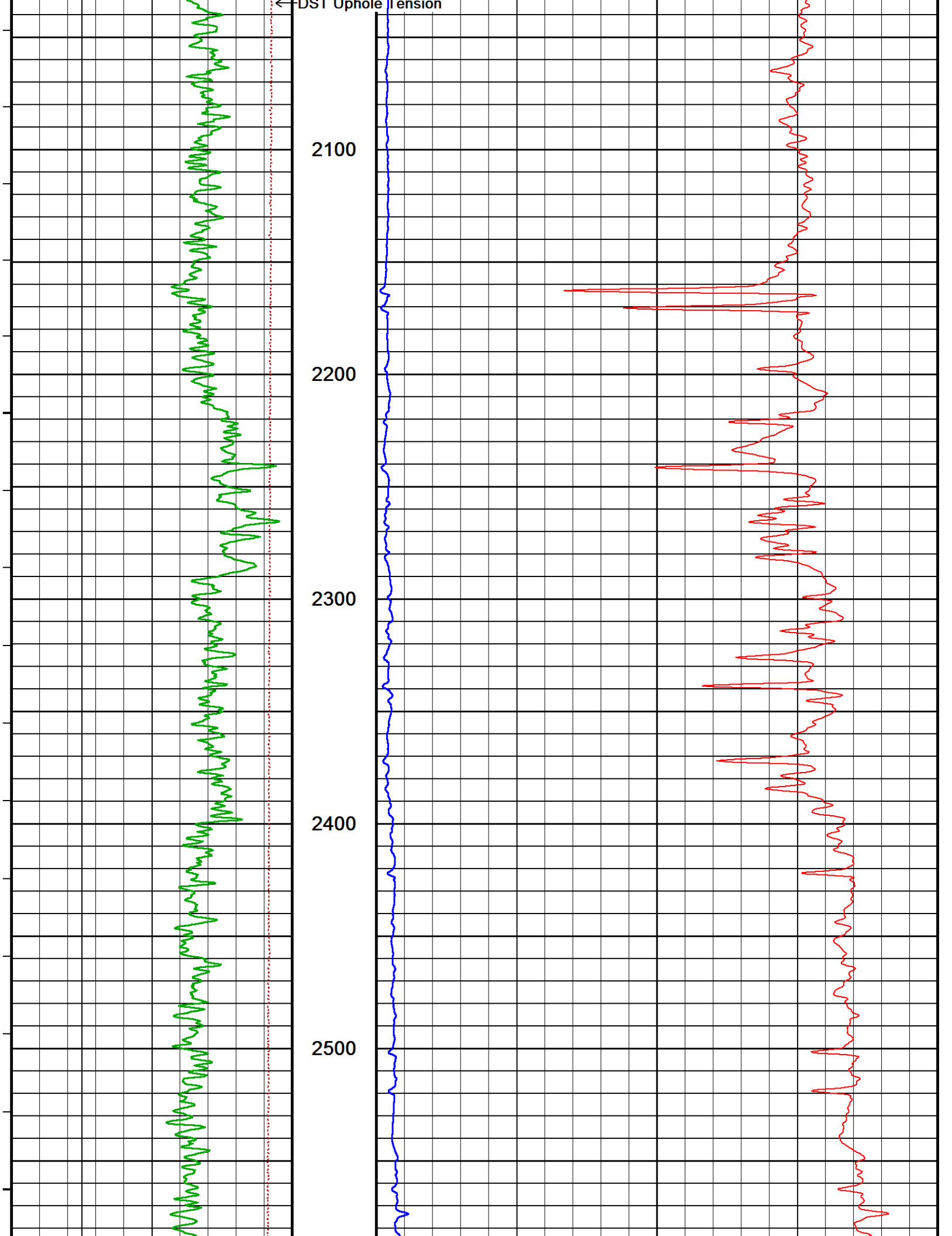
BOREHOLE RECORD					Last Edited: 08-FEB-2016 00:20
Bit Size inches		Depth From feet		Depth To feet	
8.500		1893.00		6613.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	9.625	0.00	1893.00	36.00	

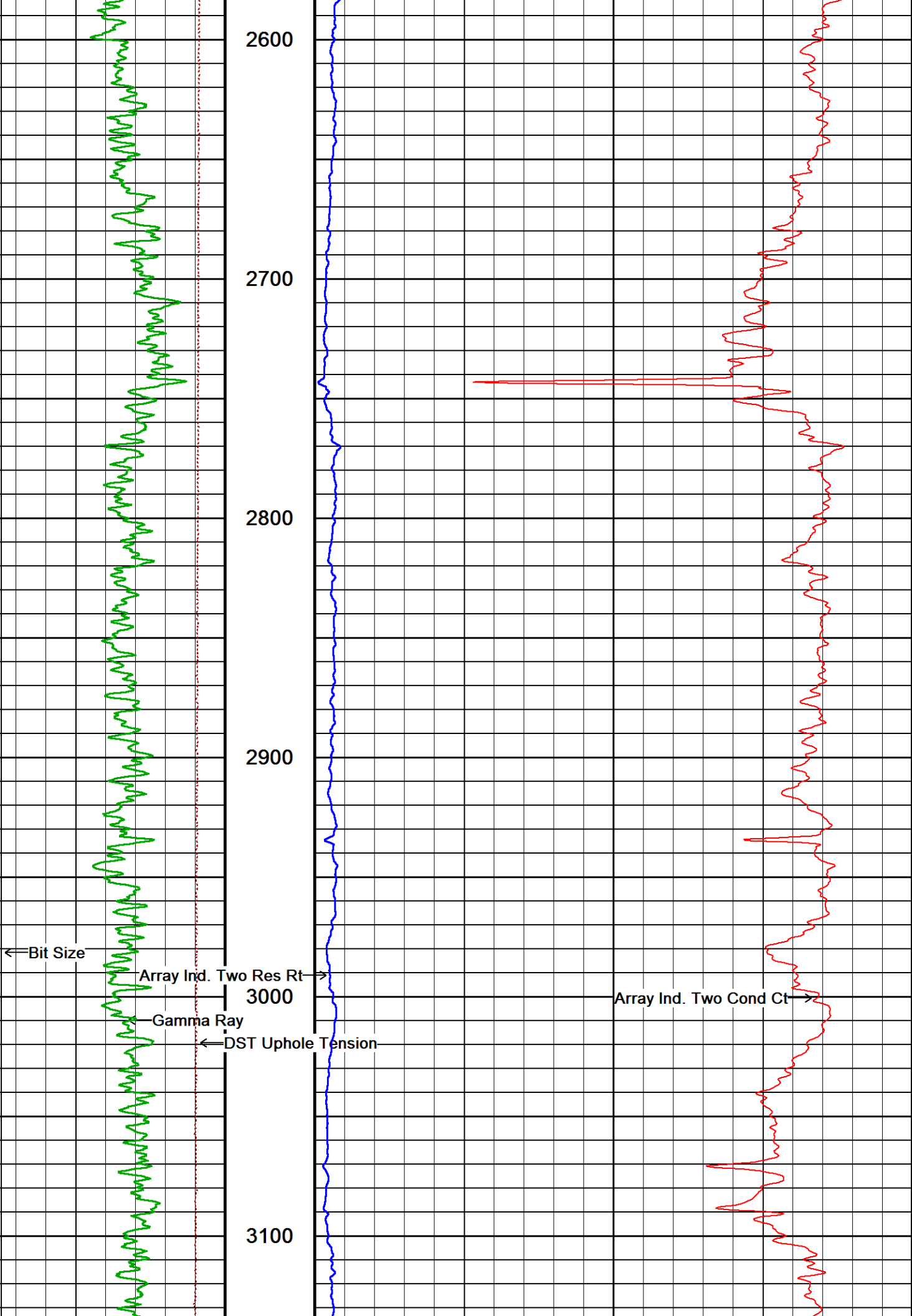
REMARKS
SOFTWARE: 15.03.5939
TOOLS: CBH, SHA, MLK, MLK, MCG, MISD, MAI run in combination
HARDWARE: MAI: ICA CENTRALIZER BASKET
REACHED 7200 FT WITH KOP AT 6632 FT.
ALL INTERVALS LOGGED AND SCALED PER CLIENT REQUEST.
TIGHT PULLS, BOREHOLE SIZE AND RUGOSITY WILL AFFECT REPEATABILITY AND DATA QUALITY.
RIG: PRECISION 460

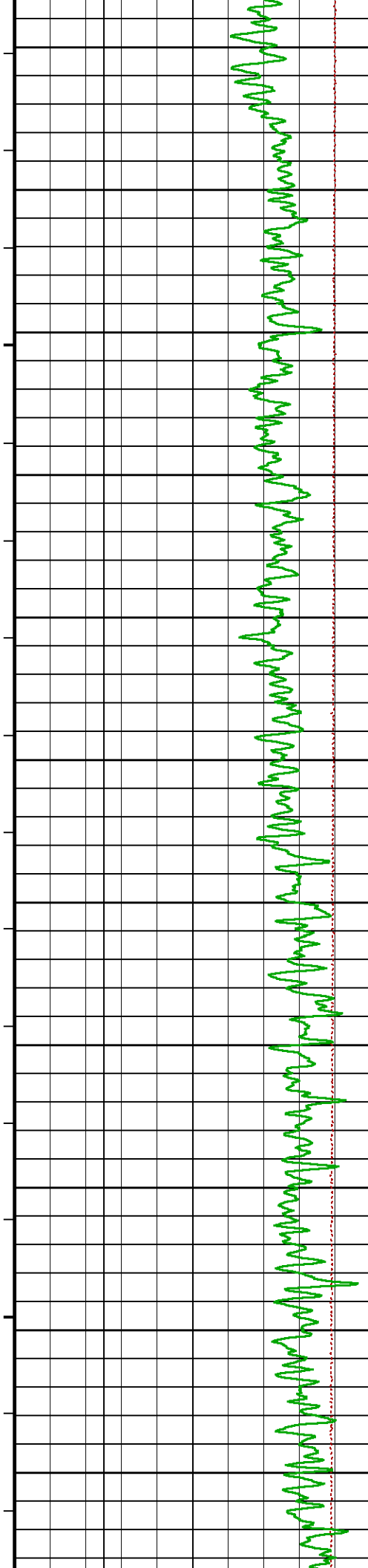
In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will 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.









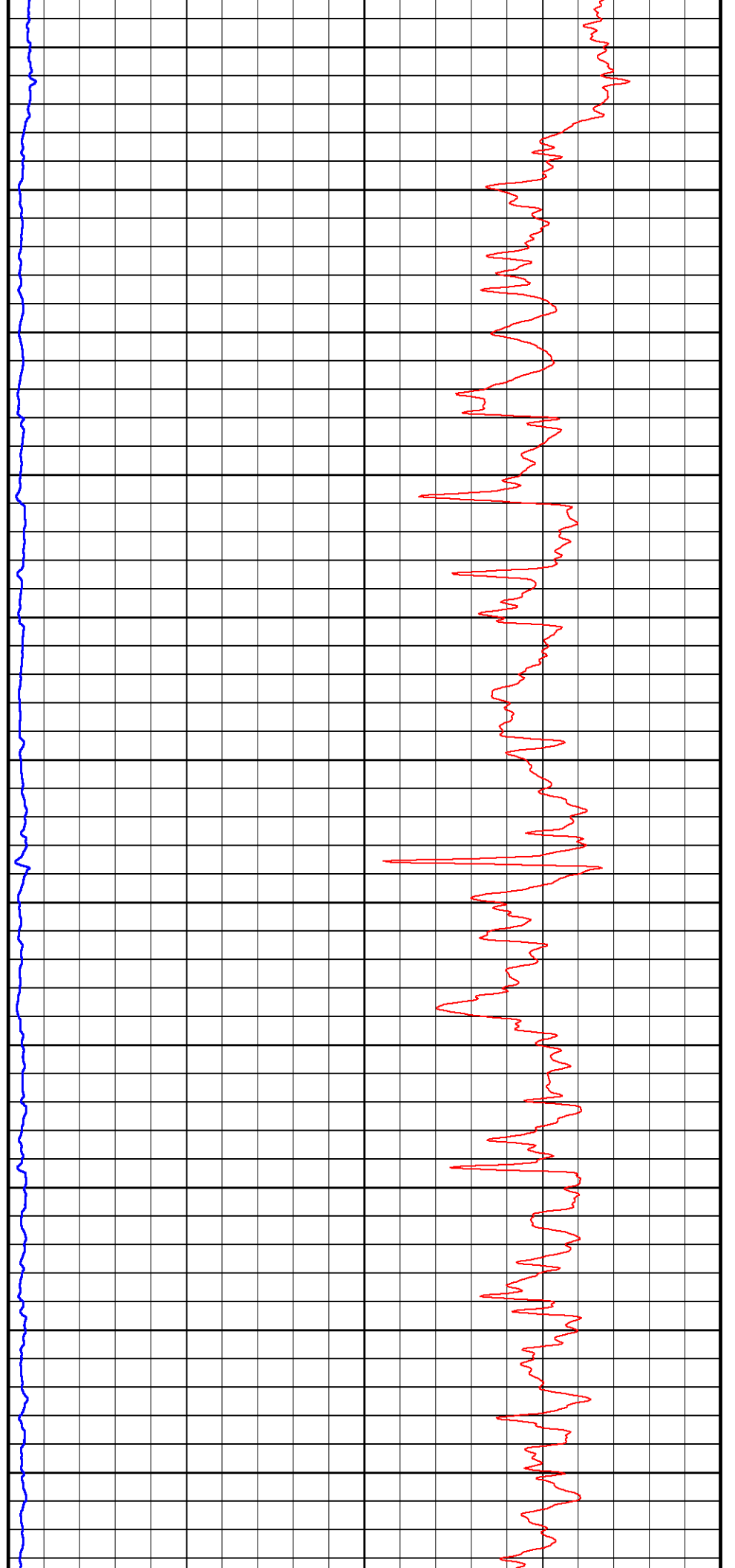
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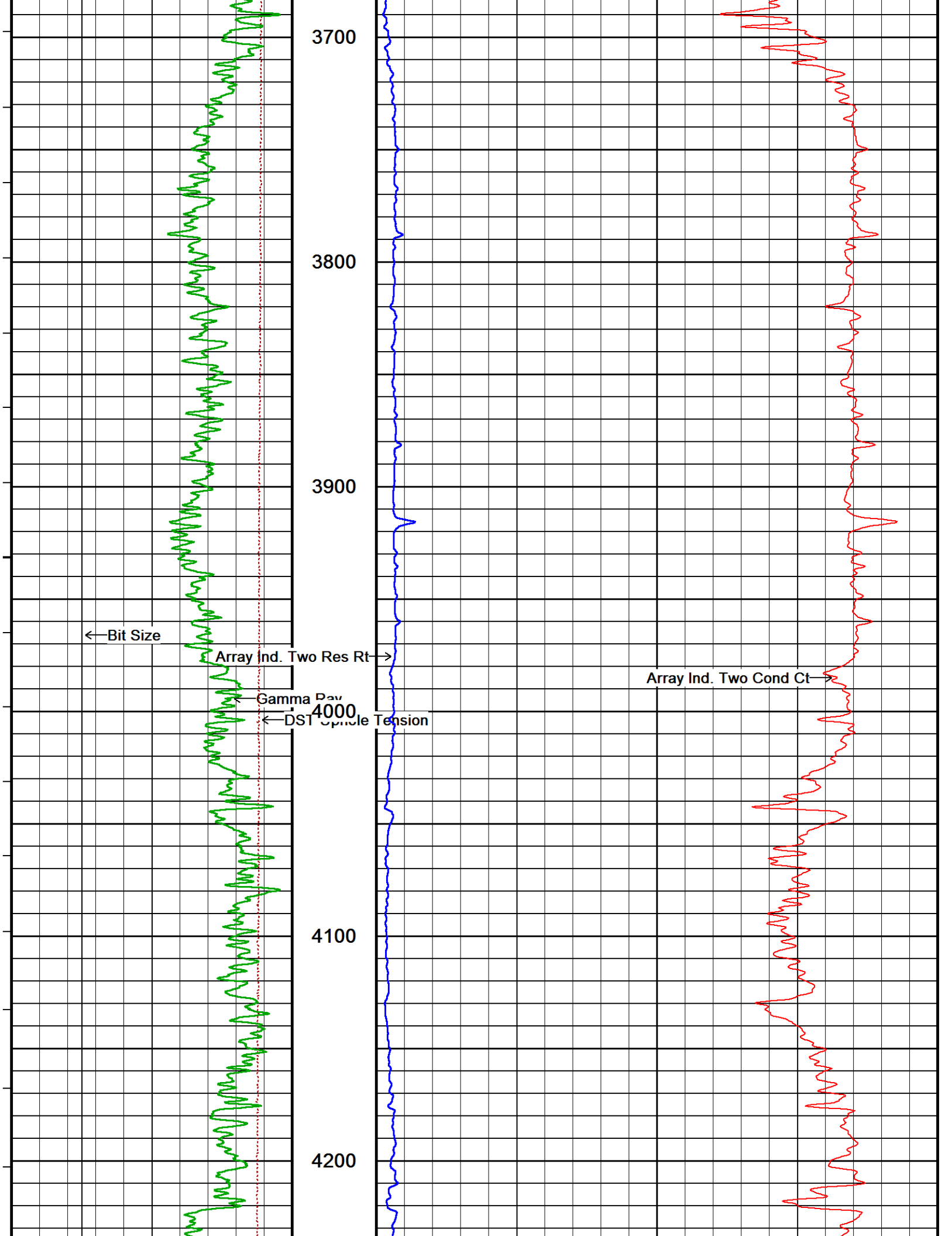
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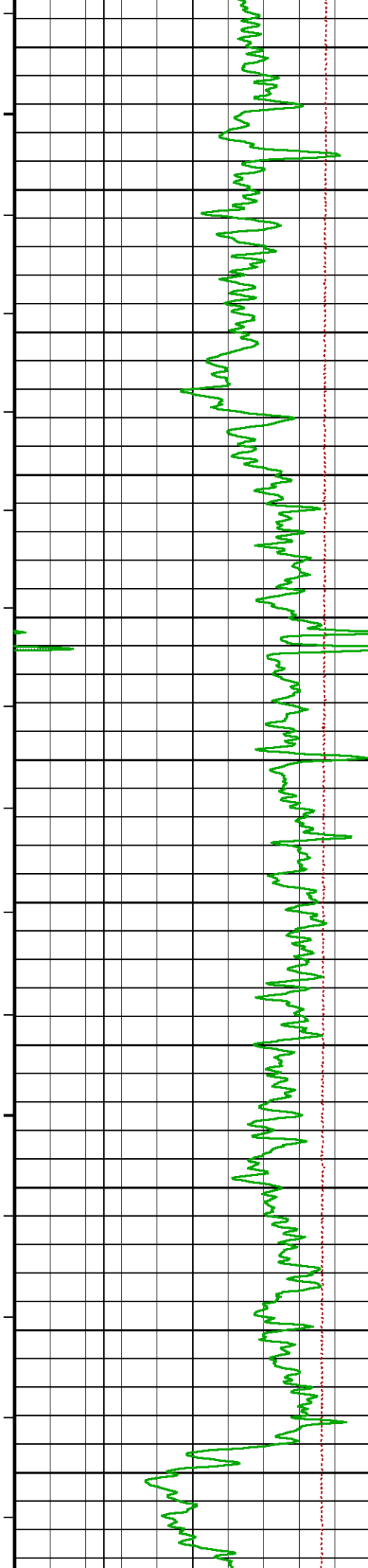
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3500

3600







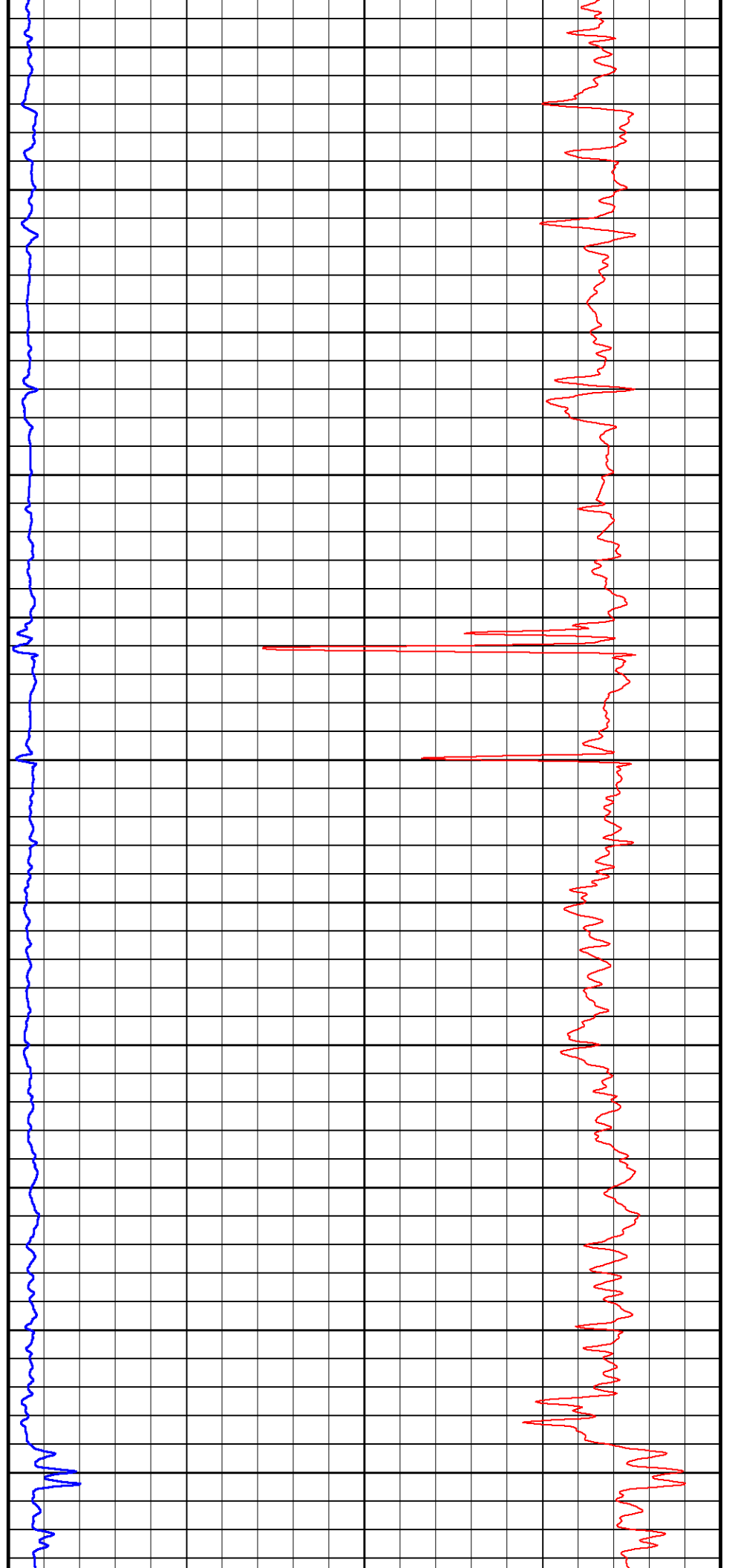
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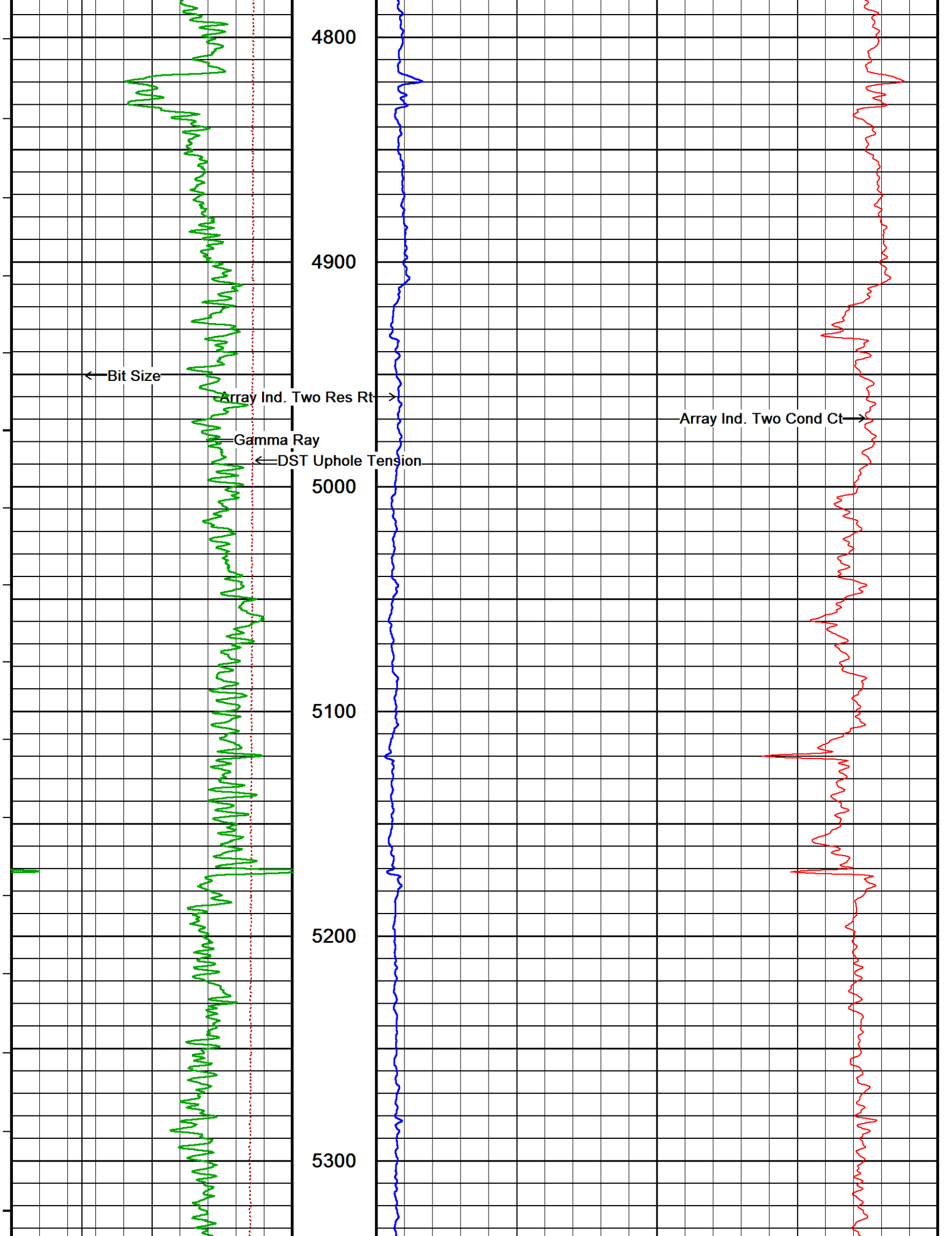
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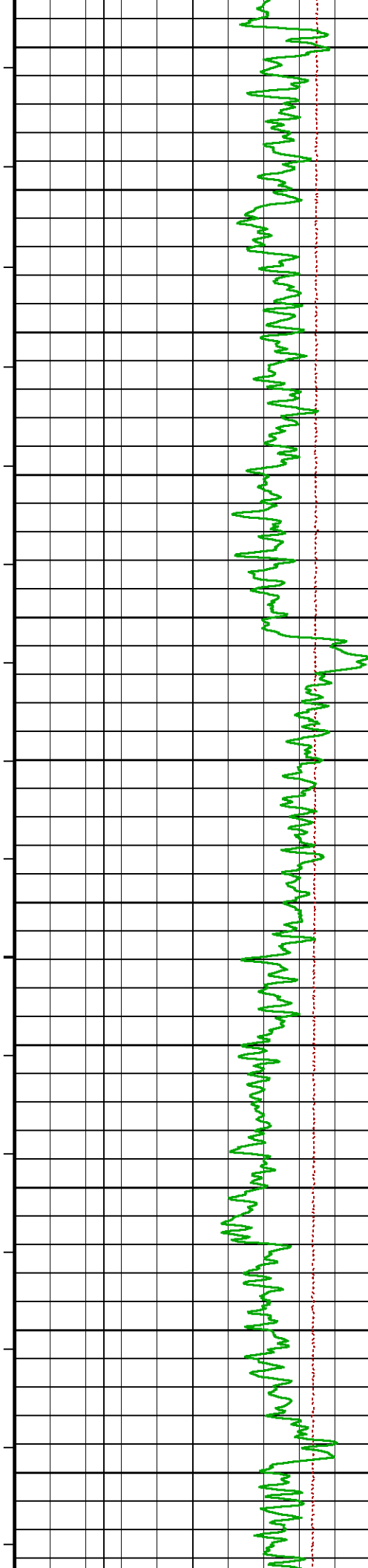
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4600

4700







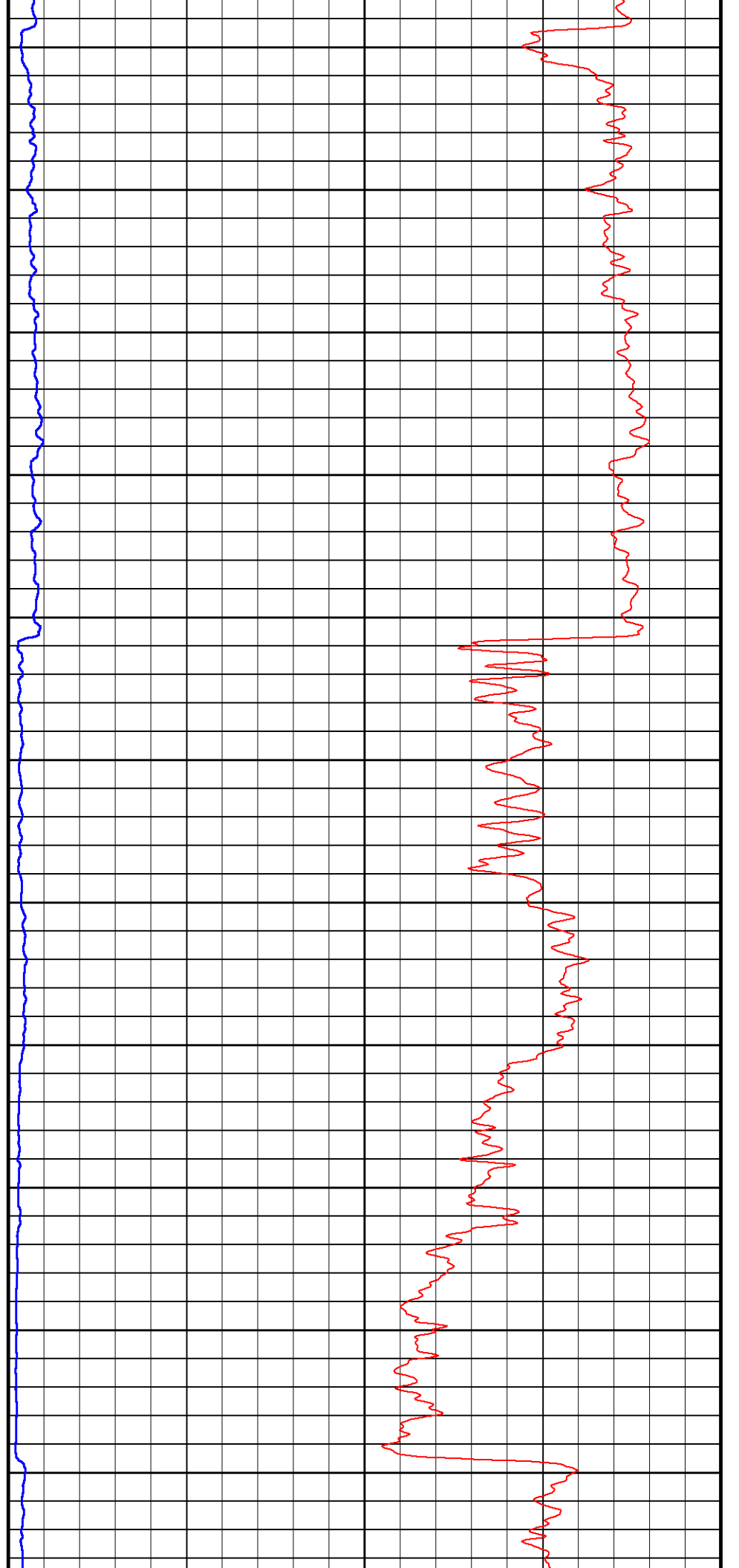
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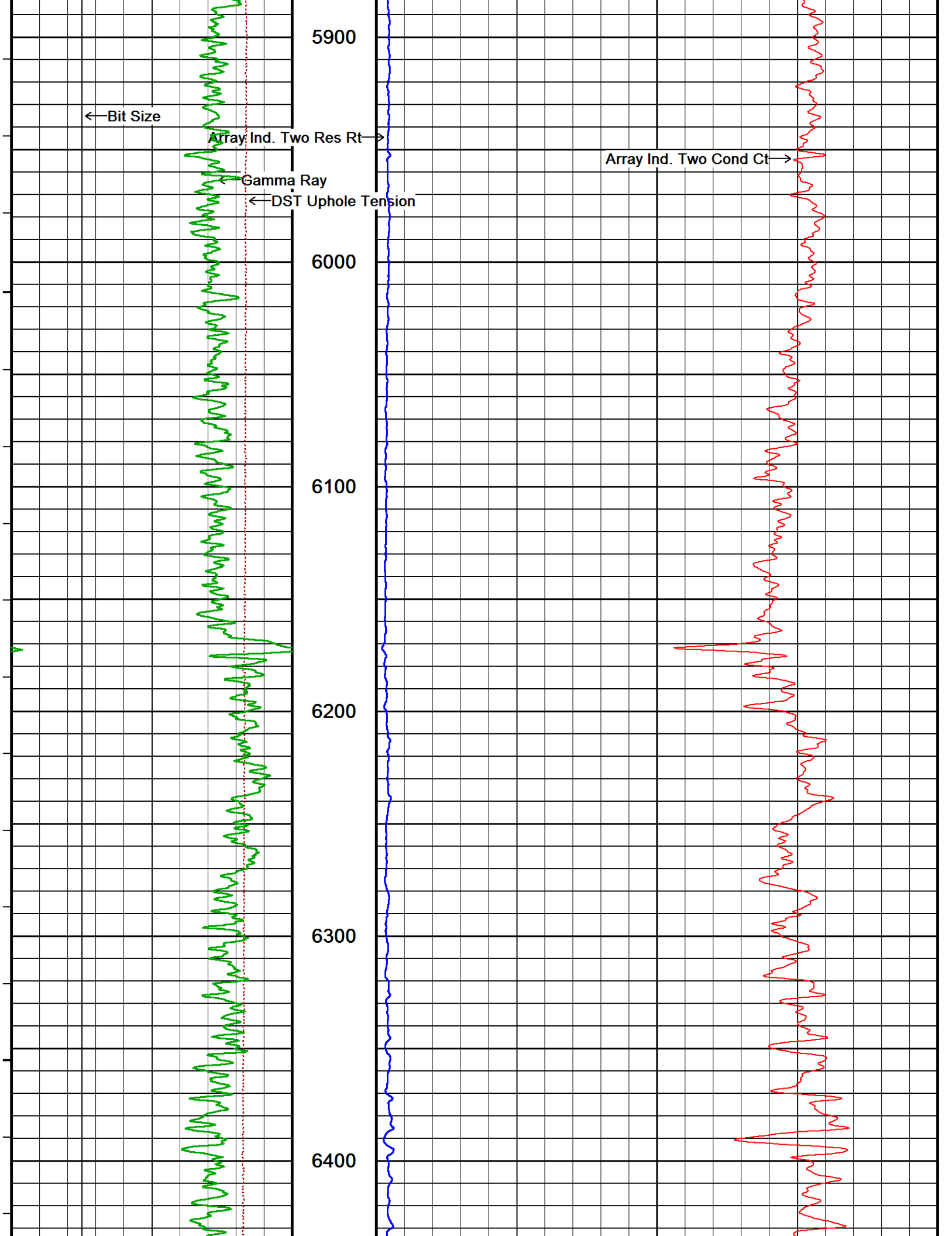
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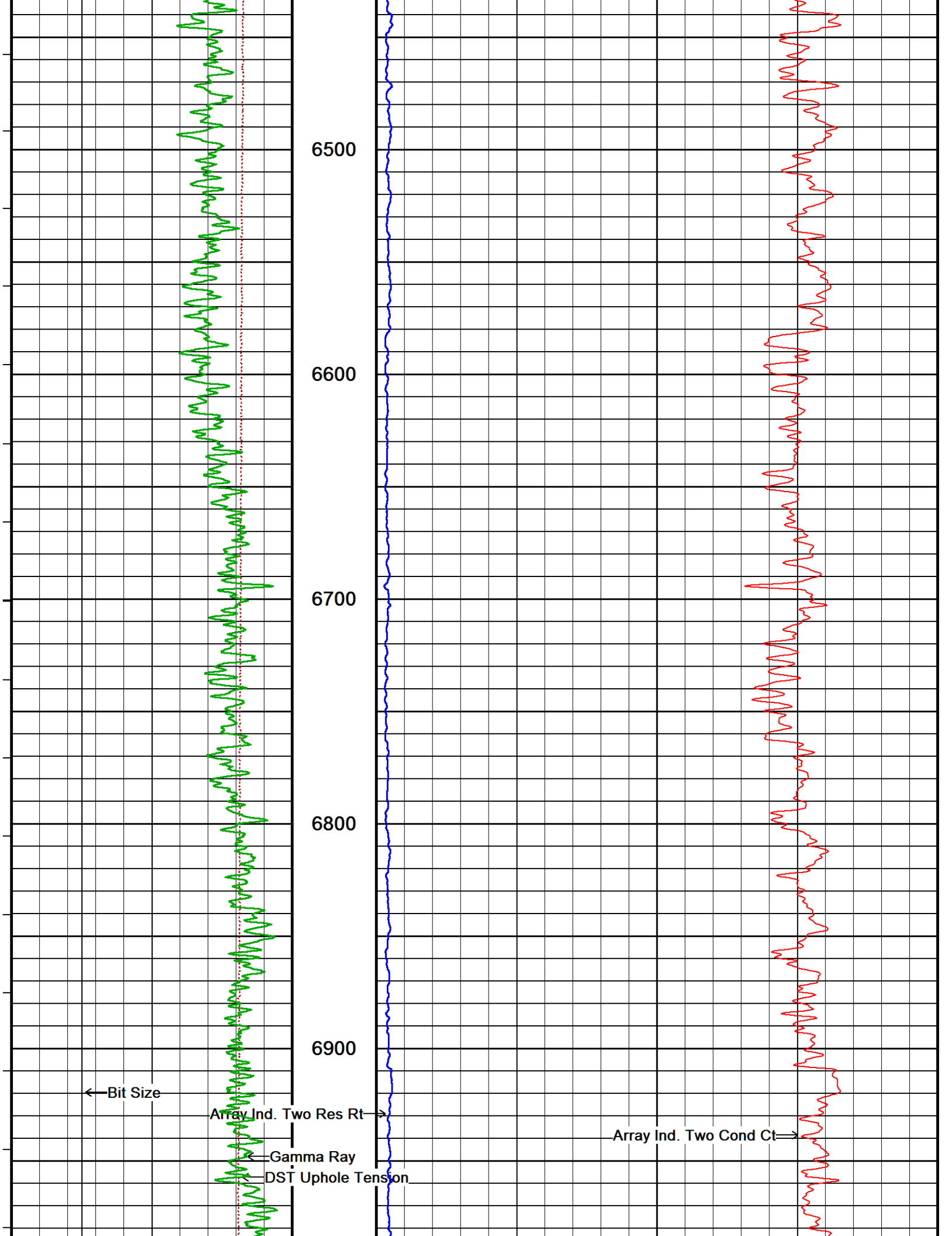
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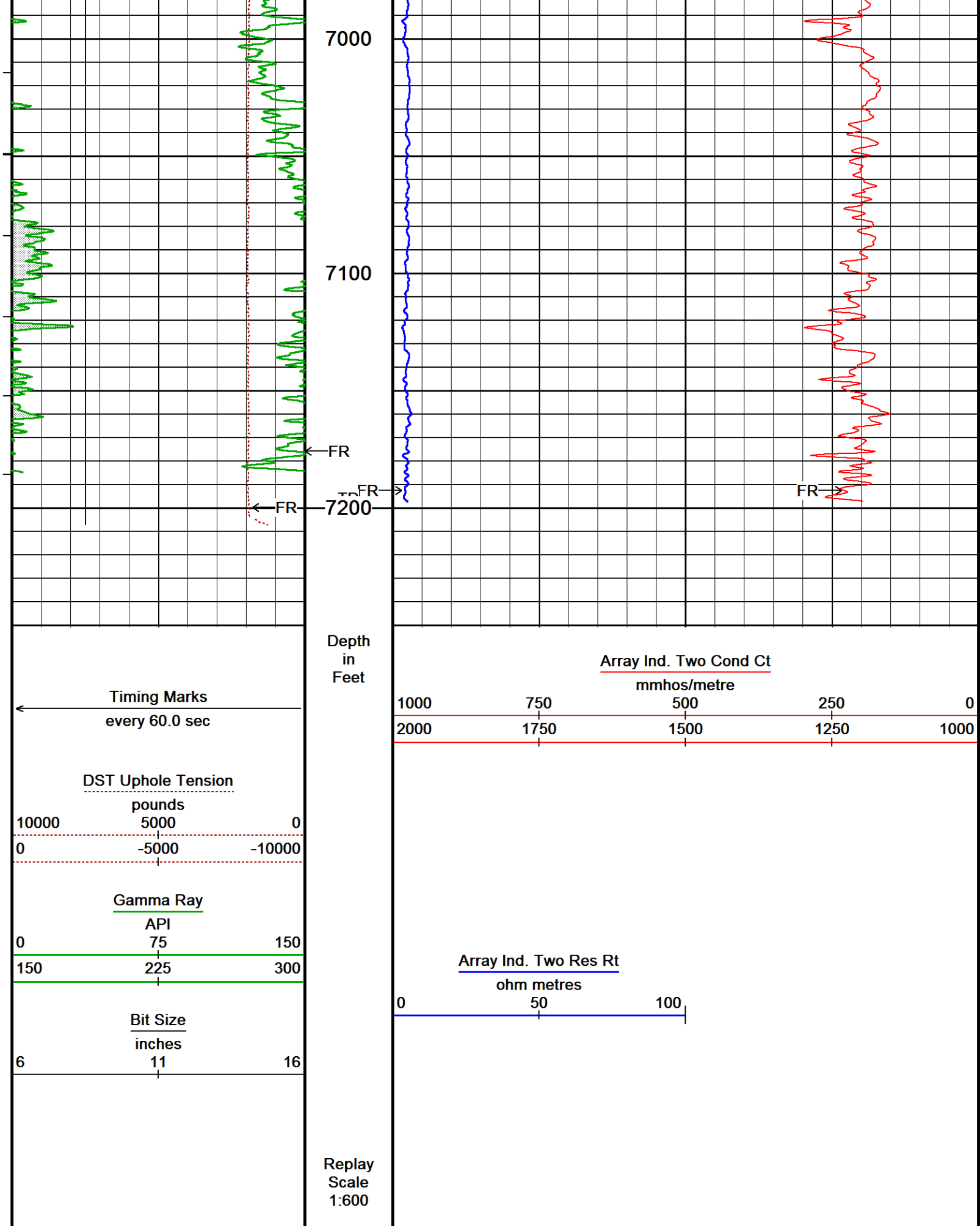
5700

5800



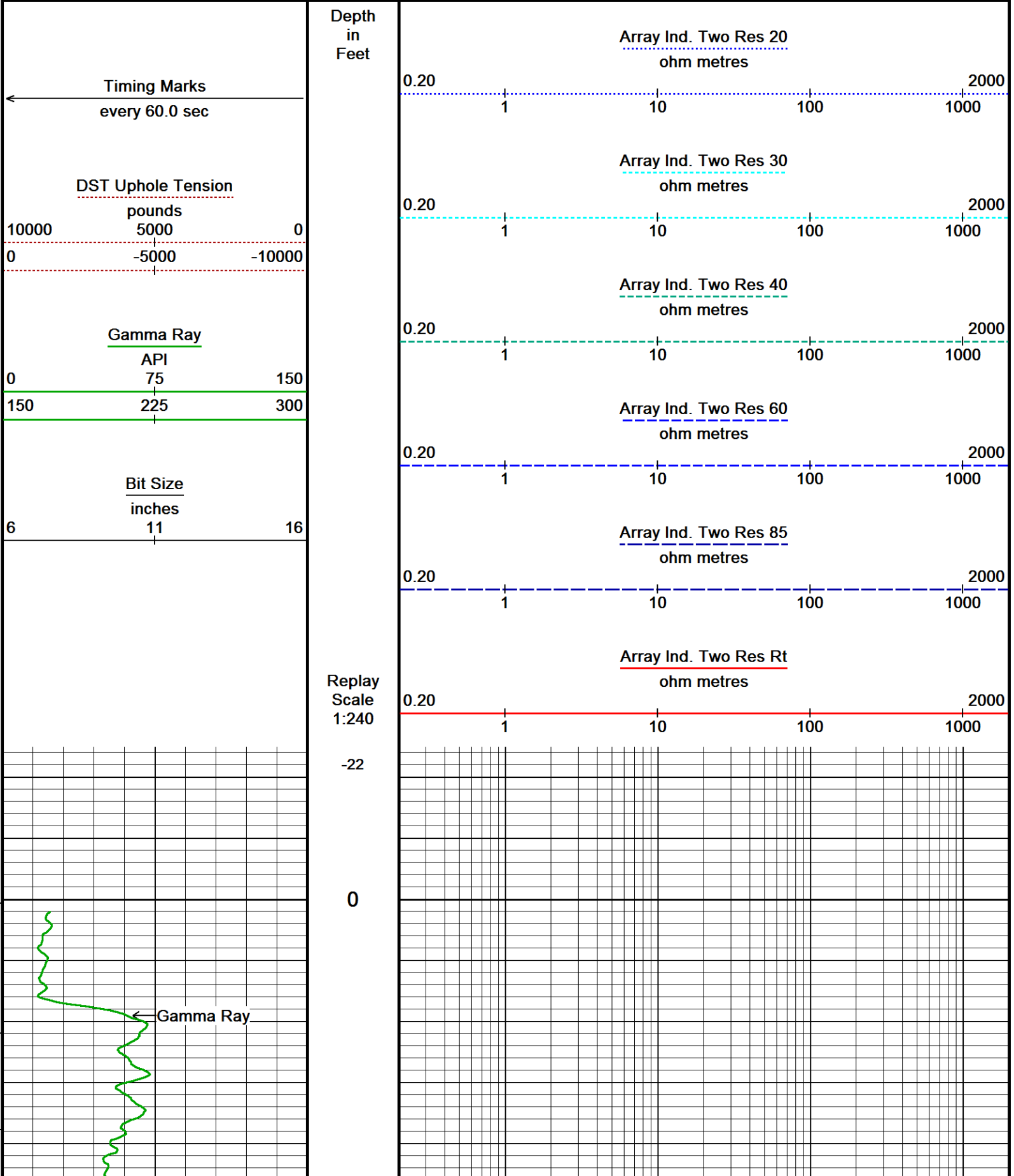


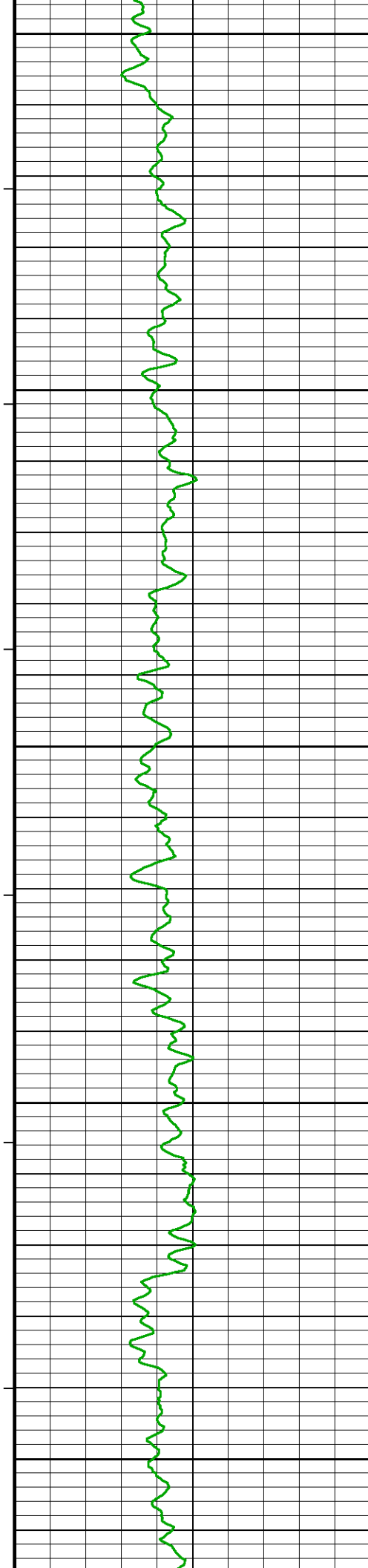




Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\Logs\Anadarko\RMF-5N-15HZ\run_1\8149-141880560\main.dta
System Versions: Logged with 15.03.5939 Plotted with 15.03.5939

Plotted on 08-FEB-2016 08:51
Recorded on 08-FEB-2016 04:49





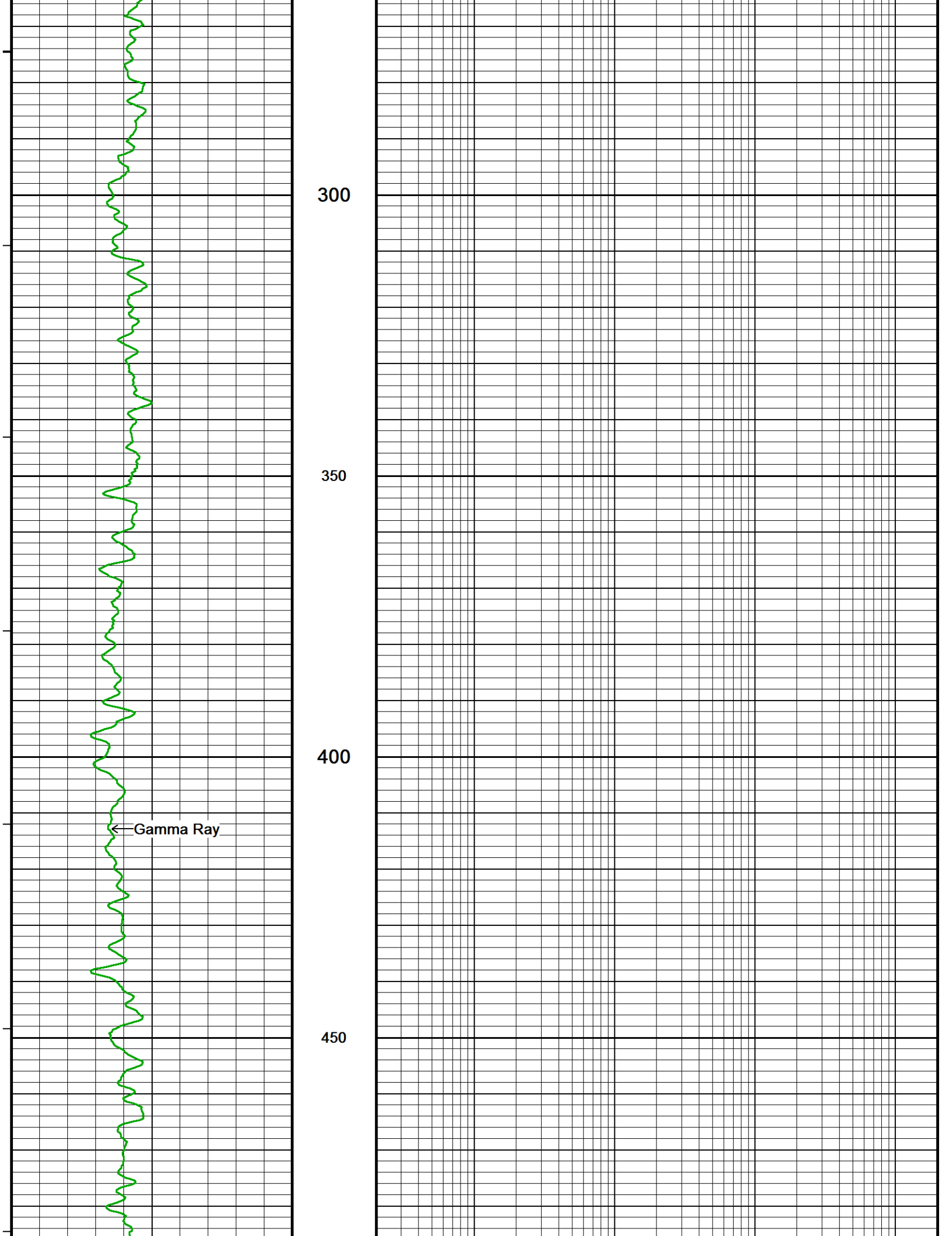
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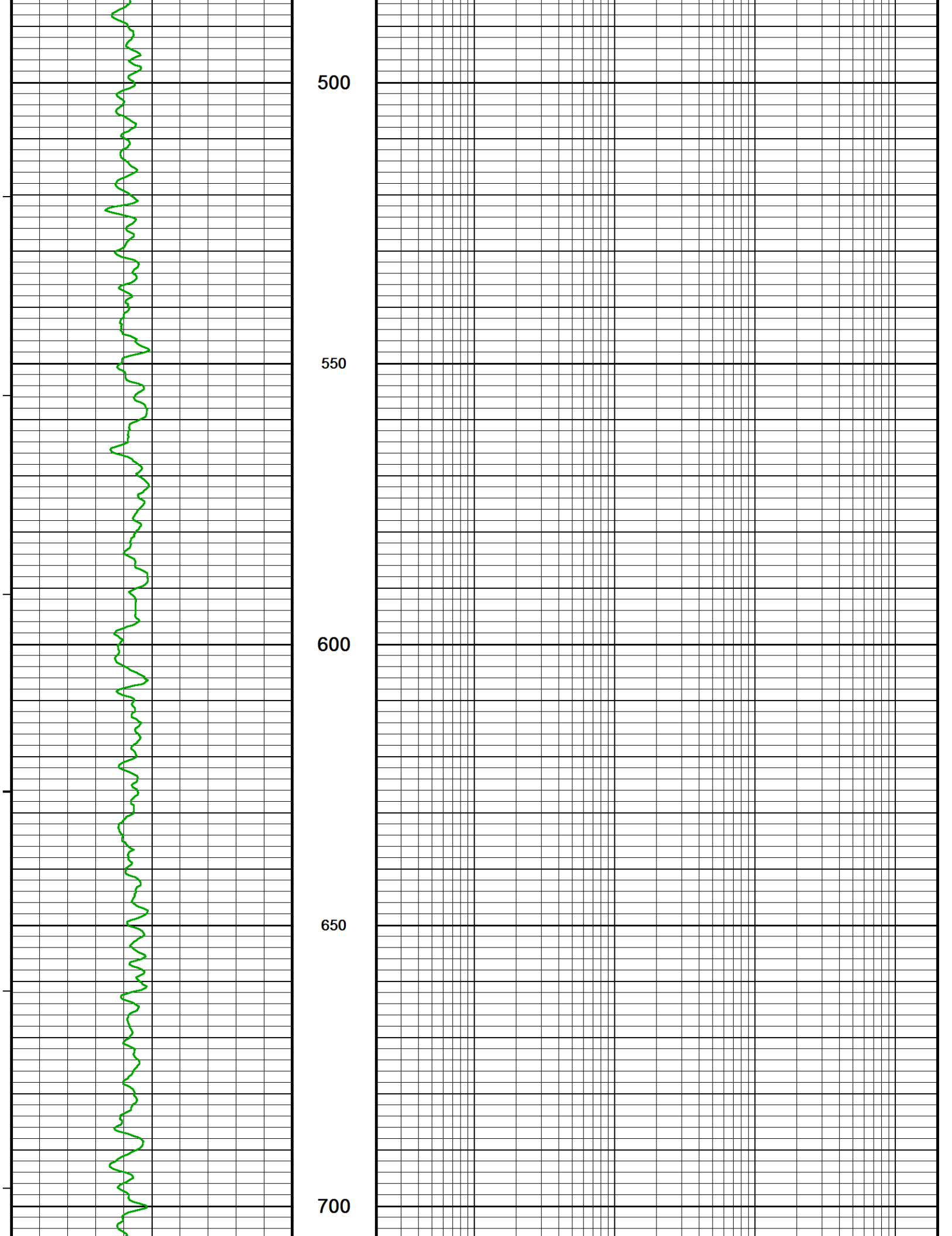
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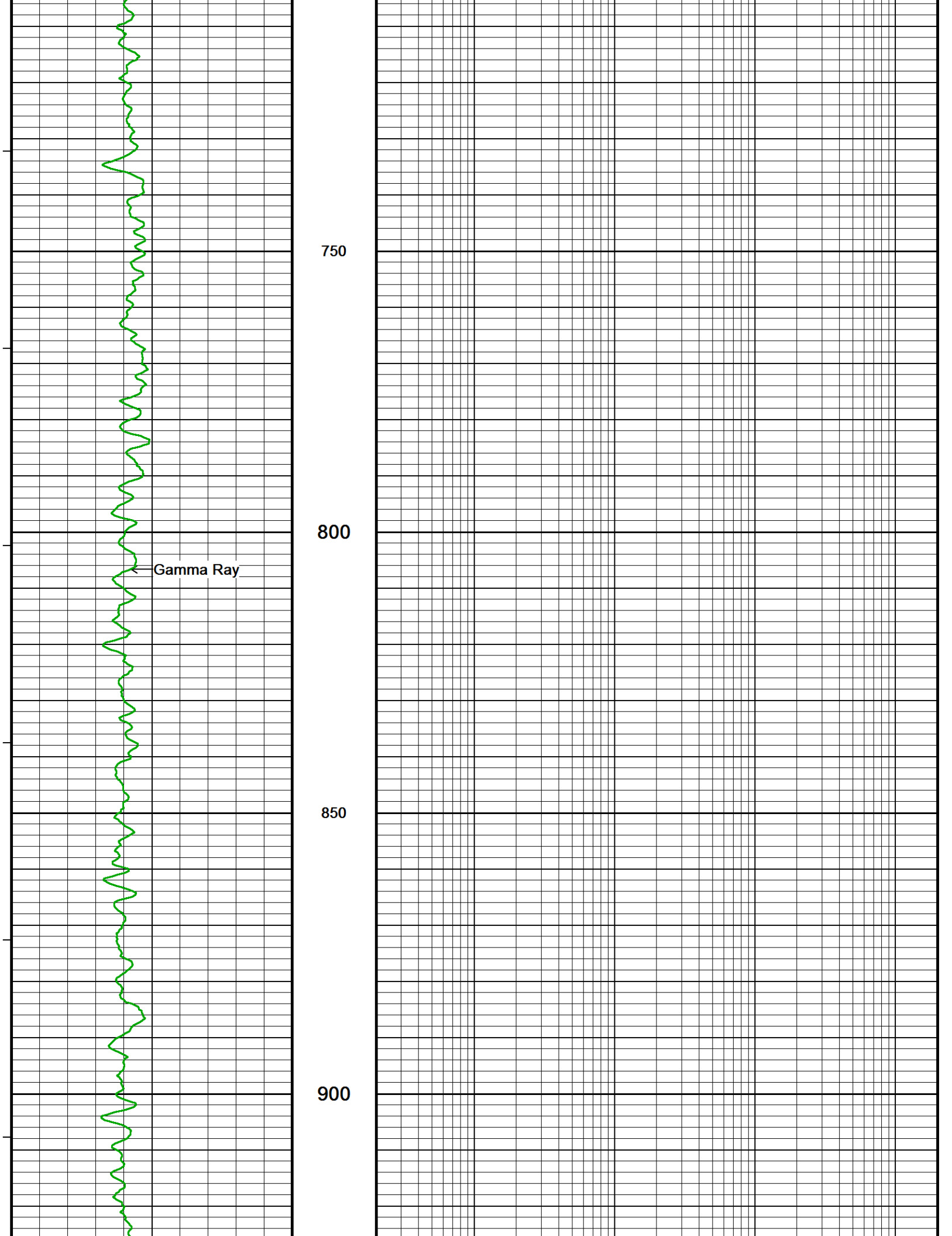
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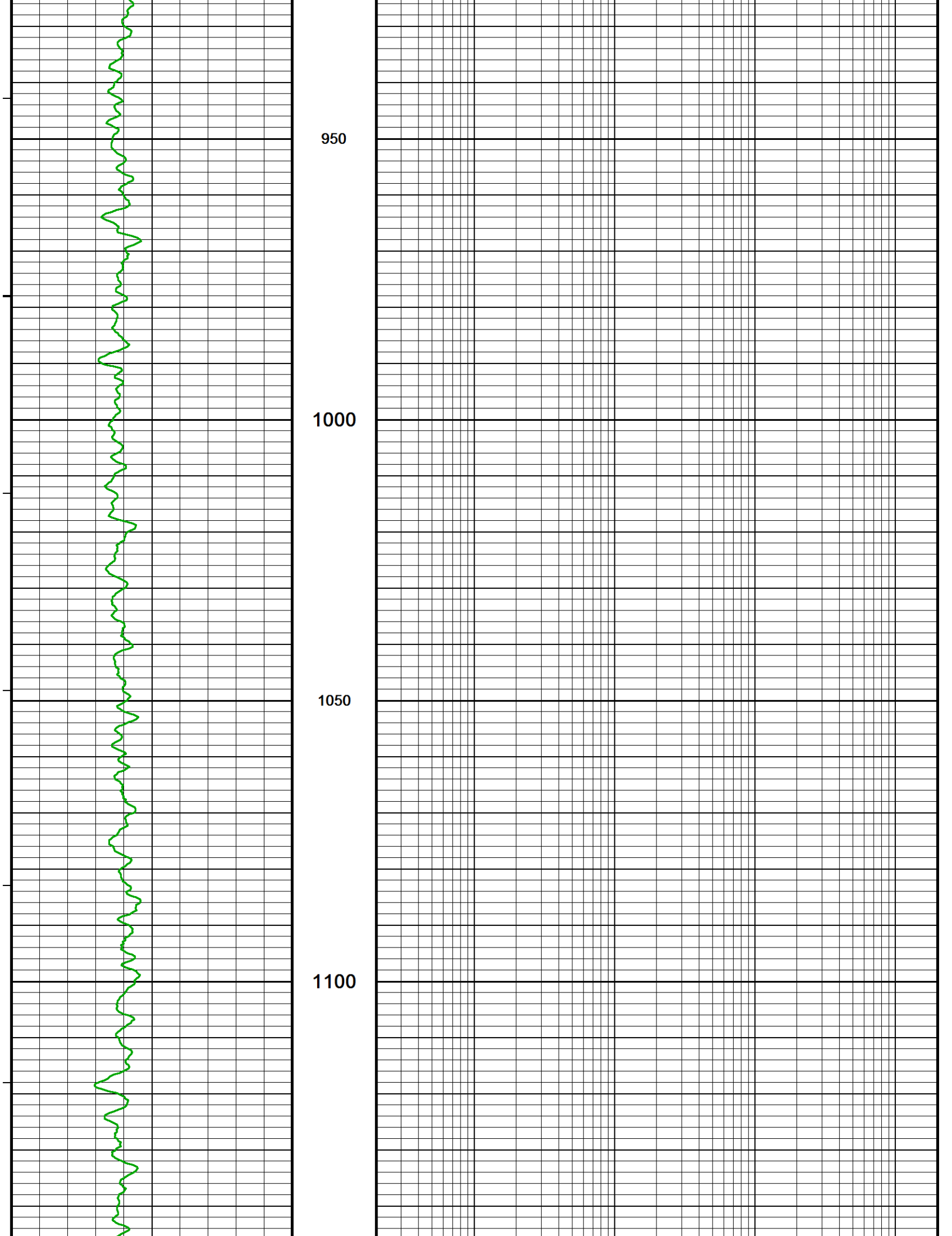
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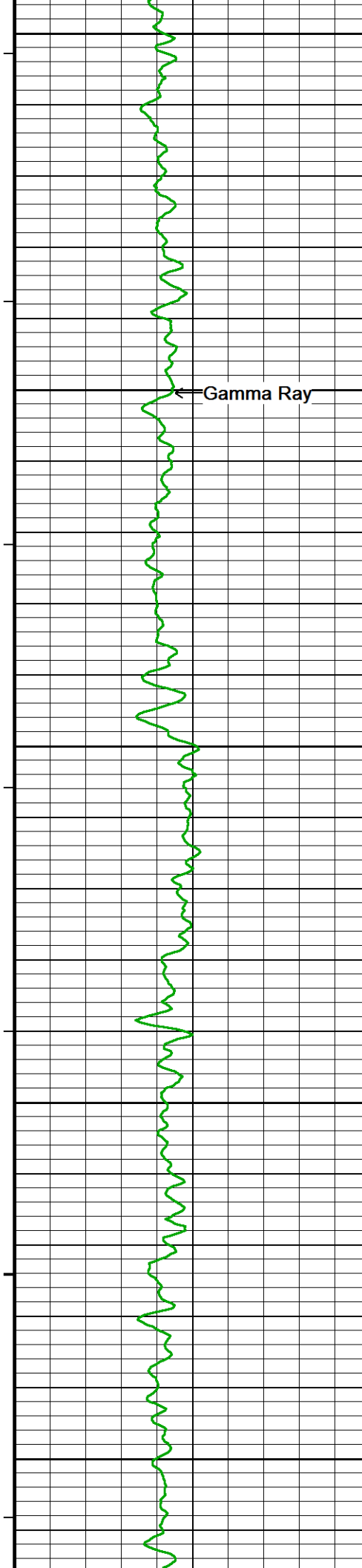
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1150

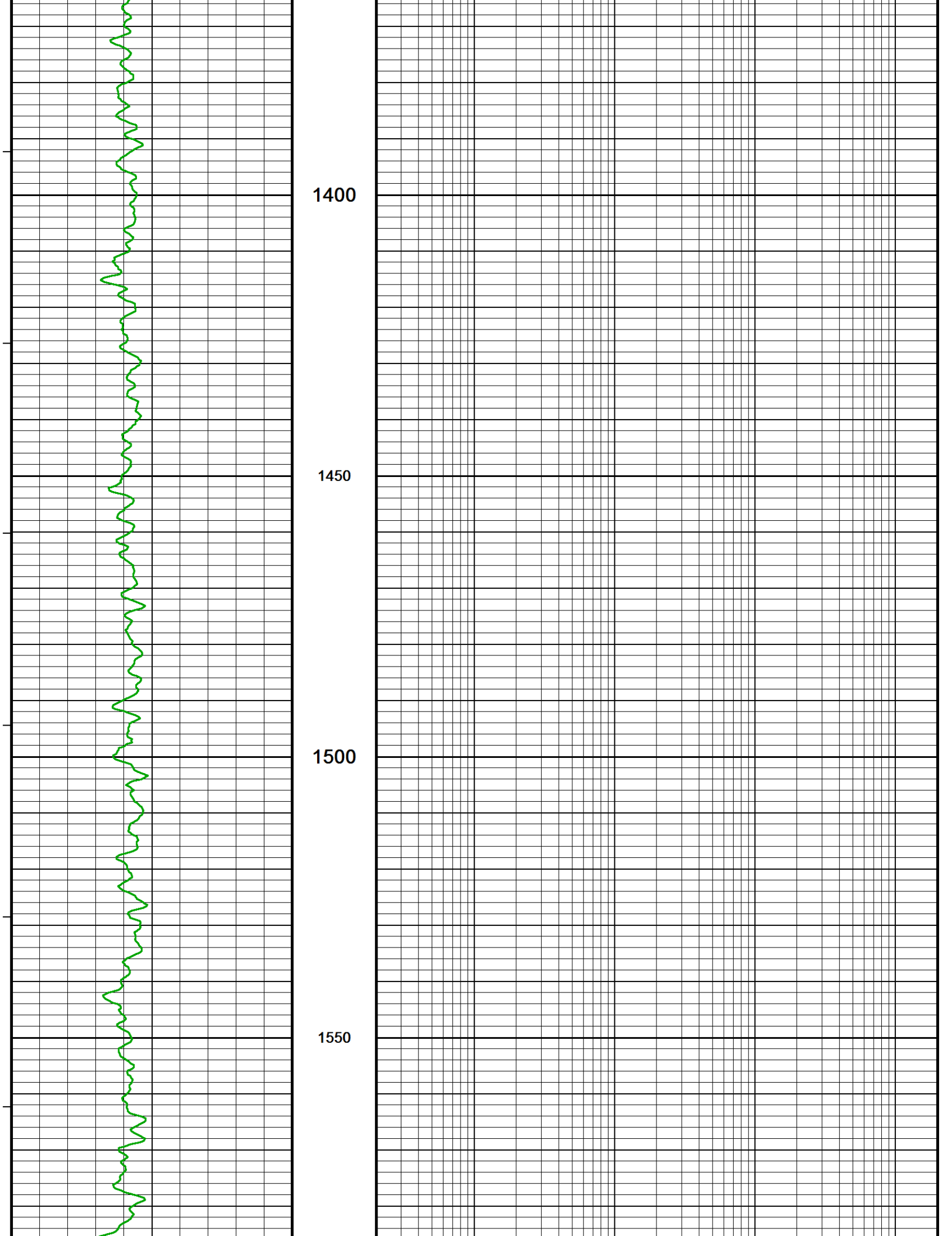
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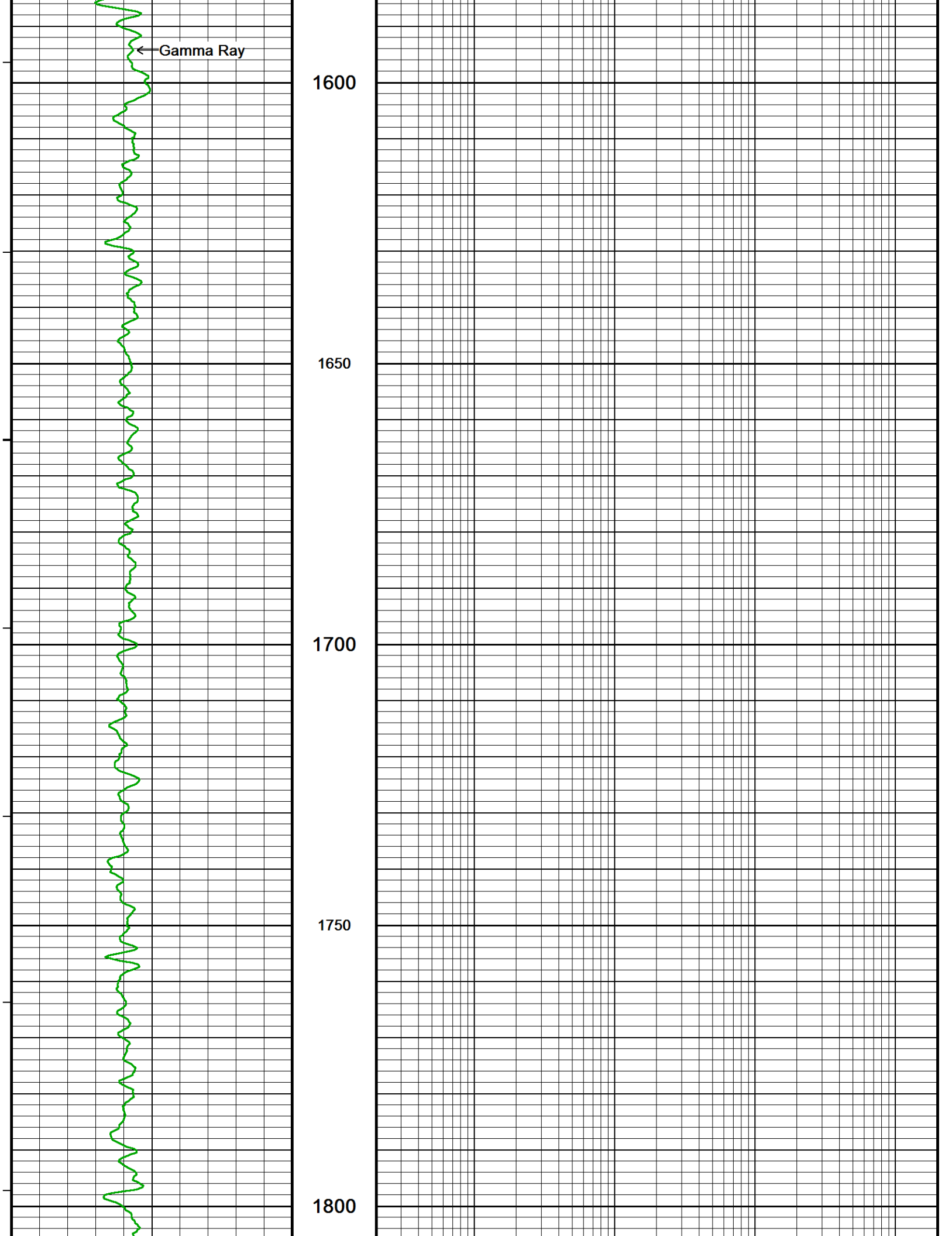
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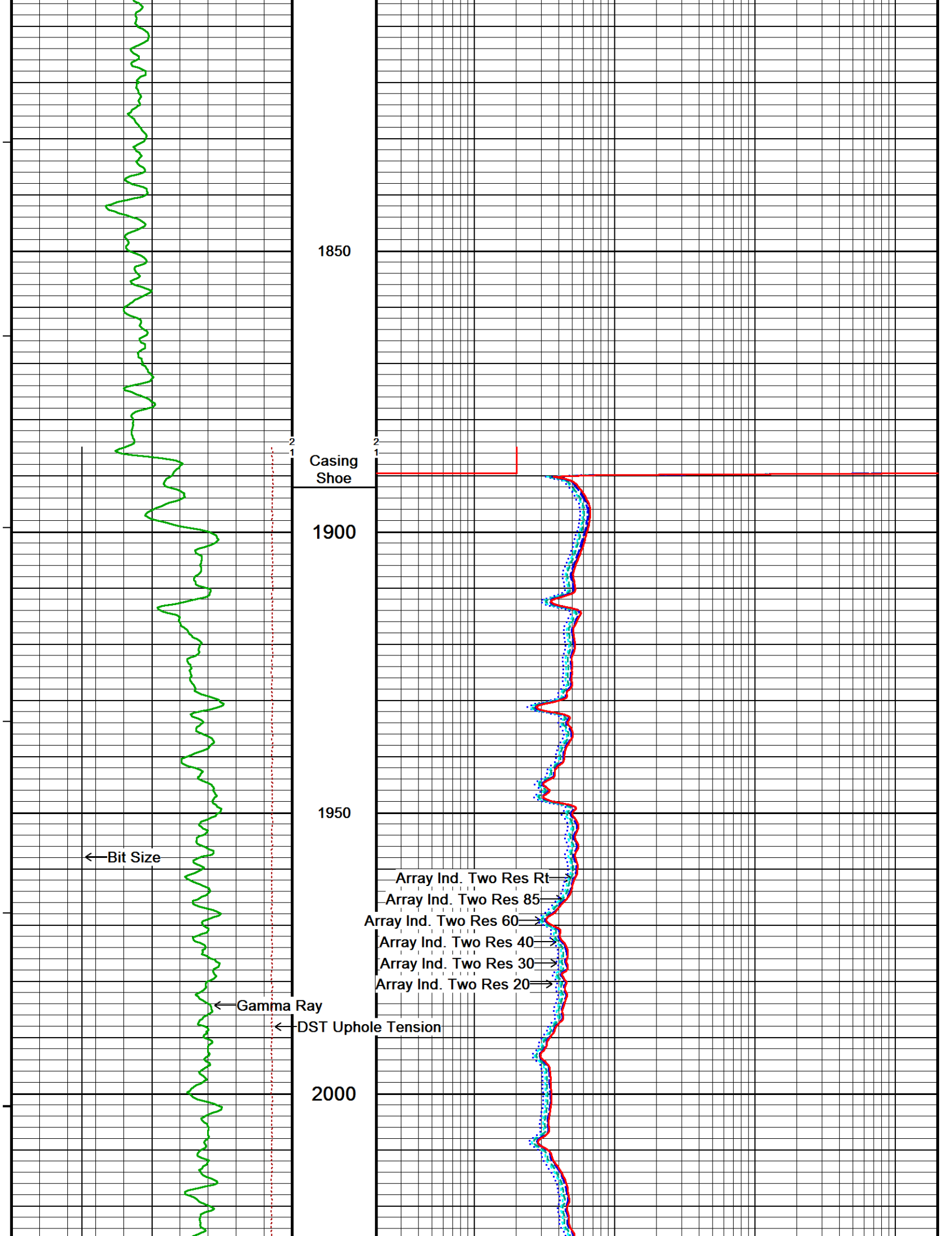
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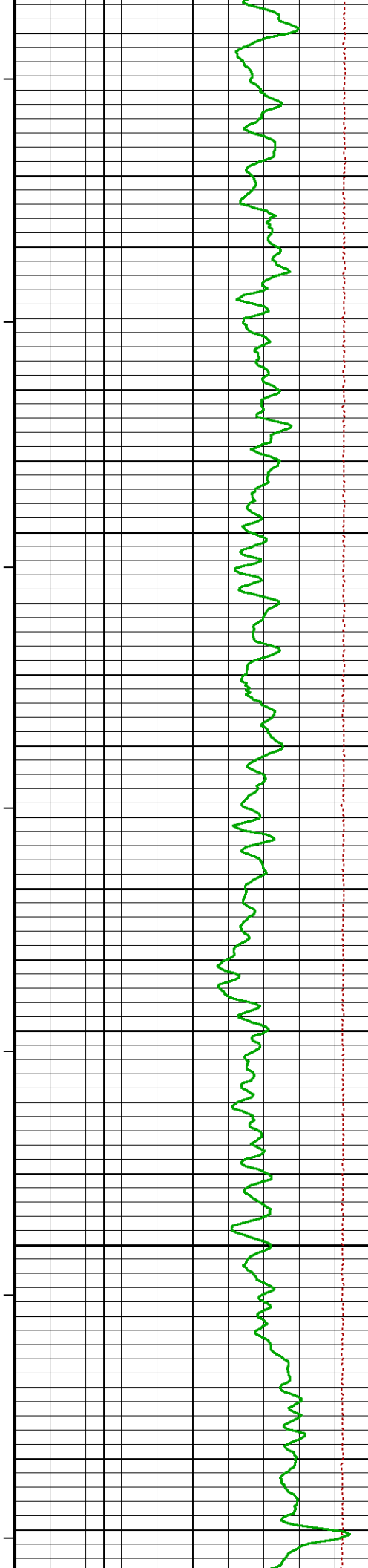
1350

← Gamma Ray







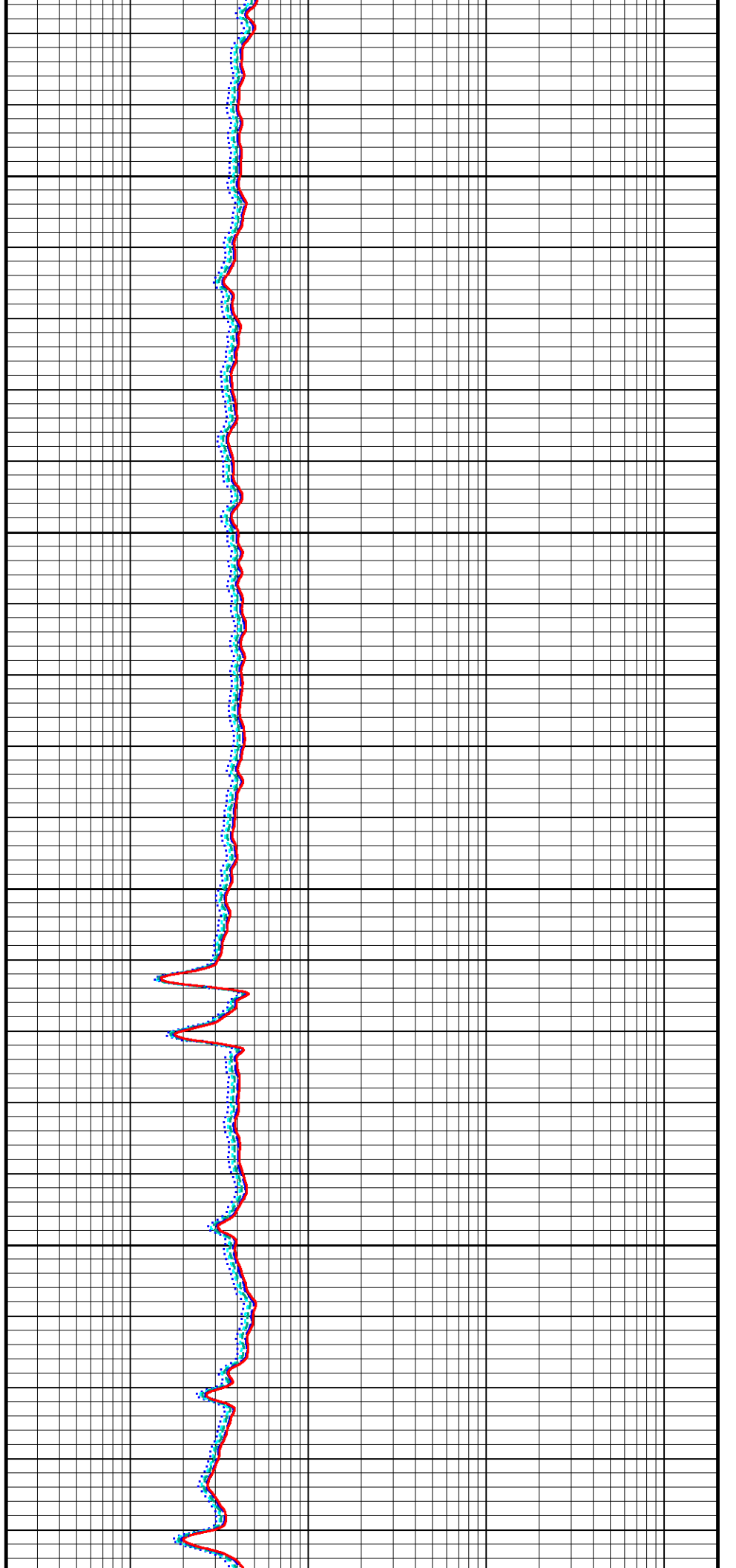


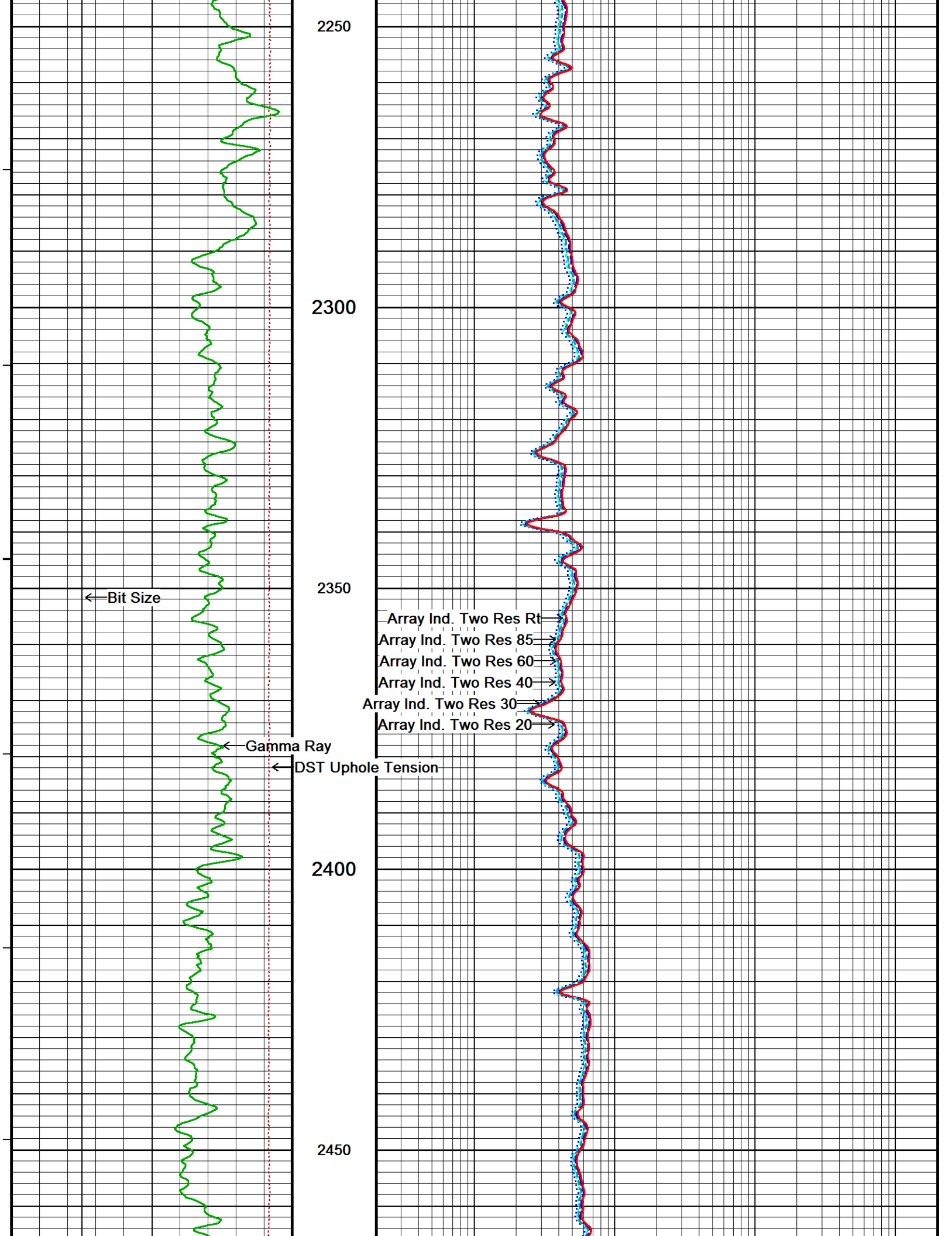
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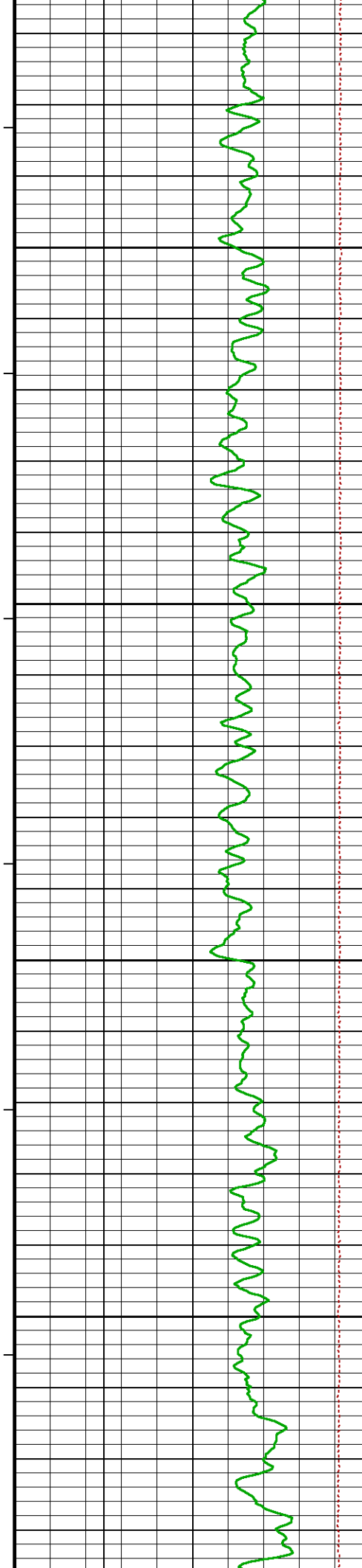
2100

2150

2200





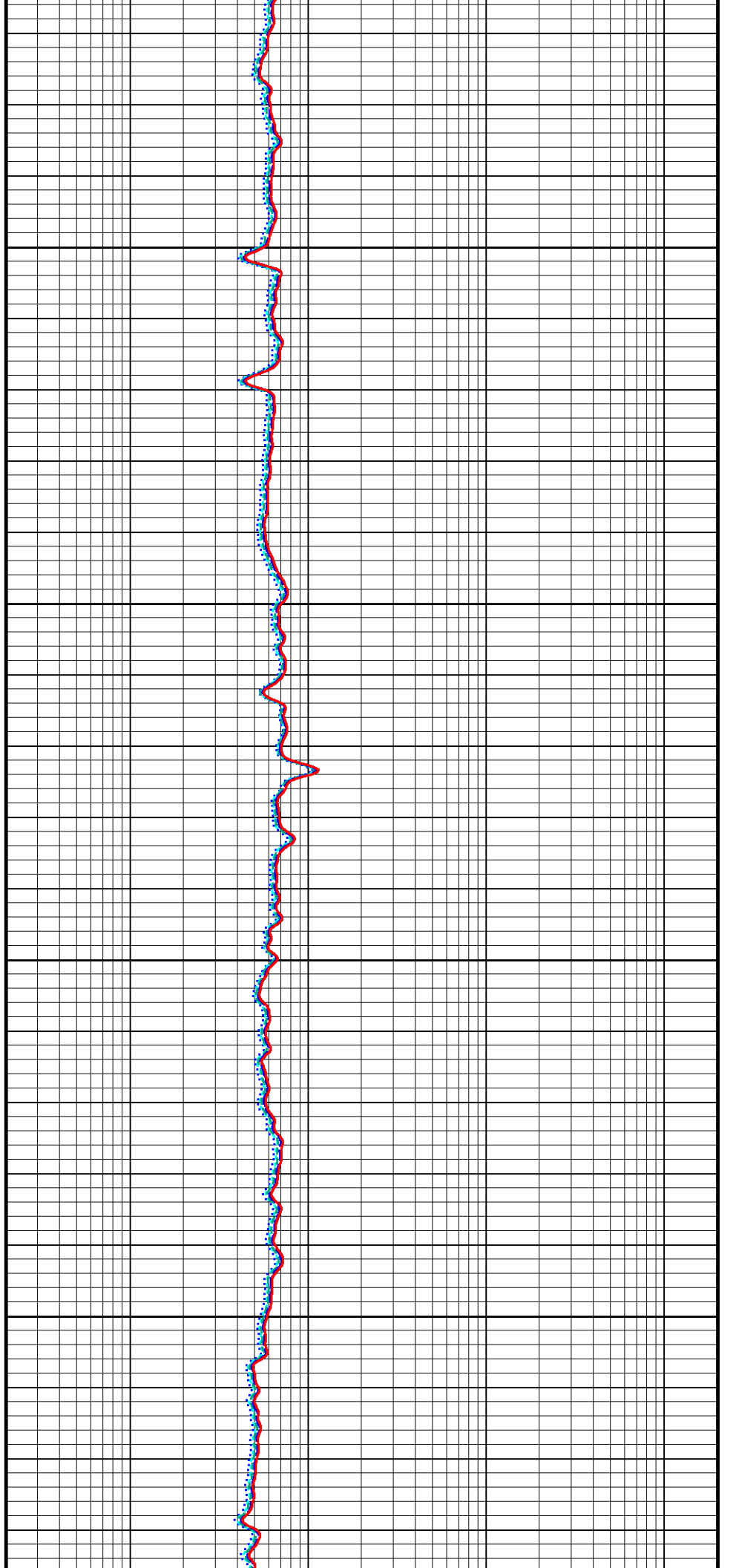


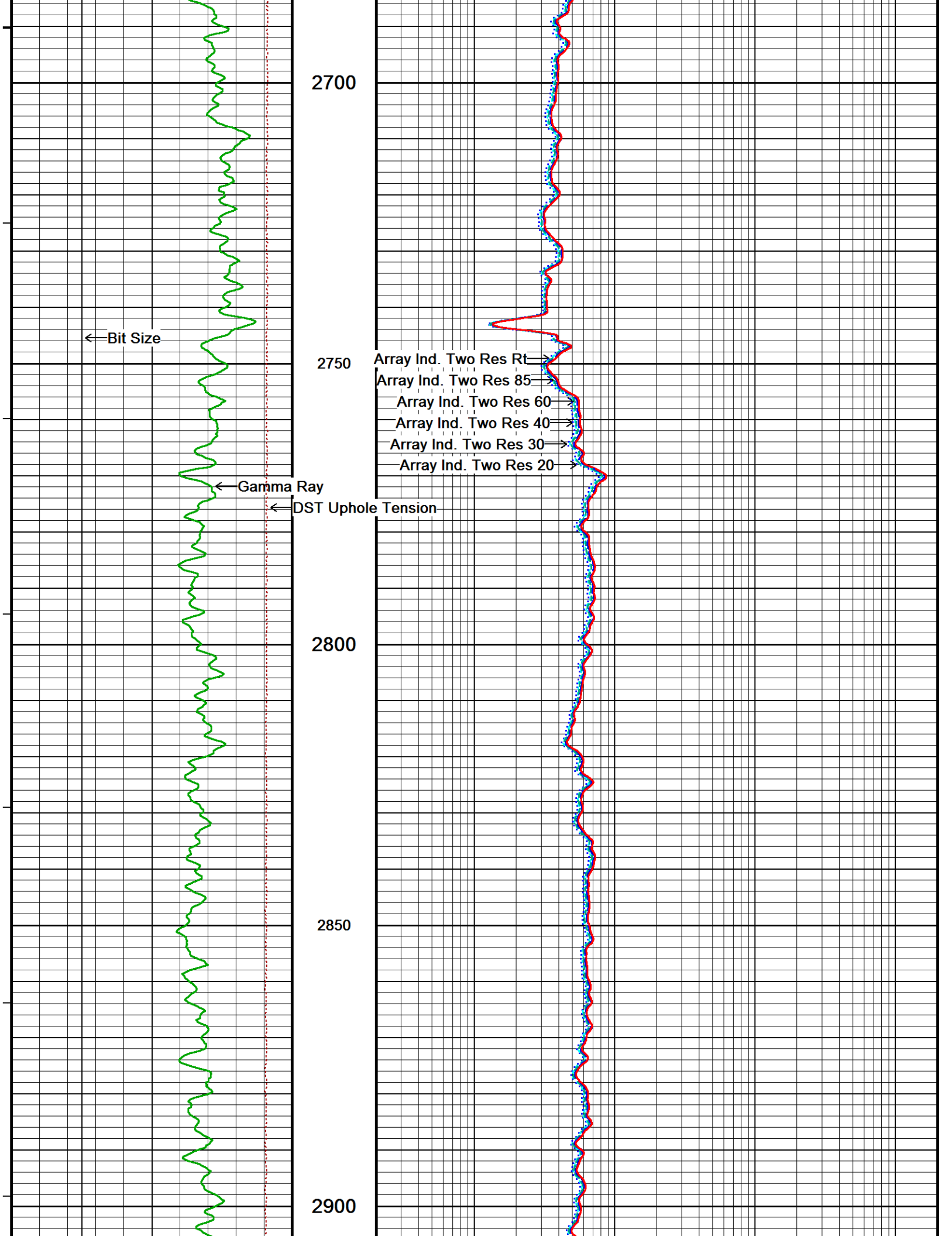
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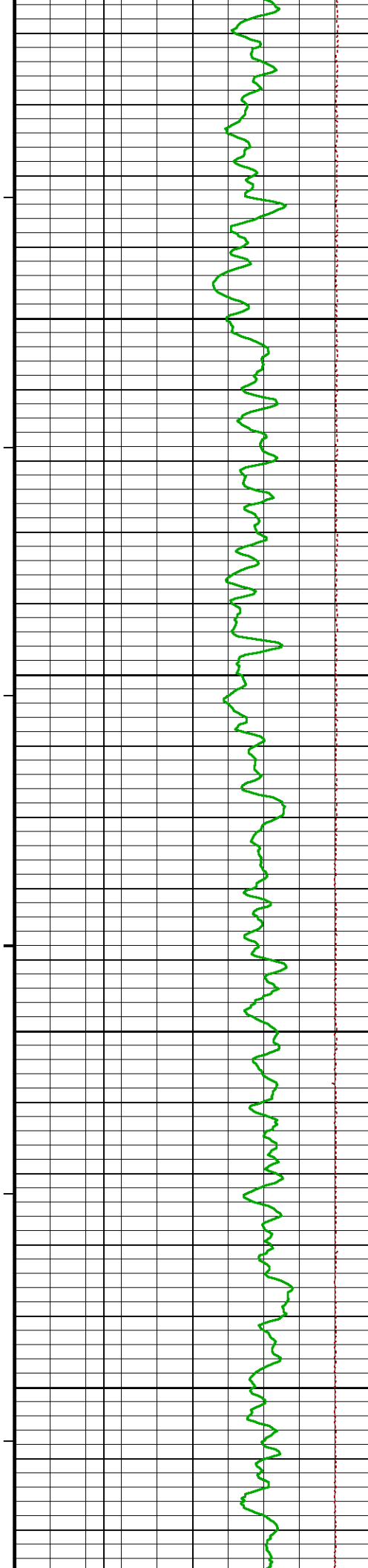
2550

2600

2650





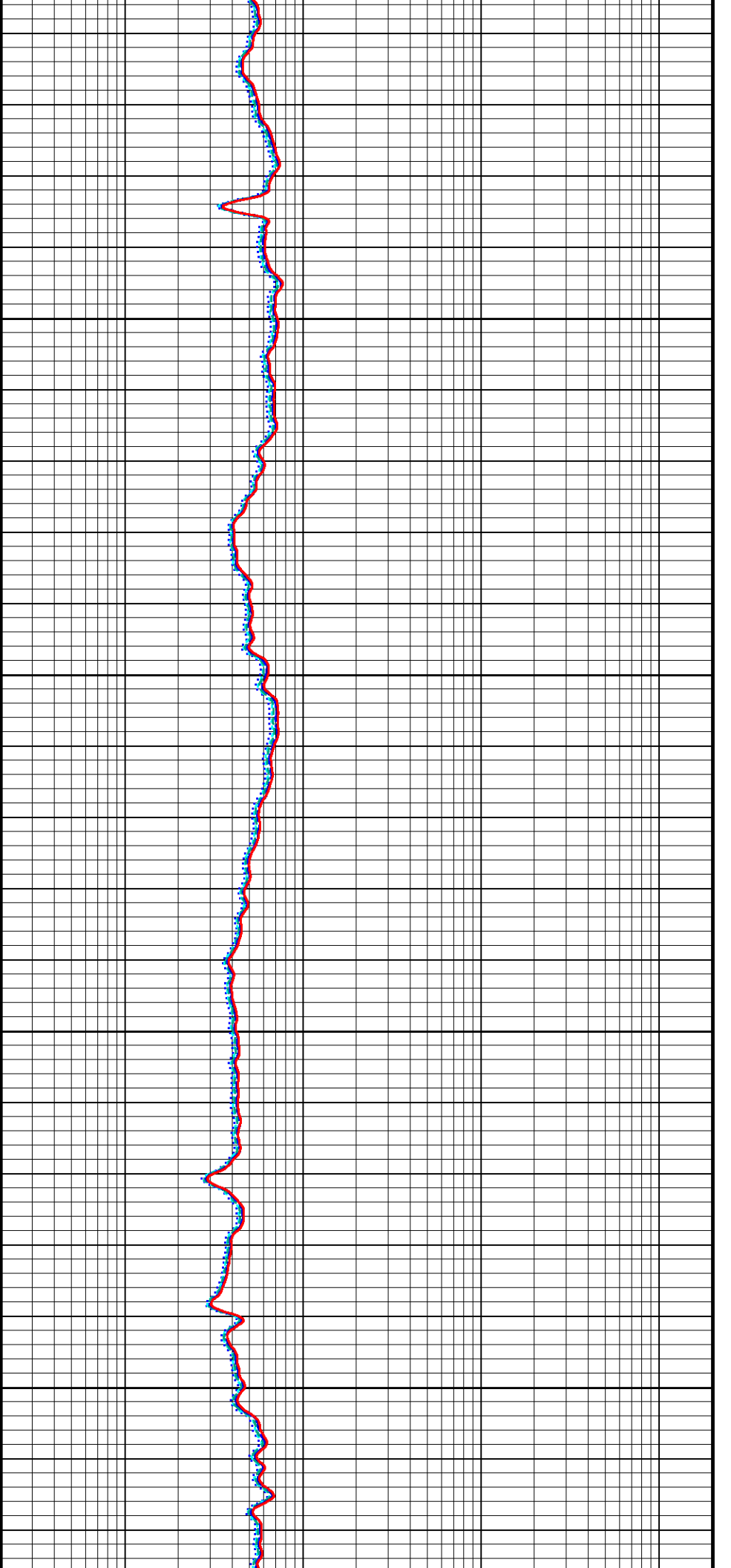


2950

3000

3050

3100



← Bit Size

← Gamma Ray

← DST Uphole Tension

3150

3200

3250

3300

Array Ind. Two Res Rt →

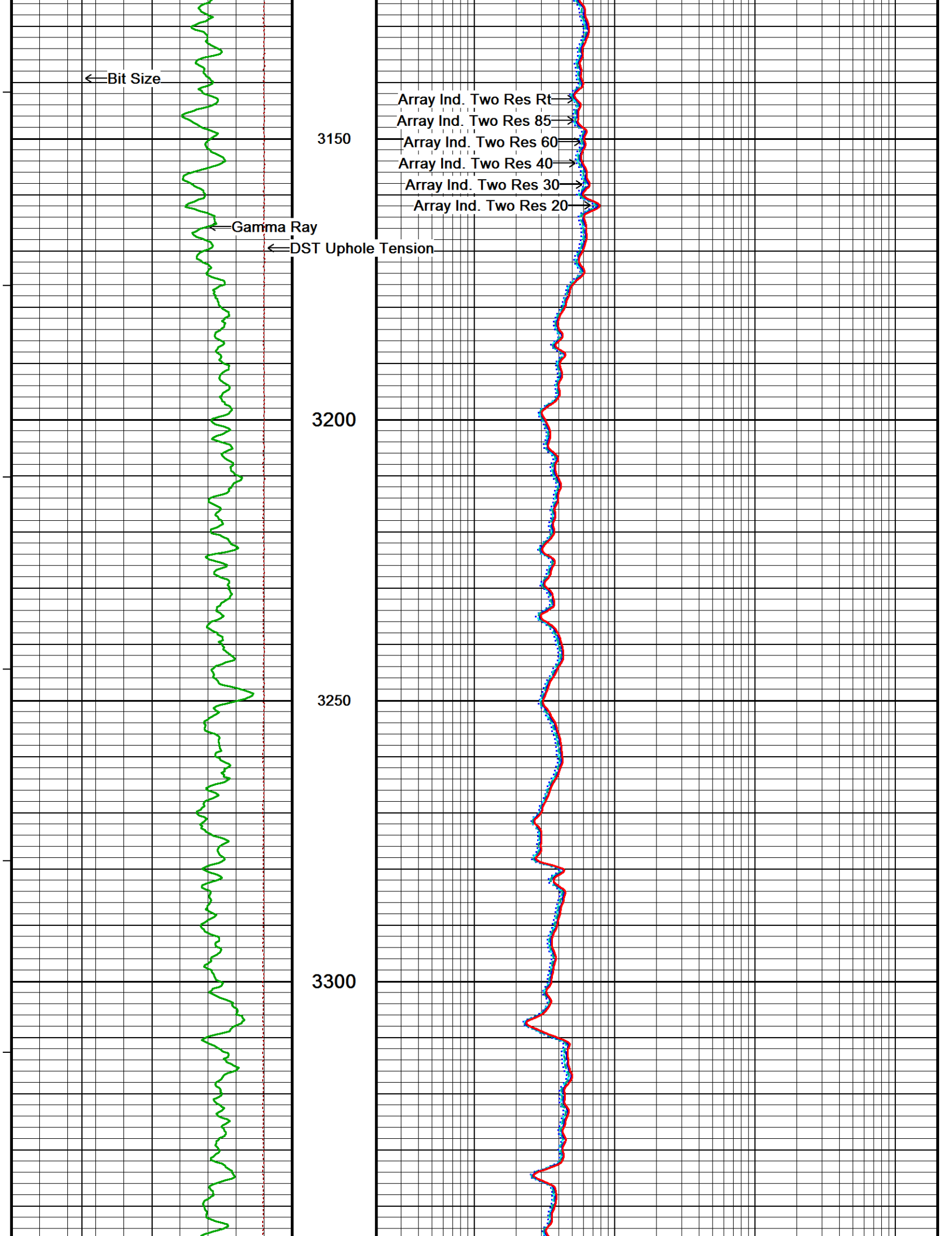
Array Ind. Two Res 85 →

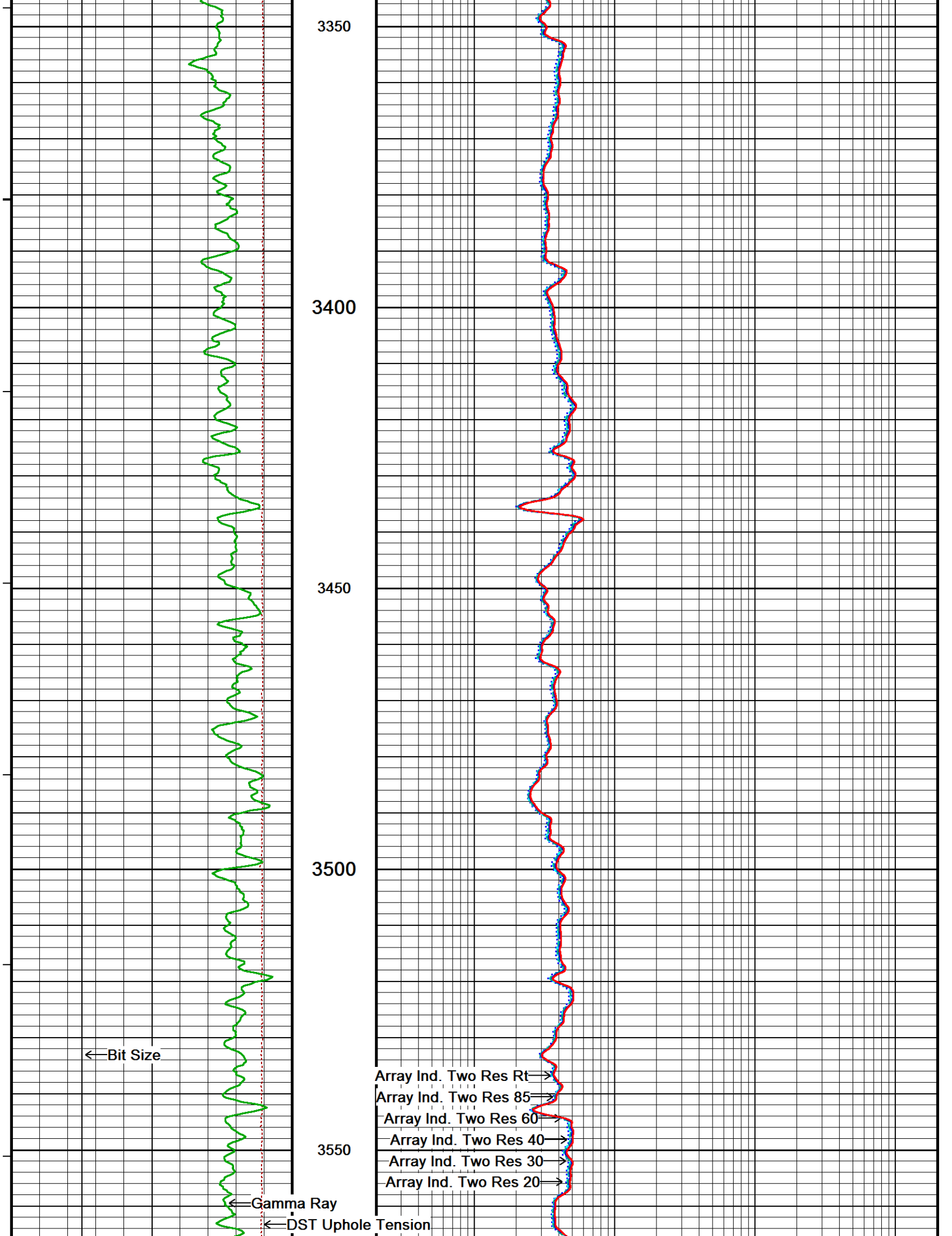
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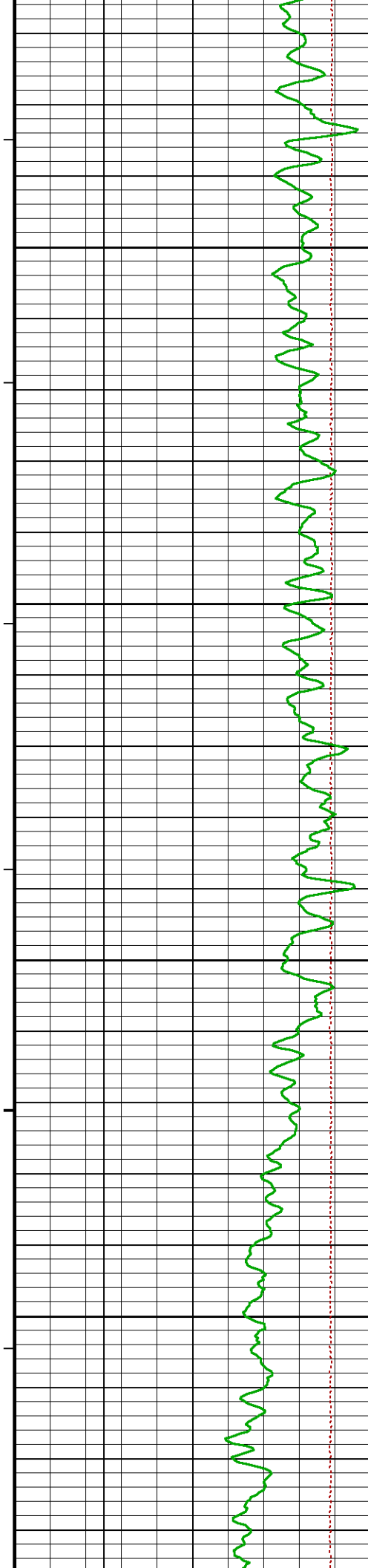
Array Ind. Two Res 40 →

Array Ind. Two Res 30 →

Array Ind. Two Res 20 →





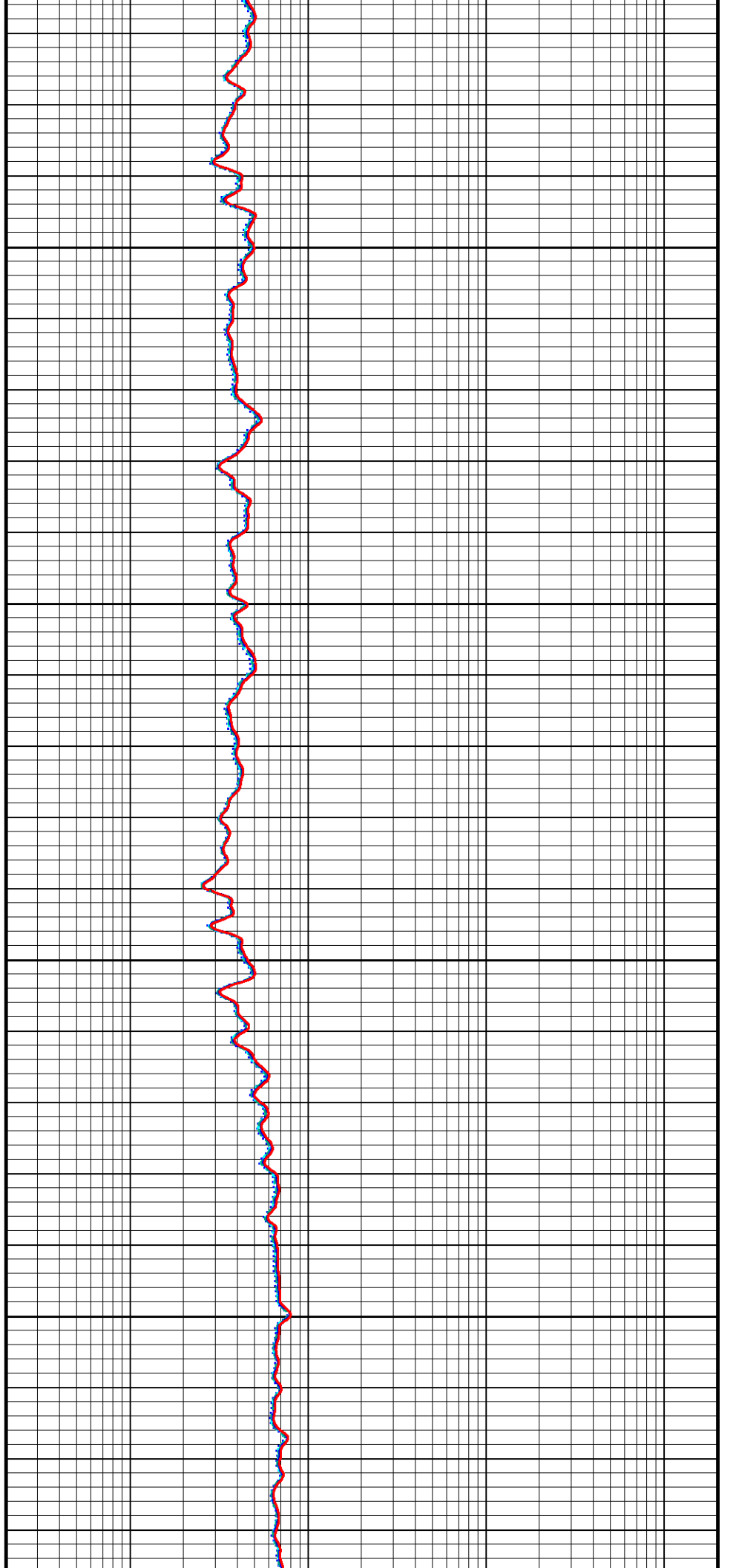


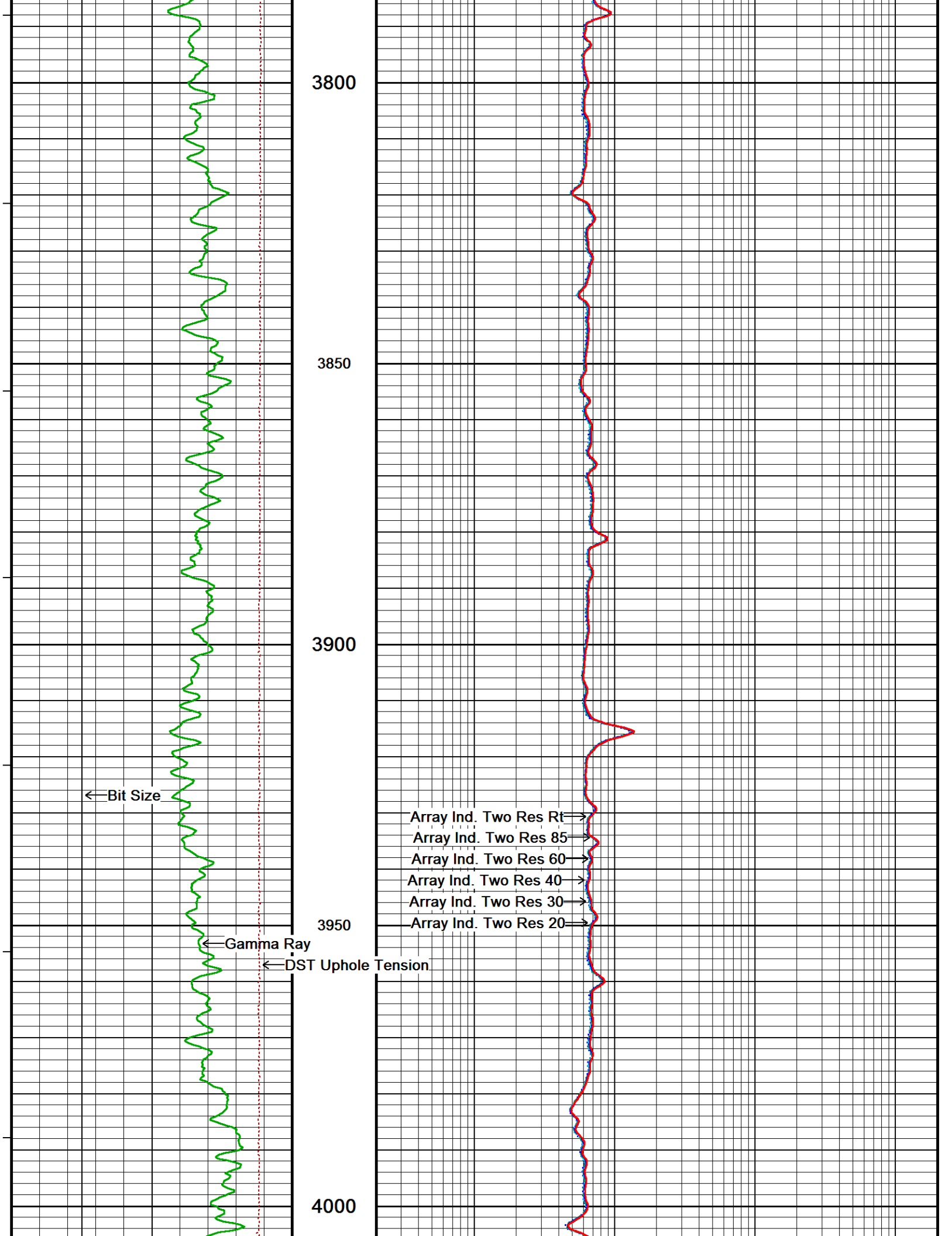
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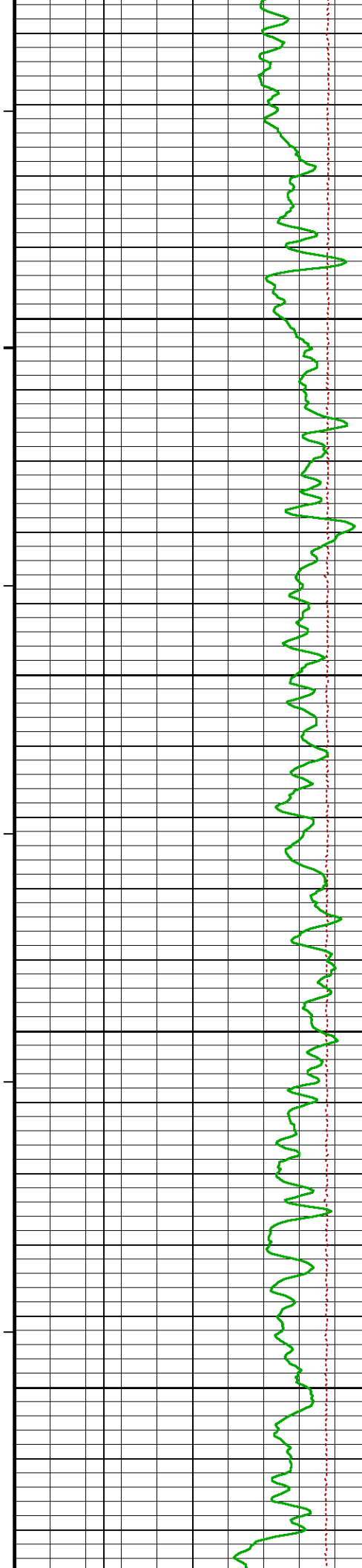
3650

3700

3750





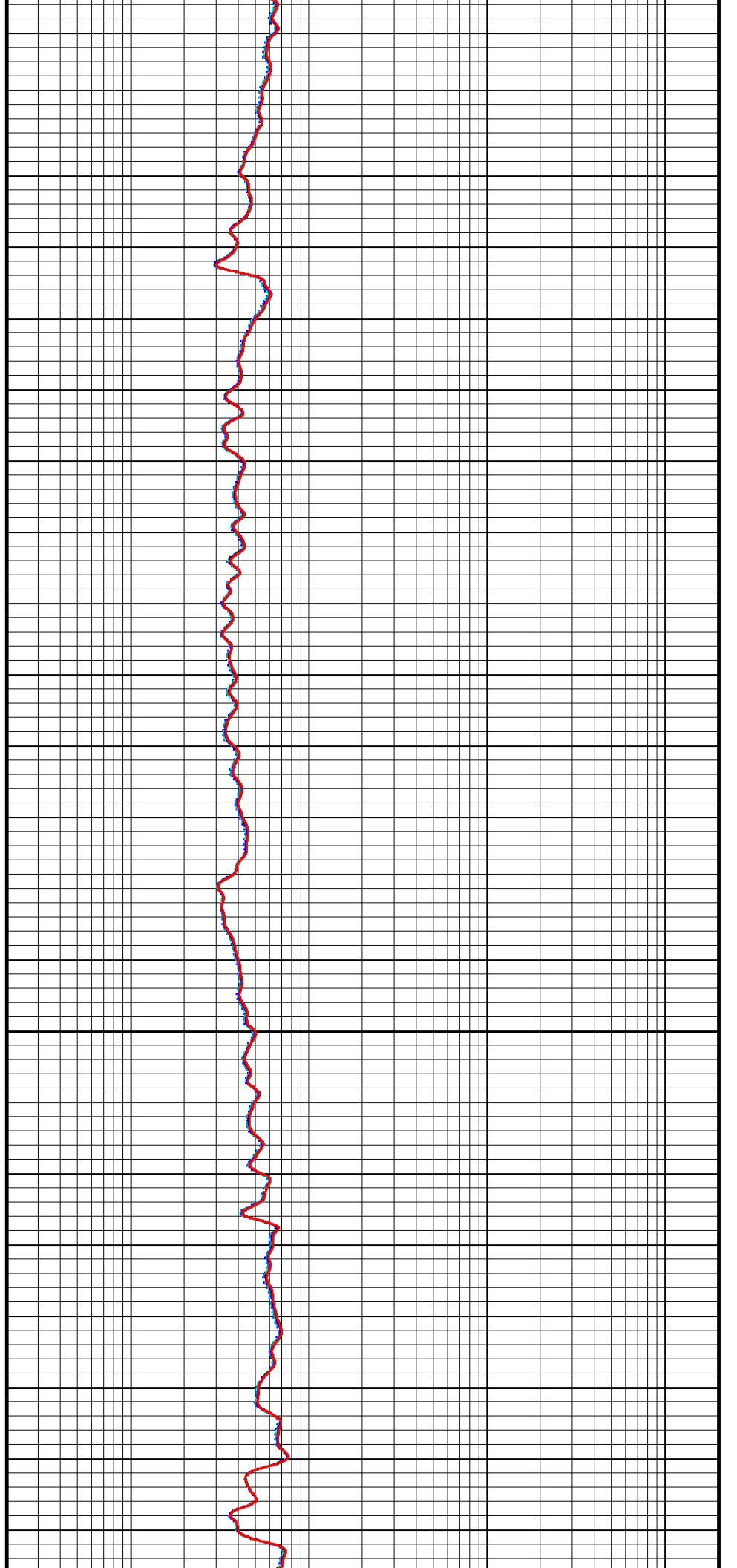


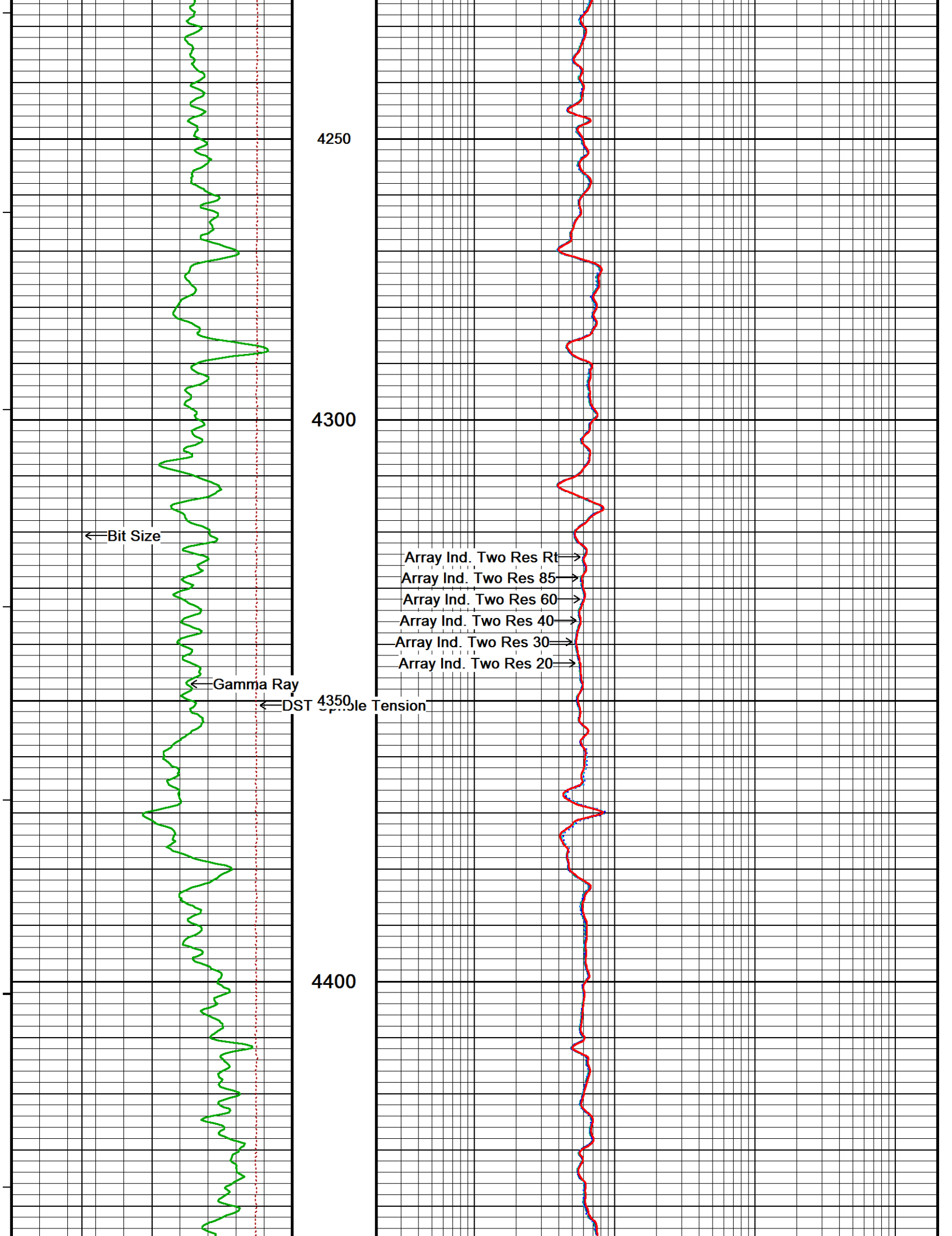
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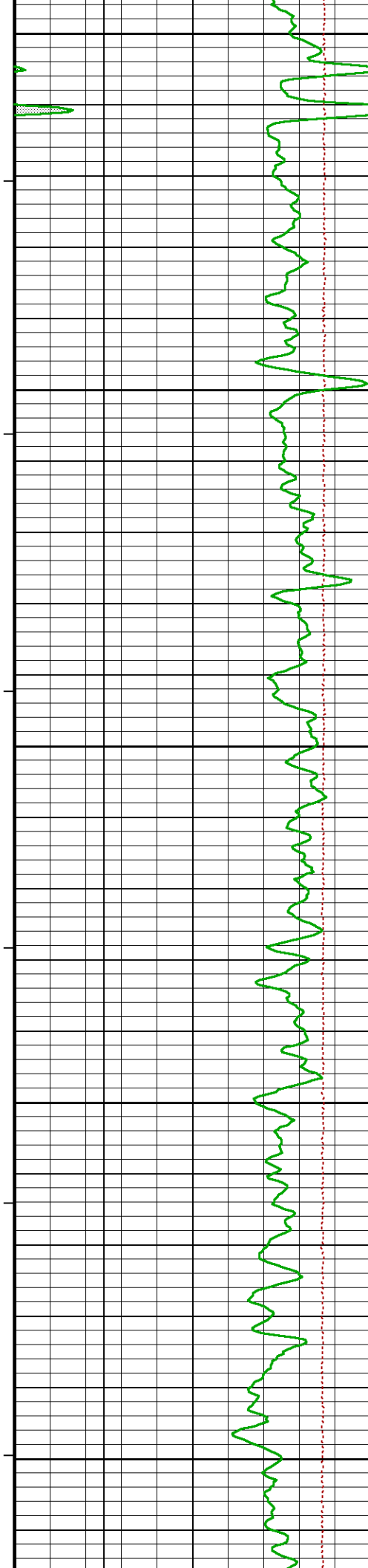
4100

4150

4200







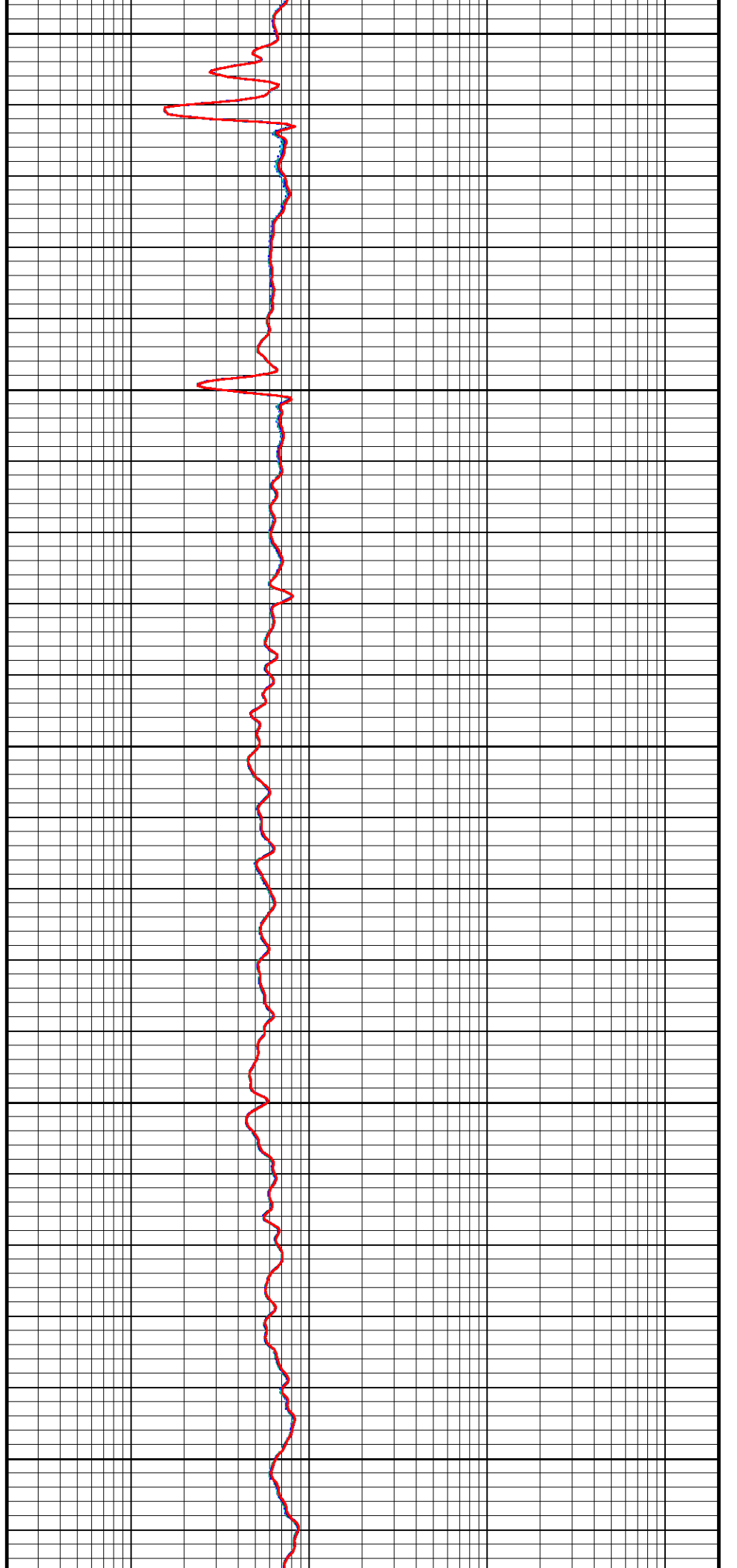
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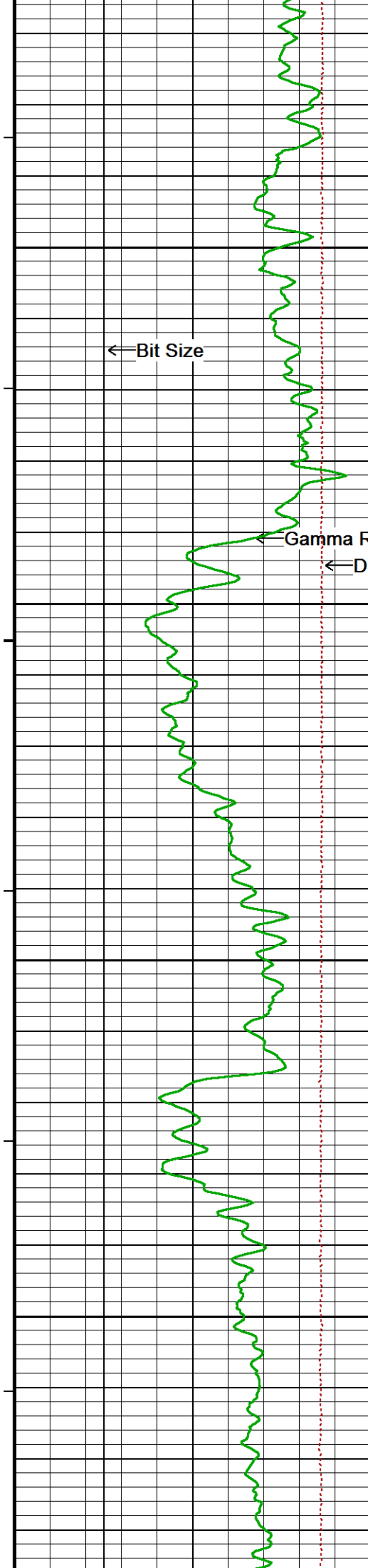
4500

4550

4600

4650





4700

← Bit Size

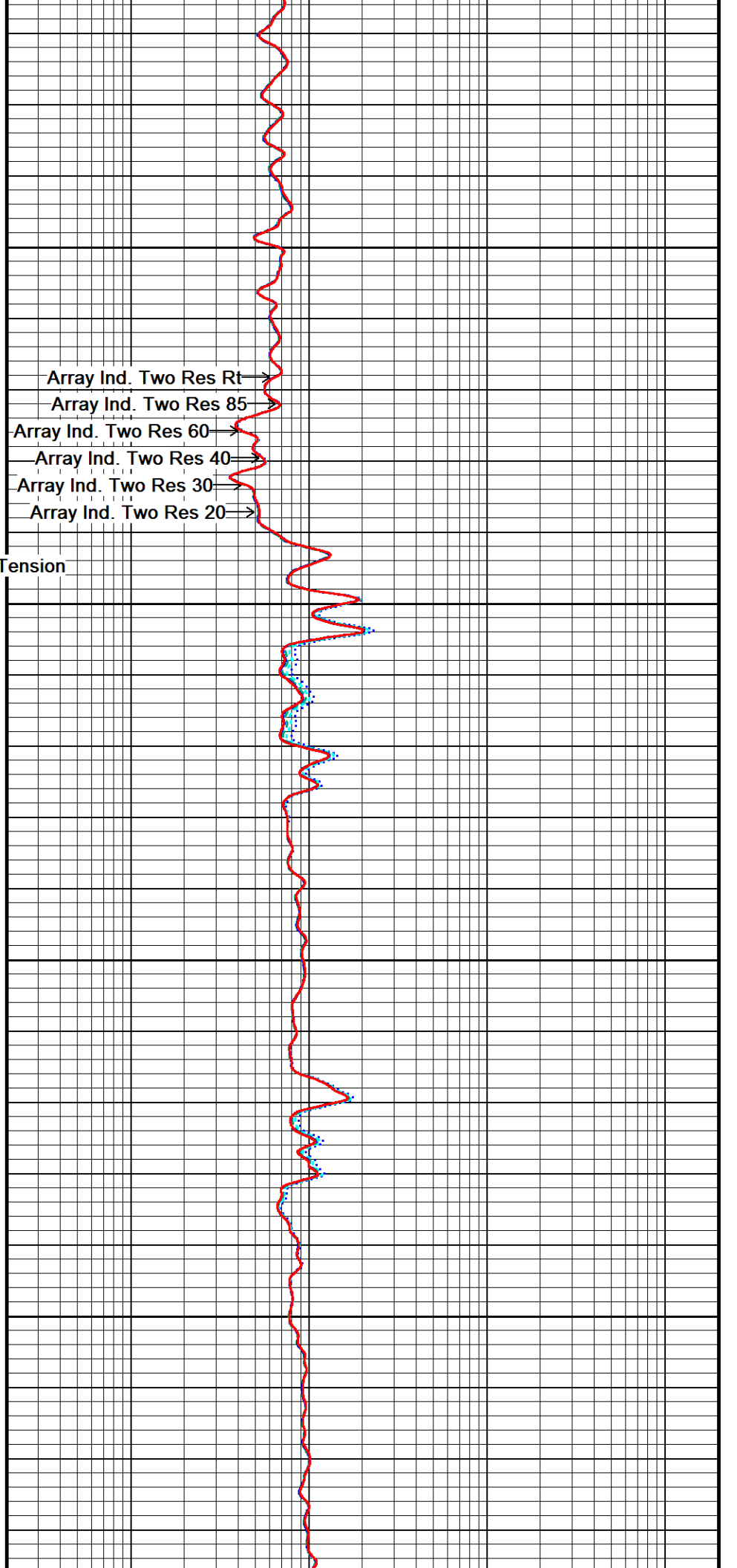
← Gamma Ray

← DST Uphole Tension

4750

4800

4850



Array Ind. Two Res Rt →

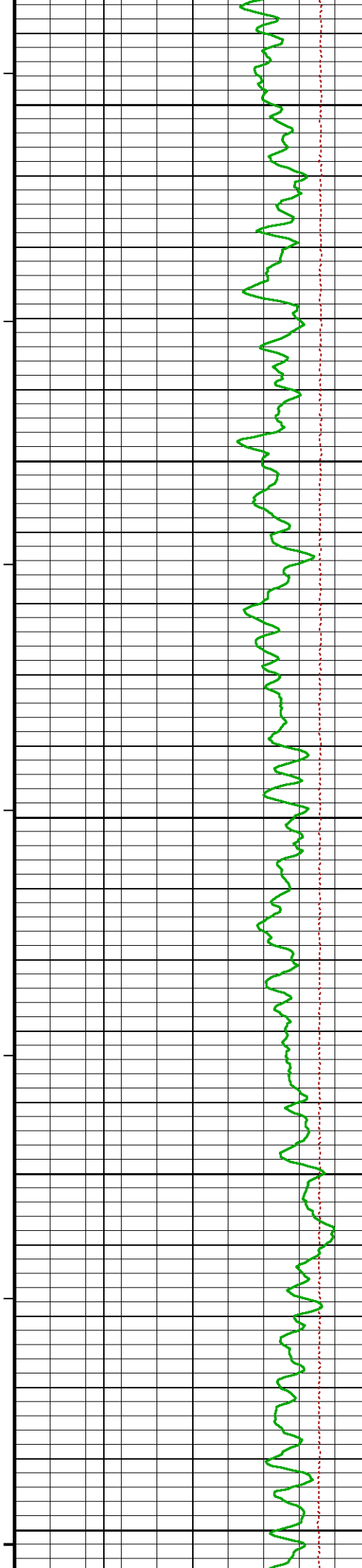
Array Ind. Two Res 85 →

Array Ind. Two Res 60 →

Array Ind. Two Res 40 →

Array Ind. Two Res 30 →

Array Ind. Two Res 20 →



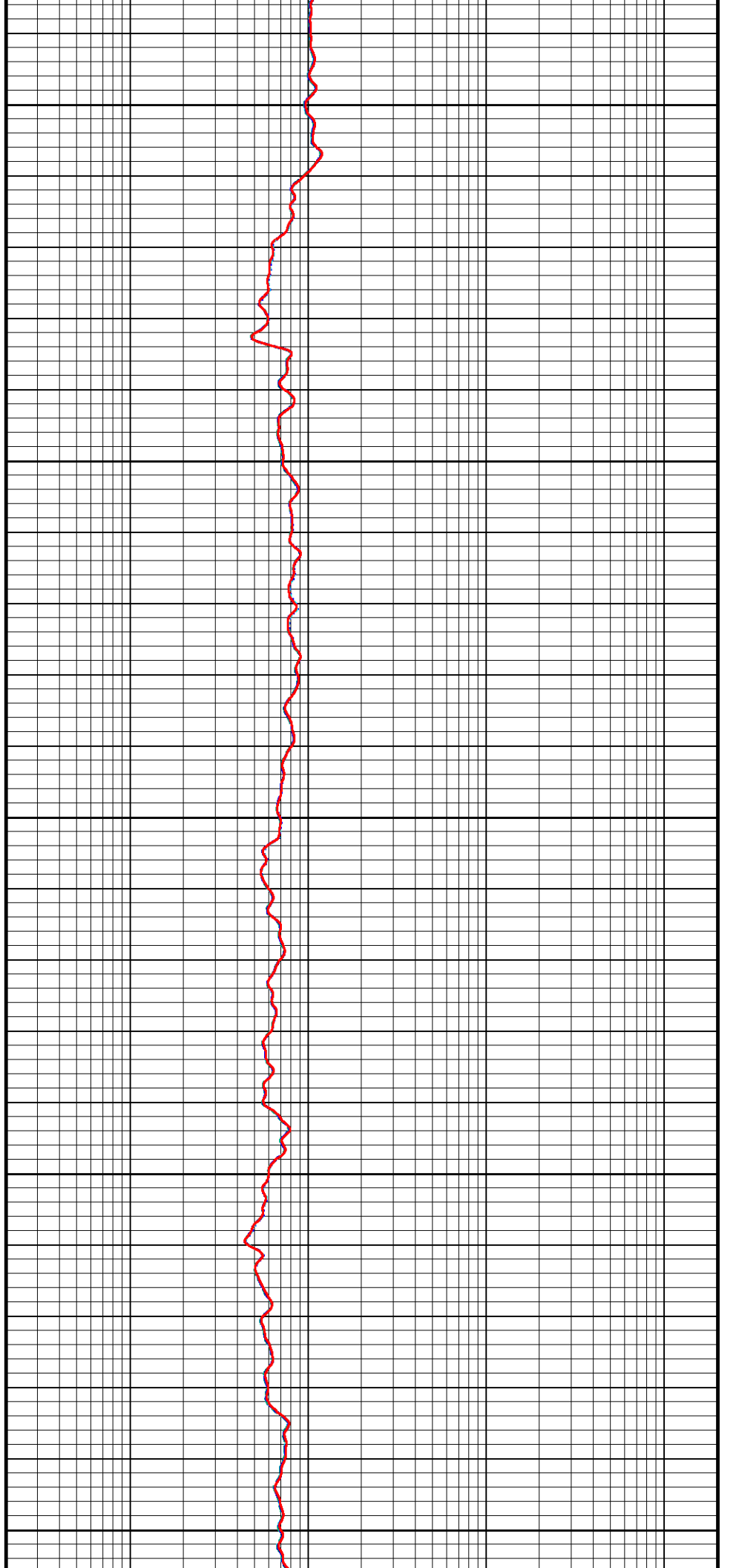
4900

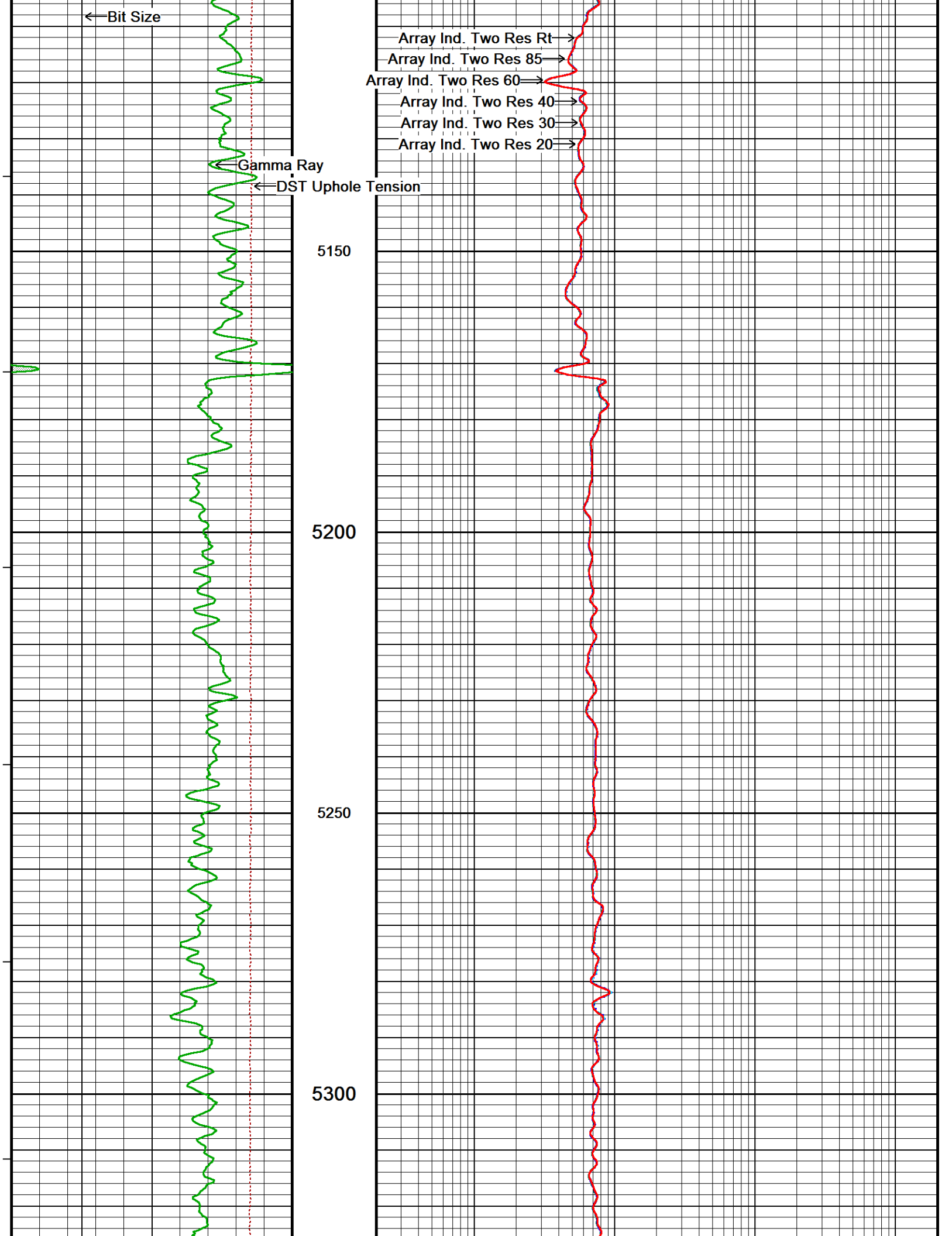
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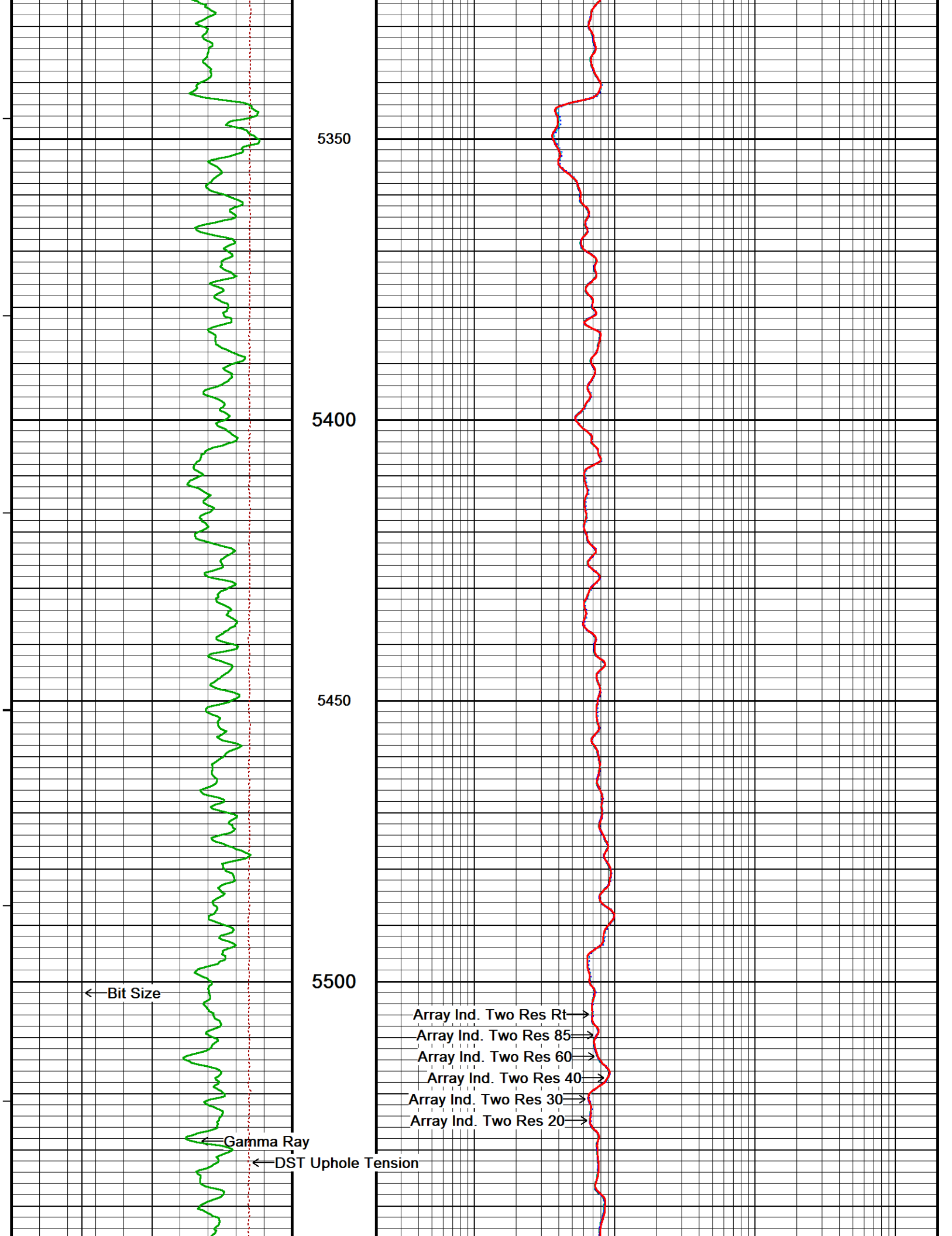
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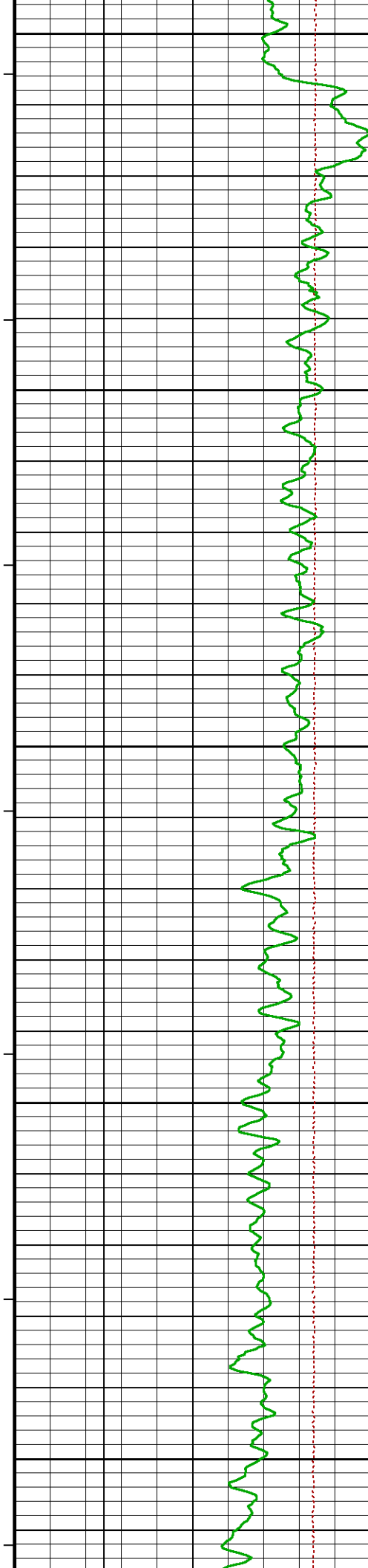
5050

5100









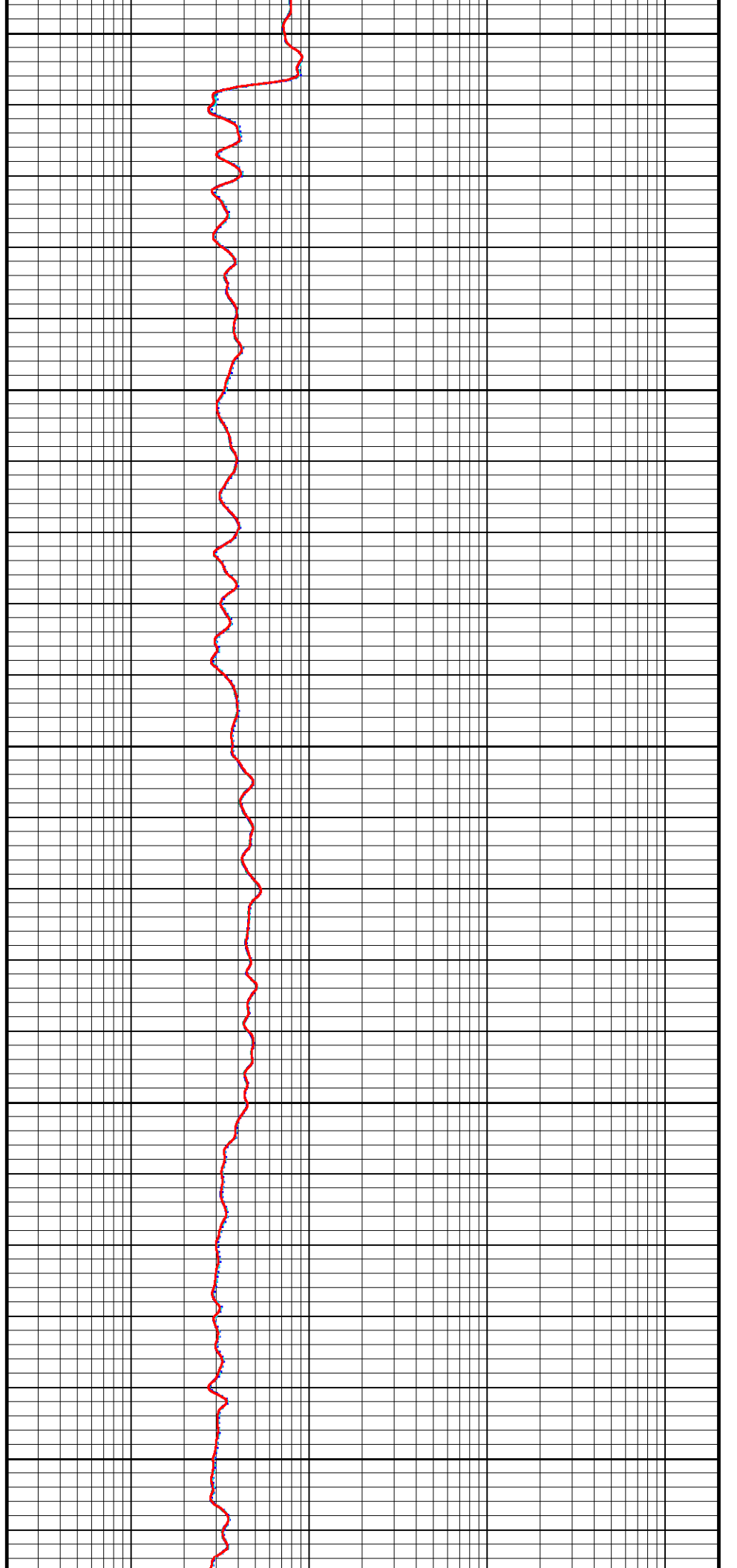
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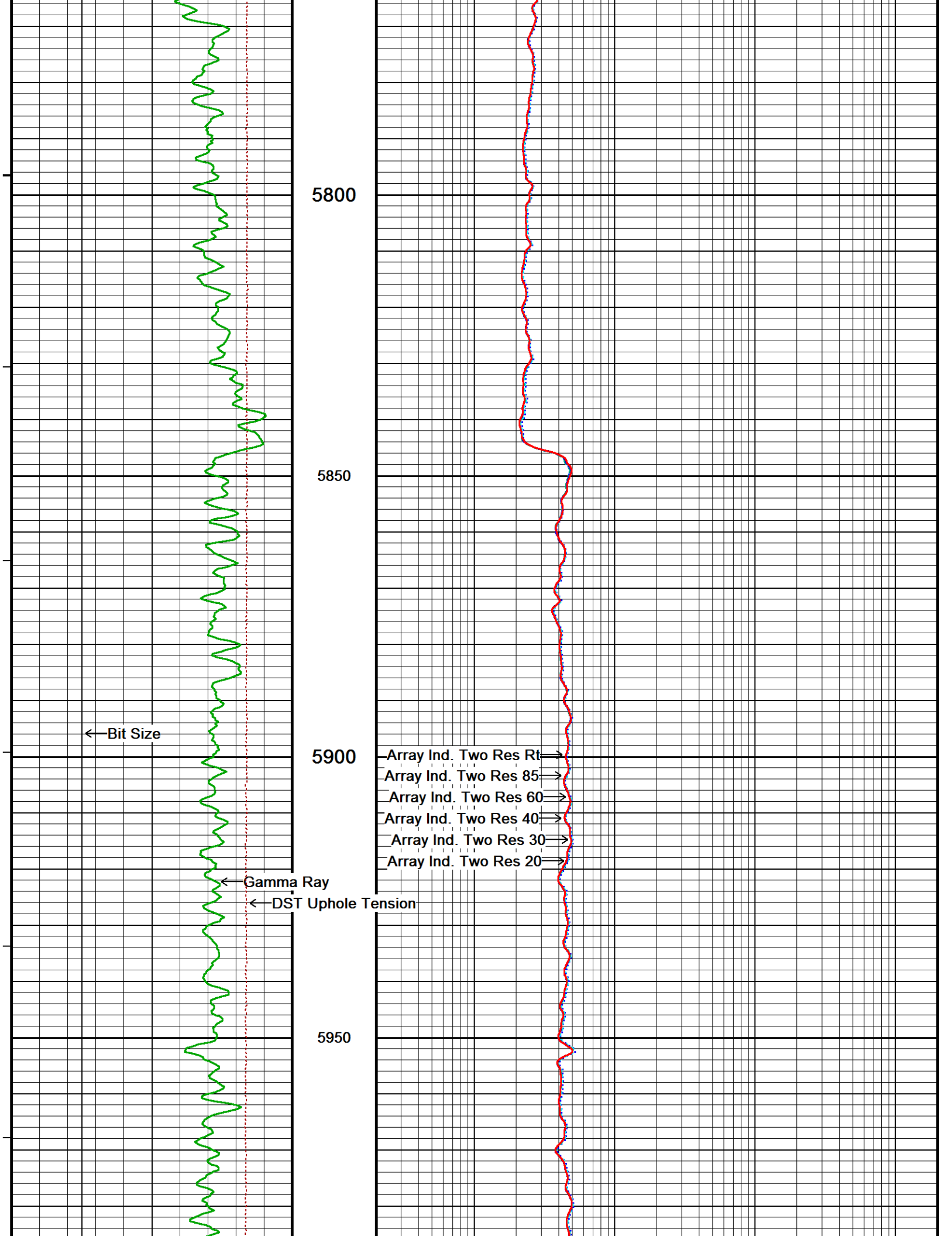
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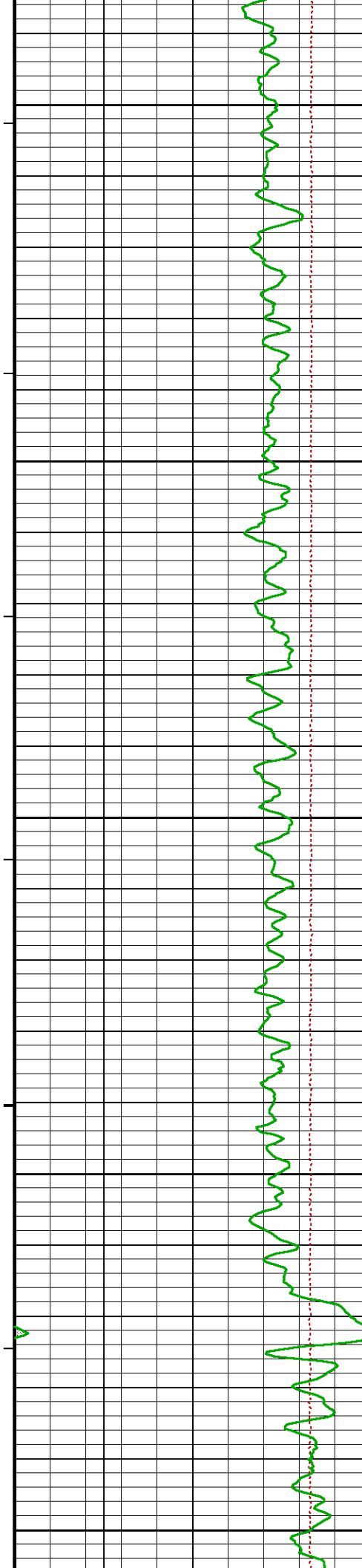
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5700

5750







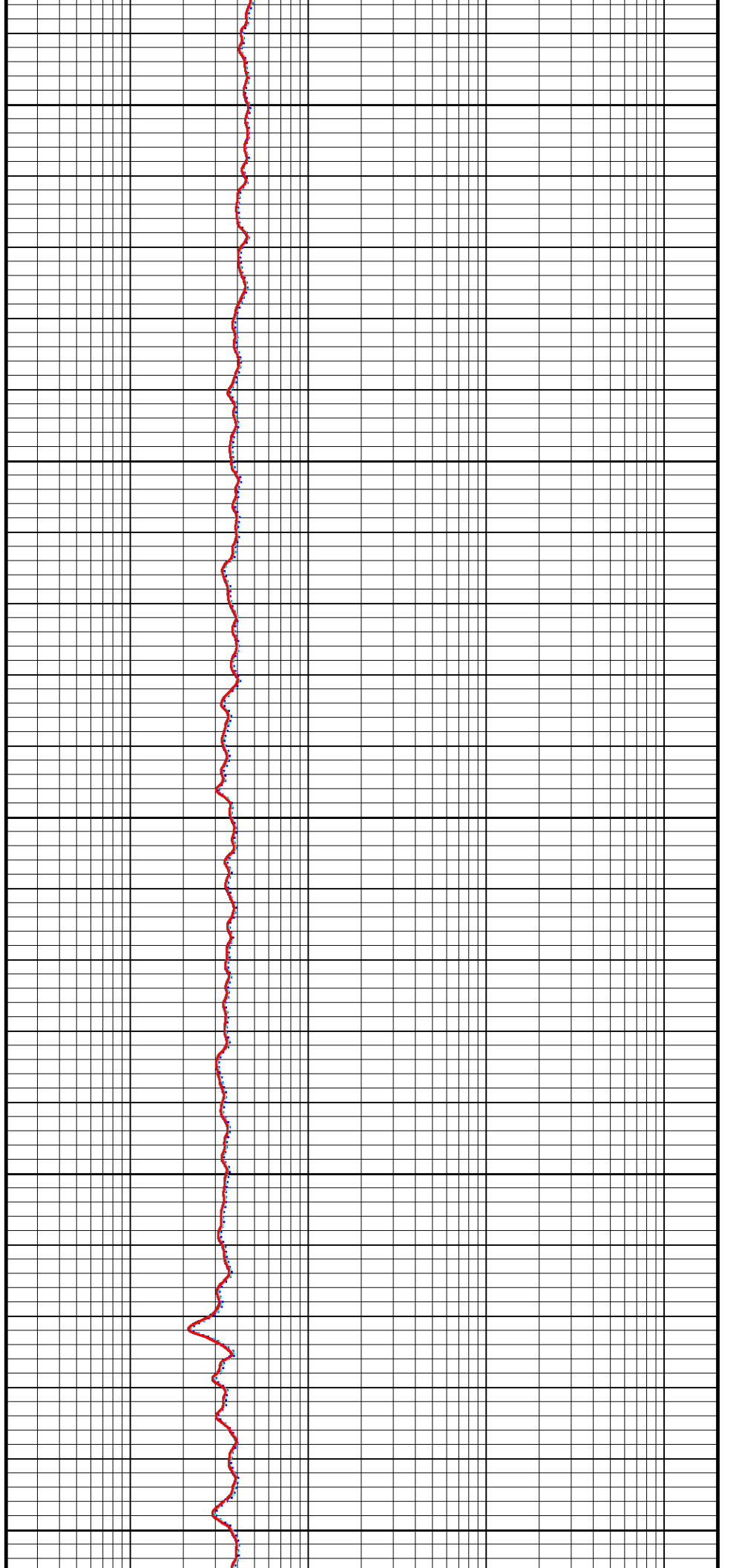
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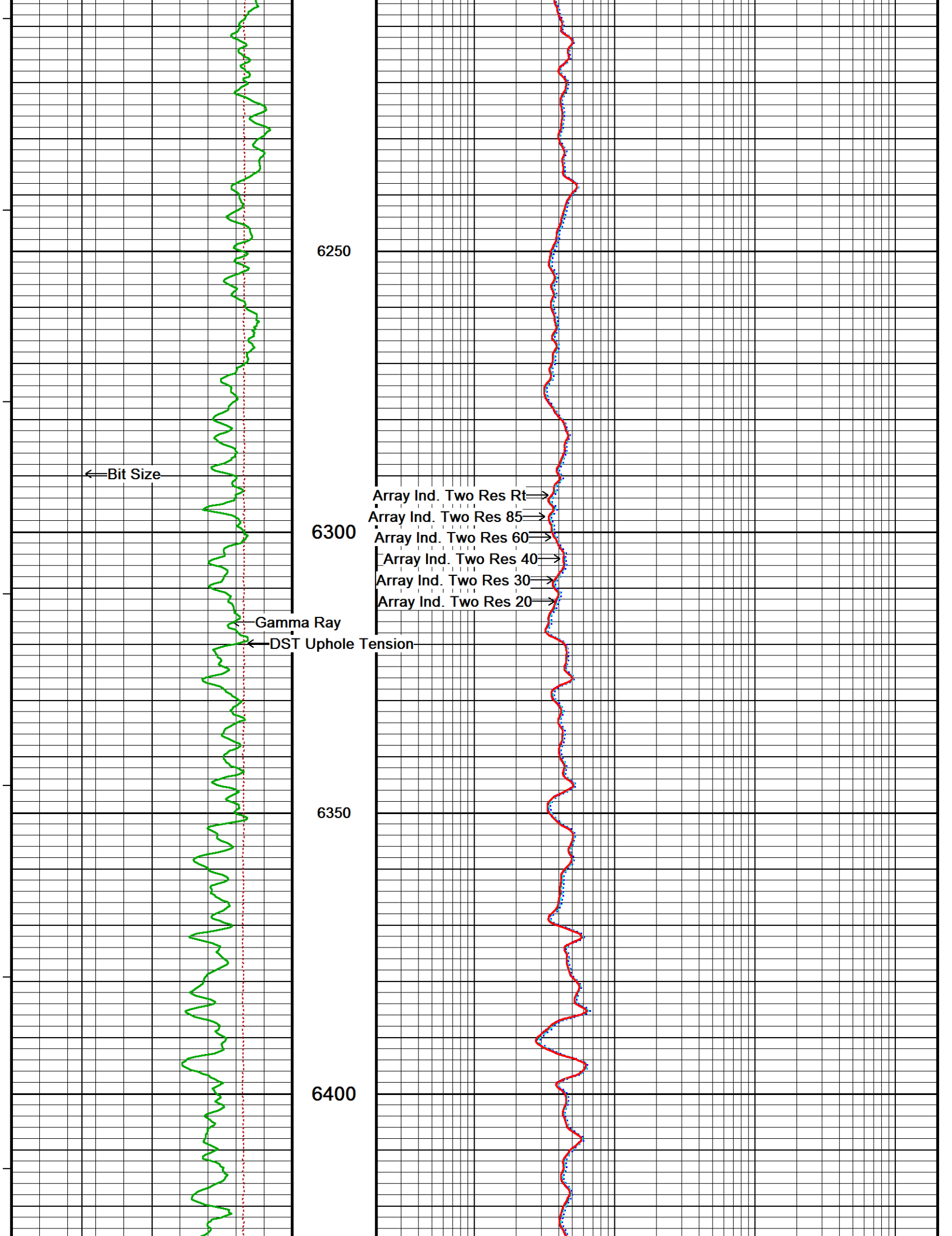
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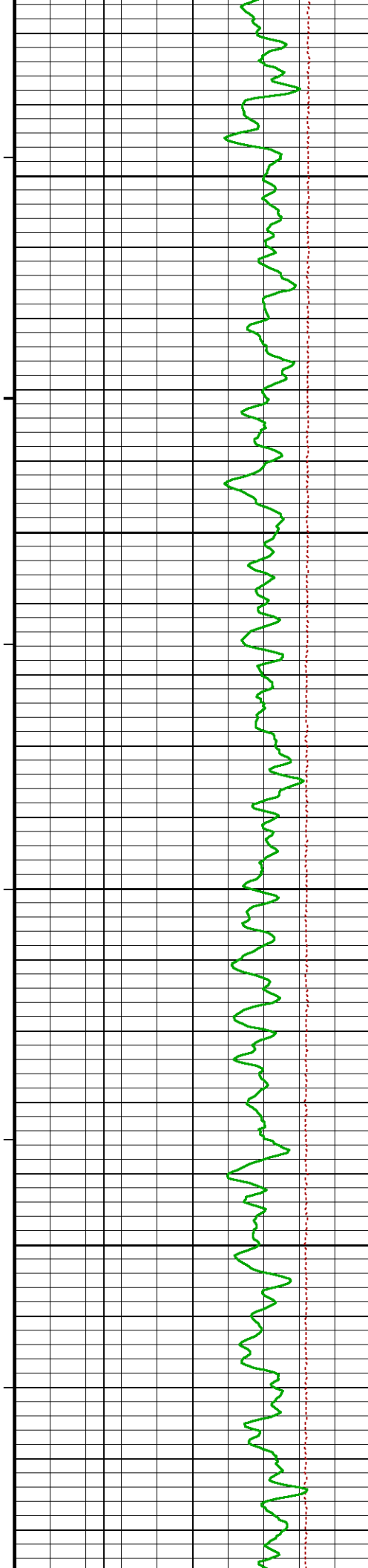
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6150

6200





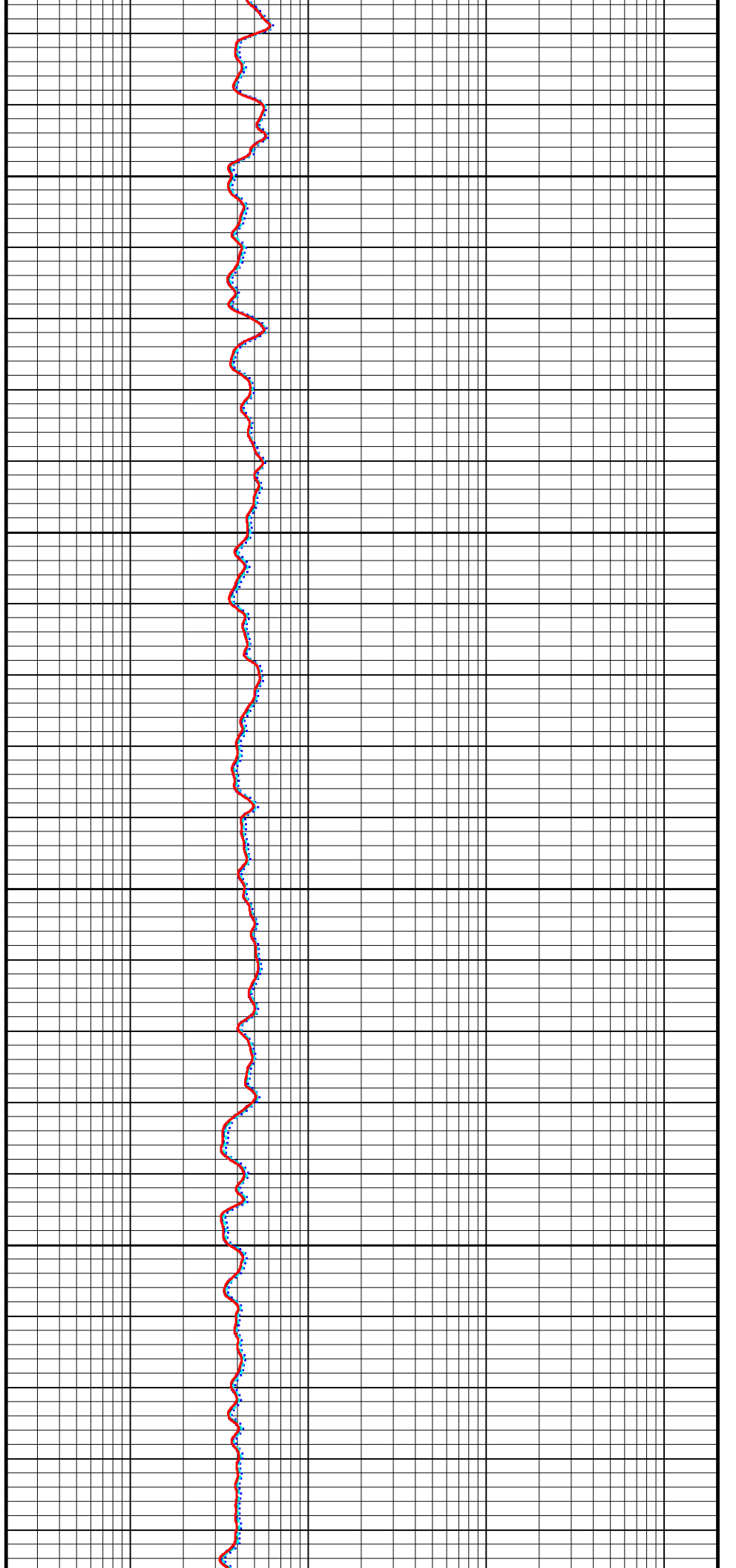


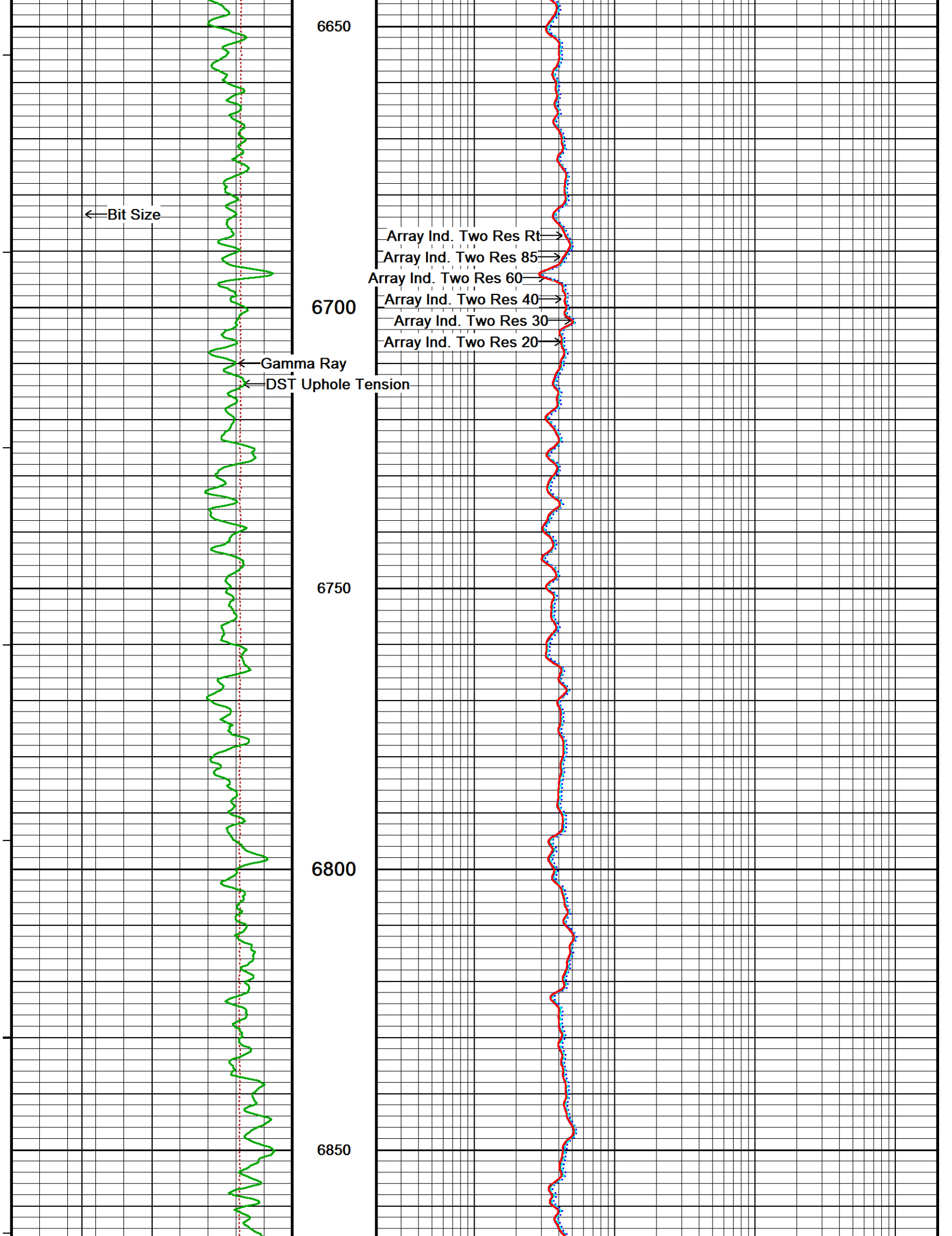
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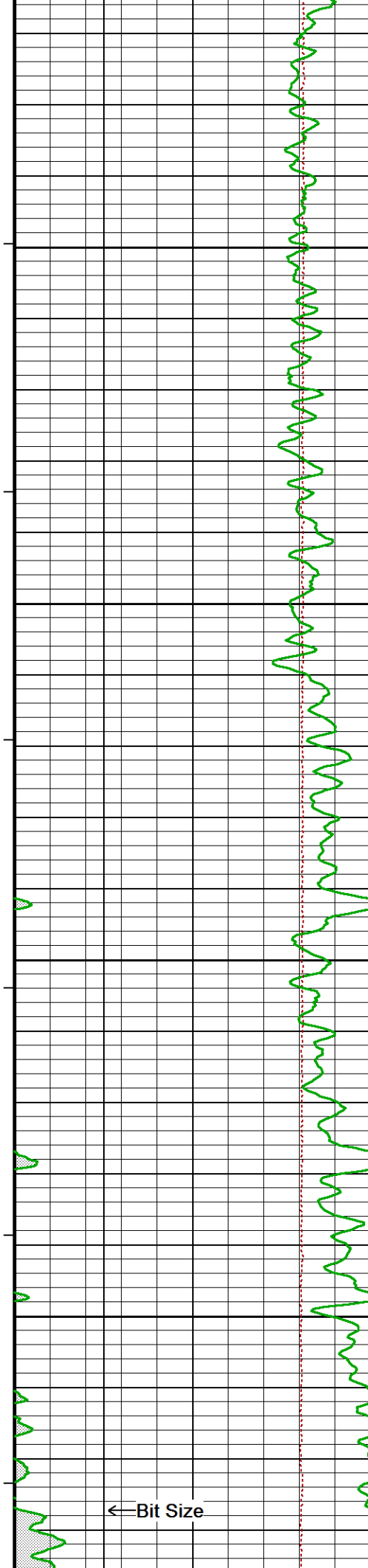
6500

6550

6600







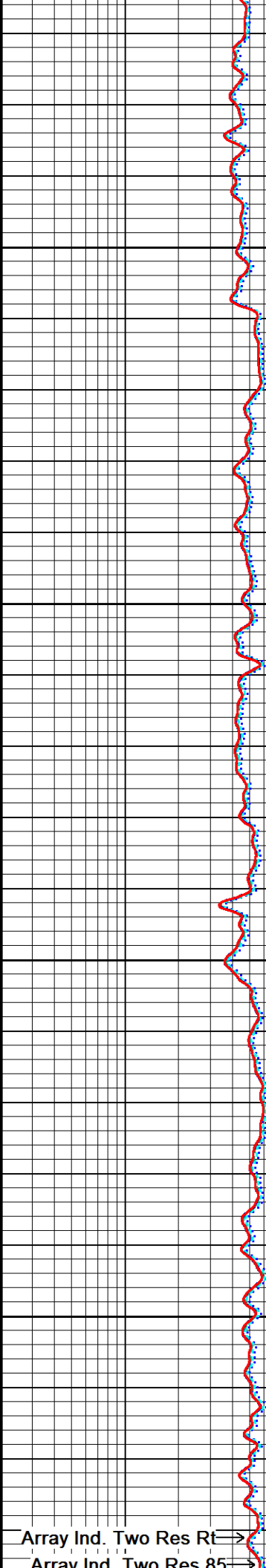
6900

6950

7000

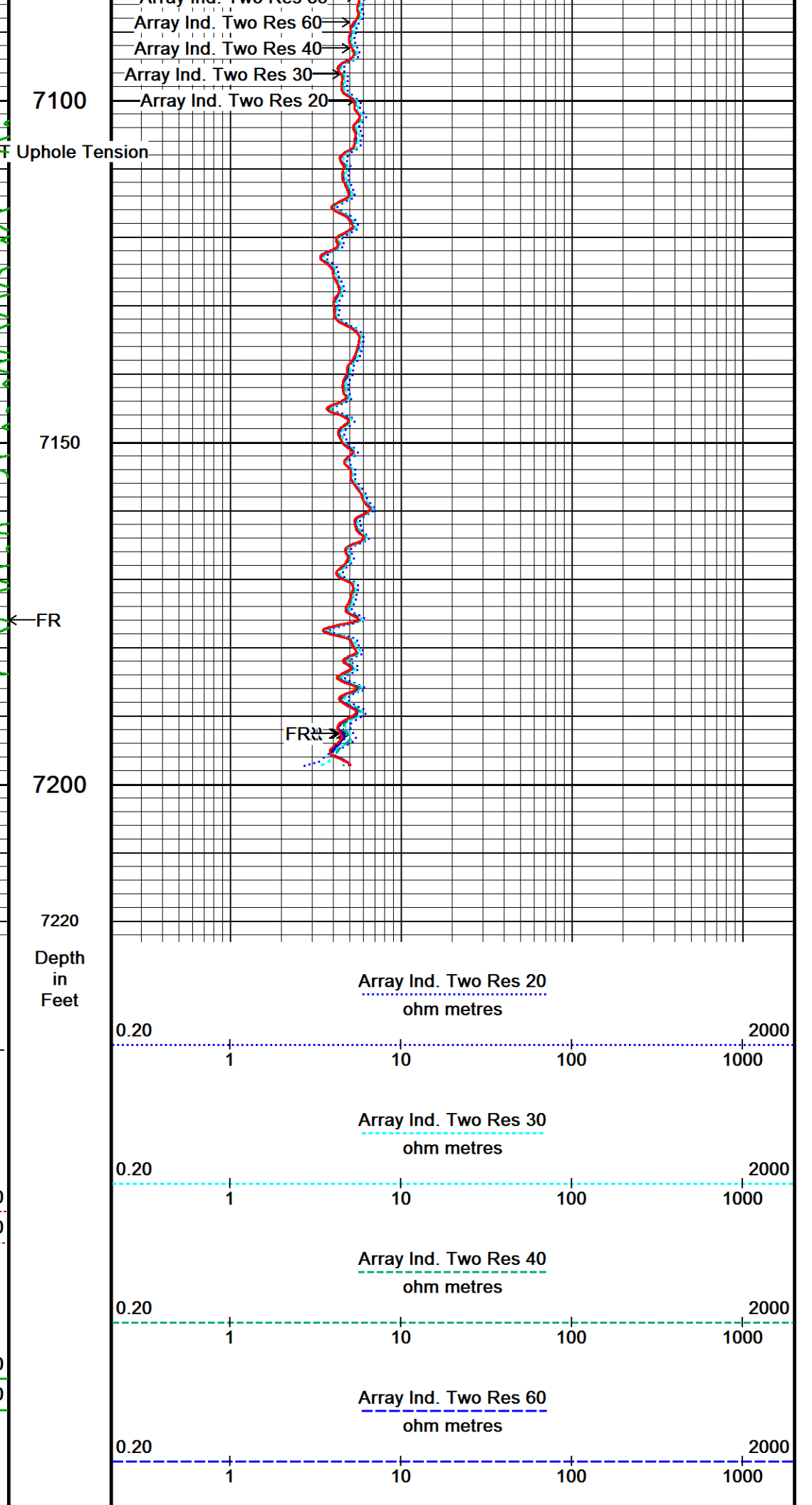
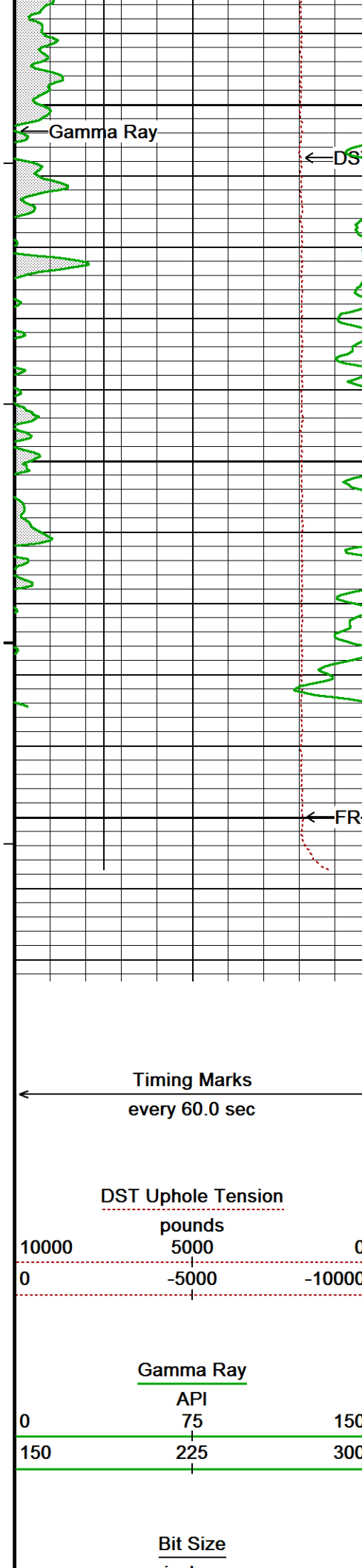
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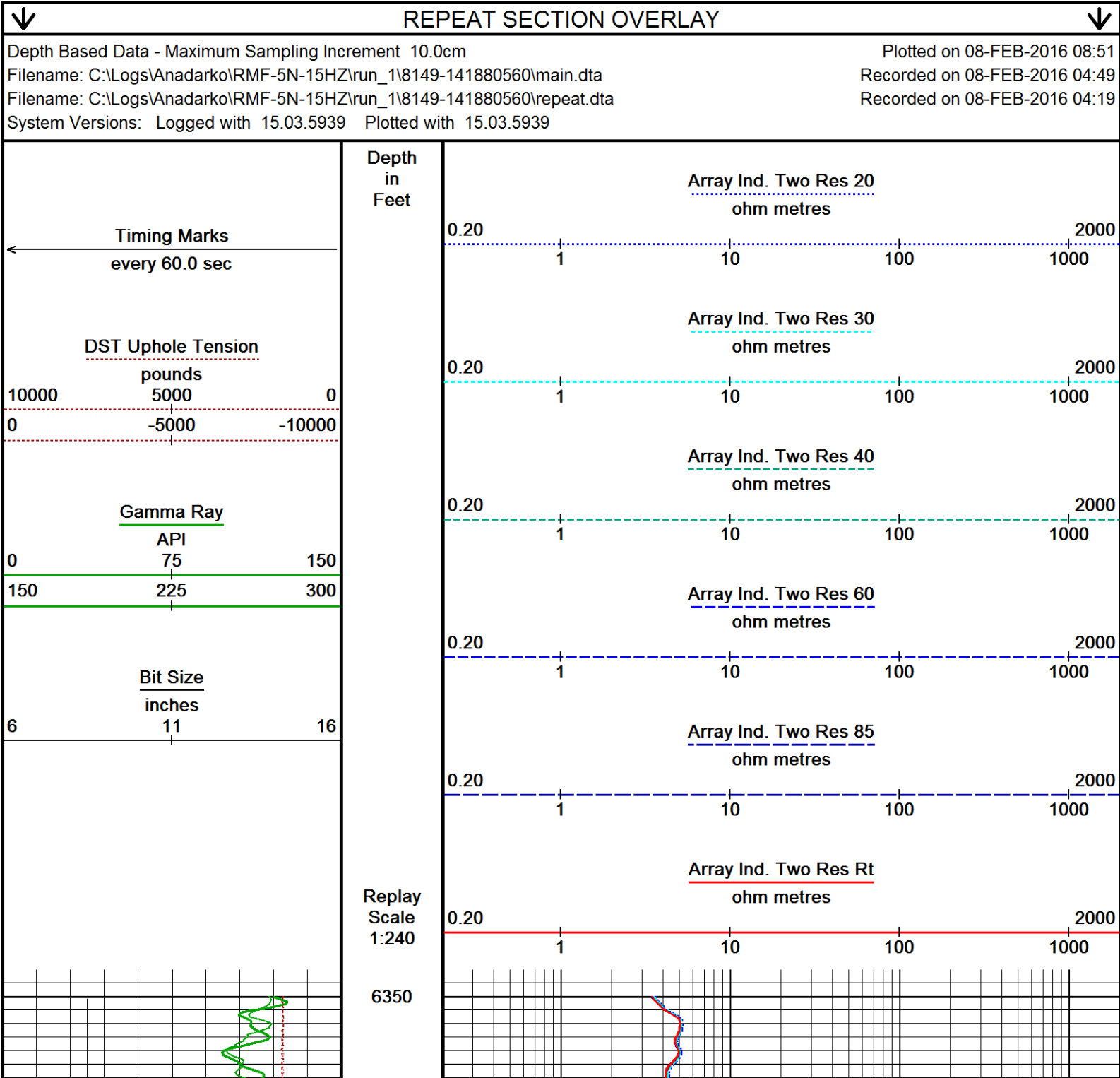
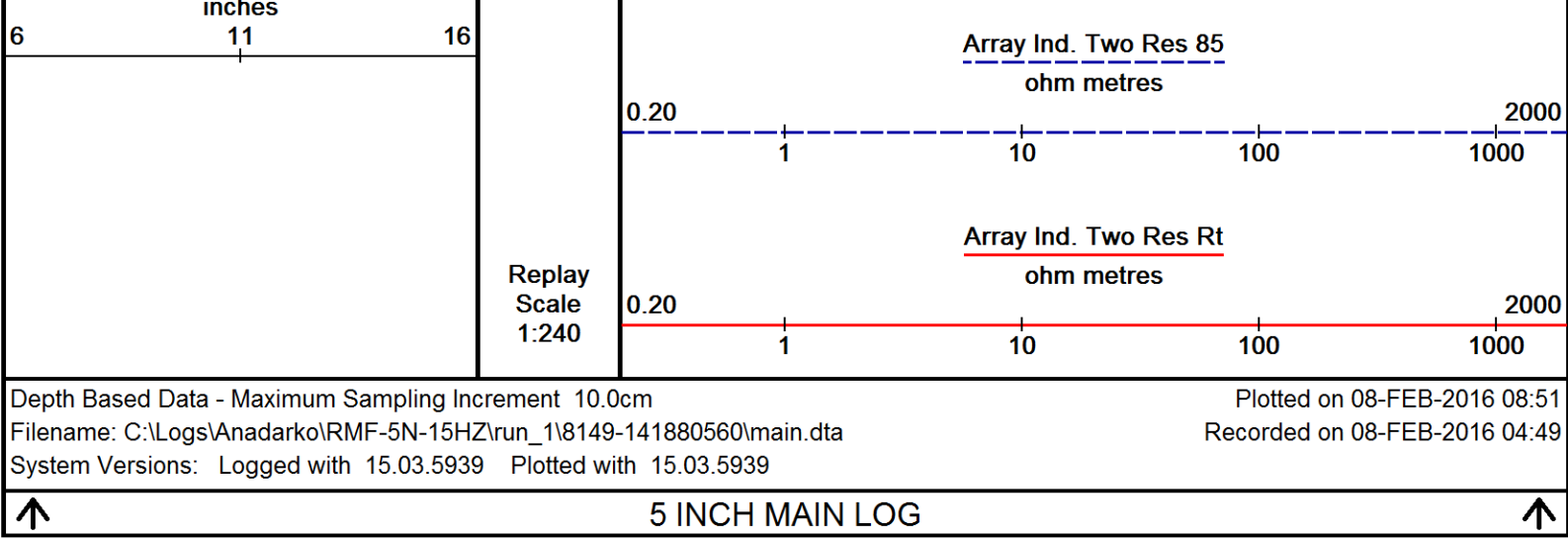
← Bit Size

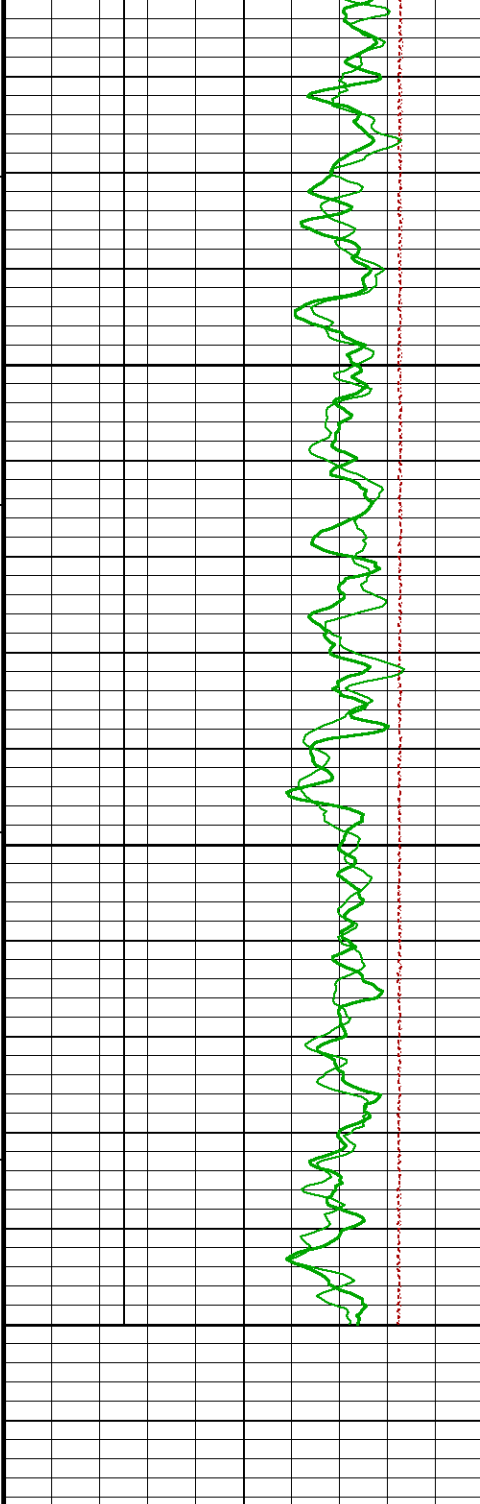


Array Ind. Two Res Rt →

Array Ind. Two Res 85 →







6400

6450

6500

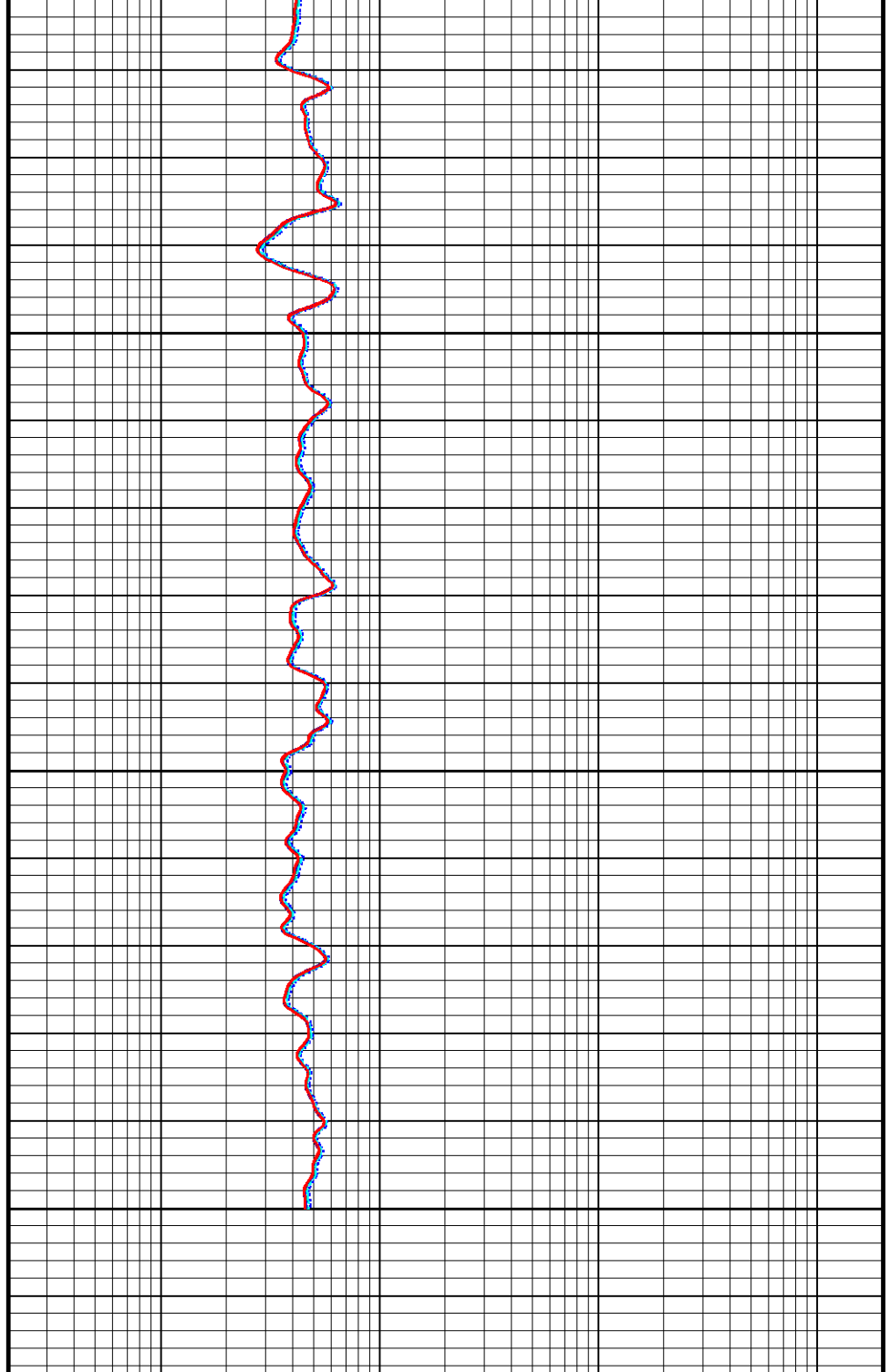
6516

Depth
in
Feet

← Timing Marks
every 60.0 sec

DST Uphole Tension
pounds
10000 5000 0
0 -5000 -10000

Gamma Ray
API
0 75 150



Array Ind. Two Res 20
ohm metres

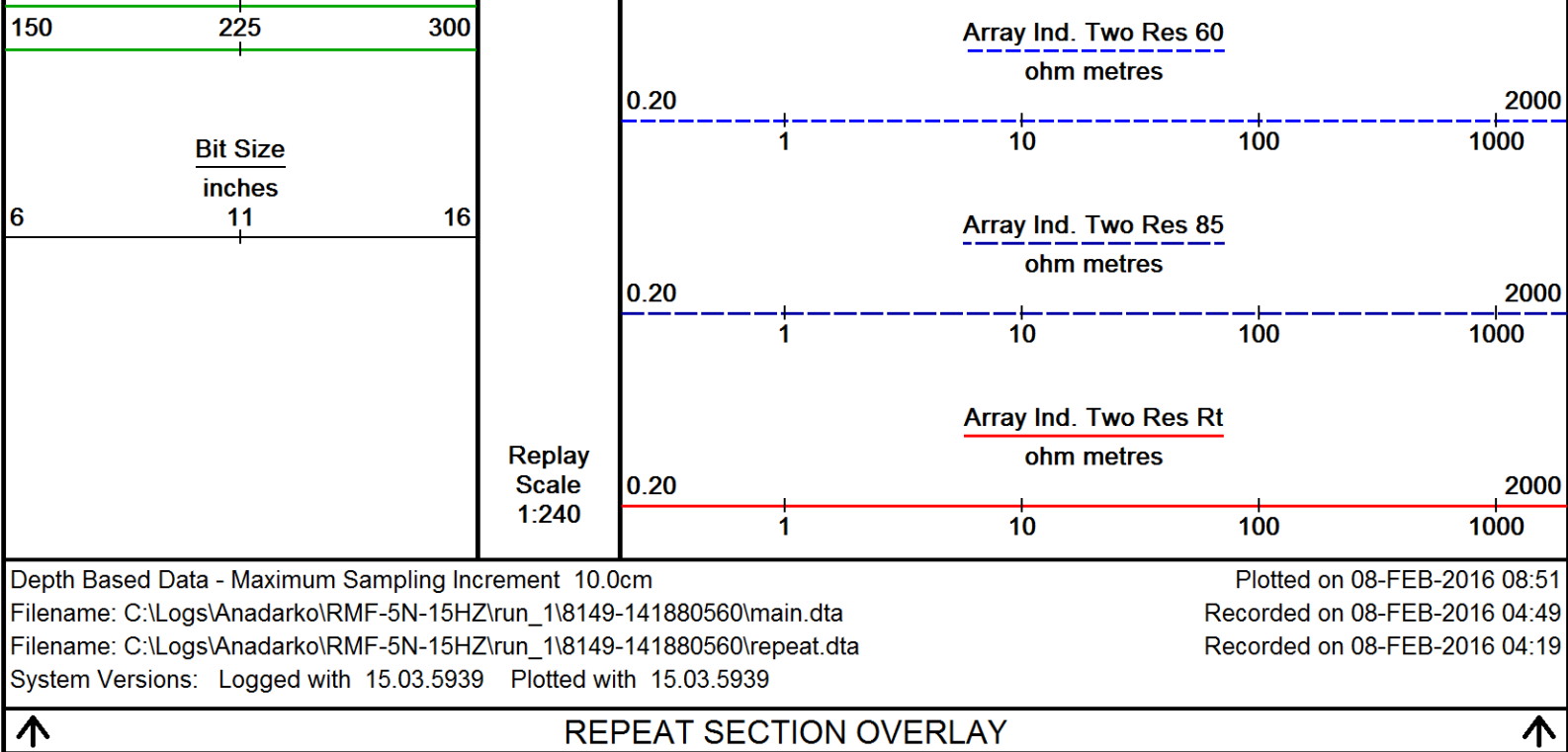
0.20 1 10 100 1000 2000

Array Ind. Two Res 30
ohm metres

0.20 1 10 100 1000 2000

Array Ind. Two Res 40
ohm metres

0.20 1 10 100 1000 2000



BEFORE SURVEY CALIBRATION

C:\Logs\Anadarko\RMF-5N-15HZ\run_1\8149-141880560\main.dta

General Constants All 000

Last Edited on 08-FEB-2016,00:19

General Parameters

Mud Resistivity 1000.000 ohm-metres

Mud Resistivity Temperature 70.000 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 Bit Size

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

Gamma Calibration MCG-E.A 514

Field Calibration on 08-FEB-2016 00:19

Background 119 82

Calibrator (Gross) 1445 994

Calibrator (Net) 1326 912

Gamma Calibration Tolerances MCG-E.A 514

Ratio 1.454

1.40 1.475 1.55

Counts/API

Gamma Constants MCG-E.A 514

Last Edited on 08-FEB-2016,00:06

Gamma Calibrator Number GRC 72

GRC-M Calibrator Jig in Use? NO

Inactive Background Jig in Use? NO

Mud Density 1.16 gm/cc

Caliper Source for Processing Bit Size

Tool Position Centred

Base Calibration on 25-JAN-2016,09:48
Field Check on 08-FEB-2016 00:05

Base Calibration

Test Loop Calibration

Channel	Low	High	Low	High
1	16.2	452.6	9.3	966.2
2	5.6	366.0	7.6	821.4
3	2.9	251.0	5.2	566.0
4	1.3	130.8	2.6	279.2

Array Temperature	73.2	Deg F
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Test Loop Calibration Verified

25-JAN-2016 10:28

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1	-4.9	2133.5	-5.7	2132.5
2	14.7	1964.8	14.6	1964.4
3	15.6	1681.4	15.5	1681.0
4	11.2	1126.3	11.2	1126.0
Deep	9.4	1071.7	9.3	1071.4
Medium	24.4	2237.5	24.4	2237.1
Shallow	21.6	2939.8	21.4	2939.1
Array Temperature		49.8		39.2

Induction Calibration Tolerances MAI-C.A 456

Low Conductivity 1	16.2		mmho/m High Conductivity 1	452.6		mmho/m
Low Conductivity 2	5.6		mmho/m High Conductivity 2	366.0		mmho/m
Low Conductivity 3	2.9		mmho/m High Conductivity 3	251.0		mmho/m
Low Conductivity 4	1.3		mmho/m High Conductivity 4	130.8		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-C.A 456

Last Edited on 08-FEB-2016,00:03

Induction Model

RtAP-NC

Borehole Correction Constants

Tool Centred	Yes	
Hole Size Source	Bit Size	
Hole Size Constant Value	N/A	inches
Stand-off Type	N/A	
Stand-off	N/A	inches
Number of Fins on Stand-off	N/A	
Stand-off Fin Angle	N/A	degrees
Stand-off Fin Width	N/A	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

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

Symmetrised Receiver Gains

Receiver 1	1.00
Receiver 2	1.00
Receiver 3	1.00
Receiver 4	1.00

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\RMF-5N-15HZ\run_1\8149-141880560\main.dta

Cablehead, 11 pin

CBH-C 0 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Swivel Head Adaptor

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

Compact Linker

MLK-D.A 104 LG: 4.87 ft WT: 70.5 lb OD: 2.244 in

Compact Linker

MLK-D.A 105 LG: 4.87 ft WT: 70.5 lb OD: 2.244 in

Compact Comms Gamma

MCG-E.A 514 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

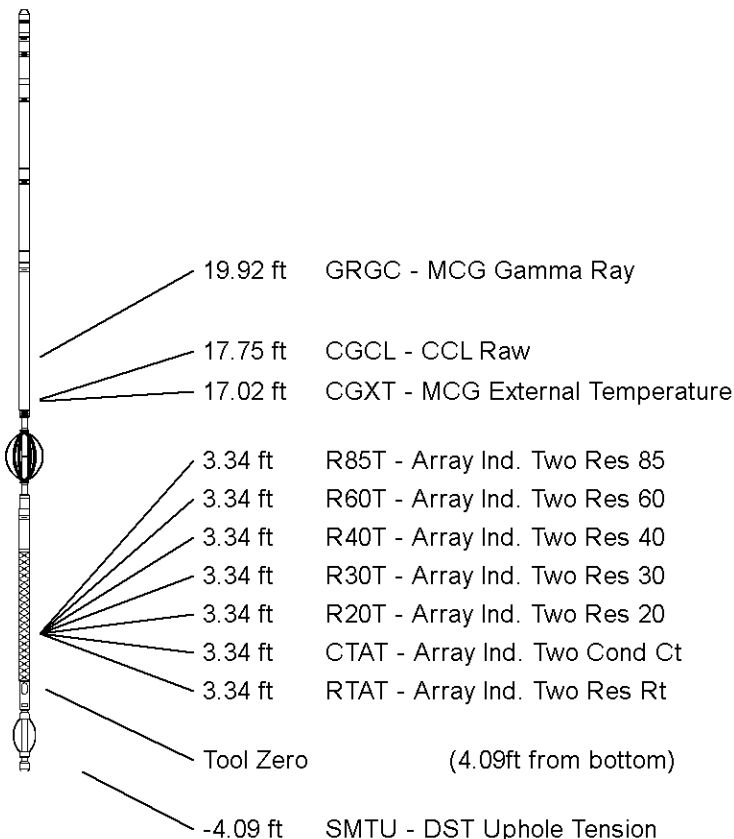
Compact Inline Bowspring sub

MIS-D.B 726 LG: 5.70 ft WT: 33.1 lb OD: 2.240 in

Compact Induction

MAI-C.A 456 LG: 14.76 ft WT: 48.5 lb OD: 2.240 in

Total Length: 43.61 ft Weight: 332.9 lb



All measurements relative to tool zero.

COMPANY

ANADARKO PETROLEUM CORP (ROCKY MOUNTAIN)

WELL

RMF-5N-15HZ

FIELD

WATTENBERG

PROVINCE/COUNTY

WELD

COUNTRY/STATE

U.S.A. / COLORADO

Elevation Kelly Bushing 4988.00 feet

First Reading 7195.00 feet

Elevation Kelly Bushing	4988.00	feet	First Reading	7195.00	feet
Elevation Drill Floor	4988.00	feet	Depth Driller		feet
Elevation Ground Level	4968.00	feet	Depth Logger	7200.00	feet



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ARRAY INDUCTION
LOG