BAKER HUGHES

Memory/Realtime Log

Multiple Propagation Resistivity
Gamma ray

Scale: 1:240 Measured Depth

Company: Kerrr-McGee oil & Gas Onshore LP

Well: Bella Federal 23N-7HZ

Field: Weld county (Kerr-McGee)

Region: RMD **Country:** United States

Status: **Final Print**

API Number: 051233744100

Surface Location:
Latitude: 40° 14' 16.181" N
Longitude: 104° 48' 6.754" W
Section8 TWN: 3N Range66E

Other Services:
2 Sector Gamma Ray
Directional
VSS

Permanent Datum (P.D.):	Ground Level	Elevation:	4876.00 ft.
Log Measured From:	Drill Floor	13.00 ft.	Above P.D.
Depth Reference:	Driller's Depth		

Elevations:
KB: N/A
DF: 4876.00 ft.
GL: 4863.00 ft.

Interval Logged		Dates		Magnetic Field Reference			
Top:	6483 ft.	Date From:	28/Jul/13	Dip Angle:	66.89 °	Azi Reference North:	True
Bottom:	11820 ft.	Date To:	02/Aug/14	Total		Mag to Reference	
		Spud Date:	28/Jul/13	Field Strength:	52665.0 nT	North Correction:	8.54 °

Borehole Record			Casing Record			
Hole Size	From	To	Size	Weight	From	To
13.500 in.	Surface	922 ft.	9.625 in.	36.00 lb/ft	Surface	922 ft.
8.750 in.	922 ft.	7616 ft.	7.000 in.	26.00 lb/ft	Surface	7606 ft.
6.125 in.	7616 ft.	11876 ft.				

Mud Record			Deviation Record			
Type	From	To	Hole Size	Interval	Inc / Az (Start)	Inc / Az (End)
Water Based - Fresh	922 ft.	10824 ft.	13.500 in.	922 ft.	0.1 ° / 243.1 °	0.4 ° / 11.0 °
			8.750 in.	6694 ft.	1.1 ° / 194.0 °	87.1 ° / 270.4 °
			6.125 in.	5182 ft.	90.3 ° / 270.0 °	90.9 ° / 271.3 °

Acquisition System	Software Version	Other	
Advantage	2.20U4	Rig: / Contractor:	Ensign 138 / Ensign Drilling
PATS	6.4.1.34	Job No:	5589811
		District: / Unit:	RMD / D&E

Log Run Summary

LWD Run No.	BHA Run No.	Bit Run No.	Bit Size (in.)	Bit Type	Bit Gauge Length (in.)	Assembly Type	Logged Interval Top (ft.)	Logged Interval Bottom (ft.)	Bit Depth Interval From (ft.)	Bit Depth Interval To (ft.)	Date / Time Start	Date / Time End	Circ. Time (hrs.)
1	1	1	8.750	PDC	2.500	Steerable	N/A	N/A	922	3668	28/Jul/2013 21:51	29/Jul/2013 10:28	11.27
2	2	1	8.750	PDC	2.500	Steerable	6548	7549.09	3668	7613	30/Jul/2013 06:38	30/Jul/2013 17:06	22.15
3	3	2	6.125	PDC	3.000	Steerable	7565	11820	7616	11876	01/Aug/2013 08:16	02/Aug/2013 13:49	30.25

Crew

Name	Arrive	Depart
David Campbell	July 13 2013	Aug 3 2013
Dave Belek	July 22	Aug 3 2013
Robert Bartlett	Aug 1 2013	Aug 3 2013
Bill Herbers	July 26 2013	Aug 3 2013

Name	Arrive	Depart
	Wellsite	Wellsite
	Wellsite	Wellsite
	Wellsite	Wellsite
	Wellsite	Wellsite

Mud Properties Record

Date / Time	LWD Run No.	Measured Depth (ft.)	Mud Type	Density (sg)	Viscosity (cp)	pH	Fluid Loss (cc)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
28/Jul/2013 23:39	1	896	Water Based - Fresh	8.4	28	9.5	26.0	0 / 99	Active Mud Pit	800	0.0
29/Jul/2013 09:00	2	2957	Water Based - Fresh	8.4	27	8.3	33.0	0 / 99	Active Mud Pit	800	0.0
29/Jul/2013 21:00	2	3939	Water Based - Fresh	8.4	27	8.3	34.0	0 / 99	Active Mud Pit	600	0.0
30/Jul/2013 09:00	3	6775	Water Based - Fresh	9.8	37	8.6	10.0	0 / 92	Active Mud Pit	1100	0.0
30/Jul/2013 21:00	3	7613	Water Based - Fresh	9.8	37	8.9	7.0	0 / 92	Active Mud Pit	1200	0.0
01/Aug/2013 09:00	3	7701	Water Based - Fresh	9.3	35	9.6	8.4	0 / 94	Active Mud Pit	1100	0.0
01/Aug/2013 21:00	3	9383	Water Based - Fresh	9.4	38	8.8	8.0	0 / 94	Active Mud Pit	1200	0.0
02/Aug/2013 06:00	3	10800	Water Based - Fresh	9.2	35	8.7	7.5	0/95	Active Mud Pit	1100	0.0

Mud Resistivity Record

				Surface				Downhole		
Date / Time	LWD Run No.	Measured Depth (ft.)	Surface Temp (deg C)	Rm (ohm.m)	Rmf (ohm.m)	Rmc (ohm.m)	BHCT (deg F)	Rm @ BHCT (ohm.m)	Rmf @ BHCT (ohm.m)	Rmc @ BHCT (ohm.m)
01/Aug/2013 06:17	3	7616	67	2.29	N/A	N/A	121	1.29	N/A	N/A
01/Aug/2013 21:24	3	9492	71	1.31	N/A	N/A	201	0.48	N/A	N/A
02/Aug/2013 05:26	3	10686	68	1.13	N/A	N/A	215	0.37	N/A	N/A

Mnemonics

Curve	Description	Units
CACLM	Conductivity Attenuation - Corrected - 2MHz	mmho/m
GRAM	Gamma Ray Apparent, 0.5 ft. Avg.	API
GRAX	Gamma Ray Apparent, 0.5 ft. Avg.	API
GRIM	Gamma Ray Data Density	piont
GRIX	Gamma Ray Data Density	point
RACHM	Resistivity Attenuation - Corrected - 2MHz	ohm.m
RACLM	Resistivity Attenuation - Corrected - 400kHz	ohm.m
ROPA	Rate of Penetration, 3.0 ft. Avg.	ft/hr
RPCLM	Resistivity Phase - Corrected - 400kHz	ohm.m
RPCHM	Resistivity Phase - Corrected - 2MHz	ohm.m
RPSIHM	Resistivity Sliding Indicator	untiless
RPTHM	Resistivity Time Since Drilled	min

Equipment and Service Data

LWD Run No.	Tool	Serial Number	Measurement	Bit Offset (m.)	Max O.D. (in.)	Min I.D. (in.)
1	DIR	12546374	Directional	63.15	6.750	0.000
1	SRIG	12595025	Gamma	59.78	6.750	0.000
2	DIR	10508935	Directional	63.81	6.750	0.000

2	SRIG	11703934	Gamma	60.44	6.750	0.000
3	CS	10623929	-	80.55	0.000	0.000
3	BCPM	10214387	Telemetry	69.61	0.000	0.000
3	STAB	11781609	-	66.47	0.000	0.000
3	OTK	10266171	Directional	61.95	4.843	2.569
3	OTK	10266171	Resistivity	55.98	4.843	2.569
3	OTK	10266171	Gamma	48.79	4.843	2.569
3	OTK	10266171	Pressure	51.42	4.843	2.569
3	CS	12031348	-	46.71	0.000	0.000

Service and Tool Mnemonics

Mnemonic	Name	Description
BCPM	BCPM	Mud pulse telemetry and downhole tool power module
DIR	Directional	Wellbore directional survey
OTK	OnTrak	Propagation resistivity, propagation conductivity, gamma ray, directional, annular pressure, system memory and VSS
SRIG	Inclination and Gamma	Probe based gamma ray and inclination module
STAB	Stabilizer	Stabilizer assembly
CS	Closure Sub	BHA power ring isolator allowing insertion of inert sub into electrically powered BHA

Comments

1.) Depth measurements obtained from a depth control system not supplied or operated by Baker Hughes. Due to the lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified.

2.) Baker Hughes runs 1 &2 utilized 6 3/4 inch NaviGamma services (Gamma Ray and Directional) behind an 8 3/4 inch bit and steerable assembly from 922 to 7616 feet MD (922 to 7144 feet TVD).

3.) Baker Hughes run 3 utilized 4 3/4 inch OnTrak services (Multiple Propagation Resistivity, 2 Sector Azimuthal Gamma Ray, Gamma Ray, and Directional) behind a 6 1/8 inch bit and steerable assembly from 7616 to 11876 feet MD (7144 to 7150 feet TVD).

4.) The interval from 922 to 6548 feet MD (922 to 6483 feet TVD) was not logged due to directional only services being provided through the surface and vertical-hole sections for Baker Hughes runs 1 and 2.

5.) A sliding indicator is shown on the right side of track 2 as a heavy line. This indicator has been depth shifted to the resistivity sensor offset to correspond with resistivity data acquired while sliding.

Remarks

Number	Measured Depth (m.)	Hole Section (in.)	LWD Run No.	Remark
1	6548	8.750	1	Begin logging due to directional only service provided thru vertical section.
2	11830	6.125	3	No sensor data due to sensor to bit offset.

Gamma Ray Apparent 0.5 ft Avg [GRAX]
0 150
API
Gamma Ray Apparent 0.5 ft Avg [GRAM]
0 150
API
Rate of Penetration 3.0 ft Avg [ROPA]
800 0
ft/hr

MD feet 1:240

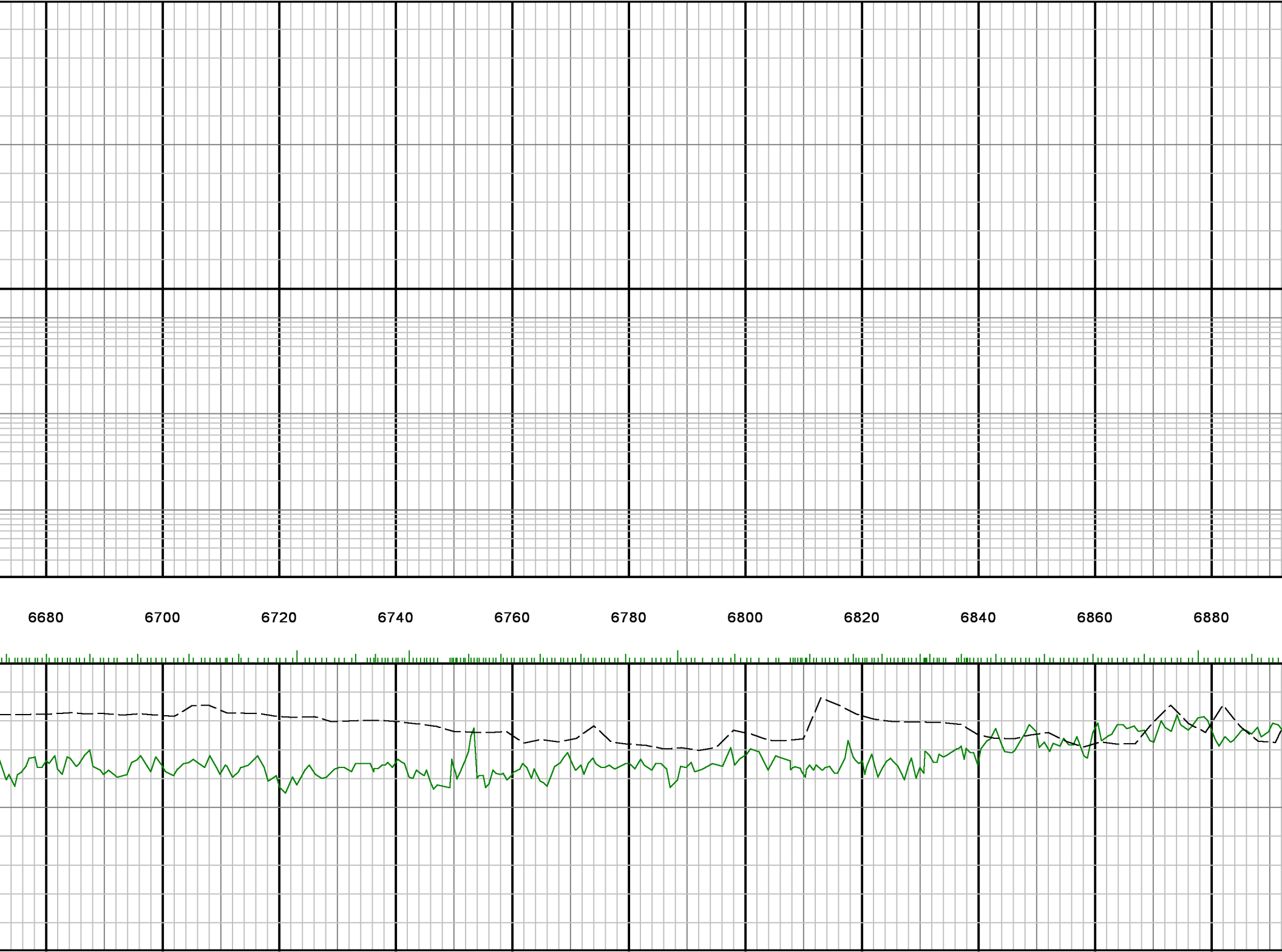
Res PD LS 2MHz Corr [RPCHM]
2 2000
ohm.m
Res PD LS 400kHz Corr [RPCLM]
2 2000
ohm.m
Res AT LS 2MHz Corr [RACHM]
2 2000
ohm.m
Res AT LS 400kHz Corr [RACLM]
2 2000
ohm.m

Con AT LS 400kHz Corr [CACLM]
40 0
mmho/m
Time Since Drilled [RPTHM]
0 600
min

6500
6520
6540
6560
6580
6600
6620
6640
6660

See Remark 1

GRAX
GRIX
ROPA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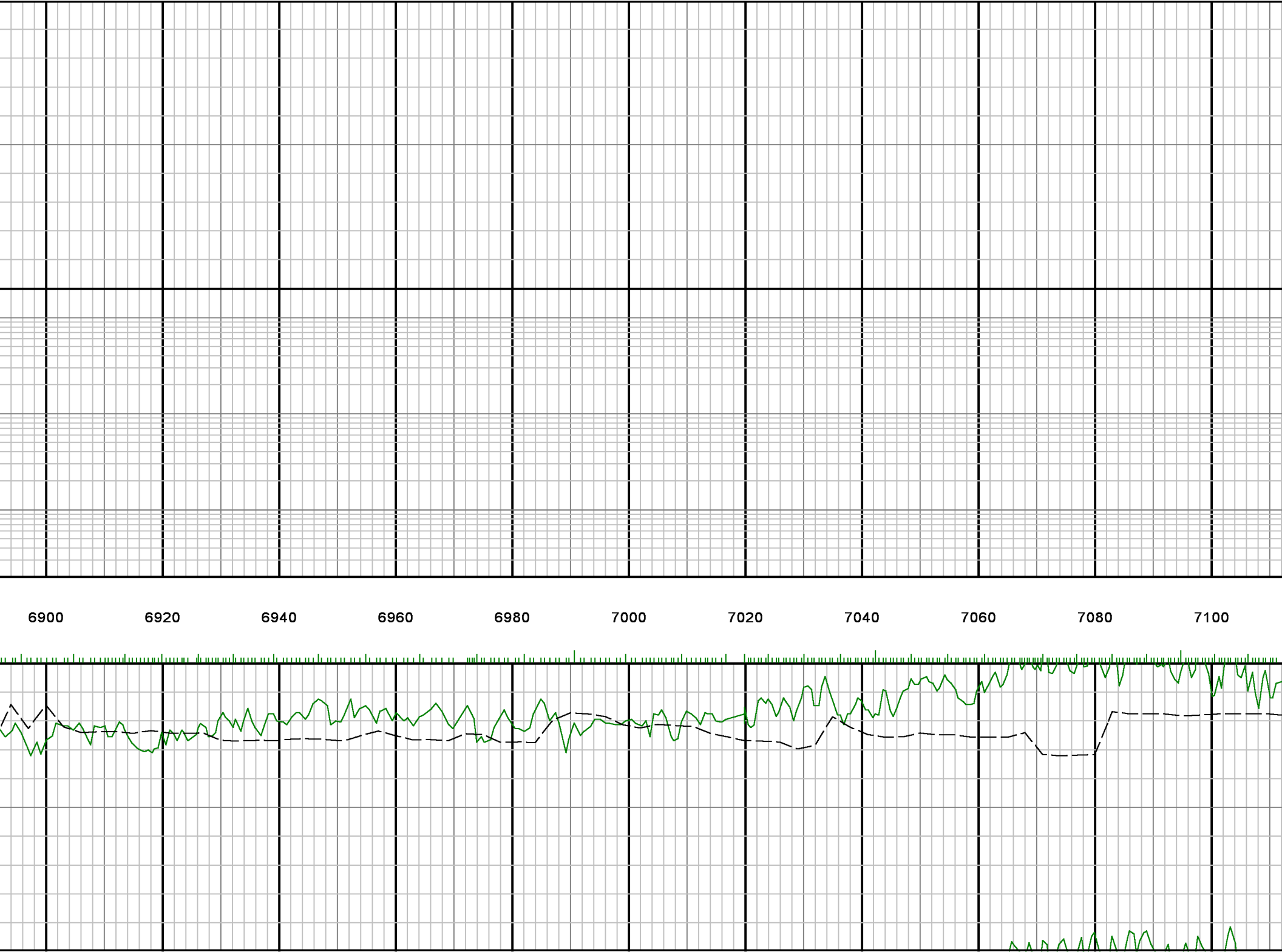
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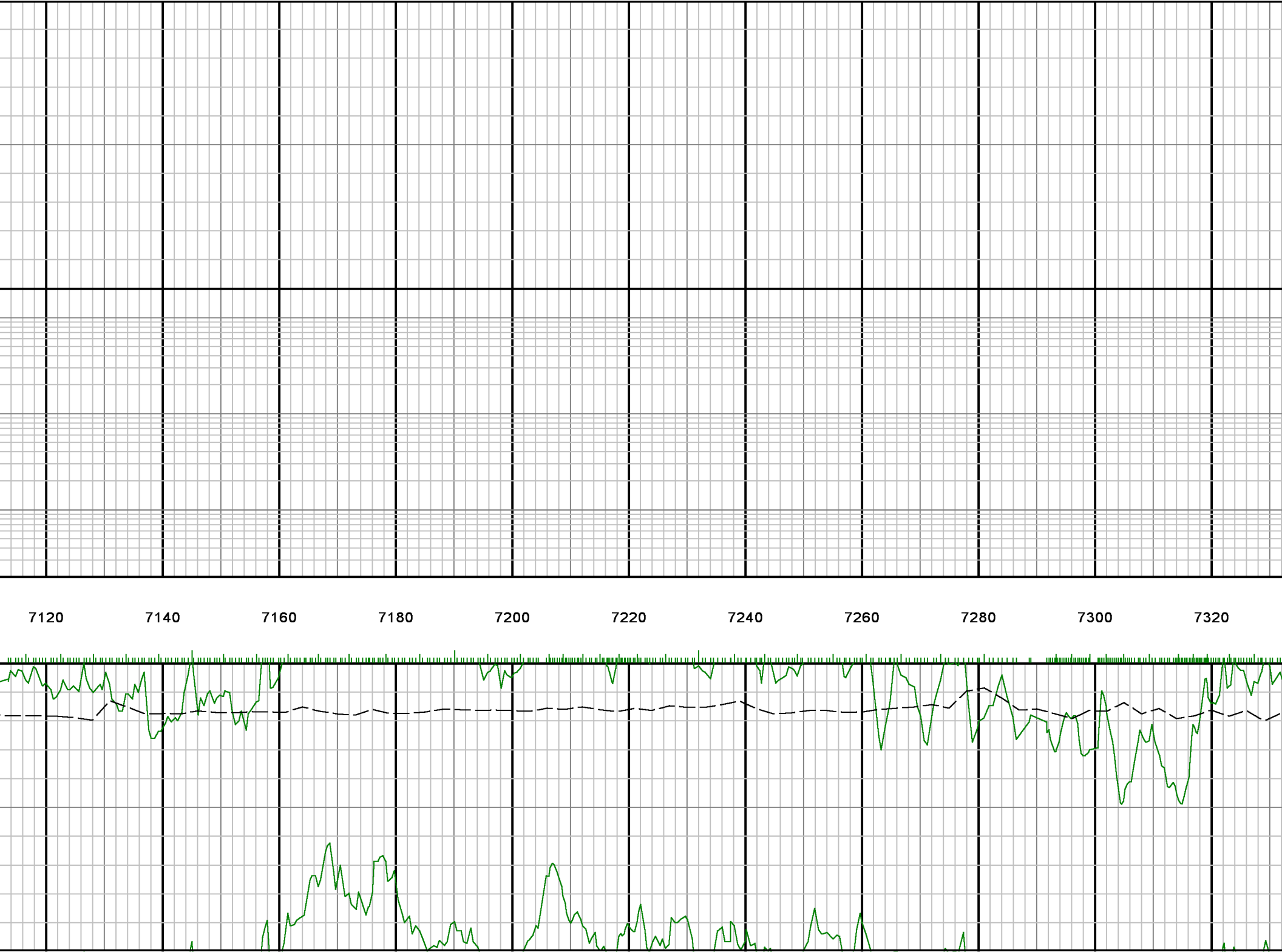
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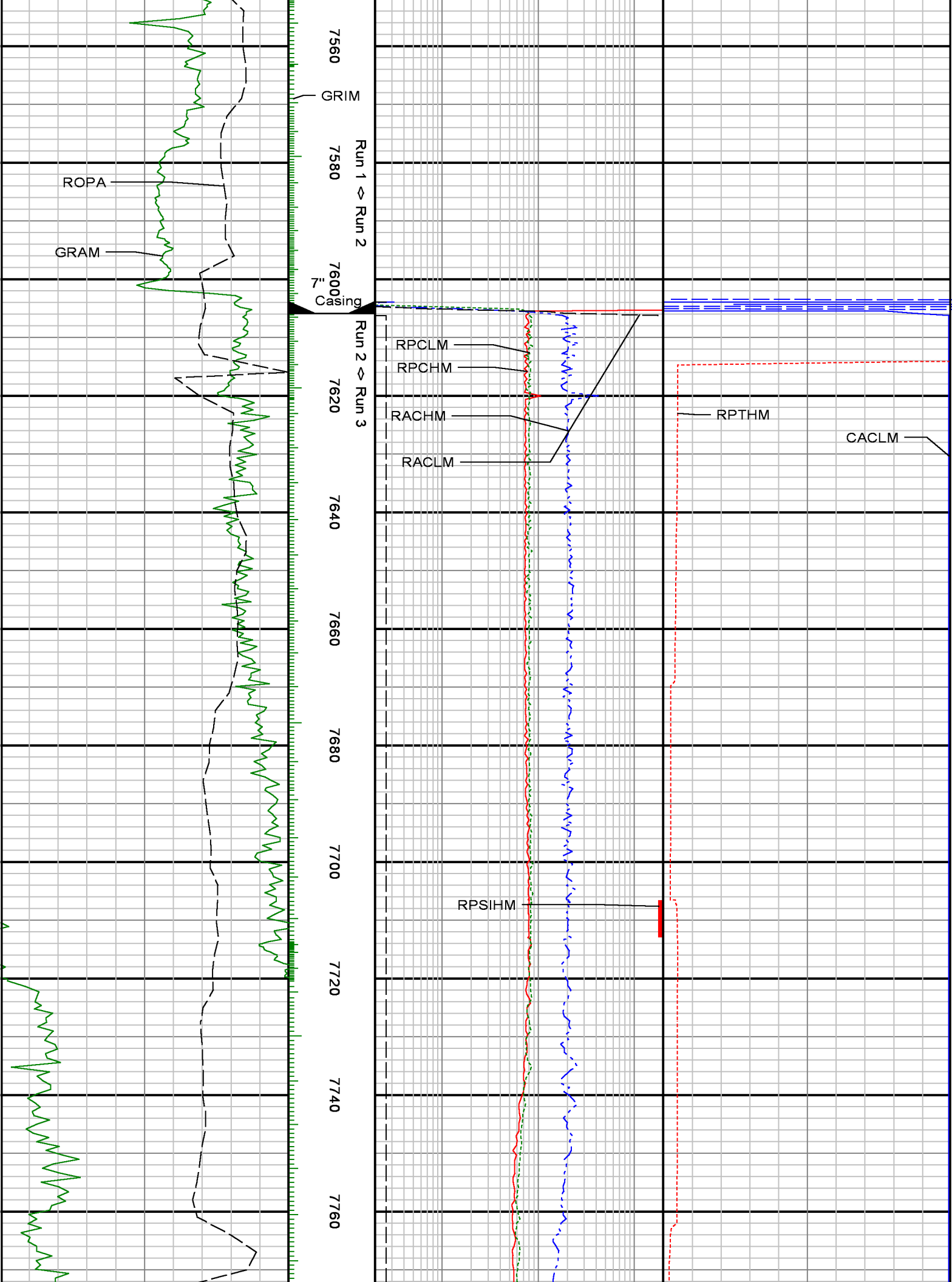
GRAX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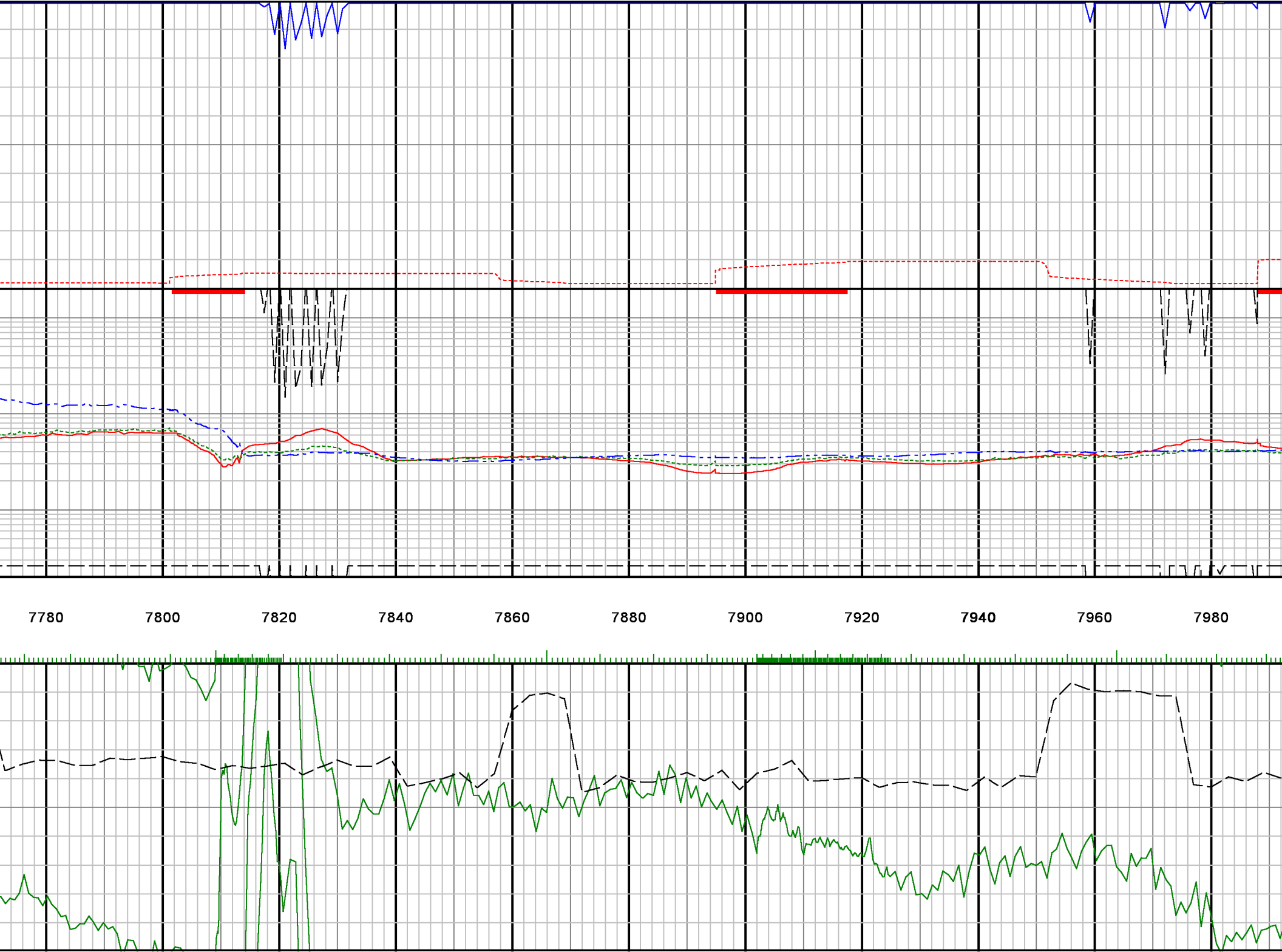
GRIM
ROPA
GRAM
Run 1 ◊ Run 2
Run 2 ◊ Run 3
7" Casing
RPCLM
RPCHM
RACHM
RACLM
RPTHM
CACLM
RPSIHM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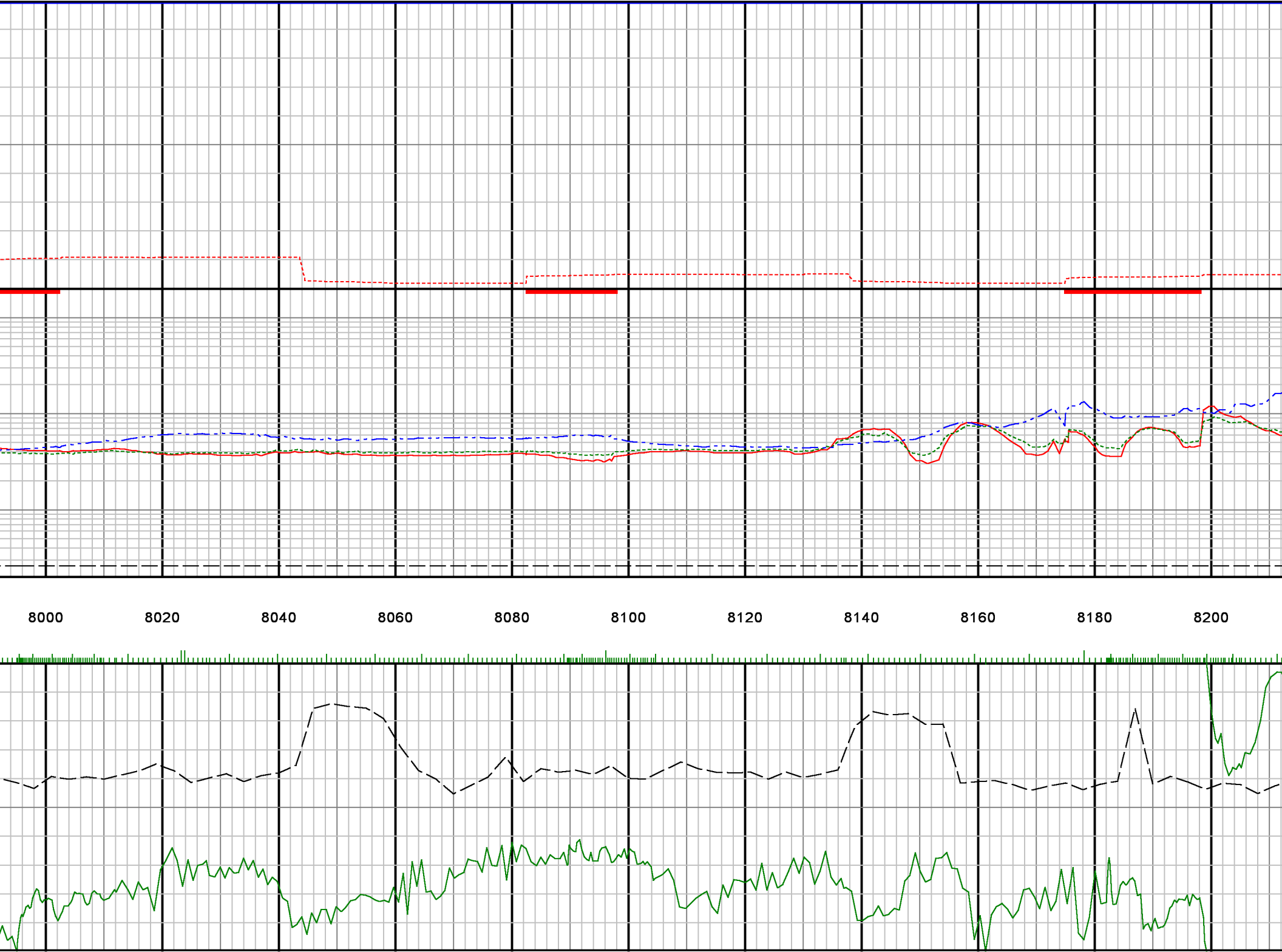
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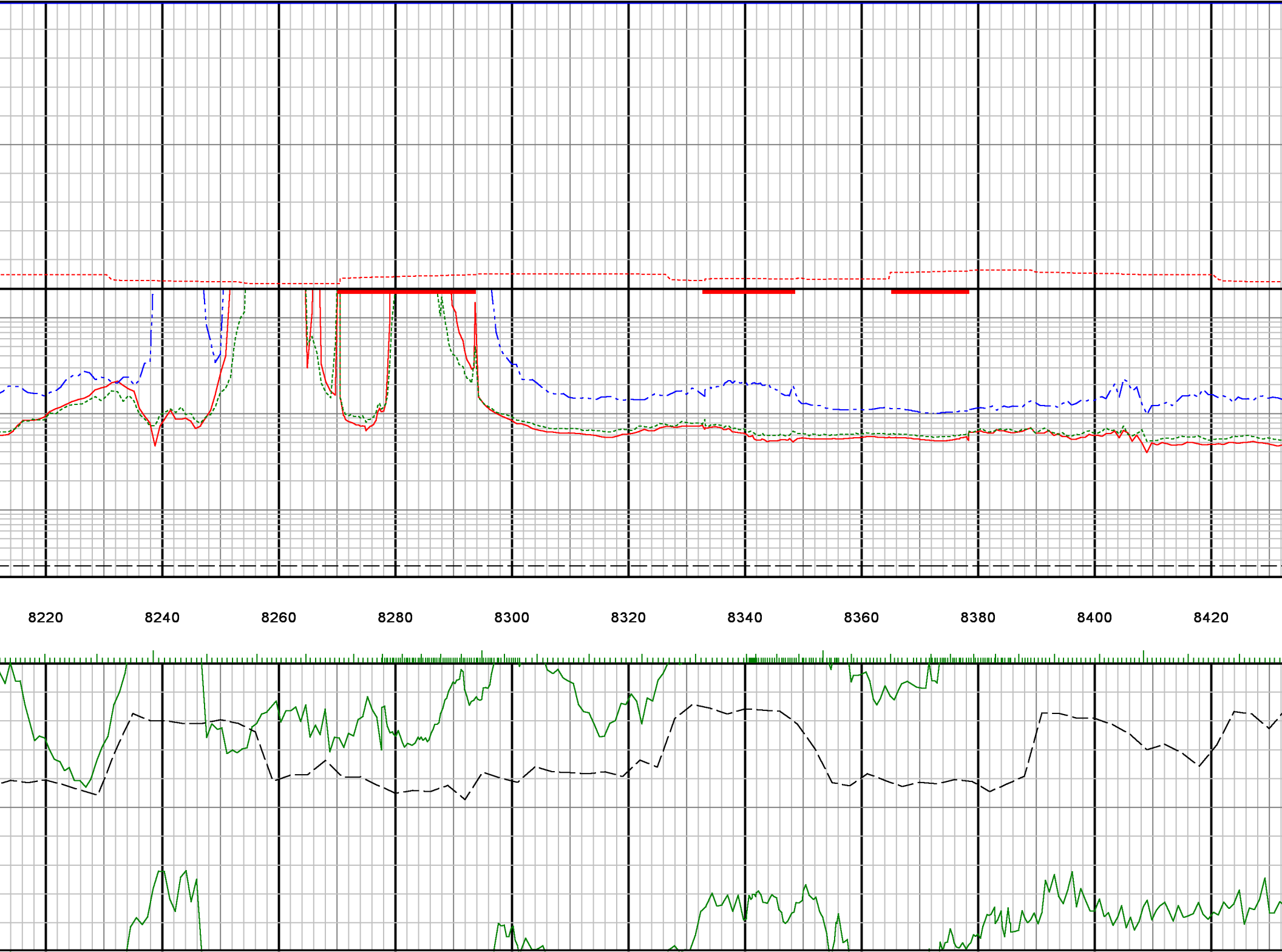
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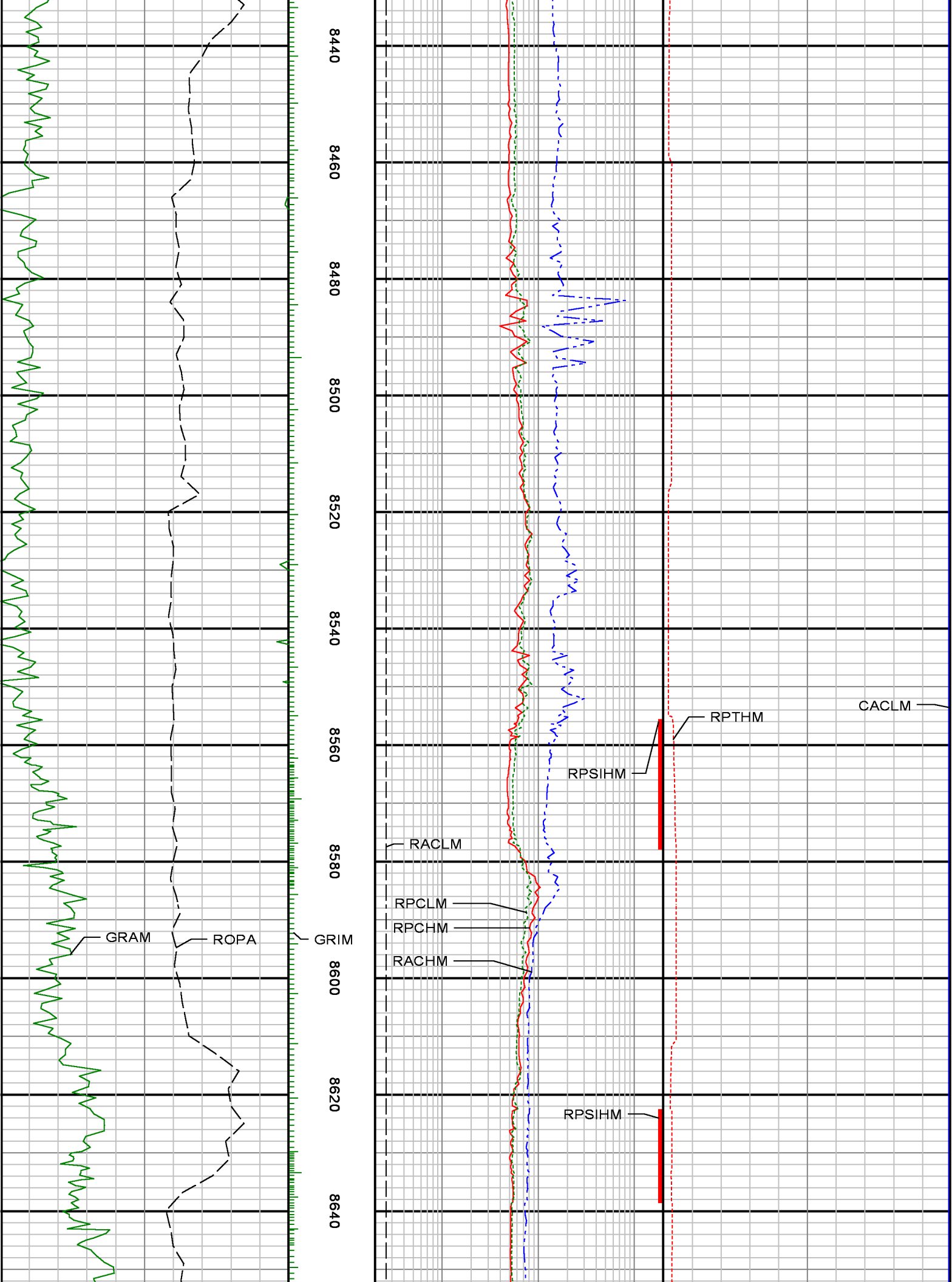
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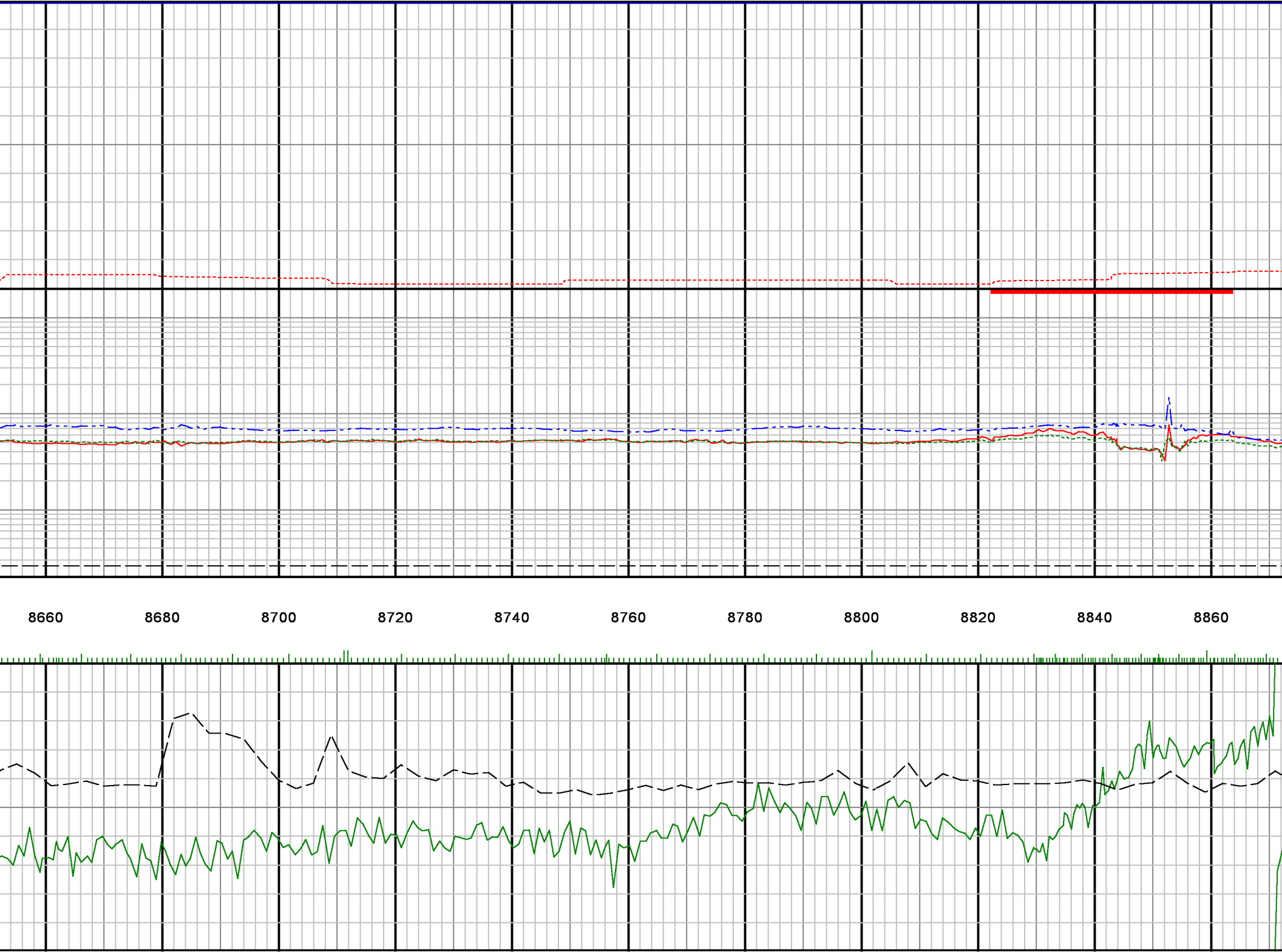
RPTHM
CACLM
RPSIHM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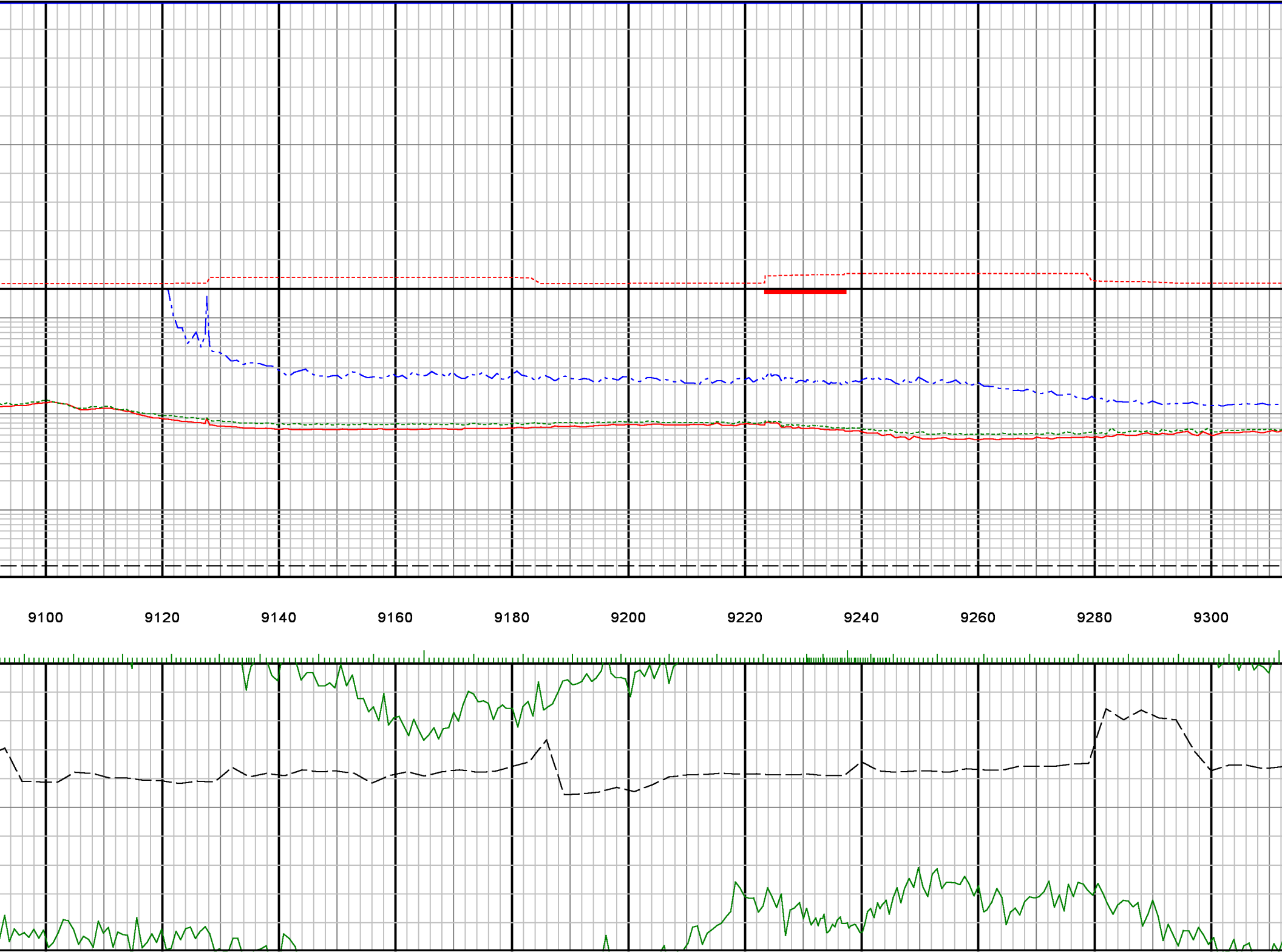
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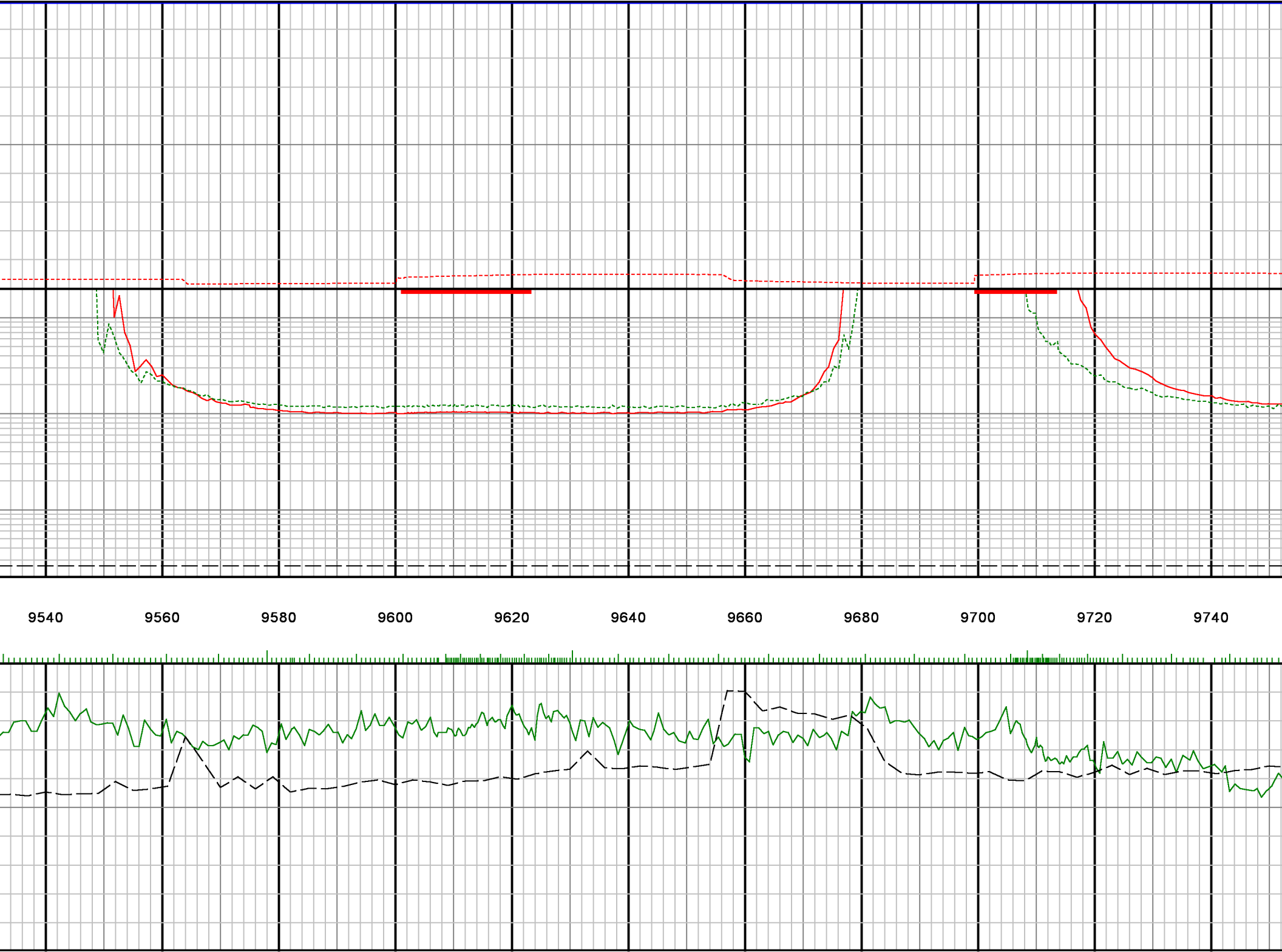
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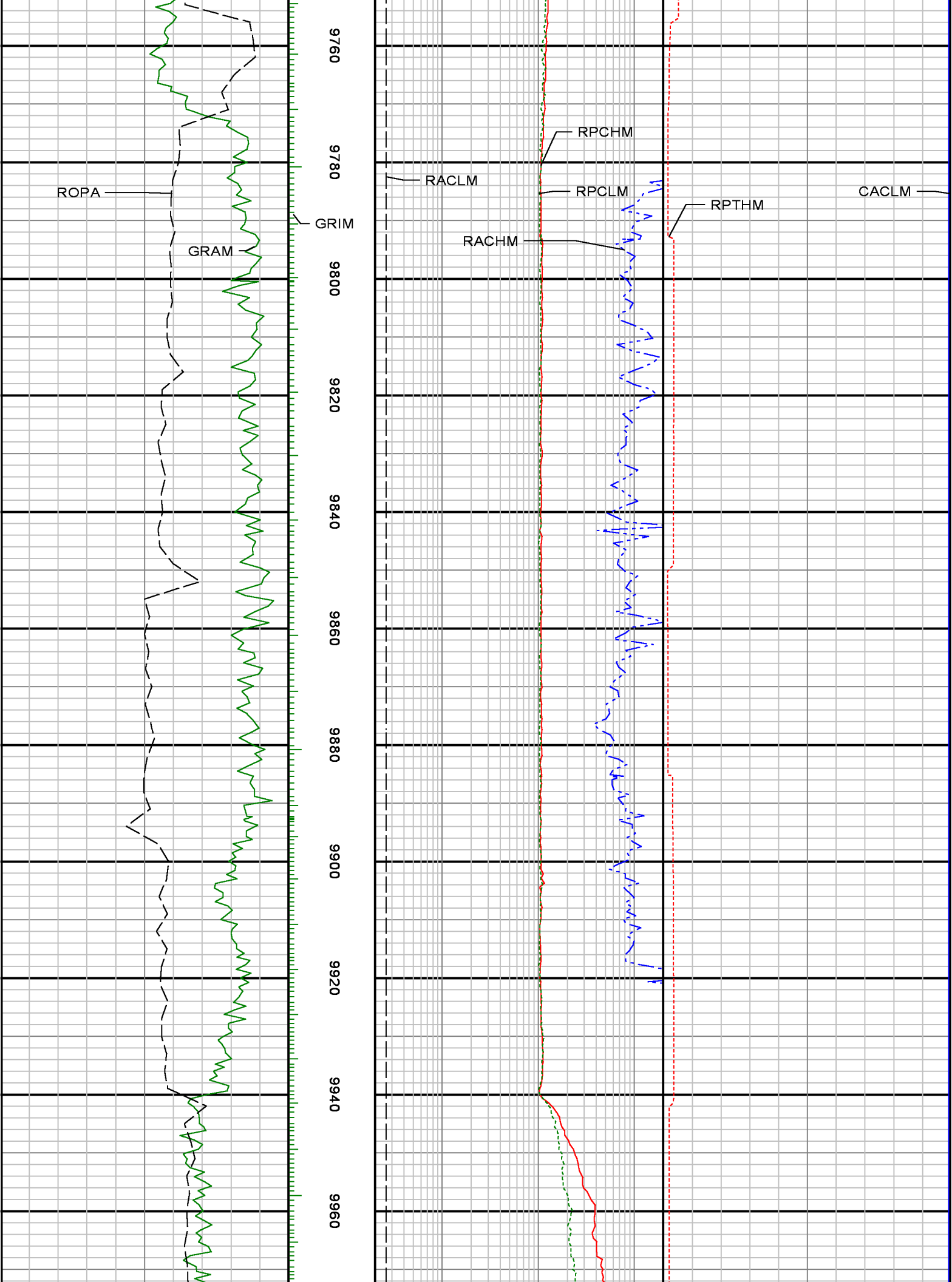
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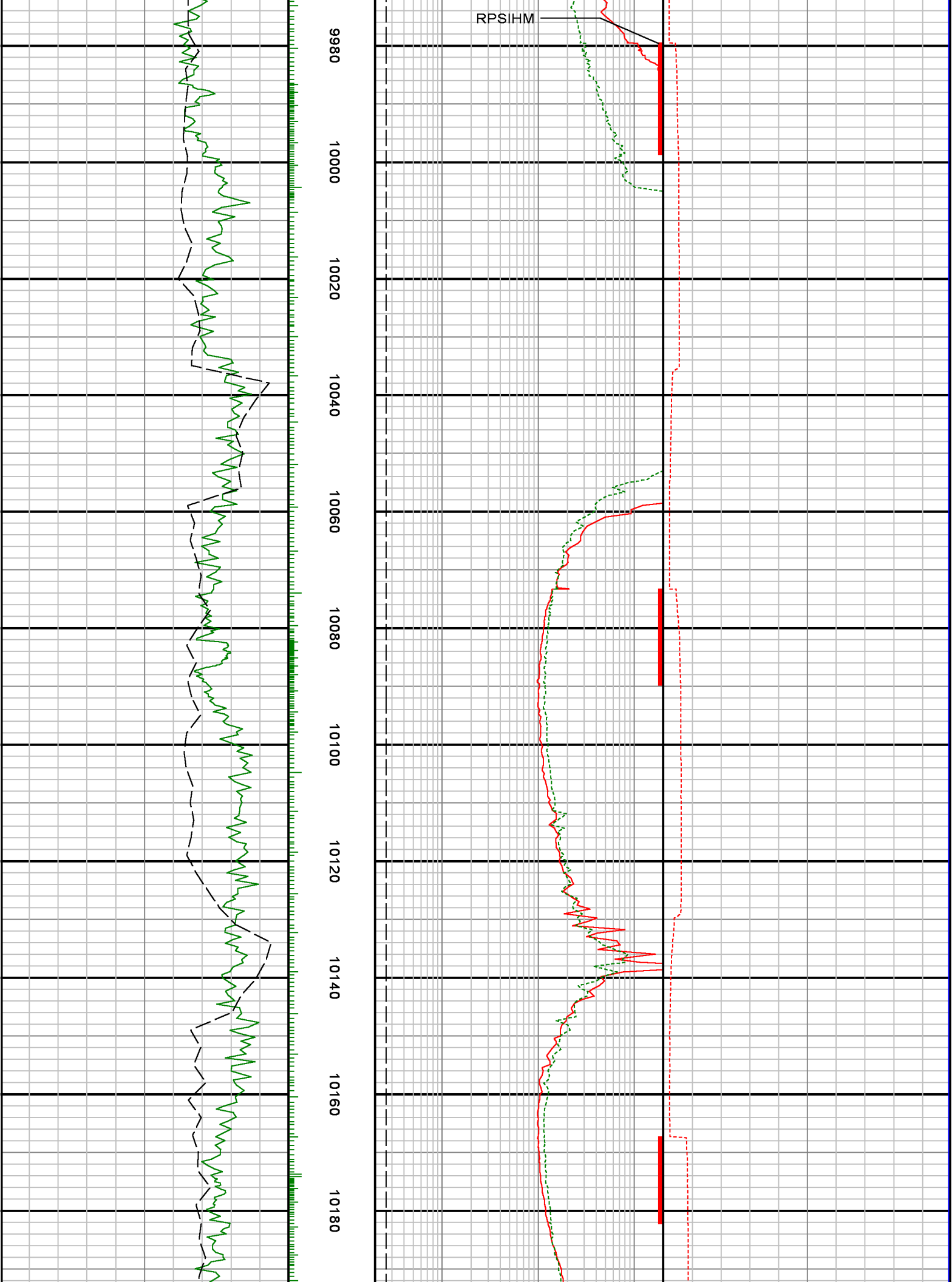
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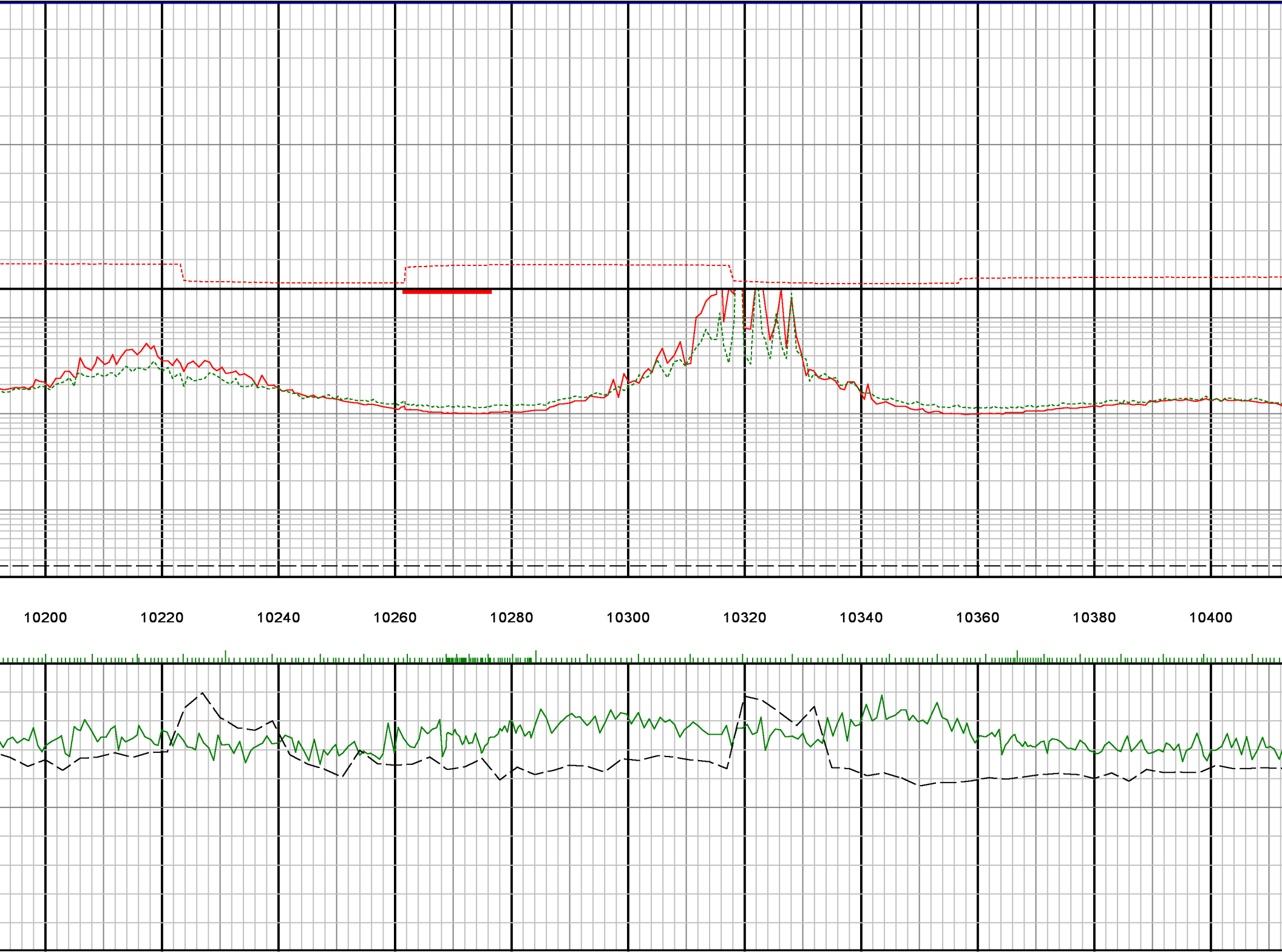
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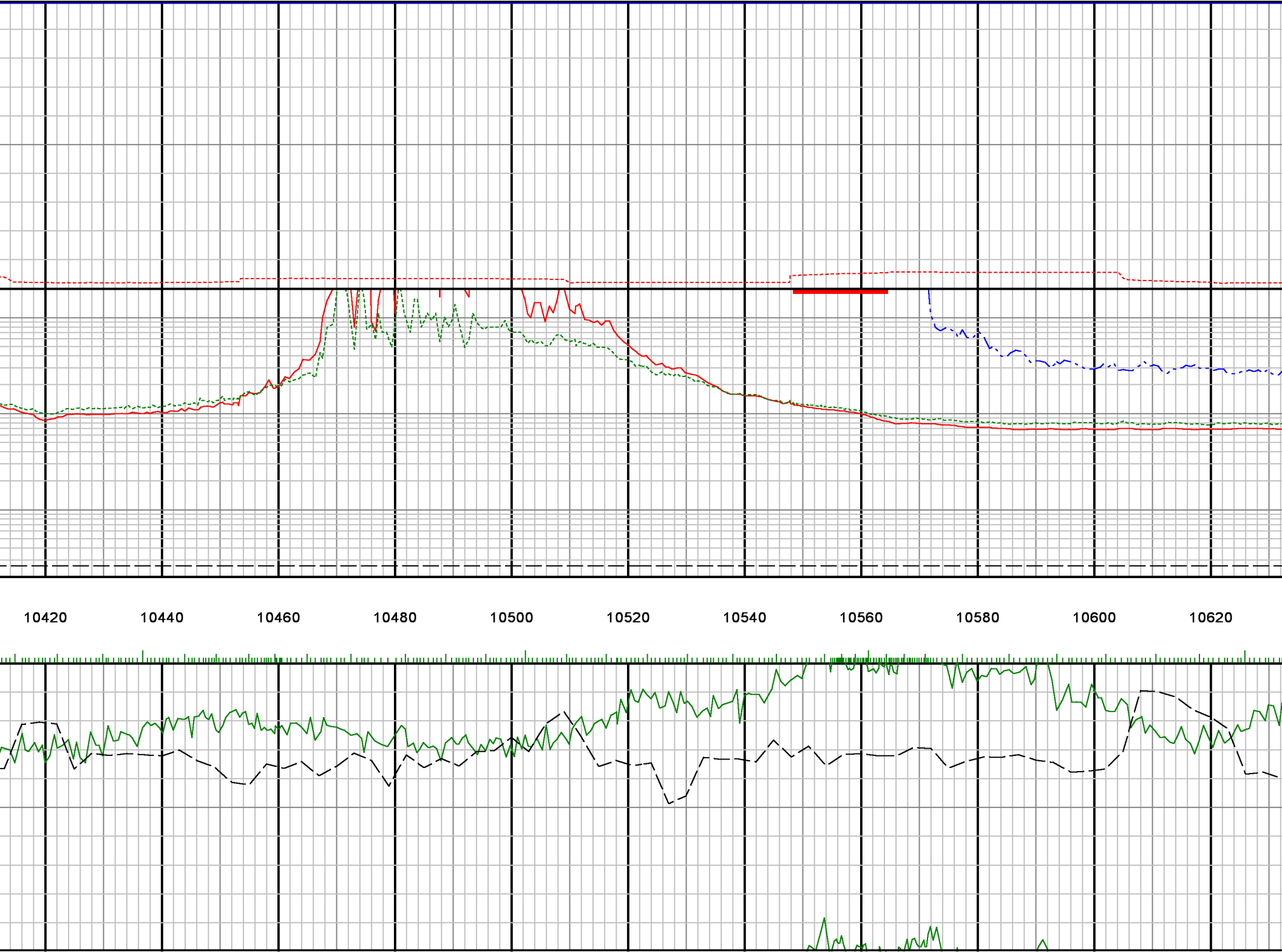
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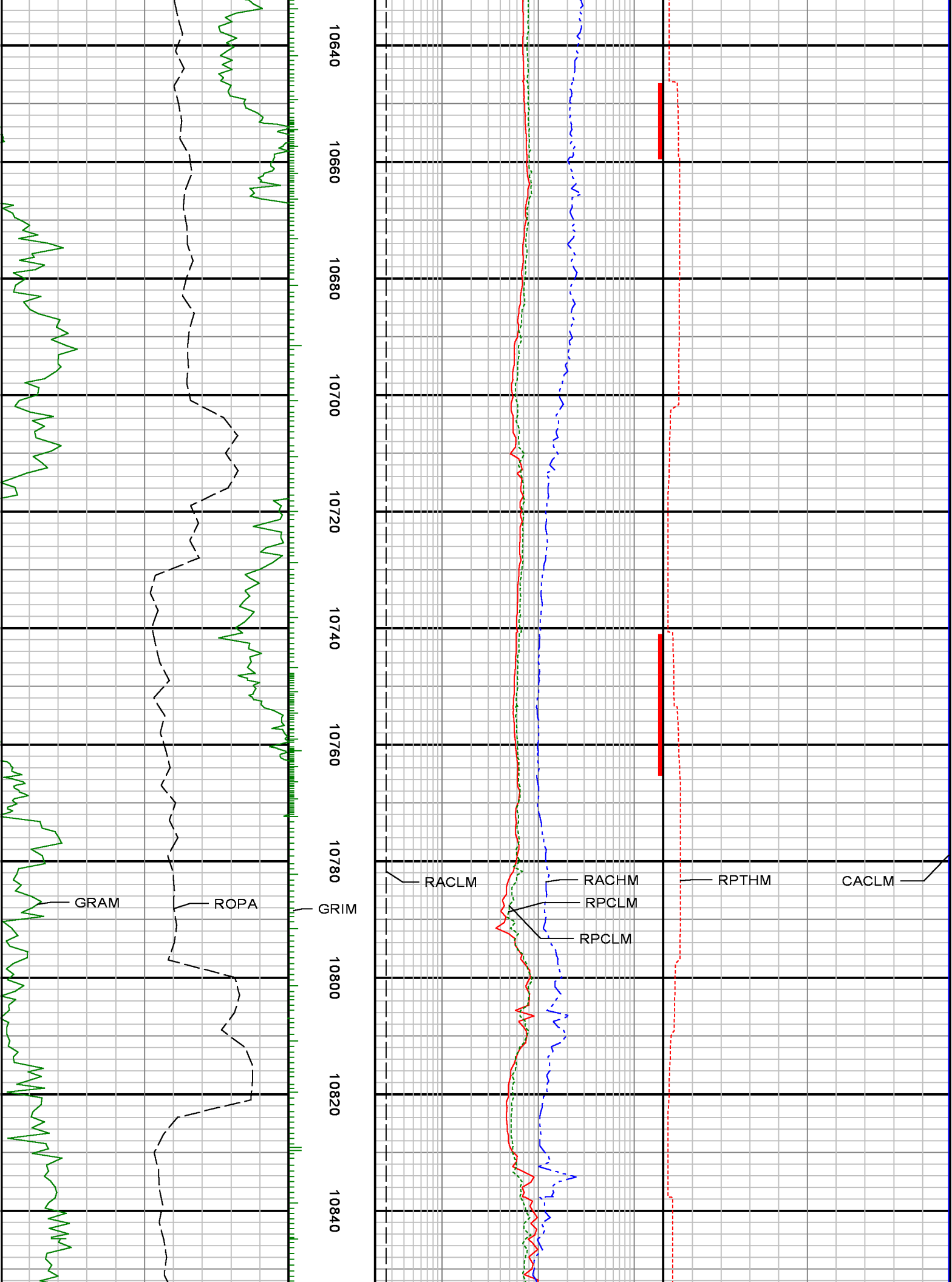
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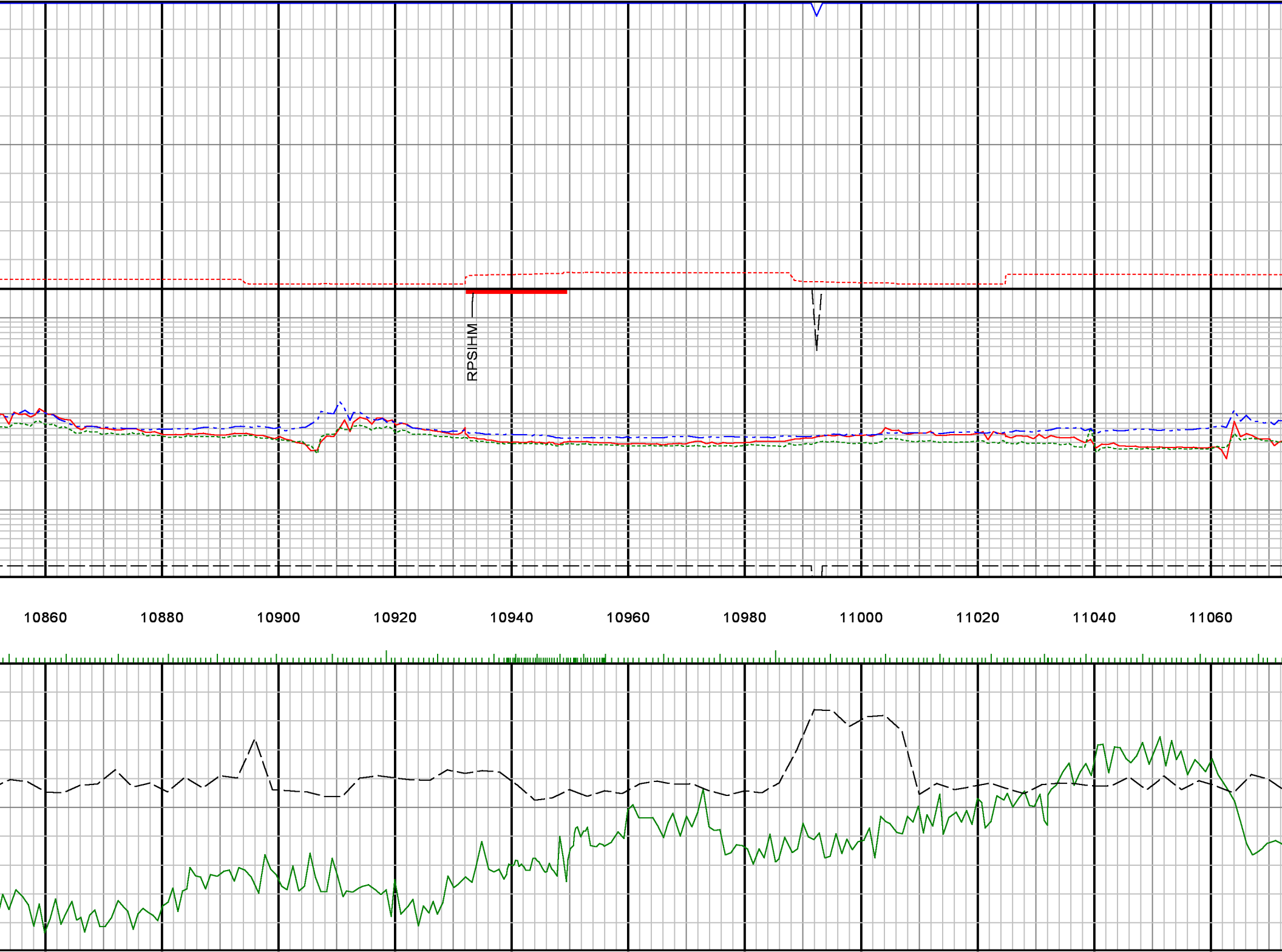
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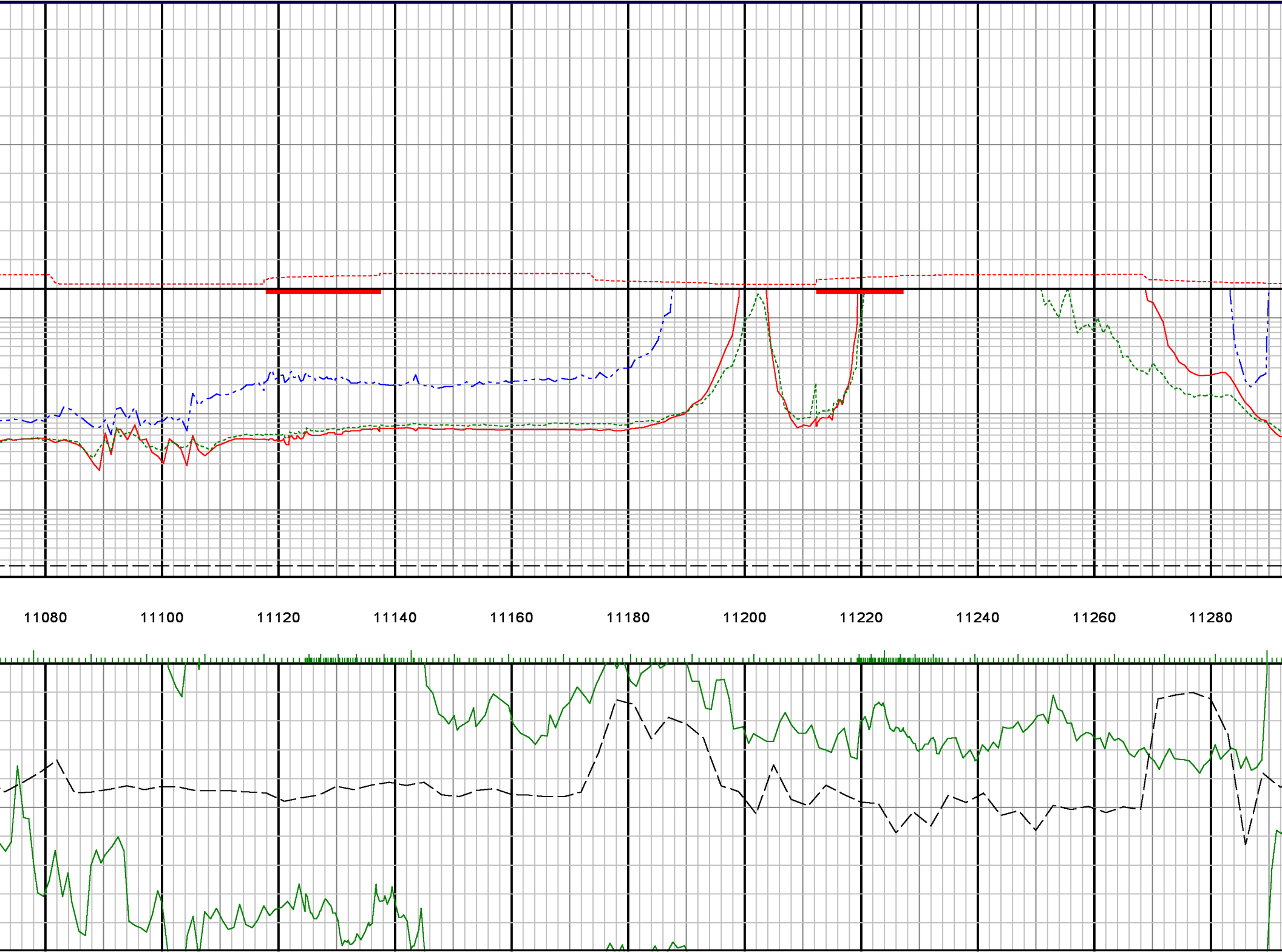
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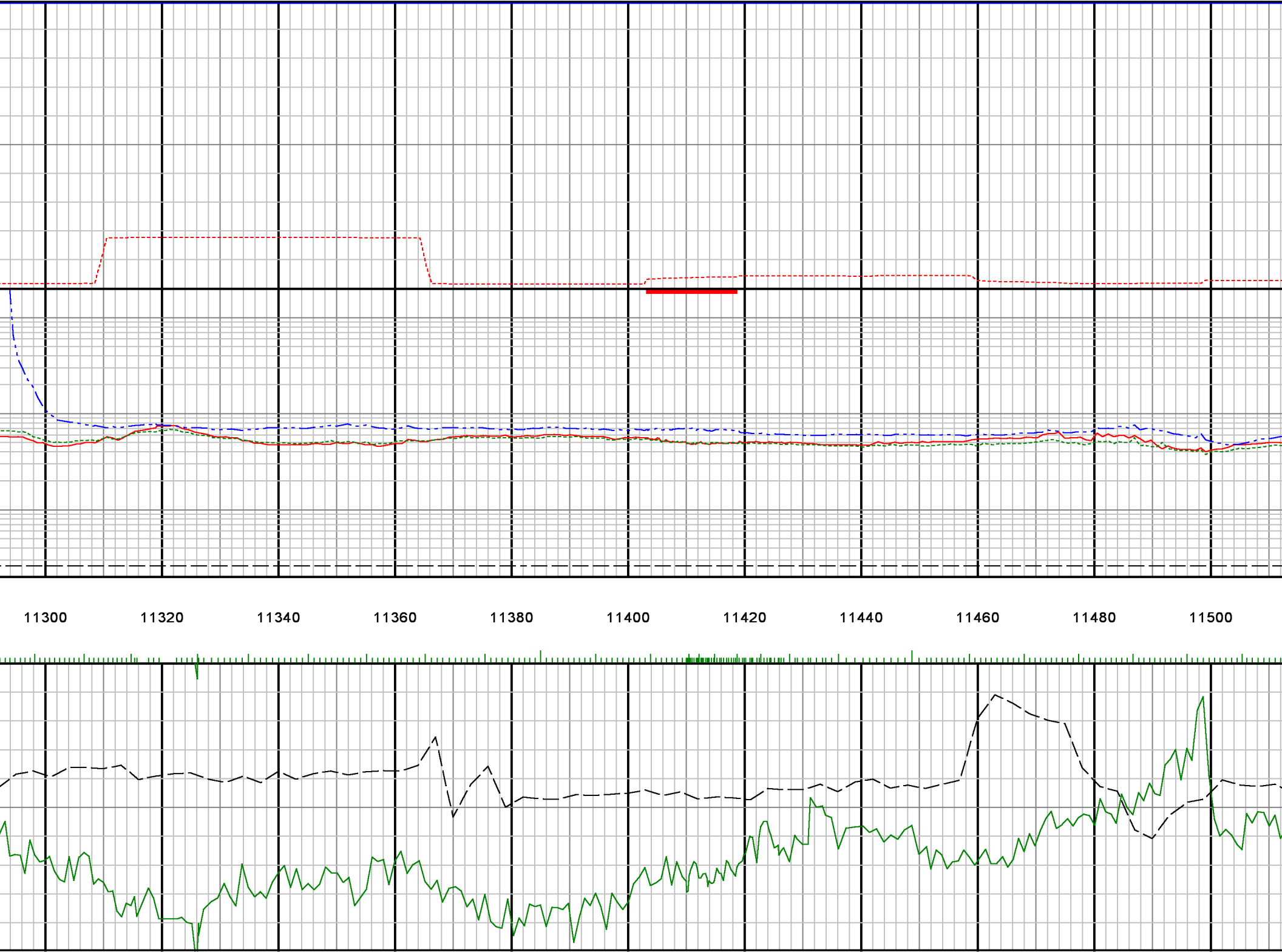
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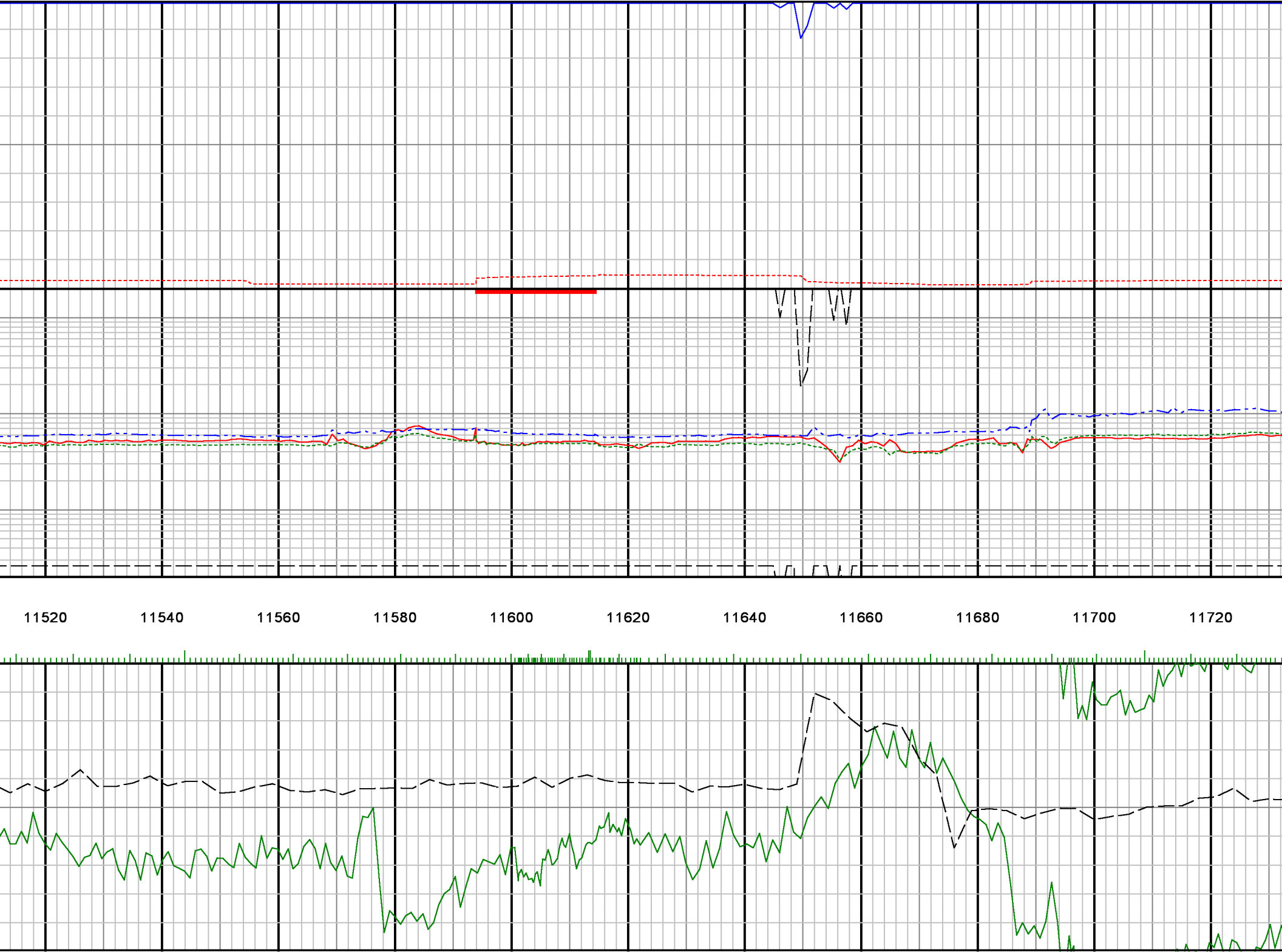
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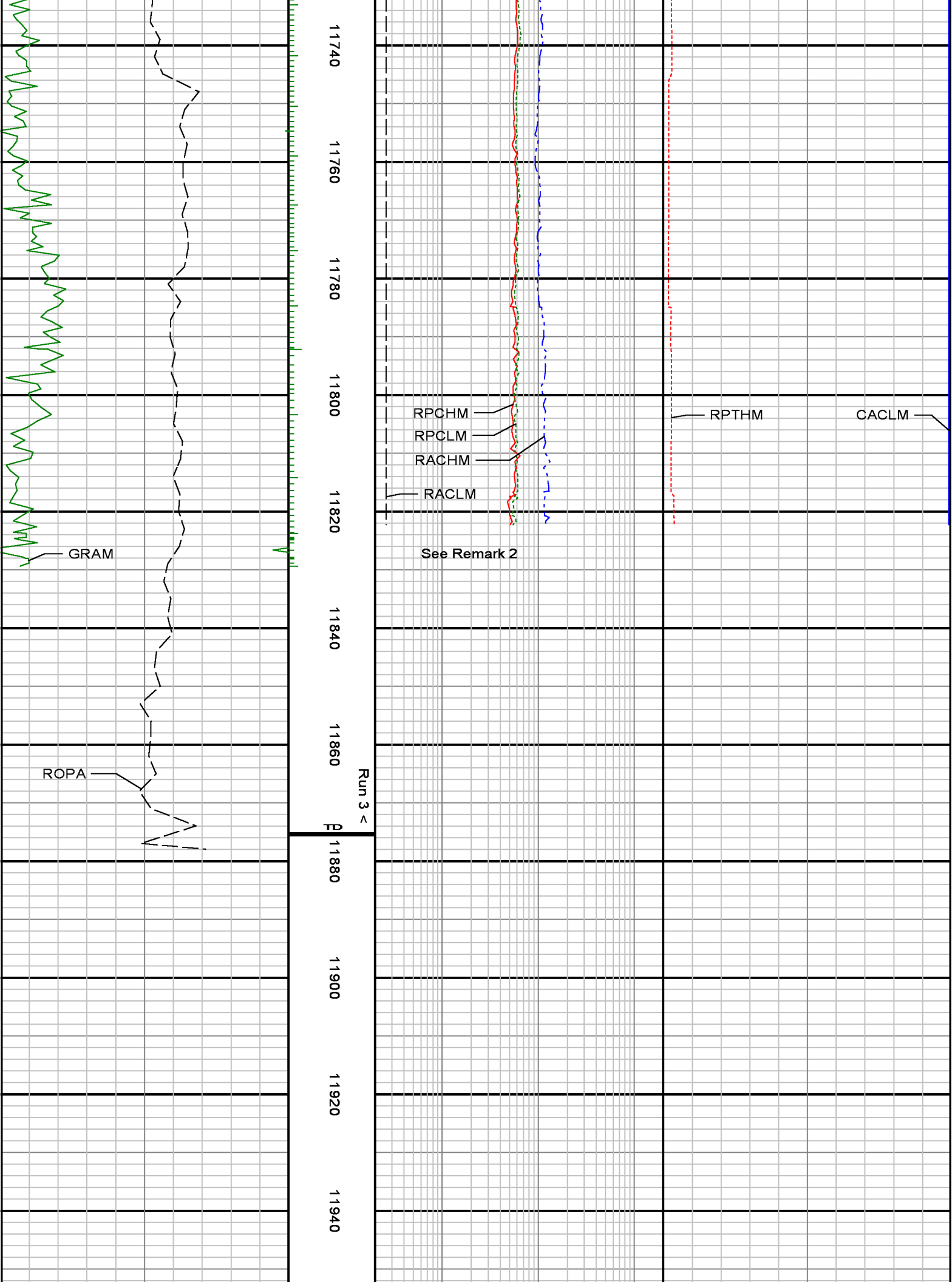
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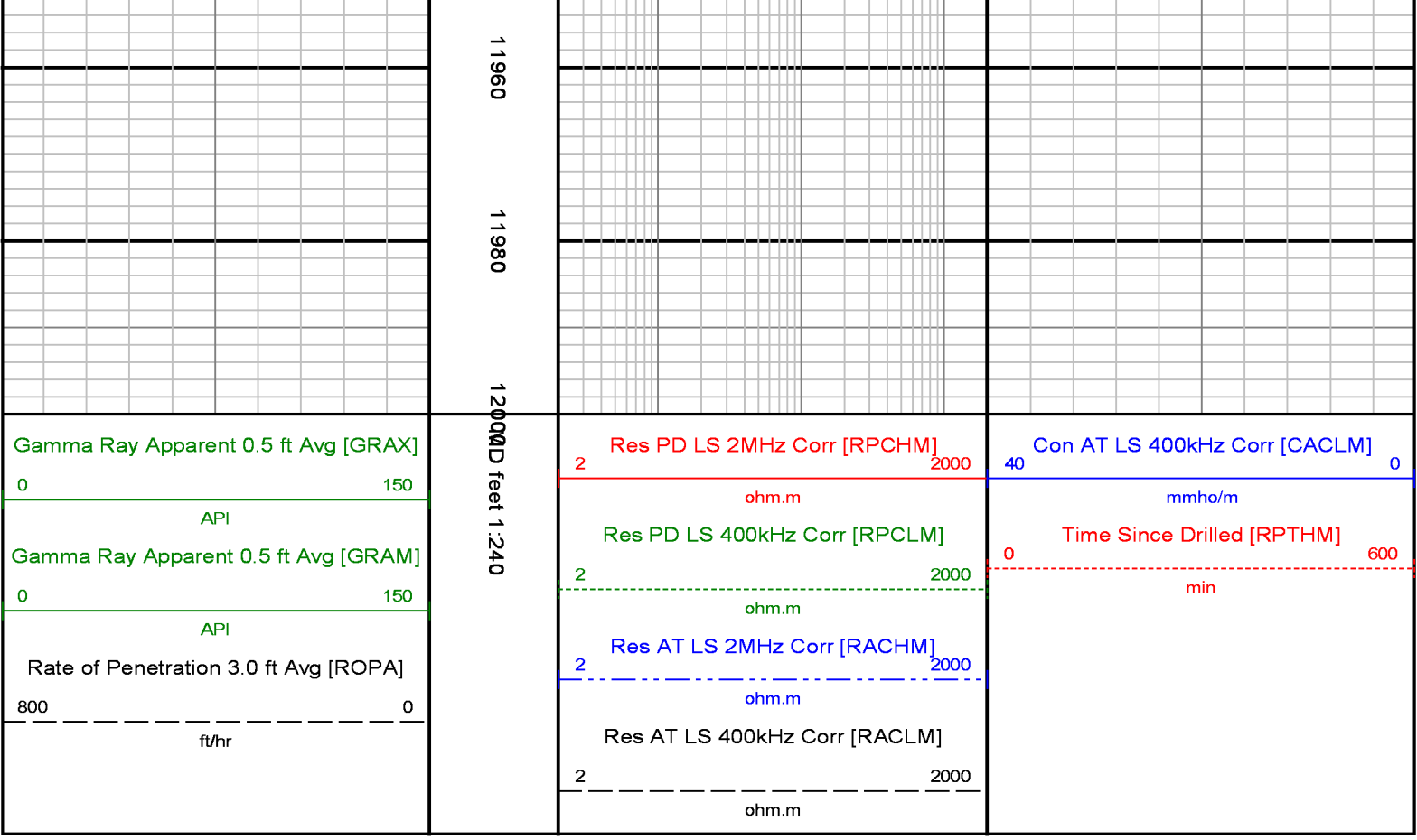
See Remark 2
RPTHM
CACLM
Run 3 <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MD feet 1:240
Gamma Ray Apparent 0.5 ft Avg [GRAX]
0
150
API
Gamma Ray Apparent 0.5 ft Avg [GRAM]
0
150
API
Rate of Penetration 3.0 ft Avg [ROPA]
800
0
ft/hr
Res PD LS 2MHz Corr [RPCHM]
2
2000
ohm.m
Res PD LS 400kHz Corr [RPCLM]
2
2000
ohm.m
Res AT LS 2MHz Corr [RACHM]
2
2000
ohm.m
Res AT LS 400kHz Corr [RACLM]
2
2000
ohm.m
Con AT LS 400kHz Corr [CACLM]
40
0
mmho/m
Time Since Drilled [RPTHM]
0
600
min