



**1 : 600 / 1 : 240**

WELL INFORMATION					
MWD Run Number	100	200			
Date run completed	19-Mar-15	20-Mar-15			
Rig Bit Number	2	3			
Bit Size (in)	8.750	8.750			
Tool Nominal OD (in)	6.790	6.790			
Log Start Depth (MD, ft)	934.00	6,137.00			
Log End Depth (MD, ft)	6,137.00	7,019.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	18-Mar-15 17:58	20-Mar-15 01:06			
Drill/Wipe End Date and Time	19-Mar-15 17:14	20-Mar-15 13:11			
Min Inc (deg) @ Depth (MD, ft)	0.17 @ 957.00	15.64 @ 6,177.00			
Max Inc (deg) @ Depth (MD, ft)	10.35 @ 3,810.00	83.05 @ 6,965.00			
Bit TFA(in2) / Bit Type	1.37 / PDC	1.37 / PDC			
Flow Rate (gpm)	586.74	550.10			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Native/Spud Mud	Native/Spud Mud			
Density (ppg) / Viscosity (spqt)	9.10 / 37.00	10.50 / 42.00			
Filtrate CL (ppm)	1,600.00	1,800.00			
pH / Fluid Loss (mptm)	9.30 / 8	9.80 / 7			
PV (cP) / YP (lhf2)	10 / 8.00	14 / 14.00			
% Solids / % Sand	4.20 / 0.25	11.20 / 0.20			
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A			
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Max Tool Temp (in F) / S	145.00 / PCM	127.00 / PCM			

Max Tool Temp (degF) / Source	145.90 / PCM	167.00 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 145.90	N/A @ 167.00			
Lead MWD Engineer	Robert Barnes	Robert Barnes			
Customer Representative	Jeremy Stolz	Jim Turner			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	11342274	11342274			
Insert Serial Number	11680766	11680766			
Date and Time Initialized	18-Mar-15 01:37	01-Jan-70 00:00			
Date and Time Read	20-Mar-15 20:14	01-Jan-70 00:00			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	55.00	54.00			
Software Version	6.21	6.21			
Sub Serial Number	11342274	11342274			
Sonde Serial Number	11478053	11478053			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	211.57	140.38			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	47.64	46.81			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11342274	11342274			
Insert/Sonde Serial Number	11293345	11293345			

## REMARKS

1. All depths are calibrated to driller's pipe tally and are true vertical depth from the Drill Floor.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" model for water based fluids and the "Brigham Plastic" model for oil and synthetic based fluids.
4. All data presented is recorded data unless otherwise specified.
5. The following smoothing parameters have been applied to the data:
  - 1:600 Log  
PGRC (Gamma CG) and ROPA (Average Rate of Penetration)  
Interval Resolution: 1.0 ft  
Interval Distance: 3.0 ft
  - 1:240 Log  
PGRC (Gamma CG):  
Interval Resolution: 0.5 ft  
Interval Distance: 0.6 ft
  - ROPA (Average Rate Of Penetration):  
Interval Resolution: 0.5 ft

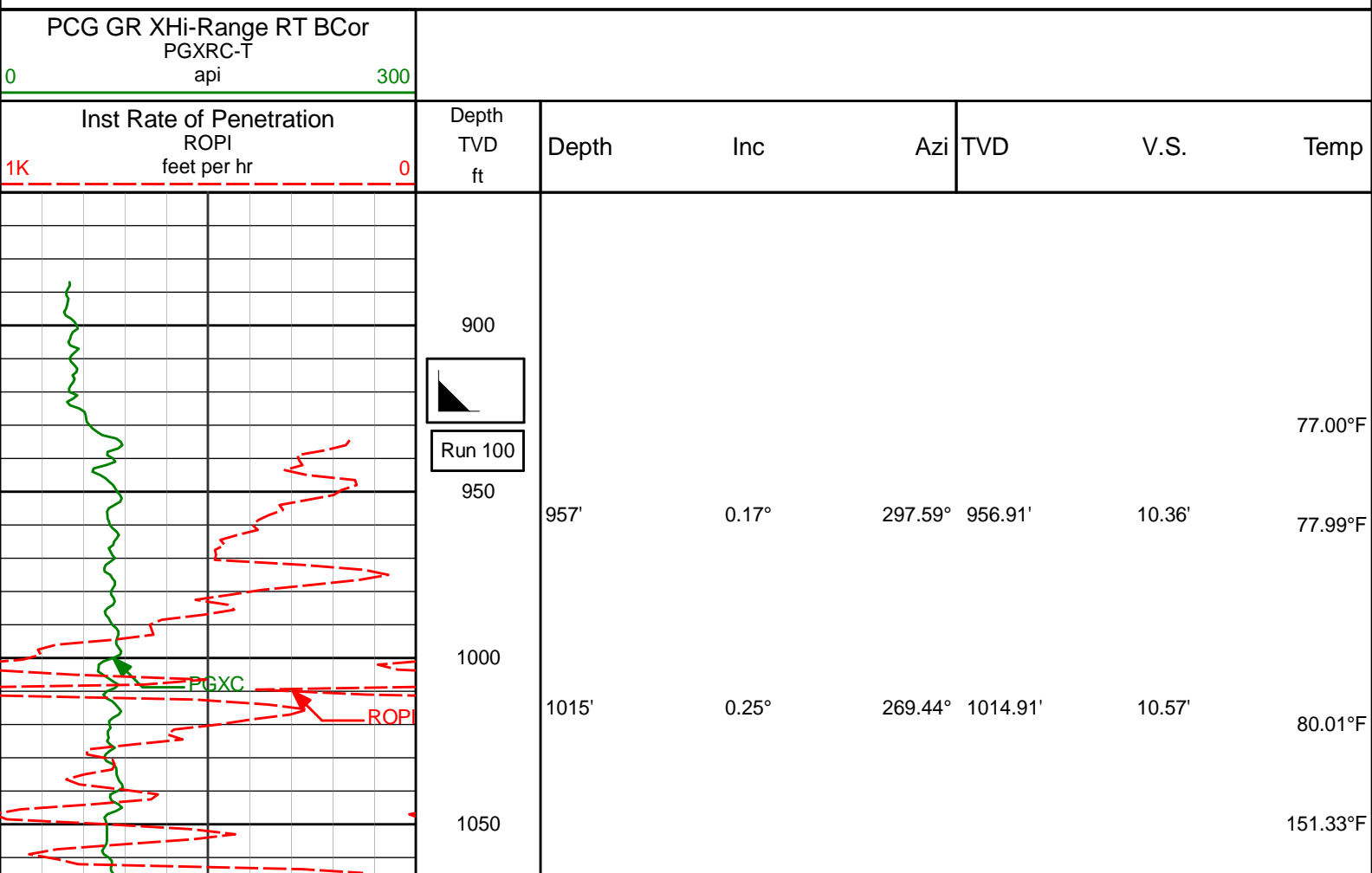
Interval Resolution: 0.5 ft  
Interval Distance: 1.2 ft

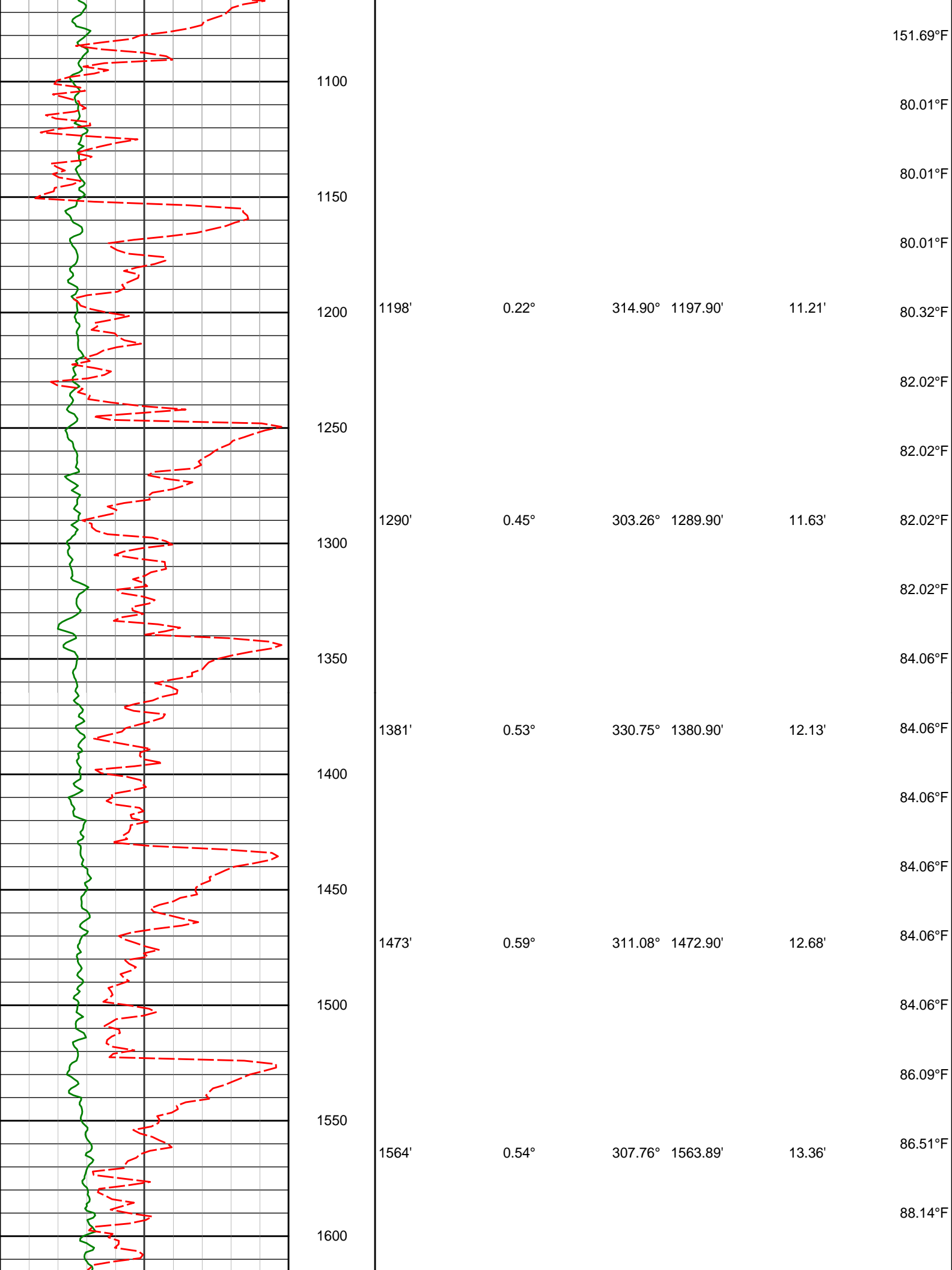
6. Insite Version V8.1.10

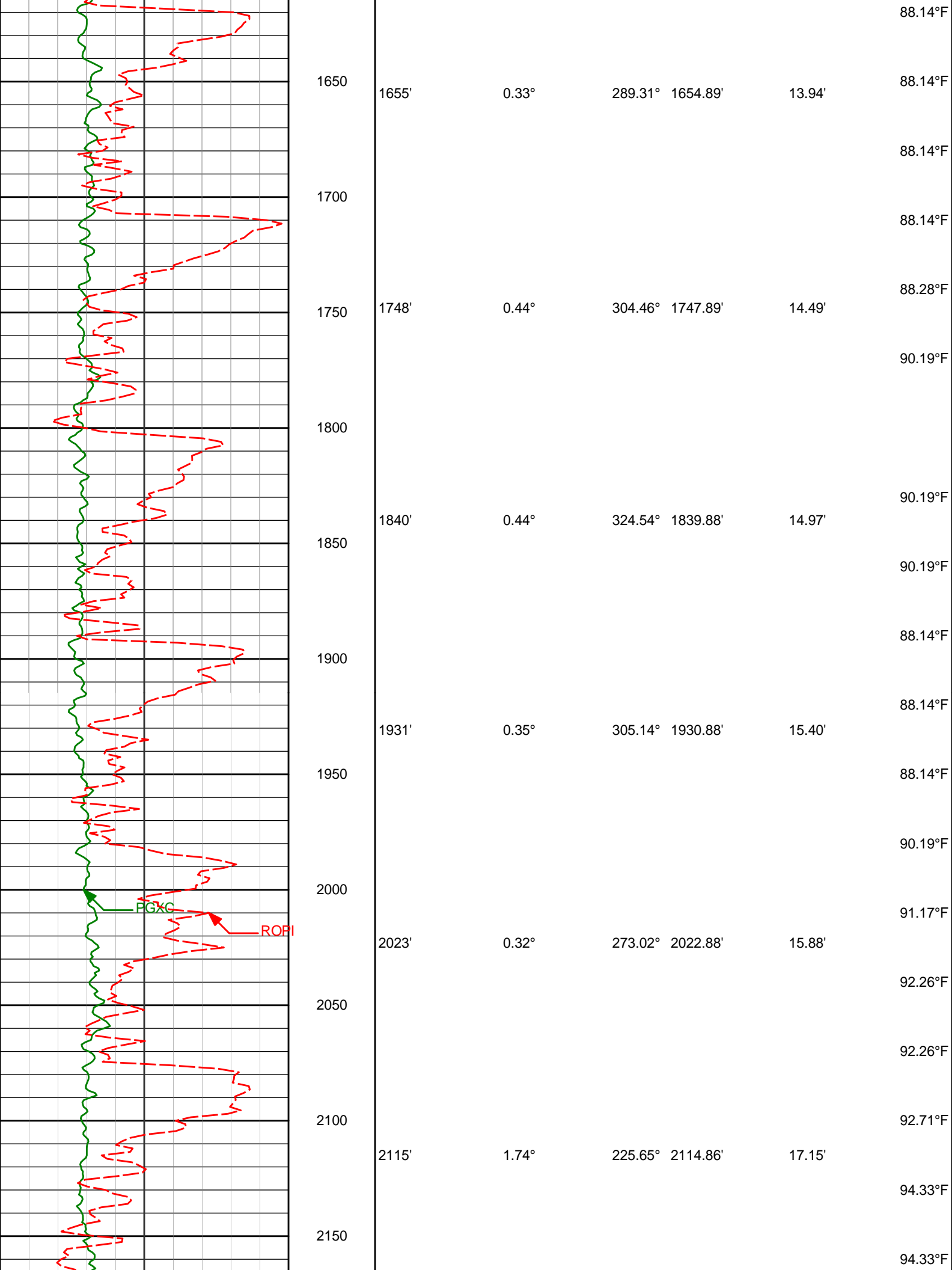
## WARRANTY

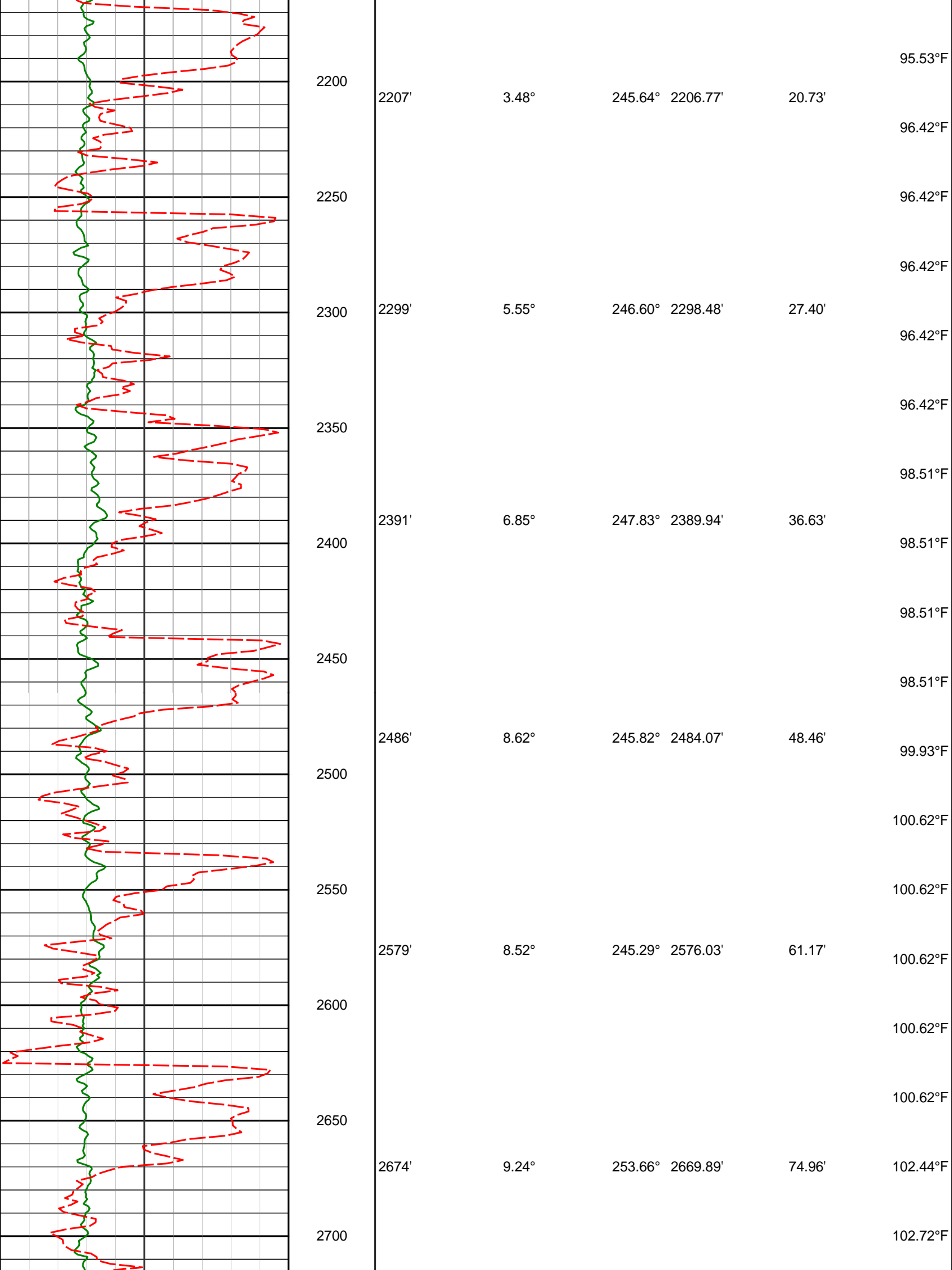
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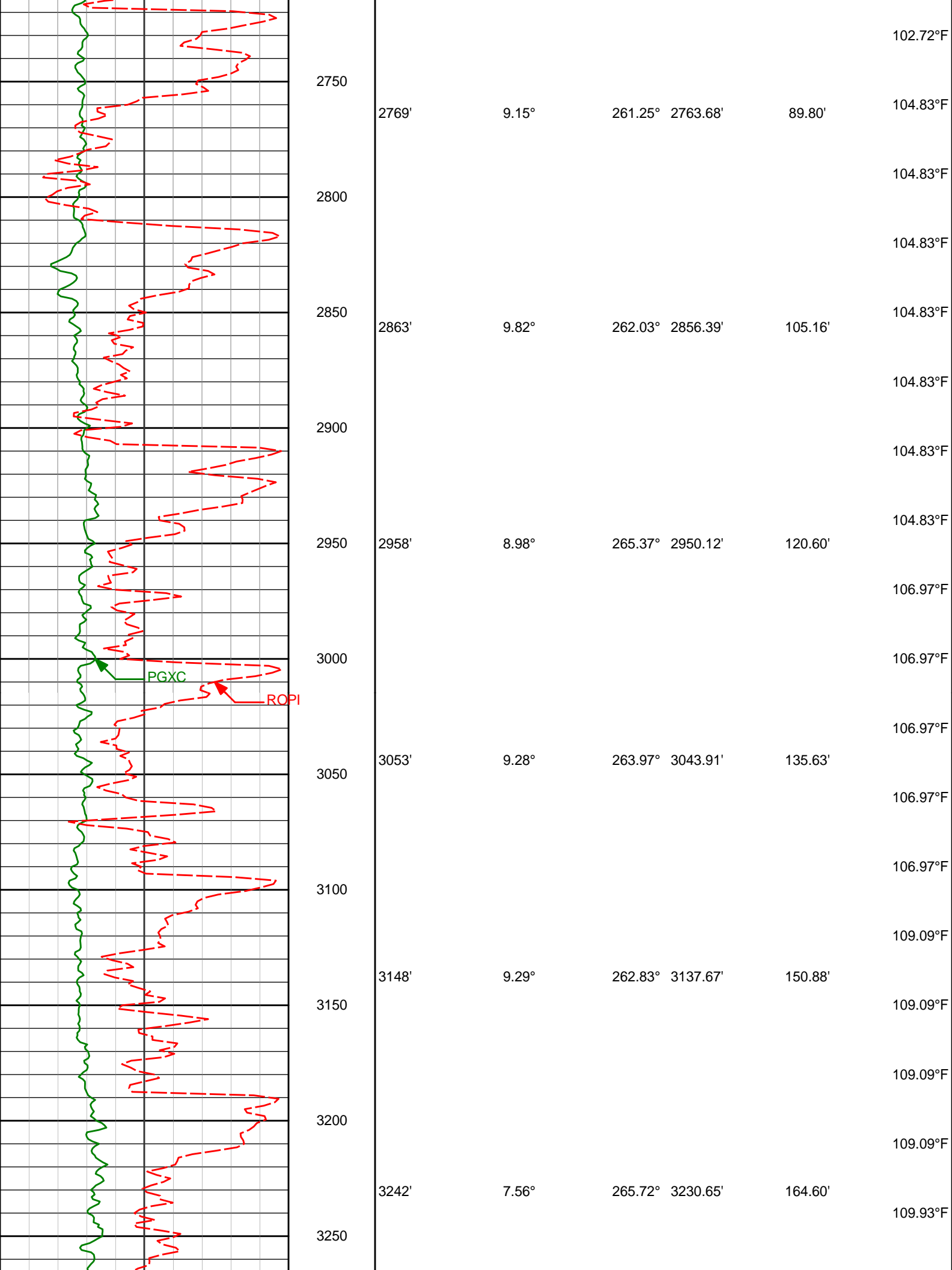
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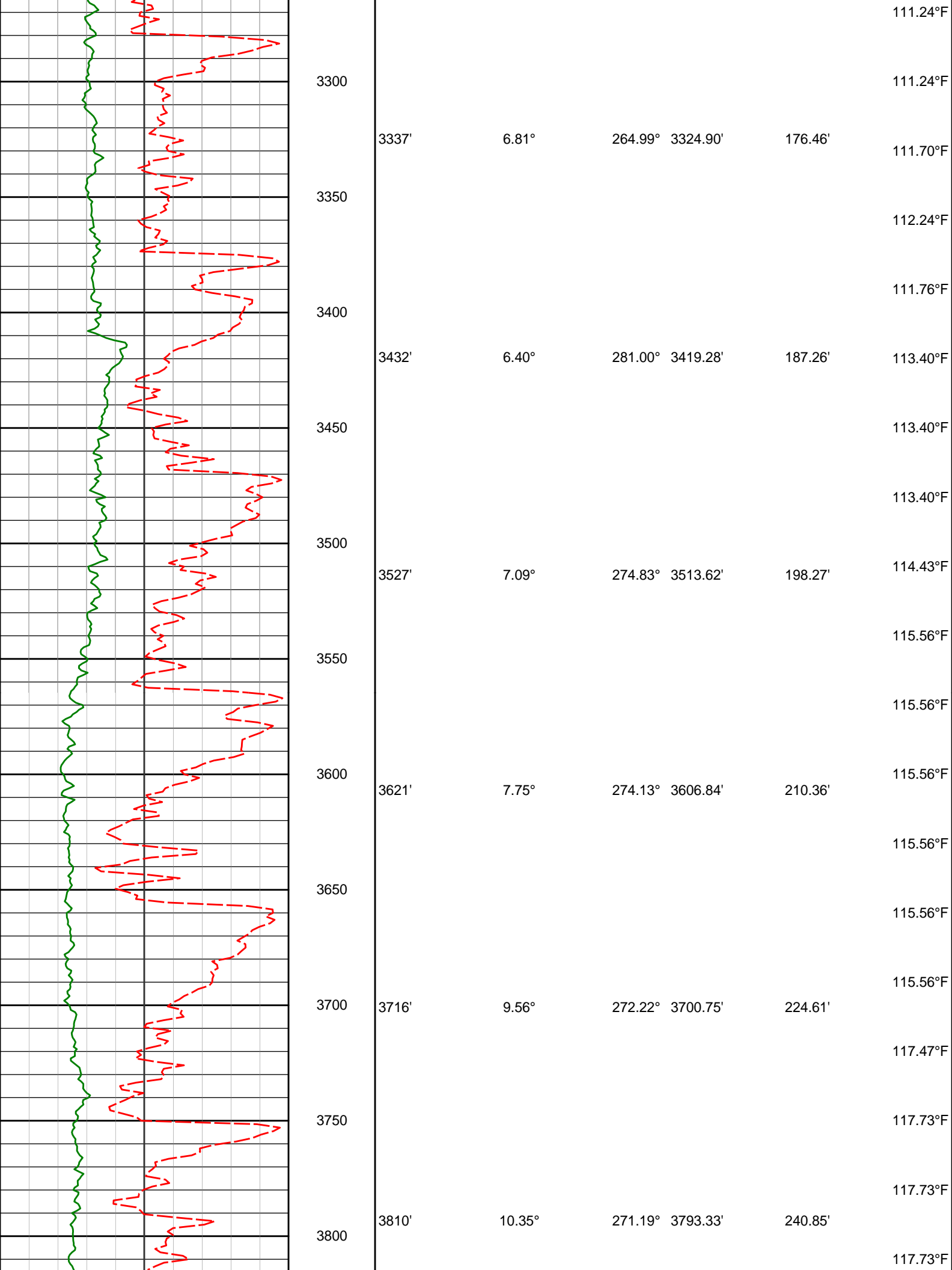




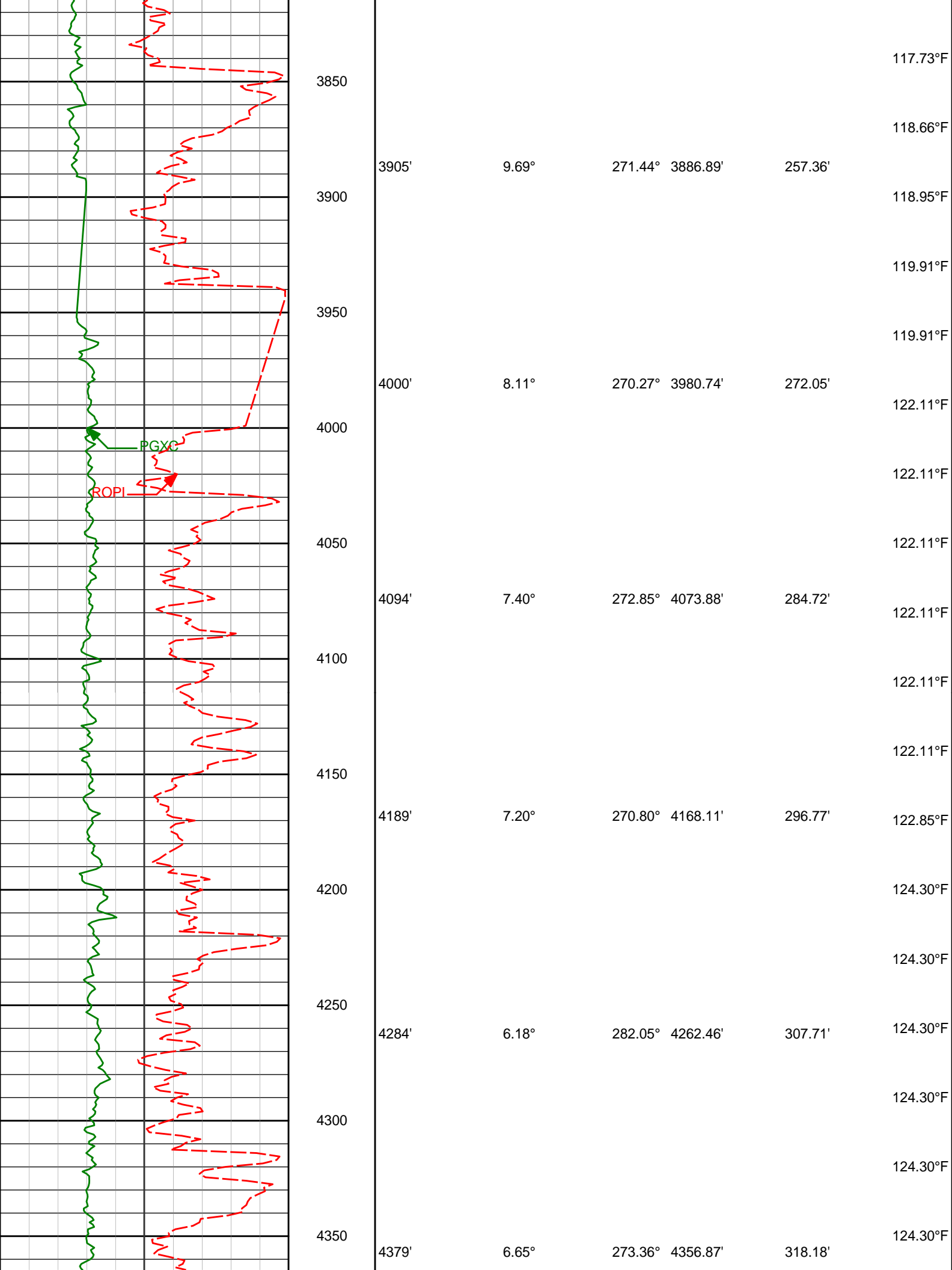


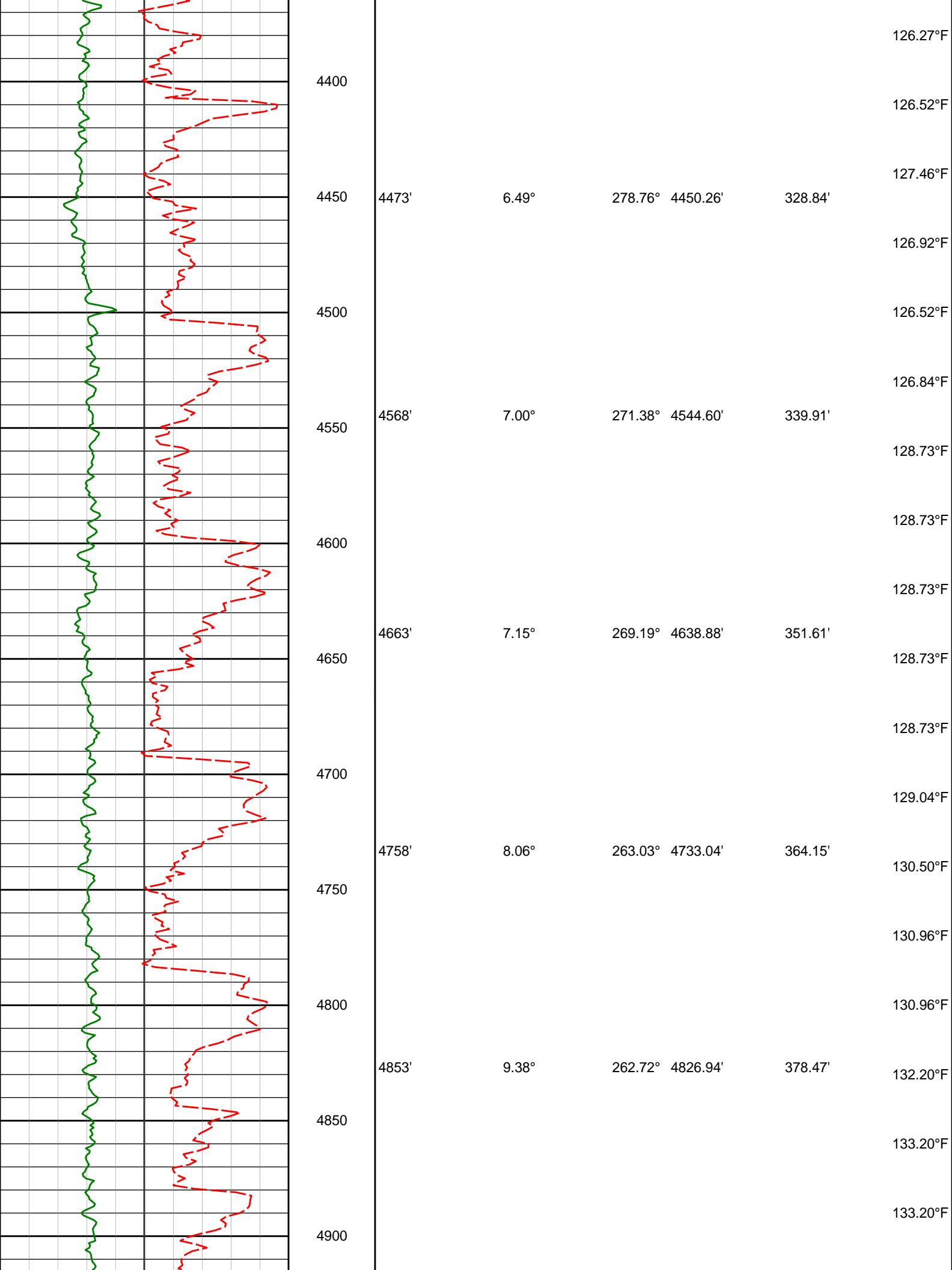


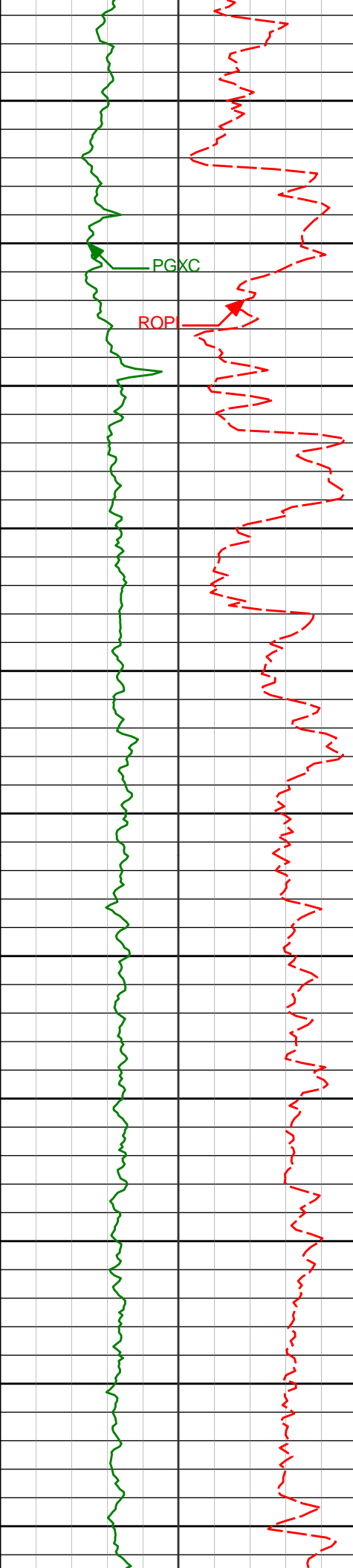




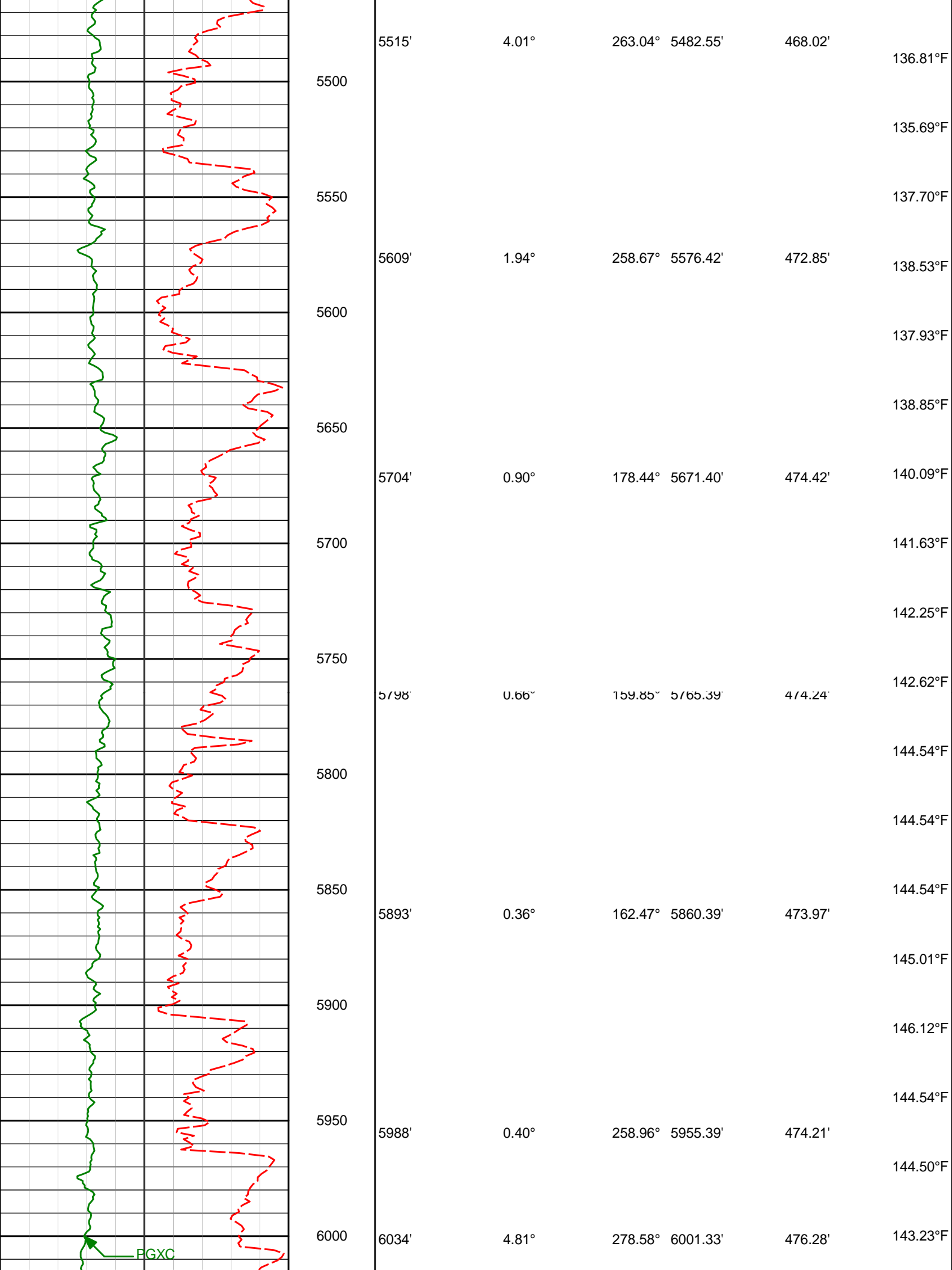


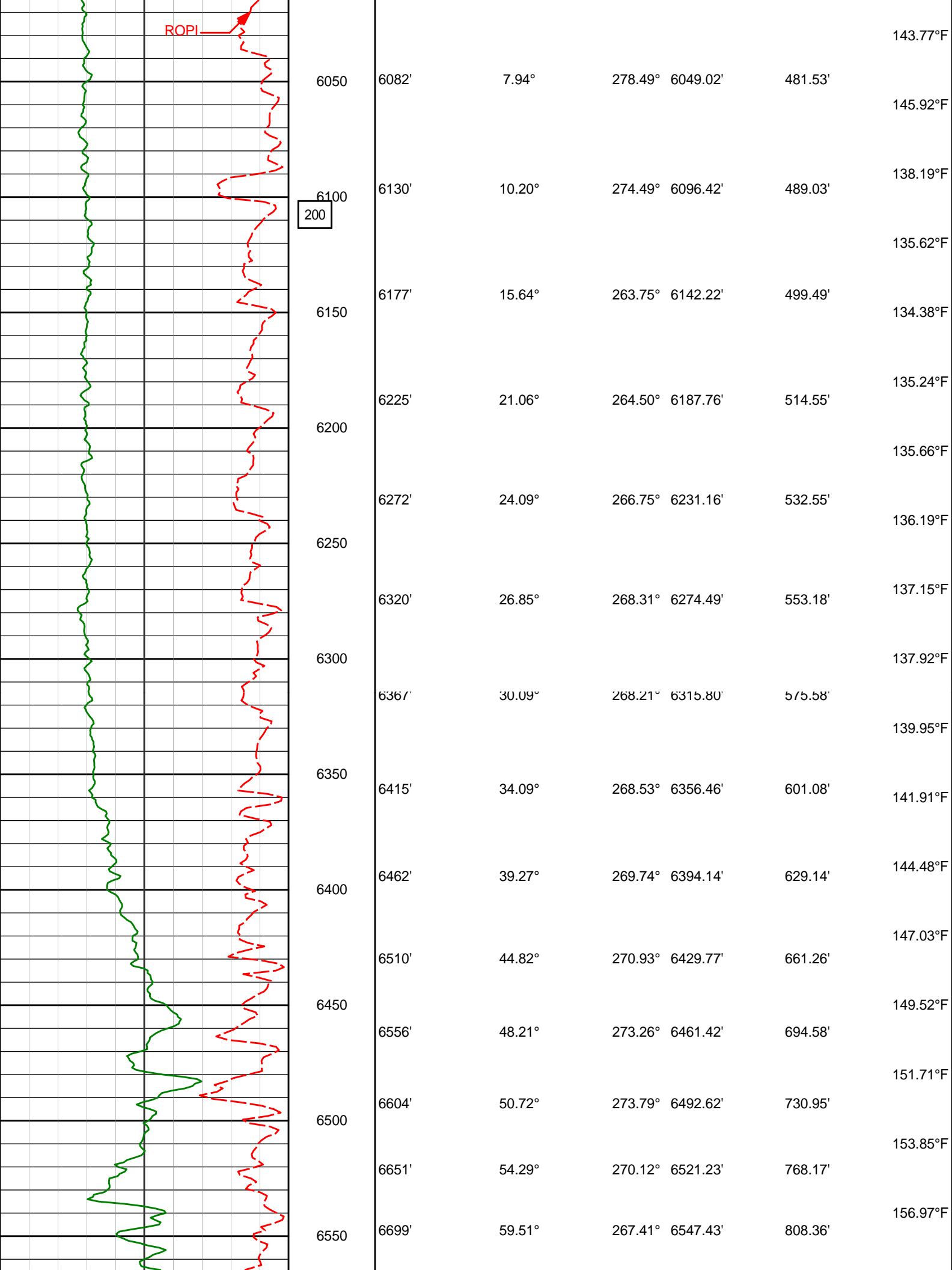


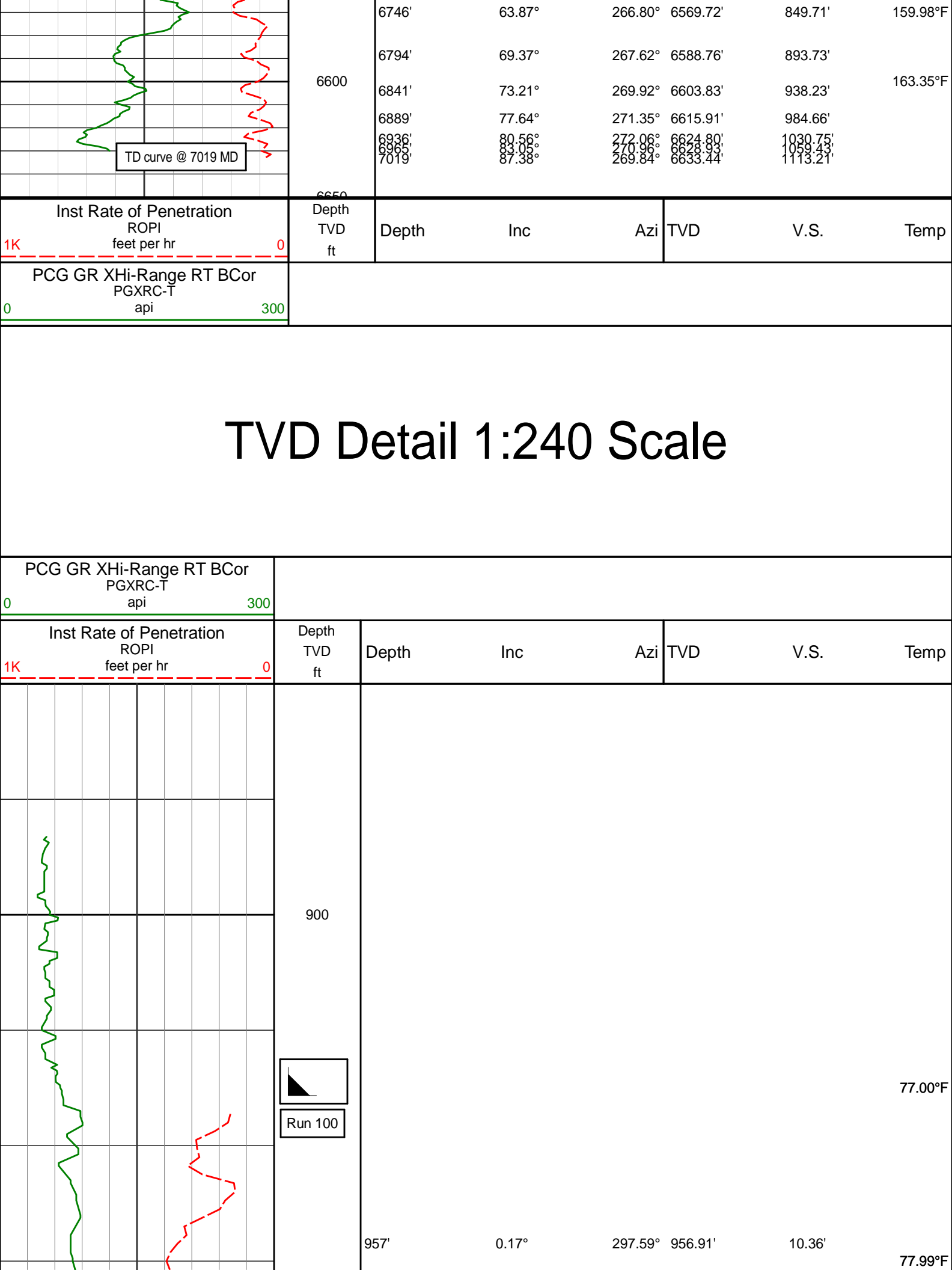


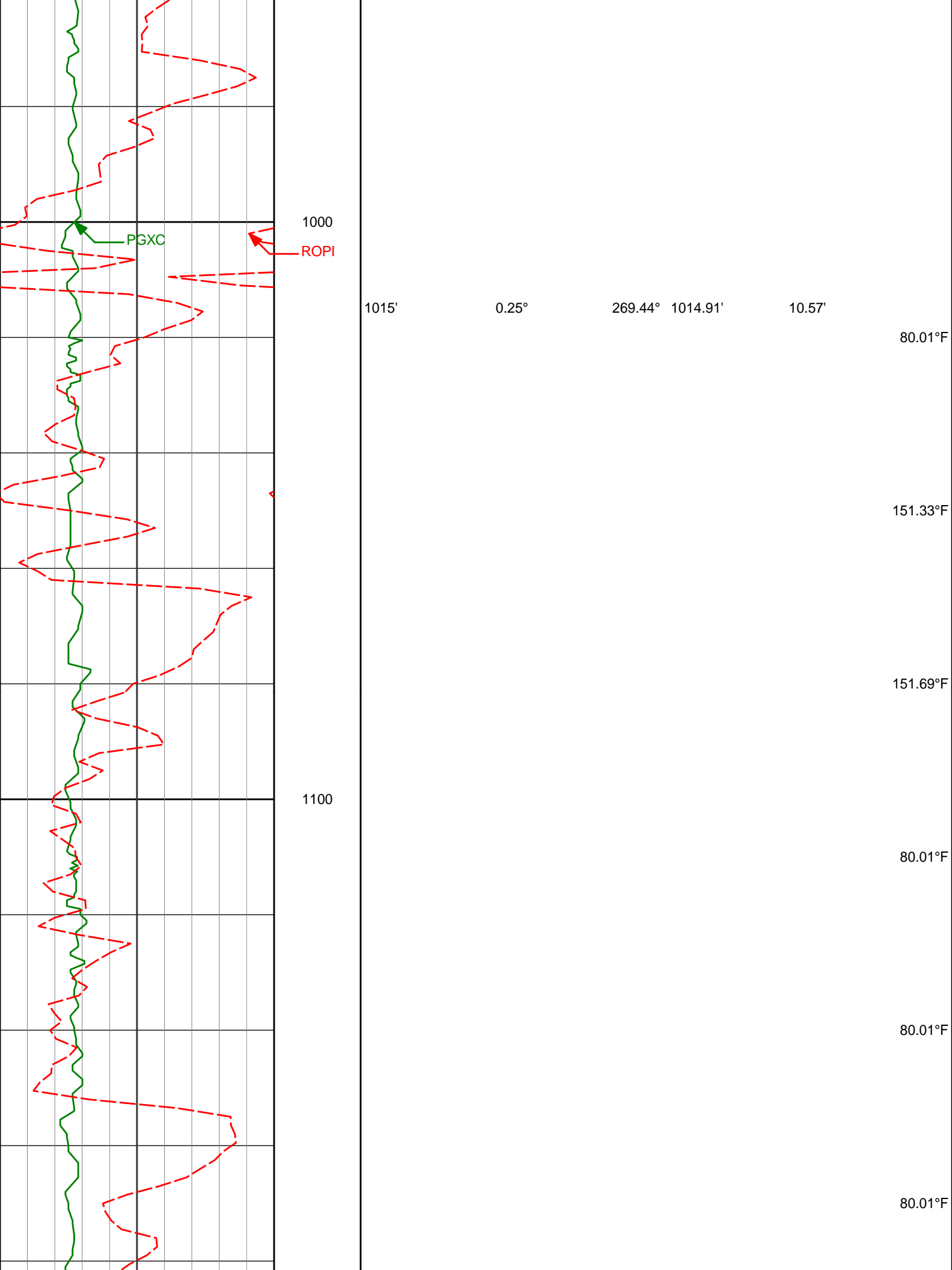


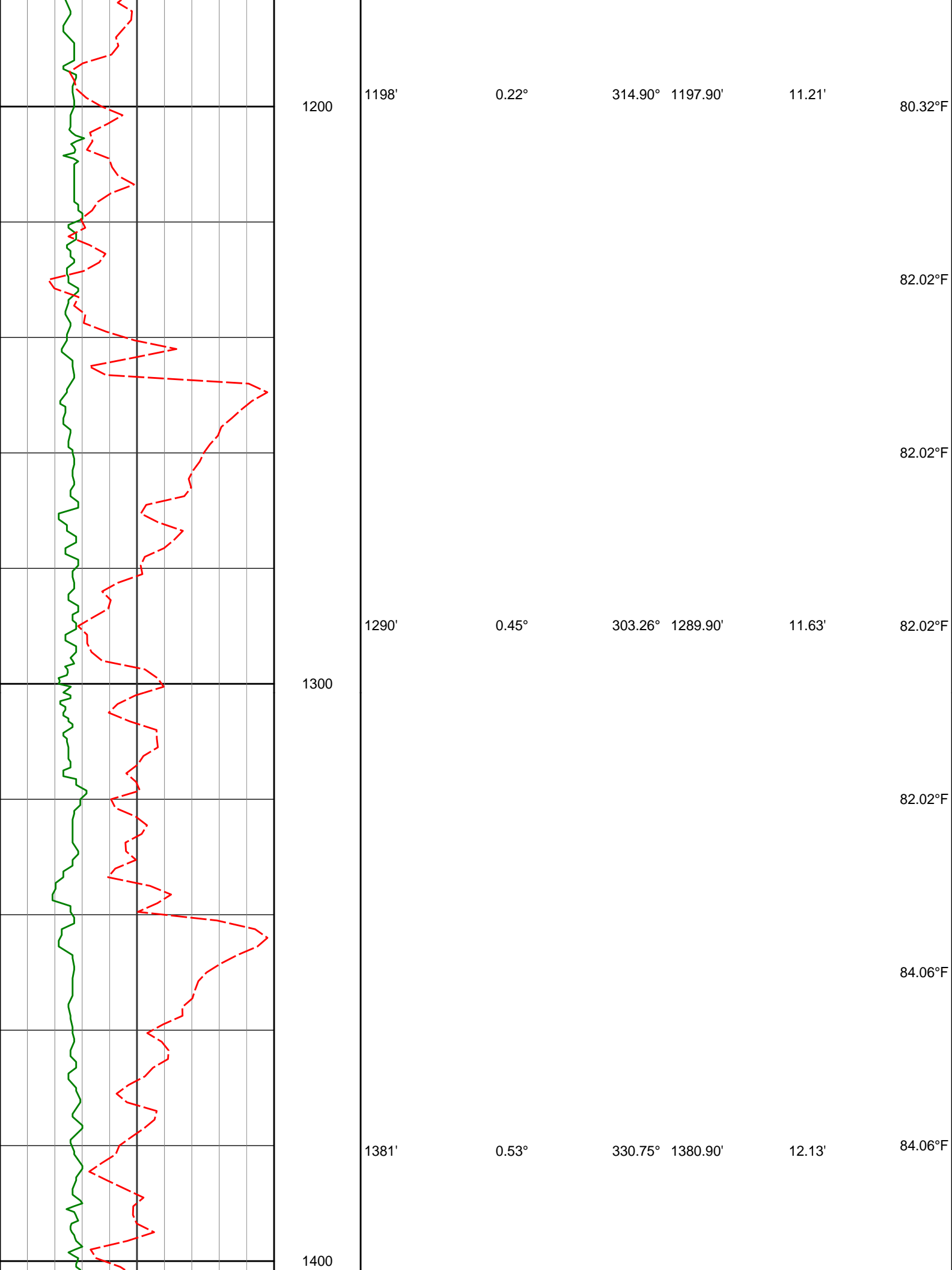
4947'	7.52°	272.28°	4919.92'	392.22'	133.20°F
4950					133.20°F
					133.20°F
5000					133.20°F
5042'	9.10°	268.06°	5013.92'	405.94'	133.20°F
					133.20°F
5050					133.58°F
					135.19°F
5100	8.86°	257.32°	5107.76'	420.62'	133.85°F
					133.85°F
5150					135.45°F
5200	8.77°	257.17°	5200.65'	434.72'	135.45°F
					135.45°F
5250					135.45°F
					135.45°F
5300	7.40°	257.06°	5294.71'	447.79'	136.43°F
					135.68°F
5350					136.91°F
5400	6.80°	258.43°	5387.99'	459.18'	136.00°F
					134.14°F
5450					135.45°F



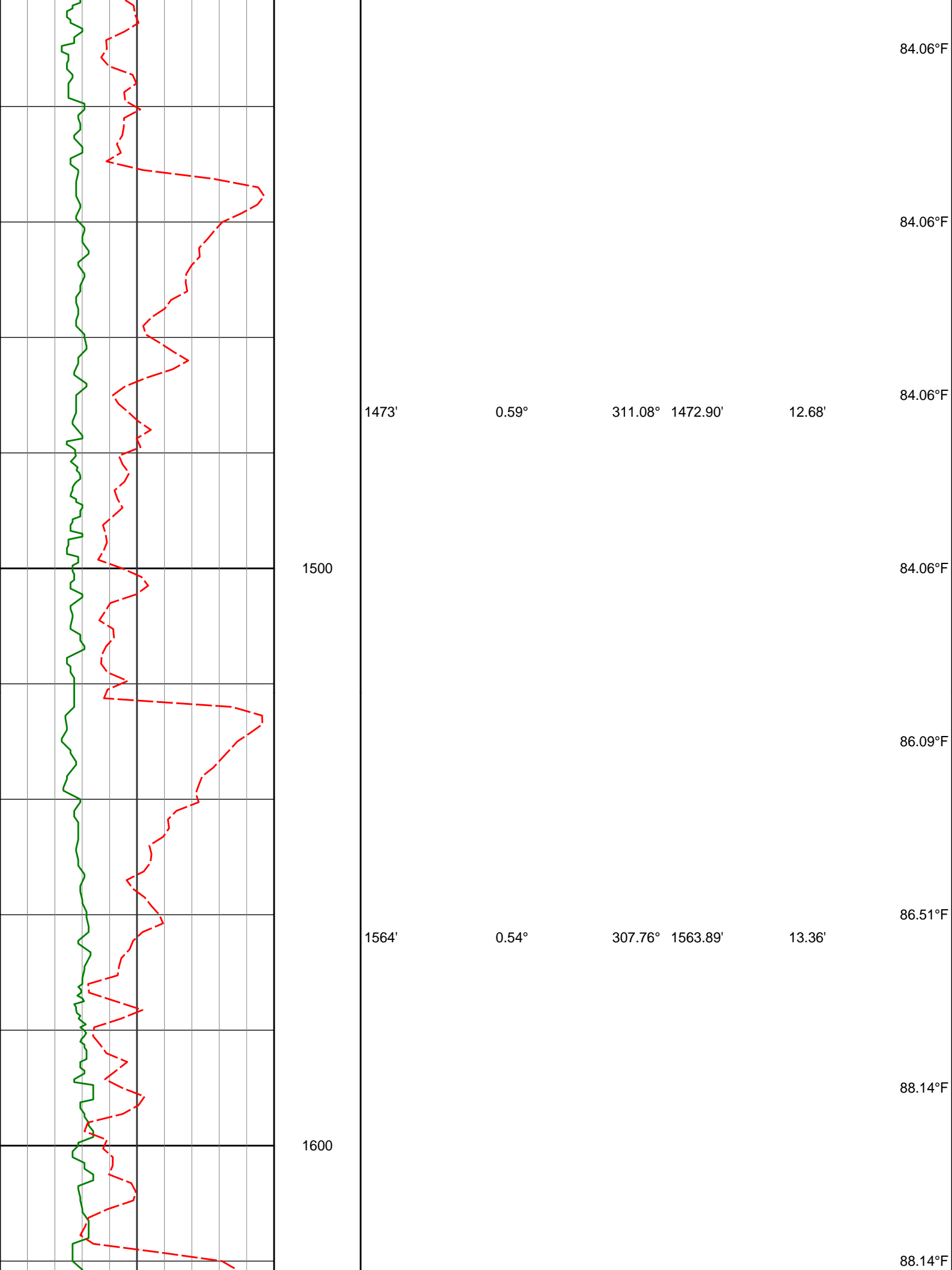


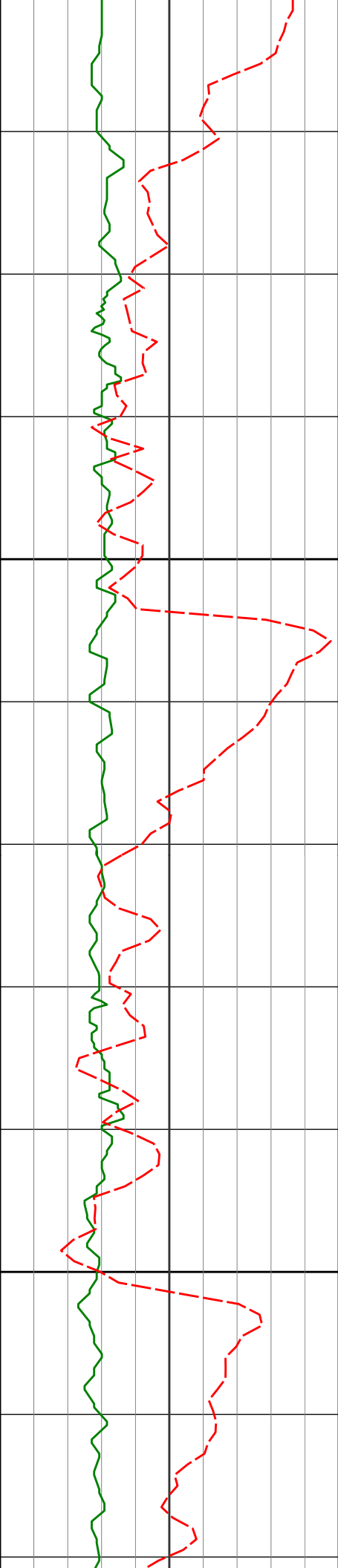












1700

1800

1655'

1748'

1840'

0.33°

0.44°

0.44°

289.31° 1654.89'

304.46° 1747.89'

324.54° 1839.88'

13.94'

14.49'

14.97'

88.14°F

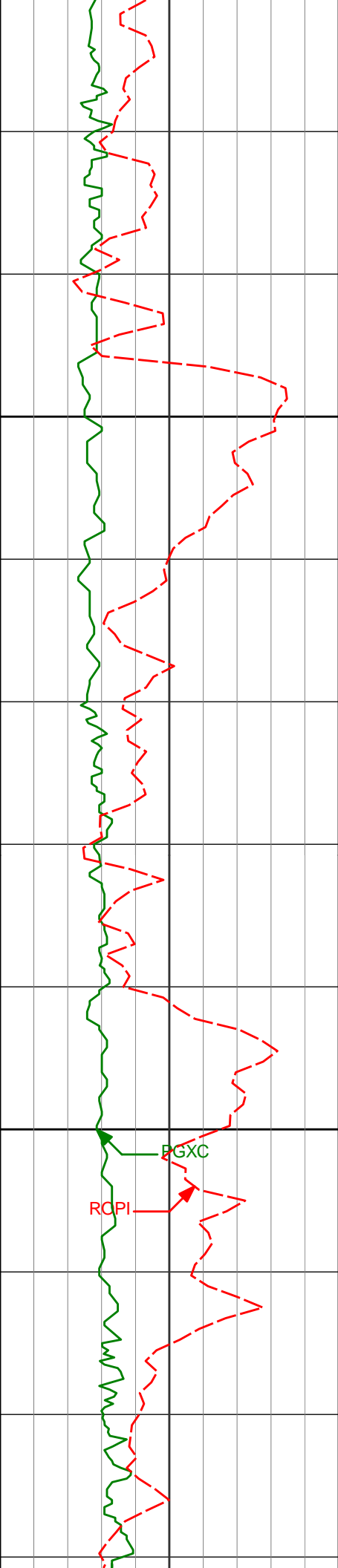
88.14°F

88.14°F

88.28°F

90.19°F

90.19°F



1900

1931'

0.35°

305.14°

1930.88'

15.40'

2000

2023'

0.32°

273.02°

2022.88'

15.88'

90.19°F

88.14°F

88.14°F

88.14°F

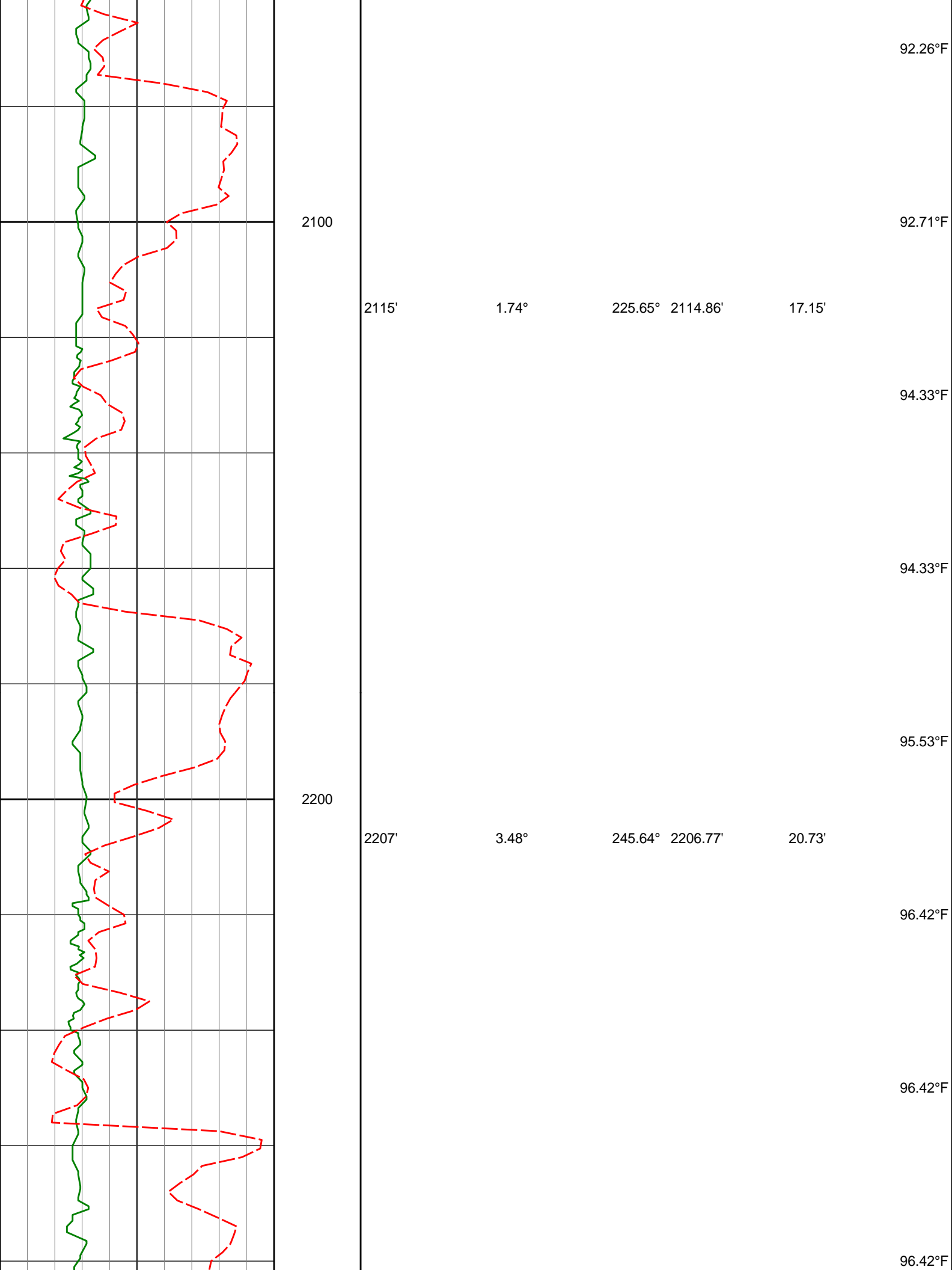
90.19°F

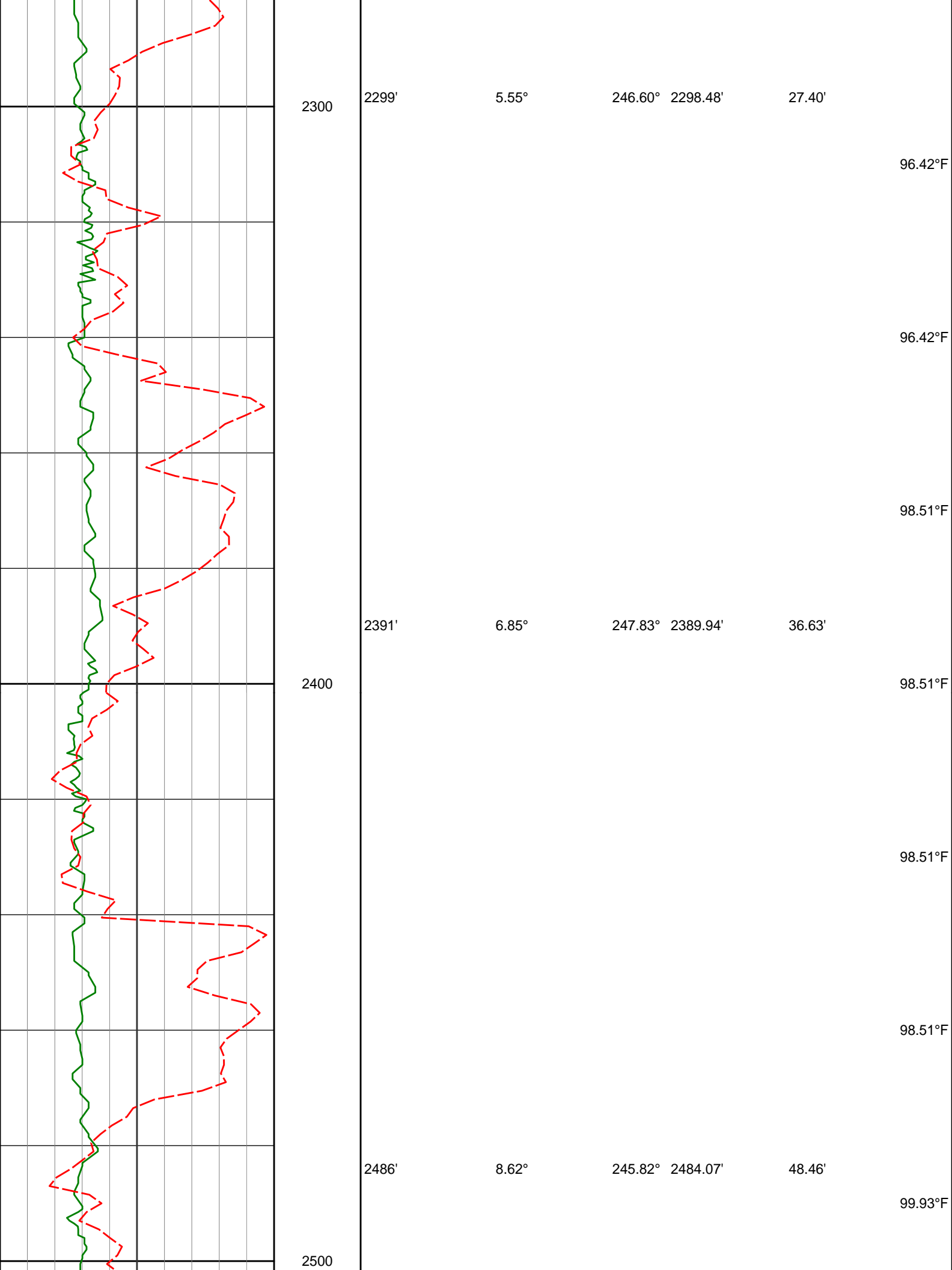
91.17°F

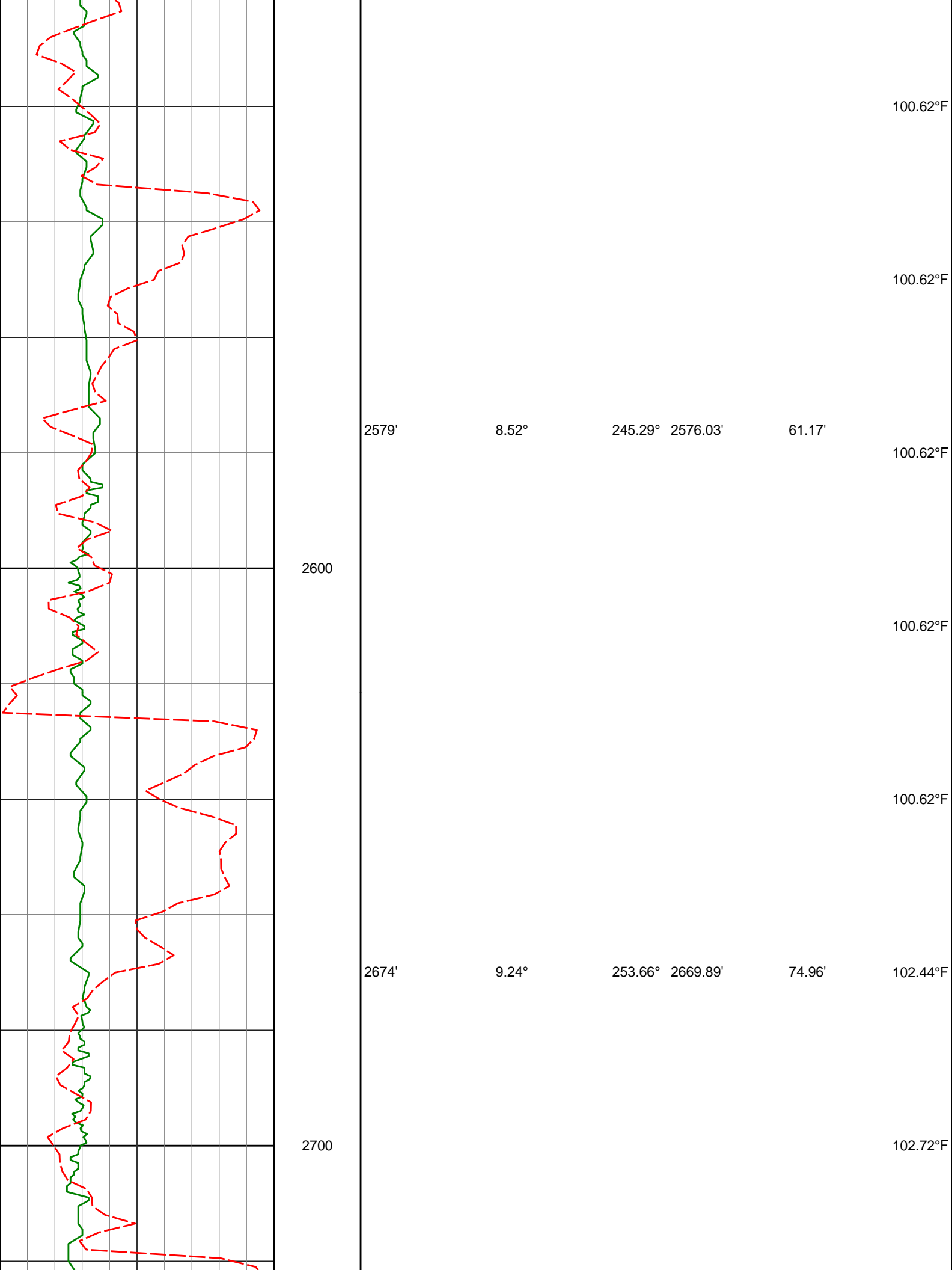
92.26°F

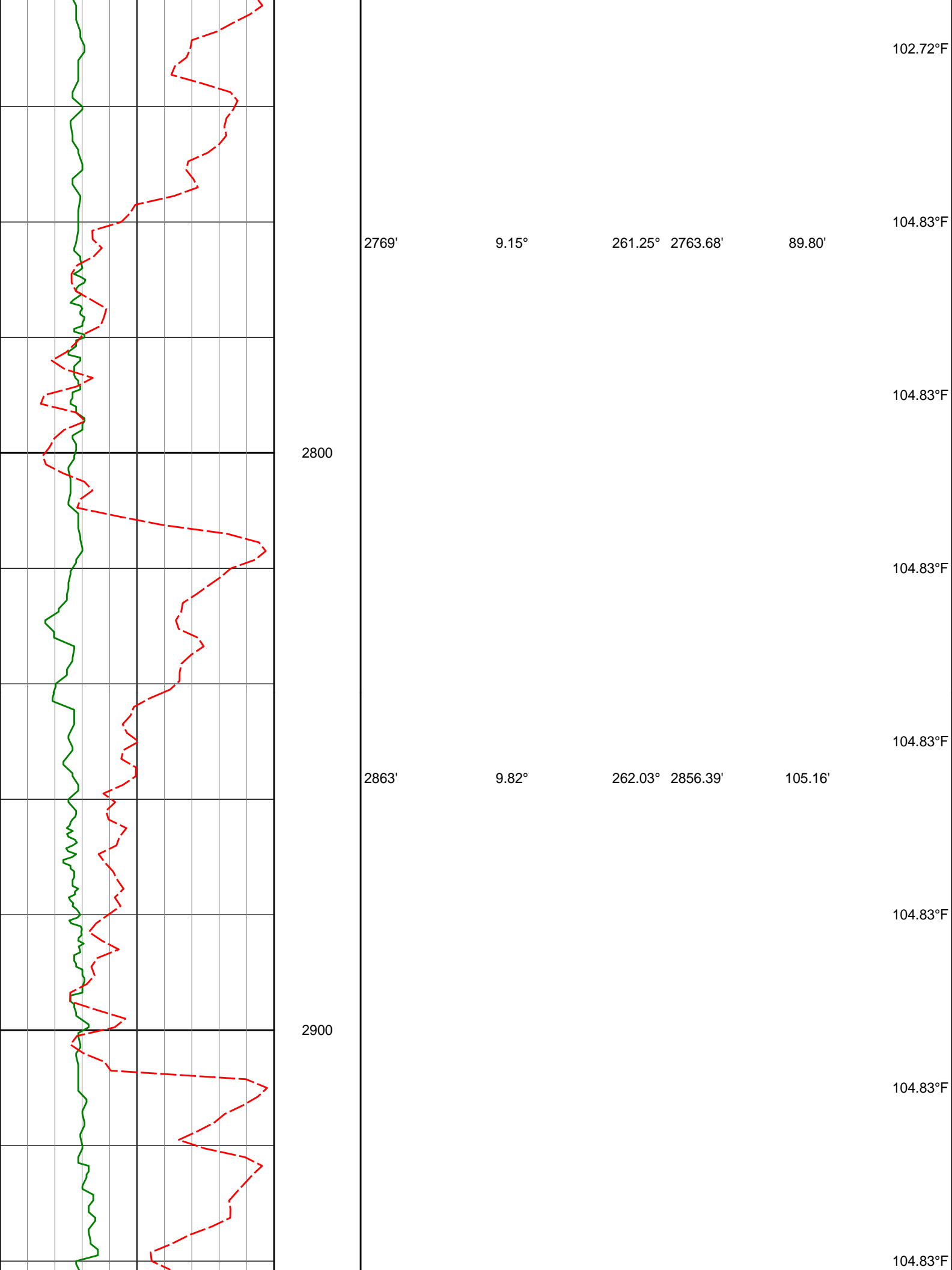
PGXC

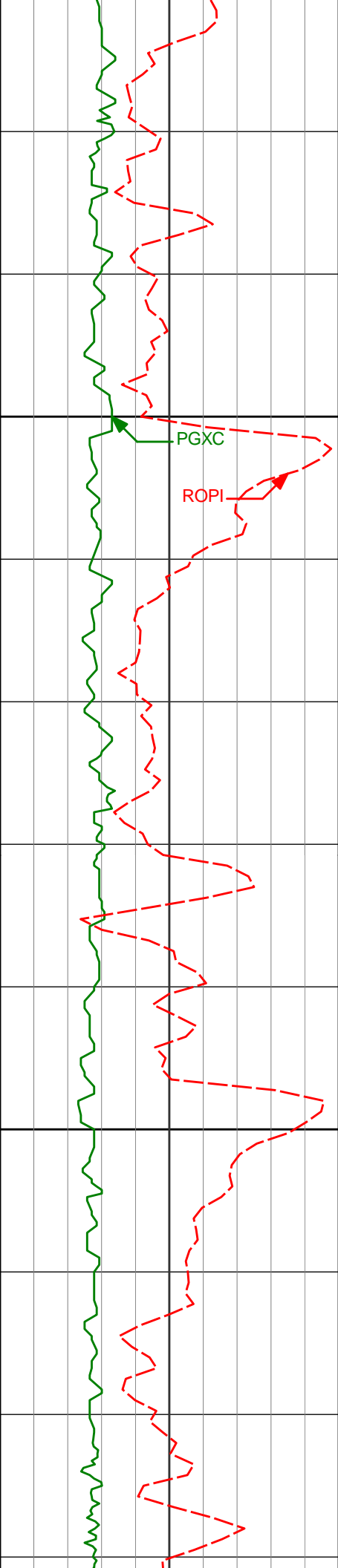
RCPI











3000

3100

2958'

8.98°

265.37° 2950.12'

120.60'

106.97°F

106.97°F

106.97°F

3053'

9.28°

263.97° 3043.91'

135.63'

106.97°F

106.97°F

3148'

9.29°

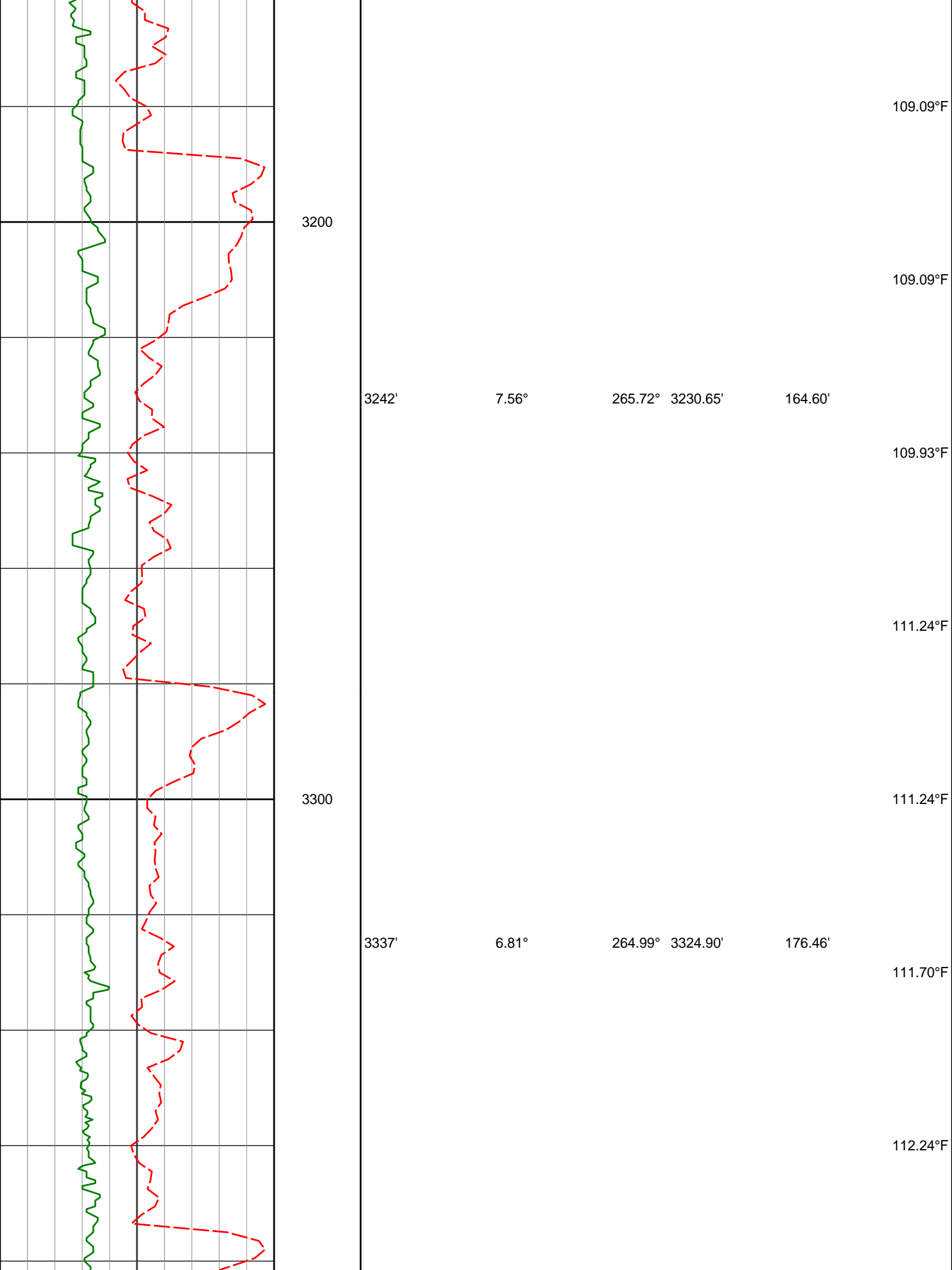
262.83° 3137.67'

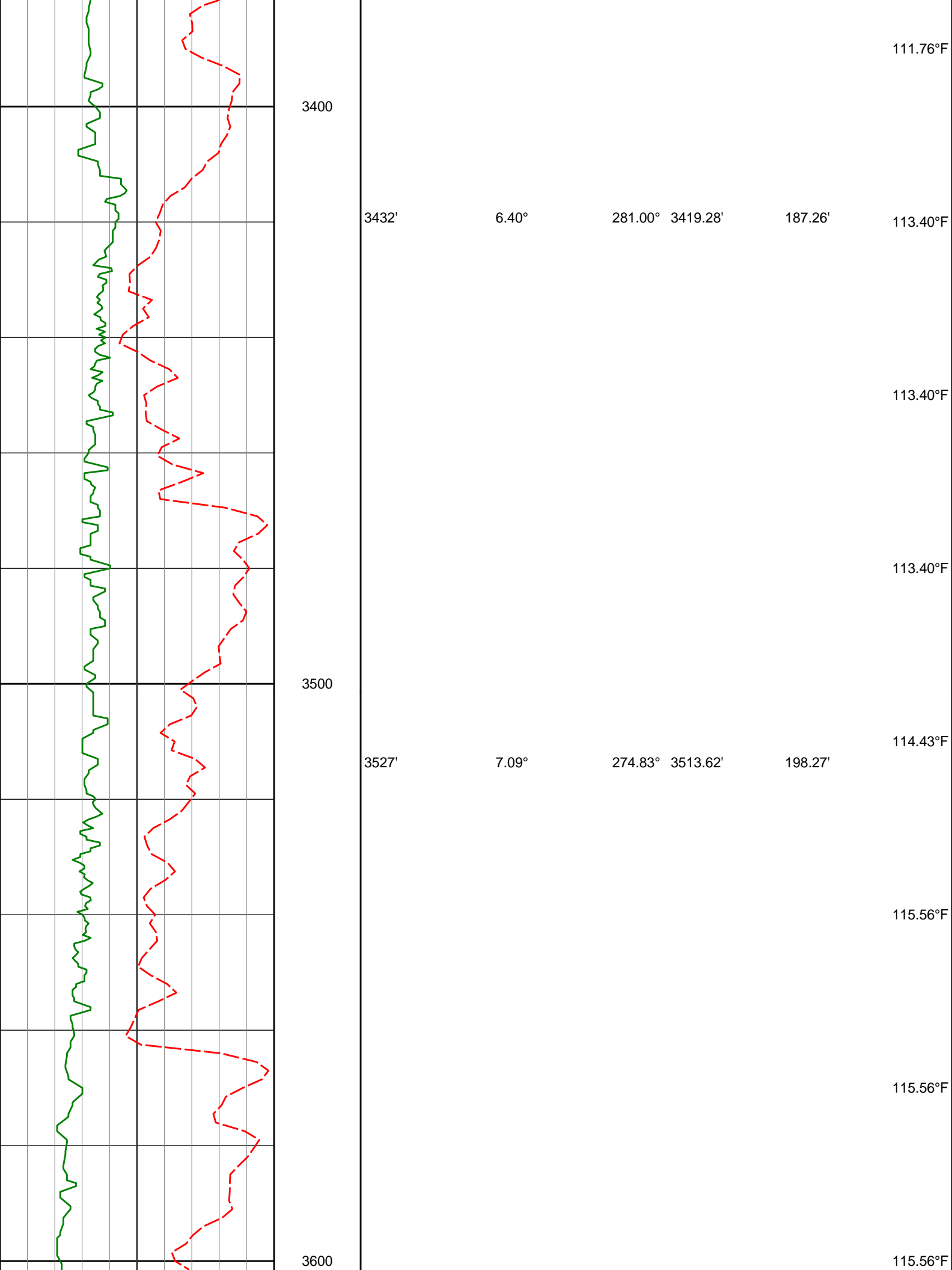
150.88'

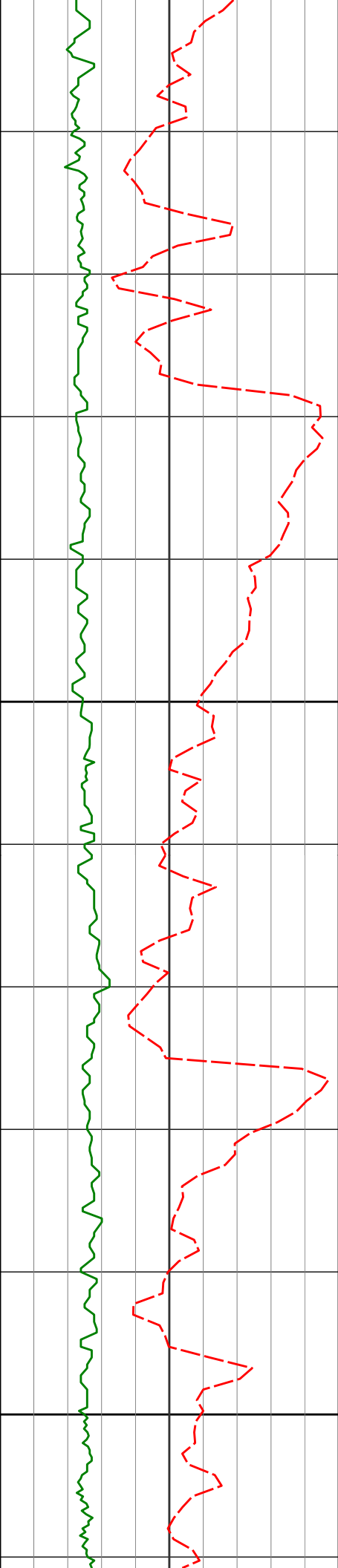
109.09°F

109.09°F

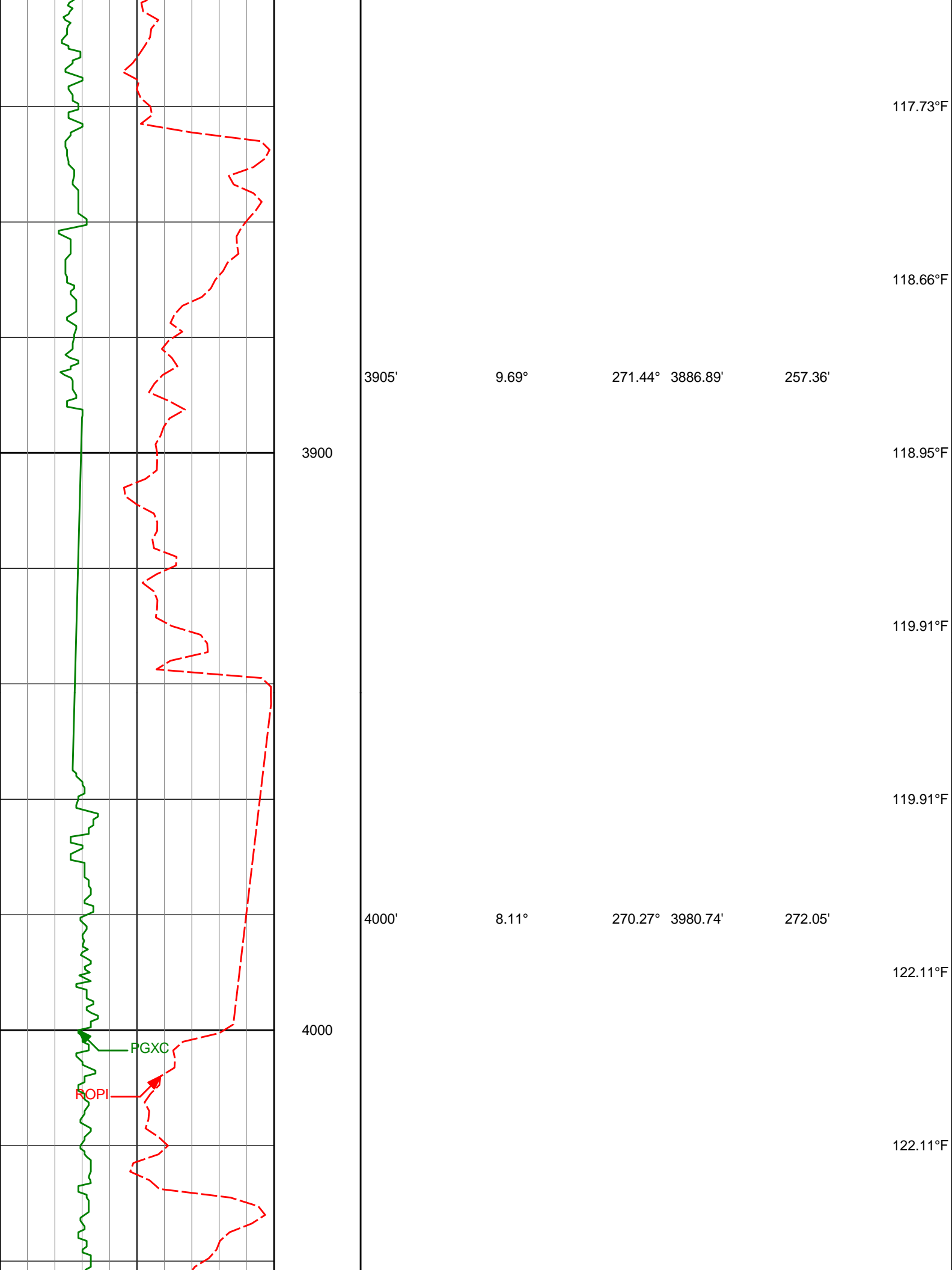


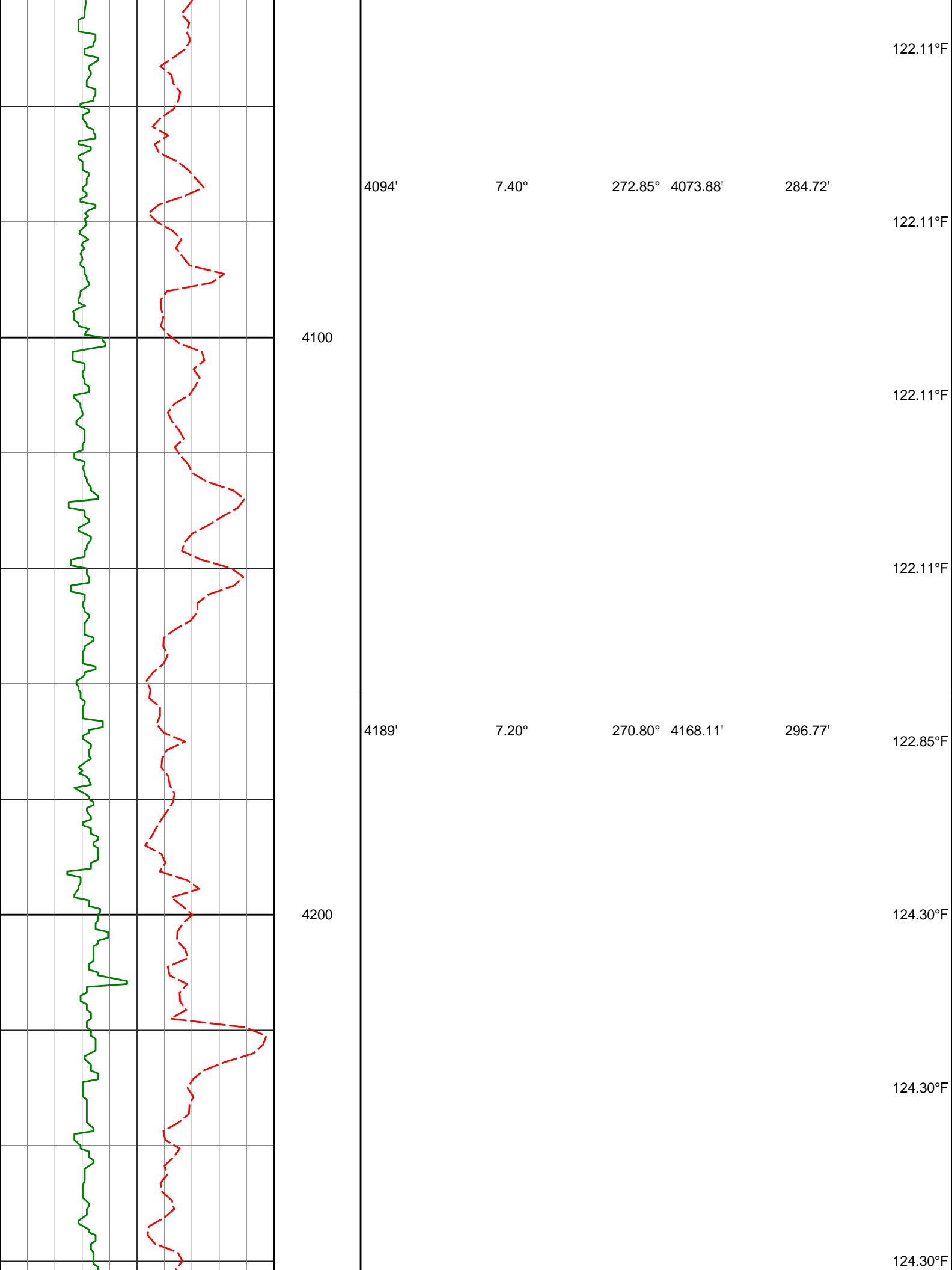


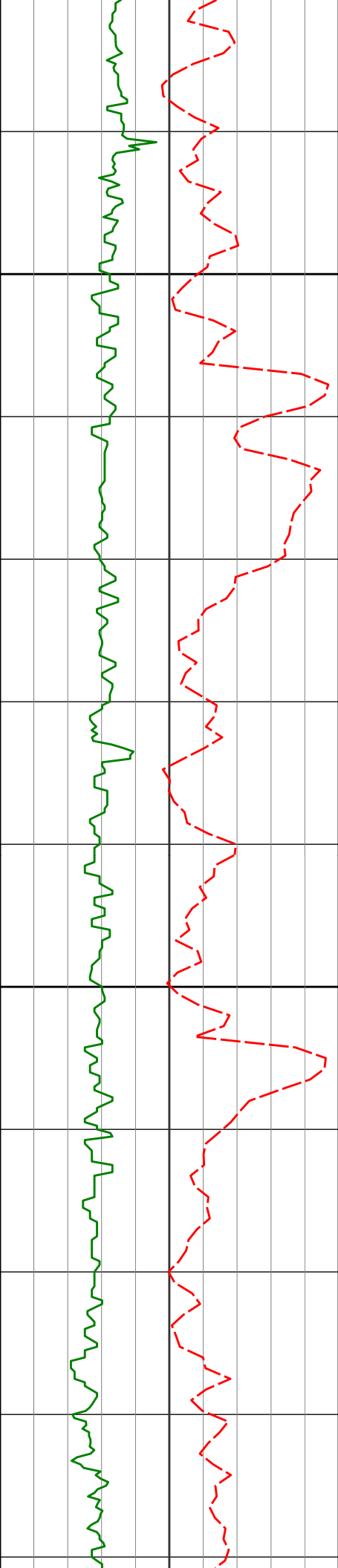




	3621'	7.75°	274.13°	3606.84'	210.36'	
						115.56°F
						115.56°F
						115.56°F
3700	3716'	9.56°	272.22°	3700.75'	224.61'	
						117.47°F
						117.73°F
						117.73°F
						117.73°F
3800	3810'	10.35°	271.19°	3793.33'	240.85'	
						117.73°F







4300

4400

4284'

4379'

4473'

6.18°

6.65°

6.49°

282.05°

273.36°

278.76°

4262.46'

4356.87'

4450.26'

307.71'

318.18'

328.84'

124.30°F

124.30°F

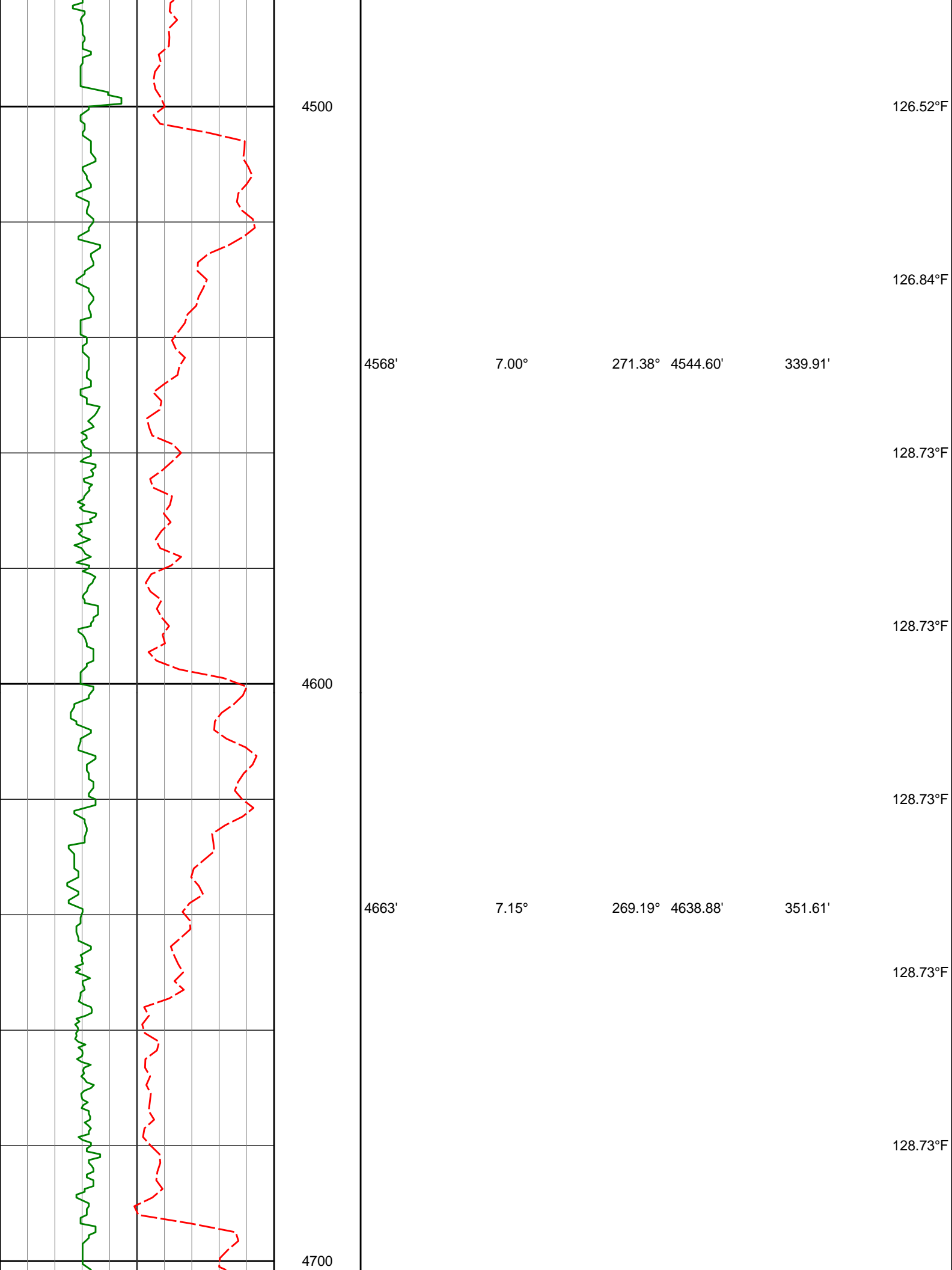
124.30°F

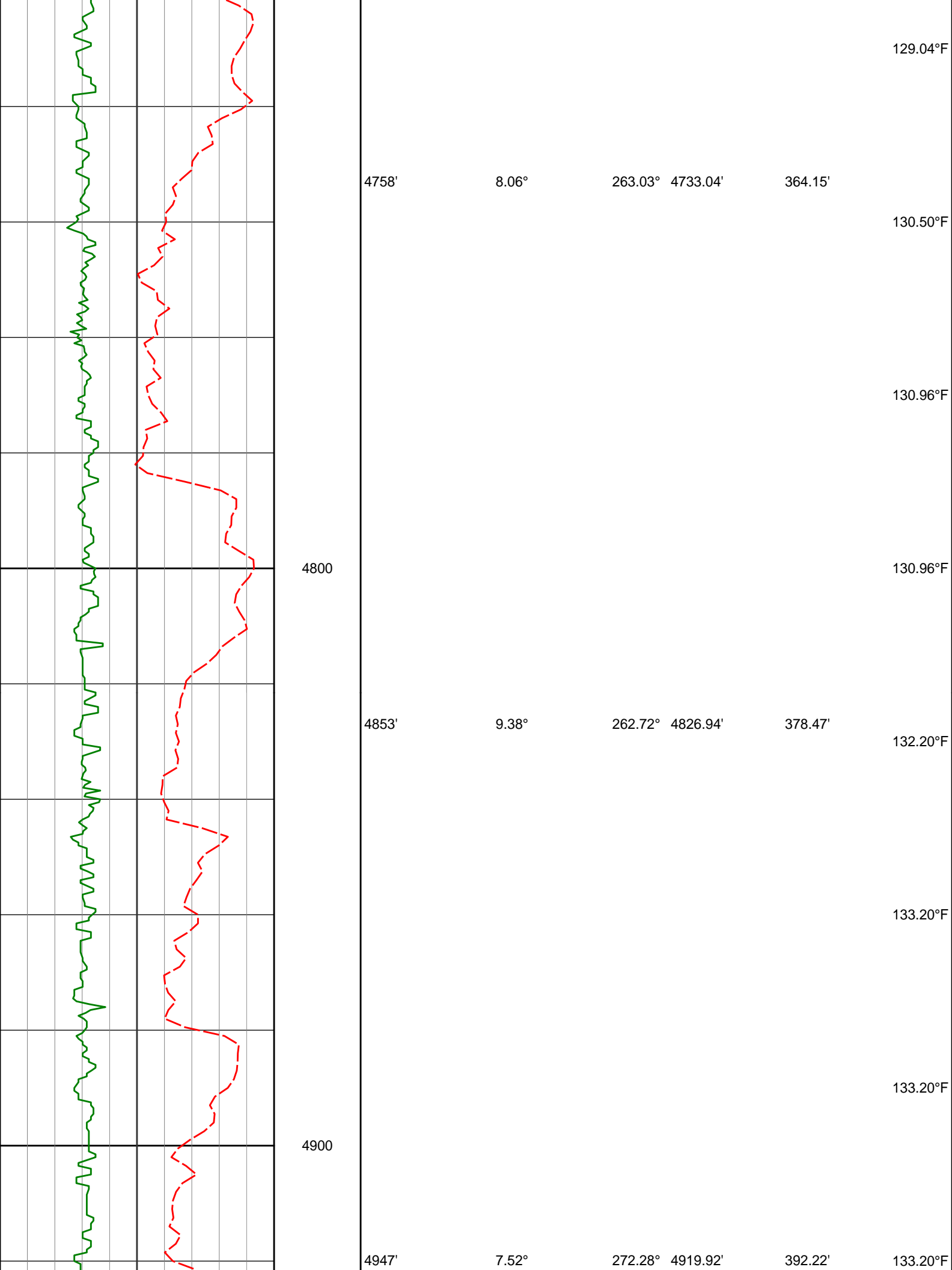
126.27°F

126.52°F

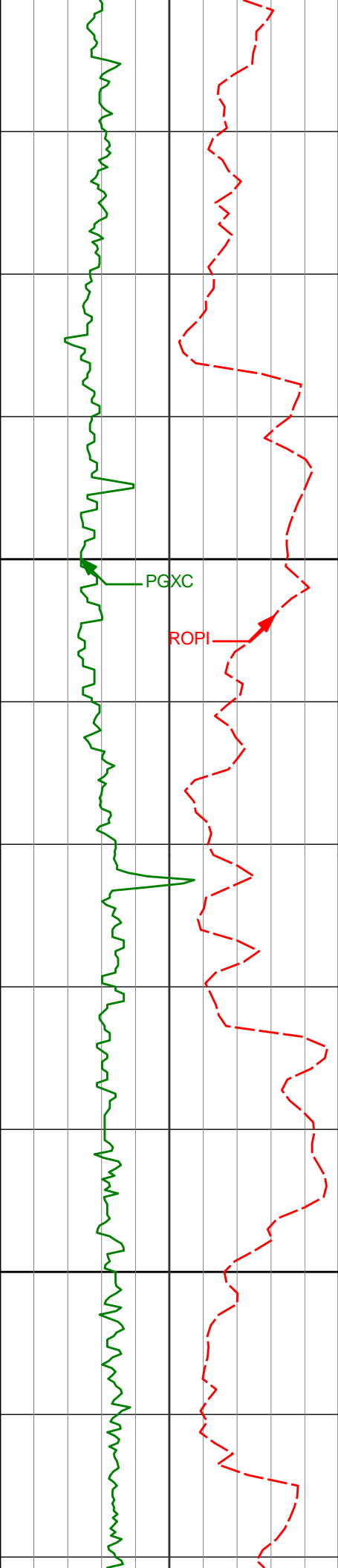
127.46°F

126.92°F









5000

5042'

9.10°

268.06°

5013.92'

405.94'

133.20°F

133.20°F

133.20°F

133.20°F

133.58°F

5100

5137'

8.86°

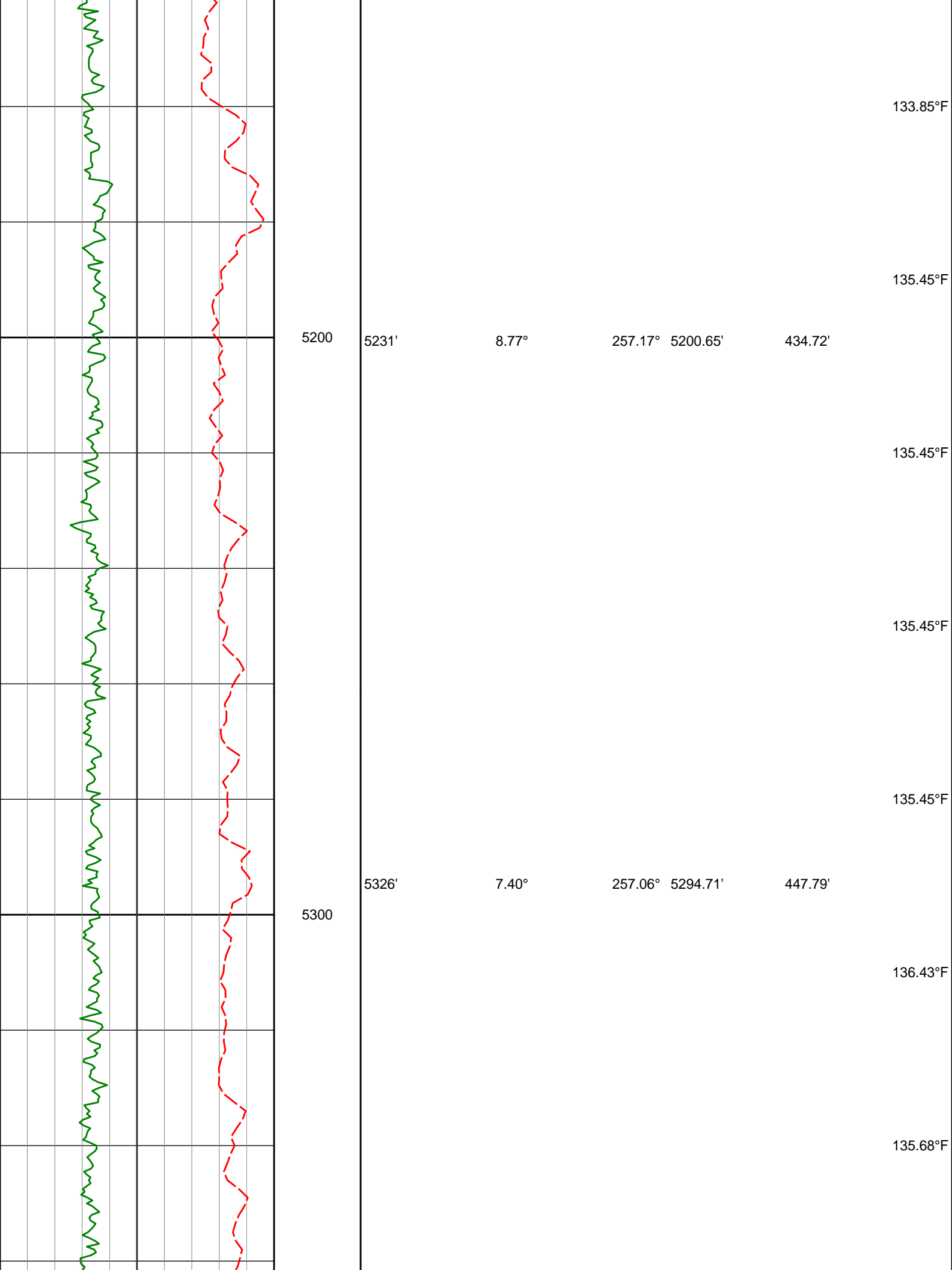
257.32°

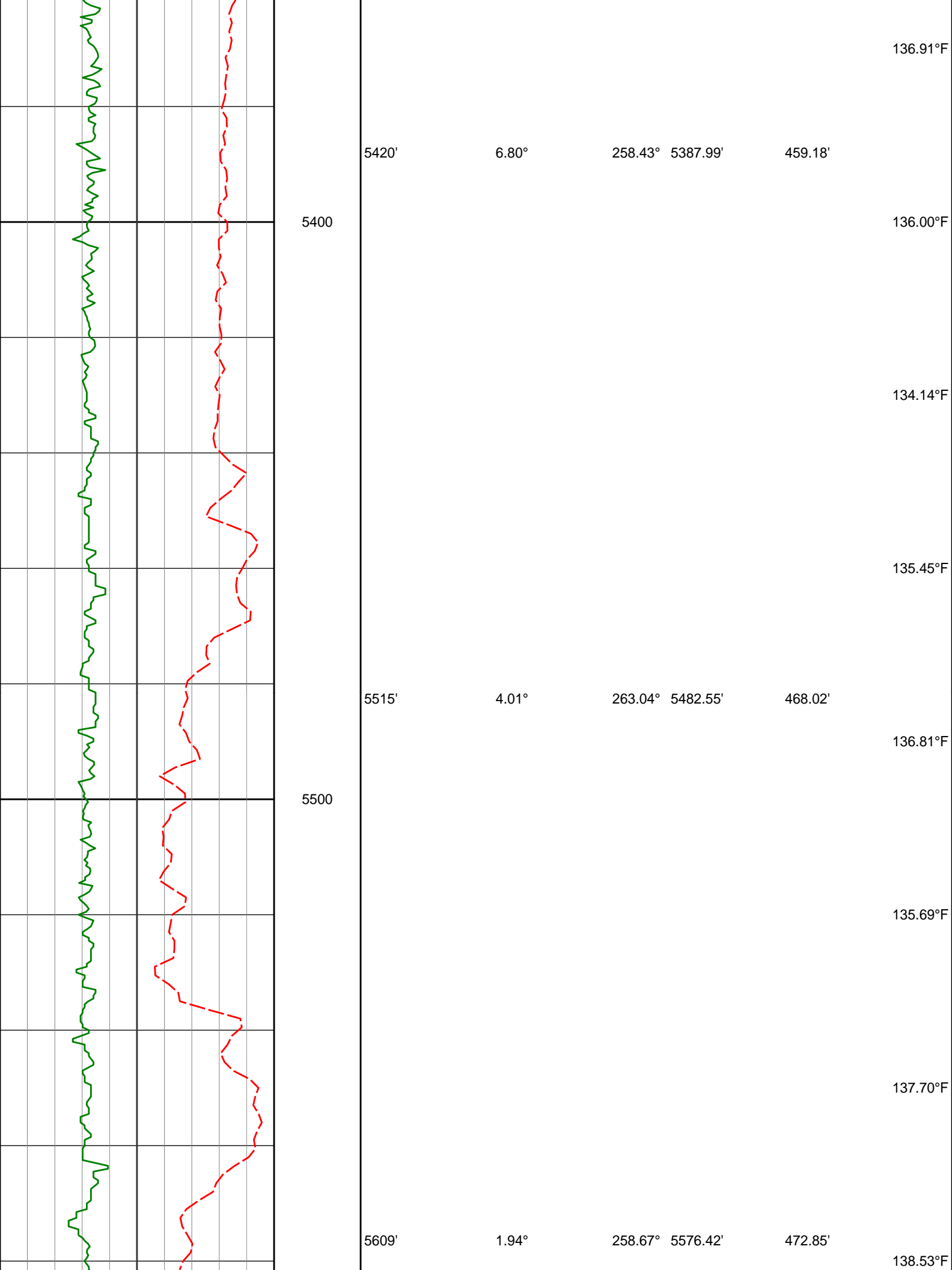
5107.76'

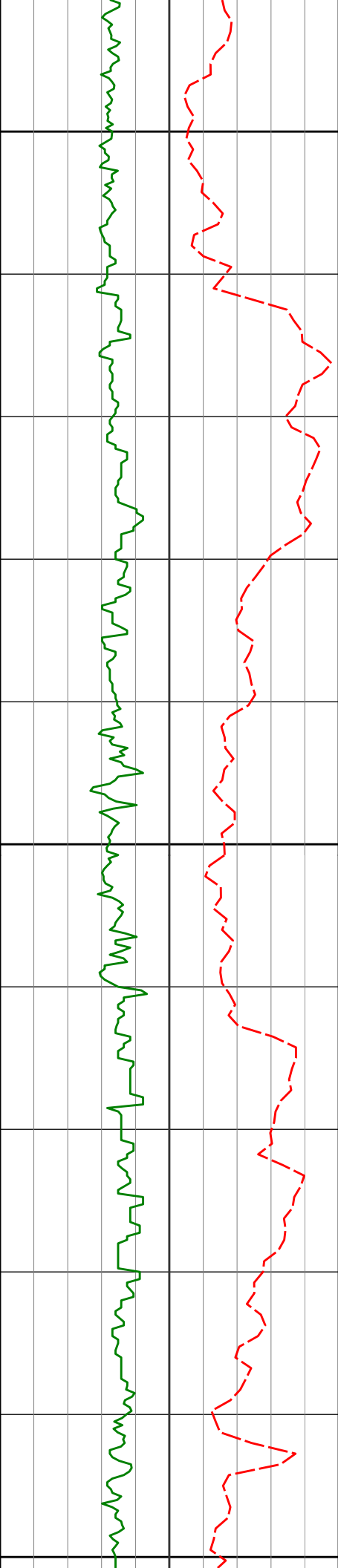
420.62'

135.19°F

133.85°F







5600

137.93°F

138.85°F

5704'

0.90°

178.44°

5671.40'

474.42'

140.09°F

5700

141.63°F

142.25°F

5798'

0.66°

159.85°

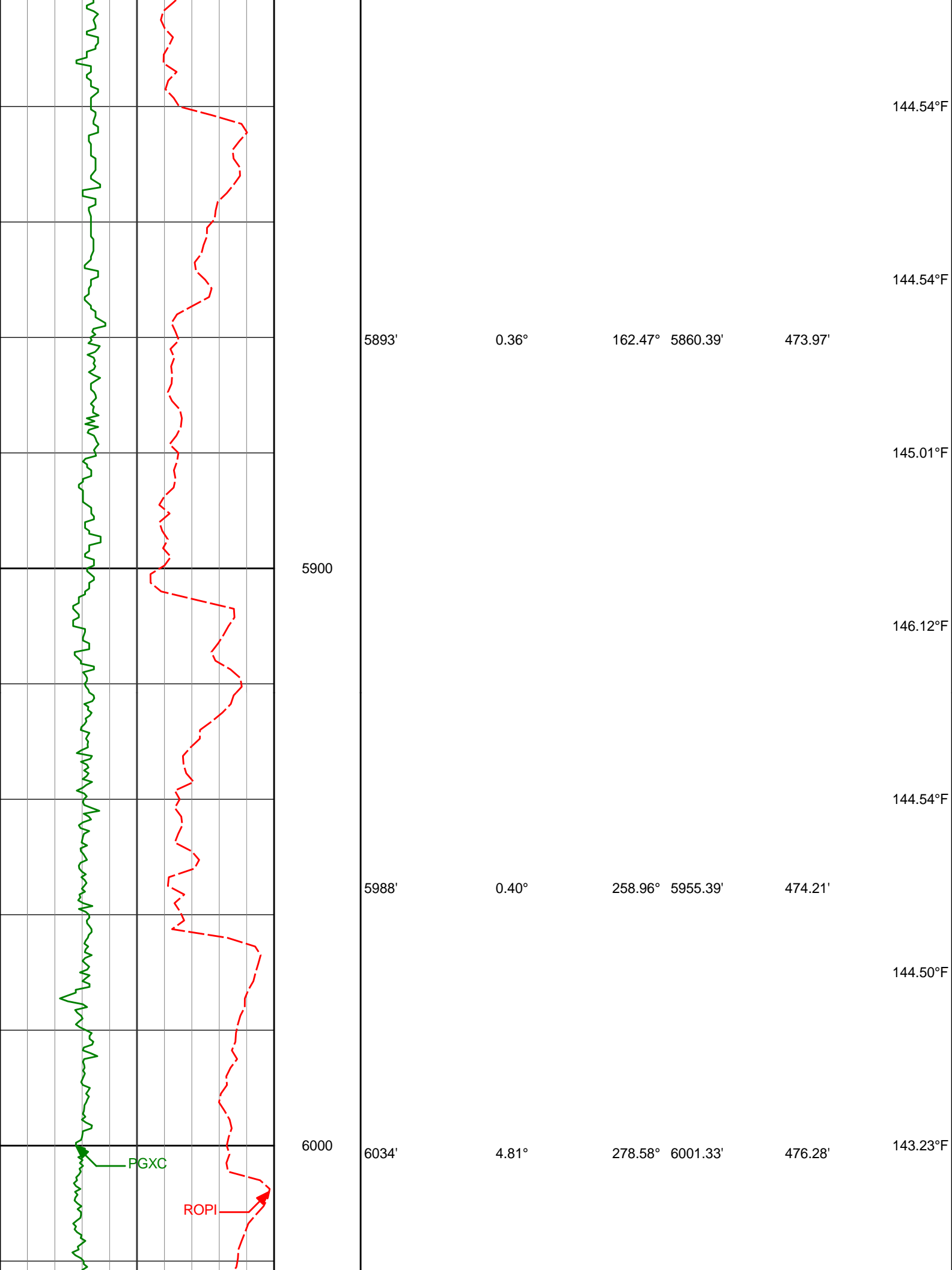
5765.39'

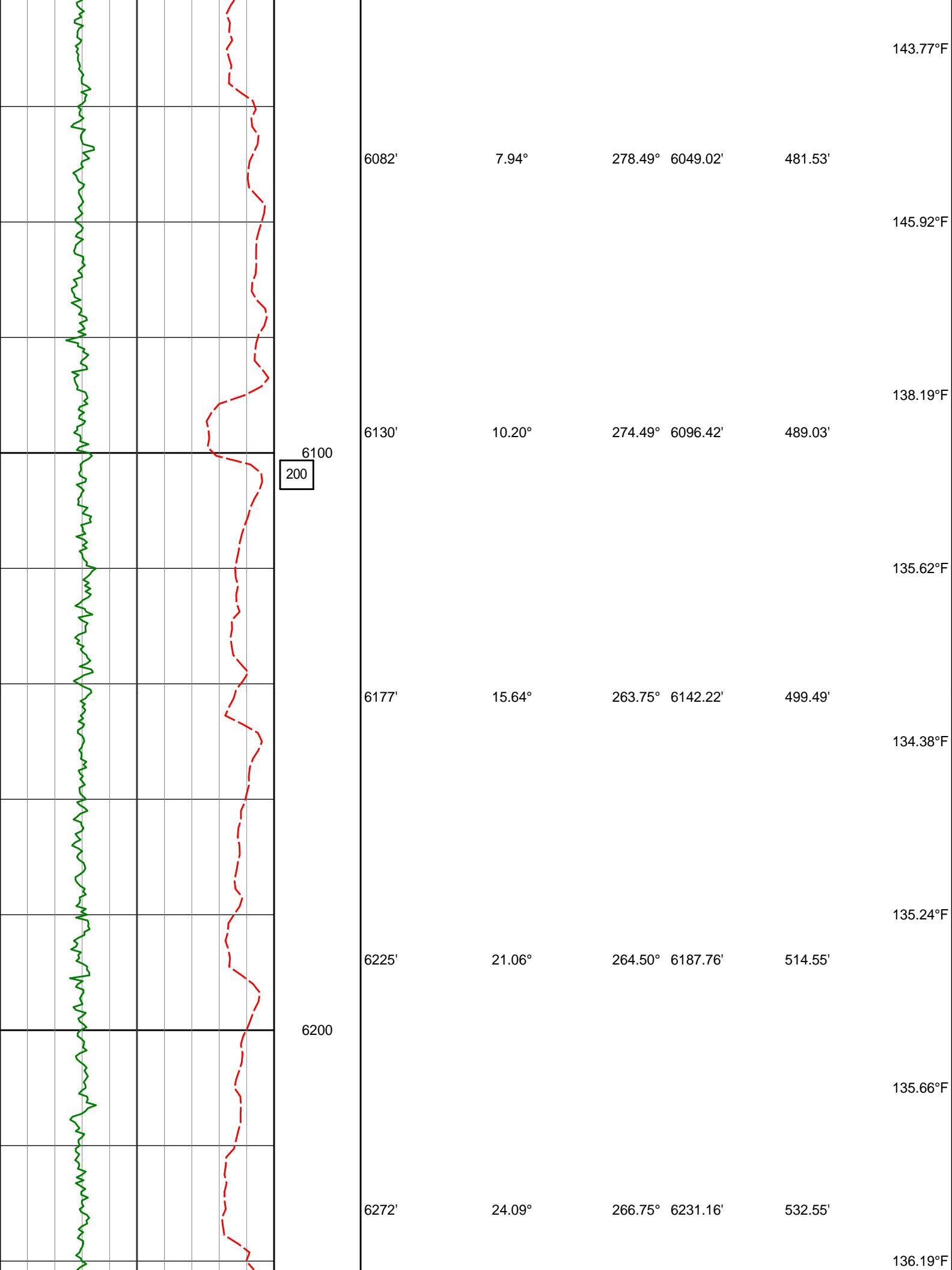
474.24'

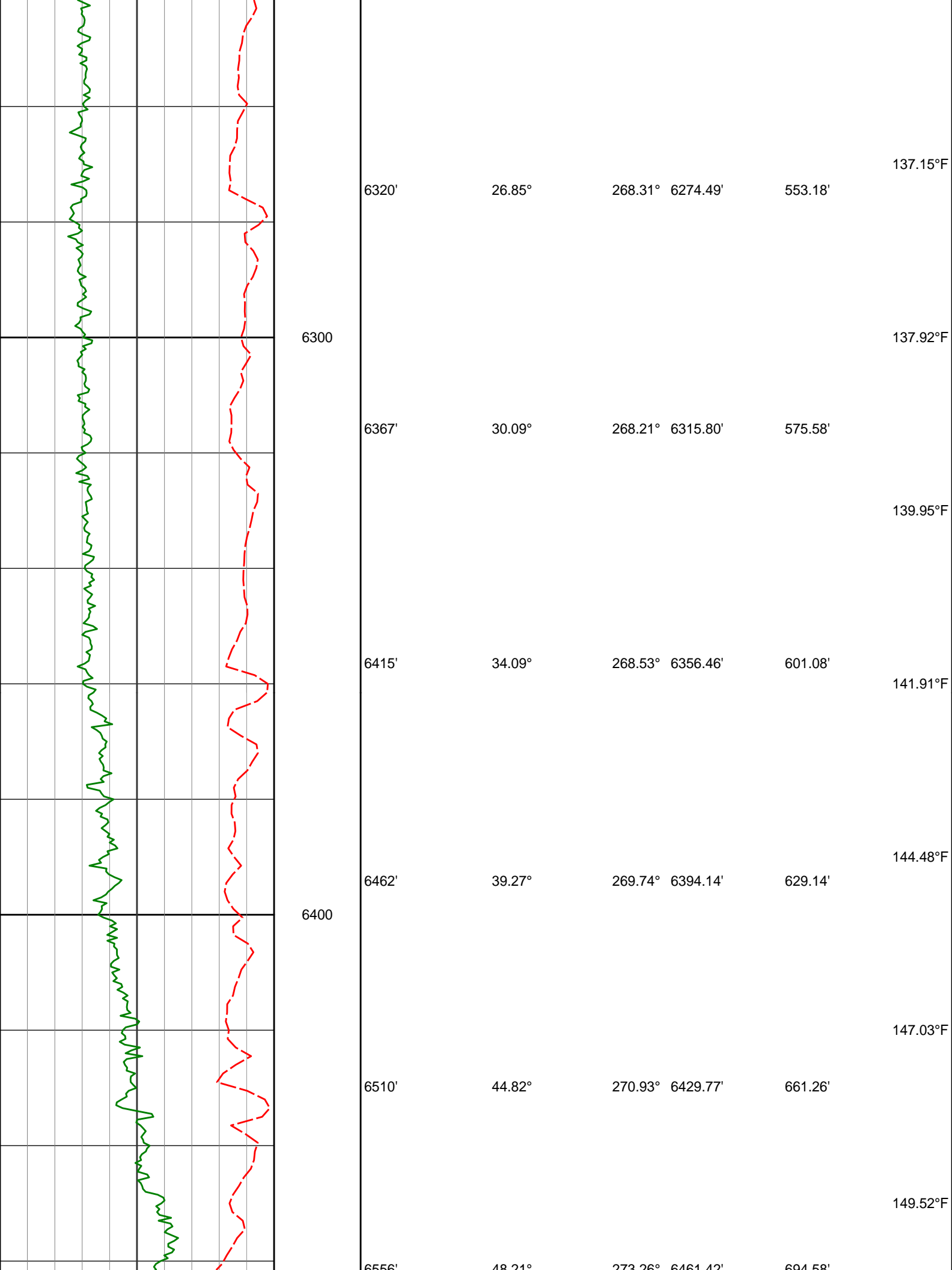
142.62°F

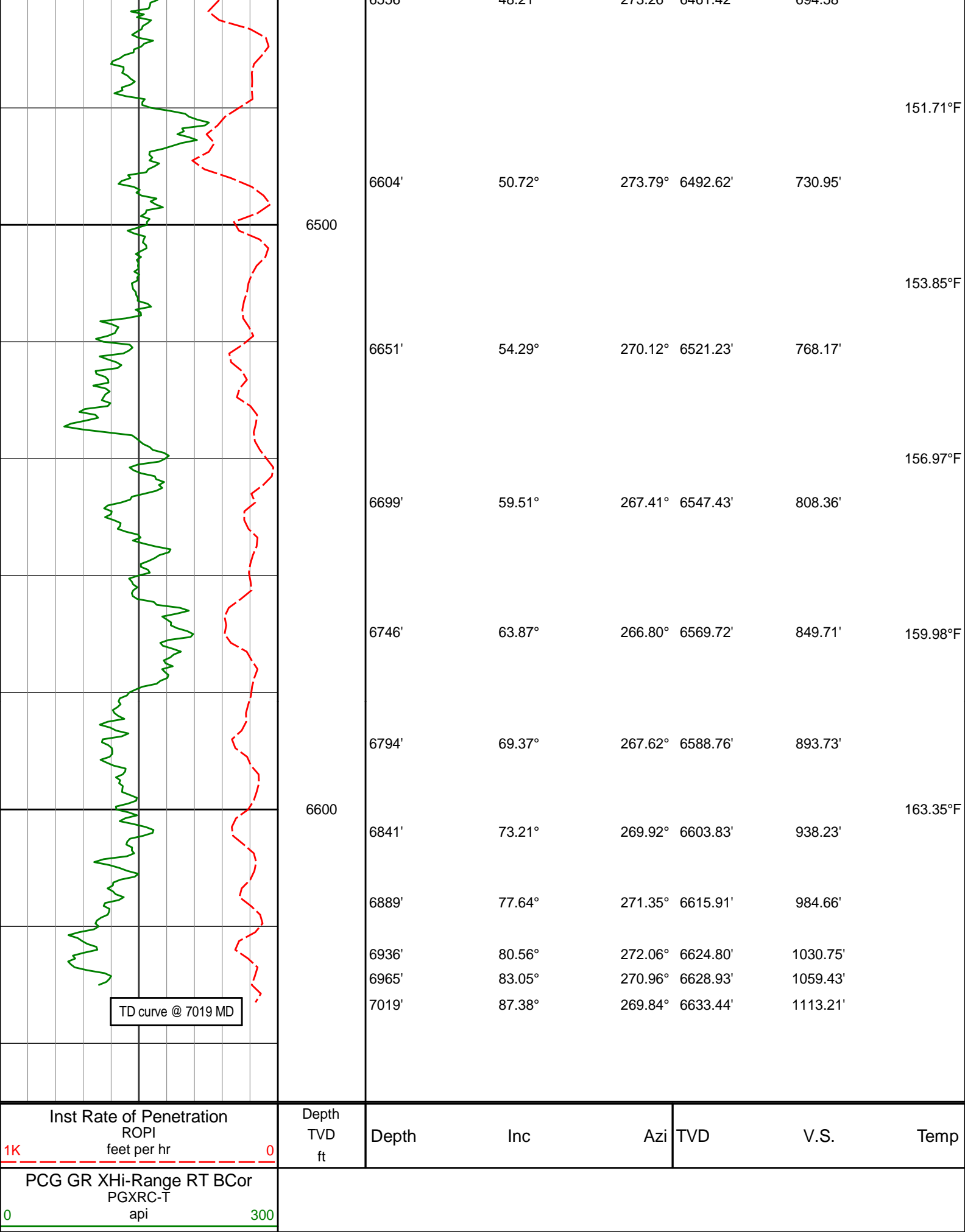
144.54°F

5800











# HALLIBURTON

## DIRECTIONAL SURVEY REPORT

Noble Energy

Colt A13-648

Wattenberg

Weld Colorado

USA

CA-XX-0902175901

Tied in @ Surface

First two Survey's from 3rd party source (Muulti Shot EMS)

Final survey projected to bit.

<i>Measured Depth (feet)</i>	<i>Inclination (degrees)</i>	<i>Direction (degrees)</i>	<i>Vertical Depth (feet)</i>	<i>Latitude (feet)</i>	<i>Departure (feet)</i>	<i>Vertical Section (feet)</i>	<i>Dogleg (deg/100ft)</i>
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
306.00	1.20	294.32	305.98	1.32 N	2.92 W	2.90	0.39
708.00	0.80	311.82	707.92	4.92 N	8.85 W	8.76	0.12
957.00	0.17	297.59	956.91	6.25 N	10.47 W	10.36	0.26
1015.00	0.25	269.44	1014.91	6.29 N	10.67 W	10.57	0.22
1198.00	0.22	314.90	1197.90	6.54 N	11.32 W	11.21	0.10
1290.00	0.45	303.26	1289.90	6.86 N	11.75 W	11.63	0.26
1381.00	0.53	330.75	1380.90	7.42 N	12.25 W	12.13	0.27
1473.00	0.59	311.08	1472.90	8.11 N	12.82 W	12.68	0.22
1564.00	0.54	307.76	1563.89	8.68 N	13.51 W	13.36	0.07
1655.00	0.33	289.31	1654.89	9.03 N	14.10 W	13.94	0.27
1748.00	0.44	304.46	1747.89	9.32 N	14.64 W	14.49	0.16
1840.00	0.44	324.54	1839.88	9.80 N	15.14 W	14.97	0.17
1931.00	0.35	305.14	1930.88	10.25 N	15.57 W	15.40	0.18
2023.00	0.32	273.02	2022.88	10.42 N	16.06 W	15.88	0.20
2115.00	1.74	225.65	2114.86	9.46 N	17.31 W	17.15	1.68
2207.00	3.48	245.64	2206.77	7.33 N	20.85 W	20.73	2.11
2299.00	5.55	246.60	2298.48	4.41 N	27.48 W	27.40	2.25
2391.00	6.85	247.83	2389.94	0.58 N	36.65 W	36.63	1.42
2486.00	8.62	245.82	2484.07	4.48 S	48.39 W	48.46	1.88
2579.00	8.52	245.29	2576.03	10.21 S	61.00 W	61.17	0.14
2674.00	9.24	253.66	2669.89	15.30 S	74.72 W	74.96	1.55
2769.00	9.15	261.25	2763.68	18.60 S	89.50 W	89.80	1.28
2863.00	9.82	262.03	2856.39	20.84 S	104.83 W	105.16	0.73
2958.00	8.98	265.37	2950.12	22.57 S	120.24 W	120.60	1.05
3053.00	9.28	263.97	3043.91	23.97 S	135.25 W	135.63	0.39
3148.00	9.29	262.83	3137.67	25.73 S	150.47 W	150.88	0.19
3242.00	7.56	265.72	3230.65	27.14 S	164.17 W	164.60	1.89
3337.00	6.81	264.99	3324.90	28.10 S	176.01 W	176.46	0.80
3432.00	6.40	281.00	3419.28	27.58 S	186.82 W	187.26	1.98
3527.00	7.09	274.83	3513.62	26.08 S	197.86 W	198.27	1.05
3621.00	7.75	274.13	3606.84	25.13 S	209.96 W	210.36	0.71
3716.00	9.56	272.22	3700.75	24.36 S	224.24 W	224.61	1.93
3810.00	10.35	271.19	3793.33	23.89 S	240.48 W	240.85	0.86
3905.00	9.69	271.44	3886.89	23.51 S	257.00 W	257.36	0.70
4000.00	8.11	270.27	3980.74	23.27 S	271.70 W	272.05	1.67
4094.00	7.40	272.85	4073.88	22.94 S	284.37 W	284.72	0.84
4189.00	7.20	270.80	4168.11	22.56 S	296.44 W	296.77	0.35
4284.00	6.18	282.05	4262.46	21.40 S	307.39 W	307.71	1.74
4379.00	6.65	273.36	4356.87	20.01 S	317.88 W	318.18	1.13
4473.00	6.49	278.76	4450.26	18.89 S	328.57 W	328.84	0.68
4568.00	7.00	271.38	4544.60	17.93 S	339.66 W	339.91	1.06
4663.00	7.15	269.19	4638.88	17.87 S	351.36 W	351.61	0.32
4758.00	8.06	263.03	4733.04	18.77 S	363.88 W	364.15	1.28
4853.00	9.38	262.72	4826.94	20.55 S	378.17 W	378.47	1.39
4947.00	7.52	272.28	4919.92	21.28 S	391.92 W	392.22	2.47
5042.00	9.10	268.06	5013.92	21.29 S	405.64 W	405.94	1.78
5137.00	8.86	257.32	5107.76	23.15 S	420.29 W	420.62	1.78
5231.00	8.77	257.17	5200.65	26.33 S	434.34 W	434.72	0.10
5326.00	7.40	257.06	5294.71	29.31 S	447.36 W	447.79	1.44
5420.00	6.80	258.43	5387.99	31.78 S	458.71 W	459.18	0.66
5515.00	4.01	263.04	5482.55	33.31 S	467.52 W	468.02	2.97

5615.00	4.81	258.67	5576.42	34.02 S	472.35 W	472.85	2.21
5609.00	1.94	258.67	5576.42	34.02 S	472.35 W	472.85	2.21
5704.00	0.90	178.44	5671.40	35.08 S	473.90 W	474.42	2.10
5798.00	0.66	159.85	5765.39	36.33 S	473.70 W	474.24	0.37
5893.00	0.36	162.47	5860.39	37.13 S	473.42 W	473.97	0.32
5988.00	0.40	258.96	5955.39	37.47 S	473.65 W	474.21	0.60
6034.00	4.81	278.58	6001.33	37.22 S	475.72 W	476.28	9.64
6082.00	7.94	278.49	6049.02	36.43 S	480.99 W	481.53	6.52
6130.00	10.20	274.49	6096.42	35.61 S	488.51 W	489.03	4.89
6177.00	15.64	263.75	6142.22	35.97 S	498.96 W	499.49	12.60
6225.00	21.06	264.50	6187.76	37.50 S	513.99 W	514.55	11.30
6272.00	24.09	266.75	6231.16	38.86 S	531.98 W	532.55	6.70
6320.00	26.85	268.31	6274.49	39.73 S	552.60 W	553.18	5.92
6367.00	30.09	268.21	6315.80	40.41 S	574.99 W	575.58	6.89
6415.00	34.09	268.53	6356.46	41.13 S	600.47 W	601.08	8.34
6462.00	39.27	269.74	6394.14	41.54 S	628.53 W	629.14	11.13
6510.00	44.82	270.93	6429.77	41.33 S	660.67 W	661.26	11.68
6556.00	48.21	273.26	6461.42	40.09 S	694.01 W	694.58	8.23
6604.00	50.72	273.79	6492.62	37.85 S	730.42 W	730.95	5.30
6651.00	54.29	270.12	6521.23	36.61 S	767.67 W	768.17	9.80
6699.00	59.51	267.41	6547.43	37.50 S	807.85 W	808.36	11.86
6746.00	63.87	266.80	6569.72	39.59 S	849.16 W	849.71	9.35
6794.00	69.37	267.62	6588.76	41.73 S	893.15 W	893.73	11.57
6841.00	73.21	269.92	6603.83	42.68 S	937.65 W	938.23	9.39
6889.00	77.64	271.35	6615.91	42.16 S	984.09 W	984.66	9.67
6936.00	80.56	272.06	6624.80	40.78 S	1030.21 W	1030.75	6.39
6965.00	83.05	270.96	6628.93	40.03 S	1058.91 W	1059.43	9.37
7019.00	87.38	269.84	6633.44	39.65 S	1112.70 W	1113.21	8.28

**CALCULATION BASED ON MINIMUM CURVATURE METHOD**

**SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT  
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT**

**VERTICAL SECTION RELATIVE TO WELL HEAD  
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 269.04 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.42 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7019.00 FEET  
IS 1113.41 FEET ALONG 267.96 DEGREES (GRID)**