

PCGC - Pressure Case Gamma

[illegible]

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	11-Mar-15	12-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 (TVD, ft)	931.95	6,531.33			
Log End Depth (TVD, ft)	6,531.33	6,687.48			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	10-Mar-15 11:20	11-Mar-15 17:45			
Drill/Wipe End Date and Time	11-Mar-15 08:35	11-Mar-15 23:00			
Min Inc (deg) @ Depth (TVD, ft)	0.37 @ 1,015.95	42.28 @ 6,526.18			
Max Inc (deg) @ Depth (TVD, ft)	37.19 @ 6,489.28	88.00 @ 6,687.48			
Bit TFA(in2) / Bit Type	1.37 / PDC	1.49 / PDC			
Flow Rate (gpm)	610.79	574.77			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	473.0 / N/A			
Fluid Type	Native/Spud Mud	Native/Spud Mud			
Density (ppg) / Viscosity (spqt)	8.70 / 29.00	10.65 / 36.00			
Filtrate CL (ppm)	1,900.00	2,100.00			
pH / Fluid Loss (mptm)	11.90 / 39	9.00 / 8			
PV (cP) / YP (lbf2)	1 / 3.00	8 / 8.00			
% Solids / % Sand	3.70 / 0.40	10.90 / 0.25			
% Oil / Oil:Water Ratio	N/A / N/A	0.50 / 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 Tool)	154.00 / 20M	122.00 / 20M			

Max Tool Temp (degF) / Source	154.30 / PCM	162.80 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 154.30	N/A @ 162.80			
Lead MWD Engineer	Robert Barnes	Robert Barnes			
Customer Representative	Jeremy Stolz	Jeremy Stolz			

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	09-Mar-15 23:06	01-Jan-70 00:00			
Date and Time Read	12-Mar-15 05:12	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	53.00			
Software Version	6.33	6.33			
Sub Serial Number	11342274	11342274			
Sonde Serial Number	11145674	11145674			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	46.61	121.95			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	47.76	45.48			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11342274	11342274			
Insert/Sonde Serial Number	11293410	11293410			

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

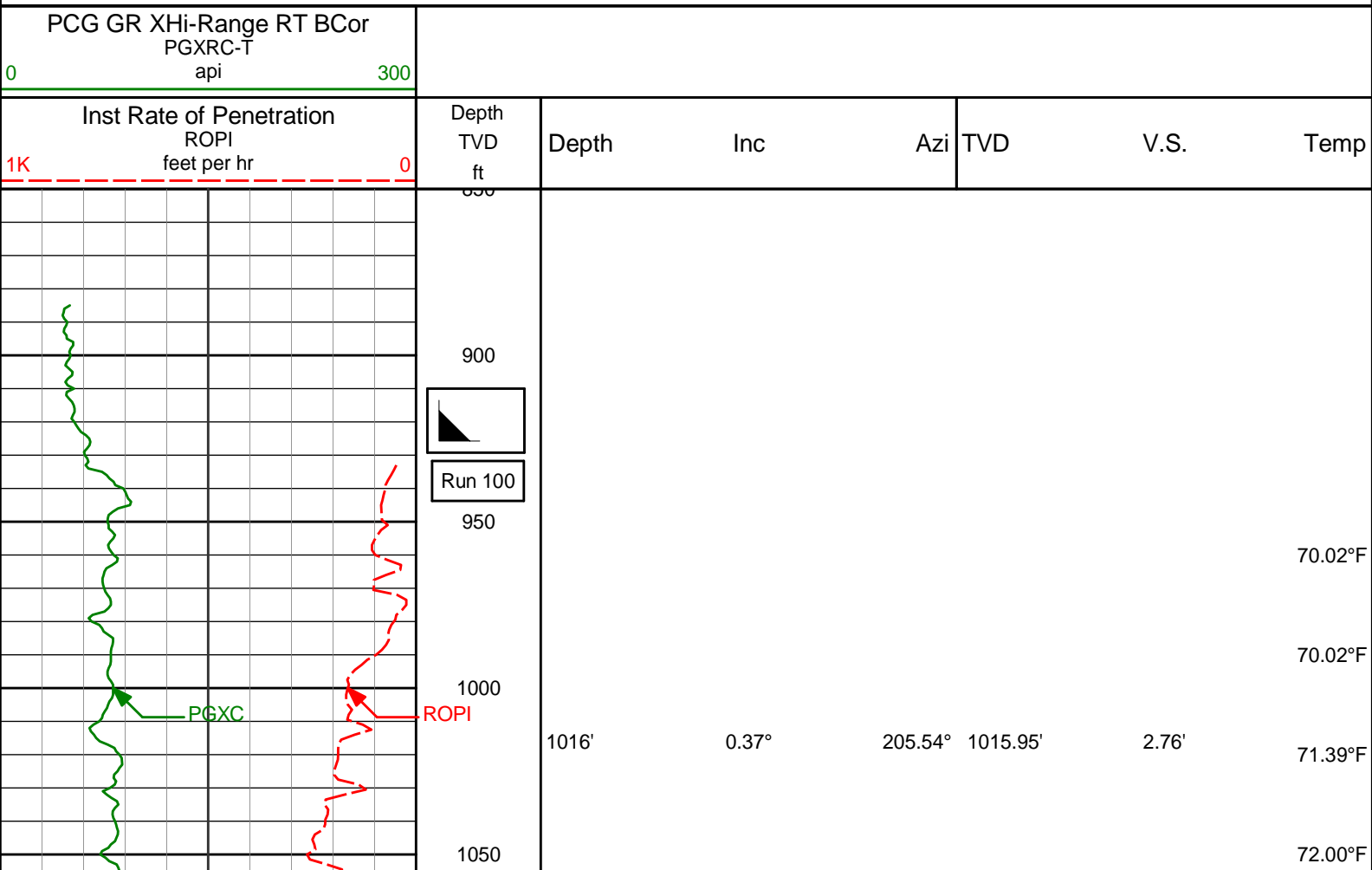
Interval Resolution: 0.1 ft
Interval Distance: 1.2 ft

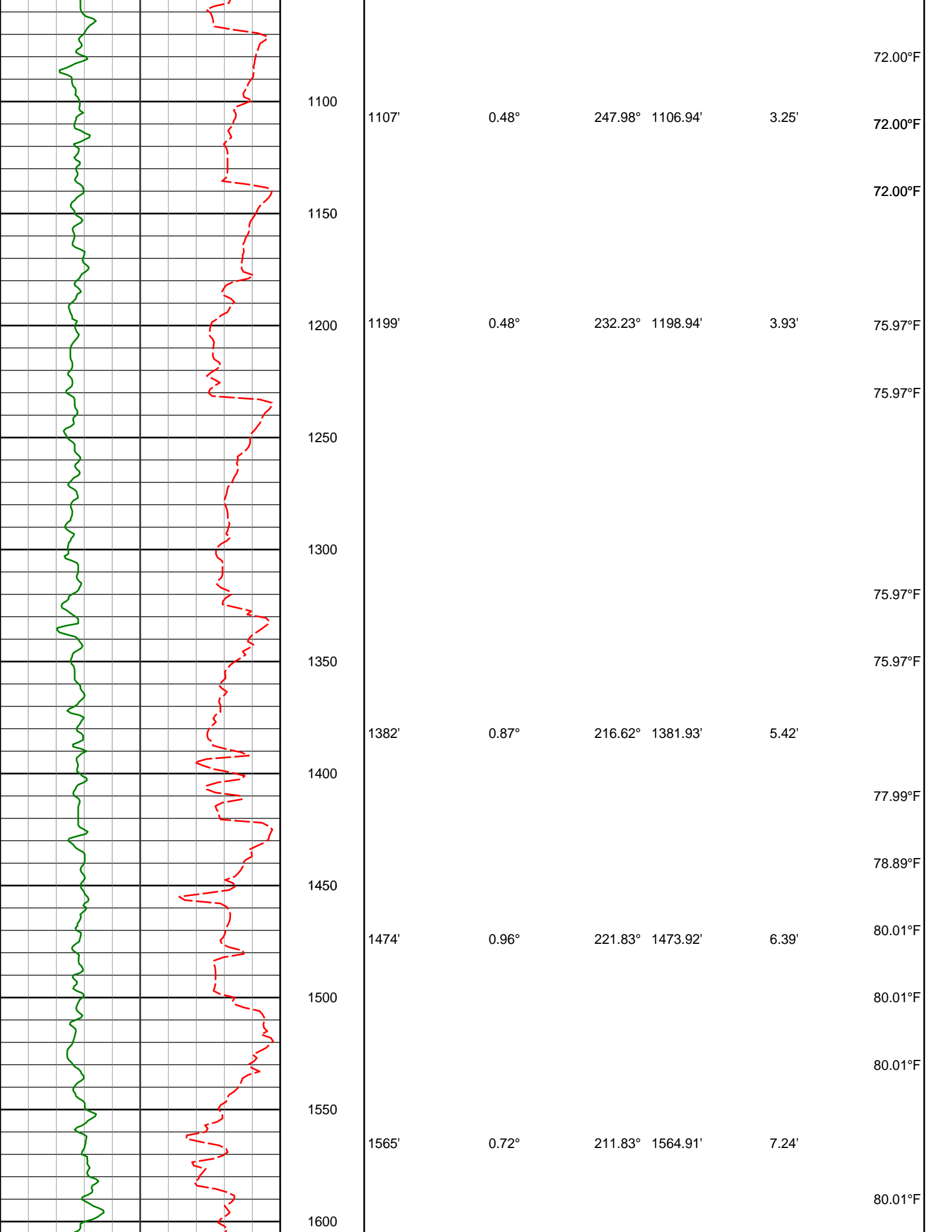
6. Insite Version v8.1.10

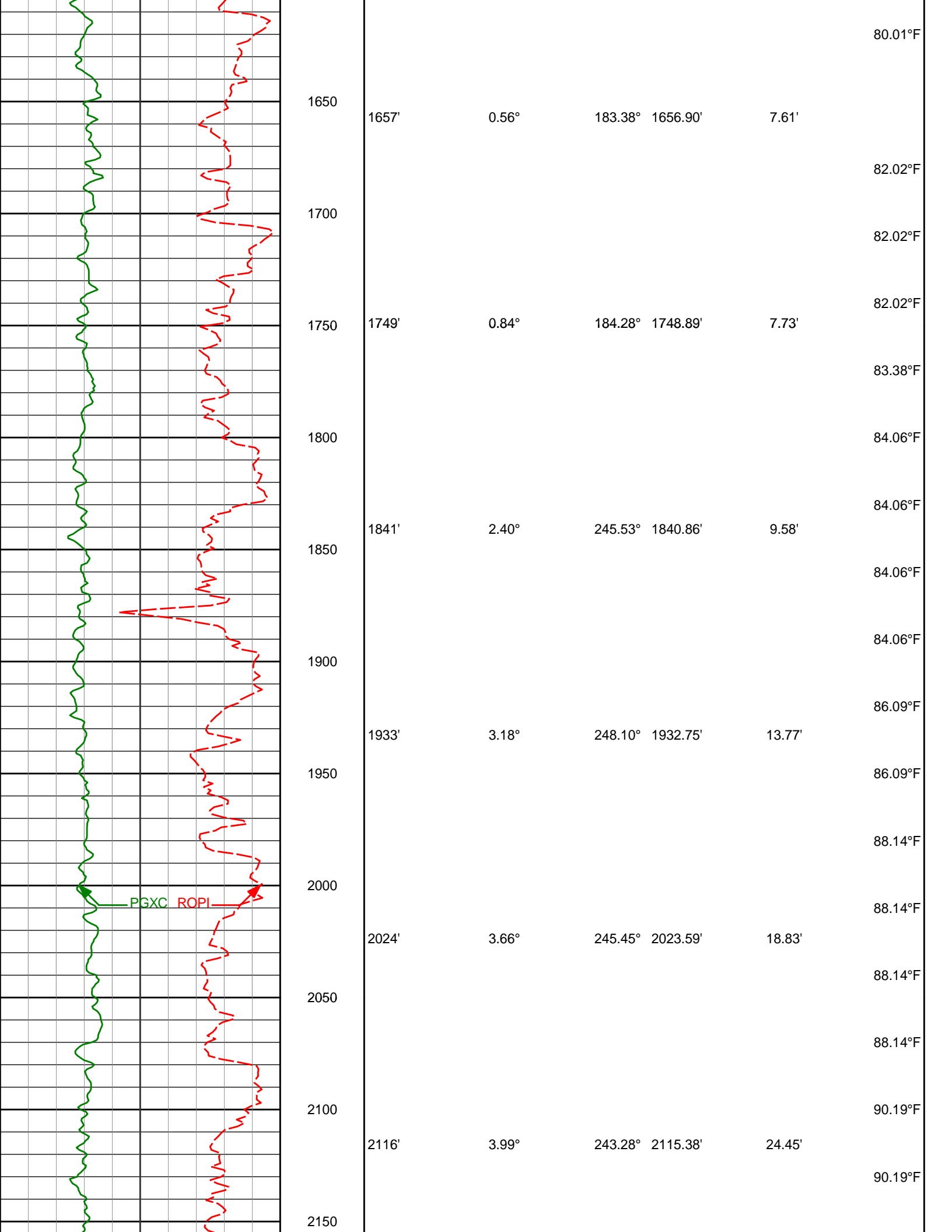
WARRANTY

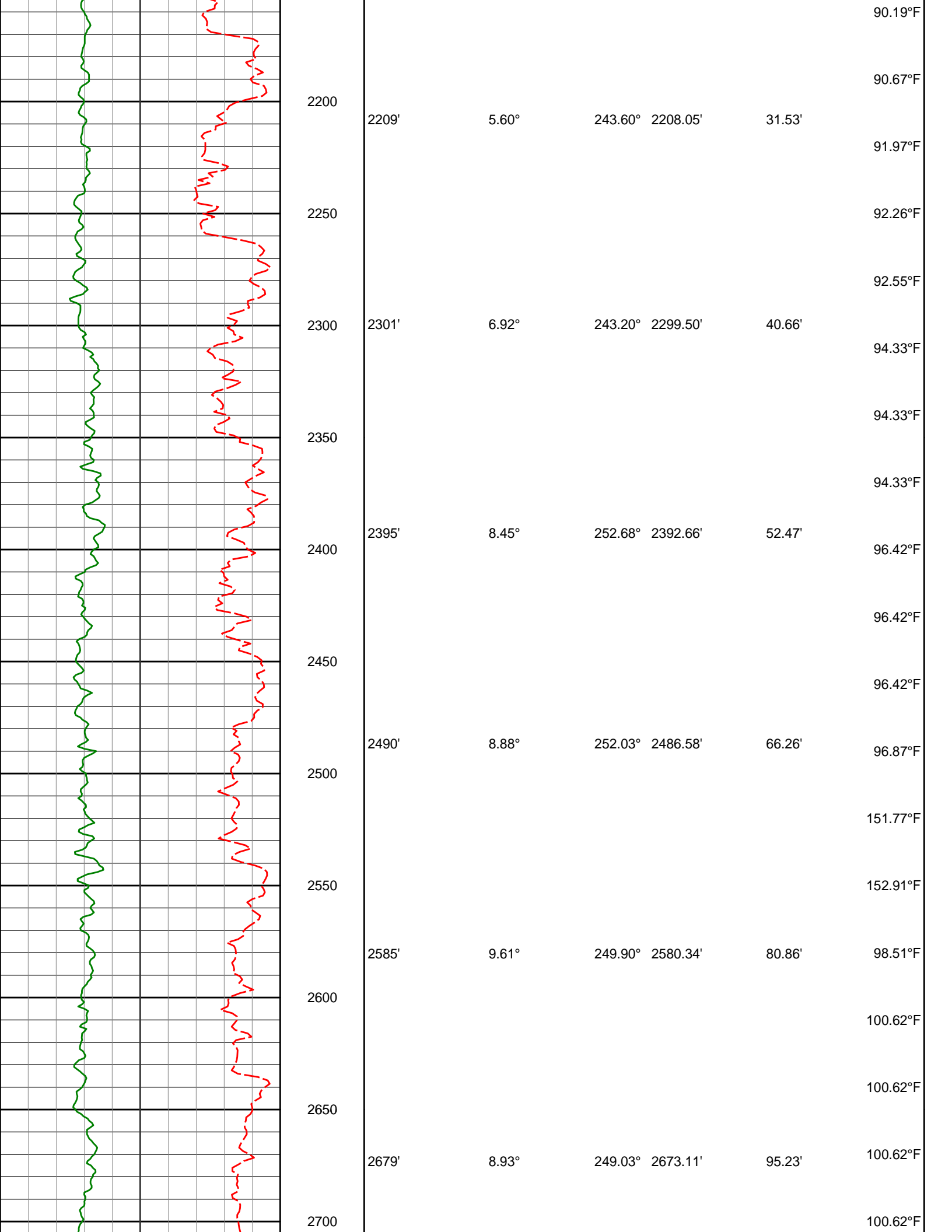
HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES SHOULD ANY SUCH INFORMATION OR INTERPRETATION BE RELIED UPON AS THE SOLE BASIS FOR ANY DRILLING, COMPLETION, PRODUCTION, OR FINANCIAL DECISION OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING VENTURE, DRILLING RIG OR ITS CREW OR ANY OTHER THIRD PARTY. THE CUSTOMER HAS FULL RESPONSIBILITY FOR ALL DRILLING, COMPLETION AND PRODUCTION OPERATION. HALLIBURTON MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE SERVICES RENDERED. IN NO EVENT WILL HALLIBURTON BE LIABLE FOR FAILURE TO OBTAIN ANY PARTICULAR RESULTS OR FOR ANY DAMAGES, INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, RESULTING FROM THE USE OF ANY INFORMATION OR INTERPRETATION PROVIDED BY HALLIBURTON.

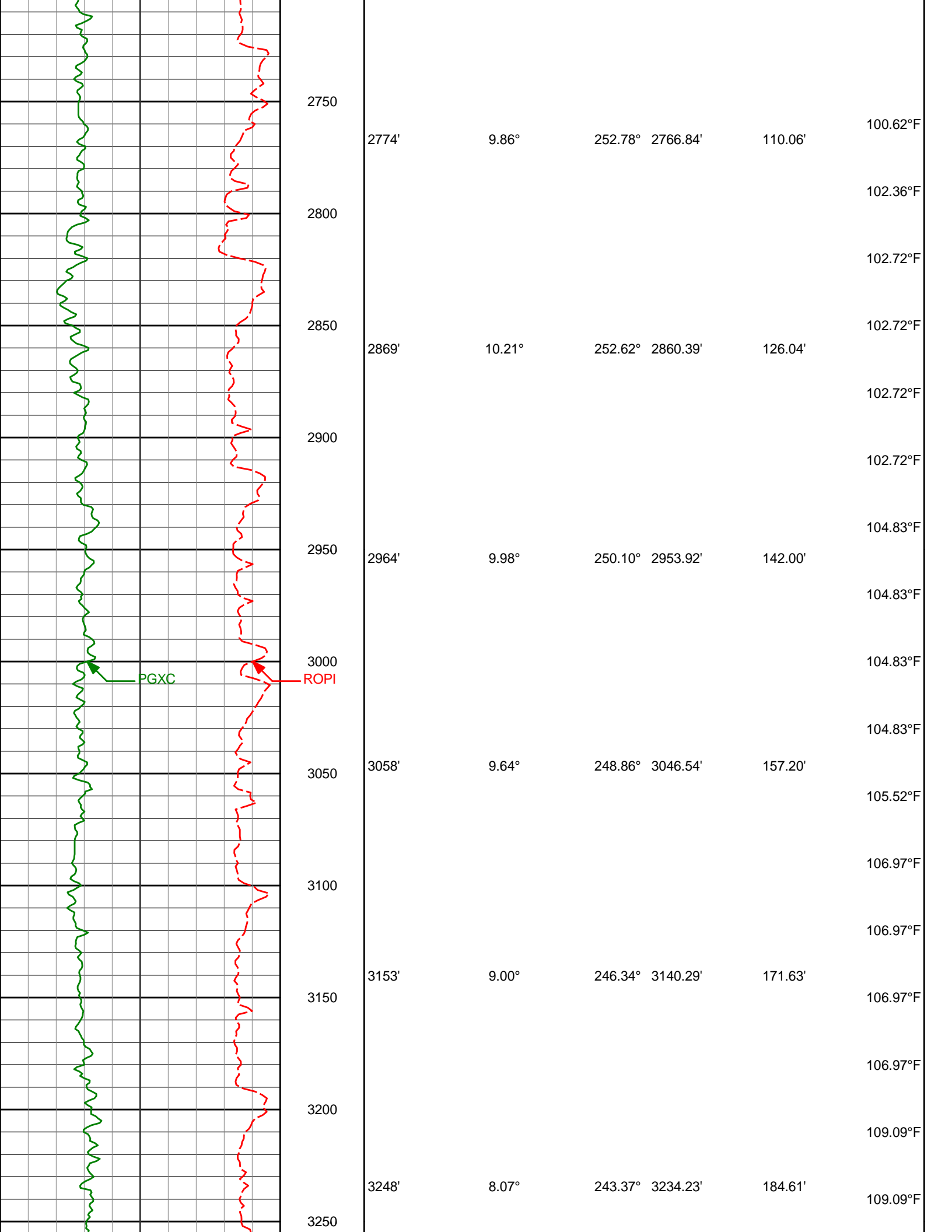
TVD Detail 1:600 Scale

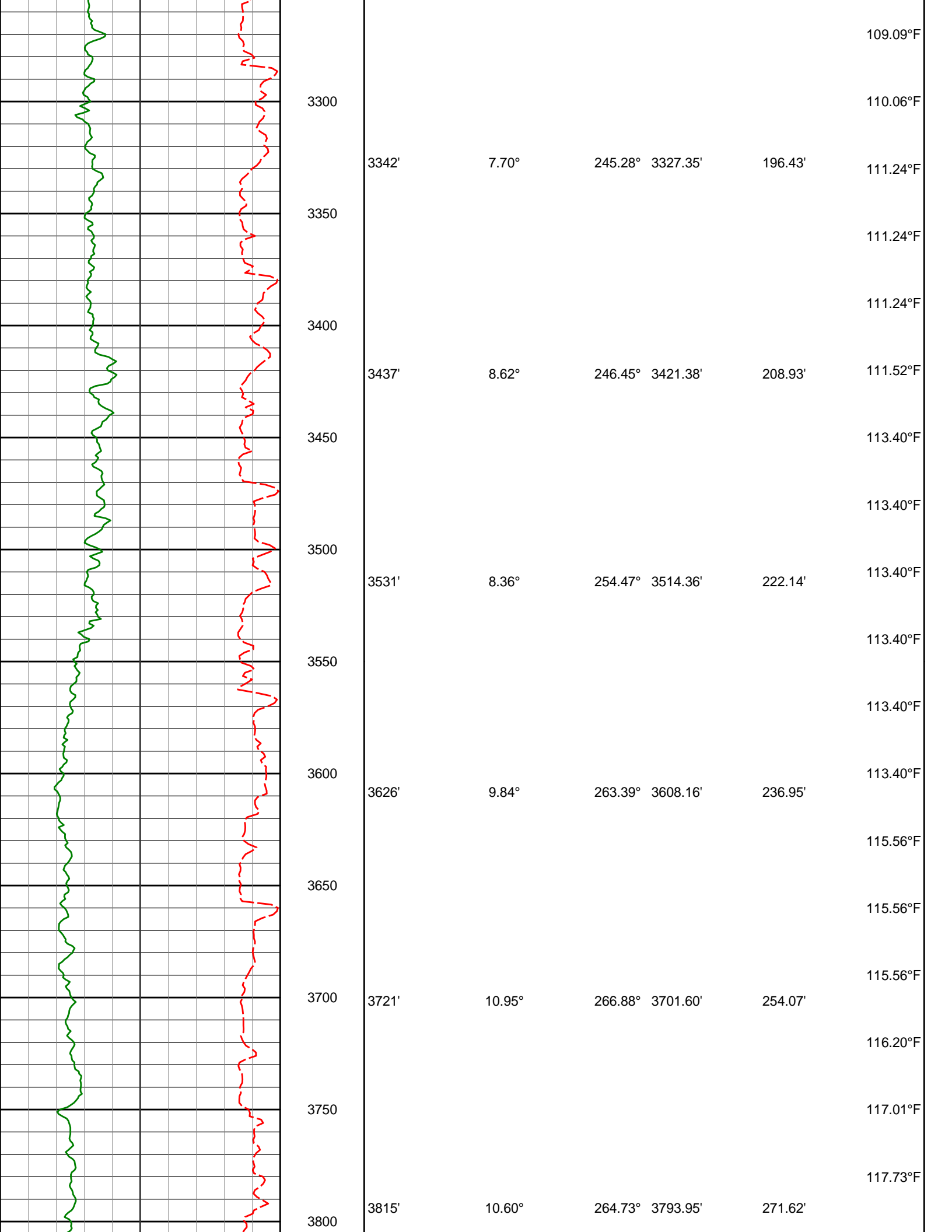


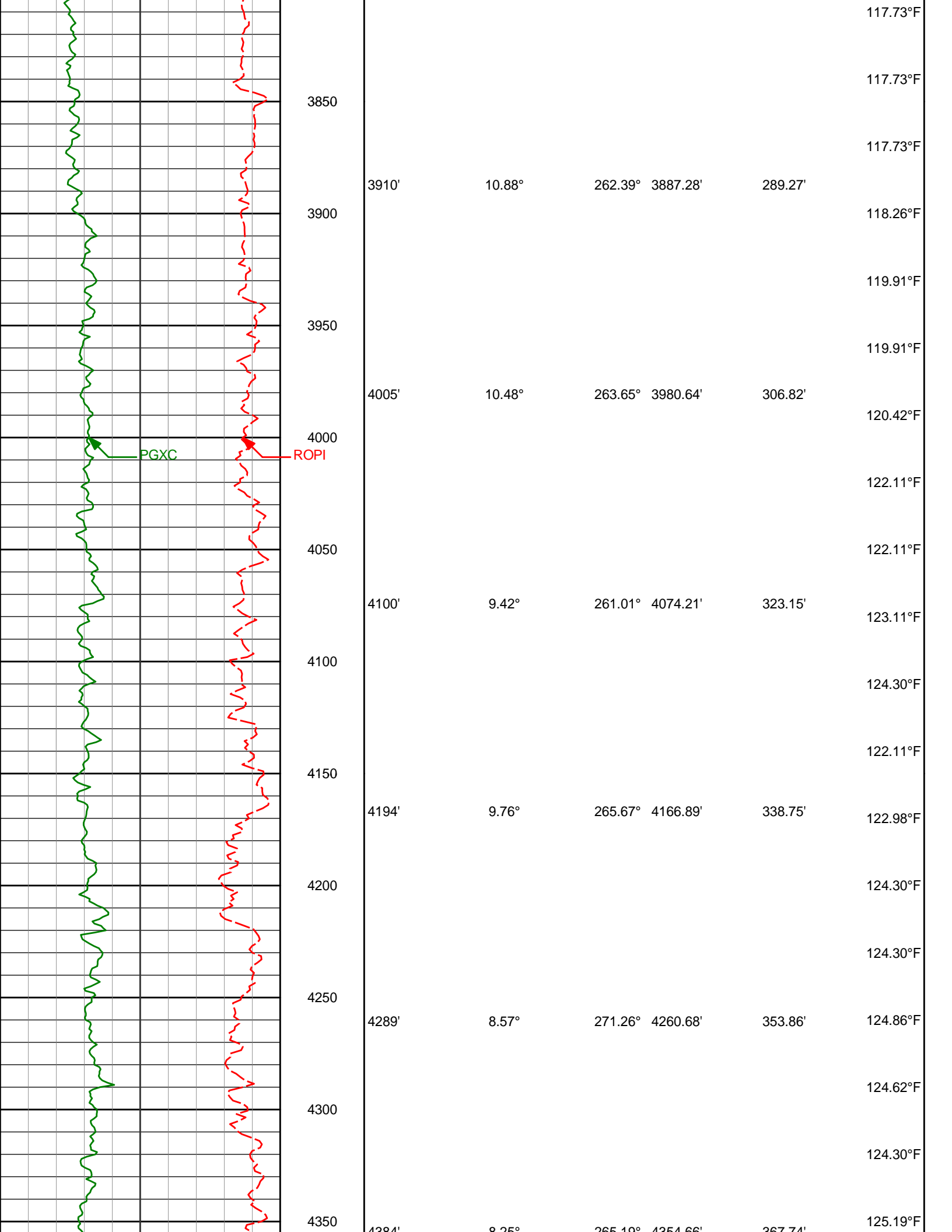


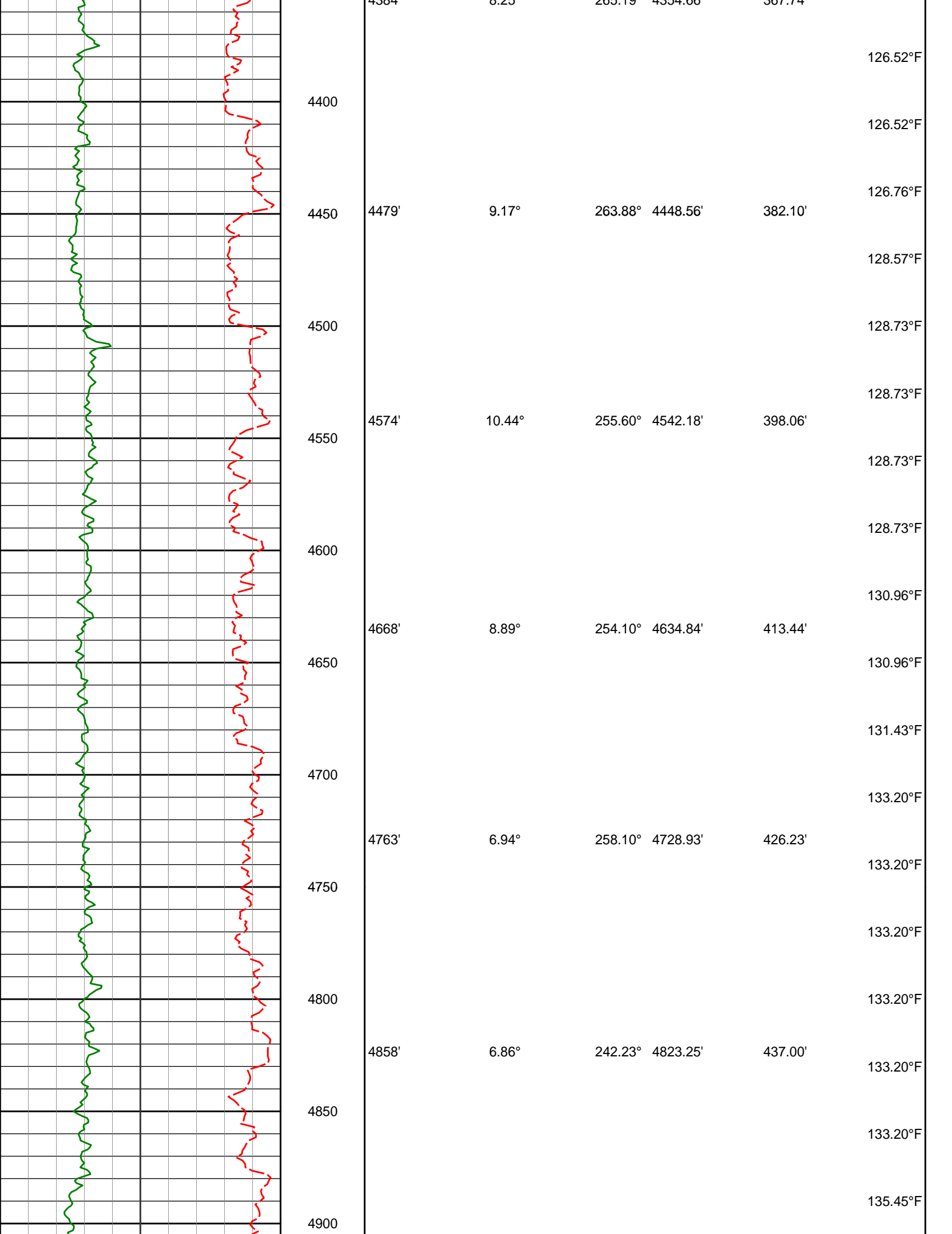


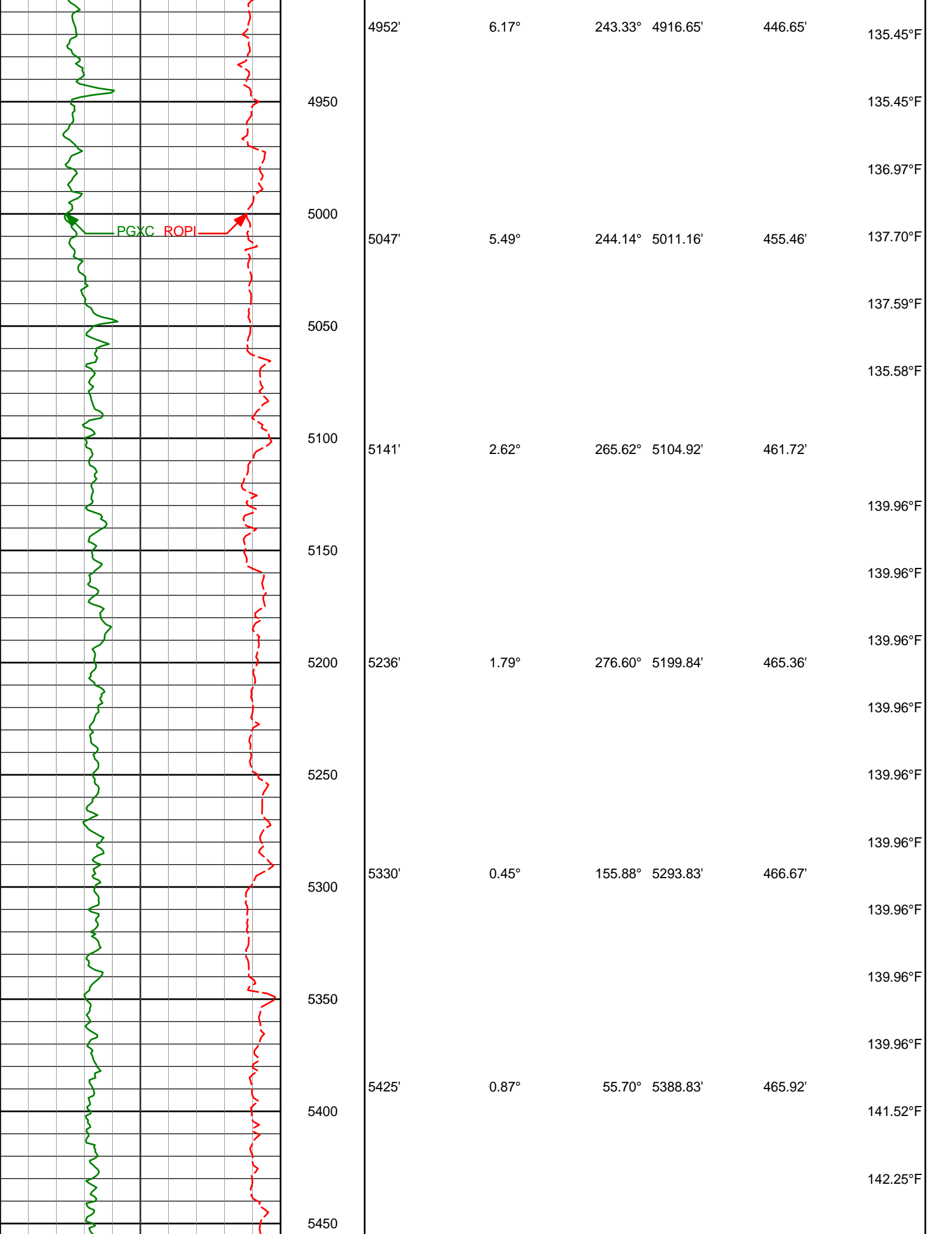


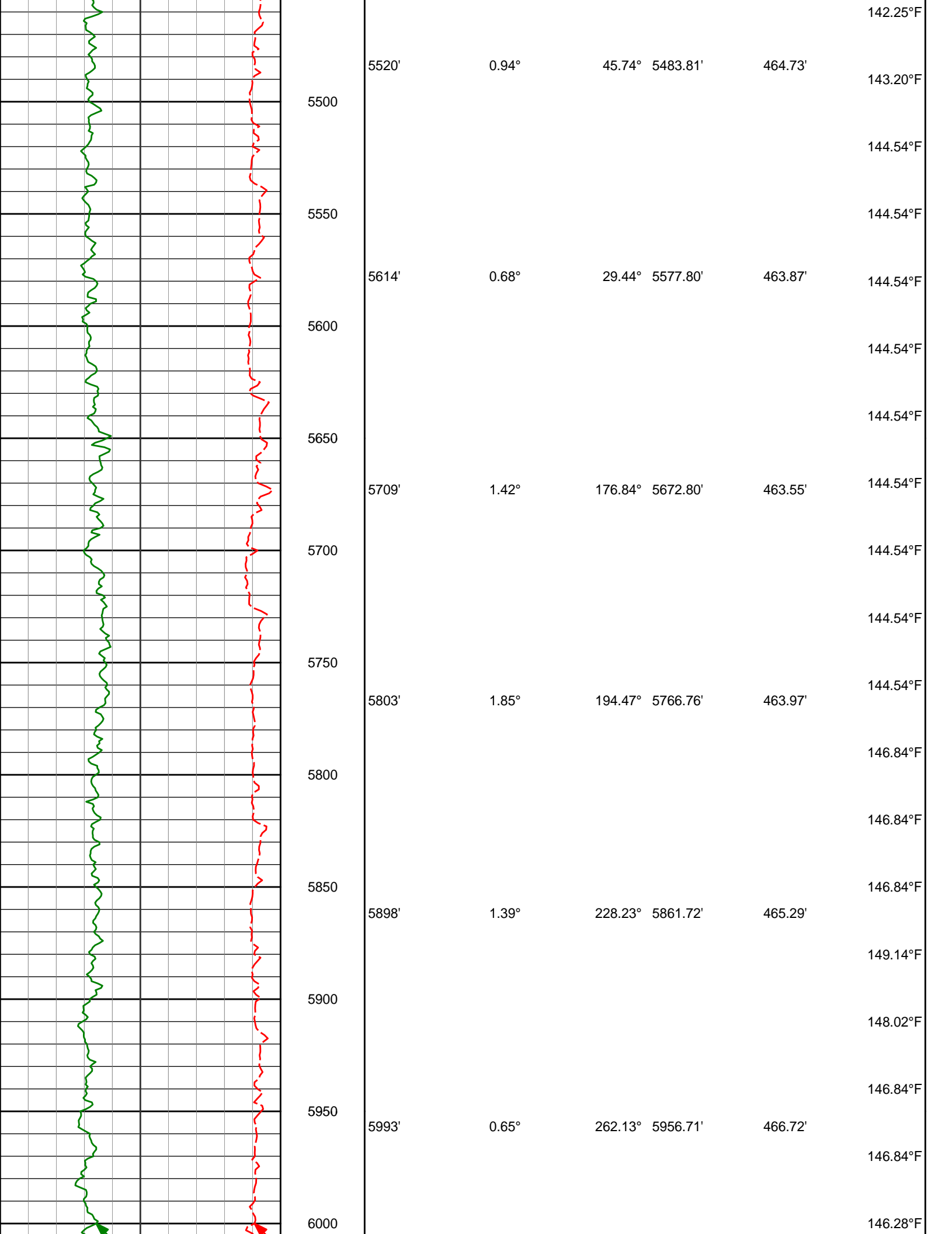


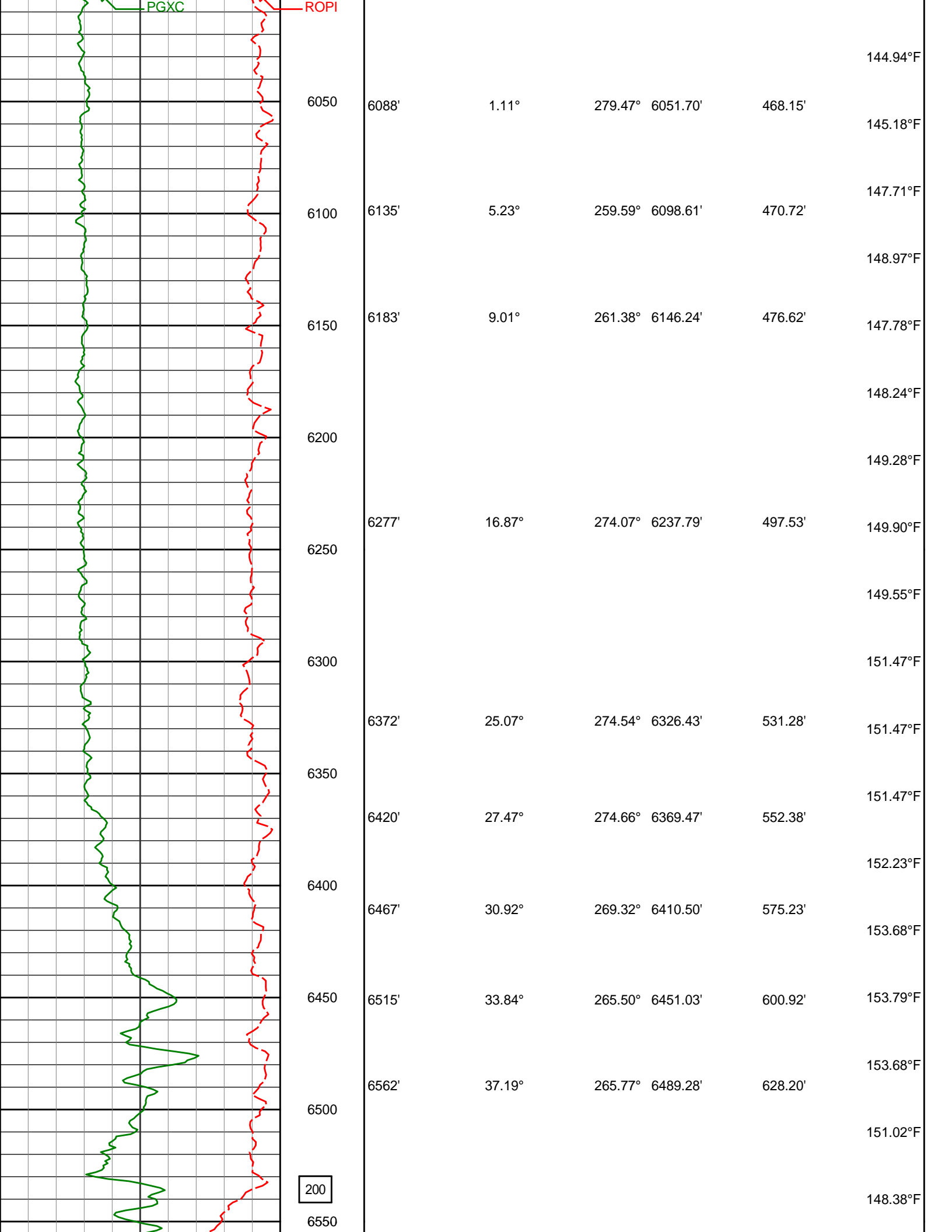


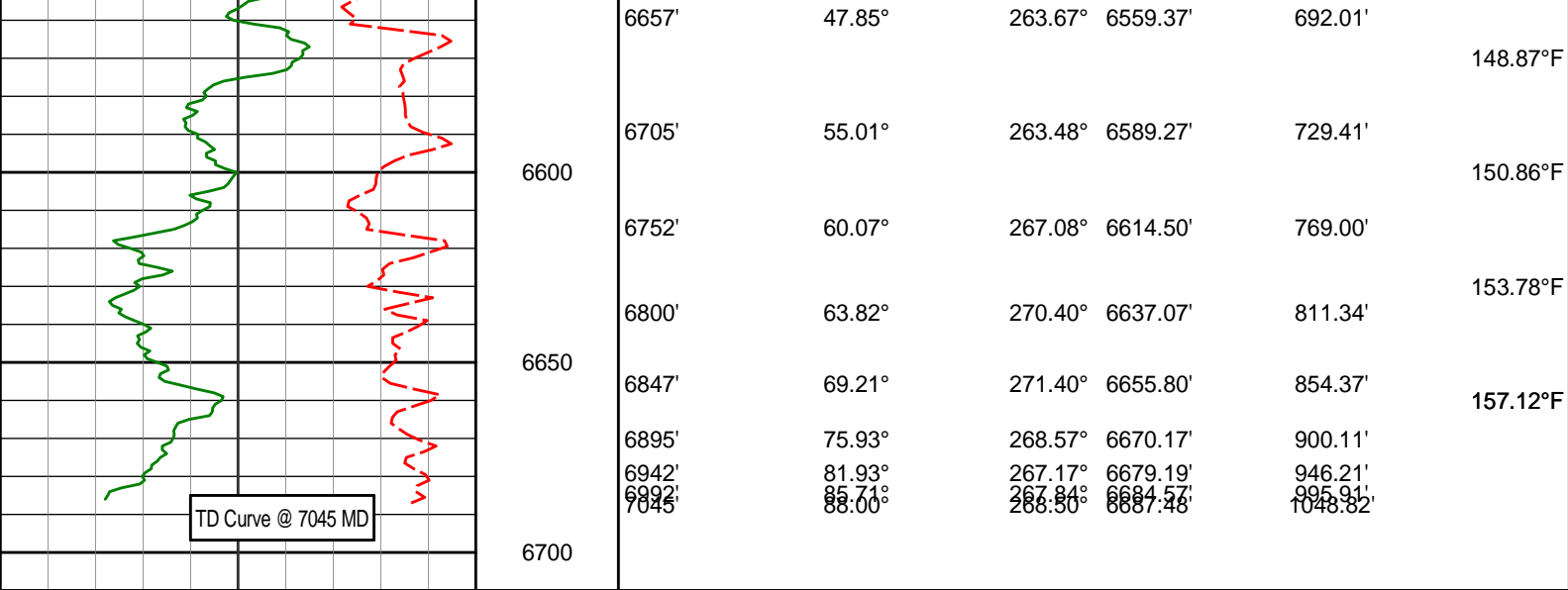












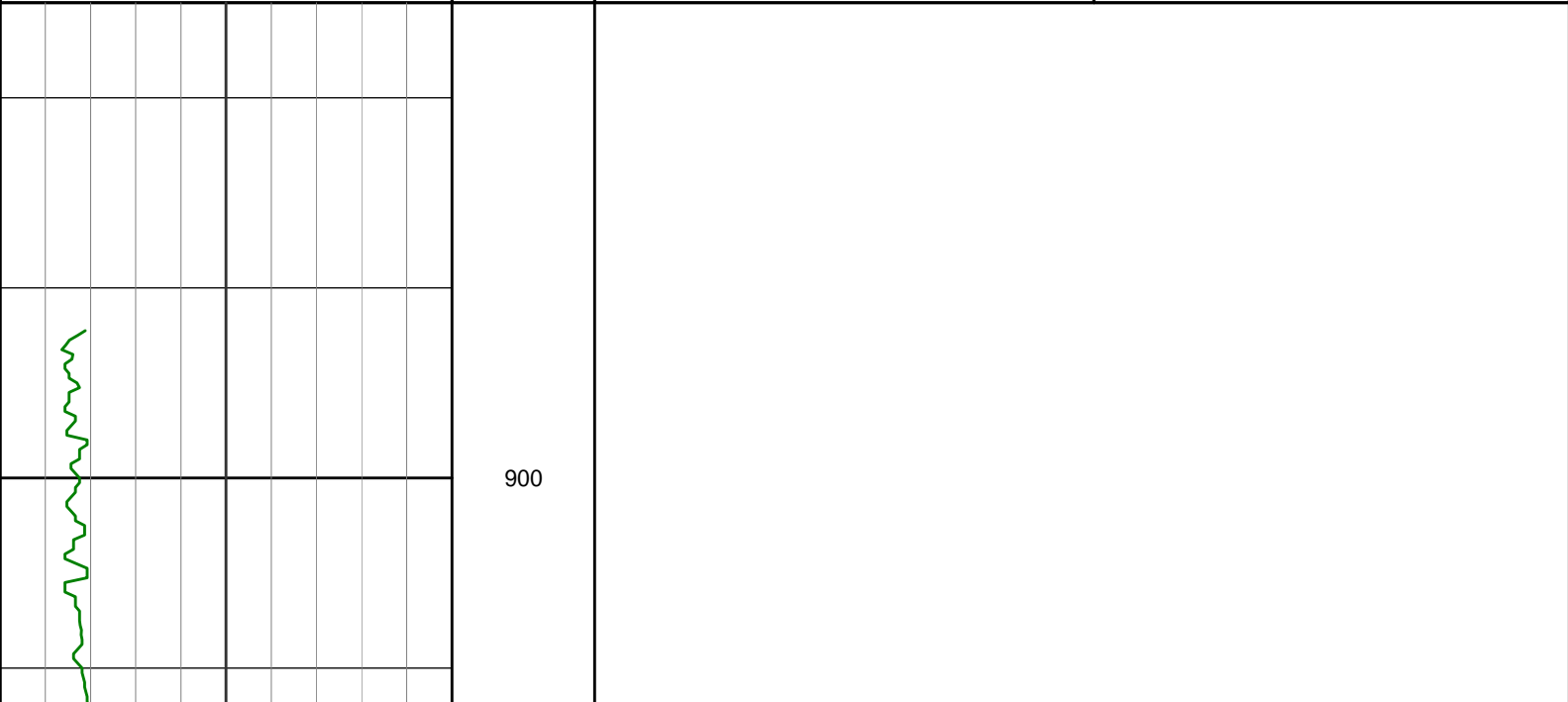
Inst Rate of Penetration ROPI feet per hr	Depth TVD ft	Depth	Inc	Azi	TVD	V.S.	Temp
1K 0							

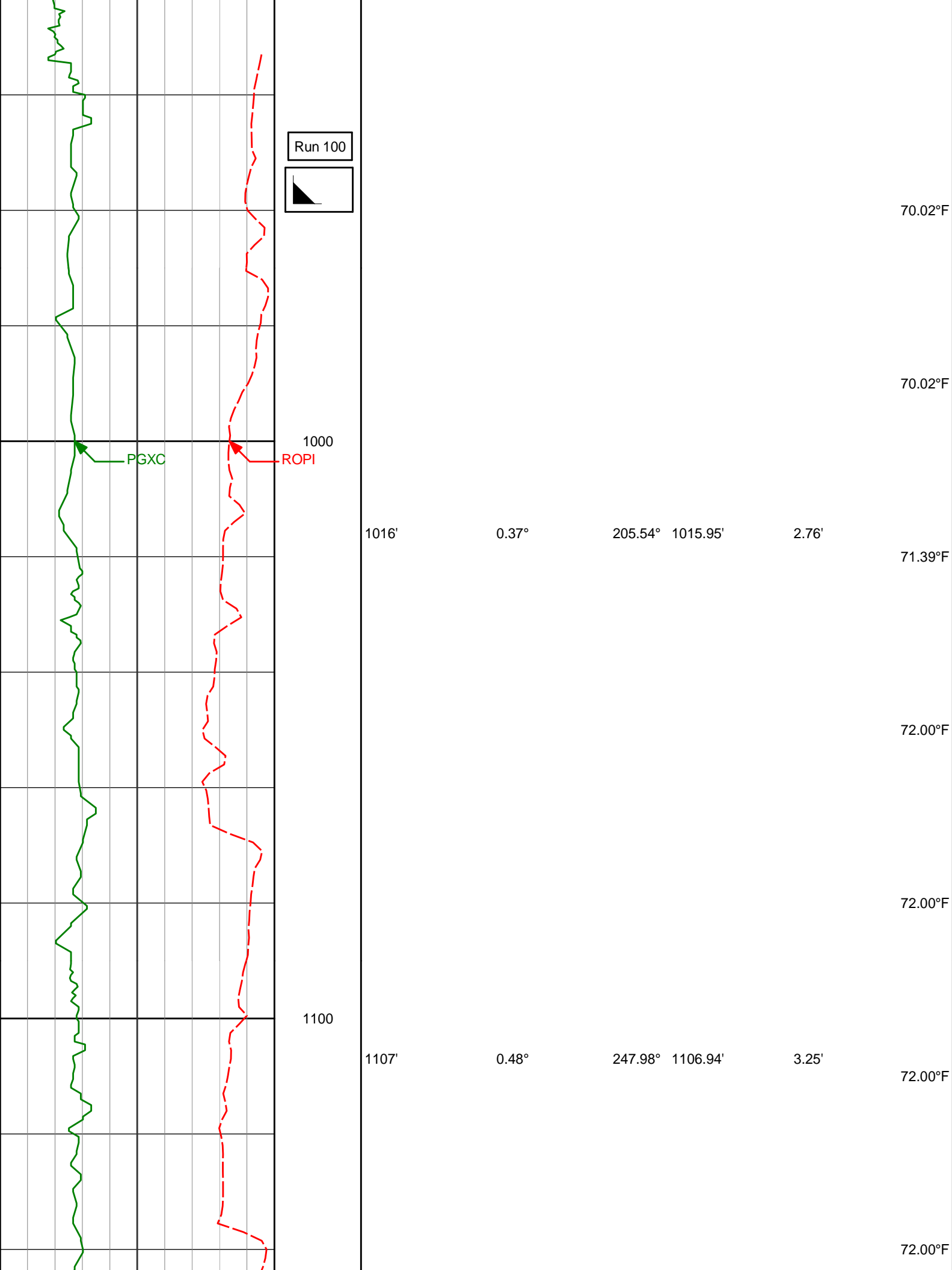
PCG GR XHi-Range RT BCor PGXRC-T api	
0 300	

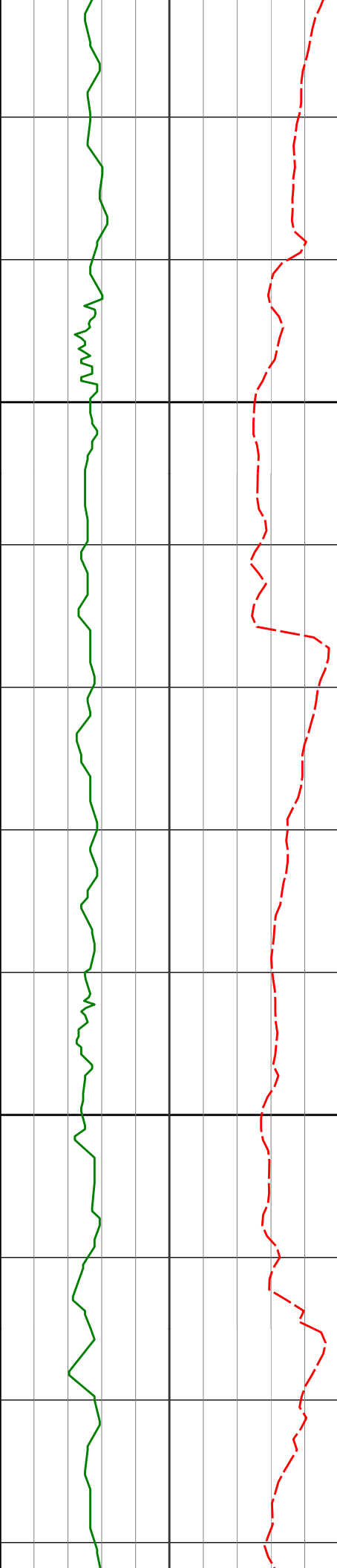
TVD Detail 1:240 Scale

PCG GR XHi-Range RT BCor PGXRC-T api	
0 300	

Inst Rate of Penetration ROPI feet per hr	Depth TVD ft	Depth	Inc	Azi	TVD	V.S.	Temp
1K 0							







1200

1199'

0.48°

232.23°

1198.94'

3.93'

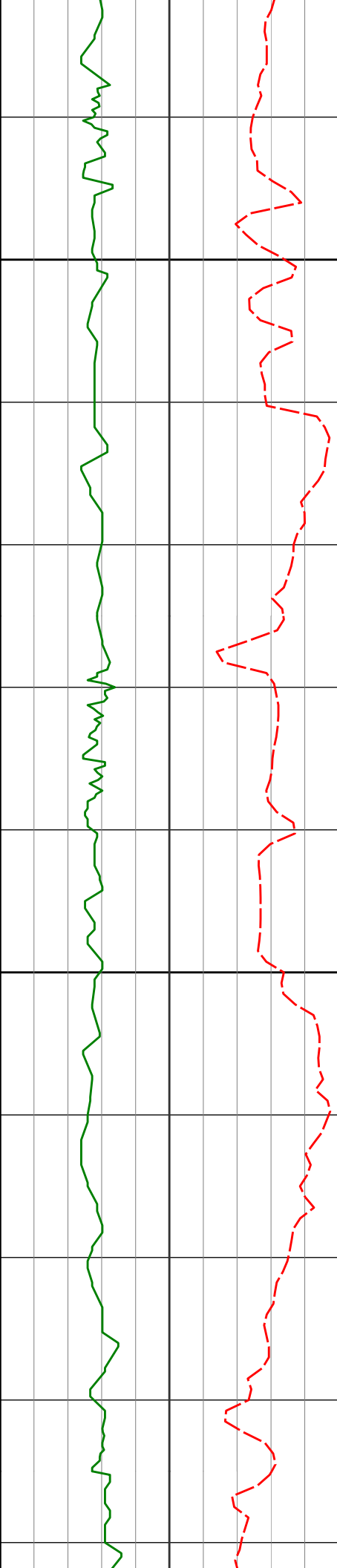
75.97°F

75.97°F

1300

75.97°F

75.97°F



1400

1500

1382'

0.87°

216.62°

1381.93'

5.42'

77.99°F

78.89°F

1474'

0.96°

221.83°

1473.92'

6.39'

80.01°F

80.01°F

80.01°F

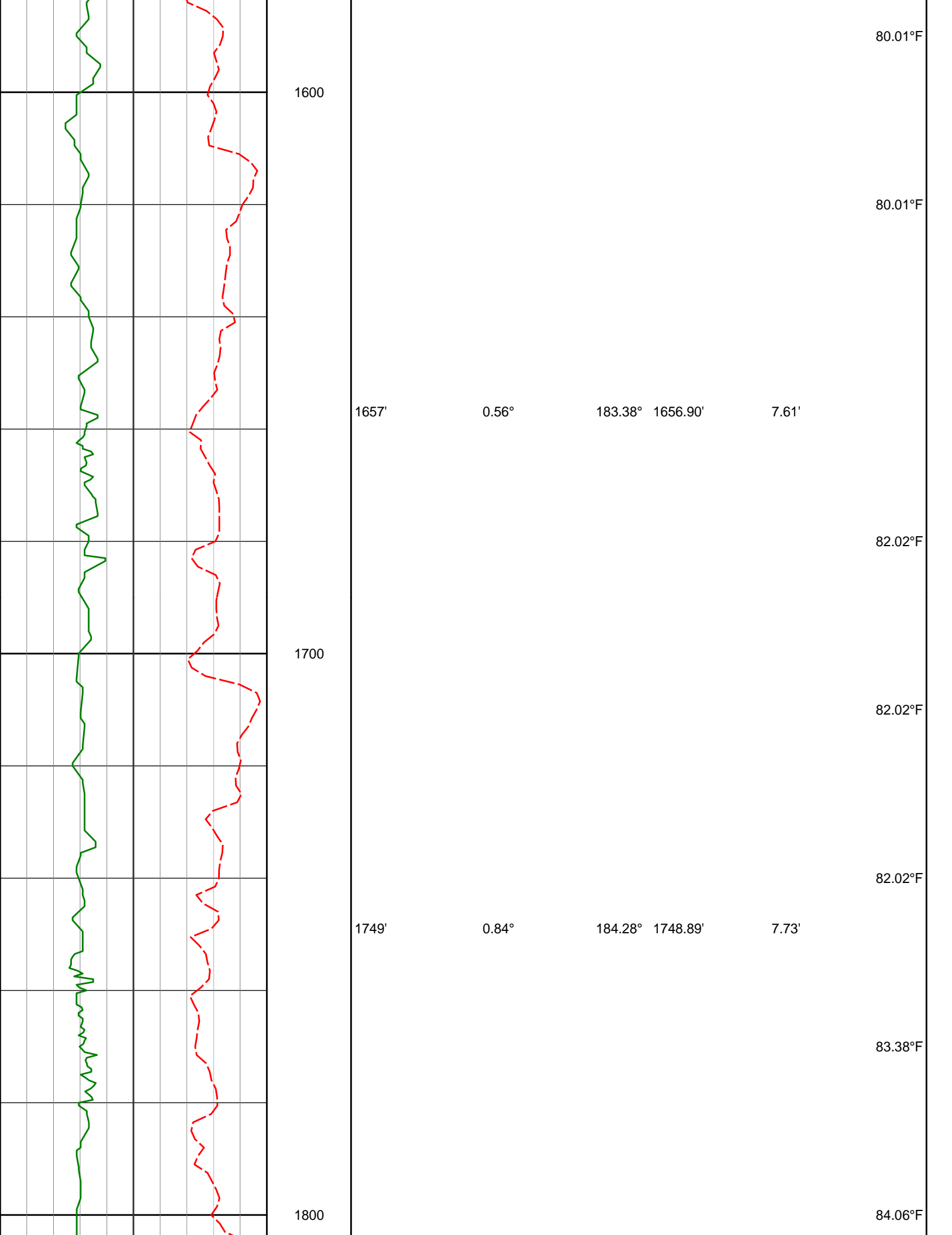
1565'

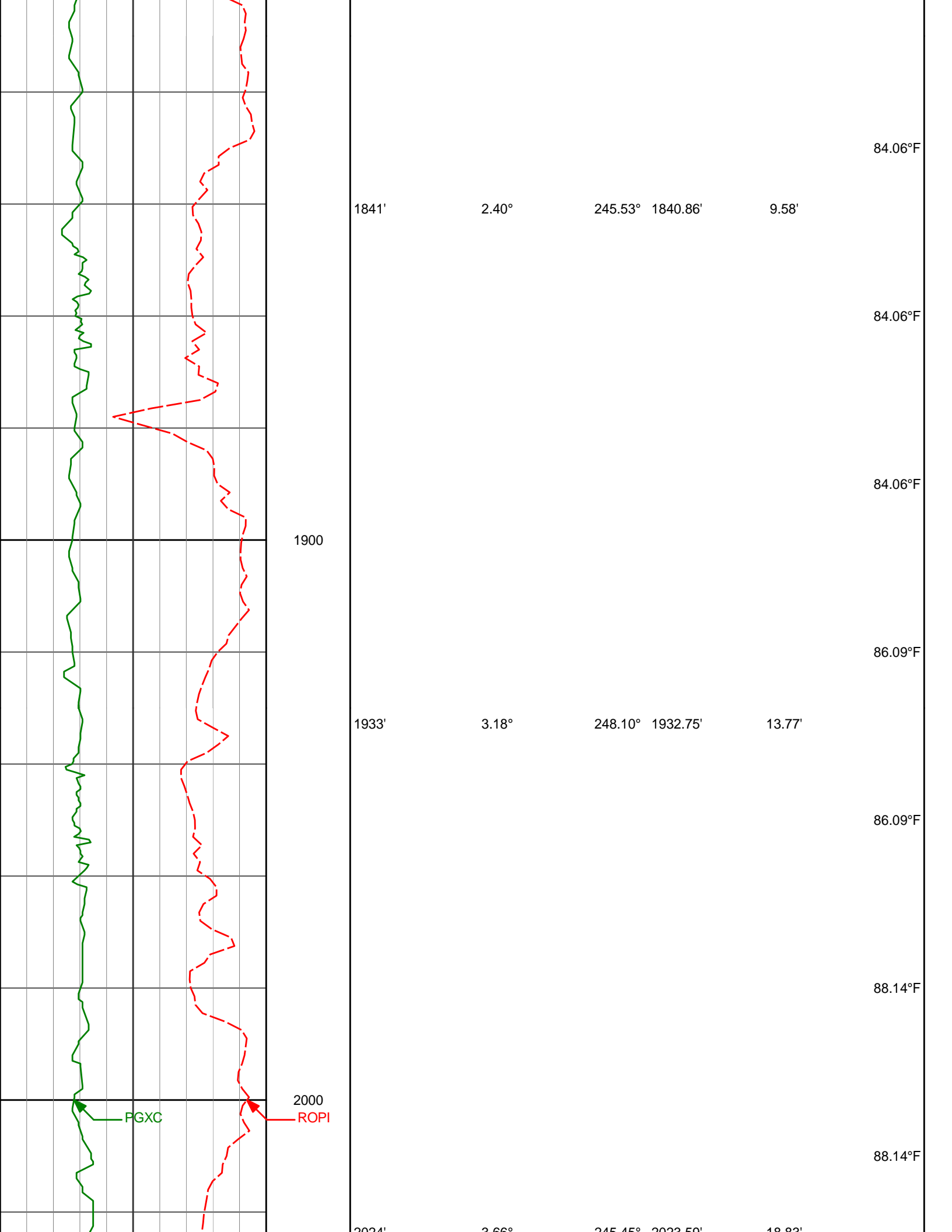
0.72°

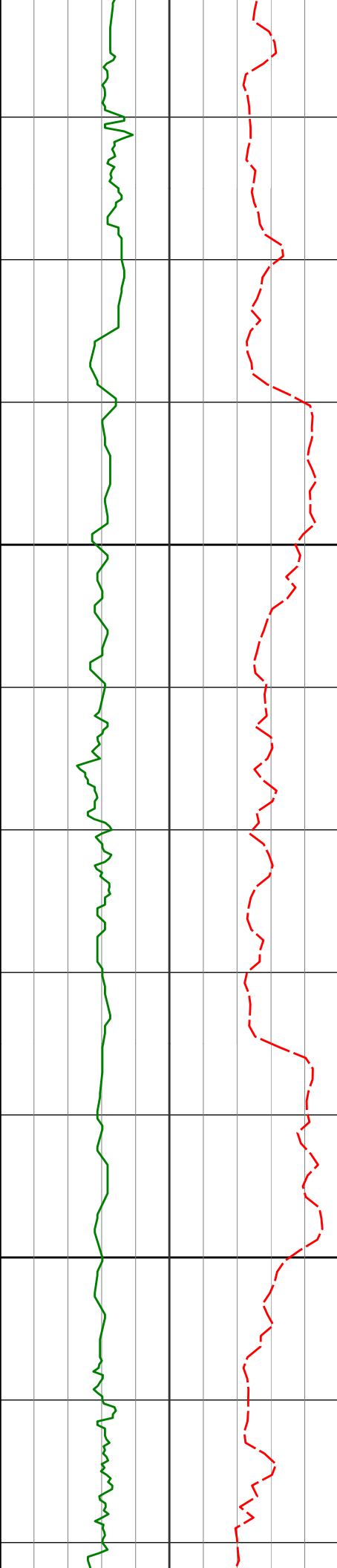
211.83°

1564.91'

7.24'







2100

2116'

3.99°

243.28°

2115.38'

24.45'

90.19°F

90.19°F

90.19°F

90.67°F

2200

2209'

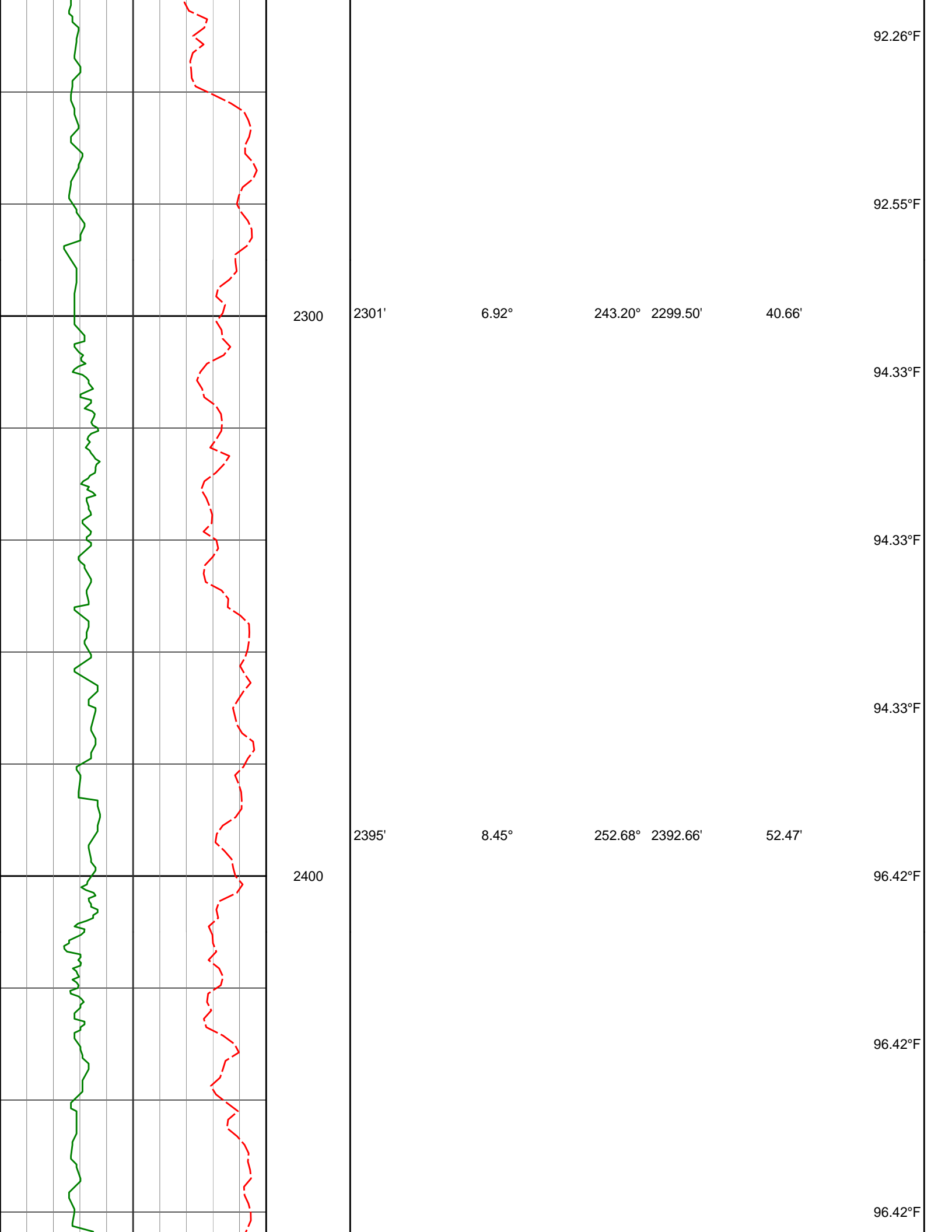
5.60°

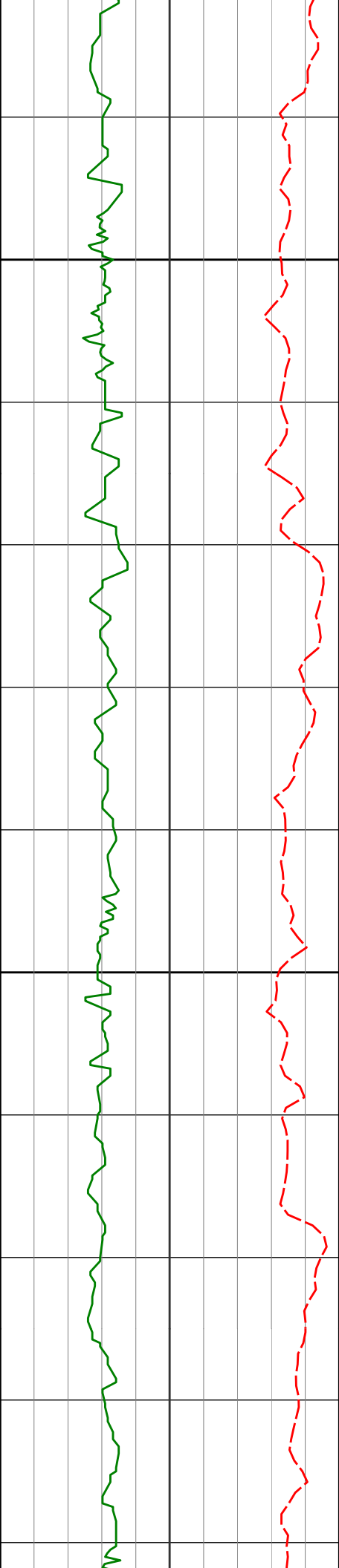
243.60°

2208.05'

31.53'

91.97°F





2490'

8.88°

252.03°

2486.58'

66.26'

96.87°F

2500

151.77°F

152.91°F

2585'

9.61°

249.90°

2580.34'

80.86'

98.51°F

2600

100.62°F

100.62°F

2679'

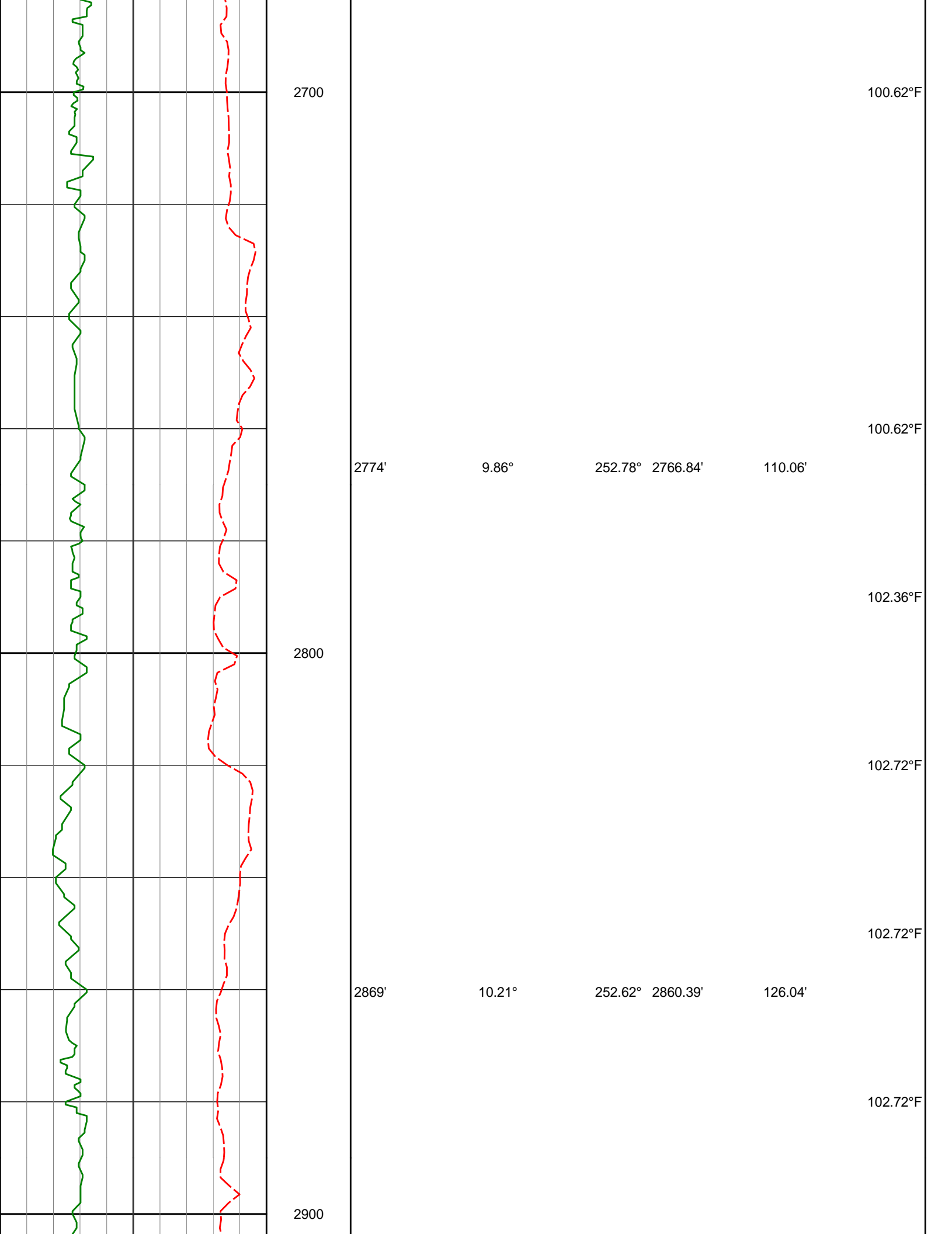
8.93°

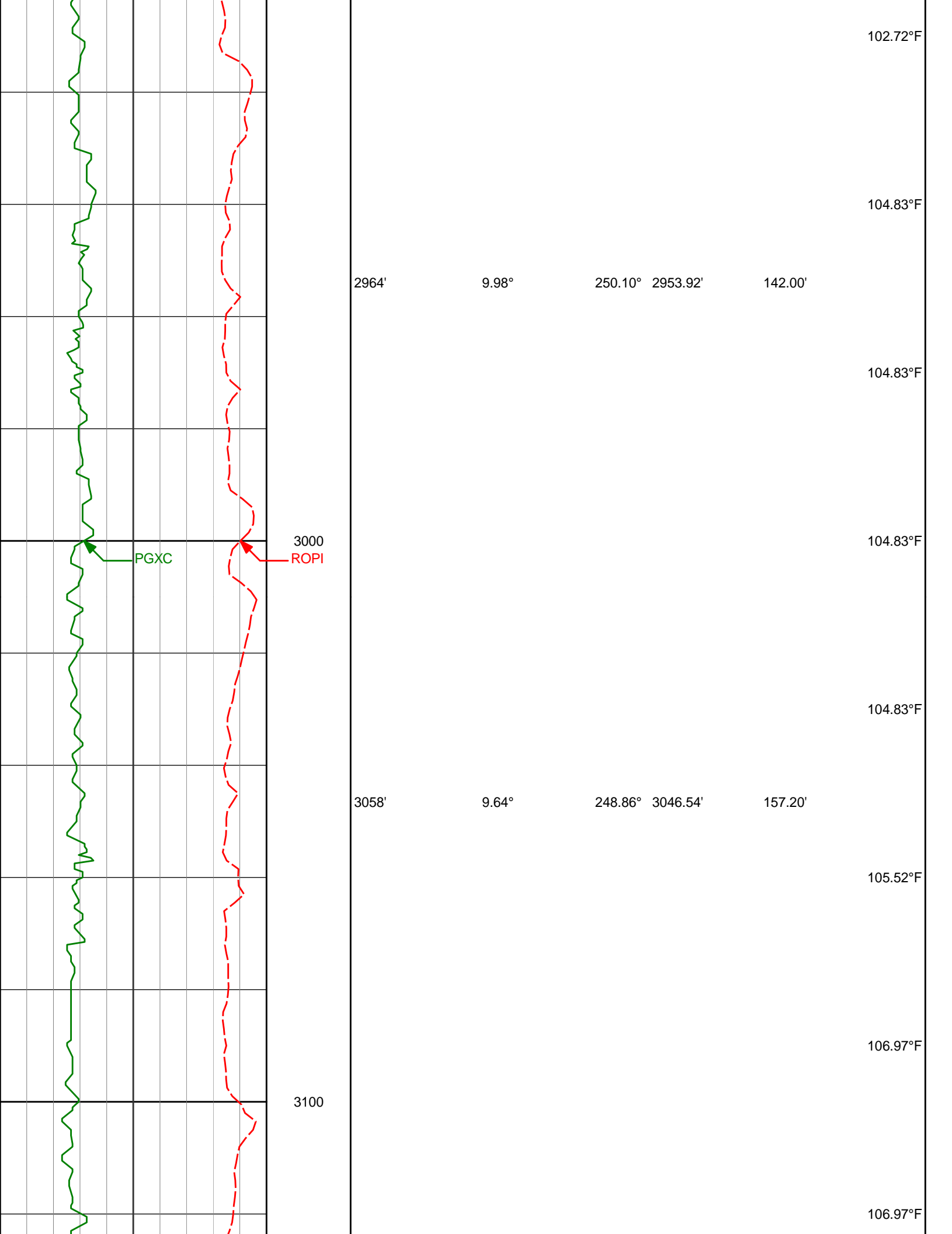
249.03°

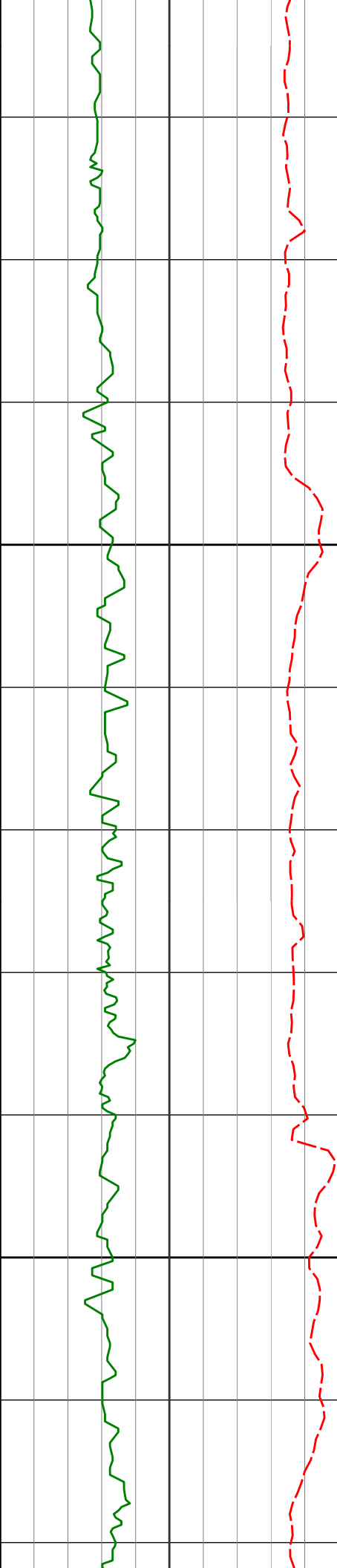
2673.11'

95.23'

100.62°F







3200

3300

3153'

9.00°

246.34°

3140.29'

171.63'

106.97°F

106.97°F

109.09°F

3248'

8.07°

243.37°

3234.23'

184.61'

109.09°F

109.09°F

110.06°F

3342'

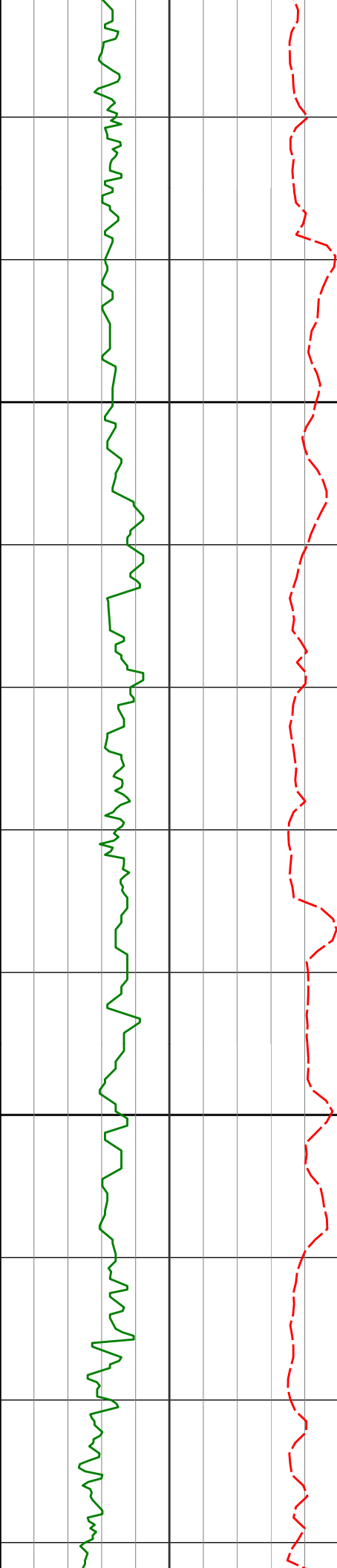
7.70°

245.28°

3327.35'

196.43'

111.24°F



3400

3437'

8.62°

246.45°

3421.38'

208.93'

111.52°F

111.24°F

111.24°F

113.40°F

113.40°F

3500

3531'

8.36°

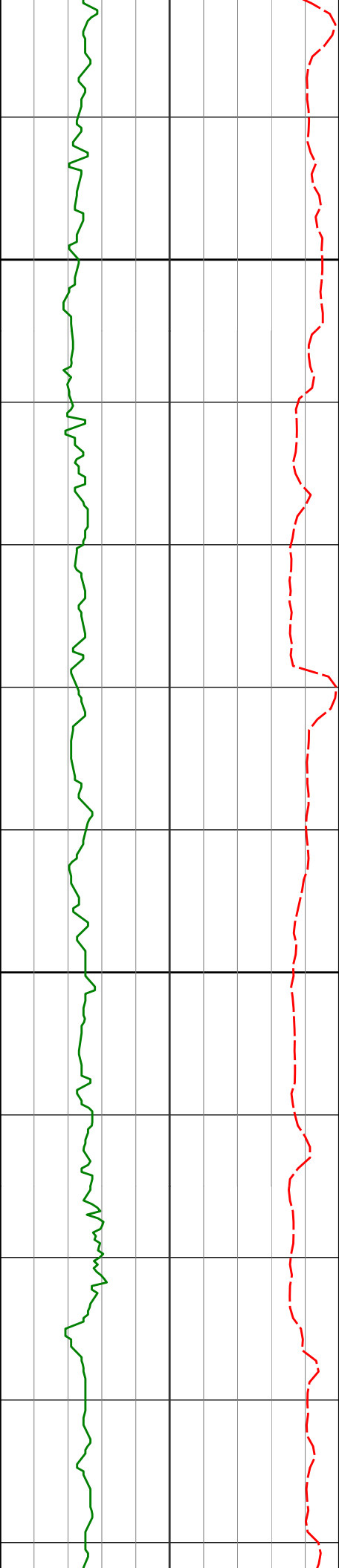
254.47°

3514.36'

222.14'

113.40°F

113.40°F



3600

3626'

9.84°

263.39°

3608.16'

236.95'

3700

3721'

10.95°

266.88°

3701.60'

254.07'

113.40°F

113.40°F

115.56°F

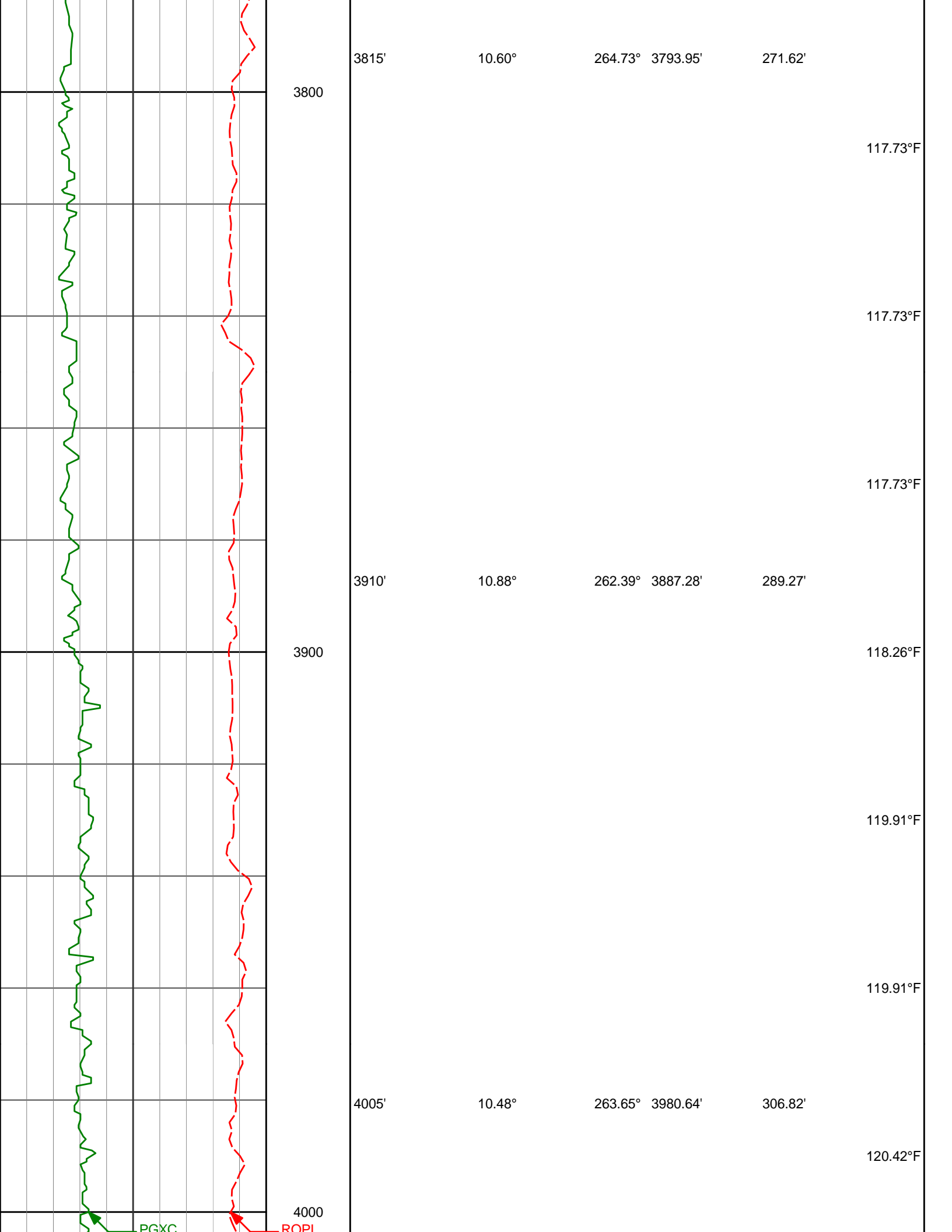
115.56°F

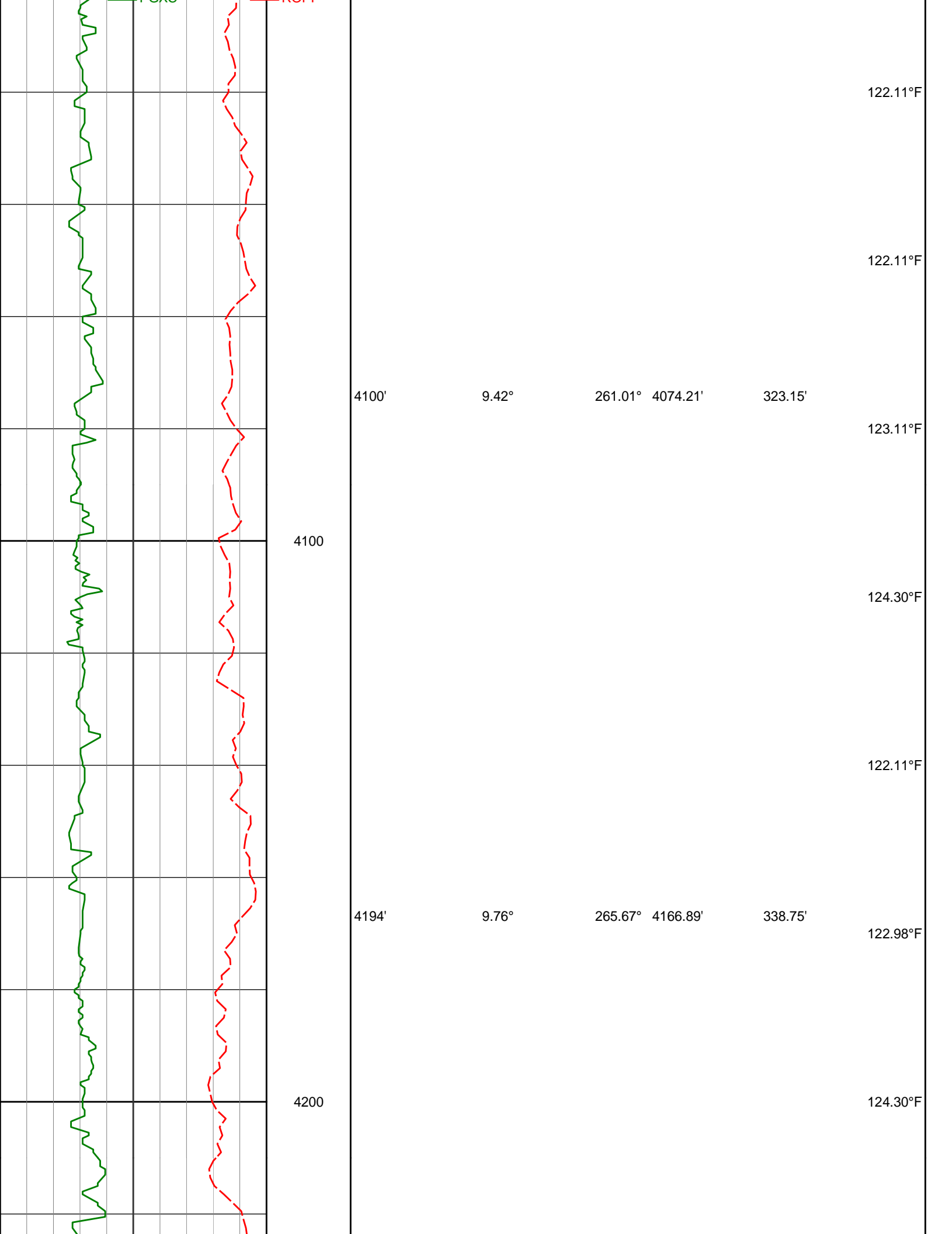
115.56°F

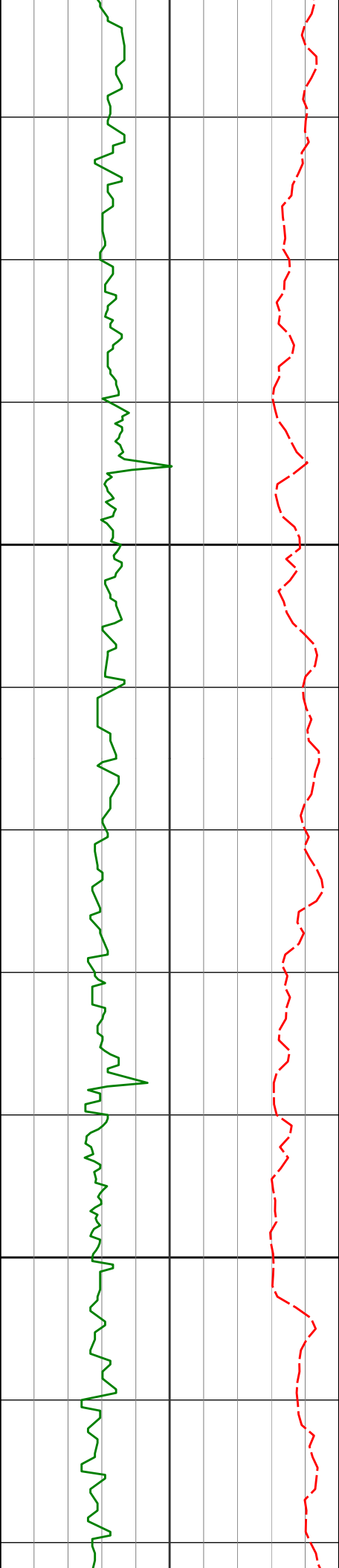
116.20°F

117.01°F

117.73°F







4300

4400

4289'

8.57°

271.26°

4260.68'

353.86'

124.86°F

124.62°F

124.30°F

125.19°F

126.52°F

126.52°F

126.76°F

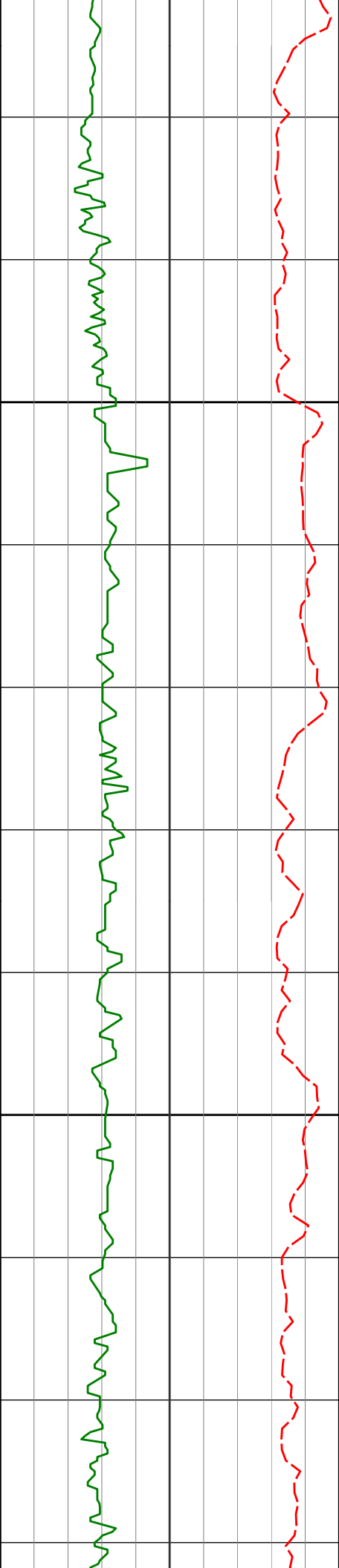
4384'

8.25°

265.19°

4354.66'

367.74'



4479'

9.17°

263.88°

4448.56'

382.10'

128.57°F

4500

128.73°F

128.73°F

4574'

10.44°

255.60°

4542.18'

398.06'

128.73°F

128.73°F

4600

130.96°F

4668'

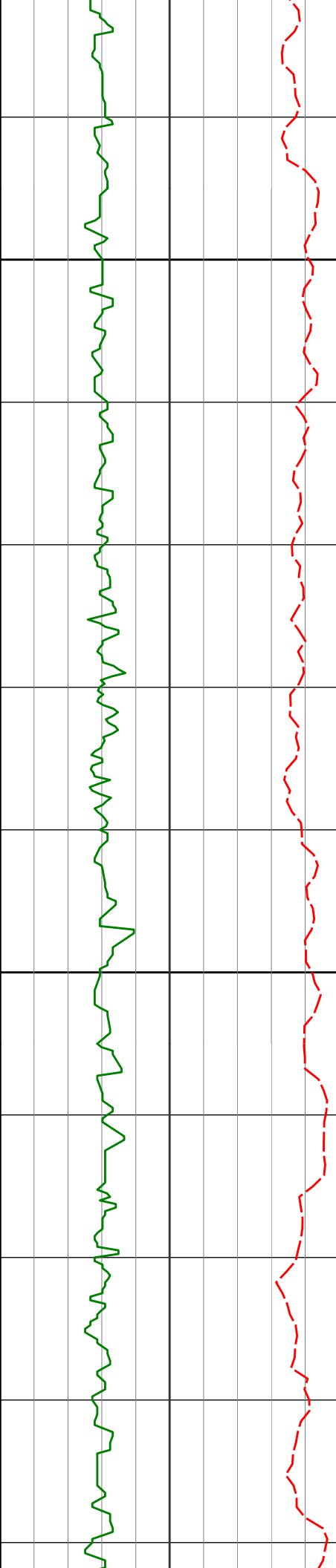
8.89°

254.10°

4634.84'

413.44'

130.96°F



4700

4763'

6.94°

258.10°

4728.93'

426.23'

4800

4858'

6.86°

242.23°

4823.25'

437.00'

131.43°F

133.20°F

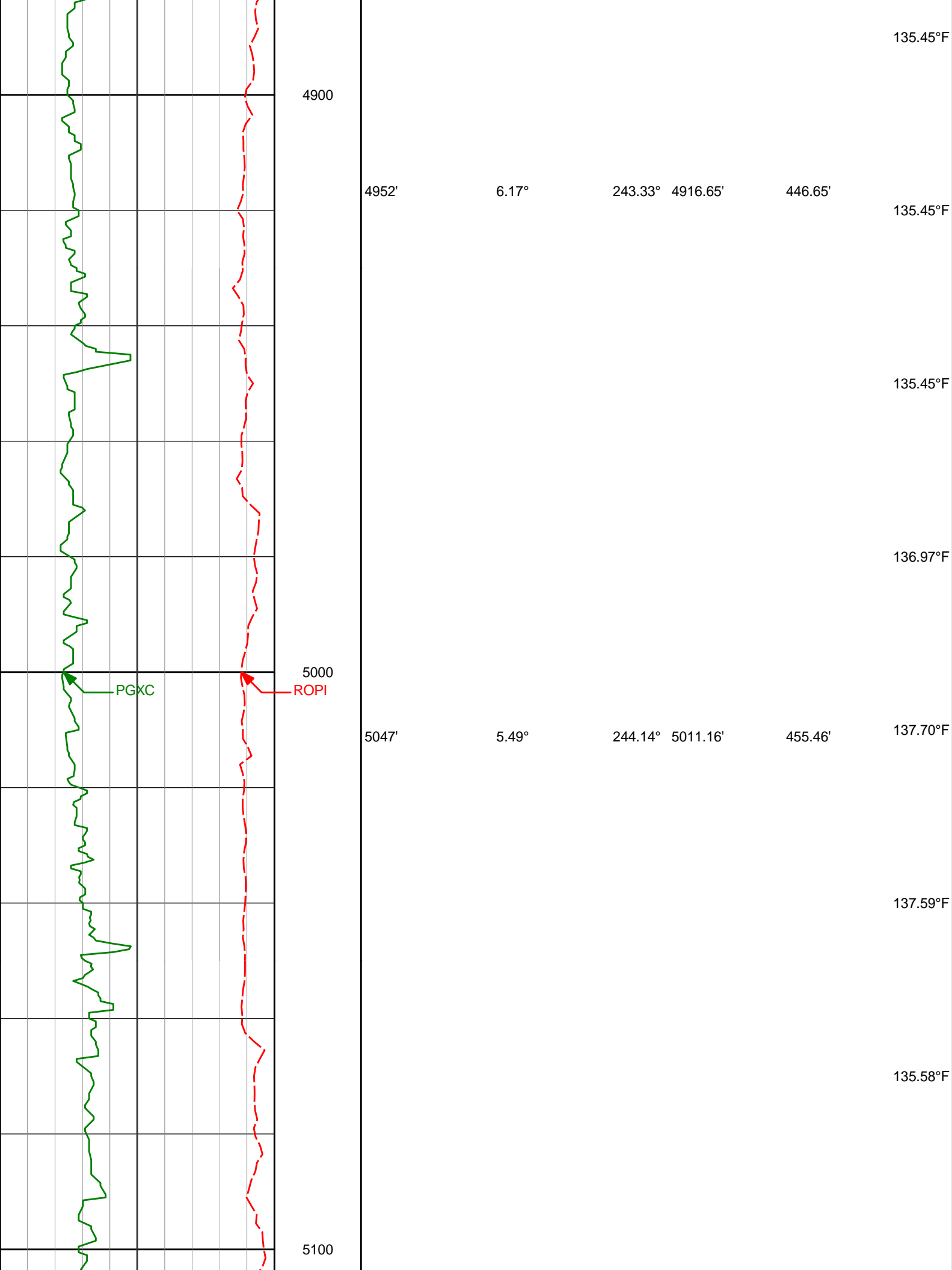
133.20°F

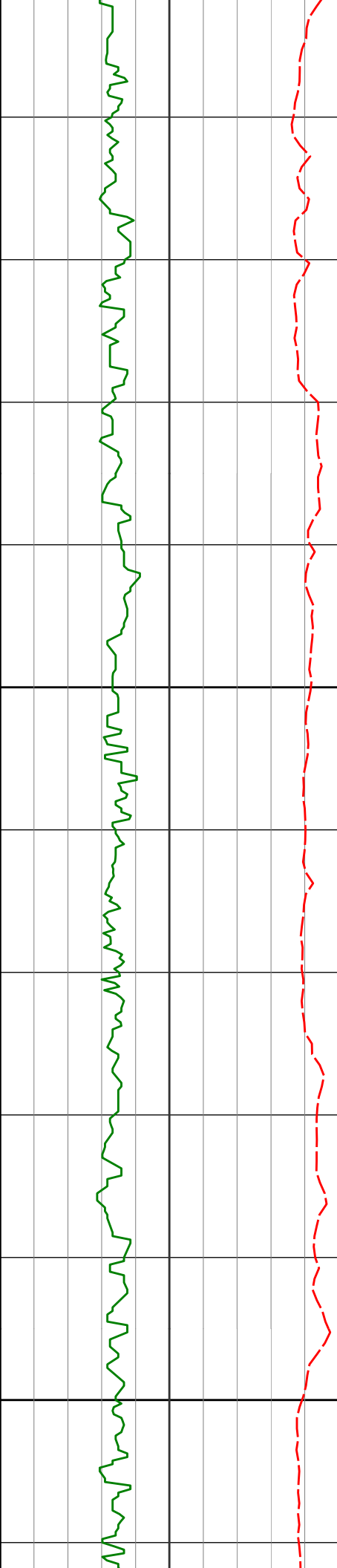
133.20°F

133.20°F

133.20°F

133.20°F

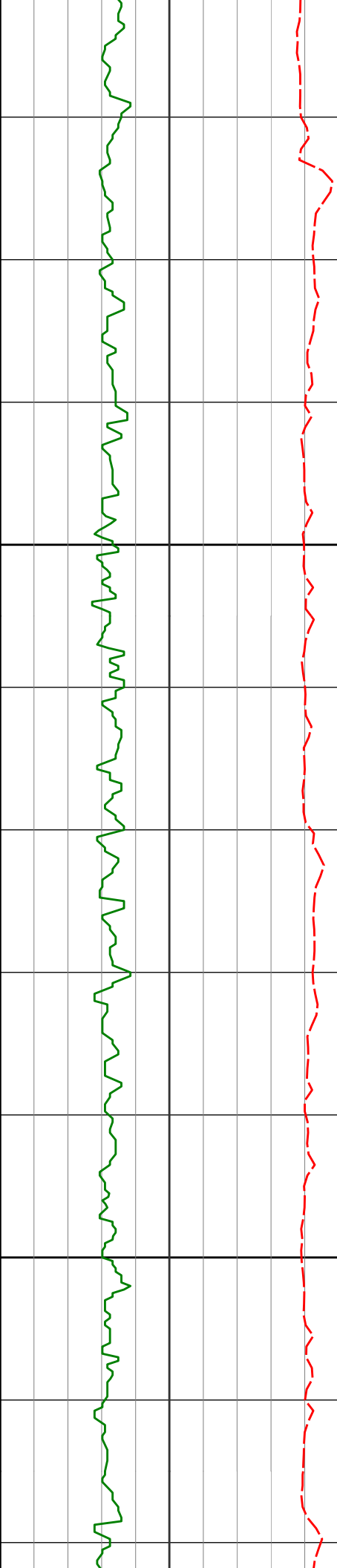




5200

5300

5141'	2.62°	265.62°	5104.92'	461.72'	
					139.96°F
					139.96°F
					139.96°F
5236'	1.79°	276.60°	5199.84'	465.36'	
					139.96°F
					139.96°F
					139.96°F
5330'	0.45°	155.88°	5293.83'	466.67'	
					139.96°F



5400

5500

5425'

0.87°

55.70°

5388.83'

465.92'

5520'

0.94°

45.74°

5483.81'

464.73'

139.96°F

139.96°F

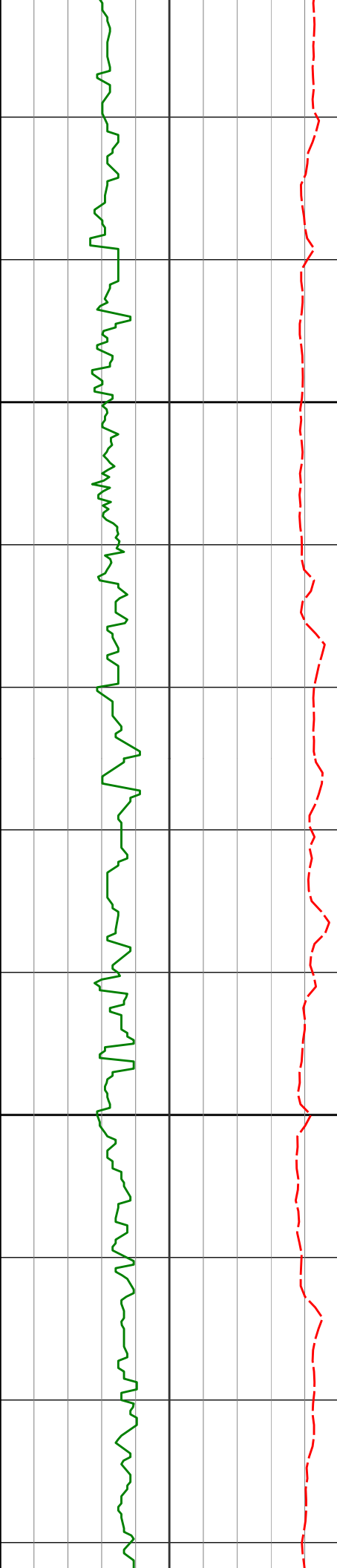
141.52°F

142.25°F

142.25°F

143.20°F

144.54°F



5600

5700

5614'

0.68°

29.44° 5577.80'

463.87'

5709'

1.42°

176.84° 5672.80'

463.55'

144.54°F

144.54°F

144.54°F

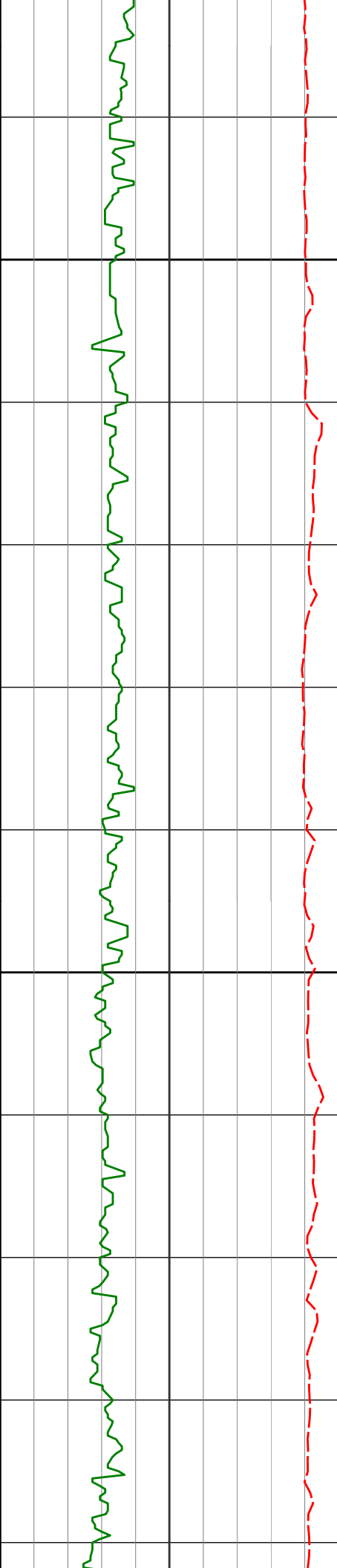
144.54°F

144.54°F

144.54°F

144.54°F

144.54°F



5803'

1.85°

194.47° 5766.76'

463.97'

5800

146.84°F

146.84°F

146.84°F

5898'

1.39°

228.23° 5861.72'

465.29'

5900

149.14°F

148.02°F

146.84°F

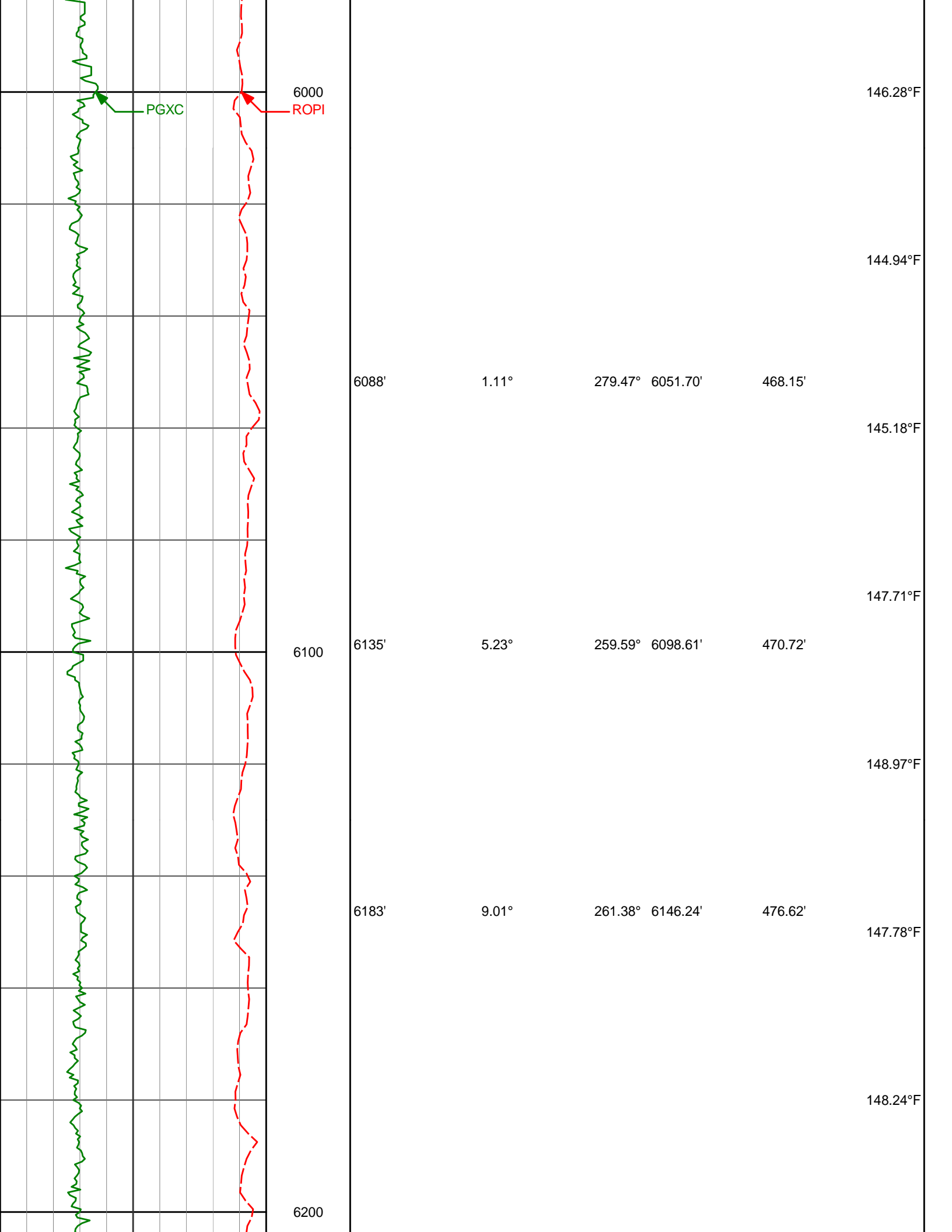
5993'

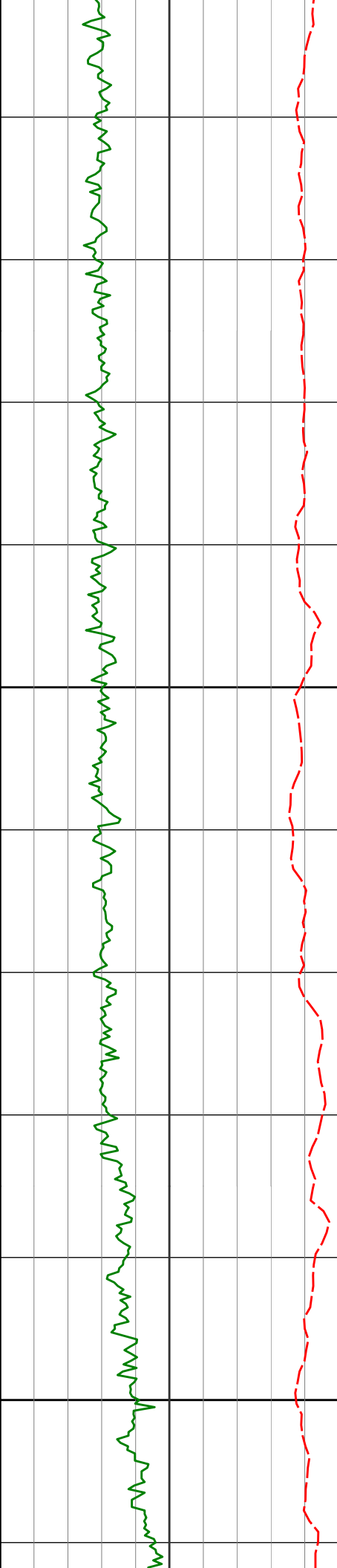
0.65°

262.13° 5956.71'

466.72'

146.84°F





6300

6400

6277'

16.87°

274.07°

6237.79'

497.53'

149.90°F

149.55°F

151.47°F

6372'

25.07°

274.54°

6326.43'

531.28'

151.47°F

151.47°F

6420'

27.47°

274.66°

6369.47'

552.38'

152.23°F

6467'

30.92°

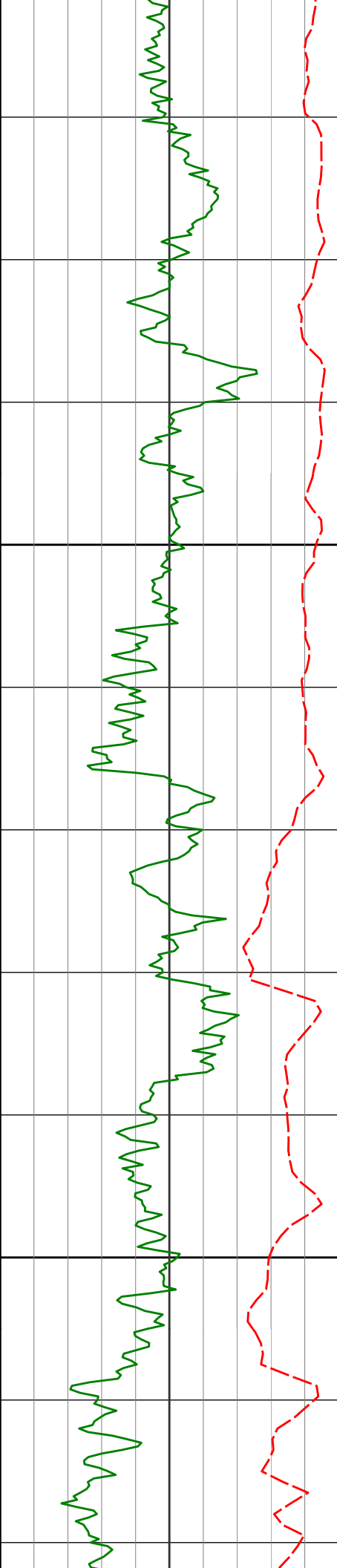
269.32°

6410.50'

575.23'

153.68°F

149.28°F

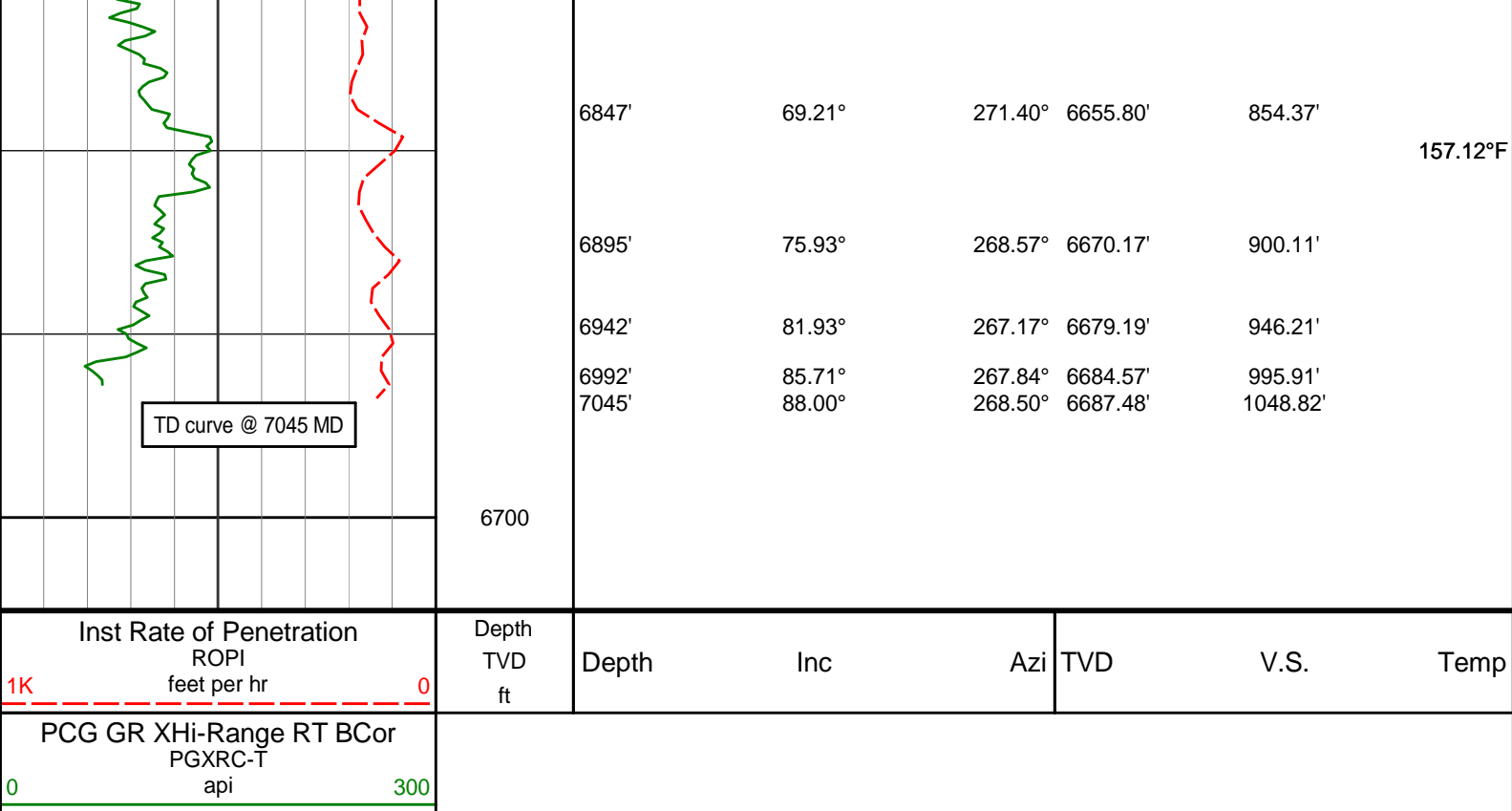


6500

200

6600

6515'	33.84°	265.50°	6451.03'	600.92'	153.79°F
6562'	37.19°	265.77°	6489.28'	628.20'	153.68°F
					151.02°F
					148.38°F
6657'	47.85°	263.67°	6559.37'	692.01'	148.87°F
6705'	55.01°	263.48°	6589.27'	729.41'	150.86°F
6752'	60.07°	267.08°	6614.50'	769.00'	153.78°F
6800'	63.82°	270.40°	6637.07'	811.34'	



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Colt A13-645
Wattenberg
Weld Colorado
USA

CA-XX-0902175509

Tied in @ Surface

First Three Survey's from 3rd party source (Multi Shot EMS)

Final survey projected to bit.

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
268.00	0.40	154.83	268.00	0.85 S	0.40 E	-0.37	0.15
575.00	0.40	95.43	574.99	1.92 S	1.92 E	-1.85	0.13
820.00	1.40	251.13	819.97	2.97 S	0.06 W	0.17	0.72
1016.00	0.37	205.54	1015.95	4.31 S	2.60 W	2.76	0.60
1107.00	0.48	247.98	1106.94	4.72 S	3.08 W	3.25	0.36
1199.00	0.48	232.23	1198.94	5.10 S	3.74 W	3.93	0.14
1382.00	0.87	216.62	1381.93	6.69 S	5.18 W	5.42	0.23
1474.00	0.96	221.83	1473.92	7.82 S	6.11 W	6.39	0.13
1565.00	0.72	211.83	1564.91	8.87 S	6.92 W	7.24	0.31
1657.00	0.56	183.38	1656.90	9.81 S	7.25 W	7.61	0.38
1749.00	0.84	184.28	1748.89	10.94 S	7.32 W	7.73	0.30
1841.00	2.40	245.53	1840.86	12.41 S	9.13 W	9.58	2.31
1933.00	3.18	248.10	1932.75	14.16 S	13.25 W	13.77	0.86
2024.00	3.66	245.45	2023.59	16.30 S	18.23 W	18.83	0.56
2116.00	3.99	243.28	2115.38	18.96 S	23.76 W	24.45	0.39
2209.00	5.60	243.60	2208.05	22.44 S	30.72 W	31.53	1.73
2301.00	6.92	243.20	2299.50	26.93 S	39.69 W	40.66	1.44
2395.00	8.45	252.68	2392.66	31.54 S	51.33 W	52.47	2.11
2490.00	8.88	252.03	2486.58	35.88 S	64.97 W	66.26	0.46
2585.00	9.61	249.90	2580.34	40.87 S	79.39 W	80.86	0.85

2679.00	8.93	249.03	2673.11	46.18 S	93.58 W	95.23	0.74
2774.00	9.86	252.78	2766.84	51.22 S	108.23 W	110.06	1.17
2869.00	10.21	252.62	2860.39	56.15 S	124.04 W	126.04	0.37
2964.00	9.98	250.10	2953.92	61.46 S	139.81 W	142.00	0.52
3058.00	9.64	248.86	3046.54	67.07 S	154.81 W	157.20	0.43
3153.00	9.00	246.34	3140.29	72.92 S	169.04 W	171.63	0.80
3248.00	8.07	243.37	3234.23	78.90 S	181.80 W	184.61	1.08
3342.00	7.70	245.28	3327.35	84.49 S	193.42 W	196.43	0.48
3437.00	8.62	246.45	3421.38	89.99 S	205.73 W	208.93	0.98
3531.00	8.36	254.47	3514.36	94.64 S	218.77 W	222.14	1.29
3626.00	9.84	263.39	3608.16	97.42 S	233.49 W	236.95	2.15
3721.00	10.95	266.88	3701.60	98.85 S	250.56 W	254.07	1.34
3815.00	10.60	264.73	3793.95	100.13 S	268.09 W	271.62	0.57
3910.00	10.88	262.39	3887.28	102.12 S	285.68 W	289.27	0.55
4005.00	10.48	263.65	3980.64	104.26 S	303.15 W	306.82	0.49
4100.00	9.42	261.01	4074.21	106.43 S	319.42 W	323.15	1.21
4194.00	9.76	265.67	4166.89	108.23 S	334.96 W	338.75	0.90
4289.00	8.57	271.26	4260.68	108.69 S	350.07 W	353.86	1.56
4384.00	8.25	265.19	4354.66	109.10 S	363.93 W	367.74	0.99
4479.00	9.17	263.88	4448.56	110.48 S	378.25 W	382.10	0.99
4574.00	10.44	255.60	4542.18	113.43 S	394.12 W	398.06	1.99
4668.00	8.89	254.10	4634.84	117.54 S	409.35 W	413.44	1.67
4763.00	6.94	258.10	4728.93	120.73 S	422.03 W	426.23	2.13
4858.00	6.86	242.23	4823.25	124.56 S	432.67 W	437.00	2.00
4952.00	6.17	243.33	4916.65	129.44 S	442.15 W	446.65	0.75
5047.00	5.49	244.14	5011.16	133.71 S	450.80 W	455.46	0.72
5141.00	2.62	265.62	5104.92	135.84 S	456.99 W	461.72	3.40
5236.00	1.79	276.60	5199.84	135.84 S	460.63 W	465.36	0.98
5330.00	0.45	155.88	5293.83	136.00 S	461.94 W	466.67	2.19
5425.00	0.87	55.70	5388.83	135.94 S	461.19 W	465.92	1.10
5520.00	0.94	45.74	5483.81	134.99 S	460.04 W	464.73	0.18
5614.00	0.68	29.44	5577.80	133.96 S	459.21 W	463.87	0.37
5709.00	1.42	176.84	5672.80	134.65 S	458.87 W	463.55	2.13
5803.00	1.85	194.47	5766.76	137.28 S	459.18 W	463.97	0.70
5898.00	1.39	228.23	5861.72	139.53 S	460.42 W	465.29	1.09
5993.00	0.65	262.13	5956.71	140.37 S	461.82 W	466.72	0.97
6088.00	1.11	279.47	6051.70	140.30 S	463.26 W	468.15	0.55
6135.00	5.23	259.59	6098.61	140.61 S	465.82 W	470.72	8.94
6183.00	9.01	261.38	6146.24	141.57 S	471.69 W	476.62	7.89
6277.00	16.87	274.07	6237.79	141.70 S	492.61 W	497.53	8.84
6372.00	25.07	274.54	6326.43	139.13 S	526.48 W	531.28	8.63
6420.00	27.47	274.66	6369.47	137.42 S	547.65 W	552.38	5.00
6467.00	30.92	269.32	6410.50	136.69 S	570.54 W	575.23	9.19
6515.00	33.84	265.50	6451.03	137.88 S	596.20 W	600.92	7.43
6562.00	37.19	265.77	6489.28	139.96 S	623.42 W	628.20	7.14
6610.00	42.28	264.34	6526.18	142.62 S	653.98 W	658.83	10.77
6657.00	47.85	263.67	6559.37	146.10 S	687.06 W	692.01	11.89
6705.00	55.01	263.48	6589.27	150.30 S	724.32 W	729.41	14.92
6752.00	60.07	267.08	6614.50	153.53 S	763.83 W	769.00	12.55
6800.00	63.82	270.40	6637.07	154.44 S	806.16 W	811.34	9.91
6847.00	69.21	271.40	6655.80	153.75 S	849.24 W	854.37	11.63
6895.00	75.93	268.57	6670.17	153.79 S	895.01 W	900.11	15.09
6942.00	81.93	267.17	6679.19	155.51 S	941.08 W	946.21	13.10
6992.00	85.71	267.84	6684.57	157.67 S	990.73 W	995.91	7.68
7045.00	88.00	268.50	6687.48	159.36 S	1043.62 W	1048.82	4.50

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 267.87 DEGREES (GRID)
A TOTAL CORRECTION OF 7.43 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7045.00 FEET
IS 1055.72 FEET ALONG 261.32 DEGREES (GRID)