OCCURRENCE OF GYPSUM AT THE WCS SITE

Outcrops of the Dockum Group in the RCRA landfill at the WCS site contain minor amounts of gypsum. Gypsum appears to be confined to a ~20 ft thick horizon roughly 30 ft below the caliche caprock and is absent from this horizon where calcic alteration has penetrated the upper Dockum surface. The gypsum horizon does not occur throughout the RCRA landfill excavation and is limited to the southern-most outcrops. Gypsum is contained within burrowed, mottled red, silty to sandy mudstone displaying blocky fabrics consistent with paleosol formation and pedogenic movement of clays. Slickensides are also common within the mudstone. Dockum Group cores from the site area show little evidence of gypsum to depths of up to 270 ft, indicating that the gypsum occurs only locally. The gypsum displays a variety of morphologies including fibrous antitaxial veins, lenticular gypsum rosettes, and passive pore-filling cements in fractures. In the following, we discuss describe each of these gypsum morphologies and then comment on its origin.

GYPSUM MORPHOLOGIES

Poorly preserved, discontinuous, arcuate to planar, subvertical to subhorizontal, antitaxial gypsum-filled veins occur within the gypsum-bearing interval at the WCS site (Figure 1). Crystals within the veins are blocky and are primarily oriented perpendicular to the edge of the vein, indicating that minimum principle stresses were oriented subvertically when the veins formed (e.g., Durney and Ramsay, 1973; Ramsay, 1980). Gypsum crystals within the veins appear to be partly corroded or fluted and may show local overgrowths or recrystallization (Figure 2), indicating a complex fluid history since the veins first formed. Medial lines,

commonly associated with antitaxial veins, are poorly preserved due to gypsum dissolution, overgrowth, and possible recrystallization.

At the WCS site, lenticular gypsum rosettes occur in elongated zones along some fractures, in cylindrical zones (possible rizoliths) (Figure 3), and as irregular masses (Figure 4). Gypsum crystals range up to ~1 cm and contain inclusions of the mudstone host rock. The morphology of the gypsum crystals provides some information about their origin. Lenticular gypsum crystals form from alkaline fluids (pH >7.5) in the presence of soluble organic materials at relatively high temperatures (greater than ~ 35° C) (e.g., Cody, 1979; Cody and Cody, 1988). Lenticular penetration twins observed at the WCS site also require the presence of high concentrations of terrestrial humic substances in the pore fluids (Cody and Cody, 1988).

Large (several cm), interlocking gypsum crystals occupy some fractures at the WCS site (Figure 5). Some crystals contain small inclusions of mudstone, while the surfaces of other crystals are lenticular. The large crystal size indicates that most of this gypsum grew passively into and filled existing void space associated with fractures. Limited displacive and incorporative growth may have occurred as the crystals began to encroach on the boundary of previously open fractures.

DISCUSSION

Widespread occurrences of antitaxial gypsum veins have been attributed to stresses induced by large-scale processes such as unloading (Holt and Powers, 1990 a, b; El Tabakh et al, 1998) and collapse due to regional-scale dissolution (Gustavson et al., 1994). The limited vertical and areal extent of gypsum at the WCS site, however, eliminates unloading and dissolution as a potential cause of the gypsum veins found at the site. Because the veins are typically small in

length (< 1 m), discontinuous, subvertical, and often arcuate, they likely developed below the water table in response to localized stress conditions within ductile Dockum mudstones. Under these conditions fracturing is not required to produce antitaxial gypsum veins, as the force of crystallization is sufficient to open the space required by the vein, and the orientation of veins and their fibers reflect local stress conditions (e.g., Means and Li, 2001; Elburg et al., 2002; Hilgers and Urai, 2005). Furthermore, it is difficult to maintain open fractures within a water-saturated mudstone. The original fibrous texture of the veins has been altered by recrystallization and overgrowth, and later gypsum undersaturated fluids dissolved and corroded vein fibers. Because other forms of gypsum are also present within the same limited area, it is likely that these veins developed within the same hydrologic environment as the other forms of gypsum present at the site. This does not represent a new concept as syndepositional gypsum veins have been reported elsewhere (e.g., Holt and Powers, 1990 a,b; Aref and Morsy, 2000).

The forms of gypsum present at the WCS site reveal additional information about the hydrologic system in which they formed. Crystal habits suggest that lenticular gypsum rosettes at the WCS site formed displacively in soft sediments containing warm and alkaline groundwater with high amounts of humic substances (e.g., Cody and Cody, 1988), requiring the decomposition of large amounts of plant matter. The lenticular habit of some of the passive pore-filling crystals suggests that they are coeval with the rosettes and also formed in warm, alkaline, humic-rich groundwater.

The limited extent of gypsum and its proximity to the caliche caprock at the WCS site suggest that hydrologic environments that formed gypsum were also of limited vertical and areal extent. Because abundant humic substances are required to form lenticular gypsum rosettes, the gypsum formed in a shallow, phreatic aquifer in a warm climate with abundant vegetation.

These conditions suggest that the gypsum likely developed beneath or at the margins of a small saline lake or wetland.

The source of dissolved gypsum within the groundwater need not be the deep evaporites that occur over 1,500 ft below the gypsum horizon. Low permeability mudstones separate deeper Dockum aquifers from the gypsum horizon, and current groundwater age dating (Darling, 2006) supports hydrologic separation. During the Triassic and throughout most of the Cenozoic, eastward-draining fluvial systems associated with the Dockum Group and Ogallala Formation crossed evaporite-bearing rocks exposed west and northwest of the WCS site. Groundwaters associated with these fluvial systems were likely to be enriched in dissolved gypsum. Sulfate may also have been derived from sulfide minerals within the Dockum group mudstones (e.g., Joeckel et al., 2005), atmospheric sulfer (e.g., Dultz and Kühn, 2005), Cretaceous seawater, or shallow saline groundwaters associated with saline lakes (e.g., Wood and Jones, 1990).

Gypsum at the WCS site could not have formed in the Holocene. The relationship to pedogenic carbonate indicates gypsum formed earlier than the calcretes. The OAG interval at the WCS RCRA landfill currently contains no groundwater. Nearby, the pH of groundwater in two samples from the OAG aquifer is 7.36 and 7.15 (Darling, 2006), too low to generate lenticular crystals (Cody and Cody, 1988). Furthermore, OAG waters are undersaturated with respect to gypsum, and the vegetative cover cannot provide sufficient humic substances to generate gypsum rosettes.

The gypsum horizon predates the development of the caprock caliche. Gypsum is absent where calcic alteration associated with the caliche caprock has penetrated the upper Dockum surface. The caprock developed on a long stable topography. In the vicinity of topographically low areas, downward percolating fluids dissolved gypsum, reducing the areal extent of the

gypsum horizon. The gypsum horizon was preserved in topographically high areas where gypsum was beyond the depth of high amounts of infiltrating precipitation. Some etching and corrosion of gypsum veins likely occurred during the development of the caprock.

In the vicinity of the WCS site, conditions suitable for the development of warm, alkaline, saline lakes or wetlands bounded by vegetated environments have existed several times prior to the development of the caprock. Dockum mudstone textures observed at the WCS site are consistent with a wetland or a shallow lacustrine environment, and the Dockum environment was sufficiently warm to produce lenticular gypsum. Abundant burrowing attests to significant biological activity, and soil textures suggest subaerial exposure and the presence of plants. During the accumulation of the Dockum, fluvial systems drained evaporite terrains west and northwest of the site (McGowen et al., 1979). Groundwaters associated with these systems were likely sufficiently alkaline and saline to lead to localized gypsum accumulation in the vicinity of wetlands and lakes. These conditions persisted after Dockum deposition. Eastward drainage of evaporite terrains likely continued after Dockum deposition until the accumulation of the Antlers Formation during the Cretaceous. While this period of time is dominated by net erosion, localized wetlands or saline lakes capable of accumulating the WCS gypsum may have developed. During the Cenozoic, eastward drainage over evaporite terrains again resumed, and localized wetlands or saline lakes could have formed.

SUMMARY

There are three major summary points from this examination of gypsum occurrences at the WCS site and a review of literature:

- Because the gypsum is limited in areal extent and occurs within a limited horizon near the upper surface of the Dockum redbeds, the occurrence of gypsum cannot be related to large-scale processes such as unloading or dissolution of underlying evaporites.
- Antitaxial gypsum vein morphologies suggest that the veins developed in response to localized stress conditions.
- Gypsum morphologies indicate formation in shallow, warm, alkaline groundwaters. The most likely setting and time of formation is syndepositional, as sulfate, organic activity, and warm temperatures should have been present at and near the surface; other possible periods of exposure or near-exposure occurred between Dockum deposition and the deposition of the Cretaceous Antlers Formation and in the Cenozoic prior to the accumulation of the caprock.

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APPENDIX A FIGURES

Figure 1. Antitaxial gypsum veins found in the WCS RCRA landfill are discontinuous and display planar (P) and arcuate (A) morphologies.

Figure 2. Gypsum crystals within antitaxial veins appear to be partly corroded or fluted and show local overgrowths and possible recrystallization.

Figure 3. Rosettes of gypsum crystals display lenticular crystal habits. This example occurs in a roughly cylindrical zone and could be a rizolith.

Figure 4. Some lenticular gypsum rosettes occur in irregular masses within the host mudstone.

Figure 5. This gypsum fracture filling from the WCS site displays large interlocking crystals with lenticular surfaces. Note that some wall rock mudstone has been incorporated within the crystals, especially along crystal boundaries.

APPENDIX B

BASIC STRATIGRAPHIC DATA FROM OIL AND GAS WELLS

AT AND AROUND THE WCS SITE

Stratigraphic Data at WCS Site (Figures 14-19)												
		Depth Data (ft below reference elevation)				Elevation Data (ft amsl)				Thickness Data (ft)		
API Number	Reference Elevation (ft amsl)	Top of Rustler Fm	Base of Rustler Fm	Base of Cowden Anhydrite	Base of Salado Fm	Top of Rustler Fm	Base of Rustler Fm	Base of Cowden Anhydrite.	Base Salado	Rustler Fm	Salado Fm	Base of Cowden to base Salado
25-06572	3417	1272	1472	2264	2565	2145	1945	1153	852	200	1093	301
25-06769	3420	1324	1523	2293	2585	2096	1897	1127	835	199	1062	292
25-07890	3566	1615	1826	2607	2896	1951	1740	959	670	211	1070	289
25-07894	3577	1621	1834	2605	2890	1956	1743	972	687	213	1056	285
25-09969	3380	1120	1342			2260	2038			222		
25-12111	3406	1582	1820	2628	2913	1824	1586	778	493	238	1093	285
25-12112	3399	1565	1804	2590	2882	1834	1595	809	517	239	1078	292
25-12114	3362	1365	1600			1997	1762			235		
25-21104	3377	1330	1555	2390	2684	2047	1822	987	693	225	1129	294
25-21105	3386	1364	1595	2440	2734	2022	1791	946	652	231	1139	294
25-22768	3362	1416	1656	2499	2796	1946	1706	863	566	240	1140	297
25-22796	3483	1560	1786	2553	2837	1922.9	1696.9	929.9	645.9	226	1051	284
25-22883	3458	1557	1786	2584	2878	1901	1672	874	580	229	1092	294
25-22969	3463	1547	1773	2570	2862	1916	1690	893	601	226	1089	292
25-22977	3428	1520	1752	2572	2867	1908	1676	856	561	232	1115	295
25-22980	3363	1338	1558	2418	2711	2024.5	1804.5	944.5	651.5	220	1153	293
25-24841	3339	1175	1400	2237	2535	2164	1939	1102	804	225	1135	298
25-25158	3465	1177	1406	2256	2572	2288	2059	1209	893	229	1166	316
25-25479	3382	1196	1424	2227	2530	2186	1958	1155	852	228	1106	303
25-25644	3368	1186	1410	2220	2517	2182	1958	1148	851	224	1107	297
25-27902	3434	1404	1613	2397	2679	2029.5	1820.5	1036.5	754.5	209	1066	282
25-30005	3572	1631	1840	2615	2888	1941	1732	957	684	209	1048	273
25-33347	3583	1629	1845	2619	2897	1954	1738	964	686	216	1052	278
25-34171	3421	1190	1408	2195	2499	2231	2013	1226	922	218	1091	304
25-36130	3408	1563	1800	2591	2881	1845	1608	817	527	237	1081	290
25-37203	3411	1207	1404	2223	2524	2204	2007	1188	887	197	1120	301
25-37483	3372	1279	1500	2291	2580	2093	1872	1081	792	221	1080	289
3-00975	3422	1668	1903	2725	3000	1754	1519	697	422	235	1097	275
3-01209	3496	1620	1832			1876	1664			212		
3-01811	3441	1567	1798	2596	2877	1874	1643	845	564	231	1079	281
3-01812	3466	1560	1790	2597	2877	1906	1676	869	589	230	1087	280
3-01813	3491	1612	1833	2623	2917	1879	1658	868	574	221	1084	294
3-01814	3465	1616	1830	2613	2905	1849	1635	852	560	214	1075	292
3-02591	3368	1510	1742	2565	2847	1857.5	1625.5	802.5	520.5	232	1105	282
3-03756	3359	1630	1890	2595	2850	1728.5	1468.5	763.5	508.5	260	960	255
3-03757	3340	1600	1800	2551	2810	1740	1540	789	530	200	1010	259
3-04076	3554	1604	1816	2600	2880	1950	1738	954	674	212	1064	280
3-05102	3366	1603	1784	2547	2805	1762.7	1581.7	818.7	560.7	181	1021	258
3-05500	3386	1630	1830	2582	2850	1756	1556	804	536	200	1020	268
3-05906	3380	1545	1770	2568	2852	1835	1610	812	528	225	1082	284
3-06707	3332	1582	1796	2570	2835	1750	1536	762	497	214	1039	265

Stratigraphic Data at WCS Site (Figures 14-19)												
		Depth Data (ft below reference elevation)				Elevation Data (ft amsl)				Thickness Data (ft)		
API Number	Reference Elevation (ft amsl)	Top of Rustler Fm	Base of Rustler Fm	Base of Cowden Anhydrite	Base of Salado Fm	Top of Rustler Fm	Base of Rustler Fm	Base of Cowden Anhydrite.	Base Salado	Rustler Fm	Salado Fm	Base of Cowden to base Salado
3-07838	3345	1587	1793	2560	2815	1758	1552	785	530	206	1022	255
3-10364	3378	1613	1802	2554	2816	1765	1576	824	562	189	1014	262
3-10503	3378	1623	1806	2550	2816	1755	1572	828	562	183	1010	266
3-10806	3480	1601	1807	2587	2860	1879	1673	893	620	206	1053	273
3-11054	3525	1612	1827	2623	2911	1913	1698	902	614	215	1084	288
3-30290	3312	1600	1810	2587	2853	1712	1502	725	459	210	1043	266
3-31132	3557	1610	1825	2626	2898	1947	1732	931	659	215	1073	272
3-31589	3360	1644	1894	2590	2845	1716	1466	770	515	250	951	255
3-32910	3428	1654	1882	2688	2968	1774	1546	740	460	228	1086	280
3-33854	3435	1700	1918	2711	2983	1734.5	1516.5	723.5	451.5	218	1065	272
3-33882	3337	1720	1942	2710	2970	1617	1395	627	367	222	1028	260
3-34548	3540	1604	1814	2590	2867	1936	1726	950	673	210	1053	277
3-36041	3447	1637	1836	2608	2869	1810	1611	839	578	199	1033	261
3-36094	3471	1656	1895	2685	2966	1815	1576	786	505	239	1071	281
3-36289	3456	1724	1942	2703	2974	1732	1514	753	482	218	1032	271
3-36567	3435	1638	1838	2610	2875	1797	1597	825	560	200	1037	265
3-36967	3477	1661	1865	2639	2906	1816	1612	838	571	204	1041	267
3-37072	3468	1627	1810	2588	2856	1840.5	1657.5	879.5	611.5	183	1046	268
3-37214	3446	1654	1842	2621	2887	1792	1604	825	559	188	1045	266
3-37580	3382	1624	1854	2648	2930	1757.5	1527.5	733.5	451.5	230	1076	282
3-37680	3456	1673	1875	2650	2920	1783	1581	806	536	202	1045	270
3-37698	3438	1705	1935	2734	3010	1733	1503	704	428	230	1075	276
3-37734	3364	1620	1809	2540	2795	1744	1555	824	569	189	986	255
3-37880	3402	1636	1878	2700	2975	1766	1524	702	427	242	1097	275
3-38605	3410	1653	1854	2604	2864	1757	1556	806	546	201	1010	260
3-39026	3328	1545	1744	2507	2769	1783	1584	821	559	199	1025	262

Uncertain contacts or uninterpretable log intervals show as blank values

APPENDIX C

BASIC STRATIGRAPHIC DATA FROM OIL AND GAS WELLS

ACROSS A SECTION OF THE MESCALERO RIDGE, NM

Basic Drillhole Data from Mescalero Ridge for Figures 25-27													
API (30-025-#)	Township (S)	Range (E)	Section	Feet from north (n) or south (s) line	Feet from east (e) or west (w) line	UTMX (m)	UTMY (m)	Reference Point Elevation (ft. amsl)	Depth (ft) to top of Rustler Fm	Depth (ft) to top of Salado Fm	Thickness (ft) of Rustler Fm	Elevation (ft. amsl) of top of Rustler	Elevation (ft. amsl) of top of Salado
26706	18	34	23	330S	660E	638315	3621782	3995	1843	2103	260	2152	1892
02370	18	34	28	1980S	660E	635107	3620611	4028	1824	2085	261	2204	1943
02376	18	34	32	660N	1980W	632692	3619768	3927	1673	1950	277	2254	1977
26532	18	34	36	330N	1980W	638640	3619464	3986	1914	2183	269	2072	1803
26698	18	34	36	660N	660W	638740	3619867	3992	1907	2176	269	2085	1816
26817	18	34	36	380N	660E	639940	3619980	3969	1929	2200	271	2040	1769
03146	18	35	29	1980N	660W	641875	3621128	3948	1853	2112	259	2095	1836
27333	18	35	29	660s	660e	643255	3620304	3927	1792	2052	260	2135	1875
27392	18	35	30	990S	330W	640235	3620407	3971	1929	2198	269	2042	1773
26287	18	35	30	1980S	1980E	641106	3620710	3959	1905	2178	273	2054	1781
03149	18	35	31	660S	660E	641576	3618679	3921	1834	2101	267	2087	1820
26661	18	35	31	330N	330W	640241	3620000	3963	1923	2207	284	2040	1756
27618	18	35	31	660S	1980W	640762	3618694	3960	1910	2183	273	2050	1777
25839	18	35	32	1980N	660W	641933	3619885	3945	1860	2125	265	2085	1820
29121	18	35	32	660S	660E	643183	3618697	3935	1854	2126	272	2081	1809
29336	18	35	32	2280N	660E	643155	3619403	3931	1824	2090	266	2107	1841
26590	19	34	1	1980N	660E	639954	3617894	3962	1883	2165	282	2079	1797
22365	19	34	1	660S	660W	638736	3616930	3977	1863	2150	287	2114	1827
27827	19	34	2	1980N	1650E	638048	3617855	4020	1920	2209	289	2100	1811
32435	19	34	2	550S	1980E	637932	3616902	3989	1861	2150	289	2128	1839
36680	19	34	3	1650S	1650E	636407	3617293	4021	1872	2156	284	2149	1865
27181	19	34	3	1980N	660E	636735	3617784	3999	1871	2158	287	2128	1841
21156	19	34	3	718N	660E	636736	3618213	4003	1862	2142	280	2141	1861
36391	19	34	3	760N	660W	635534	3618183	4002	1830	2108	278	2172	1894
32963	19	34	4	2355S	400W	633847	3617410	3892	1644	1923	279	2248	1969
26348	19	34	11	1980N	660E	638333	3616221	3977	1848	2130	282	2129	1847
26783	19	34	11	1980S	660W	637138	3615794	3992	1857	2145	288	2135	1847
26473	19	34	11	660S	660E	638345	3615415	3970	1838	2130	292	2132	1840
27096	19	34	11	660S	660W	637146	3615393	3992	1871	2160	289	2121	1832
26707	19	34	11	990N	990E	638226	3616521	3981	1850	2134	284	2131	1847
36902	19	34	11	1830N	1980W	637572	3616222	3993	1862	2149	287	2131	1844
02384	19	34	12	660N	660W	638730	3616631	3974	1855	2150	295	2119	1824
22719	19	34	12	1980S	1980W	639147	3615833	3969	1845	2130	285	2124	1839
22984	19	34	12	1980S	660E	639945	3615847	3956	1867	2155	288	2089	1801
23634	19	34	12	520N	520E	639976	3616696	3932	1845	2126	281	2087	1806
22519	19	34	13	2310S	330W	638730	3614307	3965	1860	2162	302	2105	1803
22671	19	34	13	1980N	660W	638760	3614618	3954	1846	2142	296	2108	1812
28207	19	34	13	460N	990E	639854	3615102	3954	1856	2143	287	2098	1811
22181	19	34	13	660N	660W	638755	3615020	3968	1850	2145	295	2118	1823
22717	19	34	13	660S	660W	638771	3613814	3878	1793	2098	305	2085	1780
22069	19	34	14	1320N	660E	638353	3614812	3973	1857	2160	303	2116	1813
25493	19	34	14	1980N	1680E	638044	3614604	3967	1865	2165	300	2102	1802
23029	19	34	14	2080S	1980E	637957	3614233	3896	1800	2103	303	2096	1793
25506	19	34	14	660N	1980E	637946	3615004	3977	1852	2143	291	2125	1834
02386	19	34	15	330S	330W	635456	3613656	3777	1740	2048	308	2037	1729
26087	19	34	15	1980S	660W	635550	3614160	3780	1753	2057	304	2027	1723
21286	19	34	15	660N	660E	636748	3614982	3928	1810	2112	302	2118	1816
20812	19	34	15	660S	660W	635555	3613759	3801	1742	2050	308	2059	1751
23356	19	34	20	2310S	1650W	632656	3612605	3714	1650	1973	323	2064	1741
27556	19	34	23	1980N	1980E	637974	3612996	3827	1810	2120	310	2017	1707

Basic Drillhole Data from Mescalero Ridge for Figures 25-27														
API (30-025-#)	Township (S)	Range (E)	Section	Feet from north (n) or south (s) line	Feet from east (e) or west (w) line	UTMX (m)	UTMY (m)	Reference Point Elevation (ft amsl)	Depth (ft) to top of Rustler Fm	Depth (ft) to top of Salado Fm	Thickness (ft) of Rustler Fm	Elevation (ft amsl) of top of Rustler	Elevation (ft amsl) of top of Salado
29406	19	34	23	1980N	1980W	637580	3612988	3817	1794	2101	307	2023	1716
29299	19	34	23	1980N	660E	638378	3613002	3832	1804	2110	306	2028	1722
30839	19	34	24	1650S	2310W	639295	3612516	3812	1805	2105	300	2007	1707
24413	19	34	24	1980N	760E	639955	3613031	3840	1803	2100	297	2037	1740
24390	19	34	24	330S	1700E	639681	3612121	3794	1799	2108	309	1995	1686
2393	19	34	24	660N	660E	639980	3613434	3862	1802	2100	298	2060	1762
23502	19	34	24	660S	660W	638794	3612205	3794	1804	2110	306	1990	1684
28571	19	34	24	760S	2080E	639563	3612249	3814	1815	2123	308	1999	1691
21369	19	34	25	1980S	660W	638812	3610999	3753	1814	2120	306	1939	1633
25101	19	34	25	1670N	2310E	639504	3611508	3775	1795	2110	315	1980	1665
20889	19	34	25	1780N	1980W	639210	3611469	3771	1806	2117	311	1965	1654
25123	19	34	25	1800N	990E	639908	3611476	3772	1804	2113	309	1968	1659
22967	19	34	25	1980S	660E	640016	3611020	3762	1803	2120	317	1959	1642
21098	19	34	25	2130N	760W	638837	3611356	3775	1808	2122	314	1967	1653
24868	19	34	25	330N	1650W	639102	3611909	3788	1807	2113	306	1981	1675
23708	19	34	25	610S	1880W	639191	3610588	3745	1815	2132	317	1930	1613
27896	19	34	25	660N	1980W	639204	3611811	3798	1815	2120	305	1983	1678
02394	19	34	25	660N	660W	638800	3611803	3779	1800	2110	310	1979	1669
02396	19	34	25	660S	1980W	639222	3610604	3743	1813	2126	313	1930	1617
02395	19	34	25	660S	660E	640022	3610618	3746	1808	2128	320	1938	1618
24069	19	34	25	760N	760E	639973	3611794	3786	1802	2108	306	1984	1678
24867	19	34	25	990N	1980E	639601	3611718	3781	1801	2110	309	1980	1671
21745	19	34	25	990S	1650W	639119	3610703	3737	1807	2123	316	1930	1614
21370	19	34	25	990S	400W	638736	3610696	3741	1817	2130	313	1924	1611
22081	19	34	26	1650S	1980W	637609	3610878	3751	1805	2122	317	1946	1629
36196	19	34	28	1980S	660W	633984	3610919	3714	1695	2032	337	2019	1682
32003	19	34	32	2310N	1980E	633195	3609597	3680	1512	1840	328	2168	1840
32783	19	34	34	1980S	1980E	636418	3609349	3696	1677	2020	343	2019	1676
20096	19	34	36	660S	330E	640147	3609010	3702	1830	2153	323	1872	1549
20144	19	35	6	1980S	660E	641585	3617492	3898	1830	2106	276	2068	1792
20322	19	35	6	1980S	1980E	639806	3617492	3900	1822	2096	274	2078	1804
20590	19	35	6	860N	660E	641557	3618217	3924	1840	2110	270	2084	1814
21171	19	35	6	560S	1880E	641213	3617059	3921	1850	2134	284	2071	1787
39842	19	35	6	660S	660W	640393	3617038	3950	1859	2140	281	2091	1810
29945	19	35	18	1780S	660E	641623	3614203	3919	1870	2159	289	2049	1760
29041	19	35	18	660N	1980W	640813	3615023	3949	1869	2159	290	2080	1790
03169	19	35	19	990S	660W	640400	3612349	3829	1808	2111	303	2021	1718
03168	19	35	19	660S	660E	643242	3613873	3802	1808	2110	302	1994	1692
33762	19	35	30	990S	700E	641678	3610736	3758	1808	2122	314	1950	1636
24034	19	35	30	2090S	760E	641659	3611071	3778	1810	2120	310	1968	1658
23987	19	35	30	1980S	1980W	640881	3611010	3752	1810	2122	312	1942	1630
03259	19	35	30	2310N	330E	641757	3611332	3768	1800	2105	305	1968	1663
03260	19	35	30	660S	1980E	641288	3610635	3752	1812	2124	312	1940	1628
03256	19	35	30	330S	990W	640579	3610507	3738	1796	2115	319	1942	1623
03258	19	35	30	1980S	660E	641690	3611038	3757	1803	2115	312	1954	1642

UTM (NAD27) coordinates were calculated from the nearest section corner.

APPENDIX D

BASIC STRATIGRAPHIC DATA FROM OIL AND GAS WELLS

ACROSS A SECTION OF MONUMENT DRAW, NM (T21S, R37E)

Basic Drillhole Data from T21S, R37E for Figures 29-31														
API (30-025-#)	Township (S)	Range (E)	Section	Feet from north (n) or south (s) line	Feet from east (e) or west (w) line	UTMX (m)	UTMY (m)	Reference Point Elevation (ft amsl)	Depth (ft) to top of Rustler Fm	Depth (ft) to top of Salado Fm	Thickness (ft) of Rustler Fm	Elevation (ft amsl) of top of Rustler	Elevation (ft amsl) of top of Salado
34937	21	37	1	990s	2430w	676917	3597578	3527	1538	1744	206	1989	1783
34411	21	37	2	3800s	1200w	674926	3598426	3498	1389	1590	201	2109	1908
06373	21	37	2	660s	1980w	675164	3597469	3473	1349	1554	205	2124	1919
37725	21	37	3	330s	330w	673048	3597335	3476	1282	1489	207	2194	1987
35734	21	37	3	1300s	1980e	673956	3597664	3477	1305	1513	208	2172	1964
37727	21	37	3	1940s	1760w	673483	3597825	3437	1257	1460	203	2180	1977
06388	21	37	3	1980s	660w	673148	3597838	3450	1275	1495	220	2175	1955
35354	21	37	3	3448n	1576w	673389	3598560	3469	1299	1522	223	2170	1947
35225	21	37	3	3240s	1839w	673508	3598222	3458	1283	1490	207	2175	1968
35352	21	37	3	2310n	990w	673211	3598907	3488	1310	1520	210	2178	1968
06386	21	37	3	1582n	330w	673010	3599129	3490	1320	1527	207	2170	1963
35224	21	37	4	3196s	426e	672817	3598208	3450	1280	1490	210	2170	1960
35768	21	37	4	330s	1980e	672343	3597335	3477	1276	1493	217	2201	1984
37983	21	37	4	2630s	2310e	672243	3598036	3483	1303	1517	214	2180	1966
37463	21	37	4	2310s	350e	672840	3597938	3481	1293	1503	210	2188	1978
36314	21	37	4	130s	1270e	672560	3597274	3479	1273	1496	223	2206	1983
36141	21	37	4	2460s	990e	672645	3597984	3479	1299	1511	212	2180	1968
35341	21	37	4	3630n	810e	672662	3598505	3428	1265	1480	215	2163	1948
35557	21	37	4	1050n	150e	672863	3599291	3483	1330	1542	212	2153	1941
34737	21	37	4	2620n	116e	672874	3598812	3483	1306	1516	210	2177	1967
06400	21	37	4	1582n	990e	672607	3599129	3486	1320	1529	209	2166	1957
35493	21	37	4	3168s	1650e	672444	3598200	3473	1304	1520	216	2169	1953
34738	21	37	4	3810s	200e	672886	3598395	3445	1257	1470	213	2188	1975
35351	21	37	4	2310n	810e	672662	3598907	3463	1304	1515	211	2159	1948
06397	21	37	4	1980s	660e	672746	3597838	3483	1295	1506	211	2188	1977
36811	21	37	4	3480s	1650e	672444	3598295	3480	1296	1514	218	2184	1966
06399	21	37	4	4620s	660e	672746	3598642	3465	1282	1494	212	2183	1971
35895	21	37	4	330s	2050w	671968	3597302	3478	1295	1512	217	2183	1966
06389	21	37	4	660s	660w	671544	3597402	3498	1304	1524	220	2194	1974
35875	21	37	4	330s	760w	671575	3597302	3501	1303	1523	220	2198	1978
12759	21	37	4	1980s	1980w	671947	3597805	3487	1293	1513	220	2194	1974
37236	21	37	5	3630n	330e	671192	3598481	3488	1326	1549	223	2162	1939
27954	21	37	7	330n	660e	669540	3597073	3538	1347	1577	230	2191	1961
21621	21	37	8	1980n	1980e	670739	3596597	3548	1330	1552	222	2218	1996
35350	21	37	9	1980s	330e	672882	3596220	3487	1292	1502	210	2195	1985
06445	21	37	9	660n	585e	672769	3597033	3480	1274	1484	210	2206	1996
37028	21	37	10	2375s	505e	674440	3596376	3446	1265	1471	206	2181	1975
37026	21	37	10	330n	330e	674459	3597167	3457	1296	1502	206	2161	1955
35905	21	37	10	550n	740e	674334	3597100	3449	1285	1486	201	2164	1963
35637	21	37	10	704n	2208e	673887	3597053	3431	1277	1475	198	2154	1956
35545	21	37	10	1470n	1350e	674149	3596820	3426	1250	1450	200	2176	1976
34367	21	37	10	42n	2334e	673849	3597255	3427		1455			1972
37876	21	37	10	2360n	1650e	674057	3596549	3447	1260	1460	200	2187	1987
06553	21	37	12	660s	2310e	677097	3595907	3463	1460	1670	210	2003	1793
23953	21	37	18	660s	330e	669686	3594159	3509	1230	1443	213	2279	2066
21035	21	37	19	990n	884w	668478	3593627	3533	1257	1472	215	2276	2061
23494	21	37	30	1650s	660w	668461	3591214	3527	1199	1424	225	2328	2103
24084	21	37	30	660s	1820w	668815	3590912	3518	1200	1424	224	2318	2094
24120	21	37	31	330n	330w	668361	3590610	3523	1184	1405	221	2339	2118

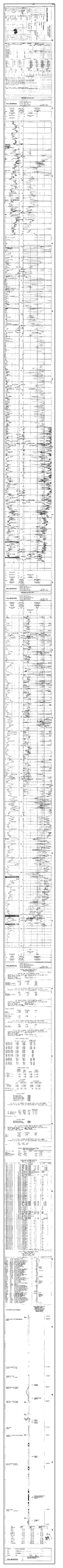
Value in red indicates a ground-level elevation obtained from a topographic map. UTM (NAD27) coordinates were calculated from the map values of the nearest section corner.

APPENDIX E

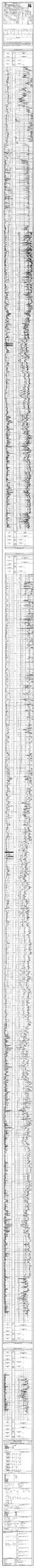
ELECTRONIC FILES OF GEOPHYSICAL LOGS OF DRILLHOLES AT AND NEAR THE WCS SITE

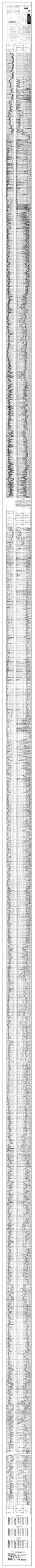
A CD-ROM is attached to the report with electronic files of geophysical logs from drillholes in the vicinity of the WCS site. These files are in TIFF format and are best viewed with software such as Quick View Plus® because of the length of each log. There are no markings of stratigraphic contacts on these logs from this study.

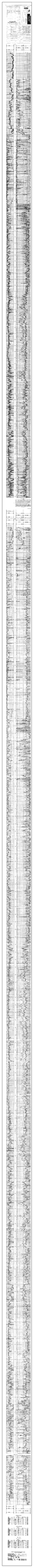
The files from the CD-ROM have been converted to PDFs and follow this page.



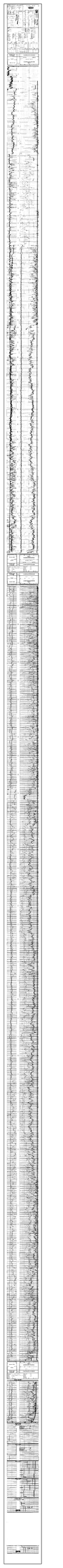
| | | |

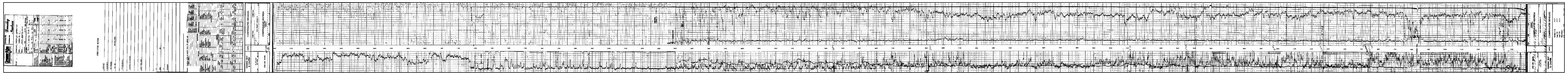


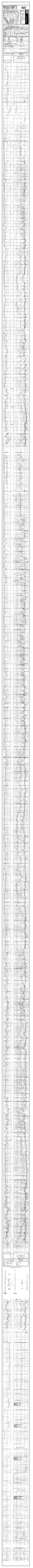


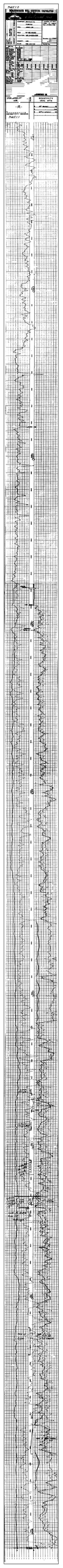


| | | |









SCHLUMBERGER WELL SURVEYING CORPORATION

gamma ray-neutron

COMPANY MERRILL G. PENROSE INC.

WELL LINDHARDT # -2

FIELD WILDCAT

LOCATION SEC 5-22S-38E

COUNTY LEA

STATE NEW MEXICO

Location of Well
660' F N&E'L
DRILL-WELL

Elevation: D.F. 3395
K.B.
G.L.

PERMANENT DATUM: GROUND LEVEL
LOG MEASURED FROM: K.B. 18 FT. ABOVE PERM. DATUM
DRILLING MEASURED FROM: K.B.

RUN NO.			
Date	7-8-57		7-8-57
Type Log	GR-N		GR-N
Depth-Driller	7000		7000
Depth-Logger	6998		6998
Bottom Logged Interval	6998		6998
Top Logged Interval	6998		6998
Type Fluid in Hole	Brine		Brine
Salinity, PPM Cl	10%		10%
Density	10.0		10.0
Level	Full		Full
Max. Rec. Temp. °F	160		160
Operating Rig Time	4 HRS		
Recorded By	Kinder		Kinder
Witnessed By	Hughes		Hughes

Run No.	1		
Bit Size	7 7/8"		
Casing Driller	8 5/8" @ 1013'		
Casing Logger	1013'		
Casing Weight & Grade	24# J-55		
Type Fluid in Hole	Brine		
Viscosity	30		
Fluid Loss	10 cc		
Source of Sample	Flowline		
Rm @ Meas. Temp.	.65 @ 70°		
Rmf @ Meas. Temp.	.52 @ 70°		
Rmc @ Meas. Temp.	.75 @ 70°		
Source of Rmf & Rmc	Calc.		
Rm @ BHT	.36 @ 160°		
Time Since Circ.	4 HRS		
Max. Rec. Temp. °F	160		
Equip. Location	1220-Hobbs		
Recorded By	Kinder		
Witnessed By	Hughes		

REMARKS	LOGGING DISTANCE	DEPTH DRILLER	DEPTH LOGGER	CASING SCHLUMBERGER	CASING LOGGER	TOP LOG INTERVAL
GAMMA RAY - NEUTRON	6998	7000	6998	1013	1013	6998

GAMMA RAY
MICROGRAMS RA EQ TON

NEUTRON
STANDARD COUNTS/SECOND

Scale 1" = 100'

Gamma Ray Neutron

Gamma Ray Neutron

Gamma Ray Neutron

Gamma Ray Neutron

SCHLUMBERGER WELL SURVEYING CORPORATION

HOUSTON, TEXAS

SIMULTANEOUS

Gamma Ray-Neutron

COUNTY	Lea
FIELD or LOCATION	Wildcat
WELL	Lockhart # 1
COMPANY	Neville G. Penrose

COMPANY	NEVILLE G. PENROSE
WELL	LOCKHART # 1
FIELD	WILDCAT
LOCATION	SEC. 4-22S-38E
COUNTY	LEA
STATE	NEW MEXICO

Location of Well
660' F SEE/L
Sec. 4-22S-38E

5172

GRN

Elevation: D.F. 3436
K.B.
or G.L.

FILING No.

RUN NO.	1	
Date	8-11-55	
Depth Reference	GL	
First Reading	4513	
Last Reading	40	
Footage Measured	4473	
Max. Depth Reached	4514	
Bottom Driller	4515	
Maximum Temp. °F		
Mud Nature	Dry	
Density		
Viscosity		
Resistivity		
Casing Size & 1	8 5/8" to 2912	to
Weight 2	to	to
Open Hole 1	8" to	to
2	to	to
Fluid Level		
Recording Speed (ft/min)	2000' & 4000'	
Sensitivity Ref. (GR)	140 (N) 400/4000	(GR) (N)
Time Constant	1.4 1. .4	
Panel	GNP-8 # 47	
Opr. Rig Time	4 hrs.	
Source Size & Type	3 528	
Truck No.	1762-Hobbs	
Observer	Haboney	

Fold Here

REMARKS:
GAMMA RAY 90 170 100 SENS. C.T. 200 SENS. RECORD 100
NEUTRON 240 100 400 400/4000
RECORDING SPEED 4513 TO 4300 1000 FPM — 4300 TO 40 4000 FPM

gamma ray zero   neutron zero

4567
4515
4564

pick up line color

GAMMA RAY MICROGRAMS RA-EQ TON		**NEUTRON** STANDARD COUNTS SECOND

GAMMA RAY FIRST READING 550r
NEUTRON FIRST READING 453
TOTAL DEPTH 46.4

NEVILLE G. PENROSE
LOCKHART # 1
WILDCAT
LEA COUNTY, N.M.

70502-14

SCHLUMBERGER

WELL SURVEYING CORPORATION

Location of Well

2500' FEL & 500' FSL
SEC. 9 T26-37E

Elevation: GL 3360
KB
DF
GL

COMPANY: HUMBLE OIL & REFINING COMPANY

WELL: STATE B #20

FIELD: ..... DRINKARD

LOCATION: SEC. 9 T26-37E

COUNTY: LEA

STATE: NEW MEXICO

FILING No.: .....

COMPANY HUMBLE OIL & REFINING CO.
WELL STATE B #20
FIELD DRINKARD
COUNTY LEA
STATE NEW MEXICO

RUN NO. 1

Date 6-12-57
First Reading 6525
Last Reading 5925
Footage Measured 600
Csg. Shoe Schlum. 6525
Csg. Shoe Driller 6525
Max. Depth Reached 6545
Bottom Driller 6545
Depth Driller 2 Spherical SP
Depth Logger 2 Spherical SP
Mud Density 9.0
Mud Viscosity 38
Fluid Loss 8.0 cc
Resist. in Mud 1.45 @ 80 °F
Resist. in Mud Cake 1.10 @ 80 °F
Mud Source Pits
Max. Rec. Temp. 120
Bit Size 6 3/4"
Type Fluid in Hole Salt
pH 10.0
Viscosity 38
Fluid Loss 8.0 cc
Source of Sample Pits
Rm @ Meas. Temp. 1.45 @ 80 °F
Rmf @ Meas. Temp. 1.10 @ 80 °F
Source of Rmf & Rmc Pits
Rm @ BHT 1.45 @ 120 °F
Time Since Circ. 2 hrs.
Max. Rec. Temp. 120
Equip. No. & Location 2179 Odessa
Recorded By Gaines
Witnessed By Mr. Hall

REMARKS

Rm = 1.3
Rmf = 2.2

Spontaneous Potential millivolts | Scale | Resistivity ohms m²/m

NORMAL 0 — 75 — 150

LATERAL 0 — 75

RADIOACTIVITY INCREASES →

6500

6550

6600

6650

6700

6750

6800

6850

6900

6950

7000

7050

7100

7150

7200

7250

7300

7350

7400

7450

7500

7550

7600

7650

7700

7750

7800

7850

7900

7950

8000

8050

8100

8150

8200

8250

8300

8350

8400

8450

PERFORATING CO. OF ATLAS CORP.

RUTANEOUS RADIATION LOG

COMPANY	L. E. ELLIOTT
WELL	PARCELL #4
FIELD	LITTMAN
COUNTY	LEA
STATE	NEW MEXICO
LOCATION	2310 FSL 2310 FEL TWP 21S RGE 36E
PERMANENT DATUM	GROUND LEVEL
ELEVATION	3677
LOG MEASURED FROM	KELLY BUSHING
DRILLING MEASURED FROM	ROTARY TABLE
ELEVATION	3687
DATE	10-4-55
RUN NO.	ONE
DEPTH DRILLER	4320
DEPTH LOGGER	4319
BTM. LOG INTERVAL	4315
TOP LOG INTERVAL	SURFACE
CASING DRILLER	8 5/8" @ 306
CASING LOGGER	306
BIT SIZE	7 7/8"
TYPE FLUID IN HOLE	GEL
DENS.	9.2
VISC.	55
PH	9.0
FLUID LOSS	15 cc
SOURCE OF SAMPLE	MUD PIT
RM @ MEAS. TEMP.	.43 @ 80°
RM @ BHT	.16 @ 160°
TIME SINCE CIRC.	12 HRS
MAX. REC. TEMP.	160°
EQUIP. NO. & LOCATION	1305 HOBBS
RECORDED BY	R. ELLISON
WITNESSED BY	MR. ELLISON

CASING RECORD

SIZE	WEIGHT	SETTING
8 5/8"	24#	SURFACE TO 306

OPEN HOLE RECORD

BIT SIZE	INTERVAL
7 7/8"	306 TO 4320

REMARKS AND OTHER DATA

GAMMA RAY NEGATIVE DEFLECTION TO RIGHT

GAMMA RAY NEUTRON

BHC NEUTRON

L. E. ELLIOTT
PARCELL #4
LITTMAN FIELD
LEA COUNTY, NEW MEXICO
4.00" STANDARD CALIBRATION

PERFORATING GUNS ATLAS CORP

SIMULTANEOUS RADIATION LOG

LOCATION	L.E. ELLIOTT
990'FNL	FEDERAL ELLIOTT B #6
1980'FEL	LITTMAN
SEC. 21 S	LEA
T-17-S R-35-E	NEW MEXICO

ELEVATIONS: 1' ABOVE ROTARY TABLE

	GAMMA RAY	BORAX NEUTRON
RUN NUMBER	ONE	ONE
DATE	12-55	12-55
DEPTH DRILLER	7461	7461
DEPTH LOGGER	7461	7461
BOTTOM LOGGED INTERVAL	AVERAGE	AVERAGE
TYPE FLUID IN HOLE	SALT	SALT
FLUID LEVEL	FULL	FULL
MAX REC. TEMPERATURE	3 5/8	3 5/8
TIME SINCE CIRCULATION	12-60	12-60
LOGGING SPEED	60	60
EQUIPMENT NUMBER	3	3
LOCATION	12-60	12-60
RECORDED BY	RACKLEY	
WITNESSED BY	PARKS-PRATT	

CASING RECORD: SIZE 9 5/8, WEIGHT, SETTING DEPTH: SURFACE TO 3044

OPEN HOLE RECORD: BIT SIZE 7 7/8, FROM SURFACE TO 7305, TO 7460

REMARKS AND OTHER DATA

SPUD DATE COMP DATE

DST RECORD

CASING RECORD

PERFORATING RECORD

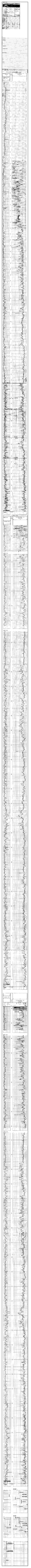
ACID FRAC SHOT

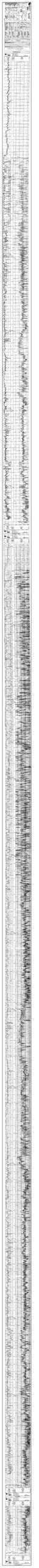
I.P.

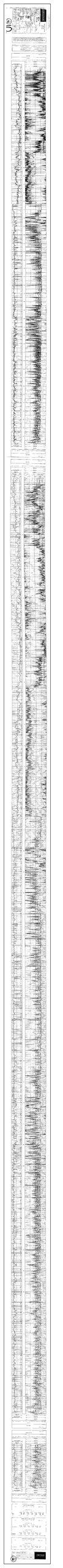
GOR GR

T.P. C.P.

REMARKS:







TX 505472

ANDREWS

COMPANY: Texland Petroleum

WELL: SSAU #1173

FIELD: Fullerton Prospect

COUNTY: Andrews **STATE:** Texas

Schlumberger

Compensated Neutron
Litho Density Log
w/NGT & Caliper

Field:	Fullerton Prospect
Location:	1308' FNL & 1317' FSL
Well:	SSAU #1173
Company:	Texland Petroleum

LOCATION	1308' FNL & 1317' FSL Section 11, Block A-31 PSL Survey	Elev.:	K.B.	3384 F
			G.L.	3375 F
			D.F.	3383 F
	Permanent Datum: Ground Level	Elev.:	3375 F	
	Log Measured From: Kelly Bushing	9.0 F	above Perm. Datum	
	Drilling Measured From: Kelly Bushing			

API Serial No.	SECTION	TOWNSHIP	BLOCK
42-003-37734			A-31

Logging Date	Oct 20, 1995		
Run Number	One		
Depth Driller	7400 F		
Schlumberger Depth	7450 F		
Bottom Log Interval	7445 F		
Top Log Interval	200 F		
Casing Driller Size @ Depth	8.625 IN	@ 1655 F	@
Casing Schlumberger	1632 F		
Bit Size	7.875 IN		
Type Fluid In Hole	Brine		
Density / Viscosity	10 LB/G	30 S	
Fluid Loss / PH	14 C3	12	
Source Of Sample	Mud Pit		
RM @ Measured Temperature	0.048 OHMM	@ 65 DEGF	@
RMF @ Measured Temperature	0.048 OHMM	@ 65 DEGF	@
RMC @ Measured Temperature		@	@
Source RMF / RMC	Measured	NC	
RM @ MRT / RMF @ MRT	0.026 @ 117	0.026 @ 117	@ / @
Maximum Recorded Temperatures	117 DEGF		
Circulation Stopped / Time	20-Oct-1995	22:15	
Logger On Bottom / Time	Oct 20, 1995	15:40	
Unit Number / Location	2002	Midland, TX	
Recorded By	[illegible]		
Witnessed By	Jack McCollough		

	Run 1	Run 2	Run 3	Run 4
Logging Date				
Run Number				
Depth Driller				
Schlumberger Depth				
Bottom Log Interval				
Top Log Interval				
Casing Driller Size @ Depth	@		@	
Casing Schlumberger				
Bit Size				
Type Fluid In Hole				
MUD: Density / Viscosity				
Fluid Loss / PH				
Source Of Sample				
RM @ Measured Temperature	@		@	
RMF @ Measured Temperature	@		@	
RMC @ Measured Temperature	@		@	
Source RMF / RMC				
RM @ MRT / RMF @ MRT	@	@	@	@
Maximum Recorded Temperatures				
Circulation Stopped / Time				
Logger On Bottom / Time				
Unit Number / Location				
Recorded By				
Witnessed By				

ALL INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS AND WE CANNOT, AND DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATIONS, AND WE SHALL NOT, EXCEPT IN THE CASE OF GROSS OR WILLFUL NEGLIGENCE ON OUR PART, BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COSTS, DAMAGES OR EXPENSES INCURRED OR SUSTAINED BY ANYONE RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR OFFICERS, AGENTS OR EMPLOYEES. THESE INTERPRETATIONS ARE ALSO SUBJECT TO CLAUSE 4 OF OUR GENERAL TERMS AND CONDITIONS AS SET OUT IN OUR CURRENT PRICE SCHEDULE.

OTHER SERVICES1
OS1 OSTE-LDT CNL NGT
OS2 LDT CNL NGT
OS3
OS4
OS5

REMARKS: RUN NUMBER 1
5.5 inch Casing used to Calculate Cement Volume

MDEN = 2.71 g/cc FD = 1.0 g/cc MATRIX = Limestone

Logged Missing Footage w/LDT CNL NGT

OTHER SERVICES2
OS1
OS2
OS3
OS4
OS5

REMARKS: RUN NUMBER 2

RUN 1			RUN 2		
SERVICE ORDER #:		844799	SERVICE ORDER #:		
PROGRAM VERSION:		7C0 427	PROGRAM VERSION:		
FLUID LEVEL:		RT	FLUID LEVEL:		
LOGGED INTERVAL	START	STOP	LOGGED INTERVAL	START	STOP

EQUIPMENT DESCRIPTION

RUN 1	RUN 2
SURFACE EQUIPMENT	

HGM AA
NGT FE 180
NGB VB
GSR 17 3401

DSHI FY 2002
HGM AH 1403

DOWNHOLE EQUIPMENT

SSP SRT-S	155.6
LEH-QB 2002 LEH-QB 120	75.6
TCC-B 2002 BCH-KC 2520	73.4
SGT-L 2002 SGH-K 813 SGC SA 242 SGD-TAB 2066	70.4
NGT-D 3401 NGD-B 637 NGH-C 836 NGC-C 1826 NGCH-A 1909	64.9
CNT-H 2002 CND-A 1101 NLB-RF 2378 NBR F 2378 CNC HA 126	55.7
LDT-D 2002 GSR-J 1820 PGD G 931 NSC-L 747 ECH-MKA 737 DRS E 7849 PDH L 840	48.4
AH 169	31.1

SP SPARC
80.3
TelStatus
CTEM
70.4
Gamma Ray
69.5
Detector
63.2
CFTC
CNTC
51.2
50.7
Caliper
LS
RS
33.7
33.7
33.2

DST-E 2002
DLH CH 2990
DLC D 913
DLB H 764
SRE F 723
SRS D
29.7
LLD LLS
15.5
CALIPER 6
CALIPER 1
I1
MSFL
Tangent HV
3.5
3.2
1.7
1.5
0.0
TOOL ZERO
MAXIMUM STRING DIAMETER 5.25 IN
MEASUREMENTS RELATIVE TO TOOL ZERO
ALL LENGTHS IN FEET

Schlumberger Job Event Summary

```
                              Time              Elapsed    Depth               File
                                                Time       (FT)

Circulation Stopped           20-OCT-1995  2:15
After Calibration Completed   20-OCT-1995  6:27
Before Calibration Completed  20-OCT-1995  8:45
   .OT-CNL NGT
Rig Up Started                20-OCT-1995 15:15
```

Descent 1: DSTE/LDTD/CNTH/NGTD/TCCB/BSP

```
Begin Descent                 20-OCT-1995 18:00
Log Pass (up)                 20-OCT-1995 18:25   0:37   7467.0 -  7153.0   DSTE  .007
   Repeat Pass
Log Pass (up)                 20-OCT-1995 18:36   3:23   7467.0 -   161.0   DSTE  .008
   Main Pass
```

Descent 2: LDTD/CNTH/NGTD/TCCB/BSP

```
Begin Descent                 20-OCT-1995 22:06
   Pick Up Missing footage w/LDT-CNL NGT
Log Pass (up)                 20-OCT-1995 23:33   6:07   7440.8 -  7292.5   LDTD  .017
   Missing footage
After Calibration Completed   20-OCT-1995 22:23
```

Input DLIS Files

DEFAULT	LDTD .019		FIELD	20-OCT-1995 21:42	7450.5 FT	189.5 FT

Output DLIS Files

DEFAULT	LDTD .020	FN:18	FIELD	20-OCT-1995 21:44	7450.0 FT	181.5 FT

Integrated Hole/Cement Volume Summary

Hole Volume = 2087.74 F3

Cement Volume = 1050.84 F3 (assuming 4.50 IN casing O.D.)

Computed from 7450.0 FT to 1656.0 FT using data channel(s) CALI

OP System Version: 7C0-427

DBM

Changed Parameter Summary

DLIS Name	New Value	Previous Value	Depth & Time
BHS	OPEN	OPEN	7460.0 21:54:36

PIP SUMMARY

⊢ Integrated Borehole Volume Every 10 F3
⊢ Integrated Borehole Volume Every 100 F3
⊣ Integrated Annular Volume Every 10 F3
⊣ Integrated Annular Volume Every 100 F3

▮ Time Mark Every 60 S

Cable Tension (TENS)
10000 (LBF) 0

Bulk Density (RHOB)
2 (G/C3) 3

7100
7200
7300
7400
SGR
CGR
DRHO
RHOB
NPHI
FR NGS
FR CNL
TD
FR LDT
Litho-Density Caliper (CALI)
6 (IN) 16
Tool Sticking
Bulk Density Correction (DRHO)
-0.8 (G/C3) 0.2
Cable Stretch (Tool string not moving) (STIT)
0 (F) 50
Spectroscopy Gamma Ray (SGR)
0 (GAPI) 150
Thermal Neutron Porosity (LIME) (NPHI)
0.3 (V/V) -0.1
Cable Tension (TENS)
10000 (LBF) 0
Bulk Density (RHOB)
2 (G/C3) 3
PIP SUMMARY
Integrated Borehole Volume Every 10 F3
Integrated Borehole Volume Every 100 F3
Integrated Annulus Volume Every 10 F3
Integrated Annulus Volume Every 100 F3
Time Mark Every 60 S

Parameters

DLIS Name	Description	Value	
BFM	Borehole Fluid Medium	LIQUID	
BHS	Bore Hole Status	OPEN	
BS	Bit Size	7.875	IN
CBAR	Constant Barite	1	
CGMI	Spectro Computed Gamma Ray Minimum	0	GAPI
CGSH	Spectro Computed Gamma Ray Shale	160	GAPI
DFD	Drilling Fluid Density	10.00	LB/G
DHC	Density Hole Correction	BS	
DO	Depth Offset	0.0	FT
DPPM	Density Porosity Processing Mode	STAN	
FD	Fluid Density	1.1	G/C3
GCSE	Generalized Caliper Selection	CALI	
KMIN	Potassium Minimum	0	
KSHA	Potassium Shale	2.0000010e-02	
MATR	Rock Matrix Type	LIMESTONE	
MDEN	Matrix Density	2.71	G/C3
NFO	NGT Filtering Option	KALMAN	
PMUD	Potassium Mud	0	%
PP	Playback Processing	NORMAL	
SGMI	Spectro Gamma Ray Minimum	0	GAPI
SGSH	Spectro Gamma Ray Shale	190	GAPI
STKT	STI Stuck Threshold	2.5	FT
TMIN	Thorium Minimum	0	PPM
TSHA	Thorium Shale	12	PPM
UMIN	Uranium Minimum	0	PPM
USHA	Uranium Shale	3	PPM
WMUD	Mud Weight	10	LB/G

Format: 2_lca Vertical Scale: 2" per 100' Graphics File Created: 20-OCT-1998 21:54

OP System Version: 7C0-427
DDM

Input DLIS Files

DEFAULT	LDTD .018		FIELD	20-OCT-1998 21:42	7480.2 FT	191.5 FT

Output DLIS Files

DEFAULT	LDTD .020	FN:10	FIELD	20-OCT-1998 21:54		

Input DLIS Files

DEFAULT	LDTD .018		FIELD	20-OCT-1998 21:42	7480.2 FT	191.5 FT

Output DLIS Files

DEFAULT	LDTD .020	FN:10	FIELD	20-OCT-1998 21:54	7480.0 FT	191.5 FT

Integrated Hole/Cement Volume Summary

Hole Volume = 2989.74 F3

Cement Volume = 1894.94 F3 (assuming 5.50 IN casing O.D.)

Computed from 7480.0 FT to 1695.0 FT using data channel(s) CALI

OP System Version: 7C0-427
DDM

Changed Parameter Summary

DLIS Name	New Value	Previous Value	Depth & Time
BHS	OPEN	OPEN	7480.0 21:54:38

PIP SUMMARY

- Integrated Borehole Volume Every 10 F3
- Integrated Borehole Volume Every 100 F3
- Integrated Annulus Volume Every 10 F3
- Integrated Annulus Volume Every 100 F3

Time Mark Every 60 S

Cable Tension (TENS)
10000
(LBF)
0
Anhydrite
Spectroscopy Gamma Ray (SGR)
0
(GAPI)
150
LithoDensity - Neutron Crossover
LithoDensity Caliper (CALI)
6
(IN)
16
Cross Plot Porosity (PHIX)
0.3
(---)
-0.1

Uranium Free Gamma Ray (CGR)
0 (GAPI) 150
Pe Factor (PEF)
0 (---) 10
Thermal Neutron Porosity (LIME) (NPHI)
0.3 (V/V) -0.1
Cable Stretch (Toolstring not moving) (STIT)
0 (F) 50
Spectroscopy Gamma Ray on Backup
LithoDensity Porosity (2.71) (DPHI)
0.3 (V/V) -0.1
Uranium Indicator
Tool Sticking
Bulk Density Correction (DRHO)
-0.05 (G/C3) 0.2
200
CGR
SGR
300
400

Uranium Indicator

Tool Sticking

Bulk Density Correction (DRHO)
-0.05 (G/C3) 0.2

Spectroscopy Gamma Ray on Backup

Cable Stretch (Toolstring not moving) (STIT)
0 (F) 50

LithoDensity Porosity [2.71] (DPHI)
0.3 (V/V) -0.1

Under-gauge Borehole

Uranium Free Gamma Ray (CGR)
0 (GAPI) 150

Thermal Neutron Porosity [LIME] (NPHI)
0.3 (V/V) -0.1

Pe Factor (PEF)
0 (----) 10

LithoDensity Caliper (CALI)
6 (IN) 16

Cross Plot Porosity (PHIX)
0.3 (----) -0.1

Spectroscopy Gamma Ray (SGR)
0 (GAPI) 150

LithoDensity - Neutron Crossover

Cable Tension (TENS)
10000 (LBF) 0

Anhydrite

PIP SUMMARY

Integrated Borehole Volume Every 10 F3
Integrated Borehole Volume Every 100 F3
Integrated Annulus Volume Every 10 F3
Integrated Annulus Volume Every 100 F3

Time Mark Every 60 S

Parameters

DLIS Name	Description	Value	
BFM	Borehole Fluid Medium	LIQUID	
BHS	Bore Hole Status	OPEN	
BS	Bit Size	7.875	IN
CBAR	Constant Barite	1	
CGMI	Spectro Computed Gamma Ray Minimum	0	GAPI
CGSH	Spectro Computed Gamma Ray Shale	100	GAPI
DFD	Drilling Fluid Density	10.00	LB/G
DHC	Density Hole Correction	BS	

DO	Depth Offset	0.0	FT
DPPM	Density Porosity Processing Mode	STAN	
FD	Fluid Density	1.1	G/C3
GCSE	Generalized Caliper Selection	CALI	
KMIN	Potassium Minimum	0	
KSHA	Potassium Shale	2.000000e-02	
MATR	Rock Matrix Type	LIMESTONE	
MDEN	Matrix Density	2.71	G/C3
NFO	NGT Filtering Option	KALMAN	
PKUD	Potassium Mud	0	%
PP	Playback Processing	NORMAL	
SGMI	Spectro Gamma Ray Minimum	0	GAPI
SGSH	Spectro Gamma Ray Shale	100	GAPI
STKT	STI Stuck Threshold	2.6	FT
TMIN	Thorium Minimum	0	PPM
TSHA	Thorium Shale	12	PPM
UMIN	Uranium Minimum	0	PPM
USHA	Uranium Shale	3	PPM
WMUD	Mud Weight	10	LB/G

Format: 5_xxx   Vertical Scale: 5" per 100   Graphics File Created: 20-OCT-1996 21:34

OP System Version: 7C0-427

DBM

Input DLIS Files

DEFAULT	LDTD .010		FIELD	20-OCT-1996 21:42	7400.5 FT	101.6 FT

Output DLIS Files

DEFAULT	LDTD .020	FN:10	FIELD	20-OCT-1996 21:34

Output DLIS Files

DEFAULT	LDTD .017	FN:14	FIELD	20-OCT-1996 21:33	7480.5 FT	7282.5 FT

Integrated Hole/Cement Volume Summary

Hole Volume = 84.01 F3

Cement Volume = 38.54 F3 (assuming 5.50 in casing O.D.)

Computed from 7480.0 FT to 7282.5 FT using data channel(s) CALI

OP System Version: 7C0-427

DBM

PIP SUMMARY

⊢ Integrated Borehole Volume Every 10 F3

⊢ Integrated Borehole Volume Every 100 F3

⊣ Integrated Annulus Volume Every 10 F3

⊣ Integrated Annulus Volume Every 100 F3

Time Mark Every 60 S
Cable Tension (TENS)
10000 (LBF) 0
Spectroscopy Gamma Ray (SGR)
0 (GAPI) 100
LithoDensity Caliper (CALI)
6 (IN) 16
Uranium Free Gamma Ray (CGR)
0 (GAPI) 100
Under-gauge Borehole
Anhydrite
LithoDensity - Neutron Crossover
Cross Plot Porosity (PHIX)
0.3 (---) -0.1
Pe Factor (PEF)
0 (----) 10
Thermal Neutron Porosity [LIME] (NPHI)
0.3 (V/V) -0.1
Cable Stretch (Toolstring not moving)
(STIT)
0 (F) 50
Spectroscopy Gamma Ray on Backup
LithoDensity Porosity [2.71] (DPHI)
0.3 (V/V) -0.1
Uranium Indicator
Tool Sticking
Bulk Density Correction (DRHO)
-0.05 (G/C3) 0.2
MISSING FOOTAGE LOG
7300

TENS
SGR
CALI
7400
PEF
DRHO
PHIX
NPHI
DPHI
-TD-
Uranium Indicator
Tool Sticking
Bulk Density Correction (DRHO)
-0.05 (G/C3) 0.2
MISSING FOOTAGE LOG
Cable Stretch (Toolstring not moving) (STIT)
0 (F) 50
Spectroscopy Gamma Ray on Backup
LithoDensity Porosity (2.71) (DPHI)
0.3 (V/V) -0.1
Undergauge Borehole
Thermal Neutron Porosity (LIME) (NPHI)
0.3 (V/V) -0.1
Uranium Free Gamma Ray (CGR)
0 (GAPI) 100
Pe Factor (PEF)
0 (-) 10
LithoDensity Caliper (CALI)
6 (IN) 16
Cross Plot Porosity (PHIX)
0.3 ( ) -0.1
Spectroscopy Gamma Ray (SGR)
0 (GAPI) 100
LithoDensity Neutron Crossover
Cable Tension (TENS)
10000 (LBF) 0
Anhydrite
PIP SUMMARY
Integrated Borehole Volume Every 10 F3
Integrated Borehole Volume Every 100 F3
Integrated Annulus Volume Every 10 F3
Integrated Annulus Volume Every 100 F3
Time Mark Every 60 S

Parameters

DLIS Name	Description	Value	
BFM	Borehole Fluid Medium	LIQUID	
BHS	Bore Hole Status	OPEN	
BS	Bit Size	7.875	IN
CBAR	Constant Barite	1	
CGMI	Spectro Computed Gamma Ray Minimum	0	GAPI
CGSH	Spectro Computed Gamma Ray Shale	150	GAPI
DFD	Drilling Fluid Density	10.00	LB/G
DHC	Density Hole Correction	BS	
DPPM	Density Porosity Processing Mode	STAN	
FD	Fluid Density	1.1	G/C3
GCSE	Generalized Caliper Selection	CALI	
KMIN	Potassium Minimum	0	
KSHA	Potassium Shale	2.0000000e-02	
MATR	Rock Matrix Type	LIMESTONE	
MDEN	Matrix Density	2.71	G/C3
NFO	NGT Filtering Option	KALMAN	
PMUD	Potassium Mud	0	%
SGMI	Spectro Gamma Ray Minimum	0	GAPI
SGSH	Spectro Gamma Ray Shale	150	GAPI
STKT	ATI Stuck Threshold	2.5	FT
TMIN	Thorium Minimum	0	PPM
TSHA	Thorium Shale	12	PPM
UMIN	Uranium Minimum	0	PPM
USHA	Uranium Shale	3	PPM
WMUD	Mud Weight	10	LB/G

Format: 5_lon Vertical Scale: 5" per 100' Graphics File Created: 20-OCT-1995 21:33

OP System Version: 7C0-427

DSM

Output DLIS Files

DEFAULT LDTD .017 FN:14 FIELD 20-OCT-1995 21:33

Input DLIS Files

DEFAULT DSTE .007 FN:8 FIELD 20-OCT-1995 18:29 7487.0 FT 7164.0 FT

Output DLIS Files

DEFAULT DSTE .008 FN:8 FIELD 20-OCT-1995 18:30

OP System Version: 7C0-427

DSM

DST-E [illegible]

PIP SUMMARY
Time Mark Every 60 S
Repeat Spectroscopy Gamma Ray (SGR_REP)
0 (GAPI) 150
Repeat Litho-Density Caliper (CALI_REP)
6 (IN) 16
Repeat Uranium Free Gamma Ray (CGR_REP)
0 (GAPI) 150
Repeat Cable Tension (TENS_REP)
10000 (LBF) 0
Spectroscopy Gamma Ray on Backup
REPEAT ANALYSIS
Repeat Bulk Density (RHOB_REP)
2 (G/C3) 3
Repeat Pe Factor (PEF_REP)
0 (----) 10
Repeat Bulk Density Correction (DRHO_REP)
-0.05 (G/C3) 0.2
Repeat Thermal Neutron Porosity (LIME) (NPHI_REP)
0.3 (V/V) -0.1
RHOB_REP
RHOB
PEF_REP
PEF
NPHI_REP
NPHI
DRHO_REP
7200

Repeat Uranium Free Gamma Ray (CGR_REP)
0 (GAPI) 150

Repeat LithoDensity Caliper (CALI_REP)
6 (IN) 16

Repeat Spectroscopy Gamma Ray (SGR_REP)
0 (GAPI) 150

Repeat Pe Factor (PEF_REP)
0 (---) 10

Repeat Bulk Density (RHOB_REP)
2 (G/C3) 3

REPEAT ANALYSIS

PIP SUMMARY

Time Mark Every 60 S

Parameters

DLIS Name	Description	Value	
BFM	Borehole Fluid Medium	LIQUID	
BHS	Bore Hole Status	OPEN	
BS	Bit Size	7.875	IN
CBAR	Constant Barite	1	
CGMI	Spectro Computed Gamma Ray Minimum	0	GAPI
CGSH	Spectro Computed Gamma Ray Shale	100	GAPI
DFD	Drilling Fluid Density	10.00	LB/G
DHC	Density Hole Correction	BS	
DORL	Depth Offset Repeat Analysis	0.0	FT
DPPM	Density Porosity Processing Mode	STAN	
FD	Fluid Density	1.1	G/C3
GCSE	Generalized Caliper Selection	CALI	
KMIN	Potassium Minimum	0	
KSHA	Potassium Shale	2.000000e-02	
MATR	Rock Matrix Type	LIMESTONE	
MDEN	Matrix Density	2.71	G/C3
NFO	NGT Filtering Option	KALMAN	
PMUD	Potassium Mud	0	%
SGMI	Spectro Gamma Ray Minimum	0	GAPI
SGSH	Spectro Gamma Ray Shale	100	GAPI
TMIN	Thorium Minimum	0	PPM
TSHA	Thorium Shale	12	PPM
UMIN	Uranium Minimum	0	PPM
USHA	Uranium Shale	3	PPM
WMUD	Mud Weight	10	LB/G

Format: ran_km Vertical Scale 5" per 100' Graphics File Created: 20-OCT-1995 16:35

OP System Version: 7C0-427

DDM

DBT-E 7B427KV-400

Input DLIS Files

DEFAULT	DBTE .007	FN:8	FIELD	20-OCT-1995 16:26	7467.0 FT	7153.0 FT

Output DLIS Files

DEFAULT	DBTE .008	FN:5	FIELD	20-OCT-1995 16:30		

Output DLIS Files

DEFAULT	DBTE .006	FN:4	FIELD	20-OCT-1995 16:05	1706.0 FT	1655.0 FT

Integrated Hole/Cement Volume Summary

Hole Volume = 19.32 F3

Cement Volume = 5.53 F3 (assuming 5.00 IN casing O.D.)

Computed from 1706.0 FT to 1655.0 FT using data channel(s) CALI

OP System Version: 7C0-427

DDM

DBT-2 7B427KV-400

PIP SUMMARY

⊢ Integrated Borehole Volume Every 10 F3
⊢ Integrated Borehole Volume Every 100 F3
⊣ Integrated Annulus Volume Every 10 F3
⊣ Integrated Annulus Volume Every 100 F3

Time Mark Every 60 S

Cable Tension (TENS)
10000 (LBF) 0

Spectroscopy Gamma Ray (SGR)
0 (GAPI) 150

LithoDensity Caliper (CALI)
6 (IN) 16

Uranium Free Gamma Ray (CGR)
0 (GAPI) 150

Anhydrite

LithoDensity - Neutron Crossover

Cross Plot Porosity (PHIX)
0.3 (---) -0.1

Pe Factor (PEF)
0 (---) 10

Undergauge Borehole

Thermal Neutron Porosity (NPHI)
0.3 (V/V) -0.1

Cable Stretch (Toolstring not moving) (STIT)
0 (F) 50

Spectroscopy Gamma Ray on Backup

LithoDensity Porosity (2.71) (DPHI)
0.3 (V/V) -0.1

Uranium Indicator

Tool Sticking

Bulk Density Correction (DRHO)
-0.05 (G/C3) 0.2

BEFORE SURVEY CALIPER CHECK IN CASING
CASING
BEFORE SURVEY CALIPER CHECK IN CASING
1700

Uranium Indicator

Tool Sticking

Bulk Density Correction (DRHO)
-0.05 (G/C3) 0.2

Cable Stretch (Toolstring not moving) (STIT)
0 (F) 50

Spectroscopy Gamma Ray on Backup

LithoDensity Porosity (2.71) (DPHI)
0.3 (V/V) -0.1

Undergauge Borehole

Thermal Neutron Porosity (NPHI)
0.3 (V/V) -0.1

Uranium Free Gamma Ray (CGR)
0 (GAPI) 150

Pe Factor (PEF)
0 (---) 10

LithoDensity Caliper (CALI)
6 (IN) 16

Cross Plot Porosity (PHIX)
0.3 (---) -0.1

Spectroscopy Gamma Ray (SGR)
0 (GAPI) 150

LithoDensity - Neutron Crossover

Cable Tension (TENS)
10000 (LBF) 0

Anhydrite

PIP SUMMARY

- Integrated Borehole Volume Every 10 F3
- Integrated Borehole Volume Every 100 F3
  - Integrated Annulus Volume Every 10 F3
  - Integrated Annulus Volume Every 100 F3

Time Mark Every 60 S

Parameters

DLIS Name	Description	Value	
BFM	Borehole Fluid Medium	LIQUID	
BHS	Bore Hole Status	OPEN	
BS	Bit Size	7.875	IN
CBAR	Constant Barite	1	
CGMI	Spectro Computed Gamma Ray Minimum	0	GAPI
CGSH	Spectro Computed Gamma Ray Shale	100	GAPI
DFD	Drilling Fluid Density	10.00	LB/G
DHC	Density Hole Correction	BS	
DPPM	Density Porosity Processing Mode	STAN	
FD	Fluid Density	1.1	G/C3
GCSE	Generalized Caliper Selection	CALI	
KMIN	Potassium Minimum	0	
KSHA	Potassium Shale	2.000000e-02	
MATR	Rock Matrix Type	LIMESTONE	
MDEN	Matrix Density	2.71	G/C3
NFO	NGT Filtering Option	KALMAN	
PMUD	Potassium Mud	0	%
SGMI	Spectro Gamma Ray Minimum	0	GAPI
SGSH	Spectro Gamma Ray Shale	100	GAPI
STKT	STI Stuck Threshold	2.5	FT
TMIN	Thorium Minimum	0	PPM
TSHA	Thorium Shale	12	PPM
UMIN	Uranium Minimum	0	PPM
USHA	Uranium Shale	3	PPM
WMUD	Mud Weight	10	LB/G

Format: 5_lcn Vertical Scale: 5" per 100 Graphics File Created: 20 OCT 1995 16:05

OP System Version: 7C0-427

DEM

DST-E [illegible]

Output DLIS Files

DEFAULT DSTE .098 FN:4 FIELD 29-OCT-1995 16:06

Calibration and Check Summary

Measurement	Nominal	Master	Before	After	Change	Limit	Units
Litho Density - D Wellsite Calibration - Background Measurement							
Master: Oct 7 14:40 1995 Before: Oct 20 08:40 1995 After: Oct 20 22:17 1995							
LL Background	20.00	18.19	18.45	18.87	0.2325	1.000	CPS
LU Background	78.00	62.07	62.24	62.46	0.2412	1.000	CPS
LS Background	67.00	48.08	47.75	48.11	0.3590	1.000	CPS
LITH Background	6.000	4.776	4.853	4.890	0.03729	0.2000	CPS
SS1 Background	14.00	12.74	12.89	12.82	[illegible]	0.5000	CPS
SS2 Background	11.00	4.690	6.251	6.825	0.57368	0.4000	CPS
Litho Density - D Wellsite Calibration - Tool Quality Control Information HV							
Master: Oct 7 14:40 1995 Before: Oct 20 08:40 1995 After: Oct 20 22:17 1995							
LSHV Background	1501	1499	1488	1491	[illegible]	N/A	V
SSHV Background	1501	[illegible]	[illegible]	[illegible]	[illegible]	N/A	V
Litho Density - D Wellsite Calibration - Detectors Resolution from [illegible] Measurements							
Master: Oct 7 14:40 1995 Before: Oct 20 08:40 1995 After: Oct 20 22:17 1995							
LS Resolution Background	8.000	8.581	8.520	8.893	0.37708	N/A	
SS Resolution Background	9.000	9.723	8.214	8.749	[illegible]	N/A	
Litho Density - D Wellsite Calibration - Caliper Calibration							
Before: Oct 20 08:41 1995							
Caliper Small Ring	8.000	N/A	9.480	N/A	N/A	N/A	IN
Caliper Large Ring	12.00	N/A	14.71	N/A	N/A	N/A	IN
Litho Density - D Master Calibration - Aluminum Measurement							
Master: Oct 7 15:04 1995							
LL Aluminum	90.00	98.68	--	--	-	--	CPS
LU Aluminum	135.0	152.5	--	--	-	--	CPS
LS Aluminum	158.0	174.8	-	-		-	CPS
LITH Aluminum	60.00	61.51	--	-	-	--	CPS
SS1 Aluminum	170.0	189.9	--	-	-	--	CPS
SS2 Aluminum	280.0	285.7		-			CPS
Litho Density - D Master Calibration - Lithology Measurement							
Master: Oct 7 14:58 1995							
LL Iron	60.00	65.40					CPS
LU Iron	120.0	139.7	--			-	CPS
LS Iron	138.0	153.0					CPS
LITH Iron	30.00	38.48					CPS
SS1 Iron	160.0	167.5	--	-	-	-	CPS
SS2 Iron	240.0	259.8		-			CPS
Litho Density - D Master Calibration - Spectrum Quality Ratios							
Master: Oct 20 12:11 1995							
QRLS Calculated	0.1600	0.1601					
QRSS Calculated	0.7200	0.7269	-	-	-	-	
QSLS Calculated	0.3800	0.3517	-	-	-	-	
QLIP Calculated	1.380	1.098			-	--	
QR Calculated	1.000	0.9831	--	-		-	
Compensated Neutron - H Wellsite Calibration - Zero Measurement							
Master: Oct 4 07:22 1995 Before: Oct 20 05:50 1995 After: Oct 20 22:10 1995							
CNTC Background	27.72	27.72	28.86	28.35	-0.8260	4.167	CPS
CFTC Background	96.02	96.52	30.73	35.95	-0.7705	4.039	CPS
Compensated Neutron - H Master Calibration - Tank Measurement							
Master: Oct 20 12:12 1995							
Thermal Near Corr. (Tank)	8091	3747	-	--	-	-	CPS
Thermal Far Corr. (Tank)	2703	2423	-	--	-	-	CPS
CNTC/CFTC (Tank)	2.109	2.339	-		-	-	
Natural Gamma Spectroscopy - D Wellsite Calibration - Background Measurement							
Master: Oct 7 15:31 1995 Before: Oct 20 08:34 1995 After: Oct 20 22:17 1995							
WINDOW 1 Background	100.0	93.87	95.19	80.38	14.82	100.0	CPS
WINDOW 2 Background	60.00	40.58	40.37	40.56	0.2034	30.00	CPS
WINDOW 3 Background	16.00	13.57	13.26	12.57	0.6826	10.00	CPS
WINDOW 4 Background	8.000	3.189	1.345	5.157	1.785	4.000	CPS
WINDOW 5 Background	10.00	2.427	1.178	8.337	3.161	10.00	CPS
SGR Background	30.00	25.20	25.61	24.66	1.462	N/A	GAPI
Natural Gamma Spectroscopy - D Wellsite Calibration - Normalized Ug Measurement							
Master: Oct 7 15:12 1995 Before: Oct 20 08:43 1995 After: Oct 20 22:21 1995							
WINDOW 1 Ug	481.0	447.8	462.5	466.1	[illegible]	24.40	CPS
WINDOW 2 Ug	262.0	263.3	264.1	267.7	3.564	18.60	CPS
WINDOW 3 Ug	42.50	42.05	42.14	41.29	0.8462	3.620	CPS
WINDOW 4 Ug	29.50	29.29	29.84	29.88	0.2716	4.500	CPS
WINDOW 5 Ug	42.50	43.55	43.35	44.18	0.8129	5.400	CPS
SGR Ug	162.0	162.5	162.0	163.4	1.441	7.000	GAPI
Natural Gamma Spectroscopy - D Master Calibration - Master Quality Control Values							
Master: Oct 7 15:13 1995							
Photomultiplier Res. CAPC3	8.000	10.89	-	--	-	-	
APU WINDOW 1 Ug	1850	877.4	-	--	-	-	CPS
APL WINDOW 1 Ug	1350	977.3	-		-	-	CPS

The CNT Master Calibration Was Done With The Following Parameters

NCT-B Water Temperature 80.0 DEG F.
Thermal Housing Size 3.000 IN

The NGT POSL Value is set to -184.240 KEV

Litho Density - D Equipment Identification

Primary Equipment		
Nuclear Services Cartridge	NSC - E	747
Pressurized Gamma Detector	PGD - G	331
Gamma Source Radioactive	GSR - J	1650
Auxiliary Equipment		
Density Porosity Sonde	DRS - F	2946
Electronics Cartridge Housing	ECH - MKA	753
Pressurized Detector Housing	PDH - L	649

Litho Density - D Wellsite Calibration
Detector Resolution From BKG Measurements
Phase
LS Resolution Background
SS Resolution Background
Value
Master
Before
After
Minimum
Nominal
Maximum
Before: Oct 20 08:40 1996

Compensated Neutron - A Equipment Identification

Primary Equipment		
Compensated Neutron Cartridge	CNC - HA	126
Neutron Logging Source	NLS - KF	2378
Neutron Source Radioactive	NSR - F	2578
Neutron Detector with Alpha Source	CNC - A	1101
Auxiliary Equipment		
Compensated Neutron Housing	CNH - A	4564
Neutron Calibration Tank	NCT - B	350

Compensated Neutron - N Master Calibration
Zero Measurement

Compensated Neutron - N Master Calibration
Tank Measurement
Phase
Thermal Near Corr. (Tank) CPS
Value
Master
Minimum
Nominal
Maximum
Thermal Far Corr. (Tank) CPS
2425
CNTC CPS (Tank)
2120
2150
Master: Oct 20 12:10 1996

Natural Gamma Spectroscopy - D / Equipment Identification

Primary Equipment
NGT Cartridge NGC G 1920
NGT Sonde NHD H 857

Auxiliary Equipment
NGT Cartridge Housing NGCH A 1604
NGT Sonde Housing NUH C 838
Gamma Source Radioactive GSR S 3401 3401

Natural Gamma Spectroscopy - D Wellsite Calibration
Background Measurement

Natural Gamma Spectroscopy - D Wellsite Calibration
Normalized Jig Measurement

Natural Gamma Spectroscopy - D Wellsite Calibration
Quality Control Values

Natural Gamma Spectroscopy - D Wellsite Calibration
Quality Control Values Check

Natural Gamma Spectroscopy - 0 Master Calibration
Master Quality Control Values

Phase	[illegible]	Value	Phase	[illegible] Avg CPS	Value	Phase	[illegible] Avg CPS	Value
Master	[illegible]	[illegible]	Master	[illegible]	877.1	Master	[illegible]	[illegible]
Minimum	Nominal	Maximum	Minimum	Nominal	Maximum	Minimum	Nominal	Maximum

Phase	[illegible]	Value
Master	[illegible]	[illegible]
Minimum	Nominal	Maximum

Master: [illegible]

COMPANY **Texland Petroleum**

WELL **SSAU #1173**

FIELD **Fullerton Prosp[illegible]**

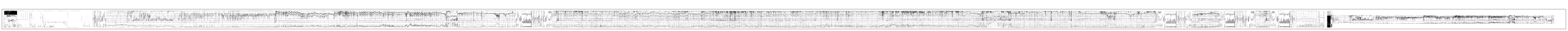
COUNTY **Andrews**

STATE **Texas**

BOTTOM LOG INTERVAL	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Schlumberger

Compensated Neutron
Litho Density Log
W/NGT & Caliper



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Chapter 142 848

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Chapter 144 860

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Chapter 151 902

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Chapter 194 1160

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Chapter 370 2216

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Chapter 584 3500

Chapter 585 3506

Chapter 586 3512

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Chapter 20
Chapter

ANDREWS

SEC 2 BLK A39 PSL A-2114

HALLIBURTON LOGGING SERVICES

COMPENSATED Z-DENSILOG — COMPENSATED NEUTRON

GAMMA RAY

9

COMPANY EXXON COMPANY U.S.A.

WELL FREUND B NO. 1

FIELD WILDCAT

COUNTY ANDREWS STATE TEXAS

LOCATION: 901' FSL & 660' FWL BLOCK A-39 P.S.L. SURVEY

2 TWP RGE

OTHER SERVICES: DLL/MLL/GR/CAL PROLOG

GROUND LEVEL ELEV. 3486.3

KB 14.7 FT. ABOVE P.D.

KELLY BUSHING

KB 3471
D 3471
3486.3

	JUNE 11, 1988	
	16484	
	7800	
	7805	
CASING INTERVAL	3802	
TUBING INTERVAL	0	
DRILLER	8 5/8 @ 1584	0
LOGGER	1584	
BIT SIZE	7 7/8	
TYPE FLUID IN HOLE	SALT WATER GEL/STARCH	
DENSITY / VISCOSITY	10.2 / 33	
PH / FLUID LOSS	9.0 / 10	
SOURCE OF SAMPLE	FLOWLINE	
RM @ MEAS. TEMP.	.045 @ 72	@
RMF @ MEAS. TEMP.	.045 @ 72	@
RMC @ MEAS. TEMP.	- @ -	@
SOURCE RMF / RMC	M / -	
RM @ BHT	.027 @ 118	@
TIME CIRCULATION	6 HR.	
MAX. REC. TEMP.	118	
EQUIP. NO. / LOC.	ML-6364 / HOBBS	
RECORDED BY	VAUGHN	
WITNESSED BY	J. THACKERY	

REPRODUCED BY
Petroleum Information
MIDLAND, TEXAS 79701

REFERENCE Y 803F

MADE FROM BEST COPY AVAILABLE

25 COMPLETION RECORD

ANDREWS WEST TEXAS WILDCAT WF

EXXON CORP
1 FREUND "B" (API 42 003 36094) (H 10 81 # 144174)

STATUS: D&A-O

LOCN: 27 MI NW ANDREWS, TX; 901 FSL 660 FWL SEC. SEC 2; BLK A39; SURVEQUIV: PSL; A-2114;

SPUD: 05/26/88 COMP: 07/19/88 EL: 3471 DF DTD: 7800 (WICHITA ALBANY) CONTR: GRACE DRLG RIG # 189

CSG/LNR/TBG: 8 5/8 @ 1544 W/725 SX, 4 1/2 @ 7791 W/2000 SX.

RESULT: D&A NO CORES OR DSTS RPTD

COMP INFO: LOG TYPES: GAL 7800, CDL 7800, GR 7800, LDT 7800; PROD TEST(S): PERF (WICHITA ALBANY) 7501-7722, ACID (7501-7722) W/750 GALS. 2% KCL, SWBD 120 BW (W/TR OIL) BRPG 7380, PERF (GLORIETA) 4483-4510, SWBD 200 BF (W/TR OIL) RIG REL: 06/13/88

LOG TOPS: YATES 2968, QUEEN 3956, GRAYBURG 4206, SAN ANDRES 4462, GLORIETA 5630, TUBB 6710, CLEARFORK L 6805, WICHITA ALBANY 7380.

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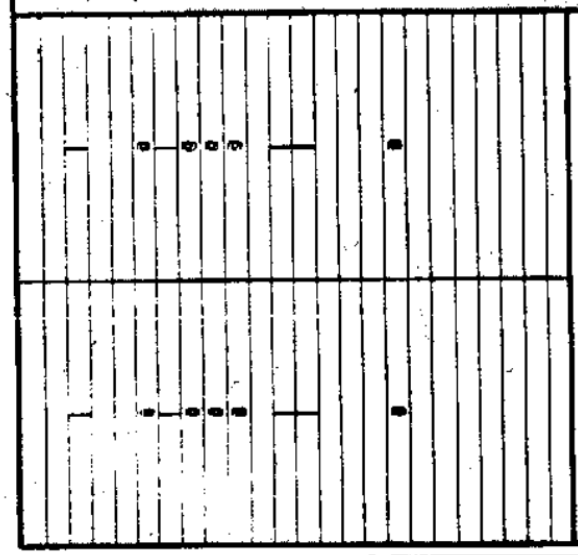
DATE 08/18/88 CARD #00003-W TEX



ATLAS WIRELINE SERVICES

Western Atlas International

IN MAKING INTERPRETATIONS OF LOGS OUR EMPLOYEES WILL GIVE CUSTOMER THE BENEFIT OF THEIR BEST JUDGEMENT, BUT SINCE ALL INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS, WE CANNOT, AND DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATION. WE SHALL NOT BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COST, DAMAGE, OR EXPENSE WHATSOEVER INCURRED OR SUSTAINED BY THE CUSTOMER RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR EMPLOYEES.

REMARKS RUN (1)

VOLUME IS CEMENT VOLUME (LESS 4.5 INCH CASING)
PE SMOOTHING OFF
CN POROSITY DECENTRALIZED AND CALIPER CORRECTED (CNC)

CREW: MEYERS & RAY

EQUIPMENT DATA

RUN	TRIP	TOOL	SERIAL NO.	SERIES NO.	POSITION
1	1	ZDL	94579	2222	DECENT 7900
1	1	CDL	94579	2222	2 FROM
1	1	GR	72389	1304	DECENT
1	1	CN	53270	2420	DECENT
1	1	ELEC	94579	2222 E	DECENT

CURVE DELAYS

CURVE	DELAY	UNITS
GR	24.9	FT,IN
CAL	1.0	FT,IN
SSD	1.3	FT,IN
HRD1	1.0	FT,IN
HRD2	1.0	FT,IN
SFT2	1.0	FT,IN
SAM	0	FT,IN
SSN	18.0	FT,IN
LSN	18.6	FT,IN

PARAMETERS

NAME	DEPTH INTERVAL		VALUE	UNITS
CHL COMP	7819 TO	35	CAL	
CHI SMTH	7819 TO	35	ACTIVE	
MATRIX	7819 TO	35	LIMESTONE	
O.D.	7819 TO	35	4.500	INCH
RHO F	7819 TO	35	1.100	G/CC

RHO M	7819 TO	35	2.710	G/CC
SALINITY	7819 TO	35	0.000	PPK

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: EXXON COMPANY U.S.A.

WELL NAME: FREUND B NO. 1

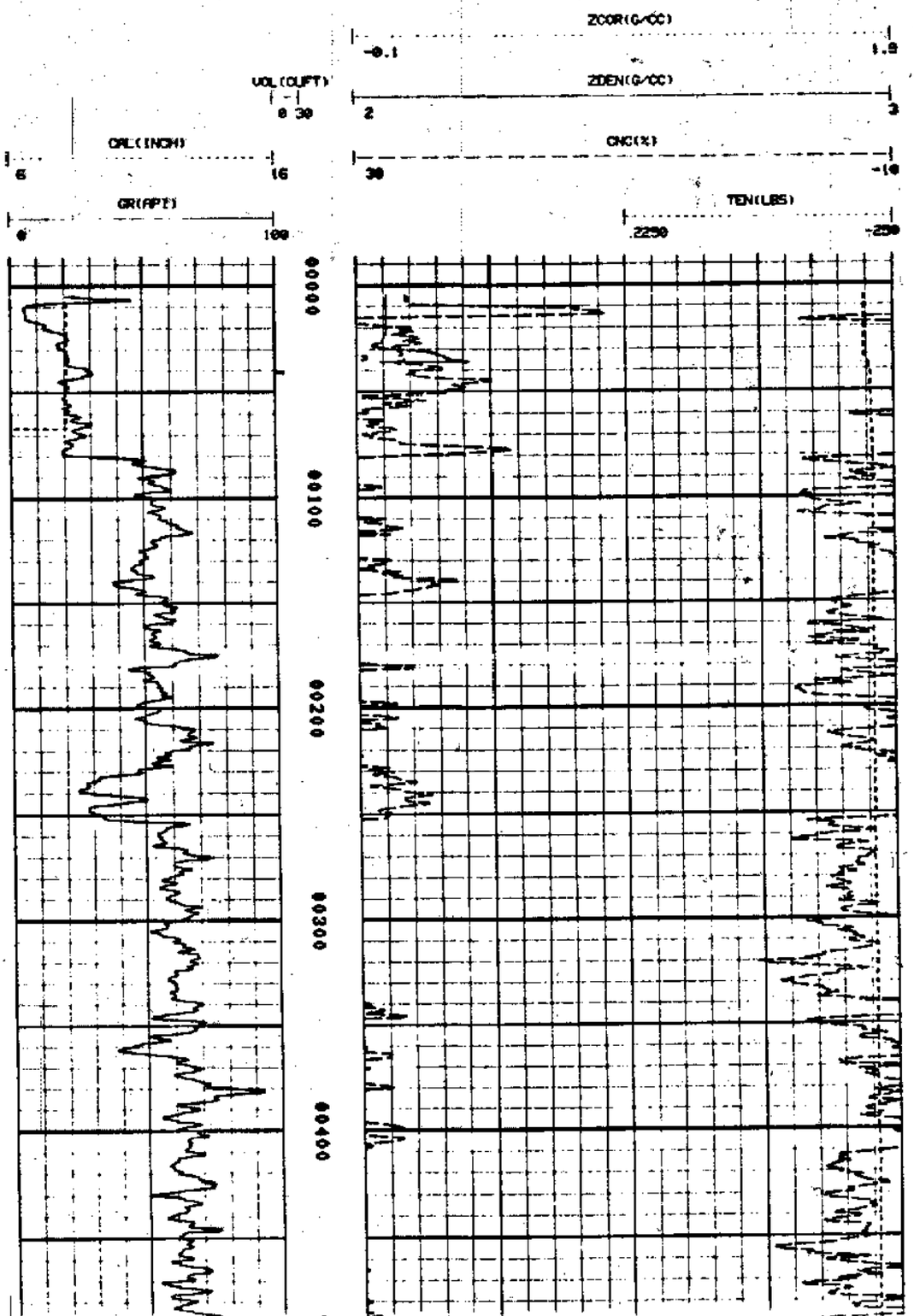
SERVICE: R LDL3 FILE: 2 DATE: 06/11/88 TIME: 06:05:22

REVISION: FSYSZS REV G501 VER 2

RUN: 1

TRIP: 1

MODE: RECORD



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0700
0900
0930
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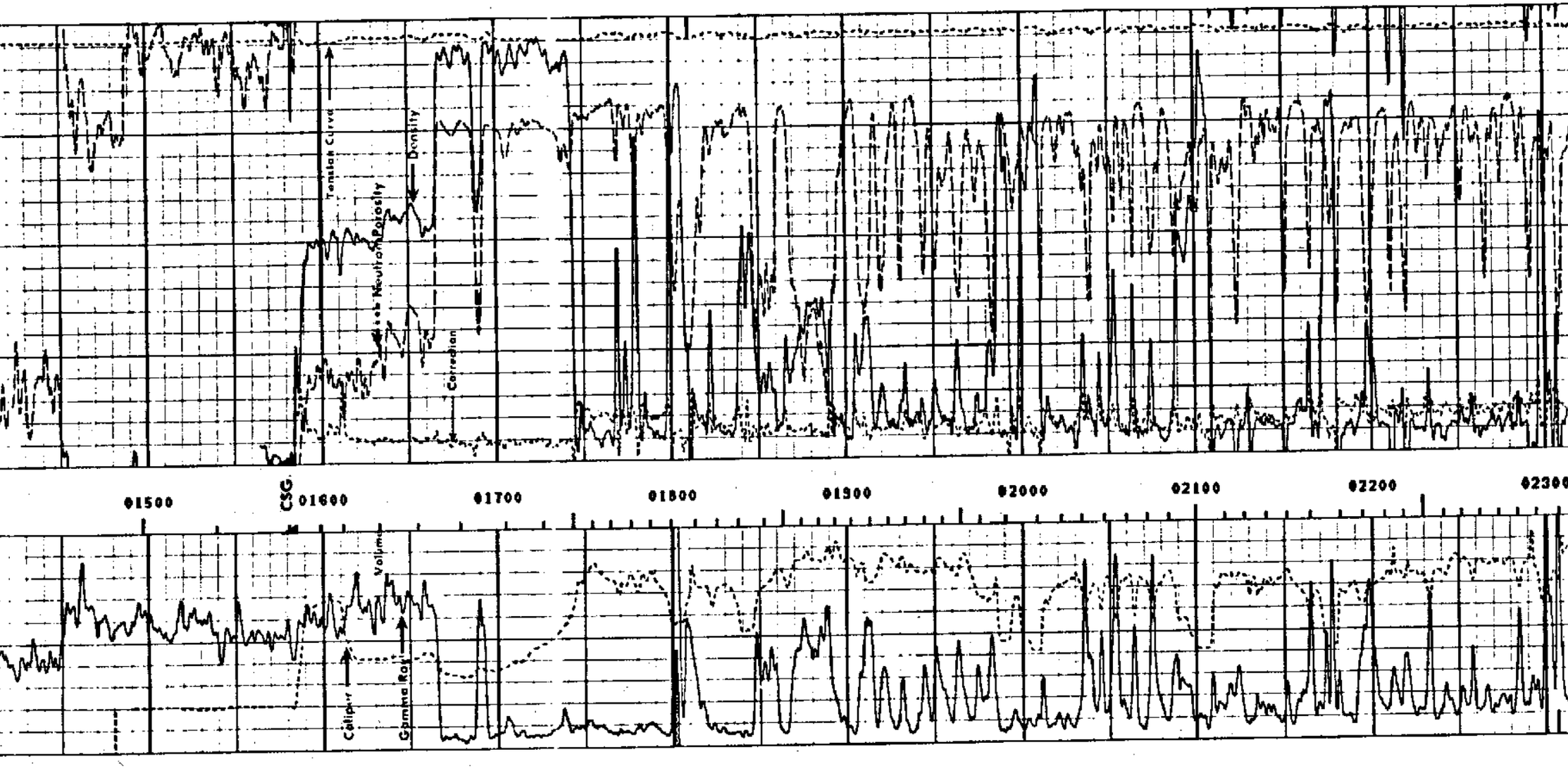
1100
1200
1300
1400


Transit Curve
Density
Neutron Porosity
Correction
CSG
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01600
01700
01800
01900
02000
02100
02200
02300
Caliper
Volume
Gamma Ray

02400
02500
02600
02700
02800
02900
03000

03200
03300
03400
03500
03600
03700
03800

04000
04100
04200
04300
04400
04500
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04900
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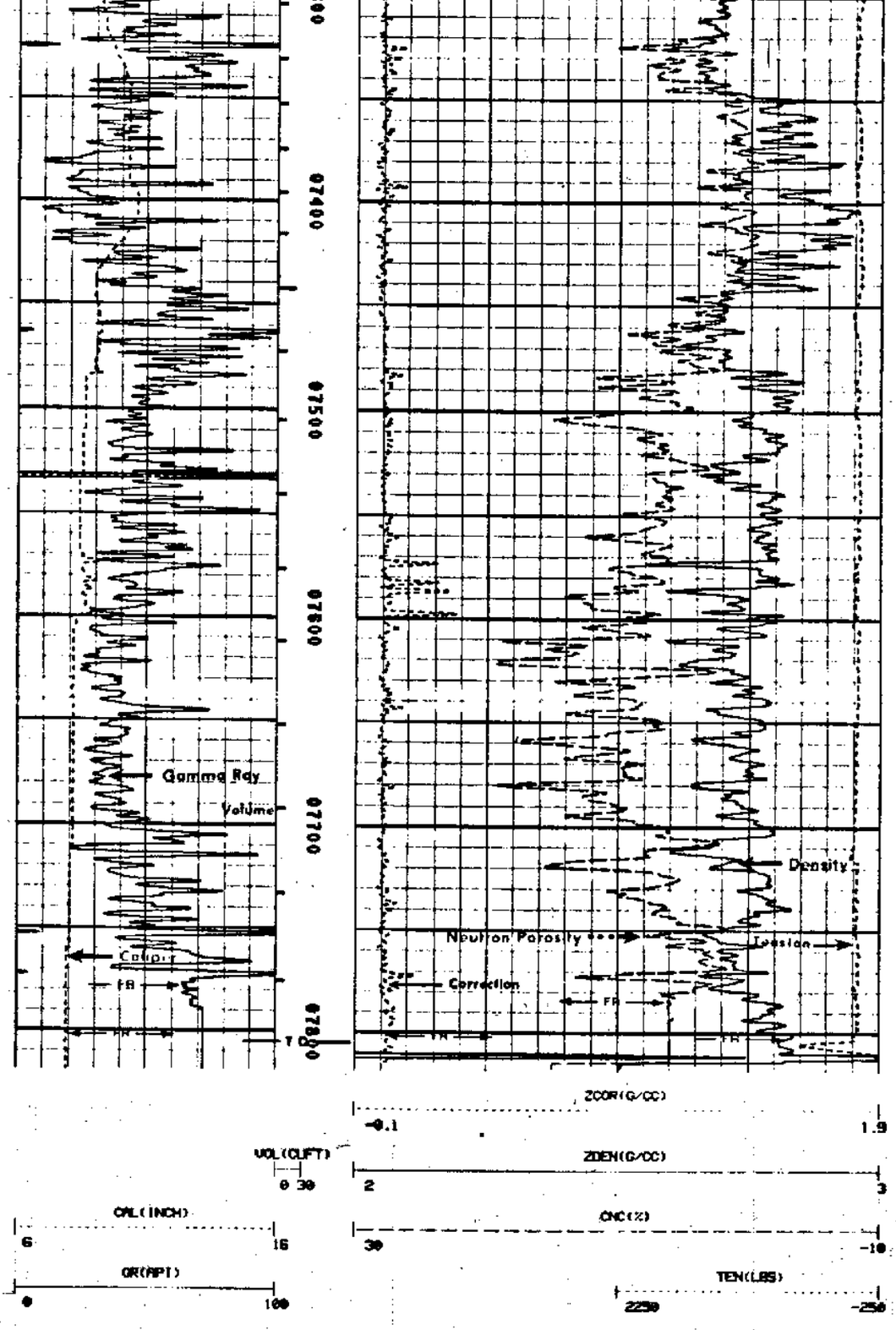


CURVE DELAYS

CURVE	DELAY	UNITS
GR	24.0	FT,IN
CAL	1.0	FT,IN
SSD	1.3	FT,IN
HRD1	1.0	FT,IN
HRD2	1.0	FT,IN
SFT2	1.0	FT,IN
SHR	0	FT,IN
SSN	18.0	FT,IN
LSN	18.6	FT,IN

PARAMETERS

NAME	DEPTH INTERVAL	VALUE	UNITS
CAL CORR	7819 TO 35	CAL	

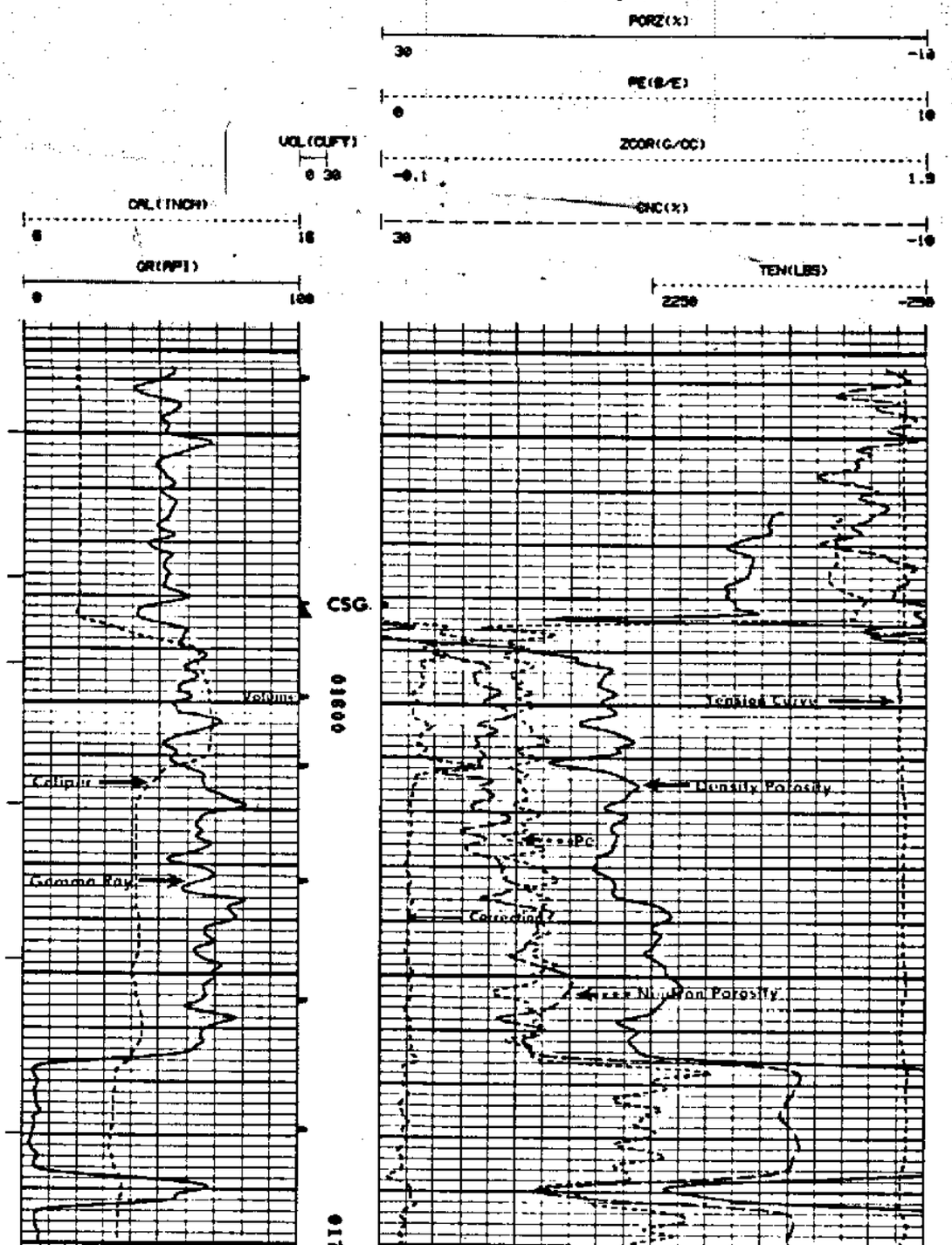
CNI SMTH	7819 TO	35	ACTIVE	
MATRIX	7819 TO	35	LIMESTONE	
O.D.	7819 TO	35	4.500	INCH
RHO F	7819 TO	35	1.100	G/CC
RHO M	7819 TO	35	2.710	G/CC
SALINITY	7819 TO	35	0.000	PPK

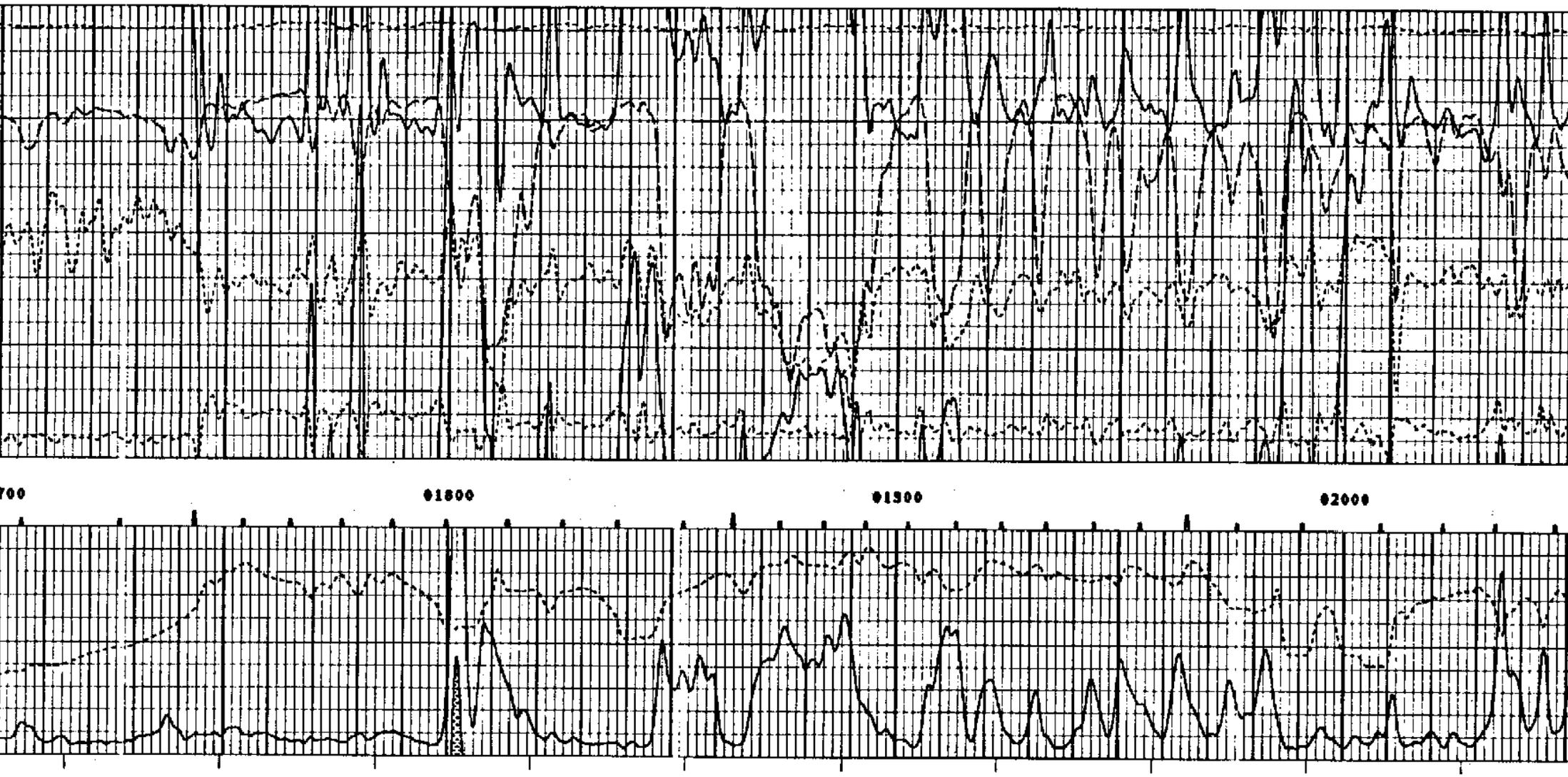
DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: EXXON COMPANY U.S.A.
WELL NAME: FREUND B NO. 1
SERVICE: R LDL3 FILE: 2
REVISION: FSYSZS REV 0S01 VER 2

RUN: 1
TRIP: 1
DATE: 06/11/88 TIME: 06:05:22
MODE: RECORD

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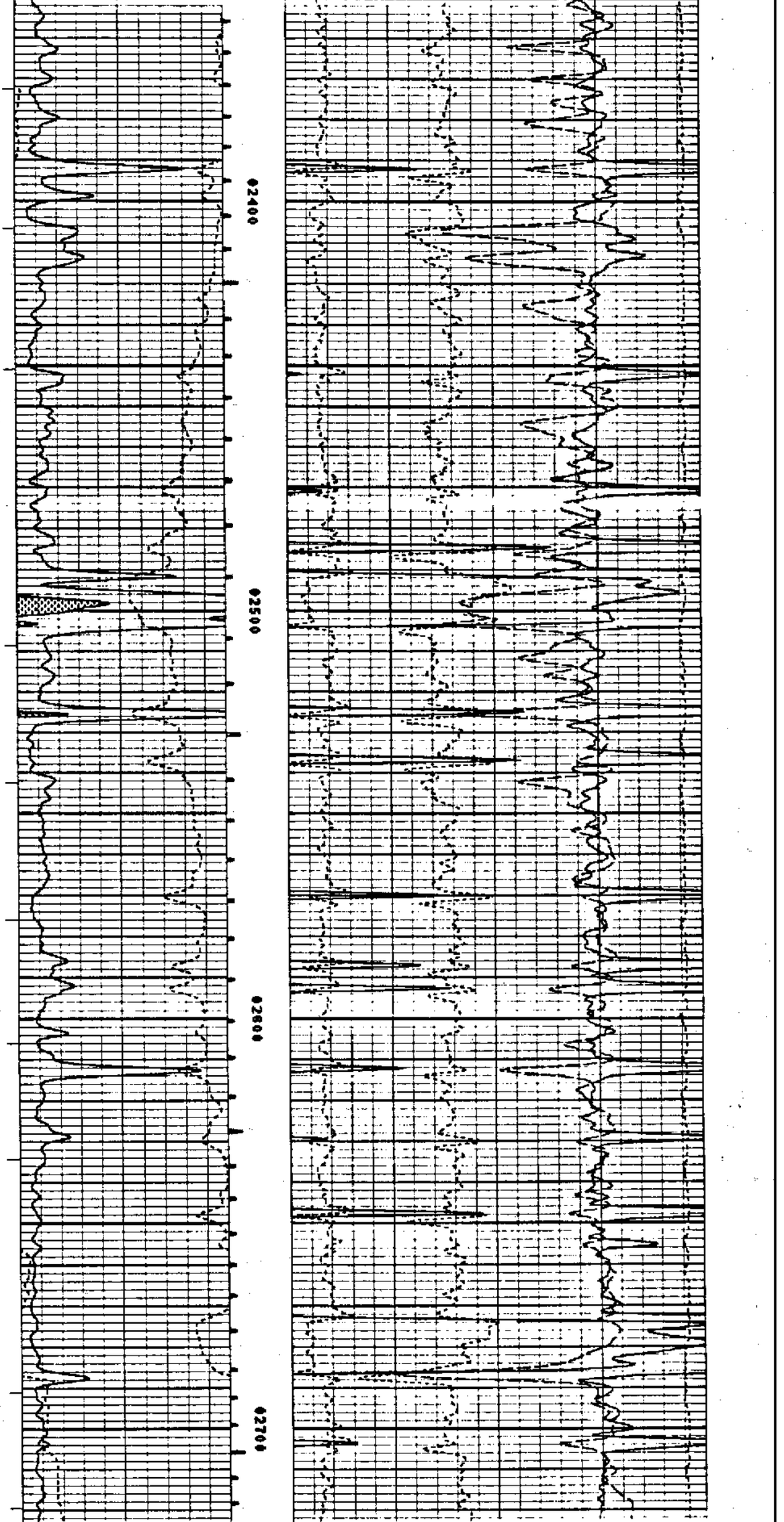
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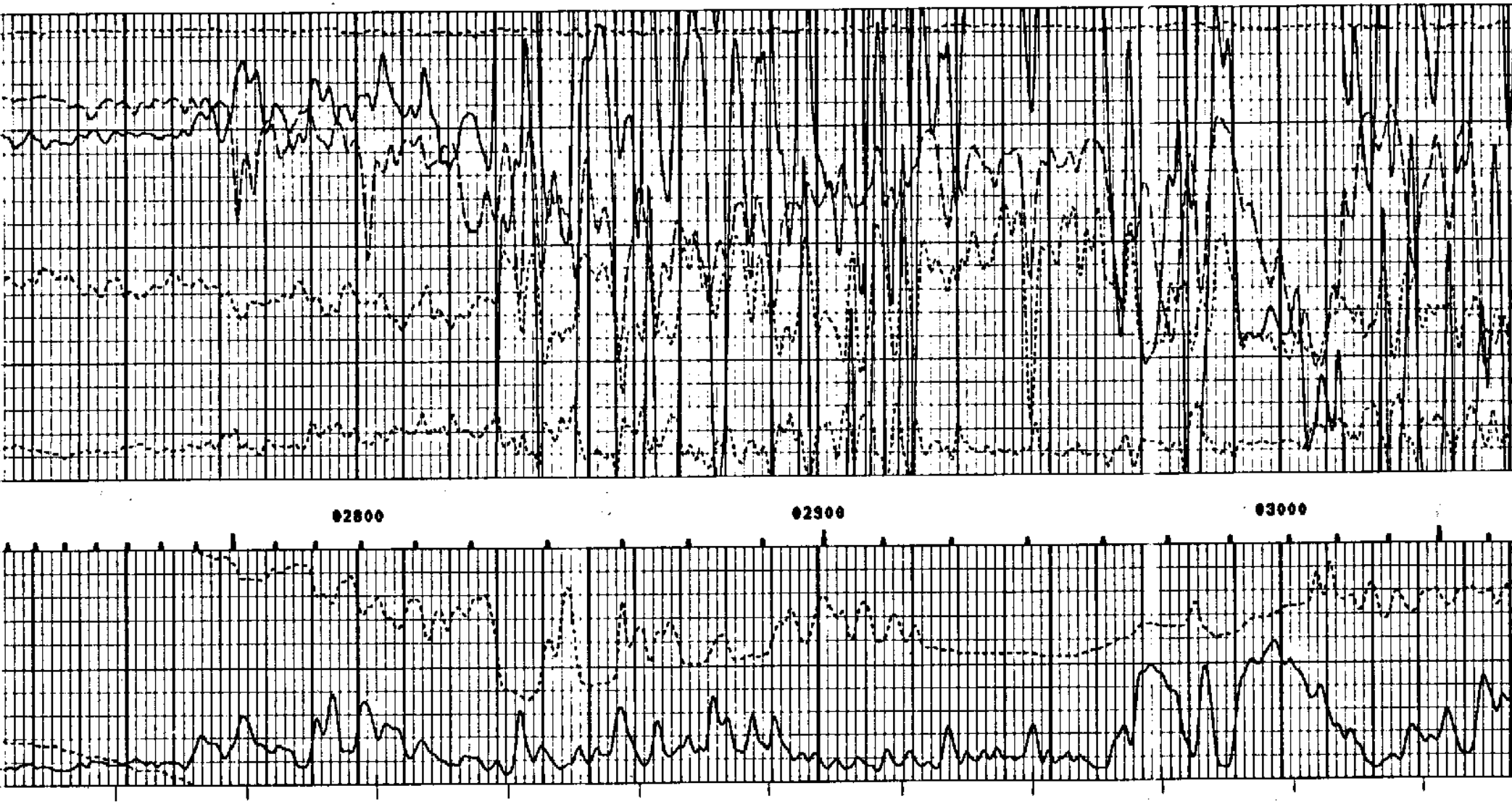
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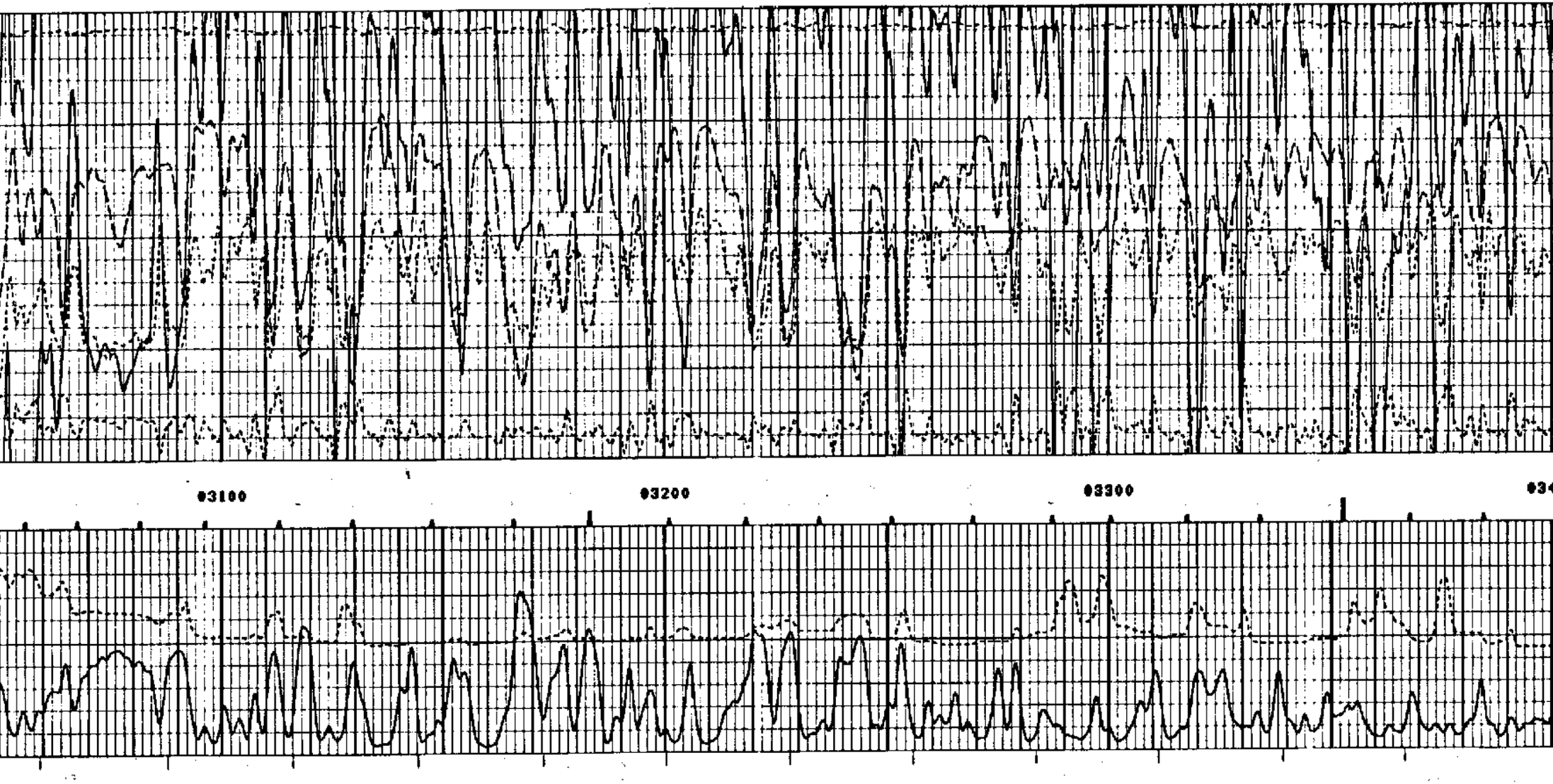
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3700

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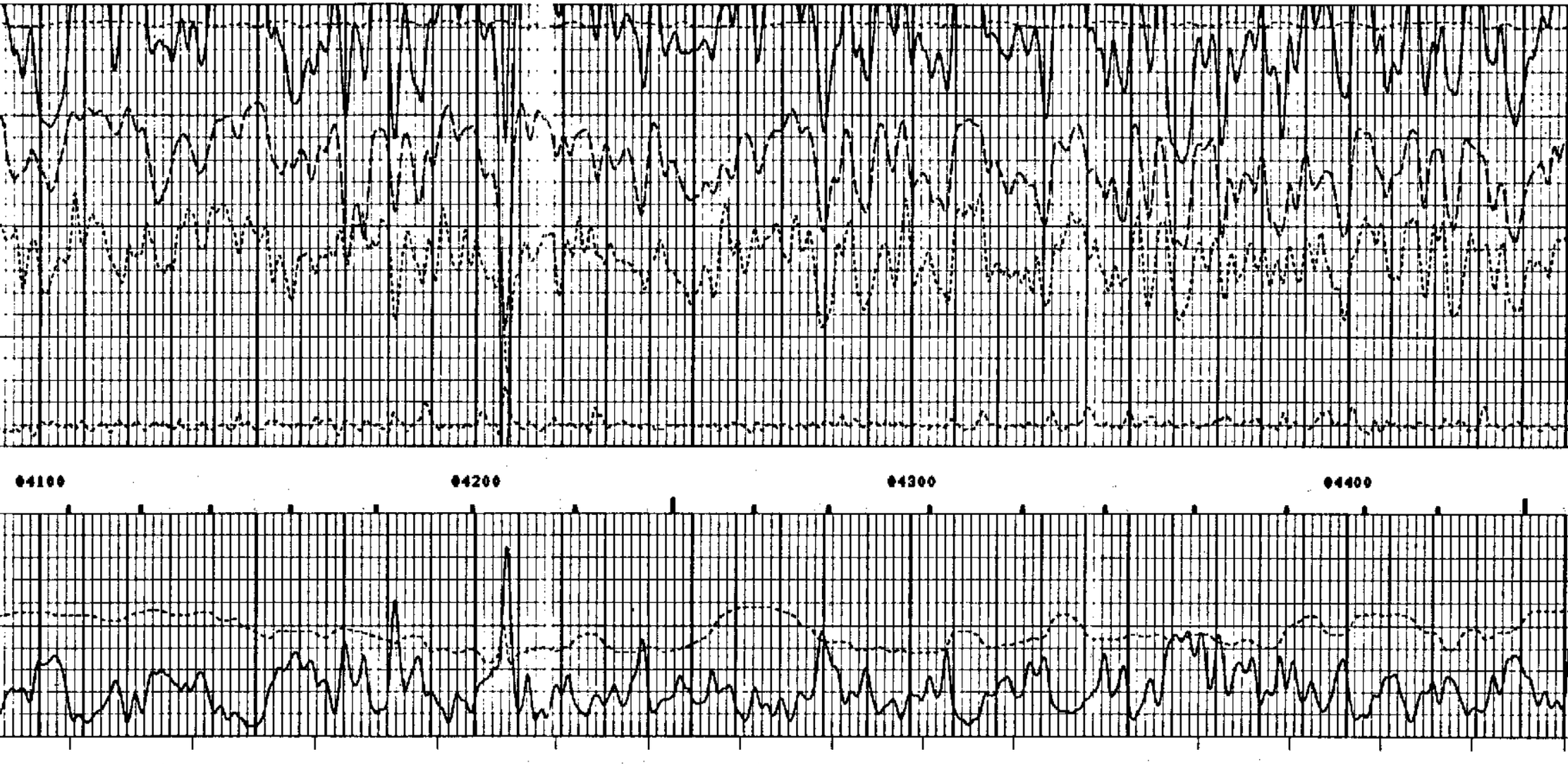
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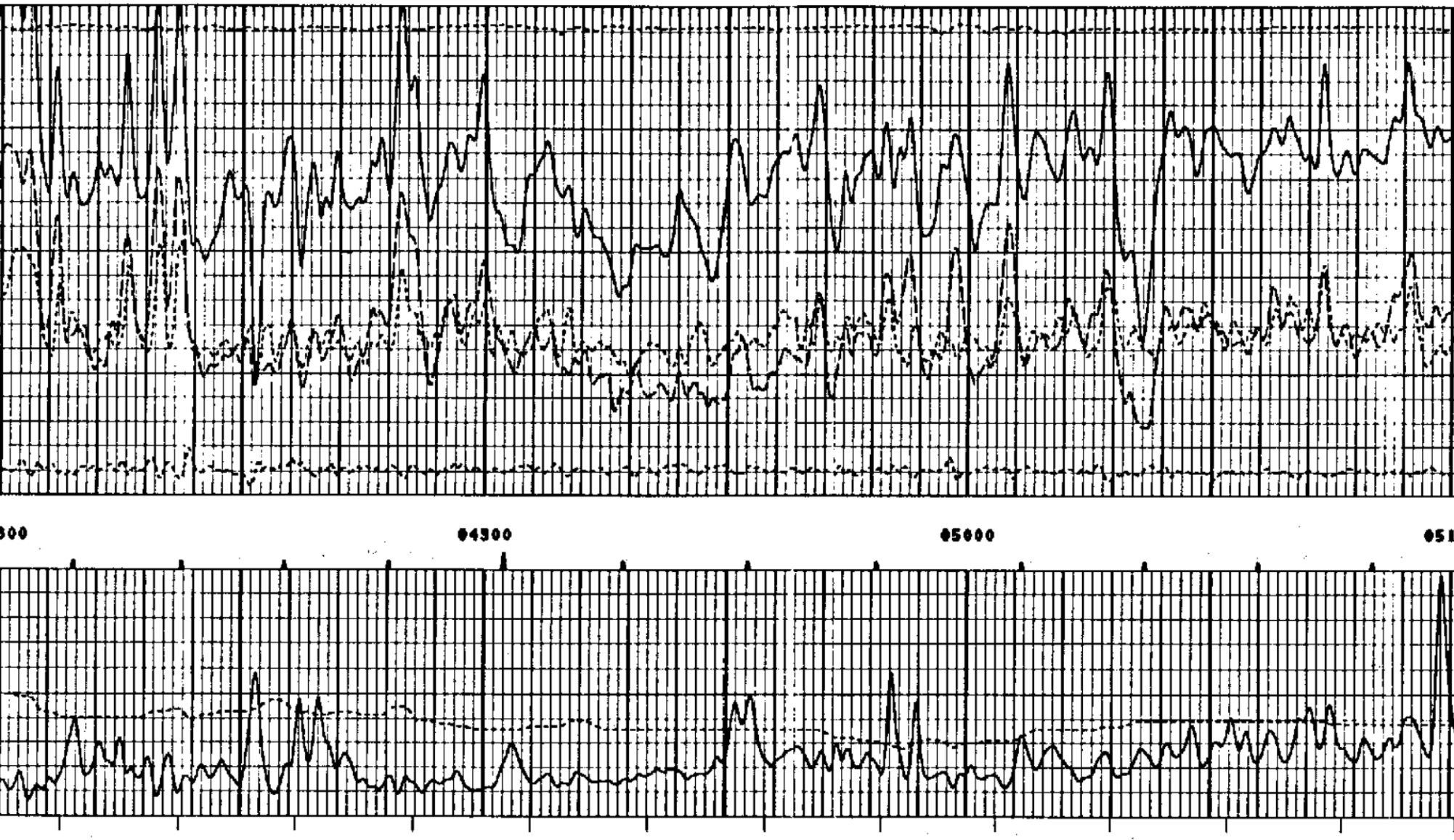
4800

4700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051

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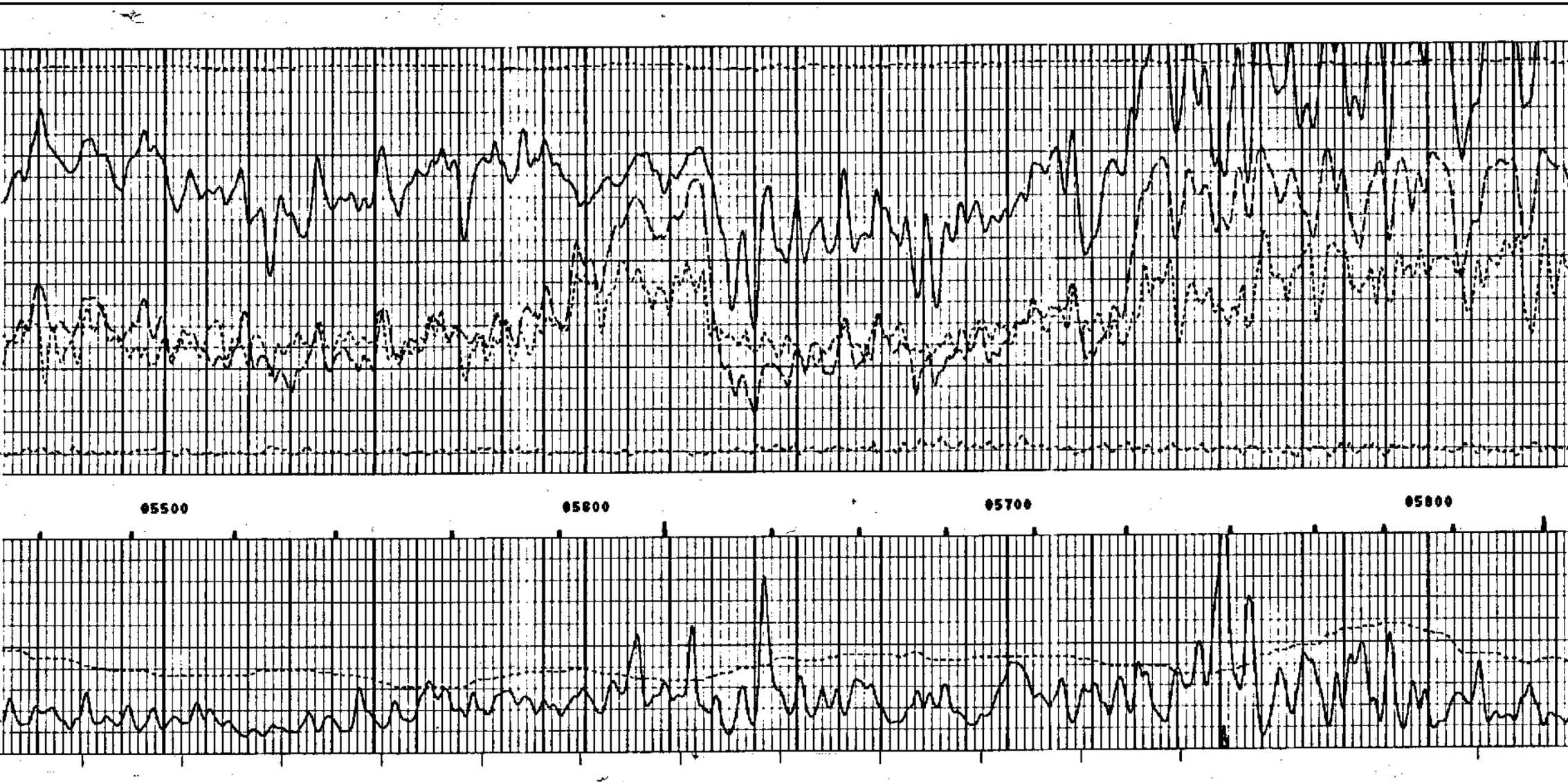
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0700

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08600
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6900

7000

7100

7200
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Gamma Ray
Caliper
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Density Porosity
Correction
Tension
TD
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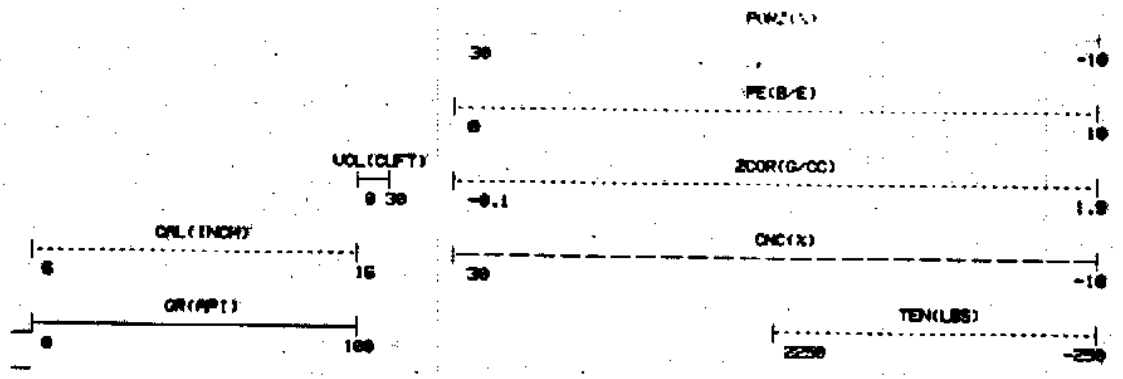


PARAMETERS

NAME	DEPTH INTERVAL	VALUE	UNITS
CAL CORR	7823 TO 7560	CAL	
CHI SMTH	7823 TO 7560	ACTIVE	
MATRIX	7823 TO 7560	LIMESTONE	
O.D.	7823 TO 7560	4.500	INCH
RHO F	7823 TO 7560	1.100	G/CC
RHO M	7823 TO 7560	2.710	G/CC
SALINITY	7823 TO 7560	0.000	PPK

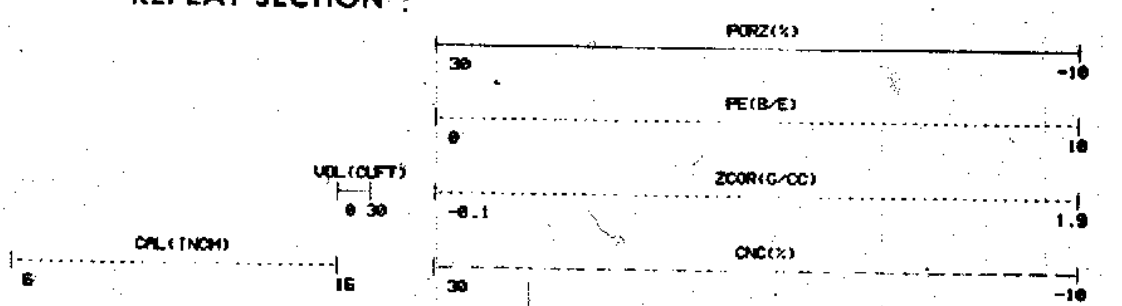
DISPLAY SCALE CHANGES

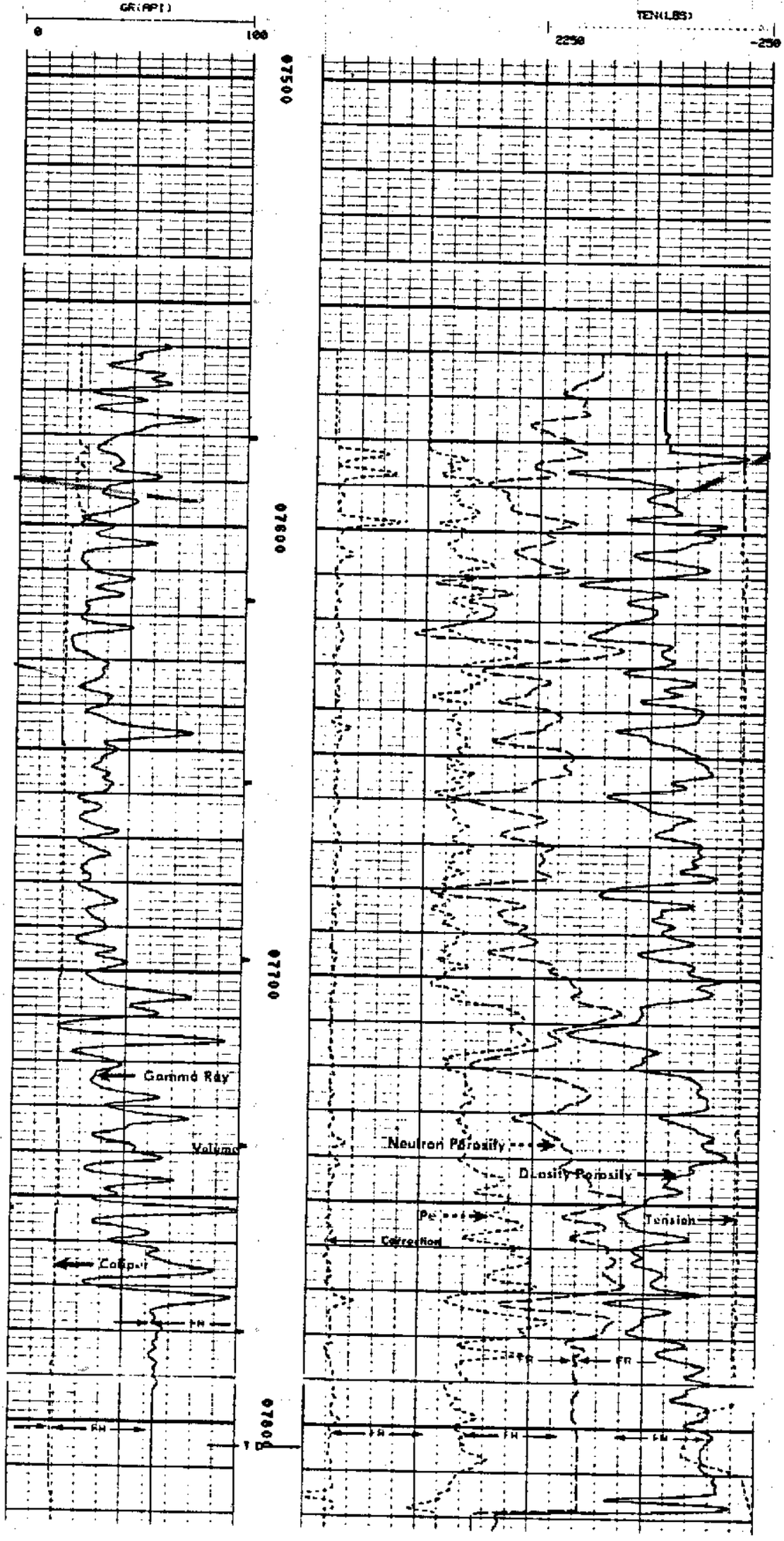
••• NONE •••

COMPANY: EXXON COMPANY U.S.A.
WELL NAME: FREUND B NO. 1
SERVICE: R LDL3 FILE: 1 DATE: 6/11/88 TIME: 5:39:44
REVISION: FSYSZS REV GS01 VER 2

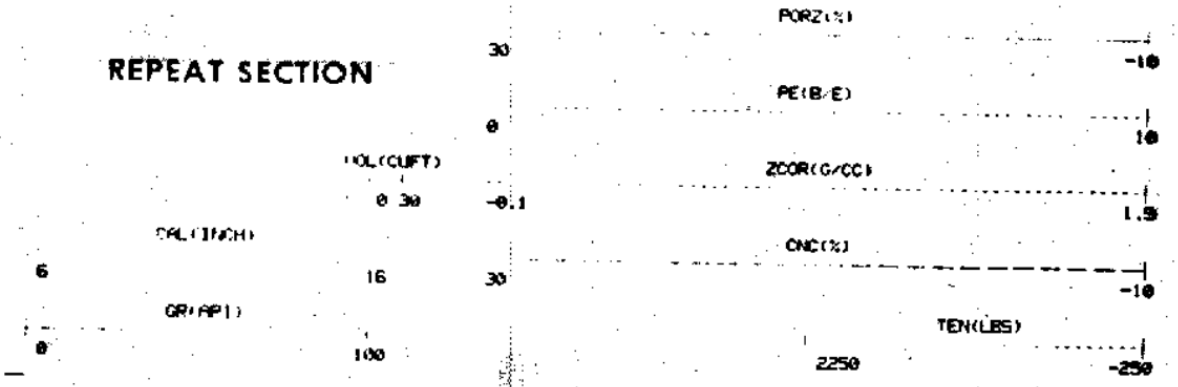
RUN: 1
TRIP: 1
MODE: PLAYBACK

REPEAT SECTION




GR(API)
0
100
TEN(LBS)
2250
-250
07500
07600
07700
07800
Gamma Ray
Caliper
Neutron Porosity
Density Porosity
Pe
Correction
Tension
FR
FR
FR
FR
FR
FR
FR
FR

REPEAT SECTION



CALIBRATION/VERIFICATION SUMMARIES
DATE 06/11/88 TIME 11:33:53
RUN 1 TRIP 1

LOG NAME ZDL ASSET NO. 94579 UNIT NO. ML 6364
CALIBRATION ENTERED ON 06/11/88 AT 03:43:58
SOURCE NUMBER 910

CURVE	COUNTS/SEC. BLOCK VALUE	SCALING FACTORS ADD.	MULT.	RATIO MG/AL	ENG. VALUE	UNITS
DATE 06/04/88	CALIBRATION				TIME 12:58:47	
SSD	DN1 13065.4					
HRD1	5441.5					
HRD2	6751.7					
ZDNA						
ZCRA					1.723	G/CC
ZDNB					-0.001	G/CC
ZCRB					1.724	G/CC
SSD	DN3 9072.9				0.001	G/CC
HRD1	988.8					
HRD2	1290.5					
ZDNA						
ZCRA					2.610	G/CC
ZDNB					0.148	G/CC
ZCRB					2.518	G/CC
SSD	DN2 6502.6	0.000	1.0000	2.0000	0.066	G/CC
HRD1	571.2	0.000	1.0000	9.5260		
HRD2	729.1	0.000	1.0000	8.7330		
ZDNA						
ZCRA					2.669	G/CC
ZDNB					-0.019	G/CC
ZCRB					2.650	G/CC
HRD1	DN4 5441.5				0.010	G/CC
HRD2	6751.7					
SHR	0.646					
PE						
HRD1	DN5 2477.3				1.990	B/E
HRD2	3383.6					
SHR	0.259					
PE						
CS					7.710	B/E
AM					229.709	CNL
					24.143	CNL
DATE 06/04/88	PRIMARY VERIFICATION				TIME 14:05:12	
SSD	DN2 6129.4	0.000	1.0000	0.0000		
HRD1	374.3	0.000	1.0000			
HRD2	521.0	0.000	1.0000			
SHR	0.455	0.000	1.0000			
ZDNA						
ZCRA					2.813	G/CC
ZDNB					0.047	G/CC
ZCRB					2.880	G/CC
PE	1				0.039	G/CC
CS					4.510	B/E
AM					229.709	CNL
					24.143	CNL
DATE 06/11/88	BEFORE LOG VERIFICATION				TIME 04:43:02	

SSD	DN2	6162.3	0.000	1.0000	0.0000		
HRD1		393.5	0.000	1.0000			
HRD2		517.0	0.000	1.0000			
SHR		0.486	0.000	1.0000			
ZDNA							
ZCRA						2.986	G/CC
ZDNB						0.047	G/CC
ZCRB						2.886	G/CC
PE						0.042	G/CC
CS						4.052	B/E
AM						229.709	CNL
						24.143	CNL

DATE 06/11/88 AFTER LOG VERIFICATION TIME 11:07:51

SSD	DN2	6149.0	0.000	1.0000	0.0000		
HRD1		395.1	0.000	1.0000			
HRD2		530.0	0.000	1.0000			
SHR		0.472	0.000	1.0000			
ZDNA							
ZCRA						2.892	G/CC
ZDNB						0.040	G/CC
ZCRB						2.872	G/CC
PE						0.038	G/CC
CS						4.252	B/E
AM						229.709	CNL
						24.143	CNL

LOG NAME CAL ASSET NO. 94579 UNIT NO. HL-6384
CALIBRATION ENTERED ON 06/11/88 AT 05:05:53

CURVE	COUNTS/SEC. LOW	HIGH	SCALING FACTORS ADD.	MULT.	ENGINEERING VALUES LOW	HIGH	UNITS
	DATE 06/11/88		CALIBRATION		TIME 04:32:08		
CAL	108.0	143.0	-4.854	0.1179	7.875	12.000	INCH
	DATE 06/11/88		PRIMARY VERIFICATION		TIME 04:34:58		
CAL	109.0	143.8	-4.854	0.1179	7.883	12.000	INCH
	DATE 06/11/88		BEFORE LOG VERIFICATION		TIME 04:39:08		
CAL	109.0	143.2	-4.854	0.1179	7.883	12.024	INCH
	DATE 06/11/88		AFTER LOG VERIFICATION		TIME 11:17:48		
CAL	109.0	142.0	-4.854	0.1179	7.883	11.882	INCH

LOG NAME GR ASSET NO. 72389 UNIT NO. HL 6384
CALIBRATION ENTERED ON 06/11/88 AT 04:08:52

CURVE	COUNTS/SEC. LOW	HIGH	SCALING FACTORS ADD.	MULT.	ENGINEERING VALUES LOW	HIGH	UNITS
	DATE 06/03/88		CALIBRATION		TIME 01:18:27		
GR	59.8	281.1	0.000	0.6780	0.000	150.000	API
	DATE 06/03/88		PRIMARY VERIFICATION		TIME 01:21:23		
GR	60.1	281.8	0.000	0.6780	40.718	191.072	API
	DATE 06/11/88		BEFORE LOG VERIFICATION		TIME 04:12:01		
GR	51.8	277.1	0.000	0.6780	35.106	187.919	API
	DATE 06/11/88		AFTER LOG VERIFICATION		TIME 11:29:22		
GR	46.5	271.5	0.000	0.6780	31.545	184.105	API

LOG NAME CN ASSET NO. 53270 UNIT NO. HL 6384
CALIBRATION ENTERED ON 06/11/88 AT 04:09:15 2413/20
SOURCE NUMBER 56521

CURVE	COUNTS/SEC.	SCALING FACTORS ADD.	MULT.	RATIO LSN/(SSN*8)	ENG. VALUE	UNITS
	DATE 05/24/88	CALIBRATION		TIME 13:01:33		
LSN	343.8	0.000	1.0000			
SSN	481.5	0.000	1.0000			
CN				0.0890	12.362	%
	DATE 05/24/88	PRIMARY VERIFICATION		TIME 13:22:32		
LSN	99.1	0.000	1.0000			
SSN	151.6	0.000	1.0000			
CN				0.0817	15.358	%
	DATE 06/11/88	BEFORE LOG VERIFICATION		TIME 04:19:47		
LSN	98.4	0.000	1.0000			
SSN	151.1	0.000	1.0000			
CN				0.0815	15.523	%
	DATE 06/11/88	AFTER LOG VERIFICATION		TIME 11:19:55		
LSN	100.3	0.000	1.0000			
SSN	151.7	0.000	1.0000			
CN				0.0827	14.821	%

GEARHART

COMPENSATED DENSITY COMPENSATED NEUTRON LOG

FILING NO

COMPANY C.F. DUALITA OPERATING INC.

WELL HEDBERG ESTATE "A" NO. 1

FIELD BOYDELL, SOUTH

COUNTY ANDREWS STATE TEXAS

LOCATION:
660' FNL & 660' FWL
PSL SURVEY

SEC 14 TWP ____ RGE BLK A-31

Other Services
DUL/MSFL

Permanent Datum GL Elev 3435
Log Measured from KB 12 Ft Above Perm. Datum
Drilling Measured From KB

Elev.: K.B. 3447
D.F. 3446
G.L. 3435

Date	2-22-88				
Run No.	One				
Depth-Driller	8470				
Depth-Logger	8338				
Bottom logged interval	8248				
Top logged interval	Surf.				
Type fluid in hole	Salt Gel Starch				
Density / Visc.	10.3 / 70				
pH / Fluid Loss	9.0 / 15				
Max rec. temp, deg F.	129 °F	°F	°F	°F	
Source of Samples	Pit				
Rm @ Meas. Temp.	.15 @ 62 °F	@ °F	@ °F	@ °F	
Rmf @ Meas. Temp.	.11 @ 62 °F	@ °F	@ °F	@ °F	
Rmc @ Meas. Temp.	.2 @ 62 °F	@ °F	@ °F	@ °F	
Source Rmf / Source Rmc	Chart / Chart				
Time: End Circulation	2100 2-21				
Time: Logger on Bottom	0730				
Recorded By	Dyatt				
Witnessed By	Mr. Price				

Run No.	Bore-Hole Record Bit	From	To	Casing Record Size	Wgt.	From	To
One	7 7/8	1690	TD	8 5/8	N/A	Surface	1690
				-			

FOLD HERE

ST COPY AVAILABLE

ANDREWS WEST TEXAS BOYDELL, SOUTH DO

OUALIA C F
1 HEDBERG ESTATE "B" (API 42-003-36041) (PERMIT # 341643) STATUS: OIL

LOC'N: 17 MI NW FRANKEL CITY, TX, 660 FNL 660 FWL, SEC. SEC 14; BLK A31; SUR/EQUIV: PSL; A-1064;

SPUD: 02/04/88 COMP: 04/02/88 EL: 3447 KB 3436 GR TD: 8470 (CLEAR FORK L) PBTD: 7480
CONTR: WES-TEX DRLG RIG # 9 RIG SUB:10

CSG/LNR/TBG: 8 5/8 @ 1890 W/660 SX, 5 1/2 @ 7665 W/515 SX, 2 3/8 @ 7122;

RESULT: IPP 51 BO, 45 MCFG, 3 BWPD, GOR 882, GTY 39 PROD ZONE - CLEAR FORK L 6958-7052 NO CORES OR DSTS RPTD

COMP INFO: LOG TYPES: POR 8240, RES 8240; PROD TEST(S): PERF (CLEAR FORK L), 7531-7541, W/2 PF, ACID (7531-7541) W/3000 GALS, 15% SWRD 98% FWTR (2% OIL) W/SSG BRPG 7460 PERF (CLEAR FORK L), 6958-6982, 7016-7038, 7046-7052, W/2 PF, ACID (6958-7052) W/1500 GALS 15% P 5a BOPD, 6 BW, 24 HR, PRODUCING INTERVAL(S) DATA: PERF (CLEAR FORK L) 6958-7052 W/2 PF GROSS, RIG REL: 02/24/88 (TD REACHED 02/24/88)

LOG TOPS: YATES 2874, SAN ANDRES 4306, CLEAR FORK 6111, CLEAR FORK L 6910;

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DATE 06/09/88 CARD # 00007-W TEX

EQUIPMENT DATA

Run No	Logging Unit	Location	Gamma Ray Tool No	Compensated Density Tool No	Compensated Density Source No	Compensated Density Source Type	Compensated Density Source Strg	Compensated Neutron Tool No	Compensated Neutron Source No	Compensated Neutron Source Type	Compensated Neutron Source Strg
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CALIBRATION DATA

Run No	Gamma Ray Bkg. cps	Gamma Ray Std cps	Compensated Density Magnesium LS	Compensated Density Magnesium SS	Compensated Density Aluminum LS	Compensated Density Aluminum SS	Compensated Density Test Block LS	Compensated Density Test Block SS	Compensated Density Caliper L. Rng	Compensated Density Caliper S. Rng	Compensated Neutron Calibrator LS	Compensated Neutron Calibrator SS	Compensated Neutron Caliper L. Rng	Compensated Neutron Caliper S. Rng
[illegible]	60.7	244.7	[illegible]	452.7	205.1	316.2	271.3	348.2	[illegible]	[illegible]	[illegible]	[illegible]	N/A	N/A

LOGGING DATA

Run No	General Depth From	General Depth To	General Speed FPM	Gamma Ray TC	Gamma Ray API PER LOG DIV	Compensated Density TC	Compensated Density Matrix Density	Compensated Density Fluid Density	Compensated Neutron TC	Compensated Neutron Matrix Type	Compensated Neutron Const. "K"	Compensated Neutron Temp. Grad.	Compensated Neutron Salinity PPM NaCL	Compensated Neutron Surf. Temp.
[illegible]	N/A	N/A	[illegible]	[illegible]	[illegible]	[illegible]	2.71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

REMARKS: Assessted by: Cortez, Mendez

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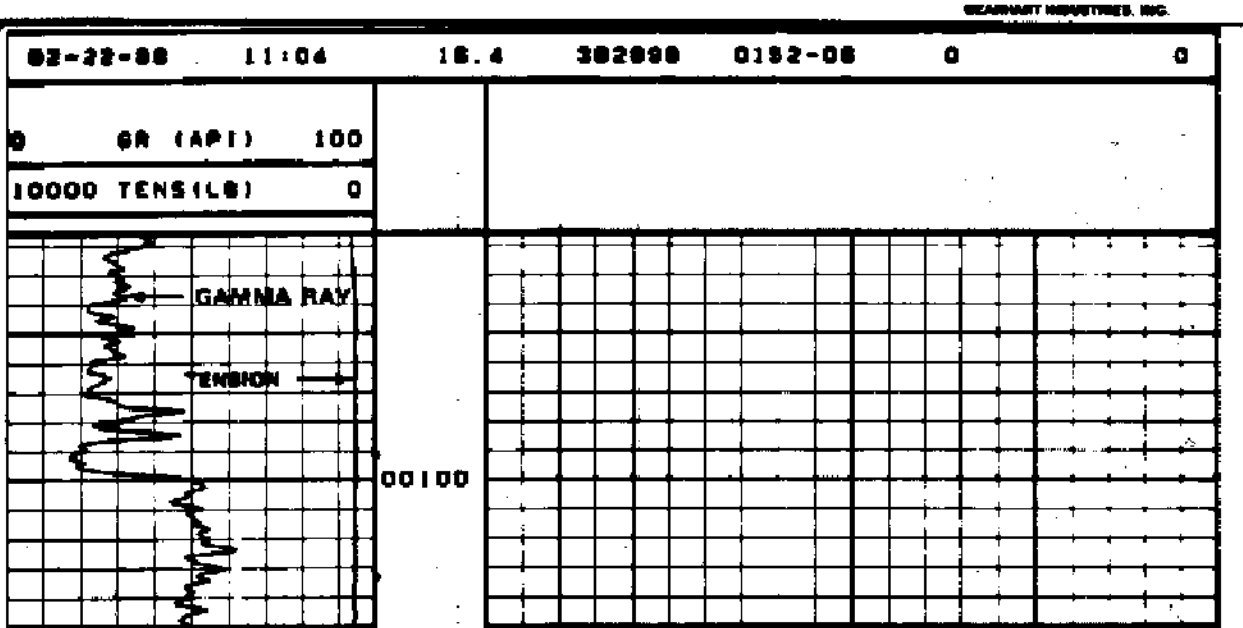
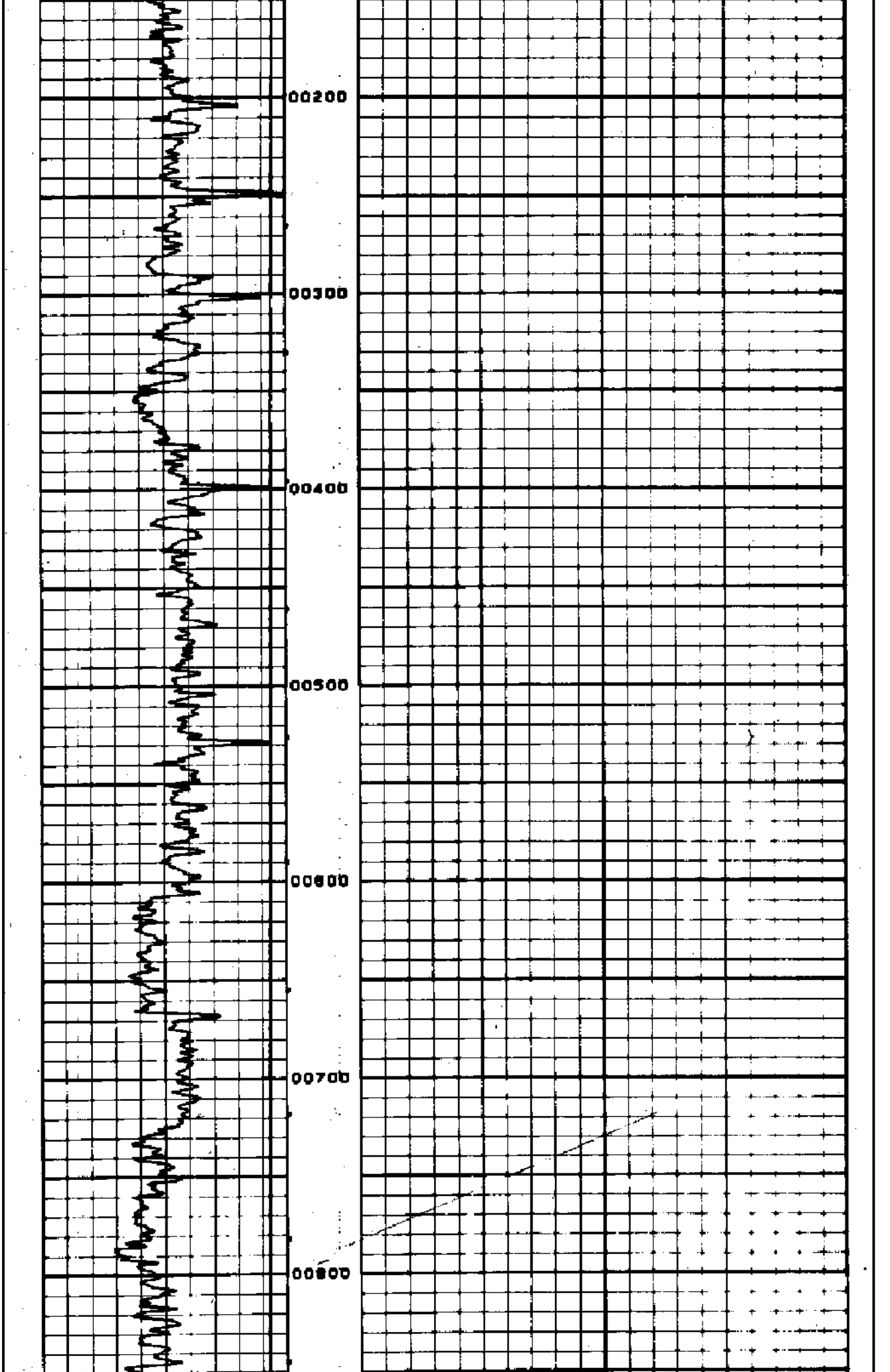
GEARHART INDUSTRIES, INC.

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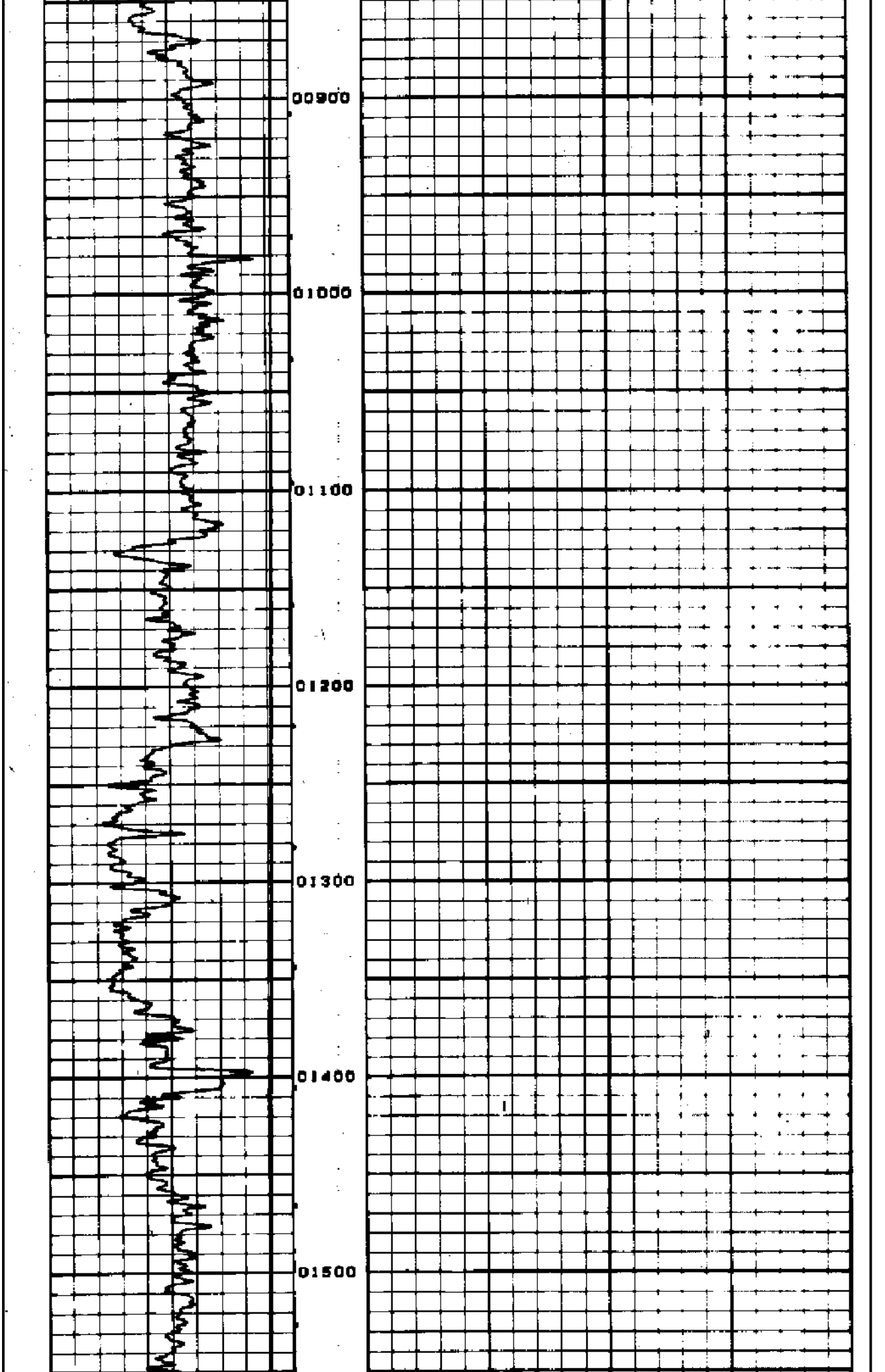
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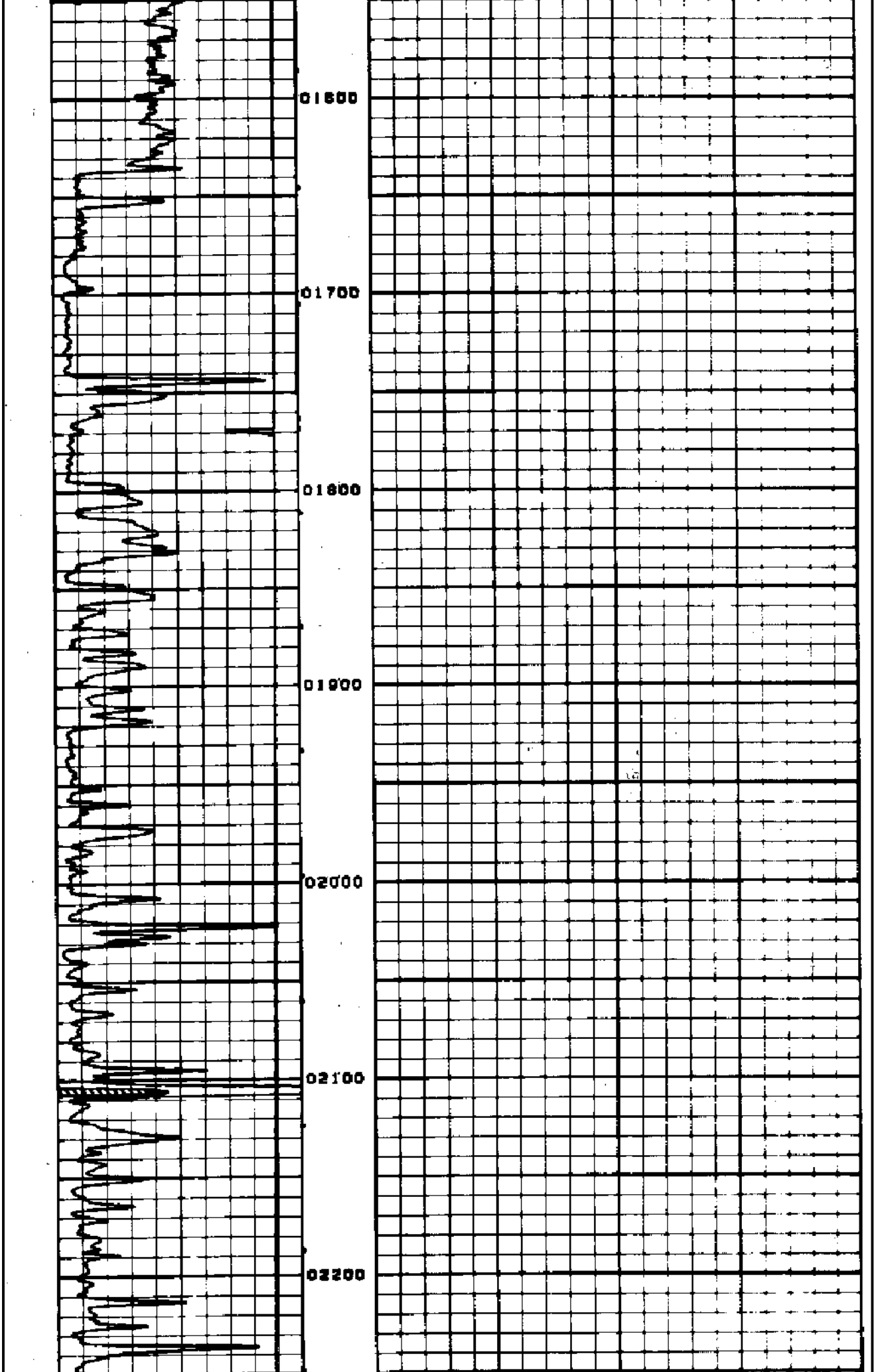
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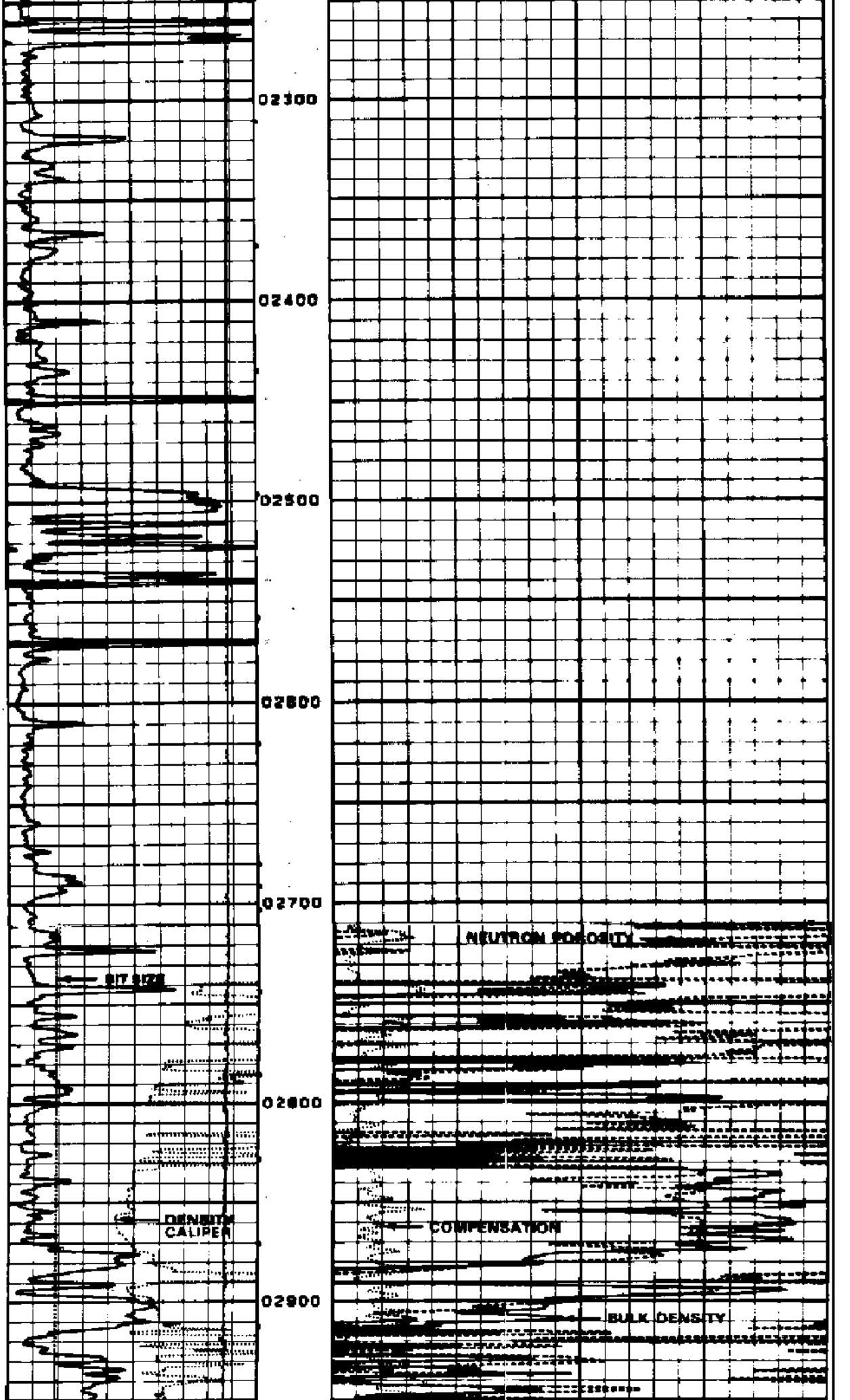
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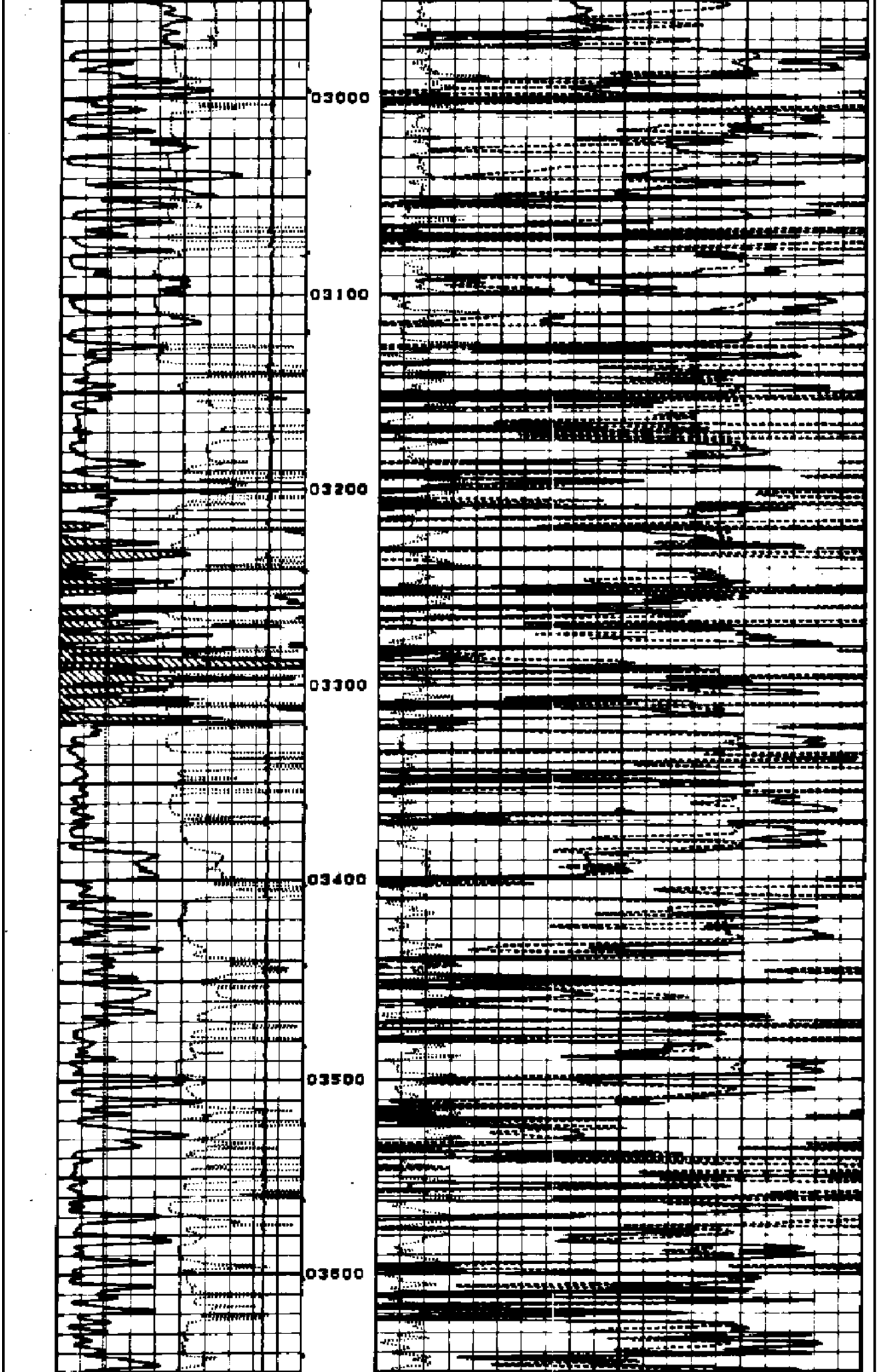
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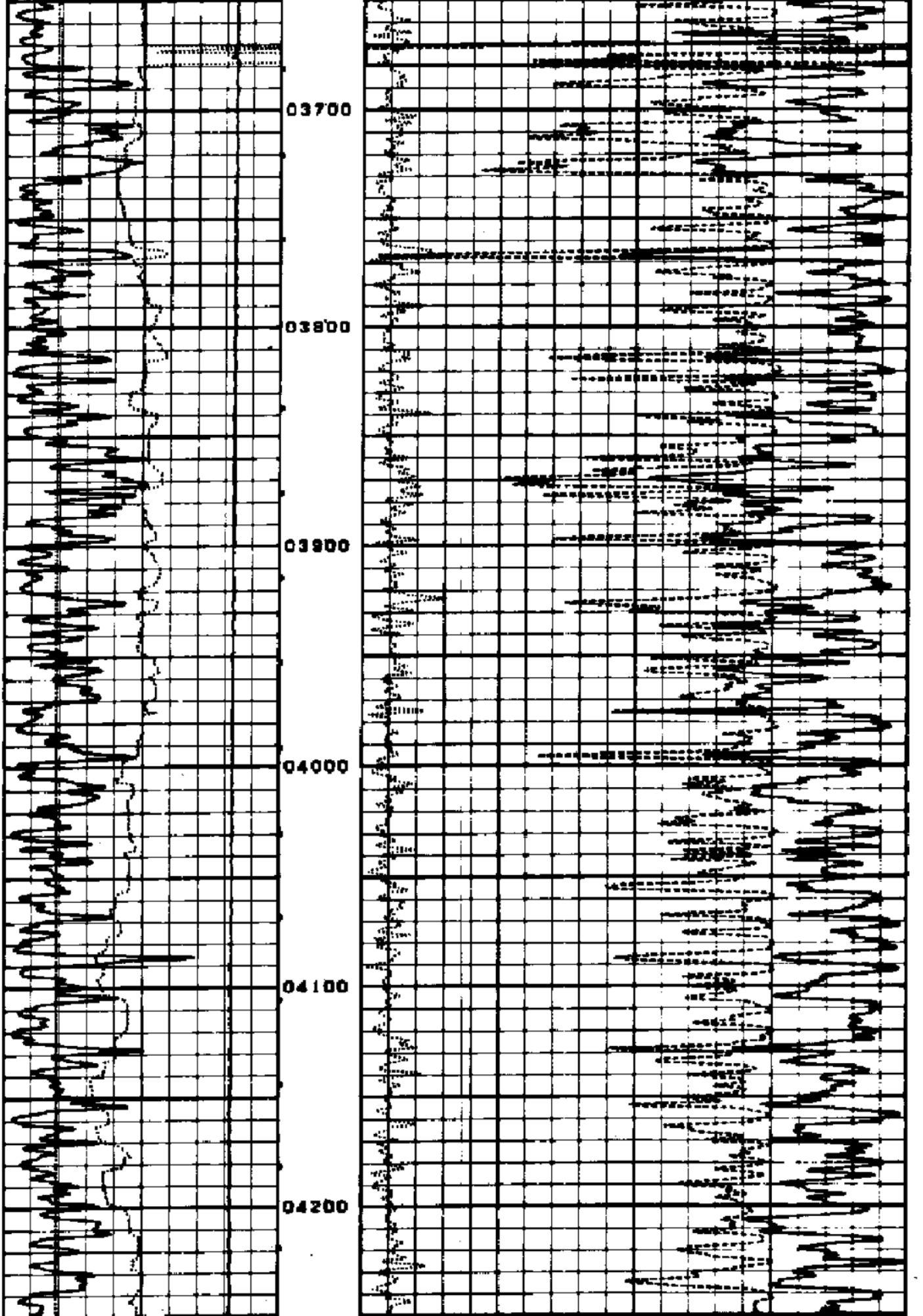
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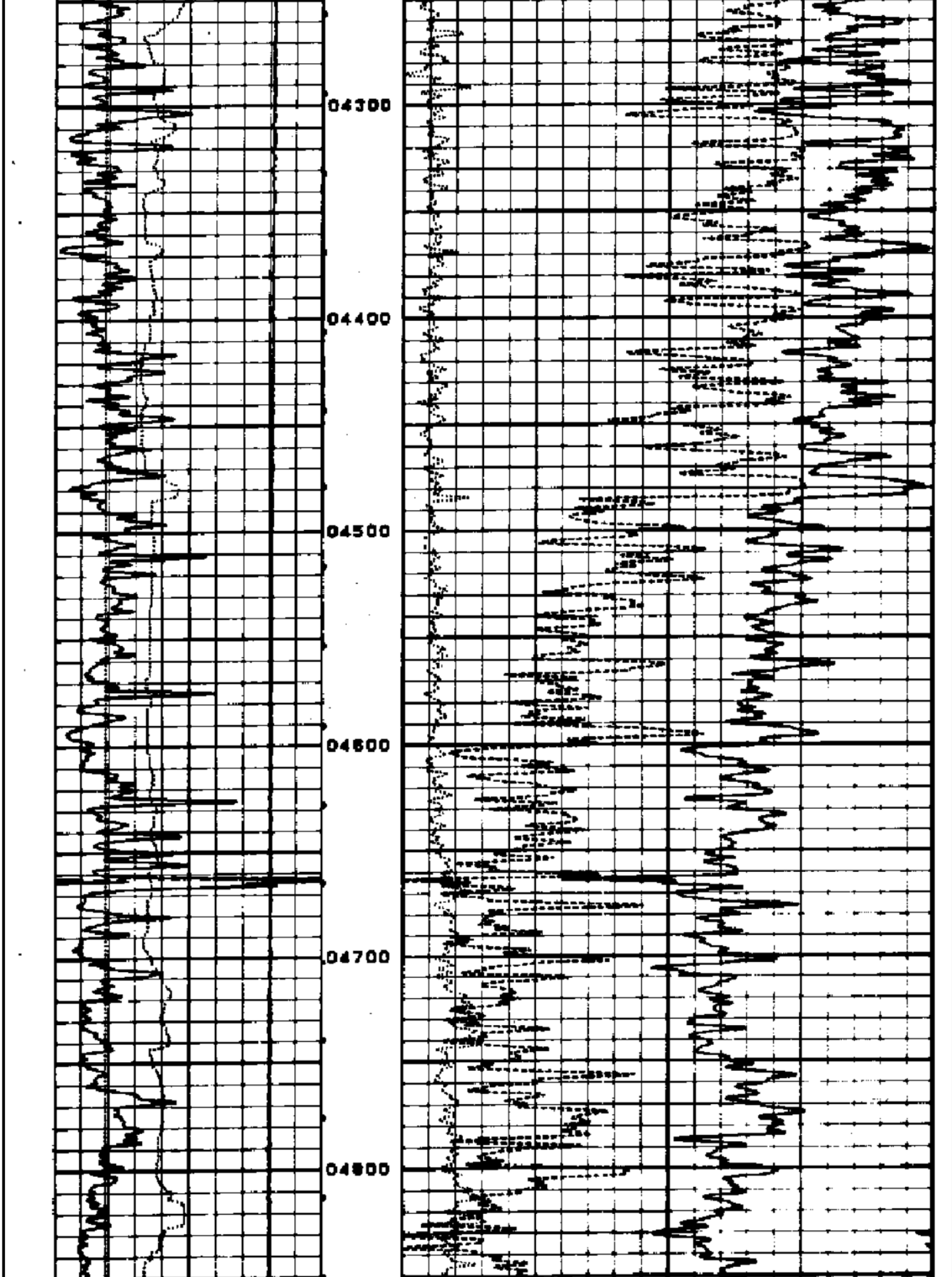
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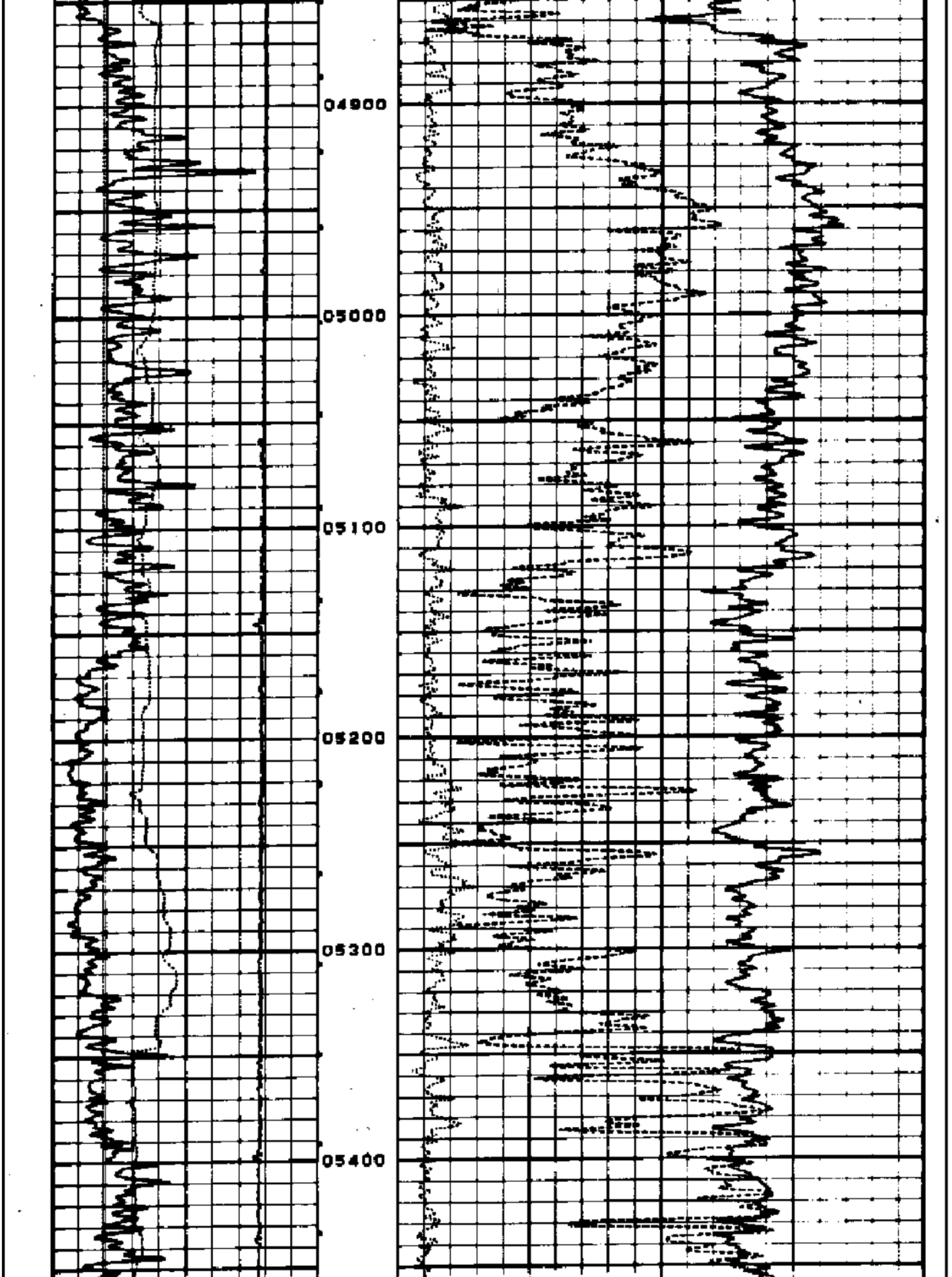
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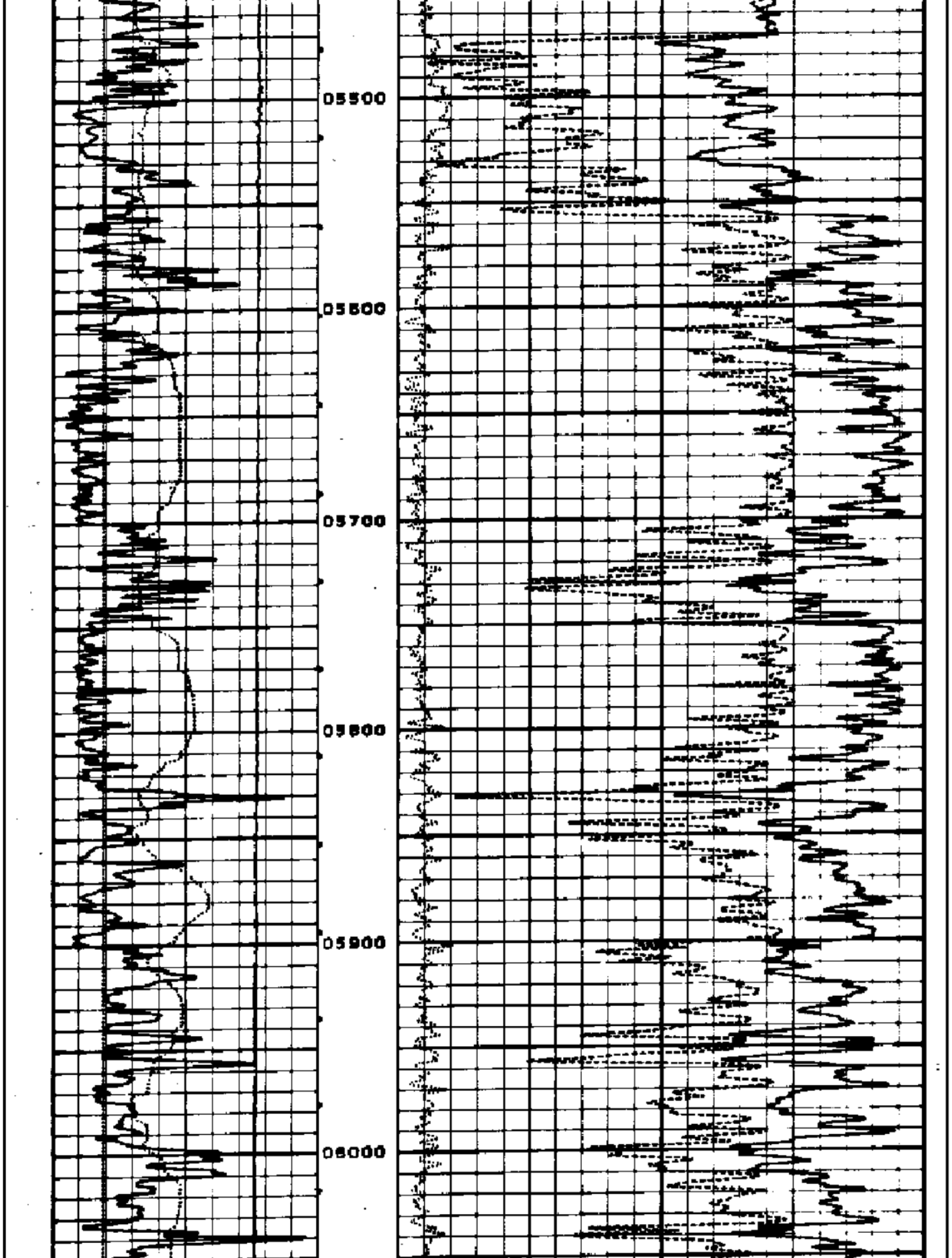
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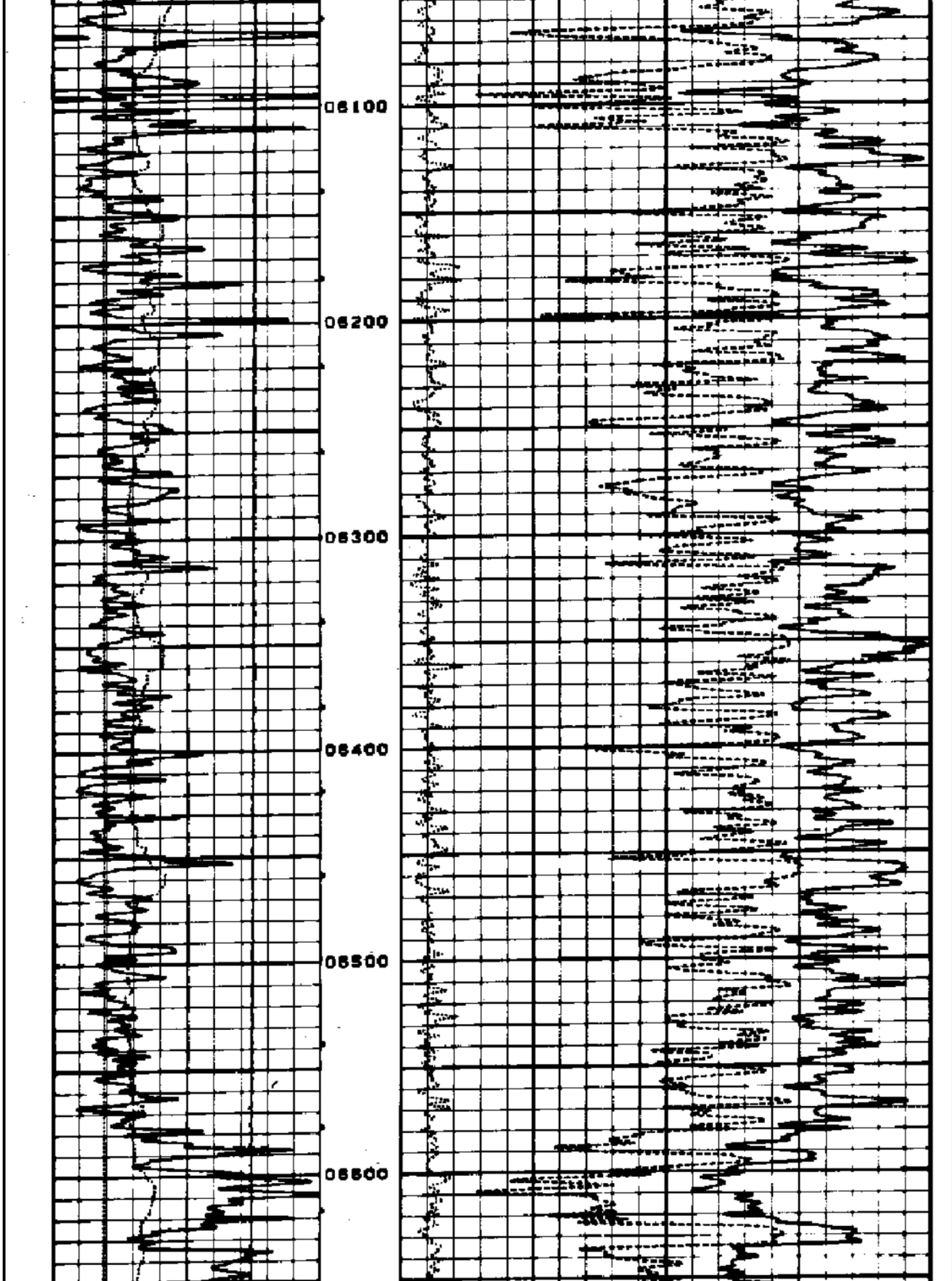
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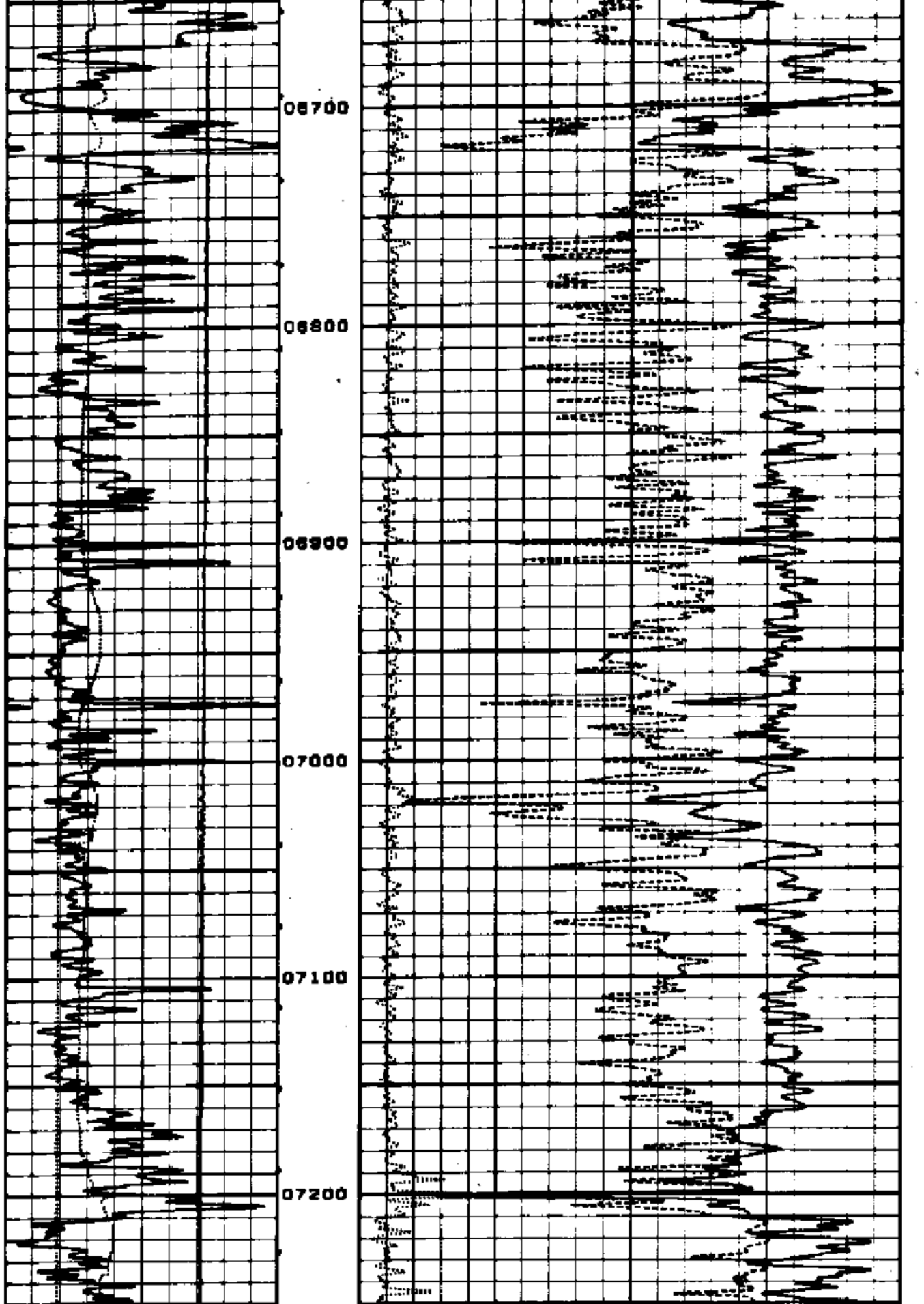
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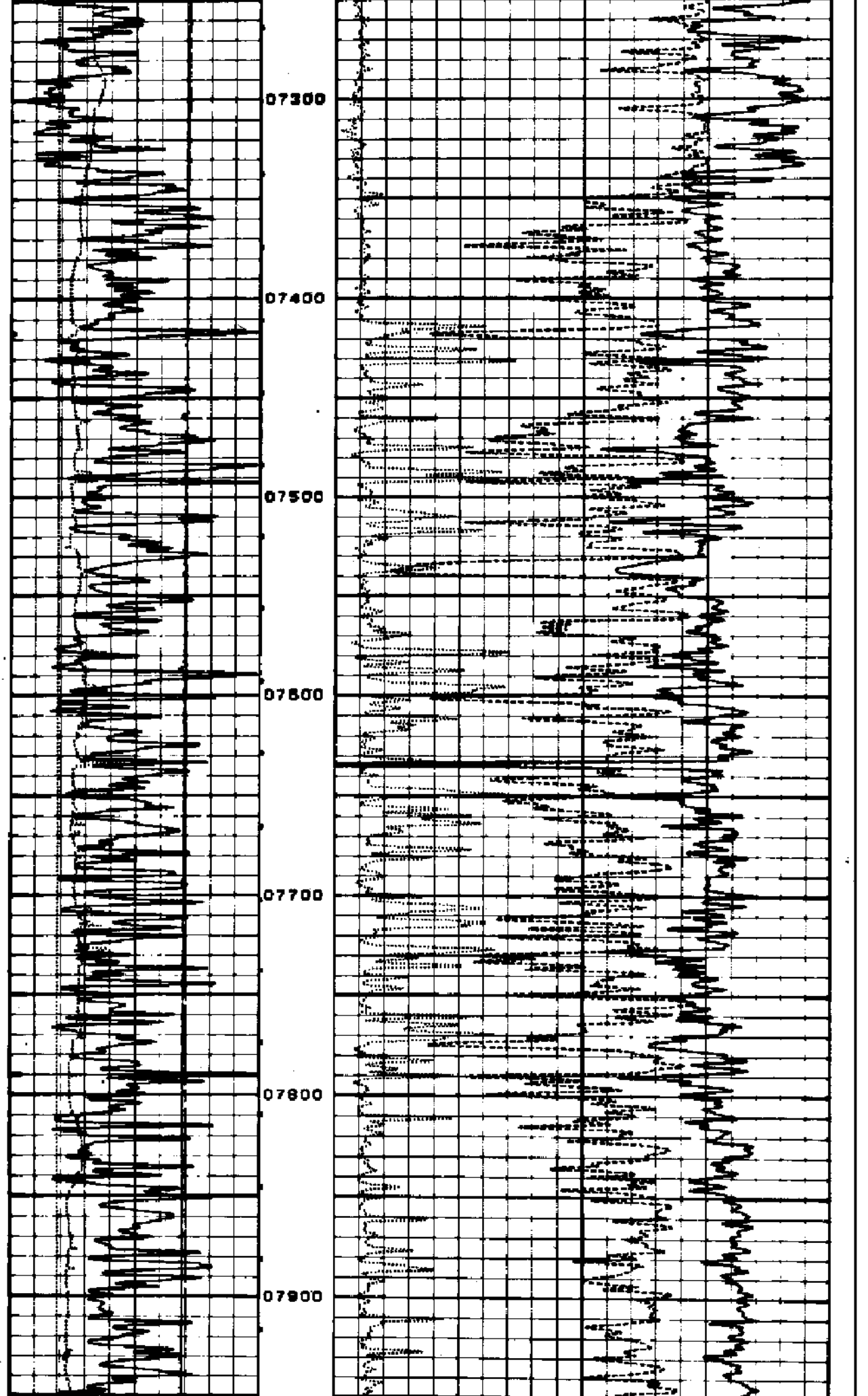
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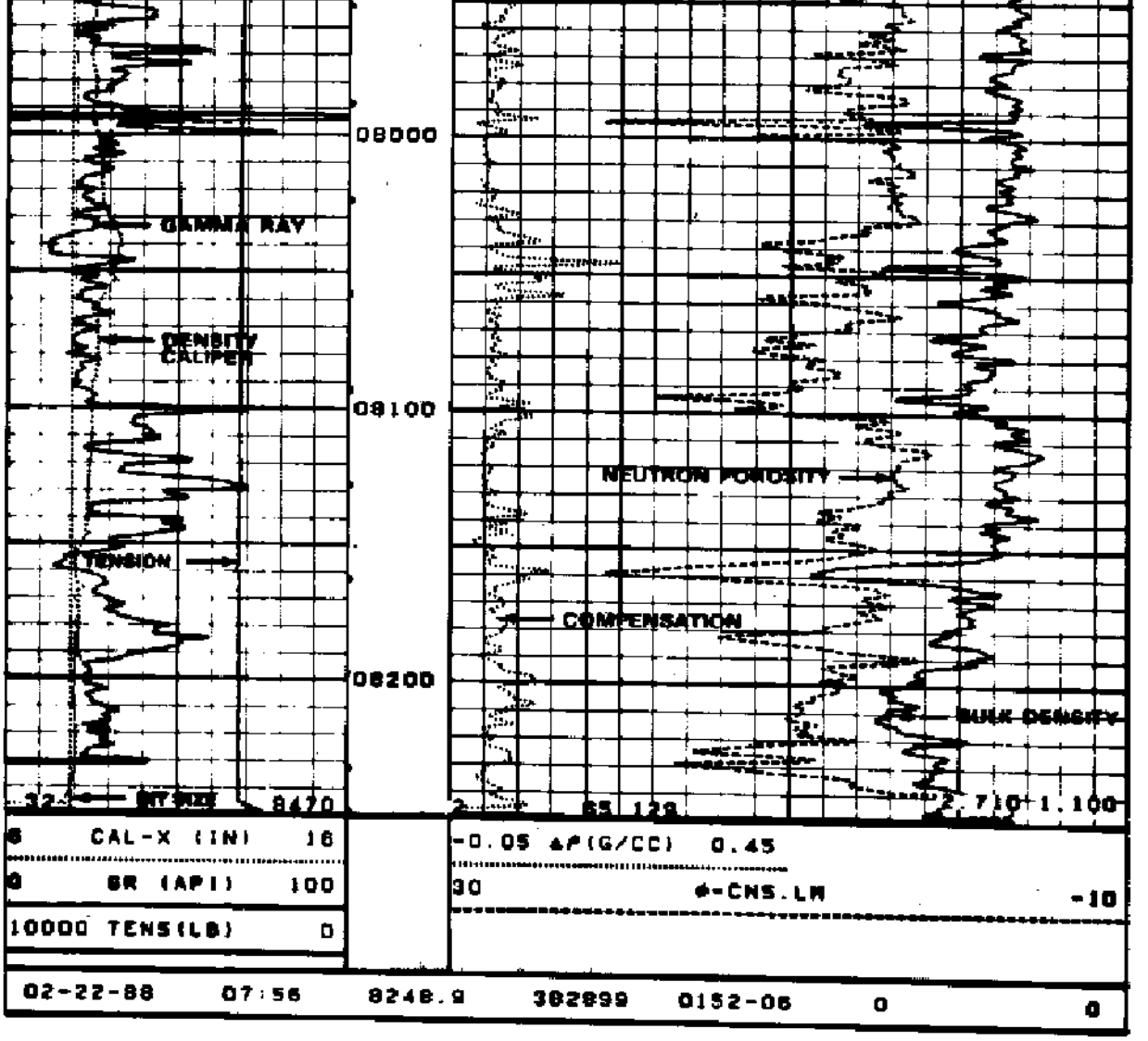
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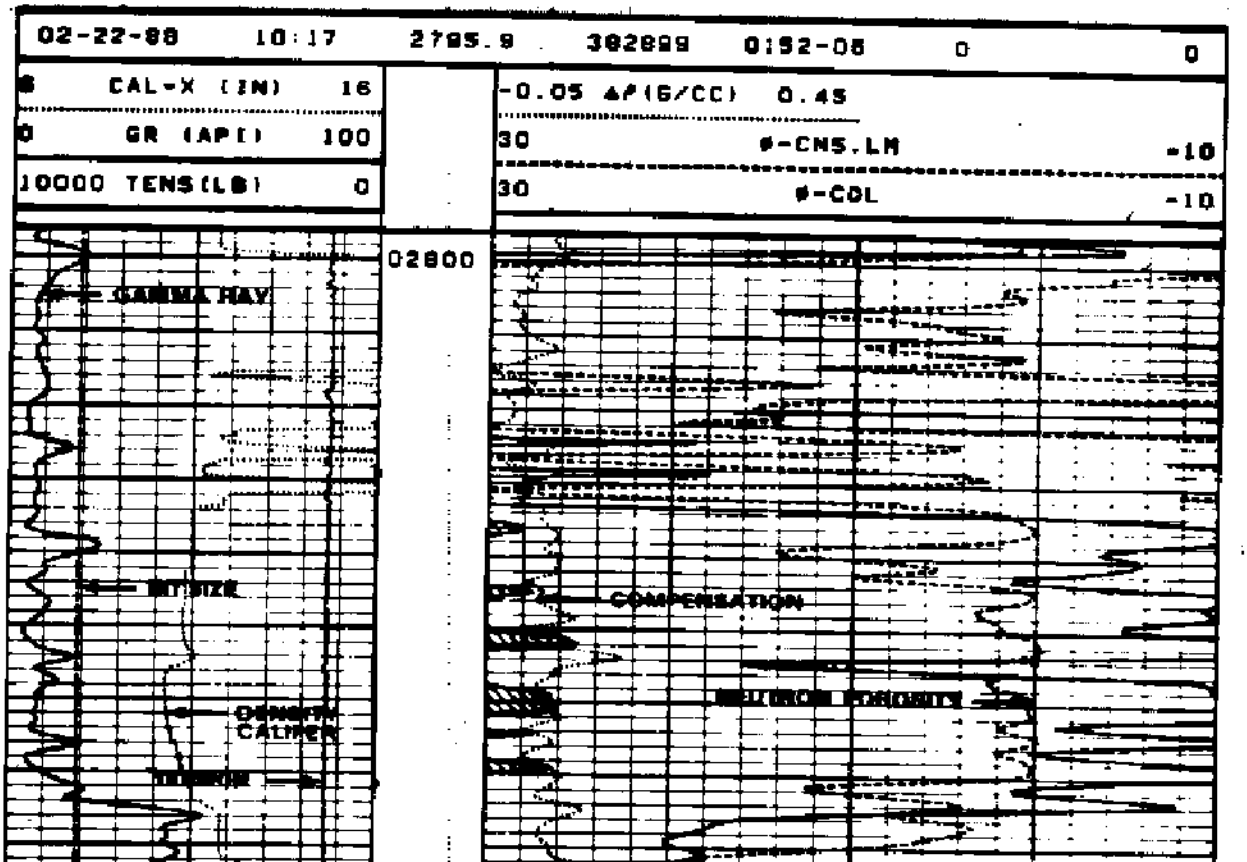
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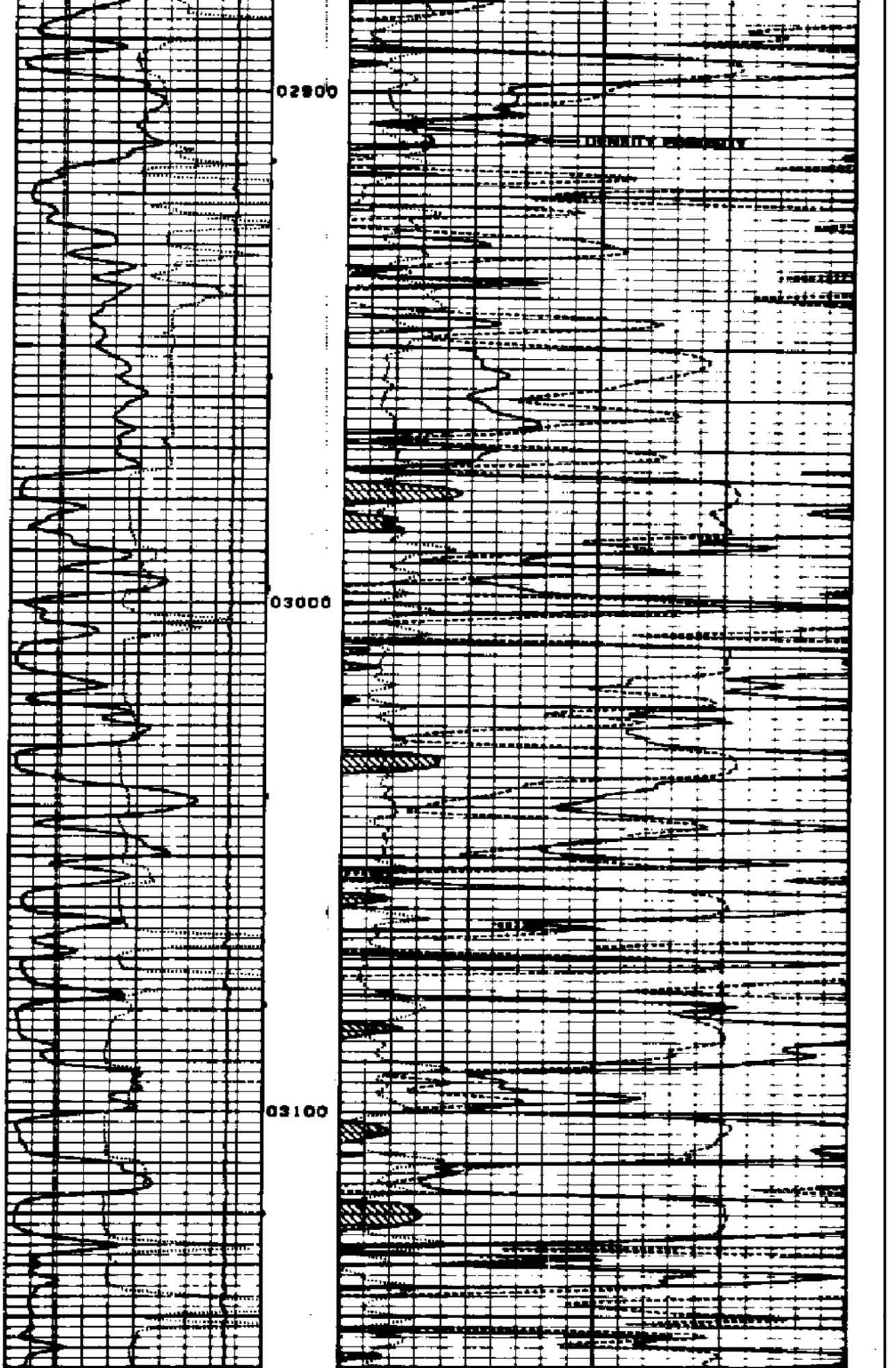
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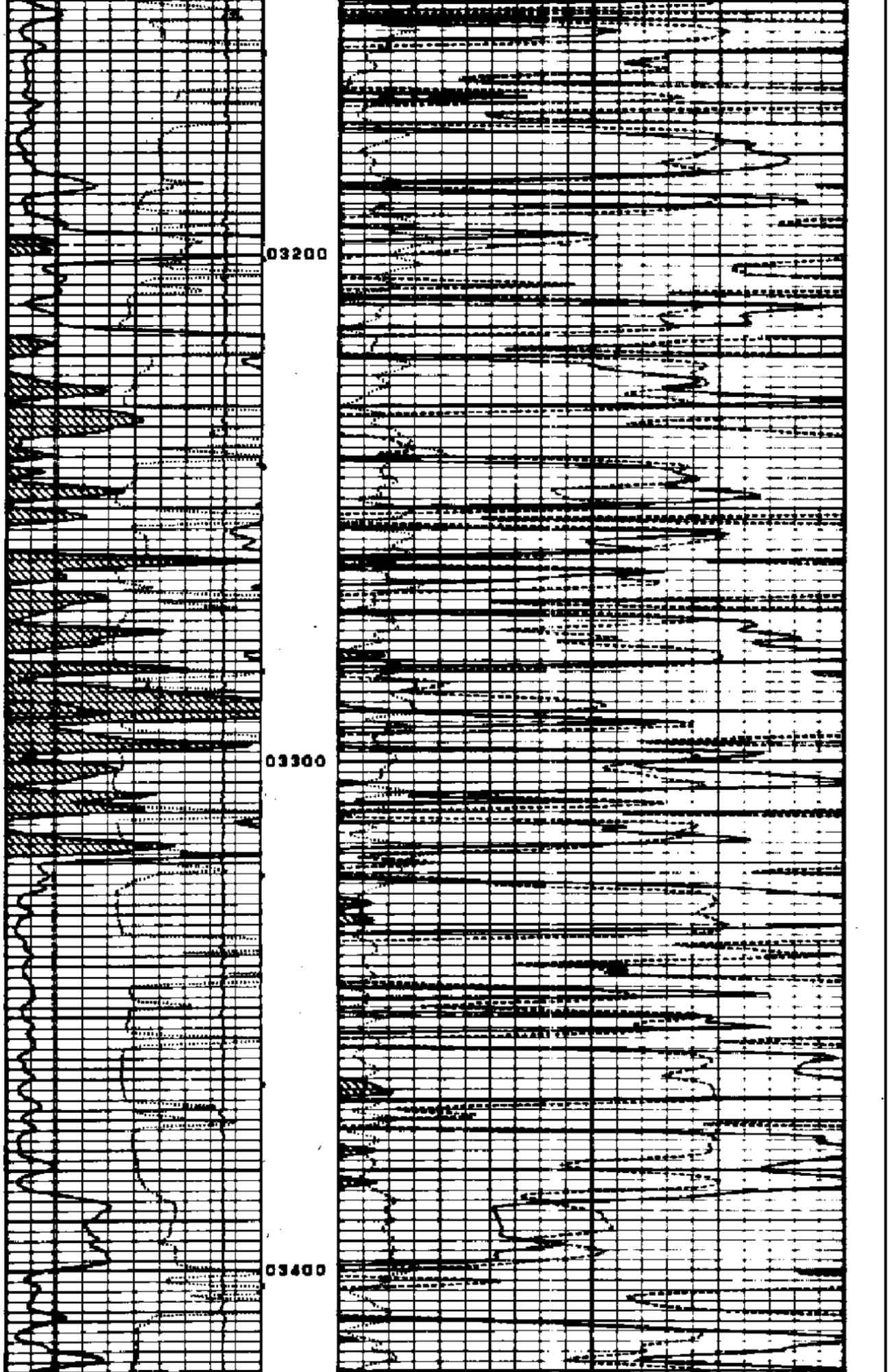
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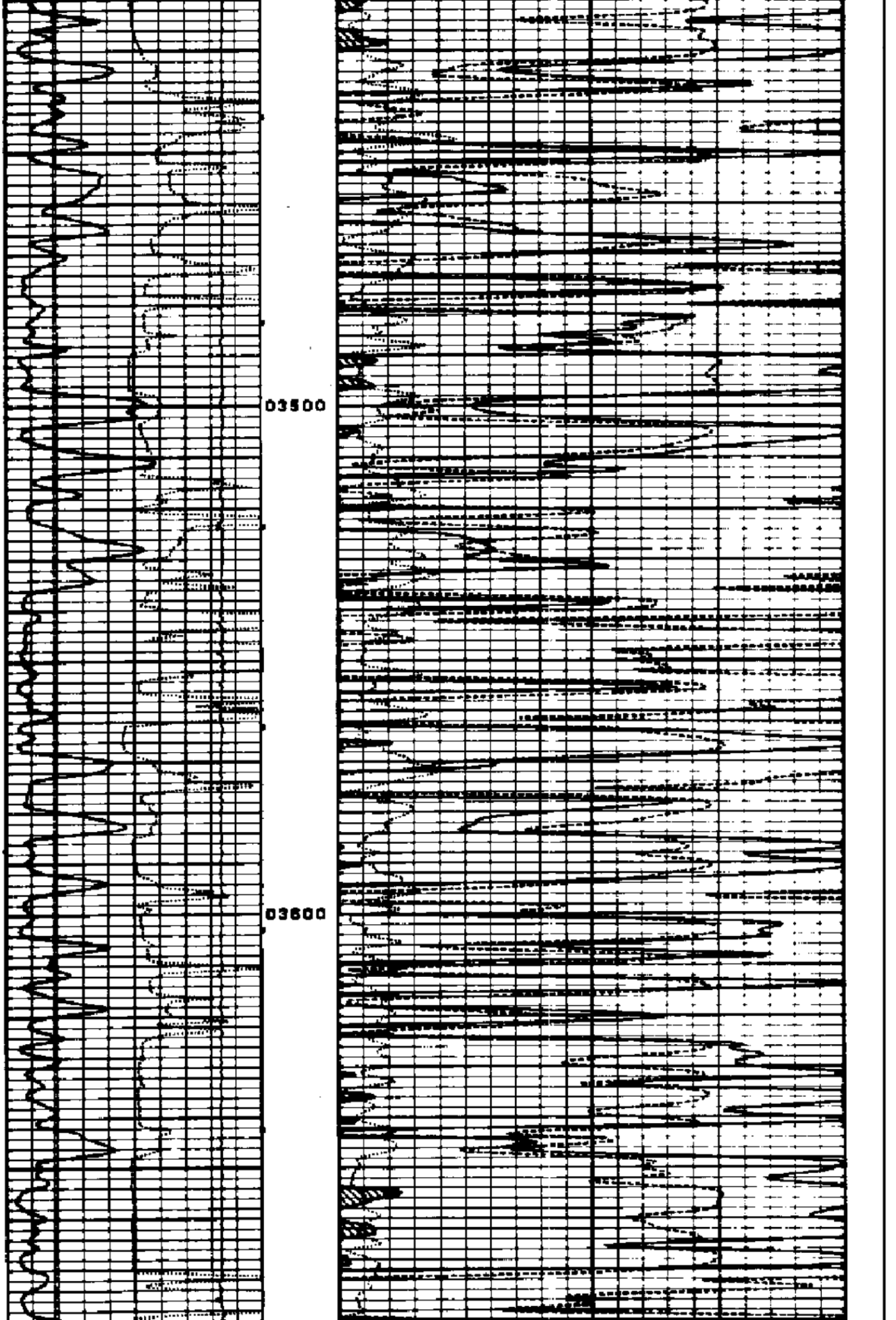
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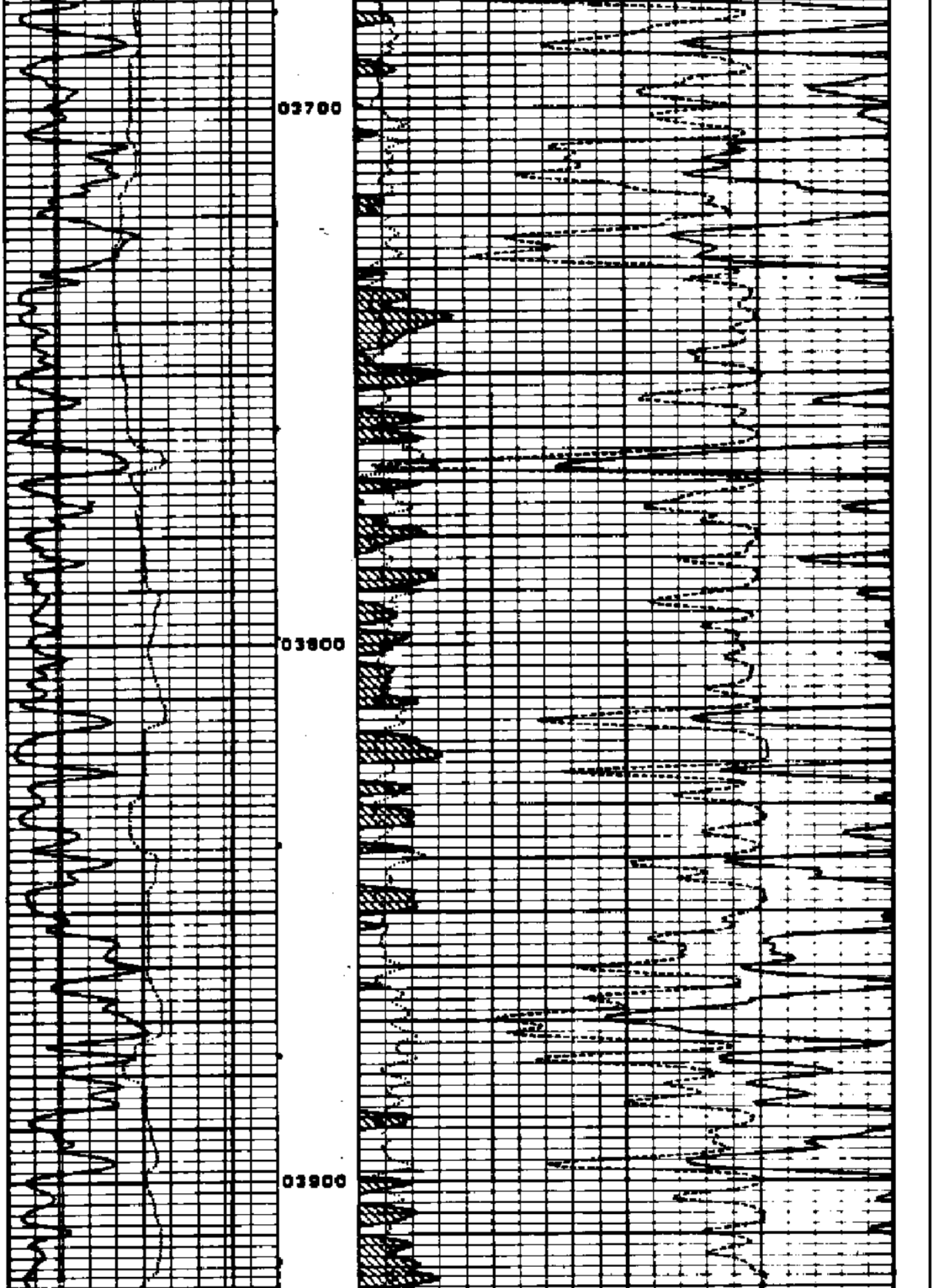
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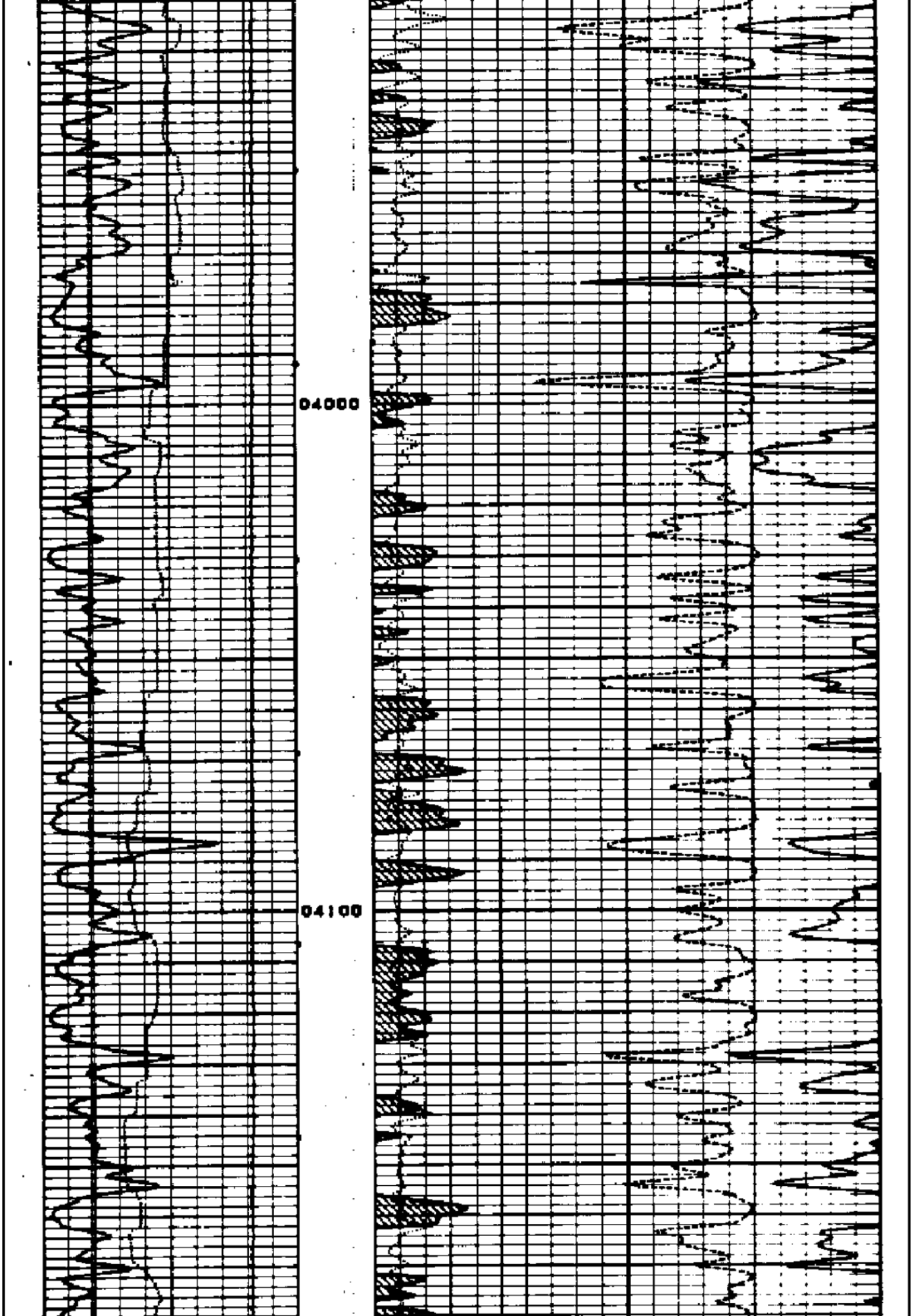
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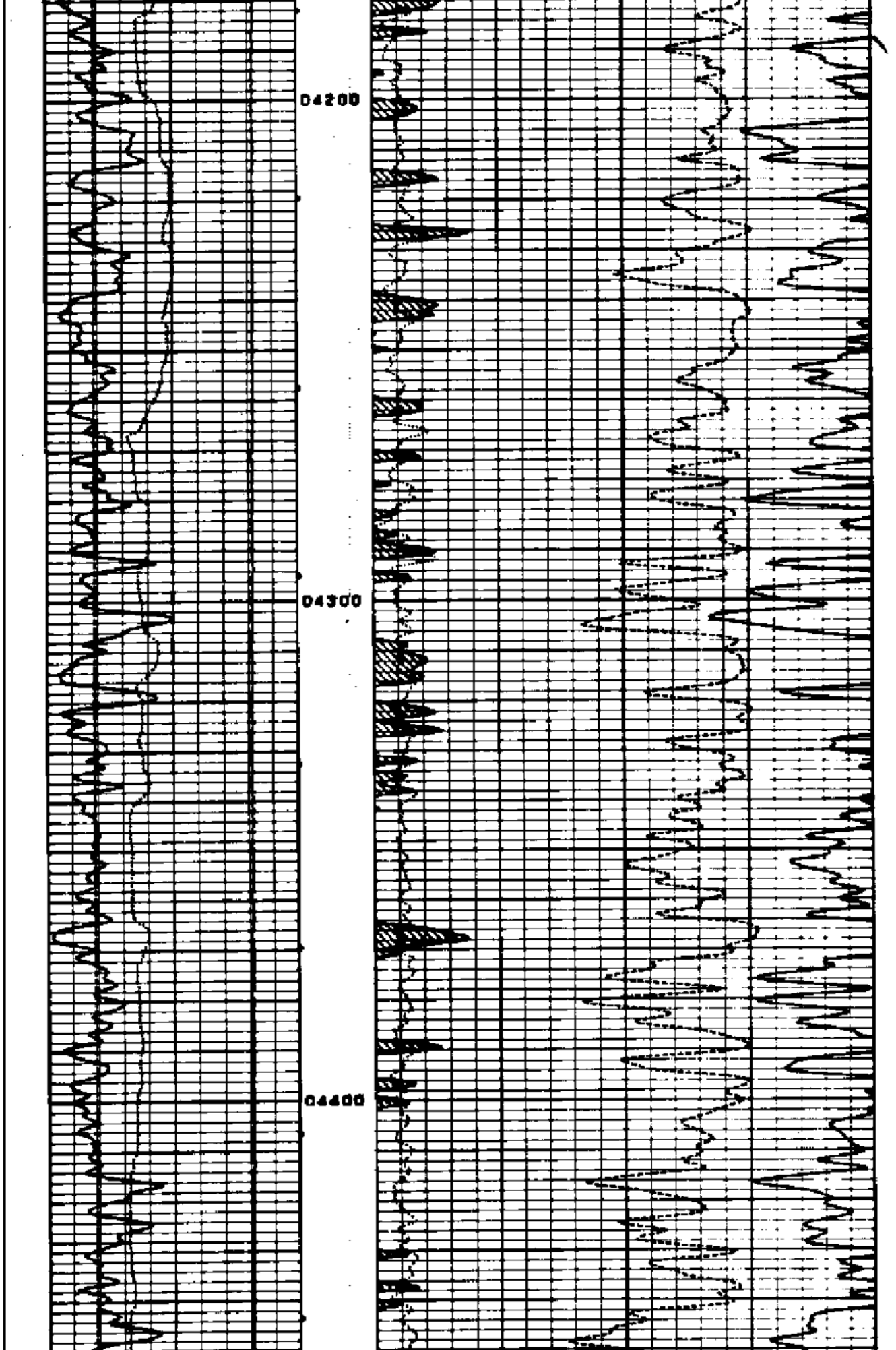
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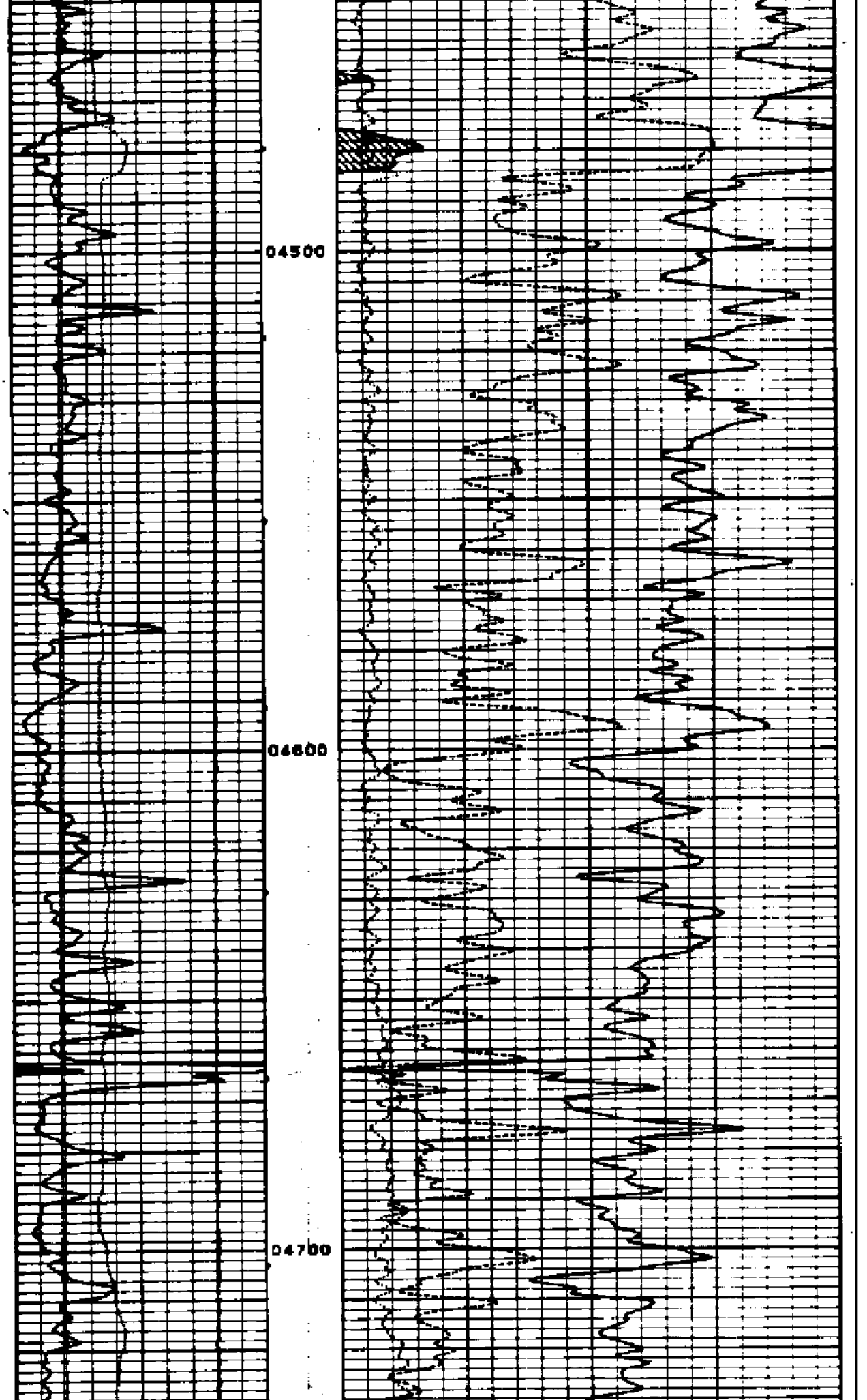
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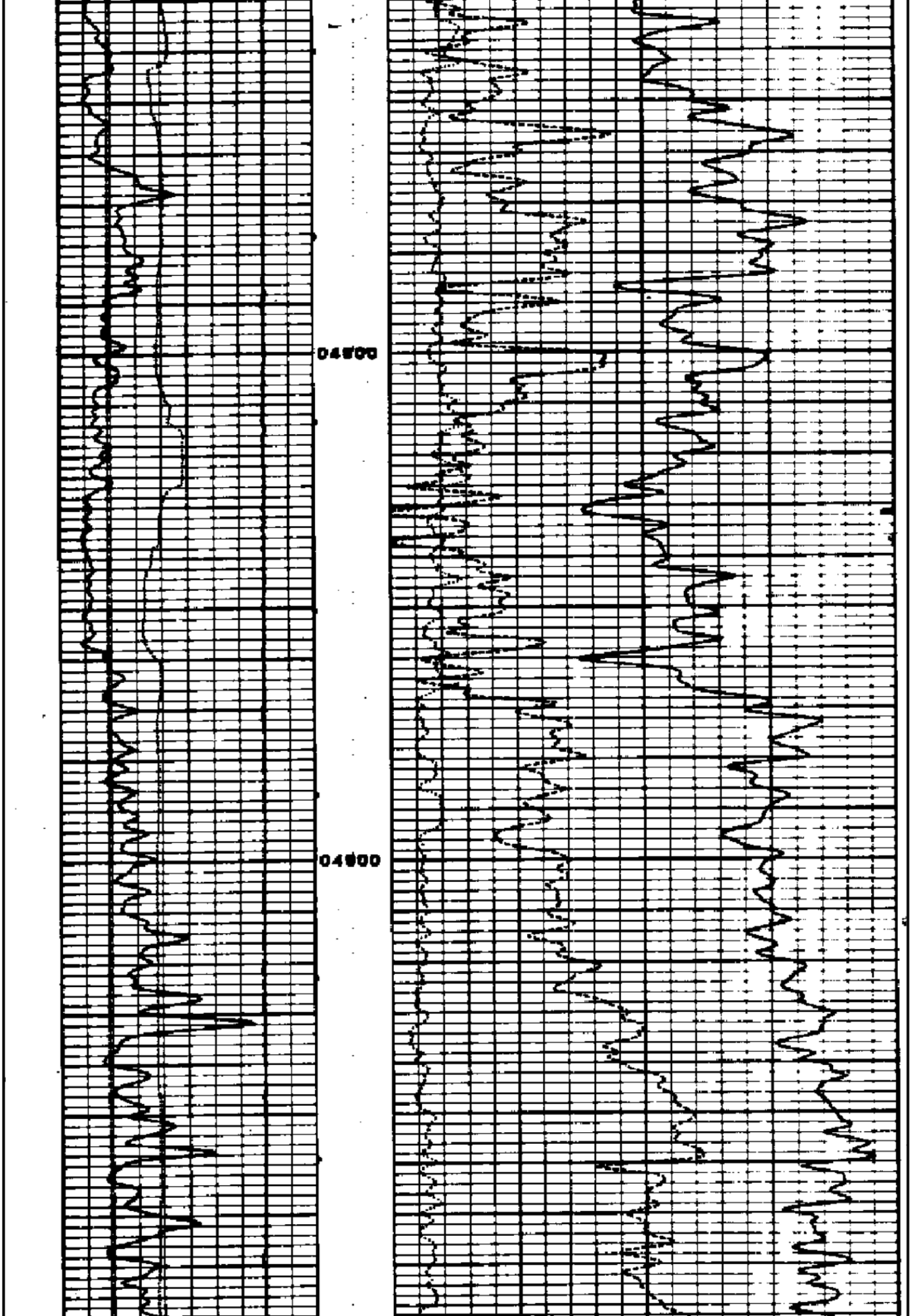
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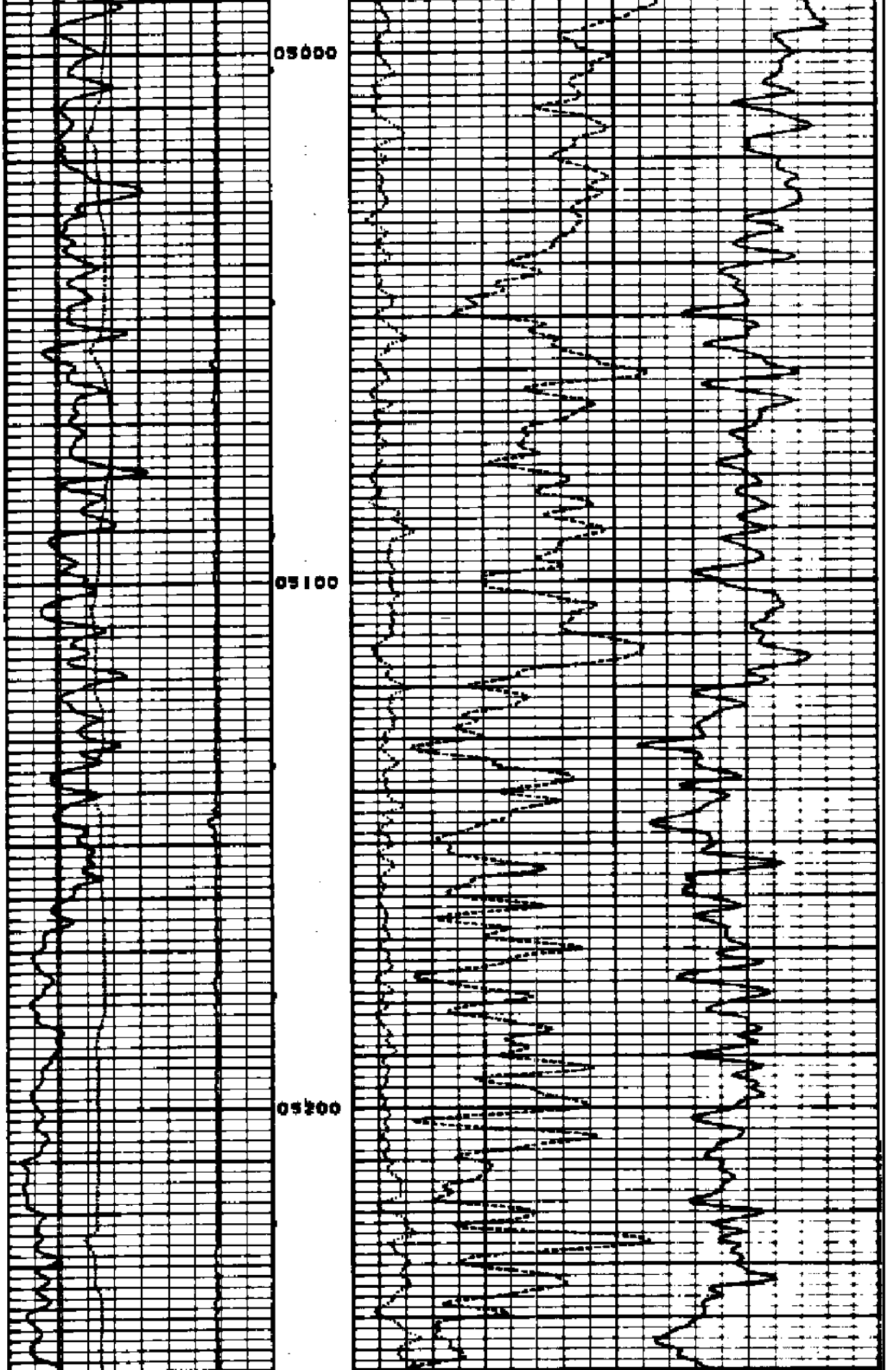
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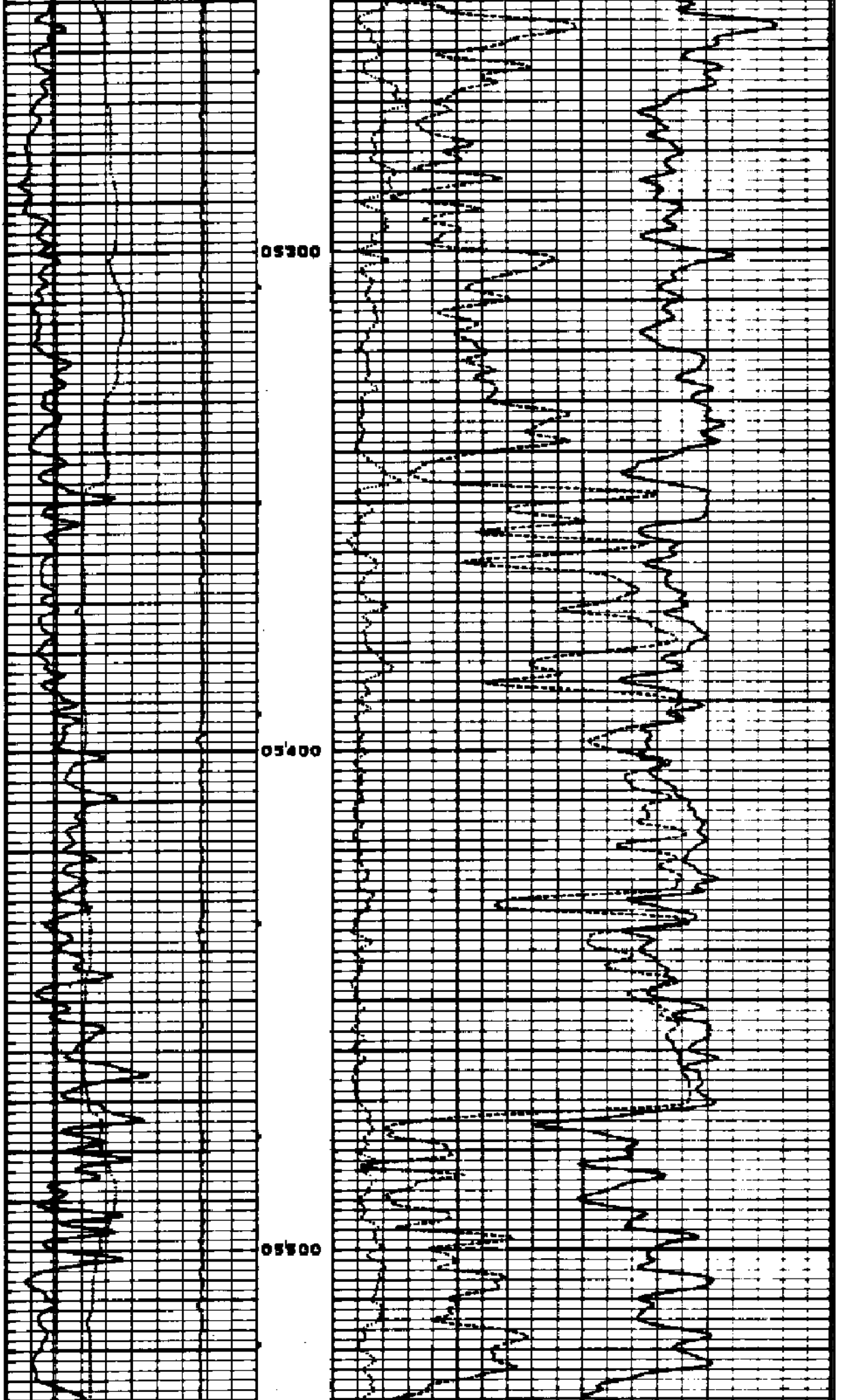
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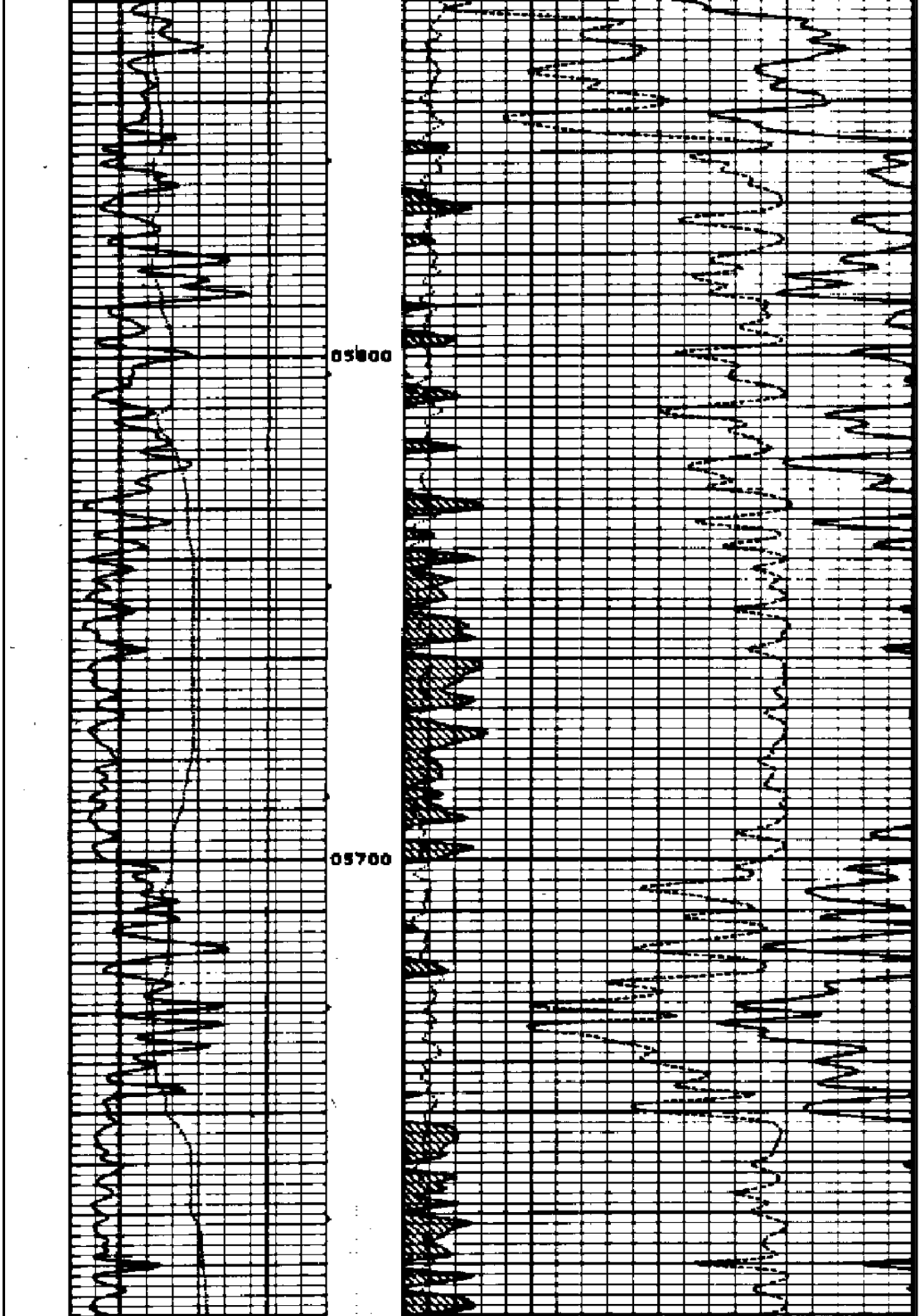
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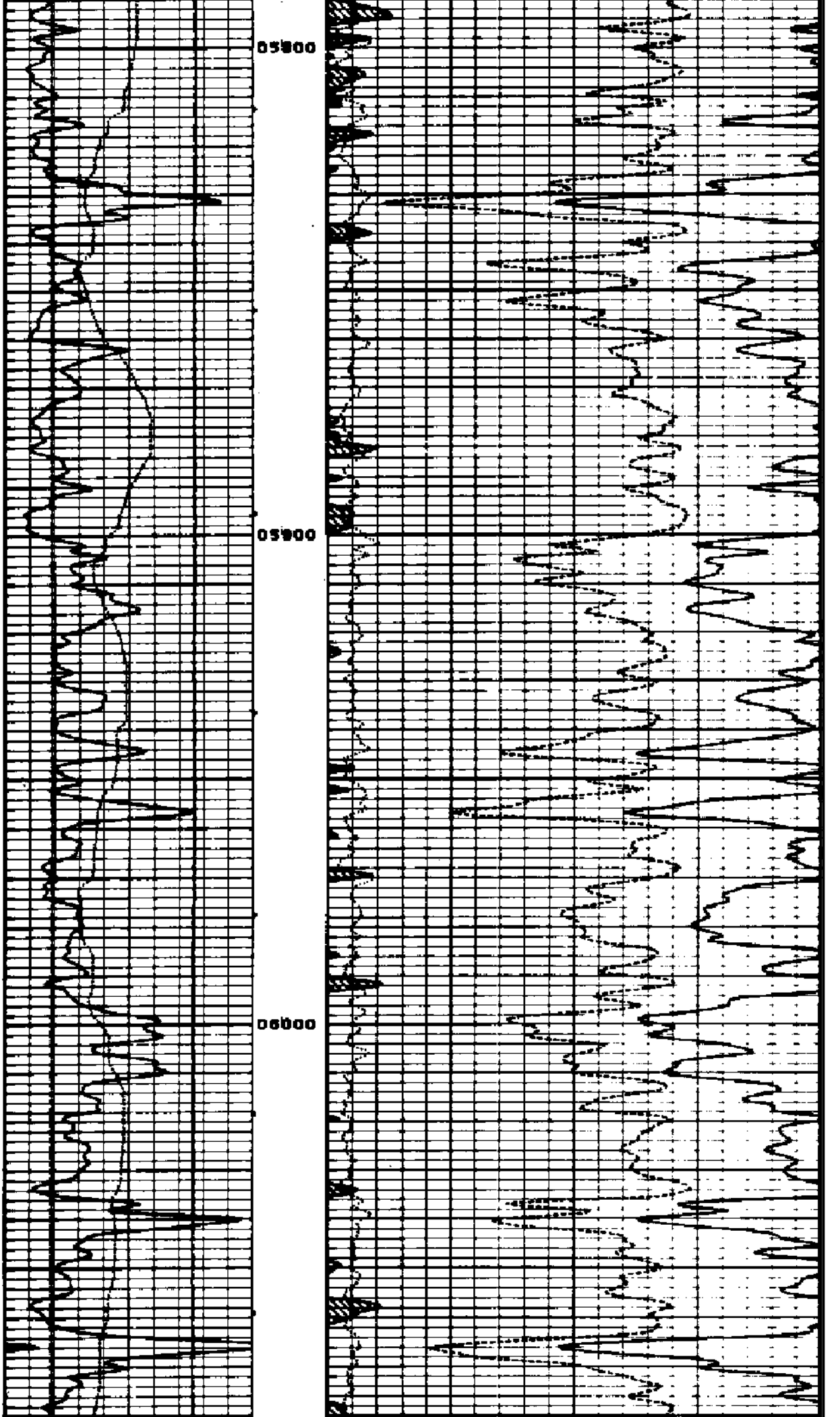
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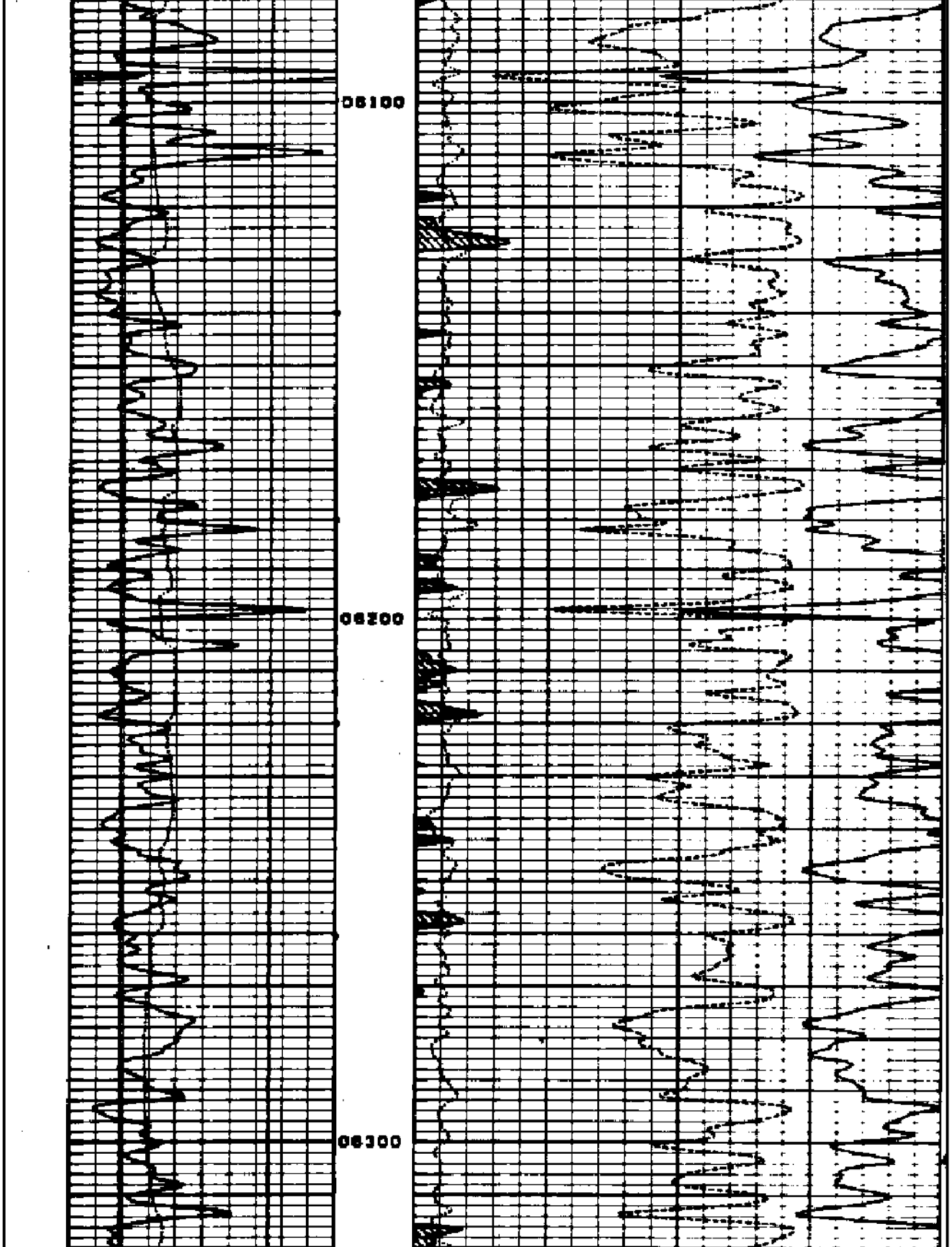
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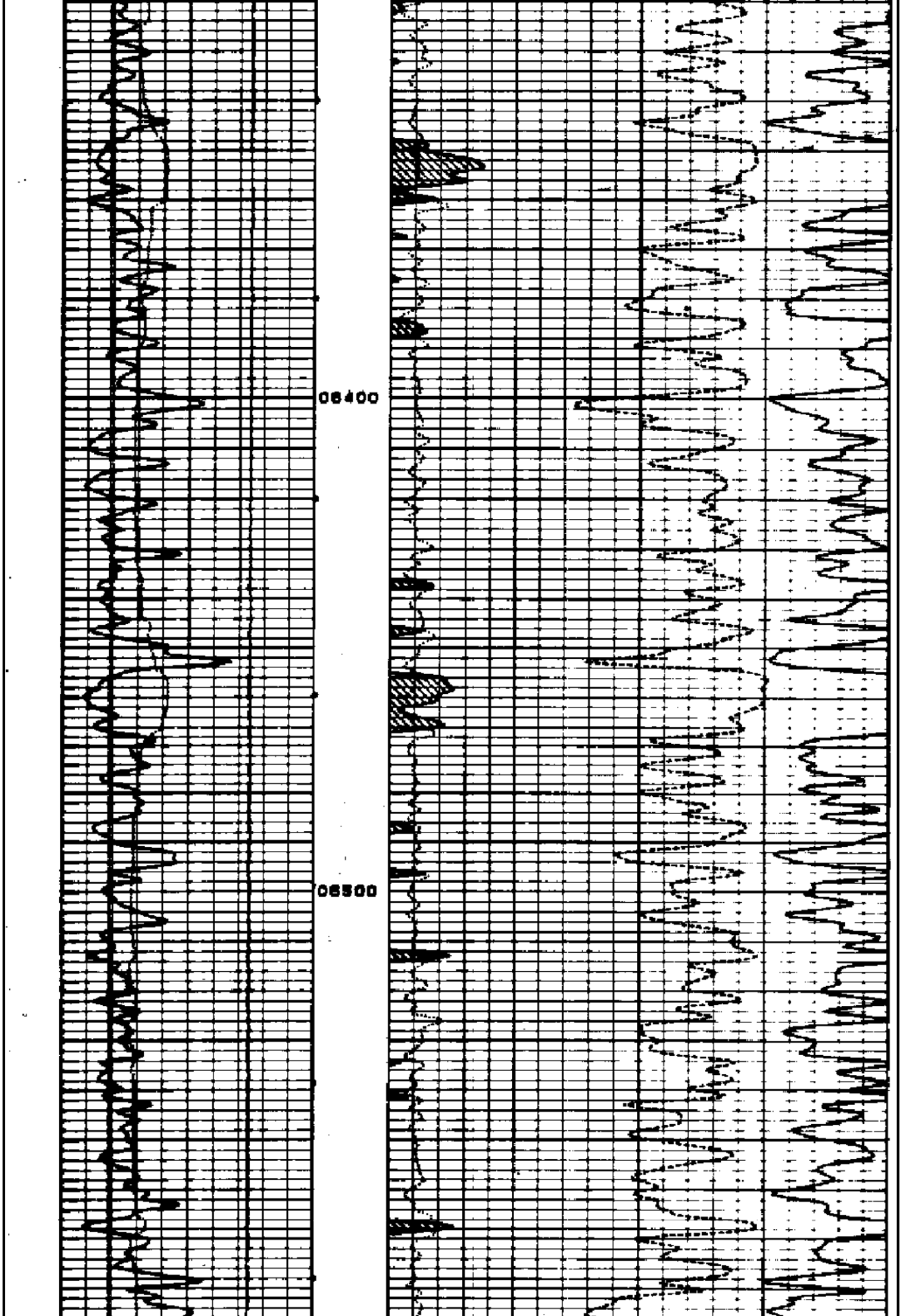
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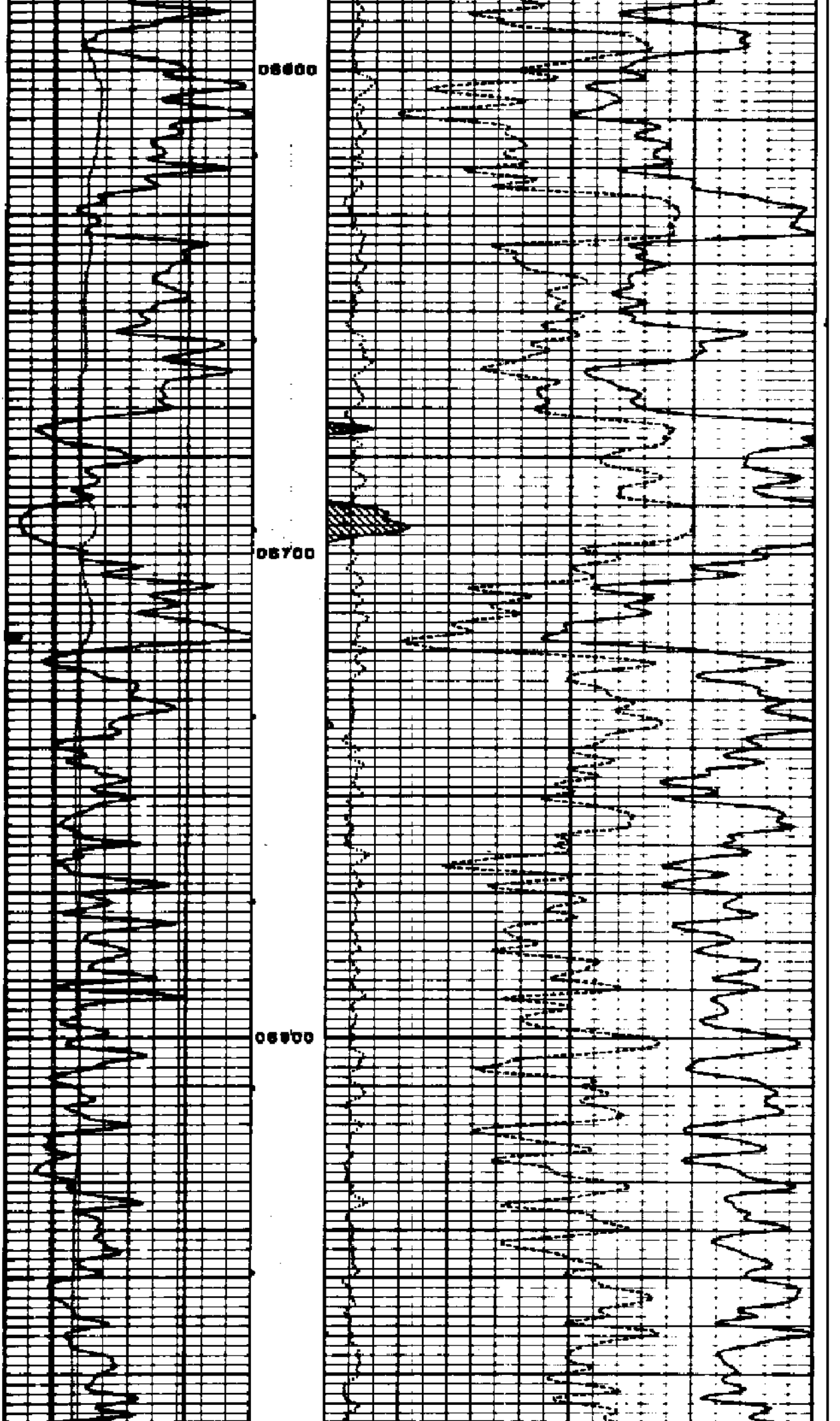
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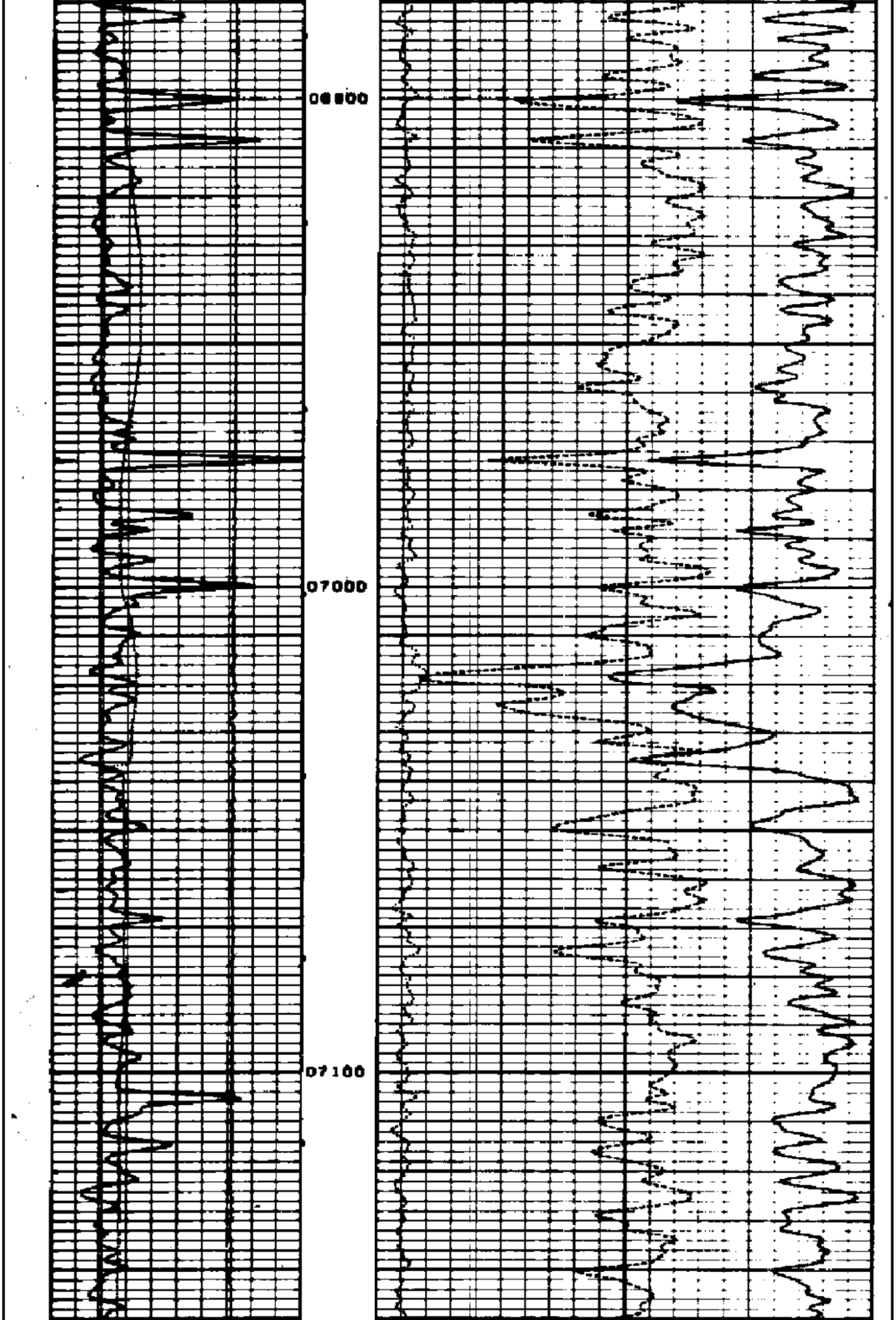
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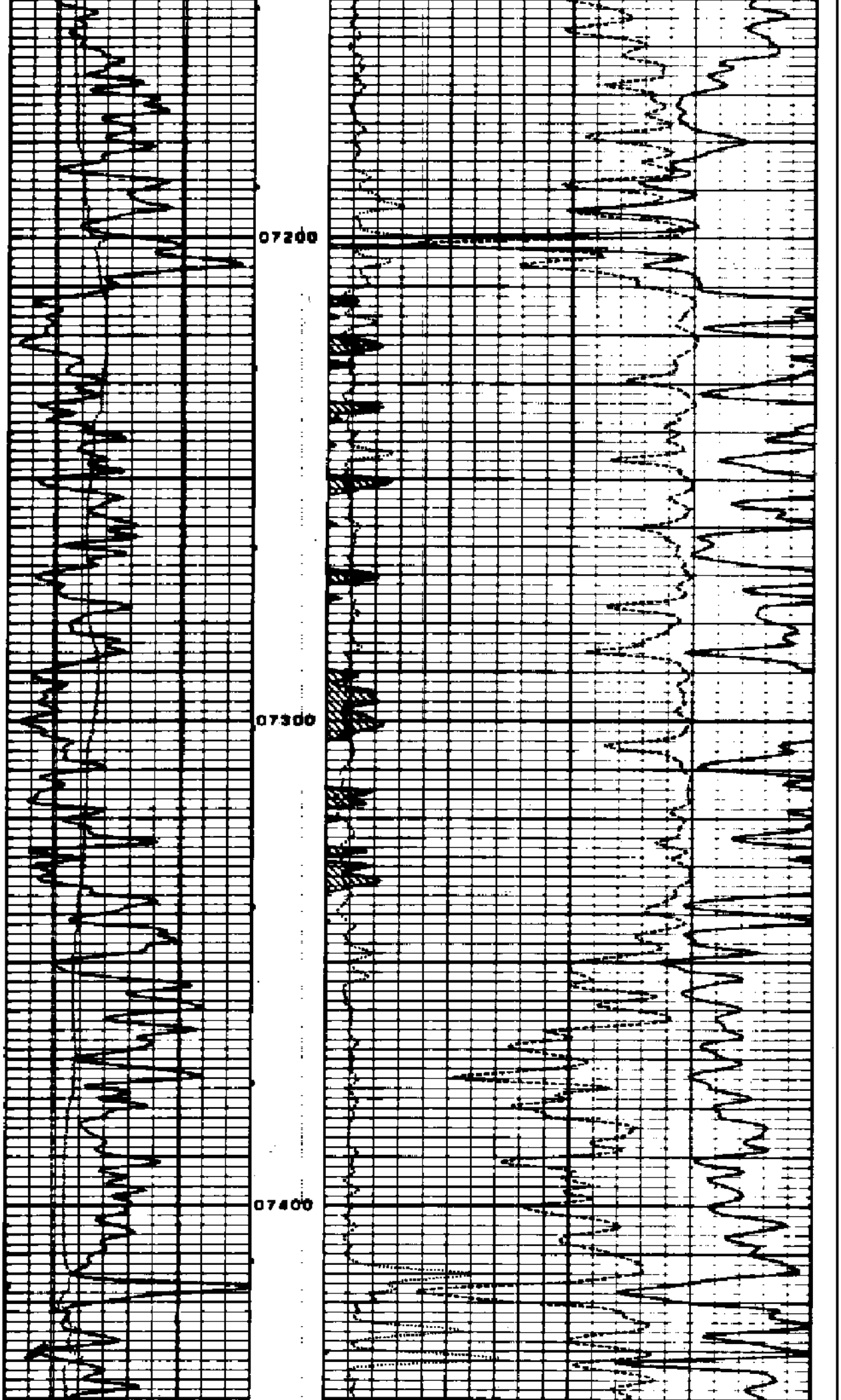
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07300
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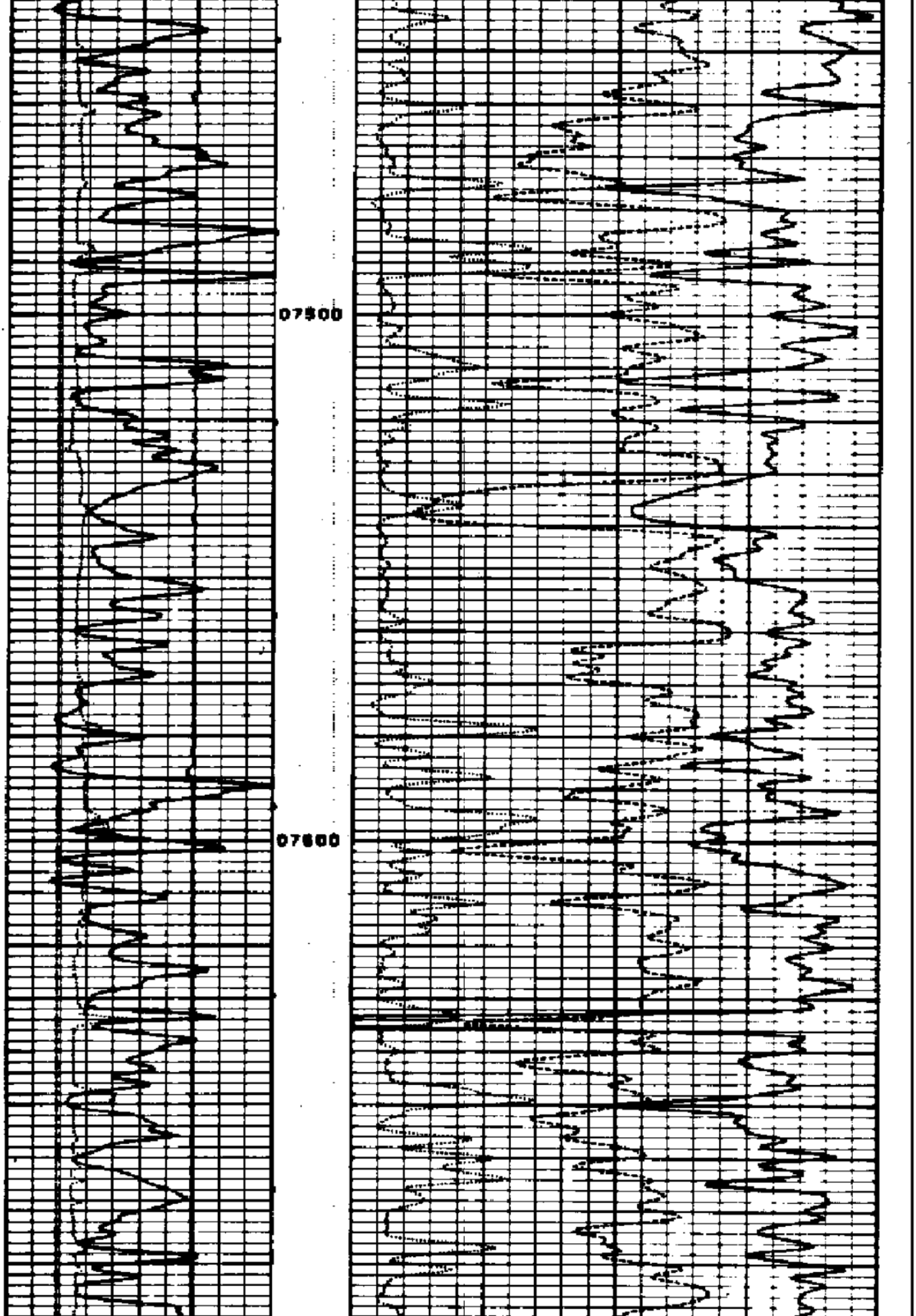
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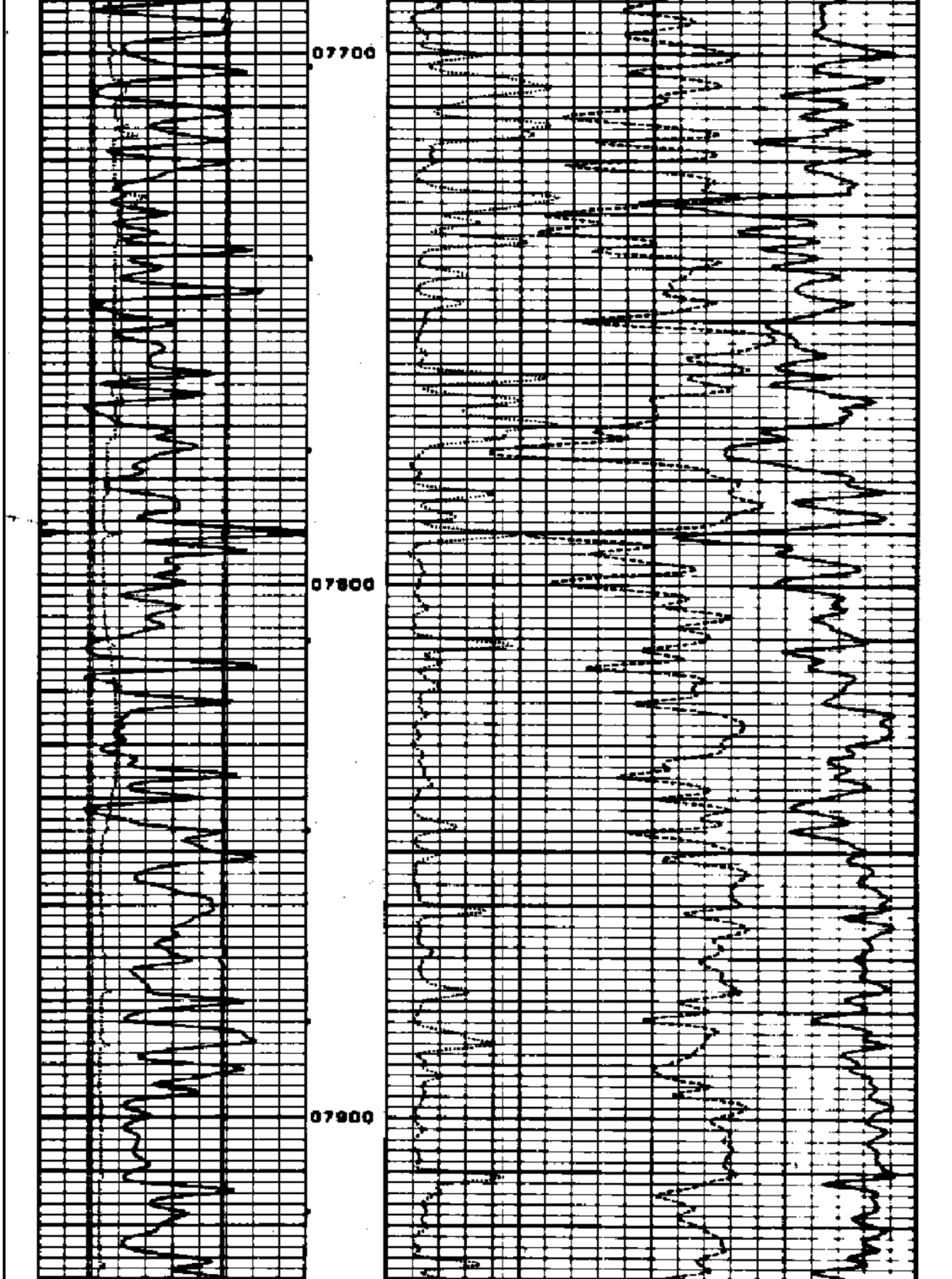
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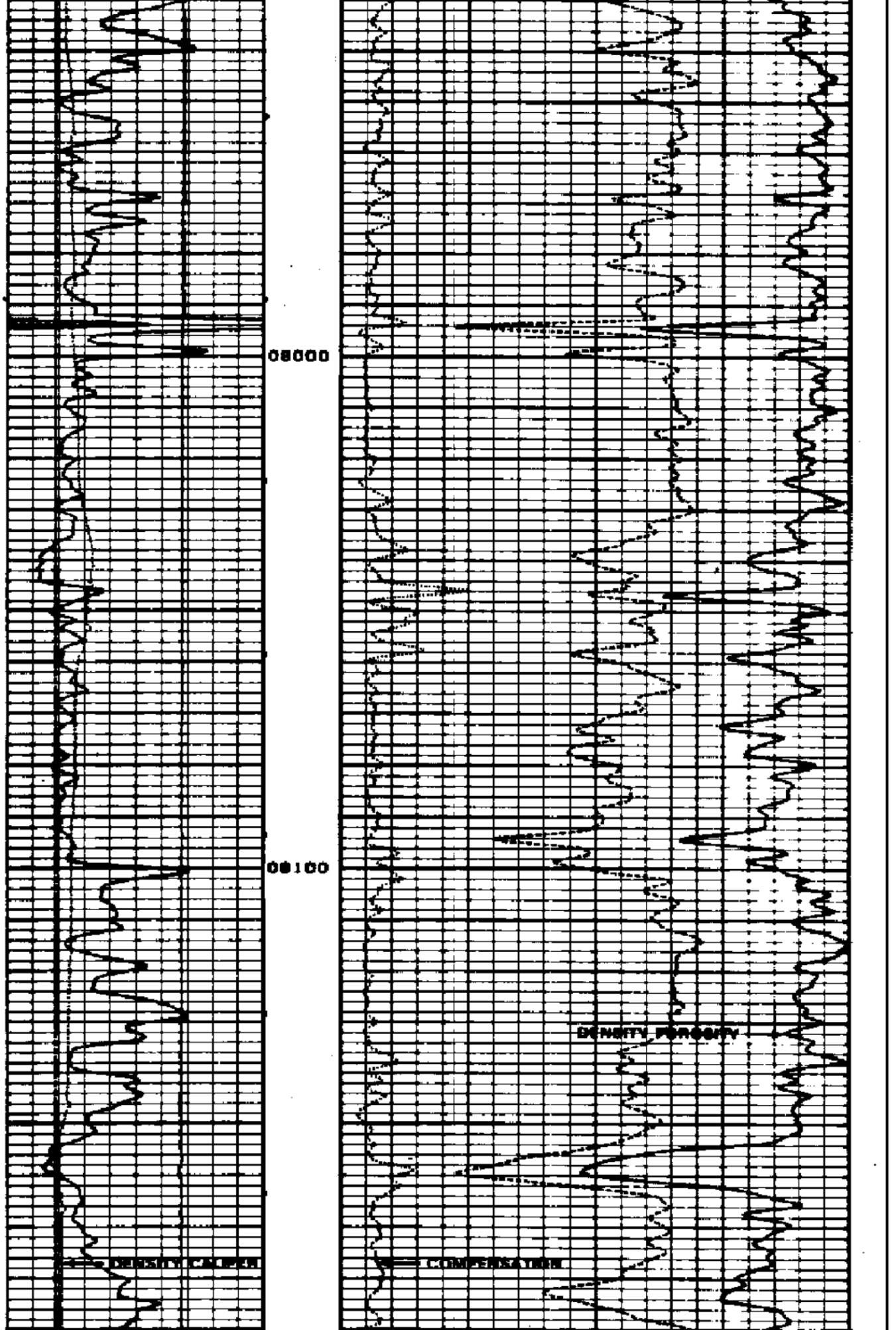
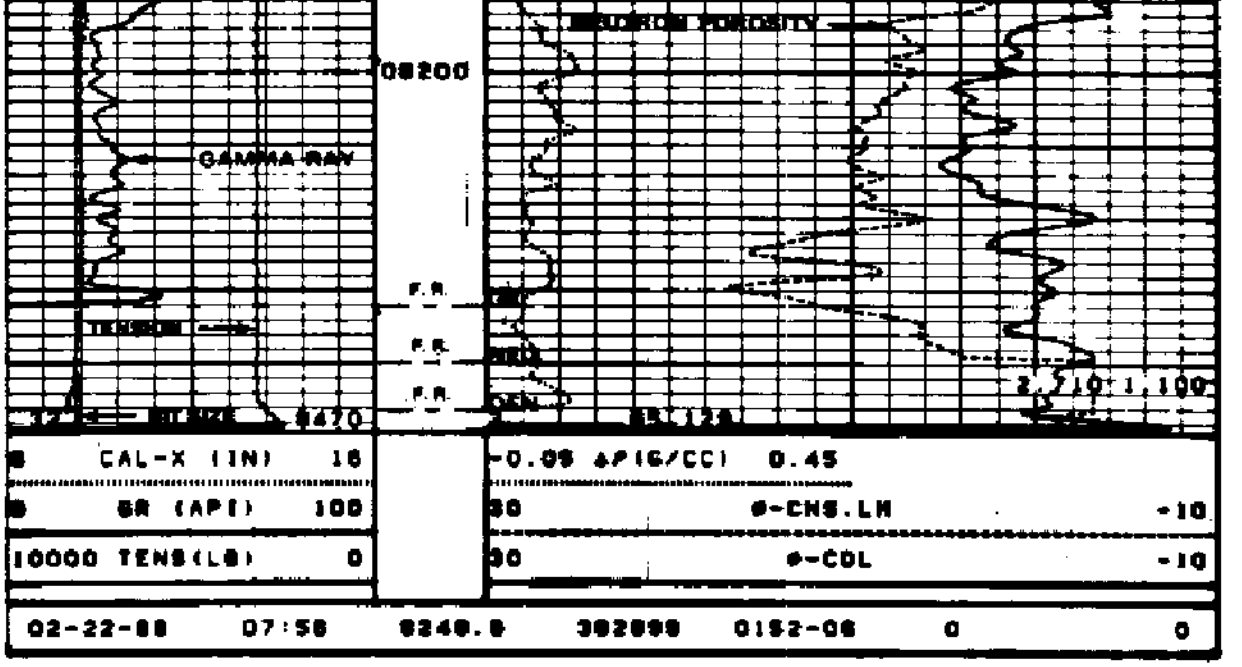
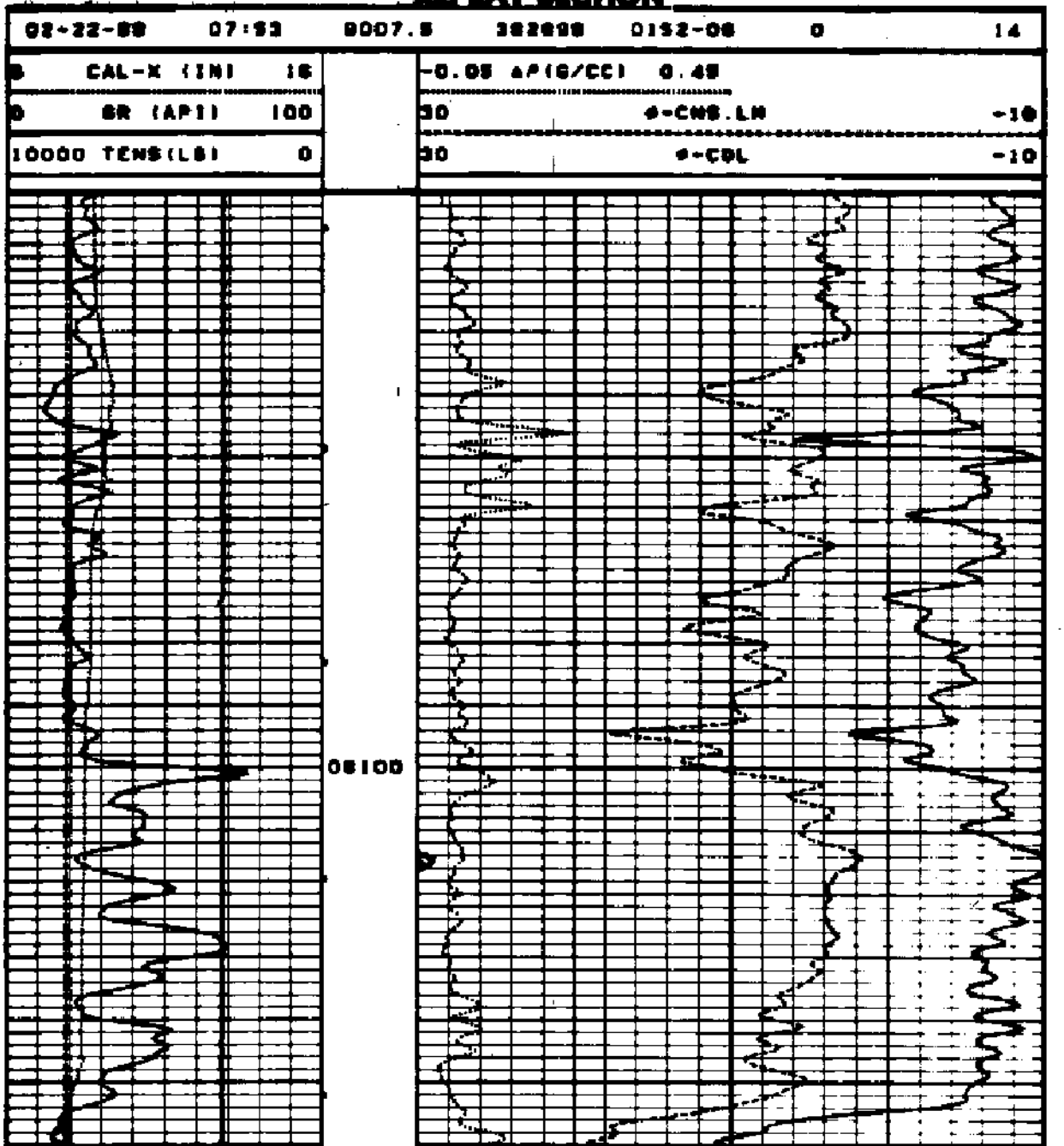
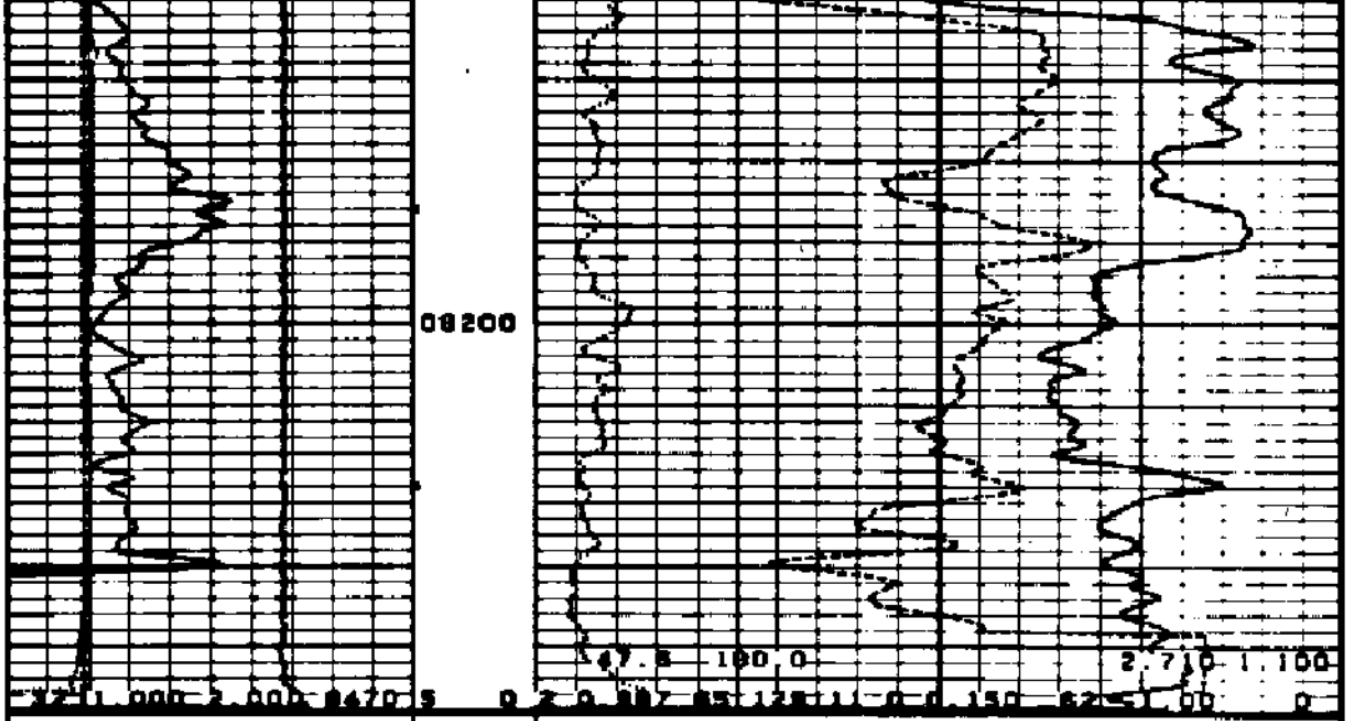

08000
08100
DENSITY POROSITY
DENSITY CALIPER
COMPENSATED



REPEAT SECTION





8 CAL-X (IN) 18		-0.05 ΔP(G/CC) 0.45	
0 GR (API) 100		30	Φ-CNS.LM -10
10000 TENS(LB) 0		30	Φ-CDL -10
02-22-88 07:46	8248.0	382888	0152-06 0 14

02-22-88 11:28	0.0	382888	0152-06 0 13

COMPENSATED NEUTRON AFTER SURVEY TOOL CHECK

TOOL TYPE: CNT-KB SERIAL NO:00078

VERIFIER NO: 00027 SOURCE NO: 00332

VERIFIER CHECK

	BEFORE	AFTER	UNITS
LS DETECTOR	241.4	240.5	CPS
SS DETECTOR	328.2	330.0	CPS
TOOL RATIO:	1.368	1.372	SS/LS
TOOL POROSITY:	10.41	10.58	LM-PU

TOOL CONSTANT: 0.997

02-22-88	11:14	0.0	382899	0152-06	0	12

COMPENSATED DENSITY AFTER SURVEY TOOL CHECK

TOOL TYPE: CDT-KB SERIAL NO:00138

VERIFIER NO: 00027 SOURCE NO: 00934

VERIFIER CHECK

	BEFORE	AFTER	UNITS
LS DETECTOR	283.2	281.8	CPS
SS DETECTOR	360.6	358.4	CPS
BULK DENSITY	2.458	2.472	G/CC

02-22-88	08:57	0.0	382899	0152-06	0	9

COMPENSATED DENSITY BEFORE SURVEY TOOL CHECK

TOOL TYPE: CDT-KB SERIAL NO:00138

VERIFIER NO: 00027 SOURCE NO: 00934

	VERIFIER CHECK	UNITS
LS DETECTOR	283.2	CPS
SS DETECTOR	360.6	CPS
BULK DENSITY	2.458	G/CC

02-22-88	08:53	0.0	382899	0152-06	0	8

CALIPER BEFORE SURVEY CALIBRATION

TOOL TYPE: CDT-KB SERIAL NO:00138

	MEASURED			CALIBRATED		
	SMALL	LARGE	UNITS	SMALL	LARGE	UNITS
CALX	8.30	9.83	IN	7.00	10.00	IN
02-04-88	08:45	0.0	138	0152-06	0	7

COMPENSATED DENSITY SHOP CALIBRATION

TOOL TYPE: CDT-KB SERIAL NO:00138

VERIFIER NO: 00027 SOURCE NO: 00934

	MAG BLK(CPS)	ALUM BLK(CPS)	SPINE ANGLE	DEN/SPINE RATIO
LS DETECTOR	1068.4	238.8		
			78.5	0.571
SS DETECTOR	517.0	361.1		

FIELD VERIFIER

	VERIFIER CHECK	UNITS
LS DETECTOR	284.5	CPS
SS DETECTOR	387.8	CPS
BULK DENSITY	2.470	G/CC

02-22-88	08:11	0.0	382899	0152-06	0	5

COMPENSATED NEUTRON BEFORE SURVEY TOOL CHECK

TOOL TYPE: CNT-KB SERIAL NO:00078

VERIFIER NO: 00027 SOURCE NO: 00332

	VERIFIER CHECK	UNITS
LS DETECTOR	241.4	CPS
SS DETECTOR	328.2	CPS
TOOL RATIO:	1.383	SS/LS
TOOL POROSITY:	10.41	LM-PU

TOOL CONSTANT: 0.887

02-22-88	05:59	0.0	382899	0152-06	0	3

GAMMA RAY BEFORE SURVEY CALIBRATION

TOOL TYPE: GRT-DG SERIAL NO:03026

BACKGROUND	CALIBRATOR	STANDARD	UNITS
60.7	284.7	120.0	GAPI

DELTA COUNTS PER SEC: 234.0 CPS/API = 1.950

02-22-88	09:56	0.0	382899	0152-06	0	2

CALIPER BEFORE SURVEY CALIBRATION

TOOL TYPE: CDT-KB SERIAL NO:00066

	MEASURED SMALL	MEASURED LARGE	MEASURED UNITS	CALIBRATED SMALL	CALIBRATED LARGE	CALIBRATED UNITS
CALX	7.55	10.00	IN	7.00	10.00	IN

02-15-88	11:47	0.0	70	0152-08	0	1

COMPENSATED NEUTRON SHOP CALIBRATION

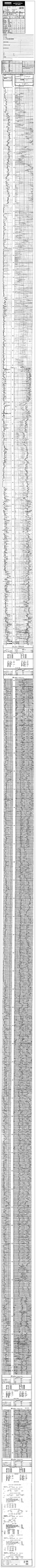
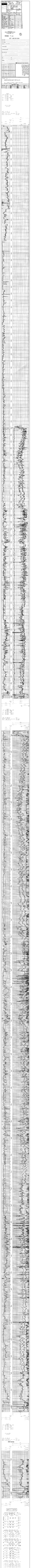
TOOL TYPE: CNT-KB SERIAL NO:00070

VERIFIER NO: 00027 SOURCE NO: 00332

	LOW - #	MED - #	HIGH - #	UNITS
TANK RATIO:	0.568	1.421	2.175	SS/LS
TANK POROSITY:	-0.34	11.83	25.88	LM-PU
LS DETECTOR	1768.3	352.2	159.0	CPS
SS DETECTOR	1012.4	510.9	359.7	CPS
TOOL RATIO:	0.571	1.440	2.247	SS/LS
TOOL POROSITY:	-0.38	11.83	26.65	LM-PU

TOOL CONSTANT: 0.987

SURFACE TEMPERATURE: 85° F

FIELD VERIFIER

SS DETECTOR	LS DETECTOR	RATIO	POROSITY
334.1 CPS	242.9 CPS	1.375	10.83