Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP-42 Section 12.2
Reference 4
Report Sect. 4
Reference 169

PARTICULATE EMISSION EVALUATION

OF THE

NO. 1 COKE OVEN BATTERY COMBUSTION STACK

AT

SHENANGO INCORPORATED
NEVILLE ISLAND PLANT
PITTSBURGH, PENNSYLVANIA 15225

BCM NO. 00-4810-36

SEPTEMBER 24, 1993

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BCM

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY 1

2.0 SCOPE AND OBJECTIVES 1

3.0 PROCEDURES 2

3.1 Field Work 2

3.1.1 Field Data Sheets 2
3.1.2 Testing Station and Traverse Locations 2
3.1.3. Gas Flow and Gas Temperature Measurements 2
3.1.4 Determination of Carbon Dioxide and Oxygen 2
3.1.5 Moisture Content Sampling 3
3.1.6 Determination of Particulate Matter 3
3.1.7 Sample Recovery Procedure 3
3.1.8 Operation Data 3

3.2 Analysis 3
3.3 Calculations 4
3.4 Calibrations 4

4.0 SUMMARY OF RESULTS 4

TABLES

Table 1 Summary of Results 5

FIGURES

Figure 1 EPA Method 5 Schematic 6

APPENDICES

Appendix A Field Data
Appendix B Operation Data
Appendix C Laboratory Analysis
Appendix D Calculations
Appendix E Calibrations

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1.0 EXECUTIVE SUMMARY

Shenango Incorporated (Shenango) retained BCM Engineers Inc. (BCM) to perform a particulate emission evaluation on No. 1 Coke Oven Battery Combustion Stack located at the Neville Island Plant in Pittsburgh, Pennsylvania. Testing and analyses were conducted according to U.S. Environmental Protection Agency (EPA) Method 5 as specified in 40 CFR, Part 60, Appendix A. The test results are intended to determine compliance with the Allegheny County Health Department, Bureau of Air Pollution Control (BAPC) particulate emission limitations. The compliance limits and measured particulate emissions were as follows:

Run No.	Compliance Limit (gr/dscf)	Measured Concentration (gr/dscf)
1	0.015	0.005
2	0.015	0.003
3	0.015	0.003
Average	0.015	0.004

2.0 SCOPE AND OBJECTIVES

The scope of this project was to determine particulate emissions from No. 1 Coke Oven Battery Combustion Stack by EPA Method 5. The results of the test are to be used to determine compliance with BAPC particulate emission limitations. The following parameters were determined for each test run:

- Gas Flow — acfm and dscfm
- Gas Temperature — °F
- Gas Analysis — % by Volume of CO_2 and O_2
- Gas Moisture — % by Volume
- Particulate Emission — gr/dscf and lb/hr

The field sampling program was performed on September 20, 21 and 23, 1993. One 2-hour sample run was conducted each day. The BCM test personnel consisted of Messrs. Paul Jadlowiec, James Phillippi and Allan Michaelotti. Mr. Nicholas Buchko served as plant liaison for this test program. The test was witnessed by Mr. W. John Logan from the BAPC.

3.0 PROCEDURES

3.1 FIELD WORK

3.1.1 Field Data Sheets

All field data sheets are contained in Appendix A.

3.1.2 Testing Station and Traverse Locations

The internal diameter of the stack at the sampling location is 9.5 feet. The nearest downstream disturbance is the exhaust, which is approximately 121 feet (12.7 diameters) from the test location. The nearest upstream disturbance is the inlet plenum, which is approximately 129 feet (13.6 diameters) from the test location. EPA Method 1 was utilized to determine the number and location of the traverse points. Twelve sampling points were used, six on each diameter.

3.1.3 Gas Flow and Gas Temperature Measurements

The flow rate and temperature profiles for the gas streams were measured by conducting simultaneous velocity and temperature traverses concurrently with the particulate sampling. Gas velocity head was measured with a calibrated "S"-type Pitot tube which was connected to an inclined manometer. The static pressure was measured using the same Pitot tube and manometer. A Chrome-Alumel thermocouple attached to a digital potentiometer was used to measure the gas temperature at each of the traverse points. The gas flow and gas temperature measurements followed EPA Method 2.

3.1.4 Determination of Carbon Dioxide and Oxygen

A Bacharach Fyrite analyzer was used to determine the molecular weight of the flue gas. Fyrite gas analyzers give accurate readings within $\pm$0.5 percent carbon dioxide or oxygen up to 538°C. Readings are unaffected by most other gases. The following parameters were measured in order to calculate molecular weight: Volume percent carbon dioxide and volume percent oxygen; the volume percent of carbon monoxide and nitrogen was determined by difference. These parameters were measured using the principle of gas absorption in specific absorbing solutions. An average of three samples was used for each test run.

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3.1.5 Moisture Content Sampling

Moisture sampling was conducted employing the principles presented in EPA Method 4 concurrently with particulate sampling. Parameters evaluated in order to determine the gas stream moisture content were: sample gas volume, sample gas temperature, sample gas pressure, impinger moisture gain, and silica gel moisture gain. Some minor modifications were made to the Method 4 train to allow concurrent particulate and moisture content sampling; these modifications involve no deviations from sampling principles.

3.1.6 Determination of Particulate Matter Emissions

EPA Method 5 - Determination of Particulate Matter Emissions From Stationary Sources was used in this test program. Particulate matter was withdrawn isokinetically from the gas stream and was collected in a heated probe and on a heated glass fiber filter. A piece of flexible tubing was used to connect the filter to the impinger train. A series of glass impingers were used to collect the moisture. A calibrated dry gas meter measured the gas sample volume. A schematic of the sampling train is presented in Figure 1. Each of the 12 sampling points were sampled for 10 minutes, resulting in a 120-minute sampling run. The average of three 120-minute sampling runs constituted the test.

3.1.7 Sample Recovery Procedure

The sample recovery was conducted onsite in the BCM air van.

3.1.8 Operation Data

The following process data are contained in Appendix B:

- Stack smoke density chart;
- Waste heat pusher side chart;
- Waste heat coke side chart;
- Stack draft pusher side chart;
- Stack draft coke side chart;
- Crossover coke side pressure chart;
- Crossover pusher side pressure chart;
- Fuel gas pusher side pressure chart;
- Fuel gas coke side pressure chart;
- Fuel gas flow to battery chart;
- Waste heat oxygen level chart;
- Offtake main temperature chart; and
- Pusher's report.

3.2 ANALYSIS

All laboratory analyses were conducted using the procedures specified in EPA Method 5 by BCM at the Pittsburgh, Pennsylvania laboratory. All analytical data sheets are contained in Appendix C.

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3.3 CALCULATIONS

Particulate emission calculations were completed using a computer spreadsheet format. The results of each pertinent parameter are detailed on the spreadsheet for each sampling run and are contained in Appendix D.

3.4 CALIBRATIONS

The following field equipment calibrations are contained in Appendix E:

- Nozzle Diameter
- Thermocouple
- Dry Gas Meter and Orifice
- Pitot Tube

4.0 SUMMARY OF RESULTS

Table 1 presents a summary of the results of the particulate emission testing for No. 1 Coke Oven Battery Combustion Stack. The particulate emissions ranged from 0.003 gr/dscf to 0.005 gr/dscf. The average of the three test runs was 0.004 gr/dscf. The compliance limit was 0.015 gr/dscf.

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TABLE 1

SUMMARY OF RESULTS

No. 1 Coke Oven Battery Combustion Stack

Run No.	1	2	3	Average
Gas Flow (acfm)	104877	99944	97605	100809
Gas Flow (dscfm)	42992	40486	39910	41129
Gas Temp. (^{o}F)	598.8	605.8	605.1	603.2
Gas Moisture (%)	16.2	16.7	16.0	16.3
Oxygen (%)	9.50	8.33	7.66	8.50
Carbon Dioxide (%)	4.83	5.50	5.83	5.39
Isokinetic (%)	95.4	96.9	96.5	96.3
Particulate Emission:				
(gr/dscf)	0.005	0.003	0.003	0.004
(lb/hr)	1.8	1.0	1.0	1.3
Allowable Emission Rate:				
(gr/dscf)	0.015	0.015	0.015	0.015

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APPENDIX A

Field Data

BCM PROJECT NO. CC 9810 56

EPA METHOD 5
FIELD DATA

PLANT SHENANGO
DATE 9-20-93
SAMPLING LOCATION NO. 1 BATTERY
SAMPLE TYPE METHOD 5
RUN NUMBER 1
OPERATOR JEP
AMBIENT TEMPERATURE ~55
BAROMETRIC PRESSURE 29.42
STATIC PRESSURE, (P_s) -.95" 29.35
FILTER NUMBER (s) 667
PITOT TUBE No. & Cp. PT 6-1 0.84

PROBE LENGTH AND TYPE PT 7-1
NOZZLE I.D. 0.5007
ASSUMED MOISTURE, % 14
SAMPLE BOX NUMBER NA
METER BOX NUMBER 582-125
METER ΔH@ 1.711 Y=1.003
K FACTOR .825
PRE-TEST LEAK CHECK RATE 0.000 CFM @ 16 "Hg
POST TEST LEAK CHECK RATE 0.000 CFM @ 15 "Hg
REFERENCE Δp 0.065 @ 570°F - Ts
100°F - Tm

SCHEMATIC OF TRAVERSE POINT LAYOUT

10 MIN / POINT MOISTURE PICKUP ~396

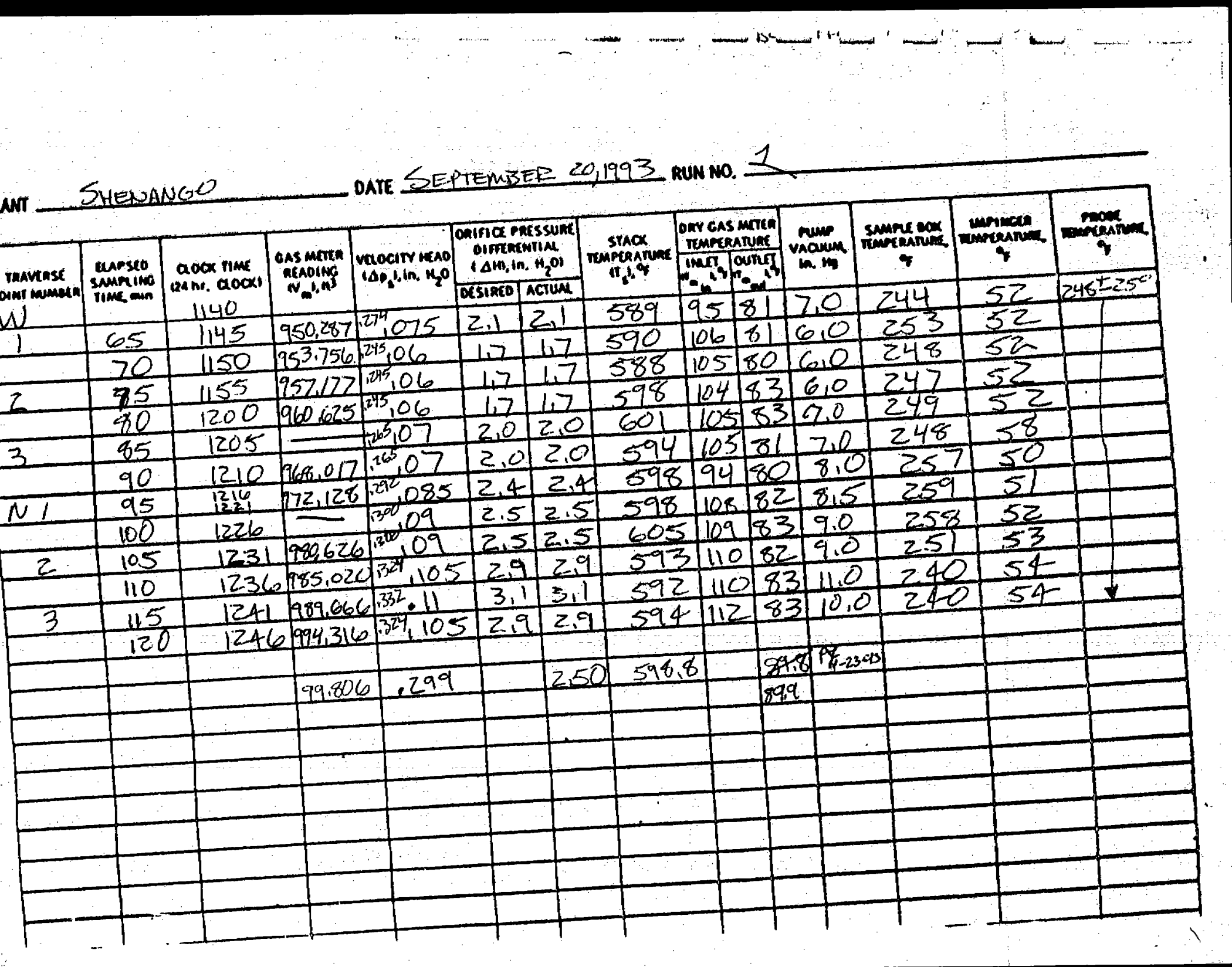
READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
E	0	1032	899.510										
1	5	1037	899.000	.316 .10	2.8	2.8	589	77	64	8.5	240	64	248° ±25°
	10	1042	903.550	.324 .105	2.9	2.9	590	90	65	9.0	239	62	
2	15	1047	908.084	.324 .105	2.9	2.9	595	94	66	10.0	253	58	
	20	1052	912.624	.324 .105	2.9	2.9	604	99	69	10.0	258	56	
3	25	1057	917.421	.374 .14	3.5	3.5	608	102	72	11.5	250	58	
	30	1102	922.309	.374 .14	3.5	3.5	608	104	74	11.5	248	57	
NO 51	35	1106 1111	—	.255 .065	1.8	1.8	595	95	73	8.0	250	52	
	40	1116	929.394	.245 .06	1.7	1.7	598	103	79	6.5	254	53	
2	45	1121	933.381	.283 .08	2.3	2.3	607	104	77	8.0	255	51	
	50	1126	937.449	.283 .08	2.3	2.3	610	107	79	8.0	257	52	
3	55	1131	942.175	.374 .14	3.5	3.5	622	108	79	11.5	242	52	
	60	1136	946.464	.283 .08	2.3	2.3	606	108	81	8.0	244	53	

TOTAL P.03

ANT SHENANGO DATE SEPTEMBER 20, 1993 RUN NO. 1

TRAVERSE OINT NUMBER	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
W		1140											
1	65	1145	950.287	.274 .075	2.1	2.1	589	95	81	7.0	244	52	248 ± 25°
	70	1150	953.756	.245 .06	1.7	1.7	590	106	81	6.0	253	52	
2	75	1155	957.177	.245 .06	1.7	1.7	588	105	80	6.0	248	52	
	80	1200	960.625	.245 .06	1.7	1.7	598	104	83	6.0	247	52	
3	85	1205	—	.265 .07	2.0	2.0	601	105	83	7.0	249	52	
	90	1210	968.017	.265 .07	2.0	2.0	594	105	81	7.0	248	58	
N 1	95	1216 1221	972.128	.292 .085	2.4	2.4	598	94	80	8.0	257	50	
	100	1226	—	.300 .09	2.5	2.5	598	108	82	8.5	259	51	
2	105	1231	980.626	.300 .09	2.5	2.5	605	109	83	9.0	258	52	
	110	1236	985.020	.324 .105	2.9	2.9	593	110	82	9.0	251	53	
3	115	1241	989.666	.332 .11	3.1	3.1	592	110	83	11.0	240	54	
	120	1246	994.316	.324 .105	2.9	2.9	594	112	83	10.0	240	54	
			99.806	.299		2.50	598.8		~~89.8~~ 89.9	PG 4-23-93			



BCM PROJECT No. 00-4810-36

EPA METHOD 5
FIELD DATA

PLANT SHENANGO
DATE 9/21/93
SAMPLING LOCATION NO 7 BATTERY
SAMPLE TYPE METHOD 5
RUN NUMBER 2
OPERATOR JEP
AMBIENT TEMPERATURE ~65
BAROMETRIC PRESSURE 29.44
STATIC PRESSURE, IP (P_s) -.97" 29.36
FILTER NUMBER (s) 668
PITOT TUBE No. & Cp. PT 6-1 0.84

PROBE LENGTH AND TYPE PT 7-1 STAINLESS STEEL
NOZZLE I.D. 0.5007
ASSUMED MOISTURE, % 16
SAMPLE BOX NUMBER NA
METER BOX NUMBER 582-125
METER ΔH@ 1.711 Y = 1.003
K FACTOR 0.825
PRE-TEST LEAK CHECK RATE 0.002 CFM @ 16 "Hg
POST TEST LEAK CHECK RATE 0.001 CFM @ 15 "Hg
REFERENCE Δp 0.65

MOISTURE PICKUP 387ml

SCHEMATIC OF TRAVERSE POINT LAYOUT

10 MIN/POINT

READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
					DESIRED	ACTUAL		INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F				
N	0	0906	994.754										248±25°
1	5	0911	999.074	.309 .095	2.6	2.6	600	96	72	9.5	242	51	
	10	0916	1003.385	.308 .095	2.6	2.6	601	104	74	9.5	244	50	
2	15	0921	1007.876	.316 .10	2.8	2.8	604	108	78	10.0	251	55	
	20	0926	1012.400	.316 .10	2.8	2.8	609	110	80	11.0	252	58	
3	25	0931	1016.928	.324 .105	2.9	2.9	613	114	83	11.0	251	60	
	30	0936	1021.537	.324 .105	2.9	2.9	617	114	84	11.0	251	61	
E 1	35	0939 0944	1025.022	.245 .06	1.7	1.7	600	103	86	7.0	242	62	
	40	0949	1028.523	.245 .06	1.7	1.7	601	109	86	7.0	242	58	
2	45	0954	1032.187	.235 .065	1.9	1.9	603	110	88	7.5	243	53	
	50	0959	1036.000	.263 .07	2.0	2.0	608	111	87	7.5	244	51	
3	55	1004	1040.816	.316 .12	3.4	3.4	615	116	88	13.0	244	51	
	60	1009	1045.721	.346 .12	3.4	3.4	613	117	91	13.0	245	51	

BCM PROJECT [illegible]

PLANT SMENANGO DATE SEPTEMBER 21, 1993 RUN NO. 2

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET, °F	DRY GAS METER TEMPERATURE OUTLET, °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
S		1013											248±25°
1	65	1018	1048.718	.1212 .045	1.3	1.3	606	100	87	5.0	240	62	
	70	1023	1051.894	.1212 .045	1.3	1.3	610	109	88	5.0	246	62	
2	75	1028	1055.491	.1215 .065	1.9	1.9	609	111	88	7.0	242	52	
	80	1033	1058.987	.1245 .06	1.7	1.7	622	111	89	6.5	238	54	
3	85	1038	1062.813	.1274 .075	2.1	2.1	602	112	89	8.0	239	53	
	90	1043	1066.686	.1274 .075	2.1	2.1	610	112	89	8.0	250	52	
W	95	1047 1052	1070.867	.1292 .085	2.4	2.4	600	107	89	9.0	248	64	
W 1	100	1057	——	.1283 .08	2.3	2.3	599	114	89	9.0	247	54	
	105	1102	1078.007	.1274 .075	2.1	2.1	600	115	90	8.0	246	54	
2	110	1107	1083.367	.1308 .095	2.7	2.7	596	115	92	10.0	244	55	
	115	1112	1087.503	.1292 .085	2.4	2.4	600	116	91	9.0	250	56	
3	120	1117	1091.740	.1300 .09	2.5	2.5	602	115	91	9.0	248	56	
			96.986	.284		2.31	605.0		98.3				

EPA METHOD 5
FIELD DATA

PLANT SHENANGO
DATE 9/22/93
SAMPLING LOCATION No. 1 BATTERY
SAMPLE TYPE METHOD 5
RUN NUMBER 3
OPERATOR JEP
AMBIENT TEMPERATURE ~70
BAROMETRIC PRESSURE 29.45 Pg 9-23-93
STATIC PRESSURE, (P_s) -.99" ~~29.35~~ 29.38
FILTER NUMBER (s) 671
PITOT TUBE No. & Cp. PT 6-1 0.84

PROBE LENGTH AND TYPE PT 7-1 STAINLESS STEEL
NOZZLE I.D. 0.5007
ASSUMED MOISTURE, % 16
SAMPLE BOX NUMBER NA
METER BOX NUMBER 582-125
METER ΔH@ 1.711 Y = 1.003
K FACTOR 0.825
PRE-TEST LEAK CHECK RATE 0.017 CFM @ 15 "Hg
POST TEST LEAK CHECK RATE ____ CFM @ ____ "Hg
REFERENCE Δp 0.65

MOISTURE PICKUP 362 ml.

SCHEMATIC OF TRAVERSE POINT LAYOUT

10 MIN./POINT
READ AND RECORD ALL DATA EVERY 5 MINUTES

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
					DESIRED	ACTUAL		INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F				
N	0	0900	92[illegible].289										
1	5	0905	96,571	.308 .095	2.7	2.7	601	81	63	11.0	236	56	248±25°
	10	0910	100,799	.300 .09	2.5	2.5	597	97	67	11.0	237	55	
2	15	0915	105,141	.308 .095	2.7	2.7	597	100	69	12.0	250	55	
	20	0920	109,510	.308 .095	2.7	2.7	605	103	73	12.0	241	56	
3	25	0925	113,873	.308 .095	2.7	2.7	608	101	74	12.0	240	57	
	30	0930	118,218	.308 .095	2.7	2.7	612	106	76	12.0	248	58	
E 1	35	0933 0940	122,289	.292 .085	2.4	2.4	596	97	78	9.0	253	60	
	40	0945	126,355	.283 .080	2.3	2.3	597	106	80	9.0	251	52	
2	45	0950	130,489	.292 .085	2.4	2.4	594	107	80	9.5	241	53	
	50	0955	134,562	.283 .080	2.3	2.3	608	107	81	9.5	246	53	
3	55	1000	139,330	.346 .12	3.4	3.4	609	109	82	14.0	250	54	
	60	1005	144,236	.346 .12	3.4	3.4	616	112	83	14.0	255	55	

PLANT SHENANGO DATE SEPTEMBER 22, 1993 RUN NO. 3

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, min	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET (T_m), °F	DRY GAS METER TEMPERATURE OUTLET (T_m), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F	PROBE TEMPERATURE, °F
S		1010											248 ± 25°
1	65	1015	147.624	.245 .06	1.7	1.7	609	102	85	7.0	240	50	
	70	1020	151.084	.245 .06	1.7	1.7	610	105	83	7.0	241	51	
2	75	1025	154.559	.245 .06	1.7	1.7	614	108	82	7.0	243	51	
	80	1030	—	.265 .07	1.9	1.9	621	106	83	8.0	245	51	
3	85	1035	162.424	.285 .08	2.3	2.3	630	105	85	10.0	246	52	
	90	1040	166.394	.300 .09	2.5	2.5	615	107	83	10.0	246	52	
W 1	95	1043 1048	169.892	.245 .06	1.7	1.7	598	90	83	7.0	250	58	
	100	1053	173.154	.224 .05	1.4	1.4	595	104	84	6.0	243	50	
2	105	1058	176.360	.224 .05	1.4	1.4	589	104	85	6.0	241	52	
	110	1103	179.300	.212 .045	1.2	1.2	603	102	85	5.5	245	51	
3	115	1108	182.628	.245 .06	1.7	1.7	597	103	87	7.0	241	52	
	120	1113	186.150	.255 .065	1.8	1.8	602	105	84	8.0	245	51	
			93.861	.278		2.22	605.1		91.2				

FYRITE FIELD DATA SHEET

CLIENT: SHELL/NGO BCM PROJECT NO: 00-4310-36

SAMPLING LOCATION: NO 1 BATTERY STACK

DATE: SEPTEMBER 20, 1993

OPERATOR: AL MICHELOTTI

RUN / GAS	1 TIME: ~1045	2 TIME: ~1110	3 TIME: ~1135	AVERAGE
CO_2	4.5	4.5	5.5	4.83 BM 9-23-93
O_2	10.0	10.5	8.0	9.5
CO and N_2 (by difference)	85.5	85.0	86.5	85.67

BCM Project No. 00-4810-36

FYRITE FIELD DATA SHEET

CLIENT: SHENANGO

SAMPLING LOCATION: NO 1 BATTERY STACK

DATE: SEPTEMBER 21, 1993

OPERATOR: AL MICHELOTTI

GAS \ RUN	1 TIME: ~0910	2 TIME: ~0945	3 TIME: ~1015	AVERAGE
CO_2	5.0	6.0	5.5	5.50
O_2	8.5	7.0	9.5	8.33
CO and N_2 (by difference)	86.5	87.0	85.0	86.17

FYRITE FIELD DATA SHEET

CLIENT: SHENANGO BLM PROJECT NO: 00-4810-36

SAMPLING LOCATION: NO. 1 BATTERY STACK

DATE: SEPTEMBER 22, 1993

OPERATOR: AL MICHELOTTI

RUN / GAS	1 TIME: ~0940	2 TIME:	3 TIME:	AVERAGE
CO_2	6.0	6.0	5.5	5.83
O_2	7.5	8.0	7.5	7.66
CO and N_2 (by difference)	86.5	86.0	87.0	86.5

FYRITE FIELD DATA SHEET

CLIENT: SHENANGO BLM PROJECT NO: 00-4810-36

SAMPLING LOCATION: NO. 1 BATTERY STACK

DATE: SEPTEMBER 22, 1993

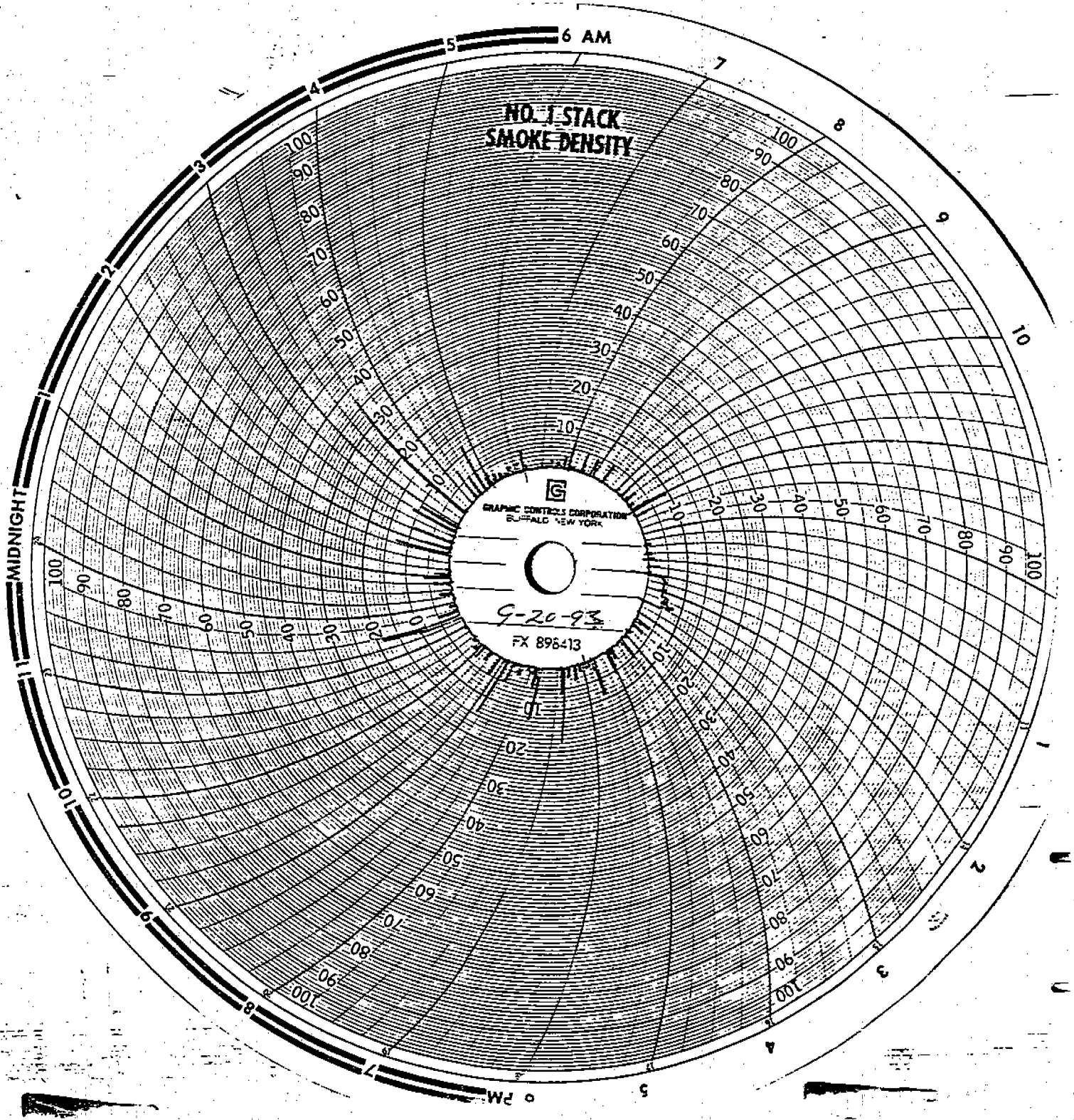
OPERATOR: AL MICHELOTTI

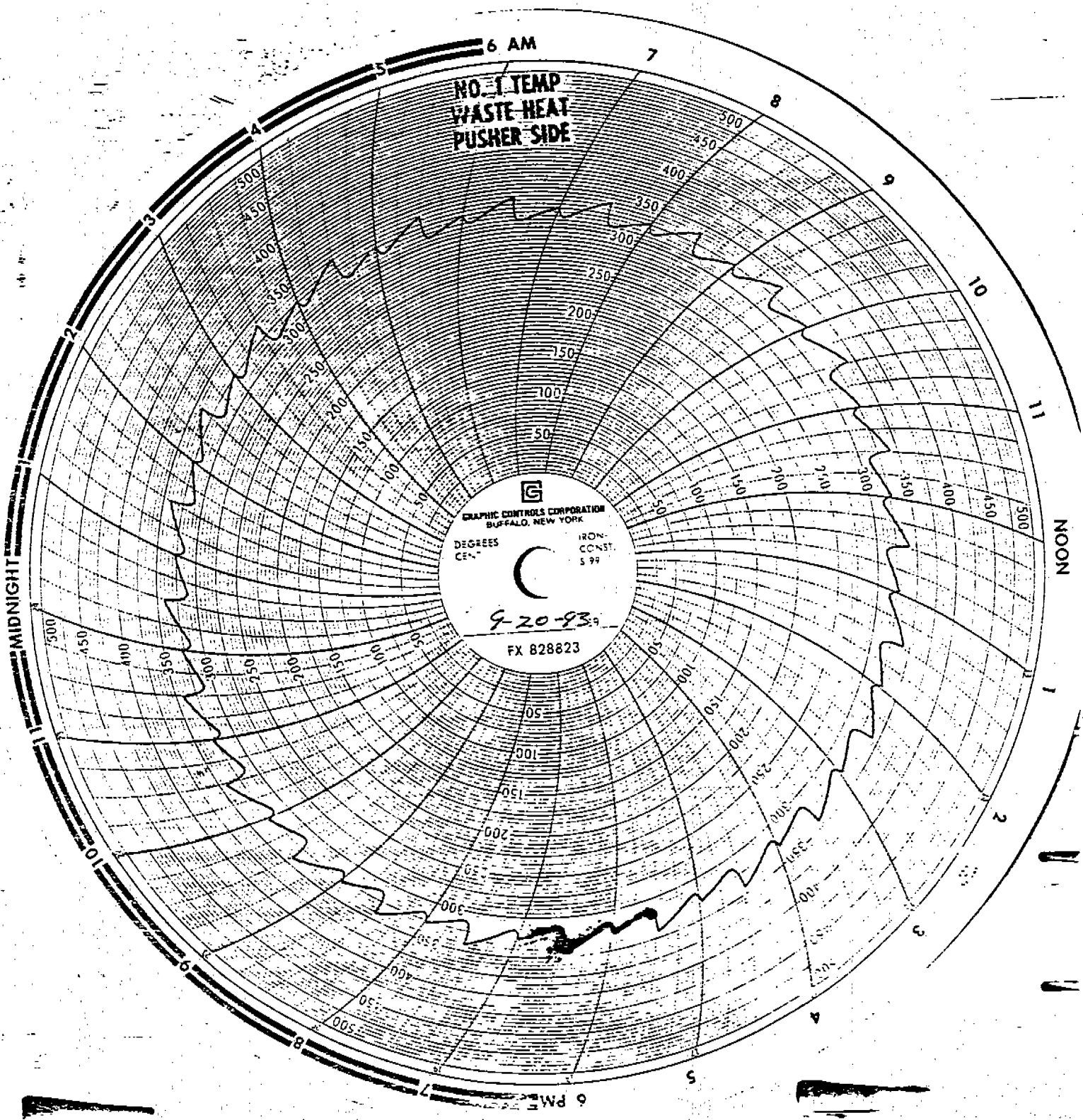
RUN / GAS	1 TIME: ~0940	2 TIME:	3 TIME:	AVERAGE
CO_2	6.0	6.0	5.5	5.83
O_2	7.5	8.0	7.5	7.66
CO and N_2 (by difference)	86.5	86.0	87.0	86.5

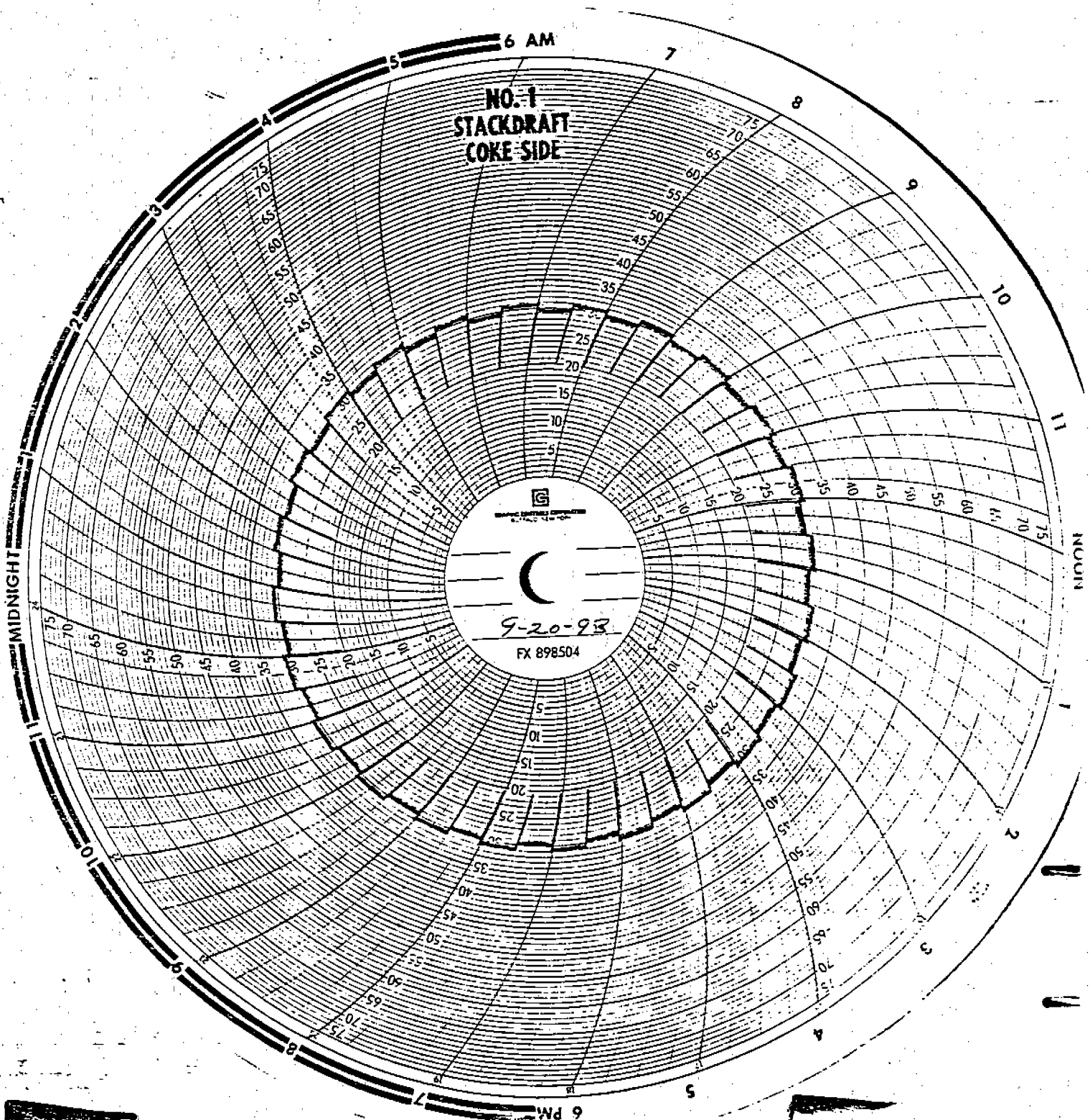
BCM

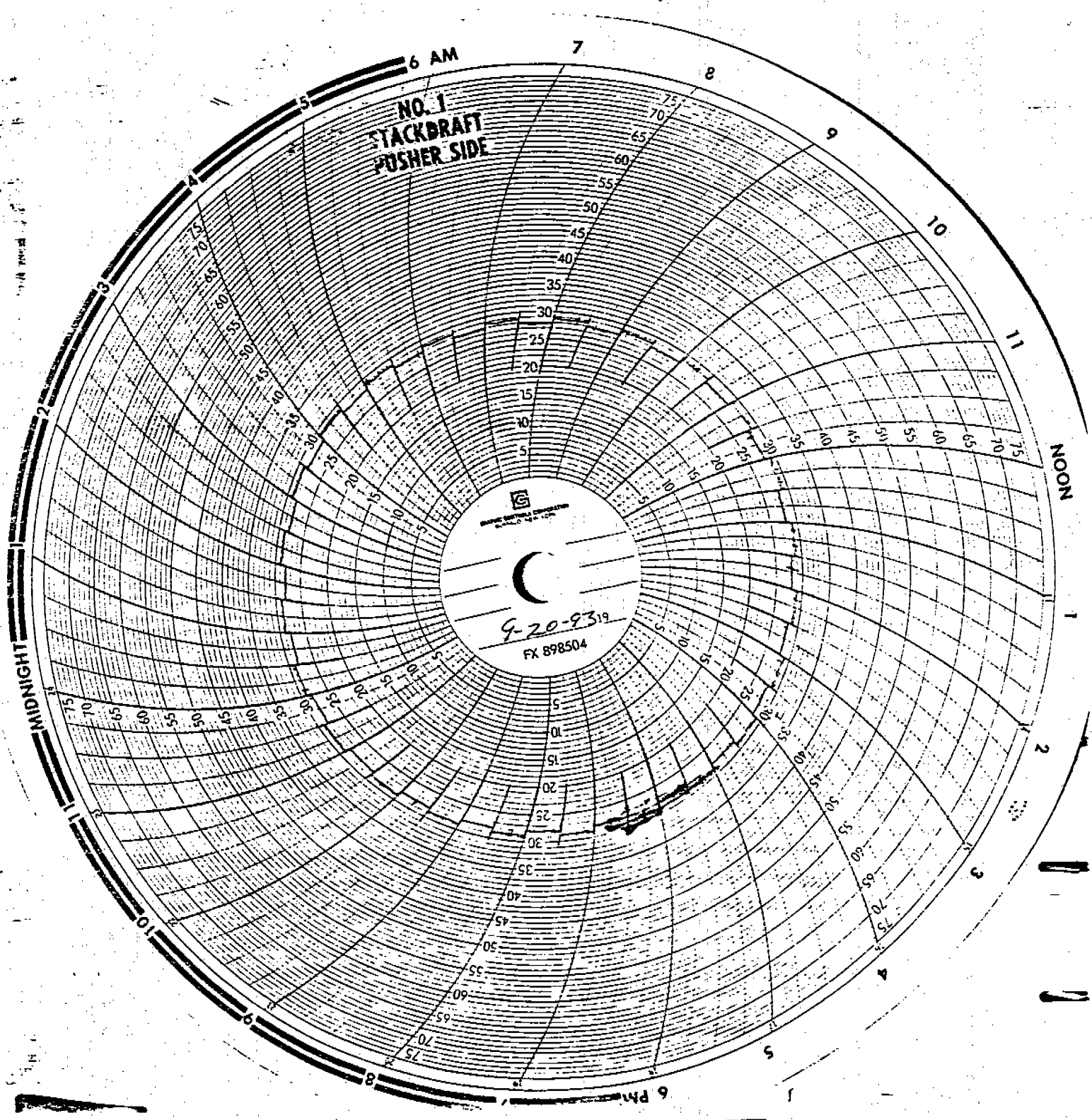
APPENDIX B

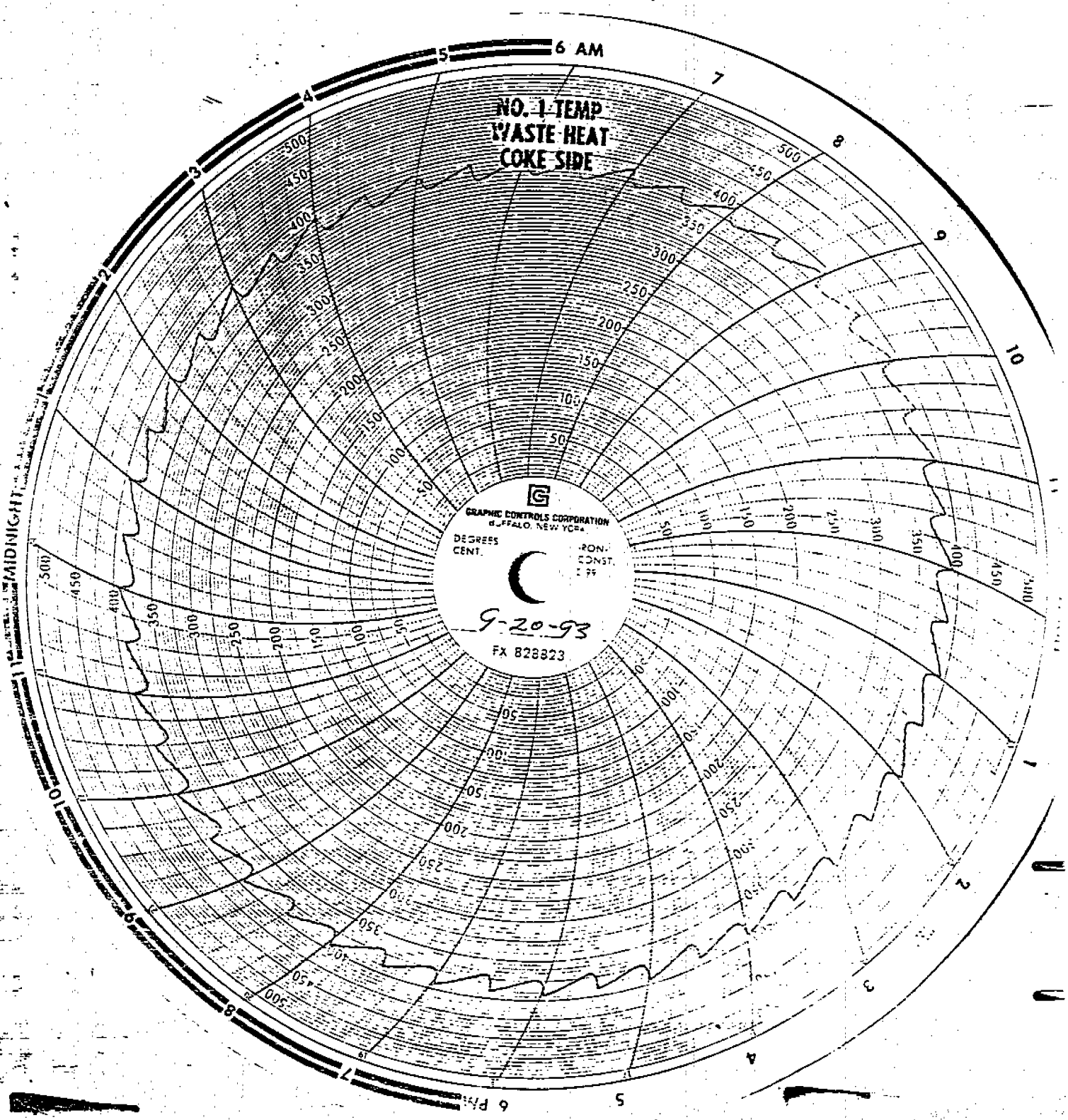
Operation Data

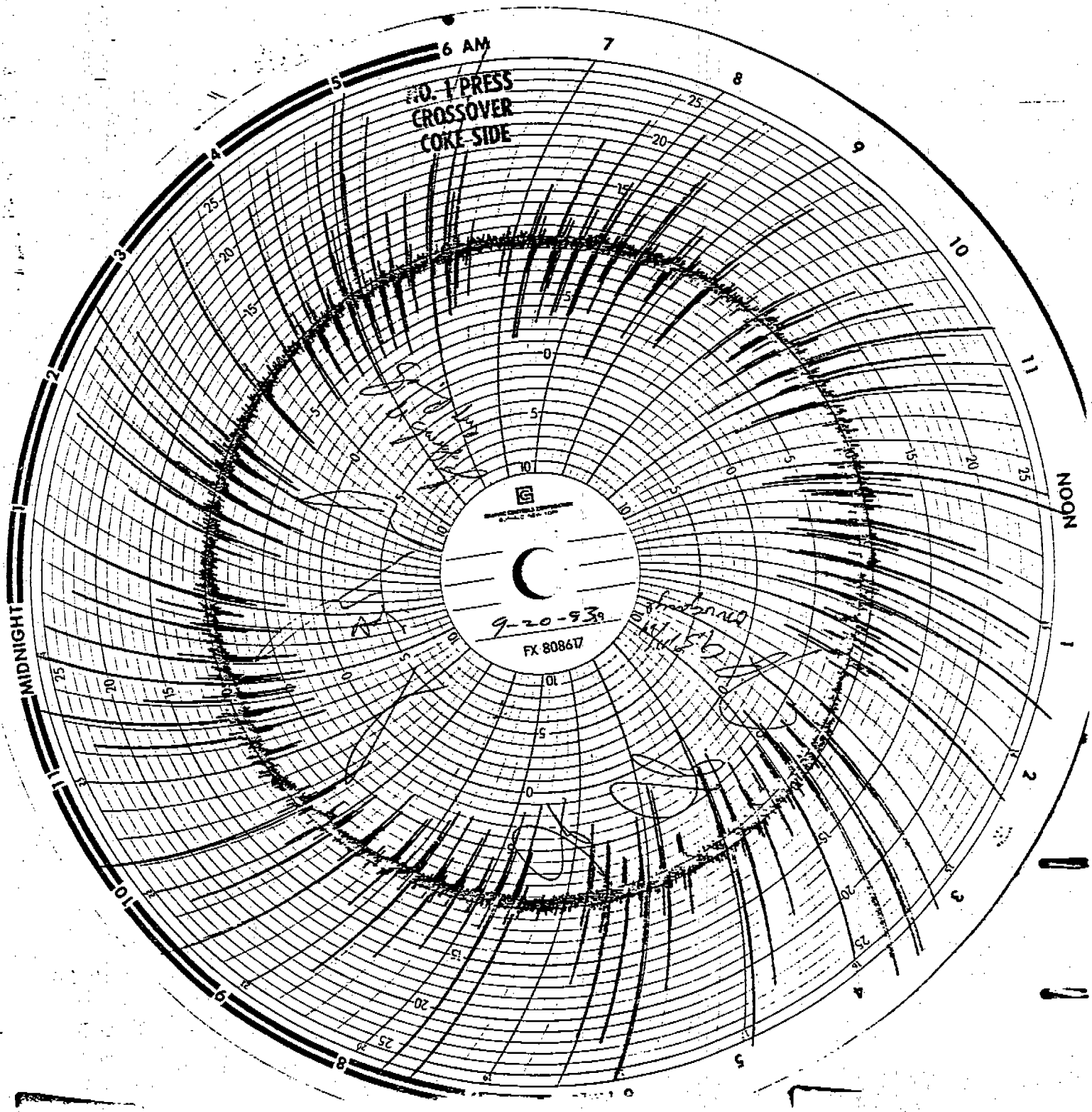

NO. 1 STACK
SMOKE DENSITY
6 AM
MIDNIGHT
6 PM
GRAPHIC CONTROLS CORPORATION
BUFFALO NEW YORK
6-20-93
FX 898413

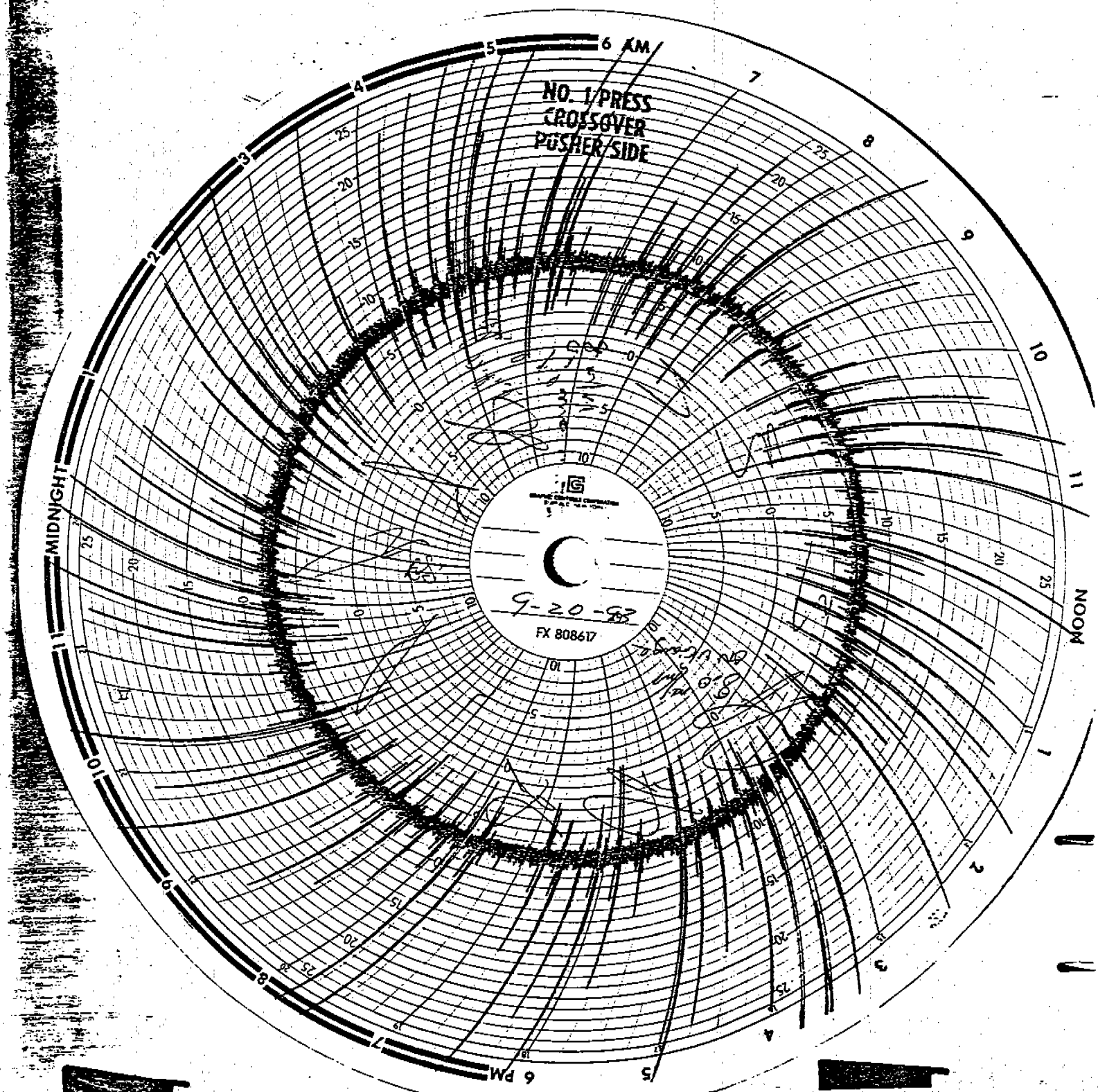

NO. 1 TEMP
WASTE HEAT
PUSHER SIDE
6 AM
NOON
MIDNIGHT
6 PM
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
DEGREES
IRON-CONST.
S 99
6-20-83
FX 828823


NO. 1
STACKDRAFT
COKE SIDE
6 AM
NOON
6 PM
MIDNIGHT
9-20-93
FX 898504

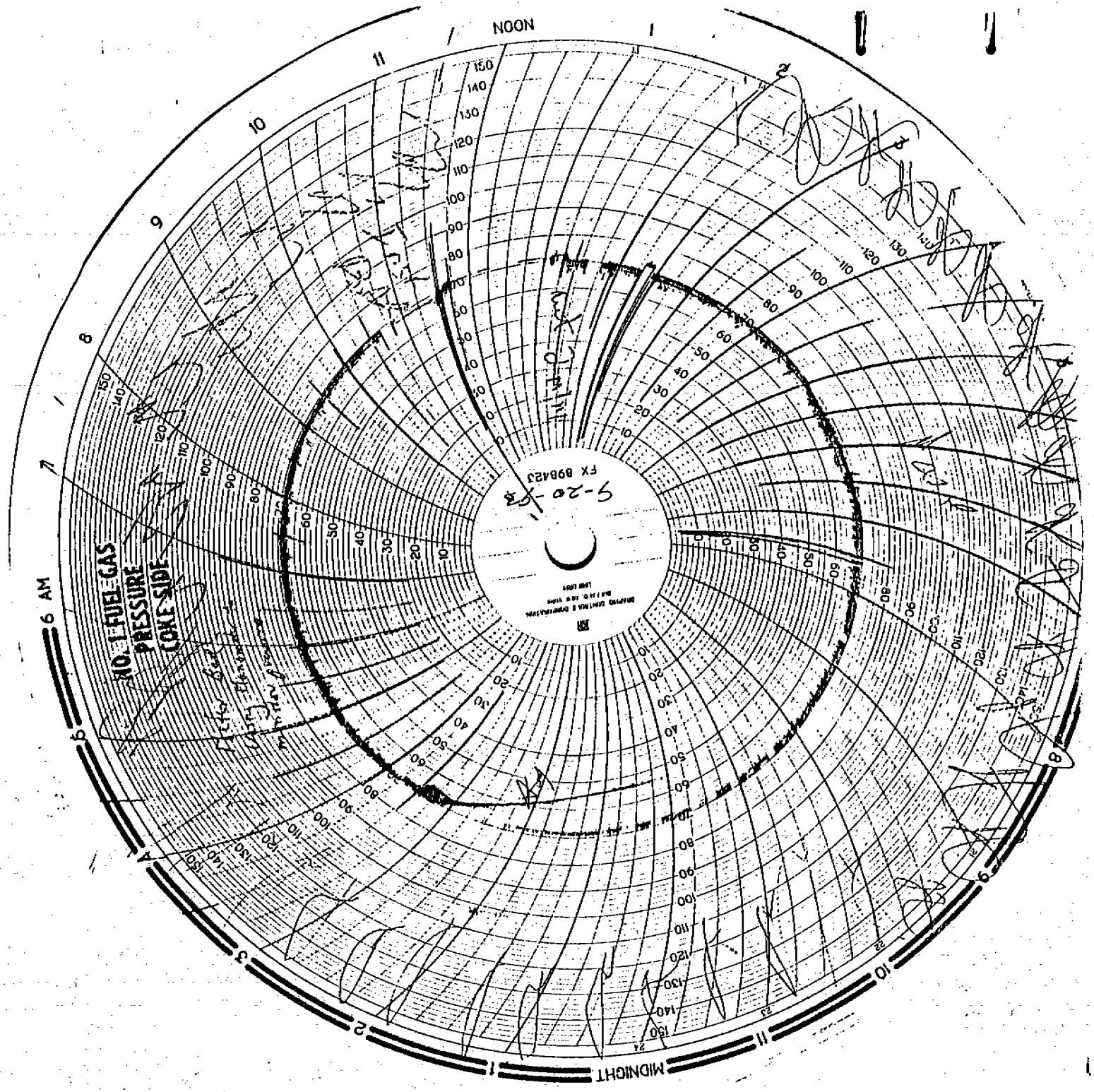

NO. 1
STACKDRAFT
PUSHER SIDE
6 AM
NOON
MIDNIGHT
6 PM
9-20-93
FX 898504

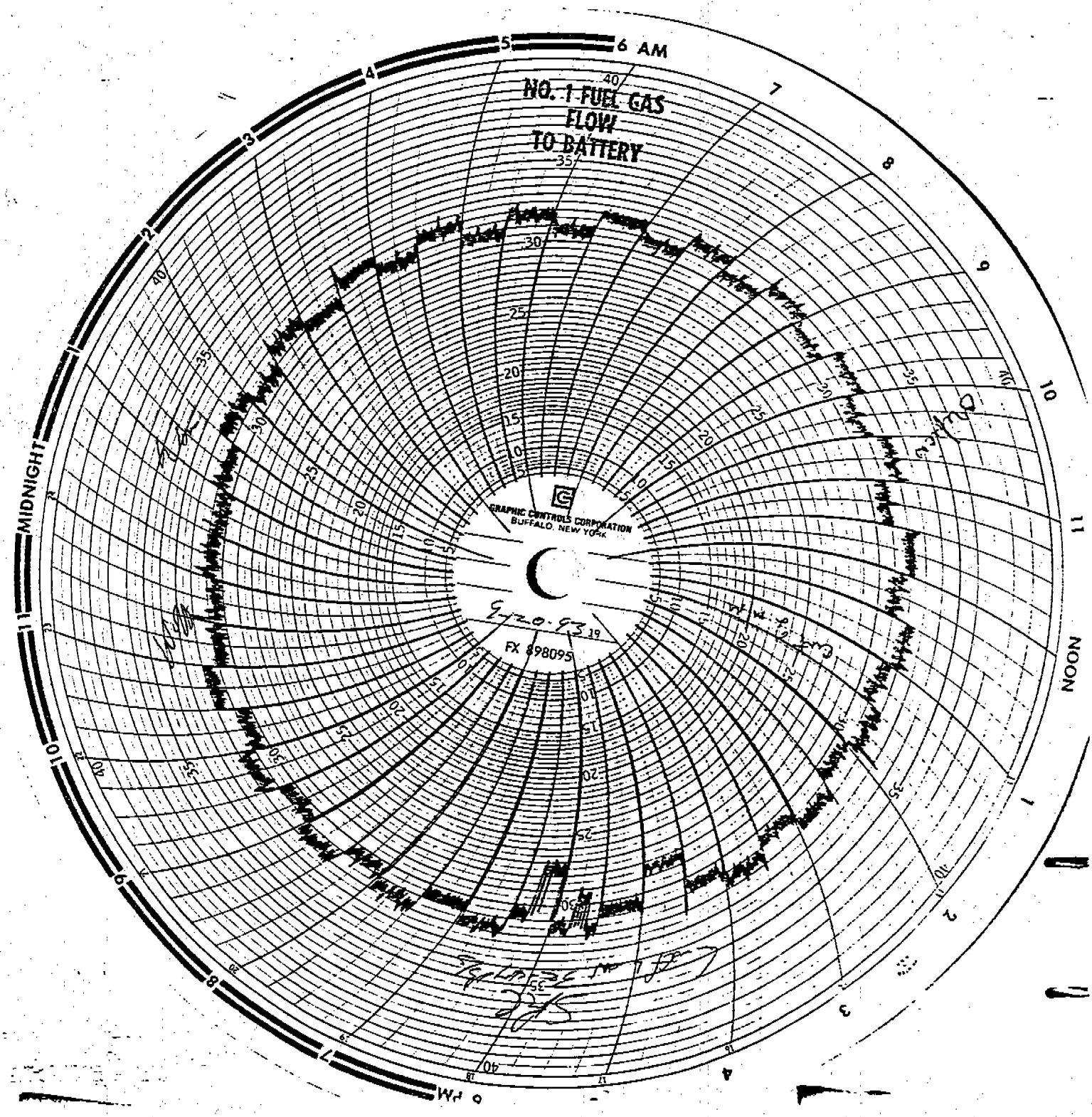

NO. 1 TEMP
WASTE HEAT
COKE SIDE
6 AM
MIDNIGHT
6 PM
GRAPHIC CONTROLS CORPORATION
DEGREES
CENT.
9-20-93
FX 828823

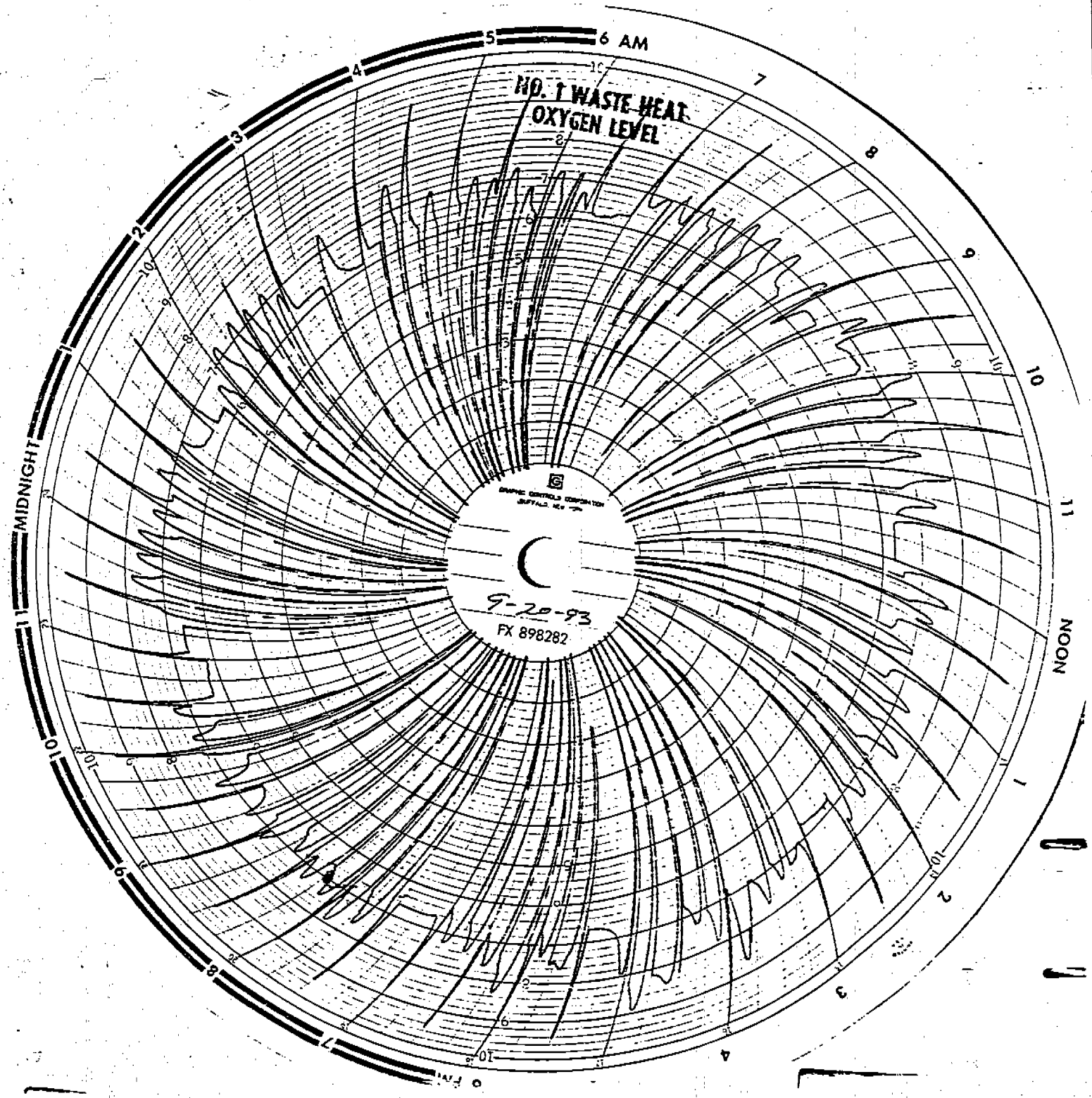

NO. 1 PRESS
CROSSOVER
COKE SIDE
6 AM
NOON
MIDNIGHT
9-20-93
FX 80867

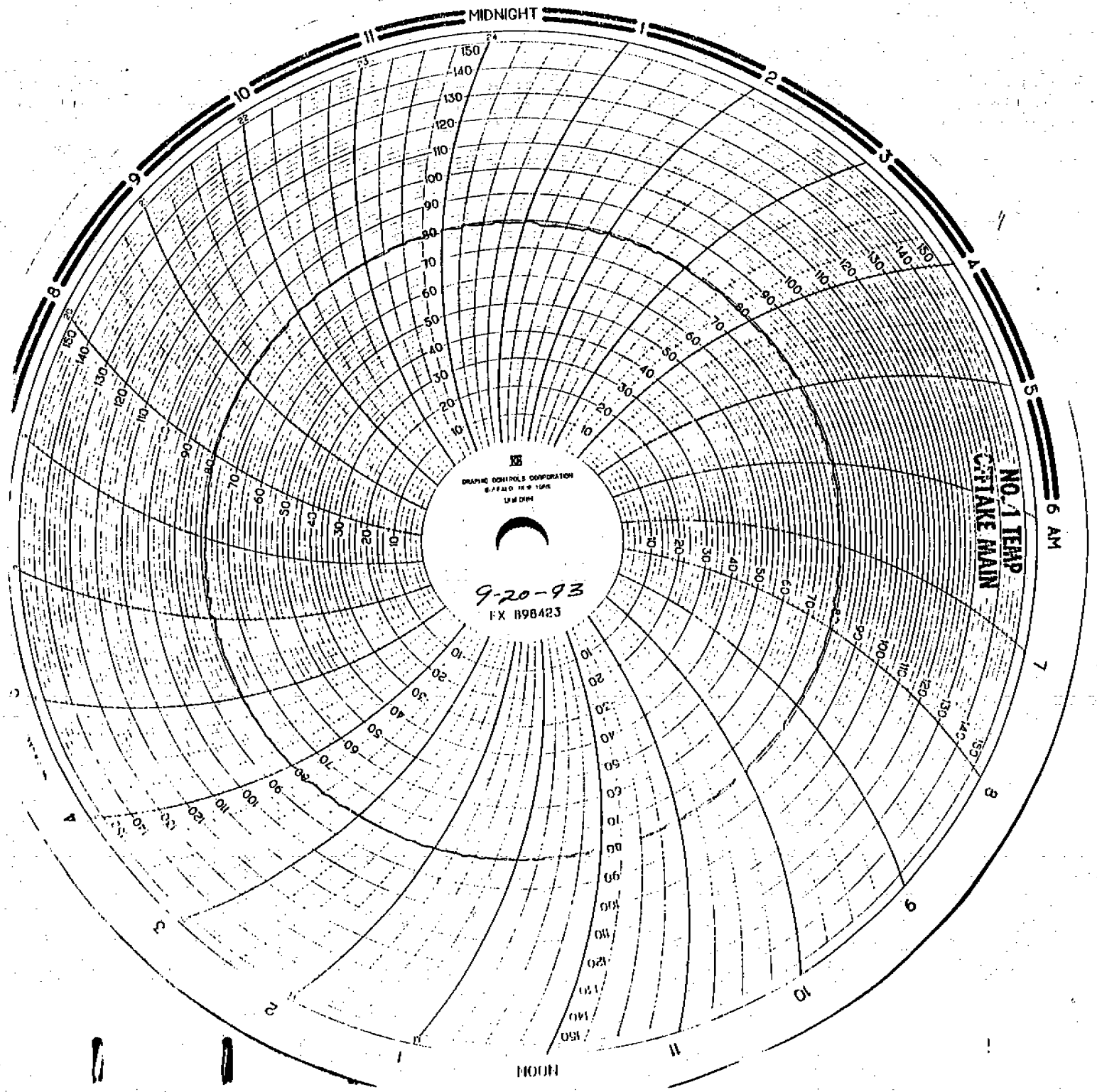

NO. 1/PRESS
CROSSOVER
PUSHER SIDE
6 AM
NOON
6 PM
MIDNIGHT
9-20-93
FX 808617

NO. 1 FUEL GAS
PRESSURE
PUSHER SIDE
6 AM
NOON
MIDNIGHT
9-20-93
FX 898423


NOON
MIDNIGHT
6 AM
NO. 1 FUEL GAS
PRESSURE
COKE SIDE


NO. 1 FUEL GAS
FLOW
TO BATTERY
6 AM
NOON
MIDNIGHT
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
FX 898095


NO. 1 WASTE HEAT
OXYGEN LEVEL
6 AM
NOON
MIDNIGHT
9-20-93
FX 898282


MIDNIGHT
6 AM
NOON
NO. 1 TEMP
INTAKE MAIN
9-20-93
FX 898423

SHENANGO INCORPORATED

NEVILLE PLANT
PUSHERS REPORT

BATTERY NO. 1

DATE 9 — 20 19 93

	OVEN NO.	TIME PUSHED	TIME CHARGED	AMPS TO PUSH		OVEN NO.	TIME PUSHED	TIME CHARGED	AMPS TO PUSH		OVEN NO.	TIME PUSHED	TIME CHARGED	AMPS TO PUSH
1	19	7:07	7:17	200	1	8		3:13		1	7		11:24	
2	29	22	33	200	2	18	3:03	27	190	2	17	11:12	37	20
3	39	38	47	220	3	28	19	46	190	3	27	29	51	19
4	49	52	8:01	220	4	38	32	59	180	4	37	43	12:05	20
5	59	8:05	14	210	5	48	52	4:13	200	5	47	56	20	21
6	2	20	30	190	6	58	4:05	28	200	6	57	12:09	43	22
7	12	42	52	200	7	1	19	44	190	7	9	26	55	19
8	22	9:04	9:21	200	8	11	36	58	200	8	19	48	1:05	19
9	32	46	10:00	210	9	21	50	5:32	200	9	29	1:00	48	21
10	42	10:04	14	200	10	31	5:20	47	200	10	39	4	12:01	19
11	52	19	28	200	11	41	37	6:02	220	11	49	54	17	20
12	62	37	45	220	12	51	52	17	200	12	59	2:06	30	21
13	4	51	58	190	13	61	6:08	30	220	13	2	21	42	19
14	14	11:07	11:15	200	14	3	23	46	200	14	12	36	53	22
15	24	12:03	12:10	210	15	13	40	7:33	210	15	22	48	3:31	20
16	34	15	20	200	16	23	7:26	47	210	16	32	3:59	4:16	21
17	44	33	42	220	17	33	40	8:07	220	17	42	4:08	29	20
18	54	47	54	210	18	43	53	20	210	18	52	20	43	20
19	6	1:03	1:12	200	19	53	8:11	36	210	19	62	34	55	22
20	16	17	24	190	20	5	26	52	200	20	4	48	5:08	20
21	26	30	37	200	21	15	43	9:10	200	21	14	5:02	19	20
22	36	42	56	190	22	25	9:00	34	190	22	24	13	35	20
23	46	50	2:10	200	23	35	19	55	200	23	34	28	48	21
24	56	2:02	26	210	24	45	42	10:05	200	24	44	42	6:01	20
25	8	19		200	25	55	59	21	210	25	54	54	16	21
26					26	7	10:16		220	26	6	6:10		20
27					27					27				
28					28					28				
29					29					29				
30					30					30				
31		#			31		#			31		#		
32		1	8	3 8	32			2	4 4 2	32		1	8	3 8
33					33					33				
34					34					34				
35					35					35				
36					36					36				
37					37					37				
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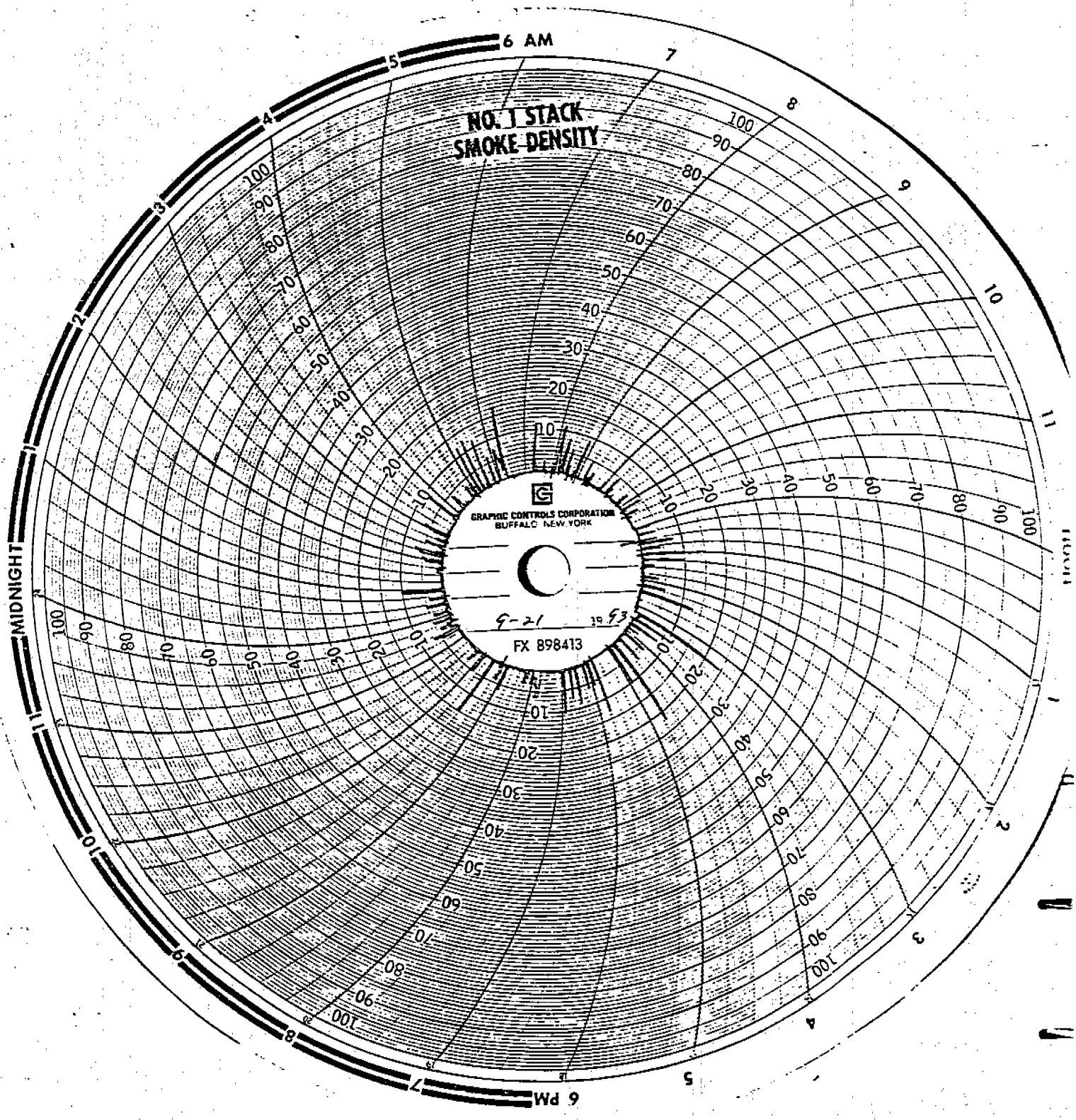
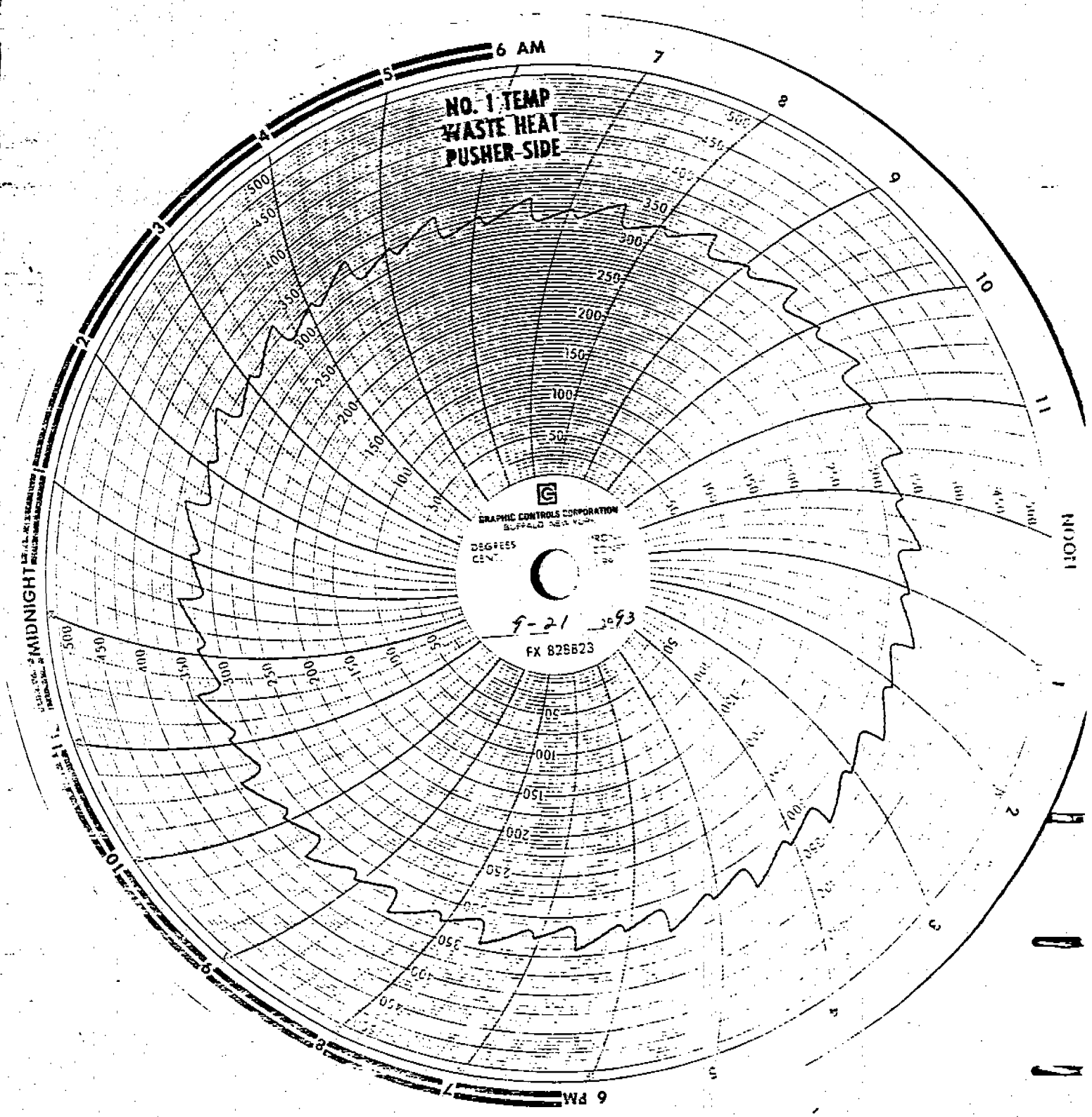
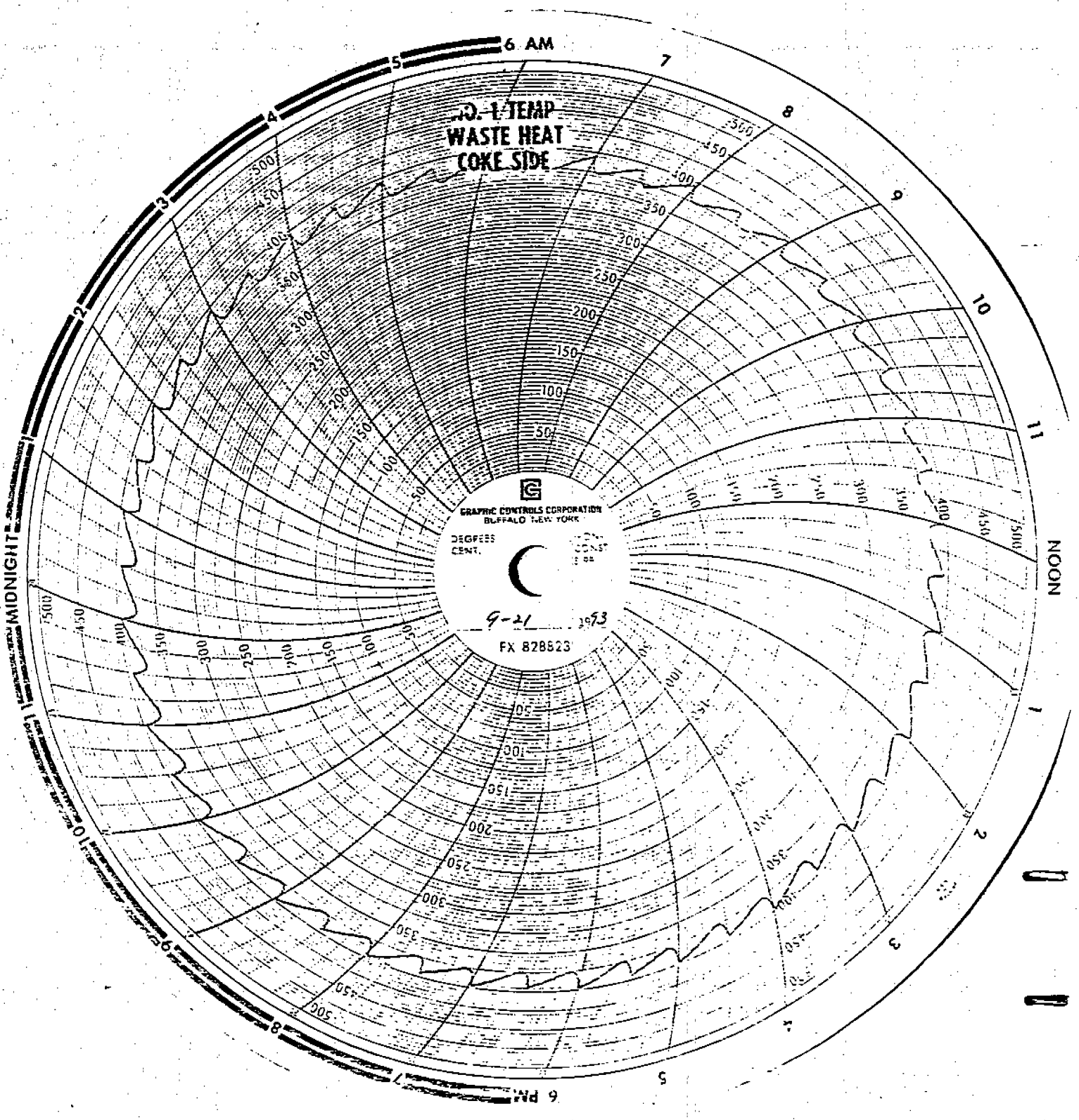
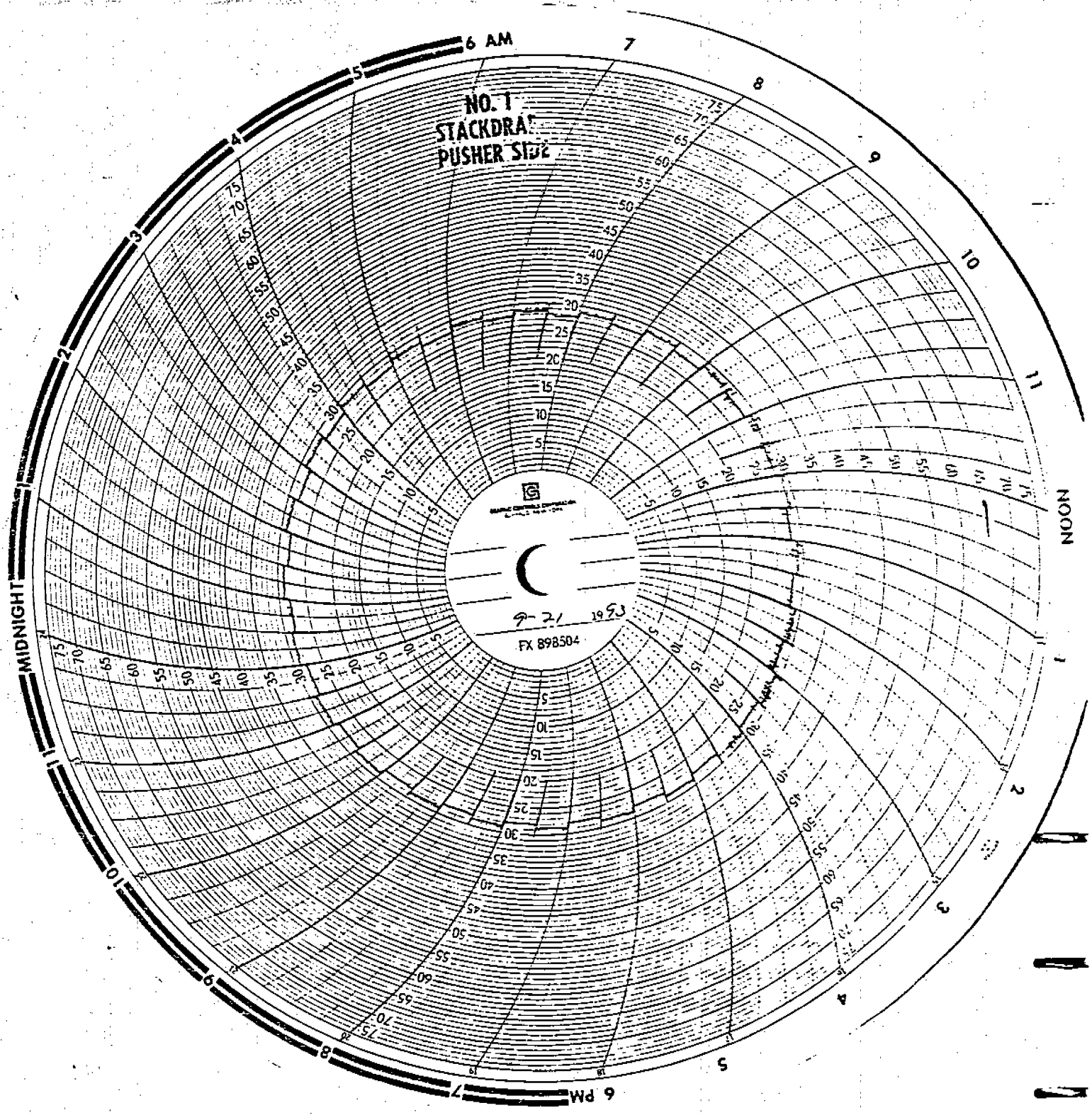
41					41					41				
42					42					42				
43					43					43				
44					44					44				
45					45					45				
46					46					46				
47					47					47				
48					48					48				
49					49					49				
50					50					50				

COAL	COAL	COAL
CHARGE	CHARGE	CHARGE
SPILLAGE	SPILLAGE	SPILLAGE
FOREMAN	FOREMAN	FOREMAN
REMARKS:	REMARKS:	REMARKS:

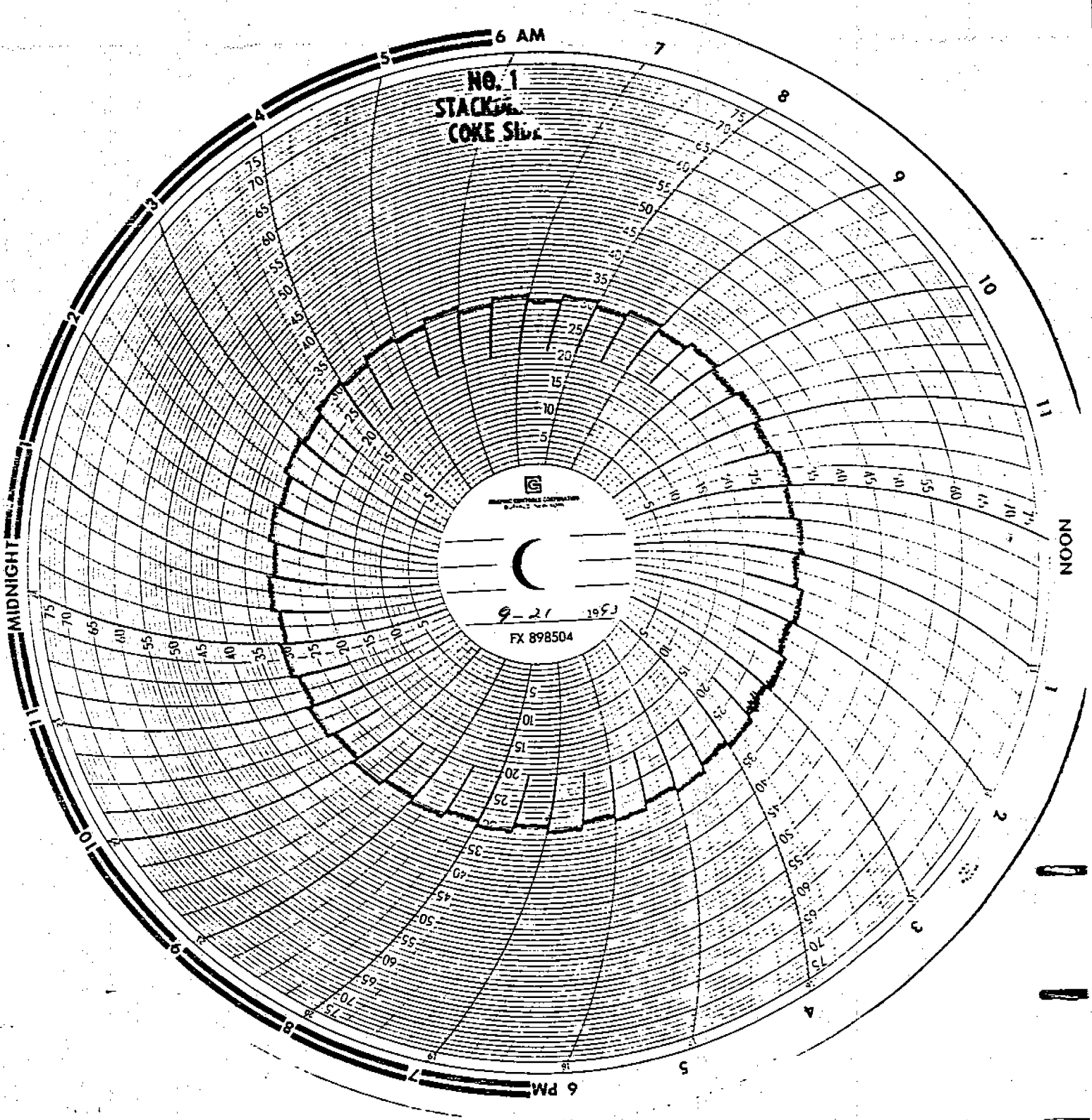

NO. 1 STACK
SMOKE DENSITY
6 AM
MIDNIGHT
6 PM
GRAPHIC CONTROLS CORPORATION
BUFFALO NEW YORK
9-21
19 93
FX 898413

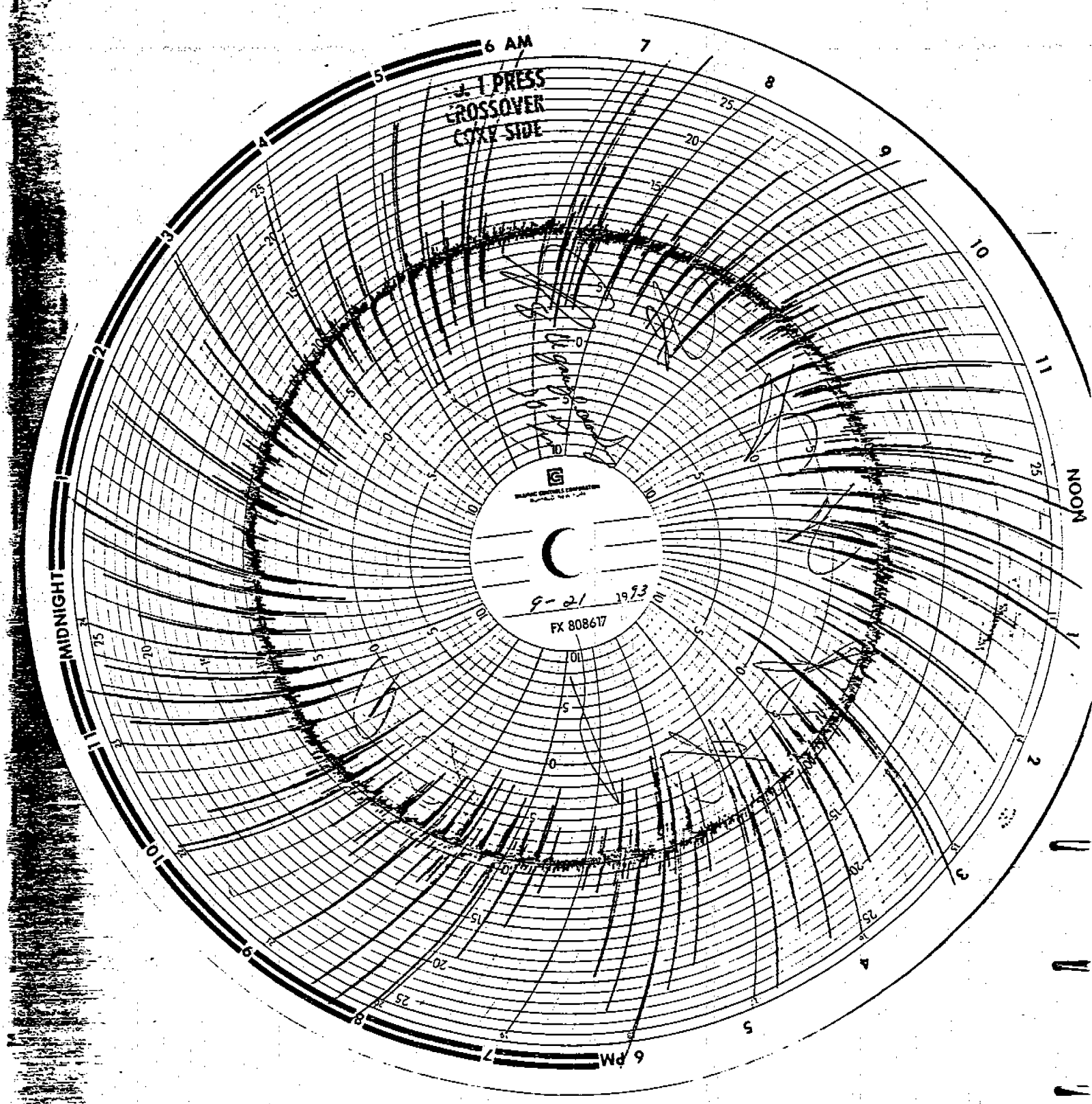

NO. 1 TEMP
WASTE HEAT
PUSHER-SIDE
6 AM
MIDNIGHT
6 PM
NOON
GRAPHIC CONTROLS CORPORATION
DEGREES
CENT
FX 828823

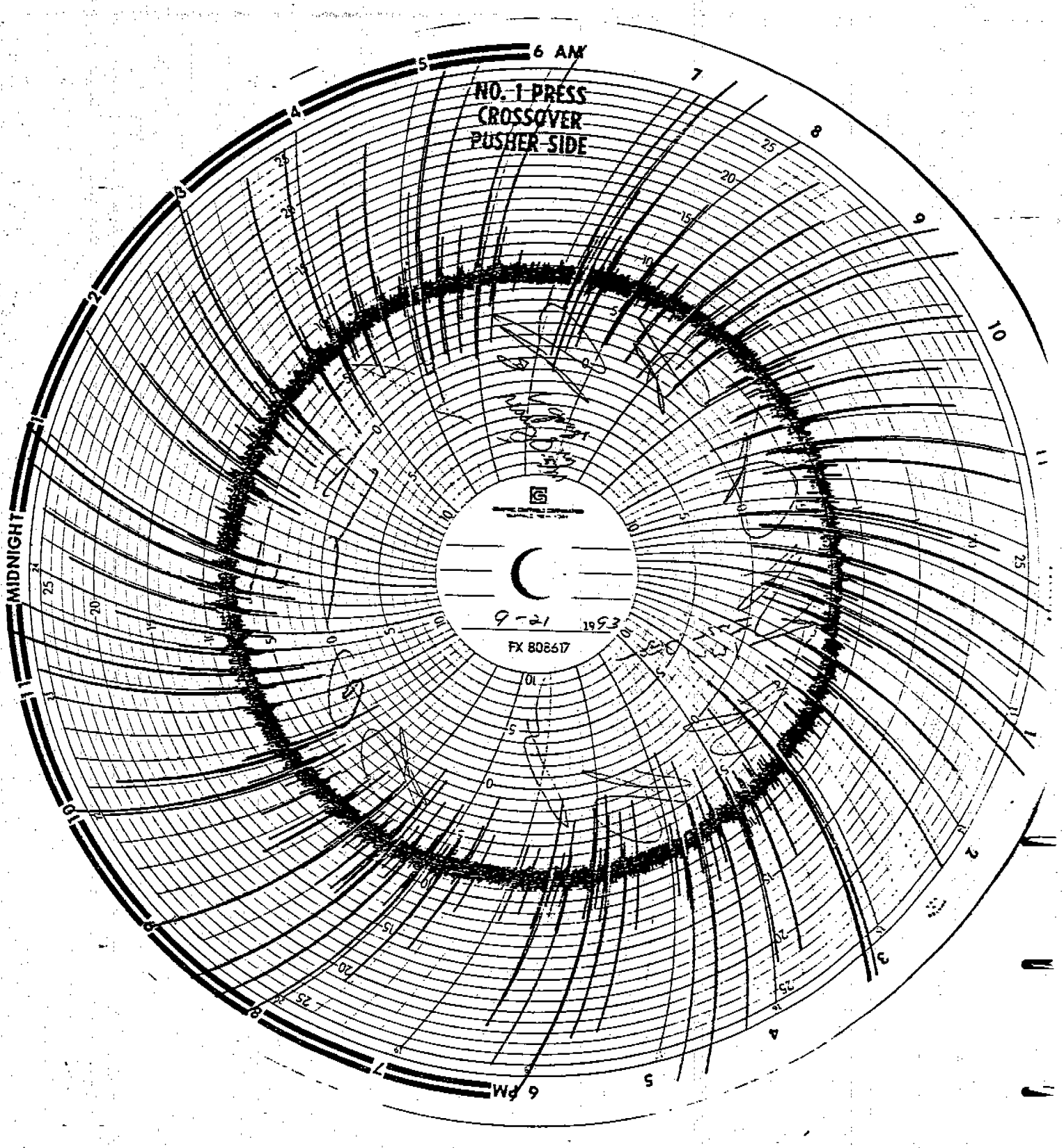

NO. 1 TEMP
WASTE HEAT
COKE SIDE
6 AM
NOON
MIDNIGHT
6 PM
GRAPHIC CONTROLS CORPORATION
BUFFALO 7, NEW YORK
DEGREES
CENT.
9-21
1953
FX 828823

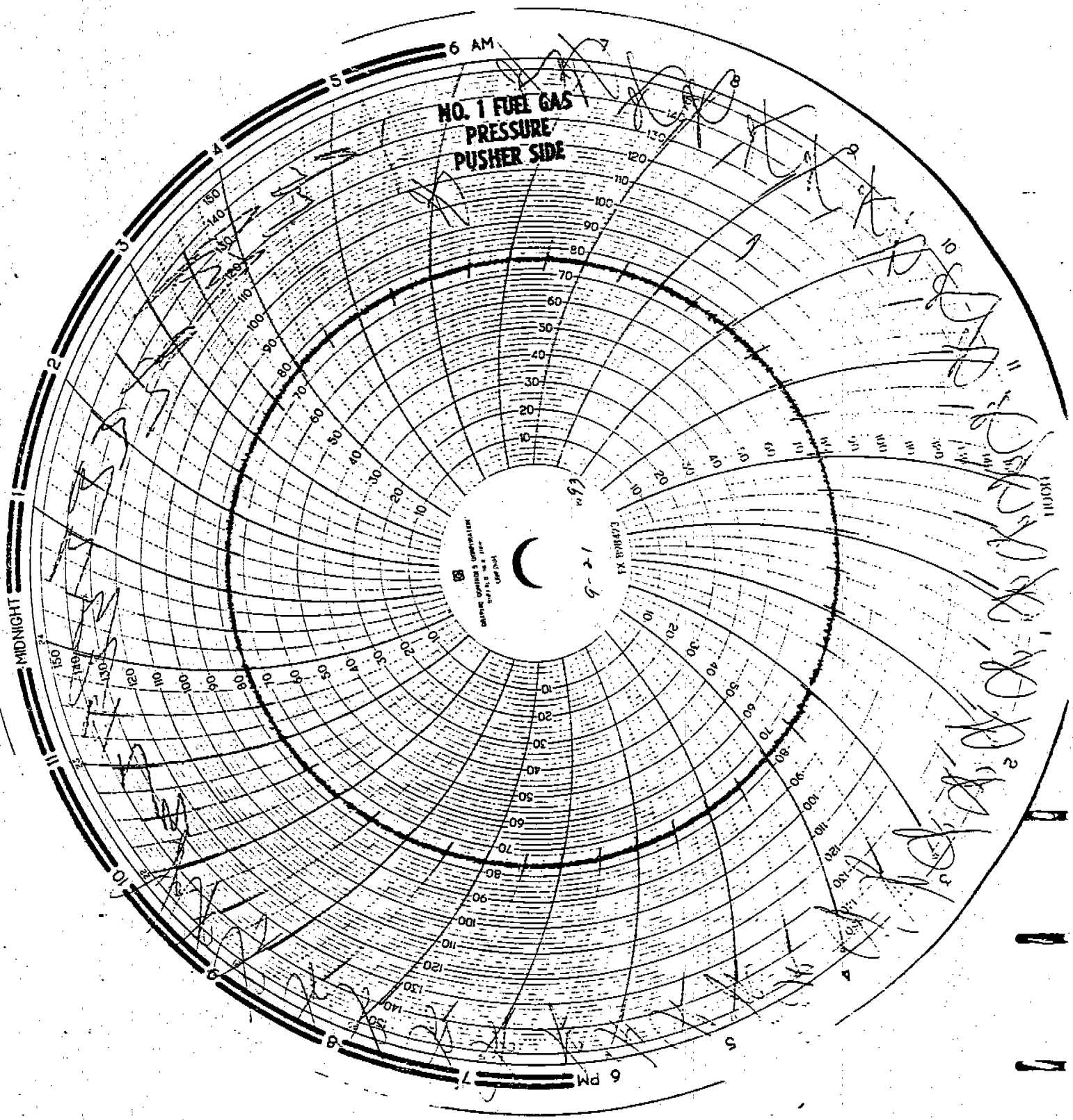

NO. 1
STACKDRAFT
PUSHER SIDE
6 AM
NOON
MIDNIGHT
6 PM
9-21 1993
FX 898504

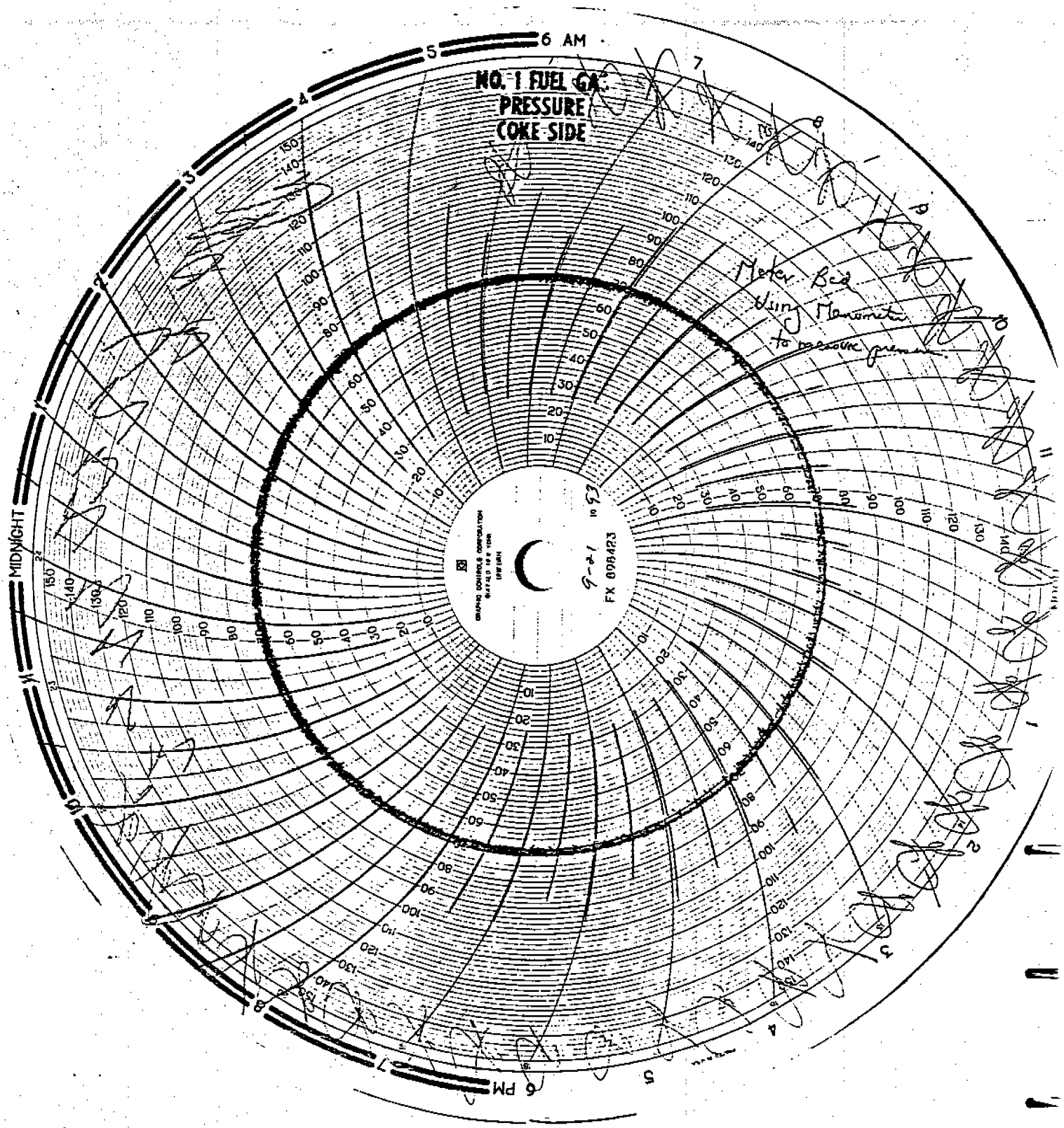
5

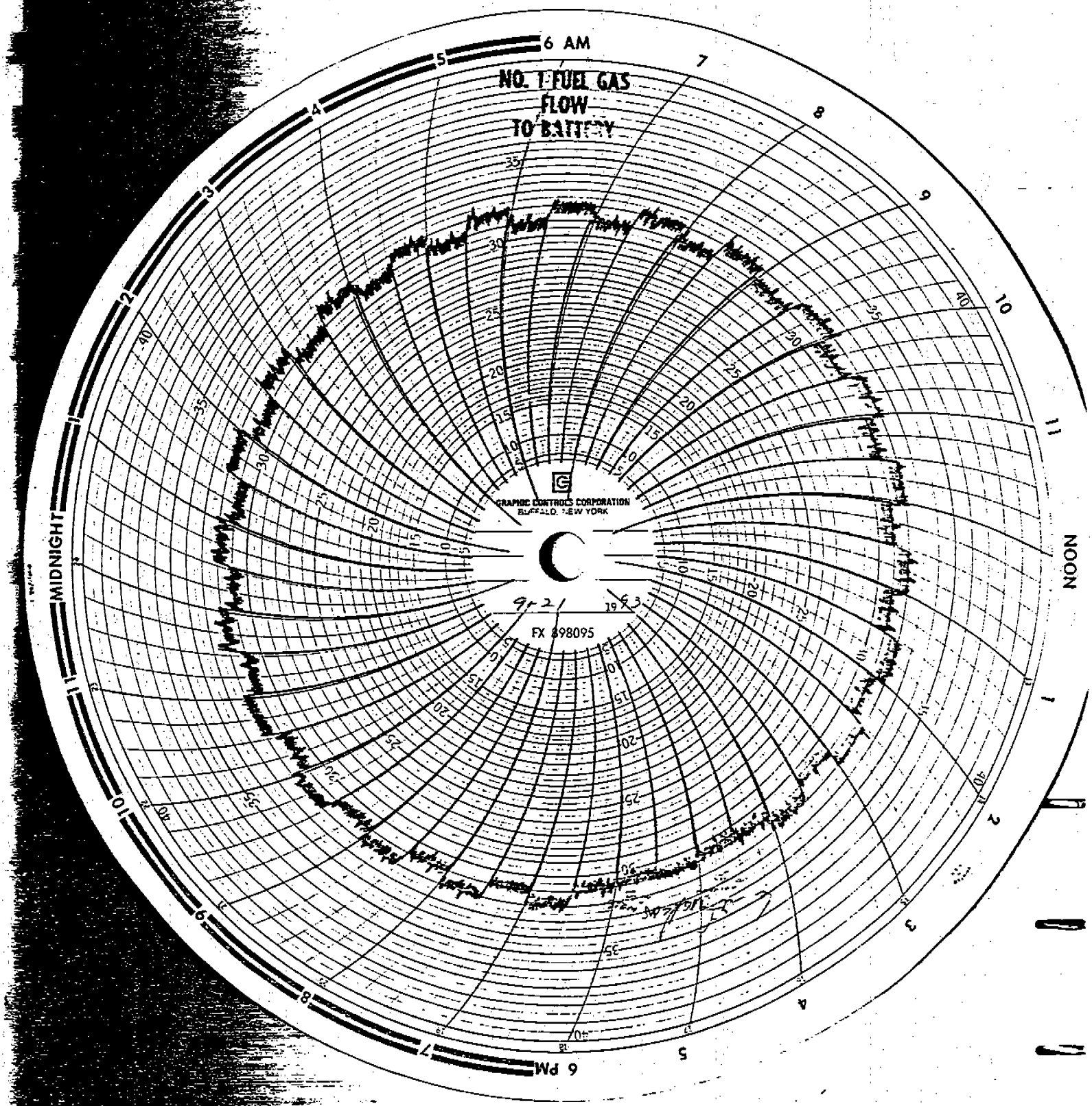


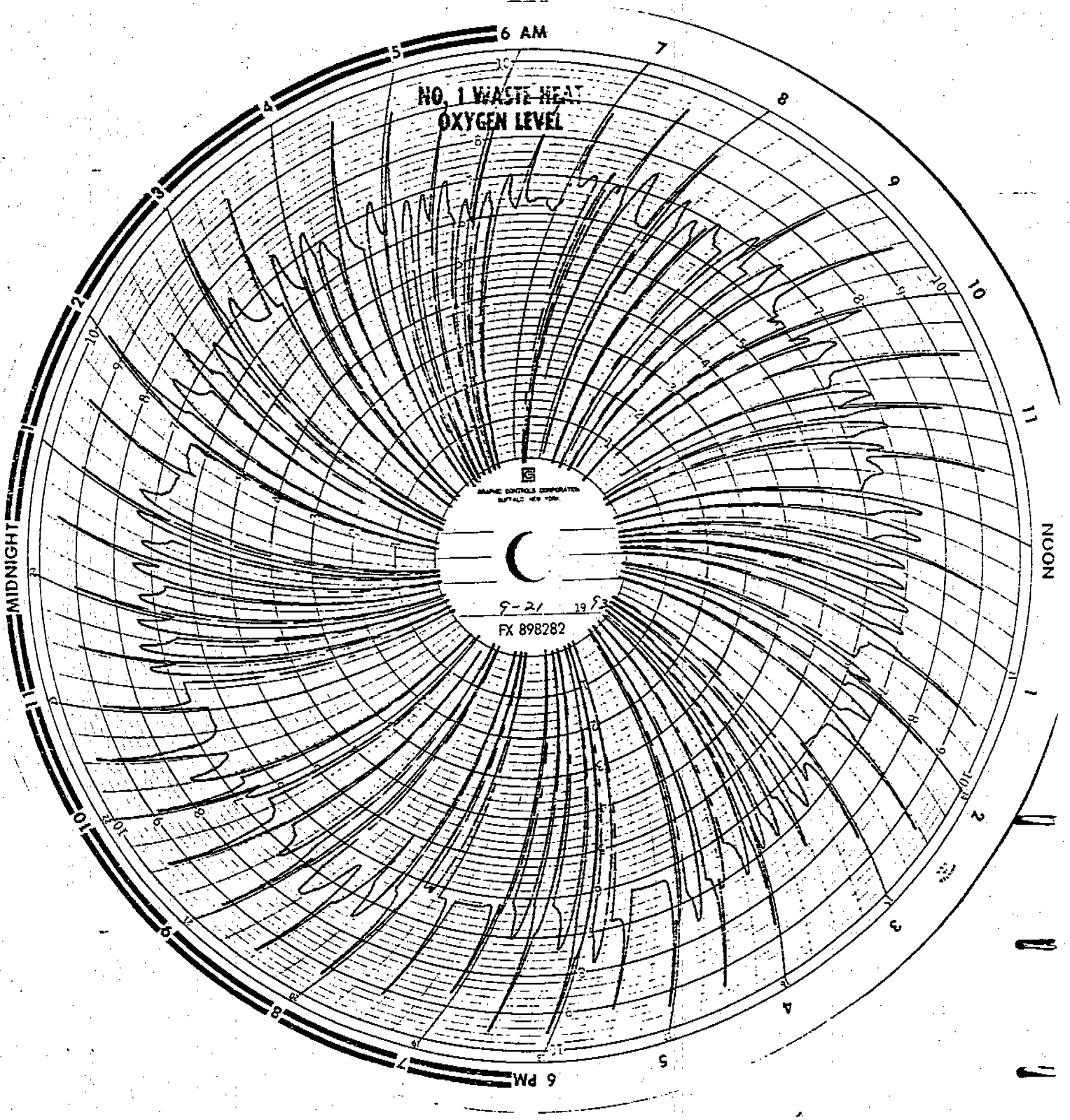

6 AM
MIDNIGHT
6 PM
NOON
J. I PRESS
CROSSOVER
COXY SIDE
9-21 1973
FX 808617

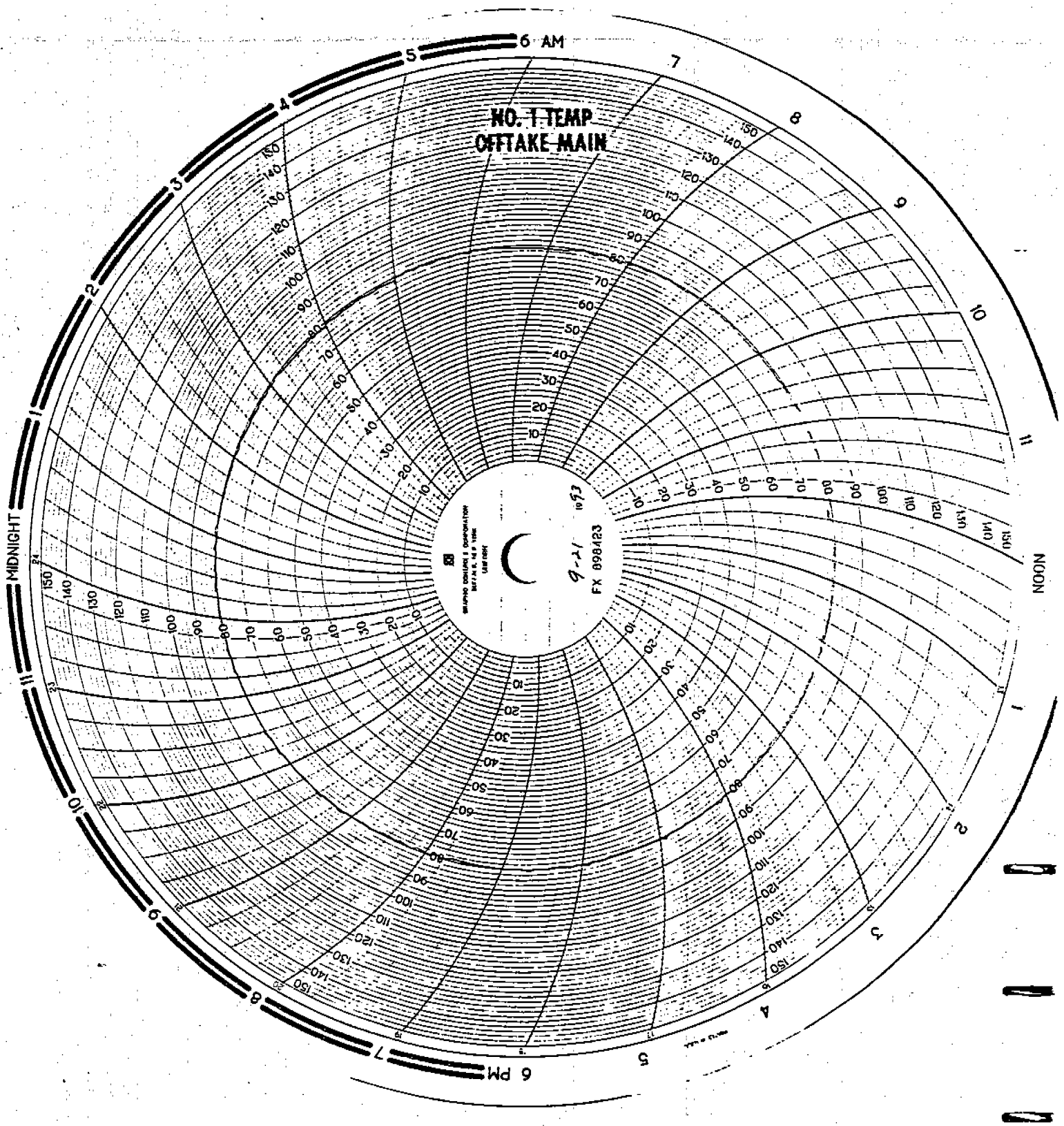

NO. 1 PRESS
CROSSOVER
PUSHER-SIDE
6 AM
MIDNIGHT
6 PM
9-21
1993
FX 808617


NO. 1 FUEL GAS
PRESSURE
PUSHER SIDE
6 AM
MIDNIGHT
6 PM


NO. 1 FUEL GAS
PRESSURE
COKE SIDE
6 AM
MIDNIGHT
6 PM
Meter Bed
Using Manometer
to measure pressure
FX 008423


6 AM
NO. 1 FUEL GAS
FLOW
TO BATTERY
MIDNIGHT
NOON
6 PM
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
FX 898095


NO. 1 WASTE HEAT
OXYGEN LEVEL
6 AM
NOON
MIDNIGHT
6 PM
9-21
19 83
FX 898282


NO. 1 TEMP
OFFTAKE MAIN
6 AM
NOON
6 PM
MIDNIGHT
FX 898423

SHENANGO INCORPORATED

FEVILLE PLANT

BATTERY NO. 1 PUSHERS REPORT DATE 9—21 19

	OVEN NO.	TIME PUSHED	TIME CHARGED	AMPS TO PUSH		OVEN NO.	TIME PUSHED	TIME CHARGED	AMPS TO PUSH		OVEN NO.	TIME PUSHED	TIME CHARGED	
1	6		11:17		1	5		3:12		1	4		11:19	
2	16	11:10	29	200	2	15	3:02	24	210	2	14	11:10	32	2
3	26	28	39	200	3	25	17	37	210	3	24	24	47	2
4	36	43	59	190	4	35	30	48	200	4	34	38	12:02	2
5	46	8:09	8:18	210	5	45	43	4:02	200	5	44	52	20	2
6	56	23	31	200	6	55	55	21	220	6	54	12:07	34	2
7	8	46	5	200	7	7	4:12	37	210	7	6	25	50	2
8	18	59	9:13	200	8	17	29	53	200	8	16	40	1:01	2
9	28	9:18	29	200	9	27	46	5:41	200	9	26	55	55	2
10	38	49	59	190	10	37	5:36	52	200	10	36	1:47	2:09	2
11	48	10:04	10:12	210	11	47	46	6:05	220	11	46	2:00	29	2
12	58	19	29	220	12	57	58	22	220	12	56	21	41	2
13	1	36	48	200	13	9	6:11	37	200	13	8	34	55	2
14	11	54	11:08	210	14	19	29	53	190	14	18	46	3:06	1
15	21	11:13	20	200	15	29	44	7:41	210	15	28	300	40	2
16	31	48	57	200	16	39	7:32	53	210	16	38	45	4:00	1
17	41	12:03	12:12	210	17	49	46	8:07	200	17	48	52	12	2
18	51	17	33	190	18	59	59	22	210	18	58	4:06	26	2
19	61	25	45	210	19	2	8:13	38	200	19	1	17	44	2
20	3	39	57	190	20	12	27	51	220	20	11	35	5:11	2
21	13	50	1:08	190	21	22	43	9:07	200	21	21	5:04	34	2
22	23	1:02	25	210	22	32	57	27	200	22	31	27	48	2
23	33	15	50	210	23	42	9:18	50	200	23	41	40	57	2
24	43	44	2:08	210	24	52	40	10:10	200	24	51	50	6:08	2
25	53	2:01	25	210	25	62	10:00	27	220	25	61	6:03	13	2
26	5	18		190	26	4	20		200	26	3	20	27	2
27					27					27				
28					28					28				
29					29					29				
30					30					30				
31		#			31		#			31		#	2483	
32		1838			32		2442			32				
33					33					33				
34					34					34				
35					35					35				
36					36					36				
37					37					37				
38					38					38				
39					39					39				
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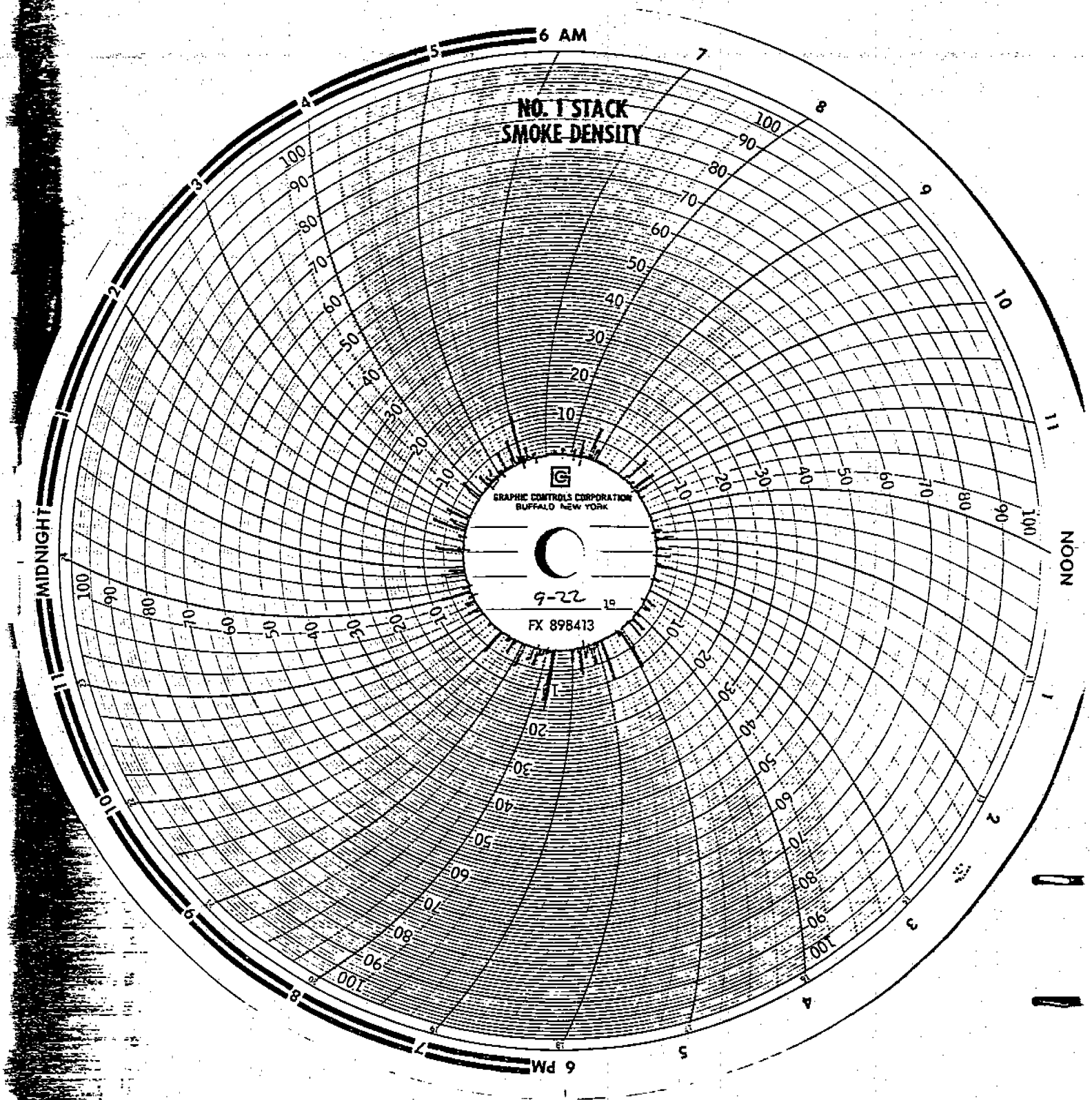
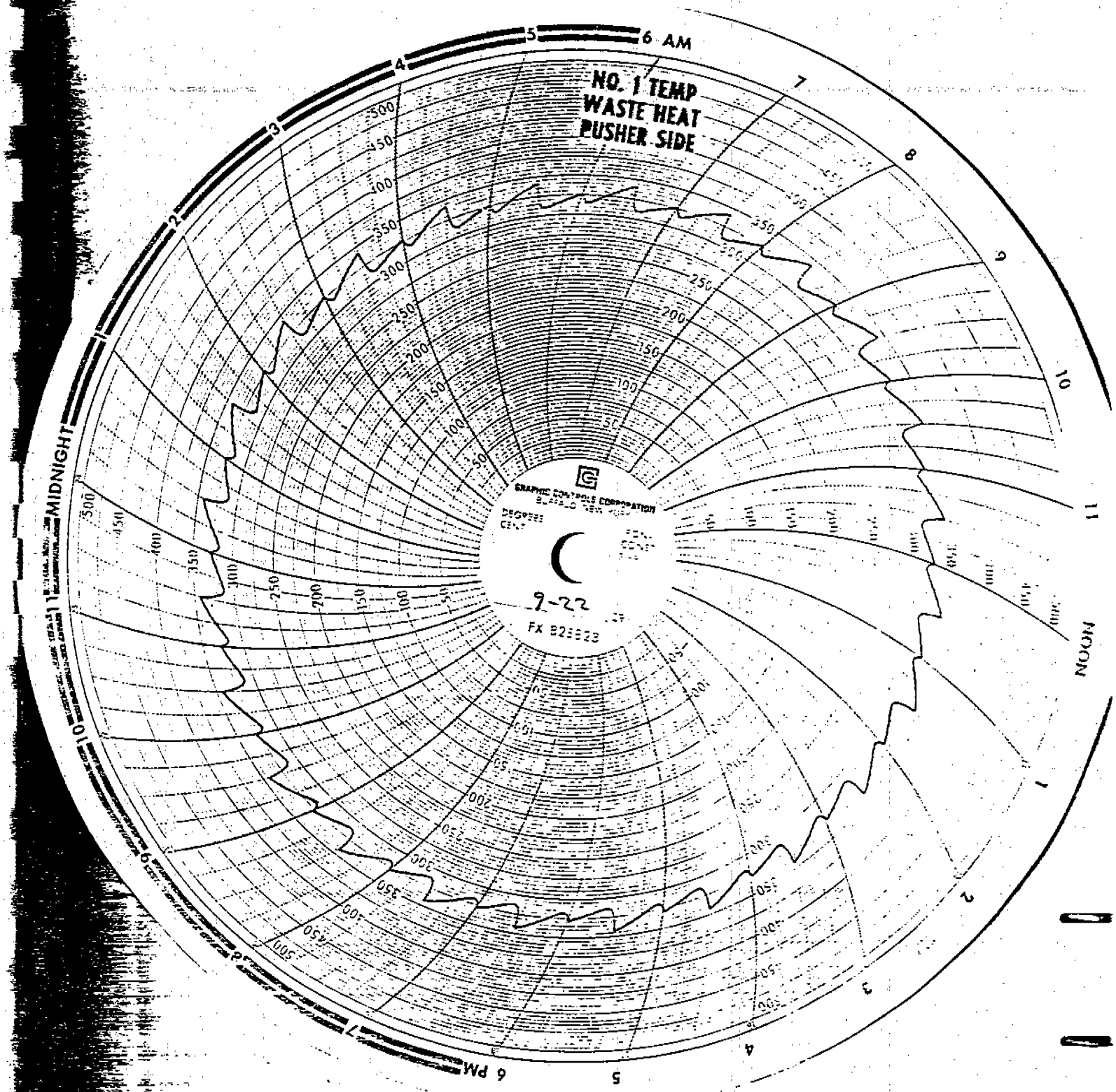
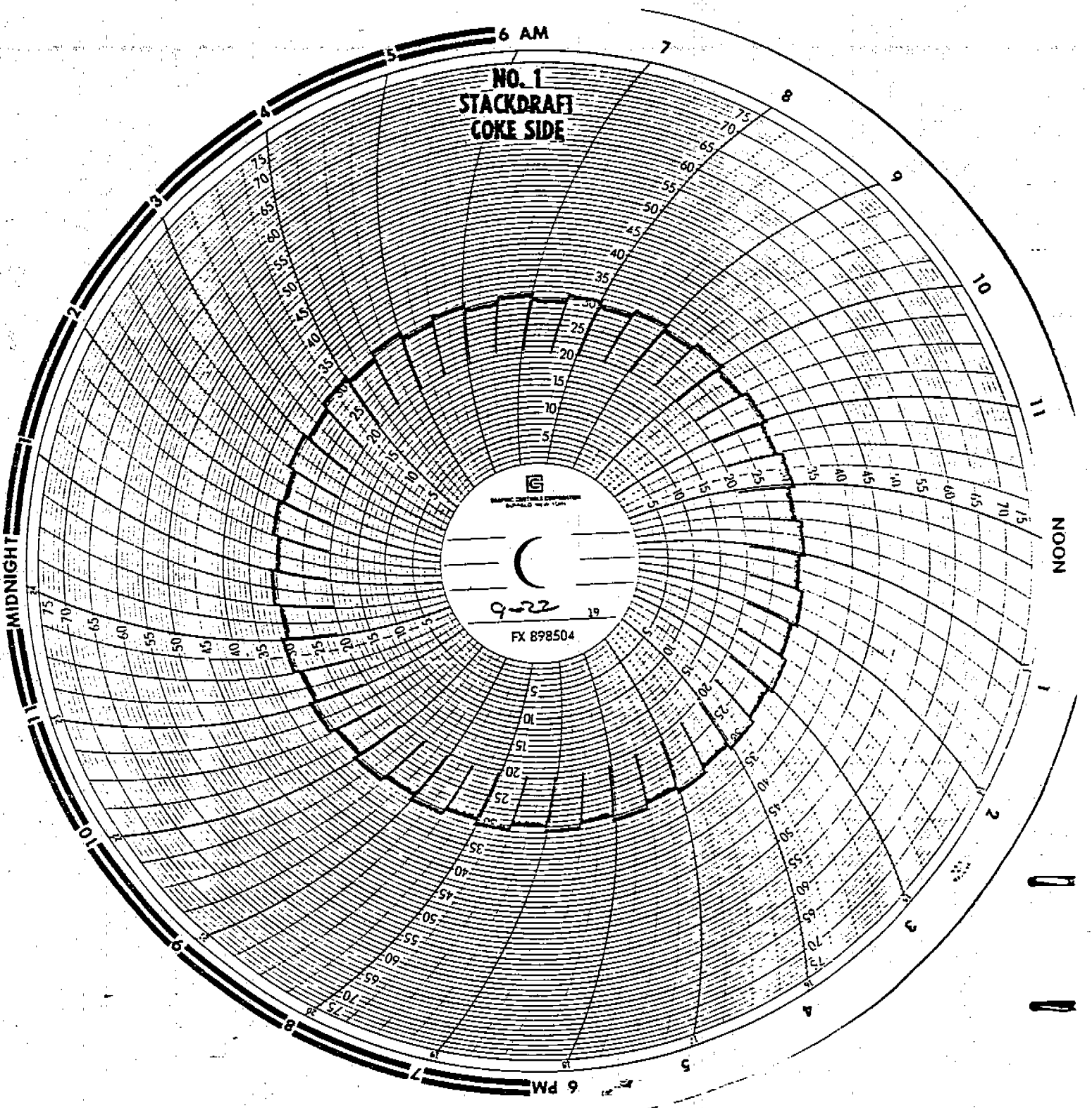
44					44					44				
45					45					45				
46					46					46				
47					47					47				
48					48					48				
49					49					49				
50					50					50				

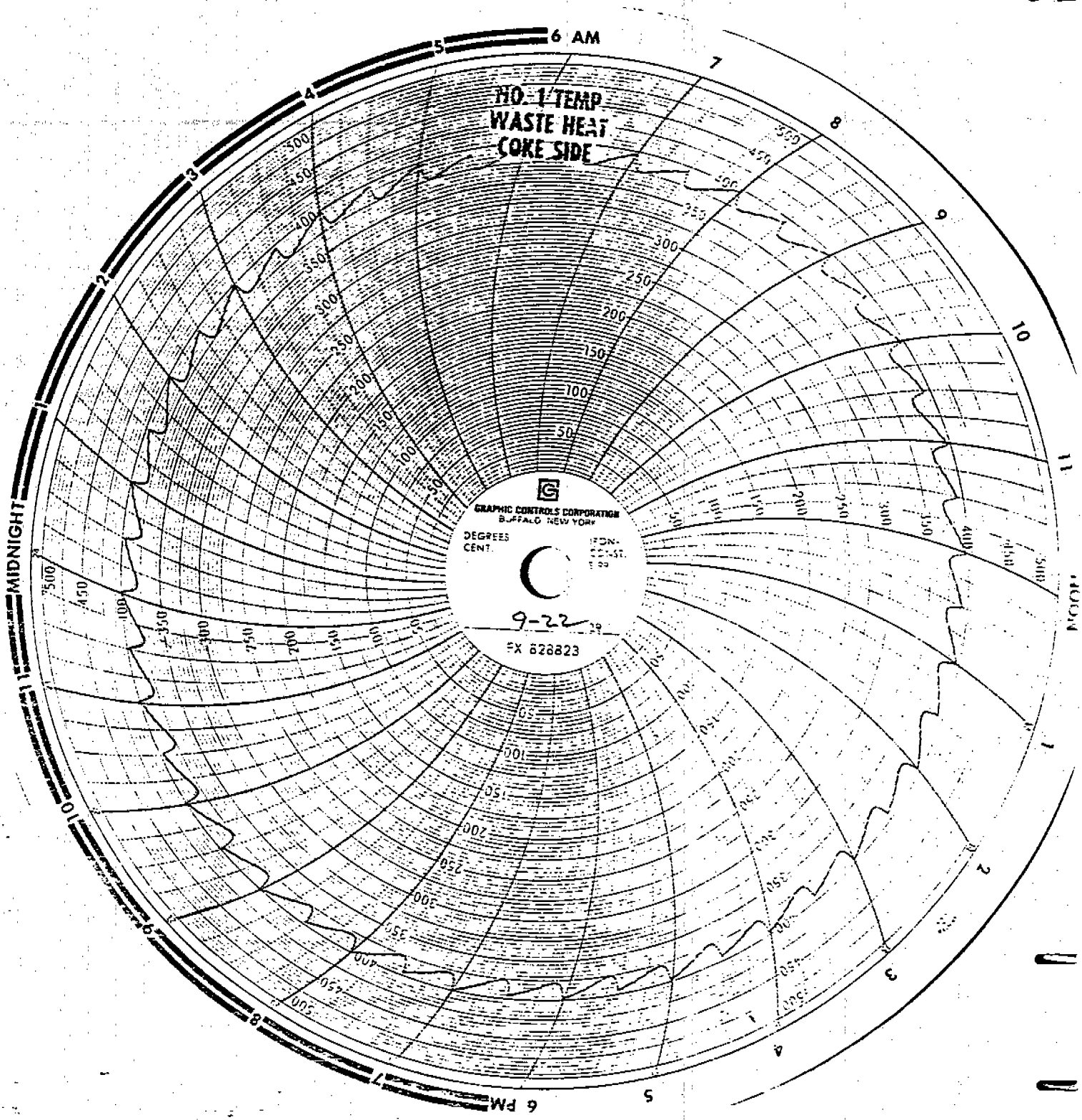
COAL CHARGE	COAL CHARGE	COAL CHARGE
SPILLAGE	SPILLAGE	SPILLAGE
FOREMAN	FOREMAN	FOREMAN
REMARKS:	REMARKS:	REMARKS: Bill Hatton

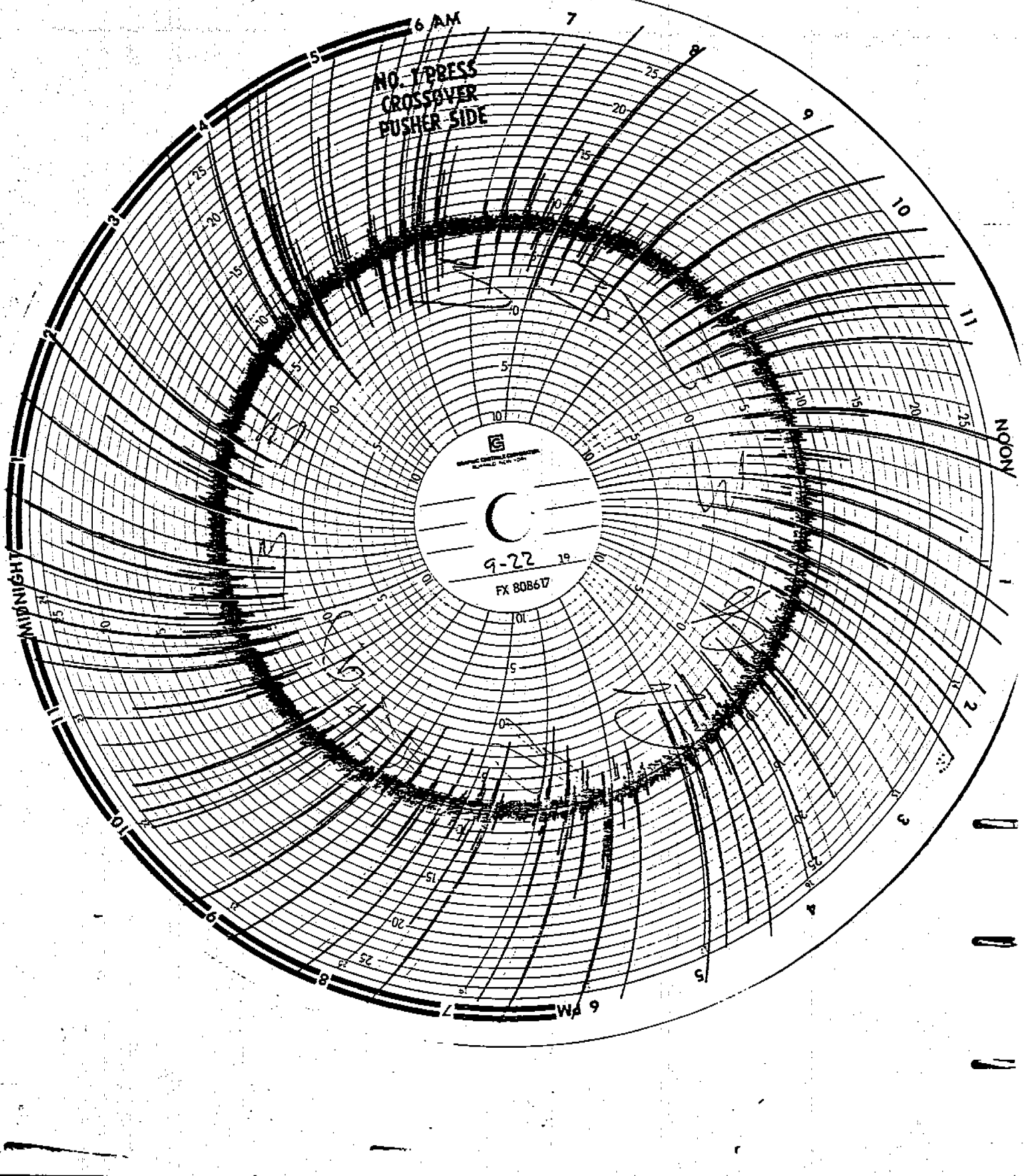

NO. 1 STACK
SMOKE DENSITY
6 AM
NOON
6 PM
MIDNIGHT
GRAPHIC CONTROLS CORPORATION
BUFFALO NEW YORK
9-22
FX 898413


NO. 1 TEMP
WASTE HEAT
PUSHER SIDE
6 AM
6 PM
MIDNIGHT
NOON
GRAPHIC CONTROLS CORPORATION
9-22


NO. 1
STACKDRAFT
COKE SIDE
6 AM
NOON
MIDNIGHT
6 PM
9-22
19
FX 898504

6 AM
NO. 1
STACKDRAFT
PUSHER SIDE
MIDNIGHT
NOON
6 PM
9-22
19
FX 898504


6 AM
MIDNIGHT
6 PM
NOON
NO. 1 TEMP
WASTE HEAT
COKE SIDE
GRAPHIC CONTROLS CORPORATION
BUFFALO NEW YORK
DEGREES
CENT
9-22
FX 828823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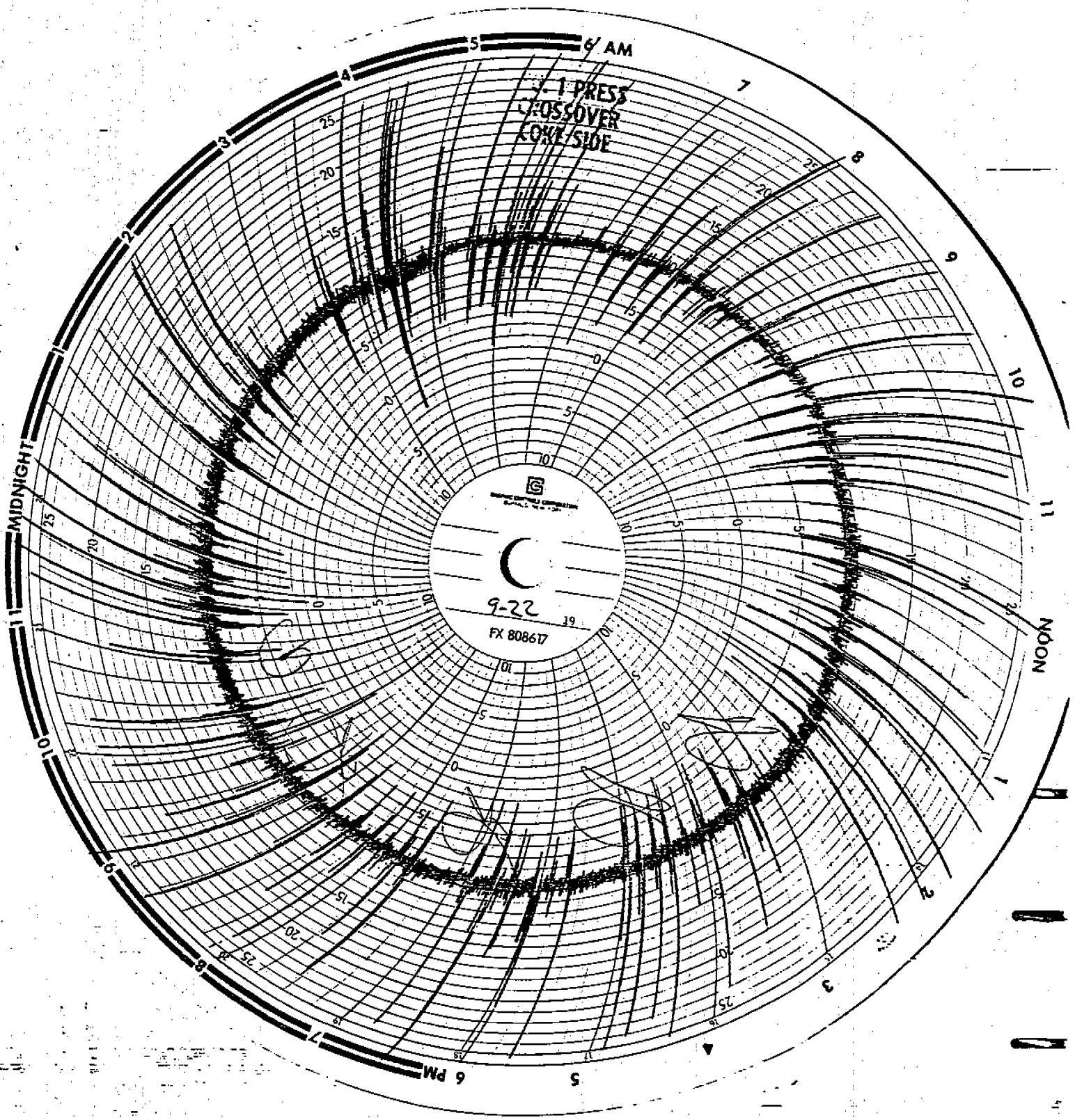
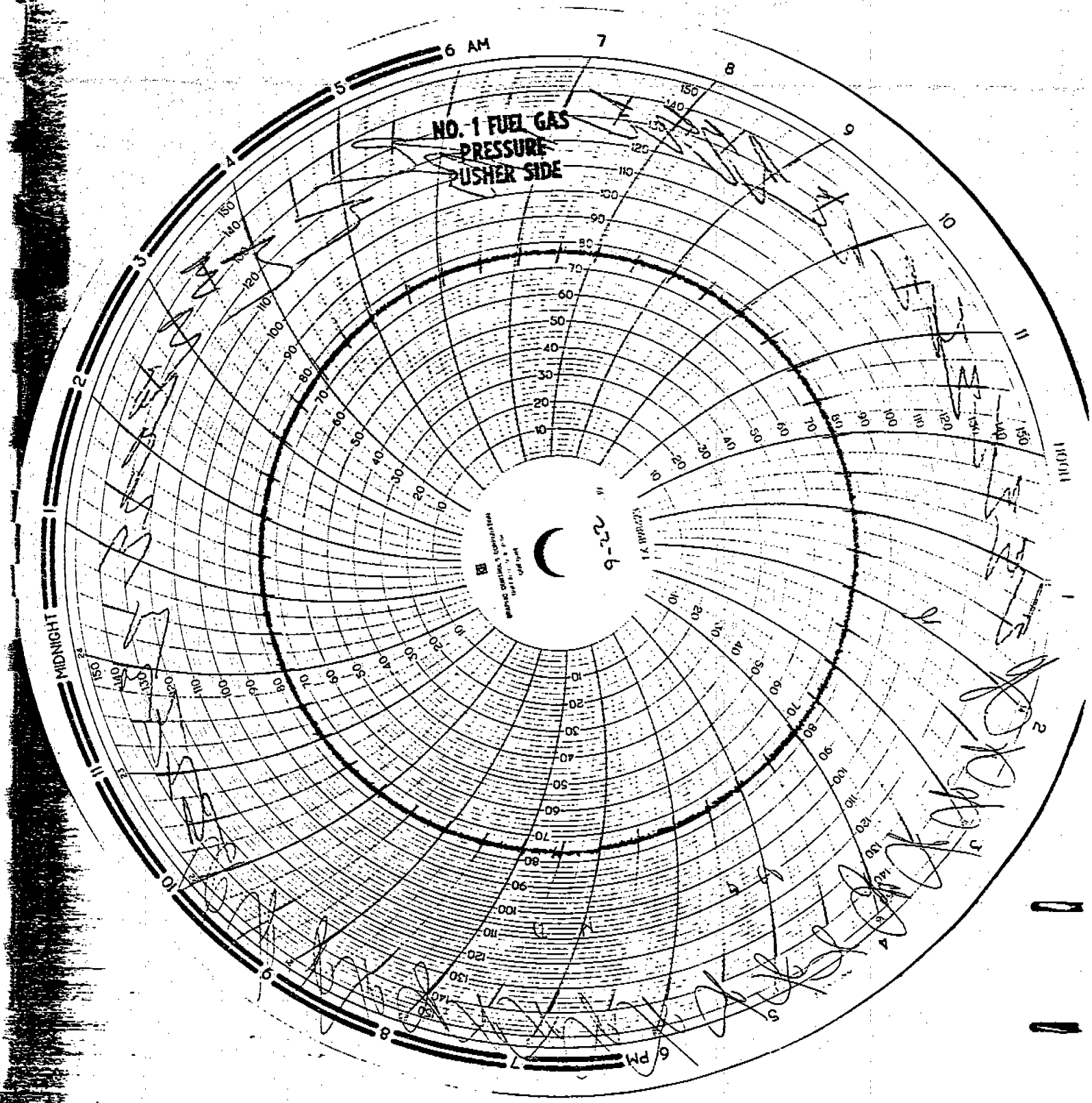
CROSSOVER
PUSHER SIDE
6 AM
NOON
MIDNIGHT
6 PM
9-22
FX 808617


6 AM
NOON
MIDNIGHT
6 PM
1 PRESS
CROSSOVER
COKE SIDE
9-22
19
FX 808617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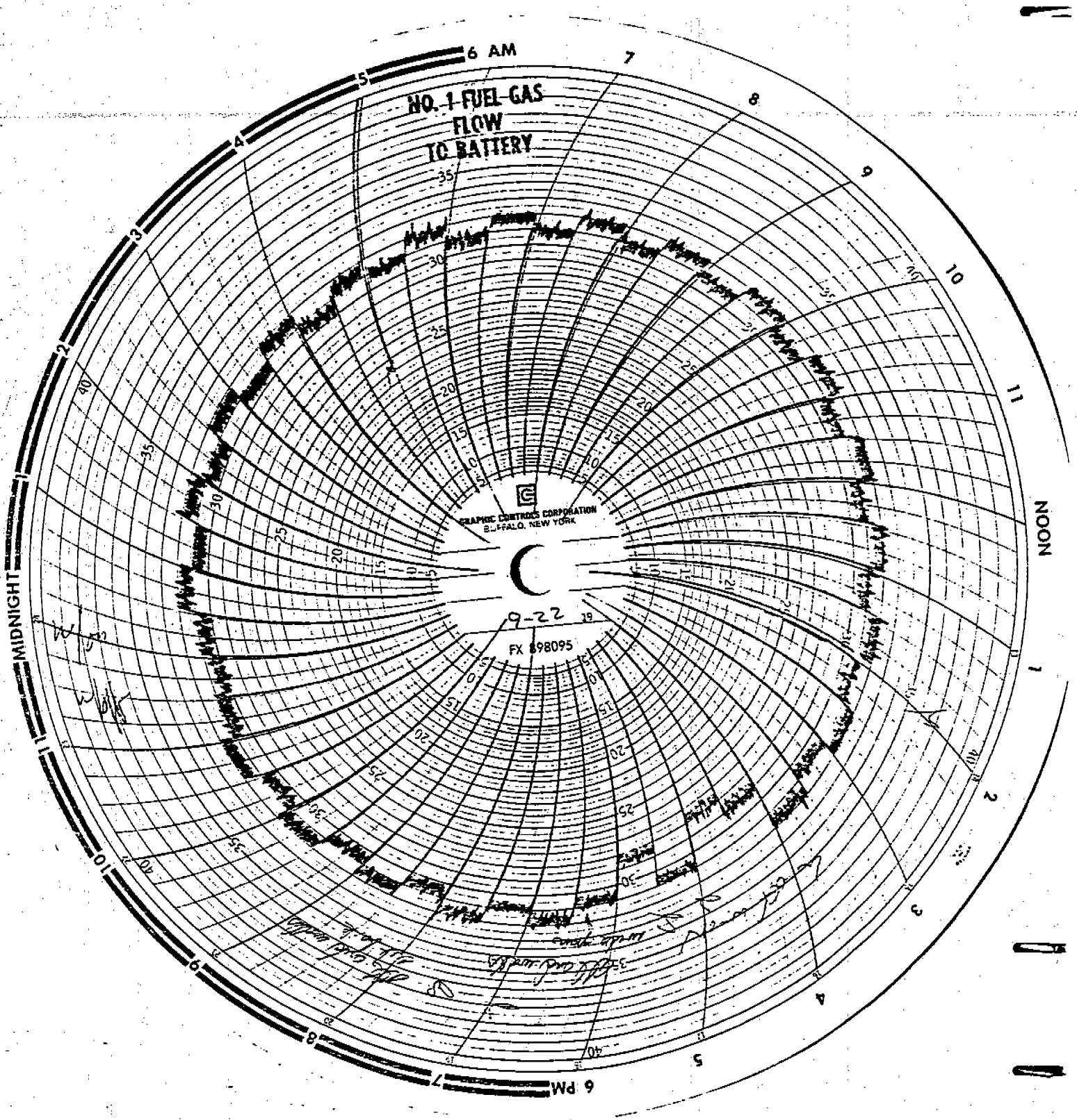
PRESSURE
PUSHER SIDE
MIDNIGHT
6 AM
6 PM

NO. 1 FUEL GAS
PRESSURE
COKE SIDE
6 AM
NOON
MIDNIGHT
6 PM
9-22
FX 898423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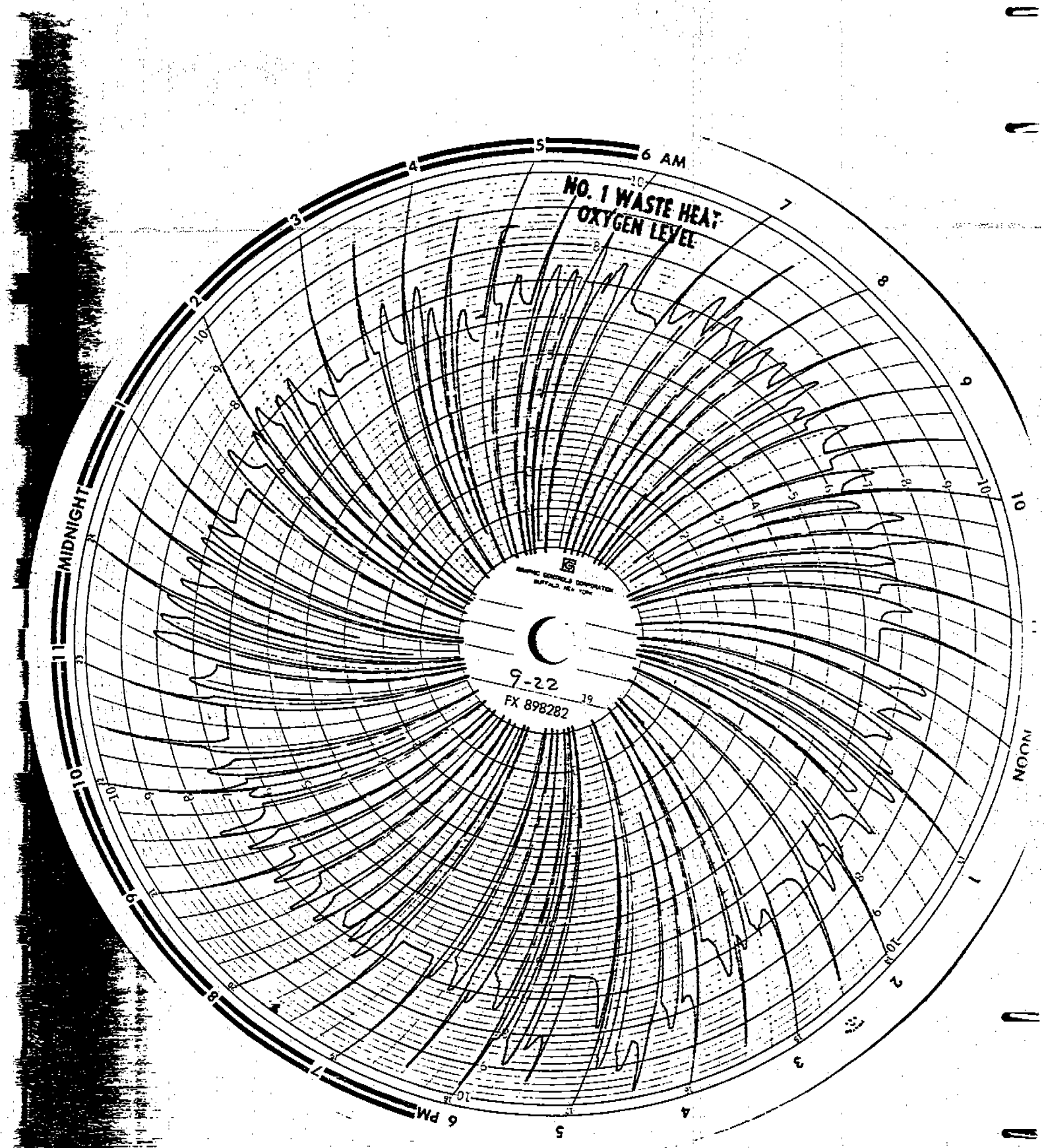
FLOW
TO BATTERY
6 AM
NOON
MIDNIGHT
6 PM
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
9-22
FX 898095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OXYGEN LEVEL
6 AM
MIDNIGHT
6 PM
NOON
9-22
FX 898282

NO. 1 TEMP
INTAKE MAIN
6 AM
MIDNIGHT
6 PM

SHENANGO INCORPORATED

NEVILLE PLANT
PUSHERS REPORT

BATTERY NO. 1 DATE 9-22 1993

	OVEN NO.	TIME PUSHED	TIME CHARGED	REPS TO PUSH		OVEN NO.	TIME PUSHED	TIME CHARGED	AMPS TO PUSH		OVEN NO.	TIME PUSHED	TIME CHARGED	REPS TO PUSH
1	13	7:06	7:15	200	1	12		3:17		1	11	—	11:07	—
2	23	23	33	200	2	22	3:08	32	180	2	21	11:13	29	220
3	33	38	48	220	3	32	22	55	190	3	31	20	40	200
4	43	53	8:01	220	4	42	44	4:07	190	4	41	34	52	190
5	53	8:06	15	210	5	52	4:00	23	180	5	51	46	12:06	200
6	5	26	36	220	6	62	13	35	210	6	61	12:00	20	220
7	15	41	49	220	7	4	28	47	190	7	3	13	36	200
8	25	9:02	9:10	220	8	14	41	5:00	180	8	13	29	47	200
9	35	35	43	190	9	24	53	40	200	9	23	41	1:30	200
10	45	10:04	10:13	220	10	34	5:32	52	200	10	33	1:24	50	200
11	55	18	28	220	11	44	45	6:02	200	11	43	38	2:01	200
12	7	34	41	200	12	54	57	21	190	12	53	56	17	190
13	17	46	57	200	13	66	12	35	180	13	5	2:11	29	200
14	27	11:05	11:10	200	14	16	30	52	180	14	15	24	46	220
15	37	50	57	200	15	26	46	7:37	190	15	25	40	3:40	190
16	47	12:02	12:12	220	16	36	7:27	47	190	16	35	3:45	4:03	190
17	57	17	32	210	17	46	42	58	200	17	45	55	15	200
18	9	24	48	190	18	56	52	8:12	200	18	55	4:09	27	220
19	19	42	1:02	190	19	8	8:02	27	190	19	7	20	38	200
20	29	54	14	210	20	18	18	48	180	20	17	33	5:05	200
21	39	1:08	28	200	21	28	38	9:13	190	21	27	56	20	200
22	49	20	52	200	22	38	9:06	28	180	22	37	5:14	37	190
23	59	44	2:10	210	23	48	20	49	220	23	47	30	50	200
24	2	2:01	27	220	24	58	42	10:08	220	24	57	43	6:07	220
25	12	20	—	220	25	1	10:00	25	190	25	9	6:02	25	200
26					26	11	20	—	200	26	19	20		200
27					27					27				
28					28					28				
29					29					29				
30					30			2442		30				
31		2483	2442		31					31		2483		
32					32					32				
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45					45					45				
46					46					46				
47					47					47				
48					48					48				
49					49					49				
50					50					50				

COAL	COAL	COAL
CHARGE	CHARGE	CHARGE
SPILLAGE	SPILLAGE	SPILLAGE
FOREMAN	FOREMAN	FOREMAN
REMARKS:	REMARKS:	REMARKS:

BCM

APPENDIX C

Laboratory Analysis

BLANK ANALYTICAL DATA

Plant SHENANGO

Sample location No. 1 BATTERY STACK

Type of blank ACETONE

Container number 20G

Density of blank (pa) .7850 g/ml

Blank volume (Va) 228 ml

Gross wt. 100376.8 mg

Tare wt. 100376.55 mg

Weight of blank (ma) 0.25 mg

$$Ca = \frac{ma}{Va\ pa} = \frac{(\ 0.25\ )}{(228\ )(.7850)} = 0.0014 \text{ mg/g}$$

EPA METHOD FIVE ANALYTICAL PARTICULATE DATA

Plant SHENANGO Date 9-20-93 Run No. 1

Sample Location NO. 1 BATTERY STACK

Density of acetone (pa) .7850 g/ml

Acetone rinse container No. 20C

Acetone rinse volume (Vaw) 274

Acetone blank residue concentration (Ca) 0.0014 mg/g

Wa = Ca Vaw pa = (0.004) (274) (.7850) = 0.30 mg

Gross wt 103789.80 mg

Tare wt 103762.65 mg

Less acetone blank wt (Wa) .30 mg

Weight of particulate in acetone rinse 26.85 mg

Filter No. 667

Gross wt 412.35 mg

Tare wt 409.10 mg

Weight of particulate on filter(s) 3.25 mg

Weight of particulate in acetone rinse 26.85 mg

Total weight of particulate 30.10 mg

EPA METHOD FIVE ANALYTICAL PARTICULATE DATA

Plant SHENANGO Date 9-21-93 Run No. 2

Sample Location NO. 1 BATTERY STACK

Density of acetone (pa) .7850 g/ml

Acetone rinse container No. 20D

Acetone rinse volume (Vaw) 198

Acetone blank residue concentration (Ca) 0.0014 mg/g

Wa = Ca Vaw pa = (0.0014) (198) (.7850) = 0.22 mg

Gross wt 110358.25 mg

Tare wt 110345.15 mg

Less acetone blank wt (Wa) 0.22 mg

Weight of particulate in acetone rinse 12.88 mg

Filter No. 668

Gross wt 410.10 mg

Tare wt 406.55 mg

Weight of particulate on filter(s) 3.55 mg

Weight of particulate in acetone rinse 12.88 mg

Total weight of particulate 16.43 mg

EPA METHOD FIVE ANALYTICAL PARTICULATE DATA

Plant SHENANGO Date 9-22-93 Run No. 3

Sample Location NO. 1 BATTERY STACK

Density of acetone (pa) .7850 g/ml

Acetone rinse container No. ZOE

Acetone rinse volume (Vaw) 186

Acetone blank residue concentration (Ca) 0.0014 mg/g

Wa = Ca Vaw pa = (0.0014) (186) (.7850) = 0.20 mg

Gross wt 102983.40 mg

Tare wt 102971.95 mg

Less acetone blank wt (Wa) 0.20 mg

Weight of particulate in acetone rinse 11.25 mg

Filter No. 671

Gross wt 414.35 mg

Tare wt 410.65 mg

Weight of particulate on filter(s) 3.70 mg

Weight of particulate in acetone rinse 11.25 mg

Total weight of particulate 14.95 mg

BCM

APPENDIX D

Calculations

BCM

SHENANGO
NO. 1 COKE OVEN BATTERY COMBUSTION STACK
9/20/93
RUN 1

PARTICULATE EMISSIONS

SYMBOL		DESCRIPTION		VALUE
Theta	=	Duration of test, min.	=	120
Vm	=	Dry sample volume (meter conditions), in. H2O	=	99.806
SQRT(dP)	=	Average of square roots of pitot pressure , in water	=	0.299
dH	=	Orifice pressure drop, in. water	=	2.500
Ts	=	Average stack temperature, deg. F	=	598.8
Tm	=	Average dry gas meter temperature, deg F	=	89.9
CO2	=	CO2 in stack gas, %	=	4.83
O2	=	O2 in stack gas, %	=	9.50
CO+N2	=	CO and N2 in stack gas, %	=	85.67
Pbar	=	Barometric pressure, in. Hg.	=	29.42
Ps	=	Stack pressure (absolute), in. Hg.	=	29.35
Cp	=	Pitot correction factor, dimensionless	=	0.84
Y	=	Dry gas meter correction factor	=	1.003
Dn	=	Diameter of nozzle, in.	=	0.502
Ds	=	Diameter of stack, in.	=	114.0
Vlc	=	Volume of liquid collected in inpingers and silica gel, ml	=	390.0
Mn	=	Total particulate catch, mg	=	30.1
An	=	Area of the nozzle, sq. ft.	=	0.00137
As	=	Area of the stack, sq.ft.	=	70.88
Md	=	Dry molecular weight of stack gas, dry basis, lb/lb-mole	=	29.15
Vw(std)	=	Volume of liquid collected, cu .ft.	=	18.357
Ms	=	Molecular weight of stack gas, wet basis, lb/lb-mole	=	27.34
Vm(std)	=	Dry sample volume (standard conditions), dscf	=	95.065
Vs	=	Stack velocity, ft/sec	=	24.66
Qs	=	Stack gas flow, acfm	=	104877
Qsd	=	Stack gas flow, dscfm	=	42992
Ts	=	Average stack temperature, deg. F	=	598.8
Bws	=	Moisture content of the gas stream, %	=	16.2
I	=	Isokinetic ratio, %	=	95.4

PARTICULATE EMISSIONS

C's	=	Particulate concentration, gr/dscf	=	0.005
E	=	Particulate emission rate, lb/hr	=	1.8

BCM

SHENANGO

NO. 1 COKE OVEN BATTERY COMBUSTION STACK

9/20/93

RUN 2

PARTICULATE EMISSIONS

SYMBOL		DESCRIPTION		VALUE
Theta	=	Duration of test, min.	=	120
Vm	=	Dry sample volume (meter conditions), in. H2O	=	96.986
SQRT(dP)	=	Average of square roots of pitot pressure , in water	=	0.284
dH	=	Orifice pressure drop, in. water	=	2.310
Ts	=	Average stack temperature, deg. F	=	605.8
Tm	=	Average dry gas meter temperature, deg F	=	98.3
CO2	=	CO2 in stack gas, %	=	5.50
O2	=	O2 in stack gas, %	=	8.33
CO+N2	=	CO and N2 in stack gas, %	=	86.17
Pbar	=	Barometric pressure, in. Hg.	=	29.44
Ps	=	Stack pressure (absolute), in. Hg.	=	29.37
Cp	=	Pitot correction factor, dimensionless	=	0.84
Y	=	Dry gas meter correction factor	=	1.003
Dn	=	Diameter of nozzle, in.	=	0.502
Ds	=	Diameter of stack, in.	=	114.0
Vlc	=	Volume of liquid collected in inpingers and silica gel, ml	=	387.0
Mn	=	Total particulate catch, mg	=	16.43
An	=	Area of the nozzle, sq. ft.	=	0.00137
As	=	Area of the stack, sq.ft.	=	70.88
Md	=	Dry molecular weight of stack gas, dry basis, lb/lb-mole	=	29.21
Vw(std)	=	Volume of liquid collected, cu .ft.	=	18.216
Ms	=	Molecular weight of stack gas, wet basis, lb/lb-mole	=	27.34
Vm(std)	=	Dry sample volume (standard conditions), dscf	=	91.008
Vs	=	Stack velocity, ft/sec	=	23.50
Qs	=	Stack gas flow, acfm	=	99944
Qsd	=	Stack gas flow, dscfm	=	40486
Ts	=	Average stack temperature, deg. F	=	605.8
Bws	=	Moisture content of the gas stream, %	=	16.7
I	=	Isokinetic ratio, %	=	96.9

PARTICULATE EMISSIONS

C's	=	Particulate concentration, gr/dscf	=	0.003
E	=	Particulate emission rate, lb/hr	=	1.0

BCM

SHENANGO
NO. 1 COKE OVEN BATTERY COMBUSTION STACK
9/20/93
RUN 3

PARTICULATE EMISSIONS

SYMBOL		DESCRIPTION		VALUE
Theta	=	Duration of test, min.	=	120
Vm	=	Dry sample volume (meter conditions), in. H2O	=	93.861
SQRT(dP)	=	Average of square roots of pitot pressure , in water	=	0.278
dH	=	Orifice pressure drop, in. water	=	2.220
Ts	=	Average stack temperature, deg. F	=	605.1
Tm	=	Average dry gas meter temperature, deg F	=	91.2
CO2	=	CO2 in stack gas, %	=	5.83
O2	=	O2 in stack gas, %	=	7.66
CO+N2	=	CO and N2 in stack gas, %	=	86.51
Pbar	=	Barometric pressure, in. Hg.	=	29.45
Ps	=	Stack pressure (absolute), in. Hg.	=	29.38
Cp	=	Pitot correction factor, dimensionless	=	0.84
Y	=	Dry gas meter correction factor	=	1.003
Dn	=	Diameter of nozzle, in.	=	0.502
Ds	=	Diameter of stack, in.	=	114.0
Vlc	=	Volume of liquid collected in inpingers and silica gel, ml	=	362.0
Mn	=	Total particulate catch, mg	=	14.95
An	=	Area of the nozzle, sq. ft.	=	0.00137
As	=	Area of the stack, sq.ft.	=	70.88
Md	=	Dry molecular weight of stack gas, dry basis, lb/lb-mole	=	29.24
Vw(std)	=	Volume of liquid collected, cu .ft.	=	17.039
Ms	=	Molecular weight of stack gas, wet basis, lb/lb-mole	=	27.44
Vm(std)	=	Dry sample volume (standard conditions), dscf	=	89.220
Vs	=	Stack velocity, ft/sec	=	22.95
Qs	=	Stack gas flow, acfm	=	97605
Qsd	=	Stack gas flow, dscfm	=	39910
Ts	=	Average stack temperature, deg. F	=	605.1
Bws	=	Moisture content of the gas stream, %	=	16.0
I	=	Isokinetic ratio, %	=	96.5

PARTICULATE EMISSIONS

C's	=	Particulate concentration, gr/dscf	=	0.003
E	=	Particulate emission rate, lb/hr	=	1.0

BCM

APPENDIX E

Calibrations

NOZZLE CALIBRATION

BCM Project No.: 00-4810-36
Client: Shenango Incorporated
Location: No1 Coke Oven Battery Stack
Date: 9-16-93
Test Method: EPA Method 5

Technician: DRP
Visual Inspection:
Damaged No ✓
Yes
Repaired No ✓
Yes

Nozzle Identification No.	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D Average
PT 5	.500	.501	.501	.001	0.5007

where:

$D_{1,2,3}$ = nozzle diameter measured on a different diameter, in.
Tolerance = measure within 0.001 in.

ΔD = maximum difference in any two measurements, in.
Tolerance - 0.004

D_{avg} = average of D_1, D_2, and D_3

STACK GAS THERMOCOUPLE CALIBRATION

BCM Project No.: 00-4810-36

Client: Shenango

Location: No 1 Coke Oven Combustion Stack

Date: 9-16-93

Technician: Paul Jadlowiec

TEMPERATURE SOURCE	TEMPERATURE	REFERENCE	% DIFFERENCE
0.1 Bath	68	68	0.00
11	255	256	0.39
11	351	345	1.74

DRY GAS METER AND ORIFICE POST TEST CALIBRATION

DATE:08/19/93 OPERATOR:PJ CONSOLE: 582-125

Wet Test Meter Gas Volumes and Temperatures

Orifice Manometer Setting (in. H2O)	Initial Reading ft (cf) Vw	Initial Reading Temp. (deg F) Tw	Final Reading ft (cf) Vw	Final Reading Temp. (deg F) Tw	Net Volume (ft) Vw	Avg. Temp. (F) Tw
1.30	0.000	84.0	10.000	84.0	10.000	84.0
1.30	0.000	84.0	10.000	84.0	10.000	84.0
1.30	0.000	83.5	10.000	83.5	10.000	83.5

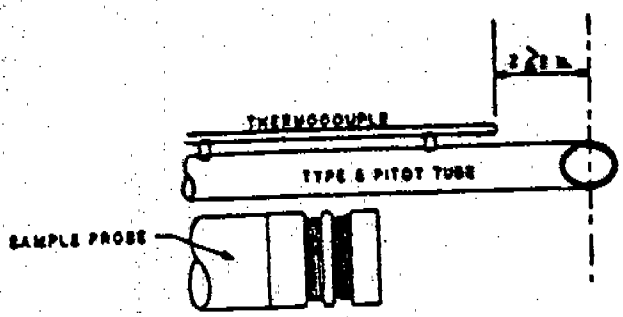
Dry Test Meter Gas Volumes and Temperatures

Orifice Manometer Setting (in. H20)	Initial Reading (cf) Vd	Final Reading (cf) Vd	Temperature Inlet (deg f) Ti	Temperature Outlet (deg f) Td	Net Volume (ft) Vd	Avg. Temp. (deg f) Td
1.30	408.400	418.752	110.0	96.0	10.352	103.0
1.30	418.752	429.169	122.0	103.0	10.417	112.5
1.30	429.169	439.669	126.0	106.0	10.500	116.0

Orifice Manometer Setting (in. H20)	Total Test Time (min.) Theta	Barometer Reading Inches ("Hg) Pb	Gamma	delta H
1.30	16.333	29.28	0.996	1.974
1.30	16.567	29.28	1.007	1.997
1.30	16.483	29.28	1.006	1.961
		Average	1.003	1.977

TYPE S PITOT TUBE ALIGNMENT SPECIFICATIONS

Type S - Pitot Tube No.	PT-6-1
BCM Project No.	00-4810-35
Client	Shenango
Location	NOI Coke Down Battery
Date	9-16-93
Technician	Paul Jablonski



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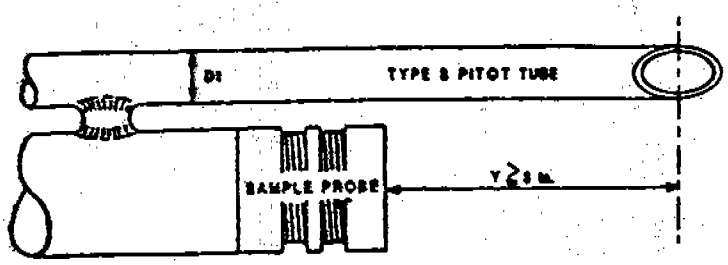

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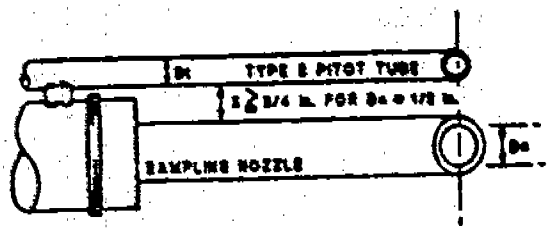

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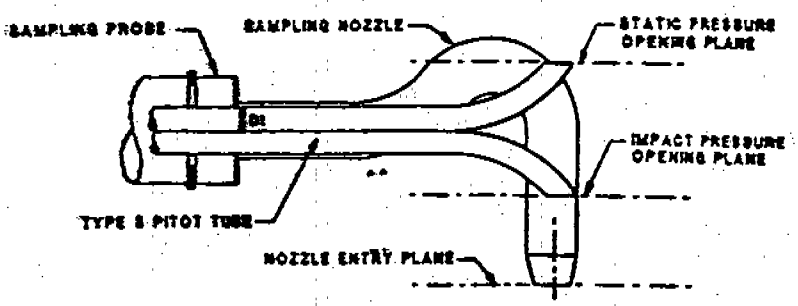

Is Ip higher than Np = Yes