REPORT OF
NITROGEN OXIDES AND CARBON MONOXIDE
EMISSIONS TESTS
FOR
Auto Shred of Louisiana
Nos. 1 and 2 Shredder Engines

Monroe, Louisiana
October 1, 1991

Permit # 2160-00045-02

Eng No. 1 Emission Pt 5-89 (Diesel Eng Exhaust)
Operating Rate 80 gal/hr

Eng. No 2

Performed By:
Environmental Monitoring Laboratories
Ridgeland, Mississippi
(601-856-3092)

ENVIRONMENTAL MONITORING LABORATORIES, INC.

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November 6, 1991

Subject: Auto Shred of Louisiana - Nos. 1 and 2 Shredder Engines

On October 1, 1991, Environmental Monitoring Laboratories performed air emissions tests for Auto Shred of Louisiana's metal processing facility in Monroe, Louisiana. Testing was performed to quantify nitrogen oxides and carbon monoxide emissions from two stationary diesel fuel fired Caterpillar engines in accordance with requirements of the Louisiana Department of Environmental Quality.

Results of testing the N0. 1 engine indicate nitrogen oxide emissions of 3.34 pounds per hour and 196 ppm. Measured carbon monoxide emissions were 7.27 pounds per hour and 700 ppm.

Results of testing the N0. 2 engine indicate nitrogen oxide emissions of 2.13 pounds per hour and 129 ppm. Measured carbon monoxide emissions were 15.8 pounds per hour and 1567 ppm.

The testing project was coordinated by Mr. Norm Paulson of Auto Shred of Louisiana. Mr. L. C. Ingles of the Louisiana Department of Environmental Quality was present to observe portions of the testing. Danny Russell of Environmental Monitoring Laboratories was responsible for the collection and analysis of the samples. Sample custody was limited to Mr. Russell.

Following is a report of the test.

REPORT OF NITROGEN OXIDES EMISSIONS TEST
FOR AUTO SHRED OF LOUISIANA
NOS. 1 AND 2 SHREDDER ENGINES
MONROE, LOUISIANA
OCTOBER 1, 1991

CONTENTS

REPORT CERTIFICATION

I certify that I have examined the information submitted herein, and based upon my inquiries of those directly responsible for obtaining the data or upon my direct acquisition of the data, I believe the submitted information is true, accurate and complete.

Signed

Daniel G. Russell

1.0 Test Results: The following table presents the measured flow parameters and test results for three separate NOx and CO emissions tests each taken on October 1, 1991, for two Caterpillar engines used for metal shredding at Auto Shred of Louisiana's metal processing facility in Monroe, Louisiana.

$CO_2 = 5$
$O_2 = 15$

1.1 No. 1 Engine:

Run. No. / Date / Time start / Time end		1 10-01-91 0946 1047	2 10-01-91 1229 1216	3 10-01-91 1229 1340	avg. ------ ------ ------
NOx EMISSIONS	#/hr.	3.02	3.34	3.66	3.34
NOx EMISSIONS	ppm	174	198	216	196
CO EMISSIONS	#/hr.	7.14	7.45	7.21	7.27
CO EMISSIONS	ppm	675	725	700	700
VOLUMETRIC FLOWRATE	acfm	5544	5316	5261	5374
VOLUMETRIC FLOWRATE	dscfm	2424	2356	2362	2381
VELOCITY	ft./sec.	108.4	104.0	102.9	105.1
STACK TEMPERATURE	degrees F	677	651	647	658
MOISTURE	%	6.09	6.95	6.10	6.38

$CO_2 = 7.5$
$O_2 = 11.0$

1.2 No. 2 Engine:

Run. No. / Date / Time start / Time end		1 10-01-91 1351 1453	2 10-01-91 1517 1618	3 10-01-91 1627 1728	avg. ------ ------ ------
NOx EMISSIONS	#/hr.	2.11	2.28	2.01	2.13
NOx EMISSIONS	ppm	127	138	122	129
CO EMISSIONS	#/hr.	11.7	18.1	17.6	15.8
CO EMISSIONS	ppm	1150	1800	1750	1567
VOLUMETRIC FLOWRATE	acfm	5245	5590	5466	5434
VOLUMETRIC FLOWRATE	dscfm	2323	2300	2301	2308
VELOCITY	ft./sec.	102.6	109.3	106.9	106.3
STACK TEMPERATURE	degrees F	677	651	647	658
MOISTURE	%	6.09	6.95	6.10	6.38

2.0 Source Description: Auto Shred of Louisiana uses two identical Caterpillar ~~1685~~ 3516 16 cylinder diesel fired 1600 horsepower engines to operate their metal shredder. Each engine exhausts to the atmosphere by way of a 12.5 inch diameter stack. The exhaust exits the engine area on horizontal, elbows to vertical for a length of 195 inches and elbows back to horizontal. Two sample ports at 90° are installed in the vertical section of stack at a location which is 108 inches (8.6 diameters) below the last elbow and 87 inches (7.0 diameters) above the first horizontal to vertical elbow.

The engine load is entirely dependent upon the supplied furnish. Metal parts, often automobiles are conveyed to the shredder were they are engaged by constant rpm blades. The energy required to accommodate that constant rpm for that particular load varies with the resistance of that load. Therefore, load may vary from idle to peak in short cycles. During testing, the shredder was operated normally with typical furnish. A record of that production rate may be requested from Auto Shredders of Louisiana.

3.0 Test Procedures: Test procedures used are those described in the Code of Federal Regulations, Title 40, Part 60, Appendix A. Specifically, Method 1 was used to determine the number of sample points, Method 2 to determine stack gas velocity and subsequent volumetric flowrate, Method 3 to determine molecular weight of stack gas, and Method 4 to determine moisture content. Nitrogen oxides concentration was determined using Method 7. Because it was suspected that NOx concentration would vary with engine load, an attempt was made to collect the Method 7 (evacuated flask) samples over a period of two the three minutes each in order to capture stack gas during engine load peaks and idle period. Carbon monoxide concentrations were determined using Method 10. Because CO concentrations varied with load, and the on line trace would be difficult to integrate, the NDIR exhaust was captured in a Tedlar bag and the composited sample was redirected to the NDIR to obtain a trace of the average CO for the test period. Sample duration was 60 minutes and samples were taken in triplicate. In addition, because the engine load varied over relatively short time intervals, two recordings at each sample point were made for velocity head and for temperature. The average values were used in calculations.

4.0 Data Reduction

Auto Shred of Louisiana
No. 1 Compressor Engine
NOx/CO Emissions Test, October 1, 1991

Collected test data

		RUN 1	RUN 2	RUN 3	
1. As	: sq ft	.8522115	.8522115	.8522115	
2. Cp	: dimensionless	.84	.84	.84	
3. Theta	: minutes	60	60	60	
4. Y	: dimensionless	1.00	1.00	1.00	
5. Pbar	: in. Hg	29.97	29.97	29.97	
6. Pg	: in. H2O	.15	.15	.15	
7. Vm	: cf (dry gas)	41.234	43.544	43.381	
8. sqr(DP),avg:	in.H2O^.5	1.3138	1.2722	1.2636	
9. DH	: in. H2O	1.8	1.8	1.8	
10. ts	: degrees F	676.63	650.71	646.62	657.99
11. tm	: degrees F	98.63	109.04	107.96	
12. Vlc	: ml	54	64.5	56	
13. CO2	: percent	5.00	5.00	5.00	
14. O2	: percent	15.00	15.00	15.00	
15. CO	: ppm (NDIR)	675	725	700	700
16. C,NOx	: ppm	174	198	216	196

Auto Shred of Louisiana
No. 1 Compressor Engine
NOx/CO Emissions Test, October 1, 1991

Calculations:

	RUN 1	RUN 2	RUN 3	AVG.
1. Pm : in.Hg (DH/13.6)+Pbar	30.10	30.10	30.10	N/A
2. Ps : in. Hg (Pg/13.6)+Pbar	29.98	29.98	29.98	N/A
3. Vmstd: dscf Vm Y(Pm/Pstd)(Tstd/Tm)	39.21065	40.64979	40.57463	N/A
4. Vwstd: scf (.04707cf/ml)(Vlc)	2.54178	3.036015	2.63592	N/A
5. Bws : dimensionless Vwstd/(Vwstd+Vmstd)	.0608774	.0694966	.0610018	.0637919
6. Md : mol.wt. dry basis .44 CO2+.32 O2+.28(CO+N2)	29.4	29.4	29.4	N/A
7. Ms : mol.wt. wet basis Md(1-Bws)+18 Bws	28.71	28.61	28.70	N/A
8. Vs : ft/sec Kp Cp (sqrDP)sqr(Ts/(Ps Ms))	108.42	103.96	102.90	105.10
9. Q : cfm Vs As(60 sec/min)	5544	5316	5261	5374
10. Qstd : dscfm Q(1-Bws)(Ps/Pstd)(Tstd/Ts)	2424	2356	2362	2381
11. E,CO : pounds/hr (C,CO*7.2708e-8)(60)(Qstd)	7.14	7.45	7.21	7.27
12. E,NOx: pounds/hr (C,NOx*7.2708e-8)(60)(Qstd)	3.02	3.34	3.66	3.34

Auto Shred of Louisiana
No. 1 Shredder Engine Exhaust
NOx Emissions Test - October 1, 1991

Collected Data

Pbar : Sample 29.97 Recovery 29.73

Run/ Sample		Vf	Initial Pressure	Final Pressure	Initial Temp.oF	Final Temp.oF	Absorbance	Dilution Factor
1	1	2119	-28.20	.00	72	82	.199	1
	2	2121	-28.30	-1.20	73	82	.502	2
	3	2123	-28.30	-1.10	75	82	.31	1
	4	2121	-28.30	-.20	76	82	.102	1
2	1	2114	-28.50	-.20	78	82	.321	2
	2	2118	-27.30	.15	80	82	.328	2
	3	2024	-27.20	.50	80	82	.182	1
	4	2116	-28.00	.20	80	82	.384	1
3	1	2119	-28.20	.30	82	82	.466	2
	2	2128	-28.20	-1.25	82	82	.099	1
	3	2111	-28.20	-1.30	83	82	.332	2
	4	2105	-28.40	-3.20	85	82	.305	1

Absorbance of Standards:
Blank
100 ug .129
200 ug .252
300 ug .388
400 ug .534

Calculations

1. Kc = 100*[A1+2A2+3A3+4A4]/[A1^2+A2^2+A3^2+A4^2]
2. Pi = Pbar + initial flask pressure
3. Pf = Pbar + final flask pressure
4. Vsc = (Tstd/Pstd)(Vf-25)((Pf/Tf)-(Pi/Ti))
5. m = 2 KC A F
6. C = (6.243 x 10e-5)(m/Vsc)
7. E = C Qstd (60 min/hr)
8. ppm = C 8.367 x 10e6

Kc= 762

Run/Samp NO.		Pi in.Hg	Pf in. Hg	Vsc ml, std	m ug	C #/dscf	ppm
1	1	1.77	29.73	1904.01	303.4505	.0000099	83.249397
	2	1.67	28.53	1831.11	1530.976	.0000522	436.73438
	3	1.67	28.63	1840.12	472.7118	.0000160	134.18786
	4	1.67	29.53	1900.00	155.5374	.0000051	42.760627
2	1	1.47	29.53	1907.79	978.9708	.0000320	268.04202
	2	2.67	29.88	1853.59	1000.319	.0000337	281.89587
	3	2.77	30.23	1786.59	277.5276	.0000097	81.141890
	4	1.97	29.93	1903.05	585.5526	.0000192	160.72304
3	1	1.77	30.03	1926.73	1421.185	.0000460	385.29365
	2	1.77	28.48	1828.88	150.9628	.0000052	43.116828
	3	1.77	28.43	1810.93	1012.518	.0000349	292.05544
	4	1.57	26.53	1690.95	465.0874	.0000172	143.67009

Average Run 1 174 ppm
Average Run 2 198 ppm
Average Run 3 216 ppm

Average all Runs 196 ppm

Auto Shred of Louisiana
No. 2 Compressor Engine
NOx/CO Emissions Test, October 1, 1991

Collected test data

	RUN 1	RUN 2	RUN 3	
1. As : sq ft	.8522115	.8522115	.8522115	
2. Cp : dimensionless	.84	.84	.84	
3. Theta : minutes	60	60	60	
4. Y : dimensionless	1.00	1.00	1.00	
5. Pbar : in. Hg	29.97	29.97	29.97	
6. Pg : in. H2O	.1	.1	.1	
7. Vm : cf (dry gas)	43.097	41.508	43.213	
8. sqr(DP),avg: in.H2O^.5	1.2553	1.3024	1.2762	
9. DH : in. H2O	1.8	1.8	1.8	
10. ts : degrees F	663.46	714.37	712.50	696.78
11. tm : degrees F	113.83	112.33	115.08	
12. Vlc : ml	53.5	77.5	61	
13. CO2 : percent	7.50	8.00	6.50	
14. O2 : percent	11.00	10.00	12.00	
15. CO : ppm (NDIR)	1150	1800	1750	1567
16. C,NOx : ppm	127	138	122	129

Auto Shred of Louisiana
No. 2 Compressor Engine
NOx/CO Emissions Test, October 1, 1991

Calculations:

	RUN 1	RUN 2	RUN 3	AVG.
1. Pm : in.Hg (DH/13.6)+Pbar	30.10	30.10	30.10	N/A
2. Ps : in. Hg (Pg/13.6)+Pbar	29.98	29.98	29.98	N/A
3. Vmstd: dscf Vm Y(Pm/Pstd)(Tstd/Tm)	39.89666	38.52637	39.91710	N/A
4. Vwstd: scf (.04707cf/ml)(Vlc)	2.518245	3.647925	2.87127	N/A
5. Bws : dimensionless Vwstd/(Vwstd+Vmstd)	.0593717	.0864964	.0671040	.0709907
6. Md : mol.wt. dry basis .44 CO2+.32 O2+.28(CO+N2)	29.64	29.68	29.52	N/A
7. Ms : mol.wt. wet basis Md(1-Bws)+18 Bws	28.95	28.67	28.75	N/A
8. Vs : ft/sec Kp Cp (sqrDP)sqr(Ts/(Ps Ms))	102.57	109.33	106.90	106.27
9. Q : cfm Vs As(60 sec/min)	5245	5590	5466	5434
10. Qstd : dscfm Q(1-Bws)(Ps/Pstd)(Tstd/Ts)	2323	2300	2301	2308
11. E,CO : pounds/hr (C,CO*7.2708e-8)(60)(Qstd)	11.65	18.06	17.56	15.76
12. E,NOx: pounds/hr (C,NOx*7.2708e-8)(60)(Qstd)	2.11	2.28	2.01	2.13

Auto Shred of Louisiana
No. 2 Shredder Engine Exhaust
NOx Emissions Test - October 1, 1991

Collected Data

Pbar : Sample 29.97 Recovery 29.73

Run/ Sample		Vf	Initial Pressure	Final Pressure	Initial Temp.oF	Final Temp.oF	Absorbance	Dilution Factor
1	1	2041	-28.30	.00	79	82	.178	1
	2	2036	-28.20	-.10	80	82	.285	2
	3	2105	-28.30	-.85	80	82	.328	1
	4	2091	-28.30	-1.00	82	82	.088	1
2	1	2001	-26.10	.00	79	82	.045	1
	2	2002	-28.20	.00	81	82	.298	2
	3	2014	-28.00	.05	81	82	.151	1
	4	2016	-26.30	-1.10	80	82	.404	1
3	1	1992	-27.30	-.80	79	82	.028	1
	2	1972	-28.20	-.10	75	82	.199	1
	3	1992	-26.40	.00	78	82	.23	2
	4	1976	-26.30	.00	79	82	.342	1

Absorbance of Standards:
Blank
100 ug .129
200 ug .252
300 ug .388
400 ug .534

Calculations

1. Kc = 100*[A1+2A2+3A3+4A4]/[A1^2+A2^2+A3^2+A4^2]
2. Pi = Pbar + initial flask pressure
3. Pf = Pbar + final flask pressure
4. Vsc = (Tstd/Pstd)(Vf-25)((Pf/Tf)-(Pi/Ti))
5. m = 2 KC A F
6. C = (6.243 x 10e-5)(m/Vsc)
7. E = C Qstd (60 min/hr)
8. ppm = C 8.367 x 10e6

Kc= 762

Run/Samp NO.		Pi in.Hg	Pf in. Hg	Vsc ml, std	m ug	C #/dscf	ppm
1	1	1.67	29.73	1841.23	271.4280	.0000092	77.003500
	2	1.77	29.63	1823.74	869.1797	.0000298	248.94800
	3	1.67	28.88	1842.32	500.1595	.0000169	141.80955
	4	1.67	28.73	1820.25	134.1891	.0000046	38.507856
2	1	3.87	29.73	1662.37	68.61945	.0000026	21.561736
	2	1.77	29.73	1799.56	908.8265	.0000315	263.80196
	3	1.97	29.78	1800.74	230.2564	.0000080	66.791749
	4	3.67	28.63	1617.16	616.0502	.0000238	198.98799
3	1	2.67	28.93	1680.84	42.69655	.0000016	13.268736
	2	1.77	29.63	1764.65	303.4505	.0000107	89.823908
	3	3.57	29.73	1673.69	701.4433	.0000262	218.91795
	4	3.67	29.73	1654.11	521.5078	.0000197	164.68716

Average Run 1 127 ppm
Average Run 2 138 ppm
Average Run 3 122 ppm

Average all Runs 129 ppm

5.0 NOMENCLATURE

SYMBOL	UNITS	DESCRIPTION
An	ft^2	Nozzle area
As	ft^2	Stack area
Bws	dimensionless	Proportion of water vapor
CO2	percent	Carbon dioxide content by volume
CO	percent	Carbon monoxide content by volume
Cp	dimensionless	Pitot correction factor
C,NO_x	ppm	NO_x concentration
Dn	inches	Nozzle diameter
delta H	in. H2O	Pressure drop across meter orifice (also DH)
delta P	in. H2O	Stack velocity pressure head (also DP)
E,NO_x	#/hr	NO_x emission rate
F	dscf	Volume of flue gas per 10^6 BTU
I	percent	Percent isokinetic sampling
Kp	consistent	Pitot tube constant = 85.49
Mn	milligrams	Particulate sample weight
Md	#/# mole	Dry molecular wt. of stack gas
Ms	#/# mole	Wet molecular wt. of stack gas
N2	percent	Nitrogen content by volume
O2	percent	Oxygen content by volume
Pbar	in. Hg	Barometric pressure
Pg	in. H2O	Static pressure
Pm	in. Hg	Meter pressure = Pbar+(delta H/13.6)
Ps	in. Hg	Stack pressure = Pbar+(Pg/13.6)
Pstd	in. Hg	Standard pressure = 29.92
Q	ft^3/min	Volumetric flow rate at stack conditions
Qstd	dscf/min	Volumetric flow rate at dry, std. conditions
Theta	minutes	Sampling time per run
tm	^oF	Meter temperature (Tm denotes ^oR)
ts	^oF	Stack temperature (Ts denotes ^oR)
Tstd	^oR	Standard temperature = 528^o
Vlc	ml	Volume of water collected
Vm	ft^3	Volume of dry gas sampled
Vmstd	dscf	Sample volume at standard conditions
Vwstd	scf	Sample volume of water vapor
Y	dimensionless	Meter correction factor
Xsair	percent	Excess air

6.0 CALIBRATIONS:

Measurement devices used by Environmental Monitoring Laboratories and subject to changes in measurement precision are initially calibrated prior to use. Those instruments for which calibration factors are subject to change or for which calibration checks are required, are calibrated following each field use or as otherwise directed and noted. Calibration procedures for specific equipment are as follows.

Dry Gas Meter:

Dry gas meters are periodically removed from the sampling consoles and cleaned and repaired (new gaskets etc. as required). Following the overhaul of a meter, the measuring precision is checked by the Bell Prover Method and adjusted when necessary to read to within 2% of 100% accuracy. This service is provided by Big Three Meter Company in Jackson, Mississippi. Overhaul service or any six month period is followed by a five point calibration described in APTD-0576 using either a wet test meter or calibrated dry gas meter (used exclusively for calibrations) as a standard reference. Following field use, a gas meter calibration is checked in one of two ways. [1] Three calibration checks at intermediate orifice settings are performed or [2] orifice meter coefficients are used.

If a meter coefficient obtained from pre-test and post-test checks differs by more than 5%, the coefficient (Y) giving the lower sample volume is used in the calculations.

Orifice:

The orifice coefficient is initially determined and is rechecked following a major gas meter repair and calibration.

Nozzles:

Nozzles are checked before each field use with a precision (.001 in.) dial caliper. Three measurements on different axes are made; an average of those three readings is used in calculations. If the tolerance among measurements exceeds 0.004 inches (highest to lowest reading) the nozzle is repaired and recalibrated or discarded.

Pitot Tubes:

Pitot tubes meeting EPA geometry standards are assigned a coefficient of 0.84. Pitot tubes are visually inspected for damage before, during and after use. Those pitot tubes not meeting the geometry standards are assigned a coefficient from the manufacturer's calibration which it retains unless damaged. All pitot tubes used by Environmental Monitoring Laboratories are manufactured by NAPP, Inc.

Temperature Measuring Instruments:

Most temperature measurements are made with a type K thermocouple and an Omega digital thermocouple thermometer which has an initial calibration traceable to NBS. Other measurements are made using bimetallic dial thermometers. The thermocouples and dial thermometers are checked following or during a test series against an ASTM mercury in glass thermometer.

Barometer:

Aneroid field barometers are checked against and adjusted to readings from a mercury barometer or readings obtained from local weather authorities.

Differential Pressure Gauges:

Velocity head (delta P) and orifice pressure differential (delta H) measurements are made using water manometers of the appropriate range unless otherwise noted in the test data. Manometers do not require calibration.

Non-dispersive Infrared Analyzer (NDIR):

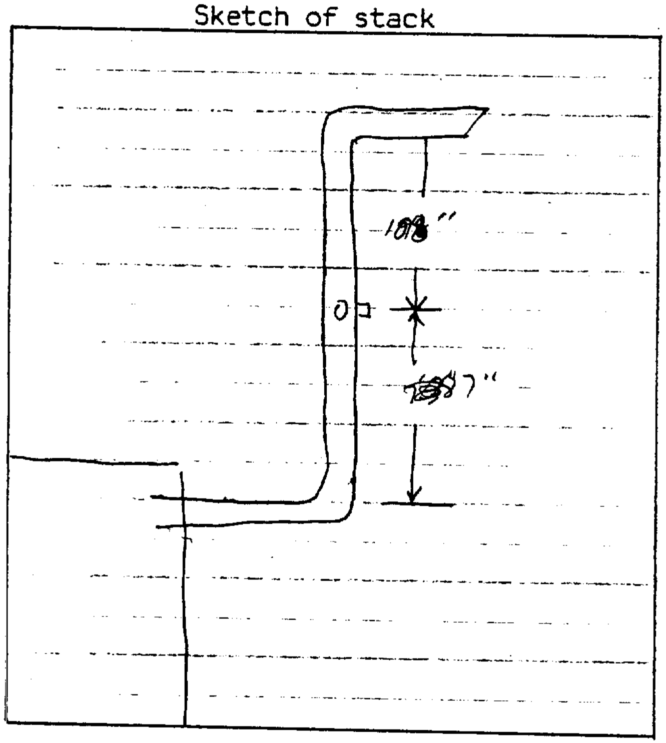
Carbon monoxide measurements are made with a Beckman 864 infrared instrument calibrated in ranges of 0 to 1000 ppm and 0 to 5000 ppm. Following a sufficient warm up period of at least 1 hour and prior to each sample run, the instrument's zero and span are checked and adjusted if necessary using a supply of 100% nitrogen and 4000 ppm CO respectively. An intermediate check at 700 ppm CO is also performed. These calibrations and adjustments are repeated at the conclusion of each 60 minute sampling period.

7.0 Appendices
a. Sampling and Analytical Data
b. Calibration Data
c. CO Strip Chart

STACK CONFIGURATION / SAMPLE AND VELOCITY POINTS

Plant Name Auto Shred of La. Source Caterpillar Engine
Data For: ______ Date ______

Sketch of stack



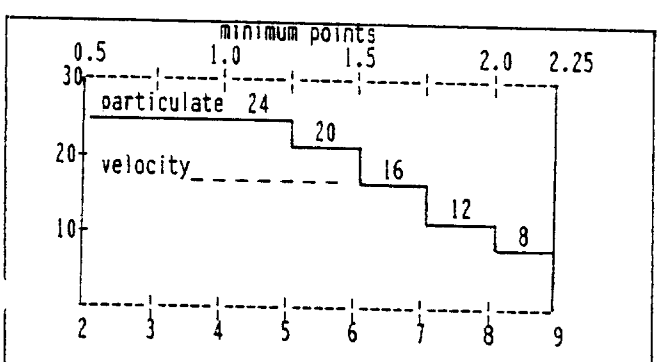
PERCENT OF DIAMETER

Point No	Points on a Diameter: 2	4	6	8	10	12	14	16
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5
5			85.4	67.7	34.2	25.0	20.1	16.9
6			95.6	80.6	65.8	35.6	26.9	22.0
7				89.5	77.4	64.4	36.6	28.3
8				96.8	85.4	75.0	63.4	37.5
9					91.8	82.3	73.1	62.5
10					97.4	88.2	79.9	71.7
11						93.3	85.4	78.0
12						97.9	90.1	83.1
13							94.3	87.5
14							98.2	91.5
15								95.1
16								98.4

Stack diameter 12.50"
Distance from ports to disturbance:
- distance to upstream disturbance 87"
- distance to downstream disturbance 108"
- upstream diameters 7.0
- downstream diameters 8.6

Minimum No. points required 12
No. points selected 6x2
Nipple length 0.25"

Point	inches from wall	velocity head
1	.6	
2	1.8	
3	3.7	
4	8.8	
5	10.7	
6	12.0	
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
Pg =		Ts =
Pitot ID		Cp =



REMARKS Caterpillar 1635 16 cyl engine - diesel 1600 HP

Plant Auto Shred of Louisiana
Sampling Location No. 1 / Caterpillar Engine Exhaust
Test For Moisture / Velocity / CO / NOx
Test Operators Russell / Moore L.C. Ingles

RUN No. 1
Date 10-1-91
Time start 0946 end 1047

Meter Box	RAC591349
Sample Box	No 3
Probe/Pitot	3' inc
Pitot Cp	.84
Nozzle Dia.	NA
Filter No.	NA
Amb. Temp. °F	75
Bar. Press. "Hg	29.97
Static Press. "H_2O	.15

No. Sample Pts.	6 x 2
Minutes/Pt.	5.0
NOMOGRAPH	
ΔH@	NA
Meter Temp.	
% H_2O	
C-Factor	
Stack Temp.	
Ref. ΔP	

Gas Analysis	Fyrite	
CO_2	~~15.0~~	5.0
O_2	~~3.0~~	15.0
CO	NDIR Comp =	
Time		

Condensate:
tare 200 fin 249
Silica gel:
tare 650.0 fin 645.0

Remarks:
Engine RPM

Port Point	El. Time, Min.	DGM Reading, Ft.³	Velocity Head ΔP, in. H_2O	Orifice ΔH in. H_2O	Stack Temp. °F	Meter Temp., °F In	Meter Temp., °F Out	Oven Temp. °F	Imp. Temp. °F	Vac in. Hg
1	0	586.457	0.75	1.80	627	79	75	NA	66	4
		—	4.70	—	751	~~63~~	~~77~~		—	4
2	5	590.0	0.58	1.80	663	83	77		66	4
		—	4.40	—	754	—	—		—	—
3	10	593.6	0.40	1.80	545	94	76		65	4
		—	3.65	—	790	—	—		—	—
4	15	596.7	0.77	1.80	641	101	79		64	5
		—	3.35	—	679	—	—		—	—
5	20	600.3	0.37	1.80	648	109	82		65	5
		—	3.30	—	721	—	—		—	—
6	25	604.0	0.60	1.80	630	115	86		65	5
		—	3.50	—	757	—	—		—	—
1	30/0	607.331	0.49	1.80	600	117	90		66	5
		—	3.50	—	759	—	—		—	—
2	5	610.8	0.44	1.80	594	120	91		63	5
		—	3.50	—	768	—	—		—	—
3	10	614.3	0.45	1.80	632	124	93		64	5
		—	3.40	—	766	—	—		—	—
4	15	617.5	0.51	1.80	564	125	97		64	5
		—	3.60	—	755	—	—		—	—
5	20	621.2	0.55	1.80	555	127	100		65	5
		—	3.60	—	726	—	—		—	—
6	25	624.3	0.38	1.80	554	129	102		66	5
		—	3.35	—	760	—	—		—	—
end	60	627.691								

leak check: .035 → .036 = .001 cfm 7" Hg
pitot +ve 3.9
pitot -ve 4.0

	.7189		604.42	
41.234	1.3138	1.80	676.63	98.63
	1.9087		748.83	

Plant Auto Shred of Louisiana
Sampling Location No. 1 Engine
Test For PM / CO / ~~VOC~~ NOx
Test Operators Russell / Moore

RUN No. 2
Date 10-1-91
Time start 1115 end 1216

Meter Box	BAC591349
Sample Box	No. 3
Probe/Pitot	3' inc.
Pitot Cp	.84
Nozzle Dia.	NA
Filter No.	NA
Amb. Temp. °F	75
Bar. Press. "Hg	29.97
Static Press. "H_2O	.15

No. Sample Pts.	6x2
Minutes/Pt.	5
NOMOGRAPH	
ΔH@	NA
Meter Temp.	
% H_2O	
C-Factor	
Stack Temp.	
Ref. ΔP	

Gas Analysis	Fyrite		
CO_2	5.0		
O_2	15.0		
CO			
Time			

Condensate:
tare 200 fin 250
Silica gel:
tare 645 fin 659.5

Remarks:

Port Point	El. Time, Min.	DGM Reading, Ft.³	Velocity Head ΔP, in. H_2O	Orifice ΔH in. H_2O	Stack Temp. °F	Meter Temp., °F In	Meter Temp., °F Out	Oven Temp. °F	Imp. Temp. °F	Vac in. Hg
1	0	627.912	0.46	1.80	573	101	97	N/A	66	5
		—	4.20	—	741	—	—		—	—
2	5	631.5	0.47	1.80	582	108	98		65	5
		—	3.90	—	721	—	—		—	—
3	10	635.1	0.57	1.80	673	111	98		64	5
		—	3.75	—	741	—	—		—	—
4	15	638.4	0.41	1.80	638	116	97		60	5
		—	3.45	—	701	—	—		—	—
5	20	642.2	0.40	1.80	580	122	97		60	5
		—	3.30	—	675	—	—		—	—
6	25	645.9	0.27	1.80	508	122	98		60	5
		—	3.50	—	719	—	—		—	—
1	30/0	649.478	0.45	1.80	637	122	99		64	5
		—	3.60	—	729	—	—		—	—
2	5	653.0	0.50	1.80	631	125	100		63	5
		—	3.40	—	759	—	—		—	—
3	10	656.6	0.36	1.80	571	124	100		60	5
		—	3.40	—	745	—	—		—	—
4	15	660.8	0.33	1.80	475	125	100		60	5
		—	3.35	—	685	—	—		—	—
5	20	664.2	0.43	1.80	496	126	101		60	6
		—	3.60	—	707	—	—		—	—
6	25	667.8	0.45	1.80	604	127	102		60	6
		—	3.70	—	726	—	—		—	—
end	60	671.456								
		leak check .090 →	.093 =		.003 @ 8" Hg					
		pitot +ve 4.0								
		pitot -ve 3.5								
			1.8952							
			1.2722		720.75					
		43.544	.6492	1.80	650.71		109.04			
					580.67					

Plant: Auto Shredder
Sampling Location: No. 1 Shredder Engine
Test For: Velocity / Moisture / CO / NOx
Test Operators: Russell / Moore

RUN No. 3
Date 10-1-91
Time start 1229 end 1340

Meter Box	RAC 591349
Sample Box	No.
Probe/Pitot	3' inc
Pitot Cp	.84
Nozzle Dia.	NA
Filter No.	NA
Amb. Temp. °F	83
Bar. Press. "Hg	29.97
Static Press. "H_2O	.15

No. Sample Pts.	6×2
Minutes/Pt.	5.0
NOMOGRAPH	
ΔH@	NA
Meter Temp.	
% H_2O	
C-Factor	
Stack Temp.	
Ref. Δ P	

Gas Analysis: Fyrite
CO_2
O_2
CO
Time

Condensate: tare 200 fin 246
Silica gel: tare 701 fin 711

Remarks:

Port Point	El. Time, Min.	DGM Reading, Ft.³	Velocity Head Δ P, in. H_2O	Orifice Δ H in. H_2O	Stack Temp. °F	Meter Temp., °F In	Meter Temp., °F Out	Oven Temp. °F	Imp. Temp. °F	Vac in. Hg
1	0	672.598	0.48	1.80	664	110	98	NA	67	4
		—	4.20	—	742	—	—		—	-
2	5	676.4	0.44	1.80	532	112	100		63	4
		—	3.65	—	691	—	—		—	-
3	10	680.0	0.49	1.80	638	118	100		62	4
		—	3.60	—	736	—	—		—	-
4	15	683.5	0.36	1.80	521	120	97		62	4
		—	3.35	—	728	—	—		—	-
5	20	687.4	0.57	1.80	526	122	98		63	4
		—	3.20	—	734	—	—		—	-
6	25	691.0	0.30	1.80	493	124	99		64	4
			3.10	—	719	—	—		—	—
1	30/0	694.489	0.45	1.80	436	105	95		62	4
		—	3.45	—	698	—	—		—	-
2	5	698.2	0.46	1.80	634	109	96		60	4
		—	3.30	—	696	—	—		—	-
3	10	701.4	0.58	1.80	590	115	95		60	4
		—	3.40	—	722	—	—		—	-
4	15	705.6	0.50	1.80	613	123	99		61	4
		—	3.00	—	702	—	—		—	-
5	20	709.0	0.71	1.80	649	126	101		60	4
		—	3.25	—	759	—	—		—	-
6	25	712.5	0.36	1.80	546	127	102		61	4
		—	3.30	—	760	—	—		—	-
end	60	715.979								

leak check: .090 → .102 = .012 cfe 9"
pitot + ve 6.1
pitot - ve 4.3

		43.381	1.8422	1.8000	723.92	107.96
			1.2636	~~.6849~~	646.62	
			.6849		569.33	

Plant	Auto Shred of Louisiana
Source	Engine No. 1
Test For	NOx
Test Operators	Moore / Russell
RUN NO.	1, 2, 3
Date	10-1-91
Time start	0945
Time end	1230

Probe I.D.	SS Tube
Pbar	29.97
Amb.Temp.	70 → 84
Samples/Run	4
Interval	15 min

Notes:

Sample Recovery	
Date	10-2-91
Time	~~[illegible]~~ 0930
Pbar	29.
Sample Analysis	
Date	~~[illegible]~~ 10-3-91
Time	~~0930~~
Wavelength	405

Run No.	Sample No.	Time	Flask No.	Flask Vol. ml	Flask Temp. oF	Initial Pressure in.Hg	Leak Free ✓	Final Pressure in.Hg	Final Temp. oF	Abs orb ance	Dilut. factor	
1	1	0945	1	2119	72	28.2	✓	0	82	.199	1	
	2	10:00	2	2121	73	28.3	✓	-1.20	↓	.502	2	
	3	10:15	3	2123	75	28.3	✓	-1.10		.310	1	~~[illegible]~~ 174
	4	10:30	4	2121	76	28.3	✓	-.20		.102	1	
2	1	10:45	5	2114	78	28.5	✓	-.20		.321	2	
	2	11:00	6	2118	80	27.3	✓	+.15		.328	2	
	3	11:15	7	2024	80	27.2	✓	+.50		.182	1	~~[illegible]~~ 198
	4	11:30	8	2116	~~[illegible]~~	28.0	✓	+.20		.384	1	
3	1	11:45	9	2129	82	28.2	✓	+.30		.466	2	
	2	12:00	10	2128	82	28.2	✓	-1.25		.099	1	
	3	12:15	11	2111	83	28.2	✓	-1.30		.332	2	~~[illegible]~~ 216
	4	12:30	12	2105	85	28.4	✓	-3.2		.305	1	

Plant Auto Shred

Sampling Location No. 2 Shredder Engine

Test For Velocity / Moisture for NOx & CO

Test Operators Russell / Moore

RUN No. 1

Date 10-1-91

Time start 1351 end 1453

Meter Box	RAC591349
Sample Box	No. 3
Probe/Pitot	3' inc
Pitot Cp	.84
Nozzle Dia.	NA
Filter No.	NA
Amb. Temp. °F	84
Bar. Press. "Hg	29.97
Static Press. "H_2O	.10

No. Sample Pts.	6x2
Minutes/Pt.	5.0
NOMOGRAPH	
ΔH@	NA
Meter Temp.	
% H_2O	
C-Factor	
Stack Temp.	
Ref. ΔP	

Gas Analysis	Fyrite
CO_2	7.5
O_2	11.0
CO	
Time	

Condensate: tare 200 fin 242

Silica gel: tare 641 fin 652.5

Remarks:

Port Point	El. Time, Min.	DGM Reading, Ft.³	Velocity Head ΔP, in. H_2O	Orifice ΔH in. H_2O	Stack Temp. °F	Meter Temp., °F In	Meter Temp., °F Out	Oven Temp. °F	Imp. Temp. °F	Vac in. Hg
1	0	716.309	0.58	1.80	614	112	102	NA	64	4
		—	4.00	—	706	—	—		—	—
2	5	719.7	0.54	1.80	618	113	100		66	4
		—	3.70	—	735	—	—		—	—
3	10	723.1	0.49	1.80	616	116	101		61	4
		—	3.15	—	711	—	—		—	—
4	15	726.6	0.47	1.80	563	121	100		60	4
		—	3.20	—	696	—	—		—	—
5	20	730.3	0.56	1.80	556	122	100		62	4
		—	3.05	—	684	—	—		—	—
6	25	734.3	0.52	1.80	571	125	100		60	4
		—	3.10	—	700	—	—		—	—
1	30/0	737.571	0.61	1.80	537	124	102		63	4
		—	3.30	—	697	—	—		—	—
2	5	741.4	0.54	1.80	547	128	102		~~64~~	4
		—	3.00	—	743	—	—		—	—
3	10	744.8	0.43	1.80	510	131	104		62	4
		—	3.00	—	665	—	—		—	—
4	15	748.6	0.35	1.80	448	134	107		63	5
		—	2.90	—	688	—	—		—	—
5	20	752.2	0.53	1.80	606	133	109		64	5
		—	3.20	—	703	—	—		—	—
6	25	755.9	0.53	1.80	625	135	111		62	
end		—	3.20	—	692	—	—		—	—
	60	759.406								

Leak check: .057 → .062 = .005 cfm 10" Hg

pitot + ve 3.9

pitot - ve 3.2

	1.7969		701.67		
	1.2553		663.46		
43.097	.7142	1.80	625.25	113.83	

Plant Auto Shred of Louisiana
Sampling Location No. 2 Shredder Engine
Test For Velocity/Moisture for CO/NOx
Test Operators Russell/Moore

RUN No. 2
Date 10-1-91
Time start 1517 end 1618

Meter Box	RAC591349
Sample Box	No. 3
Probe/Pitot	3' inc
Pitot Cp	.84
Nozzle Dia.	NA
Filter No.	NA
Amb. Temp. °F	82
Bar. Press. "Hg	29.94
Static Press. "H_2O	+.10

No. Sample Pts.	6 x 2
Minutes/Pt.	5.0

NOMOGRAPH

ΔH@	NA
Meter Temp.	
% H_2O	
C-Factor	
Stack Temp.	
Ref. ΔP	

Gas Analysis Eyrite

CO_2	8.0		
O_2	10.0		
CO			
Time			

Condensate: tare 200 fin 261
Silica gel: tare 712 fin 728.5

Remarks:

Port Point	El. Time, Min.	DGM Reading, Ft.³	Velocity Head ΔP, in. H_2O	Orifice ΔH in. H_2O	Stack Temp. °F	Meter Temp., °F In	Meter Temp., °F Out	Oven Temp. °F	Imp. Temp. °F	Vac in. Hg
1	0	761.041	0.53	1.80	475	108	102	NA	67	4
		—	3.10	—	733	—	—	—	—	-
2	5	764.5	0.67	1.80	592	109	102		62	4
		—	3.50	—	757	—	—		—	-
3	10	768.0	0.50	1.80	622	115	102		63	4
		—	3.00	—	765	—	—		—	-
4	15	771.4	0.68	1.80	666	119	101		60	4
		—	3.10	—	726	—	—		—	-
5	20	774.8	0.56	1.80	651	123	102		60	4
		—	3.20	—	732	—	—		—	-
6	25	778.1	0.39	1.80	502	123	103		61	4
		—	3.20	—	696	—	—		—	-
1	30/0	781.042	0.77	1.80	678	124	107		62	3
		—	4.05	—	787	—	—		—	-
2	5	784.8	0.75	1.80	703	124	103		65	4
		—	3.75	—	866	—	—		—	-
3	10	788.3	0.68	1.80	718	126	104		64	4
		—	3.20	—	855	—	—		—	-
4	15	792.0	0.70	1.80	686	128	105		63	4
		—	3.30	—	806	—	—		—	-
5	20	795.3	0.65	1.80	711	129	105		63	4
		—	3.15	—	833	—	—		—	-
6	25	799.3	0.60	1.80	716	130	105		62	4
		—	3.20	—	869	—	—		—	-
end	60	802.549								

leak check .078 → .078 = 0.000 cfm 9" Hg
pitot + ≤ 6.0
pitot − ≤ 4.5

41.508	.7864 / 1.3024 / 1.7191	1.80	785.42 / 714.37 / 643.33	112.33	

Plant Auto Shred of Louisiana
Sampling Location No. 2 Shredder Engine
Test For Velocity/moisture for CO/NOx
Test Operators Russell/Moore

RUN No. 3
Date 10-1-91
Time start 1627 end 1728

Meter Box RAC 591359
Sample Box No. 3
Probe/Pitot 3' Inconel
Pitot Cp .84
Nozzle Dia. NA
Filter No. NA

Amb. Temp. °F 82
Bar. Press. "Hg 29.94
Static Press. "H_2O .10

No. Sample Pts. 6x2
Minutes/Pt. 5.0

NOMOGRAPH
ΔH@ NA
Meter Temp.
% H_2O
C-Factor
Stack Temp.
Ref. Δ P

Gas Analysis Fyrite
CO_2 6.5
O_2 12.0
CO
Time

Condensate:
tare 220 fin 249
Silica gel:
tare 679 fin 691

Remarks:

730 ppm

Port Point	El. Time, Min.	DGM Reading, $Ft.^3$	Velocity Head Δ P, in. H_2O	Orifice Δ H in. H_2O	Stack Temp. °F	Meter Temp., °F In	Meter Temp., °F Out	Oven Temp. °F	Imp. Temp. °F	Vac in. Hg
1	0	802.741	0.77	1.80	689	115	104	NA	66	4
		—	3.90	—	831	—	—		—	—
2	5	806.5	0.56	1.80	678	118	105		60	4
		—	3.30	—	806	—	—		—	—
3	10	809.8	0.61	1.80	654	121	104		60	4
		—	3.50	—	731	—	—		—	—
4	15	813.7	0.55	1.80	634	125	105		60	4
		—	3.20	—	806	—	—		—	—
5	20	817.1	0.66	1.80	637	127	105		61	4
		—	3.00	—	788	—	—		—	—
6	25	820.8	0.80	1.80	662	128	104		62	4
		—	2.60	—	703	—	—		—	—
1	30/0	824.504	0.73	1.80	693	126	105		62	4
		—	3.60	—	736	—	—		—	—
2	5	828.0	0.50	1.80	627	127	105		64	4
		—	2.70	—	747	—	—		—	—
3	10	831.8	0.53	1.80	593	127	105		62	4
		—	3.00	—	786	—	—		—	—
4	15	835.5	0.75	1.80	690	129	105		62	4
		—	2.80	—	747	—	—		—	—
5	20	839.3	0.72	1.80	632	130	106		60	4
		—	2.95	—	821	—	—		—	—
6	25	842.5	0.53	1.80	624	130	106		62	4
end			2.50	—	805	—	—		—	—
	60	845.954								
		43.213	.7989 1.2762 1.7534	1.8000	775.58 712.50 649.42		115.08			

leak check .095 → .096 = .001 cfm @ 6" Hg
pitot +ve 4.8
pitot -ve 4.5

Plant Auto Shred of La.
Source No. 2 B Shredder Engine
Test For NOx
Test Operators Russell / Moore

RUN NO. 1,2,3
Date 10-1-91
Time start 1350
Time end 1645

Probe I.D. SS Tube
Pbar 29.97
Amb.Temp. 80 →
Samples/Run 4
Interval 15 min.

Notes:

Sample Recovery
Date 10-2-91
Time 8:30
Pbar

Sample Analysis
Date 10-31-91
Time
Wavelength 406

Run No.	Sample No.	Time	Flask No.	Flask Vol. ml	Flask Temp. oF	Initial Pressure in.Hg	Leak Free	Final Pressure in.Hg	Final Temp. oF	Absorbance	Dilut. factor	
1	1	13:50	13	2041	79	28.3	✓	0	82	.178	1	
	2	14:05	14	2036	80	28.2	✓	-.10		.285	2	
	3	14:20	15	2105	80	28.3	✓	-.85		.328	1	127
	4	14:35	16	2091	82	28.3	✓	-1.2		.088	1	
2	1	15:00	17	2001	79	26.1	✓	0.0		.045	1	
	2	15:15	18	2002	81	28.2	✓	0.0		.298	2	
	3	15:30	19	2014	81	28.0	✓	.05		.151	1	138
	4	15:45	20	2016	80	26.3	✓	-1.10		.404	1	
3	1	16:00	21	1992	79	27.3	✓	-.8		.028	1	
	2	16:15	22	1972	75	28.2	✓	-.10		.199	1	
	3	16:30	23	1992	78	26.4	✓	0		.230	2	122
	4	16:45	24	1976	79	26.3	✓	0		.342	1	

DRY GAS METER CALIBRATION

Meter I.D.	RAC 591349	Date	08-10-91
Calibration Method	DGM/DGM Bell Prove	By	DGR
Calibration Meter I.D.	651729		
Barometric Pressure	29.75		

Vac in. H2O	DH in. H2O	Time min.	Calibrating Meter Vi cf	Calibrating Meter Vf cf	Calibrating Meter Temp F	Field Meter Vi cf	Field Meter Vf cf	Field Meter Temp F initial	Field Meter Temp F final	Y	Q	K	DH@
1	4	9.75	632.119	642.452	70	727.109	737.642	74 73	98 76	.990	1.06	.676	2.02
1	2.5	13	642.452	653.242	70	737.642	748.73	97 75	113 84	1.01	.840	.674	2.03
1	2	13.8	653.242	663.448	70	748.73	759.355	109 85	118 90	1.01	.763	.679	2.00
1	1.5	17.3	663.553	674.732	73	759.462	770.937	73 73	100 78	.985	.649	.674	2.03
1	1	20.8	674.732	686.078	73	770.937	782.686	99 79	112 89	1.00	.557	.702	1.87
										.999			1.99

$$Y = [(Vcal)(Pbar)(Tdgm)]/[(Vdgm)(Pm)(Tcal)]$$

Where:

Y = Meter Correction Factor

Vcal = Volume of gas through calibrating meter, ft.3

Vdgm = Volume of gas through field dry gas meter, ft.3

Pbar = Barometric pressure, in. Hg

Pm = Meter pressure, (Pbar=DH/13.6), in. Hg

Tdgm = Average dry gas meter temp., degrees R

Tcal = Temperature of gas through calibrating meter, degrees R

DRY GAS METER CALIBRATION

Meter I.D. RAC Date 10-12-91

Calibration Method DGM/DGM Bell Prove By DGR

Calibration Meter I.D. 651729

Barometric Pressure 29.85

Vac in. H2O	DH in. H2O	Time min.	Calibrating Meter Vi cf	Calibrating Meter Vf cf	Calibrating Meter Temp F	Field Meter Vi cf	Field Meter Vf cf	Field Meter Temp F initial	Field Meter Temp F final	Y	Q	K	DH@
7	1.8	15	881.886	892.072	64	200.093	210.444	67 67	90 74	.999	.684	.653	2.16
7	1.8	15	892.072	902.473	66	210.444	221.156	90 74	105 83	1.01	.707	.669	2.06
7	1.8	15	902.473	912.835	68	221.156	231.994	105 83	112 92	1.01	.713	.670	2.05
										1.00			2.09

$Y = [(V_{cal})(P_{bar})(T_{dgm})]/[(V_{dgm})(P_m)(T_{cal})]$

Where:

Y = Meter Correction Factor

Vcal = Volume of gas through calibrating meter, ft.3

Vdgm = Volume of gas through field dry gas meter, ft.3

Pbar = Barometric pressure, in. Hg

Pm = Meter pressure, (Pbar=DH/13.6), in. Hg

Tdgm = Average dry gas meter temp., degrees R

Tcal = Temperature of gas through calibrating meter, degrees R

THERMOMETER/THERMOCOUPLE CALIBRATION

Date: 10-1-91 By: [illegible]

Reference Thermometer ASTM Hg glass 20°-760°F

Last Service

Field Thermometer	Temp. Source	Reference Temperature	Field Therm. Temperature	% error, absolute
3' T'couple Omega 650	Stack	691	696	<1
Meter In Omega 650	Room	75	75	—
Meter Out Omega 650	Room	75	75	—
Impinger out Bimetal-dial	Room	75	77	<1
Sample Box Bimetal-dial	N/A			

PITOT TUBE GEOMETRY CALIBRATION

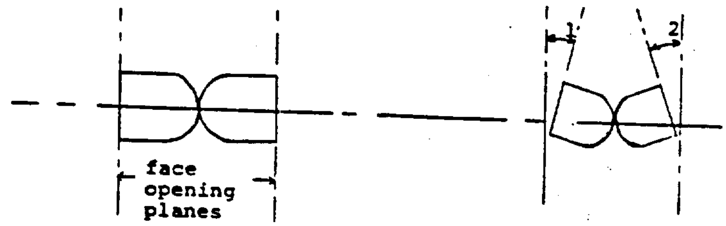
Pitot tube/probe identification: 3' inc   Date Checked: 10-1-91   By: [illegible]

. Pitot tubes having the following geometric characteristics are assigned a pitot tube coefficient of 0.84.

1. Face openings perpendicular to transverse axis: ($\alpha 1$ and $\alpha 2 < 10^0$)

$\alpha 1$ = 0

$\alpha 2$ = 0

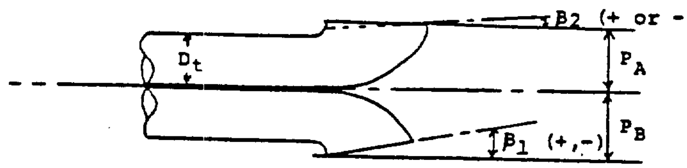


2. Face openings parallel to longitudinal axis: (β_1 and β_2 5^0; P = 1.05 D_t to 1.50 D_t; $P_A = P_B$)

D_t = .375 β_1 = 0

P_A = .50 β_2 = 0

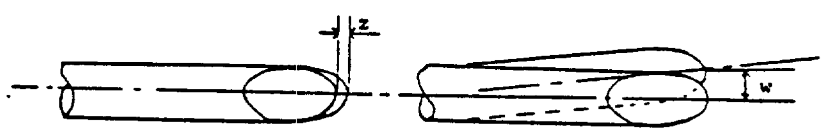
P_B = .50



3. Both legs equal length and centerline coincident (z < .125 inch; w < .031 inch)

z = 0

w = 0



PITOT/PROBE CLEARANCE CHECK:

Nozzle ID: ~~[illegible]~~ .175   Nozzle dia: .175   Date: 10-1-91

II. Pitot/probe/nozzle assemblies have the same Cp as the isolated Pitot tube when the following conditions exist.

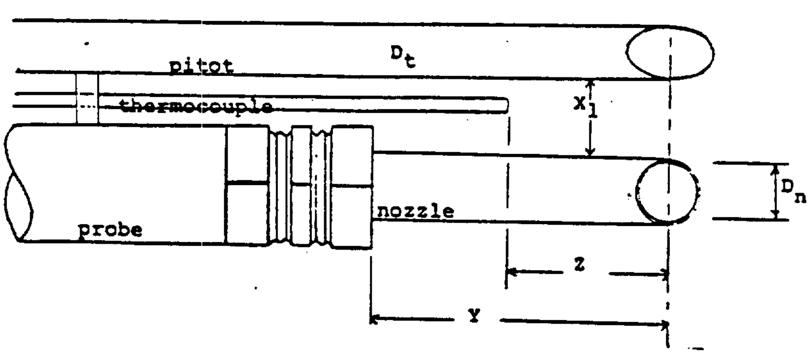
1. D_t > .188 & < .375 inch D_t = .375

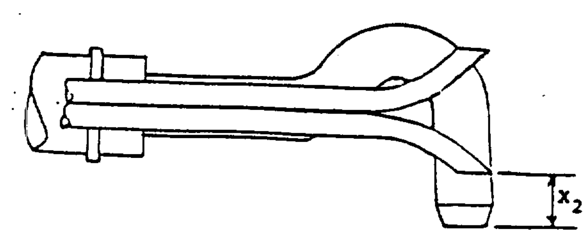
2. $X_1 \geq$ .75 inch X_1 = 1.1

3. $X_2 \geq$ 0 inch X_2 = .10

4. Y $\geq$ 3.0 inch   Y = 6.25

5. z $\geq$ 2.0 inch   z = 2.30





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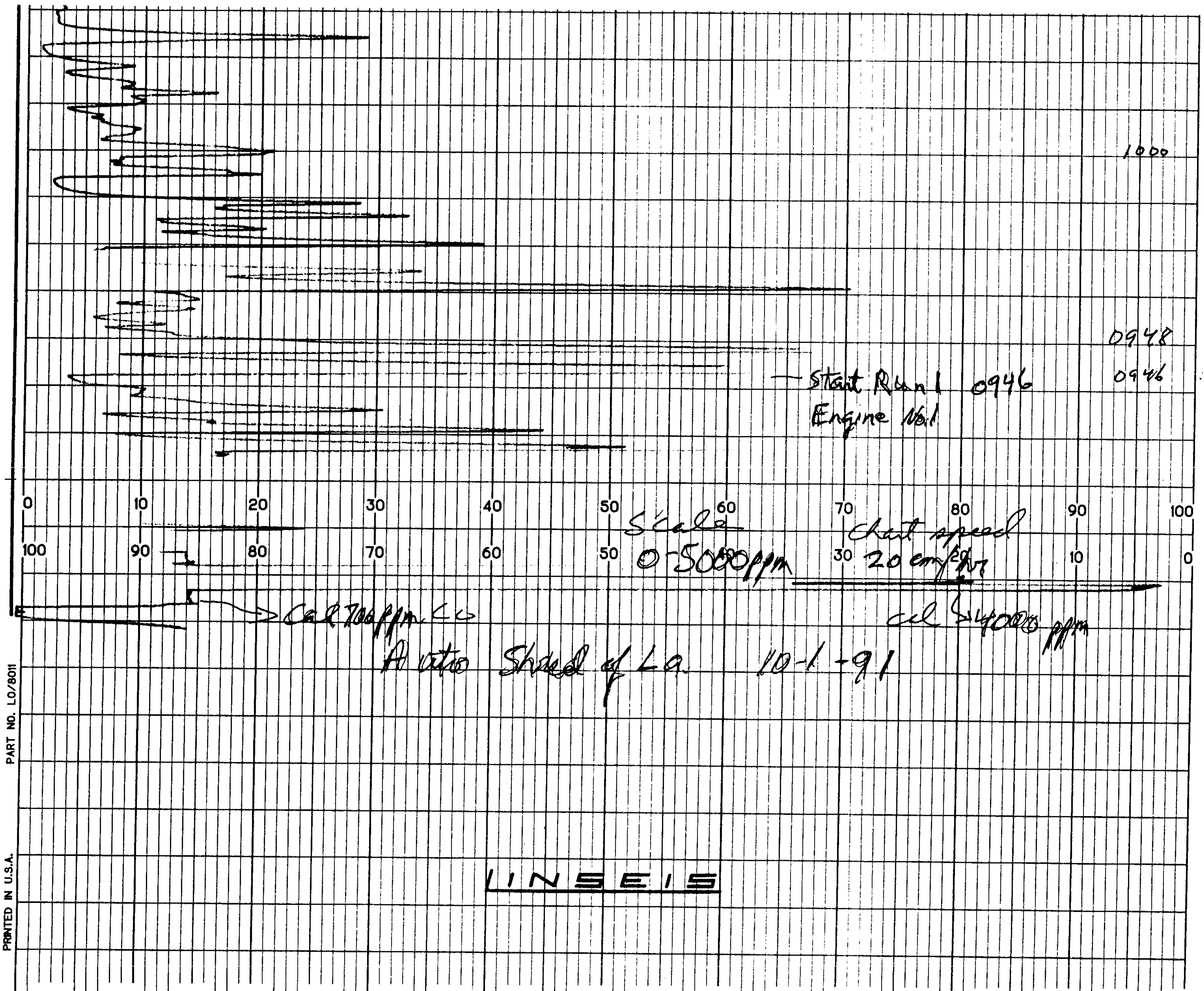

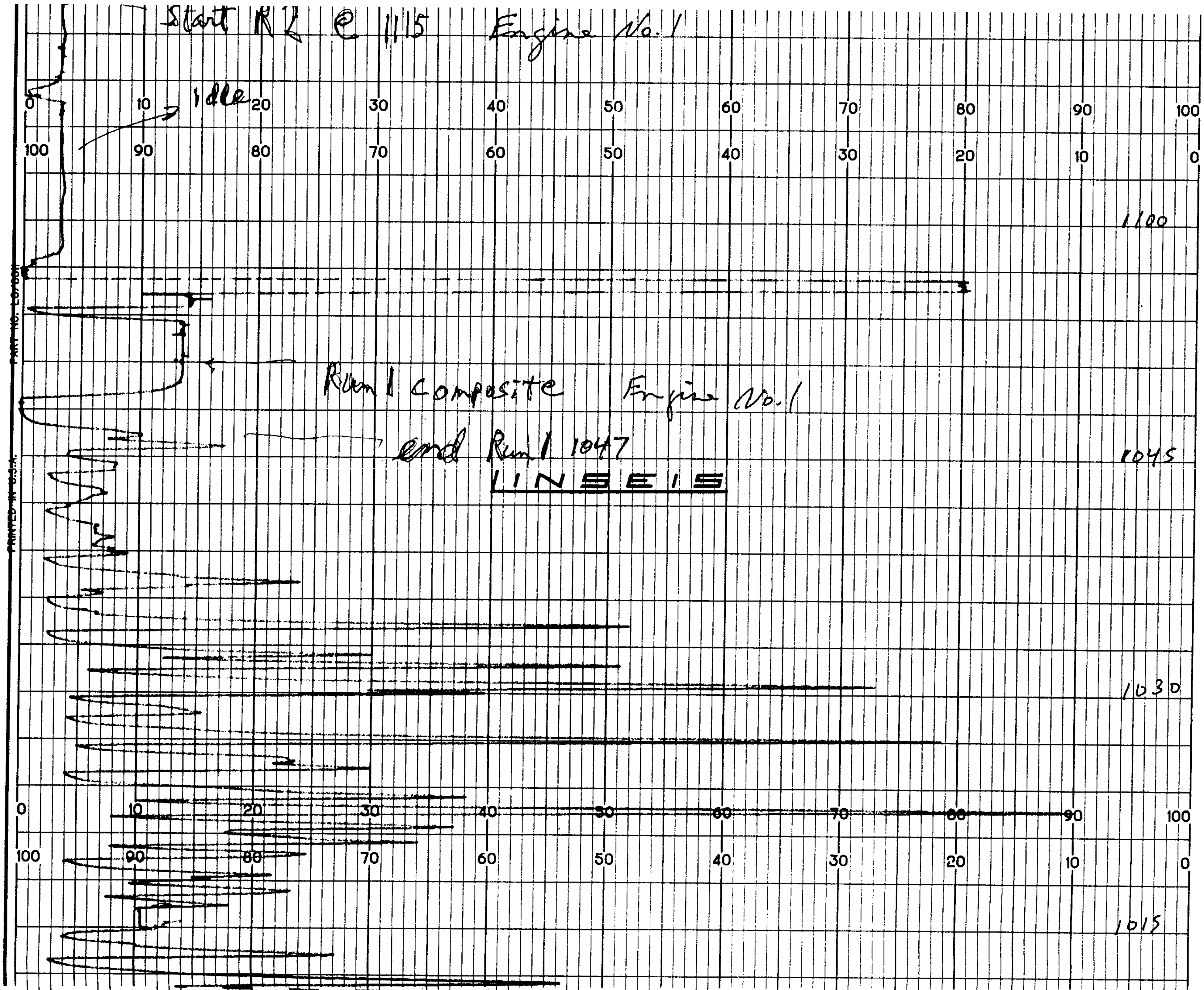
Start R2 @ 1115 Engine No. 1
idle
Run 1 composite Engine No. 1
end Run 1 1047
LINSEIS
1100
1045
1030
1015
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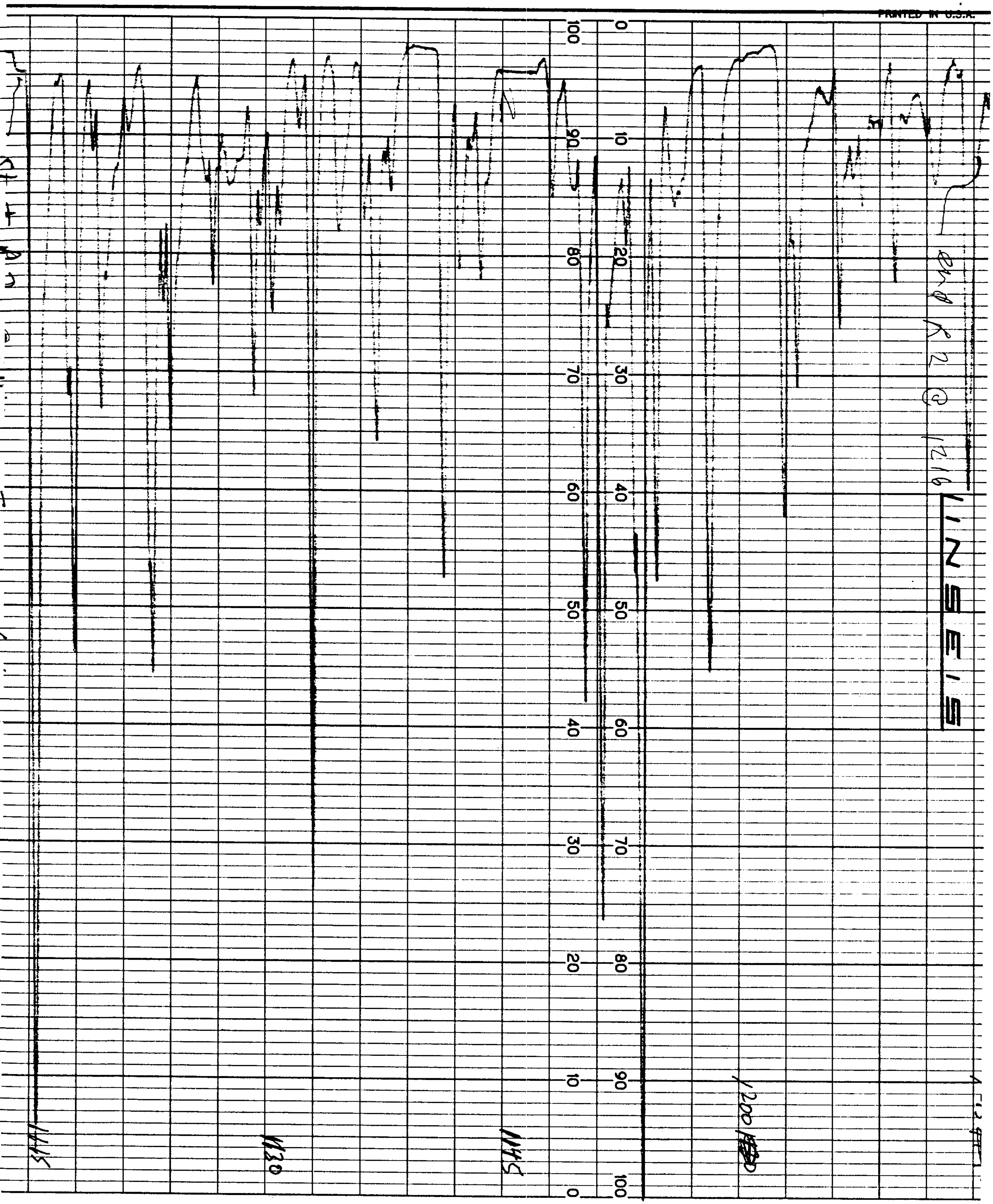
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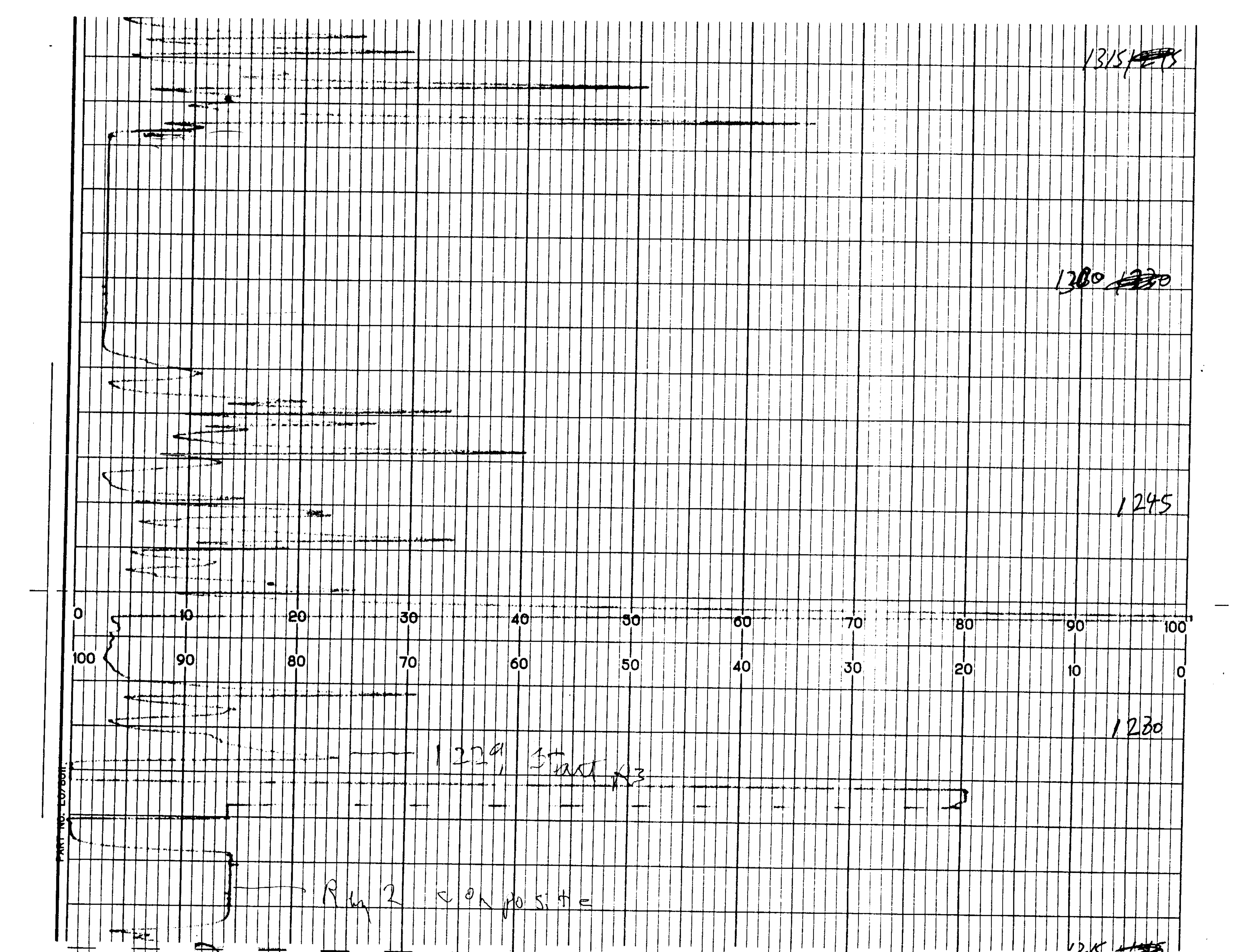
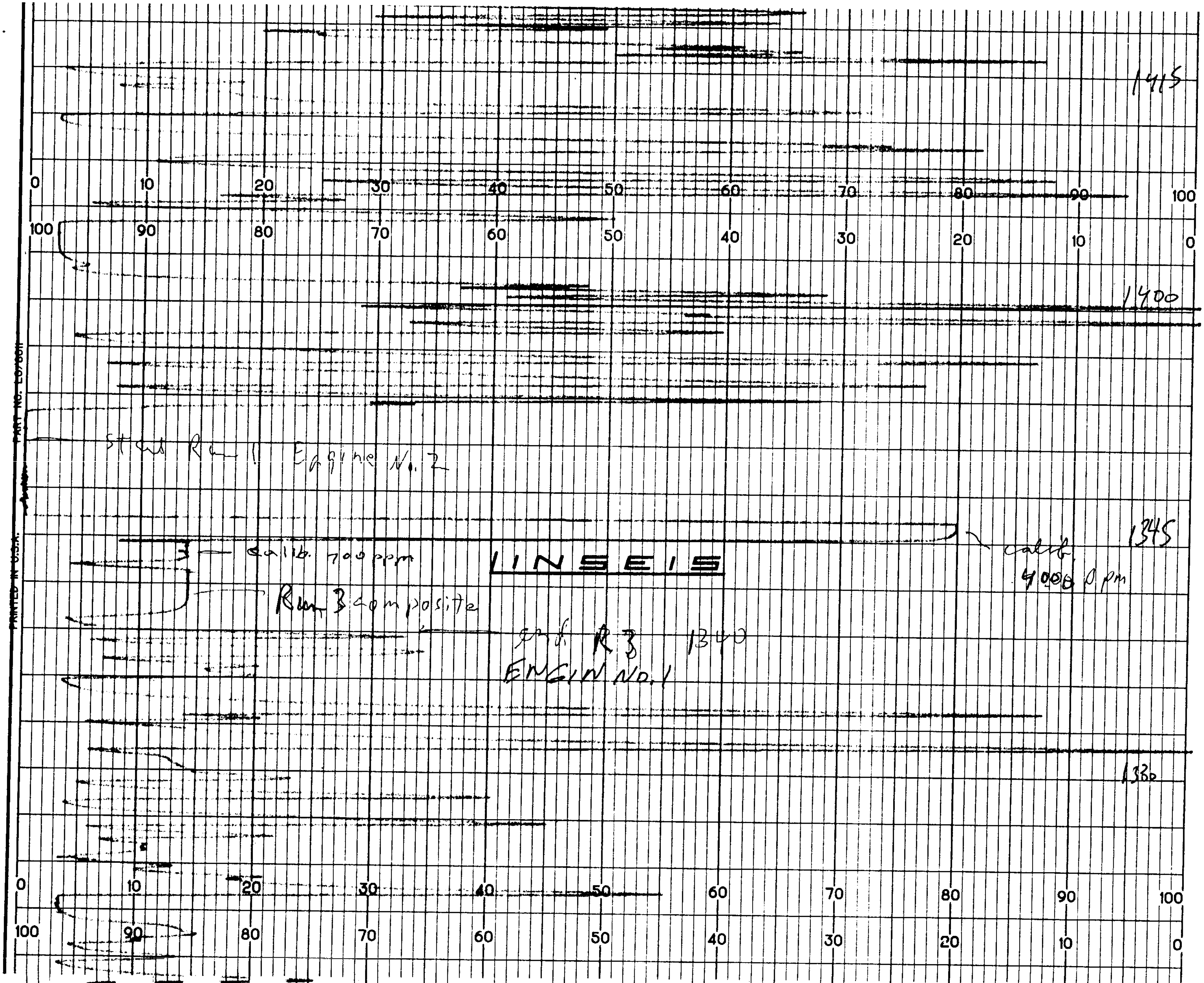
LINSEIS
end K2 @ 1216
1445
1430
1415
1200


PART NO. L07801
1315
1300
1245
1230
1229 Start R3
Run 2 composite
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0



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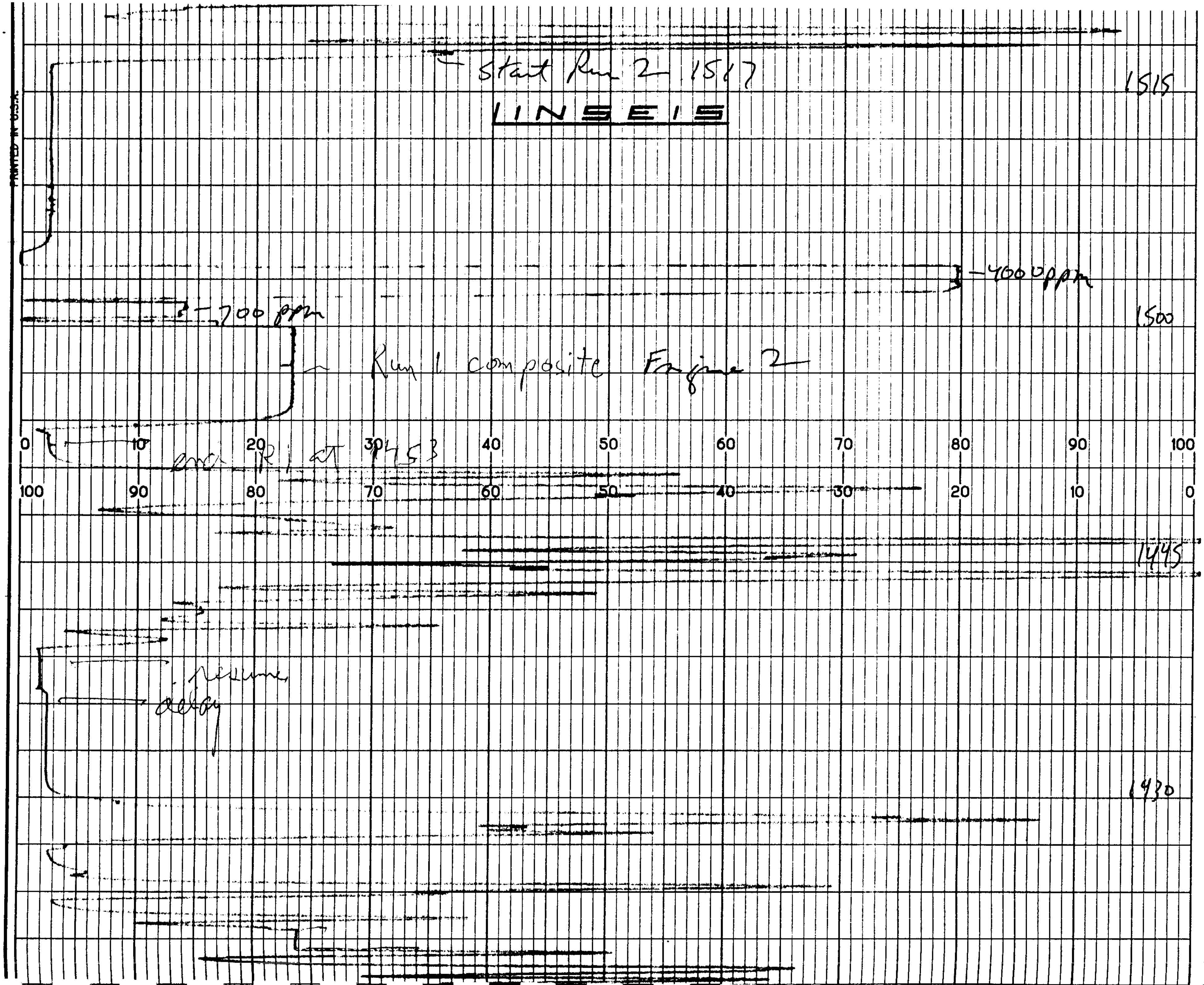
LINSEIS
1415
1400
Start Run 1 Engine No. 2
1345
calib. 700 ppm
calib. 4000 ppm
Run 3 composite
end R3 1340
ENGIN No. 1
1330



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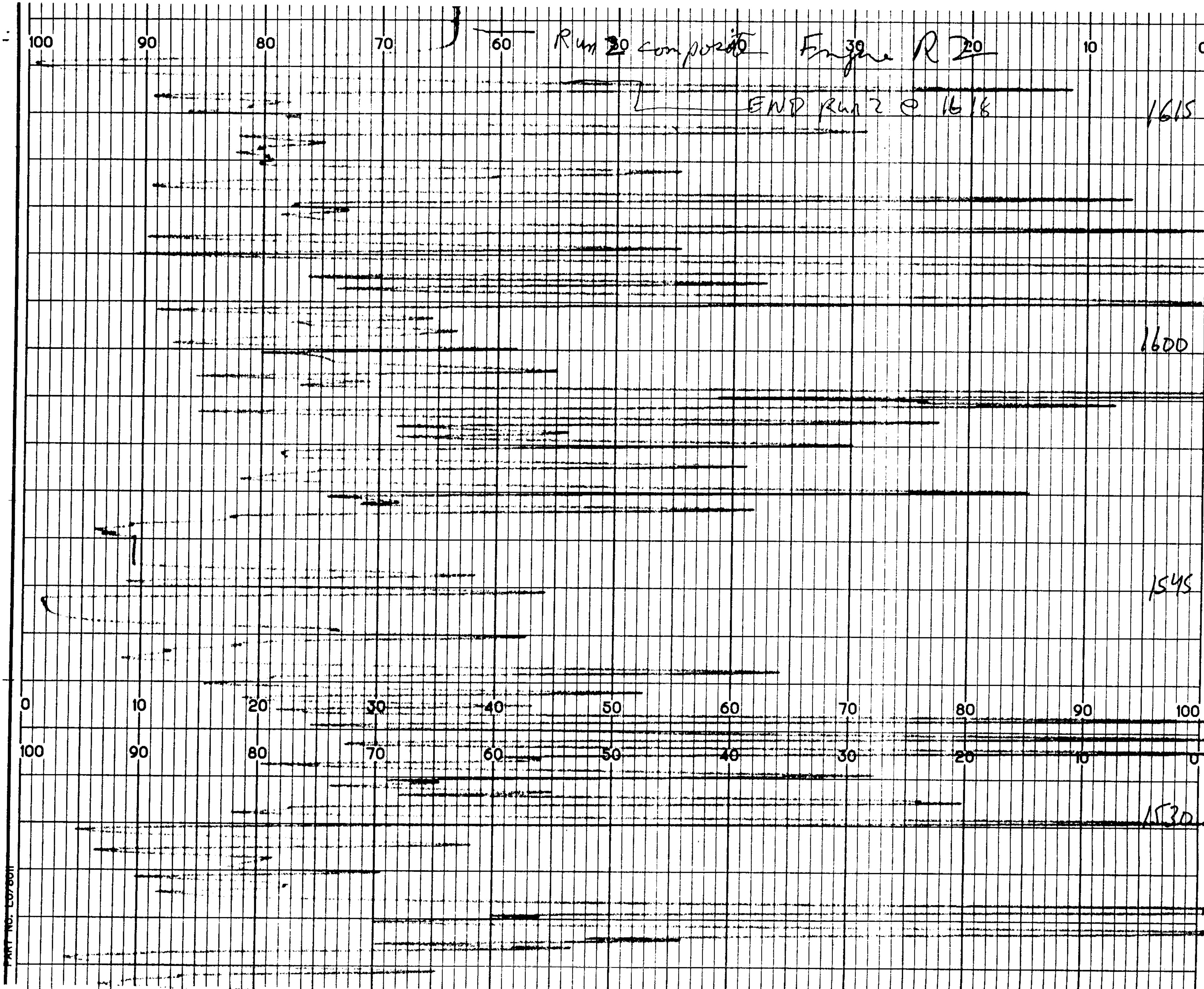
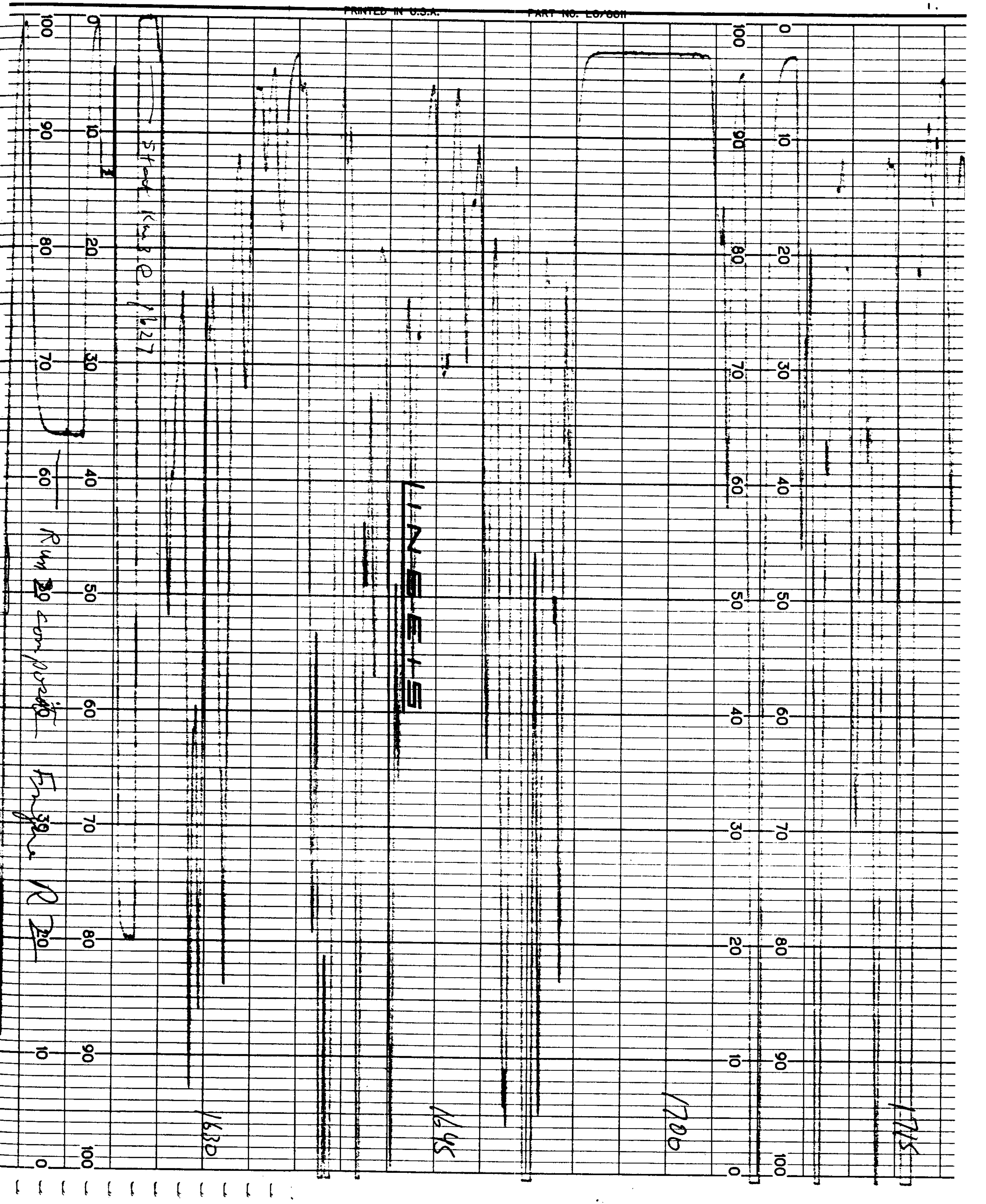
Start Run 2 1517
LINSEIS
1515
-400 ppm
-700 ppm
1500
Run 1 composite Engine 2
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0
end R1 at 1453
1445
resume
delay
1430


Run 20 composite
Engine R 20
END Run 2 @ 1618
1615
1600
1545
1530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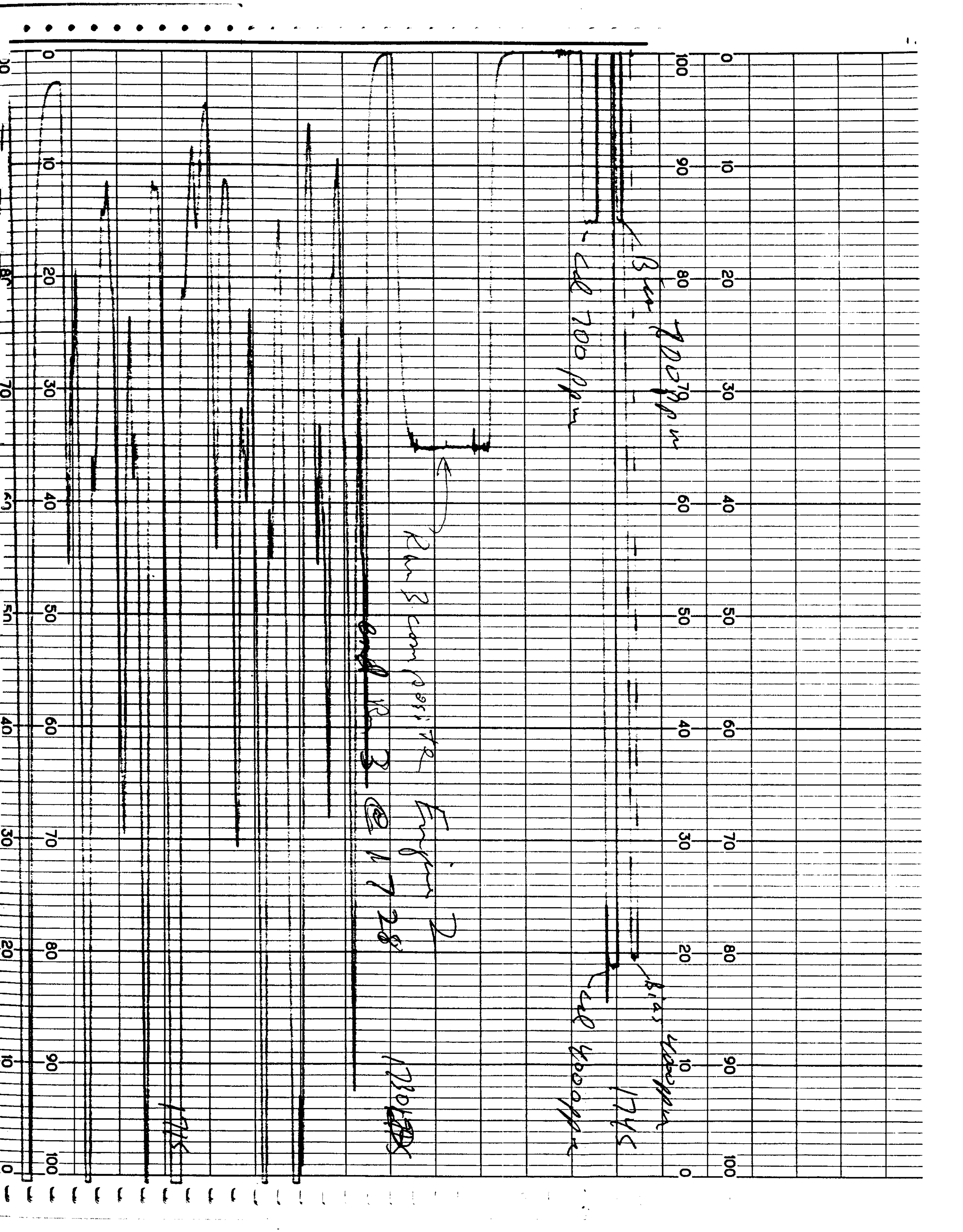
Start Run 2 @ 1627
Run 20 composite Fraction R 20
LINES
1630
1645
1700
1715



cal 700 ppm
cal 400 ppm
1745