

HE
18.5
.A34
no.
DOT-
TSC-
NHTSA-
78-16

REPORT NOS. DOT-TSC-NHTSA-78-16

HS-803 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES
IN THE UNITED STATES
Second Series - Report No. 5
1977 Ford 140 CID (2.3 Liters), 2V

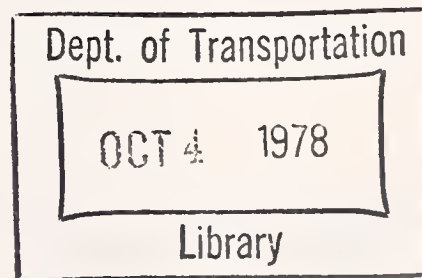
D. E. Koehler
T. W. Chamberlain
K. R. Stamper
W. F. Marshall

U.S. DEPARTMENT OF ENERGY
BARTLESVILLE ENERGY RESEARCH CENTER
P.O. Box 1398
Bartlesville OK 74003



MAY 1978

INTERIM REPORT



DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC
THROUGH THE NATIONAL TECHNICAL
INFORMATION SERVICE, SPRINGFIELD,
VIRGINIA 22161

Prepared for
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
Washington DC 20590

NOTICE

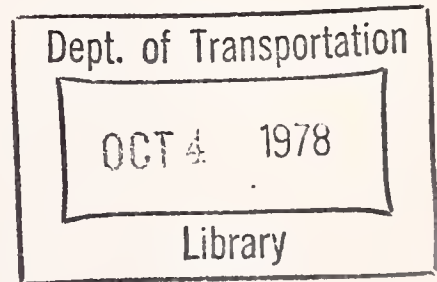
Work reported herein was done under sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

NOTICE

The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

18, 1
 DOT
 NHTSA
 78-16

1. Report No. HS-803 332		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES Second Series - Report No. 5 1977 Ford 140 CID (2.3 Liters), 2V				5. Report Date May 1978	
				6. Performing Organization Code	
7. Author(s) T. W. Chamberlain, D. E. Koehler, K. R. Stamper and W. F. Marshall				8. Performing Organization Report No. DOT-TSC-NHTSA-78-16 BERC/OP-77/57	
9. Performing Organization Name and Address U.S. Department of Energy* Bartlesville Energy Research Center P.O. Box 1398 Bartlesville OK 74003				10. Work Unit No. (TRAIS) HS827/R8402	
				11. Contract or Grant No. RA-76-23	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Research and Development Office of Passenger Vehicle Research Technology Assessment Division Washington DC 20590				13. Type of Report and Period Covered Interim Report November 1977	
				14. Sponsoring Agency Code	
15. Supplementary Notes *Interagency agreement with: U.S. Department of Transportation Transportation Systems Center Kendall Square Cambridge MA 02142					
16. Abstract Experimental data were obtained in dynamometer tests of a 1977 Ford 2.3 liter (140 CID) engine to determine fuel consumption and emissions (hydrocarbon, carbon monoxide, oxides of nitrogen) at steady-state engine-operating modes. The objective of the program is to obtain engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of the work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.					
17. Key Words Fuel Economy Auto Emissions			18. Distribution Statement DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 60	22. Price



PREFACE

This report, prepared by the U.S. Department of Energy, Bartlesville Energy Research Center, for the U.S. Department of Transportation, Transportation Systems Center, Energy Technology Branch, Cambridge MA, presents results of experimental work to obtain information on performance characteristics of an engine used in automobiles sold in the U.S. The engine used in this work is one of a series of 10 engines to be tested in the current program. This is the fifth of the reports to be published covering work with those engines.

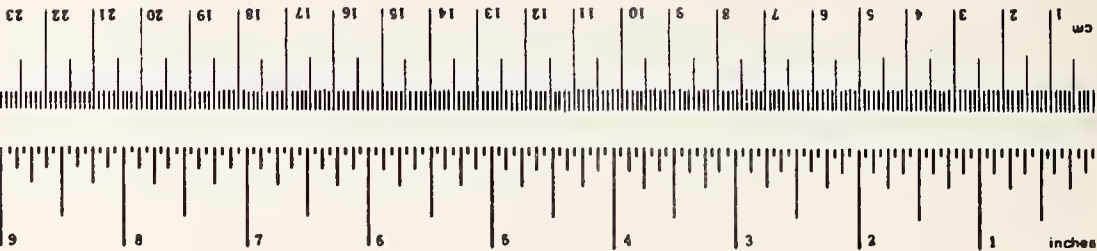
This project is funded by the National Highway Traffic Safety Administration, Office of Research and Development, Office of Passenger Vehicle Research, Technology Assessment Division.

Ralph G. Colello and James A. Kidd, Jr., of the U.S. Department of Transportation, Transportation Systems Center, are the technical monitors.

METRIC CONVERSION FACTORS

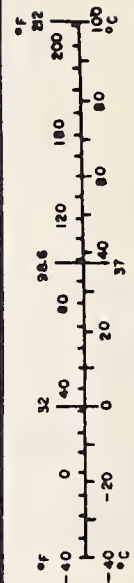
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
teaspoon	teaspoons	5	milliliters	ml
Tablespoon	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	square miles	mi ²
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



1. INTRODUCTION

Data acquired from steady-state tests of a 1977 Ford 2.3 liter (140 cubic-inch-displacement) engine are presented in this report. The test results are sufficient to establish maps of fuel consumption and emissions of carbon monoxide, unburned hydrocarbons, and oxides of nitrogen over the operating range of the engine.

The Ford 2.3 liter engine is one of a series of 10 engines to be tested in the current program. The steady-state maps of emissions and fuel economy generated by this study may be used to predict engine and emission control system performance for transient operation.

2. ENGINE TEST REPORT

A new mean-tolerance 1977 Ford 2.3 liter engine was acquired for this series of tests. The engine was mounted on a test stand and coupled to an eddy-current dynamometer. All engine accessories were included in the test stand installation except for the cooling fan and radiator. An alternator was mounted on the engine but was not connected to the electrical system. Emission control systems included exhaust-gas recirculation and oxidation catalyst. Table 1 contains the manufacturer's general specifications for the Ford 2.3 liter engine.

Prior to the start of the testing program, the engine was broken in at speeds and power settings comparable to normal vehicle operation. Table 2 contains details of the break-in schedule that was used. A single batch of unleaded, regular grade gasoline was used for the entire break-in period and test program. An analysis of the fuel appears in table 3.

Steady-state tests of the engine were made at the speed and load points indicated in table 4. The following data items were recorded at each test point:

- Test number
- Date
- Barometric pressure, mm Hg
- Dew point, °F
- Inlet air temperature, °F
- Speed, rpm
- Torque, lb-ft -- BLH strain gage load cell; Daytronics indicator
- Fuel rate, lb/hr -- Fluidyne positive displacement fuel flowmeter
- Ignition timing, °BTC
- Manifold vacuum, in. Hg
- Throttle angle, deg
- CO, pct -- Beckman NDIR
- CO₂, pct -- Beckman NDIR
- O₂, pct -- Beckman polarographic detector
- HC, ppmC -- Custom-built heated flame ionization detector
- NO_x, ppm -- Thermo-Electron chemiluminescent detector
- Oil temperature, °F
- Oil pressure, psig
- Coolant temperature, °F
- Exhaust temperature, °F
- Exhaust pressure, in. H₂O
- Intake manifold temperature, °F.

The following equations were used in calculating power, air/fuel ratio, absolute humidity, and mass emission rates of carbon monoxide (CO), unburned hydrocarbons (HC), and oxides of nitrogen (NO_x):

1. Partial pressure of water vapor in intake air (millimeters of mercury):

$$P = \exp \left[18.717 - \frac{7308.1}{393 + D} \right] ,$$

where D = dewpoint, °F.

2. Absolute humidity (grains moisture per pound dry air):

$$H = \frac{4347.8(P)}{B - P} ,$$

where B = barometric pressure, mm Hg.

3. Humidity correction factor (dimensionless):

$$K_H = \frac{1}{1 - 0.0047(H - 75)} .$$

Note: This factor is used to correct the NO_x mass emission rate to a standard humidity of 75 grains moisture per pound dry air.

4. Stoichiometric air/fuel ratio (dimensionless):

$$AF_s = \frac{69(2 + \frac{x}{2} - y)}{MW_{fuel}} ,$$

where x = hydrogen-carbon atomic ratio of fuel,
 y = oxygen-carbon atomic ratio of fuel,
 MW_{fuel} = fuel molecular weight per carbon atom,
 $= 12.01115 + 1.00797x + 15.9994y$.

5. Hydrogen concentration in raw exhaust (percent):

$$H_2 = \frac{x(CO)(CO + CO_2)}{2(CO + 3CO_2)} ,$$

where CO = carbon-monoxide concentration (percent),
 CO₂ = carbon-dioxide concentration (percent).

Note: This equation assumes a water-gas shift equilibrium constant

$$\frac{(CO)(H_2O)}{(CO_2)(H_2)} = 3.$$

6. Correction factor for emission concentrations from wet basis to dry basis (dimensionless):

$$C_w = 1 + \frac{(\frac{x}{2})(CO + CO_2) - H_2}{100}.$$

Note: In these tests only HC is measured on a wet basis. All other species are measured on a dry basis.

7. Air/fuel ratio (dimensionless):

$$AF = \frac{AF_s}{2 + \frac{x}{2} - y} \left[\frac{(1 + \frac{x}{2} - y)(CO) + (2 + \frac{x}{2} - y)(CO_2) + 2(O_2) + \frac{NO_x}{10^4} - H_2}{CO + CO_2 + C_w (\frac{HC}{10^4})} \right],$$

where O_2 = oxygen concentration (percent),
 NO_x = oxides of nitrogen (ppm),
 HC = unburned hydrocarbon concentration (ppmC).

8. Exhaust flow (pounds per hour):

$$M_{EX} = M_F(1 + AF).$$

where M_F = fuel flow rate (pounds per hour).

9. Carbon monoxide mass emission rate (grams per hour):

$$M_{CO} = \frac{M_{EX}}{C_w} \left(\frac{CO}{100} \right) \left(\frac{MW_{CO}}{MW_{EX}} \right) 453.59237,$$

where MW_{CO} = molecular weight of CO (=28.01115),
 MW_{EX} = molecular weight of exhaust gas (=28.967).

10. Unburned hydrocarbon mass emission rate (grams per hour):

$$M_{HC} = M_{EX} \left(\frac{HC}{10^6} \right) \left(\frac{MW_{HC}}{MW_{EX}} \right) 453.59237,$$

where MW_{HC} = molecular weight per carbon atom of HC,
 $= 12.01115 + 1.00797x + 15.9994y$.

11. Oxides of nitrogen mass emission rate (grams per hour):

$$i_{\text{NO}_x} = \frac{M_{\text{EX}}}{C_w} \left(\frac{\text{NO}_x}{10^6} \right) \left(\frac{MW_{\text{NO}_x}}{MW_{\text{EX}}} \right) (K_H) 453.59237,$$

where i_{NO_x} = molecular weight of NO_2 (=46.0028).

12. Power (brake horsepower corrected to a standard barometric pressure of 736.6 mm Hg and a standard temperature of 85° F):

$$\text{HP} = \frac{N(T)}{5252.113} \left(\frac{736.6}{B - P} \right) \sqrt{\frac{t + 460}{545}},$$

where N = engine speed (revolutions per minute),
T = brake torque (foot-pounds),
t = air temperature (°F).

3. DISCUSSION OF TEST RESULTS

The maximum torque and power outputs measured in these tests were in good agreement with the manufacturer's specifications (table 1). Emission rates of CO, HC, and NO_x were typical of modern spark ignition engines equipped with exhaust-gas-recirculation (EGR) systems and oxidation catalysts. The carburetor was set to provide a fuel-lean mixture during low power operation (figure 2), enabling the catalyst to control CO and HC effectively. At higher power levels, the air/fuel ratio tended to decrease, resulting in less effective catalytic treatment of CO and HC (figures 3 and 4). Oxides of nitrogen tended to reach a peak at about 60% of maximum power (figure 5). Beyond this power level, fuel rich engine operation tended to decrease NO_x emission rates. Fuel rate increased with increased BHP. See figure 6.

The data presented in this report are sufficient to establish steady-state maps of fuel consumption and emission rates for the 1977 Ford 2.3 liter engine.

4. CONCLUSIONS

The purpose of the experimental work reported here is to establish fuel consumption and emission rate data for this engine. Those data are presented in the tables accompanying this report.

TABLE 1. MANUFACTURER'S ENGINE SPECIFICATIONS

Displacement, cu. in.....	140
Maximum horsepower, bhp @ 5,000 rpm.....	92
Maximum torque, lb-ft @ 3,000 rpm.....	121
Bore and stroke, in.....	3.78 x 3.126
Configuration.....	in-line 4-cylinder
Compression ratio.....	9.0:1
Firing order.....	1-3-4-2
Ignition timing at idle speed, °BTDC @ 600 rpm.....	20
Block material.....	cast iron
Head material.....	cast iron
Number of crankshaft main bearings.....	5
Number of compression rings/piston.....	2
Number of oil rings/piston.....	1
Cam drive type.....	belt and sprocket
Valve lift:	
Intake, in.....	0.3997
Exhaust, in.....	0.3997
Valve timing:	
Intake opens, °BTC	22
Intake closes, °ABC.....	66
Exhaust opens, °BBC.....	64
Exhaust closes, °ATC.....	24
Spark plug gap, in.....	0.034
Engine weight, lb.....	250
Exhaust-gas-recirculation system:	
Valve type.....	tapered stem
Control signal.....	ported vacuum
Point of discharge.....	intake manifold
Crankcase emission control:	
Control method.....	positive crankcase ventilation
Point of discharge.....	intake manifold
Carburetor type.....	2V downdraft
Distributor specifications:	
Centrifugal advance, begins, ° @ 250 rpm.....	0
Centrifugal advance, intermediate, ° @ 1,000 rpm.....	0.5
Centrifugal advance, full, ° @ 2,500 rpm.....	6
Vacuum advance, begins, ° @ 2 in. Hg.....	10
Vacuum advance, maximum, ° @ 16 in. Hg.....	22
Carburetor number.....	D7EE-J4
EGR valve number.....	XE-196500-1115E
Distributor number.....	D7EE-12127-CA

TABLE 2. ENGINE BREAK-IN SCHEDULE

Simulated Vehicle Speed, mph	Engine Speed, rpm	Manifold Vacuum, in. Hg	Fraction of Time in Mode
0	Idle	14.5	1/10
20	1,300	15.2	"
30	1,600	12.2	"
40	2,050	12.8	"
50	2,450	11.8	"
60	2,950	10.4	"
25	1,400	13.7	"
35	1,800	12.4	"
45	2,225	12.4	"
55	2,650	11.5	"

Mileage per cycle = 90.

Total mileage accumulated over 42.5-hour break-in period = 1,530.

TABLE 3. FUEL SPECIFICATIONS

Fuel No.....	7619
Research octane No.....	91.5
Motor octane No.....	83.5
Specific gravity.....	0.7161
API gravity, deg.....	66.1
Distillation, °F:	
10 pct evaporated.....	128
50 pct ".....	218
95 pct ".....	404
100 pct ".....	417
Reid vapor pressure, psig.....	9.5
FIA analysis, pct:	
Aromatics.....	6
Olefins.....	17
Paraffins.....	77
Sulfur, pct.....	0.024
Lead, g/gal.....	Trace
Hydrogen/carbon atomic ratio.....	2.040
Oxygen/carbon atomic ratio.....	0.000

TABLE 4. TEST-NUMBER CROSS-REFERENCE INDEX

Pct Full Load	Engine Speed, rpm										
	650	750	1,000	1,500	2,000	2,500	3,000	3,500	4,300	5,000	5,300
0		1 72	14 78	22 83	30 88	31 39	47 98	103	63 104	71 113	
10			13 77	21 82	29 87	38 92	46 97	55 102	62 105	70 112	
25			12 76	20 81	28 86	37 91	45 96	54 101	61 106	69 111	
40			11 74	19 80	27 85	36 90	44 95	53 100	60 107	68 110	
60	4 73	2	10 114	18	26 178	35 178	43	52	59	67	
75			9 75	17 79	25 84	34 89	42 94	51 99	58 108	66 109	
90			8	16	24	33	41	50	57	65	
100	6	3	7	15	23	32	40	49	56	64	123

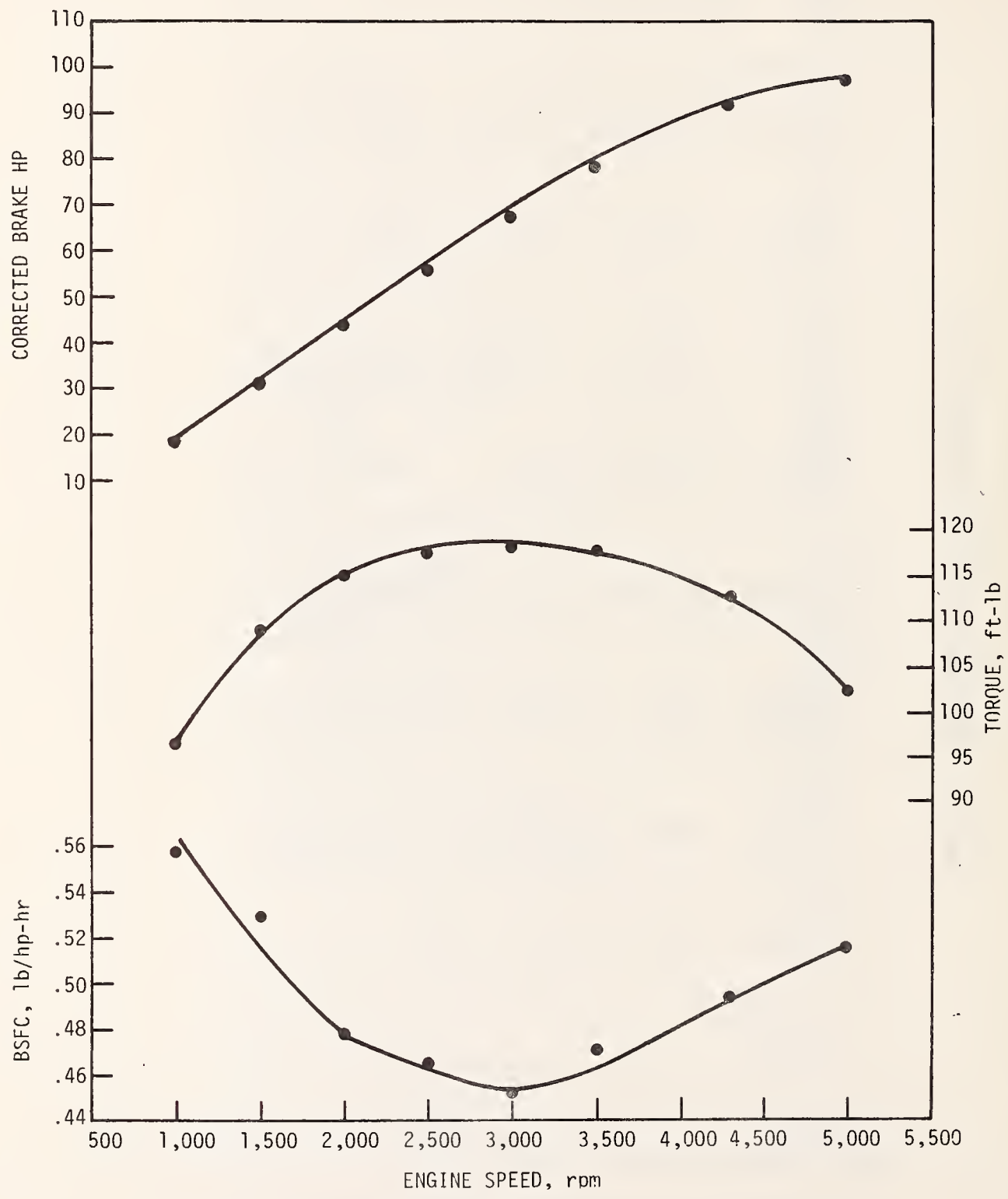


FIGURE 1. Brake Specific Fuel Consumption, Torque, and Brake Horsepower versus Engine rpm at Wide-Open-Throttle--Ford 2.3 liter Engine.

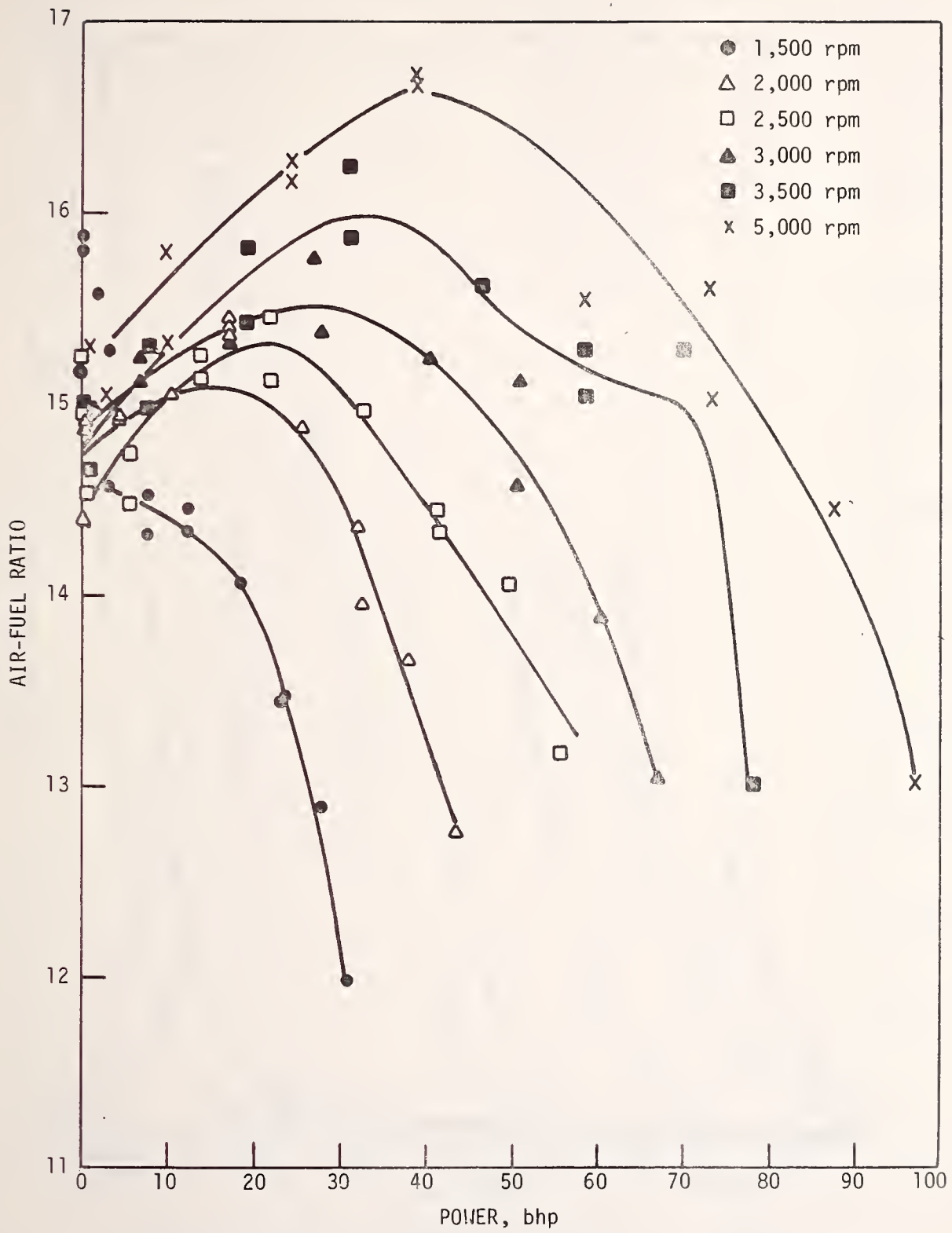


FIGURE 2. Air/Fuel Ratio versus Power at Various Speed and Load Conditions--Ford 2.3 liter Engine.

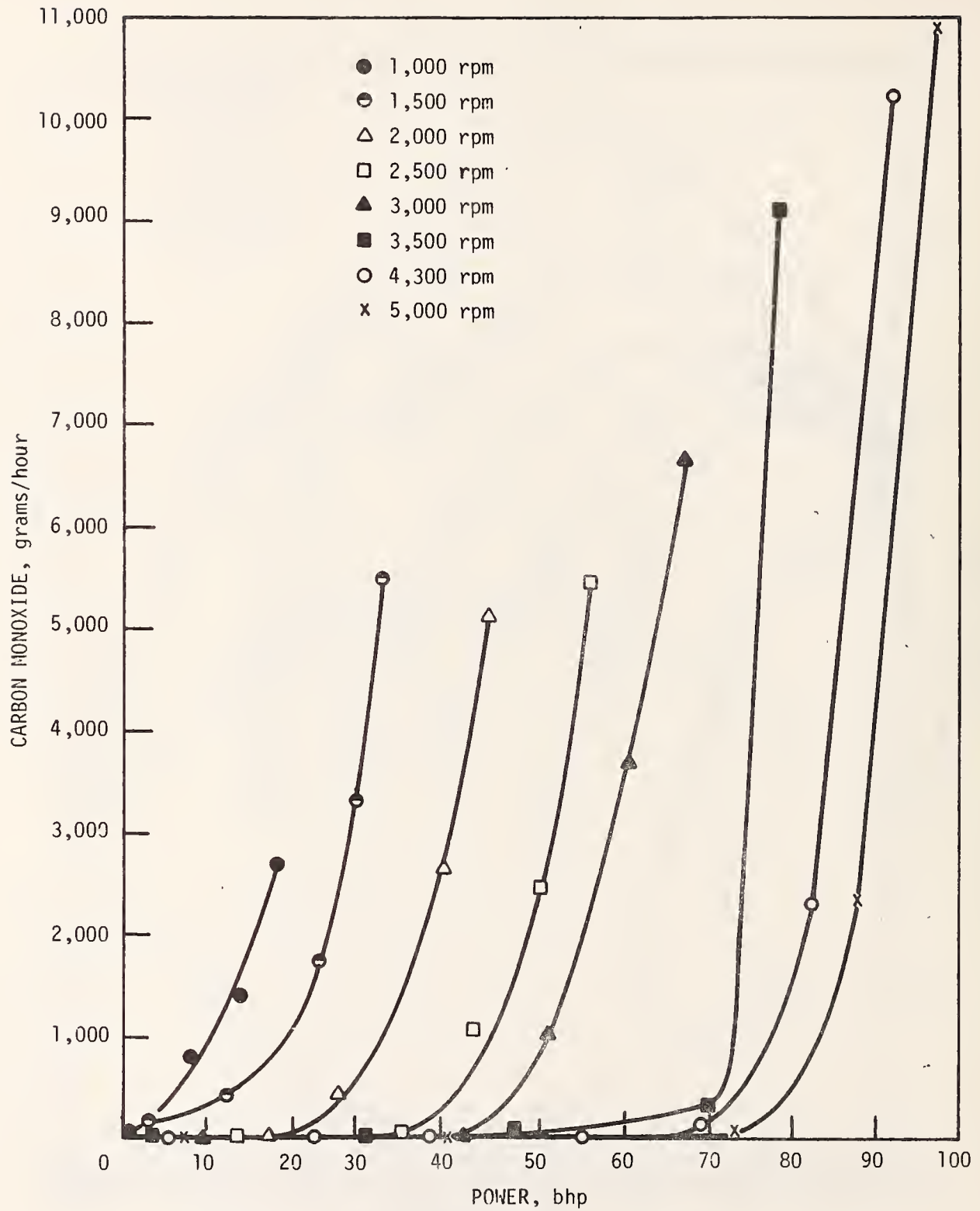


FIGURE 3. Carbon Monoxide Emissions versus Power at Various Speed and Load Conditions--Ford 2.3 liter Engine.

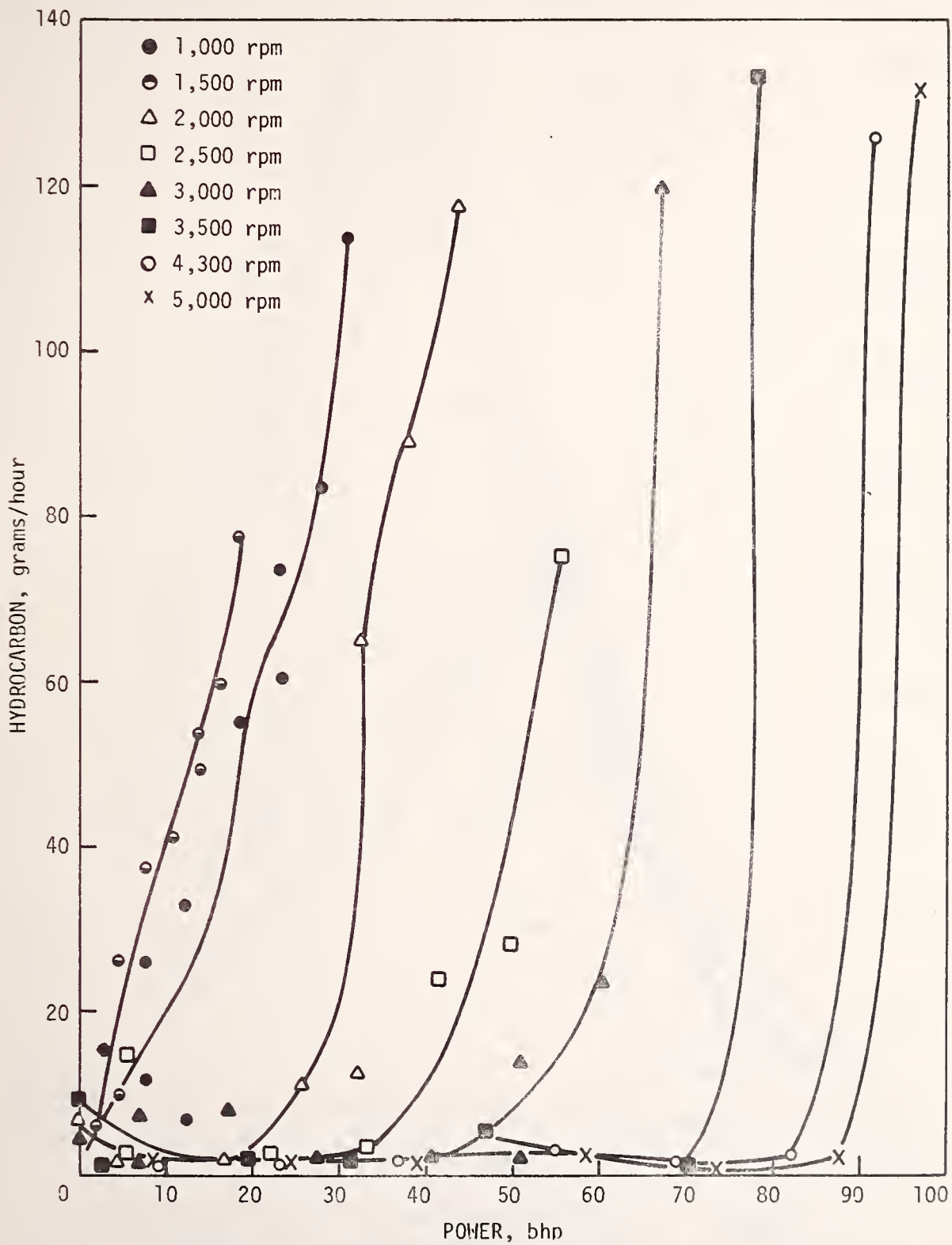


FIGURE 4. Hydrocarbon Emissions versus Power at Various Speed and Load Conditions-- Ford 2.3 liter Engine.

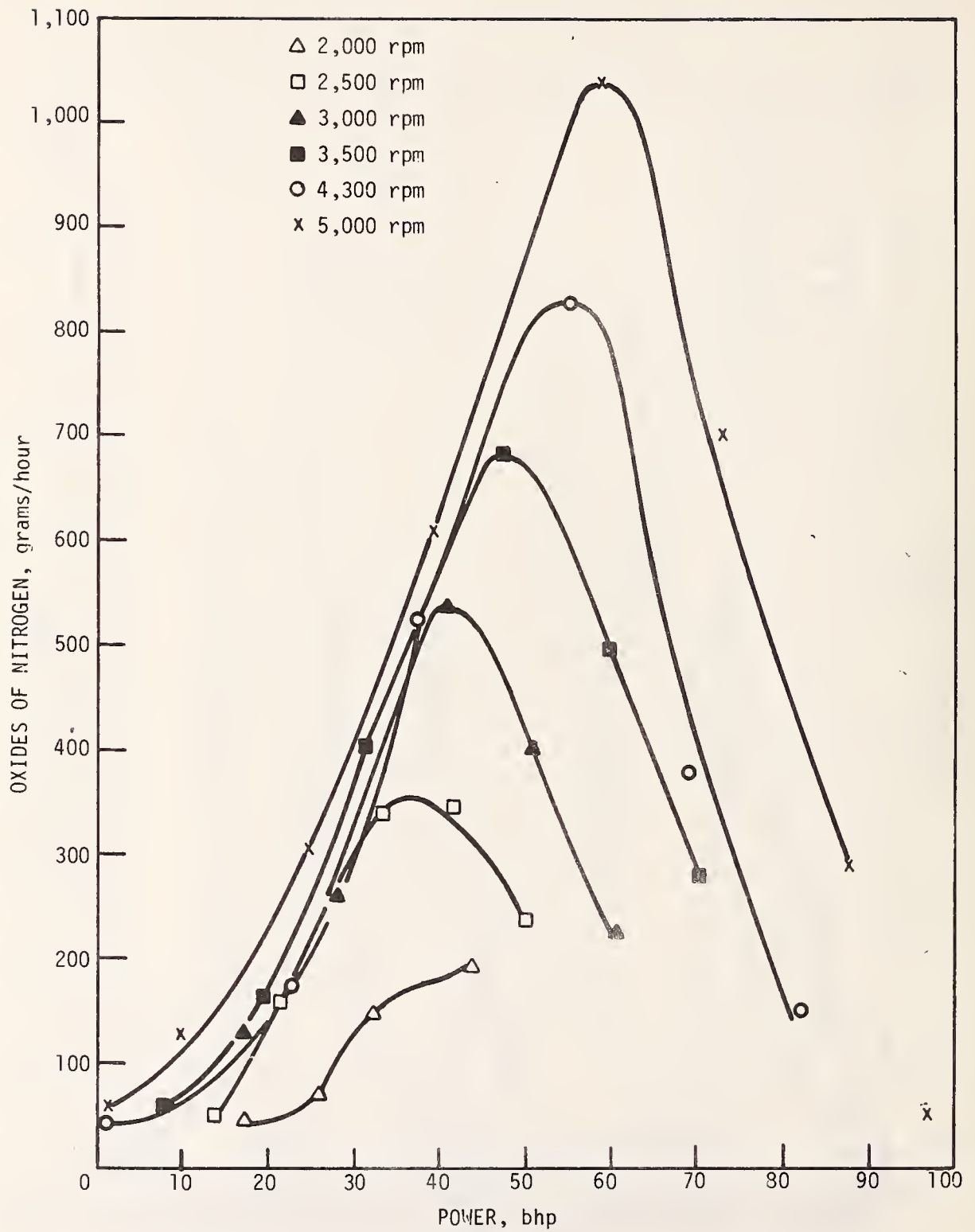


FIGURE 5. Oxides of Nitrogen Emissions versus power at Various Speed and Load Conditions-- Ford 2.3 liter Engine.

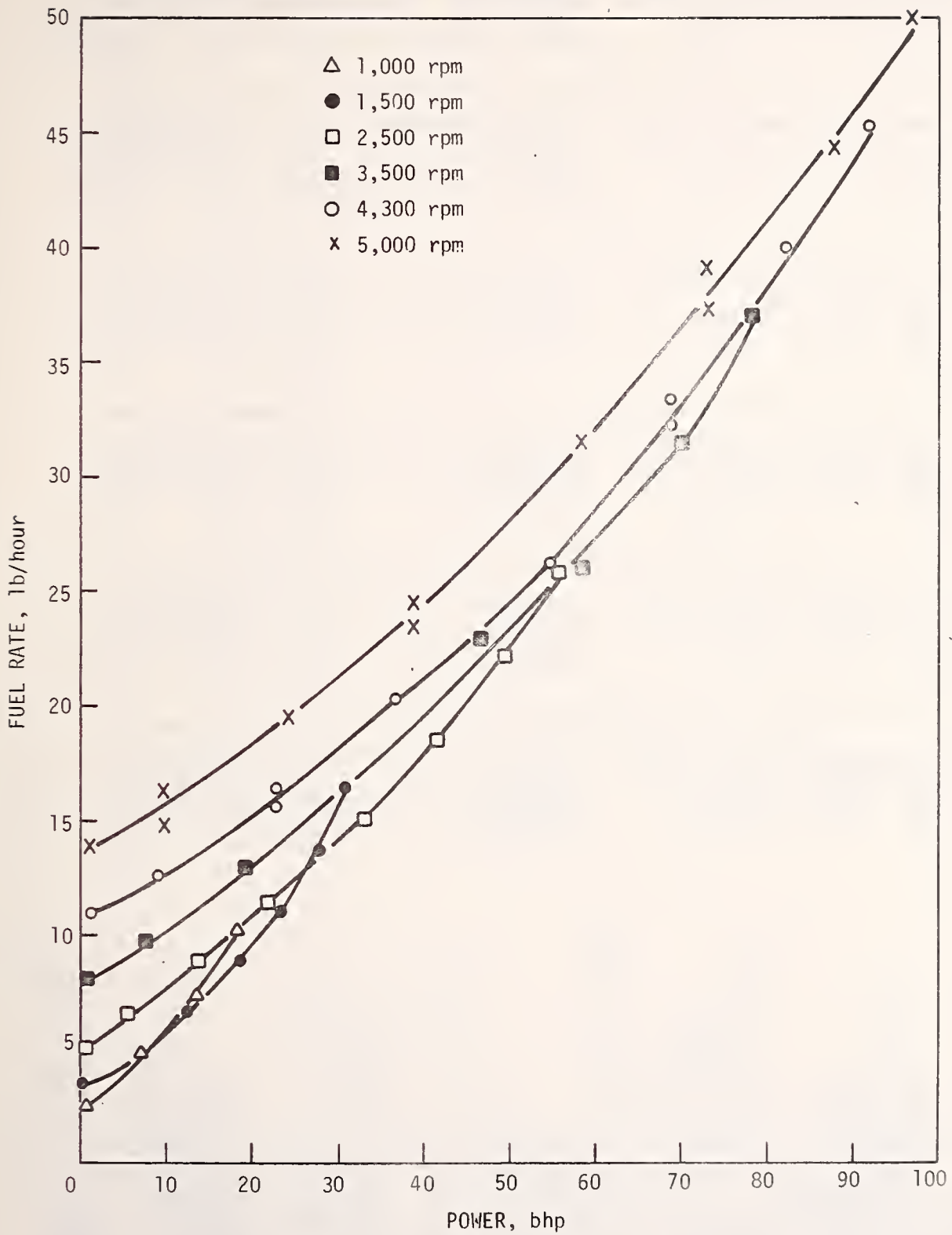


FIGURE 6. Fuel Rate versus Power at Various Speed and Load Conditions--Ford 2.3 liter Engine.

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619				
TEST NUMBER	1.1	2.1	2.2	3.1
TEST DATE	3/ 1/77	3/ 1/77	3/ 1/77	3/ 1/77
BAROMETER, MMHG	746.8	746.8	746.8	746.8
HUMIDITY, GRAINS/LB	36	34	34	34
TEMPERATURE, F	76	76	76	76
ENGINE SPEED, RPM	750	750	750	750
TORQUE, FT-LB	1.0	10.0	10.0	20.0
POWER, BHP*	.1	1.4	1.4	2.8
FUEL RATE, LB/HR	1.9	1.9	2.1	2.5
IGNITION TIMING, DEG BTDC	20.0	20.0	20.0	20.0
MANIFOLD VACUUM, IN HG	18.5	16.0	16.0	16.0
THROTTLE ANGLE, DEG	.0	.0	.0	.0
INTAKE MAN. TEMP., F	118	118	118	108
CONCENTRATIONS, DRY BASIS				
CO, %	.1731	.2969	.0015	.3706
CO2, %	12.48	13.78	14.38	14.21
O2, %	3.97	1.74	1.32	1.05
HC, PPMC	6330	2258	169	2605
NOX, PPM	900	69	68	194
AIR/FUEL RATIO	16.99	15.63	15.70	15.09
EMISSION RATES, G/HR				
CO	22.4	35.1	.2	56.3
HC	41.2	13.4	1.2	19.9
NOX+	16.2	1.1	1.3	4.1
OIL TEMPERATURE, F	183	178	178	180
OIL PRESSURE, PSI	41	39	39	41
COOLANT TEMPERATURE, F	185	178	178	180
EXHAUST PRESSURE, IN. H2O	.0	.0	.0	.0
EXHAUST TEMPERATURE, F	668	588	634	600

* CORRECTED SAE J8168
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE:	7619				
TEST NUMBER	4.1	4.2	5.1	5.2	6.1
TEST DATE	3/ 1/77	3/ 1/77	3/ 1/77	3/ 1/77	3/ 2/77
BAROMETER, MMHG	746.8	746.8	746.8	746.8	746.4
HUMIDITY, GRAINS/LB	34	34	34	34	48
TEMPERATURE, F	77	77	76	76	77
ENGINE SPEED, RPM	650	650	650	650	650
TORQUE, FT-LB	13.3	13.3	20.0	20.0	30.0
POWER, BHP*	1.6	1.6	2.4	2.4	3.7
FUEL RATE, LB/HR	1.9	1.9	2.1	2.1	2.6
IGNITION TIMING, DEG BTDC	20.0	20.0	20.0	20.0	20.0
MANIFOLD VACUUM, IN HG	16.0	16.0	15.5	15.5	13.7
THROTTLE ANGLE, DEG	.0	.0	.0	.0	1.8
INTAKE MAN. TEMP., F	116	116	111	112	104
CONCENTRATIONS, DRY BASIS					
CO, %	.1391	.0040	.2932	.0056	1.2077
CO2, %	13.45	13.92	14.06	14.65	14.39
O2, %	2.37	1.89	1.44	.78	.11
HC, PPMC	2985	217	2959	219	2548
NOX, PPM	74	67	142	5	167
AIR/FUEL RATIO	16.11	16.12	15.35	15.31	14.14
EMISSION RATES, G/HR					
CO	17.0	.5	36.9	.7	100.0
HC	19.3	1.4	19.3	1.4	19.1
NOX+	1.2	1.2	2.6	.1	3.6
OIL TEMPERATURE, F	180	180	177	177	178
OIL PRESSURE, PSI	36	36	36	36	50
COOLANT TEMPERATURE, F	178	178	178	179	180
EXHAUST PRESSURE, IN. H2O	.0	.0	1.0	.0	3.0
EXHAUST TEMPERATURE, F	567	526	552	504	489

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

7.1
3/ 2/77
746.4
48
79
1000
97.0
18.3
10.2
22.0
.1
79.0
64

7.2
3/ 2/77
746.4
48
79
1000
97.0
18.3
10.2
22.0
.1
79.0
64

8.1
3/ 2/77
746.4
49
77
1000
87.0
16.4
8.5
21.5
2.9
21.5
73

8.2
3/ 2/77
746.4
49
78
1000
87.0
16.4
8.5
21.5
2.9
21.5
73

9.1
3/ 2/77
746.4
55
76
1000
73.0
13.8
7.2
29.0
5.0
15.2
93

9.2
3/ 2/77
746.4
52
78
1000
73.0
13.8
7.3
29.0
4.9
15.1
95

CONCENTRATIONS, DRY BASIS

CO, %
CO2, %
O2, %
HC, PPMC
NOX, PPM

5.7300
10.76
.45
3077
1364

3.4634
12.80
.21
2864
540

3.0960
13.01
.01
2577
480

3.1500
11.90
.38
2853
490

3.5500
11.78
.25
2698
370

AIR/FUEL RATIO

12.43

12.58

13.27

13.31

13.39

13.16

EMISSION RATES, G/HR

CO
HC
NOX+

3006.7
81.1
104.4

2694.3
77.7
87.9

1595.8
66.3
36.5

1430.0
59.9
32.5

1252.1
56.9
29.3

1408.2
53.8
21.8

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

200
60
184
11.0
872

200
60
184
7.0
792

192
63
184
10.0
899

192
63
184
6.0
749

171
63
184
8.0
815

194
63
183
5.0
705

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE:	7619				
TEST NUMBER	10.1	10.2	11.1	11.2	12.1
TEST DATE	3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77	3/ 9/77
BAROMETER, MMHG	746.4	746.4	746.4	746.4	740.3
HUMIDITY, GRAINS/LB	53	53	53	53	48
TEMPERATURE, F	77	77	77	77	80
ENGINE SPEED, RPM	1000	1000	1000	1000	1000
TORQUE, FT-LB	57.0	58.0	38.8	38.8	24.0
POWER, BHP*	10.8	11.0	7.3	7.3	4.6
FUEL RATE, LB/HR	6.0	5.9	4.8	4.8	3.7
IGNITION TIMING, DEG BTDC	36.0	36.0	39.0	39.0	20.0
MANIFOLD VACUUM, IN HG	8.0	8.0	13.0	13.0	16.5
THROTTLE ANGLE, DEG	10.6	10.6	6.6	6.6	3.8
INTAKE MAN. TEMP., F	106	106	91	91	104

CONCENTRATIONS, DRY BASIS

CO, %	3.3400	3.1100	4.0000	4.0740	1.6959
CO2, %	11.66	11.78	11.33	11.55	13.42
O2, %	.67	.40	.65	.43	.35
HC, PPMC	2792	2507	2897	2832	2754
NOX, PPM	399	370	525	623	220
AIR/FUEL RATIO	13.49	13.43	13.19	13.06	14.04

EMISSION RATES, G/HR

CO	1118.9	1018.6	1053.3	1060.5	365.0
HC	47.0	41.2	38.3	37.0	29.8
NOX+	19.9	18.1	20.6	24.2	6.9
OIL TEMPERATURE, F	192	192	191	191	193
OIL PRESSURE, PSI	45	45	45	45	45
COOLANT TEMPERATURE, F	183	183	183	183	184
EXHAUST PRESSURE, IN. H2O	6.0	5.0	5.0	4.0	3.0
EXHAUST TEMPERATURE, F	784	655	721	600	612

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE:	7619				
TEST NUMBER	13.1	14.1	14.2	15.1	15.2
TEST DATE	3/ 9/77	3/ 9/77	3/ 9/77	3/10/77	3/10/77
BAROMETER, MMHG	740.3	740.3	740.3	734.2	734.2
HUMIDITY, GRAINS/LB	48	48	48	59	59
TEMPERATURE, F	79	79	79	81	81
ENGINE SPEED, RPM	1000	1000	1000	1500	1500
TORQUE, FT-LB	10.0	10.0	10.0	107.0	107.0
POWER, BHP*	1.9	1.9	1.9	31.0	31.0
FUEL RATE, LB/HR	2.7	2.3	2.4	16.4	16.4
IGNITION TIMING, DEG BTDC	20.0	20.0	20.0	20.0	20.0
MANIFOLD VACUUM, IN HG	18.1	19.7	19.7	19.7	19.7
THROTTLE ANGLE, DEG	2.0	1.1	1.1	79.0	79.0
INTAKE MAN. TEMP., F	110	117	117	60	60

CONCENTRATIONS, DRY BASIS

CO, %	.3986	.2328	.0009	6.5700	6.7300
CO2, %	13.83	13.65	13.78	10.53	10.68
O2, %	.93	1.38	1.40	.19	.19
HC, PPMC	1853	1539	70	2871	2775
NOX, PPM	128	62	86	548	550

AIR/FUEL RATIO

	15.08	15.51	15.80	11.99	11.98
--	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	65.9	34.6	.1	5377.1	5492.3
HC	15.4	11.5	.5	118.0	113.7
NOX+	3.1	1.3	1.9	68.7	68.8

OIL TEMPERATURE, F	190	190	190	210	210
OIL PRESSURE, PSI	45	45	45	45	45
COOLANT TEMPERATURE, F	185	184	184	187	187
EXHAUST PRESSURE, IN. H2O	4.0	2.0	1.0	19.0	10.0
EXHAUST TEMPERATURE, F	713	705	555	1081	913

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE:	7619				
TEST NUMBER	16.1	17.1	17.2	18.1	18.2
TEST DATE	3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77
BAROMETER, MMHG	742.4	742.4	742.4	742.4	742.4
HUMIDITY, GRAINS/LB	58	58	58	58	58
TEMPERATURE, F	81	81	83	81	81
ENGINE SPEED, RPM	1500	1500	1500	1500	1500
TORQUE, FT-LB	98.0	81.0	81.0	65.0	65.0
POWER, BHP*	28.0	23.2	23.2	18.6	18.6
FUEL RATE, LB/HR	13.7	11.1	11.0	8.9	8.9
IGNITION TIMING, DEG BTDC	23.0	31.0	31.0	36.0	36.0
MANIFOLD VACUUM, IN HG	3.0	5.5	5.5	7.5	7.5
THROTTLE ANGLE, DEG	30.5	22.0	22.0	17.0	17.0
INTAKE MAN. TEMP., F	67	83	83	108	108

CONCENTRATIONS, DRY BASIS

CO, %	4.4750	3.3400	3.1900	1.8900	1.7900
CO2, %	11.33	11.90	12.13	12.62	12.88
O2, %	.52	.52	.38	.65	.38
HC, PPMC	2479	2456	2402	2487	2137
NOX, PPM	570	755	725	898	745

AIR/FUEL RATIO

	12.98	13.46	13.44	14.16	14.06
--	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	3279.8	2057.0	1950.1	979.4	919.8
HC	91.2	75.9	73.7	64.7	55.2
NOX+	63.7	70.9	67.5	70.9	58.3
OIL TEMPERATURE, F	200	207	207	207	207
OIL PRESSURE, PSI	50	50	50	50	50
COOLANT TEMPERATURE, F	185	184	184	184	184
EXHAUST PRESSURE, IN. H2O	16.0	12.0	9.0	10.0	8.0
EXHAUST TEMPERATURE, F	1085	1033	883	1018	868

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

	19.1	19.2	20.1	20.2	21.1	21.2
TEST NUMBER	3/ 2/77	3/ 2/77	3/ 9/77	3/ 9/77	3/ 2/77	3/ 2/77
TEST DATE	742.4	742.4	740.3	740.3	742.4	742.4
BAROMETER, MMHG	58	58	48	48	58	58
HUMIDITY, GRAINS/LB	72	72	80	80	72	72
TEMPERATURE, F	1500	1500	1500	1500	1500	1500
ENGINE SPEED, RPM	43.0	43.6	27.3	27.3	10.9	10.9
TORQUE, FT-LB	12.2	12.4	7.8	7.8	3.1	3.1
POWER, BHP*	6.6	6.5	5.3	5.4	3.9	3.9
FUEL RATE, LB/HR	44.0	44.0	42.0	42.0	30.0	30.0
IGNITION TIMING, DEG BTDC	12.0	12.0	17.3	17.3	19.8	19.8
MANIFOLD VACUUM, IN HG	10.5	10.5	7.5	7.5	4.7	4.7
THROTTLE ANGLE, DEG	135	135	91	91	94	94
INTAKE MAN. TEMP., F						

CONCENTRATIONS, DRY BASIS

CO, %	1.3900	1.2800	1.2423	.9678	1.1600	.8649
CO2, %	12.88	13.14	13.63	13.81	13.14	13.40
O2, %	.80	.40	.38	.09	.70	.43
HC, PPMC	2806	1702	2610	1631	2238	1314
NOX, PPM	473	350	1647	1252	173	135

AIR/FUEL RATIO

	14.44	14.33	14.31	14.32	14.53	14.57
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	543.9	492.3	388.9	306.3	266.6	199.2
HC	55.1	32.9	41.0	25.9	25.8	15.2
NOX+	28.2	20.5	75.4	57.9	6.1	4.7

OIL TEMPERATURE, F	204	204	197	197	197	197
OIL PRESSURE, PSI	50	50	50	50	50	50
COOLANT TEMPERATURE, F	182	183	187	187	180	180
EXHAUST PRESSURE, IN. H2O	6.0	5.0	5.0	4.0	4.0	3.0
EXHAUST TEMPERATURE, F	915	814	855	710	831	647

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

22.1
3/28/77
740.3
48
80
1500
.5
.1
3.6
20.0
20.8
4.5
101

23.1
3/9/77
734.2
57
82
2000
113.0
43.6
20.7
20.0
.4
79.0
63

23.2
3/10/77
734.2
57
82
2000
113.0
43.6
20.8
20.0
.4
79.0
63

24.1
3/2/77
742.4
58
72
2000
101.0
38.2
17.3
25.0
3.0
36.5
64

24.2
3/2/77
742.4
58
72
2000
101.0
38.2
17.3
25.0
3.0
36.5
64

CONCENTRATIONS, DRY BASIS

CO, % .6501
CO2, % 13.81
O2, % .58
HC, PPMC 9016
NOX, PPM 879
AIR/FUEL RATIO 14.06

4.2033
12.04
.33
2591
1336
13.05

4.6760
11.86
.08
2138
1161
12.76

2.6300
12.38
.55
2137
1295
13.83

2.7200
12.26
.32
1816
1150
13.66

EMISSION RATES, G/HR

CO 133.7
HC 93.1
NOX+ 26.4
OIL TEMPERATURE, F 199
OIL PRESSURE, PSI 45
COOLANT TEMPERATURE, F 183
EXHAUST PRESSURE, IN. H2O 2.0
EXHAUST TEMPERATURE, F 839

4676.6
144.8
225.1
218
47
189
38.0
1263

5119.1
117.5
192.5
218
47
189
18.0
1092

2583.6
105.4
193.9
212
50
187
28.0
1246

2652.3
88.9
170.9
212
50
187
18.0
1056

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	25.1	26.1	26.2	27.1	27.2
TEST DATE	3/29/77	3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77
BAROMETER, MMHG	734.1	742.4	742.4	742.4	742.4
HUMIDITY, GRAINS/LB	50	58	58	58	58
TEMPERATURE, F	82	77	77	77	77
ENGINE SPEED, RPM	2000	2000	2000	2000	2000
TORQUE, FT-LB	84.7	67.8	67.8	45.2	45.2
POWER, BHP*	32.7	25.8	25.8	17.2	17.2
FUEL RATE, LB/HR	14.7	11.8	11.8	8.9	8.9
IGNITION TIMING, DEG BTDC	32.0	38.0	38.0	44.0	44.0
MANIFOLD VACUUM, IN HG	6.0	8.0	8.0	11.5	11.5
THROTTLE ANGLE, DEG	.0	21.6	21.6	15.6	15.6
INTAKE MAN. TEMP., F	84	97	97	121	121

CONCENTRATIONS, DRY BASIS

CO, %	1.8600	.9637	.5840	.5422	.0073
CO2, %	13.40	13.14	13.53	13.01	13.67
O2, %	.20	.81	.50	1.28	.83
HC, PPMC	2039	2190	303	2273	60
NOX, PPM	1662	1848	640	950	540

AIR/FUEL RATIO

AIR/FUEL RATIO	13.99	14.76	14.88	15.25	15.42
----------------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	1565.3	686.8	418.6	302.4	4.1
HC	86.2	78.4	10.9	63.7	1.7
NOX+	206.4	200.7	69.9	80.7	46.2

OIL TEMPERATURE, F	218	217	217	215	215
OIL PRESSURE, PSI	46	50	50	50	50
COOLANT TEMPERATURE, F	187	184	184	183	183
EXHAUST PRESSURE, IN. H2O	19.0	16.0	10.0	11.0	8.0
EXHAUST TEMPERATURE, F	1169	1137	995	1070	968

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

	28.1	28.2	29.1	29.2	30.1	30.2
TEST NUMBER	3/28/77	3/28/77	3/28/77	3/28/77	3/3/77	3/3/77
TEST DATE	740.3	740.3	740.3	740.3	736.2	736.2
BAROMETER, MMHG	48	48	48	48	47	47
HUMIDITY, GRAINS/LB	81	81	81	81	78	78
TEMPERATURE, F	2000	2000	2000	2000	2000	2000
ENGINE SPEED, RPM	28.0	28.2	11.3	11.3	.0	.0
TORQUE, FT-LB	10.7	10.8	4.3	4.3	.0	.0
POWER, BHP*	7.3	7.3	5.2	5.2	4.2	4.2
FUEL RATE, LB/HR	43.0	43.0	42.0	42.0	34.0	34.0
IGNITION TIMING, DEG BTDC	14.4	14.4	20.2	20.2	21.8	21.8
MANIFOLD VACUUM, IN HG	11.7	11.7	7.0	7.0	5.0	5.0
THROTTLE ANGLE, DEG	150	150	103	103	100	100
INTAKE MAN. TEMP., F						

CONCENTRATIONS, DRY BASIS

CO, %	.3327	.0169	.5593	.1225	1.0140	.8324
CO2, %	13.76	14.27	13.74	14.31	13.40	13.80
O2, %	.94	.39	.72	.23	.32	.05
HC, PPMC	1860	72	1899	89	1772	573
NOX, PPM	200	200	847	397	105	70

AIR/FUEL RATIO

	15.12	15.07	14.88	14.92	14.39	14.41
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	150.1	7.6	176.2	38.6	248.9	204.1
HC	42.2	1.6	30.0	1.4	21.8	7.1
NOX+	13.2	13.2	39.0	18.3	3.7	2.5

OIL TEMPERATURE, F	210	210	209	209	203	203
OIL PRESSURE, PSI	48	48	48	48	50	3
COOLANT TEMPERATURE, F	188	188	184	184	183	183
EXHAUST PRESSURE, IN. H2O	8.0	6.0	4.0	3.0	3.0	3.0
EXHAUST TEMPERATURE, F	1035	904	860	694	927	723

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE:	7619				
TEST NUMBER	31.1	32.1	32.2	33.1	33.2
TEST DATE	3/28/77	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77
BAROMETER, MMHG	740.3	736.1	736.2	736.2	736.2
HUMIDITY, GRAINS/LB	48	43	43	41	41
TEMPERATURE, F	80	82	83	83	83
ENGINE SPEED, RPM	2500	2500	2500	2500	2500
TORQUE, FT-LB	4	116.0	116.0	104.0	104.0
POWER, BHP*	2	55.6	55.7	49.9	49.9
FUEL RATE, LB/HR	4.8	25.8	25.9	22.2	22.2
IGNITION TIMING, DEG BTDC	45.0	23.0	23.0	23.0	23.0
MANIFOLD VACUUM, IN HG	22.2	6	6	2.4	2.4
THROTTLE ANGLE, DEG	7.0	79.0	79.0	47.0	47.0
INTAKE MAN. TEMP., F	98	65	65	64	64

CONCENTRATIONS, DRY BASIS

CO, %	.5796	3.7200	3.9000	2.0300	1.9300
CO2, %	13.66	12.13	12.25	13.13	13.53
O2, %	.71	.25	.10	.40	.10
HC, PPMC	1314	2379	1063	1950	437
NOX, PPM	272	1975	1975	2175	1325
AIR/FUEL RATIO	14.90	13.22	13.18	14.06	14.04

EMISSION RATES, G/HR

CO	171.2	5217.1	5469.9	2590.0	2451.7
HC	19.5	167.6	74.9	124.9	27.9
NOX+	11.7	395.8	395.8	393.8	238.9
OIL TEMPERATURE, F	213	235	235	232	232
OIL PRESSURE, PSI	50	50	50	52	52
COOLANT TEMPERATURE, F	186	188	188	188	188
EXHAUST PRESSURE, IN. H2O	3.0	66.0	31.0	57.0	27.0
EXHAUST TEMPERATURE, F	969	1401	1212	1391	1225

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	34.1	34.2	35.1	35.2	36.1	36.2
TEST DATE	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77
BAROMETER, MMHG	736.2	736.2	736.2	736.2	736.2	736.2
HUMIDITY, GRAINS/LB	43	43	43	43	41	41
TEMPERATURE, F	83	83	82	82	81	81
ENGINE SPEED, RPM	2500	2500	2500	2500	2500	2500
TORQUE, FT-LB	87.0	87.0	69.0	69.0	46.0	46.0
POWER, BHP*	41.8	41.8	33.1	33.1	22.0	22.0
FUEL RATE, LB/HR	18.6	18.6	15.1	15.0	11.1	11.1
IGNITION TIMING, DEG BTDC	33.0	33.0	41.0	41.0	46.0	46.0
MANIFOLD VACUUM, IN HG	5.0	5.0	7.9	7.9	12.2	12.2
THROTTLE ANGLE, DEG	34.0	34.0	26.0	26.0	19.0	19.0
INTAKE MAN. TEMP., F	78	78	92	92	116	116

CONCENTRATIONS, DRY BASIS

CO, %	1.7900	1.2000	.7380	.0584	.3600	.0112
CO2, %	13.40	13.66	13.80	14.77	14.07	14.63
O2, %	.40	.15	.70	.15	.85	.40
HC, PPMC	2182	1075	222	73	2163	92
NOX, PPM	2175	1912	2900	2600	1900	1700

AIR/FUEL RATIO

	14.15	14.33	15.02	14.96	15.06	15.12
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	1924.0	1306.9	681.5	53.3	245.2	7.6
HC	117.8	58.8	10.3	3.3	74.0	3.1
NOX+	334.0	297.5	382.6	338.9	183.7	164.4

OIL TEMPERATURE, F	234	234	230	230	226	224
OIL PRESSURE, PSI	52	52	52	52	50	50
COOLANT TEMPERATURE, F	187	187	186	186	185	186
EXHAUST PRESSURE, IN. H2O	40.0	20.0	30.0	15.0	17.0	9.0
EXHAUST TEMPERATURE, F	1289	1116	1232	1120	1127	974

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	37.1	37.2	38.1	38.2	39.1	39.2
TEST DATE	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77
BAROMETER, MMHG	736.2	736.2	736.2	736.2	736.2	736.2
HUMIDITY, GRAINS/LB	41	41	41	41	41	41
TEMPERATURE, F	80	80	80	80	80	80
ENGINE SPEED, RPM	2500	2500	2500	2500	2500	2500
TORQUE, FT-LB	29.0	29.0	11.6	11.6	.0	.1
POWER, BHP*	13.9	13.9	5.6	5.6	.0	.0
FUEL RATE, LB/HR	8.6	8.6	6.5	6.5	4.7	4.8
IGNITION TIMING, DEG BTDC	46.0	46.0	46.0	46.0	46.0	46.0
MANIFOLD VACUUM, IN HG	15.0	15.0	18.5	18.5	21.6	21.6
THROTTLE ANGLE, DEG	14.5	14.1	9.9	9.9	6.8	6.8
INTAKE MAN. TEMP., F	135	135	133	133	103	98

CONCENTRATIONS, DRY BASIS

CO, %	.5840	.0725	1.1200	1.0700	.8419	.2875
CO2, %	13.67	14.49	13.93	13.67	13.53	14.21
O2, %	1.13	.68	1.11	.73	1.37	.85
HC, PPMC	2230	67	2265	734	1372	65
NOX, PPM	550	158	171	61	275	138
AIR/FUEL RATIO	15.10	15.24	14.83	14.74	15.22	15.25

EMISSION RATES, G/HR

CO	311.1	38.8	436.8	419.8	247.8	85.5
HC	59.6	1.8	44.4	14.5	20.3	1.0
NOX+	41.6	12.0	9.5	3.4	11.5	5.8
OIL TEMPERATURE, F	217	217	215	215	213	212
OIL PRESSURE, PSI	55	55	54	54	54	54
COOLANT TEMPERATURE, F	186	186	182	182	182	181
EXHAUST PRESSURE, IN. H2O	10.0	7.0	6.0	5.0	5.0	4.0
EXHAUST TEMPERATURE, F	1087	921	1039	9844	972	793

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE:	7619				
TEST NUMBER	40.1	40.2	41.1	41.2	42.1
TEST DATE	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
BAROMETER, MMHG	742.0	742.0	742.0	742.0	742.0
HUMIDITY, GRAINS/LB	39	39	43	41	38
TEMPERATURE, F	80	80	82	82	83
ENGINE SPEED, RPM	3000	3000	3000	3000	3000
TORQUE, FT-LB	118.0	118.0	106.0	106.0	89.0
POWER, BHP*	67.2	67.2	60.5	60.5	50.8
FUEL RATE, LB/HR	31.7	30.4	27.3	27.3	22.0
IGNITION TIMING, DEG BTDC	26.0	26.0	25.0	25.0	35.0
MANIFOLD VACUUM, IN HG	.8	.8	2.4	2.4	5.1
THROTTLE ANGLE, DEG	79.5	79.5	53.0	53.0	38.0
INTAKE MAN. TEMP., F	62	62	63	63	78

CONCENTRATIONS, DRY BASIS

CO, %	4.1800	4.0900	2.2700	2.4000	1.0600
CO2, %	12.13	12.25	13.66	14.00	14.35
O2, %	.20	.05	.60	.10	.55
HC, PPMC	2456	1466	1962	301	1759
NOX, PPM	1562	1425	1950	1025	2850

AIR/FUEL RATIO

	13.01	13.04	14.11	13.89	14.63
--	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	7091.6	6652.1	3564.1	3700.2	1387.8
HC	209.2	119.8	154.7	23.3	115.7
NOX+	372.8	326.0	437.9	224.5	523.1

OIL TEMPERATURE, F	218	218	240	240	242
OIL PRESSURE, PSI	55	55	53	53	55
COOLANT TEMPERATURE, F	190	190	189	189	188
EXHAUST PRESSURE, IN. H2O	81.0	40.0	84.0	39.0	60.0
EXHAUST TEMPERATURE, F	1430	1194	1475	1317	1227

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	43.1	44.1	44.2	45.1	45.2
TEST DATE	3/ 4/77	3/28/77	3/28/77	3/ 4/77	3/ 4/77
BAROMETER, MMHG	742.0	722.0	722.0	742.0	742.0
HUMIDITY, GRAINS/LB	38	64	62	38	38
TEMPERATURE, F	83	85	85	80	80
ENGINE SPEED, RPM	3000	3000	3000	3000	3000
TORQUE, FT-LB	71.0	47.0	47.0	30.0	30.0
POWER, BHP*	40.5	27.8	27.8	17.1	17.1
FUEL RATE, LB/HR	18.3	13.5	13.5	10.9	10.9
IGNITION TIMING, DEG BTDC	43.0	47.0	47.0	49.0	49.0
MANIFOLD VACUUM, IN HG	7.7	12.3	12.3	15.1	15.1
THROTTLE ANGLE, DEG	31.0	23.0	23.0	18.0	18.0
INTAKE MAN. TEMP., F	92	103	86	120	120

CONCENTRATIONS, DRY BASIS

CO, %	.2875	.1253	.0112	.2625	.0112
CO2, %	14.35	14.35	14.63	14.07	14.63
O2, %	.73	1.00	.75	1.15	.75
HC, PPMC	1621	1663	63	1775	230
NOX, PPM	3400	2000	2000	1000	1000
AIR/FUEL RATIO	15.12	15.33	15.37	15.32	15.32

EMISSION RATES, G/HR

CO	323.4	105.6	9.4	178.3	7.6
HC	91.6	70.4	2.7	60.5	7.8
NOX+	536.1	263.5	260.8	95.2	94.8

OIL TEMPERATURE, F	241	233	233	230	230
OIL PRESSURE, PSI	53	53	53	55	55
COOLANT TEMPERATURE, F	186	186	187	184	184
EXHAUST PRESSURE, IN. H2O	44.0	26.0	13.0	17.0	9.0
EXHAUST TEMPERATURE, F	1328	1208	1010	1177	977

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

46.1
3/ 4/77
742.0
41
80
3000
12.0
6.8
8.1
48.0
18.5
13.0
146

47.1
3/ 4/77
741.5
41
80
3000
.0
.0
7.0
48.0
19.5
11.0
19

47.2
3/ 4/77
741.5
41
80
3000
.0
.0
6.9
48.0
19.5
11.0
162

48.1
3/ 4/77
741.5
41
81
3500
.0
.0
8.1
51.0
19.6
13.5
147

48.2
3/ 4/77
741.5
41
81
3500
.0
.0
8.1
51.0
19.6
13.5
147

CONCENTRATIONS, DRY BASIS

CO, % .4362
CO2, % 14.07
O2, % 1.00
HC, PPMC 1647
NOX, PPM 210

.0112
14.91
.50
288
190

.7905
13.80
1.10
287
98

.0787
15.06
.15
202
43

.7218
14.19
1.10
1418
48

.0231
15.21
.45
370
60

AIR/FUEL RATIO

15.13

15.11

15.17

14.86

15.08

15.06

EMISSION RATES, G/HR

CO 218.9
HC 41.5
NOX+ 15.0

5.6
7.2
13.5

340.4
6.2
6.0

32.7
4.2
2.5

359.6
35.5
3.4

11.4
9.2
4.2

OIL TEMPERATURE, F 222
OIL PRESSURE, PSI 55
COOLANT TEMPERATURE, F 186
EXHAUST PRESSURE, IN. H2O 11.0
EXHAUST TEMPERATURE, F 1165

220
55
183
8.0
1186

220
55
183
8.0
1186

220
55
183
8.0
1186

220
55
183
5.0
966

231
58
185
10.0
1238

231
55
185
7.0
1020

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER
 FUEL CODE: 7619

TEST NUMBER	49.1	49.2	50.1	50.2	51.1	51.2
TEST DATE	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
BAROMETER, MMHG	742.0	742.0	742.0	742.0	742.0	742.0
HUMIDITY, GRAINS/LB	41	36	40	40	40	40
TEMPERATURE, F	86	87	85	85	85	85
ENGINE SPEED, RPM	3500	3500	3500	3500	3500	3500
TORQUE, FT-LB	117.5	117.0	105.0	105.0	87.7	87.7
POWER, BHP*	78.6	78.2	70.1	70.1	58.6	58.6
FUEL RATE, LB/HR	37.2	36.8	31.2	31.5	25.8	25.8
IGNITION TIMING, DEG BTDC	28.0	28.0	28.0	28.0	38.0	38.0
MANIFOLD VACUUM, IN HG	1.0	1.0	2.0	2.0	5.0	5.0
THROTTLE ANGLE, DEG	77.0	77.0	61.1	61.2	43.5	43.5
INTAKE MAN. TEMP., F	67	68	58	58	75	75

CONCENTRATIONS, DRY BASIS

CO, %	4.3860	4.6188	1.3283	.1272	.7584	.0450
CO2, %	11.80	11.74	13.17	14.54	13.58	14.50
O2, %	.49	.37	1.42	.74	1.17	.60
HC, PPMC	2239	1345	1208	12	1547	23
NOX, PPM	1344	1075	2490	1011	2949	2551
AIR/FUEL RATIO	13.09	13.00	15.12	15.28	15.20	15.28

EMISSION RATES, G/HR

CO	8793.2	9103.9	2559.4	248.9	1214.8	72.3
HC	225.4	133.2	116.9	1.2	124.4	1.8
NOX+	382.7	295.1	679.3	280.1	669.0	580.2
OIL TEMPERATURE, F	247	254	250	250	253	253
OIL PRESSURE, PSI	55	55	55	55	55	55
COOLANT TEMPERATURE, F	189	188	190	190	187	188
EXHAUST PRESSURE, IN. H2O	100.0	60.0	104.0	62.0	70.0	40.0
EXHAUST TEMPERATURE, F	1490	1280	1652	1490	1442	1370

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

52.1

3/ 4/77

TEST DATE

742.0

40

BAROMETER, MMHG

85

HUMIDITY, GRAINS/LB

3500

TEMPERATURE, F

70.0

ENGINE SPEED, RPM

46.7

TORQUE, FT-LB

22.9

POWER, BHP*

41.0

FUEL RATE, LB/HR

6.5

IGNITION TIMING, DEG BTDC

37.8

MANIFOLD VACUUM, IN HG

85

THROTTLE ANGLE, DEG

85

INTAKE MAN. TEMP., F

52.2	53.1	53.2	54.1	54.2
3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
742.0	742.0	742.0	742.0	742.0
40	40	40	40	40
85	84	84	83	83
3500	3500	3500	3500	3500
70.0	46.8	46.8	29.0	29.0
46.7	31.2	31.2	19.3	19.3
22.9	15.8	16.1	12.7	12.9
41.0	48.0	48.0	50.0	50.0
6.5	12.0	12.0	15.0	15.0
37.8	26.5	26.5	21.1	21.1
85	101	101	114	114

CONCENTRATIONS, DRY BASIS

.2485	.1611	.0900	.1611	.1125
13.79	13.31	13.57	13.67	13.95
1.31	2.12	1.91	1.71	1.47
1312	1286	48	1300	50
3354	2274	2289	1020	950
15.58	16.24	16.22	15.84	15.81

AIR/FUEL RATIO

EMISSION RATES, G/HR

363.0	106.2	95.9	132.0	93.9
96.3	68.1	2.6	53.5	2.1
693.7	339.6	345.4	118.3	112.3

250	244	244	238	238
55	55	55	55	55
186	185	185	184	184
55.0	31.0	19.0	21.0	133.0
1415	1307	1124	1246	1062

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619					
TEST NUMBER	55.1	56.1	56.2	57.1	57.2
TEST DATE	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
BAROMETER, MMHG	742.0	744.5	744.5	744.5	744.5
HUMIDITY, GRAINS/LB	40	47	47	47	47
TEMPERATURE, F	82	85	86	88	88
ENGINE SPEED, RPM	3500	4300	4300	4300	4300
TORQUE, FT-LB	11.7	112.0	112.0	100.0	100.0
POWER, BHP*	7.8	91.7	91.8	82.1	82.1
FUEL RATE, LB/HR	9.5	45.3	45.3	39.7	40.0
IGNITION TIMING, DEG 8TDC	50.0	27.0	27.0	28.0	28.0
MANIFOLD VACUUM, IN HG	18.5	1.5	1.5	2.0	2.0
THROTTLE ANGLE, DEG	15.8	77.8	77.8	64.4	64.4
INTAKE MAN. TEMP., F	135	63	64	58	58
CONCENTRATIONS, DRY BASIS					
CO, %	.4426	4.0110	4.2253	2.0702	.9786
CO2, %	13.75	12.12	12.10	13.00	14.27
O2, %	1.29	.10	.10	.56	.02
HC, PPMC	1348	1812	1034	844	20
NOX, PPM	262	1325	615	2302	450
AIR/FUEL RATIO	15.36	13.05	13.02	14.24	14.41
EMISSION RATES, G/HR					
CO	264.9	9751.8	10234.9	4791.6	2297.0
HC	40.5	221.2	125.7	98.1	2.4
NOX+	22.2	468.7	216.9	775.3	153.6
OIL TEMPERATURE, F	233	245	264	272	272
OIL PRESSURE, PSI	55	60	60	55	55
COOLANT TEMPERATURE, F	183	189	189	188	188
EXHAUST PRESSURE, IN. H2O	15.0	140.0	86.0	145.0	84.0
EXHAUST TEMPERATURE, F	1266	1645	1351	1660	1539

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	58.1	58.2	59.1	59.2	60.1	60.2
TEST DATE	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
BAROMETER, MMHG	744.5	744.5	744.5	744.5	744.5	744.5
HUMIDITY, GRAINS/LB	47	47	47	47	47	47
TEMPERATURE, F	86	86	85	85	84	84
ENGINE SPEED, RPM	4300	4300	4300	4300	4300	4300
TORQUE, FT-LB	84.0	84.0	67.0	67.0	44.8	44.8
POWER, BHP*	68.9	68.9	54.9	54.9	36.7	36.7
FUEL RATE, LB/HR	32.6	32.2	26.3	26.3	20.3	20.3
IGNITION TIMING, DEG BTDC	39.0	39.0	46.0	46.0	51.0	51.0
MANIFOLD VACUUM, IN HG	4.5	4.5	7.5	7.5	11.4	11.4
THROTTLE ANGLE, DEG	51.1	51.1	40.0	40.8	32.4	32.4
INTAKE MAN. TEMP., F	72	72	81	81	91	91

CONCENTRATIONS, DRY BASIS

CO, %	1.1889	.0665	.2311	.0045	.1309	.0036
CO2, %	13.48	14.84	13.71	14.03	13.14	13.42
O2, %	.71	.10	1.27	1.04	2.14	2.01
HC, PPMC	1125	18	942	37	736	33
NOX, PPM	2685	1095	3244	3394	2185	2281

AIR/FUEL RATIO

	14.73	14.88	15.61	15.65	16.32	16.36
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	2337.2	129.8	388.3	7.6	177.7	4.8
HC	111.1	1.7	79.5	3.1	50.1	2.3
NOX+	768.0	310.9	793.2	829.0	431.6	450.9

OIL TEMPERATURE, F	270	270	265	265	259	259
OIL PRESSURE, PSI	55	55	55	55	55	55
COOLANT TEMPERATURE, F	187	187	185	185	185	185
EXHAUST PRESSURE, IN. H2O	104.0	60.0	72.0	40.0	49.0	26.0
EXHAUST TEMPERATURE, F	1613	1483	1487	1312	1416	1210

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

61.1
3/ 4/77
744.5
47
83
4300
28.0
22.9
15.6
52.0
15.0
25.1
105

61.2
3/ 4/77
744.5
47
83
4300
28.0
22.9
15.6
52.0
15.0
25.1
105

62.1
3/ 4/77
744.5
47
82
4300
11.2
9.1
12.6
53.0
17.5
20.2
120

62.2
3/ 4/77
744.5
47
82
4300
11.2
9.1
12.6
53.0
17.5
20.2
120

63.1
3/ 4/77
744.5
47
82
4300
2.3
1.9
11.2
53.0
19.0
17.8
130

63.2
3/ 4/77
744.5
47
82
4300
2.3
1.9
11.0
53.0
19.0
17.8
130

CONCENTRATIONS, DRY BASIS

CO, % .1521
CO2, % 13.64
O2, % 1.54
HC, PPMC 600
NOX, PPM 1185

.2341
14.04
.98
2999
439

.0054
14.40
.73
40
793

.3184
14.08
.90
2379
251

AIR/FUEL RATIO

15.78

15.79

15.08

15.33

15.10

EMISSION RATES, G/HR

CO 153.1
HC 40.4
NOX+ 173.5

181.2
116.6
49.5

4.3
1.6
90.6

210.5
82.0
25.1

OIL TEMPERATURE, F

253

253

247

247

246

OIL PRESSURE, PSI

57

57

58

58

59

COOLANT TEMPERATURE, F

184

184

183

183

183

EXHAUST PRESSURE, IN. H2O

30.0

16.0

21.0

11.0

10.0

EXHAUST TEMPERATURE, F

1356

1148

1377

1127

1140

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	64.1	64.2	65.1	65.2	66.1	66.2
TEST DATE	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
BAROMETER, MMHG	744.5	744.5	744.5	744.5	744.5	744.5
HUMIDITY, GRAINS/LB	47	47	46	46	46	46
TEMPERATURE, F	84	84	89	89	89	89
ENGINE SPEED, RPM	5000	5000	5000	5000	5000	5000
TORQUE, FT-LB	102.0	102.0	91.8	91.8	76.5	76.5
POWER, BHP*	97.0	97.0	87.7	87.7	73.1	73.1
FUEL RATE, LB/HR	50.0	50.0	44.2	44.4	37.4	37.3
IGNITION TIMING, DEG BTDC	34.0	34.0	34.0	34.0	37.0	37.0
MANIFOLD VACUUM, IN HG	1.0	1.0	2.4	2.4	4.0	4.0
THROTTLE ANGLE, DEG	77.8	77.8	64.7	64.7	55.6	55.6
INTAKE MAN. TEMP., F	61	61	59	59	70	70

CONCENTRATIONS, DRY BASIS

CO, %	4.0235	4.0769	2.0969	.8896	1.2228	.0340
CO2, %	12.14	12.21	12.98	14.31	13.36	14.62
O2, %	.00	.00	.60	.00	.88	.25
HC, PPMC	1867	980	815	16	781	9
NOX, PPM	777	135	2466	767	2788	1721

AIR/FUEL RATIO

	12.97	13.01	14.27	14.45	14.86	15.02
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	10721.6	10899.5	5422.6	2321.3	2779.6	77.6
HC	249.8	131.5	105.8	2.1	89.2	1.0
NOX+	301.4	52.4	924.1	289.9	918.4	569.3

OIL TEMPERATURE, F	266	266	281	281	284	284
OIL PRESSURE, PSI	55	55	55	55	55	55
COOLANT TEMPERATURE, F	190	190	191	191	188	188
EXHAUST PRESSURE, IN. H2O	151.0	110.0	151.0	104.0	136.0	78.0
EXHAUST TEMPERATURE, F	1660	1417	1665	1592	1660	1554

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	67.1	67.2	68.1	68.2	69.1	69.2
TEST DATE	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
BAROMETER, MMHG	744.5	744.5	744.5	744.5	744.5	744.5
HUMIDITY, GRAINS/LB	46	46	46	46	46	46
TEMPERATURE, F	88	88	86	86	84	84
ENGINE SPEED, RPM	5000	5000	5000	5000	5000	5000
TORQUE, FT-LB	61.2	61.2	40.8	40.8	25.5	25.5
POWER, BHP*	58.4	58.4	38.9	38.9	24.3	24.3
FUEL RATE, LB/HR	31.9	31.5	23.5	23.5	19.0	19.0
IGNITION TIMING, DEG BTDC	46.0	46.0	55.0	55.0	55.0	54.0
MANIFOLD VACUUM, IN HG	7.0	7.0	11.0	11.0	14.5	14.5
THROTTLE ANGLE, DEG	47.3	47.3	36.5	36.5	29.6	29.6
INTAKE MAN. TEMP., F	78	78	86	86	92	92

CONCENTRATIONS, DRY BASIS

CO, %	.6036	.0035	.1411	.0029	.1498	.0042
CO2, %	13.61	14.12	12.87	13.03	13.27	13.47
O2, %	1.05	.89	2.42	2.36	1.96	1.82
HC, PPMC	857	23	460	20	958	28
NOX, PPM	3528	3589	2616	2577	1372	1364

AIR/FUEL RATIO

	15.28	15.55	16.60	16.68	16.11	16.18
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	1202.7	7.0	226.1	4.7	187.5	5.3
HC	85.8	2.3	37.0	1.6	60.2	1.8
NOX+	1018.8	1041.2	607.5	600.8	248.9	248.3

OIL TEMPERATURE, F	283	283	277	277	268	268
OIL PRESSURE, PSI	55	55	57	57	55	55
COOLANT TEMPERATURE, F	188	188	186	186	185	185
EXHAUST PRESSURE, IN. H2O	101.0	56.0	65.0	35.0	44.0	22.0
EXHAUST TEMPERATURE, F	1651	1432	1485	1274	1452	1226

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

70.1
3/ 4/77
744.5
46
84
5000
10.2
9.7
14.8
55.0
17.5
23.5
110

70.2
3/ 4/77
744.5
46
84
5000
10.2
9.7
14.8
55.0
17.5
23.5
110

71.1
3/ 4/77
744.5
46
86
5000
2.8
2.7
13.9
55.0
18.3
21.9
118

71.2
3/ 4/77
744.5
46
84
5000
2.8
2.7
13.7
55.0
18.3
21.9
118

72.1
3/ 7/77
742.0
46
79
750
.2
.0
1.8
20.0
18.0
.0
122

72.2
3/ 7/77
742.0
46
79
750
.2
.0
1.8
20.0
18.0
.0
122

CONCENTRATIONS, DRY BASIS

.2204
13.90
1.11
1651
577

.0025
14.35
.71
35
611

.2604
14.05
.88
2617
434

.0037
14.57
.35
37
442

.1709
11.43
4.49
8674
21

.0010
12.65
2.79
180
40

AIR/FUEL RATIO

15.32

15.32

15.04

15.06

17.22

16.96

EMISSION RATES, G/HR

203.7
76.6
77.3

2.3
1.6
81.9

222.6
112.3
53.7

3.1
1.6
54.0

22.5
57.3
.4

.1
1.2
.8

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

264
58
186
29.0
1457

264
58
186
15.0
1216

264
58
187
26.0
1474

264
27
187
11.0
1258

184
41
179
4.0
628

184
41
179
.0
677

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	73.1	73.2	74.1	74.2	75.1	75.2
TEST DATE	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/28/77	3/28/77
BAROMETER, MMHG	742.0	742.0	742.0	742.0	722.0	722.0
HUMIDITY, GRAINS/LB	45	46	46	46	64	64
TEMPERATURE, F	79	79	79	79	82	82
ENGINE SPEED, RPM	650	650	1000	1000	1000	1000
TORQUE, FT-LB	8.4	8.4	73.0	73.0	39.0	39.0
POWER, BHP*	1.0	1.0	13.9	13.9	7.7	7.7
FUEL RATE, LB/HR	1.8	1.9	7.2	7.3	4.8	4.9
IGNITION TIMING, DEG BTDC	20.0	20.0	31.0	31.0	40.0	40.0
MANIFOLD VACUUM, IN HG	16.0	16.0	6.0	6.0	13.0	13.0
THROTTLE ANGLE, DEG	.0	.0	15.1	15.1	.0	.0
INTAKE MAN. TEMP., F	121	121	100	100	91	91

CONCENTRATIONS, DRY BASIS

CO, %	.1324	.0025	3.8931	3.8358	3.3040	3.1500
CO2, %	12.59	13.00	12.14	12.34	12.50	12.88
O2, %	2.72	2.28	.01	.25	.25	.00
HC, PPMC	3604	227	2620	2490	2928	2820
NOX, PPN	43	57	313	339	975	875

AIR/FUEL RATIO

	16.38	16.51	12.94	13.14	13.32	13.27
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	16.4	.3	1503.6	1511.5	871.0	834.6
HC	22.5	1.5	50.8	49.3	38.8	37.5
NOX+	.8	1.1	17.6	19.4	40.2	36.2

OIL TEMPERATURE, F	182	182	194	194	189	189
OIL PRESSURE, PSI	40	40	41	41	45	45
COOLANT TEMPERATURE, F	181	181	185	185	187	187
EXHAUST PRESSURE, IN. H2O	4.0	.0	9.0	5.0	3.0	4.0
EXHAUST TEMPERATURE, F	603	631	827	738	789	683

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	76.1	77.1	77.2	78.1	78.2
TEST DATE	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
BAROMETER, MMHG	742.0	742.0	742.0	742.0	742.0
HUMIDITY, GRAINS/LB	46	46	46	46	46
TEMPERATURE, F	79	79	80	79	80
ENGINE SPEED, RPM	1000	1000	1000	1000	1000
TORQUE, FT-LB	24.0	10.0	10.0	.8	.8
POWER, BHP*	4.6	1.9	1.9	.2	.2
FUEL RATE, LB/HR	3.5	2.6	2.7	2.3	2.4
IGNITION TIMING, DEG BTDC	20.0	20.0	20.0	20.0	20.0
MANIFOLD VACUUM, IN HG	16.5	19.0	19.0	19.5	19.5
THROTTLE ANGLE, DEG	3.8	2.0	2.0	1.1	1.1
INTAKE MAN. TEMP., F	101	111	111	115	115

CONCENTRATIONS, DRY BASIS

CO, %	1.0725	.2901	.0013	.2549	.0030
CO2, %	13.81	13.78	14.14	13.61	13.82
O2, %	.52	1.37	1.11	1.71	1.51
HC, PPMC	2260	1730	126	2222	120
NOX, PPM	262	86	79	48	47

AIR/FUEL RATIO

AIR/FUEL RATIO	14.46	15.44	15.57	15.65	15.87
----------------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	222.6	47.0	.2	37.3	.5
HC	23.6	14.1	1.1	16.3	.9
NOX+	7.9	2.0	2.0	1.0	1.1
OIL TEMPERATURE, F	193	190	190	188	188
OIL PRESSURE, PSI	41	41	41	44	44
COOLANT TEMPERATURE, F	182	183	183	182	182
EXHAUST PRESSURE, IN. H2O	5.0	4.0	.0	4.0	.0
EXHAUST TEMPERATURE, F	722	707	604	715	575

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

79.1

3/29/77

80.1

3/ 7/77

81.1

3/ 7/77

734.1

50

734.1

742.0

46

46

80

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

12.87

2.8500

1.4584

.8970

1.2037

.7963

CO₂, %

.15

.05

.57

.08

.51

.12

HC, PPMC

2154

1983

2646

339

2602

739

NOX, PPM

913

825

549

156

1905

1500

AIR/FUEL RATIO

13.56

13.47

14.30

14.45

14.42

14.52

EMISSION RATES, G/HR

CO

1662.2

1732.0

570.5

353.3

379.3

252.0

HC

66.1

60.5

52.0

6.7

41.2

11.7

NOX+

82.3

74.0

31.1

8.9

87.1

68.8

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H₂O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	82.1	82.2	83.1	83.2	84.1	84.2
TEST DATE	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
BAROMETER, MMHG	742.0	742.0	742.0	742.0	742.0	742.0
HUMIDITY, GRAINS/LB	46	46	46	46	46	46
TEMPERATURE, F	80	80	80	80	86	81
ENGINE SPEED, RPM	1500	1500	1500	1500	2000	2000
TORQUE, FT-LB	10.9	10.9	1.0	1.0	84.7	84.7
POWER, BHP*	3.1	3.1	.3	.3	32.4	32.2
FUEL RATE, LB/HR	3.8	3.8	3.5	3.5	14.2	14.2
IGNITION TIMING, DEG BTDC	31.0	31.0	22.0	22.0	36.0	36.0
MANIFOLD VACUUM, IN HG	20.0	20.0	20.8	20.8	6.0	6.0
THROTTLE ANGLE, DEG	4.7	4.7	4.5	4.5	27.7	27.7
INTAKE MAN. TEMP., F	100	100	102	102	80	80

CONCENTRATIONS, DRY BASIS

CO, %	.4022	.0030	.5657	.0018	1.2683	1.1457
CO2, %	14.06	14.43	14.10	14.63	13.48	13.89
O2, %	.84	.68	.79	.60	.41	.07
HC, PPMC	1612	117	1657	93	2281	296
NOX, PPM	222	211	90	82	2298	1194

AIR/FUEL RATIO

AIR/FUEL RATIO	15.04	15.27	14.92	15.21	14.37	14.36
----------------	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	93.6	.7	120.9	.4	1063.0	957.1
HC	18.8	1.4	17.8	1.0	96.0	12.4
NOX+	7.5	7.2	2.8	2.6	279.4	144.7

OIL TEMPERATURE, F

OIL TEMPERATURE, F	199	199	198	198	193	193
--------------------	-----	-----	-----	-----	-----	-----

OIL PRESSURE, PSI

OIL PRESSURE, PSI	45	45	46	46	50	50
-------------------	----	----	----	----	----	----

COOLANT TEMPERATURE, F

COOLANT TEMPERATURE, F	184	184	184	184	184	184
------------------------	-----	-----	-----	-----	-----	-----

EXHAUST PRESSURE, IN. H2O

EXHAUST PRESSURE, IN. H2O	5.0	4.0	5.0	2.0	20.0	11.0
---------------------------	-----	-----	-----	-----	------	------

EXHAUST TEMPERATURE, F

EXHAUST TEMPERATURE, F	841	713	873	703	1141	1064
------------------------	-----	-----	-----	-----	------	------

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	85.1	85.2	86.1	86.2	87.1	87.2
TEST DATE	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
BAROMETER, MMHG	742.0	742.0	742.0	742.0	742.0	742.0
HUMIDITY, GRAINS/LB	46	46	46	46	46	46
TEMPERATURE, F	81	81	81	81	81	81
ENGINE SPEED, RPM	2000	2000	2000	2000	2000	2000
TORQUE, FT-LB	45.2	45.2	28.3	28.3	11.3	11.3
POWER, BHP*	17.2	17.2	10.8	10.8	4.3	4.3
FUEL RATE, LB/HR	8.9	9.0	7.2	7.3	5.0	4.9
IGNITION TIMING, DEG BTDC	46.0	46.0	46.0	46.0	46.0	46.0
MANIFOLD VACUUM, IN HG	12.0	12.0	15.0	15.0	21.0	21.0
THROTTLE ANGLE, DEG	15.6	15.6	11.7	11.7	7.0	7.0
INTAKE MAN. TEMP., F	129	129	151	151	97	97

CONCENTRATIONS, DRY BASIS

CO, %	1704	.0031	.4727	.0186	.5332	.1364
CO2, %	13.66	14.06	13.72	14.39	13.83	14.49
O2, %	1.12	.80	.88	.37	.72	.21
HC, PPMC	2269	66	2731	72	1469	99
NOX, PPM	1209	480	302	207	781	368

AIR/FUEL RATIO

	15.32	15.38	14.93	15.05	14.93	14.90
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	95.7	1.7	206.7	8.3	161.8	40.7
HC	64.0	1.9	60.0	1.6	22.4	1.5
NOX+	98.5	39.4	19.1	13.4	34.4	15.9

OIL TEMPERATURE, F	215	214	214	214	209	209
OIL PRESSURE, PSI	50	50	50	50	50	50
COOLANT TEMPERATURE, F	185	185	184	184	184	184
EXHAUST PRESSURE, IN. H2O	11.0	6.0	9.0	5.0	6.0	4.0
EXHAUST TEMPERATURE, F	1054	944	1029	933	902	798

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	88.1	89.1	89.2	90.1	90.2
TEST DATE	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
BAROMETER, MMHG	742.0	742.0	742.0	742.0	742.0
HUMIDITY, GRAINS/LB	46	46	46	46	46
TEMPERATURE, F	81	75	83	83	83
ENGINE SPEED, RPM	2000	2500	2500	2500	2500
TORQUE, FT-LB	.8	87.0	87.0	46.0	46.0
POWER, BHP*	.3	41.2	41.5	21.9	21.9
FUEL RATE, LB/HR	4.1	18.4	18.4	11.7	11.8
IGNITION TIMING, DEG BTDC	36.0	36.0	36.0	46.0	46.0
MANIFOLD VACUUM, IN HG	22.0	5.5	5.5	12.0	12.0
THROTTLE ANGLE, DEG	5.0	34.0	34.0	19.0	19.0
INTAKE MAN. TEMP., F	100	75	75	113	113

CONCENTRATIONS, DRY BASIS

CO, %	.5041	1.1823	1.0000	.1640	.0031
CO2, %	13.91	13.41	14.48	13.74	14.10
O2, %	.66	.65	.04	1.09	.80
HC, PPMC	1362	1795	439	1930	47
NOX, PPM	162	2659	2200	2232	2075

AIR/FUEL RATIO

	14.89	14.62	14.44	15.37	15.44
--	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	126.8	1305.0	1081.4	121.1	2.3
HC	17.2	99.5	23.8	71.6	1.8
NOX+	5.9	425.8	345.1	239.1	223.9

OIL TEMPERATURE, F	208	229	229	230	230
OIL PRESSURE, PSI	50	50	50	50	50
COOLANT TEMPERATURE, F	184	187	187	185	185
EXHAUST PRESSURE, IN. H2O	5.0	34.0	20.0	17.0	10.0
EXHAUST TEMPERATURE, F	931	1270	1230	1159	1060

* CORRECTED SAE J8168
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

	91.1	91.2	92.1	92.2	93.1	93.2
TEST NUMBER	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
TEST DATE	742.0	742.0	742.0	742.0	742.0	742.0
BAROMETER, MMHG	46	46	46	46	46	46
HUMIDITY, GRAINS/LB	82	82	80	82	81	81
TEMPERATURE, F	2500	2500	2500	2500	2500	2500
ENGINE SPEED, RPM	29.0	29.0	11.6	11.6	1.0	1.0
TORQUE, FT-LB	13.8	13.8	5.5	5.5	.5	.5
POWER, BHP*	9.0	9.0	6.6	6.6	5.0	5.0
FUEL RATE, LB/HR	48.0	48.0	48.0	48.0	46.0	46.0
IGNITION TIMING, DEG BTDC	15.4	15.4	19.0	19.0	22.0	22.0
MANIFOLD VACUUM, IN HG	14.4	14.4	9.5	9.5	9.9	9.9
THROTTLE ANGLE, DEG	135	135	132	132	97	97
INTAKE MAN. TEMP., F						

CONCENTRATIONS, DRY BASIS

CO, %	.3101	.0239	1.0360	.7648	1.5669	.6656
CO2, %	13.83	14.35	13.68	14.20	13.45	14.31
O2, %	.92	.46	.56	.03	.44	.04
HC, PPMC	2099	48	2382	140	2185	159
NOX, PPM	700	603	186	61	245	106

AIR/FUEL RATIO

	15.11	15.13	14.49	14.48	14.20	14.53
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	173.3	13.3	404.2	299.8	457.2	197.9
HC	58.9	1.4	46.7	2.7	32.0	2.4
NOX+	56.7	48.9	10.5	3.4	10.4	4.6

OIL TEMPERATURE, F	224	224	219	219	215	215
OIL PRESSURE, PSI	50	50	50	50	50	50
COOLANT TEMPERATURE, F	184	184	183	183	183	183
EXHAUST PRESSURE, IN. H2O	11.0	6.0	9.0	5.0	6.0	4.0
EXHAUST TEMPERATURE, F	1105	988	1045	904	966	841

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE:	7619				
TEST NUMBER	94.1	94.2	95.1	95.2	96.1
TEST DATE	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
BAROMETER, MMHG	742.0	742.0	742.0	742.0	742.0
HUMIDITY, GRAINS/LB	46	46	46	46	46
TEMPERATURE, F	83	83	84	84	83
ENGINE SPEED, RPM	3000	3000	3000	3000	3000
TORQUE, FT-LB	89.0	89.0	47.0	47.0	30.0
POWER, BHP*	50.9	50.9	26.9	26.9	17.2
FUEL RATE, LB/HR	22.2	22.2	13.8	13.8	11.0
IGNITION TIMING, DEG BTDC	38.0	38.0	48.0	48.0	48.0
MANIFOLD VACUUM, IN HG	5.2	5.2	12.4	12.4	15.2
THROTTLE ANGLE, DEG	38.0	38.0	23.0	23.0	18.0
INTAKE MAN. TEMP., F	70	72	104	104	109

CONCENTRATIONS, DRY BASIS

CO, %	.7303	.0091	.1249	.0024	.1754
CO2, %	13.44	14.43	13.49	13.79	13.71
O2, %	.92	.35	1.47	1.21	1.18
HC, PPMC	1392	31	1670	42	1751
NOX, PPM	2933	2030	2433	2504	1212

AIR/FUEL RATIO

	15.06	15.11	15.71	15.75	15.41
--	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	998.3	12.5	110.6	2.2	121.9
HC	95.6	2.2	74.3	1.9	61.1
NOX+	581.6	403.1	312.6	323.5	122.2

OIL TEMPERATURE, F	208	238	238	238	235
OIL PRESSURE, PSI	54	54	54	54	54
COOLANT TEMPERATURE, F	190	190	186	186	185
EXHAUST PRESSURE, IN. H2O	46.0	25.0	22.0	12.0	15.0
EXHAUST TEMPERATURE, F	1347	1288	1222	1120	1177

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	97.1	97.2	98.1	98.2	99.1	99.2
TEST DATE	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 8/77	3/ 8/77
BAROMETER, MMHG	742.0	742.0	742.0	742.0	745.7	745.7
HUMIDITY, GRAINS/LB	46	46	46	46	48	48
TEMPERATURE, F	82	82	82	82	86	86
ENGINE SPEED, RPM	3000	3000	3000	3000	3500	3500
TORQUE, FT-LB	12.0	12.0	1.9	1.9	88.0	88.0
POWER, BHP*	6.9	6.9	1.1	1.1	58.6	58.6
FUEL RATE, LB/HR	8.7	8.7	7.0	7.0	26.4	26.4
IGNITION TIMING, DEG BTDC	48.0	48.0	50.0	50.0	37.0	37.0
MANIFOLD VACUUM, IN HG	18.0	18.0	19.5	19.5	4.6	4.6
THROTTLE ANGLE, DEG	13.0	13.0	11.0	11.0	43.5	43.5
INTAKE MAN. TEMP., F	135	135	163	163	70	70

CONCENTRATIONS, DRY BASIS

CO, %	.2949	.0021	.5870	.1332	.8136	.0127
CO2, %	13.78	14.27	13.49	14.47	13.53	14.58
O2, %	1.02	.61	1.15	.32	.85	.24
HC, PPMC	2096	54	3380	59	605	20
NOX, PPM	345	358	123	547	3150	2099

AIR/FUEL RATIO

	15.17	15.24	14.98	14.98	15.06	15.04
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	159.6	1.1	253.8	57.2	1321.0	20.4
HC	57.0	1.5	73.4	1.3	49.3	1.6
NOX+	27.1	28.2	7.7	34.0	745.9	493.8

OIL TEMPERATURE, F	229	229	226	226	256	256
OIL PRESSURE, PSI	52	52	52	52	52	52
COOLANT TEMPERATURE, F	185	185	185	185	190	190
EXHAUST PRESSURE, IN. H2O	11.0	6.0	10.0	5.0	78.0	35.0
EXHAUST TEMPERATURE, F	1152	999	1167	1019	1435	1350

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	100.1	100.2	101.1	101.2	102.1	102.2
TEST DATE	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77
BAROMETER, MMHG	745.7	745.7	745.7	745.7	745.7	745.7
HUMIDITY, GRAINS/LB	43	46	48	48	41	41
TEMPERATURE, F	85	85	84	84	84	84
ENGINE SPEED, RPM	3500	3500	3500	3500	3500	3500
TORQUE, FT-LB	47.0	47.0	29.0	29.0	11.7	11.7
POWER, BHP*	31.3	31.3	19.3	19.3	7.8	7.8
FUEL RATE, LB/HR	16.2	16.1	13.0	13.0	9.8	9.8
IGNITION TIMING, DEG BTDC	49.5	49.5	50.0	50.0	50.0	50.0
MANIFOLD VACUUM, IN HG	12.1	12.1	15.2	15.2	18.3	18.3
THROTTLE ANGLE, DEG	26.5	26.5	21.1	21.1	15.8	15.8
INTAKE MAN. TEMP., F	100	100	114	114	135	135

CONCENTRATIONS, DRY BASIS

CO, %	.1109	.0008	.1860	.0020	.5776	.0531
CO2, %	13.51	13.76	13.77	14.16	13.89	14.54
O2, %	1.54	1.35	1.16	.81	.79	.26
HC, PPMC	1329	31	1491	42	1596	22
NOX, PPM	2581	2666	1278	1363	386	219

AIR/FUEL RATIO

	15.81	15.87	15.42	15.42	14.93	14.97
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	116.5	.8	152.0	1.7	346.2	31.6
HC	70.1	1.6	61.2	1.7	48.0	.7
NOX+	388.5	403.7	152.4	162.0	32.8	18.5

OIL TEMPERATURE, F	248	248	243	243	238	238
OIL PRESSURE, PSI	53	53	53	53	48	48
COOLANT TEMPERATURE, F	188	188	187	187	187	187
EXHAUST PRESSURE, IN. H2O	33.0	16.0	21.0	.0	13.0	.0
EXHAUST TEMPERATURE, F	1296	1109	1225	1067	1213	1042

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619					
TEST NUMBER	103.1	103.2	104.1	104.2	105.1
TEST DATE	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77
BAROMETER, MMHG	745.7	745.7	745.7	745.7	745.7
HUMIDITY, GRAINS/LB	41	41	41	41	41
TEMPERATURE, F	84	84	84	84	84
ENGINE SPEED, RPM	3500	3500	4300	4300	4300
TORQUE, FT-LB	1.3	1.3	1.6	1.6	11.2
POWER, BHP*	.9	.9	1.3	1.3	9.1
FUEL RATE, LB/HR	8.2	8.2	10.9	11.0	12.5
IGNITION TIMING, DEG BTDC	50.0	50.0	55.0	55.0	54.0
MANIFOLD VACUUM, IN HG	19.8	19.8	19.2	19.1	17.5
THROTTLE ANGLE, DEG	13.5	13.5	17.8	17.8	20.2
INTAKE MAN. TEMP., F	150	150	128	128	118
CONCENTRATIONS, DRY BASIS					
CO, %	.8678	.3889	.3404	.0028	.0573
CO2, %	13.74	14.47	13.53	14.30	13.73
O2, %	.62	.02	1.25	.53	1.18
HC, PPMC	1793	110	3382	25	1348
NOX, PPM	153	53	287	365	580
AIR/FUEL RATIO	14.66	14.65	15.17	15.19	15.42
EMISSION RATES, G/HR					
CO	427.0	190.5	231.3	1.9	155.1
HC	44.3	2.7	115.4	.8	53.5
NOX+	10.7	3.7	27.6	35.4	65.1
OIL TEMPERATURE, F	235	235	250	250	254
OIL PRESSURE, PSI	53	53	55	55	55
COOLANT TEMPERATURE, F	185	185	189	189	189
EXHAUST PRESSURE, IN. H2O	9.0	6.0	16.0	8.0	21.0
EXHAUST TEMPERATURE, F	1213	1021	1326	1143	1348

* CORRECTED SAE J8168
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE:	7619				
TEST NUMBER	106.1	106.2	107.1	107.2	108.1
TEST DATE	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77
BAROMETER, MMHG	743.3	743.3	743.3	743.3	743.3
HUMIDITY, GRAINS/LB	38	38	41	41	41
TEMPERATURE, F	83	83	85	85	86
ENGINE SPEED, RPM	4300	4300	4300	4300	4300
TORQUE, FT-LB	28.0	28.0	44.8	44.8	84.0
POWER, BHP*	22.9	22.9	36.7	36.7	68.9
FUEL RATE, LB/HR	16.3	16.4	20.4	20.4	33.4
IGNITION TIMING, DEG BTDC	52.0	52.0	50.0	50.0	35.5
MANIFOLD VACUUM, IN HG	14.7	14.7	11.0	11.0	3.8
THROTTLE ANGLE, DEG	25.1	25.1	32.4	32.4	51.1
INTAKE MAN. TEMP., F	92	92	87	87	69

CONCENTRATIONS, DRY BASIS

CO, %	.1366	.0029	.1156	.0033	1.1741
CO2, %	13.32	13.53	12.98	13.16	13.30
O2, %	1.86	1.71	2.24	2.11	.99
HC, PPMC	595	17	649	17	1035
NOX, PPM	1628	1617	2758	2692	2755

AIR/FUEL RATIO

	16.09	16.10	16.46	16.48	14.93
					15.00

EMISSION RATES, G/HR

CO	147.0	3.1	159.6	4.6	2387.5
HC	32.2	.9	45.0	1.2	105.7
NOX+	245.3	244.5	540.8	526.9	795.4

OIL TEMPERATURE, F	246	246	263	263	269
OIL PRESSURE, PSI	56	56	55	55	54
COOLANT TEMPERATURE, F	188	188	191	191	192
EXHAUST PRESSURE, IN. H2O	35.0	14.0	54.0	24.0	120.0
EXHAUST TEMPERATURE, F	1327	1121	1388	1188	1613

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER
 FUEL CODE: 7619

TEST NUMBER	109.1	109.2	110.1	110.2	111.1	111.2
TEST DATE	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77
BAROMETER, MMHG	743.3	743.3	743.3	743.3	743.3	743.3
HUMIDITY, GRAINS/LB	41	41	41	41	41	41
TEMPERATURE, F	87	87	88	88	88	88
ENGINE SPEED, RPM	5000	5000	5000	5000	5000	5000
TORQUE, FT-LB	76.5	76.5	40.8	40.8	25.5	25.5
POWER, BHP*	73.0	73.0	39.0	39.0	24.4	24.4
FUEL RATE, LB/HR	39.0	39.1	24.5	24.5	19.6	19.6
IGNITION TIMING, DEG BTDC	35.0	35.0	52.0	52.0	54.0	54.0
MANIFOLD VACUUM, IN HG	2.9	2.9	10.2	10.2	13.9	13.9
THROTTLE ANGLE, DEG	55.6	55.6	36.5	36.5	29.6	29.6
INTAKE MAN. TEMP., F	64	64	87	87	96	96

CONCENTRATIONS, DRY BASIS

CO, %	.7868	.0045	.1277	.0045	.1329	.0022
CO2, %	13.23	13.92	12.78	12.93	13.10	13.31
O2, %	1.26	1.04	2.41	2.38	2.05	1.92
HC, PPMC	256	2	796	15	511	82
NOX, PPM	2043	1982	2605	2575	1664	1648

AIR/FUEL RATIO

	15.36	15.61	16.57	16.71	16.27	16.28
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	1931.7	11.3	213.0	7.6	173.5	2.9
HC	31.5	.3	66.7	1.3	33.5	5.4
NOX+	712.2	702.2	616.9	614.3	308.4	306.2

OIL TEMPERATURE, F	263	263	281	278	278	278
OIL PRESSURE, PSI	55	55	54	54	54	54
COOLANT TEMPERATURE, F	192	192	190	190	188	188
EXHAUST PRESSURE, IN. H2O	174.0	78.0	78.0	34.0	52.0	22.0
EXHAUST TEMPERATURE, F	1683	1529	1488	1275	1450	1229

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

	112.1	112.2	113.1	113.2	123.1	123.2
TEST NUMBER	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/10/77	3/10/77
TEST DATE	743.3	743.3	743.3	743.3	734.2	734.2
BAROMETER, MMHG	41	41	41	41	61	61
HUMIDITY, GRAINS/LB	87	87	87	87	90	90
TEMPERATURE, F	5000	5000	5000	5000	5300	5300
ENGINE SPEED, RPM	10.2	10.2	1.0	1.0	90.0	90.0
TORQUE, FT-LB	9.7	9.7	1.0	1.0	92.8	92.8
POWER, BHP*	16.2	16.3	13.9	14.0	50.6	50.6
FUEL RATE, LB/HR	54.0	54.0	55.0	55.0	35.0	35.0
IGNITION TIMING, DEG BTDC	16.5	16.5	18.0	18.0	1.7	1.7
MANIFOLD VACUUM, IN HG	23.5	23.5	21.9	21.9	79.0	79.0
THROTTLE ANGLE, DEG	106	106	118	118	63	63
INTAKE MAN. TEMP., F						

CONCENTRATIONS, DRY BASIS

CO, %	.1325	.0042	.2332	.0031	3.8901	3.9101
CO2, %	13.54	13.71	13.67	14.15	12.04	12.17
O2, %	1.43	1.33	1.22	.69	.20	.09
HC, PPMC	1434	39	3317	17	1777	1136
NOX, PPM	850	863	451	480	1645	1655

AIR/FUEL RATIO

	15.64	15.79	15.21	15.30	13.16	13.15
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	137.8	4.4	202.1	2.7	10657.1	10691.8
HC	74.9	2.1	144.4	.8	244.5	156.0
NOX+	125.6	129.4	55.5	59.7	696.0	698.9

OIL TEMPERATURE, F	271	271	270	270	293	293
OIL PRESSURE, PSI	54	54	55	55	53	53
COOLANT TEMPERATURE, F	188	188	189	189	192	192
EXHAUST PRESSURE, IN. H2O	36.0	15.0	27.0	11.0	202.0	94.0
EXHAUST TEMPERATURE, F	1444	1218	1466	1251	1640	1432

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

153.1	153.2	154.1	154.2	155.1	155.2
3/24/77	3/24/77	3/24/77	3/24/77	3/24/77	3/24/77
742.0	742.0	742.0	742.0	742.0	742.0
48	48	48	48	48	48
77	77	78	78	78	78
1000	1000	1500	1500	2000	2000
-12.0	-12.0	-19.8	-19.8	-21.6	-21.6
2.3	2.3	5.6	5.6	8.2	8.2
1.7	1.7	1.9	1.9	1.8	1.8
21.0	21.0	22.0	22.0	24.0	28.0
20.5	20.5	23.0	23.0	24.0	24.0
.0	.0	.0	.0	.0	.0
122	122	123	123	129	129

CONCENTRATIONS, DRY BASIS

CO, %	.0000	.0000	.0000	.0000	.0000
CO2, %	8.28	12.02	6.63	12.26	7.33
O2, %	9.00	3.75	11.38	3.50	10.63
HC, PPMC	1	180	1	484	1
NOX, PPM	8	27	7	21	8

AIR/FUEL RATIO

25.48	17.85	31.65	17.54	29.04	17.83
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	.0	.0	.0	.0	.0
HC	.0	1.2	.0	3.3	.0
NOX+	.2	.5	.3	.4	.3

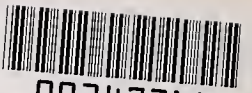
OIL TEMPERATURE, F	182	182	182	189	189
OIL PRESSURE, PSI	44	44	46	46	50
COOLANT TEMPERATURE, F	176	176	176	176	178
EXHAUST PRESSURE, IN. H2O	3.0	1.0	4.0	4.0	4.0
EXHAUST TEMPERATURE, F	558	556	502	795	926

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

HE 18.5.A34
no: DOT-TSC-
NHTSA- 78-16

BORROWER

Form DOT F 1
FORMERLY FORM



00347264

**U. S. DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SYSTEMS CENTER**

KENDALL SQUARE, CAMBRIDGE, MA. 02142

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, \$300



POSTAGE AND FEES PAID

U. S. DEPARTMENT OF TRANSPORTATION

513