MASTER

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PERFORMANCE CHARACTERISTICS OF
AUTOMOTIVE ENGINES IN THE UNITED STATES :

Report No. 9 -- Chrysler (1975) 225-CID 1-bbl Engine

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INTERIM REPORT

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16. Abstract Experimental data were obtained in dynamometer tests of a 1975 Chrysler 225-CID, 1-bbl engine to determine fuel consumption and emissions (hydrocarbon, carbon monoxide, and 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.			
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PREFACE

This report, prepared by the Energy Research and Development Administration, 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 United States. The engine used in this work is one of a series of 23 engines to be tested in the current program.

Mr. Ralph G. Colello, Department of Transportation, is the technical monitor for this project.

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	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				
tsp	teaspoons	5	milliliters	ml
Tbsp	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	acres	
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	36	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

The data acquired from tests of a 1975 Chrysler 225-CID, 1-bbl engine are presented in this report. This engine is used by Chrysler in the Plymouth Valiant, Duster, and Fury vehicles and the Dodge Dart and Coronet vehicles. The test results are sufficient to establish steady-state maps for fuel consumption and emissions (carbon monoxide, unburned hydrocarbon, and oxides of nitrogen) over the entire operating range of the engine.

The objective of this program is to obtain engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of this work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.

2. ENGINE TEST REPORT

General engine specifications for the Chrysler 225-CID, 1V are listed in table 1. The engine breakin and tests were run using a single batch of unleaded regular grade gasoline; an analysis of the fuel is presented in table 2.

The engine was mounted on a test stand and coupled to an eddy-current dynamometer. Engine cooling was provided through the use of a water-cooled heat exchanger, and the fan was not included in the test setup. The engine was equipped with an alternator, but it was not wired into the engine's electrical system. The emission control systems included exhaust-gas recirculation (EGR), an oxidation catalyst, and charcoal canister.

The engine was operated at various speeds and loads designed to approximate road-load conditions over a 38-hour period for breakin. Details of the breakin schedule are given in table 3. The engine tests began on Jan. 27, 1976, and ended on Feb. 11, 1976, giving a total engine operating time of approximately 85 hours. The engine was tested while operating at the following steady-state modes:

Speeds: 1,000; 1,600; 2,000; 2,500; 3,000; 3,600 rpm

Loads: 0, 10, 25, 40, 60, 75, 90, 100 pct of full load (repeated at 0, 10, 25, 40, 60 pct of full load, at each speed)

Idle-speed loads: 0, 0.7, 1.4 bhp (repeated at each condition)

Total number of test modes.....	58
Repeats.....	39
Total number of tests.....	97.

The following data were recorded for each test point:

Test number
Date
Barometric pressure, mm Hg
Dew point, °F
Inlet air temperature, °F
Speed, rpm
Torque, lb-ft -- BLH strain gauge load cell; Daytronics indicator
Fuel rate, lb/hr -- Fluidyne positive displacement fuel flow meter
Ignition timing, °BTC
Manifold vacuum, in. Hg
Throttle angle, degrees

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 computed data include absolute humidity (grains per pound dry air), power (bhp), air-fuel ratio (includes air injection), and emission rates of carbon monoxide (CO), unburned hydrocarbons (HC), and oxides of nitrogen (NO_x) in grams per hour. The following equations were applied in the computations:

$$W = \exp 12.02 \left(\frac{D - 1.4}{D + 212} \right), \quad (1)$$

$$H = \frac{4348 W}{B - W}, \quad (2)$$

$$P = \left(\frac{N \times T}{5252} \right) \left(\frac{736.6}{B - W} \right) \left(\frac{t + 460}{545} \right)^{0.5}, \quad (3)$$

$$A/F = 4.895 \frac{(CO) + 2(CO_2) + 2(O_2) + \left(\frac{NO_x}{10^4} \right) + 3.148 (CO_2) \left(\frac{CO + CO_2}{CO + 3CO_2} \right)}{(CO) + (CO_2) + \left(\frac{HC}{10^4} \right) \left[1 + 0.03148(CO_2) \left(\frac{CO + CO_2}{CO + 3CO_2} \right) \right]}, \quad (4)$$

The equation for A/F is based on:

1. Fuel = CH_{2.099}
2. Water-gas-shift equilibrium constant = $\frac{(CO) (H_2O)}{(CO_2) (H_2)} = 3$
3. HC was determined on a raw exhaust versus wet basis, all other species were measured on a dry basis.
4. All NO_x is NO.

$$\text{Mass CO} = (\text{Exhaust flow rate}) \times (CO) \times \frac{\text{Mol. wt CO}}{\text{Mol. wt exhaust}}$$

x correction for water removal,

$$\text{Mass CO} = 4.383 (F) (A/F + 1) (CO) \left[\frac{1}{1 + 0.03148(CO_2) \left(\frac{CO + CO_2}{CO + 3CO_2} \right)} \right], \quad (5)$$

$$\text{Mass HC} = 0.0002207 (F) (A/F + 1) (HC), \quad (6)$$

$$\text{Mass NO}_x = 0.0007201 (F) (A/F + 1) (NO_x) \left[\frac{1}{1 + 0.03148(CO_2) \left(\frac{CO + CO_2}{CO + 3CO_2} \right)} \right] \times K_H, \quad (7)$$

$$K_H = \frac{1}{1 - 0.0047 (H - 75)}, \quad (8)$$

where A/F = air-fuel ratio

B = barometric pressure, mm Hg

CO = carbon monoxide concentration, pct, vol

CO₂ = carbon dioxide concentration, pct, vol

D = intake air dew point, °F

F = fuel rate, lb/hr

H = humidity, grains H₂O/lb dry air

HC = unburned hydrocarbon concentration, ppmC, vol

K_H = humidity correction factor

N = engine speed, rpm

NO = nitric oxide concentration, ppm, vol

NO_x = nitrogen oxides concentration, ppm, vol

O₂ = oxygen concentration, pct, vol

P = corrected power, brake horsepower

t = intake air temperature, °F

T = torque, lb-ft

W = water vapor pressure, mm Hg.

TABLE 1. - GENERAL ENGINE SPECIFICATIONS

Displacement, cubic inches.....	225
Maximum brake horsepower, bhp @ 3,000 rpm.....	100
Maximum torque, lb-ft @ 1,600 rpm.....	170
Bore and stroke, inches.....	3.40 x 4.125
Configuration.....	In-line 6 Cylinder
Compression ratio.....	8.4
Firing order.....	1-5-3-6-2-4
Ignition timing at idle speed.....	TDC @ 750 rpm
Block material.....	Cast iron
Head material.....	Cast iron
Number of crankshaft main bearings.....	4
Number of compression rings/piston.....	2
Number of oil rings/piston.....	1
Cam drive.....	Chain
Valve port size:	
Intake, inches.....	1.625
Exhaust, inches.....	1.365
Valve timing:	
Intake opens, °BTC.....	16
Intake closes, °ATC.....	48
Exhaust opens, °BBC.....	54
Exhaust closes, °ATC.....	10
Valve lift:	
Intake, inches.....	0.406
Exhaust, inches.....	0.414
Spark plug gap, inches.....	0.035
Engine weight, pounds.....	510
Exhaust-gas-recirculation system:	
Valve type.....	Poppet
Control signal.....	Amplified venturi vacuum
Point of discharge.....	Intake manifold
Crankcase emission control:	
Control method.....	Positive crankcase ventilation
Point of discharge.....	Breather
Carburetor type.....	Single venturi concen- tric downdraft
Distributor specifications:	
Centrifugal advance, begins, ° @ 600 rpm.....	2.75
Centrifugal advance, intermediate, ° @ 900 rpm....	9.25
Centrifugal advance, maximum, ° @ 2,200 rpm.....	12.25
Vacuum advance, begins, ° @ 7 in. Hg.....	1.50
Vacuum advance, maximum, ° @ 11.5 in. Hg.....	8.5
Carburetor number.....	3830518
EGR valve number.....	3769658
Distributor number.....	3874082

TABLE 2. - FUEL ANALYSIS

Fuel No.....	7516
Research octane No.....	91.5
Motor octane No.....	83.8
Reid vapor pressure, psig.....	11.9
Distillation, °F:	
10 pct.....	134
50 pct.....	214
95 pct.....	388
100 pct.....	418
API gravity, degrees.....	67.0
FIA analysis, pct:	
Aromatics.....	11
Olefins.....	16
Paraffins.....	73
Sulfur, pct.....	0.0290
Lead, g/gallon.....	Trace
Hydrogen-to-carbon ratio.....	2.09

TABLE 3. - ENGINE BREAKIN SCHEDULE

Simulated vehicle speed, mph	Engine speed, rpm	Manifold vacuum, in. Hg	Fraction of time in mode
20	990	15.4	1/9 hr.
30	1,300	14.0	"
40	1,650	11.6	"
50	2,050	9.9	"
60	2,400	8.8	"
25	1,150	14.7	"
35	1,475	13.2	"
45	1,850	10.5	"
55	2,225	9.4	"

Time per cycle = 2-1/4 hours.

Mileage per cycle = 80 miles.

Total accumulated mileage = 1,520 miles

3. DISCUSSION OF TEST RESULTS

Engine performance, emission, and fuel consumption data show good repeatability. Brake horsepower and torque at wide-open throttle (WOT) conditions (figure 1) for various engine speeds show peak values very close to those quoted in table 1. The minimum value of brake specific fuel consumption at WOT conditions occurs at the same engine speed as peak torque. A slightly lean air-fuel ratio was maintained for each load point below 75 pct of full power for all engine speeds (figure 2). Emission levels of CO and HC were well controlled through the use of the catalytic reactor except near WOT conditions (figures 3 and 4). The HC emissions seem somewhat irregular in that at three mid-range engine speeds peak values occur at 75 and 90 pct of full load rather than 100 pct. Oxides of nitrogen emissions appear to be typical of most gasoline engines using EGR and fuel enrichment for power demand (figure 5); the peak value occurs near stoichiometric air-fuel ratios and at conditions in which there is little or no EGR. Fuel consumption was found to exhibit nearly a linear relationship with power (figure 6).

4. CONCLUSIONS

Replicate consumption, emissions, and engine performance data are satisfactory for the purposes of this test.

FIGURE 1. - BRAKE SPECIFIC FUEL CONSUMPTION, BRAKE HORSEPOWER, AND TORQUE VERSUS ENGINE RPM AT WIDE OPEN THROTTLE --CHRYSLER 225-CID ENGINE.

FIGURE 2. - AIR-FUEL RATIO VERSUS POWER AT SEVERAL SPEEDS--
CHRYSLER 225-CID ENGINE.

FIGURE 3. - CARBON MONOXIDE EMISSIONS VERSUS POWER AT SEVERAL SPEEDS--CHRYSLER 225-CID ENGINE.

FIGURE 4. - HYDROCARBON EMISSIONS VERSUS POWER AT SEVERAL SPEEDS
--CHRYSLER 225-CID ENGINE.

FIGURE 5. - OXIDES OF NITROGEN EMISSIONS VERSUS POWER AT SEVERAL SPEEDS--CHRYSLER 225-CID ENGINE.

FIGURE 6. - FUEL RATE VERSUS POWER AT SEVERAL SPEEDS--
CHRYSLER 225-CID ENGINE.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	1	2	3	4	5
Test Date.....	1/27/76	1/27/76	1/27/76	1/27/76	1/27/76
Barometer, mm Hg.....	748.0	748.0	748.0	748.0	748.0
Humidity, grains/lb.....	71	71	71	71	71
Temperature, F.....	107	106	110	108	83
Engine speed, rpm.....	800	800	800	750	750
Torque, lb-ft.....	0.0	5.0	10.0	0.0	5.0
Power, bhp*.....	0.0	.8	1.6	0.0	.7
Fuel rate, lb/hr.....	3.8	3.8	3.8	3.8	3.9
Ignition timing, deg BTC....	0.0	0.0	0.0	0.0	0.0
Manifold vacuum, in Hg.....	15.5	14.5	13.5	15.0	14.0
Throttle angle, deg.....	0.0	0.0	0.0	0.0	0.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1180	.1180	.1130	.1060	.1040
CO2, %.....	13.40	13.40	13.40	13.10	13.30
O2, %.....	1.95	2.07	2.00	2.28	2.23
HC, ppmC.....	628	605	685	512	536
NOx, ppm.....	83	76	90	73	88
Air-fuel ratio.....	16.21	16.30	16.24	16.50	16.44
Emission rates, g/hr:					
CO.....	30.0	30.0	28.5	27.1	26.9
HC.....	8.0	7.8	8.7	6.6	7.0
NOx**.....	3.4	3.1	3.7	3.0	3.6
Oil temperature, F.....	177	186	190	188	190
Oil pressure, psi.....	45	45	42	45	44
Coolant temperature, F.....	189	190	183	185	185
Exhaust temperature, F.....	682	666	655	665	661
Exhaust pressure, in H2O....	7.0	7.0	7.0	7.0	7.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	0.0000	0.0000	.1080	.0049	0.0000
CO2, %.....	13.50	13.50	13.50	13.50	13.40
O2, %.....	1.83	1.85	1.93	1.90	2.03
HC, ppmC.....	913	799	914	799	798
NOx, ppm.....	66	68	87	70	79
Air-fuel ratio.....	16.15	16.18	16.16	16.21	16.32
Emission rates, g/hr:					
CO.....	0.0	0.0	27.0	1.2	0.0
HC.....	11.6	10.2	11.5	10.1	10.3
NOx**.....	2.7	2.8	3.5	2.8	3.3
Exhaust temperature, F.....	585	576	574	563	566
Exhaust pressure, in H2O....	1.0	1.0	1.0	1.0	1.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	6	7	8	9	10
Test Date.....	1/27/76	1/27/76	1/27/76	1/27/76	2/11/76
Barometer, mm Hg.....	748.0	748.0	748.0	748.0	749.7
Humidity, grains/lb.....	71	71	71	71	47
Temperature, F.....	82	81	81	80	108
Engine speed, rpm.....	750	650	650	650	1000
Torque, lb-ft.....	10.0	0.0	5.0	10.0	127.0
Power, bhp*.....	1.4	0.0	.6	1.2	24.5
Fuel rate, lb/hr.....	3.9	3.3	3.2	3.2	13.8
Ignition timing, deg BTC....	0.0	0.0	0.0	0.0	4.0
Manifold vacuum, in Hg.....	14.0	15.5	14.5	14.5	.5
Throttle angle, deg.....	0.0	0.0	0.0	0.0	20.5
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1040	.1510	.1470	.1470	.7030
CO2, %.....	13.30	13.70	13.80	13.80	14.50
O2, %.....	2.13	1.67	1.57	1.57	.62
HC, ppmC.....	610	870	917	917	521
NOx, ppm.....	100	70	86	93	2375
Air-fuel ratio.....	16.36	15.94	15.86	15.86	15.04
Emission rates, g/hr:					
CO.....	26.8	32.2	30.6	30.6	587.3
HC.....	7.9	9.3	9.6	9.6	21.9
NOx**.....	4.2	2.4	2.9	3.1	287.8
Oil temperature, F.....	190	189	189	188	167
Oil pressure, psi.....	43	43	40	40	46
Coolant temperature, F.....	190	184	183	190	188
Exhaust temperature, F.....	652	621	581	563	1017
Exhaust pressure, in H2O....	7.0	7.0	7.0	7.0	27.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	0.0000	.0024	.0024	.0024	.4750
CO2, %.....	13.50	13.90	14.10	14.10	14.80
O2, %.....	1.97	1.43	1.37	1.27	.08
HC, ppmC.....	799	126	132	161	1332
NOx, ppm.....	91	65	70	85	550
Air-fuel ratio.....	16.26	15.92	15.87	15.79	14.66
Emission rates, g/hr:					
CO.....	0.0	.5	.5	.5	386.8
HC.....	10.3	1.4	1.4	1.7	54.7
NOx**.....	3.8	2.2	2.3	2.8	65.0
Exhaust temperature, F.....	562	545	512	495	899
Exhaust pressure, in H2O....	1.0	1.0	1.0	1.0	14.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	11	12	13	14	15
Test Date.....	1/28/76	1/28/76	1/28/76	1/28/76	1/28/76
Barometer, mm Hg.....	746.3	746.3	746.3	746.3	746.3
Humidity, grains/lb.....	79	79	79	79	79
Temperature, F.....	94	93	93	89	86
Engine speed, rpm.....	1000	1000	1000	1000	1000
Torque, lb-ft.....	119.0	99.0	79.0	53.0	33.0
Power, bhp*.....	23.0	19.1	15.2	10.2	6.3
Fuel rate, lb/hr.....	11.7	10.8	10.5	6.7	5.1
Ignition timing, deg BTC....	2.5	1.5	1.5	19.5	18.5
Manifold vacuum, in Hg.....	4.0	4.5	5.0	12.0	16.0
Throttle angle, deg.....	16.2	14.5	13.5	6.0	3.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	1.4300	.8200	.3910	.0610	.0750
CO2, %.....	13.80	13.50	13.50	13.30	13.30
O2, %.....	.68	1.25	1.70	2.37	2.37
HC, ppmC.....	785	620	561	941	1055
NOx, ppm.....	1338	935	625	610	500
Air-fuel ratio.....	14.70	15.37	15.90	16.54	16.51
Emission rates, g/hr:					
CO.....	997.6	555.9	264.7	27.4	25.6
HC.....	27.6	21.2	19.1	21.3	18.1
NOx**.....	156.2	106.1	70.8	45.9	28.5
Oil temperature, F.....	200	203	204	205	204
Oil pressure, psi.....	45	45	45	45	45
Coolant temperature, F.....	186	185	187	187	186
Exhaust temperature, F.....	1034	1036	1043	835	748
Exhaust pressure, in H2O....	21.0	20.5	20.0	11.0	8.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.4490	.0097	.0049	.0024	.0024
CO2, %.....	14.50	14.60	14.40	13.30	13.50
O2, %.....	.07	.65	.95	2.37	2.07
HC, ppmC.....	52	43	35	39	46
NOx, ppm.....	820	760	520	520	405
Air-fuel ratio.....	14.80	15.38	15.59	16.69	16.44
Emission rates, g/hr:					
CO.....	314.9	6.5	3.2	1.1	.8
HC.....	1.8	1.5	1.2	.9	.8
NOx**.....	96.3	85.9	57.5	39.4	23.0
Exhaust temperature, F.....	1068	1042	1031	762	695
Exhaust pressure, in H2O....	13.0	10.0	9.0	3.0	2.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	16	17	26	27	28
Test Date.....	1/28/76	1/28/76	1/28/76	1/28/76	1/28/76
Barometer, mm Hg.....	746.3	746.3	746.3	746.3	746.3
Humidity, grains/lb.....	79	79	79	79	79
Temperature, F.....	85	83	93	95	100
Engine speed, rpm.....	1000	1000	1600	1600	1600
Torque, lb-ft.....	13.0	5.0	165.0	148.0	123.0
Power, bhp*.....	2.5	1.0	50.9	45.7	38.2
Fuel rate, lb/hr.....	4.5	4.4	23.7	21.2	17.4
Ignition timing, deg BTC....	12.5	7.0	15.0	15.5	14.0
Manifold vacuum, in Hg.....	17.5	17.5	1.0	3.5	4.0
Throttle angle, deg.....	2.5	1.5	76.0	25.0	21.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1230	.1420	2.9300	2.9300	.3040
CO2, %.....	13.50	13.50	12.40	12.80	13.90
O2, %.....	1.95	1.78	.72	.18	.90
HC, ppmC.....	851	514	1207	0	872
NOx, ppm.....	145	92	1950	1075	1675
Air-fuel ratio.....	16.17	16.08	14.03	13.80	15.37
Emission rates, g/hr:					
CO.....	36.8	41.2	3979.5	3483.2	329.7
HC.....	12.8	7.5	82.6	0.0	47.7
NOx**.....	7.3	4.5	443.5	214.0	304.2
Oil temperature, F.....	202	195	215	222	226
Oil pressure, psi.....	45	45	45	45	45
Coolant temperature, F.....	188	185	187	189	187
Exhaust temperature, F.....	718	693	1169	1163	1161
Exhaust pressure, in H2O....	8.0	8.0	50.0	39.0	35.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.0024	.0049	1.9400	2.8900	.0073
CO2, %.....	13.80	13.80	13.70	12.90	14.40
O2, %.....	1.75	1.58	.05	.08	.67
HC, ppmC.....	50	395	87	1270	39
NOx, ppm.....	13	85	400	1000	1550
Air-fuel ratio.....	16.16	16.00	14.13	13.65	15.43
Emission rates, g/hr:					
CO.....	.7	1.4	2634.4	3398.1	7.9
HC.....	.7	5.7	5.9	75.2	2.1
NOx**.....	.6	4.1	91.0	196.9	281.7
Exhaust temperature, F.....	643	593	1267	1118	1128
Exhaust pressure, in H2O....	1.0	1.0	37.0	32.0	29.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	29	30	31	32	33
Test Date.....	1/28/76	1/28/76	1/28/76	1/28/76	1/28/76
Barometer, mm Hg.....	746.3	746.3	746.3	746.3	746.3
Humidity, grains/lb.....	79	79	79	79	79
Temperature, F.....	95	91	87	86	84
Engine speed, rpm.....	1600	1600	1600	1600	1600
Torque, lb-ft.....	99.0	66.0	41.0	16.0	10.0
Power, bhp*.....	30.6	20.3	12.6	4.9	3.1
Fuel rate, lb/hr.....	14.6	11.1	8.7	6.2	6.4
Ignition timing, deg BTC....	14.5	29.0	32.0	32.5	32.5
Manifold vacuum, in Hg.....	5.0	9.5	13.0	18.0	18.5
Throttle angle, deg.....	16.5	9.5	5.9	3.0	2.5
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1720	.1770	.1080	.1300	.1370
CO2, %.....	13.70	13.40	13.30	12.60	12.60
O2, %.....	1.45	1.80	2.07	2.90	2.95
HC, ppmC.....	550	959	1015	2266	2606
NOx, ppm.....	920	690	420	180	130
Air-fuel ratio.....	15.84	16.05	16.28	16.80	16.79
Emission rates, g/hr:					
CO.....	162.0	128.7	62.2	55.3	60.6
HC.....	26.1	35.2	29.4	48.6	58.1
NOx**.....	145.1	84.0	40.5	12.8	9.6
Oil temperature, F.....	227	225	222	214	214
Oil pressure, psi.....	45	45	45	45	45
Coolant temperature, F.....	189	186	187	187	187
Exhaust temperature, F.....	1143	1042	945	979	850
Exhaust pressure, in H2O....	29.0	20.0	15.0	10.0	10.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.0049	.0049	.0049	.0049	.0049
CO2, %.....	13.80	13.80	13.50	13.00	13.00
O2, %.....	1.52	1.45	1.92	2.50	2.50
HC, ppmC.....	27	34	42	455	511
NOx, ppm.....	1050	690	400	200	150
Air-fuel ratio.....	16.04	15.97	16.33	16.76	16.75
Emission rates, g/hr:					
CO.....	4.7	3.5	2.8	2.1	2.2
HC.....	1.3	1.2	1.2	9.7	11.4
NOx**.....	167.6	83.4	38.6	14.2	11.1
Exhaust temperature, F.....	1092	1018	895	1038	845
Exhaust pressure, in H2O....	20.0	15.0	10.0	5.0	3.0

* Corrected - SAE J816b
 ** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	34	35	36	37	38
Test Date.....	2/11/76	1/29/76	1/29/76	1/29/76	1/29/76
Barometer, mm Hg.....	749.7	750.4	750.4	750.4	750.4
Humidity, grains/lb.....	47	81	81	81	81
Temperature, F.....	111	92	94	95	89
Engine speed, rpm.....	2000	2000	2000	2000	2000
Torque, lb-ft.....	164.0	153.0	127.0	102.0	68.0
Power, bhp*.....	63.5	58.6	48.8	39.2	26.0
Fuel rate, lb/hr.....	29.5	27.1	22.7	19.6	13.4
Ignition timing, deg BTC....	17.0	15.0	17.5	17.5	34.0
Manifold vacuum, in Hg.....	.5	3.5	4.0	4.5	10.0
Throttle angle, deg.....	76.0	32.0	28.0	25.0	12.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	2.5300	2.0800	.2750	.1370	.1330
CO2, %.....	12.60	13.30	14.40	13.50	13.60
O2, %.....	.90	.25	.90	1.55	1.72
HC, ppmC.....	862	1182	715	457	743
NOx, ppm.....	2450	1950	2275	1025	970
Air-fuel ratio.....	14.37	14.12	15.41	15.96	16.04
Emission rates, g/hr:					
CO.....	4367.9	3241.8	389.3	174.5	115.9
HC.....	75.0	92.9	51.0	29.3	32.6
NOx**.....	613.6	514.8	545.5	221.1	143.1
Oil temperature, F.....	202	226	238	239	238
Oil pressure, psi.....	46	46	46	46	45
Coolant temperature, F.....	188	192	189	191	188
Exhaust temperature, F.....	1217	1276	1269	1257	1107
Exhaust pressure, in H2O....	72.0	63.0	52.0	47.0	25.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	1.4800	1.3900	.0190	.0024	0.0000
CO2, %.....	13.90	13.80	14.40	13.80	13.80
O2, %.....	.10	.14	.50	1.30	1.60
HC, ppmC.....	73	635	32	17	27
NOx, ppm.....	430	2300	1875	1338	810
Air-fuel ratio.....	14.35	14.42	15.32	15.89	16.09
Emission rates, g/hr:					
CO.....	2536.9	2206.8	26.8	3.0	0.0
HC.....	6.3	50.8	2.3	1.1	1.2
NOx**.....	106.9	618.5	448.0	286.9	119.8
Exhaust temperature, F.....	1327	1238	1232	1201	1071
Exhaust pressure, in H2O....	48.0	45.0	39.0	36.0	11.0

* Corrected - SAE J816b
 ** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	39	40	41	42	43
Test Date.....	1/29/76	1/29/76	1/29/76	1/29/76	1/29/76
Barometer, mm Hg.....	750.4	750.4	750.4	750.4	750.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	86	85	84	85	88
Engine speed, rpm.....	2000	2000	2000	2500	2500
Torque, lb-ft.....	42.0	17.0	.5	166.0	149.0
Power, bhp*.....	16.0	6.5	.2	79.0	71.1
Fuel rate, lb/hr.....	10.9	8.3	6.8	37.3	31.7
Ignition timing, deg BTC....	34.0	34.0	34.0	19.0	19.0
Manifold vacuum, in Hg.....	13.0	16.5	20.0	1.0	3.5
Throttle angle, deg.....	8.5	5.0	3.5	76.0	37.7
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1680	.1560	.1680	2.2200	.7030
CO2, %.....	13.40	13.00	12.30	13.00	13.90
O2, %.....	2.05	2.37	3.35	.45	.50
HC, ppmC.....	856	1194	4295	553	587
NOx, ppm.....	355	210	120	2650	3450
Air-fuel ratio.....	16.24	16.47	16.89	14.26	15.00
Emission rates, g/hr:					
CO.....	121.6	87.6	79.2	4812.8	1358.6
HC.....	31.2	33.8	102.0	60.4	57.2
NOx**.....	43.5	20.0	9.6	973.1	1129.3
Oil temperature, F.....	235	230	225	232	246
Oil pressure, psi.....	45	45	45	46	45
Coolant temperature, F.....	188	190	189	191	189
Exhaust temperature, F.....	1038	979	883	1332	1371
Exhaust pressure, in H2O....	9.0	14.0	12.0	105.0	90.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.0024	0.0000	.0012	2.0800	.1180
CO2, %.....	13.70	13.30	13.00	13.30	13.30
O2, %.....	1.75	2.20	2.50	.12	.20
HC, ppmC.....	35	36	47	196	297
NOx, ppm.....	390	210	145	2075	1575
Air-fuel ratio.....	16.19	16.55	16.81	14.14	15.04
Emission rates, g/hr:					
CO.....	1.7	0.0	.6	4463.7	230.7
HC.....	1.3	1.0	1.1	21.2	29.2
NOx**.....	47.6	20.0	11.5	754.2	521.6
Exhaust temperature, F.....	991	931	933	1354	1380
Exhaust pressure, in H2O....	5.0	2.0	2.0	68.0	60.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	44	45	46	47	48
Test Date.....	1/29/76	1/29/76	1/29/76	1/29/76	1/29/76
Barometer, mm Hg.....	750.4	750.4	750.4	750.4	750.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	92	92	92	88	87
Engine speed, rpm.....	2500	2500	2500	2500	2500
Torque, lb-ft.....	124.0	99.0	66.0	41.0	16.0
Power, bhp*.....	59.4	47.4	31.6	19.6	7.6
Fuel rate, lb/hr.....	26.2	24.4	17.4	13.0	10.8
Ignition timing, deg BTC....	19.0	19.0	36.0	34.5	35.0
Manifold vacuum, in Hg.....	4.5	5.0	10.5	14.0	16.0
Throttle angle, deg.....	32.0	28.0	15.5	10.5	8.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1180	.1200	.1560	.2010	.2010
CO2, %.....	13.50	13.30	13.50	13.00	12.60
O2, %.....	1.67	1.92	1.63	2.10	2.70
HC, ppmC.....	183	177	486	1138	3117
NOx, ppm.....	1875	1100	1538	415	220
Air-fuel ratio.....	16.12	16.29	16.02	16.26	16.50
Emission rates, g/hr:					
CO.....	203.1	194.2	177.0	173.2	146.8
HC.....	15.9	14.4	27.8	49.4	114.7
NOx**.....	546.5	301.6	295.6	60.6	27.2
Oil temperature, F.....	253	254	253	249	244
Oil pressure, psi.....	45	45	45	45	45
Coolant temperature, F.....	189	191	189	188	189
Exhaust temperature, F.....	1346	1322	1190	1090	1041
Exhaust pressure, in H2O....	72.0	62.0	34.0	22.0	20.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1180	.0024	.0012	.0012	.0012
CO2, %.....	13.50	13.50	13.70	13.40	13.30
O2, %.....	1.60	1.83	1.53	1.80	2.08
HC, ppmC.....	1200	9	19	27	52
NOx, ppm.....	1900	1075	1400	475	240
Air-fuel ratio.....	15.95	16.29	16.07	16.26	16.46
Emission rates, g/hr:					
CO.....	201.1	3.9	1.4	1.0	.9
HC.....	103.0	.7	1.1	1.2	1.9
NOx**.....	548.4	294.5	269.6	69.1	29.5
Exhaust temperature, F.....	1294	1262	1164	1051	1050
Exhaust pressure, in H2O....	50.0	45.0	25.0	15.0	10.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	49	50	51	52	53
Test Date.....	1/29/76	1/29/76	1/29/76	1/29/76	1/29/76
Barometer, mm Hg.....	750.4	750.4	750.4	750.4	750.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	87	86	89	91	91
Engine speed, rpm.....	2500	3000	3000	3000	3000
Torque, lb-ft.....	0.0	159.0	143.0	119.0	95.0
Power, bhp*.....	0.0	90.9	82.0	68.3	54.6
Fuel rate, lb/hr.....	8.7	44.3	40.6	34.2	29.3
Ignition timing, deg BTC....	35.5	20.0	20.0	20.0	21.0
Manifold vacuum, in Hg.....	19.0	2.0	3.0	4.0	5.0
Throttle angle, deg.....	6.0	76.0	45.0	40.5	32.7
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.2210	2.0800	1.5200	.0770	.0890
CO2, %.....	12.10	13.10	13.40	13.30	12.90
O2, %.....	3.25	.27	.22	1.57	2.22
HC, ppmC.....	2539	691	748	100	89
NOx, ppm.....	130	2650	2700	2750	1050
Air-fuel ratio.....	17.05	14.19	14.40	16.13	16.58
Emission rates, g/hr:					
CO.....	135.2	5332.1	3614.8	173.3	176.6
HC.....	78.3	89.2	89.7	11.4	8.9
NOx**.....	13.5	1150.6	1087.6	1048.3	352.9
Oil temperature, F.....	240	242	263	271	272
Oil pressure, psi.....	45	45	45	45	45
Coolant temperature, F.....	188	192	192	189	189
Exhaust temperature, F.....	986	1344	1429	1414	1379
Exhaust pressure, in H2O....	16.0	150.0	124.0	110.0	87.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	0.0000	2.1900	.9810	.0024	.0024
CO2, %.....	13.00	13.10	13.90	13.40	13.00
O2, %.....	2.30	.12	.13	1.57	2.15
HC, ppmC.....	57	438	346	12	8
NOx, ppm.....	160	2400	2800	2700	1075
Air-fuel ratio.....	16.66	14.07	14.63	16.17	16.59
Emission rates, g/hr:					
CO.....	0.0	5564.6	2364.0	5.4	4.8
HC.....	1.7	56.1	42.0	1.4	.8
NOx**.....	16.1	1032.9	1142.9	1031.4	361.2
Exhaust temperature, F.....	1055	1315	1393	1357	1323
Exhaust pressure, in H2O....	5.0	88.0	78.0	70.0	59.0

* Corrected - SAE J816b
 ** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	54	55	56	57	58
Test Date.....	1/29/76	1/29/76	1/29/76	1/29/76	1/29/76
Barometer, mm Hg.....	750.4	750.4	750.4	750.4	750.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	92	90	90	89	82
Engine speed, rpm.....	3000	3000	3000	3000	3600
Torque, lb-ft.....	63.0	39.0	15.0	1.0	145.0
Power, bhp*.....	36.2	22.4	8.6	.6	99.1
Fuel rate, lb/hr.....	21.4	17.8	13.6	11.2	51.4
Ignition timing, deg BTC....	37.0	38.0	36.5	36.0	25.0
Manifold vacuum, in Hg.....	10.5	13.0	16.0	18.0	3.0
Throttle angle, deg.....	19.0	15.0	10.5	8.2	76.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1830	.1650	.2340	.2530	2.9600
CO2, %.....	13.10	13.00	12.50	12.10	12.50
O2, %.....	1.87	2.00	2.70	3.20	.14
HC, ppmC.....	399	489	2832	5305	823
NOx, ppm.....	1875	950	300	140	1725
Air-fuel ratio.....	16.24	16.31	16.53	16.62	13.69
Emission rates, g/hr:					
CO.....	259.1	195.4	214.9	192.9	8506.7
HC.....	28.4	29.2	131.1	203.8	119.1
NOx**.....	449.6	190.5	46.7	18.1	839.7
Oil temperature, F.....	270	266	262	257	209
Oil pressure, psi.....	45	45	45	45	47
Coolant temperature, F.....	188	189	188	189	190
Exhaust temperature, F.....	1210	1156	1114	1080	1400
Exhaust pressure, in H2O....	47.0	35.0	35.0	22.0	160.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.0024	.0024	.0012	.0024	2.8600
CO2, %.....	13.40	13.30	13.00	13.10	12.60
O2, %.....	1.70	1.85	2.10	2.10	.09
HC, ppmC.....	17	14	568	683	598
NOx, ppm.....	1800	975	330	180	1725
Air-fuel ratio.....	16.23	16.32	16.45	16.42	13.72
Emission rates, g/hr:					
CO.....	3.4	2.8	1.1	1.8	8235.1
HC.....	1.2	.8	26.1	25.7	86.8
NOx**.....	430.9	195.4	50.9	22.8	841.3
Exhaust temperature, F.....	1180	1120	1128	1159	1339
Exhaust pressure, in H2O....	32.0	15.0	10.0	5.0	105.0

* Corrected - SAE J816b
 ** Corrected for humidity.

Engine..... Chrysler 225-GID
 Fuel..... 7516

Test Number.....	59	60	61	62	63
Test Date.....	1/29/76	1/29/76	1/29/76	1/29/76	1/29/76
Barometer, mm Hg.....	750.4	750.4	750.4	750.4	750.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	87	88	89	89	88
Engine speed, rpm.....	3600	3600	3600	3600	3600
Torque, lb-ft.....	130.0	108.0	87.0	58.0	36.0
Power, bhp*.....	89.3	74.2	59.9	39.9	24.7
Fuel rate, lb/hr.....	44.7	38.4	34.3	26.4	21.6
Ignition timing, deg BTC....	22.5	23.0	25.0	39.5	39.5
Manifold vacuum, in Hg.....	3.0	4.0	5.0	10.0	13.0
Throttle angle, deg.....	49.9	45.0	37.5	23.0	18.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	1.1800	.0540	.0560	.1720	.2580
CO2, %.....	13.50	13.40	12.90	13.10	13.30
O2, %.....	.25	1.40	2.25	2.05	1.70
HC, ppmC.....	575	43	284	216	257
NOx, ppm.....	2550	2100	1275	2200	1275
Air-fuel ratio.....	14.58	15.99	16.61	16.41	16.05
Emission rates, g/hr:					
CO.....	3130.0	135.1	130.3	303.8	364.6
HC.....	76.8	5.5	33.3	19.3	18.3
NOx**.....	1145.7	890.0	502.5	658.2	305.2
Oil temperature, F.....	260	278	286	288	286
Oil pressure, psi.....	45	45	44	45	45
Coolant temperature, F.....	192	191	187	188	189
Exhaust temperature, F.....	1494	1489	1445	1312	1237
Exhaust pressure, in H2O....	155.0	144.0	119.0	70.0	48.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	1.1600	.0012	.0024	.0024	.0073
CO2, %.....	13.70	13.40	13.00	13.00	13.50
O2, %.....	.13	1.45	2.20	2.00	1.50
HC, ppmC.....	346	13	9	11	11
NOx, ppm.....	2425	2188	1350	2250	1250
Air-fuel ratio.....	14.54	16.07	16.63	16.52	16.06
Emission rates, g/hr:					
CO.....	3062.4	3.0	5.6	4.3	10.3
HC.....	46.0	1.6	1.0	1.0	.8
NOx**.....	1084.4	931.6	532.4	678.7	299.3
Exhaust temperature, F.....	1453	1429	1383	1277	1198
Exhaust pressure, in H2O....	95.0	89.0	76.0	49.0	30.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	64	65	66	67	68
Test Date.....	1/29/76	1/29/76	1/30/76	1/30/76	1/30/76
Barometer, mm Hg.....	750.4	750.4	745.4	745.4	745.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	88	87	81	81	82
Engine speed, rpm.....	3600	3600	1000	1000	1000
Torque, lb-ft.....	14.0	2.0	79.0	53.0	33.0
Power, bhp*.....	9.6	1.4	15.1	10.1	6.3
Fuel rate, lb/hr.....	18.1	13.5	10.7	5.7	5.1
Ignition timing, deg BTC....	39.0	39.5	4.0	17.0	20.0
Manifold vacuum, in Hg.....	15.0	17.0	5.0	13.5	16.0
Throttle angle, deg.....	13.0	10.0	12.5	6.0	4.7
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.2340	.2380	.3390	.0610	.0940
CO2, %.....	12.80	12.50	13.00	13.00	13.40
O2, %.....	2.25	2.65	2.30	2.55	1.80
HC, ppmC.....	8520	2606	695	1165	1484
NOx, ppm.....	580	250	570	765	540
Air-fuel ratio.....	15.51	16.51	16.38	16.69	16.03
Emission rates, g/hr:					
CO.....	269.5	217.3	243.2	23.6	31.4
HC.....	494.4	119.9	25.1	22.7	25.0
NOx**.....	113.1	38.7	69.1	49.9	30.5
Oil temperature, F.....	282	273	190	198	197
Oil pressure, psi.....	45	45	45	45	45
Coolant temperature, F.....	188	187	188	190	188
Exhaust temperature, F.....	1197	1164	1036	843	697
Exhaust pressure, in H2O....	35.0	30.0	21.0	10.0	9.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.0073	.0024	.0024	.0012	.0012
CO2, %.....	13.30	13.10	13.80	13.30	13.70
O2, %.....	1.90	2.00	1.85	2.25	1.55
HC, ppmC.....	28	59	48	67	81
NOx, ppm.....	600	270	570	600	440
Air-fuel ratio.....	16.34	16.42	16.25	16.60	16.04
Emission rates, g/hr:					
CO.....	8.8	2.2	1.7	.5	.4
HC.....	1.7	2.7	1.7	1.3	1.4
NOx**.....	122.5	41.4	68.2	38.9	24.8
Exhaust temperature, F.....	1164	1184	978	819	651
Exhaust pressure, in H2O....	20.0	15.0	12.0	5.0	2.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	69	70	76	77	78
Test Date.....	1/30/76	1/30/76	1/30/76	1/30/76	1/30/76
Barometer, mm Hg.....	745.4	745.4	745.4	745.4	745.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	81	82	83	82	83
Engine speed, rpm.....	1000	1000	1600	1600	1600
Torque, lb-ft.....	13.0	.5	99.0	66.0	41.0
Power, bhp*.....	2.5	.1	30.3	20.2	12.5
Fuel rate, lb/hr.....	4.6	4.4	15.5	10.6	8.1
Ignition timing, deg BTC....	8.0	5.0	14.0	32.0	31.0
Manifold vacuum, in Hg.....	17.0	18.0	5.0	12.0	15.0
Throttle angle, deg.....	3.9	3.0	18.0	12.0	8.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1890	.1770	.0890	.1470	.0990
CO2, %.....	13.70	13.60	13.10	13.10	13.00
O2, %.....	1.45	1.50	2.15	2.00	2.60
HC, ppmC.....	859	515	615	1053	1080
NOx, ppm.....	140	80	675	450	660
Air-fuel ratio.....	15.77	15.85	16.43	16.22	16.71
Emission rates, g/hr:					
CO.....	56.3	50.5	92.8	103.1	54.7
HC.....	12.9	7.4	32.3	37.2	30.1
NOx**.....	7.0	3.8	118.9	53.3	61.6
Oil temperature, F.....	197	196	204	209	208
Oil pressure, psi.....	45	45	45	45	45
Coolant temperature, F.....	189	188	188	190	190
Exhaust temperature, F.....	679	696	1128	933	951
Exhaust pressure, in H2O....	9.0	7.0	31.0	19.0	14.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.0012	.0012	.0012	.0012	0.0000
CO2, %.....	13.90	13.80	13.10	13.50	13.40
O2, %.....	1.25	1.30	2.10	1.80	1.85
HC, ppmC.....	70	50	29	37	50
NOx, ppm.....	123	83	800	525	665
Air-fuel ratio.....	15.80	15.85	16.52	16.25	16.30
Emission rates, g/hr:					
CO.....	.4	.3	1.3	.8	0.0
HC.....	1.1	.7	1.5	1.3	1.3
NOx**.....	6.2	4.0	141.7	62.1	60.4
Exhaust temperature, F.....	612	622	1066	870	923
Exhaust pressure, in H2O....	2.0	1.0	20.0	14.0	5.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	79	80	81	82	83
Test Date.....	1/30/76	1/30/76	1/30/76	1/30/76	1/30/76
Barometer, mm Hg.....	745.4	745.4	745.4	745.4	745.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	83	82	81	85	85
Engine speed, rpm.....	1600	1600	2000	2000	2000
Torque, lb-ft.....	16.0	0.0	102.0	68.0	42.0
Power, bhp*.....	4.9	0.0	39.0	26.1	16.1
Fuel rate, lb/hr.....	5.9	5.1	20.0	14.0	11.1
Ignition timing, deg BTC....	31.5	31.5	15.5	31.5	32.5
Manifold vacuum, in Hg.....	18.0	20.0	5.0	10.0	13.0
Throttle angle, deg.....	3.0	1.0	23.9	15.5	8.5
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1200	.2120	.1080	.1130	.2010
CO2, %.....	12.60	12.60	13.40	13.10	13.00
O2, %.....	2.80	2.65	1.80	1.78	2.05
HC, ppmC.....	1813	5102	491	751	1024
NOx, ppm.....	255	130	880	970	425
Air-fuel ratio.....	16.79	16.20	16.15	16.14	16.24
Emission rates, g/hr:					
CO.....	49.1	72.5	142.1	104.2	147.6
HC.....	37.4	88.0	32.6	34.9	37.9
NOx**.....	17.6	7.5	195.6	151.0	52.7
Oil temperature, F.....	210	210	184	210	220
Oil pressure, psi.....	45	45	46	45	45
Coolant temperature, F.....	188	188	188	189	190
Exhaust temperature, F.....	861	757	1015	1097	1016
Exhaust pressure, in H2O....	10.0	9.0	39.0	26.0	20.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	0.0000	.0024	.0024	0.0000	.0012
CO2, %.....	13.00	13.40	13.40	13.40	13.40
O2, %.....	2.45	1.73	1.85	1.65	1.72
HC, ppmC.....	61	68	19	33	35
NOx, ppm.....	280	155	775	970	440
Air-fuel ratio.....	16.78	16.19	16.30	16.17	16.20
Emission rates, g/hr:					
CO.....	0.0	.8	3.2	0.0	.9
HC.....	1.3	1.2	1.3	1.5	1.3
NOx**.....	19.3	8.9	173.9	151.0	54.3
Exhaust temperature, F.....	840	763	885	1058	971
Exhaust pressure, in H2O....	2.0	1.0	25.0	20.0	12.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	84	85	86	87	88
Test Date.....	1/30/76	1/30/76	1/30/76	1/30/76	1/30/76
Barometer, mm Hg.....	745.4	745.4	745.4	745.4	745.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	85	84	84	87	87
Engine speed, rpm.....	2000	2000	2500	2500	2500
Torque, lb-ft.....	17.0	1.0	99.0	66.0	41.0
Power, bhp*.....	6.5	.4	47.4	31.7	19.7
Fuel rate, lb/hr.....	8.0	6.4	22.1	16.8	13.4
Ignition timing, deg BTC....	34.0	33.0	25.0	35.0	35.0
Manifold vacuum, in Hg.....	17.0	19.5	7.0	11.0	14.0
Throttle angle, deg.....	5.0	3.0	21.9	14.9	11.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1650	.1680	.1180	.1420	.1650
CO2, %.....	12.60	12.10	13.10	13.20	13.00
O2, %.....	2.65	3.40	1.85	1.73	2.00
HC, ppmC.....	2267	5190	364	570	853
NOx, ppm.....	205	120	1225	1400	563
Air-fuel ratio.....	16.59	16.84	16.24	16.11	16.25
Emission rates, g/hr:					
CO.....	90.1	74.8	173.3	156.6	146.8
HC.....	62.4	116.4	27.0	31.7	38.3
NOx**.....	18.9	9.0	303.8	260.8	84.5
Oil temperature, F.....	222	220	223	238	241
Oil pressure, psi.....	45	45	46	45	45
Coolant temperature, F.....	188	187	189	189	188
Exhaust temperature, F.....	963	897	1153	1135	1079
Exhaust pressure, in H2O....	14.0	11.0	46.0	42.0	23.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.0024	0.0000	0.0000	.0012	.0024
CO2, %.....	13.10	12.90	13.10	13.40	13.40
O2, %.....	2.15	2.45	1.90	1.55	1.73
HC, ppmC.....	59	43	15	21	33
NOx, ppm.....	225	150	1175	1300	563
Air-fuel ratio.....	16.53	16.79	16.39	16.11	16.21
Emission rates, g/hr:					
CO.....	1.3	0.0	0.0	1.3	2.1
HC.....	1.6	.9	1.1	1.1	1.5
NOx**.....	20.6	11.2	294.2	241.9	84.1
Exhaust temperature, F.....	948	930	1097	1095	1040
Exhaust pressure, in H2O....	5.0	2.0	30.0	15.0	11.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	89	90	91	92	93
Test Date.....	1/30/76	1/30/76	1/30/76	1/30/76	1/30/76
Barometer, mm Hg.....	745.4	745.4	745.4	745.4	745.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	87	86	86	87	88
Engine speed, rpm.....	2500	2500	3000	3000	3000
Torque, lb-ft.....	16.0	.5	95.0	63.0	39.0
Power, bhp*.....	7.7	.2	54.7	36.3	22.5
Fuel rate, lb/hr.....	10.7	8.8	29.4	20.1	16.5
Ignition timing, deg BTC....	35.0	35.0	19.5	37.0	36.5
Manifold vacuum, in Hg.....	16.0	19.0	5.0	11.0	14.0
Throttle angle, deg.....	8.0	5.5	33.2	18.0	13.9
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.1890	.2280	.0890	.1770	.2010
CO2, %.....	12.60	12.10	12.80	13.00	12.80
O2, %.....	2.60	3.15	2.20	1.73	1.85
HC, ppmC.....	2834	4514	100	432	579
NOx, ppm.....	210	130	1200	1838	830
Air-fuel ratio.....	16.46	16.70	16.59	16.14	16.18
Emission rates, g/hr:					
CO.....	136.3	137.5	177.3	234.7	219.9
HC.....	103.0	137.2	10.1	28.9	31.9
NOx**.....	25.6	13.2	403.8	411.6	153.4
Oil temperature, F.....	238	236	236	255	257
Oil pressure, psi.....	45	45	45	45	45
Coolant temperature, F.....	189	187	192	189	189
Exhaust temperature, F.....	1043	1002	1253	1212	1164
Exhaust pressure, in H2O....	19.0	16.0	87.0	43.0	32.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	0.0000	.0012	0.0000	.0024	.0024
CO2, %.....	13.10	12.90	12.90	13.10	13.10
O2, %.....	1.95	2.25	2.20	1.55	1.60
HC, ppmC.....	47	56	10	18	16
NOx, ppm.....	245	155	1163	1775	825
Air-fuel ratio.....	16.39	16.63	16.64	16.15	16.15
Emission rates, g/hr:					
CO.....	0.0	.7	0.0	3.2	2.6
HC.....	1.7	1.7	1.0	1.2	.9
NOx**.....	29.6	15.6	392.4	397.8	152.0
Exhaust temperature, F.....	1038	1047	1278	1178	1134
Exhaust pressure, in H2O....	7.0	3.0	59.0	35.0	20.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	94	95	96	97	98
Test Date.....	1/30/76	1/30/76	1/30/76	1/30/76	1/30/76
Barometer, mm Hg.....	745.4	745.4	745.4	745.4	745.4
Humidity, grains/lb.....	81	81	81	81	81
Temperature, F.....	91	87	82	85	88
Engine speed, rpm.....	3000	3000	3600	3600	3600
Torque, lb-ft.....	15.0	.5	87.0	58.0	36.0
Power, bhp*.....	8.7	.3	59.9	40.0	24.9
Fuel rate, lb/hr.....	13.5	11.0	34.8	25.2	20.4
Ignition timing, deg BTC....	37.0	37.0	23.0	39.0	39.0
Manifold vacuum, in Hg.....	16.0	18.0	5.5	10.5	13.0
Throttle angle, deg.....	11.0	8.0	37.0	22.0	17.8
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.2330	.2580	.0800	.3090	.2120
CO2, %.....	12.50	11.90	12.90	13.10	13.00
O2, %.....	2.25	3.25	2.15	1.50	1.73
HC, ppmC.....	1699	5295	119	342	330
NOx, ppm.....	350	140	1200	2350	1275
Air-fuel ratio.....	16.33	16.68	16.54	15.92	16.11
Emission rates, g/hr:					
CO.....	211.3	194.5	188.1	506.5	284.6
HC.....	77.7	201.2	14.1	28.2	22.3
NOx**.....	53.6	17.8	476.5	650.6	289.1
Oil temperature, F.....	256	253	192	249	263
Oil pressure, psi.....	45	45	47	45	45
Coolant temperature, F.....	188	188	192	188	189
Exhaust temperature, F.....	1127	1075	1337	1316	1244
Exhaust pressure, in H2O....	26.0	21.0	112.0	64.0	45.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.0024	.0024	.0024	.0049	.0049
CO2, %.....	13.00	12.30	13.00	13.40	13.30
O2, %.....	1.90	2.15	2.00	1.35	1.57
HC, ppmC.....	50	79	28	47	22
NOx, ppm.....	360	175	1375	2188	1275
Air-fuel ratio.....	16.37	16.63	16.48	15.99	16.13
Emission rates, g/hr:					
CO.....	2.2	1.8	5.6	8.1	6.6
HC.....	2.3	3.0	3.3	3.9	1.5
NOx**.....	55.1	22.2	544.0	607.7	288.9
Exhaust temperature, F.....	1122	1141	1261	1294	1216
Exhaust pressure, in H2O....	14.0	7.0	73.0	46.0	30.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	99	100	101	102	103
Test Date.....	1/30/76	1/30/76	2/ 9/76	2/ 9/76	2/ 9/76
Barometer, mm Hg.....	745.4	745.4	738.1	738.1	738.1
Humidity, grains/lb.....	81	81	39	39	39
Temperature, F.....	88	88	81	81	81
Engine speed, rpm.....	3600	3600	650	650	650
Torque, lb-ft.....	14.0	1.0	0.0	5.0	10.0
Power, bhp*.....	9.7	.7	0.0	.6	1.2
Fuel rate, lb/hr.....	17.2	13.8	3.2	3.3	3.5
Ignition timing, deg BTC....	39.0	39.0	0.0	0.0	0.0
Manifold vacuum, in Hg.....	15.0	17.0	15.5	15.2	14.8
Throttle angle, deg.....	14.0	11.0	0.0	0.0	0.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.2430	.2480	.2205	.2335	.2205
CO2, %.....	12.80	12.30	13.94	13.94	14.21
O2, %.....	1.95	2.65	1.47	1.50	1.43
HC, ppmC.....	1022	3958	1148	1148	1064
NOx, ppm.....	630	240	60	58	69
Air-fuel ratio.....	16.17	16.36	15.72	15.73	15.68
Emission rates, g/hr:					
CO.....	276.1	230.9	44.3	48.9	48.3
HC.....	58.5	185.7	11.6	12.1	11.8
NOx**.....	120.9	37.7	1.7	1.7	2.1
Oil temperature, F.....	270	270	167	178	181
Oil pressure, psi.....	45	45	45	43	42
Coolant temperature, F.....	189	188	188	188	188
Exhaust temperature, F.....	1204	1174	572	576	587
Exhaust pressure, in H2O.....	35.0	28.0	6.0	6.0	6.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.0073	.0024	.0024	.0024	.0024
CO2, %.....	13.30	12.80	14.35	14.35	14.56
O2, %.....	1.57	1.93	1.15	1.20	1.17
HC, ppmC.....	31	79	96	86	118
NOx, ppm.....	635	260	50	51	60
Air-fuel ratio.....	16.10	16.40	15.70	15.74	15.70
Emission rates, g/hr:					
CO.....	8.2	2.2	.5	.5	.5
HC.....	1.7	3.7	1.0	.9	1.3
NOx**.....	121.0	40.9	1.4	1.5	1.8
Exhaust temperature, F.....	1175	1183	509	500	511
Exhaust pressure, in H2O.....	20.0	16.0	1.0	1.0	1.0

* Corrected - SAE J816b
 ** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	104	105	106	107	108
Test Date.....	2/ 9/76	2/ 9/76	2/ 9/76	2/ 9/76	2/ 9/76
Barometer, mm Hg.....	738.1	738.1	738.1	738.1	738.1
Humidity, grains/lb.....	39	39	39	39	39
Temperature, F.....	80	81	82	82	82
Engine speed, rpm.....	750	750	750	800	800
Torque, lb-ft.....	0.0	5.0	10.2	.6	5.0
Power, bhp*.....	0.0	.7	1.5	.1	.8
Fuel rate, lb/hr.....	3.7	3.8	4.0	3.8	4.0
Ignition timing, deg BTC....	0.0	0.0	0.0	0.0	0.0
Manifold vacuum, in Hg.....	15.5	15.6	15.0	16.0	15.5
Throttle angle, deg.....	0.0	0.0	0.0	0.0	0.0
<u>Before Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.2533	.2635	.2011	.2508	.1890
CO2, %.....	14.35	14.28	14.21	14.35	14.35
O2, %.....	1.35	1.40	1.50	1.32	1.45
HC, ppmC.....	835	864	719	749	662
NOx, ppm.....	68	69	81	61	75
Air-fuel ratio.....	15.63	15.66	15.78	15.62	15.75
Emission rates, g/hr:					
CO.....	59.7	63.1	51.3	59.9	48.4
HC.....	9.9	10.4	9.2	9.0	8.5
NOx**.....	2.3	2.3	2.9	2.0	2.7
Oil temperature, F.....	184	186	189	190	189
Oil pressure, psi.....	44	44	43	45	44
Coolant temperature, F.....	187	190	185	183	188
Exhaust temperature, F.....	619	616	649	647	657
Exhaust pressure, in H2O....	6.0	7.0	8.0	7.0	8.0
<u>After Catalyst</u>					
Concentrations, dry basis:					
CO, %.....	.0024	.0036	.0012	.0024	.0024
CO2, %.....	14.63	14.70	14.63	14.78	14.63
O2, %.....	1.13	1.07	1.30	1.05	1.22
HC, ppmC.....	66	78	58	64	54
NOx, ppm.....	59	60	76	57	66
Air-fuel ratio.....	15.68	15.63	15.79	15.62	15.74
Emission rates, g/hr:					
CO.....	.6	.9	.3	.6	.6
HC.....	.8	.9	.7	.8	.7
NOx**.....	2.0	2.0	2.7	1.9	2.4
Exhaust temperature, F.....	542	545	568	564	564
Exhaust pressure, in H2O....	1.0	1.0	1.0	1.0	1.0

* Corrected - SAE J816b

** Corrected for humidity.

Engine..... Chrysler 225-CID
 Fuel..... 7516

Test Number.....	109	110	
Test Date.....	2/ 9/76	2/ 9/76	
Barometer, mm Hg.....	738.1	738.1	
Humidity, grains/lb.....	39	39	
Temperature, F.....	82	89	
Engine speed, rpm.....	800	3800	
Torque, lb-ft.....	10.0	132.0	
Power, bhp*.....	1.5	96.5	
Fuel rate, lb/hr.....	4.2	51.4	
Ignition timing, deg BTC....	0.0	21.0	
Manifold vacuum, in Hg.....	15.0	2.0	
Throttle angle, deg.....	0.0	78.0	
<u>Before Catalyst</u>			
Concentrations, dry basis:			
CO, %.....	.1580	3.1100	
CO2, %.....	14.21	13.27	
O2, %.....	1.63	.15	
HC, ppmC.....	587	1072	
NOx, ppm.....	84	1550	
Air-fuel ratio.....	15.90	13.67	
Emission rates, g/hr:			
CO.....	42.4	8859.1	
HC.....	7.9	154.0	
NOx**.....	3.2	620.4	
Oil temperature, F.....	190	267	
Oil pressure, psi.....	44	45	
Coolant temperature, F.....	186	191	
Exhaust temperature, F.....	665	1468	
Exhaust pressure, in H2O....	8.0	150.0	
<u>After Catalyst</u>			
Concentrations, dry basis:			
CO, %.....	.0012	3.2300	
CO2, %.....	14.49	13.27	
O2, %.....	1.45	.08	
HC, ppmC.....	46	899	
NOx, ppm.....	76	1500	
Air-fuel ratio.....	15.91	13.60	
Emission rates, g/hr:			
CO.....	.3	9150.9	
HC.....	.6	128.4	
NOx**.....	2.3	597.1	
Exhaust temperature, F.....	571	1417	
Exhaust pressure, in H2O....	1.0	110.0	

* Corrected - SAE J816b

** Corrected for humidity.