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PERFORMANCE CHARACTERISTICS OF 1977 CHRYSLER 318 CID ENGINE

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16. Abstract

Experimental data were obtained in dynamometer tests of a 1977 Chrysler 318 CID engine to determine fuel consumption and emissions (hydrocarbons, carbon monoxide, and oxides of nitrogen) at steady-state engine operating modes. The objective of the test was to obtain engine performance data for estimating fuel consumption and emissions for varied engine service and duty and to provide basic engine characteristic data required for the TSC Vehicle Simulator (VEHSIM).

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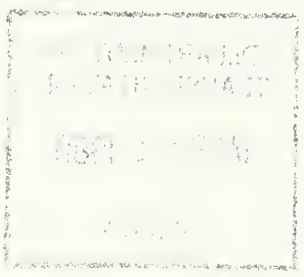


PREFACE

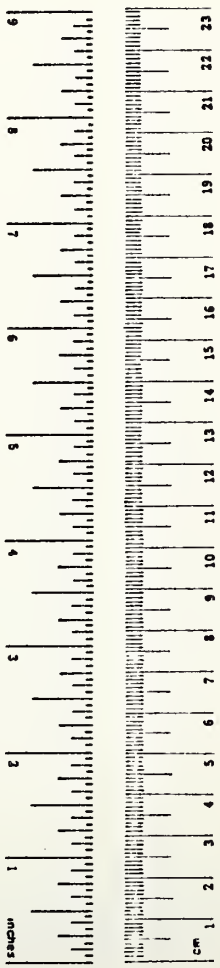
This report was prepared under PPA HS027, Research and Analysis in Automotive Fuel Economy and Related Areas, sponsored by the Technology Assessment Division of the National Highway Traffic Safety Administration. It presents the results of laboratory testing of the 1977 Chrysler 318 CID engine to determine fuel economy and emissions over a sufficient speed-load range to effectively map the engine.

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

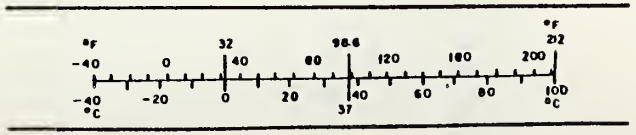
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	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

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



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	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



CONTENTS

LIST OF TABLES

1. INTRODUCTION

The purpose of the study was to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. This work supports the data base of the VEHSIM (Vehicle Simulator) Computer program at the Transportation Systems Center (TSC).

The data presented in this report are for an 8-cylinder spark ignition 1977 Chrysler 318 CID engine with a catalytic converter, EGR, manifold preheated air inlet system, alternator (driven only, no output) exhaust gas aspirator, and fan. The engine as equipped is intended for use in a forty-nine state (Federal) vehicle with automatic transmission. The test results present steady-state data sufficient to map the engine for fuel economy and emissions (carbon monoxide, hydrocarbons, and oxides of nitrogen) over the entire operating range of the engine.

2. ENGINE TEST REPORT

The engine test set-up included a complete mean tolerance engine (SAE definition) coupled to Schenck eddy-current dynamometer capable of absorbing 180 horsepower and 250 lb-ft of torque. The alternator was included but not wired into the engine's electrical system. The engine was also equipped with a catalytic converter, EGR, fan, manifold preheated air inlet system, and exhaust gas aspirator.

The manufacturer's specifications for the engine are given in Table 1.

TABLE 1. MANUFACTURER'S ENGINE SPECIFICATIONS

Year	1977
Manufacturer	Chrysler
Displacement	318 CID
No. Cylinders	8
Maximum Horsepower	145 BHP @ 4000 RPM
Maximum Torque	245 lb - ft @ 1600 RPM
Carburetor	2 V
Bore and Stroke	3.91 in. x 3.31 in.
Compression Ratio	8.5

Emissions instrumentation consisted of the following Beckman Instruments Corp. instruments.

CO	Model 864 Infrared Analyzer (NDIR)
CO_2	Model 864 Infrared Analyzer (NDIR)
NO/NO_x	Model 951 Chemiluminescent Detector
O_2	Model F3 Paramagnetic Analyzer
HC	Model 402 Flame Ionization Detector

Prior to testing, the engine break-in consisted of following the schedule shown in Table 2. A single batch of unleaded gasoline was used for break-in and engine testing. The gasoline specifications are shown in Table 3.

TABLE 2. ENGINE BREAK-IN SCHEDULE

PROGRAM 1:	MPH	RPM	DURATION (MINUTES)
	20	680	4
	40	1365	4
	60	2050	4
	50	1700	4
	30	1025	4

(37 Cycles for an Accumulated 500 Miles)

PROGRAM 2:	MPH	RPM	DURATION (MINUTES)
	40	1365	4
	60	2050	4
	70	2390	4
	60	2050	4
	70	2390	4
	65	2220	4
	55	1875	4

(36 Cycles for an Accumulated 1500 Miles)

TABLE 3. FUEL SPECIFICATIONS

TYPE	AMCO INDOLENE
Specific gravity @ 60°F	0.7416
Percent Carbon	85.34
Percent Hydrogen	14.32

During the steady-state test, the engine was operated at the following speed-load modes:

SPEED-RPM	LOADS-TORQUE
850	
750	
1000	18
1400	0
1600	0%, 10%, 20%, 30%, 40%, 55%, 70%, 85%, 100% WOT Torque
2000	
3000	
4000	

Each test point was duplicated and the following data were recorded for each:

Ambient Pressure, mm Hg

Ambient Temperature, °F

Ambient Relative Humidity, %

Engine Speed, RPM

Torque, lb-ft.

Accumulated Fuel, cc (Fluidyne model 1250)

Ignition Timing, °BTDC

Manifold Vacuum, inches Hg

Throttle Angle, degrees

Oil Pump Exit Pressure, psi

Oil Temperature, °F

Coolant Exit Temperature, °F

Exhaust Temperature Before Catalyst, °F

Exhaust Pressure Before Catalyst, inches H_2O

Emissions Concentrations After Catalyst, dry basis:

- CO, %
- CO_2, %
- HC, ppm
- NO_x, ppm

Exhaust Temperature After Catalyst, °F.

The following equations were used in calculating corrected torque, corrected horsepower, mass fuel flow rate, corrected brake specific fuel consumption, air-to-fuel ratio based on emissions, mass emission rates of CO, HC, NO_x, and ambient absolute humidity.

CORRECTED TORQUE, Tc (lb-ft)[1] From SAE J245, Spark Ignition Engine Rating Code, adjusted to standard SAE ambient conditions:

$$T_c = \frac{B_d^*}{B_{dt}} \left(\frac{t_t + A}{t^* + A} \right)^{1/2} T_t$$

where

B_d^* = Standard Dry Barometric Pressure (29.00 in Hg, 97.9 kPa)

B_{dt} = Dry Barometric Pressure at Test Conditions

t_t = Ambient Air Temperature at Test Conditions

t^* = Standard Ambient Temperature (85°F, 29.4°C)

A = Absolute Temperature Constant (460°R, 273°K)

T_t = Measured Torque at Test Conditions.

CORRECTED HORSEPOWER, hpc[1] From SAE J245, Spark Ignition Engine Rating Code, adjusted to standard SAE ambient conditions:

$$hp_c = \frac{T_c N}{G}$$

where

T_c = Corrected Torque (See Above)

N = Engine Speed (RPM)

G = Power Constant (5252 English, 955 SI).

(1) Engines with manifold preheated air inlet systems are designed to control carburetor air inlet temperature to a specific temperature. Excursions in ambient temperature below this value do not appreciably affect the controlled temperature. The engine performance correction factor as described in SAE J245 Engine Rating Code for Spark Ignition Engines has therefore been updated as follows: If ambient temperature is less than or equal to the manufacturer's stated controlled temperatures, no correction component involving carburetor inlet temperature is made. If ambient temperature exceeds the targeted controlled temperature, the normal J245 correction factor is applied with the targeted controlled temperature used in place of the standard ambient temperature.

MASS FUEL FLOW RATE (lb/hr) From volumetric measurement (corrected to 60°F per ASTM petroleum tables) and fuel specific gravity:

$$\dot{m}_f = \frac{(SpG)_f \left(\frac{lb}{vol}\ H_2O\right) (vol)_f}{\Delta\ t_T}$$

where

$\dot{m}_f$ = Fuel Flow Rate lb/hr

$(SpG)_f$ = Specific Gravity of Fuel

$(lb\ H_2O/vol)$ = Pounds of Water per Unit Volume

(vol_f) = Volume of Fuel Measured, corrected to 60°F per ASTM petroleum tables

$\Delta\ t_T$ = Time Interval of Volume Measurement (hrs).

CORRECTED BRAKE SPECIFIC FUEL CONSUMPTION (BSFC) (lb/HP-Hr)

$$BSFC_c = \frac{\dot{m}_f}{HP_c}$$

where

$BSFC_c$ = Corrected Brake Specific Fuel Consumption

HP_c = Corrected Horsepower

$\dot{m}f$ - Mass Fuel Flow Rate (lb/hr).

AIR/FUEL RATIO (A/F) Based on emissions measurements from SPINDT, SAE #650507:

$$A/F = F_b \left[11.492\ F_c \left(\frac{1+R/2+Q}{1+R} \right) + \left(\frac{120(1-FC)}{3.5+R} \right) \right]$$

where

$$R = \frac{\%\ CO}{\%\ CO_2} = \frac{\text{Percent CO Concentration}}{\text{Percent } CO_2 \text{ Concentration}}$$

F_c = Mass Fraction of Carbon in Fuel

$$F_b = \frac{\%\ CO + \%\ CO_2}{\%\ CO + \%\ CO_2 + \%\ CH}$$

$$Q = \frac{\%\ O_2}{\%\ CO_2} = \frac{\text{Percent } O_2 \text{ Concentration}}{\text{Percent } CO_2 \text{ Concentration}}$$

CARBON MONOXIDE (CO) MASS EMISSION RATE (Grams/Hr)

$$\text{MASS CO} = (4.383)\ (\dot{m}_f)(A/F+1)(\%CO) \left[\frac{1}{1 + 0.03148\ (\%\ CO_2)\ \frac{\%CO+\%CO_2}{\%CO+3\%CO_2}} \right]$$

where

$\dot{m}_f$ = Mass Fuel Flow Rate
A/F = Air to Fuel Ratio
% CO = Percent CO Concentration
% CO_2 = Percent CO_2 Concentration .

HYDROCARBON (HC) MASS EMISSION RATE. (Grams/Hr)

$$\text{Mass HC} = (0.0002207)\ (\dot{m}_f)\ (A/F+1)\ (\text{ppm HC})$$

where

$\dot{m}_f$ = Mass Fuel Flow Rate
A/F = Air to Fuel Ratio
ppm HC = Parts per Million of HC Concentration.

OXIDES OF NITROGEN (NO_x) MASS EMISSIONS RATE (Gram/Hr)

$$\text{Mass } NO_x = 0.007201\ (\dot{m}_f)\ (A/F+1)\ (\text{ppm } NO_x)\left[\frac{1}{1 + .03148\ (\%\ CO_2)\left(\frac{\%CO+\%CO_2}{\%CO+3\%CO_2}\right)}\right]$$

where

$\dot{m}_f$ = Mass Fuel Flow Rate
A/F = Air to Fuel Ration
ppm NO_x = Parts per Million NO_x Concentration
% CO = Percent CO Concentration
% CO_2 = Percent CO_2 Concentration
K_H = Humidity Correction Factor .

HUMIDITY CORRECTION FACTOR

$$K_H = \frac{1}{1-.0047\ (\text{Absolute Humidity} - 75)}$$

where absolute humidity is in grams/pound of dry air.

ABSOLUTE HUMIDITY (AH) (Grains/Lb Dry Air):

$$AH = \frac{(RH)\ P_{SU}}{1.608\ (P_{AMB} - RH \cdot P_{SU})}$$

where

RH = Measured Relative Humidity
P_{SU} = Saturated Vapor Pressure (from Keenan and Keyes Steam Tables)
P_{AMB} = Ambient Barometric Pressure.

3. DISCUSSION OF TEST RESULTS

Appendixes A and B summarize engine map data in tabular and graphical form, respectivley. Each test point is repeated once. Fuel consumption, hydrocarbon mass rates, and oxides of nitrogen mass rates demonstrated excellent repeatability. Air-to-fuel rates, however, were not very repeatable below 1600 RPM.

APPENDIX A TABULAR SUMMARY OF ENGINE MAP DATA

Engine..... CHRYSLER 318 CID

Test Number.....	3	67	2	66	4	5
Test Date.....	11/ 2/77	11/ 4/77	10/31/77	11/ 4/77	11/ 2/77	1/26/77
Barometer, mm Hg.....	777.5	774.4	778.5	774.4	777.5	760.2
Humidity, grains/lb.....	40.	58.	31.	56.	40.	80.
Ambient temperature, F....	73.	69.	73.	74.	73.	73.
Engine speed, rpm.....	750.	750.	850.	850.	1000.	1000.
Torque, lb-ft*.....	19.1	17.8	0.1	0.2	0.3	24.7
Power, bhp*.....	2.7	2.5	0.0	0.0	0.1	4.7
Fuel rate, lb/hr.....	4.9	4.9	4.6	4.2	5.6	6.6
Ignition timing, deg BTC..	10.0	10.0	9.5	11.0	11.0	12.5
Manifold vacuum, in Hg....	-18.0	-18.2	-20.0	-19.5	-19.8	-18.6
Throttle angle, deg.....	0.0	0.0	0.0	0.0	0.5	1.0
Brake specific fuel cons*.	1.816	1.911	244.500	30.890	85.460	1.406
Oil temperature, F.....	177.	176.	177.	179.	180.	188.
Oil pressure, psi.....	31.	32.	37.	38.	43.	35.
Coolant temperatue, F.....	195.	195.	198.	196.	193.	207.
Before Catalyst						
Exhaust temperature, F....	532.	506.	531.	539.	616.	647.
Exhaust pressure, in H2O..	0.7	0.2	0.8	0.5	1.1	1.9
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.078	0.089	0.068	0.103	0.014	0.031
CO2, %.....	11.94	12.35	11.72	12.02	12.28	13.38
O2, %.....	3.65	3.24	3.37	3.57	3.31	2.01
HC, ppmC.....	1431.	1627.	718.	1705.	996.	1056.
NOx, ppm.....	79.	92.	43.	59.	64.	162.
Air-fuel ratio.....	17.50	17.06	17.44	17.37	17.34	16.22
Emission rates, g/hr:						
CO.....	28.	30.	22.	31.	6.	14.
HC.....	28.7	31.5	13.4	29.2	22.8	26.7
NOx**.....	4.6	5.2	2.3	2.9	4.2	11.7
Exhaust temperature, F....	484.	456.	498.	489.	610.	763.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	6	7	9	10	11	12
Test Date.....	1/26/77	1/26/77	9/27/77	9/27/77	9/27/77	11/ 2/77
Barometer, mm Hg.....	760.2	760.2	755.1	755.1	755.1	777.5
Humidity, grains/lb.....	81.	84.	42.	41.	43.	41.
Ambient temperature, F....	73.	74.	81.	77.	78.	75.
Engine speed, rpm.....	1000.	1000.	1000.	1000.	1000.	1000.
Torque, lb-ft*.....	46.5	69.5	95.1	128.7	167.6	190.3
Power, bhp*.....	8.9	13.3	18.3	24.7	32.1	36.2
Fuel rate, lb/hr.....	7.2	8.6	10.0	14.6	16.9	19.0
Ignition timing, deg BTC..	25.0	30.0	28.5	10.5	9.5	10.0
Manifold vacuum, in Hg....	-18.0	-16.1	-13.1	-4.1	-1.7	-1.2
Throttle angle, deg.....	1.5	3.0	4.5	14.5	22.3	26.5
Brake specific fuel cons*.	0.813	0.645	0.546	0.593	0.528	0.524
Oil temperature, F.....	189.	190.	187.	189.	191.	191.
Oil pressure, psi.....	34.	32.	32.	30.	29.	30.
Coolant temperatue, F.....	206.	203.	199.	200.	196.	197.
Before Catalyst						
Exhaust temperature, F....	607.	654.	716.	980.	1008.	975.
Exhaust pressure, in H2O..	2.1	2.9	3.7	9.3	11.3	11.3
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.036	0.025	0.018	0.003	0.012	0.080
CO2, %.....	13.47	13.27	12.84	12.32	13.07	13.99
O2, %.....	1.74	2.04	2.72	3.49	2.39	0.76
HC, ppmC.....	1372.	1228.	483.	16.	121.	183.
NOx, ppm.....	598.	1451.	1417.	647.	885.	911.
Air-fuel ratio.....	16.02	16.26	16.84	17.55	16.56	15.24
Emission rates, g/hr:						
CO.....	17.	14.	12.	3.	14.	94.
HC.....	37.3	40.1	18.9	0.9	7.9	12.4
NOx**.....	46.5	135.7	159.9	111.7	166.6	176.0
Exhaust temperature, F....	764.	771.	820.	968.	1057.	1104.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	68	69	70	71	72	73
Test Date.....	11/ 4/77	11/ 4/77	11/ 4/77	11/ 4/77	11/ 4/77	11/ 4/77
Barometer, mm Hg.....	774.4	773.9	773.2	773.2	773.2	773.2
Humidity, grains/lb.....	58.	59.	58.	57.	56.	56.
Ambient temperature, F....	69.	70.	72.	73.	73.	75.
Engine speed, rpm.....	1000.	1000.	1000.	1000.	1000.	1000.
Torque, lb-ft*.....	0.3	21.2	46.3	68.4	89.7	124.8
Power, bhp*.....	0.0	4.1	8.9	13.1	17.2	23.9
Fuel rate, lb/hr.....	5.7	6.5	7.2	8.8	9.8	14.9
Ignition timing, deg BTC..	11.0	15.0	29.5	31.5	31.0	11.5
Manifold vacuum, in Hg....	-20.0	-18.8	-18.1	-16.3	-13.9	-4.3
Throttle angle, deg.....	1.0	1.5	2.0	3.0	5.0	14.0
Brake specific fuel cons*.	118.500	1.606	0.811	0.669	0.572	0.625
Oil temperature, F.....	178.	179.	180.	183.	184.	187.
Oil pressure, psi.....	45.	42.	40.	38.	36.	33.
Coolant temperatue, F.....	195.	196.	195.	198.	199.	200.
Before Catalyst						
Exhaust temperature, F....	596.	602.	564.	611.	668.	938.
Exhaust pressure, in H2O..	0.5	0.8	1.2	1.5	2.9	7.9
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.181	0.371	0.711	0.478	0.131	0.009
CO2, %.....	12.58	12.39	12.35	12.37	12.42	12.15
O2, %.....	2.77	2.87	2.63	2.68	3.14	3.52
HC, ppmC.....	1038.	1101.	1502.	1356.	735.	99.
NOx, ppm.....	78.	144.	641.	1408.	1645.	621.
Air-fuel ratio.....	16.67	16.65	16.21	16.41	17.06	17.60
Emission rates, g/hr:						
CO.....	71.	165.	340.	281.	90.	10.
HC.....	23.2	28.0	41.1	45.6	28.7	6.0
NOx**.....	5.0	10.5	50.4	136.3	185.7	110.1
Exhaust temperature, F....	538.	561.	532.	579.	663.	924.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	74	75	17	18	19	20
Test Date.....	11/ 4/77	11/ 4/77	11/ 2/77	11/ 2/77	10/ 7/77	10/ 7/77
Barometer, in Hg.....	773.2	773.2	777.5	777.5	770.6	770.6
Humidity, grains/lb.....	53.	53.	41.	41.	24.	25.
Ambient temperature, F....	74.	72.	74.	74.	75.	73.
Engine speed, rpm.....	1000.	1000.	1400.	1400.	1400.	1400.
Torque, lb-ft*.....	161.9	191.0	0.7	24.1	50.6	77.9
Power, bhp*.....	31.0	36.5	0.2	6.4	13.5	20.8
Fuel rate, lb/hr.....	16.7	18.5	6.6	7.9	10.2	12.9
Ignition timing, deg BTC..	11.0	9.0	26.5	37.0	36.5	37.0
Manifold vacuum, in Hg....	-2.5	-1.5	-21.4	-20.1	-17.9	-14.0
Throttle angle, deg.....	20.0	25.5	1.0	2.5	5.0	7.5
Brake specific fuel cons*.	0.539	0.506	39.870	1.230	0.757	0.620
Oil temperature, F.....	190.	190.	184.	184.	187.	189.
Oil pressure, psi.....	31.	31.	57.	55.	48.	45.
Coolant temperatue, F.....	201.	199.	198.	199.	196.	195.
Before Catalyst						
Exhaust temperature, F....	959.	971.	695.	687.	763.	853.
Exhaust pressure, in H2O..	9.5	10.7	1.2	1.6	2.7	5.8
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.010	0.022	0.007	0.016	0.012	0.002
CO2, %.....	12.67	13.04	12.73	12.68	13.19	12.43
O2, %.....	2.82	2.21	2.83	3.02	2.15	3.09
HC, ppmC.....	105.	126.	182.	612.	27.	102.
NOx, ppm.....	1106.	1460.	110.	454.	935.	1039.
Air-fuel ratio.....	16.94	16.40	16.92	17.08	16.36	17.21
Emission rates, g/hr:						
CO.....	11.	28.	3.	9.	8.	2.
HC.....	6.9	8.9	4.8	19.3	1.1	5.3
NOx**.....	210.6	297.0	8.3	41.3	104.9	155.0
Exhaust temperature, F....	957.	1018.	719.	698.	820.	869.

* Corrected - SAE J245 Spark ignition engine rating code

** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	21	23	24	77	78	79
Test Date.....	10/ 7/77	10/11/77	11/ 2/77	11/ 7/77	11/ 7/77	11/ 7/77
Barometer, mm Hg.....	772.2	769.6	777.5	773.9	773.9	774.2
Humidity, grains/lb.....	24.	29.	42.	33.	33.	34.
Ambient temperature, F....	69.	77.	76.	74.	74.	74.
Engine speed, rpm.....	1400.	1400.	1400.	1400.	1400.	1400.
Torque, lb-ft*.....	102.9	142.9	174.7	0.5	24.8	50.3
Power, bhp*.....	27.4	38.1	46.7	0.1	6.6	13.4
Fuel rate, lb/hr.....	15.3	21.4	24.1	6.6	8.0	10.3
Ignition timing, deg BTC..	31.0	14.0	17.0	23.5	36.0	36.0
Manifold vacuum, in Hg....	-10.9	-4.0	-1.8	-21.3	-20.3	-17.4
Throttle angle, deg.....	10.0	20.0	28.0	2.0	3.0	5.0
Brake specific fuel cons*.	0.559	0.562	0.516	58.420	1.213	0.767
Oil temperature, F.....	190.	196.	194.	182.	183.	186.
Oil pressure, psi.....	43.	39.	41.	58.	55.	52.
Coolant temperatue, F.....	199.	199.	199.	195.	195.	198.
Before Catalyst						
Exhaust temperature, F....	918.	1113.	1101.	664.	655.	750.
Exhaust pressure, in H2O..	8.3	17.4	18.7	1.0	1.2	2.9
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.002	0.019	0.013	0.038	0.263	0.007
CO2, %.....	12.49	12.91	13.38	12.37	12.68	12.14
O2, %.....	3.18	2.63	1.74	2.97	2.57	3.48
HC, ppmC.....	39.	36.	63.	396.	737.	134.
NOx, ppm.....	958.	745.	995.	92.	407.	761.
Air-fuel ratio.....	17.26	16.75	16.03	17.05	16.50	17.56
Emission rates, g/hr:						
CO.....	2.	28.	20.	17.	142.	5.
HC.....	2.4	3.0	5.7	10.4	22.7	5.6
NOx**.....	170.6	179.2	258.2	7.0	36.1	92.6
Exhaust temperature, F....	928.	1102.	1103.	655.	638.	766.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	80	81	82	83	25	26
Test Date.....	11/ 7/77	11/ 7/77	11/ 7/77	11/ 7/77	11/ 2/77	10/11/77
Barometer, mm Hg.....	774.2	773.9	773.9	774.2	776.7	767.1
Humidity, grains/lb.....	35.	34.	31.	31.	42.	35.
Ambient temperature, F....	75.	76.	77.	77.	74.	69.
Engine speed, rpm.....	1400.	1400.	1400.	1400.	1600.	1600.
Torque, lb-ft*.....	76.0	101.0	138.3	176.5	0.3	30.0
Power, bhp*.....	20.2	26.8	36.7	46.9	0.1	9.2
Fuel rate, lb/hr.....	12.6	15.6	20.5	23.6	7.2	10.2
Ignition timing, deg BTC..	37.0	27.5	15.5	15.5	37.0	38.0
Manifold vacuum, in Hg....	-13.6	-9.3	-4.2	-2.3	-21.5	-19.0
Throttle angle, deg.....	7.5	11.0	20.0	26.0	2.0	4.0
Brake specific fuel cons*.	0.624	0.582	0.559	0.504	107.500	1.110
Oil temperature, F.....	188.	191.	196.	197.	185.	186.
Oil pressure, psi.....	49.	46.	43.	41.	61.	56.
Coolant temperatue, F.....	199.	198.	200.	200.	195.	196.
Before Catalyst						
Exhaust temperature, F....	826.	923.	1063.	1086.	642.	800.
Exhaust pressure, in H2O..	5.1	8.5	14.5	17.6	1.7	2.5
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.003	0.006	0.005	0.006	0.083	0.023
CO2, %.....	12.00	12.01	12.65	12.96	12.05	13.50
O2, %.....	3.73	3.63	2.74	2.34	3.58	1.79
HC, ppmC.....	145.	96.	46.	49.	2144.	112.
NOx, ppm.....	934.	584.	607.	1215.	164.	448.
Air-fuel ratio.....	17.80	17.72	16.89	16.53	17.32	16.06
Emission rates, g/hr:						
CO.....	3.	7.	7.	10.	43.	15.
HC.....	7.6	6.2	3.7	4.5	62.7	4.3
NOx**.....	141.5	109.1	141.9	319.0	13.9	49.0
Exhaust temperature, F....	831.	916.	1038.	1073.	629.	957.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	27	28	29	31	32	33
Test Date.....	11/ 2/77	10/11/77	10/11/77	10/12/77	10/12/77	11/ 2/77
Barometer, mm Hg.....	776.7	767.1	767.1	763.8	763.8	776.7
Humidity, grains/lb.....	42.	33.	34.	55.	53.	43.
Ambient temperature, F....	75.	72.	76.	78.	78.	77.
Engine speed, rpm.....	1600.	1600.	1600.	1600.	1600.	1600.
Torque, lb-ft*.....	50.3	85.6	104.7	140.4	179.8	209.8
Power, bhp*.....	15.3	26.0	31.9	42.5	54.6	63.7
Fuel rate, lb/hr.....	12.5	16.0	18.3	24.6	28.7	30.4
Ignition timing, deg BTC..	38.0	37.0	26.0	17.0	16.0	16.0
Manifold vacuum, in Hg....	-15.8	-12.1	-9.1	-4.0	-2.3	-2.5
Throttle angle, deg.....	6.5	9.5	12.5	22.0	28.0	30.0
Brake specific fuel cons*.	0.815	0.613	0.574	0.578	0.526	0.478
Oil temperature, F.....	188.	191.	193.	198.	200.	200.
Oil pressure, psi.....	57.	50.	47.	43.	42.	45.
Coolant temperatue, F.....	200.	199.	198.	198.	199.	199.
Before Catalyst						
Exhaust temperature, F....	862.	952.	1032.	1183.	1205.	1165.
Exhaust pressure, in H2O..	5.1	8.3	11.7	20.4	24.8	27.6
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.008	0.014	0.012	0.003	0.007	0.005
CO2, %.....	12.12	12.66	12.67	13.16	13.83	13.55
O2, %.....	3.65	2.89	2.75	2.33	1.50	1.45
HC, ppmC.....	219.	44.	38.	23.	29.	88.
NOx, ppm.....	615.	774.	633.	670.	1301.	1940.
Air-fuel ratio.....	17.69	17.00	16.89	16.50	15.83	15.81
Emission rates, g/hr:						
CO.....	7.	15.	15.	5.	13.	10.
HC.....	11.2	2.8	2.8	2.2	3.1	10.0
NOx**.....	91.4	141.5	131.8	182.3	395.3	625.2
Exhaust temperature, F....	887.	961.	1033.	1175.	1220.	1159.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	84	85	86	88	89	90
Test Date.....	11/ 7/77	11/ 7/77	11/ 7/77	11/ 8/77	11/ 8/77	11/ 8/77
Barometer, mm Hg.....	774.2	774.2	774.2	772.2	772.2	772.2
Humidity, grains/lb.....	31.	32.	31.	43.	43.	44.
Ambient temperature, F....	75.	75.	75.	75.	77.	78.
Engine speed, rpm.....	1600.	1600.	1600.	1600.	1600.	1600.
Torque, lb-ft*.....	0.3	23.9	50.1	74.0	97.8	140.4
Power, bhp*.....	0.1	7.3	15.3	22.6	29.8	42.8
Fuel rate, lb/hr.....	7.4	9.4	12.3	14.5	20.0	24.2
Ignition timing, deg BTC..	36.0	38.0	38.0	37.5	20.0	16.0
Manifold vacuum, in Hg....	-21.8	-19.9	-16.2	-13.3	-6.8	-3.7
Throttle angle, deg.....	2.0	3.5	6.5	9.0	13.0	20.5
Brake specific fuel cons*.	96.160	1.286	0.802	0.643	0.672	0.565
Oil temperature, F.....	183.	185.	188.	190.	195.	198.
Oil pressure, psi.....	61.	59.	57.	55.	50.	48.
Coolant temperatue, F.....	192.	195.	198.	199.	199.	200.
Before Catalyst						
Exhaust temperature, F....	675.	745.	860.	896.	1077.	1140.
Exhaust pressure, in H2O..	1.2	1.8	4.1	5.8	12.7	18.0
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.270	0.019	0.006	0.003	0.005	0.005
CO2, %.....	13.34	13.21	12.44	12.27	12.27	12.75
O2, %.....	1.69	1.89	3.05	3.27	3.25	2.53
HC, ppmC.....	1440.	142.	138.	106.	46.	38.
NOx, ppm.....	105.	349.	573.	596.	333.	619.
Air-fuel ratio.....	15.70	16.14	17.15	17.37	17.37	16.72
Emission rates, g/hr:						
CO.....	129.	12.	5.	3.	7.	9.
HC.....	39.5	5.1	6.8	6.2	3.7	3.6
NOx**.....	8.2	35.5	81.3	101.5	78.2	168.6
Exhaust temperature, F....	673.	792.	865.	889.	1055.	1112.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	91	92	34	35	36	37
Test Date.....	11/ 8/77	11/ 8/77	10/26/77	10/26/77	10/26/77	10/26/77
Barometer, mm Hg.....	772.2	771.9	768.6	767.8	767.1	767.3
Humidity, grains/lb.....	44.	45.	29.	34.	56.	57.
Ambient temperature, F....	78.	78.	68.	69.	72.	72.
Engine speed, rpm.....	1600.	1600.	2000.	2000.	2000.	2000.
Torque, lb-ft*.....	176.3	212.6	0.3	28.5	51.2	77.6
Power, bhp*.....	53.8	65.0	0.1	10.8	19.5	29.5
Fuel rate, lb/hr.....	27.4	30.3	11.4	14.6	17.5	20.0
Ignition timing, deg BTC..	16.0	16.0	40.0	39.0	40.0	35.0
Manifold vacuum, in Hg....	-2.3	-2.4	-17.6	-15.8	-13.2	-11.0
Throttle angle, deg.....	27.0	28.5	3.0	9.5	12.0	14.0
Brake specific fuel cons*.	0.509	0.467	105.800	1.346	0.897	0.677
Oil temperature, F.....	200.	202.	185.	188.	192.	195.
Oil pressure, psi.....	46.	45.	63.	61.	60.	58.
Coolant temperatue, F.....	200.	201.	198.	196.	198.	198.
Before Catalyst						
Exhaust temperature, F....	1157.	1167.	777.	928.	1001.	1085.
Exhaust pressure, in H2O..	21.1	25.1	8.9	9.7	11.6	14.2
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.004	0.010	0.030	0.012	0.011	0.006
CO2, %.....	13.41	13.83	10.60	11.84	12.03	12.47
O2, %.....	1.67	1.16	5.75	4.13	3.74	3.09
HC, ppmC.....	39.	77.	382.	443.	316.	61.
NOx, ppm.....	1261.	1926.	85.	440.	505.	541.
Air-fuel ratio.....	15.99	15.58	20.00	18.12	17.77	17.19
Emission rates, g/hr:						
CO.....	8.	20.	28.	14.	14.	9.
HC.....	4.0	8.6	20.2	27.2	22.9	4.9
NOx**.....	370.6	609.0	13.2	78.5	105.7	125.2
Exhaust temperature, F....	1141.	1169.	1349.	1197.	1188.	1112.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	38	39	40	43	44	93
Test Date.....	10/26/77	10/26/77	10/26/77	10/27/77	10/27/77	11/ 8/77
Barometer, mm Hg.....	767.3	766.6	766.6	765.0	765.0	769.9
Humidity, grains/lb.....	58.	58.	58.	67.	67.	46.
Ambient temperature, F....	73.	74.	75.	78.	79.	75.
Engine speed, rpm.....	2000.	2000.	2000.	2000.	2000.	2000.
Torque, lb-ft*.....	99.5	140.9	179.8	219.0	246.8	1.0
Power, bhp*.....	37.8	53.6	68.4	83.7	94.4	0.4
Fuel rate, lb/hr.....	24.3	30.2	34.9	40.6	50.0	9.7
Ignition timing, deg BTC..	27.5	19.0	17.0	19.0	18.0	40.0
Manifold vacuum, in Hg....	-8.1	-4.3	-3.4	-2.4	-1.0	-21.0
Throttle angle, deg.....	18.0	26.5	31.0	37.0	75.0	5.0
Brake specific fuel cons*.	0.645	0.563	0.509	0.485	0.530	30.030
Oil temperature, F.....	198.	201.	205.	206.	206.	186.
Oil pressure, psi.....	56.	53.	51.	49.	48.	63.
Coolant temperatue, F.....	198.	199.	199.	200.	199.	196.
Before Catalyst						
Exhaust temperature, F....	1170.	1280.	1300.	1317.	1263.	773.
Exhaust pressure, in H2O..	20.8	32.1	39.7	49.7	56.2	2.4
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.004	0.004	0.015	0.159	4.339	0.025
CO2, %.....	12.42	13.15	13.67	14.16	11.82	13.11
O2, %.....	3.15	2.21	1.46	0.51	0.40	2.22
HC, ppmC.....	18.	18.	20.	250.	1370.	576.
NOx, ppm.....	520.	797.	1644.	1542.	1013.	181.
Air-fuel ratio.....	17.26	16.42	15.81	15.04	13.11	16.34
Emission rates, g/hr:						
CO.....	7.	8.	34.	394.	11651.	16.
HC.....	1.8	2.1	2.6	36.0	213.2	21.4
NOx**.....	147.3	265.1	606.8	629.1	446.9	19.2
Exhaust temperature, F....	1159.	1256.	1294.	1372.	1255.	909.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	94	95	97	98	99	100
Test Date.....	11/ 8/77	11/ 8/77	11/ 9/77	11/ 9/77	11/ 9/77	11/ 9/77
Barometer, mm Hg.....	769.9	769.9	766.8	766.8	766.8	766.8
Humidity, grains/lb.....	47.	46.	52.	54.	54.	52.
Ambient temperature, F....	76.	77.	77.	77.	79.	80.
Engine speed, rpm.....	2000.	2000.	2000.	2000.	2000.	2000.
Torque, lb-ft*.....	23.9	47.8	76.6	99.2	139.0	187.8
Power, bhp*.....	9.1	18.2	29.2	37.8	52.8	71.5
Fuel rate, lb/hr.....	12.7	15.7	19.1	22.8	30.2	35.7
Ignition timing, deg BTC..	40.0	40.0	39.0	31.0	19.0	18.0
Manifold vacuum, in Hg....	-18.0	-14.9	-12.0	-9.3	-4.3	-2.9
Throttle angle, deg.....	7.0	10.0	12.0	15.0	25.5	32.0
Brake specific fuel cons*.	1.395	0.865	0.654	0.604	0.571	0.499
Oil temperature, F.....	190.	193.	197.	198.	204.	205.
Oil pressure, psi.....	62.	60.	59.	58.	55.	54.
Coolant temperatue, F.....	198.	198.	199.	199.	200.	199.
Before Catalyst						
Exhaust temperature, F....	911.	976.	1017.	1089.	1231.	1257.
Exhaust pressure, in H2O..	4.3	6.8	10.1	14.1	26.1	34.1
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.004	0.004	0.005	0.007	0.004	0.016
CO2, %.....	12.62	12.71	13.14	13.22	13.59	14.12
O2, %.....	2.94	2.78	2.30	2.09	1.59	0.75
HC, ppmC.....	243.	106.	75.	41.	17.	56.
NOx, ppm.....	338.	361.	576.	595.	773.	1687.
Air-fuel ratio.....	17.02	16.91	16.48	16.31	15.91	15.27
Emission rates, g/hr:						
CO.....	3.	4.	6.	11.	8.	36.
HC.....	12.2	6.6	5.5	3.6	1.9	7.1
NOx**.....	49.0	64.5	121.7	148.6	248.7	615.0
Exhaust temperature, F....	930.	975.	1002.	1066.	1197.	1249.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	101	45	46	47	48	49
Test Date.....	11/ 9/77	10/27/77	10/27/77	10/27/77	10/27/77	10/28/77
Barometer, mm Hg.....	767.1	765.3	765.3	765.6	765.6	763.8
Humidity, grains/lb.....	52.	67.	63.	62.	63.	45.
Ambient temperature, F....	81.	80.	82.	82.	83.	74.
Engine speed, rpm.....	2000.	3000.	3000.	3000.	3000.	3000.
Torque, lb-ft*.....	213.7	0.6	24.6	45.8	70.6	91.1
Power, bhp*.....	81.3	0.4	14.1	26.3	40.4	52.0
Fuel rate, lb/hr.....	40.2	17.2	21.0	24.1	28.4	32.3
Ignition timing, deg BTC..	19.5	45.0	45.0	45.0	45.0	40.0
Manifold vacuum, in Hg....	-2.4	-17.6	-15.6	-14.1	-12.2	-10.7
Throttle angle, deg.....	36.5	11.0	13.5	15.5	19.0	20.0
Brake specific fuel cons*.	0.494	49.260	1.489	0.920	0.703	0.623
Oil temperature, F.....	207.	202.	204.	206.	208.	207.
Oil pressure, psi.....	52.	63.	62.	61.	60.	60.
Coolant temperatue, F.....	201.	197.	198.	199.	199.	197.
Before Catalyst						
Exhaust temperature, F....	1269.	1027.	1131.	1149.	1175.	1216.
Exhaust pressure, in H2O..	40.1	14.2	17.0	22.0	29.3	36.4
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.286	0.021	0.016	0.006	0.010	0.008
CO2, %.....	14.49	12.15	12.34	12.39	12.49	12.97
O2, %.....	0.26	3.77	3.44	3.32	3.17	2.55
HC, ppmC.....	200.	355.	82.	39.	20.	13.
NOx, ppm.....	1556.	223.	333.	532.	856.	1134.
Air-fuel ratio.....	14.80	17.75	17.49	17.40	17.26	16.70
Emission rates, g/hr:						
CO.....	689.	26.	24.	11.	19.	18.
HC.....	28.1	25.3	7.0	3.8	2.2	1.7
NOx**.....	616.7	46.0	82.3	150.7	282.4	411.5
Exhaust temperature, F....	1293.	1296.	1167.	1152.	1166.	1205.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine.....	CHRYSLER 318 CID					
Test Number.....	50	51	52	53	102	103
Test Date.....	10/28/77	10/28/77	10/28/77	11/ 1/77	11/ 9/77	11/ 9/77
Barometer, mm Hg.....	763.0	763.0	763.0	777.2	766.6	766.6
Humidity, grains/lb.....	45.	44.	46.	36.	53.	53.
Ambient temperature, F....	76.	80.	81.	82.	80.	81.
Engine speed, rpm.....	3000.	3000.	3000.	3000.	3000.	3000.
Torque, lb-ft*.....	125.8	159.5	193.6	218.3	0.2	18.2
Power, bhp*.....	71.8	91.1	110.7	124.6	0.1	10.4
Fuel rate, lb/hr.....	43.9	51.5	60.4	73.2	16.2	19.5
Ignition timing, deg BTC..	25.0	22.5	22.5	22.5	45.0	45.0
Manifold vacuum, in Hg....	-6.1	-4.0	-3.3	-2.0	-18.8	-16.8
Throttle angle, deg.....	29.0	36.0	42.0	75.0	8.5	11.0
Brake specific fuel cons*.	0.612	0.565	0.545	0.587	174.500	1.881
Oil temperature, F.....	213.	218.	220.	221.	200.	201.
Oil pressure, psi.....	58.	57.	56.	56.	64.	63.
Coolant temperatue, F.....	200.	200.	199.	200.	199.	199.
Before Catalyst						
Exhaust temperature, F....	1388.	1429.	1419.	1408.	1029.	1092.
Exhaust pressure, in H2O..	62.9	79.3	95.9	115.4	7.9	11.1
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.005	0.152	1.526	3.001	0.012	0.007
CO2, %.....	13.55	14.39	13.62	12.33	12.93	13.06
O2, %.....	1.72	0.47	0.28	0.70	2.59	2.40
HC, ppmC.....	4.	25.	555.	678.	374.	91.
NOx, ppm.....	1028.	937.	1658.	1302.	180.	264.
Air-fuel ratio.....	16.01	15.01	14.25	13.87	16.69	16.56
Emission rates, g/hr:						
CO.....	14.	476.	5340.	12459.	13.	9.
HC.....	0.7	4.5	112.7	162.8	23.7	6.9
NOx**.....	484.5	482.9	953.3	888.1	32.7	57.3
Exhaust temperature, F....	1371.	1453.	1410.	1383.	1082.	1083.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	104	105	107	108	109	110
Test Date.....	11/ 9/77	11/ 9/77	11/10/77	11/10/77	11/10/77	11/10/77
Barometer, mm Hg.....	766.6	767.3	766.8	766.6	766.6	766.3
Humidity, grains/lb.....	52.	52.	50.	50.	51.	50.
Ambient temperature, F....	82.	82.	82.	85.	87.	85.
Engine speed, rpm.....	3000.	3000.	3000.	3000.	3000.	3000.
Torque, lb-ft*.....	46.0	67.9	90.4	123.7	158.1	192.6
Power, bhp*.....	26.2	38.7	51.5	70.6	90.4	110.0
Fuel rate, lb/hr.....	24.1	28.3	32.4	44.0	51.6	59.8
Ignition timing, deg BTC..	45.0	45.0	39.0	24.5	24.0	23.0
Manifold vacuum, in Hg....	-14.6	-12.7	-10.5	-5.7	-3.8	-3.2
Throttle angle, deg.....	14.0	16.0	20.0	30.0	37.0	44.0
Brake specific fuel cons*.	0.918	0.732	0.629	0.623	0.571	0.543
Oil temperature, F.....	205.	207.	211.	217.	221.	221.
Oil pressure, psi.....	62.	61.	60.	59.	58.	57.
Coolant temperatue, F.....	199.	199.	200.	199.	200.	201.
Before Catalyst						
Exhaust temperature, F....	1119.	1143.	1197.	1377.	1407.	1389.
Exhaust pressure, in H2O..	16.9	22.6	29.9	52.9	67.3	80.9
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.004	0.007	0.007	0.009	0.423	1.762
CO2, %.....	12.99	13.07	13.28	13.96	14.35	13.70
O2, %.....	2.37	2.38	2.05	1.11	0.19	0.17
HC, ppmC.....	31.	21.	19.	2.	94.	633.
NOx, ppm.....	527.	860.	1126.	986.	1011.	1668.
Air-fuel ratio.....	16.56	16.55	16.28	15.54	14.70	14.08
Emission rates, g/hr:						
CO.....	6.	14.	16.	25.	1302.	6027.
HC.....	2.9	2.3	2.4	0.3	16.9	126.0
NOx**.....	141.2	270.7	398.4	450.2	511.2	937.3
Exhaust temperature, F....	1093.	1114.	1170.	1343.	1413.	1367.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	55	56	57	58	59	60
Test Date.....	11/ 3/77	11/ 3/77	11/ 3/77	11/ 3/77	11/ 3/77	11/ 3/77
Barometer, mm Hg.....	777.0	777.5	777.5	777.5	777.5	776.7
Humidity, grains/lb.....	45.	50.	50.	49.	50.	46.
Ambient temperature, F....	82.	82.	82.	82.	83.	85.
Engine speed, rpm.....	4000.	4000.	4000.	4000.	4000.	4000.
Torque, lb-ft*.....	0.4	14.4	32.4	47.8	65.4	89.3
Power, bhp*.....	0.3	10.9	24.7	36.4	49.8	68.1
Fuel rate, lb/hr.....	24.0	27.8	32.1	36.0	40.9	52.7
Ignition timing, deg BTC..	48.5	48.0	49.5	49.5	47.0	34.0
Manifold vacuum, in Hg....	-17.3	-15.8	-14.3	-12.8	-10.9	-7.2
Throttle angle, deg.....	12.0	14.0	17.0	19.0	22.0	30.0
Brake specific fuel cons*.	90.110	2.556	1.301	0.988	0.821	0.774
Oil temperature, F.....	218.	220.	221.	223.	225.	230.
Oil pressure, psi.....	63.	62.	61.	60.	60.	58.
Coolant temperatue, F.....	200.	199.	200.	200.	199.	201.
Before Catalyst						
Exhaust temperature, F....	1228.	1253.	1269.	1290.	1329.	1460.
Exhaust pressure, in H2O..	18.2	24.8	32.1	40.0	51.9	80.6
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.011	0.004	0.008	0.004	0.009	0.006
CO2, %.....	12.91	12.92	12.98	13.03	13.18	13.70
O2, %.....	2.20	2.44	2.21	2.14	1.91	1.31
HC, ppmC.....	69.	21.	0.	7.	1.	2.
NOx, ppm.....	235.	362.	587.	844.	1129.	1063.
Air-fuel ratio.....	16.43	16.62	16.43	16.38	16.19	15.70
Emission rates, g/hr:						
CO.....	18.	8.	17.	10.	25.	20.
HC.....	6.3	2.2	0.0	1.0	0.2	0.5
NOx**.....	62.2	112.4	208.1	334.3	502.4	589.0
Exhaust temperature, F....	1205.	1210.	1226.	1248.	1290.	1415.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

Engine..... CHRYSLER 318 CID

Test Number.....	61	62	63	111	112	113
Test Date.....	11/ 3/77	11/ 3/77	11/ 3/77	11/10/77	11/10/77	11/10/77
Barometer, mm Hg.....	777.0	777.0	777.2	764.0	763.8	763.3
Humidity, grains/lb.....	51.	53.	53.	54.	56.	55.
Ambient temperature, F....	87.	87.	88.	78.	79.	85.
Engine speed, rpm.....	4000.	4000.	4000.	4000.	4000.	4000.
Torque, lb-ft*.....	115.2	132.9	156.3	0.6	15.8	34.2
Power, bhp*.....	87.9	101.4	119.3	0.5	12.0	26.0
Fuel rate, lb/hr.....	63.5	70.0	81.7	23.8	27.7	31.9
Ignition timing, deg BTC..	27.0	26.5	25.0	50.0	49.5	49.0
Manifold vacuum, in Hg....	-4.6	-4.0	-2.8	-17.0	-15.6	-14.0
Throttle angle, deg.....	39.0	43.0	73.0	14.0	16.0	18.5
Brake specific fuel cons*.	0.722	0.691	0.685	58.710	2.309	1.228
Oil temperature, F.....	235.	236.	237.	220.	221.	224.
Oil pressure, psi.....	57.	57.	56.	64.	63.	62.
Coolant temperatue, F.....	201.	201.	200.	199.	200.	200.
Before Catalyst						
Exhaust temperature, F....	1544.	1512.	1503.	1221.	1241.	1258.
Exhaust pressure, in H2O..	108.4	120.4	149.6	16.1	21.0	27.1
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.666	1.739	3.017	0.011	0.006	0.006
CO2, %.....	13.96	13.33	12.71	13.55	13.48	13.51
O2, %.....	0.40	0.30	0.33	1.67	1.89	1.79
HC, ppmC.....	65.	381.	664.	110.	27.	10.
NOx, ppm.....	850.	1127.	1151.	236.	374.	638.
Air-fuel ratio.....	14.74	14.19	13.66	15.96	16.14	16.07
Emission rates, g/hr:						
CO.....	2534.	7041.	13742.	16.	11.	13.
HC.....	14.4	89.4	175.5	9.8	2.8	1.2
NOx**.....	531.1	749.7	861.4	60.1	112.1	219.3
Exhaust temperature, F....	1517.	1479.	1470.	1208.	1198.	1213.

* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

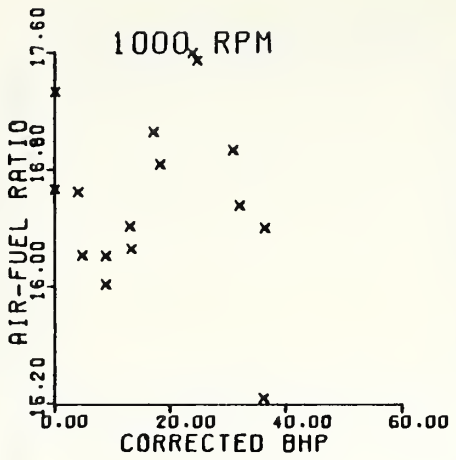
Engine..... CHRYSLER 318 CID

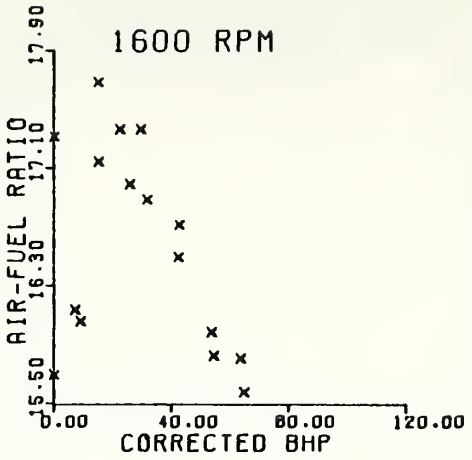
Test Number.....	115	116	117	118	119	120
Test Date.....	11/11/77	11/11/77	11/11/77	11/11/77	11/11/77	11/11/77
Barometer, mm Hg.....	760.0	759.7	760.7	761.2	761.7	761.7
Humidity, grains/lb.....	30.	30.	27.	24.	23.	23.
Ambient temperature, F....	81.	83.	87.	90.	91.	91.
Engine speed, rpm.....	4000.	4000.	4000.	4000.	4000.	4000.
Torque, lb-ft*.....	48.8	68.4	91.6	117.6	134.9	162.2
Power, bhp*.....	37.1	51.9	69.5	89.7	102.9	123.7
Fuel rate, lb/hr.....	35.0	40.7	50.8	62.8	67.2	77.2
Ignition timing, deg BTC..	49.0	43.0	31.0	24.0	25.0	25.0
Manifold vacuum, in Hg....	-12.6	-10.5	-7.0	-4.4	-4.0	-2.8
Throttle angle, deg.....	19.0	22.0	29.0	39.0	42.0	73.0
Brake specific fuel cons*.	0.945	0.785	0.730	0.700	0.653	0.624
Oil temperature, F.....	222.	225.	230.	236.	236.	238.
Oil pressure, psi.....	62.	61.	60.	59.	58.	58.
Coolant temperatue, F.....	199.	200.	201.	202.	201.	200.
Before Catalyst						
Exhaust temperature, F....	1262.	1315.	1441.	1508.	1479.	1477.
Exhaust pressure, in H2O..	36.6	49.9	76.3	103.1	114.6	145.3
After catalyst						
Concentrations, dry basis:						
CO, %.....	0.010	0.011	0.011	0.784	1.830	2.840
CO2, %.....	13.41	13.59	13.81	13.78	13.39	12.71
O2, %.....	1.91	1.74	1.27	0.67	0.53	0.62
HC, ppmC.....	14.	14.	10.	106.	477.	735.
NOx, ppm.....	921.	1164.	1058.	948.	1154.	1287.
Air-fuel ratio.....	16.16	16.02	15.66	14.86	14.29	13.90
Emission rates, g/hr:						
CO.....	23.	28.	36.	2975.	7148.	12826.
HC.....	1.9	2.1	1.9	23.2	108.1	186.6
NOx**.....	349.4	508.4	562.6	591.2	740.6	925.1
Exhaust temperature, F....	1231.	1288.	1409.	1495.	1458.	1457.

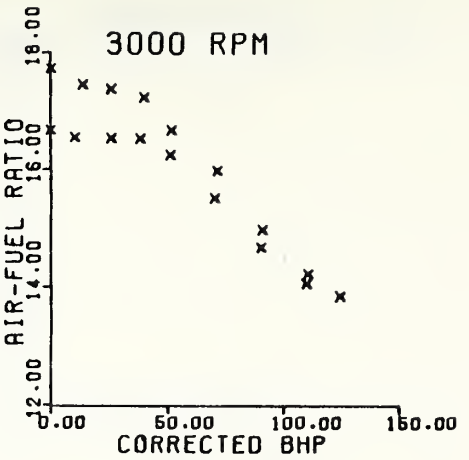
* Corrected - SAE J245 Spark ignition engine rating code
** Corrected for humidity

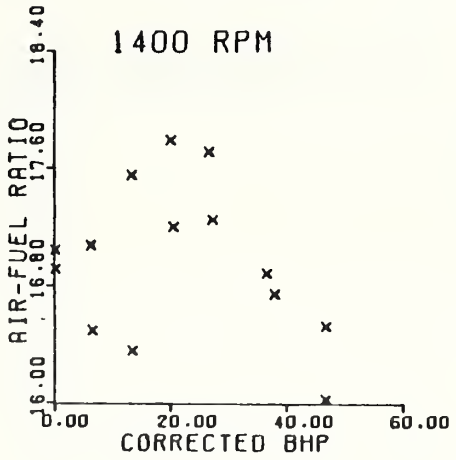
APPENDIX B GRAPHICAL SUMMARY OF ENGINE MAP DATA

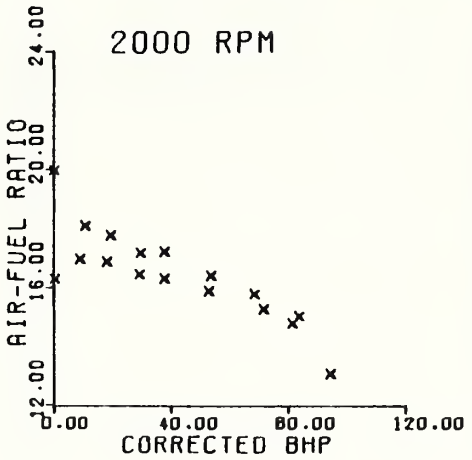
1000 RPM
FUEL RATE (LB/HR)
5.00
10.00
15.00
20.00
0.00
20.00
40.00
60.00
CORRECTED BHP
1400 RPM
FUEL RATE (LB/HR)
5.00
14.00
22.00
30.00
0.00
20.00
40.00
60.00
CORRECTED BHP
1600 RPM
FUEL RATE (LB/HR)
7.00
15.00
23.00
31.00
0.00
40.00
80.00
120.00
CORRECTED BHP
2000 RPM
FUEL RATE (LB/HR)
5.00
20.00
40.00
60.00
0.00
40.00
80.00
120.00
CORRECTED BHP
3000 RPM
FUEL RATE (LB/HR)
5.00
40.00
80.00
120.00
0.00
60.00
100.00
160.00
CORRECTED BHP
4000 RPM
FUEL RATE (LB/HR)
5.00
40.00
80.00
120.00
0.00
60.00
100.00
160.00
CORRECTED BHP

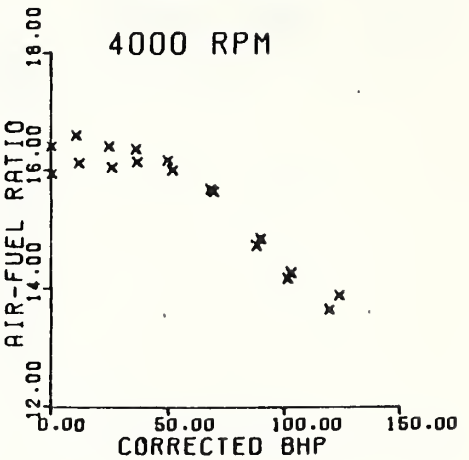

1000 RPM
AIR-FUEL RATIO
17.60
16.80
16.00
15.20
0.00
20.00
40.00
60.00
CORRECTED BHP

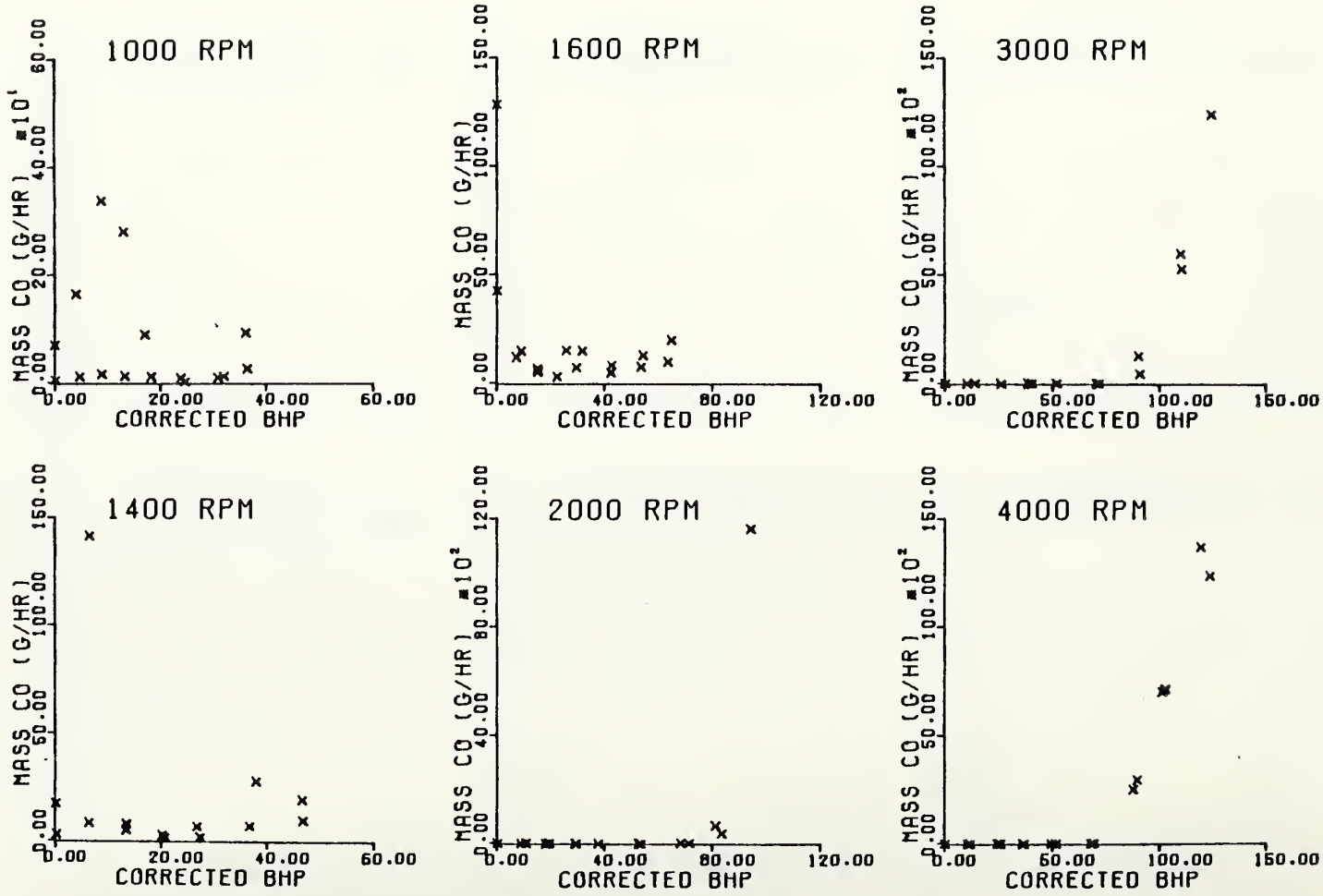

1600 RPM
AIR-FUEL RATIO
17.90
17.10
16.30
15.50
0.00
40.00
80.00
120.00
CORRECTED BHP

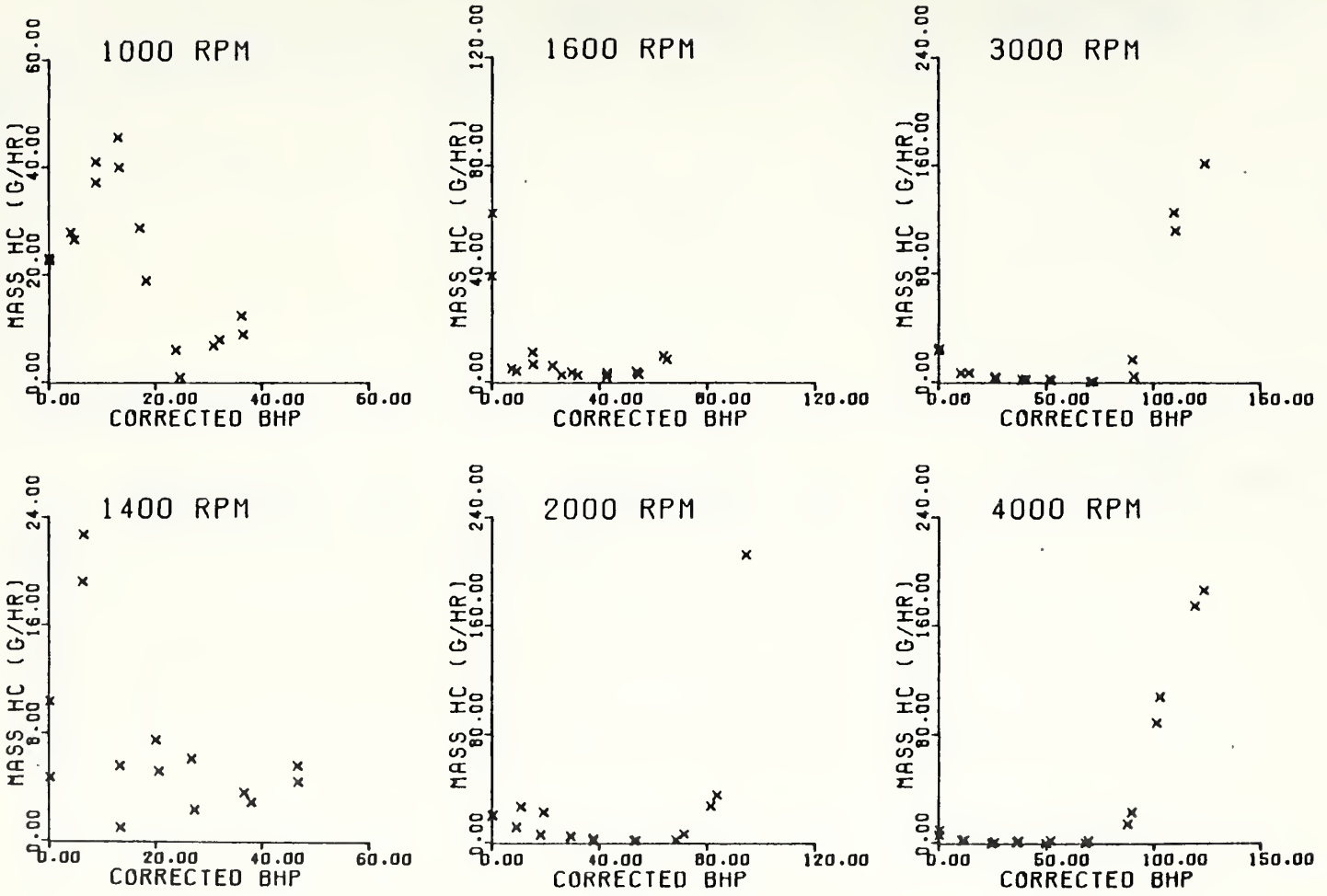

3000 RPM
AIR-FUEL RATIO
18.00
16.00
14.00
12.00
0.00
50.00
100.00
150.00
CORRECTED BHP


1400 RPM
AIR-FUEL RATIO
18.40
17.60
16.80
16.00
0.00
20.00
40.00
60.00
CORRECTED BHP

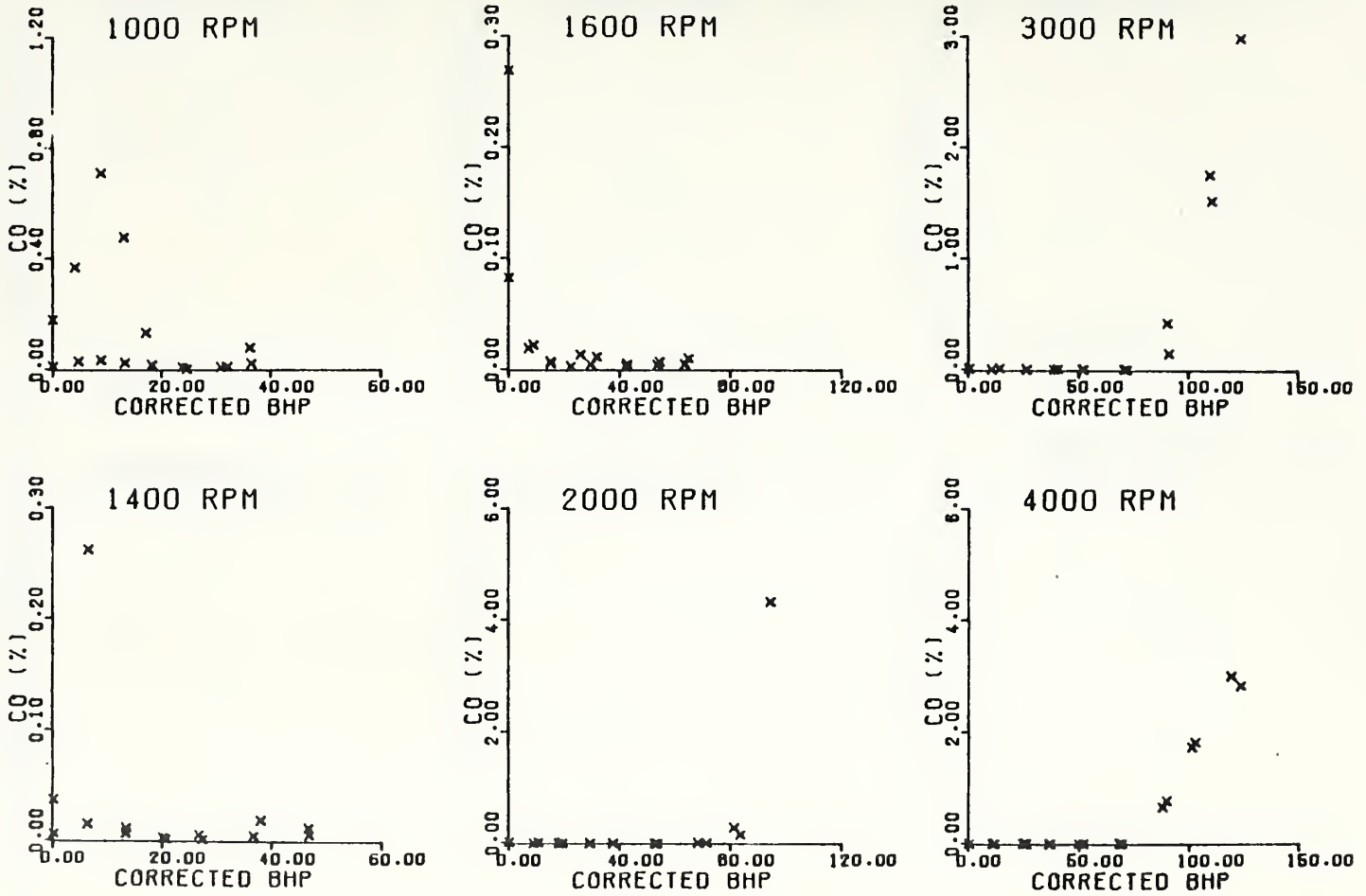

2000 RPM
AIR-FUEL RATIO
24.00
20.00
16.00
12.00
0.00
40.00
80.00
120.00
CORRECTED BHP

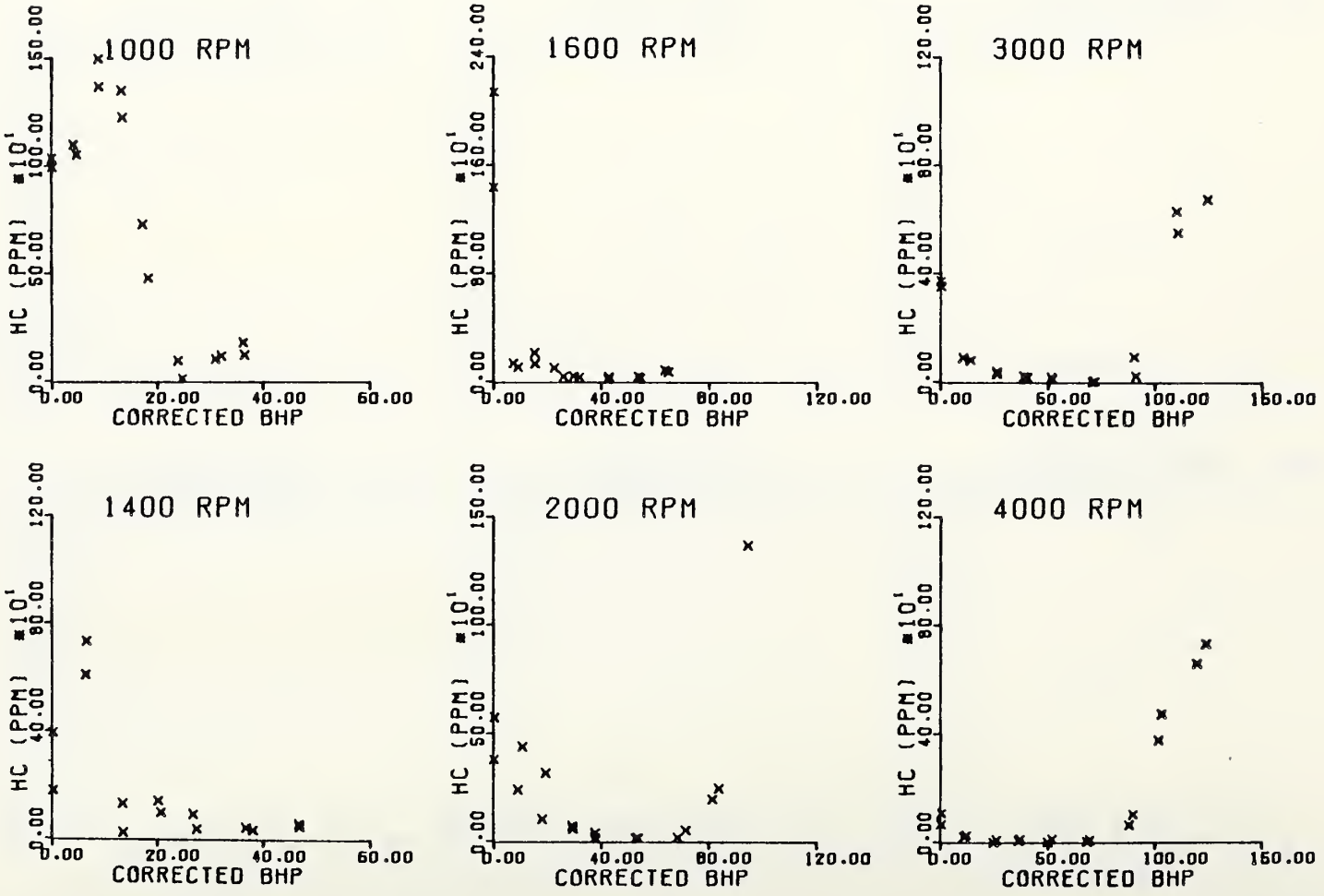

4000 RPM
AIR-FUEL RATIO
18.00
16.00
14.00
12.00
0.00
50.00
100.00
150.00
CORRECTED BHP


1000 RPM
MASS CO (G/HR) *10¹
0.00
20.00
40.00
60.00
CORRECTED BHP
1600 RPM
MASS CO (G/HR)
0.00
50.00
100.00
150.00
0.00
40.00
80.00
120.00
CORRECTED BHP
3000 RPM
MASS CO (G/HR) *10²
0.00
50.00
100.00
150.00
0.00
60.00
100.00
150.00
CORRECTED BHP
1400 RPM
MASS CO (G/HR)
0.00
50.00
100.00
150.00
0.00
20.00
40.00
60.00
CORRECTED BHP
2000 RPM
MASS CO (G/HR) *10²
0.00
40.00
80.00
120.00
0.00
40.00
80.00
120.00
CORRECTED BHP
4000 RPM
MASS CO (G/HR) *10²
0.00
50.00
100.00
150.00
0.00
60.00
100.00
150.00
CORRECTED BHP


1000 RPM
MASS HC (G/HR)
0.00
20.00
40.00
60.00
0.00
20.00
40.00
60.00
CORRECTED BHP
1600 RPM
MASS HC (G/HR)
0.00
40.00
80.00
120.00
0.00
40.00
80.00
120.00
CORRECTED BHP
3000 RPM
MASS HC (G/HR)
0.00
80.00
160.00
240.00
0.00
50.00
100.00
150.00
CORRECTED BHP
1400 RPM
MASS HC (G/HR)
0.00
8.00
16.00
24.00
0.00
20.00
40.00
60.00
CORRECTED BHP
2000 RPM
MASS HC (G/HR)
0.00
80.00
160.00
240.00
0.00
40.00
80.00
120.00
CORRECTED BHP
4000 RPM
MASS HC (G/HR)
0.00
80.00
160.00
240.00
0.00
50.00
100.00
150.00
CORRECTED BHP

1000 RPM
MASS NOX (G/HR) *10'
0.00
10.00
20.00
30.00
0.00
20.00
40.00
60.00
CORRECTED BHP
1400 RPM
MASS NOX (G/HR) *10'
0.00
20.00
40.00
60.00
0.00
20.00
40.00
60.00
CORRECTED BHP
1600 RPM
MASS NOX (G/HR) *10'
0.00
40.00
80.00
120.00
0.00
40.00
80.00
120.00
CORRECTED BHP
2000 RPM
MASS NOX (G/HR) *10'
0.00
40.00
80.00
120.00
0.00
40.00
80.00
120.00
CORRECTED BHP
3000 RPM
MASS NOX (G/HR) *10'
0.00
40.00
80.00
120.00
0.00
50.00
100.00
150.00
CORRECTED BHP
4000 RPM
MASS NOX (G/HR) *10'
0.00
40.00
80.00
120.00
0.00
50.00
100.00
150.00
CORRECTED BHP


1000 RPM
CO (%)
0.00
0.40
0.80
1.20
0.00
20.00
40.00
60.00
CORRECTED BHP
1600 RPM
CO (%)
0.00
0.10
0.20
0.30
0.00
40.00
80.00
120.00
CORRECTED BHP
3000 RPM
CO (%)
0.00
1.00
2.00
3.00
0.00
50.00
100.00
150.00
CORRECTED BHP
1400 RPM
CO (%)
0.00
0.10
0.20
0.30
0.00
20.00
40.00
60.00
CORRECTED BHP
2000 RPM
CO (%)
0.00
2.00
4.00
6.00
0.00
40.00
80.00
120.00
CORRECTED BHP
4000 RPM
CO (%)
0.00
2.00
4.00
6.00
0.00
50.00
100.00
150.00
CORRECTED BHP


1000 RPM
1600 RPM
3000 RPM
1400 RPM
2000 RPM
4000 RPM
HC (PPM) *10¹
CORRECTED BHP

1000 RPM
NOX (PPM) *10'
0.00
80.00
160.00
240.00
0.00
20.00
40.00
60.00
CORRECTED BHP

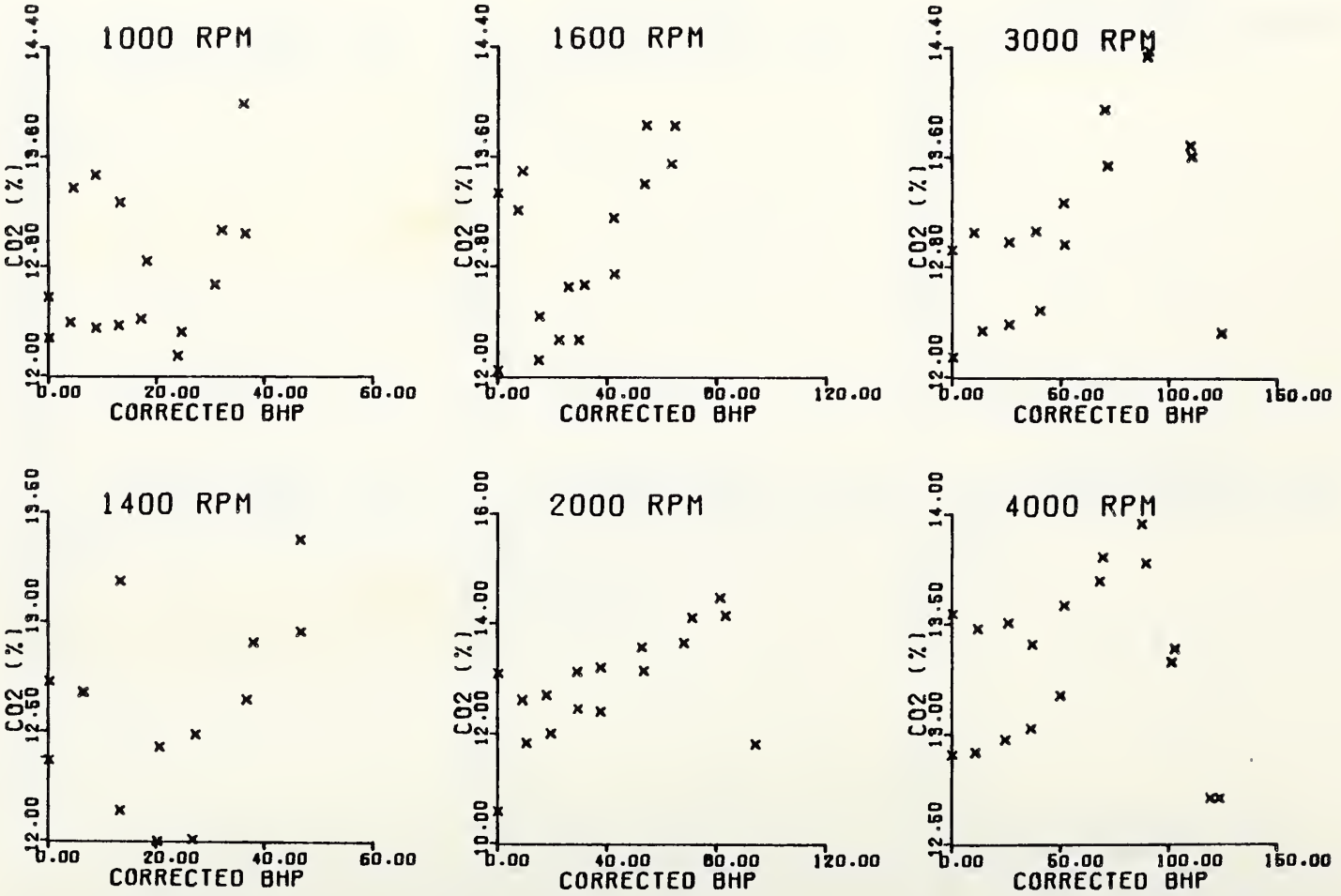
1600 RPM
NOX (PPM) *10'
0.00
80.00
160.00
240.00
0.00
40.00
80.00
120.00
CORRECTED BHP

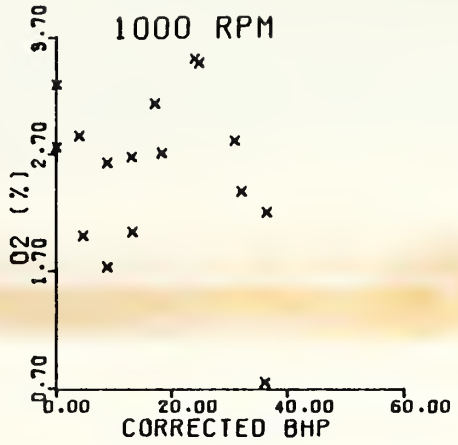
3000 RPM
NOX (PPM) *10'
0.00
80.00
160.00
240.00
0.00
60.00
100.00
160.00
CORRECTED BHP

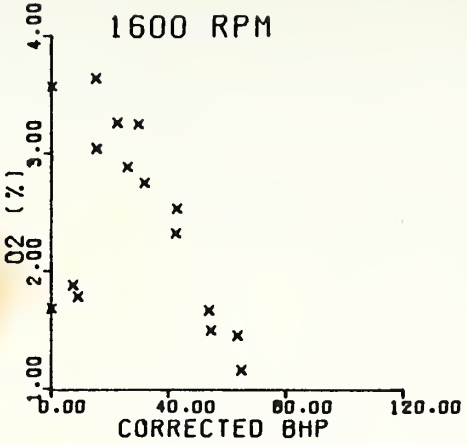
1400 RPM
NOX (PPM) *10'
0.00
50.00
100.00
150.00
0.00
20.00
40.00
60.00
CORRECTED BHP

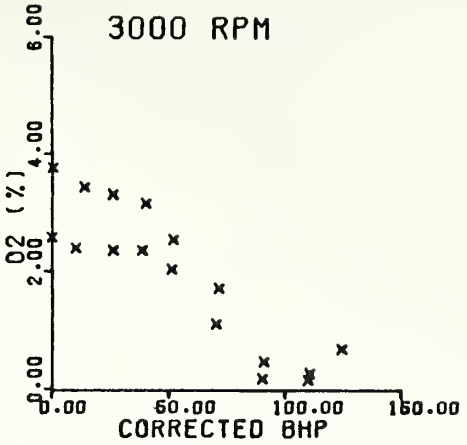
2000 RPM
NOX (PPM) *10'
0.00
80.00
160.00
240.00
0.00
40.00
80.00
120.00
CORRECTED BHP

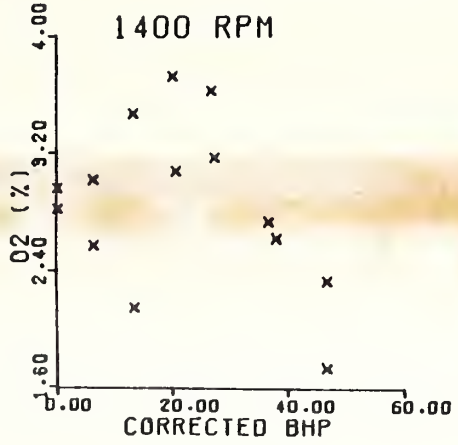
4000 RPM
NOX (PPM) *10'
0.00
60.00
100.00
140.00
0.00
60.00
100.00
160.00
CORRECTED BHP

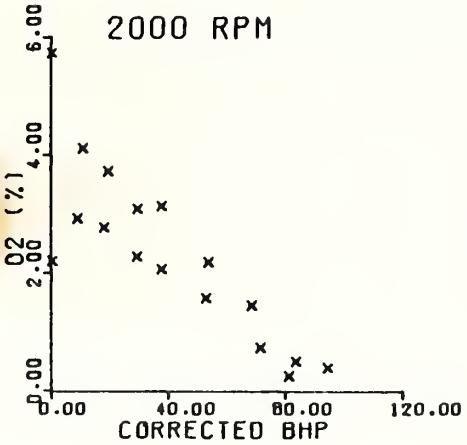

1000 RPM
1600 RPM
3000 RPM
1400 RPM
2000 RPM
4000 RPM
CO2 (%)
CORRECTED BHP

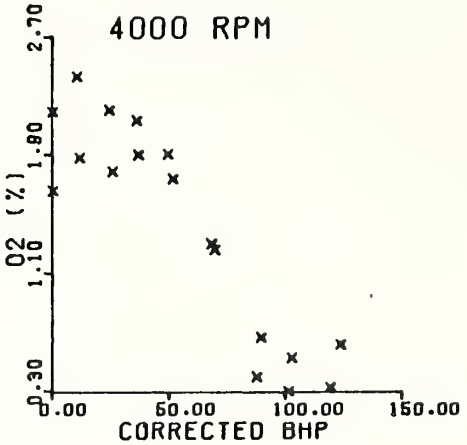

1000 RPM
O2 (%)
3.70
2.70
1.70
0.70
0.00
20.00
40.00
60.00
CORRECTED BHP

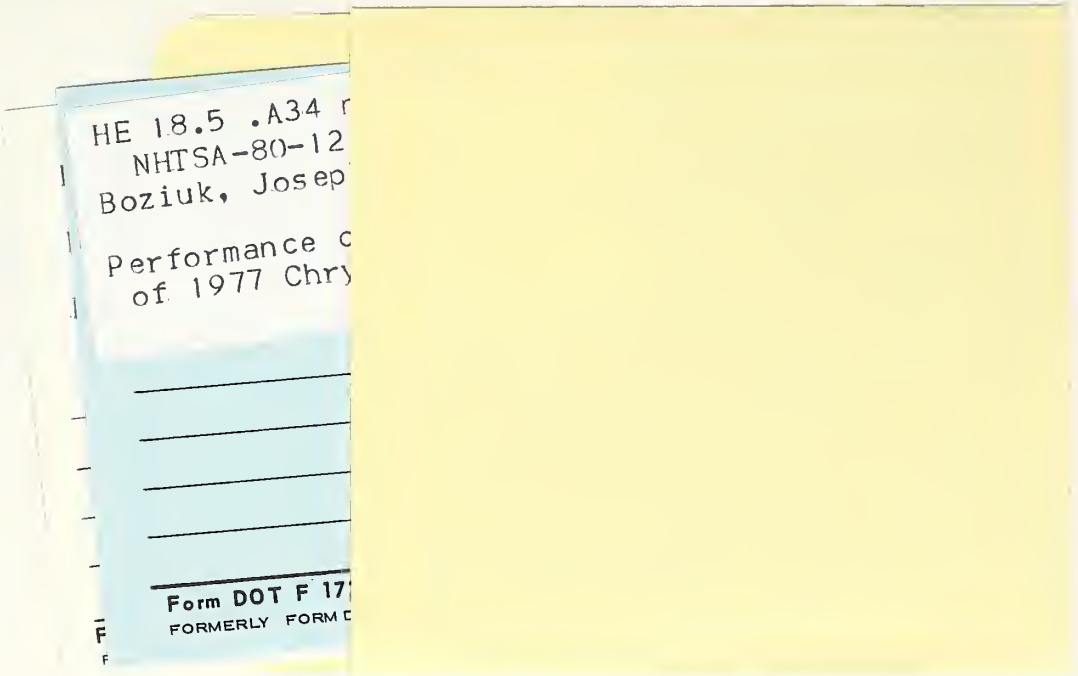

1600 RPM
O2 (%)
4.00
3.00
2.00
1.00
0.00
40.00
80.00
120.00
CORRECTED BHP


3000 RPM
O2 (%)
6.00
4.00
2.00
0.00
0.00
50.00
100.00
150.00
CORRECTED BHP


1400 RPM
O2 (%)
4.00
3.20
2.40
1.60
0.00
20.00
40.00
60.00
CORRECTED BHP


2000 RPM
O2 (%)
6.00
4.00
2.00
0.00
0.00
40.00
80.00
120.00
CORRECTED BHP


4000 RPM
O2 (%)
2.70
1.80
1.10
0.30
0.00
50.00
100.00
150.00
CORRECTED BHP



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613