CRC Report No. 520

1980 CRC FUEL RATING PROGRAM: ROAD OCTANE PERFORMANCE IN 1980 MODEL CARS

Contract DAAK-70-81-C-0128

July 1981

COORDINATING RESEARCH COUNCIL, INC.
219 PERIMETER CENTER PARKWAY, ATLANTA, GEORGIA 30346

DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

(12)

COORDINATING RESEARCH COUNCIL
INCORPORATED
219 PERIMETER CENTER PARKWAY
ATLANTA, GEORGIA 30346
(404) 396-3400

1980 CRC FUEL RATING PROGRAM: ROAD OCTANE PERFORMANCE IN 1980 MODEL CARS

(CRC Project No. CM-124-80)

Prepared by the
1980 Analysis Panel
of the
CRC - Road Test Group

July 1981

Light-Duty Vehicle Fuel, Lubricant, and Equipment Research Committee
of the
Coordinating Research Council, Inc.

TABLE OF CONTENTS

TEXT

TABLES

FIGURES

APPENDICES

I. INTRODUCTION

Road octane rating programs have been conducted periodically since 1963 by the Coordinating Research Council (CRC) Light-Duty Vehicle Road Test Group to investigate relationships between gasoline variables and road octane numbers. Leaded gasolines were tested during the 1963 - 1969 period; unleaded gasolines were tested in the 1971, 1973, 1975, and 1978 programs. This is the eleventh program in the series and includes gasoline blends containing ethanol (gasohol) in addition to normal gasoline variables.

Full-Throttle Modified Uniontown Road Octane Numbers (Road ON) were obtained by twelve participating laboratories in thirty-seven cars that represent twenty-four different 1980 makes and models, one 1979 model, and one 1981 model. Part-throttle Road ON ratings were obtained by four participating laboratories in twelve cars representing nine different 1980 makes and models.

II. SUMMARY

The data were analyzed using multiple linear regression and analysis of variance techniques. Analyses were made on all-car average data, as well as data from individual cars and from several subgroups. On an all-car basis, full-throttle Road ON's were found to be well predicted by the following equation containing only Research octane number (RON) and Motor octane number (MON):

$$\text{Road ON} = 26.275 + 0.286\,(\text{RON}) + 0.450\,(\text{MON})$$

The equation fit was improved considerably (lower standard deviation), however, by first adding a $(\text{RON})^2$ term, then adding a term for heavy aromatics content:

$$\text{Road ON} = -163.216 + 4.294(\text{RON}) - 0.021(\text{RON})^2 + 0.432(\text{MON}) - 0.012\,(\text{Heavy Aromatics})$$

This equation indicates that the effect of RON on Road ON decreases with increasing RON level, and that heavy aromatics have an adverse effect on Road ON which is independent of its direct effects on RON and MON.

The all-car data did not show a significant ethanol-content effect, but eight of the thirty-seven cars did show significant effects.

Analysis of variance showed that fuels had the largest effect on full-throttle Road ON. Cars had smaller, but highly significant, effects. The effects of fuels on Road ON varied among the cars.

The part-throttle ratings were also well predicted with an equation containing only RON and MON:

$$\text{Road ON} = 32.008 + 0.091\ (\text{RON}) + 0.553\ (\text{MON})$$

Equation fit was improved by adding a heavy aromatics term, but ethanol did not have a significant effect on the average part-throttle Road ON:

$$\text{Road ON} = 31.823 + 0.089(\text{RON}) + 0.559(\text{MON}) - 0.009\ (\text{Heavy Aromatics})$$

Only one car showed a significant effect of ethanol at part-throttle.

Analysis of variance showed that cars had a larger effect than fuels on the part-throttle ratings. The reverse was true for the full-throttle ratings. The effects of fuels did not vary among the cars, as they did with the full-throttle ratings.

III. DESCRIPTION OF PROGRAM

Appendix A lists the participating laboratories in the 1980 program and the membership of the Analysis Panel. The program is presented in Appendix B. Fuel properties, test car descriptions, the road rating procedure, and a brief outline of data analyses employed are summarized in the following paragraphs.

A. Test Fuels

The twenty unleaded test fuels used in the program were designed to estimate the effects of RON, MON, heavy aromatics content (C_9 and heavier, by volume), and ethanol content (by volume) on Road ON performance. A computer optimization program was used to design the fuel set. The optimization provided for the evaluation of $(RON)^2$ and $(MON)^2$ effects, in addition to linear effects for the four variables. There were three levels of RON, five levels of MON, and two levels each of heavy aromatics and ethanol. (R+M)/2 ranged from 86.4 to 93.4 ON, and sensitivity ranged from 5.6 to 12.8 ON.

Laboratory inspection data for the twenty fuels submitted by the participants were screened for outliers. All outliers were rejected, and the remaining values were averaged. Targeted and actual values for the four variables are compared in Table I. Many of the RON and MON values were more than one octane number off target, and some of the heavy aromatics and ethanol values were not within limits. The test fuel set was still found, however, to be capable of very good evaluation of the effects of the four parameters. This is indicated by the low

correlations among the four design parameters, as shown in Table II. The RON/MON correlation is not as low as the others, but it is approximately the same as in the 1978 program (0.784 versus 0.779), and it is difficult to design a set of fuels with a RON/MON correlation much less than 0.8. Low correlation values are necessary for accurate determination of the effects of the four parameters.

Volatility and total aromatics data are shown for the test fuels in Table III. Only six fuels met the RVP requirement of 8-10 lbs. The other fuels had RVP's below 8 lb. All fuels met the distillation and total aromatics specifications. The test fuel specifications are shown in Appendix B.

B. Test Cars

Thirty-seven cars representing twenty-four different 1980 models, one 1979 model, and one 1981 model were used in the program. Only two cars, T 218M and PL 217M, were equipped with manual gear-shift transmission, and the remaining cars had automatic transmissions. The test car models and their engine characteristics are shown in Table IV. The car-laboratory testing array for both full- and part-throttle Road ON is shown in Appendix C. The odometer readings ranged from 7,115 to 42,134; and the mean was 15,741 miles. The odometer reading is shown in Appendix H for each test car, along with other test details.

C. Road Rating Technique

Fuel ratings were obtained by the Modified Uniontown Technique under both full- and part-throttle conditions. Full-throttle primary reference fuel curves were used to establish the Road ON under full-throttle conditions. Part-throttle primary reference fuel curves were used to establish the Road ON at part-throttle. Thirty-seven cars were tested at full-throttle, and twelve of these cars were also tested at part-throttle. All ratings were conducted on chassis dynamometers. The CRC Modified Uniontown rating technique is described in Appendix D.

D. Data Analysis

Analyses were conducted on both full-throttle and part-throttle data. Other subgroups of data were analyzed, including all-car averages, all-automatic-transmission-car averages, all-U.S.-car averages, all-imported-car averages, model averages, and individual cars. Linear and second-order equations were developed using RON, MON, $(RON)^2$, $(MON)^2$, heavy aromatics, and ethanol content as variables. Analysis of variance (ANOVA) techniques were used to evaluate individual contributions of cars, fuels, car-fuel interactions, and test error to the variability of the road test ratings.

IV. DISCUSSION OF RESULTS

A. Test Results

Average full-throttle and part-throttle Road ON ratings for the twenty test fuels are listed in Tables Va and Vb, together with the standard deviations and the minimum and maximum ratings for each fuel. Because of difficulties with three of the ethanol-containing fuels, twenty-one missing data points at full-throttle and twelve at part-throttle were estimated. In addition, one data point on Fuel 15, a non-ethanol fuel, was estimated. Road ON estimates were made by developing a prediction equation for each car that did not test all fuels, and then calculating the missing Road ON. The use of these estimated ratings completed the data set in Table Va which covers all thirty-seven cars at full-throttle and twelve cars at part-throttle. Table Vb gives the average values when only the vehicles in which all fuels were rated are included. The average full-throttle ratings varied from 89.3 to 94.2 ON and 88.9 to 93.9 ON among the twenty test fuels for the 37-car and 26-car data sets, respectively. Individual fuel ratings varied as much as 7.3 ON (Fuel 7) among the thirty-seven cars, and 5.3 ON (Fuel 17) among the twenty-six cars.

The twelve-car average part-throttle ratings were 3.8 ON lower than the thirty-seven full-throttle ratings. The eight-car part-throttle ratings were 3.5 ON lower than the twenty-six full-throttle ratings on the average. Individual fuel ratings varied as much as 8.7 ON (Fuel 20) among the twelve cars, and 6.6 ON (Fuel 16) among the eight cars.

Three import car models (E 215, T 218M, and T 222), three models having the same engine (one M V250 and two O V250's), and four Model PC 137's were tested. Average full-throttle ratings for these selections are listed in Appendix E, Table E-1.

Average full-throttle ratings for each of the thirty-seven cars are listed in Table E-2. Average part-throttle ratings for each of the twelve cars are listed in Table E-3. Individual experimental observations are tabulated in Appendix H.

B. Full-Throttle Data Analysis

1. Multiple Regression Analysis

A total of twenty-nine equation models were developed, as shown in Table VI. Six of these equations were used for only those indiviual car analyses where RON or MON was not a significant variable. Results of the aralyses are shown in Appendix F for both full-throttle and part-throttle ratings. Full-throttle results are presented in Tables F-1 through F-9. Equation models 1-16 are shown in Table F-1 using the all-car average data. Equation models 1-6 are shown in Tables F-2 through F-8 for all cases: car model averages (three or more of the same model), all-car averages, all-car averages testing all fuels, all-U.S.-car averages, all-automatic-transmission-car averages. all-imported-car averages, and individual cars. Equation models 3, 8, and

10 were used for a 37-car individual data analysis and are shown in Table F-9. For the individual car cases, additional equations are shown where all terms are significant.

a. All-Car Average Data

The all-car average results show that Road octane ratings were predicted best by Equations 3, 7, 8, and 10. As shown below, these equations include only the RON, MON, $(RON)^2$, and heavy aromatics terms. The inclusion of the ethanol term as well as other quadratic terms did not improve prediction accuracy, and their coefficients were not statistically significant at the 95% confidence level.

Full-Throttle Regression Equations
For 37-Car Road ON Averages

Equation Model	Constant b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	(R+M)/2 b_5	$(RON)^2$ b_6	Std. Dev.	R^2
3	26.275	0.286	0.450					0.276	0.977
4	26.005	0.284	0.457	-0.009				0.269	0.979
5	26.599	0.300	0.430		0.015			0.275	0.979
6	26.616	0.295	0.437	-0.009	0.014			0.269	0.981
7	29.700					0.690		0.296	0.972
8	-143.663	3.997	0.425				-0.020	0.209	0.988
10	-163.216	4.294	0.432	-0.012			-0.021	0.178	0.991
10*	-174.765	4.613	0.420	-0.011			-0.023	0.169	0.992

NOTE: Underlined values are not significant at the 95% confidence level.

* 26-car average equation. Eleven cars that did not rate all design fuels were eliminated.

The inclusion of the $(RON)^2$ and heavy aromatics terms (Equation 10), along with RON and MON, substantially improved prediction accuracy over Equation 3; the standard deviation was reduced from 0.276 to 0.178, and the square of the coefficient of correlation (R^2) was increased from 0.977 to 0.991. It is interesting to compare Equation 4 with Equation 10 and to note that the heavy aromatics term was not significant (Equation 4), unless the $(RON)^2$ term was used (Equation 10).

The last equation shown is based on those twenty-six cars that rated all twenty fuels, and is shown for comparison.

Prediction of the 37-car average full-throttle Road ON using Equations 3, 8, and 10 are shown in Figures 1, 2, and 3, respectively. The improvement in prediction accuracy is illustrated.

The 37-car average equation model (Equation 8), in terms of RON, MON, and $(RON)^2$, demonstrates the effect of fuel octane level on the relative contribution of RON and MON to Road ON quality. For premium unleaded type fuels, for example, a change in RON will have little effect on actual Road octane quality, whereas the opposite is true for regular unleaded type fuels. This effect is shown in Table VII for the linearized second-order model.

b. Individual Car Data

The observed individual Road ON ratings for the thirty-seven cars versus predicted Road ON ratings for all twenty fuels is shown in the scatter diagram on Figure 4. Regressing the individual ratings gave results similar to the all-car average data; the coefficients were essentially the same. The large standard deviations shown in Table F-9 are due to variations in ratings among the thirty-seven cars. These variations are not present when all-car average data are used.

The coefficient for the ethanol term was significant in eight of the thirty-seven cars (22%) tested. All but two of these coefficients were positive, indicating a possible Road octane bonus for these cars. This is in contrast to the all-car average results which showed that the ethanol term was insignificant in combination with any other terms.

Road ON averages and regression results varied considerably among the thirty-seven cars. The following table shows these variations in the twenty-fuel average full-throttle Road ON's (standard deviations and ranges), as well as the means; the standard deviations; and the ranges for the constant, RON, and MON coefficients for Equation 3 regression parameters.

Variation of Full-Throttle Road ON
Regression Results Among Cars

	Mean	Standard Deviation	Min.	Max.
Full-Throttle Road ON (37 Cars)	91.903	1.051	89.725	94.845
Full-Throttle Road ON (Equation 3)				
Constant, b_0	25.885	13.194	-7.256	44.110
RON Coefficient, b_1	0.285	0.119	0.036	0.588
MON Coefficient, b_2	0.456	0.142	0.146	0.729

The RON coefficients varied from near zero to approximately 0.6, the MON coefficients from approximately 0.1 to 0.7, and the constant from -7 to 44.

2. Analysis of Variance (ANOVA)

The full-throttle data were subjected to ANOVA techniques to evaluate the overall contributions of fuel effect, car effect, car-fuel interaction, and test error to the variability in the observed Road octane ratings.

The fuel effect, a measure of the variation caused by fuel composition, was highly significant and caused most of the variability -- about 65%.

The car effect, a measure of the difference in ratings between cars, was highly significant and caused about 20% of the variability observed. The car effect is confounded with the laboratory effect, though; hence, the two effects cannot be separately determined.

The car-fuel interaction, the variation resulting from the differences in response of individual cars to individual fuels, was significant and accounted for about 7% of the variability.

Error, a measure of the variability of replicate ratings, represented about 8% of the total variability.

Standard deviations of the effects are summarized below for all cars (except E 215), and for two models for which three or more of the same model were tested. A more detailed tabulation of the ANOVA results is given in Appendix G.

Analysis of Variance Summary for All Cars and for Two Car Models

Car Model	No. of Cars	Estimated Standard Deviation (s-Values)			
		Cars	Fuels	Fuel x Car	Error
All Cars (Ex. E 215)	36	0.946	1.724	0.563	0.614
PC 137	4	0.757	2.080	0.468	1.051
O V250/ M V250	3	1.728	1.639	0.132	0.554

The s-values shown are estimates of the standard deviations of the different effects. They provide a measure of the relative influence of each effect on Road octane number.

The data were also analyzed on a laboratory-by-laboratory basis to provide an indication of the variation in the effects among the laboratories, and to examine effects which were independent of laboratory effects. The following table presents a summary of this analysis. Table G-2 of Appendix G gives the results in more detail.

Analysis of Variance Summary for Individual Laboratories

Lab	No. of Cars	Estimated Standard Deviation (s-Values)			
		Cars	Fuels	Fuel x Car	Error
3	4	0.089	1.720	0.240	0.651
4	4	0.747	1.487	0.533	0.337
5	3	0.402	2.177	0.655	0.332
7	4	1.176	1.637	0.479	0.565
8	5	0.483	1.414	0.226	0.325
26	4	1.037	1.778	0.326	0.790
29	4	0.504	1.786	*	0.687
30	2	0.684	2.500	*	1.257
35	2	0.568	1.616	*	0.745
41	3	2.047	1.770	0.925	0.436
47	1	**	1.651	**	0.191
50	1	**			

* The component of variance for the car-fuel interaction effect is negative and non-significant. Hence, the standard deviation is imaginary and meaningless.

** Insufficient data for ANOVA.

The table shows that the car, fuel, and car-fuel interaction effects were similar to the all-car ANOVA. In many cases, the error standard deviations are greater than standard deviations attributable to car-fuel interaction.

C. Part-Throttle Data Analysis

1. Multiple Regression Analysis

Equations 1-6 and 8-16 were used for regressions on the twelve-car average data. Only Equations 2, 3, and 4 gave low standard deviations, high correlations (R^2 values), and statistically significant coefficients for the variables. Regression results for these equations and Equation 5 are shown below. Results for all fifteen equations are shown in Appendix F, Table F-10. Individual car results are presented in Table F-11; Equations 1-6, 8-9, 4b, 5b, and 6b are included.

Part-Throttle Regression Equations
For 12-Car Road ON Averages

Equation Model	Constant b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	Std. Dev.	R^2
2	29.977		0.677			0.238	0.969
3	32.008	0.091	0.553			0.144	0.989
4	31.823	0.089	0.559	-0.009		0.119	0.993
5	31.740	0.086	0.562		<u>-0.007</u>	0.145	0.990

NOTE: Underlined value is not significant at the 95% confidence level.

As in the full-throttle results, Equation 3 was an effective predictor of Road ON. The MON coefficient was much larger than the RON coefficient, however, and in fact, MON alone was a reasonably good predictor, as shown in Equation 2.

Figure 5 graphically illustrates the good correlation using Equation 3; however, adding the percent heavy aromatics term, although very small, decreased the standard deviation from 0.144 to 0.119. The correlation is shown in Figure 6.

The table also shows results for Equation 5 which includes a term for percent ethanol in the fuels, one of the design variables. The ethanol term was very small, however, and statistically insignificant.

There were large variations in the regression results among the twelve cars tested at part-throttle. The following table shows means, standard deviations, and ranges for the twenty-fuel average ratings and the regression equation parameters (Equation 3).

Variation of Part-Throttle Road ON Regression Results Among Cars

	Mean	Standard Deviation	Min.	Max.
Part-Throttle Road ON (12 Cars)	86.035	2.197	83.805	90.75
Part-Throttle Road ON Equation				
Constant, b_0	32.267	7.373	22.276	43.611
RON Coefficient, b_1	0.102	0.084	-0.050	0.230
MON Coefficient, b_2	0.538	0.101	0.406	0.770

Average Road ON values ranged from 84 to 91. The constant varied from 22 to 44, the RON coefficient from slightly negative to 0.2, and the MON coefficient from 0.4 to nearly 0.8.

2. Analysis of Variance (ANOVA)

The part-throttle data were also evaluated by ANOVA. In the part-throttle data, the car effect was the most significant factor, with 66% of the total variability. Its influence was only 20% in the full-throttle data. The fuel effect caused only 23% of the variability, and the car-fuel interaction was not significant. The ANOVA results are given in more detail in Appendix G, Table G-4.

Comparison of the part-throttle with the full-throttle ANOVA is presented in the following table.

Part-Throttle and Full-Throttle Standard Deviations

Rating	No. of Cars	Estimated Standard Deviation (s-Values)			
		Cars	Fuels	Fuel x Car	Error
Full-Throttle	36	0.946	1.724	0.563	0.614
Part-Throttle	12	2.153	1.287	0.0	0.937

The most significant difference between the two data sets is that the car effect is much larger in the part-throttle fuel ratings.

D. Comparison of Results With Previous Programs

In the past, the Road Test Group has conducted fuel rating programs from which relationships for all-car averages have been developed in the form Road ON = b_0 + b_1 RON + b_2 MON. Comparison of this program's full-throttle equation with those of previous years is shown below:

1963-1980 All-Car Full-Throttle Road ON Equations

	No. of Cars Tested	Constant* b_0	Coefficients RON b_1	Coefficients MON b_2	Std. Dev.	R^2
Program						
Premium Grade Fuels						
1964	35	14.12	0.33	0.56	-	-
1966	40	21.05	0.34	0.48	0.37	0.96
1967	14	32.04	0.01	0.71	0.63	0.90
Regular Grade Fuels						
1963	30	2.64	0.48	0.52	-	-
1965	36	17.15	0.32	0.53	0.68	0.84
1969	35	20.47	0.10	0.73	0.31	0.98
Unleaded Fuels						
1971	43	32.04	0.15	0.52	0.23	0.99
1973	34	2.18	0.17	0.83	0.80	0.89
1975	37	29.61	0.13	0.56	0.27	0.98
1978	34	30.94	0.31	0.36	0.21	0.99
1980	37	25.90	0.29	0.45	0.28	0.98

* Constants are recalculated to account for rounding off of coefficients from three-decimal form (Appendix F) to two-decimal form.

NOTE: Underlined values are not significant at the 95% confidence level.

The results of the 1980 fuel rating program show that the MON coefficient is approximately 50% higher than the RON coefficient, as compared with the 1978 program in which the RON and MON coefficients were about equal. In the other three programs conducted on unleaded fuels in 1971, 1973, and 1975, the MON coefficients were considerably higher than the RON coefficients.

In this program and in the 1978 program, the quadratic equation form which contained a $(RON)^2$ term, i.e., Road ON = $b_0 + b_1RON + b_2MON + b_6(RON)^2$, has given the best correlation because of non-linearity in fuel-rating response. In the 1975 program, however, the best equation contained a $(MON)^2$ term, i.e., Road ON = $b_0 + b_1RON + b_2MON + b_7(MON)^2$. Comparison of the full-throttle quadratic equation from this program with those of 1975 and 1978 are shown below:

1978 and 1980 All-Car Full-Throttle Quadratic Road ON Equations

Program	No. of Cars Tested	Constant b_0	Coefficients				Std. Dev.	R^2
			RON b_1	MON b_2	$(RON)^2$ b_6	$(MON)^2$ b_7		
1975	37	-192.167	0.146	5.789	-	-0.031	0.19	.99
1978	34	- 92.97	3.019	0.380	-.015	-	0.117	.997
1980	37	-143.66	3.997	0.425	-.020	-	0.209	.988

The negative coefficient for $(RON)^2$ in the 1978 and 1980 programs indicate that the relative importance of RON decreases as the RON level of fuels increases. In 1975, the negative coefficient for $(MON)^2$ indicates that the relative importance of MON decreases as the MON level of fuels increases. These findings are contradictory, possibly indicating that the equation form used is not the best one.

Analysis of variance of the full-throttle and part-throttle data from this program are compared below with the 1975 and 1978 programs:

1975-1980 Full-Throttle and Part-Throttle Standard Deviations

Rating	No. of Cars	Estimated Standard Deviation (s-Values)			
		Cars	Fuels	Fuel x Car	Error
Full-Throttle					
1975	37	1.38	1.84	0.58	0.63
1978	34	1.277	1.850	0.848	0.416
1980	36	0.946	1.724	0.563	0.614
Part-Throttle					
1975	-	-	-	-	-
1978	16	3.535	1.527	0.941	0.440
1980	12	2.153	1.287	0.0	0.937

In all three programs, the fuel effect accounted for most of the variability in the full-throttle data. At part-throttle, the car effect was the greatest source of variability. Car-fuel interaction was significant in the 1978 program, but not in the 1980 program.

V. DISCUSSION AND RECOMMENDATIONS FOR FUTURE PROGRAMS

Past programs have always shown significant effects of RON and MON, but no significant gasoline composition effects. This program showed that heavy aromatics adversely affects Road ON, and that ethanol gave beneficial effects in a few cars. These effects are believed to be due to imperfect fuel distribution in the intake manifold. Certain cylinders do not receive all the high-octane tail-end components such as heavy aromatics, and conversely, they may receive a higher portion of light, high-octane components such as ethanol.

This program also showed that the fuel effects vary among car models. This was demonstrated by the ethanol effect showing up in only a few cars. The findings concerning heavy aromatics and ethanol in this program are not necessarily relevant to the 1980 model car population, because the test car population is somewhat different from the 1980 car population. For example, manual transmissions and imported cars were grossly underrepresented. These car design differences may have significant effects on the cars' response to the fuel variables.

In previous programs, there has been little attempt to select test cars to represent the U.S. car population. The only effort in this direction was to recommend that select models from the octane requirement survey program be tested; however, the selection has been biased by specifying automatic transmissions. The result has been that too few imported cars and manual transmissions have been tested. It is important to have them properly represented in the test program. It is recommended that a procedure be established to assure a proper selection of test car models representing current or future vehicle populations.

Another recommendation for future programs is that fuels containing other oxygenated compounds (alcohols and ethers) be included because of the growing interest in and use of those products. Also, some type of test should be used to look at gasoline octane distribution to help explain the effects of high-octane components on Road ON.

Blank

TABLES

AND

FIGURES

Blank

TABLE I

COMPARISON OF ACTUAL AND TARGET FUEL PROPERTIES

Fuel No.	RON		MON		Heavy Aromatics, %		Ethanol Content, %	
	Target	Actual	Target	Actual	Target	Actual	Target	Actual
1	90	90.2	82	82.5	5	7.1	0	-
2	90	89.3	82	83.4	5	6.9	10	6.9
3	90	91.4	82	82.7	25	20.1	0	-
4	90	90.2	84	84.6	5	6.5	10	9.6
5	90	90.5	84	84.3	25	26.1	0	-
6	90	90.6	84	84.4	25	25.8	10	9.8
7	94	95.3	82	84.7	5	6.4	10	9.8
8	94	95.0	82	84.8	25	24.3	0	-
9	94	94.1	82	84.1	25	23.6	10	9.8
10	94	95.4	85	85.7	5	7.4	0	-
11	94	93.8	85	86.2	5	5.3	10	9.7
12	94	94.8	88	87.5	5	7.8	0	-
13	94	94.8	88	87.2	25	26.5	0	-
14	94	94.1	88	87.3	25	21.8	10	8.6
15	98	99.1	86	86.3	5	6.5	0	-
16	98	99.1	86	86.7	25	25.8	0	-
17	98	98.1	86	87.7	25	25.3	10	7.1
18	98	98.9	88	87.6	5	6.1	0	-
19	98	98.1	88	88.4	5	6.8	10	9.8
20	98	97.9	88	88.9	25	26.3	10	10.0

TABLE II

AVERAGES AND CORRELATION MATRIX OF FUEL VARIABLES

20 Fuels			Correlation Coefficient, r					
Variable	Mean	Std. Dev.	RON	MON	Heavy Aromatics	Ethanol	(R+M)/2	Sensitivity
RON	94.535	3.298	1.000	0.784	0.035	-0.101	0.971	0.838
MON	85.750	1.899		1.000	0.083	0.129	0.910	0.318
Heavy Aromatics	15.620	9.302			1.000	-0.021	0.053	-0.021
Ethanol	4.555	4.743				1.000	-0.020	-0.268
(R+M)/2*	90.145	2.455					1.000	0.682
Sensitivity*	8.785	2.159						1.000

* Non-design fuel variable.

TABLE III

ADDITIONAL FUEL PROPERTIES

Fuel No.	RVP, lb	ASTM Distillation, °F			Total Aromatics, %*
		10%	50%	90%	
1	7.0	143	223	339	20
2	7.1	136	226	311	22
3	6.3	144	236	344	23
4	8.3	131	220	318	18
5	6.8	140	246	341	30
6	8.8	122	251	351	27
7	7.0	138	233	312	38
8	6.7	138	241	335	34
9	6.4	138	244	336	38
10	6.1	144	224	335	30
11	7.7	134	215	308	25
12	6.4	147	236	329	27
13	6.4	142	240	343	28
14	8.1	129	241	352	24
15	6.8	144	227	350	27
16	6.0	143	257	346	48
17	8.1	130	245	348	34
18	7.2	136	237	331	30
19	8.3	129	224	311	34
20	8.6	126	233	351	28

* Average of data from four participants and the fuel supplier.

TABLE IV

TEST CARS

Car Code	Model Year	No. Tested	No. Cyl.	Displ. Liters/CuIn	Carb. Bbl.	Trans.	CR*	Net bhp
E 215	1980	1	4	1.5/90.8	2	A	8 5	67
HC5 225	1980	1	4	2.5/151	2	A	8.2	90
HIA 238	1980	1	6	3.8/231	2	A	8.0	110
HIK 238	1980	2	6	3.8/229	2	A	8.6	115
HLV 225	1980	1	4	2.5/151	2	A	8.2	86
IIF 243	1980	1	8	4.3/260	2	A	7.5	105
KI 137	1980	1	6	3.7/225	1	A	8.4	90
LIA 238	1980	2	6	3.8/231	2	A	8.0	110
M V250	1980	1	8	5.0/302	V2	A	8.4	130
NC5 225	1980	1	4	2.5/151	2	A	8.2	90
NC7 228	1980	1	6	2.8/173	2	A	8.5	115
NFH 450	1980	1	8	5.0/305	4	A	8.6	155
NH 450	1980	1	8	5.0/305	4	A	8.6	155
NIG 230	1979	1	8	5.0/305	2	A	8.4	130
NIJ 244	1980	1	8	4.4/267	2	A	8.3	120
NIK 238	1980	2	6	3.8/229	2	A	8.6	115
NL9 216	1981	1	4	1.6/98	2	A	8.6	74
O V250	1980	2	8	5.0/302	V2	A	8.4	130
OCA 133	1980	2	6	3.3/200	1	A	8.6	91
OCA 223	1980	1	4	2.3/140	2	A	9.0	88
OCA 242	1980	2	8	4.2/255	2	A	8.8	119
OI V258	1980	1	8	5.8/351	V2	A	8.3	140
OL 223	1980	2	4	2.3/140	2	A	9.0	88
PC 137	1980	4	6	3.7/225	1	A	8.4	90
PL 217M	1980	1	4	1.7/105	2	M	8.7	65
T 218M	1980	1	4	1.8/108	2	M	9.0	75
T 222	1980	1	4	2.2/133.6	2	A	8.4	90
		37						

* Manufacturer's specifications.

V = Variable venturi

TABLE Va

AVERAGE FULL- AND PART-THROTTLE ROAD OCTANE NUMBERS

Fuel No.	Full-Throttle (37 Cars)				Part-Throttle (12 Cars)			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
1	89.273	1.184	86.10	92.45	86.050	2.175	81.80	88.30
2	89.396	1.028	86.00	92.30	86.350	1.975	82.60	88.30
3	89.553	1.022	86.85	92.00	86.142	1.861	82.65	88.25
4	90.022	1.067	88.00	93.50	86.913	1.768	83.35	89.35
5	89.623	0.919	86.80	92.25	86.783	2.088	83.15	89.05
6	89.715	1.433	86.60	93.50	86.613	1.776	83.25	88.85
7	92.009	1.391	89.00	96.30	87.525	2.259	83.30	90.85
8	91.789	1.355	89.00	95.60	87.625	2.349	83.35	90.55
9	91.324	1.329	88.50	94.70	86.921	2.353	82.30	89.75
10	92.324	1.201	90.00	95.15	88.317	2.311	83.75	91.35
11	92.297	0.943	90.00	95.15	88.396	2.374	83.75	91.20
12	92.830	1.001	91.25	96.00	89.063	2.406	84.45	92.45
13	92.653	0.935	90.75	95.40	88.654	2.343	84.15	91.90
14	92.850	1.298	89.50	95.70	88.867	1.957	85.65	91.45
15	93.127	1.442	89.50	95.80	88.746	2.252	84.65	92.00
16	93.322	1.396	90.45	97.15	88.908	2.651	83.70	92.25
17	93.664	1.447	90.50	96.70	89.325	2.434	84.80	92.25
18	93.957	1.299	91.50	97.85	89.508	2.333	85.05	92.25
19	94.127	1.474	90.95	97.45	89.921	2.356	85.65	93.00
20	94.189	1.330	91.20	97.05	90.133	2.605	84.85	93.55

NUMBER OF ESTIMATED RATINGS

Fuel	Full-Throttle	Part-Throttle
2	8	4
7	4	4
15	1	0
17	9	4

TABLE Vb

AVERAGE FULL- AND PART-THROTTLE ROAD OCTANE NUMBERS

Fuel No.	Full-Throttle (26 Cars)				Part-Throttle (8 Cars)			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
1	88.935	0.959	86.10	89.90	86.144	2.009	83.00	88.30
2	89.123	0.851	86.00	90.70	86.388	1.829	83.45	88.25
3	89.421	0.843	86.85	91.25	86.250	1.822	83.45	88.25
4	89.744	0.775	88.00	91.60	86.888	1.454	84.25	88.60
5	89.446	0.768	86.80	90.65	86.725	1.971	83.75	89.05
6	89.296	1.153	86.60	91.75	86.725	1.690	84.20	88.6[illegible]
7	91.710	1.065	89.00	94.00	87.638	2.183	84.50	90.85
8	91.525	1.109	89.00	93.60	87.656	2.231	84.70	90.55
9	91.077	1.036	88.50	92.65	87.044	2.192	83.70	89.75
10	91.992	0.998	89.95	93.30	88.294	2.025	85.45	91.35
11	92.110	0.773	90.00	93.25	88.506	2.160	85.35	91.20
12	92.587	0.707	91.20	93.70	89.125	2.334	85.90	92.45
13	92.527	0.854	90.75	94.05	88.763	2.233	85.70	91.90
14	92.444	1.045	89.50	94.15	88.800	1.886	85.80	91.45
15	92.881	1.295	89.50	94.50	88.894	2.188	85.45	92.00
16	93.108	1.264	90.45	95.45	88.900	2.319	85.65	92.25
17	93.385	1.349	90.50	95.75	89.350	2.275	85.90	92.25
18	93.577	1.020	91.50	95.50	89.650	2.212	86.70	92.25
19	93.819	1.205	91.50	95.90	90.025	2.241	86.60	93.00
20	93.933	1.213	91.20	96.40	90.131	2.156	86.75	92.90

TABLE VI

REGRESSION EQUATIONS

General Model: Road ON = $b_0+b_1RON+b_2MON+b_3HVYA+b_4ETOH+b_5(R+M)/2+b_6(RON)^2+b_7(MON)^2+b_8RXM$

Eqn. No.	Constant b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	(R+M)/2 b_5	$(RON)^2$ b_6	$(MON)^2$ b_7	RONxMON b_8
1	X	X							
2	X		X						
3	X	X	X						
4	X	X	X	X					
4a*	X	X		X					
4b*	X		X	X					
5	X	X	X		X				
5a*	X	X			X				
5b*	X		X		X				
6	X	X	X	X	X				
6a*	X	X		X	X				
6b*	X		X	X	X				
7	X					X			
8	X	X	X				X		
9	X	X	X					X	
10	X	X	X	X			X		
11	X	X	X		X		X		
12	X	X	X	X				X	
13	X	X	X		X			X	
14	X	X	X	X	X		X		
15	X	X	X	X	X			X	
16	X	X	X				X	X	X
17	X	X	X	X			X	X	X
18	X	X	X		X		X	X	X
19	X	X	X	X	X		X	X	X
20	X	X					X		
21	X		X					X	
22	X	X		X			X		
23	X	X			X		X		

* For individual cars there were twelve Equation 3 regressions for which either RON or MON was not a significant variable. These equations were used for those FT or PT cases.

TABLE VII

LINEARIZED RON, MON, $(RON)^2$ EQUATION*

(37-Car Average Full-Throttle Road Octane Ratings)

RON	Constant b_o'	RON b_1'	MON b_2'	$b_1' + b_2'$	$b_2'/(b_1' + b_2')$
89	8.141	0.509	0.425	0.934	0.455
90	11.631	0.470	0.425	0.895	0.475
91	15.251	0.430	0.425	0.855	0.497
92	18.820	0.391	0.425	0.816	0.520
93	22.428	0.352	0.425	0.777	0.547
94	26.075	0.313	0.425	0.748	0.576
95	29.760	0.274	0.425	0.699	0.608
96	33.326	0.234	0.425	0.659	0.645
97	37.344	0.195	0.425	0.620	0.685
98	41.147	0.156	0.425	0.581	0.731
99	44.989	0.117	0.425	0.542	0.784

---

* To Convert Second Order Road ON Equation (1)

(1) Road ON = $b_o + b_1 RON + b_2 MON + b_6 (RON)^2$

To Linearized Form (2)

(2) Road ON = $b_o' + b_1' RON + b_2' MON$

As Follows:

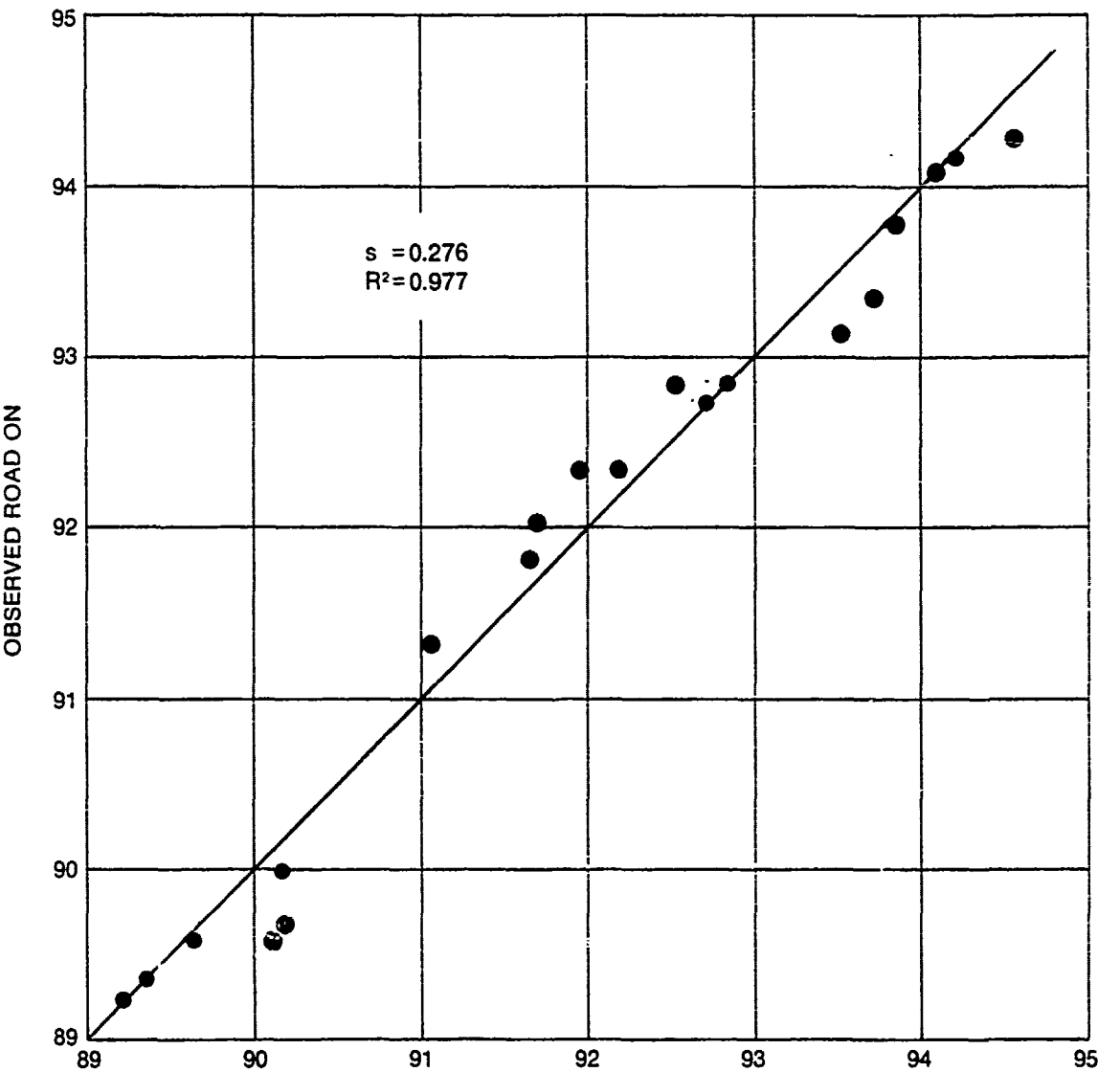
$$b_1' = \left(\frac{\partial \text{Road ON}}{\partial \text{RON}}\right)_{MON} = b_1 + 2b_6 RON$$

$$b_2' = \left(\frac{\partial \text{Road ON}}{\partial \text{MON}}\right)_{RON} = b_2$$

$$b_o' = \text{Road ON} - b_1' RON - b_2' MON$$

Figure 1

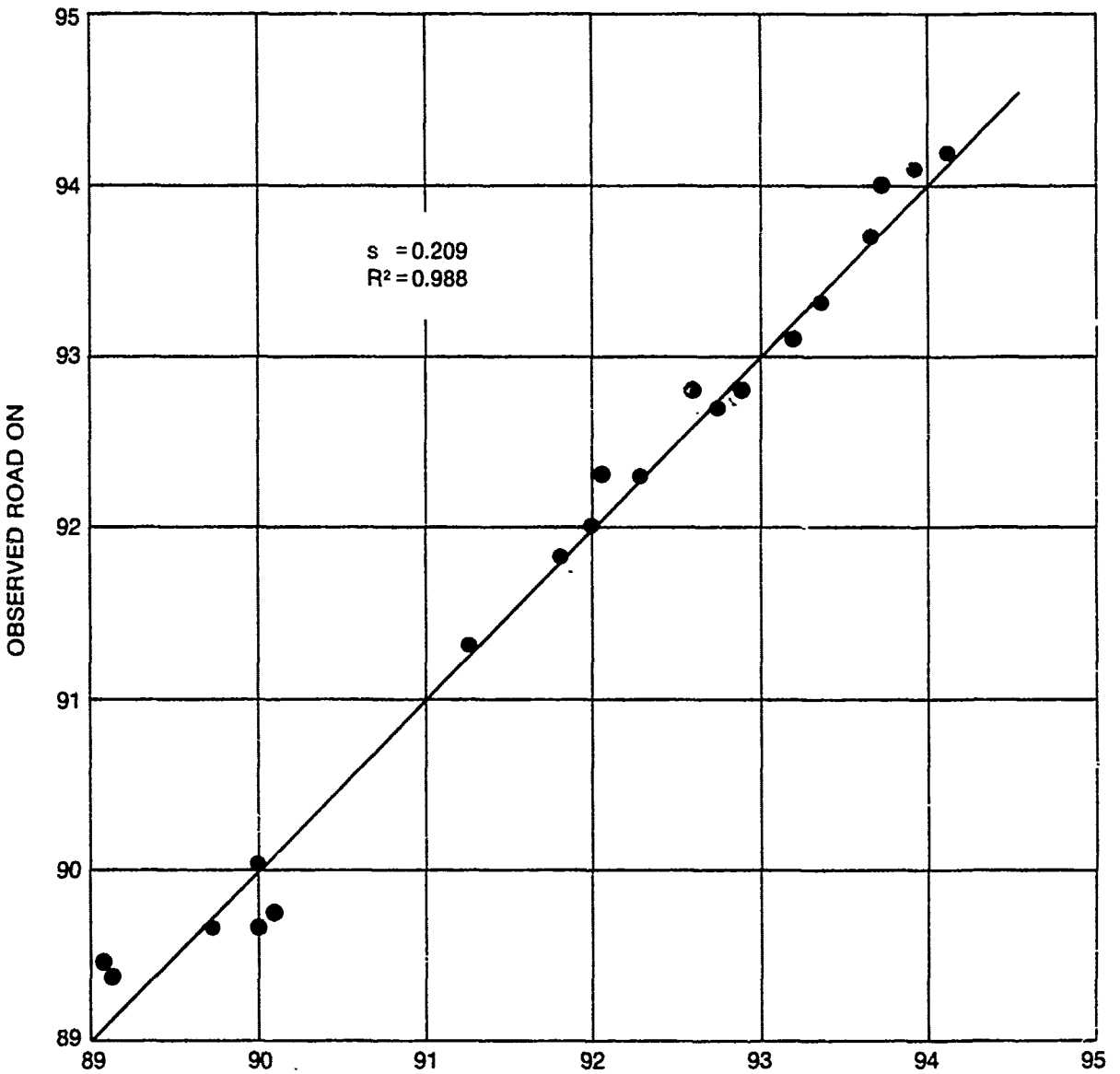
PREDICTION OF 37-CAR AVERAGE FULL-THROTTLE
ROAD ON BY RON, MON EQUATION



ROAD ON = 26.275 + 0.286 RON + 0.450 MON

Figure 2

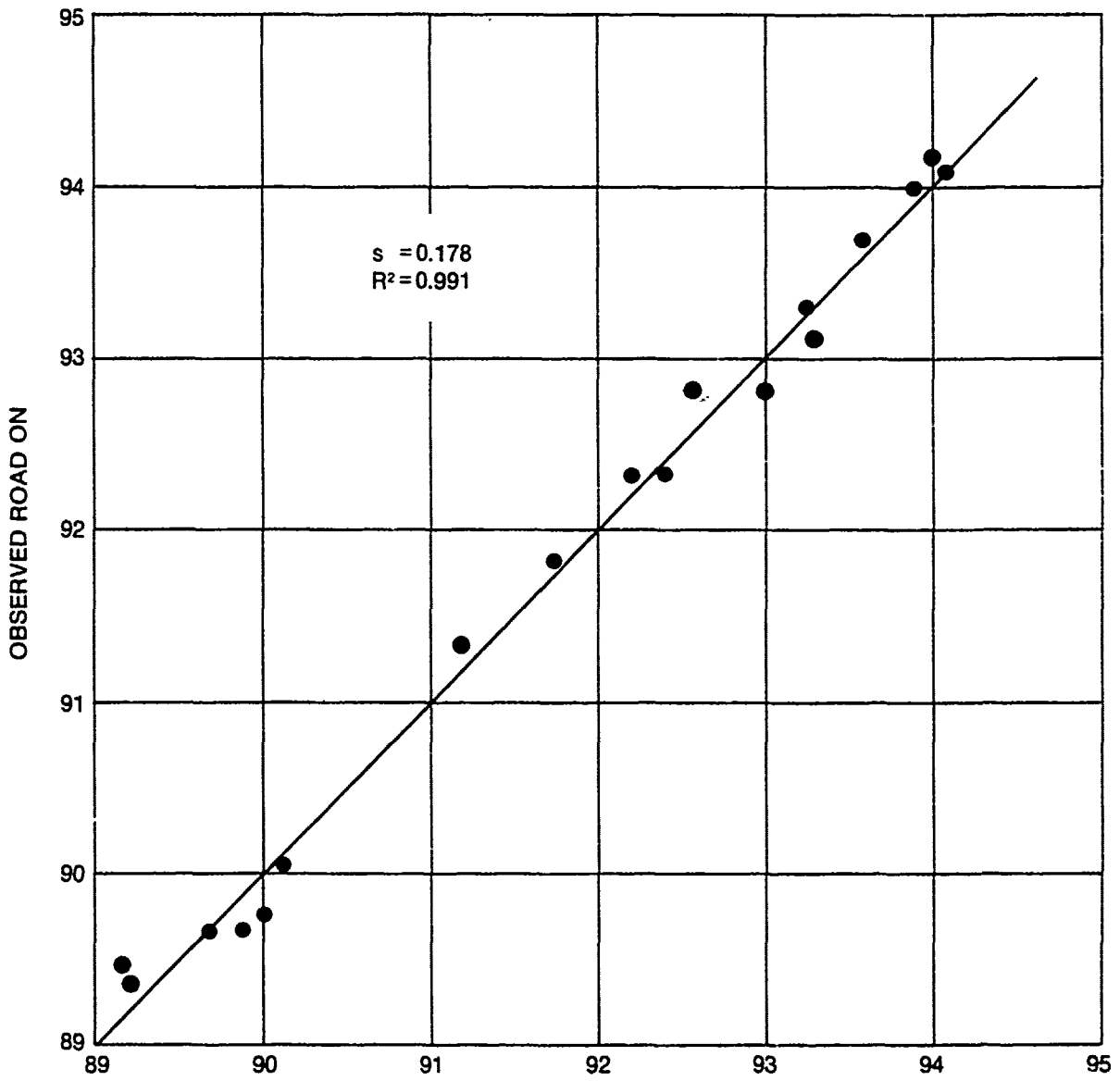
PREDICTION OF 37-CAR AVERAGE FULL-THROTTLE
ROAD ON BY RON, MON, $(RON)^2$ EQUATION



ROAD ON = 143.663 + 3.997 RON + 0.425 MON — 0.020 $(RON)^2$

Figure 3

PREDICTION OF 37-CAR AVERAGE FULL-THROTTLE
ROAD ON BY RON, MON, $(RON)^2$ HEAVY AROMATICS EQUATION



ROAD ON = -163.216 + 4.294 RON + 0.432 MON -0.021 $(RON)^2$ -0.012 HEAVY AROMATICS

Figure 4

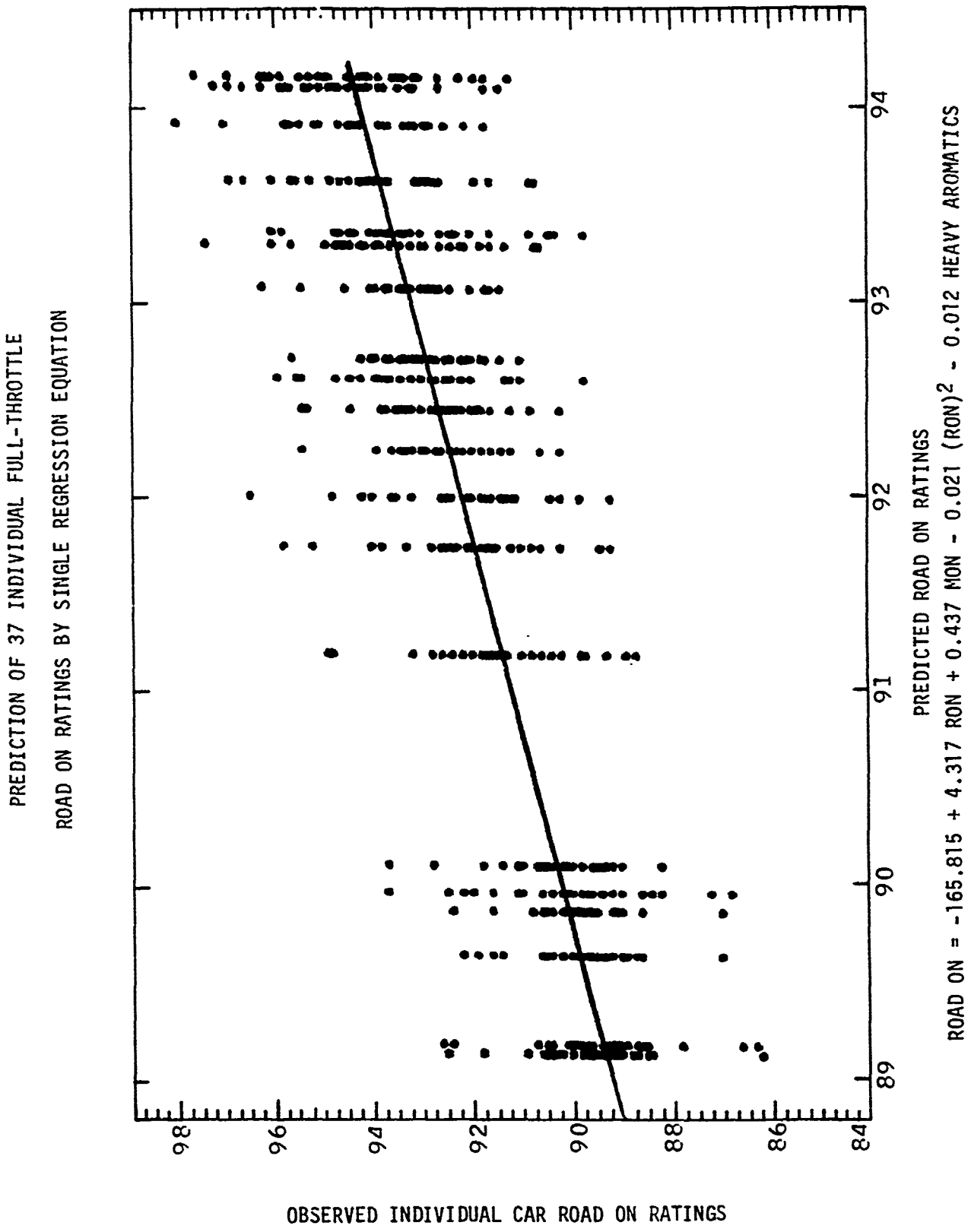
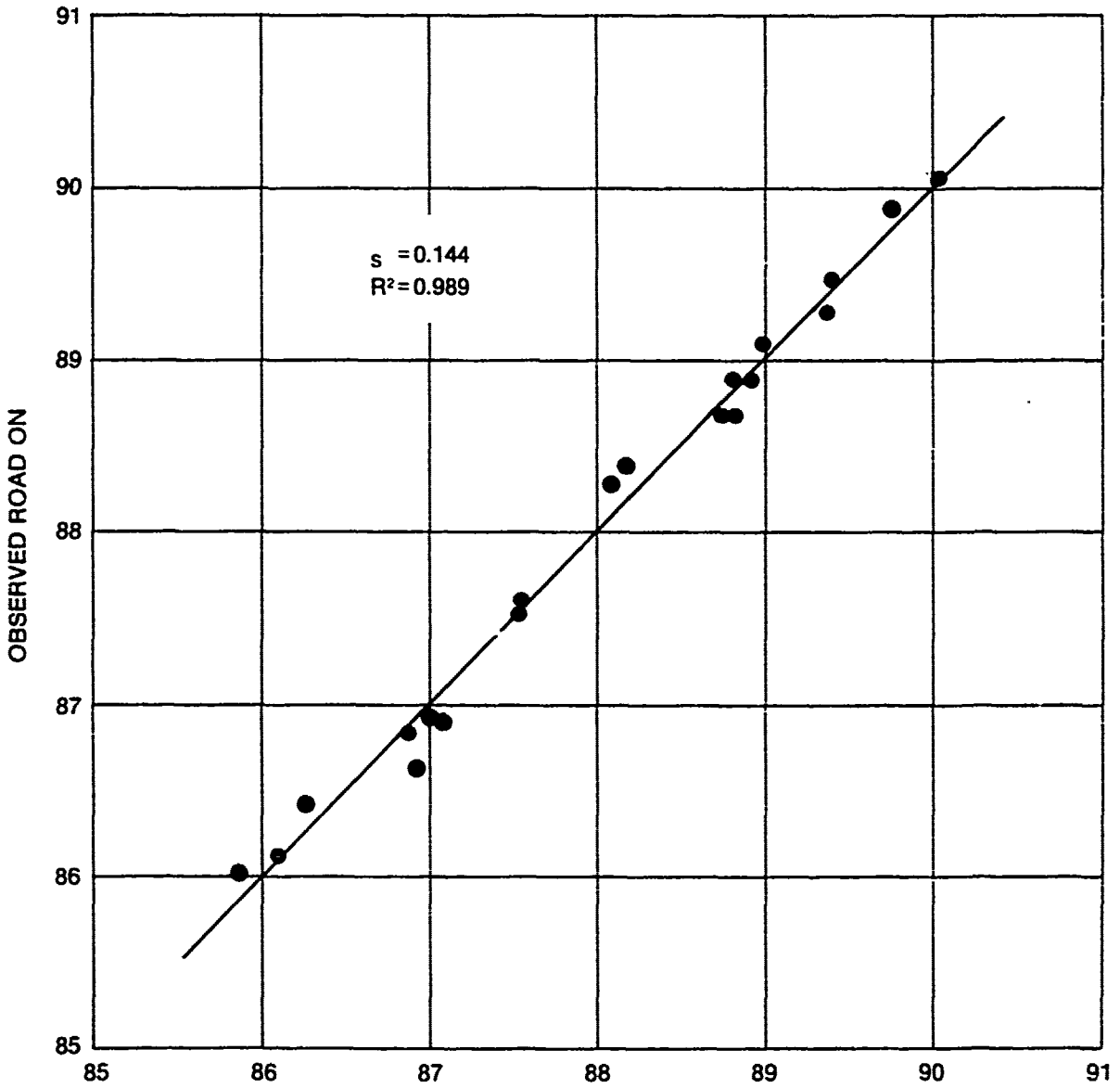

PREDICTION OF 37 INDIVIDUAL FULL-THROTTLE
ROAD ON RATINGS BY SINGLE REGRESSION EQUATION
PREDICTED ROAD ON RATINGS
ROAD ON = -165.815 + 4.317 RON + 0.437 MON - 0.021 (RON)2 - 0.012 HEAVY AROMATICS
OBSERVED INDIVIDUAL CAR ROAD ON RATINGS
98
96
94
92
90
88
86
84
94
93
92
91
90
89

Figure 5

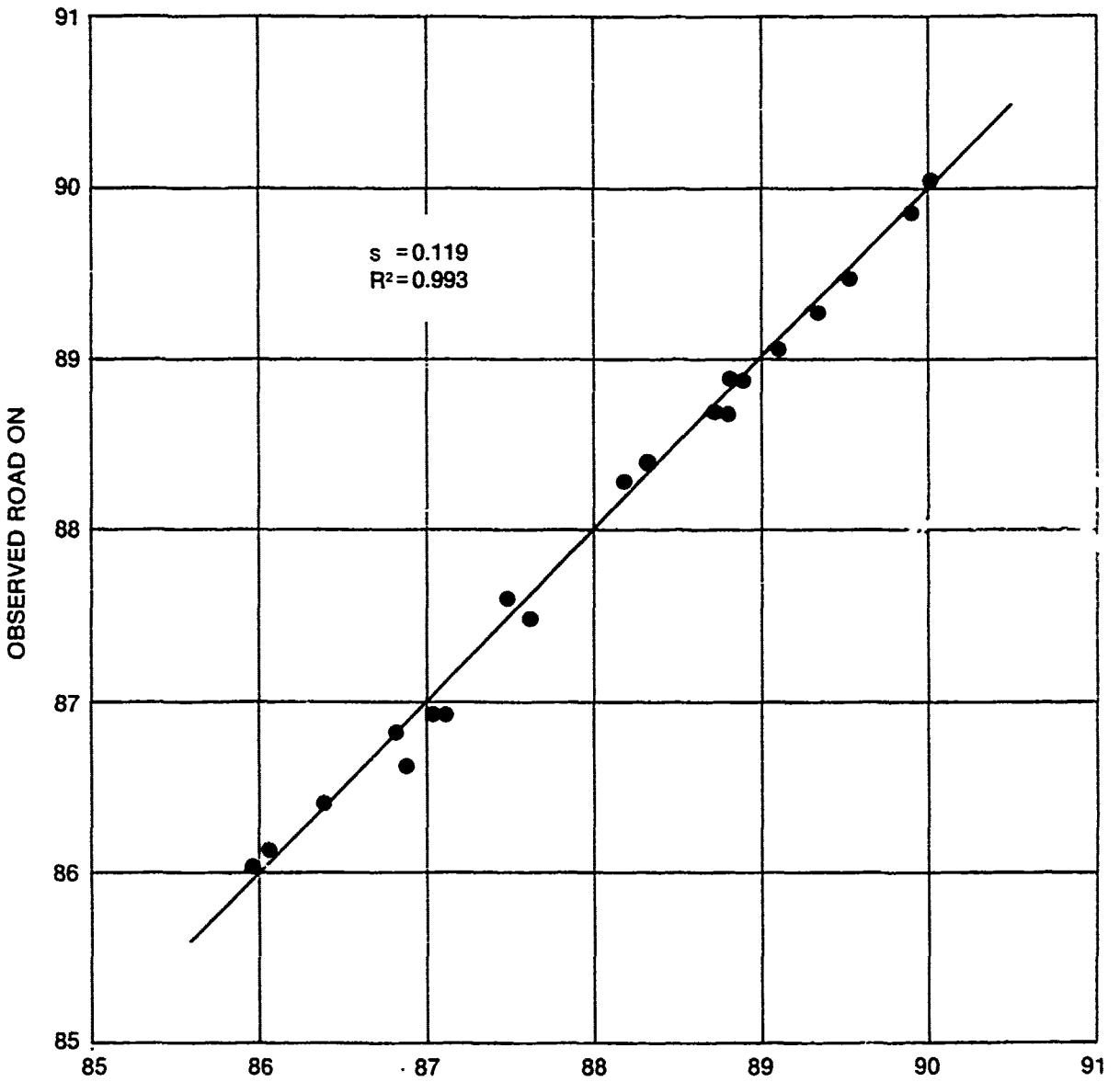
PREDICTION OF 12-CAR AVERAGE PART-THROTTLE ROAD ON BY RON, MON EQUATION



ROAD ON = 32.008 + 0.091 RON + 0.553 MON

Figure 6

PREDICTION OF 12-CAR AVERAGE PART-THROTTLE
ROAD ON BY RON, MON, HEAVY AROMATICS EQUATION



ROAD ON = 31.823 + 0.089 RON + 0.559 MON - 0.009 HEAVY AROMATICS

APPENDIX A

PARTICIPATING LABORATORIES

AND

MEMBERSHIP OF ANALYSIS PANEL

PARTICIPATING LABORATORIES

Amoco Oil Company*
Chevron Research Company
E. I. du Pont de Nemours & Company, Inc.
E.R.I.
Gulf Research and Development Company
Mobil Research and Development Corporation
Shell Development Company
Standard Oil Company (Ohio)
Suntech, Inc.
Texaco Inc.
Union Oil Company of California
Universal Oil Products Company

CRC ANALYSIS PANEL

J. C. Ingamells, Leader	Chevron Research Company
F. S. Bove	Texaco Inc.
E. S. Corner	Consultant
M. J. Gorham	Union Oil Company of California
J. D. Rogers, Jr.	E. I. du Pont de Nemours & Company, Inc.
K. R. Schaper	Gulf Research and Development Company
J. F. Wickey	Shell Development Company

---

* Supplied laboratory inspection data only.

APPENDIX B

PROGRAM

1980 FUEL RATING PROGRAM:

ROAD OCTANE PERFORMANCE IN 1980 MODEL CARS

CRC Project No. CM-124-80

April, 1980

TABLE OF CONTENTS

PROPOSED 1980 FUEL RATING PROGRAM
ROAD OCTANE PERFORMANCE IN 1980 MODEL CARS

I. Forward

Road octane rating programs have been conducted periodically by the CRC Motor Road Test Group to investigate the relationship between the laboratory properties of a set of motor gasolines and the road anti-knock performance of these fuels in a selected group of cars. Leaded gasolines were employed during the 1963-1969 period. The programs of 1971, 1973, and 1975 involved unleaded fuels; the 1975 and 1978 programs were run with cars equipped with catalytic converters. The testing was done by Road Test Group participants from the oil and automobile industries at their own laboratories.

II. Objective

In past programs total aromatics and olefins contents have been evaluated for possible effects on road octane performance, and their effects have been found to be statistically nonsignificant. However, heavy aromatics may be a significant factor affecting Road octane number. Another gasoline variable of interest is ethanol content, since ethanol is used in "gasohol" blends being widely distributed. The objective of this program is to evaluate these variables along with Research octane number (RON) and Motor octane number (MON) in 1980 model cars.

III. Test Cars

The desire is to test the fuels in a population of cars representative of the 1980 models that will be on the road. In order to do this, a variety of car and engine models is required. However, because of the size limitation of the program, low sales volume models should not be tested. Models with manual transmissions should be included, however, because they constitute a significant portion of new car sales.

Engines of cars used for road rating of the fuels in this program should not be altered from their factory configuration except as necessary for instrumentation required for the Modified Uniontown technique. The cars should have at least 6000 miles and maximum octane requirements (CRC E-15 Technique) of at least 86 RON with 1979

or 1980 FBRU fuels. Cars used for part-throttle ratings should have part-throttle octane requirements of 86 RON FBRU minimum. In addition, spark timing should not exceed the following limits when rating any of the test fuels: 10 degrees retarded to 15 degrees advanced, relative to manufacturer's recommended basic timing.

IV. Fuels (Unleaded)

Fuel variables to be investigated are RON, MON, heavy aromatics (C_9+), and ethanol content. A computer optimization program was used to design a test fuel set of 20. The optimization provided for the evaluation of $(RON)^2$ and $(MON)^2$ effects in addition to linear effects for the four variables. Small second-order effects were found for RON and MON in the 1978 program, but second-order effects are not expected for heavy aromatics or ethanol content.

Table I and Figures 1 and 2 show the fractional factorial design of the test fuel set. Because only linear effects are expected for heavy aromatics and ethanol content, only low and high values are used; intermediate values are not needed. Five levels of MON and three levels of RON are required to evaluate both linear and second-order effects. Normally only three levels are needed to assess nonlinearity of a variable. However, because sensitivity was constrained to 6-12 ON for all fuels, the combinations of RON and MON were limited, as shown in Figure 1. In this situation more than three levels of MON are required for an optimum test fuel set.

Test fuel specifications are shown in Table II. Samples of the test fuels will be sent to the participants for octane, hydrocarbon composition, distillation, and Reid vapor pressure data.

V. Test Procedure

All fuels are to be rated in duplicate in each car by the Modified Uniontown (CRC Designation F-28-70) technique. Ratings are to be obtained at full throttle (maximum or wide open) and at the most critical part-throttle condition occurring with manifold vacuum of 4 in. Hg or greater above the full throttle vacuum. However, part-throttle tests should not be conducted if ratings cannot be determined on all design fuels without exceeding the spark advance limits. Part-throttle ratings must be determined from part-throttle primary reference fuel curves.

At least three accelerations should be made for each rating. The fuels should be rated in a random order. The maximum speed investigated for Modified Uniontown rating should not exceed 60 mph.

VI. Data Reporting

Data should be reported to CRC prior to December 1, 1980, using data forms to be provided. To aid in analysis, each participant is requested to report the manufacturer's recommended ignition timing for the cars and the spark advance (t idle speed) for each Modified Uniontown fuel rating. If spark advance is read at other than idle speed, the data should be corrected to idle speed for reporting on the data forms. Other important details to be reported are transmission gear for full throttle ratings, manifold vacuum for part-throttle ratings, and complete car information as indicated on the data forms.

In all cases, each participant is requested to report data for all items included on the data report forms. To assure legible copies, each participant is requested to use a soft pencil or black ink when completing the data forms in longhand.

VII. Data Analysis

Analyses will be conducted on both full throttle and part-throttle data. Other subgroups of data that will be analyzed are all car averages, model averages, individual cars, and individual laboratories. Linear and second-order equations will be developed using RON, $(RON)^2$, MON, $(MON)^2$, heavy aromatics, and ethanol content as the variables. Analysis of variance (ANOVA) techniques will be used to evaluate individual contributions of cars, fuels, car-fuel interactions, and test error to the variability of the Road octane ratings.

TABLE I

TEST FUEL DESIGN

Fuel No.	RON	MON	Sensitivity	Heavy Aromatics*	Ethanol*
1	90	82	8	5	0
2	90	82	8	5	10
3	90	82	8	25	0
4	90	84	6	5	10
5	90	84	6	25	0
6	90	84	6	25	10
7	94	82	12	5	10
8	94	82	12	25	0
9	94	82	12	25	10
10	94	85	9	5	0
11	94	85	9	5	10
12	94	88	6	5	0
13	94	88	6	25	0
14	94	88	6	25	10
15	98	86	12	5	0
16	98	86	12	25	0
17	98	86	12	25	10
18	98	88	10	5	0
19	98	88	10	5	10
20	98	88	10	25	10

*Percent by volume.

TABLE II

TEST FUEL SPECIFICATIONS

Octanes

Meet the specified octanes within ±0.5 ON.

Heavy Aromatics

Meet the specified C_9 and heavier aromatics contents within ±2% by volume.

Ethanol

Meet the specified ethanol contents within ±0.5% by volume. Ethanol must be at least 198-proof CDA-19 or CDA-20.

Volatility

Reid Vapor Pressure	- 8-10 Lb
ASTM D 86 Distillation	
IBP	- 90°F Minimum
10% Evaporated	- 110-150°F
30% Evaporated	- 140-195°F
50% Evaporated	- 180-260°F
70% Evaporated	- 220-310°F
90% Evaporated	- 285-380°F
EP	- 450°F Maximum

Other

Total Aromatics Content	- 10-50%
Total Olefins Content	- 0-25%
Benzene Content	- 1% Maximum
Lead Content	- 0.03 g/Gal. Maximum
Sulfur Content	- 0.05% Maximum
Manganese	- None to be Added
Antioxidant	- 5 PTB (100% Active)
Blending Components	- Normal Refinery Components

FIGURE 1

TEST FUEL DESIGN

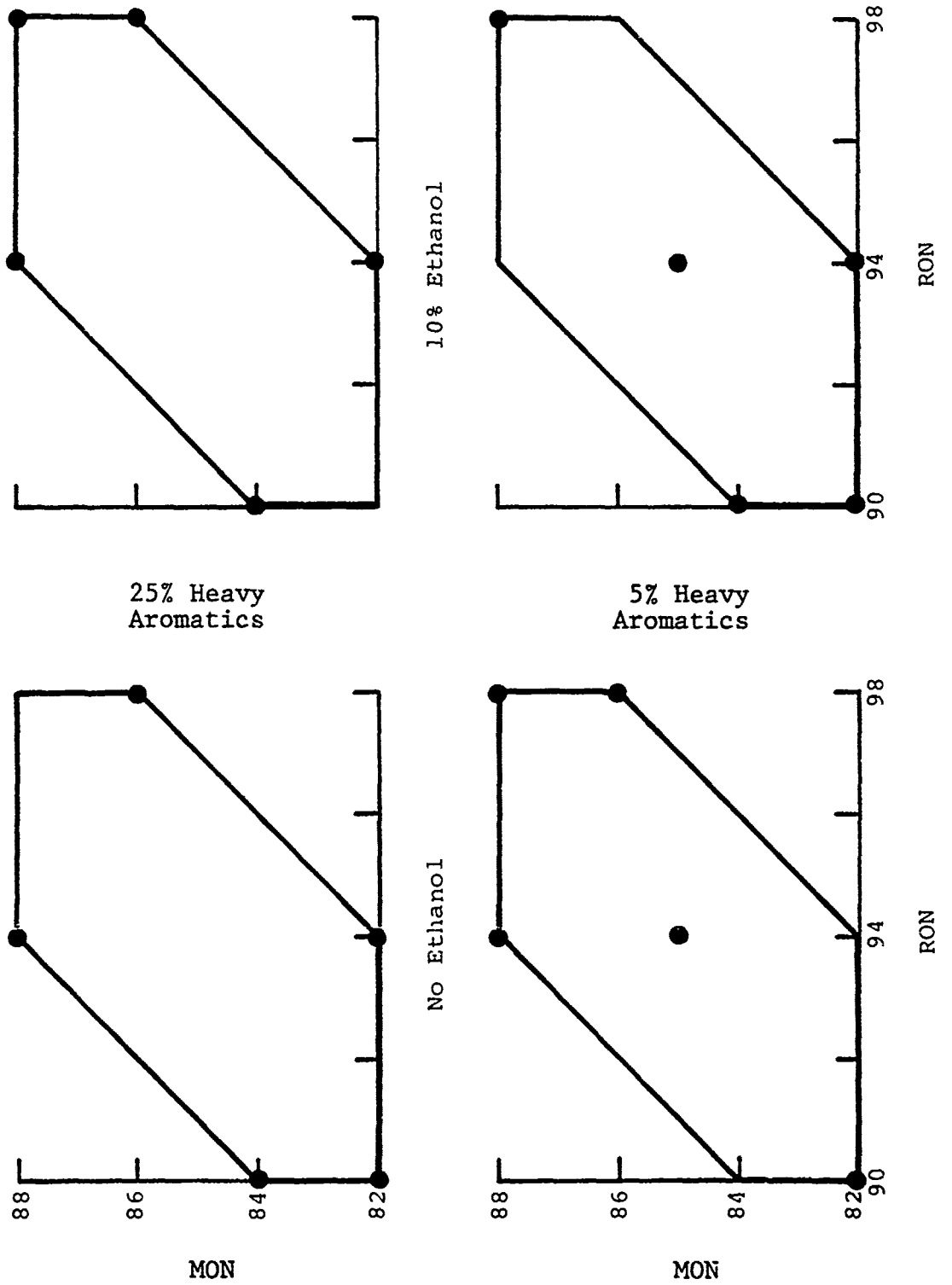
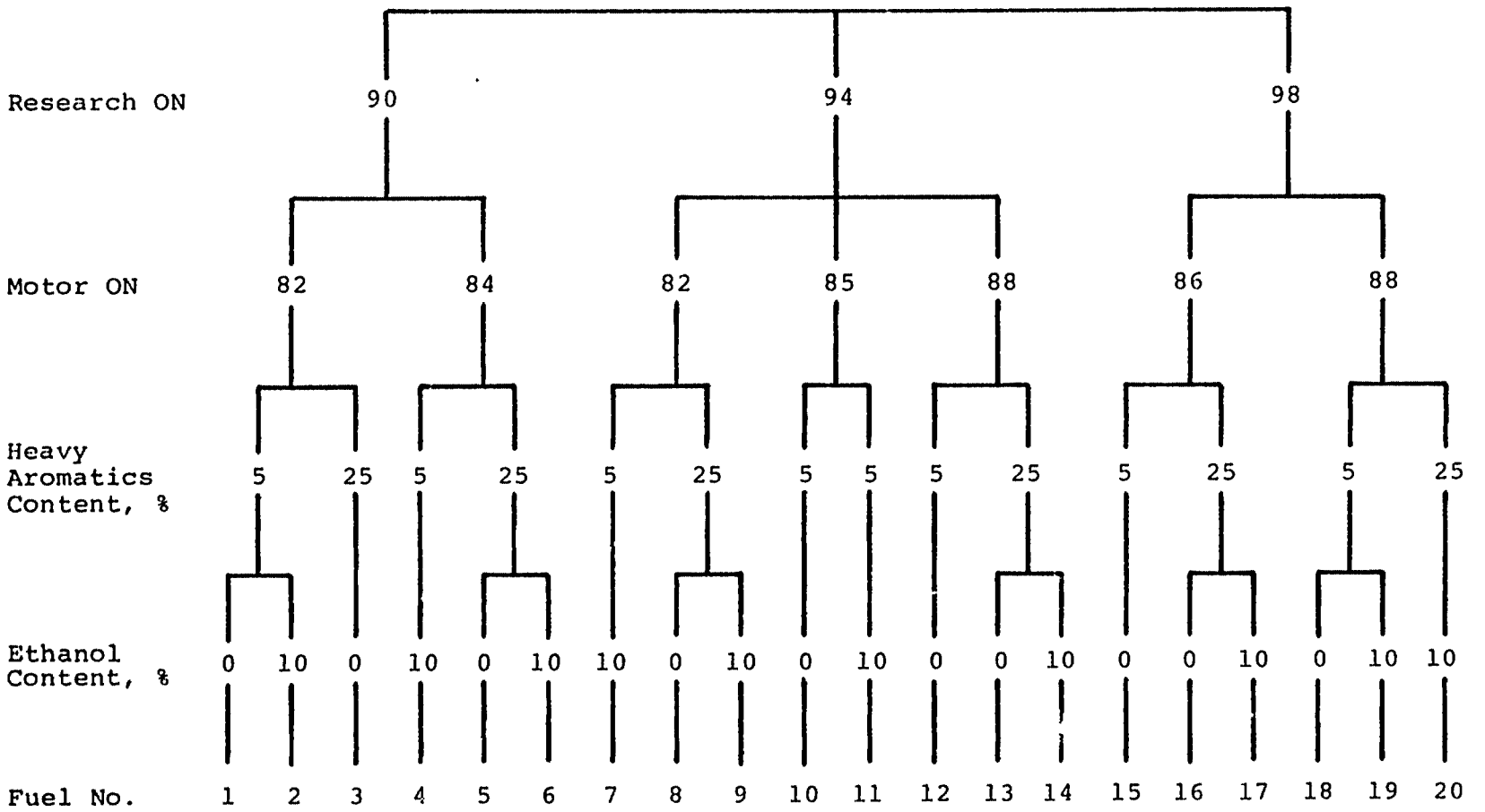


FIGURE 2

TEST FUEL DESIGN



APPENDIX C

CAR-LABORATORY TESTING ARRAY

CAR-LABORATORY TESTING ARRAY

Car Code:	HC5 225	HIA 238	HIK 238	HLV 225	IIF 243	KI 137	LIA 238
Laboratory			**FULL-THROTTLE MODIFIED UNIONTOWN**				
3	1		1				
4							
5						1	
7							
8		1					
26							
29							2
30							
35			1				
41				1	1		
47							
50							
Total	1	1	2	1	1	1	2
			PART-THROTTLE MODIFIED UNIONTOWN				
4							
5							
7							
29							2
Total							2

CAR-LABORATORY TESTING ARRAY

Car Code:	M V250	NC5 225	NC7 228	NFH 450	NH 450	NIG 230*	NIJ 244
Laboratory		**FULL-THROTTLE MODIFIED UNIONTOWN**					
3							
4		1					
5							
7							
8	1			1	1		1
26			1				
29							
30							
35						1	
41							
47							
50							
Total	1	1	1	1	1	1	1
		PART-THROTTLE MODIFIED UNIONTOWN					
4		1					
5							
7							
29							
Total		1					

* 1979 Model

CAR-LABORATORY TESTING ARRAY

Car Code:	NIK 238	NL9 216**	O V250	OCA 133	OCA 223	OCA 242	OI V258
Laboratory							
FULL-THROTTLE MODIFIED UNIONTOWN							
3			1				
4	1					1	1
5	1					1	
7		1	1				
8							
26					1		
29				2			
30							
35							
41							
47							
50							
Total	2	1	2	2	1	2	1
PART-THROTTLE MODIFIED UNIONTOWN							
4						1	1
5						1	
7		1	1				
29				2			
Total		1	1	2		2	1

** 1981 Model

CAR-LABORATORY TESTING ARRAY

Car Code:	OL 223	PC 137	PL 217M	E 215	T 218M	T 222	TOTALS
Laboratory		**FULL-THROTTLE MODIFIED UNIONTOWN**					
3	1						4
4							4
5							3
7	1	1					4
8							5
26		1				1	4
29							4
30		2					2
35							2
41					1		3
47			1				1
50				1			1
Total	2	4	1	1	1	1	37
		PART-THROTTLE MODIFIED UNIONTOWN					
4							3
5							1
7	1	1					4
29							4
Total	1	1					12

APPENDIX D

MODIFIED UNIONTOWN TECHNIQUE

(CRC DESIGNATION F-28-70)

INDEX OF APPENDIX D

MODIFIED UNIONTOWN TECHNIQUE (CRC Designation F-28-70)

MODIFIED UNIONTOWN TECHNIQUE

(CRC Designation F-28-70)

This research technique has been developed for research purposes only and is not to be construed as a specification or standard, since the Coordinating Research Council, Inc. does not promulgate specifications or standards.

Prepared by the

Road Rating Techniques Study Panel

of the

CRC-Motor Road Test Group

June 1970

Revised: October 1975

A. SCOPE

The Modified Uniontown Test Technique is designed to determine a single road octane rating of a gasoline under level road accelerating conditions. The ratings are generally made at maximum throttle but may be made at part throttle if desired or more critical. It is under these relatively severe conditions that the motoring public would probably encounter knock and thus be able to compare or evalute fuel octane quality.

The Modified Uniontown Technique employs the vehicle's standard spark advance mechanism. The basic spark setting is varied until trace knock is obtained during acceleration for the primary reference fuel series and the gasoline(s) being rated. Trace knock is the lowest level of knock intensity that can be heard repeatedly.

The Modified Uniontown rating of a gasoline is the octane number of the PRF blend which would be expected to produce trace knock at the same basic spark advance as the test gasoline.

B. VEHICLE PREPARATION FOR TEST

The mechanical checks given below should be made as indicated. All adjustments should be made to conform with manufacturers' specifications unless otherwise specified in this section.

(1) Procurement checks: The checks listed below should be made upon initial receipt of vehicle for test. The vehicle should have accumulated sufficient mileage to provide adequate break-in and achieve deposit accumulation.

(a) Compression pressures should be checked according to manufacturers' recommended procedures.

(b) Check timing mark vs TDC on cylinder number one piston, using a dial gage or equivalent.

(c) Carburetors should be in good operating condition. If the vehicle is to be used for fuel rating for an extended period of time, it is recommended that carburetor mixture checks be made periodically to assure that the carburetor remains in the as-received condition.

(d) Check the tappet clearance against manufacturers' specification and adjust to limits.

(CRC Designation F-28-70)

B. VEHICLE PREPARATION FOR TEST (Cont'd)

(e) Install new set of spark plugs of recommended heat range (preferably after the deposit stabilization accelerations described in E2b). For continued high-speed operation, colder plugs may be desirable.

(f) Check distributor automatic spark advance mechanism for conformance to manufacturer's recommended specifications.

(g) Check fuel pump as per manufacturer's recommended procedure. Replace fuel filter element.

(h) Observe choke plate and make certain it is in wide-open position with the engine fully warmed up. Wire open automatic choke if necessary.

(i) Check throttle opening linkage for true wide-open throttle position, freedom from sticking, etc.

(j) Check heat valve to determine if it is free and operating normally. Allow it to function as in normal driving operation.

(k) Check crankcase breather or emission control system to insure satisfactory operation. Check air cleaner element and replace if necessary.

(l) Check the exhaust emission control system for proper operation.

(m) Check the fuel system evaporative control system, and also deactivate the fuel recirculating system, if so equipped, to obviate the possibility of flooding the fuel system.

(n) Check the operating temperature of the coolant thermostat to ascertain if it is operating correctly.

(o) Check the automatic transmission's shift characteristics for conformance with manufacturers' specifications.

(p) Check all belts for tightness and condition.

(2) Daily checks: The daily checks should include the items listed as (h), (i) and (j) in Paragraph (1) above, and also items listed below.

(a) Check tire pressure.
(b) Check oil level.
(c) Check coolant level and note type and freezing point of coolant used.

(CRC Designation F-28-70)

B. VEHICLE PREPARATION FOR TEST (Cont'd)

(d) Operate the vehicle to test general performance characteristics, misfiring, surging, excessive noise, etc. A check of vehicle acceleration time under standard rating conditions at manufacturers' recommended spark timing would provide a good indication of overall vehicle performance.

(e) Check brakes for safe operating and reserve pedal.

(f) Make a visual check of the engine compartment just before start of test and periodically during testing to observe general mechanical condition of the engine. Look for water, oil and gasoline leaks, or any other sign of malfunctioning.

(3) Weekly or 1000 mile checks: Weekly or 1000 mile checks should include items (a), (i), (j), and (k) in paragraph (1) above, and also items listed below.

(a) Check auxiliary fuel systems for leaks, particularly if valving is used that might permit contamination of test or reference fuels.

(b) Check spark plugs for misfiring and gap to manufacturers' recommended procedures.

C. INSTRUMENTATION

(1) Spark Advance Measurement: A method of accurately measuring basic spark timing should be provided. This can be done either mechanically or electronically. The equipment should be:

(a) Convenient to read from the passenger compartment during normal vehicle operation, unless remotely indicated or recorded.

(b) Capable of indicating spark timing within $\pm$ 1/2 crank-angle degree.

(c) Unaffected by the vibrations, accelerations, or shock normal to full throttle vehicle acceleration.

(2) Spark Advance Control: A mechanism should be provided to control spark advance from the passenger compartment. This control should be positive, with a minium of hunting or backlash, and should not be affected by engine movement due to torque reaction.

(CRC Designation F-28-70)

C. INSTRUMENTATION (Cont'd)

(3) Engine Speed Measurement: A method of measuring engine revolutions per minute should be provided which is:

(a) Capable of instantaneous reading and/or recording throughout the engine speed range.

(b) Convenient for reading from the passenger compartment during vehicle operation.

(c) Capable of indicating within an accuracy of ± 50 rpm and with a repeatability of ± 1% of the speed being read.

(d) Unaffected by the vibrations, accelerations, or shock normal to full throttle vehicle accelerations.

(4) Manifold Vacuum Measurement: A vacuum gage should be connected to the intake manifold and located where it can be seen by the driver. This is important for automatic transmission test cars in order that the car can be driven repeatably at a low engine speed and at as low a manifold vacuum as possible without automatic downshifting to a lower gear.

(5) Temperature Measurement: While temperature measurements are not directly necessary for fuel rating, they are important for checking the general operation of the engine and for controlling the operating conditions of the car when it is used on successive occasions. It is, therefore, suggested that thermocouples be installed in the following locations and the suitable instrumentation be provided to measure or record the following temperatures:

(a) Carburetor inlet air

(b) Engine coolant (block exit)

(c) Engine oil (sump or gallery)

(d) Automatic transmission oil

(e) Intake mixture (after stove area)

(6) Weather Measurements: It is suggested that the following ambient weather conditions be measured and recorded hourly during fuel rating tests:

(a) Temperature

(b) Humidity

(c) Barometric pressure

(CRC Designation F-28-70)

C. INSTRUMENTATION (Cont'd)

(7) Auxiliary Fuel System: An auxiliary fuel system should be provided to facilitate convenient switching from one fuel to another. The auxiliary fuel line should be connected to the inlet side of the fuel pump, should be of minimum length, and should be routed in such a way as to avoid trapping fuel vapor. Installation should give consideration to safety as well as convenience of fuel handling. To minimize mixing of test fuels during fuel change-over it is recommended that fuel settling bowls or large filters be blocked off and/or replaced by small filter assembly with the bowl mounted in an inverted position.

If an electric fuel pump is used, the fuel pressure at the carburetor should be checked to conform with the manufacturers' recommendation.

For cars used extensively for fuel ratings, carburetor bowl drain lines connected to a pump and waste can have been found to improve the speed and completeness of fuel system draining when changing from one fuel to another.

D. REFERENCE FUELS

Primary reference fuel blends should be prepared in two octane number increments over the range required to bracket the fuels being rated.

E. TEST PROCEDURE

(1) Engine Warmup

To stabilize engine temperatures, a minimum of fifteen miles of operation under road load conditions at speeds of 50 to 60 mph in top gear is required.

(2) Combustion Chamber Deposits Stabilization

(a) Cars should have a minimum of 2000 deposit miles prior to use for road octane rating. The last 500 miles should be accumulated under medium to high speed conditions to insure stabilization of combustion chamber deposits.

(b) Just prior to conducting each series of road octane rating tests, the following deposit stabilization run should be made:

(1) With the vehicle fully warmed up, set the spark timing to produce approximately light knock on tank fuel or other fuel which knocks near the manufacturers' recommended spark setting. (Knock should cover the expected range of testing.)

E. TEST PROCEDURE (Cont'd)

(2) At the above spark setting make several accelerations over the speed range in which road ratings are desired. The accelerations should be conducted primarily at wide-open throttle employing part throttle only as required to limit maximum knock to light intensity.

(3) Fuel Changeover

(a) Catalytic Device Cars

Caution: Because of the installation of catalytic devices on these cars, permanent damage may result if the engine runs over lean or stalls. Therefore, changeover from one fuel to another must be accomplished without running the carburetor dry.

To eliminate contamination of the new fuel with residual amounts of the previous fuel, the car will be operated under the following conditions after charging with the new fuel: operate car for 2 miles at a maximum speed of 55 mph during which time four part-throttle accelerations at approximately 4" Hg manifold vacuum are made.

(b) Non-catalytic device cars or catalytic device cars for which the manufacturer has provided written approval to run the carburetor dry with assurance the procedure will not damage the catalytic device.

(1) With one and two-barrel carburetors, the carburetor shall be run dry at 55 mph, road load, in highest gear.

(2) With four-barrel carburetors, the primary float chamber shall be run dry at 55 mph, road load, in highest gear. The secondary float chamber shall be run dry by going to wide-open throttle for short periods of time, being careful to avoid excessively high engine speeds. This must be accomplished in passing gear on those vehicles in which the secondary throttle plates are mechanically actuated by depressing the throttle beyond the detent position.

Caution: In cars equipped with automatic transmissions, care should be taken to maintain the car speed sufficiently high to keep the engine turning over. This is especially important to cars equipped with power brakes since a serious safety hazard may be encountered with a dead engine.

(c) Charge the fuel system with a new test fuel and repeat the operations described in paragraphs (a) or (b).

(d) After fuel changeover, make one preliminary acceleration before beginning Vehicle Rating Procedure and operate one-half mile at 50 to 60 mph, road load, to obtain stabilized conditions.

(4) Operating Conditions

(a) The vehicles should be tested at or as near maximum throttle as possible over the widest practicable speed range.

In the case of manual transmissions, this is wide-open throttle in top gear.

(CRC Designation F-28-70)

E. TEST PROCEDURE (Cont'd)

In the case of automatic transmissions, it is dependent upon the transmission control system and may vary considerably among car makes. Operating characteristics of each vehicle should be explored to determine the drive ratio which will allow operation at or near wide-open throttle over the widest range of engine speed.

(b) Fuel ratings should be run on a smooth, level, straight road in either direction as long as audibility of knock is not affected by the wind. Tests shall not be conducted during periods of rain or rapidly changing weather conditions. Fuel ratings may also be run on a chassis dynamometer with proven good road correlation.

(c) Care should be taken not to operate at greater than light knock intensity because of the effect on combustion chamber temperatures and knock intensity during the remainder of the acceleration.

(d) Excessively advanced or retarded ignition timings may lead to abnormal fuel ratings. Where possible, road rating determinations should be made within the range of 15 degrees advance to 10 degrees retard from the manufacturers' standard spark advance (recommended basic ignition timing plus centrifugal spark advance) at any speed.

(e) The speed range investigated will normally extend to 3000 rpm, but where conditions necessitate should be extended beyond.

(5) Details of Observations

(a) The vehicles should be accelerated from as low a speed as practicable to as high a speed as desired. For manual transmission cars the acceleration should be made in highest gear from the lowest speed giving reasonably smooth operation; the minimum engine speed will normally be about 700 rpm.

In the case of automatic transmission cars, the critical rating condition is dependent upon the transmission control system and may vary considerably among car makes. Operating characteristics of each vehicle should be explored to determine the drive ratio and throttle position which will allow operation at or near wide-open throttle over the widest range of engine speed with the gear selector in Drive position. It may be expedient to decrease intake manifold vacuum during the acceleration in accordance with a schedule predetermined for the particular test car.

(CRC Designation F-28-70)

E. TEST PROCEDURE (Cont'd)

(b) Adjust basic spark timing to produce knock of trace intensity over as narrow a speed range as possible during the acceleration. Trace knock is defined as the lowest level of knock that is readily and constantly discernible to the ear. It is NOT the threshold between knock and no knock. Generally, the spark setting should not be changed during an acceleration except when encountering heavy knock. All comparative tests with different fuels must be made at the same trace knock intensity over the same speed range, recognizing that all fuels may not knock in the same portion of the speed range.

(c) Subsequent accelerations should be spaced at relatively constant time increments in order that repeatability of testing conditions is assured. Excessive braking between accelerations should not be utilized as temperature equilibria may not be reached before each successive acceleration is commenced. Experience with a particular vehicle and/or testing condition may dictate otherwise, but a time period of approximately 20 seconds between successive accelerations with several seconds at constant speed before the start of each acceleration is considered satisfactory to yield reproducible results.

(d) The first one or more accelerations is exploratory, to enable the operator to become acquainted with the knocking characteristics of the fuel. At least two accelerations are made for recording of data. Basic spark advances required for trace knock intensity are recorded with the corresponding speed range of knocking.

(e) With adequate instrumentation and adherence to procedural details, basic spark advances for trace knock accelerations generally will not differ more than one crankshaft degree. In such instances, two trace knock accelerations shall suffice and the average of the spark settings for the two accelerations shall be reported for the fuel.

If the spark advances for the first two trace knock accelerations will differ by more than one degree, one or more additional accelerations shall be made as required to establish a good average spark setting.

(f) It is recommended that at least four different reference fuels be ra. to establish a reference fuel framework before running the test gasolines. Additional reference fuels should be interspersed with the test gasolines to complete the reference fuel framework in two octane number increments. Several reference fuels should be rechecked at intervals.

(CRC Designation F-28-70)

F. REPORT AND INTERPRETATION OF DATA [1]

(1) Calculate average basic spark advance for each fuel. Where rechecks have been run, use all valid spark advance observations.

(2) Establish basic spark advance vs octane number curve for reference fuels.

(3) Obtain the octane number rating of each test gasoline by determining the octane number corresponding to the average basic spark advance value. The octane number is reported with the speed of maximum knock.

(4) The reproducibility[2] of the Modified Uniontown Road Octane Number Test has been found to be about one octane number. Therefore it is recommended that when the result of a single determination is to be reported it should be rounded off to the nearest 0.5 number. However, when multiple ratings are obtained, these individual ratings should not be rounded off, but the average may or may not be, depending on the individual laboratory's testing errors, and the ultimate utilization of the rating number.

---

(1) All calculations described herein may be accomplished either manually or by E.D.P.(electronic data process).

(2) Reproducibility is a quantitative expression of the random error associated with single determinations at different laboratories of a property of an identical material utilizing the same method. It represents the maximum difference between such measurements which would be expected to be exceeded in a given percentage of cases

The reproducibility figures quoted above are calculated for one standard deviation which is normally exceeded in about 30% of the cases. Reproducibility is currently defined as the square root of the total testing variance minus the fuel variance.

(It must be noted that this reproducibility figure does not correspond to that of ASTM which is normally exceeded in only one case out of 20.)

APPENDIX E

AVERAGE ROAD OCTANE RATINGS

MODIFIED UNIONTOWN TECHNIQUE

INDEX OF APPENDIX E

Index of Tables

TABLE E-1

AVERAGE FULL-THROTTLE ROAD OCTANE NUMBER RATINGS

Population Averages

Population:	All Imports*	PC 137*	0 V250/M V250*
No. of Cars	3	4	3
Fuel No.			
1	89.9	88.0	90.6
2	(89.9)	(89.6)	(90.4)
3	89.8	90.1	90.2
4	90.8	89.6	91.0
5	90.0	89.2	90.4
6	89.9	91.0	91.0
7	92.9	(92.6)	(92.8)
8	92.1	92.0	93.2
9	91.8	91.9	92.5
10	92.6	92.6	93.2
11	91.9	92.8	93.0
12	93.4	92.6	94.0
13	92.6	92.6	93.5
14	93.4	93.6	93.5
15	(93.0)	93.9	93.9
16	93.0	93.8	94.6
17	(93.8)	(94.9)	(94.3)
18	94.8	94.6	94.6
19	94.8	95.1	94.9
20	94.7	95.3	94.8

* In developing the averages, it was necessary to estimate some ratings. Numbers in ( ) contain such estimated ratings.

TABLE E-2

AVERAGE FULL-THROTTLE ROAD OCTANE NUMBER RATINGS

Individual Cars

Car Code:	HC5 225	HIA 238	HIK 238	HIK 238*	HLV 225*
Car Number:	2	13	4	27	30
Laboratory:	3	8	3	35	41
Fuel No.					
1	89.4	89.0	89.8	90.2	88.1
2	90.2	89.0	89.8	90.3	(89.1)
3	90.0	88.8	90.0	88.7	88.4
4	91.6	89.4	90.0	90.2	89.8
5	90.4	89.6	89.8	90.2	88.4
6	90.4	88.4	90.0	90.0	88.4
7	92.3	90.2	93.0	91.8	92.4
8	91.8	90.4	93.1	91.5	90.4
9	91.8	89.6	92.4	91.2	90.2
10	92.2	91.0	93.2	92.4	91.8
11	91.8	91.0	93.2	92.7	92.4
12	92.5	91.2	93.5	92.6	92.2
13	92.2	91.2	93.7	93.1	91.6
14	92.2	91.0	93.7	93.0	94.2
15	93.0	91.4	93.8	93.8	93.4
16	93.4	91.4	94.2	93.6	92.0
17	93.8	91.4	94.2	(93.7)	(93.4)
18	94.4	91.9	94.0	93.6	95.5
19	94.8	92.0	93.9	93.8	95.6
20	94.5	92.4	93.8	93.8	94.4

* In developing the averages, it was necessary to estimate some ratings. Numbers in ( ) contain such estimated ratings.

TABLE E-2
(Continued)

AVERAGE FULL-THROTTLE ROAD OCTANE NUMBER RATINGS

Individual Cars

Car Code:	IIF 243*	KI 137	LIA 238	LIA 238	M V250
Car Number:	31	10	21	22	16
Laboratory:	41	5	29	29	8
Fuel No.					
1	88.4	88.4	89.5	89.2	89.9
2	(88.3)	86.0	89.6	89.6	88.9
3	88.4	89.2	88.8	90.3	89.3
4	88.8	88.0	89.8	90.2	89.3
5	88.8	86.8	89.6	90.6	88.9
6	89.2	89.2	89.5	90.2	89.6
7	89.6	92.2	91.8	92.4	91.8
8	90.6	92.2	91.9	92.2	91.3
9	88.7	91.3	91.6	91.6	91.1
10	92.5	92.8	92.0	93.0	91.6
11	90.4	92.5	92.2	92.8	91.2
12	91.5	93.2	93.4	93.2	92.4
13	92.2	93.5	93.1	93.0	91.8
14	91.1	94.0	93.4	92.8	92.2
15	90.1	94.2	94.2	93.2	92.4
16	91.6	94.3	94.4	93.4	93.0
17	(91.7)	94.6	95.0	93.8	92.6
18	93.6	94.8	95.2	94.1	93.1
19	91.0	95.0	95.0	94.2	93.3
20	92.4	94.8	95.5	94.4	93.6

* In developing the averages, it was necessary to estimate some ratings. Numbers in ( ) contain such estimated ratings.

TABLE E-2
(Continued)

AVERAGE FULL-THROTTLE ROAD OCTANE NUMBER RATINGS

Individual Cars

Car Code:	NC5 225	NC7 228	NFH 450	NH 450	NIG 230*
Car Number:	5	20	15	14	28
Laboratory:	4	26	8	8	35
Fuel No.					
1	89.0	87.6	89.2	89.8	88.8
2	89.4	88.6	89.4	89.2	88.9
3	88.4	86.8	89.1	89.1	88.4
4	89.9	89.0	89.6	90.2	89.2
5	89.4	88.4	89.6	90.3	88.9
6	88.0	86.6	88.8	88.8	88.8
7	90.0	91.0	91.4	92.3	90.9
8	90.0	89.2	91.4	92.4	91.4
9	90.0	89.1	90.6	92.0	90.6
10	90.0	90.0	91.4	92.4	91.4
11	91.4	91.4	91.6	92.4	91.6
12	91.2	91.4	92.2	92.8	92.5
13	91.6	90.8	92.2	92.9	91.8
14	91.0	90.8	91.8	92.6	92.3
15	90.6	90.2	91.8	93.0	92.2
16	91.1	90.4	92.2	93.4	92.8
17	92.4	90.6	92.6	93.4	(92.9)
18	92.3	92.6	92.7	93.4	93.0
19	92.4	91.7	92.8	93.6	93.2
20	91.2	93.6	93.0	93.5	93.2

* In developing the averages, it was necessary to estimate some ratings. Numbers in ( ) contain such estimated ratings.

TABLE E-2
(Continued)

AVERAGE FULL-THROTTLE ROAD OCTANE NUMBER RATINGS

Individual Cars

Car Code:	NIJ 244	NIK 238	NIK 238	NL9 216*	0 V250
Car Number:	12	7	9	35	1
Laboratory:	8	4	5	7	3
Fuel No.					
1	89.4	89.2	89.6	90.2	89.6
2	89.2	89.5	89.6	(90.1)	90.0
3	89.4	90.3	89.6	89.8	90.0
4	89.6	90.3	90.5	90.4	90.2
5	89.7	89.6	89.6	90.4	90.2
6	88.4	89.8	90.2	90.8	89.9
7	91.2	91.9	92.2	(91.6)	92.2
8	91.0	92.1	92.6	91.6	92.6
9	90.8	91.2	91.8	91.6	91.8
10	91.7	92.1	92.6	91.6	92.8
11	91.8	92.1	92.2	92.4	92.8
12	92.4	93.0	93.0	92.6	93.7
13	92.0	92.8	93.2	92.2	93.2
14	92.0	92.2	93.2	93.6	93.0
15	92.4	92.8	93.6	93.2	93.5
16	92.4	93.4	94.0	93.0	93.7
17	92.7	93.4	93.6	(93.5)	93.7
18	92.6	93.6	94.0	93.6	94.1
19	92.8	94.0	94.6	93.9	94.7
20	93.2	94.0	94.6	93.9	94.2

* In developing the averages, it was necessary to estimate some ratings. Numbers in ( ) contain such estimated ratings.

TABLE E-2
(Continued)

AVERAGE FULL-THROTTLE ROAD OCTANE NUMBER RATINGS

Individual Cars

Car Code:	O V250*	OCA 133	OCA 133	OCA 223	OCA 242
Car Number:	34	23	24	17	8
Laboratory:	7	29	29	26	4
Fuel No.					
1	92.2	88.9	88.3	88.7	88.8
2	(92.3)	89.0	88.2	89.8	88.8
3	91.4	89.7	89.0	88.8	89.6
4	93.5	89.8	89.1	90.0	90.0
5	92.2	89.8	89.9	89.0	89.6
6	93.5	89.4	89.6	88.2	89.6
7	(94.6)	91.1	91.4	91.5	93.0
8	95.6	91.0	90.8	90.8	92.4
9	94.6	89.5	90.8	91.3	91.2
10	95.2	90.6	91.8	92.4	93.0
11	95.2	91.6	92.0	92.2	93.0
12	96.0	92.6	92.6	92.4	93.2
13	95.4	92.6	92.8	91.9	93.4
14	95.3	92.6	92.3	92.2	93.0
15	95.8	93.1	92.8	93.2	94.4
16	97.2	93.2	92.7	93.0	94.4
17	(96.7)	93.4	92.8	93.4	93.9
18	96.8	93.5	92.9	93.0	93.9
19	96.7	93.6	92.9	94.2	94.6
20	96.7	94.0	93.2	94.2	95.0

* In developing the averages, it was necessary to estimate some ratings. Numbers in ( ) contain such estimated ratings.

TABLE E-2
(Continued)

AVERAGE FULL-THROTTLE ROAD OCTANE NUMBER RATINGS

Individual Cars

Car Code:	OCA 242	OI V258	OL 223	OL 223*	PC 137*	PC 137
Car Number:	11	6	3	37	36	19
Laboratory:	5	4	3	7	7	26
Fuel No.						
1	89.6	89.6	89.6	89.7	90.3	89.0
2	88.8	89.4	89.3	(90.4)	(90.3)	88.5
3	90.4	90.2	89.6	92.0	90.4	89.4
4	90.4	89.8	89.8	91.2	90.5	89.0
5	90.0	89.6	89.3	90.2	89.9	89.0
6	90.0	89.2	89.0	92.0	92.3	88.8
7	93.4	91.0	91.2	(93.8)	(93.3)	92.2
8	93.6	90.8	91.3	93.8	92.6	91.8
9	92.6	90.4	91.8	93.0	91.8	92.0
10	93.1	92.3	92.8	94.2	93.6	91.8
11	93.1	91.8	93.2	92.7	93.4	92.0
12	93.1	92.7	93.2	94.3	93.2	91.8
13	93.8	92.0	92.5	93.8	92.3	91.8
14	93.5	92.3	92.5	93.2	94.5	92.2
15	94.5	92.1	93.7	95.6	94.1	93.2
16	94.5	92.7	94.2	95.8	94.2	91.9
17	95.0	92.5	94.4	(95.4)	(95.3)	92.8
18	94.8	92.7	94.9	95.2	95.4	93.4
19	95.0	92.9	95.2	95.8	96.0	93.1
20	95.0	92.9	95.1	95.1	96.0	93.2

* In developing the averages, it was necessary to estimate some ratings. Numbers in ( ) contain such estimated ratings.

TABLE E-2
(Continued)

AVERAGE FULL-THROTTLE ROAD OCTANE NUMBER RATINGS

Car Code:	PC 137	PC 137	PL 217M*	E 215	T 218M*	T 222*
Car Number:	25	26	32	33	29	18
Laboratory:	30	30	47	50	41	26
Fuel No.						
1	86.4	86.1	90.5	88.5	92.4	88.8
2	90.7	88.8	(89.5)	88.5	(91.6)	89.6
3	91.2	89.5	90.0	88.5	91.7	89.4
4	90.8	88.0	90.4	89.0	92.6	90.9
5	89.4	88.4	90.4	89.0	91.4	89.5
6	91.8	91.4	90.2	87.0	91.8	90.9
7	94.0	91.0	92.2	89.0	96.3	93.3
8	91.8	92.1	91.8	89.0	95.0	92.3
9	92.2	91.4	91.5	88.5	94.7	92.4
10	93.3	91.8	93.5	90.0	95.1	92.8
11	93.0	92.7	93.7	90.0	93.0	92.8
12	93.1	92.2	93.8	91.5	95.2	93.5
13	94.0	92.0	93.5	91.5	93.4	93.1
14	93.4	94.2	94.0	89.5	95.7	95.2
15	94.2	94.2	93.4	89.5	95.6	(93.7)
16	95.4	93.7	93.4	90.5	94.7	93.9
17	95.8	95.8	94.0	90.5	(96.4)	94.6
18	95.5	94.2	94.0	91.5	97.8	94.9
19	95.9	95.6	94.6	91.5	97.4	95.6
20	96.4	95.6	94.8	91.5	97.0	95.4

* In developing the averages, it was necessary to estimate some ratings. Numbers in ( ) contain such estimated ratings.

TABLE E-3

AVERAGE PART-THROTTLE ROAD OCTANE NUMBER RATINGS

Individual Cars

Car Code:	LIA 238	LIA 238	NC5 225	NL9 216*	0 V250*	OCA 133
Car Number:	21	22	5	35	34	23
Laboratory:	29	29	4	7	7	29
Fuel No.						
1	87.0	86.0	83.4	81.8	87.3	87.2
2	87.6	86.7	83.8	(82.6)	(87.6)	87.4
3	87.0	86.1	83.4	82.6	87.0	87.2
4	87.6	86.8	84.2	83.4	87.8	87.4
5	87.0	87.4	83.8	83.2	88.4	87.6
6	87.4	86.4	84.6	83.2	87.0	86.8
7	88.6	86.8	85.0	(83.3)	(88.6)	88.0
8	88.6	86.4	85.0	83.4	89.3	88.0
9	88.7	86.5	84.1	82.3	88.2	87.8
10	88.6	87.3	86.0	83.8	90.4	89.1
11	89.4	88.7	85.4	83.8	89.4	89.4
12	90.2	89.0	85.9	84.4	91.0	89.8
13	90.2	87.8	85.7	84.2	90.4	89.5
14	89.8	88.4	85.8	85.6	8[illegible] 9	89.4
15	90.5	88.9	86.1	84.6	89.0	89.0
16	90.6	88.4	85.8	83.7	91.4	90.2
17	90.4	89.0	86.4	(84.8)	(90.8)	89.8
18	91.2	88.2	86.7	85.0	90.4	90.6
19	91.8	88.6	86.6	85.6	91.0	91.0
20	92.1	89.0	86.8	84.8	91.7	90.8

---

* In developing the averages, it was necessary to estimate some ratings. Numbers in ( ) contain such estimated ratings.

TABLE E-3
(Continued)

AVERAGE PART-THROTTLE ROAD OCTANE NUMBER RATINGS

Individual Cars

Car Code:	OCA 133	OCA 242	OCA 242	OI V258	OL 223*	PC 137*
Car Number:	24	8	11	6	37	36
Laboratory:	29	4	5	4	7	7
Fuel No.						
1	88.3	83.0	88.2	85.8	88.0	86.3
2	88.2	83.4	87.8	86.2	(88.3)	(86.6)
3	88.1	83.7	88.2	86.2	87.4	86.6
4	88.6	85.4	88.2	86.6	89.4	87.4
5	89.0	84.0	88.7	86.4	89.0	87.0
6	88.8	84.2	88.8	86.8	88.4	87.0
7	90.8	84.5	89.8	87.6	(89.4)	(87.9)
8	90.6	84.7	90.5	87.4	89.8	87.8
9	89.8	83.7	88.8	87.1	88.9	87.2
10	91.4	85.4	90.3	88.2	90.5	88.8
11	91.2	85.4	90.5	88.0	91.0	88.6
12	92.4	86.2	90.8	88.7	91.0	89.4
13	91.9	85.9	90.8	88.4	90.0	89.2
14	91.4	87.0	90.6	88.0	91.2	89.2
15	92.0	85.4	90.2	89.0	91.0	89.2
16	92.2	85.6	90.2	88.2	91.4	89.2
17	92.2	85.9	91.6	89.4	(91.8)	(89.7)
18	92.2	86.8	91.8	89.6	91.7	89.8
19	93.0	87.8	91.8	89.6	92.4	89.8
20	92.9	87.8	91.6	90.0	93.6	90.4

* In developing the averages, it was necessary to estimate some ratings. Numbers in ( ) contain such estimated ratings.

APPENDIX F

MULTIPLE REGRESSION EQUATIONS

INDEX OF APPENDIX F

MULTIPLE REGRESSION EQUATIONS

Index of Tables

Index of Tables (Continued)

TABLE F-1

FULL-THROTTLE ROAD ON REGRESSION EQUATIONS

All-Car Averages; 37 Cars; Road ON Mean = 91.900

Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7	RxM b_8	(R+M)/2 b_5
1	0.608	0.882	45.578 (0.0001)	0.490 (0.0001)							
2	0.659	0.861	19.870 (0.0094)		0.840 (0.0001)						
3	0.276	0.977	26.275 (0.0001)	0.286 (0.0001)	0.450 (0.0001)						
4	0.269	0.979	26.005 (0.0001)	0.284 (0.0001)	0.457 (0.0001)	-0.009 (0.194)					
5	0.275	0.979	26.599 (0.0001)	0.300 (0.0001)	0.430 (0.0001)		0.015 (0.302)				
6	0.269	0.981	26.616 (0.0001)	0.295 (0.0001)	0.437 (0.0001)	-0.009 (0.212)	0.014 (0.323)				
7	0.296	0.972	29.700 (0.0001)								0.690 (0.0001)
8	0.209	0.988	-143.663 (0.0065)	3.997 (0.0011)	0.425 (0.0001)			-0.020 (0.0020)			

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-1 (Continued)

FULL-THROTTLE ROAD ON REGRESSION EQUATIONS

All-Car Averages; 37 Cars; Road ON Mean = 91.900

Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7	RxM b_8	(R+M)/2 b_5
9	0.284	0.997	23.853 (0.886)	0.286 (0.0001)	0.564 (0.872)				-0.001 (0.974)		
10	0.178	0.991	-163.216 (0.0012)	4.294 (0.0002)	0.432 (0.0001)	-0.012 (0.019)		-0.021 (0.0003)			
11	0.206	0.989	-146.002 (0.0075)	3.942 (0.0012)	0.408 (0.0001)		0.013 (0.240)	-0.019 (0.0023)			
12	0.278	0.979	29.006 (0.851)	0.284 (0.0001)	0.422 (0.902)	-0.009 (0.209)			0.000 (0.992)		
13	0.284	0.979	20.164 (0.894)	0.298 (0.0001)	0.593 (0.865)		0.015 (0.318)		-0.001 (0.963)		
14	0.175	0.992	-156.431 (0.0014)	4.236 (0.0002)	0.416 (0.0001)	-0.011 (0.021)	0.012 (0.220)	-0.021 (0.0004)			
15	0.278	0.981	25.073 (0.860)	0.295 (0.0001)	0.455 (0.894)	-0.009 (0.229)	0.014 (0.341)		0.000 (0.996)		
16	0.213	0.989	-86.898 (0.505)	3.329 (0.110)	-0.093 (0.984)			-0.031 (0.091)	-0.015 (0.785)	-0.032 (0.559)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-2

FULL-THROTTLE ROAD ON REGRESSION EQUATIONS

All-Car Averages; Cars That Tested All Fuels; 26 Cars; Road ON Mean = 91.620

Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
1	0.599	0.886	45.109 (0.0001)	0.492 (0.0001)					
2	0.673	0.856	19.590 (0.012)		0.840 (0.0001)				
3	0.279	0.977	26.105 (0.0001)	0.293 (0.0001)	0.441 (0.0001)				
4	0.276	0.978	25.905 (0.0001)	0.291 (0.0001)	0.447 (0.0001)	-0.008 (0.268)			
5	0.282	0.978	26.486 (0.0001)	0.302 (0.0001)	0.426 (0.0001)		0.012 (0.435)		
[illegible]	0.280	0.979	26.290 (0.0001)	0.300 (0.0001)	0.432 (0.0001)	-0.008 (0.292)	0.011 (0.466)		
8	0.196	0.989	-166.583 (0.0019)	4.341 (0.0003)	0.414 (0.0001)			-0.021 (0.0006)	
10	0.169	0.992	-174.765 (0.0004)	4.613 (0.0001)	0.420 (0.0001)	-0.011 (0.022)		-0.023 (0.0001)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR >0.05) are underlined.

TABLE F-3

FULL-THROTTLE ROAD ON REGRESSION EQUATIONS

All-Car Averages; Automatic Transmissions; 35 Cars; Road ON Mean = [illegible]

Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
1	0.603	0.883	45.478 (0.0001)	0.490 (0.0001)					
2	0.651	0.864	19.684 (0.0093)		0.841 (0.0001)				
3	0.259	0.980	26.013 (0.0001)	0.285 (0.0001)	0.453 (0.0001)				
4	0.250	0.981	25.788 (0.0001)	0.284 (0.0001)	0.458 (0.0001)	-0.007 (0.311)			
5	0.257	0.981	26.525 (0.0001)	0.297 (0.0001)	0.433 (0.0001)		0.015 (0.278)		
6	0.257	0.982	26.384 (0.0001)	0.295 (0.0001)	0.438 (0.0001)	-0.006 (0.336)	0.014 (0.302)		
8	0.185	0.990	-143.642 (0.0028)	3.993 (0.0004)	0.428 (0.0001)			-0.020 (0.0008)	
10	0.165	0.993	-157.303 (0.0007)	4.229 (0.0001)	0.433 (0.0001)	-0.009 (0.039)		-0.021 (0.0002)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR >0.05) are underlined.

TABLE F-4

FULL-THROTTLE ROAD ON REGRESSION EQUATIONS

All-Car Averages; U.S. Cars; 34 Cars; Road ON Mean = 91.865

Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
1	0.615	0.879	45.637 (0.0001)	0.489 (0.0001)					
2	0.654	0.863	19.664 (0.0096)		0.842 (0.0001)				
3	0.278	0.977	25.924 (0.0001)	0.283 (0.0001)	0.457 (0.0001)				
4	0.274	0.989	25.723 (0.0001)	0.281 (0.0001)	0.463 (0.0001)	-0.008 (0.232)			
5	0.279	0.978	26.463 (0.0001)	0.293 (0.0001)	0.439 (0.0001)		0.013 (0.370)		
6	0.276	0.980	26.181 (0.0001)	0.291 (0.0001)	0.446 (0.0001)	-0.008 (0.254)	0.012 (0.397)		
8	0.202	0.988	-163.223 (0.0033)	4.199 (0.0005)	0.430 (0.0001)			-0.020 (0.0010)	
10	0.173	0.992	-172.540 (0.0006)	4.483 (0.0001)	0.436 (0.0001)	-0.011 (0.020)		-0.022 (0.0002)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR >0.05) are underlined.

TABLE F-5

FULL-THROTTLE ROAD ON REGRESSION EQUATIONS

All-Car Averages; Imported Cars; 3 Cars; Road ON Mean = 92.255

Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
1	0.770	0.909	48.013 (0.0001)	0.468 (0.0001)					
2	0.726	0.830	21.683 (0.010)		0.823 (0.0001)				
3	0.516	0.919	27.204 (0.0001)	0.250 (0.0005)	0.483 (0.0002)				
4	0.482	0.934	26.648 (0.0001)	0.245 (0.0003)	0.499 (0.0001)	-0.022 (0.080)			
5	0.508	0.926	28.562 (0.0001)	0.274 (0.0003)	0.439 (0.0007)		0.032 (0.234)		
6	0.474	0.940	27.853 (0.0001)	0.268 (0.0003)	0.458 (0.0003)	-0.022 (0.087)	0.030 (0.238)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR >0.05) are underlined.

TABLE F-6

FULL-THROTTLE ROAD ON REGRESSION EQUATIONS

All-Car Averages; PC 137; 4 Cars; Road ON Mean = 92.290

Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
1	0.853	0.847	36.325 (0.0001)	0.592 (0.0001)					
2	0.959	0.806	6.283 (0.534)		1.003 (0.0001)				
3	0.604	0.927	14.345 (0.040)	0.361 (0.0001)	0.511 (0.0004)				
4	0.618	0.928	14.475 (0.043)	0.363 (0.0001)	0.506 (0.0007)	0.007 (0.645)			
5	0.440	0.964	17.954 (0.0017)	0.430 (0.0001)	0.388 (0.0006)		0.091 (0.0010)		
6	0.443	0.966	18.306 (0.0018)	0.432 (0.0001)	0.380 (0.0009)	0.009 (0.402)	0.092 (0.0011)		

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR >0.05) are underlined.

TABLE F-7

FULL-THROTTLE ROAD ON REGRESSION EQUATIONS

All-Car Averages; 0 V250/M V250; 3 Cars; Road ON Mean = 92.820

Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
1	0.579	0.881	49.961 (.193)	0.465 (0.0001)					
2	0.707	0.823	25.349 (0.0024)		0.781 (0.0001)				
3	0.358	0.957	32.365 (0.0001)	0.293 (0.0001)	0.382 (0.0001)				
4	0.365	0.958	32.194 (0.0001)	0.292 (0.0001)	0.386 (0.0001)	-0.005 (0.557)			
5	0.366	0.958	32.700 (0.0001)	0.299 (0.0001)	0.371 (0.0002)		0.009 (0.648)		
6	0.374	0.959	32.534 (0.0001)	0.298 (0.0001)	0.375 (0.0002)	-0.005 (0.583)	0.008 (0.676)		
8	0.306	0.971	-153.036 (0.041)	4.263 (0.011)	0.356 (0.0001)			-0.021 (0.016)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR >0.05) are underlined.

TABLE F-8

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 3; Car No. 2; 20 Fuels; Road ON Mean = 92.135

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
HC5 225	1	0.658	0.829	51.769 (0.0001)	0.472 (0.0001)					
	2	0.684	0.815	29.023 (0.0007)		0.736 (0.0001)				
	3	0.458	0.921	34.485 (0.0001)	0.247 (0.0C02)	0.400 (0.0003)				
	4	0.454	0.928	34.213 (0.0001)	0.244 (0.0002)	0.409 (0.0003)	-0.013 (0.?66)			
	5	0.393	0.946	36.708 (0.0001)	0.288 (0.0001)	0.326 (0.0010)		0.054 (0.017)		
	6	0.387	0.951	36.433 (0.0001)	0.284 (0.0001)	0.336 (0.0008)	-0.012 (0.244)	0.053 (0.018)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 8; Car No. 13; 20 Fuels; Road ON Mean = 90.515

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
HIA 238	1	0.560	0.788	60.358 (0.0001)	0.319 (0.0001)					
	2	0.449	0.864	40.780 (0 0001)		0.580 (0.0001)				
	3	0.333	0.930	44.110 (0.0001)	0.148 (0.0010)	0.378 (0.0001)				
	4	0.315	0.941	43.769 (0.0001)	0.145 (0.0008)	0.388 (0.0001)	-0.014 (0.102)			
	5	0.321	0.938	43.096 (0.0001)	0.130 (0.0036)	0.411 (0.0001)		-0.025 (0.156)		
	6	0.297	0.950	42.597 (0.0001)	0.126 (0.0029)	0.424 (0.0001)	-0.014 (0.074)	-0.026 (0.109)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 3; Car No. 4; 20 Fuels; Road ON Mean = 92.455

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
HIK 238	1	0.719	0.843	45.944 (0.0001)	0.492 (0.0001)					
	2	0.975	0.712	25.055 (0.023)		0.786 (0.0001)				
	3	0.640	0.883	33.067 (0.0002)	0.357 (0.0001)	0.299 (0.028)				
	4	0.659	0.883	32.998 (0.0002)	0.357 (0.0002)	0.300 (0.033)	-0.001 (0.926)			
	5	0.659	0.883	33.126 (0.0003)	0.359 (0.0003)	0.296 (0.045)		0.002 (0.943)		
	6	0.680	0.883	33.057 (0.0005)	0.359 (0.0005)	0.297 (0.053)	-0.001 (0.931)	0.002 (0.948)		
	8	0.398	0.957	-443.764 (0.0002)	10.473 (0.0001)	0.231 (0.0098)			-0.053 (0.0001)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 35; Car No. 27; 19 Fuels (Except 17); Road ON Mean = 91.921

				Coefficients*						
Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
HIK 238	1	0.745	0.796	50.691 (0.0001)	0.437 (0.0001)					
	2	0.670	0.820	26.144 (0.0027)		0.768 (0.0001)				
	3	0.500	0.914	30.780 (0.0001)	0.235 (0.0007)	0.455 (0.0003)				
	4	0.487	0.923	30.746 (0.0001)	0.229 (0.0008)	0.465 (0.0002)	-0.017 (0.192)			
	5	0.516	0.914	30.934 (0.0001)	0.236 (0.0017)	0.452 (0.0007)		0.002 (0.931)		
	6	0.504	0.923	30.759 (0.0001)	0.228 (0.0021)	0.466 (0.0005)	-0.017 (0.209)	-0.001 (0.978)		

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 41; Car No. 30; 18 Fuels (Except 2, 17); Road ON Mean = 91.678

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
HLV 225	1	1.353	0.690	32.536 (0.0048)	0.625 (0.0001)					
	2	1.203	0.755	-2.414 (0.858)		1.097 (0.0001)				
	3	1.035	0.830	1.445 (0.901)	0.310 (0.021)	0.710 (0.0031)				
	4	0.818	0.901	3.133 (0.739)	0.268 (0.015)	0.749 (0.0004)	-0.068 (0.0069)			
	5	0.992	0.854	4.339 (0.698)	0.368 (0.0091)	0.606 (0.011)		0.079 (0.150)		
	6	0.765	0.919	5.678 (0.524)	0.321 (0.0049)	0.657 (0.0012)	-0.066 (0.0063)	0.070 (0.106)		

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 41; Car No. 31; 18 Fuels (Except 2, 17); Road ON Mean = 90.494

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
IIF 243	1	1.121	0.538	55.009 (0.0001)	0.375 (0.0005)					
	2	0.919	0.689	29.510 (0.011)		0.711 (0.0001)				
	3	0.903	0.719	31.180 (0.0078)	0.131 (0.231)	0.547 (0.0072)				
	4b	0.948	0.689	30.414 (0.014)		0.701 (0.0001)	-0.003 (0.915)			
	5b	0.771	0.795	26.447 (0.0081)		0.752 (0.0001)		-0.106 (0.014)		
	6b	0.797	0.796	26.514 (0.010)		0.752 (0.0001)	-0.004 (0.850)	-0.107 (0.017)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 5; Car No. 10; 20 Fuels; Road ON Mean = 91.850

Car Code	Eqn	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
KI 137	1	1.090	0.865	14.993 (0.051)	0.813 (0.0001)					
	2	1.534	0.732	-19.539 (0.235)		1.299 (0.0001)				
	3	0.934	0.906	-6.440 (0.525)	0.588 (0.0001)	0.498 (0.014)				
	4	0.962	0.906	-6.413 (0.543)	0.589 (0.0001)	0.496 (0.018)	0.003 (0.892)			
	5	0.959	0.906	-5.761 (0.585)	0.600 (0.0001)	0.476 (0.029)		0.016 (0.747)		
	6	0.990	0.907	-5.669 (0.604)	0.601 (0.0001)	0.473 (0.036)	0.004 (0.883)	0.017 (0.749)		
	8	0.634	0.959	-655.626 (0.0003)	14.536 (0.0002)	0.404 (0.0053)			-0.074 (0.0003)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 29; Car No. 21; 20 Fuels; Road ON Mean = 92.275

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
LIA 238	1	0.804	0.876	32.623 (0.0001)	0.631 (0.0001)					
	2	0.857	0.859	-0.850 (0.923)		1.086 (0.0001)				
	3	0.387	0.973	7.340 (0.095)	0.366 (0.0001)	0.587 (0.0001)				
	4	0.396	0.973	7.244 (0.109)	0.365 (0.0001)	0.590 (0.0001)	-0.004 (0.659)			
	5	0.394	0.974	7.712 (0.088)	0.376 (0.0001)	0.571 (0.0001)		0.012 (0.554)		
	6	0.405	0.974	7.715 (0.103)	0.374 (0.0001)	0.574 (0.0001)	-0.004 (0.688)	0.011 (0.579)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 29; Car No. 22; 20 Fuels; Road ON Mean = 92.210

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
LIA 238	1	0.627	0.860	48.724 (0.0001)	0.460 (0.0001)					
	2	0.650	0.850	24.125 (0.0021)		0.794 (0.0001)				
	3	0.351	0.959	30.046 (0.0001)	0.263 (0.0001)	0.435 (0.0001)				
	4	0.360	0.959	29.924 (0.0001)	0.263 (0.0001)	0.437 (0.0001)	-0.003 (0.731)			
	5	0.351	0.959	30.019 (0.0001)	0.265 (0.0001)	0.433 (0.0001)		0.002 (0.924)		
	6	0.372	0.959	29.997 (0.0001)	0.264 (0.0001)	0.435 (0.0001)	-0.003 (0.743)	0.001 (0.940)		
	8	0.209	0.986	-235.076 (0.0001)	5.938 (0.0001)	0.397 (0.0001)			-0.030 (0.0001)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 8; Car No. 16; 20 Fuels; Road ON Mean = 91.365

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
M V250	1	0.541	0.884	49.770 (0.0001)	0.440 (0.0001)					
	2	0.765	0.767	30.311 (0.0012)		0.712 (0.0001)				
	3	0.420	0.934	37.123 (0.0001)	0.308 (0.0001)	0.293 (0.0023)				
	4	0.428	0.935	36.984 (0.0001)	0.306 (0.0001)	0.298 (0.0026)	-0.006 (0.559)			
	5	0.426	0.936	37.717 (0.0001)	0.320 (0.0001)	0.272 (0.0071)		0.016 (0.479)		
	6	0.435	0.937	37.582 (0.0001)	0.318 (0.0001)	0.277 (0.0079)	-0.006 (0.590)	0.015 (0.508)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level ($PR > 0.05$) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 4; Car No. 5; 20 Fuels; Road ON Mean = 90.465

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
NC5 225	1	0.833	0.594	62.388 (0.0001)	0.297 (0.0001)					
	2	0.627	0.770	40.044 (0.0001)		0.588 (0.0001)				
	3	0.619	0.789	41.887 (0.0001)	0.083 (0.249)	0.475 (0.0011)				
	4b	0.605	0.798	39.655 (0.0001)		0.597 (0.0001)	-0.023 (0.147)			
	5b	0.642	0.772	39.760 (0.0001)		0.592 (0.0001)		-0.013 (0.693)		
	6b	0.620	0.800	39.290 (0.0001)		0.602 (0.0001)	-0.023 (0.154)	-0.014 (0.648)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 26; Car No. 20; 20 Fuels; Road ON Mean = 89.990

					Coefficients*					
Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_5	$(MON)^2$ b_7
NC7 228	1	1.244	0.564	50.474 (0.0001)	0.418 (0.0001)					
	2	0.912	0.766	17.531 (0.080)		0.845 (0.0001)				
	3	0.916	0.777	19.621 (0.061)	0.094 (0.373)	0.717 (0.0009)				
	4b	0.820	0.821	16.667 (0.067)		0.864 (0.0001)	-0.046 (0.035)			
	5b	0.934	0.768	17.959 (0.082)		0.839 (0.0001)		0.019 (0.680)		
	6b	0.841	0.823	17.022 (0.071)		0.859 (0.0001)	-0.046 (0.041)	0.016 (0.699)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 8; Car No. 15; 20 Fuels; Road ON Mean = 91.170

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
NFH 450	1	0.617	0.814	55.152 (0.0001)	0.381 (0.0001)					
	2	0.569	0.842	33.460 (0.0001)		0.673 (0.0001)				
	3	0.394	0.929	37.868 (0.0001)	0.201 (0.0003)	0.400 (0.0001)				
	4	0.397	0.931	37.676 (0.0001)	0.199 (0.0004)	0.406 (0.0001)	-0.008 (0.419)			
	5	0.404	0.929	37.610 (0.0001)	0.195 (0.0009)	0.410 (0.0002)		-0.007 (0.741)		
	6	0.408	0.932	37.336 (0.0001)	0.193 (0.0012)	0.417 (0.0002)	-0.008 (0.422)	-0.008 (0.713)		
	8	0.332	0.952	-170.576 (0.035)	4.702 (0.0095)	0.370 (0.0001)			-0.024 (0.012)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 8; Car No. 14; 20 Fuels; Road ON Mean = 91.875

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
NH 450	1	0.685	0.835	48.862 (0.0001)	0.455 (0.0001)					
	2	0.873	0.732	28.420 (0.0056)		0.740 (0.0001)				
	3	0.588	0.885	35.351 (0.0001)	0.314 (0.0002)	0.313 (0.014)				
	4	0.602	0.887	35.228 (0.0001)	0.312 (0.0003)	0.318 (0.016)	-0.007 (0.655)			
	5	0.606	0.885	35.224 (0.0001)	0.311 (0.0005)	0.318 (0.022)		-0.004 (0.903)		
	6	0.621	0.887	35.020 (0.0001)	0.309 (0.0008)	0.324 (0.024)	-0.007 (0.660)	-0.005 (0.888)		
	8	0.467	0.932	-314.124 (0.0092)	7.743 (0.0034)	0.263 (0.012)			-0.039 (0.0045)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 35; Car No. 28; 19 Fuels (Except 17); Road ON Mean = 91.047

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
NIG 230	1	0.718	0.832	46.326 (0.0001)	0.474 (0.0001)					
	2	0.684	0.848	20.045 (0.014)		0.829 (0.0001)				
	3	0.406	0.949	25.149 (0.0001)	0.260 (0.0001)	0.483 (0.0001)				
	4	0.411	0.951	25.210 (0.0001)	0.257 (0.0001)	0.487 (0.0001)	-0.008 (0.444)			
	5	0.419	0.949	25.222 (0.0001)	0.261 (0.0001)	0.481 (0.0001		0.001 (0.951)		
	6	0.426	0.951	25.125 (0.0001)	0.257 (0.0002)	0.488 (0.0001)	-0.008 (0.4[illegible])	0.000 (0.995)		
	8	0.366	0.962	-157.850 (0.0813)	4.112 (0.035)	0.455 (0.0001)			-0.020 (0.046)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 8; Car No. 12; 20 Fuels; Road ON Mean = 91.235

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
NIJ 244	1	0.621	0.828	53.232 (0.0001)	0.402 (0.0001)					
	2	0.652	0.810	32.067 (0.0002)		0.690 (0.0001)				
	3	0.440	0.918	37.301 (0.0001)	0.234 (0.0002)	0.371 (0.0004)				
	4	0.434	0.925	36.943 (0.0001)	0.231 (0.0002)	0.381 (0.0004)	-0.013 (0.242)			
	5	0.447	0.921	36.621 (0.0001)	0.222 (0.0007)	0.393 (0.0006)		-0.016 (0.509)		
	6	0.440	0.928	36.277 (0.0001)	0.218 (0.0008)	0.404 (0.0005)	-0.013 (0.236)	-0.017 (0.465)		
	8	0.396	0.938	-165.839 (0.089)	4.488 (0.032)	0.343 (0.0005)			-0.022 (0.040)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 4; Car No. 7; 20 Fuels; Road ON Mean = 91.865

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
NIK 238	1	0.570	0.877	49.419 (0.0001)	0.449 (0.0001)					
	2	0.658	0.836	26.523 (0.0011)		0.762 (0.0001)				
	3	0.329	0.961	32.614 (0.0001)	0.273 (0.0001)	0.390 (0.0001)				
	4	0.338	0.962	32.424 (0.0001)	0.273 (0.0001)	0.393 (0.0001)	-0.004 (0.679)			
	5	0.339	0.961	32.606 (0.0001)	0.274 (0.0001)	0.389 (0.0001)		0.000 (0.978)		
	6	0.349	0.962	32.509 (0.0001)	0.273 (0.0001)	0.392 (0.0001)	-0.004 (0.690)	0.000 (0.995)		
	8	0.271	0.975	-149.486 (0.025)	4.209 (0.0053)	0.363 (0.0001)			-0.021 (0.0082)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 5; Car No. 9; 20 Fuels; Road ON Mean = 92.215

				Coefficients*						
Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
NIK 238	1	0.625	0.881	44.853 (0.0001)	0.501 (0.0001)					
	2	0.738	0.834	19.585 (0.020)		0.847 (0.0001)				
	3	0.362	0.962	26.388 (0.0001)	0.309 (0.0001)	0.427 (0.0001)				
	4	0.372	0.962	26.430 (0.0001)	0.308 (0.0001)	0.428 (0.0001)	-0.002 (0.852)			
	5	0.362	0.964	27.135 (0.0001)	0.322 (0.0001)	0.403 (0.0001)		0.018 (0.349)		
	6	0.374	0.964	27.066 (0.0001)	0.322 (0.0001)	0.404 (0.0001)	-0.001 (0.890)	0.018 (0.369)		
	8	0.313	0.973	-153.159 (0.041)	4.218 (0.013)	0.400 (0.0001)			-0.021 (0.020)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 7; Car No. 35; 17 Fuels (Except 2, 7, 17); Road ON Mean = 92.047

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
NL9 216	1	0.702	0.757	56.766 (0.0001)	0.373 (0.0001)					
	2	0.534	0.859	34.366 (0.0001)		0.672 (0.0001)				
	3	0.409	0.923	37.110 (0.0001)	0.167 (0.0042)	0.456 (0.0001)				
	4	0.424	0.923	37.237 (0.0001)	0.166 (0.0062)	0.456 (0.0001)	-0.002 (0.850)			
	5	0.371	0.941	39.490 (0.0001)	0.209 (0.0009)	0.380 (0.0006)		0.043 (0.066)		
	6	0.385	0.942	39.633 (0.0001)	0.208 (0.0015)	0.380 (0.0009)	-0.003 (0.796)	0.043 (0.076)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 3; Car No. 1; 20 Fuels; Road ON Mean = 92.295

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
0 V250	1	0.657	0.857	47.296 (0.0001)	0.476 (0.0001)					
	2	0.699	0.839	22.237 (0.0066)		0.817 (0.0001)				
	3	0.397	0.951	28.379 (0.0001)	0.277 (0.0001)	0.440 (0.0001)				
	4	0.390	0.955	28.176 (0.0001)	0.274 (0.0001)	0.448 (0.0001)	-0.012 (0.219)			
	5	0.407	0.951	28.125 (0.0001)	0.271 (0.0001)	0.450 (0.0001)		0.008 (0.707)		
	6	0.400	0.956	27.780 (0.0001)	0.267 (0.0001)	0.461 (0.0001)	-0.013 (0.224)	-0.009 (0.656)		
	8	0.304	0.973	-217.825 (0.0056)	5.561 (0.0016)	0.404 (0.0001)			-0.028 (0.0023)	
	10	0.265	0.981	-230.185 (0.0013)	5.970 (0.0003)	0.413 (0.0001)	-0.016 (0.028)		-0.031 (0.0005)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 7; Car No. 34; 17 Fuels (Except 2, 7, 17); Road ON Mean = 94.900

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
0 V250	1	0.796	0.807	48.552 (0.0001)	0.490 (0.0001)					
	2	0.882	0.764	25.717 (0.021)		0.806 (0.0001)				
	3	0.616	0.892	30.627 (0.0007)	0.302 (0.0011)	0.416 (0.0050)				
	4	0.639	0.892	30.627 (0.0011)	0.302 (0.0017)	0.416 (0.0069)	0.000 (0.978)			
	5	0.623	0.898	32.228 (0.0008)	0.331 (0.0015)	0.364 (0.023)		0.030 (0.421)		
	6	0.648	0.898	32.228 (0.0013)	0.331 (0.0023)	0.364 (0.029)	0.000 (0.995)	0.030 (0.440)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 29; Car No. 23; 20 Fuels; Road ON Mean = 91.450

					Coefficients*					
Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OCA 133	1	0.816	0.797	46.357 (0.0001)	0.477 (0.0001)					
	2	0.604	0.889	16.419 (0.017)		0.875 (0.0001)				
	3	0.417	0.950	21.150 (0.0002)	0.213 (0.0003)	0.585 (0.0001)				
	4	0.430	0.950	21.219 (0.0003)	0.213 (0.0004)	0.584 (0.0001)	0.001 (0.922)			
	5	0.409	0.955	20.172 (0.0003)	0.192 (0.0011)	0.621 (0.0001)		-0.027 (0.220)		
	6	0.423	0.955	20.077 (0.0005)	0.193 (0.0016)	0.621 (0.0001)	0.000 (0.971)	-0.027 (0.237)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 29, Car No. 24; 20 Fuels; Road ON Mean = 91.295

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OCA 133	1	0.750	0.816	47.242 (0.0001)	0.466 (0.0001)					
	2	0.672	0.852	20.380 (0.0090)		0.827 (0.0001)				
	3	0.455	0.936	25.732 (0.0001)	0.240 (0.0002)	0.500 (0.0001)				
	4	0.466	0.937	25.880 (0.0001)	0.241 (0.0003)	0.496 (0.0001)	0.006 (0.626)			
	5	0.464	0.937	25.039 (0.0001)	0.229 (0.0007)	0.521 (0.0001)		-0.015 (0.532)		
	6	0.475	0.938	25.290 (0.0002)	0.230 (0.0010)	0.516 (0.0001)	0.005 (0.655)	-0.015 (0.559)		
	8	0.312	0.972	-287.937 (0.0008)	7.003 (0.0003)	0.454 (0.0001)			-0.036 (0.0004)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 26; Car No. 17; 20 Fuels; Road ON Mean = 91.510

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OCA 223	1	0.821	0.817	43.108 (0.0001)	0.512 (0.0001)					
	2	0.866	0.797	16.222 (0.087)		0.878 (0.0001)				
	3	0.610	0.905	22.933 (0.0026)	0.300 (0.0004)	0.469 (0.0010)				
	4	0.545	0.928	22.223 (0.0016)	0.293 (0.0002)	0.491 (0.0003)	-0.031 (0.036)			
	5	0.589	0.916	24.740 (0.0014)	0.334 (0.0002)	0.408 (0.0041)		0.046 (0.154)		
	6	0.522	0.938	23.878 (0.0008)	0.325 (0.0001)	0.434 (0.0012)	-0.030 (0.036)	0.042 (0.138)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 4; Car No. 8; 20 Fuels; Road ON Mean = 92.240

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OCA 242	1	0.705	0.893	35.519 (0.0001)	0.600 (0.0001)					
	2	0.972	0.796	7.862 (0.444)		0.984 (0.0001)				
	3	0.485	0.952	16.918 (0.0045)	0.404 (0.0001)	0.433 (0.0003)				
	4	0.492	0.953	16.648 (0.0059)	0.403 (0.0001)	0.439 (0.0003)	-0.009 (0.495)			
	5	0.495	0.953	17.444 (0.0051)	0.415 (0.0001)	0.414 (0.0009)		0.014 (0.598)		
	6	0.504	0.954	17.265 (0.0068)	0.412 (0.0001)	0.421 (0.0011)	-0.008 (0.523)	0.013 (0.628)		
	8	0.363	0.975	-292.160 (0.0025)	7.023 (0.0010)	0.388 (0.0001)			-0.035 (0.0016)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 5; Car No. 11; 20 Fuels; Road ON Mean = 92.710

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OCA 242	1	0.610	0.917	36.273 (0.0001)	0.597 (0.0001)					
	2	1.110	0.724	13.648 (0.250)		0.922 (0.0001)				
	3	0.521	0.943	24.097 (0.0004)	0.470 (0.0001)	0.282 (0.013)				
	4	0.530	0.944	24.290 (0.0006)	0.472 (0.0001)	0.276 (0.017)	0.008 (0.541)			
	5	0.521	0.946	25.175 (0.0004)	0.490 (0.0001)	0.246 (0.037)		0.026 (0.334)		
	6	0.530	0.948	25.419 (0.0005)	0.493 (0.0001)	0.238 (0.047)	0.009 (0.509)	0.028 (0.237)		
	8	0.281	0.984	-383.673 (0.0001)	9.281 (0.0001)	0.222 (0.0010)			-0.047 (0.0001)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 4; Car No. 6; 20 Fuels; Road ON Mean = 91.345

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OI V258	1	0.640	0.785	57.312 (0.0001)	0.360 (0.0001)					
	2	0.585	0.820	36.465 (0.0001)		0.640 (0.0001)				
	3	0.449	0.900	40.576 (0.0001)	0.186 (0.0018)	0.387 (0.0004)				
	4	0.436	0.911	40.260 (0.0001)	0.182 (0.0018)	0.398 (0.0003)	-0.015 (0.174)			
	5	0.430	0.913	39.258 (0.0001)	0.159 (0.0066)	0.434 (0.0002)		-0.035 (0.131)		
	6	0.410	0.926	38.805 (0.0001)	0.154 (0.0064)	0.448 (0.0001)	-0.016 (0.131)	-0.037 (0.101)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 3; Car No. 3; 20 Fuels; Road ON Mean = 92.130

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OL 223	1	0.807	0.865	35.220 (0.0001)	0.602 (0.0001)					
	2	0.961	0.808	5.522 (0.587)		1.010 (0.0001)				
	3	0.555	0.939	13.950 (0.031)	0.378 (0.0001)	0.495 (0.0003)				
	4	0.517	0.951	13.278 (0.028)	0.373 (0.0001)	0.513 (0.0001)	-0.024 (0.075)			
	5	0.569	0.940	14.488 (0.033)	0.388 (0.0001)	0.477 (0.0009)		0.013 (0.658)		
	6	0.531	0.951	13.852 (0.031)	0.380 (0.0001)	0.498 (0.0004)	-0.024 (0.087)	0.011 (0.704)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 7; Car No. 37; 17 Fuels (Except 2, 7, 17); Road ON Mean = 93.388

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OL 223	1	0.572	0.915	40.040 (0.0001)	0.564 (0.0001)					
	2	1.201	0.625	25.750 (0.077)		0.788 (0.0002)				
	3	0.560	0.924	33.751 (0.0001)	0.498 (0.0001)	0.146 (0.222)				
	4a	0.589	0.916	39.738 (0.0001)	0.566 (0.0001)		0.007 (0.687)			
	5a	0.572	0.920	39.448 (0.0001)	0.569 (0.0001)			0.030 (0.333)		
	6a	0.591	0.921	39.167 (0.0001)	0.571 (0.0001)		0.006 (0.709)	0.029 (0.355)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 7; Car No. 36; 17 Fuels (Except 2, 7, 17); Road ON Mean = 92.971

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
PC 137	1	1.017	0.748	43.028 (0.0001)	0.528 (0.0001)					
	2	0.951	0.780	14.775 (0.189)		0.911 (0.0001)				
	3	0.763	0.868	19.286 (0.045)	0.279 (0.0087)	0.551 (0.0031)				
	4	0.783	0.870	19.755 (0.047)	0.275 (0.012)	0.552 (0.0041)	-0.011 (0.604)			
	5	0.653	0.910	24.301 (0.0078)	0.370 (0.0009)	0.388 (0.021)		0.093 (0.028)		
	6	0.667	0.914	24.869 (0.0087)	0.366 (0.0014)	0.388 (0.025)	-0.012 (0.503)	0.094 (0.031)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 26; Car No. 19; 20 Fuels; Road ON Mean = 91.345

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
PC 137	1	0.639	0.865	46.157 (0.0001)	0.478 (0.0001)					
	2	1.039	0.644	29.862 (0.012)		0.717 (0.0001)				
	3	0.623	0.879	38.859 (0.0001)	0.401 (0.0001)	0.170 (0.179)				
	4a	0.649	0.869	46.246 (0.0001)	0.479 (0.0001)		-0.011 (0.513)			
	5a	0.605	0.886	45.164 (0.0001)	0.486 (0.0001)			0.052 (0.097)		
	6a	0.615	0.889	45.240 (0.0001)	0.487 (0.0001)		-0.010 (0.510)	0.051 (0.106)		
	20	0.437	0.940	-405.409 (0.0007)	10.076 (0.0001)				-0.051 (0.0002)	
	23	0.397	0.954	-383.486 (0.0005)	9.653 (0.0001)			0.042 (0.047)	-0.049 (0.0002)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 30; Car No. 25; 20 Fuels; Road ON Mean = 92.915

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
PC 137	1	1.257	0.756	31.089 (0.0014)	0.654 (0.0001)					
	2	1.307	0.737	-3.211 (0.817)		1.121 (0.0001)				
	3	1.058	0.837	5.335 (0.641)	0.384 (0.0048)	0.598 (0.0099)				
	4	1.079	0.840	5.729 (0.625)	0.387 (0.0056)	0.587 (0.0133)	0.016 (0.566)			
	5	0.922	0.884	10.077 (0.326)	0.475 (0.0005)	0.436 (0.036)		0.120 (0.023)		
	6	0.932	0.888	10.652 (0.309)	0.480 (0.0006)	0.420 (0.047)	0.019 (0.431)	0.122 (0.023)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 30; Car No. 26; 20 Fuels; Road ON Mean = 91.935

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
PC 137	1	1.372	0.758	24.153 (0.016)	0.717 (0.0001)					
	2	1.331	0.773	-15.939 (0.264)		1.258 (0.0001)				
	3	1.081	0.858	-7.256 (0.536)	0.388 (0.0052)	0.729 (0.0030)				
	4	1.044	0.876	-6.354 (0.578)	0.397 (0.0038)	0.701 (0.0034)	0.039 (0.155)			
	5	0.963	0.894	-2.727 (0.802)	0.476 (0.0007)	0.573 (0.011)		0.116 (0.033)		
	6	0.896	0.914	-1.490 (0.882)	0.483 (0.0004)	0.537 (0.011)	0.042 (0.081)	0.120 (0.020)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 47; Car No. 32; 19 Fuels (Except 2); Road ON Mean = 92.616

					Coefficients*					
Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
PL 217M	1	0.938	0.694	51.184 (0.0001)	0.437 (0.0001)					
	2	0.626	0.864	22.114 (0.0046)		0.821 (0.0001)				
	3	0.549	0.901	24.575 (0.0009)	0.157 (0.025)	0.619 (0.0001)				
	4	0.516	0.918	24.828 (0.0006)	0.146 (0.028)	0.636 (0.0001)	-0.023 (0.099)			
	5	0.567	0.901	24.434 (0.0016)	0.155 (0.039)	0.623 (0.0001)		-0.003 (0.929)		
	6	0.534	0.918	24.315 (0.0012)	0.143 (0.046)	0.642 (0.0001)	-0.023 (0.111)	-0.004 (0.882)		
	8	0.455	0.936	-305.502 (0.018)	7.189 (0.010)	0.572 (0.0001)			-0.037 (0.012)	
	10	0.396	0.955	-314.472 (0.0071)	7.368 (0.0038)	0.588 (0.0001)	-0.024 (0.030)		-0.038 (0.0043)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 50; Car No. 33; 20 Fuels; Road ON Mean = 89.725

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
E 215	1	0.950	0.504	62.972 (0.0001)	0.283 (0.0005)					
	2	0.686	0.741	38.704 (0.0001)		0.595 (0.0001)				
	3	0.702	0.744	39.502 (0.0001)	0.036 (0.653)	0.546 (0.0009)				
	4b	0.671	0.766	38.298 (0.0001)		0.604 (0.0001)	-0.022 (0.198)			
	5b	0.588	0.820	36.915 (0.0001)		0.620 (0.0001)		-0.078 (0.014)		
	6b	0.558	0.848	36.380 (0.0001)		0.631 (0.0001)	-0.024 (0.107)	-0.080 (0.0096)		

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 41; Car No. 29; 18 Fuels (Except 2, 17); Road ON Mean = 94.489

					Coefficients*					
Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
T 218M	1	1.096	0.721	42.822 (0.0001)	0.546 (0.0001)					
	2	1.430	0.525	27.501 (0.104)		0.781 (0.0007)				
	3	1.093	0.740	33.149 (0.017)	0.447 (0.0031)	0.222 (0.315)				
	4a	1.073	0.749	44.613 (0.0001)	0.533 (0.0001)		-0.036 (0.215)			
	5a	1.014	0.776	40.992 (0.0001)	0.561 (0.0001)			0.096 (0.075)		
	6a	0.990	0.801	42.669 (0.0001)	0.549 (0.0001)		-0.034 (0.206)	0.093 (0.077)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-8
(Continued)

FULL-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 26, Car No. 18, 19 Fuels (Except 15); Road ON Mean = 92.574

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
T 222	1	1.027	0.790	35.620 (0.0001)	0.604 (0.0001)					
	2	0.869	0.850	4.110 (0.651)		1.032 (0.0001)				
	3	0.695	0.910	9.750 (0.209)	0.282 (0.0050)	0.656 (0.0003)				
	4	0.710	0.911	9.542 (0.230)	0.285 (0.0058)	0.657 (0.0004)	-0.010 (0.587)			
	5	0.536	0.950	13.481 (0.036)	0.343 (0.0002)	0.540 (0.0003)		0.096 (0.0036)		
	6	0.551	0.950	13.223 (0.044)	0.345 (0.0003)	0.542 (0.0004)	-0.006 (0.662)	0.095 (0.0051)		
	11	0.457	0.966	-265.836 (0.028)	6.242 (0.017)	0.525 (0.0001)		0.095 (0.0013)	-0.031 (0.022)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-9

FULL-THROTTLE ROAD ON REGRESSION EQUATIONS

37 Cars; Individual Car Road ON Ratings (No Averaging); Road ON Mean = 91.904

Equation	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	$(RON)^2$ b_6
3	1.252	0.638	25.954 (0.0001)	0.284 (0.0001)	0.465 (0.0001)		
8	1.241	0.645	-144.749 (0.0013)	4.004 (0.0001)	0.430 (0.0001)		-0.020 (0.0002)
10	1.236	0.648	-165.815 (0.0004)	4.317 (0.0001)	0.437 (0.0001)	-0.012 (0.015)	-0.021 (0.0001)

* Number in parentheses represents the probability that the number is not significant.

TABLE F-10

PART-THROTTLE ROAD ON REGRESSION EQUATIONS

All-Car Averages; 12 Cars; Road ON Mean = 88.030

Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7	RxM b_8	(R+M)/2 b_5
1	0.684	0.740	55.794 (0.0001)	0.341 (0.0001)							
2	0.238	0.969	29.977 (0.0001)		0.677 (0.0001)						
3	0.144	0.989	32.008 (0.0001)	0.091 (0.0001)	0.553 (0.0001)						
4	0.119	0.993	31.823 (0.0001)	0.089 (0.0001)	0.559 (0.0001)	-0.009 (0.0080)					
5	0.145	0.990	31.740 (0.0001)	0.086 (0.0001)	0.562 (0.0001)		-0.007 (0.347)				
6	0.115	0.994	31.483 (0.0001)	0.083 (0.0001)	0.570 (0.0001)	-0.009 (0.0062)	-0.008 (0.188)				
8	0.148	0.989	15.591 (0.569)	0.361 (0.620)	0.551 (0.0001)			-0.001 (0.710)			
9	0.144	0.990	106.807 (0.174)	0.093 (0.0001)	-1.179 (0.509)				-0.010 (0.336)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR $>$ 0.05) are underlined.

TABLE F-10
(Continued)

PART-THROTTLE ROAD ON REGRESSION EQUATIONS

All-Car Averages; 12 Cars; Road ON Mean = 88.030

Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7	RxM b_8	(R+M)/2 b_5
10	0.120	0.993	11.056 (0.768)	0.595 (0.322)	0.556 (0.0001)	-0.009 (0.0074)		-0.003 (0.398)			
11	0.148	0.990	20.678 (0.612)	0.393 (0 591)	0.561 (0.0001)		-0.007 (0.349)	-0.002 (0.674)			
12	0.116	0.994	111.960 (0.080)	0.091 (0.0001)	-1.321 (0.360)	-0.009 (0.0066)			0.011 (0.199)		
13	0.145	0.994	108.512 (0.173)	0.088 (0.0001)	-1.193 (0.505)		-0.007 (0.341)		0.010 (0.331)		
14	0.116	0.994	-20.749 (0.837)	0.638 (0.276)	0.567 (0.0001)	-0.009 (0.0055)	-0.009 (0.173)	-0.003 (0.341)			
15	0.112	0.995	114.193 (0.070)	0.085 (0.0001)	-1.340 (0.338)	-0.009 (0.0049)	-0.008 (0.170)		0.011 (0.179)		
16	0.150	0.990	73.437 (0.538)	-0.154 (0.912)	0.152 (0.963)			-0.011 (0.414)	-0.012 (0.764)	0.025 (0.522)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-11

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 29; Car No. 21; 20 Fuels; Road ON Mean = 89.215

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
LIA 238	1	0.770	0.790	47.525 (0.0001)	0.441 (0.0001)					
	2	0.575	0.883	19.757 (0.0038)		0.810 (0.0001)				
	3	0.413	0.943	24.210 (0.0001)	0.196 (0.0006)	0.542 (0.0001)				
	4	0.417	0.945	23.948 (0.0001)	0.194 (0.0007)	0.549 (0.0001)	-0.009 (0.415)			
	5	0.413	0.946	25.007 (0.0001)	0.212 (0.0005)	0.514 (0.0001)		0.020 (0.342)		
	6	0.418	0.948	24.823 (0.0001)	0.209 (0.0008)	0.521 (0.0081)	-0.008 (0.445)	0.020 (0.370)		
	9	0.351	0.961	519.722 (0.011)	0.210 (0.0001)	-11.083 (0.019)				0.068 (0.014)

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 29, Car No. 22; 20 Fuels; Road ON Mean = 87.620

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
LIA 238	1	0.778	0.518	65.121 (0.0001)	0.238 (0.0003)					
	2	0.489	0.809	43.373 (0.0001)		0.516 (0.0001)				
	3	0.502	0.810	43.611 (0.0001)	0.012 (0.834)	0.500 (0.0001)				
	4b	0.487	0.821	43.075 (0.0001)		0.522 (0.0001)	-0.013 (0.302)			
	5b	0.498	0.814	43.013 (0.0001)		0.521 (0.0001)		-0.015 (0.552)		
	6b	0.496	0.826	42.719 (0.0001)		0.527 (0.0001)	-0.013 (0.302)	-0.016 (0.529)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 4; Car No. 5; 20 Fuels; Road ON Mean = 85.225

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
NC5 225	1	0.558	0.769	56.865 (0.0001)	0.300 (0.0001)					
	2	0.361	0.903	36.776 (0.0001)		0.565 (0.0001)				
	3	0.272	0.948	39.350 (0.0001)	0.117 (0.0013)	0.406 (0.0001)				
	4	0.252	0.958	39.147 (0.0001)	0.114 (0.0010)	0.414 (0.0001)	-0.012 (0.073)			
	5	0.280	0.948	39.363 (0.0001)	0.116 (0.0029)	0.407 (0.0001)		-0.001 (0.963)		
	6	0.261	0.958	38.993 (0.0001)	0.113 (0.0024)	0.417 (0.0001)	-0.012 (0.082)	-0.002 (0.885)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 7, Car No. 35; 17 Fuels (Except 2, 7, 17); Road ON Mean = 83.847

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
NL9 216	1	0.837	0.441	62.754 (0.0001)	0.223 (0.0036)					
	2	0.466	0.826	39.470 (0.0001)		0.517 (0.0001)				
	3	0.480	0.828	38.985 (0.0001)	-0.023 (0.692)	0.548 (0.0001)				
	4b	0.469	0.836	39.991 (0.0001)		0.513 (0.0001)	-0.011 (0.380)			
	5b	0.483	0.826	39.466 (0.0001)		0.517 (0.0001)		0.001 (0.955)		
	6b	0.487	0.836	40.081 (0.0001)		0.512 (0.0001)	-0.012 (0.395)	0.003 (0.915)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 7; Car No. 34; 17 Fuels (Except 2, 7, 17); Road ON Mean = 89.388

				Coefficients*						
Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
0 V250	1	0.969	0.637	52.877 (0.0001)	0.386 (0.0001)					
	2	0.694	0.814	26.042 (0.0045)		0.738 (0.0001)				
	3	0.660	0.843	28.106 (0.0023)	0.127 (0.131)	0.574 (0.0008)				
	4b	0.714	0.816	25.655 (0.0068)		0.741 (0.0001)	0.008 (0.692)			
	5b	0.600	0.870	23.085 (0.0047)		0.776 (0.0001)		-0.077 (0.028)		
	6b	0.614	0.874	22.482 (0.0073)		0.781 (0.0001)	0.011 (0.550)	-0.078 (0.030)		

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 29; Car No. 23; 20 Fuels; Road ON Mean = 88.800

Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	Coefficients* RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OCA 133	1	0.741	0.711	56.374 (0.0001)	0.343 (0.0001)					
	2	0.469	0.884	31.862 (0.0001)		0.664 (0.0001)				
	3	0.418	0.913	34.394 (0.0001)	0.112 (0.029)	0.511 (0.0001)				
	4	0.405	0.923	34.078 (0.0001)	0.108 (0.030)	0.522 (0.0001)	-0.015 (0.164)			
	5	0.416	0.919	33.456 (0.0001)	0.094 (0.074)	0.543 (0.0001)		-0.023 (0.300)		
	6	0.399	0.930	32.978 (0.0001)	0.090 (0.078)	0.556 (0.0001)	-0.015 (0.145)	-0.025 (0.251)		

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 29; Car No. 24; 20 Fuels; Road ON Mean = 90.750

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OCA 133	1	0.728	0.825	46.602 (0.0001)	0.467 (0.0001)					
	2	0.602	0.880	18.892 (0.0072)		0.838 (0.0001)				
	3	0.368	0.958	24.074 (0.0001)	0.230 (0.0001)	0.524 (0.0001)				
	4	0.367	0.961	23.829 (0.0001)	0.228 (0.0001)	0.531 (0.0001)	-0.010 (0.307)			
	5	0.369	0.960	23.340 (0.0001)	0.216 (0.0001)	0.549 (0.0001)		-0.019 (0.341)		
	6	0.366	0.963	23.023 (0.0001)	0.213 (0.0002)	0.558 (0.0001)	-0.010 (0.284)	-0.020 (0.313)		
	8	0.289	0.976	-198.329 (0.0078)	4.975 (0.0025)	0.492 (0.0001)			-0.025 (0.0036)	

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 4; Car No. 8; 20 Fuels; Road ON Mean = 85.290

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OCA 242	1	1.027	0.490	57.213 (0.0001)	0.297 (0.0006)					
	2	0.444	0.905	25.179 (0.0001)		0.701 (0.0001)				
	3	0.443	0.910	23.989 (0.0001)	-0.050 (0.324)	0.770 (0.0001)				
	4b	0.440	0.912	24.967 (0.0001)		0.706 (0.0001)	-0.013 (0.265)			
	5b	0.446	0.909	25.603 (0.0001)		0.695 (0.0001)		0.020 (0.374)		
	6b	0.443	0.916	25.378 (0.0001)		0.700 (0.0001)	-0.012 (0.281)	0.019 (0.391)		

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 5; Car No. 11; 20 Fuels; Road ON Mean = 89.960

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OCA 242	1	0.705	0.729	57.629 (0.0001)	0.342 (0.0001					
	2	0.512	0.857	34.823 (0.0001)		0.643 (0.0001)				
	3	0.411	0.900	37.770 (0.0001)	0.133 (0.016)	0.462 (0.0001)				
	4	0.454	0.900	37.727 (0.0001)	0.132 (0.019)	0.464 (0.0001)	-0.002 (0.845)			
	5	0.449	0.902	37.164 (0.0001)	0.122 (0.036)	0.482 (0.0001)		-0.015 (0.537)		
	6	0.463	0.903	37.136 (0.0001)	0.121 (0.044)	0.484 (0.0001)	-0.003 (0.823)	-0.015 (0.542)		
	8	0.392	0.926	-137.372 (0.073)	4.568 (0.028)	0.432 (0.0001)			-0.023 (0.032)	

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 4; Car No. 6; 20 Fuels; Road ON Mean = 87.850

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OI V258	1	0.574	0.809	54.962 (0.0001)	0.348 (0.0001)					
	2	0.422	0.897	33.237 (0.0001)		0.637 (0.0001)				
	3	0.268	0.961	36.651 (0.0001)	0.158 (0.0001)	0.423 (0.0001)				
	4	0.254	0.967	36.517 (0.0001)	0.155 (0.0001)	0.430 (0.0001)	-0.011 (0.101)			
	5	0.273	0.962	37.063 (0.0001)	0.165 (0.0001)	0.410 (0.0001)		0.009 (0.526)		
	6	0.259	0.968	36.857 (0.0001)	0.161 (0.0001)	0.419 (0.0001)	-0.011 (0.116)	0.008 (0.561)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 7; Car No. 37; 17 Fuels (Except 2, 7, 17); Road ON Mean = 90.276

Car Code	Eqn.	Std. Dev.	R^2	Coefficients* Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
OL 223	1	0.990	0.657	51.306 (0.0001)	0.412 (0.0001)					
	2	0.555	0.892	20.492 (0.0051)		0.813 (0.0001)				
	3	0.520	0.912	22.276 (0.0022)	0.110 (0.101)	0.671 (0.0001)				
	4b	0.557	0.899	21.232 (0.0047)		0.807 (0.0001)	-0.014 (0.359)			
	5b	0.570	0.894	21.037 (0.0061)		0.806 (0.0001)		0.014 (0.644)		
	6b	0.572	0.901	21.872 (0.0057)		0.799 (0.0001)	-0.015 (0.358)	0.016 (0.608)		

* Number in parentheses represents the probability that the number is not significant.
Constant and coefficients not significant at the 95% confidence level (PR>0.05) are underlined.

TABLE F-11
(Continued)

PART-THROTTLE ROAD ON MULTIPLE REGRESSION EQUATIONS - INDIVIDUAL CARS

Lab 7; Car No. 36; 17 Fuels (Except 2, 7, 17); Road ON Mean = 88.406

					Coefficients*					
Car Code	Eqn.	Std. Dev.	R^2	Constant* b_0	RON b_1	MON b_2	Heavy Aromatics b_3	Ethanol b_4	$(RON)^2$ b_6	$(MON)^2$ b_7
PC 137	1	0.692	0.724	56.530 (0.0001)	0.337 (0.0001)					
	2	0.283	0.954	32.184 (0.0001)		0.655 (0.0001)				
	3	0.189	0.981	33.789 (0.0001)	0.101 (0.0006)	0.525 (0.0001)				
	4	0.178	0.984	34.116 (0.0001)	0.098 (0.0005)	0.526 (0.0001)	-0.008 (0.120)			
	5	0.179	0.984	32.889 (0.0001)	0.084 (0.0035)	0.555 (0.0001)		-0.017 (0.124)		
	6	0.166	0.987	33.203 (0.0001)	0.082 (0.0030)	0.555 (0.0001)	-0.008 (0.108)	-0.016 (0.111)		

* Number in parentheses represents the probability that the number is not significant. Constant and coefficients not significant at the 95% confidence level (PR > 0.05) are underlined.

APPENDIX G

ANALYSIS OF VARIANCE RESULTS

INDEX OF APPENDIX G

ANALYSIS OF VARIANCE RESULTS

Index of Tables

TABLE G-1

ANALYSIS OF VARIANCE - ALL-CAR AND SUBGROUP AVERAGES

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
All Cars (Ex. E 215)-36 Cars							
Cars (Labs)	35	37.525	0.894	0.946	19.60	99.5	0.0001
Fuels	19	210.059	2.973	1.724	65.19	557.0	0.0001
Cars x Fuels	643	0.862	0.317	0.563	6.94	2.3	0.0001
Error	698	0.377	0.377	0.614	8.27		
All Auto. Trans. (Ex. E 215) - 34 Cars							
Cars (Labs)	33	37.809	0.751	0.867	17.00	82.3	0.0001
Fuels	19	198.822	2.980	1.726	67.45	514.2	0.0001
Cars x Fuels	608	0.871	0.300	0.548	6.80	2.2	0.0001
Error	661	0.387	0.387	0.622	8.75		
All U.S. Cars - 34 Cars							
Cars (Labs)	33	31.886	0.754	0.868	17.30	86.1	0.0001
Fuels	19	196.131	2.932	1.712	67.32	529.6	0.0001
Cars x Fuels	608	0.839	0.300	0.547	6.88	2.3	0.0001
Error	661	0.370	0.370	0.609	8.50		
Cars Testing All Fuels (Ex. E 215) - 25 Cars							
Cars (Labs)	24	20.044	0.479	0.692	11.62	50.4	0.0001
Fuels	19	151.253	3.008	1.734	72.94	380.1	0.0001
Cars x Fuels	456	0.875	0.239	0.488	5.79	2.2	0.0001
Error	500	0.398	0.398	0.631	9.65		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-1
(Continued)

ANALYSIS OF VARIANCE - ALL-CAR AND SUBGROUP AVERAGES

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
HIK 238 - 2 Cars							
Cars (Labs)	1	3.539	0.124	0.353	3.58	5.4	0.025
Fuels	19	10.790	2.691	1.640	77.61	16.6	0.0001
Cars x Fuels	18	0.390	-0.139		0.00	0.6	0.870
Error	39	0.652	0.652	0.807	18.81		
LIA 238 - 2 Cars							
Cars	1	0.045	-0.016		0.00	0.1	0.816
Fuels	19	14.685	3.504	1.872	81.02	17.9	0.0001
Cars x Fuels	19	0.670	-0.075		0.00	0.8	0.676
Error	40	0.821	0.821	0.906	18.98		
NC5 225/HC5 225 - 2 Cars							
Cars (Labs)	1	56.448	1.397	1.182	40.21	261.3	0.0001
Fuels	19	7.342	1.694	1.301	48.64	34.0	0.0001
Cars x Fuels	19	0.567	0.175	0.419	5.04	2.6	0.0050
Error	40	0.216	0.216	0.466	6.20		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% -0.0001

TABLE G-1
(Continued)

ANALYSIS OF VARIANCE - ALL-CAR AND SUBGROUP AVERAGES

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
NIK 238 - 2 Cars							
Cars (Labs)	1	2.738	0.065	0.255	2.22	18.4	0.0001
Fuels	19	10.968	2.709	1.646	92.67	73.5	0.0001
Cars x Fuels	19	0.132	-0.008		0.00	0.9	0.599
Errors	40	0.149	0.149	0.380	5.11		
O V250/M V250 - 3 Cars							
Cars (Labs)	2	109.256	2.985	1.728	49.78	355.4	0.0001
Fuels	19	15.083	2.686	1.639	44.80	49.1	0.0001
Cars x Fuels	35	0.276	0.017	0.132	0.29	0.9	0.630
Error	57	0.307	0.307	0.554	5.13		
OCA 133 - 2 Cars							
Cars	1	0.528	0.003	0.057	0.11	4.3	0.044
Fuels	19	11.620	2.806	1.675	91.44	95.3	0.0001
Cars x Fuels	19	0.397	0.137	0.371	4.48	3.2	0.0008
Error	40	0.122	0.122	0.349	3.97		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-1
(Continued)

ANALYSIS OF VARIANCE - ALL-CAR AND SUBGROUP AVERAGES

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
OCA 242 - 2 Cars							
Cars (Labs)	1	4.753	0.114	0.338	2.57	41.8	0.0001
Fuels	19	16.919	4.185	2.046	94.14	148.9	0.0001
Cars x Fuels	19	0.179	0.033	0.180	0.73	1.6	0.113
Error	40	0.114	0.114	0.337	2.56		
OL 223 - 2 Cars							
Cars (Labs)	1	23.647	0.752	0.867	14.90	60.2	0.0001
Fuels	19	14.428	3.629	1.905	71.85	36.7	0.0001
Cars x Fuels	16	0.903	0.276	0.525	5.47	2.3	0.018
Error	37	0.393	0.393	0.627	7.78		
PC 137 - 4 Cars							
Cars (Labs)	3	18.817	0.573	0.757	9.20	17.0	0.0001
Fuels	19	34.992	4.327	2.080	69.53	31.7	0.0001
Cars x Fuels	54	1.475	0.219	0.468	3.51	1.3	0.121
Error	77	1.105	1.105	1.051	17.76		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-2

ANALYSIS OF VARIANCE - INDIVIDUAL LABORATORIES

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
Laboratory 3 - 4 Cars							
Cars	3	0.859	0.008	0.089	0.23	2.0	0.116
Fuels	19	24.198	2.957	1.720	85.79	57.0	0.0001
Cars x Fuels	57	0.540	0.058	0.240	1.67	1.3	0.160
Error	80	0.424	0.424	0.651	12.31		
Laboratory 4 - 4 Cars							
Cars	3	23.000	0.558	0.747	17.61	202.8	0.0001
Fuels	19	18.381	2.212	1.487	69.84	162.0	0.0001
Cars x Fuels	57	0.682	0.284	0.533	8.97	6.0	0.0001
Error	80	0.113	0.113	0.337	3.58		
Laboratory 5 - 3 Cars							
Cars	2	7.448	0.162	0.402	2.98	67.6	0.0001
Fuels	19	29.400	4.738	2.177	87.09	266.7	0.0001
Cars x Fuels	38	0.969	0.430	0.655	7.90	8.8	0.0001
Error	60	0.110	0.110	0.332	2.03		
Laboratory 7 - 4 Cars							
Cars	3	47.772	1.382	1.176	29.98	149.7	0.0001
Fuels	16	22.212	2.679	1.637	58.12	69.6	0.0001
Cars x Fuels	48	0.778	0.230	0.479	4.98	2.4	0.0004
Error	68	0.319	0.319	0.565	6.92		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-2
(Continued)

ANALYSIS OF VARIANCE - INDIVIDUAL LABORATORIES

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
Laboratory 8 - 5 Cars							
Cars	4	9.545	0.233	0.483	9.77	90.5	0.0001
Fuels	19	20.197	1.999	1.414	83.68	191.5	0.0001
Cars x Fuels	76	0.208	0.051	0.226	2.14	2.0	0.0008
Error	100	0.105	0.105	0.325	4.41		
Laboratory 26 - 4 Cars							
Cars	3	43.275	1.075	1.037	21.65	69.3	0.0001
Fuels	19	25.815	3.160	1.778	63.63	41.3	0.0001
Cars x Fuels	56	0.776	0.106	0.326	2.14	1.2	0.186
Error	79	0.625	0.625	0.790	12.58		
Laboratory 29 - 4 Cars							
Cars	3	10.634	0.254	0.504	6.49	22.6	0.0001
Fuels	19	4.359	3.189	1.786	81.47	55.1	0.0001
Cars x Fuels	57	0.464	-0.004		0.00	1.0	0.520
Error	80	0.471	0.471	0.687	12.04		
Laboratory 30 - 2 Cars							
Cars	1	19.701	0.468	0.684	5.63	12.5	0.0011
Fuels	19	25.981	6.250	2.500	75.33	16.5	0.0001
Cars x Fuels	19	0.996	-0.292		0.00	0.6	0.859
Error	40	1.580	1.580	1.257	19.04		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-2
(Continued)

ANALYSIS OF VARIANCE - INDIVIDUAL LABORATORIES

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
Laboratory 35 - 2 Cars							
Cars	1	14.329	0.372	0.610	10.56	27.1	0.0001
Fuels	18	10.679	2.623	1.620	74.42	20.2	0.0001
Cars x Fuels	18	0.188	-0.171		0.00	0.4	0.989
Error	38	0.529	0.529	0.727	15.02		
Laboratory 41 - 3 Cars							
Cars	2	152.762	4.191	2.047	50.08	803.2	0.0001
Fuels	17	20.695	3.132	1.770	37.43	108.8	0.0001
Cars x Fuels	34	1.902	0.857	0.925	10.22	10.0	0.0001
Error	54	0.190	0.190	0.436	2.27		
Laboratory 47 - 1 Car							
Cars	0						
Fuels	18	5.487	2.725	1.651	98.68	151.1	0.0001
Cars x Fuels	0						
Error	19	0.036	0.036	0.191	1.32		
Laboratory 50 - 1 Car							
Cars	0						
Fuels	19	1.428					
Cars x Fuels	0						
Error	0						

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-3

ANALYSIS OF VARIANCE - INDIVIDUAL CARS

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
HC5 225 - Lab 3 (2)							
Fuels	19	4.686	2.111	1.487	89.35	17.8	0.0001
Error	20	0.264	0.264	0.513	10.65		
HIA 238 - Lab 8 (13)							
Fuels	19	2.834	1.365	1.168	92.87	27.1	0.0001
Error	20	0.105	0.105	0.324	7.13		
HIK 238 - Lab 3 (4)							
Fuels	19	6.307	2.904	1.704	85.32	12.6	0.0001
Error	20	0.500	0.500	0.707	14.68		
HIK 238 - Lab 35 (27)							
Fuels	18	4.911	2.094	1.447	71.32	5.8	0.0003
Error	18	0.842	0.842	0.918	28.68		
HLV 225 - Lab 41 (30)							
Fuels	17	11.120	5.519	2.349	98.53	134.8	0.0001
Error	18	0.082	0.082	0.287	1.47		
IIF 243 - Lab 41 (31)							
Fuels	17	5.155	2.526	1.589	96.11	50.4	0.0001
Error	18	0.102	0.102	0.320	3.89		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-3
(Continued)

ANALYSIS OF VARIANCE - INDIVIDUAL CARS

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
KI 137 - Lab 5 (10)							
Fuels	19	16.768	8.357	2.891	99.35	307.7	0.0001
Error	20	0.054	0.054	0.233	0.65		
LIA 238 - Lab 29 (21)							
Fuels	19	9.942	4.282	2.069	75.64	7.2	0.0001
Error	20	1.379	1.379	1.174	24.36		
LIA 238 - Lab 29 (22)							
Fuels	19	5.412	2.575	1.605	90.74	20.6	0.0001
Error	20	0.263	0.263	0.513	9.26		
M V250 - Lab 8 (16)							
Fuels	19	4.758	2.301	1.517	93.65	30.5	0.0001
Error	20	0.156	0.156	0.395	6.35		
NC5 225 - Lab 4 (5)							
Fuels	19	3.223	1.527	1.236	90.06	19.1	0.0001
Error	20	0.168	0.168	0.410	9.94		
NC7 228 - Lab 26 (20)							
Fuels	19	6.629	2.867	1.693	76.20	7.4	0.0001
Error	20	0.895	0.895	0.946	23.80		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-3
(Continued)

ANALYSIS OF VARIANCE - INDIVIDUAL CARS

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev of Effect	Percent of Variation	F	Significance Probability*
NFH 450 - Lab 8 (15)							
Fuels	19	3.923	1.905	1.380	94.39	34.6	0.0001
Error	20	0.113	0.113	0.337	5.61		
NH 450 - Lab 8 (14)							
Fuels	19	5.291	2.594	1.610	96.14	50.9	0.0001
Error	20	0.104	0.104	0.322	3.86		
NIG 230 - Lab 35 (28)							
Fuels	18	5.695	2.724	1.651	91.72	21.3	0.0001
Error	19	0.246	0.246	0.496	8.28		
NIJ 244 - Lab 8 (12)							
Fuels	19	4.222	2.087	1.444	97.69	85.7	0.0001
Error	20	0.049	0.049	0.222	2.31		
NIK 238 - Lab 4 (7)							
Fuels	19	4.498	2.384	1.544	93.01	27.6	0.0001
Error	20	0.179	0.179	0.423	6.99		
NIK 238 - Lab 5 (9)							
Fuels	19	6.152	3.016	1.737	96.20	51.6	0.0001
Error	20	0.119	0.119	0.345	3.80		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-3
(Continued)

ANALYSIS OF VARIANCE - INDIVIDUAL CARS

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
NL9 216 - Lab 7 (35)							
Fuels	16	3.697	1.728	1.314	87.72	15.3	0.0001
Error	17	0.242	0.242	0.492	12.28		
O V250 - Lab 3 (1)							
Fuels	19	5.724	2.596	1.611	82.96	10.7	0.0001
Error	20	0.533	0.533	0.730	17.04		
O V250 - Lab 7 (34)							
Fuels	16	6.083	2.932	1.712	93.03	27.7	0.0001
Error	17	0.220	0.220	0.469	6.97		
OCA 133 - Lab 29 (23)							
Fuels	19	6.218	3.050	1.746	96.30	53.0	0.0001
Error	20	0.117	0.117	0.342	3.70		
OCA 133 - Lab 29 (24)							
Fuels	19	5.799	2.836	1.684	95.73	45.8	0.0001
Error	20	0.126	0.126	0.356	4.27		
OCA 223 - Lab 26 (17)							
Fuels	19	6.878	3.304	1.818	92.46	25.5	0.0001
Error	20	0.270	0.270	0.519	7.54		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-3
(Continued)

ANALYSIS OF VARIANCE - INDIVIDUAL CARS

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
OCA 242 - Lab 4 (8)							
Fuels	19	8.679	4.304	2.075	98.39	123.6	0.0001
Error	20	0.070	0.070	0.265	1.61		
OCA 242 - Lab 5 (11)							
Fuels	19	8.419	4.131	2.032	96.34	53.6	0.0001
Error	20	0.157	0.157	0.396	3.66		
OI V258 - Lab 4 (6)							
Fuels	19	3.576	1.770	1.330	98.02	100.0	0.0001
Error	20	0.036	0.036	0.189	1.98		
OL 223 - Lab 3 (3)							
Fuels	19	9.100	4.349	2.086	91.55	22.7	0.0001
Error	20	0.402	0.402	0.634	8.45		
OL 223 - Lab 7 (37)							
Fuels	16	7.137	3.377	1.838	89.82	18.6	0.0001
Error	17	0.383	0.383	0.619	10.18		
PC 137 - Lab 7 (36)							
Fuels	16	7.629	3.598	1.897	89.28	17.7	0.0001
Error	17	0.432	0.432	0.657	10.72		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-3
(Continued)

ANALYSIS OF VARIANCE - INDIVIDUAL CARS

FULL-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
PC 137 - Lab 26 (19)							
Fuels	19	5.772	2.522	1.588	77.60	7.9	0.0001
Error	20	0.728	0.728	0.853	22.40		
PC 137 - Lab 30 (25)							
Fuels	19	12.324	5.606	2.368	83.46	11.1	0.0001
Error	20	1.111	1.111	1.054	16.54		
PC 137 - Lab 30 (26)							
Fuels	19	14.670	6.311	2.512	75.49	7.2	0.0001
Error	20	2.048	2.048	1.431	24.51		
PL 217M - Lab 47 (32)							
Fuels	18	5.487	2.725	1.651	98.68	151.1	0.0001
Error	19	0.036	0.036	0.191	1.32		
E 215 - Lab 50 (33)							
Fuels	19	1.428					
Error	0						
T 218M - Lab 41 (29)							
Fuels	17	8.223	3.918	1.979	91.04	21.3	0.0001
Error	18	0.386	0.386	0.621	8.96		
T 222 - Lab 26 (18)							
Fuels	18	9.402	4.398	2.097	87.90	15.5	0.0001
Error	19	0.606	0.606	0.778	12.10		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

TABLE G-4

ANALYSIS OF VARIANCE - ALL-CAR AVERAGES

PART-THROTTLE ROAD ON RATINGS

Source	Degrees of Freedom	Mean Sum of Squares	Variance Component	Std. Dev. of Effect	Percent of Variation	F	Significance Probability*
All Cars - 12 Cars							
Cars	11	130.158	4.636	2.153	64.65	205.1	0.0001
Fuels	19	38.626	1.657	1.287	23.10	44.0	0.0001
Cars x Fuels	197	0.492	-0.099		0.00	0.5	1.000
Error	228	0.879	0.879	0.937	12.25		

* 95% Probability - 0.05; 99% - 0.01; 99.9% - 0.001; 99.99% - 0.0001

APPENDIX H

DETAILED TEST RESULTS

INDEX OF APPENDIX H

GLOSSARY OF TERMS

LAB NO	Rating Participant - CRC Confidential Code
CAR CODE	Car Identification - CRC Confidential Code
EM CT	Emission Certification: F=Federal, C=California
TRANS	Transmission Type: A=Automatic, M=Manual
C.R.	Compression Ratio
AIR CND	Air Conditioned: Y=Yes, N=No
ODOM MILES	Odometer Miles on Car
STD SPK	Basic Spark Advance Setting
TEST LOC	D = Rating Performed on Chassis Dynamometer
RUN NO	Number of Test Replicates
G	Gear: D=Drive, P=Passing, 4=Fourth
DATE	Month, Day, and Year Tested
AMB TMP	Dry Bulb Temperature on Test Date, °F
BARO	Barometric Pressure on Test, "Hg
HUM	Relative Humidity, %
FUEL NO	Fuels Described in Appendix B
SPK ADV	Engine Spark Advance, Degrees
RPM	Engine Speed, RPM
MUON	Road Octane Number by Modified Uniontown Technique Described in Appendix D

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	G	FULL THROTTLE DATE	AMB TMP	BARO	RUN	G	PART THROTTLE DATE	AMB TMP	ENGN	RUN
2	1	HC5 22S	F	1980	A	8.2	N	11633	10	D	1	D	11-18-80	66	29.76	21					
											2	D	11-19-80	70	30.17	8					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MANIFOLD	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MANIFOLD
1	1	6.0	2800	89.6			
1	2	7.0	2700	89.3			
2	1	7.0	2800	90.0			
2	2	9.0	2700	90.5			
3	1	7.0	2800	90.0			
3	2	8.0	2700	89.9			
4	1	10.0	2800	91.2			
4	2	12.0	2700	92.0			
5	1	8.0	2800	90.4			
5	2	9.0	2700	90.5			
6	1	9.0	2800	90.4			
6	2	9.0	2700	90.5			
7	1	12.0	2800	92.1			
7	2	13.0	2700	92.5			
8	1	11.0	2800	91.6			
8	2	12.0	2700	92.0			
9	1	12.0	2800	92.1			
9	2	11.0	2700	91.6			
10	1	14.0	2800	92.5			
10	2	12.0	2700	92.0			
11	1	12.0	2800	92.1			
11	2	11.0	2700	91.6			
12	1	13.0	2800	92.5			
12	2	13.0	2700	92.5			
13	1	13.0	2800	92.5			
13	2	12.0	2700	92.0			
14	1	13.0	2800	92.5			
14	2	12.0	2700	92.0			
15	1	15.0	2800	93.4			
15	2	13.0	2700	92.5			
16	1	16.0	2800	93.9			
16	2	14.0	2700	92.9			
17	1	17.0	2800	94.4			
17	2	15.0	2700	93.4			
18	1	18.0	2800	95.0			
18	2	16.0	2700	93.7			
19	1	19.0	2800	95.5			
19	2	17.0	2700	94.0			
20	1	18.0	2800	95.0			
20	2	17.0	2700	94.0			

CAP NO	LAB NO	CAM CODE	EM CT	MODEL YEAR	TRANS	CARB	ATM CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE 0	DATE	ADV TMG	MANO	RPM	PART THROTTLE 0	DATE	ADV TMG	MANO	RPM
13	8	HIA 238	F	1980	A	8.0	Y	28774	15	0	1	0	[-15-8]	25	29.96	16					
											2	0	[-16-8]	25	29.99	21					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	RPM	MANO	PART THROTTLE SPRK ADV	RPM	MANO
1	1	17.7	1900	89.3			
1	2	16.6	1900	88.8			
2	1	17.9	1900	89			
2	2	16.4	1900	8[illegible]			
3	1	17.5	1900	8[illegible]			
3	2	15.2	1900	8[illegible]			
4	1	18.8	1900	89.[illegible]			
4	2	17.7	1900	89.1			
5	1	18.7	1900	89.7			
5	2	18.8	1900	89.5			
6	1	15.9	1900	88.6			
6	2	14.7	1900	88.1			
7	1	19.5	1900	90.0			
7	2	21.7	1900	90.5			
8	1	21.6	1900	90.7			
8	2	21.8	1900	90.2			
9	1	19.6	1900	89.9			
9	2	18.7	1900	89.6			
10	1	21.8	1900	91.1			
10	2	21.9	1900	90.6			
11	1	22.2	1900	91.0			
11	2	22.5	1900	90.9			
12	1	22.2	1900	91.0			
12	2	24.0	1900	91.5			
13	1	22.5	1900	91.1			
13	2	23.3	1900	91.2			
14	1	22.0	1900	90.9			
14	2	23.3	1900	91.2			
15	1	24.0	1900	91.6			
15	2	21.5	1900	91.3			
16	1	24.0	1900	91.6			
16	2	23.5	1900	91.3			
17	1	23.1	1900	91.4			
17	2	23.7	1900	91.4			
18	1	25.3	1900	92.1			
18	2	24.1	1900	91.7			
19	1	24.8	1900	91.9			
19	2	25.7	1900	92.2			
20	1	25.9	1900	92.2			
20	2	25.7	1900	92.[illegible]			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	G	FULL THROTTLE DATE	AMB TMP	BARO	ODM	G	PART THROTTLE DATE	AMB TMP	BARO	ODM
6	3	BIK 23B	F	1980	A	8.6	Y	16110	10	U	1	D	11-16-80	82	30.11	22					
											2	D	11-17-80	64	30.13	28					

FUEL NO	RUN NO	FULL THROTTLE SPARK ADV	FULL THROTTLE RPM	FULL THROTTLE MANIF	PART THROTTLE SPARK ADV	PART THROTTLE RPM	PART THROTTLE MANIF
1	1	9.0	1700	89.5			
1	2	13.0	1700	90.0			
2	1	11.0	1700	90.5			
2	2	11.0	1700	89.0			
3	1	10.0	1700	90.0			
3	2	13.0	1700	90.0			
4	1	11.0	1700	90.5			
4	2	12.0	1700	89.5			
5	1	10.0	1700	90.0			
5	2	12.0	1700	89.5			
6	1	11.0	1700	90.5			
6	2	12.0	1700	89.5			
7	1	17.0	1700	93.2			
7	2	20.0	1700	92.7			
8	1	17.0	1700	93.2			
8	2	21.0	1700	93.0			
9	1	16.0	1700	92.8			
9	2	18.0	1700	92.0			
10	1	18.0	1700	93.7			
10	2	20.0	1700	92.7			
11	1	18.0	1700	93.7			
11	2	20.0	1700	92.7			
12	1	18.0	1700	93.7			
12	2	22.0	1700	93.7			
13	1	19.0	1700	94.1			
13	2	22.0	1700	93.3			
14	1	19.0	1700	94.1			
14	2	22.0	1700	93.1			
15	1	20.0	1700	94.5			
15	2	21.0	1700	93.0			
16	1	21.0	1700	94.9			
16	2	23.0	1700	93.5			
17	1	21.0	1700	94.9			
17	2	23.0	1700	93.5			
18	1	20.0	1700	94.5			
18	2	23.0	1700	93.5			
19	1	20.0	1700	94.5			
19	2	22.0	1700	93.1			
20	1	20.0	1700	94.5			
20	2	21.0	1700	93.0			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	CARB	AIR CND	ODOM MILES	STD SPK	IST LOC	RUN NO	FULL THROTTLE				PART THROTTLE			
												G	DATE	ANN IMP	BARO	ODM	G	DATE	ANN IMP	BARO	ODM
27	15	NEK 210	1	1980	A	2.6	Y	43240	10	D	1	D	1-4-81	29	29.25	24					
											2	D	1-13-81	27	9.48	61					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MANIF	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MANIF
1	1	4.0	1890	91.1			
1	2	2.0	1980	89.0			
2	1	3.5	1925	91.0			
2	2	1.0	2020	89.6			
3	1	0.0	2200	88.0			
3	2	2.5	2100	89.4			
4	1	4.0	1900	91.1			
4	2	2.0	2050	89.0			
5	1	3.5	1890	91.0			
5	2	2.5	2050	89.4			
6	1	3.5	1950	91.0			
6	2	2.0	2050	89.0			
7	1	5.0	2000	92.0			
7	2	4.5	1950	91.5			
8	1	4.5	1925	91.5			
8	2	4.5	1950	91.5			
9	1	1.0	1850	90.5			
9	2	5.0	2000	92.0			
10	1	5.5	1900	92.5			
10	2	5.5	1900	92.3			
11	1	6.0	1900	92.3			
11	2	4.0	1950	93.1			
12	1	7.0	1900	92.8			
12	2	6.0	2010	92.5			
13	1	6.5	1880	92.5			
13	2	9.5	1900	93.7			
14	1	6.0	1890	92.1			
14	2	9.5	2010	93.7			
15	1	8.5	2100	91.5			
15	2						
16	1	8.0	2130	91.1			
16	2	10.0	1950	91.0			
17	1						
17	2						
18	1	8.2	1900	91.4			
18	2	9.5	1900	93.7			
19	1	8.5	2110	91.5			
19	2	10.0	2050	91.0			
20	1	7.0	2130	91.1			
20	2	10.5	1900	90.5			

CAR NO	LAB NO	CAR CODE	EN CY	MODEL YEAR	TRANS	CMPR	AIR CND	ODOM MILES	STD SPK	EST LOC	RUN NO	FULL THROTTLE G	FULL THROTTLE DATE	FULL THROTTLE ADV IND	FULL THROTTLE MAP O	FULL THROTTLE RPM	PART THROTTLE G	PART THROTTLE DATE	PART THROTTLE ADV I SP	PART THROTTLE MAP O	PART THROTTLE RPM
30	41	OLV 225	C	1980	A	8.2	Y	7170	12	0	1	P	1-26-81	20	30.09	49					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MAP	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MAP
1	1	15.4	2400	88.9			
1	2	16.0	2450	89.3			
2	1						
2	2						
3	1	15.1	2400	88.7			
3	2	14.5	2400	88.2			
4	1	16.4	2500	89.6			
4	2	17.0	2450	90.0			
5	1	15.0	2400	88.6			
5	2	14.6	2400	88.1			
6	1	14.6	2100	88.1			
6	2	14.8	2200	88.4			
7	1	21.0	2500	92.7			
7	2	20.2	2400	92.2			
8	1	18.0	2100	90.7			
8	2	17.0	2150	90.0			
9	1	17.8	2300	90.6			
9	2	16.0	2450	89.4			
10	1	19.8	2000	91.9			
10	2	19.6	2050	91.8			
11	1	20.2	2500	92.2			
11	2	20.6	2400	92.5			
12	1	20.4	2200	92.1			
12	2	20.0	2200	92.1			
11	1	19.6	2100	91.8			
13	2	19.2	2150	91.5			
14	1	23.0	2500	94.0			
14	2	23.6	2400	94.3			
15	1	21.8	2400	93.2			
15	2	22.4	2550	93.6			
16	1	20.2	2350	92.2			
16	2	19.8	2250	91.9			
17	1						
17	2						
18	1	25.2	2400	95.1			
18	2	24.8	2400	94.7			
19	1	25.6	2450	95.4			
19	2	26.4	2550	95.9			
20	1	24.0	2350	94.5			
20	2	23.6	2300	94.3			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	FULL THROTTLE DATE	FULL THROTTLE AMB TMP	FULL THROTTLE BARO	FULL THROTTLE HUM	PART THROTTLE G	PART THROTTLE DATE	PART THROTTLE AMB TMP	PART THROTTLE BARO	PART THROTTLE HUM
31	41	IIF 243	F	1980	A	7.5	Y	21314	20	D	1	P	4-14-81	68	29.90	74					
											2	P	4-14-81	68	29.90	74					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE RMON	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE RMON
1	1	22.1	1700	88.6			
1		21.6	1750	88.3			
2	1						
2	2						
3	1	21.9	1800	88.5			
3	2	21.4	1900	88.2			
4	1	23.0	2000	89.0			
4	2	22.0	1950	88.5			
5	1	22.8	1900	88.9			
5	2	22.2	1750	88.6			
6	1	21.5	1800	89.3			
6	2	23.0	1900	89.0			
7	1	23.8	2100	89.5			
7	2	24.4	2150	89.8			
8	1	25.1	2000	90.9			
8	2	25.6	1900	90.5			
9	1	22.6	1800	88.9			
9	2	22.0	1800	88.5			
10	1	28.6	2100	92.3			
10	2	24.2	2050	92.7			
11	1	25.0	1700	90.2			
11	2	26.0	2000	90.7			
12	1	26.7	2000	91.2			
12	2	27.8	2050	91.8			
13	1	28.0	1700	92.0			
13	2	28.8	1800	92.4			
14	1	26.2	1950	90.3			
14	2	27.0	1850	91.3			
15	1	24.2	1750	89.7			
15	2	25.6	1800	90.5			
16	1	27.7	1900	91.8			
16	2	26.9	1950	91.3			
17	1						
17	2						
18	1	30.4	1950	93.4			
18	2	31.2	1950	93.9			
19	1	25.9	1950	90.7			
19	2	26.8	2000	91.2			
20	1	28.2	1800	93.1			
20	2	29.0	1750	92.6			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	FULL THROTTLE DATE	FULL THROTTLE AMB TMP	FULL THROTTLE BARO	FULL THROTTLE HUM	PART THROTTLE G	PART THROTTLE DATE	PART THROTTLE AMB TMP	PART THROTTLE BARO	PART THROTTLE HUM
10	5	KI 137	F	1980	A	8.4	Y	12149	12	D	1	D	12-8-80	71	30.11	50					
											2	D	12-9-80	69	29.97	59					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MANIF	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MANIF
1	1	4.0	1150	88.0			
1	2	5.0	1050	89.7			
2	1	2.0	1150	86.0			
2	2	1.0	1050	86.0			
3	1	5.0	1150	89.0			
3	2	6.0	1050	89.3			
4	1	4.0	1150	88.0			
4	2	4.0	1050	88.0			
5	1	3.0	1150	87.0			
5	2	2.0	1050	86.6			
6	1	5.0	1150	89.0			
6	2	6.0	1050	89.3			
7	1	9.0	1150	92.0			
7	2	11.0	1050	92.5			
8	1	10.0	1150	92.5			
8	2	10.0	1050	92.0			
9	1	8.0	1150	91.3			
9	2	9.0	1050	91.3			
10	1	10.0	1150	92.5			
10	2	12.0	1050	93.0			
11	1	10.0	1150	92.5			
11	2	11.0	1050	92.5			
12	1	12.0	1150	93.5			
12	2	12.0	1050	93.0			
13	1	12.0	1150	93.5			
13	2	13.0	1050	93.5			
14	1	13.0	1150	94.0			
14	2	13.0	1050	94.0			
15	1	13.0	1150	94.0			
15	2	14.0	1050	94.3			
16	1	14.0	1150	94.3			
16	2	15.0	1150	94.3			
17	1	15.0	1150	94.7			
17	2	16.0	1050	94.6			
18	1	15.0	1150	94.7			
18	2	17.0	1050	95.0			
19	1	16.0	1150	95.0			
19	2	17.0	1050	95.0			
20	1	16.0	1150	95.0			
20	2	16.0	1050	94.6			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	IST LOC	RUN NO	FULL THROTTLE G	FULL THROTTLE DATE	FULL THROTTLE AMB TMP	FULL THROTTLE BARO	FULL THROTTLE HUM	PART THROTTLE G	PART THROTTLE DATE	PART THROTTLE AMB TMP	PART THROTTLE BARO	PART THROTTLE HUM
21	29	LIA 238	F	1980	A	8.0	Y	12137	15	D	1	D	11-8-80	70	29.42	40	D	11-8-80	70	29.42	40
											2	D	11-10-80	71	29.83	57	D	11-10-80	71	29.83	57

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MJOU	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MJOU
1	1	2.6	1650	90.0	14.2	1650	85.5
1	2	7.0	1800	89.0	12.8	1850	88.6
2	1	2.0	1700	89.6	13.8	1650	85.2
2	2	8.1	1850	89.5	15.2	1850	90.0
3	1	0.8	1650	88.9	20.4	1650	85.3
3	2	6.4	1850	88.7	13.2	1850	88.8
4	1	3.0	1750	90.2	14.8	1650	85.6
4	2	8.4	1850	89.4	14.6	1850	89.7
5	1	2.4	1750	89.8	12.8	1650	84.8
5	2	8.1	1850	89.5	13.9	1850	89.2
6	1	2.2	1750	89.7	14.0	1650	85.3
6	2	7.8	1850	89.3	14.0	1850	89.4
7	1	8.8	1700	93.0	16.2	1650	86.3
7	2	10.2	1850	90.5	16.8	1850	90.9
8	1	10.5	1750	93.7	17.4	1650	86.9
8	2	9.4	1850	90.1	15.4	1850	90.4
9	1	8.5	1700	92.8	14.0	1650	86.4
9	2	9.8	1850	90.3	16.9	1850	91.0
10	1	9.3	1750	93.2	17.0	1650	86.7
10	2	11.0	1850	90.8	16.2	1850	90.6
11	1	9.8	1700	93.4	18.2	1600	87.2
11	2	11.2	1850	90.9	18.3	1850	91.7
12	1	12.1	1700	94.1	20.0	1600	88.3
12	2	14.2	1850	92.5	19.0	1850	92.2
13	1	11.8	1750	94.2	20.0	1650	88.3
13	2	13.2	1850	92.0	18.8	1850	92.0
14	1	12.5	1750	94.4	19.5	1650	88.0
14	2	14.0	1850	92.4	18.3	1850	91.7
15	1	13.0	1750	94.6	20.7	1600	88.7
15	2	16.5	1850	93.8	19.4	1850	92.3
16	1	13.5	1700	94.8	21.0	1600	88.9
16	2	16.8	1850	94.0	19.0	1850	92.2
17	1	14.2	1750	95.2	20.4	1650	88.5
17	2	18.5	1850	94.9	19.6	1850	92.4
18	1	14.4	1750	95.5	22.0	1650	89.7
18	2	18.2	1850	94.4	20.4	1850	92.8
19	1	14.4	1700	95.5	22.6	1600	90.0
19	2	17.9	1851	94.5	22.0	1850	91.6
20	1	16.4	1750	96.0	23.4	1650	90.5
20	2	18.6	1850	95.0	22.3	1850	93.7

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
22	29	11A 23A	F	1980	A	8.0	Y	8146	15	D	1	D	11-21-80	70	29.37	44	D	11-21-80	70	29.37	44
											2	D	11-22-80	70	29.25	38	D	11-22-80	70	29.25	38

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MUON	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MUON
1	1	8.0	1900	89.0	15.2	1500	86.7
1	2	11.3	1850	89.6	15.6	1500	85.4
2	1	11.5	1850	89.5	15.9	1550	87.0
2	2	11.9	1850	89.6	16.2	1500	86.4
3	1	11.7	1800	90.7	15.2	1550	86.8
3	2	12.4	1800	89.9	12.4	1500	85.4
4	1	12.0	1850	90.8	16.6	1550	87.2
4	2	12.0	1800	89.6	16.6	1500	86.5
5	1	12.9	1400	91.2	17.2	1500	87.9
5	2	13.0	1900	90.1	17.7	1550	86.8
6	1	10.2	1850	90.0	15.0	1550	86.7
6	2	11.0	1400	90.4	15.8	1500	86.2
7	1	17.5	1900	92.9	17.0	1550	87.4
7	2	17.0	1850	92.0	15.0	1500	86.1
8	1	18.2	1800	92.5	14.4	1500	86.5
8	2	16.6	1850	91.8	15.5	1550	86.2
9	1	16.1	1900	92.6	15.0	1550	86.7
9	2	14.7	1850	90.9	15.8	1550	86.3
10	1	18.6	1900	93.2	17.0	1600	87.4
10	2	19.0	1850	92.8	18.7	1550	87.2
11	1	18.8	1800	93.1	22.1	1550	89.4
11	2	18.0	1800	92.4	21.2	1500	88.0
12	1	19.5	1800	93.5	22.6	1500	89.6
12	2	19.2	1850	92.8	22.0	1550	88.3
13	1	19.0	1850	93.4	19.4	1550	88.3
13	2	18.6	1900	92.7	19.0	1550	87.3
14	1	16.6	1900	92.6	18.8	1500	88.5
14	2	19.4	1850	91.0	21.6	1550	88.2
15	1	19.5	1800	93.5	20.7	1800	88.8
15	2	19.2	1900	93.0	21.5	1550	89.3
16	1	19.6	1800	93.6	19.6	1500	89.4
16	2	20.0	1850	93.2	21.8	1550	88.4
17	1	21.3	1850	94.0	21.4	1500	89.3
17	2	21.0	1900	93.6	21.2	1600	88.6
18	1	22.6	1800	94.3	19.4	1500	88.3
18	2	21.8	1850	93.9	21.1	1550	89.0
19	1	23.1	1900	94.5	19.3	1500	88.5
19	2	22.1	1900	94.0	22.8	1600	88.7
20	1	24.6	1800	94.7	20.1	1500	88.6
20	2	22.4	1900	94.2	24.3	1600	89.4

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	EST LOC	RUN NO	FUEL THROTTLE G	FUEL THROTTLE DATE	FUEL THROTTLE AMB TMP	FUEL THROTTLE BARO	FUEL THROTTLE HUM	PART THROTTLE G	PART THROTTLE DATE	PART THROTTLE AMB TMP	PART THROTTLE BARO	PART THROTTLE HUM
16	8	M V250	F	1980	A	8.4	Y	26041	6	D	1	D	2-3-81	75	29.84	21					
											2	D	2-4-81	75	29.96	10					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE NOISE	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE NOISE
1	1	8.2	1700	90.6			
1	2	6.2	1700	89.2			
2	1	5.6	1700	88.0			
2	2	5.5	1700	88.8			
3	1	6.0	1700	89.4			
3	2	6.7	1700	89.3			
4	1	6.4	1700	89.5			
4	2	5.8	1700	88.0			
5	1	5.7	1700	89.1			
5	2	5.4	1700	88.7			
6	1	5.8	1700	89.1			
6	2	7.9	1700	90.2			
7	1	9.7	1700	91.4			
7	2	11.3	1700	92.1			
8	1	9.5	1700	91.3			
8	2	9.8	1700	91.3			
9	1	8.9	1700	91.0			
9	2	9.6	1700	91.2			
10	1	9.8	1700	91.5			
10	2	10.7	1700	91.8			
11	1	9.6	1700	91.3			
11	2	9.7	1700	91.2			
12	1	11.0	1700	92.1			
12	2	12.4	1700	92.6			
13	1	9.7	1700	91.4			
13	2	11.7	1700	92.3			
14	1	10.9	1700	92.1			
14	2	11.9	1500	92.4			
15	1	11.2	1700	92.2			
15	2	12.8	1700	92.7			
16	1	13.3	1700	93.0			
16	2	13.5	1700	93.0			
17	1	12.0	1700	92.5			
17	2	12.8	1700	92.7			
18	1	13.1	1700	93.0			
18	2	14.0	1700	93.2			
19	1	13.5	1700	93.0			
19	2	15.0	1700	93.6			
20	1	14.8	1700	93.5			
20	2	15.2	1700	93.7			

CAR NO	LAB NO	CAR CODE	EN CT	MODEL YEAR	TRANS	C.R.	AIR COND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
5	4	MC5 225	C	1980	A	8.2	Y	19521	6	D	1	D	1-24-81	74	28.94	42	D	1-27-81	69	28.84	33
											2	D	1-25-81	68	29.00	24	D	1-29-81	72	28.77	40

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MANIFOLD	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MANIFOLD
1	1	36.0	2400	89.0	31.0	1900	83.1
1	2	35.0	2400	89.1	34.0	1900	83.8
2	1	36.0	2400	89.0	32.0	1900	83.5
2	2	37.0	2400	89.7	35.0	1900	84.0
3	1	33.0	2400	88.1	31.0	1900	83.1
3	2	34.0	2400	88.7	34.0	1900	83.8
4	1	38.0	2400	89.6	33.0	1900	84.0
4	2	39.0	2400	90.2	36.0	1900	84.5
5	1	35.0	2400	88.7	32.0	1900	83.5
5	2	38.0	2400	90.0	35.0	1900	84.0
6	1	33.0	2400	88.1	36.0	1900	84.7
6	2	32.0	2400	88.0	36.0	1900	84.5
7	1	39.0	2400	89.8	37.0	1900	85.0
7	2	39.0	2400	90.2	38.0	1900	85.1
8	1	39.0	2400	89.8	36.0	1900	84.7
8	2	39.0	2400	90.2	39.0	1900	85.4
9	1	38.0	2400	89.6	34.0	1900	84.2
9	2	40.0	2400	90.5	35.0	1900	84.0
10	1	40.0	2400	90.0	39.0	1900	85.6
10	2	38.0	2400	90.0	42.0	1900	86.3
11	1	44.0	2400	90.9	39.0	1900	85.6
11	2	46.0	2400	91.9	38.0	1900	85.1
12	1	44.0	2400	90.9	42.0	1900	86.4
12	2	44.0	2400	91.5	39.0	1900	85.4
13	1	49.0	2400	91.8	40.0	1900	86.0
13	2	44.0	2400	91.5	39.0	1900	85.4
14	1	44.0	2400	90.9	39.0	1900	85.6
14	2	42.0	2400	91.0	41.0	1900	86.0
15	1	41.0	2400	90.3	39.0	1900	85.6
15	2	42.0	2400	91.0	41.0	1900	86.6
16	1	44.0	2400	90.9	40.0	1900	86.0
16	2	43.0	2400	91.3	40.0	1900	85.7
17	1	53.0	2400	92.5	41.0	1900	85.7
17	2	47.0	2400	92.2	41.0	1900	85.0
18	1	51.0	2400	92.2	42.0	1900	87.1
18	2	48.0	2400	92.4	42.0	1900	86.3
19	1	52.0	2400	92.1	44.0	1900	86.9
19	2	49.0	2400	92.6	42.0	1900	86.3
20	1	44.0	2400	90.4	41.0	1900	86.4
20	2	44.0	2400	91.5	41.0	1900	86.6

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	ADJ TMP	BARO	HUM
20	26	NC/ 228	F	1980	A	8.5		42104	8	D	1	D	12-9-80	71	30.00	50					
											2	D	12-11-80	72	30.30	41					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	RPM	MJOW	PART THROTTLE SPRK ADV	RPM	MJOW
1	1	22.3	2500	88.5			
1	2	16.5	2300	84.8			
2	1	25.5	2350	89.5			
2	2	22.3	2300	87.8			
3	1	17.0	2400	86.4			
3	2	17.5	2400	85.9			
4	1	24.0	2300	89.3			
4	2	23.0	2350	88.8			
5	1	21.3	2400	88.2			
5	2	25.5	2300	88.6			
6	1	17.8	2400	87.0			
6	2	16.5	2450	86.2			
7	1	28.5	2300	90.7			
7	2	32.0	2300	91.2			
8	1	27.0	2450	90.0			
8	2	24.0	2200	88.3			
9	1	21.3	2300	88.4			
9	2	26.5	2500	89.8			
10	1	27.0	2350	90.2			
10	2	30.0	2300	89.7			
11	1	30.5	2300	91.2			
11	2	33.0	2350	91.5			
12	1	27.0	2350	90.2			
12	2	42.5	2250	92.6			
13	1	27.5	2300	90.4			
13	2	31.5	2400	91.1			
14	1	31.5	2350	91.4			
14	2	32.5	2200	90.3			
15	1	24.5	2150	89.5			
15	2	45.5	2250	91.0			
16	1	24.0	2150	89.6			
16	2	36.5	2300	91.3			
17	1	29.5	2400	90.6			
17	2	31.0	2350	90.5			
18	1	43.0	2250	91.6			
18	2	33.5	2250	91.6			
19	1	27.5	2550	90.4			
19	2	41.0	2250	91.0			
20	1	44.5	2300	91.8			
20	2	46.0	2200	92.0			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
15	8	NEW 450	F	1980	A	8.6	Y	15018	4	D	1	D	1-28-81	75	29.68	18					
											2	D	1-29-81	75	29.80	29					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MANIF	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MANIF
1	1	8.4	1400	89.2			
1	2	8.0	1400	89.1			
2	1	9.2	1400	89.4			
2	2	9.1	1400	89.4			
3	1	8.5	1400	89.1			
3	2	8.2	1400	89.1			
4	1	9.7	1400	89.5			
4	2	10.4	1400	89.7			
5	1	9.3	1400	89.4			
5	2	10.5	1400	89.8			
6	1	7.2	1400	88.6			
6	2	7.3	1400	88.9			
7	1	13.0	1400	91.8			
7	2	13.7	1400	90.9			
8	1	13.3	1400	91.5			
8	2	15.1	1400	91.4			
9	1	11.5	1400	90.6			
9	2	12.7	1400	90.5			
10	1	15.2	1400	91.8			
10	2	14.2	1400	91.1			
11	1	15.0	1400	92.1			
11	2	14.6	1400	91.2			
12	1	15.7	1400	92.5			
12	2	16.1	1400	91.8			
13	1	15.8	1400	92.5			
13	2	16.5	1400	91.9			
14	1	14.0	1400	92.1			
14	2	14.1	1400	91.6			
15	1	16.1	1400	92.2			
15	2	15.4	1400	91.5			
16	1	16.9	1400	92.4			
16	2	16.9	1400	92.1			
17	1	17.6	1400	92.4			
17	2	17.6	1400	92.3			
18	1	18.3	1400	92.8			
18	2	18.4	1400	92.6			
19	1	18.9	1400	93.0			
19	2	18.6	1400	92.7			
20	1	18.8	1400	93.1			
20	2	18.8	1400	92.8			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	IST LOC	RUN NO	FUEL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
14	8	NH 450	F	1980	A	8.6	Y	19430	4	D	1	D	1-21-81	75	29.99	21					
											2	D	1-22-81	75	29.61	18					

FUEL NO	RUN NO	FUEL THROTTLE SPRK ADV	FUEL THROTTLE RPM	FUEL THROTTLE RUN	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE RUN
1	1	5.6	1800	89.5			
1	2	8.4	1800	90.2			
2	1	6.5	1800	89.6			
2	2	5.6	1800	88.9			
3	1	6.1	1800	89.4			
3	2	7.0	1800	88.8			
4	1	6.9	1800	90.5			
4	2	7.2	1800	89.9			
5	1	7.4	1800	90.6			
5	2	7.6	1800	90.0			
6	1	5.7	1800	89.1			
6	2	5.2	1800	88.6			
7	1	9.5	1800	92.3			
7	2	13.1	1800	92.3			
8	1	11.6	1800	92.5			
8	2	11.7	1800	92.3			
9	1	9.6	1800	92.0			
9	2	12.3	1800	92.1			
10	1	12.0	1800	92.3			
10	2	12.2	1800	92.0			
11	1	11.8	1800	92.6			
11	2	11.9	1800	92.3			
12	1	11.9	1800	93.0			
12	2	14.1	1800	92.6			
13	1	12.1	1800	93.0			
13	2	14.8	1800	92.8			
14	1	10.7	1800	92.7			
14	2	13.6	1800	92.5			
15	1	13.7	1800	93.9			
15	2	14.1	1800	93.1			
16	1	15.8	1800	93.9			
16	2	13.9	1800	92.8			
17	1	12.9	1800	93.1			
17	2	17.4	1800	93.6			
18	1	15.0	1800	93.1			
18	2	15.4	1800	93.5			
19	1	15.6	1800	93.5			
19	2	16.6	1800	93.1			
20	1	15.0	1800	93.5			
20	2	18.0	1800	93.9			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	G	FULL THROTTLE DATE	AMB TMP	BARO	RUN	G	PART THROTTLE DATE	AMB TMP	BARO	RUN
28	35	NTG 230	F	1979	A	8.4	Y	33046	6	D	1	D	1-6-81	72	29.62	68					
											2	D	1-21-81	76	29.67	59					

FUEL RUN	RUN NO	FULL THROTTLE SPRK ADV	RPM	MUDD	PART THROTTLE SPRK ADV	RPM	MUDD
1	1	6.4	1900	88.5			
1	2	5.7	2050	89.1			
2	1	6.4	2200	88.5			
2	2	6.0	2050	87.1			
3	1	6.2	2200	88.2			
3	2	5.0	2140	88.7			
4	1	7.0	2030	89.7			
4	2	6.5	2080	89.7			
5	1	7.5	2080	90.8			
5	2	5.5	2070	89.0			
6	1	7.0	2030	90.7			
6	2	5.5	2010	89.0			
7	1	10.0	2215	90.8			
7	2	8.5	2200	91.0			
8	1	10.7	2150	91.4			
8	2	9.0	2210	91.1			
9	1	9.0	1975	90.0			
9	2	9.0	2100	91.3			
10	1	11.5	2200	91.5			
10	2	9.0	2140	91.1			
11	1	11.0	2295	91.0			
11	2	10.5	2170	92.2			
12	1	12.5	2180	92.2			
12	2	12.0	2140	92.8			
13	1	11.5	2295	91.5			
13	2	10.5	2240	92.2			
14	1	12.5	2190	92.2			
14	2	11.0	2090	92.6			
15	1	11.5	2200	91.5			
15	2	12.0	2150	93.8			
16	1	13.5	2175	92.7			
16	2	12.0	2250	92.9			
17	1						
17	2						
18	1	14.0	2180	92.9			
18	2	13.0	2170	93.3			
19	1	14.0	2150	92.9			
19	2	13.5	2100	93.6			
20	1	13.5	2020	92.7			
20	2	14.0	2200	93.6			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPD	TST LOC	RUN NO	FULL THROTTLE				PART THROTTLE			
												S	DATE	ADV TMP	HUMD	ODM	S	DATE	SPD LOC	HUMD	ODM
12	8	NIJ 2#4	F	1980	A	8.3	Y	22386	4	D	1	D	1-8-81	80	29.88	16					
											2	D	1-9-81	80	30.12	17					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	RPM	HUMD	PART THROTTLE SPRK ADV	RPM	HUMD
1	1	7.8	1700	89.3			
1	2	8.4	1700	89.6			
2	1	7.2	1700	89.8			
2	2	6.4	1700	89.1			
3	1	7.7	1700	89.2			
3	2	7.1	1700	89.7			
4	1	8.8	1700	89.7			
4	2	6.4	1700	89.4			
5	1	8.8	1700	89.7			
5	2	7.0	1700	89.7			
6	1	5.7	1700	89.4			
6	2	4.8	1700	89.3			
7	1	12.0	1700	91.0			
7	2	11.4	1700	91.1			
8	1	11.0	1700	90.8			
8	2	11.6	1700	91.4			
9	1	11.1	1700	90.7			
9	2	10.1	1700	91.1			
10	1	13.7	1700	91.7			
10	2	12.6	1700	91.7			
11	1	14.0	1700	92.8			
11	2	12.8	1700	91.8			
12	1	16.4	1700	92.6			
12	2	13.7	1700	92.1			
13	1	14.5	1700	92.0			
13	2	13.1	1700	92.0			
14	1	14.3	1700	91.9			
14	2	13.4	1700	92.0			
15	1	14.7	1700	92.4			
15	2	14.3	1700	92.1			
16	1	15.1	1700	92.3			
16	2	16.8	1700	92.6			
17	1	16.6	1700	92.6			
17	2	16.2	1700	92.9			
18	1	16.8	1700	92.7			
18	2	15.5	1700	92.6			
19	1	17.1	1700	92.9			
19	2	15.4	1700	92.6			
20	1	16.1	1700	93.1			
20	2	17.1	1700	93.1			

CAR NO	LAB NO	CAR CODE	EN CY	MODEL YEAR	BODY	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	MIN HO	G	DATE	FULL THROTTLE AND TRP	HARD	ODOM	G	DATE	PART THROTTLE AND TRP	HARD	ODOM
1	4	MIN 438	F	1980	A	8.6	Y	17963	10	D	1	D	2-6-81	82	29.16	28				
											2	D	2-5-81	81	29.69	11				

FUEL NO	MIN TH	FULL THROTTLE SPRK ADV	RPM	MTON	PART THROTTLE SPRK ADV	RPM	MTON
1	1	26.0	1800	89.6			
1	2	25.0	1800	88.9			
2	1	26.0	1800	89.6			
2	2	26.0	1800	89.6			
3	1	26.0	1800	90.4			
3	2	27.0	1800	90.2			
4	1	26.0	1800	90.4			
4	2	27.0	1800	90.2			
5	1	26.0	1800	90.4			
5	2	25.0	1800	88.9			
6	1	26.0	1800	89.6			
6	2	27.0	1800	90.2			
7	1	31.0	1800	92.0			
7	2	30.0	1800	91.8			
8	1	32.0	1800	92.0			
8	2	30.0	1800	91.8			
9	1	29.0	1800	91.0			
9	2	29.0	1800	91.1			
10	1	32.0	1800	92.4			
10	2	30.0	1800	91.8			
11	1	32.0	1800	92.4			
11	2	30.0	1800	91.8			
12	1	34.0	1800	93.2			
12	2	32.0	1800	92.7			
13	1	33.0	1800	92.4			
13	2	32.0	1800	92.7			
14	1	31.0	1800	92.0			
14	2	31.0	1800	92.3			
15	1	31.0	1800	92.0			
15	2	32.0	1800	92.7			
16	1	34.0	1800	93.2			
16	2	34.0	1800	93.0			
17	1	35.0	1800	93.5			
17	2	33.0	1800	93.2			
18	1	34.0	1800	93.2			
18	2	35.0	1800	93.8			
19	1	35.5	1800	93.6			
19	2	36.0	1800	94.0			
20	1	35.0	1800	93.5			
20	2	36.0	1800	94.0			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	ADJ CRB	ODOM MILES	STD SPK	TST LOC	IDLE RPM	G	FULL THROTTLE DATE	AMB TMP	BARO	RPM	G	PART THROTTLE DATE	AMB TMP	BARO	RPM
9	5	NIK 238	F	1980	A	8.6	Y	11962	10	0	1	D	11-19-80	70	29.68	56					
											2	D	11-19-80	70	30.20	52					

FUEL NO	IDM NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MANIF	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MANIF
1	1	11.0	1850	89.1			
1	2	11.0	1850	93.0			
2	1	12.0	1850	90.0			
2	2	10.0	1850	89.2			
3	1	12.0	1850	90.0			
3	2	10.0	1850	89.2			
4	1	13.0	1850	90.5			
4	2	12.0	1850	90.5			
5	1	12.0	1850	90.0			
5	2	10.0	1850	89.2			
6	1	13.0	1850	90.5			
6	2	11.0	1850	90.0			
7	1	16.0	1850	92.0			
7	2	16.0	1850	92.4			
8	1	18.0	1850	92.5			
8	2	17.0	1850	92.8			
9	1	15.0	1850	91.5			
9	2	15.0	1850	92.0			
10	1	17.0	1850	92.5			
10	2	17.0	1850	92.8			
11	1	16.0	1850	92.0			
11	2	16.0	1850	92.4			
12	1	17.0	1850	92.7			
12	2	18.0	1850	93.3			
13	1	18.0	2050	91.0			
13	2	19.0	1850	91.3			
14	1	18.0	2050	91.0			
14	2	18.0	1850	91.1			
15	1	19.0	1850	91.5			
15	2	19.0	1850	91.6			
16	1	20.0	2050	94.0			
16	2	20.0	1900	94.0			
17	1	20.0	2050	94.0			
17	2	18.0	1850	91.1			
18	1	20.0	2050	94.0			
18	2	20.0	1850	94.0			
19	1	21.0	2050	94.5			
19	2	22.0	1900	95.8			
20	1	21.0	2050	94.5			
20	2	22.0	1900	96.0			

CAR NO	LAP NO	CAR CODE	EM CT	MODEL YEAR	TRANS	CODE	AIR COND	ODOM MILES	STD SPK	TST LOC	DOT NO	FULL THROTTLE					PART THROTTLE				
												S	DATE	ABS TRP	HARD	ODM	S	DATE	ABS TRP	HARD	ODM
35	1	NLV 216	F	1981	A	F-5	Y	56271	18	D	1	D	4-13-81	70	30.38	51	D	4-13-81	71	30.69	52
											2	D	4-13-81	71	30.57	60	D	4-13-81	71	30.83	50

FUEL NO	ODM CAR	FULL THROTTLE SPDM ADV	RPM	ODOM	PART THROTTLE SPDM ADV	RPM	ODOM
1	1	19.0	2200	89.8	26.0	1950	81.7
1	2	18.0	2200	90.1	25.0	1900	81.9
2	1						
2	2						
3	1	19.0	2200	89.8	25.0	1950	82.2
3	2	18.0	2200	89.8	22.0	1900	83.1
4	1	20.0	2200	90.2	29.0	1950	80.0
4	2	18.0	2200	90.1	27.0	2050	82.7
5	1	19.0	2200	89.8	28.0	1950	83.6
5	2	19.0	2200	91.1	27.0	1800	82.1
6	1	23.0	2200	91.4	26.0	1950	82.7
6	2	17.0	2200	90.2	10.0	1900	81.8
7	1						
7	2						
8	1	23.0	2200	91.4	27.0	1950	81.2
8	2	21.0	2200	91.9	29.0	1900	81.5
9	1	24.0	2200	91.8	25.0	1950	82.2
9	2	20.0	2200	91.5	26.0	1900	82.4
10	1	23.0	2200	91.4	29.0	1950	80.0
10	2	21.0	2200	91.9	29.0	1950	81.5
11	1	26.0	2200	92.5	7.0	1950	80.4
11	2	22.0	2200	92.2	28.0	1900	83.1
12	1	26.0	2200	92.5	31.0	1950	80.8
12	2	21.0	2200	92.6	31.0	1900	80.1
13	1	25.0	2200	92.1	31.0	1950	80.8
13	2	22.0	2200	92.2	29.0	1900	83.5
14	1	29.0	2200	93.4	15.0	1900	80.4
14	2	27.0	2200	93.8	13.0	1950	80.9
15	1	27.0	2200	92.8	31.0	1950	80.8
15	2	26.0	2200	93.5	13.0	1900	80.5
16	1	26.0	2200	92.5	28.0	1950	81.0
16	2	26.0	2200	93.5	10.0	1900	81.9
17	1						
17	2						
18	1	29.0	2200	93.1	12.0	1950	85.2
18	2	25.0	2200	94.1	11.0	1900	80.9
19	1	11.0	2200	94.0	15.0	1950	80.1
19	2	27.0	2200	93.4	11.0	1950	85.0
20	1	12.0	2200	94.1	11.0	1950	85.0
20	2	26.0	2200	93.5	31.0	1950	80.1

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	SPK ADV	TST LOC	RUN NO	G	DATE	FULL THROTTLE AIR TMP	BARO	RPM	G	DATE	PART THROTTLE AIR TMP	BARO	RPM
1	1	0 V250	F	1980	A	8.4	Y	13763	6	D	1	D	11-13-80	86	30.40	21					
											2	D	11-14-80	79	29.96	30					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MPGM	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MPGM
1	1	6.0	2100	89.5			
1	2	7.5	1900	89.8			
2	1	6.0	2100	90.5			
2	2	7.0	1900	89.5			
3	1	6.0	2100	90.5			
3	2	7.0	1900	89.5			
4	1	6.0	2100	90.5			
4	2	8.0	1900	90.0			
5	1	5.0	2100	90.0			
5	2	8.0	1900	90.1			
6	1	6.0	2100	90.5			
6	2	6.0	1900	89.1			
7	1	11.0	2100	92.9			
7	2	11.0	1900	91.5			
8	1	11.0	2100	92.9			
8	2	13.0	1900	92.4			
9	1	9.0	2100	92.0			
9	2	11.5	1900	91.7			
10	1	10.0	2100	92.4			
10	2	14.0	1900	93.1			
11	1	12.0	2100	93.1			
11	2	12.5	1900	92.2			
12	1	13.0	2100	93.7			
12	2	15.0	1900	93.7			
13	1	13.0	2100	93.7			
13	2	13.0	1900	92.7			
14	1	11.0	2100	93.7			
14	2	12.5	1900	92.2			
15	1	14.0	2100	94.1			
15	2	14.0	1900	92.9			
16	1	15.0	2100	94.5			
16	2	14.0	1900	92.9			
17	1	14.0	2100	94.1			
17	2	15.0	1900	93.3			
18	1	16.0	2100	94.9			
18	2	15.0	1900	93.3			
19	1	17.0	2100	95.2			
19	2	17.0	1900	94.0			
20	1	16.0	2100	94.9			
20	2	15.5	1900	93.6			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	RHM	PART THROTTLE G	DATE	AMB TMP	BARO	RHM
34	7	0 V250	F	1980	A	8.4	Y	6377	6	D	1	D	4-7-81	69	30.51	58	D	4-10-81	70	30.47	61
											2	D	4-7-81	70	30.49	57	D	4-10-81	71	30.47	60

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MUON	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MUON
1	1	14.0	1700	92.6	18.0	1450	87.8
1	2	15.0	1700	91.9	15.0	1900	86.8
2	1						
2	2						
3	1	13.0	1700	91.8	17.0	1950	87.2
3	2	14.0	1700	90.9	15.0	1400	86.8
4	1	15.0	1700	93.2	18.0	1450	87.8
4	2	18.0	1700	93.8	17.0	1400	87.7
5	1	14.0	1700	92.6	19.0	1450	84.3
5	2	15.0	1700	91.9	19.0	1350	88.6
6	1	15.0	1700	93.2	17.0	1450	87.2
6	2	18.0	1700	93.8	15.0	1400	86.8
7	1						
7	2						
8	1	20.0	1700	95.8	22.0	1450	90.0
8	2	21.0	1700	95.4	19.0	1400	88.6
9	1	18.0	1700	94.8	19.0	1900	88.3
9	2	19.0	1700	94.4	18.0	1400	88.2
10	1	19.0	1700	95.4	24.0	1850	90.9
10	2	20.0	1700	94.9	22.0	1700	89.8
11	1	19.0	1700	95.4	20.0	1350	89.9
11	2	20.0	1700	94.9	20.0	1400	89.0
12	1	21.0	1700	96.2	25.0	1350	91.4
12	2	22.0	1700	95.6	24.0	1400	90.6
13	1	19.0	1700	95.4	24.0	1350	90.9
13	2	21.0	1700	95.4	22.0	1500	89.8
14	1	20.0	1700	95.8	22.0	1350	90.0
14	2	20.0	1700	94.8	22.0	1400	89.8
15	1	19.0	1700	95.4	21.0	2250	89.4
15	2	23.0	1700	96.2	19.0	2100	88.6
16	1	24.0	1700	97.4	26.0	1350	91.6
16	2	25.0	1700	96.9	25.0	1650	90.9
17	1						
17	2						
18	1	26.0	1700	96.6	24.0	1850	90.9
18	2	25.0	1700	96.9	22.0	1400	89.8
19	1	25.0	1700	96.2	25.0	1350	91.4
19	2	26.0	1700	97.2	24.0	1400	90.5
20	1	25.0	1700	96.2	25.0	1350	91.4
20	2	26.0	1700	97.2	24.0	1700	92.0

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	IST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
23	29	OCA 133	F	1980	A	8.6	Y	16345	10	0	1	0	11-19-80	70	29.95	53	0	11-19-80	70	29.95	53
											2	0	11-20-80	70	29.82	70	0	11-20-80	70	29.82	70

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MBON	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MBON
1	1	8.6	2100	88.8	13.4	1900	86.9
1	2	9.3	2150	89.0	14.4	1950	87.5
2	1	8.8	2100	89.0	14.0	1900	87.2
2	2	9.3	2200	89.0	14.4	1950	87.5
3	1	9.6	2150	89.4	13.0	1900	86.7
3	2	11.0	2200	90.0	14.6	1950	87.6
4	1	10.1	2100	89.7	14.4	1900	87.4
4	2	11.0	2200	90.0	14.4	1950	87.5
5	1	10.0	2100	89.6	14.4	1900	87.4
5	2	11.0	2150	90.0	14.9	1950	87.8
6	1	10.1	2100	89.7	14.2	1900	87.3
6	2	9.3	2150	89.0	12.5	1950	86.4
7	1	12.0	2100	90.7	15.0	1900	87.6
7	2	13.5	2150	91.5	16.0	1950	88.3
8	1	12.0	2100	90.7	15.1	1900	87.7
8	2	13.0	2150	91.2	16.0	1950	88.3
9	1	10.0	2100	89.6	14.0	1900	87.2
9	2	10.0	2150	89.4	15.9	1950	88.3
10	1	11.4	2100	90.4	18.6	1900	89.3
10	2	12.2	2150	90.8	17.2	1900	88.9
11	1	12.5	2100	91.0	18.2	1900	89.1
11	2	14.6	2200	92.1	19.0	1950	89.8
12	1	15.7	2100	92.5	19.2	1900	89.5
12	2	15.6	2150	92.6	19.8	1950	90.2
13	1	15.0	2100	92.2	18.0	1900	89.0
13	2	16.2	2250	93.0	19.5	1950	90.0
14	1	15.2	2100	92.3	19.1	1900	89.5
14	2	15.8	2200	92.8	18.8	1950	89.1
15	1	16.8	2100	93.0	18.0	1900	89.0
15	2	16.5	2150	93.2	17.6	1950	89.1
16	1	16.8	2100	93.3	20.0	1900	89.9
16	2	16.8	2200	93.3	20.4	1950	90.6
17	1	18.2	2100	93.5	19.6	1900	89.7
17	2	17.1	2150	93.4	19.5	1950	90.0
18	1	18.4	2100	93.6	21.0	1900	90.3
18	2	17.1	2150	93.4	21.0	1950	91.0
19	1	14.4	2100	93.6	22.4	1900	90.3
19	2	17.1	2150	93.7	22.4	1950	91.2
20	1	14.9	2100	93.8	21.4	1900	90.4
20	2	18.7	2250	94.2	22.7	1950	91.3

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	ATP CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
24	29	OCA 133	F	1980	A	8.6	Y	20580	10	D	1	D	11-24-80	70	30.17	41	D	11-24-80	70	30.17	41
											2	D	11-25-80	70	30.15	48	D	11-25-80	70	30.15	48

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	RPM	MUON	PART THROTTLE SPRK ADV	RPM	MUON
1	1	7.7	2100	89.0	10.5	1800	88.3
1	2	8.4	2150	88.6	10.6	1900	88.3
2	1	8.6	2100	88.5	11.2	1800	88.6
2	2	7.4	2150	87.9	9.9	1850	87.9
3	1	10.0	2100	89.3	10.5	1800	88.3
3	2	8.4	2150	88.6	9.9	1850	87.9
4	1	10.0	2100	89.3	11.0	1800	89.6
4	2	8.9	2150	88.9	11.8	1900	88.6
5	1	10.6	2100	89.6	11.5	1800	88.9
5	2	11.0	2200	90.2	12.0	1900	89.2
6	1	10.3	2100	89.5	11.7	1800	89.0
6	2	10.0	2150	89.6	10.9	1900	88.5
7	1	14.0	2100	91.3	15.6	1800	91.1
7	2	13.0	2150	91.4	14.6	1850	90.6
8	1	13.4	2100	91.1	14.9	1800	90.9
8	2	11.5	2150	90.5	14.0	1850	90.3
9	1	12.1	2100	90.4	12.9	1800	89.7
9	2	12.5	2150	91.1	13.0	1850	89.8
10	1	13.9	2100	91.3	15.5	1800	91.1
10	2	15.0	2200	92.4	16.5	1900	91.6
11	1	15.5	2100	92.0	16.5	1800	91.6
11	2	14.0	2150	91.9	14.9	1850	90.8
12	1	15.9	2100	92.2	18.0	1800	92.3
12	2	16.1	2200	92.9	19.1	1850	92.6
13	1	17.4	2100	92.8	18.3	1900	91.8
13	2	16.0	2150	92.9	18.5	1850	92.0
14	1	15.9	2100	92.2	16.5	1800	91.6
14	2	15.0	2150	92.4	16.0	1850	91.3
15	1	17.4	2100	92.8	18.9	1800	91.8
15	2	17.2	2150	92.7	17.7	1850	92.2
16	1	16.5	2100	92.4	18.0	1800	92.3
16	2	18.0	2150	93.0	17.8	1850	92.2
17	1	17.0	2100	92.6	17.6	1800	92.7
17	2	18.0	2150	93.0	16.9	1850	91.8
18	1	17.5	2100	92.8	18.5	1800	92.5
18	2	18.3	2150	93.0	17.5	1850	92.0
19	1	19.0	2100	93.0	20.3	1900	91.7
19	2	19.8	2200	92.9	19.5	1850	92.7
20	1	18.7	2100	93.3	19.3	1900	92.9
20	2	19.0	2200	93.0	17.3	1850	92.7

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	DATE	ABR BAP	BARO	RUM	PART THROTTLE G	DATE	ABR BAP	BARO	RUM
17	26	OCA 223	F	1980	A	9.0	Y	20236	6	D	1	D	1-28-81	71	30.00	55					
											2	D	1-30-81	72	30.10	58					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	RPM	RUGH	PART THROTTLE SPRK ADV	RPM	RUGH
1	1	34.0	2500	89.6			
1	2	35.0	2500	89.8			
2	1	35.5	2500	90.1			
2	2	37.0	2500	89.6			
3	1	34.0	2500	89.3			
3	2	34.0	2600	89.4			
4	1	38.0	2500	90.3			
4	2	37.5	2500	89.8			
5	1	35.5	2450	89.2			
5	2	35.0	2500	88.8			
6	1	33.5	2500	88.4			
6	2	33.0	2450	88.0			
7	1	39.0	2600	91.9			
7	2	40.5	2500	91.1			
8	1	40.5	2500	91.3			
8	2	38.5	2550	90.			
9	1	40.5	2550	91.3			
9	2	41.0	2500	91.3			
10	1	41.5	2500	92.9			
10	2	42.0	2500	91.9			
11	1	40.5	2550	92.5			
11	2	42.0	2550	91.8			
12	1	41.5	2400	92.9			
12	2	42.0	2400	91.9			
13	1	42.5	2400	92.0			
13	2	42.0	2500	91.8			
14	1	42.0	2550	93.1			
14	2	41.5	2550	91.4			
15	1	41.0	2500	92.7			
15	2	45.5	2500	93.6			
16	1	44.0	2500	92.6			
16	2	45.0	2450	93.4			
17	1	45.5	2450	93.2			
17	2	45.5	2500	93.6			
18	1	45.0	2450	93.0			
18	2	44.5	2700	93.1			
19	1	45.0	2550	94.1			
19	2	46.5	2700	94.2			
20	1	46.5	2450	94.5			
20	2	47.5	2450	93.9			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
8	4	OCA 242	C	1980	A	8.8	Y	15115	6	D	1	D	2-17-81	76	29.38	65	D	2-19-81	74	29.01	79
											2	D	2-18-81	77	29.15	54	D	2-20-81	74	28.80	55

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MUON	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MUON
1	1	15.0	1800	89.6	36.0	1600	83.3
1	2	15.0	1800	89.9	37.0	1600	82.7
2	1	15.0	1800	88.6	37.0	1600	83.7
2	2	15.0	1800	88.9	38.0	1600	83.2
3	1	16.0	1800	89.3	38.0	1600	84.2
3	2	17.0	1800	90.0	39.0	1600	83.2
4	1	17.0	1800	89.9	41.0	1600	85.6
4	2	17.0	1800	90.0	42.0	1600	85.3
5	1	16.0	1800	89.3	38.0	1600	84.2
5	2	17.0	1800	90.0	39.0	1600	83.7
6	1	16.0	1800	89.3	39.0	1600	84.7
6	2	17.0	1800	90.0	39.0	1600	83.7
7	1	22.0	1800	92.9	39.0	1600	84.7
7	2	23.0	1800	93.0	40.0	1600	84.3
8	1	21.0	1800	92.4	40.0	1600	85.1
8	2	22.0	1800	92.5	40.0	1600	84.3
9	1	19.0	1800	91.3	37.0	1600	83.7
9	2	19.0	1800	91.0	39.0	1600	83.7
10	1	22.0	1800	92.5	41.0	1600	85.6
10	2	23.0	1800	93.0	42.0	1600	85.3
11	1	22.0	1800	92.9	40.0	1600	85.1
11	2	23.0	1800	93.0	43.0	1600	85.8
12	1	23.0	1800	93.4	43.0	1600	86.5
12	2	23.0	1800	93.6	43.0	1600	85.8
13	1	23.0	1800	93.4	42.0	1600	86.0
13	2	24.0	1800	93.5	43.0	1600	85.8
14	1	22.0	1800	92.9	45.0	1600	87.3
14	2	23.0	1800	93.0	45.0	1600	86.7
15	1	25.0	1800	[illegible]	40.0	1600	85.1
15	2	26.0	1800	94.4	43.0	1600	85.8
16	1	25.0	1800	94.1	42.0	1600	86.0
16	2	26.0	1800	94.4	42.0	1600	85.1
17	1	24.0	1800	93.7	41.0	1600	85.6
17	2	25.0	1800	93.9	44.0	1600	86.2
18	1	25.0	1800	94.1	44.0	1600	86.9
18	2	24.0	1800	93.5	45.0	1600	86.7
19	1	26.0	1800	94.7	46.0	1600	87.3
19	2	26.0	1800	94.6	48.0	1600	87.8
20	1	27.0	1800	95.1	46.0	1600	87.3
20	2	27.0	1800	94.8	48.0	1600	87.8

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	ATC CNT	ODOM MILES	STD SPK	TST LOC	RUN NO	G	FULL THROTTLE DATE	FULL THROTTLE AMB TMP	FULL THROTTLE BARO	FULL THROTTLE HUM	G	PART THROTTLE DATE	PART THROTTLE AMB TMP	PART THROTTLE BARO	PART THROTTLE HUM
11	5	OCA 242	F	1980	A	8.8	Y	12062	6	D	1	D	1-7-81	73	29.60	47	D	1-7-81	73	29.60	47
											2	D	1-8-81	73	30.15	56	D	1-8-81	73	30.15	56

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MBON	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MBON
1	1	3.0	1950	90.0	10.0	17.0	88.0
1	2	3.0	2150	89.3	10.0	1750	88.5
2	1	2.0	1950	89.0	9.0	1750	87.5
2	2	2.0	2150	88.7	9.0	1750	88.0
3	1	4.0	1950	90.7	10.0	1750	88.0
3	2	4.0	2150	90.0	10.0	1750	88.5
4	1	4.0	1950	90.7	10.0	1750	88.0
4	2	4.0	2150	90.0	10.0	1750	88.5
5	1	4.0	1950	90.4	12.0	1750	89.0
5	2	3.0	2150	89.6	10.0	1750	88.4
6	1	4.0	1950	90.0	10.0	1750	88.7
6	2	4.0	2150	90.0	11.0	1750	89.0
7	1	10.0	1950	93.7	13.0	1750	89.3
7	2	10.0	2150	93.0	14.0	1750	90.1
8	1	10.0	1950	93.7	16.0	1750	90.0
8	2	11.0	2150	93.5	16.0	1750	91.0
9	1	8.0	1950	92.8	12.0	1750	88.8
9	2	9.0	2150	92.5	10.0	1750	88.7
10	1	9.0	1950	93.2	15.0	1750	90.0
10	2	10.0	2150	93.0	15.0	1750	90.6
11	1	9.0	1950	93.2	15.0	1750	90.0
11	2	10.0	2150	93.0	16.0	1750	91.0
12	1	9.0	1950	93.2	16.0	1750	90.5
12	2	10.0	2150	93.0	16.0	1750	91.0
13	1	10.0	1950	93.7	16.0	1750	90.5
13	2	11.0	1950	94.0	16.0	1750	91.0
14	1	11.0	1950	94.0	16.0	1750	90.5
14	2	10.0	2150	93.0	15.0	1750	90.7
15	1	12.0	1950	94.5	15.0	1750	90.0
15	2	13.0	2150	94.5	15.0	1750	90.3
16	1	12.0	1950	94.5	15.0	1750	90.0
16	2	13.0	2150	94.5	15.0	1750	90.3
17	1	14.0	1950	95.5	18.0	1750	92.0
17	2	13.0	2150	94.5	17.0	1750	91.3
18	1	13.0	1950	95.0	18.	1750	92.0
18	2	13.0	2150	94.5	18.0	1750	91.7
19	1	13.0	1950	95.0	17.0	1750	91.3
19	2	14.0	2150	95.0	20.0	1750	92.3
20	1	14.0	1950	95.5	17.3	1750	91.3
20	2	13.0	2150	94.5	19.0	1750	92.0

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	IST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
6	4	01 V258	F	1980	A	8.3	Y	20898	28	0	1	0	3-3-81	76	29.13	71	0	3-5-81	73	29.60	56
											2	0	3-4-81	76	28.97	51	0	3-6-81	76	29.34	47

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	RPM	MOON	PART THROTTLE SPRK ADV	RPM	MOON
1	1	32.0	1800	89.5	35.0	1400	86.0
1	2	33.0	1800	89.7	34.0	1400	85.7
2	1	32.0	1800	89.5	36.0	1400	86.4
2	2	32.0	1800	89.3	35.0	1400	86.1
3	1	34.0	1800	90.3	37.0	1400	86.7
3	2	34.0	1800	90.2	36.0	1400	85.7
4	1	33.0	1800	89.9	37.0	1400	86.7
4	2	33.0	1800	89.7	36.0	1400	86.5
5	1	32.0	1800	89.5	37.0	1400	86.7
5	2	33.0	1800	89.7	35.0	1400	86.1
6	1	31.0	1800	89.1	38.0	1400	87.0
6	2	32.0	1800	89.3	36.0	1400	86.5
7	1	36.0	1800	91.1	40.0	1400	87.7
7	2	36.0	1800	90.9	39.0	1400	87.5
8	1	35.0	1800	90.7	39.0	1400	87.4
8	2	36.0	1800	90.9	39.0	1400	87.5
9	1	34.0	1800	90.3	38.0	1400	87.0
9	2	35.0	1800	90.5	38.0	1400	87.2
10	1	40.0	1800	92.6	42.0	1400	88.3
10	2	39.0	1800	92.0	41.0	1400	88.2
11	1	38.0	1800	91.9	41.0	1400	88.0
11	2	38.0	1800	91.6	40.0	1400	87.9
12	1	40.0	1800	92.6	44.0	1400	88.9
12	2	41.0	1800	92.8	42.0	1400	88.5
13	1	38.0	1800	91.9	41.0	1400	88.0
13	2	39.0	1800	92.0	43.0	1400	88.8
14	1	39.0	1800	92.2	41.0	1400	88.0
14	2	40.0	1800	92.4	40.0	1400	87.9
15	1	39.0	1800	92.2	45.0	1400	89.2
15	2	39.0	1800	92.0	43.0	1400	88.8
16	1	40.0	1800	92.6	42.0	1400	88.3
16	2	41.0	1800	92.8	41.0	1400	88.2
17	1	39.0	1800	92.2	47.0	1400	89.7
17	2	41.0	1800	92.8	44.0	1400	89.1
18	1	40.0	1800	92.6	46.0	1400	89.4
18	2	41.0	1800	92.8	46.0	1400	89.7
19	1	41.0	1800	93.0	46.0	1400	89.4
19	2	41.0	1800	92.8	46.0	1400	89.7
20	1	41.0	1800	93.0	48.0	1400	90.0
20	2	41.0	1800	92.8	47.0	1400	90.0

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	FULL THROTTLE DATE	FULL THROTTLE AMB TMP	FULL THROTTLE BARO	FULL THROTTLE HUM	PART THROTTLE G	PART THROTTLE DATE	PART THROTTLE AMB TMP	PART THROTTLE BARO	PART THROTTLE HUM
3	3	OL 223	F	1980	A	9.0	N	11512	6	D	1	D	11-17-80	73	30.13	28					
											2	D	11-18-80	72	29.89	29					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MBON	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MBON
1	1	5.0	2900	89.6			
1	2	7.0	2900	89.5			
2	1	5.0	2900	89.6			
2	2	6.0	2900	89.0			
3	1	6.0	2900	90.1			
3	2	6.0	2900	89.0			
4	1	6.0	2900	90.1			
4	2	7.0	2900	89.5			
5	1	5.0	2900	89.6			
5	2	6.0	2900	89.0			
6	1	5.0	2900	89.6			
6	2	5.0	2900	88.5			
7	1	10.0	2900	92.0			
7	2	9.0	2900	90.5			
8	1	9.0	2900	91.6			
8	2	10.0	2900	91.0			
9	1	11.0	2900	92.5			
9	2	10.0	2900	91.0			
10	1	12.0	2900	93.0			
10	2	13.0	2900	92.5			
11	1	12.0	2900	93.0			
11	2	13.0	2900	93.5			
12	1	13.0	2900	93.4			
12	2	14.0	2900	93.0			
13	1	12.0	2900	93.0			
13	2	12.0	2900	92.6			
14	1	12.0	2900	93.0			
14	2	12.0	2900	92.0			
15	1	14.0	2900	93.9			
15	2	15.0	2900	93.5			
16	1	16.0	2900	94.8			
16	2	15.0	2900	93.5			
17	1	14.0	2900	93.9			
17	2	14.0	2900	93.0			
18	1	15.0	2900	94.3			
18	2	19.0	2900	95.5			
19	1	16.0	2900	94.8			
19	2	19.0	2900	95.5			
20	1	17.0	2900	95.2			
20	2	18.0	2900	95.1			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	ATP CND	ODOM MILES	SID SPK	TST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
37	1	OL 223	F	1980	A	9.0	Y	8064	6	D	1	D	4-29-81	72	29.75	70	D	5-1-81	70	29.80	65
											2	D	4-30-81	71	29.92	60	D	5-6-81	71	30.13	56

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MUON	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MUON
1	1	21.0	2500	90.2	26.0	2500	87.6
1	2	21.0	2450	89.2	27.0	2350	88.5
2	1						
2	2						
3	1	24.0	2600	92.8	23.0	2500	86.3
3	2	25.0	2450	92.8	27.0	2350	88.5
4	1	22.0	2600	90.8	29.0	2500	89.6
4	2	24.0	2450	91.5	28.0	2350	89.1
5	1	20.0	2600	89.5	28.0	2500	88.8
5	2	21.0	2450	91.0	29.0	2350	89.1
6	1	24.0	2600	92.0	26.0	2500	87.6
6	2	25.0	2450	92.0	28.0	2350	89.1
7	1						
7	2						
8	1	27.0	2600	93.5	30.0	2500	90.0
8	2	30.0	2450	94.2	29.0	2350	89.6
9	1	27.0	2600	93.5	27.0	2500	88.2
9	2	28.0	2450	93.5	29.0	2350	89.6
10	1	28.0	2600	93.9	31.0	2500	90.4
10	2	31.0	2450	94.6	31.0	2350	90.6
11	1	24.0	2600	92.0	31.0	2500	90.4
11	2	28.0	2450	93.4	33.0	2350	91.5
12	1	29.0	2600	94.4	31.0	2500	90.4
12	2	30.0	2450	94.2	33.0	2350	91.5
13	1	27.0	2600	93.5	30.0	2500	90.0
13	2	30.0	2450	94.2	30.0	2350	90.1
14	1	26.0	2600	93.0	33.0	2500	91.4
14	2	28.0	2450	93.4	32.0	2350	91.1
15	1	30.0	2600	94.9	33.0	2500	91.4
15	2	29.0	2450	94.2	31.0	2350	90.6
16	1	32.0	2600	95.4	33.0	2500	91.4
16	2	34.0	2450	95.4	33.0	2350	91.5
17	1						
17	2						
	1	31.0	2600	95.3	33.0	2500	91.4
	2	32.0	2450	95.0	34.0	2500	92.0
19	1	31.0	2600	95.3	35.0	2500	92.4
19	2	35.0	2450	96.2	35.0	2350	92.5
20	1	27.0	2600	93.4	38.0	2500	93.7
20	2	34.0	2450	95.4	37.0	2350	93.4

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR COND	ODOM MILES	STD SPK	EST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
36	7	PC 137	F	1980	A	8.4	Y	16036	12	D	1	D	4-20-81	70	29.36	61	D	4-21-81	71	30.34	60
											2	D	4-22-81	71	30.27	60	D	4-22-81	67	30.30	58

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MBDN	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MBDN
1	1	9.0	1550	90.0	21.0	1450	85.7
1	2	9.0	1350	90.6	22.0	1350	86.9
2	1						
2	2						
3	1	10.0	1550	90.7	22.0	1450	86.4
3	2	8.0	1350	90.0	22.0	1350	86.9
4	1	9.0	1550	90.0	24.0	1450	87.3
4	2	10.0	1350	91.0	24.0	1350	87.5
5	1	8.0	1550	89.2	23.0	1450	86.9
5	2	9.0	1350	90.6	23.0	1350	87.2
6	1	13.0	1550	92.2	22.0	1450	86.4
6	2	13.0	1350	92.4	24.0	1350	87.5
7	1						
7	2						
8	1	13.0	1550	92.1	25.0	1450	87.8
8	2	14.0	1350	92.9	25.0	1350	87.8
9	1	11.0	1550	91.3	24.0	1450	87.3
9	2	13.0	1350	92.4	24.0	1350	87.2
10	1	17.0	1550	93.9	27.0	1450	88.5
10	2	15.0	1350	93.2	29.0	1350	89.2
11	1	14.0	1550	92.7	26.0	1450	88.2
11	2	17.0	1350	94.0	28.0	1350	88.9
12	1	16.0	1550	93.5	30.0	1450	89.5
12	2	14.0	1350	92.8	29.0	1350	89.2
13	1	12.0	1550	91.8	29.0	1450	89.2
13	2	14.0	1350	92.8	29.0	1350	89.2
14	1	19.0	1550	94.5	29.0	1450	89.2
14	2	18.0	1350	94.4	29.0	1350	89.2
15	1	20.0	1550	93.1	31.0	1450	89.8
15	2	20.0	1350	95.1	27.0	1350	88.5
16	1	17.0	1550	93.9	29.0	1450	89.2
16	2	18.0	1350	94.4	29.0	1350	89.2
17	1						
17	2						
18	1	22.0	1550	95.7	31.0	1450	89.8
18	2	20.0	1350	95.1	31.0	1350	89.8
19	1	22.0	1550	95.7	30.0	1450	89.5
19	2	23.0	1350	96.2	32.0	1350	90.0
20	1	24.0	1550	96.4	33.0	1450	90.1
20	2	21.0	1350	95.5	34.0	1350	90.5

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	IST LOC	RUN NO	FUEL THROTTLE				PART THROTTLE				
												S	DATE	ANR IMP	HARD	RUN	S	DATE	ANR IMP	HARD	RUN
19	26	PC 137	F	1980	A	8.4	Y	10902	12	0	1	0	12-16-80	71	29.90	55					
											2	0	12-17-80	71	30.10	51					

FUEL NO	RUN NO	FUEL THROTTLE SPRK ADV	FUEL THROTTLE RPM	FUEL THROTTLE MOON	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MOON
1	1	-1.0	1250	89.4			
1	2	-0.8	1250	88.7			
2	1	-1.3	1200	87.5			
2	2	-0.8	1200	89.5			
3	1	-0.5	1250	89.6			
3	2	0.0	1250	89.1			
4	1	0.3	1200	88.1			
4	2	0.8	1250	90.0			
5	1	1.0	1200	88.5			
5	2	0.8	1250	89.4			
6	1	-0.3	1200	87.9			
6	2	-0.5	1250	89.6			
7	1	6.3	1250	91.9			
7	2	7.8	1250	92.4			
8	1	4.5	1250	91.3			
8	2	7.3	1250	92.2			
9	1	9.0	1200	91.9			
9	2	7.3	1250	92.2			
10	1	6.3	1200	90.7			
10	2	8.8	1250	92.8			
11	1	5.0	1200	91.5			
11	2	8.0	1200	92.6			
12	1	7.8	1200	91.4			
12	2	7.5	1250	92.3			
13	1	7.5	1200	92.3			
13	2	7.8	1200	91.4			
14	1	10.0	1200	92.3			
14	2	7.3	1250	92.2			
15	1	11.0	1300	92.7			
15	2	11.5	1300	93.7			
16	1	8.0	2000	91.5			
16	2	7.5	1250	92.3			
17	1	5.5	1400	92.1			
17	2	10.8	1250	93.6			
18	1	10.5	1200	92.5			
18	2	11.0	1200	94.2			
19	1	10.3	1250	93.6			
19	2	12.0	1250	94.8			
20	1	11.5	1200	92.9			
20	2	11.3	1250	93.5			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	FULL THROTTLE DATE	FULL THROTTLE AMB TMP	FULL THROTTLE BARO	FULL THROTTLE HUM	PART THROTTLE G	PART THROTTLE DATE	PART THROTTLE AMB TMP	PART THROTTLE BARO	PART THROTTLE HUM
25	30	PC 137	F	1980	A	8.4	Y	9450	12	D	1	D	11-11-80	74	29.60	54					
											2	D	11-12-80	77	29.67	58					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MBDN	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MBDN
1	1	7.5	1440	14.8			
1	2	11.0	1390	88.0			
2	1	15.5	1445	92.2			
2	2	12.0	1385	89.2			
3	1	15.0	1430	91.9			
3	2	13.5	1390	90.6			
4	1	14.0	1425	91.3			
4	2	13.0	1365	90.2			
5	1	10.0	1385	87.9			
5	2	14.0	1385	91.0			
6	1	16.0	1370	92.5			
6	2	14.0	1400	91.0			
7	1	20.5	1450	94.4			
7	2	20.0	1390	93.6			
8	1	14.5	1430	91.6			
	2	15.5	1380	92.0			
9	1	16.0	1395	92.5			
9	2	15.5	1385	92.0			
10	1	18.5	1395	93.6			
10	2	18.0	1375	93.0			
11	1	17.5	1400	93.2			
11	2	17.0	1440	92.7			
12	1	17.5	1435	93.2			
12	2	18.0	1390	93.0			
13	1	21.0	1455	94.6			
13	2	19.0	1390	93.5			
14	1	19.0	1425	93.8			
14	2	18.0	1385	93.0			
15	1	20.5	1438	94.4			
15	2	21.5	1360	94.1			
16	1	26.0	1340	96.2			
16	2	23.0	1360	94.7			
17	1	27.0	1400	96.5			
17	2	24.0	1400	95.0			
18	1	25.0	1380	94.0			
18	2	24.0	1375	[illegible]			
19	1	25.0	1400	96.0			
19	2	25.5	1355	95.8			
20	1	25.0	1435	[illegible]			
20	2	27.0	1355	96.8			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	RUN	PART THROTTLE G	DATE	AMB TMP	BARO	RUN
26	30	PC 137	F	1980	A	8.4	Y	9408	12	D	1	D	11-13-80	86	29.22	68					
											2	D	11-14-80	79	29.50	72					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MIXTURE	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MIXTURE
1	1	10.0	1430	88.9			
1	2	7.0	1445	83.3			
2	1	11.0	1425	90.0			
2	2	11.5	1460	87.5			
3	1	12.0	1440	90.7			
3	2	12.5	1440	88.3			
4	1	10.0	1425	88.9			
4	2	11.0	1470	87.1			
5	1	10.5	1420	89.4			
5	2	11.5	1465	87.5			
6	1	15.5	1440	92.6			
6	2	15.0	1470	90.1			
7	1	13.0	1445	91.4			
7	2	16.0	1405	90.7			
8	1	16.5	1425	92.9			
8	2	17.0	1450	91.3			
9	1	13.0	1445	91.4			
9	2	17.0	1430	91.3			
10	1	17.0	1430	93.0			
10	2	16.0	1400	90.7			
11	1	17.0	1470	93.0			
11	2	19.0	1475	92.4			
12	1	15.0	1420	92.7			
12	2	17.5	1450	91.6			
13	1	18.0	1430	93.1			
13	2	16.0	1430	90.7			
14	1	20.0	1450	96.0			
14	2	21.0	1505	94.3			
15	1	19.0	1430	93.6			
15	2	20.0	1450	94.9			
16	1	19.0	1425	93.5			
16	2	22.0	1455	93.8			
17	1	20.0	1430	95.6			
17	2	20.5	1425	95.1			
18	1	18.0	1465	91.3			
18	2	20.5	147	95.0			
19	1	21.0	1400	95.1			
19	2	22.0	1405	94.1			
20	1	19.0	1425	93.7			
20	2	20.0	1440	94.5			

CAR NO	LAB NO	CAR CODE	FM CT	MODEL YEAR	TRANS	C.R.	AIR PMP	ODOM MILES	STD SPK	TST LOC	RUN NO	FUEL THROTTLE G	DATE	AMB TMP	BARO	RUN	PART THROTTLE G	DATE	AMB TMP	BARO	RUN
32	47	PL 217M	C	1980	M	8.2	Y	11500	12	D	1	4	3-11-81	70	29.80	50					
											2	4	3-11-80	70	29.87	50					

FUEL NO	RUN NO	FUEL THROTTLE SPRK ADV	RPM	MROON	PART THROTTLE SPRK ADV	RPM	MROON
1	1	12.0	1600	90.5			
1	2	12.0	1600	90.5			
2	1						
2	2						
3	1	11.0	1600	90.0			
3	2	11.0	1600	90.0			
4	1	12.0	1600	90.5			
4	2	11.5	1600	90.3			
5	1	11.5	1600	90.3			
5	2	12.0	1600	90.5			
6	1	11.0	1600	90.0			
6	2	11.5	1600	90.3			
7	1	15.0	1250	92.0			
7	2	16.5	1250	92.5			
8	1	14.0	1250	91.5			
8	2	15.0	1250	92.0			
9	1	14.0	1250	91.5			
9	2	14.0	1250	91.5			
10	1	19.0	1250	93.1			
10	2	20.0	1250	93.7			
11	1	20.0	1250	93.7			
11	2	20.0	1250	93.7			
12	1	21.0	1250	94.0			
12	2	20.0	1250	93.7			
13	1	19.5	1600	93.5			
13	2	19.5	1600	93.5			
14	1	22.0	1250	94.2			
14	2	20.0	1250	93.7			
15	1	19.0	1250	93.1			
15	2	19.5	1250	93.3			
16	1	19.0	1250	93.1			
16	2	19.5	1250	93.3			
17	1	21.0	1250	94.0			
17	2	21.0	1250	94.0			
18	1	21.0	1250	94.0			
18	2	21.0	1250	94.0			
19	1	24.0	1250	94.9			
19	2	24.0	1250	94.9			
20	1	24.0	1250	94.9			
20	2	24.0	1250	94.9			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	IST LOC	RUN NO	FULL THROTTLE G	DATE	AMB TMP	BARO	HUM	PART THROTTLE G	DATE	AMB TMP	BARO	HUM
33	50	F 215	F	1980	A	8.5	Y	6730	8	D	1	D	11-17-90	74	29.54	60					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	RPM	MJOUL	PART THROTTLE SPRK ADV	RPM	MJOUL
1	1	11.0	3550	88.5			
1	2						
2	1	11.0	3850	88.5			
2	2						
3	1	11.0	3400	88.5			
3	2						
4	1	12.0	3550	89.0			
4	1						
5	1	12.0	3500	89.0			
5	2						
6	1	9.0	3000	87.0			
6	2						
7	1	12.0	3450	89.0			
7	2						
8	1	12.0	3550	89.0			
8	2						
9	1	11.0	3550	88.5			
9	2						
10	1	14.0	3600	90.0			
10	1						
11	1	14.0	3850	90.0			
11	2						
12	1	16.0	3500	91.5			
12	2						
13	1	16.0	3750	91.5			
13	2						
14	1	13.0	3700	89.5			
14	2						
15	1	13.0	3500	89.5			
15	2						
16	1	15.0	3750	90.5			
16	2						
17	1	15.0	3850	90.5			
17	2						
18	1	16.0	3750	91.5			
18	2						
19	1	17.0	3750	91.5			
19	2						
20	1	17.0	3650	91.5			
20	2						

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC	RUN NO	FULL THROTTLE G	FULL THROTTLE DATE	FULL THROTTLE AMB TMP	FULL THROTTLE BARO	FULL THROTTLE HUM	PART THROTTLE G	PART THROTTLE DATE	PART THROTTLE SPK TMP	PART THROTTLE BARO	PART THROTTLE HUM
29	41	T 21RM	C	1980	M	9.0	N	7113	10	D	1	4	1-13-81	64	30.18	46					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MUON	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MUON
1	1	15.5	1700	92.6			
1	2	15.0	1750	92.3			
2	1						
2	2						
3	1	14.0	1750	91.6			
3	2	14.2	1750	91.8			
4	1	15.0	1900	92.3			
4	2	16.2	1800	93.0			
5	1	14.2	1700	91.8			
5	2	13.0	1800	91.0			
6	1	14.5	1650	92.0			
6	2	13.8	1700	91.5			
7	1	21.6	1800	96.2			
7	2	22.0	1850	96.4			
8	1	19.5	1900	95.0			
8	2	19.5	1900	95.0			
9	1	18.5	1650	96.4			
9	2	19.5	1700	95.0			
10	1	19.0	1850	94.7			
10	2	20.5	1900	95.5			
11	1	15.5	1800	93.6			
11	2	16.9	1750	93.4			
12	1	20.5	1600	95.5			
12	2	19.5	1700	95.0			
13	1	17.5	1700	93.8			
13	2	16.0	1650	92.9			
14	1	19.5	1700	95.0			
14	2	22.0	1700	96.3			
15	1	21.5	1800	96.1			
15	2	19.8	1850	95.2			
16	1	17.5	1600	93.8			
16	2	20.6	1700	95.6			
17	1						
17	2						
18	1	24.5	1700	97.0			
18	2	26.5	1750	98.1			
19	1	23.5	1850	97.2			
19	2	24.5	1850	97.7			
20	1	24.0	1650	97.4			
20	2	22.5	1700	96.7			

CAR NO	LAB NO	CAR CODE	EM CT	MODEL YEAR	TRANS	C.R.	AIR CND	ODOM MILES	STD SPK	TST LOC.	RUN NO	FULL THROTTLE					PART THROTTLE				
												G	DATE	AMB TMP	BARO	HUM	G	DATE	AMB TMP	BARO	HUM
18	26	T 222	F	1980	A	8.4	Y	12782	8	D	1	D	1-7-81	70	30.10	41					
											2	D	1-14-81	69	29.90	57					

FUEL NO	RUN NO	FULL THROTTLE SPRK ADV	FULL THROTTLE RPM	FULL THROTTLE MUOD	PART THROTTLE SPRK ADV	PART THROTTLE RPM	PART THROTTLE MUOD
1	1	16.8	2200	88.8			
1	2	21.0	2100	88.9			
2	1	25.5	2100	90.1			
2	2	26.0	2100	89.2			
3	1	23.0	2200	90.0			
3	2	23.0	2100	88.7			
4	1	25.0	2100	91.0			
4	2	25.5	2200	90.8			
5	1	21.0	2100	90.1			
5	2	21.0	2150	88.9			
6	1	24.5	2100	90.7			
6	2	26.0	2200	91.1			
7	1	30.0	2200	91.1			
7	2	33.0	2200	91.5			
8	1	28.5	2200	91.2			
8	2	26.0	2200	91.4			
9	1	27.0	2200	91.9			
9	2	30.0	2200	92.8			
10	1	34.0	2200	91.9			
10	2	33.0	2200	91.8			
11	1	26.5	2200	91.7			
11	2	34.0	2200	91.9			
12	1	34.0	2200	93.9			
12	2	30.0	2200	93.1			
13	1	28.0	2200	93.0			
13	2	30.5	2200	93.2			
14	1	32.5	2200	94.9			
14	2	40.0	2100	95.4			
15	1						
15	2						
16	1	33.0	2150	94.1			
16	2	32.5	2200	93.7			
17	1	39.5	2100	95.1			
17	2	38.5	2100	93.8			
18	1	35.0	2200	94.5			
18	2	38.5	2200	95.2			
19	1	35.0	2200	94.1			
19	2	42.0	2200	95.0			
20	1	42.0	2200	95.0			
20	2	42.5	2100	94.1			