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# TWO-TEMPERATURE VAPOR LOCK AND HIGH-TEMPERATURE DRIVEABILITY PERFORMANCE OF 1982 PASSENGER VEHICLES

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**TWO-TEMPERATURE VAPOR LOCK AND HIGH-TEMPERATURE DRIVEABILITY  
PERFORMANCE OF 1982 PASSENGER VEHICLES  
(CRC PROJECT No. CM-118-82)**

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Prepared by the  
1982 Analysis Panel  
of the  
CRC Volatility Group

December 1984

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

ABSTRACT

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The 1982 CRC High-Temperature Driveability Program was conducted at the US Army Proving Grounds near Yuma, Arizona, from September 20 through October 19, 1982, at nominal ambient temperatures of 70°F (21.1°C) and 95°F (35°C). CRC has conducted previous programs for the evaluation of vapor lock and hot start and driveability of 1971 and 1975 model passenger cars. Since 1975, vehicle designs have changed rapidly to meet more stringent exhaust emissions and fuel economy standards. These changes may affect vehicle high-temperature performance. The 1982 CRC High-Temperature Driveability Program investigated the effect of such changes on vapor lock performance of nineteen 1982 passenger vehicles at nominal temperatures of 70°F (21°C) and 95°F (35°C). The two-temperature vapor lock evaluation was used in updating ambient temperature corrections of volatility over a range of temperature from 70°F (21°C) to 95°F (35°C). Hot-start and driveability performance was evaluated at a nominal 95°F (35°C) temperature by two test procedures. A new city driveability procedure emphasized conditions that could cause performance problems encountered in heavy stop-and-go traffic after a period of temperature stabilization. Selected vehicles were also evaluated using the CRC Hot-Start and Driveability Procedure.



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## I. INTRODUCTION

The 1982 CRC High-Temperature Driveability Program was conducted at the US Army Proving Grounds near Yuma, Arizona, from September 20 through October 19, 1982. The series of road tests comprising the program were conducted at nominal ambient temperatures of 70°F (21°C) and 95°F (35°C).

CRC has conducted previous programs for the evaluation of vapor lock and hot start and driveaway of 1971 and 1975 model passenger cars. Since 1975, vehicle designs have changed rapidly to meet more stringent exhaust emissions and fuel economy standards. These changes may affect vehicle high-temperature performance. The 1982 CRC High-Temperature Driveability Program investigated the effect of such changes on vapor lock performance of nineteen 1982 passenger vehicles at nominal temperatures of 70°F (21°C) and 95°F (35°C). The vapor lock tolerance of each vehicle was determined for each temperature by evaluating incremental blends from a fuel series ranging in volatility from approximately 7.0 to 17.0 psi Reid vapor pressure. Various blends were tested to determine the fuel which would give a 25 percent increase in acceleration time relative to a base acceleration. This fuel in terms of  $T_{V/L}=20$  defined the vapor lock tolerance of the vehicle. The two-temperature vapor lock evaluation was used in updating ambient temperature corrections of volatility over a range of temperature from 70°F (21°C) to 95°F (35°C). In addition, an alternate vapor lock procedure was run in two vehicles.

Hot-start and driveaway performance was evaluated at a nominal 95°F (35°C) temperature by two test procedures. A new test procedure that emphasized low speed, mild acceleration, and frequent idle periods was evaluated in this program. This City Driveability Procedure emphasized conditions that could cause performance problems encountered in heavy stop-and-go traffic after a period of temperature stabilization. A special pentane-rich fuel and one or more vapor lock fuels were tested in all vehicles using the City Driveability Procedure. Eleven of the vehicles were also evaluated using the CRC Hot-Start and Driveaway Procedure. Performance was expressed for both procedures in terms of CRC demerits, with poorer performance resulting in higher demerit levels.

Appendix A lists participants in the test program, members of the Program Panel, and members of the Data Analysis and Report-Writing Panel. The program proposal approved by the CRC Volatility Group is shown in Appendix B.

## II. SUMMARY

- Vapor lock severity increased in most cases as fuel volatility and ambient temperature increased.
- The 1982 model cars tested had fewer vapor lock problems than 1975 and 1971 model cars tested in previous CRC programs. A fuel with  $T_{V/L=20}$  of 124°F (ASTM Class C) satisfied 75 percent of 1982 model cars, 45 percent of 1975 model cars, and 20 percent of 1971 model cars at 95°F.
- For vapor lock tests, the ambient temperature correction factor for adjusting  $T_{V/L=20}$  data was established to be 0.7°F  $T_{V/L=20}$  per degree ambient temperature.
- There appeared to be no appreciable difference in vapor lock performance for cars with and without fuel return lines.
- The limiting vapor lock requirements were outside the range of test fuels for five of nineteen cars at a nominal 95°F (35°C) test temperature, and for seven of nineteen cars at a nominal 70°F (21°C) test temperature.
- Ten of twelve cars at their critical soak condition had more severe vapor lock requirements at 95°F (35°C) than at 70°F (21°C).
- Twelve of fourteen cars were idle soak limited at 95°F (35°C). At 70°F (21°C), six of twelve cars were idle soak limited, and six were key-off soak limited.
- Data did not establish a definitive relationship between a vehicle's vapor lock tolerance and its hot-start and driveaway performance.
- For the City Driveability Procedure, seven vehicles showed large changes in demerit levels with changes in fuel volatility.
- Both the City Driveability Procedure and the CRC Hot-Start and Driveaway Procedure showed volatility and vehicle effects.
- From these data, there is no clear advantage to recommend either the City Driveability Procedure or the CRC Hot-Start and Driveaway Procedure for driveability evaluations.

### III. TEST VEHICLES

Eighteen passenger cars and one passenger van were tested in this program. Selection was based upon a list of twenty primary and five secondary vehicles listed in the test plan, contingent upon availability from rental agencies. In the selection of test cars, consideration was given to sales volume and vehicles of special interest. All vehicles were equipped with automatic transmissions, air conditioning, and Federal exhaust emission control devices. Vehicles are described in detail in Table I.

Prior to the start of the test program, the vehicles were delivered to a contractor for test preparation. Car preparation included installation of fuel tank drains, installation of a vacuum tee, checking and adjusting timing and idle speed, and checking integrity of emission control equipment. Thermocouples were installed on test vehicles by test participants at the start of the test program. One thermocouple was taped to the exterior of the fuel line as close to the carburetor or fuel injector as possible. For General Motors vehicles, a second thermocouple was installed in the fuel tank through the drain line. For all other vehicles, a second thermocouple was taped to the exterior of the fuel line as close to the fuel pump inlet as possible. At the conclusion of the test, the vehicles were returned to the contractor for removal of the tank drains. A flat 3/32-inch brass plate was soldered over the tank drain hole.

### IV. TEST FUELS

Vapor lock test fuels consisted of three base fuels of 7.1, 11.8, and 16.3 psi Reid vapor pressure (RVP) identified as RMFV 90-82, 91-82, and 92-82, respectively. The fuel series design accommodated a 10.5 psi RVP fuel as representative of a typical summer fuel, and a 13.5 psi RVP fuel as representative of a typical winter fuel. Increased volatility was accomplished primarily by the addition of butane. Intermediate test fuels were blended on-site using two blending pumps. One blending pump dispensed the low and intermediate volatility fuels and blends of the low and intermediate fuels. The other pump dispensed the intermediate and high volatility fuels and blends of the intermediate and high fuels. Table II presents the average fuel inspection data for the odd number fuels available from the blend pumps. The blends were prepared by one laboratory and were shipped to participating laboratories for analysis. Individual inspection data by participating laboratories are presented in Appendix C.

Figure 1 shows the relationship of  $T_{V/L=20}$  and percent evaporated at 158°F to RVP for the series of vapor lock fuels. The curves in Figure 1 correspond to least-squares equations; the fuel series curves were used to derive the other volatility values from measured RVP's when processing data from the vapor lock and driveability tests:

$$T_{V/L=20} = 213.05 - 9.9293 (RVP) + 0.19306 (RVP^2)$$

$$\%@158^\circ F = 5.94 + 1.8945 (RVP) - 0.0099081 (RVP^2)$$

A special fuel blend (RMFV 93-82), shown in Table II as Fuel 20 and used in simulated low-speed city driving tests, was intended to emphasize problems in the hot-start and driveaway application. It was a pentane-rich high volatility fuel. In order to relate other properties to measured RVP's on tank samples subjected to weathering during the road tests, samples of this fuel were allowed to evaporate to varying degrees, then RVP and T versus V/L curves were determined on-site at Yuma on the fresh and weathered samples. Subsequently, a retain sample was also weathered in several stages, and RVP and ASTM D 86 distillations were determined on the fresh and weathered portions at one of the cooperating laboratories. Data points and least-square curves for  $T_{V/L=20}$  and percent evaporated at 158°F versus RVP of weathered RMFV 93-82 fuel are shown in Figure 1, along with corresponding curves for the vapor lock fuels. Equations for the volatility relations of weathered Fuel 20 are:

$$T_{V/L=20} = 215.71 - 9.919 (RVP) + 0.1758 (RVP^2)$$

$$\%@158^\circ F = -10.524 + 3.9496 (RVP)$$

(For percent evaporated at 158°F, the linear equation fit the data as well as a second-order equation and was, therefore, used. Since the data were obtained in only one cooperating laboratory, the constant term in the equation was adjusted to match the point for the all-laboratory average RVP and percent evaporated at 158°F.)

## V. TEST FACILITIES

Facilities made available for the test work at the US Army Yuma Proving Ground included a five-mile test track, fuel storage, a soak shelter, a cold room for fuel dispensing, and a petroleum testing laboratory. A fork-lift truck, a refrigerated trailer, a temporary soak shelter to accommodate three vehicles, and a mobile office trailer were provided by CRC.

The test course, shown in Figure 2, consisted of the following:

- Yuma Proving Ground Dynamometer Course - level blacktop with two-mile straightaway and half-mile loops at each end
- Gravel roads, one to two miles long, running between the dynamometer course and Arizona Highway Route 95
- A 7.5-mile section of essentially level blacktop highway - Arizona Highway Route 95

Car warm-up was achieved by proceeding from the dynamometer course via a gravel road to the highway, driving fifteen miles on the highway, returning to the dynamometer course to complete one lap around the course (five miles), and then proceeding to the soak shelter. All vapor lock and hot-start and driveaway evaluations were conducted on the dynamometer course.

Three roofless soak shelters, twelve feet by twenty-four feet and constructed of plywood with plastic end curtains, were used primarily for vapor lock testing. A permanent twenty-foot by forty-foot roofless soak shelter with doors at both ends was used primarily for hot-start and driveaway tests.

Dry-bulb air temperature was recorded at the soak area of the dynamometer test track at fifteen-minute intervals while testing was in progress.

On-site fuel analyses were performed in the Yuma Proving Ground Petroleum Laboratory. Reid vapor pressure was determined using an automatic RVP instrument supplied by Southwest Research Institute.

A refrigerated trailer van was used for the bulk storage of all test fuels, except the low volatility vapor lock fuel, which was stored outdoors. Daily fuel supplies were stored in a large walk-in refrigerator, and were dispensed to the test cars through two blend pumps. Fuel 20 was distributed through a separate portable pump. Both the refrigerator and refrigerated trailer were maintained at approximately 40°F.

Duplicate samples were taken from the fuel tanks, through the drain line, in one-quart bottles using a Quick-Chill Sampling Apparatus. Samples were taken through the drain line to prevent significant loss of tank pressure during sampling. For all tests, samples were taken during the soak and idle periods.

## VI. TEST TECHNIQUES

The 1982 CRC High-Temperature Driveability Program used four test techniques, two for vapor lock and two for hot start and driveaway:

- 1975 CRC Vapor Lock Technique
- An alternate vapor lock technique which alters the timing of the accelerations
- CRC Hot-Start and Driveaway Technique
- City Driveability Procedure

### A. 1975 CRC Vapor Lock Technique

The primary vapor lock technique used in this program was the same as used in the 1975 CRC High-Temperature Driveability Program. Vapor lock was evaluated at both 70°F (21°C) and 95°F (35°C). This technique and the data rating system used are described in detail in Appendix D. In brief, the percent gain in acceleration time may be established on any one fuel by comparing a wide-open-throttle acceleration, following a prescribed idle or soak period, with the average for base accelerations obtained during the warm-up operation. The limiting volatility for a 25 percent increase in acceleration time may then be defined by bracketing with fuels which produced higher or lower acceleration times.

### B. Alternate Vapor Lock Procedure

A few runs were made with an alternate vapor lock technique that altered the timing of the accelerations. The procedure used was the same as the 1975 CRC Vapor Lock Technique, with the exception that the timed acceleration was from 0 to 30, 50, and 60 mph, instead of from 15 to 50, 60, and 70 mph.

### C. CRC Hot-Start and Driveaway Technique

The CRC Hot-Start and Driveaway Procedure is described in detail in Appendix D. Briefly, it consists of the following:

- a. A prescribed warm-up during which a base start and run time are obtained.

- b. A ten-minute idle, followed by a back-up and abrupt stop at prescribed acceleration and deceleration rates.
- c. A series of accelerations of prescribed duration and rates, followed by prescribed decelerations and short idle periods.
- d. A twenty-minute engine-off soak, followed by a hot start and run of sixty seconds before driveaway.
- e. A repeat of Item c.

D. City Driveability Procedure

The City Driveability Procedure is a new hot-start and driveaway technique designed to appraise low-speed driveability and hot-starting problems. This new procedure was the primary driveability procedure used in the 1982 CRC High-Temperature Driveability Program, and was compared with the CRC Hot-Start and Driveaway Procedure for selected cars. The Procedure is described in detail in Appendix D. Briefly, it consists of the following:

- a. A prescribed warm-up.
- b. Simulated low-speed city traffic for four miles.
- c. A ten-minute idle soak, followed by an acceleration.
- d. Simulated low-speed city traffic for four miles.
- e. A twenty-minute key-off soak, followed by a hot start, followed by an acceleration.

For both driveability procedures, hesitation, stumble, surge, backfire, and stalls are recorded during acceleration and deceleration. Idle quality and stalls are recorded during idle periods, and cranking start time and total start time are recorded after engine-off soak. In addition to the number of times a malfunction occurs, the quality of all malfunctions, except stalls and start time, are evaluated as trace, moderate, or heavy. Sample data sheets are presented in Appendix D.

## VII. TEST DESIGN

Since evaluation of vapor lock tolerance of the vehicle was necessary prior to hot driveability evaluations, only vapor lock testing for 95°F (35°C) was conducted for the first two days of the program, using four test crews. On the third day, the test crews were reassigned into five test crews: three vapor lock crews and two hot driveability crews. It was necessary to extend the test program a few days longer than had been originally planned in order to obtain the desired number of hot driveability test evaluations. By the end of the program, 115 95°F (35°C) vapor lock tests, 94 70°F (21°C) vapor lock tests, 66 City Driveability Procedure tests, and 20 CRC Hot-Start and Driveaway tests had been conducted. It was discovered during the test program that the low to intermediate blending pump had malfunctioned on October 4-6, dispensing 100 percent intermediate fuel for all settings. Although tests conducted during this time resulted in valid data, the desired volatility effects were not obtained for some runs.

## VIII. AMBIENT CONDITIONS

Ambient conditions were not altogether favorable during the test program. During the first week, attempts were made to evaluate vapor lock at 70°F (21°C), but ambient temperatures were such that the maximum temperature was exceeded before completion of a test. During the second test week, temperatures did not exceed 90°F (32°C); therefore, no hot driveability or 95°F (35°C) vapor lock tests were conducted. During the third test week, high winds and cool temperatures precluded extensive testing. Although more normal conditions prevailed during the fourth week, temperatures were somewhat cooler than desired. To facilitate obtaining additional test hours, it was decided during the fourth week to reduce the starting temperature for hot driveability tests to 85°F (29°C) from 90°F (32°C).

## IX. ON-SITE DATA RECORDING AND PROCESSING

Preliminary data processing was conducted on-site with the aid of a microcomputer and printer. Data recorded by the test crews were transcribed from the original data sheets (sample in Appendix D) to computerized spread sheets with similar data arrangement.



For vapor lock tests, average RVP's for duplicate samples were entered on each spread sheet. The computer program automatically calculated percent increases in acceleration time and fuel  $T_{V/L=20}$ , both unadjusted and adjusted to 70°F or 95°F (21°C or 35°C). Correlation used on-site to estimate  $T_{V/L=20}$  from RVP were based on the supplier's fuel data. When volatility data were subsequently obtained on the vapor lock fuels from cooperative laboratories, the spread sheets were recalculated with new constants from the final correlation formula. Final printouts from the vapor lock tests are shown in Appendix G.

For driveability tests, the computer program calculated driveability demerits. Results from each driveability test occupy one entire page; therefore, only summary results are included in Appendix F. A complete set of driveability printouts is available for inspection at the CRC offices.

## X. DISCUSSION OF RESULTS

### A. Vapor Lock

#### 1. Limiting $T_{V/L=20}$

Vapor lock limiting  $T_{V/L=20}$  is shown in Table III for each car corrected to ambient temperatures of 95°F (35°C) and 70°F (21°C). This is the  $T_{V/L=20}$  for a 25 percent increase in acceleration time at the most critical soak and speed condition. At 95°F (35°C), six of the nineteen cars tested were not fully characterized as to limiting volatility with the fuel series. Cars 2, 3, 8, 13, and 18 did not encounter vapor lock on the most volatile fuel tested. Car 1 encountered vapor lock with the least volatile fuel tested. Of the cars characterized for critical soak condition at 95°F (35°C), twelve were idle soak-limited, and two were engine-off soak-limited.

At 70°F (21°C), seven of the nineteen cars tested did not encounter vapor lock on the most volatile fuel tested, and were not, therefore, fully characterized as to limiting volatility. Of the cars characterized for critical soak condition at 70°F (21°C), six were idle soak-limited, and six were engine-off soak-limited. Of the twelve cars characterized for critical soak conditions at both temperatures, five cars which were idle limited at 95°F (35°C) were engine-off limited at 70°F (21°C), one car which was engine-off limited at 95°F (35°C) was idle limited at 70°F (21°C), and six cars had the same limiting condition at both temperatures.

Of the twelve cars for which limiting  $T_{V/L=20}$  was obtained at 70°F (21°C), ten had higher  $T_{V/L=20}$  for limiting vapor lock at 95°F (35°C). Two cars, 9 and 11, had higher  $T_{V/L=20}$  for limiting vapor lock at 70°F (21°C). For these two cars, no explanation of the reversal of expected results was obtained.

## 2. Ambient Temperature Vapor Lock Corrections

Vapor lock tests were conducted over a range of 87°F (30°C) to 111°F (44°C) for 95°F (35°C) vapor lock, and a range of 65°F (18°C) to 85°F (29°C) for 70°F (21°C) vapor lock. The  $T_{V/L=20}$  test data were corrected from actual ambient test conditions to nominal 95°F (35°C) and 70°F (21°C) temperatures using a previously established CRC expression, where:

$$\text{Adjusted } T_{V/L=20} = \text{Actual } T_{V/L=20} + K \begin{pmatrix} (95 \\ \text{or - Air Temperature} \\ (70) \end{pmatrix}$$

The K value used was K=1.

The 70°F (21°C) vapor lock tests were performed at both idle and engine-off soak conditions, so that comparable soak condition data would be available for both test temperatures. Comparable soak condition limiting  $T_{V/L=20}$ 's are shown in Table IV for the ten cars that were characterized at both test temperatures. The ten cars show an average limiting  $T_{V/L=20}$  difference of 17.1 between the two test temperatures, giving a 0.68  $T_{V/L=20}$  correction for a one-degree change in ambient temperature. For convenience, the correction was rounded off to 0.7. The 0.7 factor is significantly different from the 1.0 previously used adjustment factor. It also shows a significant difference from a zero correction factor. With the exception of Table IV, all adjusted vapor lock data presented in this report use a K factor of 0.7 for ambient temperature correction.

## 3. Vapor Lock Distributions

Figure 3 shows distribution lines for limiting  $T_{V/L=20}$  for 95°F (35°C) for 1971 and 1975<sup>(1)</sup> cars tested in previous CRC programs compared with 1982 cars tested in this program. These data show a trend of decreasing vapor lock severity with more recent model year cars. A fuel with a 124°F (51°C)  $T_{V/L=20}$  would satisfy 20 percent of the 1971 cars tested, 45 percent of the 1975 cars tested, and 75 percent of the 1982 cars tested under the conditions of the CRC Vapor Lock Test at 95°F (35°C).

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(1) Coordinating Research Council, Inc., "Driveability Performance of 1975 Passenger Cars at High Ambient Temperatures," CRC Report No. 490, November 1976.

The distribution of limiting  $T_{V/L=20}$  values for the 1982 cars tested at 95°F (35°C) and 70°F (21°C) is shown in Figure 4 for their most severe soak and speed conditions. Six cars at 95°F (35°C) and seven cars at 70°F (21°C) had indeterminate values, because their requirements were outside the volatility range of the test fuels. The level of volatility distribution is different with the cars having a higher vapor lock severity at 95°F (35°C). The slopes of the distribution lines are different with a trend towards converging at the more severe vapor lock level.

The distribution of limiting  $T_{V/L=20}$  values at 95°F (35°C) for 1982 cars with and without fuel return lines are shown in Figure 5. The slopes of the distribution lines are different, with the cars having fuel return lines showing a lower slope. There is no appreciable difference in vapor lock performance for cars with and without fuel return lines.

#### 4. Alternate Vapor Lock Procedure

An alternate vapor lock procedure was run on two cars at 95°F (35°C). The alternate vapor lock procedure was the same as the CRC procedure, except accelerations were timed from 0 to 30, 50, and 60 mph. Limiting  $T_{V/L=20}$ 's for the alternate procedure and the CRC procedure are shown in Table V. Car 5 showed similar limiting  $T_{V/L=20}$ 's for both procedures. Car 14 was more severe on the CRC procedure. Based upon the limited data available, no conclusion can be reached as to the performance of this alternate procedure.

#### B. Comparison of City Driveability Procedure Versus CRC Hot-Start and Driveaway Procedure

In previous CRC tests, the CRC Hot-Start and Driveaway Procedure has shown it is capable of defining car performance in terms of fuel volatility. In this program, a limited number of tests were run using the CRC Hot-Start and Driveaway Procedure and a greater number were run using a new City Driveability Procedure. The purpose of these tests was to compare results of the two procedures and their ability to define car performance by segregating fuel effects. Detailed descriptions of both procedures are provided in Appendix D. The City Driveability Procedure includes thirty-four 0-20 mph accelerations, followed by idle periods and two 0-30 mph part-throttle accelerations. The CRC Hot-Start and Driveaway Procedure includes a back-up maneuver with moderate to severe braking, idle periods, and sixteen accelerations to different speeds at varied rates. Both procedures were completed by trained raters. Comparisons of trained rater results are provided in Appendix E.

In both cycles, driveability problems are quantified by assigning them numerical values that increase as problem severity increases. These values are termed "demerits;" large total demerit values are indicative of poor driveability. Seventeen comparison tests were completed in which the cars were run through both procedures with the same fuel and driver. The demerit values obtained are shown in Table VI. Average demerits of the City Driveability Procedure were about twice the average of the CRC Hot-Start and Driveaway Technique. The total weighted demerit (TWD) values for comparable runs are plotted in Figure 6. The linear relationship between the two cycles was:

$$\text{TWD(CITY)} = 1.48 \text{ TWD(CRC)} + 92.6$$

$$R^2 = 0.23$$

Three cars were significantly more severe on the CRC procedure than the new procedure (cars 7, 9, and 14). Although no single driving problem caused the differences in demerits between the two procedures, demerits from driving stalls were about 34 to 51 percent higher for the CRC technique with the most volatile fuel. Correlation between the procedures was improved significantly when these cars were deleted from the model:

$$\text{TWD(CITY)} = 3.15 \text{ TWD(CRC)} - 98.9$$

$$R^2 = 0.69$$

To segregate fuel effects, regression models typically are developed which relate fuel volatility characteristics (i.e.,  $T_{V/L=20}$ , RVP, %@158°F, or distillation temperatures) to car performance. Unfortunately, this fuel set was not designed to segregate volatility effects on driveability, nor were the tests performed in a balanced scheme which lends to proper model development. Consequently, models that identify the significant volatility parameter could not be developed for either test. Some regression work was completed with data from the City Driveability Procedure, but it is in a very general form (see Appendix F). Although the data indicate that both tests can separate fuels of different volatility, the ability of the new City Driveability Procedure versus the CRC Hot-Start and Driveaway Procedure to identify significant fuel parameters that affect car performance cannot be determined from this program. To evaluate the two test techniques, another program specifically designed to assess hot-weather driveability is required.

C. Comparison of Vapor Lock Versus City Driveability

To determine if there was a relationship between vapor lock performance and the City Driveability Procedure performance, a ranking was made of vapor lock and driveability performance. The ranking of the City Driveability Procedure performance was made with data obtained from the runs using the pentane-rich fuel (Fuel 20), since all nineteen cars were run on this fuel. The vehicles were ranked in order of decreasing vapor lock volatility tolerance and of increasing hot-start and driveaway total weighted demerits. These rankings are shown in Table VII and plotted in Figure 7. Those cars with undetermined limiting  $T_{V/L=20}$  were ranked equally, and were not included in the data regression analysis. The regression line shown in Figure 7 has a positive slope of 0.34 and a coefficient of determination of 0.20. These data do not establish a strong relationship between a vehicle's vapor lock volatility tolerance and its city cycle hot-start and driveaway performance.

D. Fuel System Temperature Measurements

Fuel system temperatures were obtained on seventeen of the test vehicles for 95°F (35°C) vapor lock tests and for fourteen of the vehicles for 70°F (21°C) vapor lock tests. The following temperature measurements were obtained:

- o Surface temperature of the fuel line at the inlet to the carburetor or fuel injector for all vehicles.
- o Temperature of the fuel in the fuel tank for all General Motors vehicles.
- o Surface temperature of the fuel line at the inlet to the fuel pump for all non General Motors vehicles.

The average temperature of the fuel line at the inlet to the carburetor or fuel injector for all runs for each soak for each vehicle are listed in Tables VIII and IX for the 95°F (35°C) and 70°F (21°C) vapor lock tests, respectively. Tables X and XI show similar data for the fuel pump and fuel tank temperatures. Temperature data between idle and key-off soaks in some cases are not comparable. This is due to the nature of the vapor lock test, since after a few runs, idle or key-off is established as the limiting condition and further runs are not made on the non-limiting condition. In these cases, the number in parentheses is the average temperature for the runs in which both soak conditions were run.

There was no apparent correlation between vapor lock performance and fuel system temperatures. It would be expected that the critical soak condition that produced the highest carburetor and/or fuel pump temperature would be the most critical vapor lock condition. Table XII shows that for twelve cases, the most critical vapor lock soak condition also showed the highest carburetor and fuel pump temperatures. It also shows that for thirteen cases, the highest carburetor and/or fuel pump temperatures did not occur for the most critical vapor lock condition.

T A B L E S  
A N D  
F I G U R E S

TABLE I  
DESCRIPTION OF TEST CARS  
(1982 Model Year)

Make	Model	Engine Disp., l.	PS	PB	Fuel Return	Vehicle Identification No.	Fuel Inj.	Elec. F.P.	Emission System*
Buick	Century	3.0	Y	Y	N	1G4AL19E4C0402668	N	N	CL
Buick	Limited	3.8	Y	Y	N	1G4AM47A1CR110954	N	N	CL
Cadillac	Sedan DeVille	4.1	Y	Y	Y	1G6AV6982C9229870	Y	Y	CL
Chevrolet	Cavalier	1.8	Y	Y	N	1G1AD69G7CC125391	N	N	CL
Chevrolet	Chevette	1.6	Y	N	N	1G1AB68C9CA113775	N	N	CL
Chevrolet	Citation	2.5	Y	Y	Y	1G1AX68R8C6105093	Y	Y	CL
Chevrolet	Monte Carlo	3.8	Y	Y	N	1G1AZ37K50R157602	N	N	CL
Datsun	210	1.5	N	Y	Y	JN1PB025XCU692212	N	N	OL
Ford	Club Wagon	4.9	Y	Y	N	1FMEE11E4CHA53342	N	N	OL
Ford	Escort	1.6	Y	Y	Y	1FABP0628CW122769	N	N	OL
Ford	Granada	3.3	Y	Y	Y	1FABP27B0CA126399	N	N	OL
Ford	Granada	3.8	Y	Y	Y	1FABP27B0CG127235	N	N	OL
Ford	Mustang	2.3	Y	Y	Y	1FABP10AOCF147848	N	N	OL
Lincoln	Town Car	5.0	Y	Y	Y	1LNBP94FXCY621223	N	N	CL
Honda	Accord	1.8	Y	Y	N	JHMSZ3427CC023143	N	Y	OL
Oldsmobile	Cutlass	4.3	Y	Y	N	1G3AM6980CM480736	N	N	CL
Plymouth	Reliant	2.2	Y	Y	Y	1P3BP4689CF223384	N	N	CL
Toyota	Corolla	1.8	Y	Y	N	JT2TEL2L4C0738623	N	N	OL
Volkswagen	Rabbit	1.7	Y	Y	Y	1VMBB0174V010629	Y	Y	CL

\* CL = Closed Loop  
OL = Open Loop



TABLE II  
AVERAGE TEST FUEL PROPERTIES

Fuel No.	1	3	5	7	9	11	13	15	17	20
RMFV	90-82	-	-	-	91-82	-	-	-	92-82	93-82
RVP, psf	7.1	8.2	9.3	10.6	11.8	13.1	14.2	15.4	16.3	13.4
T <sub>9</sub> /L-20, °F(°C)	152.5(66.9)	145.0(62.8)	137.2(58.4)	129.0(53.9)	123.0(50.5)	116.5(46.9)	110.3(43.5)	106.3(41.3)	102.2(39.0)	107.2(41.8)
Distillation (D-86) T°F (T°C) @ % Evap.										
10	136 (57.8)	132 (55.5)	123 (50.5)	120 (48.9)	114 (45.5)	106 (41.1)	100 (37.8)	94 (34.4)	93 (33.9)	98 (36.7)
50	228 (108.9)	229 (109.4)	225 (107.2)	224 (106.7)	222 (105.5)	220 (104.4)	216 (102.2)	213 (100.5)	212 (100.0)	184 (84.4)
90	347 (175.0)	348 (175.5)	345 (173.9)	346 (174.4)	344 (173.3)	343 (172.8)	344 (173.3)	346 (174.4)	343 (172.8)	300 (148.9)
EP	417 (213.9)	418 (214.4)	416 (213.3)	417 (213.9)	416 (213.3)	416 (213.3)	414 (212.2)	414 (212.2)	414 (212.2)	415 (212.8)
API Gravity	56.8	57.6	58.5	59.4	60.4	61.4	62.1	63.0	63.8	74.4

TABLE III

LIMITING VAPOR LOCK AT 95°F(35°C) AND 70°F(21°C)

Car No.	95°F (35°C) Critical Test Condition $LT_{V/L}=20$			70°F (21°C) Critical Test Condition $LT_{V/L}=20$		
	Hot Soak	Speed	°F (°C)	Hot Soak	Speed	°F (°C)
1	I	70	>150(>65.5)	KO	70	123 (50.5)
2	--	--	<108(<42.2)	--	--	<100(<37.8)
3	--	--	<103(<39.4)	--	--	< 97(<36.1)
4	KO	50,60,70	113 (45.0)	I	70	99 (37.2)
5	I	50	126 (52.2)	I	60	102 (38.9)
6	I	60,70	107 (41.7)	KO	50	105 (40.5)
7	I	50,60,70	113 (45.0)	KO	50,60,70	104 (40.0)
8	--	--	<113(<45.0)	--	--	< 99(<37.2)
9	I	60	119 (48.3)	KO	50	126 (52.2)
10	I	50,60,70	124 (51.1)	KO	50	118 (47.8)
11	KO	60,70	122 (50.0)	KO	70	130 (54.4)
12	I	60,70	125 (51.7)	I	70	103 (39.4)
13	--	--	<108(<42.2)	--	--	<106(<41.1)
14	I	60,70	124 (51.1)	I	70	103 (39.4)
15	I	70	121 (49.4)	--	--	<104(<40.0)
16	I	70	127 (52.8)	I	60,70	104 (40.0)
17	I	60,70	111 (43.9)	--	--	< 99(<37.2)
18	--	--	<111(<43.9)	--	--	<105(<40.5)
19	I	50	127 (52.8)	I	50	100 (37.8)

Note: I = Idle; KO = Key Off

TABLE IV

COMPARISON OF LIMITING  $T_{V/L=20}$  AT 95°F (35°C) AND 70°F (21°C)

Car	Soak Condition	Limiting $T_{V/L=20}$ , °F (°C)		$\Delta$ Limiting $T_{V/L=20}$ (95-70)
		95 (35)	70 (21)	
4	KO	114 (45.5)	99 (37.2)	15 ( 8.3)
5	I	126 (52.2)	98 (36.7)	28 (15.5)
7	I	110 (43.3)	100 (37.8)	10 ( 5.5)
9	I	118 (47.8)	116 (46.7)	2 ( 1.1)
10	I	123 (50.5)	107 (41.7)	16 ( 8.8)
11	KO	125 (51.7)	126 (52.2)	-1 (-0.5)
12	I	124 (51.1)	101 (38.3)	23 (12.8)
14	I	119 (48.3)	101 (38.3)	18 (10.0)
16	I	124 (51.1)	102 (38.9)	22 (12.2)
19	I	134 (56.7)	96 (35.5)	38 (21.2)

AVERAGE

17.1 ( 9.49)

CHANGE IN  $T_{V/L=20}$ /CHANGE IN AMBIENT TEMPERATURE 0.68°F (0.38°C)

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Note: I = Idle; KO = Key Off

TABLE V

ALTERNATE VAPOR LOCK PROCEDURE VERSUS  
CRC VAPOR LOCK PROCEDURE

<u>Car No.</u>	<u>CRC</u>		<u>ALTERNATE</u>	
	<u>Limiting Condition</u>	<u><math>L_{TV/L=20}</math>, °F(°C)</u>	<u>Limiting Condition</u>	<u><math>L_{TV/L=20}</math>, °F(°C)</u>
5	Idle 15-50	125 (52.2)	Idle 0-30	127 (52.8)
14	Idle 15-60	124 (51.1)	Idle 0-60	116 (46.7)

TABLE VI

COMPARABLE DRIVEABILITY RUNS

<u>Car</u>	<u>Fuel</u>	<u>CRC</u>			<u>CITY</u>		
		<u>TWD</u>	<u>Temperature</u>		<u>TWD</u>	<u>Temperature</u>	
			<u>°F</u>	<u>°C</u>		<u>°F</u>	<u>°C</u>
1	1	263	89.3	31.8	757	82.0	27.8
2	20	130	88.8	31.5	99	92.6	33.7
2	17	124	92.3	33.5	126	87.6	30.9
3	20	47	93.0	33.9	164	99.4	37.4
3	17	97	91.0	32.8	86	104.2	40.1
5	20	324	92.3	33.5	850	89.8	32.1
5	5	156	93.8	34.3	230	90.4	32.4
7	20	187	93.8	34.3	22	105.4	40.8
7	14	219	89.0	31.7	8	93.0	33.9
9	20	326	90.0	32.2	376	98.2	36.8
9	9	248	92.8	33.8	269	93.0	33.9
10	20	239	89.5	31.9	820	88.6	31.4
12	20	259	87.0	30.6	793	99.8	37.7
12	5	115	88.0	31.1	660	103.2	39.6
14	20	374	93.3	34.1	480	84.6	29.2
14	6	55	90.8	32.7	360	106.2	41.2
16	20	186	92.3	33.5	445	92.0	33.3
AVERAGE		197	91.0	32.8	385	94.7	34.8
No. Maneuvers for TWD		36			72		
Avg. TWD/Maneuver		5.5			5.3		

TABLE VII

TEST VEHICLE VAPOR LOCK AND CITY DRIVEABILITY RANKINGS

Rank	City Driveability		Critical	
	TWD	Car No.	$I_{V/L=20}$ @ 95°F (35°C)	Car No.
1	0	8	<103 (<39.4)	3
2	9	6	<108 (<42.2)	2
3	22	7	<108 (<42.2)	13
4	24	13	<111 (<43.9)	18
5	60	11	<113 (<45.0)	8
6	61	18	107 ( 41.7)	6
7	70	19	111 ( 43.9)	17
8	99	2	113 ( 45.0)	4
9	138	17	113 ( 45.0)	7
10	164	3	119 ( 48.3)	9
11	214	15	121 ( 49.4)	15
12	376	9	122 ( 50.0)	11
13	445	16	124 ( 51.1)	10
14	480	14	124 ( 51.1)	14
15	772	10	125 ( 51.7)	12
16	775	1	126 ( 52.2)	5
17	812	12	127 ( 52.8)	16
18	850	5	127 ( 52.8)	19
19	891	4	>150 (>65.5)	1

TABLE VIII

CARBURETOR FUEL LINE TEMPERATURES FOR 95°F(35°C) VAPOR LOCK TESTS

Car No.	Critical Vapor Lock Condition <sup>(1)</sup>	Temperatures, °F			Temperatures, °F		
		Key-Off Ambient	Soak Carb.	$\Delta$ (2)	Idle Soak Ambient	Soak Carb.	$\Delta$ (2)
1	I	105	150	45	104	180(183) <sup>(3)</sup>	76
3	NL	102	173	71	107	172(176)	65
4	KO	88	147(147)	59	87	144	57
5	I	92	194	102	90	194(188)	104
6	I	102	188	86	104	180(179)	76
7	I	105	170(170)	65	105	170	65
9	I	106	156	50	100	167(170)	67
10	I	97	147	50	97	156(152)	59
11	KO	89	193	104	--	--	--
12	I	111	174	63	102	176(184)	74
13	NL	110	160	50	102	153(161)	51
14	I	110	216	106	101	183(194)	82
15	I	97	168	71	95	173(173)	78
16	I	101	152	51	94	156(160)	62
17	I	90	130	40	90	134	44
18	NL	89	151	62	90	124	34
19	I	107	172	65	91	160(168)	69

(1) I = Idle, NL = Not Limited, KO = Key-Off.

(2)  $\Delta$  = Carburetor Temperature - Ambient Temperature.

(3) Number in parentheses is the average temperature for only those runs in which both key-off and idle soaks were conducted.

TABLE IX

CARBURETOR FUEL LINE TEMPERATURES FOR 70°F(21°C) VAPOR LOCK TESTS

Car No.	Critical Vapor Lock Condition <sup>(1)</sup>	Temperatures, °F Key-Off Soak			Temperatures, °F Idle Soak		
		Ambient	Carb.	$\Delta$ <sup>(2)</sup>	Ambient	Carb.	$\Delta$ <sup>(2)</sup>
1	KO	75	129	54	76	159	83
3	NL	78	145	67	80	142	62
4	I	76	138	62	77	135	58
5	I	75	173	98	78	171	93
6	KO	77	158	81	78	159	81
7	KO	73	142	69	74	139	65
9	KO	77	140	63	77	127	50
10	KO	76	131	55	77	136	59
11	KO	77	185	108	77	148	71
12	I	74	147	73	77	156(152) <sup>(3)</sup>	79
14	I	75	184(177)	109	74	164(156)	90
15	NL	65	136	71	66	139	73
16	I	81	136	55	74	131(148)	57
17	NL	--	--	--	79	114	35
19	I	76	148	72	77	145	68

(1) I = Idle, NL = Not Limited, KO = Key-Off.

(2)  $\Delta$  = Carburetor Temperature - Ambient Temperature.

(3) Number in parentheses is the average temperature for only those runs in which both key-off and idle soaks were conducted.



TABLE X

FUEL PUMP INLET AND FUEL TANK TEMPERATURES FOR 95°F(35°C) VAPOR LOCK TESTS

Car No.	Critical Vapor Lock Condition <sup>(1)</sup>	Temperatures, °F Key-Off Soak				Temperatures, °F Idle Soak			
		Amb.	Pump	Tank	$\Delta$ (2)	Amb.	Pump	Tank	$\Delta$ (2)
1	I	105	--	110	5	104	--	113(112) <sup>(3)</sup>	9
3	NL	102	--	106	4	107	--	116(118)	9
4	KO	88	128	--	40	87	128	--	41
5	I	92	--	--	--	88	--	97	9
6	I	102	--	108	6	104	--	111(112)	7
7	I	105	--	108(108)	3	105	--	114	9
9	I	106	144	--	38	100	148(152)	--	48
10	I	97	125	--	28	97	147(144)	--	50
11	KO	92	142(153)	--	50	106	174	--	68
12	I	111	125	--	14	102	151(158)	--	49
14	I	110	172	--	62	101	151(194)	--	50
15	I	97	--	113	16	97	--	113(110)	16
16	I	101	154	--	53	94	161(164)	--	67
19	I	--	--	--	--	89	168	--	79

(1) I = Idle, NL = Not Limited, KO = Key-Off.

(2)  $\Delta$  = Fuel Pump Inlet or Fuel Tank Temperature - Ambient Temperature.

(3) Number in parentheses is the average temperature for only those runs in which both key-off and idle soaks were conducted.

TABLE XI

FUEL PUMP INLET AND FUEL TANK TEMPERATURES FOR 70°F(21°C) VAPOR LOCK TESTS

Car No.	Critical Vapor Lock Condition <sup>(1)</sup>	Temperatures, °F Key-Off Soak				$\Delta$ (2)	Temperatures, °F Idle Soak			
		Amb.	Pump	Tank	Amb.		Pump	Tank	$\Delta$ (2)	
1	KO	75	--	82	7	76	--	87	11	
3	NL	78	--	82	4	80	--	91	11	
4	I	76	119	--	43	77	118	--	41	
5	I	75	--	80(83) <sup>(3)</sup>	5	78	--	88	12	
6	KO	77	--	83	6	78	--	87	9	
7	KO	73	--	80	7	74	--	86	12	
9	KO	77	120	--	43	77	119	--	42	
10	KO	76	108	--	32	77	123	--	46	
11	KO	76	126	--	50	76	145	--	69	
12	I	74	98	--	24	77	134(120)	--	57	
14	I	75	140(133)	--	65	74	125(120)	--	51	
16	I	81	137	--	56	74	136(155)	--	62	
19	I	76	111	--	35	77	148	--	71	

(1) I = Idle, NL = Not Limited, KO = Key-Off.

(2)  $\Delta$  = Fuel Pump Inlet or Fuel Tank Temperature - Ambient Temperature.

(3) Number in parentheses is the average temperature for only those runs in which both key-off and idle soaks were conducted.

TABLE XII

CONDITION OF MAXIMUM TEMPERATURE VERSUS VAPOR LOCK CRITICAL CONDITION

Car No.	95°F (35°C) Vapor Lock			70°F (21.C) Vapor Lock		
	Critical Vapor Lock Condition	Condition for Highest Temperature Recorded		Critical Vapor Lock Condition	Condition for Highest Temperature Recorded	
		Carb.	Fuel Pump		Carb.	Fuel Pump
1	I	I	--	KO	I	--
3	NL	I	--	NL	KO	--
4	KO	KO	KO & I	I	KO	KO
5	I	KO	--	I	KO	KO
6	I	KO	--	KO	I	--
7	I	KO & I	--	KO	KO	--
9	I	I	I	KO	KO	KO
10	I	I	I	KO	I	I
11	KO	--	I	KO	KO	I
12	I	I	I	I	I	I
13	NL	I	--	--	--	--
14	I	KO	I	I	KO	KO
15	I	I	--	NL	I	--
16	I	I	I	I	I	I
17	I	I	--	NL	--	I
18	NL	KO	--	I	KO	I
19	I	KO	--	I	KO	I

NOTE: I = Idle; NL = Not Limited; KO = Key Off

TEMPERATURE AT V/L = 20 AND  
PERCENT EVAPORATED AT 158°F.  
VERSUS REID VAPOR PRESSURE

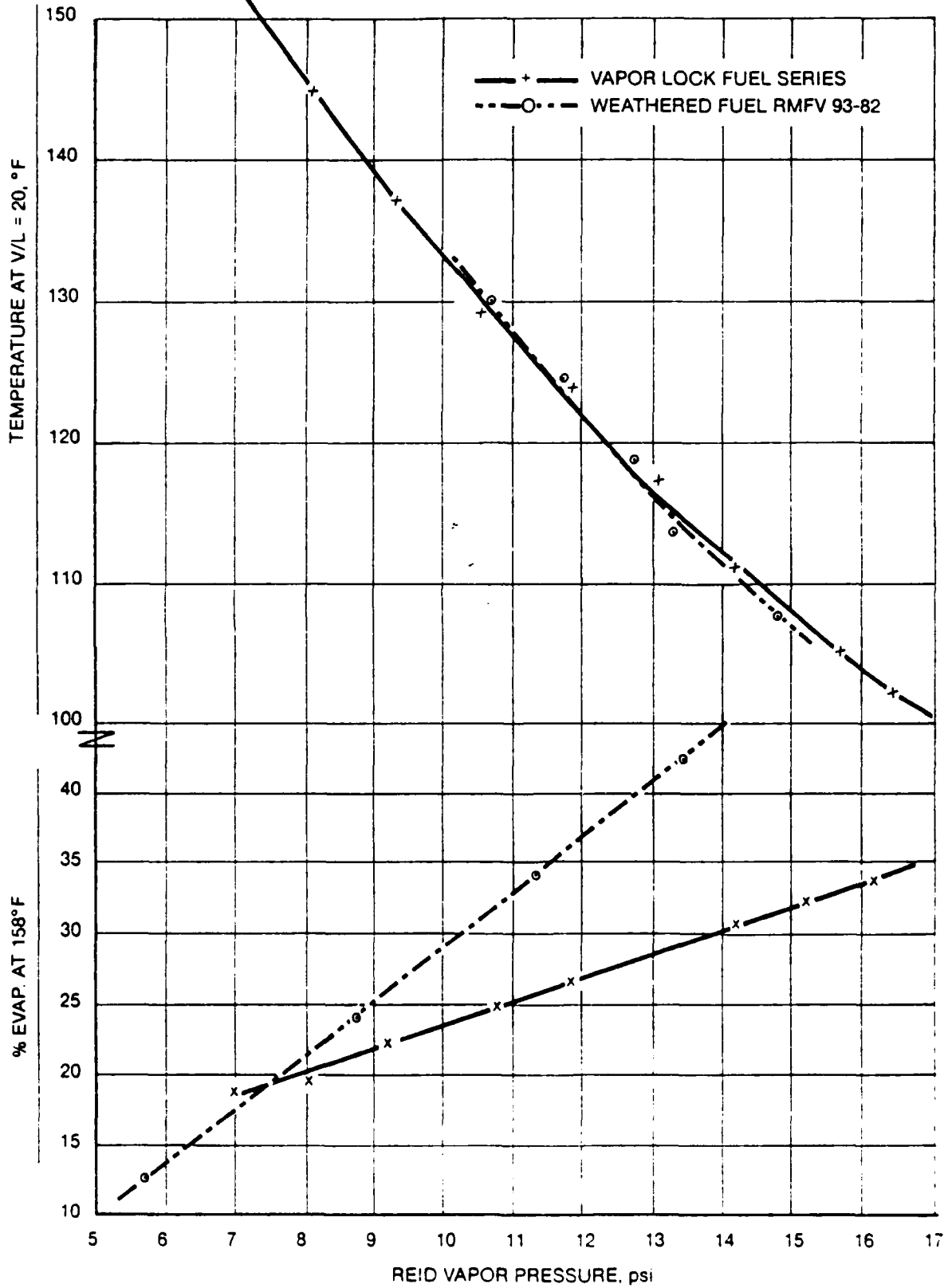


Figure 2

TEST COURSE

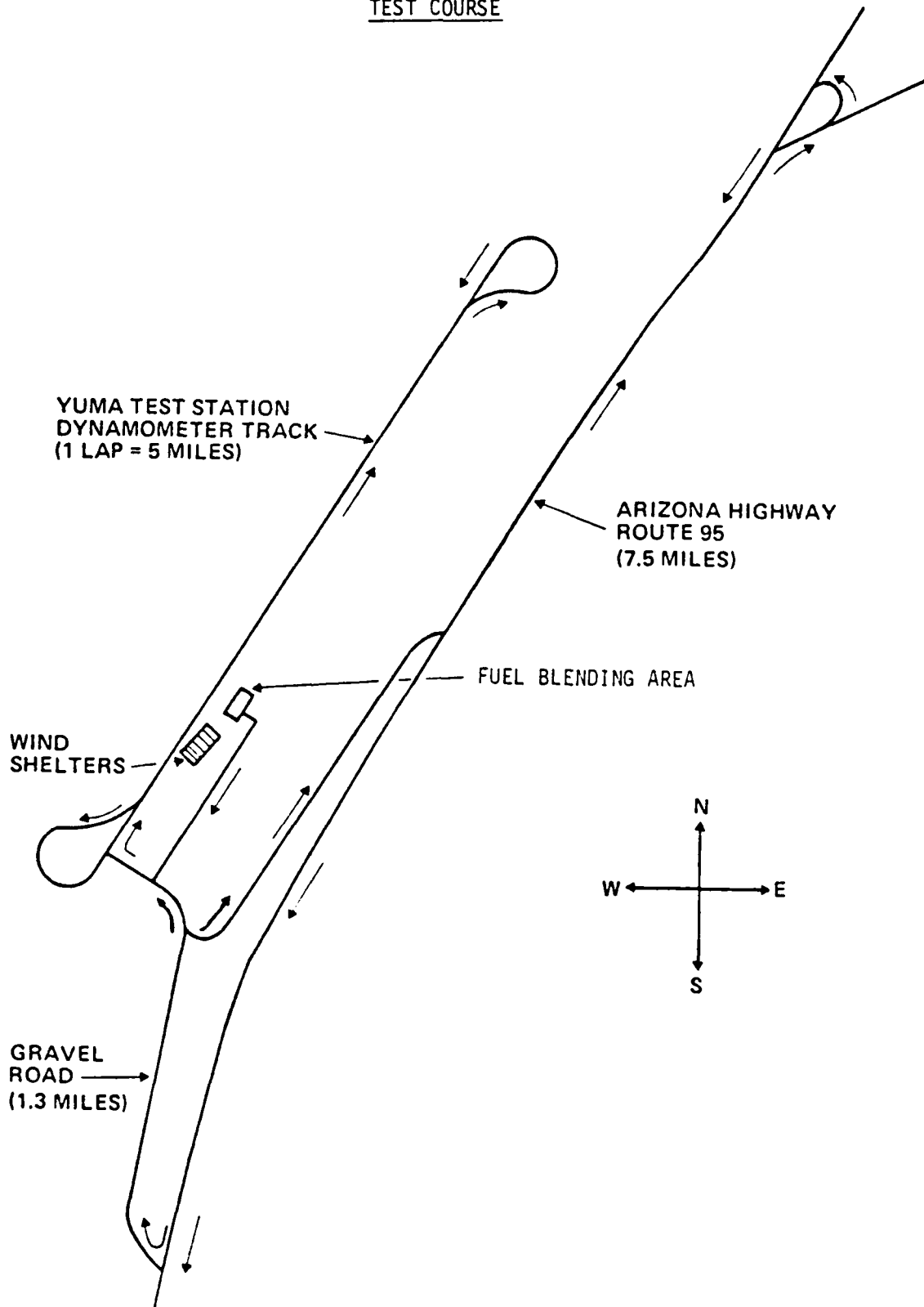


Figure 3  
DISTRIBUTION OF LIMITING  $T_{vi}$  <sup>20</sup>  
FOR THREE MODEL YEARS AT 95°F (35°C)

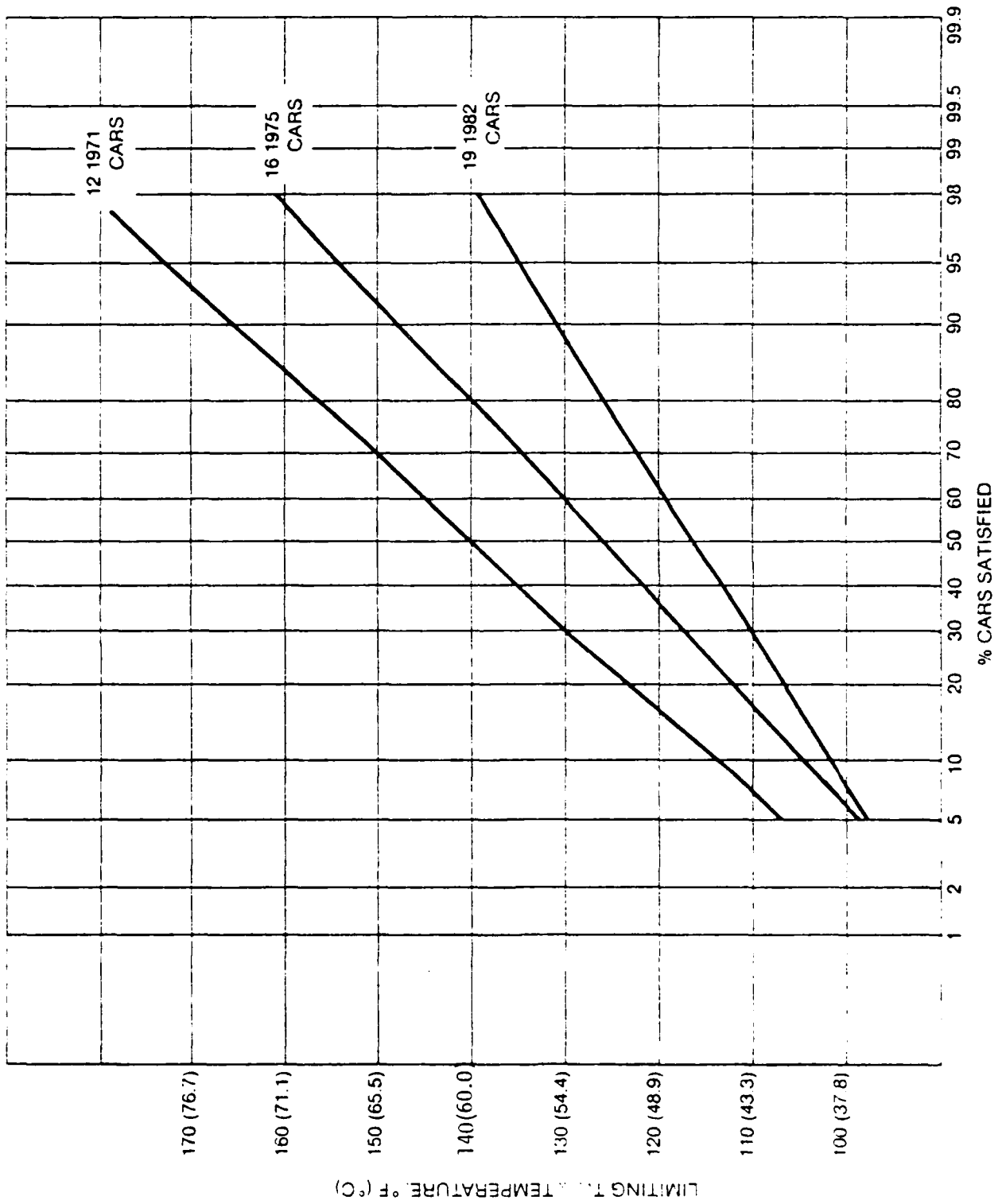


Figure 4  
DISTRIBUTION OF LIMITING  $T_{VL,20}$   
AT 70°F (21°C) AND 95°F (35°C)

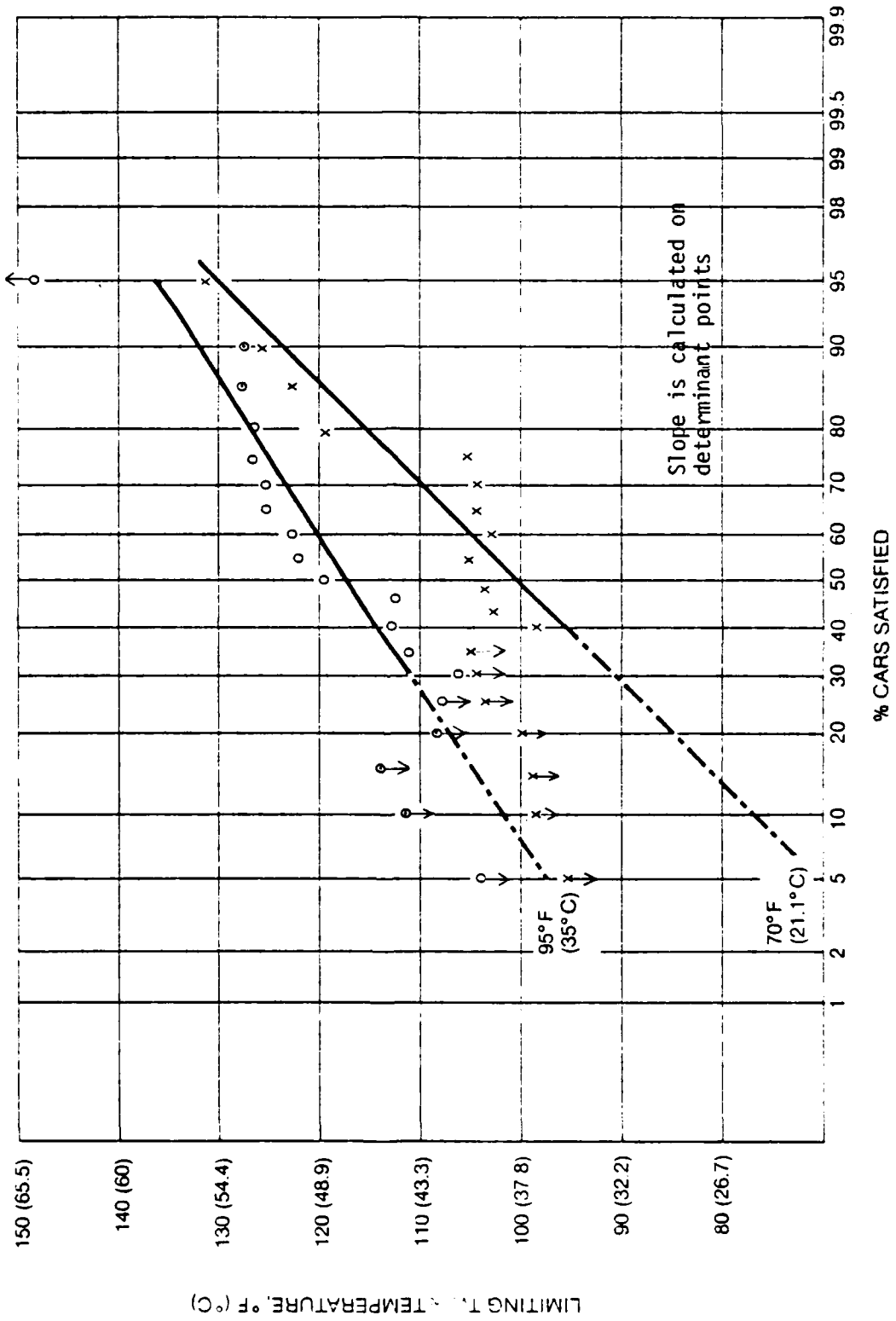


Figure 5  
DISTRIBUTION OF LIMITING  $T_{vi, 20}$   
OF 1982 MODEL YEAR CARS  
EQUIPPED WITH FUEL-RETURN VERSUS NON-FUEL-RETURN LINES

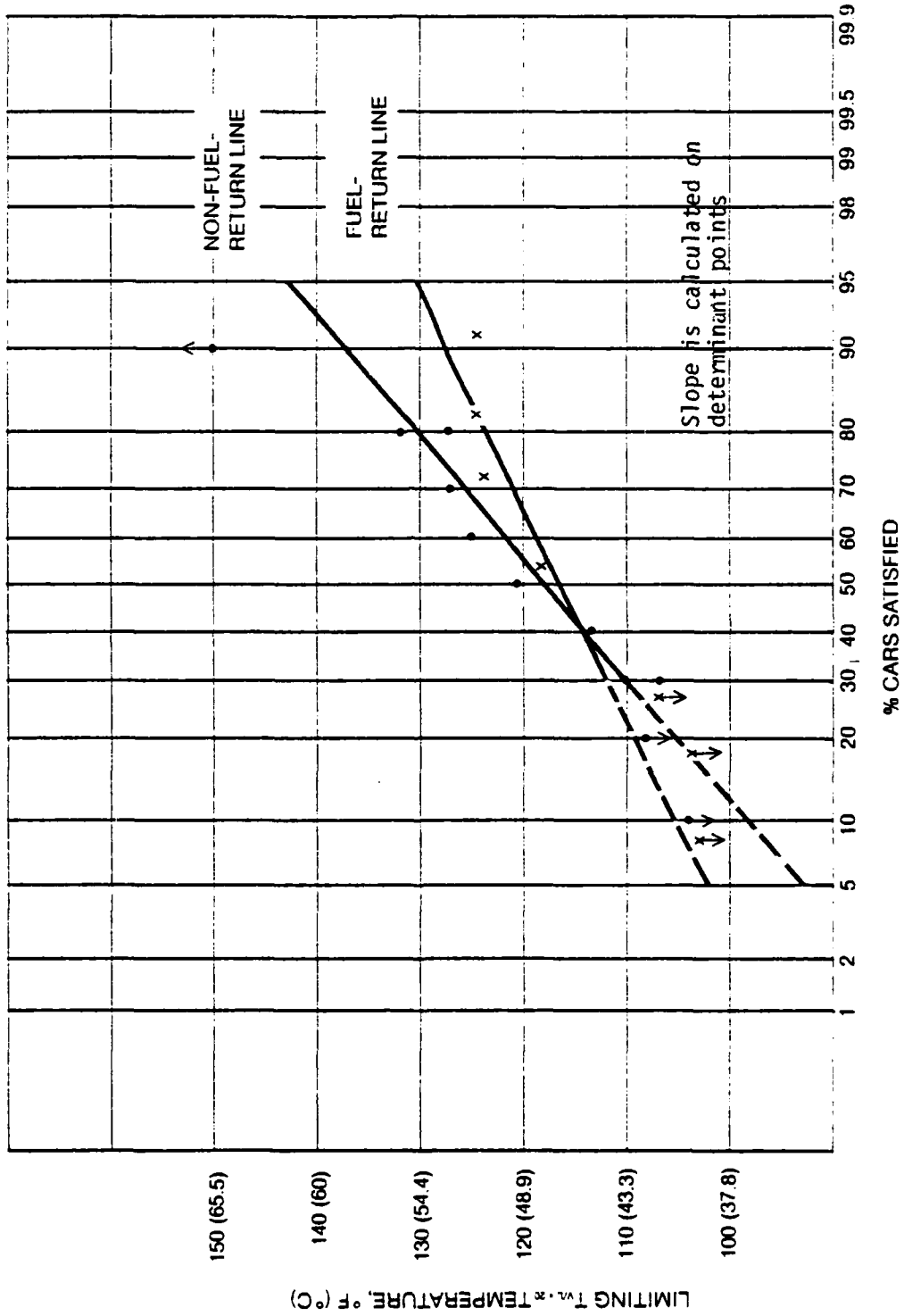




Figure 6

TWD's: COMPARABLE DRIVEABILITY RUNS

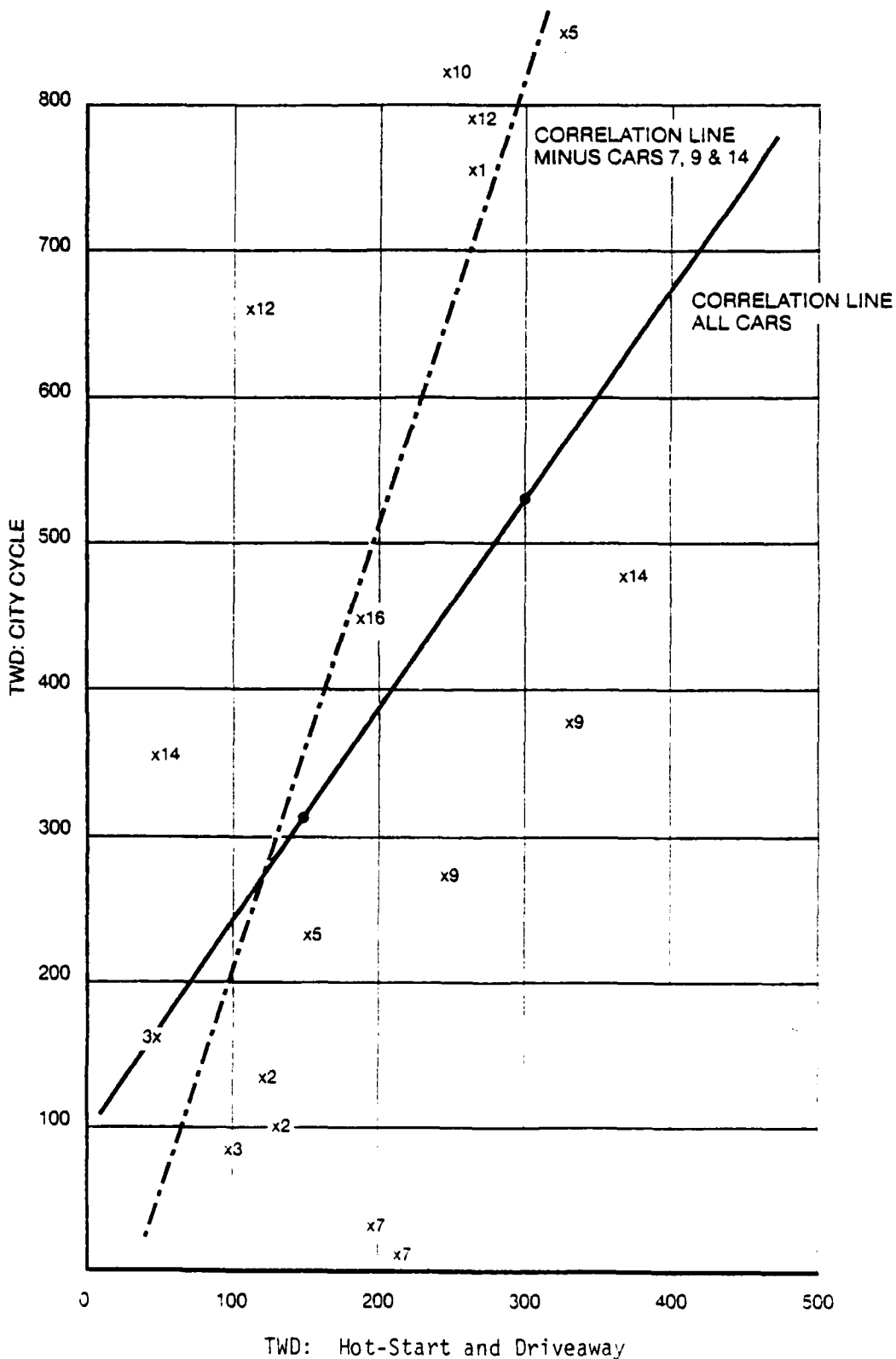
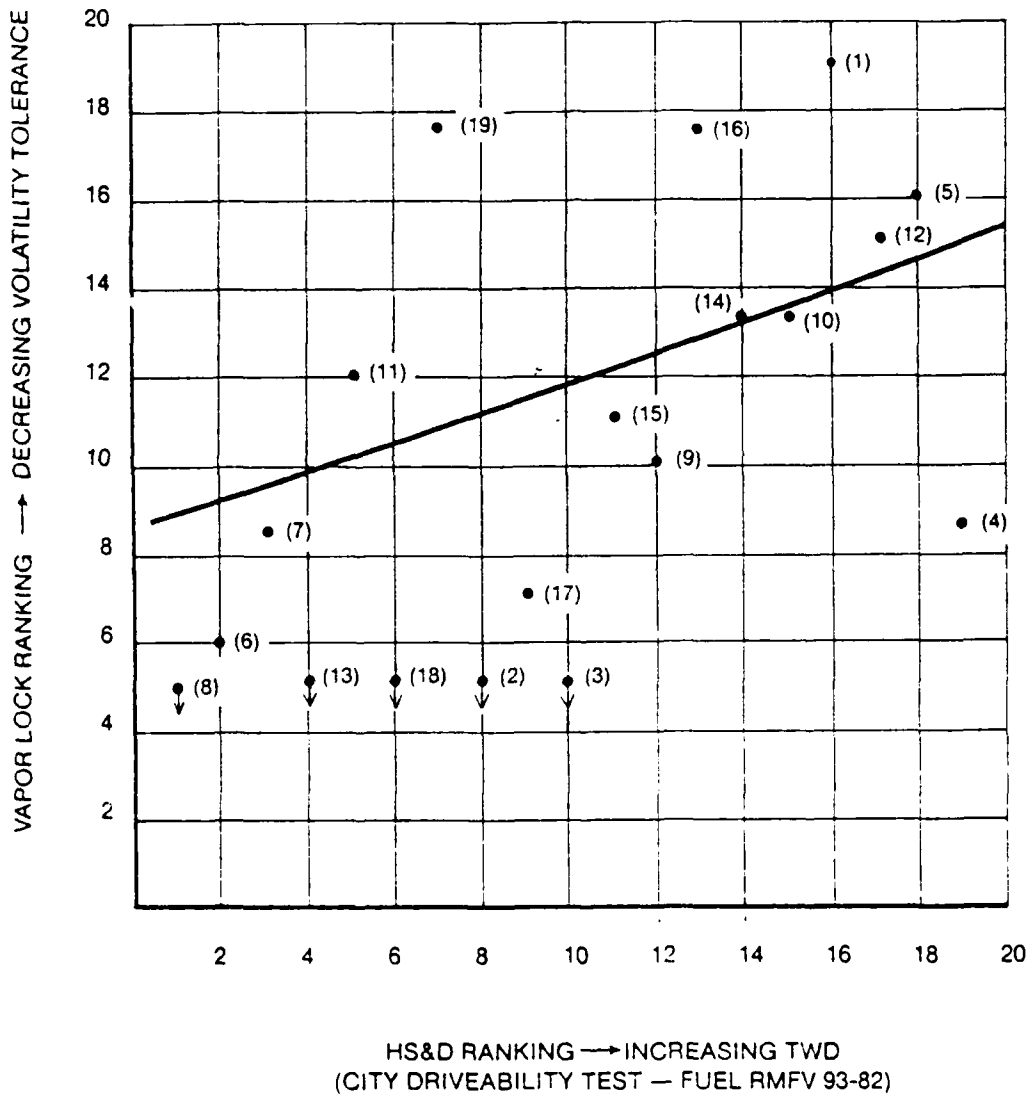


Figure 7  
VEHICLE RANKING:  
VAPOR LOCK VERSUS HOT START AND DRIVEAWAY  
(BY CAR NUMBER)



A P P E N D I X    A

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A P P E N D I X    B

PROGRAM: 1982 CRC HIGH-TEMPERATURE  
DRIVEABILITY PROGRAM

B-1

**1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM**

**CRC Project No. CM-118-82**

Prepared by the  
Program Panel  
of the  
CRC Light-Duty Volatility Group

February 1982

Revised: May 1982

## 1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM

### Objective

Determine vapor lock performance of a selected group of 1982 cars at nominal temperature of 70°F and 95°F. Determine hot start and drive-away performance of the same group of cars at a nominal temperature of 95°F.

### Introduction

CRC has conducted high temperature programs for the evaluation of vapor lock and hot start and driveability on 1972 and 1975 model passenger cars. Since 1975, changes in vehicle design that may affect high temperature performance are exhaust emission systems, design for fuel economy, and introduction of new front wheel drive designs. This program will indicate the effect of such changes on vapor lock performance at a nominal temperature of 95°F. In addition, vapor lock will be evaluated at a nominal temperature of 70°F. The lower temperature vapor lock evaluation will be useful in updating ambient temperature corrections of volatility and in giving guidance for volatility specification for a range of temperatures from 70 to 95°F.

A new hot start and driveaway procedure will be investigated in this program. The new procedure emphasizes conditions that might cause performance problems encountered in heavy stop and go traffic after a period of temperature stabilization. Selected cars will compare performance results from the 1975 CRC hot start and driveaway procedure to the new procedure.

### Test Fuels

Vapor lock test fuels consisting of three base fuels of 6.0, 12.0, and 17.0 RVP are identified as RMFV 90-82, 91-82, and 92-82, respectively. The fuel series is representative of a typical 10.5 lb. RVP summer fuel and a 13.5 lb. RVP winter fuel. Test fuel specifications are shown in Attachment A.

A special fuel blended to emphasize hot start and driveaway problems is also shown on the fuel specification sheet as RMFV 93-82. Use of this fuel is discussed in the test procedure section.

### Test Cars

Twenty-one test vehicles are selected for the test program as follows for 1982:



<u>Car No.</u>	<u>Make and Model</u>	<u>Engine Size, Liter/Type</u>
1	GM T Body Chevrolet Chevette Pontiac T-1000	1.6/L-4
2	GM J Body Chevrolet Cavalier Pontiac J-2000 Buick Skyhawk Oldsmobile Firenza Cadillac Cimmaron	1.8/L-4
3	GM A Body Chevrolet Celebrity Pontiac A-6000 Buick Century Oldsmobile Ciera	2.5/L-4
4	GM X Body Chevrolet Citation Pontiac Phoenix Buick Skylark Oldsmobile Omega	2.8/V-6
5	GM G Body Chevrolet Malibu Chevrolet Monte Carlo Pontiac Bonneville Pontiac Grand Prix Buick Regal Oldsmobile Cutlass	2.8/V-6
6	GM G Body Chevrolet Malibu Chevrolet Monte Carlo Pontiac Bonneville Pontiac Grand Prix Buick Regal Oldsmobile Cutlass	3.0/V-6
7	Buick Regal	3.8/V-6
8	Buick LeSabre	4.1/V-6
9	Ford Escort-Mercury Lynx	1.6/L-4
10	Ford Mustang-Mercury Capri	2.3/L-4
11	Ford Futura-Granada	3.3/L-6

<u>Car No.</u>	<u>Make and Model</u>	<u>Engine Size, Liter/Type</u>
12	Ford Futura-Granada	3.8/V-6
13	Ford Futura-LTD-Thunderbird	4.2/V-8
14	Plymouth Reliant-Dodge Aries	2.2/L-4
15	Datsun 210	1.4 or 1.5/L-4
16	Toyota Corolla	1.8/L-4
17	Volkswagen Rabbit	1.6/L-4
18	Honda Accord	1.8/L-4
19	Chevrolet Van	5.0/V-8
20	Ford Van	4.9/V-8
21	Dodge Van	3.7/L-6

In some cases, several vehicles are listed, such as Chevrolet Celebrity, Pontiac A-6000, Oldsmobile Ciera, or Buick Century for a General Motors A-body car with a 2.5-liter engine. The actual car to be tested will be determined by a particular model of the choices listed being available from the rental agency. If one or more of the selected vehicles are not available, alternate selections are as follows:

1. Dodge Diplomat, or equivalent, with a 3.7-liter engine
2. Cadillac Deville with a 4.1-liter engine
3. Lincoln with a 5.0-liter engine
4. Chevrolet S-10 pickup truck
5. Ford Ranger pickup truck with a 2.3-liter engine

All vehicles are to be equipped with automatic transmission and air conditioning. Car preparation will include checking timing, idle speed, emission control system operation, installation of vacuum gauge lines, installation of temperature thermistors and installation of fuel tank drains.

### Vapor Lock Test Procedure

The vapor lock test procedure will essentially be the same as used in the 1975 CRC program. A copy of this procedure is shown as Attachment B. Sections 12a, b, c, d, and e will change the speed for determining increases in acceleration times from 70 mph to 60 mph. Test temperatures will be 65 to 80°F for the lower temperature portion of the program and 90 to 105°F for the higher temperature portion. Data will be corrected to 70 and 95°F for the lower and higher temperatures of the program.

If time allows, selected cars will be evaluated by an alternate vapor lock procedure. Vapor lock evaluation will be made by timing accelerations from 0 to 30, 50, and 60 mph. All other aspects of the alternate procedure will be the same as the CRC procedure. Purpose is to compare the severity of timed accelerations from 0 to 30, 50, and 60 mph of the alternate procedure with timed accelerations of 15 to 50, 60, and 70 mph of the current CRC procedure.

### Hot Start and Driveaway Test Procedure

The hot start and driveaway test procedure is designed to appraise low speed driveability and hot starting problems. The procedure is based on a similar procedure devised and conducted by Amoco Oil Company. The procedure consists of stabilization at 55 mph, simulated city traffic for 4 miles to maximize engine heating, a 10 minute idle soak, simulated city traffic for 3 miles, a 20 minute key-off soak, and simulated city traffic for 3 miles. Details of the procedure are included as Attachment C. Stabilization will be run on the highway and the simulated city course in a marked course on the Yuma Proving Grounds Dynamometer Track.

Each car will make the following runs:

- two fuels bracketing the critical vapor lock fuel ( $\pm$  1 lb. RVP)
- duplicate tests with Fuel RMFV 93-82
- the lowest volatility fuel (6 lb. RVP) only if problems occur with Fuel RMFV 93-82.

Fuel RMFV 93-82 is a high volatility, pentane-rich fuel that is designed to emphasize problems occurring in simulated low speed city driving. Fuel samples will be obtained at the end of each soak and inspected for RVP using an automatic RVP apparatus.

If time allows, up to five selected cars that had hot start and driveaway problems on the new procedure will also be run on the 1975 CRC Hot Start and Driveability Procedure. This will allow comparison of the severity of the two procedures. The 1975 CRC Hot Start and Driveability Procedure is included as Attachment D.

### Temperature Measurements

Temperature measurements will be obtained at two locations on all vehicles. A common point of temperature measurement will be the surface temperature of the vehicles fuel line at a position of 6 to 12 inches from the carburetor. The second temperature point will be selected by the various car manufacturers or by panel members if a recommendation is not made by the manufacturers. Temperatures will be obtained during the first and last minute of all soak periods for vapor lock and hot start and driveaway tests.

### Test Location and Schedule

Suitable temperatures and facilities are available at the Yuma Army Proving Grounds. Suggested timing is September 20, 1982 to October 15, 1982. Twenty-three test days are available. Two days are rescheduled for test site setup and driver practice. Temperature studies indicate a daily average of 2.2 hours of 70 to 80°F temperatures, and 5.1 hours of 90 to 100°F temperatures. Additional test time is probably available because of extending the test temperatures to 65 to 80°F and 90 to 105°F. With three-man test crews a full vapor lock test requires 55 minutes. After establishing the most severe soak, idle or key off, a vapor lock test requires 35 minutes. With the assumption that three vapor lock tests (one out of three to be a full vapor lock test) can be averaged for the 2.2 hours available at the lower temperatures and six at the higher temperatures, it will require 14 test days to complete the 65 to 80°F vapor lock tests and 7 days to complete the 90 to 105°F vapor lock tests. The hot start and driveaway tests will require 12 days to complete at 90 to 100°F. This leaves an allowance of 7 days at the lower temperature and 2 days at the higher temperature for adverse weather or alternate vapor lock procedure.

### Manpower

Manpower requirements are based on a four-week test program, twenty-one test vehicles, and three test crews. Requirements are as follows:

- 3 Drivers-Raters
  - 3 Observers
  - 3 Preparers and Warmup
  - 1 Data Analysis
  - 1 Lab Operator
  - 1 Track Boss
  - 1 Track Assistant and Fuel Dispenser
- 
- 13 Total

ATTACHMENT ATEST FUEL SPECIFICATIONS FOR 1982 VOLATILITY PROGRAM

	<u>RMFV 90-82<sup>(1)</sup></u>	<u>RMFV 91-82</u>	<u>RMFV 92-82<sup>(2)</sup></u>	<u>RMFV 93-82</u>
RVP, psi	6.0 ± 0.5	12.0 ± 0.5	17.0 ± 0.5	13.5 ± 1
<u>Distillation, °F (D86)</u>				
10% Evap.	145 ± 10	110 ± 10	90 ± 10	95 ± 10
30% Evap.	200 ± 10	160 ± 10	140 ± 10	135 ± 10
50% Evap.	235 ± 10	215 ± 10	205 ± 10	175 ± 10
70% Evap.	270 ± 10	265 ± 10	260 ± 10	230 ± 10
90% Evap.	350 ± 10	345 ± 10	345 ± 10	290 ± 10
End Point	437 Max.	437 Max.	437 Max.	437 Max.
<u>Percent Evap. @ 158°F</u>				40 - 45
<u>V/L 20, °F</u>				108 ± 4
<u>Octane</u>				
MON	85 Min.			
(R+M)/2	89 Min.			
Lead, g/gal	0.05 Max.			
Phosphorus, g/gal	0.005 Max.			
Sulfur, % wt.	0.10 Max.			
Benzene, % vol.	1.0 Max.			
Antioxidant, PTB Phenylene Diamine type	5 Min.			

(1) 10.5 psi RVP blend of RMFV 90-82 and RMFV 91-82 to have percent evap. @ 153°F between 25-30%.

(2) 13.5 psi RVP blend of RMFV 91-82 and 92-82 to have percent evap. @ 158°F between 30-35%.

ATTACHMENT B

CRC VAPOR LOCK TEST PROCEDURE

1. Drain gasoline tank and refill with 8 gallons (6 gallons with tanks of 16-gallon capacity or less) of test fuel for the next test. Test fuel shall not be put in tanks more than 10 minutes before the start of the test. Take fill sample in duplicate if scheduled.
2. Drive 20 miles at 55 mph for vehicle warm-up, establishing base total start time after 15 miles of operation.
3. Obtain baseline acceleration time on the track following 15 miles of warm up by accelerating from a stop, at light throttle, to reach 10 mph within 5 seconds. Then accelerate at the desired throttle position (wide-open throttle) to 70 mph, timing by stopwatch from 15 mph to 50, 60, and 70 mph, as indicated by speedometer. Record acceleration times and note surging or abnormal vehicle performance. Complete one lap around the track at 55 mph and return to wind shelter.
4. Park car in soak shed for 15 minutes with engine off. Obtain soak fuel sample in duplicate.
5. At end of soak period, start car using vehicle manufacturer's recommended procedure. Record start time to nearest 0.1 second and number of stalls. Idle for 5 seconds in neutral after the original start and any restarts, and record any abnormality in the stability of idle performance. Accelerate from soak shed as described in Item 6.
6. Turn headlights on. Obtain wide-open throttle acceleration time by accelerating from the soak shed at part throttle to reach 10 mph in 5 seconds, and then accelerate at wide-open throttle to 80 mph, recording time from 15 mph to 50, 60, and 70 mph. Record acceleration time and abnormal vehicle performance. In this technique, a transient and/or abnormal change in acceleration rate is called surge. The intensity of surge may vary, as described below:

Satisfactory (S) - A rating indicating no malfunction. Some loss in acceleration may be measured, but no surging in the accepted understanding of the term may be recognized.

Trace (T) - A rating that is just discernible to a test driver; or might not be observed by the casual driver.

Moderate (M) - A rating that is judged to be probably noticeable to the average driver and definitely noticeable to the test driver. It is occasional in frequency and is associated with limited delays in acceleration rather than an actual decrease in speed.

Heavy (H) - A rating that is pronounced and judged to be obvious to any driver. It is persistent or constant in frequency and is associated with prolonged delays in acceleration or even actual decreases in speed level reached.

Lock (L) - That which completely stalls the engine over a stretch of at least 3/10 of a mile, or a period of time in excess of 20 seconds.

Turn headlights off at north turn.

7. Complete two laps around the track at 55 mph, to restabilize temperatures.
8. Idle for 10 minutes in neutral in the soak shed. Record number of stalls. Obtain "idle" fuel sample in duplicate.
9. At end of idle period, accelerate from soak shelter as described in Item 6.
10. Complete one lap around the track at 55 mph; return to fueling area.
11. Car volatility tolerances are to be defined only for the more critical condition (soak or idle); the remaining tests will be run as follows:
  - a. If the fuel selected for the previous test was either too volatile or too low in volatility to determine whether the idle or the soak acceleration was the more critical, the soak and idle procedure shall be repeated on a new test fuel.
  - b. If, during the preceding test, the soak acceleration is found to be appreciably more critical than the idle acceleration (>20% increase in acceleration time) with a fuel giving 25 to 75% loss in acceleration performance, the remaining tests will be run using only the soak procedure, otherwise the idle procedure will be used in all cases.
12. Continue testing with other fuels of different T-V/L levels to obtain curves of acceleration time from 15-50, 15-60, and 15-70 mph versus fuel volatility. To establish the vehicle limiting T-V/L data, a minimum of five fuels of each series will be tested at the desired limiting condition (soak or idle). Fuels will be selected with the following objectives:
  - a. A fuel with sufficient volatility to cause acceleration time to 70 mph to increase between 50 and 100%.
  - b. A fuel with sufficient volatility to cause acceleration time to 70 mph to increase between 25 and 50%.

- c. A fuel with sufficient volatility to cause acceleration time to 70 mph to increase between 10 and 25%.
- d. A fuel with sufficient volatility to result in less than a 10% increase in acceleration time, or if minimum acceleration time exceeds 10%, two fuels giving essentially equal performance and differing by at least 4°F in the temperature for 20:1 V/L ratio (0.5 to 1.0 lb RVP).
- e. A fuel estimated to give a 25% increase in acceleration time to 70 mph.



ATTACHMENT C  
CITY DRIVEABILITY PROCEDURE  
AND DRIVEABILITY RATINGS

1. Stabilize engine and fuel system temperatures by driving 15 miles at 55 mph.
2. Drive 4 miles in "city" traffic simulated as follows:
  - A. Within each mile stop 4 times for a 15 second idle, and at the end of each mile idle for 30 seconds to record driveability problems. All idle soaks should be about 0.2 miles apart.
  - B. Maximum car speed should be 20 mph.
  - C. Accelerate very gently following each idle by dropping the engine vacuum at the start of an acceleration by 5" Hg below its idle value and hold the throttle at this position until the car reaches 20 mph.

The purpose of this portion of the test is to maximize engine heating and underhood temperatures. During this portion of the test, the driver should rate the severity of subjective problems, such as hesitation, stumble, surge, idle roughness, and backfire; and count the number of stalls.

3. Idle for 10 minutes in the soak shelter with the transmission in neutral or "Park" for safety. Appraise idle quality, record stalls and restart times if stalling occurs. Obtain fuel samples for RVP inspection.
4. Leave the soak shelter and make a 0-30 mph part-throttle (3" Hg manifold vacuum) acceleration. Observe severity of any acceleration problems including hesitation, stumble, and surge.
5. Drive 3 miles in city traffic per Step 2 above.
6. Park in a soak shelter for 20 minutes with key off. Observe hot start stalls and measure restart time. Obtain fuel samples for RVP inspection.
7. Repeat Step 4 above.
8. Compile driveability demerits for the cycle using an appropriate rating scale, which weighs problems according to their relative severity.

ATTACHMENT DCRC HOT START AND DRIVEAWAY PROCEDURE

1. Drain fuel tank and fill with 8 gallons of test fuel.
2. Drive 20 miles at 55 mph for vehicle warm-up, establishing base total start time after running 15 miles of operation.
3. Pull into soak shed and idle in neutral for 10 minutes. Record idle speed and quality initially, after 5 minutes, and at the end of 10 minutes.
4. Back vehicle out of soak shed for approximately 30 feet and stop abruptly (10 ft./sec.<sup>2</sup>). Record idle quality during 10-second idle in drive. Also number of stalls, and restart time, if any.
5. Accelerate from 0 to 30 mph at 5 ft./sec.<sup>2</sup>, stop abruptly (20 ft./sec.<sup>2</sup>). Evaluate and record hesitation, stumble, surge, and stall.
6. Idle in drive for 15 seconds, recording idle quality.
7. Accelerate at 5 ft./sec.<sup>2</sup> from 0-45 mph. Evaluate and record hesitation, stumble, surge, and stall.
8. Make four successive accelerations from 0-25 mph at 5 ft./sec.<sup>2</sup>. Decelerate moderately, using brake, and idle for 15 seconds following each acceleration. Record hesitation, stumble, surge, stall, and idle speed and quality for each cycle of operation.
9. Immediately following final 15 second idle in Item 8, accelerate at 8" Hg. constant manifold vacuum from 0-55 mph. Record hesitation, stumble, surge, and stalls.
10. Complete 10 miles at 55 mph for temperature restabilization.
11. Pull into soak shed and idle in drive for one minute. Record idle speed and quality.
12. Turn off engine and soak for 20 minutes. Obtain duplicate fuel sample.
13. At the end of the soak period, with the transmission in park or neutral, set the throttle to manufacturer's recommendation. Engage the starter immediately after opening throttle. Do not pump the throttle before making the start. If the engine does not start after 15 seconds of cranking, depress throttle to floor board; crank an additional 15 seconds to check for overrich condition. If engine does not start, manipulate throttle as required to start engine. Record initial start time and detail any abnormal starting procedure.

14. When engine starts, allow it to accelerate to 1000 rpm before de-energizing start motor and releasing throttle to idle position. The engine must continue to run for one minute after the throttle is returned to idle to constitute a successful start and run test. If engine stalls, immediately repeat starting and idle procedure. If engine stalls 4 times in succession, increase idle speed as required to keep engine running. Evaluate and record idle quality and speed, number of stalls, and total starting time. Total starting time is the cumulative period of time the starter motor is engaged. The time interval that the engine is idling between stalls is not included in total starting time.
15. Repeat Items 4 through 9 and return to fueling area.

A P P E N D I X   C

FUEL INSPECTION DATA

1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM

INDIVIDUAL LABORATORY RESULTS

Fuel 1

	Lab. 1		Lab. 2		Lab. 3		Lab. 4		Avg.	Std. Dev.
	1	2	1	2	1	2	1	2		
RVP, psi	7.4	7.0	7.0	7.0	7.0	7.0	7.3	7.0	7.1	0.16
API Gravity	57.0	57.0	56.9	56.8	56.7	57.0	56.5	56.3	56.8	0.26
T <sub>V/L=20'</sub> °F	154	154	153.1	153.0	154.3	153.4	149.0	149.0	152.5	2.19
Distillation (D86)										
T °F @ % Evap.										
IBP	108	101	93	99	94	96	87	88	96	6.9
5	130	127	123	122	120	114	113	114	120	6.3
10	142	140	138	138	138	130	131	134	136	4.3
20	165	163	161	161	162	154	157	159	160	3.5
30	188	187	187	186	187	181	183	184	185	2.4
40	212	209	210	211	210	205	206	206	209	2.6
50	231	229	229	230	230	225	227	227	228	2.0
60	248	247	247	248	249	243	245	244	246	2.1
70	269	268	271	271	289	265	266	265	270	7.8
80	303	300	304	303	308	300	300	299	302	3.0
90	348	345	352	348	349	343	345	347	347	2.8
95	375	373	384	378	381	374	374	376	377	3.9
EP	417	415	410	408	412	414	430	432	417	9.0

1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM

INDIVIDUAL LABORATORY RESULTS

Fuel 3

	Lab. 1		Lab. 2		Lab. 3		Lab. 4		Avg.	Std. Dev.
	1	2	1	2	1	2	1	2		
RVP, psi	7.6	8.2	8.1	8.1	8.1	8.1	8.5	8.5	8.2	0.28
API Gravity	57.8	57.8	57.6	57.7	57.7	57.5	57.4	57.6	57.6	0.14
T <sub>v</sub> /L=20', °F	148	146	145.1	145.1	146.0	146.8	141.4	141.5	145.0	2.37
Distillation (D86) T °F @ % Evap.										
IBP	96	100	93	93	96	97	89	92	94	3.4
5	118	122	118	114	115	119	114	114	117	3.0
10	132	136	132	130	132	134	131	129	132	2.2
20	156	159	157	155	158	159	159	157	158	1.5
30	182	185	184	182	184	185	185	183	184	1.3
40	205	208	208	208	209	208	210	208	208	1.4
50	226	229	229	230	231	229	233	228	229	2.1
60	244	247	247	248	248	248	250	247	247	1.7
70	266	269	270	269	272	272	271	268	270	2.1
80	299	302	303	301	305	304	304	301	302	2.0
90	346	347	350	347	347	346	352	348	348	2.1
95	373	375	379	378	378	375	377	375	376	2.1
EP	414	418	410	412	413	416	432	428	418	7.9

1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM  
INDIVIDUAL LABORATORY RESULTS

Fuel 5

	Lab. 1		Lab. 2		Lab. 3			Lab. 4		Avg.	Std. Dev.
	1	2	1	2	1	2	3	1	2		
RVP, psi	8.9	9.0	9.3	9.3	9.4	9.3	9.3	9.7	9.7	9.3	.27
API Gravity	58.5	58.5	58.6	58.6	58.3	58.7	58.7	58.4	58.4	58.5	.14
T <sub>V/L=20'</sub> , °F	138	138	138.6	137.0	138.0	137.0	138.6	134.9	135.1	137.2	1.40
Distillation (D86)											
<u>T °F @ % Evap.</u>											
IBP	90	92	93	88	88	88	86	83	85	88	3.2
5	114	117	113	107	105	101	100	102	107	107	6.1
10	127	129	127	123	125	120	118	119	122	123	3.9
20	151	153	151	147	151	144	144	146	148	148	3.3
30	178	182	179	176	179	173	171	176	177	177	3.3
40	204	207	205	204	205	200	198	202	203	203	2.8
50	227	229	226	225	226	223	222	224	223	225	2.2
60	246	247	245	244	246	243	242	237	243	244	3.0
70	266	268	268	267	269	265	264	265	266	266	1.7
80	301	302	302	299	303	298	297	300	298	300	2.1
90	344	347	351	345	347	342	341	345	345	345	2.9
95	375	375	384	377	381	373	373	374	374	376	3.8
EP	426	418	414	408	414	410	408	424	422	416	6.8

1932 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM

INDIVIDUAL LABORATORY RESULTS

Fuel 7

	Lab. 1		Lab. 2		Lab. 3		Lab. 4		Avg.	Std. Dev.
	1	2	1	2	1	2	1	2		
RVP, psi	10.2	10.3	10.6	10.7	10.6	10.5	11.1	10.6	10.6	0.27
API Gravity	58.8	59.7	59.5	59.6	59.4	59.2	59.5	59.5	59.4	0.28
T <sub>v/L=20'</sub> °F	132	130	130.0	129.3	129.3	129.3	125.3	126.7	129.0	2.08
Distillation (D86)										
<u>T °F @ Evap.</u>										
IBP	93	90	91	86	88	84	88	88	88	2.8
5	108	109	104	102	101	101	100	111	104	4.2
10	120	121	118	116	119	118	115	133	120	5.6
20	144	146	143	140	144	144	142	150	144	2.9
30	174	175	173	170	173	171	170	171	172	1.9
40	202	203	201	199	202	198	198	198	200	2.1
50	225	226	225	223	225	221	221	224	224	1.9
60	244	245	244	243	245	242	243	240	243	1.7
70	264	265	266	264	267	265	266	268	266	1.4
80	297	297	300	297	299	298	302	305	299	2.9
90	342	343	349	343	341	342	352	353	346	4.9
95	370	372	377	371	373	375	386	392	377	7.9
EP	418	417	408	408	416	405	432	434	417	10.8



1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM  
INDIVIDUAL LABORATORY RESULTS

Fuel 9

	Lab. 1		Lab. 2		Lab. 3		Lab. 4		Avg.	Std. Dev.
	1	2	1	2	1	2	1	2		
RVP, psi	11.5	11.5	11.7	11.7	11.8	11.8	12.3	12.3	11.8	0.32
API Gravity	60.5	60.7	60.3	60.4	60.2	60.4	60.1	60.2	60.4	0.19
T <sub>V/L=20'</sub> °F	122	125	127.0	121.5	124.7	122.7	120.4	120.4	123.0	2.38
Distillation (D86)										
<u>T °F @ % Evap.</u>										
IBP	87	87	93	88	86	83	82	85	86	3.4
5	103	102	102	100	98	96	96	96	99	3.0
10	117	114	116	114	115	112	113	112	114	1.8
20	138	138	138	137	140	137	137	137	138	1.0
30	167	168	169	166	171	166	168	167	168	1.7
40	197	197	199	198	201	198	197	197	198	1.4
50	222	222	222	221	226	222	221	221	222	1.6
60	242	242	242	241	246	243	243	242	243	1.5
70	263	263	267	265	268	264	265	264	265	1.8
80	295	295	298	297	300	298	297	298	297	1.7
90	341	342	349	346	345	341	344	344	344	2.7
95	372	370	387	380	377	373	377	377	377	5.3
EP	415	414	408	406	416	414	427	432	416	8.8

1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM

INDIVIDUAL LABORATORY RESULTS

Fuel 11

	Lab. 1		Lab. 2		Lab. 3		Lab. 4		Avg.	Std. Dev.
	1	2	1	2	1	2	1	2		
RVP, psi	12.8	12.9	12.9	12.9	13.2	13.1	13.6	13.6	13.1	0.32
API Gravity	61.6	61.8	61.2	61.3	61.1	62.2	60.6	61.0	61.4	0.50
T <sub>V/L=20'</sub> °F	119	121	117.5	115.4	114.9	117.3	113.4	113.6	116.5	2.67
Distillation (D86)										
<u>T °F @ % Evap.</u>										
IBP	85	86	86	79	81	79	76	78	81	3.9
5	97	99	95	84	92	88	84	86	91	6.0
10	109	109	108	102	109	105	103	104	106	2.9
20	132	133	130	124	134	129	134	132	131	3.3
30	162	161	160	155	166	161	163	163	161	3.2
40	193	193	193	189	198	193	194	194	193	2.4
50	220	219	219	217	224	219	219	221	220	2.1
60	240	230	239	238	245	239	241	243	239	4.4
70	261	260	262	259	267	265	266	267	263	3.2
80	293	294	294	291	301	298	298	297	296	3.3
90	339	341	343	340	347	345	344	346	343	2.9
95	372	370	379	371	382	381	377	380	376	4.8
EP	415	415	408	403	414	413	428	432	416	9.6

1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM

INDIVIDUAL LABORATORY RESULTS

Fuel 13

	Lab. 1		Lab. 2		Lab. 3		Lab. 4		Avg.	Std. Dev.
	1	2	1	2	1	2	1	2		
RVP, psi	13.9	14.1	14.0	14.1	14.3	14.3	14.5	14.7	14.2	0.27
API Gravity	62.4	62.8	62.1	62.3	62.2	62.2	61.8	61.2	62.1	0.47
T <sub>v/L=20'</sub> °F	110	115	110.0	109.5	110.3	109.9	109.0	109.0	110.3	1.94
<u>Distillation (D86)</u>										
<u>T °F @ % Evap.</u>										
IBP	87	84	88	84	76	79	77	75	81	5.1
5	95	91	90	-	81	84	-	-	88	5.6
10	105	102	105	98	99	103	90	96	100	5.1
20	126	123	127	124	125	129	117	121	124	3.7
30	155	153	158	152	156	159	147	152	154	3.8
40	188	187	192	187	188	190	180	187	187	3.5
50	216	215	220	217	218	219	208	216	216	3.7
60	238	238	240	238	241	242	231	239	238	3.3
70	259	257	262	258	260	262	254	263	259	3.0
80	291	291	296	292	294	295	286	300	293	4.2
90	341	339	351	344	342	344	341	354	344	5.3
95	369	369	383	-	373	375	-	-	374	5.8
EP	415	415	406	408	413	412	421	425	414	6.3

1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM

INDIVIDUAL LABORATORY RESULTS

Fuel 15

	Lab. 1		Lab. 2		Lab. 3		Lab. 4		Avg.	Std. Dev.
	1	2	1	2	1	2	1	2		
RVP, Dsi	15.2	15.1	15.2	15.4	15.3	15.4	15.5	15.9	15.4	0.25
API Gravity	63.4	63.1	63.1	63.3	62.8	63.0	62.6	62.5	63.0	0.32
T <sub>V/L=20'</sub> °F	110	112	104.6	104.6	105.3	105.3	104.6	104.3	106.3	2.95
<b>Distillation (D86)</b>										
<b>T °F @ % Evap.</b>										
IBP	80	80	82	75	76	80	72	76	78	3.4
5	84	86	-	-	77	83	-	-	82	3.9
10	98	98	96	86	90	98	94	94	94	4.3
20	119	119	121	114	105	122	122	124	118	6.1
30	149	148	151	143	134	152	155	157	149	7.3
40	184	183	187	180	171	185	189	190	184	6.0
50	214	213	216	209	202	215	216	217	213	5.0
60	236	235	238	231	226	240	236	239	235	4.6
70	257	256	260	255	248	260	259	264	257	4.7
80	290	286	292	285	283	293	300	301	291	6.7
90	349	334	356	343	335	340	355	355	346	9.1
95	361	379	-	-	366	371	-	-	369	7.7
EP	415	414	399	401	408	413	434	428	414	12.1

1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM

INDIVIDUAL LABORATORY RESULTS

Fuel 17

	Lab. 1		Lab. 2		Lab. 3		Lab. 4		Avg.	Std. Dev.
	1	2	1	2	1	2	1	2		
RVP, psi	16.1	16.2	16.5	16.5	16.6	16.4	16.2	16.2	16.3	0.18
API Gravity	64.3	64.4	63.7	64.0	63.8	63.4	63.5	63.5	63.8	0.38
T <sub>V/L=20'</sub> °F	110	110	99.0	99.4	100.1	102.4	98.2	98.2	102.2	5.02
Distillation (D86)										
T °F @ % Evap.	76	84	79	77	80	78	75	76	78	2.9
IBP	-	-	-	-	-	-	-	-	-	-
5	92	95	90	-	93	96	-	-	93	2.4
10	113	115	115	108	115	118	105	107	112	4.7
20	142	143	145	136	144	149	135	139	142	4.7
30	179	179	184	176	180	187	174	177	180	4.2
40	211	211	214	208	213	218	207	210	212	3.5
50	234	234	236	231	238	241	231	236	235	3.4
60	256	255	261	255	261	265	253	257	258	4.0
70	286	286	292	285	293	300	282	290	289	5.7
80	335	335	349	339	344	354	-	-	343	7.8
90	-	-	-	-	-	-	-	-	-	-
95	414	413	399	412	418	420	418	421	414	7.0
EP	-	-	-	-	-	-	-	-	-	-

1982 CRC HIGH-TEMPERATURE DRIVEABILITY PROGRAM

INDIVIDUAL LABORATORY RESULTS

Fuel 20

	Lab. 1		Lab. 2		Lab. 3		Lab. 4		Avg.	Std. Dev.
	1	2	1	2	1	2	1	2		
RVP, PSI	13.3	13.3	13.6	13.8	13.9	13.8	12.8	12.8	13.4	0.44
API Gravity	74.8	74.8	74.4	74.4	74.0	74.1	74.3	74.1	74.4	0.31
T <sub>V/L=20'</sub> , °F	108	107	106.9	107.1	107.8	107.8	106.7	106.4	107.2	0.58
Distillation (D86)										
<u>T °F @ % Evap.</u>										
IBP	79	80	79	81	80	76	80	78	79	1.6
5	89	93	85	90	90	86	90	87	89	2.6
10	96	99	98	98	101	97	98	96	98	1.6
20	105	111	109	109	115	110	111	111	110	2.8
30	121	127	124	124	131	126	130	127	126	3.3
40	143	149	152	147	154	151	151	150	150	3.4
50	178	182	183	182	190	187	184	184	184	3.6
60	216	219	211	216	221	219	216	215	217	3.1
70	231	231	232	234	237	235	236	234	234	2.2
80	243	244	248	246	254	252	255	252	249	4.6
90	287	293	302	296	306	306	312	300	300	8.0
95	346	351	361	348	355	354	364	361	355	6.5
EP	409	407	410	408	414	409	432	428	415	9.8

A P P E N D I X    D

TEST PROCEDURES  
AND  
DATA RATING SYSTEMS

## I. TEST PROCEDURES

### A. CRC Vapor Lock Test Technique

1. Drain gasoline tank and refill with six gallons of test fuel for the next test. Test fuel shall not be put in tanks more than 10 minutes before the start of the test.
2. Drive 20 miles at 55 mph for vehicle warm-up, establishing base total start time after 15 miles of operation.
3. Obtain baseline acceleration time on the track following 15 miles of warm up by accelerating from a stop, at light throttle, to reach 10 mph within 5 seconds. Then accelerate at the desired throttle position (wide-open throttle) to 70 mph, timing by stopwatch from 15 mph to 50, 60, and 70 mph, as indicated by speedometer. Record acceleration times and note surging or abnormal vehicle performance. Complete one lap around the track at 55 mph and return to wind shelter.
4. Park car in soak shed for 15 minutes with engine off. Obtain soak fuel sample in duplicate.
5. At end of soak period, start car using vehicle manufacturer's recommended procedure. Record start time to nearest 0.1 second and number of stalls. Idle for 5 seconds in neutral after the original start and any restarts, and record any abnormality in the stability of idle performance. Accelerate from soak shed as described in Item 6.
6. Turn headlights on. Obtain wide-open throttle acceleration time by accelerating from the soak shed at part throttle to reach 10 mph in 5 seconds, and then accelerate at wide-open throttle to 70 mph, recording time from 15 mph to 50, 60, and 70 mph. Record acceleration time and abnormal vehicle performance. In this technique, a transient and/or abnormal change in acceleration rate is called surge. The intensity of surge may vary, as described below:

Satisfactory (S) - A rating indicating no malfunction. Some loss in acceleration may be measured, but no surging in the accepted understanding of the term may be recognized.

Trace (T) - A rating that is just discernible to a test driver, or might not be observed by the casual driver.

Moderate (M) - A rating that is judged to be probably noticeable to the average driver and definitely noticeable to the test driver. It is occasional in frequency and is associated with limited delays in acceleration rather than an actual decrease in speed.



Heavy (H) - A rating that is pronounced and judged to be obvious to any driver. It is persistent or constant in frequency and is associated with prolonged delays in acceleration or even actual decreases in speed level reached.

Lock (L) - That which completely stalls the engine over a stretch of at least 3/10 of a mile, or a period of time in excess of 20 seconds.

7. Complete two laps around the track at 60 mph, to restabilize temperatures.
8. Idle for 10 minutes in neutral in the soak shed. Record number of stalls. Obtain "idle" fuel sample in duplicate.
9. At end of idle period, accelerate from soak shelter as described in Item 6.
10. Complete one lap around the track at 60 mph, and return to fueling area.
11. Car volatility tolerances are to be defined only for the more critical condition (soak or idle); the remaining tests will be run as follows:
  - a. If the fuel selected for the previous test was either too volatile or too low in volatility to determine whether the idle or the soak acceleration was the more critical, the soak and idle procedure shall be repeated on a new test fuel.
  - b. If, during the preceding test, the soak acceleration is found to be appreciably more critical than the idle acceleration (>20% increase in acceleration time) with a fuel giving 25 to 75% loss in acceleration performance, the remaining tests will be run using only the soak procedures; otherwise the idle procedure will be used in all cases.
12. Continue testing with other fuels of different T-V/L levels to obtain curves of acceleration time from 15-50, 15-60, and 15-70 mph versus fuel volatility. To establish the vehicle limiting T-V/L data, a minimum of five fuels will be tested at the desired limiting condition (soak or idle). Fuels will be selected with the following objectives:
  - a. A fuel with sufficient volatility to cause acceleration time to 70 mph to increase between 50 and 100%.
  - b. A fuel with sufficient volatility to cause acceleration time to 70 mph to increase between 25 and 50%.

- c. A fuel with sufficient volatility to cause acceleration time to 70 mph to increase between 10 and 25%.
- d. A fuel with sufficient volatility to result in less than a 10% increase in acceleration time; or if minimum acceleration time exceeds 10%, two fuels giving essentially equal performance and differing by at least 4°F in the temperature for 20:1 V/L ratio (0.5 to 1.0 lb RVP).
- e. A fuel estimated to give a 25% increase in acceleration time to 70 mph.

B. CRC Hot Start and Driveaway Test Technique

1. Drain fuel tank and fill with six gallons of test fuel.
2. Drive 20 miles at 55 mph for vehicle warm-up, establishing base total start time after running 15 miles of operation.
3. Pull into soak shed and idle in neutral for 10 minutes. Record idle speed and quality initially, after 5 minutes, and at the end of 10 minutes.
4. Back vehicle out of soak shed for approximately 30 feet and stop abruptly (10 ft./sec.<sup>2</sup>). Record idle quality during 10-second idle in drive. Also record the number of stalls, and restart time, if any.
5. Accelerate from 0 to 30 mph at 5 ft./sec.<sup>2</sup>, and stop abruptly (20 ft./sec.<sup>2</sup>). Evaluate and record hesitation, stumble, surge, and stall.
6. Idle in drive for 15 seconds, recording idle quality.
7. Accelerate at 5 ft./sec.<sup>2</sup> from 0-45 mph. Evaluate and record hesitation, stumble, surge, and stall.
8. Make four successive accelerations from 0-25 mph at 5 ft./sec.<sup>2</sup>. Decelerate moderately, using brake, and idle for 15 seconds following each acceleration. Record hesitation, stumble, surge, stall, and idle speed and quality for each cycle of operation.
9. Immediately following the final 15-second idle in Item 8, accelerate at 8" Hg constant manifold vacuum from 0-55 mph. Record hesitation, stumble, surge, and stalls.
10. Complete 10 miles at 55 mph for temperature restabilization.
11. Pull into soak shed and idle in drive for one minute. Record idle speed and quality.

12. Turn off engine and soak for 20 minutes. Obtain duplicate fuel sample.
13. At the end of the soak period, with the transmission in park or neutral, set the throttle to manufacturer's recommendation. Engage the starter immediately after opening throttle. Do not pump the throttle before making the start. If the engine does not start after 15 seconds of cranking, depress throttle to floor board; crank an additional 15 seconds to check for overrich condition. If engine does not start, manipulate throttle as required to start engine. Record initial start time and detail any abnormal starting procedure.
14. When engine starts, allow it to accelerate to 1000 rpm before de-energizing start motor and releasing throttle to idle position. The engine must continue to run for one minute after the throttle is returned to idle to constitute a successful start and run test. If engine stalls, immediately repeat starting and idle procedure. If engine stalls four times in succession, increase idle speed as required to keep engine running. Evaluate and record idle quality and speed, number of stalls, and total starting time. Total starting time is the cumulative period of time the starter motor is engaged. The time interval that the engine is idling between stalls is not included in total starting time.
15. Repeat Items 4 through 9 and return to fueling area.

C. City Driveability Procedure

1. Stabilize engine and fuel system temperatures by driving 15 miles at 55 mph.
2. Drive 4 miles in "city" traffic, simulated as follows:
  - a. Within each mile, stop 4 times for a 15-second idle, and at the end of each mile, idle for 30 seconds to record driveability problems. All idle soaks should be about 0.2 miles apart.
  - b. Maximum car speed should be 20 mph.
  - c. Accelerate very gently following each idle by dropping the engine vacuum at the start of an acceleration by 5" Hg below its idle value and hold the throttle at this position until the car reaches 20 mph.

The purpose of this portion of the test is to maximize engine heating and underhood temperatures. During this portion of the test, the driver should rate the severity of subjective problems, such as hesitation, stumble, surge, idle roughness, and backfire; and count the number of stalls.

3. Idle for 10 minutes in the soak shelter with the transmission in neutral or "Park" for safety. Appraise idle quality, record stalls and restart times if stalling occurs. Obtain fuel samples for RVP inspection.
4. Leave the soak shelter and make a 0-30 mph part-throttle (3" Hg manifold vacuum) acceleration. Observe severity of any acceleration problems including hesitation, stumble, and surge.
5. Drive 3 miles in city traffic per Step 2 above.
6. Park in a soak shelter for 20 minutes with key off. Observe hot start stalls and measure restart time. Obtain fuel samples for RVP inspection.
7. Repeat Step 4 above.
8. Compile driveability demerits for the cycle using an appropriate rating scale which weights problems according to their relative severity.

## II. DATA RATING SYSTEMS

### A. Vapor Lock Rating System

Reid vapor pressures measured on samples from the car tank for each road test were converted to equivalent  $T_{V/L=20}$  based on the correlation established in Section IV. These values were then adjusted for the difference between ambient air temperature at the time of testing and the reference temperature of 95°F or 70°F as follows:

$$\text{Adjusted } T_{V/L=20} = \text{Actual } T_{V/L=20} + K \begin{pmatrix} 95 \\ \text{or - Air T} \\ 70 \end{pmatrix}$$

$$K = 0.7$$

Printouts of complete vapor lock data for each car are presented in Appendix G. Because surge was encountered in many of the base accelerations\*, average base acceleration times were taken from those accelerations judged to best represent base-line performance.

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\* The frequency of surge in base accelerations in this program may be related to the slight delay at the end of the warm-up run needed to stop and allow the test crew to replace the warm-up driver.

Adjusted temperatures at V/L=20 were plotted against percent increase in car acceleration time at 15-50 mph, 15-60 mph, and 15-70 mph for all test sets. From these plots the most critical speed range and the limiting temperature at V/L=20 (hereafter described as  $LT_{V/L=20}$ ) were determined for 25% as in previous programs\*.

#### B. Driveability Demerit Rating System

Starting Time - Time recorded in seconds (hot-start time is the sum of times for initial start and all re-starts).

Stalls at Idle - Number of occurrences during each maneuver or time period.

Stalls, Driving - Number of occurrences during each maneuver.

Idle Roughness)  
Backfire )  
Hesitation ) - Severity of any occurrence rated as trace (T),  
Stumble ) moderate (M), or heavy (H) during each  
Surge ) maneuver.

Weighted demerits are assigned to each malfunction as summarized below:

#### Weighted Demerits\*\*

Starting time:	Seconds - 2.0 (but zero if negative)		
Stalls at idle:	8		
Stalls, driving:	32		
	<u>T</u>	<u>M</u>	<u>H</u>
Idle roughness	1	2	4
Backfire	6	12	24
Hesitation	6	12	24
Stumble	6	12	24
Surge	4	8	16

The total weighted demerit (TWD) value for each run was computed by adding the weighted demerits for the several malfunctions in each maneuver or idling period, subject to the following constraints:

\* For example, reference, "1966 CRC Vapor Lock Tests," CRC Report No. 420.

\*\* "Evaluation of a High Temperature Driveability Test Procedure - 1971 Yuma Program," CRC Report No. 455.

1. Only one driving stall was counted per maneuver.
2. No more than three idling stalls were counted per idling interval.
3. No more than five idling stalls were counted for the whole hot-start and idle procedure (lines 14-18 of data sheet).
4. For each maneuver or idling interval, only the one malfunction giving the highest weighted demerits was counted. Thus, if heavy hesitation (24 weighted demerits) and a stall were recorded in the same maneuver, only 32 weighted demerits were counted towards the TWD.

1982 CRC REGULAR VAPOR LOCK DATA SHEET

Start \_\_\_\_\_ End \_\_\_\_\_

Car No.: \_\_\_\_\_ Car Make: \_\_\_\_\_  
 Date: \_\_\_\_\_ Run No. (Office Use): \_\_\_\_\_ Time, Base Run: \_\_\_\_\_  
 Driver No.: \_\_\_\_\_ Observer: \_\_\_\_\_ No. in Car: \_\_\_\_\_ Odometer, Base Run: \_\_\_\_\_  
 Fuel No.: \_\_\_\_\_ Gal: \_\_\_\_\_ Blend: \_\_\_\_\_ Time, Key-Off Soak: \_\_\_\_\_  
 \_\_\_\_\_ Gal: \_\_\_\_\_ Blend: \_\_\_\_\_ Time, Idle Soak: \_\_\_\_\_  
 Temperature Probe at: A: \_\_\_\_\_ B: \_\_\_\_\_

COMMENTS:

SAMPLE NUMBERS	TEMPERATURES		WEATHER			STARTING	ACCELERATION TIME, sec.				
	Start of Soak	Just Before Acceleration	Sky Cover: SN, SC, CL, OV	Shade: N, P, S	Wind Velocity, mph.	Wind from N, NE, E, etc.	Time, sec.	Restarts	15 mph-50 mph	15 mph-60 mph	15 mph-70 mph
<div style="border: 1px solid black; height: 100px; width: 100%;"></div>											
<u>BASE RUN</u>	Air:										
<u>KEY-OFF SOAK</u>	Air:										
	A:										
	B:										
<u>IDLING SOAK</u>	Air:										
	A:										
	B:										

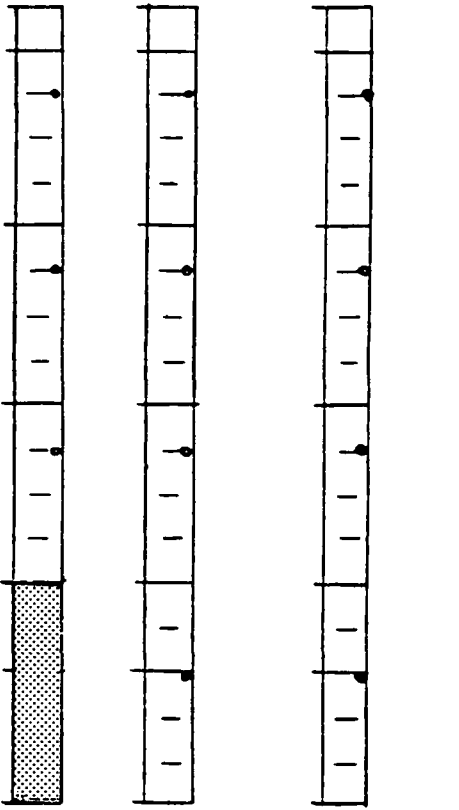
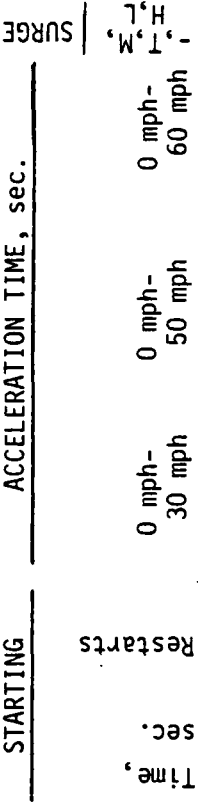
1982 CRC ALTERNATE VAPOR LOCK DATA SHEET

Car No.: \_\_\_\_\_ Car Make: \_\_\_\_\_ Start \_\_\_\_\_ End \_\_\_\_\_  
 Date: \_\_\_\_\_ Run No. (Office Use): \_\_\_\_\_ Time, Base Run: \_\_\_\_\_  
 Driver No.: \_\_\_\_\_ Observer: \_\_\_\_\_ No. in Car \_\_\_\_\_ Odometer, Base Run: \_\_\_\_\_  
 Fuel No.: \_\_\_\_\_ Gal: \_\_\_\_\_ Blend: \_\_\_\_\_ Time, Key-Off Soak: \_\_\_\_\_  
 Temperature Probe at: A: \_\_\_\_\_ Blend: \_\_\_\_\_ Time, Idle Soak: \_\_\_\_\_  
 B: \_\_\_\_\_

COMMENTS:

D-9

SAMPLE NUMBERS	TEMPERATURES			WEATHER			STARTING			ACCELERATION TIME, sec.		
	Start of Soak	Just Before Acceleration	Air	Sky Cover: SN, SC, CL, OV	Shade: N, P, S	Wind Velocity, mph	Wind from N, NE, E, etc.	Time, sec.	Restarts	0 mph - 30 mph	0 mph - 50 mph	0 mph - 60 mph
BASE RUN           	_____	_____	Air: _____	_____	_____	_____	_____	_____	_____	_____	_____	_____
KEY-OFF SOAK           	_____	_____	Air: _____ A: _____ B: _____	_____	_____	_____	_____	_____	_____	_____	_____	_____
IDLING SOAK           	_____	_____	Air: _____ A: _____ B: _____	_____	_____	_____	_____	_____	_____	_____	_____	_____





1975 CRC TRAFFIC DRIVEAWAY DATA SHEET

Run No.: \_\_\_\_\_

Date: \_\_\_\_\_

Car No.: \_\_\_\_\_

Fuel No.: \_\_\_\_\_

Driver: \_\_\_\_\_

Observer: \_\_\_\_\_

Sample No.; End of Test \_\_\_\_\_

Line No.	Mode	Instruc. No.	Time of Day	Ambient Temp.	Overheat	Backfire	Starting Time; Sec.	Idle			Driving				
								RPM Range	Roughness	Stalls	Hesitation	Stumble	Surge	Stalls	
1	Base Start Time	2													
2	10 min. idle	Initial													
3		5 min.													3
4		10 min.													
5	Back-Up & Stop	4													
6	Accel 0-30 & st	5/6													
7	Accel 0-45	7													
8	Accel 0-25	8													
9	0-25														
10	0-25														
11	0-25														
12	Accel 0-60	9													
13	Idle Drive	11													
14	Hot Start	13													
15	1 min. idle	14													
16															
17															
18															
19	Back-Up & Stop	4													
20	Accel 0-30 & st	5/6													
21	Accel 0-45	7													
22	Accel 0-25	8													
23	0-25														
24	0-25														
25	0-25														
26	Accel 0-60	9													
27	COMMENTS: _____														
28															

1962 CRC HOT WEATHER DRIVABILITY DATA SHEET

Car Make: \_\_\_\_\_ Fuel No: \_\_\_\_\_  
 Run No. (Office): \_\_\_\_\_ Gal: \_\_\_\_\_ Blend: \_\_\_\_\_  
 Observer: \_\_\_\_\_ No. in Car: \_\_\_\_\_ Gal: \_\_\_\_\_ Blend: \_\_\_\_\_  
 Temp Probes at A: \_\_\_\_\_ B: \_\_\_\_\_  
 Odometer: \_\_\_\_\_

-----Time & Odometer @ Start of:-----  
 First Idle 10-min. Idle 20 min. Park  
 Time: \_\_\_\_\_  
 Odometer: \_\_\_\_\_

COMMENTS:

WEATHER

Sky (SN, SC, CL, OV): 


  
 Wind velocity, mph: 


  
 Wind from (N, NE, E, etc.): 


  
 Start, 0.0 mi: 


  
 Idle, 10 min.: 


  
 Park, 20 min.: 


D-11

IDLES, 15 sec/30 sec at \*

	GENTLE ACCELERATIONS																				
	0.0*	0.2	0.4	0.6	0.8	1.0*	1.2	1.4	1.6	1.8	2.0*	2.2	2.4	2.6	2.8	3.0*	3.2	3.4	3.6	3.8	
Roughness																					
Stalls, #																					
Restarts, sec																					
Problem X																					
Hesitation																					
Stumble																					
Surge																					
Backfire																					
Stalls, #																					
Problem Y																					
Problem Z																					

Temperatures, First Idle


Air: 


  
 A: 


  
 B: 


Idle 10 min:

PT Accel: 


Mile Post: 


Roughness

Stalls, #

Restarts, sec

Problem X

Hesitation

Stumble

Surge

Backfire

Stalls, #

Problem Y

Problem Z

IDLES, 15 sec/30 sec at \*

	GENTLE ACCELERATIONS																					
	3.0	3.2*	3.4	3.6	3.8	4.0*	4.2	4.4	4.6	4.8	5.0*	5.2	5.4	5.6	5.8	6.0*	6.2	6.4	6.6	6.8	7.0	
Roughness																						
Stalls, #																						
Restarts, sec																						
Problem X																						
Hesitation																						
Stumble																						
Surge																						
Backfire																						
Stalls, #																						
Problem Y																						
Problem Z																						

Idle Sample #'s


Temperatures, Start of Idle


Air: 


  
 A: 


  
 B: 


End of Idle


Air: 


  
 A: 


  
 B: 


PT Accel: 


Mile Post: 


Roughness

Stalls, #

Restarts, sec

Problem X

Hesitation

Stumble

Surge

Backfire

Stalls, #

Problem Y

Problem Z

Park 20 min. PT Accel. 


Park Sample #'s 


Temperatures, Start of Park


Air: 


  
 A: 


  
 B: 


End of Park


Air: 


  
 A: 


  
 B: 


A P P E N D I X   E

RATER COMPARISONS

CITY DRIVEABILITY PROCEDURE

## APPENDIX E

RATER COMPARISONS - CITY DRIVEABILITY PROCEDURE

Past programs have shown large differences can exist among raters when evaluating vehicle driveability. To evaluate rater differences, data on cars driven by the same rater on the same fuels provide the best measures of biases. Ratings were obtained by each rater on the same fuel (No. 20) for only two vehicles:

<u>Vehicle</u>	<u>Rater 04</u>	<u>Total Weighted Demerits</u>			<u>Average</u>	<u>St. Dev.</u>	<u>St. Dev.</u>
		<u>Rater 10</u>	<u>Rater 17</u>	<u>%*</u>			
10	917	874,766	530	755.7	201.4	27	
12	884	793,761	812	824.3	54.6	7	

\*Standard deviation as percent of the mean.

Because of the inconsistencies indicated above and the small amount of data, rater severity values could not be developed to correct the TWD values for each vehicle/fuel combination.

Repeatability can best be measured by comparison tests performed by individual raters on the same vehicle/fuel combinations. Repeat ratings were completed by Rater 04 with three vehicles and by Rater 10 with two vehicles:

<u>Rater</u>	<u>Car</u>	<u>Fuel</u>	<u>Run 1</u>	<u>Run 2</u>	<u>Average</u>	<u>St. Dev.</u>	<u>St. Dev., %</u>
04	9	1	184	269	226.5	60.1	26.5
	14	1	112	48	80.0	45.3	56.6
	14	20	393	567	480.0	23.0	25.6
							Avg. = 36.2
10	10	20	874	766	820.0	76.4	9.3
	12	20	793	761	777.0	22.6	2.9
							Avg. = 6.1

Rater 04 may have had difficulty repeating ratings, or the particular cars Rater 04 ran for repeatability were not consistent in driveability. No repeatability data were available for Rater 17.

A P P E N D I X    F

EFFECTS OF FUEL VOLATILITY CHANGES

CITY DRIVEABILITY PROCEDURE

## APPENDIX F

EFFECTS OF FUEL VOLATILITY CHANGES - CITY DRIVEABILITY PROCEDURE

Total weighted demerit values obtained with the nineteen test fuels are shown in Table F-1 and illustrated in Figure F-1. As indicated, all vehicles were tested on at least two fuels, and every vehicle was tested on Fuel 20. As time permitted, vehicles with high demerit levels with Fuel 20 were tested using the vapor lock fuels. The test plan called for each car to run two vapor lock fuels bracketing the critical fuel. Because bracketing fuels varied for the different vehicles, an unbalanced data set was created, causing significant difficulty in model development.

Initially, to determine if changes in fuel volatility significantly affected TWD ratings, the data for vehicles tested on the extreme fuels were averaged and compared. In this data set, seven vehicles were tested on two fuels of widely different volatility (Vehicles 1, 4, 6, 9, 10, 12, and 14 on Fuels 1 and 20). Although these data are limited, the average TWD values follow the expected trend, increasing considerably as fuel volatility increases:

Fuel No.	Avg. TWD for Seven Vehicles	Inspections		
		RVP, psi	T V/L=20	% 158
1	219	7.1	152.5	19.2
20	552	13.4	107.2	42.4

The analysis was expanded to include data for all fuels and all vehicles, rater biases, car biases, and ambient temperature. Ambient temperature was found to be insignificant in the temperature range tested and was excluded from further model development. The expanded model, excluding ambient temperature, was:

$$\begin{aligned} \text{TWD} = & b_0 + b_1 C_1 + b_2 C_2 + \dots + b_{19} C_{19} + b_{20} R_{04} \\ & + b_{21} R_{10} + b_{22} R_{17} + b_{23} T_{V/L=20} \\ & + b_{24} \%158 + b_{25} \text{RVP} \end{aligned}$$

where:

C = dummy variable for Cars 1-19  
R = dummy variable for Raters 04, 10, 17

The three fuel variables did not appear to be significant, indicating the combination of variables did not correlate with TWD. Rater coefficients were insignificant; therefore, the rater effect was eliminated from further model development. Correlation and regression coefficients are shown in Table F-II.

Fuel variables were next examined individually. The models used were developed using the common log of the TWD values. A constant of 10 was added to the TWD term to raise it above zero.

Models used for separately correlating RVP, %158, and  $T_{V/L=20}$  were:

RVP:

$$\begin{aligned} \text{Log (TWD + 10)} &= b_1 C_1 + b_2 C_2 + \dots + b_{19} C_{19} \\ &+ b_{25} (\text{RVP} - 12.4) \end{aligned}$$

%158:

$$\begin{aligned} \text{Log (TWD + 10)} &= b_1 C_1 + b_2 C_2 + \dots + b_{19} C_{19} \\ &+ b_{24} (\%158 - 33.7) \end{aligned}$$

$T_{V/L=20}$ :

$$\begin{aligned} \text{Log (TWD + 10)} &= b_1 C_1 + b_2 C_2 + \dots + b_{19} C_{19} \\ &+ b_{23} (T_{V/L=20} - 120.3) \end{aligned}$$

Results follow the expected trend -- TWD values increase as fuel volatility increases. All three fuel variables appear to be equally good predictors of hot-weather driveability and not just  $T_{V/L=20}$ , as for the 1975 CRC program. When using individual fuel variables, the model correlation coefficients improved. Correlation and regression coefficients are shown in Table F-II.

TABLE F-1

DRIVEABILITY RESULTS - CITY PROCEDURE

Car	Total Weighted Demerits																				
	Fuel:	1	3	5	6	8	9	10	11	13	14	17	20								
1	757	394	---	---	---	---	232	---	---	---	---	---	---	---	---	---	---	---	---	775	
2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<u>126</u>	99
3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<u>86</u>	164
4	42*	---	---	---	---	---	---	---	866*	---	---	---	---	---	---	---	---	---	---	942*	891*
5	---	---	<u>230</u>	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	850
6	<u>105</u>	---	---	---	---	---	---	---	---	---	84	---	---	---	---	---	---	---	---	<u>9</u>	22
7	---	---	---	---	---	---	---	---	---	---	8	---	---	---	---	---	---	---	---	---	0
8	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0
9	<u>246</u>	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	376/81
10	116	---	---	---	---	---	<u>184/269</u>	---	---	254	---	---	---	---	---	---	---	---	---	---	917/874/766/530*
11	---	<u>48</u>	---	---	---	---	<u>727</u>	---	---	---	---	---	---	---	---	---	---	---	---	---	60
12	175	---	660	---	---	578	---	---	---	---	---	---	---	---	---	---	---	---	---	---	884/793/761/812*
13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	24
14	<u>112/48</u>	---	---	---	<u>360</u>	---	---	<u>804</u>	---	---	---	---	---	---	---	---	---	---	---	<u>6</u>	393/567
15	---	---	---	---	---	---	---	---	---	---	---	<u>101</u>	---	---	---	---	---	---	---	---	214
16	---	---	44*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	445*
17	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	124/151*
18	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	61
19	---	---	62*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<u>70*</u>

\*\* Rater indicated by: 04 - No additional marking  
 10 - Underlined  
 17 - Asterisked



TABLE F-11

REGRESSION EQUATIONS - TMD AS A FUNCTION OF FUEL PROPERTIES

Equation Form	Regression Coefficient									
	<u>b<sub>0</sub></u>	<u>b<sub>1</sub></u>	<u>b<sub>2</sub></u>	<u>b<sub>3</sub></u>	<u>b<sub>4</sub></u>	<u>b<sub>5</sub></u>	<u>b<sub>6</sub></u>	<u>b<sub>7</sub></u>	<u>b<sub>8</sub></u>	<u>b<sub>9</sub></u>
TMD = <u>b<sub>0</sub></u> + <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>20-22</sub></u> R + + <u>b<sub>23</sub></u> 1/V/L-20 + <u>b<sub>24</sub></u> \$158 + <u>b<sub>25</sub></u> RVP	<u>3385.7</u>	<u>0.0</u>	<u>-749.2</u>	<u>-448.4</u>	<u>173.6</u>	<u>-241.0</u>	<u>-689.0</u>	<u>-581.0</u>	<u>-613.4</u>	<u>-498.8</u>
log(TMD;10) = <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>23</sub></u> (1/V/L-20-120.3)	--	<u>2.7</u>	<u>1.9</u>	<u>2.1</u>	<u>2.7</u>	<u>2.7</u>	<u>1.9</u>	<u>1.4</u>	<u>1.0</u>	<u>2.4</u>
log(TMD;10) = <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>24</sub></u> (\$158-33.7)	--	<u>2.7</u>	<u>2.0</u>	<u>2.1</u>	<u>2.7</u>	<u>2.7</u>	<u>1.9</u>	<u>1.5</u>	<u>1.0</u>	<u>2.4</u>
log(TMD;10) = <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>25</sub></u> (RVP-12.4)	--	<u>2.7</u>	<u>1.9</u>	<u>2.1</u>	<u>2.7</u>	<u>2.7</u>	<u>1.9</u>	<u>1.4</u>	<u>1.0</u>	<u>2.4</u>

F-4

NOTE: Underlined coefficients are not significant at 95% confidence.

TABLE F-11  
(Continued)

REGRESSION EQUATIONS - TMD AS A FUNCTION OF FUEL PROPERTIES

Equation Form	Regression Coefficient										
	<u>b<sub>10</sub></u>	<u>b<sub>11</sub></u>	<u>b<sub>12</sub></u>	<u>b<sub>13</sub></u>	<u>b<sub>14</sub></u>	<u>b<sub>15</sub></u>	<u>b<sub>16</sub></u>	<u>b<sub>17</sub></u>	<u>b<sub>18</sub></u>	<u>b<sub>19</sub></u>	<u>T<sub>15</sub></u>
TMD = <u>b<sub>0</sub></u> + <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>B<sub>20-22</sub></u> R + <u>b<sub>23</sub></u> T <sub>V/L=20</sub> + <u>b<sub>24</sub></u> S <sub>158</sub> + <u>b<sub>25</sub></u> RVP	<u>27.5</u>	<u>-733.9</u>	<u>83.7</u>	<u>-742.3</u>	<u>-368.8</u>	<u>-664.5</u>	<u>-277.4</u>	<u>-488.1</u>	<u>-783.6</u>	<u>-462.0</u>	<u>1.5</u>
log(TMD+10) = <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>23</sub></u> (T <sub>V/L=20</sub> -120.3)	<u>2.7</u>	<u>1.8</u>	<u>1.8</u>	<u>1.4</u>	<u>2.5</u>	<u>2.2</u>	<u>2.2</u>	<u>2.1</u>	<u>1.7</u>	<u>1.9</u>	
log(TMD+10) = <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>24</sub></u> (S <sub>158</sub> -33.7)	<u>2.7</u>	<u>1.8</u>	<u>2.8</u>	<u>1.4</u>	<u>2.5</u>	<u>2.2</u>	<u>2.2</u>	<u>2.1</u>	<u>1.8</u>	<u>1.9</u>	
log(TMD+10) = <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>25</sub></u> (RVP-12.4)	<u>2.7</u>	<u>1.8</u>	<u>2.8</u>	<u>1.4</u>	<u>2.5</u>	<u>2.2</u>	<u>2.2</u>	<u>2.1</u>	<u>1.7</u>	<u>1.9</u>	

NOTE: Underlined coefficients are not significant at 95% confidence.

TABLE F-11  
(Continued)

REGRESSION EQUATIONS - TWD AS A FUNCTION OF FUEL PROPERTIES

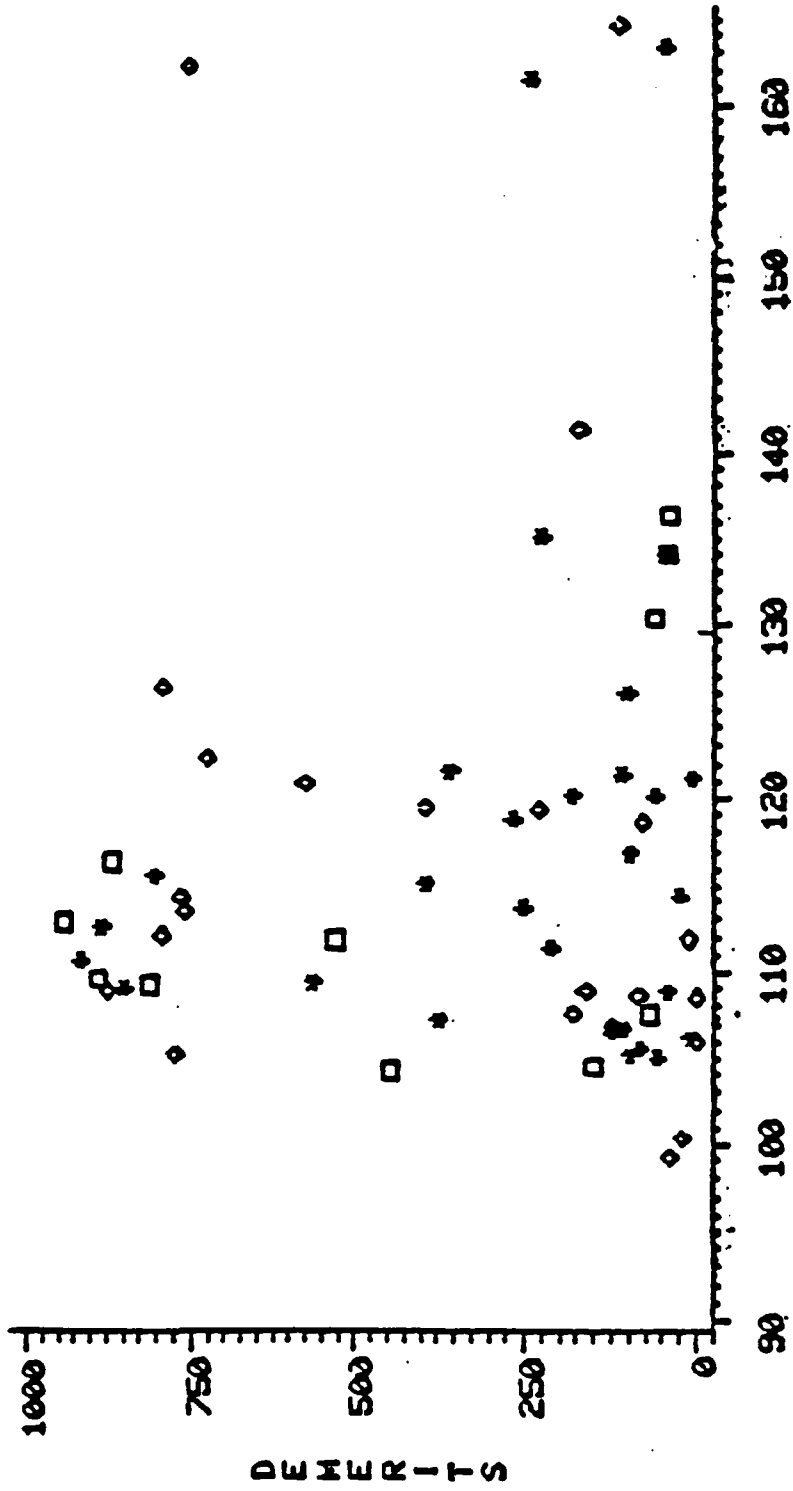
Equation Form	Regression Coefficient					r <sup>2</sup>	RMS	
	<u>b<sub>20</sub></u>	<u>b<sub>21</sub></u>	<u>b<sub>22</sub></u>	<u>b<sub>23</sub></u>	<u>b<sub>24</sub></u>			<u>b<sub>25</sub></u>
TWD = <u>b<sub>0</sub></u> + <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>20-22</sub></u> R + <u>b<sub>23</sub></u> T <sub>v/L=20</sub> + <u>b<sub>24</sub></u> X <sub>158</sub> + <u>b<sub>25</sub></u> RVP	<u>206.6</u>	0.0	<u>-59.5</u>	<u>-20.4</u>	<u>4.7</u>	<u>-81.7</u>	0.75	200.2
log(TWD+10) = <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>23</sub></u> (T <sub>v/L=20</sub> -120.3)	--	--	--	-0.1	--	--	0.79	0.30
log(TWD+10) = <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>24</sub></u> (X <sub>158</sub> -33.7)	--	--	--	--	0.12	--	0.78	0.31
log(TWD+10) = <u>b<sub>1-19</sub></u> C <sub>1-19</sub> + <u>b<sub>25</sub></u> (RVP-12.4)	--	--	--	--	--	0.06	0.79	0.30

NOTE: Underlined coefficients are not significant at 95% confidence.

FIGURE F-1

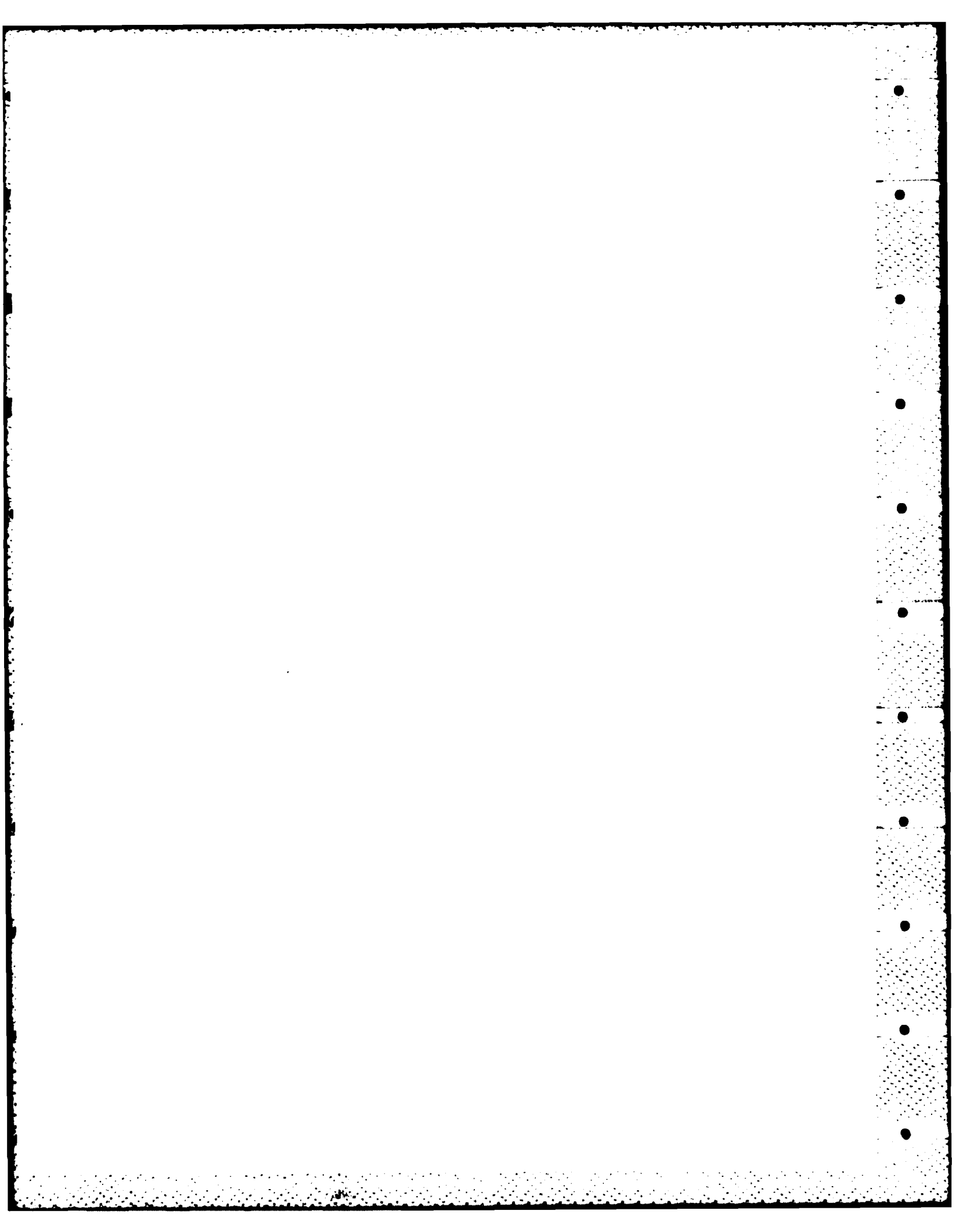
# DRIVEABILITY

TWD VS  $T_{V/L=20}$  ADJUSTED



$T_{V/L=20}$ , ADJUSTED

LEGEND: RATER    ♦ ♦ ♦ 4    ♦ ♦ ♦ 10    □ □ □ 17



A P P E N D I X    6

1982 CRC VAPOR LOCK TEST DATA

## 1982 CRC Regular Vapor Lock, Hot

Car#:01

CRC Fuel Data Comments: No

Temp Adjustment =.70F/1.0F

BASE DATA													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	921	1	5	9	106		1183	1226	1149	113	166	351	T
2	922	1	5	10	109		1242	1195	1097	113	188	349	
3	922	1	5	5	108		943	1366	1275	127	191	332	
4	922	1	5	1	108		697	1532	1441	130	192	365	
5	924	1	5	1	93		697	1532	1546	134	197	373	
6	924	1	5	2	98		759	1488	1467	124	178	353	
							0	0	0				
							0	0	0				

Avg: 124. 185. 354.

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#
-1	490	106 139 110	105 150 110	1055	SN		2
				0			
				0			
				0			
				0			
				0			

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	132 7	194 5	378 7		1187	1224	1150
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#
1	474	105 139 113	105 183 112	1050	SN		
2	466	109	109 177	1090	SN		2
3	475	109 161 120	109 181 120	1090	SN		3
4	457	108 142 123	108 186 122	1080	SN		2
5	59	93 129 106	93 174 106	930	SN		
6	88	98 135 114	99 178 110	985	SN		3
				0			

## IDLE SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	175 42	278 50	559 58	H	1098	1273	1203
2	161 30	250 35	499 41	M	1197	1219	1121
3	146 18	238 28	527 49	M	997	1332	1234
4	146 18	229 24	481 36	M	898	1394	1303
5	132 7	205 11	449 27		792	1465	1479
6	161 30	270 46	510 44	H	1160	1238	1214
	0	0	0			0	0

NOTES: Runs included in base acceleration time averages: All  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Hot

Car#: 02

CRC Fuel Data Comments: Run 1

Temp Adjustment =.70F/1.0F

-----BASE DATA-----												
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations- Surg		
										-50	-60	-70
1	1004	17	7	14	95		1475	1086	1086	132	222	378
2	1004	17	7	17	94		1644	1020	1027	138	234	360
3	1005	17	7	1	89		697	1532	1574	144	242	422
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			

Avg: 138 233. 387.

-----KEY-OFF SOAK CONDITIONS-----												
Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting			
		Air	TcA	TcB	Air	TcA	TcB	AirT			sec	RSt#
1	200	95			94	945	SC				2	1
2	182	94			92	930	SC				3	1
3	234	90			90	900	SN				1	
						0						
						0						
						0						
						0						

-----KEY-OFF SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A					
	Time	%Inc	Time	%Inc	Time	%Inc						
1	106	-23	164	-30	260	-33	1514	1070	1073			
2	110	-20	170	-27	230	-41	1627	1026	1040			
3	112	-19	176	-24	304	-21	1241	1196	1231			
		0		0		0		0	0			
		0		0		0		0	0			
		0		0		0		0	0			
		0		0		0		0	0			

-----IDLE SOAK CONDITIONS-----												
Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting			
		Air	TcA	TcB	Air	TcA	TcB	AirT			sec	RSt#
1	159	94			93	935	SC					
2	198	92			91	915	SC					
3	243	90			91	905	SN					
						0						
						0						
						0						
						0						

-----IDLE SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A					
	Time	%Inc	Time	%Inc	Time	%Inc						
1	108	-22	164	-30	262	-32	1441	1101	1111			
2	106	-23	168	-28	256	-34	1530	1063	1088			
3	110	-20	174	-25	298	-23	1224	1204	1236			
		0		0		0		0	0			
		0		0		0		0	0			
		0		0		0		0	0			
		0		0		0		0	0			

NOTES: Runs included in base acceleration time averages: All  
 RVP is psix100; T020V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10



1982 CRC Regular Vapor Lock, Hot

Car#: 3

CRC Fuel Data Comments: No

Temp Adjustment =.70F/1.0F

-----BASE DATA-----												
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-	Surg	
										-50	-60	-70
1	921	12	16	9	106		1183	1226	1149	108	149	199
2	922	12	16	14	99		1475	1086	1058	116	151	194
3	922	12	16	16	109		1588	1041	943.	108	154	212
4	922	12	16	17	109		1644	1020	922.	110	148	204 T
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			

Avg: 111. 151. 202.

-----KEY-OFF SOAK CONDITIONS-----

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#
1	494	106 147 120	105 170 108	1055	SNP		10
2	458	99 142 114	100 176 103	995	SNN		2
				0			
				0			
				0			
				0			

-----KEY-OFF SOAK ACCELERATIONS-----

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	110 0	151 0	205 1		1149	1244	1171
2	124 12	160 6	207 2		1366	1134	1103
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0

-----IDLE SOAK CONDITIONS-----

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#
1	497	105 147 117	105 178 120	1050	SNP		
2	499	101 147 118	102 174 115	1015	SNN		
3	482	109 148 117	110 164 115	1095	SNN		
4	470	109 150 119	112 173 113	1105	SNN		
				0			
				0			
				0			

-----IDLE SOAK ACCELERATIONS-----

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	113 2	156 4	212 5	T	1092	1276	1206
2	121 10	170 13	225 11	T	1267	1182	1137
3	120 9	170 13	221 9	T	1303	1164	1063
4	118 7	170 13	225 11		1355	1140	1031
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0

NOTES: Runs included in base acceleration time averages: All  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Hot

Car#: 04

CRC Fuel Data Comments: No

Temp Adjustment = .70F/1.0F

BASE DATA												
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations		
										-50	-60	-70
1	1006	17	7	11	93		1301	1165	1179	138	218	342
2	1012	17	7	15	85		1532	1062	1132	132	218	332
3	1013	17	7	17	85		1644	1020	1090	132		368
4	1013	17	7	15	87		1532	1062	1118	136	218	364
5	1013	17	7	13	90		1417	1111	1146	132	214	326
										0	0	0
										0	0	0
										0	0	0
										Avg: 134 217 346.		

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp	Start	End	Avg	Sky	Wind	Starting	
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec RSt#
1	244	93	127	118	92	151	138	925	SN 2
2	286	85	120	109	85	144	116	850	SN 1
3	324	85	116	108	86	145	125	855	SN 3
4	346	88	118	110	89	145	132	885	SN 2
5	333	90	120	112	89	151	129	895	SN 2
0									
0									

## KEY-OFF SOAK ACCELERATIONS

Run#	-15-50	-15-60	-15-70	Surg	RVP	T20	T20A
Time %Inc		Time %Inc	Time %Inc				
1	146 9	234 8	362 5		1314	1159	1177
2	148 10	250 15	414 20		1517	1068	1138
3	258 93	538 148	790 128	H	1701	1000	1067
4	142 6	298 37	496 43	M	1554	1054	1099
5	148 10	262 21	424 22		1469	1088	1127
0							
0							

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp	Start	End	Avg	Sky	Wind	Starting	
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec RSt#
1	225	91	126	121	90	155	136	905	SN
2	292	85	116	107	85	127	118	850	SN
3	319	87	118	110	87	151	131	870	SN
0									
0									
0									

## IDLE SOAK ACCELERATIONS

Run#	-15-50	-15-60	-15-70	Surg	RVP	T20	T20A
Time %Inc		Time %Inc	Time %Inc				
1	142 6	250 15	378 9	T	1283	1174	1206
2	134 0	216 0	342 -1		1475	1086	1156
3	148 10	252 16	670 93	T	1576	1045	1101
0							
0							
0							
0							

NOTES: Runs included in base acceleration time averages: All  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

AD-A155 413

TWO-TEMPERATURE VAPOR LOCK AND HIGH-TEMPERATURE  
DRIVEABILITY PERFORMANCE OF 1982 PASSENGER VEHICLES(U)  
COORDINATING RESEARCH COUNCIL INC ATLANTA GA DEC 84

2/2

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CRC-538

F/G 13/6

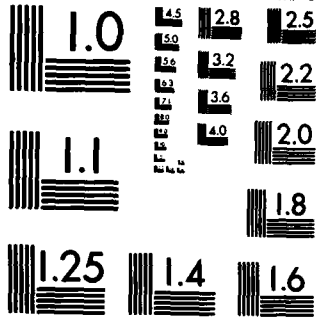
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END

FORM 1

DTIC



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

1982 CRC Regular Vapor Lock, Hot

Car#: 05

CRC Fuel Data Comments: No

Temp Adjustment =.70F/1.0F

BASE DATA													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	1005	17	7	12	91		1359	1138	1166	166	238	328	H
2	1006	17	7	1	91		697	1532	1560	124	206	294	M
3	1006	17	7	1	93		697	1532	1546	116	182	258	
4	1013	8	2	6	87		1004	1328	1384	115	178	264	
5	1013	8	2	8	89		1124	1258	1300	111	176	246	
6	1013	8	2	4	88		882	1405	1454	115	178	260	
							0	0	0				
							0	0	0				

Avg: 114. 179. 257

KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting	
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#	
1	189	91 152	91 196	910	SN		2 1	
2	232	91 151	92 192	915	SN		2 2	
				0				
				0				
				0				
				0				
				0				

KEY-OFF SOAK ACCELERATIONS

Run#	-15-50	-15-60	-15-70	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	152 33	220 23	308 20	H	1385	1126	1154
2	120 5	182 2	254 -1	M	1256	1188	1212
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0

IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting	
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#	
1	242	91 148	91 177	910	SN			
2	205	92 147	92 200	920	SN			
3	226	93 152	93 196	930	SN			
4	343	87 155	87 198	97	870	SN		
5	332	89 151	99 196	98	895	SN		1
6	325	88 154	99 195	95	875	SN		
				0				

IDLE SOAK ACCELERATIONS

Run#	-15-50	-15-60	-15-70	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	174 52	232 30	310 21	H	1335	1149	1177
2	190 66	254 42	332 29	H	1224	1204	1225
3	170 49	238 33	310 21	H	1250	1191	1205
4	137 20	206 15	290 13	M	1090	1278	1334
5	148 30	210 18	285 11	M	1198	1218	1257
6	117 2	181 1	269 5		981	1342	1395
	0	0	0			0	0

NOTES: Runs included in base acceleration time averages: 3-6  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Hot

Car#:06

CRC Fuel Data Comments: Run 4

Temp Adjustment =.70F/1.0F

Run#	Date	Drvr	BASE DATA			Wind	RVP	T20	T20A	Accelerations-			Surg
			Obsr	Fuel	AirT					-50	-60	-70	
1	921	1	5	9	106		1183	1226	1149	114	178	257	T
2	921	1	5	12	105		1359	1138	1068	116	176	248	
3	922	1	5	16	95		1588	1041	1041	118	172	241	H
4	922	1	5	1	100		697	1532	1497	107	158	224	
5	922	1	5	17	110		1644	1020	915	144	199	276	H
							0	0	0				
							0	0	0				
							0	0	0				
										Avg:	107	158	224

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--		--Tmp @ End--		Avg	Sky	Wind	Starting	
		Air	TcA	TcB	Air				TcA	TcB
1	496	106		106	193	111	1060	SN		5
2	473	105	149	105	190	108	1050	SN		3
3	495	95	143	97	185	103	960	SN		3
4	454	100	146	102	183	112	1010	SN		2

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	116	8	177	12	252	13	H	1142	1248	1171
2	116	8	172	9	241	8	M	1204	1215	1145
3	119	11	181	15	257	15	H	1439	1101	1094
4	116	8	173	9	237	6	H	1100	1272	1230
		0		0		0			0	0
		0		0		0			0	0
		0		0		0			0	0

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--		--Tmp @ End--		Avg	Sky	Wind	Starting	
		Air	TcA	TcB	Air				TcA	TcB
1	491	106	149	119	106	185	113	1060	SN	
2	477	105	148	115	105	180	110	1050	SN	
3	467	99	149	109	99	175	108	990	SN	
4	479	103	150	116	103	176	116	1030	SN	
5	462	107	153	106	108	182	106	1075	SN	

## IDLE SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	125	17	193	22	272	21	M	1065	1292	1215
2	118	10	180	14	252	13	T	1121	1260	1190
3	116	8	179	13	258	15	T	1312	1160	1132
4	119	11	176	11	252	13	T	1036	1309	1253
5	129	21	216	37	350	56	H	1371	1132	1045
		0		0		0			0	0
		0		0		0			0	0

NOTES: Runs included in base acceleration time averages: 4 only.  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Hot

Car#: 7

CRC Fuel Data Comments: Runs 3,5

Temp Adjustment =.70F/1.0F

Run#	Date	Drvr	BASE DATA			Wind	RVP	T20	T20A	Accelerations-			Surg	
			Obsr	Fuel	AirT					-50	-60	-70		
1	921	12	16	9	106		1183	1226	1149	158	232	348	M	
2	922	12	16	7	97		1064	1293	1279	142	212	312	M	
3	922	12	16	1	103		697	1532	1476	142	210	301		
4	922	12	16	16	108		1588	1041	950.	210	289	466	H	
5	922	12	16	14	111		1475	1086	974.		255	363	M	
6	923	17	16	13	99		1417	1111	1083	158	230	315	H	
7	923	17	16	14	103		1475	1086	1030	180	251	357	H	
							0	0	0					
											Avg:	142	210	301

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-15-50--		-15-60--		-15-70--		Surg	RVP	T20	T20A	Sky	Wind	Starting sec RSt#
		Time	%Inc	Time	%Inc	Time	%Inc							
1	486	106	143	108	106	169	108	1060	SNP					1
2	480	97	133	108	99	163	107	980	SNN					1
3	459	103	144	117	105	172	116	1040	SNN					2
4	488	108	145	106	107	176	108	1075	SNN					3
5	30	111	145	110	111	173	107	1110	SNN					4 1
6	95	99	137	105	100	165	104	995	SN					3 1
7	21	103	140	106	105	173	106	1040	SN					3

## KEY-OFF SOAK ACCELERATIONS

Run#	-15-50--		-15-60--		-15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	149	5	222	6	322	7	M	1141	1249	1172
2	130	-8	195	-7	289	-4		1057	1297	1276
3	144	1	212	1	307	2	T	777	1476	1413
4	225	58	330	57	474	57	H	1404	1117	1029
5	193	36	258	23	377	25	M	1299	1166	1054
6	159	12	232	10	329	9	H	1342	1146	1114
7	175	23	251	20	368	22	H	1389	1124	1061

## IDLE SOAK CONDITIONS

Run#	Smp#	-15-50--		-15-60--		-15-70--		Surg	RVP	T20	T20A	Sky	Wind	Starting sec RSt#
		Time	%Inc	Time	%Inc	Time	%Inc							
1	498	106	144	114	106	169	114	1060	SNP					
2	453	99	134	112	99	172	111	990	SNN					
3	163	106	142	118	107	174	119	1065	SNN					
4	471	108	145	112	108	169	114	1080	SNN					
5	19	111	142	114	110	175	114	1105	SNN					
6	97	101	138	111	101	162	109	1010	SN					

## IDLE SOAK ACCELERATIONS

Run#	-15-50--		-15-60--		-15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	141	-1	212	1	300	0	M	1072	1288	1211
2	161	13	225	7	318	6	M	1024	1316	1288
3	156	10	221	5	320	6	M	768	1482	1401
4	190	34	260	24	363	21	M	1240	1196	1105
5	208	46	288	37	410	36	H	1153	1242	1134
6	155	9	238	13	343	14	H	1247	1192	1150
		0		0		0			0	0

NOTES: Runs included in base acceleration time averages; Run 3 only  
RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Hot

Car#: 08

CRC Fuel Data Comments: No

Temp Adjustment =.70F/1.0F

BASE DATA												
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations- Surg		
										-50	-60	-70
1	922	4	10	15	103		1532	1062	1006	91	137	202
2	922	4	10	17	108		1644	1020	929.	94	139	208
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			

Avg: 92.5 138 205

KEY-OFF SOAK CONDITIONS												
Run#	Smp#	-Tmp @ Start	--Tmp @ End--		Avg			Sky	Wind	Starting		
		Air TcA TcB	Air TcA TcB	AirT					sec	RSt#		
1	456	103		105	1040		SN		2			
2	469	108		108	1080		SN		7	1		
					0							
					0							
					0							
					0							
					0							

KEY-OFF SOAK ACCELERATIONS										
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A			
	Time %Inc	Time %Inc	Time %Inc							
1	91 -2	139 1	203 -1		1314	1159	1096			
2	92 -1	136 -1	204 0		1363	1136	1045			
	0	0	0			0	0			
	0	0	0			0	0			
	0	0	0			0	0			
	0	0	0			0	0			
	0	0	0			0	0			

IDLE SOAK CONDITIONS												
Run#	Smp#	-Tmp @ Start	--Tmp @ End--		Avg			Sky	Wind	Starting		
		Air TcA TcB	Air TcA TcB	AirT					sec	RSt#		
1	483	106		107	1065		SN					
2	487	109		110	1095		SN					
					0							
					0							
					0							
					0							

IDLE SOAK ACCELERATIONS										
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A			
	Time %Inc	Time %Inc	Time %Inc							
1	92 -1	134 -3	201 -2		1190	1222	1142			
2	95 3	141 2	220 7		1169	1234	1132			
	0	0	0			0	0			
	0	0	0			0	0			
	0	0	0			0	0			
	0	0	0			0	0			
	0	0	0			0	0			

NOTES: Runs included in base acceleration time averages; All RVP is psix100; T20V/L & Avg Air Temp are deg Fx10; Acceleration times are sec.x10



## 1982 CRC Regular Vapor Lock, Hot

Car#: 09

CRC Fuel Data Comments: No

Temp Adjustment = .70F/1.0F

## BASE DATA

Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-	Surg	
										-50	-60	-70
1	922	4	10	4	112		882	1405	1286	152	230	374
2	923	17	16	7	105		1064	1293	1223	140	210	360
3	923	17	16	9	106		1183	1226	1149	144	210	350
4	924	17	16	13	93		1417	1111	1125	140	210	361
5	924	17	16	11	94		1301	1165	1172	138	205	349
6	924	17	16	9	101		1183	1226	1184	145	212	342
7							0	0	0			
							0	0	0			
											Avg: 143. 213. 356	

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec RSt#
1	472	112			111		SN		
2	66	105	131	125	105	156	144	1050	4
3	31	106	131	123	106	155	143	1060	4
								0	
								0	
								0	
								0	

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	150 5	225 6	377 6		904	1391	1275
2	150 5	230 8	398 12	T	1072	1288	1218
3	152 6	249 17	398 12	M	1156	1241	1164
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec RSt#
1	7	111			111		SN		
2	18	105	147	125	106	169	152	1055	
3	1	107	133	122	107	170	152	1070	
4	43	93	115	111	93	162	142	930	SC
5	85	94	122	116	94	164	147	940	CL
6	76	101	126	126	101	169	149	1010	CL
								0	

## IDLE SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	164 15	244 15	405 14		868	1414	1302
2	154 8	227 7	382 7		1036	1309	1236
3	150 5	275 29	415 17	H	1105	1269	1185
4	228 59	392 84	558 57	H	1413	1113	1127
5	160 12	410 93	551 55	H	1331	1151	1158
6	152 6	265 25	417 17	M	1169	1234	1192
	0	0	0			0	0

NOTES: Runs included in base acceleration time averages: All  
RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Hot

Car#: 10

CRC Fuel Data Comments: No

Temp Adjustment = .70F/1.0F

BASE DATA													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations- Surg			
										-50	-60	-70	
1	924	17	16	9	98		1183	1226	1205	120	160	252	
2	924	17	16	4	101		882	1405	1363	114	167	245	
3	924	17	16	1	104		697	1532	1469	112	163	237	
4	1004	2	8	2	94		759	1488	1495	93	129	185	T
5	1004	2	8	1	93		697	1532	1546	95	133	210	T
6	1014	17	7	3	91		821	1445	1473	98	146	220	
										0	0	0	
										Avg 1,2,3= 115. 163. 245.			
										Avg 4,5,6= 95.3 136 205			

KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting sec	RSt#
		Air TcA TcB	Air TcA TcB	AirT				
1	84	98 132 127	99 154 134	985	CL		2	
				0				
				0				
4	170	95 120 118	95 140 116	950	SC		3	
				0				
				0				

KEY-OFF SOAK ACCELERATIONS

Run#	-15-50	-15-60	-15-70	Surg	RVP	T20	T20A
		Time %Inc	Time %Inc				
1	115	0 258 58	363 48	H	1197	1219	1194
		0	0			0	0
		0	0			0	0
4	109	14 155 14	236 15	T	1206	1214	1214
		0	0			0	0
		0	0			0	0
		0	0			0	0

IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting sec	RSt#
		Air TcA TcB	Air TcA TcB	AirT				
1	64	100 134 130	100 159 144	1000	CL			
2	74	101 137 133	101 169 158	1010	CL			
3	29	104 143 133	105 169 158	1045	CL			
4	154	94 120 121	94 145 139	940	SC			
5	186	93 118 118	92 147 140	925	SC			
6	315	91 122 124	91 148 139	910	SN			
				0				

IDLE SOAK ACCELERATIONS

Run#	-15-50	-15-60	-15-70	Surg	RVP	T20	T20A
		Time %Inc	Time %Inc				
1	132	14 478 193	518 112	H	1148	1245	1210
2	162	40 512 213	720 194	H	1088	1279	1237
3	122	6 203 24	357 46	M	881	1406	1339
4	103	8 151 11	264 29	M	1181	1227	1234
5	96	1 144 6	246 20	M	1248	1192	1209
6	104	9 148 9	222 8		884	1404	1432
		0	0			0	0

NOTES: Runs included in base acceleration time averages; All RVP is psix100; T20V/L & Avg Air Temp are deg Fx10; Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Hot

Car#: 11

CRC Fuel Data Comments: Run 1

Temp Adjustment = .70F/1.0F

BASE DATA												
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-	Surg	
										-50	-60	-70
1	924	17	16	9	102		1183	1226	1177	174	276	409
2	924	17	16	1	106		697	1532	1455	162	256	357
3	1004	17	7	3	92		821	1445	1466	142	216	310
4	1004	17	7	5	90		943	1366	1401	138	210	300
5	1005	17	7	8	91		1124	1258	1286	146	224	330
6	1006	17	7	10	89		1242	1195	1237	138	216	306
7	1006	17	7	7	92		1064	1293	1314	138	214	304
8	1012	17	7	7	87		1064	1293	1349	140	216	304
9	1012	17	7	10	84		1242	1195	1272	142	228	330
10	1013	17	7	3	87		821	1445	1501	142	216	310
11	1013	17	7	13	90		1417	1111	1146	142	222	312
12	1013	17	7	15	89		1532	1062	1104	140	218	312
										Avg: 141. 218 312.		

KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting sec	RSt#		
		Air TcA TcB	Air TcA TcB	AirT						
1	68	102	139	103	154	1025	CL	2		
2	36	106	140	107	152	1065	CL	1		
3	177	92	123	122	93	192	143	925	SC	1
4	213	90	125	122	89	194	139	895	SC	2
5	236	91	150	128	91	195	139	910	SN	1
6	231	90			91	200	147	905	SN	2
7	224	92	138	125	93	198	149	925	SN	1
8	273	87	124	114	86	194	133	865	SN	1
9	312	84	114	120	84	179	126	840	SN	1
10	322	87	116	119	87	194	134	870	SN	2
11	318	89	118	120	89	193	145	890	SN	2
12	323	89	124	119	88	193	143	885	SN	2

KEY-OFF SOAK ACCELERATIONS

Run#	-15-50	-15-60	-15-70	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	174 24	287 32	423 36		1088	1279	1226
2	172 22	310 42	537 72		774	1478	1397
3	152 8	236 8	370 19		1228	1202	1220
4	134 5	216 -1	332 6		1260	1186	1224
5	152 8	262 20	434 39		1254	1189	1217
6	160 14	262 20	414 33		1317	1158	1189
7	154 9	252 16	396 27		1275	1178	1196
8	142 1	236 8	394 26		1135	1252	1312
9	148 5	238 9	402 29		1319	1157	1234
10	148 5	228 5	340 9		889	1400	1456
11	152 8	234 7	362 16		1464	1091	1133
12	158 12	240 10	358 15		1611	1032	1077

NOTES: Runs included in base acceleration time averages: 3-10  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Hot

Car#: 11

CRC Fuel Data Comments: Run 1

Temp Adjustment = .70F/1.0F

		BASE DATA											
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-	Surg		
										-50	-60	-70	
1	924	17	16	9	102		1183	1226	1177	174	276	409	
2	924	17	16	1	106		697	1532	1455	162	256	357	
3	1004	17	7	3	92		821	1445	1466	142	216	310	
4	1004	17	7	5	90		943	1366	1401	138	210	300	
5	1005	17	7	8	91		1124	1258	1286	146	224	330	
6	1006	17	7	10	89		1242	1195	1237	138	216	306	
7	1006	17	7	7	92		1064	1293	1314	138	214	304	
8	1012	17	7	7	87		1064	1293	1349	140	216	304	
9	1012	17	7	10	84		1242	1195	1272	142	228	330	
10	1013	17	7	3	87		821	1445	1501	142	216	310	
11	1013	17	7	13	90		1417	1111	1146	142	222	312	
12	1013	17	7	15	89		1532	1062	1104	140	218	312	
										Avg:	141.	218	312.

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp	@ Start	-Tmp	@ End	Avg	Sky	Wind	Starting
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec RSt#
1	90	104	140	143	104	173	1040	CL	
2	87	107		137	107	175	1070	CL	

## IDLE SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
Time %Inc Time %Inc Time %Inc							
1	0	0	0		998	1332	1269
2	198	41	303	39	434	39	767 1486 1402

NOTES: Runs included in base acceleration time averages: 3-10  
RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Hot

Car#: 12

CRC Fuel Data Comments: No

Temp Adjustment =.70F/1.0F

-----BASE DATA-----												
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations- Surg		
										-50	-60	-70
1	922	1	5	9	112		1183	1226	1107	109	163	224
2	923	1	5	9	95		1183	1226	1226	104	154	207
3	923	1	5	5	97		943	1366	1352	101	149	204
4	923	1	5	7	99		1064	1293	1265	97	142	197
5	923	1	5	8	104		1124	1258	1195	109	163	219
										0	0	0
										0	0	0
										0	0	0

Avg: 104 154. 210.

-----KEY-OFF SOAK CONDITIONS-----

Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg			Sky	Wind	Starting
		Air	TcA	TcB	Air	TcA	TcB	AirT			sec RSt#
1	14	112	146	130	111	174	125	1115	SN		9
0											
0											
0											
0											
0											

-----KEY-OFF SOAK ACCELERATIONS-----

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
Time %Inc		Time %Inc	Time %Inc				
1	108	162	223		1062	1294	1178
0		0	0			0	0
0		0	0			0	0
0		0	0			0	0
0		0	0			0	0
0		0	0			0	0

-----IDLE SOAK CONDITIONS-----

Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg			Sky	Wind	Starting
		Air	TcA	TcB	Air	TcA	TcB	AirT			sec RSt#
1	4	111	148	132	111	184	158	1110	SN		
2	92	95	136	124	95	174	151	950	SN		
3	28	97	140	129	97	174	148	970	SN		
4	93	99	143	127	100	169	148	995	SN		
5	98	105	142	131	105	178	151	1050	SN		
0											
0											

-----IDLE SOAK ACCELERATIONS-----

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
Time %Inc		Time %Inc	Time %Inc				
1	115	304	97	423	101	H	965 1352 1240
2	112	8	231	50	327	56	H 1164 1236 1236
3	107	3	158	2	219	4	1006 1327 1313
4	106	2	153	-1	242	15	M 1071 1288 1257
5	109	5	162	5	316	50	H 1069 1290 1220
0		0	0	0			0 0
0		0	0	0			0 0

NOTES: Runs included in base acceleration time averages: All RVP is psix100; T20V/L & Avg Air Temp are deg Fx10; Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Hot

Car#: 13

CRC Fuel Data Comments: -No

Temp Adjustment = .70F/1.0F

Run#	Date	Drvr	BASE DATA			RVP	T20	T20A	Accelerations-			Surg
			Obsr	Fuel	AirT				Wind	-50	-60	
1	922	1	5	9	111	1183	1226	1114	89	131	172	
2	923	1	5	9	96	1183	1226	1219	84	125	182	
3	923	1	5	13	98	1417	1111	1090	97	139	.93	
4	923	1	5	15	101	1532	1062	1020	98	141	197	T
5	923	1	5	17	105	1644	1020	950.	93	133	188	
						0	0	0				
						0	0	0				
						0	0	0				

Avg: 92.2 134. 186.

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--		--Tmp @ End---		Avg	Sky	Wind	Starting	sec RSt#
		Air	TcA	Air	TcA					
1	44	111	147	110	160	1105	SN		2	
						0				
						0				
						0				
						0				
						0				

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	97	5	142	6	196	5	1104	1270	1161	
		0		0		0		0	0	
		0		0		0		0	0	
		0		0		0		0	0	
		0		0		0		0	0	
		0		0		0		0	0	

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--		--Tmp @ End---		Avg	Sky	Wind	Starting	sec RSt#
		Air	TcA	Air	TcA					
1	5	110	138	110	161	1100	SN			
2	99	97	125	97	150	970	SN			
3	37	99	130	99	150	990	SN			
4	7	101	130	101	152	1010	SN			
5	23	105	134	105	152	1050	SN			
						0				
						0				

## IDLE SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	110	19	161	20	225	21	T	998	1332	1227
2	100	8	145	8	203	9		1185	1225	1211
3	112	21	167	25	227	22		1289	1171	1143
4	111	20	160	20	224	20	T	1364	1135	1093
5	114	24	167	25	226	21		1327	1153	1083
		0		0		0		0	0	
		0		0		0		0	0	

NOTES: Runs included in base acceleration time averages: All  
RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Hot

Car#: 14

CRC Fuel Data Comments: No

Temp Adjustment = .70F/1.0F

BASE DATA												
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations- Surg		
										-50	-60	-70
1	922	16	12	9	110		1183	1226	1121	84	130	210
2	923	17	16	5	98		943	1366	1345	90	138	224
3	923	17	16	7	101		1064	1293	1251	99	130	223
4	923	17	16	9	105		1183	1226	1156	92	134	220
5	923	17	16	8	106		1124	1258	1181	98	138	227
6	924	17	16	9	93		1183	1226	1240	95	139	230
7	1014	17	7	8	90		1124	1258	1293	84	132	224

Avg: 91.7 134. 223.

KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--			--Tmp @ End---			Avg	Sky	Wind	Starting sec RSt#	
		Air	TcA	TcB	Air	TcA	TcB	AirT				
1	33	110	162	130	110	216	172	1100	SN		3	
								0				
								0				
								0				
								0				
								0				

KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	87	-5	215	60	300	35	M	1148	1245	1140
		0		0		0		0	0	0
		0		0		0		0	0	0
		0		0		0		0	0	0
		0		0		0		0	0	0
		0		0		0		0	0	0

IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--			--Tmp @ End---			Avg	Sky	Wind	Starting sec RSt#	
		Air	TcA	TcB	Air	TcA	TcB	AirT				
1	45	110	141	131	110	194	160	1100	SN			
2	38	98	138	121	99	184	150	985	SN			
3	94	101	140	124	101	173	146	1010	SN			
4	46	105	134	125	105	193	157	1050	SN			
5	10	106	135	126	107	188	153	1065	SN			
6	6	93	131	113	93	183	147	930	SN			
7	380	90	125	112	90	167	143	900	SN			

IDLE SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	90	-2	276	105	371	67	H	1058	1296	1191
2	94	2	142	6	257	15	M	968	1350	1326
3	96	5	141	5	241	8		1063	1293	1251
4	155	69	330	145	420	89	H	1162	1237	1167
5	100	9	240	79	357	60	H	1113	1264	1184
6	97	6	194	44	317	42	H	1183	1226	1240
7	92	0	140	4	234	5		1180	1228	1263

NOTES: Runs included in base acceleration time averages: All RVP is psix100; t@20V/L & Avg Air Temp are deg Fx10; Acceleration times are secs.x10

## 1982 CRC Regular Vapor Lock, Hot

Car#: 15

CRC Fuel Data Comments: Run 7

Temp Adjustment = .70F/1.0F

Run#	Date	Drvr	BASE DATA			Wind	RVP	T20	T20A	Accelerations			Surg
			Obsr	Fuel	AirT					-50	-60	-70	
1	923	5	15	9	106		1183	1226	1149	99	192	271	T
2	924	5	15	14	93		1475	1086	1100	83	138	192	
3	924	5	15	16	97		1588	1041	1027	95	145	208	
4	924	5	15	17	100		1644	1020	985.	115	167	242	H
5	924	5	15	6	103		1004	1328	1272	92	142	201	T
6	1004	1	8	17	91		1644	1020	1048	97	148	210	T
7	1004	1	8	15	94		1532	1062	1069	93	139	195	T
8	1004	1	8	16	91		1588	1041	1069	87	138	189	
9	1012	1	8	8	86		1124	1258	1321	95	143	207	T
10	1012	1	8	10	85		1242	1195	1265	87	134	194	T
										Avg: 91.1 141. 200.			

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-15-50-			-15-60-			-15-70-			Avg	Sky	Wind	Starting sec	RSt#
		Time	%Inc	Time	%Inc	Time	%Inc	Surg	RVP	T20					
1	35	106	142	116	107	176	130	1065	SN				4		
6	193	91	123	101	92	164	115	915	SC				2		
7	185	93	120	102	92	163	94	925	SC				2		

## KEY-OFF SOAK ACCELERATIONS

Run#	-15-50-		-15-60-		-15-70-		Surg	RVP	T20	T20A	
	Time	%Inc	Time	%Inc	Time	%Inc					
1	98	8	175	24	245	23	T	1093	1276	1195	
6	102	12	150	6	208	4	T	1504	1074	1098	
7	191	110	296	110	419	110	L!!	1386	1125	1143	Proxy times!!

## IDLE SOAK CONDITIONS

Run#	Smp#	-15-50-			-15-60-			-15-70-			Avg	Sky	Wind	Starting sec	RSt#
		Time	%Inc	Time	%Inc	Time	%Inc	Surg	RVP	T20					
1	26	107	138	108	107	184	120	1070	SN						
2	47	93	131	110	93	170	111	930	CL						
3	86	97	128	116	97	166	123	970	CL						
4	51	100	135	127	100	175	131	1000	CL						
5	15	103	142	113	104	191	119	1035	CL						
6	187	93	122	111	94	163	117	935	SC						
7	184	93	124	100	93	171	93	930	SC						
8	210	91	121	107	90	162	87	905	SC						
9	337	86	117		86	176		860	SN						
10	344	85	109		84	174		845	SN						

## IDLE SOAK ACCELERATIONS

Run#	-15-50-		-15-60-		-15-70-		Surg	RVP	T20	T20A	
	Time	%Inc	Time	%Inc	Time	%Inc					
1	119	31	207	47	281	41	M	1045	1304	1220	
2	101	11	154	9	210	5	T	1409	1115	1129	
3	96	5	150	6	202	1		1484	1082	1068	
4	102	12	161	14	227	14	M	1384	1126	1091	
5	114	25	176	25	244	22	M	1013	1323	1263	
6	138	51	189	34	247	24	H	1352	1141	1151	
7	103	13	155	10	213	7	T	1265	1183	1197	
8	102	12	150	6	206	3	M	1428	1106	1138	
9	95	4	146	4	210	5	T	1188	1223	1286	
10	94	3	142	1	197	-1	T	1303	1164	1238	

NOTES: Runs included in base acceleration time averages: 2,3,5-10  
RVP is psix100; T020V/L & Avg Air Temp are deg Fx10;  
Acceleration times are sec.x10



## 1982 CRC Regular Vapor Lock, Hot

Car#: 16

CRC Fuel Data Comments: Runs 1,8

Temp Adjustment =.70F/1.0F

Run#	Date	Drvr	BASE DATA			Wind	RVP	T20	T20A	Accelerations			Surg
			Obsr	Fuel	AirT					-50	-60	-70	
1	924	5	15	9	101		1183	1226	1184	124	183	281	
2	924	5	15	4	104		882	1405	1342	125	188	277	
3	924	5	15	6	107		1004	1328	1244	123	184	268	
4	1004	2	8	6	89		1004	1328	1370	124	179	257	T
5	1005	2	8	4	91		882	1405	1433	127	185	270	T
6	1005	2	8	9	90		1183	1226	1261	131	189	286	T
7	1006	2	8	2	90		759	1488	1523	126	184	277	T
8	1006	2	8	1	92		697	1532	1553	126	183	272	M
9	1013	2	8	5	89		943	1366	1408	127	184	303	
10	1014	2	8	6	89		1004	1328	1370	123	179	273	T

Avg: 126. 184. 276.

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--			--Tmp @ End---			Avg	Sky	Wind	Starting
		Air	TcA	TcB	Air	TcA	TcB				
1	22	101	134	136	101	152	154	1010	CL	4	

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	132	5	253	38	358	30	M	1140	1249	1207

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--			--Tmp @ End---			Avg	Sky	Wind	Starting
		Air	TcA	TcB	Air	TcA	TcB				
1	465	102	136	140	103	160	164	1025	CL		
2	468	104	142	144	105	165	171	1045	CL		
3	60	106	140	143	106	162	168	1060	CL		
4	203	89	124	135	88	148	151	885	SC		
5	230	91	127	132	91	152	155	910	SN		
6	215	91	128	138	91	152	158	910	SN		
7	259	90	124	130	91	155	159	905	SN		
8	252	92	127	132	92	155	165	920	SN		
9	314	89	124	133	89	157	159	890	SN		
10	339	89	125	135	89	149	156	890	SN		

## IDLE SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A	
	Time	%Inc	Time	%Inc	Time	%Inc					
1	129	3	195	6	273	200		1078	1284	1232	Proxy %Inc.!!
2	132	5	194	6	356	29	M	947	1363	1297	
3	129	3	200	9	378	37	M	1018	1320	1243	
4	131	4	192	4	313	13	M	1275	1178	1224	
5	130	4	408	122	513	86	H	1274	1179	1207	
6	134	7	199	8	575	108	L	1255	1188	1216	
7	129	3	191	4	550	99	H	1289	1171	1203	
8	128	2	1050	200		200	L!!	1279	1176	1197	Proxy %Inc.!!
9	131	4	201	9	308	11		1036	1309	1351	
10	122	-3	182	-1	276	0	T	1083	1282	1324	

NOTES: Runs included in base acceleration time averages: All  
RVP is psixi00; T20V/L & Avg Air Temp are deg Fx10;  
Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Hot

Car#: 17

CRC Fuel Data Comments: No

Temp Adjustment =.70F/1.0F

-----BASE DATA-----													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	1013	8	2	17	90		1644	1020	1055	92	143	231	
2	1014	8	1	17	90		1644	1020	1055	110	168	280	
3	1014	8	2	15	90		1532	1062	1097	109	153	266	
										0	0	0	
										0	0	0	
										0	0	0	
										0	0	0	
										0	0	0	

Avg: 104. 158 259

-----KEY-OFF SOAK CONDITIONS-----											
Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting		
		Air	TcA	TcB	Air	TcA	TcB	AirT	---	---	sec RSt#
1	350	90	101		90	124		900	SN		32 3
2	372	90	110		90	136		900	SN		19
3	320	90	111		90	131		900	SN		4
0											
0											
0											
0											

-----KEY-OFF SOAK ACCELERATIONS-----											
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A				
		Time %Inc	Time %Inc	Time %Inc							
1	109	5 167	6 277	7	T 1684	1006	1041				
2	125	21 193	22 319	23	1627	1026	1061				
3	124	20 189	20 313	21	1510	1071	1106				
		0	0	0							
		0	0	0							
		0	0	0							
		0	0	0							

-----IDLE SOAK CONDITIONS-----											
Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting		
		Air	TcA	TcB	Air	TcA	TcB	AirT	---	---	sec RSt#
1	301	90	105		90	127		900	SN		
2	373	90	108		90	140		900	SN		
3	348	91	110		91	134		910	SN		
0											
0											
0											
0											

-----IDLE SOAK ACCELERATIONS-----											
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A				
		Time %Inc	Time %Inc	Time %Inc							
1	106	2 162	3 273	5	T 1591	1039	1074				
2	131	26 204	29 351	36	1516	1069	1104				
3	126	22 190	20 305	18	1440	1101	1129				
		0	0	0							
		0	0	0							
		0	0	0							
		0	0	0							

NOTES: Runs included in base acceleration time averages: All RVP is psix100; T20V/L & Avg Air Temp are deg Fx10; Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Hot

Car#: 18

CRC Fuel Data Comments: Run 1

Temp Adjustment = .70F/1.0F

BASE DATA													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	1006	8	2	17	90		1644	1020	1055	96	145	217	
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
										Avg:			96 145 217

KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	--Tmp @ End--			Avg	Sky	Wind	Starting	
		Air TcA TcB	Air TcA TcB	Air TcA TcB	AirT			sec	RSt#	
1	282	90 113	89 151	895	SN			4	1	
				0						
				0						
				0						
				0						
				0						
				0						

KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--	--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc	Time %Inc	Time %Inc				
1	103 7	153 6	231 6	T	1516	1069	1107		
	0	0	0		0	0	0		
	0	0	0		0	0	0		
	0	0	0		0	0	0		
	0	0	0		0	0	0		
	0	0	0		0	0	0		
	0	0	0		0	0	0		

IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	--Tmp @ End--			Avg	Sky	Wind	Starting	
		Air TcA TcB	Air TcA TcB	Air TcA TcB	AirT			sec	RSt#	
1	256	90 112	90 124	900	SN					
				0						
				0						
				0						
				0						
				0						
				0						

IDLE SOAK ACCELERATIONS

Run#	--15-50--	--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc	Time %Inc	Time %Inc				
1	90 -6	131 -10	217 0		1617	1030	1065		
	0	0	0		0	0	0		
	0	0	0		0	0	0		
	0	0	0		0	0	0		
	0	0	0		0	0	0		
	0	0	0		0	0	0		
	0	0	0		0	0	0		

NOTES: Runs included in base acceleration time averages: All  
 RVP is psix100; T020V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Hot

Car#: 19

CRC Fuel Data Comments: Runs 6,7

Temp Adjustment = .70F/1.0F

Run#	Date	Drvr	BASE DATA			Wind	RVP	T20	T20A	Accelerations			Surg
			Obsr	Fuel	AirT					-50	-60	-70	
1	924	5	15	9	106		1183	1226	1149	141	212	317	
2	1005	1	8	15	90		1532	1062	1097	124	194	301	T
3	1005	1	8	13	91		1417	1111	1139	124	200	317	T
4	1005	1	8	11	91		1301	1165	1193	131	206	334	T
5	1006	1	8	7	90		1064	1293	1328	120	196	298	T
6	1006	1	8	1	91		697	1532	1560	107	179	294	T
7	1006	1	8	1	93		697	1532	1546	129	198	303	T
8	1012	1	8	6	85		1004	1328	1398	108	162	277	T
9	1012	1	8	3	84		821	1445	1522	122	185	290	T
10	1013	1	2	1	85		697	1532	1602	111	178	298	
11	1013	1	2	2	87		759	1488	1544	112	172	277	T

Avg: 121. 189. 301.

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting sec	RSt#
		Air TcA TcB	Air TcA TcB	AirT				
1	53	106 134	107 172	1065	CL		2	

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	128 6	212 12	335 11		1177	1229	1149

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting sec	RSt#
		Air TcA TcB	Air TcA TcB	AirT				
1	24	107 126	107 168	1070	CL			
2	214	90 116	90 164	900	SN			
3	227	91 114	91 162	910	SN			
4	249	91 113	91 168	910	SN			
5	260	90 119	90 164	900	SN			
6	255	92 113	92 165	920	SN			
7	258	93 115	93 166	930	SN			
8	341	85 107	85 170	850	SN			
9	342	84 106	84 169	840	SN			
10	311	85 106	86 127	855	SN			
11	340	87 113	88 133	875	SN			

## IDLE SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	184 52	264 39	378 26	H	1134	1253	1169
2	220 82	315 66	475 58	H	1508	1072	1107
3	219 81	323 71	496 65	H	1488	1080	1108
4	199 65	281 48	456 52	H	1381	1127	1155
5	199 65	283 50	416 38	H	1258	1187	1222
6			372 24	H	1272	1180	1201
7	176 46	254 34	391 30	H	1258	1187	1201
8	137 13	232 23	396 32	T	1088	1279	1349
9	139 15	223 18	362 20	T	912	1385	1462
10	121 0	195 3	309 3		798	1461	1528
11	129 7	207 9	339 13	T	826	1442	1495

NOTES: Runs included in base acceleration time averages: All  
RVP is psia\*100; T20V/L & Avg Air Temp are deg F\*10;  
Acceleration times are sec.\*10

## 1982 CRC Regular Vapor Lock, Cool

Car#: 01

CRC Fuel Data Comments: No

Temp Adjustment = .70F/1.0F

-----BASE DATA-----												
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-	Surg	
										-50	-60	-70
1	928	1	5	12	67		1359	1138	1159	117	177	321
2	928	1	5	3	72		821	1445	1431	121	184	334
3	928	1	5	4	80		882	1405	1335	120	189	346
4	929	1	5	5	70		943	1366	1366	126	188	337
5	929	1	5	6	77		1004	1328	1279	125	188	352
6	929	1	5	8	83		1124	1258	1167	124	184	351
7	930	1	5	6	66		1004	1328	1356	128	197	387
8	1012	1	8	7	76		1064	1293	1251	125	192	376
										Avg: 124. 188. 349.		

## -----KEY-OFF SOAK CONDITIONS-----

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#
1	414	67 110 70	69 127 75	680	SN		2
2	445	72 111 87	74 133 85	730	SN		3 1
3	419	80 115 95	80 138 92	800	SN		3
4	107	70 105 78	71 108 75	705	SN		
5	120	77 111 87	79 137 84	780	SN		2
6	134	83 118 96	83 137 93	830	SC		3
7	104	66 107 77	66 121 70	660	SN		2
8	283	76 116 87	76 134 83	760	SN		2

## -----KEY-OFF SOAK ACCELERATIONS-----

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	130 5	338 80	487 39	H	1440	1101	1115
2	123 0	194 3	409 17		933	1372	1351
3	123 0	190 1	383 10	T	954	1359	1289
4	122 -1	185 -1	368 5		1008	1326	1322
5	127 3	199 7	453 30		1061	1294	1238
6	122 -1	183 -2	372 6		1177	1229	1138
7	133 8	210 12	510 46		1098	1273	1301
8	127 3	194 3	451 29	T	1151	1243	1201

NOTES: Runs included in base acceleration time averages: 2,3,4,5,6,8  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Cool

Car#: 02

CRC Fuel Data Comments: Run 1

Temp Adjustment =.70F/1.0F

BASE DATA													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations			Surg
1	1001	4	10	17	73		1644	1020	999.	-50	-60	-70	
							0	0	0	142	240	473	
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				

Avg: 142 240 473

KEY-OFF SOAK CONDITIONS												
Run#	Smp#	Temp @ Start	Temp @ End	Avg	Sky	Wind	Starting			RSt#		
		Air TcA TcB	Air TcA TcB	AirT TcB			sec	RSt#				
1	158	73 75	74 76	735	SN			2				
				0								
				0								
				0								
				0								
				0								
				0								

KEY-OFF SOAK ACCELERATIONS												
Run#	Time	%Inc	Time	%Inc	Time	%Inc	Surg	RVP	T20	T20A		
1	148	4	258	8	515	9	T	1640	1021	997.		
		0		0		0			0	0		
		0		0		0			0	0		
		0		0		0			0	0		
		0		0		0			0	0		
		0		0		0			0	0		
		0		0		0			0	0		

IDLE SOAK CONDITIONS												
Run#	Smp#	Temp @ Start	Temp @ End	Avg	Sky	Wind	Starting			RSt#		
		Air TcA TcB	Air TcA TcB	AirT TcB			sec	RSt#				
1	167	75	76	755	SN							
				0								
				0								
				0								
				0								

IDLE SOAK ACCELERATIONS												
Run#	Time	%Inc	Time	%Inc	Time	%Inc	Surg	RVP	T20	T20A		
1	148	4	253	5	472	0		1622	1028	1518		
		0		0		0			0	0		
		0		0		0			0	0		
		0		0		0			0	0		
		0		0		0			0	0		

NOTES: Runs included in base acceleration time averages: All RVP is psix100; T20V/L & Avg Air Temp are deg Fx10; Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Cool

Car#: 03

CRC Fuel Data Comments: No

Temp Adjustment =.70F/1.0F

BASE DATA												
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	-Accel times-		Surg
										-50	-60	-70
1	922	12	16	14	81		1475	1086	1009	102	144	189
2	923	12	16	17	82		1644	1020	936.	100	147	185
3	927	17	12	17	68		1644	1020	1034	95	137	189
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			

Avg: 99 143. 188.

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	--Tmp @ End--			Avg	Sky	Wind	Starting	
		Air TcA TcB	Air TcA TcB	Air TcA TcB	AirT			sec	RSt#	
1	500	81 115 101	83 159 88	820	SNP			1		
2	39	82 124 104	83 163 90	825	SN			2		
3	2	68 102 76	68 112 68	680	SC			1		
					0					
					0					
					0					
					0					

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	111 12 148	4 196	4		1372	1132	1048
2	108 9 153	7 210	12		1547	1056	969.
3	110 11 153	7 212	13		1535	1061	1075
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	--Tmp @ End--			Avg	sky	Wind	Starting	
		Air TcA TcB	Air TcA TcB	Air TcA TcB	AirT			sec	RSt#	
1	461	83 121 99	85 142 99	840	SNP					
2	91	85 131 103	86 161 101	855	SN					
3	405	68 101 73	68 123 72	680	SC					
					0					
					0					
					0					
					0					

## IDLE SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	106 7 148	4 196	4		1372	1132	1034
2	110 11 151	6 210	12	T	1491	1079	971.
3	116 17 148	4 208	11		1527	1064	1078
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0
	0	0	0		0	0	0

NOTES: Runs included in base acceleration time averages: All  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10; 10  
 Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Cool

Car#: 04

CRC Fuel Data Comments: Runs 1,5

Temp Adjustment = .70F/1.0F

-----BASE DATA-----													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	930	1	15	14	74		1475	1086	1058	146	256	461	
2	930	1	15	17	78		1644	1020	964.	130	204	302	
3	930	1	15	15	80		1532	1062	992.	134	210	335	
4	1001	1	15	17	68		1644	1020	1034	125	197	311	
5	1001	1	15	17	77		1644	1020	971.	146	223	346	
									0	0	0		
									0	0	0		
									0	0	0		

Avg: 130. 204. 316

-----KEY-OFF SOAK CONDITIONS-----												
Run#	Smp#	-Tmp @ Start	--Tmp @ End--			Avg	Sky	Wind	Starting			
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec	RSt#		
1	103	74	109	99	75	135	120	745	SN	3		
2	123	78	123	106	78	140	125	780	SN	3		
3	160	80	115	106	80	137	122	800	SN	6	1	
4	176	68	103	89	69	132	110	685	SN	5	1	
5	174	77	110	101	78	146	116	775	SN	5		
									0			
									0			

-----KEY-OFF SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--		--15-70--		Surg	RVP	T20	T20A			
		Time	%Inc	Time	%Inc	Time	%Inc					
1	157	21	273	34	464	47	1530	1063	1032			
2	156	20	279	37	491	55	1654	1016	960.			
3	149	15	243	19	372	18	1577	1045	975.			
4	144	11	243	19	376	19	1681	1007	1017			
5	146	13	278	36	432	37	T 1679	1008	955.			
		0	0	0	0	0						
		0	0	0	0	0						

-----IDLE SOAK CONDITIONS-----												
Run#	Smp#	-Tmp @ Start	--Tmp @ End--			Avg	Sky	Wind	Starting			
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec	RSt#		
1	142	75	116	100	75	128	112	750	SN			
2	175	78	113	106	79	137	120	785	SN			
3	152	80	114	106	80	136	120	800	SN			
4	199	70	105	98	72	130	113	710	SN			
5	172	79	112	107	79	143	126	790	SN			
									0			
									0			

-----IDLE SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--		--15-70--		Surg	RVP	T20	T20A			
		Time	%Inc	Time	%Inc	Time	%Inc					
1	146	13	246	21	445	41	1501	1075	1040			
2	144	11	243	19	440	39	1584	1042	983.			
3	141	9	230	13	354	12	1524	1066	996.			
4	132	2	222	9	359	14	1657	1015	1008			
5	148	14	256	26	428	35	1618	1029	966.			
		0	0	0	0	0						
		0	0	0	0	0						

NOTES: Runs included in base acceleration time averages: 2,3,4  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10



## 1982 CRC Regular Vapor Lock, Cool

Car#: 05

CRC Fuel Data Comments: Runs 1,3

Temp Adjustment = .70F/1.0F

-----BASE DATA-----													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	930	1	15	14	70		1475	1086	1086	119	184	272	T
2	930	1	15	17	72		1644	1020	1006	157	224	313	H
3	930	1	15	15	77		1532	1062	1013	161	227	312	H
4	1001	1	15	16	73		1588	1041	1020	127	186	259	H
5	1001	1	2	14	80		1475	1086	1016	113	178	260	T
							0	0	0				
							0	0	0				
							0	0	0				
										Avg:	116	181	266

## -----KEY-OFF SOAK CONDITIONS-----

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#
1	114	70 131 78	71 159 74	705	SN		2
2	117	72 134 83	73 170 77	725	SN		6 1
3	449	77 142 89	78 176	775	SN		5 1
4	178	73 127	74 174	735	SN		2
5	165	80 131 92	81 187 88	805	SN		3
				0			
				0			

## -----KEY-OFF SOAK ACCELERATIONS-----

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	128 10	191 6	276 4	M	1497	1077	1073
2	137 18	202 12	279 5	H	1718	994	977
3	123 6	186 3	264 -1	T	1596	1038	985
4	164 41	223 23	298 12	H	1652	1017	993
5	200 72	260 44	331 24	H	1545	1057	984
	0	0	0		0	0	0
	0	0	0		0	0	0

## -----IDLE SOAK CONDITIONS-----

Run#	Smp#	-Tmp @ Start	-Tmp @ End	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#
1	131	71 132	71 153	710	SN		
2	118	73 132 86	74 170 86	735	SN		
3	197	78 142	78 179	780	SN		
4	161	76 130	76 173	760	SN		
5	162	81 140 93	82 181 91	815	SN		5 2
				0			
				0			

## -----IDLE SOAK ACCELERATIONS-----

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	115 -1	184 2	271 2	T	1479	1084	1077
2	139 20		287 8	H	1678	1008	983
3	224 93	288 59	376 41	H	1520	1067	1011
4	218 88	280 55	354 33	H	1627	1026	984
5	195 68	258 43	331 24	H	1498	1076	996
	0	0	0		0	0	0
	0	0	0		0	0	0

NOTES: Runs included in base acceleration time averages: 1,5  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Cool

Car#: 6

CRC Fuel Data Comments: No

Temp Adjustment = .70F/1.0F

BASE DATA													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	922	1	5	14	79		1475	1086	1023	101	159	229	T
2	923	1	5	12	82		1359	1138	1054	111	166	236	H
3	927	1	15	14	68		1475	1086	1100	104	160	236	T
4	927	17	12	17	78		1644	1020	964.	140	202	281	H
5	928	1	5	17	70		1644	1020	1020	102	154	220	
6	928	1	5	15	76		1532	1062	1020	99	154	217	T
							0	0	0				
							0	0	0				

Avg: 102. 157. 226.

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting	
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec	RSt#
1	451	80	96	127	82	173	89	810	3	
2	40	83	131	98	84	176	89	835	2	
3	421	68	117	76	68	139	72	680	2	
4	446	78	133	86	78	159	82	780	2	
5	55	70	117	81	71	130	78	705	3	
6	422	76	122	90	78	169	87	770	4	1
								0		

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc	
1	135	33	191	22	258	14	H 1392 1122 1045
2	146	44	203	30	274	22	H 1380 1128 1033
3	108	6	166	6	231	2	M 1478 1085 1099
4	120	18	180	15	241	7	H 1645 1020 964.
5	150	48	202	29	266	18	H 1610 1032 1029
6	119	17	177	13	235	4	H 1581 1043 994.
							0 0

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting	
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec	RSt#
1	476	83	139	99	85	161	94	840	SN	
2	34	85	138	101	87	165	93	860	SN	
3	426	68	119	76	68	157	73	680	SC	
4	450	79	133	88	80	157	87	795	SC	
5	418	71	120	86	72	151	83	715	SN	
6	61	78	135	93	79	160	91	785	SN	
								0		

## IDLE SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc	
1	113	11	176	12	254	13	H 1355 1140 1042
2	107	5	175	12	254	13	H 1336 1149 1037
3	102	0	162	3	230	2	T 1472 1087 1101
4	114	12	173	10	249	10	H 1605 1034 968.
5	100	-1	157	0	214	-5	M 1585 1042 1031
6	110	8	174	11	239	6	H 1533 1062 1003
							0 0

NOTES: Runs included in base acceleration time averages: 1,3,5,6  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Cool

Car#: 07

CRC Fuel Data Comments: Run 5

Temp Adjustment = .70F/1.0F

-----BASE DATA-----													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	928	17	12	17	70		1644	1020	1020	119	179	252	
2	928	17	12	15	78		1532	1062	1006	126	194	267	M
3	929	17	12	14	69		1475	1086	1093	112	175	256	
4	929	17	12	15	79		1532	1062	999.	118	179	268	T
5	930	17	16	17	65		1644	1020	1055	130	183	278	
6	1012	17	7	12	75		1359	1138	1103	110	172	248	
							@	@	@				
							@	@	@				
										Avg: 115. 176. 256			

-----KEY-OFF SOAK CONDITIONS-----												
Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting			
		Air	TcA	TcB	Air	TcA	TcB	AirT		sec	RSt#	
1	415	71	99	77	71	140	78	710	SN	2		
2	437	80	107	87	80	156	95	800	SN	2		
3	130	70	98	76	71	135	75	705	SN	1		
4	110	80	108	84	80	150	86	800	SN	2		
5	122	65	97	70	65	130	68	650	SN	5		
6	254	76			76			760	SN	1		
							@	@	@			

-----KEY-OFF SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A					
		Time %Inc	Time %Inc	Time %Inc								
1	176	53	246	40	330	29	H 1642	1021	1014			
2			209	19	308	20	H 1583	1042	972.			
3	122	6	194	10	269	5	T 1513	1070	1067			
4	135	18	197	12	279	9	M 1573	1046	976.			
5	165	44	230	30	340	33	M 1676	1009	1044			
6	142	24	206	17	294	15	M 1381	1127	1085			
		@	@	@	@	@	@	@	@			

-----IDLE SOAK CONDITIONS-----												
Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting			
		Air	TcA	TcB	Air	TcA	TcB	AirT		sec	RSt#	
1	416	71	104	84	71	145	85	710	SN			
2	427	80	118	96	80	158	96	800	SN			
3	119	72	101	81	72	128	81	720	SN			
4	149	81	112	89	82	146	93	815	SC			
5	109	66	99	74	66	119	73	660	SN			
6	269	77			77			770	SN			
							@	@	@			

-----IDLE SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A					
		Time %Inc	Time %Inc	Time %Inc								
1	168	46	243	38	332	30	H 1613	1031	1024			
2	180	57	253	44	332	30	H 1482	1083	1013			
3	111	-3	178	1	251	-2	M 1453	1095	1081			
4	162	41	233	32	320	25	H 1521	1067	986.			
5	115	@	185	5	279	9	T 1663	1013	1041			
6			202	15	274	7-	1374	1131	1082			
		@	@	@	@	@	@	@	@			

NOTES: Runs included in base acceleration time averages: 1,3,4,6  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10



## 1982 CRC Regular Vapor Lock, Cool

Car#: 9

CRC Fuel Data Comments: Runs 3,6

Temp Adjustment = .70F/1.0F

Run#	Date	Drvr	BASE DATA		AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
			Obsr	Fuel						"-50	"-60	"-70	
1	927	17	12	12	71		1359	1138	1131	163	263	470	
2	927	17	12	9	77		1183	1226	1177	138	213	382	
3	928	17	12	8	67		1124	1258	1279	140	221	399	
4	928	17	12	6	74		1004	1328	1300	122	203	358	
5	928	17	12	4	82		882	1405	1321	129	207	346	
6	929	17	12	4	74		882	1405	1377	113	190	363	
7	929	17	12	2	83		759	1488	1397	126	202	339	

Avg: 131 209. 365.

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--		-Tmp @ End---		Avg	Sky	Wind	Starting	
		Air	TcA	TcB	Air					TcA
1	429	71	100	92	72	136	114	715	SC	1
2	443	77	110	102	78	141	126	775	SC	1
3	423	68	89	84	69	133	112	685	SN	1
4	409	74	97	91	75	141	121	745	SN	1
5	442	82	99	98	82	144	127	820	SN	1
6	121	75	93	89	77	141	118	760	SN	1
7	106	83	105	98	83	145	126	830	SC	1

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	sec	%Inc	sec	%Inc	sec	%Inc				
1	336	156	430	106	650	78	H	1390	1123	1113
2	150	15	410	96	628	72	H	1254	1189	1136
3	200	53	280	34	442	21	H	1222	1205	1216
4	193	47	275	31	440	21	H	1101	1271	1240
5	158	21	231	10	400	10	M	964	1353	1269
6	152	16	237	13	440	21	T	950	1361	1319
7	140	7	220	5	363	0		843	1431	1340

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--		-Tmp @ End---		Avg	Sky	Wind	Starting
		Air	TcA	TcB	Air				
1	431	72	102	96	73	124	111	725	SC
2	448	78	112	104	78	133	122	780	SC
3	410	70	91	84	70	121	114	700	SN
4	424	76	100	93	77	125	119	765	SN
5	440	81	103	101	81	139	133	810	SN
6	129	77	95	92	79	116	112	780	SN
7	101	83	108	99	84	129	123	835	SC

## IDLE SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	sec	%Inc	sec	%Inc	sec	%Inc				
1	183	40	372	78	558	53	H	1388	1124	1107
2	150	15	340	63	490	34	H	1236	1198	1142
3	145	11	226	8			T	1206	1214	1214
4	141	8	213	2	370	1		1083	1282	1236
5	159	21	240	15	395	8	H	959	1356	1279
6	136	4	215	3	390	7		944	1365	1309
7	142	8	223	7	365	0		837	1435	1340

NOTES: Runs included in base acceleration time averages: 2,3,4,5,7

RVP is psix100; T20V/L &amp; Avg Air Temp are deg Fx10;

Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Cool

Car#: 10

CRC Fuel Data Comments: No

Temp Adjustment = .70F/1.0F

-----BASE DATA-----														
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg	
							x100	x10	x10	"-50	"-60	"-70		
1	927	4	10	14	75		1475	1086	1051	115	161	259		
2	927	4	10	11	78		1301	1165	1109	106	157	247		
3	928	4	10	11	70		1301	1165	1165	100	143	222		
4	928	4	10	10	75		1242	1195	1160	104	147	216		
5	928	4	10	7	81		1064	1293	1216	99	141	218		
6	929	4	10	3	69		821	1445	1452	101	148	226		
7	929	4	10	5	80		943	1366	1296	100	149	230		
8	1012	2	8	12	71		1359	1138	1131	89	133	202	T	
9	1012	2	8	3	80		821	1445	1375	92	136	197	T	
										Avg: 97.9			142.	216.

-----KEY-OFF SOAK CONDITIONS-----												
Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting			
		Air	TcA	TcB	Air	TcA	TcB	AirT		sec	RSt#	
1	435	75	118	103	75	123	107	750	SC	2		
2	432	78	125	110	78	133	113	780	SC	2		
3	62	70	118	101	70	130	104	700	SN	4		
4	63	75	119	105	76	140	115	755	SN	2		
5	433	81	131	116	82	142	122	815	SN	2		
6	148	69	112	94	70	127	104	695	SN	2		
7	113	80	121	103	82	137	106	810	SC	2		
8	296	72	99	96	72	112	95	720	SN	2		
9	280	80	111	107	80	135	111	800	SN	2		

-----KEY-OFF SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A					
	sec	%Inc	sec	%Inc	sec	%Inc		x100	x10	x10		
1	262	168	318	123	425	97	H	1511	1071	1036		
2	133	36	205	44	308	43	M	1386	1125	1069		
3	145	48	182	28	264	22	M	1353	1140	1140		
4	115	18	168	18	269	25		1327	1153	1114		
5	168	72	213	50	311	44	H	1152	1243	1162		
6	110	12	159	12	248	15		965	1352	1356		
7	119	22	174	22	260	20		1030	1313	1236		
8	95	-3	136	-5	207	-4	T	1389	1124	1110		
9	102	4	150	5	227	5	T	924	1378	1308		

NOTES: Runs included in base acceleration time averages: 3-9  
RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
Acceleration times are secx10

## 1982 CRC Regular Vapor Lock, Cool

Car#: 11

CRC Fuel Data Comments: Runs 1,2

Temp Adjustment = .70F/1.0F

BASE DATA													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	930	12	16	14	70		1475	1086	1086	153	260	399	
2	930	12	21	12	74		1359	1138	1110	172	278	445	
3	930	17	21	9	78		1183	1226	1170	157	251	375	
4	930	17	21	6	79		1004	1328	1265	141	220	320	T
5	1001	21	11	3	69		821	1445	1452	146	229	339	
6	1001	21	11	5	79		943	1366	1303	138	218	319	
							0	0	0				
							0	0	0				

Avg: 142. 222. 326

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec RSt#
1	144	70	101	71	106	705	SN		1
2	183	74	107	109	75	177	121	745	1
3	145	78	124	118	78	187	131	780	1
4	169	79	114	116	80	190	132	795	1
5	192	70	112	104	72	180	123	710	1
6	156	79	114	113	79	191	140	790	2

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	170 20	338 52	625 92	T	1479	1084	1081
2	153 8	261 17	639 96	T	1414	1112	1081
3	198 40	338 52	558 71		1359	1138	1082
4	161 14	275 24	495 52	T	1160	1238	1172
5	156 10	270 21	396 21	T	910	1387	1380
6	153 8	280 26	490 50	T	1024	1316	1253

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec RSt#
1	141	71	107	71	130	710	SN		
2	153	75	116	113	75	146	145	750	SN
3	125	78	111	116	78	149	149	780	SN
4	164	80	115	120	80	150	151	800	SN
5	195	73	107	114	73	145	144	730	SN
6	181	81	108	115	81	152	153	810	SN

## IDLE SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	150 6	249 12	395 21		1459	1093	1086
2	161 14	260 17	410 26		1401	1118	1083
3	161 14	245 10	358 10		1335	1149	1093
4	149 5	235 6	329 1		1142	1248	1178
5	149 5	235 6	349 7	T	893	1398	1377
6	137 -3	211 -5	305 -6		1029	1313	1236

NOTES: Runs included in base acceleration time averages: 4,5,6  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Cool

Car#: 12

CRC Fuel Data Comments: No

Temp Adjustment =.70F/1.0F

-----BASE DATA-----													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	927	17	12	17	74		1644	1020	992.	100	152	208	
2	1012	17	7	17	71		1644	1020	1013	88	136	186	
3	1012	17	2	14	79		1475	1086	1023	90	138	186	
4	1012	17	7	11	80		1301	1165	1095	94	136	188	
5	1013	17	7	10	68		1242	1195	1209	88	136	182	
6	1013	17	7	11	74		1301	1165	1137	86	132	180	
7	1013	17	7	12	80		1359	1138	1068	90	142	184	

Avg: 89.3 137. 184.

-----KEY-OFF SOAK CONDITIONS-----												
Run#	Smp#	-Temp	@ Start	--Temp	@ End	Avg			Sky	Wind	Starting	
		Air	TcA	TcB	Air	TcA	TcB	AirT			sec	RSt#
1	408	74	126	98	75	153	90	745	SC		1	
2	271	71	123	99	72	141	107	715	SN		1	
@ @ @ @												

-----KEY-OFF SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A					
		Time %Inc	Time %Inc	Time %Inc								
1	106	19	158	16	219	19	1608	1033	1002			
2	98	10	142	4	210	14	1641	1021	1010			
@ @ @ @ @												

-----IDLE SOAK CONDITIONS-----												
Run#	Smp#	-Temp	@ Start	--Temp	@ End	Avg			Sky	Wind	Starting	
		Air	TcA	TcB	Air	TcA	TcB	AirT			sec	RSt#
1	70	75	131	102	76	151	111	755	SC			
2	299	74	121	104	75	154	128	745	SN			
3	270	80	120	113	80	157	140	800	SN			
4	272	81	124	114	82	159	141	815	SN			
5	313	69	116	103	70	158	140	695	SN			
6	302	76	121	108	76	156	142	760	SN			
7	305	84	118	109	81	156	140	810	SN			

-----IDLE SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A					
		Time %Inc	Time %Inc	Time %Inc								
1	100	12	152	11	210	14	1566	1049	1010			
2	98	10	144	5	286	55	H 1618	1029	998.			
3	92	3	138	1	314	70	H 1528	1064	994.			
4	100	12	148	8	246	33	M 1379	1128	1048			
5	86	-4	136	0	198	2	1318	1157	1161			
6	92	3	140	2	188	2	1375	1130	1088			
7	88	-1	138	1	282	53	H 1413	1113	1036			

NOTES: Runs included in base acceleration time averages: 2-7  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10





## 1982 CRC Regular Vapor Lock, Cool

Car#: 14

CRC Fuel Data Comments: No

Temp Adjustment = .70F/1.0F

Run#	Date	Drvr	BASE DATA			Wind	RVP	T20	T20A	Accelerations-			Surg
			Obsr	Fuel	AirT					"-50	"-60	"-70	
1	927	4	10	13	71	1417	1111	1104	90	138	240		
2	927	4	10	16	77	1588	1041	992.	102	158	264	H	
3	927	4	10	14	79	1475	1086	1023	101	146	245		
4	928	4	10	14	68	1475	1086	1100	90	132	218	M	
5	928	4	10	15	72	1532	1062	1048	88	129	219	T	
						0	0	0					
						0	0	0					
						0	0	0					

Avg: 92.3 136. 231.

KEY-OFF SOAK CONDITIONS												
Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting			
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec	RSt#		
1	403	71	183	139	72	177	133	715	3	SC		
2	27	77	184	130	78	191	147	775	3	SC		
								0				
								0				
								0				
								0				

KEY-OFF SOAK ACCELERATIONS												
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A					
	sec	%Inc	sec	%Inc	sec	%Inc	sec	%Inc	x100	x10	x10	
1	88	-5	134	-2	220	-5			1489	1080	1070	
2	130	41	218	60	323	40	H		1633	1024	971.	
		0		0		0				0	0	
		0		0		0				0	0	
		0		0		0				0	0	
		0		0		0				0	0	
		0		0		0				0	0	

IDLE SOAK CONDITIONS												
Run#	Smp#	-Tmp	@ Start	--Tmp	@ End	Avg	Sky	Wind	Starting			
		Air	TcA	TcB	Air	TcA	TcB	AirT	sec	RSt#		
1	402	73	150	117	74	156	120	735	SC			
2	447	78	152	119	78			780	SC			
3	438	79	162	125	80	166	129	795	SC			
4	401	68	144	106	69	162	120	685	SN			
5	407	72	154	118	72	170	131	720	SN			
								0				
								0				

IDLE SOAK ACCELERATIONS												
Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A					
	sec	%Inc	sec	%Inc	sec	%Inc	sec	%Inc	x100	x10	x10	
1	94	2	139	2	247	7			1476	1085	1061	
2	103	12	325	139	441	91	H		1594	1038	982.	
3	105	14	308	126	409	77	H		1517	1068	1002	
4	95	3	141	3	246	7	M		1535	1061	1072	
5	94	2	140	3	306	33	H		1592	1039	1025	
		0		0		0				0	0	
		0		0		0				0	0	

NOTES: Runs included in base acceleration time averages: 1,3,4,5  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Cool

Car#: 15

CRC Fuel Data Comments: Run 1

Temp Adjustment =.70F/1.0F

BASE DATA													
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										-50	-60	-70	
1	930	4	10	17	65		1644	1020	1055	88	139	191	
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
										Avg:	88	139	191

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp	@ Start	-Tmp	@ End	Avg	Sky	Wind	Starting									
										sec	RSt#							
										Air	TcA	TcB	Air	TcA	TcB	AirT		
1	136	65	119		65	136		650	SN									
								0										
								0										
								0										
								0										
								0										
								0										

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A										
								Time	%Inc	Time	%Inc	Time	%Inc				
1	79	-10	130	-6	185	-3	1672	1010	1045								
								0									
								0									
								0									
								0									
								0									
								0									
								0									

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp	@ Start	-Tmp	@ End	Avg	Sky	Wind	Starting									
										sec	RSt#							
										Air	TcA	TcB	Air	TcA	TcB	AirT		
1	127	66	125		66	139		660	SN									
								0										
								0										
								0										
								0										
								0										
								0										

## IDLE SOAK ACCELERATIONS

Run#	--15-50--	--15-60--	--15-70--	Surg	RVP	T20	T20A											
								Time	%Inc	Time	%Inc	Time	%Inc					
1	83	-6	130	-6	183	-4	1652	1017	1045									
								0										
								0										
								0										
								0										
								0										
								0										
								0										

NOTES: Runs included in base acceleration time averages: All  
RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Cool

Car#: 16

CRC Fuel Data Comments: No

Temp Adjustment =.70F/1.0F

-----BASE DATA-----												
Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-	Surg	
										-50	-60	-70
1	928	5	15	13	82		1417	1111	1027	116	173	258
2	929	5	15	11	73		1301	1165	1144	113	173	261
3	929	5	15	12	82		1359	1138	1054	112	166	259
4	930	5	15	12	65		1359	1138	1173	114	172	289
5	930	5	15	14	68		1475	1086	1100	113	174	273
6	930	5	15	16	71		1588	1041	1034	122	179	274
							0	0	0			
							0	0	0			
										Avg: 115 173. 269		

-----KEY-OFF SOAK CONDITIONS-----												
Run#	Smp#	-Tmp @ Start	--Tmp @ End--			Avg	Sky	Wind	Starting			
		Air TcA TcB	Air TcA TcB	AirT				sec	RSt#			
1	417	82 113 121	81 136 137	815	SN			2				
				0								
				0								
				0								
				0								
				0								
				0								

-----KEY-OFF SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--		--15-70--		Surg	RVP	T20	T20A			
	Time %Inc	Time %Inc	Time %Inc	Time %Inc	Time %Inc							
1	125 9	370 114	477 77	H	1443	1100	1019					
	0	0	0			0	0					
	0	0	0			0	0					
	0	0	0			0	0					
	0	0	0			0	0					
	0	0	0			0	0					

-----IDLE SOAK CONDITIONS-----												
Run#	Smp#	-Tmp @ Start	--Tmp @ End--			Avg	Sky	Wind	Starting			
		Air TcA TcB	Air TcA TcB	AirT				sec	RSt#			
1	139	81 113 121	82 148 155	815	SN							
2	147	74 105 115	76 131 137	750	SN							
3	132	82 113 122	83 138 144	825	SC							
4	133	65 98 102	65 119 126	650	SN							
5	102	68 103 109	68 122 127	680	SN							
6	116	71 108 112	72 128 130	715	SN							
				0								

-----IDLE SOAK ACCELERATIONS-----												
Run#	--15-50--	--15-60--		--15-70--		Surg	RVP	T20	T20A			
	Time %Inc	Time %Inc	Time %Inc	Time %Inc	Time %Inc							
1	132 15	708 310	796 196	H	1404	1117	1036					
2	122 6	186 8	295 10		1381	1127	1092					
3	120 4	188 9	386 43	M	1399	1119	1032					
4	117 2	186 8	285 6		1417	1111	1146					
5	119 3	188 9	284 6		1558	1052	1066					
6	114 -1	176 2	383 42	M	1645	1020	1009					
	0	0	0			0	0					

NOTES: Runs included in base acceleration time averages: All  
 RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Cool

Car#: 17

CRC Fuel Data Comments: Run 1

Temp Adjustment = .70F/1.0F

BASE DATA

Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations- Surg		
							x100	x10	x10	"-50	"-60	"-70
1	929	4	10	17	74		1644	1020	992.	120	188	302
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			

Avg: 120 188 302

KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	--Tmp @ End	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#
1	135	74	76	750	SN		4 1
				0			
				0			
				0			
				0			
				0			
				0			

KEY-OFF SOAK ACCELERATIONS

Run#	--15-50	--15-60	--15-70	Surg	RVP	T20	T20A
	sec %Inc	sec %Inc	sec %Inc		x100	x10	x10
1	129 8	203 8	330 9		1638	1022	987.
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0

IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	--Tmp @ End	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#
1	137	77 106	79 114	780	SN		
				0			
				0			
				0			
				0			
				0			
				0			

IDLE SOAK ACCELERATIONS

Run#	--15-50	--15-60	--15-70	Surg	RVP	T20	T20A
	sec %Inc	sec %Inc	sec %Inc		x100	x10	x10
1	121 0	187 -1	299 -1		1611	1032	976.
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0
	0	0	0			0	0

NOTES: Runs included in base acceleration time averages: All BVP is psix100; T20V/L & Avg Air Temp are deg Fx10; Acceleration times are sec.x10

1982 CRC Regular Vapor Lock, Cool

Car#: 18

CRC Fuel Data Comments: Yes

Temp Adjustment = .70F/1.0F

----- BASE DATA -----

Run#	Date	Drv	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations	Surg	
1	930	4	10	17	78		1644	1020	964.	-50 -60 -70		
										102	153	237
										0	0	0
										0	0	0
										0	0	0
										0	0	0
										0	0	0
										0	0	0
										0	0	0
										0	0	0
										0	0	0

Avg: 102 153 237

----- KEY-OFF SOAK CONDITIONS -----

Run#	Smp#	-Tmp @ Start	--Tmp @ End	Avg	Sky	Wind	Starting	
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#	
1	111	78	78	780	SN			
								0
								0
								0
								0
								0
								0
								0

----- KEY-OFF SOAK ACCELERATIONS -----

Run#	-15-50	--15-60	--15-70	Surg	RVP	T20	T20A	
		Time %Inc	Time %Inc	Time %Inc				
1	110	8 163	7 247	4	1438	1102	1046	
								0
								0
								0
								0
								0
								0
								0

----- IDLE SOAK CONDITIONS -----

Run#	Smp#	-Tmp @ Start	--Tmp @ End	Avg	Sky	Wind	Starting	
		Air TcA TcB	Air TcA TcB	AirT			sec RSt#	
1	163	78	78	780	SN		4 1	
								0
								0
								0
								0
								0
								0

----- IDLE SOAK ACCELERATIONS -----

Run#	-15-50	--15-60	--15-70	Surg	RVP	T20	T20A	
		Time %Inc	Time %Inc	Time %Inc				
1	107	5 161	5 249	5	1459	1093	1037	
								0
								0
								0
								0
								0
								0
								0

NOTES: Runs included in base acceleration time averages: All RVP is psix100; T20V/L & Avg Air Temp are deg Fx10; Acceleration times are sec.x10

## 1982 CRC Regular Vapor Lock, Cool

Car#: 19

CRC Fuel Data Comments: Runs 2,6

Temp Adjustment = .70F/1.0F

Run#	Date	Dvr	Obsr	BASE DATA			RVP	T20	T20A	Accelerations-			Surg
				Fuel	AirT	Wind				-50	-60	-70	
1	930	12	16	17	70		1644	1020	1020	126	227	385	
2	930	12	21	15	71		1532	1062	1055	129	210	398	
3	930	17	21	17	76		1644	1020	978.	128	201	394	M
4	930	17	21	16	78		1588	1041	985.	148	212	345	H
5	1001	21	11	17	74		1644	1020	992.	126	210	348	
6	1001	21	11	15	81		1532	1062	985.	125	198	439	H
							0	0	0				
							0	0	0				
										Avg: 126 219. 367.			

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--			--Tmp @ End---			Avg	Sky	Wind	Starting	sec	RSt#
		Air	TcA	TcB	Air	TcA	TcB						
1	124	70	100	104	71	131	97	705	SN		5		
2	126	72	95	101	72	132	110	720	SN		1		
3	140	76	109	115	76	141	113	760	SN		1		
4	108	78	111	120	78	159	115	780	SN		1		
5	157	75	101	109	77	160	115	760	SN		4		
6	191	81	103	114	81	165	117	810	SN		2		
								0					

## KEY-OFF SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	142	13	275	26	472	29		1669	1011	1008
2	131	4	241	10	411	12		1585	1042	1028
3	130	3	244	12	510	39	T	1711	997.	955.
4	159	26	258	18	465	27	H	1653	1017	961.
5	212	68	321	47	555	51	H	1692	1003	961.
6	171	36	267	22	439	20	H	1609	1033	956.
		0		0		0			0	0

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--			--Tmp @ End---			Avg	Sky	Wind	Starting	sec	RSt#
		Air	TcA	TcB	Air	TcA	TcB						
1	146	71	93	113	71	124	127	710	SN				
2	150	73	96	113	73	139	142	730	SN				
3	436	76	101	118	77	149	153	765	SN				
4	171	79	105	120	79	149	151	790	SN				
5	188	78	101	120	79	154	157	785	SN				
6	196	81	105	124	81	157	160	810	SN				
								0					

## IDLE SOAK ACCELERATIONS

Run#	--15-50--		--15-60--		--15-70--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	142	13	233	7	430	17		1663	1013	1006
2	158	25	240	10	461	26		1566	1049	1028
3	206	63	300	37	485	32	H	1670	1011	965.
4	189	50	260	19	415	13	H	1609	1033	970.
5	262	108	370	69	551	50	H	1659	1015	955.
6	262	108	351	61	476	30	H	1565	1049	972.
		0		0		0			0	0

NOTES: Runs included in base acceleration time averages: 1,5  
 RVP is psix100; T020V/L & Avg Air Temp are deg Fx10;  
 Acceleration times are sec.x10

## 1982 CRC Alternate Vapor Lock, Hot

Car#: 05

CRC Fuel Data Comments: Run 3

Temp Adjustment = .70F/1.0F

BASE DATA													
Run#	Date	Drvr	Obsr	Fx1	AirT	Wind	RVP	T20	T20A	Accelerations-			Surg
										0-30	0-50	0-60	
1	1015	1	11	6	92		1004	1328	1349	76	155	223	T
2	1015	1	11	8	94		1124	1258	1265	84	163	228	T
3	1015	1	11	4	91		882	1405	1433	79	157	224	
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				
							0	0	0				

Avg: 79.7 158. 225

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start	--Tmp @ End--		Avg	Sky	Wind	Starting	
		Air TcA TcB	Air TcA TcB	AirT			sec	RSt#	
1	388	92			93	925	SC	5	2
2	387	94			94	940	SC	2	
3	389	91			90	905	SC	2	
					0				
					0				
					0				
					0				

## KEY-OFF SOAK ACCELERATIONS

Run#	--0-30--		--0-50--		--0-60--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	77	-3	212	34	278	24	H	1050	1301	1318
2	76	-5	212	34	273	21	H	1211	1211	1218
3	77	-3	175	11	237	5	H	975	1346	1377
		0		0		0			0	0
		0		0		0			0	0
		0		0		0			0	0
		0		0		0			0	0

## IDLE SOAK CONDITIONS

Run#	Smp#	-Imp <sup>2</sup> @ Start	--Tmp @ End--		Avg	Sky	Wind	Starting	
		Air TcA TcB	Air TcA TcB	AirT			sec	RSt#	
1	391	95			95	950	SC	2	1
2	378	93			93	930	SC		
3	369	91			91	910	SC	2	1
					0				
					0				
					0				
					0				

## IDLE SOAK ACCELERATIONS

Run#	--0-30--		--0-50--		--0-60--		Surg	RVP	T20	T20A
	Time	%Inc	Time	%Inc	Time	%Inc				
1	71	-11	169	7	235	4	H	1039	1307	1307
2	82	3	255	61	325	44	H	1177	1229	1243
3	76	-5	151	-5	221	-2	T	974	1347	1375
		0		0		0			0	0
		0		0		0			0	0
		0		0		0			0	0
		0		0		0			0	0

NOTES: Runs included in base acceleration time averages; All RVP is psix100; T020V/L & Avg Air Temp are deg Fx10; Acceleration times are sec.x10



## 1982 CRC Alternate Vapor Lock, Hot

Car#: 14

CRC Fuel Data Comments: No

Temp Adjustment = .70F/1.0F

## BASE DATA

Run#	Date	Drvr	Obsr	Fuel	AirT	Wind	RVP	T20	T20A	Accelerations-	Surg	
										0-30	0-50	0-60
1	1014	1	2	9	91		1183	1226	1254	55	117	162
2	1016	11	7	11	90		1301	1165	1200	58	124	164
3	1016	7	11	13	92		1417	1111	1132	53	114	155
4	1016	11	7	15	93		1532	1062	1076	54	124	162
							0	0	0			
							0	0	0			
							0	0	0			
							0	0	0			

Avg: 55 120. 161.

## KEY-OFF SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--	--Tmp @ End---	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec Rst#
1	376	91 123 110	91 205 154	910	SN		4
2	368	90	91	905	SN		2
3	550	92	92	920	SN		3
4	549	93	92	925	SN		3
				0			
				0			
				0			

## KEY-OFF SOAK ACCELERATIONS

Run#	0-30	0-50	0-60	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	57 4	132 10	204 27	H	1230	1201	1229
2	60 9	118 -1	160 0		1310	1161	1193
3	55 0	115 -4	184 14	H	1429	1106	1127
4	60 9	122 2	218 36	H	1500	1075	1093
	0 0	0 0	0 0		0 0	0 0	
	0 0	0 0	0 0		0 0	0 0	
	0 0	0 0	0 0		0 0	0 0	

## IDLE SOAK CONDITIONS

Run#	Smp#	-Tmp @ Start--	--Tmp @ End---	Avg	Sky	Wind	Starting
		Air TcA TcB	Air TcA TcB	AirT			sec Rst#
1	383	90 135 110	90 144 900	900	SN		
2	382	91	91	910	SN		
3	514	93	93	930	SN		
4	547	92	92	920	SN		
				0			
				0			
				0			

## IDLE SOAK ACCELERATIONS

Run#	0-30	0-50	0-60	Surg	RVP	T20	T20A
	Time %Inc	Time %Inc	Time %Inc				
1	56 2	119 -1	163 1		1198	1218	1253
2	60 9	122 2	172 7	M	1270	1181	1209
3	59 7	124 4	239 49	H	1384	1126	1140
4	62 13	130 9	368 129	H	1415	1112	1133
	0 0	0 0	0 0		0 0	0 0	
	0 0	0 0	0 0		0 0	0 0	
	0 0	0 0	0 0		0 0	0 0	

NOTES: Runs included in base acceleration time averages; All  
RVP is psix100; T20V/L & Avg Air Temp are deg Fx10;  
Acceleration times are sec.x10

1982 CRC HOT DRIVEABILITY SUMMARY  
(Cooperative Laboratory Data)

Car#	Ø1, Drvr# 10	----Driving Demerits----					TWD	Fuel	RVP	AirT	T2Ø	%158
Run#	Idle Demerits-	Hes	Stmb	Surg	Bkfr	Stll	#	Avg	Avg	Avg	Avg	
	Ruff	Still	ReSt									
1	24	8					775	20	1384	936	1121	44.1
2	10						232	9	1255	900	1188	28.2
3	12						394	9	1237	906	1198	27.9
4	1						757	1	783	820	1471	20.2

Car#	Ø2, Drvr# 04	----Driving Demerits----					TWD	Fuel	RVP	AirT	T2Ø	%158
Run#	Idle Demerits-	Hes	Stmb	Surg	Bkfr	Stll	#	Avg	Avg	Avg	Avg	
	Ruff	Still	ReSt									
1	39						99	20	1404	926	1111	44.9
2	114						126	17	1633	876	1024	34.2

Car#	Ø3, Drvr# 10	----Driving Demerits----					TWD	Fuel	RVP	AirT	T2Ø	%158
Run#	Idle Demerits-	Hes	Stmb	Surg	Bkfr	Stll	#	Avg	Avg	Avg	Avg	
	Ruff	Still	ReSt									
1	74						164	20	1209	994	1215	37.2
2	74						86	17	1193	1042	1221	27.1

Car#	Ø4, Drvr# 17	----Driving Demerits----					TWD	Fuel	RVP	AirT	T2Ø	%158
Run#	Idle Demerits-	Hes	Stmb	Surg	Bkfr	Stll	#	Avg	Avg	Avg	Avg	
	Ruff	Still	ReSt									
1	39						891	20	1361	904	1133	43.2
2	38						866	11	1248	928	1192	28.1
3	36						42	1	988	906	1338	23.7
4	72	8					942	17	1301	938	1165	28.9

Car#	Ø5, Drvr# 04	----Driving Demerits----					TWD	Fuel	RVP	AirT	T2Ø	%158
Run#	Idle Demerits-	Hes	Stmb	Surg	Bkfr	Stll	#	Avg	Avg	Avg	Avg	
	Ruff	Still	ReSt									
1	66						850	20	1378	898	1124	43.9
2	68						230	5	1007	904	1326	24.0

Car#	Ø6, Drvr# 04	----Driving Demerits----					TWD	Fuel	RVP	AirT	T2Ø	%158
Run#	Idle Demerits-	Hes	Stmb	Surg	Bkfr	Stll	#	Avg	Avg	Avg	Avg	
	Ruff	Still	ReSt									
1	3						9	20	1348	960	1139	42.7
2	20						110	17	1298	1000	1167	28.9
3	18						84	14	1234	1050	1199	27.8
4	21						105	1	917	1066	1382	22.5

Car#	Ø7, Drvr# 10	----Driving Demerits----					TWD	Fuel	RVP	AirT	T2Ø	%158
Run#	Idle Demerits-	Hes	Stmb	Surg	Bkfr	Stll	#	Avg	Avg	Avg	Avg	
	Ruff	Still	ReSt									
1	2	16					22	20	1282	1054	1174	40.1
2	2	32					40	17	1319	1066	1157	29.2
3		8					8	14	1336	930	1149	29.5

Car#	Ø8, Drvr# 10	----Driving Demerits----					TWD	Fuel	RVP	AirT	T2Ø	%158
Run#	Idle Demerits-	Hes	Stmb	Surg	Bkfr	Stll	#	Avg	Avg	Avg	Avg	
	Ruff	Still	ReSt									
1							0	20	1282	982	1174	40.1
2		1					1	17	1341	960	1146	29.6

NOTE: RVP is psi x 100; Avg air temperature & T2ØV/L are deg F x 10

1982 CRC HOT DRIVEABILITY SUMMARY  
(Cooperative Laboratory Data)

Car#	Drvr#	Run#	Idle Demerits-	----Driving Demerits----	TWD	Fuel	RVP	AirT	T20	%158
			Ruff Still ReSt	Hes Stmb Surg Bkfr Still	---	#	Avg	Avg	Avg	Avg
Car# 09, Drvr# 04										
		1	56 16 2	6 234 32 96	376	20	1259	982	1187	39.2
		2	64	54 186 4	254	13	1302	926	1165	28.9
		3	61	48 204 4	269	9	1209	930	1212	27.4
		4	52	132	184	9	1225	906	1204	27.7
		5	72	174	246	1	792	820	1465	20.3
Car# 09, Drvr# 10		6	81		81	20	1435	772	1096	46.2
Car# 10, Drvr# 10										
		1	58	48 792 8	874	20	1357	912	1135	43.1
		2	61	666	727	9	1200	900	1217	27.3
		3	34	6 72 4	116	1	768	810	1482	19.9
		4	34	96 708 4	766	20	1421	824	1103	45.6
Car# 10, Drvr# 04		5	77	840 816 248	917	20	1426	860	1100	45.8
Car# 10, Drvr# 17		6	26	24 492 72	530	20	1399	858	1114	44.7
Car# 11, Drvr# 04										
		1	36	24	60	20	1456	902	1086	47.0
		2	48		48	5	980	936	1343	23.6
Car# 12, Drvr# 10										
		1	31	714 702 332	793	20	1148	998	1250	34.8
		2	2	540 396 8	660	5	952	1032	1360	23.1
		3	19	138 18 6	175	1	749	1064	1495	19.6
		4	22	492 186 12	578	9	1176	924	1230	26.9
		5	77	42 684 28 6	761	20	1375	858	1126	43.8
Car# 12, Drvr# 04		6	104	756 594 268	884	20	1445	830	1091	46.5
Car# 12, Drvr# 17		7	52	732 498 296	812	20	1400	884	1113	44.8
Car# 13, Drvr# 04										
		1		6	6	17	1173	932	1231	26.8
		2		24	24	20	1134	984	1258	34.3

NOTE: Avg RVP is psi x 100; Avg air temperature & T20V/L are deg F x 10

1982 CRC HOT DRIVEABILITY SUMMARY  
 (Cooperative Laboratory Data)

Car# 14, Drvr# 04				----Driving Demerits----							TWD	Fuel	RVP	AirT	T20	%158
Run#	Idle	Demerits-		Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg		
----	Ruff	Stll	ReSt													
1	36			582	744	276			804	10	1108	1026	1267	25.7		
2	36			240	294	92			360	6	976	1062	1345	23.5		
3	36			24	66	12			112	9	1216	902	1209	27.5		
4	36				12				48	1	779	812	1474	20.1		
5	39			306	282	84			393	20	1444	804	1091	46.5		
6	57			384	390	64			567	20	1394	888	1116	44.5		
Car# 15, Drvr# 04				----Driving Demerits----							TWD	Fuel	RVP	AirT	T20	%158
Run#	Idle	Demerits-		Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg		
----	Ruff	Stll	ReSt													
1	38	24	4	24	36	44		64	214	20	1310	912	1159	41.2		
2	37	24	4	6	6	20		32	101	17	1299	900	1166	28.9		
Car# 16, Drvr# 17				----Driving Demerits----							TWD	Fuel	RVP	AirT	T20	%158
Run#	Idle	Demerits-		Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg		
----	Ruff	Stll	ReSt													
1	49			204	342	228			445	20	1430	920	1098	46.0		
2	34				6	4			44	5	996	918	1333	23.8		
Car# 17, Drvr# 10				----Driving Demerits----							TWD	Fuel	RVP	AirT	T20	%158
Run#	Idle	Demerits-		Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg		
----	Ruff	Stll	ReSt													
1	94				30				124	20	1367	928	1130	43.5		
2	144	24	27		12				179	17	1579	878	1044	33.4		
Car# 17, Drvr# 17				----Driving Demerits----							TWD	Fuel	RVP	AirT	T20	%158
Run#	Idle	Demerits-		Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg		
----	Ruff	Stll	ReSt													
3	91			48	54				151	20	1401	936	1113	44.8		
Car# 18, Drvr# 04				----Driving Demerits----							TWD	Fuel	RVP	AirT	T20	%158
Run#	Idle	Demerits-		Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg		
----	Ruff	Stll	ReSt													
1	51				6	4			61	20	1281	842	1175	40.1		
2	37				6				43	17	1573	864	1046	33.3		
Car# 19, Drvr# 17				----Driving Demerits----							TWD	Fuel	RVP	AirT	T20	%158
Run#	Idle	Demerits-		Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg		
----	Ruff	Stll	ReSt													
1	36			30		8			70	20	1409	898	1109	45.1		
2	36			18		8			62	5	1041	926	1306	24.6		

NOTE: Avg RVP is psi x 100; Avg air temperature &amp; T20V/L are deg F x 10

1982 CRC (1975) HOT START & DRIVEAWAY SUMMARY  
 (Cooperative Laboratory Data)

Car#	01, Drvr:	10	----Driving Demerits----					TWD	Fuel	RVP	AirT	T20	%158		
Run#	Idle Demerits-	StTm	Ruff	Stll	Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg
1	23				6	234	4			263	1	788	893	1468	20.3

Car#	02, Drvr:	04	----Driving Demerits----					TWD	Fuel	RVP	AirT	T20	%158		
Run#	Idle Demerits-	StTm	Ruff	Stll	Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg
1	82					48				130	20	1407	888	1110	38.7
2	86					12			32	124	17	1514	923	1070	32.4

Car#	03, Drvr:	10	----Driving Demerits----					TWD	Fuel	RVP	AirT	T20	%158		
Run#	Idle Demerits-	StTm	Ruff	Stll	Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg
1	21					18		8		47	20	1359	930	1134	29.9
2	49					42	6	12		97	17	1420	910	1110	30.9

Car#	05, Drvr:	04	----Driving Demerits----					TWD	Fuel	RVP	AirT	T20	%158		
Run#	Idle Demerits-	StTm	Ruff	Stll	Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg
1	2 86					12	132	60	96	324	20	1426	923	1100	39.3
2	80						42	8	32	156	5	972	938	1348	23.4

Car#	07, Drvr:	10	----Driving Demerits----					TWD	Fuel	RVP	AirT	T20	%158		
Run#	Idle Demerits-	StTm	Ruff	Stll	Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg
1	33						78	28	64	187	20	1388	938	1119	38.0
2	33					18	156	48		219	14	1429	890	1106	31.0

Car#	07, Drvr:	04	----Driving Demerits----					TWD	Fuel	RVP	AirT	T20	%158		
Run#	Idle Demerits-	StTm	Ruff	Stll	Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg
3	46					6	12	20	64	136	1	874	938	1410	21.8

Car#	09, Drvr:	04	----Driving Demerits----					TWD	Fuel	RVP	AirT	T20	%158		
Run#	Idle Demerits-	StTm	Ruff	Stll	Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg
1	2 68					6	36	16	224	326	20	1394	900	1115	38.2
2	1 76						12	8	160	248	9	1229	928	1202	27.7

Car#	10, Drvr:	10	----Driving Demerits----					TWD	Fuel	RVP	AirT	T20	%158		
Run#	Idle Demerits-	StTm	Ruff	Stll	Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg
1	-23							3		239	20	1437	895	1095	39.7

Car#	12, Drvr:	10	----Driving Demerits----					TWD	Fuel	RVP	AirT	T20	%158		
Run#	Idle Demerits-	StTm	Ruff	Stll	Hes	Stmb	Surg	Bkfr	Stll	---	#	Avg	Avg	Avg	Avg
1	19					96	150	36	64	259	20	1461	870	1083	40.5
2	57					18	36	8		115	5	1036	880	1309	24.5

NOTE: Avg RVP is psi x 100; Avg air temperature &amp; T20V/L are deg F x 10

1982 CRC (1975) HOT START & DRIVEAWAY SUMMARY  
(Cooperative Laboratory Data)

Car# 14, Drvr: 04  
 Run# Idle Demerits- ----Driving Demerits---- TWD Fuel RVP AirT T20 %158  
 ---- StTm Ruff Still Hes Stmb Surg Bkfr Still --- # Avg Avg Avg Avg  
 1 7 56 108 84 32 192 374 20 1376 933 1125 37.6  
 2 31 24 55 6 1072 908 1288 25.1

Car# 16, Drvr: 17  
 Run# Idle Demerits- ----Driving Demerits---- TWD Fuel RVP AirT T20 %158  
 ---- StTm Ruff Still Hes Stmb Surg Bkfr Still --- # Avg Avg Avg Avg  
 1 2 40 96 72 48 186 20 1437 923 1095 39.7

Car# 18, Drvr: 07  
 Run# Idle Demerits- ----Driving Demerits---- TWD Fuel RVP AirT T20 %158  
 ---- StTm Ruff Still Hes Stmb Surg Bkfr Still --- # Avg Avg Avg Avg  
 1 9 17 16 33 20 1290 888 1170 34.6  
 Car# 18, Drvr: 17  
 2 5 15 16 6 6 4 64 107 17 1519 925 1068 32.4

NOTE: Avg RVP is psi x 100; Avg air temperature & T20V/L are deg F x 10

**END**

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**7-85**

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