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Technical Report

Vehicle Test Results From a Small Twin-Roll Electric Dynamometer

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NOTICE

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1. Test Program Objectives

The investigation of the electric chassis dynamometer reported herein had two objectives. The first objective was to determine the level of equivalency between emissions and fuel economy test results obtained on a hydrokinetic power absorbtion unit dynamometer and on the D.C. motor electric dynamometer and to define any differences between them. The second objective was to quantify, if possible, performance advantages of the electric dynamometer. Specifically, it was to investigate the changes in the measured emissions and fuel economy resulting from changes in the shape of the dynamometer road load force versus velocity curve.*

2. Background

The small twin-roll hydrokinetic dynamometer is extensively used by EPA and the automotive industry to simulate the road load experience of a vehicle during exhaust emission and fuel economy measurements. This machine is described as a small twin-roll hydrokinetic dynamometer because a pair of small rollers (8.65 inches diameter) is used to transmit power from the drive wheels of the test vehicle to the two components of the dynamometer which simulate the total on-road power demands placed on the engine. These two components are the hydrokinetic power absorber and the flywheels. The power absorber simulates the road load forces acting on the vehicle, primarily aerodynamic drag. Flywheels, connected to the dynamometer rollers, simulate the weight of the vehicle as this weight resists changes in vehicle speed. On road power losses at the tires are largely simulated on the dynamometer by the drive axle tire losses which occur at the contact surfaces between the tires and the dynamometer rolls and by windage losses of the drive wheels.

Energy imparted to the dynamometer rolls by the vehicle is converted into water born kinetic energy by the rotor of the power absorber and dissipated as the water is decelerated in the stator of the power absorber. The water in the power absorber is maintained at a constant temperature by means of heat exchanger. The amount of power dissipated is controlled by the volume of water in the power absorber unit. Since kinetic energy is proportional to velocity to the second power and vehicle aerodynamic drag is closely proportional to

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* The D.C. motor electric dynamoteter used in this study also allowed adjustment of the spacing between the dynamometer rolls. Data has been collected at different roll spacings on a very small vehicle which uses especially small wheels and tires. These data are not reported herein, but will be covered in a separate report.

velocity to the second power, the hydrokinetic dynamometer can closely approximate road loads for a generic vehicle. The volume of water in the power absorber cannot, however, be varied rapidly. The shape of the road load force versus velocity curve of the power absorber cannot, therefore, be either rapidly or accurately adjusted to tailor the curve to a specific vehicle. While some minor dynamic control can be performed to improve the similarity between two or more dynamometers, the basic power absorption setting point is the load at 50 mph and power absorbtion at other speeds is non-adjustable.

The small twin-roll hydrokinetic dynamometer was selected for exhaust emission testing because the dynamometer provides a reasonable simulation of the road experience of a vehicle and because it was available to EPA and the automotive industry in the quantities required and at a relatively low cost. The present installed cost of a hydrokinetic dynamometer with mechanical flywheels is on the order of $70,000 to $80,000.

Other types of automotive dynamometers have been available for a long time. The most prominent alternative chassis dynamometer has been the large single-roll machine. As the name implies, this machine uses a large single roll, typically about 67.23 inches in diameter, which transmits power from the vehicle to the power absorber. The power absorber of this machine is typically a large DC motor connected to the main electrical system through a motor-generator set. The major advantage of this system is the wide control latitude possible with the electric power absorption system. For example, the power absorption may be adjusted to match the specific road load of the test vehicle at all speeds, or other parameters such as the effect of wind and grade may be accurately simulated. Typically, this machine simulates the vehicle inertia by electrically varying the load imposed on the vehicle, although flywheels are used on some machines. Also, the large roll minimizes the energy losses at the tire to dynamometer interface and allows long-term continuous operation of a vehicle on the dynamometer, even at high speeds.

The large single-roll dynamometer is generally used as a research machine in the automotive and petroleum industries. They are not often used for emissions or fuel economy testing primarily because of their high cost, typically greater than $250,000 installed.

In the past decade a third type of dynamometer has become available, the small twin-roll electric machine. Except for the power absorber, this machine is structurally very similar to the standard hydrokinetic dynamometer; a pair of small rollers is used to transmit power to the power absorber and to mechanical flywheels which simulate the inertia of the vehicle. The power absorption system for this type of machine

is typically an industrial DC motor which can be operated either as a motor or as a generator by the system electronics. The recent development of solid state electronic components capable of directly switching the currents necessary to control a DC motor or generator of the required size has made this machine feasible.

The small twin-roll electric dynamometer has the same controller flexibility as the large-roll electric machine. It is intermediate in cost between the large-roll electric and the hydrokinetic dynamometer, typically about $100,000 to $120,000. The performance/cost ratio of the small-roll electric machine makes it an attractive choice as a more sophisticated alternative to the hydrokinetic dynamometer. In addition these machines typically have features, such as variable roll spacing and more finely-adjustable inertia weight simulation, which were not available on the preceding generation of dynamometers. Variable roll spacing could potentially facilitate the testing of vehicles with smaller than normal wheels and tires.

In the spring of 1983 Clayton Manufacturing Company offered to lend a small twin-roll electric dynamometer, their model DC-80, to EPA for a cooperative test program. This offer was accepted and the subsequent program, described in this report, investigated exhaust emission and fuel economy test results obtained from vehicles tested on this electric dynamometer.

3. Experimental Design

As was stated previously, the program had two separate goals: to compare the electric and the hydrokinetic dynamometers and to investigate the potential effect of the enhanced adjustability of the electric dynamometer. This section of the report discusses the experimental design and the subsequent test conditions.

3.1 Comparison of the Electric and Hydrokinetic Dynamometers

This segment of the program was a simple comparison of the test results from the two dynamometers operating under standard conditions. Therefore, the experimental design was conceptually straightforward, simply conduct multiple tests on each machine and compare the results. The only significant questions were the choice of test vehicles, the number of tests to be conducted, and the specific test conditions.

3.1.1 Test Vehicles

Variations in the dynamometer behavior might be different in diverse performance ranges, or they might affect different types of vehicles in various ways. Therefore, two diverse test

vehicles which together represent the majority of vehicles presently either in use or sold in the U.S. were selected for testing. A 1984 Ford Escort, was chosen to be representative of the many smaller front-engine front-wheel-drive vehicles of the current in-use fleet. This vehicle is described in Appendix A. A 1979 Oldsmobile Cutlass Supreme was selected as representative of the traditional larger U.S. manufactured vehicles with front engine and rear wheel drive. This test vehicle is described in Appendix B. These specific vehicles were selected because extensive road and dynamometer data were available from similar vehicles from a previous EPA test program.[1]

3.1.2. Test Conditions

The comparison segment of this program was an examination of the differences and similarities between the test results obtained on the two dynamometers when used in the typical EPA certification process. Specifically all tests for this phase were conducted with the dynamometers adjusted to provide the same total vehicle load at 50 mph. The electric dynamometer was set to provide a power absorber unit (PAU) loading proportional to the velocity squared as does the hydrokinetic dynamometer. The usual EPA calibration tests were made on each machine, but the load curves of the two machines were not specifically matched for the comparison segment.

3.1.3 Number of Tests

The number of tests to be conducted on each vehicle on each dynamometer is an important consideration in establishing the test program. Obviously, there is always the desire to reduce the number of tests to minimize program costs while there is the need to maintain acceptable overall program precision.

The intended analysis for this segment of the program was the comparison of the mean of the results from the hydrokinetic dynamometer to the mean of the results from the electric machine. It was decided that emphasis would be placed on fuel economy data, since improved fuel economy measurement accuracy would be the most likely reason to adopt electric dynamometers. It was further decided that the program should have a minimum expected precision of 0.5 mpg. That is, it would be unacceptable to have an experimental difference of 0.5 mpg and not be able to conclude that this difference was statistically significant. A test precision of 0.2 mpg was considered optimal.

The standard statistical test for determining the significance of the difference between the means of two samples is the paired statistical t-test analysis.[2] In starting the dynamometer comparison program, it was assumed there was no

reason to expect different sample sizes for tests performed on the two dynamometers, and it was also assumed there was no reason to expect different sample standard deviations. The minimum acceptable program size was viewed as guaranteeing significance of results when the difference between the means of the 2 groups would be equal to 0.5 mpg. For test sizes which were practical, i.e., tens of tests or less, this required a t-test value of about 2.1 for a 97.5 percent confidence level. The previously referenced earlier test program[1] indicated that a standard deviation of about 0.35 mpg would be achievable. This value resulted in a calculated number of required test observations of 4.3. It was decided, therefore, that a minimum number of 5 tests per vehicle, per dynamometer would be required to guarantee the desired program precision.

The value for the standard deviation used above was somewhat pessimistic, however, since it was calculated from tests conducted in a time period spanning many months. For tests conducted over a shorter period of time i.e., one or two months, a standard deviation of 0.3 mpg was considered to be more realistic. Using this value for the standard deviation, resulted in the projection that differences between the means of the 2 groups should be statistically detectable at the 0.28 mpg level. It was concluded, therefore, that with 5 tests, the program should guarantee a resolution of 0.5 mpg, and probably would resolve to 0.3 mpg. It was also concluded that increasing the number of tests to 6 would increase the probable resolution to only about 0.25 mpg. Expanding the test to ten tests per vehicle would be required to realize a resolution of 0.2 mpg.

As a result of the preceeding analysis, it was decided to conduct 6 tests at each point. This would give a probable precision of approximately 0.25 mpg. Even if one of the test results was subsequently considered invalid and rejected, the remaining 5 tests should, under worst conditions, guarantee meeting the desired precision for the program.

3.2. The Effect of Changes in the Road Load Force Versus Velocity Curve of the Electric Dynamometer

The main performance advantage of the electric dynamometer is its ability to change the shape of the road load force versus velocity curve. This capability of the electronic dynamometer provides the potential for a better simulation of the road experience of those vehicles for which the fixed load versus speed curve of the hydrokinetic dynamometer does not adequately match the road load curve. To directly measure this potential performance benefit would necessitate measurement of the specific road load characteristics of the test vehicles, matching these characteristics with the electric dynamometer and then conducting multiple tests of the vehicles on both

dynamometers. This would be a very test-intensive program if any significant number of vehicles was involved. It was decided, therefore, to approach the problem by choosing a range of dynamometer adjustments for the electric dynamometer which might reasonably be expected to occur from road tests and to test representative vehicles under these conditions. The results could then be analyzed to ascertain if the observed differences were significant. If the resulting test results were significantly different and sensitivity coefficients were developed for the dynamometer parameters which determine the road load-versus-velocity curve, then the effect of exercising the performance advantage of the electric dynamometer could be theoretically estimated for any vehicle for which road and dynamometer coast-down data were known.

3.2.1. Test Conditions

In the electric dynamometer under evaluation, the force applied to the vehicle's wheels by the power absorbing unit of the dynamometer is expressed by the following equation:

$$F = A+BV+CV^K,$$

in which:

F is the road load force exerted by the dynamometer rolls on the driving wheels of the vehicle (the opposite is also true; i.e., the force exerted by the wheels of the vehicle on the surface of the roll of the dynamometer).

V is the velocity at the surface of the roll and equals the simulated speed of the test vehicle.

A is the force coefficient independent of velocity.

B is the force coefficient dependent on velocity (usually assumed equal to zero).

C is the windage force coefficient of the K power of velocity.

K is the exponent of the velocity for the windage term (adjustable from 1.0 to 3.0, but usually 2.0).

The forces exerted by the dynamometer roll on the vehicle at the tire to roll interface and the reaction forces are considered equal under all conditions. The parameters A, B, and C in the equation characterize components of these forces. In the electric dynamometer, parameters A, B and C are controlled by the dynamometer power absorber. In the hydrokinetic dynamometer, only parameter C can be varied, leaving A and B fixed by the vehicle's tire losses and the residual friction of the vehicle-dynamometer system. The basic

performance advantage of the electric dynamometer is, therefore, its ability to vary parameters A, B and C independently.

The basic information desired in this portion of the study was the sensitivity of the exhaust emissions and fuel economy data to variations in parameters A and C for the electric dynamometer in which parameter B was assumed to be insignificant. This evaluation was accomplished by selecting a standard reference condition and then varying parameters A and C about this reference condition. The standard reference condition for the electric dynamometer was selected where A=0 and C was equal to the value which resulted in a loading at 50 mph equal to that imposed by the hydrokinetic dynamometer.

The alternative conditions were selected as follows. In the first alternative, the constant term (parameter A) was set to yield 1.0 hp while parameter C was reduced to yield a decrease of 1.0 hp at 50 mph thereby, leaving the net road load at 50 miles per hour unchanged from the standard condition. In the second alternative, the velocity-squared coefficient (parameter C) was increased to yield a net increase in road load of 1.0 hp at 50 mph with parameter A set equal to zero (the same as in the initial or standard condition). For the third and final alternative condition, parameter A was set to yield 1.0 hp while maintaining parameter C at its standard value so that the total road load at 50 mph was increased by 1.0 hp as was the case in the second alternative condition. The test conditions are all shown generically in tabular form in Table 1 and in graphical form in Figure 1.

Since all testing would be performed on each vehicle without changing the flywheel (inertia) settings of the dynamometer the effects of the changes in the road load curves relative to the standard curve would be as follows. For the first alternative, the effect simulated would be one of emphasizing power requirements at low speeds while holding the 50 mph power requirement constant. Effectively, these condition would simulate a vehicle with increased frictional loadings and reduced aerodynamic loadings. For the second alternative the test conditions would simulate a vehicle where high speed powerrequirements were higher than standard; i.e., where aerodynamic drag was higher than normal. For the third and last alternative, the test conditions would simulated a vehicle with average aerodynamic drag forces but with increased frictional loads.

3.2.2. Test Vehicles and Number of Tests

Because of their general representativeness of the in-use vehicle fleet, the same vehicles, i.e. the Oldsmobile and the Ford, were used for the sensitivity study segment of the program as were used for the dynamometer comparisons. A sample

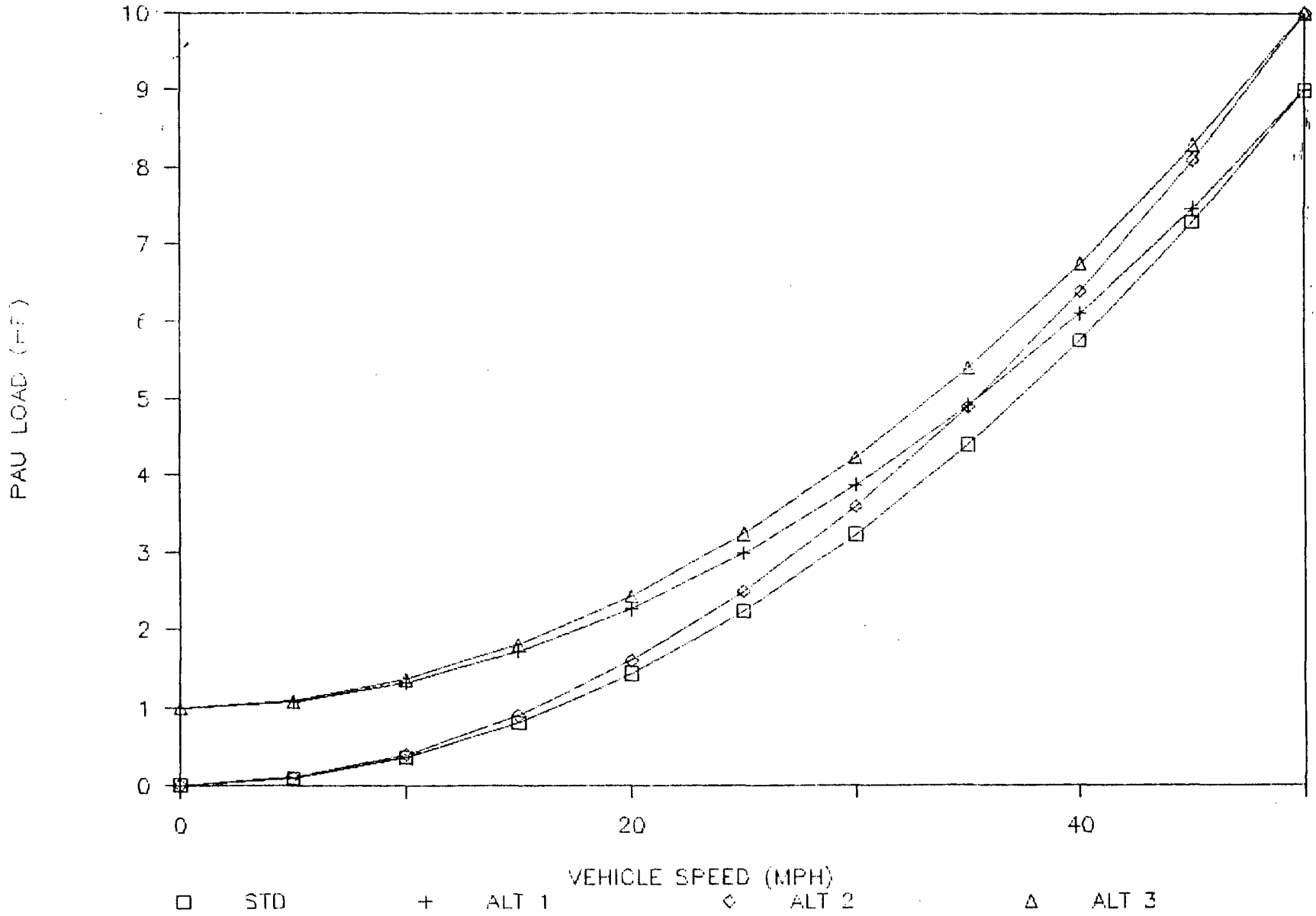
Table 1

Electric Dynamometer Loadings Used In Evaluating The Effects of Power Absorber Unit Adjustability on Test Results

Test Configuration	Force Components			Total at 50 MPH
	A	BV	CV^2	F_{50}
Standard	0	0	Std. @ 50 MPH	Std.
Alternative 1	1.0	0	(Std. @ 50 MPH)-1	Std.
Alternative 2	0	0	(Std. @ 50 MPH)+1	Std. + 1
Alternative 3	1.0	0	Std. @ 50 MPH	Std. + 1

ELECTRIC DYNO PAU LOAD VS VEHICLE SPEED

FIGURE 1



size of six tests at each condition was chosen for the same reasons presented previously in the dynamometer comparison section. Choosing the same vehicles and selecting the standard electric dynamometer condition as the reference in the sensitivity analysis allowed the test data obtained at this condition to be used for both segments of the program. This, of course, reduced the total program cost.

4. Equpiment and Data Collection

4.1 Test Facilities

The dynamometers used for this program were located in test cells in the Evaluation and Development area of the MVEL. The hydrokinetic dynamometer was a standard Clayton ECE-50 similar to the other hydrokinetic dynamometers used by EPA for certification and evaluation testing. This dynamometer was located in room 510. The electric dynamometer, located in room 514, was a Clayton DC-80 equipped with rolls and flywheel assemblies meeting the same specifications as those used on the hydrokinetic unit.

The dynamometers were in approximately the same position in each room. Each room had similar temperature and air flow characteristics. Each room was equipped with its own Constant Volume Sampling System (CVS). The units were, however, similar in operating characteristics. The same exhaust gas analyzer system was used for all the tests. The calibration of all auxiliary test equipment was checked prior to starting the test program, and during the program. These precautions insured that the conditions of the two test cells were as similar as possible so that any observed differences in test results should be attributable to the dynamometers.

4.2. Data Collection

With the exception of three minor variations to conserve test time, all tests were conducted in the same manner as specified for the official EPA certification programs. The exceptions were: 1) to designate the test of the preceding day as the preparatory cycle for the test of the subsequent day (however, if a vehicle were not subjected to testing on a preceding day, it would receive the standard preparation per certification procedures on the day prior to testing for this program); 2) to eliminate the need for a fuel tank heat build, the vehicle was refueled with non-chilled fuel prior to each test; and 3) evaporative emission tests were not performed in this program since minor variations in the dynamometer would not affect the results of there measurements.

The data for comparison of the two dynamometers using standard settings and the data for evaluation of the effects of changes in the road load versus speed curve were collected as a

single data collection element. The order in which the tests were performed was randomized so that any systematic shifts in either the vehicles or the dynamometers would not have a significant influence on the results. However, care was taken to ensure that approximately the same number of test results were accumulated under each test configuration so that if any vehicle or system parameter changed with time it would have approximately the same effect on each test configuration and should have a minimal effect on the final comparisons.

From six to eight tests were conducted for each test configuration. The test data were reviewed, including any operator comments, to ensure validity. Whenever conditions occurred which might indicate a questionable test under EPA certification guidelines, the test results were deleted. If deletions resulted in less than five tests under any configuration, additional tests were conducted to ensure that at least five valid results were obtained in each configuration. The detailed test data are shown in Appendix A for the Ford Escort and in Appendix B for the Oldsmobile Cutlass. The EPA test number is given for each test so that the detailed raw data can be retrieved from the EPA data base, if desired.

5. Data Analysis

The data analysis for the two segments of the program were slightly different and were, therefore, treated separately.

5.1. Dynamometer Comparison

All tests of this phase of the program were conducted with the dynamometers adjusted to provide the same total load at 50 mph. The question to be answered in this segment of the evaluation was the equivalency of the results from the two dynamometers and to identify differences among the results. For this comparison the means and standard deviations of the exhaust emissions and fuel economy measurements were computed for each vehicle and each dynamometer. These results are presented in Appendices A and B and are summarized here in Table 2 for the Ford and in Table 3 for the Oldsmobile.

A paired t-test analysis was performed on each hydrokinetic-versus-electric dynamometer pair of tests. The results of the t-test analyses are shown in Table 4. The t-test values thus derived were then inspected for statistically significant equality or difference in the results at the 0.975 confidence level. This was done by comparing the calculated paired statistical t-test values to reference values which distinguish between equality or difference at the selected confidence level for the number of tests involved (degrees of freedom). From Table 4 it can be seen that, for the Ford Escort, both the emissions and fuel economy results

Table 2

Electric Dynamometer Standard Settings vs. Hydrokinetic Dynamometer
Test Result Means and Standard Deviations

Test Vehicle: Ford Escort

Dynamometer	Emissions (g/mile) HC $\bar{X}$	HC s	CO $\bar{X}$	CO s	NOx $\bar{X}$	NOx s	Fuel Economy (mpg) $\bar{X}$	Fuel Economy (mpg) s
	Composite FTP							
Hydrokinetic	0.308	0.015	3.410	0.176	0.693	0.023	26.29	0.18
Electric	0.296	0.015	3.260	0.349	0.664	0.039	26.38	0.29
	Bag 1							
Hydrokinetic	0.675	0.031	11.306	0.916	1.078	0.058	23.78	0.25
Electric	0.680	0.048	11.218	1.900	1.054	0.038	23.94	0.32
	Bag 2							
Hydrokinetic	0.140	0.013	0.255	0.076	0.630	0.024	25.93	0.36
Electric	0.140	0.010	0.304	0.077	0.588	0.051	26.20	0.49
	Bag 3							
Hydrokinetic	0.343	0.038	3.443	0.426	0.520	0.045	29.25	0.30
Electric	0.298	0.040	2.820	0.630	0.522	0.039	29.10	0.24
	HFET							
Hydrokinetic	0.063	0.005	0.183	0.138	0.288	0.046	37.29	0.28
Electric	0.064	0.009	0.230	0.062	0.266	0.021	37.33	0.43

Table 3

Electric Dynamometer Standard Settings vs. Hydrokinetic Dynamometer
Test Results Means and Standard Deviations

Test Vehicle: Oldsmobile Cutlass

Dynamometer	Emissions (g/mile) HC $\bar{X}$	HC s	CO $\bar{X}$	CO s	NOx $\bar{X}$	NOx s	Fuel Economy (mpg) $\bar{X}$	Fuel Economy (mpg) s
	Composite FTP							
Hydrokinetic	0.760	0.057	6.840	0.799	4.426	0.797	19.99	0.16
Electric	0.698	0.033	5.950	0.219	4.787	1.104	20.19	0.18
	Bag 1							
Hydrokinetic	2.257	0.187	27.560	2.016	3.783	0.738	17.49	0.20
Electric	2.112	0.110	25.803	0.700	4.750	1.146	17.72	0.13
	Bag 2							
Hydrokinetic	0.286	0.028	0.984	0.471	4.877	0.924	20.33	0.28
Electric	0.247	0.008	0.388	0.186	5.207	1.196	20.65	0.26
	Bag 3							
Hydrokinitic	0.536	0.100	2.340	0.838	4.057	0.615	21.63	0.16
Electric	0.482	0.098	1.517	0.257	4.402	0.943	21.52	0.26
	HFET							
Hydrokinetic	0.104	0.016	0.462	0.264	2.623	0.319	26.46	0.34
Electric	0.086	0.013	0.378	0.170	3.068	0.877	26.49	0.41

Table 4

Electric Dynamometer Standard Settings vs.
Hydrokinetic Dynamometer
T-Test Statistics of Test Means

Ford Escort

Test	Degrees of Freedom	t-Statistic HC	CO	NOx	MPG
FTP	9	1.365	0.928	1.545	-0.617
Bag 1	9	-0.208	0.100	0.798	-0.915
Bag 2	9	0.000	-1.062	1.806	-0.852
Bag 3	10	1.006	2.007	-0.069	0.972
HFET	9	-0.306	-0.695	0.910	-0.199

Oldsmobile Cutlass

Test	Degrees of Freedom	t-Statistic HC	CO	NOx	MPG
FTP	11	2.321	2.630	-0.683	-2.196
Bag 1	11	1.670	2.022	-0.888	-2.372
Bag 2	11	0.933	2.896	-0.561	-2.634
Bag 3	11	0.980	2.303	-0.793	0.941
HFET	10	2.119	0.650	-1.168	-0.138

NOTE: Underlined values denote statistical difference in the test results at the 0.975 confidence level; i.e. the absolute value is greater than 2.201 with 11 degrees of freedom, 2.228 with 10 degrees of freedom and 2.262 with 9 degrees of freedom.

obtained from the two dynamometers were statistically equivalent. It can also be seen from Table 4 that some of the test results were statistically different in the case of the Oldsmobile Cutlass. The test results were statistically different for the FTP HC and CO emissions, the Bag 2 and Bag 3 CO emissions and the Bags 1 and 2 fuel economy values.

Inspection of the emissions and fuel economy test data from the Oldsmobile Cutlass shown in Appendix B showed that there was a significant shift in the data with time. The shift occurred on both dynamometers. Since the data on the Ford Escort had been collected during the same time period, it was concluded that the shift in the Oldsmobile Cutlass data with time was not caused either by the dynamometers or by the sample collection and analytical equipment. It was concluded that the data shift was caused by a shift in the test vehicle. While the statistically determined differences in the test results obtained on the two dynamometers for the Oldsmobile Cutlass can not be assigned with absolute certainly to the shift which occurred in the test vehicle it appears probable that this is the cause of the differences. It appears, therefore, that emissions and fuel economy measurements made on an electric dynamometer using standard settings would be equivalent to those obtained from a hydrokinetic dynamometer.

In addition to the comparability of mean values, test-to-test variability differences between the two dynamometers are also important. Returning to Tables 2 and 3, some observations about variability as indicated by the standard deviations can be made. Table 2 indicates that for the Ford vehicle, the coefficient of variation, as measured by the standard deviation divided by the mean, was quite low for both the hydrokinetic and electric dynamometers. Most values were below ten percent, with several being less than one percent. For most parameters, the results obtained on the electric dynamometer tended to have somewhat greater variability, but at these low levels the difference have little significance. For the Oldsmobile (Table 3), it again appears that the variability is similar for the two dynamometers. Overall, the variability for both dynamometers is higher for the Oldsmobile than for the Ford, reflecting the apparant shift in vehicle performance with time noted above.

5.2 Sensitivity of Vehicle Test Results to Changes in Electric Dynamometer Loading

This segment of the program investigated the effect of varying the individual electric dynamometer PAU parameters. There were two considerations in this evaluation. First, is there a significant effect of relatively small changes in the PAU control coefficients? Second, if the effect is significant, could the effect be characterized in terms of changes in the control parameters for the dynamometer?

5.2.1.5 Significance of Differences from Standard Conditions

Parameters A and C of the road load force versus velocity equation were varied to achieve the changes in the road load horsepower shown previously in Table 1. The effects of these changes in parameters A and C on the total load imposed on the test vehicle by the dynamometer are shown graphically in Figures 2 and 3. The percentage increases in dynamometer load relative to vehicle speed, for each of the test vehicles, are shown in Figures 4 and 5. As can be seen from Figures 2 through 5, the effects on the dynamometer imposed loads are as follows:

- The first optional dynamometer settings (A = 1, and HP at 50 mph is unchanged) substantially increase the total dynamometer load at low vehicle speeds and reduces the increase in load to zero at 50 mph.

- The second optional dynamometer setting (A = 0 and hp at 50 mph is increased by 1 hp) has very little effect at low speeds but increases the 50 mph loading by approximately 8 and 17 percent for the Cutlass and the Escort respectively.

- The third optional dynamometer setting (A = 1 and hp at 50 mph is increased by 1 hp) increases the loading throughout the speed range with the largest increase being at low speeds.

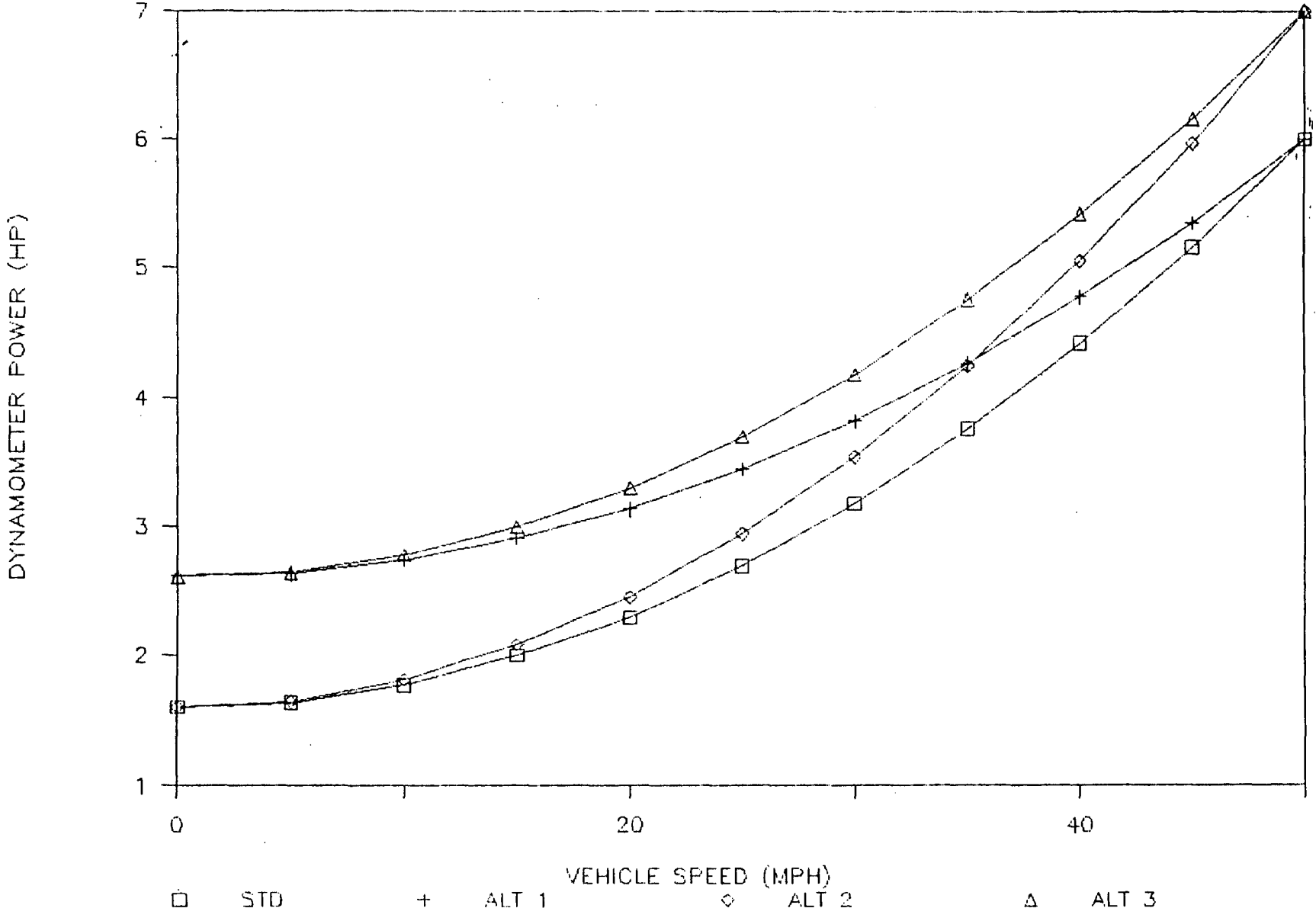
The means and standard deviations of the test results and the t-statistics were computed as in the comparison between the two types of dynamometers. The results are shown in Tables 5 through 12.

Inspection of Table 11 shows that for the Ford Escort, with loading increased primarily at low speeds (first option), the results are statistically different for NOx emissions in the FTP, in Bag 3 of the FTP and in the HFET. Further inspection of Table 11 shows that increased loading, primarily at high speeds (second option) results in statistically different HC emissions on the FTP, statistically different CO and NOx emissions on the HFET, and statistically different fuel economy values in Bag 1 of the FTP and in the HFET. Under the third loading option (loading is increased through the speed range), (see Table 11), HC emissions are statistically different on the FTP and in Bag 1 of the FTP, CO emissions are statistically different in the HFET and all NOx values are statistically different.

Review of the mean test values for the Ford Escort shown in Tables 5, 6 and 7 indicates that in all cases where the test results were statistically different, the effects of the

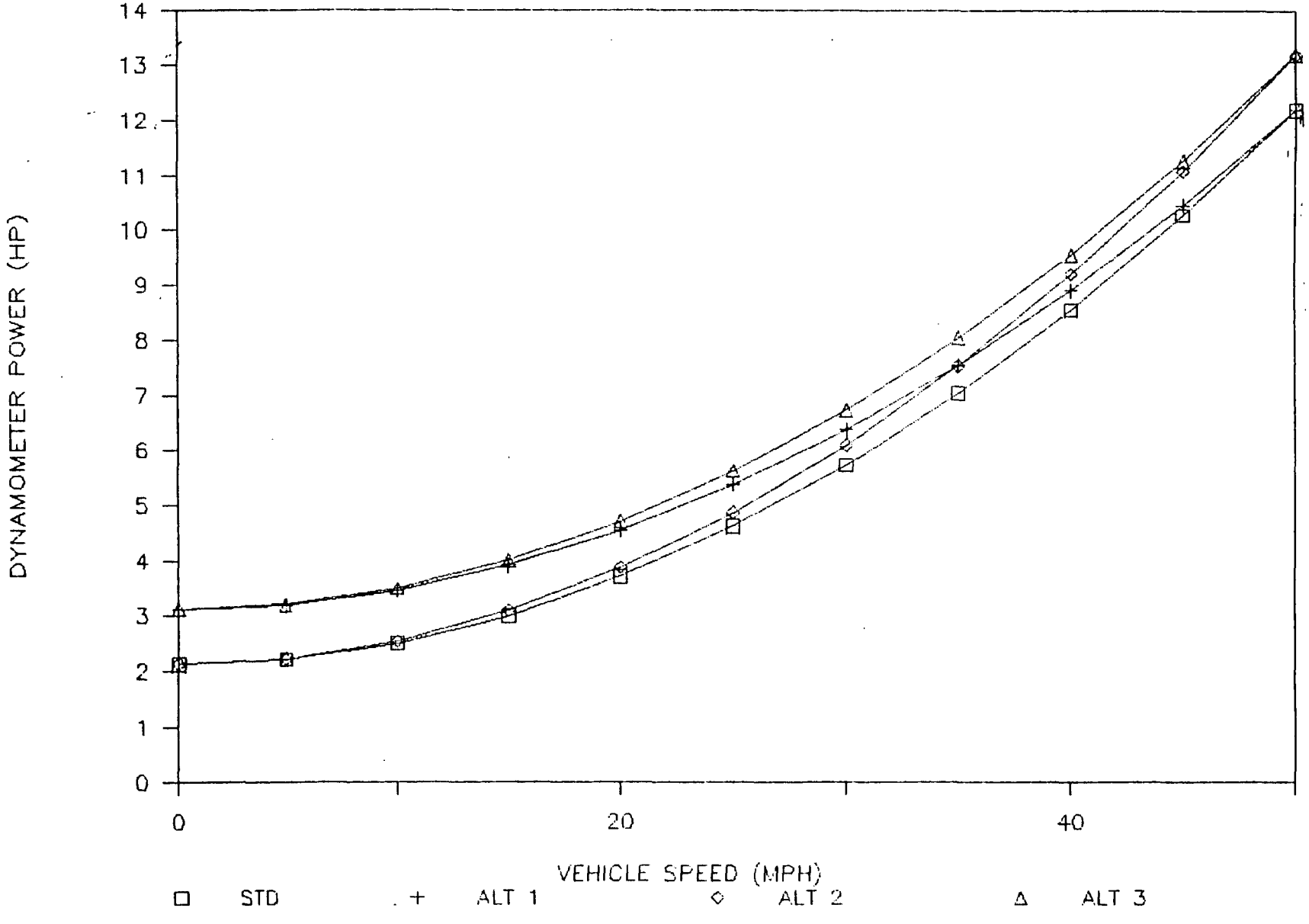
ELECTRIC DYNO TOTAL LOAD VS VEH. SPEED

FORD ESCORT FIGURE 2



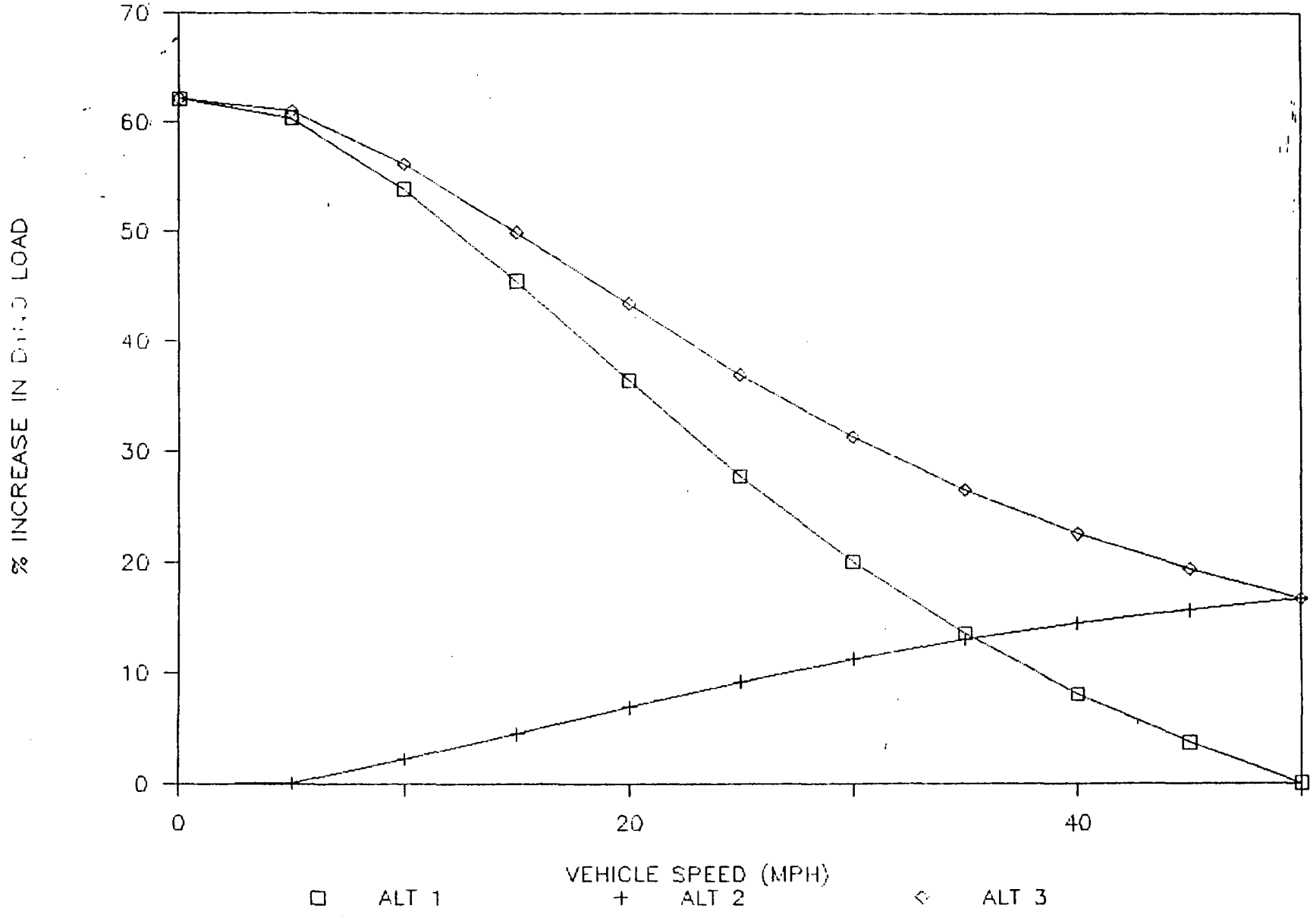
ELECTRIC DYNO TOTAL LOAD VS VEH. SPEED

OLDSMOBILE CUTLASS FIGURE 3



PERCENT DYNO LOAD INCREASE VS SPEED

FORD ESCORT FIGURE 4



PERCENT DYNO LOAD INCREASE VS SPEED

OLDSMOBILE CUTLASS FIGURE 5

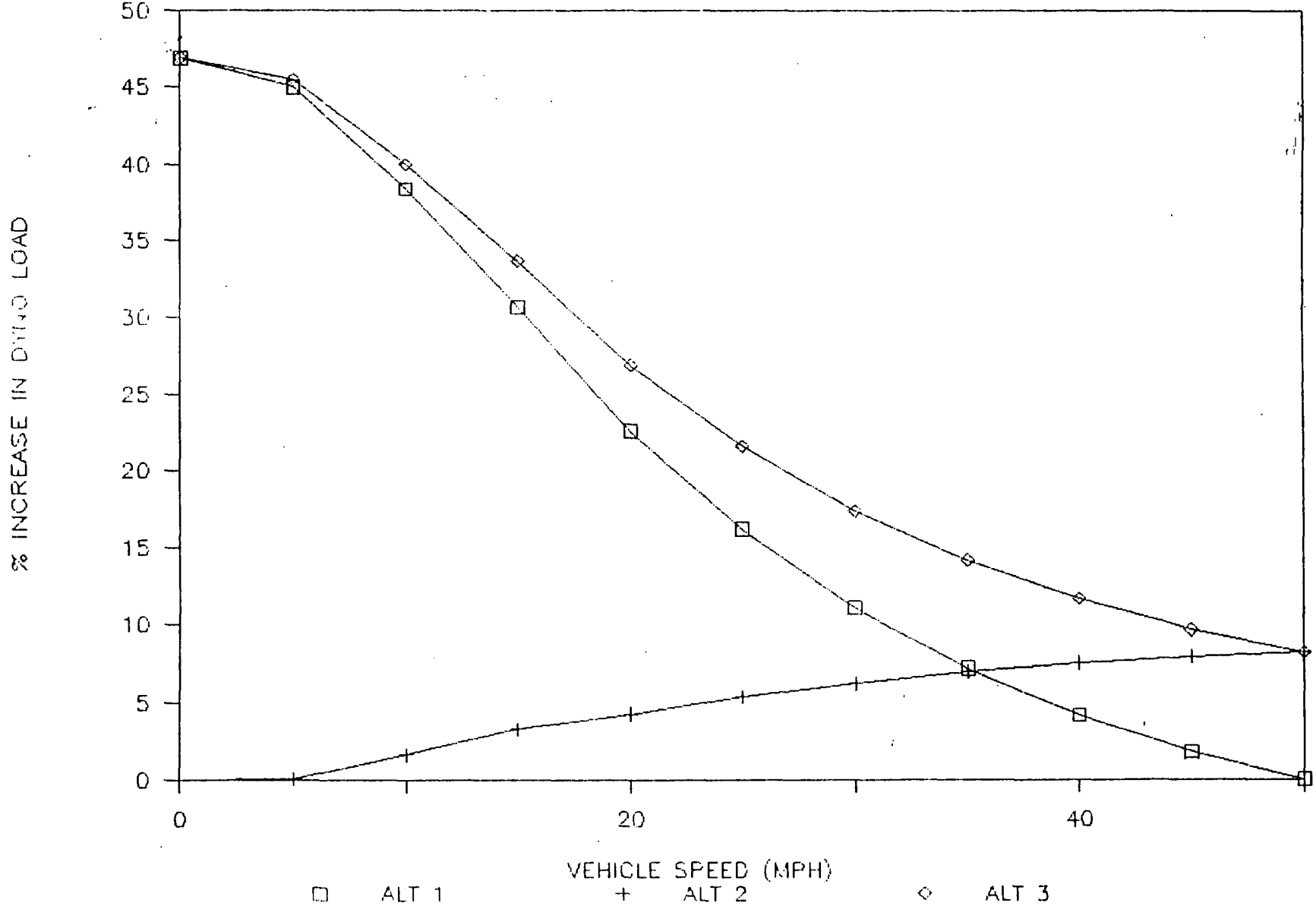


Table 5

Electric Dynamometer Non-Standard Settings vs. Standard Settings
Test Result Means and Standard Deviations

Test Vehicle: Ford Escort

Non-Standard Settings: A = 1; HP @ 50 mph = Standard

Dynamometer	Emissions (g/mile) HC $\bar{X}$	HC s	CO $\bar{X}$	CO s	NOx $\bar{X}$	NOx s	Fuel Economy (mpg) $\bar{X}$	Fuel Economy (mpg) s
	Composite FTP							
Standard	0.296	0.015	3.260	0.349	0.664	0.039	26.38	0.29
Non-Standard	0.286	0.012	3.297	0.401	0.733	0.056	26.25	0.28
	Bag 1							
Standard	0.680	0.048	11.218	1.900	1.054	0.038	23.94	0.32
Non-Standard	0.629	0.043	11.550	1.489	1.105	0.089	23.56	0.37
	Bag 2							
Standard	0.140	0.010	0.304	0.077	0.588	0.051	26.20	0.49
Non-Standard	0.133	0.017	0.258	0.092	0.649	0.054	26.11	0.30
	Bag 3							
Standard	0.298	0.040	2.820	0.630	0.522	0.039	29.10	0.24
Non-Standard	0.297	0.024	2.677	0.431	0.603	0.080	29.04	0.33
	HFET							
Standard	0.064	0.009	0.230	0.062	0.266	0.021	37.33	0.43
Non-Standard	0.057	0.005	0.147	0.113	0.331	0.051	37.43	0.53

Table 6

Electric Dynamometer Non-Standard Settings vs. Standard Settings
Test Result Means and Standard Deviations

Test Vehicle: Ford Escort

Non-Standard Settings: A = 0; HP @ 50 mph = (Standard + 1)

Dynamometer	Emissions (g/mile) HC $\bar{X}$	HC s	CO $\bar{X}$	CO s	NOx $\bar{X}$	NOx s	Fuel Economy (mpg) $\bar{X}$	Fuel Economy (mpg) s
	Composite FTP							
Standard	0.296	0.015	3.260	0.349	0.664	0.039	26.38	0.29
Non-Standard	0.277	0.010	3.252	0.195	0.710	0.039	26.45	0.38
	Bag 1							
Standard	0.680	0.048	11.218	1.900	1.054	0.038	23.94	0.32
Non-Standard	0.627	0.039	11.997	0.725	1.050	0.050	23.47	0.33
	Bag 2							
Standard	0.140	0.010	0.304	0.077	0.588	0.051	26.20	0.49
Non-Standard	0.128	0.024	0.240	0.086	0.645	0.039	26.58	0.50
	Bag 3							
Standard	0.298	0.040	2.820	0.630	0.522	0.039	29.10	0.24
Non-Standard	0.293	0.034	2.363	0.417	0.580	0.055	28.93	0.35
	HFET							
Standard	0.064	0.009	0.230	0.062	0.266	0.021	37.33	0.43
Non-Standard	0.057	0.007	0.110	0.051	0.345	0.048	36.45	0.52

Table 7

Electric Dynamometer Non-Standard Settings vs. Standard Settings
Test Result Means and Standard Deviations

Test Vehicle: Ford Escort

Non-Standard Settings: A = 1; HP @ 50 mph = (Standard + 1)

Dynamometer	Emissions (g/mile) HC $\bar{X}$	HC s	CO $\bar{X}$	CO s	NOx $\bar{X}$	NOx s	Fuel Economy (mpg) $\bar{X}$	Fuel Economy (mpg) s
	Composite FTP							
Standard	0.296	0.015	3.260	0.349	0.664	0.039	26.38	0.29
Non-Standard	0.273	0.010	2.957	0.238	0.763	0.032	26.20	0.21
	Bag 1							
Standard	0.680	0.048	11.218	1.900	1.054	0.038	23.94	0.32
Non-Standard	0.608	0.050	10.218	1.041	1.157	0.042	23.65	0.41
	Bag 2							
Standard	0.140	0.010	0.304	0.077	0.588	0.051	26.20	0.49
Non-Standard	0.123	0.016	0.238	0.094	0.682	0.034	26.00	0.49
	Bag 3							
Standard	0.298	0.040	2.820	0.630	0.522	0.034	29.10	0.24
Non-Standard	0.303	0.031	2.635	0.488	0.623	0.048	28.90	0.22
	HFET							
Standard	0.064	0.009	0.230	0.062	0.266	0.021	37.33	0.43
Non-Standard	0.056	0.006	0.120	0.087	0.355	0.069	36.83	0.64

Table 8

Electric Dynamometer Non-Standard Settings vs. Standard Settings
Test Result Means and Standard Deviations

Test Vehicle: Oldsmobile Cutlass

Non-Standard Settings: A = 1; HP @ 50 mph = Standard

Dynamometer	Emissions (g/mile) HC $\bar{X}$	HC s	CO $\bar{X}$	CO s	NOx $\bar{X}$	NOx s	Fuel Economy (mpg) $\bar{X}$	Fuel Economy (mpg) s
	Composite FTP							
Standard	0.698	0.033	5.950	0.219	4.787	1.104	20.19	0.18
Non-Standard	0.712	0.085	6.042	1.108	4.830	1.198	19.92	0.17
	Bag 1							
Standard	2.112	0.110	25.803	0.700	4.250	1.146	17.72	0.13
Non-Standard	2.118	0.314	25.188	3.343	4.216	1.207	17.64	0.29
	Bag 2							
Standard	0.247	0.008	0.388	0.186	5.207	1.196	20.65	0.26
Non-Standard	0.252	0.028	0.524	0.573	5.356	1.361	20.22	0.18
	Bag 3							
Standard	0.482	0.098	1.517	0.257	4.402	0.943	21.52	0.26
Non-Standard	0.516	0.087	2.036	0.562	4.314	0.878	21.34	0.13
	HFET							
Standard	0.086	0.013	0.378	0.170	3.068	0.877	26.49	0.41
Non-Standard	0.088	0.016	0.352	0.176	2.802	0.577	26.66	0.31

Table 9

Electric Dynamometer Non-Standard Settings vs. Standard Settings
Test Result Means and Standard Deviations

Test Vehicle: Oldsmobile Cutlass

Non-Standard Settings: A = 0; HP @ 50 mph = (Standard + 1)

Dynamometer	Emissions (g/mile) HC $\bar{X}$	HC s	CO $\bar{X}$	CO s	NOx $\bar{X}$	NOx s	Fuel Economy (mpg) $\bar{X}$	Fuel Economy (mpg) s
	Composite FTP							
Standard	0.698	0.033	5.950	0.129	4.787	1.104	20.19	0.18
Non-Standard	0.798	0.150	6.832	1.634	4.413	1.211	19.85	0.32
	Bag 1							
Standard	2.112	0.110	25.803	0.700	4.250	1.146	17.72	0.13
Non-Standard	2.508	0.646	27.770	4.114	3.853	1.175	17.43	0.26
	Bag 2							
Standard	0.247	0.008	0.388	0.186	5.207	1.196	20.65	0.26
Non-Standard	0.268	0.053	0.818	0.722	4.817	1.388	20.40	0.41
	Bag 3							
Standard	0.482	0.098	1.517	0.257	4.402	0.943	21.52	0.26
Non-Standard	0.503	0.095	2.420	1.614	4.073	0.917	20.98	0.30
	HFET							
Standard	0.086	0.013	0.378	0.170	3.068	0.877	26.49	0.41
Non-Standard	0.101	0.025	0.621	0.429	2.827	0.361	25.19	1.18

Table 10

Electric Dynamometer Non-Standard Settings vs. Standard Settings
Test Result Means and Standard Deviations

Test Vehicle: Oldsmobile Cutlass

Non-Standard Settings: A = 1; HP @ 50 mph = (Standard + 1)

Dynamometer	Emissions (g/mile) HC $\bar{X}$	HC s	CO $\bar{X}$	CO s	NOx $\bar{X}$	NOx s	Fuel Economy (mpg) $\bar{X}$	Fuel Economy (mpg) s
	Composite FTP							
Standard	0.698	0.033	5.950	0.219	4.787	1.104	20.19	0.18
Non-Standard	0.723	0.075	6.285	1.127	4.253	0.804	19.65	0.19
	Bag 1							
Standard	2.112	0.110	25.803	0.700	4.250	1.146	17.72	0.13
Non-Standard	2.212	0.239	25.937	3.972	3.650	0.597	17.38	0.20
	Bag 2							
Standard	0.247	0.008	0.388	0.186	5.207	1.196	20.65	0.26
Non-Standard	0.250	0.035	0.742	0.575	4.642	1.004	20.03	0.26
	Bag 3							
Standard	0.482	0.098	1.517	0.257	4.402	0.943	21.52	0.26
Non-Standard	0.538	0.064	1.972	0.763	3.478	1.515	20.95	0.24
	HFET							
Standard	0.086	0.013	0.378	0.170	3.068	0.877	26.49	0.41
Non-Standard	0.089	0.019	0.372	0.276	2.702	0.186	25.83	0.25

Table 11

Electric Dynamometer Non-Standard Settings vs. Standard Settings
T-Test Statistics of Test Means

Test Vehicle: Ford Escort

Non-Standard Settings: A = 1; HP @ 50 mph = Standard

Test	Degrees of Freedom	t-Statistic HC	CO	NOx	MPG
FTP	10	2.084	-0.167	-2.358	0.783
Bag 1	11	2.015	-0.353	-1.198	1.890
Bag 2	11	0.900	0.943	-2.021	0.409
Bag 3	11	0.067	0.484	-2.261	0.360
HFET	10	1.888	1.476	-2.694	-0.334

Non-Standard Settings: A = 0; HP @ 50 mph = (Standard + 1)

Test	Degrees of Freedom	t-Statistic HC	CO	NOx	MPG
FTP	9	2.513	0.050	-1.946	-0.360
Bag 1	9	1.690	-0.934	0.146	2.412
Bag 2	9	1.009	1.291	-2.115	-1.290
Bag 3	10	0.233	1.480	-2.112	0.977
HFET	9	1.559	3.515	-3.424	3.032

Non-Standard Settings: A = 1; HP @ 50 mph = (Standard +1)

Test	Degrees of Freedom	t-Statistic HC	CO	NOx	MPG
FTP	9	2.946	1.713	-4.639	1.180
Bag 1	9	2.411	1.112	-4.202	1.287
Bag 2	9	1.983	1.251	-3.673	0.687
Bag 3	10	-0.242	0.569	-3.996	1.549
HFET	9	1.755	2.358	-2.763	1.503

NOTE: Underlined values denote statistical differences in the test results at the 0.975 confidence level; i.e. the absolute value is greater than 2.201 with 11 degrees of freedom, 2.228 with 10 degrees of freedom and 2.262 with 9 degrees of freedom.

Table 12

Electric Dynamometer Non-Standard Settings vs. Standard Settings
T-Test Statistics of Test Means

Test Vehicle: Oldsmobile Cutlass

Non-Standard Settings: A = 1; HP @ 50 mph = Standard

Test	Degrees of Freedom	t-Statistic HC	CO	NOx	MPG
FTP	9	-0.366	-0.201	-0.062	2.615
Bag 1	9	-0.047	0.444	0.048	0.586
Bag 2	9	-0.452	-0.552	-0.194	3.131
Bag 3	9	-0.607	-2.037	0.158	1.350
HFET	10	-0.200	0.267	0.622	-0.814

Non-Standard Settings: A = 0; HP @ 50 mph = (Standard + 1)

Test	Degrees of Freedom	t-Statistic HC	CO	NOx	MPG
FTP	10	-1.592	-1.310	0.558	2.294
Bag 1	10	-1.483	-1.154	0.592	2.390
Bag 2	10	-0.995	-1.414	0.521	1.274
Bag 3	10	-0.390	-1.356	0.611	3.273
HFET	11	-1.297	-1.515	0.669	2.765

Non-Standard Settings: A = 1; HP @ 50 mph = (Standard + 1)

Test	Degrees of Freedom	t-Statistic HC	CO	NOx	MPG
FTP	10	-0.994	-0.715	0.957	5.085
Bag 1	10	-0.933	-0.081	1.137	3.352
Bag 2	10	0.999	-1.433	0.886	4.132
Bag 3	10	-1.185	-1.384	0.935	3.870
HFET	10	1.000	0.050	1.002	3.344

NOTE: Underlined values denote statistical differences in the test results at the 0.975 confidence level; i.e., the absolute value is greater than 2.201 with 11 degrees of freedom, 2.228 with 10 degrees of freedom and 2.262 with 9 degrees of freedom.

increased loadings were for a decrease in fuel economy, an increase in NOx emissions and a decrease in HC and CO emissions. Since an increase in dynamometer loading causes an increase in the work performed on the test cycles, a decrease in fuel economy is to be expected. The increase in NOx emissions is readily understandable by tracking the factors involved; i.e., the increased dynamometer loading caused higher combustion temperatures and pressures which resulted in greater NOx formation in the engine and because the measured tailpipe emissions increased an overpowering of the reducing catalyst. The reductions in HC and CO emissions are most probably the result of increased oxidzing catalyst activity. Factors which could contribute to increased catalyst activity are the higher combustion temperatures which would lead to earlier catalyst light off and an increase in the volume of secondary air because of later transmission upshifts caused by the increased loading.

A similar inspection of the t-test statistics for the Oldsmobile Cutlass (Table 12) data showed that all differences were confined to fuel economy. With increased loading primarily at low speeds (first option) the FTP and Bag 2 of the FTP fuel economy values were statistically different. With increased loading primarily at higher speeds (second option), with the exception of Bag 2 of the FTP all fuel economy values were different. Finally, with increased loading throughout the speed range, all fuel economy values were statistically different. Inspection of the mean fuel economy values in Tables 8, 9 and 10 shows that in all cases where the mean results were statistically different, the fuel economy was lower when the load imposed by the dynamometer was higher. As with the Ford Escort, these results are to be expected because the vehicle's engine has to perform a greater quantity of work with increased dynamometer loading and it would be expected that fuel consumption would increase.

Comparison of Figures 4 and 5 shows that the alternative dynamometer settings employed resulted in considerably smaller percentage increases in the loads imposed on the Oldsmobile than in those imposed on the Ford. The lack of statistically significant differences in the emissions results when the Cutlass was tested at the selected higher loadings indicates that either the change in loading was not sufficient to significantly impact engine out emissions or that changes in engine out emissions were not large enough to exceed the catalyst's control capacity.

In addition to the overall lower impact seen on the Oldsmobile, the alternative dynamometer settings affected the various measured parameters differently on the two vehicles. For the 16 test results on the Ford and the 11 on the Oldsmobile which were statistically impacted by change in dynamometer loading, there were only two parameters common to

both vehicles. The two cases of overlap occurred in fuel economy differences in Bag 1 of the FTP and in the HFET when the dynamometer PAU setting was increased by 1 hp at 50 mph but without any change at the 0 mph point. This should not be unexpected because differences, or the lack thereof, in the test results stem from a change made in one component (dynamometer load) of a total system which consists of the test vehicle, including all of its systems (e.g., engine size, fuel metering, EGR, catalyst, secondary air, transmission, etc.) and the dynamometer. Since the test results are functions of the interactive responses of the vehicle systems to changes in loading applied by the dynamometer and since the response functions of the systems will vary between vehicles, it is not surprising that the test results are different.

6. Conclusions

The first phase of this study showed that, for the Escort (vehicle was stable throughout the test program), there is no statistical significance in differences between the test results obtained on the electric dynamometer when set to standard loading conditions relative to results obtained on a hydrokinetic chassis dynamometer. For the Cutlass, which exhibited a drift in test results during the test program, the statistical differences in test results are probably attributable to the vehicle. The second phase of the study showed that statistically different test results can be obtained as the loading characteristics of the electric dynamometer are altered and that the differences are test vehicle dependent. Since the test result differences are test vehicle dependent, a generalized statement of where differences can be expected to occur can not be developed.

References

1. "Texas Transportation Institute Track Versus Dynamometer Study", U.S. EPA, OANR, OMS, ECTD, SDSB, M. Reineman and G. Thompson, SDSB-82-02, January 1983.

2. Statistics for the Social Sciences, 2nd Ed., by William L. Hays, University of Georgia; Holt, Rinehart, and Winston, Inc., New York, NY, Publishers.

Appendix A

Vehicle: Ford Escort

Test Vehicle Description

Manufacturer:	Ford Motor Co.
Model, Year:	Ford Escort, 1984
Body Style:	3-Door Hatchback
Chassis Configuration:	Front Engine, Front Wheel Drive
Engine:	1.6 liter, 4-cycle
Fuel Metering:	Carburetor, 2 bbl.
Transmission:	Automatic
Tires:	P165/80 R13
Inertia Weight:	2,500 lbs.

Table A-1

Vehicle: Ford Escort Dynamometer: Hydrokinetic (D208) Test: FTP - Composite

Test Date	Test Number	Odometer (miles)	Dynamometer Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
06/01/84	84-4251	5280	17.25	6.0	4.2	12.9	25.0	0.32	3.38	0.70	26.06
06/07/84	84-4255	5358	17.25	6.0	4.2	13.0	24.8	0.31	3.44	0.66	26.36
06/13/84	84-4257	5465	17.25	6.0	4.2	12.0	25.3	0.32	3.08	0.70	26.09
06/20/84	84-4706	5600	17.25	6.0	4.2	-	-	0.31	3.50	0.73	26.51
08/01/84	84-4717	5981	17.25	6.0	4.2	12.9	24.8	0.28	3.47	0.69	26.44
08/15/84	84-4719	6102	17.25	6.0	4.2	13.0	24.6	0.31	3.59	0.68	26.27
				$\bar{X}$		12.76	24.90	0.308	3.410	0.693	26.29
				S		0.43	0.26	0.015	0.176	0.023	0.18

Table A-2

Vehicle: Ford Escort Dynamometer: Electric (D214) Standard Settings (A = 0; HP @ 50 MPH = Std.) Test: FTP - Composite

Test Date	Test Number	Odometer (miles)	Dynamometer Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
05/17/84	84-4211	5045	17.25	6.0	4.4	11.9	23.9	0.28	3.44	0.64	26.06
06/14/84	84-4259	5498	17.25	6.0	4.4	11.1	23.9	0.28	3.02	0.72	26.42
06/26/84	84-4708	5705	17.25	6.0	4.4	12.8	23.9	0.30	2.93	0.63	26.43
07/17/84	84-4712	5893	17.25	6.0	4.4	11.7	23.9	0.31	3.13	0.64	26.17
08/31/84	84-6081	6309	17.25	6.0	4.4	12.1	23.9	0.31	3.78	0.69	26.80
				$\bar{X}$		11.92	23.90	0.296	3.260	0.664	26.38
				S		0.62	0.00	0.015	0.349	0.039	0.29

Table A-3

Vehicle: Ford Escort

Dynamometer: Electric (D214)
First Alternative Setting
(A = 1; HP @ 50 MPH = Std.)

Test: FTP - Composite

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/18/84	84-4247	5115	17.25	6.0	4.4	-	-	0.29	3.95	0.75	25.77
06/06/84	84-4253	5325	17.25	6.0	4.4	10.9	23.6	0.27	3.15	0.72	26.25
06/15/84	84-4704	5531	17.25	6.0	4.4	11.2	23.9	0.27	2.63	0.84	26.63
07/10/84	84-4710	5787	17.25	6.0	4.4	11.0	23.7	0.30	3.22	0.67	26.16
07/19/84	84-4715	5933	17.25	6.0	4.4	12.2	23.8	0.28	3.47	0.68	26.06
08/17/84	84-5797	6168	17.25	6.0	4.4	11.7	24.0	0.27	3.20	0.73	26.40
09/11/84	84-6240	6386	17.25	6.0	4.4	11.9	23.8	0.28	3.46	0.74	26.45
				$\bar{X}$		11.48	23.80	0.286	3.297	0.733	26.25
				S		0.53	0.14	0.012	0.401	0.056	0.28

Table A-4

Vehicle: Ford Escort

Dynamometer: Electric (D214)
Second Alternative Setting
(A = 0; HP @ 50 MPH = (Std + 1))

Test: FTP - Composite

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/23/84	84-4234	5168	17.25	7.0	5.4	10.1	20.6	0.28	3.22	0.70	26.80
06/08/84	84-4238	5392	17.25	7.0	5.4	10.7	20.7	0.28	3.16	0.66	26.56
06/22/84	84-4244	5665	17.25	7.0	5.4	11.2	20.7	0.28	3.64	0.74	26.11
07/11/84	84-4246	5820	17.25	7.0	5.4	11.1	20.7	0.29	3.10	0.69	26.10
08/03/84	84-4977	6051	17.25	7.0	5.4	11.0	20.7	0.27	3.22	0.77	26.96
08/21/84	84-4979	6209	17.25	7.0	5.4	10.7	20.7	0.26	3.17	0.70	26.17
				$\bar{X}$		10.80	20.68	0.277	3.252	0.710	26.45
				S		0.40	0.04	0.010	0.195	0.039	0.38

Table A-5

Vehicle: Ford Escort

Dynamometer: Electric (D214)
Third Alternative Setting
(A = 1; HP @ 50 MPH = (Std + 1))

Test: FTP - Composite

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/24/84	84-4236	5200	17.25	7.0	5.4	10.3	20.6	0.28	2.78	0.76	25.99
06/12/84	84-4240	5432	17.25	7.0	5.4	10.8	20.5	0.27	2.60	0.81	26.16
06/21/84	84-4242	5633	17.25	7.0	5.4	9.8	20.5	0.29	3.04	0.73	25.95
07/12/84	84-4973	5853	17.25	7.0	5.4	12.1	20.7	0.27	3.15	0.73	26.33
08/02/84	84-4975	6014	17.25	7.0	5.4	10.9	20.5	0.27	3.24	0.79	26.24
08/29/84	84-4981	6269	17.25	7.0	5.4	11.2	20.5	0.26	2.93	0.76	26.52
				$\bar{X}$		10.85	20.55	0.273	2.957	0.763	26.20
				S		0.79	0.08	0.010	0.238	0.032	0.21

Table A-6

Vehicle: Ford Escort Dynamometer: Hydrokinetic (D208) Test: FTP - Bag 1

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
06/01/84	84-4251	5280	17.25	6.0	4.2	12.9	25.0	0.66	10.80	1.14	24.1
06/07/84	84-4255	5358	17.25	6.0	4.2	13.0	24.8	0.73	12.05	1.02	23.8
06/13/84	84-4257	5465	17.25	6.0	4.2	12.0	25.3	0.69	9.95	1.11	23.9
06/20/84	84-4706	5600	17.25	6.0	4.2	-	-	0.67	12.53	1.14	23.6
08/01/84	84-4717	5981	17.25	6.0	4.2	12.9	24.8	0.64	11.39	1.04	23.4
08/15/84	84-4719	6102	17.25	6.0	4.2	13.0	24.6	0.66	11.11	1.02	23.9
				$\bar{X}$		12.76	24.90	0.675	11.306	1.078	23.78
				S		0.43	0.26	0.031	0.916	0.058	0.25

Table A-7

Vehicle: Ford Escort Dynamometer: Electric (D214) Standard Settings (A = 0; HP @ 50 MPH = Std) Test: FTP - Bag 1

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/17/84	84-4211	5045	17.25	6.0	4.4	11.9	23.9	0.65	13.67	1.08	23.5
06/14/84	84-4259	5498	17.25	6.0	4.4	11.1	23.9	0.65	9.66	1.06	24.2
06/26/84	84-4708	5705	17.25	6.0	4.4	12.8	23.9	0.65	9.47	1.02	24.3
07/17/84	84-4712	5893	17.25	6.0	4.4	11.7	23.9	0.76	10.51	1.01	23.8
08/31/84	84-6081	6309	17.25	6.0	4.4	12.1	23.9	0.69	12.78	1.10	23.9
				$\bar{X}$		11.92	23.90	0.680	11.218	1.054	23.94
				S		0.62	0.00	0.048	1.900	0.038	0.32

Table A-8

Vehicle: Ford Escort

Dynamometer: Electric (D214)
First Alternative Setting
(A = 1; HP @ 50 MPH = Std.)

Test: FTP - Bag 1

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/18/84	84-4247	5115	17.25	6.0	4.4	-	-	0.71	14.61	1.13	23.0
06/06/84	84-4253	5325	17.25	6.0	4.4	10.9	23.6	0.61	10.71	1.04	24.1
06/15/84	84-4704	5531	17.25	6.0	4.4	11.2	23.9	0.60	9.91	1.31	24.0
07/10/84	84-4710	5787	17.25	6.0	4.4	11.0	23.7	0.64	11.64	1.07	23.6
07/18/84	84-4714	5926	17.25	6.0	4.4	-	-	0.57	10.27	1.10	23.7
07/19/84	84-4715	5933	17.25	6.0	4.4	12.2	23.8	0.61	11.93	1.05	23.3
08/17/84	84-5797	6168	17.25	6.0	4.4	11.7	24.0	0.63	10.98	1.10	23.4
09/11/84	84-6240	6386	17.25	6.0	4.4	11.9	23.8	0.66	12.35	1.04	23.4
				$\bar{X}$		11.48	23.80	0.629	11.550	1.105	23.56
				S		0.53	0.14	0.043	1.489	0.089	0.37

Table A-9

Vehicle: Ford Escort Dynamometer: Electric (D214) Test: FTP - Bag 1
Second Alternative Setting
(A = 0; HP @ 50 MPH = (Std + 1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/23/84	84-4234	5168	17.25	7.0	5.4	10.1	20.6	0.62	12.29	1.09	23.5
06/08/84	84-4238	5392	17.25	7.0	5.4	10.7	20.7	0.60	11.75	0.96	23.7
06/22/84	84-4244	5665	17.25	7.0	5.4	11.2	20.7	0.70	13.34	1.08	23.0
07/11/84	84-4246	5820	17.25	7.0	5.4	11.1	20.7	0.62	11.64	1.04	23.5
08/03/84	84-4977	6051	17.25	7.0	5.4	11.0	20.7	0.59	11.39	1.04	23.9
08/21/84	84-4979	6209	17.25	7.0	5.4	10.7	20.7	0.63	11.57	1.09	23.2
				$\bar{X}$		10.80	20.68	0.627	11.997	1.050	23.47
				S		0.40	0.04	0.039	0.725	0.050	0.33

Table A-10

Vehicle: Ford Escort Dynamometer: Electric (D214) Test: FTP - Bag 1
Third Alternative Setting
(A = 1; HP @ 50 MPH = (Std + 1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/24/84	84-4236	5200	17.25	7.0	5.4	10.3	20.6	0.61	10.41	1.22	23.5
06/12/84	84-4240	5432	17.25	7.0	5.4	10.8	20.5	0.59	8.75	1.19	24.3
06/21/84	84-4242	5633	17.25	7.0	5.4	9.8	20.5	0.70	9.95	1.13	23.7
07/12/84	84-4973	5853	17.25	7.0	5.4	12.1	20.7	0.59	10.49	1.11	23.9
08/02/84	84-4975	6014	17.25	7.0	5.4	10.9	20.5	0.61	11.92	1.13	23.3
08/29/84	84-4981	6269	17.25	7.0	5.4	11.2	20.5	0.55	9.79	1.16	23.2
				$\bar{X}$		10.85	20.55	0.608	10.218	1.157	23.65
				S		0.79	0.08	0.050	1.041	0.042	0.41

Table A-11

Vehicle: Ford Escort Dynamometer: Hydrokinetic (D208) Test: FTP - Bag 2

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
06/01/84	84-4251	5280	17.25	6.0	4.2	12.9	25.0	0.15	0.27	0.65	25.6
06/07/84	84-4255	5358	17.25	6.0	4.2	13.0	24.8	0.16	0.28	0.61	25.9
06/13/84	84-4257	5465	17.25	6.0	4.2	12.0	25.3	0.14	0.28	0.62	25.6
06/20/84	84-4706	5600	17.25	6.0	4.2	-	-	0.13	0.14	0.67	26.4
08/01/84	84-4717	5981	17.25	6.0	4.2	12.9	24.8	0.13	0.20	0.62	26.4
08/15/84	84-4719	6102	17.25	6.0	4.2	13.0	24.6	0.13	0.36	0.61	26.0
					$\bar{X}$	12.76	24.90	0.140	0.255	0.630	25.93
					S	0.43	0.26	0.013	0.076	0.024	0.36

Table A-12

Vehicle: Ford Escort Dynamometer: Electric (D214) Standard Settings (A = 0; HP @ 50 MPH = Std.) Test: FTP - Bag 2

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/17/84	84-4211	5045	17.25	6.0	4.4	11.9	23.9	0.15	0.26	0.55	25.7
06/14/84	84-4259	5498	17.25	6.0	4.4	11.1	23.9	0.13	0.29	0.66	26.2
06/26/84	84-4708	5705	17.25	6.0	4.4	12.8	23.9	0.14	0.43	0.54	26.1
07/17/84	84-4712	5893	17.25	6.0	4.4	11.7	23.9	0.15	0.31	0.57	26.0
08/31/84	84-6081	6309	17.25	6.0	4.4	12.1	23.9	0.13	0.23	0.62	27.0
					$\bar{X}$	11.92	23.90	0.140	0.304	0.588	26.20
					S	0.62	0.00	0.010	0.077	0.051	0.49

Table A-13

Vehicle: Ford Escort

Dynamometer: Electric (D214)
First Alternative Setting
(A = 1; HP @ 50 MPH = Std.)

Test: FTP - Bag 2

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/18/84	84-4247	5115	17.25	6.0	4.4	-	-	0.14	0.34	0.69	25.8
06/06/84	84-4253	5325	17.25	6.0	4.4	10.9	23.6	0.15	0.29	0.69	25.8
06/15/84	84-4704	5531	17.25	6.0	4.4	11.2	23.9	0.13	0.13	0.74	26.4
07/10/84	84-4710	5787	17.25	6.0	4.4	11.0	23.7	0.16	0.40	0.60	25.9
07/18/84	84-4714	5926	17.25	6.0	4.4	-	-	0.12	0.18	0.59	26.2
07/19/84	84-4715	5933	17.25	6.0	4.4	12.2	23.8	0.13	0.27	0.60	25.9
08/17/84	84-5797	6168	17.25	6.0	4.4	11.7	24.0	0.11	0.17	0.63	26.4
09/11/84	84-6240	6386	17.25	6.0	4.4	11.9	23.8	0.12	0.28	0.65	26.5
				$\bar{X}$		11.48	23.80	0.133	0.258	0.649	26.11
				S		0.53	0.14	0.017	0.092	0.054	0.30

Table A-14

Vehicle: Ford Escort Dynamometer: Electric (D214) Test: FTP - Bag 2
Second Alternative Setting
(A = 0; HP @ 50 MPH = (Std + 1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/23/84	84-4234	5168	17.25	7.0	5.4	10.1	20.6	0.13	0.21	0.63	27.1
06/08/84	84-4238	5392	17.25	7.0	5.4	10.7	20.7	0.13	0.27	0.61	26.6
06/22/84	84-4244	5665	17.25	7.0	5.4	11.2	20.7	0.13	0.21	0.67	26.3
07/11/84	84-4246	5820	17.25	7.0	5.4	11.1	20.7	0.17	0.40	0.64	25.9
08/03/84	84-4977	6051	17.25	7.0	5.4	11.0	20.7	0.10	0.18	0.71	27.2
08/21/84	84-4979	6209	17.25	7.0	5.4	10.7	20.7	0.11	0.17	0.61	26.4
				$\bar{X}$		10.80	20.68	0.128	0.240	0.645	26.58
				S		0.40	0.04	0.024	0.086	0.039	0.50

Table A-15

Vehicle: Ford Escort Dynamometer: Electric (D214) Test: FTP - Bag 2
Third Alternative Setting
(A = 1; HP @ 50 MPH = (Std + 1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/24/84	84-4236	5200	17.25	7.0	5.4	10.3	20.6	0.14	0.21	0.65	25.8
06/12/84	84-4240	5432	17.25	7.0	5.4	10.8	20.5	0.14	0.33	0.74	25.5
06/21/84	84-4242	5633	17.25	7.0	5.4	9.8	20.5	0.13	0.37	0.66	25.6
07/12/84	84-4973	5853	17.25	7.0	5.4	12.1	20.7	0.12	0.23	0.66	26.1
08/02/84	84-4975	6014	17.25	7.0	5.4	10.9	20.5	0.10	0.14	0.70	26.2
08/29/84	84-4981	6269	17.25	7.0	5.4	11.2	20.5	0.11	0.15	0.68	26.8
				$\bar{X}$		10.85	20.55	0.123	0.238	0.682	26.00
				S		0.79	0.08	0.016	0.094	0.034	0.48

Table A-16

Vehicle: Ford Escort Dynamometer: Hydrokinetic (D208) Test: FTP - Bag 3

Test Date	Test Number	Odometer (miles)	Dynamometer Roll Spacing (in.)	Dynamometer Act. HP	Dynamometer Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
06/01/84	84-4251	5280	17.25	6.0	4.2	12.9	25.0	0.37	3.70	0.45	28.8
06/07/84	84-4255	5358	17.25	6.0	4.2	13.0	24.8	0.29	2.93	0.48	29.7
06/13/84	84-4257	5465	17.25	6.0	4.2	12.0	25.3	0.36	3.19	0.53	29.3
06/20/84	84-4706	5600	17.25	6.0	4.2	-	-	0.36	3.11	0.55	29.4
08/01/84	84-4717	5981	17.25	6.0	4.2	12.9	24.8	0.30	3.71	0.56	29.2
08/15/84	84-4719	6102	17.25	6.0	4.2	13.0	24.6	0.38	4.02	0.55	29.1
				$\bar{X}$		12.76	24.90	0.343	3.443	0.520	29.25
				S		0.43	0.26	0.038	0.426	0.045	0.30

Table A-17

Vehicle: Ford Escort Dynamometer: Electric (D214) Standard Settings (A = 0; HP @ 50 MPH = Std.) Test: FTP - Bag 3

Test Date	Test Number	Odometer (miles)	Dynamometer Roll Spacing (in.)	Dynamometer Act. HP	Dynamometer Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
05/17/84	84-4211	5045	17.25	6.0	4.4	11.9	23.9	0.25	1.75	0.48	29.1
05/30/84	84-4250	5240	17.25	6.0	4.4	-	-	0.31	2.72	0.58	29.5
06/14/84	84-4259	5498	17.25	6.0	4.4	11.1	23.9	0.28	3.20	0.56	29.0
06/26/84	84-4708	5705	17.25	6.0	4.4	12.8	23.9	0.32	2.72	0.50	28.9
07/17/84	84-4712	5893	17.25	6.0	4.4	11.7	23.9	0.27	2.89	0.50	28.9
08/31/84	84-6081	6309	17.25	6.0	4.4	12.1	23.9	0.36	3.64	0.51	29.2
				$\bar{X}$		11.92	23.90	0.298	2.820	0.522	29.10
				S		0.62	0.00	0.040	0.630	0.039	0.24

Table A-18

Vehicle: Ford Escort

Dynamometer: Electric (D214)
First Alternative Setting
(A = 1; HP @ 50 MPH = Std.)

Test: FTP - Bag 3

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/18/84	84-4247	5115	17.25	6.0	4.4	-	-	0.27	2.77	0.56	28.4
06/06/84	84-4253	5325	17.25	6.0	4.4	10.9	23.6	0.26	2.84	0.52	29.0
06/15/84	84-4704	5531	17.25	6.0	4.4	11.2	23.9	0.30	1.93	0.70	29.4
07/10/84	84-4710	5787	17.25	6.0	4.4	11.0	23.7	0.30	2.24	0.53	29.0
07/19/84	84-4715	5933	17.25	6.0	4.4	12.2	23.8	0.32	3.05	0.56	29.0
08/17/84	84-5797	6168	17.25	6.0	4.4	11.7	24.0	0.32	3.09	0.64	29.2
09/11/84	84-6240	6386	17.25	6.0	4.4	11.9	23.8	0.31	2.82	0.71	29.3
				$\bar{X}$		11.48	23.80	0.297	2.677	0.603	29.04
				S		0.53	0.14	0.024	0.431	0.080	0.33

Table A-19

Vehicle: Ford Escort Dynamometer: Electric (D214) Test: FTP - Bag 3
Second Alternative Setting
(A = 0; HP @ 50 MPH = (Std + 1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/23/84	84-4234	5168	17.25	7.0	5.4	10.1	20.6	0.28	2.09	0.54	29.3
06/08/84	84-4238	5392	17.25	7.0	5.4	10.7	20.7	0.33	2.21	0.54	29.3
06/22/84	84-4244	5665	17.25	7.0	5.4	11.2	20.7	0.25	2.82	0.60	28.6
07/11/84	84-4246	5820	17.25	7.0	5.4	11.1	20.7	0.28	1.76	0.54	28.8
08/03/84	84-4977	6051	17.25	7.0	5.4	11.0	20.7	0.34	2.78	0.68	29.1
08/21/84	84-4979	6209	17.25	7.0	5.4	10.7	20.7	0.28	2.52	0.58	28.5
				$\bar{X}$		10.80	20.68	0.293	2.363	0.580	28.93
				S		0.40	0.04	0.034	0.417	0.055	0.35

Table A-20

Vehicle: Ford Escort Dynamometer: Electric (D214) Test: FTP - Bag 3
Third Alternative Setting
(A = 1; HP @ 50 MPH = (Std + 1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/24/84	84-4236	5200	17.25	7.0	5.4	10.3	20.6	0.31	1.90	0.64	28.7
06/12/84	84-4240	5432	17.25	7.0	5.4	10.8	20.5	0.26	2.25	0.66	29.2
06/21/84	84-4242	5633	17.25	7.0	5.4	9.8	20.5	0.27	2.91	0.56	28.6
07/12/84	84-4973	5853	17.25	7.0	5.4	12.1	20.7	0.32	3.15	0.59	28.9
08/02/84	84-4975	6014	17.25	7.0	5.4	10.9	20.5	0.34	2.57	0.69	29.0
08/29/84	84-4981	6269	17.25	7.0	5.4	11.2	20.5	0.32	3.03	0.60	29.0
				$\bar{X}$		10.85	20.55	0.303	2.635	0.623	28.90
				S		0.79	0.08	0.031	0.488	0.048	0.22

Table A-21

Vehicle: Ford Escort Dynamometer: Hydrokinetic (D208) Test: HFET

Test Date	Test Number	Odometer (miles)	Dynamometer Roll Spacing (in.)	Dynamometer Act. HP	Dynamometer Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
06/01/84	84-4252	5292	17.25	6.0	4.2	12.9	25.0	0.061	0.08	0.28	37.21
06/07/84	84-4256	5369	17.25	6.0	4.2	13.0	24.8	0.064	0.17	0.25	37.34
06/13/84	84-4258	5476	17.25	6.0	4.2	12.0	25.3	0.061	0.44	0.27	37.44
06/20/84	84-4707	5611	17.25	6.0	4.2	-	-	0.067	0.16	0.27	37.19
08/01/84	84-4718	5992	17.25	6.0	4.2	12.9	24.8	0.054	0.05	0.38	37.70
08/15/84	84-4720	6113	17.25	6.0	4.2	13.0	24.6	0.069	0.20	0.28	36.87
				$\bar{X}$		12.76	24.90	0.063	0.183	0.288	37.29
				S		0.43	0.26	0.005	0.138	0.046	0.28

Table A-22

Vehicle: Ford Escort Dynamometer: Electric (D214) Standard Settings (A = 0; HP @ 50 MPH = Std.) Test: HFET

Test Date	Test Number	Odometer (miles)	Dynamometer Roll Spacing (in.)	Dynamometer Act. HP	Dynamometer Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
05/30/84	84-4249	5251	17.25	6.0	4.4	-	-	0.063	0.23	0.25	37.49
06/14/84	84-4259	5498	17.25	6.0	4.4	11.1	23.9	0.055	0.19	0.28	37.82
06/26/84	84-4709	5712	17.25	6.0	4.4	12.8	23.9	0.063	0.15	0.24	37.51
07/17/84	84-4713	5904	17.25	6.0	4.4	11.7	23.9	0.079	0.28	0.27	37.15
08/16/84	84-5776	6146	17.25	6.0	4.4	-	-	0.060	0.30	0.29	36.70
				$\bar{X}$		11.92	23.90	0.064	0.230	0.266	37.33
				S		0.62	0.00	0.009	0.062	0.021	0.43

Table A-23

Vehicle: Ford Escort

Dynamometer: Electric (D214)
First Alternative Setting
(A = 1; HP @ 50 MPH = Std.)

Test: HFET

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
06/06/84	84-4253	5336	17.25	6.0	4.4	10.9	23.6	0.064	0.12	0.28	37.83
06/15/84	84-4705	5564	17.25	6.0	4.4	11.2	23.9	0.058	0.08	0.38	38.34
07/10/84	84-4711	5798	17.25	6.0	4.4	11.0	23.7	0.060	0.12	0.26	37.52
07/19/84	84-4716	5945	17.25	6.0	4.4	12.2	23.8	0.052	0.20	0.31	37.34
08/17/84	84-5798	6180	17.25	6.0	4.4	11.7	24.0	0.051	0.06	0.37	36.76
09/11/84	84-6241	6398	17.25	6.0	4.4	11.9	23.8	0.057	0.38	0.33	37.14
09/12/84	84-6265	6420	17.25	6.0	4.4	-	-	0.054	0.07	0.39	37.06
				$\bar{X}$		11.48	23.80	0.057	0.147	0.331	37.43
				S		0.53	0.14	0.005	0.113	0.051	0.53

Table A-24

Vehicle: Ford Escort Dynamometer: Electric (D214) Test: HFET
Second Alternative Setting
(A = 0; HP @ 50 MPH = (Std + 1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/23/84	84-4235	5178	17.25	7.0	5.4	10.1	20.6	0.060	0.18	0.30	37.19
06/08/84	84-4239	5404	17.25	7.0	5.4	10.7	20.7	0.058	0.09	0.33	36.60
06/22/84	84-4245	5676	17.25	7.0	5.4	11.2	20.7	0.061	0.14	0.32	36.73
07/11/84	84-4972	5831	17.25	7.0	5.4	11.1	20.7	0.064	0.14	0.32	36.43
08/03/84	84-4978	6058	17.25	7.0	5.4	11.0	20.7	0.048	0.05	0.43	36.02
08/21/84	84-4980	6221	17.25	7.0	5.4	10.7	20.7	0.049	0.06	0.37	35.72
				$\bar{X}$		10.80	20.68	0.057	0.110	0.345	36.45
				S		0.40	0.04	0.007	0.051	0.048	0.52

Table A-25

Vehicle: Ford Escort Dynamometer: Electric (D214) Test: HFET
Third Alternative Setting
(A = 1; HP @ 50 MPH = (Std + 1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/24/84	84-4237	5211	17.25	7.0	5.4	10.3	20.6	0.053	0.07	0.36	38.02
06/12/84	84-4241	5443	17.25	7.0	5.4	10.8	20.5	0.066	0.28	0.30	36.85
06/21/84	84-4243	5644	17.25	7.0	5.4	9.8	20.5	0.060	0.11	0.29	36.59
08/02/84	84-4976	6025	17.25	7.0	5.4	10.9	20.5	0.050	0.04	0.48	36.16
08/29/84	84-4982	6280	17.25	7.0	5.4	11.2	20.5	0.051	0.07	0.33	36.45
09/07/84	84-6177	6357	17.25	7.0	5.4	-		0.056	0.15	0.37	36.89
				$\bar{X}$		10.60	20.52	0.056	0.120	0.355	36.83
				S		0.55	0.05	0.006	0.087	0.069	0.64

Appendix B

Vehicle: Oldsmobile Cutlass

Test Vehicle Description

Manufacturer:	General Motors Corporation
Model, Year:	Oldsmobile Cutlass, 1975
Body Style:	4-Door Sedan
Chassis Configuration:	Front Engine, Rear Wheel Drive
Engine:	3.8 liter, V-6
Fuel Metering:	Carburetor, 2 bbl.
Transmission:	Automatic
Tires:	P195/75 R14
Inertia Weight:	3,500 lbs.

Table B-1

Vehicle: Oldsmobile Cutlass Dynamometer: Hydrokinetic (D208) Test: FTP - Composite

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
06/07/84	84-3917	38681	17.25	12.2	10.1	11.6	17.5	0.84	7.88	3.62	19.70
06/12/84	84-4662	38759	17.25	12.2	10.1	11.7	17.5	0.79	7.02	3.87	20.04
06/19/84	84-4664	38819	17.25	12.2	10.1	11.9	17.6	0.80	6.61	3.95	20.11
06/27/84	84-4670	39029	17.25	12.2	10.1	12.4	17.4	0.75	6.85	4.11	20.15
07/11/84	84-4672	39154	17.25	12.2	10.1	12.2	17.6	0.74	7.26	4.41	19.98
08/07/84	84-4998	39342	17.25	12.2	10.1	12.4	16.9	0.74	6.99	5.21	20.05
8/24/84	84-5002	39500	17.25	12.2	10.1	12.1	17.0	0.66	5.27	5.81	19.87
				$\bar{X}$		12.04	17.36	0.760	6.840	4.426	19.99
				S		0.32	0.29	0.057	0.799	0.797	0.16

Table B-2

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Standard Settings (A = 0; HP @ 50 MPH = Std.) Test: FTP Composite

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/24/84	84-3915	38613	17.25	12.2	10.1	11.8	17.3	0.72	6.07	3.67	19.89
06/22/84	84-4666	38954	17.25	12.2	10.1	12.2	17.3	0.74	6.04	3.91	20.21
07/17/84	84-4994	39193	17.25	12.0	10.1	12.4	17.3	0.68	6.18	4.15	20.35
08/08/84	84-5000	39374	17.25	12.2	10.1	12.1	17.3	0.66	6.00	4.80	20.09
08/29/84	84-6050	39550	17.25	12.2	10.1	12.0	17.3	0.72	5.85	5.74	20.23
09/12/84	84-6263	39715	17.25	12.2	10.1	12.2	17.3	0.67	5.56	6.45	20.35
				$\bar{X}$		12.12	17.30	0.698	5.950	4.787	20.19
				S		0.20	0.00	0.033	0.219	1.104	0.18

Table B-3

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214)
First Alternative Setting
(A = 1; HP @ 50 MPH = Std.) Test: FTP - Composite

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
06/08/84	84-3919	38714	17.25	12.2	10.1	11.9	17.3	0.81	6.97	3.47	19.91
06/26/84	84-4668	38994	17.25	12.2	10.1	12.0	17.3	0.80	7.15	4.02	19.81
07/18/84	84-4996	39224	17.25	12.2	10.1	12.1	17.3	0.65	5.46	4.57	19.99
08/30/84	84-6067	39582	17.25	12.2	10.1	12.3	17.3	0.65	6.16	5.72	19.72
09/04/84	84-6116	39626	17.25	12.2	10.1	12.1	17.3	0.65	4.47	6.37	20.15
				$\bar{X}$		12.08	17.30	0.712	6.042	4.830	19.92
				S		0.15	0.00	0.085	1.108	1.198	0.17

Table B-4

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Composite
Second Alternative Setting
(A = 0; HP @ 50 MPH = (Std. + 1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/11/84	84-3943	38349	17.25	13.2	11.1	11.5	16.0	0.91	9.47	3.15	19.25
06/13/84	84-3949	38792	17.25	13.2	11.1	11.6	16.0	0.74	6.71	3.33	19.98
07/05/84	84-3955	39082	17.25	13.2	11.1	11.5	16.0	1.04	8.03	3.84	19.93
07/25/84	84-3959	39272	17.25	13.2	11.1	11.8	16.0	0.67	5.51	4.69	20.12
08/17/84	84-3963	39421	17.25	13.2	11.1	-	-	0.78	6.04	5.16	19.75
09/07/84	84-6175	39665	17.25	13.2	11.1	11.5	16.1	0.65	5.23	6.31	20.05
				$\bar{X}$		11.58	16.02	0.798	6.832	4.413	19.85
				S		0.13	0.05	0.150	1.634	1.211	0.32

Table B-5

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Composite
Third Alternative Setting
(A = 0; HP @ 50 MPH = (Std. + 1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/22/84	84-3947	38549	17.25	13.2	11.1	11.3	16.0	0.80	7.64	3.54	19.30
06/14/84	84-3951	38823	17.25	13.2	11.1	11.4	15.9	0.84	6.77	3.61	19.74
16/15/84	84-3953	38863	17.25	13.2	11.1	11.4	15.9	0.66	4.54	3.71	19.87
07/10/84	84-3957	39122	17.25	13.2	11.1	11.6	15.9	0.74	7.06	4.21	19.64
07/26/84	84-3961	39303	17.25	13.2	11.1	11.8	16.0	0.66	5.49	4.98	19.63
08/23/84	84-5978	39468	17.25	13.2	11.1	11.5	16.0	0.69	6.21	5.47	19.71
				$\bar{X}$		11.50	15.95	0.732	6.285	4.253	19.65
				S		0.18	0.06	0.075	1.127	0.804	0.19

Table B-6

Vehicle: Oldsmobile Cutlass Dynamometer: Hydrokinetic (D208) Test: FTP - Bag 1

Test Date	Test Number	Odometer (miles)	Dynamometer Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
06/07/84	84-3917	38681	17.25	12.2	10.1	11.6	17.5	2.47	29.28	3.10	17.1
06/12/84	84-4662	38759	17.25	12.2	10.1	11.7	17.5	2.33	27.41	3.32	17.5
06/19/84	84-4664	38819	17.25	12.2	10.1	11.9	17.6	2.27	26.90	3.37	17.7
06/27/84	84-4670	39029	17.25	12.2	10.1	12.4	17.4	2.24	27.75	3.48	17.7
07/11/84	84-4672	39154	17.25	12.2	10.1	12.2	17.6	2.27	28.86	3.66	17.4
08/07/84	84-4998	39342	17.25	12.2	10.1	12.4	16.9	2.35	29.22	4.36	17.5
08/24/84	84-5002	39500	17.25	12.2	10.1	12.1	17.0	1.87	23.50	5.19	17.5
				$\bar{X}$		12.04	17.36	2.257	27.560	3.783	17.49
				S		0.32	0.29	0.187	2.016	0.738	0.20

Table B-7

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Standard Settings (A = 0; HP @ 50 MPH = Std.) Test: FTP - Bag 1

Test Date	Test Number	Odometer (miles)	Dynamometer Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
05/24/84	84-3915	38613	17.25	12.2	10.1	11.8	17.3	2.19	25.41	3.26	17.8
06/22/84	84-4666	38954	17.25	12.2	10.1	12.2	17.3	2.19	25.90	3.40	17.9
07/17/84	84-4994	39193	17.25	12.0	10.1	12.4	17.3	2.19	27.11	3.53	17.8
08/08/84	84-5000	39374	17.25	12.2	10.1	12.1	17.3	2.08	25.63	4.06	17.6
08/29/84	84-6050	39550	17.25	12.2	10.1	12.0	17.3	2.11	25.70	5.11	17.6
09/12/84	84-6263	39715	17.25	12.2	10.1	12.2	17.3	1.91	25.07	6.14	17.6
				$\bar{X}$		12.12	17.30	2.112	25.803	4.250	17.72
				S		0.20	0.00	0.110	0.700	1.146	0.13

Table B-8

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Bag 1
First Alternative Setting
(A = 1; HP @ 50 MPH = Std.)

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Dynamometer: Coastdown Time (sec.) Veh.	Dynamometer: Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
06/08/84	84-3919	38714	17.25	12.2	10.1	11.9	17.3	2.32	28.00	3.00	17.7
06/26/84	84-4668	38994	17.25	12.2	10.1	12.0	17.3	2.57	27.90	3.40	17.6
07/18/84	84-4996	39224	17.25	12.2	10.1	12.1	17.3	1.93	23.54	3.73	17.7
08/30/84	84-6067	39582	17.25	12.2	10.1	12.3	17.3	1.94	26.35	5.10	17.2
09/04/84	84-6116	39626	17.25	12.2	10.1	12.1	17.3	1.83	20.15	5.85	18.0
				$\bar{X}$		12.08	17.30	2.118	25.188	4.216	17.64
				S		0.15	0.00	0.314	3.343	1.207	0.29

Table B-9

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Bag 1
Second Alternative Setting
(A = 0; HP @ 50 MPH = (Std. +1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/11/84	84-3943	38349	17.25	13.2	11.1	11.5	16.0	2.61	33.70	2.77	17.2
06/13/84	84-3949	38792	17.25	13.2	11.1	11.6	16.0	2.30	26.93	2.97	17.5
07/05/84	84-3955	39082	17.25	13.2	11.1	11.5	16.0	3.64	31.85	3.18	17.6
07/25/84	84-3959	39272	17.25	13.2	11.1	11.8	16.0	1.97	24.23	3.93	17.8
08/17/84	84-3963	39421	17.25	13.2	11.1	-	-	2.68	26.32	4.36	17.1
09/07/84	84-6175	39665	17.25	13.2	11.1	11.5	16.1	1.85	23.59	5.91	17.4
				$\bar{X}$		11.58	16.02	2.508	27.770	3.853	17.43
				S		0.13	0.05	0.646	4.114	1.175	0.26

Table B-10

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Bag 1
Third Alternative Setting
(A = 1; HP @ 50 MPH = (Std. +1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/22/84	84-3947	38549	17.25	13.2	11.1	11.3	16.0	2.43	30.39	3.14	17.2
06/14/84	84-3951	38823	17.25	13.2	11.1	11.4	15.9	2.47	25.28	3.18	17.6
06/15/84	84-3953	38863	17.25	13.2	11.1	11.4	15.9	2.00	19.26	3.36	17.6
07/10/84	84-3957	39122	17.25	13.2	11.1	11.6	15.9	2.36	28.78	3.43	17.4
07/26/84	84-3961	39303	17.25	13.2	11.1	11.8	16.0	1.91	24.23	4.22	17.4
08/23/84	84-5978	39468	17.25	13.2	11.1	11.5	16.0	2.10	27.68	4.57	17.1
				$\bar{X}$		11.50	15.95	2.212	25.937	3.650	17.38
				S		0.18	0.06	0.239	3.972	0.597	0.20

Table B-11

Vehicle: Oldsmobile Cutlass Dynamometer: Hydrokinetic (D208) Test: FTP - Bag 2

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
06/07/84	84-3917	38681	17.25	12.2	10.1	11.6	17.5	0.33	1.54	3.99	20.0
06/12/84	84-4662	38759	17.25	12.2	10.1	11.7	17.5	0.30	1.05	4.25	20.3
06/19/84	84-4664	38817	17.25	12.2	10.1	11.9	17.6	0.27	0.73	4.25	20.5
06/27/84	84-4670	39029	17.25	12.2	10.1	12.4	17.4	0.28	1.15	4.49	20.5
07/11/84	84-4672	39154	17.25	12.2	10.1	12.2	17.6	0.30	1.40	4.88	20.4
08/07/84	84-4998	39342	17.25	12.2	10.1	12.4	16.9	0.28	0.90	5.82	20.4
08/24/84	84-5002	39500	17.25	12.2	10.1	12.1	17.0	0.24	0.12	6.46	20.2
				$\bar{X}$		12.04	17.36	0.286	0.984	4.877	20.33
				S		0.32	0.29	0.028	0.471	0.924	0.28

Table B-12

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Standard Settings (A = 0; HP @ 50 MPH = Std.) Test: FTP - Bag 2

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/24/84	84-3915	38613	17.25	12.2	10.1	11.8	17.3	0.25	0.53	3.88	20.2
06/22/84	84-4666	38954	17.25	12.2	10.1	12.2	17.3	0.25	0.52	4.21	20.6
07/17/84	84-4994	39193	17.25	12.0	10.1	12.4	17.3	0.25	0.46	4.58	20.7
08/08/84	84-5000	39374	17.25	12.2	10.1	12.1	17.3	0.25	0.51	5.37	20.6
08/29/84	84-6050	39550	17.25	12.2	10.1	12.0	17.3	0.23	0.21	6.38	20.9
09/12/84	84-6263	39715	17.25	12.2	10.1	12.2	17.3	0.25	0.10	6.82	20.9
				$\bar{X}$		12.12	17.30	0.247	0.388	5.207	20.65
				S		0.20	0.00	0.008	0.186	1.196	0.26

Table B-13

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Bag 2
First Alternative Setting
(A = 1; HP @ 50 MPH = Std.)

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
06/08/84	84-3919	38714	17.25	12.2	10.1	11.9	17.3	0.28	0.89	3.77	20.1
06/26/84	84-4668	38994	17.25	12.2	10.1	12.0	17.3	0.28	1.34	4.40	20.1
07/18/84	84-4996	39224	17.25	12.2	10.1	12.1	17.3	0.22	0.09	5.16	20.3
08/30/84	84-6067	39582	17.25	12.2	10.1	12.3	17.3	0.23	0.30	6.41	20.1
09/04/84	84-6116	39626	17.25	12.2	10.1	12.1	17.3	0.25	0.00	7.04	20.5
				$\bar{X}$		12.08	17.30	0.252	0.524	5.356	20.22
				S		0.15	0.00	0.028	0.573	1.361	0.18

Table B-14

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Bag 2
Second Alternative Setting
(A = 0; HP @ 50 MPH = (Std. +1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
05/11/84	84-3943	38349	17.25	13.2	11.1	11.5	16.0	0.36	1.92	3.33	19.6
06/13/84	84-3949	38792	17.25	13.2	11.1	11.6	16.0	0.29	1.20	3.52	20.6
07/05/84	84-3955	39082	17.25	13.2	11.1	11.5	16.0	0.27	1.15	4.18	20.5
07/25/84	84-3959	39272	17.25	13.2	11.1	11.8	16.0	0.22	0.18	5.23	20.6
08/17/84	84-3963	39421	17.25	13.2	11.1	-	-	0.22	0.36	5.75	20.4
09/07/84	84-6175	39665	17.25	13.2	11.1	11.5	16.1	0.25	0.10	6.89	20.7
					$\bar{X}$	11.58	16.02	0.268	0.818	4.817	20.40
					S	0.13	0.05	0.053	0.722	1.388	0.41

Table B-15

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Bag 2
Third Alternative Setting
(A = 1; HP @ 50 MPH = (Std. +1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
05/22/84	84-3947	38549	17.25	13.2	11.1	11.3	16.0	0.28	0.99	3.76	19.6
06/14/84	84-3951	38823	17.25	13.2	11.1	11.4	15.9	0.30	1.73	3.80	20.0
06/15/84	84-3953	38863	17.25	13.2	11.1	11.4	15.9	0.22	0.38	3.91	20.3
07/10/84	84-3957	39122	17.25	13.2	11.1	11.6	15.9	0.26	0.83	4.70	20.0
07/26/84	84-3961	39303	17.25	13.2	11.1	11.8	16.0	0.22	0.19	5.57	20.0
08/23/84	84-5978	39468	17.25	13.2	11.1	11.5	16.0	0.22	0.33	6.11	20.3
					$\bar{X}$	11.50	15.95	0.250	0.742	4.642	20.03
					S	0.18	0.06	0.035	0.575	1.004	0.26

Table B-16

Vehicle: Oldsmobile Cutlass Dynamometer: Hydrokinetic (D208) Test: FTP - Bag 3

Test Date	Test Number	Odometer (miles)	Dynamometer Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
06/07/84	84-3917	38681	17.25	12.2	10.1	11.6	17.5	0.58	3.86	3.33	21.6
06/12/84	84-4662	38759	17.25	12.2	10.1	11.7	17.5	0.57	2.91	3.56	21.9
06/19/84	84-4664	38819	17.25	12.2	10.1	11.9	17.6	0.70	2.45	3.83	21.7
06/27/84	84-4670	39029	17.25	12.2	10.1	12.4	17.4	0.52	1.99	3.85	21.6
07/11/84	84-4672	39154	17.25	12.2	10.1	12.2	17.6	0.43	2.08	4.08	21.5
08/07/84	84-4998	39342	17.25	12.2	10.1	12.4	16.9	0.40	1.78	4.70	21.7
08/24/84	84-5002	39500	17.25	12.2	10.1	12.1	17.0	0.55	1.31	5.05	21.4
				$\bar{X}$		12.04	17.36	0.536	2.340	4.057	21.63
				S		0.32	0.29	0.100	0.838	0.615	0.16

Table B-17

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Standard Settings (A = 0; HP @ 50 MPH = Std.) Test: FTP - Bag 3

Test Date	Test Number	Odometer (miles)	Dynamometer Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.) Veh.	Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
05/24/84	84-3915	38613	17.25	12.2	10.1	11.8	17.3	0.51	1.93	3.58	21.2
06/22/84	84-4666	38954	17.25	12.2	10.1	12.2	17.3	0.56	1.47	3.72	21.7
07/17/84	84-4994	39193	17.25	12.0	10.1	12.4	17.3	0.35	1.24	3.81	21.9
08/08/84	84-5000	39374	17.25	12.2	10.1	12.1	17.3	0.37	1.63	4.28	21.3
08/29/84	84-6050	39550	17.25	12.2	10.1	12.0	17.3	0.58	1.57	5.02	21.4
09/12/84	84-6263	39715	17.25	12.2	10.1	12.2	17.3	0.52	1.26	6.00	21.6
				$\bar{X}$		12.12	17.30	0.482	1.517	4.402	21.52
				S		0.20	0.00	0.098	0.257	0.943	0.26

Table B-18

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Bag 3
First Alternative Setting
(A = 1; HP @ 50 MPH = Std.)

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Dynamometer: Coastdown Time (sec.) Veh.	Dynamometer: Coastdown Time (sec.) Dyno.	Emissions (g/mile) HC	Emissions (g/mile) CO	Emissions (g/mile) NOx	Fuel Economy (MPG)
06/08/84	84-3919	38714	17.25	12.2	10.1	11.9	17.3	0.66	2.58	3.28	21.4
06/26/84	84-4668	38994	17.25	12.2	10.1	12.0	17.3	0.44	2.45	3.79	21.2
07/18/84	84-4996	39224	17.25	12.2	10.1	12.1	17.3	0.49	1.93	4.13	21.4
08/30/84	84-6067	39582	17.25	12.2	10.1	12.3	17.3	0.46	2.07	4.88	21.2
09/04/84	84-6116	39626	17.25	12.2	10.1	12.1	17.3	0.53	1.15	5.49	21.5
				$\bar{X}$		12.08	17.30	0.516	2.036	4.314	21.34
				S		0.15	0.00	0.087	0.562	0.878	0.13

Table B-19

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Bag 3
Second Alternative Setting
(A = 0; HP @ 50 MPH = (Std. +1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/11/84	84-3943	38349	17.25	13.2	11.1	11.5	16.0	0.65	5.43	3.09	20.4
06/13/84	84-3949	38792	17.25	13.2	11.1	11.6	16.0	0.43	1.97	3.25	21.1
07/05/84	84-3955	39082	17.25	13.2	11.1	11.5	16.0	0.55	3.02	3.71	21.0
07/25/84	84-3959	39272	17.25	13.2	11.1	11.8	16.0	0.52	1.52	4.24	21.2
08/17/84	84-3963	39421	17.25	13.2	11.1	-	-	0.38	1.44	4.63	21.0
09/07/84	84-6175	39665	17.25	13.2	11.1	11.5	16.1	0.49	1.14	5.52	21.2
					$\bar{X}$	11.58	16.02	0.503	2.420	4.073	20.98
					S	0.13	0.05	0.095	1.614	0.917	0.30

Table B-20

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: FTP - Bag 3
Third Alternative Setting
(A = 1; HP @ 50 MPH = (Std. +1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Act. HP	Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/22/84	84-3947	38549	17.25	13.2	11.1	11.3	16.0	0.57	3.07	3.44	20.5
06/14/84	84-3951	38823	17.25	13.2	11.1	11.4	15.9	0.63	2.40	3.59	21.1
06/15/84	84-3953	38863	17.25	13.2	11.1	11.4	15.9	0.50	1.30	3.60	21.2
07/10/84	84-3957	39122	17.25	13.2	11.1	11.6	15.9	0.44	2.42	3.88	20.9
07/26/84	84-3961	39303	17.25	13.2	11.1	11.8	16.0	0.55	1.42	4.43	21.0
08/23/84	84-5978	39468	17.25	13.2	11.1	11.5	16.0	0.54	1.22	4.93	21.0
					$\bar{X}$	11.50	15.95	0.538	1.972	3.478	20.95
					S	0.18	0.06	0.064	0.763	1.515	0.24

Table B-21

Vehicle: Oldsmobile Cutlass Dynamometer: Hydrokinetic (D208) Test: HFET

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
06/07/84	84-3918	38701	17.25	12.2	10.1	11.6	17.5	0.126	0.79	2.45	26.42
06/12/84	84-4663	38770	17.25	12.2	10.1	11.7	17.5	0.093	0.26	2.43	26.57
06/19/84	84-4665	38918	17.25	12.2	10.1	11.9	17.6	0.089	0.26	2.41	26.74
06/27/84	84-4671	39039	17.25	12.2	10.1	12.4	17.4	0.091	0.20	2.56	26.82
07/11/84	84-4993	39164	17.25	12.2	10.1	12.2	17.6	0.101	0.50	2.64	26.31
08/07/84	84-4999	39353	17.25	12.2	10.1	12.4	16.9	0.122	0.76	3.25	25.89
				$\bar{X}$		12.03	17.42	0.104	0.462	2.623	26.46
				S		0.35	0.26	0.016	0.264	0.319	0.34

Table B-22

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Standard Settings (A = 0; HP @ 50 MPH = Std.) Test: HFET

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/24/84	84-3916	38645	17.25	12.2	10.1	11.8	17.3	0.098	0.60	2.62	26.30
06/22/84	84-4667	38955	17.25	12.2	10.1	12.2	17.3	0.093	0.27	2.48	27.14
07/17/84	84-4995	39203	17.25	12.2	10.1	12.4	17.3	0.086	0.40	2.40	26.80
08/08/84	84-5001	39385	17.25	12.2	10.1	12.1	17.3	0.096	0.54	2.85	25.99
08/29/84	84-6051	39561	17.25	12.2	10.1	12.0	17.3	0.066	0.15	3.34	26.36
09/12/84	84-6264	39726	17.25	12.2	10.1	12.2	17.3	0.076	0.31	4.72	26.34
				$\bar{X}$		12.12	17.30	0.086	0.378	3.068	26.49
				S		0.20	0.00	0.013	0.170	0.877	0.41

Table B-23

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: HFET
First Alternative Setting
(A = 1; HP @ 50 MPH = Std.)

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/23/84	84-3914	38592	17.25	12.2	10.1	-	-	0.099	0.44	2.36	27.20
06/08/84	84-3920	38730	17.25	12.2	10.1	11.9	17.3	0.109	0.61	2.40	26.69
06/26/84	84-4669	39004	17.25	12.2	10.1	12.0	17.3	0.096	0.42	2.42	26.79
07/18/84	84-4997	39325	17.25	12.2	10.1	12.1	17.3	0.076	0.19	2.62	26.51
08/30/84	84-6068	39593	17.25	12.2	10.1	12.3	17.3	0.077	0.32	3.24	26.33
09/04/84	84-6117	39637	17.25	12.2	10.1	12.1	17.3	0.068	0.13	3.77	26.44
					$\bar{X}$	12.08	17.30	0.088	0.352	2.802	26.66
					S	0.15	0.00	0.016	0.176	0.577	0.31

Table B-24

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: HFET
Second Alternative Setting
(A = 0; HP @ 50 MPH = (Std. +1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/11/84	84-3944	38449	17.25	13.2	11.1	11.5	16.0	0.129	0.94	2.47	25.35
05/18/84	84-3946	38520	17.25	13.2	11.1	-	-	0.120	1.06	2.79	25.26
06/13/84	84-3950	38802	17.25	13.2	11.1	11.6	16.0	0.098	0.48	2.41	26.31
07/05/84	84-3956	39093	17.25	13.2	11.1	11.5	16.0	0.124	1.10	2.55	25.70
07/25/84	84-3960	39282	17.25	13.2	11.1	11.8	16.0	0.079	0.15	3.14	22.65
08/17/84	84-3964	39432	17.25	13.2	11.1	-	-	0.095	0.58	3.18	25.32
09/07/84	84-6176	39676	17.25	13.2	11.1	11.5	16.1	0.060	0.04	3.25	25.19
				$\bar{X}$		11.58	16.02	0.101	0.621	2.827	25.19
				S		0.13	0.05	0.025	0.429	0.361	1.18

Table B-25

Vehicle: Oldsmobile Cutlass Dynamometer: Electric (D214) Test: HFET
Third Alternative Setting
(A = 1; HP @ 50 MPH = (Std. +1))

Test Date	Test Number	Odometer (miles)	Dynamometer: Roll Spacing (in.)	Dynamometer: Act. HP	Dynamometer: Ind. HP	Coastdown Time (sec.): Veh.	Coastdown Time (sec.): Dyno.	Emissions (g/mile): HC	Emissions (g/mile): CO	Emissions (g/mile): NOx	Fuel Economy (MPG)
05/22/84	84-3948	38660	17.25	13.2	11.1	11.3	16.0	0.122	0.90	2.64	25.50
06/14/84	84-3952	38842	17.25	13.2	11.1	11.4	15.9	0.092	0.32	2.58	26.25
06/15/84	84-3954	38874	17.25	13.2	11.1	11.4	15.9	0.085	0.13	2.61	25.89
07/10/84	84-3958	39132	17.25	13.2	11.1	11.6	15.9	0.091	0.40	2.60	25.79
07/26/84	84-3962	39314	17.25	13.2	11.1	11.8	16.0	0.075	0.29	2.71	25.88
08/23/84	84-5977	39479	17.25	13.2	11.1	11.5	16.0	0.068	0.19	3.07	25.67
				$\bar{X}$		11.50	15.95	0.089	0.372	2.702	25.83
				S		0.18	0.06	0.019	0.276	0.186	0.25