3. CHARACTERISTICS OF MDVs AND LHDVs

The two major categories of on-road trucks are "light-duty" and "heavy-duty". Under California law, heavy-duty trucks are those trucks with a gross vehicle weight rating in excess of 6,000 pounds. Near the 6,000 GVW end of the category, many of the heavy-duty vehicles are simply "uprated" light duty trucks (pickup trucks and vans) with stronger springs, larger tires, and other refinements to allow them to safely carry heavier loads. Many of these vehicles weigh no more than medium or large passenger cars (e.g., ≈4,000 pounds) when unladen and they have a power-to-weight ratio similar to typical passenger cars. At the opposite end of the spectrum, there are large Diesel-powered "tractors" for pulling multiple semi-trailers that are rated in excess of 100,000 pounds GVW.

With such large differences in vehicles classified as "heavy-duty", it has been necessary to divide them into a number of subcategories for regulatory purposes. Heavy-duty vehicles are often referred to by the Motor Vehicle Manufacturers Association (MVMA) classification scheme. MVMA has established eight categories based on GVW ranging from Class 1 (0-6000 lbs GVW) to Class 8 (>33,000 GVW). The sales of all trucks by MVMA category is illustrated in Figure 7.

Truck Population Distribution by GVW

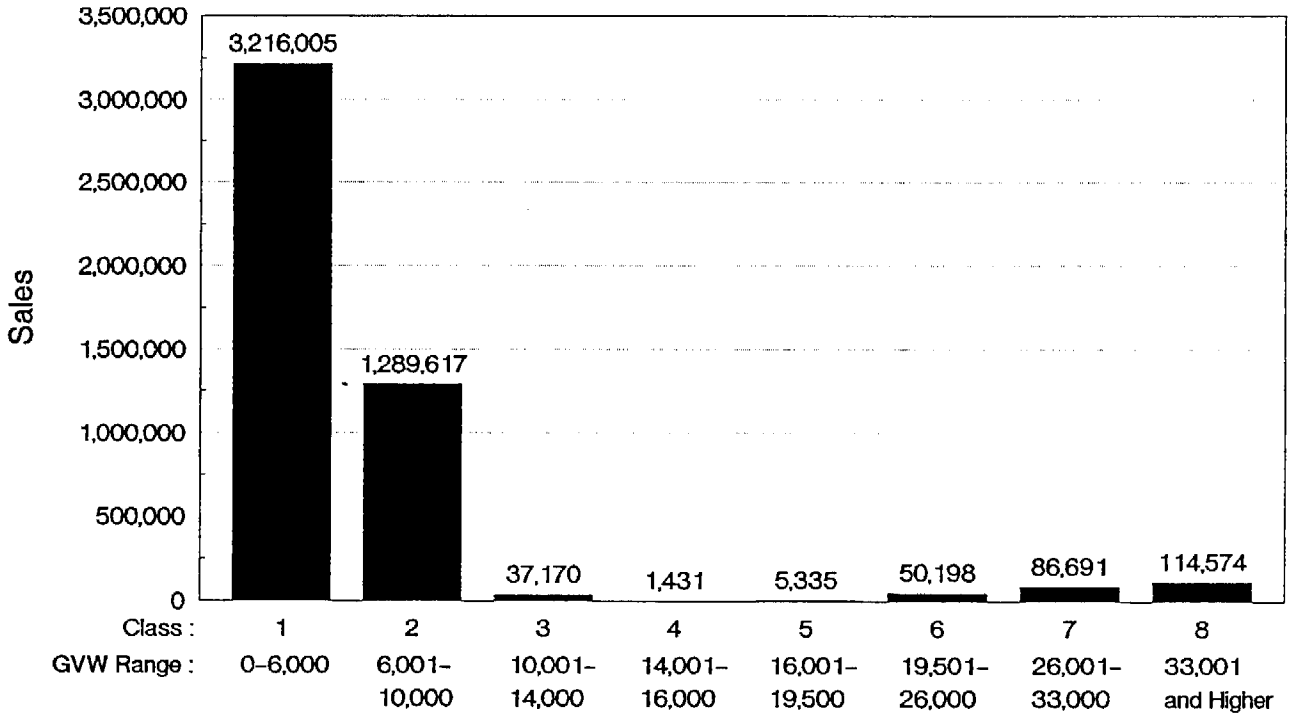
As illustrated in Figure 7, light-duty trucks (Class 1) are sold in the greatest numbers. In 1986, the 3.2 million light-duty trucks sold in the U.S. accounted for 67% of all truck sales. The first heavy-duty class, Class 2, covers vehicles from 6,001 to 10,000 pounds GVW. The 1.3 million Class 2 sales accounted for 27% of all trucks, and 81% of all heavy-duty trucks.

Class 2 is subdivided into Class 2A (6,001-8,500 GVW) and Class 2B (8,501-10,000 GVW). The range of weights covered by Class 2A is identical to that covered by ARB's "medium-duty vehicle" category. Based on the Truck Inventory and Use Survey, about 85% of Class 2 vehicles are in the 2A (6,001-8,500) subcategory. However, recent sales estimates obtained from Ford, indicate that a shift toward the 2B category may be occurring and the fraction of 6,001-8,500 pound vehicles in Class 2 may be dropping to about 75%.

Class 2B (8,501-10,000) and Class 3 (10,001-14,000) comprise the "light-heavy-duty" category that has been defined by EPA. (Class 2A is not included in this category because EPA considers all trucks ≤8,500 GVW to be "light-duty trucks".) Vehicles in the light-heavy-duty category are mostly large pickup trucks and vans, and specialty

Figure 7

Distribution of Truck Sales by GVW Class (1986)



Source :
Automotive News, 1987 Market Data Book

vehicles (such as motor homes) built on pickup or van chassis. These vehicles closely resemble those in the "medium-duty" category.

Beyond the light-heavy-duty category, there is overlap between the EPA and MVMA classifications. EPA's "medium-heavy-duty" category includes all of MVMA Classes 3-7 and Class 8 trucks up to 50,000 pounds GVW. Medium-heavy-duty vehicles include school buses, and a variety of pickup and delivery type vehicles. "Heavy-heavy-duty" vehicles are the large tractor-trailer combinations intended for long distance freight and heavy hauling applications.

Operational Characteristics

Because the medium-duty trucks are so similar to light-duty trucks, they have been subject to emission standards based on the same chassis dynamometer test procedures used for passenger cars and light trucks. However, a feature of the light-duty test procedure is testing of the vehicle with the dynamometer adjusted to simulate only 300 pounds of load. As a result, emission control systems do not have to be

designed to control emissions under operation at higher engine loads. Since trucks are frequently used to carry cargo, the lack of required control at higher loads might be expected to result in increased emissions in customer service.

To investigate the extent to which relatively high vehicle loads might be occurring in actual customer service, an analysis was conducted of owner responses to the following questions asked in the 1982 Truck Inventory and Use Survey (TIUS) conducted by the U.S. Bureau of the Census:

- What is the weight of this vehicle or vehicle/trailer combination when empty?

- What was the average weight of the vehicle or vehicle/trailer combination when carrying a typical payload during the past year?

- What was the maximum gross weight (MGW) at which this vehicle or vehicle/trailer combination was operated?.

The questionnaire noted that "an estimate is acceptable". The questionnaire also requested the license number and the vehicle identification number (VIN) of the vehicle. The Bureau of the Census sent copies of the VIN's to appropriate vehicle manufacturers and requested that they identify the gross vehicle weight (GVW) rating of the vehicle.

An estimate of the average loads that vehicles registered in California experience was computed using the above information. The TIUS data base was first sorted and a subset of the vehicles registered in California was created. That data set was then reviewed for inconsistencies using the following criteria:

- review of missing fields - records were excluded if the following information was not included: area of operation, weight category, fuel type, annual miles of operation.

- screen for outliers - records were rejected if unusually high VMT or fuel economy levels were noted.

This review eliminated approximately 15 percent of the records from the data base. The file was next sorted into GVW ratings for gasoline vehicles. Five values were computed for each GVW category:

- average empty weight;

- average weight;

- average maximum weight;

- average of the difference between the empty weight and the average weight reported for each vehicle;

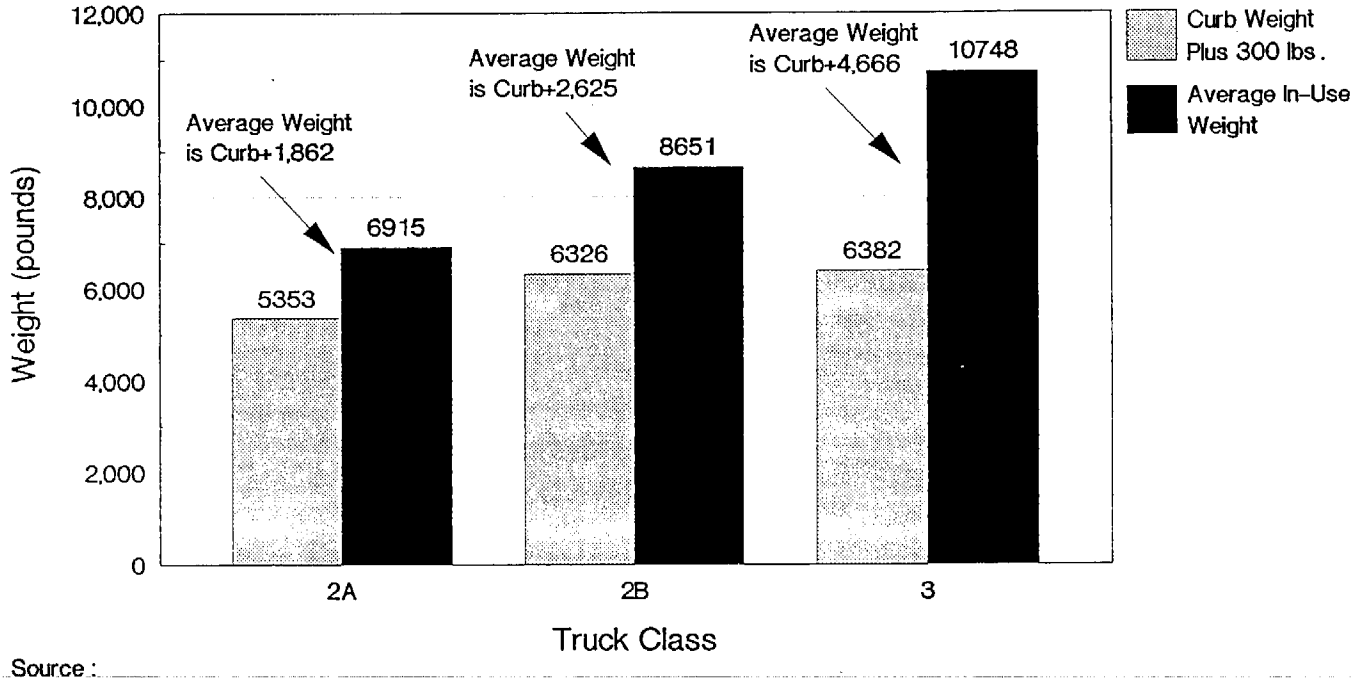
- average of the difference between the empty weight and the maximum gross weight reported for each vehicle.

The empty weight, average weight and maximum weight values were reviewed for reasonableness. The reported empty weight and average weight information is shown in Figure 8. (Specific data were not available to distinguish between class 2A and 2B vehicles so all vehicles reporting a maximum load of over 8,500 lbs were assumed to be class 2B trucks.) As the figure shows, the average weight reported for each class is greatly in excess of curb weight plus 300 pounds.

Since the information used to estimate the average loading that vehicles experience is based largely on perceptions of the owner, the confidence limits around these estimates are certain to be larger than if the data were based on actual weight measurements. However, the owners of heavy-duty trucks have paid a premium price for cargo-carrying capacity that is not available in less-expensive, light-duty trucks. These owners would appear to be more likely to know the cargo-carrying capacity of their vehicles than would the typical owners of passenger cars and light-trucks.

Figure 8

Loading of Medium-Duty and Light-Heavy-Duty Gasoline Vehicles



Source :
1982 California Truck Inventory and Use Survey

Emission Control System Use

A review of the available certification records indicates that the emissions control system usage for medium- and light-heavy-duty vehicles is fundamentally different. First, there are no longer any Diesel-powered vehicles certified in the medium-duty category. The 0.2 gram per mile particulate standard has eliminated them from the California market pending the development of a successful particulate trap. In the light-heavy-duty class, Diesels are increasing in popularity and are now estimated to account for approximately 20% of the vehicles sold.

The second significant difference between MDVs and LHDVs is that all gasoline-powered medium-duty vehicles are equipped with 3-way catalyst control systems, but many light-heavy-duty engines still use oxidation catalysts. (Ford has certified relatively high sales volume light-heavy-duty engines equipped with 3-way catalysts.) As discussed in the following section of the report, this difference reflects the fact that light-heavy-duty vehicles are currently subject to less stringent NOx emission standards.

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4. COMPARATIVE STRINGENCY OF EMISSION STANDARDS

Because of the severity of the air pollution problem in California, it has generally been ARB's policy to require the most stringent emission controls technologically and economically feasible. There are numerous measures of the "stringency" of a set of vehicle emission standards. They include:

1) the percentage reduction in uncontrolled emissions required to meet the standards,

2) the absolute level of "grams per mile" of emissions allowed, and

3) the "grams per unit of work" (g/bhp-hr) done by the engine.

The percentage reduction from uncontrolled emissions is not always a good indication of the stringency of a set of standards because the uncontrolled baseline can be quite different for different vehicle categories. A high percentage reduction is easy to achieve if the uncontrolled baseline includes a large number of high polluting vehicles that are easy to clean up (as was the case with HC emissions from motorcycles). On the other hand, it can be very difficult to achieve a high percentage reduction if the uncontrolled baseline emissions are difficult to reduce (as was the case with the HC and CO emissions from Diesel-powered passenger cars).

The grams per mile level of the emission standard is not a fair measure of stringency when there are significant differences in the size or function of the vehicles. Grams/mile emission limits that are applied to small "mini-pickup" trucks would not be reasonable for "line haul" tractor-trailer rigs that haul large amounts of freight in intercity and interstate commerce.

The grams/bhp-hr level of the emission standard is not a good measure of stringency when the efficiency of the vehicle design can contribute significantly to the emissions of the vehicle. With equally efficient engines, a box-shaped (non-aerodynamic) car with an inefficient transmission and overweight chassis would have significantly higher emissions than a vehicle using light-weight and efficient components.

Emission standards for passenger cars are currently expressed in terms of "grams per mile" because the primary function of most automobiles is very similar and differences in vehicle size and weight are often unrelated to the utility of the vehicle. (There are two-to-one differences in vehicle weight for passenger cars of equal occupant capacity.) Emission standards for heavy-duty truck engines are

expressed in "grams per brake horsepower hour" because it is assumed that most heavy-duty trucks are utilitarian vehicles that are only as big as they need to be in order to accomplish their intended function. Because the basis for the standards is fundamentally different, a comparison of the stringency of different emission standards is not straightforward.

In this section of the report, the current emission standards for medium- and light-heavy-duty vehicles are compared to uncontrolled levels. However, the emissions of cars and trucks of various capacities are compared based on the amount of fuel consumption required for the vehicle to perform its intended function.

Comparisons Based on Percent Reductions and Emissions Rate

Medium-Duty Standards - Since the implementation of exhaust emissions standards for heavy-duty engines (HDEs) in the 1969 model year, progressively more stringent exhaust emission standards have been adopted for engines used in vehicles above 6,000 pounds GVW. When the 1989 model year emission standards for medium-duty vehicles go into effect, the required reduction from uncontrolled emission levels will be about 90% for HC and CO, and 75-90% for NOx. Estimated uncontrolled emission levels and 1989 California standards for medium-duty trucks are shown in Table 5. The 1989 standards for passenger cars are also shown for comparison. On a grams per mile basis, the medium-duty vehicle emission standards for the lightest test weight class are very similar.

Table 5

Medium-Duty Vehicle Emissions
Uncontrolled vs. 1989

	grams/mile		
	HC	CO	NOx
Uncontrolled Emissions	≈7	≈80	4-6
1989 Medium-Duty Standards:			
≤3,750 Test Weight (MDV1)	0.39	9.0	0.4
3,751-5,750 Test Weight (MDV2)	0.50	9.0	1.0
5,751-8,500 Test Weight (MDV3)	0.60	9.0	1.5
(1989 Passenger Car Standards	0.39	7.0	0.4)

To achieve the 1989 emission standards, medium-duty vehicles require the same basic emissions control technology applied to late model passenger cars. Elements of the required system include 1) a 3-way catalyst to provide simultaneous reductions of HC, CO, and NOx emissions, 2) an oxygen sensor and feedback control system to maintain air/fuel ratio at the chemically correct ratio needed for optimum catalyst performance, and 3) an EGR system with flow proportional to engine load to reduce NOx emissions without significantly affecting HC emissions or driveability.

Light-Heavy-Duty Standards - The control of exhaust emissions from heavy-duty gasoline engines has not paralleled the control of medium-duty trucks. Not until 1987 were "catalyst forcing" standards implemented. Since the implementation of exhaust emissions standards for heavy-duty gasoline engines in the 1970 model year, exhaust emission levels from new trucks have been reduced by approximately 90% for HC and CO, but NOx emissions have hardly been reduced at all. In 1991 the NOx standards will be tightened, but the level of control will be only 25% below uncontrolled levels. The uncontrolled emission levels[3] and California standards for light-heavy-duty gasoline engines (≤14,000 pounds GVW) are shown in Table 6. Also included in the table is an estimate of what the emission standards from the average 1991 LHDV would be on a grams/mile basis. (The estimate is based on conversion factors developed under an ARB contract.[4])

Table 6

Light-Heavy-Duty Gasoline Engine Emissions
Uncontrolled vs. 1988-1991

	g/bhp-hr		
	HC	CO	NOx
Uncontrolled Emissions	10.9	155.0	6.7
1988 California Standards	1.1	14.4	6.0
1991 California Standards	1.1	14.4	5.0
	grams/mi		
Estimated 1991 LHDV Emissions in Grams/Mile (NMHC)	0.72	11.1	3.9

The grams/mile estimated for MDVs might be expected to be lower since they are smaller vehicles. However, the current standards for medium-duty vehicles are also more stringent based on the percent of NOx reduction from uncontrolled levels. The level of hydrocarbon and

carbon monoxide control required appears to be comparable on a percentage reduction basis.

Comparisons Based on Fuel Consumption

Although the fuel economy of apparently similar cars and trucks may differ significantly, the fuel economy of vehicles on a consistent driving cycle can be accurately estimated by an equation that accounts for differences in vehicle weight, engine size, engine horsepower, overall gear ratio, and compression ratio. A regression analysis of EPA fuel economy test results by Murrell[5] produced a standard error of estimate of only 1.5 miles per gallon. The form of the equation is:

$$MPG = A(CID \times N/V)^{-4/5} + B(IW)^{-2/3} + C(HP/IW)$$
$$+ D(HP/CID) + E((CR^{.4} - 1)/CR^{.4}) + F$$

where: A, B, C, D, E, and F are constants determined by regression analysis;

CID = engine displacement in cubic inches;

N/V = engine rpm/vehicle speed in mph in top gear;

IW = vehicle test weight in pounds;

HP = horsepower rating of the engine; and

CR = compression ratio of the engine.

Using the above equation, fuel consumption for a wide range of vehicles from passenger cars to light-heavy-duty trucks tested at 14,000 pounds has been estimated. Appendix A contains the detailed results of the analysis. As shown in the Appendix, engine size, horsepower, and vehicle gearing were set to levels typical of each vehicle simulated with the model.

Figure 9 shows the truck fuel consumption values computed by the model, relative to the fuel consumption which the model predicts for two typical passenger cars, one at 3,750 pounds test weight and one at 5,500 pounds test weight. As shown in the figure, light trucks are predicted to have slightly higher fuel consumption than cars of the same weight because of their higher gearing. At 14,000 pounds test weight, a typical truck is predicted to consume twice as much fuel as a 5,550 pound car and over 2 1/2 times as much fuel as a 3,750 pound car.

Because of the greater quantities of fuel needed for heavier vehicles, there would be a proportionally greater volume of exhaust gas and emission standards would be expected to be numerically higher for equivalent stringency. As shown in Figure 10, the emission standards

Figure 9

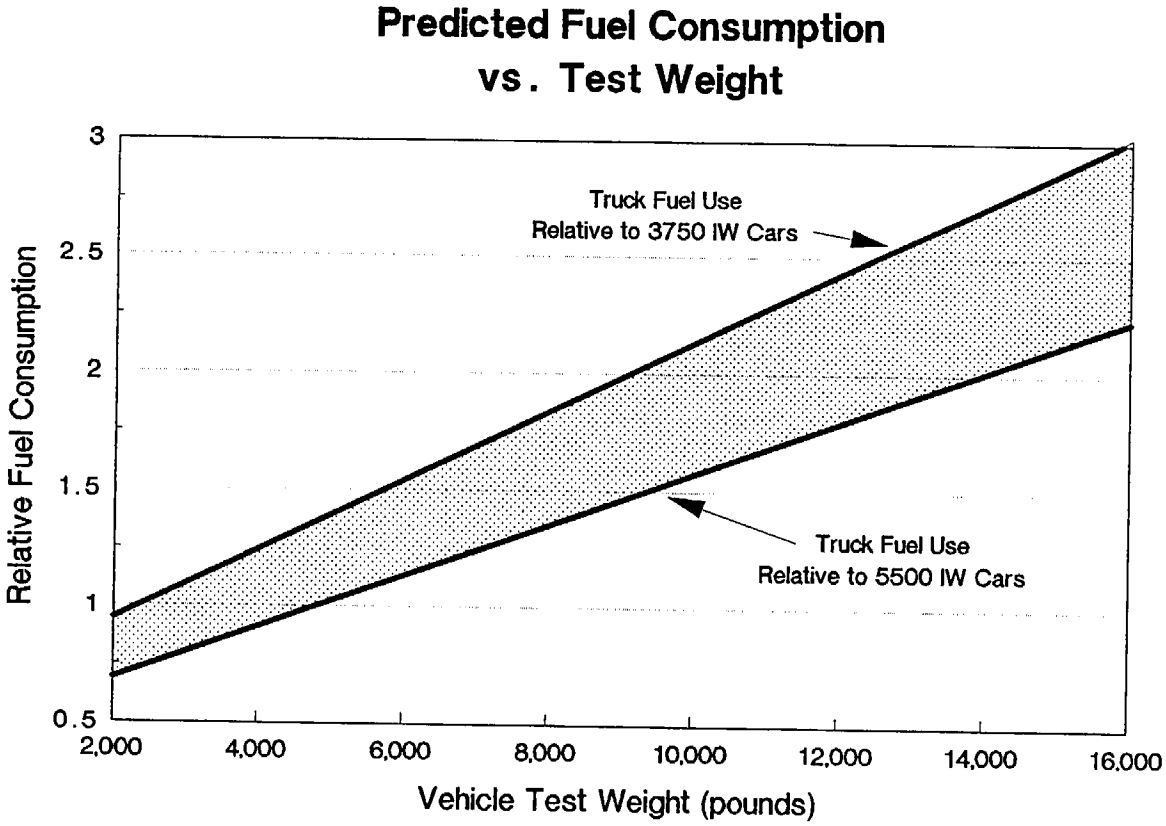
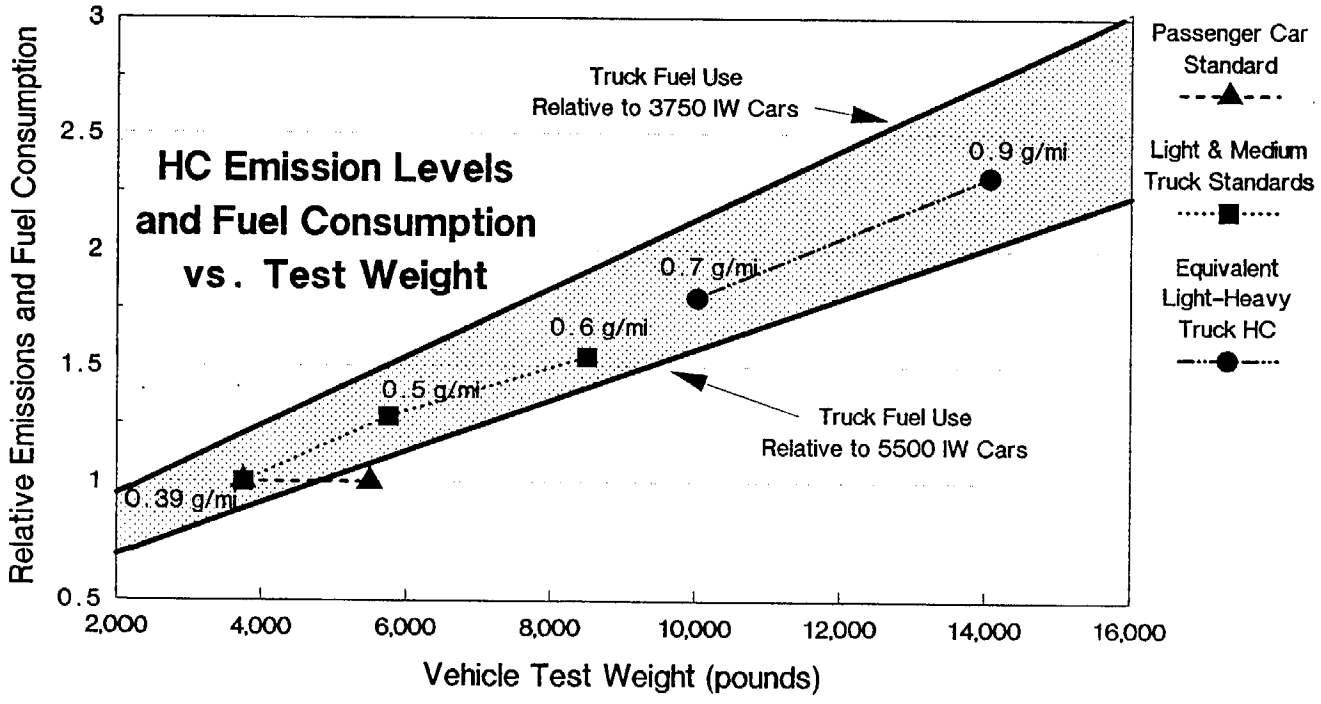


Figure 10



that have been established for medium-duty vehicles are consistent with the fuel consumption trend. The HC standards for various vehicle categories are plotted relative to the lowest standard for any one category (0.39 g/mi). Figure 10 also shows the emission standards for light-heavy-duty vehicles required to be equivalent to the medium-duty vehicle standards in terms of fuel consumption. Note that the 0.7 g/mi equivalent standard for the weight class of vehicles up to 10,000 pounds (where the bulk of the sales occur) is almost precisely equal to the gram/mile equivalent of the current engine dynamometer (g/bhp-hr) standards that were estimated in Table 6. For the up to 14,000 pound class, Figure 10 indicates that the equivalent standard would be about 0.9 g/mi.

Figure 11 shows CO emission standards for cars and light- and medium-duty trucks plotted in the same manner. Truck standards are shown relative to the numerically lower passenger car standard. Unlike the case with hydrocarbon emissions, previous standards-setting efforts did not account for differences in test weight in setting the CO standards. All cars must meet a 7.0 g/mi standard and all light- and medium-duty trucks must meet a 9.0 gram standard. Using a 3,750 pound passenger car as the benchmark and adjusting for fuel consumption, an equivalent CO level for trucks up to 10,000 pounds would be about 12 g/mi. At 14,000 pound test weight, the equivalent level of stringency would be 15 g/mi.

Figure 11

CO Emission Standards and Fuel Consumption vs. Test Weight

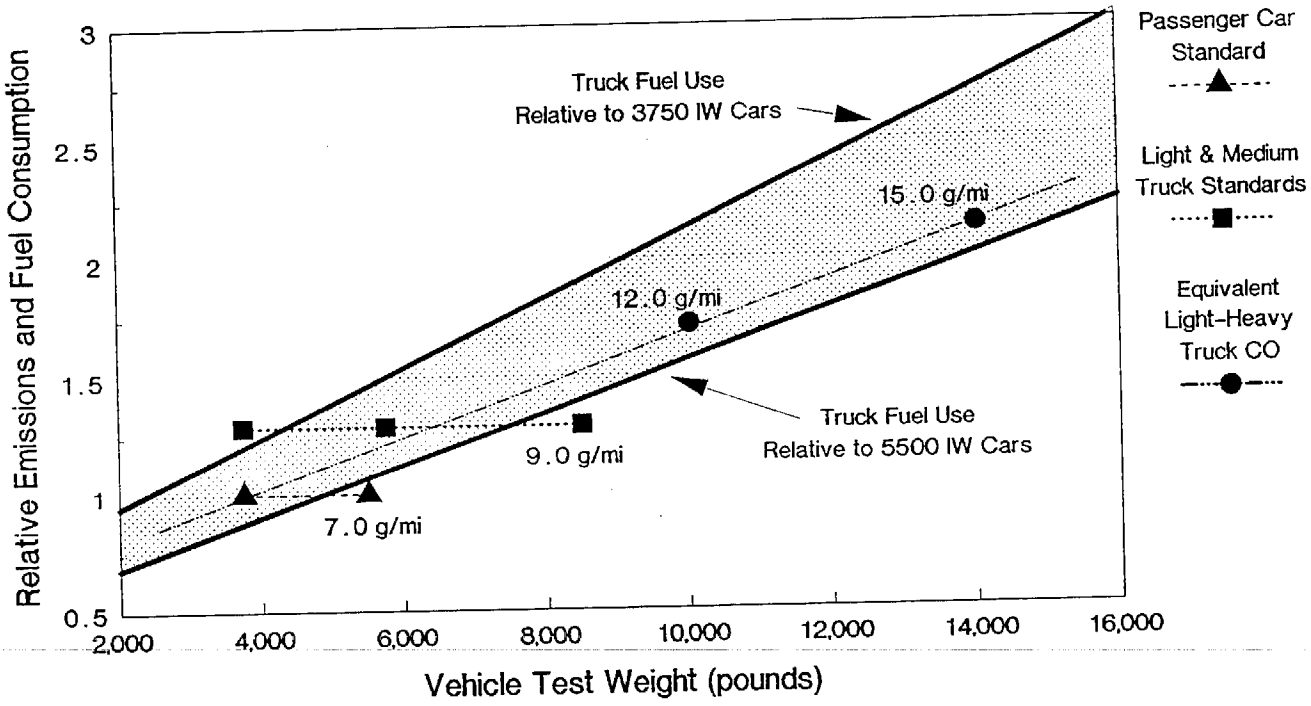
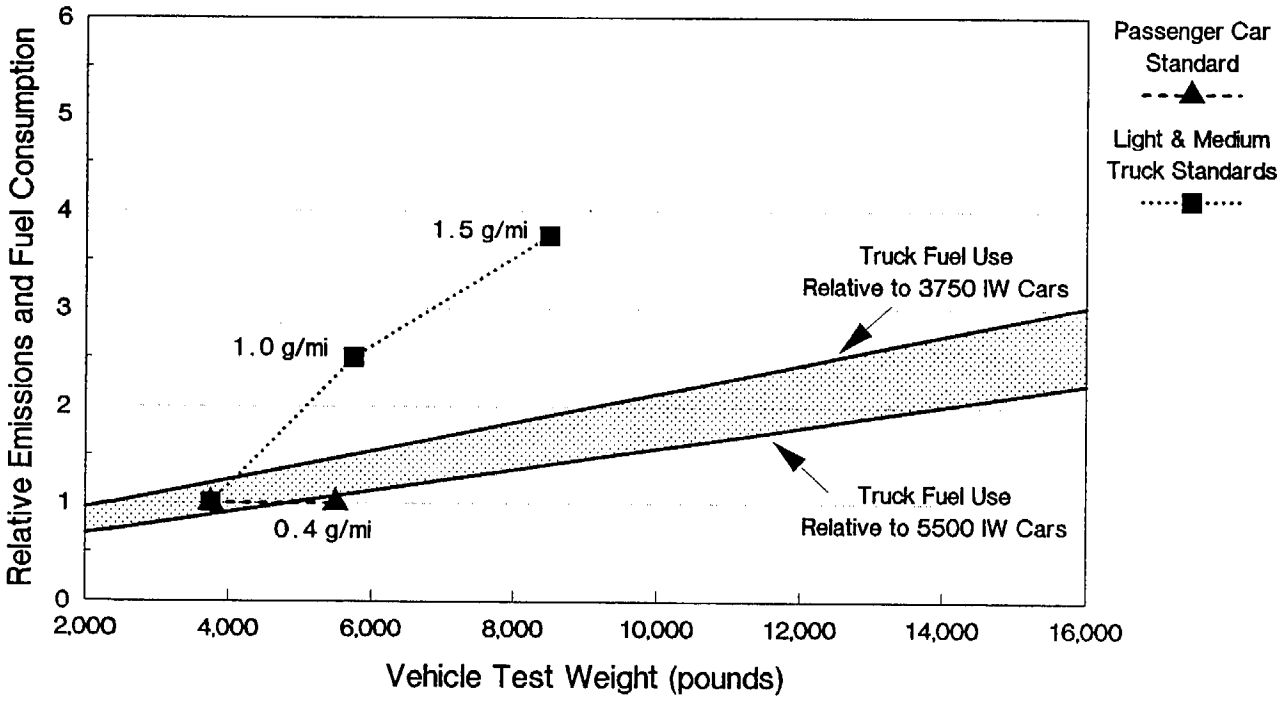


Figure 12 shows the relationship between NOx emission standards for cars and light- and medium-duty trucks. Unlike the case for HC and CO, the NOx standards for the higher test weights are well outside the envelope of relative fuel consumption vs. test weight. At first, it may appear as though the current NOx standards for heavier test weight trucks are much too lenient relative to the 0.4 g/mi standard that has been established for passenger cars and light trucks. However, there is a non-linear relationship between engine loading and NOx emissions that makes it relatively more difficult to control emissions with vehicles that require a higher fraction of available horsepower to keep up with traffic.

Figure 12

NOx Emission Levels and Fuel Consumption vs. Test Weight



The relatively higher NOx emission levels for vehicles requiring higher engine loading to keep up with the test cycle, has been estimated using an emissions simulation model (called "VEHSIME", pronounced "vee'-sime") originally developed under contract with EPA and subsequently resurrected under an ARB contract. Based on computer simulations of a Chevrolet V-8 powered pickup truck operating over a test weight range of 4,500 to 8,000 pounds, increasing test weight causes a greater increase in NOx emissions than fuel consumption.

This effect is illustrated in Figure 13. As the figure shows, the computer simulation model results indicate that the NOx emission standards for heavier test weights are not as lenient as they appear to be based on fuel consumption differences. Figure 13 also shows that the NOx standards for LHDVs would have to be in the range of 1.7-2.3 g/mi to be equivalent to the MDV standards. As shown earlier in Table 6, the current NOx standards for LHDVs appear to be much less stringent than that.

Figure 13

NOx Emission Levels
Fuel Consumption, and VEHSIME Model Results
vs. Test Weight

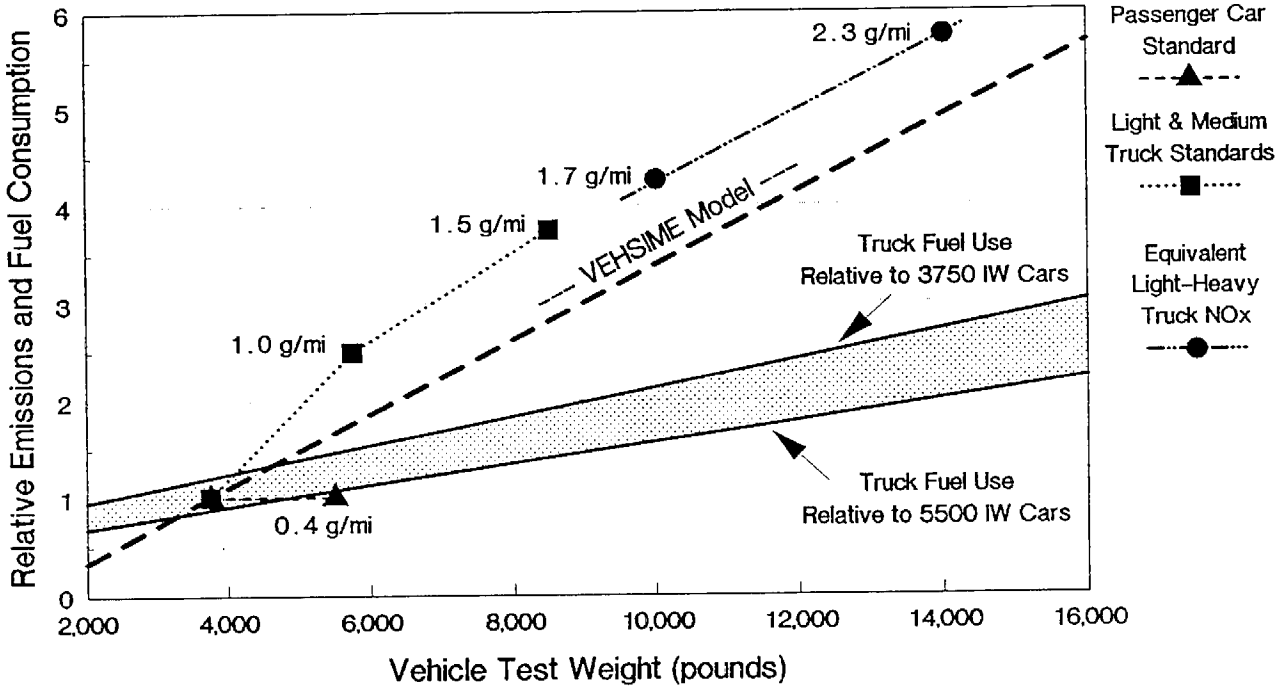
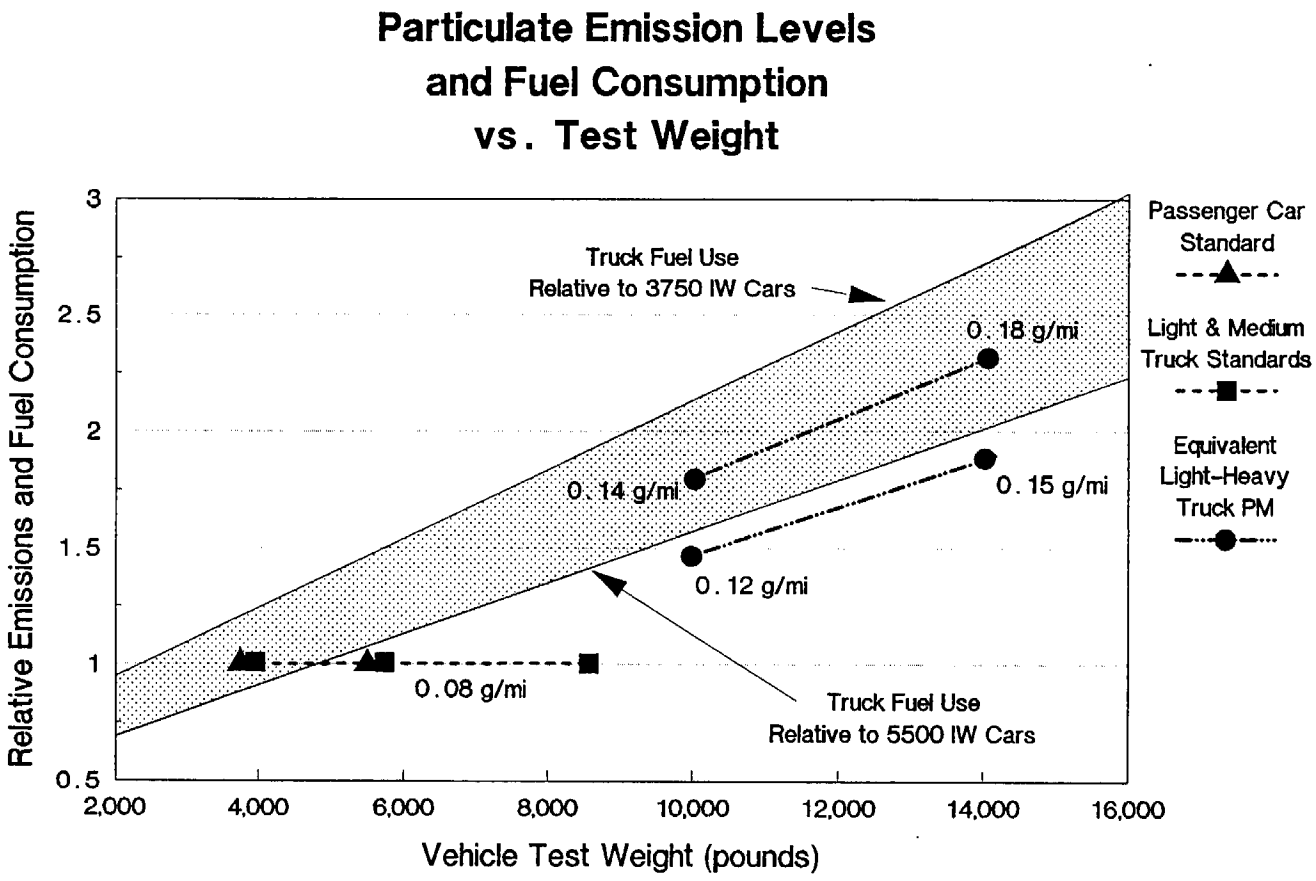


Figure 14 shows the particulate emission standards for cars, light trucks, and medium-duty trucks. As the figure shows, previously established particulate standards for these vehicle categories have not reflected any consideration of vehicle weight or fuel consumption. Based on the stringency for 3,750 pound vehicles, the fuel consumption adjusted levels for LHDVs would be in the range of 0.14 to 0.18 g/mi. Based on the stringency of the current standards for the heaviest cars and light-duty trucks, the fuel consumption adjusted equivalent levels would be 0.12 to 0.15 g/mi.

Figure 14


Particulate Emission Levels
and Fuel Consumption
vs. Test Weight
Relative Emissions and Fuel Consumption
3
2.5
2
1.5
1
0.5
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
Vehicle Test Weight (pounds)
Truck Fuel Use
Relative to 3750 lW Cars
Truck Fuel Use
Relative to 5500 lW Cars
0.18 g/mi
0.14 g/mi
0.15 g/mi
0.12 g/mi
0.08 g/mi
Passenger Car
Standard
Light & Medium
Truck Standards
Equivalent
Light-Heavy
Truck PM

###

5. EFFECT OF VEHICLE LOADING ON EMISSIONS

As discussed earlier, there is potential for large emission increases associated with the failure to test medium-duty vehicles with more than 300 pounds added to the unladen weight of the vehicle. To estimate the effect of alternative inertia weight loadings on vehicular emission levels, an emissions simulation model called "VEHSIME" has been utilized. The model uses "maps" of engine emissions over a full range of speeds and loads to compute the emission changes that occur as vehicle load or driving cycle changes. (Appendix B provides a more thorough description of how the model works.)

During one series of computer runs, the effect of payload on pickup truck emissions during operation on the standard emissions test procedure driving cycle was evaluated. The engine map selected for use in the analysis was for a Chevrolet 350 CID V-8 engine equipped with an oxidation catalyst. Simulation runs were conducted at several test weights from 4,500 to 12,000 pounds. At each of the selected inertia weight loadings, three separate runs were conducted for the following engine map permutations:

1) engine out - provided second-by-second emissions coming out of the engine without the benefit of catalytic control;

2) tailpipe - provided second-by-second emission rates at the tailpipe with normal catalytic control. (Normal control involved rich operation at high power conditions with no air injection, resulting in a loss of HC and CO emissions control.)

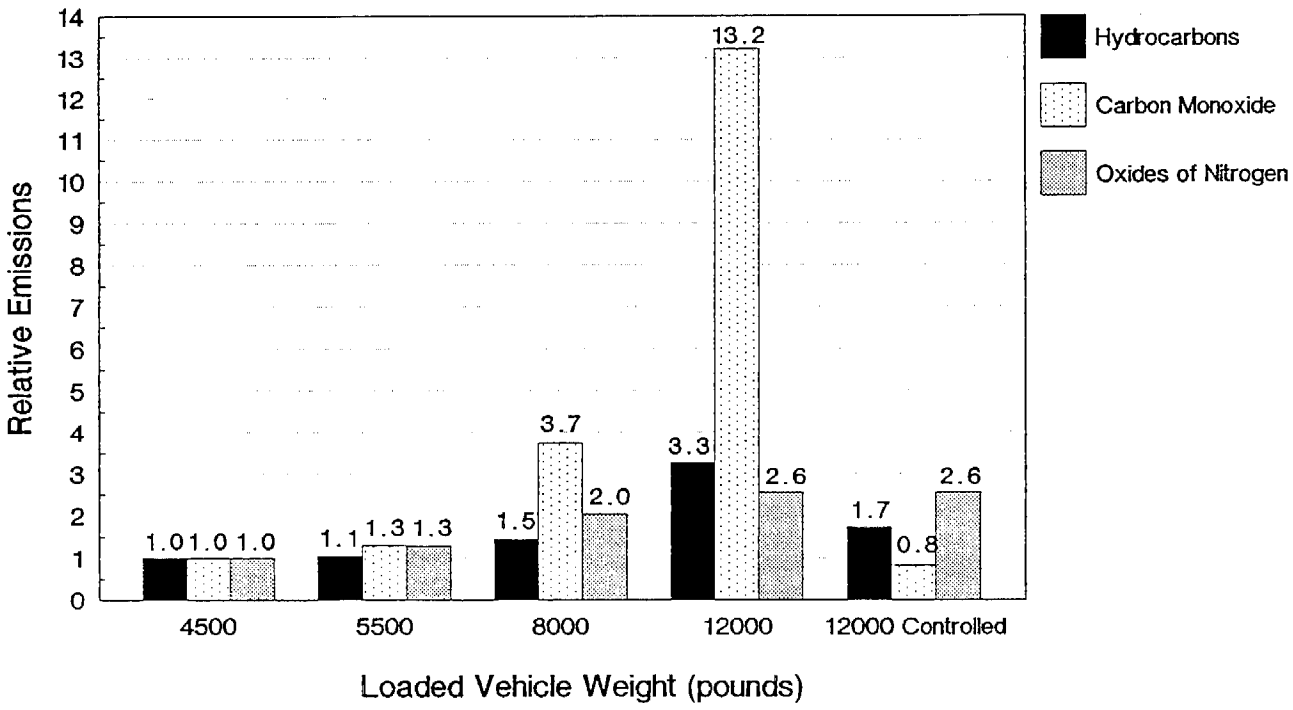
3) tailpipe with full time catalytic control - provided revised emission rates after the "normal" tailpipe engine maps were altered to reflect the the use of air injection during rich operation.

The above process produced separate second-by-second estimates of instantaneous emission levels for each pollutant as well as information on the distance covered, the computed engine speed and load points and the cumulative (grams) and grams per mile emission rates for HC, CO and NOx. An additional output was the estimated emission rate for the entire FTP.

Using the results of the above analysis, it was possible to produce a comparison of the FTP emissions at each of the inertia weight increments. Figure 15 shows a comparison of the FTP results for all three pollutants at selected inertia weight loadings. The base weight

Figure 15

VEHSIME Model Predictions of Effect of Test Weight on Exhaust Emissions



for a vehicle with that engine was selected to be 4,500 pounds. It is clear from a review of the graph that the most pronounced effect of the increased weight is on CO. The effect of increasing the weight from 8,000 to 12,000 pounds causes an enormous increase in CO. The effect on HC and NOx is less dramatic, however, there is still a significant increase in these pollutants as load increases. (Note that the emission levels shown in the figure are normalized to 1.0 at the baseline weight of 4,500 pounds. The actual predicted baseline emission rates were 0.2 g/mi HC, 3 g/mi CO, and 1.4 g/mi NOx. The HC and CO levels are relatively low because the model does not predict cold-start emissions.)

The results displayed in Figure 15 are all based on tailpipe emission levels with the exception of the last set of bars which show the results for the modified engine map with full time catalytic control for HC and CO at a 12,000 pound loading. The effect of the modified engine map produced an enormous reduction in CO under the high load levels associated with the 12,000 pound weight. In addition, there is an approximate 50% reduction in HC emissions with full-time catalytic control. The dramatic effect of the CO reduction shows that lack of catalytic control at wide open throttle conditions, while seeming innocuous, can lead to very large increases in CO levels for heavily loaded vehicles.

The source of the emissions increase under high load conditions can be seen through a review of the instantaneous emission estimates produced by the VEHSIME model. Figure 16 shows the instantaneous emission rates through the most demanding acceleration of the FTP for the baseline vehicle loading conditions for each of the three engine maps that were used (no catalyst, normal catalyst, and full-time catalyst). It shows that under the most demanding conditions of the FTP there is essentially no hint of any emission problems that could occur under more severe vehicle loads. Under those conditions there is essentially no difference between the "normal" and "full-time" catalyst emission maps, indicating that the engine is not being pushed to operate in the high load regions where catalytic control is lost.

Figure 16

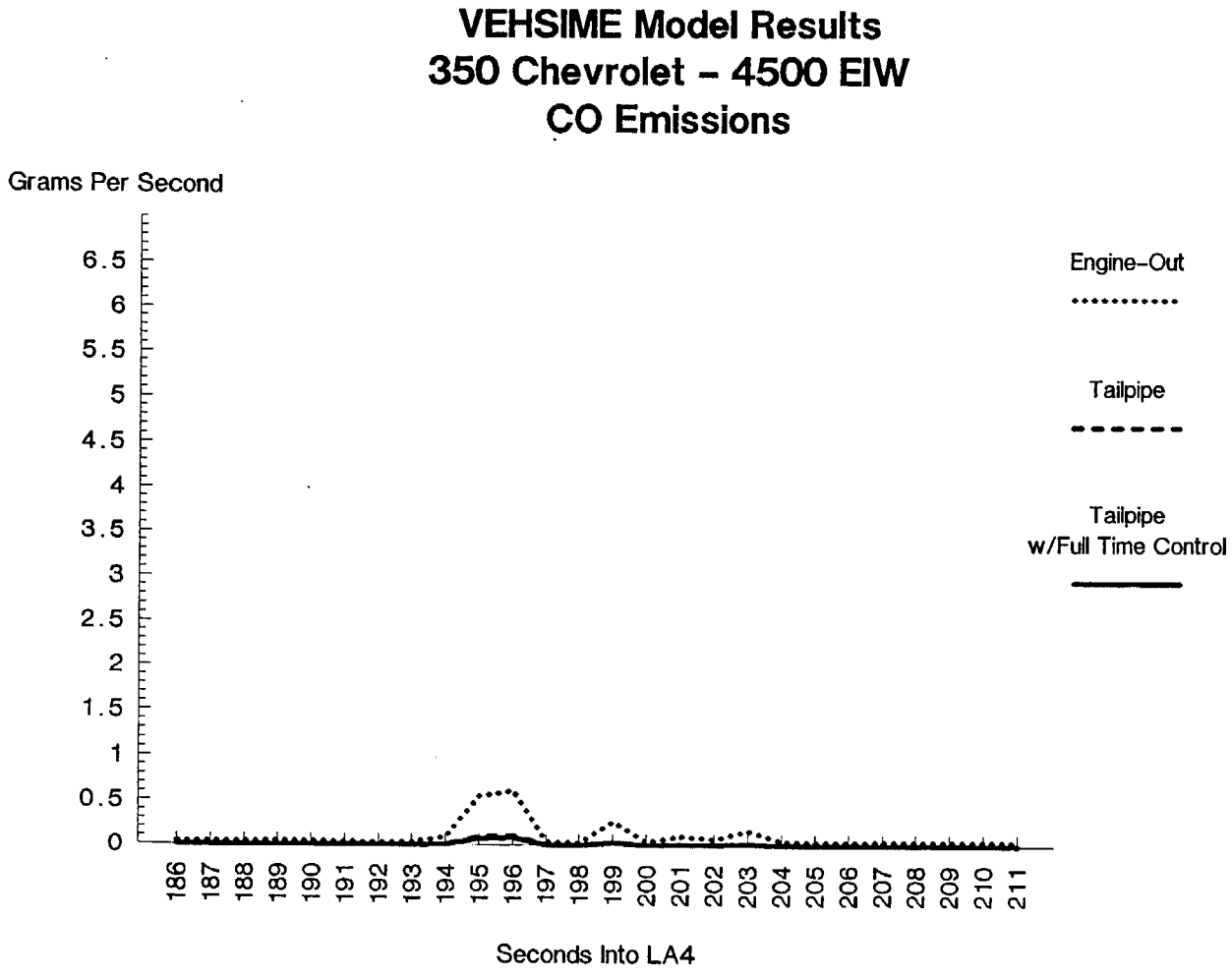


Figure 17 provides a similar plot of emissions over the same region of the FTP for a 12,000 pound test weight. The impact of the increased weight is to drive the engine into higher loads and wide open throttle with a commensurate loss in catalytic control. The result is a dramatic increase in the instantaneous emission rate for CO. As can be seen there is almost no difference between the engine out and tailpipe emission rates, indicating an almost complete loss of catalytic control. However, the effect of full-time catalytic control produces a precipitous drop in emissions that are only marginally above the levels observed at the 4,500 load.

Figure 17

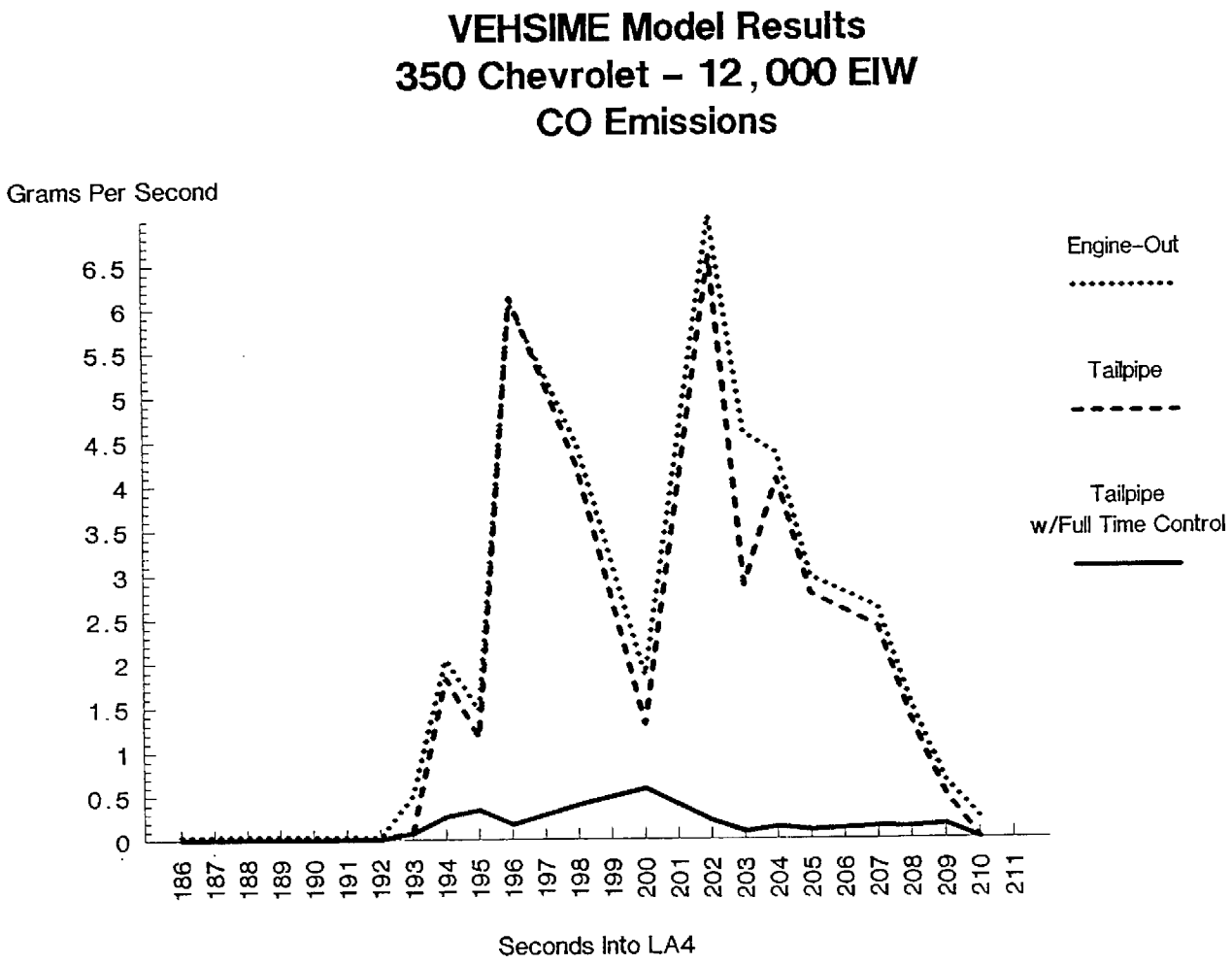


Figure 18 shows the results of a regression analysis of the vehicle emissions predictions generated with the VEHSIME model. Using the mathematical relationships shown in the figure, average in-use emissions can be predicted for medium- and light-heavy-duty trucks certified using chassis dynamometer test procedures at curb weight plus 300 pounds. The average in-use vehicle loadings assumed are those derived from the Bureau of Census Truck Inventory and Use Survey and shown earlier in Figure 8.

The results of the analysis are shown in Figures 19, 20, and 21. Estimated hydrocarbon emission increases, shown in Figure 19, are 29% for Class 2A trucks (6,001-8,500 pounds), and 45% and 101% for Class 2B (8,501-10,000) and 3 (10,001-14,000). Since all Class 2A trucks are certified using the current chassis dyno test at curb weight plus 300 pounds, the 29% increase represents the best estimate of actual in-use emission increases that may be occurring due to higher vehicle loading. For Class 2B and 3, the projected emission increases would occur only to the extent that vehicles were certified using the optional chassis test procedure. However, numerous high sales volume models have been so certified.

Figure 18

VEHSIME Model Predictions of Effect of Test Weight on Exhaust Emissions

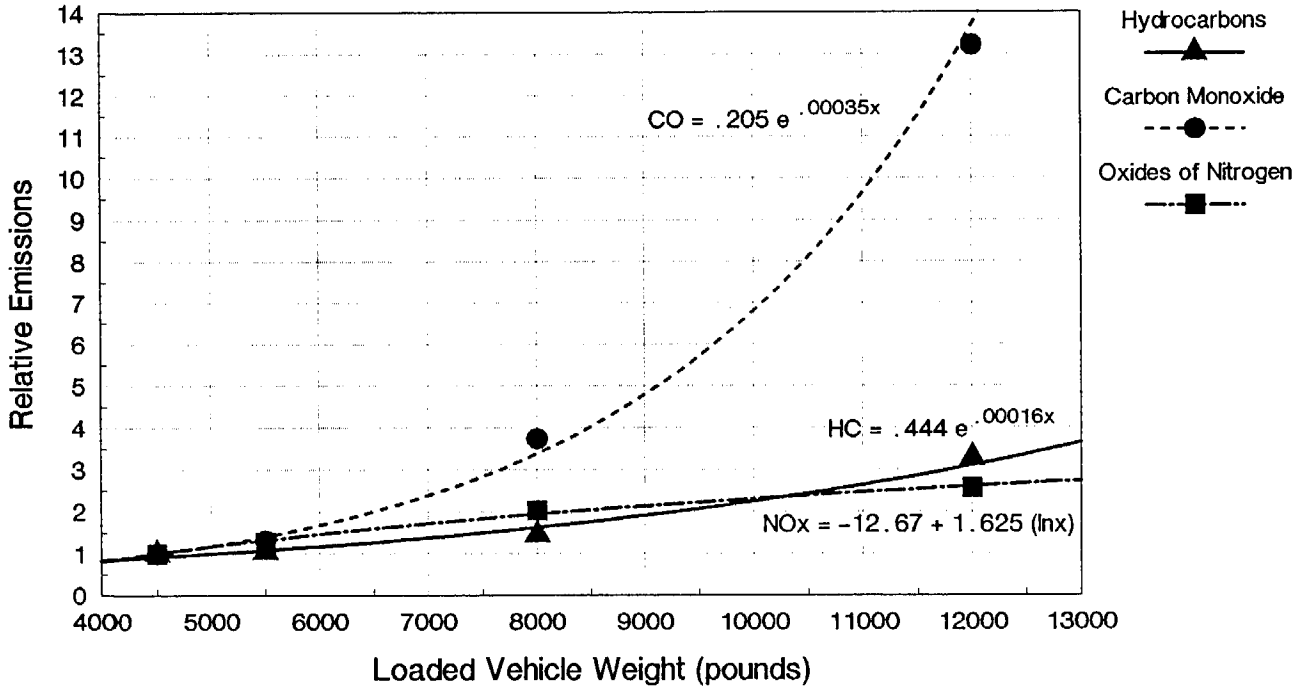


Figure 19

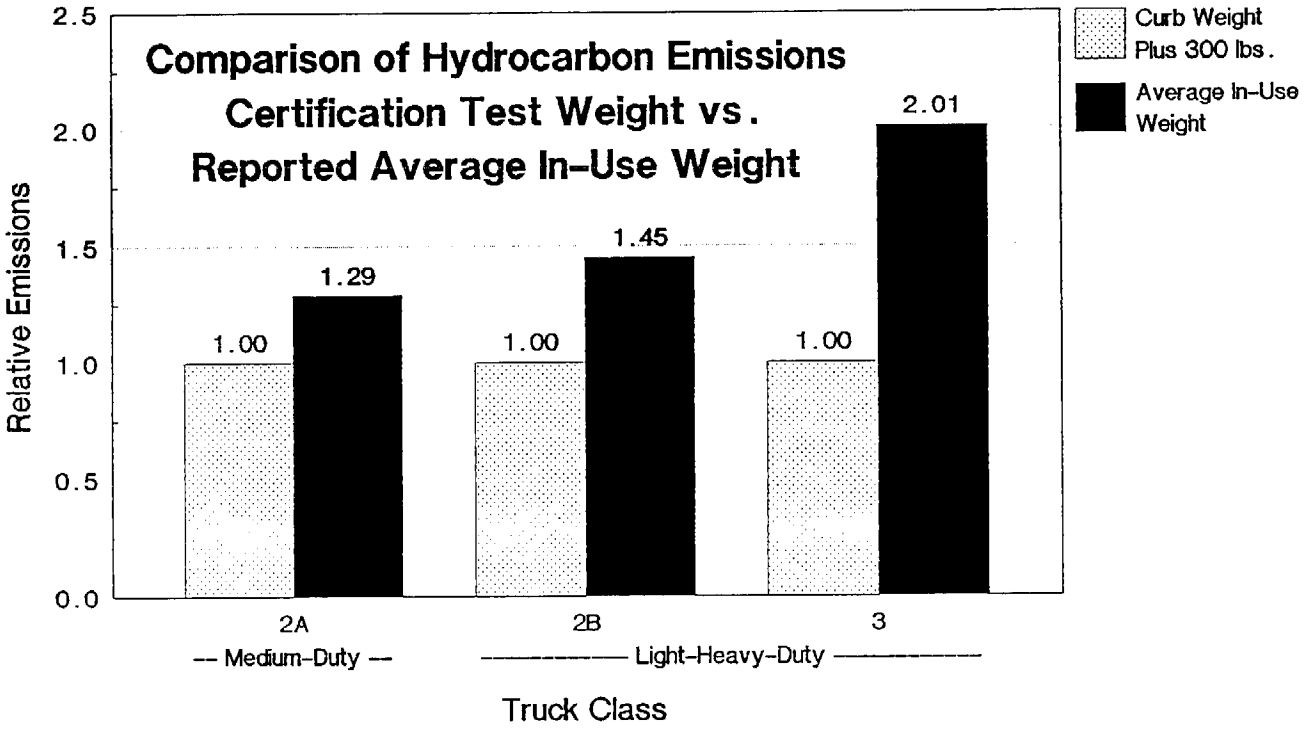


Figure 20

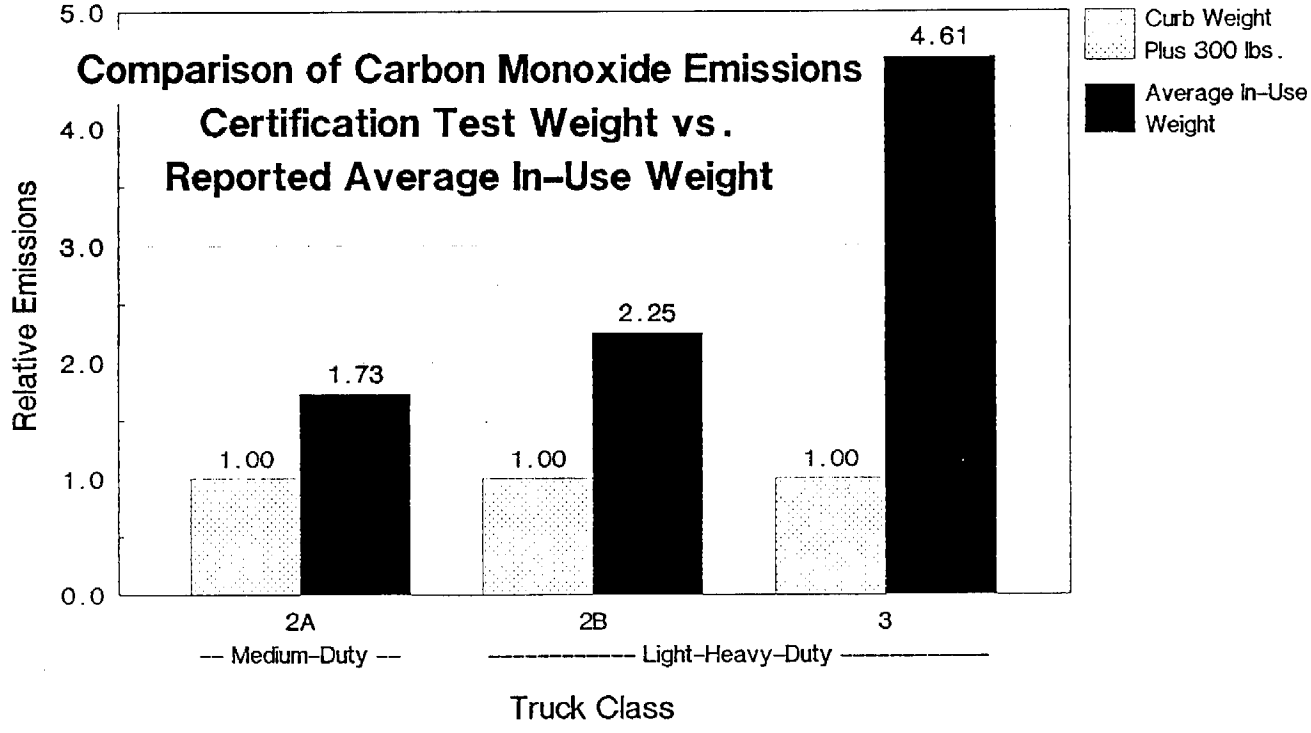
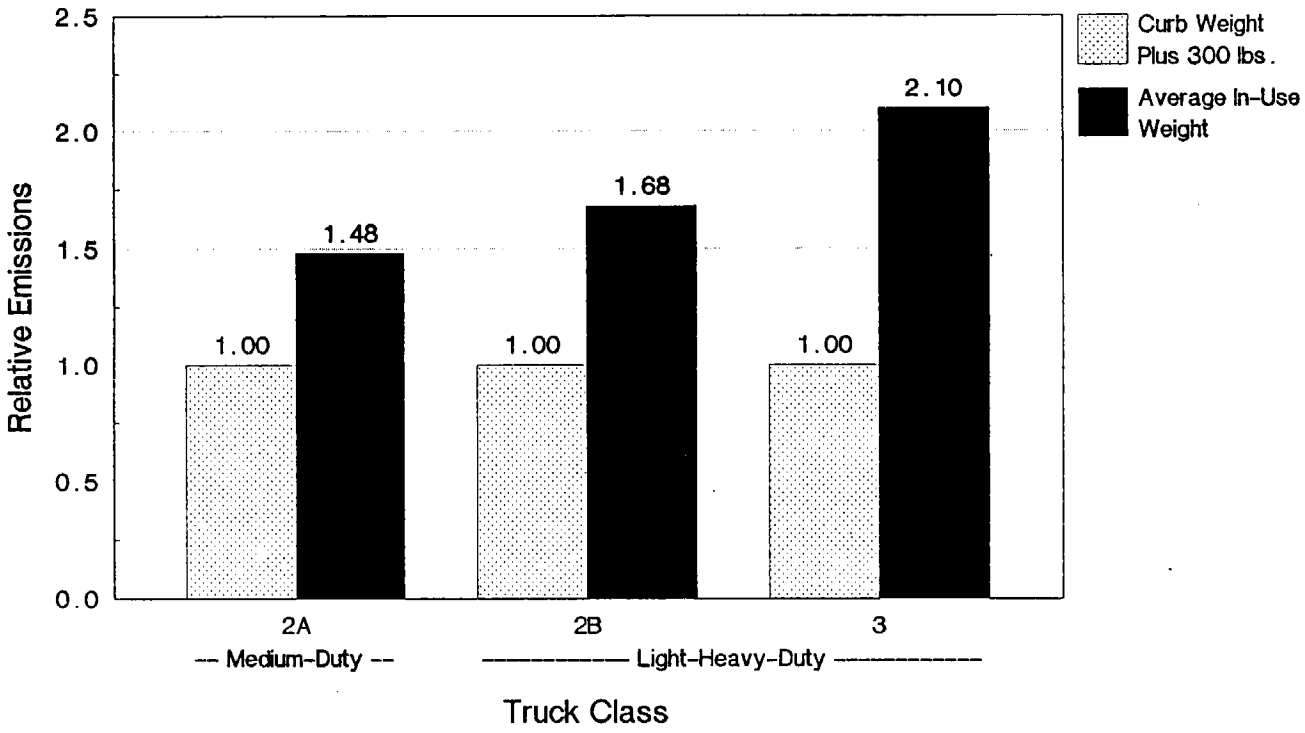


Figure 21

Comparison of Oxides of Nitrogen Emissions Certification Test Weight vs. Reported Average In-Use Weight



As would be expected from the earlier discussion, Figure 20 shows that the projected increase in CO emissions at average in-use vehicle loadings are even larger. For medium-duty vehicles, it is estimated that CO emissions could be 73% higher than certification levels. For light-heavy-duty trucks certified using the optional chassis test, the increased emissions could be 125-360% higher.

Figure 21 shows that the estimated NOx emission increases are similar to the increases for HC emissions.

It should be noted that the projections shown in Figures 19-21 are based on several assumptions of uncertain accuracy. First, it is assumed that the TIUS data on in-use truck loading is accurate. Second, it is assumed that the emissions vs. load characteristics of the computer simulation are representative of typical vehicles.

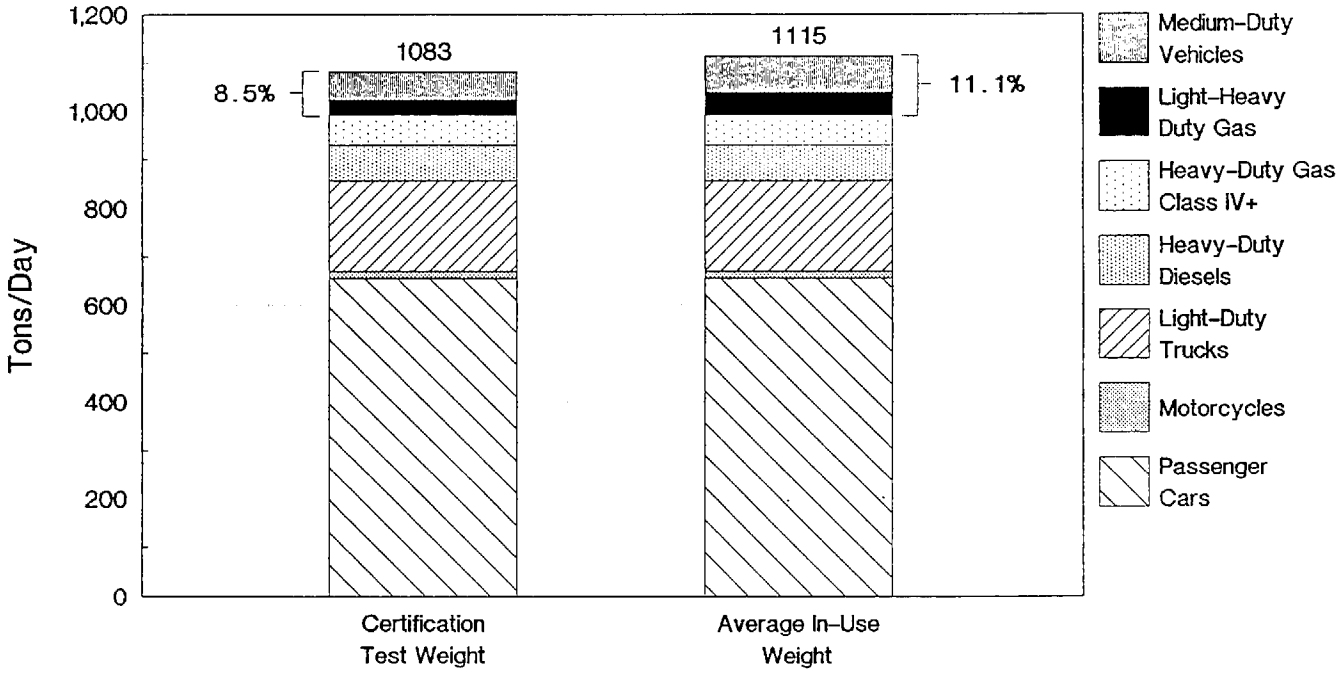
Although these uncertainties exist, it should be noted that the staff sent out a questionnaire during 1987 in which manufacturers were asked whether rich air fuel ratios are used at high engine power levels and whether full-time catalytic control is maintained. Every manufacturer who responded indicated that emission characteristics of their engines at high power levels are similar to those assumed in the computer simulation. It also should be noted that the estimates shown in

Figures 19-21 do not represent the worst possible case. As shown in Figure 18, the relationship between CO emissions and vehicle loading is non-linear. The average emissions of vehicles operating with a wide range of cargo loading would be higher than the average emissions of the same vehicles all carrying the average cargo loading. Even if the TIUS estimates of average in-use loading prove to be high, the actual emissions increase in customer service could still be as large as indicated in the above figures.

Figures 22-24 show the effect of the potential emission increases due to higher in-use loading on the emissions inventory for all on-road motor vehicles. As the figures illustrate, the contribution of medium- and light-heavy-duty trucks could be increased from 8.5% to 11.1% of the HC inventory, from 12.6% to 22.6% of the CO inventory, and from 7.9% to 11.8% of the NOx inventory. The adjustments shown in the figures were computed by increasing the medium- and light-heavy-duty emissions by the same percentages indicated in Figures 19-21.

Figure 22

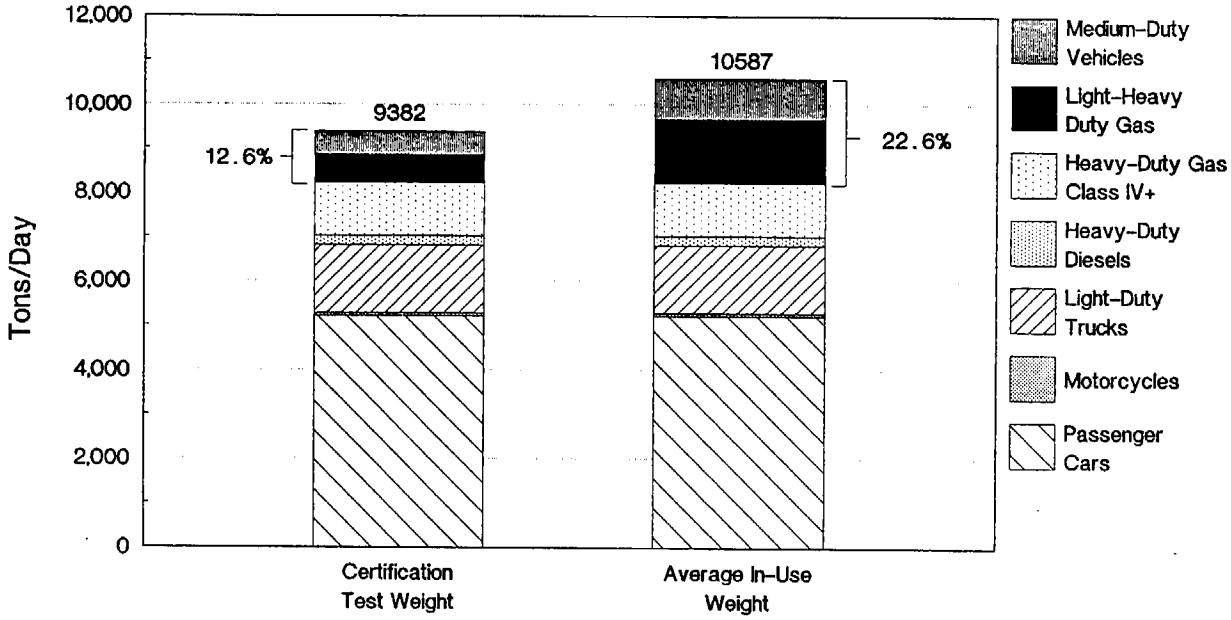
On-Road Vehicle HC Emissions Effect of Higher Cargo Loading in Medium and Light-Heavy-Duty Trucks



Note : Estimates based on 1987 Inventory

Figure 23

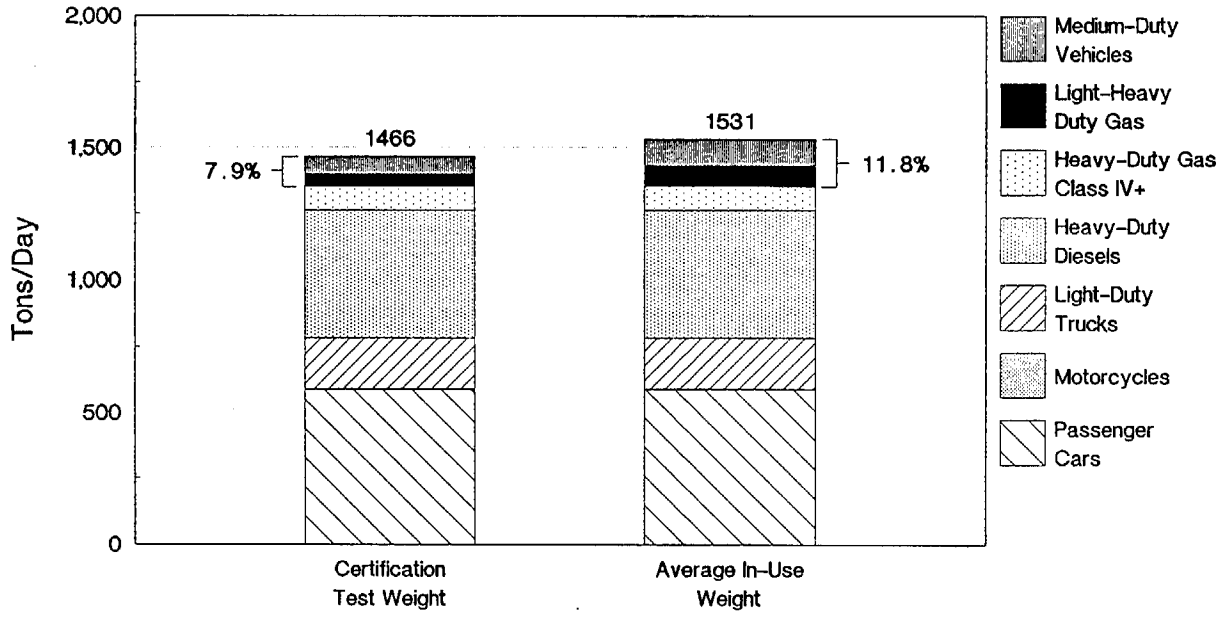
On-Road Vehicle CO Emissions Effect of Higher Cargo Loading in Medium and Light-Heavy-Duty Trucks



Note : Estimates based on 1987 Inventory

Figure 24

On-Road Vehicle NOx Emissions Effect of Higher Cargo Loading in Medium and Light-Heavy-Duty Trucks



Note : Estimates based on 1987 Inventory

6. TEST PROCEDURE OPTIONS

Current Test Procedure Descriptions

Medium-Duty Vehicles - The emissions measurement procedure for medium-duty vehicles is the Federal Test Procedure (FTP) for light-duty vehicles which involves testing of a complete vehicle on a chassis dynamometer. In the light-duty FTP, the vehicle is operated over a specified speed/time driving cycle on a chassis dynamometer. The driving cycle used (called the "LA4") simulates moderate urban driving with 18% of the time spent at idle, a maximum speed of 57 mph, and an average speed of 20 mph. The weight of the vehicle is simulated by the use of inertia weights (flywheels attached to the dynamometer) while air resistance is simulated by a water brake. The test weight of the vehicle is set at curb weight plus 300 pounds. At this test weight, it is assumed that the vehicle is not carrying any significant amount of cargo. Pollutant emissions are expressed in grams of pollutant per mile of (simulated) operation.

Due to the design of the FTP, the engine operating conditions experienced during testing are a function of the vehicle's power to weight ratio. In a vehicle with a low power to weight ratio (such as an economy car), the engine must produce a significant fraction of its rated horsepower in order to keep up with the speed/time trace. A vehicle with a higher power to weight ratio (such as an unloaded pickup truck) would use a comparatively smaller fraction of its rated power to keep up. Similarly, the engine speed experienced in the test is a function of the vehicle's gearing and power requirements.

For the power to weight ratios typical of most highway vehicles, the FTP requires only moderate engine loading and speeds well below the engine's rated maximum. This is reasonable, since the engines in most light-duty vehicles rarely operate anywhere close to their rated speed or power output for more than a few seconds at a time. As a consequence, however, light-duty emission rates under high-power conditions are effectively unregulated. Because of this fact, manufacturers are able to greatly enrich the air/fuel mixture at high loads to increase peak engine power by a few percent, while causing large increases in CO emissions.

Heavy-Duty Transient Test - The heavy-duty transient test procedure applies to the engine alone, rather than to the entire vehicle. The engine is connected to an engine dynamometer, and operated through a specified speed/load operating cycle. The speed and load conditions in this cycle are specified as fractions of the engine's rated speed and power output--thus, engines tested under this procedure experience similar loading conditions, regardless of their power ratings.

Measured pollutant emissions are expressed in terms of grams per unit of work output, with the work output measured in horsepower-hours.

Two speed/load cycles are used in the heavy-duty transient test procedure. The original, developed by EPA, is used for diesel engines, while a modified cycle developed by MVMA is used for heavy-duty gasoline engines. Both are based on measurements of actual engine operating conditions in heavy-duty trucks that were done in the mid-70's. Both cycles include operation under high-load conditions at or near rated engine speed.

Issues Related to Test Procedure Choice

Vehicle Operating Characteristics - Power to weight ratios in the heaviest trucks are typically much lower than in light-duty vehicles. Thus, the average power output from a heavy-truck engine is a larger fraction of its maximum power than for a light-duty engine. In addition, with more transmission gears available, maximum speed ratings for heavy-duty engines are typically much lower than for engines used in light-duty vehicles. Consequently, operation at near-rated speed is normal. The heavy-duty transient test cycles reflect these characteristics of heavy truck operation.

In their physical characteristics, light-heavy duty trucks more closely resemble light-duty trucks than they do the larger medium-heavy and heavy-heavy trucks that they are classed with for regulatory purposes. Power to weight ratios and engine speed ratings in light-heavy duty trucks are also similar to those of light-duty trucks, rather than heavy-duty vehicles. It is questionable, therefore, whether the heavy-duty transient test results for light-heavy duty engines are really representative of light-heavy vehicle emissions in use. However, the available survey data regarding average vehicle loadings do seem to indicate that light-heavy trucks, and even medium-duty trucks, spend a significant fraction of time operating under much heavier loads than would be typical of light-duty vehicles.

The case against continuing to allow light-heavy-duty vehicles to be certified with only 300 pounds load is bolstered by Ford's comments to EPA. Ford says that customer survey data show that trucks above 8,500 GVWR are most likely to be purchased by businesses, rather than individuals. The point Ford has made is that such vehicles can be expected to experience higher loads. (Light-heavy-duty trucks purchased by businesses are unlikely to be used as commuter vehicles.)

If the light-heavy-duty vehicles were to be certified on the light duty FTP it is clear that the test weight would have to be substantially higher than curb weight plus 300 pounds. If LHDVs continue to be certified using the engine dynamometer test, the option of using the light-duty test procedures (including curb weight plus 300 pounds test weight) should be disallowed. It is also clear that medium-duty trucks should be tested at a much higher loading than curb weight plus 300 pounds.

Were engine loading characteristics the only issue, there does not appear to be a compelling reason to change to the chassis based test procedure for light-heavy-duty vehicles. However, the lack of a chassis based procedure currently makes in-use compliance testing impractical.

Concerns With Chassis Dynamometer Procedures

Manufacturers have provided comments on the use of chassis dynamometer testing for light-heavy-duty vehicles in response to a recent ARB Mail-Out. Manufacturers' positions on chassis dynamometer testing have been uniform. All manufacturers of light-heavy-duty gasoline engines have taken the position that the cost of chassis dynamometer testing would be too high considering the relatively low sales volumes over which the cost of new testing facilities would have to be amortized. The basis for the high cost estimates was that existing chassis dynamometer testing facilities would be inadequate for the testing of light-heavy duty vehicles. The problems raised regarding the use of existing facilities included inadequate test cell size, inadequate test cell cooling and excessive tire heating on small diameter dynamometer rollers.

Ford raised the concern that chassis dynamometer testing would be complicated by the fact that engine, chassis, and body are sometimes supplied by three different companies. Ford argues that "multiple company business relationships" would be threatened by the need for increased coordination between these companies. However, Ford's concerns could be addressed by a testing concept under which only the "worst case" engine/chassis/body configuration would have to be tested. The companies who purchase a partially built chassis from Ford would not have to be involved in the certification process.

With a California-only program, Ford estimated that the test facilities cost alone would add $100-500 to the cost of each vehicle. However, Ford's estimates appear to be based on the assumption that ARB would require each vehicle configuration to be tested in its completed form. If the testing of incomplete chassis were allowed, such cost increases would not be expected.

GM also stated opposition to a requirement that light-heavy duty vehicles be tested using a chassis dynamometer. However, GM wishes to retain and expand the optional certification of light-heavy-duty engines on the chassis dynamometer test. In commenting on an EPA proposal for more stringent light- and heavy-duty truck standards, GM said, "...we recognize the desirability of expanding this optional certification category up to 14,000 GVWR."

To determine the relative difficulty of chassis dynamometer testing, a standard equation[1] for computing rear wheel power requirements for different vehicles has been utilized:

$$\text{Power(watts)} = \left[.015\ \text{Kg}\ (9.81\ \text{m/s}^2) + 0.6\ (\text{Cd})\ (\text{A})\ (\text{V})^2 + (\text{Km})(\text{Kg})\ a\right] \times V$$

where: 0.015 = coefficient of rolling resistance

Kg = vehicle mass in kilograms

$9.81\ \text{m/s}^2$ = gravitational acceleration

0.6 = air density in kg/cubic meter

Cd = drag coefficient

A = frontal area in square meters

V = velocity in m/s

Km = factor to account for rotational inertia

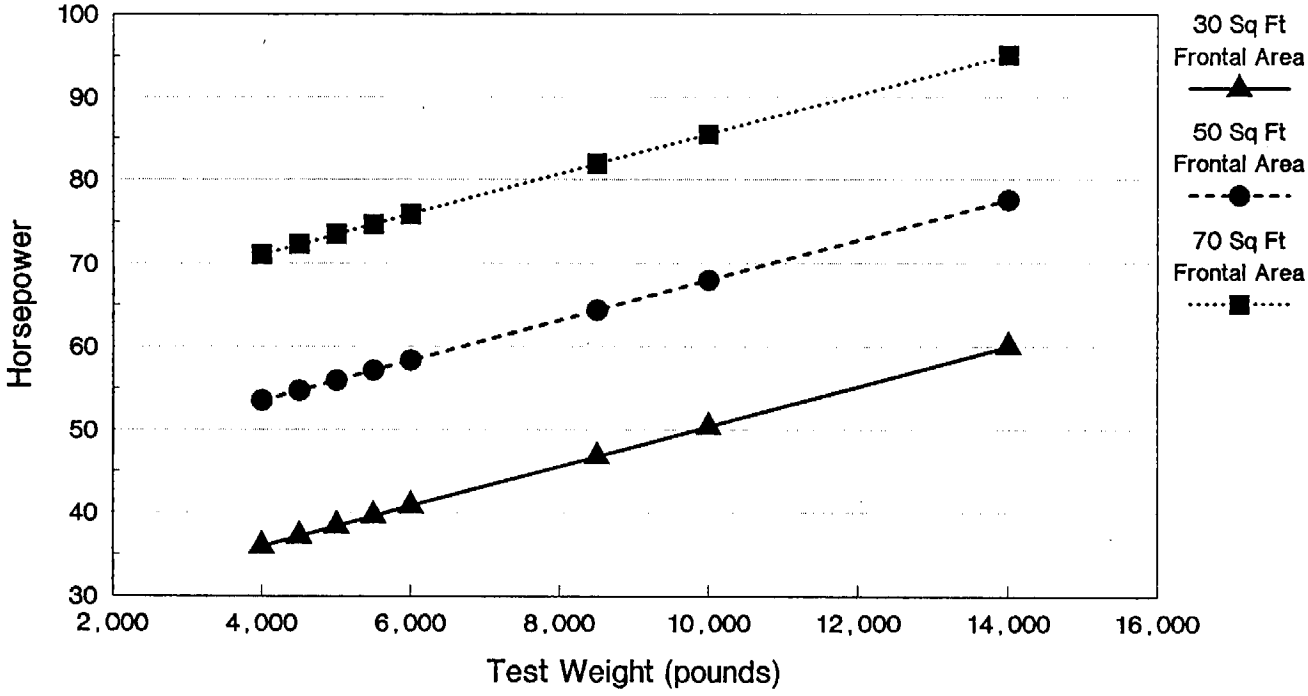
a = vehicle acceleration rate

The size of power absorber required in a dynamometer test system has been calculated from the steady state horsepower demand estimated for light-heavy-duty vehicles. Figure 25 shows the results of computations for vehicles with small, medium, and large frontal areas. (The 70 sq. ft. frontal area line might apply to a large, van-based motor home like a "Minnie-Winnie".) As the figure shows, the power absorption required for 60 mph speeds exceeds the 50 horsepower limit of typical light-duty dynamometers, but remains under 100 horsepower for even 14,000 pound test weight vehicles with large frontal areas.

Figure 25 also indicates that the testing of medium-duty vehicles at their rated GVW (up to 8,500 pounds) should not require larger dynamometer power absorption than 50 horsepower, except for vehicles that have larger frontal areas than most pickup trucks and vans (≈30 sq. ft.). The standard light-duty dynamometers should also be sufficient for medium-duty vehicles as far as the actual weight put on the rollers is concerned. A representative of the dynamometer manufacturer Clayton, reports that the light-duty dynamometer can accept an axle-weight of 4,000 pounds. The concern about the roll size of standard dynamometers raised by at least one vehicle manufacturer is not a concern, according to Clayton. Clayton indicated that the roll size they would recommend for light-heavy-duty vehicle testing would be the same 8.625 inch diameter used with light-

Figure 25

Dynamometer Horsepower Requirements for Chassis Dyno Testing at Gross Vehicle Weight



Required power absorbtion calculated at 60 mph

duty vehicle dynamometers. Supplemental flywheels might have to be added to some light-duty dynamometer installations because, under the curb weight plus 300 pound requirement, many medium-duty trucks can currently be tested using the standard 1500-5375 pound set of inertia weight flywheels used for light-duty vehicle testing. Clayton reports that the cost of extending the test weight capability of a light-duty dyno to 9,375 pounds is about $7,000.

Based on communications with Clayton, the cost of a complete dynamometer system to accommodate up to 14,250 pound test weights and 100 horsepower road load would be only slightly more expensive than a conventional light-duty dynamometer. Clayton says the width of the light-heavy-duty dynamometer would be slightly wider to accommodate larger vehicles but the depth of the pit required to house the dyno would be unchanged.

To avoid problems with fitting certain vehicles into test cells, the LHDVs could be tested as "chassis bucks" (i.e., vehicles without bodies). There is no need to have the body installed to accurately simulate vehicle operation when a chassis dynamometer is used.

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7. FEASIBILITY OF FURTHER EMISSION CONTROL

Target Standards

To establish medium- and light-heavy-duty vehicle emission standards representative of the same degree of emission control that the staff knows to be available for lighter vehicles, the staff has used the relationships between emissions and vehicle weight described in Section 4. In each case, the recommended standards are projected along a line that maintains the same proportionality between emissions and weight established by the fuel consumption and NOx modelling analysis described in Section 4. Figures 26-29 show what the medium and light-heavy-duty standards must be in order to represent the same degree of emission control that is available for passenger cars and light trucks. Based on previous staff analyses, the achievable levels for passenger cars and the lightest trucks (≤3,750 test weight) are 0.25 g/mi HC and 0.4 g/mi NOx. The feasibility of compliance with the federal 3.4 CO standard has also been clearly demonstrated.

Figure 26

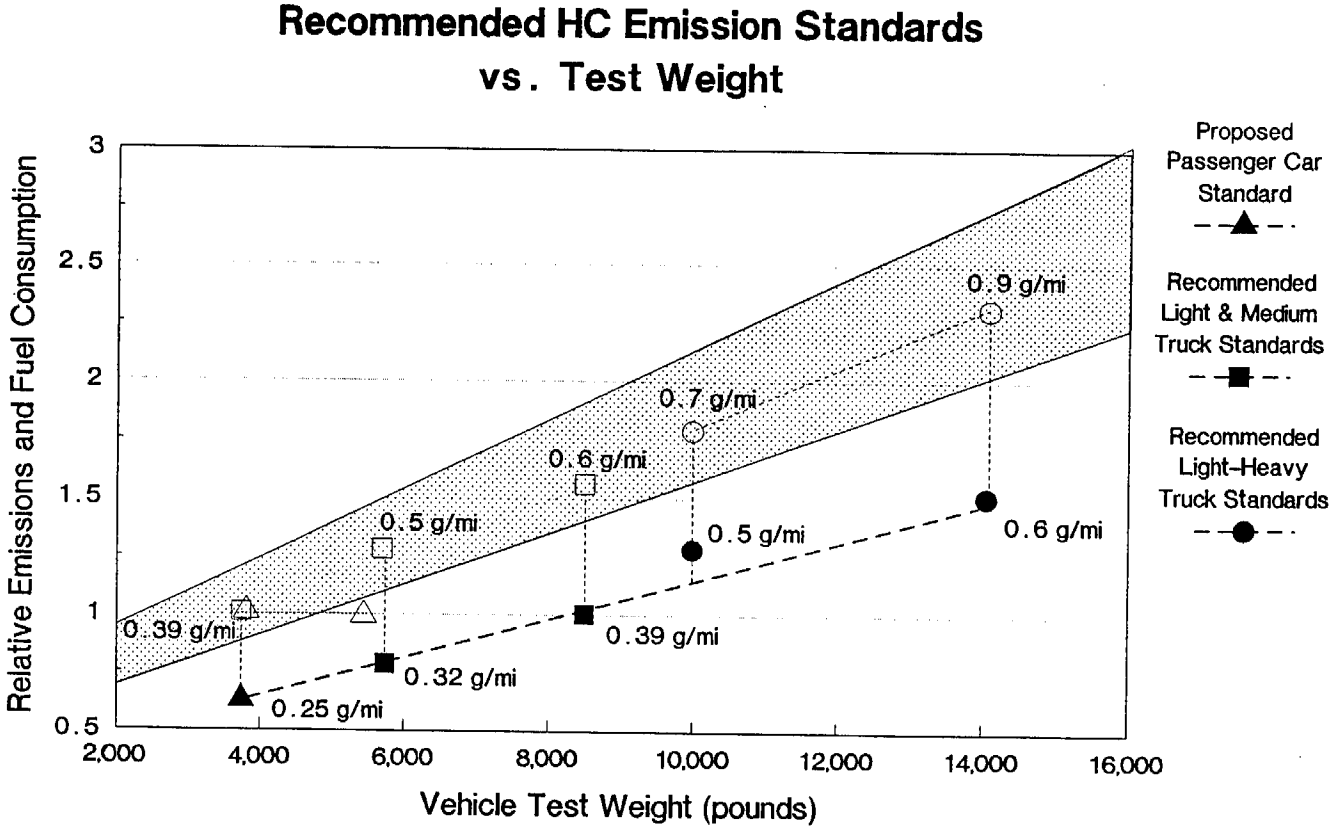


Figure 27

Recommended CO Emission Standards vs. Test Weight

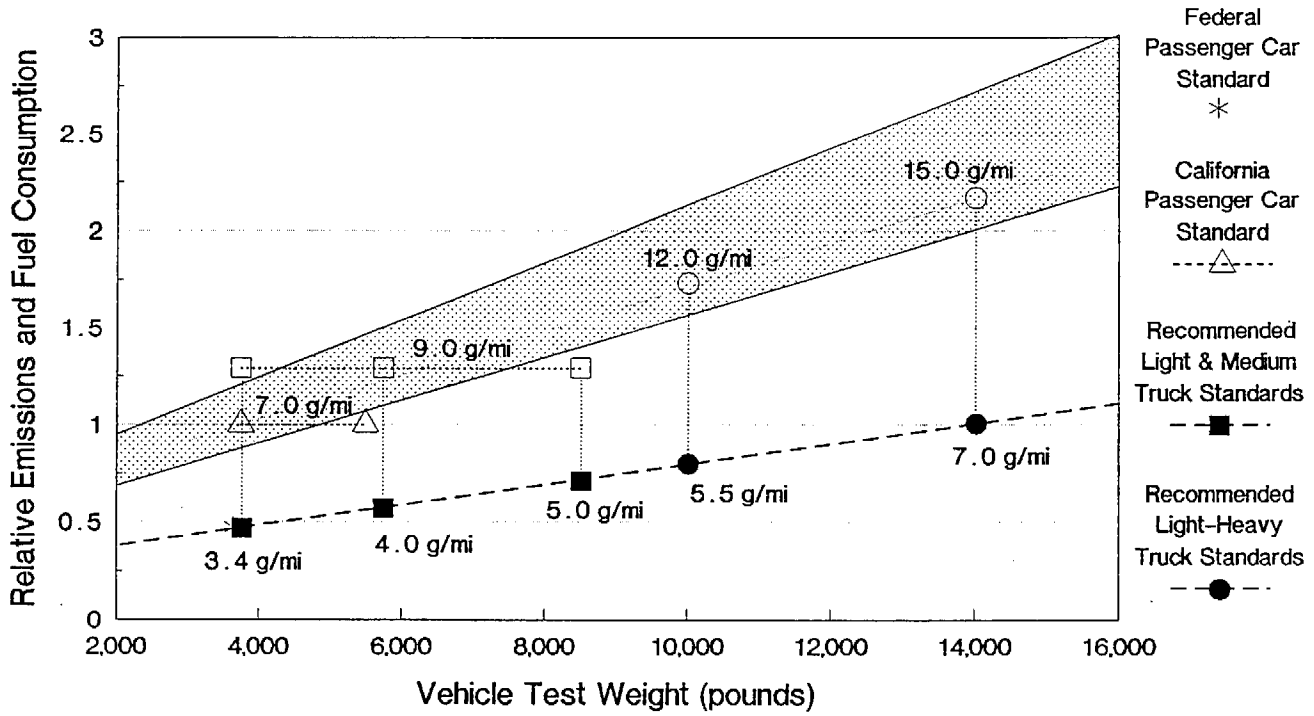


Figure 28

Recommended NOx Emission Standards vs. Test Weight

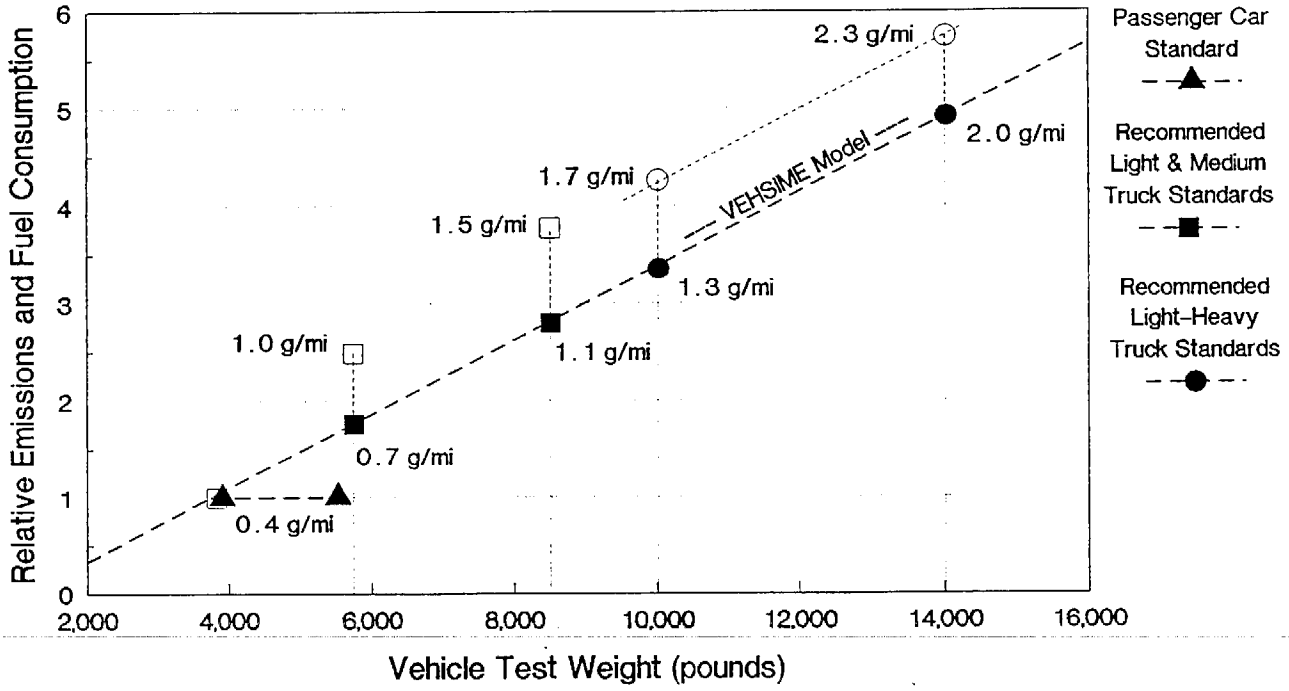
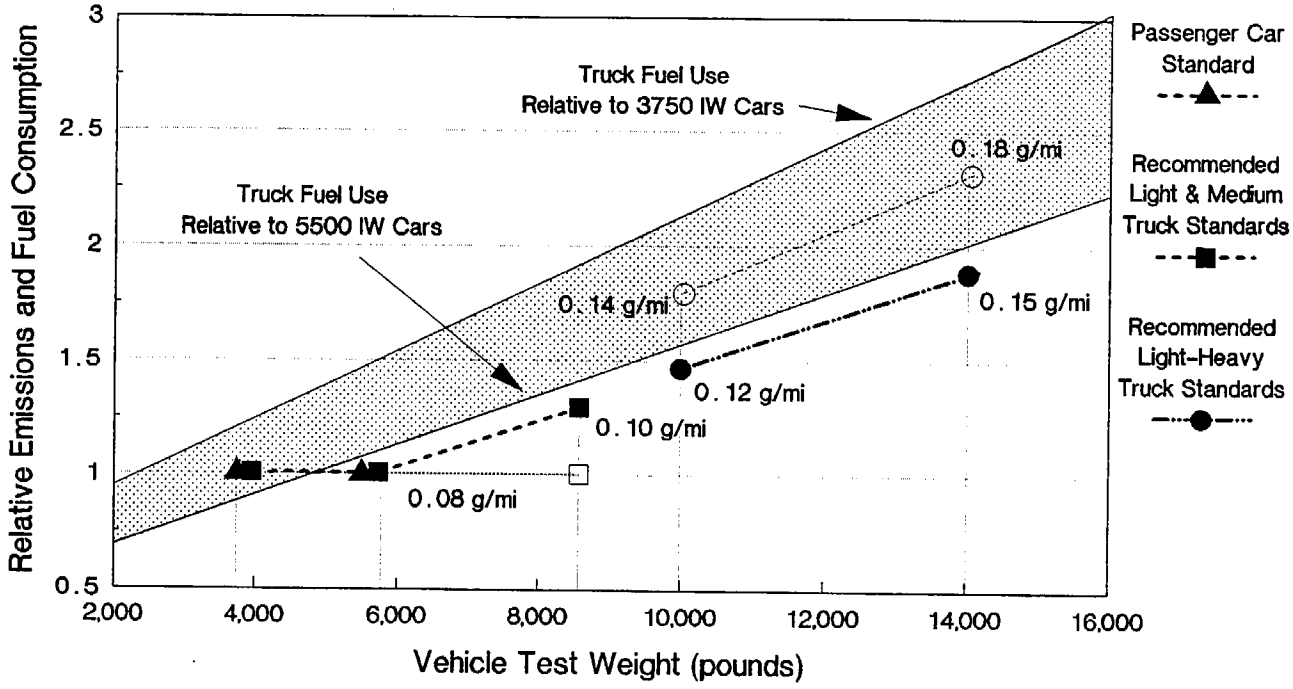


Figure 29

Recommended Particulate Emission Standards and Fuel Consumption vs. Test Weight



As shown in Figure 26, by increasing the achievable light-duty standards in proportion to fuel consumption, HC emissions for MDVs and LHDVs would range from 0.32 to 0.60 g/mi at higher test weights.

Figure 27 indicates that the CO emissions would range from 3.4 to 7.0 g/mi. Figure 28 indicates that by adjusting NOx emissions in proportion to the relationship between test weight and NOx computed using the VEHSIME model, NOx emission standards for MDVs and LHDVs would range from 0.4 to 2.0 g/mi. Figure 29 indicates that particulate standards would span the range of 0.08 to 0.15 g/mi. The standards that would apply to the 0-3,750 and 3,751-5,750 are only of academic interest under an approach where all vehicles are required to be tested at their rated GVW.

In Figures 26-29, the recommended standards for medium- and light-heavy-duty trucks are extrapolated from the capabilities of cars and light trucks of 3,750 pound test weight. 3,750 was chosen as the point from which to extrapolate because this is the upper end of the lightest truck weight class and it is close to the minimum weight needed for a "full size" passenger car. Heavier passenger cars must meet the same standards, but it is recognized that the task is more

difficult and expensive for heavier vehicles. Since so few vehicles are at the upper end of the passenger car test weight categories (5,500 pounds), the staff has not based its previous technology assessments on the capabilities of these overweight vehicles.

It also should be noted that the standards from which the recommended medium- and light-heavy-duty standards were extrapolated are 50,000 mile standards. The recommended standards are therefore proposed for adoption as standards that apply for 50,000 miles of customer service. This is an apparent departure from the current standards for light-heavy-duty engines which technically apply for 110,000 miles. However, under the current light-heavy-duty engine test procedures, manufacturers are not actually required to run durability tests that represent 110,000 miles. Furthermore, the risk of in-use enforcement is minimal because of the fact that the test procedure would require removing engines from vehicles to test them. For these reasons, the staff believes there is no loss of emissions control associated with changing to 50,000 mile standards and requiring a durability demonstration for that distance.

Notwithstanding the staff's concerns regarding the use of "full-life" distances as the basis for emission standards, the full-life approach to standard setting does require manufacturers to seriously consider component life when designing emission control systems. The staff therefore believes that some requirements should be established beyond 50,000 miles. Analyses previously performed by Toyota and Nissan and reported in a recent study[12] indicate that emissions can be expected to increase by 35% from 50,000 to 120,000 miles. This would translate into a 25% increase at 100,000 miles. In order to ensure that systems are designed to last for the expected service life of the vehicle, the staff believes that it would be appropriate to set 100,000 mile emission standards at a level 25% higher than the basic 50,000 mile standards.

Gasoline Engine Control

Exhaust Hydrocarbon Control - ARB has previously evaluated the feasibility of meeting emission standards of equivalent stringency as the target standards for medium- and light-heavy-duty vehicles. In fact, the certification data available for passenger cars and light trucks provide considerable evidence of the feasibility of achieving this degree of control. In a recent staff report[7], it was pointed out that 82% of all 1986 engine families are certified below 0.25 g/mi HC. Even providing a 20% cushion to deal with in-use compliance uncertainties, 53% of the 1986 engine families are certified at or below 0.20 g/mi HC.

For models that don't yet achieve 0.25, a warm-up or "start" catalyst (preceding the main catalyst) could be used for cold-start hydrocarbon control. To avert thermal damage and lower the catalyst deterioration rate, this small catalyst could be bypassed at all times other than during cold-start.

Data from tests run by Chrysler and previously reported by EPA[10] demonstrate the potential of start catalyst installations. The data are displayed in Table 7.

Start catalysts have not been used on very many production vehicles for the simple reason that emission control technology has progressed to the point where start catalysts are not needed to comply with either California or federal emission standards. Some start catalyst systems have been used on production vehicles. However, excessive deterioration due to the exposure to high temperatures that results from the close-coupling of the converter has been a problem. Ideally, the start catalyst would be bypassed as soon as the main catalyst has reached operating temperature. Such a bypassable start catalyst system was developed by General Motors during the early 1970s, but the emission standards were eventually met without the need for the system and it was never introduced into production.

Table 7

Effect of Start Catalyst
on Composite Emissions

	grams per mile		
	HC	CO	NOx
Two Test Average Without Start Catalyst	0.37	2.7	1.35
Three Test Average With Start Catalyst	0.20	1.4	1.35
Change With Start Catalyst	-46%	-48%	0%

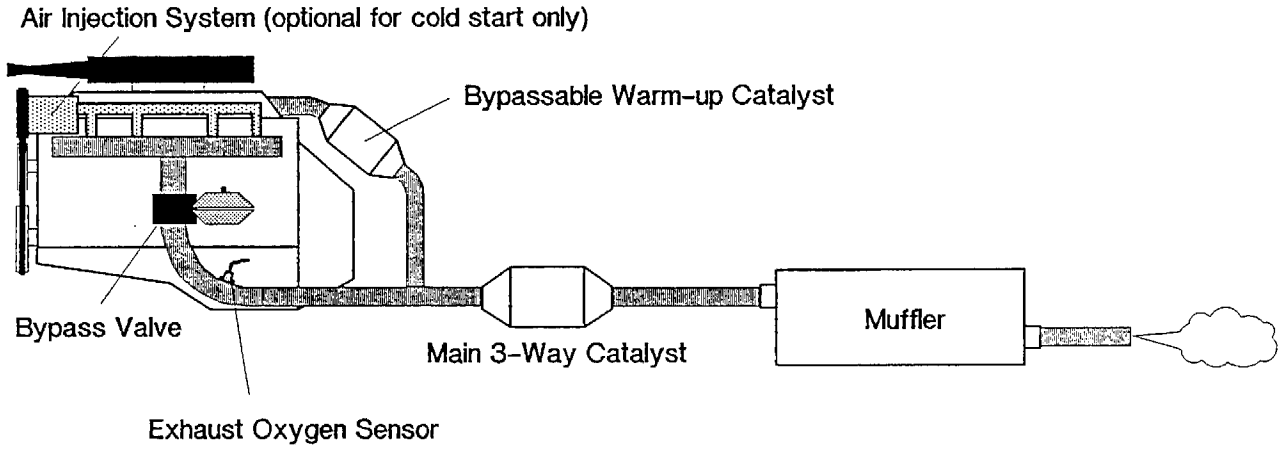
In the system developed by GM, a heat riser-type valve in the exhaust system is closed during cold starting, thereby forcing all exhaust gases into the heat-riser passages of the intake manifold. A separate exhaust outlet is provided at the back of the intake manifold and a small volume start catalyst is mounted as close as possible to the outlet. Exhaust gases pass through the start catalyst and enter the exhaust system downstream of the heat riser valve. From there they enter the main catalyst. As soon as the main catalyst has reached operating temperature, the heat riser valve is opened and the exhaust gases flow directly to the main catalyst, bypassing the start catalyst. A schematic of the system is shown in Figure 30.

NOx Control - Several previous staff studies have addressed NOx control equivalent to the 0.4 g/mi level for passenger cars and light trucks. Two separate analyses[8,9] supported adoption of a 0.4 NOx certification standard which will be phased-in beginning with the 1989 model year. The first study was published in 1985 and the second in 1986.

In the 1985 study performed for ARB[8], 1982 model year certification results were analyzed. An analysis was performed using detailed information on the emissions, fuel economy, and control system design of each gasoline engine powered passenger car model certified by thirteen different manufacturers that represent a reasonable cross section of the total California fleet. The 1985 study showed a clear relationship between NOx levels below 0.4 g/mi and catalyst loading. The 1986 study[9] showed the same relationship: vehicles with higher rhodium loading are more likely to be below 0.4 g/mi NOx.

Figure 30

Light-Duty Vehicle System Concept for Stringent HC and NOx Standards



Adapting Light-Duty Control Technology to Heavier Vehicles - Based on the previous technology assessments for light duty vehicles, achievement of HC and NOx standards of stringency equal to 0.25 g/mi HC and 0.4 g/mi NOx for passenger cars and light trucks is clearly

possible through the application of 3-way catalyst technology. By using appropriate adjustments to account for the larger exhaust volume of trucks tested at higher weights, the same basic technology can be used to meet standards of equal stringency with MDVs and LHDVs tested at GVW. However, there is one complicating factor -- light-duty emission control systems generally do not have to control emissions under full power or near full power vehicle operation. With a requirement for MDVs and LHDVs to be tested at GVW, the emission control system would have to function under high load conditions.

Vehicle manufacturers have expressed the concern that full-time catalytic control of exhaust emissions would degrade the durability of 3-way catalyst control systems. The reason for the concern over catalyst durability is that medium- and light-heavy-duty engines (like passenger cars and light trucks) are normally calibrated to use air/fuel ratios that are richer than stoichiometric as they approach full power. As discussed in Section 2, this causes a large increase in HC and CO emissions from the engine. In order to meet the standards that have been proposed, this excess HC and CO would have to be eliminated. By oxidizing the HC and CO in the catalyst, durability of the catalyst could be reduced.

If the system is designed to control the HC and CO from rich operation with a 3-way catalyst, modulated air injection upstream of the catalyst under high load conditions would be required to provide the oxygen needed for complete oxidation while maintaining the exhaust stoichiometry needed to maintain NOx control. However, this would cause catalyst temperature to increase significantly because large quantities of HC and CO would be burned in the bed of the catalyst. For current systems, the increase in temperature could be sufficient to damage a 3-way catalyst because catalysts containing rhodium are more susceptible to thermal degradation. However, there are alternative ways to deal with the high load emissions/catalyst durability problem.

Full-Time Stoichiometric Operation - The engine can be calibrated so that it does not run with a richer-than-stoichiometric air/fuel ratio at full load. This approach is not used at present for two reasons. By maintaining a stoichiometric air/fuel ratio, the peak horsepower output of the engine is reduced by about 3-5%. In addition, stoichiometric operation is more likely to cause exhaust valve burning.

The 3-5% derating of engines would be commercially acceptable, in the staff's opinion. Differences between the peak horsepower rating of competing engines are already greater than this. Engine design changes are possible to eliminate any valve durability problem associated with stoichiometric operation at full power.

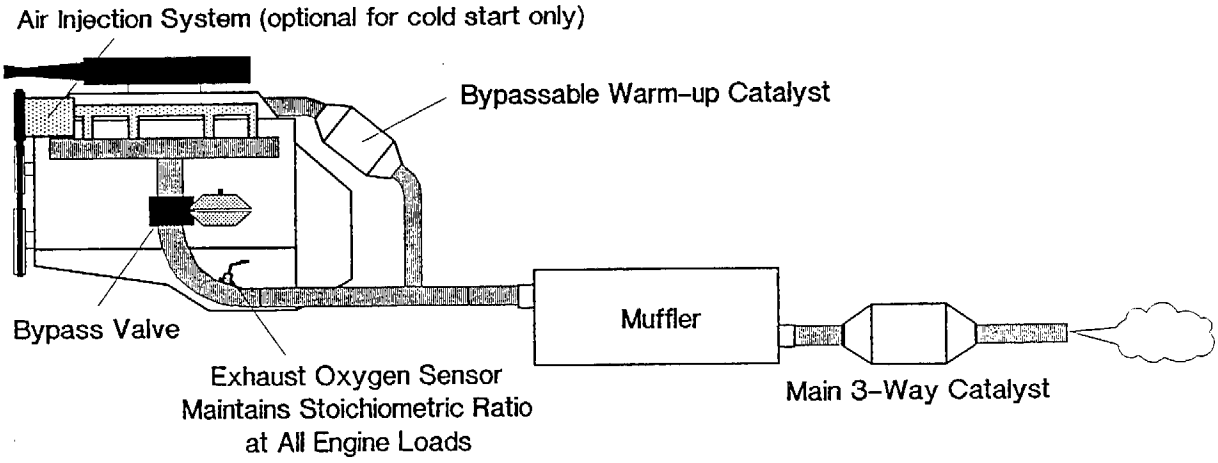
This technique would eliminate the large temperature increase caused by catalytic oxidation of the high HC and CO levels associated with rich operation at full load. Under stoichiometric conditions, a state-of-the-art 3-way catalyst could provide the conversion efficiency needed to meet the proposed standards with acceptable

durability. To maximize 3-way catalyst durability, the catalyst could be located behind the muffler. As discussed below, GM has determined that this technique is capable of reducing catalyst temperatures significantly. With the use of a bypassable warm-up catalyst for maximum HC control, post-muffler location of the 3-way catalyst would not present a problem with cold start performance. If necessary, the bypassable catalyst could also be switched back into the system during extended idle or light load operation. A schematic of this system concept is illustrated in Figure 31.

Post-Muffler Dual-Bed Catalyst System - For manufacturers wishing to avoid full-time stoichiometric operation, another method to deal with the problem of controlling HC and CO emissions under high load while minimizing the 3-way catalyst temperature would be to use a dual-bed catalyst system located behind the muffler. The 3-way catalyst would be placed just ahead of the oxidation catalyst and air would be injected between them. During high load operation, the rich air/fuel ratio would prevent the 3-way catalyst from controlling HC and CO, but it would still be effective in reducing NOx. The air injection in

Figure 31

Medium- and Light-Heavy-Duty Vehicle System Concept for Stringent HC and NOx Standards and Full-Time Catalytic Emission Control



front of the second catalyst bed would allow the HC and CO to be eliminated in the oxidation catalyst. Being more temperature resistant in the first place, the post-muffler location of an oxidation catalyst would make it possible to catalytically oxidize high HC and CO levels with less risk of catalyst damage.

This technique would offer the advantage of not having to reduce the horsepower rating of the engine. In addition, valve burning at stoichiometric full load conditions would not be an issue.

GM's recent comments[6] in response to an ARB questionnaire summarize the concerns that have been expressed and the progress that has been made to date in achieving full time catalyst control. An extended excerpt from the GM response is contained in Appendix C.

As shown in the Appendix, GM makes the point that certain engine design changes can minimize the need to run rich air fuel ratios at full-load in order to prevent damage to valves and valve guides. GM also indicates that two design approaches can be used to protect an oxidation catalyst from excessive temperatures under full-load while still reducing emissions. First, the catalyst can be located behind the muffler to allow additional cooling of the exhaust gases before entering the converter, and second, electronically-controlled fuel injection can be adapted to the engines to control air/fuel ratios better. GM says these approaches "minimize the occurrence of high catalyst temperatures, either from high engine exhaust temperatures or from high energy release in the converter, while maintaining sufficient catalyst efficiency to reach emissions levels below the emissions standards for HDGEs (heavy-duty-gasoline engines) used in vehicles under 14,000# GVWR (gross vehicle weight rating)."

As did other manufacturers, GM has expressed concern about the durability of 3-way catalysts during full-load operation with full-time catalyst control (no enrichment). However, GM says that the occurrence frequency of temperatures too high to maintain rhodium catalyst efficiency would be expected to decrease at GVWRs near 8,500. More importantly, GM reported that a behind-the-muffler catalyst location is effective in reducing peak temperatures. GM points out that the post-muffler catalyst location reduces inlet temperatures during part throttle operation too much to maintain catalyst efficiency and says that "no solution to this inlet temperature dilemma has been found...". However, as discussed above, it appears that a successful system could be developed by using a post-muffler 3-way catalyst in conjunction with a by-passable, close-coupled oxidation catalyst of the type GM developed on a prototype basis during the 1970s.

GM's comments to ARB also point out that further cylinder head design changes may be necessary to maintain acceptable durability with 3-way catalyst systems that maintain full-time stoichiometric operation because of the 50-150°F higher exhaust gas temperatures associated with stoichiometric air/fuel ratio. A large exhaust valve stem diameter is one option for increasing valve stem cooling. As GM's

comments indicate, substantial progress has been made in adapting catalyst systems to heavy-duty gasoline engines, but more development work is required.

In addition to the post-muffler catalyst location investigated by GM, other techniques are available to control 3-way catalyst deterioration during operation under high load conditions. Ford has recently certified heavy-duty engines using a more temperature-resistant catalyst. However, the more temperature-resistant catalyst reportedly does not have sufficient conversion efficiency to achieve the target emission standards proposed by the staff. Further refinement of temperature resistant formulations may be needed to achieve adequate conversion efficiency without resorting to post-muffler locations of more active, but less temperature resistant catalysts. Comments received in confidence from catalyst vendors indicate that superior formulations are now available that have not been evaluated by heavy-duty engine manufacturers. While such formulations do not appear to be necessary to achieve the proposed standards, they could reduce the cost of compliance by eliminating the need for two separate catalyst systems (one close-coupled and one remotely located).

Evaporative Emissions - Current regulations for the control of evaporative emissions from gasoline-fueled heavy-duty vehicles (HDVs) allow manufacturers to certify vehicles on the basis of an engineering analysis showing that the emission control system used is functionally equivalent to the systems used to meet the 2 gram standard on a light-duty vehicle. No actual data are available to quantify the effectiveness of these control systems on HDVs. The information obtained from the Bureau of the Census TIUS study (on the loading patterns that MDVs and LHDVs experience under in-use conditions) suggests that MDV and LHDV duty cycles are more severe than previously considered. Higher loads tend to increase underhood temperatures and higher temperatures cause higher evaporative emissions.

The indication that MDVs and LHDVs are experiencing higher than expected loads has caused the staff to reconsider the adequacy of the existing evaporative emission standards. A review of EPA's Rulemaking for 1985 and later HDVs* indicates that the industry is capable of meeting more rigorous standards and building an information base that better substantiates the achievement of those standards than currently exists in California. The staff is also persuaded that the 3.0 gram standard for HDVs with GVWRs between 8,500 and 14,000 lbs (Classes 2B and 3) is equivalent to the 2 grams standard for light-duty vehicles.

Changes are therefore proposed to the standards, test procedure, certification procedure, and incomplete vehicle provisions of the existing evaporative emission regulations. Basically, the staff

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* "Evaporative Emission Regulation and Test Procedure for 1985 and Later Model Year Gasoline-fueled Heavy-Duty Vehicles; Final Rule", Federal Register, Volume 48, No.8, Wednesday, January 12, 1983

proposes to replace existing regulations with those specified by the above referenced Final Rule for vehicles up to 14,000 pounds GVW. However, the staff is proposing to deviate from the EPA Final Rule regarding vehicle test weight and compliance demonstration.

The proposed changes to each element of the evaporative standards and procedures are as follows:

Standards:

	GVWR	Standard
Current Standard:	all	engineering evaluation
Proposed Standards:	8,500 - 14,000	3.0

Test Procedure:

Test Weight - The discussion in the Final Rule indicated that EPA originally planned to set a test weight that was 70 percent of the GVWR. That value was revised to 50 percent based on data from commenters that indicated typical loaded weights of 30 - 60 percent of GVWR. The data and analysis presented in this document suggest that substantially higher loads are being experienced by California vehicles. In addition, testing vehicles at their average weight is not appropriate when the emissions of the vehicles could be non-linear functions of test weight. At sufficiently high weights, breakthrough could occur when the canister is overloaded with vapors and the evaporative emissions from the vehicle could increase substantially. Unless it can be demonstrated that California LHDVs are not experiencing these loads, the staff believes all preconditioning should be done with the vehicle loaded to GVW.

The test procedure proposed for determining compliance with the EPA standards is a full-SHED procedure similar to the light-duty vehicle evaporative emission test procedure, but there is no requirement for manufacturers to actually perform any tests. When testing is done, the 20 bench-type load-purge cycles needed to stabilize new carbon canisters suggested by EPA are an acceptable alternative to mileage accumulation on the full vehicle. Staff also endorses the EPA position on the dynamometer load settings, that is, the .67 aerodynamic drag coefficient should be retained. A provision for the use of the "coastdown" procedure in setting the dynamometer horsepower is also proposed. The staff agree with EPA's driving cycle specification. The 24°F heat rise specified for use during the diurnal portion of the test is also endorsed. The Final Rule also provides for a doubling of the maximum cooling capacity of the fans (from 5,300 cfm to 10,600 cfm), which allows hoods to remain closed during the operation of the driving cycle.

Certification Procedures:

The staff disagree with EPA's position that allows "each manufacturer to determine the amount and kind of testing, if any, it deems necessary to assure compliance with the full-SHED standards." This

approach is designed to allow manufacturers to pursue the most cost effective methods of predicting full-SHED test results, but the EPA language would allow no testing at all. In addition to EPA's requirement that the manufacturer certify in writing that its HDGVs meet the full-SHED standards, the staff is proposing to require the submission of some SHED data for each evaporative family. The staff also propose that ARB reserve the right to do confirmatory testing.

The staff has reviewed the changes in the control system determinants contained in EPA's Final Rule and concurs with those selected: method of vapor storage; method of carburetor sealing; method of air cleaner sealing, number of storage devices; method of purging stored vapors; method of venting the carburetor during both engine off and engine operation; and liquid fuel hose material. The deletion of nominal fuel tank capacity as a family determinant should substantially reduce the number of family systems that need to be developed.

Incomplete Vehicles:

Staff is aware that many HDVs leave the factory in an incomplete configuration. EPA's Final Rule indicated that the most significant issue is when secondary manufacturers want to increase the fuel tank capacity beyond that supplied by the primary manufacturer. Increasing fuel tank capacity will increase the amount of hydrocarbon vapors that must be controlled. If the primary manufacturer's control system is not adequate to handle the extra fuel tank vapors, a loss of control can occur. It is proposed that ARB follow EPA's resolution of this issue: "The primary manufacturer will include each of its incomplete vehicles in an evaporative emission family-control system." Each vehicle will be certified for sale with a label stating the maximum fuel tank capacity for which the control system is adequate. Under this approach, if a secondary manufacturer wishes to exceed this maximum fuel tank capacity, it must increase the working capacity of the evaporative hydrocarbon storage device and notify ARB in writing.

Diesel Engine Control

The recommended emission standards for Diesel vehicles are based on achieving an equivalent degree of control to that required or proposed for light-duty vehicles, rather than on a specific technology assessment for Diesel-powered medium- and light-heavy-duty trucks. Diesel-powered vehicles, at least those with prechamber engines, have generally been able to meet the same HC and CO emission standards as catalyst equipped gasoline-powered vehicles. In addition, available in-use surveillance testing data indicate that Diesels experience significantly less deterioration of emissions control in customer service. Under the current regulations, Diesels are given some credit for this superior in-use performance by allowing them to meet an 18% less stringent emissions standard in exchange for a 100,000 mile certification distance. The staff is recommending that this same approach be applied in the future.

To meet the recommended particulate standards, traps will almost certainly be required. As yet, no manufacturer has certified a medium-duty vehicle to meet the 0.08 g/mi level required for the 1989 model year under current standards. If and when such certification occurs, the same technology could be applied to meet the recommended standards for full GVW testing of medium-duty vehicles and light-heavy-duty vehicles.

As with the current medium-duty standards, optional 100,000 mile NOx standards are recommended for both medium- and light-heavy-duty Diesels. By setting the standards at twice the level of the 50,000 mile standards, the 100,000 mile NOx standards for light-heavy-duty Diesels reflect approximately the same percentage increase in emissions as has historically been provided for medium-duty vehicles certified under the 100,000 mile option. These standards are probably achievable through the use of EGR and/or pre-chamber engines.

Table 8 provides a summary of the standards that are recommended for Diesel vehicles.

Table 8

Proposed Optional 100,000 Mile Standards
for Diesel-Powered MDVs and LHDVs

		grams/mile			
	Test Weight	HC	CO	NOx	PM
Medium-Duty Vehicles	0-3,750	not allowed			
	3,751-5,750	not allowed			
	5,751-8,500	0.46	5.0	2.0	0.10*
Light-Heavy-Duty Vehicles	8,501-10,000	0.60	5.5	2.6	0.12
	10,001-14,000	0.70	7.0	4.0	0.15

*Standard applies for 50,000 miles only.

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8. COST/EFFECTIVENESS AND LEAD TIME

Costs

MDVs - The standards for lighter test weights from which the recommended MDV and LHDV standards were extrapolated (0.25 g/mi HC standard in conjunction with a 0.4 g/mi NOx requirement) have been addressed in previous analyses.[8,9] To meet standards of this stringency, the previous analyses have indicated that average catalyst rhodium loadings would increase by about 0.5 grams per vehicle, and some vehicles will require supplemental HC control systems. The supplemental controls specifically addressed were bypassable start catalysts but other possible alternatives include: 1) larger main catalysts or improved catalyst formulations which allow for closer coupling of the main catalyst, 2) improved non-catalytic cold start controls (e.g., intake manifold heating systems), and 3) engine modifications to minimize HC emissions. To the extent that manufacturers rely on alternative technologies, start catalyst systems will not be required on all vehicles. Since the bypassable start catalyst system is a relatively complex system, alternative system concepts may involve lower total system costs. For improved NOx control, alternatives to increase rhodium loadings include: 1) improved catalyst formulations, and 2) engine modifications providing increased EGR tolerance.

A 1983 EPA assessment of emission control system costs[11] provides a basis for estimating the costs of more effective control systems on medium-duty vehicles. The "1982 dollars" used in the EPA report were inflated by 28% to account for inflation and provide estimates based on "current" dollars. In addition, a more recent cost for rhodium ($1,300 per troy ounce) was obtained from Engelhard.

Start catalysts were not specifically addressed in the EPA report, but the cost of components needed for a bypassable start catalyst system could be estimated from the report. A start catalyst system cost was estimated from:

- half the cost of a full-size oxidation catalyst ($112),
- the cost of an "EFE" valve for blocking the outlet of an exhaust manifold ($7), and
- the cost of a vacuum control valve for activating the EFE valve ($3).

Under this approach, total start catalyst system cost would be estimated at $122. However, the staff has also received estimates

from control system vendors that the cost of a small warm-up catalyst should be about $30. With $10-20 for plumbing a small catalyst into this system with a by-pass valve, the cost for the start catalyst system would be about $45. Averaging the two estimates, start catalyst system cost is estimated at about $80. The incremental cost of increasing catalyst rhodium loadings by 0.5 grams per vehicle is estimated at $17.

The staff has previously estimated that start catalyst systems will probably not be required on most passenger cars and light trucks in order to achieve a 0.25 g/mi HC standard. By conservatively assuming 50% utilization of start catalyst systems and higher rhodium usage would be required to allow medium-duty vehicles to meet a 0.25 g/mi HC standard and a 0.4 g/mi NOx standard, system cost would be about $57 per vehicle ([$80÷2] + $17). For the vehicles in the ≤3,750 test weight class, it can be assumed that the cost of more rhodium has already been assigned to the 0.4 NOx standard which begins a phase-in during the 1989 model year in California. By subtracting the rhodium cost, the estimated cost increase associated with the target standards under consideration here would be $40.

The need for any addition start catalyst use (beyond the 50% assumed here) will depend on whether manufacturers can achieve sufficient temperature resistance from improved 3-way catalysts to enable them to be used on a full-time basis when MDVs are tested at their rated GVW. If sufficient temperature resistance cannot be achieved, it may be necessary to move the 3-way further downstream in the exhaust system than normal (perhaps behind the muffler). In this location, there is likely to be sufficient delay in warming up the catalyst that a close-coupled oxidation start catalyst system will be needed to meet the HC and CO standards. 100% use of bypassable start catalyst systems could increase the cost of medium duty vehicles by another $40.

LHDVs - The cost of applying 3-way catalyst technology to heavy-duty gasoline engines has been estimated from the incremental cost of systems incorporating feedback fuel metering and 3-way catalysts reported by EPA.[11] After adjusting EPA's system costs to current dollars, the differential cost between open-loop systems with oxidation catalysts and feedback 3-way systems is approximately $210. Although the larger size of catalysts for heavy-duty engines results in higher costs than for similar systems installed on light-duty vehicles, this is already reflected in the baseline cost for heavy-duty engines equipped with oxidation catalyst systems. The differential cost for light-duty emission control systems was therefore considered to be a reasonable estimate for heavy-duty gasoline engines. All vehicles would not require this cost increase since some LHDV models are already certified with 3-way catalyst systems. As with medium duty vehicles, additional costs might include bypassable catalyst systems. Because of the extended time at high load that LHDVs will require to drive the cycle, more of them could need bypassable start catalysts to provide for adequate cold start and warm-up performance with a post-muffler location of the 3-way catalyst to protect it from excessive temperature. Because of the larger catalyst size and possible increase in valving required, the cost of

the by-passable start catalyst system for LHDVs has been estimated to be $120. The worst case total system cost increase for LHDVs is therefore $210 + $120 = $330 per engine.

Cost/Effectiveness

For LHDVs, cost/effectiveness relative to the 1991 standards has been computed by dividing the estimated cost of compliance by the product of the emissions reduction in grams/mile and the lifetime vehicle driving distance. The 8,501-10,000 GVW class was used in the calculation because it comprises the vast majority of all vehicles in the LHDV category. The calculation is as follows:

LHDV Cost/Effectiveness:
= ($330) ÷ ([0.22 g/mi HC + 2.55 g/mi NOx] × [13015 mi/yr × 10 yr])
= $837/ton of HC + NOx
= $0.42/lbs of HC + NOx

For MDVs an alternative methodology would be desirable because much of the benefit of the proposed standards is associated with the change in test weight rather than the change in the numerical value of the standards. However, this effect is difficult to estimate. The differential between the recommended HC standards (which only apply to test weights of 6,001-8,500 lbs.) and the current standards for the 5,751-8,500 test weight class may also be inappropriate because so few vehicles are currently certified in that weight class. To be conservative, benefits have been estimated based on the difference between the current standards in the lightest weight class and what the recommended standards in that class would be if curb plus 300 were still the recommended test weight:

MDV Cost/Effectiveness (0.39-.25 HC)
= ($40) ÷ (0.14 g/mi HC × 10909 mi/yr × 10 yrs)
= $2,378/ton of HC
= $1.19/lb. of HC

There are apparent benefits associated with the increased stringency of the NOx standards in the top weight class, but there are so few medium-duty vehicles currently certified in the heaviest weight class that there has been no attempt to estimate emission benefits.

Total emissions benefits of the recommended standards for MDVs and LHDVs have similarly been calculated based on the assumption that the only in-use benefit is associated with the difference in level of the current certification standards and what the recommended standards would have been in that weight class if it still existed (e.g., the benefits of the recommended standards have been calculated based on a difference in in-use emissions rate for HC of 0.39-0.25 = 0.14 g/mi). Actual emission reductions would be larger because of the adverse impact of high load operation that is not currently reflected in the

official emissions inventory. Using this very conservative approach, the emission reductions associated with the recommended standards in calendar year 2000 are:

HC	CO	NOx
4.4 tons/day	126.3 tons/day	43.1 tons/day

These available reductions represent 6% of the HC, 11% of the CO, and 20% of the NOx that would otherwise be emitted by gasoline-fueled medium- and light-heavy-duty vehicles in year 2000. These reductions are 1% of the total HC emissions from on-road vehicles, 2% of the CO, and 3% of the NOx. Considering the benefits of the "full-time" emissions control that would be required, the actual benefits are likely to be higher for HC and CO.

Lead Time Requirements

As discussed above, the further development of 3-way catalyst systems for use on heavy-duty gasoline engines appears to be needed. Some engines may also require cylinder head redesign to achieve adequate durability of exhaust valves when operating at stoichiometric air fuel ratios during relatively high load conditions. However, all of the required changes appear to be relatively straightforward.

Previous experience under both the California and Federal programs for the control of light duty vehicle emissions indicates that three to four years are generally required to design, develop, certify, and produce new emission control systems after concepts of proven feasibility have been demonstrated. The concepts that can achieve the proposed standards (post-muffler 3-way catalysts and by-passable, close coupled catalysts) have both been successfully demonstrated on a prototype basis.

Since new emission control concepts are generally developed on just a few prototype vehicles, the first step required after proof of feasibility is the construction of a fleet of vehicles that represent a manufacturer's total product line. Six months for design and construction of the fleet would be followed by six months of durability testing. Model-specific problems with the new technology must be investigated and solved. Such problems might include packaging, vibration, and recalibration of related emission control systems.

Design modifications will usually begin during the running of the first durability fleet and might continue for three months thereafter. Work on tooling modifications may begin between the completion of the first and a second durability test fleet.

Four months might be required for construction of a second fleet to test the acceptability of design modifications made as a result of the testing of the first fleet. Six to nine months may be required to

complete durability testing and make any additional design modifications required.

Final design changes may occur during the evaluation of the second durability fleet and the construction of a fleet of vehicles for certification may begin shortly thereafter. Three months may be required to build the certification vehicles and prepare applications. During the six months that will be required for the certification durability testing, final tooling and assemblyline modifications will be made. Following the completion of certification durability testing, another three to four months may be required to complete the testing of emission data vehicles.

Based on the schedule outlined above, 3 to 3 1/2 years is required to develop and certify the systems needed to meet the proposed standards. If commitments are made by mid-1988, vehicles can be certified to the proposed standards and produced before the end of the 1991 calendar year, and in time for the 1992 model year.

To provide manufacturers additional time for extended durability testing to evaluate possible changes needed to comply with an extended certification requirement, a 1995 model year compliance date is proposed for 100,000 mile certification.

Evaporative Emissions Cost and Lead Time - The proposed revisions represent an alignment between ARB and EPA HDV evaporative emission regulations. EPA's analysis, in 1983, showed these standards to have a negligible cost impact on the industry. Because of the minor cost impacts and the fact that industry is currently certifying to the proposed standards on 49-state vehicles, staff believes that the proposed standards should also become effective in 1992.

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9. CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis contained herein, the staff has reached the following conclusions:

1. The failure to test medium-duty vehicles at test weights that are representative of the relatively high loads that frequently occur in customer service has resulted in the development and use of emission control systems that are ineffective in controlling emissions from MDVs operating at relatively high power levels.

2. Additional assurance that vehicles meet emission standards in customer service could be achieved through the implementation of chassis dynamometer exhaust emission test procedures and SHED procedure evaporative emission test procedures for LHDVs.

3. The current NOx standards for medium- and light-heavy-duty vehicles do not require as much control as the standards that have been adopted for passenger cars and light trucks.

4. The current HC standards for medium- and light-heavy-duty vehicles require a level of control that is equivalent to the control required for passenger cars and light trucks to meet the 0.39 g/mi standard.

5. CO emission standards for the lighter MDVs are somewhat less stringent than the 7.0 g/mi level currently required of passenger cars and much less stringent than the 3.4 g/mi CO standard that applies to federal passenger cars.

6. The particulate emission standard for the heaviest MDVs is more stringent than the standards that apply to passenger cars and lighter trucks.

7. Increased assurance that emission control systems would last for the full service life of a vehicle would be provided by a longer certification distance. At 100,000 miles, a 25% increase in the numerical value of the standards would provide for equivalent stringency.

Based on the above conclusions, the following recommendations can be made:

1. The test weight for medium-duty vehicles should be changed from curb weight plus 300 pounds to GVW.

2. Light-heavy-duty vehicles should be certified using a chassis dynamometer test procedure and a test weight equivalent to GVW. With the conversion to chassis testing, evaporative emissions compliance should also be demonstrated using the SHED test procedure and the emission standards should be adjusted to reflect the use of SHED testing instead of functional equivalency to the systems used on smaller vehicles.

3. For NOx standards to be equivalent to the 0.4 g/mi standard for passenger cars and light trucks, MDV NOx standards should be reduced by about 30% and LHDV NOx standards need to be cut in half.

4. The same technology required to meet a 0.25 g/mi standard with passenger cars can be applied to MDVs and LHDVs and would allow them to certify at 35% lower HC levels.

5. CO emission levels for various test weight categories should be established in proportion to the estimated amount of fuel consumption required to complete the test and to require the same degree of control associated with the 3.4 g/mi federal standard.

6. The particulate emission standard for the heaviest MDVs should be relaxed slightly to provide equivalent stringency to the standards that apply to passenger cars and lighter trucks, and particulate standards for LHDVs should be established that are proportional to the MDV standard.

7. 100,000 mile standards should be established at a level 25% above the basic 50,000 mile standards.

The proposed new emission standards are summarized in Tables 9 - 11.

Table 9

Proposed 50,000 Mile Primary Standards

		grams/mile			grams/test
	Test Weight	HC	CO	NOx	Evaporative HC
Medium-Duty Vehicles	0-3,750	not allowed			
	3,751-5,750	not allowed			
	5,751-8,500	0.39	5.0	1.1	2.0
Light-Heavy-Duty Vehicles	8,501-10,000	0.50	5.5	1.3	3.0
	10,001-14,000	0.60	7.0	2.0	3.0

Table 10

Proposed 100,000 Mile Optional Standards
for Diesel-Powered Vehicles

	Test Weight	grams/mile HC	CO	NOx	PM
Medium-Duty Vehicles	0-3,750	not allowed			
	3,751-5,750	not allowed			
	5,751-8,500	0.46	5.0	2.0	0.10*
Light-Heavy-Duty Vehicles	8,501-10,000	0.60	5.5	2.6	0.12
	10,001-14,000	0.70	7.0	4.0	0.15

*Standard applies for 50,000 miles only.

Table 11

Proposed 100,000 Mile Primary Standards

	Test Weight	grams/mile HC	CO	NOx	grams/test Evaporative HC
Medium-Duty Vehicles	0-3,750	not allowed			
	3,751-5,750	not allowed			
	5,751-8,500	0.49	6.3	1.4	2.0
Light-Heavy-Duty Vehicles	8,501-10,000	0.63	6.9	1.6	3.0
	10,001-14,000	0.75	8.8	2.5	3.0

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10. REFERENCES

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5. J.D. Murrell, "Factors Affecting Automotive Fuel Economy," SAE Paper No. 750958, October, 1975.

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11. C.L. Gray, "Updated Cost Estimates of Controlling HC Emissions from Mobile Sources," Emission Control Technology Division, U.S. Environmental Protection Agency, November 28, 1983.

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Appendix A

Fuel Consumption Predictions for Various Types of Vehicles

Fuel Economy Prediction
Passenger Cars:

Test Weight	2250	3000	3750	4500	5500
Horsepower	79.3125	105.75	132.1875	158.625	193.875
CID	105.75	141	176.25	211.5	258.5
Comp. Ratio	9	9	9	9	9
N/V	30	30	30	30	30
MPG	26.78347	21.40315	17.94368	15.50712	13.17473
Gallons/Mile	0.037336	0.046722	0.055729	0.064486	0.075902
Ratio from 3750				1.157125	1.361976

Trucks:

Test Weight	3750	5750	8500	10000	14000
Horsepower	132.1875	181.0675	227.8	221.1	309.54
CID	176.25	270.25	340	330	462
Comp. Ratio	9	9	9	9	9
N/V	40	45	45	45	45
MPG	16.23560	11.31660	8.953819	8.683676	6.634532
Gallons/Mile	0.061593	0.088365	0.111684	0.115158	0.150726
Ratio from 3750	1.105205	1.585606	2.004025	2.066369	2.704588
Ratio from 5500	0.811471	1.164195	1.471409	1.517184	1.985782

Appendix B

Description of the Vehicle Simulation Model
("VEHSIM")

VEHSIM, a vehicle simulation model, was originally developed by General Motors Corporation in the early 1970's as a tool for predicting instantaneous fuel consumption and recording time histories of speed, torque and fuel consumption for various driving cycles. The model was modified and expanded by the Department of Transportation in the mid-1970's and the Environmental Protection Agency in the late 1970's to evaluate the effects of driving cycle changes on automobile fuel economy and emission levels. Recently the model has been restored to operating form by Sierra Research, Inc. to evaluate the relationship between vehicle loading and exhaust emissions. Sierra has also modified the model to investigate the effect of changing emission control system designs to provide full-time catalytic control of emissions.

The VEHSIM program was modified by EPA to perform simultaneous computations of fuel economy and emission factors for HC, CO and NOx. This was accomplished by writing a new program, which EPA called "VSIME", which utilizes the VEHSIM program output for engine speed and torque time histories and engine emission inputs to calculate instantaneous and cumulative emission rates over the driving cycle. The program output includes emission quantities computed by VSIME and fuel consumption quantities computed by VEHSIM. Inputs to VEHSIM are organized into three categories:

-engine map for fuel consumption;

-driving cycle data;

-vehicle configuration data.

The engine map contains information on the fuel consumed for incremental load points at speed points characterizing the range of engine operation. For example, one of the available engine maps is for a Chevrolet 350 CID V-8 with an oxidation catalyst. Speed points range from 650 rpm to 3800 rpm. For each speed value incremental load points (lb-ft) are expressed with associated fuel rates (pounds per hr), throttle settings (degrees) and manifold settings (inches of mercury below atmospheric).

The driving cycle file specifies the vehicle acceleration/deceleration requirements and associated vehicle speed levels for each segment of the cycle. Segments are defined to be one second in length. Cycle specifications are available for a variety of driving cycles.

Vehicle configuration data characterize shift logic, fan losses, power steering losses, and air conditioning losses. The shift logic is expressed for gear changes per vehicle speed and manifold setting. VEHSIM computes the engine speed, load and fuel consumed by a vehicle to maintain the acceleration and speed requirements set for a particular segment of the driving cycle being used. The program employs a series of tests to determine if a vehicle has achieved the velocity required by a particular segment. Acceleration/deceleration requirements are specified by the driving cycle and the program uses them to determine the engine speed and load required to achieve the desired velocity set for the segment.

The program employs many contingencies to accommodate conditions where the vehicle is unable to achieve the desired velocity or if the specifications of the engine map are exceeded. Once the desired engine speed and load conditions needed to satisfy a particular segment have been identified, the instantaneous fuel consumption rate (i.e., the rate across the segment) is determined by a double interpolation with respect to speed and load within the engine map. The first two interpolations are with respect to load within each of the relevant rpm settings. The second interpolation is between the load values for each of the rpm settings. Instantaneous (i.e., per segment) engine speed, load point and fuel consumption values are then recorded for each segment of the cycle. The outputs of VEHSIM are as follows:

-cumulative time (seconds)

-cumulative distance (miles)

-cumulative fuel consumption (pounds)

-engine horsepower (hp)

-engine load (lb-ft)

-engine rotational speed (rpm)

-manifold vacuum (inches of mercury)

-percent of wide open throttle

-segment identification

Inputs to VSIME consist of the above outputs from VEHSIM plus engine emission maps for HC, CO and NOx. Each engine emission map gives the emission rate as a function of engine rotational speed and engine torque (lb-ft). The HC and NOx emission rates are input in units of grams per hour. The CO emission rate is entered in units of 10 grams per hour. Constraints placed on the engine maps are as follows:

-speed values must increase steadily

-engine displacement must be positive

-load data must increase steadily

For each segment of the driving cycle the time duration is first determined. The load and the rpm values are then read. Each emission rate is then determined by double interpolation with respect to load and rpm within each engine map. The first two interpolations are with respect to load, for the constant rpm lines that bracket the rpm value, and the final interpolation is with respect to rpm. In any interpolation, if the independent variable lies beyond the range of tabulated values, the near end-point value is utilized. The emission in grams per segment is calculated by converting the rate from grams per hour to grams per second and multiplying the interpolated emission by the segment duration. VSIME program outputs include:

-cumulative time (seconds)
-cumulative distance (miles)
-engine torque (lb)
-engine rotational speed (rpm)
-incremental HC emitted during segment (grams)
-incremental CO emitted during segment (grams)
-incremental NOx emitted during segment(grams)
-cumulative HC (grams)
-cumulative CO (grams)
-cumulative NOx (grams)

These outputs are provided for each segment of the test procedure. The program also computes the grams per mile rate for each of the pollutants in each test segment.

EPA has been unable to locate the source code for the VSIME model, but Sierra has written a new version of the model from the description of the model's structure provided by EPA. Sierra's version of VSIME is referred to as "VEHSIME" to distinguish it from the original version of the model.

Appendix C

Excerpt from General Motors Response
to ARB Questionnaire

"First, excessively high engine component temperatures (primarily valve stems and guides) resulted in catastrophic valve and engine failures. The high temperatures result from the reduced air/fuel ratio enrichment during full-power operation needed to maintain low CO emission levels and minimize catalyst temperatures. Changes in the engine design to provide direct water cooling of the valve stems have allowed the engine to operate durably at higher exhaust gas temperatures, minimizing the need for as much air/fuel enrichment during full-power operation.

The second major problem encountered on HDGEs with oxidizing catalyst systems was the very rapid catalyst efficiency deterioration and structural failures that occurred from the high exhaust temperatures, particularly during full-power engine operation. Limiting the maximum catalyst operating temperatures is critical for successful operation of the system. Current experimental development programs are concentrating on this aspect of the oxidizing catalyst technology applied to HDGEs. Based on recent experiments, two design approaches appear to lower the catalyst temperatures sufficiently that successful operation for extended periods may be possible. 1) The catalyst has been located behind the muffler to allow additional cooling of the exhaust gases before entering the converter, and 2) electronically-controlled fuel injection has been adapted to the engines to control air/fuel ratios better. These minimize the occurrence of high catalyst temperatures, either from high engine exhaust temperatures or from high energy release in the converter, while maintaining sufficient catalyst efficiency to reach emissions levels below the emissions standards for HDGEs use in vehicles under 14,000# GVWR.

Durability testing of the recent design oxidizing catalyst systems is underway but the testing has not progressed sufficiently to determine whether the problem of high-catalyst deterioration has been resolved. Based on catalyst temperature information, we expect that this overall system configuration can achieve successful high-mileage operation and are proceeding to schedule use of the concept on one HDGE in the 1989 MY.

It is important to note that essentially all of our HDGE development experience with this oxidizing catalyst system has been with the current HDGE dynamometer-based testing procedures. We have not evaluated the emission control potential of this system configuration on vehicles up to 16,000# GVWR using a vehicle dynamometer-based test process, such as the current light-duty truck procedure. Thus, emission control potential on such a performance test must be considered unknown at this time. However, since HDGEs, even in vehicles below 16,000# GVWR, can be

expected to operate a significant portion of time at or near full-power, especially in commercial service, we would expect high exhaust temperatures to occur that could adversely affect catalyst durability.

With respect to 3-way catalyst systems applied to HDGEs, our experimental studies indicate that there is no 3-way catalyst technology, using rhodium as the primary NOx reduction catalyst, that will maintain efficiency when exposed to the high exhaust temperatures that occur during full-power operation. Rapid oxidation of the rhodium catalyst occurs at typical full-power exhaust gas temperatures. Such temperatures are frequent occurrences with the higher GVWR heavy-duty vehicles. Control of the engine fuel/air ratio to stoichiometry would increase the current full-power exhaust temperatures in the range of 50-150°F. This temperature increase would exacerbate the rhodium oxidation rate and, thus, increase the loss of rhodium catalyst efficiency. The occurrence frequency of temperatures too high to maintain rhodium catalyst efficiency would be expected to decrease at lower GVWRs, near 8500# GVWR, but definitive information is not available to determine an acceptable GVWR limit for the variety of heavy-duty engine/vehicle/GVWR combinations used in customer service.

Attempts have been made to avoid the high exhaust temperature degradation of 3-way catalysts including mounting the converter after the muffler as with the oxidizing catalyst. This converter location does reduce the peak exhaust inlet temperatures. However, inlet temperatures during part throttle operation become too low to maintain catalyst efficiency. No solution to this inlet temperature dilemma has been found so that a 3-way converter can be successfully applied to HDGEs in the heavier vehicles."

Excerpt from letter from S.A. Leonard, GM Environmental Activities Staff, to J. Wendt, July 7, 1987.

sierra research

A Study of Excess Motor Vehicle Emissions – Causes and Control

Section VIII

Investigation of "Pattern Failure" Vehicles in the California Smog Check Program

prepared for:

State of California
Air Resources Board

prepared by:

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SECTION VIII

A STUDY OF EXCESS MOTOR VEHICLE EMISSIONS CAUSES AND CONTROL

Investigation of "Pattern Failure Vehicles" in the California Smog Check Program

prepared for:

California Air Resources Board

December 1988

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A STUDY OF
EXCESS MOTOR VEHICLE EMISSIONS -
CAUSES AND CONTROL

Investigation of
"Pattern Failure" Vehicles
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1. SUMMARY

"Pattern Failure" is a term coined by the U.S. Environmental Protection Agency to describe an inspection and maintenance (I/M) program test failure that is associated with a "pattern" of frequent failures for a particular vehicle model. EPA has defined "Type I" Pattern Failure vehicles to mean vehicle models which experience high I/M program failure rates due to one or more commonly occurring defects. "Type II" Pattern Failure vehicles are models which experience a high failure rate even when no defects are present. Type II Pattern Failure models are vehicles that have high emissions during I/M testing even though they are capable of passing the emission standards under the more rigorous "Federal Test Procedure" used in the new vehicle certification program. For Type II Pattern Failure vehicles, the I/M test results are not a good indication of excess emissions in customer service.

Through analysis of data from the California I/M (Smog Check) program and the recently completed I/M Evaluation Program, the following findings have been made.

1. Many vehicle models identified by EPA as Type II Pattern Failures do experience high failure rates in the Smog Check program; however, other models identified as Type II Pattern Failures by EPA have very low failure rates. On the average, the failure rate for EPA Pattern Failure models is only slightly higher than the failure rate for other vehicles. Models designated as Pattern Failures by EPA have a 24.4% overall failure rate compared to 22.6% for all 1981 and later models.

2. The contribution of Pattern Failure vehicles to excess HC and CO emissions in California is less than the contribution of other late-model vehicles that fail the California Smog Check. EPA Pattern Failure models exceed the standards they

were certified to meet by only half as much as other failing models.

3. The fail rates of Type II Pattern Failure vehicles in new-car dealerships are lower than in other Smog Check stations, indicating that dealership service personnel may be better able to perform the I/M test without letting the vehicle get into a high emission operating mode.

4. The waiver rates on the Type I and Type II Pattern Failure vehicles that fail the Smog Check inspection are much lower in new-car dealerships than in other Smog Check stations, indicating that dealership service personnel may be doing a better job of preconditioning, testing, and repairing Pattern Failure vehicles than is being done at other stations.

5. There does not appear to be any generic emission control component, or combination of components, that is unique to Pattern Failure vehicles; however, air injection systems that are "dumped" during periods of extended idle appear to be a significant source of Pattern Failure problems. Vehicles exhibiting this problem can be identified through analysis of Test Analyzer System data because there are significant differences in CO + CO_2 for passing and failing vehicles.

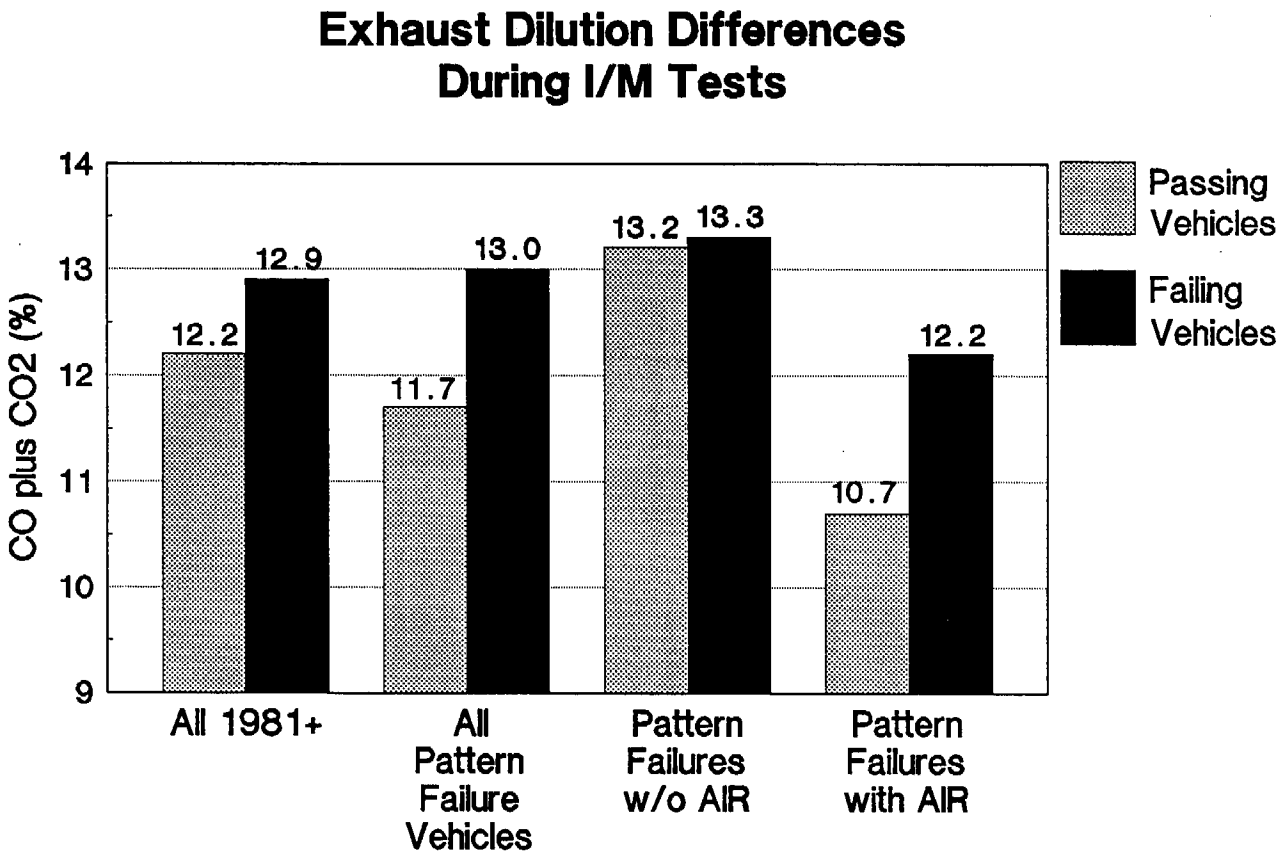
This last finding is illustrated in Figure 1. As the first group of bars in the figure shows, the sum of CO + CO_2 is slightly lower (12.2% vs. 12.9%) for 1981 and later model vehicles that pass the I/M test. This indicates that there is slightly more dilution of the exhaust in passing vehicles. Since almost all 1981 and later models have engines that are calibrated to run at stoichiometric air/fuel ratio, the dilution of exhaust emitted from the engine should be about the same for all vehicles, except for those that are equipped with air injection. The increased dilution in passing vehicles may indicate a higher amount of air injection is occurring.

The second group of bars in Figure 1 indicates that the difference in exhaust dilution is twice as large for vehicles that have been designated as Pattern Failures by EPA. Passing vehicles have only 11.7% CO + CO_2 while failing vehicles have 13.0%.

A probable cause of certain Pattern Failures becomes clearer when the Pattern Failure vehicles are separated into those which have no air injection and those which are equipped with air pumps. The third group of bars in the figure indicates that there is no significant difference in dilution for passing and failing vehicles that are not equipped with air injection systems (13.2% vs. 13.3%). However, there is a 1.5% difference in the CO + CO_2 levels of passing and failing vehicles that are equipped with air pumps (10.7% vs. 12.2%). The failing vehicles have exhaust dilution levels that are much closer to the exhaust dilution levels of vehicles that are not equipped with air pumps. In other words, it appears that air injection systems are not

working on many of the failing vehicles. Consultation with vehicle manufacturers indicates that air injection systems that are "dumped" during periods of extended idle contribute to high failure rates. Our study indicates that such vehicles can be detected through the analysis of I/M test results.

Figure 1



Discussions with vehicle manufacturers and I/M program officials in other states indicates that the frequency of Type II Pattern Failures is related primarily to preconditioning and testing procedures employed during the I/M test. Differences in the test procedures used in the California I/M program (i.e., the inclusion of an engine restart and 2500 rpm test) minimize the failure rate of some models identified as Pattern Failure vehicles by EPA. Knowledge of the preconditioning required to avoid high emission operating modes during an I/M test appears to be the reason why new car dealerships report lower failure rates for Pattern Failure models than other Smog Check stations.

Based on the above findings, three major conclusions of the study are:

1. EPA's approach to the identification of Pattern Failure models is not appropriate for the California Smog Check program. The existence of Type II Pattern Failures is so test-procedure-specific that abnormally high failure rates observed in other I/M programs are not a good indication that problems will exist in California. In addition, EPA's practice of designating vehicles as Pattern Failure models based on relatively high failure rates compared to other models of similar age does not appear to be a reliable way of identifying problem vehicles during their first few years of customer service. Theoretically, this approach can provide an early indication of Type I Pattern Failure problems, however, the California data base indicates that many models so designated turn out to experience normal failure rates at higher mileages. More effective criteria for designating potential Pattern Failure models in California might be based on a) significant differences in exhaust dilution for passed and failed vehicles (about 1% or more) or b) failure rates exceeding some "deminimus" value (e.g., 10%) which are among the highest failure rates for vehicles of equivalent model year and mileage (e.g., the top 10-20%). Final determinations could be reserved until laboratory or referee facility evaluation of a sample of the potential Pattern Failure model has been completed.

2. Many Type II Pattern Failures can be avoided through the use of model-specific preconditioning and testing procedures. However, some of the preconditioning and testing procedures needed to avoid Pattern Failures are inconsistent with the current Smog Check program test procedures. Vehicle-specific exhaust measurement scheduling needs to be incorporated into Test Analyzer Systems to minimize future Pattern Failure problems. Some vehicles may need to be tested with the transmission in gear if Type II Pattern Failures are to be eliminated.

3. Many Type I Pattern Failures can be corrected through knowledge of the likely cause of the problem. Mechanics need

to receive more information regarding the probable cause of certain Pattern Failures before significant reductions in Type I Pattern Failures can be achieved.

Based on these conclusions, it appears that the effectiveness of the California Smog Check program could be improved if more Smog Check mechanics can be made to follow model-specific preconditioning, testing, and repair procedures. To accomplish this objective, Smog Check mechanics need to receive more information regarding Pattern Failure problems. In the short term, bulletins or some other form of supplemental information could be distributed. In the longer term, more advanced Test Analyzer Systems could prompt mechanics to use model-specific preconditioning, inspection, and repair procedures.

A fourth major conclusion is that Type II Pattern Failures could be prevented through changes to the new vehicle certification regulations that would require auto manufacturers to demonstrate that each model can pass a standard I/M test using a standard preconditioning procedure.

Based on our conclusions, the following recommendations for ARB action have been developed:

1. To eliminate future problems with Type II Pattern Failures, ARB should consider requiring a demonstration of compliance with Smog Check test procedures as an element of the new vehicle certification program.

2. To assist mechanics in the identification and correction of Pattern Failure problems with the current fleet, ARB should support the development of Test Analyzer Systems with mass storage devices and programming capable of detecting when a Pattern Failure vehicle is being tested.

3. To provide information for distribution to mechanics through bulletins or enhanced Test Analyzer Systems, ARB should consider the implementation of data analysis and laboratory testing programs to routinely identify potential Pattern Failure models and develop optimum inspection and repair procedures.

2. INTRODUCTION

Pattern Failures vehicles have been defined by the Environmental Protection Agency as groups of vehicles with unusually high I/M failure rates that are known or suspected to fail due to a common cause. The problem arose in state I/M programs around the country when 1981 and later model year vehicles became due for inspection. The states were reporting that the same types of vehicles were seen to fail I/M inspections at a relatively high rate but were found to have nothing wrong with either emission control components or operating parameters. Pattern Failure vehicles create problems in I/M programs, not only because of the difficulty in testing them properly but also because of the inconvenience and frustration experienced by both vehicle owners and mechanics in diagnosing and re-testing.

EPA has grouped Pattern Failures into two categories. Type I failure vehicles are not performing as designed and usually have an identifiable defect which can be repaired. Type II vehicles are performing as designed, and so have low emissions in normal service, but some element of the design is not compatible with some part of an I/M test. Many, if not most, Type II Pattern Failures are caused by certain elements of the design or programming of onboard computer control systems. For instance, when the vehicle is undergoing an I/M test the control system may change the air/fuel ratio or the ignition timing, or re-route ("dump") the secondary air normally injected into the exhaust system. In many cases, these responses are part of catalyst protection strategies.

Because Type I failure vehicles are not performing as designed, their mass emissions can exceed standards. Only a few of the Pattern Failure vehicles defined so far have been Type I failures. Because Type II vehicles <u>are</u> performing as designed, their mass emissions do not exceed standards, or at least are not excessively high.

Pattern Failures are a cause of concern for other important reasons. Much time and effort is spent by mechanics in trying to solve what may be non-problems. If the vehicles are Type II failures, such efforts may result in "repairs" that make in-service emissions worse than they were at the start. Another possible problem would be overloading the Referee Stations with Pattern Failure vehicles that fail the I/M test but have no identifiable problem.

Pattern Failures have received much attention from EPA, state agencies, and manufacturers. Non-dealer repair shops, which make up the large majority of Smog Check facilities, may suffer from a serious lack of knowledge of Pattern Failures, such as which vehicles are so

classified, how to get around the problems during the I/M test, and how to remedy the problems causing the failure.

Appendix F contains the actual lists of Pattern Failure models published by EPA. In addition to available failure rate information, one of the two EPA lists contains EPA's comments on the probable cause of the high failure rate. The failure rates for Pattern Failure vehicles reported by EPA are shown in Table 1. Failure rates presented in the table are for an idle test with no preconditioning. As the table shows, there is a very wide range of failure rates for vehicles which EPA lists in the Pattern Failure category. A number of the Pattern Failure models have I/M failure rates using a simple idle test of less than 10%. EPA's apparent rationale for labeling vehicles with such low failure rates as Pattern Failure models is that the observed failure rate is high relative to other vehicles of the same model year. In addition, EPA appears to have defined several vehicles as Pattern Failure models because they are known to have emission control system features that could cause high emissions to occur under certain test conditions.

As can be seen from Table 1, the fact that a vehicle has been categorized by EPA as a Pattern Failure model does not necessarily indicate that a high failure rate in the Smog Check program should be anticipated.

Table 1

Reported Fail Rates for EPA-Identified Pattern Failure Vehicles

Group No.	Description	Failure Rate
1.	85-86 Ford Trk 2.3L	25.0
2.	81-82 Nissan 1.2L	31.4-33.8
3.	84-86 Buick, Olds 5.0L 4V	unknown
4.	81-82 Toyota 1.3L	10.5-12.5
5.	81-82 Nissan 1.5L	23.4-27.3
6.	83 Mitsubishi 1.6L	22.0
7.	83 Nissan 1.6L 3CL	7.9
8.	84 Ford Truck 2.8L	unknown
9.	81-85 Ford 1.6L	variable

Table 1 (continued)

Group No.	Description	Failure Rate
10.	81-83 Ford 2.3L	10.6 (82 MY)
11.	83 Honda 1.3L	16.9
12.	83 Nissan 1.6L OXC	7.9
13.	84 Honda 1.3L	16.7
14.	84-86 Ford 2.3L	variable
15.	82 Chevrolet 3.8L	3.8
16.	83 Honda 1.5L	18.3
17.	82-84 GM 1.6L	4.3- 9.6
18.	82 GM 3.8L	5.5
19.	81-82 GM 1.6L 3CL	17.0
20.	83-85 GM 2.5L	3.0- 6.7
21.	82 GM Truck 5.7L	9.6
22.	83-84 Mazda 1.5L 3CL	6.8- 7.9
23.	82 GM 5.7L FI	3.7
24.	81-82 Mazda 1.5L	12.3-18.4
25.	81 Mazda Truck 2.3L	47.6
26.	82 Nissan Truck 2.3L	32.7
27.	81-83 Ford 3.3L	11.4-20.1
28.	81-83 Nissan 2.8L 3CL	12.8-20.5
29.	81-82 AMC 258 CID	18.8-20.5
30.	84-85 Honda 1.8L	39.1 (84 MY)
31.	83-84 Nissan Truck 2.4L	35.7-47.6
32.	81-83 Mitsubishi 2.6L	22.0-47.3
33.	82 Chrysler 135 CID	8.4

Table 1 (continued)

Group No.	Description	Failure Rate
34.	82 Honda 1.8L	unknown
35.	81-86 Ford 302 CID	11.4-39.3
36.	82-83 Mazda Truck 2.0L	41.6-53.5
37.	84-85 Chrysler Van 2.6L	unknown
38.	82 GM 4.1L V6	3.9
39.	83 GM 5.7L 4V	8.7
40.	83 Nissan 2.0L	12.7
41.	84-85 Chrysler 135 CID TBI	20.0
42.	84 Chev, Pont 5.0L 4V	8.8
43.	84-86 Buick 3.8L	analyzer dependent
44.	84-86 Ford 3.8L	17.2 (84 MY)
45.	85-86 GM 3.8L FI	analyzer dependent
46.	82 Chev Pickup 5.0L	5.7
47.	82 Nissan 1.5L 3CL	24.4
48.	81 VW Truck 1.7L 3CL	29.8
49.	81 Audi 1.7L	13.4
50.	81 VW Van 2.0L OXC	45.9
51.	81 VW Van 2.0L 3CL	51.0

An investigation of Pattern Failures occurring in the California Smog Check Program was Task Number 7 of the Scope of Work under a contract with the California Air Resources Board for "A Study of Excess Motor Vehicle Emissions - Causes and Control" (ARB Contract No. A5-188-32). The principal objectives of the task were to determine the extent to which Pattern Failures are occurring in the Smog Check program and to determine how Pattern Failures might be handled most effectively in

the future. To accomplish these objectives, the following subtasks were outlined in the scope of work:

- development of algorithms to identify vehicles with significantly higher failure rates than the norm;
- development of algorithms for ranking high failure rate models;
- development of algorithms to analyze the performance of new-car dealers versus other Smog Check stations;
- analysis of a sample of Smog Check program data using the algorithms; and
- assessment of emission control system design characteristics to identify designs prone to Pattern Failure.

Following this introductory section, Section 3 provides a brief description of methodology used in the course of the study. Section 4 summarizes the results of the data analysis and consultation with representatives of vehicle manufacturers and officials of other state I/M programs. Section 5 contains the conclusions and recommendations developed. Section 6 lists references cited in the body of the report. A lengthy series of appendices presents the detailed results of the data analysis performed, descriptions of the vehicle groups analyzed, and EPA Pattern Failure descriptions and failure rates.

3. METHODOLOGY

EPA-furnished lists of known "Pattern Failure" engine families were used to define 51 groups of vehicles by model year, make, engine size, and emission control system description. Copies of the EPA lists are contained in Appendix F. The emission control system description was limited to EGR, catalyst type (oxidation or three-way), air injection, and feedback control, i.e., closed- or open-loop.

The basic analytical approach was:

1. to compare performance in the Smog Check program among EPA-identified Pattern Failures, the entire fleet of 1981-and-later models, and non-Pattern Failure vehicles with high failure rates;

2. to compare Smog Check performance for new car dealerships and other Smog Check stations for the above vehicle stratifications;

3. to determine the extent to which Pattern Failures are related to vehicle design characteristics; and

4. to analyze the extent to which Pattern Failures are contributing to excess emissions in customer service.

Analysis of TAS Data

Under the Smog Check program, test results are recorded on cassette tapes in each Test Analyzer System (TAS) used at Smog Check stations. Engine families are not recorded on TAS records, but combinations of model year, make, engine size, and emission control system descriptions allow possible Pattern Failure vehicles to be identified.

For this study, Sierra obtained from the Bureau of Automotive Repair (BAR) a sample of several hundred thousand Smog Check TAS records from June 1986 which BAR had weighted by the vehicle population in each air quality management district. Sierra distilled that sample down to 175,000 records, weighted by the number of records in each district. Such a sample is large enough to be valid but not so large as to preclude rapid manipulation and calculation. This large sample of TAS records was then searched to identify and collect for analysis each of the Pattern Failure vehicle groups that had been defined, as well as other vehicle stratifications, as will be discussed.

In the Smog Check program, a Bureau of Automotive Repair contractor is responsible for reading the TAS cassette tapes and writing the data onto 9-track tape, but the BAR conducts all routine data analysis itself. To maximize the usefulness of the data, Sierra has found it necessary to employ specific screening and cleaning procedures. The files Sierra obtained from BAR were examined and modified by a proprietary Fortran program that identifies calibration records, identifies aborted records, and checks the validity of each record. Calibration records and aborted records are removed and written to separate files. Invalid records are written to one of several "bad data" files, depending on the nature of the problem with the record. Records are classified as "Incomplete", "Machine Error", or "Operator Error".

"Incomplete" records are those which do not contain 256 bytes of information. Such records may be the result of tape recorder failure or power failure during testing.

"Machine Error" records are records containing invalid characters in certain fields, or machine-generated data that are internally inconsistent. Examples of machine errors include: the presence of non-printing ASCII characters in a field, an invalid TAS number, an invalid Smog Check station number, an invalid mechanic number, an emissions standards category that is inconsistent with the model year and emission control system description for a vehicle, numeric characters in a field requiring alphabetic characters, or alphabetic characters in a field requiring number characters. Such records may be the result of a hardware failure or inaccurate setup of the machine.

"Operator Error" records are those containing obviously incorrect mechanic-entered information. One type of error often detected is referred to as a "Certification List" error, which occurs when a test record contains a vehicle and emission control system description which does not match any certified vehicle configuration reported by the EPA. Sierra has compiled and maintains an up-to-date lookup table containing information on every vehicle configuration certified by EPA since 1973. The information includes

- model year
- vehicle type (passenger car, light truck, etc.)
- manufacturer
- engine size
- fuel system (TBI, MFI, EFI, 2V, 3V, 4V carburetor)
- area of certification (California, 49-state, or both)
- use of air injection (pumped air, pulse air, or none)
- catalyst type (none, oxidation, 3-way, or oxidation + 3-way)
- EGR (yes or no)
- feedback control (yes or no, that is, open-loop or closed-loop)

Sierra's program checks the contents of each test record against the lookup table. An entry of "P", "D", "M", or "S" for each emission

control component on the test record indicates that the vehicle is supposed to have that component. These are checked against the lookup table, and an error is assumed whenever the combination of model year, manufacturer, engine size, and emission control component has no match in the table.

Other operator errors include repair cost values which apparently are off by a factor of 100, odometer values which apparently are high by a factor of 10 or low by 100,000 miles, and internally inconsistent visual and functional test results. An example of the last error would be a "Pass" for the visual inspection of an air pump and a "Not Applicable" for the functional test.

The general approach used for TAS data analysis at Sierra is to construct a file of screened and cleaned data before any particular analysis is performed. We deviated from this approach for this particular study to determine the extent to which "operator error" records might indicate abnormally high failure rates that could be confused with Pattern Failures.

For each Pattern Failure model identified by EPA, the latest version of Sierra's standard "summary statistics" report was generated. That report presents data on failure rates for tailpipe, visual, and functional test results in addition to dozens of other statistics. Appendices A, B, and C contain printouts in the standard summary statistics format.

As shown in the appendices, the Summary Statistics report contains approximately 200 calculated values. Each calculated value is labeled, however, many of the labels may not be sufficiently clear. Each label is described below.

Record Counts - As shown in the upper left hand portion of the of each Summary Statistics report, there are four different entries under "Record Counts". "Test Records Processed" is the total number of test records analyzed. Note that "After Repair Test Records" divided by "Initial Test Records" is not exactly equal to the computed failure (shown later) because of the effect of multiple tests on individual vehicles and because a vehicle which fails an initial test may improperly receive another "initial" test after repairs are made. "Referee Test Records" indicates the number of tests for a particular vehicle category that were conducted at the Referee Facility.

Average Odometer Reading - The four results listed under this heading show the average odometer readings for vehicles in the category indicated on the title of the printout. Individual results are shown for "All Vehicles", "Initial Test Vehicles", "After Repair Test Vehicles", and "Referee Test Vehicles".

One problem with the odometer data is that typographical errors may frequently occur when the data is being entered into the Test Analyzer System by the mechanic. In addition, vehicles with odometers that only go to 99,999.9 miles lead to erroneous entries. A vehicle with

120,000 actual miles would be recorded as having only 20,000 miles. To deal with these problems, our data analysis program incorporates a routine to check the odometer data for reasonableness. For older vehicles with extremely low mileage (less than 4,000 miles per year), we add 100,000 miles to the recorded odometer reading. For newer vehicles with extremely high mileage (i.e., more than 50,000 miles per year), we divide the odometer reading by 10.

Pass/Fail Percentages - Under this heading, the percent of vehicles which passed or failed the I/M test is displayed. In addition, the information indicates how vehicles failed the test. Percentages are reported for the initial test pass rate and failure rate. The additional information provided indicates the percentage of the vehicles failed the underhood inspection ("Failing Underhood") and failed the tailpipe exhaust emissions test ("Failing Tailpipe"). These two numbers usually do not add up to the overall failure rate because some vehicles failed both the underhood and tailpipe test. The summary statistics report also indicates:

- the percentage of the vehicles that failed only the underhood inspection and not the tailpipe emission test ("Failing Underhood Only");
- the percentage of the vehicles that failed only the tailpipe test and not the underhood inspection ("Failing Tailpipe Only");
- the percentage of the vehicles that failed both the underhood inspection and the tailpipe emission test ("Failing Tailpipe and Underhood");
- the percentage of the vehicles that failed the CO emission standard, but not the HC standard ("Failing CO Only"); and
- the percentage of the vehicles that failed the hydrocarbon emission standard, but not the CO standard ("Failing HC Only").

Following the pass/fail results for the "Initial Test", a second row of information is provided for the "After Repair Test". As shown on the tables in the appendices, a certain percentage of all vehicles eventually passed the after repair test. (Please note that this is the pass rate only for those vehicles which failed the initial test.) A certain percentage of the vehicles eventually received a "Waiver". In other words, they failed the after repair test but received a Certificate of Inspection because full repairs would have caused the repair cost ceiling to be exceeded. These two percentages add up to 100%. Also shown is the percentage of all after repair tests were "intermediate" tests; i.e.; the vehicle failed and did not qualify for a waiver. Such vehicles had to be tested a second time. The percentage value is also shown for the vehicles which failed the

initial test and eventually passed an after repair test but did not receive full repairs. (Incomplete repairs were reported for these vehicles because of a cost exceedance.)

Average Emission/RPM Levels - Under this heading, tailpipe emission levels are reported for various subcategories. In the first row, the initial test results for all vehicles are presented.

The second row lists the average emission levels for the vehicles that passed the initial test. The third row shows the higher emissions for those vehicles which failed. The remaining headings should be self-explanatory. Note that entries such as "After Repair Test - All Vehicles" give the results only for vehicles which received an after repair test.

Repair Action Percentages - Under this heading, the repair actions reported by Smog Check mechanics are summarized. There are seven reapair action categories:

"MIS" means a problem related to ignition misfire or vacuum leaks;

"TMG" means a problem related to spark timing adjustment or spark advance controls;

"A/F" means repairs made to adjust or correct the air/fuel mixture;

"CRK" means repairs to the positive crankcase ventilation (PCV) system;

"EVP" means repairs to the evaporative emissions control system (including the gas cap);

"EXH" means repairs to any exhaust emissions control device or system other that EGR (including thermostatic air cleaner, air injection, fillpipe restrictor, catalysts); and

"EGR" means repairs to the exhaust gas recirculation system.

For each category, a "Yes" indicates that repairs were made and a "No" indicates that no repairs were made. "Excd" indicates that repairs were needed but not made because the Repair Cost Ceiling that applies to the program would have been exceeded.

The "ANY" category indicates the percentage of vehicles that had information coded in one or more of the categories.

Average Repair Costs - Under this heading, the average costs reported for emissions and safety repairs are listed. Only after repair tests are used in computing these averages.

Observed Tampering Pattern - Visual Inspection Percentages - Under this heading the results of the visual inspection results for the initial test only are summarized. There are twelve visual inspection categories:

"PCV" means positive crankcase ventilation system;

"TAC" means thermostatically controlled air cleaner;

"AIR" means air injection system;

"FEC" means fuel evaporative controls;

"FIL" means fillpipe lead restrictor;

"OXC" means oxidation catalyst;

"3WC" means three-way catalyst or three-way plus oxidation catalyst;

"EGR" means exhaust gas recirculation;

"ISC" means ignition/spark controls;

"CLP" means closed-loop control system;

"CFI" means carburetor or fuel injection system; and

"OTH" means other.

The "ANY" category indicates the percentage of vehicles that had defects in one or more of the categories.

For each of the categories, there are six values:

"Disc" indicates the percentage of the vehicles that had "disconnected" emission control devices in a particular category;

"Mod" indicates the percentage of "modified" emission control devices;

"Miss" indicates the percentage of "missing" emission control devices;

"Totl" indicates the sum of disconnected, modified, and missing devices;

"Pass" indicates the percentage of vehicles that passed the visual inspection of a particular type of device; and

"N/A" indicates the percentage of vehicles that were not factory equipped with a particular type of device.

The summary statistics program was rerun after being modified to distinguish between Smog Check stations that were franchised new-car dealerships and all other Smog Check stations. In order to distinguish Smog Check station type, Sierra obtained a listing of all Station names, types, and I.D. numbers from BAR. A significant number of modifications to the information obtained from BAR were made based on Sierra's manual review of the station type coded for each Smog Check station. For example, a number of facilities were not coded as new-car dealers that had names such as "Worthington Chevrolet". Other facilities were coded as franchised new-car dealers that had names like "Greenhaven Chevron". Telephone directories were consulted to confirm whether the station type was improper in these cases.

In addition to the summary statistics programs, special algorithms were developed to generate average failure rates for each unique combination of model year, make, engine size, and emission control system configuration that was found in the large sample of TAS data.

Analysis of FTP Emission Data

Data included mass emissions measured by the Federal Test Procedure (FTP) in the undercover test program that was the central part of the I/M Evaluation Test Program. Thorough vehicle descriptions, including Engine Family designations, were also recorded in this test program.

The data were examined to determine whether Pattern Failure vehicles among the I/M Evaluation test fleet contributed to excess emissions. The data files were searched to find vehicles with Engine Families identified by EPA as Pattern Failures, and to find the Baseline, or as-received, emissions from those vehicles.

4. RESULTS

Mass Emissions Analysis

In Table 2, average FTP mass emissions from vehicles identified by EPA to be Pattern Failure models are compared with all 1981 and later vehicles that failed when tested under recently completed I/M Evaluation Program. (Pattern Failure vehicles are always 1981 and later models.) All FTP data were obtained from the I/M Evaluation Program data base. As shown in the table, Pattern Failure HC emissions were about 30% lower, and CO emissions about 39% lower, than those from the entire 1981-and-later vehicle sample. Average NOx emissions were about 10% higher for the Pattern Failure vehicles, compared to the entire 1981-and-later fleet.

Table 2

Average FTP Emissions
(and Percent Above Standard)
for 1981 and Later Vehicles

(I/M Evaluation Test Program Test Results)

	------ grams/mile -------			Number of
	HC	CO	NOx	Vehicles
All I/M Failures	1.102 (169%)	17.45 (149%)	1.146 (64%)	220
Pattern Failures	.776 (89%)	10.71 (53%)	1.257 (80%)	46

Contributions to excess emissions can also be expressed by the value "Percent Above Standard". Pattern Failure vehicles contributed about half as much excess HC emissions (89% above standards vs. 169%) as the whole I/M Evaluation test fleet. They contributed about one third as much CO emissions (53% vs. 149% above standards). Excess NOx emissions from the Pattern Failure vehicles were about one fourth higher than from the whole fleet (80% above standards vs. 64% above standards).

Emissions for individual manufacturers are summarized in Table 3, which shows that the pattern of lower emissions from Pattern Failure vehicles holds in general for all manufacturers. The manufacturers listed accounted for 215 of the 220 post-1980 vehicles in the fleet. No manufacturer had higher CO emissions from Pattern Failure vehicles,

Table 3

Average FTP Emissions
from 1981 and Later Vehicles

(I/M Evaluation Program Test Results)

	grams/mile			Number of
	HC	CO	NOx	Vehicles
Chrysler				
All I/M Failures	1.216	26.65	1.087	12
Pattern Failures	.541	13.05	1.052	5
Ford				
All I/M Failures	1.409	22.34	1.074	25
Pattern Failures	.995	11.79	1.428	5
General Motors				
All I/M Failures	1.232	19.06	1.193	78
Pattern Failures	.831	13.92	1.122	14
Honda				
All I/M Failures	.694	6.15	1.280	28
Pattern Failures	.885	5.86	1.389	10
Mazda				
All I/M Failures	.688	13.48	1.430	13
Pattern Failures	.456	10.60	1.263	7
Mitsubishi				
All I/M Failures	.679	10.13	1.070	5
Pattern Failures	--	--	--	--
Nissan				
All I/M Failures	1.108	21.08	.997	23
Pattern Failures	.866	8.12	1.394	5
Toyota				
All I/M Failures	1.096	16.18	.810	30
Pattern Failures	--	--	--	--
Volkswagen				
All I/M Failures	.73	6.5	1.50	1
Pattern Failures	--	--	--	--

and only Honda showed higher HC emissions. Ford, Honda, and Nissan had higher NOx emissions from Pattern Failure vehicles.

TAS Failure and Waiver Patterns

Sierra's I/M summary statistics program was run on the TAS data for the entire body of 1981 and later model vehicles in the sample. The summary statistics and other data on the 1981+ models served as a baseline against which data for other vehicle categories were compared. These data (summary statistics, etc.) were also developed for EPA-defined Pattern Failures (EPA PF's), for EPA PF's with high fail rates, and for non-EPA PF's with high fail rates. The summary statistics reports for these four vehicle categories are in Appendix G. TAS data were also analyzed for information on the modes in which vehicles failed, the repair actions taken, and other information to be discussed in this section.

Table 4 gives an indication of the differences - and similarities - among these four vehicle categories in the Smog Check program.

Table 4

Fail Rates, Waiver Rates,
and Emissions Levels
for All Vehicle Categories

	Vehicle Category			
	All 1981+	EPA PF's	EPA PF's w/ High FR	non-EPA PF's w/ High FR
Initial Test - All Vehicles				
Fail Rate, %	22.6	24.4	35.5	38.1
Idle HC, ppm	73	74	103	88
Idle CO, %	0.34	0.33	0.43	0.34
2500 HC, ppm	55	53	70	72
2500 CO, %	0.51	0.52	0.75	1.05
After-Repair Test - All Vehicles Receiving Repair				
Fail Rate, %	22.6	25.6	29.7	18.6
Waiver Rate, %	23.1	21.8	22.9	26.5
Idle HC, ppm	108	100	110	88
Idle CO, %	0.55	0.49	0.51	0.30
2500 HC, ppm	79	70	77	75
2500 CO, %	0.94	0.94	1.02	1.04

EPA Pattern Failure Vehicles - It is clear from Table 4 that there is very little difference between EPA-defined Pattern Failure vehicles and the entire 1981 and later fleet in terms of their performance in the Smog Check program. The 24.4% failure rate for the models designated as Pattern Failures by EPA is only slightly higher than the 22.6% failure rate for all 1981 and later models.

EPA PF's With Higher-than-Normal Failure Rates - Summary statistics for each of the 51 Pattern Failure groups identified by EPA revealed that 23, or 45.1%, of them had failure rates that were higher than the overall failure rates for the same manufacturer and model year. The manufacturers included General Motors (8 groups), Ford (5 groups), Nissan (4 groups), Honda (3 groups), and Mazda, Mitsubishi, and Toyota with 1 group each. The summary statistics reports for these groups can be found in Appendix A, arranged in order of decreasing fail rates.

The group with the highest failure rate was composed of 1985-86 Ford Rangers and Aerostar vans equipped with 2.3-liter closed-loop engines, with 61.3 percent failing the initial inspection. This group encompassed engine families FFM2.3T5FAG7 and GFM2.3T5FAG8. Next highest were 1981-82 Nissan 1.2-liter vehicles, with a fail rate of 58.2%. Third highest, with 52.9% failing, was the group encompassing 1984-86 Buicks and Oldsmobiles fitted with 5.0-liter engine, 4-bbl carburetor and 3-way closed-loop systems plus oxidation catalysts, representing engine families E3G5.0V4NBM0, F3G5.0V4NBM1, and G3G5.0V4NBM2.

Another 22 vehicle groups had normal or lower failure rates compared to the overall rate. The summary statistics tables for these groups are in Appendix B. For the remaining 6 groups, there were insufficient numbers of TAS records for valid analysis, and the summary statistics for individual groups are not presented.

Non-EPA PF's With Higher-Than-Normal Failure Rates - TAS records for all 1981 and later models were sorted into combinations defined by vehicle type, model year, make, engine size, and emission control system (air injection, catalyst type, EGR, and presence or absence of feedback control) as entered on the TAS records. Minimal consistency checking was done - closed loop systems had to have three-way catalysts, not oxidation catalysts only. Several hundred different combinations were found, many of which do not exist. For instance, 283 open-loop three-way catalyst Volvos were found. The erroneous groupings illustrate the problem of inaccurate mechanic entries in the TAS data.

Analyses were conducted for each combination to determine Overall and Tailpipe failure rates on the initial test, and the percent having replicate initial tests. The list was ordered by decreasing Tailpipe Failure Rate from 85.11% to 10%, and is presented in Appendix D.

The highest Overall fail rate found in this analysis was for 1985 model year Ford trucks equipped with 2.3-liter engines, EGR and three-way catalyst with closed-loop control. This vehicle is an EPA-identified Pattern Failure, so this finding correlated well with the analysis of EPA PF's described above, as did many others.

There were several vehicles, however, with high Smog Check failure rates that have not been defined by EPA as Pattern Failure vehicles. These tended to be older, that is, of 1981 and '82 model years. Heading the list of such vehicles were 1981 and '82 Plymouth and Dodge makes with 1.4 liter engines. Failure rates for these cars ranged between 71% and 58.8%.

Because EPA Pattern Failure vehicles are usually identified relatively early in their service lives, these high-fail-rate older vehicles clearly are not Type II pattern failure vehicles but are failing because of problems that develop after significant mileage accumulation. Some of these vehicles may fit the definition of Type I failures, but further information would be needed to determine whether consistent problems exist.

The non-EPA Pattern Failure vehicles with the highest fail rates are:

1981-82 Dodge/Plymouth 1.4 l
1981-82 Dodge/Plymouth 1.6 l
1981-82 Toyota 1.4 l and 1.5 l
1981-82 Toyota 2.4 l
1981 Toyota 1.8 l

TAS records for these five vehicle groups, taken separately and as a group, were analyzed to yield I/M statistics plus the other data used in our analyses. The I/M summary statistics reports are presented in Appendix H.

Identifying and Differentiating Pattern Failures

An analysis of TAS data was conducted to see whether any patterns would be revealed that could be used to either identify Pattern Failure vehicles or differentiate between the types of Pattern Failures. Obvious data to examine would include fail rates and waiver rates, but pattern failure-indicating tendencies might also be seen in "idle dilution percentage" of the exhaust emissions, in the failure mode distribution, or in the distribution of the repair actions taken.

Idle Dilution Percentage - "Idle dilution percentage" is the sum of the idle concentrations of CO and CO_2. The correct sum of these two exhaust constituents for a given vehicle depends on the air/fuel ratio and whether supplemental air is added to the exhaust stream. This value is used typically in I/M programs to indicate whether the exhaust is being sampled correctly, and it can be used also as a check on air injection system efficiency. In the context of I/M program enforcement, a value that is very low means that the exhaust sample is

being diluted, indicating incorrect insertion of the exhaust probe. More of a concern with respect to Pattern Failure vehicles is the possibility of an abnormally high sum of CO and CO_2, indicating minimum dilution, i.e., non-functioning air injection.

Idle dilution values were calculated, for initial test passing and failing vehicles, for the following vehicle stratifications:

1) the entire 1981+ fleet;
2) all EPA Pattern Failures;
3) EPA Pattern Failures with high fail rates;
4) non-EPA Pattern Failures with high fail rates;
5) EPA Pattern Failures with and without Air Injection;
6) all Ford-manufactured Pattern Failures;
7) all GM-manufactured Pattern Failures; and
8) each of the 45 EPA Pattern Failure vehicles for which an adequate sample size existed.

The results are presented in Table 5 and graphically in Figure 2 for 1) through 4). Generally, the variations in idle dilution values across broad vehicle categories and between pass and fail status within broad categories are not more than about 10%. Note, however, that the EPA PF's failing Smog Check have higher CO plus CO_2 values, at 13.0%, than those passing the test, which have a value of 11.7%. Greater exhaust dilution, i.e., a lower value of (CO + CO_2), appears to contribute to the ability to pass the test. This is possibly associated with the lack of air pump dumping on some models when they are preconditioned so as to avoid the Pattern Failure problems.

The differences in idle dilution between passing vehicles and failing vehicles vary widely from model to model, and even within broader categories. These differences provide insight on the effects that air injection and air injection dumping have on Smog Check fail rates. For example, Ford Pattern Failure vehicles <u>with</u> air injection have idle dilution values of 9.8% on average when they pass the inspection, and 12.3% when they fail. On the other hand, Ford Pattern Failure vehicles that do <u>not</u> have air injection show little difference in idle dilution values between passing and failing vehicles - 12.6% vs. 12.8%.

Table 5

Idle Dilution Percentages
on Baseline Initial Test

Vehicle Category	Idle Dilution ($CO + CO_2$), % Pass	Fail
1) Entire 1981+ Fleet	12.2	12.9
2) EPA Pattern Failures	11.7	13.0
3) EPA PF's w/ High Fail Rates	11.9	12.7
4) non-EPA PF's w/ High Fail Rates	12.5	12.3
5) EPA Pattern Failures		
No Air Injection	13.2	13.3
w/ Air Injection (Any)	11.6	12.8
w/ Pulse Air Injection	12.9	13.5
w/ Pumped Air Injection	10.7	12.2
6) Ford PF's, No Air Injection	12.6	12:8
Ford PF's, w/ Air Injection	9.8	12.3
7) GM PF's, No Air Injection	13.5	13.0
GM PF's, w/ Air Injection	11.4	12.4
8) EPA Pattern Failure Vehicles with Adequate Sample Sizes		
85-86 Ford Trk 2.3L	14.7	14.7
81-82 Nissan 1.2L	13.3	14.0
84-86 Buick, Olds 5.0L 4V	10.1	11.2
81-82 Toyota 1.3L	12.4	11.6
81-82 Nissan 1.5L	13.2	13.4
83 Mitsubishi 1.6L	13.0	12.9
83 Nissan 1.6L 3CL	13.6	13.4
84 Ford Truck 2.8L	10.5	10.8
81-85 Ford 1.6L	10.1	12.0
81-83 Ford 2.3L	10.6	12.5
83 Honda 1.3L	13.5	13.5
83 Nissan 1.6L OXC	13.0	12.6
84 Honda 1.3L	12.2	13.9
84-86 Ford 2.3L	10.4	12.3
82 Chevrolet 3.8L	13.6	14.0
83 Honda 1.5L	13.3	13.9
82-84 GM 1.6L	11.8	13.3
82 GM 3.8L	13.5	13.8
81-82 GM 1.6L 3CL	11.7	13.3
83-85 GM 2.5L	14.0	14.1
82 GM Truck 5.7L	9.9	9.5
83-84 Mazda 1.5L 3CL	12.4	12.9
82 GM 5.7L FI	11.2	12.6

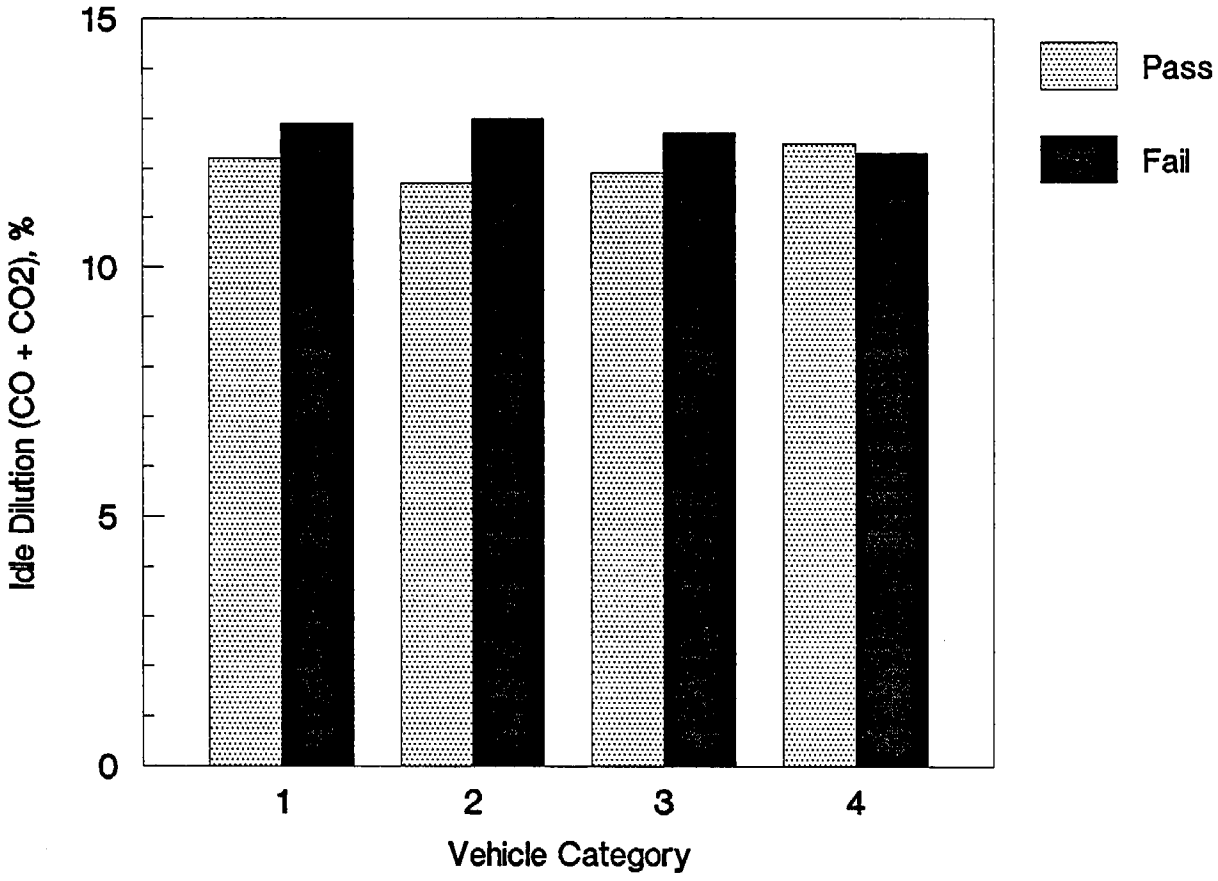
Table 5 (cont.)

Idle Dilution Percentages
on Baseline Initial Test

Vehicle Category	Idle Dilution ($CO + CO_2$), % Pass	Fail
81-82 Mazda 1.5L	11.2	11.1
81 Mazda Truck 2.3L	11.0	12.7
82 Nissan Truck 2.3L	12.9	13.0
81-83 Ford 3.3L	9.0	13.0
81-83 Nissan 2.8L 3CL	14.4	14.2
81-82 AMC 258 CID	10.4	12.8
84-85 Honda 1.8L	13.2	14.9
83-84 Nissan Truck 2.4L	14.5	15.3
81-83 Mitsubishi 2.6L	13.0	14.1
82 Chrysler 135 CID	11.1	11.5
82 Honda 1.8L	12.9	13.9
81-86 Ford 302 CID	9.7	13.6
82-83 Mazda Truck 2.0L	8.0	11.8
84-85 Chrysler Van 2.6L	13.0	13.9
82 GM 4.1L V6	10.0	11.8
83 GM 5.7L 4V	11.1	11.9
83 Nissan 2.0L	12.9	15.0
84-85 Chrysler 135 CID TBI	10.5	11.4
84 Chev, Pont 5.0L 4V	10.6	12.1
84-86 Buick 3.8L	14.5	13.4
84-86 Ford 3.8L	8.7	10.5
85-86 GM 3.8L FI	12.0	11.5

Figure 2

Idle Dilution Percentages On Baseline Initial Test



Vehicle Category:
1) Entire 1981+ Fleet
2) EPA Pattern Failures
3) EPA PF's w/ High Fail Rates
4) Non-EPA PF's w/ High Fail Rates

Failure Mode Distribution - The results of the analysis of modes of failure for each vehicle category are presented in Table 6 and Figures 3a - 3e. The frequency of failure for each mode is normalized on the overall failure rate for each vehicle category, and is expressed as percent of total failures. The term "baseline initial test" means the initial test of a failed vehicle for which after-repair test results were available. Failed initial tests without corresponding after-repair tests were ignored.

Table 6

Failure Mode on Baseline Initial Test
as Percent of Total Failures
for All Vehicle Categories

	Percent of Total Failures			
Failure Mode	All 1981+	EPA PF's	EPA PF's w/ High FR	non-EPA PF's w/ High FR
Tailpipe	95.5	95.8	97.4	95.9
Underhood	8.1	7.1	5.2	9.4
Tailpipe only	91.9	93.0	94.8	90.6
Underhood only	4.5	4.2	2.6	4.1
Tailpipe & Underhood	3.6	2.9	2.6	5.4
HC only	35.6	37.7	40.8	13.8
CO only	23.7	21.3	21.9	33.7
HC and CO	36.2	36.8	34.8	48.5
Idle only	45.0	48.6	50.6	16.3
2500 rpm only	23.2	20.8	22.1	34.6
Idle and 2500 rpm	27.3	26.4	24.7	45.1
Idle	72.3	75.0	75.4	61.4
2500 rpm	50.5	47.2	46.8	79.6
Idle only HC only	31.9	34.9	37.7	12.4
Idle only HC	42.1	46.2	48.7	15.0
Idle only CO only	2.8	2.5	1.9	1.3
Idle only CO	13.1	13.8	12.9	3.9
2500 only HC only	1.7	1.1	1.3	0.6
2500 only HC	3.5	2.7	2.9	3.9
2500 only CO only	19.8	18.1	19.2	30.6
2500 only CO	21.6	19.7	20.8	33.9

Figure 3a

Failures on Baseline Initial Test as Percent of Total Failures by Failure Mode

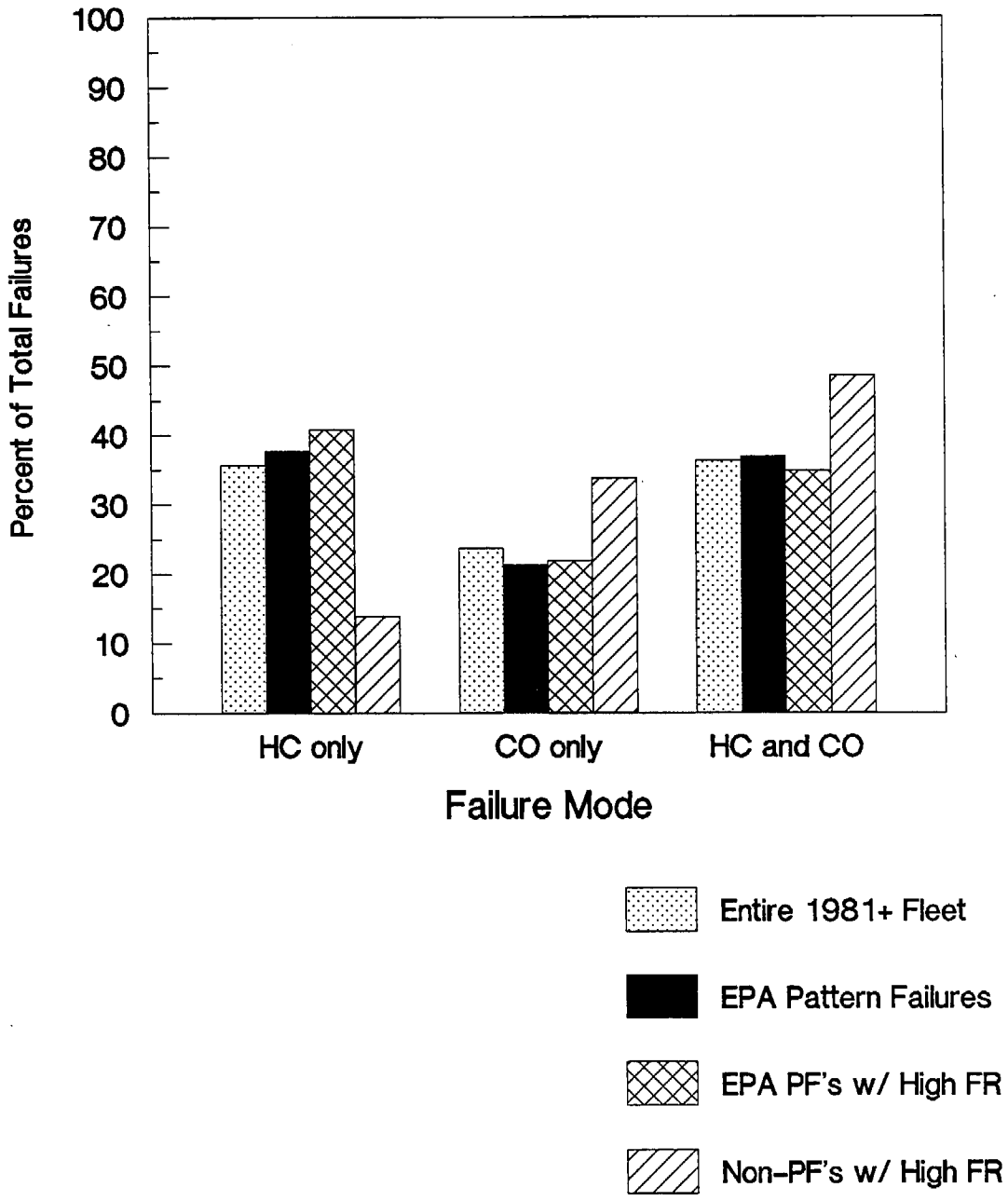


Figure 3b

Failures on Baseline Initial Test as Percent of Total Failures by Failure Mode

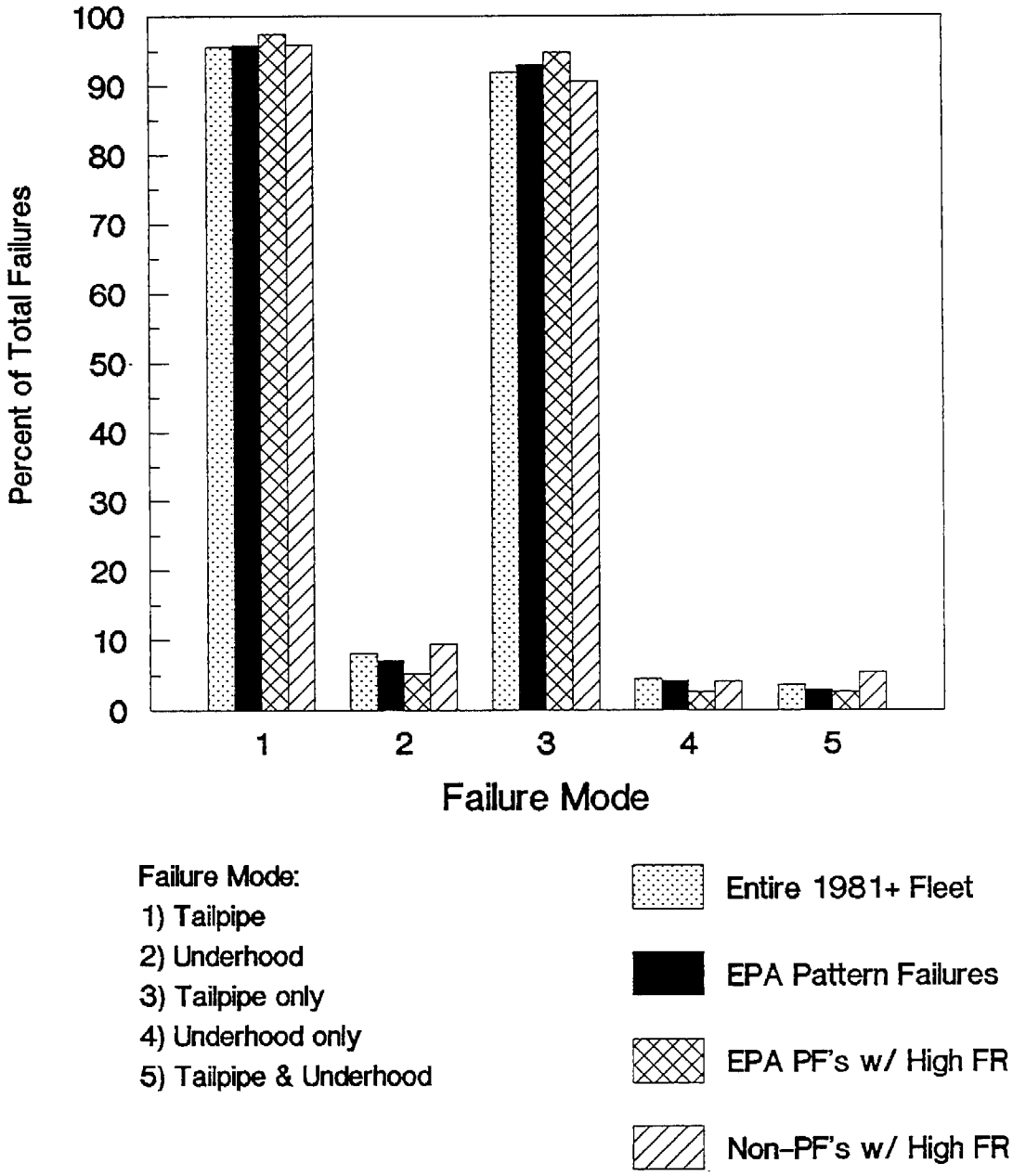
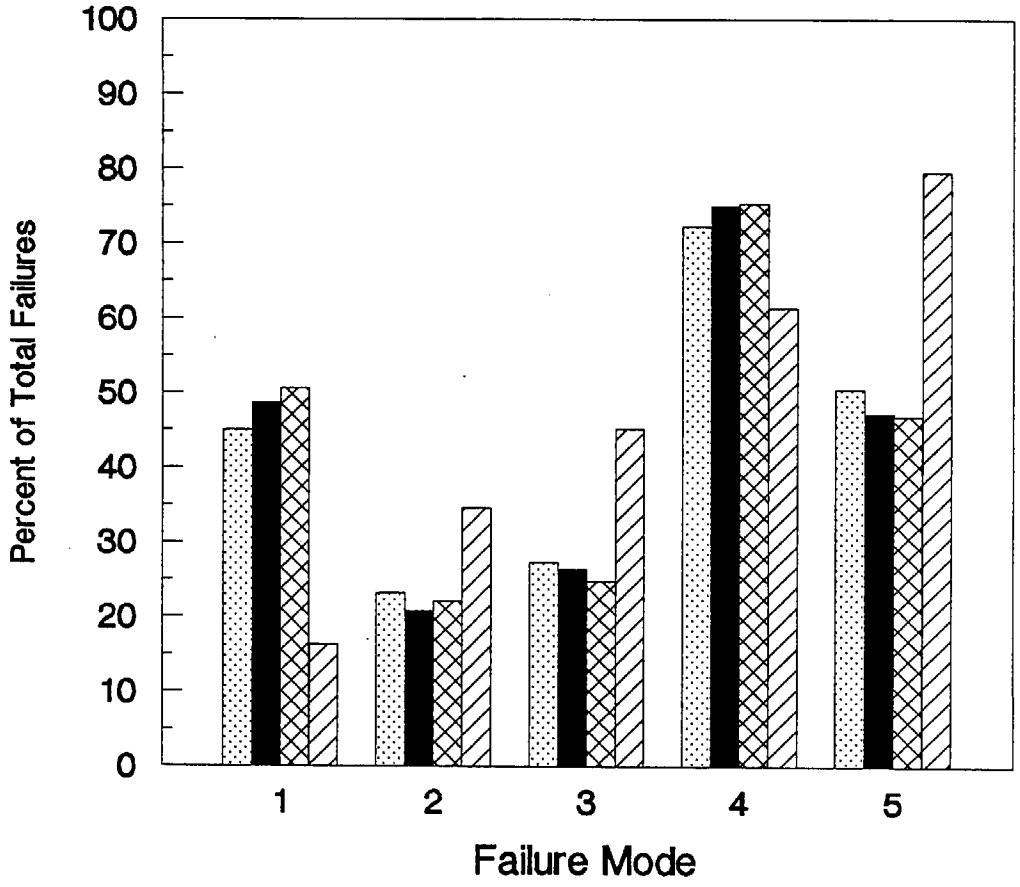


Figure 3c

Failures on Baseline Initial Test as Percent of Total Failures by Failure Mode



Failure Mode:
1) Idle only
2) 2500 rpm only
3) Idle and 2500 rpm
4) Idle
5) 2500 rpm

Entire 1981+ Fleet

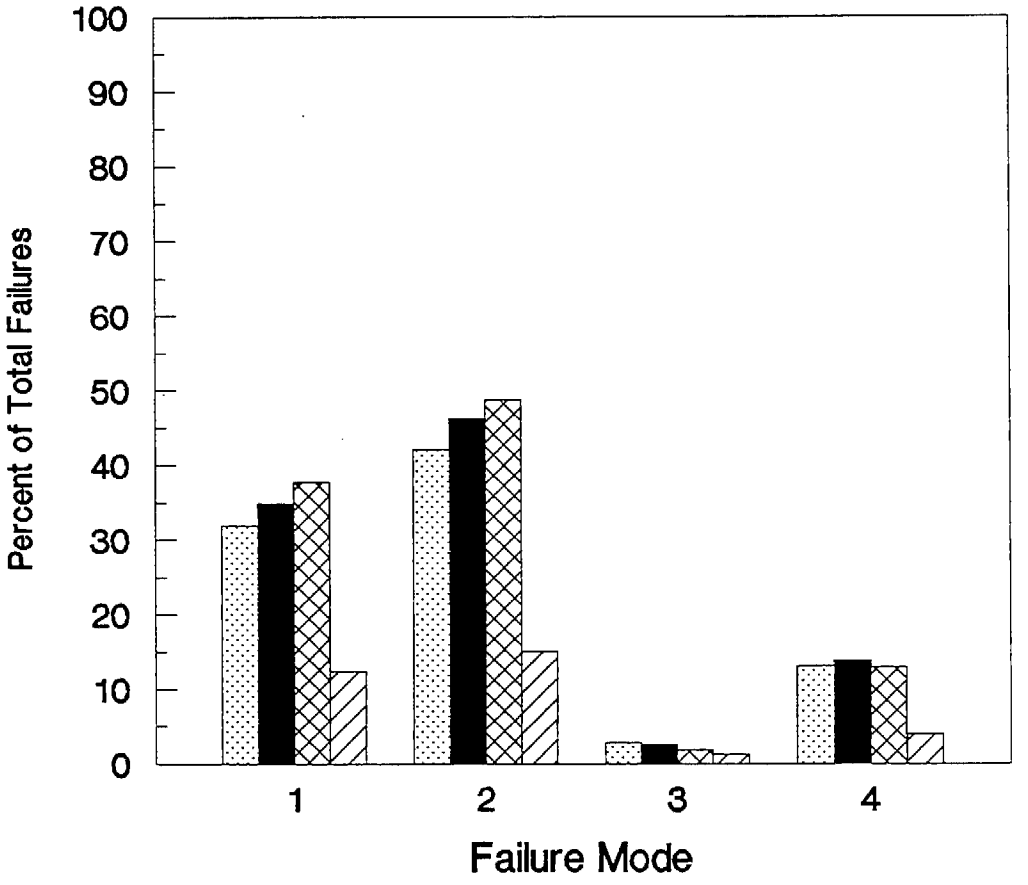
EPA Pattern Failures

EPA PF's w/ High FR

Non-PF's w/ High FR

Figure 3d

Failures on Baseline Initial Test as Percent of Total Failures by Failure Mode



Failure Mode:
1) Idle only HC only
2) Idle only HC
3) Idle only CO only
4) Idle only CO

Entire 1981+ Fleet

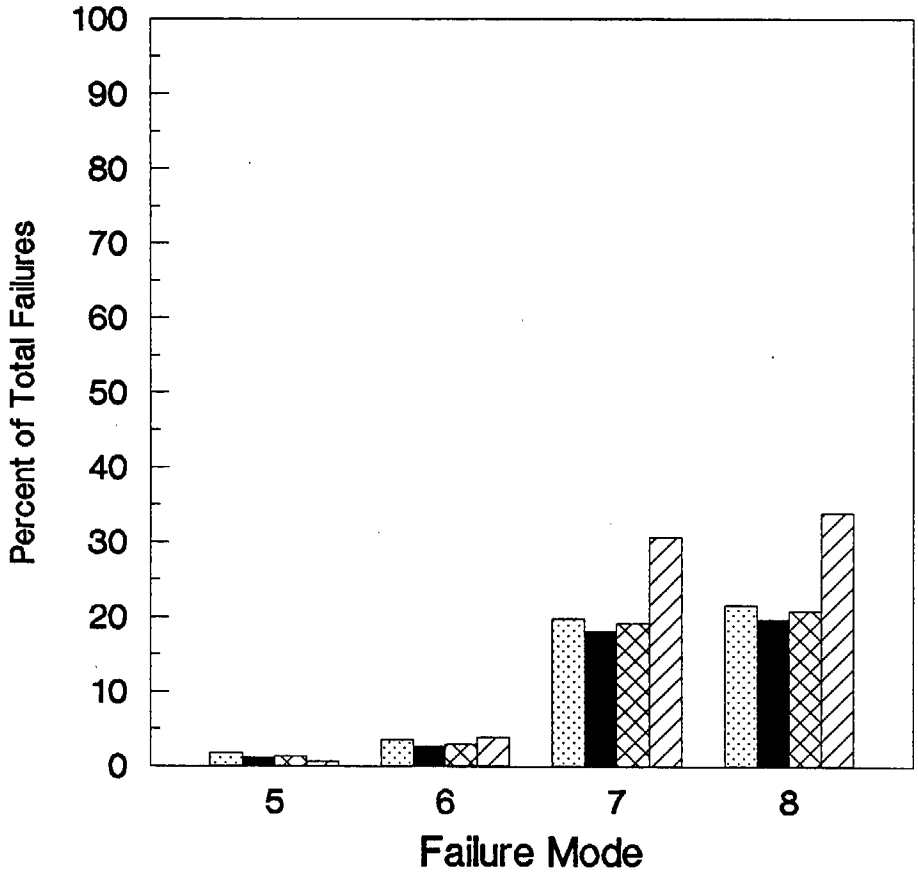
EPA Pattern Failures

EPA PF's w/ High FR

Non-PF's w/ High FR

Figure 3e

Failures on Baseline Initial Test as Percent of Total Failures by Failure Mode



Failure Mode:
5) 2500 only HC only
6) 2500 only HC
7) 2500 only CO only
8) 2500 only CO

Entire 1981+ Fleet

EPA Pattern Failures

EPA PF's w/ High FR

Non-PF's w/ High FR

Failure mode distribution is fairly similar for three of the four categories under consideration, becoming noticeably different only for the non-EPA Pattern Failures with High Fail Rates. While tailpipe failure among these vehicles occurs at about the same percentage of total failures as it does for the first three categories (95.9% vs. 98.5%, 95.8% and 97.4%), the modes of tailpipe failures are significantly different. As an example, the incidence of HC-only failures is only about one third as high as in the other three categories (13.8% vs. 35.6%-40.8%). The non-EPA PF's also exhibit much lower rates of Idle-only failures. The higher failure rates at 2500 rpm, especially of CO, indicate a possible problem of off-idle air/fuel ratio control among the non-EPA PF's.

Repair Action Distribution - Repair actions for each vehicle category are shown in Table 7 and Figures 4a and 4b. Explanation of the table may be in order. For instance, according to TAS data, misfires were repaired on 30.5% of all 1981 and later vehicles receiving repairs, and on 32.3% of the EPA PF's with high fail rates.

Table 7

Distribution of Repair Actions
for All Vehicle Categories

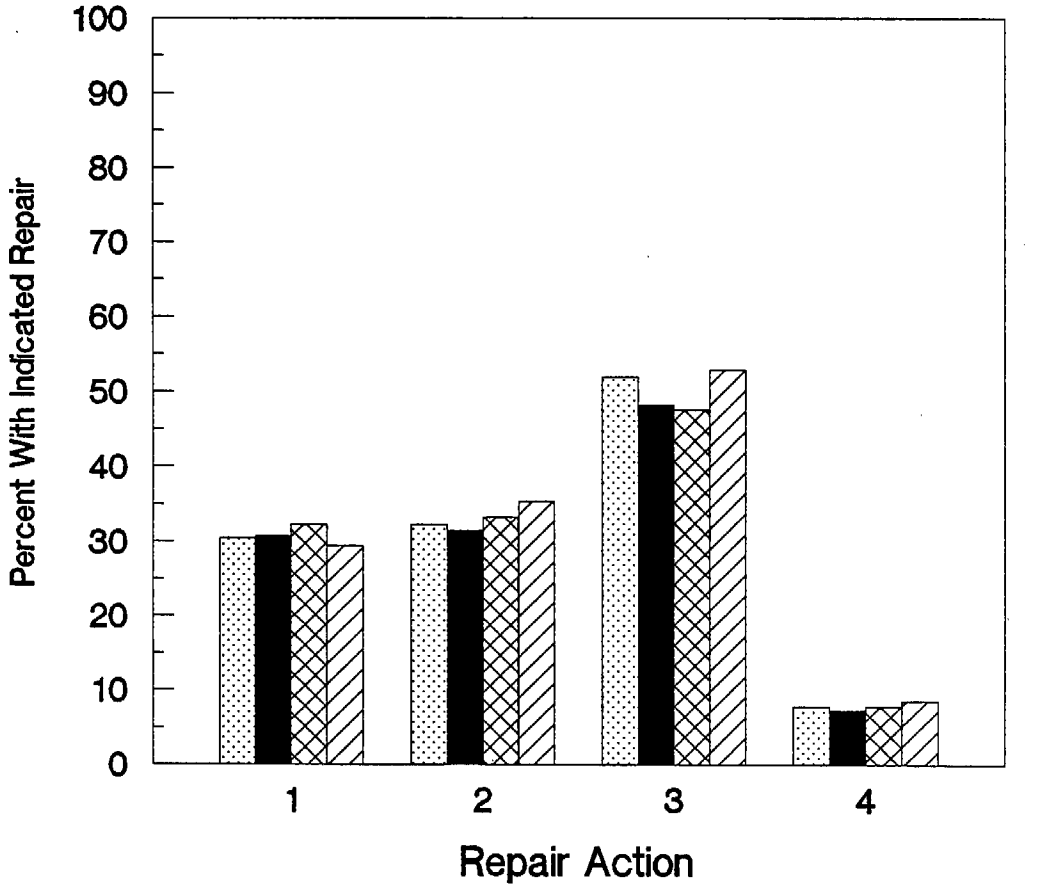
Percent of After-Repair Tests
With Indicated Repair

		Repair Action Taken							
		MIS	TMG	A/F	CRK	EVP	EXH	EGR	ANY
1981 +	Y	30.5	32.3	51.9	7.8	6.8	10.1	7.2	79.5
Fleet	N	59.1	66.9	29.2	91.5	92.8	88.2	90.6	95.7
	E	10.2	0.6	18.7	0.4	0.2	1.5	2.0	29.0
EPA	Y	30.7	31.5	48.2	7.3	6.3	10.1	6.7	79.2
PF's	N	59.2	67.8	33.0	92.2	93.3	88.4	91.7	96.5
	E	10.0	0.6	18.7	0.4	0.3	1.5	1.5	28.1
EPA PF's	Y	32.3	33.3	47.6	7.8	6.9	9.6	6.9	80.0
with	N	56.7	66.2	33.8	92.0	92.9	88.9	91.8	96.5
High FR	E	11.0	0.5	18.5	0.2	0.2	1.4	1.4	28.9
Non-EPA	Y	29.4	35.3	52.9	8.6	7.4	11.3	7.8	80.8
PF's w/	N	60.9	63.8	25.5	90.8	92.2	86.8	90.2	95.3
High FR	E	9.5	0.7	21.4	0.4	0.1	1.9	1.8	31.1

Note:
1. Y = Repairs were made.
2. N = No repairs were made.
3. E = Repairs were needed but not made because of repair cost ceiling.
4. Repair categories explained on p. 12.

Figure 4a

Reported Repair Action Patterns

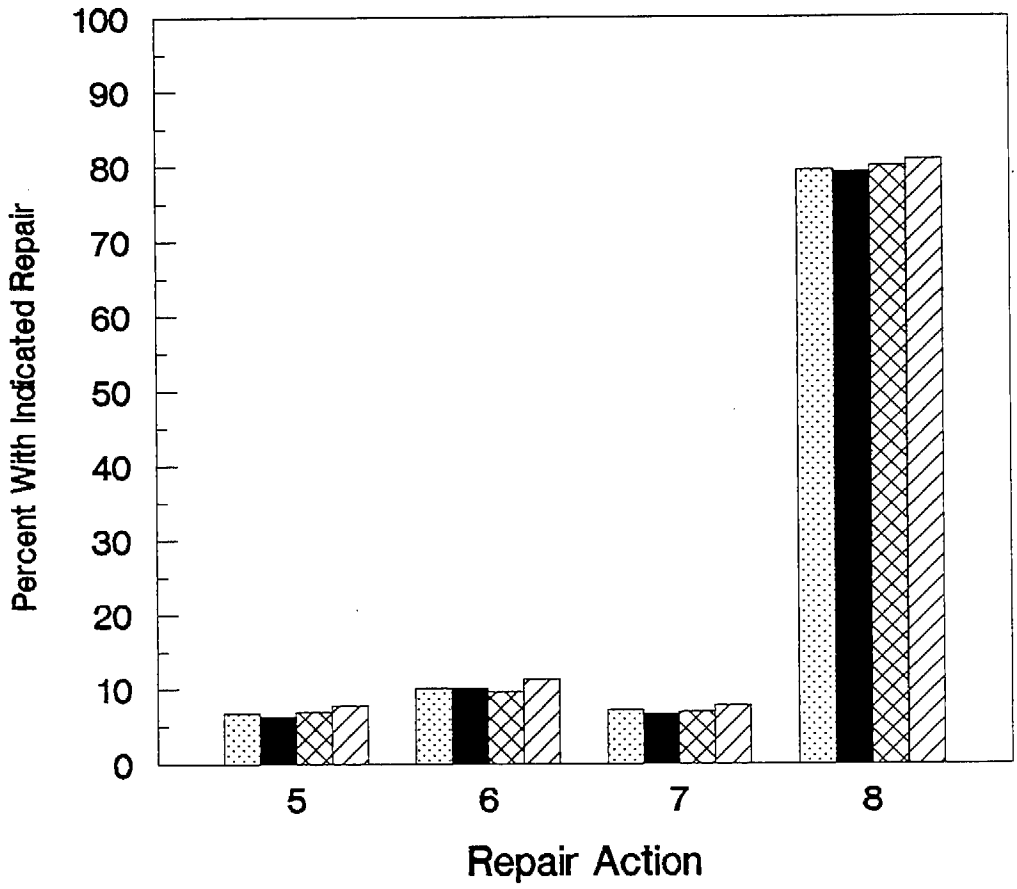


Repair Action:
1) Misfire
2) Timing
3) Air/Fuel Mixture
4) PCV

Entire 1981+ Fleet
EPA Pattern Failures
EPA PF's w/ High FR
Non-PF's w/ High FR

Figure 4b

Reported Repair Action Patterns



Repair Action:
5) Evap Control
6) Exhaust System
7) EGR
8) Any Repair

Entire 1981+ Fleet

EPA Pattern Failures

EPA PF's w/ High FR

Non-PF's w/ High FR

There are no dramatic differences in the percentages of a particular repair action across vehicle categories. The largest difference is in the incidence of air/fuel ratio adjustment - 52.9% of the non-EPA PF's with high fail rates received this repair, but only 47.6% of the EPA PF's with high fail rates.

To summarize the results of the analyses of the TAS data for insight into patterns of idle dilution, failure modes, and repair actions, only the idle dilution value may be suitable as an indicator of whether a vehicle is a Pattern Failure. Distinguishing between Pattern Failure types is even more of a problem, and it appears that none of the above factors could be used for that purpose.

Performance of New Car Dealers vs. Other Smog Check Stations

I/M summary statistics reports are presented in Appendix I for the entire 1981 and later fleet and for all EPA Pattern Failure vehicles. These reports were prepared for all Smog Check stations, new car dealers, and all other stations.

The relative performance of new car dealers and other types of Smog Check stations was evaluated using initial test fail rates and the waiver rates on failed vehicles receiving repair.

Fail Rates - Appendix C contains I/M summary statistics tables, for new car dealers and for all other Smog Check stations, for the 23 EPA-defined Pattern Failure vehicle groups for which the fail rate was higher than the average for the manufacturer and model year. They appear in the same order as in Appendix A.

Fail rates are summarized in Table 8 below, with the vehicle groups listed in the same order as in Appendices A and C. In 18 of the 23 groups listed, the fail rate was lower at new car dealers than at other stations. This finding may be due to the dealers' having greater familiarity with the vehicles (especially the newer models), specialized diagnostic tools, and better information on problem vehicles because of factory service bulletins and contact with factory service representatives. It may also reflect greater incentive for a dealer to pass a vehicle covered by the 5-yr/50,000 mile warranty so as to avoid having to do repairs under warranty if it fails.

These explanations break down occasionally, as in the case of the first group listed, for which the fail rate at dealers was over 6 percentage points higher than at other stations. This group, of 85-86 2.3-liter Ford light trucks, was the newest in terms of model years covered, and also had the highest fraction checked at new car dealers: about 46%.

For the entire sample of Pattern Failure vehicles, the fail rate at new car dealers is lower than at other Smog Check stations, 31.3% vs.

35.8%. New car dealers are doing about 23% of the Smog Check business on these vehicles (3,201 out of 13,931 initial tests).

Table 8

Smog Check Fail Rates
for Pattern Failure Vehicles

(Number of Initial Tests and Percent Failing)

Group	New Car Dealers % Failing	New Car Dealers N	All Other Stations % Failing	All Other Stations N
85-86 Ford Trk 2.3L	64.7	51	58.3	60
81-82 Nissan 1.2L	35.7	14	60.4	144
84-86 Buick, Olds 5.0L 4v	41.2	313	57.7	766
81-82 Toyota 1.3L	52.4	21	47.4	171
81-82 Nissan 1.5L	37.5	56	49.0	480
83 Mitsubishi 1.6L	33.3	15	50.0	60
83 Nissan 1.6L 3CL	37.6	189	49.2	569
84 Ford Truck 2.8L	42.6	195	43.6	443
81-85 Ford 1.6L	36.9	149	40.0	826
81-83 Ford 2.3L	31.5	73	39.0	433
83 Honda 1.3L	43.8	16	36.4	121
83 Nissan 1.6L OXC	13.0	23	37.2	207
84 Honda 1.3L	28.6	14	35.4	82
84-86 Ford 2.3L	28.1	545	32.6	961
82 Chevrolet 3.8L	27.1	48	31.4	277
83 Honda 1.5L	36.8	76	28.4	462
82-84 GM 1.6L	26.4	265	29.3	1032
82 GM 3.8L	29.9	97	28.5	572
81-82 GM 1.6L 3CL	27.4	248	28.5	829
83-85 GM 2.5L	26.9	424	28.7	842
82 GM Truck 5.7L	22.2	36	26.1	222
83-84 Mazda 1.5L 3CL	17.9	67	24.0	292
82 GM 5.7L FI	21.4	266	22.8	879
All Ford	34.3	1013	38.2	2723
All General Motors	28.8	1697	31.9	5419
All Nissan	35.5	282	48.5	1400
All Honda	36.8	106	30.7	665
All Pattern Failure Vehicles	31.3	3201	35.8	10,730

Waiver Rates - Another indicator of Smog Check station performance is shown in Table 9, which lists waiver rates at new-car dealers and other stations for the vehicle groups that have been the subject of this discussion. Except for 2 of the 3 Honda groups and 2 of the 8 General Motors groups, waiver rates at new-car dealers were much lower than at other stations. For all Pattern Failure vehicles in the analysis, waivers were given more than twice as often at other stations as at new-car dealers (24.9% vs. 10.8%).

A logical conclusion to be drawn from these figures is that, because of specialized training and diagnostic tools, more up-to-date information, and simple familiarity with the vehicles due to repeated exposure, new-car dealer service departments, more often than other shops, can achieve proper repair of these Pattern Failure vehicles and do not have to resort to waivers.

This reasoning is applicable only to Type I Pattern Failure vehicles, since they are the ones that actually have repairable defects. Type II vehicles require no repair, simply proper preconditioning or testing procedures. Only two of the listed vehicle groups, however are Type I - the 81-82 GM 1.6L and the 83-85 GM 2.5L groups. The question may then be raised as to why so many Type II vehicles, presumably with no repairable defects, are receiving repair cost waivers. The waiver rates probably reflect both the difficulty in testing these vehicles properly, and the ease with which mechanics can state that the needed "repair" will cost more than $50.

Table 9

Smog Check Waiver Rates
for Pattern Failure Vehicles

Group	Percent of Failing Vehicles Receiving Waivers	
	New-Car Dealers	All Other Stations
85-86 Ford Trk 2.3L	5.9	7.7
81-82 Nissan 1.2L	0.0	50.0
84-86 Buick, Olds 5.0L 4v	0.0	19.6
81-82 Toyota 1.3L	25.0	34.6
81-82 Nissan 1.5L	15.4	30.7
83 Mitsubishi 1.6L	0.0	45.0
83 Nissan 1.6L 3CL	6.7	23.9
84 Ford Truck 2.8L	8.9	21.0
81-85 Ford 1.6L	34.4	34.5
81-83 Ford 2.3L	7.1	31.5
83 Honda 1.3L	25.0	20.0
83 Nissan 1.6L OXC	0.0	13.6
84 Honda 1.3L	0.0	22.2
84-86 Ford 2.3L	9.5	26.2
82 Chevrolet 3.8L	0.0	30.3
83 Honda 1.5L	37.5	20.0
82-84 GM 1.6L	9.6	21.6
82 GM 3.8L	8.7	25.8
81-82 GM 1.6L 3CL	9.8	21.9
83-85 GM 2.5L	3.6	20.5
82 GM Truck 5.7L	25.0	16.7
83-84 Mazda 1.5L 3CL	18.2	33.3
82 GM 5.7L FI	23.5	23.1
All Ford	12.7	28.3
All General Motors	8.5	22.1
All Nissan	7.6	27.4
All Honda	30.7	20.3
All Pattern Failure Vehicles	10.8	24.9

Overall Performance - The available data indicate that new car dealer performance in the Smog Check program, relative to the performance of all other stations, is about the same for Pattern Failure vehicles, and non-PF vehicles with high fail rates, as for the 1981+ fleet as a whole. Performance can be indicated by initial test fail rate and the waiver rate for failing vehicles. When these statistics are developed, it is seen that the relative differences in fail rates and waiver rates between dealers and other stations remain about the same for all the different vehicle categories examined. These statistics are shown in Table 10.

Table 10

Fail Rates and Waiver Rates
at New Car Dealers and All Other Stations
for All Vehicle Categories

Vehicle Category	Initial Test Fail Rate, %	
	New Car Dealers	All Other Stations
All 1981+ Models	18.3	23.6
Pattern Failures	31.3	35.8
Pattern Failures with High Fail Rates	32.2	36.6
Non-PF's with High Fail Rates	31.6	39.0

	Waiver Rate, %	
	New Car Dealers	All Other Stations
All 1981+ Models	10.6	25.3
Pattern Failures	10.8	24.9
Pattern Failures with High Fail Rates	11.2	26.0
Non-PF's with High Fail Rates	13.1	27.7

As Table 10 shows, the initial test fail rates for the three other vehicle categories studied are all about 13 to 16 percentage points higher than for the entire fleet of 1981+ models, for both types of Smog Check stations considered. With similar consistency, the fail rate at new car dealers is about 4 to 7 percentage points lower than at all other stations, for all vehicle categories.

The consistency of differences between new car dealers and all others is also shown by the waiver rates on vehicles failing the initial test. New car dealers and other stations issue their waivers at about the same rates for all vehicle categories, but new car dealers issue them at only about 40% to 50% of the rate done by other stations.

The fail rate and waiver rate data indicate that Smog Check performance differences between new car dealers and other stations are fairly consistent across all vehicle types, whether they are EPA-identified Pattern Failures, "normal" vehicles, or vehicles with high fail rates.

Analysis of ECS Characteristics

Table 11 below shows the emission control systems in use on the Pattern Failure vehicles that, in the sample studied, had fail rates higher than normal. All use EGR, the majority have three-way catalyst systems, either open-loop or closed-loop, and almost all employ air injection. The one unusual item is that the incidence of pulse-air systems (indicated by PLS) seems higher than in the general vehicle population.

Table 11

Emission Control System Descriptions
for Pattern Failure Vehicles
With Fail Rates Higher Than Normal

Vehicle Group	Emission Control System
85-86 Ford Truck 2.3L	EGR,3CL
81-82 Nissan 1.2L	EGR,PLS,OXD
84-86 Buick, Olds 5.0L 4v	EGR,PMP,OXD,3CL
81-82 Toyota 1.3L	EGR,PLS,OXD
81-82 Nissan 1.5L	EGR,PLS,OXD
83 Mitsubishi 1.6L	EGR,PLS,OXD
83 Nissan 1.6L 3CL	EGR,3CL
84 Ford Truck 2.8L	EGR,PMP,OXD,3CL
81-85 Ford 1.6L	EGR,PMP,OXD,3WY
81-83 Ford 2.3L	EGR,PMP,OXD,3WY/3CL
83 Honda 1.3L	EGR,PLS,OXD
83 Nissan 1.6L OXC	EGR,PLS,OXD
84 Honda 1.3L	EGR,3WY
84-86 Ford 2.3L	EGR,PMP,OXD,3CL
82 Chevrolet 3.8L	EGR,PMP,OXD,3CL
83 Honda 1.5L	EGR,PLS,OXD
82-84 GM 1.6L	EGR,PMP,OXD,3CL
82 Pontiac, Olds, Buick 3.8L	EGR,PMP,3CL
81-82 GM 1.6L 3CL	EGR,PLS,3CL
83-85 GM 2.5L	EGR,3CL
82 GM Truck 5.7L	EGR,PMP,OXD
83-84 Mazda 1.5L 3CL	EGR,PLS,3CL
82 GM 5.7L FI	EGR,PMP,OXD,3CL

As shown in Table 11, the characteristics of the emission control systems that are associated with Pattern Failures are very similar to the typical control system characteristics for the fleet. It is apparent that insufficient information is available from general system descriptions reported by EPA or recorded on TAS analyzers to isolate the characteristics of emissions control systems that are associated with Pattern Failure problems. Based on the known causes of Pattern Failures, it is clear that detailed information regarding system programming is necessary in order to determine whether a particular model is likely to have Type II Pattern Failure problems.

Only two Type I failures are in the above list. One is the 81-82 GM 1.6-liter vehicles. Corrosion of the pulse-air tubing on these vehicles contributed to excess CO emissions. A recall of this engine family was ordered in 1985 for repairs to the pulse-air system. On 83-85 GM 2.5L vehicles, changing the PROM was required to solve a problem of excess emissions at idle due to catalyst cool-down.

Causes of Pattern Failure Problems

Preconditioning and Test Procedure Effects - The approved Smog Check test procedure requires that the engine be switched off and then restarted before the exhaust concentration measurements are made. While appropriate for the early pattern-fail Ford models, it is completely inappropriate for many other makes, and, it turns out, the 85-86 Ford 2.3 liter engines that power Ford's light vans and pickups as well. EPA information on this group, found in Appendix F, states "failure rates may be adversely affected by use of restart and/or 2500 rpm preconditioning" (Emphasis added).

The high failure rate of the 5-liter Buick/Olds group may also be due to the test procedure, or a lack of preconditioning. As discussed below in greater detail (see Information from Manufacturers and I/M Program Officials) these vehicles are in open-loop mode for two and a half minutes after a restart, in addition to which, secondary air is dumped after half a minute above 1200 rpm with no load.

Mileage Accumulation Effects - Odometer readings were studied to determine whether higher amounts of accumulated miles might be responsible for I/M failures in the sample, that is, whether failing vehicles had, on average, accumulated more miles than the rest of the group. The pertinent information is found under the heading "Average Odometer Readings" on the Summary Statistics tables. For all but a few of the Pattern Failure groups in Appendix A, the odometer readings are virtually the same for All Vehicles, Initial Test Vehicles, and After Repair Test (i.e., Failed) Vehicles.

The largest odometer difference was found for the group labelled "'83-'84 MAZD 1.5L 3CL", for which Initial Test Vehicles had an average odometer reading of 42,160 and After Repair Test Vehicles a reading of 54,188. On further examination it was found that the standard deviations for the two averages were about 23,000 miles, giving

coefficients of variation of about 56% and 42%, respectively. Such large coefficients of variation indicate that the difference in odometer readings is less significant than it may first appear to be.

Table 12 presents a comparison of the I/M failure rates for Pattern Failures reported by EPA to the failure rates observed in the California Smog Check program. As the Table shows, there are wide discrepancies in the EPA-reported failure rates and those occurring in the California program. In general, the California failure rates are much higher. In only 12 of the 51 cases are the failure rates from the California Smog Check program lower than those reported by EPA. One reason may be that the "Arizona I" data cited were furnished by EPA and are less up-to-date than the California data. The California data, therefore, are from vehicles that have been in service longer than the vehicles in the Arizona data, have accumulated more mileage, and therefore have experienced more emission control deterioration.

Table 12

Fail Rates for EPA-Identified
Pattern Failure Vehicles

"Arizona I" vs. California Smog Check Program

Group No.	Description	--- Percentage Failure Rate -- Arizona I	California
1.	85-86 Ford Trk 2.3L	25 *	61.3
2.	81-82 Nissan 1.2L	31.4-33.8	58.2
3.	84-86 Buick, Olds 5.0L 4V	unknown *	52.9
4.	81-82 Toyota 1.3L	10.5-12.5	47.9
5.	81-82 Nissan 1.5L	23.4-27.3	47.8
6.	83 Mitsubishi 1.6L	22.0	46.7
7.	83 Nissan 1.6L 3CL	7.9	46.3
8.	84 Ford Truck 2.8L	unknown *	43.3
9.	81-85 Ford 1.6L	variable	39.5
10.	81-83 Ford 2.3L	10.6 (82 MY)	37.9
11.	83 Honda 1.3L	16.9	37.2

Table 12 (continued)

Group No.	Description	--- Percentage Failure Rate -- Arizona I	California
12.	83 Nissan 1.6L OXC	7.9	34.8
13.	84 Honda 1.3L	16.7	34.4
14.	84-86 Ford 2.3L	variable	30.9
15.	82 Chevrolet 3.8L	3.8	30.8
16.	83 Honda 1.5L	18.3	29.6
17.	82-84 GM 1.6L	4.3- 9.6	28.7
18.	82 GM 3.8L	5.5	28.7
19.	81-82 GM 1.6L 3CL	17 *	28.2
20.	83-85 GM 2.5L	3.0- 6.7	28.1
21.	82 GM Truck 5.7L	9.6	25.6
22.	83-84 Mazda 1.5L 3CL	6.8- 7.9	22.8
23.	82 GM 5.7L FI	3.7	22.4
24.	81-82 Mazda 1.5L	12.3-18.4	35.2
25.	81 Mazda Truck 2.3L	47.6	28.6
26.	82 Nissan Truck 2.3L	32.7	27.2
27.	81-83 Ford 3.3L	11.4-20.1	26.3
28.	81-83 Nissan 2.8L 3CL	12.8-20.5	24.4
29.	81-82 AMC 258 CID	18.8-20.5	22.9
30.	84-85 Honda 1.8L	39.1 (84 MY)	21.5
31.	83-84 Nissan Truck 2.4L	35.7-47.6	21.3
32.	81-83 Mitsubishi 2.6L	22.0-47.3	20.5
33.	82 Chrysler 135 CID	8.4	20.1
34.	82 Honda 1.8L	unknown *	16.4
35.	81-86 Ford 302 CID	11.4-39.3	13.9

Table 12 (continued)

Group No.	Description	--- Percentage Failure Rate -- Arizona I	California
36.	82-83 Mazda Truck 2.0L	41.6-53.5	13.6
37.	84-85 Chrysler Van 2.6L	unknown *	12.9
38.	83 GM 4.1L V6	3.9	12.4
39.	83 GM 5.7L 4V	8.7	12.1
40.	83 Nissan 2.0L	12.7	11.2
41.	84-85 Chrysler 135 CID TBI	20 *	10.8
42.	84 Chev, Pont 5.0L 4V	8.8	6.9
43.	84-86 Buick 3.8L	analyzer dependent	6.0
44.	84-86 Ford 3.8L	17.2 (84 MY)	5.3
45.	85-86 GM 3.8L FI	analyzer dependent	4.0
46.	82 Chev Pickup 5.0L	5.7	70.6 (N=17)
47.	82 Nissan 1.5L 3CL	24.4	54.5 (N=22)
48.	81 VW Truck 1.7L 3CL	29.8	50.0 (N=6)
49.	81 Audi 1.7L	13.4	34.8 (N=23)
50.	81 VW Van 2.0L OXC	45.9	50.0 (N=2)
51.	81 VW Van 2.0L 3CL	51.0	25.0 (N=4)

* Fail Rate from EPA I/M Pattern Failure Summary, 11/03/85

Information from Manufacturers and I/M Programs

Interviews with staff engineers from domestic manufacturers and with I/M program personnel provided insights into reasons for the wide range of fail rates that were observed among Pattern Failure vehicles.

For instance, the GM Buick and Olds 5.0-liter 4V engine is in open loop for 156 seconds after restart.[1]* Many Smog Check mechanics may not know that they have to wait for closed-loop operation to begin. It is also difficult to get a valid reading at 2500 rpm, because secondary air is dumped after 25 seconds above 1200 rpm with no load, and it is difficult for I/M mechanics to open the throttle, quickly reach and hold 2500 rpm and record a valid exhaust sample before the air is dumped. In one decentralized I/M program,[2] all Buick and Oldsmobile 5.0-liter cars are tested at the Referee Station, whose personnel have had enough practice to be able to get low CO readings within the time window allowed by the TAS.

In one centralized program,[3] the state-run lanes employ older analyzers and manual data recording, so analyzer time lockouts are not a problem and a degree of subjectivity can be applied to interpreting the exhaust concentrations on known Pattern Failure vehicles. In this program, the fail rate of late model Buick and Olds 5.0-liter vehicles is below 10%.

Confirmation of these problems is provided by the summary statistics tables for "'84-'86 Buick, Olds 5.0L 4V" in Appendices A and C. For the entire sample of 1426 test records, the fail rate was 52.9%, and the average 2500-rpm CO for failing cars was 4.61%. It is also seen that 46.7% of the Repair Actions were air/fuel ratio adjustment (or so it was claimed by the mechanic entering data into the TAS), with the result that average After-Repair 2500-rpm CO increased to 5.1%. In the Appendix C tables it will be seen that 2500-rpm CO on failing vehicles was reduced from 4.35% to 1.23% by new-car dealers, and from 4.68% to 2.91% by other stations. Note also that for this vehicle group, the waiver rate at dealers was 0, while at other stations it was 19.6%.

Late-model Ford vehicles operate in a way opposite to that described above. In Ford vehicles, secondary air is dumped after extended idle, thus reducing the oxidation of HC and CO.[4] The diversion is controlled by mechanical or electronic timers, the times ranging from about 15 seconds to over 3 minutes. The proper I/M test procedure for Fords, therefore, is to turn off and re-start the engine just before taking the tailpipe readings. Because the problem with Ford vehicles was known when the test procedures for California Smog Check program were developed, the re-start test procedure is the specified procedure for all vehicles tested under the Smog Check program. Unfortunately, this procedure leads to Pattern Failures with the GM vehicles discussed above. It is not a violation of the California Smog Check procedures to delay the testing of GM vehicles until 156 seconds after the re-start, but no instructions are currently provided Smog Check stations regarding this issue.

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* Superscripts denote references listed in Section 6.

Certain 84-86 GM 3.8-liter engines with Computer Controlled Combustion Ignition systems fire 2 spark plugs simultaneously on both compression and exhaust strokes. Two high voltage pulses per engine revolution caused lockout on many analyzers because of excessive idle speed. Test equipment suppliers, however, have responded to this situation by developing adapters and other devices to circumvent this problem and enable idle speed to be measured correctly.

In addition to the information Sierra obtained directly from vehicle manufacturers, EPA has reported the cause of some of the Pattern Failures. EPA's descriptions of problems with most Ford and GM vehicles are consistent with the information obtained from the manufacturers. EPA has also identified the following Pattern Failure causes:

1. vehicles operating open loop in neutral,

2. vehicles with excessive evaporative canister purge rates at idle,

3. excessive mixture richness under 2500 rpm no-load conditions (Honda 1.8 L), and

4. low idle speed causing high idle emission concentrations even though mass emission rates remain low (some Ford models).

Combined with the Ford secondary air dump problem, the GM closed-loop delay/air secondary air dump problem, and the GM CCCI ignition problem, a total of seven types of Type II Pattern Failure problems have been identified.

5. CONCLUSIONS AND RECOMMENDATIONS

Analysis of TAS data from the California I/M (Smog Check) program, and of mass emissions data from the I/M Evaluation Test Program, led to several findings about the performance of EPA-identified Pattern Failure vehicles in California.

1. Many vehicle models identified by EPA as Type II Pattern Failures experience high failure rates in the Smog Check program, but many other models so identified have very low failure rates. In the Smog Check program, the failure rate of all Pattern Failure vehicles taken together (24.4%) is only slightly higher than that of the entire 1981 and later fleet (22.6%).

2. The contribution of Pattern Failure vehicles to excess emissions in California is about 50% less than the contribution of other late-model vehicles that fail the Smog Check test.

3. The fail rates of Type II Pattern Failure vehicles in new-car dealerships are lower than in other Smog Check stations, indicating that dealership service personnel may be better able to perform the I/M test without letting the vehicle get into a high emission operating mode.

4. The waiver rates on Type I and Type II Pattern Failure vehicles that fail the Smog Check inspection are much lower in new-car dealerships than in other Smog Check stations, indicating that dealership service personnel may be doing a better job of preconditioning, testing, and repairing of these vehicles than is being done at other stations.

5. There does not appear to be any generic emission control component, or combination of components, that is unique to Pattern Failure vehicles; however, air injection systems that employ dumping strategies for catalyst protection during extended idling appear to be a significant source of Pattern Failure problems. Vehicles with this problem can be identified through analysis of the CO and CO_2 data on TAS records, because there are significant differences in the sum of CO + CO_2 between passing and failing vehicles.

Consultation with vehicle manufacturers and I/M program officials in other states indicates that the frequency of Type II Pattern Failures is related primarily to preconditioning and testing procedures

employed during the I/M test. Differences in the test procedures used in the California I/M (Smog Check) program (i.e., the inclusion of an engine restart and 2500 rpm test) can contribute to lower failure rates for some models that have been identified as Pattern Failure vehicles by EPA (some Ford models). Knowledge of the preconditioning required to avoid high emission operating modes during an I/M test appears to be the reason why new car dealerships report lower failure rates for Pattern Failure models than other Smog Check stations.

However, several of the identified Pattern Failure causes cannot be overcome within the confines of the current test procedures specified in the Smog Check program. For example:

- ⊙ vehicles that fail because they run open loop at idle would have to be tested with the transmission in gear,
- ⊙ the 2500 rpm test would have to be deleted for vehicles that have abnormally high emission levels during high rpm/no load operation,
- ⊙ vehicles with the GM CCCI ignition system would have to be tested only on Test Analyzer Systems that incorporate modifications or design features to allow for vehicles with such systems to be accurately tested, and
- ⊙ extended preconditioning procedures would have to be specified for vehicles that have I/M test problems associated with high evaporative canister purge rates.

The above findings lead to three major conclusions:

1. EPA's approach to the identification of Pattern Failure models is not appropriate for the California Smog Check program. Because Type II Pattern Failures are test-procedure-specific, abnormally high failure rates observed on a vehicle in other I/M programs will not necessarily indicate that the vehicle will be a Pattern Failure problem in California. In addition, EPA's practice of designating vehicles as Pattern Failure models based on <u>relatively</u> high failure rates compared to other models of similar age does not appear to be a reliable way of identifying problem vehicles during their first few years of customer service. Theoretically, this approach can provide an early indication of Type I Pattern Failure problems, however, the California data base indicates that many models so designated turn out to experience normal failure rates at higher mileages.

   More effective criteria for designating <u>potential</u> Pattern Failure models in California might be based on a) significant differences in exhaust dilution for passed and failed vehicles (about 1% or more) or b) failure rates exceeding some "deminimus" value (e.g., 10%) which are among the

highest failure rates for vehicles of equivalent model year and mileage (e.g., the top 10-20%). Final determinations could be reserved until laboratory or referee facility evaluation of a sample of the potential Pattern Failure model has been completed.

2. Many Type II Pattern Failures can be avoided through the use of model-specific preconditioning and testing procedures. However, these may be inconsistent with current Smog Check program test procedures. Vehicle-specific exhaust measurement scheduling needs to be incorporated into Test Analyzer Systems to minimize future Pattern Failure problems. Some vehicles may need to be tested with the transmission in gear if Type II Pattern Failures are to be eliminated.

3. Many Type I Pattern Failures can be corrected through knowledge of the likely cause of the problem. Before significant reductions in Type I Pattern Failures can be achieved, mechanics will have to be given more information regarding the probable cause of certain Pattern Failures.

Based on these conclusions, it appears that the effectiveness of the California Smog Check program could be improved if more Smog Check mechanics can be made to follow model-specific preconditioning, testing, and repair procedures. To accomplish this objective, Smog Check mechanics need to receive more information regarding Pattern Failure problems. In the short term, bulletins or some other form of supplemental information could be distributed to Smog Check mechanics. In the longer term, advanced Test Analyzer Systems could prompt mechanics to use model-specific preconditioning, inspection, and repair procedures.

A fourth major conclusion is this:

4. Type II Pattern Failures could be prevented if, in the new vehicle certification process, manufacturers were required to demonstrate that each model can pass a standard I/M test using a standard preconditioning procedure.

Based on our conclusions, the following recommendations for ARB action have been developed:

1. To eliminate future problems with Type II Pattern Failures, ARB should consider requiring a demonstration of compliance with Smog Check test procedures as an element of the new vehicle certification program.

2. To assist mechanics in the identification and correction of Pattern Failure problems with the current fleet, ARB should support the development of Test Analyzer Systems with mass

storage devices and programming capable of detecting when a Pattern Failure vehicle is being tested.

3. To provide information for distribution to mechanics through bulletins or enhanced Test Analyzer Systems, ARB should consider the implementation of data analysis and laboratory testing programs to routinely identify potential Pattern Failure models and develop optimum inspection and repair procedures.

Before advanced TAS's are available, programming changes to the current machines would help minimize Pattern Failures. These changes include:

1. skipping the 2500 rpm test on certain combinations of model year, make, and engine size; and

2. moving the actual sampling period to an earlier point in the 30-second testing period for some models.

Current TAS machines may have sufficient memory to allow these changes to be made with existing hardware, but more evaluation of this issue is needed.

The development of specific recommendations for changing Smog Check test procedures to deal with Pattern Failure vehicles was not an element of the scope of work. However, the nature of the possible changes is apparent from the comments made above.

6. REFERENCES

1. Personal communication with Robert Van Cura, Environmental Activities Staff, General Motors Corp., Warren, Michigan.

2. Personal communication with Lee Husson, I/M Program Manager, Fairbanks North Star Borough, Fairbanks, Alaska

3. Personal communication with William P. Jasper, Oregon Dept. of Environmental Quality, Vehicle Inspection Program, Portland, Oregon.

4. Personal communication with Michael J. Schwarz, Ford Motor Company, Dearborn, Michigan.

Appendix A

I/M Summary Statistics

EPA Pattern Failure Vehicles
With Fail Rates Higher Than Overall Rate for
Same Manufacturer and Model Year

Record Counts

Test Records Processed:	156
Initial Test Records:	111
After Repair Test Records:	45
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	12062
Initial Test Vehicles:	12015
After Repair Test Vehicles:	12176
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	38.7	61.3	--	--	0.0	61.3	0.0	61.3	0.0	0.0	59.5
After Repair	93.3	50.0	13.3	6.7	0.0	100.0	0.0	100.0	0.0	0.0	100.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.13	194	760	0.15	47	2491
Initial Test - Pass Vehicles	0.03	42	813	0.04	27	2495
Initial Test - Fail Vehicles	0.20	290	726	0.22	60	2489
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.20	290	726	0.22	60	2489
After Repair Test - All Vehicles	0.19	124	827	0.16	29	2506
After Repair Test - Pass Vehicles	0.09	70	814	0.06	16	2507
After Repair Test - Fail Vehicles	0.35	203	837	0.32	42	2486
After Repair Test - Inc. Repr. Vehicles	0.07	236	709	0.17	35	2552
After Repair Test - Waived Vehicles	0.42	306	933	0.44	114	2631
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.36	215	848	0.33	50	2503
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	53.3	42.2	4.4
TMG	35.6	62.2	2.2
A/F	33.3	60.0	6.7
CRK	6.7	93.3	0.0
EVP	8.9	91.1	0.0
EXH	17.8	82.2	0.0
EGR	11.1	88.9	0.0
ANY	84.4	93.3	13.3

Average Repair Costs

Parts Cost: $ 5.56 Labor Cost: $ 18.96

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	89.2	21.6	100.0	100.0	0.0	100.0	100.0	94.6	100.0	100.0	70.3	100.0
N/A	0.0	10.8	78.4	0.0	0.0	100.0	0.0	0.0	5.4	0.0	0.0	29.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	77.5	43.2	43.2	91.0
Fail	0.0	0.0	0.0	0.0
N/A	22.5	44.1	44.1	60.4

Record Counts

Test Records Processed:	241
Initial Test Records:	158
After Repair Test Records:	83
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	63492
Initial Test Vehicles:	63189
After Repair Test Vehicles:	64067
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	41.8	58.2	--	--	1.9	57.6	0.6	56.3	1.3	2.5	18.4
After Repair	51.8	48.2	5.4	48.2	0.0	100.0	0.0	100.0	0.0	14.8	40.7
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	1.04	225	858	0.76	95	2521
Initial Test - Pass Vehicles	0.07	56	868	0.09	42	2524
Initial Test - Fail Vehicles	1.73	346	850	1.24	133	2519
Initial Test - Underhood Fail Only	0.18	59	876	0.02	44	2524
Initial Test - Tailpipe Fail Only	1.75	353	850	1.27	135	2516
After Repair Test - All Vehicles	1.01	199	898	0.98	85	2482
After Repair Test - Pass Vehicles	0.13	64	869	0.33	46	2451
After Repair Test - Fail Vehicles	1.67	289	894	1.35	111	2499
After Repair Test - Inc. Repr. Vehicles	0.36	132	906	1.29	75	2608
After Repair Test - Waived Vehicles	1.32	253	933	1.30	102	2499
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.49	271	913	1.32	106	2499
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	30.1	50.6	19.3
TMG	45.8	54.2	0.0
A/F	37.3	31.3	31.3
CRK	9.6	90.4	0.0
EVP	9.6	90.4	0.0
EXH	9.6	88.0	2.4
EGR	12.0	88.0	0.0
ANY	74.7	92.8	45.8

Average Repair Costs

Parts Cost: $ 14.04 Labor Cost: $ 22.22

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.6
Miss	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
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.6
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	99.4	97.5	6.3	94.9	58.2	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	1.9	93.7	5.1	41.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	67.1	56.3	57.6	83.5
Fail	0.0	1.9	0.6	1.9
N/A	32.9	25.3	25.3	49.4

Record Counts

Test Records Processed:	1426
Initial Test Records:	1079
After Repair Test Records:	347
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	27724
Initial Test Vehicles:	27432
After Repair Test Vehicles:	28635
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	47.1	52.9	--	--	0.2	52.8	0.1	52.7	0.1	36.0	1.3
After Repair	84.7	60.6	9.7	15.3	0.0	100.0	0.0	100.0	0.0	75.8	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.30	55	784	2.55	90	2461
Initial Test - Pass Vehicles	0.01	17	751	0.24	26	2476
Initial Test - Fail Vehicles	0.56	89	815	4.61	147	2449
Initial Test - Underhood Fail Only	0.00	13	582	0.08	14	2514
Initial Test - Tailpipe Fail Only	0.56	89	815	4.62	147	2448
After Repair Test - All Vehicles	0.36	52	785	2.59	105	2459
After Repair Test - Pass Vehicles	0.04	17	763	0.57	28	2469
After Repair Test - Fail Vehicles	0.79	97	801	5.01	211	2452
After Repair Test - Inc. Repr. Vehicles	0.22	41	810	3.28	91	2468
After Repair Test - Waived Vehicles	0.43	71	843	4.18	115	2425
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.72	92	810	4.85	189	2447
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	19.3	77.2	3.5
TMG	21.9	77.8	0.3
A/F	46.7	36.9	16.4
CRK	9.5	90.5	0.0
EVP	13.5	86.5	0.0
EXH	11.0	86.2	2.9
EGR	6.3	93.4	0.3
ANY	74.1	96.0	20.2

Average Repair Costs

Parts Cost: $ 4.36 Labor Cost: $ 17.29

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	99.9	22.8	77.2	100.0	97.4	100.0	97.2	66.6	100.0
N/A	0.0	0.0	0.0	0.0	0.1	77.2	22.8	0.0	2.6	0.0	2.8	33.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	97.9	61.2	60.7	98.1
Fail	0.1	0.0	0.1	0.2
N/A	2.0	20.2	20.6	21.6

EPA PATTERN FAILURES (ALL STATIONS) - '81-'82 1.3L TOYOTA
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	263
Initial Test Records:	192
After Repair Test Records:	71
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	65706
Initial Test Vehicles:	64445
After Repair Test Vehicles:	69117
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	52.1	47.9	--	--	3.6	46.4	1.6	44.3	2.1	5.7	14.1
After Repair	66.1	26.8	3.6	33.9	10.5	94.7	5.3	89.5	5.3	0.0	31.6
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.55	194	876	0.86	107	2499
Initial Test - Pass Vehicles	0.06	39	866	0.11	45	2505
Initial Test - Fail Vehicles	1.07	362	886	1.68	175	2493
Initial Test - Underhood Fail Only	0.00	32	886	0.01	52	2473
Initial Test - Tailpipe Fail Only	1.12	360	885	1.73	177	2493
After Repair Test - All Vehicles	0.36	213	908	0.97	110	2448
After Repair Test - Pass Vehicles	0.12	67	917	0.33	61	2468
After Repair Test - Fail Vehicles	0.39	422	885	1.24	126	2435
After Repair Test - Inc. Repr. Vehicles	0.42	278	954	1.74	149	2369
After Repair Test - Waived Vehicles	0.81	332	910	2.01	194	2418
After Repair Test - Underhood Fail Only	0.23	124	958	0.18	46	2674
After Repair Test - Tailpipe Fail Only	0.66	386	895	1.77	173	2413
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	28.2	45.1	26.8
TMG	36.6	63.4	0.0
A/F	53.5	19.7	26.8
CRK	4.2	95.8	0.0
EVP	2.8	97.2	0.0
EXH	5.6	93.0	1.4
EGR	4.2	94.4	1.4
ANY	76.1	100.0	40.8

Average Repair Costs

Parts Cost: $ 9.07 Labor Cost: $ 24.74

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.0	0.5	0.0	0.0	0.0	1.0
Mod	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
Miss	0.0	0.0	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Totl	0.0	0.5	0.5	0.5	0.5	0.5	0.0	1.0	0.5	0.0	0.0	0.0	1.6
Pass	99.5	99.5	99.5	99.5	99.5	99.5	0.0	99.0	97.4	8.3	99.0	68.8	100.0
N/A	0.5	0.0	0.0	0.0	0.0	0.0	100.0	0.0	2.1	91.7	1.0	31.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	69.8	66.7	66.7	90.6
Fail	0.0	1.6	1.6	3.1
N/A	30.2	18.2	18.2	43.2

Record Counts

Test Records Processed:	725
Initial Test Records:	536
After Repair Test Records:	189
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	61081
Initial Test Vehicles:	60721
After Repair Test Vehicles:	62103
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	52.2	47.8	--	--	1.5	47.2	0.6	46.3	0.9	6.5	14.9
After Repair	70.6	23.5	7.2	29.4	2.2	97.8	2.2	97.8	0.0	33.3	26.7
					'Waivers' Only						

Average Emission/RPM Levels

	CO (%)	Idle RPM HC (ppm)	RPM	CO (%)	2500 RPM HC (ppm)	RPM
Initial Test - All Vehicles	1.10	177	878	0.56	70	2515
Initial Test - Pass Vehicles	0.08	45	882	0.14	38	2511
Initial Test - Fail Vehicles	2.21	322	874	1.03	104	2520
Initial Test - Underhood Fail Only	0.04	110	794	0.27	50	2584
Initial Test - Tailpipe Fail Only	2.27	329	874	1.02	105	2519
After Repair Test - All Vehicles	0.55	132	898	0.73	63	2500
After Repair Test - Pass Vehicles	0.17	63	892	0.23	42	2502
After Repair Test - Fail Vehicles	1.02	247	895	1.41	90	2482
After Repair Test - Inc. Repr. Vehicles	0.57	170	930	0.72	74	2490
After Repair Test - Waived Vehicles	1.08	206	915	1.38	90	2510
After Repair Test - Underhood Fail Only	0.81	133	941	0.30	44	2423
After Repair Test - Tailpipe Fail Only	1.05	225	906	1.41	91	2499
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	40.2	46.0	13.8
TMG	41.8	58.2	0.0
A/F	52.4	24.3	23.3
CRK	6.3	93.7	0.0
EVP	4.8	95.2	0.0
EXH	6.9	93.1	0.0
EGR	5.3	94.2	0.5
ANY	86.2	97.4	34.4

Average Repair Costs

Parts Cost: $ 8.72 Labor Cost: $ 19.79

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Miss	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
Totl	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Pass	99.6	100.0	100.0	99.8	100.0	100.0	0.0	100.0	97.9	7.8	96.6	67.9	100.0
N/A	0.2	0.0	0.0	0.0	0.0	0.0	100.0	0.0	2.1	92.2	3.4	32.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	61.9	56.0	56.0	84.3
Fail	0.0	0.7	0.6	1.1
N/A	38.1	25.6	25.7	55.6

Record Counts

Test Records Processed:	103
Initial Test Records:	75
After Repair Test Records:	28
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	43733
Initial Test Vehicles:	43991
After Repair Test Vehicles:	43043
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	53.3	46.7	--	--	0.0	46.7	0.0	46.7	0.0	25.3	1.3
After Repair	60.9	21.7	4.3	39.1	0.0	100.0	0.0	100.0	0.0	66.7	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.58	80	850	1.11	81	2526
Initial Test - Pass Vehicles	0.09	27	869	0.19	39	2537
Initial Test - Fail Vehicles	1.14	141	828	2.16	129	2514
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.14	141	828	2.16	129	2514
After Repair Test - All Vehicles	0.41	64	849	1.40	93	2471
After Repair Test - Pass Vehicles	0.05	22	832	0.09	38	2456
After Repair Test - Fail Vehicles	0.04	65	866	2.86	169	2483
After Repair Test - Inc. Repr. Vehicles	0.00	2	906	0.00	26	2494
After Repair Test - Waived Vehicles	1.19	128	864	2.61	138	2489
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.78	106	865	2.70	149	2487
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	39.3	57.1	3.6
TMG	35.7	60.7	3.6
A/F	35.7	28.6	35.7
CRK	17.9	78.6	3.6
EVP	7.1	89.3	3.6
EXH	10.7	85.7	3.6
EGR	7.1	89.3	3.6
ANY	78.6	89.3	35.7

Average Repair Costs

Parts Cost: $ 17.23 Labor Cost: $ 19.68

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	96.0	14.7	100.0	65.3	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	4.0	85.3	0.0	34.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	76.0	56.0	57.3	93.3
Fail	0.0	0.0	0.0	0.0
N/A	24.0	26.7	25.3	48.0

Record Counts

Test Records Processed:	1009
Initial Test Records:	758
After Repair Test Records:	249
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	46157
Initial Test Vehicles:	45938
After Repair Test Vehicles:	47002
Referee Test Vehicles:	24200

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	53.7	46.3	--	--	4.1	44.6	1.7	42.2	2.4	2.2	33.9
After Repair	79.9	22.1	6.4	20.1	0.0	100.0	0.0	100.0	0.0	14.6	68.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.28	119	881	0.66	81	2509
Initial Test - Pass Vehicles	0.04	34	882	0.23	36	2512
Initial Test - Fail Vehicles	0.56	219	879	1.16	134	2505
Initial Test - Underhood Fail Only	0.09	40	904	0.19	34	2507
Initial Test - Tailpipe Fail Only	0.56	224	878	1.20	137	2505
After Repair Test - All Vehicles	0.18	82	871	0.71	66	2495
After Repair Test - Pass Vehicles	0.07	43	874	0.36	45	2495
After Repair Test - Fail Vehicles	0.36	152	862	1.44	97	2504
After Repair Test - Inc. Repr. Vehicles	0.13	89	883	0.71	47	2518
After Repair Test - Waived Vehicles	0.44	159	871	1.30	118	2481
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.39	153	866	1.37	106	2492
Referee Test - All Vehicles	0.22	220	883	0.56	88	2622
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.22	220	883	0.56	88	2622
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.22	220	883	0.56	88	2622

Repair Action Percentages

	Yes	No	Excd
MIS	31.7	52.2	16.1
TMG	38.6	61.0	0.4
A/F	43.0	43.4	13.7
CRK	7.6	92.4	0.0
EVP	6.8	93.2	0.0
EXH	10.4	88.8	0.8
EGR	5.6	94.0	0.4
ANY	79.1	97.6	27.3

Average Repair Costs

Parts Cost: $ 12.14 Labor Cost: $ 24.59

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Totl	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Pass	99.7	99.5	37.1	99.9	99.6	0.0	100.0	100.0	97.6	100.0	97.4	69.8	100.0
N/A	0.3	0.5	62.9	0.0	0.3	100.0	0.0	0.0	2.4	0.0	2.6	30.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	92.9	64.6	65.4	97.1
Fail	3.4	0.9	0.3	4.0
N/A	3.7	16.6	16.5	19.0

EPA PATTERN FAILURES (ALL STATIONS) - '84 FORD TRUCK 2.8L
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	858
Initial Test Records:	638
After Repair Test Records:	219
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	32404
Initial Test Vehicles:	31495
After Repair Test Vehicles:	34950
Referee Test Vehicles:	54800

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	56.7	43.3	--	--	0.5	43.3	0.0	42.8	0.5	2.8	16.1
After Repair	83.3	40.4	7.7	16.7	0.0	100.0	0.0	100.0	0.0	0.0	69.2
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.68	114	865	0.41	64	2503
Initial Test - Pass Vehicles	0.08	46	873	0.13	34	2511
Initial Test - Fail Vehicles	1.47	204	856	0.78	103	2492
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.47	205	856	0.78	103	2491
After Repair Test - All Vehicles	0.76	127	877	0.34	53	2500
After Repair Test - Pass Vehicles	0.14	56	881	0.13	32	2498
After Repair Test - Fail Vehicles	1.94	246	866	0.69	82	2510
After Repair Test - Inc. Repr. Vehicles	0.51	133	884	0.16	61	2480
After Repair Test - Waived Vehicles	1.00	193	881	0.55	89	2482
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.67	231	870	0.65	84	2502
Referee Test - All Vehicles	0.23	1382	900	0.34	117	2456
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.23	1382	900	0.34	117	2456
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.23	1382	900	0.34	117	2456

Repair Action Percentages

	Yes	No	Excd
MIS	37.0	51.6	11.4
TMG	32.9	66.7	0.5
A/F	55.7	31.5	12.8
CRK	9.6	90.4	0.0
EVP	7.3	92.7	0.0
EXH	11.0	88.1	0.9
EGR	9.6	90.0	0.5
ANY	75.3	95.4	22.4

Average Repair Costs

Parts Cost: $ 7.97 Labor Cost: $ 21.41

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	8.3	91.7	100.0	94.4	100.0	96.9	71.0	100.0
N/A	0.0	0.0	0.0	0.0	0.0	91.7	8.3	0.0	5.6	0.0	3.1	29.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	73.7	47.8	47.3	87.3
Fail	0.0	0.3	0.2	0.5
N/A	26.3	34.5	35.1	53.1

EPA PATTERN FAILURES (ALL STATIONS) - '81-'85 1.6L FORD
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	1305
Initial Test Records:	975
After Repair Test Records:	330
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	54297
Initial Test Vehicles:	52232
After Repair Test Vehicles:	60399
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	60.5	39.5	--	--	2.5	38.5	1.0	37.0	1.4	16.3	5.6
After Repair	64.7	31.0	11.1	34.5	3.4	97.7	2.3	96.6	1.1	41.4	24.1
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.63	118	864	1.00	92	2491
Initial Test - Pass Vehicles	0.10	43	866	0.25	44	2486
Initial Test - Fail Vehicles	1.45	233	862	2.16	167	2498
Initial Test - Underhood Fail Only	0.09	45	865	0.20	39	2508
Initial Test - Tailpipe Fail Only	1.48	235	862	2.22	166	2498
After Repair Test - All Vehicles	0.75	141	867	1.29	93	2476
After Repair Test - Pass Vehicles	0.27	68	864	0.52	56	2467
After Repair Test - Fail Vehicles	1.24	228	864	2.01	122	2496
After Repair Test - Inc. Repr. Vehicles	0.87	142	866	1.42	101	2509
After Repair Test - Waived Vehicles	1.22	201	872	2.12	138	2474
After Repair Test - Underhood Fail Only	0.02	71	856	0.40	70	2497
After Repair Test - Tailpipe Fail Only	1.22	216	869	2.11	131	2484
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	27.6	56.1	16.4
TMG	42.1	57.0	0.9
A/F	52.4	23.0	24.5
CRK	8.2	91.8	0.0
EVP	4.5	95.5	0.0
EXH	6.1	92.4	1.5
EGR	5.5	92.4	2.1
ANY	81.5	97.9	41.8

Average Repair Costs

Parts Cost: $ 16.20 Labor Cost: $ 24.33

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6
Mod	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Miss	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.3	0.5	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	1.1
Pass	99.9	99.4	99.5	99.6	100.0	100.0	0.0	99.9	94.5	15.7	93.4	65.4	100.0
N/A	0.1	0.3	0.0	0.3	0.0	0.0	100.0	0.0	5.5	84.3	6.6	34.5	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	70.6	49.0	48.7	81.1
Fail	0.0	0.7	0.8	1.4
N/A	29.4	26.4	26.6	46.8

Record Counts

Test Records Processed:	661
Initial Test Records:	506
After Repair Test Records:	154
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	57441
Initial Test Vehicles:	56728
After Repair Test Vehicles:	59900
Referee Test Vehicles:	39600

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	62.1	37.9	--	--	4.0	36.0	2.0	34.0	2.0	13.8	3.8
After Repair	68.0	23.2	8.0	28.8	5.6	97.2	2.8	94.4	2.8	41.7	19.4
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.95	123	877	0.99	72	2492
Initial Test - Pass Vehicles	0.10	40	884	0.15	29	2502
Initial Test - Fail Vehicles	2.33	259	866	2.35	141	2475
Initial Test - Underhood Fail Only	0.19	37	867	0.23	41	2455
Initial Test - Tailpipe Fail Only	2.41	267	865	2.39	147	2476
After Repair Test - All Vehicles	0.89	115	890	1.52	76	2486
After Repair Test - Pass Vehicles	0.22	58	897	0.35	38	2486
After Repair Test - Fail Vehicles	1.82	174	886	3.55	118	2507
After Repair Test - Inc. Repr. Vehicles	0.81	204	897	1.24	74	2516
After Repair Test - Waived Vehicles	1.79	207	881	2.79	132	2464
After Repair Test - Underhood Fail Only	0.27	72	879	0.23	52	2507
After Repair Test - Tailpipe Fail Only	1.67	183	881	3.18	128	2485
Referee Test - All Vehicles	0.00	29	968	0.00	19	2568
Referee Test - Pass Vehicles	0.00	29	968	0.00	19	2568
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	23.4	65.6	11.0
TMG	27.9	70.8	1.3
A/F	54.5	18.2	27.3
CRK	7.1	92.9	0.0
EVP	5.2	94.2	0.6
EXH	9.1	90.9	0.0
EGR	11.0	84.4	4.5
ANY	76.6	95.5	37.7

Average Repair Costs

Parts Cost: $ 12.34 Labor Cost: $ 25.25

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.2	0.4	0.2	0.2	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.2	1.2
Mod	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.4
Miss	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.2	0.8	0.2	0.2	0.0	0.0	0.0	0.4	0.2	0.0	0.0	0.2	1.8
Pass	99.4	99.0	99.8	99.8	100.0	100.0	0.0	99.6	93.5	26.5	94.9	65.4	100.0
N/A	0.4	0.2	0.0	0.0	0.0	0.0	100.0	0.0	6.3	73.5	5.1	34.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	73.7	54.7	53.6	85.6
Fail	0.2	0.8	1.8	2.8
N/A	26.1	24.3	24.5	42.3

Record Counts

Test Records Processed:	171
Initial Test Records:	137
After Repair Test Records:	34
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	46600
Initial Test Vehicles:	45951
After Repair Test Vehicles:	49215
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	62.8	37.2	--	--	1.5	36.5	0.7	35.8	0.7	0.7	29.2
After Repair	79.3	17.2	6.9	20.7	0.0	100.0	0.0	100.0	0.0	0.0	66.7
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.15	185	882	0.29	85	2510
Initial Test - Pass Vehicles	0.01	29	886	0.10	36	2511
Initial Test - Fail Vehicles	0.39	447	877	0.61	167	2509
Initial Test - Underhood Fail Only	0.00	11	985	0.00	13	2610
Initial Test - Tailpipe Fail Only	0.40	458	876	0.62	171	2509
After Repair Test - All Vehicles	0.17	158	898	0.41	79	2479
After Repair Test - Pass Vehicles	0.05	63	899	0.23	50	2490
After Repair Test - Fail Vehicles	0.35	451	919	0.87	144	2438
After Repair Test - Inc. Repr. Vehicles	0.52	432	899	0.56	120	2509
After Repair Test - Waived Vehicles	0.50	275	879	0.73	135	2469
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.43	355	897	0.79	139	2455
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	38.2	52.9	8.8
TMG	26.5	73.5	0.0
A/F	44.1	38.2	17.6
CRK	2.9	97.1	0.0
EVP	0.0	100.0	0.0
EXH	8.8	91.2	0.0
EGR	0.0	100.0	0.0
ANY	79.4	100.0	23.5

Average Repair Costs

Parts Cost: $ 5.30 Labor Cost: $ 30.12

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.7
Mod	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
Miss	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
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.7
Pass	99.3	100.0	100.0	100.0	100.0	100.0	0.0	99.3	94.9	8.0	94.2	70.1	100.0
N/A	0.7	0.0	0.0	0.0	0.0	0.0	100.0	0.0	5.1	92.0	5.8	29.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	65.0	48.2	46.7	78.8
Fail	0.0	0.0	1.5	1.5
N/A	35.0	29.9	29.9	51.8

EPA PATTERN FAILURES (ALL STATIONS) - '83 NISSAN 1.6L OXC
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	284
Initial Test Records:	230
After Repair Test Records:	54
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	47881
Initial Test Vehicles:	48221
After Repair Test Vehicles:	46430
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	65.2	34.8	--	--	2.2	33.9	0.9	32.6	1.3	4.8	24.3
After Repair	87.0	17.4	10.9	13.0	16.7	83.3	16.7	83.3	0.0	16.7	66.7
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.23	120	874	0.45	83	2513
Initial Test - Pass Vehicles	0.09	49	863	0.20	51	2509
Initial Test - Fail Vehicles	0.49	253	894	0.93	144	2521
Initial Test - Underhood Fail Only	0.07	78	866	0.28	49	2510
Initial Test - Tailpipe Fail Only	0.51	259	893	0.95	148	2519
After Repair Test - All Vehicles	0.19	103	862	0.70	64	2488
After Repair Test - Pass Vehicles	0.14	72	871	0.42	49	2492
After Repair Test - Fail Vehicles	0.45	180	843	2.10	121	2486
After Repair Test - Inc. Repr. Vehicles	0.26	139	934	1.01	79	2538
After Repair Test - Waived Vehicles	0.22	211	828	0.71	91	2466
After Repair Test - Underhood Fail Only	0.11	16	837	0.04	29	2404
After Repair Test - Tailpipe Fail Only	0.37	198	839	1.66	110	2481
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	40.7	51.9	7.4
TMG	44.4	55.6	0.0
A/F	42.6	46.3	11.1
CRK	11.1	85.2	3.7
EVP	9.3	90.7	0.0
EXH	11.1	85.2	3.7
EGR	11.1	88.9	0.0
ANY	81.5	90.7	25.9

Average Repair Costs

Parts Cost: $ 6.45 Labor Cost: $ 14.06

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.4
Miss	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
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.4
Pass	99.6	99.6	100.0	100.0	100.0	100.0	0.0	99.6	97.4	25.2	96.5	63.9	100.0
N/A	0.4	0.4	0.0	0.0	0.0	0.0	100.0	0.0	2.6	74.8	3.5	36.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	77.4	51.7	52.2	84.8
Fail	0.9	0.9	0.4	2.2
N/A	21.7	30.0	30.0	43.0

Record Counts

Test Records Processed:	115
Initial Test Records:	96
After Repair Test Records:	17
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	33412
Initial Test Vehicles:	32475
After Repair Test Vehicles:	38412
Referee Test Vehicles:	35900

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	65.6	34.4	--	--	0.0	34.4	0.0	34.4	0.0	0.0	27.1
After Repair	83.3	41.7	0.0	16.7	0.0	100.0	0.0	100.0	0.0	0.0	100.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.24	96	841	0.19	31	2498
Initial Test - Pass Vehicles	0.02	17	836	0.06	17	2508
Initial Test - Fail Vehicles	0.65	247	850	0.44	57	2480
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.65	247	850	0.44	57	2480
After Repair Test - All Vehicles	0.38	110	870	0.24	30	2521
After Repair Test - Pass Vehicles	0.25	64	827	0.17	26	2486
After Repair Test - Fail Vehicles	0.73	170	917	0.37	24	2596
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	0.14	193	972	0.28	66	2508
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.56	176	932	0.35	36	2571
Referee Test - All Vehicles	0.06	234	848	0.79	111	2555
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.06	234	848	0.79	111	2555
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.06	234	848	0.79	111	2555

Repair Action Percentages

	Yes	No	Excd
MIS	41.2	52.9	5.9
TMG	41.2	58.8	0.0
A/F	29.4	64.7	5.9
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	0.0	100.0	0.0
EGR	0.0	100.0	0.0
ANY	70.6	100.0	11.8

Average Repair Costs

Parts Cost: $ 5.94 Labor Cost: $ 10.94

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	0.0	97.9	100.0	41.7	58.3	100.0	100.0	0.0	93.8	74.0	100.0
N/A	0.0	0.0	100.0	2.1	0.0	58.3	41.7	0.0	0.0	100.0	6.3	26.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	59.4	53.1	53.1	80.2
Fail	0.0	0.0	0.0	0.0
N/A	40.6	38.5	38.5	63.5

Record Counts

Test Records Processed:	1818
Initial Test Records:	1506
After Repair Test Records:	309
Referee Test Records:	3

Average Odometer Readings

All Vehicles:	28422
Initial Test Vehicles:	27893
After Repair Test Vehicles:	31001
Referee Test Vehicles:	28633

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	69.1	30.9	--	--	0.2	30.9	0.1	30.7	0.1	8.0	9.8
After Repair	79.4	32.6	9.4	20.2	0.0	100.0	0.0	100.0	0.0	21.3	23.4

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.40	82	854	0.76	58	2487
Initial Test - Pass Vehicles	0.05	32	861	0.23	31	2489
Initial Test - Fail Vehicles	1.18	194	839	1.93	119	2481
Initial Test - Underhood Fail Only	0.01	16	703	0.01	18	2680
Initial Test - Tailpipe Fail Only	1.18	195	839	1.94	119	2481
After Repair Test - All Vehicles	0.71	100	855	1.11	68	2478
After Repair Test - Pass Vehicles	0.13	43	857	0.33	35	2477
After Repair Test - Fail Vehicles	1.79	194	841	2.54	134	2482
After Repair Test - Inc. Repr. Vehicles	0.31	103	826	1.18	62	2479
After Repair Test - Waived Vehicles	1.27	172	873	1.88	93	2468
After Repair Test - Underhood Fail Only	0.03	16	808	0.13	47	2659
After Repair Test - Tailpipe Fail Only	1.60	186	854	2.30	119	2477
Referee Test - All Vehicles	0.38	56	935	5.15	156	2596
Referee Test - Pass Vehicles	0.00	12	944	1.09	45	2488
Referee Test - Fail Vehicles	0.57	78	931	7.18	212	2650
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.57	78	931	7.18	212	2650

Repair Action Percentages

	Yes	No	Excd
MIS	30.4	59.2	10.4
TMG	27.2	72.5	0.3
A/F	46.0	33.7	20.4
CRK	4.9	94.8	0.3
EVP	4.2	95.5	0.3
EXH	11.7	86.7	1.6
EGR	3.9	95.1	1.0
ANY	70.9	96.8	27.8

Average Repair Costs

Parts Cost: $ 6.60 Labor Cost: $ 20.43

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Pass	100.0	97.1	100.0	99.7	99.9	8.1	91.9	100.0	94.1	100.0	97.9	67.1	100.0
N/A	0.0	2.9	0.0	0.3	0.1	91.9	8.1	0.0	5.9	0.0	2.1	32.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	75.1	54.8	53.4	90.1
Fail	0.0	0.0	0.1	0.1
N/A	24.9	28.6	29.9	47.1

Record Counts

Test Records Processed:	414
Initial Test Records:	325
After Repair Test Records:	88
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	59479
Initial Test Vehicles:	58050
After Repair Test Vehicles:	64800
Referee Test Vehicles:	55400

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	69.2	30.8	--	--	3.1	28.9	1.8	27.7	1.2	2.5	15.1
After Repair	73.7	15.8	9.2	26.3	5.0	95.0	5.0	95.0	0.0	20.0	40.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.45	97	731	0.53	101	2506
Initial Test - Pass Vehicles	0.08	37	733	0.20	52	2506
Initial Test - Fail Vehicles	1.27	231	727	1.28	212	2506
Initial Test - Underhood Fail Only	0.19	61	698	0.31	43	2538
Initial Test - Tailpipe Fail Only	1.33	243	730	1.35	229	2510
After Repair Test - All Vehicles	0.38	107	780	0.76	127	2486
After Repair Test - Pass Vehicles	0.17	77	772	0.39	68	2497
After Repair Test - Fail Vehicles	0.56	180	751	1.54	386	2447
After Repair Test - Inc. Repr. Vehicles	0.31	219	757	1.37	72	2497
After Repair Test - Waived Vehicles	0.83	147	821	1.33	138	2478
After Repair Test - Underhood Fail Only	0.10	88	926	0.58	85	2278
After Repair Test - Tailpipe Fail Only	0.75	162	791	1.43	236	2472
Referee Test - All Vehicles	0.37	143	812	0.56	126	2354
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.37	143	812	0.56	126	2354
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.37	143	812	0.56	126	2354

Repair Action Percentages

	Yes	No	Excd
MIS	30.7	59.1	10.2
TMG	26.1	72.7	1.1
A/F	54.5	22.7	22.7
CRK	10.2	89.8	0.0
EVP	8.0	90.9	1.1
EXH	9.1	90.9	0.0
EGR	11.4	85.2	3.4
ANY	77.3	93.2	34.1

Average Repair Costs

Parts Cost: $ 20.77 Labor Cost: $ 20.28

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Miss	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
Totl	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Pass	99.7	99.7	99.7	100.0	100.0	46.5	53.5	100.0	95.7	100.0	96.3	73.8	100.0
N/A	0.0	0.3	0.0	0.0	0.0	53.5	46.5	0.0	4.3	0.0	3.7	26.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	96.9	67.7	66.8	97.8
Fail	1.2	0.6	1.2	3.1
N/A	1.8	12.9	13.2	14.8

Record Counts

Test Records Processed:	645
Initial Test Records:	538
After Repair Test Records:	105
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	44402
Initial Test Vehicles:	44026
After Repair Test Vehicles:	45697
Referee Test Vehicles:	77750

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	70.4	29.6	--	--	0.0	29.6	0.0	29.6	0.0	1.1	21.9
After Repair	76.9	15.4	6.6	23.1	0.0	100.0	0.0	100.0	0.0	4.8	76.2
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.17	128	883	0.31	53	2502
Initial Test - Pass Vehicles	0.02	33	884	0.13	30	2503
Initial Test - Fail Vehicles	0.53	354	878	0.75	110	2500
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.53	354	878	0.75	110	2500
After Repair Test - All Vehicles	0.18	131	898	0.37	56	2488
After Repair Test - Pass Vehicles	0.09	56	893	0.23	39	2485
After Repair Test - Fail Vehicles	0.33	260	935	0.54	83	2484
After Repair Test - Inc. Repr. Vehicles	0.50	167	928	0.43	74	2491
After Repair Test - Waived Vehicles	0.37	292	892	0.75	95	2501
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.35	279	909	0.67	90	2494
Referee Test - All Vehicles	0.71	343	921	0.75	58	2531
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.71	343	921	0.75	58	2531
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.71	343	921	0.75	58	2531

Repair Action Percentages

	Yes	No	Excd
MIS	34.3	49.5	16.2
TMG	29.5	69.5	1.0
A/F	45.7	41.0	13.3
CRK	3.8	96.2	0.0
EVP	3.8	96.2	0.0
EXH	5.7	94.3	0.0
EGR	1.9	98.1	0.0
ANY	80.0	99.0	28.6

Average Repair Costs

Parts Cost: $ 7.69 Labor Cost: $ 23.60

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	99.6	7.1	94.4	68.8	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.4	92.9	5.6	31.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	58.9	53.7	53.5	79.9
Fail	0.0	0.0	0.0	0.0
N/A	41.1	23.4	23.6	54.6

Record Counts

Test Records Processed:	1599
Initial Test Records:	1297
After Repair Test Records:	297
Referee Test Records:	5

Average Odometer Readings

All Vehicles:	49212
Initial Test Vehicles:	47811
After Repair Test Vehicles:	55038
Referee Test Vehicles:	66620

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.3	28.7	--	--	3.2	26.9	1.8	25.4	1.5	6.1	11.6
After Repair	80.6	25.3	8.0	19.0	6.7	95.6	4.4	93.3	2.2	24.4	35.6
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.32	81	880	0.67	76	2511
Initial Test - Pass Vehicles	0.04	32	886	0.15	37	2514
Initial Test - Fail Vehicles	1.02	202	865	1.94	171	2505
Initial Test - Underhood Fail Only	0.05	49	859	0.31	43	2524
Initial Test - Tailpipe Fail Only	1.08	203	865	2.05	170	2504
After Repair Test - All Vehicles	0.48	113	889	0.92	75	2487
After Repair Test - Pass Vehicles	0.13	60	898	0.38	48	2496
After Repair Test - Fail Vehicles	1.25	239	868	2.30	124	2461
After Repair Test - Inc. Repr. Vehicles	0.49	150	894	1.39	100	2488
After Repair Test - Waived Vehicles	0.93	170	879	1.36	124	2488
After Repair Test - Underhood Fail Only	0.11	88	897	0.23	39	2415
After Repair Test - Tailpipe Fail Only	1.15	212	871	1.93	126	2472
Referee Test - All Vehicles	1.13	209	879	0.68	164	2588
Referee Test - Pass Vehicles	0.46	118	950	0.55	72	2680
Referee Test - Fail Vehicles	1.30	232	862	0.71	188	2565
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.30	232	862	0.71	188	2565

Repair Action Percentages

	Yes	No	Excd
MIS	35.0	54.2	10.8
TMG	33.3	66.3	0.3
A/F	52.9	29.3	17.8
CRK	7.4	92.3	0.3
EVP	5.1	94.9	0.0
EXH	10.1	89.2	0.7
EGR	6.7	91.6	1.7
ANY	82.8	98.0	27.9

Average Repair Costs

Parts Cost: $ 11.14 Labor Cost: $ 22.86

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.1	0.3	0.2	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.2	0.7
Mod	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Miss	0.0	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Totl	0.1	0.3	0.5	0.1	0.0	0.2	0.2	0.3	0.0	0.0	0.0	0.2	1.4
Pass	99.8	99.7	99.5	99.9	99.9	43.3	56.3	99.7	97.1	84.9	96.0	67.2	100.0
N/A	0.1	0.0	0.0	0.0	0.1	56.4	43.6	0.0	2.9	15.1	4.0	32.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	93.4	55.1	54.5	96.2
Fail	1.0	0.6	1.2	2.5
N/A	5.6	20.7	20.7	24.1

Record Counts

Test Records Processed:	850
Initial Test Records:	669
After Repair Test Records:	178
Referee Test Records:	3

Average Odometer Readings

All Vehicles:	56780
Initial Test Vehicles:	56463
After Repair Test Vehicles:	57847
Referee Test Vehicles:	64067

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.3	28.7	--	--	3.3	26.9	1.8	25.4	1.5	2.8	15.1
After Repair	74.2	17.9	6.0	23.2	5.7	100.0	0.0	94.3	5.7	20.0	42.9
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	84	701	0.44	89	2499
Initial Test - Pass Vehicles	0.07	33	704	0.16	47	2501
Initial Test - Fail Vehicles	1.00	212	692	1.14	194	2493
Initial Test - Underhood Fail Only	0.11	41	673	0.19	35	2522
Initial Test - Tailpipe Fail Only	0.99	204	695	1.10	187	2492
After Repair Test - All Vehicles	0.37	82	763	0.78	94	2485
After Repair Test - Pass Vehicles	0.11	36	762	0.32	58	2477
After Repair Test - Fail Vehicles	0.90	146	731	1.80	106	2496
After Repair Test - Inc. Repr. Vehicles	0.18	30	754	1.60	75	2509
After Repair Test - Waived Vehicles	0.84	183	803	1.53	207	2497
After Repair Test - Underhood Fail Only	0.06	41	673	0.16	31	2517
After Repair Test - Tailpipe Fail Only	0.89	168	772	1.60	162	2496
Referee Test - All Vehicles	1.19	118	773	0.80	115	2411
Referee Test - Pass Vehicles	0.00	15	736	0.01	51	2376
Referee Test - Fail Vehicles	1.79	169	792	1.20	147	2428
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.37	143	812	0.56	126	2354

Repair Action Percentages

	Yes	No	Excd
MIS	30.3	60.7	9.0
TMG	26.4	73.6	0.0
A/F	54.5	31.5	14.0
CRK	10.1	89.9	0.0
EVP	8.4	89.9	1.7
EXH	10.1	87.6	2.2
EGR	10.7	85.4	3.9
ANY	80.9	94.4	28.7

Average Repair Costs

Parts Cost: $ 15.27 Labor Cost: $ 21.62

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.3
Pass	100.0	99.6	100.0	100.0	100.0	0.0	100.0	100.0	97.8	100.0	97.0	74.3	100.0
N/A	0.0	0.3	0.0	0.0	0.0	100.0	0.0	0.0	2.2	0.0	2.8	25.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	96.6	65.9	63.7	97.6
Fail	1.0	0.3	1.9	3.1
N/A	2.4	14.2	14.8	15.8

EPA PATTERN FAILURES (ALL STATIONS) - '81-'82 1.6L 3CL GM
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	1332
Initial Test Records:	1077
After Repair Test Records:	252
Referee Test Records:	3

Average Odometer Readings

All Vehicles:	48985
Initial Test Vehicles:	47230
After Repair Test Vehicles:	56367
Referee Test Vehicles:	59067

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.8	28.2	--	--	2.9	26.7	1.5	25.3	1.4	5.8	11.8
After Repair	80.7	27.9	8.6	18.8	8.1	94.6	5.4	91.9	2.7	24.3	40.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.32	81	881	0.65	75	2510
Initial Test - Pass Vehicles	0.04	31	886	0.15	36	2512
Initial Test - Fail Vehicles	1.03	208	867	1.93	172	2505
Initial Test - Underhood Fail Only	0.04	42	891	0.24	35	2519
Initial Test - Tailpipe Fail Only	1.05	205	865	2.01	167	2503
After Repair Test - All Vehicles	0.47	114	888	0.93	73	2486
After Repair Test - Pass Vehicles	0.13	57	895	0.36	48	2497
After Repair Test - Fail Vehicles	1.25	245	868	2.33	125	2461
After Repair Test - Inc. Repr. Vehicles	0.50	137	907	1.21	95	2507
After Repair Test - Waived Vehicles	0.78	160	887	1.30	109	2483
After Repair Test - Underhood Fail Only	0.11	88	897	0.23	39	2415
After Repair Test - Tailpipe Fail Only	1.10	213	874	1.95	120	2469
Referee Test - All Vehicles	1.69	280	838	0.71	95	2535
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	1.69	280	838	0.71	95	2535
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.69	280	838	0.71	95	2535

Repair Action Percentages

	Yes	No	Excd
MIS	35.7	54.0	10.3
TMG	33.7	65.9	0.4
A/F	52.8	29.4	17.9
CRK	7.1	92.5	0.4
EVP	4.8	95.2	0.0
EXH	10.3	88.9	0.8
EGR	6.0	92.1	2.0
ANY	82.9	98.4	28.2

Average Repair Costs

Parts Cost: $ 9.87 Labor Cost: $ 23.45

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.1	0.3	0.1	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.2	0.6
Mod	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Miss	0.0	0.0	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Totl	0.1	0.3	0.4	0.0	0.0	0.3	0.1	0.4	0.0	0.0	0.0	0.2	1.3
Pass	99.8	99.7	99.6	100.0	99.9	35.3	64.3	99.6	97.8	100.0	95.7	66.9	100.0
N/A	0.1	0.0	0.0	0.0	0.1	64.4	35.6	0.0	2.2	0.0	4.3	32.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	96.0	56.1	55.6	97.9
Fail	0.9	0.5	1.0	2.2
N/A	3.1	19.9	19.8	21.7

Record Counts

Test Records Processed:	1504
Initial Test Records:	1266
After Repair Test Records:	238
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	31775
Initial Test Vehicles:	31914
After Repair Test Vehicles:	31040
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.9	28.1	--	--	1.2	27.3	0.9	26.9	0.3	0.4	25.3
After Repair	84.0	27.3	4.8	15.5	0.0	100.0	0.0	100.0	0.0	3.4	86.2
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.19	90	907	0.17	44	2532
Initial Test - Pass Vehicles	0.09	36	903	0.10	21	2532
Initial Test - Fail Vehicles	0.44	229	918	0.34	101	2533
Initial Test - Underhood Fail Only	0.08	31	903	0.09	24	2539
Initial Test - Tailpipe Fail Only	0.41	229	919	0.34	100	2533
After Repair Test - All Vehicles	0.34	97	894	0.23	46	2523
After Repair Test - Pass Vehicles	0.10	48	886	0.12	27	2534
After Repair Test - Fail Vehicles	0.74	187	913	0.40	89	2504
After Repair Test - Inc. Repr. Vehicles	0.16	72	919	0.08	25	2585
After Repair Test - Waived Vehicles	0.90	204	902	0.49	79	2494
After Repair Test - Underhood Fail Only	0.01	24	819	0.00	22	2421
After Repair Test - Tailpipe Fail Only	0.81	196	911	0.44	86	2502
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	45.4	46.6	8.0
TMG	40.3	59.2	0.4
A/F	32.8	54.2	13.0
CRK	10.9	88.2	0.8
EVP	8.4	90.8	0.8
EXH	8.8	89.1	2.1
EGR	9.7	88.7	1.7
ANY	80.7	94.1	21.4

Average Repair Costs

Parts Cost: $ 9.97 Labor Cost: $ 19.85

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.6	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Pass	99.9	95.8	0.0	99.8	99.9	45.2	54.7	100.0	96.2	100.0	98.4	65.2	100.0
N/A	0.1	3.6	100.0	0.1	0.0	54.8	45.3	0.0	3.8	0.0	1.6	34.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	96.4	55.6	55.6	97.6
Fail	0.3	0.2	0.2	0.6
N/A	3.2	21.6	21.6	23.1

EPA PATTERN FAILURES (ALL STATIONS) - '82 GM TRUCK 5.7L
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	313
Initial Test Records:	258
After Repair Test Records:	55
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	57952
Initial Test Vehicles:	57828
After Repair Test Vehicles:	58535
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	74.4	25.6	--	--	2.7	24.8	0.8	22.9	1.9	2.3	20.5
After Repair	82.6	19.6	2.2	17.4	0.0	100.0	0.0	100.0	0.0	12.5	75.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.14	135	774	0.23	45	2519
Initial Test - Pass Vehicles	0.05	45	783	0.10	25	2525
Initial Test - Fail Vehicles	0.40	397	749	0.60	105	2501
Initial Test - Underhood Fail Only	0.68	92	671	0.11	13	2544
Initial Test - Tailpipe Fail Only	0.38	411	754	0.63	112	2500
After Repair Test - All Vehicles	0.52	112	845	0.63	54	2530
After Repair Test - Pass Vehicles	0.04	46	840	0.14	28	2541
After Repair Test - Fail Vehicles	2.31	268	816	2.42	98	2473
After Repair Test - Inc. Repr. Vehicles	0.00	0	960	0.01	4	2504
After Repair Test - Waived Vehicles	0.81	246	900	0.94	130	2545
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.60	257	856	1.72	113	2507
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	41.8	49.1	9.1
TMG	36.4	63.6	0.0
A/F	43.6	45.5	10.9
CRK	9.1	90.9	0.0
EVP	10.9	89.1	0.0
EXH	25.5	74.5	0.0
EGR	12.7	87.3	0.0
ANY	89.1	94.5	20.0

Average Repair Costs

Parts Cost: $ 16.02 Labor Cost: $ 31.80

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.8	0.4	0.0	0.0	0.4	1.2
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.8
Miss	0.0	0.0	0.4	0.0	0.4	0.8	0.0	0.0	0.0	0.0	0.0	0.0	1.6
Totl	0.0	0.0	0.8	0.4	0.4	0.8	0.0	1.2	0.4	0.0	0.4	0.4	3.5
Pass	100.0	100.0	99.2	99.6	99.6	99.2	0.0	98.8	95.7	21.7	94.6	66.3	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	3.9	78.3	5.0	33.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	73.3	67.4	67.4	91.1
Fail	0.0	0.4	0.4	0.8
N/A	26.7	17.1	17.1	39.1

EPA PATTERN FAILURES (ALL STATIONS) - '83-'84 1.5L 3CL MAZD
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	433
Initial Test Records:	359
After Repair Test Records:	74
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	44216
Initial Test Vehicles:	42160
After Repair Test Vehicles:	54188
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	77.2	22.8	--	--	1.4	22.0	0.8	21.4	0.6	5.6	2.2
After Repair	69.4	19.4	4.8	30.6	5.3	100.0	0.0	94.7	5.3	52.6	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.51	52	863	0.64	56	2496
Initial Test - Pass Vehicles	0.01	16	860	0.05	21	2494
Initial Test - Fail Vehicles	2.20	173	872	2.63	175	2503
Initial Test - Underhood Fail Only	0.09	36	785	0.53	50	2550
Initial Test - Tailpipe Fail Only	2.33	180	874	2.71	181	2500
After Repair Test - All Vehicles	0.34	63	867	1.23	78	2496
After Repair Test - Pass Vehicles	0.07	29	875	0.19	32	2485
After Repair Test - Fail Vehicles	0.68	104	839	3.12	159	2523
After Repair Test - Inc. Repr. Vehicles	0.01	11	840	0.31	11	2615
After Repair Test - Waived Vehicles	0.73	112	865	2.39	134	2506
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.76	115	858	2.56	141	2518
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	17.6	67.6	13.5
TMG	18.9	75.7	4.1
A/F	51.4	21.6	25.7
CRK	6.8	87.8	4.1
EVP	5.4	89.2	4.1
EXH	5.4	83.8	9.5
EGR	1.4	91.9	5.4
ANY	75.7	93.2	36.5

Average Repair Costs

Parts Cost: $ 25.63 Labor Cost: $ 24.81

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6
Mod	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
Miss	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
Totl	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6
Pass	99.7	99.4	100.0	99.4	100.0	0.0	100.0	100.0	95.5	100.0	94.7	64.1	100.0
N/A	0.3	0.6	0.0	0.3	0.0	100.0	0.0	0.0	4.5	0.0	5.3	35.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	78.6	57.9	57.9	91.9
Fail	0.0	0.6	0.3	0.8
N/A	21.4	21.7	22.0	39.6

Record Counts

Test Records Processed:	1345
Initial Test Records:	1145
After Repair Test Records:	200
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	52625
Initial Test Vehicles:	52386
After Repair Test Vehicles:	53995
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	77.6	22.4	--	--	1.5	21.5	1.0	21.0	0.5	3.6	9.3
After Repair	75.0	22.0	4.3	23.2	0.0	100.0	0.0	100.0	0.0	21.1	42.1
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.36	97	765	0.49	56	2508
Initial Test - Pass Vehicles	0.04	33	766	0.18	23	2508
Initial Test - Fail Vehicles	1.46	315	758	1.57	170	2508
Initial Test - Underhood Fail Only	0.18	38	796	0.10	18	2519
Initial Test - Tailpipe Fail Only	1.54	329	756	1.64	179	2507
After Repair Test - All Vehicles	0.58	117	810	0.92	88	2501
After Repair Test - Pass Vehicles	0.16	46	805	0.32	42	2503
After Repair Test - Fail Vehicles	1.56	258	802	2.15	122	2489
After Repair Test - Inc. Repr. Vehicles	0.41	110	852	1.89	256	2458
After Repair Test - Waived Vehicles	1.07	223	835	1.73	211	2502
After Repair Test - Underhood Fail Only	0.02	18	773	0.17	15	2562
After Repair Test - Tailpipe Fail Only	1.31	240	819	1.93	168	2495
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	37.5	55.5	7.0
TMG	32.0	67.5	0.5
A/F	43.5	37.5	19.0
CRK	7.0	93.0	0.0
EVP	8.0	92.0	0.0
EXH	12.5	86.5	1.0
EGR	6.5	92.0	1.5
ANY	84.0	97.5	27.0

Average Repair Costs

Parts Cost: $ 9.17 Labor Cost: $ 25.35

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.3
Totl	0.0	0.0	0.3	0.1	0.1	0.3	0.0	0.2	0.0	0.0	0.0	0.1	1.0
Pass	100.0	99.9	97.4	99.9	99.7	55.0	44.5	99.7	96.2	74.8	96.1	70.1	100.0
N/A	0.0	0.1	2.4	0.0	0.3	44.6	55.5	0.2	3.8	25.2	3.9	29.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	90.1	70.4	69.4	95.7
Fail	0.1	0.0	0.7	0.8
N/A	9.8	15.5	15.8	22.5

Appendix B

I/M Summary Statistics

EPA Pattern Failure Vehicles
With Fail Rates Lower Than Overall Rate for
Same Manufacturer and Model Year

EPA PATTERN FAILURES (ALL STATIONS) - '81-'82 MAZDA 1.5L
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	1427
Initial Test Records:	1081
After Repair Test Records:	344
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	56706
Initial Test Vehicles:	53910
After Repair Test Vehicles:	65500
Referee Test Vehicles:	55350

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	64.8	35.2	--	--	2.3	34.2	0.9	32.8	1.4	12.1	2.7
After Repair	67.0	27.4	5.9	32.2	3.4	98.9	1.1	96.6	2.3	48.3	6.9
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.67	84	863	1.00	66	2493
Initial Test - Pass Vehicles	0.03	25	864	0.09	24	2490
Initial Test - Fail Vehicles	1.85	192	863	2.68	143	2497
Initial Test - Underhood Fail Only	0.10	46	854	0.39	38	2551
Initial Test - Tailpipe Fail Only	1.93	195	861	2.75	147	2497
After Repair Test - All Vehicles	0.53	88	874	1.45	77	2491
After Repair Test - Pass Vehicles	0.11	38	877	0.41	38	2476
After Repair Test - Fail Vehicles	1.23	146	870	2.67	116	2519
After Repair Test - Inc. Repr. Vehicles	0.57	65	908	1.47	57	2459
After Repair Test - Waived Vehicles	0.82	142	873	2.58	126	2497
After Repair Test - Underhood Fail Only	0.19	70	903	0.34	24	2561
After Repair Test - Tailpipe Fail Only	1.03	147	872	2.62	122	2505
Referee Test - All Vehicles	0.69	180	860	0.74	76	2491
Referee Test - Pass Vehicles	0.00	6	862	0.00	9	2500
Referee Test - Fail Vehicles	1.38	353	858	1.48	142	2482
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.38	353	858	1.48	142	2482

Repair Action Percentages

	Yes	No	Excd
MIS	27.6	62.5	9.6
TMG	32.0	66.0	1.7
A/F	50.3	21.8	27.6
CRK	7.6	90.7	1.5
EVP	6.4	91.9	1.5
EXH	10.8	84.0	4.9
EGR	5.8	92.2	1.7
ANY	76.2	94.5	36.9

Average Repair Costs

Parts Cost: $ 17.49 Labor Cost: $ 24.62

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.4
Mod	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
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2
Totl	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.6
Pass	99.9	99.4	99.9	99.6	99.9	33.4	66.6	99.9	88.0	38.8	96.3	64.9	100.0
N/A	0.1	0.6	0.0	0.3	0.1	66.6	33.4	0.0	11.9	61.2	3.7	35.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	71.0	54.5	54.8	87.8
Fail	0.0	1.2	0.7	1.9
N/A	29.0	22.5	22.7	46.3

EPA PATTERN FAILURES (ALL STATIONS) - '81 MAZDA TRUCK 2.3L
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	136
Initial Test Records:	105
After Repair Test Records:	31
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	60536
Initial Test Vehicles:	60652
After Repair Test Vehicles:	60142
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.4	28.6	--	--	3.8	26.7	1.9	24.8	1.9	16.2	3.8
After Repair	66.7	29.2	4.2	29.2	0.0	100.0	0.0	100.0	0.0	57.1	14.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.80	90	888	0.66	25	2507
Initial Test - Pass Vehicles	0.15	34	891	0.15	13	2511
Initial Test - Fail Vehicles	2.41	229	883	1.93	57	2497
Initial Test - Underhood Fail Only	0.22	30	893	0.23	13	2378
Initial Test - Tailpipe Fail Only	2.38	244	880	1.81	60	2501
After Repair Test - All Vehicles	0.87	104	906	1.34	36	2504
After Repair Test - Pass Vehicles	0.37	44	920	0.51	18	2501
After Repair Test - Fail Vehicles	1.02	116	880	2.57	46	2561
After Repair Test - Inc. Repr. Vehicles	0.36	15	935	2.14	14	2662
After Repair Test - Waived Vehicles	1.95	239	907	2.13	72	2458
After Repair Test - Underhood Fail Only	0.40	24	866	0.33	6	2483
After Repair Test - Tailpipe Fail Only	1.49	178	894	2.35	59	2509
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	25.8	67.7	6.5
TMG	22.6	74.2	3.2
A/F	54.8	9.7	35.5
CRK	6.5	93.5	0.0
EVP	3.2	93.5	3.2
EXH	3.2	96.8	0.0
EGR	19.4	74.2	6.5
ANY	77.4	96.8	38.7

Average Repair Costs

Parts Cost: $ 3.00 Labor Cost: $ 19.19

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0
Miss	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
Totl	1.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.9
Pass	99.0	99.0	100.0	100.0	100.0	100.0	0.0	99.0	95.2	1.9	96.2	66.7	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	4.8	98.1	3.8	33.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	68.6	52.4	50.5	83.8
Fail	0.0	1.0	2.9	3.8
N/A	31.4	23.8	23.8	47.6

Record Counts

Test Records Processed:	485
Initial Test Records:	401
After Repair Test Records:	83
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	54584
Initial Test Vehicles:	53981
After Repair Test Vehicles:	57273
Referee Test Vehicles:	73000

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	72.8	27.2	--	--	1.2	26.2	1.0	25.9	0.2	8.2	5.7
After Repair	84.0	10.7	5.3	16.0	0.0	100.0	0.0	100.0	0.0	50.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.47	97	860	0.46	62	2523
Initial Test - Pass Vehicles	0.06	46	864	0.15	44	2523
Initial Test - Fail Vehicles	1.54	234	851	1.29	109	2523
Initial Test - Underhood Fail Only	0.06	49	886	0.19	39	2564
Initial Test - Tailpipe Fail Only	1.60	242	849	1.35	113	2522
After Repair Test - All Vehicles	0.53	103	890	0.75	68	2504
After Repair Test - Pass Vehicles	0.18	59	883	0.28	48	2514
After Repair Test - Fail Vehicles	1.55	203	912	1.92	136	2444
After Repair Test - Inc. Repr. Vehicles	0.66	101	914	0.45	111	2618
After Repair Test - Waived Vehicles	1.66	265	917	2.44	128	2489
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.62	240	915	2.23	131	2471
Referee Test - All Vehicles	2.43	163	970	2.01	103	2672
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	2.43	163	970	2.01	103	2672
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	2.43	163	970	2.01	103	2672

Repair Action Percentages

	Yes	No	Excd
MIS	24.1	63.9	12.0
TMG	21.7	77.1	1.2
A/F	62.7	21.7	15.7
CRK	6.0	94.0	0.0
EVP	4.8	95.2	0.0
EXH	7.2	92.8	0.0
EGR	6.0	94.0	0.0
ANY	80.7	97.6	20.5

Average Repair Costs

Parts Cost: $ 11.22 Labor Cost: $ 26.27

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Totl	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.7
Pass	100.0	100.0	100.0	99.8	99.8	100.0	0.0	99.8	95.5	8.0	97.0	63.6	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	4.5	92.0	3.0	36.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	63.3	57.6	56.4	82.5
Fail	0.0	0.0	0.7	0.7
N/A	36.7	22.4	22.9	50.4

Record Counts

Test Records Processed:	1301
Initial Test Records:	1057
After Repair Test Records:	244
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	62018
Initial Test Vehicles:	60847
After Repair Test Vehicles:	67093
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	73.7	26.3	--	--	4.2	23.9	2.4	22.1	1.8	5.3	5.1
After Repair	72.8	20.8	7.4	25.2	5.9	98.0	2.0	94.1	3.9	41.2	23.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.49	93	840	0.45	48	2481
Initial Test - Pass Vehicles	0.02	30	843	0.07	26	2481
Initial Test - Fail Vehicles	1.82	267	834	1.51	111	2482
Initial Test - Underhood Fail Only	0.01	32	846	0.11	33	2453
Initial Test - Tailpipe Fail Only	1.99	287	833	1.63	118	2486
After Repair Test - All Vehicles	0.51	98	854	0.99	63	2462
After Repair Test - Pass Vehicles	0.17	49	858	0.34	34	2461
After Repair Test - Fail Vehicles	1.09	172	856	2.56	135	2471
After Repair Test - Inc. Repr. Vehicles	0.84	148	875	2.04	94	2469
After Repair Test - Waived Vehicles	1.05	182	843	1.65	91	2464
After Repair Test - Underhood Fail Only	0.00	26	843	0.00	20	2367
After Repair Test - Tailpipe Fail Only	1.09	180	850	2.12	113	2469
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	28.7	62.3	9.0
TMG	37.7	61.5	0.8
A/F	52.0	25.4	22.5
CRK	7.8	92.2	0.0
EVP	5.7	94.3	0.0
EXH	12.7	87.3	0.0
EGR	7.4	88.9	3.7
ANY	82.4	96.3	32.4

Average Repair Costs

Parts Cost: $ 14.48 Labor Cost: $ 22.34

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.2	0.9	0.5	0.2	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.2	1.3
Mod	0.2	0.4	0.2	0.0	0.3	0.0	0.0	0.2	0.0	0.0	0.1	0.1	0.9
Miss	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.6
Totl	0.4	1.6	0.7	0.2	0.3	0.1	0.0	0.5	0.2	0.0	0.1	0.5	2.8
Pass	99.6	98.4	99.3	99.7	99.7	99.9	0.0	99.5	96.7	12.0	94.7	67.3	100.0
N/A	0.0	0.0	0.0	0.1	0.0	0.0	100.0	0.0	3.1	88.0	5.2	32.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	66.2	60.7	59.4	85.5
Fail	0.3	0.7	1.7	2.5
N/A	33.5	20.9	21.2	48.2

EPA PATTERN FAILURES (ALL STATIONS) - '81-'83 2.8L 3CL NISSAN
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	7866
Initial Test Records:	6733
After Repair Test Records:	1129
Referee Test Records:	4

Average Odometer Readings

All Vehicles:	38979
Initial Test Vehicles:	37984
After Repair Test Vehicles:	44900
Referee Test Vehicles:	43000

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	75.6	24.4	--	--	2.3	23.1	1.4	22.1	0.9	2.4	14.0
After Repair	81.5	19.5	4.6	18.1	2.3	97.7	2.3	97.7	0.0	24.0	46.8
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.29	73	850	0.43	51	2507
Initial Test - Pass Vehicles	0.05	30	851	0.15	27	2508
Initial Test - Fail Vehicles	1.04	205	847	1.28	127	2503
Initial Test - Underhood Fail Only	0.07	37	854	0.23	34	2496
Initial Test - Tailpipe Fail Only	1.10	214	845	1.33	132	2503
After Repair Test - All Vehicles	0.37	87	868	0.69	61	2492
After Repair Test - Pass Vehicles	0.12	47	869	0.31	40	2496
After Repair Test - Fail Vehicles	0.92	172	869	1.46	112	2486
After Repair Test - Inc. Repr. Vehicles	0.33	98	879	0.93	65	2489
After Repair Test - Waived Vehicles	0.93	173	867	1.55	102	2479
After Repair Test - Underhood Fail Only	0.13	41	818	0.19	36	2489
After Repair Test - Tailpipe Fail Only	0.95	174	868	1.53	109	2483
Referee Test - All Vehicles	0.06	110	908	0.09	11	2569
Referee Test - Pass Vehicles	0.02	22	910	0.12	12	2566
Referee Test - Fail Vehicles	0.16	373	902	0.02	8	2576
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.16	373	902	0.02	8	2576

Repair Action Percentages

	Yes	No	Excd
MIS	30.8	61.1	7.9
TMG	31.5	67.8	0.4
A/F	46.4	38.1	15.3
CRK	6.6	92.6	0.7
EVP	6.7	93.1	0.0
EXH	11.5	86.9	1.4
EGR	7.4	92.0	0.4
ANY	80.1	95.7	23.0

Average Repair Costs

Parts Cost: $ 9.81 Labor Cost: $ 18.33

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.5
Pass	99.7	73.3	34.7	99.8	99.9	22.4	77.5	99.8	95.9	78.5	98.4	72.1	100.0
N/A	0.3	26.7	65.2	0.1	0.1	77.6	22.5	0.0	4.1	21.4	1.5	27.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	88.4	61.7	61.6	94.3
Fail	1.7	0.3	0.3	2.1
N/A	10.0	20.4	20.6	27.6

EPA PATTERN FAILURES (ALL STATIONS) - '81-'82 258 CID AMC 5-AUG-1987
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	109
Initial Test Records:	96
After Repair Test Records:	13
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	55246
Initial Test Vehicles:	55330
After Repair Test Vehicles:	54623
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	77.1	22.9	--	--	3.1	19.8	3.1	19.8	0.0	3.1	8.3
After Repair	53.8	0.0	0.0	46.2	0.0	100.0	0.0	100.0	0.0	50.0	16.7
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.40	69	834	0.40	45	2468
Initial Test - Pass Vehicles	0.02	21	828	0.06	13	2470
Initial Test - Fail Vehicles	1.65	231	854	1.55	154	2461
Initial Test - Underhood Fail Only	0.08	16	771	0.14	17	2406
Initial Test - Tailpipe Fail Only	1.90	265	868	1.77	175	2470
After Repair Test - All Vehicles	0.88	78	832	1.72	69	2452
After Repair Test - Pass Vehicles	0.01	17	838	0.21	20	2417
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	1.90	150	824	3.49	128	2493
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.90	150	824	3.49	128	2493
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	7.7	84.6	7.7
TMG	23.1	76.9	0.0
A/F	15.4	46.2	38.5
CRK	7.7	92.3	0.0
EVP	15.4	84.6	0.0
EXH	23.1	76.9	0.0
EGR	7.7	92.3	0.0
ANY	69.2	100.0	46.2

Average Repair Costs

Parts Cost: $ 1.38 Labor Cost: $ 14.15

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1
Mod	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
Miss	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
Totl	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1
Pass	100.0	96.9	100.0	100.0	100.0	0.0	100.0	100.0	99.0	100.0	100.0	67.7	100.0
N/A	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	1.0	0.0	0.0	32.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	87.5	60.4	59.4	95.8
Fail	0.0	0.0	1.0	1.0
N/A	12.5	25.0	25.0	36.5

Record Counts

Test Records Processed:	1408
Initial Test Records:	1286
After Repair Test Records:	120
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	26955
Initial Test Vehicles:	26827
After Repair Test Vehicles:	28369
Referee Test Vehicles:	24900

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	78.5	21.5	--	--	0.1	21.4	0.1	21.4	0.0	5.5	1.1
After Repair	79.3	37.9	0.0	20.7	0.0	100.0	0.0	100.0	0.0	50.0	11.1
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.33	46	885	0.64	31	2483
Initial Test - Pass Vehicles	0.01	15	884	0.07	12	2485
Initial Test - Fail Vehicles	1.52	162	890	2.73	100	2478
Initial Test - Underhood Fail Only	0.01	16	910	0.01	14	2450
Initial Test - Tailpipe Fail Only	1.52	163	890	2.74	100	2478
After Repair Test - All Vehicles	0.46	64	888	1.08	54	2476
After Repair Test - Pass Vehicles	0.00	16	892	0.12	13	2494
After Repair Test - Fail Vehicles	1.19	136	884	2.47	125	2458
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	0.89	115	884	2.18	81	2444
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.08	129	884	2.37	109	2453
Referee Test - All Vehicles	0.00	2	913	1.14	29	2417
Referee Test - Pass Vehicles	0.00	2	892	0.43	8	2556
Referee Test - Fail Vehicles	0.00	2	934	1.86	50	2278
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.00	2	934	1.86	50	2278

Repair Action Percentages

	Yes	No	Excd
MIS	27.5	65.8	6.7
TMG	31.7	68.3	0.0
A/F	45.8	35.0	19.2
CRK	4.2	95.8	0.0
EVP	3.3	96.7	0.0
EXH	10.8	88.3	0.8
EGR	5.0	95.0	0.0
ANY	79.2	99.2	25.0

Average Repair Costs

Parts Cost: $ 7.83 Labor Cost: $ 22.98

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Mod	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
Miss	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
Totl	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Pass	99.8	99.7	100.0	99.9	99.9	12.7	87.1	100.0	99.4	100.0	96.8	73.0	100.0
N/A	0.2	0.3	0.0	0.0	0.1	87.3	12.9	0.0	0.6	0.0	3.2	27.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	71.3	55.5	55.3	86.3
Fail	0.0	0.0	0.0	0.0
N/A	28.7	23.3	23.6	44.0

EPA PATTERN FAILURES (ALL STATIONS) - '83-'84 NISSAN TRUCK 2.4L 5-AUG-1987
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	241
Initial Test Records:	216
After Repair Test Records:	24
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	35476
Initial Test Vehicles:	34974
After Repair Test Vehicles:	38408
Referee Test Vehicles:	73400

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	78.7	21.3	--	--	0.0	21.3	0.0	21.3	0.0	2.8	6.5
After Repair	85.0	20.0	0.0	15.0	0.0	100.0	0.0	100.0	0.0	0.0	33.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.68	98	865	0.52	52	2521
Initial Test - Pass Vehicles	0.09	44	877	0.29	38	2526
Initial Test - Fail Vehicles	2.82	294	821	1.35	104	2500
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	2.82	294	821	1.35	104	2500
After Repair Test - All Vehicles	0.80	97	864	0.81	69	2504
After Repair Test - Pass Vehicles	0.18	55	860	0.37	45	2488
After Repair Test - Fail Vehicles	1.32	164	883	0.72	98	2555
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	3.63	249	860	3.46	164	2530
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	2.31	200	873	1.89	127	2544
Referee Test - All Vehicles	0.06	0	878	0.25	0	2544
Referee Test - Pass Vehicles	0.06	0	878	0.25	0	2544
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	33.3	66.7	0.0
TMG	29.2	70.8	0.0
A/F	54.2	29.2	16.7
CRK	12.5	87.5	0.0
EVP	8.3	91.7	0.0
EXH	12.5	87.5	0.0
EGR	8.3	91.7	0.0
ANY	87.5	95.8	16.7

Average Repair Costs

Parts Cost: $ 38.13 Labor Cost: $ 17.63

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	99.5	100.0	100.0	100.0	100.0	100.0	0.0	100.0	96.8	36.6	95.4	63.9	100.0
N/A	0.5	0.0	0.0	0.0	0.0	0.0	100.0	0.0	3.2	63.4	4.6	36.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	78.7	47.7	47.7	88.4
Fail	0.0	0.0	0.0	0.0
N/A	21.3	32.9	32.9	45.8

EPA PATTERN FAILURES (ALL STATIONS) - '81-'83 2.6L MITSUBISHI
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	730
Initial Test Records:	629
After Repair Test Records:	101
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	57470
Initial Test Vehicles:	56856
After Repair Test Vehicles:	61290
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	79.5	20.5	--	--	2.4	18.6	1.9	18.1	0.5	16.2	0.5
After Repair	79.3	16.1	5.7	17.2	13.3	93.3	6.7	86.7	6.7	73.3	6.7
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	33	853	0.44	35	2505
Initial Test - Pass Vehicles	0.07	21	852	0.16	25	2509
Initial Test - Fail Vehicles	1.38	79	859	1.52	73	2488
Initial Test - Underhood Fail Only	0.06	24	883	0.24	23	2498
Initial Test - Tailpipe Fail Only	1.49	70	856	1.65	62	2490
After Repair Test - All Vehicles	0.59	48	860	0.73	38	2486
After Repair Test - Pass Vehicles	0.09	29	861	0.36	28	2503
After Repair Test - Fail Vehicles	2.08	119	851	2.11	71	2407
After Repair Test - Inc. Repr. Vehicles	0.25	44	879	0.64	39	2501
After Repair Test - Waived Vehicles	1.57	70	855	1.28	53	2479
After Repair Test - Underhood Fail Only	0.01	32	907	0.09	27	2483
After Repair Test - Tailpipe Fail Only	1.90	98	855	1.81	64	2448
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	22.8	72.3	5.0
TMG	32.7	67.3	0.0
A/F	58.4	22.8	18.8
CRK	7.9	91.1	1.0
EVP	4.0	95.0	1.0
EXH	5.9	93.1	1.0
EGR	8.9	83.2	7.9
ANY	81.2	98.0	27.7

Average Repair Costs

Parts Cost: $ 12.26 Labor Cost: $ 21.98

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Pass	100.0	98.6	100.0	100.0	99.8	100.0	0.0	100.0	89.2	14.6	97.5	66.9	100.0
N/A	0.0	1.4	0.0	0.0	0.0	0.0	100.0	0.0	10.8	85.4	2.5	33.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	67.9	56.4	54.5	84.1
Fail	0.0	0.3	1.9	2.2
N/A	32.1	24.0	24.3	48.5

Record Counts

Test Records Processed:	249
Initial Test Records:	219
After Repair Test Records:	30
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	54556
Initial Test Vehicles:	53530
After Repair Test Vehicles:	62047
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	79.9	20.1	--	--	1.8	18.3	1.8	18.3	0.0	2.7	2.7
After Repair	84.0	20.0	8.0	16.0	0.0	100.0	0.0	100.0	0.0	50.0	25.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.45	59	877	0.27	43	2495
Initial Test - Pass Vehicles	0.02	25	877	0.04	21	2497
Initial Test - Fail Vehicles	2.16	195	881	1.17	133	2489
Initial Test - Underhood Fail Only	0.00	41	931	0.19	38	2518
Initial Test - Tailpipe Fail Only	2.37	210	876	1.27	143	2486
After Repair Test - All Vehicles	0.61	118	896	0.54	70	2491
After Repair Test - Pass Vehicles	0.05	41	897	0.15	33	2510
After Repair Test - Fail Vehicles	2.88	415	917	1.47	169	2459
After Repair Test - Inc. Repr. Vehicles	0.44	121	811	0.31	123	2494
After Repair Test - Waived Vehicles	0.69	154	864	1.42	143	2433
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.90	299	893	1.45	158	2448
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	36.7	60.0	3.3
TMG	26.7	73.3	0.0
A/F	43.3	36.7	20.0
CRK	6.7	93.3	0.0
EVP	16.7	83.3	0.0
EXH	6.7	93.3	0.0
EGR	3.3	96.7	0.0
ANY	80.0	96.7	23.3

Average Repair Costs

Parts Cost: $ 4.70 Labor Cost: $ 24.03

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Miss	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Totl	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Pass	100.0	86.3	100.0	99.5	98.6	0.0	100.0	100.0	94.5	100.0	97.3	64.8	100.0
N/A	0.0	13.2	0.0	0.5	0.9	100.0	0.0	0.0	5.5	0.0	2.7	35.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	82.6	51.1	51.1	92.7
Fail	0.5	0.0	0.5	0.9
N/A	16.9	27.4	26.9	38.8

Record Counts

Test Records Processed:	1167
Initial Test Records:	1043
After Repair Test Records:	124
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	56512
Initial Test Vehicles:	55426
After Repair Test Vehicles:	65652
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	83.6	16.4	--	--	0.8	15.8	0.6	15.6	0.2	7.4	4.6
After Repair	79.0	24.0	6.0	21.0	0.0	100.0	0.0	100.0	0.0	47.6	23.8
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.09	42	892	0.45	51	2495
Initial Test - Pass Vehicles	0.01	22	893	0.25	35	2493
Initial Test - Fail Vehicles	0.47	146	889	1.47	135	2504
Initial Test - Underhood Fail Only	0.00	30	909	0.21	36	2505
Initial Test - Tailpipe Fail Only	0.49	151	887	1.51	139	2504
After Repair Test - All Vehicles	0.28	76	895	1.05	83	2476
After Repair Test - Pass Vehicles	0.12	40	898	0.50	48	2468
After Repair Test - Fail Vehicles	0.61	135	900	2.43	149	2484
After Repair Test - Inc. Repr. Vehicles	0.93	123	923	1.95	115	2488
After Repair Test - Waived Vehicles	0.50	143	882	1.54	138	2497
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.56	138	892	2.01	144	2490
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	19.4	67.7	12.9
TMG	25.0	75.0	0.0
A/F	52.4	25.8	21.8
CRK	4.0	95.2	0.8
EVP	4.0	96.0	0.0
EXH	4.8	93.5	1.6
EGR	3.2	96.8	0.0
ANY	79.8	98.4	29.0

Average Repair Costs

Parts Cost: $ 11.23 Labor Cost: $ 16.17

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Pass	99.9	99.9	100.0	99.9	99.9	100.0	0.0	100.0	98.2	9.0	95.4	68.6	100.0
N/A	0.1	0.0	0.0	0.0	0.0	0.0	100.0	0.0	1.8	91.0	4.6	31.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	66.2	54.3	54.5	81.9
Fail	0.0	0.4	0.1	0.5
N/A	33.8	25.4	25.5	49.6

Record Counts

Test Records Processed:	3689
Initial Test Records:	3355
After Repair Test Records:	333
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	38362
Initial Test Vehicles:	36777
After Repair Test Vehicles:	54257
Referee Test Vehicles:	63700

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	86.1	13.9	--	--	1.2	13.3	0.6	12.7	0.5	1.8	3.4
After Repair	76.0	19.4	10.8	23.3	6.2	95.4	4.6	93.8	1.5	21.5	32.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.35	53	803	0.26	32	2479
Initial Test - Pass Vehicles	0.02	21	804	0.04	18	2479
Initial Test - Fail Vehicles	2.39	251	799	1.62	122	2481
Initial Test - Underhood Fail Only	0.05	28	825	0.15	22	2481
Initial Test - Tailpipe Fail Only	2.45	258	797	1.70	128	2479
After Repair Test - All Vehicles	0.74	114	831	0.72	56	2469
After Repair Test - Pass Vehicles	0.14	49	828	0.14	25	2472
After Repair Test - Fail Vehicles	2.18	274	815	2.03	125	2452
After Repair Test - Inc. Repr. Vehicles	0.67	139	825	0.64	51	2471
After Repair Test - Waived Vehicles	1.55	194	853	1.54	102	2471
After Repair Test - Underhood Fail Only	0.29	22	808	0.19	26	2505
After Repair Test - Tailpipe Fail Only	1.82	236	839	1.77	115	2461
Referee Test - All Vehicles	0.90	169	900	2.09	167	2358
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.90	169	900	2.09	167	2358
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.90	169	900	2.09	167	2358

Repair Action Percentages

	Yes	No	Excd
MIS	26.4	61.0	12.6
TMG	24.6	75.1	0.3
A/F	47.4	27.9	24.6
CRK	5.7	93.1	1.2
EVP	3.6	96.1	0.3
EXH	11.7	87.1	1.2
EGR	6.6	90.4	3.0
ANY	76.6	98.8	34.5

Average Repair Costs

Parts Cost: $ 13.64 Labor Cost: $ 24.46

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Miss	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.4	0.1	0.1	0.1	0.0	0.1	0.2	0.0	0.1	0.0	0.0	0.8
Pass	100.0	98.9	99.9	99.9	99.8	0.0	99.9	99.8	92.9	99.9	98.7	71.7	100.0
N/A	0.0	0.7	0.0	0.0	0.1	100.0	0.0	0.0	7.1	0.0	1.3	28.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	78.1	62.4	62.3	93.2
Fail	0.1	0.0	0.5	0.6
N/A	21.8	24.3	23.8	42.3

EPA PATTERN FAILURES (ALL STATIONS) - '82-'83 MAZDA TRUCK 2.0L
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	373
Initial Test Records:	330
After Repair Test Records:	43
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	53598
Initial Test Vehicles:	52271
After Repair Test Vehicles:	63784
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	86.4	13.6	--	--	0.6	13.0	0.6	13.0	0.0	4.5	4.5
After Repair	71.1	13.2	7.9	28.9	0.0	100.0	0.0	100.0	0.0	36.4	45.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.12	49	800	0.37	33	2518
Initial Test - Pass Vehicles	0.03	25	800	0.11	16	2515
Initial Test - Fail Vehicles	0.72	202	802	2.05	146	2534
Initial Test - Underhood Fail Only	0.00	36	825	0.12	17	2561
Initial Test - Tailpipe Fail Only	0.76	209	800	2.14	152	2533
After Repair Test - All Vehicles	0.37	162	824	0.96	51	2483
After Repair Test - Pass Vehicles	0.09	61	829	0.42	37	2490
After Repair Test - Fail Vehicles	1.80	412	836	1.98	61	2528
After Repair Test - Inc. Repr. Vehicles	0.16	189	802	1.65	74	2452
After Repair Test - Waived Vehicles	0.40	297	803	1.83	81	2445
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.83	333	814	1.87	75	2471
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	23.3	55.8	20.9
TMG	32.6	65.1	2.3
A/F	37.2	37.2	25.6
CRK	4.7	95.3	0.0
EVP	4.7	95.3	0.0
EXH	9.3	88.4	2.3
EGR	4.7	93.0	2.3
ANY	74.4	97.7	39.5

Average Repair Costs

Parts Cost: $ 21.48 Labor Cost: $ 24.72

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.3
Mod	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
Miss	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
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.3
Pass	100.0	99.7	100.0	100.0	100.0	100.0	0.0	99.7	96.4	8.5	97.3	68.8	100.0
N/A	0.0	0.3	0.0	0.0	0.0	0.0	100.0	0.0	3.6	91.5	2.7	31.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	63.3	57.3	57.9	82.1
Fail	0.0	0.3	0.0	0.3
N/A	36.7	20.6	20.3	48.5

Record Counts

Test Records Processed:	283
Initial Test Records:	263
After Repair Test Records:	20
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	26753
Initial Test Vehicles:	26821
After Repair Test Vehicles:	25870
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	87.1	12.9	--	--	0.8	12.2	0.8	12.2	0.0	11.4	0.0
After Repair	88.9	11.1	5.6	11.1	0.0	100.0	0.0	100.0	0.0	100.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.12	14	855	0.31	20	2514
Initial Test - Pass Vehicles	0.03	10	858	0.10	15	2514
Initial Test - Fail Vehicles	0.72	41	828	1.73	49	2515
Initial Test - Underhood Fail Only	0.00	17	802	0.28	35	2547
Initial Test - Tailpipe Fail Only	0.76	42	830	1.82	50	2513
After Repair Test - All Vehicles	0.53	16	831	0.62	19	2471
After Repair Test - Pass Vehicles	0.13	9	827	0.33	14	2473
After Repair Test - Fail Vehicles	2.56	55	889	1.79	37	2486
After Repair Test - Inc. Repr. Vehicles	0.00	7	791	0.00	13	2519
After Repair Test - Waived Vehicles	1.74	32	810	1.79	35	2440
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	2.15	43	850	1.79	36	2463
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	10.0	90.0	0.0
TMG	15.0	85.0	0.0
A/F	55.0	35.0	10.0
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	0.0	100.0	0.0
EGR	0.0	95.0	5.0
ANY	70.0	100.0	15.0

Average Repair Costs

Parts Cost: $ 4.85 Labor Cost: $ 8.40

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	99.6	100.0	100.0	100.0	100.0	0.0	100.0	95.8	33.5	97.0	65.0	100.0
N/A	0.0	0.4	0.0	0.0	0.0	0.0	100.0	0.0	4.2	66.5	3.0	35.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	76.4	53.2	53.2	86.7
Fail	0.0	0.4	0.4	0.8
N/A	23.6	30.0	30.0	46.0

Record Counts

Test Records Processed:	194
Initial Test Records:	169
After Repair Test Records:	25
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	51507
Initial Test Vehicles:	51903
After Repair Test Vehicles:	48832
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	87.6	12.4	--	--	2.4	10.1	2.4	10.1	0.0	1.2	4.1
After Repair	81.3	56.3	18.8	12.5	0.0	100.0	0.0	100.0	0.0	0.0	50.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.17	44	706	0.12	59	2504
Initial Test - Pass Vehicles	0.04	31	712	0.07	51	2508
Initial Test - Fail Vehicles	1.10	137	658	0.48	116	2478
Initial Test - Underhood Fail Only	0.00	21	734	0.02	32	2523
Initial Test - Tailpipe Fail Only	1.36	164	640	0.58	136	2467
After Repair Test - All Vehicles	0.70	114	730	0.67	80	2519
After Repair Test - Pass Vehicles	0.07	51	702	0.21	72	2534
After Repair Test - Fail Vehicles	1.47	209	770	1.47	96	2508
After Repair Test - Inc. Repr. Vehicles	0.02	32	654	0.45	95	2631
After Repair Test - Waived Vehicles	1.67	138	686	0.44	93	2438
After Repair Test - Underhood Fail Only	0.00	27	826	0.00	14	2578
After Repair Test - Tailpipe Fail Only	1.50	196	755	1.28	95	2495
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	44.0	44.0	12.0
TMG	20.0	80.0	0.0
A/F	52.0	28.0	20.0
CRK	16.0	84.0	0.0
EVP	12.0	88.0	0.0
EXH	16.0	80.0	4.0
EGR	12.0	84.0	4.0
ANY	76.0	88.0	32.0

Average Repair Costs

Parts Cost: $ 31.16 Labor Cost: $ 23.88

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Mod	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
Miss	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
Totl	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Pass	99.4	99.4	100.0	99.4	100.0	44.4	55.6	100.0	96.4	100.0	95.9	62.1	100.0
N/A	0.0	0.0	0.0	0.6	0.0	55.6	44.4	0.0	3.6	0.0	4.1	37.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	97.0	71.6	71.6	98.2
Fail	0.0	0.6	0.6	1.2
N/A	3.0	14.8	14.8	16.0

EPA PATTERN FAILURES (ALL STATIONS) - '83 GM 5.7L 4V
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	2073
Initial Test Records:	1896
After Repair Test Records:	175
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	44821
Initial Test Vehicles:	44235
After Repair Test Vehicles:	50937
Referee Test Vehicles:	65700

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	87.9	12.1	--	--	1.2	11.1	0.9	10.9	0.3	2.3	5.1
After Repair	81.6	24.1	5.0	16.3	4.3	100.0	0.0	95.7	4.3	26.1	39.1
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.14	51	753	0.35	41	2499
Initial Test - Pass Vehicles	0.02	23	753	0.13	19	2498
Initial Test - Fail Vehicles	1.00	250	750	1.96	201	2502
Initial Test - Underhood Fail Only	0.07	38	731	0.19	15	2454
Initial Test - Tailpipe Fail Only	0.94	255	754	2.05	215	2507
After Repair Test - All Vehicles	0.54	103	795	0.80	53	2490
After Repair Test - Pass Vehicles	0.11	62	785	0.24	34	2495
After Repair Test - Fail Vehicles	1.49	200	808	1.69	91	2474
After Repair Test - Inc. Repr. Vehicles	0.65	449	815	1.05	155	2510
After Repair Test - Waived Vehicles	1.34	171	826	2.34	97	2492
After Repair Test - Underhood Fail Only	0.04	30	751	0.05	40	2481
After Repair Test - Tailpipe Fail Only	1.19	178	821	2.02	94	2477
Referee Test - All Vehicles	0.00	18	624	0.48	70	2362
Referee Test - Pass Vehicles	0.00	18	624	0.48	70	2362
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	29.7	62.3	8.0
TMG	21.7	78.3	0.0
A/F	41.1	44.6	14.3
CRK	9.1	90.9	0.0
EVP	8.6	90.9	0.6
EXH	13.7	84.6	1.7
EGR	7.4	89.1	3.4
ANY	76.0	95.4	24.6

Average Repair Costs

Parts Cost: $ 9.57 Labor Cost: $ 19.27

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Mod	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2
Pass	99.9	99.9	99.4	100.0	99.7	41.0	58.3	99.6	97.4	87.9	97.0	67.9	100.0
N/A	0.1	0.1	0.6	0.0	0.3	58.9	41.7	0.4	2.6	12.1	3.0	32.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	95.1	66.4	65.2	97.3
Fail	0.0	0.2	0.8	1.0
N/A	4.9	17.1	17.7	21.0

Record Counts

Test Records Processed:	161
Initial Test Records:	144
After Repair Test Records:	17
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	47184
Initial Test Vehicles:	46044
After Repair Test Vehicles:	56847
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	88.9	11.1	--	--	0.0	11.1	0.0	11.1	0.0	2.8	2.8
After Repair	92.3	30.8	0.0	7.7	0.0	100.0	0.0	100.0	0.0	100.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.47	52	839	0.10	28	2520
Initial Test - Pass Vehicles	0.10	33	845	0.08	27	2520
Initial Test - Fail Vehicles	3.46	205	792	0.28	40	2520
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	3.46	205	792	0.28	40	2520
After Repair Test - All Vehicles	0.63	66	874	0.28	33	2501
After Repair Test - Pass Vehicles	0.14	38	866	0.03	23	2506
After Repair Test - Fail Vehicles	1.87	133	904	0.90	59	2467
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	1.58	132	856	0.86	48	2576
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.81	133	894	0.89	57	2489
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	47.1	52.9	0.0
TMG	35.3	64.7	0.0
A/F	47.1	47.1	5.9
CRK	23.5	76.5	0.0
EVP	17.6	82.4	0.0
EXH	5.9	94.1	0.0
EGR	5.9	94.1	0.0
ANY	88.2	94.1	5.9

Average Repair Costs

Parts Cost: $ 4.12 Labor Cost: $ 15.53

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	99.3	100.0	100.0	100.0	100.0	100.0	0.0	100.0	99.3	16.0	97.9	66.0	100.0
N/A	0.7	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.7	84.0	2.1	34.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	70.1	55.6	55.6	87.5
Fail	0.0	0.0	0.0	0.0
N/A	29.9	23.6	23.6	49.3

Record Counts

Test Records Processed:	867
Initial Test Records:	813
After Repair Test Records:	54
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	23620
Initial Test Vehicles:	23388
After Repair Test Vehicles:	27106
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	89.2	10.8	--	--	0.1	10.7	0.1	10.7	0.0	2.7	3.3
After Repair	93.3	20.0	2.2	6.7	0.0	100.0	0.0	100.0	0.0	66.7	33.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.16	42	890	0.26	39	2497
Initial Test - Pass Vehicles	0.01	22	893	0.07	27	2496
Initial Test - Fail Vehicles	1.34	207	867	1.87	141	2506
Initial Test - Underhood Fail Only	0.00	13	949	0.03	27	2533
Initial Test - Tailpipe Fail Only	1.35	210	866	1.89	142	2505
After Repair Test - All Vehicles	0.09	47	880	0.41	48	2488
After Repair Test - Pass Vehicles	0.05	32	868	0.08	32	2492
After Repair Test - Fail Vehicles	0.22	107	920	1.63	111	2487
After Repair Test - Inc. Repr. Vehicles	0.35	131	993	0.36	106	2395
After Repair Test - Waived Vehicles	0.22	83	927	1.35	88	2431
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.22	101	922	1.56	105	2473
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	27.8	68.5	3.7
TMG	16.7	81.5	1.9
A/F	68.5	25.9	5.6
CRK	1.9	98.1	0.0
EVP	1.9	98.1	0.0
EXH	1.9	98.1	0.0
EGR	1.9	98.1	0.0
ANY	81.5	98.1	11.1

Average Repair Costs

Parts Cost: $ 6.54 Labor Cost: $ 19.24

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	96.9	100.0	100.0	100.0	0.0	100.0	100.0	96.3	100.0	97.4	54.5	100.0
N/A	0.0	3.1	0.0	0.0	0.0	100.0	0.0	0.0	3.7	0.0	2.6	45.5	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	80.6	53.4	53.3	92.6
Fail	0.0	0.1	0.0	0.1
N/A	19.4	29.6	29.9	45.5

EPA PATTERN FAILURES (ALL STATIONS) - '84 CHEV, PONT 5.0L 4V
CALIFORNIA I/M SUMMARY STATISTICS

5-AUG-1987

Record Counts

Test Records Processed:	1352
Initial Test Records:	1282
After Repair Test Records:	70
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	29629
Initial Test Vehicles:	29376
After Repair Test Vehicles:	34264
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	93.1	6.9	--	--	0.5	6.6	0.3	6.5	0.2	1.8	3.6
After Repair	83.3	45.8	4.2	14.6	0.0	100.0	0.0	100.0	0.0	57.1	14.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.07	27	797	0.24	22	2513
Initial Test - Pass Vehicles	0.01	17	796	0.13	16	2513
Initial Test - Fail Vehicles	0.86	168	807	1.74	103	2513
Initial Test - Underhood Fail Only	0.06	46	719	0.21	19	2618
Initial Test - Tailpipe Fail Only	0.90	173	813	1.84	108	2508
After Repair Test - All Vehicles	0.53	79	830	1.88	70	2537
After Repair Test - Pass Vehicles	0.16	45	814	0.32	31	2519
After Repair Test - Fail Vehicles	1.09	122	858	4.58	143	2570
After Repair Test - Inc. Repr. Vehicles	2.16	110	783	2.28	63	2559
After Repair Test - Waived Vehicles	1.02	148	852	2.56	77	2520
After Repair Test - Underhood Fail Only	0.00	1	680	0.00	0	2664
After Repair Test - Tailpipe Fail Only	1.07	128	856	4.09	127	2558
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	22.9	71.4	5.7
TMG	21.4	78.6	0.0
A/F	42.9	42.9	14.3
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	8.6	91.4	0.0
EGR	0.0	98.6	1.4
ANY	74.3	100.0	20.0

Average Repair Costs

Parts Cost: $ 11.97 Labor Cost: $ 18.79

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2
Pass	100.0	99.9	99.9	100.0	99.9	30.4	69.5	100.0	97.0	100.0	97.3	65.6	100.0
N/A	0.0	0.1	0.0	0.0	0.0	69.6	30.4	0.0	3.0	0.0	2.7	34.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	97.0	68.3	67.7	97.3
Fail	0.0	0.0	0.3	0.3
N/A	3.0	17.8	18.0	19.1

EPA PATTERN FAILURES (ALL STATIONS) - '84-'86 BUICK 3.8L
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	85
Initial Test Records:	84
After Repair Test Records:	1
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	15042
Initial Test Vehicles:	15035
After Repair Test Vehicles:	15700
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	94.0	6.0	--	--	0.0	6.0	0.0	6.0	0.0	1.2	4.8
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.03	19	746	0.09	14	2494
Initial Test - Pass Vehicles	0.02	8	746	0.03	8	2500
Initial Test - Fail Vehicles	0.29	190	748	1.02	120	2401
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.29	190	748	1.02	120	2401
After Repair Test - All Vehicles	0.73	142	754	0.88	236	2436
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	0.73	142	754	0.88	236	2436
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.73	142	754	0.88	236	2436
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ 0.00 Labor Cost: $ 0.00

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	48.8	0.0	100.0	100.0	35.7	64.3	100.0	97.6	100.0	97.6	54.8	100.0
N/A	0.0	51.2	100.0	0.0	0.0	64.3	35.7	0.0	2.4	0.0	2.4	45.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	100.0	72.6	71.4	100.0
Fail	0.0	0.0	0.0	0.0
N/A	0.0	17.9	19.0	19.0

EPA PATTERN FAILURES (ALL STATIONS) - '84-'86 3.8L FORD
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	1792
Initial Test Records:	1721
After Repair Test Records:	71
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	26413
Initial Test Vehicles:	26282
After Repair Test Vehicles:	29579
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	94.7	5.3	--	--	0.1	5.3	0.1	5.3	0.0	0.8	3.0
After Repair	93.7	12.7	3.2	6.3	0.0	100.0	0.0	100.0	0.0	25.0	75.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.04	37	746	0.16	32	2461
Initial Test - Pass Vehicles	0.01	29	746	0.12	28	2461
Initial Test - Fail Vehicles	0.68	167	745	0.81	100	2460
Initial Test - Underhood Fail Only	0.00	1	710	0.00	4	2534
Initial Test - Tailpipe Fail Only	0.69	169	746	0.81	101	2459
After Repair Test - All Vehicles	0.04	54	786	0.22	38	2471
After Repair Test - Pass Vehicles	0.01	41	785	0.15	33	2476
After Repair Test - Fail Vehicles	0.20	130	789	0.48	69	2384
After Repair Test - Inc. Repr. Vehicles	0.01	153	769	0.53	88	2557
After Repair Test - Waived Vehicles	0.16	101	800	0.76	56	2571
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.18	120	793	0.58	65	2446
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	49.3	46.5	4.2
TMG	26.8	73.2	0.0
A/F	46.5	49.3	4.2
CRK	5.6	94.4	0.0
EVP	1.4	98.6	0.0
EXH	2.8	97.2	0.0
EGR	1.4	98.6	0.0
ANY	88.7	100.0	8.5

Average Repair Costs

Parts Cost: $ 1.93 Labor Cost: $ 19.06

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	99.9	99.9	100.0	100.0	100.0	9.2	90.8	100.0	93.9	100.0	99.3	68.4	100.0
N/A	0.1	0.1	0.0	0.0	0.0	90.8	9.2	0.0	6.1	0.0	0.7	31.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	71.5	62.5	62.3	93.2
Fail	0.0	0.1	0.0	0.1
N/A	28.5	25.3	25.6	49.0

Record Counts

Test Records Processed:	427
Initial Test Records:	420
After Repair Test Records:	7
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	18965
Initial Test Vehicles:	19054
After Repair Test Vehicles:	13643
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	96.0	4.0	--	--	0.0	4.0	0.0	4.0	0.0	1.0	1.9
After Repair	100.0	16.7	0.0	0.0	--	--	--	--	--	--	--
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.04	19	704	0.12	16	2500
Initial Test - Pass Vehicles	0.01	14	704	0.04	12	2502
Initial Test - Fail Vehicles	0.78	137	720	1.85	114	2444
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.78	137	720	1.85	114	2444
After Repair Test - All Vehicles	0.17	53	778	0.21	51	2458
After Repair Test - Pass Vehicles	0.07	38	782	0.10	21	2462
After Repair Test - Fail Vehicles	0.73	142	754	0.88	236	2436
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.73	142	754	0.88	236	2436
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	14.3	85.7	0.0
TMG	28.6	71.4	0.0
A/F	42.9	57.1	0.0
CRK	0.0	100.0	0.0
EVP	14.3	85.7	0.0
EXH	14.3	85.7	0.0
EGR	0.0	100.0	0.0
ANY	100.0	100.0	0.0

Average Repair Costs

Parts Cost: $ 0.00 Labor Cost: $ 0.00

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	99.8	78.8	66.4	100.0	100.0	0.0	100.0	100.0	96.4	100.0	99.3	72.4	100.0
N/A	0.2	21.2	33.6	0.0	0.0	100.0	0.0	0.0	3.6	0.0	0.7	27.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	99.0	65.2	65.7	99.3
Fail	0.0	0.0	0.0	0.0
N/A	1.0	24.5	24.0	25.7

Appendix C

I/M Summary Statistics

EPA Pattern Failure Vehicles
With Fail Rates Higher Than Overall Rate for
Same Manufacturer and Model Year

Segregated By Type of Smog Check Station
(New-Car Dealers and All Others)

New-Car Dealers

Record Counts

Test Records Processed:	78
Initial Test Records:	51
After Repair Test Records:	27
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	13264
Initial Test Vehicles:	14475
After Repair Test Vehicles:	10978
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	35.3	64.7	--	--	0.0	64.7	0.0	64.7	0.0	0.0	62.7
After Repair	94.1	58.8	11.8	5.9	0.0	100.0	0.0	100.0	0.0	0.0	100.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.14	216	773	0.20	47	2505
Initial Test - Pass Vehicles	0.05	42	818	0.02	14	2496
Initial Test - Fail Vehicles	0.18	311	748	0.29	66	2510
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.18	311	748	0.29	66	2510
After Repair Test - All Vehicles	0.24	131	846	0.21	34	2509
After Repair Test - Pass Vehicles	0.10	68	825	0.06	17	2510
After Repair Test - Fail Vehicles	0.43	202	867	0.42	52	2495
After Repair Test - Inc. Repr. Vehicles	0.12	287	748	0.25	30	2574
After Repair Test - Waived Vehicles	0.61	445	976	0.47	113	2642
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.45	224	877	0.42	58	2509
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	51.9	40.7	7.4
TMG	22.2	77.8	0.0
A/F	33.3	63.0	3.7
CRK	3.7	96.3	0.0
EVP	7.4	92.6	0.0
EXH	22.2	77.8	0.0
EGR	11.1	88.9	0.0
ANY	85.2	96.3	11.1

Average Repair Costs

Parts Cost: $ 2.22 Labor Cost: $ 22.78

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	86.3	21.6	100.0	100.0	0.0	100.0	100.0	96.1	100.0	100.0	66.7	100.0
N/A	0.0	13.7	78.4	0.0	0.0	100.0	0.0	0.0	3.9	0.0	0.0	33.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	74.5	29.4	29.4	90.2
Fail	0.0	0.0	0.0	0.0
N/A	25.5	70.6	70.6	86.3

Record Counts

Test Records Processed:	17
Initial Test Records:	14
After Repair Test Records:	3
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	51759
Initial Test Vehicles:	49371
After Repair Test Vehicles:	62900
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	64.3	35.7	--	--	0.0	35.7	0.0	35.7	0.0	7.1	14.3
After Repair	100.0	50.0	50.0	0.0	--	--	--	--	--	--	--

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.92	161	866	0.64	74	2495
Initial Test - Pass Vehicles	0.02	37	874	0.06	41	2486
Initial Test - Fail Vehicles	2.54	385	852	1.68	134	2511
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	2.54	385	852	1.68	134	2511
After Repair Test - All Vehicles	0.13	69	928	1.22	59	2520
After Repair Test - Pass Vehicles	0.19	100	930	1.14	70	2619
After Repair Test - Fail Vehicles	0.02	8	926	1.37	37	2322
After Repair Test - Inc. Repr. Vehicles	0.38	174	963	2.28	115	2574
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.02	8	926	1.37	37	2322
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	66.7	33.3	0.0
IMG	33.3	66.7	0.0
A/F	33.3	33.3	33.3
CRK	33.3	66.7	0.0
EVP	0.0	100.0	0.0
EXH	0.0	100.0	0.0
EGR	0.0	100.0	0.0
ANY	100.0	100.0	33.3

Average Repair Costs

Parts Cost: $ 0.00 Labor Cost: $ 10.00

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	92.9	7.1	100.0	64.3	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	7.1	92.9	0.0	35.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	85.7	71.4	71.4	100.0
Fail	0.0	0.0	0.0	0.0
N/A	14.3	28.6	28.6	42.9

Record Counts

Test Records Processed:	380
Initial Test Records:	313
After Repair Test Records:	67
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	24914
Initial Test Vehicles:	24616
After Repair Test Vehicles:	26306
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	58.8	41.2	--	--	0.0	41.2	0.0	41.2	0.0	24.6	2.9
After Repair	100.0	39.6	4.2	0.0	--	--	--	--	--	--	--
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.23	50	759	1.91	85	2458
Initial Test - Pass Vehicles	0.01	16	734	0.20	27	2469
Initial Test - Fail Vehicles	0.55	98	794	4.35	167	2443
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.55	98	794	4.35	167	2443
After Repair Test - All Vehicles	0.12	31	744	1.23	48	2491
After Repair Test - Pass Vehicles	0.00	12	734	0.24	15	2497
After Repair Test - Fail Vehicles	0.40	79	769	3.73	129	2478
After Repair Test - Inc. Repr. Vehicles	0.00	10	898	1.70	55	2435
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.40	79	769	3.73	129	2478
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	29.9	70.1	0.0
TMG	23.9	76.1	0.0
A/F	53.7	43.3	3.0
CRK	9.0	91.0	0.0
EVP	32.8	67.2	0.0
EXH	17.9	82.1	0.0
EGR	9.0	91.0	0.0
ANY	94.0	95.5	3.0

Average Repair Costs

Parts Cost: $ 6.45 Labor Cost: $ 15.12

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	9.9	90.1	100.0	97.8	100.0	98.7	61.3	100.0
N/A	0.0	0.0	0.0	0.0	0.0	90.1	9.9	0.0	2.2	0.0	1.3	38.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	98.1	54.0	53.0	98.1
Fail	0.0	0.0	0.0	0.0
N/A	1.9	27.5	28.4	30.0

Record Counts

Test Records Processed:	25
Initial Test Records:	21
After Repair Test Records:	4
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	59876
Initial Test Vehicles:	59967
After Repair Test Vehicles:	59400
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	47.6	52.4	--	--	9.5	47.6	4.8	42.9	4.8	0.0	19.0
After Repair	75.0	0.0	25.0	25.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0
								'Waivers' Only			

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.57	211	867	0.97	118	2498
Initial Test - Pass Vehicles	0.06	25	858	0.13	34	2520
Initial Test - Fail Vehicles	1.04	381	876	1.74	195	2478
Initial Test - Underhood Fail Only	0.01	12	781	0.01	27	2662
Initial Test - Tailpipe Fail Only	1.26	302	882	2.10	184	2443
After Repair Test - All Vehicles	0.52	168	918	1.43	124	2477
After Repair Test - Pass Vehicles	0.32	147	908	0.81	105	2490
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	0.67	324	915	1.82	157	2373
After Repair Test - Waived Vehicles	1.13	230	946	3.26	179	2438
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.13	230	946	3.26	179	2438
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	0.0	50.0	50.0
TMG	0.0	100.0	0.0
A/F	50.0	25.0	25.0
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	0.0	100.0	0.0
EGR	0.0	100.0	0.0
ANY	50.0	100.0	50.0

Average Repair Costs

Parts Cost: $ 56.67 Labor Cost: $ 33.67

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	4.8	0.0	0.0	0.0	4.8
Mod	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
Miss	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
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	4.8	0.0	0.0	0.0	4.8
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	95.2	95.2	19.0	100.0	71.4	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	81.0	0.0	28.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	66.7	90.5	85.7	100.0
Fail	0.0	0.0	4.8	4.8
N/A	33.3	0.0	0.0	33.3

Record Counts

Test Records Processed:	70
Initial Test Records:	56
After Repair Test Records:	14
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	52549
Initial Test Vehicles:	52698
After Repair Test Vehicles:	51950
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	62.5	37.5	--	--	0.0	37.5	0.0	37.5	0.0	12.5	5.4
After Repair	84.6	7.7	0.0	15.4	0.0	100.0	0.0	100.0	0.0	0.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.68	150	860	0.37	52	2511
Initial Test - Pass Vehicles	0.08	41	861	0.09	32	2517
Initial Test - Fail Vehicles	1.68	332	859	0.84	85	2502
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.68	332	859	0.84	85	2502
After Repair Test - All Vehicles	0.73	101	855	0.35	45	2464
After Repair Test - Pass Vehicles	0.19	44	839	0.18	35	2471
After Repair Test - Fail Vehicles	0.17	133	886	2.46	141	2338
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	3.98	399	927	0.22	53	2491
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	2.71	310	913	0.97	82	2440
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	14.3	71.4	14.3
TMG	28.6	71.4	0.0
A/F	50.0	50.0	0.0
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	14.3	85.7	0.0
EGR	0.0	100.0	0.0
ANY	78.6	100.0	14.3

Average Repair Costs

Parts Cost: $ 0.00 Labor Cost: $ 16.15

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	89.3	10.7	94.6	53.6	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	10.7	89.3	5.4	46.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	67.9	55.4	55.4	98.2
Fail	0.0	0.0	0.0	0.0
N/A	32.1	39.3	39.3	69.6

EPA PATTERN FAILURES (NEW CAR DEALERS) - '83 1.6L MITSUBISHI 4-AUG-1987
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	19
Initial Test Records:	15
After Repair Test Records:	4
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	38674
Initial Test Vehicles:	38500
After Repair Test Vehicles:	39325
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	66.7	33.3	--	--	0.0	33.3	0.0	33.3	0.0	13.3	0.0
After Repair	100.0	33.3	33.3	0.0	--	--	--	--	--	--	--
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.42	63	831	0.97	63	2550
Initial Test - Pass Vehicles	0.07	23	864	0.31	34	2554
Initial Test - Fail Vehicles	1.12	144	765	2.28	121	2541
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.12	144	765	2.28	121	2541
After Repair Test - All Vehicles	0.00	17	869	0.61	53	2507
After Repair Test - Pass Vehicles	0.00	8	851	0.00	23	2473
After Repair Test - Fail Vehicles	0.00	44	922	2.45	140	2610
After Repair Test - Inc. Repr. Vehicles	0.00	2	906	0.00	26	2494
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.00	44	922	2.45	140	2610
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	50.0	25.0	25.0
TMG	25.0	50.0	25.0
A/F	50.0	25.0	25.0
CRK	25.0	50.0	25.0
EVP	25.0	50.0	25.0
EXH	50.0	25.0	25.0
EGR	25.0	50.0	25.0
ANY	75.0	50.0	25.0

Average Repair Costs

Parts Cost: $ 18.75 Labor Cost: $ 56.00

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	86.7	0.0	100.0	73.3	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	13.3	100.0	0.0	26.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	86.7	66.7	66.7	100.0
Fail	0.0	0.0	0.0	0.0
N/A	13.3	20.0	20.0	33.3

EPA PATTERN FAILURES (NEW CAR DEALERS) - '83 NISSAN 1.6L 3CL 4-AUG-1987
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	246
Initial Test Records:	189
After Repair Test Records:	57
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	43462
Initial Test Vehicles:	44058
After Repair Test Vehicles:	41486
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	62.4	37.6	--	--	0.5	37.6	0.0	37.0	0.5	3.7	26.5
After Repair	93.3	26.7	4.4	6.7	0.0	100.0	0.0	100.0	0.0	33.3	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.16	98	881	0.64	70	2500
Initial Test - Pass Vehicles	0.04	30	875	0.23	31	2505
Initial Test - Fail Vehicles	0.36	211	892	1.32	134	2493
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.36	211	891	1.33	134	2493
After Repair Test - All Vehicles	0.11	70	865	0.53	68	2481
After Repair Test - Pass Vehicles	0.07	48	863	0.29	52	2493
After Repair Test - Fail Vehicles	0.23	136	886	0.67	79	2469
After Repair Test - Inc. Repr. Vehicles	0.22	193	915	0.49	78	2478
After Repair Test - Waived Vehicles	0.08	103	809	3.36	248	2371
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.20	130	870	1.21	112	2449
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	26.3	70.2	3.5
TMG	28.1	71.9	0.0
A/F	57.9	35.1	7.0
CRK	3.5	96.5	0.0
EVP	1.8	98.2	0.0
EXH	8.8	89.5	1.8
EGR	3.5	96.5	0.0
ANY	86.0	100.0	12.3

Average Repair Costs

Parts Cost: $ 21.04 Labor Cost: $ 41.60

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	98.9	5.3	100.0	100.0	0.0	100.0	100.0	96.3	100.0	99.5	66.1	100.0
N/A	0.0	1.1	94.7	0.0	0.0	100.0	0.0	0.0	3.7	0.0	0.5	33.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	97.9	78.8	78.3	98.9
Fail	0.0	0.0	0.5	0.5
N/A	2.1	17.5	17.5	18.5

Record Counts

Test Records Processed:	270
Initial Test Records:	195
After Repair Test Records:	75
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	31297
Initial Test Vehicles:	30293
After Repair Test Vehicles:	33907
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	57.4	42.6	--	--	1.0	42.6	0.0	41.5	1.0	3.1	16.9
After Repair	91.1	33.9	14.3	8.9	0.0	100.0	0.0	100.0	0.0	0.0	60.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.68	118	862	0.40	56	2511
Initial Test - Pass Vehicles	0.07	43	869	0.08	25	2516
Initial Test - Fail Vehicles	1.50	218	852	0.83	97	2504
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.47	218	852	0.84	98	2503
After Repair Test - All Vehicles	0.59	114	861	0.23	41	2504
After Repair Test - Pass Vehicles	0.12	57	868	0.07	20	2502
After Repair Test - Fail Vehicles	1.64	242	843	0.55	82	2520
After Repair Test - Inc. Repr. Vehicles	0.35	143	902	0.19	40	2517
After Repair Test - Waived Vehicles	1.46	212	854	0.66	95	2465
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.60	236	845	0.57	85	2509
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	41.3	49.3	9.3
TMG	34.7	64.0	1.3
A/F	62.7	24.0	13.3
CRK	6.7	93.3	0.0
EVP	4.0	96.0	0.0
EXH	12.0	86.7	1.3
EGR	10.7	89.3	0.0
ANY	86.7	100.0	21.3

Average Repair Costs

Parts Cost: $ 11.59 Labor Cost: $ 32.48

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	6.7	93.3	100.0	92.3	100.0	98.5	76.9	100.0
N/A	0.0	0.0	0.0	0.0	0.0	93.3	6.7	0.0	7.7	0.0	1.5	23.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	68.7	44.1	42.1	84.6
Fail	0.0	0.5	0.5	1.0
N/A	31.3	54.4	56.4	72.3

EPA PATTERN FAILURES (NEW CAR DEALERS) - '81-'85 1.6L FORD
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	188
Initial Test Records:	149
After Repair Test Records:	39
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	51407
Initial Test Vehicles:	48668
After Repair Test Vehicles:	61874
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	63.1	36.9	--	--	0.7	36.2	0.7	36.2	0.0	12.8	6.0
After Repair	65.6	21.9	34.4	34.4	0.0	100.0	0.0	100.0	0.0	18.2	45.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.54	111	859	0.91	97	2507
Initial Test - Pass Vehicles	0.05	38	867	0.19	46	2511
Initial Test - Fail Vehicles	1.36	236	844	2.12	184	2500
Initial Test - Underhood Fail Only	0.00	11	689	0.02	0	2697
Initial Test - Tailpipe Fail Only	1.39	240	847	2.16	188	2497
After Repair Test - All Vehicles	0.93	164	866	1.35	100	2513
After Repair Test - Pass Vehicles	0.31	90	867	0.91	86	2492
After Repair Test - Fail Vehicles	0.46	237	864	1.52	78	2560
After Repair Test - Inc. Repr. Vehicles	0.52	114	859	1.41	113	2529
After Repair Test - Waived Vehicles	2.41	259	867	2.07	141	2522
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.65	250	866	1.86	117	2537
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	17.9	38.5	43.6
TMG	43.6	56.4	0.0
A/F	69.2	12.8	17.9
CRK	10.3	89.7	0.0
EVP	5.1	94.9	0.0
EXH	12.8	82.1	5.1
EGR	5.1	89.7	5.1
ANY	82.1	94.9	66.7

Average Repair Costs

Parts Cost: $ 25.56 Labor Cost: $ 38.74

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	99.3	100.0	100.0	100.0	100.0	100.0	0.0	100.0	87.2	14.1	99.3	57.0	100.0
N/A	0.7	0.0	0.0	0.0	0.0	0.0	100.0	0.0	12.8	85.9	0.7	43.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	69.8	46.3	45.6	79.2
Fail	0.0	0.0	0.7	0.7
N/A	30.2	50.3	50.3	59.7

Record Counts

Test Records Processed:	90
Initial Test Records:	73
After Repair Test Records:	17
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	48356
Initial Test Vehicles:	48515
After Repair Test Vehicles:	47671
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	68.5	31.5	--	--	0.0	31.5	0.0	31.5	0.0	6.8	6.8
After Repair	92.9	21.4	42.9	7.1	0.0	100.0	0.0	100.0	0.0	0.0	100.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.64	105	877	0.89	75	2528
Initial Test - Pass Vehicles	0.12	47	878	0.16	38	2534
Initial Test - Fail Vehicles	1.77	232	872	2.46	153	2514
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.77	232	872	2.46	153	2514
After Repair Test - All Vehicles	0.29	118	888	1.10	46	2523
After Repair Test - Pass Vehicles	0.12	115	897	0.62	41	2501
After Repair Test - Fail Vehicles	0.79	112	837	3.36	58	2621
After Repair Test - Inc. Repr. Vehicles	0.16	221	918	0.90	64	2491
After Repair Test - Waived Vehicles	0.96	174	930	0.49	83	2522
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.83	127	860	2.64	64	2596
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	41.2	35.3	23.5
TMG	64.7	35.3	0.0
A/F	58.8	5.9	35.3
CRK	11.8	88.2	0.0
EVP	11.8	88.2	0.0
EXH	17.6	82.4	0.0
EGR	11.8	88.2	0.0
ANY	88.2	88.2	47.1

Average Repair Costs

Parts Cost: $ 4.59 Labor Cost: $ 27.47

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	87.7	28.8	100.0	53.4	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	12.3	71.2	0.0	46.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	83.6	63.0	63.0	86.3
Fail	0.0	0.0	0.0	0.0
N/A	16.4	37.0	37.0	39.7

Record Counts

Test Records Processed:	20
Initial Test Records:	16
After Repair Test Records:	4
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	60310
Initial Test Vehicles:	60369
After Repair Test Vehicles:	60075
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	56.3	43.8	--	--	0.0	43.8	0.0	43.8	0.0	0.0	18.8
After Repair	75.0	0.0	0.0	25.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.56	271	878	0.50	114	2576
Initial Test - Pass Vehicles	0.00	33	867	0.11	41	2581
Initial Test - Fail Vehicles	1.29	578	891	1.01	208	2571
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.29	578	891	1.01	208	2571
After Repair Test - All Vehicles	0.03	95	783	0.78	125	2545
After Repair Test - Pass Vehicles	0.03	59	789	0.54	108	2503
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	0.01	205	762	1.48	176	2668
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.01	205	762	1.48	176	2668
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	25.0	50.0	25.0
TMG	25.0	75.0	0.0
A/F	75.0	25.0	0.0
CRK	25.0	75.0	0.0
EVP	0.0	100.0	0.0
EXH	25.0	75.0	0.0
EGR	0.0	100.0	0.0
ANY	100.0	100.0	25.0

Average Repair Costs

Parts Cost: $ 5.00 Labor Cost: $ 38.25

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	81.3	0.0	100.0	100.0	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	18.8	100.0	0.0	0.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	68.8	43.8	43.8	81.3
Fail	0.0	0.0	0.0	0.0
N/A	31.3	31.3	31.3	50.0

EPA PATTERN FAILURES (NEW CAR DEALERS) - '83 NISSAN 1.6L OXC
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	25
Initial Test Records:	23
After Repair Test Records:	2
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	42252
Initial Test Vehicles:	41387
After Repair Test Vehicles:	52200
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	87.0	13.0	--	--	0.0	13.0	0.0	13.0	0.0	0.0	4.3
After Repair	100.0	0.0	0.0	0.0	--	--	--	--	--	--	--
					'Waivers' Only						

Average Emission/RPM Levels

	CO (%)	Idle RPM HC (ppm)	RPM	CO (%)	2500 RPM HC (ppm)	RPM
Initial Test - All Vehicles	0.09	73	845	0.36	61	2517
Initial Test - Pass Vehicles	0.05	44	840	0.17	51	2497
Initial Test - Fail Vehicles	0.34	268	882	1.67	129	2646
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.34	268	882	1.67	129	2646
After Repair Test - All Vehicles	0.00	13	855	0.07	18	2566
After Repair Test - Pass Vehicles	0.00	13	855	0.07	18	2566
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	50.0	50.0	0.0
TMG	0.0	100.0	0.0
A/F	0.0	100.0	0.0
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	0.0	100.0	0.0
EGR	0.0	100.0	0.0
ANY	50.0	100.0	0.0

Average Repair Costs

Parts Cost: $ 0.00 Labor Cost: $ 0.00

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	95.7	100.0	100.0	100.0	100.0	0.0	100.0	95.7	47.8	100.0	60.9	100.0
N/A	0.0	4.3	0.0	0.0	0.0	0.0	100.0	0.0	4.3	52.2	0.0	39.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	91.3	52.2	52.2	95.7
Fail	0.0	0.0	0.0	0.0
N/A	8.7	34.8	34.8	39.1

Record Counts

Test Records Processed:	17
Initial Test Records:	14
After Repair Test Records:	3
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	30135
Initial Test Vehicles:	29314
After Repair Test Vehicles:	33967
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.4	28.6	--	--	0.0	28.6	0.0	28.6	0.0	0.0	21.4
After Repair	100.0	0.0	0.0	0.0	--	--	--	--	--	--	--
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.22	90	786	0.24	36	2460
Initial Test - Pass Vehicles	0.01	10	751	0.01	14	2458
Initial Test - Fail Vehicles	0.75	291	871	0.81	91	2467
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.75	291	871	0.81	91	2467
After Repair Test - All Vehicles	0.03	25	873	0.21	29	2456
After Repair Test - Pass Vehicles	0.03	25	873	0.21	29	2456
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	66.7	33.3	0.0
TMG	33.3	66.7	0.0
A/F	66.7	33.3	0.0
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	0.0	100.0	0.0
EGR	0.0	100.0	0.0
ANY	100.0	100.0	0.0

Average Repair Costs

Parts Cost: $ 21.67 Labor Cost: $ 18.33

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	0.0	100.0	100.0	42.9	57.1	100.0	100.0	0.0	100.0	71.4	100.0
N/A	0.0	0.0	100.0	0.0	0.0	57.1	42.9	0.0	0.0	100.0	0.0	28.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	100.0	64.3	64.3	100.0
Fail	0.0	0.0	0.0	0.0
N/A	0.0	35.7	35.7	35.7

EPA PATTERN FAILURES (NEW CAR DEALERS) - '84-'86 2.3L FORD
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	663
Initial Test Records:	545
After Repair Test Records:	118
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	26673
Initial Test Vehicles:	26368
After Repair Test Vehicles:	28086
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.9	28.1	--	--	0.0	28.1	0.0	28.1	0.0	8.4	7.7
After Repair	90.5	40.5	16.7	9.5	0.0	100.0	0.0	100.0	0.0	25.0	37.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.33	71	858	0.71	51	2492
Initial Test - Pass Vehicles	0.06	31	865	0.21	28	2497
Initial Test - Fail Vehicles	1.01	175	840	2.00	111	2477
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.01	175	840	2.00	111	2477
After Repair Test - All Vehicles	0.76	95	856	1.15	63	2482
After Repair Test - Pass Vehicles	0.12	48	860	0.47	36	2469
After Repair Test - Fail Vehicles	2.21	198	838	2.52	112	2505
After Repair Test - Inc. Repr. Vehicles	0.14	105	822	1.49	61	2478
After Repair Test - Waived Vehicles	0.70	113	898	1.78	108	2502
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.92	182	850	2.38	111	2504
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	31.4	62.7	5.9
TMG	30.5	69.5	0.0
A/F	60.2	26.3	13.6
CRK	3.4	96.6	0.0
EVP	4.2	95.8	0.0
EXH	16.9	82.2	0.8
EGR	4.2	95.8	0.0
ANY	85.6	98.3	19.5

Average Repair Costs

Parts Cost: $ 10.35 Labor Cost: $ 25.55

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	99.6	100.0	99.8	99.8	10.8	89.2	100.0	91.9	100.0	99.3	77.4	100.0
N/A	0.0	0.4	0.0	0.2	0.2	89.2	10.8	0.0	8.1	0.0	0.7	22.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	74.9	58.0	54.3	88.8
Fail	0.0	0.0	0.0	0.0
N/A	25.1	36.0	39.6	53.6

Record Counts

Test Records Processed:	60
Initial Test Records:	48
After Repair Test Records:	12
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	58963
Initial Test Vehicles:	56915
After Repair Test Vehicles:	67158
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	72.9	27.1	--	--	4.2	22.9	4.2	22.9	0.0	0.0	14.6
After Repair	100.0	20.0	10.0	0.0	--	--	--	--	--	--	--
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.33	100	725	0.48	94	2478
Initial Test - Pass Vehicles	0.11	33	721	0.25	53	2480
Initial Test - Fail Vehicles	0.94	279	736	1.11	206	2474
Initial Test - Underhood Fail Only	0.20	100	728	0.23	60	2541
Initial Test - Tailpipe Fail Only	1.07	312	738	1.28	233	2462
After Repair Test - All Vehicles	0.30	76	697	0.53	70	2517
After Repair Test - Pass Vehicles	0.27	68	715	0.45	70	2539
After Repair Test - Fail Vehicles	0.44	114	610	0.94	70	2407
After Repair Test - Inc. Repr. Vehicles	0.55	146	694	0.71	69	2528
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.44	114	610	0.94	70	2407
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	25.0	66.7	8.3
TMG	33.3	58.3	8.3
A/F	75.0	16.7	8.3
CRK	8.3	91.7	0.0
EVP	8.3	91.7	0.0
EXH	8.3	91.7	0.0
EGR	16.7	83.3	0.0
ANY	91.7	91.7	16.7

Average Repair Costs

Parts Cost: $ 6.92 Labor Cost: $ 23.83

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	2.1	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
Miss	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
Totl	2.1	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
Pass	97.9	100.0	97.9	100.0	100.0	56.3	43.8	100.0	97.9	100.0	97.9	56.3	100.0
N/A	0.0	0.0	0.0	0.0	0.0	43.8	56.3	0.0	2.1	0.0	2.1	43.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	100.0	70.8	70.8	100.0
Fail	0.0	2.1	2.1	4.2
N/A	0.0	20.8	20.8	20.8

Record Counts

Test Records Processed:	96
Initial Test Records:	76
After Repair Test Records:	20
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	44100
Initial Test Vehicles:	44632
After Repair Test Vehicles:	42080
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	63.2	36.8	--	--	0.0	36.8	0.0	36.8	0.0	1.3	23.7
After Repair	62.5	25.0	0.0	37.5	0.0	100.0	0.0	100.0	0.0	0.0	83.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.21	157	875	0.37	58	2507
Initial Test - Pass Vehicles	0.01	37	871	0.16	33	2506
Initial Test - Fail Vehicles	0.55	364	883	0.74	100	2510
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.55	364	883	0.74	100	2510
After Repair Test - All Vehicles	0.18	165	905	0.27	50	2473
After Repair Test - Pass Vehicles	0.00	22	909	0.11	18	2474
After Repair Test - Fail Vehicles	0.16	333	914	0.59	109	2414
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	0.48	294	893	0.34	62	2509
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.35	309	902	0.44	81	2471
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	45.0	50.0	5.0
TMG	60.0	35.0	5.0
A/F	25.0	50.0	25.0
CRK	10.0	90.0	0.0
EVP	5.0	95.0	0.0
EXH	10.0	90.0	0.0
EGR	0.0	100.0	0.0
ANY	90.0	100.0	35.0

Average Repair Costs

Parts Cost: $ 12.42 Labor Cost: $ 42.65

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	3.9	96.1	75.0	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	96.1	3.9	25.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	48.7	46.1	46.1	67.1
Fail	0.0	0.0	0.0	0.0
N/A	51.3	32.9	32.9	59.2

Record Counts

Test Records Processed:	327
Initial Test Records:	265
After Repair Test Records:	62
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	40624
Initial Test Vehicles:	38869
After Repair Test Vehicles:	48123
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	73.6	26.4	--	--	3.0	24.9	1.5	23.4	1.5	4.9	10.9
After Repair	90.4	19.2	5.8	9.6	0.0	100.0	0.0	100.0	0.0	20.0	40.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.32	70	866	0.69	76	2497
Initial Test - Pass Vehicles	0.04	31	873	0.13	37	2505
Initial Test - Fail Vehicles	1.11	179	845	2.26	184	2473
Initial Test - Underhood Fail Only	0.02	32	899	0.53	32	2352
Initial Test - Tailpipe Fail Only	1.09	182	840	2.23	186	2481
After Repair Test - All Vehicles	0.21	75	890	0.58	59	2462
After Repair Test - Pass Vehicles	0.05	42	906	0.17	37	2476
After Repair Test - Fail Vehicles	0.34	168	831	2.13	140	2395
After Repair Test - Inc. Repr. Vehicles	0.02	78	958	0.31	55	2485
After Repair Test - Waived Vehicles	1.45	204	853	1.33	107	2471
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.71	180	838	1.86	129	2420
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	45.2	48.4	6.5
TMG	22.6	75.8	1.6
A/F	58.1	33.9	8.1
CRK	6.5	93.5	0.0
EVP	3.2	96.8	0.0
EXH	14.5	83.9	1.6
EGR	6.5	93.5	0.0
ANY	90.3	98.4	14.5

Average Repair Costs

Parts Cost: $ 5.70 Labor Cost: $ 25.87

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.4	0.4	0.4	0.0	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.0	1.1
Mod	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Miss	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Totl	0.4	0.4	0.8	0.0	0.0	0.4	0.4	0.4	0.0	0.0	0.0	0.0	1.9
Pass	99.6	99.6	99.2	100.0	100.0	38.9	60.4	99.6	99.2	94.0	96.6	59.2	100.0
N/A	0.0	0.0	0.0	0.0	0.0	60.8	39.2	0.0	0.8	6.0	3.4	40.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	94.3	63.0	62.6	96.2
Fail	1.1	0.0	0.4	1.5
N/A	4.5	26.4	26.4	28.7

Record Counts

Test Records Processed:	125
Initial Test Records:	97
After Repair Test Records:	28
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	53325
Initial Test Vehicles:	53200
After Repair Test Vehicles:	53757
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	70.1	29.9	--	--	4.1	27.8	2.1	25.8	2.1	0.0	19.6
After Repair	91.3	21.7	0.0	8.7	0.0	100.0	0.0	100.0	0.0	0.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.33	107	694	0.41	90	2482
Initial Test - Pass Vehicles	0.07	31	703	0.18	44	2492
Initial Test - Fail Vehicles	0.94	286	673	0.96	198	2457
Initial Test - Underhood Fail Only	0.12	46	675	0.03	57	2534
Initial Test - Tailpipe Fail Only	0.88	239	681	0.87	139	2446
After Repair Test - All Vehicles	0.51	74	720	0.50	75	2465
After Repair Test - Pass Vehicles	0.17	37	742	0.23	55	2458
After Repair Test - Fail Vehicles	0.67	138	658	0.45	119	2499
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	3.63	306	646	3.45	180	2453
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.52	186	654	1.31	136	2486
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	35.7	60.7	3.6
TMG	25.0	75.0	0.0
A/F	71.4	25.0	3.6
CRK	14.3	85.7	0.0
EVP	14.3	85.7	0.0
EXH	17.9	82.1	0.0
EGR	25.0	75.0	0.0
ANY	89.3	89.3	7.1

Average Repair Costs

Parts Cost: $ 13.18 Labor Cost: $ 29.04

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	95.9	100.0	99.0	68.0	100.0
N/A	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	4.1	0.0	1.0	32.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	100.0	74.2	69.1	100.0
Fail	0.0	0.0	4.1	4.1
N/A	0.0	14.4	15.5	15.5

Record Counts

Test Records Processed:	309
Initial Test Records:	248
After Repair Test Records:	61
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	40967
Initial Test Vehicles:	39208
After Repair Test Vehicles:	48118
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	72.6	27.4	--	--	3.2	25.8	1.6	24.2	1.6	4.8	11.7
After Repair	90.2	19.6	5.9	9.8	0.0	100.0	0.0	100:0	0.0	20.0	40.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	72	865	0.72	78	2494
Initial Test - Pass Vehicles	0.04	31	873	0.13	38	2502
Initial Test - Fail Vehicles	1.14	181	845	2.27	183	2473
Initial Test - Underhood Fail Only	0.02	32	899	0.53	32	2352
Initial Test - Tailpipe Fail Only	1.12	184	840	2.25	185	2482
After Repair Test - All Vehicles	0.20	74	889	0.58	60	2459
After Repair Test - Pass Vehicles	0.04	40	906	0.16	37	2472
After Repair Test - Fail Vehicles	0.34	168	831	2.13	140	2395
After Repair Test - Inc. Repr. Vehicles	0.02	78	958	0.31	55	2485
After Repair Test - Waived Vehicles	1.45	204	853	1.33	107	2471
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.71	180	838	1.86	129	2420
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	44.3	49.2	6.6
TMG	21.3	77.0	1.6
A/F	57.4	34.4	8.2
CRK	4.9	95.1	0.0
EVP	1.6	98.4	0.0
EXH	13.1	85.2	1.6
EGR	4.9	95.1	0.0
ANY	90.2	100.0	14.8

Average Repair Costs

Parts Cost: $ 5.80 Labor Cost: $ 25.55

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.4	0.4	0.4	0.0	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.0	1.2
Mod	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Miss	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Totl	0.4	0.4	0.8	0.0	0.0	0.4	0.4	0.4	0.0	0.0	0.0	0.0	2.0
Pass	99.6	99.6	99.2	100.0	100.0	35.9	63.3	99.6	99.6	100.0	97.2	58.5	100.0
N/A	0.0	0.0	0.0	0.0	0.0	63.7	36.3	0.0	0.4	0.0	2.8	41.5	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	96.8	63.7	63.3	98.4
Fail	1.2	0.0	0.4	1.6
N/A	2.0	26.2	26.2	27.0

Record Counts

Test Records Processed:	500
Initial Test Records:	424
After Repair Test Records:	76
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	28867
Initial Test Vehicles:	28640
After Repair Test Vehicles:	30130
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	73.1	26.9	--	--	1.2	26.4	0.5	25.7	0.7	0.5	23.3
After Repair	96.4	38.2	1.8	3.6	0.0	100.0	0.0	100.0	0.0	0.0	50.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.22	91	898	0.16	38	2528
Initial Test - Pass Vehicles	0.08	34	894	0.11	22	2529
Initial Test - Fail Vehicles	0.61	247	909	0.29	82	2525
Initial Test - Underhood Fail Only	0.19	66	897	0.17	78	2517
Initial Test - Tailpipe Fail Only	0.50	231	910	0.28	71	2527
After Repair Test - All Vehicles	0.50	70	891	0.15	47	2520
After Repair Test - Pass Vehicles	0.09	38	889	0.10	25	2527
After Repair Test - Fail Vehicles	1.12	134	892	0.25	100	2502
After Repair Test - Inc. Repr. Vehicles	0.01	24	930	0.03	33	2506
After Repair Test - Waived Vehicles	4.82	237	943	0.25	64	2511
After Repair Test - Underhood Fail Only	0.01	29	736	0.01	29	2335
After Repair Test - Tailpipe Fail Only	1.51	148	904	0.26	100	2510
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	52.6	46.1	1.3
TMG	51.3	48.7	0.0
A/F	34.2	60.5	5.3
CRK	7.9	92.1	0.0
EVP	7.9	92.1	0.0
EXH	10.5	89.5	0.0
EGR	9.2	89.5	1.3
ANY	92.1	94.7	7.9

Average Repair Costs

Parts Cost: $ 10.73 Labor Cost: $ 22.97

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Totl	0.0	0.5	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Pass	100.0	99.5	0.0	100.0	99.8	48.6	51.2	100.0	96.9	100.0	99.5	61.8	100.0
N/A	0.0	0.0	100.0	0.0	0.0	51.4	48.8	0.0	3.1	0.0	0.5	38.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	95.5	58.0	58.0	96.7
Fail	0.7	0.5	0.2	0.7
N/A	3.8	25.9	26.2	27.4

Record Counts

Test Records Processed:	40
Initial Test Records:	36
After Repair Test Records:	4
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	60195
Initial Test Vehicles:	60372
After Repair Test Vehicles:	58600
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	77.8	22.2	--	--	2.8	22.2	0.0	19.4	2.8	0.0	16.7
After Repair	75.0	0.0	0.0	25.0	0.0	100.0	0.0	100.0	0.0	0.0	100.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.32	111	769	0.32	48	2518
Initial Test - Pass Vehicles	0.05	39	773	0.15	21	2532
Initial Test - Fail Vehicles	1.23	361	755	0.91	142	2467
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.22	384	768	0.92	146	2457
After Repair Test - All Vehicles	0.00	102	776	0.03	35	2481
After Repair Test - Pass Vehicles	0.00	22	804	0.03	30	2498
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	0.00	342	693	0.02	49	2429
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.00	342	693	0.02	49	2429
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	50.0	50.0	0.0
TMG	25.0	75.0	0.0
A/F	50.0	25.0	25.0
CRK	25.0	75.0	0.0
EVP	25.0	75.0	0.0
EXH	50.0	50.0	0.0
EGR	25.0	75.0	0.0
ANY	100.0	75.0	25.0

Average Repair Costs

Parts Cost: $ 0.00 Labor Cost: $ 34.50

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	2.8
Totl	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	2.8
Pass	100.0	100.0	100.0	100.0	100.0	97.2	0.0	100.0	97.2	33.3	94.4	61.1	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	2.8	66.7	5.6	38.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	77.8	72.2	72.2	94.4
Fail	0.0	0.0	0.0	0.0
N/A	22.2	25.0	25.0	44.4

EPA PATTERN FAILURES (NEW CAR DEALERS) - '83-'84 1.5L 3CL MAZD 4-AUG-1987
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	81
Initial Test Records:	67
After Repair Test Records:	14
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	39594
Initial Test Vehicles:	37439
After Repair Test Vehicles:	49907
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	82.1	17.9	--	--	0.0	17.9	0.0	17.9	0.0	7.5	0.0
After Repair	81.8	27.3	18.2	18.2	0.0	100.0	0.0	100.0	0.0	100.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.58	38	850	0.58	38	2498
Initial Test - Pass Vehicles	0.01	9	853	0.03	13	2493
Initial Test - Fail Vehicles	3.19	171	839	3.08	154	2525
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	3.19	171	839	3.08	154	2525
After Repair Test - All Vehicles	0.18	42	839	0.93	57	2533
After Repair Test - Pass Vehicles	0.00	20	840	0.03	19	2496
After Repair Test - Fail Vehicles	0.28	93	836	3.32	180	2584
After Repair Test - Inc. Repr. Vehicles	0.01	3	858	0.03	6	2586
After Repair Test - Waived Vehicles	0.83	68	841	1.35	44	2625
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.50	83	838	2.53	126	2600
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	7.1	92.9	0.0
TMG	7.1	92.9	0.0
A/F	71.4	21.4	7.1
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	0.0	78.6	21.4
EGR	0.0	100.0	0.0
ANY	78.6	100.0	28.6

Average Repair Costs

Parts Cost: $ 64.62 Labor Cost: $ 24.00

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	98.5	98.5	100.0	98.5	100.0	0.0	100.0	100.0	94.0	100.0	94.0	56.7	100.0
N/A	1.5	1.5	0.0	1.5	0.0	100.0	0.0	0.0	6.0	0.0	6.0	43.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	88.1	65.7	64.2	97.0
Fail	0.0	0.0	0.0	0.0
N/A	11.9	22.4	23.9	34.3

Record Counts

Test Records Processed:	310
Initial Test Records:	266
After Repair Test Records:	44
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	47987
Initial Test Vehicles:	48530
After Repair Test Vehicles:	44705
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	78.6	21.4	--	--	0.8	21.4	0.0	20.7	0.8	3.8	6.8
After Repair	76.5	29.4	5.9	23.5	0.0	100.0	0.0	100.0	0.0	12.5	37.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.47	88	749	0.55	42	2500
Initial Test - Pass Vehicles	0.05	31	754	0.18	24	2498
Initial Test - Fail Vehicles	1.99	298	734	1.91	110	2505
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.97	294	735	1.91	109	2502
After Repair Test - All Vehicles	0.53	88	784	0.85	73	2498
After Repair Test - Pass Vehicles	0.10	33	772	0.21	24	2501
After Repair Test - Fail Vehicles	1.57	171	804	1.62	95	2498
After Repair Test - Inc. Repr. Vehicles	0.09	6	894	0.51	45	2519
After Repair Test - Waived Vehicles	0.61	163	798	1.97	203	2492
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.14	167	802	1.78	143	2495
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	31.8	63.6	4.5
TMG	27.3	72.7	0.0
A/F	45.5	38.6	15.9
CRK	4.5	95.5	0.0
EVP	9.1	90.9	0.0
EXH	18.2	79.5	2.3
EGR	6.8	93.2	0.0
ANY	93.2	100.0	22.7

Average Repair Costs

Parts Cost: $ 8.20 Labor Cost: $ 27.37

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Totl	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Pass	100.0	100.0	97.0	100.0	100.0	46.2	53.0	100.0	97.4	86.8	95.9	66.9	100.0
N/A	0.0	0.0	3.0	0.0	0.0	53.0	47.0	0.0	2.6	13.2	4.1	33.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	95.1	70.3	70.3	97.0
Fail	0.0	0.0	0.0	0.0
N/A	4.9	22.9	22.9	24.8

All Other Stations

Record Counts

Test Records Processed:	78
Initial Test Records:	60
After Repair Test Records:	18
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	10859
Initial Test Vehicles:	9925
After Repair Test Vehicles:	13972
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	41.7	58.3	--	--	0.0	58.3	0.0	58.3	0.0	0.0	56.7
After Repair	92.3	38.5	15.4	7.7	0.0	100.0	0.0	100.0	0.0	0.0	100.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.13	175	748	0.11	47	2479
Initial Test - Pass Vehicles	0.01	42	809	0.04	36	2493
Initial Test - Fail Vehicles	0.21	271	705	0.15	54	2469
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.21	271	705	0.15	54	2469
After Repair Test - All Vehicles	0.13	114	798	0.09	22	2500
After Repair Test - Pass Vehicles	0.09	72	799	0.05	15	2504
After Repair Test - Fail Vehicles	0.20	205	777	0.12	21	2467
After Repair Test - Inc. Repr. Vehicles	0.03	184	671	0.09	41	2531
After Repair Test - Waived Vehicles	0.23	167	889	0.42	114	2619
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.20	199	796	0.17	36	2492
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	55.6	44.4	0.0
TMG	55.6	38.9	5.6
A/F	33.3	55.6	11.1
CRK	11.1	88.9	0.0
EVP	11.1	88.9	0.0
EXH	11.1	88.9	0.0
EGR	11.1	88.9	0.0
ANY	83.3	88.9	16.7

Average Repair Costs

Parts Cost: $ 10.56 Labor Cost: $ 13.22

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	91.7	21.7	100.0	100.0	0.0	100.0	100.0	93.3	100.0	100.0	73.3	100.0
N/A	0.0	8.3	78.3	0.0	0.0	100.0	0.0	0.0	6.7	0.0	0.0	26.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	80.0	55.0	55.0	91.7
Fail	0.0	0.0	0.0	0.0
N/A	20.0	21.7	21.7	38.3

Record Counts

Test Records Processed:	224
Initial Test Records:	144
After Repair Test Records:	80
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	64382
Initial Test Vehicles:	64533
After Repair Test Vehicles:	64111
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	39.6	60.4	--	--	2.1	59.7	0.7	58.3	1.4	2.1	18.8
After Repair	50.0	48.1	3.7	50.0	0.0	100.0	0.0	100.0	0.0	14.8	40.7
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	1.05	231	857	0.77	97	2524
Initial Test - Pass Vehicles	0.08	59	867	0.09	42	2530
Initial Test - Fail Vehicles	1.68	343	850	1.22	133	2520
Initial Test - Underhood Fail Only	0.18	59	876	0.02	44	2524
Initial Test - Tailpipe Fail Only	1.71	351	850	1.24	135	2517
After Repair Test - All Vehicles	1.05	204	897	0.97	86	2481
After Repair Test - Pass Vehicles	0.12	62	865	0.27	44	2439
After Repair Test - Fail Vehicles	1.73	300	892	1.34	113	2505
After Repair Test - Inc. Repr. Vehicles	0.34	111	877	0.80	55	2625
After Repair Test - Waived Vehicles	1.32	253	933	1.30	102	2499
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.52	276	913	1.32	108	2502
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	28.8	51.3	20.0
TMG	46.3	53.8	0.0
A/F	37.5	31.3	31.3
CRK	8.8	91.3	0.0
EVP	10.0	90.0	0.0
EXH	10.0	87.5	2.5
EGR	12.5	87.5	0.0
ANY	73.8	92.5	46.3

Average Repair Costs

Parts Cost: $ 14.58 Labor Cost: $ 22.68

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.7
Miss	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
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.7
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	99.3	97.9	6.3	94.4	57.6	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	1.4	93.8	5.6	42.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	65.3	54.9	56.3	81.9
Fail	0.0	2.1	0.7	2.1
N/A	34.7	25.0	25.0	50.0

Record Counts

Test Records Processed:	1046
Initial Test Records:	766
After Repair Test Records:	280
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	28745
Initial Test Vehicles:	28582
After Repair Test Vehicles:	29192
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	42.3	57.7	--	--	0.3	57.6	0.1	57.4	0.1	40.6	0.7
After Repair	80.4	66.7	11.3	19.6	0.0	100.0	0.0	100.0	0.0	75.8	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.33	57	795	2.81	92	2463
Initial Test - Pass Vehicles	0.01	17	760	0.26	25	2479
Initial Test - Fail Vehicles	0.56	87	821	4.68	141	2450
Initial Test - Underhood Fail Only	0.00	13	582	0.08	14	2514
Initial Test - Tailpipe Fail Only	0.56	87	822	4.69	142	2450
After Repair Test - All Vehicles	0.42	58	794	2.91	119	2451
After Repair Test - Pass Vehicles	0.05	19	773	0.69	33	2460
After Repair Test - Fail Vehicles	0.86	100	806	5.23	224	2448
After Repair Test - Inc. Repr. Vehicles	0.24	44	801	3.45	95	2472
After Repair Test - Waived Vehicles	0.43	71	843	4.18	115	2425
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.76	94	815	5.00	197	2443
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	16.8	78.9	4.3
TMG	21.4	78.2	0.4
A/F	45.0	35.4	19.6
CRK	9.6	90.4	0.0
EVP	8.9	91.1	0.0
EXH	9.3	87.1	3.6
EGR	5.7	93.9	0.4
ANY	69.3	96.1	24.3

Average Repair Costs

Parts Cost: $ 3.84 Labor Cost: $ 17.82

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	99.9	28.1	71.9	100.0	97.3	100.0	96.6	68.8	100.0
N/A	0.0	0.0	0.0	0.0	0.1	71.9	28.1	0.0	2.7	0.0	3.4	31.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	97.8	64.1	63.8	98.2
Fail	0.1	0.0	0.1	0.3
N/A	2.1	17.2	17.4	18.1

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '81-'82 1.3L TOYOTA
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	238
Initial Test Records:	171
After Repair Test Records:	67
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	66318
Initial Test Vehicles:	64995
After Repair Test Vehicles:	69697
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	52.6	47.4	--	--	2.9	46.2	1.2	44.4	1.8	6.4	13.5
After Repair	65.4	28.8	1.9	34.6	11.1	94.4	5.6	88.9	5.6	0.0	33.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.54	192	877	0.85	106	2500
Initial Test - Pass Vehicles	0.06	41	867	0.10	46	2503
Initial Test - Fail Vehicles	1.08	359	887	1.67	173	2495
Initial Test - Underhood Fail Only	0.00	42	938	0.00	65	2379
Initial Test - Tailpipe Fail Only	1.11	367	886	1.68	176	2498
After Repair Test - All Vehicles	0.35	216	908	0.95	110	2446
After Repair Test - Pass Vehicles	0.10	60	918	0.29	57	2466
After Repair Test - Fail Vehicles	0.39	422	885	1.24	126	2435
After Repair Test - Inc. Repr. Vehicles	0.17	231	992	1.66	141	2365
After Repair Test - Waived Vehicles	0.79	337	908	1.94	195	2417
After Repair Test - Underhood Fail Only	0.23	124	958	0.18	46	2674
After Repair Test - Tailpipe Fail Only	0.64	391	894	1.72	173	2412
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	29.9	44.8	25.4
TMG	38.8	61.2	0.0
A/F	53.7	19.4	26.9
CRK	4.5	95.5	0.0
EVP	3.0	97.0	0.0
EXH	6.0	92.5	1.5
EGR	4.5	94.0	1.5
ANY	77.6	100.0	40.3

Average Repair Costs

Parts Cost: $ 6.88 Labor Cost: $ 24.34

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.6
Mod	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
Miss	0.0	0.0	0.6	0.6	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Totl	0.0	0.6	0.6	0.6	0.6	0.6	0.0	0.6	0.0	0.0	0.0	0.0	1.2
Pass	99.4	99.4	99.4	99.4	99.4	99.4	0.0	99.4	97.7	7.0	98.8	68.4	100.0
N/A	0.6	0.0	0.0	0.0	0.0	0.0	100.0	0.0	2.3	93.0	1.2	31.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	70.2	63.7	64.3	89.5
Fail	0.0	1.8	1.2	2.9
N/A	29.8	20.5	20.5	44.4

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '81-'82 1.5L NISSAN
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	655
Initial Test Records:	480
After Repair Test Records:	175
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	61993
Initial Test Vehicles:	61656
After Repair Test Vehicles:	62915
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	51.0	49.0	--	--	1.7	48.3	0.6	47.3	1.0	5.8	16.0
After Repair	69.3	25.0	7.9	30.7	2.3	97.7	2.3	97.7	0.0	34.9	27.9
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	1.15	181	880	0.59	72	2516
Initial Test - Pass Vehicles	0.08	45	885	0.15	39	2510
Initial Test - Fail Vehicles	2.26	322	876	1.05	106	2522
Initial Test - Underhood Fail Only	0.04	110	794	0.27	50	2584
Initial Test - Tailpipe Fail Only	2.32	328	876	1.04	106	2520
After Repair Test - All Vehicles	0.54	135	902	0.76	64	2503
After Repair Test - Pass Vehicles	0.17	65	898	0.23	43	2506
After Repair Test - Fail Vehicles	1.05	250	895	1.38	89	2486
After Repair Test - Inc. Repr. Vehicles	0.57	170	930	0.72	74	2490
After Repair Test - Waived Vehicles	0.94	197	914	1.44	92	2511
After Repair Test - Underhood Fail Only	0.81	133	941	0.30	44	2423
After Repair Test - Tailpipe Fail Only	0.99	222	905	1.42	91	2501
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	42.3	44.0	13.7
TMG	42.9	57.1	0.0
A/F	52.6	22.3	25.1
CRK	6.9	93.1	0.0
EVP	5.1	94.9	0.0
EXH	6.3	93.7	0.0
EGR	5.7	93.7	0.6
ANY	86.9	97.1	36.0

Average Repair Costs

Parts Cost: $ 9.42 Labor Cost: $ 20.07

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Miss	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
Totl	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Pass	99.6	100.0	100.0	99.8	100.0	100.0	0.0	100.0	99.0	7.5	96.9	69.6	100.0
N/A	0.2	0.0	0.0	0.0	0.0	0.0	100.0	0.0	1.0	92.5	3.1	30.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	61.3	56.0	56.0	82.7
Fail	0.0	0.8	0.6	1.3
N/A	38.8	24.0	24.2	54.0

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '83 1.6L MITSUBISHI 4-AUG-1987
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	84
Initial Test Records:	60
After Repair Test Records:	24
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	44877
Initial Test Vehicles:	45363
After Repair Test Vehicles:	43663
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	50.0	50.0	--	--	0.0	50.0	0.0	50.0	0.0	28.3	1.7
After Repair	55.0	20.0	0.0	45.0	0.0	100.0	0.0	100.0	0.0	66.7	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.62	84	855	1.15	86	2520
Initial Test - Pass Vehicles	0.09	28	870	0.15	41	2531
Initial Test - Fail Vehicles	1.15	140	839	2.14	130	2509
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.15	140	839	2.14	130	2509
After Repair Test - All Vehicles	0.48	72	845	1.53	100	2466
After Repair Test - Pass Vehicles	0.06	25	827	0.12	41	2451
After Repair Test - Fail Vehicles	0.05	71	852	2.97	177	2451
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	1.19	128	864	2.61	138	2489
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.84	110	861	2.72	150	2478
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	37.5	62.5	0.0
TMG	37.5	62.5	0.0
A/F	33.3	29.2	37.5
CRK	16.7	83.3	0.0
EVP	4.2	95.8	0.0
EXH	4.2	95.8	0.0
EGR	4.2	95.8	0.0
ANY	79.2	95.8	37.5

Average Repair Costs

Parts Cost: $ 16.95 Labor Cost: $ 13.63

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	98.3	18.3	100.0	63.3	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	1.7	81.7	0.0	36.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	73.3	53.3	55.0	91.7
Fail	0.0	0.0	0.0	0.0
N/A	26.7	28.3	26.7	51.7

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '83 NISSAN 1.6L 3CL
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	763
Initial Test Records:	569
After Repair Test Records:	192
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	47027
Initial Test Vehicles:	46562
After Repair Test Vehicles:	48640
Referee Test Vehicles:	24200

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	50.8	49.2	--	--	5.3	46.9	2.3	43.9	3.0	1.8	36.4
After Repair	76.1	20.8	6.9	23.9	0.0	100.0	0.0	100.0	0.0	13.2	73.7
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.32	126	880	0.66	85	2511
Initial Test - Pass Vehicles	0.04	35	885	0.22	39	2514
Initial Test - Fail Vehicles	0.61	221	876	1.12	134	2508
Initial Test - Underhood Fail Only	0.09	40	904	0.19	34	2507
Initial Test - Tailpipe Fail Only	0.61	228	874	1.16	138	2508
After Repair Test - All Vehicles	0.20	86	873	0.76	66	2498
After Repair Test - Pass Vehicles	0.07	41	877	0.38	43	2496
After Repair Test - Fail Vehicles	0.41	158	853	1.71	103	2517
After Repair Test - Inc. Repr. Vehicles	0.11	70	877	0.75	42	2525
After Repair Test - Waived Vehicles	0.47	164	876	1.14	108	2490
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.43	158	865	1.41	105	2501
Referee Test - All Vehicles	0.22	220	883	0.56	88	2622
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.22	220	883	0.56	88	2622
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.22	220	883	0.56	88	2622

Repair Action Percentages

	Yes	No	Excd
MIS	33.3	46.9	19.8
TMG	41.7	57.8	0.5
A/F	38.5	45.8	15.6
CRK	8.9	91.1	0.0
EVP	8.3	91.7	0.0
EXH	10.9	88.5	0.5
EGR	6.3	93.2	0.5
ANY	77.1	96.9	31.8

Average Repair Costs

Parts Cost: $ 9.34 Labor Cost: $ 19.41

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Totl	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Pass	99.6	99.6	47.6	99.8	99.5	0.0	100.0	100.0	98.1	100.0	96.7	71.0	100.0
N/A	0.4	0.4	52.4	0.0	0.4	100.0	0.0	0.0	1.9	0.0	3.3	29.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	91.2	59.9	61.2	96.5
Fail	4.6	1.2	0.2	5.1
N/A	4.2	16.3	16.2	19.2

Record Counts

Test Records Processed:	588
Initial Test Records:	443
After Repair Test Records:	144
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	32912
Initial Test Vehicles:	32023
After Repair Test Vehicles:	35494
Referee Test Vehicles:	54800

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	56.4	43.6	--	--	0.2	43.6	0.0	43.3	0.2	2.7	15.8
After Repair	79.0	44.0	4.0	21.0	0.0	100.0	0.0	100.0	0.0	0.0	71.4
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.68	113	867	0.41	68	2499
Initial Test - Pass Vehicles	0.08	47	874	0.15	39	2510
Initial Test - Fail Vehicles	1.46	199	857	0.75	106	2486
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.47	200	857	0.76	105	2486
After Repair Test - All Vehicles	0.85	134	885	0.39	60	2497
After Repair Test - Pass Vehicles	0.15	55	889	0.16	40	2496
After Repair Test - Fail Vehicles	2.07	248	876	0.75	82	2506
After Repair Test - Inc. Repr. Vehicles	0.83	114	849	0.11	103	2406
After Repair Test - Waived Vehicles	0.90	189	887	0.53	88	2486
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.69	229	880	0.68	84	2499
Referee Test - All Vehicles	0.23	1382	900	0.34	117	2456
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.23	1382	900	0.34	117	2456
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.23	1382	900	0.34	117	2456

Repair Action Percentages

	Yes	No	Excd
MIS	34.7	52.8	12.5
TMG	31.9	68.1	0.0
A/F	52.1	35.4	12.5
CRK	11.1	88.9	0.0
EVP	9.0	91.0	0.0
EXH	10.4	88.9	0.7
EGR	9.0	90.3	0.7
ANY	69.4	93.1	22.9

Average Repair Costs

Parts Cost: $ 5.97 Labor Cost: $ 15.60

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	9.0	91.0	100.0	95.3	100.0	96.2	68.4	100.0
N/A	0.0	0.0	0.0	0.0	0.0	91.0	9.0	0.0	4.7	0.0	3.8	31.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	75.8	49.4	49.7	88.5
Fail	0.0	0.2	0.0	0.2
N/A	24.2	25.7	25.7	44.7

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '81-'85 1.6L FORD
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	1117
Initial Test Records:	826
After Repair Test Records:	291
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	54784
Initial Test Vehicles:	52875
After Repair Test Vehicles:	60201
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	60.0	40.0	--	--	2.8	38.9	1.1	37.2	1.7	16.9	5.6
After Repair	64.5	32.3	7.7	34.5	3.9	97.4	2.6	96.1	1.3	44.7	21.1
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.65	119	865	1.02	92	2488
Initial Test - Pass Vehicles	0.10	43	866	0.26	43	2482
Initial Test - Fail Vehicles	1.46	232	865	2.17	164	2498
Initial Test - Underhood Fail Only	0.10	48	885	0.22	43	2487
Initial Test - Tailpipe Fail Only	1.50	235	865	2.22	162	2498
After Repair Test - All Vehicles	0.73	138	867	1.28	92	2471
After Repair Test - Pass Vehicles	0.27	65	864	0.46	52	2463
After Repair Test - Fail Vehicles	1.32	227	863	2.06	126	2489
After Repair Test - Inc. Repr. Vehicles	1.10	160	870	1.42	92	2497
After Repair Test - Waived Vehicles	1.05	193	873	2.12	137	2467
After Repair Test - Underhood Fail Only	0.02	71	856	0.40	70	2497
After Repair Test - Tailpipe Fail Only	1.17	211	869	2.14	133	2478
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	28.9	58.4	12.7
TMG	41.9	57.0	1.0
A/F	50.2	24.4	25.4
CRK	7.9	92.1	0.0
EVP	4.5	95.5	0.0
EXH	5.2	93.8	1.0
EGR	5.5	92.8	1.7
ANY	81.4	98.3	38.5

Average Repair Costs

Parts Cost: $ 14.89 Labor Cost: $ 22.39

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7
Mod	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Miss	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.4	0.6	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	1.3
Pass	100.0	99.3	99.4	99.5	100.0	100.0	0.0	99.9	95.8	16.0	92.4	66.9	100.0
N/A	0.0	0.4	0.0	0.4	0.0	0.0	100.0	0.0	4.2	84.0	7.6	32.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	70.7	49.5	49.3	81.5
Fail	0.0	0.8	0.8	1.6
N/A	29.3	22.0	22.3	44.4

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '81-'83 2.3L FORD
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	571
Initial Test Records:	433
After Repair Test Records:	137
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	58873
Initial Test Vehicles:	58112
After Repair Test Vehicles:	61418
Referee Test Vehicles:	39600

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	61.0	39.0	--	--	4.6	36.7	2.3	34.4	2.3	15.0	3.2
After Repair	64.9	23.4	3.6	31.5	5.7	97.1	2.9	94.3	2.9	42.9	17.1
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	1.00	126	878	1.00	71	2486
Initial Test - Pass Vehicles	0.10	39	886	0.15	27	2495
Initial Test - Fail Vehicles	2.41	262	865	2.34	140	2470
Initial Test - Underhood Fail Only	0.19	37	867	0.23	41	2455
Initial Test - Tailpipe Fail Only	2.51	273	864	2.37	146	2470
After Repair Test - All Vehicles	0.96	114	890	1.57	79	2482
After Repair Test - Pass Vehicles	0.23	48	896	0.30	37	2483
After Repair Test - Fail Vehicles	1.94	181	892	3.57	125	2494
After Repair Test - Inc. Repr. Vehicles	1.80	178	864	1.75	89	2554
After Repair Test - Waived Vehicles	1.81	208	880	2.86	134	2462
After Repair Test - Underhood Fail Only	0.27	72	879	0.23	52	2507
After Repair Test - Tailpipe Fail Only	1.73	187	883	3.22	133	2477
Referee Test - All Vehicles	0.00	29	968	0.00	19	2568
Referee Test - Pass Vehicles	0.00	29	968	0.00	19	2568
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	21.2	69.3	9.5
TMG	23.4	75.2	1.5
A/F	54.0	19.7	26.3
CRK	6.6	93.4	0.0
EVP	4.4	94.9	0.7
EXH	8.0	92.0	0.0
EGR	10.9	83.9	5.1
ANY	75.2	96.4	36.5

Average Repair Costs

Parts Cost: $ 13.37 Labor Cost: $ 24.96

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.2	0.5	0.2	0.2	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.2	1.4
Mod	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.5
Miss	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.2	0.9	0.2	0.2	0.0	0.0	0.0	0.5	0.2	0.0	0.0	0.2	2.1
Pass	99.3	98.8	99.8	99.8	100.0	100.0	0.0	99.5	94.5	26.1	94.0	67.4	100.0
N/A	0.5	0.2	0.0	0.0	0.0	0.0	100.0	0.0	5.3	73.9	6.0	32.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	72.1	53.3	52.0	85.5
Fail	0.2	0.9	2.1	3.2
N/A	27.7	22.2	22.4	42.7

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '83 HONDA 1.3L
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	151
Initial Test Records:	121
After Repair Test Records:	30
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	44784
Initial Test Vehicles:	44045
After Repair Test Vehicles:	47767
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	63.6	36.4	--	--	1.7	35.5	0.8	34.7	0.8	0.8	30.6
After Repair	80.0	20.0	8.0	20.0	0.0	100.0	0.0	100.0	0.0	0.0	80.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.10	173	883	0.26	81	2502
Initial Test - Pass Vehicles	0.01	28	888	0.10	35	2503
Initial Test - Fail Vehicles	0.25	426	875	0.55	160	2499
Initial Test - Underhood Fail Only	0.00	11	985	0.00	13	2610
Initial Test - Tailpipe Fail Only	0.25	439	873	0.55	165	2499
After Repair Test - All Vehicles	0.19	166	914	0.36	73	2470
After Repair Test - Pass Vehicles	0.05	64	915	0.18	42	2488
After Repair Test - Fail Vehicles	0.35	451	919	0.87	144	2438
After Repair Test - Inc. Repr. Vehicles	0.52	432	899	0.56	120	2509
After Repair Test - Waived Vehicles	0.59	289	902	0.58	126	2429
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.47	370	911	0.72	135	2434
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	40.0	53.3	6.7
TMG	26.7	73.3	0.0
A/F	40.0	40.0	20.0
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	6.7	93.3	0.0
EGR	0.0	100.0	0.0
ANY	76.7	100.0	23.3

Average Repair Costs

Parts Cost: $ 5.33 Labor Cost: $ 29.03

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.8
Mod	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
Miss	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
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.8
Pass	99.2	100.0	100.0	100.0	100.0	100.0	0.0	99.2	96.7	9.1	93.4	66.1	100.0
N/A	0.8	0.0	0.0	0.0	0.0	0.0	100.0	0.0	3.3	90.9	6.6	33.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	64.5	48.8	47.1	78.5
Fail	0.0	0.0	1.7	1.7
N/A	35.5	29.8	29.8	52.1

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '83 NISSAN 1.6L OXC
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	259
Initial Test Records:	207
After Repair Test Records:	52
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	48424
Initial Test Vehicles:	48981
After Repair Test Vehicles:	46208
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	62.8	37.2	--	--	2.4	36.2	1.0	34.8	1.4	5.3	26.6
After Repair	86.4	18.2	11.4	13.6	16.7	83.3	16.7	83.3	0.0	16.7	66.7
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.25	125	877	0.46	86	2513
Initial Test - Pass Vehicles	0.10	49	867	0.20	51	2510
Initial Test - Fail Vehicles	0.50	252	895	0.90	145	2516
Initial Test - Underhood Fail Only	0.07	78	866	0.28	49	2510
Initial Test - Tailpipe Fail Only	0.52	258	893	0.92	149	2514
After Repair Test - All Vehicles	0.20	107	862	0.72	66	2485
After Repair Test - Pass Vehicles	0.14	75	872	0.43	51	2488
After Repair Test - Fail Vehicles	0.45	180	843	2.10	121	2486
After Repair Test - Inc. Repr. Vehicles	0.26	139	934	1.01	79	2538
After Repair Test - Waived Vehicles	0.22	211	828	0.71	91	2466
After Repair Test - Underhood Fail Only	0.11	16	837	0.04	29	2404
After Repair Test - Tailpipe Fail Only	0.37	198	839	1.66	110	2481
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	40.4	51.9	7.7
TMG	46.2	53.8	0.0
A/F	44.2	44.2	11.5
CRK	11.5	84.6	3.8
EVP	9.6	90.4	0.0
EXH	11.5	84.6	3.8
EGR	11.5	88.5	0.0
ANY	82.7	90.4	26.9

Average Repair Costs

Parts Cost: $ 6.72 Labor Cost: $ 14.63

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.5
Miss	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
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.5
Pass	99.5	100.0	100.0	100.0	100.0	100.0	0.0	99.5	97.6	22.7	96.1	64.3	100.0
N/A	0.5	0.0	0.0	0.0	0.0	0.0	100.0	0.0	2.4	77.3	3.9	35.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	75.8	51.7	52.2	83.6
Fail	1.0	1.0	0.5	2.4
N/A	23.2	29.5	29.5	43.5

Record Counts

Test Records Processed:	98
Initial Test Records:	82
After Repair Test Records:	14
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	33981
Initial Test Vehicles:	33015
After Repair Test Vehicles:	39364
Referee Test Vehicles:	35900

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	64.6	35.4	--	--	0.0	35.4	0.0	35.4	0.0	0.0	28.0
After Repair	77.8	55.6	0.0	22.2	0.0	100.0	0.0	100.0	0.0	0.0	100.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.24	97	850	0.19	30	2505
Initial Test - Pass Vehicles	0.02	18	852	0.07	18	2517
Initial Test - Fail Vehicles	0.64	241	847	0.39	53	2482
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.64	241	847	0.39	53	2482
After Repair Test - All Vehicles	0.45	129	870	0.25	30	2535
After Repair Test - Pass Vehicles	0.34	81	807	0.15	24	2499
After Repair Test - Fail Vehicles	0.73	170	917	0.37	24	2596
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	0.14	193	972	0.28	66	2508
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.56	176	932	0.35	36	2571
Referee Test - All Vehicles	0.06	234	848	0.79	111	2555
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.06	234	848	0.79	111	2555
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.06	234	848	0.79	111	2555

Repair Action Percentages

	Yes	No	Excd
MIS	35.7	57.1	7.1
TMG	42.9	57.1	0.0
A/F	21.4	71.4	7.1
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	0.0	100.0	0.0
EGR	0.0	100.0	0.0
ANY	64.3	100.0	14.3

Average Repair Costs

Parts Cost: $ 2.57 Labor Cost: $ 9.23

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	0.0	97.6	100.0	41.5	58.5	100.0	100.0	0.0	92.7	74.4	100.0
N/A	0.0	0.0	100.0	2.4	0.0	58.5	41.5	0.0	0.0	100.0	7.3	25.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	52.4	51.2	51.2	76.8
Fail	0.0	0.0	0.0	0.0
N/A	47.6	39.0	39.0	68.3

Record Counts

Test Records Processed:	1155
Initial Test Records:	961
After Repair Test Records:	191
Referee Test Records:	3

Average Odometer Readings

All Vehicles:	29426
Initial Test Vehicles:	28758
After Repair Test Vehicles:	32803
Referee Test Vehicles:	28633

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	67.4	32.6	--	--	0.3	32.5	0.1	32.3	0.2	7.7	11.0
After Repair	73.2	28.2	5.4	26.2	0.0	100.0	0.0	100.0	0.0	20.5	20.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle CO (%)	Idle HC (ppm)	Idle RPM	2500 CO (%)	2500 HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.44	88	852	0.78	62	2484
Initial Test - Pass Vehicles	0.05	33	858	0.25	32	2484
Initial Test - Fail Vehicles	1.26	203	838	1.90	123	2483
Initial Test - Underhood Fail Only	0.01	16	703	0.01	18	2680
Initial Test - Tailpipe Fail Only	1.27	205	839	1.91	123	2483
After Repair Test - All Vehicles	0.68	103	854	1.08	71	2475
After Repair Test - Pass Vehicles	0.13	40	854	0.23	34	2483
After Repair Test - Fail Vehicles	1.46	191	843	2.55	151	2464
After Repair Test - Inc. Repr. Vehicles	0.60	99	832	0.63	63	2481
After Repair Test - Waived Vehicles	1.39	185	868	1.90	90	2461
After Repair Test - Underhood Fail Only	0.03	16	808	0.13	47	2659
After Repair Test - Tailpipe Fail Only	1.43	189	856	2.26	123	2464
Referee Test - All Vehicles	0.38	56	935	5.15	156	2596
Referee Test - Pass Vehicles	0.00	12	944	1.09	45	2488
Referee Test - Fail Vehicles	0.57	78	931	7.18	212	2650
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.57	78	931	7.18	212	2650

Repair Action Percentages

	Yes	No	Excd
MIS	29.8	57.1	13.1
TMG	25.1	74.3	0.5
A/F	37.2	38.2	24.6
CRK	5.8	93.7	0.5
EVP	4.2	95.3	0.5
EXH	8.4	89.5	2.1
EGR	3.7	94.8	1.6
ANY	61.8	95.8	33.0

Average Repair Costs

Parts Cost: $ 4.34 Labor Cost: $ 17.20

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Pass	100.0	95.7	100.0	99.6	99.9	6.6	93.4	100.0	95.3	100.0	97.2	61.2	100.0
N/A	0.0	4.3	0.0	0.3	0.1	93.4	6.6	0.0	4.7	0.0	2.8	38.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	75.2	53.1	52.9	90.8
Fail	0.0	0.0	0.2	0.2
N/A	24.8	24.5	24.5	43.4

Record Counts

Test Records Processed:	354
Initial Test Records:	277
After Repair Test Records:	76
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	59566
Initial Test Vehicles:	58247
After Repair Test Vehicles:	64428
Referee Test Vehicles:	55400

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	68.6	31.4	--	--	2.9	30.0	1.4	28.5	1.4	2.9	15.2
After Repair	69.7	15.2	9.1	30.3	5.0	95.0	5.0	95.0	0.0	20.0	40.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.47	96	732	0.54	103	2511
Initial Test - Pass Vehicles	0.08	38	736	0.19	52	2510
Initial Test - Fail Vehicles	1.32	224	726	1.30	213	2511
Initial Test - Underhood Fail Only	0.18	42	684	0.35	35	2537
Initial Test - Tailpipe Fail Only	1.36	234	729	1.36	229	2516
After Repair Test - All Vehicles	0.39	112	793	0.79	136	2481
After Repair Test - Pass Vehicles	0.15	79	784	0.37	68	2487
After Repair Test - Fail Vehicles	0.58	193	780	1.66	450	2455
After Repair Test - Inc. Repr. Vehicles	0.27	231	767	1.48	73	2492
After Repair Test - Waived Vehicles	0.83	147	821	1.33	138	2478
After Repair Test - Underhood Fail Only	0.10	88	926	0.58	85	2278
After Repair Test - Tailpipe Fail Only	0.77	165	803	1.47	247	2477
Referee Test - All Vehicles	0.37	143	812	0.56	126	2354
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.37	143	812	0.56	126	2354
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.37	143	812	0.56	126	2354

Repair Action Percentages

	Yes	No	Excd
MIS	31.6	57.9	10.5
TMG	25.0	75.0	0.0
A/F	51.3	23.7	25.0
CRK	10.5	89.5	0.0
EVP	7.9	90.8	1.3
EXH	9.2	90.8	0.0
EGR	10.5	85.5	3.9
ANY	75.0	93.4	36.8

Average Repair Costs

Parts Cost: $ 23.14 Labor Cost: $ 19.70

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	99.6	100.0	100.0	100.0	44.8	55.2	100.0	95.3	100.0	96.0	76.9	100.0
N/A	0.0	0.4	0.0	0.0	0.0	55.2	44.8	0.0	4.7	0.0	4.0	23.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	96.4	67.1	66.1	97.5
Fail	1.4	0.4	1.1	2.9
N/A	2.2	11.6	11.9	13.7

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '83 1.5L HONDA
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	549
Initial Test Records:	462
After Repair Test Records:	85
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	44455
Initial Test Vehicles:	43926
After Repair Test Vehicles:	46548
Referee Test Vehicles:	77750

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.6	28.4	--	--	0.0	28.4	0.0	28.4	0.0	1.1	21.6
After Repair	80.0	13.3	8.0	20.0	0.0	100.0	0.0	100.0	0.0	6.7	73.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.16	123	884	0.30	53	2501
Initial Test - Pass Vehicles	0.02	32	886	0.12	29	2502
Initial Test - Fail Vehicles	0.53	352	877	0.75	112	2498
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.53	352	877	0.75	112	2498
After Repair Test - All Vehicles	0.18	123	897	0.39	57	2492
After Repair Test - Pass Vehicles	0.10	62	890	0.24	42	2487
After Repair Test - Fail Vehicles	0.40	231	943	0.52	73	2511
After Repair Test - Inc. Repr. Vehicles	0.50	167	928	0.43	74	2491
After Repair Test - Waived Vehicles	0.32	291	891	0.91	108	2497
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.35	267	912	0.76	94	2503
Referee Test - All Vehicles	0.71	343	921	0.75	58	2531
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.71	343	921	0.75	58	2531
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.71	343	921	0.75	58	2531

Repair Action Percentages

	Yes	No	Excd
MIS	31.8	49.4	18.8
TMG	22.4	77.6	0.0
A/F	50.6	38.8	10.6
CRK	2.4	97.6	0.0
EVP	3.5	96.5	0.0
EXH	4.7	95.3	0.0
EGR	2.4	97.6	0.0
ANY	77.6	98.8	27.1

Average Repair Costs

Parts Cost: $ 6.60 Labor Cost: $ 19.06

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	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
Miss	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
Totl	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
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	99.6	7.6	94.2	67.7	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.4	92.4	5.8	32.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	60.6	55.0	54.8	82.0
Fail	0.0	0.0	0.0	0.0
N/A	39.4	21.9	22.1	53.9

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '82-'84 1.6L GM
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	1272
Initial Test Records:	1032
After Repair Test Records:	235
Referee Test Records:	5

Average Odometer Readings

All Vehicles:	51420
Initial Test Vehicles:	50107
After Repair Test Vehicles:	56863
Referee Test Vehicles:	66620

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	70.7	29.3	--	--	3.3	27.4	1.8	26.0	1.5	6.4	11.7
After Repair	77.8	27.0	8.6	21.6	7.5	95.0	5.0	92.5	2.5	25.0	35.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.32	84	884	0.66	75	2515
Initial Test - Pass Vehicles	0.04	32	889	0.16	37	2516
Initial Test - Fail Vehicles	1.00	208	869	1.86	169	2513
Initial Test - Underhood Fail Only	0.05	53	851	0.26	45	2560
Initial Test - Tailpipe Fail Only	1.07	207	871	2.00	167	2509
After Repair Test - All Vehicles	0.55	123	888	1.00	79	2493
After Repair Test - Pass Vehicles	0.16	66	895	0.45	52	2502
After Repair Test - Fail Vehicles	1.43	253	875	2.33	121	2474
After Repair Test - Inc. Repr. Vehicles	0.58	164	882	1.59	108	2489
After Repair Test - Waived Vehicles	0.87	166	882	1.36	126	2490
After Repair Test - Underhood Fail Only	0.11	88	897	0.23	39	2415
After Repair Test - Tailpipe Fail Only	1.23	217	877	1.94	125	2481
Referee Test - All Vehicles	1.13	209	879	0.68	164	2588
Referee Test - Pass Vehicles	0.46	118	950	0.55	72	2680
Referee Test - Fail Vehicles	1.30	232	862	0.71	188	2565
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.30	232	862	0.71	188	2565

Repair Action Percentages

	Yes	No	Excd
MIS	32.3	55.7	11.9
TMG	36.2	63.8	0.0
A/F	51.5	28.1	20.4
CRK	7.7	91.9	0.4
EVP	5.5	94.5	0.0
EXH	8.9	90.6	0.4
EGR	6.8	91.1	2.1
ANY	80.9	97.9	31.5

Average Repair Costs

Parts Cost: $ 12.59 Labor Cost: $ 22.06

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.3	0.2	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.2	0.6
Mod	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Miss	0.0	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Totl	0.0	0.3	0.5	0.1	0.0	0.2	0.1	0.3	0.0	0.0	0.0	0.2	1.3
Pass	99.9	99.7	99.5	99.9	99.9	44.5	55.2	99.7	96.6	82.6	95.8	69.2	100.0
N/A	0.1	0.0	0.0	0.0	0.1	55.3	44.7	0.0	3.4	17.4	4.2	30.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	93.2	53.1	52.4	96.2
Fail	1.0	0.8	1.5	2.7
N/A	5.8	19.2	19.2	23.0

Record Counts

Test Records Processed:	725
Initial Test Records:	572
After Repair Test Records:	150
Referee Test Records:	3

Average Odometer Readings

All Vehicles:	57375
Initial Test Vehicles:	57016
After Repair Test Vehicles:	58611
Referee Test Vehicles:	64067

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.5	28.5	--	--	3.1	26.7	1.7	25.3	1.4	3.3	14.3
After Repair	71.1	17.2	7.0	25.8	6.1	100.0	0.0	93.9	6.1	21.2	45.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	80	702	0.45	89	2502
Initial Test - Pass Vehicles	0.07	33	704	0.16	48	2502
Initial Test - Fail Vehicles	1.01	199	696	1.17	193	2499
Initial Test - Underhood Fail Only	0.11	40	672	0.23	31	2519
Initial Test - Tailpipe Fail Only	1.01	198	697	1.14	195	2500
After Repair Test - All Vehicles	0.35	84	771	0.83	97	2488
After Repair Test - Pass Vehicles	0.10	36	766	0.34	58	2482
After Repair Test - Fail Vehicles	0.95	148	748	2.11	103	2495
After Repair Test - Inc. Repr. Vehicles	0.18	30	754	1.60	75	2509
After Repair Test - Waived Vehicles	0.67	176	813	1.42	208	2500
After Repair Test - Underhood Fail Only	0.06	41	673	0.16	31	2517
After Repair Test - Tailpipe Fail Only	0.80	166	787	1.64	165	2497
Referee Test - All Vehicles	1.19	118	773	0.80	115	2411
Referee Test - Pass Vehicles	0.00	15	736	0.01	51	2376
Referee Test - Fail Vehicles	1.79	169	792	1.20	147	2428
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.37	143	812	0.56	126	2354

Repair Action Percentages

	Yes	No	Excd
MIS	29.3	60.7	10.0
TMG	26.7	73.3	0.0
A/F	51.3	32.7	16.0
CRK	9.3	90.7	0.0
EVP	7.3	90.7	2.0
EXH	8.7	88.7	2.7
EGR	8.0	87.3	4.7
ANY	79.3	95.3	32.7

Average Repair Costs

Parts Cost: $ 15.69 Labor Cost: $ 20.19

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	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
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
Miss	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.3
Pass	100.0	99.5	100.0	100.0	100.0	0.0	100.0	100.0	98.1	100.0	96.7	75.3	100.0
N/A	0.0	0.3	0.0	0.0	0.0	100.0	0.0	0.0	1.9	0.0	3.1	24.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	96.0	64.5	62.8	97.2
Fail	1.2	0.3	1.6	3.0
N/A	2.8	14.2	14.7	15.9

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '81-'82 1.6L 3CL GM
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	1023
Initial Test Records:	829
After Repair Test Records:	191
Referee Test Records:	3

Average Odometer Readings

All Vehicles:	51407
Initial Test Vehicles:	49629
After Repair Test Vehicles:	59001
Referee Test Vehicles:	59067

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.5	28.5	--	--	2.8	27.0	1.4	25.7	1.3	6.2	11.8
After Repair	77.4	30.8	9.6	21.9	9.4	93.8	6.3	90.6	3.1	25.0	40.6
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.31	83	886	0.63	74	2515
Initial Test - Pass Vehicles	0.04	31	891	0.15	36	2515
Initial Test - Fail Vehicles	1.00	215	874	1.83	169	2514
Initial Test - Underhood Fail Only	0.05	45	889	0.14	37	2575
Initial Test - Tailpipe Fail Only	1.04	211	873	1.95	163	2509
After Repair Test - All Vehicles	0.55	126	887	1.04	78	2495
After Repair Test - Pass Vehicles	0.16	65	891	0.45	52	2507
After Repair Test - Fail Vehicles	1.46	262	876	2.37	122	2476
After Repair Test - Inc. Repr. Vehicles	0.61	150	896	1.40	104	2512
After Repair Test - Waived Vehicles	0.68	154	892	1.30	109	2485
After Repair Test - Underhood Fail Only	0.11	88	897	0.23	39	2415
After Repair Test - Tailpipe Fail Only	1.18	220	881	1.97	118	2479
Referee Test - All Vehicles	1.69	280	838	0.71	95	2535
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	1.69	280	838	0.71	95	2535
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.69	280	838	0.71	95	2535

Repair Action Percentages

	Yes	No	Excd
MIS	33.0	55.5	11.5
TMG	37.7	62.3	0.0
A/F	51.3	27.7	20.9
CRK	7.9	91.6	0.5
EVP	5.8	94.2	0.0
EXH	9.4	90.1	0.5
EGR	6.3	91.1	2.6
ANY	80.6	97.9	32.5

Average Repair Costs

Parts Cost: $ 11.19 Labor Cost: $ 22.78

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.5
Mod	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Totl	0.0	0.2	0.2	0.0	0.0	0.2	0.0	0.4	0.0	0.0	0.0	0.2	1.1
Pass	99.9	99.8	99.8	100.0	99.9	35.1	64.7	99.6	97.2	100.0	95.3	69.5	100.0
N/A	0.1	0.0	0.0	0.0	0.1	64.7	35.3	0.0	2.8	0.0	4.7	30.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	95.8	53.8	53.3	97.7
Fail	0.8	0.6	1.2	2.4
N/A	3.4	18.0	17.9	20.1

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '83-'85 2.5L GM
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	1004
Initial Test Records:	842
After Repair Test Records:	162
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	33224
Initial Test Vehicles:	33562
After Repair Test Vehicles:	31467
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.3	28.7	--	--	1.2	27.7	1.1	27.6	0.1	0.4	26.2
After Repair	78.8	22.7	6.1	20.5	0.0	100.0	0.0	100.0	0.0	3.7	88.9
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.17	89	912	0.18	46	2534
Initial Test - Pass Vehicles	0.10	37	908	0.10	21	2533
Initial Test - Fail Vehicles	0.36	220	922	0.36	110	2537
Initial Test - Underhood Fail Only	0.05	24	904	0.07	12	2544
Initial Test - Tailpipe Fail Only	0.37	228	923	0.37	114	2536
After Repair Test - All Vehicles	0.26	110	895	0.26	46	2524
After Repair Test - Pass Vehicles	0.11	53	885	0.13	28	2538
After Repair Test - Fail Vehicles	0.48	225	927	0.51	81	2505
After Repair Test - Inc. Repr. Vehicles	0.18	78	918	0.09	24	2595
After Repair Test - Waived Vehicles	0.61	202	899	0.50	80	2493
After Repair Test - Underhood Fail Only	0.01	19	902	0.00	15	2506
After Repair Test - Tailpipe Fail Only	0.54	214	914	0.50	80	2499
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	42.0	46.9	11.1
TMG	35.2	64.2	0.6
A/F	32.1	51.2	16.7
CRK	12.3	86.4	1.2
EVP	8.6	90.1	1.2
EXH	8.0	88.9	3.1
EGR	9.9	88.3	1.9
ANY	75.3	93.8	27.8

Average Repair Costs

Parts Cost: $ 9.62 Labor Cost: $ 18.35

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Mod	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
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Pass	99.9	93.9	0.0	99.8	100.0	43.5	56.5	100.0	95.8	100.0	97.9	67.0	100.0
N/A	0.1	5.5	100.0	0.1	0.0	56.5	43.5	0.0	4.2	0.0	2.1	33.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	96.9	54.4	54.4	98.1
Fail	0.1	0.1	0.2	0.5
N/A	3.0	19.4	19.2	20.9

EPA PATTERN FAILURES (ALL OTHER STATIONS) - '82 GM TRUCK 5.7L
CALIFORNIA I/M SUMMARY STATISTICS

4-AUG-1987

Record Counts

Test Records Processed:	273
Initial Test Records:	222
After Repair Test Records:	51
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	57623
Initial Test Vehicles:	57415
After Repair Test Vehicles:	58529
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	73.9	26.1	--	--	2.7	25.2	0.9	23.4	1.8	2.7	21.2
After Repair	83.3	21.4	2.4	16.7	0.0	100.0	0.0	100.0	0.0	14.3	71.4
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.11	139	775	0.22	45	2519
Initial Test - Pass Vehicles	0.05	45	785	0.09	25	2524
Initial Test - Fail Vehicles	0.29	402	748	0.56	100	2506
Initial Test - Underhood Fail Only	0.68	92	671	0.11	13	2544
Initial Test - Tailpipe Fail Only	0.27	415	752	0.59	107	2506
After Repair Test - All Vehicles	0.56	112	850	0.68	56	2534
After Repair Test - Pass Vehicles	0.04	48	843	0.15	28	2544
After Repair Test - Fail Vehicles	2.31	268	816	2.42	98	2473
After Repair Test - Inc. Repr. Vehicles	0.00	0	960	0.01	4	2504
After Repair Test - Waived Vehicles	0.93	232	930	1.07	142	2561
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	1.71	252	866	1.83	117	2512
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	41.2	49.0	9.8
TMG	37.3	62.7	0.0
A/F	43.1	47.1	9.8
CRK	7.8	92.2	0.0
EVP	9.8	90.2	0.0
EXH	23.5	76.5	0.0
EGR	11.8	88.2	0.0
ANY	88.2	96.1	19.6

Average Repair Costs

Parts Cost: $ 17.30 Labor Cost: $ 31.59

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.9	0.5	0.0	0.0	0.5	1.4
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.9
Miss	0.0	0.0	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.4
Totl	0.0	0.0	0.9	0.5	0.5	0.5	0.0	1.4	0.5	0.0	0.5	0.5	3.6
Pass	100.0	100.0	99.1	99.5	99.5	99.5	0.0	98.6	95.5	19.8	94.6	67.1	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	4.1	80.2	5.0	32.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	72.5	66.7	66.7	90.5
Fail	0.0	0.5	0.5	0.9
N/A	27.5	15.8	15.8	38.3

Record Counts

Test Records Processed:	352
Initial Test Records:	292
After Repair Test Records:	60
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	45279
Initial Test Vehicles:	43243
After Repair Test Vehicles:	55187
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	76.0	24.0	--	--	1.7	22.9	1.0	22.3	0.7	5.1	2.7
After Repair	66.7	17.6	2.0	33.3	5.9	100.0	0.0	94.1	5.9	47.1	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.50	55	865	0.65	60	2496
Initial Test - Pass Vehicles	0.02	18	862	0.06	23	2495
Initial Test - Fail Vehicles	2.03	173	878	2.55	178	2499
Initial Test - Underhood Fail Only	0.09	36	785	0.53	50	2550
Initial Test - Tailpipe Fail Only	2.17	181	881	2.64	186	2495
After Repair Test - All Vehicles	0.37	67	873	1.30	83	2488
After Repair Test - Pass Vehicles	0.08	32	884	0.23	35	2482
After Repair Test - Fail Vehicles	0.81	108	841	3.05	151	2502
After Repair Test - Inc. Repr. Vehicles	0.01	29	806	0.88	22	2674
After Repair Test - Waived Vehicles	0.71	117	868	2.51	144	2492
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.81	121	863	2.57	144	2501
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	20.0	61.7	16.7
TMG	21.7	71.7	5.0
A/F	46.7	21.7	30.0
CRK	8.3	85.0	5.0
EVP	6.7	86.7	5.0
EXH	6.7	85.0	6.7
EGR	1.7	90.0	6.7
ANY	75.0	91.7	38.3

Average Repair Costs

Parts Cost: $ 17.03 Labor Cost: $ 25.00

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.7
Mod	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
Miss	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
Totl	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.7
Pass	100.0	99.7	100.0	99.7	100.0	0.0	100.0	100.0	95.9	100.0	94.9	65.8	100.0
N/A	0.0	0.3	0.0	0.0	0.0	100.0	0.0	0.0	4.1	0.0	5.1	33.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	76.4	56.2	56.5	90.8
Fail	0.0	0.7	0.3	1.0
N/A	23.6	21.6	21.6	40.8

Record Counts

Test Records Processed:	1035
Initial Test Records:	879
After Repair Test Records:	156
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	54014
Initial Test Vehicles:	53552
After Repair Test Vehicles:	56615
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	77.2	22.8	--	--	1.7	21.5	1.3	21.0	0.5	3.5	10.0
After Repair	74.6	20.0	3.8	23.1	0.0	100.0	0.0	100.0	0.0	23.3	43.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.33	99	769	0.47	60	2510
Initial Test - Pass Vehicles	0.04	34	770	0.17	23	2511
Initial Test - Fail Vehicles	1.31	320	765	1.47	187	2508
Initial Test - Underhood Fail Only	0.18	38	796	0.10	18	2519
Initial Test - Tailpipe Fail Only	1.40	339	762	1.55	200	2508
After Repair Test - All Vehicles	0.60	125	817	0.94	92	2502
After Repair Test - Pass Vehicles	0.18	49	814	0.36	47	2504
After Repair Test - Fail Vehicles	1.55	291	802	2.36	132	2485
After Repair Test - Inc. Repr. Vehicles	0.53	151	835	2.44	341	2434
After Repair Test - Waived Vehicles	1.20	239	845	1.66	213	2505
After Repair Test - Underhood Fail Only	0.02	18	773	0.17	15	2562
After Repair Test - Tailpipe Fail Only	1.36	263	825	1.98	176	2496
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	39.1	53.2	7.7
TMG	33.3	66.0	0.6
A/F	42.9	37.2	19.9
CRK	7.7	92.3	0.0
EVP	7.7	92.3	0.0
EXH	10.9	88.5	0.6
EGR	6.4	91.7	1.9
ANY	81.4	96.8	28.2

Average Repair Costs

Parts Cost: $ 9.45 Labor Cost: $ 24.77

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.6
Mod	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2
Totl	0.0	0.0	0.3	0.1	0.1	0.2	0.0	0.2	0.0	0.0	0.0	0.1	1.0
Pass	100.0	99.9	97.5	99.9	99.5	57.7	41.9	99.5	95.8	71.2	96.1	71.1	100.0
N/A	0.0	0.1	2.2	0.0	0.3	42.1	58.1	0.2	4.2	28.8	3.9	28.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	88.6	70.4	69.2	95.3
Fail	0.1	0.0	0.9	1.0
N/A	11.3	13.3	13.7	21.8

Appendix D

Failure Rates for All Vehicle Groups Found in TAS Records

1981 AND LATER VEHICLES FROM JUNE 86 CALIFORNIA TAS SAMPLE

Vehicle Type	Model Year	Make	Engine Size (liters)	Emission Control System Air	Cat	EGR	Loop	Number of Vehicles	% With Replicate Initial Tests	Failure Rates (%) Tailpipe	Overall
T	85	FORD	2.3	N	T	Y	C	47	29.79 %	85.11 %	85.11 %
P	84	OLDS	5.0	Y	O	Y	O	21	33.33 %	80.85 %	80.95 %
P	81	DODG	1.4	Y	O	Y	O	53	13.21 %	71.70 %	71.70 %
P	82	DATS	1.2	Y	O	Y	O	77	16.88 %	68.83 %	70.13 %
P	81	PLYM	1.4	Y	O	Y	O	41	9.76 %	65.85 %	68.29 %
P	81	FIAT	2.0	N	T	N	O	23	13.04 %	65.22 %	65.22 %
P	81	DODG	1.6	Y	O	Y	O	92	11.96 %	64.13 %	64.13 %
T	82	CHEV	1.9	Y	T	Y	C	25	16.00 %	64.00 %	64.00 %
P	82	DODG	1.4	Y	O	Y	O	47	19.15 %	63.83 %	63.83 %
P	81	AUDI	1.7	N	T	N	O	23	4.35 %	60.87 %	60.87 %
P	83	DODG	1.4	Y	O	Y	O	48	20.83 %	60.42 %	62.50 %
P	83	FORD	2.3	N	T	Y	C	25	32.00 %	60.00 %	60.00 %
P	85	BUIC	5.0	Y	T	Y	C	40	37.50 %	60.00 %	60.00 %
P	82	PLYM	1.4	Y	O	Y	O	34	14.71 %	58.82 %	58.82 %
P	83	MITS	1.8	N	O	Y	O	24	4.17 %	58.33 %	58.33 %
P	83	NISN	1.6	Y	T	Y	O	31	12.90 %	58.06 %	58.06 %
P	84	OLDS	5.0	Y	T	Y	C	348	26.72 %	56.61 %	56.90 %
P	83	BOND	1.3	N	O	Y	O	23	26.09 %	56.52 %	56.52 %
P	81	FORD	1.6	Y	T	Y	C	86	16.28 %	55.81 %	56.98 %
T	83	FORD	2.8	Y	T	Y	C	128	17.19 %	55.47 %	55.47 %
P	84	BUIC	5.0	Y	T	Y	C	181	19.89 %	55.25 %	55.25 %
P	84	RENA	1.4	N	T	Y	O	20	5.00 %	55.00 %	55.00 %
P	84	PONT	2.5	Y	T	Y	C	33	27.27 %	54.55 %	54.55 %
P	82	TOYO	1.5	Y	T	Y	O	46	19.57 %	54.35 %	54.35 %
T	82	FORD	5.8	Y	T	Y	O	24	12.50 %	54.17 %	54.17 %
P	82	FORD	5.0	Y	T	Y	C	109	14.68 %	54.13 %	54.13 %
P	81	PLYM	1.6	Y	O	Y	O	73	12.33 %	53.42 %	53.42 %
P	81	DATS	1.2	Y	O	Y	O	90	17.78 %	53.33 %	53.33 %
P	82	FORD	5.0	Y	O	Y	O	34	20.59 %	52.94 %	52.94 %
P	81	MAZD	1.1	Y	T	N	O	72	18.06 %	52.78 %	52.78 %
P	83	PONT	1.8	Y	T	Y	C	36	11.11 %	52.78 %	52.78 %
P	81	DATS	1.5	N	O	Y	O	116	11.21 %	52.59 %	52.59 %
T	81	TOYO	2.4	Y	T	Y	O	101	7.92 %	52.48 %	54.46 %
P	82	TOYO	1.6	Y	T	Y	C	21	19.05 %	52.38 %	52.38 %
P	83	MITS	1.8	Y	O	Y	O	86	22.09 %	52.33 %	52.33 %
P	81	TOYO	1.3	Y	O	Y	O	117	15.38 %	52.14 %	52.14 %
P	81	VOLK	1.8	N	T	N	O	25	16.00 %	52.00 %	52.00 %
T	84	FORD	2.8	Y	T	Y	O	25	16.00 %	52.00 %	52.00 %
P	82	MAZD	1.5	Y	T	Y	C	41	4.88 %	51.22 %	53.66 %
P	81	OLDS	2.8	Y	T	Y	C	20	10.00 %	50.00 %	50.00 %
P	81	TOYO	1.4	Y	T	Y	O	46	13.04 %	50.00 %	50.00 %
P	82	DATS	1.4	Y	O	Y	O	24	16.67 %	50.00 %	50.00 %
P	82	DATS	1.6	Y	O	Y	O	20	10.00 %	50.00 %	50.00 %
P	83	MERC	1.6	Y	T	Y	C	22	4.55 %	50.00 %	50.00 %
P	83	RENA	1.4	N	T	Y	C	42	16.67 %	50.00 %	52.38 %
T	82	ISUZ	1.8	Y	T	Y	C	20	15.00 %	50.00 %	50.00 %
P	81	MAZD	1.5	Y	O	Y	O	129	10.08 %	49.61 %	49.61 %
P	85	OLDS	5.0	Y	T	Y	C	59	30.51 %	49.15 %	49.15 %
T	81	TOYO	2.4	Y	O	Y	O	216	13.43 %	49.07 %	52.78 %
P	81	FORD	2.3	Y	O	Y	O	94	7.45 %	48.94 %	51.06 %
P	81	MAZD	1.5	Y	T	Y	O	137	12.41 %	48.91 %	50.36 %
T	81	TOYO	2.4	Y	T	Y	C	426	12.44 %	48.83 %	53.76 %
P	82	DODG	1.8	Y	O	Y	O	39	23.08 %	48.72 %	48.72 %
P	84	ISUZ	2.0	N	T	Y	C	39	25.64 %	48.72 %	48.72 %
P	84	NISN	1.6	N	T	Y	O	33	18.18 %	48.48 %	51.52 %
P	82	TOYO	1.4	Y	T	Y	O	64	14.06 %	48.44 %	48.44 %
T	83	DODG	3.7	Y	O	Y	O	31	9.68 %	48.39 %	48.39 %
P	84	PONT	2.5	N	T	Y	C	153	16.99 %	48.37 %	49.02 %
P	82	MAZD	1.5	Y	O	Y	O	110	12.73 %	48.18 %	48.18 %
P	82	FORD	4.9	Y	T	Y	C	27	22.22 %	48.15 %	51.85 %
T	81	DATS	2.0	Y	O	Y	O	27	7.41 %	48.15 %	48.15 %
P	81	TOYO	1.5	Y	T	Y	C	102	8.82 %	48.04 %	49.02 %
P	83	DATS	1.8	N	T	Y	O	25	8.00 %	48.00 %	48.00 %
P	82	TOYO	1.5	Y	T	Y	C	165	14.55 %	47.27 %	47.88 %
T	82	GMC	2.8	Y	T	Y	C	36	13.89 %	47.22 %	47.22 %
P	83	DATS	1.6	Y	T	Y	C	89	15.73 %	47.19 %	48.31 %
P	82	TOYO	1.4	Y	O	Y	O	70	15.71 %	47.14 %	50.00 %
P	83	NISN	1.6	Y	T	Y	C	157	13.38 %	47.13 %	47.77 %
P	81	VOLK	1.6	N	T	N	C	34	2.94 %	47.06 %	47.06 %
P	84	NISN	1.6	Y	T	Y	O	34	20.59 %	47.06 %	47.06 %
P	82	FORD	1.6	Y	T	Y	C	149	12.75 %	46.98 %	46.98 %
P	81	DATS	1.5	Y	O	Y	O	676	11.69 %	46.89 %	47.78 %
P	83	NISN	1.8	N	T	Y	O	32	15.63 %	46.88 %	50.00 %
T	81	FORD	5.0	Y	T	Y	C	32	12.50 %	46.88 %	46.88 %
T	83	FORD	2.3	Y	O	Y	O	32	15.63 %	46.88 %	46.88 %

T	84	FORD	4.9	Y	T	Y	C	175	18.29 %	46.29 %	46.29 %
P	81	FORD	1.6	Y	O	Y	O	238	8.82 %	46.22 %	48.32 %
P	81	TOYO	1.3	N	O	Y	O	26	15.38 %	46.15 %	50.00 %
T	83	FORD	2.3	Y	T	Y	C	280	13.57 %	46.07 %	46.07 %
P	82	MERC	1.6	Y	O	Y	O	37	10.81 %	45.95 %	45.95 %
P	84	BUIC	2.5	N	T	Y	C	37	16.22 %	45.95 %	45.95 %
T	82	FORD	2.3	Y	T	Y	C	24	20.83 %	45.83 %	45.83 %
P	83	PONT	1.8	N	T	Y	C	33	9.09 %	45.45 %	45.45 %
P	84	TOYO	1.5	N	T	Y	C	22	13.64 %	45.45 %	45.45 %
P	81	TOYO	1.5	Y	O	Y	O	64	10.94 %	45.31 %	46.88 %
P	83	BUIC	1.8	Y	T	Y	C	20	10.00 %	45.00 %	45.00 %
P	82	FORD	1.6	Y	O	Y	O	189	13.23 %	44.97 %	45.50 %
P	82	FORD	1.6	Y	T	Y	O	334	11.08 %	44.91 %	47.31 %
P	82	MERC	5.0	Y	T	Y	C	49	14.29 %	44.90 %	46.94 %
P	82	CHEV	5.7	Y	T	Y	C	65	13.85 %	44.62 %	46.15 %
P	82	TOYO	1.4	Y	T	Y	C	213	13.62 %	44.60 %	45.07 %
T	81	FORD	5.0	Y	O	Y	O	27	3.70 %	44.44 %	48.15 %
P	83	NISN	1.6	N	T	Y	C	268	12.31 %	44.03 %	45.90 %
T	82	TOYO	2.2	Y	T	Y	C	25	8.00 %	44.00 %	44.00 %
P	82	FORD	2.3	Y	T	Y	O	41	19.51 %	43.90 %	48.78 %
P	83	FORD	2.3	Y	T	Y	O	23	8.70 %	43.48 %	47.83 %
T	84	FORD	2.8	Y	T	Y	C	500	12.80 %	43.40 %	43.40 %
P	81	DODG	5.2	Y	T	Y	C	30	10.00 %	43.33 %	43.33 %
P	82	DATS	1.5	Y	O	Y	O	416	11.06 %	43.27 %	43.51 %
P	81	FORD	1.6	Y	T	Y	O	222	10.36 %	43.24 %	44.14 %
P	81	MERC	1.6	Y	O	Y	O	58	10.34 %	43.10 %	46.55 %
P	83	DATS	1.6	Y	O	Y	O	56	10.71 %	42.86 %	44.64 %
P	83	TOYO	1.3	N	T	N	C	21	14.29 %	42.86 %	42.86 %
P	81	FIAT	2.0	N	T	N	C	21	4.76 %	42.86 %	42.86 %
T	84	FORD	2.3	Y	T	Y	O	28	17.86 %	42.86 %	42.86 %
T	81	CHEV	5.0	Y	O	Y	O	148	8.78 %	42.57 %	43.24 %
P	81	TOYO	1.5	Y	T	Y	O	33	12.12 %	42.42 %	42.42 %
T	84	FORD	4.9	Y	O	Y	O	26	15.38 %	42.31 %	42.31 %
T	81	FORD	4.9	Y	T	Y	O	45	6.67 %	42.22 %	42.22 %
P	84	FORD	2.3	Y	O	Y	O	38	21.05 %	42.11 %	42.11 %
T	83	FORD	2.3	Y	T	Y	O	57	12.28 %	42.11 %	43.86 %
P	81	DATS	1.4	Y	O	Y	O	50	8.00 %	42.00 %	48.00 %
P	82	CHEV	2.8	Y	O	Y	O	31	16.13 %	41.94 %	41.94 %
P	82	TOYO	1.3	Y	O	Y	O	62	8.06 %	41.94 %	45.16 %
T	81	FORD	5.8	Y	T	Y	C	55	3.64 %	41.82 %	41.82 %
P	83	DATS	1.6	N	T	Y	C	134	14.93 %	41.79 %	46.27 %
P	82	DATS	2.2	Y	T	Y	C	24	8.33 %	41.67 %	45.83 %
T	82	CHEV	2.8	Y	T	Y	C	195	9.74 %	41.54 %	42.05 %
P	81	DATS	2.0	N	T	Y	O	46	10.87 %	41.30 %	41.30 %
P	81	MAZD	1.5	Y	T	Y	C	34	11.76 %	41.18 %	41.18 %
T	84	FORD	2.3	Y	T	Y	C	139	15.83 %	41.01 %	41.01 %
P	81	TOYO	1.8	Y	O	Y	O	264	10.61 %	40.91 %	42.42 %
P	81	FORD	2.3	Y	T	Y	O	88	5.68 %	40.91 %	46.59 %
P	81	DATS	2.8	N	T	Y	C	208	10.10 %	40.87 %	42.31 %
T	82	GMC	5.0	Y	O	Y	O	27	7.41 %	40.74 %	44.44 %
P	82	PLYM	1.6	Y	O	Y	O	37	5.41 %	40.54 %	40.54 %
T	84	DODG	2.0	Y	O	Y	O	47	17.02 %	40.43 %	40.43 %
T	84	DODG	3.7	Y	T	Y	C	52	11.54 %	40.38 %	42.31 %
P	83	FORD	3.3	Y	T	Y	C	50	20.00 %	40.00 %	40.00 %
P	81	MERB	3.8	Y	T	N	C	25	20.00 %	40.00 %	40.00 %
P	81	MERC	1.6	Y	T	Y	O	50	12.00 %	40.00 %	40.00 %
T	82	CHEV	1.9	Y	O	Y	O	20	10.00 %	40.00 %	40.00 %
P	82	MAZD	1.5	Y	T	Y	O	113	12.39 %	39.82 %	43.36 %
T	81	DODG	3.7	Y	O	Y	O	68	7.35 %	39.71 %	39.71 %
P	83	NISN	1.6	N	O	Y	O	48	14.58 %	39.58 %	39.58 %
T	81	TOYO	2.2	Y	O	Y	O	38	7.89 %	39.47 %	39.47 %
P	84	BUIC	1.8	N	T	Y	C	28	10.71 %	39.29 %	42.86 %
P	84	CHEV	2.5	Y	T	Y	C	28	10.71 %	39.29 %	39.29 %
P	81	VOLK	1.7	N	T	Y	O	23	8.70 %	39.13 %	39.13 %
T	81	CHEV	5.7	Y	N	N	O	23	4.35 %	39.13 %	39.13 %
P	81	PONT	2.8	Y	T	Y	C	23	8.70 %	39.13 %	39.13 %
P	81	PONT	1.6	Y	T	Y	C	23	8.70 %	39.13 %	39.13 %
P	84	FORD	2.8	Y	T	Y	C	87	19.54 %	39.08 %	39.08 %
P	84	FORD	2.3	Y	T	Y	O	82	14.63 %	39.02 %	39.02 %
P	82	NISN	1.5	Y	O	Y	O	108	12.96 %	38.89 %	38.81 %
P	81	TOYO	1.4	Y	O	Y	O	75	8.00 %	38.67 %	38.67 %
P	81	VOLK	1.7	N	T	Y	C	26	7.69 %	38.46 %	38.46 %
P	81	TOYO	1.4	Y	T	Y	C	169	13.02 %	38.46 %	40.24 %
P	81	VOLK	1.7	N	T	N	O	167	6.59 %	38.32 %	38.92 %
P	81	MERB	3.8	Y	T	N	O	21	14.29 %	38.10 %	42.86 %
P	81	FORD	2.3	Y	T	Y	C	239	11.30 %	38.08 %	41.42 %
P	81	TOYO	1.8	Y	T	Y	O	200	11.00 %	38.00 %	39.50 %
P	83	FORD	1.6	Y	T	Y	C	130	20.77 %	37.69 %	37.69 %
P	81	TOYO	1.8	Y	T	Y	C	690	11.16 %	37.68 %	39.86 %
P	81	AUDI	1.7	N	T	N	C	24	4.17 %	37.50 %	37.50 %
P	83	HOND	1.3	Y	O	Y	O	110	15.45 %	37.27 %	38.18 %
P	83	DATS	1.6	N	O	Y	O	27	11.11 %	37.04 %	37.04 %
P	81	MAZD	1.1	Y	O	N	O	81	7.41 %	37.04 %	37.04 %
P	81	DATS	2.4	N	O	Y	O	38	7.89 %	36.84 %	39.47 %

P	81	DATS	2.0	M	T	Y	C	151	16.56 %	36.42 %	37.09 %
P	82	DATS	2.8	M	T	Y	C	198	8.08 %	36.36 %	38.38 %
P	81	FORD	5.0	Y	T	Y	O	22	0.00 %	36.36 %	40.91 %
T	82	FORD	5.0	Y	O	Y	O	33	18.18 %	36.36 %	36.36 %
P	81	CHEV	1.6	Y	T	Y	C	168	9.52 %	36.31 %	39.29 %
T	81	CHEV	5.7	Y	O	Y	O	91	6.59 %	36.26 %	40.66 %
T	82	FORD	4.9	Y	O	Y	O	72	4.17 %	36.11 %	37.50 %
P	84	NISN	1.6	Y	O	Y	O	25	20.00 %	36.00 %	36.00 %
T	82	TOYO	2.2	Y	O	Y	O	25	12.00 %	36.00 %	36.00 %
T	81	FORD	4.9	Y	T	Y	C	139	8.63 %	35.97 %	41.73 %
P	81	MERC	5.0	Y	T	Y	C	28	14.29 %	35.71 %	35.71 %
T	81	GMC	5.0	Y	O	Y	O	28	14.29 %	35.71 %	39.29 %
P	81	HOND	1.3	M	O	Y	O	160	14.38 %	35.63 %	36.25 %
P	81	CHEV	5.0	Y	O	Y	O	45	11.11 %	35.56 %	37.78 %
P	81	DATS	1.6	Y	O	Y	O	31	6.45 %	35.48 %	35.48 %
P	81	CHEV	1.6	Y	O	Y	O	79	8.86 %	35.44 %	40.51 %
P	81	BUIC	2.8	Y	T	Y	C	96	11.46 %	35.42 %	39.58 %
T	81	FORD	5.8	Y	O	Y	O	48	8.33 %	35.42 %	41.67 %
P	82	DATS	1.5	M	O	Y	O	65	3.08 %	35.38 %	35.38 %
P	82	FORD	3.8	Y	T	Y	O	34	8.82 %	35.29 %	35.29 %
T	82	TOYO	2.4	Y	T	Y	O	136	6.62 %	35.29 %	37.50 %
T	83	NISN	2.4	Y	T	Y	C	68	11.76 %	35.29 %	38.24 %
P	83	FORD	1.6	Y	T	Y	O	188	11.17 %	35.11 %	37.23 %
P	83	PLYM	2.2	Y	T	Y	O	20	15.00 %	35.00 %	35.00 %
P	84	MITS	1.8	Y	T	Y	C	40	17.50 %	35.00 %	35.00 %
P	84	MITS	2.0	Y	T	Y	O	20	15.00 %	35.00 %	35.00 %
P	81	SUBA	1.6	Y	T	Y	O	20	10.00 %	35.00 %	35.00 %
P	83	MITS	1.8	Y	T	Y	O	23	4.35 %	34.78 %	34.78 %
P	84	TOYO	1.4	Y	T	Y	O	23	4.35 %	34.78 %	34.78 %
T	81	FORD	4.9	Y	O	Y	O	115	9.57 %	34.78 %	39.13 %
P	81	SUBA	1.6	M	T	Y	O	23	4.35 %	34.78 %	34.78 %
T	84	FORD	2.8	Y	O	Y	O	23	13.04 %	34.78 %	34.78 %
P	81	FORD	5.0	Y	T	Y	C	95	6.32 %	34.74 %	37.89 %
P	82	FORD	4.2	Y	T	Y	C	26	0.00 %	34.62 %	34.62 %
P	81	MERC	4.2	Y	T	Y	C	26	15.38 %	34.62 %	38.46 %
P	81	DATS	2.8	M	T	Y	O	52	5.77 %	34.62 %	40.38 %
T	83	FORD	4.9	Y	O	Y	O	52	15.38 %	34.62 %	34.62 %
T	82	FORD	5.8	Y	T	Y	C	116	11.21 %	34.48 %	36.21 %
P	85	CHEV	1.0	Y	T	Y	C	38	15.79 %	34.21 %	34.21 %
P	85	PONT	2.5	M	T	Y	C	38	13.16 %	34.21 %	34.21 %
P	82	MERC	3.8	Y	T	Y	C	47	12.77 %	34.04 %	36.17 %
P	82	FORD	5.0	Y	T	Y	O	68	4.41 %	33.82 %	33.82 %
T	82	FORD	5.0	Y	T	Y	C	77	10.39 %	33.77 %	35.06 %
P	82	FORD	3.8	Y	T	Y	C	83	8.43 %	33.73 %	34.94 %
P	85	FORD	2.3	Y	T	Y	C	205	12.68 %	33.66 %	33.66 %
P	82	MERC	1.8	Y	T	Y	C	21	19.05 %	33.33 %	33.33 %
T	81	DATS	2.2	M	O	Y	O	36	2.78 %	33.33 %	36.11 %
P	81	DATS	2.2	Y	O	Y	O	24	4.17 %	33.33 %	33.33 %
T	82	CHEV	5.7	Y	O	Y	O	45	6.67 %	33.33 %	33.33 %
T	82	DODG	3.7	Y	O	Y	O	99	5.05 %	33.33 %	33.33 %
T	82	FORD	4.9	Y	T	Y	O	27	11.11 %	33.33 %	33.33 %
T	83	FORD	4.9	Y	T	Y	O	27	7.41 %	33.33 %	37.04 %
P	81	PONT	3.8	Y	O	Y	O	33	6.06 %	33.33 %	33.33 %
P	81	CHEV	3.8	Y	T	Y	C	380	7.89 %	32.89 %	33.68 %
P	84	TOYO	1.5	Y	T	Y	C	70	14.29 %	32.86 %	32.86 %
P	81	DATS	2.4	M	T	Y	C	55	5.45 %	32.73 %	32.73 %
P	83	FORD	1.6	Y	O	Y	O	107	11.21 %	32.71 %	32.71 %
T	82	TOYO	2.4	Y	O	Y	O	208	9.13 %	32.69 %	33.17 %
T	81	MAZD	2.0	Y	O	Y	O	49	4.08 %	32.65 %	36.73 %
P	81	BUIC	5.0	Y	T	Y	C	46	15.22 %	32.61 %	32.61 %
P	82	MAZD	2.0	Y	O	Y	O	172	13.37 %	32.56 %	33.14 %
P	81	MAZD	2.0	Y	O	Y	O	169	10.06 %	32.54 %	32.54 %
P	81	CHEV	2.8	Y	T	Y	C	99	8.08 %	32.32 %	33.33 %
P	81	FORD	4.2	Y	T	Y	C	65	10.77 %	32.31 %	32.31 %
T	83	NISN	2.4	M	T	Y	C	96	11.46 %	32.29 %	32.29 %
P	85	CHEV	2.5	M	T	Y	C	31	16.13 %	32.26 %	32.26 %
P	81	FORD	4.1	Y	O	Y	O	31	0.00 %	32.26 %	32.26 %
T	82	TOYO	2.4	Y	T	Y	C	625	9.92 %	32.16 %	33.12 %
P	81	MERC	1.6	Y	T	Y	C	28	7.14 %	32.14 %	35.71 %
P	83	CHEV	2.8	Y	O	Y	O	25	8.00 %	32.00 %	32.00 %
P	83	PONT	1.6	Y	T	Y	C	25	12.00 %	32.00 %	32.00 %
P	84	TOYO	1.6	Y	O	Y	O	25	8.00 %	32.00 %	32.00 %
P	82	MAZD	1.1	Y	T	M	C	25	0.00 %	32.00 %	32.00 %
P	82	DODG	5.2	Y	T	Y	C	22	4.55 %	31.82 %	31.82 %
P	82	TOYO	1.8	Y	O	Y	O	126	6.35 %	31.75 %	31.75 %
P	82	FORD	2.3	Y	T	Y	C	120	10.83 %	31.67 %	35.00 %
T	83	TOYO	2.4	Y	O	Y	O	152	9.21 %	31.58 %	32.89 %
P	84	CHEV	2.5	M	T	Y	C	51	9.80 %	31.37 %	31.37 %
T	83	FORD	4.9	Y	T	Y	C	148	9.46 %	31.08 %	31.76 %
P	81	PLYM	2.2	Y	O	Y	O	26	11.54 %	30.77 %	34.62 %
P	84	RENA	1.4	M	T	Y	C	62	8.06 %	30.65 %	30.65 %
P	84	DATS	2.9	M	T	Y	C	59	10.17 %	30.51 %	30.51 %
P	82	PLYM	2.2	Y	O	Y	O	23	4.35 %	30.43 %	30.43 %
P	84	OLDS	2.5	M	T	Y	C	69	10.14 %	30.43 %	30.43 %

P	82	CHEV	3.8	Y	T	Y	C	146	4.79 %	30.14 %	32.19 %
P	81	DATS	2.8	N	O	Y	O	143	7.69 %	30.07 %	30.07 %
P	83	BOND	1.5	Y	O	Y	O	443	10.38 %	30.02 %	30.02 %
P	81	PLYM	2.2	Y	T	Y	O	20	15.00 %	30.00 %	30.00 %
P	83	MERC	1.6	Y	T	Y	O	40	7.50 %	30.00 %	30.00 %
P	83	MERC	3.3	Y	O	Y	O	20	10.00 %	30.00 %	30.00 %
P	82	MERC	3.3	Y	T	Y	O	50	8.00 %	30.00 %	30.00 %
P	81	TOYO	2.4	Y	O	Y	O	150	7.33 %	30.00 %	33.33 %
P	81	MERC	3.3	Y	T	Y	O	20	10.00 %	30.00 %	30.00 %
P	81	DATS	2.0	Y	T	Y	C	20	15.00 %	30.00 %	30.00 %
P	81	PONT	3.8	Y	T	Y	C	107	5.61 %	29.91 %	31.78 %
P	84	NISN	1.6	N	T	Y	C	265	8.30 %	29.81 %	31.70 %
P	82	CHRY	5.2	Y	T	Y	C	104	5.77 %	29.81 %	30.77 %
P	81	FORD	4.9	Y	T	Y	C	44	4.55 %	29.55 %	31.82 %
T	83	TOYO	2.4	Y	T	Y	C	610	10.00 %	29.51 %	30.33 %
T	82	CHEV	2.8	Y	O	Y	O	51	9.80 %	29.41 %	29.41 %
T	82	JEEP	4.2	Y	T	Y	C	34	5.88 %	29.41 %	29.41 %
T	83	CHEV	5.0	Y	O	Y	O	51	13.73 %	29.41 %	29.41 %
P	83	PONT	3.8	Y	T	Y	C	41	4.88 %	29.27 %	29.27 %
P	81	DODG	2.2	Y	T	Y	C	113	7.96 %	29.20 %	30.97 %
P	82	MAZD	2.0	Y	T	Y	O	137	13.87 %	29.20 %	29.93 %
P	84	RENA	1.4	N	T	N	C	24	12.50 %	29.17 %	29.17 %
P	82	CHEV	2.5	N	O	Y	O	24	4.17 %	29.17 %	29.17 %
P	83	TOYO	1.4	Y	O	Y	O	31	9.68 %	29.03 %	29.03 %
P	82	MAZD	1.1	Y	T	N	O	93	10.75 %	29.03 %	29.03 %
P	82	DATS	2.0	Y	O	Y	O	90	10.00 %	28.89 %	31.11 %
P	81	MAZD	2.0	Y	T	Y	C	52	5.77 %	28.85 %	30.77 %
P	82	DATS	2.2	N	T	Y	C	115	9.57 %	28.70 %	30.43 %
P	81	DODG	2.2	Y	O	Y	O	21	0.00 %	28.57 %	33.33 %
P	81	FORD	3.3	Y	T	Y	C	35	8.57 %	28.57 %	34.29 %
P	81	BUIC	3.8	Y	T	Y	C	336	6.25 %	28.57 %	31.55 %
P	82	OLDS	2.8	Y	T	Y	C	21	14.29 %	28.57 %	28.57 %
P	82	MAZD	2.0	Y	T	Y	C	56	8.93 %	28.57 %	28.57 %
T	81	FORD	2.0	Y	O	Y	O	70	4.29 %	28.57 %	32.86 %
P	84	FORD	2.3	Y	T	Y	C	580	10.86 %	28.45 %	28.62 %
T	83	CHEV	2.8	Y	O	Y	O	81	12.35 %	28.40 %	30.86 %
P	81	CHEV	3.8	Y	O	Y	O	138	5.80 %	28.26 %	28.99 %
P	82	TOYO	1.8	Y	T	Y	C	507	7.69 %	28.21 %	28.80 %
P	82	FORD	2.3	Y	O	Y	O	39	2.56 %	28.21 %	33.33 %
P	82	BUIC	2.8	Y	T	Y	C	75	12.00 %	28.00 %	30.67 %
P	83	SUBA	1.8	Y	O	Y	O	25	8.00 %	28.00 %	28.00 %
P	82	DATS	2.2	N	T	Y	O	25	8.00 %	28.00 %	28.00 %
P	81	CHRY	5.2	Y	T	Y	C	61	4.92 %	27.87 %	29.51 %
P	83	FORD	5.0	Y	T	Y	O	83	7.23 %	27.71 %	27.71 %
P	84	DODG	1.6	Y	T	Y	C	65	13.85 %	27.69 %	29.23 %
P	84	NISN	1.6	Y	T	Y	C	210	10.95 %	27.62 %	29.52 %
P	84	FORD	5.0	Y	O	Y	O	29	10.34 %	27.59 %	27.59 %
P	83	TOYO	1.4	Y	T	Y	O	51	11.76 %	27.45 %	31.37 %
P	84	CADI	4.1	Y	T	Y	O	22	9.09 %	27.27 %	27.27 %
P	81	CHEV	5.0	Y	T	Y	C	118	10.17 %	27.12 %	27.97 %
P	83	TOYO	1.4	Y	T	Y	C	259	7.34 %	27.03 %	27.41 %
T	83	DODG	3.7	Y	T	Y	C	63	9.52 %	26.98 %	26.98 %
P	83	NISN	1.6	Y	O	Y	O	89	17.98 %	26.97 %	26.97 %
P	82	OLDS	3.8	Y	O	Y	O	52	3.85 %	26.92 %	26.92 %
T	81	DODG	2.5	Y	O	Y	O	26	7.69 %	26.92 %	26.92 %
P	82	BUIC	3.8	Y	T	Y	C	197	1.52 %	26.90 %	28.93 %
P	84	BOND	1.3	N	T	Y	O	41	21.95 %	26.83 %	26.83 %
P	84	JEEP	2.5	Y	T	Y	C	41	12.20 %	26.83 %	26.83 %
P	81	OLDS	3.8	Y	T	Y	C	326	4.91 %	26.69 %	27.91 %
P	81	MERC	5.8	Y	T	Y	C	30	6.67 %	26.67 %	30.00 %
P	82	DATS	2.8	N	O	Y	O	30	13.33 %	26.67 %	26.67 %
P	81	VOLK	1.7	N	T	N	C	150	6.00 %	26.67 %	30.00 %
T	81	DATS	2.2	Y	O	Y	O	378	8.73 %	26.19 %	27.25 %
P	82	PONT	2.8	Y	T	Y	C	88	6.82 %	26.14 %	27.27 %
P	81	FORD	4.9	Y	O	Y	O	23	4.35 %	26.09 %	26.09 %
P	81	MERC	3.3	Y	O	Y	O	115	5.22 %	26.09 %	26.96 %
P	81	BMW	1.8	N	T	N	O	69	5.80 %	26.09 %	26.09 %
T	84	NISN	2.4	Y	O	Y	O	69	6.70 %	26.09 %	26.09 %
T	81	FORD	2.3	Y	O	Y	O	100	2.00 %	26.00 %	28.00 %
P	84	FORD	1.8	Y	T	Y	C	158	7.59 %	25.95 %	25.95 %
P	84	BUIC	2.0	Y	T	Y	C	27	7.41 %	25.93 %	25.93 %
P	83	TOYO	1.4	N	T	Y	C	31	9.68 %	25.81 %	25.81 %
P	85	OLDS	2.5	N	T	Y	C	31	12.90 %	25.81 %	25.81 %
P	82	PONT	1.6	Y	T	Y	C	31	16.13 %	25.81 %	25.81 %
P	85	BOND	1.8	Y	O	Y	O	39	17.95 %	25.64 %	25.64 %
P	81	MERC	2.3	Y	T	Y	C	43	11.63 %	25.58 %	30.23 %
P	81	BUIC	3.8	Y	O	Y	O	90	3.33 %	25.56 %	26.67 %
P	85	RENA	1.4	N	T	Y	C	47	8.51 %	25.53 %	25.53 %
P	83	TOYO	1.5	Y	T	Y	C	165	14.55 %	25.45 %	27.27 %
P	81	FORD	3.3	Y	O	Y	O	511	5.28 %	25.44 %	28.77 %
P	84	DODG	1.4	Y	T	Y	C	88	10.23 %	25.00 %	26.14 %
P	83	CHEV	2.5	Y	T	Y	C	28	3.57 %	25.00 %	25.00 %
P	84	MITS	2.0	Y	T	Y	C	104	4.81 %	25.00 %	25.00 %
P	84	RENA	1.4	Y	T	Y	C	20	15.00 %	25.00 %	25.00 %

T	82	DATS	2.2	Y	O	Y	O	329	6.38 %	24.92 %	26.14 %
T	82	FORD	4.9	Y	T	Y	C	177	6.78 %	24.86 %	27.12 %
P	81	OLDS	5.0	Y	T	Y	C	65	9.23 %	24.62 %	26.15 %
P	85	TOYO	1.6	N	T	Y	C	102	11.76 %	24.51 %	24.51 %
P	83	FORD	2.3	Y	T	Y	C	98	10.20 %	24.49 %	25.51 %
P	81	TOYO	2.4	Y	T	Y	C	424	9.43 %	24.29 %	26.42 %
T	82	CHEV	5.0	Y	O	Y	O	136	7.35 %	24.26 %	25.00 %
T	82	FORD	2.3	Y	O	Y	O	33	6.06 %	24.24 %	24.24 %
P	82	CHEV	2.8	Y	T	Y	C	269	7.06 %	24.16 %	26.39 %
P	82	DATS	2.2	Y	O	Y	O	29	6.90 %	24.14 %	27.59 %
P	84	TOYO	1.6	N	T	Y	C	58	12.07 %	24.14 %	24.14 %
P	83	DATS	2.4	N	T	Y	O	29	10.34 %	24.14 %	31.03 %
P	82	SUBA	1.6	Y	T	Y	O	29	0.00 %	24.14 %	24.14 %
T	83	JEEP	4.2	Y	T	Y	C	29	10.34 %	24.14 %	24.14 %
P	83	TOYO	1.5	N	T	Y	C	25	8.00 %	24.00 %	24.00 %
P	84	MITS	2.6	Y	T	Y	C	25	8.00 %	24.00 %	24.00 %
P	82	DATS	2.8	N	T	Y	O	67	5.97 %	23.88 %	23.88 %
P	82	BMW	2.0	N	T	N	C	21	9.52 %	23.81 %	23.81 %
P	81	CHEV	2.8	Y	O	Y	O	42	2.38 %	23.81 %	26.19 %
T	82	FORD	2.0	Y	O	Y	O	21	9.52 %	23.81 %	23.81 %
P	81	FORD	5.8	Y	T	Y	C	38	5.26 %	23.68 %	26.32 %
P	81	CADI	4.1	Y	T	Y	C	38	2.63 %	23.68 %	26.32 %
P	83	DATS	2.8	N	T	Y	C	169	7.69 %	23.67 %	27.22 %
P	83	DODG	2.2	Y	T	Y	C	182	7.14 %	23.63 %	24.18 %
P	83	HOND	1.8	Y	T	Y	C	51	15.69 %	23.53 %	23.53 %
P	82	OLDS	3.8	Y	T	Y	C	252	6.35 %	23.41 %	24.60 %
P	81	SUBA	1.8	N	T	Y	C	30	3.33 %	23.33 %	26.67 %
P	83	CHEV	1.6	Y	T	Y	C	103	5.83 %	23.30 %	23.30 %
P	81	AUDI	2.1	N	T	N	O	43	2.33 %	23.26 %	23.26 %
P	84	FORD	2.3	N	T	Y	C	56	10.71 %	23.21 %	23.21 %
P	85	FORD	2.3	N	T	Y	C	39	5.13 %	23.08 %	23.08 %
P	81	TOYO	1.6	Y	O	Y	O	26	11.54 %	23.08 %	23.08 %
P	82	JEEP	4.2	Y	T	Y	C	26	11.54 %	23.08 %	23.08 %
P	82	CHEV	1.6	Y	T	Y	C	148	5.41 %	22.97 %	25.00 %
P	81	AUDI	2.1	N	T	N	C	48	6.25 %	22.92 %	22.92 %
P	83	CHEV	3.8	Y	T	Y	C	140	9.29 %	22.86 %	23.57 %
T	83	CHEV	2.8	Y	T	Y	C	232	7.33 %	22.84 %	24.57 %
P	84	FORD	4.9	Y	T	Y	O	22	4.55 %	22.73 %	22.73 %
P	81	BMW	2.8	N	T	N	C	22	0.00 %	22.73 %	22.73 %
P	81	DATS	2.0	N	O	Y	O	185	7.03 %	22.70 %	24.32 %
P	84	MERC	2.3	Y	T	Y	C	168	13.69 %	22.62 %	22.62 %
P	84	OLDS	2.5	Y	T	Y	C	31	6.45 %	22.58 %	22.58 %
P	81	OLDS	4.3	Y	T	Y	C	40	10.00 %	22.50 %	22.50 %
P	81	PLYM	2.6	N	O	Y	O	27	11.11 %	22.22 %	25.93 %
T	83	DATS	2.4	N	T	Y	C	36	5.56 %	22.22 %	25.00 %
P	82	DODG	2.2	Y	T	Y	C	90	10.00 %	22.22 %	23.33 %
P	83	BUIC	2.8	Y	T	Y	C	77	9.09 %	22.08 %	23.38 %
T	85	FORD	2.8	Y	T	Y	C	127	11.02 %	22.05 %	22.05 %
P	82	BMW	1.8	N	T	N	C	160	7.50 %	21.88 %	22.50 %
T	84	JEEP	2.8	Y	T	Y	C	32	9.38 %	21.88 %	21.88 %
T	84	MITS	2.0	Y	O	Y	O	32	3.13 %	21.88 %	21.88 %
P	83	HOND	1.5	N	O	Y	O	87	8.05 %	21.84 %	21.84 %
P	83	PONT	2.8	Y	T	Y	C	69	5.80 %	21.74 %	21.74 %
P	83	VOLV	2.3	N	T	N	O	46	15.22 %	21.74 %	23.91 %
P	84	DODG	2.2	N	T	Y	C	69	1.45 %	21.74 %	21.74 %
P	83	CHEV	2.5	N	T	Y	C	46	10.87 %	21.74 %	23.91 %
P	85	TOYO	1.6	Y	T	Y	O	23	4.35 %	21.74 %	21.74 %
P	81	SUBA	1.8	Y	T	Y	C	23	4.35 %	21.74 %	21.74 %
P	81	MAZD	2.0	Y	T	Y	O	161	4.97 %	21.74 %	23.60 %
P	81	FORD	3.3	Y	T	Y	O	97	2.06 %	21.65 %	22.68 %
T	84	DODG	2.6	Y	O	Y	O	37	5.41 %	21.62 %	24.32 %
T	84	JEEP	2.5	Y	T	Y	C	37	10.81 %	21.62 %	21.62 %
P	82	PONT	1.8	Y	T	Y	C	88	5.68 %	21.59 %	22.73 %
P	82	MAZD	1.1	Y	O	N	O	65	12.31 %	21.54 %	23.08 %
P	83	DATS	2.2	N	T	Y	C	56	7.14 %	21.43 %	25.00 %
P	84	JEEP	2.8	Y	T	Y	C	28	3.57 %	21.43 %	21.43 %
P	82	PONT	3.8	Y	T	Y	C	28	0.00 %	21.43 %	25.00 %
T	83	TOYO	2.4	Y	T	Y	O	150	6.00 %	21.33 %	23.33 %
P	84	BUIC	3.0	Y	T	Y	C	319	7.84 %	21.32 %	21.63 %
P	81	AMC	4.2	Y	T	Y	C	47	8.51 %	21.28 %	27.66 %
P	83	CHRY	2.2	Y	T	Y	C	52	7.69 %	21.15 %	21.15 %
T	82	DATS	2.2	N	O	Y	O	38	7.89 %	21.05 %	21.05 %
P	83	TOYO	1.6	Y	T	Y	C	409	7.82 %	21.03 %	21.03 %
P	81	TOYO	2.4	Y	T	Y	O	100	12.00 %	21.00 %	27.00 %
P	83	TOYO	1.8	Y	T	Y	O	86	6.98 %	20.93 %	23.26 %
P	81	PLYM	2.2	Y	T	Y	C	115	6.96 %	20.87 %	22.61 %
P	82	TOYO	1.8	Y	T	Y	O	139	10.07 %	20.86 %	21.58 %
P	82	HOND	1.8	Y	T	Y	C	24	12.50 %	20.83 %	20.83 %
P	85	SAAB	2.0	N	T	N	C	24	8.33 %	20.83 %	20.83 %
P	82	HOND	1.3	N	O	Y	O	24	0.00 %	20.83 %	25.00 %
P	83	TOYO	2.4	N	T	Y	O	48	8.33 %	20.83 %	20.83 %
P	81	OLDS	3.8	Y	O	Y	O	77	1.30 %	20.78 %	22.08 %
P	85	MERC	2.3	Y	T	Y	C	53	7.55 %	20.75 %	20.75 %
P	82	FORD	3.3	Y	T	Y	C	63	1.59 %	20.63 %	22.22 %

P	82	DATS	2.2	M	O	Y	O	78	3.85 %	20.51 %	23.08 %
P	83	MAZD	1.1	Y	T	M	C	44	4.55 %	20.45 %	20.45 %
P	83	VOLK	1.8	M	T	M	O	44	4.55 %	20.45 %	20.45 %
P	84	BOND	1.8	M	T	Y	C	93	10.75 %	20.43 %	21.51 %
P	82	TOYO	2.4	Y	O	Y	O	93	10.75 %	20.43 %	21.51 %
P	84	BOND	1.8	M	T	Y	O	49	8.16 %	20.41 %	20.41 %
P	82	CHEV	2.5	M	T	Y	C	124	3.23 %	20.16 %	20.16 %
P	82	SUBA	1.8	M	O	Y	O	20	10.00 %	20.00 %	20.00 %
P	84	FORD	5.0	Y	T	Y	O	80	8.75 %	20.00 %	20.00 %
P	83	TOYO	1.6	M	T	Y	O	25	8.00 %	20.00 %	20.00 %
P	81	SUBA	1.8	M	O	Y	O	50	4.00 %	20.00 %	22.00 %
P	85	TOYO	1.5	Y	T	Y	C	55	10.91 %	20.00 %	20.00 %
T	81	DODG	2.6	Y	O	Y	O	25	4.00 %	20.00 %	24.00 %
P	82	CHEV	3.8	Y	O	Y	O	35	8.57 %	20.00 %	20.00 %
T	81	GMC	4.1	Y	O	Y	O	20	15.00 %	20.00 %	30.00 %
T	82	CHEV	5.0	Y	T	Y	C	20	0.00 %	20.00 %	20.00 %
T	82	FORD	5.8	Y	O	Y	O	35	5.71 %	20.00 %	20.00 %
T	84	DATS	2.4	M	O	Y	O	20	5.00 %	20.00 %	25.00 %
P	84	TOYO	1.4	Y	T	Y	C	137	8.03 %	19.71 %	20.44 %
P	85	BOND	1.8	Y	T	Y	C	219	9.59 %	19.63 %	19.63 %
P	82	VOLK	1.7	M	T	Y	C	46	6.52 %	19.57 %	23.91 %
P	83	JEEP	4.2	Y	T	Y	C	41	4.88 %	19.51 %	21.95 %
P	84	BOND	1.3	M	O	Y	O	36	2.78 %	19.44 %	19.44 %
P	84	NISN	2.9	M	T	Y	C	72	11.11 %	19.44 %	19.44 %
P	83	CHEV	2.8	Y	T	Y	C	252	7.54 %	19.44 %	20.63 %
P	83	FORD	3.3	Y	T	Y	O	72	6.94 %	19.44 %	20.83 %
P	83	MAZD	1.1	Y	T	Y	C	67	8.96 %	19.40 %	19.40 %
P	83	TOYO	1.6	M	O	Y	O	31	0.00 %	19.35 %	19.35 %
P	81	TOYO	2.2	Y	T	Y	C	26	3.85 %	19.23 %	23.08 %
P	81	TOYO	2.2	Y	O	Y	O	26	3.85 %	19.23 %	26.92 %
P	83	TOYO	2.8	Y	T	Y	C	52	5.77 %	19.23 %	19.23 %
T	83	NISN	2.4	Y	O	Y	O	26	19.23 %	19.23 %	19.23 %
T	85	DODG	2.0	Y	T	Y	C	26	3.85 %	19.23 %	19.23 %
P	83	OLDS	2.8	Y	T	Y	C	21	9.52 %	19.05 %	19.05 %
P	84	TOYO	1.6	M	T	Y	O	21	4.76 %	19.05 %	19.05 %
P	85	PONT	2.5	Y	T	Y	C	21	0.00 %	19.05 %	19.05 %
P	85	TOYO	1.4	M	T	Y	C	21	0.00 %	19.05 %	19.05 %
P	83	TOYO	1.4	M	T	Y	O	21	4.76 %	19.05 %	19.05 %
P	82	CHEV	2.5	Y	T	Y	C	37	2.70 %	18.92 %	21.62 %
P	82	CHEV	1.8	Y	T	Y	C	186	4.30 %	18.82 %	19.89 %
P	82	MERB	3.8	Y	T	M	C	48	8.33 %	18.75 %	18.75 %
T	81	DODG	2.0	Y	O	Y	O	32	0.00 %	18.75 %	21.88 %
P	81	CHEV	5.7	Y	T	Y	C	96	8.33 %	18.75 %	19.79 %
P	82	CHEV	5.0	Y	O	Y	O	43	13.95 %	18.60 %	18.60 %
P	83	FORD	3.8	Y	O	Y	O	43	6.98 %	18.60 %	18.60 %
P	82	AMC	4.2	Y	T	Y	C	43	2.33 %	18.60 %	18.60 %
P	84	FORD	1.6	Y	O	Y	O	70	4.29 %	18.57 %	18.57 %
P	83	BUIC	2.5	Y	T	Y	C	27	0.00 %	18.52 %	18.52 %
P	82	DATS	2.4	M	O	Y	O	27	3.70 %	18.52 %	18.52 %
T	83	FORD	5.0	Y	O	Y	O	27	3.70 %	18.52 %	18.52 %
T	84	GMC	2.8	Y	T	Y	C	54	5.56 %	18.52 %	18.52 %
P	82	NISN	2.0	Y	O	Y	O	103	3.88 %	18.45 %	18.45 %
P	81	OLDS	2.5	Y	T	Y	C	87	5.75 %	18.39 %	21.84 %
T	84	CHEV	5.0	Y	O	Y	O	60	5.00 %	18.33 %	18.33 %
T	81	CHEV	4.1	Y	O	Y	O	131	6.87 %	18.32 %	22.14 %
P	83	AMC	1.4	M	T	Y	C	22	9.09 %	18.18 %	18.18 %
P	83	FORD	5.0	Y	O	Y	O	33	3.03 %	18.18 %	18.18 %
P	86	TOYO	1.4	Y	T	Y	C	22	18.18 %	18.18 %	18.18 %
P	83	NISN	2.8	M	T	Y	C	22	4.55 %	18.18 %	18.18 %
P	81	PONT	4.9	Y	T	Y	C	33	6.06 %	18.18 %	21.21 %
P	82	OLDS	1.8	Y	T	Y	C	22	4.55 %	18.18 %	18.18 %
T	83	TOYO	2.2	Y	T	Y	C	22	4.55 %	18.18 %	18.18 %
P	83	PLYM	2.2	Y	T	Y	C	176	8.52 %	18.18 %	18.75 %
P	83	VOLV	2.9	M	T	M	C	33	15.15 %	18.18 %	18.18 %
T	84	NISN	2.4	Y	T	Y	O	33	9.09 %	18.18 %	18.18 %
T	85	DODG	5.2	Y	T	Y	C	33	12.12 %	18.18 %	18.18 %
T	85	MITS	2.0	Y	T	Y	C	22	13.64 %	18.18 %	18.18 %
P	83	TOYO	2.4	Y	O	Y	O	39	5.13 %	17.95 %	17.95 %
P	83	MAZD	1.5	Y	T	Y	O	39	7.69 %	17.95 %	17.95 %
P	82	VOLV	2.1	M	T	M	C	184	6.52 %	17.93 %	18.48 %
P	82	DATS	2.4	M	T	Y	C	56	1.79 %	17.86 %	19.64 %
P	83	CADI	4.1	Y	O	Y	O	28	7.14 %	17.86 %	17.86 %
P	83	TOYO	2.4	Y	T	Y	C	220	7.73 %	17.73 %	17.73 %
P	84	PEUG	2.0	Y	T	Y	C	34	8.82 %	17.65 %	17.65 %
P	81	VOLK	2.0	M	T	Y	C	34	2.94 %	17.65 %	23.53 %
P	81	PONT	2.5	Y	T	Y	C	68	1.47 %	17.65 %	19.12 %
P	81	VOLK	1.7	M	O	M	O	34	5.88 %	17.65 %	17.65 %
P	84	BOND	1.8	M	O	Y	O	91	5.49 %	17.58 %	18.68 %
P	82	BOND	1.8	M	O	Y	O	205	4.88 %	17.56 %	18.05 %
T	85	FORD	4.9	Y	T	Y	C	57	5.26 %	17.54 %	17.54 %
P	84	TOYO	1.6	M	O	Y	O	23	8.70 %	17.39 %	17.39 %
P	85	TOYO	1.6	M	T	Y	O	23	8.70 %	17.39 %	17.39 %
P	82	AMC	4.2	Y	T	Y	O	23	4.35 %	17.39 %	17.39 %
T	85	TOYO	2.0	M	T	Y	C	23	4.35 %	17.39 %	17.39 %

P	81	DATS	2.0	Y	O	Y	O	186	4.30 %	17.20 %	17.20 %
P	83	VOLV	2.3	N	T	N	C	233	9.87 %	17.17 %	17.17 %
T	84	DATS	2.4	N	T	Y	C	105	9.52 %	17.14 %	20.00 %
P	82	FORD	3.3	Y	O	Y	O	146	2.05 %	17.12 %	20.55 %
P	83	DODG	2.6	Y	T	Y	C	41	9.76 %	17.07 %	17.07 %
P	83	PORS	2.5	N	T	N	C	47	2.13 %	17.02 %	17.02 %
P	83	TOYO	2.8	N	T	Y	C	341	7.33 %	17.01 %	17.60 %
P	84	HOND	1.8	Y	T	Y	C	800	7.25 %	17.00 %	17.13 %
T	84	NISN	2.4	N	T	Y	C	336	6.85 %	16.96 %	19.94 %
P	82	VOLK	1.7	N	T	N	C	195	6.67 %	16.92 %	17.95 %
P	83	BUIC	3.8	Y	T	Y	C	166	6.63 %	16.87 %	18.07 %
P	83	DODG	5.2	Y	T	Y	O	101	25.74 %	16.83 %	16.83 %
P	84	OLDS	3.0	Y	T	Y	C	262	8.40 %	16.79 %	16.79 %
P	82	DODG	2.6	Y	O	Y	O	48	6.25 %	16.67 %	16.67 %
P	84	VOLK	1.9	N	T	N	C	54	3.70 %	16.67 %	18.52 %
P	81	CHEV	2.5	Y	O	Y	O	30	3.33 %	16.67 %	16.67 %
P	82	PONT	4.1	Y	T	Y	C	24	8.33 %	16.67 %	20.83 %
P	84	NISN	1.8	N	T	Y	C	24	16.67 %	16.67 %	16.67 %
P	84	DATS	3.0	N	T	Y	C	60	8.67 %	16.67 %	16.67 %
T	83	MITS	2.0	Y	O	Y	O	30	10.00 %	16.67 %	16.67 %
P	82	BUIC	5.0	Y	T	Y	C	72	9.72 %	16.67 %	16.67 %
P	82	CHEV	1.6	Y	O	Y	O	36	2.78 %	16.67 %	19.44 %
T	84	FORD	5.0	Y	T	Y	O	30	13.33 %	16.67 %	16.67 %
P	82	SUBA	1.8	Y	T	Y	O	186	3.23 %	16.67 %	17.20 %
T	85	TOYO	2.4	Y	T	Y	O	24	8.33 %	16.67 %	16.67 %
P	82	OLDS	5.0	Y	T	Y	C	115	5.22 %	16.52 %	17.39 %
P	82	TOYO	2.4	Y	T	Y	C	607	5.77 %	16.47 %	16.97 %
T	84	FORD	5.8	Y	T	Y	C	79	2.53 %	16.46 %	16.46 %
P	81	CADI	6.0	Y	T	Y	O	79	3.80 %	16.46 %	17.72 %
P	83	FORD	3.8	Y	T	Y	C	347	5.76 %	16.43 %	17.29 %
P	84	CHRY	2.2	N	T	Y	C	122	6.56 %	16.39 %	16.39 %
P	83	FORD	3.3	Y	O	Y	O	55	5.45 %	16.36 %	18.18 %
T	83	CHEV	5.0	Y	T	Y	C	86	4.65 %	16.28 %	17.44 %
P	82	VOLK	1.7	N	T	N	O	172	1.16 %	16.28 %	16.86 %
P	81	VOLV	2.1	N	T	N	O	117	5.98 %	16.24 %	17.95 %
P	82	DATS	2.4	N	T	Y	O	37	0.00 %	16.22 %	18.22 %
P	84	JEEP	4.2	Y	T	Y	C	37	2.70 %	16.22 %	16.22 %
P	85	NISN	1.6	N	T	Y	C	68	8.82 %	16.18 %	16.18 %
P	83	SUBA	1.8	Y	T	Y	C	99	3.03 %	16.16 %	16.16 %
P	84	JAGU	4.2	Y	T	N	C	31	3.23 %	16.13 %	16.13 %
P	84	FORD	1.8	Y	T	Y	O	206	7.28 %	16.02 %	16.50 %
P	82	DODG	2.2	Y	O	Y	O	25	8.00 %	16.00 %	16.00 %
P	85	NISN	2.8	N	T	Y	C	25	12.00 %	16.00 %	16.00 %
T	84	TOYO	2.0	N	T	Y	C	50	2.00 %	16.00 %	16.00 %
P	84	CHEV	1.6	Y	T	Y	C	125	5.60 %	16.00 %	17.60 %
P	82	PONT	5.0	Y	T	Y	C	119	5.88 %	15.97 %	16.81 %
P	81	DODG	2.6	Y	O	Y	O	63	1.59 %	15.87 %	19.05 %
P	82	AUDI	2.1	N	T	N	C	63	4.76 %	15.87 %	17.46 %
P	83	TOYO	1.6	Y	O	Y	O	38	10.53 %	15.79 %	18.42 %
T	84	NISN	2.4	N	O	Y	O	38	7.89 %	15.79 %	15.79 %
P	83	OLDS	3.8	Y	T	Y	C	337	4.45 %	15.73 %	15.73 %
P	82	CHEV	5.0	Y	T	Y	C	280	3.21 %	15.71 %	17.86 %
P	84	TOYO	1.8	Y	T	Y	C	414	3.86 %	15.70 %	16.43 %
P	82	FORD	3.3	Y	T	Y	O	179	6.15 %	15.64 %	18.99 %
P	82	HOND	1.8	Y	T	Y	O	32	6.25 %	15.63 %	15.63 %
P	84	JAGU	4.2	Y	T	Y	C	32	12.50 %	15.63 %	15.63 %
P	83	TOYO	1.5	Y	T	Y	O	32	6.25 %	15.63 %	15.63 %
P	83	TOYO	2.4	N	T	Y	C	327	6.12 %	15.60 %	15.90 %
P	83	MAZD	1.5	Y	T	Y	C	135	4.44 %	15.56 %	16.30 %
P	83	FORD	3.8	Y	T	Y	O	193	8.29 %	15.54 %	15.54 %
P	82	BMW	2.7	N	T	N	C	58	5.17 %	15.52 %	15.52 %
T	81	DODG	5.2	Y	O	Y	O	84	3.57 %	15.48 %	17.86 %
P	83	MAZD	1.1	Y	T	N	O	110	6.36 %	15.45 %	15.45 %
P	82	OLDS	3.0	Y	T	Y	C	39	2.56 %	15.38 %	17.95 %
T	84	CHEV	5.7	Y	T	Y	C	52	7.69 %	15.38 %	17.31 %
T	81	CHEV	1.8	Y	O	Y	O	98	3.06 %	15.31 %	17.35 %
P	81	CHEV	5.7	Y	O	Y	O	46	0.00 %	15.22 %	19.57 %
P	81	VOLV	2.1	N	T	N	C	171	5.85 %	15.20 %	16.96 %
P	84	NISN	3.0	N	T	Y	C	79	5.06 %	15.19 %	15.19 %
P	82	BUIC	3.0	Y	T	Y	C	66	6.06 %	15.15 %	16.67 %
P	83	VOLV	2.1	N	T	N	C	86	8.14 %	15.12 %	15.12 %
P	83	NISN	2.4	N	T	Y	C	40	0.00 %	15.00 %	17.50 %
P	82	VOLV	2.1	N	T	N	O	120	4.17 %	15.00 %	15.00 %
P	82	MERC	3.3	Y	T	Y	C	20	5.00 %	15.00 %	15.00 %
P	83	MAZD	1.1	Y	O	N	O	20	5.00 %	15.00 %	15.00 %
P	81	TOYO	2.8	N	O	Y	O	20	0.00 %	15.00 %	15.00 %
P	82	HOND	1.5	N	O	Y	O	94	9.57 %	14.89 %	17.02 %
P	85	CHEV	2.0	N	T	Y	C	47	4.26 %	14.89 %	14.89 %
P	84	HOND	1.5	Y	O	Y	O	47	8.51 %	14.89 %	14.89 %
P	82	PLYM	2.6	N	O	Y	O	27	0.00 %	14.81 %	18.52 %
P	81	BUIC	2.5	Y	T	Y	C	129	6.20 %	14.73 %	16.28 %
P	83	CADI	4.1	Y	T	Y	C	673	6.69 %	14.71 %	15.16 %
P	83	JAGU	4.2	Y	T	Y	C	34	5.88 %	14.71 %	14.71 %
P	81	CADI	6.0	Y	T	Y	C	279	4.66 %	14.70 %	16.13 %

P	81	BMW	1.8	N	T	N	C	104	4.81 %	14.42 %	15.38 %
P	83	MAZD	1.1	Y	T	Y	O	28	7.14 %	14.29 %	14.29 %
T	81	DODG	5.9	Y	O	Y	O	49	4.08 %	14.29 %	18.37 %
P	82	PONT	2.5	N	T	Y	C	56	8.93 %	14.29 %	16.07 %
P	81	BOND	1.5	Y	O	Y	O	70	4.29 %	14.29 %	14.29 %
T	83	MAZD	2.0	Y	T	Y	O	21	0.00 %	14.29 %	14.29 %
T	84	DATS	2.4	Y	O	Y	O	21	4.76 %	14.29 %	14.29 %
P	83	TOYO	2.8	N	T	Y	O	49	14.29 %	14.29 %	16.33 %
P	83	NISN	2.0	Y	T	Y	C	21	4.76 %	14.29 %	14.29 %
P	85	FORD	5.0	Y	T	Y	O	28	7.14 %	14.29 %	14.29 %
P	85	TOYO	1.6	Y	T	Y	C	228	9.65 %	14.04 %	14.04 %
P	81	SUBA	1.8	N	T	Y	O	107	2.80 %	14.02 %	17.76 %
P	84	DODG	2.2	Y	T	Y	C	301	5.32 %	13.95 %	14.29 %
P	85	BOND	1.8	N	T	Y	C	43	4.65 %	13.95 %	13.95 %
P	84	FORD	4.9	Y	T	Y	C	79	7.59 %	13.92 %	15.19 %
P	83	RENA	1.4	N	T	N	C	29	3.45 %	13.79 %	13.79 %
P	83	AMC	4.2	Y	T	Y	C	29	6.90 %	13.79 %	13.79 %
P	82	AUDI	1.7	N	T	N	C	29	3.45 %	13.79 %	13.79 %
P	82	AUDI	1.7	N	T	N	O	22	0.00 %	13.64 %	13.64 %
P	82	PLYM	2.6	Y	O	Y	O	22	9.09 %	13.64 %	13.64 %
P	83	CHEV	5.0	Y	O	Y	O	44	9.09 %	13.64 %	13.64 %
P	84	CHEV	2.0	N	T	Y	C	22	9.09 %	13.64 %	13.64 %
P	82	BUIC	2.5	Y	T	Y	C	22	9.09 %	13.64 %	13.64 %
P	85	BOND	1.8	Y	T	Y	O	37	2.70 %	13.51 %	13.51 %
P	82	CADI	1.8	Y	T	Y	C	67	2.99 %	13.43 %	13.43 %
P	83	MERC	3.8	Y	T	Y	O	60	1.67 %	13.33 %	13.33 %
T	84	DATS	2.4	Y	T	Y	C	60	6.33 %	13.33 %	13.33 %
P	82	VOLK	1.7	N	T	Y	O	30	3.33 %	13.33 %	13.33 %
P	84	MAZD	2.0	Y	O	Y	O	30	6.67 %	13.33 %	13.33 %
P	85	TOYO	2.0	N	T	Y	C	128	10.94 %	13.28 %	13.28 %
P	84	MERC	1.6	Y	T	Y	O	23	17.39 %	13.04 %	13.04 %
P	84	TOYO	2.8	N	T	Y	O	23	8.70 %	13.04 %	13.04 %
P	83	PLYM	2.6	Y	O	Y	O	23	8.70 %	13.04 %	13.04 %
P	84	MAZD	1.5	Y	T	Y	O	23	8.70 %	13.04 %	13.04 %
P	84	BMW	1.8	N	T	N	C	254	5.51 %	12.99 %	13.39 %
P	83	BUIC	3.0	Y	T	Y	C	108	3.70 %	12.96 %	12.96 %
P	86	TOYO	1.6	N	T	Y	C	31	9.68 %	12.90 %	12.90 %
P	85	CHRY	5.2	Y	T	Y	C	55	3.64 %	12.73 %	12.73 %
P	81	BOND	1.5	N	O	Y	O	606	3.47 %	12.71 %	13.53 %
P	83	NISN	2.0	Y	O	Y	O	79	1.27 %	12.66 %	12.66 %
T	82	MAZD	2.0	Y	O	Y	O	95	3.16 %	12.63 %	13.68 %
P	84	MAZD	1.5	Y	T	Y	C	103	4.85 %	12.62 %	13.59 %
T	82	CHEV	4.1	Y	O	Y	O	56	3.57 %	12.50 %	17.86 %
P	82	CADI	4.1	Y	O	Y	O	48	0.00 %	12.50 %	12.50 %
T	84	DODG	2.6	Y	T	Y	C	24	8.33 %	12.50 %	12.50 %
P	82	PLYM	2.2	Y	T	Y	C	64	1.56 %	12.50 %	14.06 %
P	85	DODG	1.5	Y	T	Y	C	24	8.33 %	12.50 %	12.50 %
P	85	SUBA	1.8	Y	T	Y	C	32	3.13 %	12.50 %	12.50 %
T	83	CHEV	5.7	Y	T	Y	C	24	0.00 %	12.50 %	12.50 %
P	84	BOND	1.8	Y	T	Y	O	226	7.52 %	12.39 %	12.39 %
P	85	CADI	4.1	Y	T	Y	C	276	6.88 %	12.32 %	12.32 %
P	83	OLDS	2.5	N	T	Y	C	57	5.26 %	12.28 %	14.04 %
T	84	TOYO	2.4	N	T	Y	C	147	3.40 %	12.24 %	12.93 %
T	84	TOYO	2.4	Y	T	Y	O	213	3.76 %	12.21 %	12.21 %
P	83	OLDS	2.5	Y	T	Y	C	41	9.76 %	12.20 %	14.63 %
P	83	BUIC	2.5	N	T	Y	C	41	12.20 %	12.20 %	17.07 %
P	83	VOLK	1.7	N	T	N	O	41	0.00 %	12.20 %	12.20 %
P	82	SUBA	1.8	Y	T	Y	C	107	4.67 %	12.15 %	12.15 %
P	81	BOND	1.6	N	O	Y	O	33	6.06 %	12.12 %	12.12 %
P	84	CADI	4.1	Y	T	Y	C	629	5.41 %	12.08 %	12.08 %
P	81	BOND	1.5	N	O	N	O	25	4.00 %	12.00 %	12.00 %
P	85	BUIC	2.5	N	T	Y	C	25	8.00 %	12.00 %	12.00 %
P	82	VOLK	2.0	N	T	Y	C	25	0.00 %	12.00 %	20.00 %
P	83	MAZD	2.0	Y	T	Y	O	25	12.00 %	12.00 %	12.00 %
T	84	CHEV	5.0	Y	T	Y	C	142	3.52 %	11.97 %	11.97 %
P	84	CHEV	5.7	Y	T	Y	C	142	6.34 %	11.97 %	12.68 %
T	84	TOYO	2.4	Y	O	Y	O	134	5.97 %	11.94 %	12.69 %
P	84	MAZD	1.1	Y	T	Y	C	42	9.52 %	11.90 %	11.90 %
P	83	BUIC	4.1	Y	T	Y	C	110	2.73 %	11.82 %	11.82 %
P	82	CHRY	2.2	Y	T	Y	C	34	0.00 %	11.76 %	11.76 %
P	83	TOYO	2.4	Y	T	Y	O	34	2.94 %	11.76 %	11.76 %
P	83	MERB	3.8	Y	T	N	C	60	8.33 %	11.67 %	11.67 %
P	85	NISN	3.0	N	T	Y	C	43	11.63 %	11.63 %	11.63 %
P	83	OLDS	3.8	Y	O	Y	O	52	9.62 %	11.54 %	11.54 %
P	81	SUBA	1.8	Y	T	Y	O	78	2.56 %	11.54 %	15.38 %
T	83	MAZD	2.0	Y	O	Y	O	166	3.61 %	11.45 %	11.45 %
P	82	BOND	1.5	Y	O	Y	O	352	5.11 %	11.36 %	12.22 %
T	84	CHEV	2.8	Y	O	Y	O	71	1.41 %	11.27 %	11.27 %
P	82	LINC	5.0	Y	T	Y	C	89	2.25 %	11.24 %	14.61 %
P	81	CHEV	2.5	Y	T	Y	C	179	2.23 %	11.17 %	13.41 %
P	85	TOYO	1.4	Y	T	Y	C	63	4.76 %	11.11 %	11.11 %
P	82	BUIC	1.8	Y	T	Y	C	36	2.78 %	11.11 %	11.11 %
P	84	DATS	2.4	N	T	Y	C	90	4.44 %	11.11 %	14.44 %
P	82	TOYO	2.4	Y	T	Y	O	108	3.70 %	11.11 %	12.04 %

T	85	FORD	5.0	Y	T	Y	C	46	4.35 %	10.87 %	10.87 %
P	82	SUBA	1.8	Y	O	Y	O	37	0.00 %	10.81 %	13.51 %
P	82	AUDI	2.1	N	T	N	O	37	0.00 %	10.81 %	13.51 %
T	83	FORD	5.8	Y	T	Y	C	47	6.38 %	10.64 %	12.77 %
P	84	TOYO	1.6	Y	T	Y	O	66	6.06 %	10.61 %	10.61 %
P	82	CADI	4.1	Y	T	Y	C	397	5.54 %	10.58 %	11.59 %
P	83	OLDS	3.0	Y	T	Y	C	123	4.07 %	10.57 %	13.01 %
T	82	DODG	5.2	Y	O	Y	O	144	3.47 %	10.42 %	11.81 %
P	81	PLYM	2.6	Y	O	Y	O	48	4.17 %	10.42 %	12.50 %
T	84	FORD	5.0	Y	T	Y	C	154	1.95 %	10.39 %	10.39 %
P	85	RENA	1.4	Y	T	Y	C	29	10.34 %	10.34 %	10.34 %
P	85	BUIC	3.0	Y	T	Y	C	58	8.62 %	10.34 %	10.34 %
P	84	PLYM	2.2	Y	T	Y	C	214	3.27 %	10.28 %	10.28 %
P	82	BOND	1.3	Y	O	Y	O	88	3.41 %	10.23 %	11.36 %
P	83	CHEV	5.0	Y	T	Y	C	408	2.94 %	10.05 %	11.27 %
P	83	CHEV	3.8	Y	O	Y	O	20	5.00 %	10.00 %	10.00 %
P	84	NISN	2.0	N	T	Y	C	170	5.29 %	10.00 %	14.71 %
P	82	DODG	2.5	Y	O	Y	O	20	0.00 %	10.00 %	10.00 %
T	83	FORD	5.8	Y	O	Y	O	30	0.00 %	10.00 %	10.00 %
P	84	CADI	4.1	Y	O	Y	O	30	3.33 %	10.00 %	10.00 %
T	85	CHEV	2.8	Y	T	Y	C	60	5.00 %	10.00 %	11.67 %

Summary Totals

TAS Records Processed = 177174
Valid Initial Test Vehicles = 105725
% With Replicate Initial Tests = 7.12 %
Tailpipe Failure Rate = 21.18 %
Overall Failure Rate = 22.09 %

Error Records Flagged

Error 1 (Air) : 0
Error 2 (Cat) : 0
Error 3 (EGR) : 0
Error 4 (Loop) : 0
Error 5 (CLP/3Way) : 20898
Error 6 (Eng. Units) : 13239

Appendix E

Pattern Failure Vehicle Groups

Descriptions and Engine Family Designations

Group No.	Description	Engine Families	
1.	85-86 Ford Trk 2.3L	*FM2.3T5FAG*	See Note 1 below.
2.	81-82 Nissan 1.2L	*NS1.2V2A***	
3.	84-86 Buick, Olds 5.0L 4V	*3G5.0V4N***	
4.	81-82 Toyota 1.3L	*TY1.3V2A**	
5.	81-82 Nissan 1.5L	*NS1.5V2****	
6.	83 Mitsubishi 1.6L	DMT1.6V2B***	
7.	83 Nissan 1.6L 3CL	DNS1.6V2FAC9	
8.	84 Ford Truck 2.8L	EFN2.8T2H***	
9.	81-85 Ford 1.6L	several	
10.	81-83 Ford 2.3L	several	
11.	83 Honda 1.3L	DHN1.3V3A***	
12.	83 Nissan 1.6L OXC	DNS1.6V2AAF2	
13.	84 Honda 1.3L	EHN1.3V3EAF3	
14.	84-86 Ford 2.3L	several	
15.	82 Chevrolet 3.8L	C1G3.8V2ACA0	
16.	83 Honda 1.5L	DHN1.5V3A***	
17.	82-84 GM 1.6L	several	
18.	82 GM 3.8L	C4G3.8V2TMA5	
19.	81-82 GM 1.6L 3CL	11W2TNQZ C1G1.6V2****	
20.	83-85 GM 2.5L	*2G2.5V5TPG*	
21.	82 GM Truck 5.7L	C1G5.7T4HAC*	
22.	83-84 Mazda 1.5L 3CL	*TK1.5V2H***	
23.	82 GM 5.7L FI	C1G5.7V5NBM*	
24.	81-82 Mazda 1.5L	*TK1.5V2G***	

25.	81 Mazda Truck 2.3L	BTK2.3T2AF3
26.	82 Nissan Truck 2.3L	CNS2.2T2A***
27.	81-83 Ford 3.3L	3.3GQF *FM3.3V1GXF*
28.	81-83 Nissan 2.8L 3CL	*NS2.8V5F***
29.	81-82 AMC 258 CID	*AM258V2H***
30.	84-85 Honda 1.8L	*HN1.8V0F***
31.	83-84 Nissan Truck 2.4L	*NS2.4T2A***
32.	81-83 Mitsubishi 2.6L	*MT2.6V2B***
33.	82 Chrysler 135 CID	CCR2.2V2H***
34.	82 Honda 1.8L	CHN1.8V3A***
35.	81-86 Ford 302 CID	several
36.	82-83 Mazda Truck 2.0L	*TK2.0T2A***
37.	84-85 Chrysler Van 2.6L	*CR2.6T2****
38.	82 GM 4.1L V6	C4G4.1*4AEA*
39.	83 GM 5.7L 4V	D1G5.7V4NDA0
40.	83 Nissan 2.0L	DNS2.0V2AA**
41.	84-85 Chrysler 135 CID TBI	*CR2.2V5H***
42.	84 Chev, Pont 5.0L 4V	E1G5.0W4NEAX
43.	84-86 Buick 3.8L	*4G3.8V9X***
44.	84-86 Ford 3.8L	*FM3.8V5H***
45.	85-86 GM 3.8L FI	*4G3.8V8X***
46.	82 Chev Pickup 5.0L	C1G5.0T4HGH2
47.	82 Nissan 1.5L 3CL	CNS1.5V*A***
48.	81 VW Truck 1.7L 3CL	BVW1.7T6*******
49.	81 Audi 1.7L	BAD1.7V6FF04004F
50.	81 VW Van 2.0L OXC	BVW2.0T5AF3

51. 81 VW Van 2.0L 3CL BVW2.0T5FA8

1. The asterisk (*) indicates that different characters will be found in the position indicated.