EPA-AA-TSS-I/M-90-7

Technical Report

I/M Test Variability Observed in the Louisville I/M Program

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August 1990

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ABSTRACT

271 vehicles from the 1981 through 1988 model years that failed their regularly scheduled I/M test received extra tests while still in the inspection lane. Those extra tests consisted of an immediate retest (i.e., a second chance test) and a similar test preceded by three minutes of 2500 rpm, no-load operation. Analysis of the test results shows that the three-minute, 2500 rpm, no-load preconditioning cycle added very little over simply an immediate retest for most of the vehicles in this study; however, that preconditioning cycle did have a significant effect in reducing the failure rate of those vehicles that exceeded only the HC standard on the initial test.

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I/M Test Variability
Observed in the Louisville I/M Program

1.0 EXECUTIVE SUMMARY

1.1 Objectives of Work

The primary objective of this program was to determine the effect of an immediate second chance test on vehicles which failed at a centralized I/M test after no more than a short period of time waiting (i.e., idling) prior to the test.

A secondary objective of this program was to characterize those vehicles which after failing the Louisville I/M test then exhibited significant changes in idle emissions on either:

- an immediate retest (i.e., a second chance test) or
- a similar test preconditioned with three minutes of 2500 rpm, no-load operation.

1.2 Conclusions Reached

An immediate second chance test reduced the number of failing vehicles by 29 percent (cf. page 14) which is comparable to what was found in earlier studies. However, the second chance tests in those earlier studies were not immediate retests.

The three-minute, 2500 rpm, no-load preconditioning cycle produced a larger reduction in the I/M failure rate than did the immediate retest (35 percent versus 29 percent) (cf. pg 14). The preconditioning cycle had a more significant effect in reducing the failure rate of those vehicles that exceeded only the HC standard on the initial I/M test (cf. page 18). The three minute preconditioning cycle had the greatest effect on the failure rate of the open-loop carbureted vehicles and the least effect on the closed-loop fuel injected vehicles (cf. pp. 15 and 16).

The pass/fail results for the individual vehicles were more variable between the initial test and either of the two retests than between the retests themselves (i.e., the pass/fail determinations for the retests agreed more frequently) (cf. page 14).

Two possible explanations for the variability between the two retests being smaller than the variability between the initial test and either of the two retests are:

- The initial I/M test served as a consistent preconditioning cycle for the first retest, thus, reducing some of the variability.

- The initial idle test was preconditioned by operating at approximately one-half throttle while the preconditioning cycle for both retests was a controlled 2500±300 rpm. (If this difference in preconditioning cycles does, in fact, account for some of the differences among the test scores, then the use of a tachometer might eliminate that portion of the variability in I/M pass/fail results.)

For about one-sixth of the vehicles in this sample, the variability in the I/M pass/fail results is apparently due either to the sensitivity of those vehicles to the sampling algorithm which determines when the testing is complete or to the sensitivity of those vehicles to the timing of the insertion of the probe into the vehicle's tailpipe. In some instances, the variability resulted from the use of a percent of point stability check (cf. pages 28 & 29). (Since a fixed percentage of a low emission value results in a very small level of variability permitted for a "stable" test. A better approach would be to include a minimum absolute amount criteria to the stability decision.)

In future testing programs, it would probably be good to have the probe in place during the preconditioning for consistent start of test in order to reduce the instances of variability which result from the timing of the insertion of the probe into the vehicle's tailpipe.

2.0 BACKGROUND AND PROGRAM SUMMARY

In 1985 and 1986, EPA conducted emissions test programs in Maryland.[1,2]* While performing those studies, we found that a significant percentage of the 1981 and newer cars that failed at the Maryland I/M test lanes would pass a similar test conducted at the Contractor's laboratory. GM has also collected data on low mileage GM cars which point in the same direction. Similar results were found in other studies conducted in California.[3,4] A number of possible causes for this variability exist, including:

- The time a vehicle spends waiting in line for the I/M test, a feature of centralized I/M programs, may cause the oxygen sensor and/or catalyst to cool down so that a subsequent I/M test would not accurately identify a vehicle's FTP emissions. (This might explain the variability in a centralized program such as Maryland's but not in a decentralized program such as California's.)

- Variations in the preconditioning cycle might account for some of the variability in the idle test results. (In the Maryland I/M program, each vehicle operates for fifteen seconds at an uncontrolled one-third to one-half throttle prior to conducting the idle test. Thus, the preconditioning cycle might vary between an initial test and an immediate retest.)

- Variations in the delays between the completion of the preconditioning mode and the beginning of the measurement (i.e., idle) mode may result in substantial variations in the idle emissions.

- The evaporative canister fill levels may vary.

- Some vehicles may be variable due to intermittent problems.

Passing those vehicles that exhibit variable I/M pass/fail results could be useful since earlier studies have demonstrated that the FTP emissions of the I/M variable vehicles are substantially lower than those of the vehicles that consistently fail I/M tests.[2]

Those vehicles with variable I/M pass/fail scores could be identified by obtaining passing scores for some of the failing vehicles. Two possible approaches for obtaining passing scores for vehicles that initially failed are (1) simply to perform an immediate retest or (2) to perform a retest that follows some specified type of preconditioning. With those two approaches in mind, we designed the program described in Section 3.

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* Numbers in brackets denote references at the end of this report (pg. 33).

3.0 PROGRAM DESCRIPTION

3.1 Objectives and Strategy:

The primary objective of this program was to determine the effect of an immediate second chance test on vehicles which failed at a centralized I/M test after no more than a short period of time waiting (i.e., idling) prior to the test. To accomplish this objective, EPA developed this test program. At EPA's request, Gordon-Darby Enterprises, the contractor which operates the I/M testing program in Jefferson County (Louisville, KY), performed two types of retests on vehicles which had just failed their initial I/M test. Those two retests (which are described in detail in Section 3.4) are:

- an immediate retest and

- a retest that was preceded by preconditioning the vehicle by operating it at 2500 rpm for three minutes with the vehicle's transmission in either park or neutral.

In this testing program, the target was to recruit and test approximately 300 late-model year (i.e., 1981 and newer) cars and light trucks which failed the Louisville I/M program. This report summarizes the effort to study:

- the variability of the idle emissions of these new technology cars and

- the effects on I/M emissions of a three-minute, 2500 rpm preconditioning cycle.

For the vehicles in this program, Gordon-Darby personnel performed an official Louisville I/M test (described in Reference 5 and below in Section 3.3) on each of the 271 test vehicles; they then performed a special test (described in Section 3.4) on each of those vehicles.

One of the primary reasons we chose to use the Louisville I/M program for this study was the ease of programming of the lane analyzers permitted by the centralized mainframe which controlled the entire system (see Section 3.3).

3.2 Test Fleet Selection:

Every 1981 and newer, gasoline-fueled passenger car and light truck which failed the official I/M test during specified times at any one of the four Louisville testing stations was considered for this program. Gordon-Darby Enterprises attempted to recruit test vehicles during non-peak periods to avoid creating long waiting times for the other drivers. Thus, testing only at non-peak hours removed from this study those vehicles which had been idling in line for some time. The testing began on July 8, 1987 and continued through December 23, 1987.

The incentives for the drivers to participate in this program were two more opportunities to pass the official I/M test without any additional inconvenience or fees. (A "pass" on either the first or second retest in this program, as described in Steps 2 and 5 in Section 3.4, was treated as a "pass" on the official test.)

3.3 Description of the Louisville I/M Program:

The Jefferson County Vehicle Exhaust Testing (VET) program utilizes four centralized, four-lane stations distributed throughout the county. Approximately 385,000 vehicles are covered. The Jefferson County program has the broadest vehicle coverage of any program in the country. All vehicles are covered except heavy-duty vehicles of more than 18,000 GVWR. There are no exemptions for vehicle age or fuel type, although diesels are required to pass only an opacity test. Motorcycles must also be tested.

The cut points which are used in the Louisville I/M program are given in Table 3.1. The failure rate for 1981 and newer passenger cars and light trucks has been averaging between six and eight percent in the Louisville I/M program.

Table 3.1

Idle Emission Cut Points for the Louisville Program

Vehicle Type	Model Year	CO (%)	HC (ppm)
Passenger Cars	1981+	1.2	220
Light Trucks	1981	1.7	350
	1982+	1.2	220

An unusual feature of the Louisville program is that the entire system is controlled by a central mainframe computer. (One of the primary reasons we chose to use the Louisville I/M program for this study was the ease of programming of the lane analyzers permitted by the centralized mainframe.) Terminals at each test lane allow entry of a vehicle's license plate number by the inspector. This number is used to locate the registration record for the vehicle so that the car's identity and its status (i.e., due for test, retest, not due for test, etc.) can be confirmed. The information is then stored in the central computer. The main computer also signals for the automatic calibration checks and stores results of all calibrations.

The Louisville program uses an idle test for all vehicles except diesels (which must pass an opacity test) and two-stroke motorcycles. The idle test procedure calls for preconditioning for 10 seconds at half throttle for all vehicles, except 1981 and later model Fords which have a restart, followed by 30 seconds at half throttle. Motorists entering the stations are asked if the vehicle is warmed up, then advised to put the vehicle in park (or neutral for manual transmission), set the emergency brake, and turn off all accessories. The motorist is then advised to apply half throttle for either ten or 30 seconds, as appropriate. A timed light is used to indicate the end of the conditioning period. During this time, the analyzer performs a HC hang-up test. If the HC measurements do not exceed ten ppm (hexane) (i.e., an HC hang up check), the computer instructs the tester to insert the probe into the vehicle's tailpipe, and the readings are taken.

When this program was run, the computer read the analyzer measurements in three-second blocks of data.* The algorithm used by the computer required the sum of the readings CO plus CO_2 to exceed six percent (i.e., a dilution check). After the first three-second block in which $(CO + CO_2) > 6\%$, the computer averaged the HC and CO readings from three consecutive three-seconds blocks (a total of nine seconds) separately for HC and CO. If the emissions in each of the three three-second blocks:

1. varied by no more than 10% from the average,
2. the HC emissions were within 20 ppm of the average,
3. the CO emissions were within 0.2% of the average, and
4. the CO_2 emissions were within 1% of the average;

then the 9-second averages were reported. Otherwise, the process continued for up to 30 seconds, at which time either:

1. the computer reported "CO_2 Failure" if the CO-CO_2 criterion was not met, or

2. the computer reported the averages of the last nine seconds.

The analyzer compared the reported reading to the applicable standard. A "pass" or "fail" certificate was then printed, and given to the motorist.

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* Since this test program was completed, changes were made to the sampling algorithm.

Observations made by EPA auditors of the inspectors' performance showed that the specified procedures were followed routinely by all inspectors, with some variations. One shortcoming observed in the test procedure was variability in the preconditioning phase. This consisted of inconsistent "half throttle" and preconditioning times that were longer than specified caused by motorists not releasing the throttle when the light went out. However, the inspectors in most cases did prompt the motorists to raise or lower the engine speed when it was clearly too low or high and, overall, the speeds were controlled reasonably well. The inspectors also were quick to prompt motorists to release the throttle, and even when motorists did not follow the light, delays rarely exceeded 10 seconds.

A second source of the variation in test results was brought about by Louisville's use of a single analyzer in two adjacent lanes. Preconditioning of a vehicle was sometimes completed before the probe was made available from the adjoining lane, resulting in small lags before the idle testing could be initiated.

3.4 Description of the Special Test:

The special testing took place immediately following the initial I/M test failure. (The test vehicles were not moved.) The special testing consisted of the following six steps:

1. Tachometer Hookup:

   The vehicle's hood was opened, and a Sears Engine Analyzer (model 161.216300) was connected to the battery terminal, or a handheld Shimpo Digital Tachometer (DT-501) was positioned near a spark plug.

2. "Second Chance" Test:

   The standard Louisville I/M test (described in the preceding section) was rerun with one change. Rather than asking the driver to operate the engine at one-half throttle, the I/M inspector had the driver operate the engine at 2500 $\pm$300 rpm (by using one of the tachometers described in the first step). This difference might make it difficult to compare the results from this step (i.e., the second chance test) with those from the official (i.e., initial) test; however, it produces a high degree of consistency between the second and third tests performed on each of the test vehicles.

   The driver was instructed to leave the engine idling at the end of this step.

3. Extended Preconditioning:

The driver was instructed to increase engine speed to 2500 ($\pm$300) rpm and to maintain that engine speed for three minutes.

4. Ford/Honda Restart:

If the vehicle was either a Ford or a 1984 Honda Prelude, the driver was instructed to turn off the engine and then to restart it after 10 seconds. Drivers of other models were instructed to return the car to idle for 10 seconds.

5. "Third Chance" Test:

The modified standard Louisville test (described in Step 2) was repeated.

6. Test Completion:

The engine was shut off, the tachometer was removed, and the vehicle was released.

4.0 RESULTS

4.1 Profile of the Test Fleet:

A total of 271 1981 and newer vehicles were tested in this program. Two vehicles (a 1983 Oldsmobile Cutlass Calais and a 1981 Cadillac Eldorado (vehicles 270 and 271, respectively) were originally diesels but had been converted to gasoline-fueled vehicles. Since the current owners were unable to provide any information on the replacement engines and emission control systems, those two vehicles were dropped from the following analyses. The distribution of the remaining 269 vehicles by model year and vehicle type is given below:

Table 4.1

Distribution of the Test Vehicles

Model Year	Passenger Cars	Light Trucks
1981	68	3
1982	49	10
1983	28	11
1984	20	5
1985	26	5
1986	26	11
1987	5	1
1988	0	1
Totals:	222	47

From the values in this table, we observe that the majority (52.7%) of the passenger cars fell into only two model years (1981 and 1982), while over two-thirds (68.1%) of the light trucks were concentrated in three model years (1982, 83, and 86). This is not the distribution we would expect from a random sample of 269 vehicles. Three trucks (vehicles 121, 122, and 222) were 1981 model year vehicles and, thus, were subject to the less stringent 1981 standards (from Table 3.1).

EPA employed two computer programs to obtain information from the individual Vehicle Identification Numbers (VINs) of the test vehicles. One program was written for EPA, under an earlier contract, by Energy and Environmental Analysis, Inc. The second program (named "VINDICATOR") was written by the Highway Loss Data Institute (Washington, DC) and was made available to EPA. The results of that decoding are given in Appendix A. Using the results of those decodings and the certification records, we obtain the distributions in Table 4.2.

Table 4.2

Composition of the Sample Fleet by Control Configuration and Vehicle Type

Vehicle Type	Fuel Metering	Open-Loop with AIR	Open-Loop No AIR	Closed-Loop with AIR	Closed-Loop No AIR	Closed-Loop ?	Totals
All	Carb	79	1	114	0	0	194
	FI	0	0	31	41	3	75
TOTALS:		79	1	145	41	3	269
Pass Cars	Carb	54	1	103	0	0	158
	FI	0	0	29	33	2	64
TOTALS:		54	1	132	33	2	222
Light Trk	Carb	25	0	11	0	0	36
	FI	0	0	2	8	1	11
TOTALS:		25	0	13	8	1	47

Examining the data in Table 4.2, we observe that the test vehicles are not evenly distributed among the possible categories. All of the fuel injected vehicles are closed-loop, and they are distributed almost equally between vehicles which are equipped with air injection reaction (AIR) systems (either pump type or pulse-air type) and those not so equipped. (We were unable to determine from the VINs whether three of the fuel injected vehicles were equipped with AIR systems.) While the carbureted vehicles are almost exclusively equipped with AIR systems, and they are divided (in a two-to-three ratio) between open-loop and closed-loop. This distribution of test vehicles (i.e., the carbureted vehicles being almost exclusively equipped with AIR and divided between open-loop and closed-loop, while the fuel-injected vehicles being exclusively closed-loop and divided between AIR and No AIR) is almost identical to the distribution in an earlier test program described in Reference 2.

In a similar fashion, the vehicle data in Appendix A may be stratified by manufacturer, vehicle type, fuel metering system, and engine displacement to obtain Tables 4.3 and 4.4.

Table 4.3

Composition by Manufacturer of the Truck Sample

Manufacturer	CID	Fuel Metering	Sample Size
Chrysler	122	Carb.	1
	135	Carb.	1
Ford	122	Carb.	1
	140	Carb.	4
	140	F.I.	1
	171	Carb.	2
	179	F.I.	4
	225	Carb.	1
	300	Carb.	6
	302	Carb.	1
	302	F.I.	1
	351	Carb.	3
	462	Carb.	1
GM	119	Carb.	1
	151	F.I.	1
	173	Carb.	4
	229	Carb.	1
	262	F.I.	3
	305	Carb.	6
	350	Carb.	1
Mitsubishi	122	Carb.	1
Toyota	122	F.I.	1
	144	Carb.	1

Table 4.4

Composition by Manufacturer of the Passenger Car Sample

Manufacturer	CID	Fuel Metering	Sample Size
AMC/Renault	85	F.I.	2
Audi	131	F.I.	1
	136	F.I.	1
BMW	108	F.I.	1
Chrysler	135	Carb.	10
	135	F.I.	4
	152	F.I.	5
	156	Carb.	3
	318	Carb.	4
Fiat	122	F.I.	1
Ford	98	Carb.	23
	113	Carb.	1
	140	Carb.	4
	140	F.I.	10
	152	F.I.	5
	200	Carb.	9
	231	Carb.	4
	231	F.I.	1
	255	Carb.	2
	302	Carb.	5
	302	F.I.	1
	351	Carb.	5
GM	98	Carb.	10
	110	F.I.	1
	112	Carb.	3
	121	F.I.	1
	151	Carb.	1
	151	F.I.	3
	173	Carb.	7
	173	F.I.	5
	229	Carb.	6
	231	Carb.	21
	231	F.I.	2
	249	F.I.	1

-- **Table 4.4 continued on next page** --

Table 4.4 (Continued)

Composition by Manufacturer of the Passenger Car Sample

Manufacturer	CID	Fuel Metering	Sample Size
GM (Cont.)	252	Carb.	2
	265	Carb.	2
	305	Carb.	3
	307	Carb.	6
	368	F.I.	2
Honda	91	Carb.	2
	107	Carb.	2
	112	Carb.	4
	119	Carb.	4
Isuzu	111	Carb.	1
Jaguar	258	F.I.	1
Mitsubishi	86	Carb.	1
	90	Carb.	1
	156	Carb.	2
Nissan/Dats	--*	Carb.	1
	91	Carb.	2
	92	F.I.	1
	98	Carb.	2
	120	Carb.	2
	146	F.I.	5
	181	F.I.	3
Peugeot	120	F.I.	1
Porsche	183	F.I.	1
TKM (Mazda)	91	Carb.	2
Toyota	108	Carb.	1
Volvo	130	F.I.	2
VW	105	F.I.	2
	109	F.I.	1

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* A unique determination of the CID was not available. The possible displacements of that 4-cylinder Datsun 210 are 75, 85, or 91 CID.

4.2 Comparison of Overall Pass/Fail (P/F) Results:

The first level of analysis was simply to observe the number of vehicles which passed or failed each of the two retests (without regard to whether the cause of the failure was HC, CO, or both). From this analysis, we obtain Table 4.5:

Table 4.5

Distribution of Test Results

Second Chance Test	Third Chance Test Pass	Fail	Totals
Pass:	58	20	78
Fail:	35	156	191
Totals:	93	176	269

Repeating that analysis after stratifying the sample by vehicle type (passenger car vs. light truck), fuel metering system (carbureted vs. fuel injected), control of the air/fuel ratio (open-loop vs. closed-loop), and AIR system (where applicable) produces Table 4.6.

Table 4.6

Distribution of Test Results by Stratum

-------- Strata --------					Retest Pass/Fail Percentages (Second Chance/Third Chance)			
Fuel Metr	Mixtr Cntrl	Supp. AIR ?	Veh. Type	Strata Size	P/P	P/F	F/P	F/F
Both	Both	Both	Both	269	21.6%	7.4%	13.0%	58.0%
Carb	C/L	Yes	Car	103	19.4%	4.9%	13.6%	62.1%
			Trk	11	18.2%	27.3%	18.2%	36.4%
	O/L	No	Car	1	0.0%	0.0%	100.0%	0.0%
		Yes	Car	54	14.8%	7.4%	16.7%	61.1%
			Trk	25	20.0%	4.0%	20.0%	56.0%
FI	C/L	?	Car	2	100.0%	0.0%	0.0%	0.0%
			Trk	1	100.0%	0.0%	0.0%	0.0%
		No	Car	33	30.3%	6.1%	9.1%	54.5%
			Trk	8	25.0%	37.5%	0.0%	37.5%
		Yes	Car	29	27.6%	6.9%	3.4%	62.1%
			Trk	2	0.0%	0.0%	0.0%	100.0%

From the preceding table, we made the following two observations:

1. The percent of the vehicles which continued to fail both retests (even after three minutes of preconditioning at 2500 rpm, no-load) ranged from about 50% to 60% for all strata containing at least 20 vehicles.

2. For most strata, more vehicles passed the retest that followed the three-minute preconditioning cycle than passed the retest which was not preceded by that cycle. (Those vehicles, which passed only after extensive preconditioning, are discussed in Section 4.5.)

The primary exception to the second observation was the group of 22 closed-loop light trucks. This behavior of the closed-loop light trucks in this study might be representative of those vehicles, or it may simply be an aberration resulting from the small number of those vehicles in this testing program. To determine which of these two explanations is correct, a follow-up testing program would be necessary.

The data in Table 4.6 suggests that the preconditioning cycle had a more significant effect on the failure rate of the carbureted vehicles than on the failure rate of the fuel injected vehicles. We can calculate that essentially the same percentage of the 194 carbureted vehicles and 75 fuel injected vehicles passed after the preconditioning cycle (34% and 36%, respectively). However, the percentages of the vehicles which passed <u>only</u> after preconditioning are significantly different (16% of the carbureted vehicles versus only 5% of the fuel injected vehicles). An equivalent approach to using the data in Table 4.6 would be to stratify the population of 269 vehicles based on the pass/fail status of each retest (i.e., pass the first retest, pass only the first retest, pass the second retest, pass only the second retest, pass either retest, and fail both retests), and then to examine the distribution of vehicle technology groups with those six strata. This approach also suggests that the three minutes of 2500 rpm operation appears to be most effective in reducing the failure rate of the open-loop carbureted vehicles.

To consider the hypothesis that some of the variability results from a cooling off of the oxygen sensor, we can assume that the oxygen sensor becomes less effective as it cools off, and the vehicles equipped with an oxygen sensor (i.e., the closed-loop vehicles) would then exhibit idle emissions that are more variable than similar cars without oxygen sensors. (This assumption does not consider the effects of different operating strategies in the ECM.) From Tables 4.2 or 4.6, the two pairs of strata in which the vehicles differ only by the existence of an oxygen sensor are the following:

- for the carbureted, light trucks, with AIR: the 25 open-loop versus the 11 closed-loop trucks and
- for the carbureted, passenger cars, with AIR: the 54 open-loop cars versus the 103 closed-loop cars.

Examining the passenger car strata, we observe that the open-loop passenger cars appear to be slightly more variable than their closed-loop counterparts. However, the differences are not statistically significant. Examining the light truck strata, we observe the opposite result (i.e., the open-loop light trucks appear to be less variable than the closed-loop light trucks). However, that may have resulted from the small size (i.e., 11 vehicles) of the stratum containing the closed-loop, light trucks, equipped with AIR. Thus, the data gathered in this program are insufficient to test that hypothesis.

To examine the effects of AIR systems, the only comparable strata are the closed-loop, fuel injected passenger cars with and without AIR. The data suggest that the fuel-injected vehicles without AIR are slightly more variable than those with AIR. However, the differences between the corresponding values are not significant since they are all within 90 percent confidence intervals of one another. The data necessary to compare carbureted vehicles with and without AIR were not obtained in this study.

Stratifying the sample by vehicle type and manufacturer combinations (rather than by technology as with Table 4.6) and then selecting only those combinations that are represented by at least four vehicles, we obtain Table 4.7 (next page).

From Table 4.7 we observe that, for most of the strata (including the two largest), more vehicles passed the retest which followed the three-minute preconditioning cycle (i.e., third chance test) than passed the immediate retest that was not preceded by that cycle (i.e., the second chance test). The three strata which ran counter to this pattern were the Chrysler and Nissan cars and the Ford trucks.

Table 4.7

Distribution of Test Results
by Manufacturer and Vehicle Type

Manufacturer/ Vehicle Type		Strata Size	(Second Chance/Third Chance) P/P	P/F	F/P	F/F
GM	-- Car	76	26.3%	5.3%	13.2%	55.3%
	Trk	17	11.8%	17.6%	23.5%	47.1%
Ford	-- Car	70	21.4%	5.7%	12.9%	60.0%
	Trk	25	20.0%	16.0%	12.0%	52.0%
Chrysler	-- Car	26	19.2%	7.7%	3.8%	69.2%
Mitsubishi	-- Car	4	25.0%	0.0%	50.0%	25.0%
Nissan	-- Car	16	25.0%	12.5%	0.0%	62.5%
Honda	-- Car	12	16.7%	0.0%	33.3%	50.0%

4.3 Comparison of HC and CO Pass/Fail Results:

Before examining the relationships among the HC and CO emission levels of the three tests, let us first consider each test separately. A distribution of the failures (i.e., failure due to: HC only, CO only, or both HC and CO) is given in Table 4.8 and in percentage form in Table 4.9 (both on the next page). From Tables 4.8 and 4.9, we note:

- The failure patterns are fairly consistent among the three tests. Of the tests that fail, 44% to 50% exhibit failing levels of HC, and 78% to 85% exhibit failing levels of CO. Thus, the test failures for exceeding the CO standard are far more common than for exceeding the HC standard. (In fact, four-fifths of the failing tests involve a failing CO score, while only one-half of the failing tests involve a failing HC score.)

- The only value in Table 4.9 which appears to be out of place is the 14.8% for the "HC Only" failures on the second retest (i.e., third chance test). This suggests that the three minutes of 2500 rpm preconditioning substantially reduces the number of vehicles that initially failed for HC only.

Table 4.8

Characterizing I/M Failures by Emission Component

Test Sequence	Fail: HC Only	Fail: HC & CO	Fail: CO Only	Pass Both
Initial Test	59	67	143	--
First Retest	39	57	95	78
Second Retest	26	51	99	93

Table 4.9

Percentage of Failures per Test Sequence by Emission Component

Test Sequence	Failure (%) Due To				
	HC Only	HC & CO	CO Only	HC	CO
Initial Test	21.9	24.9	53.2	46.8	78.1
First Retest	20.4	29.8	49.7	50.3	79.6
Second Retest	14.8	29.0	56.2	43.8	85.2

The behavior of the individual pollutants (i.e., HC or CO) is a major factor that the analysis in the Section 4.2 ignores. In this section, a similar analysis was performed in which pass/fail for each test was replaced by pass/fail on each pollutant. From this analysis, we obtained Table 4.10 (next page).

Table 4.10

Distribution of Pass/Fail Results by Emission Component

Initial Failure	Sample Size	Second Chance Test	Failures on: Third Chance test: HC Only	HC & CO	CO Only	Neither
HC Only	59	HC Only	21	0	0	16
		HC & CO	0	2	0	0
		CO Only	0	0	0	0
		Neither	4	0	0	16
HC & CO	67	HC Only	1	1	0	0
		HC & CO	0	35	8	3
		CO Only	0	5	6	0
		Neither	0	1	1	6
CO Only	143	HC Only	0	0	0	0
		HC & CO	0	3	6	0
		CO Only	0	2	66	16
		Neither	0	2	12	36

From the data in Table 4.10, we observe the following:

1. There is a high degree of consistency among the passing emissions. Most vehicles which initially passed HC continued to pass HC on both retests, and most vehicles which initially passed CO continued to pass CO on both retests.

2. Considering Table 4.10 as three 4x4 matrices, we note that the "HC & CO" and the "CO Only" matrices are relatively symmetric; however, the "HC Only" matrix is not symmetric. This lack of symmetry is due to the statistically significant difference between the number of vehicles that failed the first retest but not the second and those that failed the second but not the first.

3. The preceding point suggests that the nature of the vehicles that failed only HC on the initial test are critical to determining the usefulness of the three minutes of 2500 rpm preconditioning. To examine the distribution of the 59 vehicles which initially failed only the HC standard, we can generate Table 4.11 (next page) which is similar to Table 4.6 but is also stratified by the initial I/M failure.

Table 4.11

Distribution of Test Results
By Initial I/M Failure Type by Stratum

Initial I/M Failure	Fuel Metr	Mixtr Cntrl	Veh. Type	Size	Pass Immed. Second Chance Test	Pass Only After 3-Min 2500 RPM
HC-Only	All	All	All	59	20 (34%)	16 (27%)
	Carb	Clsd	All	21	5 (24%)	8 (38%)
			Car	18	4 (22%)	6 (33%)
			Trk	3	1 (33%)	2 (67%)
	Carb	Open	All	24	5 (21%)	6 (25%)
			Car	11	3 (27%)	2 (18%)
			Trk	13	2 (15%)	4 (31%)
	FI	Clsd	All	14	10 (71%)	2 (14%)
			Car	11	8 (73%)	2 (18%)
			Trk	3	2 (67%)	0 (0%)
CO-Only	All	All	All	143	50 (35%)	16 (11%)
	Carb	Clsd	All	64	23 (36%)	8 (12%)
			Car	58	19 (33%)	8 (14%)
			Trk	6	4 (67%)	0 (0%)
	Carb	Open	All	44	13 (30%)	7 (16%)
			Car	34	9 (26%)	6 (18%)
			Trk	10	4 (40%)	1 (10%)
	FI	Clsd	All	35	14 (40%)	1 (3%)
			Car	30	12 (40%)	1 (3%)
			Trk	5	2 (40%)	0 (0%)
HC & CO	All	All	All	67	8 (12%)	3 (5%)
	Carb	Clsd	All	29	2 (7%)	0 (0%)
			Car	27	2 (7%)	0 (0%)
			Trk	2	0 (0%)	0 (0%)
	Carb	Open	All	12	0 (0%)	2 (17%)
			Car	10	0 (0%)	2 (20%)
			Trk	2	0 (0%)	0 (0%)
	FI	Clsd	All	26	6 (23%)	1 (4%)
			Car	23	4 (17%)	1 (4%)
			Trk	3	2 (67%)	0 (0%)

From Table 4.11, we can make the following observations:

- Among the 59 vehicles that initially failed their I/M tests for only HC, the 45 carbureted vehicles (all equipped with supplementary AIR) exhibited behavior significantly different (relative to both retests) from the 14 fuel injected vehicles (all of which were closed-loop):

  -- The proportion (65 to 75 percent) of the fuel injected vehicles that passed the immediate retest was significantly larger than the corresponding proportion (20 to 30 percent) of the carbureted vehicles (either open-loop or closed-loop).

  -- The preceding trend was reversed (and less significant) between the corresponding retests that passed only after being preconditioned by 3-minutes of 2500 rpm operation.

  -- Although a larger proportion of the carbureted vehicles than the fuel injected vehicles passed only after being preconditioned by 3-minutes of 2500 rpm operation, that did not offset the larger proportion of the fuel injected vehicles that passed the first retest. Thus, the proportion (about 85 percent) of the fuel injected vehicles (all closed-loop) that passed either retest was significantly larger than the corresponding proportion (about 53 percent) of the carbureted vehicles (either open-loop or closed-loop).

- Among the 67 vehicles that initially failed their I/M tests for both HC and CO, the 41 carbureted vehicles (all equipped with supplementary AIR) exhibited behavior significantly different (relative to the first retest) from the 26 fuel injected vehicles (all of which were closed-loop):

  -- Less than 10 percent of the carbureted vehicles (either open-loop or closed-loop) passed the immediate retest, while approximately one-fourth of the fuel injected vehicles (either open-loop or closed-loop) passed that retest.

  -- About 20 percent of the carbureted vehicles (either open-loop or closed-loop) required the 3-minute preconditioning cycle to pass the retest, while less than five percent of the fuel injected vehicles (either open-loop or closed-loop) required that preconditioning cycle to pass the retest.

- The only statistically significant trend exhibited by the 143 vehicles that initially failed their I/M tests for only CO was that a larger proportion (about 14 percent) of the 108 carbureted vehicles than of the 35 fuel injected vehicles (about 3 percent) passed only the retest that followed the 3-minutes of 2500 rpm operation.

4.4 Comparison of Magnitude of Changes:

A third approach to analyzing the data is to study the magnitude of the change in the emissions. That is, some vehicles may alternate between "pass" and "fail" simply because their emissions are near the standards (see Table 3.1), and, thus, the variability in those vehicles' pass/fail results is due to slight test-to-test variability. Alternatively, some vehicles may consistently fail, but the emissions on one failing test might be only marginally above the standards while on another failing test the emissions might be quite high.

Most of the vehicles exhibited a decrease in idle emission scores with each successive test. Summaries of the magnitude of the changes appear in Tables 4.12 and 4.13 (next page). Those data suggest that the three minute preconditioning cycle has a more pronounced effect on the average idle HC emissions than on the idle CO emissions.

As shown in Tables 4.12 and 4.13, most of the results of the two retests were close to the initial values. However, thirteen of the vehicles (4.83% of the sample) exhibited either HC changes in excess of 800 ppm or CO changes in excess of 5.00% between pairs of tests. Those 13 vehicles are identified in Table 4.14 (page 24).

By using the vehicle data from Appendix A, we can examine the distribution of these 13 vehicles by the vehicle parameters such as control configuration (i.e., open-loop vs closed-loop), fuel metering (i.e., fuel-injected vs carbureted), and the possession of a supplementary air system. The distribution of these 13 vehicles is close to what would be expected from 13 vehicles randomly selected from a population of these 269 vehicles as described in Table 4.2. Hence, the large changes in idle emissions do not appear to be related to those vehicle parameters.

From the emissions data in Appendix B, we observe that some of the changes in the overall pass/fail status were due to changes to emissions which were close to (i.e., within 10% of) the standard (i.e., ± 22 ppm HC or ± 0.12% CO). Fifty-nine (59) of the test vehicles had emission scores close enough to the standard so that a change of no more than 10% of the I/M standard would alter the pass/fail status of the initial test or of one of the two retests. Other possibilities include shifting vehicles among the four categories in Table 4.5. No attempt was made to consider the effects of small changes in the emission levels of the vehicles which initially passed the Louisville I/M test.

Table 4.12

Distributio f Differences in Idle HC Scores

	Initial Test minus First Retest	Initial Test minus Second Retest	First Retest minus Second Retest
Percent within 50 ppm	52.8%	42.2%	64.3%
Percent within 100 ppm	69.1%	65.1%	75.8%
Percent within 150 ppm	81.8%	76.6%	82.9%
Percent within 200 ppm	87.7%	83.3%	87.7%
Percent within 250 ppm	91.1%	89.2%	90.0%
Percent between 250 & 550	7.1%	7.1%	6.7%
Percent between 550 & 850	0.7%	3.3%	2.6%
Percent greater than 850	1.1%	0.4%	0.7%
Mean of Differences (ppm)	37.8	76.3	38.5
Standard Deviations	205.8	199.8	189.2

Table 4.13

Distribution of Differences in Idle CO Scores

	Initial Test minus First Retest	Initial Test minus Second Retest	First Retest minus Second Retest
Percent within 0.25% CO	32.0%	32.3%	42.4%
Percent within 0.50% CO	48.0%	48.3%	61.7%
Percent Within 0.75% CO	56.9%	56.5%	71.4%
Percent within 1.00% CO	66.9%	62.1%	79.6%
Percent Within 1.25% CO	71.4%	65.8%	85.9%
Percent Within 1.50% CO	77.3%	73.2%	88.1%
Percent between 1.5 & 3.5	16.4%	20.4%	8.2%
Percent between 3.5 & 5.5	5.2%	3.7%	2.6%
Percent greater than 5.5	1.1%	2.6%	1.1%
Mean of Differences (%CO)	0.534	0.610	0.075
Standard Deviations	1.500	1.675	1.283

Table 4.14

Vehicles Exhibiting Large Changes in Idle Emissions

Veh No.	Mdl Yr/Make/ Engine/(Crb/FI)	Initial Test HC	Initial Test CO	First Retest HC	First Retest CO	Second Retest HC	Second Retest CO
016	82 Chry 2.2L/C	385	9.80	146	4.76	134	3.94
020	86 Chry 2.5L/C	287	3.33	823	8.53	178	7.57
022	86 Chry 2.5L/F	2001	6.58	24	.51	4	.01
044	82 Ford 1.6L/C	646	6.74	358	5.99	6	.04
092	81 Ford 4.2L/C	148	2.98	15	.26	225	8.45
139	85 GM 1.6L/C	489	6.30	29	.01	14	.01
140	84 GM 1.8L/F	564	5.93	804	6.62	150	.17
159	83 GM 2.8L/C	218	6.75	38	1.72	22	.13
172	81 GM 3.8L/C	352	6.50	1680	8.90	338	4.16
219	83 GM 5.0L/C	978	.07	1143	.10	322	.03
238	85 Mits 1.5L/C	229	6.44	89	.86	80	.74
252	83 Niss 2.4L/F	252	5.51	76	.04	89	.10
255	85 Niss 3.0L/F	1152	.32	10	.00	1185	.38

4.5 Comparison of the Vehicles Which Changed Pass/Fail Status between the Two Retests:

Most of the 55 vehicles which exhibited different results (i.e., pass/fail) on the two retests are scattered among the 269 vehicles in this study. However, six combinations of manufacturer and engine had relatively large percentages of those vehicles. Specifically:

- Five of the nine (55.6%) 1981-83 Ford 200 cid (3.3 liter), open-loop, carbureted passenger cars failed the first retest but passed after the preconditioning cycle.

- Three of the four (75.0%) 1983 Ford 231 cid (3.8 liter), open-loop, carbureted passenger cars passed the first retest but failed after the preconditioning cycle.

- Two of the four (50.0%) 1986 Ford 179 cid (2.9 liter), closed-loop, fuel injected trucks passed the first retest but failed after the preconditioning cycle.

- Two of the five (40.0%) 1985-87 GM 173 cid (2.8 liter), closed-loop, fuel injected passenger cars failed the first retest but passed after the preconditioning cycle.

- Two of the three (66.7%) 1982-83 GM 173 cid (2.8 liter), open-loop, carbureted trucks failed the first retest but passed after the preconditioning cycle.

- Two of the three (66.7%) 1981-82 Mitsubishi, open-loop, carbureted passenger cars failed the first retest but passed after the preconditioning cycle.

Of those six combinations of manufacturer and engine, only two combinations (both Ford vehicles) passed the first retest but failed after the preconditioning cycle.

From Table 4.5 (page 14), we observe that 35 vehicles which failed the first retest passed the second retest after being preconditioned with 2500 rpm operation for three minutes, and that 20 vehicles which passed the first retest failed the second retest after being preconditioned with 2500 rpm operation for three minutes. The emission changes for these vehicles are summarized in Tables 4.15 and 4.16, respectively.

From Table 4.15, for the 35 vehicles which failed the first retest but passed the subsequent retest after being preconditioned, eight of the 35 status changes were due primarily to emissions at or near the standard, rather than to dramatic changes (i.e., reductions) in measured emissions. (For the vehicles subject to the 1.20%/220 ppm standard, "emissions at or near the standard" means HC from 208 to 237 ppm, or CO from 1.07% to 1.31%. None of the three 1981 trucks (vehicles 121, 122, and 222) were in either of these two categories.) Also, we note that:

- 4 of the vehicles exhibited HC increases of at least 200 ppm after the preconditioning,

- 1 of the vehicles exhibited HC increases between 100 and 200 ppm after the preconditioning,

- 9 of the vehicles exhibited CO increases of at least 1.00% after the preconditioning, and

- 1 of the vehicles exhibited CO increases between 0.55% and 1.00% after the preconditioning.

From Table 4.16, we note that, for the vehicles which passed the first retest but failed the subsequent retest after being preconditioned, nine of the 20 status changes were due primarily to emissions at or near the standard, rather than to dramatic changes in measured emissions.

Table 4.15

Comparison of the 35 Vehicles Failing the First Retest But Passing after Preconditioning Cycle

Manfr	Veh No.	First Retest HC	First Retest CO	Second Retest HC	Second Retest CO
Chry	028	83	2.06	51	0.80
Ford	044	358	5.99	6	0.04
	054	67	2.02	43	1.15*
	059	176	4.91	39	0.23
	070	524	0.16	28	0.08
	078	231	0.00	216*	0.01
	081	186	2.11	13	0.00
	084	239	0.93	208*	1.20
	085	150	1.58	124	0.82
	086	246	3.67	133	0.58
	107	455	0.76	135	1.12
	109	289	0.04	188	0.03
	107	283	0.57	151	0.02
GM	140	804	6.62	150	0.17
	149	256	0.60	141	0.62
	151	244	0.17	215*	0.25
	159	38	1.72	22	0.13
	163	181	2.09	8	0.01
	169	141	2.88	87	1.02*
	181	225	0.08	219*	0.41
	182	356	0.09	182	0.10
	196	308	1.14	168	0.88
	198	66	2.06	16	1.14*
	209	89	1.95	62	1.18*
	210	480	0.33	182	0.32
	217	525	0.06	35	0.00
	218	390	0.01	86	0.00
Honda	223	80	1.59	34	0.63
	225	37	1.25*	6	0.40
	229	232*	0.78	210*	0.60
	231	42	1.34	5	0.42
Isuzu	235	237*	0.15	117	0.14
Mits	237	155	3.82	83	0.02
	239	46	1.37	29	1.07*
TKM	261	109	1.55	6	0.35

*Change in status ("fail" to "pass") resulted from a reduction from "fail" to barely "pass" or from barely "fail" to "pass"

Table 4.16

Comparison of the 20 Vehicles Passing the First Retest But Failing after Preconditioning Cycle

Manfr	Veh No.	First Retest HC	First Retest CO	Second Retest HC	Second Retest CO
Chry	007	60	1.20*	109	1.65
	031	67	0.79	102	1.44
Ford	088	26	0.60	105	2.49
	089	8	0.00	47	3.27
	091	9	0.17	27	2.58
	092	15	0.26	225*	8.45
	108	87	0.71	112	1.71
	113	123	1.12*	141	2.18
	114	173	0.89	168	1.24*
	120	140	1.15*	135	1.31*
GM	146	199	1.15*	245	1.54
	160	23	0.01	85	1.68
	164	113	0.85	141	1.27*
	178	166	0.34	432	0.62
	207	199	0.49	335	0.93
	208	59	1.09*	60	1.22*
	212	102	0.72	324	4.31
Jag	236	5	0.01	26	1.26*
Niss	243	214*	0.19	245	0.21
	255	10	0.00	1185	0.38

*Change in status ("pass" to "fail") resulted from an increase from barely "pass" to "fail" or from "pass" to barely "fail"

4.6 Vehicles Which Pass Either of the Two Retests:

In addition to the 55 vehicles discussed in Section 4.5, 58 other vehicles in this study passed both retests; thus, a total of 113 vehicles passed either the first or the second retest. Most of those 113 vehicles are scattered among the 269 vehicles in this study. However, some combinations of manufacturer and engine had relatively large percentages of those vehicles. In addition to those six combinations identified in the preceding section (pages 23 and 24):

- Three of the four (75.0%) 1984-86 Chrysler 135 cid (2.2 liter), closed-loop, fuel-injected passenger cars passed one or both retests.
- Three of the five (60.0%) 1986-87 Ford 152 cid (2.5 liter), closed-loop, fuel-injected passenger cars (Taurus) passed both retests.
- Three of the four (75.0%) 1983 Ford 140 cid (2.3 liter), open-loop, carbureted trucks passed one or both retests.
- Six of the 10 (60.0%) 1981-85 GM 98 cid (1.6 liter), closed-loop, carbureted passenger cars (Chevettes) passed both retests.
- All three (100%) of the 1983-86 GM 151 cid (2.5 liter), closed-loop, fuel-injected passenger cars passed one or both retests.
- All five (100%) of the 1985-87 GM 173 cid (2.8 liter), closed-loop, fuel-injected passenger cars passed one or both retests.
- All three (100%) of the 1984-87 Nissan 181 cid (3.0 liter), closed-loop, fuel-injected passenger cars passed one or both retests.

4.7 Examination of the 3-Second Emission Data:

The Louisville I/M program records the emission data in three-second blocks. (The discussion of the computer algorithm is on page 6. The emission data are available from the author.) One criterion of that algorithm is that the emissions in any one of three consecutive blocks shall vary by no more than 10% from the average in order to ensure stability. Examining those data, we observed the following:

1. The stability requirement can result in the measurements continuing longer than seemingly necessary when the emission levels are small since 10% of a small value produces a very small tolerance.

2. The stability requirement can result in the measurements ending "early" (before 30 seconds, in this sample of 807 tests on 269 vehicles, 12 to 18 seconds) while the average emissions are exceeding the standard, when it is possible that the vehicle might have passed if the test ended a few seconds later. Six possible cases (vehicles 147, 120, 188, 198, 208, and 152) of this were observed.

3. Similarly, the stability requirement can result in the measurements ending while the average emissions are still below the standard, when it is possible that the vehicle might have failed if the test ended a few seconds later. Ten possible cases of this were observed. I/M programs with algorithms that always take readings at the end of 25 or 30 seconds may fail vehicles that would have passed earlier.

4. In a fashion similar to the six vehicles in the second point, four other vehicles exhibited failing but decreasing emissions on their tests (but, these four tests each continued for the entire 30 seconds). These vehicles might have passed if the start of the 30-second time limit had simply been delayed three to six seconds by a later probe insertion.

5. The stability requirement can result in the measurements continuing until the average emissions are exceeding the standard, when the vehicle would have passed if the test had begun a few seconds earlier. Twenty-three (23) examples of this situation were observed.

The first point was illustrated by 24 tests on 18 vehicles. Those pass/fail results are relatively insensitive to the choice of the stability algorithm and to the starting time of the test. (All of those tests produced passing results; the choice of the algorithm only resulted in increasing the length of the tests.) However, the second through fifth points suggest that 51 tests (6.3% of the sample of 807 tests) on 43 vehicles (16.0% of the sample of 269 vehicles) were highly sensitive either to the stability algorithm used or to the timing of the test. (i.e., How soon after the 2500 rpm mode do the measurements begin?)

Also, in the fifth point, we note that ten vehicles (i.e., 077, 087, 091, 098, 113, 116, 138, 159, 220, and 255) exhibited substantial jumps in their emissions. Those ten represent different models with the exception of vehicles 113 and 116 which are 1986 Ford 2.9 liter fuel-injected trucks. The other two 1986 Ford 2.9 liter fuel-injected trucks are vehicles 114 and 115, and the initial tests of both those trucks and the second retest of 114 exhibits the less distinctive jumps found in the initial test and second retest of 116. (Ford has confirmed that the high CO failure rate of these trucks is due to open-loop operation, which is moderately rich, following a short period of idle.)

Since the computer recorded the times at which the emission measurements began and ended for each test, we can estimate the time that elapsed between each test. We say "estimate" because there is no way to determine the exact length of the 10-second (30 seconds for Ford) 2500rpm/half-throttle mode or the length of time between the completion of that preconditioning mode and the beginning of the 30-second idle test. The recorded times indicate:

Table 4.16

Elapse Time (in seconds) Between Tests

Elapse Time Between	Minimum	Maximum	Mean	Std. Dev.
Initial Test and First Retest	118	995	283.7	82.0
First and Second Retests	141	477	262.5	51.1

If the procedures described in Section 3.4 (pages 7 and 8) had been precisely followed, the measurement period for the second retest would have begun in no less than than 200 seconds (220 for Fords) following the completion of the first retest. However, as Table 4.16 indicates, one vehicle began its second retest only 141 seconds following the completion of its first retest. In fact, a total of 13 vehicles began their second retest in less than three minutes (i.e., less than 180 seconds) following the completion of their first retest. Also, for eight vehicles, at least six minutes had elapsed. For the remaining 248 vehicles, the second retest began in at least three minutes but less than six minutes after the completion of the first retest.

However, those differences in elapse times do not appear to correlate with changes in the vehicles' pass/fail status.

5.0 CONCLUSIONS

This study suggests that the 3-minute, 2500 rpm, no-load preconditioning cycle produced a slightly larger reduction in the I/M failure rate than did an immediate retest (i.e., a "second chance" test) for most vehicles (35 percent versus 29 percent). However, the small size of this effect might simply have resulted from the vehicles in this study not necessarily being subjected to the "cool down" of the catalyst and oxygen sensor that has been hypothesized to be associated with waiting in long lines prior to an I/M test at a centralized lane since testing took place only at non-peak hours. The preconditioning cycle was most effective in reducing the failure rate for carbureted vehicles and least effective for fuel injected vehicles.

The pass/fail results for the individual vehicles were more variable between the initial test and either of the two retests than between the retests themselves (i.e., the pass/fail determinations for the retests agreed more frequently). This variability might have resulted from either:

- the initial I/M test served as a consistent preconditioning cycle for the first retest, thus, reducing some of the variability or

- the initial idle test was preconditioned by operating at approximately one-half throttle while the preconditioning cycle for both retests was a controlled 2500±300 rpm.

If this difference in preconditioning cycles does, in fact, account for some of the differences among the test scores, then the use of a tachometer (to control the preconditioning cycle) might eliminate that portion of the variability in I/M pass/fail results.

Two other sources of variability are the sensitivity of some vehicles to the algorithm which determines when the testing is complete and the sensitivity of some vehicles to the timing of the start of the idle test (relative to the preconditioning cycle). Approximately one-sixth of the vehicles in this sample displayed such a sensitivity. In some of those instances, the variability resulted from the use of a percent of point stability check. (Since a tolerance based on a fixed percentage of a low emission value results in only a very small level of variability permitted for a "stable" test. This situation could be avoided by establishing a minimum level for each tolerance value (HC, CO, CO_2).)

In future testing programs, it would probably be good to have the probe in place during the preconditioning for consistent start of test in order to reduce the instances of variability which result from the timing of the insertion of the probe into the vehicle's tailpipe.

A second chance test reduced the number of failing vehicles by one-third. Thus, in an I/M program such as Louisville's (in which the failure rate for 1981 and newer passenger cars and light trucks averages between six and eight percent), the use of an immediate retest would result in a reduced failure rate ranging from 4.3 to 5.7 percent, while the use of an immediate retest that was preceded by a three minutes of 2500 rpm preconditioning cycle would result in a failure rate averaging 3.9 to 5.2 percent. The effects of such reductions in the failure rate on reductions in excess FTP emissions have not yet been determined.

APPENDIX A

Description of the 271 Vehicles Tested

VEH No.	VIN	YEAR	Mfr	CLS	MAKE	SERIES/MODEL	---ENGINE---- No. Cyl	--Disp-- CID	Lit	Fuel Mtr.	CNTRL CNFIG	SUPP. AIR ?
001	1AMDC9530DK211705	1983	AMC	Car	RENA	ALLIANCE L	4	85	1.4	FI	CLSD	NO
002	1XMDC9565FK104499	1985	AMC	Car	RENA	ALLIANCE DL	4	85	1.4	FI	CLSD	NO
003	WAUGB0448EA151916	1984	AUDI	Car	AUDI	5000 S WGN	5	131	2.1	FI	CLSD	NO
004	WAUFB0445FN040844	1985	AUDI	Car	AUDI	5000 S	5	136	2.2	FI	CLSD	NO
005	WBAAG3308C8056848	1982	BMW	Car	BMW	320 I	4	108	1.8	FI	CLSD	NO
006	1B3BE46D8EC260486	1984	CHRY	Car	DODG	600	4	135	2.2	FI	CLSD	?
007	1B3BA44D7FG106313	1985	CHRY	Car	DODG	DAYTONA	4	135	2.2	FI	CLSD	NO
008	1C3BC56D1FF226971	1985	CHRY	Car	CHRY	LE BARON	4	135	2.2	FI	CLSD	NO
009	1P3BP36D0GF121487	1986	CHRY	Car	PLYM	RELIANT SPECIAL EDITION	4	135	2.2	FI	CLSD	YES
010	1P3BL28B2BD235013	1981	CHRY	Car	PLYM	HORIZON	4	135	2.2	2bbl	CLSD	YES
011	1P3BK26B5BF230642	1981	CHRY	Car	PLYM	RELIANT	4	135	2.2	2bbl	CLSD	YES
012	1P3BL24BXBD336760	1981	CHRY	Car	PLYM	HORIZON TC3	4	135	2.2	2bbl	CLSD	YES
013	1P3BL28B8BD235016	1981	CHRY	Car	PLYM	HORIZON	4	135	2.2	2bbl	CLSD	YES
014	1P3BL28B5BD234969	1981	CHRY	Car	PLYM	HORIZON	4	135	2.2	2bbl	CLSD	YES
015	1P3BP49B6CF232653	1982	CHRY	Car	PLYM	RELIANT CUSTOM WAGON	4	135	2.2	2bbl	CLSD	YES
016	1B3BD49B0CF205555	1982	CHRY	Car	DODG	ARIES CUSTOM WGN	4	135	2.2	2bbl	CLSD	YES
017	1C3DC51B5CC166021	1982	CHRY	Car	CHRY	LE BARON MEDALLION	4	135	2.2	2bbl	CLSD	YES
018	1C3BC41B1CG106643	1982	CHRY	Car	CHRY	LE BARON	4	135	2.2	2bbl	CLSD	YES
019	1B3BZ54C3ED308362	1984	CHRY	Car	DODG	OMNI/CHARGER 2.2	4	135	2.2	2bbl	CLSD	YES
020	1B3BV51K0GG176556	1986	CHRY	Car	DODG	600	4	152	2.5	FI	CLSD	YES
021	1C3BC56K5GF186488	1986	CHRY	Car	CHRY	LE BARON	4	152	2.5	FI	CLSD	YES
022	1B3BA44K6GG290420	1986	CHRY	Car	DODG	DAYTONA	4	152	2.5	FI	CLSD	YES
023	1C3BH48KXGN181012	1986	CHRY	Car	CHRY	LE BARON GTS	4	152	2.5	FI	CLSD	NO
024	1C3BH48K9HN320855	1987	CHRY	Car	CHRY	LE BARON GTS	4	152	2.5	FI	CLSD	NO
025	1B3BD59G6FF169599	1985	CHRY	Car	DODG	ARIES LE WAGON	4	156	2.6	2bbl	CLSD	YES
026	1B3BK49D8BF100851	1981	CHRY	Car	DODG	ARIES CUSTOM WAGON	4	156	2.6	2bbl	OPEN	YES
027	1P3BK59D4BF104870	1981	CHRY	Car	PLYM	RELIANT WAGON	4	156	2.6	2bbl	OPEN	YES
028	2C3BF66K8CR179924	1982	CHRY	Car	CHRY	NEW YORKER 4D/5TH	8	318	5.2	2bbl	CLSD	YES
029	1C3BF66P2FX596649	1985	CHRY	Car	CHRY	NEW YORKER/5TH AVE	8	318	5.2	2bbl	CLSD	YES
030	1B3BM46N7BG158676	1981	CHRY	Car	DODG	DIPLOMAT SALON (hd)	8	318	5.2	4bbl	CLSD	YES
031	1B3BR47M6BA107504	1981	CHRY	Car	DODG	ST. REGIS	8	318	5.2	4bbl	CLSD	YES

VEH No.	VIN	YEAR	Mfr	CLS	MAKE	SERIES/MODEL	---ENGINE---- No. Cyl	--Disp-- CID	Lit	Fuel Mtr.	CNTRL CNFIG	SUPP. AIR ?
032	JB7FL24D9HP005081	1987	CHRY	Trk	DODG	RAM50/D50 P/U SH 4	4	122	2.0	2bbl	CLSD	YES
033	2P4FH41C4FR102656	1985	CHRY	Trk	PLYM	VOYAGER SE WAGON	4	135	2.2	2bbl	OPEN	YES
034	ZFAAS00B5E5505188	1984	FIAT	Car	FIAT	124/SPIDER CONV	4	122	2.0	FI	CLSD	NO
035	1FABP0525BW226782	1981	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
036	1FABP0822BT132212	1981	FORD	Car	FORD	ESCORT WGN	4	98	1.6	2bbl	OPEN	YES
037	1FABP0529BT109997	1981	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
038	1FABP0523BT166292	1981	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
039	1MEBP6328BW664002	1981	FORD	Car	MERC	LYNX	4	98	1.6	2bbl	OPEN	YES
040	1FABP0823BT152100	1981	FORD	Car	FORD	ESCORT WGN	4	98	1.6	2bbl	OPEN	YES
041	1FABP0525BW158225	1981	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
042	1FABP0522BW264650	1981	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
043	1FABP052XBT217514	1981	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
044	1FABP0527CT101866	1982	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
045	1MEBP6424CT607233	1982	FORD	Car	MERC	LYNX L	4	98	1.6	2bbl	OPEN	YES
046	2MEBP6123CX628470	1982	FORD	Car	MERC	LN7	4	98	1.6	2bbl	OPEN	YES
047	1FABP0622CT137351	1982	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
048	2FABP0123CX173804	1982	FORD	Car	FORD	EXP	4	98	1.6	2bbl	OPEN	YES
049	2FABP0523CX188099	1982	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
050	2FABP0521CX189283	1982	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
051	1MEBP6440CW629696	1982	FORD	Car	MERC	LYNX L	4	98	1.6	2bbl	OPEN	YES
052	2FABP0645DX137866	1983	FORD	Car	FORD	ESCORT GLX	4	98	1.6	2bbl	OPEN	YES
053	1FABP1542DW137472	1983	FORD	Car	FORD	ESCORT GLX	4	98	1.6	2bbl	OPEN	YES
054	2FABP0141DX106931	1983	FORD	Car	FORD	EXP	4	98	1.6	2bbl	OPEN	YES
055	2FABP044XDX189013	1983	FORD	Car	FORD	ESCORT	4	98	1.6	2bbl	OPEN	YES
056	1MEBP6349DW629196	1983	FORD	Car	MERC	LYNX LS WAGON	4	98	1.6	2bbl	OPEN	YES
057	1FABP1342EW150047	1984	FORD	Car	FORD	ESCORT L	4	98	1.6	2bbl	OPEN	YES
058	2FABP3197GB126552	1986	FORD	Car	[illegible]RD	ESCORT PONY	4	113	1.9	2bbl	OPEN	YES
059	1MEBP75X6FK634217	1985	FORD	Car	MERC	TOPAZ GS	4	140	2.3	FI	CLSD	YES
060	1FABP19S7FK269338	1985	FORD	Car	FORD	TEMPO GL	4	140	2.3	FI	CLSD	YES
061	1FABP20X2FK258004	1985	FORD	Car	FORD	TEMPO GLX	4	140	2.3	FI	CLSD	YES
062	1FABP19X8FK269005	1985	FORD	Car	FORD	TEMPO GL	4	140	2.3	FI	CLSD	YES
063	2FABP22X7FB300707	1985	FORD	Car	FORD	TEMPO GL	4	140	2.3	FI	CLSD	YES
064	1FABP19S3GK183557	1986	FORD	Car	FORD	TEMPO GL	4	140	2.3	FI	CLSD	YES
	1FABP22X4GK225262	1986	FORD	Car	FORD	TEMPO GL	4	140	2.3	FI	CLSD	YES
0[illegible]	[illegible]ABP22X1GB164866	1986	FORD	Car	FORD	TEMPO GL	4	140	2.3	FI	CLSD	YES
06[illegible]	[illegible]X7GK258286	1986	FORD	Car	FORD	TEMPO GL	4	140	2.3	FI	CLSD	YES
068	[illegible]GB207127	1986	FORD	Car	FORD	TEMPO GL	4	140	2.3	FI	CLSD	YES

VEH							---ENGINE----					
							No.	--Disp--		Fuel	CNTRL	SUPP.
No.	VIN	YEAR	Mfr	CLS	MAKE	SERIES/MODEL	Cyl	CID	Lit	Mtr.	CNFIG	AIR ?
069	1MEBP79A9EF611091	1984	FORD	Car	MERC	CAPRI	4	140	2.3	1bbl	CLSD	YES
070	1FABP26A9GF273158	1986	FORD	Car	FORD	MUSTANG LX	4	140	2.3	1bbl	CLSD	YES
071	1FABP10A2CF135555	1982	FORD	Car	FORD	MUSTANG	4	140	2.3	2bbl	OPEN	YES
072	1FABP16A5CF119048	1982	FORD	Car	FORD	MUSTANG L	4	140	2.3	2bbl	OPEN	YES
073	1FABP29D9GA171040	1986	FORD	Car	FORD	TAURUS L	4	152	2.5	FI	CLSD	YES
074	1FABP29D3GA233192	1986	FORD	Car	FORD	TAURUS L	4	152	2.5	FI	CLSD	YES
075	1FABP29D3GA235315	1986	FORD	Car	FORD	TAURUS L	4	152	2.5	FI	CLSD	YES
076	1FABP29D5GA198896	1986	FORD	Car	FORD	TAURUS L	4	152	2.5	FI	CLSD	YES
077	1FABP50D9HA142511	1987	FORD	Car	FORD	TAURUS L	4	152	2.5	FI	CLSD	YES
078	1MEBP71B4BK628856	1981	FORD	Car	MERC	ZEPHYR	6	200	3.3	1bbl	OPEN	YES
079	1FABP23B0BK156646	1981	FORD	Car	FORD	FAIRMONT WGN	6	200	3.3	1bbl	OPEN	YES
080	1MEBP71B1BA617383	1981	FORD	Car	MERC	ZEPHYR	6	200	3.3	1bbl	OPEN	YES
081	1FABP27B2CG105051	1982	FORD	Car	FORD	GRANADA L	6	200	3.3	1bbl	OPEN	YES
082	1FABP21B0CA100118	1982	FORD	Car	FORD	FAIRMONT FUTURA	6	200	3.3	1bbl	OPEN	YES
083	1FABP26B2CG177207	1982	FORD	Car	FORD	GRANADA L	6	200	3.3	1bbl	OPEN	YES
084	1FABP21B5CA109459	1982	FORD	Car	FORD	FAIRMONT FUTURA	6	200	3.3	1bbl	OPEN	YES
085	1MEBP89X5DG604335	1983	FORD	Car	MERC	MARQUIS	6	200	3.3	1bbl	OPEN	YES
086	1MEBP86X1DK607105	1983	FORD	Car	MERC	ZEPHYR	6	200	3.3	1bbl	OPEN	YES
087	1MEBP9239GH619545	1986	FORD	Car	MERC	COUGAR	6	231	3.8	FI	CLSD	YES
088	1MEBP9030DG657508	1983	FORD	Car	MERC	MARQUIS WGN	6	231	3.8	2bbl	OPEN	YES
089	1MEBP8938DG604309	1983	FORD	Car	MERC	MARQUIS	6	231	3.8	2bbl	OPEN	YES
090	1MEBP8936DG610920	1983	FORD	Car	MERC	MARQUIS	6	231	3.8	2bbl	OPEN	YES
091	1MEBP9235DH627279	1983	FORD	Car	MERC	COUGAR	6	231	3.8	2bbl	OPEN	YES
092	1FABP33D3BU155535	1981	FORD	Car	FORD	LTD	8	255	4.2	2bbl	CLSD	YES
093	1FABP27D6BG136433	1981	FORD	Car	FORD	GRANADA L	8	255	4.2	2bbl	OPEN	YES
094	1FABP28F8DF130318	1983	FORD	Car	FORD	MUSTANG GL	8	302	5.0	FI	CLSD	YES
095	1FABP31F3BU133331	1981	FORD	Car	FORD	LTD S	8	302	5.0	2bbl	CLSD	YES
096	1FABP42FXBH182796	1981	FORD	Car	FORD	THUNDERBIRD	8	302	5.0	2bbl	CLSD	YES
097	1FABP42F9BH141849	1981	FORD	Car	FORD	THUNDERBIRD	8	302	5.0	2bbl	CLSD	YES
098	1MEBP85FXCZ606873	1982	FORD	Car	MERC	GRAND MARQUIS	8	302	5.0	2bbl	CLSD	YES
099	1FABP16F5CF138971	1982	FORD	Car	FORD	MUSTANG L	8	302	5.0	2bbl	OPEN	YES
100	2FABP31G9CB197521	1982	FORD	Car	FORD	LTD S	8	351	5.8	2bbl	CLSD	YES
101	2FABP43G0FX195179	1985	FORD	Car	FORD	LTD CROWN VICTORIA	8	351	5.8	2bbl	CLSD	YES
102	2FABP43G2FX226559	1985	FORD	Car	FORD	LTD CROWN VICTORIA	8	351	5.8	2bbl	CLSD	YES
103	2FABP43G7FX195146	1985	FORD	Car	FORD	LTD CROWN VICTORIA	8	351	5.8	2bbl	CLSD	YES
104	2FABP72G9HX122561	1987	FORD	Car	FORD	LTD CROWN VICTORIA S	8	351	5.8	2bbl	CLSD	YES

VEH No.	VIN	YEAR	Mfr	CLS	MAKE	SERIES/MODEL	---ENGINE---- No. Cyl	--Disp-- CID	Lit	Fuel Mtr.	CNTRL CNFIG	SUPP. AIR ?
105	1FTBR10C5EUB15739	1984	FORD	Trk	FORD	RANGER PICKUP 4X2	4	122	2.0	1bbl	OPEN	YES
106	1FTBR10A6GUD33660	1986	FORD	Trk	FORD	RANGER PICKUP 4X2	4	140	2.3	FI	CLSD	NO
107	1FTCR11A1DUB58961	1983	FORD	Trk	FORD	RANGER PICKUP 4X4	4	140	2.3	1bbl	OPEN	YES
108	1FTCR10A4DUA97199	1983	FORD	Trk	FORD	RANGER PICKUP 4X2	4	140	2.3	1bbl	OPEN	YES
109	1FTCR10A5DUB11353	1983	FORD	Trk	FORD	RANGER PICKUP 4X2	4	140	2.3	1bbl	OPEN	YES
110	1FTBR10A1DUA35822	1983	FORD	Trk	FORD	RANGER PICKUP 4X2	4	140	2.3	1bbl	OPEN	YES
111	1FMBU14S4EUA13053	1984	FORD	Trk	FORD	BRONCO II 4X4	6	171	2.8	2bbl	CLSD	YES
112	1FTBR10S1FUA23018	1985	FORD	Trk	FORD	RANGER PICKUP 4X2	6	171	2.8	2bbl	CLSD	YES
113	1FMCU14T0GUA36409	1986	FORD	Trk	FORD	BRONCO II 4X4	6	179	2.9	FI	CLSD	NO
114	1FTBR10T2GUC79632	1986	FORD	Trk	FORD	RANGER PICKUP 4X2	6	179	2.9	FI	CLSD	NO
115	1FTCR14T5GPA48995	1986	FORD	Trk	FORD	RANGER SUPER CAB P/U 4X4	6	179	2.9	FI	CLSD	NO
116	1FTCR14T1GPA63994	1986	FORD	Trk	FORD	RANGER SUPER CAB P/U 4	6	179	2.9	FI	CLSD	NO
117	1FTCF10D1CNA02416	1982	FORD	Trk	FORD	F100 PICKUP 4X2	8	255	4.2	2bbl	OPEN	YES
118	2FTCF10E0CCA66705	1982	FORD	Trk	FORD	F100 PICKUP 4X2	6	300	4.9	1bbl	OPEN	YES
119	1FTDF15YXELA82393	1984	FORD	Trk	FORD	F150 PICKUP 4X2	6	300	4.9	1bbl	CLSD	YES
120	1FTCF15Y4GNA72266	1986	FORD	Trk	FORD	F150 PICKUP 4X2	6	300	4.9	1bbl	CLSD	YES
121	1FTCF10E9BUA61212	1981	FORD	Trk	FORD	F100 PICKUP 4X2	6	300	4.9	1bbl	OPEN	YES
122	1FTDF15E8BUA07655	1981	FORD	Trk	FORD	F150 PICKUP 4X2	6	300	4.9	1bbl	OPEN	YES
123	1FTCF10Y4DLA80804	1983	FORD	Trk	FORD	F100 PICKUP 4X2	6	300	4.9	1bbl	OPEN	YES
124	1FTDE14N4GHB25819	1986	FORD	Trk	FORD	E150 ECONOLINE CARGO VAN	8	302	5.0	FI	CLSD	?
125	1FTDF15F7EPB18547	1984	FORD	Trk	FORD	F150 PICKUP 4X2	8	302	5.0	2bbl	OPEN	YES
126	2FTHF25G9CCA70693	1982	FORD	Trk	FORD	F250 PICKUP 4X2	8	351	5.8	2bbl	CLSD	YES
127	1FMEU15G0CLA56072	1982	FORD	Trk	FORD	BRONCO 4WD	8	351	5.8	2bbl	CLSD	YES
128	1FBHE21G3CHA56715	1982	FORD	Trk	FORD	E250 ECONOLINE CLUB WGN	8	351	5.8	2bbl	OPEN	YES
129	1FTJE34L6CHA71477	1982	FORD	Trk	FORD	E350 ECONOLINE CARGO VAN	8	460	7.5	4bbl	OPEN	YES
130	1G1AJ089XBY210204	1981	GM	Car	CHEV	CHEVETTE SCOOTER	4	98	1.6	2bbl	CLSD	YES
131	1G1AB689XBY272640	1981	GM	Car	CHEV	CHEVETTE	4	98	1.6	2bbl	CLSD	YES
132	1G2AM6896BA208660	1981	GM	Car	PONT	T1000	4	98	1.6	2bbl	CLSD	YES
133	1G1AB6897BY205817	1981	GM	Car	CHEV	CHEVETTE	4	98	1.6	2bbl	CLSD	YES
134	1G1AB6897BY290626	1981	GM	Car	CHEV	CHEVETTE	4	98	1.6	2bbl	CLSD	YES
135	1G1AB08CXCA162643	1982	GM	Car	CHEV	CHEVETTE	4	98	1.6	2bbl	CLSD	YES
136	1G2AL08C0CY223997	1982	GM	Car	PONT	T1000/1000	4	98	1.6	2bbl	CLSD	YES
137	1G1AB68CXEY180265	1984	GM	Car	CHEV	CHEVETTE	4	98	1.6	2bbl	CLSD	YES
138	1G1TB68C5FA211232	1985	GM	Car	CHEV	CHEVETTE	4	98	1.6	2bbl	CLSD	YES
139	1G1TB08C7FA195709	1985	GM	Car	CHEV	CHEVETTE	4	98	1.6	2bbl	CLSD	YES
140	1G3AC6907EK379527	1984	GM	Car	OLDS	FIRENZA	4	110	1.8	FI	CLSD	NO

VEH No.	VIN	YEAR	Mfr	CLS	MAKE	SERIES/MODEL	---ENGINE---- No. Cyl	--Disp-- CID	Lit	Fuel Mtr.	CNTRL CNFIG	SUPP. AIR ?
141	1G1AE77G7C7132047	1982	GM	Car	CHEV	CAVALIER TYPE 10	4	112	1.8	2bbl	CLSD	YES
142	1G1AD35G9C7214151	1982	GM	Car	CHEV	CAVALIER WGN	4	112	1.8	2bbl	CLSD	YES
143	1G1AD27G5C7161309	1982	GM	Car	CHEV	CAVALIER	4	112	1.8	2bbl	CLSD	YES
144	1G4AS69P2EK482043	1984	GM	Car	BUIC	SKYHAWK CUSTOM	4	121	2.0	FI	CLSD	YES
145	1G1AX68R3D6118299	1983	GM	Car	CHEV	CITATION	4	151	2.5	FI	CLSD	NO
146	1G4AL19R2E6413931	1984	GM	Car	BUIC	CENTURY LIMITED	4	151	2.5	FI	CLSD	NO
147	1G2PM37R2GP223204	1986	GM	Car	PONT	FIERO SPORT	4	151	2.5	FI	CLSD	NO
148	1G3AE6959BW180215	1981	GM	Car	OLDS	OMEGA BROUGHAM	4	151	2.5	2bbl	CLSD	YES
149	1G2PG3791FP249279	1985	GM	Car	PONT	FIERO GT	6	173	2.8	FI	CLSD	NO
150	1G2PF3799FP254118	1985	GM	Car	PONT	FIERO SE	6	173	2.8	FI	CLSD	NO
151	1G1AW35W5F6271202	1985	GM	Car	CHEV	CELEBRITY WGN	6	173	2.8	FI	CLSD	NO
152	2G2AH19W5G9274339	1986	GM	Car	PONT	6000 STE	6	173	2.8	FI	CLSD	NO
153	1G1AW51W6H6103122	1987	GM	Car	CHEV	CELEBRITY	6	173	2.8	FI	CLSD	?
154	1G4AB69X9BT207372	1981	GM	Car	BUIC	SKYLARK	6	173	2.8	2bbl	CLSD	YES
155	1G1AX08X0B6119211	1981	GM	Car	CHEV	CITATION	6	173	2.8	2bbl	CLSD	YES
156	1G1AX68X2B6160183	1981	GM	Car	CHEV	CITATION	6	173	2.8	2bbl	CLSD	YES
157	1G1AS8718CN136484	1982	GM	Car	CHEV	CAMARO BERLINETTA	6	173	2.8	2bbl	CLSD	YES
158	1G4AC69X4CW492155	1982	GM	Car	BUIC	SKYLARK LIMITED	6	173	2.8	2bbl	CLSD	YES
159	1G1AW19X0D6832846	1983	GM	Car	CHEV	CELEBRITY	6	173	2.8	2bbl	CLSD	YES
160	1G2AS8719EN248516	1984	GM	Car	PONT	FIREBIRD	6	173	2.8	2bbl	CLSD	YES
161	1G1AT27K9BB415445	1981	GM	Car	CHEV	MALIBU	6	229	3.8	2bbl	CLSD	YES
162	1G1AP87K7BL172848	1981	GM	Car	CHEV	CAMARO Z28	6	229	3.8	2bbl	CLSD	YES
163	1G1AW69K5BK441861	1981	GM	Car	CHEV	MALIBU CLASSIC	6	229	3.8	2bbl	CLSD	YES
164	2G1AL69K2C1230689	1982	GM	Car	CHEV	IMPALA	6	229	3.8	2bbl	CLSD	YES
165	2G1AL69K6C1256227	1982	GM	Car	CHEV	IMPALA	6	229	3.8	2bbl	CLSD	YES
166	1G1AZ3797DR109758	1983	GM	Car	CHEV	MONTE CARLO	6	229	3.8	2bbl	CLSD	YES
167	1G4EZ57BXGU407886	1986	GM	Car	BUIC	RIVIERA	6	231	3.8	FI	CLSD	NO
168	1G4EZ57B6GU407075	1986	GM	Car	BUIC	RIVIERA	6	231	3.8	FI	CLSD	NO
169	1G3AR47A5BM468219	1981	GM	Car	OLDS	CUTLASS SUPREME	6	231	3.8	2bbl	CLSD	YES
170	1G4AH69A7BH125251	1981	GM	Car	BUIC	CENTURY	6	231	3.8	2bbl	CLSD	YES
171	1G2AJ37A4BP514191	1981	GM	Car	PONT	GRAND PRIX	6	231	3.8	2bbl	CLSD	YES
172	1G4AM47A4BH153463	1981	GM	Car	BUIC	REGAL LIMITED	6	231	3.8	2bbl	CLSD	YES
173	1G4AL69A8BH122471	1981	GM	Car	BUIC	CENTURY LIMITED	6	231	3.8	2bbl	CLSD	YES
174	1G3AR69A0BD448257	1981	GM	Car	OLDS	CUTLASS LS	6	231	3.8	2bbl	CLSD	YES
175	1G3AM69A4BM490008	1981	GM	Car	OLDS	CUTLASS SUPREME BROUGHAM	6	231	3.8	2bbl	CLSD	YES
176	1G3AR69A0BG446815	1981	GM	Car	OLDS	CUTLASS LS	6	231	3.8	2bbl	CLSD	YES
177	1G2AD69A1BP656021	1981	GM	Car	PONT	LEMANS	6	231	3.8	2bbl	CLSD	YES

VEH No.	VIN	YEAR	Mfr	CLS	MAKE	SERIES/MODEL	---ENGINE---- No. Cyl	--Disp-- CID	Lit	Fuel Mtr.	CNTRL CNFIG	SUPP. AIR ?
178	1G2AK37A9BP604191	1981	GM	Car	PONT	GRAND PRIX LJ	6	231	3.8	2bbl	CLSD	YES
179	1G2AS87A4BL140943	1981	GM	Car	PONT	FIREBIRD	6	231	3.8	2bbl	CLSD	YES
180	1G3AR47A6BM475180	1981	GM	Car	OLDS	CUTLASS SUPREME	6	231	3.8	2bbl	CLSD	YES
181	1G4AJ47A7CH188539	1982	GM	Car	BUIC	REGAL	6	231	3.8	2bbl	CLSD	YES
182	1G3AR47AXCM545118	1982	GM	Car	OLDS	CUTLASS SUPREME	6	231	3.8	2bbl	CLSD	YES
183	1G2AN69A2CP617050	1982	GM	Car	PONT	BONNEVILLE	6	231	3.8	2bbl	CLSD	YES
184	2G3AR69A3C2319498	1982	GM	Car	OLDS	CUTLASS SUPREME	6	231	3.8	2bbl	CLSD	YES
185	1G4AM47AXCH103720	1982	GM	Car	BUIC	REGAL LIMITED	6	231	3.8	2bbl	CLSD	YES
186	1G3AN69A1CM285065	1982	GM	Car	OLDS	DELTA-88 ROYALE	6	231	3.8	2bbl	CLSD	YES
187	1G3AR47A2DM422138	1983	GM	Car	OLDS	CUTLASS SUPREME	6	231	3.8	2bbl	CLSD	YES
188	2G2AJ37A0D2211676	1983	GM	Car	PONT	GRAND PRIX	6	231	3.8	2bbl	CLSD	YES
189	1G4AJ47A2DH912607	1983	GM	Car	BUIC	REGAL	6	231	3.8	2bbl	CLSD	YES
190	1G6CD4787F4384481	1985	GM	Car	CADI	DEVILLE	8	249	4.1	FI	CLSD	YES
191	1G6AD4743B9141607	1981	GM	Car	CADI	DEVILLE RWD	6	252	4.1	4bbl	CLSD	YES
192	1G2AN6948CP535060	1982	GM	Car	PONT	BONNEVILLE	6	252	4.1	4bbl	CLSD	YES
193	1G4AM47SXBK142169	1981	GM	Car	BUIC	REGAL LIMITED	8	265	4.3	2bbl	CLSD	YES
194	1G2AP37S5BP535851	1981	GM	Car	PONT	GRAND PRIX BROUGHAM	8	265	4.3	2bbl	CLSD	YES
195	1G2AX87H5CL508904	1982	GM	Car	PONT	FIREBIRD SE	8	305	5.0	4bbl	CLSD	YES
196	1G1AN35H2CX119808	1982	GM	Car	CHEV	CAPRICE ESTATE WGN	8	305	5.0	4bbl	CLSD	YES
197	2G2AP37H6E2205233	1984	GM	Car	PONT	GRAND PRIX BROUGHAM	8	305	5.0	4bbl	CLSD	YES
198	1G4AZ57Y2BE438538	1981	GM	Car	BUIC	RIVIERA	8	307	5.0	4bbl	CLSD	YES
199	1G3AZ57Y3BE321748	1981	GM	Car	OLDS	TORONADO BROUGHAM	8	307	5.0	4bbl	CLSD	YES
200	2G2AN69Y2B1716248	1981	GM	Car	PONT	BONNEVILLE	8	307	5.0	4bbl	CLSD	YES
201	1G3AX69Y7BM152462	1981	GM	Car	OLDS	98 REGENCY	8	307	5.0	4bbl	CLSD	YES
202	1G3AX69Y4BM233841	1981	GM	Car	OLDS	98 REGENCY	8	307	5.0	4bbl	CLSD	YES
203	1G4AN69Y4EH857671	1984	GM	Car	BUIC	LESABRE CUSTOM	8	307	5.0	4bbl	CLSD	YES
204	1G6AD6990B9106673	1981	GM	Car	CADI	DEVILLE RWD	8	368	6.0	FI	CLSD	YES
205	1G6AS6992BE691088	1981	GM	Car	CADI	SEVILLE	8	368	6.0	FI	CLSD	YES

VEH No.	VIN	YEAR	Mfr	CLS	MAKE	SERIES/MODEL	---ENGINE---- No. Cyl	--Disp-- CID	Lit	Fuel Mtr.	CNTRL CNFIG	SUPP. AIR ?
206	1GCBS14A8C0106437	1982	GM	Trk	CHEV	S10 PICKUP	4	119	1.9	2bbl	OPEN	YES
207	1GCCT14E5F2183411	1985	GM	Trk	CHEV	T10 PICKUP 4X4	4	151	2.5	FI	CLSD	NO
208	1G8CS18BXF0188919	1985	GM	Trk	CHEV	S10 BLAZER	6	173	2.8	2bbl	CLSD	YES
209	1GCBS14B1C8114650	1982	GM	Trk	CHEV	S10 PICKUP	6	173	2.8	2bbl	OPEN	YES
210	1GTBS14BXC2514595	1982	GM	Trk	GMC	S15 PICKUP	6	173	2.8	2bbl	OPEN	YES
211	1GTCS14B1D8508607	1983	GM	Trk	GMC	S15 PICKUP	6	173	2.8	2bbl	OPEN	YES
212	1GCCW80A7CR146897	1982	GM	Trk	CHEV	EL CAMINO	6	229	3.8	2bbl	CLSD	YES
213	1G8DM15Z1GB154082	1986	GM	Trk	CHEV	ASTRO MVP VAN	6	262	4.3	FI	CLSD	YES
214	1G8CM15Z9GB213794	1986	GM	Trk	CHEV	ASTRO VAN MPV	6	262	4.3	FI	CLSD	YES
215	2GCDC14Z4J1131672	1988	GM	Trk	CHEV	C10 PICKUP 1/2T	6	262	4.3	FI	CLSD	NO
216	2GCCC14H7G1208028	1986	GM	Trk	CHEV	C10 PICKUP 1/2T	8	305	5.0	4bbl	CLSD	YES
217	1GBEG25H3G7134650	1986	GM	Trk	CHEV	CHEVY VAN 3/4T	8	305	5.0	4bbl	CLSD	YES
218	2GCDC14H5D1175045	1983	GM	Trk	CHEV	C10 PICKUP 1/2T	8	305	5.0	4bbl	OPEN	YES
219	1GCFC24H3DF370150	1983	GM	Trk	CHEV	C20 PICKUP 3/4TON	8	305	5.0	4bbl	OPEN	YES
220	1GCDC14H7DS126929	1983	GM	Trk	CHEV	C10 PICKUP 1/2T	8	305	5.0	4bbl	OPEN	YES
221	1GBEG25H8F7189979	1985	GM	Trk	CHEV	CHEVY VAN 3/4T	8	305	5.0	4bbl	OPEN	YES
222	1GCGC24M3BF356439	1981	GM	Trk	CHEV	20 PICKUP 3/4T	8	350	5.7	4bbl	OPEN	YES
223	JHMAK3437FS006135	1985	HOND	Car	HOND	CIVIC CVCC	4	91	1.5	3bbl	CLSD	YES
224	JHMSR3321CS002408	1982	HOND	Car	HOND	CIVIC CVCC DX	4	91	1.5	3bbl	OPEN	YES
225	JHMSM5429BC186241	1981	HOND	Car	HOND	ACCORD	4	107	1.8	3bbl	OPEN	NO
226	1HGSZ542XDA001214	1983	HOND	Car	HOND	ACCORD	4	107	1.8	3bbl	OPEN	YES
227	JHMAB5225EC009288	1984	HOND	Car	HOND	PRELUDE	4	112	1.8	2bbl	CLSD	YES
228	JHMAB5229GC012584	1986	HOND	Car	HOND	PRELUDE	4	112	1.8	2bbl	CLSD	YES
229	1HGAD5324FA130077	1985	HOND	Car	HOND	ACCORD	4	112	1.8	3bbl	CLSD	YES
230	1HGAD5322FA128814	1985	HOND	Car	HOND	ACCORD	4	112	1.8	3bbl	CLSD	YES
231	1HGBA7425GA061232	1986	HOND	Car	HOND	ACCORD	4	119	2.0	2bbl	CLSD	YES
232	1HGBA5430GA078663	1986	HOND	Car	HOND	ACCORD LX	4	119	2.0	2bbl	CLSD	YES
233	1HGBA7436GA040639	1986	HOND	Car	HOND	ACCORD LX	4	119	2.0	2bbl	CLSD	YES
234	JHMBA5324GC038323	1986	HOND	Car	HOND	ACCORD	4	119	2.0	2bbl	CLSD	YES
235	JABAT69B9E0803449	1984	ISUZ	Car	ISUZ	I-MARK (SOHC)	4	111	1.8	2bbl	CLSD	YES
236	SAJAV1366DC365119	1983	JAG	Car	JAG	XJ6	6	258	4.2	FI	CLSD	YES

VEH No.	VIN	YEAR	Mfr	CLS	MAKE	SERIES/MODEL	---ENGINE---- No. Cyl	--Disp-- CID	--Disp-- Lit	Fuel Mtr.	CNTRL CNFIG	SUPP. AIR ?
237	JB3BE2423BU114511	1981	MITS	Car	DODG	COLT 2D HTCH	4	86	1.4	2bbl	OPEN	YES
238	JB3BA34K3FU717384	1985	MITS	Car	DODG	COLT DL HTCH	4	90	1.5	2bbl	CLSD	YES
239	JB3BD4371BY400930	1981	MITS	Car	DODG	CHALLENGER	4	156	2.6	2bbl	OPEN	YES
240	JB3BD4376CY706071	1982	MITS	Car	DODG	CHALLENGER	4	156	2.6	2bbl	OPEN	YES
241	JB7FP2459DY105151	1983	MITS	Trk	DODG	RAM50/D50 P/U SH 4	4	122	2.0	2bbl	OPEN	YES
242	JN1PB04S889261169	1981	NISS	Car	DATS	210	4	*	*	2bbl	OPEN	YES
243	JN1PN06S5BM108072	1981	NISS	Car	DATS	310	4	91	1.5	2bbl	OPEN	YES
244	JN1PB01S6C9352091	1982	NISS	Car	DATS	210 SEDAN	4	91	1.5	2bbl	OPEN	YES
245	JN1CN24S2DM104254	1983	NISS	Car	NISS	PULSAR (turbo)	4	92	1.5	FI	CLSD	NO
246	JN1MN24S8EM006612	1984	NISS	Car	NISS	PULSAR GX	4	98	1.6	2bbl	CLSD	YES
247	JN1PB11S5DU037271	1983	NISS	Car	NISS	SENTRA	4	98	1.6	2bbl	OPEN	YES
248	JN1HT14S3CT016713	1982	NISS	Car	NISS	STANZA	4	120	2.0	2bbl	OPEN	YES
249	JN1HT13SXCT034966	1982	NISS	Car	NISS	STANZA	4	120	2.0	2bbl	OPEN	YES
250	JN1HU01S6BT006428	1981	NISS	Car	DATS	810	6	146	2.4	FI	CLSD	NO
251	JN1HU01S0CT035327	1982	NISS	Car	DATS	810	6	146	2.4	FI	CLSD	NO
252	JN1HU05S1DX033154	1983	NISS	Car	DATS	810 WAGON	6	146	2.4	FI	CLSD	NO
253	JN1HU01S6ET216404	1984	NISS	Car	NISS	MAXIMA SEDAN	6	146	2.4	FI	CLSD	NO
254	JN1HU01S6ET228553	1984	NISS	Car	NISS	MAXIMA SEDAN	6	146	2.4	FI	CLSD	NO
255	JN1HU11S0FT046905	1985	NISS	Car	NISS	810/MAXIMA SEDAN	6	181	3.0	FI	CLSD	YES
256	JN1HU11S3HT247765	1987	NISS	Car	NISS	810/MAXIMA SEDAN	6	181	3.0	FI	CLSD	YES
257	JN1HZ14S8EX009072	1984	NISS	Car	NISS	300 ZX	6	181	3.0	FI	CLSD	NO
258	VF3BA11FXFS372706	1985	PEUG	Car	PEUG	505	4	120	2.0	FI	CLSD	YES
259	WP0EA0919DS170642	1983	PORS	Car	PORS	911 TARGA/CABRIOLE	6	183	3.0	FI	CLSD	NO
260	JM1BD2219D0709658	1983	TOKO	Car	MAZD	GLC SEDAN	4	91	1.5	2bbl	CLSD	YES
261	JM1BD2315E0762275	1984	TOKO	Car	MAZD	GLC	4	91	1.5	2bbl	CLSD	YES

* The displacement of that Datsun 210 is either 75, 85, or 91 CID.

							---ENGINE----					
VEH No.	VIN	YEAR	Mfr	CLS	MAKE	SERIES/MODEL	No. Cyl	--Disp-- CID	Lit	Fuel Mtr.	CNTRL CNFIG	SUPP. AIR ?
262	JT2TE72CXB0568704	1981	TOYO	Car	TOYO	COROLLA DELUXE SPORT	4	108	1.8	2bbl	CLSD	YES
263	JT3YR26V2E5007554	1984	TOYO	Trk	TOYO	VAN 4X2 LUX. ED.	4	122	2.0	FI	CLSD	NO
264	JT4RN38DXD0063680	1983	TOYO	Trk	TOYO	PICKUP SH 1/2T 4X4 DELUXE	4	144	2.4	2bbl	OPEN	YES
265	YV1AX4541B1626327	1981	VOLV	Car	VOLV	240 DL	4	130	2.1	FI	CLSD	NO
266	YV1AX4741D1909973	1983	VOLV	Car	VOLV	240 WAGON (turbo)	4	130	2.1	FI	CLSD	NO
267	WVWCA053XCK026059	1982	VW	Car	VOLK	SCIROCCO	4	105	1.7	FI	CLSD	NO
268	1VWGB9173CV043504	1982	VW	Car	VOLK	RABBIT SEDAN LS	4	105	1.7	FI	CLSD	NO
269	1VWDC0171DV019909	1983	VW	Car	VOLK	RABBIT GTI	4	109	1.8	FI	CLSD	NO
270	1G3AM19TXDD336927	1983	GM	Car	OLDS	CUTLASS CIERA	------- Converted Diesel --					
271	1G6AL57N4BE610776	1981	GM	Car	CADI	ELDORADO	------- Converted Diesel --					

APPENDIX B

Idle Emissions of the Test Vehicles

Veh No.	Make	Md Yr	Testing Center	Test Date	-----First Test----- Time	--HC--	--CO---	-----Second Test---- Time	--HC--	--CO---	-----Third Test----- Time	--HC--	--CO---
001	RENA	83	Poplar	07-24-87	10:08	0397 F	7.77 F	10:13	0331 F	7.05 F	10:17	0333 F	7.15 F
002	RENA	85	Outer L	09-08-87	09:42	0478 F	1.82 F	09:44	0644 F	1.69 F	09:48	0559 F	1.38 F
003	AUDI	84	Goose C	10-20-87	12:00	0109 P	5.16 F	12:03	0095 P	4.22 F	12:08	0076 P	1.83 F
004	AUDI	85	22nd St	08-19-87	10:13	0155 P	8.49 F	10:18	0139 P	8.40 F	10:21	0130 P	8.16 F
005	BMW	82	Goose C	11-19-87	12:38	0213 P	2.08 F	12:41	0054 P	2.66 F	12:46	0446 F	1.75 F
006	DODG	84	Outer L	08-19-87	16:27	0153 P	1.70 F	16:31	0040 P	0.01 P	16:34	0029 P	0.01 P
007	DODG	85	Outer L	12-10-87	17:19	0043 P	1.41 F	17:22	0060 P	1.20 P	17:26	0109 P	1.65 F
008	CHRY	85	Goose C	12-10-87	10:49	0164 P	2.90 F	10:52	0064 P	0.61 P	10:56	0005 P	0.00 P
009	PLYM	86	Outer L	11-05-87	09:52	0324 F	5.03 F	09:56	0727 F	7.29 F	10:00	0150 P	8.32 F
010	PLYM	81	22nd St	08-08-87	12:35	0125 P	5.42 F	12:39	0144 P	5.39 F	12:43	0048 P	3.24 F
011	PLYM	81	22nd St	11-14-87	10:40	0002 P	1.32 F	10:44	0060 P	1.10 P	10:47	0043 P	0.81 P
012	PLYM	81	22nd St	09-10-87	10:48	0132 P	5.56 F	10:53	0148 P	5.94 F	10:56	0147 P	6.07 F
013	PLYM	81	Goose C	10-17-87	11:00	0115 P	5.36 F	11:03	0123 P	5.42 F	11:08	0122 P	5.38 F
014	PLYM	81	Outer L	09-09-87	17:09	0744 F	7.70 F	17:13	0967 F	8.89 F	17:18	1321 F	9.07 F
015	PLYM	82	22nd St	12-02-87	15:43	0107 P	3.48 F	15:47	0106 P	1.64 F	15:50	0097 P	1.24 F
016	DODG	82	22nd St	08-20-87	12:33	0385 F	9.80 F	12:38	0146 P	4.76 F	12:42	0134 P	3.94 F
017	CHRY	82	22nd St	11-20-87	14:19	0135 P	5.37 F	14:25	0140 P	5.64 F	14:28	0121 P	5.11 F
018	CHRY	82	22nd St	09-01-87	14:05	0174 P	6.63 F	14:10	0150 P	5.65 F	14:15	0159 P	6.25 F
019	DODG	84	22nd St	12-09-87	12:49	0174 P	2.69 F	12:55	0145 P	3.01 F	12:59	0143 P	2.62 F
020	DODG	86	Outer L	07-10-87	10:31	0287 F	3.33 F	10:39	0823 F	8.53 F	10:43	0178 P	7.57 F
021	CHRY	86	22nd St	12-03-87	10:38	0148 P	4.72 F	10:42	0001 P	0.00 P	10:45	0001 P	0.00 P
022	DODG	86	Outer L	09-25-87	11:47	2001 F	6.58 F	11:50	0024 P	0.51 P	11:54	0004 P	0.01 P
023	CHRY	86	Goose C	09-29-87	09:38	0635 F	6.76 F	09:41	0680 F	9.46 F	09:46	0386 F	7.24 F
024	CHRY	87	Goose C	11-28-87	10:51	0422 F	7.78 F	10:54	0375 F	7.41 F	10:59	0285 F	6.23 F
025	DODG	85	22nd St	11-10-87	14:44	0065 P	1.54 F	14:50	0062 P	1.37 F	14:54	0059 P	1.30 F
026	DODG	81	22nd St	11-10-87	16:36	0445 F	10.01 F	16:40	0328 F	10.01 F	16:43	0345 F	10.01 F
027	PLYM	81	Poplar	08-06-87	10:31	0064 P	4.11 F	10:37	0104 P	5.56 F	10:41	0059 P	4.07 F
028	CHRY	82	22nd St	09-03-87	11:26	0085 P	2.33 F	11:30	0083 P	2.06 F	11:34	0051 P	0.80 P
029	CHRY	85	22nd St	10-01-87	12:44	0583 F	7.96 F	12:48	0312 F	7.60 F	12:54	0345 F	7.00 F
030	DODG	81	Outer L	12-10-87	17:05	0956 F	0.18 P	17:10	0852 F	0.18 P	17:14	0689 F	0.17 P
031	DODG	81	Goose C	11-06-87	13:11	0080 P	1.54 F	13:14	0067 P	0.79 P	13:18	0102 P	1.44 F

Veh		Md	Testing	Test	-----First Test-----					-----Second Test----					-----Third Test-----				
No.	Make	Yr	Center	Date	Time	--HC--		--CO---		Time	--HC--		--CO---		Time	--HC--		--CO---	
032	DODG	87	Outer L	12-05-87	10:39	0114	P	1.28	F	10:43	0104	P	1.11	P	10:47	0061	P	1.06	P
033	PLYM	85	22nd St	12-12-87	09:08	0234	F	0.01	P	09:13	0197	P	0.01	P	09:16	0179	P	0.01	P
034	FIAT	84	Outer L	12-03-87	12:26	0096	P	3.27	F	12:28	0099	P	3.11	F	12:32	0088	P	2.94	F
035	FORD	81	Poplar	08-13-87	14:10	0250	F	5.04	F	14:15	0228	F	4.10	F	14:19	0237	F	4.80	F
036	FORD	81	Outer L	11-11-87	08:18	0216	P	3.61	F	08:23	0244	F	4.44	F	08:27	0176	P	2.20	F
037	FORD	81	22nd St	09-11-87	09:09	0132	P	2.63	F	09:13	0097	P	1.61	F	09:17	0082	P	1.29	F
038	FORD	81	Outer L	11-12-87	14:52	0166	P	3.64	F	14:55	0148	P	3.57	F	14:59	0162	P	3.42	F
039	MERC	81	Outer L	07-23-87	12:29	0379	F	8.31	F	12:35	0212	P	7.07	F	12:40	0214	P	6.95	F
040	FORD	81	Outer L	11-11-87	12:07	0352	F	0.22	P	12:13	0220	P	0.06	P	12:17	0073	P	0.01	P
041	FORD	81	Goose C	09-10-87	16:02	0184	P	2.82	F	16:05	0130	P	1.43	F	16:09	0153	P	2.31	F
042	FORD	81	22nd St	12-10-87	12:37	0076	P	2.20	F	12:42	0028	P	0.34	P	12:45	0041	P	0.80	P
043	FORD	81	Outer L	11-20-87	11:14	0500	F	0.01	P	11:19	0519	F	0.01	P	11:24	0432	F	0.01	P
044	FORD	82	Goose C	12-12-87	12:40	0646	F	6.74	F	12:43	0358	F	5.99	F	12:47	0006	P	0.04	P
045	MERC	82	22nd St	09-02-87	14:14	0360	F	3.45	F	14:21	0266	F	1.89	F	14:24	0289	F	1.32	F
046	MERC	82	Outer L	11-11-87	15:08	0669	F	9.32	F	15:11	0773	F	9.00	F	15:15	0593	F	9.08	F
047	FORD	82	Outer L	09-25-87	10:57	0161	P	3.29	F	11:01	0166	P	3.01	F	11:06	0152	P	2.40	F
048	FORD	82	Outer L	11-04-87	10:48	0151	P	5.38	F	10:51	0164	P	6.70	F	10:56	0181	P	7.81	F
049	FORD	82	Poplar	09-03-87	14:54	0148	P	1.69	F	14:58	0113	P	0.90	P	15:03	0124	P	1.00	P
050	FORD	82	Outer L	12-04-87	12:23	0178	P	2.36	F	12:27	0048	P	0.02	P	12:32	0030	P	0.01	P
051	MERC	82	22nd St	12-23-87	15:47	0617	F	0.27	P	15:51	0507	F	0.08	P	15:54	0338	F	0.02	P
052	FORD	83	Poplar	08-07-87	10:27	0101	P	3.79	F	10:32	0020	P	0.00	P	10:35	0030	P	0.16	P
053	FORD	83	Goose C	11-21-87	12:31	0068	P	1.71	F	12:35	0046	P	0.29	P	12:39	0052	P	0.64	P
054	FORD	83	Goose C	10-16-87	18:00	0076	P	2.99	F	18:03	0067	P	2.02	F	18:08	0043	P	1.15	P
055	FORD	83	Outer L	12-08-87	13:30	0487	F	0.07	P	13:34	0445	F	0.10	P	13:39	0381	F	0.03	P
056	MERC	83	Outer L	12-08-87	12:57	0162	P	5.62	F	13:00	0196	P	7.43	F	13:04	0215	P	8.44	F
057	FORD	84	Goose C	08-18-87	09:33	1224	F	0.05	P	09:37	1593	F	0.35	P	09:41	0810	F	0.03	P
058	FORD	86	Goose C	08-07-87	15:38	0187	P	4.17	F	15:44	0080	P	0.46	P	15:49	0013	P	0.00	P
059	MERC	85	Outer L	11-06-87	10:20	0147	P	1.22	F	10:23	0176	P	4.91	F	10:29	0039	P	0.23	P
060	FORD	85	Outer L	09-23-87	12:44	0107	P	1.40	F	12:48	0232	F	1.61	F	12:52	0147	P	2.23	F
061	FORD	85	22nd St	11-07-87	10:03	0265	F	4.91	F	10:07	0882	F	7.60	F	10:11	0542	F	5.71	F
062	FORD	85	Outer L	08-26-87	14:44	0277	F	2.69	F	14:48	0262	F	1.71	F	14:53	0211	P	2.70	F
063	FORD	85	22nd St	11-04-87	11:09	0663	F	6.89	F	11:14	0432	F	6.10	F	11:17	0392	F	4.77	F
064	FORD	86	Goose C	09-11-87	14:34	0095	P	1.86	F	14:38	0426	F	5.99	F	14:43	0251	F	4.95	F
065	FORD	86	22nd St	10-21-87	15:53	0499	F	4.96	F	15:58	0612	F	8.97	F	16:01	0830	F	8.78	F
066	FORD	86	22nd St	09-08-87	10:21	0329	F	6.32	F	10:25	0117	P	1.77	F	10:29	0100	P	1.39	F
[illegible]	[illegible]	86	Poplar	11-06-87	13:31	0143	P	3.96	F	13:35	0156	P	4.64	F	13:39	0145	P	4.78	F
068	FORD	86	22nd St	08-27-87	12:18	0102	P	1.31	F	12:24	0180	P	2.37	F	12:28	0162	P	1.99	F

Veh		Md	Testing	Test	First Test					Second Test					Third Test				
No.	Make	Yr	Center	Date	Time	HC		CO		Time	HC		CO		Time	HC		CO	
069	MERC	84	Outer L	08-19-87	10:24	0225	F	1.12	P	10:27	0209	P	1.02	P	10:31	0217	P	0.81	P
070	FORD	86	Poplar	08-26-87	16:02	0645	F	0.45	P	16:07	0524	F	0.16	P	16:12	0028	P	0.08	P
071	FORD	82	Outer L	08-06-87	09:50	0159	P	3.73	F	09:55	0146	P	3.35	F	10:00	0136	P	2.34	F
072	FORD	82	22nd St	08-27-87	17:24	0889	F	3.01	F	17:28	0846	F	2.09	F	17:31	0801	F	3.38	F
073	FORD	86	22nd St	11-19-87	10:43	0174	P	1.73	F	10:47	0054	P	0.64	P	10:51	0099	P	0.61	P
074	FORD	86	Poplar	09-24-87	09:20	0241	F	3.77	F	09:24	0249	F	4.87	F	09:28	0222	F	5.69	F
075	FORD	86	22nd St	10-15-87	11:08	0136	P	1.61	F	11:13	0053	P	0.50	P	11:15	0042	P	0.87	P
076	FORD	86	Outer L	12-10-87	15:57	0130	P	3.30	F	16:02	0007	P	0.00	P	16:07	0004	P	0.00	P
077	FORD	87	Goose C	11-18-87	13:28	0418	F	6.30	F	13:31	0165	P	1.83	F	13:36	0345	F	6.16	F
078	MERC	81	22nd St	09-25-87	10:26	0260	F	0.03	P	10:31	0231	F	0.00	P	10:34	0216	P	0.01	P
079	FORD	81	Outer L	11-04-87	15:10	0161	P	4.45	F	15:15	0110	P	2.57	F	15:20	0104	P	1.90	F
080	MERC	81	Goose C	12-05-87	10:48	0188	P	4.12	F	10:51	0292	F	4.63	F	10:54	0205	P	4.32	F
081	FORD	82	22nd St	09-05-87	10:04	0192	P	2.56	F	10:09	0186	P	2.11	F	10:12	0013	P	0.00	P
082	FORD	82	22nd St	10-09-87	14:49	0161	P	1.95	F	14:55	0215	P	1.49	F	14:57	0167	P	1.49	F
083	FORD	82	Goose C	12-19-87	13:26	0133	P	2.43	F	13:29	0120	P	1.87	F	13:33	0115	P	1.63	F
084	FORD	82	22nd St	10-02-87	11:18	0325	F	1.13	P	11:22	0239	F	0.93	P	11:26	0208	P	1.20	P
085	MERC	83	22nd St	08-22-87	13:10	0177	P	2.56	F	13:15	0150	P	1.58	F	13:18	0124	P	0.82	P
086	MERC	83	Goose C	10-29-87	09:08	0230	F	3.88	F	09:11	0246	F	3.67	F	09:14	0133	P	0.58	P
087	MERC	86	Goose C	08-08-87	13:49	0360	F	1.49	F	13:54	0017	P	0.00	P	13:59	0001	P	0.00	P
088	MERC	83	Outer L	09-11-87	11:08	0054	P	1.23	F	11:12	0026	P	0.60	P	11:16	0105	P	2.49	F
089	MERC	83	22nd St	08-20-87	16:49	0120	P	3.73	F	16:52	0008	P	0.00	P	16:57	0092	P	3.02	F
090	MERC	83	22nd St	09-01-87	14:42	0035	P	1.54	F	14:48	0019	P	1.67	F	14:52	0047	P	3.27	F
091	MERC	83	Goose C	08-26-87	13:19	0010	P	1.88	F	13:23	0009	P	0.17	P	13:28	0027	P	2.58	F
092	FORD	81	Poplar	08-13-87	14:53	0148	P	2.98	F	14:58	0015	P	0.26	P	15:02	0225	F	8.45	F
093	FORD	81	22nd St	08-22-87	10:55	0124	P	2.68	F	11:00	0178	P	2.41	F	11:04	0157	P	2.63	F
094	FORD	83	Goose C	08-21-87	14:22	0467	F	7.19	F	14:29	0196	P	6.69	F	14:34	0401	F	7.10	F
095	FORD	81	Outer L	11-11-87	11:43	0213	P	5.03	F	11:47	0168	P	3.53	F	11:51	0286	F	5.78	F
096	FORD	81	Outer L	08-05-87	08:33	0147	P	2.51	F	08:41	0049	P	0.24	P	08:45	0028	P	0.06	P
097	FORD	81	Outer L	10-02-87	12:09	0473	F	7.70	F	12:13	0341	F	5.83	F	12:17	0398	F	6.32	F
098	MERC	82	Poplar	09-24-87	12:29	0497	F	5.02	F	12:33	0340	F	3.70	F	12:36	0366	F	4.15	F
099	FORD	82	Outer L	09-11-87	09:01	0240	F	3.96	F	09:05	0255	F	4.54	F	09:09	0263	F	4.65	F
100	FORD	82	22nd St	10-15-87	09:59	0134	P	3.56	F	10:03	0160	P	0.66	P	10:06	0064	P	0.47	P
101	FORD	85	22nd St	11-17-87	08:17	0275	F	4.69	F	08:21	0374	F	7.21	F	08:24	0178	P	6.28	F
102	FORD	85	22nd St	11-05-87	15:53	0068	P	1.54	F	15:58	0001	P	0.04	P	16:02	0005	P	0.09	P
103	FORD	85	22nd St	11-03-87	16:22	0161	P	4.27	F	16:25	0153	P	4.29	F	16:29	0111	P	3.16	F
104	FORD	87	22nd St	10-23-87	10:49	0074	P	3.44	F	10:53	0059	P	2.52	F	10:56	0053	P	2.34	F

Veh No.	Make	Md Yr	Testing Center	Test Date	-----First Test----- Time	--HC--		--CO--		-----Second Test---- Time	--HC--		--CO--		-----Third Test----- Time	--HC--		--CO--	
105	FORD	84	22nd St	11-10-87	15:59	0115	P	3.17	F	16:04	0222	F	3.71	F	16:08	0252	F	3.86	F
106	FORD	86	Goose C	08-15-87	11:36	0269	F	1.50	F	11:40	0001	P	0.03	P	11:45	0011	P	0.05	P
107	FORD	83	Outer L	11-04-87	17:09	0268	F	0.43	P	17:12	0455	F	0.76	P	17:17	0135	P	1.12	P
108	FORD	83	Outer L	09-08-87	14:12	0158	P	2.14	F	14:16	0087	P	0.71	P	14:20	0112	P	1.71	F
109	FORD	83	22nd St	10-13-87	09:13	0251	F	0.03	P	09:19	0289	F	0.04	P	09:22	0188	P	0.03	P
110	FORD	83	22nd St	08-20-87	10:41	0248	F	5.11	F	10:46	0230	F	3.75	F	10:50	0237	F	3.88	F
111	FORD	84	Poplar	09-11-87	16:04	0240	F	3.99	F	16:09	0175	P	1.76	F	16:12	0098	P	1.21	F
112	FORD	85	22nd St	11-10-87	17:07	0191	P	1.71	F	17:11	0168	P	1.66	F	17:14	0178	P	1.45	F
113	FORD	86	22nd St	12-18-87	11:16	0140	P	2.58	F	11:22	0123	P	1.12	P	11:26	0141	P	2.18	F
114	FORD	86	Outer L	09-04-87	10:51	0252	F	2.60	F	10:55	0173	P	0.89	P	11:00	0168	P	1.24	F
115	FORD	86	Outer L	11-18-87	14:06	0146	P	2.01	F	14:09	0168	[illegible]	1.51	F	14:14	0134	P	2.47	F
116	FORD	86	Outer L	11-11-87	10:36	0210	P	2.66	F	10:41	0179	P	1.69	F	10:46	0178	P	2.62	F
117	FORD	82	Outer L	11-05-87	17:03	0670	F	0.16	P	17:09	1023	F	0.15	P	17:14	0645	F	0.30	P
11[illegible]	[illegible]	82	22nd St	09-24-87	12:20	0417	F	0.04	P	12:25	0534	F	0.03	P	12:29	0231	F	0.01	P
119	FORD	84	22nd St	08-05-87	10:23	0387	F	4.18	F	10:27	0381	F	3.85	F	10:30	0258	F	2.64	[illegible]
120	FORD	86	Outer L	09-08-87	13:24	0192	P	3.13	F	13:33	0140	P	1.15	P	13:37	0135	P	1.31	F
121	FORD	81	Outer L	11-17-87	15:22	0273	P	2.80	F	15:26	0311	P	4.73	F	15:31	0271	P	4.23	F
122	FORD	81	Goose C	08-22-87	12:19	0149	P	2.12	F	12:25	0075	P	0.75	P	12:29	0032	P	0.04	P
123	FORD	83	Goose C	08-19-87	09:19	0271	F	0.75	P	09:23	0068	P	0.00	P	09:28	0041	P	0.00	P
124	FORD	86	Goose C	08-19-87	14:34	0215	P	2.90	F	14:41	0001	P	0.01	P	14:46	0008	P	0.00	P
125	FORD	84	Outer L	07-08-87	10:18	0093	P	1.60	F	10:23	0078	P	0.36	P	10:28	0047	P	0.00	P
126	FORD	82	Outer L	09-09-87	15:51	0096	P	3.41	F	13:56	0065	P	1.99	F	14:00	0087	[illegible]	[illegible].69	F
127	FORD	82	Poplar	08-08-87	10:53	0275	F	0.05	P	10:59	0283	F	0.57	P	11:04	0151	[illegible]	[illegible]	P
128	FORD	82	Goose C	08-19-87	08:55	0917	F	0.09	P	09:03	0949	F	0.09	P	09:07	0701	F	[illegible]	[illegible]
129	FORD	82	22nd St	12-08-87	13:58	0171	P	2.54	F	14:02	0202	P	2.60	F	14:05	0109	P	[illegible]	[illegible]
130	CHEV	81	Outer L	09-05-87	13:43	0294	F	0.23	P	13:48	0281	F	0.15	P	13:52	0581	F	0.50	P
131	CHEV	81	22nd St	10-13-87	14:50	0091	P	1.21	F	14:54	0074	P	0.68	P	14:57	0067	P	0.52	P
132	PONT	81	Outer L	07-24-87	10:12	0116	P	2.13	F	10:17	0066	P	1.01	P	10:23	0040	P	0.69	P
133	CHEV	81	Outer L	09-12-87	12:34	0112	P	2.17	F	12:38	0052	P	0.23	P	12:42	0020	P	0.12	P
134	CHEV	81	Outer L	12-02-87	09:45	0165	P	1.60	F	09:49	0171	P	0.42	P	09:54	0141	P	0.22	P
135	CHEV	82	Goose C	09-03-87	14:28	0083	P	1.26	F	14:32	00[illegible]	[illegible]	[illegible]	P	14:36	0052	P	1.10	P
136	PONT	82	Goose C	11-21-87	10:09	0342	F	2.10	F	10:12	029[illegible]	[illegible]	[illegible]	F	10:16	0210	P	2.46	F
137	CHEV	84	22nd St	09-09-87	14:27	0498	F	7.22	F	14:31	0471	F	7.26	F	14:34	0399	F	6.94	F
138	CHEV	85	Outer L	09-02-87	16:23	0372	F	6.08	F	16:29	0430	F	5.[illegible]5	F	16:33	0303	F	3.31	F
139	CHEV	85	Outer L	09-08-87	09:24	0489	F	6.30	F	09:27	0029	P	[illegible].01	P	09:31	0014	P	0.01	P
140	OLDS	84	22nd St	09-04-87	10:20	0564	F	5.93	F	10:24	0804	[illegible]	6.62	F	10:28	0150	P	0.17	P

Veh No.	Make	Md Yr	Testing Center	Test Date	First Test Time	First Test --HC--		First Test --CO---		Second Test Time	Second Test --HC--		Second Test --CO---		Third Test Time	Third Test --HC--		Third Test --CO---	
141	CHEV	82	Goose C	08-19-87	13:38	0418	F	5.73	F	13:42	0132	P	1.26	F	13:46	0136	P	1.21	F
142	CHEV	82	22nd St	10-28-87	12:14	0098	P	3.02	F	12:18	0094	P	3.03	F	12:21	0085	P	2.88	F
143	CHEV	82	22nd St	11-12-87	12:39	0144	P	4.25	F	12:43	0113	P	2.44	F	12:45	0098	P	2.14	F
144	BUIC	84	Goose C	11-19-87	14:06	0373	F	9.43	F	14:10	0401	F	9.75	F	14:14	0217	P	9.22	F
145	CHEV	83	Goose C	12-03-87	14:22	0081	P	1.35	F	14:26	0040	P	0.53	P	14:30	0012	P	0.31	P
146	BUIC	84	Goose C	11-19-87	16:07	0251	F	2.12	F	16:10	0199	P	1.15	P	16:15	0245	F	1.54	F
147	PONT	86	Outer L	08-26-87	15:57	0225	F	0.15	P	16:01	0080	P	0.07	P	16:05	0031	P	0.31	P
148	OLDS	81	Outer L	08-13-87	16:10	0157	P	5.83	F	16:17	0123	P	3.92	F	16:21	0114	P	4.55	F
149	PONT	85	Outer L	11-12-87	11:41	0330	F	1.08	P	11:45	0256	F	0.60	P	11:50	0141	P	0.62	P
150	PONT	85	22nd St	09-02-87	10:09	0256	F	0.23	P	10:13	0080	P	0.16	P	10:17	0033	P	0.10	P
151	CHEV	85	Goose C	08-20-87	17:11	0325	F	0.23	P	17:15	0244	F	0.17	P	17:19	0215	P	0.25	P
152	PONT	86	22nd St	11-05-87	16:39	0230	F	0.17	P	16:43	0132	P	0.07	P	16:46	0001	P	0.00	P
153	CHEV	87	22nd St	12-03-87	16:52	0306	F	0.15	P	16:56	0000	P	0.00	P	16:59	0002	P	0.00	P
154	BUIC	81	Poplar	07-10-87	09:04	0221	F	6.18	F	09:09	0329	F	4.87	F	09:14	0861	F	3.94	F
155	CHEV	81	Outer L	11-07-87	11:54	0111	P	1.84	F	11:57	0111	P	1.74	F	12:02	0130	P	3.56	F
156	CHEV	81	Goose C	11-20-87	16:09	0276	F	4.82	F	16:12	0118	P	2.63	F	16:16	0371	F	6.52	F
157	CHEV	82	Outer L	09-24-87	15:36	0282	F	4.70	F	15:39	0330	F	4.61	F	15:43	0267	F	5.40	F
158	BUIC	82	Outer L	11-13-87	11:41	0251	F	6.29	F	11:44	0372	F	6.49	F	11:48	0333	F	6.25	F
159	CHEV	83	22nd St	10-08-87	15:01	0218	P	6.75	F	15:06	0038	P	1.72	F	15:10	0022	P	0.13	P
160	PONT	84	Outer L	11-05-87	12:05	0086	P	1.70	F	12:09	0023	P	0.01	P	12:13	0085	P	1.68	F
161	CHEV	81	Goose C	11-20-87	10:04	0276	F	4.00	F	10:07	0260	F	0.55	P	10:12	0453	F	0.55	P
162	CHEV	81	Outer L	11-19-87	11:20	0354	F	6.70	F	11:23	0296	F	5.53	F	11:27	0260	F	5.70	F
163	CHEV	81	Outer L	11-10-87	14:02	0190	P	2.86	F	14:08	0181	P	2.09	F	14:12	0008	P	0.01	P
164	CHEV	82	22nd St	11-18-87	10:22	0086	P	1.57	F	10:27	0113	P	0.85	P	10:30	0141	P	1.27	F
165	CHEV	82	Goose C	12-15-87	08:34	0318	F	6.53	F	08:38	0299	F	4.48	F	08:42	0283	F	5.68	F
166	CHEV	83	Outer L	09-03-87	12:23	0210	P	2.74	F	12:26	0118	P	0.89	P	12:30	0157	P	1.20	P
167	BUIC	86	Goose C	11-11-87	16:28	0101	P	1.28	F	16:30	0088	P	0.48	P	16:33	0095	P	1.09	P
168	BUIC	86	Goose C	08-13-87	10:28	0137	P	2.46	F	10:32	0011	P	0.00	P	10:36	0013	P	0.00	P
169	OLDS	81	22nd St	10-13-87	16:23	0124	P	2.68	F	16:28	0141	P	2.88	F	16:31	0087	P	1.02	P
170	BUIC	81	22nd St	09-24-87	11:35	0318	F	1.05	P	11:39	0286	F	1.01	P	11:43	0245	F	1.01	P
171	PONT	81	22nd St	12-18-87	12:54	0184	P	6.23	F	12:58	0154	P	5.92	F	13:01	0157	P	6.22	F
172	BUIC	81	Outer L	08-05-87	09:32	0352	F	6.50	F	09:36	1680	F	8.90	F	09:41	0338	F	4.16	F
173	BUIC	81	Outer L	11-05-87	15:17	0119	P	1.64	F	15:20	0120	P	1.60	F	15:24	0115	P	2.65	F
174	OLDS	81	22nd St	08-28-87	09:24	0193	P	1.85	F	09:29	0289	F	1.46	F	09:33	0088	P	2.75	F
175	OLDS	81	22nd St	11-11-87	13:36	0012	P	1.37	F	13:39	0002	P	0.00	P	13:42	0001	P	0.00	P
176	OLDS	81	22nd St	08-20-87	16:35	0304	F	7.89	F	16:39	0176	P	6.09	F	16:42	0166	P	5.49	F
177	PONT	81	Outer L	09-24-87	16:21	0253	F	10.00	F	16:24	0208	P	9.44	F	16:28	0225	F	9.90	F

Veh No.	Make	Md Yr	Testing Center	Test Date	First Test Time	--HC--		--CO--		Second Test Time	--HC--		--CO--		Third Test Time	--HC--		--CO--	
178	PONT	81	22nd St	08-15-87	10:17	0242	F	0.42	P	10:24	0166	P	0.34	P	10:28	0432	F	0.62	P
179	PONT	81	22nd St	09-01-87	11:39	0147	P	5.20	F	11:43	0174	P	5.72	F	11:47	0153	P	6.26	F
180	OLDS	81	22nd St	08-20-87	11:21	0137	P	2.48	F	11:25	0103	P	1.79	F	11:30	0123	P	2.18	F
181	BUIC	82	Outer L	12-09-87	16:06	0354	F	0.06	P	16:10	0225	F	0.08	P	16:14	0219	P	0.41	P
182	OLDS	82	Poplar	09-24-87	12:17	0239	F	0.05	P	12:21	0356	F	0.09	P	12:24	0182	P	0.10	P
183	PONT	82	Outer L	11-04-87	12:53	0180	P	3.16	F	12:58	0215	P	4.99	F	13:03	0181	P	3.30	F
184	OLDS	82	22nd St	08-08-87	12:25	0447	F	1.64	F	12:28	0317	F	0.81	P	12:32	0424	F	3.97	F
185	BUIC	82	22nd St	12-08-87	11:46	0586	F	1.15	P	11:50	0590	F	1.03	P	11:54	0605	F	0.79	P
186	OLDS	82	Outer L	08-20-87	10:07	0413	F	0.07	P	10:10	0348	F	0.15	P	10:14	0280	F	0.33	P
187	OLDS	83	22nd St	08-13-87	16:26	1998	F	6.98	F	16:31	1658	F	6.06	F	16:35	1320	F	6.00	F
188	PONT	83	22nd St	10-16-87	10:16	0092	P	1.38	F	10:21	0084	P	1.31	F	10:24	0080	P	1.78	F
189	BUIC	83	22nd St	09-02-87	09:17	0340	F	0.06	P	09:33	0042	P	0.00	P	09:36	0022	P	0.01	P
190	CADI	85	22nd St	11-21-87	09:39	0222	F	0.03	P	09:44	0023	P	0.00	P	09:47	0030	P	0.00	P
191	CADI	81	22nd St	11-18-87	12:39	0059	P	1.65	F	12:43	0010	P	0.01	P	12:46	0015	P	0.00	P
192	PONT	82	22nd St	08-22-87	12:00	0086	P	1.30	F	12:04	0052	P	0.34	P	12:07	0086	P	1.20	P
193	BUIC	81	Outer L	09-09-87	09:40	0139	P	2.47	F	09:44	0124	P	1.82	F	09:47	0118	P	2.14	F
194	PONT	81	22nd St	08-06-87	14:25	0302	F	2.46	F	14:30	0408	F	3.93	F	14:34	0311	F	2.57	F
195	PONT	82	22nd St	11-06-87	10:02	0216	P	3.43	F	10:07	0315	F	2.94	F	10:10	0313	F	3.93	F
196	CHEV	82	22nd St	08-27-87	15:02	0234	F	1.15	P	15:07	0308	F	1.14	P	15:10	0168	P	0.88	P
197	PONT	84	Poplar	11-06-87	11:46	0253	F	0.13	P	11:52	0251	F	0.15	P	11:55	0225	F	0.11	P
198	BUIC	81	Outer L	09-04-87	15:41	0041	P	1.24	F	15:45	0066	P	2.06	F	15:48	0016	P	1.14	P
199	OLDS	81	Outer L	12-03-87	16:27	0319	F	0.40	P	16:32	0307	F	0.30	P	16:36	0275	F	0.38	P
200	PONT	81	Outer L	08-27-87	12:44	0141	P	2.55	F	12:49	0124	P	2.95	F	12:53	0105	P	3.34	F
201	OLDS	81	22nd St	10-01-87	13:53	0359	F	0.81	P	13:57	0414	F	0.92	P	14:02	0364	F	0.87	P
202	OLDS	81	22nd St	12-09-87	13:29	0110	P	1.77	F	13:34	0134	P	1.47	F	13:37	0134	P	1.59	F
203	BUIC	84	22nd St	11-25-87	14:33	0258	F	0.17	P	14:37	0059	P	0.01	P	14:39	0031	P	0.01	P
204	CADI	81	22nd St	10-28-87	12:24	0560	F	0.68	P	12:29	0587	F	0.64	P	12:31	0332	F	0.74	P
205	CADI	81	22nd St	11-20-87	12:26	1760	F	10.01	F	12:30	1504	F	10.01	F	12:34	1617	F	10.01	F

Veh No.	Make	Md Yr	Testing Center	Test Date	First Test Time	First Test HC	First Test CO	Second Test Time	Second Test HC	Second Test CO	Third Test Time	Third Test HC	Third Test CO
206	CHEV	82	Outer L	11-13-87	11:25	0114 P	1.85 F	11:30	0118 P	1.38 F	11:34	0209 P	1.93 F
207	CHEV	85	Outer L	12-09-87	16:48	0373 F	1.00 P	16:51	0199 P	0.49 P	16:55	0335 F	0.93 P
208	CHEV	85	22nd St	11-05-87	10:15	0064 P	1.32 F	10:21	0059 P	1.09 P	10:25	0060 P	1.22 F
209	CHEV	82	Outer L	07-09-87	10:53	0092 P	1.52 F	10:59	0084 P	1.95 F	11:04	0062 P	1.18 P
210	GMC	82	Outer L	11-04-87	16:44	0236 F	0.44 P	16:48	0480 F	0.33 P	16:52	0182 P	0.32 P
211	GMC	83	Outer L	07-09-87	10:13	0377 F	0.01 P	10:16	0337 F	0.00 P	10:21	0246 F	0.00 P
212	CHEV	82	Outer L	09-11-87	10:07	0103 P	1.31 F	10:10	0102 P	0.72 P	10:14	0324 F	4.31 F
213	CHEV	86	22nd St	11-18-87	13:39	0298 F	1.62 F	13:44	0208 P	2.03 F	13:47	0256 F	2.13 F
214	CHEV	86	Goose C	10-22-87	14:57	0274 F	0.71 P	15:00	0282 F	0.43 P	15:04	0242 F	0.81 P
215	CHEV	88	Goose C	10-06-87	16:49	0230 F	0.80 P	16:54	0146 P	0.76 P	16:59	0118 P	0.91 P
216	CHEV	86	Goose C	09-09-87	09:19	0243 F	0.01 P	09:23	0125 P	0.00 P	09:28	0015 P	0.00 P
217	CHEV	86	Goose C	10-08-87	14:10	0577 F	0.08 P	14:15	0525 F	0.06 P	14:19	0035 P	0.00 P
218	CHEV	83	22nd St	08-26-87	15:00	0583 F	0.01 P	15:06	0390 F	0.01 P	15:09	0086 P	0.00 P
219	CHEV	83	Goose C	12-08-87	12:03	0978 F	0.07 P	12:07	1143 F	0.10 P	12:10	0322 F	0.03 P
220	CHEV	83	22nd St	08-26-87	15:44	0921 F	0.21 P	15:49	0529 F	0.15 P	15:53	0505 F	0.25 P
221	CHEV	85	Goose C	09-24-87	11:16	0887 F	0.53 P	11:19	0943 F	0.48 P	11:23	0262 F	0.61 P
222	CHEV	81	Outer L	08-20-87	10:38	0655 F	9.39 F	10:41	0630 F	9.08 F	10:44	0755 F	9.66 F
223	HOND	85	Goose C	08-22-87	11:39	0133 P	2.57 F	11:41	0080 P	1.59 F	11:45	0034 P	0.63 P
224	HOND	82	Goose C	09-11-87	11:16	0131 P	2.31 F	11:20	0140 P	1.96 F	11:24	0135 P	1.82 F
225	HOND	81	Goose C	08-22-87	13:30	0044 P	1.38 F	13:34	0037 P	1.25 F	13:38	0006 P	0.40 P
226	HOND	83	22nd St	11-20-87	12:00	0225 F	0.99 P	12:05	0246 F	1.30 F	12:08	0250 F	1.66 F
227	HOND	84	Goose C	07-23-87	10:09	0112 P	2.94 F	10:12	0266 F	4.04 F	10:18	0192 P	2.84 F
228	HOND	86	Goose C	07-17-87	10:53	0264 F	6.13 F	10:56	0359 F	8.74 F	11:02	0205 P	4.22 F
229	HOND	85	Goose C	10-20-87	16:08	0271 F	0.72 P	16:11	0232 F	0.78 P	16:15	0210 P	0.60 P
230	HOND	85	Outer L	07-16-87	09:13	0234 F	2.07 F	09:15	0273 F	1.71 F	09:20	0219 P	2.12 F
231	HOND	86	Goose C	08-19-87	12:37	0068 P	2.19 F	12:40	0042 P	1.34 F	12:44	0005 P	0.42 P
232	HOND	86	22nd St	11-20-87	12:41	0200 P	2.02 F	12:46	0007 P	0.00 P	12:49	0007 P	0.00 P
233	HOND	86	Goose C	09-08-87	11:44	0057 P	2.32 F	11:47	0043 P	1.47 F	11:52	0046 P	1.84 F
234	HOND	86	22nd St	08-18-87	12:33	0212 P	1.47 F	12:39	0165 P	1.12 P	12:42	0007 P	0.00 P
235	ISUZ	84	Goose C	08-28-87	15:08	0324 F	0.16 P	15:11	0237 F	0.15 P	15:16	0117 P	0.14 P
236	JAGU	83	Goose C	08-08-87	12:08	0123 P	3.24 F	12:12	0005 P	0.01 P	12:16	0026 P	1.26 F

Veh No.	Make	Md Yr	Testing Center	Test Date	-----First Test-----					-----Second Test----					-----Third Test-----				
					Time	--HC--		--CO---		Time	--HC--		--CO---		Time	--HC--		--CO---	
237	DODG	81	Goose C	08-08-87	12:21	0169	P	4.17	F	12:24	0155	P	3.82	F	12:29	0083	P	0.02	P
238	DODG	85	22nd St	08-22-87	10:41	0229	F	6.44	F	10:46	0089	P	0.86	P	10:50	0080	P	0.74	P
239	DODG	81	22nd St	08-08-87	11:25	0050	P	1.42	F	11:30	0046	P	1.37	F	11:33	0029	P	1.07	P
240	DODG	82	22nd St	08-18-87	10:18	0084	P	3.88	F	10:23	0076	P	3.70	F	10:27	0047	P	3.29	F
241	DODG	83	Goose C	10-02-87	13:26	0049	P	1.85	F	13:29	0053	P	1.96	F	13:34	0057	P	2.54	F
242	DATS	81	Goose C	09-10-87	14:41	0463	F	0.45	P	14:44	0496	F	2.13	F	14:48	1091	F	1.81	F
243	DATS	81	22nd St	12-23-87	13:43	0238	F	0.19	P	13:47	0214	P	0.19	P	13:50	0245	F	0.21	P
244	DATS	82	Poplar	08-07-87	09:43	0419	F	6.59	F	09:48	0317	F	5.05	F	09:52	0354	F	5.64	F
245	DATS	83	Poplar	08-06-87	09:53	0841	F	10.01	F	10:01	0550	F	10.01	F	10:06	0661	F	10.01	F
246	DATS	84	Goose C	11-05-87	11:47	0199	P	4.99	F	11:49	0245	F	4.84	F	11:53	0214	P	4.89	F
247	DATS	83	22nd St	11-18-87	11:46	0067	P	2.62	F	11:53	0052	P	2.17	F	11:55	0069	P	2.84	F
248	DATS	82	22nd St	08-19-87	14:33	0050	P	2.65	F	14:38	0050	P	2.02	F	14:43	0033	P	1.52	F
249	DATS	82	22nd St	08-26-87	13:30	0284	F	0.59	P	13:35	0208	P	0.54	P	13:38	0181	P	0.60	P
250	DATS	81	22nd St	10-29-87	13:16	0406	F	7.75	F	13:20	0426	F	7.82	F	13:23	0472	F	6.03	F
251	DATS	82	22nd St	10-30-87	11:06	0183	P	4.71	F	11:11	0179	P	5.07	F	11:14	0180	P	5.09	F
252	DATS	83	Outer L	07-15-87	15:29	0252	F	5.51	F	15:35	0076	P	0.04	P	15:42	0089	P	0.10	P
253	DATS	84	Outer L	09-25-87	11:56	0119	P	2.61	F	11:58	0119	P	2.24	F	12:02	0119	P	2.65	F
254	DATS	84	Poplar	09-23-87	10:24	0131	P	1.35	F	10:30	0132	P	1.34	F	10:33	0126	P	1.41	F
255	NISS	85	22nd St	08-28-87	15:42	1152	F	0.32	P	15:47	0010	P	0.00	P	15:51	1185	F	0.38	P
256	NISS	87	Goose C	09-03-87	13:16	0655	F	0.24	P	13:19	0011	P	0.00	P	13:23	0010	P	0.00	P
257	DATS	84	22nd St	12-02-87	12:31	0275	F	0.75	P	12:35	0040	P	0.01	P	12:39	0047	P	0.03	P
258	PEUG	85	22nd St	09-02-87	14:29	0183	P	6.65	F	14:34	0172	P	6.21	F	14:37	0178	P	6.37	F
259	PORS	83	Outer L	12-03-87	13:10	0058	P	2.27	F	13:13	0054	P	2.53	F	13:17	0062	P	2.27	F
260	MAZD	83	Goose C	08-08-87	10:29	0176	P	4.56	F	10:33	0168	P	5.61	F	10:39	0165	P	6.64	F
261	MAZD	84	Goose C	11-21-87	10:48	0108	P	1.83	F	10:50	0109	P	1.55	F	10:54	0006	P	0.35	P

Veh		Md	Testing	Test	-----First Test-----					-----Second Test----					-----Third Test-----				
No.	Make	Yr	Center	Date	Time	--HC--		--CO---		Time	--HC--		--CO---		Time	--HC--		--CO---	
262	TOYT	81	22nd St	09-04-87	12:23	0134	P	3.68	F	12:28	0131	P	3.17	F	12:31	0126	P	3.29	F
263	TOYO	84	22nd St	09-10-87	14:17	0110	P	3.05	F	14:22	0131	P	4.00	F	14:25	0109	P	2.79	F
264	TOYT	83	Goose C	10-02-87	14:03	0066	P	1.57	F	14:00	0014	P	0.00	P	14:12	0014	P	0.00	P
265	VOLV	81	Goose C	08-21-87	14:10	0042	P	1.28	F	14:15	0046	P	1.16	P	14:19	0040	P	1.18	P
266	VOLV	83	Goose C	08-15-87	12:36	0082	P	1.33	F	12:41	0070	P	1.32	F	12:45	0078	P	1.71	F
267	VOLK	82	Goose C	12-09-87	12:18	0098	P	5.84	F	12:20	0104	P	6.07	F	12:24	0120	P	6.49	F
268	VOLK	82	Goose C	10-02-87	09:51	0102	P	6.59	F	09:55	0100	P	6.69	F	09:59	0102	P	6.88	F
269	VOLK	83	Goose C	08-18-87	13:25	0114	P	7.76	F	13:28	0130	P	8.37	F	13:32	0118	P	8.10	F
270	OLDS	83	22nd St	08-22-87	11:13	0101	P	2.47	F	11:18	0101	P	2.45	F	11:25	0104	P	2.44	F
271	CADI	81	22nd St	08-18-87	13:07	0405	F	5.77	F	13:12	0451	F	5.34	F	13:15	0282	F	3.67	F