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Technical Report

Restorative Maintenance Retesting of 1977 Model Year Passenger Cars in Denver

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by

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Abstract

This report describes the results of a exhaust emission testing program in which 24 relatively-new vehicles sampled in a Restorative Maintenance Program in Denver were retested approximately one year later. The vehicles involved were 1977 model year passenger cars certified for sale at high altitude. Vehicles manufactured by Chrysler, Ford and General Motors were represented equally. The vehicles were subjected to the same sequence of inspections, maintenance and tests as used in the 1977 program. Again, representatives of the three automobile manufacturers assisted in the inspection and maintenance activities.

The results show that average HC and CO levels from vehicles which were tuned-up earlier had degraded to a point slightly worse than their original levels in as-received condition. The average NOx level had also increased but not quite past the original value. Many vehicles had experienced maladjustment and disablements even though the owner reported that he felt his vehicle had been maintained according to the manufacturer's recommendations. The most frequent maladjustment was idle mixture, followed by maladjusted ignition timing, incorrect choke settings and disabled EGR systems. Reductions in average emission levels followed the correction of the maladjustment and disablement actions to a point close to those after the prior tune-up. Modest fuel economy improvements were noted this year, probably due to the fact that the vehicles had now overcome the "green engine" effect.

Background

During the period from February to May of 1977, a prescribed sequence of emission and fuel economy tests were performed on forty-two 1977 model year passenger cars in Denver (Reference 1). Vehicles of this model year were the first to actually undergo EPA certification testing under high altitude conditions. The purpose of that program was to investigate and quantify the effects of various types of emission control malperformance on exhaust emissions and fuel economy. This type of effort is known as a "Restorative Maintenance Evaluation." This report concerns a program conducted in May, 1978 in which 24 of these original 42 vehicles were retested after approximately one year of in-use service. There were three basic purposes behind this retesting:

1. To determine the extent and nature of modifications which have occurred to the vehicles since they were inspected and tested in the previous program.

2. To examine the effects of vehicle deterioration on exhaust emissions and fuel economy.

3. To evaluate vehicle restorability in terms of the baseline emission data established in the previous testing.

In both cases, the actual testing was carried out by Automotive Testing Laboratories, Inc. under contract to EPA.

Vehicle Selection

In the original 1977 Denver Restorative Maintenance (RM) testing, the 42 vehicles were divided into a "Group A" and a "Group B". For each Group A vehicle there was a Group B counterpart which was identical in engine displacement, carburetor venturis and transmission type. Matching of vehicles was done to establish Group B as a "control group." The "A" vehicles received a series of up to 3 tests, depending on what, if any, disablements, maladjustments or defective emission components were discovered. The "B" group received only one test and inspection with no adjustments or repairs.

Of the original 42 vehicles tested last year, 6 had been sold. The inability to contact the new owners of these vehicles reduced the number available for testing to 36. Each of these owners was willing to participate again. From these 36, the 24 vehicles to be involved in this years' retesting were selected. These vehicles were selected to be a reasonable subset of the original group with regard to engine size, model type and mileage accumulated. GM, Ford and Chrysler were represented with 8 vehicles each. Each fleet of 8 vehicles was made up of 4 of the original group "A" vehicles and their original group "B" counterparts.

Test Procedures

All vehicles involved in the retesting underwent the first test sequence in their "as-received" condition. The test sequence consisted of a 1975 FTP, a Highway Fuel Economy Test and three short cycles (Federal Three Mode, Federal Short Cycle, Two-Speed Idle). The vehicles were then examined for any maladjustment or disablement actions and failure of any emission components. The criteria for these determinations were the same as used in the original program. This was the extent of the testing and inspection for the Group B vehicles which were then returned to their owners. If the Group A vehicles passed the first test and no maladjustment or disablement actions were found, they were also returned to the owners. However, if any maladjustment or disablement action was encountered on a Group A vehicle, it was corrected and the vehicle received a second test. If it then failed test two, the vehicle received a major tune up along with the replacement of any defective emission components.* It was then tested a third and final time. Upon completion of the third test, the vehicle was returned to the owner. A flow chart illustrating this procedure is attached. Test results on individual vehicles are contained in the Appendix.

Inspection Results

With the aid of representatives of the three automobile manufacturers, inspections were performed on all vehicles. Through these inspections it was found that 92% of the test vehicles exhibited some form of maladjustment and/or disablement. Of these, 50% failed Federal Standards on their initial test. The most frequently observed problem was maladjusted idle mixtures found on 71% of the vehicles tested. Manufacturer's recommended procedures were used in this determination ("Propane enrichment" on the Ford and Chrysler vehicles, and the "lean-drop" procedure on the GM vehicles). If a .5% idle CO cutpoint was used as in low-altitude RM programs the rate of idle mixture maladjustment would be reduced to 21%. Ignition timing on 41% of the vehicles was advanced beyond manufacturer's specifications. 33% had maladjusted chokes and the EGR system had been disabled on 16%. Two vehicles (#7003 and #7108) emitted exceptionally high amounts of HC and CO. Through inspection, the primary cause of the high amounts of these pollutants was found to be a maladjustment on one car and a maladjustment and disablement on the other. Vehicle #7003, a Plymouth station wagon with a 318 cubic inch engine and a 2 barrel carburetor, was found to have maladjusted metering rods which are located in the main power circuit of the carburetor. This caused the vehicle to run "rich" when it was off idle. According to the owner, this vehicle had not received a tune-up between last years' and this years' tests, although it had been returned to the dealer at least three times for driveability problems. Vehicle #7108's high HC and CO emissions were

*Only replacement of defective components was allowed in preparation for test number 3 in the original testing of these vehicles since the mileage constraint (< 4000) was lower than any scheduled major maintenance point.

traceable to a rich idle mixture and a disconnected vacuum line which caused the air pump to continually vent to the atmosphere. The emission-related component which was observed to be defective most frequently was the temperature sensor which controls the heated air door in the air cleaner assembly. 16% of them were defective. One EGR valve had a leaky diaphragm and one throttle stop solenoid was inoperative.

FTP Results

Attached as Table 1 is a summary of the overall results on the entire fleet from last year along with the results from the 24 vehicles retested this year. As this table shows, the retested Group A vehicles which met Federal Standards fell from 100% on the final test last year to 58% on the initial test this year. Test results on individual vehicles are attached as an appendix.

In Group A, HC and CO were the dominant problem areas showing average increases of 215% and 275%, respectively. The principal reason for these large increases was vehicle #7003. Its HC and CO emissions were so high when tested as-received that its results have been separated from the others in Tables 1 and 2. Without these values, the average increases would be 47% and 72%. This vehicle's Group B counterpart, #7103 showed relatively low HC and CO emissions, but failed NOx. Of all Group B vehicles retested, the percentage that passed federal standards fell from 83% to 58%. The unusually high results in the HC and CO column of the Group B vehicles tested this year (in Tables 1 and 4) are due to vehicle #7108. The HC and CO emissions of this car's counterpart in Group A were within Federal Standards, but it failed NOx when tested as received. Through correction of maladjustment and disablement actions, along with the replacement of defective emission components and a major tune-up, Group A's final pass rate increased to 92%. The only Group A vehicle that failed the final test was a Chevrolet Chevelle that failed NOx with a reading of 2.22 gm/mi versus the 2.0 gm/mi standard. This vehicle was somewhat atypical of the rest of the group because of its high mileage (over 49,000 miles). Average fuel economy increased slightly between the initial and final test on the Group A vehicles while overall average fuel economy for both groups increased since last year.

Idle Test Results

All vehicles tested underwent idle tests for HC and CO using a garage-type instrument. 79% of all vehicles tested passed the idle test "as-received" when typical cutpoints of 150 ppm HC and .5% CO were used. The CO cutpoint is the same as that used in earlier Restorative/Maintenance programs. Of those vehicles which passed the idle test, 68% met the applicable Federal Standards for the FTP when tested "as received." Of all vehicles tested, there was only one that passed the FTP and failed the idle test. 75% of Group A passed the idle test, and of these vehicles, 67% met Federal Standards. Of the Group A vehicles which

failed the idle test, 33% met Federal Standards. After maintenance, only one Group A car failed the idle test. In Group B, 83% passed and 70% of these vehicles met Federal Standards. 17% of the Group B vehicles failed the idle test and of these vehicles, none met Federal Standards. Table 5 shows average emission results with regard to idle test results.

Summary

This program shows the impcrtance that proper maintenance has in the effort to reduce motor vehicle emissions. It reveals that many of the 1977 model year vehicles in this program failed to meet federal standards when tested in an as-received condition. According to the owner questionnaires, 92% had been maintained in accordance to the manufacturer's recommendations and 33% had been returned to the dealer for driveability problems. The majority of the vehicles tested exhibited maladjustment and disablement actions, primarily idle mixture and initial ignition timing. After correction of these maladjustments and other maintenance procedures, all but one Group A vehicle met 1977 Federal Standards.

References

1. J. T. White, "An Evaluation of Restorative Maintenance on Exhaust Emissions from In-Use Automobiles," SAE Paper 780082, March, 1978.

Restorative Maintenance Retesting of
1977 Model year Vehicles in Denver

Vehicle Flow Diagram

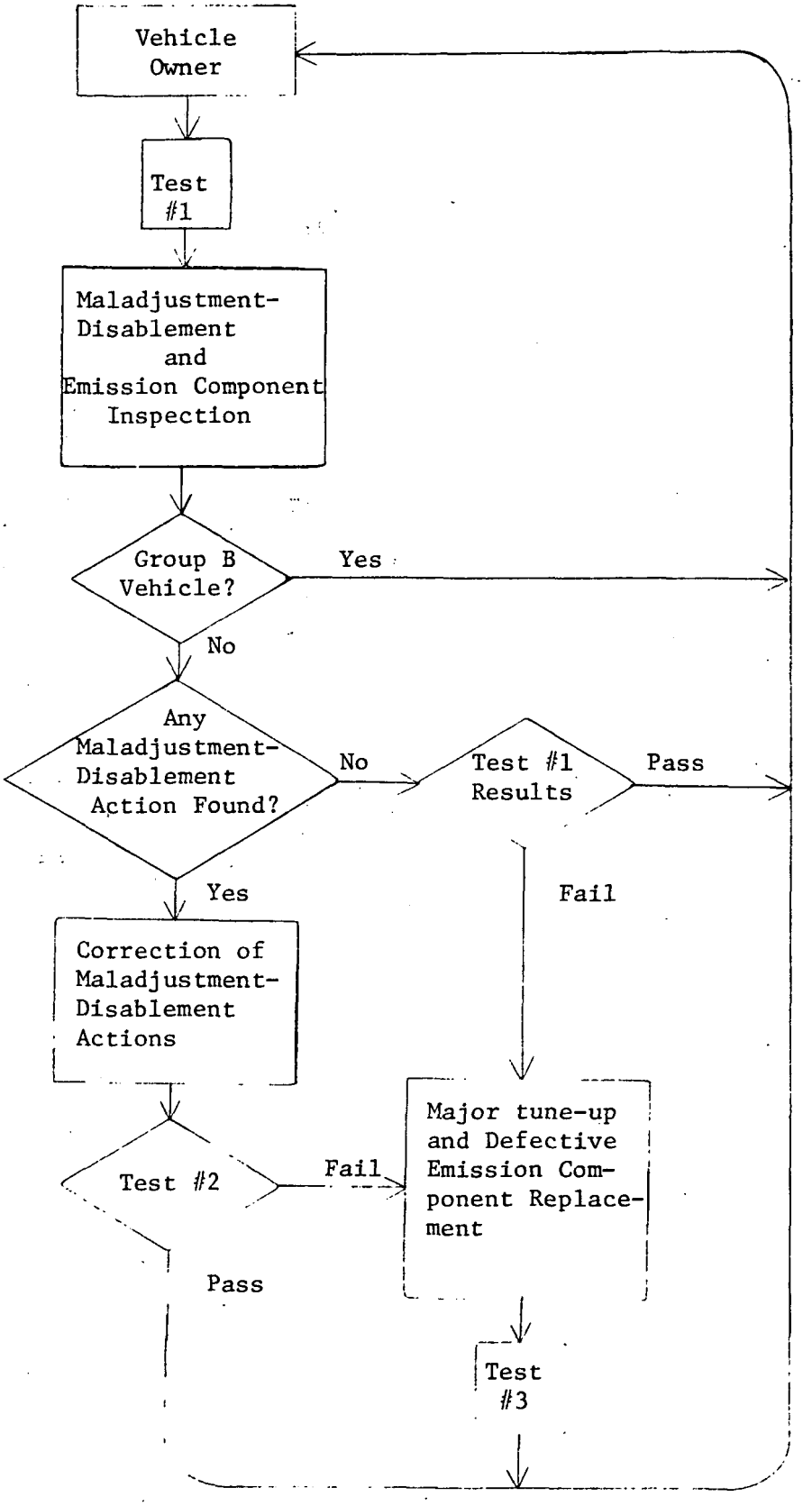

Table 1

Restorative Maintenance Evaluation
Retesting of 1977 GM, Ford and Chrysler
Vehicles in Denver

TEST RESULTS

	Group A						Group B		
	Last Year (Apr-May 77)				This Year (May 78)		Last Year (Apr-May 77)		This Year (May 78)
	Entire Fleet		These Vehicles		These Vehicles		Entire Fleet	These Vehicles	These Vehicles
Number of Vehicles	21		12		12		21	12	12
Avg. Odometer	1986		2088		15128		2628	2505	13490
	Initial	Final	Initial	Final	Initial	Final	[One Test Only]		
Avg. HC (gm/mi)	.71	.51	.54	.53	1.67 (.78)*	.71	.70	.60	1.77 (.80)**
Avg. CO (gm/mi)	11.85	7.15	7.32	5.97	22.41 (10.29)*	8.62	8.77	7.10	22.11 (9.23)**
Avg. NOxc(gm/mi)	1.98	1.46	1.96	1.30	1.70	1.41	1.81	1.51	1.94
Avg. MPG(FTP)	12.9	12.7	12.8	12.7	13.2	13.4	12.9	12.9	13.8
Avg. MPG(HFET)	17.4	17.0	17.4	17.0	17.3	18.1	17.5	17.5	19.0
MET FED STDS	48%	76%	67%	100%	58%	92%	67%	83%	58%

* Average HC and CO without vehicle #7003 which emitted high amounts of these pollutants prior to major tune-up.

** Average HC and CO without vehicle #7108 which emitted high amounts of these pollutants.

Table 2

Restorative Maintenance Evaluation
Retesting of 1977 Chrysler Vehicles in Denver

TEST RESULTS

	Group A						Group B		
	Last Year (Apr 77)				This Year (May 78)		Last Year (Apr 77)		This Year (May 78)
	Entire Chrysler		These Vehicles		These Vehicles		Entire Chrysler	These Vehicles	These Vehicles
Number of Vehicles	7		4		4		7	4	4
Avg. Odometer	1353		1187		13161		2337	2207	17772
	Initial	Final	Initial	Final	Initial	Final	[One Test Only]		
Avg. HC (gm/mi)	.46	.45	.41	.40	3.43 (.75)*	.69	.46	.35	.61
Avg. CO (gm/mi)	7.52	9.40	8.14	6.88	45.68 (9.01)*	9.55	6.57	5.39	7.59
Avg. NOxc(gm/mi)	1.94	.95	2.21	.99	1.44	1.31	1.27	1.15	2.17
Avg. MPG(FTP)	12.8	12.7	11.9	11.4	11.8	12.0	12.5	12.1	13.4
Avg. MPG(HFET)	17.0	16.1	15.9	14.8	14.2	15.3	16.7	15.9	17.6
MET FED STDS	57%	85%	50%	100%	50%	100%	100%	100%	25%

* Average HC and CO without vehicle #7003 which emitted high amounts of these pollutants prior to major tune-up.

Table 3

Restorative Maintenance Evaluation
Retesting of 1977 GM Vehicles in Denver

TEST RESULTS

	Group A						Group B		
	Last Year (May 77)				This Year (May 78)		Last Year (May 77)		This Year (May 78)
	Entire GM		These Vehicles		These Vehicles		Entire GM	These Vehicles	These Vehicles
Number of Vehicles	7		4		4		7	4	4
Avg. Odometer	2157		2448		19967		2474	2260	11213
	Initial	Final	Initial	Final	Initial	Final	[One Test Only]		
Avg. HC (gm/mi)	.42	.42	.41	.42	.82	.55	.68	.54	.81
Avg. CO (gm/mi)	4.85	5.51	4.74	4.12	13.20	8.16	9.88	6.70	12.68
Avg. NOxc(gm/mi)	1.90	1.80	1.58	1.60	1.59	1.74	1.98	2.01	1.65
Avg. MPG(FTP)	12.8	12.8	13.1	13.2	14.2	14.2	13.0	13.4	14.1
Avg. MPG(HFET)	17.7	17.4	18.2	18.4	19.5	20.4	18.1	18.7	19.8
MET FED STDS	57%	71%	100%	100%	50%	75%	43%	50%	75%

Table 4

Restorative Maintenance Evaluation
Retesting of 1977 Ford Vehicles in Denver

TEST RESULTS

	Group A						Group B		
	Last Year (Apr 77)				This Year (May 78)		Last Year (May 77)	This Year (May 78)	
	Entire Ford		These Vehicles		These Vehicles		Entire Ford	These Vehicles	These Vehicles
Number of Vehicles	7		4		4		7	4	4
Avg. Odometer	2448		2630		12256		3072	3047	11486
	Initial	Final	Initial	Final	Initial	Final	[One Test Only]		
Avg. HC (gm/mi)	1.26	.66	.81	.79	.78	.89	.94	.93	3.90 (1.05)*
Avg. CO (gm/mi)	23.19	6.54	9.08	6.91	8.37	8.16	9.77	9.23	46.07 (6.84)*
Avg. NOxc(gm/mi)	2.10	1.61	2.10	1.31	2.09	1.18	2.19	1.38	2.00
Avg. MPG(FTP)	13.0	13.0	13.5	13.7	13.9	14.3	12.5	13.3	13.9
Avg. MPG(HFET)	17.6	17.5	18.4	18.3	19.3	19.2	17.3	18.1	19.8
MET FED STDS	29%	71%	50%	100%	75%	100%	57%	100%	75%

* Average HC and CO without vehicle #7108 which emitted high amounts of these pollutants.

Table 5

Restorative Maintenance Evaluation
Idle Test Results of
24 1977 GM, Ford and Chrysler Vehicles
Retested in Denver

			FTP Results			Fuel Economy		Met FTP	Idle Test	
Group A		N	HC	CO	NOx	FTP	HFET	Standards	HC	CO
As Received	Passed Idle Test	9	1.88	25.32	1.50	13.2	17.1	67%	20	.01
	Failed Idle Test	3	1.06	13.69	2.31	13.4	17.9	33%	193	2.60
After Maintenance	Passed Idle Test	11	.73	8.42	1.34	13.4	17.9	100%	18	0.02
	Failed Idle Test	1	.54	10.80	2.22	13.0	20.1	0%	153	0.10
Group B										
As Received	Passed Idle Test	10	.71	7.31	1.89	14.2	19.2	70%	21	.02
	Failed Idle Test	2	7.07	96.15	2.21	12.0	18.2	0%	761	6.03
Group A & B Combined										
As Received	Passed Idle Test	19	1.27	15.8	1.70	13.7	18.2	68%	21	.02
	Failed Idle Test	5	3.46	46.7	2.27	12.8	18.0	20%	420	4.06

Note: FTP results are in grams/mile
Fuel economy values are in miles per gallon
Idle HC results are in ppm
Idle CO results are in mole percent

APPENDIX

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7002 SITE DENVER VIN HL29C7B101830 ODOMETER 13268 (LAST YEAR 2170)

MAKE PLYMOUTH MODEL VOLARE CID 225 TRANS A CARB 1 INERTIA WT. 4000

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR 1	4/12	.54	6.24	2.78	15.02	19.69	30	.1	CAPS OK, IDLE RICH
2	4/13	.56	6.20	1.05	14.79	18.99	0	0	IDLE MIXTURE ADJ.
1	5/11/78	0.71	7.24	2.30	15.25	19.62	12	.03	DEFECTIVE HAD. TEMP. SENSOR MALADJUSTED VACUUM AMPLIFIER IDLE RPM +130, CAPS MISSING
2	5/15	.88	8.28	1.15	15.07	18.98	6	0	ADJ. IDLE MIXTURE 3 RPM REPLACED VACUUM AMPLIFIER*

*BECAUSE OF THE NATURE OF THE MALADJUSTMENT, THIS COMPONENT COULD NOT BE ADJUSTED CORRECTLY. THEREFORE, IT WAS REPLACED FOR TEST #2.

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7003 SITE DENVER VIN HH45G7G105644 ODOMETER 14549 (536) LAST YEAR

MAKE PLY MODEL STAW CID 318 TRANS A CARB 2 INERTIA WT. 4500

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR 1	3/10/77	.34	3.5	4.18	13.0	17.6	25	.04	CAPS MISSING, OSAC REROUTED, TIMING +5. FOR PLUGGED IDLE RICH
2	3/12/77	.30	6.0	.99	10.9	13.6	0	0	IDLE MIXTURE ADJ. OSAC CONNECTED, TIMING ADJ. FOR UNPLUGGED.
1	5/11/78	11.47	155.69	0.89	9.52	9.81	10	.01	CAPS MISSING OSAC LINES REROUTED CHOKE ROD BINDING
2.	5/12/78	13.89	209.25	0.60	8.43	9.08	14	0	OSAC LINES CONNECTED PROPERLY CHOKE ROD FIXED IDLE MIXTURE ADJ.
3	5/15	.66	8.10	1.59	12.00	14.61	1	0	ADJ. METERING RODS* MAJOR TUNE-UP

* BECAUSE THIS MALADJUSTMENT IS FOUND INTERNALLY IN THE CARBURETOR, IT WAS CORRECTED FOR TEST #3 UNLIKE OTHER MALADJUSTMENTS WHICH ARE CORRECTED FOR TEST #2.

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7005 SITE DENVER VIN NL45G7G123781 ODOMETER 14009 (LAST YEAR 1,721)

MAKE DODGE MODEL ASPEN CID 318 TRANS A CARB 2 INERTIA WT. 4500

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR 1	2/10/77	.44	9.9	.98	10.7	14.1	22	.052	CAPS MISSING, TIMING +5
2	2/18/77	.33	6.5	.84	10.2	13.4	.5	.035	IDLE MIXTURE ADJ., TIMING ADJ.
1	5/11	.81	6.38	1.23	11.73	14.63	11	.01	TIMING +7 OSAC DISCONNECTED CAPS MISSING
2.	5/12	.57	11.85	1.08	9.7	12.18	8	0	IDLE MIXTURE ADJ. OSAC CONNECTED TIMING ADJ.

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7007 SITE DENVER VIN 5S22J7R153672 ODOMETER 10,819 (LAST YEAR 448)

MAKE CHRY MODEL CORD CID 360 TRANS A CARB 4 INERTIA WT. 4500

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR 1	2/16/77	.31	12.9	.91	10.2	13.9	7	.015	CAPS OK, IDLE RICH
2	2/18/77	.40	8.8	1.07	10.8	14.3	0	0	ADJ. IDLE MIXTURE
1	5/10/78	.74	13.41	1.34	12.05	16.65	12	.05	IDLE RICH, CAPS MISSING
2.	5/12/78	.66	9.96	1.41	12.38	17.37	4	0	ADJ. IDLE MIXTURE

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7008 SITE DENVER VIN 7J62A102595 ODOMETER 8,847 (LAST YEAR 2036)

MAKE FORD MODEL LTD CID 460 TRANS A CARB 4 INERTIA WT. 5000

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	4/18/77	.84	16.01	4.33	10.57	13.59	240	5.2	CAPS MISSING, TIMING +6, EGR PLUGGED
2	8/20/77	.58	15.57	.80	10.93	14.18	400	8.3	TIMING ADJ. EGR UNPLUGGED, IDLE MIXT. ADJ.
2A	9/21/77	.52	7.78	.88	11.23	13.73	150	2.3	READJUSTED IDLE MIXTURE
1	5/22/78	.78	10.77	4.42	11.07	14.61	321	4.68	TIMING +4, IDLE RICH, CAPS MISSING EGR LINE PLUGGED AND DISC. THROTTLE SOLENOID DEFECTIVE
2	5/25/78	.95	9.80	1.17	11.10	14.31	12	0.0	TIMING ADJ. EGR UNPLUGGED AND RECONNECTED, IDLE MIXTURE ADJ.

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7009 SITE DENVER VIN 7T11Y110996 ODOMETER 11,110 (LAST YEAR 2185)

MAKE FORD MODEL PINTO CID 140 TRANS 4 CARB 2 INERTIA WT. 2750

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	4/28/77	.99	7.26	1.03	19.57	32.56	8	.016	CAPS MISSING
1	5/25/78	.96	6.21	1.45	19.10	31.45	31	0.0	DEFECTIVE HAD TEMP SENSOR IDLE RICH CAPS MISSING
2	5/26/78	0.76	5.07	1.04	21.79	31.87	21	0.0	ADJ IDLE MIXTURE

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7010 SITE DENVER VIN 7W84F141160 ODOMETER 15,154 (LAST YEAR 3484)

MAKE FORD MODEL GRANADA CID 302 TRANS A CARB 2 INERTIA WT. 4000

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	4/22/77	.82	11.51	1.01	12.50	16.55	10	.02	CAPS OK, IDLE RICH, VACUUM BREAK MALADJUSTED
	4/23/77	.84	9.90	1.48	13.27	17.07	21	0	IDLE MIXTURE ADJ., VACUUM BREAK ADJ.
1	5/25/78	.70	6.79	1.34	14.56	18.56	121	2.03	CAPS MISSING VACUUM BREAK MALADJUSTED IDLE RICH
2	5/26/78	.82	6.53	1.19	14.22	18.42	72	0.0	ADJ IDLE MIXTURE ADJ VACUUM BREAK

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7013 SITE DENVER VIN 7W34F516838 ODOMETER 13,914 (LAST YEAR 2813)

MAKE MERC MODEL MONARCH CID 302 TRANS A CARB 2 INERTIA WT. 4000

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
1	4/21/77	.57	1.52	2.12	14.35	18.84	9	0	CAPS OK IDLE RICH
2	4/23/77	.80	2.68	1.83	13.00	17.81	65	0	ADJ. IDLE MIXTURE
1	5/23/78	.69	9.70	1.13	13.16	18.99	14	0.0	CAPS MISSING, TIMING +6 CHOKE 2 N.L., VACUUM BREAK LEAN IDLE RICH
2	5/24/78	1.04	11.25	1.32	13.45	18.94	13	0.0	TIMING ADJ, CHOKE ADJ VACUUM BREAK ADJ. IDLE MIXTURE ADJ.

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

LAST YEAR (3808)

VEHICLE NO. 7015 SITE DENVER VIN 4J57L7Z129310 ODOMETER 8625

MAKE BUICK MODEL REGAL CID 350 TRANS A CARB 4 INERTIA WT. 4500

		1975 FTP (gm/mi)			MPG				
TEST #	DATE	HC	CO	NO_{XC}	FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	5/9/77	.39	6.95	1.49	12.91	17.35	10	0	CAPS OK, VACUUM BREAK MALADJUS
	5/11/77	.41	4.48	1.58	13.04	18.02	0	0	VACUUM BREAK ADJ
1	5/17/78	.39	9.01	1.58	13.71	19.02	16	0.0	EAPS OK

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7018 SITE DENVER VIN 1Y69L7L107517 ODOMETER 12,797 (3656) LAST YEAR

MAKE CHEV MODEL NOVA CID 350 TRANS A CARB 4 INERTIA WT. 4000

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR 1	5/10/77	.46	3.44	1.47	13.49	18.04	2	0	CAPS OK
#1	5/17/78	.53	4.95	2.37	14.94	19.58	43	0.0	+3° TIMING, CAPS OK -160 IDLE RPM,
#2	5/19/78	.48	5.66	1.92	15.30	19.68	35	0	TIMING ADJ IDLE RPM ADJ

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7019 SITE DENVER VIN 1C29L7K505235 ODOMETER 49,311 (LAST YEAR 950)

MAKE CHEV MODEL CHEVELLE CID 350 TRANS A CARB 4 INERTIA WT. 4500

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR 1	5/10/77	.40	5.10	1.88	12.20	17.47	0.	0.0	CAPS OK
1	5/16/78	.65	15.31	1.21	13.04	17.90	32	0.0	TIMING +4, CHOKE & NR, IDLE RICH VACUUM ADVANCE LINE DISC., CAPS MISSING HAD TEMP SENSOR BAD
2.	5/17/78	.89	10.15	2.18	13.72	20.06	176	0.0	TIMING ADJ VAC ADV LINE CONNECTED, ADJ. IDLE MIXTURE, ADJ. CHOKE
3.	5/19/78	.54	10.80	2.22	13.02	20.06	153	0.1	M.T.V. H.A.D. SENSOR REPLACED

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7020 SITE DENVER VIN 3M57R7R165432 ODOMETER 9135 (LAST YEAR 1376)

MAKE OLDS MODEL CUTLASS CID 50 TRANS A CARB 4 INERTIA WT. 4500

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	5/13/77	.39	3.47	1.46	14.15	20.28	0	.01	CARS OK
1.	5/18/78	1.69	23.52	1.18	15.23	22.08	136	1.15	CAPS MISSING IDLE RICH
2.	5/19/78	.80	7.15	1.24	15.17	23.57	13	0	ADJ. IDLE MIXTURE AND SPEED

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7102 SITE DENVER VIN HL41C7F113296 ODOMETER 18,845 (2334) LAST YEAR

MAKE PLYM. MODEL VOLA CID 225 TRANS A CARB 1 INERTIA WT. 4000

		1975 FTP (gm/mi)			MPG				
TEST #	DATE	HC	CO	NO_{XC}	FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR 1.	4/14/77	.50	7.05	1.27	15.10	18.64	15	.03	CAPS MISSING
1	5/11/78	0.81	7.88	2.35	17.87	21.83	11	0.0	TIMING +7 DEFECTIVE MAP. TEMP SENSOR CAPS MISSING

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7103 SITE DENVER VIN HH45G7G119594 ODOMETER 14898 (LAST YEAR 1678)

MAKE PLYM MODEL VOLARE CID 318 TRANS A CARB 2 INERTIA WT. 4500

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR 1	2/18/77	.28	2.8	1.29	11.6	15.8	0	0	CAPS MISSING TIMING +6.
1	5/11/77	0.42	4.86	2.44	12.26	15.96	2.5	.03	IDLE RICH, CAPS MISSING AIR CLEANER GASKET MISSING

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7105 SITE DENVER VIN NH45G7G121902 ODOMETER 15564 (LAST YEAR 1304)

MAKE DODGE MODEL ASPEN CID 318 TRANS A CARB 2 INERTIA WT. 4500

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	2/16/77	.34	2.7	1.10	11.0	13.9	0	0	CAPS MISSING, IDLE RICH HEATED AIR TUBE DISCONNECTE
1	5/12/78	.52	4.62	3.09	13.28	16.98	8.5	.01	TIMING +3; EGR PLUGGED CHOKE KICKDOWN MALADJUSTED IDLE RICH, CAPS MISSING

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7107 SITE DENVER VIN SS 22J7R172039 ODOMETER 21782 (3558) LAST YEAR

MAKE CHRY MODEL CORD CID 360 TRANS A CARB 4 INERTIA WT. 4500

		1975 FTP (gm/mi)			MPG				
TEST #	DATE	HC	CO	NO_{XC}	FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	2/8/77	.27	9.0	.93	11.3	15.8	0	.02	CAPS MISSING; TIMING +7 IDLE RICH
1	5/12/78	.67	13.0	.81	11.69	16.75	19	.15	IDLE RICH, CAPS MISSING

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7108 SITE DENVER VIN 7P64A117979 ODOMETER 8710 (2067) LAST YEAR

MAKE FORD MODEL LTD CID 460 TRANS A CARB 4 INERTIA WT. 5000

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	4/26/77	.56	4.18	.94	10.73	14.85	800	5.2	CAPS MISSING, IDLE RPM HIGH IDLE MIXTURE RICH,
1	5/25/78	12.43	163.77	3.19	10.43	15.56	1406	10.13	EGR AND AIR PUMP COOLANT TEMP SENSOR LINE DISCONNECTED. IDLE RICH, CAPS MISSING

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7109 SITE DENVER VIN 7R12Y107200 ODOMETER 13929 (3592) LAST YEAR

MAKE FORD MODEL PINTO CID 140 TRANS 4 CARB 2 INERTIA WT. 3000

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	4/29/77	1.23	11.42	1.32	18.38	27.81	19	0.0	CAPS MISSING IDLE RICH, TIMING -4
1	5/24/78	1.23	7.45	1.54	20.77	30.14	16	0.0	TIMING +6, CAPS MISSING FAST IDLE RPM -100 IDLE RICH

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7113 SITE DENVER VIN 7W38F501535 ODOMETER 10921 (LAST YEAR 3858)

MAKE MERC MODEL MONARCH CID 302 TRANS A CARB 2 INERTIA WT. 4000

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	4/22/77	1.04	11.41	1.69	13.7	17.25	21	0.0	CAPS OK, IDLE RICH CHOKE 3 N.L.
1	5/25/77	.91	7.46	1.58	14.75	20.68	61	0.0	CAPS MISSING, IDLE RICH CHOKE 3 N.L.

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7110 SITE DENVER VIN 7W81F124248 ODOMETER 12,383 (LAST YEAR 2671)

MAKE FORD MODEL GRANADA CID 302 TRANS A CARB 2 INERTIA WT. 4000

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	4/25/78	.87	9.9	1.55	12.55	16.80	20	0.0	CAPS OK, CHOKE 5 N.L. IDLE RICH
1	5/24/78	1.03	5.61	1.68	13.21	17.75	67	0.0	CAPS MISSING, CHOKE 5 N.L. EGR DIAPHRAGM LEAKS

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7118 SITE DENVER VIN 1Y69L7K116801 ODOMETER 14115 (2678) LAST YEAR

MAKE CHEV MODEL NOVA CID 350 TRANS A CARB 4 INERTIA WT. 4000

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	5/10/77	.41	3.56	2.32	13.89	18.43	0	0.0	CAPS MISSING, TIMING +5 IDLE RICH.
1	5/16	.62	7.16	1.66	14.62	19.60	14	0.0	TIMING +6, CAPS MISSING IDLE RICH

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7119 SITE DENVER VIN 1D29L7Z430982 ODOMETER 9001 (LAST YEAR 2,333)

MAKE CHEV. MODEL MALIBU CID 350 TRANS A CARB 4 INERTIA WT. 4500

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	5/12/77	.57	5.22	2.85	13.60	18.7	0	0.0	CAPS MISSING, TIMING +4 VAC BREAK MALASUSTED
1	5/16/78	.51	8.08	2.02	13.88	19.15	7	0.0	TIMING +4 VAC, BREAK Maldjusted CAPS MISSING

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7115 SITE DENVER VIN 4J57L7Z119381 ODOMETER 11,678 (LAST YEAR 1992)

MAKE BUICK MODEL REGAL CID 350 TRANS A CARB 4 INERTIA WT. 4500

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	5/13/77	.36	6.65	1.85	12.76	17.55	0	0.0	CAPS OK
1	5/19/78	.40	6.94	1.68	13.78	18.86	3	.01	CAPS OK

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1

RESTORATIVE MAINTENANCE EVALUATION

SUMMARY OF TEST RESULTS

VEHICLE NO. 7121 SITE DENVER VIN 2J57R7P215339 ODOMETER 10,058 (2037) LAST YEAR

MAKE PONT MODEL GRAN PRIX CID 350 TRANS A CARB 4 INERTIA WT. 4500

TEST #	DATE	1975 FTP (gm/mi) HC	CO	NO_{XC}	MPG FTP	HFET	IHC (ppm)	ICO (%)	COMMENTS
LAST YEAR	5/16/77	.82	11.35	1.03	13.54	20.28	0	0.0	CAPS OK, TIMING -3 VACUUM BREAK MALADJUSTED
1	5/19/78	1.70	28.53	1.23	14.16	21.86	115	1.91	CAPS MISSING VACUUM BREAK MALADJUSTED FAST IDLE RPM +700

	HC	CO	Nox
1977	1.5	15	2.0
1976 Standards	1.5	15	3.1