



Automotive Testing Laboratories, Inc.

Final Report

A Study of Emissions
from
1980 Model Year Vehicles
in the Denver Metropolitan Area

Contract No. 68-03-2891
Task Order #3

May 12, 1981

prepared for:
U. S. Environmental Protection Agency
2565 Plymouth Road
Ann Arbor, MI 48105

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**submitted by:

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ABSTRACT

This task order consisted of a series of emission and fuel economy tests on thirty five (35) in-use vehicles operated in the Denver metropolitan area. The vehicles tested were from the 1980 model year and were sales-weighted in accordance with the vehicle population of the Denver area.

Testing was performed in Aurora, Colorado during August, 1980.

The testing program consisted of a 1975 Federal Test Procedure without evaporative emissions test, a Highway Fuel Economy Test, a Four Speed Idle Test and a Loaded Two Mode Test. Basic engine status parameters were also recorded.

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1. INTRODUCTION

The United States Environmental Protection Agency (EPA) is designated under the provisions of the Clean Air Act as having responsibility for the control and prevention of air pollution. In order to fulfill these responsibilities, the EPA designs, conducts and promotes surveys and studies of air pollution sources.

National programs to characterize and reduce air pollution from mobile sources are developed and implemented through EPA's Emission Control Technology Division (ECTD). Mobile emission control strategies developed by the ECTD are based, in part, on projections of nationwide motor vehicle emissions. These projections are derived from surveys designed to obtain emission data from representative samples of in-use vehicles.

In July of 1980, the EPA contracted with Automotive Testing Laboratories, Inc. (ATL) to perform a series of emission and fuel economy tests on thirty five (35) 1980 model year vehicles operated in the Denver metropolitan area. The actual test sample was determined utilizing sales-weighted information for the vehicle population of the Denver area.

In addition to emission and fuel economy measurements, the contract included requirements for the measurement of basic engine parameters.

This report describes the design and conduct of the project and presents both *summary and detailed results of the test sequences performed.*

2. TECHNICAL DISCUSSION

2.1 PROGRAM OBJECTIVES

This task order was performed to provide information on the various levels of emissions for thirty five (35) in-use 1980 model-year vehicles operated in the Denver metropolitan area. The selected fleet was to be sales-weighted in accordance with the vehicle population of the Denver area.

2.2 PROGRAM DESIGN

Testing was performed on a sample of thirty five 1980 model-year vehicles recruited from the Denver metropolitan area. Actual vehicle selection was coordinated with and approved by the EPA project officer.

Vehicles selected for testing are detailed in Appendix A, Listing of Vehicles and Test Parameters and summarized in Tables 1 and 2, Section 3.

Upon arrival at the laboratory, each vehicle was examined to insure that no extensive modifications had been performed and that the vehicle was safe to operate.

Each vehicle received a single test sequence conducted to determine the as-received level of emissions. The test sequence consisted of a basic engine status inspection, a 12 to 36 hour soak, a Federal Test Procedure (without evaporative emissions test), a Highway Fuel Economy Test, a Four Speed Idle Test, and a Loaded Two Mode Test.

2.3 TEST VEHICLE PROCUREMENT

2.3.1 Test Vehicle Selection

The thirty five vehicles selected for this task were procured from the Denver metropolitan area. The test sample was determined using sales-weighted data for the 1980 model year vehicle population of the Denver area. Final specifications for the test vehicles were reviewed and approved by the EPA project officer.

Candidate vehicles were acquired almost exclusively through media advertising and were screened to include only vehicles operated in the Denver area.

2.3.2 Incentives for Owner Participation

The incentives provided to owners of test vehicles to encourage participation in the program were

- o Use of a late model, fully insured loan vehicle while testing was being conducted,
- o A \$100 U. S. Savings Bond, and
- o Return of the owner's vehicle with a full tank of fuel.

2.3.3 Test Vehicle Selection and Screening Criteria

Those vehicle owners indicating a willingness to participate provided information by telephone for a preliminary comparison between the EPA approved vehicle list and their vehicle. Each owner was also questioned regarding the nature of any recent maintenance and the extent of any driveline modifications.

If the vehicle was determined to meet testing criteria and the owner remained willing to participate in the program, the vehicle was scheduled for delivery to the laboratory for a physical inspection and screening procedure.

Prospective test vehicles were given an examination for test suitability upon their arrival at the laboratory and were accepted or rejected based upon this examination. Any questions regarding vehicle test suitability were resolved by the EPA project officer.

2.3.4 Test Vehicle Preconditioning Procedure

Following acceptance into the program, the test vehicles' fuel tanks were drained and then refilled to 40% capacity with Indolene test fuel.

2.4 VEHICLE TEST FACILITY AND EQUIPMENT

The ATL test facility and associated equipment utilized in this task are located at 19900 East Colfax Avenue, Aurora, Colorado.

This task was performed under a pre-existing contract to provide additional testing capabilities for the EPA. Accordingly, facility and equipment check procedures were performed at the beginning of the contract and periodically rechecked by representatives of the EPA.

2.5 VEHICLE TEST PLAN

The test sequence performed at the ATL facility was

- o A Federal Test Procedure (without evaporative test),
- o A Highway Fuel Economy Test,
- o A Four Speed Idle Test, and
- o A Loaded Two Mode Test.

Prior to this test sequence, the vehicles were soaked for 12 to 36 hours.

Following the test sequence, a procedural review was conducted to assure that exhaust emission tests had been performed as prescribed by the EPA. If any problems were determined, the vehicle was again soaked and tested.

After-test measurements were performed on the vehicles, including the basic engine parameters relative to manufacturers settings for idle CO and HC, timing, dwell (if applicable), idle rpm, and propane enrichment rpm gain.

Vehicles were returned to their owners upon completion of testing.

2.6 LABORATORY TEST PROCEDURES

Each vehicle received a prescribed sequence of test and inspection procedures during the course of the task. These procedures and others associated with the conduct of the program include the following:

Vehicle Preparation

Federal Test Procedure

Highway Fuel Economy Test

Four Speed Idle Test

Loaded Two Mode test

After Test Procedures

Test Vehicle Depreparation

Details of these tests and procedures are presented in the following sections.

2.6.1 Test Vehicle Preparation Procedures

All vehicles selected for testing received a uniform series of preparation procedures to maintain standard testing conditions and to avoid possible vehicle malfunctions.

After acceptance of a vehicle into the program, as-received fuel was drained and the tank was then refilled to 40% capacity with Indolene clear fuel. Additionally, a fuel lead test was performed to establish the amount of lead in the as-received fuel. The pressures of the tires on the drive wheels were adjusted to 35 psi for all test vehicles.

Test preparation procedures were performed in the laboratory at a location separate from the soak and emission test areas.

2.6.2 Federal Test Procedure (Mass Exhaust Emission Test)

The Federal Test Procedure (FTP) was performed in accordance with procedures specified in 42 Federal Register 124. Preconditioning requirements for this test include a 12 to 36 hour soak period in an area with an ambient temperature between 20 and 30 degrees Centigrade (68 to 86 Fahrenheit). Each vehicle remained stationary while soaking with the ignition in the unlock position, the transmission in neutral and all accessories in the off position.

None of the vehicles acquired for this task received those segments of the FTP which deal with evaporative loss measurements. Consequently, following the soak period, test vehicles were moved to the dynamometer for the mass exhaust emission segment of the FTP.

Before the test vehicle was placed on the dynamometer and secured, the proper inertia weight and load adjustments were set. During those portions of the test with the

engine operating, the vehicle hood was opened and a cooling fan was placed in front of the vehicle grille.

The Federal Test Procedure consists of three sequential segments: the cold transient stage, the cold stabilized stage and the hot transient stage. Emission sampling for the initial cold transient portion was begun simultaneously with engine crank. This segment continued for 505 seconds at an average speed of 25.6 miles per hour over a cumulative distance of 3.59 miles. At the 505 second point, the exhaust sample was diverted from the first sample bag of the Constant Volume Sampler (CVS) to the second bag. This marked the beginning of the cold stabilized portion of the test. This segment covers 3.91 miles at an average speed of 16.0 miles per hour. Its duration is 869 seconds. At the end of this phase the engine was stopped, sampling was terminated and the vehicle was soaked on the dynamometer for ten minutes. After soaking, the vehicle was restarted and sampling was switched to the third CVS bag for 505 seconds at an average speed of 25.6 miles per hour. CVS sample and background bags were analyzed within ten minutes after completion of each segment of the test.

2.6.3 Highway Fuel Economy Test Procedure

The Highway Fuel Economy Test (HFET) consisted of vehicle operation on the dynamometer over a 10.2 mile, 765 second driving schedule with the vehicle in a warmed-up condition. Before testing was begun, each vehicle was driven at high cruise (50 mph) on the dynamometer for three minutes. Within one minute of the end of the cruise period, the vehicle was brought to idle and the test begun. During the entire driving schedule, CVS dilute exhaust was diverted into a sample bag. Sampling was terminated at the end of the schedule and the content of the sample bag was analyzed for HC, CO, CO₂ and NO_x content.

Load settings, inertia weights and vehicle speed tolerances for the HFET were identical to those used during the Federal Test Procedure.

2.6.4 Four Speed Idle Test

The Four Speed Idle Test consisted of four operating modes (three modes for vehicles equipped with manual transmissions) and was preceded by a six (+ 1) minute idle period with the cooling fan on and the engine compartment open. At the end of the six minutes, the vehicle was operated at curb idle in neutral, idle at 2500 rpm in neutral, curb idle in neutral, and for vehicles equipped with automatic transmission, at curb idle in the drive position. Each of the operating modes was maintained for a maximum of three minutes. Raw tailpipe samples were analyzed at each speed after rpm and analyzer outputs for CO, HC and NO had stabilized for a minimum of 30 seconds.

2.6.5 Loaded Two Mode Test

The Loaded Two Mode Test consisted of two steady state operating modes and was preceded by a six (+ 1) minute idle period with the cooling fan on and the engine compartment open. At the end of the six minutes, the vehicle was operated at low cruise (30 mph) for a maximum of three minutes. This operating mode was followed by vehicle operation at idle in neutral for a maximum of three minutes. For the cruise mode of this test, a horsepower setting of 9.0 was used and dynamometer inertia weight was set to the minimum level. Raw tailpipe samples were analyzed for each operating mode after rpm and analyzer outputs for CO, HC and NO had stabilized for a minimum of 30 seconds.

2.6.6 After Test Procedures

Basic engine parameters were measured after the test sequence to further document test conditions. These parameters consisted of basic ignition timing, dwell, idle speed, and undiluted CO and HC. These measurements were performed according to procedures outlined on the emission data sticker.

2.6.7 Test Vehicle Depreparation

Before a vehicle was returned to its owner, the following procedures were performed:

1. Tire pressures were adjusted to their original levels.
2. Test vehicle fuel tanks were refilled to full capacity.
3. Visual checks were performed to assure that the general condition of the vehicle was the same as when it was delivered to the laboratory.

2.7 DATA PROCESSING PROCEDURES

Accumulated raw test data and associated materials received a systematic review of each test point in the task from initial generation to final processing. These data accumulation and review procedures are described below.

2.7.1 Data Collection

Emission test procedures and laboratory conditions were monitored and controlled through the use of strip chart recorders. These units provided a constant read-out of data and also served to document test activities for later review. Test parameters registered on the recorders included emission analyzer outputs, wet and dry bulb temperatures of the air directed to the front of the test vehicle and dilute exhaust stream temperatures. Driver and vehicle performance traces were also documented on a strip chart recorder and included speed calibrations and calibration checks performed before and after each test.

A NOVA 2 minicomputer was utilized to collect and integrate CVS sample and background bag emission data. Speed/time profiles were generated for each test schedule by the computer and produced on the driver and vehicle performance trace. The computer also totalized and recorded CVS mass pump revolutions during each exhaust emission test segment.

Movement of each test vehicle through segments of the task was controlled through and documented on various data sheets. All data forms were collected in test packets which were assigned to each vehicle prior to testing. As testing progressed, relevant sheets were completed, signed and returned to the packet by the appropriate technician. Included in the packet were: all data sheets used to identify the vehicle,

data sheets used during tests, analyzer strip chart recordings, computer system sheets and magnetic tapes, and all applicable temperature strip chart recordings.

Laboratory personnel were also furnished a form indicating the daily test schedule including the order each vehicle was to be tested and the estimated duration of each test segment. Preconditioning personnel were also furnished with a similar schedule indicating the time each vehicle was to be placed in soak.

2.7.2 Data Review and Editing

Vehicle packets were reviewed for completeness, accuracy and compliance with temperature and speed tolerances on a test by test basis. This review was performed as soon as possible after each test to allow for a timely and appropriate solution to any problems. The test packet was again reviewed after all tests had been completed. After resolution of any discrepancies, the completed packet was forwarded to the data processing department.

Data processing procedures included an additional review of packet contents by personnel not directly involved in the original tests. Following this review, data from the on-site NOVA 2 minicomputer and from the manually prepared data sheets were combined into a single magnetic tape which was input to an offsite, time-share computer. When obvious data entry errors had been resolved and corrected, a computerized edit program was applied to the data. This program subjects each entry to a test of reasonableness. If recorded information failed to fall within a predetermined range, the computer indicated the presence of a possible error and identified the area requiring investigation. Any discrepancies found at this stage were resolved either through further clarifying information from test personnel, reference to test records or through a partial or complete retest of the vehicle.

When all problems were resolved, the data were reduced and printed for a final review before the test was declared valid. The data were delivered to the EPA in 80

column card format on magnetic tape along with the completed data packet.

2.7.3 Calculation of Test Results

2.7.3.1 Federal Test Procedure Emission Data - Mass emission test results were calculated using equations specified in 42 Federal Register 124 and reported in grams per mile for CO, CO₂, HC and NO_x. Fuel economy data for this test were calculated using the carbon balance equation. Calculations were made using distance constants of 3.59 and 3.91 miles respectively for the transient and stabilized modes.

2.7.3.2 Highway Fuel Economy Test - Exhaust emission results for this test were calculated using Federal Register equations and a distance constant of 10.242 miles. Fuel economy was calculated using the mass emission results and the carbon balance equation.

2.7.3.3 Four Speed Idle Test - Emission results from this test were comprised of undiluted tailpipe concentrations and reported as measured.

2.7.3.4 Loaded Two Mode Test - Emission results from this test were comprised of undiluted tailpipe concentrations and reported as measured.

3. TABLES

TABLE 1
SUMMARY OF SAMPLE MAKES

DENVER-1980

MANUFACTURER	1980
-----	----
DOMESTICS	
AMC	0
BUICK	2
CADILLAC	1
CHEVROLET	5
CHRYSLER	0
DODGE	2
FORD	5
LINCOLN	1
MERCURY	2
OLDSMOBILE	1
PLYMOUTH	0
PONTIAC	2
IMPORTS	
AUDI	0
DATSUN	3
FIAT	0
HONDA	2
MAZDA	1
RENAULT	0
SAAB	1
SUBARU	1
TOYOTA	4
VOLKSWAGEN	1
VOLVO	1
-----	----
TOTALS	35

TABLE 2

SUMMARY OF TEST VEHICLE CHARACTERISTICS

DENVER-1980

	1980
-----	-----
MILEAGE INTERVALS	
10000 & UNDER	29
10001 - 20000	6
20001 - 30000	0
30001 - 40000	0
40001 - 50000	0
50001 & OVER	0
INERTIA WEIGHT IN POUNDS	
1750	0
2000	1
2250	6
2500	7
2750	3
3000	6
3500	6
4000	4
4500	2
5000	0
5500	0
DISPLACEMENT (CUBIC INCHES)	
UNDER 251	26
251 - 330	7
331 - 399	2
OVER 399	0
NUMBER OF ENGINE CYLINDERS	
ROTARY	0
4	20
5	0
6	6
8	9
-----	-----
TOTALS	35

TABLE 3

EXHAUST EMISSION TEST RESULTS BY MODEL YEAR

DENVER-1980

1975 FEDERAL TEST PROCEDURE

MODEL YEAR	VEH	AVERAGE ODOM	HC	CO	CO ₂	NO _x c	FUEL ECONOMY FTP	ECONOMY HFET
1980	35	6276	0.57	18.10	454.1	1.08	18.32	25.98
TOTALS	35	6276	0.57	18.10	454.1	1.08	18.32	25.98

EMISSION RESULTS IN GRAMS PER MILE
FUEL ECONOMY IN MILES PER GALLON

VEHICLES MEETING FEDERAL STANDARDS

1980 FEDERAL STANDARDS

MODEL YEAR	NO. VEH	HC < .4 gm/mi -NO. PCT	CO < 7 gm/mi -NO. PCT	NO _x c < 2.0 gm/mi -NO. PCT	PASSED ALL THREE NO. PCT
1980	35	11 31	8 23	32 91	5 14

TABLE 4

1980 VEHICLES MEETING 1980 FEDERAL STANDARDS

DENVER-1980

1975 FEDERAL TEST PROCEDURE

MANUFACTURER	NO. VEH	HC		CO		NO _x		PASSED		
		< .4 -NO.	gm/mi PCT	< 7 -NO.	gm/mi PCT	< 2.0 -NO.	gm/mi PCT	ALL NO.	THREE PCT	
DOMESTICS										
AMC	0									
BUICK	2	1	50	0	0	2	100	0	0	
CADILLAC	1	0	0	0	0	0	0	0	0	
CHEVROLET	5	0	0	0	0	4	80	0	0	
CHRYSLER	0									
DODGE	2	0	0	0	0	2	100	0	0	
FORD	5	2	40	1	20	5	100	0	0	
LINCOLN	1	0	0	1	100	1	100	0	0	
MERCURY	2	1	50	0	0	2	100	0	0	
OLDSMOBILE	1	0	0	0	0	1	100	0	0	
PLYMOUTH	0									
PONTIAC	2	0	0	0	0	1	50	0	0	
IMPORTS										
AUDI	0									
DATSUN	3	0	0	0	0	3	100	0	0	
FIAT	0									
HONDA	2	1	50	2	100	2	100	1	50	
MAZDA	1	0	0	0	0	1	100	0	0	
RENAULT	0									
SAAB	1	1	100	1	100	1	100	1	100	
SUBARU	1	0	0	0	0	1	100	0	0	
TOYOTA	4	3	75	2	50	4	100	2	50	
VOLKSWAGEN	1	1	100	0	0	1	100	0	0	
VOLVO	1	1	100	1	100	1	100	1	100	
TOTALS	35	11	31	8	23	32	91	5	14	

APPENDICES

APPENDIX A - LISTING OF VEHICLE AND TEST PARAMETERS

Legend

VEH. NO. - Vehicle number

YR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

CYL - Number of cylinders

BBL - Number of carburetor venturis (F: fuel injected)

T - Type of transmission (A: automatic; 2: semi-automatic;
3: 3-speed manual; 4: 4-speed manual; 5: 5-speed manual)

ENGINE FAMILY - Engine family

AC - Vehicle equipped with air conditioning (Y: yes; N: no)

FT - Fuel tank capacity in gallons

I.WT - Dynamometer inertia weight setting for Federal Test
Procedure (if applicable)

A.HP - Actual road load horsepower setting for Federal Test
Procedure (if applicable)

ACL - Was 10% AHP added to simulate air conditioner (Y: yes; N: no;
M: manufacturer's certification AHP setting)

TEST NO. - Contractor run number

TEST DATE - Date of test (month/day/year)

IRPM - Idle RPM

TMG - Ignition timing in degrees (+ indicates before top dead center;
-: indicates after top dead center; 000: indicates top dead center)

DB - Dry bulb temperature (degrees Fahrenheit)

WB - Wet bulb temperature (degrees Fahrenheit)

BARO. - Barometric pressure (inches Hg)

The engine and test parameters were obtained as indicated by the following designations:

SPEC - Manufacturer's specifications

BASE - Measured as-received from vehicle owner with indolene fuel

APPENDIX A

LISTING OF VEHICLES AND TEST PARAMETERS

DENVER--1980

VEH. NO.	YR	MAKE	MODL	CID	C Y	B B	L L	T	ENGINE FAMILY	A C	FT	I.WT	A.HP	L	TEST NO.	TEST DATE	IRPM	TMG	DB	WB	BARO.
0001	80	CHEV	CHET	098	4	1	A		01W2F/0B5-1	Y	13	2500	9.2 M SPEC BASE		0005	08/04/80	750 +18 750 +20		73	63	24.35
0002	80	CHEV	CHET	098	4	1	4		01W2F/0P5-1	N	13	2500	9.2 M SPEC BASE		0013	08/05/80	800 +12 1050 +15		79	65	24.43
0003	80	CHEV	MONZ	151	4	2	4		02X2E/0B6-2	N	19	3000	9.9 M SPEC BASE		0028	08/07/80	550 +12 780 +13		76	62	24.69
0004	80	CHEV	CITA	151	4	2	4		02X2E/0B6-2	Y	14	2750	6.6 M SPEC BASE		0010	08/05/80	1000 +10 980 +16		74	60	24.43
0005	80	PONT	PHOE	173	6	2	A		01C2J/0B6-1	Y	14	3000	7.3 M SPEC BASE		0012	08/05/80	650 +02 650 +20		80	63	24.48
0006	80	BUIC	SKYL	173	6	2	A		01C2J/0B6-1	Y	14	3000	7.3 M SPEC BASE		0011	08/05/80	650 +02 690 +02		77	57	24.43
0007	80	BUIC	REGA	265	8	2	A		02H2C / 0B3-2	Y	18	3500	11.2 M SPEC BASE		0038	08/08/80	550 +10 570 +10		77	68	24.80
0008	80	CHEV	STAW	267	8	2	A		01D2A/0B3-1	Y	18	4000	12.5 M SPEC BASE		0003	08/04/80	500 +04 500 +02		74	63	24.35
0009	80	OLDS	SPRM	260	8	1	A		03H2E/0B3-3	Y	18	3500	11.6 M SPEC BASE		0017	08/06/80	500 +20 540 +18		75	61	24.45
0010	80	PONT	BONN	301	8	4	A		02S4V/0B4-2	Y	25	4000	12.2 M SPEC BASE		0037	08/08/80	500 +12 600 +12		78	69	24.82
0011	80	CADI	DEVI	368	8	4	A		06T4B-0B4-6	Y	21	4500	11.3 M SPEC BASE		0001	08/04/80	500 +18 580 +11		76	62	24.45
0012	80	FORD	PINT	140	4	2	A		2.3AC/B	Y	13	2750	9.7 M SPEC BASE		0024	08/06/80	750 +06 980 +10		78	65	24.45
0013	80	FORD	MUST	140	4	2	4		2.3AC/B	N	12	3000	8.0 M SPEC BASE		0040	08/08/80	850 +06 930 +08		76	67	24.80

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APPENDIX A (CONT)

LISTING OF VEHICLES AND TEST PARAMETERS

DENVER-1980

VEH. NO.	YR	MAKE	MODL	CID	C L	B L	T	ENGINE	FAMILY	A C	FT	I.WT	A.HP	L	TEST NO.	TEST DATE	IRPM	TMG	DB	WB	BARO.
0014	80	MERC	STAW	200	6	1	A	3.3GA	A	N	14	3000	11.3 M SPEC BASE		0022	08/06/80	550 +07 710 +07	79	65	24.48	
0015	80	FORD	GRAN	250	6	1	A	4.1FA/G		Y	18	3500	11.1 M SPEC BASE		0019	08/06/80	550 +10 550 +13	75	61	24.46	
0016	80	FORD	THND	302	8	2	A	4.2/5.0BJF		Y	18	3500	10.6 M SPEC BASE		0009	08/05/80	500 +10 590 +11	75	60	24.43	
0017	80	MERC	XR7	200	6	1	A	3.3GA/A		Y	18	3500	10.6 M SPEC BASE		0035	08/08/80	625 +10 740 +10	76	67	24.78	
0018	80	FORD	LTD	302	8	2	A	4.2/5.0 BU		Y	19	4000	11.3 M SPEC BASE		0002	08/04/80	500 +06 650 +06	76	57	24.4?	
0019	80	LINC	CONT	351	8	2	A	5.8WAXF-S		Y	20	4500	13.5 M SPEC BASE		0030	08/07/80	640 +99 690 +99	78	62	24.69	
0020	80	DODG	OMNI	105	4	2	A	0FA1052BBP/OE-1	N	13	2500	7.1 M SPEC BASE		0014	08/05/80	900 +12 870 +17	77	65	24.43		
0021	80	DODG	ASPE	318	8	2	A	0FA318BTP/OE3/6	Y	18	4000	12.6 M SPEC BASE		0034	08/08/80	700 +12 680 +12	77	67	24.74		
0022	80	DATS	210	085	4	2	A	A1415F/EVPCARB2	Y	13	2250	9.3 M SPEC BASE		0006	08/04/80	650 +08 750 +10	74	62	24.36		
0023	80	DATS	310	085	4	2	4	A1415F/EVPCARB2	N	13	2250	9.5 M SPEC BASE		0015	08/05/80	750 +08 900 +14	75	65	24.43		
0024	80	DATS	510	122	4	2	5	220SF/EVPCARB1	N	13	2500	9.4 M SPEC BASE		0018	08/06/80	600 +08 600 +08	74	61	24.46		
0025	80	HOND	ACOD	107	4	3	5	A80D/80FB		Y	13	2500	9.6 M SPEC BASE		0021	08/06/80	800 000 760 +08	75	60	24.47	
0026	80	HOND	STAW	076	4	2	5	A80C/80FA		N	11	2250	9.6 M SPEC BASE		0039	08/08/80	750 000 980 +02	80	68	24.80	

AUTOMOTIVE TESTING LABORATORIES, INC.
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APPENDIX A (CONT)

LISTING OF VEHICLES AND TEST PARAMETERS

DENVER-1980

VEH. NO.	YR	MAKE	MODL	CID	C L	B L	T	ENGINE FAMILY	A C	FT	I.WT	A.HP	L	TEST NO.	TEST DATE	IRPM	TMG	DB	WB	BARO.
0027	80	MAZD	GLC	086	4	2	4	OUCP/OSCAF	N	11	2250	9.0 M SPEC BASE		0036	08/08/80	700 +05 790 +04		75	66	24.83
0028	80	SÅAB	GLI	121	4	F	4	B120CA	N	15	2750	9.8 M SPEC BASE		0041	08/08/80	875 +20 980 +19		79	66	24.78
0029	80	SUBA	GLF	097	4	2	5	DU/EVAP/GU	Y	13	2500	9.4 M SPEC BASE		0042	08/19/80	900 +08 930 +07		75	60	24.60
0030	80	TOYO	TERC	089	4	2	A	1-A/EV-A	Y	12	2250	8.4 M SPEC BASE		0027	08/06/80	650 +05 870 +07		76	63	24.49
0031	80	TOYO	CORO	108	4	2	5	3T-(F) / EV-TF	Y	13	2500	8.8 M SPEC BASE		0007	08/04/80	700 +10 900 +10		75	60	24.38
0032	80	TOYO	TERC	091	4	2	5	1A/EV-A	Y	12	2000	7.6 M SPEC BASE		0023	08/06/80	650 +05 710 +06		78	66	24.45
0033	80	TOYO	CRES	156	6	F	A	4ME/EV-ME	Y	17	3000	11.2 M SPEC BASE		0016	08/05/80	800 +12 650 +13		76	64	24.44
0034	80	VOLK	RABB	090	4	F	5	37F / 37	N	11	2250	6.8 M SPEC BASE		0025	08/06/80	925 -03 800 -04		79	65	24.46
0035	80	VOLV	242	130	4	F	4	4C / E2	N	16	3500	12.5 M SPEC BASE		0029	08/07/80	950 +08 1050 +08		76	63	24.69

AUTOMOTIVE TESTING LABORATORIES, INC.
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APPENDIX B - LISTING OF FEDERAL TEST PROCEDURE
RESULTS ON INDIVIDUAL VEHICLES

Legend

VEH. NO. - Vehicle number

MODL YEAR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

TEST TYPE - Indicates the portion of the test or composite

BASE - Measured as-received from vehicle owner with
indolene fuel

COLD TRANS - Cold transient portion of test

COLD STABI - Cold stabilized portion of test

HOT TRANS - Hot transient portion of test

75 FTP - 1975 Federal Test Procedure composite

EMISSION RESULTS

(gm/mi) - Emission results measured in grams per mile

HC - Hydrocarbon emissions in grams per mile

CO - Carbon monoxide emissions in grams per mile

CO₂ - Carbon dioxide emissions in grams per mile

NO_{xc} - Oxides of nitrogen emission corrected for humidity in
grams per mile

FUEL ECON MPG - Fuel economy calculated by the carbon balance method in
miles per gallon

IHC - Hydrocarbon concentration with vehicle at normal idle,
measured with garage-type instrumentation in parts per
million hexane equivalent

ICO (act) - Carbon monoxide concentration with vehicle at normal idle,
measured with garage-type instrumentation in mole per cent

ICO (spec) - Carbon monoxide concentration with vehicle at normal idle,
as specified by the manufacturer (N/A: no specifications
available).

OTHER TESTS - Lists other emission factor tests conducted on the vehicle

HFET - Vehicle was used in Highway Fuel Economy test

SHORT TESTS - Vehicle was used in the series of Short Tests

APPENDIX B

LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TEST TYPE	--EMISSION RESULTS (gm/mi)--				FUEL ECON MPG
						HC	CO	CO2	NOxc	
0001	1980	CHEV	CHET	098	BASE COLD TRANS	2.02	89.5	433.4	1.11	15.29
					IHC: 6 ppm hexane BASE COLD STABL	0.08	29.1	447.1	0.29	18.00
					ICO [act]: 0.0 %CO BASE HOT TRANS	0.21	42.8	407.6	0.79	18.67
					ICO [spec]: N/A %CO BASE 75 FTP	0.51	45.2	433.5	0.59	17.53
					OTHER TESTS: HFET, SHORT TESTS					
0002	1980	CHEV	CHET	098	BASE COLD TRANS	1.71	52.4	356.5	0.77	19.98
					IHC: 6 ppm hexane BASE COLD STABL	0.11	20.5	381.5	0.34	21.44
					ICO [act]: 0.0 %CO BASE HOT TRANS	0.36	26.1	328.6	0.67	23.94
					ICO [spec]: N/A %CO BASE 75 FTP	0.51	28.6	361.9	0.52	21.73
					OTHER TESTS: HFET, SHORT TESTS					
0003	1980	CHEV	MONZ	151	BASE COLD TRANS	3.56	53.1	398.6	2.10	17.99
					IHC: 21 ppm hexane BASE COLD STABL	0.81	20.6	421.6	1.38	19.44
					ICO [act]: 0.0 %CO BASE HOT TRANS	1.70	37.1	350.3	1.72	21.43
					ICO [spec]: N/A %CO BASE 75 FTP	1.62	31.8	397.4	1.62	19.61
					OTHER TESTS: HFET, SHORT TESTS					
0004	1980	CHEV	CITA	151	BASE COLD TRANS	1.66	25.7	338.9	3.54	23.09
					IHC: 9 ppm hexane BASE COLD STABL	0.13	0.8	371.1	3.68	23.81
					ICO [act]: 0.0 %CO BASE HOT TRANS	0.47	10.9	301.6	3.78	27.73
					ICO [spec]: N/A %CO BASE 75 FTP	0.54	8.7	345.5	3.68	24.60
					OTHER TESTS: HFET, SHORT TESTS					
0005	1980	PONT	PHOE	173	BASE COLD TRANS	1.73	30.5	404.0	3.58	19.41
					IHC: 9 ppm hexane BASE COLD STABL	0.17	5.0	452.1	2.23	19.28
					ICO [act]: 0.0 %CO BASE HOT TRANS	0.29	14.1	385.0	2.46	21.75
					ICO [spec]: N/A %CO BASE 75 FTP	0.52	12.7	423.9	2.57	19.92
					OTHER TESTS: HFET, SHORT TESTS					
0006	1980	BUIC	SKYL	173	BASE COLD TRANS	0.72	21.7	462.9	1.58	17.77
					IHC: 3 ppm hexane BASE COLD STABL	0.05	0.5	498.8	1.35	17.76
					ICO [act]: 0.0 %CO BASE HOT TRANS	0.23	12.6	405.0	1.33	20.86
					ICO [spec]: N/A %CO BASE 75 FTP	0.24	8.2	465.8	1.39	18.51
					OTHER TESTS: HFET, SHORT TESTS					
0007	1980	BUIC	REGA	265	BASE COLD TRANS	2.29	29.3	599.1	2.37	13.60
					IHC: 18 ppm hexane BASE COLD STABL	0.26	3.1	547.8	1.12	16.04
					ICO [act]: 0.0 %CO BASE HOT TRANS	0.36	7.2	493.6	1.40	17.54
					ICO [spec]: N/A %CO BASE 75 FTP	0.70	9.6	543.6	1.45	15.82
					OTHER TESTS: HFET, SHORT TESTS					
0008	1980	CHEV	STAW	267	BASE COLD TRANS	2.38	57.0	679.1	1.26	11.43
					IHC: 15 ppm hexane BASE COLD STABL	0.17	20.9	658.6	0.58	12.83
					ICO [act]: 0.0 %CO BASE HOT TRANS	0.31	27.9	585.9	0.78	14.07
					ICO [spec]: N/A %CO BASE 75 FTP	0.66	30.2	643.0	0.77	12.81
					OTHER TESTS: HFET, SHORT TESTS					

AUTOMOTIVE TESTING LABORATORIES, INC.
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APPENDIX B (CONT)

LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TEST TYPE	--EMISSION RESULTS (gm/mi)--				FUEL ECON MPG
						HC	CO	CO2	NOxc	
0009	1980	OLDS	SPRM	260	BASE COLD TRANS	1.92	60.9	593.8	0.98	12.76
					IHC: 6 ppm hexane	0.31	9.3	565.0	0.51	15.29
					ICO [act]: 0.0 %CO	0.59	22.8	523.3	0.68	15.82
					ICO [spec]: N/A %CO	0.72	23.6	559.5	0.66	14.82
					OTHER TESTS: HFET, SHORT TESTS					
0010	1980	PONT	BONN	301	BASE COLD TRANS	1.60	26.9	693.1	1.35	11.99
					IHC: 12 ppm hexane	0.12	4.8	652.5	0.89	13.44
					ICO [act]: 0.0 %CO	0.32	9.2	562.6	1.14	15.35
					ICO [spec]: N/A %CO	0.48	10.5	636.3	1.05	13.56
					OTHER TESTS: HFET, SHORT TESTS					
0011	1980	CADI	DEVI	368	BASE COLD TRANS	2.52	61.3	659.3	3.23	11.62
					IHC: 15 ppm hexane	0.23	2.4	662.5	2.18	13.31
					ICO [act]: 0.0 %CO	1.12	37.3	589.0	2.17	13.63
					ICO [spec]: N/A %CO	0.94	24.0	641.8	2.39	13.00
					OTHER TESTS: HFET, SHORT TESTS					
0012	1980	FORD	PINT	140	BASE COLD TRANS	1.03	82.0	485.9	0.50	14.36
					IHC: 18 ppm hexane	0.46	84.3	481.8	0.13	14.41
					ICO [act]: 0.0 %CO	0.57	75.9	421.1	0.31	16.37
					ICO [spec]: N/A %CO	0.61	81.5	466.1	0.25	14.89
					OTHER TESTS: HFET, SHORT TESTS					
0013	1980	FORD	MUST	140	BASE COLD TRANS	2.86	36.1	455.2	0.76	17.03
					IHC: 12 ppm hexane	0.31	16.1	495.7	0.30	17.00
					ICO [act]: 0.0 %CO	1.24	23.8	391.9	0.40	20.48
					ICO [spec]: N/A %CO	1.09	22.4	459.1	0.42	17.84
					OTHER TESTS: HFET, SHORT TESTS					
0014	1980	MERC	STAW	200	BASE COLD TRANS	1.50	60.5	463.3	1.64	15.76
					IHC: 167 ppm hexane	0.20	13.4	443.6	2.10	19.08
					ICO [act]: 1.2 %CO	1.18	53.7	386.7	1.45	18.69
					ICO [spec]: N/A %CO	0.73	34.1	432.1	1.83	18.19
					OTHER TESTS: HFET, SHORT TESTS					
0015	1980	FORD	GRAN	250	BASE COLD TRANS	0.77	35.0	585.4	0.40	13.80
					IHC: 6 ppm hexane	0.03	9.0	532.7	0.25	16.23
					ICO [act]: 0.0 %CO	0.22	9.6	522.1	0.47	16.50
					ICO [spec]: N/A %CO	0.24	14.5	540.7	0.34	15.73
					OTHER TESTS: HFET, SHORT TESTS					
0016	1980	FORD	THND	302	BASE COLD TRANS	0.75	29.7	659.6	0.82	12.52
					IHC: 36 ppm hexane	0.08	5.8	683.7	0.39	12.81
					ICO [act]: 0.1 %CO	0.35	19.6	559.6	0.48	15.01
					ICO [spec]: N/A %CO	0.29	14.5	644.9	0.50	13.28
					OTHER TESTS: HFET, SHORT TESTS					

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APPENDIX B (CONT)

LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TEST TYPE	--EMISSION RESULTS (gm/ml)--				FUEL ECON MPG
						HC	CO	CO2	NOxc	
0017	1980	MERC	XR7	200	BASE COLD TRANS	1.11	56.1	648.7	1.05	11.99
					IHC: 9 ppm hexane	0.11	9.5	605.3	1.28	14.30
					ICO [act]: 0.0 %CO	0.42	35.2	578.6	0.87	13.97
					ICO [spec]: N/A %CO	0.40	26.1	607.0	1.12	13.67
					OTHER TESTS: HFET, SHORT TESTS					
0018	1980	FORD	LTD	302	BASE COLD TRANS	1.35	13.8	652.1	4.22	13.09
					IHC: 6 ppm hexane	0.29	0.9	658.3	0.81	13.44
					ICO [act]: 0.0 %CO	0.34	6.2	580.6	1.25	15.01
					ICO [spec]: N/A %CO	0.52	5.0	635.8	1.63	13.75
					OTHER TESTS: HFET, SHORT TESTS					
0019	1980	LINC	CONT	351	BASE COLD TRANS	1.51	17.4	637.9	1.62	13.25
					IHC: 6 ppm hexane	0.14	0.2	644.0	1.12	13.77
					ICO [act]: 0.0 %CO	0.20	1.2	549.2	1.07	16.09
					ICO [spec]: N/A %CO	0.44	4.0	616.9	1.21	14.21
					OTHER TESTS: HFET, SHORT TESTS					
0020	1980	DODG	OMNI	105	BASE COLD TRANS	2.93	39.8	411.9	1.20	18.35
					IHC: 33 ppm hexane	0.68	7.2	394.9	0.48	21.73
					ICO [act]: 0.0 %CO	0.69	8.6	362.1	1.12	23.49
					ICO [spec]: N/A %CO	1.14	14.3	389.4	0.80	21.36
					OTHER TESTS: HFET, SHORT TESTS					
0021	1980	DODG	ASPE	318	BASE COLD TRANS	1.48	42.0	688.5	0.94	11.69
					IHC: 9 ppm hexane	0.28	15.8	669.4	0.46	12.77
					ICO [act]: 0.0 %CO	0.58	22.1	588.7	0.90	14.19
					ICO [spec]: N/A %CO	0.61	22.9	651.3	0.68	12.88
					OTHER TESTS: HFET, SHORT TESTS					
0022	1980	DATS	210	085	BASE COLD TRANS	1.43	47.8	361.7	1.29	20.11
					IHC: 341 ppm hexane	0.51	15.1	318.6	0.62	25.81
					ICO [act]: 2.6 %CO	0.71	19.8	313.3	1.10	25.60
					ICO [spec]: 2.0 %CO	0.75	23.1	326.1	0.89	24.33
					OTHER TESTS: HFET, SHORT TESTS					
0023	1980	DATS	310	085	BASE COLD TRANS	1.37	23.5	312.1	1.93	25.12
					IHC: 341 ppm hexane	0.30	14.2	308.7	0.92	26.73
					ICO [act]: 2.9 %CO	0.75	8.9	290.7	2.00	28.91
					ICO [spec]: 2.0 %CO	0.64	14.7	304.5	1.42	26.93
					OTHER TESTS: HFET, SHORT TESTS					
0024	1980	DATS	510	122	BASE COLD TRANS	1.23	34.4	341.7	0.73	22.20
					IHC: 9 ppm hexane	0.13	7.9	328.8	0.39	25.98
					ICO [act]: 0.0 %CO	0.43	13.3	298.0	0.69	27.71
					ICO [spec]: 1.5 %CO	0.44	14.8	323.0	0.54	25.52
					OTHER TESTS: HFET, SHORT TESTS					

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APPENDIX B (CONT)

LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TEST TYPE	--EMISSION RESULTS (gm/mi)--				FUEL ECON MPG
						HC	CO	CO2	NOxc	
0025	1980	HOND	ACCO	107	BASE COLD TRANS	1.24	15.0	350.0	2.69	23.51
					IHC: 39 ppm hexane	0.18	2.9	347.3	1.49	25.18
					ICO [act]: 0.1 %CO	0.31	3.1	306.1	2.27	28.45
					ICO [spec]: 0.4 %CO	0.44	5.4	336.6	1.95	25.61
					OTHER TESTS: HFET, SHORT TESTS					
0026	1980	HOND	STAW	076	BASE COLD TRANS	1.22	7.0	314.4	1.65	26.96
					IHC: 6 ppm hexane	0.10	1.3	312.7	0.95	28.17
					ICO [act]: 0.0 %CO	0.23	2.2	300.1	1.42	29.16
					ICO [spec]: 0.1 %CO	0.37	2.7	309.6	1.22	28.17
					OTHER TESTS: HFET, SHORT TESTS					
0027	1980	MAZD	GLC	086	BASE COLD TRANS	1.86	33.0	332.0	0.54	22.77
					IHC: 6 ppm hexane	0.24	5.2	334.1	0.68	25.88
					ICO [act]: 0.0 %CO	0.34	9.6	296.3	0.65	28.40
					ICO [spec]: N/A %CO	0.60	12.1	323.3	0.64	25.78
					OTHER TESTS: HFET, SHORT TESTS					
0028	1980	SAAB	GLI	121	BASE COLD TRANS	0.89	17.5	438.5	0.29	18.93
					IHC: 6 ppm hexane	0.04	0.4	454.0	0.55	19.51
					ICO [act]: 0.0 %CO	0.16	8.6	378.9	0.43	22.59
					ICO [spec]: 1.0 %CO	0.25	6.2	430.3	0.46	20.14
					OTHER TESTS: HFET, SHORT TESTS					
0029	1980	SUBA	GLF	097	BASE COLD TRANS	1.64	49.0	378.4	1.38	19.27
					IHC: 3 ppm hexane	0.17	20.7	404.1	0.82	20.30
					ICO [act]: 0.0 %CO	1.04	32.3	349.4	1.35	22.00
					ICO [spec]: 4.5 %CO	0.71	29.7	383.9	1.08	20.51
					OTHER TESTS: HFET, SHORT TESTS					
0030	1980	TOYO	TERC	089	BASE COLD TRANS	1.16	26.1	330.8	1.54	23.64
					IHC: 57 ppm hexane	0.11	2.7	317.5	0.53	27.56
					ICO [act]: 5.4 %CO	0.19	6.7	295.7	1.22	28.93
					ICO [spec]: N/A %CO	0.35	8.6	314.3	0.93	26.98
					OTHER TESTS: HFET, SHORT TESTS					
0031	1980	TOYO	CORO	108	BASE COLD TRANS	1.99	60.9	328.8	0.97	20.60
					IHC: 3 ppm hexane	0.27	16.7	383.3	0.37	21.62
					ICO [act]: 0.0 %CO	0.30	18.8	322.8	0.56	25.12
					ICO [spec]: N/A %CO	0.63	26.4	355.6	0.55	22.24
					OTHER TESTS: HFET, SHORT TESTS					
0032	1980	TOYO	TERC	091	BASE COLD TRANS	1.06	12.5	323.6	1.66	25.60
					IHC: 12 ppm hexane	0.12	2.1	328.9	0.70	26.69
					ICO [act]: 0.0 %CO	0.19	2.8	283.2	1.41	30.79
					ICO [spec]: N/A %CO	0.33	4.4	315.4	1.09	27.44
					OTHER TESTS: HFET, SHORT TESTS					

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APPENDIX B (CONT)

LISTING OF FEDERAL TEST PROCEDURE RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	TEST TYPE	--EMISSION RESULTS (gm/mi)--				FUEL ECON MPG
						HC	CO	CO2	NOx c	
0033	1980	TOYO	CRES	156	BASE COLD TRANS	1.08	9.6	499.6	1.29	17.13
					IHC: 3 ppm hexane BASE COLD STABL	0.01	0.4	417.0	0.08	21.25
					ICO [act]: 0.0 %CO BASE HOT TRANS	0.02	0.3	411.7	0.68	21.53
					ICO [spec]: N/A %CO BASE 75 FTP	0.24	2.2	432.6	0.49	20.32
					OTHER TESTS: HFET, SHORT TESTS					
0034	1980	VOLK	RABB	090	BASE COLD TRANS	0.87	16.7	355.1	1.28	23.10
					IHC: 9 ppm hexane BASE COLD STABL	0.07	2.1	374.5	1.03	23.48
					ICO [act]: 0.0 %CO BASE HOT TRANS	0.37	10.6	320.4	0.95	26.25
					ICO [spec]: 0.5 %CO BASE 75 FTP	0.32	7.4	355.8	1.06	24.09
					OTHER TESTS: HFET, SHORT TESTS					
0035	1980	VOLV	242	130	BASE COLD TRANS	1.06	13.7	467.0	0.34	18.05
					IHC: 6 ppm hexane BASE COLD STABL	0.04	0.5	512.8	0.03	17.28
					ICO [act]: 0.0 %CO BASE HOT TRANS	0.12	1.0	452.5	0.15	19.53
					ICO [spec]: 2.0 %CO BASE 75 FTP	0.27	3.3	487.0	0.12	18.00
					OTHER TESTS: HFET, SHORT TESTS					

AUTOMOTIVE TESTING LABORATORIES, INC.
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APPENDIX C - LISTING OF HIGHWAY FUEL ECONOMY
AND EMISSION RESULTS ON INDIVIDUAL VEHICLES

Legend

VEH. NO. - Vehicle number

MODL YEAR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

SEQ - Test sequence

BASE - Measured as-received from vehicle owner with
indolene fuel

EMISSION RESULTS

(gm/mi) - Emission results measured in grams per mile

HC - Hydrocarbon emissions in grams per mile

CO - Carbon monoxide emissions in grams per mile

CO₂ - Carbon dioxide emissions in grams per mile

NO_{xc} - Oxides of nitrogen emission corrected for humidity in
grams per mile

FUEL ECON MPG - Fuel economy calculated by the carbon balance method in
miles per gallon

APPENDIX C

LISTING OF HIGHWAY FUEL ECONOMY & EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	SEQ.	EMISSION RESULTS (gm/mi)-				FUEL ECON MPG
						HC	CO	CO ₂	NO _x c	
0001	1980	CHEV	CHET	098	BASE	0.60	72.5	314.3	0.68	20.63
0002	1980	CHEV	CHET	098	BASE	0.10	15.0	265.8	0.70	30.64
0003	1980	CHEV	MONZ	151	BASE	0.24	10.7	247.3	1.75	33.51
0004	1980	CHEV	CITA	151	BASE	0.09	1.9	230.8	4.65	37.93
0005	1980	PONT	PHOE	173	BASE	0.09	10.8	312.0	1.72	26.95
0006	1980	BUIC	SKYL	173	BASE	0.08	4.2	312.6	1.35	27.79
0007	1980	BUIC	REGA	265	BASE	0.27	5.5	379.1	1.71	22.84
0008	1980	CHEV	STAW	267	BASE	0.09	21.3	488.8	0.79	16.98
0009	1980	OLDS	SPRM	260	BASE	0.20	10.0	415.4	0.56	20.55
0010	1980	PONT	BONN	301	BASE	0.11	3.9	424.7	1.35	20.58
0011	1980	CADI	DEVI	368	BASE	0.13	3.6	496.4	2.04	17.66
0012	1980	FORD	PINT	140	BASE	0.45	79.0	317.3	0.15	20.04
0013	1980	FORD	MUST	140	BASE	0.05	6.1	302.9	0.34	28.39
0014	1980	MERC	STAW	200	BASE	1.06	50.3	318.7	1.18	22.12
0015	1980	FORD	GRAN	250	BASE	0.02	1.5	417.8	0.61	21.12
0016	1980	FORD	THND	302	BASE	0.05	4.3	371.1	0.50	23.48
0017	1980	MERC	XR7	200	BASE	0.08	18.5	422.0	0.45	19.66
0018	1980	FORD	LTD	302	BASE	0.13	0.2	415.6	0.85	21.32
0019	1980	LINC	CONT	351	BASE	0.06	0.8	372.9	0.63	23.70
0020	1980	DODG	OMNI	105	BASE	0.10	1.0	316.5	1.26	27.88
0021	1980	DODG	ASPE	318	BASE	0.07	3.4	443.3	0.86	19.77
0022	1980	DATS	210	085	BASE	0.16	8.1	279.4	0.95	30.33
0023	1980	DATS	310	085	BASE	0.07	1.7	243.7	2.30	35.99
0024	1980	DATS	510	122	BASE	0.07	5.2	236.4	0.42	36.25
0025	1980	HOND	ACCO	107	BASE	0.05	1.5	230.0	0.87	38.19

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APPENDIX C (CONT)

LISTING OF HIGHWAY FUEL ECONOMY & EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	SEQ.	- EMISSION RESULTS (gm/mi)-				FUEL ECON MPG
						HC	CO	CO ₂	NO _x c	
0026	1980	HOND	STAW	076	BASE	0.04	0.5	243.2	1.71	36.35
0027	1980	MAZD	GLC	086	BASE	0.12	3.0	250.8	0.70	34.69
0028	1980	SAAB	GLI	121	BASE	0.04	1.8	309.6	0.08	28.40
0029	1980	SUBA	GLF	097	BASE	0.28	29.4	246.0	1.24	30.28
0030	1980	TOYO	TERC	089	BASE	0.07	3.8	256.9	1.11	33.74
0031	1980	TOYO	CORO	108	BASE	0.11	8.7	259.2	0.72	32.48
0032	1980	TOYO	TERC	091	BASE	0.05	1.1	220.7	1.30	39.86
0033	1980	TOYO	CRES	156	BASE	0.01	0.1	363.4	0.29	24.41
0034	1980	VOLK	RABB	090	BASE	0.33	13.7	240.1	0.86	33.79
0035	1980	VOLV	242	130	BASE	0.13	1.8	339.5	0.05	25.90

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APPENDIX D - LISTING OF FOUR SPEED IDLE EMISSION
RESULTS ON INDIVIDUAL VEHICLES

Legend

VEH. NO. - Vehicle number

MODL YEAR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

SEQ - Test sequence

BASE - Measured as-received from vehicle owner with
indolene fuel

TYPE - Test speed

IDLE (N) - measured with vehicle in neutral, at normal idle

2500 RPM - measured with vehicle at 2500 RPM

IDLE (N) - measured with vehicle in neutral, at normal idle

IDLE (D) - measured with vehicle in drive, at normal idle

HC ppmh - Exhaust hydrocarbon concentration in ppm hexane

CO % - Exhaust carbon monoxide concentration in mole per cent

NO ppm - Exhaust oxides of nitrogen concentration in ppm

APPENDIX D

LISTING OF FOUR SPEED IDLE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	SEQ.	TYPE	HC ppmh	CO %	NO ppm
0001	1980	CHEV	CHET	098	BASE	IDLE (N)	7	0.03	58
						2500 RPM	72	7.25	44
						IDLE (N)	6	0.04	62
						IDLE (D)	5	0.03	99
0002	1980	CHEV	CHET	098	BASE	IDLE (N)	7	0.04	73
						2500 RPM	7	0.04	92
						IDLE (N)	6	0.04	72
0003	1980	CHEV	MONZ	151	BASE	IDLE (N)	19	0.02	29
						2500 RPM	9	0.03	71
						IDLE (N)	20	0.02	28
0004	1980	CHEV	CITA	151	BASE	IDLE (N)	7	0.04	113
						2500 RPM	6	0.04	261
						IDLE (N)	8	0.03	123
0005	1980	PONT	PHOE	173	BASE	IDLE (N)	9	0.04	68
						2500 RPM	215	7.60	32
						IDLE (N)	9	0.04	71
						IDLE (D)	5	0.04	133
0006	1980	BUIC	SKYL	173	BASE	IDLE (N)	9	0.03	55
						2500 RPM	12	0.04	99
						IDLE (N)	3	0.03	55
						IDLE (D)	3	0.03	126
0007	1980	BUIC	REGA	265	BASE	IDLE (N)	12	0.02	43
						2500 RPM	162	4.32	65
						IDLE (N)	19	0.02	59
						IDLE (D)	15	0.03	110
0008	1980	CHEV	STAW	267	BASE	IDLE (N)	17	0.03	40
						2500 RPM	16	0.03	58
						IDLE (N)	14	0.03	46
						IDLE (D)	14	0.03	122
0009	1980	OLDS	SPRM	260	BASE	IDLE (N)	27	0.03	55
						2500 RPM	18	0.03	147
						IDLE (N)	4	0.03	100
						IDLE (D)	12	0.03	278
0010	1980	PONT	BONN	301	BASE	IDLE (N)	8	0.04	87
						2500 RPM	96	1.55	43
						IDLE (N)	11	0.03	85
						IDLE (D)	6	0.03	214

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APPENDIX D (CONT)

LISTING OF FOUR SPEED IDLE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	SEQ.	TYPE	HC ppmh	CO %	NO ppm
0011	1980	CADI	DEVI	368	BASE	IDLE (N)	27	0.04	202
						2500 RPM	48	0.04	179
						IDLE (N)	15	0.04	235
						IDLE (D)	14	0.04	416
0012	1980	FORD	PINT	140	BASE	IDLE (N)	347	7.61	81
						2500 RPM	232	9.04	12
						IDLE (N)	18	0.04	53
						IDLE (D)	15	2.04	19
0013	1980	FORD	MUST	140	BASE	IDLE (N)	261	2.20	51
						2500 RPM	13	0.03	46
						IDLE (N)	10	0.03	39
0014	1980	MERC	STAW	200	BASE	IDLE (N)	164	1.22	47
						2500 RPM	149	1.74	949
						IDLE (N)	166	1.17	67
						IDLE (D)	16	0.04	830
0015	1980	FORD	GRAN	250	BASE	IDLE (N)	10	0.04	63
						2500 RPM	11	0.03	36
						IDLE (N)	6	0.03	67
						IDLE (D)	5	0.03	192
0016	1980	FORD	THND	302	BASE	IDLE (N)	27	0.03	21
						2500 RPM	33	0.04	20
						IDLE (N)	35	0.05	13
						IDLE (D)	33	0.05	1
0017	1980	MERC	XR7	200	BASE	IDLE (N)	48	1.87	51
						2500 RPM	10	0.02	54
						IDLE (N)	8	0.01	67
						IDLE (D)	10	0.02	263
0018	1980	FORD	LTD	302	BASE	IDLE (N)	53	0.63	27
						2500 RPM	90	0.23	39
						IDLE (N)	6	0.03	85
						IDLE (D)	6	0.03	198
0019	1980	LINC	CONT	351	BASE	IDLE (N)	10	0.04	25
						2500 RPM	14	0.03	90
						IDLE (N)	6	0.03	28
						IDLE (D)	6	0.03	57
0020	1980	DODG	OMNI	105	BASE	IDLE (N)	92	0.03	31
						2500 RPM	54	0.06	54
						IDLE (N)	33	0.03	34
						IDLE (D)	94	0.03	44

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APPENDIX D (CONT)

LISTING OF FOUR SPEED IDLE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	SEQ.	TYPE	HC ppmh	CO %	NO ppm
0021	1980	DODG	ASPE	318	BASE	IDLE (N)	15	0.03	34
						2500 RPM	8	0.05	98
						IDLE (N)	9	0.03	52
						IDLE (D)	12	0.03	113
0022	1980	DATS	210	085	BASE	IDLE (N)	333	2.77	29
						2500 RPM	207	3.96	111
						IDLE (N)	341	2.52	29
						IDLE (D)	300	2.16	63
0023	1980	DATS	310	085	BASE	IDLE (N)	464	3.27	22
						2500 RPM	36	0.06	80
						IDLE (N)	333	2.89	8
0024	1980	DATS	510	122	BASE	IDLE (N)	13	0.04	41
						2500 RPM	13	0.06	76
						IDLE (N)	7	0.04	41
0025	1980	HOND	ACCO	107	BASE	IDLE (N)	65	0.12	27
						2500 RPM	9	0.13	95
						IDLE (N)	39	0.15	28
0026	1980	HOND	STAW	076	BASE	IDLE (N)	7	0.04	40
						2500 RPM	7	0.04	105
						IDLE (N)	7	0.04	81
0027	1980	MAZD	GLC	086	BASE	IDLE (N)	6	0.04	25
						2500 RPM	13	0.00	127
						IDLE (N)	6	0.04	24
0028	1980	SAAB	GLI	121	BASE	IDLE (N)	7	0.04	15
						2500 RPM	7	0.04	31
						IDLE (N)	6	0.04	11
0029	1980	SUBA	GLF	097	BASE	IDLE (N)	2	0.01	13
						2500 RPM	4	1.22	57
						IDLE (N)	1	0.01	13
0030	1980	TOYO	TERC	089	BASE	IDLE (N)	196	4.77	18
						2500 RPM	24	0.08	48
						IDLE (N)	56	5.37	9
						IDLE (D)	13	0.04	459
0031	1980	TOYO	CORO	108	BASE	IDLE (N)	10	0.04	49
						2500 RPM	39	1.28	14
						IDLE (N)	4	0.03	54
0032	1980	TOYO	TERC	091	BASE	IDLE (N)	15	0.04	35
						2500 RPM	11	0.07	51
						IDLE (N)	12	0.04	36

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APPENDIX D (CONT)

LISTING OF FOUR SPEED IDLE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	SEQ.	TYPE	HC ppmh	CO %	NO ppm
0033	1980	TOYO	CRES	156	BASE	IDLE (N)	7	0.04	0
						2500 RPM	5	0.04	56
						IDLE (N)	4	0.04	25
						IDLE (D)	3	0.04	1
0034	1980	VOLK	RABB	090	BASE	IDLE (N)	12	0.04	64
						2500 RPM	38	0.62	0
						IDLE (N)	10	0.04	63
0035	1980	VOLV	242	130	BASE	IDLE (N)	6	0.04	9
						2500 RPM	61	2.63	1
						IDLE (N)	5	0.04	7

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APPENDIX E - LISTING OF LOADED TWO MODE EMISSION
RESULTS ON INDIVIDUAL VEHICLES

Legend

VEH. NO. - Vehicle number

MODL YEAR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

SEQ - Test sequence

BASE - Measured as-received from vehicle owner with
indolene fuel

MODE - Identifies the mode of the Loaded Two Mode Test
30 MPH - Vehicle at 30 miles per hour
IDLE (N) - Vehicle at idle, transmission in neutral

RLHP - Dynamometer load used in test

HC - Exhaust hydrocarbon concentration in ppm hexane

CO - Exhaust carbon monoxide concentration in mole per cent

NO - Exhaust oxides of nitrogen concentrations in ppm

APPENDIX E

LISTING OF LOADED TWO MODE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	SEQ.	MODE	RLHP	HC ppmh	CO %	NO ppm
0001	1980	CHEV	CHET	098	BASE BASE	30 MPH IDLE (N)	9.0	18 4	4.16 0.04	72 50
0002	1980	CHEV	CHET	098	BASE BASE	30 MPH IDLE (N)	9.0	11 6	0.05 0.04	328 72
0003	1980	CHEV	MONZ	151	BASE BASE	30 MPH IDLE (N)	9.0	19 12	0.03 0.01	269 29
0004	1980	CHEV	CITA	151	BASE BASE	30 MPH IDLE (N)	9.0	31 9	0.06 0.04	2025 182
0005	1980	PONT	PHOE	173	BASE BASE	30 MPH IDLE (N)	9.0	14 11	0.04 0.04	963 79
0006	1980	BUIC	SKYL	173	BASE BASE	30 MPH IDLE (N)	9.0	11 6	0.04 0.03	646 90
0007	1980	BUIC	REGA	265	BASE BASE	30 MPH IDLE (N)	9.0	18 8	0.03 0.02	112 44
0008	1980	CHEV	STAW	267	BASE BASE	30 MPH IDLE (N)	9.0	18 9	0.04 0.03	96 50
0009	1980	OLDS	SPRM	260	BASE BASE	30 MPH IDLE (N)	9.0	25 11	0.03 0.02	99 87
0010	1980	PONT	BONN	301	BASE BASE	30 MPH IDLE (N)	9.0	13 6	0.03 0.03	94 70
0011	1980	CADI	DEVI	368	BASE BASE	30 MPH IDLE (N)	9.0	16 12	0.04 0.03	322 251
0012	1980	FORD	PINT	140	BASE BASE	30 MPH IDLE (N)	9.0	288 17	9.28 0.04	20 53
0013	1980	FORD	MUST	140	BASE BASE	30 MPH IDLE (N)	9.0	12 8	0.04 0.03	105 39
0014	1980	MERC	STAW	200	BASE BASE	30 MPH IDLE (N)	9.0	12 48	0.07 0.84	560 3
0015	1980	FORD	GRAN	250	BASE BASE	30 MPH IDLE (N)	9.0	6 6	0.04 0.04	46 71
0016	1980	FORD	THND	302	BASE BASE	30 MPH IDLE (N)	9.0	21 22	0.03 0.02	16 18
0017	1980	MERC	XR7	200	BASE BASE	30 MPH IDLE (N)	9.0	7 6	0.06 0.02	126 73

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APPENDIX E (CONT)

LISTING OF LOADED TWO MODE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	SEQ.	MODE	RLHP	HC ppmh	CO %	NO ppm
0018	1980	FORD	LTD	302	BASE BASE	30 MPH IDLE (N)	9.0	23 13	0.04 0.03	125 58
0019	1980	LINC	CONT	351	BASE BASE	30 MPH IDLE (N)	9.0	5 5	0.03 0.02	34 16
0020	1980	DODG	OMNI	105	BASE BASE	30 MPH IDLE (N)	9.0	50 21	0.10 0.03	322 36
0021	1980	DODG	ASPE	318	BASE BASE	30 MPH IDLE (N)	9.0	21 6	0.19 0.03	218 48
0022	1980	DATS	210	085	BASE BASE	30 MPH IDLE (N)	9.0	36 300	0.08 3.18	1033 17
0023	1980	DATS	310	085	BASE BASE	30 MPH IDLE (N)	9.0	34 365	0.05 3.06	1128 11
0024	1980	DATS	510	122	BASE BASE	30 MPH IDLE (N)	9.0	14 13	0.05 0.04	739 43
0025	1980	HOND	ACCO	107	BASE BASE	30 MPH IDLE (N)	9.0	15 48	0.19 0.16	951 33
0026	1980	HOND	STAW	076	BASE BASE	30 MPH IDLE (N)	9.0	15 9	0.04 0.04	497 86
0027	1980	MAZD	GLC	086	BASE BASE	30 MPH IDLE (N)	9.0	27 6	0.04 0.10	418 2
0028	1980	SAAB	GLI	121	BASE BASE	30 MPH IDLE (N)	9.0	10 6	0.05 0.04	152 22
0029	1980	SUBA	GLF	097	BASE BASE	30 MPH IDLE (N)	9.0	4 4	0.66 0.03	595 14
0030	1980	TOYO	TERC	089	BASE BASE	30 MPH IDLE (N)	9.0	19 137	0.06 3.84	725 20
0031	1980	TOYO	CORO	108	BASE BASE	30 MPH IDLE (N)	9.0	25 6	0.09 0.05	370 60
0032	1980	TOYO	TERC	091	BASE BASE	30 MPH IDLE (N)	9.0	14 7	0.04 0.03	660 37
0033	1980	TOYO	CRES	156	BASE BASE	30 MPH IDLE (N)	9.0	7 7	0.04 0.04	0 19
0034	1980	VOLK	RABB	090	BASE BASE	30 MPH IDLE (N)	9.0	55 10	0.93 0.04	56 83

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APPENDIX E

LISTING OF LOADED TWO MODE EMISSION RESULTS ON INDIVIDUAL VEHICLES

DENVER-1980

VEH. NO.	MODL YEAR	MAKE	MODL	CID	SEQ.	MODE	RLHP	HC ppmh	CO %	NO ppm
0035	1980	VOLV	242	130	BASE BASE	30 MPH IDLE (N)	9.0	140 12	3.23 0.04	2 1

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APPENDIX F - LISTING OF SELECTED VEHICLE INFORMATION

Legend

VEH. NO. - Vehicle number

YR - Model year

MAKE - Vehicle make

MODL - Vehicle model

CID - Engine displacement in cubic inches

ODOMETER - Odometer reading as-received from vehicle owner

A/C - Is vehicle equipped with air conditioning

AP - Is vehicle equipped with air pump

CATALYST - Catalyst identification

Oxidation - Vehicle equipped with oxidation catalyst

3-Way - Vehicle equipped with 3-Way catalyst

None - Vehicle not equipped with catalyst

PB - Lead content of fuel as-received from vehicle owner

N/A - Not applicable

OS - Offscale

APPENDIX F

LISTING OF SELECTED VEHICLE INFORMATION

DENVER-1980

VEH NO.	YR	MAKE	MODL	CID	ODOMETER	A/C	AP	CATALYST	PB
0001	80	CHEV	CHET	098	5383	YES	NO	OXIDATION	0.032
0002	80	CHEV	CHET	098	8879	NO	NO	OXIDATION	0.012
0003	80	CHEV	MONZ	151	8268	NO	NO	OXIDATION	0.015
0004	80	CHEV	CITA	151	6605	YES	NO	OXIDATION	0.038
0005	80	PONT	PHOE	173	5200	YES	YES	OXIDATION	0.021
0006	80	BUIC	SKYL	173	4529	YES	NO	OXIDATION	0.032
0007	80	BUIC	REGA	265	3117	YES	YES	OXIDATION	0.013
0008	80	CHEV	STAW	267	6780	YES	YES	OXIDATION	0.017
0009	80	OLDS	SPRM	260	5977	YES	YES	OXIDATION	0.006
0010	80	PONT	BONN	301	2280	YES	YES	OXIDATION	0.045
0011	80	CADI	DEVI	368	9314	YES	YES	OXIDATION	0.028
0012	80	FORD	PINT	140	865	YES	YES	OXIDATION	0.028
0013	80	FORD	MUST	140	14223	NO	YES	OXIDATION	0.006
0014	80	MERC	STAW	200	2548	NO	NO	OXIDATION	0.015
0015	80	FORD	GRAN	250	453	YES	YES	OXIDATION	0.015
0016	80	FORD	THND	302	5676	YES	YES	OXIDATION	0.006
0017	80	MERC	XR7	200	3017	YES	YES	OXIDATION	0.017
0018	80	FORD	LTD	302	19527	YES	YES	OXIDATION	0.021
0019	80	LINC	CONT	351	760	YES	YES	3 - WAY	0.012
0020	80	DODG	OMNI	105	10018	NO	NO	OXIDATION	0.017
0021	80	DODG	ASPE	318	6121	YES	YES	OXIDATION	0.027
0022	80	DATS	210	085	7560	YES	NO	OXIDATION	0.036
0023	80	DATS	310	085	11744	NO	NO	OXIDATION	0.038
0024	80	DATS	510	122	3599	NO	NO	OXIDATION	0.015
0025	80	HOND	ACCO	107	4873	YES	NO	NONE	0.015
0026	80	HOND	STAW	076	4951	NO	NO	OXIDATION	0.015
0027	80	MAZD	GLC	086	3168	NO	NO	OXIDATION	0.021
0028	80	SAAB	GLI	121	3008	NO	NO	3 - WAY	0.025
0029	80	SUBA	GLF	097	5479	YES	NO	NONE	0.038
0030	80	TOYO	TERC	089	11089	YES	NO	OXIDATION	0.015
0031	80	TOYO	CORO	108	10732	YES	NO	OXIDATION	0.006
0032	80	TOYO	TERC	091	8525	YES	NO	OXIDATION	0.027
0033	80	TOYO	CRES	156	7247	YES	NO	OXIDATION	0.019
0034	80	VOLK	RABB	090	6675	NO	NO	OXIDATION	0.013
0035	80	VOLV	242	130	1503	NO	NO	3 - WAY	0.015

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