

E.D.

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-43
Relating to Exemptions under Section 27156
of the Vehicle Code

JUDSON RESEARCH AND MFG. CO.
"JUDSON ELECTRONIC MAGNETO MODEL 74B"

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Section 39023 of the Health and Safety Code;

IT IS ORDERED AND RESOLVED: That the installation of the Judson Electronic Magneto Model 74 B device manufactured by Judson Research and Manufacturing Company of 541 East Hector Street, Conshohocken, Pennsylvania 19428 has been found to not reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for 1974 and older model-year vehicles equipped with a standard Kettering-type ignition system and with negative ground.

The "Judson Electronic Magneto Model 74B is an ignition coil with a Zener diode. The coil is encapsulated in a plastic mold and includes two electronic devices attached to the outside with one inoperative.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different than those listed by the vehicle manufacturer.

Changes made to the design or operating conditions of the device as originally submitted to the Air Resources Board for evaluation that adversely affect the performance of the vehicle's pollution control devices shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE JUDSON ELECTRONIC MAGNETO MODEL 74B DEVICE.

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Section 17500 of the Business and Professions Code makes unlawful, untrue or misleading advertising, and Section 17534 makes violation punishable as a misdemeanor.

Sections 39130 and 39184 of the Health and Safety Code provide as follows:

"39130. No person shall install, sell, offer for sale, or advertise, or, except in an application to the board for certification of a device, represent, any device as a motor vehicle pollution control device unless that device has been certified by the board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this section is a misdemeanor."

"39184. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the board for accreditation of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been accredited by the board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as an accredited device which, in fact, is not an accredited device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at Sacramento, California, this 29th day of October, 1974.

WILLIAM SIMMONS
Executive Officer

State of California

AIR RESOURCES BOARD

October 28, 1974

Staff Report

Evaluation of the Judson Research and
Manufacturing Company's "Judson Electronic Magneto Model No. 74B" For
Exemption from the Prohibitions of Section 27156 of the
California Motor Vehicle Code

I. Introduction

Judson Research and Manufacturing Company of 541 East Hector Street, Conshohocken, Pennsylvania 19428 has applied for an exemption from the prohibitions of Section 27156 of the California Motor Vehicle Code for the "Judson Electronic Magneto Model No. 74B".

Section 27156 prohibits the sale, advertising, or installation of any device or mechanism which reduces the effectiveness of the required motor vehicle emissions control system. The applicant is requesting the exemption be granted for all 1974 and older model vehicles equipped with a standard Kettering type ignition system consisting of an ignition coil, breaker points condenser and powered by a battery with a negative ground. The system is not applicable to non-Kettering systems such as capacitive discharge, breakerless, or transistorized.

II. Device Description and Function

The "Judson Electronic Magneto Model No. 74B" consists of a specially wound coil (#EM 204) and a Zener diode (10 watts, 140 volts) connected

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between the common connection of the primary and secondary windings and ground. The coil replaces the OEM coil which is removed. Coil and diode are in one case and are potted and sealed with gaskets. The Judson coil is to be mounted in the same position as the OEM coil if possible, if not, then on the firewall or fender as close to the distributor as possible. The circuit diagram and installation instructions are contained in Exhibit I and II respectively.

The Judson device functions exactly the same as the standard Kettering system with the addition of the Zener diode in the primary-secondary coil junction. According to the manufacturer, the diode's function is to limit the reverse EMF generated by the collapsing field in the primary winding to 140 volts to improve point life by reducing arcing during opening. This control of the primary circuit is claimed to extend the duration of the spark; as a result of this action, improved fuel combustion leading to increased mileage is claimed.

III. Device Evaluation

The manufacturer has submitted emission data performed on a 1974 Chevrolet Caprice using the Federal CVS-1 (1972) hot start test procedure. The vehicle was tested in an "as received" condition from the rental agency. Back to back tests were performed, first in the "as received" condition and the second with the Judson device installed by Judson personnel. The results of these test were inconclusive.

Evaluation of the Judson Research and Manufacturing Company's "Judson Electronic Magneto Model No. 74B" for Exemption from the Prohibitions of Section 27156 of the California Motor Vehicle Code

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The Scott data did not include specific information on vehicle operating specifications, maintenance, or whether the Judson Electronic Magneto was the Model 74B and was installed according to the instructions in Exhibit I.

A copy of the test by Scott Environmental Technology, Inc. for Judson Reserach & Manufacturing is designated as Exhibit III.

In order to confirm the electrical output characteristics of the ignition system the test vehicle's electrical system parameters were compared with and without the Judson coil installed.

The test vehicle had the following specifications:

Make and Model Year	1974 American Motors Ambassador Station Wagon
Engine	360 Cubic Inch Displacement
Carburetor	Two Barrel
Transmission	Automatic
Emission Control	AIR/EGR/EM
License Number	E833603

Centrifugal Spark Advance in Crankshaft Degrees

<u>RPM</u>	<u>Standard Ignition</u>	<u>Judson Electronic Magneto Device #1</u>	<u>Model No. 74B Device #2</u>
Idle	0	0	0
1000	5	5	5
1500	12.5	12.5	12.5
2000	16	16	16
2500	18	18	18
3000	21	21	21

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Spark Duration - Microseconds

<u>RPM</u>	<u>Standard Ignition</u>	<u>Judson Electronic Magneto #74B</u>	
		<u>Device #1</u>	<u>Device #2</u>
Idle	1400	1400	1400
1200	1320	1320	1320
2000	1180	1180	1180

Available Secondary Voltage

<u>RPM</u>	<u>Standard Ignition</u>	<u>Judson Electronic Magneto Model No. 74B</u>	
		<u>Device #1</u>	<u>Device #2</u>
Idle	20 KV	20 KV	20 KV
1200	26 KV	25 KV	25 KV
2200	23 KV	23 KV	23 KV

Idle Exhaust Emissions

<u>Standard Ignition</u>		<u>Judson Electronic Magneto Model No. 74B</u>	
<u>HC, ppm</u>	<u>CO, %</u>	<u>HC, ppm</u>	<u>CO, %</u>
110	0.7	110	0.7

Prior to testing, the vehicle's carburetor and ignition settings were adjusted to OEM specifications. The test consisted of measuring the spark advance, spark duration, available secondary voltage and idle HC and CO emissions. In addition, the primary pattern of the ignition system was observed to determine if there was any change in the waveform from the substitution of the Judson coil for the OEM coil. No change was observed in the primary pattern with the Judson coil.

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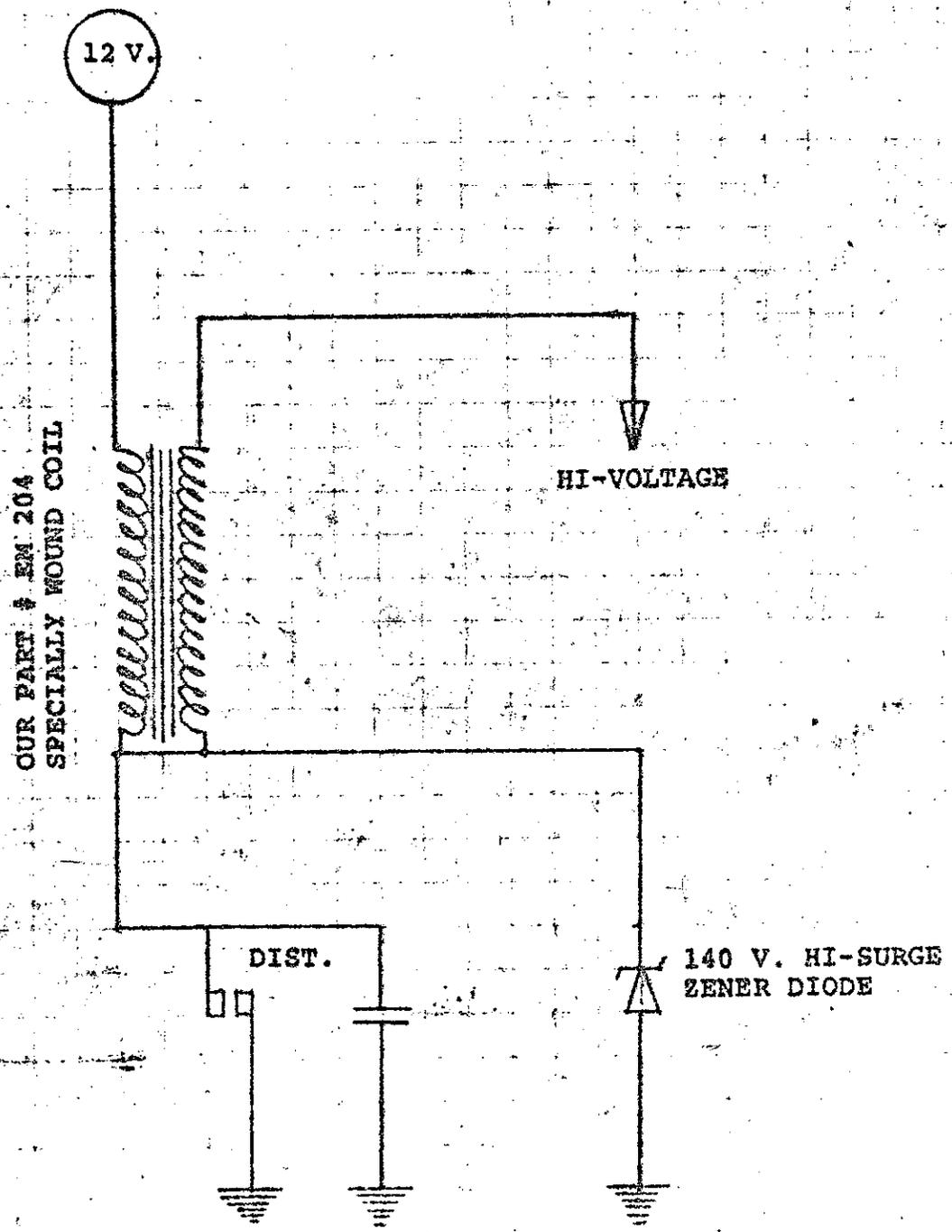
Table 1 shows the results of the test. The installation of the device, when compared to the OEM coil, did not significantly change the output characteristic of the OEM ignition system.

IV. Conclusion and Recommendation

Based on the ARB test results, the installation of the "Judson Electronic Magneto Model No. 74B" would not adversely affect the performance or operation of the OEM emission control system. The staff recommends that Judson Research and Manufacturing Company be issued an exemption from the prohibitions of Section 27156 of the Vehicle Code for its "Judson Electronic Magneto Model No. 74B" for the following vehicles:

All 1974 model-year vehicles equipped with a standard Kettering-type ignition system with negative ground.

EXHIBIT I



INSTALL ELECTRONIC MAGNETO AS FOLLOWS AND AS ILLUSTRATED ON FRONT COVER ON ALL AUTOMOBILES MANUFACTURED BY GENERAL MOTORS, FORD MOTOR CO., CHRYSLER, AND AMERICAN MOTORS.

- 1 — Remove original ignition coil.
- 2 — Mount Judson Electronic Magneto in same place as original coil was mounted. If this is not possible, install electronic magneto on firewall or fender well as close to ignition distributor as possible.
- 3 — Insert high tension cable from center of ignition distributor to socket of electronic magneto using brass contacts on both ends of wire. Make sure cable is fully inserted and making contact on both ends.
- 4 — Connect point wire from distributor to terminal on electronic magneto marked "DIST". If wire is too short, extend it with primary wire and sleeve connector by removing $\frac{1}{4}$ " insulation from both wires and inserting into sleeve. Sleeve is then compressed or crimped with pliers and wrapped with insulation tape.
- 5 — Connect battery wire from switch originally fastened at coil to terminal on electronic magneto marked "BAT". If too short extend as previously instructed (there may be two wires on this one terminal).
- 6 — Connect short piece of primary wire from side of electronic magneto to engine. If possible, make this ground connection from electronic magneto to one of the screws holding the vacuum advance mechanism to the ignition distributor.
- 7 — SET SPARK PLUG GAP TO ENGINE MANUFACTURER'S SPECIFICATIONS.

INSTALLATION IS COMPLETE

NOTE: The Judson Electronic Magneto produces a higher pressure arc than does the standard ignition system. Because of this the high tension wire if old, faulty or weak, will break down with our system. This gives the impression of magneto failure but is the high tension wire that is breaking down resulting in faulty ignition. In other words, the high tension wire is marginal and although it will function with the coil, it breaks down with our system because of the increased current. With some high tension resistance "wire" (carbon granules) this happens gradually and gives the impression of magneto failure. The car will stall, is difficult to start and misses.

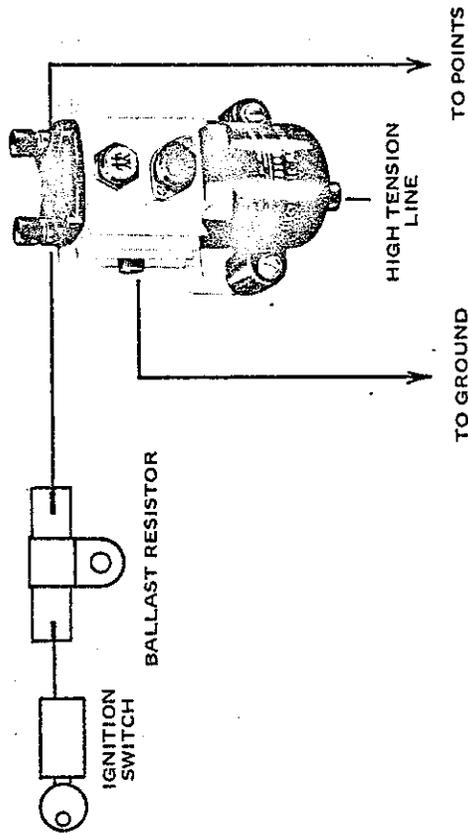
If car is two years or more old and equipped with radio resistance type spark plug wire, it should be replaced.

IMPORTANT

If the Judson Electronic Magneto is being used to replace an ordinary transistorized ignition system, the original ballast or resistance wire must be replaced or reconnected.

INSTALLATION PROCEDURE FOR 12 VOLT EUROPEAN, JAPANESE AND FOLLOWING AMERICAN VEHICLES WHICH DO NOT HAVE A RESISTOR OR RESISTANCE IN THE LINE FROM THE IGNITION SWITCH TO THE COIL: CHECKER, HUDSON, WILLYS, RAMBLER (6 cylinder), STUDEBAKER (prior to 1952) SOME CHRYSLER PRODUCTS MANUFACTURED PRIOR TO 1960 AND MANY MARINE ENGINES.

In making the installation on the above engines it is necessary to install a ballast resistor in the line connecting the ignition switch to the terminal on the Electronic Magneto marked "BAT". Use Delco ballast resistor No. D1110 which can be purchased at any General Motors dealer or automotive supply store (1.3 ohms).



Ballast resistor can be fastened to the Electronic Magneto mounting plate with one of the mounting screws. Ballast resistors become very hot in operation and should be clear of wires and hoses. In the event that the required ballast resistor is not readily available locally, it can be ordered from Judson Research and Mfg. Co. at a price of \$2.00 postpaid.

Late models of the Mercedes, BMW, Toyota, Volvo, Fiat, and Porsche 911 have a ballast resistor in the circuit and in making the installation on these vehicles, the original ballast resistor should be removed and replaced with our recommended resistor.

DO NOT INSTALL A BALLAST RESISTOR ON ANY 6 VOLT SYSTEM.

BRITISH VEHICLES —

All Lucas ignition systems as used on British cars up to the 1967 models require a positive ground Electronic Magneto and a ballast resistor must be installed on all 12 volt British systems. Late model British vehicles use the standard negative ground system and it is necessary to install a ballast resistor.

Installation Instructions

JUDSON ELECTRONIC MAGNETO

TEST PROCEDURE TO DETERMINE IF BALLAST RESISTOR IS REQUIRED IN CIRCUIT

With the Electronic Magneto installed and the engine running at idle, a volt meter connected from the "BAT" terminal on the Electronic Magneto to the side of the aluminum case should show a reading of less than 11 volts. If the volt meter shows 12 or more volts, a ballast resistor is required in the circuit.

TACHOMETER

If vehicle is equipped with an electric or electronic tachometer it is connected to the same terminal on the Electronic Magneto as it was on the original coil. No adjustments are required. The Judson Electronic Magneto will pulse or operate all electric and electronic or pulse type tachometers that are operated by a standard coil.

TEST EQUIPMENT

Standard ignition test equipment including a strobe light for timing and a cam dwell indicator for point setting can be used with this system. The normal connections and test procedures are followed. This system does not, however, produce a normal pattern on an ignition scope. The primary pattern of the Judson Electronic Magneto will show a square wave on the scope as against an oscillating spike for a standard coil.

The Judson Electronic Magneto can only be evaluated in operation on the engine as an integral part of the entire ignition system.

RADIO INTERFERENCE

The Electronic Magneto should not be mounted in close proximity to the radio antenna and radio resistance wire should be used in the hi-tension circuit.

THREE YEAR WARRANTY

The Judson Electronic Magneto is warranted against failure for a period of three years. In the event of failure, within this period, we will either rebuild or replace the defective unit under warranty on a no charge basis. This warranty does not cover postage and handling and a service charge of \$3.50 will be made to cover these costs. Service work is to be done only at the factory or by our authorized agents. This warranty is in lieu of all other warranties and does not cover equipment which has been altered, modified, abused or damaged in an accident.

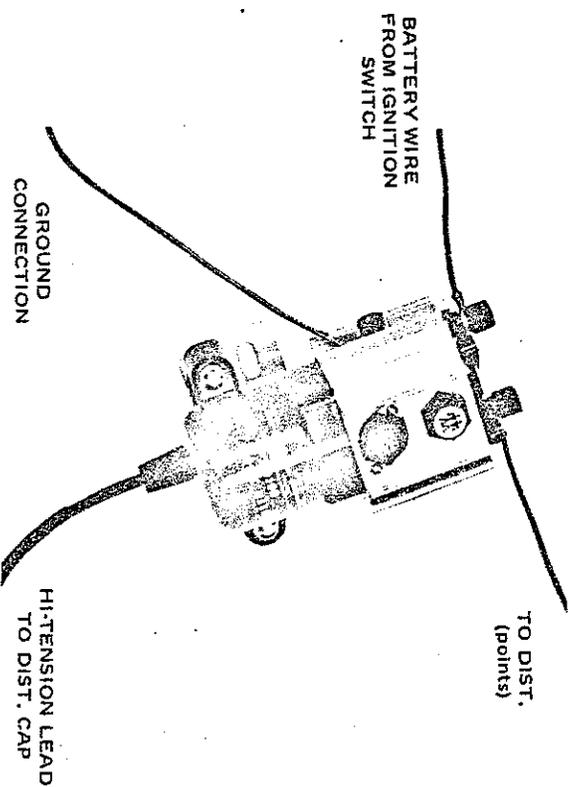


EXHIBIT 11

Same unit is used on both 6 volt and 12 volt systems. Installation procedure is exactly the same for both negative ground and positive ground systems. The difference is in the magneto itself, not its connection. Do not install a standard negative ground unit on an engine having a positive ground. Units for positive ground systems as required on British engines and some American engines manufactured prior to 1956 are stamped on the front "positive ground".

BEFORE INSTALLING THE ELECTRONIC MAGNETO, WE RECOMMEND THAT THE BREAKER POINTS IN THE IGNITION DISTRIBUTOR BE EXAMINED AND REPLACED IF WORN OR PITTED. ADJUST THE POINT CLEARANCE TO MANUFACTURER'S SPECIFICATIONS USING A CAM DWELL INDICATOR. THE IGNITION TIMING SHOULD ALSO BE SET TO MANUFACTURER'S SPECIFICATIONS. SPARK PLUGS SHOULD BE EXAMINED AND MUST BE REPLACED IF WORN OR CORRODED.

SET SPARK PLUG GAP TO ENGINE MANUFACTURER'S SPECIFICATIONS.

Do not remove the condenser from the ignition distributor as our circuit is designed to use it.



JUDSON RESEARCH & MFG. CO.
CONSHOHOCKEN, PA. 19428

EXHIBIT III

1469 01 0974

Technical Report
on
Exhaust Emission Tests
(Judson Research Vehicle)

Prepared for:

Judson Research & Manufacturing
Conshohocken, Penna.

by

Scott Environmental Technology, Inc.

1.0 INTRODUCTION

On September 18, 1974 Scott Environmental Technology, Inc. performed a series of exhaust emission test on a vehicle provided by the Judson Research and Manufacturing Company. The vehicle, test procedures, and results are described below.

2.0 TEST VEHICLE

The test vehicle was a 1974 Chevrolet Caprice (VIN IN39R4T105575) having a V-8 350 CID Engine and automatic transmission. The vehicle, as reported by the sponsor, was a rental automobile equipped as provided by the manufacturer.

3.0 TEST PROCEDURE

The testing was done in accordance with Federal Register Volume 35, Number 219, except that no twelve hour cold soak period preceded any of the tests. The test series provided two hot start CVS-1 exhaust emission tests. The first test was performed as a base line with the vehicle reported as received from the rental agent. The second was with an ignition system described as the Judson Electronic Magneto, manufactured and installed by the sponsor's personnel.

4.0 INSTRUMENTATION

Instrumentation employed during the test included a Scott Model 301 constant volume sampler, a Beckman 0-3000 ppm carbon monoxide analyzer (NDIR), a Beckman 0-4% carbon dioxide analyzer, a Beckman total hydrocarbon analyzer (FID) and a Teco chemiluminescence analyzer for oxides of nitrogen.

5.0 SUMMARY OF RESULTS

Exhaust emissions for each of the CVS-1 hot start tests along with vehicle parameters are reported on the calculation sheets provided as tables 1 and 2. Final results were:

<u>Test #</u>	<u>Sponsor Unit #</u>	<u>HC (g/mi)</u>	<u>CO (g/mi)</u>	<u>NOX (g/mi)</u>	<u>CO2 %</u>	<u>Fuel Economy (MPG)</u>
1	None	1.66	48.77	2.59	1.75	8.68
2	745-1G	1.42	43.69	2.19	1.73	9.71

* g/mi : grams per mile





SCOTT RESEARCH LABORATORIES INC.

A SUBSIDIARY OF AMERICAN BIOCULTURE, INC.

PLUMSTEADVILLE, PA. 18949
PHONE: 215-766-8861
TWX 510-665-9344

Table 1
72 EPA Hot Start

EXHAUST EMISSION DATA SHEET

Vehicle	<u>Chevrolet Caprice</u>	Odometer	<u>-</u>	Date	<u>18 Sept 74</u>
License	<u>23-F-326 PA</u>	Finish	<u>6741.8</u>	Project	<u>1469-01</u>
Trans.	<u>Automatic</u>	Start	<u>6734.4</u>	Run	<u>1</u>
Carb.	<u>-</u> bbls. <u>2</u>	Miles	<u>7.4</u>	Device	<u>None</u>
Engine	<u>V-8</u> CID <u>350</u>			Dyn. Load	<u>14.7 Rhp @ 50 mph</u>
Idle rpm	<u>-</u>	BIT	<u>-</u>	Dyn. Inertia	<u>5000#</u>
Analyst	<u>Robert C. Morris</u>	Driver	<u>Robert C. Morris</u>	Calculator	<u>Robert C. Morris</u>

Dry Bulb Temp., F	<u>77</u>	Barometric Press., mm Hg	<u>746.4</u>
Wet Bulb Temp., F	<u>69</u>	CVS Pump Press., mm Hg	<u>-12.72</u>
Gr. Water/Lb. Dry Air	<u>98</u>	(P) Sample Press., mm Hg	<u>733.98</u>
(K) Factor	<u>1.098</u>	(V) CVS Pump Disp., CFR	<u>.3232</u>
(T) Sample Temp., R	<u>579.7</u>	(N) CVS Pump Revolutions	<u>24775</u>

DILUTE EXHAUST MEASUREMENTS

COMPONENT	PVN/T	FACTOR	GRAMS/MILE	
ppm HC dil.	<u>119.66</u>			
ppm HC air	<u>11.09</u>			
ppm HC exh.	<u>108.6</u>	<u>10138.31</u>	<u>1.513 x 10⁻⁶</u>	<u>1.66</u> HC
ppm CO exh.	<u>1575</u>	<u>"</u>	<u>3.054 x 10⁻⁶</u>	<u>48.77</u> CO
ppm NO	<u>-</u>			
ppm NO ₂	<u>-</u>			
ppm NO _x	<u>46.53</u>			
(ppm NO _x) (K)	<u>51.09</u>	<u>"</u>	<u>5.017 x 10⁻⁶</u>	<u>2.59</u> NO _x
CO ₂	<u>1.75%</u>			<u>8.68</u> mpg



SCOTT RESEARCH LABORATORIES INC.

A SUBSIDIARY OF AMERICAN BIOCULTURE, INC.

PLUMSTEADVILLE, PENNA. 18949
PHONE 215 766-8861

Table 2
72 EPA Hot Start

EXHAUST EMISSION DATA SHEET

(VIN IN39R 4T105575)

Unit # 745-1G

Vehicle	<u>Chevrolet Caprice</u>	Odometer	<u>6753.2</u>	Date	<u>18 Sept. 1974</u>
License	<u>23F 326</u>	Finish	<u>6745.8</u>	Project	<u>1469-01</u>
Trans.	<u>Auto</u>	Start	<u>7.4</u>	Run	<u>2</u>
Carb.	<u> </u> bbls. <u>2</u>	Miles	<u> </u>	Device	<u>Ignition</u>
Engine	<u>V-8</u> CID <u>350</u>	BIT	<u>-</u>	Dyn. Load	<u>14.7 rhp @ 50 mph</u>
Idle rpm	<u> </u>	Driver	<u>Robert Morris</u>	Dyn. Inertia	<u>5000#</u>
Analyst	<u>Robert C. Morris</u>	Calculator	<u>Robert C. Morris</u>		

Dry Bulb Temp., F 78
Wet Bulb Temp., F 70
Gr. Water/Lb. Dry Air 98
(K) Factor 1.121
(T) Sample Temp., R 579.7

Barometric Press., mm Hg 746.4
CVS Pump Press., mm Hg 12.72
(P) Sample Press., mm Hg 733.98
(V) CVS Pump Disp., CFR .3232
(N) CVS Pump Revolutions 24749

DILUTE EXHAUST MEASUREMENTS

COMPONENT	PVN/T	FACTOR	GRAMS/MILE
ppm HC dil.	<u>107.52</u>		
ppm HC air	<u>14.91</u>		
ppm HC exh.	<u>10127.7</u>	<u>1.513 x 10⁻⁶</u>	<u>1.42</u> HC
ppm CO exh.	<u>1412.5</u>	<u>3.054 x 10⁻⁶</u>	<u>43.69</u> CO
ppm NO	<u>-</u>		
ppm NO ₂	<u>-</u>		
ppm NO _x	<u>38.49</u>		
(ppm NO _x) (K)	<u>43.16</u>	<u>5.017 x 10⁻⁶</u>	<u>2.19</u> NO _x
CO ₂	<u>1.73%</u>		<u>9.71</u> mpg