

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-59
Relating to Exemptions under Section 27156
of the Vehicle Code

PLASTIC SIGNS INC.
"VAP-AIR" VAPOR INJECTOR

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 "VAP-AIR" Vapor Injector marketed and manufactured by Plastic Signs Inc., 754 Arroyo Ave., San Fernando, CA 91340, 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 1975 and older model-year vehicles.

This device consists of a bottle, rubberhose, tee for connection into the PCV system, mounting brackets, and bottle cap with a vapor outlet port incorporating a 0.020 inches diameter orifice and an air inlet port. The fluid used is a mixture of acetone, methanol and water (Specification Number VA-65M35A).

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 or composition of the fluid 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 "VAP-AIR" VAPOR INJECTOR 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 28th day of August, 1975.

Original signed by
William Simmons

WILLIAM SIMMONS
Executive Officer

State of California

AIR RESOURCES BOARD

August 5, 1975

Staff Report

Evaluation of the "VAP-AIR" Vapor Injector for
Compliance with the Requirements of
Section 27156 of the California Motor Vehicle Code

I. Introduction

Plastic Signs Inc. has submitted an application requesting an exemption from Section 27156 of the California Motor Vehicle Code for the "VAP-AIR" Water Vapor Injector (Reference - Exhibit A). Vehicle Code Section 27156 prohibits the installation of any device or mechanism which reduces the effectiveness of the required emission control systems. This vehicle code section also authorizes the Air Resources Board to exempt devices from this prohibition if a finding shows the device will not adversely affect the performance of the emission control system. The applicant is requesting the exemption be granted for all 1975 and older model-year vehicles.

II. System Description

The "VAP-AIR" Vapor Injector is connected to the engine by means of the PCV line. The device consists of a fluid reservoir, rubber hose, tee, mounting brackets and a bottle containing a mixture of methanol, acetone and water (Specification Number VA-65M35A). A 0.020 inch diameter orifice restrictor is placed in the vapor outlet of the device to limit the flow of air and vapor into the intake manifold.

Evaluation of the "VAP-AIR" Vapor Injector for
Compliance with the Requirements of Section
27156 of the California Motor Vehicle Code

August 5, 1975

The amount of vapor bleed from the device is a function of the engine vacuum and the orifice restrictor. High manifold vacuum conditions such as idle, low speed cruises, and deceleration will result in the greatest displacement of vapor from the bottle. Little or no vapor injection occurs at low manifold vacuum.

III. System Evaluation

This device was granted an exemption from the prohibitions of Vehicle Code Section 27156 for 1970 and older model vehicles by Resolution 72-80, dated June 21, 1972. The staff has established a maximum flow rate of 0.1 cubic feet per minute for vapor injectors. Subsequent tests have shown that a 0.020inch diameter orifice in the outlet of the jar can meet this criteria.

In addition, the Air Resources Board laboratory performed a confirmatory CVS-75 back-to-back test on a 1975 Pinto with the following results.

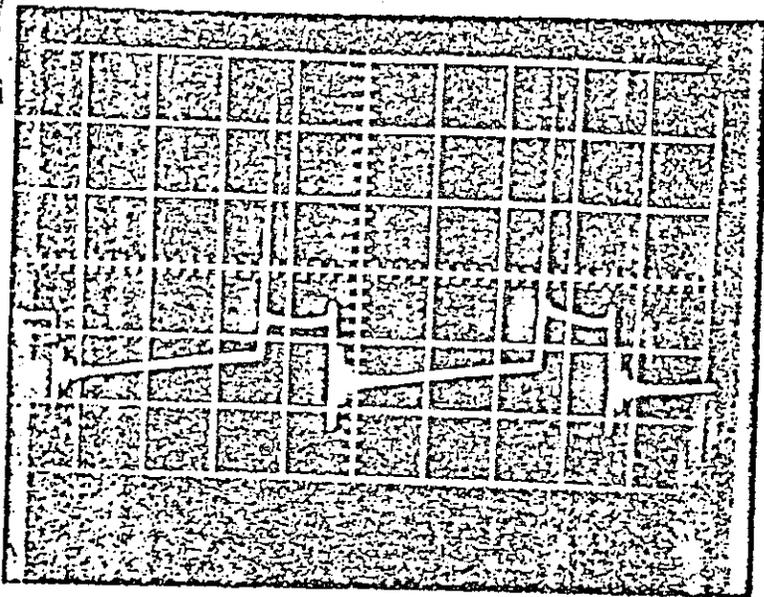
| <u>1975 Pinto (193LVF)</u> | <u>Emissions, g/mile</u> | | | <u>Fuel Economy</u> |
|----------------------------|--------------------------|-----------|------------|---------------------|
| | <u>HC</u> | <u>CO</u> | <u>NOx</u> | <u>MPG</u> |
| Baseline | 0.38 | 5.38 | 0.81 | 15.5 |
| With "Vap Air" Vaporizer | 0.18 | 5.19 | 0.74 | 13.7 |

August 5, 1975

IV. Conclusion and Recommendation

The staff is of the opinion that this device will not affect the performance and operation of the emission control system. Therefore, the staff recommends that Plastic Signs Inc. be granted an exemption from the prohibitions of Vehicle Code Section 27156 for the "VAP-AIR" Vapor Injector for 1975 and older model-year vehicles with engine sizes in classes a through f.

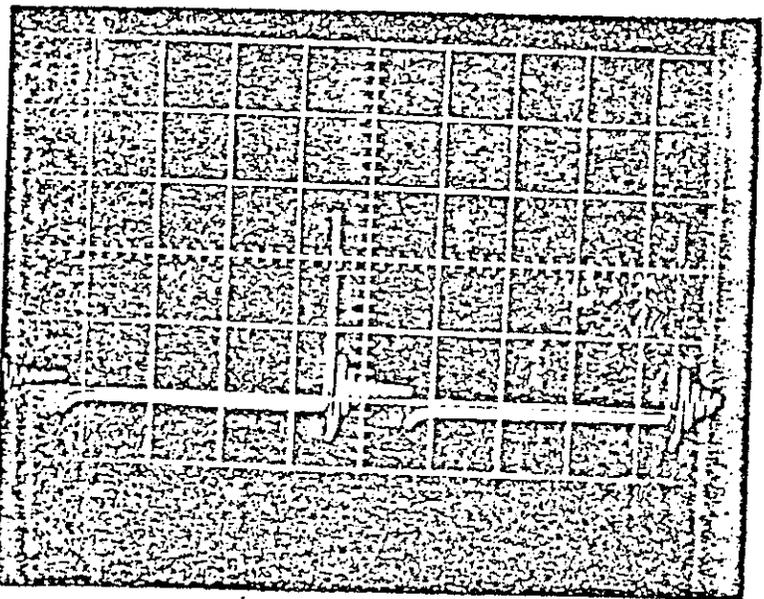
1112191-2M15 DIST., # DR-115-202 COIL
14 VOLT ~ 1.82 Ω RESISTED FEED, .0575 PAPER GAUG.



SECONDARY @ 3000 RPM

- 2V./CM VERT.

- 1M/SEC/CM HORIZ

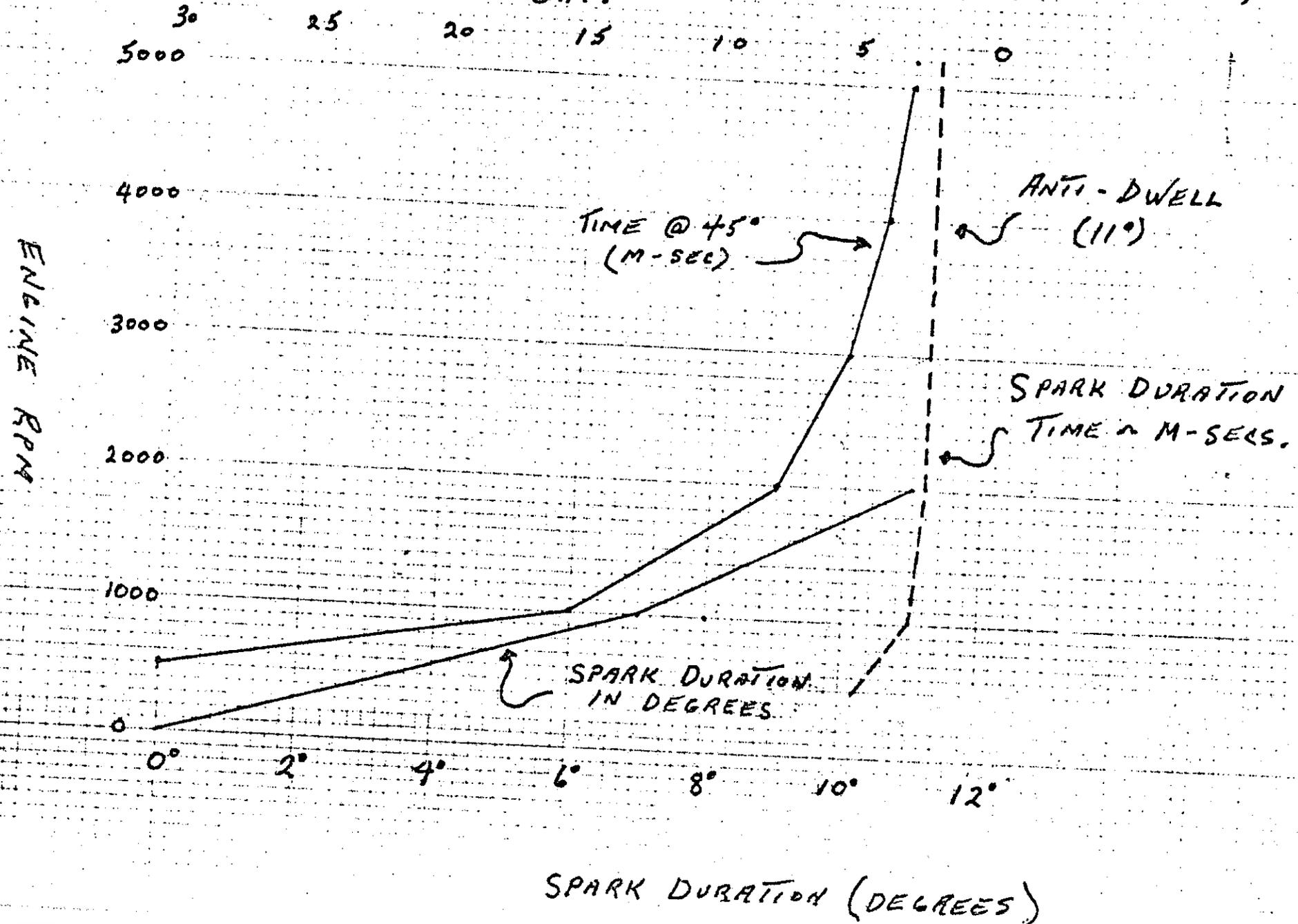


PRIMARY @ 3000 RPM

- 9V./CM VERT.

- 50V./CM HORIZ.

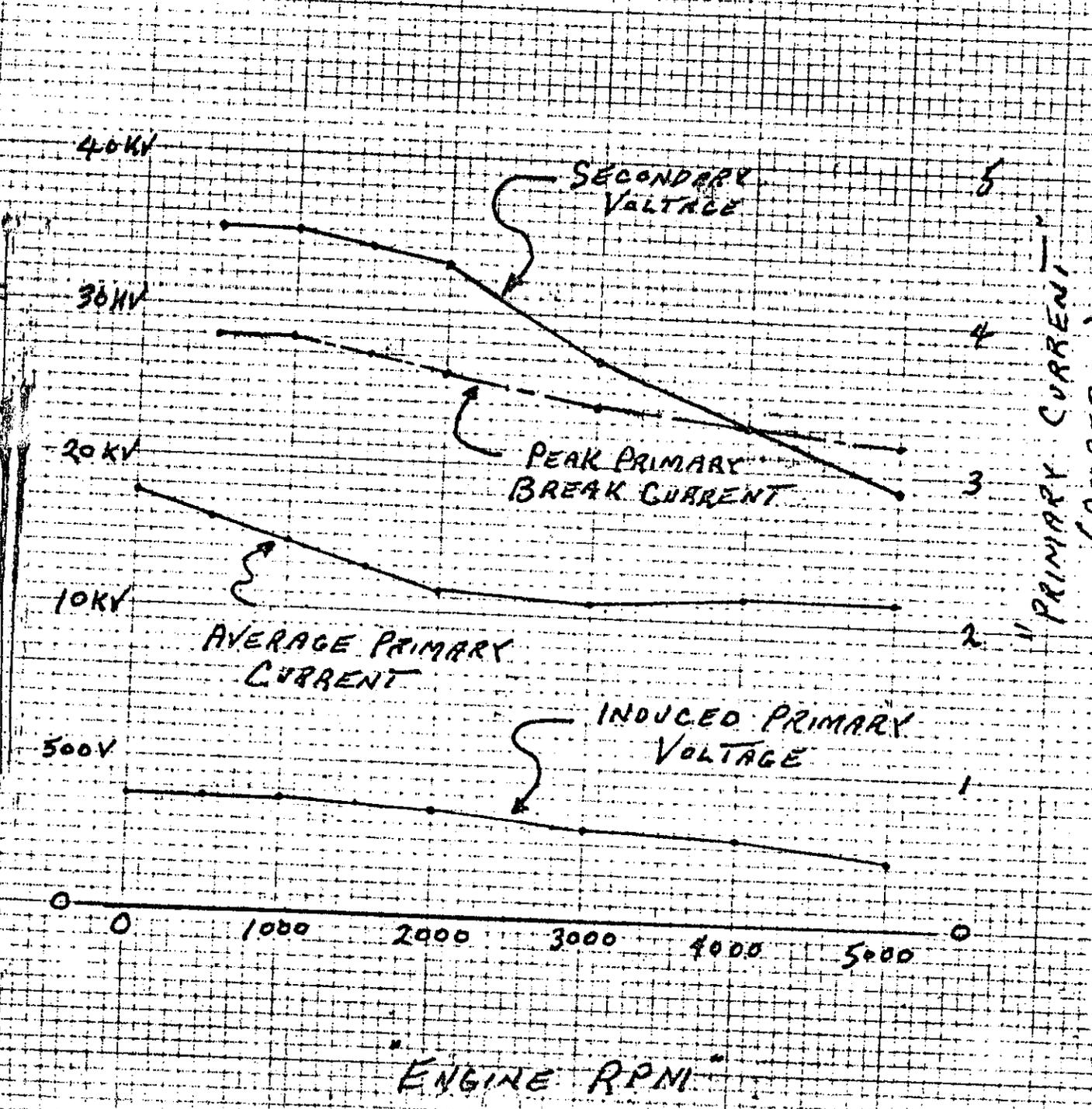
ACCULITE RETROFIT IGNITION SYSTEM - SPARK DURATION "EXHIBIT"
 8 CYL DELCO SYSTEM + DWELL MECH. FIXED 34°
 # DR-1115-202 COIL, 1.82 Ω BALLAST, 14V SOURCE,
 .037 SPARK GAP.



MILCULITE REIROFIT IGNITION SYSTEM ~ 8 CYL DELCO

"EXHIBIT A"

SECONDARY + PRIMARY
VOLTAGE
(50 PF ON COIL DIRECT)



PRIMARY CURRENT (AMPERES)

DR 1115202 COIL

14V ~ 1.82 Ω RESISTOR FEED

SECONDARY OUTPUT ENERGY = .0289 JOULES

SECONDARY VOLTAGE RISE TIME = 90 MICRO SECS @ 500 RPM

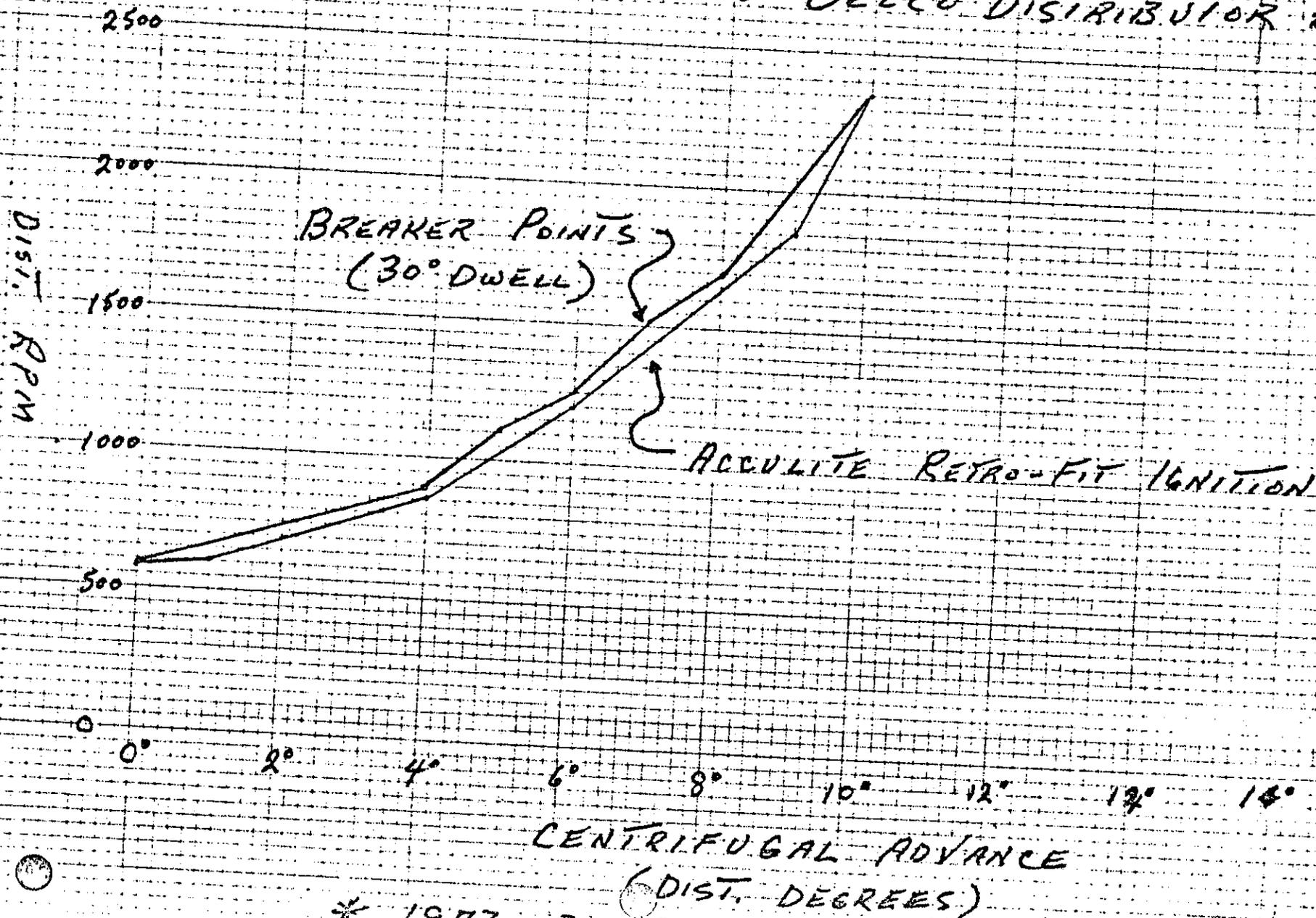
"ENGINE RPM"

ACCULITE RETRO-FIT IGNITION SYSTEM

"EXHIBIT A"

CENTRIFUGAL ADVANCE

1112191 - 2 MIS DELCO DISTRIBUTOR *



* 1077

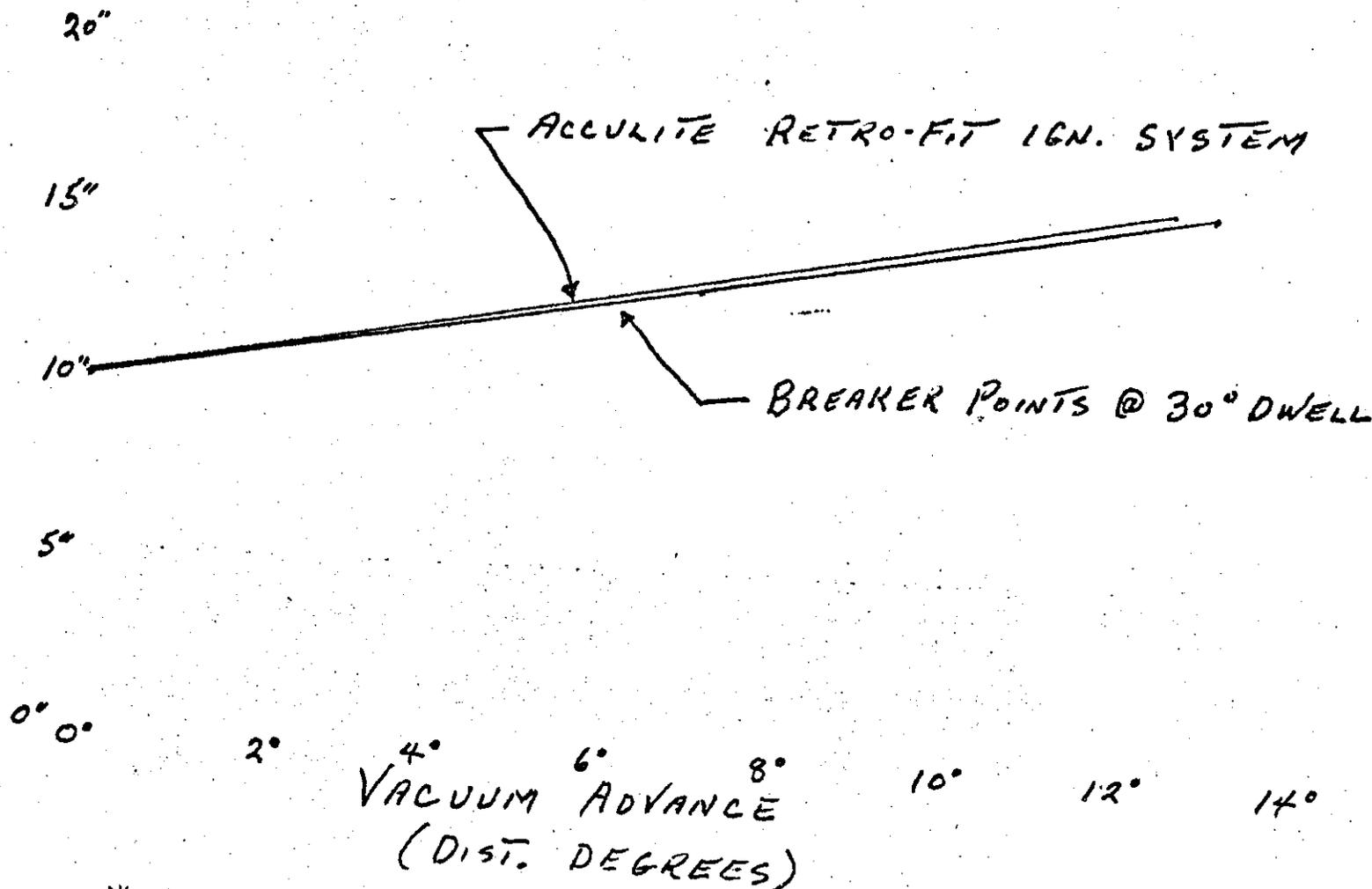
ACCULITE RETRO-FIT IGNITION SYSTEM

"EXHIBIT A"

VACUUM ADVANCE

1112191 - 2M15 DELCO DISTRIBUTOR *

VACUUM
(IN. H.G.)



* 1973

PONTIAC 455 CID IN. FIVE

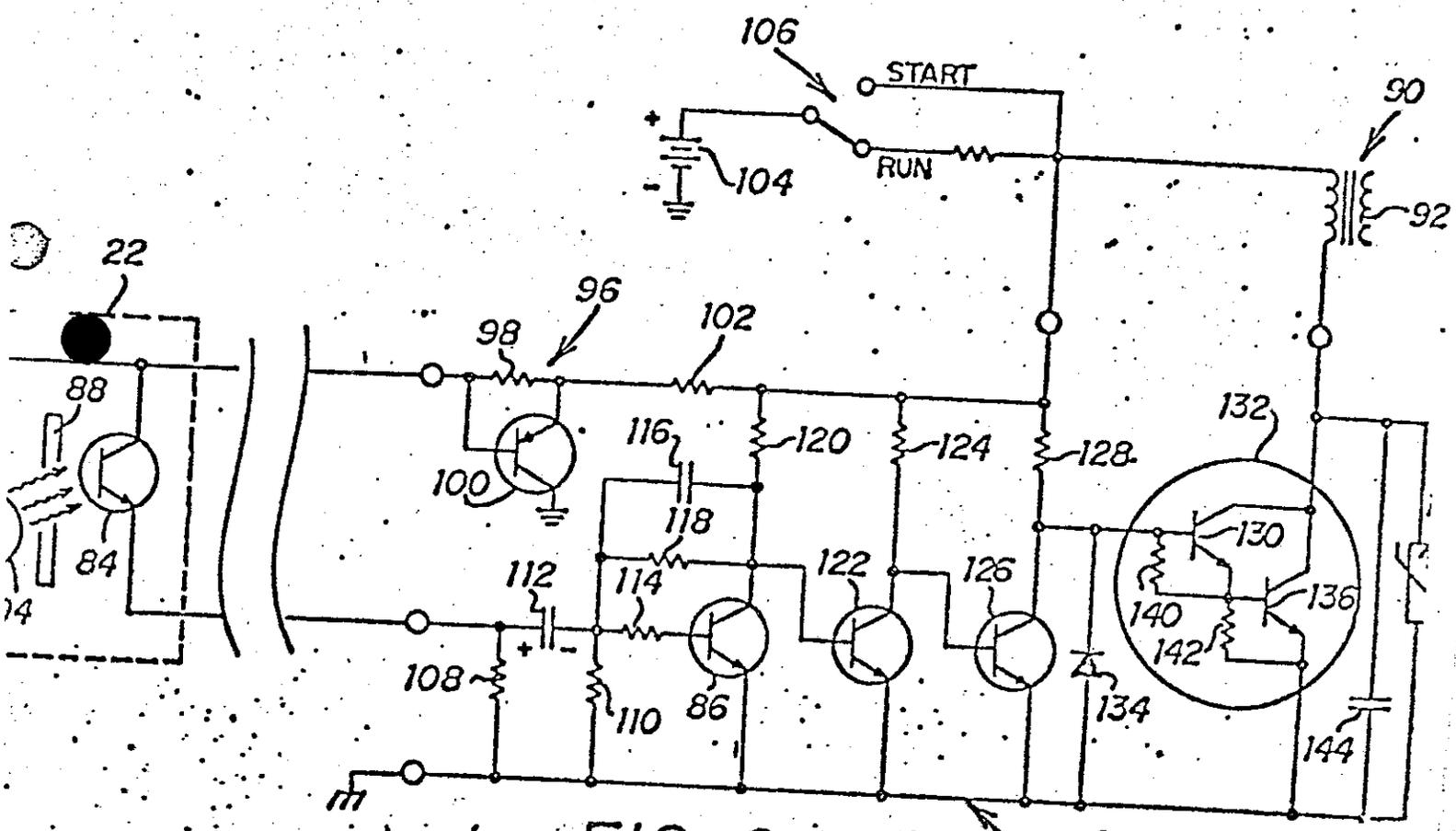


FIG. 8

ESSEX

EXHIBIT A

ESSEX INTERNATIONAL, INC.
ELECTRO-MECHANICAL DIVISION

6233 CONCORD AVENUE, DETROIT, MICHIGAN 48211 • PHONE (313) 571-8000

December 26, 1974

Air Resources Board Laboratory
State of California-Resources Agency
9528 Telestar Ave.
El Monte, California 91731

Attention: Mr. John Batchelder

Subject: Supplement to Application for Exemption-
Prohibitions to Vehicle Code Section 27156

Dear Mr. Batchelder,

With reference to our telephone conversation of 12-23-74, in which you requested a copy of a prior letter stating that the SX Elightronic Ignition System was compatable with the Carter and Dana California Retro-Nox Systems; I apparently neglected to include this information in my letter of 11-14-74 to Mr. Kenny.

Please use this letter as confirmation of our telephone conversation of 12-23-74, at which time I stated that our Elightronic Ignition System has no adverse effect on both the Dana and Carter Retro-Nox Systems.

Regards,

Wm. Swisher
Project Engineer

WS/bg

THIS LETTER IS APPLICABLE TO THE APO/SUPERIOR
APPLICATION OF JUNE 16, 1975

Allen R. Best



SUPERIOR INDUSTRIES INC.

10797 Harry Hines Blvd. • Dallas, Texas, 75220
Phone: 214/350-9911

July 31, 1975

Mr. Richard Kenny
Senior Engineer
Division of Vehicle Emission Control
Air Resources Board
9528 Telstar Avenue
El Monte, California 91731

Re: Application for Exemption to
Vehicle Section 27156

Dear Mr. Kenny:

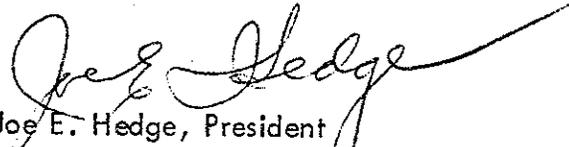
Please find attached inhouse evaluation by our quality control people which is self-explanatory. It is a very thorough report and I feel answers any questions concerning the failure of the General Motors ignition system which A.P.O. presented to you for evaluation.

Superior Industries has manufactured in excess of 250,000 retrofit electronic ignition systems for American cars and trucks and we feel that our production standards are as good as any in the industry. I do agree that occasionally one will have a component failure such as in the case of the Delco unit. As you are probably aware, we are an aftermarket manufacturer for A.P.O., Essex International, Borg-Warner, Bendix and Triple-A and several other smaller national concerns. I certainly appreciate the expeditious manner in which the testing has been conducted thus far with Mr. Bill Swisher of Essex and Mr. Allen Best of A.P.O.

Superior Industries' name was chosen to denote high quality and we certainly want to continue to strive for excellence in our products. I feel the problems with the others can be overcome and your indulgence in working with us while resolving these is most appreciated.

Thank you in advance for your help and I look forward to meeting with you personally in the coming weeks when we present the Ford/Chrysler units for your reevaluation.

Yours very truly,


Joe E. Hedge, President
Superior Industries, Inc.

JEH:cr

cc: Mr. Bill Swisher
Mr. Allen Best



SUPERIOR INDUSTRIES INC.

"EXHIBIT B"

10797 Harry Hines Blvd. • Dallas, Texas, 75220
Phone: 214/350-9911

To: Joe Hedge, President

From: Mike Allred, Director, Research and Development

Date: July 31, 1975

RE: The Superior Industries built Acculite ignition system (Delco 8 cylinder) returned by the California Air Resources Board - Evaluation

Dear Joe,

Upon initial evaluation of the above components returned to A.P.O. by the California Air Resources Board, the sensor was found to be operating normally. However, the output of the control module was found to be conducting at all times. Upon further investigation the active current limiter circuitry was found normal, but the first stage switching marks were missing from the input signal waveshape. This normally indicates an open between the input transistor or a short or open collector in the first stage.

The next test was to intermittently connect the orange and purple leads of the control module together with the sensor disconnected. This action caused normal switching of the output stage.

The sensor was again connected to the control module at which time the control module began operating normally. Upon temperature cycling and voltage cycling, the unit continued to operate and is operating at this time.

The most probable cause of the original indication is an intermittent bonding wire to metalization connection in the first stage transistor which probably opened with power removed (in transit) and effectively rewelded itself upon application of higher than normal signal voltage at the time of our second test. Although the unit is now functioning normally, it could again intermit at any time.

This is a very rare problem and one that is generally found in the assembly stages of the transistor; although it can also happen during the molding operation of the lead frame assembly of the transistor itself.

The electrical stress normally applied to this transistor is quite low compared to the capability of the device, so there would be little chance of damage by overload. In all solid state components, such as transistors, defects are virtually impossible to predict and therefore much care goes into optimizing the actual bonding process to eliminate the possibility. Temperature usually is the factor which most often will show an intermittency of this nature.

State of California
AIR RESOURCES BOARD

SPECIFICATIONS - IGNITION SYSTEM

I. Product Description

Manufacturer Superior Industries Name & Model No. APO Acculite 68-24--A8-34
10797 Harry Hines Blvd.
Address Dallas, Texas 75220 Telephone (214) 350-9911
Mounting Position Any

Type of Ignition

Lettering Capacitive Discharge Electronic X
Other Breakerless Retro-fit System

II. Input Requirement

System input voltage and current (volts and amps - RPM curve)
12V Neg. Grd. Nominal - see enclosed graph for current draw

III. OUTPUT Characteristics

A. Primary System

1. System output voltage and current (volts and amps - RPM curve)
See enclosed graph

B. Secondary System

1. Available output secondary voltage (specify RPM or submit voltage-rpm curve)
See enclosed graph

2. Secondary voltage rise time See enclosed graph
3. Secondary output energy (at input voltage) .0289 Joules at 14V. and 1.85 OHMS Resisted feed.
4. Spark duration (specify engine RPM) and spark gap See enclosed graph

IV. Design details

- Storage capacitor capacitance (uf) and stored voltage Not applicable
- C-D unit inductance (uH) Not applicable
- Pulse triggering source Infra-red light emitting diode and photo transistor
- Type of transformer in C-D and turn ratio Not applicable
- Transient voltage protection (open circuits and voltage surges)
Protection circuit operates 18V. /no secondary load
- Close point time limit N/A
- Maximum point current and ground circuit resistance N/A
- Oscillator frequency N/A
- Number and type of power transistor S11-6204, NPN Power Darlington, 400 V., 15 AMP
- Ballast resistors required? Yes X No
- Resistor Type 0-E Resistor Size (ohms) 0-E on vehicle
- Switch back to stock system? Yes X No
- Describe methods Replace points and condenser

Moisture and Vibration Protection Epoxy Encapsulation and O-E
type moisture resistant connectors

Operating Temperature Range -20°C to + 130°C

Humidity Range 0-99%

V. Modifications from O.E.M.

Ignition timing modified? Yes No X

State modifications from O.E.M. Ignition System Characteristics Fixed
dwell and more accurate cylinder to cylinder timing.

Engine Setting Changes? Yes No X

Describe Changes none

Specify any other changes from O.E.M. none

VI. Device information

Please attach circuit diagram, O.E.M. and device spark advance curves and
photograph of spark line produced by device.

Description of operating principle See attachment

IGNITION SYSTEM TEST DATA

Manufacturers Name Superior Industries, Inc.
 Device Name APU Acculite Ignition System
 Test Date 6/14/75 (TEST PER SAE J973a)
 Distributor Type: Vehicle Make Pontiac Yr. 1973 No. of cylinder 8

Baseline Test , Device Test

Note: All data is in Distributor RPM and Degrees.

Test No. 1

Centrifugal Advance Data: Distributor RPM is 325 at idle.
 0° is set at 575 Distr. RPM, Dwell set at 30 Deg. at idle.

| RPM | °ADV | RPM | °ADV. | RPM | °ADV | RPM | °ADV. | RPM | °ADV |
|------|------|------|-------|------|------|------|-------|------|------|
| 100 | 0 | 200 | 0 | 300 | 0 | 400 | 0 | 500 | 0 |
| 600 | 0.2 | 700 | 1.4 | 800 | 2.5 | 900 | 3.5 | 1000 | 4.3 |
| 1100 | 5 | 1200 | 5.6 | 1300 | 6.2 | 1400 | 6.6 | 1500 | 7 |
| 1600 | 7.7 | 1700 | 8.3 | 1800 | 8.8 | 1900 | 9.1 | 2000 | 9.4 |

Test No. 2

Vacuum Advance Data: dist. Idle RPM is 325 Dwell 30

°Adv. 0"Hg 0, 3"Hg 0, 6"Hg 0, 9"Hg 0, 12"Hg 4.2, 15"Hg 10.8, 18"Hg 13.2, 20"Hg 13.2

Test No. 3

Electrical Measurements*

| Distributor RPM: | 650 RPM | Idle RPM | 2000 RPM | Cruise RPM | Start 100 RPM |
|--------------------------------|-------------|-------------|------------|------------|---------------|
| 1. System primary voltage | 14 Vdc | 14 Vdc | 14 Vdc | 14 Vdc | 14 Vdc |
| 2. Coil primary voltage | 9.5 Vdc | 9.5 Vdc | 10.1 Vdc | 10.1 Vdc | 9.15 Vdc |
| 3. Ignition primary current | 2.3 AMPS | 2.3 AMPS | 1.95 AMPS | 1.95 AMPS | 2.5 AMPS |
| 4. Secondary voltage available | 35 KV | 35 KV | 32 KV | 32 KV | 35 KV |
| 5. Secondary voltage required | 12 KV | 12 KV | 12 KV | 12 KV | 12 KV |
| 6. Required voltage rise time | 70 μSEC | 70 μSEC | 75 μSEC | 75 μSEC | 70 μSEC |
| 7. Spark duration | 1350 μSEC | 1350 μSEC | 1300 μSEC | 1300 μSEC | -- μSEC |
| 8. Spark voltage Average | -- Va | -- Va | -- Va | -- Va | -- Va |
| 9. Spark current Average | -- Mamps | -- Mamps | -- Mamps | -- Mamps | -- Mamps |
| 10. Spark Energy | 289 Mjoules | 289 Mjoules | -- Mjoules | -- Mjoules | -- Mjoules |

*Note: All conditions measured at optimum spark gap to fire at 12KV except no. 4 which is open circuit voltage.

Optimum Spark Gap width .035 IN. .035 IN. .035 IN.

IGNITION SYSTEM TEST DATA

Manufacturers Name Superior Industries, Inc.
 Device Name APO Acculite Ignition System
 Test Date 6/14/75 (TEST PER SAE J973a)
 Distributor Type: Vehicle Make Pontiac Yr. 1973 No. of cylinder 8

Baseline Test , Device Test

Note: All data is in Distributor RPM and Degrees.

Test No. 1

Centrifugal Advance Data: Distributor RPM is 325 at idle.
 0° is set at 575 Distr. RPM, Dwell set at 30 Deg. at idle.

| RPM | °ADV | RPM | °ADV. | RPM | °ADV | RPM | °ADV. | RPM | °ADV |
|------|------------|------|------------|------|------------|------|------------|------|------------|
| 100 | <u>0</u> | 200 | <u>0</u> | 300 | <u>0</u> | 400 | <u>0</u> | 500 | <u>0</u> |
| 600 | <u>0.9</u> | 700 | <u>2.1</u> | 800 | <u>3.2</u> | 900 | <u>4.3</u> | 1000 | <u>4.8</u> |
| 1100 | <u>5.4</u> | 1200 | <u>6</u> | 1300 | <u>6.5</u> | 1400 | <u>7</u> | 1500 | <u>7.4</u> |
| 1600 | <u>7.8</u> | 1700 | <u>8.3</u> | 1800 | <u>8.9</u> | 1900 | <u>9.1</u> | 2000 | <u>9.5</u> |

Test No. 2

Vacuum Advance Data: dist. Idle RPM is 325 Dwell 30

°Adv. 0"Hg 0, 3"Hg 0, 6"Hg 0, 9"Hg 0, 12"Hg 4.1, 15"Hg 10.1, 18"Hg 12.7, 20"Hg 1

Test No. 3

Electrical Measurements*

| Distributor RPM: | 650 | Idle RPM | 2000 | Cruise RPM | Start 100 RPM |
|--------------------------------|---------------------|----------|--------------------|------------|--------------------|
| 1. System primary voltage | <u>14</u> Vdc | | <u>14</u> Vdc | | <u>14.6</u> Vdc |
| 2. Coil primary voltage | <u>9.5</u> Vdc | | <u>10.1</u> Vdc | | <u>9.15</u> Vdc |
| 3. Ignition primary current | <u>2.5</u> AMPS | | <u>2.15</u> AMPS | | <u>2.7</u> AMPS |
| 4. Secondary voltage available | <u>34</u> KV | | <u>32</u> KV | | <u>34</u> KV |
| 5. Secondary voltage required | <u>12</u> KV | | <u>12</u> KV | | <u>12</u> KV |
| 6. Required voltage rise time | <u>90</u> μSEC | | <u>100</u> μSEC | | <u>90</u> μSEC |
| 7. Spark duration | <u>1200</u> μSEC | | <u>1200</u> μSEC | | <u>1200</u> μSEC |
| 8. Spark voltage Average | <u>---</u> Va | | <u>---</u> Va | | <u>---</u> Va |
| 9. Spark current Average | <u>---</u> Mamps | | <u>---</u> Mamps | | <u>---</u> Mamps |
| 10. Spark Energy | <u>28.9</u> Mjoules | | <u>---</u> Mjoules | | <u>---</u> Mjoules |

*Note: All conditions measured at optimum spark gap to fire at 12KV except no. 4 which is open circuit voltage.

Optimum Spark Gap width .035 IN. .035 IN. .035 IN.