

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-60
Relating to Exemptions under Section 27156
of the Vehicle Code

SUPERIOR INDUSTRIES, INC.

"ELECTRONITION SOLID STATE RETROFIT IGNITION SYSTEM - MODEL NO. G8-24
AND A8-34"

"ACCULITE ELECTRONIC RETROFIT IGNITION SYSTEM - MODEL NO. G8-24 AND A8-34"

"P & D ELECTRONIC IGNITION SYSTEM - MODEL NO. CR-381"

"BORG WARNER ELECTRONIC IGNITION SYSTEM - MODEL NO. EI-I"

"ELIGHTRONIC SOLID STATE IGNITION CONVERSION SYSTEM - MODEL NO. 45-143"

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 "Electronition Solid State Retrofit Ignition System" manufactured by Superior Industries, Inc., 10797 Harry Hines Blvd., Dallas, Texas 75220 and marketed as indicated below have been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, are exempt from the prohibitions of Section 27156 of the Vehicle Code for 1974 and older model year General Motors Corporation vehicles and 1974 and older model year American Motors Corporation vehicles equipped with V-8 engines and 12 volt ignition systems, except vehicles originally equipped with transistorized, C.D., or breakerless ignition systems.

The following is a list of each device manufactured by Superior Industries and marketed as indicated; each device consists of a light emitting diode and photocell sensor, a light beam interrupter, and an electronic control module.

Acculite Electronic
Retrofit Ignition System
Model #G8-24 & A8-34

APD of America, Inc.
3003 LBJ Freeway, Suite #131
Dallas, Texas 75234

P & D Electronic
Ignition System
Model No. CR-381

P & D Automotive Products
74 Conalco Drive
P.O. Box 1767
Jackson, Tenn. 38301

Borg Warner Electronic
Ignition System
Model No. EI-I

Automotive Parts Division,
Borg Warner Corporation
11405 Gage Avenue
Franklin Park, Ill. 60131

Electronition Solid
State Retrofit Ignition Sys.
Model No. G8-24 & A8-34

Superior Industries, Inc.
10797 Harry Hines Blvd.
Dallas, Texas 75220

Elightronic Solid State
Ignition Conversion System
Model No. 45-143

Essex International, Inc.
Electro-Mechanical Division
6233 Concord Avenue
Detroit, Michigan 48211

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 exempted by the Air Resources Board, that adversely affect the performance of the vehicle's pollution control system 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 SUPERIOR INDUSTRIES, INC. "ELECTRONITION SOLID STATE RETROFIT IGNITION SYSTEM-MODEL NO. G8-24 AND A8-34", "ACCULITE ELECTRONIC RETROFIT IGNITION SYSTEM-MODEL NO. G8-24 AND A8-34", "P & D ELECTRONIC IGNITION SYSTEM-MODEL NO. CR-381", "BORG WARNER ELECTRONIC IGNITION SYSTEM-MODEL NO. EI-I", OR "ELIGHTRONIC SOLID STATE IGNITION CONVERSION SYSTEM-MODEL NO. 45-143".

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 19th day of August, 1975.

WILLIAM SIMMONS
Executive Officer

State of California

AIR RESOURCES BOARD

August 8, 1975

Staff Report

Evaluation of the Superior Industries, Inc.
Breakerless Ignition System Kits for Exemption
From the Prohibitions of Motor Vehicle Code Section 27156

I. Introduction

Superior Industries, Inc. of 10797 Harry Hines Blvd., Dallas Texas 75220 has applied for an exemption from the prohibitions of Section 27156 of the California Motor Vehicle Code for the "Electronition Solid State Retrofit Ignition System Model No. G8-24 and A8-34". (Exhibit A.) In addition, Superior Industries, Inc. has applied for exemptions for the following breakerless ignition systems marketed as follows:

Acculite Electronic
Retrofit Ignition System
Model #G8-24 & AB-34

APQ of America, Inc.
3003 LBJ Freeway, Suite #131
Dallas, Texas 75234

P & D Electronic
Ignition System
Model No. CR-381

P & D Automotive Products,
74 Conalco Drive
P. O. Box 1767
Jackson, Tenn. 38301

Borg Warner Electronic
Ignition System
Model No. EI-I

Automotive Parts Division,
Borg Warner Corporation
11045 Gage Avenue
Franklin Park, Ill. 60131

Elightronic Solid State
Ignition Conversion System
Model No. 45-143

Essex International, Inc.
Electro-Mechanical Division
6233 Concord Avenue
Detroit, Michigan 48211

August 8, 1975

According to the applicant the devices will be identical in design and performance regardless of brand name. Section 27156 of the Motor Vehicles Code prohibits the installation of any device or mechanism which reduces the effectiveness of the required emission control devices. This vehicle code section also authorizes the Air Resources Board to exempt devices from this prohibition if a finding shows that the device will not adversely effect the performance of the emission control system. The applicant is requesting the exemption be granted for 1974 and older model year General Motors Corporation vehicles and 1974 and older model year American Motors Corporation vehicles equipped with V-8 engines, and 12 volt ignition systems except vehicles originally equipped with transistorized capacitive discharge, or breakerless ignition systems.

II. System Description

The Superior Industries, Inc. electronic ignition system is a unit to replace the breaker points within a distributor. It consists primarily of a light emitting diode and photocell sensor, a light beam interrupter, and an electronic control module. The light emitting diode and photocell operate in conjunction with the light beam interrupter to generate an ignition timing signal. The ignition signal is fed to the electronic control module which accomplishes transistor switching of the primary coil in the ignition system.

August 8, 1975

III. System Evaluation

The applicant did not submit any emission data indicating the device will not have any adverse effect on the emission control system. The applicant did submit data for the characteristics of the unit. In order to evaluate the device, the output characteristics of an ignition system with and without the device were compared. Confirmatory tests were conducted on the Air Resources Boards ignition system simulator which consists of a Sun distributor tester, Tektronix Oscilloscope, Sun Ignition Analyzer and associated accessories according to SAE J973a.

The tested device was an "Acculite Electronic Retrofit Ignition System". The first unit submitted for testing was found to be inoperative which caused a complete loss of ignition. The failed unit was returned to the manufacturer for failure analysis and a second unit was supplied for testing.

The failure analysis of the first unit (Exhibit B) indicated an intermittent wire bond to a transistor within the control module. The analysis also indicated the wire rebonded itself with the application of higher voltages. The problem is attributable to reliability which could only be evaluated by investigating a large sample size and resolved by improved quality control. This is not judged to be a design deficiency.

Evaluation of the Superior Industries, Inc. Breakerless Ignition System Kits for Exemption from the Prohibitions of Motor Vehicle Code Section 27156

August 8, 1975

The ARB evaluation of the second unit consisted of measuring the spark duration, available secondary voltage, secondary voltage rise time, the centrifugal and vacuum advance characteristics. The baseline and device tests were conducted with a 1973 General Motors 8 cylinder distributor. The results of this comparison are shown in Table I.

Table I

Centrifugal Spark Advance in Crankshaft Degrees

| <u>Engine RPM</u> | <u>Baseline Test</u> | <u>Device Test</u> | <u>Deviation from Baseline</u> |
|-------------------|----------------------|--------------------|--------------------------------|
| 600 | 0 | 0 | 0 |
| 1400 | 3 | 3 | 0 |
| 2000 | 7 | 7 | 0 |
| 2600 | 10 | 10 | 0 |
| 3200 | 14 | 14 | 0 |

Vacuum Spark Advance in Crankshaft Degrees

| <u>Vacuum in. Hg.</u> | <u>Baseline Test</u> | <u>Device Test</u> | <u>Deviation From Baseline</u> |
|-----------------------|----------------------|--------------------|--------------------------------|
| 3 | 0 | 0 | 0 |
| 6 | 8 | 7 | -1 |
| 9 | 14 | 14 | 0 |
| 15 | 14 | 14 | 0 |
| 20 | 14 | 14 | 0 |

Spark Duration in Microseconds

| <u>RPM</u> | <u>Baseline Test</u> | <u>Device Test</u> |
|------------|----------------------|--------------------|
| 600 | 1800 | 1700 |
| 3000 | 1400 | 1200 |

Secondary Voltage Rise Time in Microseconds

| <u>RPM</u> | <u>Baseline Test</u> | <u>Device Test</u> |
|------------|----------------------|--------------------|
| 600 | 40 | 40 |
| 3000 | 35 | 40 |

August 8, 1975

Spark Energy in Millijoules

| <u>Engine RPM</u> | <u>Baseline Test</u> | <u>Device Test</u> |
|-------------------|----------------------|--------------------|
| 600 | 25.6 | 24.2 |
| 3000 | 22.0 | 20.5 |

The baseline and device comparison of centrifugal and vacuum advance characteristics indicates that the device does not alter the ignition timing of the distributors.

The comparison of the other electrical characteristics shows that installation of the device did not significantly change the output from the O.E.M. ignition system.

IV. Conclusion and Recommendation

Based on the evaluation of the ARB test results, the installation of the "Acculite Electronic Retrofit Ignition System" or any of the other identical devices listed in the Introduction would not adversely affect the performance or operation of the OEM emission control system. The staff recommends that Superior Industries, Inc. be issued an exemption from the prohibitions of Section 27156 of the Vehicle Code for its "Electronition Solid State Retrofit Ignition System" and the other devices manufactured by them and listed with their marketing firms in the introduction for 1974 and older model year General Motors Corporation vehicles and 1974 and older model year American Motors Corporation vehicles equipped with V-8 engines, except vehicles originally equipped with transistorized, C.D., or breakerless ignition systems.



SUPERIOR INDUSTRIES INC.

"EXHIBIT A"

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

June 18, 1975

Mr. G. C. Hass, Chief
Division of Vehicle Emission Control
Air Resources Board
9528 Telstar Avenue
El Monte, California 91731

Dear Mr. Hass:

We are hereby applying to the Air Resources Board of California for exemption to vehicle code number 27156 for the breakerless electronic ignition systems manufactured by Superior Industries, Inc.

These electronic ignition systems will be marketed by the companies and under the brand names as separately listed in this application.

Thank you for your help in this matter.

Yours very truly,

SUPERIOR INDUSTRIES, INC.

Joe E. Hedge
President

JEH:cr

Enclosures

"EXHIBIT A"

The following is a list of each device manufactured by Superior Industries, Inc. and marketed as indicated.

Acculite Electronic
Retrofit Ignition System
Model #G8-24 & A8-34

APO of America, Inc.
3003 LBJ Freeway, Suite #131
Dallas, Texas 75234

P & D Electronic
Ignition System
Model No. CR-381

P & D Automotive Products,
74 Conalco Drive
P. O. Box 1767
Jackson, Tenn. 38301

Borg Warner Electronic
Ignition System
Model NO. EI-I

Automotive Parts Division,
Borg Warner Corporation
11045 Gage Avenue
Franklin Park, Ill. 60131

Electronition Solid
State Retrofit Ignition Sys.
Model No. G8-24 & A8-34

Superior Industries, Inc.
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Elightronic Solid State
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Essex International, Inc.
Electro-Mechanical Division
6233 Concord Avenue
Detroit, Michigan 48211

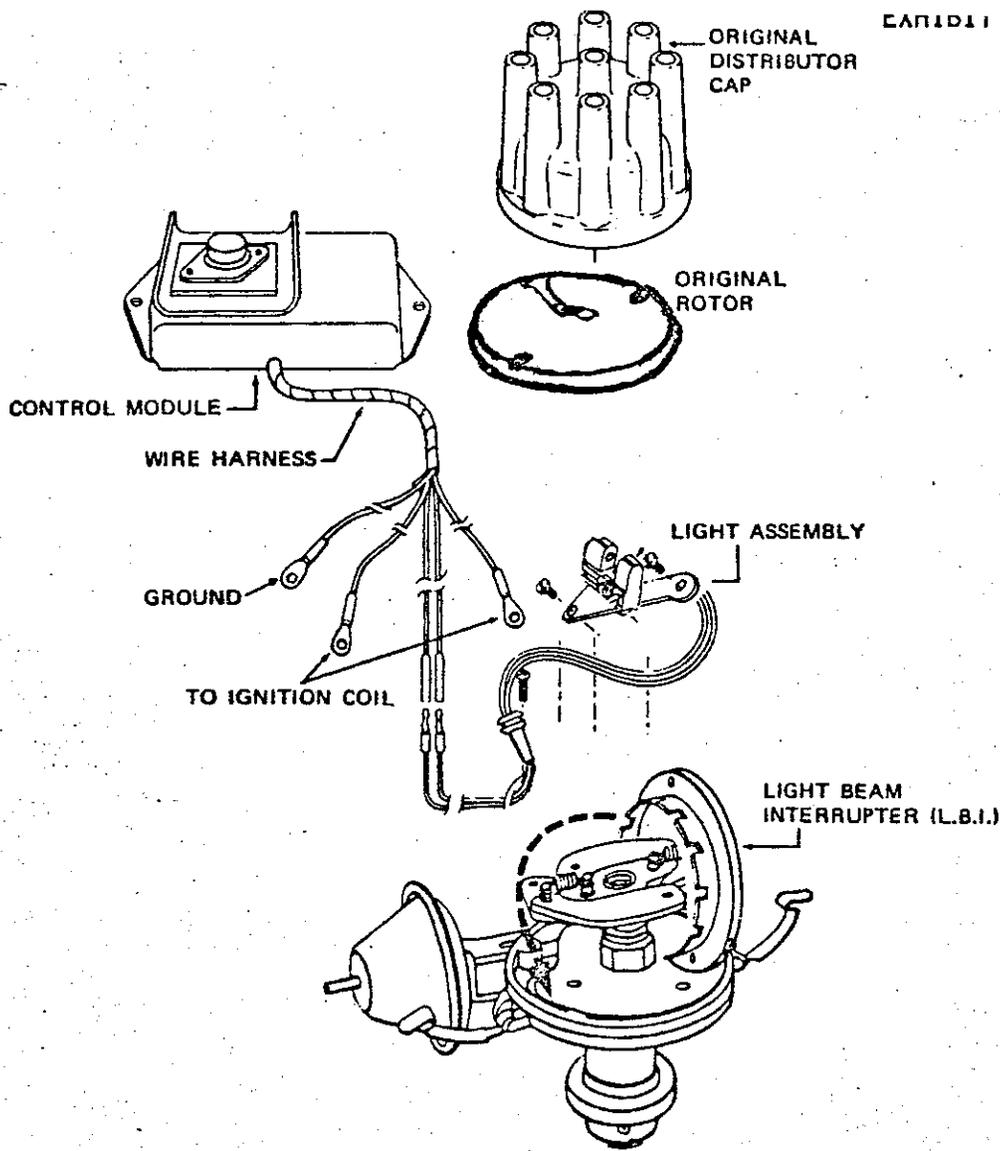
ALL ELECTRONIC IGNITION MODELS APPROVED FOR SALE IN
CALIFORNIA WILL BE IDENTIFIED BY A 1/2" DIAMETER RED
DOT WITH THE LETTER "C" PERMANENTLY LOCATED ON TOP OF
THE OUTPUT TRANSISTOR ON THE CONTROL MODULE.

THE SUPERIOR ELECTRONIC IGNITION SYSTEM

INTRODUCTION

The contact point ignition system that has been the standard of the automotive industry is now going the way of the whalebone, the iceman and the kerosene lantern. Several breakerless or pointless ignition systems have been used in the past but the increasingly stringent emissions regulations of the past few years have precipitated the total changeover to the breakerless type by American automobile companies.

Superior has now developed such a breakerless ignition system as an aftermarket item so that it can be fitted to vehicles which originally were equipped with contact points. The owner of an automobile equipped with a breakerless electronic ignition system will find that the advantages of such a system are: greater reliability, more precise cylinder to cylinder timing, more precise firing characteristics, usually a hotter spark, and always a significant decrease in maintenance and service costs since there are no parts to wear out or alter ignition timing. This results in less frequent increases in harmful emissions because of point wear.



SPECIFICATIONS and FEATURES

1. Triggering Means
2. Operating Voltage
3. RPM
4. Timing Accuracy
5. Cylinder to Cylinder Balance (Timing)
6. Current Rating
7. Transient Voltage Protection
8. Temperature Range
9. Environmentally Protected
10. Dwell
11. Output Voltage, Spark Duration and Spark Energy
12. Installation
13. Hook-up
14. Feed Source
16. Reverse Polarity Protection

Infra-red light emitting diode and photo-transistor receiver.

12 Volts \pm 6 Volts, negative ground.

Any engine speed above zero.

Up to $\frac{1}{10}$ of 1 degree.

Up to 50 times better than points.

10 Amperes, allows use of high performance coils.

Up to 400 Volts

Tested from -40°F to 300°F .

Epoxy encapsulation, waterproof connectors and terminals.

Fixed, no adjustment necessary.

Determined by coil and ballast resistor. However, the system will handle high performance coils with primary currents to 10 Amps.

Approximately 30 minutes, requires only screw driver and pliers.

Two wires to ignition coil.

Positive terminal of ignition coil.

System cannot be damaged by improper hook-up.

This system utilizes stock coil, ballast resistor, cap and rotor. Timing should be

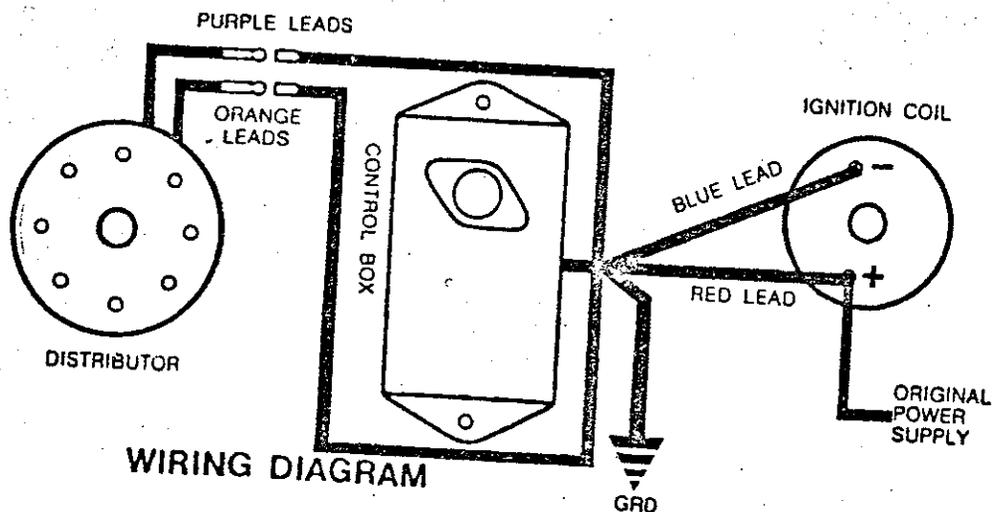
In principle this system is similar to the conventional point and condenser system where the voltage necessary to fire the spark plugs is produced by interrupting current flowing through the primary winding of the ignition coil by opening mechanical breaker points. In the Acculite system, the voltage is developed in the same manner, except that the current in the primary winding is interrupted by a transistor in the electronic control module. This occurs each time the control module receives a "timing pulse" from the distributor.

The Acculite Solid State Ignition System operates like this. A signaling device consisting of an infra-red light-emitting diode and a photo-transistor-receiver is mounted on the distributor plate. The light beam interrupter (L.B.I.) rotates with the distributor shaft and its blades pass between the infra-red sending

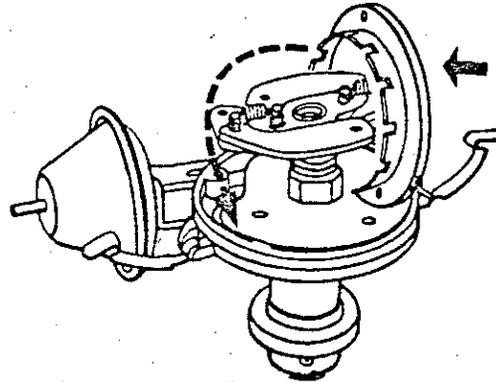
unit and the photo-transistor-receiver. As each opening between the L.B.I. blades pass the sending unit, a signal is sent to the power switching transistor in the solid state control module.

When receiving this signal, the control module breaks the coil ground connection to interrupt the current in the primary winding. This induces a high voltage in the secondary coil winding to fire the spark plugs. The length of time this flow is broken is determined by the slot width of the L.B.I. The "dwell" is built into the L.B.I. and is always correct.

The Acculite Ignition System, is designed to reduce regular ignition maintenance to cleaning or replacing spark plugs. The distributor components do not make contact, and therefore do not wear. Engine timing and dwell are built into the electronic system and do not require periodic adjustment.



1. Remove distributor cap - check for cracks or burnt electrodes - replace if found defective.
2. Remove rotor hold screws and remove rotor. Check for burnt or oxidized contacts, replace if necessary. Discard original hold down screws - use new screws and flat washers supplied in package when reassembling.
3. Disconnect distributor lead from contact points, remove points. It may be necessary to crank engine to position centrifugal advance to remove hold down screws. Remove condenser and condenser bracket screw.
4. Remove distributor lead from negative (-) terminal on the ignition coil and pull it out of the distributor completely.
5. Insert orange and purple wires individually through the distributor housing hole.
6. Position light device on base plate of the distributor. **DO NOT** align light device into its proper place at this time.
7. Take L.B.I. and slide at least half way over the centrifugal advance mechanism, align the L.B.I. into the opening on light device (see illustration). Let L.B.I. fall over the centrifugal advance mechanism and lay on base of distributor.



8. Position light device into place previously occupied by contact set and replace and tighten hold down screws firmly.
9. Using a good rotor, position it into its proper place, insert two screws and flat washers provided in package (6/32 x 3/4), lift L.B.I. up and align screw holes to rotor hold down screws.
Important: Visually check to insure that L.B.I. is seated inside of rotor skirt. Now tighten screws... but **DO NOT** over tighten.
10. Before reinstalling a good distributor cap, make sure that an ample amount of wire is provided to allow the distributor vacuum advance chamber to work freely. Position rubber grommet in distributor housing.
11. Install a good distributor cap.
12. **Caution:** Before mounting control module: Make sure wire harness will reach from distributor leads to control module location and that it is subjected to the least amount of heat. A fender well is best suited. Drill two 1/8" holes using the control module as a template.
13. Mount control module with screws provided.
14.
 - a. Connect orange wires together.
 - b. Connect purple wires together.
 - c. **Caution:** Connect black wire to good engine ground.
 - d. Connect red wire to positive (+) terminal on the coil. Make sure that the original source of battery voltage is also still on this terminal (see wiring diagram).
 - e. Connect blue wire to the negative (-) terminal on the coil.
15. Start engine, check timing and reset to manufacturers specifications if needed.
16. **Important:** For maximum performance, check the condition of all spark plug wires and spark plugs. If plugs show heavy carbon build up or burning - replace.

TROUBLESHOOTING THE ACCULITE IGNITION SYSTEM

"EXHIBIT A"

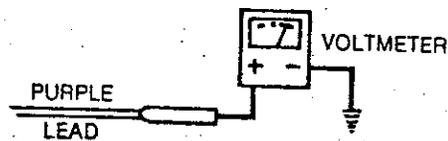
Important:

The following test procedure must be followed in sequential order. Failure to do so may result in an inaccurate diagnosis.

1. Remove distributor cap, inspect for cracks — carbon tracking and carbon on the center tower contact. Replace if necessary.
 2. Inspect distributor for excessive amounts of oil and deposits. Clean if needed. Make sure light device lenses are clean.
 3. Inspect L.B.I. for any gashes or knicks on the opening of the L.B.I. slots. If any damage is noticed, replace L.B.I.
 4. Check battery voltage at battery and battery connections. Make mental note of battery voltage.
 5. Check wiring diagram to make sure system is wired properly.
- Caution:** Black wire must be grounded at all times, it is your circuit protection.
6. Using an ohm meter, make sure that control box and black ground lead is securely grounded. If not, ground it.
 7. Disconnect orange and purple wires at bullet connectors — remove coil wire from center of distributor cap, place it about 1/4" away from

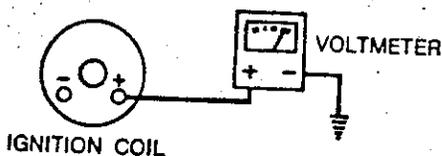
a good engine ground. Turn ignition switch to run position. Using a jumper wire, jump the orange and purple wires at the female ends of the bullet connectors intermittently.

- a. If spark jumps from the coil wire to ground, replace light device.
 - b. If no spark occurs, insert coil wire in distributor cap and proceed with step #8.
8. Using a volt meter, check available voltage at purple female bullet connector coming from wire harness.



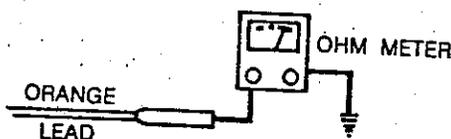
- a. If a zero voltage reading is obtained, proceed with step #9.
- b. If approximately 1/2 of the battery voltage reading is obtained, proceed with step #10.
- c. If battery voltage reading is obtained, proceed with step #11.

9. With ignition in run position, use a volt meter to check available voltage at the positive (+) or battery terminal of the coil. Red wire should be on this terminal.

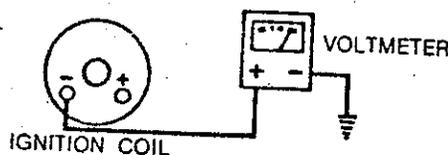
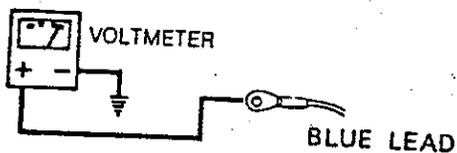


- a. If a zero voltage reading is obtained, proceed with test #14.
- b. If approximately 1/2 of the battery voltage reading is obtained, proceed with #13.
- c. If battery voltage reading is obtained, proceed with test #12.

10. When doing this step make sure ignition switch is off. Using an ohm meter, check resistance at the orange female bullet connector coming from wire harness.

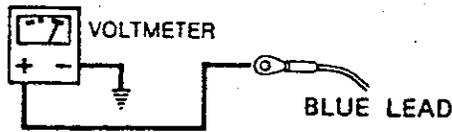


- a. If a zero ohm resistance reading is obtained, replace the control module.
 - b. If an open circuit reading is obtained, replace the control module.
11. Turn ignition switch to run position. Using a volt meter, check available voltage at the negative (-) terminal of the coil.
- a. If battery voltage reading is obtained, proceed with step #13.
 - b. If near zero voltage reading is obtained, turn ignition switch off and replace the coil.

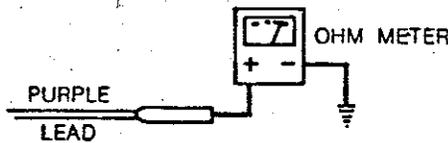


"EXHIBIT A"

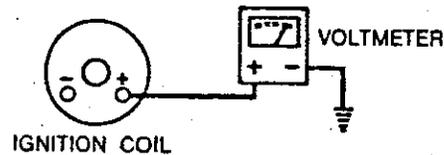
12. Remove the blue wire from (-) terminal coil, turn ignition switch to run position. Using a volt meter, check available voltage at blue wire on wire harness.



- a. If battery voltage reading is obtained, replace control module.
 - b. If zero voltage reading is obtained, replace control module. Turn ignition switch off.
13. When doing this step make sure ignition switch is off. Using an ohm meter, check the resistance at the purple female bullet connector coming from the wire harness.



- a. If zero resistance reading is obtained, replace control module.
 - b. If an open circuit reading is obtained, replace control module.
14. Remove the red wire from (+) terminal. Turn ignition switch to run position, check voltage at positive (+) battery terminal at the coil.



- a. If battery voltage reading is obtained, replace control module.
- b. If zero voltage reading is obtained, check ballast resistor or ignition switch with the normal procedures outlined in a repair book. Turn ignition switch off and connect red wire to (+) battery terminal at the coil.

In the unlikelihood of system failure where replacement components are not readily available, the system may be easily converted to conventional ignition by installing points, condenser and distributor lead or check the following interchange list.

Our request for exemption from the prohibitions of Vehicle Code 27156 covers 1957 to 1974 model year General Motors Corporation and 1963 to 1974 Model year American Motors Corporation equipped with V-8 engines, except vehicles originally equipped with transistorized, C.D., or breakerless ignition systems. Tests show the Acculite System to be compatible with all other emission controlled vehicles.

Joe Hedge

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It is my understanding that the ignition system tested was obtained from A.P.O.'s west coast warehouse inventory. The associated temperature cycling of transport and storage apparently was sufficient to expose the suspected component.

Upon reevaluation of our quality control measures as you requested, I have found no practical way that this particular type of intermittent operation can be detected. Since devices used in our ignition system are tested by the device manufacturers, after circuit assembly, before and after mounting in the housing, and after potting, our production quality is equal to or better than the state of the art.



Mike Allred
Director, Research and Development

MA:cr