

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-60-2
Relating to Exemptions Under Section 27156
of the Vehicle Code

SUPERIOR INDUSTRIES INC.
BREAKERLESS ELECTRONIC IGNITION SYSTEM

Pursuant to the authority vested in the undersigned by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Section 39515 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 has been found not to 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 1976 and older model year vehicles equipped with 12 volt ignition systems. This exemption does not apply to vehicles originally equipped with transistorized, C.D., breakerless ignition systems or dual point ignition systems where one of the points is used to retard timing for emission control.

The device consists of a light emitting diode and photocell sensor, a light beam interrupter, and an electronic control module to replace the points in a Kettering ignition system. The following is a list of companies marketing the device manufactured by Superior Industries, the trade name used by each company and their part numbers.

<u>Trade Name</u>	<u>Marketing Organization</u>	<u>Part Numbers</u>
Acculite Electronic Retrofit Ignition System	APO of America, Inc. 3003 LBJ Freeway, Suite #131 Dallas, Texas 75234	F6-84, F6-34, F8-74, F8-34, C6-23C, C8-23C, C8-32, G6-74C, G8-24, G6-25C, H8-64C, A6-34, A8-34, B4-65, B6-65, D4-74, D6-74, T4-55, T6-55.
P & D Electronic Ignition System	P & D Automotive Products 74 Conalco Drive P. O Box 1767 Jackson, Tenn. 38301	CK-26AC, CK-26A, CK-28AC, CK-28A, CK-16AC, CK-18AC, CK-18ACC, CK-36AC, CK-38A, CK-34AC, CK-48AC, CK-38, CK-54A, CK-56A, CK-64A, CK-66A, CK-74A, CK-76A.

<u>Trade Name</u>	<u>Marketing Organization</u>	<u>Part Numbers</u>
Borg Warner Electronic Ignition System	Automotive Parts Division, Borg Warner Corporation 11405 Gage Avenue Franklin Park, Ill. 60131	E1-4C, E1-4, E1-3C, E1-3, E1-6C, E1-5C, E1-9C, E1-2C, E1-1, C1-7C, E1-8C, E1-9, E1-14, E1-10, E1-11, E1-12, E1-13.
Electronition Solid State Retrofit Ignition System	Superior Industries, Inc. 10797 Harry Hines Blvd. Dallas, Texas 75220	F6-84H, F6-34H, F8-74H, F8-34H, C6-23HC, C8-23HC, C8-32H, G6-74HC, G8-24H, G4-25HC, H8-64HC, A6-34H, A8-34H, B4-65H, B6-65H, D4-74H, D6-74H, T4-55H, T6-55H.
Elightronic Solid State Ignition Conversion System	Essex International, Inc. Electro-Mechanical Division 6233 Concord Avenue Detroit, Michigan 48211	45-104, 45-102, 45-105, 45-103, 45-134, 45-135, 45-136, 45-145, 45-143, 45-146, 45-181, 45-200, 45-201, 45-235, 45-236, 45-240, 45-241.
Silver Beauty MSW Solid State Retrofit Ignition System	Triple-A Specialty Co. 5750 West 51st Street Chicago, Illinois 60638	7201 through 7217.
Micro Start Solid State Retrofit Ignition System	Triple-A Specialty Co. 5750 West 51st Street Chicago, Illinois 60638	57201 through 57217.

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. "ACCULITE ELECTRONIC RETROFIT IGNITION SYSTEM", "P & D ELECTRONIC IGNITION SYSTEM" "BORG WARNER ELECTRONIC IGNITION SYSTEM", "ELECTRONITION SOLID STATE RETROFIT IGNITION SYSTEM", "ELIGHTRONIC SOLID STATE IGNITION CONVERSION SYSTEM", "SILVER BEAUTY MSW SOLID STATE RETROFIT IGNITION SYSTEM", OR "MICRO START SOLID STATE RETROFIT IGNITION SYSTEM".

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.

Section 43644 of the Health and Safety Code provides as follows:

"43644. (a) No person shall install, sell, offer for sale, or advertise, or except in an application to the state board for certification 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 certified by the state 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 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.

Executive Order D-60-1, dated November 13, 1975 is superseded and of no further force and effect.

Executed at Sacramento, California, this 27 day of April, 1976.

Original signed by
Thomas C. Austin
Deputy Executive Officer - Technical

State of California

AIR RESOURCES BOARD

April 9, 1976

Staff Report

(Addendum to Staff Reports Dated August 8, 1975 and October 29, 1976)
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 was issued an Executive Order number D-60-1 on November 13, 1975 which is an exemption from the prohibitions of Motor Vehicle Code Section 27156 for the "Electronition Solid State Retrofit Ignition System" which is also known by other brand names described in Executive Order D-60-1. The exemption was for 1974 and older model year General Motors, American Motors Corporation and Ford Motor Company vehicles equipped with V-8 engines and 12 volt ignition systems. This exemption did not apply to vehicles originally equipped with transistorized, C.D., or breakerless ignition systems.

Superior Industries, Inc. has now applied (Exhibit A) for an extension to their exemption to include all domestic vehicles with eccentric vacuum advance breakerplate distributors, Ford 6 cylinder pivotol concentric vacuum advance breakerplate distributors and all concentric foreign distributors except those with dual point ignition systems where one of the points is used to retard ignition timing for emission control.

The following is a list of companies marketing the device manufactured by Superior Industries, Inc., the trade names used by each company and their part numbers.

<u>Trade Name</u>	<u>Marketing Organization</u>	<u>Part Numbers</u>
Acculite Electronic Retrofit Ignition System	APD of America, Inc. 3003 LBJ Freeway, Suite #131 Dallas, Texas 75234	F6-84, F6-34, F8-74, F8-38, C6-23C, C8-23C, C8-32, G6-74c, G8-24, G6-25c, H8-64c, A6-34, A8-34, B4-65, B6-65, D4-74, D6-74, T4-55, T6-55.
P & D Electronic Ignition System	P & D Automotive Products 74 Conalco Drive P. O. Box 1767 Jackson, Tenn. 38301	CK-26AC, CK-26A, CK-28AC, CK-28A, CK-16AC, CK-18AC, CK-18ACC, CK-36A, CK-38A, CK-34AC, CK-48AC, CK-38, CK-54A, CK-56A, CK-64A, CK-66A, CK-74A, CK-76A.
Borg Warner Electronic Ignition System	Automotive Parts Division Borg Warner Corporation 11405 Gage Avenue Franklin Park, Ill. 60131	E1-4C, E1-4, E1-3C, E1-3, E1-6C, E1-5C, E1-9C, E1-2C, E1-1, E1-7C, E1-8C, E1-9, E1-14, E1-10, E1-11, E1-12, E1-13.
Electronition Solid State Retrofit Ignition System	Superior Industries, Inc. 10797 Harry Hines Blvd. Dallas, Texas 75220	F6-84H, F6-34H, F8-74H, F8-34H, C6-23HC, C8-23HC, C8-32H, G6-74HC, G8-24H, G4-25HC, H8-64HC, A6-34H, A8-34H, B4-65H, B6-65H, D4-74H, D6-74H, T4-55H, T6-55H.

<u>Trade Name</u>	<u>Marketing Organization</u>	<u>Part Numbers</u>
Elightronic Solid State Ignition Conversion System	Essex International, Inc. Electro-Mechanical Division 6233 Concord Avenue Detroit, Michigan 48211	45-104, 45-102, 45-105, 45-103, 45-134, 45-135, 45-136, 45-145, 45-143, 45-146, 45-181, 45-200, 45-201, 45-235, 45-236, 45-240, 45-241.
Silver Beauth MSW Solid State Retrofit Ignition System	Triple-A Specialty Co. 5750 West 51st Street Chicago, Illinois 60638	7201 through 7217.
Micro Start Solid State Retrofit Ignition System	Triple-A Specialty Co. 5750 West 51st Street Chicago, Illinois 60638	57201 through 57217.

II. System Description

The Superior Industries, Inc. electronic ignition system is designed 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 uses transistors instead of points to make and break the primary current to the coil.

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The light beam interrupter of the models submitted is designed with contoured windows to accommodate the vacuum advance characteristics of the various designs of distributor vacuum advance breaker plates without altering the OEM calibration.

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 centrifugal and vacuum advance and electrical characteristics of the unit.

To evaluate the device, the centrifugal and vacuum advance characteristics of ignition systems with and without the device were compared. Other electrical characteristics of the ignition unit were previously evaluated for the exemption granted under Executive Order D-60. Since the applicant has made no changes to the electronic control module, there was no need to repeat the evaluation of the other electrical characteristics with domestic vehicle ignition. Since this application included foreign vehicles electrical characteristics data was submitted for Toyota and Volkswagen vehicles which use a high resistance (3 to 4 ohms) primary ignition coil and no ballast resistor.

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The tests were conducted on an ignition system simulator according to the "Ignition Systems Measurements Procedure" SAE J973a. The comparisons are shown in Tables I, II, III, IV, and V. These results are considered within experimental and test variabilities and is evaluated as meeting the Air Resources Boards criteria of $+0^\circ$ to -4° . The installation of the device will not change the ignition performance characteristics and therefore is not expected to increase emissions.

The benefits claimed by the manufacturer for his device are 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. The staff concurs that this will reduce maintenance required for points within the distributor since the points are eliminated.

The manufacturer has supplied information (Exhibit B) concerning their Quality assurance testing which indicates that the calculated mean time between failures of these devices in their system is in excess of 120,000 hours or around 15 years of continuous operation. The manufacturer also states that in the event of failure or mal-

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function of the device, the engine will cease to operate and therefore will not increase emissions. The staff concurs that failure of the device would make the engine inoperative and not cause an increase in emissions.

IV. Conclusion and Recommendations

Based on the evaluation of the application and the applicants test results, the installation of the Superior Industries Inc. - "Electronition Solid State Retrofit Ignition System" (also known by other brand names) would not adversely affect the operation of the OEM emission control system. The staff recommends that Superior Industries be issued an exemption from the prohibitions of Section 27156 of the Motor Vehicle Code for its "Electronition Solid State Ignition Conversion System" as noted in the introduction.

Table I - Superior Industries, Inc.

Ignition System Data Summary

A. Centrifugal Spark Advance in Crankshaft Degrees

<u>Engine RPM</u>	<u>1974 Datsun - 6 cylinder</u>		<u>1974 Datsun - 4 cylinder</u>	
	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	0	0	0	0
1200	1.2	1.4	0	0
1800	9.0	9.4	4.2	3.0
2400	17.0	15.8	8.0	7.6
3000	22.0	20.2	12.0	11.0
3400	22.4	20.8	16.0	13.0
4000			19.6	17.0

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
3	0	0	0	0
9	0	0	4.2	4.2
12	1.0	1.0	7.8	7.0
15	8.0	8.0	7.8	7.2
20	12.4	12.4	7.8	7.2

Table II - Superior Industries, Inc.

Ignition System Data Summary

A. Centrifugal Spark Advance in Crankshaft Degrees

<u>Engine RPM</u>	<u>Bosch Distributor - 4 cylinder</u>	
	<u>Baseline</u>	<u>Device</u>
600	0	0
1200	6.0	5.0
1800	21.0	20.0
2400	24.5	22.0
3000	29.0	27.0
3400	31.0	28.5
4000	31.0	29.5

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>
3	0	0
9	9.5	7.5
12	11.0	10.0
15	11.0	10.0
20	11.0	10.0

Table III - Superior Industries, Inc.

Ignition System Data Summary

A. Centrifugal Spark Advance in Crankshaft Degrees

Engine RPM	<u>1969 Ford - 6 cylinder</u>		<u>1970 Chrysler - 8 cylinder</u>	
	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	0	0	0	0
1200	0	0	2.0	3.0
1800	6.0	5.0	11.0	11.5
2400	12.5	12.0	14.0	13.0
3000	15.0	14.0	17.0	17.0
3400	16.0	16.0		

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
3	0	0	0	0
9	0	0	3.0	3.0
12	4.5	4.0	11.0	11.0
15	10.0	10.0	18.0	18.0
20	18.5	20.0	19.0	20.0

Table IV - Superior Industries, Inc.

A. Centrifugal Spark Advance in Crankshaft Degrees

Engine RPM	<u>1973 Chevrolet - 6 cylinder</u>		<u>1971 Oldsmobile - 6 cylinder</u>	
	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	0	0	0	0
1200	1.0	1.0	9.5	9.0
1800	9.0	7.0	17.0	15.5
2400	16.0	13.0	23.5	20.0
3000	19.0	15.5	23.5	20.0
3400	21.5	18.0	23.5	20.0

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
3	0	0	0	0
9	9.5	9.0	1.5	2.5
12	20.0	19.5	13.0	14.0
15	26.5	27.0	22.0	22.5
20	27.0	27.0	27.0	29.5

Table V - Superior Industries, Inc.

Ignition System Data Summary

A. Centrifugal Spark Advance in Crankshaft Degrees

Engine RPM	<u>1967 Toyota - 4 cylinder</u>		<u>1973 Volkswagen - 4 cylinder</u>	
	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	0	0	0	0
1200	3.0	3.0	4.0	5.5
1800	10.0	8.0	20.5	20.0
2400	17.0	15.0	24.0	23.0
3000	20.5	19.5	28.0	27.0
3400	22.5	21.0	30.0	29.5
4000	23.0	23.0	30.0	29.5

B. Vacuum Spark Advance in Crankshaft Degrees

<u>Vacuum in. Hg.</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
3	0	0	0	0
9	18.0	17.5	9	8.5
12	22.0	20.5	10	9.5
15	22.0	21.5	10	9.5
20	22.0	21.5	10	9.5

C. Spark Duration in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	1400	1300	1000	1000
4000	930	1000	800	800

D. Secondary Voltage Rise Time in Microseconds

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	40	40	50	50
4000	40	40	50	50

Table V (Continued)

E. Spark Energy in Millijoules

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	19.3	16.4	11.6	11.0
4000	12.8	12.1	8.8	8.4

F. Available Voltage in Killovolts (with load)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	19.0	17.0	19.0	18.0
4000	18.0	15.5	16.5	16.5

G. Available Voltage in Kilovolts (simulating a fouled spark plug)

<u>Engine RPM</u>	<u>Baseline</u>	<u>Device</u>	<u>Baseline</u>	<u>Device</u>
600	16.0	14.5	15.0	15.0
4000	13.5	13.0	13.5	14.0